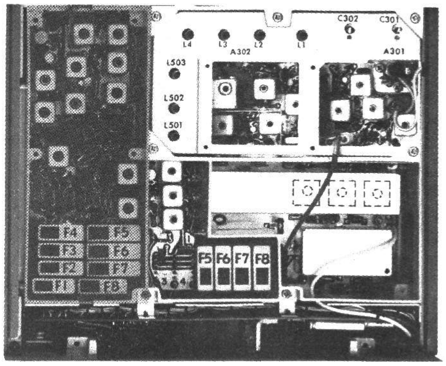
GE MOBILE RADIO

MASTR II
MAINTENANCE MANUAL

30-50 MHz DUAL FRONT END (WITH NOISE BLANKER)
OPTION 9201 (matching IF Freq.)
OPTION 9202 (non-matching IF Freq.)



Maintenance Manual LBI-4795

DF-8411

DUAL FRONT END 30-50 MHz (WITH NOISE BLANKER)

SPECIFICATIONS *

Frequency Range	30 - 50 MHz
Sensitivity	
DFE	
12-dB SINAD (EIA Method)	0.275 µV
20-dB Quieting Method	0.385 µV
Receiver	Sensitivity degraded not more than 1 dB from standard Receiver specifications.
Selectivity	
EIA Two-Signal Method	-100 dB (adjacent channel, 20 kHz Channels)
20-dB Quieting Method	-100 dB at ±15 kHz
Spurious Response	-100 dB
Frequency Stability	
5C-ICOM with EC-ICOM	±0.0005% (-40°C to +70°C)
5C-ICOM or EC-ICOM	±0.0002% (0°C to +55°C)
2C-ICOMS	±0.0002% (-40°C to +70°C)
Modulation Acceptance	±6.5 kHz (narrow-band)
RF Input Impedance	50 ohms
Intermodulation (EIA)	-80 dB
Maximum Frequency Separation	0.8% (42-50 MHz) 0.4% (25-42 MHz)
Current Drain (Typical)	Non-Matching IF's - 100 mA Matching IF-s - 75 mA

These specifications are intended primarily for the use of the serviceman. Refer to the appropriate **Specification Sheet** for the complete specifications.

GENERAL ELECTRIC

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WARNING

Although the highest DC voltage in the radio is supplied by the vehicle battery, high current may be drawn under short circuit conditions. These currents can possibly heat metal objects such as tools, rings, watchbands, etc. enough to cause burns. Be careful when working near energized circuits:

High-level RF energy in the transmitter Power Amplifier assembly can cause RF burns. KEEP AWAY FROM THESE CIRCUITS WHEN THE TRANSMITTER IS ENERGIZED!

ILLUSTRATIONS

COMBINATION NOMENCLATURE

1st Digit	2nd Digit	3rd & 4th Digits	5th Digit
Frequency Capability	Options	Frequency Range	Oscillator Stability
A 1 - Freq.	**N** Noise Blanker	**13** 30 - 36 MHz	**A** ±5 PPM (±0.0005%)
C 2 - Freq.		**23** 36 - 42 MHz	**B** ±2 PPM (±0.0002%)
E 3 - Freq.		**33** 42 - 50 MHz	
F 4 - Freq.			
G 5 - Freq.			
H 6 - Freq.			
J 7 - Freq.			

DESCRIPTION

DUAL FRONT END

MASTR II, 30 to 50 MHz Dual Front Ends (DFEs) are used with MASTR II Receivers to allow wide spaced channel operation, and most cross-band or cross-split combinations. A total of eight frequencies can be accommodated between the DFE and the Receiver Channel.

The DFE consists of the following modules:

- RF Steering Switch
- RF Assembly (standard RF assembly)
- Mixer/IF/Noise Blanker assembly (MIF/NB Board); modified standard MIF/NB assembly
- Oscillator/Multiplier (OSC/MULT); modified standard OCS/MULT assembly
- Mixer/IF Switch board (MIF Switch); used with matching IF frequencies
- Mixer IF Switch/2nd Converter Board (MIF Switch/2nd Converter); used with non-matching IF frequencies

The DFE utilizes the same LEXAN® casting which is employed in a standard Receiver, and is mounted in the hinged lower assembly of "E" Model Combinations. The modules (board assemblies) utilized by the DFE occupy the same positions as those in a standard Receiver, except the MIF Switch or the MIF Switch/2nd Converter board is used in place of the standard IFAS board.

Centralized Metering Jack J2301, located on the MIF Switch or MIF Switch/2nd Converter board, is provided for use with GE Test Set 4EX3A11 or Test Kit 4EX8K12. The Test Set meters the MULT 1 and MULT 2 test points of the OSC/MULT board and the Noise Blanker Test point (J2301-7).

A RF Steering Switch connects the antenna to either the Receiver or the DFE, depending upon the channel selected by the operator. The IF output of the DFE channel and the IF output of the Receiver channel are combined at the input of the Receiver IFAS board. Normally, the IF frequency of the DFE (11.2 MHz) matches that of the Receiver (11.2 MHz), therefore no IF frequency conversion is required (see Figure 1).

In certain instances of cross-band or cross-split combinations the IF frequency of the DFE does not match that of the receiver, therefore, a different MIF Switch board is utilized (MIF Switch/2nd Converter) to convert the IF frequency of the DFE to the frequency required by the IFAS board in the Receiver channel (see Figure 2).

Supply voltages, control functions and metering points are connected from the standard receiver (P903 of the System Board) to the DFE modules by cable harness 19B219980. RF signal connections to and from the RF Steering Switch are made through 50-ohm RF cable assemblies equipped with phono plugs. IF signal connections (W2301 and W2302) are made from the MIF Switch board to the IFAS board of the Receiver channel using 72-ohm coaxial cable. Refer to DFE Interconnection and Cable Routing Diagram for details.

CIRCUIT ANALYSIS

RF STEERING SWITCH

The RF Steering Switch consists of PIN diodes CR1 and CR2, DC switches Q1 through Q3, and associated components (see Figure 3 and Figure 4). Pin diodes CR1 and CR2 are placed in series with the input/output RF paths through the RF Steering Switch. These diodes, when forward biased, establish a low resistance path between input and output of either selected channel (J1 to J2 or J3 to J2) but not both channels simultaneously.

RF from the antenna switch is applied to J2 (ANT) of the RF Steering Switch. When the select line from the DFE OSC/MULT board is a high voltage state (approximately +10V), indicating selection of the Receiver channel (ICOM of selected channel in Receiver), transistors Q1 and Q2 are turned OFF, thus turning Q3 on. With Q3 turned ON, PIN diode CR2 is forward biased through the DC path from the collector of Q3, L2, PIN diode CR2, R6 and L3 to A-. A low resistance RF path is provided from J2 (ANT) through C6, CR2 and C5 to J1 (RX). The antenna is now connected to the Receiver channel with the RF Steering switch offering a very low insertion loss (less than 0.5 dB).

Inductors L1, L2, L3 are RF chokes which provide RF isolation from the DC circuits. The DC Voltage developed across R6 reverse biases PIN diode CR1, increasing its resistance, thus providing a minimum of 30 dB of isolation (typically 33 dB of isolation) between the selected receiver channel and the unselected DFE channel.

When the DFE Channel is selected (ICOM of selected channel in DFE), the select line pulls to a low voltage state (+8.5 V maximum). As a result, Q2 turns ON, turning Q3 OFF. Also, Q1 turns ON, forward biasing PIN diode CR1. The Antenna RF path is then established from J2 (ANT) through C6, CR1, and C4 to J3 (DFE). The DC path from the collector of Q1 is through L1, CR1, R6 and L3 to A-. The voltage developed across R6 reverse biases PIN diode CR2, thus increasing its resistance, and as a result provides RF isolation of the unselected Receiver Channel.

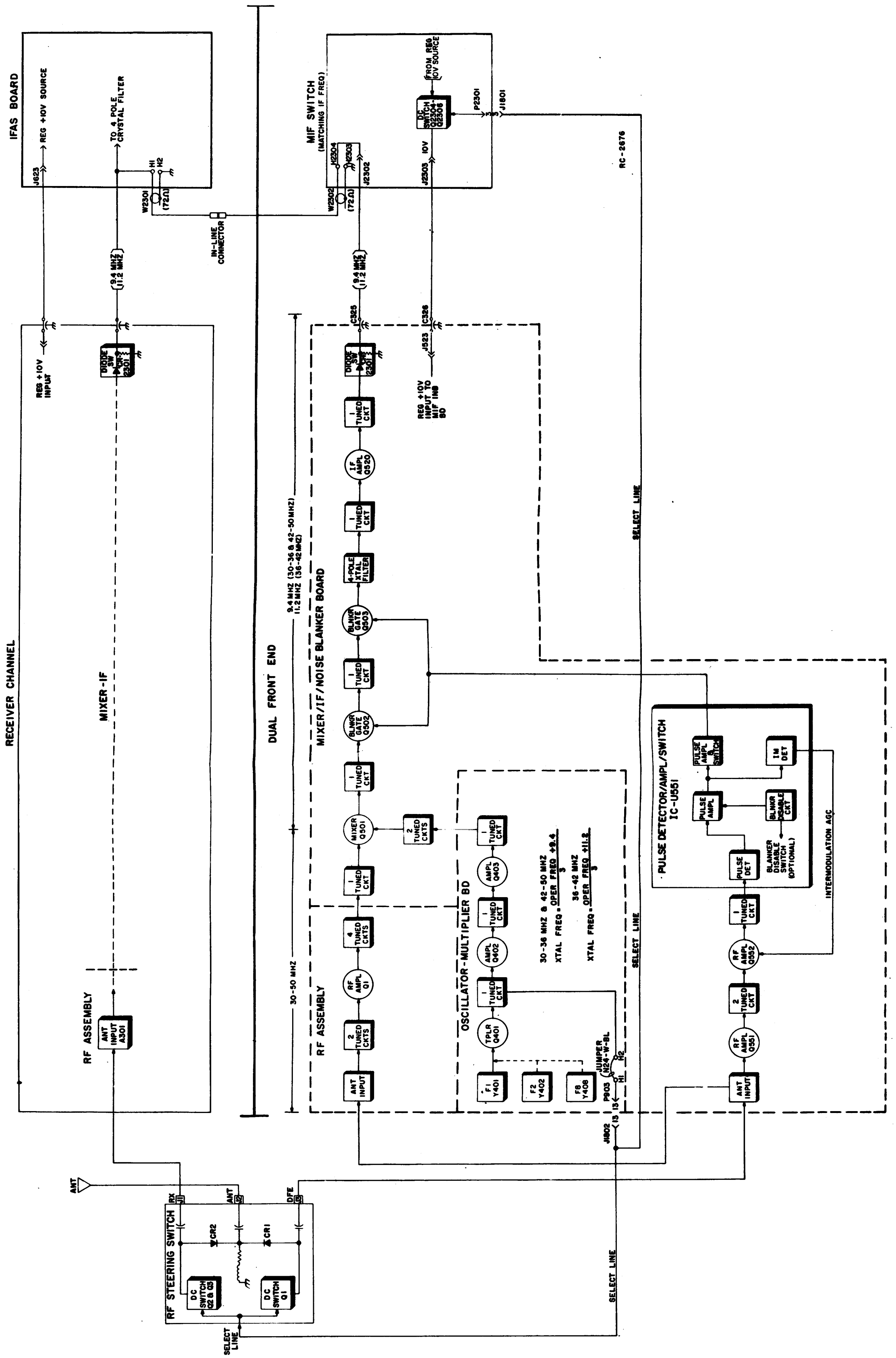


Figure 1 - DFE Block Diagram (Matching IF Frequency)

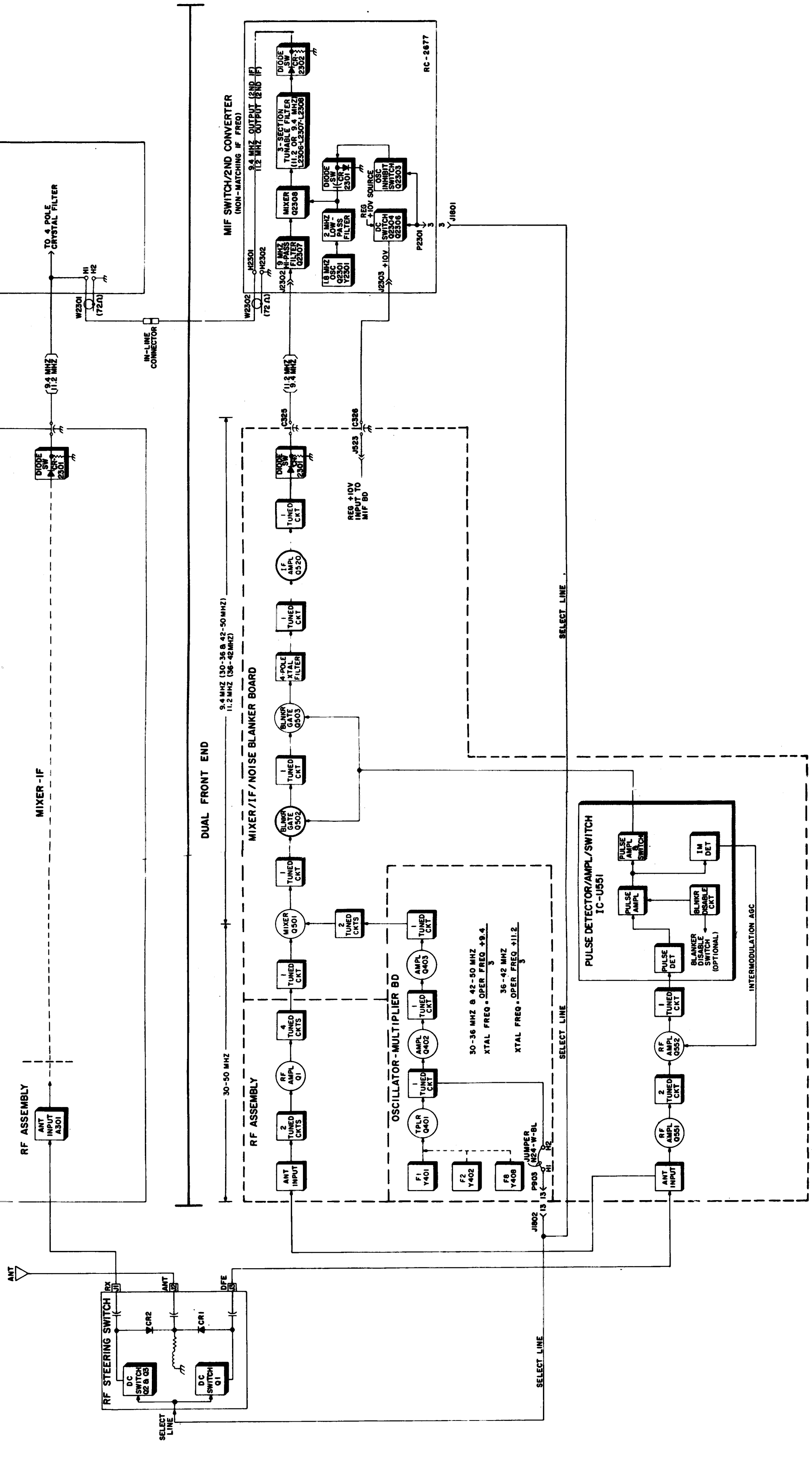
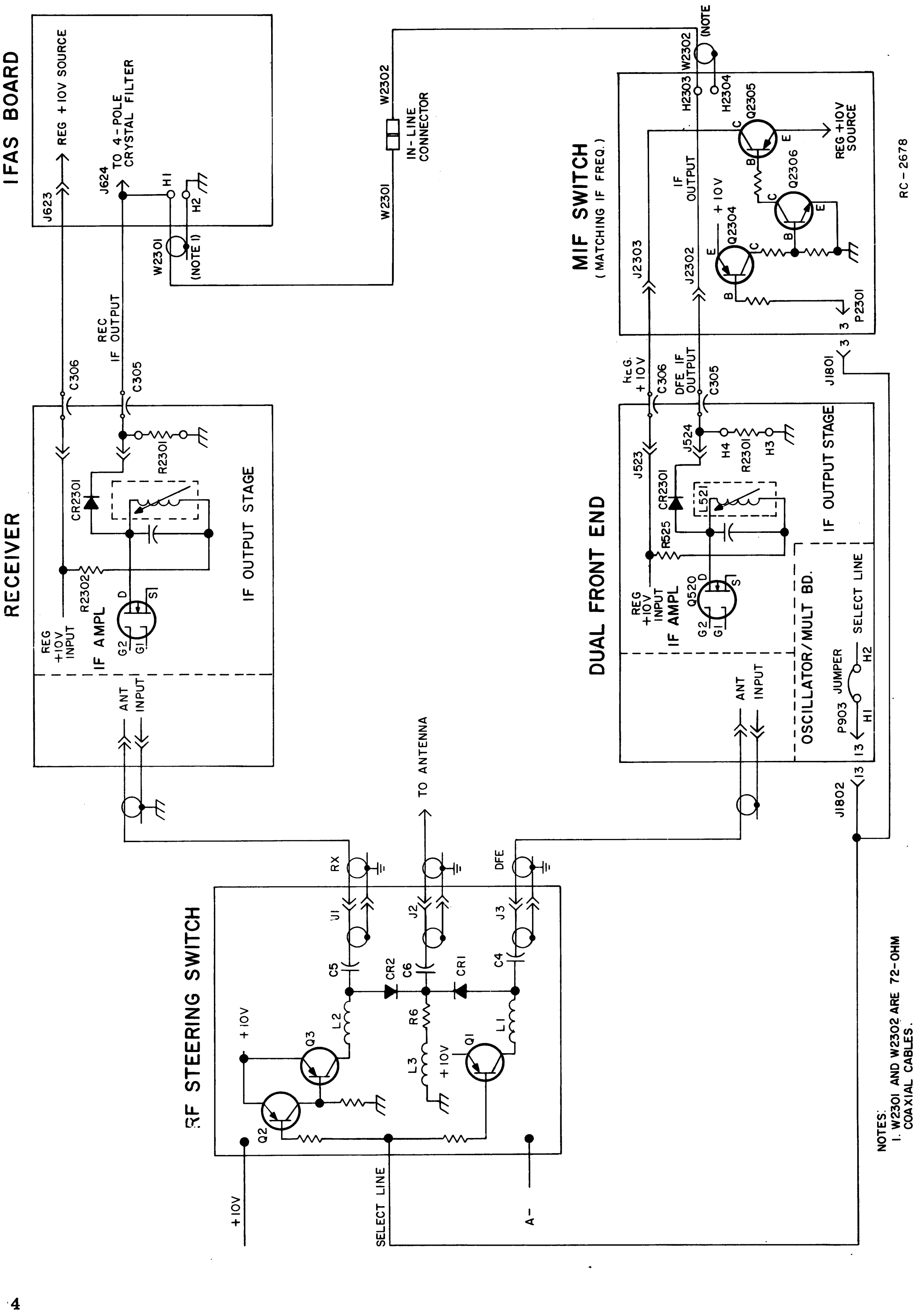


Figure 2 - DFE Block Diagram (Non-matching IF Frequency)



NOTES:
1. W2301 AND W2302 ARE 72-OHM COAXIAL CABLES.

Figure 3 - Antenna and IF Switching (matching IF's)

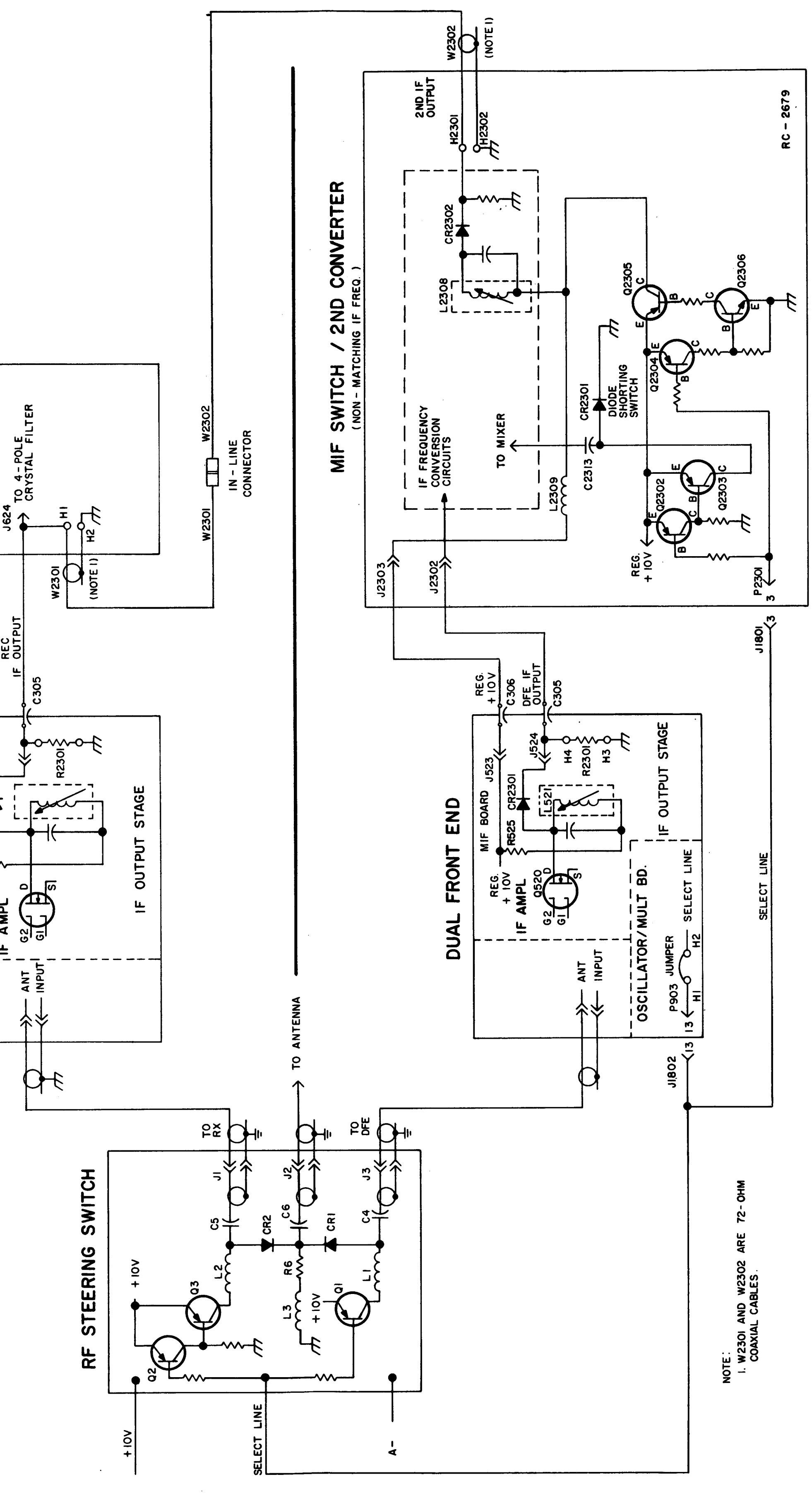


Figure 4 - Antenna and IF Switching (Non-matching IF's)

RF ASSEMBLY

ANTENNA INPUT A301

An RF signal from the RF Steering Switch is applied to the input circuit (J551) of the noise blanker section of the MIF/NB board and is then coupled through RF cable W551/P551 to the Antenna Input A301-J1. The antenna input circuit provides an AC ground between vehicle ground and receiver A-. The output of A301 is coupled through two high-Q helical resonators (L301, C301 and L302, C302) to the RF amplifier. The coils are tuned to the incoming frequency by C301 and C302.

RF AMPLIFIER A302

RF Amplifier Q1 is a Field-Effect Transistor (FET). Q1 operates as a grounded gate amplifier, with the RF input applied to the "source" terminal. This method of operation provides a low impedance input to the amplifier. The amplified output is taken from the "drain" terminal and coupled through four L-C tuned circuits (L1-C7, L2-C8, L3-C9 and L4-C10) to the mixer. The four tuned circuits and the two helical resonators provide the receiver front end selectivity.

Regulated +10V is applied to A302-J2 from J502 of the MIXER-IF board.

OSCILLATOR/MULTIPLIER

The DFE oscillator/multiplier and the Receiver oscillator-multiplier can accommodate a total of eight Integrated Circuit Oscillator Modules (ICOMs) between the two, rather than a total of 8 ICOMs for each unit. The ICOM crystal frequencies range from approximately 14 to 18 megahertz, and the crystal frequency is multiplied nine times and then amplified to provide a low side injection frequency to the mixer.

