WJ-8617B / WJ-8618B Supplement Manuals

A	SMO	Spectrum Monitor Output	A
B	FE FEX	Frequency Extender	B
C	DRD	Digitally Refreshed Display	C
D	488	IEEE-488 Remote Control Interface	D
E	ASO	Audio Scan Output	E
F	WBO	Wide Band Output	F
G	SSB	Single Sideband Demodulator	G
H	NRT	Noise Riding Threshold	H
I	LOGV	60 dB Log Video	I
J	RLOG	Record Logging	J
K	HFE/LFE	High/Low Frequency Extender	K
L	BITE	Built In Test Equipment	L
M	RTC	Real Time Clock	M
N	DFC	Direction Finder Control	N
O	VBFO	Variable Beat Frequency Oscillator	O
P	ISB	Independent Sideband	P
Q	PKC	Pluggable Keyboard Control	Q
R	232	RS-232 Remote Control	R
S	IF Amplifier and Demod Bandwidth Options		S
T	PSM	Panoramic/Sector Marker Display	T
U	Fan Attachment/Chassis Slides Options		U

WJ-861X RECEIVER

APPENDIX A

SIGNAL MONITOR OPTION

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

November 1990

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

PROPRIETARY STATEMENT

TABLE OF CONTENTS

APPENDIX A

LIST OF TABLES

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS (Continued)

APPENDIX A

SIGNAL MONITOR OPTION

A.1 GENERAL DESCRIPTION

The Signal Monitor accepts 21.4 ±2 MHz signals and provides a visual display of signal activity across a sweepwidth of 0 to 4 MHz, continuously variable by a front panel SWEEP WIDTH control. Resolution is fixed at 10 kHz. The signal widths may be displayed either linearly or logarithmically, selected by the LIN/LOG front panel control. The MARKER/ON control establishes a 21.4 MHz center frequency pip. Other front panel controls include SWEEP RATE, FOCUS and INTENSITY of the electron beam, center frequency (CENTER FREQ) and GAIN setting of the signal pips.

A.2 INSTALLATION

The Signal Monitor is connected to the receiver front panel and bezel by the retaining nuts of the control knobs. If Type 38275-1 bezel is in place it must be removed to install the Signal Monitor. Two spring loaded screws hold the signal monitor to the receiver. Three connections are necessary: multipin connector P1 plugs into J19 on the receiver, the cable from P22 on the receiver connects at A2A3J2, and the cable from P20 on the receiver connects at A2A1J1.

A.3 OPERATION

All Signal Monitor controls are located on the front panel.

A.3.1 CONTROLS

The operation of all front panel controls is as follows:

a. MARKER/ON - When set to ON a marker appears on the CRT if sweep width is greater than 200 kHz. The marker indicates a frequency of 21.4 MHz.

b. LIN/LOG - The linear/logarithmic switch establishes the gain mode for the Signal Monitor. In the LIN mode, the range is about 20 dB with any one gain setting. In the LOG mode, signals displayed have a range of 40 dB.

c. SWEEP RATE - Controls rate in which signal sweep crosses CRT. Adjustable from 15 Hz fully counterclockwise to 25 Hz fully clockwise.

d. SWEEP WIDTH - Establishes how far on either side of center frequency the Signal Monitor displays signals. Total control range is from 0 to 4 MHz, equally divided above and below 21.4 MHz.

e. CENTER FREQ - The center frequency control shifts the signals right and left on the CRT. This control is used to align the 21.4 MHz marker behind the center graticule line.

f. GAIN - Provides at least 60 dB of control on incoming signals.

g. FOCUS - Maintains sharpness of the trace. Allows adjustment to maximum detail of the trace.

h. INTENSITY - Establishes brightness of the trace. Can be set for level required by the ambient light conditions.

