INSTRUCTION MANUAL

FOR THE

WJ-8628-4/FE FREQUENCY EXTENDER

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WARNING

This equipment employs dangerous voltages which may be fatal if contacted. Exercise extreme caution in working with this equipment with any of the protective covers removed.

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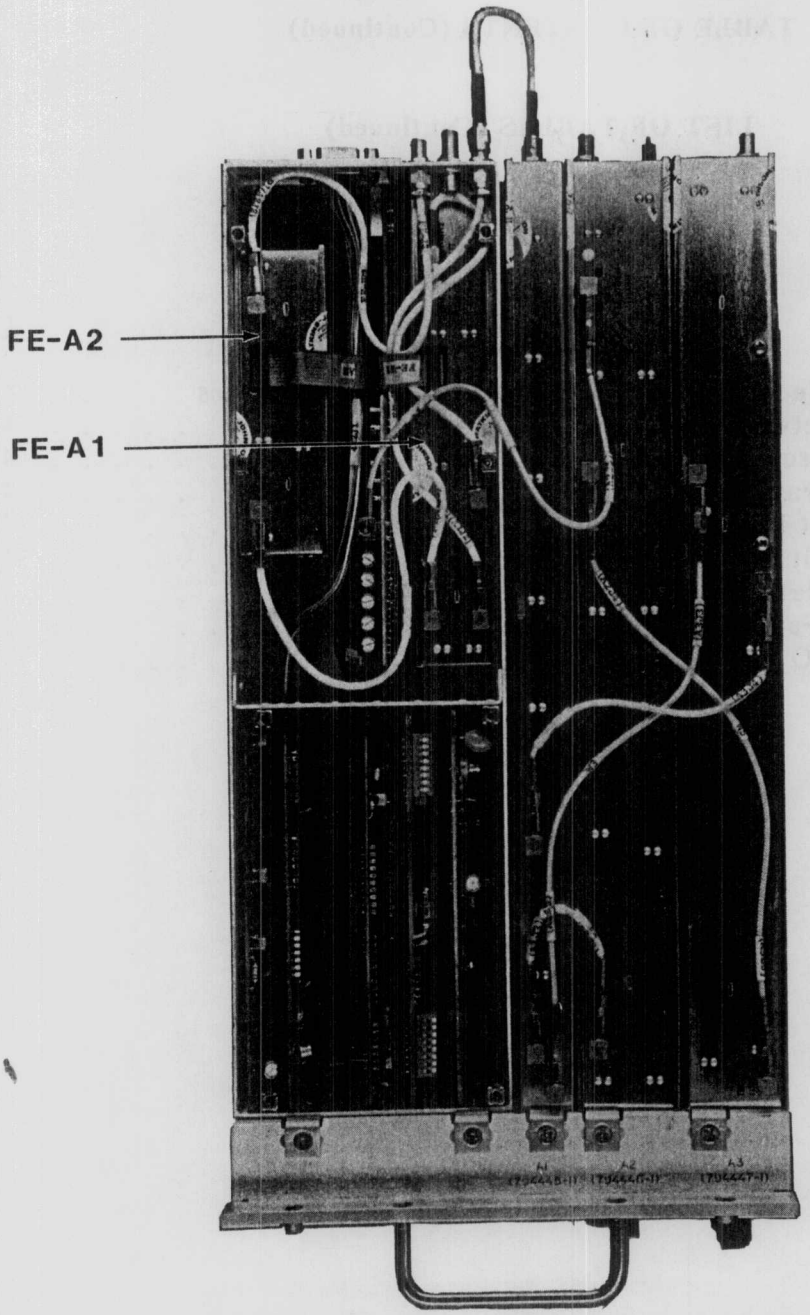


Figure 1-1. WJ-8628-4/FE Frequency Extender Location

SECTION I

GENERAL DESCRIPTION

1.1 INTRODUCTION

The WJ-8628-4/FE Frequency Extender is an option that may be installed in the WJ-8628-4 VHF/UHF Receiver/Receiver Controller.

1.2 EQUIPMENT PURPOSE, CAPABILITIES AND FEATURES

The WJ-8628-4/FE Frequency Extender extends the RF tuning range of the WJ-8628-4 VHF/UHF Receiver/Receiver Controller to 20 to 1400 MHz. **Figure 1-0** shows the physical location of a WJ-8628-4/FE Frequency Extender installed in a WJ-8628-4 VHF/UHF Receiver/Receiver Controller. The WJ-8628-FE Frequency Extender consists of two modules, the 500-1400 MHz RF Assembly (A1) Module and the 800, 1000 MHz Synthesizer (A2). Installation of dual RF antenna inputs (20-500 MHz and 500-1400 MHz) is also an option when the WJ-8628-4/FE Frequency Extender is installed in the WJ-8628-4 VHF/UHF Receiver/Receiver Controller. The WJ-8628-4/FE Frequency Extender is installed at the factory as a customer selected option during the manufacturing process. Any requirements for field installation of the Frequency Extender into existing receivers requires direct coordination with the Watkins-Johnson Company Engineering Department.

1.3 EQUIPMENT SPECIFICATIONS

See **Table 1-1** for WJ-8628-4/FE Frequency Extender Specifications.

1.4 EQUIPMENT REQUIRED BUT NOT SUPPLIED

The WJ-8628-4/FE Frequency Extender is a factory installed option to the WJ-8628-4 VHF/UHF Receiver/Receiver Controller. This factory installed option uses the internal circuitry of the VHF/UHF Receiver/Receiver Controller to supply all required voltages and signals needed to provide the extended RF frequency range (500-1400 MHz), except for an additional 50 MHz reference obtainable from one of the four outputs of the Frequency Reference Module.

Table 1-1. WJ-8628-4/FE Frequency Extender, Specifications

Frequency Range	500-1400 MHz
Image Rejection	60 dB
IF Rejection	70 dB
Noise Figure	11 dBm, Typical 13 dBm, Maximum
Third Order Intercept	0 dBm, Typical -5 dBm, Maximum
LO Radiation	-90 dBm
Input Impedence	50 ohm, unbalanced
Temperature Operating Range	0 to 50 degrees C
Power Input Requirements	+29, +18.3, -18.3 and +8.2 VDC (Supplied by the WJ-9040 EFR 100.)

SECTION II

INSTALLATION AND OPERATION

2.1 INSPECTION

The unit was thoroughly inspected and factory adjusted for optimum performance prior to shipment. It is, therefore, ready for use upon receipt.

2.2 500-1400 MHZ RF ASSEMBLY (A1) INPUT/OUTPUT CONNECTORS

Refer to **Figure 6-1.**

2.2.1 20-1400 MHZ RF INPUT (J1)

The 20-1400 MHz RF Input is received at J1 and is routed to the input switching network (A1A1). 20-500 MHz signals are switched directly back to the 20-500 MHz (J3) ouput and 500-1400 MHz signals are routed through the internal circuitry of the 20-1400 MHz RF Assembly, mixed with the 800, 1000 Local Oscillators, downconverted to the 100-300 MHz band, or 100-400 MHz band, and inputed to the radio.

2.2.2 20-500 MHZ OUTPUT (J4)

The 20-500 MHz signals that are switched to J4 are then routed to the 20-500 MHz Input (J5) through an external connection and are inputed to the Output Switch (A1A5).

2.2.3 LO INPUT (J3)

The LO INPUT signal received at LO INPUT J3 is the 800, 1000 MHz FE LO output from the 800, 1000 Synthesizer Module (A2).

2.2.4 20-500 MHZ INPUT (J5)

The 20-500 MHz input signals received at J5 are passed to the Output Switch (A1A5).

2.2.5 20-500 MHZ OUTPUT (J2)

The output of the Output Switch (A1A5) is 20-500 MHz, either from the signal received from the 20-500 MHz Input (J5) or the signal that is received from the Switch/Amplifier (A1A3). The resultant 20-500 MHz signal is then passed to the 20-500 MHz Output at J2 for distribution to the VHF/UHF Receiver/Receiver Controller circuitry.

2.3 800, 1000 MHZ SYNTHESIZER (A2) INPUT/OUTPUT CONNECTORS

Refer to **Figure 6-7.**

2.3.1 50 MHZ IN (J2)

The 50 MHz reference input signal is received at J2 and passed to the internal circuitry of the 800, 1000 MHz Synthesizer (A2) module. A minimum signal level of 0 dBm is required.

2.3.2 LO OUT (J1)

The LO ouput of the 800,1000 MHz Synthesizer (A2) Module is passed to the 20-1400 MHz RF Assembly through J1.

SECTION III

CIRCUIT DESCRIPTION

3.1 INTRODUCTION

This section describes the theory of operation of the Frequency Extender. A simplified block diagram is provided to show overall functional partitioning of the Frequency Extender. Functional block diagrams are provided for each of the Frequency Extender's major assemblies.

3.2 GENERAL DESCRIPTION

Figure 3-1 is a simplified block diagram of the WJ-8628-4 VHF/UHF Receiver/Receiver Controller showing the functional relationship of the Frequency Extender to the receiver. A general discussion of the Frequency Extender functions and signal interfaces is provided in the following paragraphs.

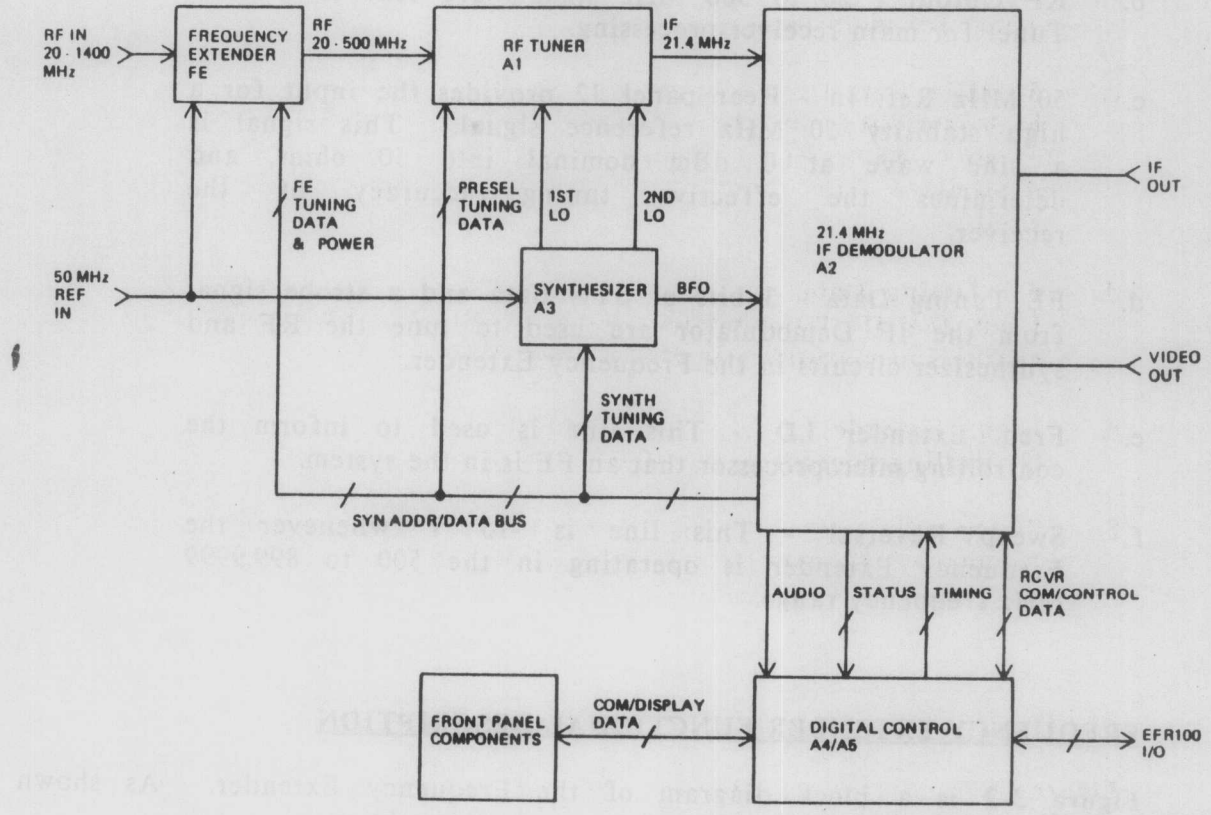


Figure 3-1. WJ-8628-4 VHF/UHF Receiver Block Diagram

3.2.1 FREQUENCY EXTENDER FUNCTIONS

The Frequency Extender performs the following functions:

a. Down Conversion - 500 to 1400 MHz RF input signals are converted to the 20 to 500 MHz range for processing by the remainder of the receiver.

b. RF Bypassing - 20 to 499.9999 MHz RF input signals are bypassed through the Frequency Extender and sent to the remainder of the receiver for processing.

3.2.2 FREQUENCY EXTENDER SIGNAL INTERFACES

The following input/output signals interface with the Frequency Extender:

a. RF Input - 20 to 1400 MHz signals from an external source serve as the main signal input to the receiver. Input impedance is 50 ohms.

b. RF Output - 20 to 500 MHz signals are sent to the RF Tuner for main receiver processing.

c. 50 MHz Ref. In - Rear panel J2 provides the input for a high stability 50 MHz reference signal. This signal is a sine wave at 0 dBm nominal into 50 ohms, and determines the effective tuning accuracy of the receiver.

d. FE Tuning Data - 3 bits of SYN data and a strobe signal from the IF Demodulator are used to tune the RF and synthesizer circuits in the Frequency Extender.

e. Freq. Extender I.D. - This line is used to inform the controlling microprocessor that an FE is in the system.

f. Sweep Reversal - This line is -15 V whenever the Frequency Extender is operating in the 500 to 899.9999 MHz frequency range.

3.3 FREQUENCY EXTENDER FUNCTIONAL DESCRIPTION

Figure 3-2 is a block diagram of the Frequency Extender. As shown in **Figure 3-2**, the Frequency Extender consists of two major assemblies:

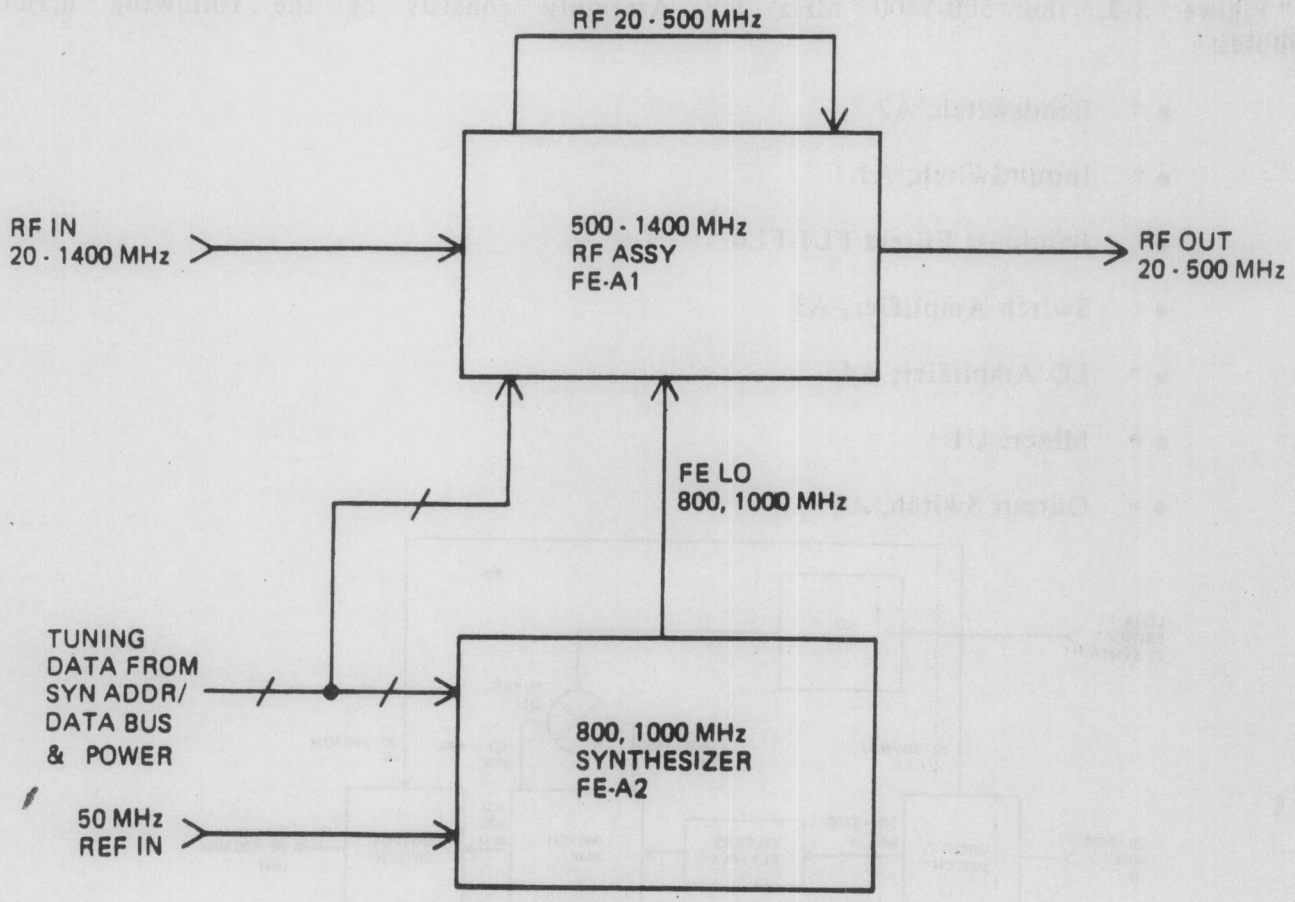


Figure 3-2. Frequency Extender Block Diagram

- 500-1400 MHz RF Assembly
- 800, 1000 MHz Synthesizer

3.3.1 500-1400 RF ASSEMBLY

Refer to **Figure 3-3**, 500-1400 MHz RF Assembly Block Diagram. As shown in **Figure 3-3**, the 500-1400 MHz RF Assembly consists of the following major modules:

- Bandswitch, A2
- Input Switch, A1
- Bandpass Filters FL1-FL4
- Switch Amplifier, A3
- LO Amplifier, A4
- Mixer, U1
- Output Switch, A5

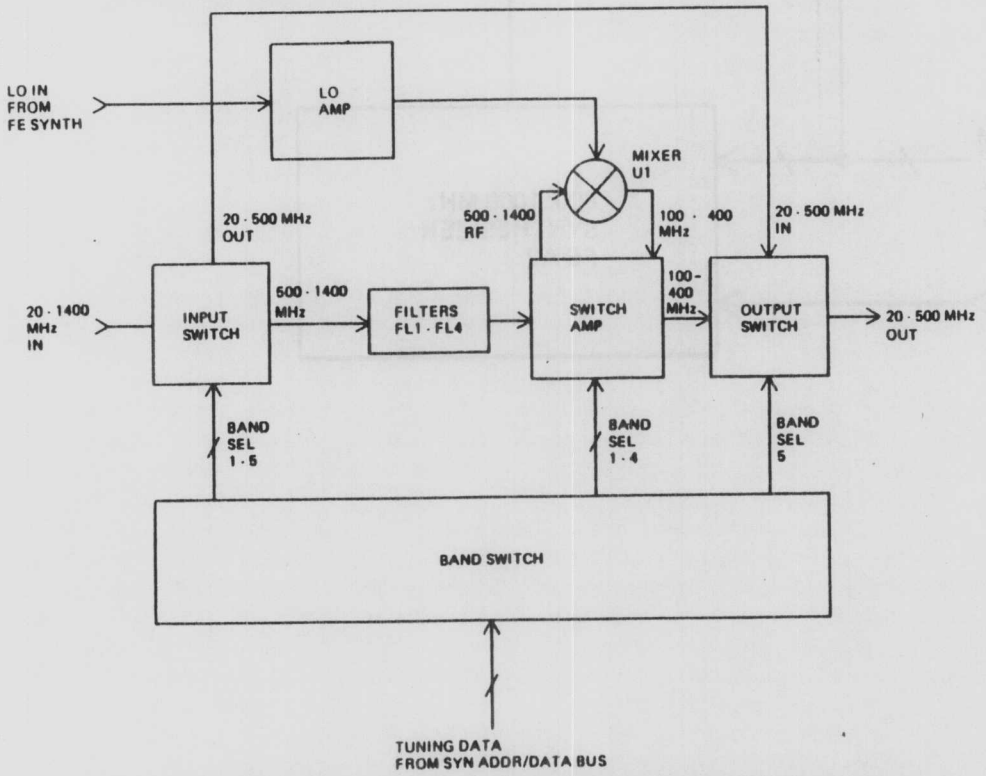


Figure 3-3. 500-1400 MHz RF Assembly Block Diagram

Tuning data from the SYN addr/data bus drives the Bandswitch. The Bandswitch decodes the tuning data and organizes the tuning of the 500-1400 MHz Assembly into five separate bands. Band Select signals 1-5 drive the Input Switch from the Band Switch. Band Select signals 1-4 drive the Switch Amplifier from the Band switch. Band Select signal 5 drives the Output Switch from the Band Switch. These bands are summarized in **Table 3-2.**

Table 3-1. Frequency Extender Bandswitching

Freq. Range	Band #	Syn Data Word	FE LO Freq.	FE IF Freq.
500-699.9999 MHz	1	011	800 MHz	300-100.0001 MHz
700-899.9999 MHz	2	010	1000 MHz	300-100.0001 MHz
900-1099.9999 MHz	3	001	800 MHz	100-299.9999 MHz
1100-1400 MHz	4	000	1000 MHz	100-400 MHz
20-499.9999 MHz	5	100	N.U.	N.U.