ICOMS

Three different types of ICOMs are available for use in the Osc/Mult module. Each of the ICOMs contains a crystal controlled colpitts oscillator, and two of the ICOMs contain compensator ICs. The different ICOMs are:

- 5C-ICOM - contains an oscillator and a 5 part-per-million (±0.0005%) compensator IC. Provides compensation for EC-ICOMs.
- EC-ICOM - contains an oscillator only. Requires external compensation from a 5C-ICOM.
- 2C-ICOM - contains an oscillator and a 2 PPM (±0.0002%) compensation IC. Will not provide compensation for an EC-ICOM.

The ICOMs are enclosed in a RF shielded can with the type ICOM (5C-ICOM, EC-ICOM or 2C-ICOM) printed on the top of the can. Access to the oscillator trimmer is obtained by prying up the plastic tab on the top of the can. The tabs can also be used to pull the ICOMs out of the radio.

Frequency selection is accomplished by switching the ICOM keying lead (terminal 6) to A- by means of the frequency selector switch on the control unit. The keying leads for the receiver and the DFE Osc/Mult ICOMs are operated in parallel, therefore ICOMs in the Receiver will not occupy the same positions as those in the DFE.

In the receive mode, +10 Volts is applied to the external ICOM load resistor (R401) by the RX Osc control line, keeping the selected ICOM turned on. Keying the transmitter removes the 10 Volts at R401, turning the ICOM off.

CAUTION

All ICOMs are individually compensated at the factory and cannot be repaired in the field. Any attempt to repair or change an ICOM frequency will void the warranty.

Normally, DFE's do not utilize the external compensation voltage (+5 Volts) supplied from the 10 Volt regulator IC in the standard radio, therefore, in DFE's requiring 5 PPM stability and utilizing EC-ICOMs, at least one 5C-ICOM must be used. The 5C-ICOM is normally used in the DFE's first frequency position. One 5C-ICOM can provide compensation for up to 15 EC-ICOMs. Should the 5C-ICOM's compensator (internal compensation voltage) fail in the open mode the lower compartment external back-up mid-temperature compensation voltage, supplied by resistors R2327 and R2328 on the MIF Switch board, will provide compensation for the EC-ICOMs. If desired, all ICOMs used in the DFE may be 5C-ICOMs. The 2C-ICOMs are self-compensated to 2 PPM and cannot provide compensation for EC-ICOMs.

If a DFE option is utilized with a Wide Spaced Transmitter option in a "E" Model Combination, an external compensation voltage (+5 volts) will be supplied to the 5C-ICOM from the additional 10 volt regulator IC (part of Wide Spaced Transmitter Option). This compensation voltage will surfice as mid-temperature range compensation for the 5C-ICOM, as well as, backup compensation for the EC-ICOMs in case of failure of the 5C-ICOM's compensator circuit. Should failure occur in the 5C-ICOM, the EC-ICOMs will maintain 2 PPM frequency stability from 0°C to +55°C (+32°F to 131°F).

Oscillator Circuit

The quartz crystals used in ICOMs exhibit the traditional "S" curve characteristics of output frequency versus operating temperature.

At both the coldest and the hottest temperatures, the frequency increases with increasing temperature. In the middle temperature range (approximately 0°C to +55°C), frequency decreases with increasing temperature.

Since the rate of change is nearly linear over the mid-temperature range, the output frequency change can be compensated by choosing a parallel compensation capacitor with a temperature coefficient approximately equal and opposite that of the crystal.

Figure 5 shows the typical performance of an uncompensated crystal as well as the typical performance of a crystal which has been matched with a properly chosen compensation capacitor.

At temperatures above and below the mid-range, additional compensation must be introduced. An externally generated compensation voltage is applied to a varactor (voltage-variable capacitor) which is in parallel with the crystal.

The compensation voltage applied to pin 2 of the ICOM establishes the varactor capacity at a constant value over the entire mid-temperature range. With no additional compensation, all of the oscillators will provide 2 PPM frequency stability from 0°C to 55°C (+32°F to 131°F).

Compensator Circuits

Both the 5C-ICOMs and 2C-ICOMs are temperature compensated at both ends of the temperature range to provide instant frequency compensation. An equivalent ICOM is shown in Figure 6.

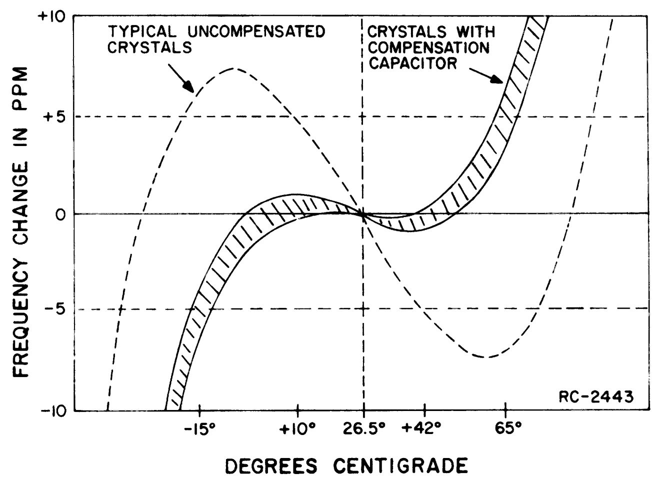


Figure 5 - Typical Crystal Characteristics

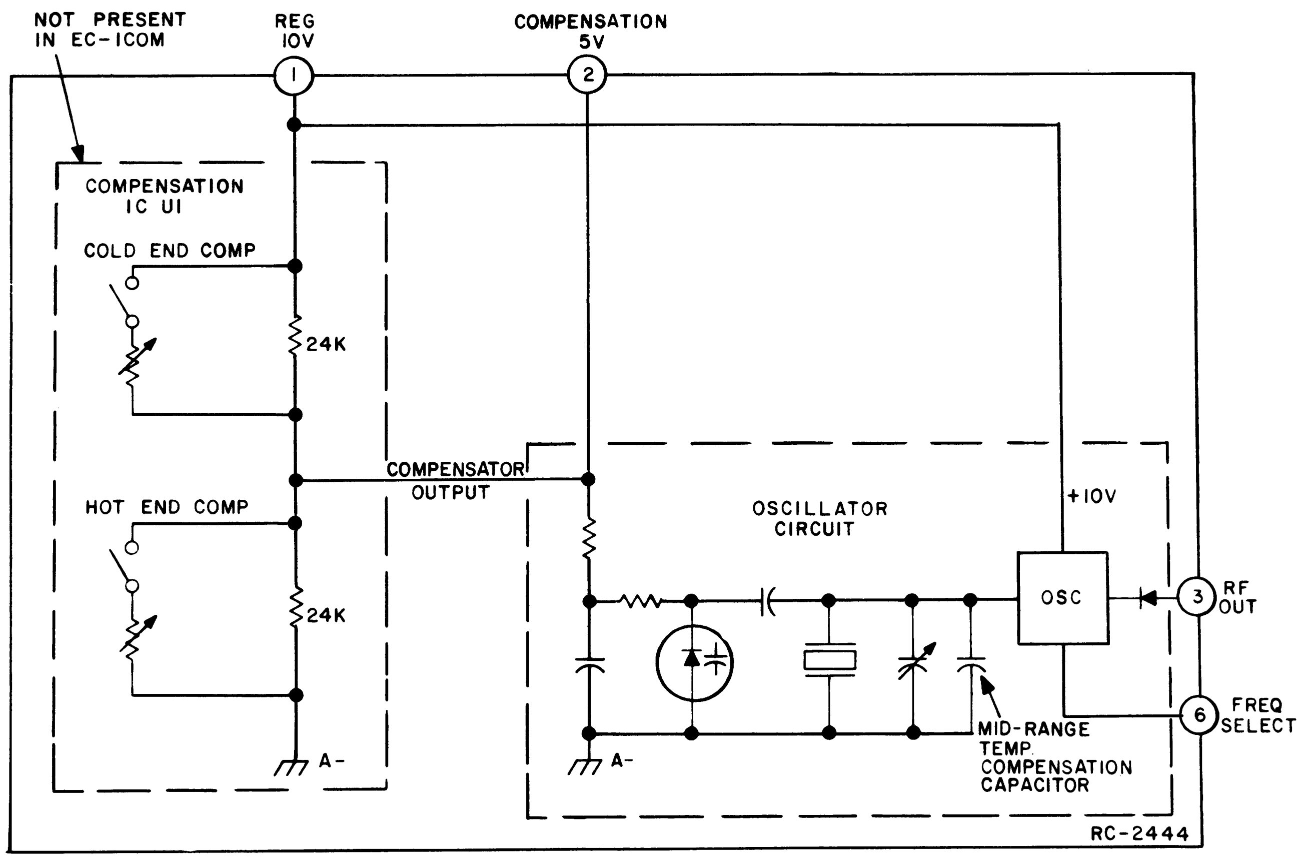


Figure 6 - Equivalent ICOM Circuit

The cold end compensation circuit does not operate at temperatures above 0°C. When the temperature drops below 0°C, the circuit is activated. As the temperature decreases, the equivalent resistance decreases and the compensation voltage increases.

The increase in compensation voltage decreases the capacitance of the varactor in the oscillator, increasing the output frequency of the ICOM.

The hot end compensation circuit does not operate at temperatures below +55°C. When the temperature rises above +55°C, the circuit is activated. As the temperature increases, the equivalent resistance decreases and the compensation voltage decreases. The decrease in compensation voltage increases the capacitance of the varactor, decreasing the output frequency of the ICOM.

Service Note: Proper ICOM operation is dependent on the closely-controlled input voltage from the 10-Volt regulator. Should all of the ICOMs shift off frequency, check the 10-Volt regulator module.

MULTIPLIER & AMPLIFIERS

The output of the selected ICOM is applied to the base of the common emitter, Class C multiplier stage, Q401. The collector tank circuit (L401-C404) is tuned to three times the crystal frequency.

Following the multiplier stages, are two common emitter, Class A amplifier stages, Q402 and Q403. Q402 is metered through R409 at metering jack J2301-3 (MULT-1) on the MIF Switch or MIF Switch/2nd Converter board. Q403 is metered through a metering network (C417, C418, CR401 and R414) at J2301-4 (MULT-2) on the MIF Switch or MIF Switch/2nd Converter Board.

The output of Q403 is coupled through three L-C circuits (L404-C416 on the Osc/ Mult board, and L502-C506 and L503-C508 on the MIF board) to the mixer stage. The three L-C circuits provide the selectivity for the oscillator-multiplier chain.

The select line, which connects from system plug P903-13 to the RF Steering Switch and the MIF Switch or MIF Switch/ 2nd Converter board, senses the selection of a DFE channel by the voltage change at the junction of L401-1 and R2303. During operation of the Receiver channel (DFE not selected) the voltage of R2303 will be in a high state (approximately +10V). When a DFE channel is selected, the voltage at R2303 will drop to a low state (+8.5V maximum).

MIXER/IF/NOISE BLANKER

MIXER & CRYSTAL FILTER

The mixer uses a FET (Q501) as the active device. The FET mixer provides a high input impedance, high power gain, and an output relatively free of harmonics (low in intermodulation products).

In the mixer stage, RF from the RF amplifier stage is coupled through L501 which matches the RF output to the gate of mixer Q501. Injection voltage from the multiplier-selectivity stages is applied to the source of the mixer. The mixer IF output signal is coupled from the drain of Q501 through a tuned circuit (L504 and C511) to the first FET noise blanker gate Q502. The IF signal is then coupled through a tuned circuit (L506 and C517) to the second FET noise blanker gate Q503.

During the presence of impulse noise from the antenna, the noise blanker circuit (IC-U551) provides a positive pulse to the gates of Q502 and Q503 which attenuates the IF signal during the noise pulse period (see noise blanker description for details). This eliminates undesirable noise interference in the received audio without degrading receiver performance.

The mixer IF output signal is then coupled to the input of the four-pole monolithic crystal filter. The highly selective crystal filter (FL501 and F1502) provides the first portion of the receiver IF Selectivity. The output of the crystal filter is coupled through tuned circuit Z502 (L520 and C501) to Gate 1 of IF amplifier Q520.

Service Note: Variable capacitor C521 does not require adjustment when performing normal IF alignment. If the four-pole monolithic crystal filter is replaced, then adjustment of C521 is necessary for optimum IF response.

IF AMPLIFIER

If amplifier Q520 is a dual-gate FET, the crystal filter output is applied to Gate 1 of the amplifier, and the output is taken from the drain. The biasing on Gate 2 and the drain load determines the gain of the stage. The amplifier provides approximately 20 dB of IF gain. The output of Q520 is coupled through a network (L521, C528 and CR2301) to J524. The output of the MIF/NB board is applied to the MIF Switch or MIF Switch/2nd Converter board through feed-through capacitor C305.

Supply voltage for the RF amplifier and MIF/NB board is supplied from the MIF Switch or MIF Switch/2nd Converter board through feed-through capacitor C306.

NOISE BLANKER

An RF signal and noise pulse from the antenna (J551) is fed simultaneously to the Noise Blanker 1st RF Amplifier and the RF Assembly (A302) RF Amplifier. The signal and noise is transformer coupled through L551 to the 1st RF amplifier Q551 (dual-gate FET). The input signal is applied to Gate 1 of the amplifier, and the output is taken from the drain. The biasing of Gate 2 and the drain load determines the gain of the stage. The signal is then coupled through tuned circuits L552/C558 and L553/C560 to the 2nd RF amplifier Q552, which is also a dual-gate FET. The combined gain of Q551 and Q552 is approximately 50 dB.

The amplified signal is coupled through tuned circuit L554/C564 to pulse detector/amplifier/switch IC (U551). IC (U551) is a custom hybrid integrated circuit which contains a pulse detector, pulse amplifier, pulse amplifier/switch, intermodulation detector and a blanker disable switch. The IC functions as a pulse detector and processing circuit for the noise blanker. Regulated 10 VDC, which powers U551, is applied through pin 3. The associated capacitors (C571, C572 and C574) provide emitter decoupling for various stages of the IC.

Pulse Detector

The impulse noise from the RF amplifier is applied to pin 6 of U551 through tuned circuit L554/C564 to the pulse detector. Bias for the detector is established by R563, R564 and CR551. Diode CR551 is normally conducting, thus biasing the pulse detector. A positive pulse applied to the pulse detector causes it to conduct heavily. The output of the detector is a negative going pulse that is relatively free of any RF components. The pulse detector metering point (Blanker Meter) connects from pin 2 of U551, through cable W552 (P553) to connector J2301-pin 7 on the MIF Switch board and serves as a convenient measuring point (J2305) when performing alignment.

Pulse Amplifier and Noise Blanker Disable Switch

The negative pulse output from the pulse detector turns the pulse amplifier ON, producing a positive output pulse. The threshold point of the pulse amplifier and the RF gain of the 1st and 2nd RF amplifier stages (Q551 and Q552) in the noise blanker circuit prevent noise blanking due to any low-level inherent receiver noise.

A noise blanker disable switch provides a means for manually disabling the noise blanker circuits of both the DFE and the Receiver channel (parallel connection). Connecting pin 4 of U551 to A- turns the disable switch ON, which in turn inhibits the pulse amplifier. The blanker disable function is provided at pin 5 of the system plug (P904) for external control.

Pulse Amplifier/Switch

The positive output pulse from the pulse amplifier is fed to the pulse amplifier/switch. This circuit functions as a constant width pulse generator whose output is a positive 6 Volt pulse with a duration of 2 microseconds. This pulse is applied from pin 11 of U551 to the noise blanker gates (Q502 and Q503). Noise blanker gates Q502 and Q503 are turned ON (conducting) during the presence of the noise blanking pulse. These gates present a low impedance RF path to A- for the pulse duration (approximately 3 microseconds), providing approximately 60 dB attenuation of the IF signal and the impulse noise present. As the noise signal from the antenna is applied to the noise blanker circuits, the RF signal is also applied to the receiver RF input. The inherent delay presented to the received RF signal and the impulse noise by the helical resonators in the receiver RF assembly (L301 and L302) and the four tuned circuits (L1/C7 through L4/C10) allows the noise blanking pulse to turn ON the blanking gates, attenuating the received signal just prior to the arrival of the impulse noise.

Intermodulation (IM) Detector

The output of the pulse amplifier is also applied to the IM detector. The IM detector does not respond to noise pulses appearing at its input because of the circuit design utilized, but the detector is activated during the presence of a sinusoidal signal. This sinusoidal signal is the beat frequency difference of two signals present in the noise blanker channel. A resultant AGC voltage (approximately +3 VDC) is developed through the integrating action of C573 and is applied from pin 13 of U551 to the 2nd RF amplifier (Q552) of the noise blanker circuit. This action sufficiently reduces the gain of the noise blanker RF stage (Q552) so that receiver performance is not degraded by blanking pulses which would create receiver intermodulation close to the receiver operating frequency.

MIXER-IF SWITCH (MATCHING IF FREQUENCY)

IF signal from the DFE MIF/NB board is applied to the Mixer-IF Switch board (MIF Switch) through J2302. The IF output of the MIF Switch is applied through W2302 and W2301 to the IFAS board of the Receiver Channel. W2302 and W2301 are 72-ohm coaxial cables.

Transistors Q2304, Q2305 and Q2306 comprise the DC switching circuit which controls the +10 V DC applied to the DFE MIF/NB board.

When the Select Line input at P2301-3 is in a high voltage state (approximately +10 V), indicating selection of the Receiver channel, transistor Q2304 is turned OFF. Turning Q2304 OFF, turns Q2306 OFF, causing pass transistor Q2305 to turn OFF. This action removes regulated +10 V from J2303, thus removing the regulated +10 V applied to the DFE MIF/NB board.

Selecting the DFE channel places the Select Line in a low voltage state (maximum of +8.5 V). Q2304 turns ON, causing Q2306 to turn ON. When Q2306 turns ON, pass transistor Q2305 turns ON, applying regulated +10 V to J2303, thereby applying regulated +10 V to the DFE MIF/NB board.

When the Receiver channel is selected, regulated +10 V is applied to the Receiver MIF board from J623 of the IFAS board (see Figure 4). This +10 V is applied through R2302 and the IF output tuned circuit to PIN diode CR2301. The positive voltage applied to the anode of CR2301 forward biases CR2301, lowering its resistance. This allows the IF output to be coupled into the IFAS board (J624).

The DC voltage that is applied through CR2301 on the Receiver IF board is passed along cable W2301 and W2302, through the MIF Switch (J2302) to the IF output of the DFE MIF/NB board (J521). This voltage reverse biases PIN diode CR2301, increasing its resistance, thereby isolating the DFE from the IFAS board.

When the DFE channel is selected, regulated +10 V is applied to J523 of the DFE MIF/NB board from J2303 of the MIF switch. +10 V is applied through R525 and L521 to the anode of PIN diode CR2301 on the DFE MIF/NB board. The positive voltage forward biases CR2301, lowering its resistance, allowing the IF output to be coupled into the MIF Switch (J2302).

The DC voltage applied through CR2301 is coupled through the MIF Switch (J2302) and is passed along cables W2302 and W2301, through the IFAS board (J624) to the IF output of the Receiver IF board. This positive voltage is then applied to the cathode of PIN diode CR2301 on the Receiver IF board. The positive voltage applied to the anode of CR2301 is slightly lower than that on its cathode (approximately 1 Volt lower), thus reverse biasing CR2301, increasing its resistance. This action provides isolation of the Receiver IF board from the IFAS board, allowing the DFE MIF Switch to operate into the IFAS board.

Metering jack J2301 provides MULT 1 (J2301-3) and MULT 2 (J2301-4) metering points. Jack J2301-5 is the noise blanker metering point.

MIXER-IF SWITCH/2nd CONVERTER (NON-MATCHING IF FREQUENCY)

The Mixer-IF Switch/2nd Converter (MIF Switch/2nd Converter) performs a second conversion of the IF output from the DFE MIF/NB board, and also applied a switched regulated +10 V to the DFE MIF/NB board when the DFE channel is selected. A 1.8 MHz local oscillator signal generated within the MIF Switch, is mixed with the incoming 11.2 MHz IF from the MIF/NB board (see Figure 4). The IF output 11.2 MHz-1.8 MHz = 9.4 MHz or 9.4 MHz + 1.8 MHz = 11.2 MHz from the MIF Switch will now match that of the IFAS board in the Receiver channel. The IF output signal is achieved by proper tuning of the circuits within the MIF Switch/2nd Converter. The MIF Switch/2nd Converter also provides unity gain of the converter output IF signal.

The MIF Switch/2nd Converter board contains a High Pass Filter, a Mixer circuit, a Bandpass Filter, a 1.8 MHz Local Oscillator and Low Pass Filter, a Diode Shorting Switch, a DC Switch and a Regulated +10 V Switch Circuit.

IF AMPLIFIER AND HIGHPASS FILTER

The IF signal from the MIF/NB board enters the MIF Switch/2nd Converter board through J2302. The IF signal is then applied to IF amplifier Q2307. The output from the emitter of Q2307 is coupled to a 9 MHz highpass filter, which consists of C2318 through C2322, and L2304 and L2305. The output of the Highpass Filter is applied to Gate 1 of Mixer Q2308 (dual-gate FET).

1.8 MHz LOCAL OSCILLATOR AND 2 MHz LOWPASS FILTER

The Local Oscillator is comprised of crystal-controlled Colpitts oscillator Y2301 and Q2301. The oscillator operates at a fundamental frequency of 1.8 MHz, with feedback developed across C2304. The output at the collector of Q2301 is coupled to the input of a 2 MHz Lowpass Filter, which is utilized to reduce injection of local oscillator harmonics into the mixer circuit. The Lowpass Filter is comprised of L2301 and L2302, and capacitors C2306 through C2310. The output of the Lowpass Filter is coupled through C2311 to Gate 2 of Mixer Q2308 (mixer injection).

MIXER

The Mixer (Q2308) uses a dual-gate FET as the active device. The mixer injection is applied to Gate 2 of Q2308, and is mixed with the IF signal applied to Gate 1, producing a difference frequency of 9.4 MHz

(11.2 MHz - 1.8 MHz = 9.4 MHz) or 11.2 MHz (9.4 MHz + 1.8 MHz = 11.2 MHz). This 2nd IF frequency is coupled from the drain of Q2308 to a tunable Bandpass Filter consisting of L2306, L2307 and L2308. The Bandpass Filter is tuned to 9.4 MHz or 11.2 MHz, as applicable.

The converter IF output or 2nd IF output from the Bandpass Filter is coupled through PIN diode CR2302 to W2302. W2302 is a 72-ohm coaxial cable equipped with an in-line connector.

DIODE SHORTING SWITCH AND DC SWITCH CIRCUIT

Transistor switches Q2302 and Q2303, and diode CR2301 are utilized as an RF shorting switch which provides a RF path to A- at the mixer injection point (GATE 2 of Q2308) when the DFE channel is not selected, thus providing additional protection against intermodulation interference in the Receiver channel.

When the DFE channel is not selected the select line goes to a high voltage state (approximately +10 V). Q2302 turns OFF and Q2303 turns ON. Diode CR2301 is forward biased by the collector voltage of Q2303. When this occurs an RF short is presented by C2313 and CR2301 to A-.

When the DFE channel is selected, the select line pulls to a low voltage state (+8.5 V maximum). As a result, Q2302 is turned ON and Q2303 is turned OFF, thus removing the RF short from the mixer injection point, allowing the mixer circuit to operate.

REGULATED +10 V SWITCH

The Regulated +10 V Switch is comprised of Q2304, Q2305 and Q2306. Selecting the DFE Channel places the select line in a low voltage state, turning Q2304 ON. When Q2304 turns ON, Q2306 is turned ON by the positive voltage applied to its base. As a result of Q2306 conducting, pass transistor Q2305 is turned ON, thus applying regulated +10 V to its collector. From the collector of Q2305, the regulated +10 V is applied through RF Choke L2309 to J2303, which is the DC connection point for powering the DFE MIF/NB board.

The switched +10 V on the collector of Q2305 is applied through L2308 to the anode of PIN diode CR2302, forward biasing CR2302 and lowering its resistance. This allows the converted (2nd IF signal) to be coupled to the Receiver IFAS board through cables W2302 and W2301. This same DC voltage is also applied to the IF output of the Receiver MIF board, reverse biasing PIN diode CR2301. The positive voltage applied to the anode of CR2301 on the Receiver IF board is slightly lower than that on its cathode (approximately 1 V lower), thus reverse biasing CR2301, increasing its resistance. This action provides isolation of the Receiver channel from the IFAS board.