A.4 FUNCTIONAL DESCRIPTION

A 21.4 MHz IF signal from the receiver is applied to Input Amplifier (A2A1A1). Shaping amplifier Q1 drives balanced mixer U1. Overall gain of the shaping amplifier is controlled by the front panel GAIN control in conjunction with AGC amplifier Q2. The 21.4 MHz signal from the shaping amplifier is combined with the sweep-oscillator signal in balanced mixer U1 to produce a 12.7 MHz IF signal. Output from the mixer is amplified by Q4 and sent to the 8 kHz Bandwidth IF Amplifier (A2A1A2). This subassembly passes only signals within 4 kHz of 12.7 MHz, for a bandwidth of 8 kHz. Overall gain for the subassembly is set by the gain control potentiometer in stage Q1. The 12.7 MHz signal from (A2A1A2) is applied to two series, gain controlled amplifier stages, Q1 and Q2 of Output Amplifier (A2A1A3). Gain of these stages is controlled by logarithmic amplifier U2. With LIN/LOG front panel switch in the LIN position, the input to amplifier U2 is grounded and Q1 and Q2 operate at nominal gain in a linear mode. When the switch is in LOG position, amplifier U2 is grounded and the gain of the two gain-controlled stages becomes logarithmic. Output from Q2 is coupled to IF amplifier U1. Amplified IF signals from U1 are detected by CR8 and applied to the non-inverting input of U3. The output of U3 is applied to vertical deflection circuits on Control Board A2A2.

Sweep Oscillator (A2A3A1) operates from a center frequency of 34.1 MHz with a maximum deviation of ±2 MHz. A sawtooth waveform from Control Board (A2A2) is coupled to a varactor-diode frequency modulator in the sweep oscillator circuit. A rising ramp of the sawtooth causes the oscillator to increase from 32.6 MHz to 35.6 MHz. When the ramp voltage suddenly drops to begin another cycle, the oscillator follows and returns to 32.6 MHz. For an inverted sawtooth, the ramp drives the oscillator high-to-low, then quickly high again. Output from the sweep oscillator is amplified and buffered by Q2 and Q3 to drive mixer U1 on IF Amplifier (A2A1A1). As the oscillator is swept across its frequency range it mixes with the output of (A2A1A1) amplifier Q1 to produce a 12.7 MHz output from the mixer. When an input to (A2A1A1) mixer U1 is 12.7 MHz below the oscillator frequency, an output from the IF amplifier assembly is produced. Reference Marker (A2A3A2) also inputs a 21.4 MHz signal to mixer U1 on IF Amplifier (A2A1A1) when the front panel MARKER switch is ON.

Control Board (A2A2) contains circuits to provide horizontal and vertical deflection, and biasing for the CRT. The control board uses a differential amplifier to supply the required signal gain and push-pull type drive. Bias voltages applied to the two vertical deflection plates establish a baseline near the bottom of the CRT, any signal voltages from the IF amplifier will cause a vertical deflection to indicate the presence of signals. Horizontal deflection circuits supply a recurring sawtooth voltage to the horizontal deflection plates to drive the electron beam across the face of the CRT. This same sawtooth voltage must be applied to sweep oscillator (A2A3A1) to maintain synchronization for converting 21.4 MHz input signals to vertical deflection voltage for the CRT. A recurring ramp voltage is directed to two places: to the

Sweep Oscillator, in this path the SWEEP WIDTH potentiometer controls the ramp voltage, which determines the excursion of the sweep oscillator above and below 34.1 MHz. The other path for the ramp voltage ultimately provides driving voltage for the horizontal deflection plates.

The calibrate adjustment determines the peak-to-peak excursion of the sawtooth voltage. The balance adjustment maintains equal peak levels of the sawtooth above and below zero volts.

The control board mounts a string of divider resistors containing the front panel FOCUS and INTENSITY controls. This divider receives 1500 Vdc from DC-DC Converter (A2A5). Voltage from these two controls is applied to the appropriate CRT elements to control the electron beam.

The DC-DC converter receives +15 Vdc and -15 Vdc inputs from the receiver power supply and converts them in transformer T1 to the high dc voltages required by the CRT.