Incoming RF signals are routed through the Input Switch. The Input Switch has five RF outputs corresponding to bands 1-5. If the receiver is tuned to the 20-499.9999 MHz range, the band 5 command from the bandswitch directs the RF through the input switch, out the 20-500 MHz port and through the Output Switch to the 20-500 MHz output port. This effectively bypasses the 500-1400 MHz processing circuitry.

If the receiver is tuned to the 500-1400 MHz range, band commands 1-4 direct the incoming RF signals through the Input Switch, through bandpass filter FL1, FL2, FL3 or FL4 as appropriate **(see Table 3-2)** and into the Switch Amplifier. The RF signals are then routed through mixer U1 and mixed with an 800 MHz or 1000 MHz LO signal **(see Table 3-2)** from the 800, 1000 MHz Synthesizer. The resulting IF signal which falls in the 20-500 MHz range (see **Table 3-2**), is routed through the Switch Amplifier and the Output Switch to the 20-500 MHz output port.

3.3.2 800, 1000 MHZ SYNTHESIZER

Refer to **Figure 3-4**, 800, 1000 MHz Synthesizer Block Diagram. As shown in **Figure 3-4**, the 800, 1000 MHz Synthesizer consists of the following modules:

- PLL, A1
- Output Amplifier, A2
- 800, 1000 MHz VCO, A3

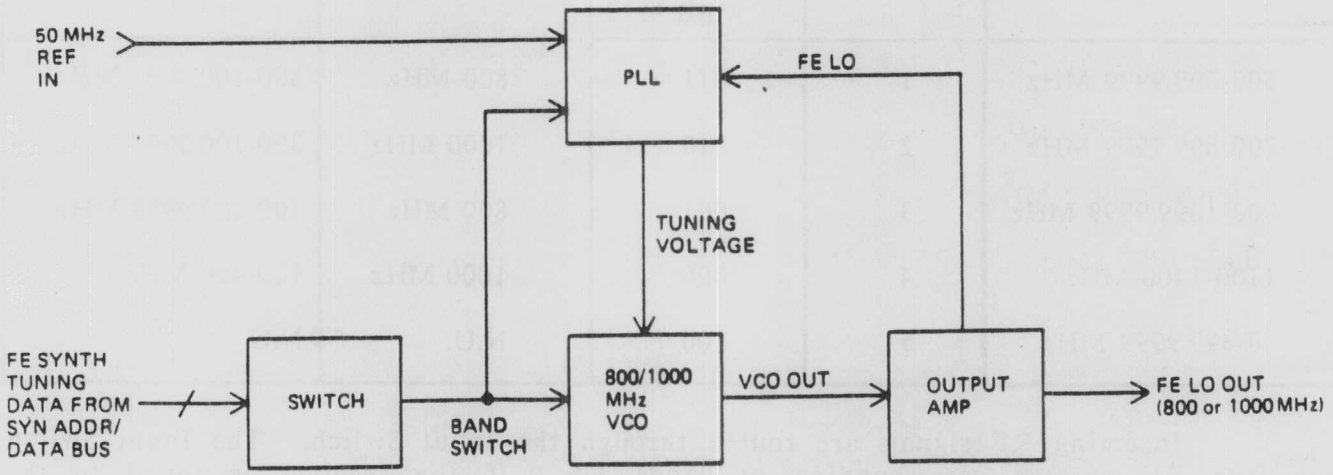


Figure 3-4. 800, 1000 MHz Synthesizer Block Diagram

Tuning data from the SYN addr/data bus drives the PLL. The switch within the PLL decodes the tuning data and organizes the tuning of the 800, 1000 MHz Synthesizer into five separate bands. The FE LO OUT frequency will be either 800 MHz or 1000 MHz according to which band is being tuned **(see Table 3-1)**.

The switch output BAND SW signal drives the 800/1000 MHz VCO. The VCO is capable of oscillating at two frequencies: approximately 800 MHz and approximately 1000 MHz. The VCO output is amplified by the Output Amplifier to give the FE LO OUT signal. A sample of the VCO signal is fed to the PLL. An internal divider in the PLL, programmed by the Bandswitch signal, compares the VCO sample with the 50 MHz Reference signal from the rear. A correction tuning voltage is sent to the 800/1000 MHz /VCO to force it to oscillate at exactly 800 or 1000 MHz as required (see **Table 3-1**)

3.4 THEORY OF OPERATION

3.4.1 500-1400 MHZ RF ASSEMBLY (A1)

3.4.1.1 Input Switching Network (A1A1)

Refer to **Figure 6-2**, Input Switching Network, A1A1, Schematic Diagram, as an aid in understanding the following description.

RF Input signals from 20 to 1400 MHz are coupled through C1 to a microstrip transmission line. Bands 1-5 outputs are tapped from the line via PIN diodes CR10, CR2, CR3, CR4/CR13 and CR5/CR12. The signals are coupled through microstrip transmission lines to their respective output terminals. The microstrip lines for band outputs 1-4 have shunt and series connected PIN diodes to maximize channel "off" isolation.

When band 1 is selected, terminal E1 is switched to -12 V. Diode CR11 is reverse-biased and CR10 is conducting, providing a low loss signal path from RF input to the 1100-1400 MHz bandpass filter, FL4. Band select terminals E2-E5 are +12 V. This causes diodes CR1, CR6-CR9, and CR11 to conduct and diodes CR2-CR5, CR10, CR12 and CR13 to be reverse-biased. This effectively isolated band outputs 2-5 from the RF input.

Selection of bands 2 through 5 via terminals E2 through E5 is identical to band 1 selection described above.

3.4.1.2 Bandswitch, (A1A2)

Refer to **Figure 6-3**, Bandswitch, A1A2, Schematic Diagram, as an aid in understanding the following description.

RF band select signals and the FE strobe from the SYN ADR/DATA bus are decoded by U5 into five separate outputs (Y0-Y4). Each output corresponds to one of the five RF bands. The U5 Y0-Y4 outputs drive sections of CMOS switches U3, U4 and U6. Each switch section provides -12 V output when not selected by U5 and +12 V output when selected by U5.

For example, consider band 1 (1100-1400 MHz). RF band select data word 000 is strobed into U5 by the FE strobe signal. This brings the Y0 output (pin 15) low (0 Vdc). This low from U5-15 causes U6 to switch, bringing pin 2/13 from -12 V to +12 V.

Switching of band select signals 2 through 5 via Y1-Y4 is similar to the band 1 selection described above. **Table 3-2** summarizes the band selection.

Table 3-2. RF Band Selection

Freq Range (MHZ)	Band	Data Word	U5 Output	CMOS Switch Output U6-13	U3-11	U3-4	U4-11	U4-4
1100-1400	1	000	Y0	-12 V	+12 V	+12 V	+12 V	+12 V
900-1099.9999	2	001	Y1	+12 V	+12 V	-12 V	+12 V	+12 V
700-899.9999	3	010	Y2	+12 V	-12 V	+12 V	+12 V	+12 V
500-699.9999	4	011	Y3	+12 V	+12 V	+12 V	+12 V	-12 V
20-499.9999	5	100	Y4	+12 V	+12 V	+12 V	-12 V	+12 V

3.4.1.3 **Switch/Amplifier (A1A3)**

Refer to **Figure 6-4**, Switch/Amplifier, A1A3, Schematic Diagram, as an aid in understanding the following description.

The RF input signals from bandpass filters FL1 through FL4 are coupled through separate microstrip transmission lines and PIN diodes to amplifier U1. Each input line has shunt and series connected PIN diodes to maximize the "off" isolation of the channel.

When band 1 (1100-1400 MHz) is selected, terminal E1 switches from -12 V to +12 V. Diode CR1 is then reverse-biased, while CR9 is conducting, providing a low loss signal path from the band 1 RF input to the input of U1. Diodes CR2-CR5 are conducting, while diodes CR6-CR8, CR10 and CR11 are reverse-biased, isolating bands 2-4 RF inputs from U1.

Selection of bands 2 through 4 is identical to the band 1 selection described above. Selected input RF is amplified by broad band amplifiers U1 and U2 and coupled to the RF output via an impedance matching and microstrip line.

The RF output from A3 drives mixer U1 (part of 500-1400 MHz RF Assembly). The RF is mixed with the 800/1000 MHz LO signal from the LO Amp, A4, to give an IF output of 100-400 MHz from mixer U1. This IF signal passes back through A3 and then on to the Output Switch, A5.

3.4.1.4 LO Amplifier (A1A4)

Refer to **Figure 6-5**, LO Amplifier, A1A4, Schematic Diagram, as an aid in understanding the following description.

The +2 dBm LO signal (800 MHz or 1000 MHz) from the synthesizer is coupled through a microstrip line and coupling capacitor to amplifier U1. U1 amplifies the LO signal to a level of +13 dBm and couples it to the LO output terminal via a microstrip line and coupling capacitor.

Regulator U2 drops the +8.2 V level at E1 to +5 V. The +5 V supply from U2 supplies U1 via isolating inductor, L1.

3.4.1.5 Output Switch (A1A5)

Refer to **Figure 6-6**, Output Switch, A1A5, Schematic Diagram, as an aid in understanding the following description.

Two RF input ports enter A5: 100-400 MHz IF from A3 and 20-500 MHz RF from Input Switch A1. Each input port is coupled through microstrip transmission lines and PIN diodes to output terminal E3.

If bands 1 through 4 are selected, the 100-400 MHz input terminal, E4, is active. Terminal E1 (band 5 select) is +12 Vdc. Diode CR2 conducts while CR3 is reverse-biased, providing a low loss RF path from E4 to E3. CR5 conducts while CR1 and CR4 are reverse-biased, isolating E2 from E3.

If band 5 is selected, the 20-500 MHz input terminal, E2, is active. Terminal E1 (band 5 select) is -15 Vdc. Diodes CR1/CR4 conduct while CR5 is reverse-biased, providing a low loss RF path from E2 to E3. CR3 conducts while CR2 is reverse-biased, isolating E4 from E3.

3.4.2 800, 1000 MHZ SYNTHESIZER (A2)

3.4.2.1 PLL/Reg (A2A1)

Refer to **Figure 6-8**, PLL/Reg, A2A1, Schematic Diagram, as an aid in understanding the following description.

The major components of the PLL portion of A1 consist of the synthesizer chip U5 and loop filter U7. The 800 or 1000 MHz VCO output is coupled from terminal E6 through divide by 128 divider U6 to the F IN terminal of U5. The 50 MHz reference signal is coupled from terminal E1 through divide by 4 divider U4 to the OSC IN terminal of U5. Frequency data is clocked from J1-3 through flip-flop U1 to the No terminal of U5. When the data bit on J1-3 is high, U5 is set for a VCO frequency of 800 MHz. When the data bit on J1-3 is low, U5 is set for a VCO frequency of 1000 MHz.

U5 internally compares the input frequency from U6 with the reference input from U4. The R and V phase outputs from U5 are filtered and amplified by U7 to become the VCO tuning voltage (Vtune). This voltage drives the VCO and locks it at either 800 MHz or 1000 MHz as set by the data bit on J1-3.

The major components of the regulator portion of A1 are U8, U9 and U10. U8 is a fixed regulator which drops +8.2 V dc input to a fixed +5.0 V. U9 is a fixed regulator which drops +18.3 V dc input to a fixed +15 V. U10 is a fixed regulator which drops -18.3 V dc input to a fixed -15 V.

3.4.2.2 Output Amplifier (A2A2)

Refer to **Figure 6-9**, Output Amplifier, A2A2, Schematic Diagram, as an aid in understanding the following description.

The 800 or 1000 MHz VCO output signal is coupled from terminal E1 through a matching attenuator to amplifier U1. U1 increases the VCO signal level by 14 dB and drives splitter U2. Splitter U2 provides two signal outputs with an overall loss of 3 dB. Each output goes to an amplifier, U3 or U4. These two amplifiers increase the signal level of each splitter output by 14 dB. U3 output is coupled through terminal E3 to become the +2 dBm LO OUT signal which drives the RF Assembly. U4 output is coupled through an attenuator to E4 and drives the prescaler input of PLL/Reg A1.

3.4.2.3 800, 1000 MHz VCO (A2A3)

Refer to **Figure 6-10**, 800, 1000 MHz VCO, A2A3, Schematic Diagram, as an aid in understanding the following description.

The major component of the VCO is transistor Q1. Q1 is connected as a Colpitts oscillator with oscillation frequency determined by a tuned microstrip line, capacitors C4, C6, C7, C8 and variactors CR1/CR2. A bandswitching PIN diode CR3 switches C6/C7 into the circuit when 800 MHz output is desired and out of the circuit when 1000 MHz output is desired.

In normal operation, Q1 oscillates at approximately 800 or 1000 MHz as determined by the PLL/Reg, A1, via the band switch input terminal E4 and diode CR3. The tuning voltage from the PLL/Reg, A1, drives CR1/CR2 and locks the frequency of Q1 at exactly 800 or 1000 MHz. The outut from Q1 is coupled through a matching attenuator to terminal E5 as the VCO OUT signal and drive the Output Amplifier, A2.

SECTION IV

MAINTENANCE

4.1 GENERAL

This section provides detailed procedures to perform preventive and corrective maintenance on the WJ-8628-4/FE Frequency Extender. Preventive maintenance helps prevent malfunctions or breakdowns. Corrective maintenance includes procedures for returning a malfunctioning Frequency Extender to operating condition.

4.2 MODULE ACCESS

The Frequency Extender is a highly compact unit consisting of small printed circuit assemblies, interconnecting cabling and chassis mounted components. Physical access to all Frequency Extender assemblies is obtained by removing the unit from the receiver main chassis and then removing the Frequency Extender side panels.

4.3 PREVENTIVE MAINTENANCE

Preventive maintenance consists of visual inspection, cleaning and lubrication. Preventive maintenance will normally be performed on the Frequency Extender in conjunction with the preventive schedule for the host WJ-8628-4 Receiver. Specific schedule recommendations are contained in the Instruction Manual for the WJ-8628-4 VHF/UHF Receiver. The following paragraphs detail the minimum recommended preventive maintenance procedures for the Frequency Extender.

4.3.1 VISUAL INSPECTION

A visual inspection of the Frequency Extender should be performed when an inspection of the host receiver is performed. The inspection should be performed thoroughly to uncover existing or potential component malfunctions. At a minimum, the following items should be checked.

1. Inspect the top, rear and side panels for condition of finish and panel markings.
2. Inspect for dents, punctures, or warped areas.
3. Inspect the external surfaces for loose or missing screws or washers.

4. Inspect the receptacles for conditions of pins, contacts, and mountings.

5. Inspect the internal components for signs of deterioration, discoloration, or charring. Check for melted insulation and damaged, cracked, or broken components.

6. Inspect the printed circuit boards for damaged tracks, loose connections, corrosion, or other signs of deterioration.

8. Inspect the PC connectors, interface connectors, and chassis wiring for excessive wear, looseness, misalignment, corrosion, or other signs of deterioration.

4.3.2 CLEANING

Dust in the interior of the unit should be removed before it builds up enough to cause arcing and short circuits during periods of high humidity. Dust is best removed by dry, low-pressure air. Dirt clinging to surfaces may be removed with a soft-bristled paint brush or a clean, lint-free cloth dampened with a mild detergent and water solution. Use a cotton-tipped applicator for cleaning in narrow spaces and on the circuit boards.

4.3.3 LUBRICATION

Lubrication is not required for the WJ-8628-4/FE Frequency Extender.

4.4 FREQUENCY EXTENDER CHECKOUT PROCEDURE

4.4.1 GENERAL

The checkout procedure outlined in this paragraph defines the minimum performance standards which ensure adequate overall gain of the Frequency Extender over the defined operating frequency range. The tests should be used for initial Frequency Extender inspection, for preventive maintenance checks, for troubleshooting or to verify Frequency Extender performance after repairs have been made.

4.4.2 TEST EQUIPMENT REQUIRED

Table 4-1 lists the test equipment required for corrective maintenance of the WJ-8628-4/FE Frequency Extender. Equivalent equipment may be used.

Table 4-1. Test Equipment Required

Instrument Type	Required Characteristics	Recommended Instrument
Signal Generator	AM, FM, CW, RF output, from -111 dBm to 0 dBm	HP8640B
Oscilloscope	DC to 50 MHz	HP180C
Digital Voltmeter	DC ranges; 1% or better	Fluke 8100A
Spectrum Analyzer	100-400 MHz Freq. Range	HP8568B
Frequency Counter	DC to 1 GHz; 1 Hz resolution	HP5303A

4.4.3 PRELIMINARY SETUP PROCEDURE

1. Connect the receiver to a DC power source such as the EPS100 Power Supply in the EFR100 Equipment Frame.

2. Remove the Frequency Extender from the receiver chassis. Connect ribbon connector FE-W1P1 to an extender ribbon cable. Connect the opposite end of the extender to connector A5J2 on the receiver.

3. Connect test equipment to the Frequency Extender as shown in **Figure 4-2.**

4. Energize the DC power source. Verify proper receiver initialization via the front panel display. Set the receiver for EXEC mode.

4.4.4 CHECKOUT PROCEDURE

1. Using the receiver front panel controls and keypad, set the receiver to the following parameters:

   a. Gain Mode - Manual

   b. RF Gain - Max. CW

   c. Frequency - 600.0000 MHz

2. Set the signal generator output frequency to 600.000 MHz and output level to -30 dBm.

3. The Spectrum Analyzer should indicate a level of -27 dBm +/- 2 dB and a frequency of 200.0000 MHz.

4. Change the receiver and signal generator frequencies to 800.0000 MHz. The Spectrum Analyzer should display a level of -27 dBm +/- 2 dB and a frequency of 200.0000 MHz.

5. Change the receiver and signal generator frequencies to 1000.0000 MHz. The Spectrum Analyzer should display a level of -27 dBm +/- 2 dB and a frequency of 200.0000 MHz.

6. Change the receiver and signal generator frequencies to 1100.0000 MHz. The Spectrum Analyzer should display a level of -27 dBm +/- 2 dB and a frequency of 100.0000 MHz.

7. De-energize the DC power source.

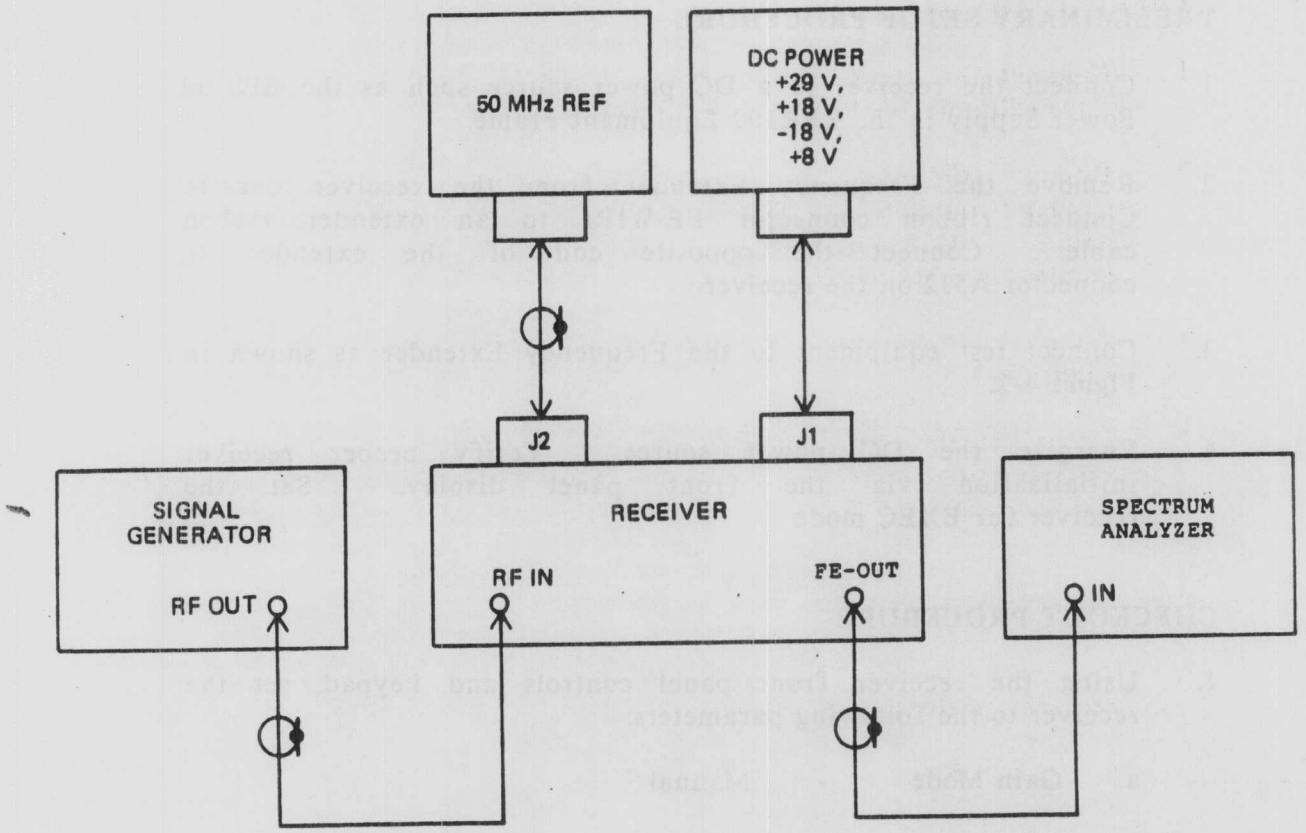


Figure 4-1. WJ-8628-4/FE Frequency Extender Test Setup

4.5 FREQUENCY EXTENDER TROUBLESHOOTING PROCEDURES

4.5.1 GENERAL

Information is provided in this paragraph to troubleshoot the Frequency Extender to a defective replaceable assembly or PC board. The unit normally requires troubleshooting as a result of failure to pass any of the performance tests outlined in **paragraph 4.4**, or as a result of operator-observed malfunctions during normal operation.