If the DFE channel is not selected, then the select line will be in a high voltage state, turning Q2304 OFF, which in turn allows the base of Q2306 to return to near A-, turning Q2306 OFF. When Q2306 is turned OFF, Q2305 is also turned OFF, removing Regulated +10 V from the DFE MIF/NB board.

Regulated +10 V is applied to the Receiver IF board from J623 of the IFAS board when the Receiver channel is selected. This +10 V is applied through R2302 and the IF tuned circuit to PIN diode CR2301. The positive voltage applied to the anode of CR2301 forward biases CR2301 lowering its resistance. The IF output from the Receiver IF board is coupled into the IFAS board through J624.

The DC voltage applied through CR2301 on the Receiver IF board is passed along cable W2301 and W2302 to the cathode of CR2302 on the MIF Switch/2nd Converter board. This voltage reverse biases PIN diode CR2302, increasing its resistance, thereby isolating the DFE from the IFAS board.

Metering jack J2301 provides MULT 1 (J2301-3) and MULT 2 (J2301-4) metering points. Jack J2301 also provides the noise blanker metering point (J2301-5).

RECEIVER MODIFICATIONS

The following modification is required in the MASTR II (25 to 50 MHz) Receiver whenever the Receiver is used with a Dual Front End Option. The necessary parts required are supplied in Modification Kit 19A129750G1. Modified Units are identified by a RED dot located in the area of the unit assembly number.

MODIFICATION TO MIXER/IF/NOISE BLANKER BOARD 19D416562 STANDARD RECEIVER

1. Replace R525 (47-ohm) with R2302 (330-ohm).
2. Replace C529 with CR2301 (PIN diode).
3. Add R2301 (22 K-ohm) between holes H3 and H4.

MODIFICATION TO IFAS BOARD 19D416610 DUAL FRONT END

1. Connect 72-ohm coaxial cable (equipped with an in-line connector) to holes H1 (center conductor) and H2 (shield).

To adapt a standard Receiver to operate as a Dual Front End, the following modification must be performed. All necessary parts required are supplied in Modification Kit 19A129750G2. Units should be identified as containing this modification by placing a RED dot near the unit assembly number after performing the modification.

MODIFICATION TO MIXER/IF/NOISE BLANKER BOARD 19D416562 DUAL FRONT END

1. Replace C529 (0.001 µf) with CR2301 (PIN Diode).
2. Add R2301 (22 K-ohm) between holes H3 and H4.

MODIFICATION TO OSCILLATOR-MULTIPLIER BOARD 19D416610 DUAL FRONT END

1. Add jumper (N24-W-BL) between holes H1 and H2.
2. Replace R404 (100-ohms) with R2303 (510-ohms).

MAINTENANCE

DISASSEMBLY

To service the DFE:

1. Pull the locking handle down and pull the radio out of the mounting frame, and turn the radio over.
2. Loosen the two bottom cover retaining screws and remove the bottom cover. All major modules and tuning adjustments in the DFE are now accessible for servicing.
3. To service the bottom of the DFE, loosen the screw in the retaining latch and slide the latch open. The bottom section will now swing open.
4. Removal of modules or board assemblies from the DFE are essentially the same as for a standard Receiver. Refer to removal procedures in standard Receiver Maintanance Manuals for details.

FRONT END ALIGNMENT

EQUIPMENT REQUIRED

1. GE Test Set Models 4EX3A11, 4EX8K12, or 20,000 ohms-per-Volt Multimeter with a 1-Volt scale.
2. A 25-50 MHz signal source. Connect a one-inch piece of insulated wire no larger than .065-inch diameter to generator output probe.

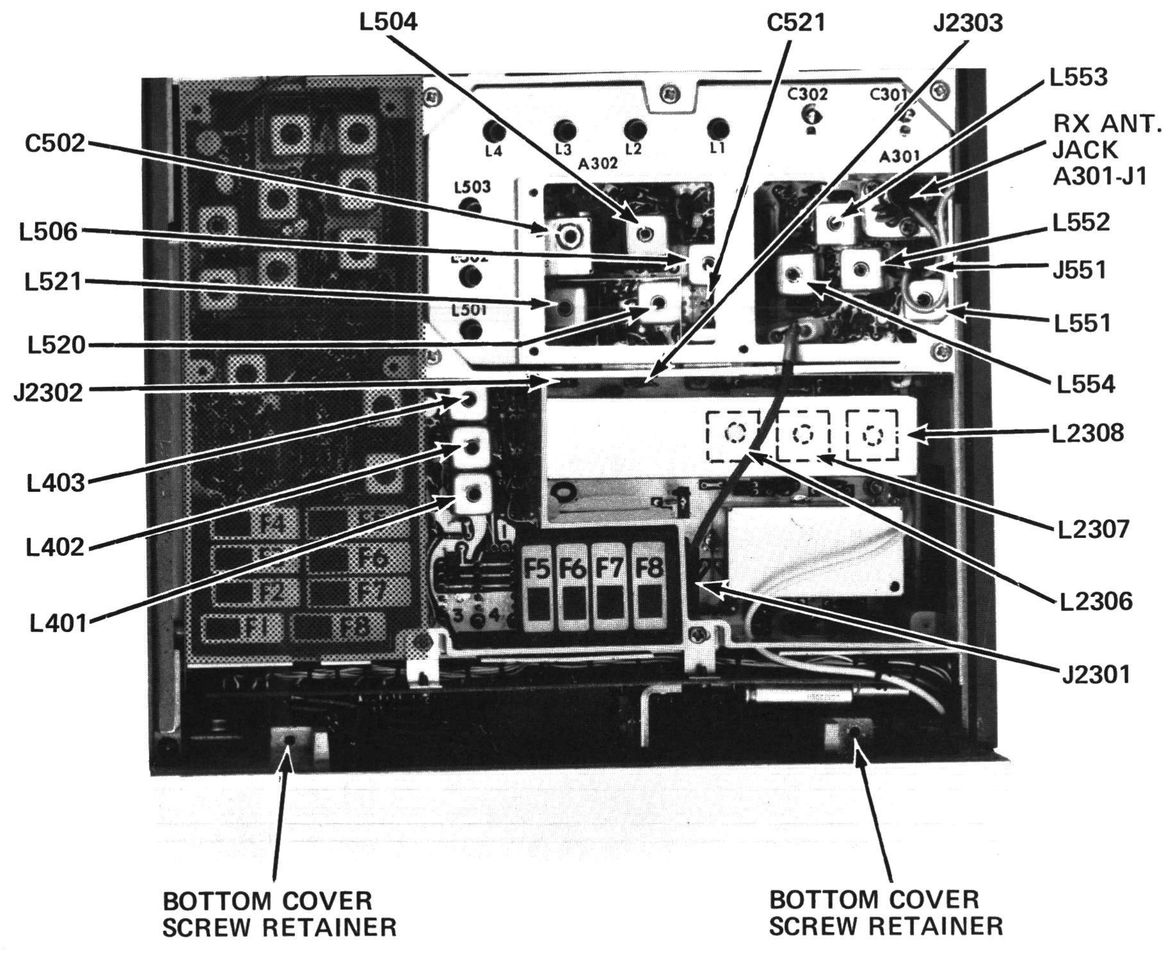
PRELIMINARY CHECKS AND ADJUSTMENTS

1. Connect black plug from Test Set to Centralized Metering Jack J2301, and red plug to system board metering jack J905. Set meter sensitivity switch to the TEST 1 position (or 1-Volt position on 4EX8K12). Select the desired DFE channel for alignment.
2. In radios with three or more frequencies, align the DFE on the channel nearest the center frequency.
3. With Test Set in Position J, check for regulated +10 Volts. If using Multimeter, measure between J905-3 (+) and J905-9 (-).
4. If using Multimeter, connect the negative lead to J2301-9 (A-).
5. Disable Channel Guard.

ALIGNMENT PROCEDURE

STEP	METERING POSITION GE Test Set	METERING POSITION Multimeter - at J2301-9	TUNING CONTROL	METER READING	PROCEDURE
			OSCILLATOR/MULTIPLIER		
1.	C (MULT-1)	Pin 3	L401, L402 & L403	See Procedure	Tune L401 for maximum meter reading, and L402 for a dip in meter reading. Adjust L403 to a position similar to that of L401 and L402.
2.	D (MULT-2)	Pin 4	L401, L402, L403, L404, (on Osc/Mult) and L502, L503 (on RF Asm)	See Procedure	Tune L404 for maximum meter reading, then tune L401, L402, L403 and L404 for maximum meter reading. Next, tune L502 for a dip in meter reading, and L503 for maximum meter reading.

STEP	METERING POSITION GE Test Set	METERING POSITION Multimeter - at J601-9	TUNING CONTROL	METER READING	PROCEDURE
			RF AMPLIFIER & SELECTIVITY		
3.	A (DISC)	Pin 2		Zero	Connect Test Set to J601 on IFAS Board of Receiver. Apply an on-frequency signal adjacent to L4 of DFE. Adjust the signal generator for discriminator zero.
4.	B (IF AMP)	Pin 1	L4	Maximum	Apply the signal as in Step 3 and tune L4 for maximum meter reading.
5.	B (IF AMP)	Pin 1	L4, L3	Maximum	Apply an on-frequency signal adjacent to L2 keeping the signal below saturation. Then tune L4 and L3 for maximum meter reading.
6.	B (IF AMP)	Pin 1	L1, L2, L3, L4, C301, C302 and L502	Maximum	Apply an on-frequency signal to DFE antenna jack A301-J1, keeping the signal below saturation. Then tune L1, L2, L3, L4, C301, C302 and C502 for maximum meter reading.
7.	B (IF AMP)	Pin 1	L502, L4, L3, L2 L1, C301 and C302	See Procedure	Apply an on-frequency signal as in Step 6 and slightly tune C502, L4, L3, L2, L1, C301 and C302 for best quieting sensitivity.



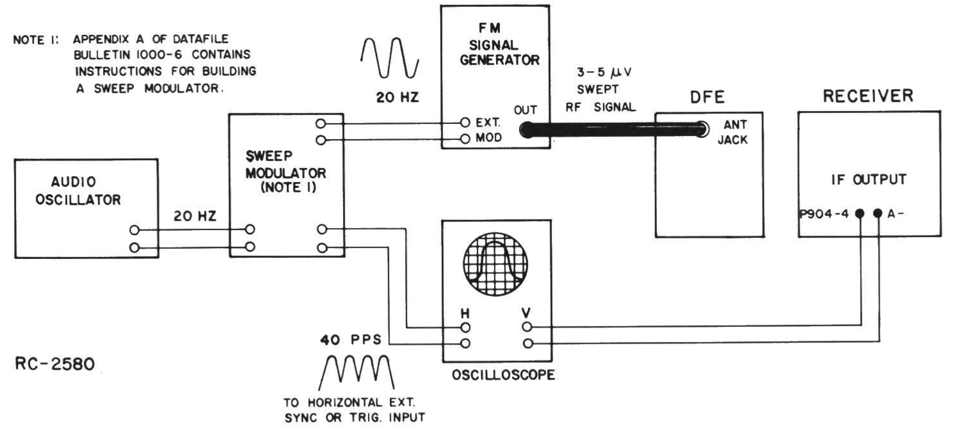


Figure 7 - Test Setup for 20-Hz Double-Trace Sweep Alignment

ICOM FREQUENCY ADJUSTMENT

First, check the frequency to determine if any adjustment is required. The frequency measurement requires equipment with an absolute accuracy which is 5 to 10 times better than the tolerance to be maintained. When performing frequency measurement, the entire radio should be as near as possible to an ambient temperature of 26.5°C (79.8°F).

MASTR II ICOMs should be reset only when the measured frequency error exceed the following limits:

A. ±0.5 PPM, when the radio is at 26.5°C (79.8°F).

B. ±2 PPM at any other temperature within the range -5°C to +55°C (+23°F to +131°F).

C. The specifications limits (±2PPM or +5 PPM) at any temperature within the ranges -40°C to -5°C (-40°F to +23°F) or +55°C to +70°C (+131°F to +158°F).

If frequency adjustment is required, lift up the cover on the top of the ICOM to expose the adjustment trimmer. Depending upon the type of frequency measuring equipment that is available, any of the following procedures may be used:

A. DIRECT MEASUREMENT IN THE INJECTION CHAIN

1. WITH A FREQUENCY COUNTER. "Count" the frequency at the junction of C415 and C417 on the Oscillator/Multiplier Board. The frequency measured at this point is 3 times the ICOM frequency. NOTE: The output from the ICOM itself is not sufficiently sinusoidal for reliable operation with most frequency counters.
2. WITH A COMMUNICATION MONITOR (for example: Cushman Model CE-3). "Monitor" frequency at the junction of C413 and C417 on the Oscillator/Multiplier Board. The frequency monitored at this point is 3 times the ICOM frequency. NOTE: This frequency will not always fall within an available measuring range of all monitors at all receiver operating frequencies.

B. STANDARD "ON FREQUENCY" SIGNAL AT THE RECEIVER INPUT (Generated from a COMMUNICATION MONITOR, for example: Cushman Model CE-3).

1. WITH A FREQUENCY COUNTER. "Count" the developed IF frequency at the junction of C612 and L603 on the IFAS board. The deviation from the nominal IF frequency (11.2 MHz) in Hz is compared to the receiver operating frequency (also in Hz) to calculate error in PPM.
2. WITH AN 11.2 MHZ IF FREQUENCY STANDARD (for example: General Electric Model 4EX9A10). Loosely couple the IF frequency standard to the IF signal path to create a heterodyne with the developed IF frequency. The resultant "beat frequency" can be monitored by either of the following methods:

NOTE

To Set ICOM frequency using "beat frequency" method, the temperature should be at 26.5°C (79.8°F). If the temperature is not 26.5°C, then offset the "ON FREQUENCY" signal (at the receivers input), as a function of actual temperature, by the frequency ERROR FACTOR (in PPM) shown in Figure 8.

a. Audible "beat frequency" from the receiver speaker (this requires careful frequency adjustment of the frequency standard).

b. Observe "beat frequency" at P904-4 with an Oscilloscope.

c. With GE TEST SET (Meter Position B) connected to J601 on the IFAS Board, visually observe the "beat frequency" indicated by meter movement.

The frequency of the "beat" is the frequency error, related to the IF frequency. This deviation, in Hz, is compared to the receiver operating frequency, also in Hz, to calculate the error in PPM.

NOTE

The Discriminator DC output (Meter Position A of the Test Set) is provided for routine test and measurement only. The limited resolution available (0.025 V per kHz as measured with GE Test Set in Meter Position A, or 0.1 V per kHz as measured with a VTVM at P904-3 or J601-2 on the IFAS board) is inadequate for oscillator frequency setting.

If the radio is at an ambient temperature of 26.5°C (79.8°F), set the oscillator for the correct mixer frequency (ICOM FREQ. X 3).

If the radio is not at an ambient temperature of 26.5°C, setting errors can be minimized as follows:

A. To hold setting error to ±0.6 PPM (which is considered reasonable for 5 PPM ICOMS):

1. Maintain the radio at 26.5°C (±5°C) and set the oscillator to required mixer injection frequency, or
2. Maintain the radio at 26.5°C (±10°C) and offset the oscillator, as a function actual temperature, by the frequency error factor shown in Figure 8.

B. To hold setting error to ±0.35 PPM (which is considered reasonable for 2 PPM ICOMS): Maintain the unit at 26.5°C (±5°C) and offset the oscillator, as a function of actual temperature, by the frequency error factor shown in Figure 8.

For example: Assume the ambient temperature of the radio is 18.5°C (65.4°F). At that temperature, the curve shows a correction factor of 0.3 PPM. (At 25 MHz, 1 PPM is 25 Hz. At 50 MHz, 1 PPM is 50 Hz).

With a mixer injection frequency of 50 MHz, adjust the oscillator for a corrected mixer injection frequency 15 Hz (0.3 x 50 Hz) higher. If a negative correction factor is obtained (at temperatures above 26.5°C), set the oscillator for the indicated PPM lower than the calculated mixer injection frequency.

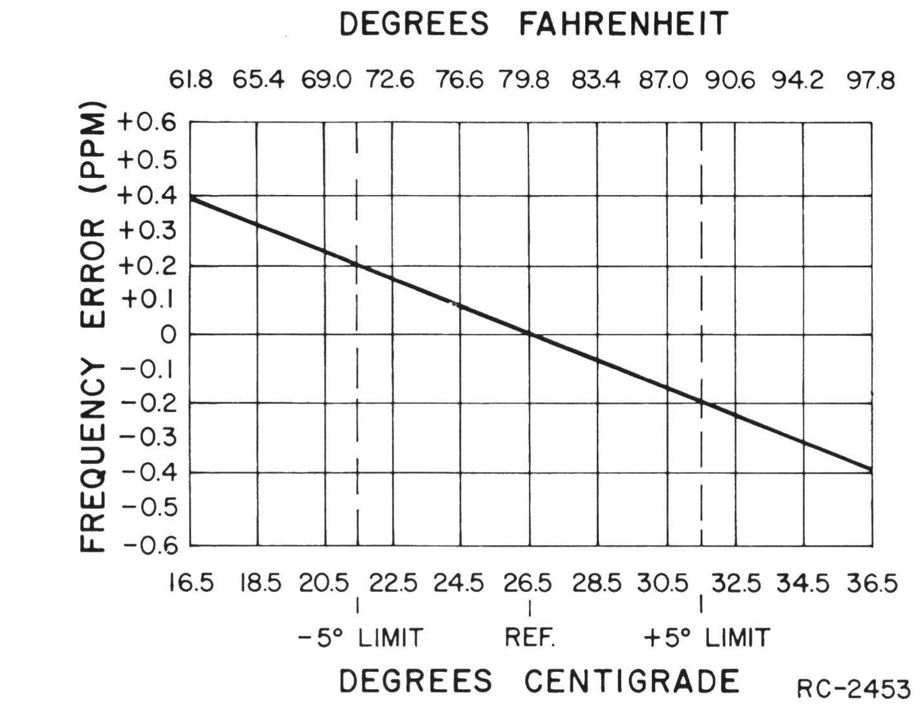


Figure 8 - Frequency Characteristics Vs. Temperature

COMPLETE DFE ALIGNMENT

EQUIPMENT REQUIRED

1. GE Test Models 4EX3A11, 4EX8K12 (or 20,000 ohms-per-Volt Multimeter with a 1-Volt scale.
2. A 9.4 MHz signal source for 30-36 and 42-50 MHz DFE's or 11.2 MHz signal source for 25-30 and 36-42 MHz DFE's (GE Test Set Model 4EX9A10). Also a 25-50 MHz signal source (measurements 803) with a one-inch piece of insulated wire no larger than .065 inch diameter connected to generator probe.
3. A VTVM.

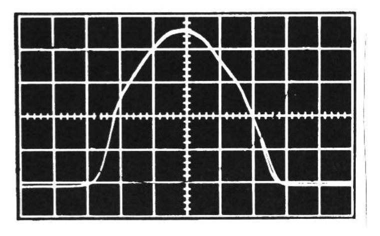
PRELIMINARY CHECKS AND ADJUSTMENTS

1. Connect the black plug from the Test Set to DFE metering jack J2301 and the red plug to system board metering jack J905. Set the meter sensitivity switch to the Test 1 (or 1-Volt position on the 4EX8K12). Select desired DFE channel for operation.
2. In DFE with three or more frequencies, align the DFE on the channel nearest the center frequency.
3. With the Test Set in Position J, check for regulated +10 Volts. With multimeter, measure from J905-3 to J905-9.
4. If using Multimeter, connect the negative lead to J2301-9 (A-).
5. Disable the Channel Guard.

ALIGNMENT PROCEDURE

STEP	METERING POSITION GE Test Set	METERING POSITION Multimeter - at J2301-9	TUNING CONTROL	METER READING	PROCEDURE
			OSCILLATOR/MULTIPLIER		
1.	C (MULT 1)	Pin 3	L401, L402 & L403	See Procedure	Tune L401 for maximum meter reading, and L402 for a dip in meter reading. Then adjust L403 to a position similar to that of L401 and L402.
2.	D (MULT 2)	Pin 4	L401, L402, L403, L404, (On Osc/Mult) and L502, L503 (On RF Asm)	See Procedure	Tune L404 for maximum meter reading, then re-tune L401, L402, L403 and L404 for maximum meter reading. Next, tune L502 for a dip in meter reading, and L503 for maximum meter reading. Carefully re-tune L401, L402, L403, L404, and L503 for maximum meter reading.

STEP	METERING POSITION GE Test Set	METERING POSITION Multimeter - at J601-9	TUNING CONTROL	METER READING	PROCEDURE
			RF AMP & SELECTIVITY		
3.	A (DISC)	Pin 2		Zero	Connect black plug from Test Set to Receiver metering jack J601 on IFAS board. Apply an on-frequency signal adjacent to L4-Adjust the signal generator for discriminator zero.
4.	B (IF AMP)	Pin 1	L4	Maximum	Apply the signal as in Step 3 and tune L4 for maximum meter reading.
5.	B (IF AMP)	Pin 1	L4, L3	Maximum	Apply an on-frequency signal adjacent to L2 keeping the signal below saturation. Then tune L4 and L3 for maximum meter reading.
6.	B (IF AMP)	Pin 1	L1, L2, L3, L4 C301, C302 and C502	Maximum	Apply an on-frequency signal to DFE antenna jack A301-J1, keeping the signal below saturation. Then tune L1, L2, L3, L4, C301, C302 and C502 for maximum meter reading.
7.	B (IF AMP)	Pin 1	C502, L4, L3, L2 L1, C301 and C302	See Procedure	Apply an on-frequency signal as in Step 6 and slightly tune C502, L4, L3, L2, L1, C301 and C302 for best quieting sensitivity.
			NOISE BLANKER		
8.	F (BLANKER)	J2301- Pin 7	L554, L553, L552 and L551	Maximum	Connect the Black Plug of the Test Set to DFE Metering Jack J2301. Set generator output to maximum. Connect generator to DFE antenna jack J551 and adjust generator frequency in accordance with the following table: DFE Operating Frequency — Align Noise Blanker to: 30-36 MHz — 40 MHz 36-42 MHz — 33 MHz 42-50 MHz — 38 MHz Tune L554, L553, L552 and L551 (Bottom slug of T551) in the order given, reducing the generator output as necessary to keep the noise blanker metering point out of saturation. NOTE In some instances the noise blanker circuit may be tuned to a specific frequency in order to minimize interference. The noise blanker must never be tuned closer than 2 MHz to the operating frequency of the DFE.
9.	F (BLANKER)	J2301- Pin 7		Greater than 0.1V VDC	Apply a 1000-microvolt signal on blanker frequency to antenna jack J551. The meter reading should be greater than 0.07 VDC.

STEP	METERING POSITION GE Test Set	METERING POSITION Multimeter - J601-9	TUNING CONTROL	METER READING	PROCEDURE
			MIXER & IF		
	The mixer and IF circuits have been aligned at the factory and will normally require no further adjustment. If adjustment is necessary, use the procedure outlined in STEPS 10, 11, and 12. NOTE Refer to DATAFILE BULLETIN 1000-6 (IF Alignment of Two-Way Radio FM Receivers) for helpful suggestions on how to determine when IF Alignment is required.				
10.			L504, L520, L521, and C521 		MATCHING IF FREQUENCY Connect scope, signal generator, and probe as shown in Figure 7. Set signal generator level for 3 to 5 µV and modulate with 10 kHz at 20 Hz. Select a DFE Channel and adjust signal generator for on frequency signal. With probe between P904-4 (or J601-1) and A-, tune L504, L520, L521 and C521 for double trace as shown on scope pattern.
11.			L504, L520, L521 and C521		NON-MATCHING IF FREQUENCY Connect scope, signal generator and probe as shown in Figure 7. Select a DFE channel and adjust signal generator for on frequency signal. Set generator level for 3 to 5 µV and modulate with 10 kHz at 20 Hz. With probe between P904-4 (or J601-1) and A-, tune L504, L520, L521 and C521 for best double trace as shown on scope pattern (STEP 10).
12.			L521, L2306, L2307 and L2308		With tuning slugs of L2306, L2307 and L2308 pre-set to bottom of coils (nearest printed wire board), tune L2306, L2307, and L2308 for maximum noise as indicated on scope. Then tune L2306 and L2307 for maximum IF response. Next, tune L521 and L2308 for optimum IF response as indicated on scope pattern (STEP 10).

ALIGNMENT PROCEDURE

30—50 MHz MASTR II
DUAL FRONT END (WITH NOISE BLANKER)

TEST PROCEDURES

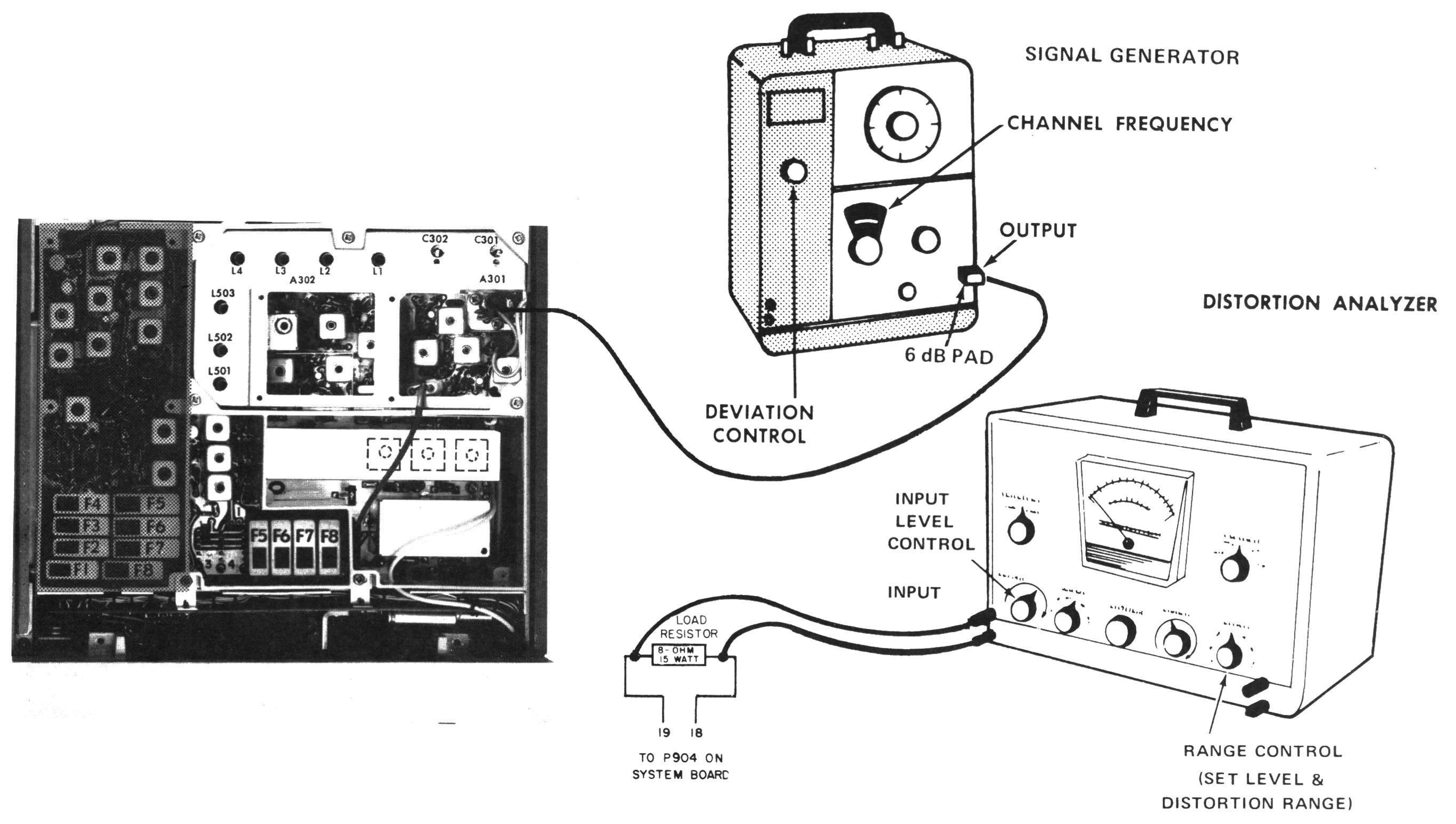
These test procedures are designed to help you to service a receiver that is operating --- but not properly. A typical problem encountered could be poor sensitivity. Any problems relating to audio distortion, low audio, poor limiter operation or squelch trouble should be localized using the standard receiver channel since the IFAS board is common to both the Receiver and DFE. Refer to appropriate Receiver Maintenance Manual for servicing procedures. After the defective stage is pin-pointed, refer to the "Service Check" listed to correct the problem. Additional corrective measures are included in the Troubleshooting Procedure. Before starting with the DFE Test Procedures, be sure the DFE is tuned and aligned to the proper operating frequency.

TEST EQUIPMENT REQUIRED

- Distortion Analyzer similar to: Heath IM-12
- Signal Generator similar to: Measurements 803
- 6-dB attenuation pad, and 8.0-ohm, 15-Watt resistor

PRELIMINARY ADJUSTMENTS

1. Connect the test equipment to the receiver and DFE as shown for all steps of the DFE Test Procedure.
2. Turn the SQUELCH control fully clockwise for all steps of the Test Procedure.
3. Turn on all of the equipment and let it warm up for 20 minutes.



STEP 1
AUDIO POWER OUTPUT AND DISTORTION

TEST PROCEDURE

Measure DFE sensitivity as follows:

A. Apply a 1000-microvolt, on-frequency signal modulated by 1000 Hz with 3.0-kHz deviation to A301-J1.

B. With 15-Watt Speaker:

Disconnect speaker lead pin from Systems Plug P701-11 (on rear of Control Unit).

Connect an 8.0-ohm, 15-Watt load resistor from P904-19 to P904-18 or from P701-4 to P701-17 (SPEAKER Hi) on the System Plug. Connect the Distortion Analyzer input across the resistor.

OR

With Handset:

Lift the handset off of the hookswitch. Connect the Distortion Analyzer input from P904-19 to P904-18.

C. Adjust the VOLUME control for 12-Watt output (9.8 VRVMS) using the Distortion Analyzer as a VTVM.

D. Place the RANGE switch on the Distortion Analyzer in the 200 to 2000-Hz distortion range position (1000-Hz filter in the circuit). Tune the filter for minimum reading or null on the lowest possible scale (100%, 30%, etc.)

E. Place the RANGE switch to the SET LEVEL position (filter out of the circuit) and adjust the input LEVEL control for a +2 dB reading on a mid range (30%).

F. While reducing the signal generator output, switch the RANGE control from SET LEVEL to the distortion range until a 12-dB difference (+2 dB to -10 dB) is obtained between the SET LEVEL and distortion range positions (filter out and filter in).

G. The 12-dB difference (Signal plus noise and distortion to noise plus distortion radio) is the "usable" sensitivity level. The sensitivity should be less than rated 12 dB SINAD specifications with an audio output of at least 6.0 Watts (6.9 Volts RMS across the 8.0-ohm receiver load using the Distortion Analyzer as a VTVM).

H. Leave all controls as they are and all equipment connected if the Modulation Acceptance Bandwidth test is to be performed.

SERVICE CHECK

If the sensitivity level is more than rated 12 dB SINAD, check the alignment of the RF stages as directed in the Alignment Procedure, and make the gain measurements as shown on the Troubleshooting Procedure.

STEP 2
MODULATION ACCEPTANCE BANDWIDTH (IF BANDWIDTH)

If STEP 1 checks out properly, measure the IF bandswith as follows:

A. Set the Signal Generator output for twice the microvolt reading obtained in the 12-dB SINAD measurement.

B. Set the RANGE control on the Distortion Analyzer in the SET LEVEL position (1000-Hz filter out of the circuit), and adjust the input LEVEL control for a +2 dB reading on the 30% range.

C. While increasing the deviation of the Signal Generator, switch the RANGE control from SET LEVEL to distortion range until a 12-dB difference is obtained between the SET LEVEL and distortion range readings (from +2 dB to -10 dB).

D. The deviation control reading for the 12-dB difference is the Modulation Acceptance Bandwidth of the receiver. It should be more than ±6.5 kHz.

SERVICE CHECK

If the Modulation Acceptance Bandwidth test does not indicate the proper width, make gain measurements as shown on the DFE Troubelshooting Procedure.

TROUBLESHOOTING PROCEDURE

Before starting the Noise Blanker troubleshooting procedure, make sure the DFE is operating properly. Align the Noise Blanker circuits as described for the ALIGNMENT PROCEDURE. Perform the following checks:

STEP 1—PERFORMANCE CHECK

Equipment Required:

1. RF Signal Generator coupled through a 6 dB pad.
2. Pulse Generator with repetition rate and level controls (Similar to General Electric Model 4EX4A10).
3. T-Connector.
4. AC VTVM or Distortion Analyzer.
5. Oscilloscope.

Procedure:

Noise Blanker Threshold Sensitivity

1. Connect Pulse Generator and RF Signal Generator to DFE antenna jack (J551) through a T-Connector, and connect AC VTVM to audio output of the Receiver Channel (Speaker LO, P904-18, Speaker HI, P904-19) as shown in Figure 1.
2. Apply an unmodulated RF signal and check the 20 dB quieting sensitivity of the DFE. (Measure with Model 4EX4A10 Pulse Generator connected but turned OFF.) Then adjust the RF level for an additional 10 dB on the signal generator.
3. Set the pulse generator (Model 4EX4A10) for 10 kHz continuous pulses. Slowly increase the pulse output level, degrading the quieting level as measured on the AC VTVM. Prior to the sudden drop in quieting, the degradation should not exceed 20 dB quieting. The noise blanking pulse may be observed where indicated on the Troubleshooting block diagram.

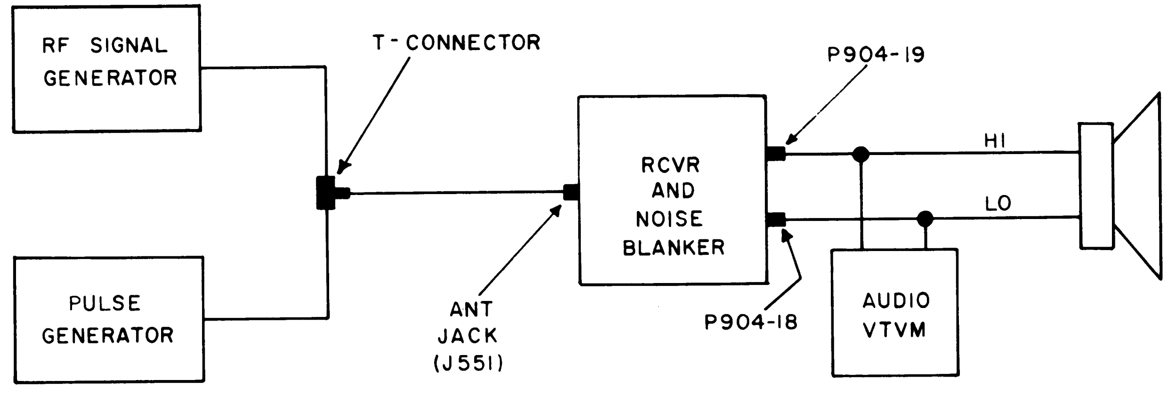


Figure 1 - Equipment Connection Diagram

IF Attenuation

1. Disable the noise blanker by connecting J2304 on IFAS module or pin 5 of P2301 to A-. (Use noise blanker disable switch on Control Unit if present).
2. Measure the 20 dB quieting sensitivity as in Step 2 of Threshold sensitivity measurement.
3. Adjust the RF output of the signal generator for 50 dB greater RF level than that established for 20 dB quieting sensitivity.
4. Adjust the pulse generator (Model 4EX4A10) for a repetition rate up to 40 kHz. Adjust the pulse level until the receiver is degraded to 20 dB quieting.
5. Remove the noise blanker disabling jumper from J2304 (or if noise blanker disable switch is provided, place to operate position), and then adjust the signal generator RF level for 20 dB quieting. The receiver sensitivity should restore to within 5 dB of 20 dB quieting level obtained in Step 2.

STEP 2—QUICK CHECKS

Equipment Required:

1. RF Voltmeter (similar to Boonton Model 91-CA or Millivac type MU-18C).
2. RF Signal Generator
3. AC VTVM or Distortion Analyzer

SYMPTOMS	PROCEDURE
NO Blanking	Check voltage ratios (STEP 3)
Partial or no Blanking	a. Check IF attenuation of Noise Blanker Gates as follows: Connect signal generator to antenna jack (J551). Adjust the signal generator for on frequency signal and output level for 20 dB quieting sensitivity (Level A). Connect +10 VDC directly to the gates of Q502 and Q503. Increase the RF output level to achieve 20 dB quieting (Level B). The difference between "Level A" and "Level B" must be 60 dB or greater.
Intermodulation Interference (AGC action)	b. Check gain of Noise blanker RF circuit (IM/AGC ACTION) as follows: Connect signal generator to antenna Jack (J551). Adjust the frequency of the signal generator to the noise blanker channel frequency and adjust the RF level for 100 microvolts (see Alignment Procedure, Step 8 for frequencies). Measure RF signal level at pin 6 of U551. This level should be 31 millivolts or greater. Apply +10 VDC through a 270 ohm resistor to the source pin of Q552 (or pin 13 of U551). (This applies approximately +3 VDC bias to Q552, simulating intermodulation AGC voltage). The RF voltage measured at pin 6 of U551 should be approximately 1 millivolt (Corresponds to approx. 30 dB decrease of gain in RF amplifier Q552).

STEP 3—VOLTAGE RATIO READINGS →

Equipment Required:

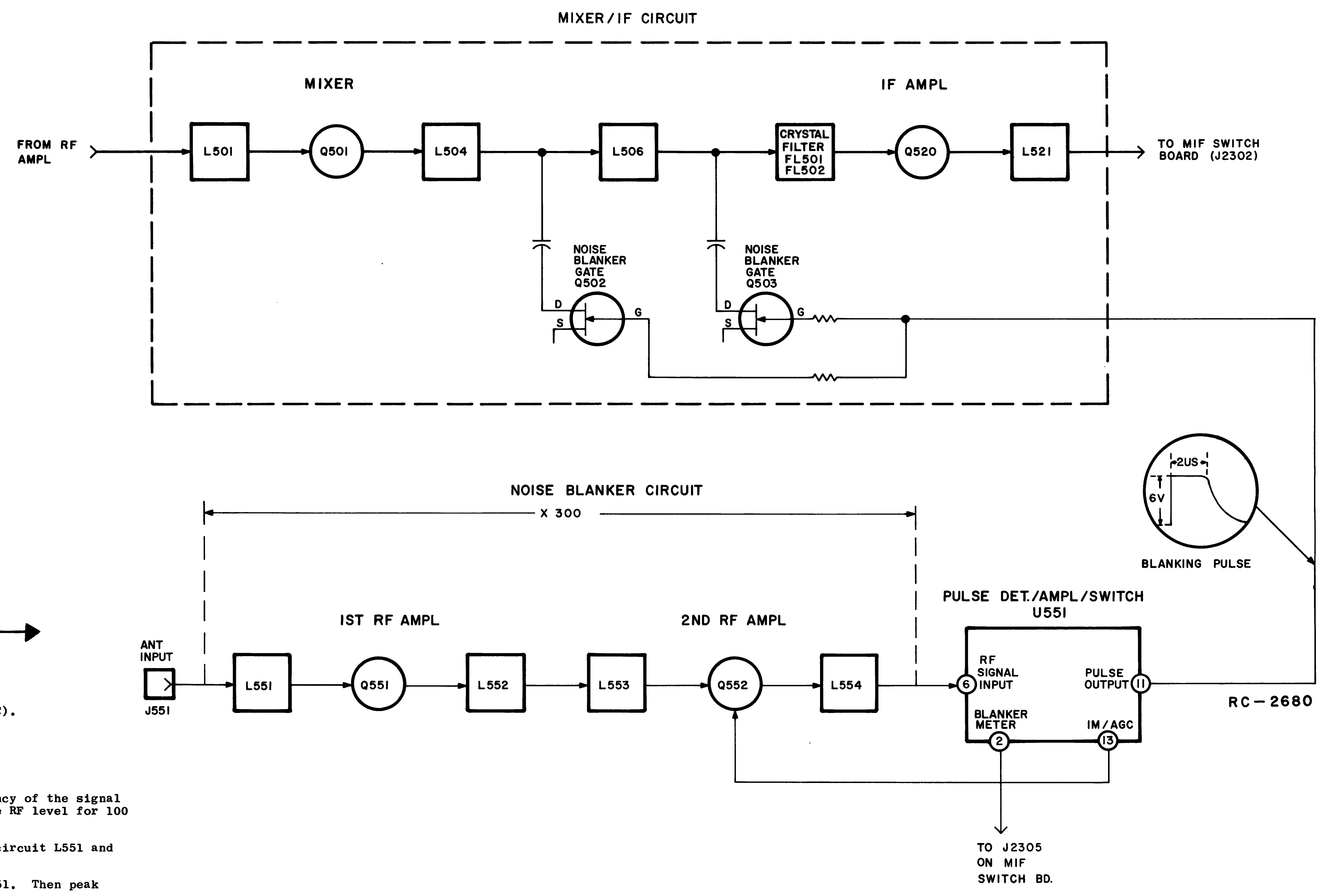
1. RF Voltmeter (Similar to Boonton Model 91-CA or Millivac Type MV-18C).
2. Signal generator.

Procedure:

1. Connect signal generator to Antenna Jack (J551). Adjust the frequency of the signal generator to the channel frequency of the noise blanker. Adjust the RF level for 100 microvolts output.
2. Apply probe of RF Voltmeter to Antenna Jack (J551). Peak resonant circuit L551 and take voltage reading (E_1).
3. Move probe to input of IC-U551 (Pin 6). Repeak resonant circuit L551. Then peak resonant L554 and take reading (E_2).
4. Convert reading by means of the following formula:

$$\text{Voltage Radio} = \frac{E_2}{E_1}$$

5. Check results with the typical voltage ratio shown on diagram.



TROUBLESHOOTING PROCEDURE

NOISE BLANKER CIRCUIT
FOR 30—50 MHz RECEIVER

STEP 1 - QUICK CHECKS

TEST SET CHECKS

These checks are typical voltage readings measured with GE Test Set Model 4EX3A11 in the Test 1 position, or Model 4EX8K12 in the 1-Volt position.

Metering Position	Reading With No Signal In
C (MULT-1)	0.4 VDC
D (MULT-2)	0.6 VDC
J (Reg. +10 Volts at System Metering jack)	+10 VDC

SYMPTOM CHECKS

SYMPTOM	PROCEDURE
NO SUPPLY VOLTAGE	• Check power connections and continuity of supply leads, and check fuse in power supply. If fuse is blown, check DFE and receiver for short circuits.
NO REGULATED 10-VOLTS	• Check the 12-Volt supply. Then check 10-Volt regulator circuit. (See Receiver Troubleshooting Procedure for 10-Volt Regulator).
LOW OSCILLATOR/MULTIPLIER READINGS	• Check alignment of Oscillator/Multiplier chain. (Refer to Front End Alignment Procedure). • Check voltage readings of Oscillator/Multiplier chain (Q401, Q402, Q403).
LOW SENSITIVITY	• Check Front End Alignment. (Refer to DFE Alignment Procedure). • Check antenna connections, cable, antenna switch, and RF Steering Switch Connections. • Check Oscillator injection voltage. • Check voltage readings of Mixer and IF amp. • Make SIMPLIFIED GAIN CHECKS (STEP 2).

STEP 3-VOLTAGE RATIO READINGS →

EQUIPMENT REQUIRED

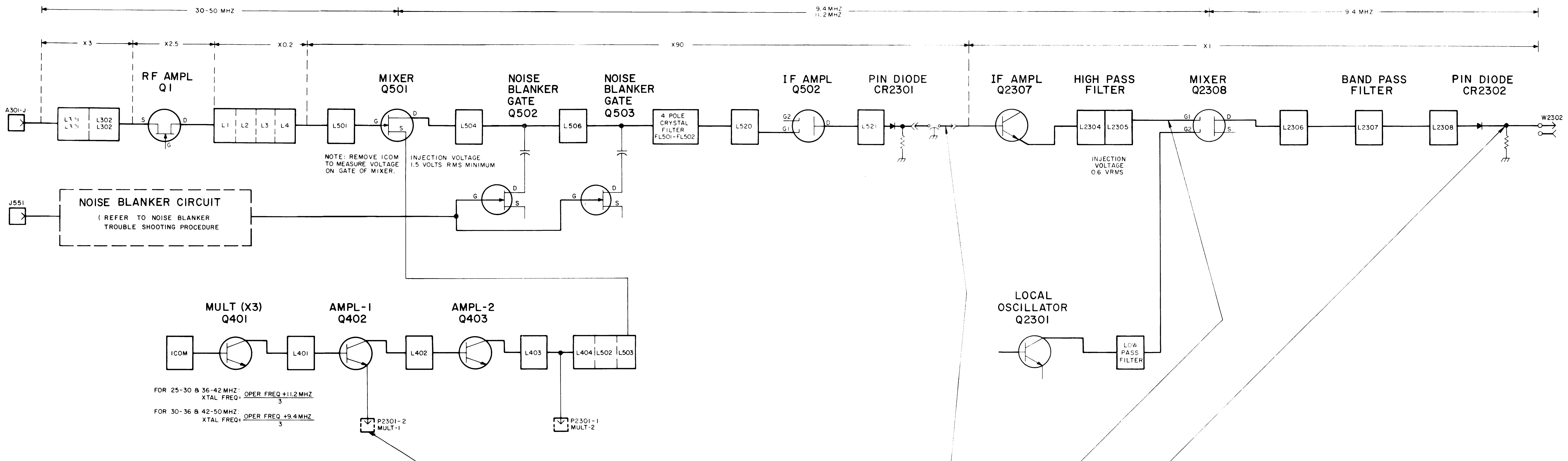
1. RF VOLTMETER (SIMILAR TO BOONTON MODEL 91-CA OR MILLIVAC TYPE MV-18C.
2. SIGNAL ON RECEIVER FREQUENCY (BELOW SATURATION). CORRECT FREQUENCY CAN BE DETERMINED BY ZEROING THE DISCRIMINATOR.

PROCEDURE:

1. APPLY PROBE TO INPUT OF STAGE (FOR EXAMPLE, SOURCE OF RF AMP). PEAK RESONANT CIRCUIT OF STAGE BEING MEASURED AND TAKE VOLTAGE READING (E_1).
2. MOVE PROBE TO INPUT OF FOLLOWING STAGE (MIXER). REPEAK FIRST RESONANT CIRCUIT THEN PEAK CIRCUIT BEING MEASURED AND TAKE READING (E_2).
3. CONVERT READINGS BY MEANS OF THE FOLLOWING FORMULA.

   $$\text{VOLTAGE RATIO} = \frac{E_2}{E_1}$$

4. CHECK RESULTS WITH TYPICAL VOLTAGE RATIOS SHOWN ON DIAGRAM.



STEP 2-SIMPLIFIED GAIN CHECKS →

EQUIPMENT REQUIRED:

1. VTVM - AC & DC
2. SIGNAL GENERATOR (MEASUREMENTS 803 OR EQUIVALENT).
3. R F VOLTMETER

PRELIMINARY STEPS:

1. SET VOLUME CONTROL FOR 9.8 VOLTS ACROSS 8.0-OHM LOAD. IF THIS CANNOT BE OBTAINED, SET TO APPROX. 70% OF MAX. ROTATION.
2. SET SQUELCH CONTROL FULLY COUNTERCLOCKWISE.
3. RECEIVER SHOULD BE PROPERLY ALIGNED.
4. CONNECT METER BETWEEN A- AND POINTS INDICATED BY ARROW.