4.5.2 TROUBLESHOOTING GUIDELINES

Table 4-2, WJ-8628-4/FE Frequency Extender Troubleshooting Chart is provided as an aid in locating defective assemblies and PC boards within the unit. The chart is designed to be used in conjunction with the Frequency Extender performance test outlined in **paragraph 4.4**. The troubleshooting procedures provide a listing of specific fault symptoms that could occur during the performance test outlined in **paragraph 4.4**. Probable causes of the fault and suggested corrective actions are also listed. The following guidelines should be applied when using **Table 4-2**.

1. Perform the performance test in **paragraph 4.4**. Note any failures to achieve the expected test result or results.
2. Refer to **Table 4-2**. Locate the test step and fault symptom noted in step 1.
3. Perform the corrective action associated with the fault symptom.
4. Repeat the performance test step in **paragraph 4.4** that resulted in the fault symptom to confirm the corrective action.
5. Defective modules removed in step 3 above may be repaired by referring to **paragraph 4.6**.
6. The Frequency Extender may be returned to service if it successfully passes all the performance tests in **paragraph 4.4**.
7. **Table 4-2** is intended as a general troubleshooting guide and is not a substitute for standard signal tracing/fault isolation techniques performed by skilled technicians familiar with the Frequency Extender circuitry.

Table 4-2. WJ-8628-4/FE Frequency Extender Troubleshooting Procedures.

Fault	Probable Cause	Corrective Action
No gain over entire frequency range.	Defective Regulators	Check +5V, +15V and -15 V at A2A1 E1, E3 and E4. If not good, replace A2A1.
	Defective Reference	Verify 50 MHz reference input at FE-W3P1.
	Defective Synthesizer	Check LO signal at FE-W4P1 at the following receiver tuned freq's: Rcvr Freq LO Freq 600 MHz 800 MHz 800 MHz 1000 MHz 1000 MHz 800 MHz 1250 MHz 1000 MHz If incorrect, check VCO out at A2A3-E5. If good, replace A2A2. If not, replace A2A1 then A2A3.
	Defective RF Assy	Check band select signals at A2 E10, E3, E4, E11 and E12. Should be approximately +12V when selected, -12 V when not. If not good, replace A1A2. Check band 1-4 RF outputs from A1A1. If not good, replace A1A1. Check RF output from A1A3. If not good, replace A1A3. Check LO output from A1A4. If not good, replace A1A4. If good, replace A1A5.
No gain in one or more bands.	Defective Synthesizer	Verify synthesizer frequency for each of the four bands as shown above. If not good, replace A2A1.
	Defective RF Assy	Check band select signals at A1A2 E10, E3, E4 and E11. If not good, replace A1A2. If good, replace A1A1, then A1A3.

4.6 MODULE TESTING AND REPAIR

4.6.1 GENERAL

This paragraph provides the testing, troubleshooting and repair information necessary to restore a malfunctioning module to normal operation. The information provided consists of the following categories:

1. Module test and troubleshooting procedures to assist signal tracing and localize faulty circuit areas.

2. Fault isolation tables to assist isolating defective components in faulty circuit areas.

3. A parts replacement guide, **paragraph 4.7**, is provided to assist in repairing a defective module.

4.6.2. PROCEDURE GUIDELINES

The module testing and troubleshooting procedures are defined using an EFR100 Equipment Frame, an EPS100 Power Supply and a functional WJ-8628-4 Receiver as a test bed. **Figure 4-2** is a block diagram showing the test bed configuration which will be used in each of the module testing and troubleshooting procedures. When testing and troubleshooting a defective module, observe the following guidelines:

1. Allow the test equipment a 30 minute warm up before any test is performed.

2. Refer to the testing and troubleshooting paragraph for the desired module. Configure the Frequency Extender and test equipment as indicated in the test procedure for the module.

3. Perform the testing and troubleshooting procedure in the sequence given. If any failure is encountered or any desired result is not obtained, the Fault Isolation Table lists which key components would most likely cause the failure.

4. Refer to **paragraph 4.7**, Parts Replacement Guide, and replace the key components indicated in step 3 above. Repeat the Testing and Troubleshooting Procedure to confirm the corrective action.

5. If the module still fails, additional troubleshooting and signal tracing is required. Refer to the circuit descriptions in Section III and schematic diagrams in Section VI as aids in performing additional troubleshooting.

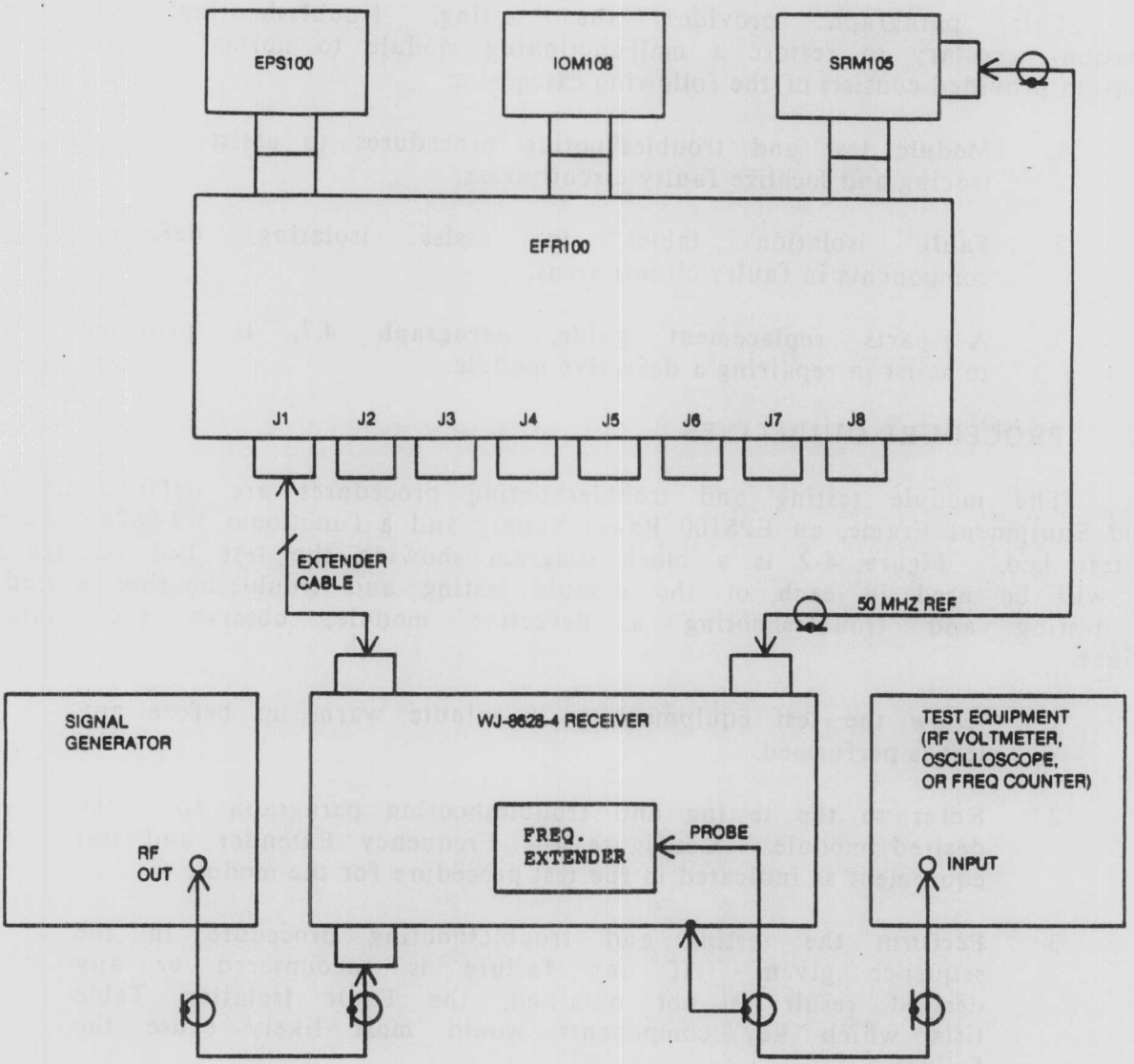


Figure 4-2. Frequency Extender Module Test Bed Configuration

4.6.3 INPUT SWITCHING NETWORK TESTING AND TROUBLESHOOTING

This paragraph describes the procedures to test, troubleshoot and repair the Input Switching Network. A Signal Generator and Spectrum Analyzer (see Table 4-1) are required to perform the tests outlined below.

4.6.3.1 Preliminary Setup Procedure

The following preliminary setup steps should be performed prior to testing or troubleshooting the Input Switching Network.

1. De-energize the Receiver.
2. Remove the Frequency Extender from the equipment frame.
3. Remove the appropriate cover from the Frequency Extender to provide access to module A1A1.
4. Connect the signal generator RF output to Frequency Extender rear panel signal input jack, J1, using a BNC to SMA adaptor.
5. Set the signal generator as follows:
   a. RF Frequency - 600.000 MHz
   b. Output Level - -30 dBm
   c. Modulation - None
6. Energize the receiver using the power switch on the equipment frame power supply. Using the front panel controls and display, set the receiver to the following parameters:
   a. Gain Mode - Manual
   b. RF Gain - Max. CW
   c. Frequency - 600.0000 MHz

4.6.3.2 Testing and Troubleshooting Procedure

The testing and troubleshooting information in this paragraph is keyed to Table 4-3, Input Switching Network Fault Isolation Table. This table is used to isolate the module fault to a defective stage or circuit. Perform the following procedures in the sequence given.

1. Perform the preliminary setup procedure in **paragraph 4.6.3.1.**

2. Use the Spectrum Analyzer to check each test point listed in **Table 4-3.**

3. When a faulty component is found, replace the key component(s) indicated in **Table 4-3.** **Paragraph 4.7,** Parts Replacement Guide, should be referred to as an aid in removing and replacing any PCB components.

4. Replacement of the indicated key component(s) will normally restore the faulty test point signal to a normal level. If a faulty signal is still observed after key component replacement, additional signal tracing/fault isolation is necessary. Refer to **paragraph 3.4.1.1,** Input Switching Network Circuit Description, and **Figure 6-2,** Input Switching Network Schematic Diagram for additional aid in troubleshooting.

Table 4-3. Input Switching Network Fault Isolation Table

Test Point	Normal Signal	Key Components	Comments
500-700 MHz	-34 dBm	CR5,CR9,CR12	Verify band select signals -12V for selected band +12V for others. Check diodes for short if signal level is low.
700-900 MHz	-34 dBm	CR4,CR6,CR7, CR13.	Set Rcvr and Sig Gen to 800 MHz. Same comments as above.
900-1100 MHz	-34 dBm	CR3,CR8	Set Rcvr and Sig Gen to 1000 MHz. Same comments as above.
1100-1400 MHz	-34 dBm	CR10,CR11	Set Rcvr and Sig Gen to 1100 MHz. Same comments as above.

4.6.4 BANDSWITCH TESTING AND TROUBLESHOOTING

This paragraph describes the procedures to test, troubleshoot and repair the Bandswitch. An oscilloscope and digital voltmeter **(see Table 4-1)** are required to perform the tests outlined below.

4.6.4.1 Preliminary Setup Procedure

The following preliminary setup steps should be performed prior to testing or troubleshooting the Bandswitch.

1. De-energize the Receiver.

2. Remove the Frequency Extender from the equipment frame.

3. Remove the appropriate cover from the Frequency Extender to provide access to module A1A2.

4. Energize the receiver using the power switch on the equipment frame power supply. Using the front panel controls and display, set the receiver to the following parameters:

   a. Gain Mode - Manual

   b. RF Gain - Max. CW

   c. Frequency - 600.0000 MHz

4.6.4.2 **Testing and Troubleshooting Procedure**

The testing and troubleshooting information in this paragraph is keyed to **Table 4-4**, Bandswitch Fault Isolation Table. This table is used to isolate the module fault to a defective stage or circuit. Perform the following procedures in the sequence given.

1. Perform the preliminary setup procedure in **paragraph 4.6.3.1.**

2. Use the oscilloscope or digital voltmeter to check each test point listed in **Table 4-4.**

3. When a faulty component is found, replace the key component(s) indicated in **Table 4-5.** **Paragraph 4.7**, Parts Replacement Guide, should be referred to as an aid in removing and replacing any PCB components.

4. Replacement of the indicated key component(s) will normally restore the faulty test point signal to a normal level. If a faulty signal is still observed after key component replacement, additional signal tracing/fault isolation is necessary. Refer to **paragraph 3.3**, Bandswitch Circuit Description, and **Figure 6-3**, Bandswitch Schematic Diagram for additional aid in troubleshooting.

Table 4-4. Bandswitch Fault Isolation Table

Test Point	Normal Signal	Key Components	Comments
U5-12	+5 V	U5	Check FE strobe, U5-4. Rcvr digital control may be defective.
E7	-12 V	U4	
U5-13	+5 V	U3	Change Rcvr to 800.000 MHz
E6	-12 V	U3	
U5-14	+5 V	U5	Change Rcvr to 1000.000 MHz
E5	-12 V	U3	
U5-15	+5 V	U5	Change Rcvr to 1250.000 MHz
E7,E9	-12 V	U6	
U5-11	+5 V	U5	Change Rcvr to 400.0000 MHz
E8	-12 V	U4	

4.6.5 SWITCH/AMPLIFIER TESTING AND TROUBLESHOOTING

This paragraph describes the procedures to test, troubleshoot and repair the Switch/Amplifier. A Signal Generator and Spectrum Analyzer **(see Table 4-1)** are required to perform the tests outlined below.

4.6.5.1 Preliminary Setup Procedure

The following preliminary setup steps should be performed prior to testing or troubleshooting the Switch/Amplifier.

1. De-energize the Receiver.
2. Remove the Frequency Extender from the equipment frame.
3. Remove the appropriate cover from the Frequency Extender to provide access to module A1A3.
4. Connect the signal generator RF output to Frequency Extender rear panel signal input jack, J1, using a BNC to SMA adaptor.

5. Set the signal generator as follows:

   a. RF Frequency - 600.000 MHz

   b. Output Level - -30 dBm

   c. Modulation - None

7. Energize the receiver using the power switch on the equipment frame power supply. Using the front panel controls and display, set the receiver to the following parameters:

   a. Gain Mode - Manual

   b. RF Gain - Max. CW

   c. Frequency - 600.0000 MHz

4.6.5.2 **Testing and Troubleshooting Procedure**

The testing and troubleshooting information in this paragraph is keyed to **Table 4-5**, Switch/Amplifier Fault Isolation Table. This table is used to isolate the module fault to a defective stage or circuit. Perform the following procedures in the sequence given.

1. Perform the preliminary setup procedure in **paragraph 4.6.5.1.**

2. Use the Spectrum Analyzer (AC coupled) to check each test point listed in **Table 4-5.**

3. When a faulty component is found, replace the key component(s) indicated in **Table 4-5. Paragraph 4.7**, Parts Replacement Guide, should be referred to as an aid in removing and replacing any PCB components.

4. Replacement of the indicated key component(s) will normally restore the faulty test point signal to a normal level. If a faulty signal is still observed after key component replacement, additional signal tracing/fault isolation is necessary. Refer to **paragraph 3.4.1.3**, Switch Amplifier Circuit Description, and **Figure 6-4**, Switch Amplifier Schematic Diagram for additional aid in troubleshooting.

Table 4-5. Switch/Amplifier Fault Isolation Table

Test Point	Normal Signal	Key Components	Comments
U1-2	-37 dBm	CR5,C11,CR8	Verify band select signals -12V for selected band +12V for others. Check all diodes for short if level is low.
U1-2	-37 dBm	CR3,CR4,CR6 CR10.	Set Rcvr and Sig Gen to 800 MHz. Same comments as above.
U1-2	-37 dBm.	CR2,CR7	Set Rcvr and Sig Gen to 1000 MHz. Same comments as above.
U1-2	-37 dBm	CR1,CR9	Set Rcvr and Sig Gen to 1250 MHz. Same comments as above.
RF OUT	-15 dBm	U1,U2	

4.6.6 LO AMPLIFIER TESTING AND TROUBLESHOOTING

This paragraph describes the procedures to test, troubleshoot and repair the LO Amplifier. A Spectrum Analyzer **(see Table 4-1)** is required to perform the tests outlined below.

4.6.6.1 Preliminary Setup Procedure

The following preliminary setup steps should be performed prior to testing or troubleshooting the LO Amplifier.

1. De-energize the Receiver.
2. Remove the Frequency Extender from the equipment frame.
3. Remove the appropriate cover from the Frequency Extender to provide access to module A1A4.
4. Energize the receiver using the power switch on the equipment frame power supply. Using the front panel controls and display, set the receiver to the following parameters:
   a. Gain Mode - Manual
   b. RF Gain - Max. CW
   c. Frequency - 600.0000 MHz

4.6.6.2 **Testing and Troubleshooting Procedure**

The testing and troubleshooting information in this paragraph is keyed to **Table 4-6**, LO Amplifier Fault Isolation Table. This table is used to isolate the module fault to a defective stage or circuit. Perform the following procedures in the sequence given.

1. Perform the preliminary setup procedure in **paragraph 4.6.6.1.**

2. Use the Spectrum Analyzer to check each test point listed in **Table 4-6.**

3. When a faulty component is found, replace the key component(s) indicated in **Table 4-6. Paragraph 4.7**, Parts Replacement Guide, should be referred to as an aid in removing and replacing any PCB components.

4. Replacement of the indicated key component(s) will normally restore the faulty test point signal to a normal level. If a faulty signal is still observed after key component replacement, additional signal tracing/fault isolation is necessary. Refer to **paragraph 3.4.1.4**, LO Amplifier Circuit Description, and **Figure 6-5**, LO Amplifier Schematic Diagram for additional aid in troubleshooting.

Table 4-6. LO Amplifier Fault Isolation Table

Test Point	Normal Signal	Key Components	Comments
U1-2	+5 Vdc	U2, L1	DC supply
U1-2	+10 dBm	U1	

4.6.7 **OUTPUT SWITCH TESTING AND TROUBLESHOOTING**

This paragraph describes the procedures to test, troubleshoot and repair the Output Switch. A Signal Generator and Spectrum Analyzer **(see Table 4-1)** are required to perform the tests outlined below.

4.6.7.1 **Preliminary Setup Procedure**

The following preliminary setup steps should be performed prior to testing or troubleshooting the Output Switch.

1. De-energize the Receiver.

2. Remove the Frequency Extender from the equipment frame.

3. Remove the appropriate cover from the Frequency Extender to provide access to module A1A5.

4. Connect the signal generator RF output to Frequency Extender rear panel signal input jack, J1, using a BNC to SMA adaptor.

5. Set the signal generator as follows:

   a. RF Frequency - 600.000 MHz

   b. Output Level - -30 dBm

   c. Modulation - None

6. Energize the receiver using the power switch on the equipment frame power supply. Using the front panel controls and display, set the receiver to the following parameters:

   a. Gain Mode - Manual

   b. RF Gain - Max. CW

   c. Frequency - 600.0000 MHz

4.6.7.2 **Testing and Troubleshooting Procedure**

The testing and troubleshooting information in this paragraph is keyed to Table 4-7, Output Switch Fault Isolation Table. This table is used to isolate the module fault to a defective stage or circuit. Perform the following procedures in the sequence given.

1. Perform the preliminary setup procedure in **paragraph 4.6.6.1.**

2. Use the Spectrum Analyzer to check each test point listed in **Table 4-7.**

3. When a faulty component is found, replace the key component(s) indicated in **Table 4-7. Paragraph 4.7,** Parts Replacement Guide, should be referred to as an aid in removing and replacing any PCB components.

4. Replacement of the indicated key component(s) will normally restore the faulty test point signal to a normal level. If a faulty signal is still observed after key component replacement, additional signal tracing/fault isolation is necessary. Refer to **paragraph 3.4.1.5.**, Output Switch Circuit Description, and **Figure 6-6**, Output Switch Schematic Diagram for additional aid in troubleshooting.

Table 4-7. Output Switch Fault Isolation Table

Test Point	Normal Signal	Key Components	Comments
A1J2	-27 dBm (+/- 2 dB)	CR2,CR3	Verify band 5 select signal is +12 V. Check diodes for short if level is low.
A1J2	-27 dBm (+/- 2 dB)	CR1,CR4,CR5	Change Rcvr and Sig Gen to 400 MHz. Verify band 5 select signal is -12 V.

4.6.8 PLL/REG TESTING AND TROUBLESHOOTING

This paragraph describes the procedures to test, troubleshoot and repair the PLL/Reg. An oscilloscope, frequency counter and digital voltmeter (see **Table 4-1**) are required to perform the tests outlined below.