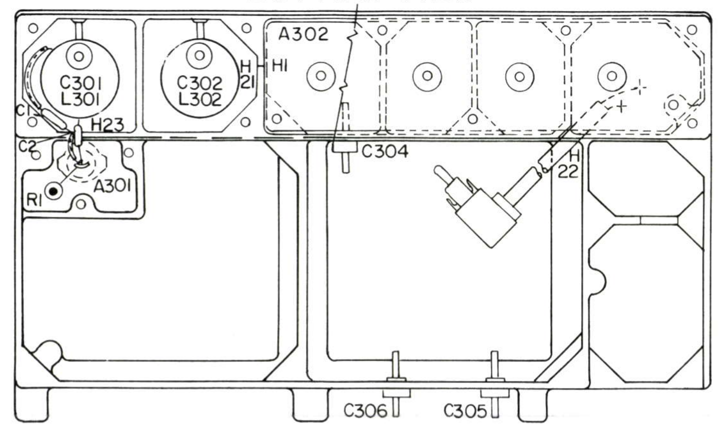
SIGNAL GENERATOR INPUT AT A301-J1 MAINTAIN SETTING AT DISCRIMINATOR ZERO			UNMODULATED	UNMODULATED	UNMODULATED
PROCEDURE			SET GENERATOR OUTPUT AT 1000 MICROVOLTS	SET GENERATOR OUTPUT AT 1000 MICROVOLTS	SET GENERATOR OUTPUT AT 1000 MICROVOLTS
READING	VTVM READING SHOULD BE APPROX 0.3 VDC	VTVM READING SHOULD BE APPROX 0.4 VDC	RF VOLTMETER READING SHOULD BE APPROX 200 MILLIVOLTS	RF VOLTMETER READING SHOULD BE 170 MILLIVOLTS	RF VOLTMETER READING SHOULD BE 200 MILLIVOLTS

RC-2681

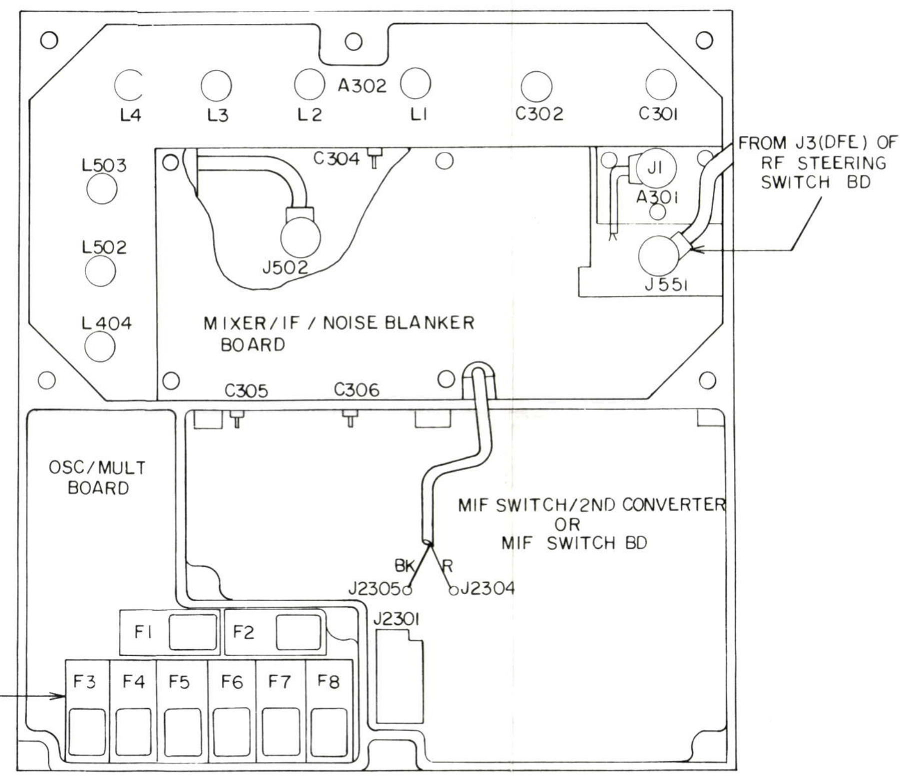
TROUBLESHOOTING PROCEDURE

30—50 MHz DUAL FRONT END WITH NOISE BLANKER

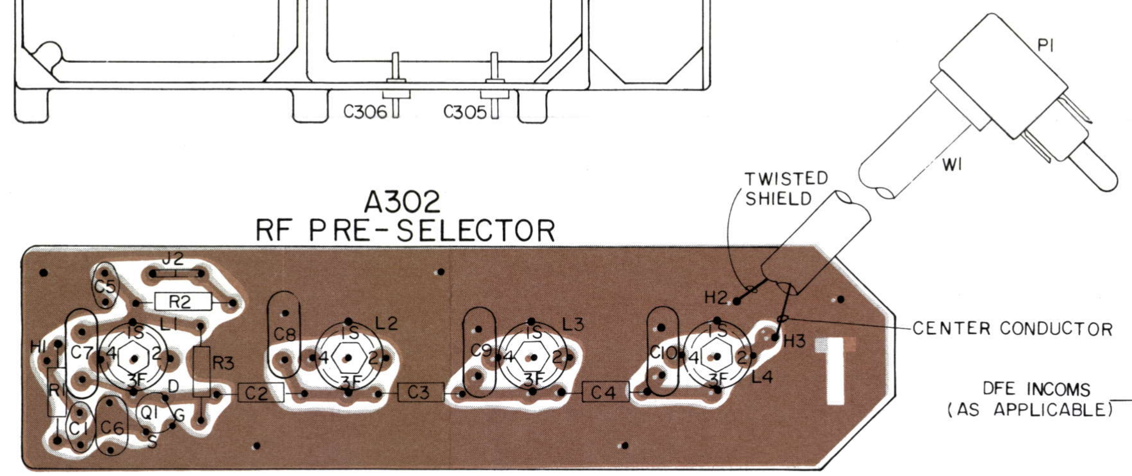
RF ASSEMBLY
BOTTOM VIEW



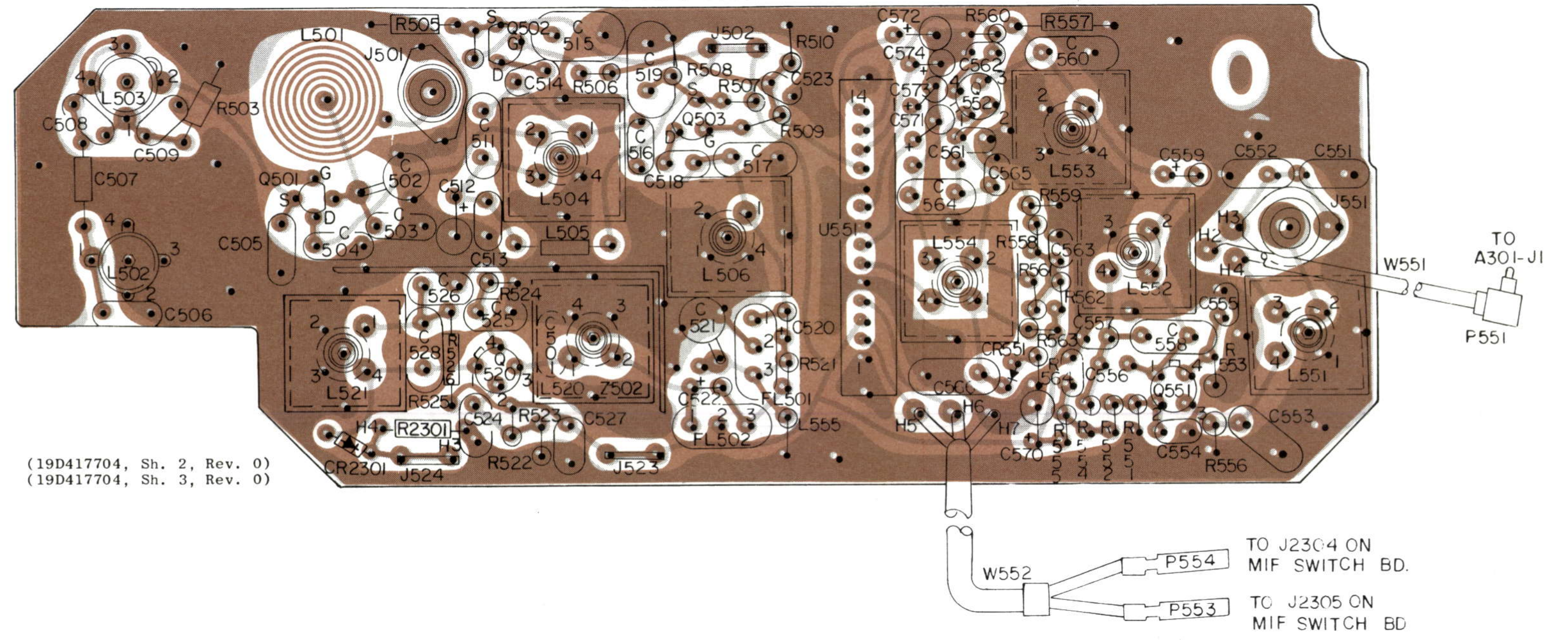
DUAL FRONT END



A302
RF PRE-SELECTOR

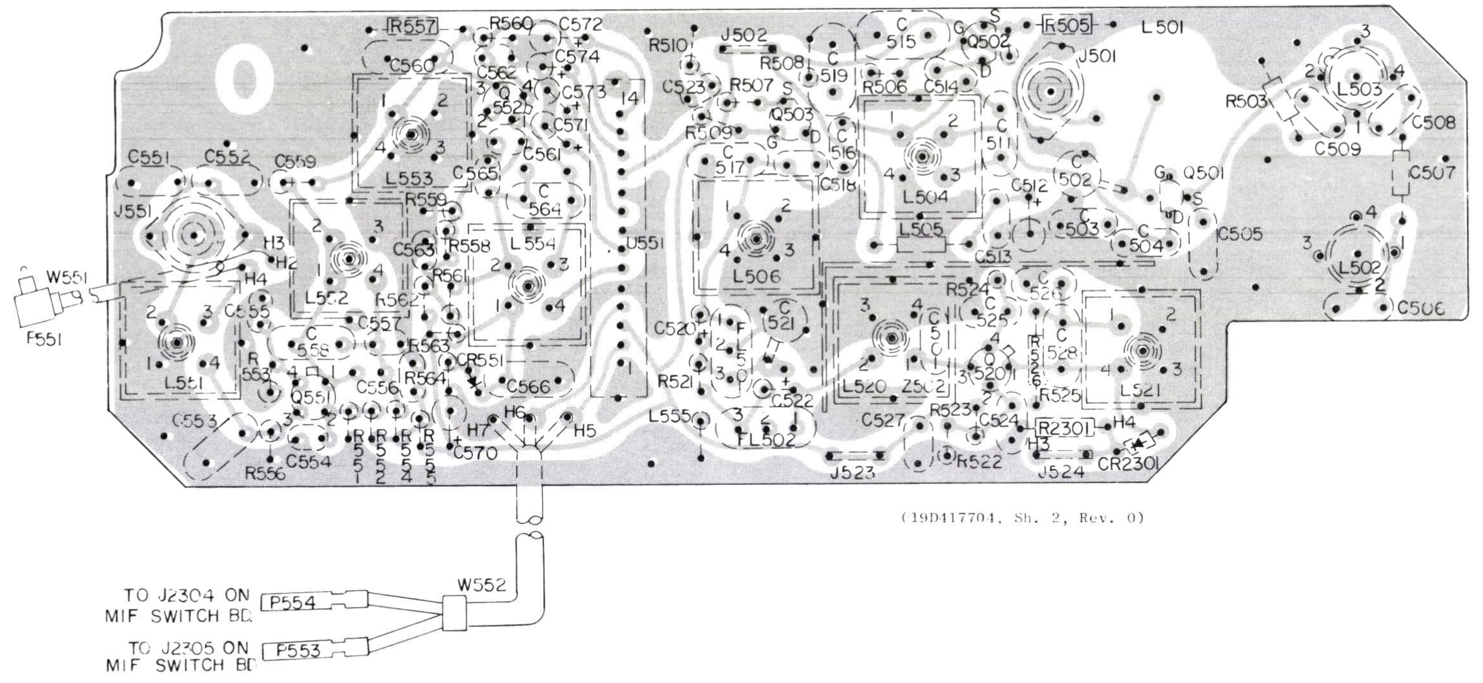


MIXER/IF/NOISE BLANKER BOARD
COMPONENT SIDE



(19D417704, Sh. 2, Rev. 0)
(19D417704, Sh. 3, Rev. 0)

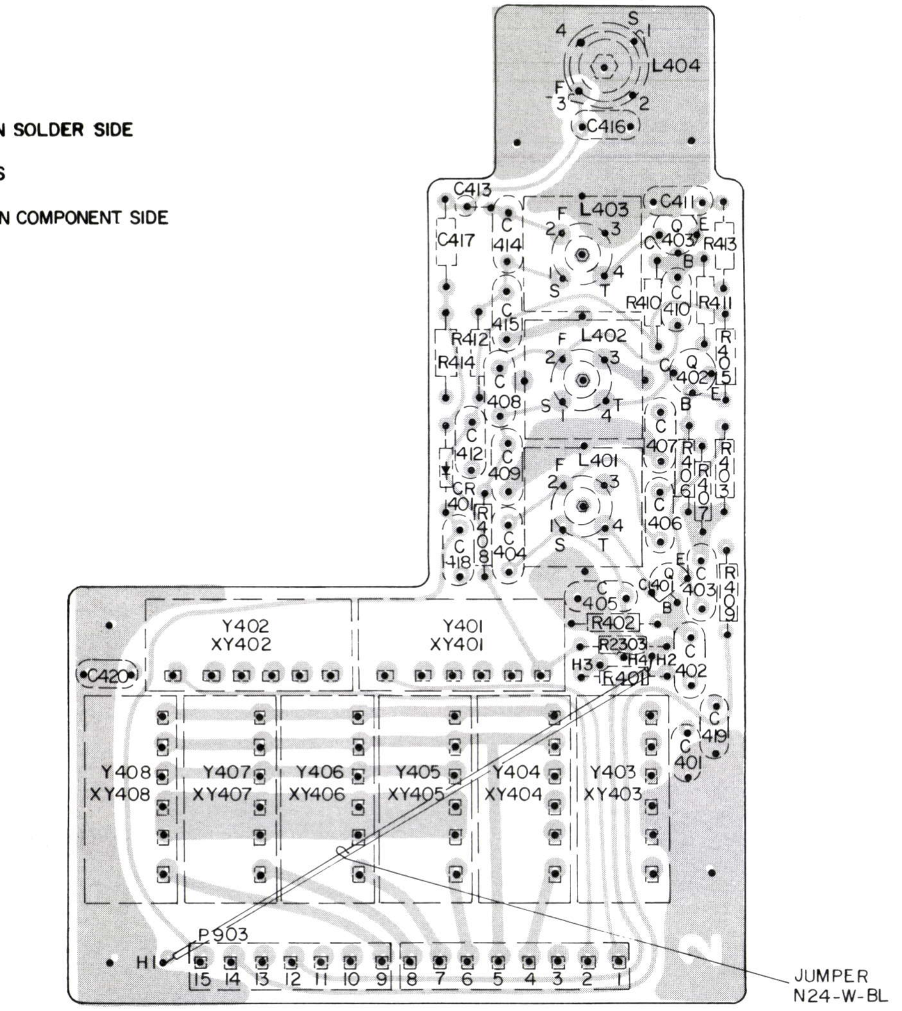
SOLDER SIDE



(19D417704, Sh. 2, Rev. 0)

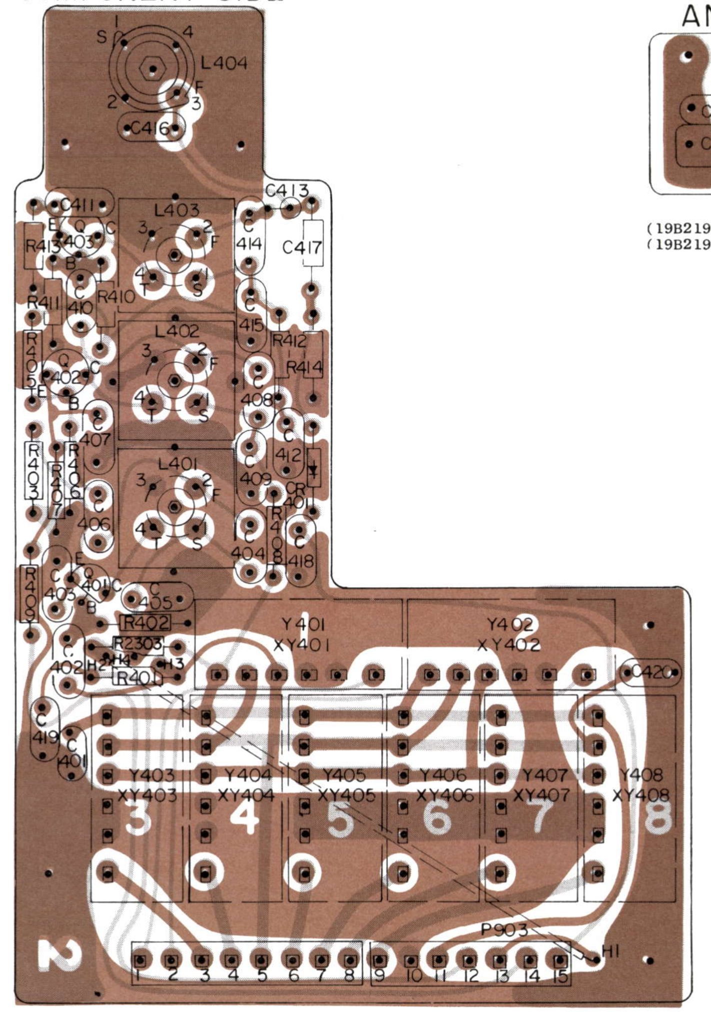
OSC/MULT BOARD

SOLDER SIDE



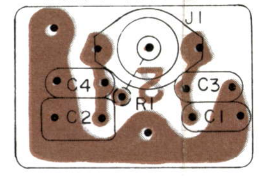
(19C320078, Sh. 2, Rev. 2)

COMPONENT SIDE

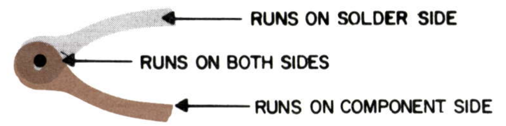


(19C320078, Sh. 1, Rev. 2)
(19C320078, Sh. 2, Rev. 2)

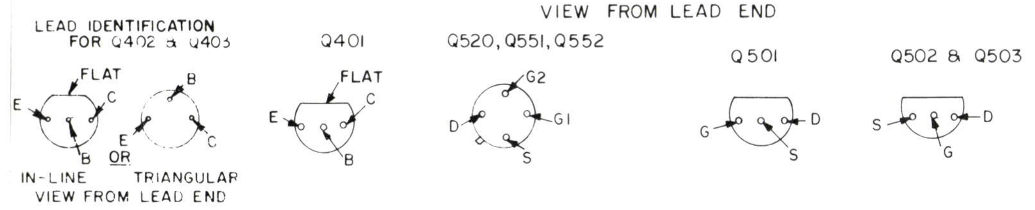
A301
ANT INPUT



(19B219449, Sh. 1, Rev. 2)
(19B219449, Sh. 2, Rev. 2)



LEAD IDENTIFICATION
VIEW FROM LEAD END



NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION

NOTES:
1. BOARDS IDENTIFIED BY A RED DOT HAVE BEEN MODIFIED FOR DUAL FRONT END OPERATION PER MODIFICATION KIT 19A129750G2

(19B622157, Rev. 0)