4.6.8.1 Preliminary Setup Procedure

The following preliminary setup steps should be performed prior to testing or troubleshooting the PLL/Reg.

1. Deenergize the Receiver.

2. Remove the Frequency Extender from the frame.

3. Remove the appropriate cover from the Frequency Extender to provide access to module A2A1.

4. Energize the receiver using the power switch on the equipment frame power supply. Using the front panel controls and display, set the receiver to the following parameters:

   a. Gain Mode - Manual
   b. RF Gain - Max. CW
   c. Frequency - 600.0000 MHz

4.6.8.2 **Testing and Troubleshooting Procedure**

The testing and troubleshooting information in this paragraph is keyed to Table 4-8, PLL/Reg Fault Isolation Table. This table is used to isolate the module fault to a defective stage or circuit. Perform the following procedures in the sequence given.

1. Perform the preliminary setup procedure in **paragraph 4.6.8.1.**

2. Use the oscilloscope or frequency counter to check each test point listed in **Table 4-8.**

3. When a faulty component is found, replace the key component(s) indicated in **Table 4-8. Paragraph 4.7,** Parts Replacement Guide, should be referred to as an aid in removing and replacing any PCB components.

4. Replacement of the indicated key component(s) will normally restore the faulty test point signal to a normal level. If a faulty signal is still observed after key component replacement, additional signal tracing/fault isolation is necessary. Refer to **paragraph 3.4.2.1,** PLL/Reg Circuit Description, and **Figure 6-8,** PLL/Reg Schematic Diagram for additional aid in troubleshooting.

Table 4-8. PLL/Reg Fault Isolation Table

Test Point	Normal Signal	Key Components	Comments
U5-27	12.5 MHz sq. wave	U4	Verify 50 MHz Ref In
U5-1	6.25 MHz sq.wave	U6	VCO divided by 128
U5-11	0 Vdc	U1	Freq. data input
U7-6	-1 Vdc	U7, U5	Tune voltage
U3-2	+15 Vdc	U3	Bandswitch - 800 MHz VCO
U5-1	7.8125 sq.wave	U6	Tune rcvr to 800 MHz
U5-11	+5 Vdc	U1	Change Freq. Data
U7-6	+10 Vdc	U7, U5	Tune Voltage
U3-2	-15 Vdc	U3	Bandswitch

4.6.9 OUTPUT AMPLIFIER TESTING AND TROUBLESHOOTING

This paragraph describes the procedures to test, troubleshoot and repair the Output Amplifier. A Spectrum Analyzer **(see Table 4-1)** is required to perform the tests outlined below.

4.6.9.1 Preliminary Setup Procedure

The following preliminary setup steps should be performed prior to testing or troubleshooting the Output Amplifier.

1. De-energize the Receiver.
2. Remove the Frequency Extender from the equipment frame.
3. Remove the appropriate cover from the Frequency Extender to provide access to module A2A2.
4. Energize the receiver using the power switch on the equipment frame power supply. Using the front panel controls and display, set the receiver to the following parameters:
   a. Gain Mode - Manual
   b. RF Gain - Max. CW
   c. Frequency - 600.0000 MHz

4.6.9.2 Testing and Troubleshooting Procedure

The testing and troubleshooting information in this paragraph is keyed to Table 4-9, Output Amplifier Fault Isolation Table. This table is used to isolate the module fault to a defective stage or circuit. Perform the following procedures in the sequence given.

1. Perform the preliminary setup procedure in **paragraph 4.6.9.1.**
2. Use the Spectrum Analyzer to check each test point listed in **Table 4-9.**
3. When a faulty component is found, replace the key component(s) indicated in **Table 4-9. Paragraph 4.7,** Parts Replacement Guide, should be referred to as an aid in removing and replacing any PCB components.

4. Replacement of the indicated key component(s) will normally restore the faulty test point signal to a normal level. If a faulty signal is still observed after key component replacement, additional signal tracing/fault isolation is necessary. Refer to **paragraph 3.4.2.2,** Output Amplifier Circuit Description, and **Figure 6-9,** Output Amplifier Schematic Diagram for additional aid in troubleshooting.

Table 4-9. Output Amplifier Fault Isolation Table

Test Point	Normal Signal	Key Components
U1-2	0 dBm	U1,L1
E3	+2 dBm	U2, U3, L2
E4	-2 dBm	U2, U4, L3

4.6.10 800, 1000 MHZ VCO TESTING AND TROUBLESHOOTING

This paragraph describes the procedures to test, troubleshoot and repair the 800,1000 MHz VCO. A Spectrum Analyzer and a digital voltmeter (see **Table 4-1**) are required to perform the tests outlined below.

4.6.10.1 Preliminary Setup Procedure

The following preliminary setup steps should be performed prior to testing or troubleshooting the 800, 1000 MHz VCO.

1. De-energize the Receiver.
2. Remove the Frequency Extender from the equipment frame.
3. Remove the appropriate cover from the Frequency Extender to provide access to module A2A3.
4. Energize the receiver using the power switch on the equipment frame power supply. Using the front panel controls and display, set the receiver to the following parameters:

   a. Gain Mode - Manual
   b. RF Gain - Max. CW
   c. Frequency - 600.0000 MHz

4.6.10.2 **Testing and Troubleshooting Procedure**

The testing and troubleshooting information in this paragraph is keyed to **Table 4-10**, 800, 1000 MHz VCO Fault Isolation Table. This table is used to isolate the module fault to a defective stage or circuit. Perform the following procedures in the sequence given.

1. Perform the preliminary setup procedure in **paragraph 4.6.10.1.**

2. Use the Spectrum Analyzer or digital voltmeter to check each test point listed in **Table 4-11.**

3. When a faulty component is found, replace the key component(s) indicated in **Table 4-10. Paragraph 4.7**, Parts Replacement Guide, should be referred to as an aid in removing and replacing any PCB components.

4. Replacement of the indicated key component(s) will normally restore the faulty test point signal to a normal level. If a faulty signal is still observed after key component replacement, additional signal tracing/fault isolation is necessary. Refer to **Figure 6-10**, 800, 1000 MHz VCO Schematic Diagram for additional aid in troubleshooting.

Table 4-10. 800, 1000 MHz VC0 Fault Isolation Table

Test Point	Normal Signal	Key Components	Comments
U1-3	+11 Vdc	U1	DC supply
E5	-3 dBm @ 800 MHz	Q1,CR1, CR2,CR3	
E5	-3 dBm @ 1000 MHz	CR3	Change Rcvr to 800 MHz

4.7 PARTS REPLACEMENT GUIDELINES

This paragraph provides techniques to assist the technician in replacing components on PC boards.

WARNING

To prevent electrical shock or damage to the unit, always disconnect the Frequency Extender from the AC power source before soldering or replacing components.

4.7.1 SOLDERING TECHNIQUES

When removing components from a printed circuit board for inspection or replacement, be especially careful not to damage the track. The soldering iron power should be no higher than 40 watts, and a solder sipper or wicking procedure should be employed when removing solder. Noncorrosive solder flux should be used when removing solder by wicking. In returning components to the board, make sure that holes are clear and that leads do not catch the edge of the track and lift it from the board. A good grade of rosin core 60/40 solder should be used. Do not heat longer than is necessary to achieve a good joint. A heat sink should be used where possible.

4.7.2 COMPONENT REPLACEMENT

Observe the following guidelines when replacing components:

1. When soldering or unsoldering diodes or resistors, solder quickly to allow as little heat conduction as possible. When wiring permits, use a heat sink between the soldering iron and the part.

2. When soldering or unsoldering transistors, use a low wattage iron and a heat sink. Solder as quickly as possible. The use of a circular solder tip to heat all three joints simultaneously is recommended.

3. When soldering or unsoldering glass or ceramic capacitors, use a heat sink between the capacitor and the iron. Excessive heat will crack the capacitor.

4. When any electronic part is removed, note the position of the part and its leads, and replace it the same way.

4.8 ADJUSTMENT/ALIGNMENT PROCEDURES

No alignment procedures are specified for the Frequency Extender.

SECTION V

REPLACEMENT PARTS LIST

5.1 UNIT NUMBERING METHOD

The unit numbering method of assigning reference designations (electrical symbol numbers) has been used to identify assemblies, subassemblies (and modules) and parts. An example of the unit numbering method follows:

Subassembly Designation A1	R1 Class and No. of Item
Identify from right to left as:	First (1) resistor (R) of first (1) subassembly (A)

As shown on the main chassis schematic, components which are an integral part of the main chassis have no subassembly designation.

5.2 REFERENCE DESIGNATION PREFIX

Partial reference designations have been used on the equipment and on the illustrations in this manual. The partial reference designations consist of the class letter(s) and identifying item number. The complete reference designations may be obtained by placing the proper prefix before the partial reference designations. Reference Designation Prefixes are provided on drawings and illustrations in parentheses within the figure titles.

5.3 LIST OF MANUFACTURERS

Mfr. Code	Name and Address
02114	Amperex Electronic Corporation 5083 Kings Highway Saugerties, NY 12477
04013	Taurus Corporation 1 Academy Hill Lambertville, NJ 08530
04713	Motorola Incorporated Semiconductor Products Division 5005 East McDowell Road Phoenix, AZ 85008
07263	Fairchild Camera & Instr. Corporation Semiconductor Division 464 Ellis Street Mountain View, CA 94040
09021	Airco Incorporated Airco Electronics Bradford, PA 17055
14482	Watkins-Johnson Company 333 Hillview Avenue Palo Alto, CA 94304
14632	Watkins-Johnson Company 700 Quince Orchard Road Gaithersburg, MD 20878
15542	Mini-Circuits Laboratories Division of Scientific Components Corporation 2625 E. 14th Street Brooklyn, NY 11235

Mfr. Code	Name and Address
16179	M/A-COM Omni Spectra Inc. Microwave Component Division
17856	Siliconix, Incorporated 2201 Laurelwood Road Santa Clara, CA 95050
18324	Signetics Corporation 811 East Arques Avenue Sunnyvale, CA 94086
18518	MSI Electronics Incorporated 34-32 57th Street Woodside, NY 11377-2124
19505	Applied Eng. Products, Company Division of Samarious, Inc. 300 Seymour Avenue Derby, CT 06418
22526	Du Pont El De Nemours and Co. Inc., Photo Products Dept. Berg Electronics Div., Rt. 83 New Cumberland, PA 17070
24539	Avantek, Inc. 3175 Bowers Avenue Santa Clara CA 95051
26805	MA-COM Omni Spectra, Inc. 140 Fourth Avenue Walton, MA 02154
27014	National Semi-Conductor Corporation 2950 San Ysidro Way Santa Clara, CA 95051
27956	Relcom 3333 Hillview Avenue Palo Alto, CA 94304
29990	American Technical Ceramics One Norden Lane Huntington Station, NY 11746
33095	Spectrum Control, Inc. 152 E. Main Street Fairview, PA 16415
50101	Frequency Sources Inc. Semiconductor Division 16 Maple Road Chelmsford, MA 01824-3737
51642	Centre Engineering Inc. 2820 E. College Avenue State College, PA 16801-7515
52648	Plessey Trading Corporation Plessey Optoelectronics and Microwave 1641 Kaiser Avenue Irvine, CA 92714
56289	Sprague Electric Company Marshall Street North Adams, MA 01247
59660	Tusonix, Incorporated 2155 N. Forbes Boulevard Tucson, AZ 85745
70903	Cooper Belden Electronic Wire & Cable 200 S. Batavia Avenue Geneva, IL 60134-3325

Mfr. Code	Name and Address
71279	Cambridge Thermionic Corporation 445 Concord Avenue Cambridge, MA 02138
73899	JFD Electronic Components Division of Murata Erie North America 112 Mott Street Oceanside, NY 11572
80131	Electronic Industries Association 2001 Eye Street, N.W. Washington, D.C. 20006
81349	Military Specifications
81350	Joint Army-Navy Specifications
96341	Microwave Associates Inc. Northwest Industrial Park South Avenue Burlington, MA 01803
99800	American Precision Industr. Inc. Devlan Electronics Division 270 Quaker Road East Aurora, NY 14052

5.4 PARTS LIST

The parts list which follows contains all electrical parts used in the equipment and certain mechanical parts which are subject to unusual wear or damage. When ordering replacement parts from Watkins-Johnson Company, specify the type and serial number of the equipment and the reference designation and description of each part ordered. The list of manufacturers provided in **paragraph 5.3** and the manufacturer's part number for components are included as a guide to the user of the equipment in the field. These parts may not necessarily agree with the parts installed in the equipment; however, the parts specified in this list will provide satisfactory operation of the equipment. Replacement parts may be obtained from any manufacturer as long as the physical and electrical parameters of the part selected agree with the original indicated part. In the case of components defined by a military or industrial specification, a vendor which can provide the necessary component is suggested as a convenience to the user.

NOTE

As improved semi-conductors become available, it is the policy of Watkins-Johnson to incorporate them in proprietary products. For this reason some transistors, diodes, and integrated circuits installed in the equipment may not agree with those specified in the parts list and schematic diagrams of this manual. However, the semi-conductors designated in the manual may be substituted in every case with satisfactory results.

5.5 TYPE WJ-8628-4/FE 500-1400 MHz FREQUENCY EXTENDER, MAIN CHASSIS

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	500-1400 MHz RF Assembly	1	794458-1		
A2	800, 1000 MHz Synthesizer	1	794459-1		
FE-J2	Adapter Connector	1	5917-1103-000	19505	
J1	Connector, Jack, SMA	2	2004-7188	26805	
J2	Adapter, Connector	1	2084-0000-00	26805	
J3	Same as J1				
W1	Cable Assembly	1	271383-1	14632	
W2	Cable Assembly	1	17300-358-1	14632	
W3	Cable Assembly	1	17300-358-2	14632	
W4	Cable Assembly	1	17300-358-3	14632	
W5	Cable Assembly	1	17300-358-4	14632	
W6	Cable Assembly	1	17300-358-5	14632	
W1P1	Connector, Plug	3	66900-010	22526	
W1P2	Same as W1P1				
W1P3	Same as W1P1				
W2P1	Connector, Jack SMB	5	2002-7571-005	19505	
W2P2	Connector Plug	3	9101-9573-005	19505	
W3P1	Same as W2P1				
W4P1	Same as W2P1				
W4P2	Same as W2P1				
W5P1	Same as W2P1				
W6P1	Same as W2P2				
W6P2	Same as W2P2				

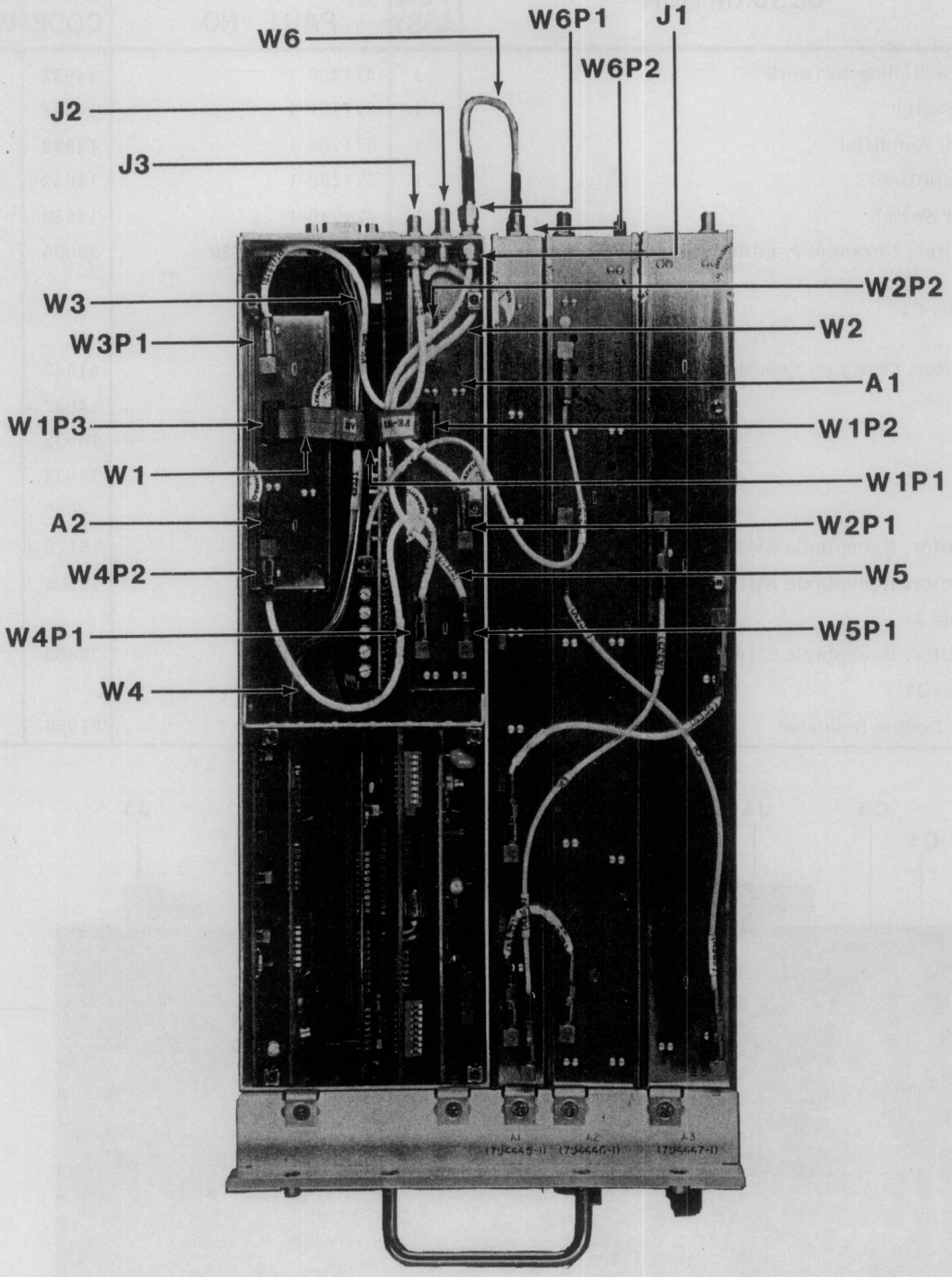


Figure 5-1. WJ-8628-4/FE Frequency Extender, Top View, Location of Components

5.5.1 **TYPE 794458-1 500-1400 MHz RF ASSEMBLY** REF DESIG PREFIX **A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	Input Switching Network	1	371206-1	14632	
A2	Band Switch	1	371207-1	14632	
A3	Switch, Amplifier	1	371208-1	14632	
A4	LO Amplifier	1	371209-1	14632	
A5	Output Switch	1	371210-1	14632	
C1	Capacitor, Ceramic, Feedthru: 1000 pF, 500 V	13	54-802-002-102P	33095	
C2 Thru C13	Same as C1				
C14	Capacitor, Ceramic, Feedthru: 1200 pF, 100 V	1	10122-1	51642	
FL1	Filter	1	92384	14632	
FL2	Filter	1	92385	14632	
FL3	Filter	1	92386	14632	
FL4	Filter	1	92387	14632	
J1	Connector, Receptacle SMA	1	244-2	16179	
J2	Connector, Receptacle SMB	3	2012-1511-000	19505	
J3	Same as J2				
J4	Connector, Receptacle SMA	1	2060-0000-00	26805	
J5	Same as J2				
U1	Mixer, Double Balanced	1	M2T	27956	

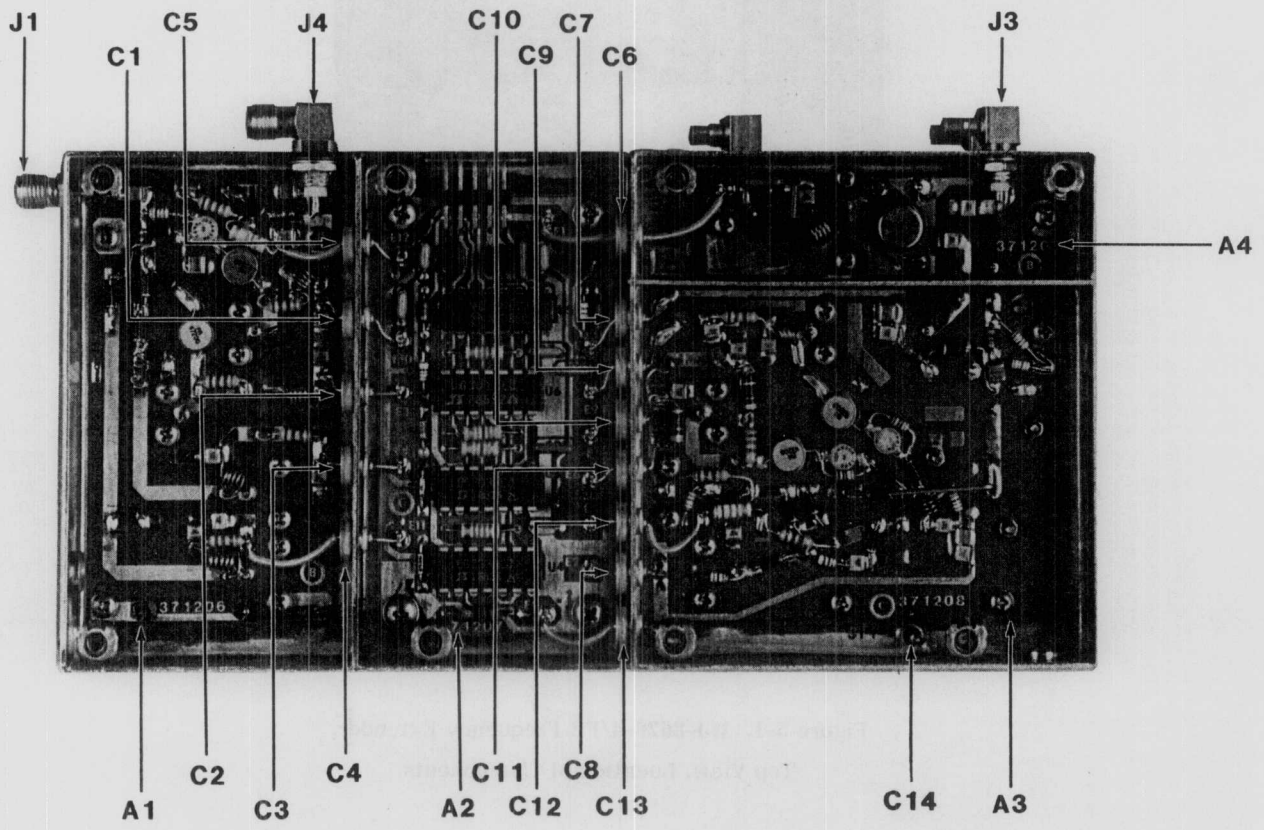


Figure 5-2. Type 794458-1 500-1400 MHz RF Assembly (A1), Top View, Location of Components

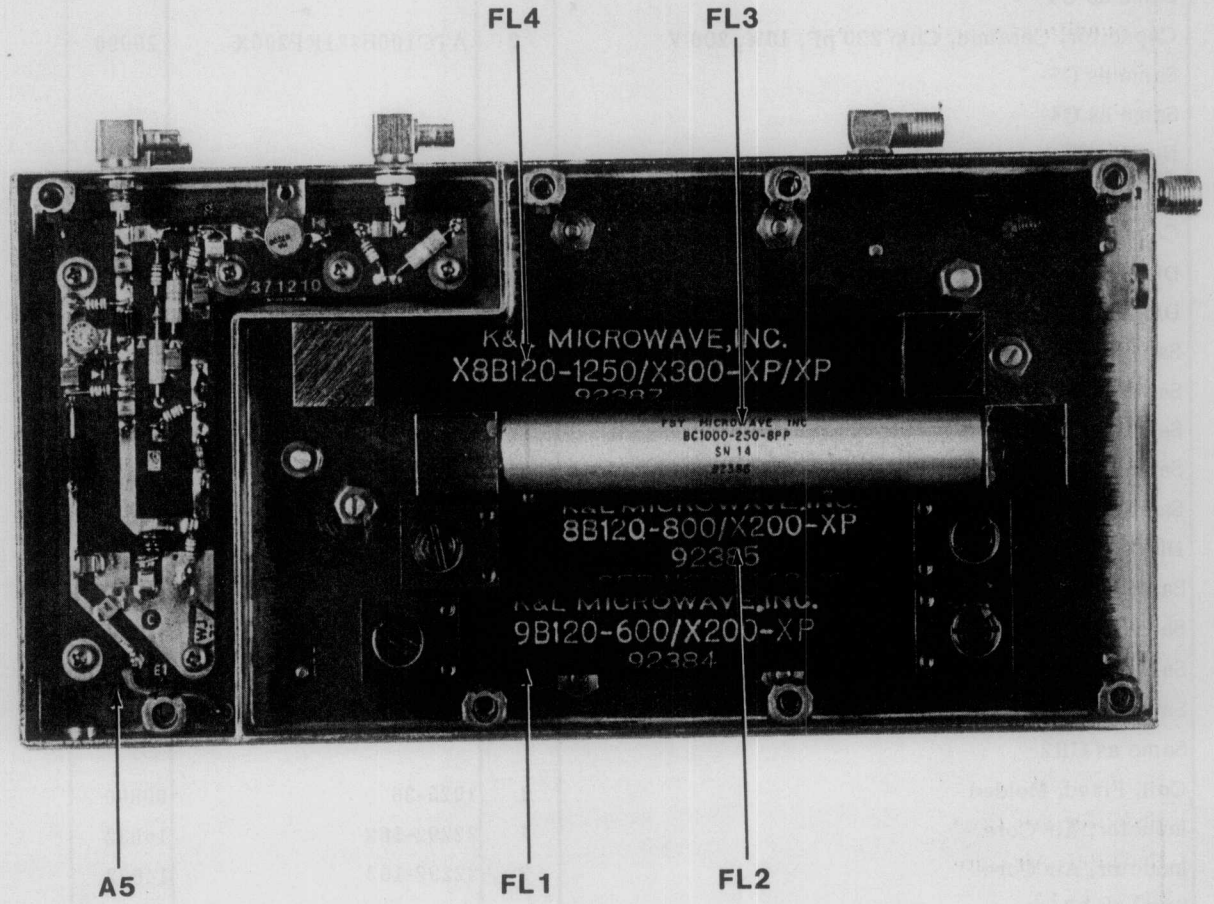


Figure 5-3. Type 794458-1 500-1400 MHz RF Assembly (A1), Bottom View, Location of Components

5.5.1.1 **Type 371206-1 Input Switching Network** REF DESIG PREFIX A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Chip: 4700 pF, 10%, 50 V	3	ATC700B472KP50X	29990	
C2	Same as C1				
C3	Same as C1				
C4	Capacitor, Ceramic Chip: 100 pF, 20%, 500 V	4	ATC100B101MP500X	29990	
C5	Same as C4				
C6	Same as C4				
C7	Capacitor, Ceramic, Chip 220 pF, 10%, 200 V	2	ATC100B221KP200X	29990	
C8	Same as C7				
C9	Same as C4				
C10	Not Used				
C11	Capacitor, Variable, Ceramic: 1-5 pF	1	9621SL	91293	
C12	Capacitor, Ceramic, Chip: 2200 pF, 10%, 50 V	1	ATC700B222KP50X	29990	
CR1	Diode	4	GC4212-15	50101	
CR2	Diode	7	GC4371-15	50101	
CR3	Same as CR2				
CR4	Same as CR2				
CR5	Same as CR2				
CR6	Same as CR1				
CR7	Same as CR1				
CR8	Diode	2	MA-47200-114	96341	
CR9	Same as CR1				
CR10	Same as CR2				
CR11	Same as CR8				
CR12	Same as CR2				
CR13	Same as CR2				
L1	Coil, Fixed, Molded	1	1025-36	99800	
L2	Inductor, Air Core	1	22292-162	14632	
L3	Inductor, Air Core	2	22292-163	14632	
L4	Same as L3				
L5	Inductor, Air Core	1	22292-165	14632	
R1	Resistor, Fixed, Film: 2 kΩ, 5%, 1/8 W	1	CF1/8-2K/J	09021	
R2	Resistor, Fixed, Film: 1.2 kΩ, 5%, 1/4 W	5	CF1/4-1.2K/J	09021	
R3 Thru R6	Same as R2				

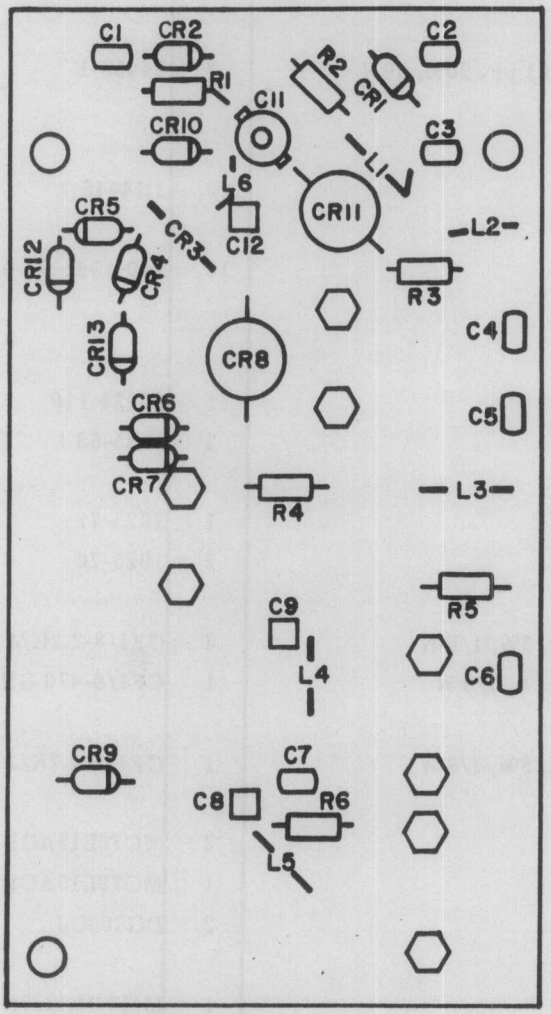


Figure 5-4. Type 371206-1 Input Switching Network (A1A1), Location of Components

5.5.1.2 **Type 371207-1 Band Switch** REF DESIG PREFIX **A1A2**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: 0.47 µF, 20%, 100 V	2	8131M100-651-474M	59660	
C2	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 50 V	4	34475-1	14632	
C3	Same as C1				
C4	Same as C2				
C5	Same as C2				
C6	Capacitor, Ceramic, Disc: 0.01 µF, 20%, 50 V	2	34453-1	14632	
C7	Same as C6				
C8	Same as C2				
CR1	Diode	2	1N4446	80131	
CR2	Same as CR1				
E1	Terminal, Forked	13	140-1941-02-01	71279	
E2 Thru E13	Same as E1				
J1	Connector, Receptacle	1	65624-110	22526	
L1	Coil, Fixed, Molded: 100 µH	2	1025-68	99800	
L2	Same as L1				
L3	Coil, Fixed, Molded: 150 µH	1	1025-72	99800	
L4	Coil, Fixed, Molded: 220 µH	2	1025-76	99800	
L5	Same as L4				
R1	Resistor, Fixed, Film: 2.2 kΩ, 5%, 1/8 W	3	CF1/8-2.2K/J	09021	
R2	Resistor, Fixed, Film: 470Ω, 5%, 1/8 W	1	CF1/8-470 OHMS/J	09021	
R3	Same as R1				
R4	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/8 W	1	CF1/8-4.7K/J	09021	
R5	Same as R1				
U1	Voltage Regulator	2	MC78L15ACP	04713	
U2	Voltage Regulator	1	MC79L15ACP	04713	
U3	Integrated Circuit	2	DG303CJ	17856	
U4	Same as U3				
U5	Integrated Circuit	1	MM74HC237N	27014	
U6	Integrated Circuit	1	DG301ACJ	17856	
U7	Integrated Circuit	1	LM317LZ	27014	
U8	Same as U1				

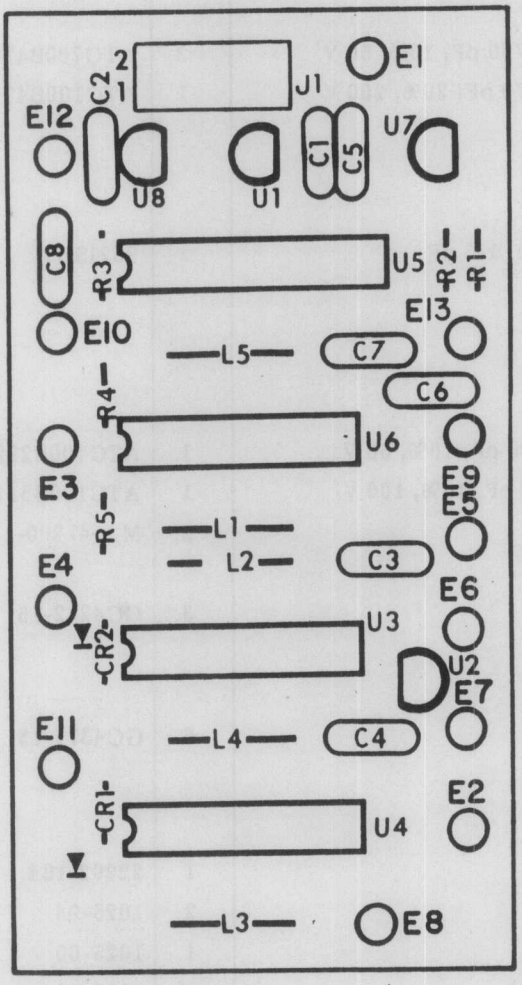


Figure 5-5. Type 371207-1 Band Switch (A1A2), Location of Components

5.5.1.3 **Type 371208-1 Switch/Amplifier** REF DESIG PREFIX **A1A3**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Chip: 100 pF, 20%, 500 V	5	ATC100B101MP500X	29990	
C2	Same as C1				
C3	Same as C1				
C4	Capacitor, Ceramic, Chip: 220 pF, 10%, 200 V	2	ATC100B221KP200X	29990	
C5	Not Used				
C6	Capacitor, Ceramic, Chip: 4700 pF, 10%, 50 V	2	ATC700B472KP50X	29990	
C7	Capacitor, Ceramic, Chip: 470 pF, 20%, 200 V	1	ATC100B471MP200X	29990	
C8	Same as C6				
C9	Same as C1				
C10	Same as C1				
C11	Capacitor, Variable, Ceramic: 1-5 pF	2	9621SL	91293	
C12	Same as C11				
C13	Same as C4				
C14	Not Used				
C15	Not Used				
C16	Capacitor, Ceramic, Chip 2200 pF, 10%, 50 V	1	ATC700B222KP50X	29990	
C17	Capacitor, Ceramic, Chip 510 pF, 10%, 100 V	1	ATC100B511KP100X	29990	
CR1	Diode	2	MA-47200-114	96341	
CR2	Same as CR1				
CR3	Diode	3	GC4212-15	50101	
CR4	Same as CR3				
CR5	Same as CR3				
CR6	Diode	6	GC4371-15	50101	
CR7 Thru CR11	Same as CR6				
L1	Inductor, Air Core	1	22292-164	14632	
L2	Coil, Fixed, Molded: 0.1 µH	2	1025-94	99800	
L3	Coil, Fixed 0.15 µH	1	1025-00	99800	
L4	Coil, Fixed, Molded: 0.22 µH	1	1025-04	99800	
L5	Same as L2				
L6	Inductor	1	170592-1	14632	
L7	Not Used				
L8	Inductor, Air Core	1	22292-162	14632	
R1	Resistor, Fixed, Film: 1.2 kΩ, 5%, 1/4 W	4	CF1/4-1.2K/J	09021	
R2 Thru R4	Same as R1				
R5	Resistor, Fixed, Film: 2 kΩ, 5%, 1/8 W	3	CF1/8-2K/J	09021	
R6	Resistor, Fixed, Film: 20Ω, 5%, 1/8 W	1	CF1/8-20 OHMS/J	09021	
R7	Resistor, Fixed, Film: 220Ω, 5%, 1/8 W	1	CF1/8-220 OHMS/J	09021	
R8	Resistor, Fixed, Film: 30Ω, 5%, 1/8 W	1	CF1/8-30 OHMS/J	09021	

REF DESIG PREFIX **A1A3**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R9	Resistor, Fixed, Film: 180Ω, 5%, 1/8 W	1	CF1/8-180 OHMS/J	09021	
R10	Resistor, Fixed, Film: 100Ω, 5%, 1/8 W	2	CF1/8-100 OHMS/J	09021	
R11	Same as R10				
R12	Same as R5				
R13	Same as R5				
R14	Not Used				
R15	Resistor, Fixed, Film: 470Ω, 5%, 1/8 W	1	CF1/8-470 OHMS/J	09021	
U1	Amplifier	1	A25-1	14482	
U2	Integrated Circuit	1	GPD 430	24539	

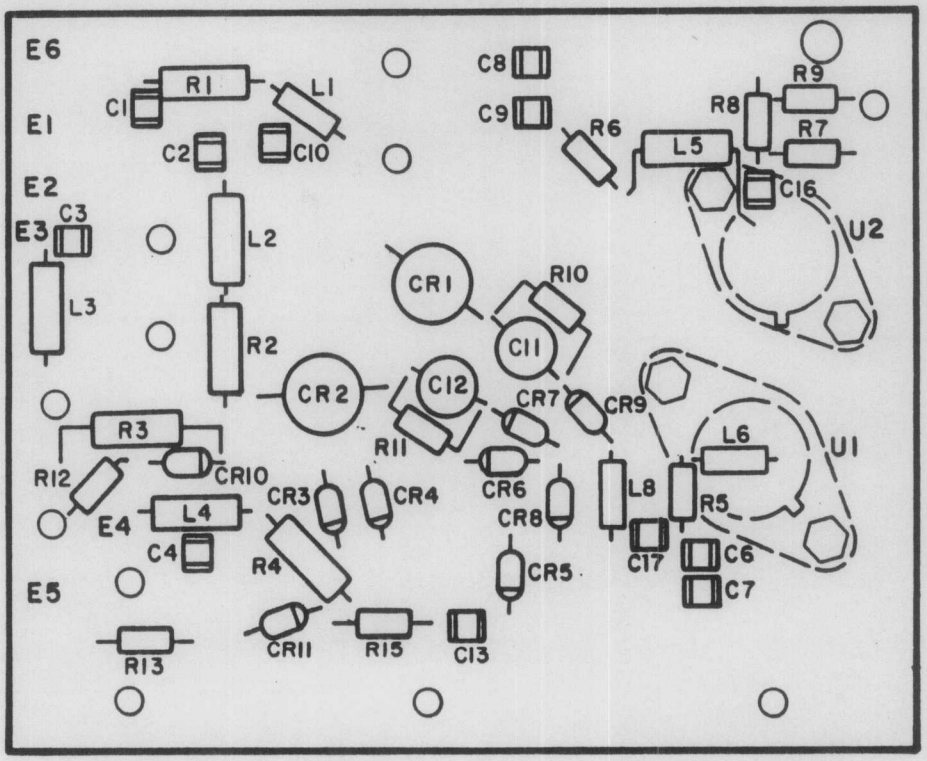


Figure 5-6. Type 371208-1 Switch Amplifier (A1A3), Location of Components

5.5.1.4 **Type 371209-1 LO Amplifier** REF DESIG PREFIX **A1A4**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Chip: 100 pF, 20%, 500 V	2	ATC100B101MP500X	29990	
C2	Capacitor, Ceramic, Chip 470 pF, 20%, 200 V	1	ATC100B471MP200X	29990	
C3	Same as C1				
C4	Capacitor, Ceramic, Disc: 0.47 µF, 20%, 100 V	2	8131M100-651-474M	59660	
C5	Same as C4				
E1	Terminal, Forked	1	140-1941-01-01	71279	
L1	Inductor, Air Core	1	22292-62	14632	
U1	Amplifier	1	GPD-331	24539	
U2	Voltage Regulator	1	MC78L05ACP	04713	

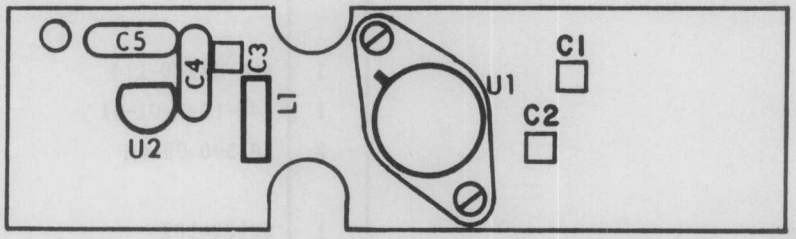


Figure 5-7. Type 371209-1 LO Amplifier (A1A4), Location of Components

5.5.1.5 **Type 371210-1 Output Switch** REF DESIG PREFIX **A1A5**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Chip 4700 pF, 10%, 50 V	5	ATC700B472KP50X	29990	
C2	Capacitor, Variable, Ceramic 1-5 pF	1	9621SL	91293	
C3	Capacitor, Ceramic, Chip 1000 pF, 10%, 50 V	2	ATC100B102KP50X	29990	
C4	Ceramic, Chip 200 pF, 20%, 300 V	1	ATC100B201MP300X	29990	
C5	Same as C3				
C6 Thru C9	Same as C1				
C11	Capacitor, Ceramic, Chip: 2200 pF, 10%, 50 V	1	ATC700B222KP50X	29990	
C12	Capacitor, Ceramic, Chip: 2.7 pF, ±0.25 pF, 500 V	1	ATC700B2R7CP500X	29990	
C10*	Capacitor, Ceramic, Chip: 3.9 pF, ±.1 pF, 500 V	1	ATC100B3R9BP500X	29990	
CR1	Diode	3	GC4371-15	50101	
CR2	Same as CR1				
CR3	Diode	1	GC4212-15	50101	
CR4	Same as CR1				
CR5	Diode	1	MA-47200-114	96341	
E1	Terminal, Forked	1	140-1941-01-01	71279	
FB1	Ferrite Bead	2	56-590-65-4A	02114	
FB2	Same as FB1				
L1	Inductor, Air Core	1	22292-162	14632	
L2	Coil, Fixed 3.9 µH	3	1025-34	99800	
L3	Same as L2				
L4	Same as L2				
R1	Resistor, Fixed, Film: 220Ω, 5%, 1/8 W	2	CF1/8-220 OHMS/J	09021	
R2	Resistor, Fixed, Film: 24Ω, 5%, 1/8 W	1	CF1/8-24 OHMS/J	09021	
R3	Same as R1				
R4	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/8 W	4	CF1/8-1.0K/J	09021	
R5	Resistor, Fixed, Film: 2 kΩ, 5%, 1/8 W	1	CF1/8-2K/J	09021	
R6 Thru R8	Same as R4				

*Nominal Value, Final Value Factory Selected.