OUTLINE DIAGRAM

30—50 MHz MASTR II
DUAL FRONT END

PARTS LIST

LBI-4558A

25-50 MHz RECEIVER RF ASSEMBLY
MIXER/IF/NOISE BLANKER AND
OSCILLATOR/MULTIPLIER

SYMBOL	GE PART NO.	DESCRIPTION
		RF ASSEMBLY 19D416478G1 25-30 MHz (LL) 19D416478G2 30-36 MHz (L) 19D416478G3 36-42 MHz (M) 19D416478G4 42-50 MHz (H)
A301		ANTENNA INPUT BOARD 19B219463G1
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C2	19A116080P5	Polyester: 0.047 µf ±20%, 50 VDCW.
C3 and C4	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J1	19A116832P1	Connector, receptacle: sim to Cinch 14H11613.
		- - - - - - - - - RESISTORS - - - - - - - - -
R1	3R152P472K	Composition: 4700 ohms ±10%, 1/4 w.
A302LL, A302L, A302M, A302H		RF PRE-SELECTOR BOARD A302LL 19C320073G1 25-30 MHz A302L 19C320073G2 30-36 MHz A302M 19C320073G3 36-42 MHz A302H 19C320073G4 42-50 MHz
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2LL	5491601P122	Phenolic: 1.2 pf ±5%, 500 VDCW.
C2L	5491601P120	Phenolic: 1.0 pf ±5%, 500 VDCW.
C2M	5491601P120	Phenolic: 1.0 pf ±5%, 500 VDCW.
C2H	5491601P119	Phenolic: 0.82 pf ±5%, 500 VDCW.
C3LL	5491601P120	Phenolic: 1.0 pf ±5%, 500 VDCW.
C3L	5491601P120	Phenolic: 1.0 pf ±5%, 500 VDCW.
C3M	5491601P122	Phenolic: 1.2 pf ±5%, 500 VDCW.
C3H	5491601P119	Phenolic: 0.82 pf ±5%, 500 VDCW.
C4LL	5491601P120	Phenolic: 1.0 pf ±5%, 500 VDCW.
C4L	5491601P122	Phenolic: 1.2 pf ±5%, 500 VDCW.
C4M	5491601P119	Phenolic: 0.82 pf ±5%, 500 VDCW.
C4H	5491601P120	Phenolic: 1.0 pf ±5%, 500 VDCW.
C5	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C6	19A116656P8K0	Ceramic: 8 pf ±1 pf ±10%, -80 PPM.
C7LL	5496219P256	Ceramic disc: 51 pf ±5%, 500 VDCW, temp coef -80 PPM.
C7L	5496219P253	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -80 PPM.
C7M	5496219P250	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef -80 PPM.
C7H	5496219P245	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -80 PPM.
C8LL	5496219P256	Ceramic disc: 51 pf ±5%, 500 VDCW, temp coef -80 PPM.
C8L	5496219P253	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -80 PPM.
C8M	5496219P250	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef -80 PPM.
C8H	5496219P245	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -80 PPM.
C9LL	5496219P254	Ceramic disc: 51 pf ±5%, 500 VDCW, temp coef -80 PPM.
C9L	5496219P253	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -80 PPM.
C9M	5496219P250	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef -80 PPM.
C9H	5496219P245	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -80 PPM.
C10LL	5496219P257	Ceramic disc: 56 pf ±5%, 500 VDCW, temp coef -80 PPM.
C10L	5496219P253	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -80 PPM.
C10M	5496219P250	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef -80 PPM.
C10H	5496219P245	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -80 PPM.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J2*	19A116975P1	Receptacle, wire spring.
		Earlier than REV A:
	19A116429P5	Contact, electrical: sim to AMP 85486-6 (Strip Form).
		- - - - - - - - - INDUCTORS - - - - - - - - -
L1 thru L3	19B219413G1	Coil. Includes:
	5491798P5	Tuning slug.
L4	19B219413G1	Coil. Includes:
	5491798P5	Tuning slug.
		- - - - - - - - - PLUGS - - - - - - - - -
P1		(Part of W1).
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A116154P1	N Channel, field effect.
		- - - - - - - - - RESISTORS - - - - - - - - -
R1 and R2	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R3L	3R152P303J	Composition: 30,000 ohms ±5%, 1/4 w.
R3M	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R3H	3R152P622J	Composition: 6200 ohms ±5%, 1/4 w.
		- - - - - - - - - CABLES - - - - - - - - -
W1	5491689P85	Cable, RF: approx 6 inches long. (Includes P1).
		- - - - - - - - - CAPACITORS - - - - - - - - -
C301	19B209168P4	Variable, air, sub-miniature: 1.80-420 pf, 650 v peak; sim to EF Johnson 189. (Part of L301).
C302	19B209168P4	Variable, air, sub-miniature: 1.80-420 pf, 650 v peak; sim to EF Johnson 189. (Part of L302).
C304	19B209448P2	Ceramic, feed-thru: 1000 pf +100 -0%, 500 VDCW; sim to Allen-Bradley Style FA5D.
C305	19B209448P2	Ceramic, feed-thru: 6.8 pf ±20%, 500 VDCW; sim to Allen-Bradley Style FA5D.
C306	19B209448P2	Ceramic, feed-thru: 1000 pf +100 -0%, 500 VDCW; sim to Allen-Bradley Style FA5D.
		- - - - - - - - - INDUCTORS - - - - - - - - -
L301LL	19B219455G1	Coil. Includes:
C1	5494481P11	Capacitor, ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
DS1	19B209067P1	Lamp, glow: 0.7 ma: sim to GE NE2ET.
L301L	19B219455G1	Coil. Includes:
C1	5494481P11	Capacitor, ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
DS1	19B209067P1	Lamp, glow: 0.7 ma: sim to GE NE2ET.
L301M	19B219455G3	Coil. Includes:
C2	5494481P11	Capacitor, ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
DS1	19B209067P1	Lamp, glow: 0.7 ma: sim to GE NE2ET.
L301H	19B219455G3	Coil. Includes:
C2	5494481P11	Capacitor, ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
DS1	19B209067P1	Lamp, glow: 0.7 ma: sim to GE NE2ET.
L302LL	19B219455G2	Coil.
L302L	19B219455G2	Coil.
L302M	19B219455G4	Coil.
L302H	19B219455G4	Coil.
		MIXER/IF/NOISE BLANKER BOARD 19D416562G1 25-30 MHz (LL) 19D416562G2 30-36 MHz (L) 19D416562G3 36-42 MHz (M) 19D416562G4 42-50 MHz (H)
		- - - - - - - - - CAPACITORS - - - - - - - - -
C501*	5493392P6	Ceramic, feed-thru: 22 pf ±10%, 500 VDCW; sim to Allen-Bradley Type FA5C. Deleted by REV D.
C502*	19B209351P9	Variable: 2.3 to 30 pf, 200 VDCW, -250 to +700 PPM/°C; sim to Matsushita ECV-1Z-W20P32. Added by REV D.
C503LL*	5496218P259	Ceramic: 68 pf ±5%, 500 VDCW, temp coef -80 PPM. Deleted by REV D.
C503L*	5496218P255	Ceramic: 47 pf ±5%, 500 VDCW, temp coef -150 PPM. Deleted by REV D.
C503M*	5496218P251	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -150 PPM. Deleted by REV D.
C503H*	5496218P639	Ceramic disc: 8.0 pf ±0.25 pf, 500 VDCW, temp coef -470 PPM. Deleted by REV D.
C503*	19A116080P107	Ceramic, stand off: 1000 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type SS5D. Deleted by REV D.
C503LL*	5496000P8	Silver mica: 68 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15. Added by REV D.
C503L*	5496000P19	Silver mica: 47 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15. Added by REV D.
C503M*	5496000P13	Silver mica: 27 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15. Added by REV D.
C503H*	5496000P9	Silver mica: 15 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15. Added by REV D.
C504*	19A116655P23J0	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef 0 PPM.
		In REV C and earlier:
	5493392P104	Ceramic, stand off: 100 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type SS5D.
C505*	5496000P27	Silver mica: 100 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
		In REV C and earlier:
	5493392P10	Ceramic, stand off: 22 pf ±10%, 500 VDCW; sim to Allen-Bradley Type SS5D.
C506LL	19A116656P27J8	Ceramic: 27 pf ±5%, temp coef -80 PPM.
C506L	19A116656P22J8	Ceramic: 22 pf ±5%, temp coef -80 PPM.
C506M	19A116656P15J8	Ceramic: 15 pf ±5%, temp coef -80 PPM.
C506H	19A116656P12J8	Ceramic: 12 pf ±5%, temp coef -80 PPM.
C507LL	5491601P120	Phenolic: 1.0 pf ±5%, 500 VDCW.
C507L	5491601P117	Phenolic: 0.68 pf ±5%, 500 VDCW.
C507M	5491601P115	Phenolic: 0.56 pf ±5%, 500 VDCW.
C508LL	19A116656P27J8	Ceramic: 27 pf ±5%, temp coef -80 PPM.
C508L	19A116656P22J8	Ceramic: 22 pf ±5%, temp coef -80 PPM.
C508M	19A116656P15J8	Ceramic: 15 pf ±5%, temp coef -80 PPM.
C508H	19A116656P12J8	Ceramic: 12 pf ±5%, temp coef -80 PPM.
C509	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C511LL	5496000P118	Silver mica: 82 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C511L	5496000P121	Silver mica: 47 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C511M	5496000P119	Silver mica: 47 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C511H	5496000P125	Silver mica: 82 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C512	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C513	19A116080P9	Polyester: 0.022 µf ±20%, 50 VDCW.
C514	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C515	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C516	19A116656P620	Ceramic disc: 6 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C517LL	5496000P19	Silver mica: 47 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C517L	5496000P127	Silver mica: 100 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C517M	5496000P19	Silver mica: 47 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C517H	5496000P127	Silver mica: 100 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C518	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C519	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C520LL	5491601P113	Phenolic: 0.47 pf ±5%, 500 VDCW.
C520L	5491601P115	Phenolic: 0.56 pf ±5%, 500 VDCW.
C520M	5491601P115	Phenolic: 0.56 pf ±5%, 500 VDCW.
C520H	5491601P113	Phenolic: 0.47 pf ±5%, 500 VDCW.
C521	19B209351P9	Variable: 2.3 to 30 pf, 200 VDCW, -250 to +700 PPM/°C; sim to Matsushita ECV-1Z-W20P32.
C522LL	5491601P113	Phenolic: 0.47 pf ±5%, 500 VDCW.
C522L	5491601P115	Phenolic: 0.56 pf ±5%, 500 VDCW.
C522M	5491601P115	Phenolic: 0.56 pf ±5%, 500 VDCW.
C522H	5491601P113	Phenolic: 0.47 pf ±5%, 500 VDCW.
C523	19A116192P13	Ceramic: 1000 pf ±20%, 50 VDCW; sim to Erie 8121-A050-W5R-102M.
C524 thru C527	19A116080P9	Polyester: 0.022 µf ±20%, 50 VDCW.
C528LL	5496000P40	Silver mica: 330 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C528L	5496000P40	Silver mica: 360 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C528M	5496000P39	Silver mica: 330 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C528H	5496000P39	Silver mica: 330 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C529	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C551 and C552	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C553LL	5496000P19	Silver mica: 68 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C553L	5496000P23	Silver mica: 68 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C553M	5496000P23	Silver mica: 47 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C553H	5496000P23	Silver mica: 68 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C554 thru C557	19A116192P10	Ceramic: 1500 pf ±20%, 50 VDCW; sim to Erie 8121-050-W5R.
C558LL	5496000P23	Silver mica: 68 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C558L	5496000P23	Silver mica: 47 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C558M	5496000P22	Silver mica: 68 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C558H	5496000P23	Silver mica: 68 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C559*	5491601P130	Phenolic: 3.3 pf ±5%, 500 VDCW.
		In REV B and earlier:
	5491601P120	Phenolic: 1.0 pf ±5%, 500 VDCW.
C560LL	5496000P23	Silver mica: 68 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C560L	5496000P23	Silver mica: 68 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C560M	5496000P23	Silver mica: 68 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C560H	5496000P23	Silver mica: 68 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C561 thru C563	19A116192P10	Ceramic: 1500 pf ±20%, 50 VDCW; sim to Erie 8121-050-W5R.
C564LL	5496000P23	Silver mica: 68 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C564L	5496000P19	Silver mica: 47 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C564M	5496000P24	Silver mica: 68 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C564H	5496000P19	Silver mica: 47 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C565	19A116192P10	Ceramic: 1500 pf ±20%, 50 VDCW; sim to Erie 8121-050-W5R.
C566	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C570	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C571	5496267P1	Tantalum: 6.8 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C572	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C573	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C574	5496267P17	Tantalum: 1.0 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR551*	19A115775P1	Silicon.
		In REV B and earlier:
	19A115250P1	Silicon.
		- - - - - - - - - FILTERS - - - - - - - - -
FL501LL	19B219573G3	Crystal, freq: Pad A: 11.200000 KHz. Pad B: 11.196024 KHz.
FL501L	19B219574G3	Crystal, freq: [illegible]
FL501M	19B219573G3	Crystal, freq: [illegible]
FL501H	19B219574G3	Crystal, freq: [illegible]
FL502LL		(Part of FL501LL).
FL502L		(Part of FL501L).
FL502M		(Part of FL501M).
FL502H		(Part of FL501H).
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J501*	19A116832P1	Receptacle, coaxial: jack; sim to Cinch 14H-11613.
		In REV C and earlier:
	7104941P16	Jack, phono: sim to National Tel.
J502	19A116975P1	Receptacle, wire spring.
J523 and J524	19A116975P1	Receptacle, wire spring.
J551	19A116832P1	Receptacle, coaxial: sim to Cinch 14H11613.
J552*	19A116647P1	Connector, printed wiring, two-part: 3 terminals: sim to Molex 03-04-4031. Deleted by REV D.
		- - - - - - - - - - - - INDUCTORS - - - - - - - -
L501*		(Part of printed board 19D417704P1). Added by REV D.
	19C320141G11	Coil. Includes: Deleted by REV D.
	5493185P12	Tuning slug.
L502	19B219419G2	Coil. Includes:
	5491798P5	Tuning slug.
L503*	19B219419G4	Coil. Includes:
	5491798P5	Tuning slug.
		In REV C and earlier:
	19B219419G3	Coil. Includes:
	5491798P5	Tuning slug.
L504	19C320141G24	Coil. Includes:
	5493185P12	Tuning slug.
L505	19B209420P130	Coil, RF: 27.0 µh ±10%, 3.60 ohms DC res max; sim to Jeffers 441316-5K.
L506	19C320141G23	Coil. Includes:
	5493185P9	Tuning slug.
L520LL*	19C320141G16	Coil. Includes: Deleted by REV D.
	5493185P9	Tuning slug.
L520L*	19C320141G27	Coil. Includes: Deleted by REV D.
	5493185P9	Tuning slug.
L520M*	19C320141G16	Coil. Includes: Deleted by REV D.
	5493185P9	Tuning slug.
L520H*	19C320141G27	Coil. Includes: Deleted by REV D.
	5493185P9	Tuning slug.
L521	19C320141G6	Coil. Includes:
	5493185P9	Tuning slug.
L551	19C320141G12	Coil. Includes:
	5493185P9	Tuning slug.
L552 and L553	19C320141G7	Coil. Includes:
	5493185P9	Tuning slug.
L554	19C320141G13	Coil. Includes:
	5493185P9	Tuning slug.
L555LL	19B209420P27	Coil, RF: 15.0 µh ±2.75%, 5 ohms DC res max; sim to Jeffers 1316-2.
L555L	19B209420P28	Coil, RF: 18.0 µh ±5%, 3.00 ohms DC res max; sim to Jeffers 13-3.
L555M	19B209420P27	Coil, RF: 15.0 µh ±5%, 2.75 ohms DC res max; sim to Jeffers 1316-2.
L555H	19B209420P28	Coil, RF: 18.0 µh ±5%, 3.00 ohms DC res max; sim to Jeffers 1316-3.
		- - - - - - - - - - - TRANSISTORS - - - - - - - - -
Q501	19A116154P1	N Channel, field effect.
Q502 and Q503	19A115934P3	N channel, field effect; sim to Type 2N3819.
Q520	19A116818P1	N Channel, field effect; sim to Type 3N187.
Q551 and Q552	19A116818P1	N Channel, field effect; sim to Type 3N187.
		- - - - - - - - - - - RESISTORS - - - - - - - - -
R503	3R152P152K	Composition: 1500 ohms ±10%, 1/4 w.
R504	3R152P682J	Composition: 6800 ohms ±5%, 1/4 w.
R505	3R152P332J	Composition: 3300 ohms ±5%, 1/4 w.
R506	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R507	3R152P682J	Composition: 6800 ohms ±5%, 1/4 w.
R508	3R152P332J	Composition: 3300 ohms ±5%, 1/4 w.
R509	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R510	3R152P431J	Composition: 430 ohms ±5%, 1/4 w.
R521	3R152P331J	Composition: 330 ohms ±5%, 1/4 w.
R522	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R523	3R152P392J	Composition: 3900 ohms ±5%, 1/4 w.
R524	3R152P221J	Composition: 220 ohms ±5%, 1/4 w.
R525	3R152P470J	Composition: 47 ohms ±5%, 1/4 w.
R551	3R152P272J	Composition: 2700 ohms ±5%, 1/4 w.
R552	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R553 thru R555	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R556* and R557*	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w. Added by REV C.
R558	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R559	3R152P272J	Composition: 2700 ohms ±5%, 1/4 w.
R560 thru R562	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R563*	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
		In REV B and earlier:
	3R152P123J	Composition: 12,000 ohms ±5%, 1/4 w.
R564	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
		- - - - - - - INTEGRATED CIRCUITS - - - - - - -
U551	19D417378G1	Noise Blanker.
		- - - - - - - - - - - - CABLES - - - - - - - - - -
W551	5491689P87	Cable, RF: approx 2-1/4 inches long; 350 VRMS, 500 VDC operating voltage.
W552*	19B219764G2	Cable: approx 6 inches long.
		In REV C and earlier:
	19B219764G1	Cable: approx 6 inches long.
		- - - - - - - - - - NETWORKS - - - - - - - - - -
Z502LL		COIL ASSEMBLY 19C320141G16
		- - - - - - - - - - CAPACITORS - - - - - - - -
C501LL	19A116114P1063	Ceramic: 91 pf ±5%, 100 VDCW; temp coef -3300 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L520LL	19C320141P26	Coil.
	5493185P9	Tuning slug.
Z502L		COIL ASSEMBLY 19C320141G27
		- - - - - - - - - - CAPACITORS - - - - - - - -
C501L	19A116114P1064	Ceramic: 100 pf ±10%, 100 VDCW; temp coef -3300 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L520L	19C320141P26	Coil.
	5493185P9	Tuning slug.
Z502M		COIL ASSEMBLY 19C320141G16
		- - - - - - - - - - CAPACITORS - - - - - - - -
C501M	19A116114P1063	Ceramic: 91 pf ±5%, 100 VDCW; temp coef -3300 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L520M	19C320141P26	Coil.
	5493185P9	Tuning slug.
Z502H		COIL ASSEMBLY 19C320141G27
		- - - - - - - - - - CAPACITORS - - - - - - - -
C501H	19A116114P1064	Ceramic: 100 pf ±10%, 100 VDCW; temp coef -3300 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L520H	19C320141P26	Coil.
	5493185P9	Tuning slug.
		OSCILLATOR/MULTIPLIER BOARD 19D416459G1 2 FREQ 25-30 MHz (LL) 19D416459G2 2 FREQ 30-36 MHz (L) 19D416459G3 2 FREQ 36-42 MHz (M) 19D416459G4 2 FREQ 42-50 MHz (H) 19D416459G5 MULTI-FREQ 25-30 MHz (LL) 19D416459G6 MULTI-FREQ 30-36 MHz (L) 19D416459G7 MULTI-FREQ 36-42 MHz (M) 19D416459G8 MULTI-FREQ 42-50 MHz (H)
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C401	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C402	19A116655P13	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C403	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C404LL	19A116656P43K8	Ceramic disc: 43 pf ±10%, temp coef -80 PPM.
C404L	19A116656P39K8	Ceramic disc: 39 pf ±10%, temp coef -80 PPM.
C404M	19A116656P24K8	Ceramic disc: 24 pf ±10%, temp coef -80 PPM.
C404H	19A116656P18K8	Ceramic disc: 18 pf ±10%, temp coef -80 PPM.
C405	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C406	19A116656P4K0	Ceramic disc: 4 pf ±1 pf, temp coef 0 PPM.
C407	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C408LL	19A116656P43K8	Ceramic disc: 43 pf ±10%, temp coef -80 PPM.
C408L	19A116656P39K8	Ceramic disc: 39 pf ±10%, temp coef -80 PPM.
C408M	19A116656P24K8	Ceramic disc: 24 pf ±10%, temp coef -80 PPM.
C408H	19A116656P18K8	Ceramic disc: 18 pf ±10%, temp coef -80 PPM.
C409	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C410	19A116656P3K0	Ceramic disc: 3 pf ±1 pf, temp coef 0 PPM.
C411 and C412	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C413LL	5491601P120	Phenolic: 1.0 pf ±5%, 500 VDCW.
C413L	5491601P119	Phenolic: 0.82 pf ±5%, 500 VDCW.
C413M	5491601P117	Phenolic: 0.68 pf ±5%, 500 VDCW.
C413H	5491601P115	Phenolic: 0.56 pf ±5%, 500 VDCW.
C414LL	19A116656P43K8	Ceramic disc: 43 pf ±10%, temp coef -80 PPM.
C414L	19A116656P39K8	Ceramic disc: 39 pf ±10%, temp coef -80 PPM.
C414M	19A116656P24K8	Ceramic disc: 24 pf ±10%, temp coef -80 PPM.
C414H	19A116656P18K8	Ceramic disc: 18 pf ±10%, temp coef -80 PPM.
C415	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C416LL	19A116656P27K8	Ceramic disc: 27 pf ±10%, temp coef -80 PPM.
C416L	19A116656P24K8	Ceramic disc: 24 pf ±10%, temp coef -80 PPM.
C416M	19A116656P15K8	Ceramic disc: 15 pf ±10%, temp coef -80 PPM.
C416H	19A116656P12K8	Ceramic disc: 12 pf ±10%, temp coef -80 PPM.
C417	5491601P104	Phenolic: 0.20 pf ±10%, 500 VDCW.
C418	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C419 and C420	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR401	19A115250P1	Silicon.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L401 thru L403	19C320141G1	Coil. Includes:
	5493185P12	Tuning slug.
L404	19B219419G2	Coil. Includes:
	5491798P5	Tuning slug.
		- - - - - - - - - - - PLUGS - - - - - - - - - -
P903		Includes:
	19B219594P1	Contact strip: 7 pins.
	19B219594P2	Contact strip: 8 pins.
		- - - - - - - - - - TRANSISTORS - - - - - - - -
Q401	19A115910P1	Silicon, NPN; sim to Type 2N3906.
Q402 and Q403	19A115328P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R401	3R152P561K	Composition: 560 ohms ±10%, 1/4 w.
R402	3R152P392K	Composition: 3900 ohms ±10%, 1/4 w.
R403	3R152P510J	Composition: 51 ohms ±5%, 1/4 w.
R404	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R405	3R152P123J	Composition: 12,000 ohms ±5%, 1/4 w.
R406	3R152P392K	Composition: 3900 ohms ±10%, 1/4 w.
R407	3R152P201J	Composition: 200 ohms ±5%, 1/4 w.
R408	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R409	3R152P243J	Composition: 24,000 ohms ±5%, 1/4 w.
R410	3R152P123J	Composition: 12,000 ohms ±5%, 1/4 w.
R411	3R152P392K	Composition: 3900 ohms ±10%, 1/4 w.
R412 and R413	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R414	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XY401 thru XY408	19A116779P1	Contact, electrical. (6 contacts with each socket).
		- - - - - - - - - - - ICOMS - - - - - - - - - -
		NOTE: When reordering specify ICOM Frequency.
		ICOM Freq. (25-30,36-42 MHz)= Oper Freq +11.2 / 3
		ICOM Freq. (30-36,42-50 MHz)= Oper Freq +9.4 / 3
Y401 thru Y408	19A129393G1	Compensated: 2 PPM; 30-36, 42-50 MHz.
	19A129393G2	Compensated: 2 PPM; 25-30, 36-42 MHz.
	19A129393G9	Compensated: 5 PPM; 30-36, 42-50 MHz.
	19A129393G10	Compensated: 5 PPM; 25-50, 36-42 MHz.
	19A129393G5	Externally Compensated: 5 PPM; 30-36, 42-50 MHz.
	19A129393G6	Externally Compensated: 5 PPM; 25-30, 36-42 MHz.
		- - - - - - - - - - MISCELLANEOUS - - - - - - -
	19B201074P304	Tap screw, Phillips POZIDRIV®: 6-32 x 1/4. (Used to secure A301 and RF Module).
	19B219470P2	Shield. (Located on Mixer/IF Board).
	19A129424G1	Can. (Used with L504, L520, L521 on Mixer/IF Board; L401-L403 on Oscillator/Multiplier Board).
	19A116779P1	Contact, electrical. (Used with Y401-Y408).
	4035306P59	Washer, fiber. (Used with FL501, FL502).
		RECEIVER MODIFICATION KIT 19A129750G1 (Used with DUAL FRONT END)
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR2301	19A116925P1	Silicon.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R2301	3R152P223J	Composition: 22,000 ohms ±5%, 1/4 w.
R2302	3R152P681K	Composition: 680 ohms ±10%, 1/4 w.
		- - - - - - - - - - - CABLES - - - - - - - - -
W2301	19B219999G2	RF: approx 10-1/2 inches long.
		DUAL FRONT END MODIFICATION KIT 19A129750G2
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR2301	19A116925P1	Silicon.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R2301	3R152P223J	Composition: 22,000 ohms ±5%, 1/4 w.
R2303	3R152P911J	Composition: 910 ohms ±5%, 1/4 w.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter", which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

REV. A - RF Assembly (19D416478G1-G4)

Incorporated in initial shipment.

REV. A thru REV. D - Mixer/IF/Noise Blanker Bd. (19D416562G1-G4)

Incorporated in initial shipment.

▲ THESE COMPONENTS ARE USED TO ADAPT A STANDARD RECEIVER TO OPERATION AS & WITH A DUAL FRONT END. THESE COMPONENTS SHOULD BE IGNORED IN THE STANDARD RECEIVER. BOARD IDENTIFIED BY A RED DOT HAVE BEEN MODIFIED FOR DFE OPERATION PER MOD KIT 19A129750G1 OR G2.	
RECEIVER CHANNEL	D. F. E. CHANNEL
ON PL19D416562 (MIXER/IF NB BD)	ON PL19D416562 (MIXER/IF NB BD)
1. R2302 USED INSTEAD OF R525 2. CR2301 USED INSTEAD OF C529 3. R2301 ADDED BETWEEN H3 & H4	1. R525 USED 2. CR2301 USED INSTEAD OF C529 3. R2301 ADDED BETWEEN H3 & H4
THESE ITEMS ARE SUPPLIED IN MOD. KIT PL19A129750G1	ON PL19D416459 (OSC/MULT BD) 1. N24-W-BL JUMPER ADDED BETWEEN H1 & H2 ON OSC/MULT BD 2. R2303 USED INSTEAD OF R404
	THESE ITEMS ARE SUPPLIED IN MOD KIT PL19A129750G2

	REV LETTER	FREQ RANGE (MHZ)	IF FREQ (MHZ)	NO. OF FREQ
RF CIRCUIT				
19D416478G1	A	25-30 (LL)		
19D416478G2	A	30-36 (L)		
19D416478G3	A	36-42 (M)		
19D416478G4	A	42-50 (H)		
MIXER/IF NB BD				
19D416562G1	D	25-30 (LL)	11.2	
19D416562G2	D	30-36 (L)	9.4	
19D416562G3	D	36-42 (M)	11.2	
19D416562G4	D	42-50 (H)	9.4	
OSC/MULT BD				
19D416459G1		25-30 (LL)		2
19D416459G2		30-36 (L)		2
19D416459G3		36-42 (M		2
19D416459G4		42-50 (H)		2
19D416459G5		25-30 (LL)		8
19D416459G6		30-36 (L)		8
19D416459G7		36-42 (M)		8
19D416459G8		42-50 (H)		8

	REV LETTER	FREQ RANGE (MHZ)	IF FREQ (MHZ)	NO. OF FREQ
RF FILTER				
19C320073G1		25-30 (LL)		
19C320073G2		30-36 (L)		
19C320073G3		36-42 (M)		
19C320073G4		42-50 (H)		

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE (P903-10) WITH TEST SET MODEL 4EX3A11 OR A 20,000 OHM PER-VOLT METER.