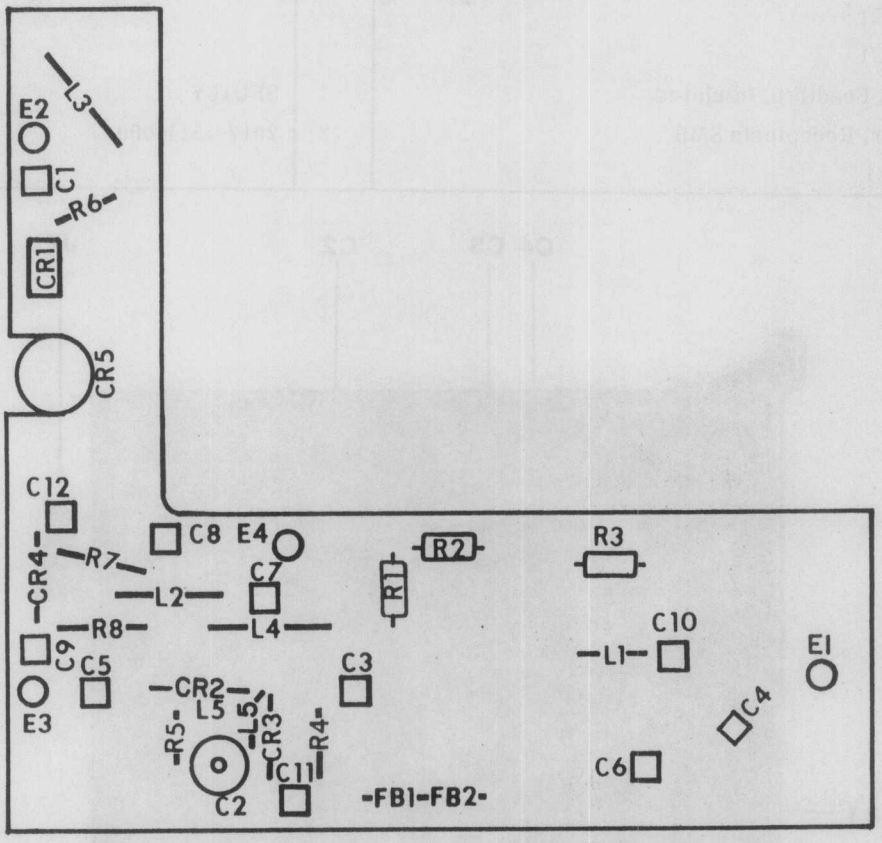


Figure 5-8. Type 371210-1 Output Switch (A1A5), Location of Compoonents

5.5.2 **TYPE 794459-1 800, 1000 MHz SYNTHESIZER** REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	PLL, Regulator	1	371228-1	14632	
A2	Output Amplifier	1	371226-1	14632	
A3	800, 1000 MHz VCO	1	371283-1	14632	
C1	Capacitor, Ceramic, Feedthru: 0.05 µF, GMV, 300 V	5	54-785-002-503P	33095	
C2	Same as C1				
C3	Capacitor, Ceramic, Feedthru: 330 pF, 10%, 500 V	1	54-794-001-3311	33095	
C4	Same as C1				
C5	Same as C1				
E1	Terminal, Feedthru, Insulated	1	SFU16Y	04013	
J1	Connector, Receptacle SMB	2	2012-1511-000	19505	
J2	Same as J1				

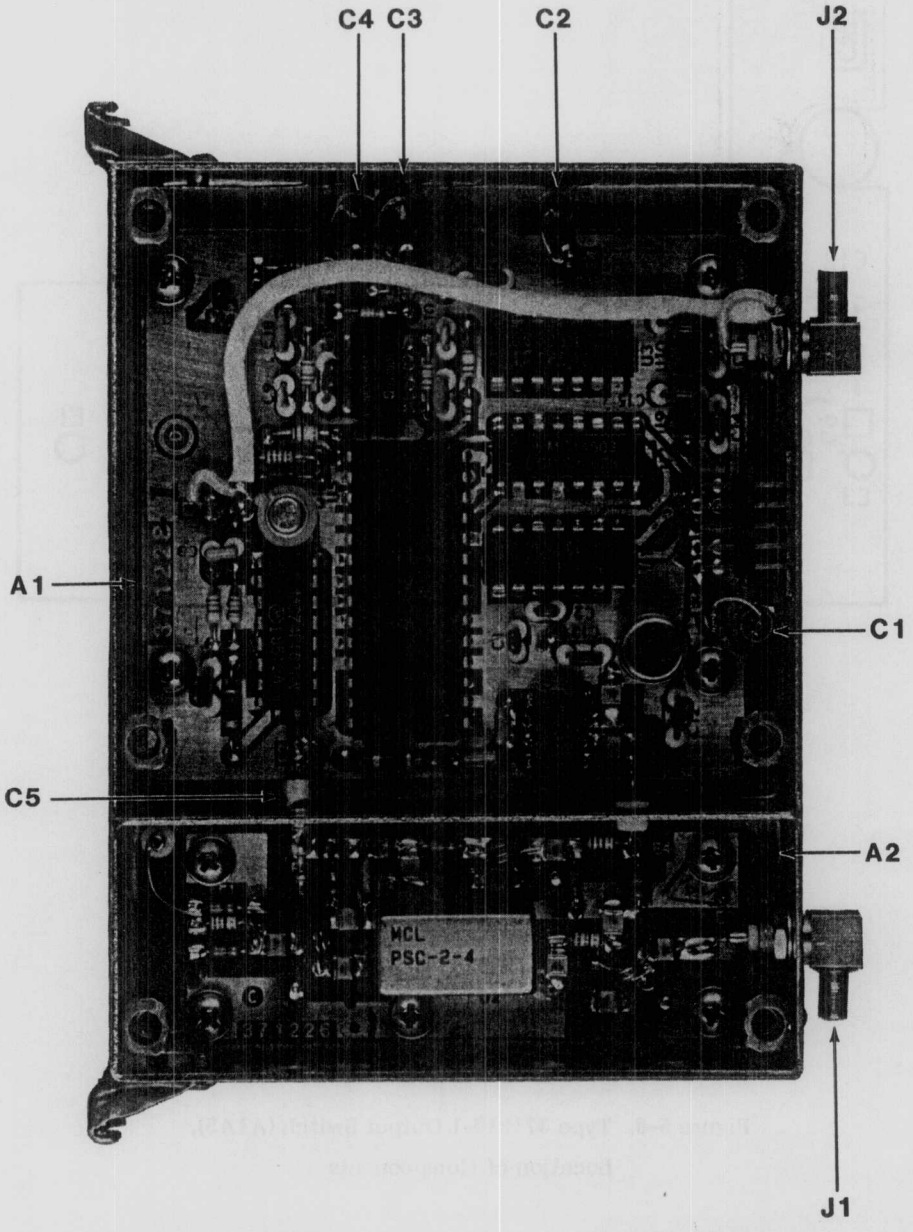


Figure 5-9. Type 794459-1 800, 1000 MHz Synthesizer (A2), Top View, Location of Components

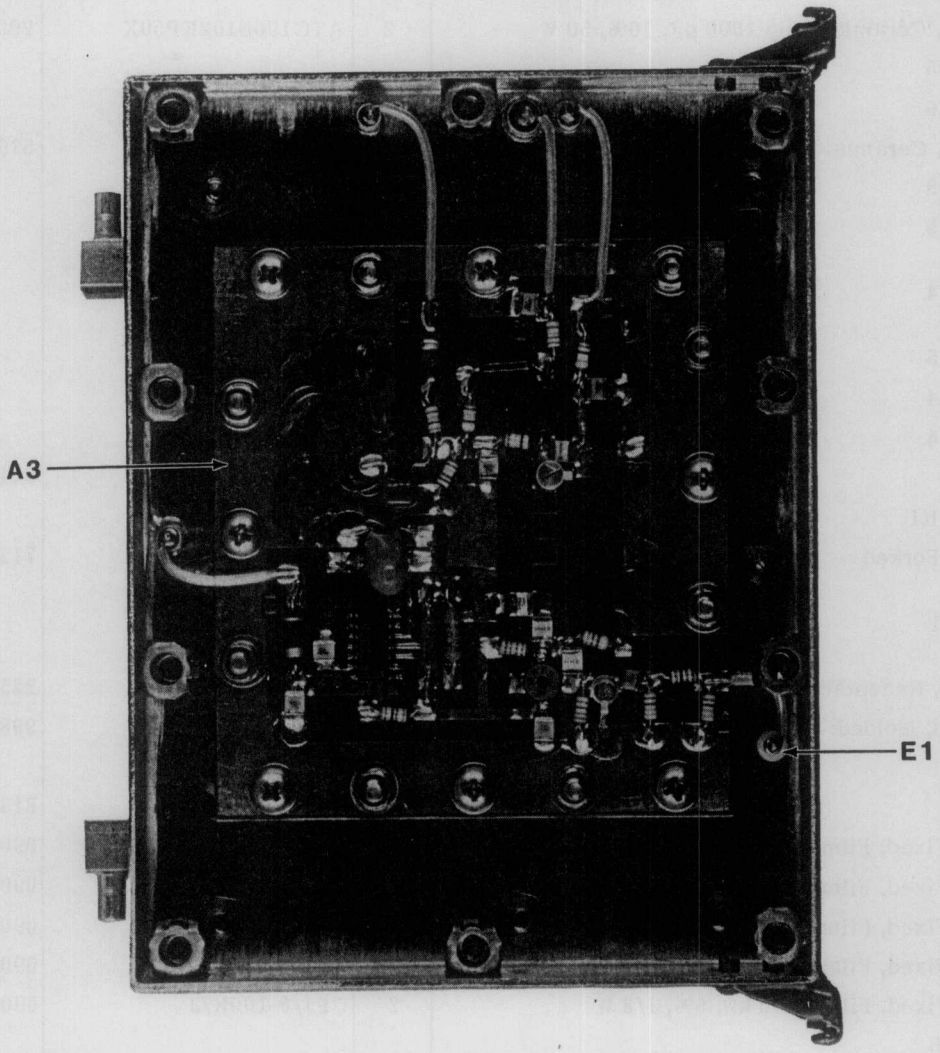


Figure 5-10. Type 794459-1 800, 1000 MHz Synthesizer (A2), Bottom View, Location of Components

5.5.2.1 **Type 371228-1 PLL/Regulator** REF DESIG PREFIX **A2A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: 100 pF, 5%, 100 V	2	8121-100-COGO-101J	59660	
C2	Same as C1				
C3	Capacitor, Ceramic, Disc: 1000 pF, 5%, 100 V	1	8121-100-COGO-102J	59660	
C4	Capacitor, Ceramic, Disc: 0.47 µF, 20%, 50 V	9	34452-1	14632	
C5	Capacitor, Ceramic, Disc: 0.01 µF, 20%, 50 V	4	34453-1	14632	
C6	Capacitor, Ceramic, Chip 1000 pF, 10%, 50 V	2	ATC100B102KP50X	29990	
C7	Same as C5				
C8	Same as C6				
C9	Capacitor, Ceramic, Monolithic: 22 pF, ±5%, 100 V	2	100-100-NPO-220J	51642	
C10	Same as C9				
C11	Same as C5				
C12 Thru C17	Same as C4				
C18	Same as C5				
C19	Same as C4				
C20	Same as C4				
CR1	Diode	2	1N4446	80131	
CR2	Same as CR1				
E1	Terminal, Forked	7	140-1941-02-01	71279	
E2 Thru E5	Same as E1				
J1	Connector, Receptacle	1	65624-110	22526	
L1	Coil, Fixed, Molded: 10 µH	2	1025-44	99800	
L2	Same as L1				
Q1	Transistor	1	2N2907/JAN	81350	
R1	Resistor, Fixed, Film: 750Ω, 5%, 1/8 W	1	CF1/8-750 OHMS/J	09021	
R2	Resistor, Fixed, Film: 36 kΩ, 5%, 1/8 W	1	CF1/8-36K/J	09021	
R3	Resistor, Fixed, Film: 9.1 kΩ, 5%, 1/8 W	1	CF/8-9.1K/J	09021	
R4	Resistor, Fixed, Film: 82 kΩ, 5%, 1/8 W	2	CF1/8-82K/J	09021	
R5	Resistor, Fixed, Film: 100 kΩ, 5%, 1/8 W	2	CF1/8-100K/J	09021	
R6	Same as R5				
R7	Resistor, Fixed, Film: 3.3 kΩ, 5%, 1/8 W	1	CF1/8-3.3K/J	09021	
R8	Same as R4				
R9	Resistor, Fixed, Film: 1.8 kΩ, 5%, 1/8 W	2	CF1/8-1.8K/J	09021	
R10	Same as R9				
U1	Integrated Circuit	1	MM74HC74N	27014	
U2	Integrated Circuit	1	MC14503BCP	04713	
U3	Integrated Circuit	1	DG301ACJ	17856	
U4	Integrated Circuit	1	74F163PC	07263	
U5	Integrated Circuit	1	MC145152P1	04713	

REF DESIG PREFIX A2A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
U6	Integrated Circuit	1	SP8703	52648	
U7	Integrated Circuit	1	NE5534AN	18324	
U8	Voltage Regulator	1	MC78lM05CG	04713	
U9	Voltage Regulator	1	MC78L15ACP	04713	
U10	Voltage Regulator	1	MC79L15ACP	04713	

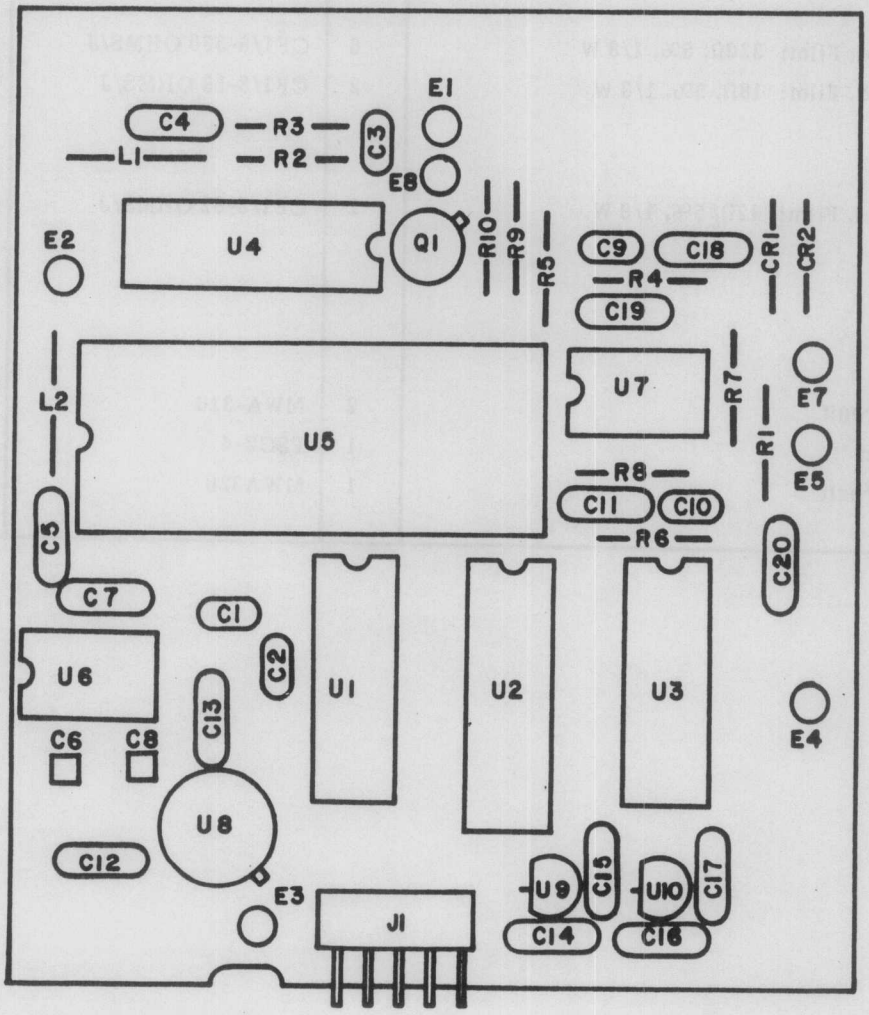


Figure 5-11. Type 371228-1 PLL/Regulator (A2A1), Location of Components

5.5.2.2 **Type 371226-1 Output Amplifier** REF DESIG PREFIX **A2A2**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: 0.01 µF, 20%, 500 V	1	34453-1	14632	
C2	Capacitor, Ceramic, Chip: 100 pF, 20%, 500 V	7	ATC100B101MP500X	29990	
C3 Thru C8	Same as C2				
C9	Capacitor, Ceramic, Chip: 1000 pF, 10%, 50V	3	ATC100B102KP50X	29990	
C10	Same as C9				
C11	Same as C9				
L1	Inductor, Air Core	3	22292-105	14632	
L2	Same as L1				
L3	Same as L1				
R1	Resistor, Fixed, Film: 330Ω, 5%, 1/8 W	6	CF1/8-330 OHMS/J	09021	
R2	Resistor, Fixed, Film: 18Ω, 5%, 1/8 W	2	CF1/8-18 OHMS/J	09021	
R3	Same as R1				
R4	Same as R1				
R5	Resistor, Fixed, Film: 82Ω, 5%, 1/8 W	1	CF1/8-82 OHMS/J	09021	
R6	Same as R1				
R7	Same as R2				
R8	Same as R1				
R9	Same as R1				
U1	Integrated Circuit	2	MWA-310	04713	
U2	Divider, Power	1	PSC2-4	15542	
U3	Integrated Circuit	1	MWA320	04713	
U4	Same as U1				

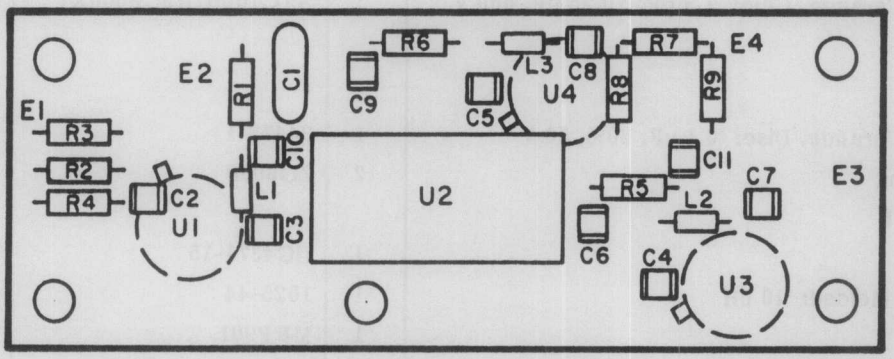


Figure 5-12. Type 371226-1 Output Amplifier (A2A2), Location of Components

5.5.2.3 **Type 371283-1 800-1000 MHz VCO** REF DESIG PREFIX **A2A3**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Electrolytic, Tantalum: 4.7 µF, 20%, 35 V	1	196D475X0035JE3	56289	
C2	Capacitor, Ceramic, Chip: 100 pF, 20%, 500 V	1	ATC100B101MP500X	29990	
C3	Capacitor, Ceramic, Chip: 1000 pF, 10%, 50 V	1	ATC100B102KP50X	29990	
C4	Capacitor, Ceramic, Chip: 3.9 pF, ±0.25 pF, 500 V	1	ATC100B3R9CP500X	29990	
C5	Same as C3				
C6	Capacitor, Variable, Air: 0.6-4.5 pF, 500V	1	GT-24T	73899	
C7*	Capacitor, Ceramic, Chip: 1.0 pF, ±0.1 pF, 500V	1	ATC100B1R0BP500X	29990	
C8*	Capacitor, Ceramic, Chip: 1.5 pF, ±0.1 pF, 500 V	1	ATC100B1R5BP500X	29990	
C9	Capacitor, Ceramic, Chip: 3.3 pF, 10%, 500 V	1	ATC100B3R3K500X	29990	
C10	Capacitor, Variable, Air: 0.4-2.5 pF, 500 V	1	27283	91293	
C11	Capacitor, Ceramic, Chip: 1.5 pF, ±0.25 pF, 500 V	1	ATC100B1R5CP500X	29990	
C12 Thru C14	Same as C3				
C15	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 50 V	1	34475-1	14632	
CR1	Diode, Tuning	2	ZC800B	18518	
CR2	Same as CR1				
CR3	Diode	1	GC4371-15	50101	
L1	Coil, Fixed, Molded: 10 µH	1	1025-44	99800	
Q1	Transistor	1	MRF901	04713	
R1	Resistor, Fixed, Film: 22Ω, 5%, 1/8 W	1	CF1/8-22 OHMS/J	09021	
R2	Resistor, Fixed, Film: 5.11 kΩ, 1%, 1/10W	1	RN55C5111F	81349	
R3	Resistor, Fixed, Film: 7.5 kΩ, 1%, 1/10 W	1	RN55C7501F	81349	
R4	Resistor, Fixed, Film: 13.7 kΩ, 1%, 1/10 W	1	RN55C1372F	81349	
R5	Resistor, Fixed, Film: 22 kΩ, 5%, 1/8 W	1	CF1/8-22K/J	09021	
R6	Ressitor, Fixed, Film: 47 kΩ, 5%, 1/8 W	2	CF1/8-47K/J	09021	
R7	Same as R6				
R8	Resistor, Fixed, Film: 15 kΩ, 5%, 1/8 W	1	CF1/8-15K/J	09021	
R9	Resistor, Fixed, Film: 20 kΩ, 5%, 1/8 W	1	CF1/8-20K/J	09021	
R10	Resistor, Fixed, Film: 330Ω, 5%, 1/8 W	3	CF1/8-330 OHMS/J	09021	
R11	Resistor, Fixed, Film: 390Ω, 5%, 1/8 W	1	CF1/8-390 OHMS/J	09021	
R12	Resistor, Fixed, Film: 8.2 kΩ, 5%, 1/8 W	1	CF1/8-8.2K/J	09021	
R13	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/8 W	1	CF1/8-4.7K/J	09021	
R14	Resistor, Fixed, Film: 220Ω, 5%, 1/8 W	1	CF1/8-220 OHMS/J	09021	
R15	Resistor, Fixed, Film: 18Ω, 5%, 1/8 W	1	CF1/8-18 OHMS/J	09021	
R16	Same as R10				
R17	Same as R10				
U1	Integrated Circuit	1	UA723CD	18324	

*Nominal Value, Final Value Factory Select.

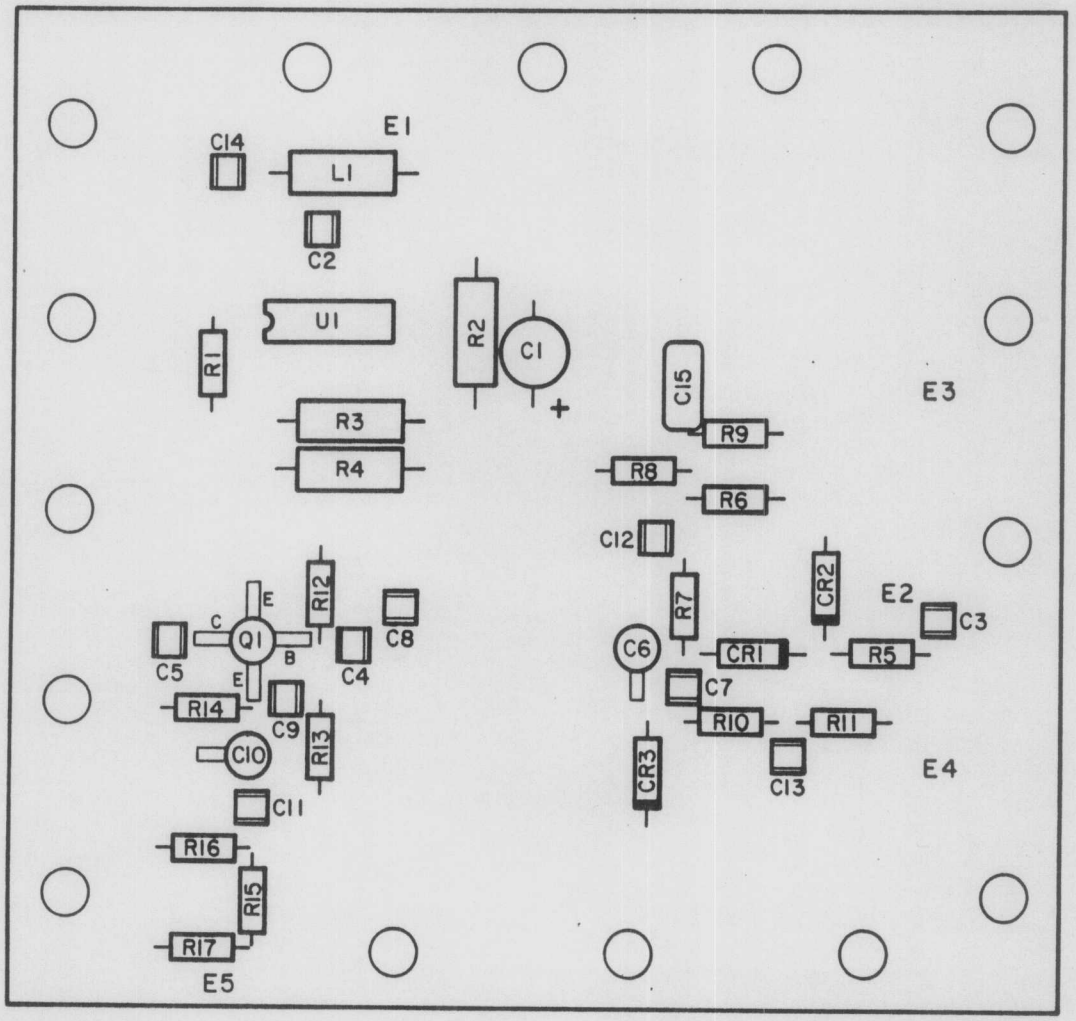


Figure 5-13. Type 371283-1 800-1000 MHz VCO (A2A3), Location of Components

SECTION VI

SCHEMATIC DIAGRAMS

NOTES:
1. UNLESS OTHERWISE SPECIFIED: FEED-THRU CAPACITORS ARE 1000pF.
2. BAND 1 = 1100 TO 1400 MHz
   BAND 2 = 900 TO 1099.9999 MHz
   BAND 3 = 700 TO 899.9999 MHz
   BAND 4 = 500 TO 699.9999 MHz
   BAND 5 = 20 TO 499.9999 MHz

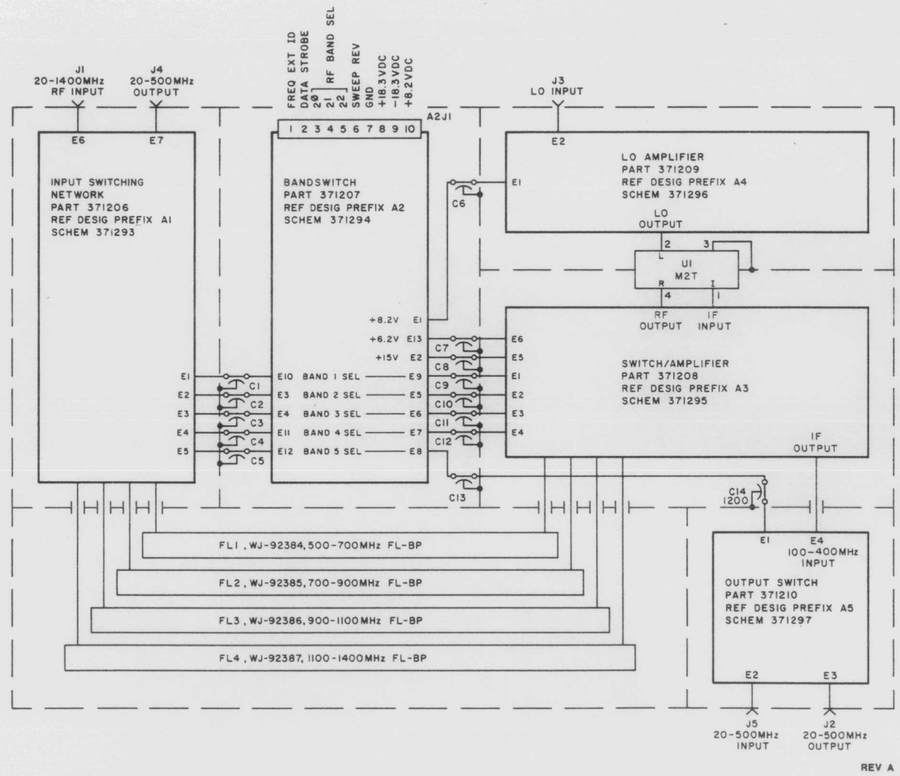


Figure 6-1. Type 794458-1 500-1400 MHz RF Assembly (A1), Schematic Diagram 471003

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/8W.
   b) CAPACITANCE IS IN pF.
   c) INDUCTANCE IS IN nH.

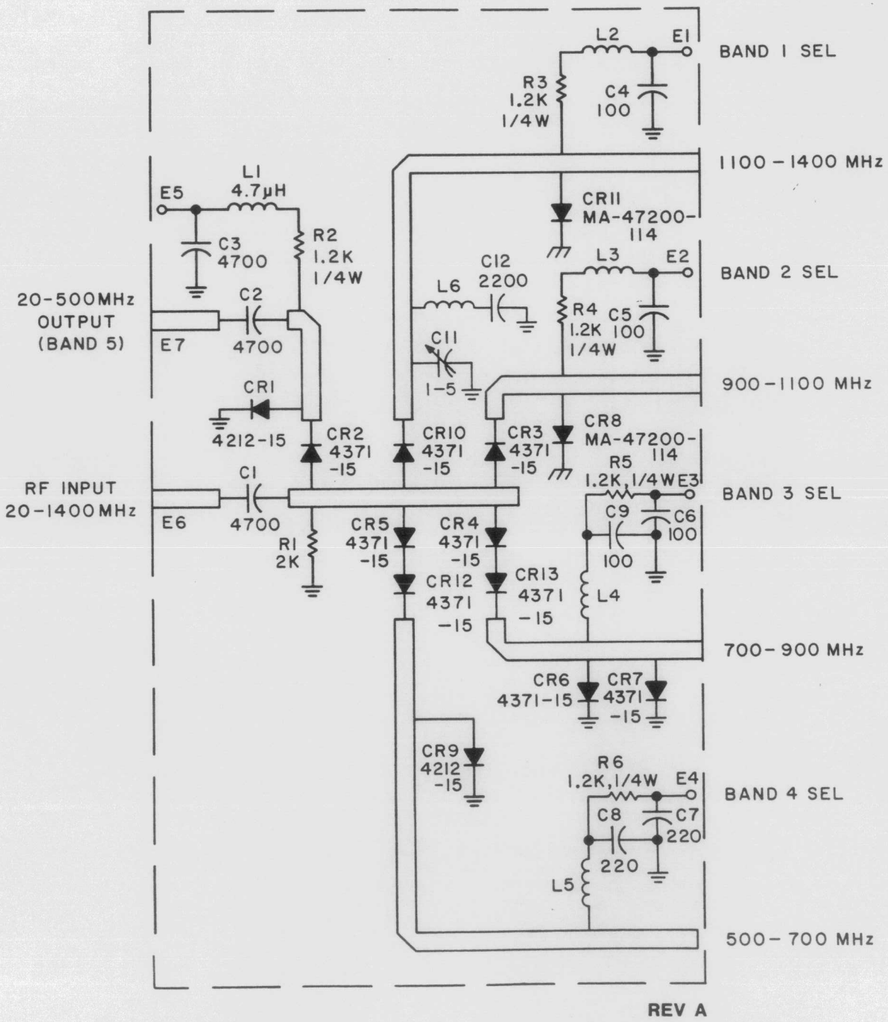


Figure 6-2. Type 371206-1 Input Switching Network (A1A1), Schematic Diagram 371293

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/8W.
   b) CAPACITANCE IS IN µF.
   c) INDUCTANCE IS IN nH.

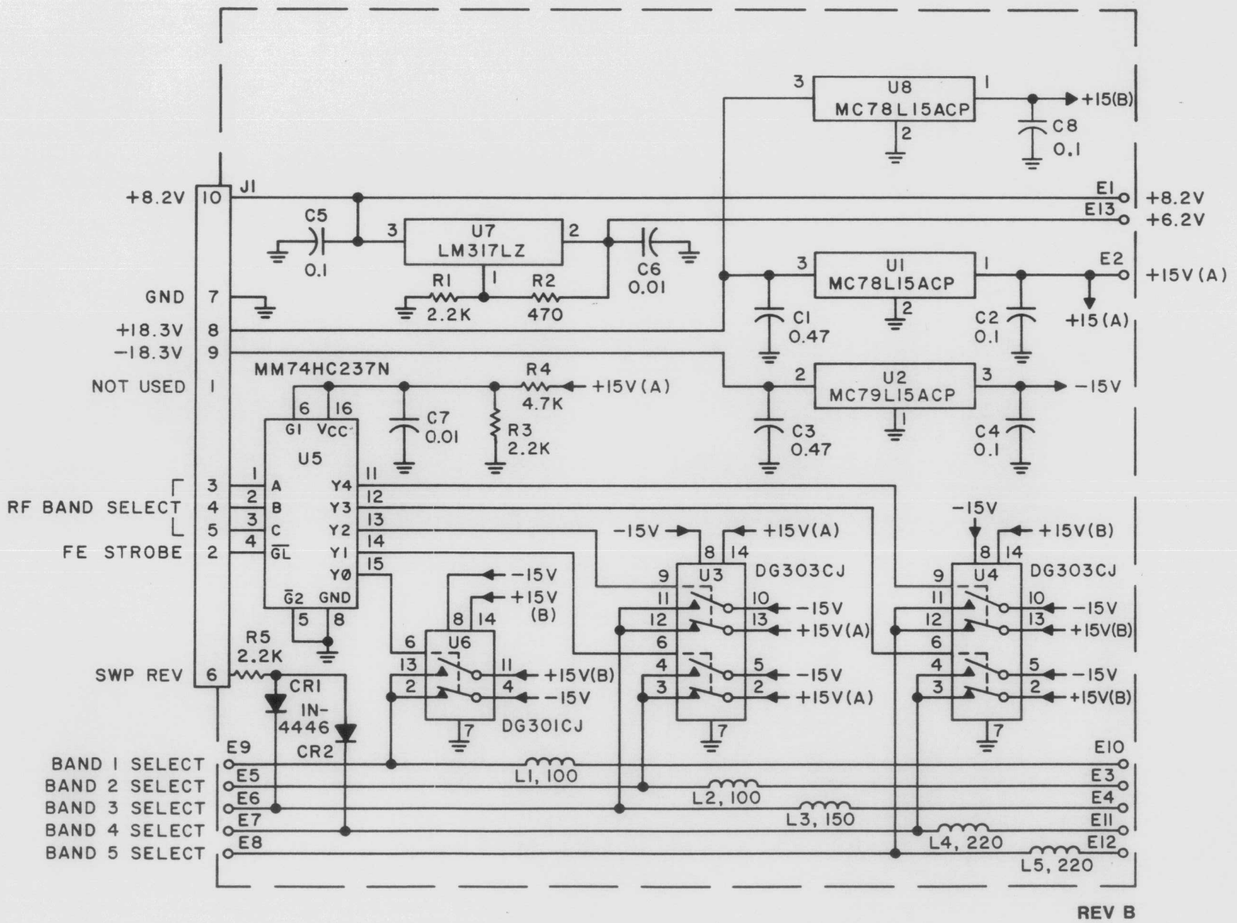


Figure 6-3. Type 371207-1 Band Switch (A1A2), Schematic Diagram 371294

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/8W.
   b) CAPACITANCE IS IN pF.
   c) INDUCTANCE IS IN nH.

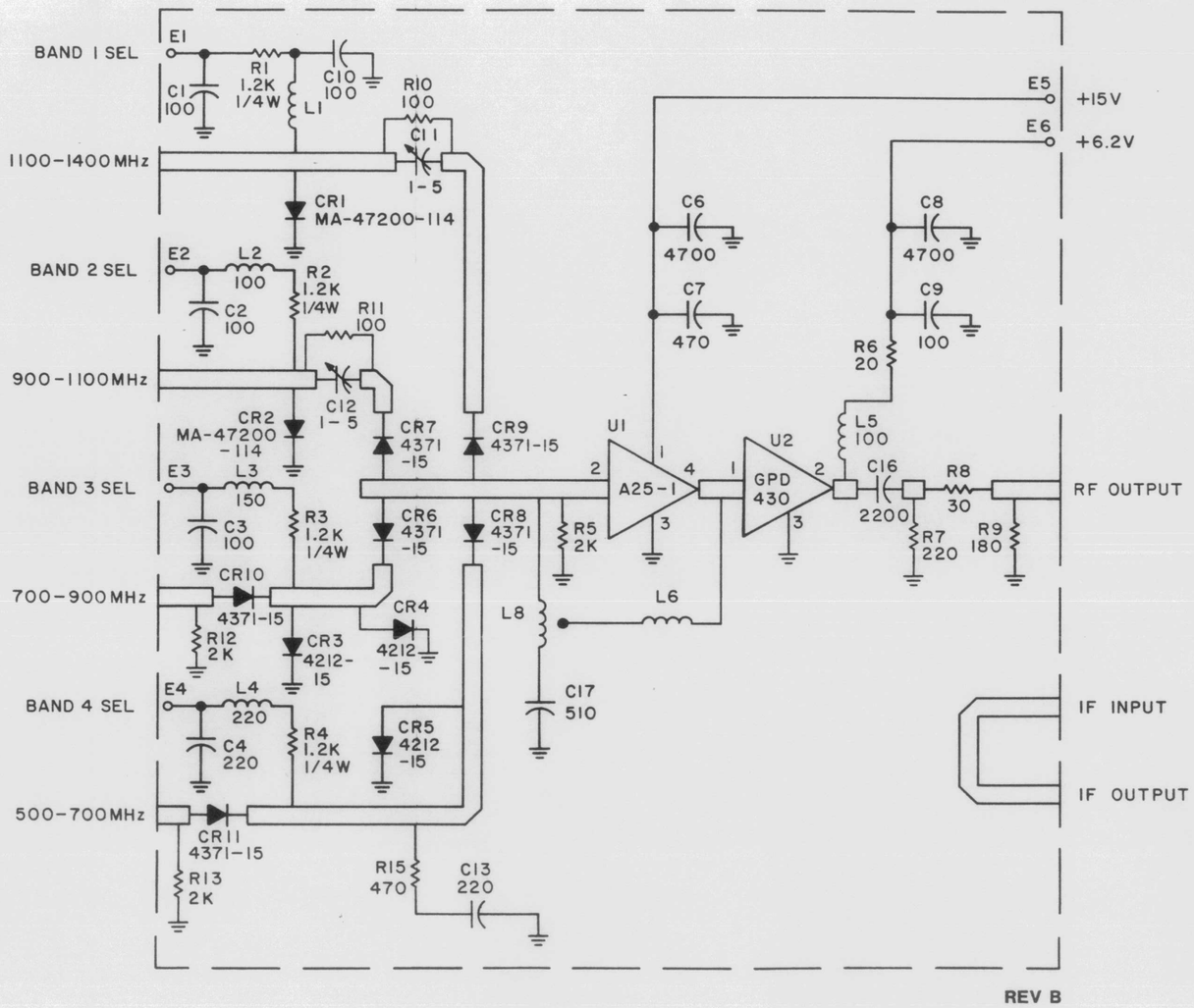
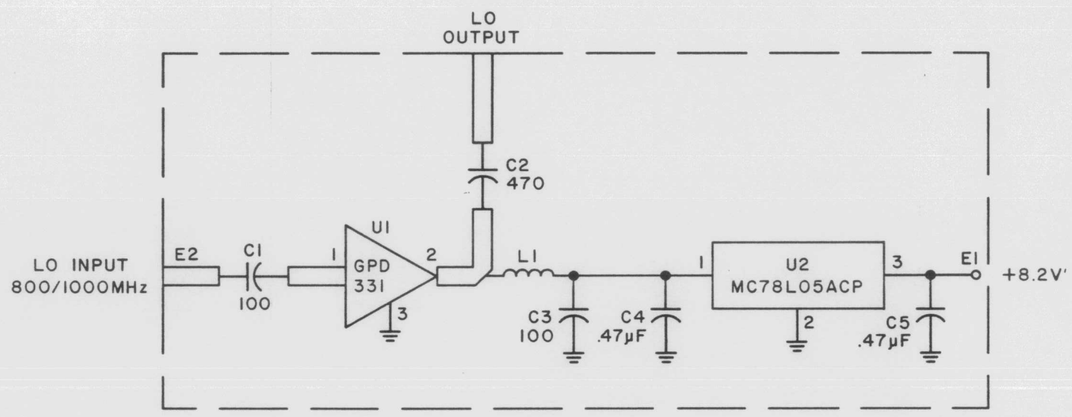


Figure 6-4. Type 371208-1 Switch/Amplifier (A1A3), Schematic Diagram 371295



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) CAPACITANCE IS IN pF.
   b) INDUCTANCE IS IN H.

Figure 6-5. Type 371209-1 LO Amplifier (A1A4), Schematic Diagram 371296

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/8W.
   b) CAPACITANCE IS IN pF.
   c) INDUCTANCE IS IN nH.