⏚ INDICATES A−

⏚ INDICATES VEHICLE GROUND

* COMPONENT VALUE TABLE				
COMP DESIG	LL	L	M	H
RF FREQ	25-30 MHZ	30-36 MHZ	36-42 MHZ	42-50 MHZ
IF FREQ	11.2 MHZ	9.4 MHZ	11.2 MHZ	9.4 MHZ
C2 (A302)	1.2	1.0	.82	1.0
C3 (A302)	1.2	1.0	.82	1.0
C4 (A302)	1.2	1.0	.82	1.0
C7 (A302)	51	39	30	18
C8 (A302)	51	39	30	18
C9 (A302)	51	39	30	18
C10 (A302)	56	39	30	18
C501	91	100	91	100
C404	43	39	24	18
C408	43	39	24	18
C413	1	.82	.68	.56
C414	43	39	24	18
C416	27	24	15	12
C503	68	47	27	15
C506	27	22	15	12
C507	1.0	.82	.68	.56
C508	27	22	15	12
C511	47	82	47	82
C517	47	100	47	100
C520	.47	.56	.47	.56
C522	.47	.56	.47	.56
C528	330	360	330	360
C553	68	47	68	47
C558	68	47	68	47
C560	68	47	68	47
C564	68	47	68	47
L555	15	18	15	18
R3		30K	15K	6.2K
FL501	FL501LL	FL501L	FL501M	FL501H
FL502	FL502LL	FL502L	FL502M	FL502H

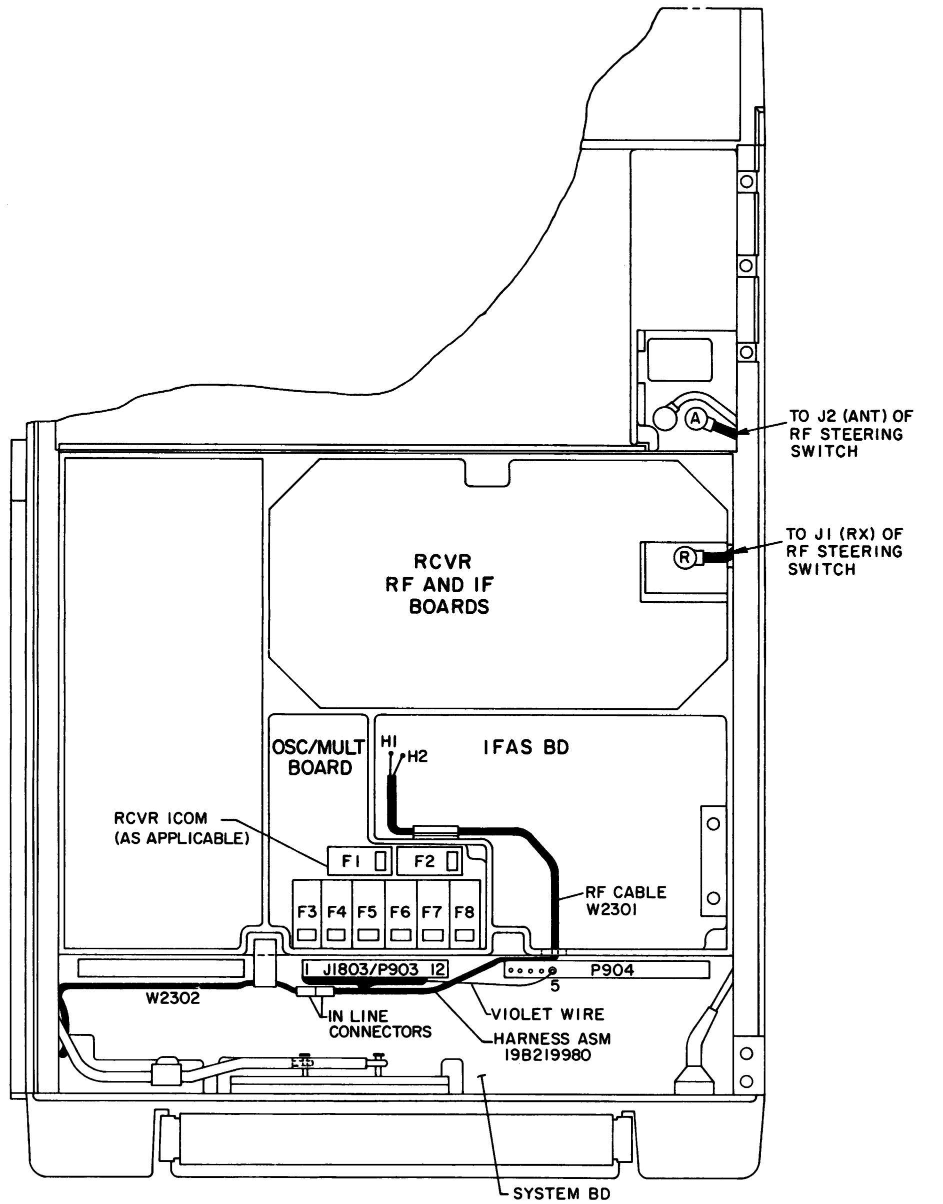
ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H= HENRYS.

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

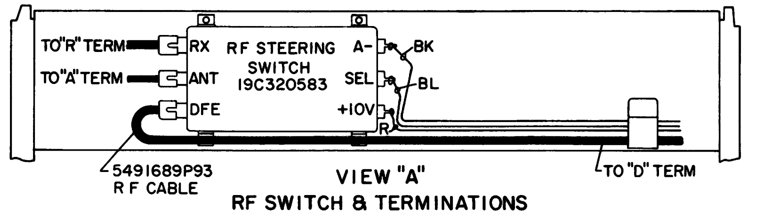
SCHEMATIC DIAGRAM

30—50 MHz, RF ASSEMBLY, OSC/MULT AND MIXER/IF/NOISE BLANKER BOARDS

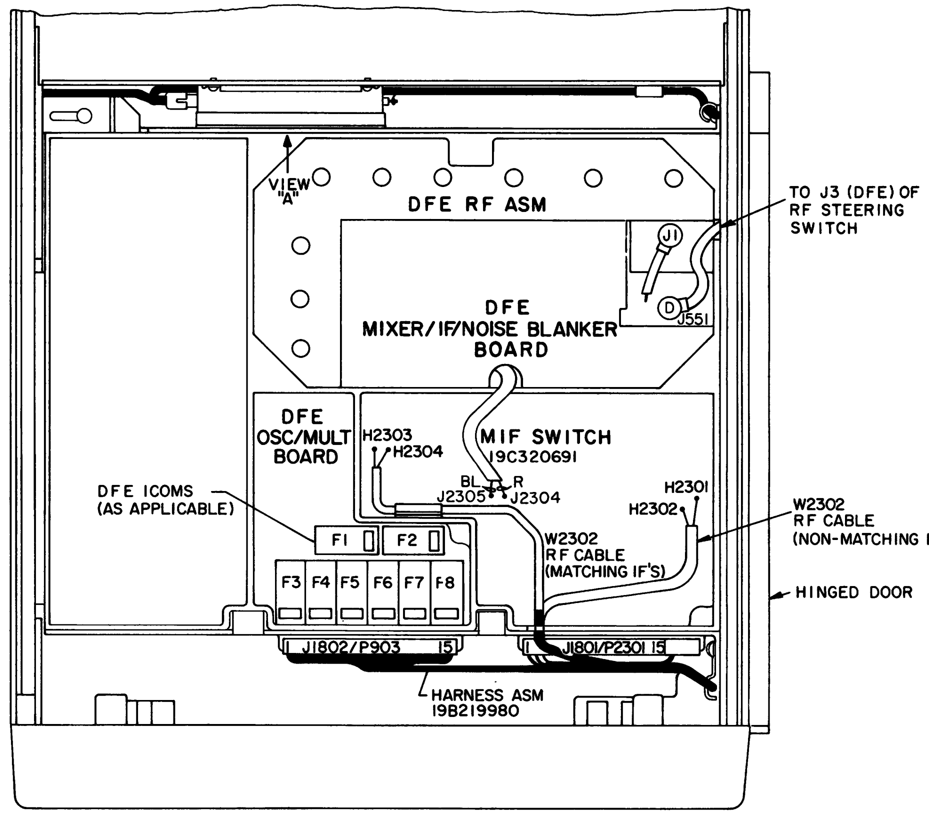
CABLE HARNESS ROUTING



TOP VIEW
RECEIVER



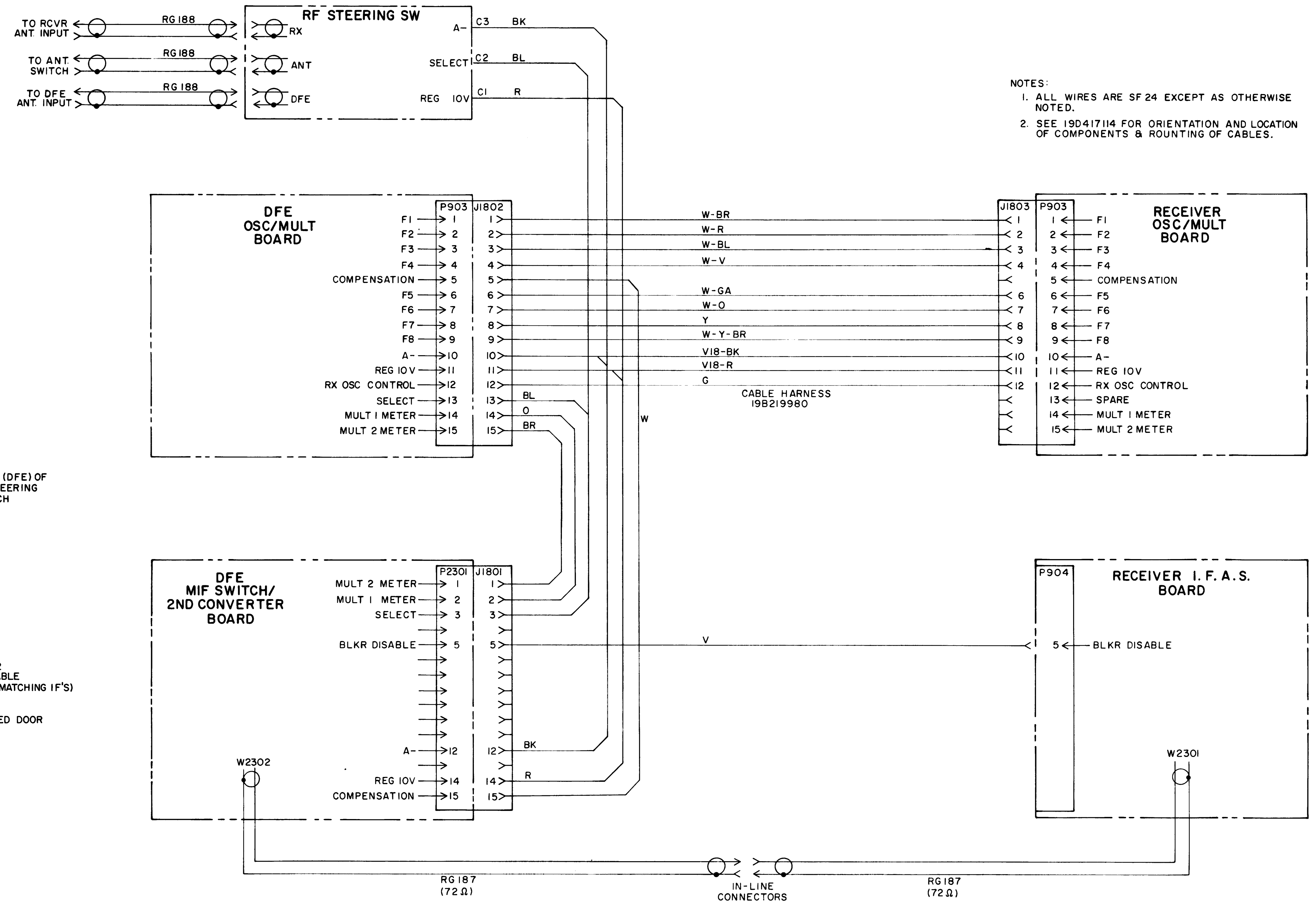
VIEW "A"
RF SWITCH & TERMINATIONS



BOTTOM VIEW OF HINGE ASM
DUAL FRONT END

RC-2682

DFE INTERCONNECTION DIAGRAM



NOTES:
1. ALL WIRES ARE SF 24 EXCEPT AS OTHERWISE NOTED.
2. SEE 19D417114 FOR ORIENTATION AND LOCATION OF COMPONENTS & ROUNTING OF CABLES.

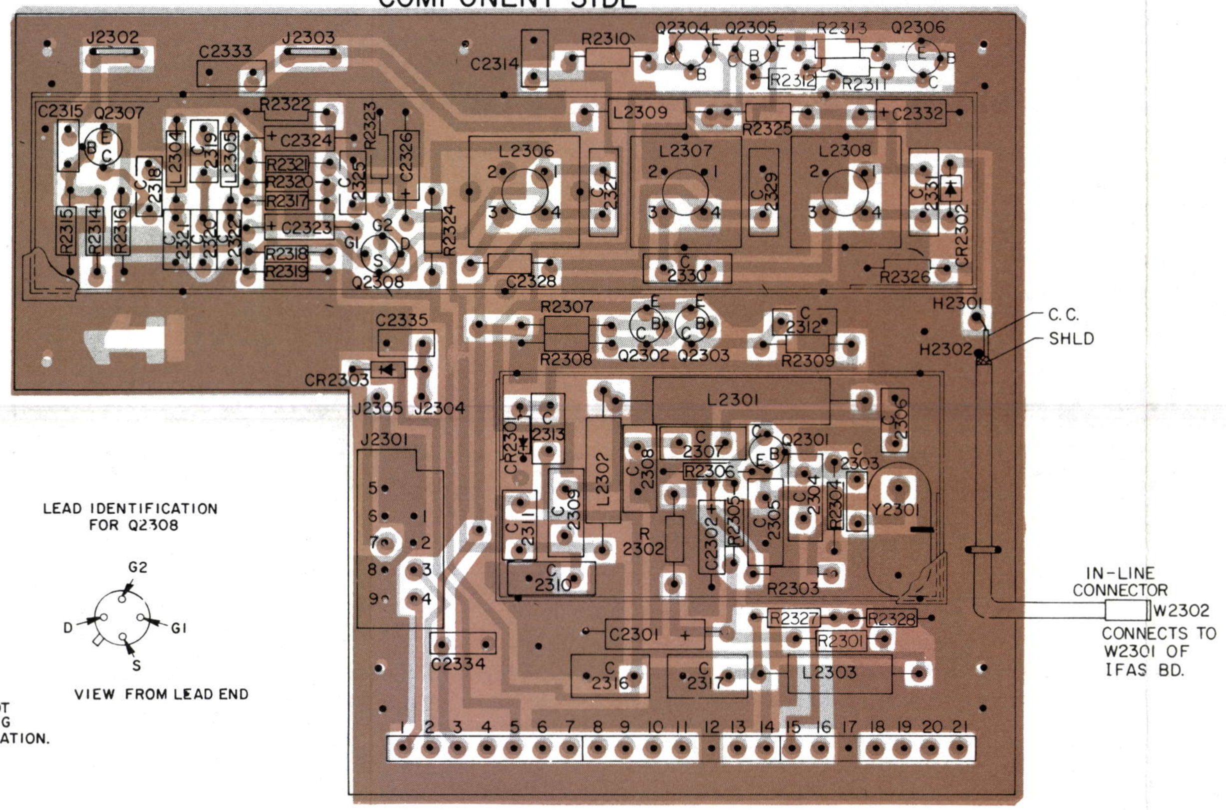
(19D417142, Rev. 2)

CABLE HARNESS ROUTING & INTERCONNECTION DIAGRAM

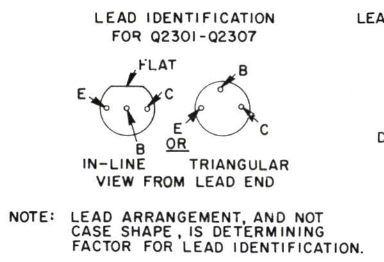
30—50 MHz DUAL FRONT END
(WITH NOISE BLANKER)

MIF SWITCH/2ND CONVERTER BOARD
(NON-MATCHING IF FREQ)

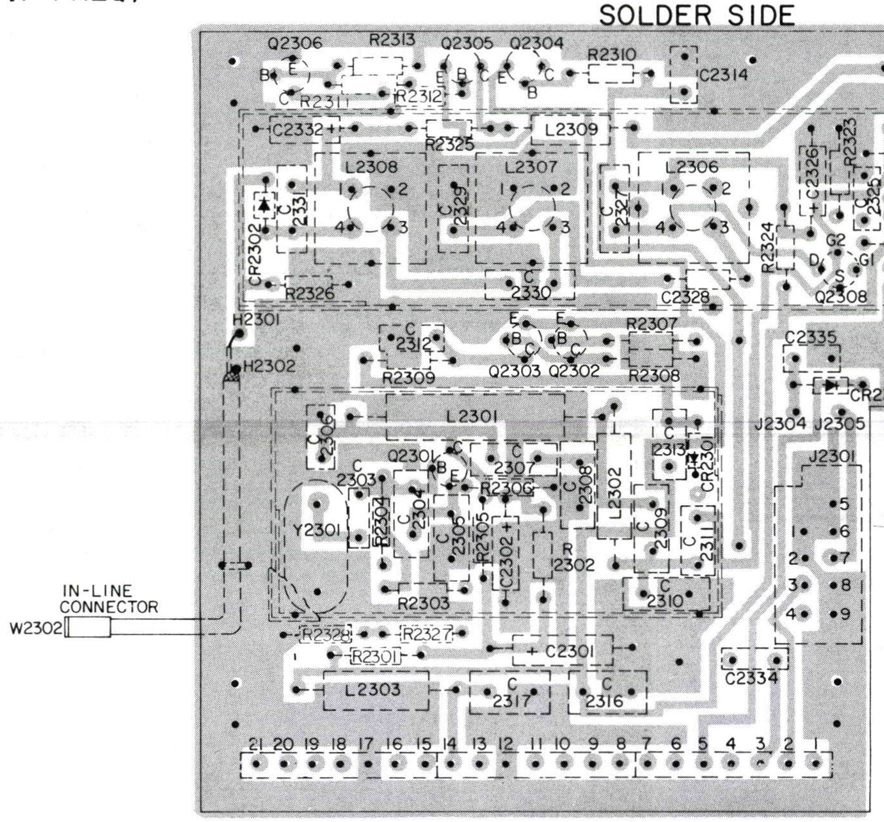
COMPONENT SIDE



(19D417284, Sh. 2, Rev. 1)
(19D417284, Sh. 3, Rev. 1)



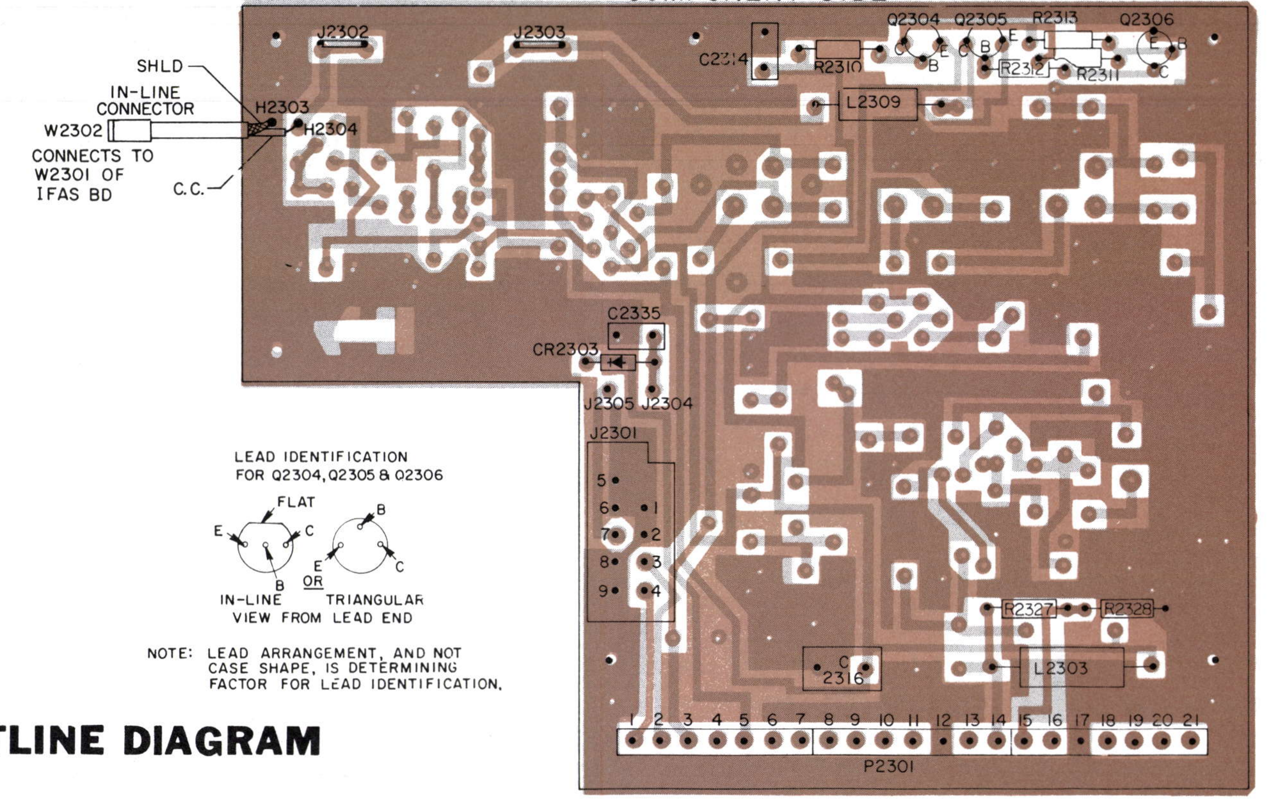
SOLDER SIDE



(19D417284, Sh. 2, Rev. 1)

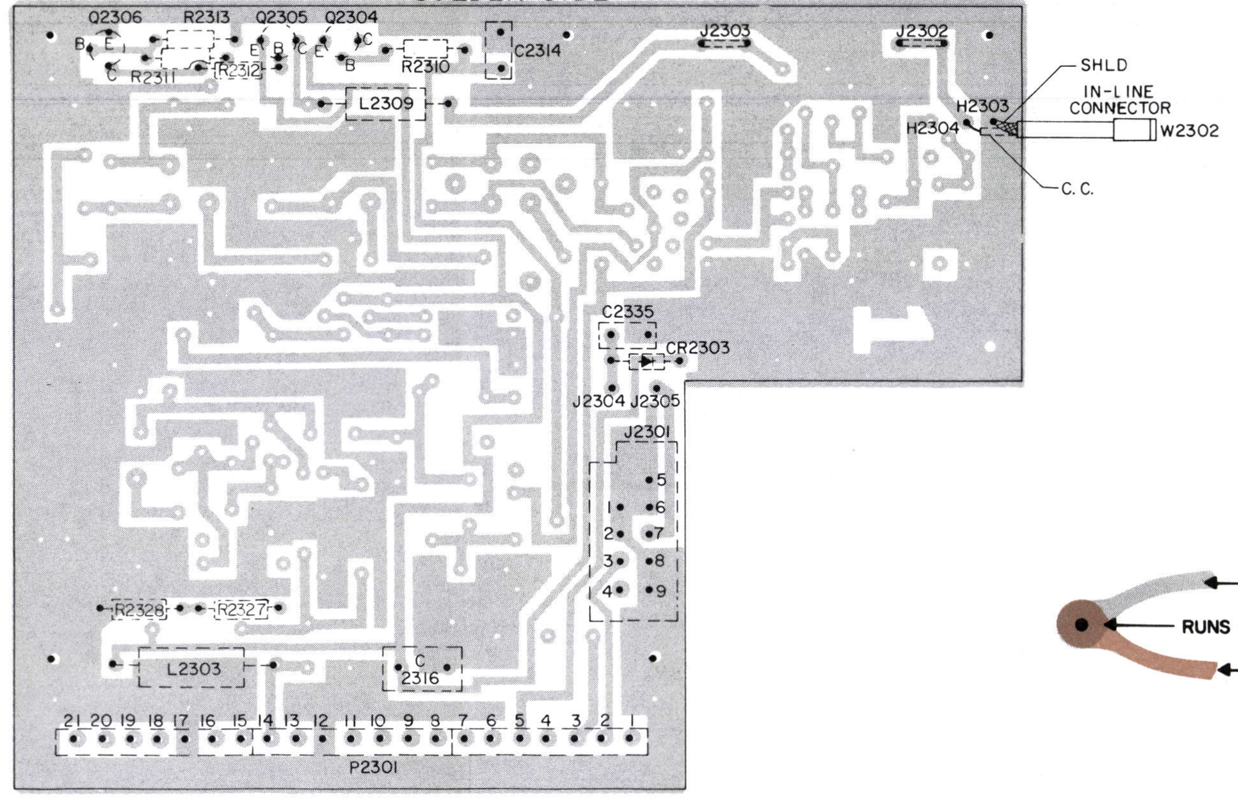
MIF SWITCH BOARD
(MATCHING IF FREQ)