2. NOMINAL VALUE, FINAL VALUE FACTORY SELECT.

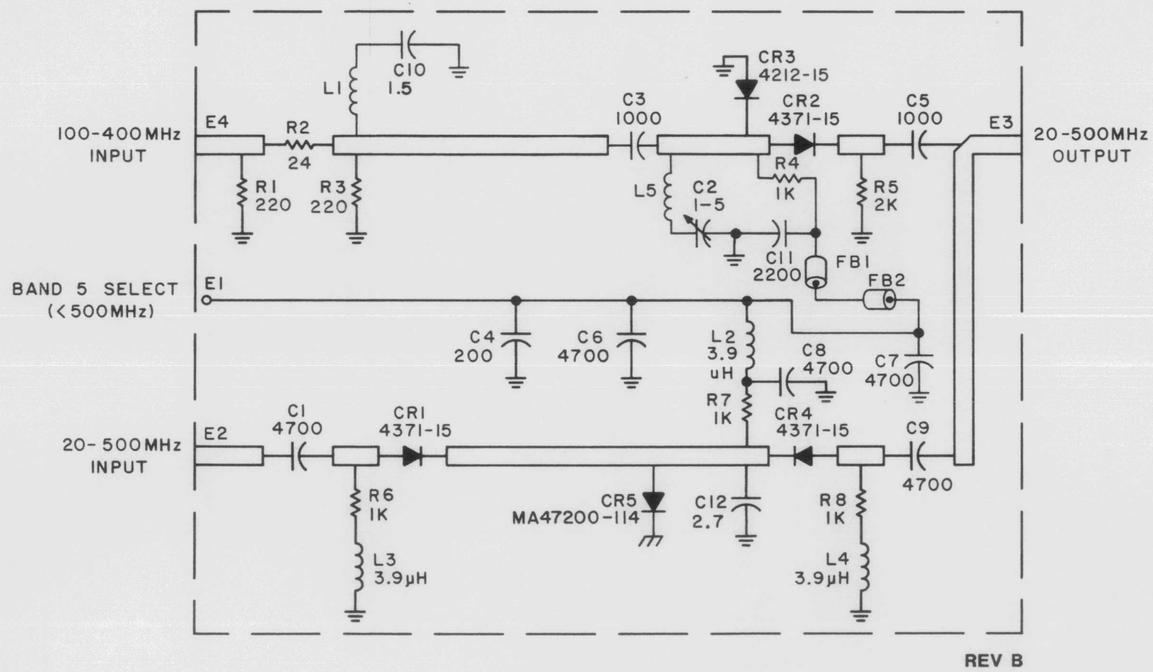


Figure 6-6. Type 371210-1 Output Switch (A1A5), Schematic Diagram 371297

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) CAPACITANCE IS IN uF.

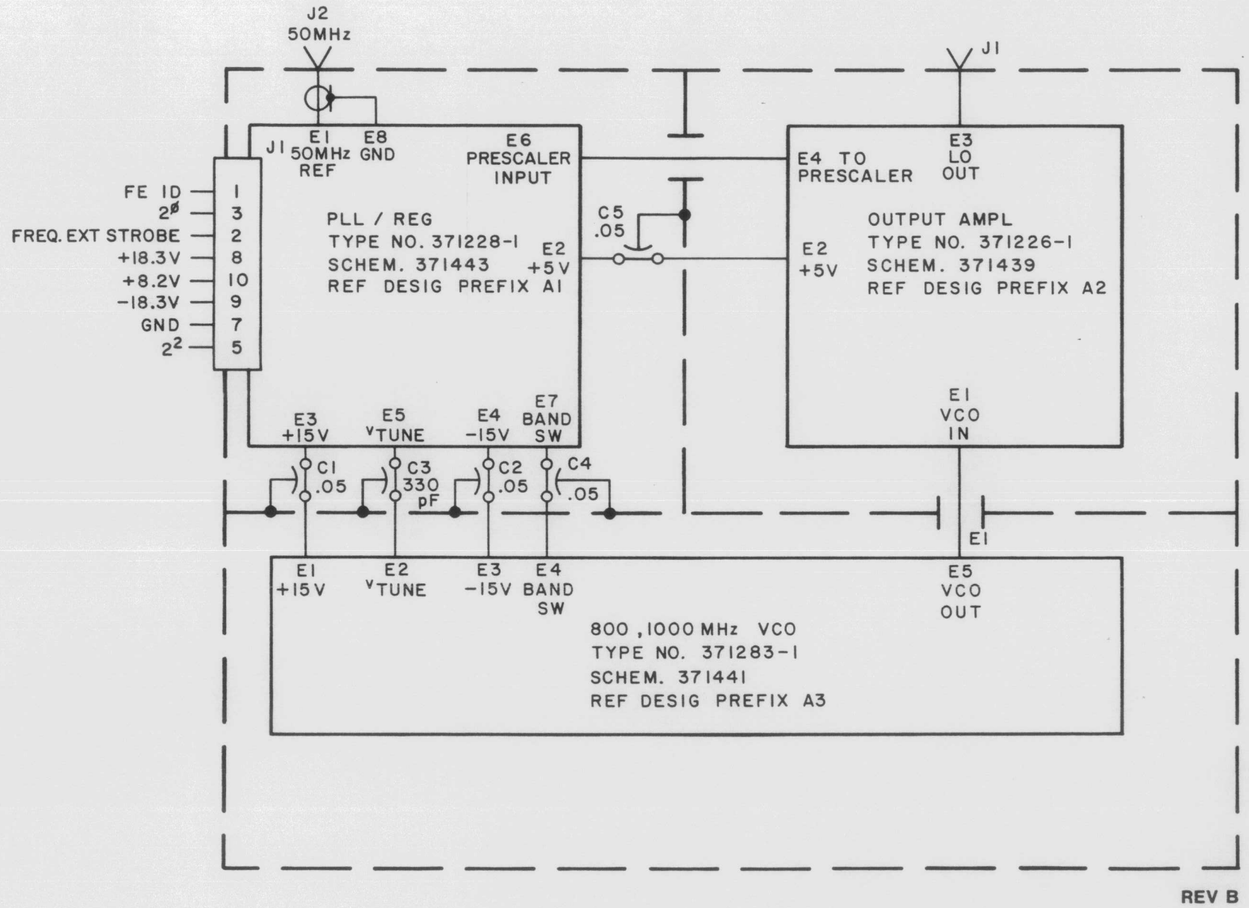
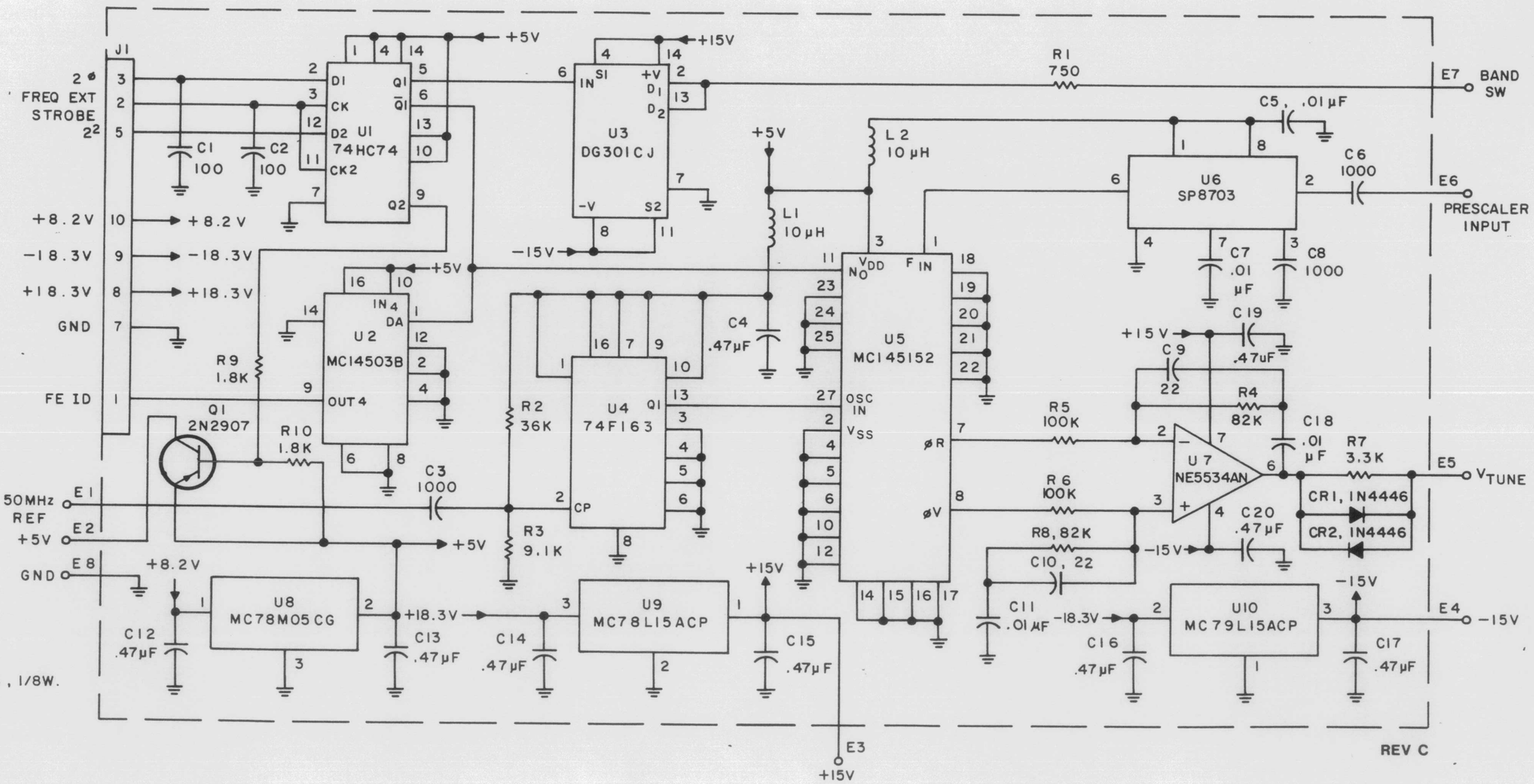


Figure 6-7. Type 794459-1 800-1000 MHz Synthesizer (A2), Schematic Diagram 371468



S:

UNLESS OTHERWISE SPECIFIED:

a) RESISTANCE IS IN OHMS, ± 5 %, 1/8W.

b) CAPACITANCE IS pF.

Figure 6-8. Type 371228-1 PLL Regulator (A2A1), Schematic Diagram 371443

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/8W.
   b) CAPACITANCE IS pF
   c) INDUCTANCE IS IN NANOHENRIES. (nH).

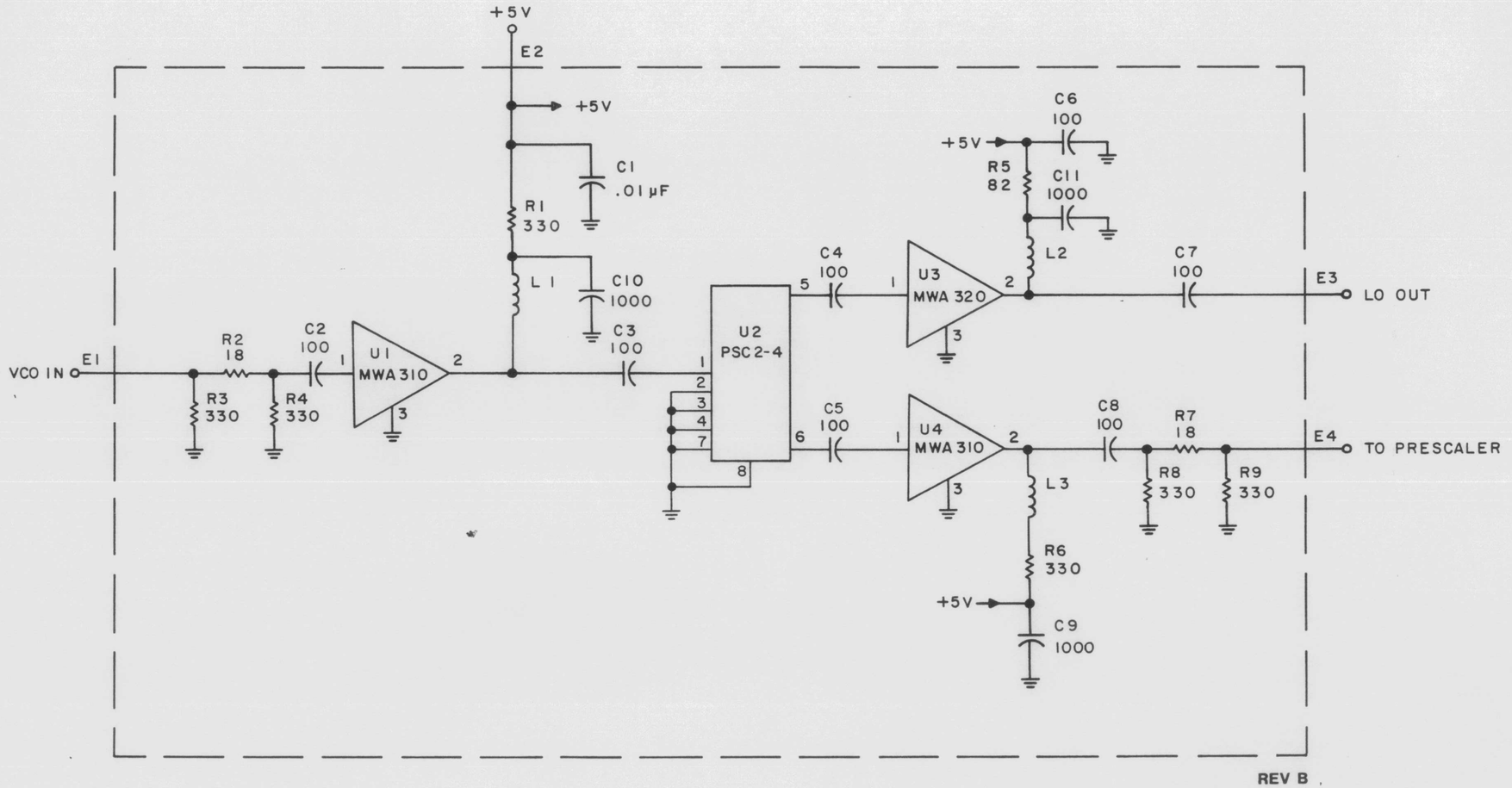


Figure 6-9. Type 371226-1 Output Amplifier (A2A2), Schematic Diagram 371439

S:

UNLESS OTHERWISE SPECIFIED:

a) RESISTANCE IS IN OHMS, 5%, 1/8W.

b) CAPACITANCE IS IN pF.

c) INDUCTANCE IS IN uH.

NOMINAL VALUE, FINAL VALUE, FACTORY SELEC

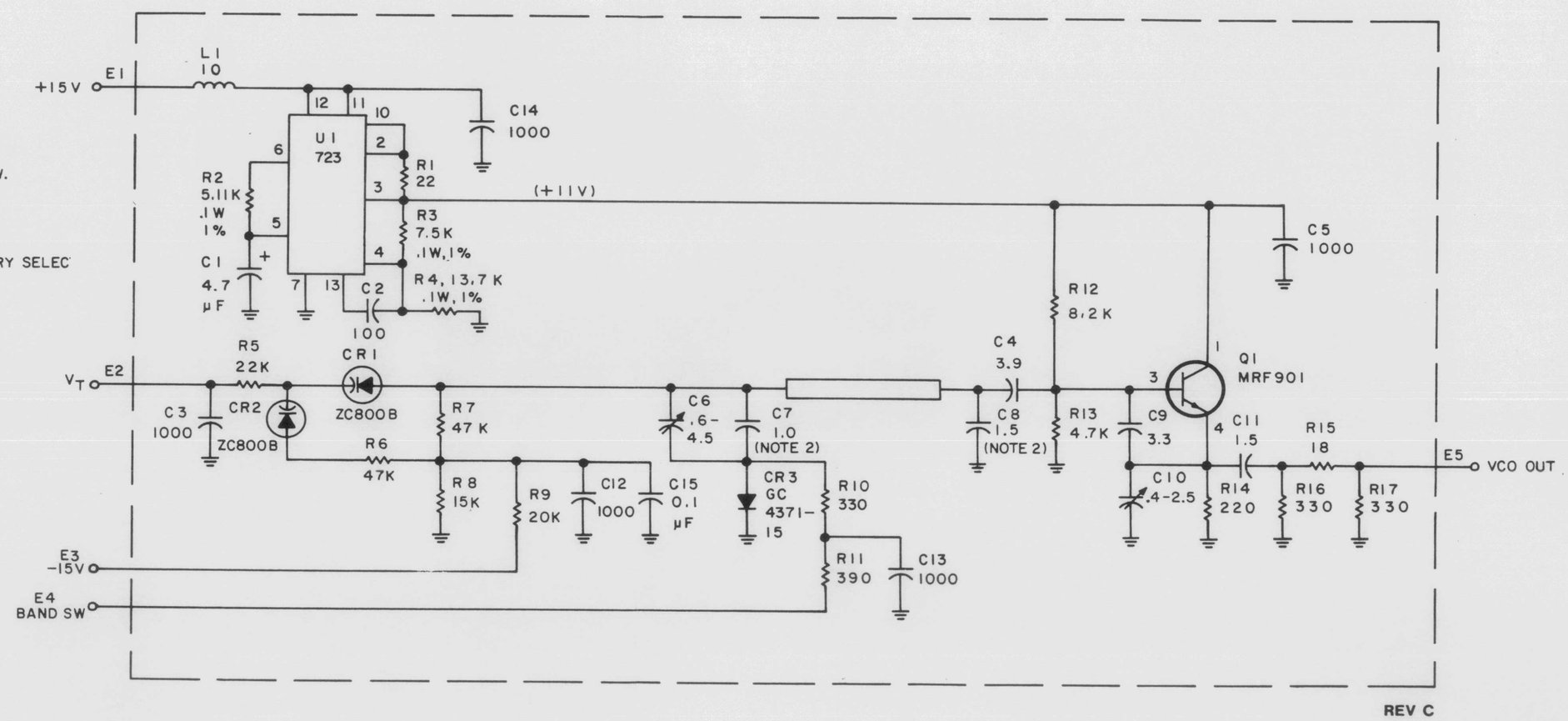
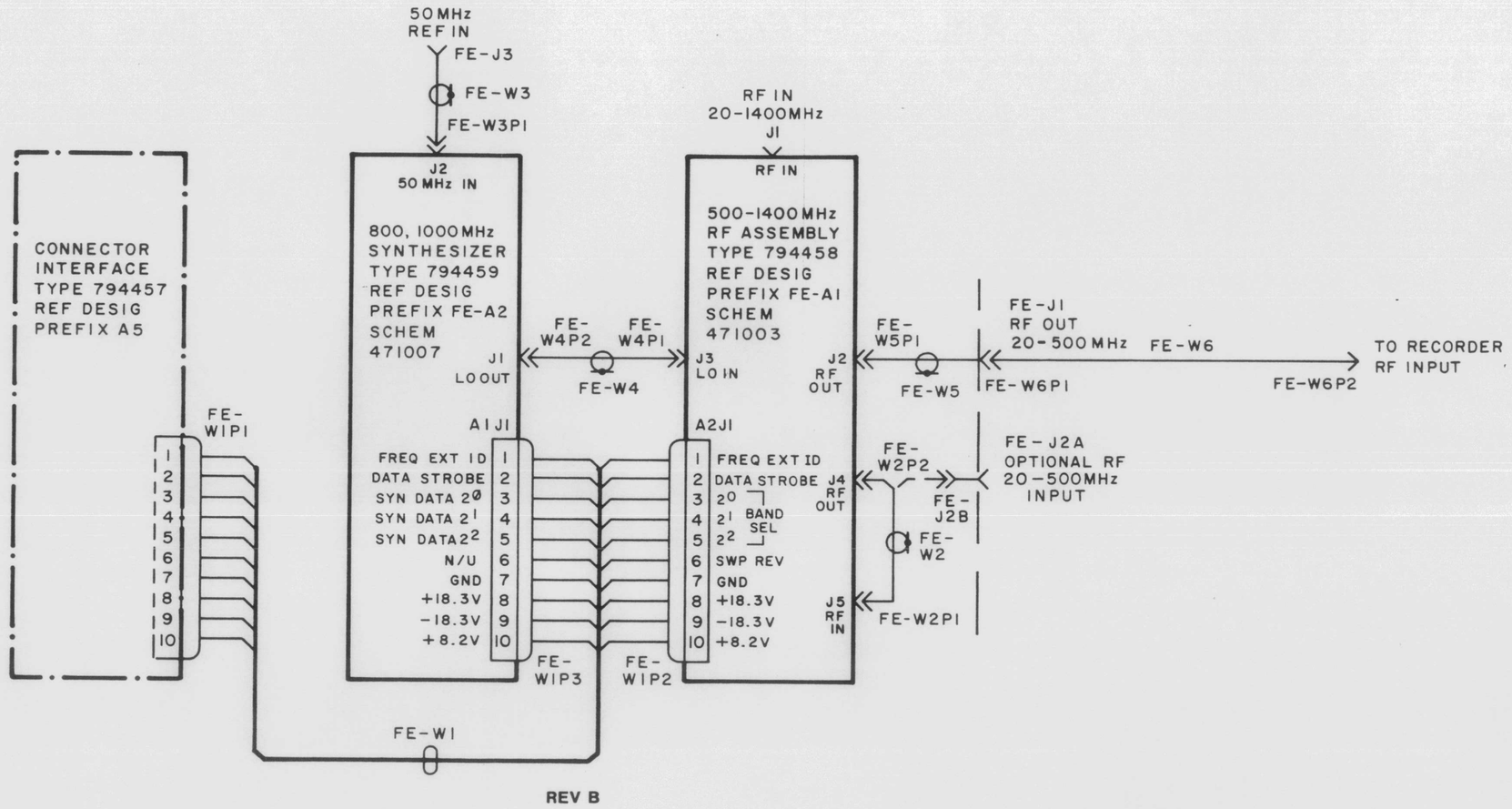


Figure 6-10. Type 371283-1 800-1000 MHz VCO (A2A3), Schematic Diagram 371441



NOTES:
1. PHANTOM LINES INDICATE PREEXISTING MODULE.

Figure 6-11. WJ-8628-4/FE Frequency Extender, Main Chassis, Schematic Diagram 371230