COMPONENT SIDE



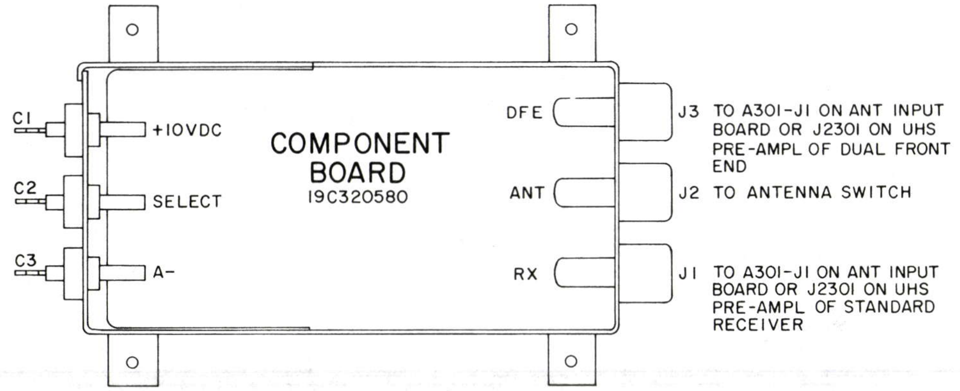
(19D417284, Sh. 2, Rev. 1)
(19D417284, Sh. 3, Rev. 1)

SOLDER SIDE



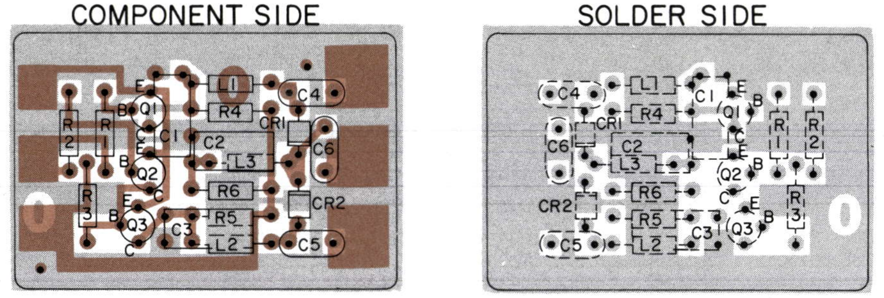
(19D417284, Sh. 2, Rev. 1)

RF STEERING SWITCH
19C320583



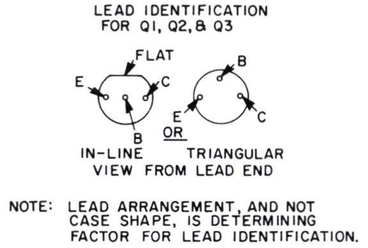
RF STEERING SWITCH BOARD

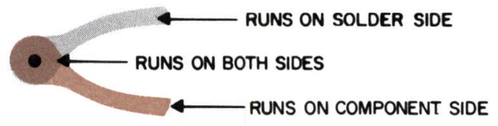
COMPONENT SIDE SOLDER SIDE



(19C320581, Sh. 2, Rev. 0)
(19C320581, Sh. 3, Rev. 0)

(19C320581, Sh. 2, Rev. 0)





OUTLINE DIAGRAM

MIF SWITCH (MATCHING IF'S)
MIF SWITCH/2nd CONVERTER (NON-MATCHING IF'S)
RF STEERING SWITCH

(19R622099, Rev. 2)

MIXER-IF-SWITCH (MATCHING IF'S)

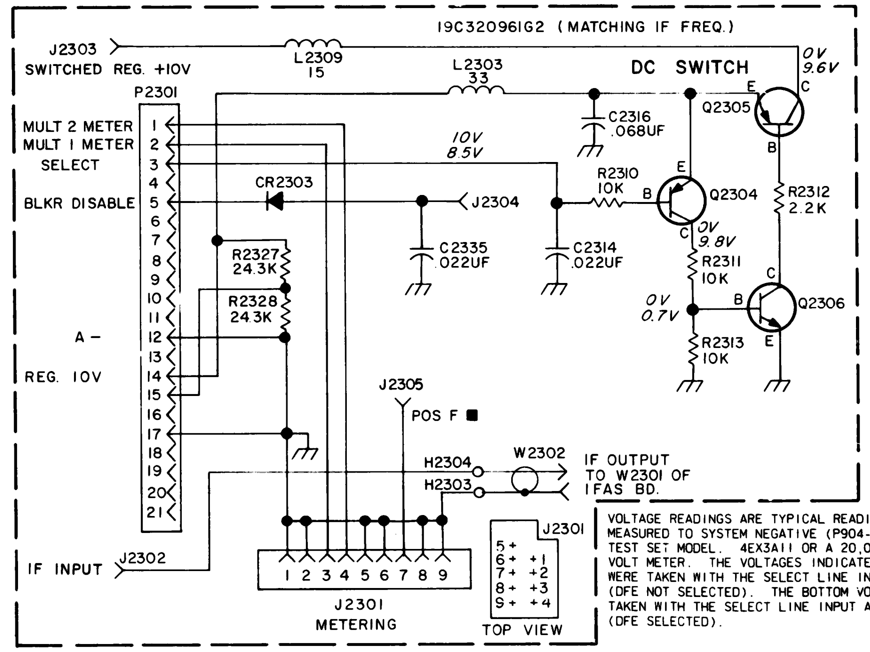
IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
19C320691G2	A

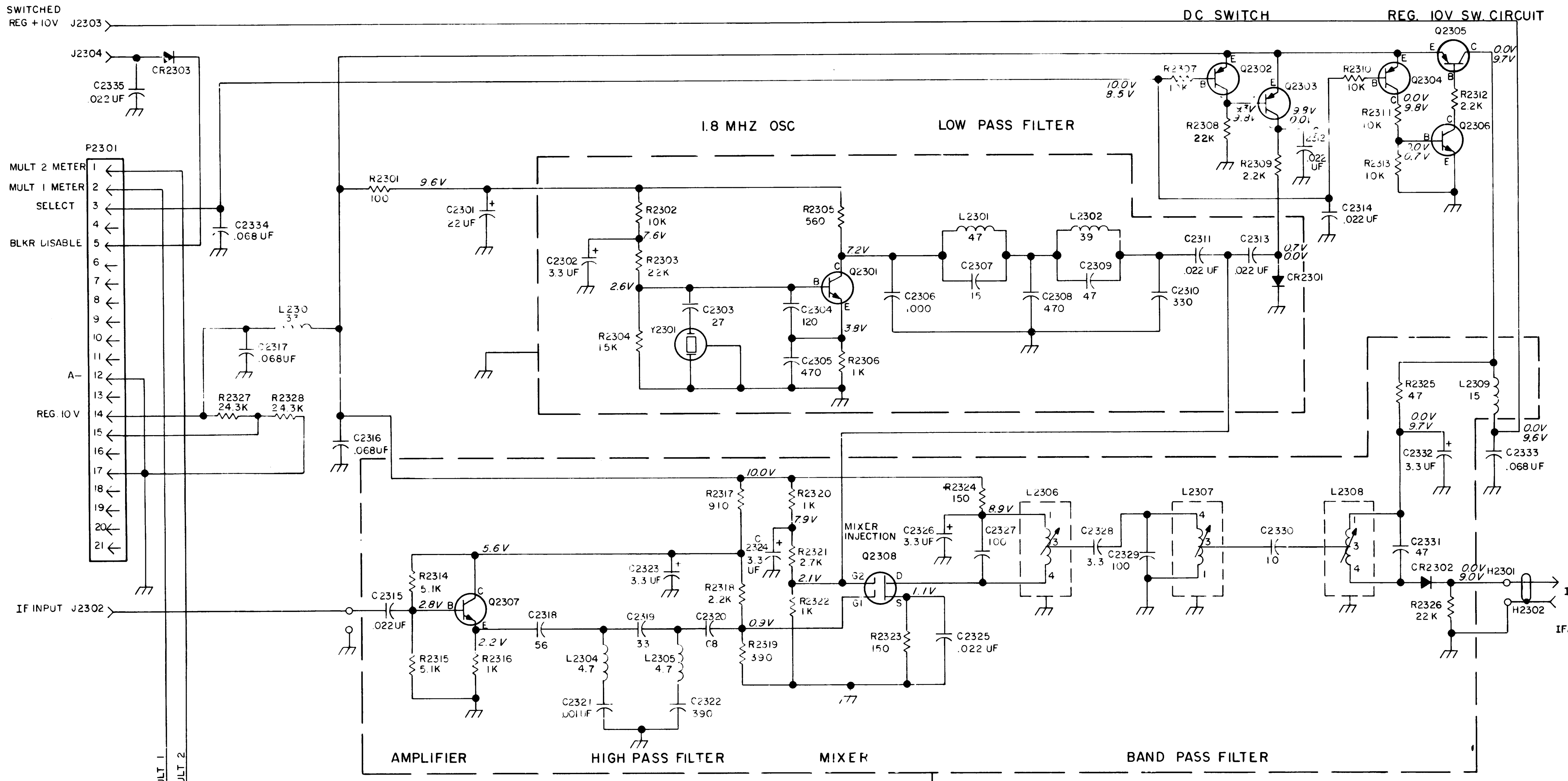
■ 25-50 MHz AND 138-174 MHz DFE NOISE BLANKER TEST POINT. 406-420 MHz AND 450-512 MHz MULT 3 TEST POINT.

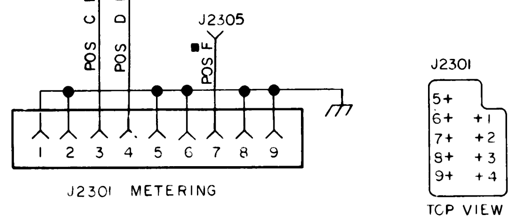


VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE (P904-17) WITH TEST SET MODEL. 4EX3A11 OR A 20,000. OHM PER VOLT METER. THE VOLTAGES INDICATED ON TOP WERE TAKEN WITH THE SELECT LINE INPUT AT +10V. (DFE NOT SELECTED). THE BOTTOM VOLTAGES WERE TAKEN WITH THE SELECT LINE INPUT AT +8.5 V (DFE SELECTED).

(19B226053, Rev. 4)

MIXER-IF SWITCH/2nd CONVERTER (NON-MATCHING IF'S)





SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
19C320691G1	A

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS

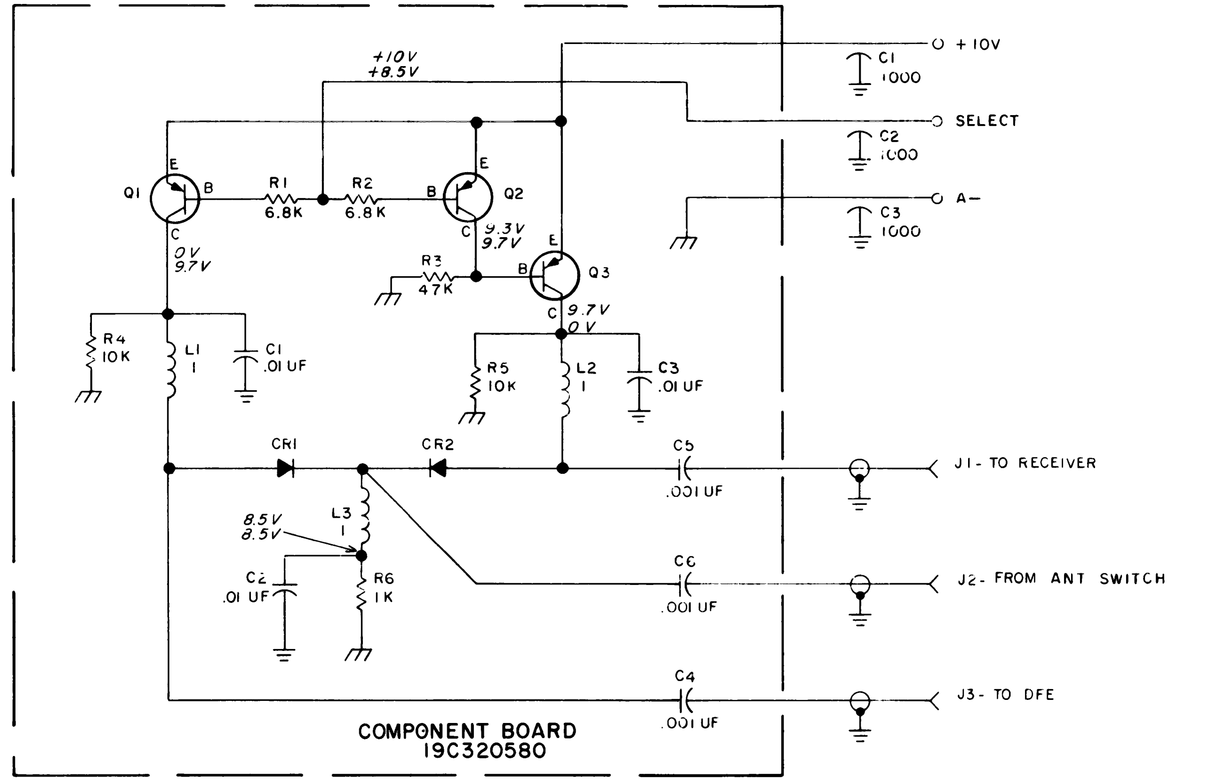
■ 25-50 MHZ AND 138-174 MHZ DFE NOISE BLANKER TEST POINT. 406-420 MHZ AND 450-512 MHZ MULT 3 TEST POINT

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE (P904-17) WITH TEST SET MODEL 4EX3A11, OR A 20,000 OHM PER VOLT METER. THE VOLTAGES INDICATED ON TOP WERE TAKEN WITH THE SELECT LINE INPUT AT +10V (DFE NOT SELECTED) THE BOTTOM VOLTAGES WERE TAKEN WITH THE SELECT LINE INPUT AT +8.5V (DFE SELECTED).

(19D417300, Rev. 4)

RF STEERING SWITCH



SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
19C320583G1	

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE (A-) WITH TEST SET MODEL 4EX3A11 OR A 20,000 OHM-PER-VOLT METER. VOLTAGES LISTED AT THE TOP ARE TAKEN WITH THE SELECT LINE IN A "HIGH STATE". THE BOTTOM VOLTAGES WERE TAKEN WITH THE SELECT LINE IN A "LOW STATE."

(19C320585, Rev. 1)

SCHEMATIC DIAGRAM

MIF SWITCH (MATCHING IF'S)
MIF SWITCH/2nd CONVERTER (NON-MATCHING IF'S)
RF STEERING SWITCH

PARTS LIST

LBI-4673A

MIF SWITCH/2ND CONVERTER
(NON-MATCHING IF FREQ)
MIF SWITCH (MATCHING IF FREQ)
RF STEERING SWITCH

SYMBOL	GE PART NO.	DESCRIPTION
		MIF SWITCH/2ND CONVERTER (NON-MATCHING IF FREQ) 19C320691G1
		- - - - - - - - - CAPACITORS - - - - - - - - - -
C2301	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C2302	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C2303	7489162P13	Silver mica: 27 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C2304	7489162P29	Silver mica: 120 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C2305	7489162P43	Silver mica: 470 pf ±5%, 300 VDCW; sim to Electro Motive Type DM-15.
C2306	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2307	7489162P8	Silver mica: 15 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C2308	7489162P43	Silver mica: 470 pf ±5%, 300 VDCW; sim to Electro Motive Type DM-15.
C2309	7489162P19	Silver mica: 47 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C2310	7489162P39	Silver mica: 330 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C2311 thru C2315	19A116080P103	Polyester: 0.022 µf ±10%, 50 VDCW.
C2316 and C2317	19A116080P106	Polyester: 0.068 µf ±10%, 50 VDCW.
C2318	7489162P21	Silver mica: 56 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C2319	7489162P15	Silver mica: 33 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C2320	7489162P23	Silver mica: 68 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C2321	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2322	7489162P41	Silver mica: 390 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C2323 and C2324	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C2325	19A116080P103	Polyester: 0.022 µf ±10%, 50 VDCW.
C2326	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C2327	7489162P27	Silver mica: 100 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C2328	5491601P130	Phenolic: 3.3 pf ±5%, 500 VDCW.
C2329	7489162P27	Silver mica: 100 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C2330	7489162P6	Silver mica: 10 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C2331	7489162P19	Silver mica: 47 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C2332	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C2333 and C2334	19A116080P106	Polyester: 0.068 µf ±10%, 50 VDCW.
C2335	19A116080P103	Polyester: 0.022 µf ±10%, 50 VDCW.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR2301	4037822P1	Silicon.
CR2302	19A116925P1	Silicon.
CR2303	19A115250P1	Silicon.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - -
J2301	19B219374G1	Connector: 9 contacts.
J2302 and J2303	19A116975P1	Receptacle, wire spring.
J2304 and J2305	19A116779P1	Contact, electrical: sim to Molex 08-54-0404.
		- - - - - - - - - - - INDUCTORS - - - - - - - - - -
L2301	7488079P69	Choke, RF: 47.0 µh ±10%, 1.10 ohms DC res max; sim to Jeffers 4424-5.
L2302	7488079P50	Choke, RF: 39.0 µh ±10%, 2.00 ohms DC res max; sim to Jeffers 4422-11.
L2303	7488079P49	Choke, RF: 33.0 µh ±10%, 1.90 ohms DC res max; sim to Jeffers 4422-10.
L2304 and L2305	19B209420P121	Coil, RF: 4.70 µh ±10%, 1.20 ohms DC res max; sim to Jeffers 4436-8.
L2306 thru L2308	19C320141G3	Coil.
L2309	7488079P18	Choke, RF: 15.0 µh ±10%, 1.20 ohms DC res max; sim to Jeffers 4421-9.
		- - - - - - - - - - - - PLUGS - - - - - - - - - - -
P2301	19B219594P1	Contact, electrical: 7 pins. (Quantity 3).
		- - - - - - - - - - - TRANSISTORS - - - - - - - - -
Q2301	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q2302 thru Q2305	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q2306 and Q2307	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q2308	19A115818P1	Silicon, NPN; sim to Type 2N3772.
		- - - - - - - - - - - RESISTORS - - - - - - - - - -
R2301	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R2302	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R2303	3R152P223J	Composition: 22,000 ohms ±5%, 1/4 w.
R2304	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R2305	3R152P561J	Composition: 560 ohms ±5%, 1/4 w.
R2306	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R2307	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R2308	3R152P223J	Composition: 22,000 ohms ±5%, 1/4 w.
R2309	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R2310 and R2311	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R2312	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R2313	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R2314 and R2315	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R2316	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R2317	3R152P911J	Composition: 910 ohms ±5%, 1/4 w.
R2318	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R2319	3R152P391J	Composition: 390 ohms ±5%, 1/4 w.
R2320	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R2321	3R152P272J	Composition: 2700 ohms ±5%, 1/4 w.
R2322	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R2323 and R2324	3R152P151J	Composition: 150 ohms ±5%, 1/4 w.
R2325	3R152P470J	Composition: 47 ohms ±5%, 1/4 w.
R2326	3R152P223J	Composition: 22,000 ohms ±5%, 1/4 w.
R2327* and R2328*	19C314256P22432	Metal film: 24,300 ohms ±1%, 1/4 w. Added by REV A.
		- - - - - - - - - - - - CABLES - - - - - - - - - -
W2302	19B219999G1	RF: approx 18-1/4 inches long.
		- - - - - - - - - - - CRYSTALS - - - - - - - - - - -
Y2301	19B226002G1	Crystal, freq: 1800 KHz.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19B226048G1	Can. (Located around L2306-L2308).
	19B219554G1	Can. (Located around Y2301).
	19B219555P1	Cover. (Located over Y2301).
	19B226046P1	Cover. (Located over L2306-L2308).
	19A129424G1	Can. (Used with L2306-L2308).
	4035306P59	Washer, fiber. (Used with Y2301).
		MIF SWITCH (MATCHING IF FREQ) 19C320691G2
		- - - - - - - - - - - CAPACITORS - - - - - - - - - -
C2314	19A116080P103	Polyester: 0.022 µf ±10%, 50 VDCW.
C2316	19A116080P106	Polyester: 0.068 µf ±10%, 50 VDCW.
C2335	19A116080P103	Polyester: 0.022 µf ±10%, 50 VDCW.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - -
CR2303	19A115250P1	Silicon.
		- - - - - - - - - JACKS AND RECEPTACLES - - - - - -
J2301	19B219374G1	Connector: 9 contacts.
J2302 and J2303	19A116975P1	Receptacle, wire spring.
J2304 and J2305	19A116779P1	Contact, electrical: sim to Molex 08-54-0404.
		- - - - - - - - - - - - INDUCTORS - - - - - - - - - -
L2303	7488079P49	Choke, RF: 33.0 µh ±10%, 1.90 ohms DC res max; sim to Jeffers 4422-10.
L2309	7488079P18	Choke, RF: 15.0 µh ±10%, 1.20 ohms DC res max; sim to Jeffers 4421-9.
		- - - - - - - - - - - - - PLUGS - - - - - - - - - - -
P2301	19B219594P1	Contact, electrical: 7 pins. (Quantity 3).
		- - - - - - - - - - - - TRANSISTORS - - - - - - - - -
Q2304 and Q2305	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q2306	19A115910P1	Silicon, NPN; sim to Type 2N3904.
		- - - - - - - - - - - - RESISTORS - - - - - - - - - -
R2310 and R2311	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R2312	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R2313	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R2327* and R2328*	19C314256P22432	Metal film: 24,300 ohms ±1%, 1/4 w. Added by REV A.
		- - - - - - - - - - - - - CABLES - - - - - - - - - -
W2302	19B219999G1	RF: approx 18-1/4 inches long.
		RF STEERING SWITCH 19C320583G1
		- - - - - - - - - - - CAPACITORS - - - - - - - - - -
C1 thru C3	5493392P7	Ceramic, feed-thru: 1000 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type FA5C.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - -
J1 thru J3	7104941P16	Jack, phono type: coaxial.
		COMPONENT BOARD 19C320580G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - - -
C1 thru C3	19A116080P101	Polyester: 0.01 µf ±20%, 50 VDCW.
C4 thru C6	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1 and CR2	19A116925P1	Silicon.
		- - - - - - - - - - - - INDUCTORS - - - - - - - - - -
L1 thru L3	19B209420P113	Coil, RF: 1.00 µh ±10%, 0.74 ohms DC res max; sim to Jeffers 4426-6.
		- - - - - - - - - - - - TRANSISTORS - - - - - - - - -
Q1 thru Q3	19A115852P1	Silicon, PNP; sim to Type 2N3906.
		- - - - - - - - - - - - RESISTORS - - - - - - - - - -
R1 and R2	3R152P682J	Composition: 6800 ohms ±5%, 1/4 w.
R3	3R152P473J	Composition: 47,000 ohms ±5%, 1/4 w.
R4 and R5	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R6	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19B219965P1	Cover.
		ASSOCIATED ASSEMBLIES
		DUAL FRONT END INTERCONNECTION CABLE 19B219980G1
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J1801 thru J1803		Includes:
	19A116659P22	Shell: sim to Molex 09-50-3151.
	19A116781P3	Contact, electrical. (J1801-3, 12, 14, J1802-10, 11, J1803-10, 11).
	19A116781P4	Contact electrical. (J1801-1, 2, 5, J1802-1, 2, 3, 4, 6, 7, 8, 9, 12, 13, 14, 15, J1803-1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12).
	4036634P1	Contact, electrical; sim to AMP 42428-2. (Quantity 1).
	5491689P93	RF Cable. (Located between DFE terminal of RF Steering Switch and antenna input of DFE).
	19A129694G1	RF Cable. (Located between antenna switch and antenna terminal of RF steering switch).
	19A129694G2	RF Cable. (Located between receiver terminal of RF steering switch and receiver antenna input).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter", which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

REV. A - MIF Switch/2ND Converter Bd. (19C320691G1 & G2)

Incorporated in initial shipment.

ORDERING SERVICE PARTS

Each component appearing on the schematic diagram is identified by a symbol number, to simplify locating it in the parts list. Each component is listed by symbol number followed by description and GE Part Number.

Service parts may be obtained from Authorized GE Communication Equipment Service Stations or through any GE Radio Communication Equipment Sales Office. When ordering a part, be sure to give:

1. GE Part Number for component
2. Description of part
3. Model number of equipment
4. Revision letter stamped on unit

MAINTENANCE MANUAL
LBI-4795

DF-8411

MOBILE RADIO DEPARTMENT
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