A.5 DETAILED CIRCUIT DESCRIPTIONS

Refer to the schematic diagrams when reading these circuit descriptions. The main chassis schematic diagram is **Figure A-30.**

A.5.1 TYPE 724005-1 IF AMPLIFIER ASSEMBLY (A2A1)

Refer to **Figure A-21** for the schematic diagram. This assembly receives 21.4 MHz signals at IF input J1 and provides a detected output at E3 which, after amplification, is used to drive the vertical deflection plates of the CRT. Three subassemblies contained within the IF amplifier assembly perform the actual circuit operations. Input Amplifier (A2A1A1) receives the 21.4 MHz signals and converts them to 12.7 MHz. These signals couple to 8 kHz Bandwidth IF Amplifier (A2A1A2) which only passes signals within 4 kHz of the 12.7 MHz center frequency. These signals are coupled to Output Amplifier (A2A1A3) where detection occurs. A2A1A3 also contains a logarithmic AGC amplifier that can be selected from a front panel LIN/LOG switch. The IF amplifier assembly also has a 12.7 MHz trap on IF input jack J1, and a low-pass filter on the output at E3.

A.5.2 PART 18106-2 INPUT AMPLIFIER (A2A1A1)

Refer to **Figure A-22** for the schematic diagram of this circuit. Shaping amplifier Q1 is a dual insulated-gate field-effect transistor (IGFET). Gain of this stage is controlled by applying a negative-going voltage to gate 2 of the transistor. Gain-control voltage is derived from both the manual gain input at E2 and AGC amplifier Q2.

With little or no signal present at input E1 (signal strength at the cathode of CR2 less than 400 mV) dual IGFET Q1 will be operating at maximum gain. As the signal strength increases, diode CR2 rectifies a portion of the output of Q1 and feeds it to the base of AGC amplifier Q2 through resistor R11. When Q2 begins to conduct, the voltage at gate 2 of Q1 begins to go in the negative direction resulting in a reduction in the gain of the stage. Manual gain voltage to E2 provides approximately 60 dB of range in the gain of the shaping amplifier. Diode CR1 prevents the junction of R2 and R7 from ever exceeding +0.6 V. The AGC loop provides 20 dB of gain control when the manual gain voltage applied to E2 is set for maximum gain.

The signal from Q1 is coupled to a single-tuned impedance-matching circuit for balanced mixer U1 consisting of variable inductor L4 and capacitors C8 and C11. A ±1.5 dB flat response over a 4 MHz bandwidth centered at 21.4 MHz is present at the input of U1. This is a result of the combination of the shaping amplifier output and the peaked response of pi-network L4, C8, and C11. Balanced mixer U1 heterodynes this signal with an LO input signal from E4. This LO input signal is centered on 34.1 MHz and continually sweeps from 32.6 MHz to 35.6 MHz when maximum sweep width is desired. The two input signals combine in the mixer to produce 55.5 MHz sum signals and 12.7 MHz difference signals. The two input frequencies are attenuated in the mixer and appear at the mixer output at the low level. Only the difference signals receive amplification by FET amplifier Q4, which has a drain circuit tuned to 12.7 MHz by C21. The IF output is taken from a tap on transformer T1.

A.5.3 PART 18107-1 8 kHz BW IF AMPLIFIER (A2A1A2)

Refer to **Figure A-23** for the schematic diagram of this circuit board. The 12.7 MHz signals from E1 enter the filter and are restricted to a bandwidth of 8 kHz. Transistor Q1 works into a 12.7 MHz tank circuit made up of L1 and C4. Gain is established by potentiometer R8 in the emitter circuit of the transistor. The amplified signals from the tank circuit couple to the base of Q2 for further amplification. Inductor L2 and capacitor C8 resonate the collector stage of this amplifier. The 8 kHz bandwidth, 12.7 MHz signals are routed out of the board at E3.

A.5.4 PART 15801-3 OUTPUT AMPLIFIER (A2A1A3)

Refer to **Figure A-24** for the schematic diagram of this circuit board. Signal flow from pin E1 to gate 1 (pin 3) of Q1 is through dc-blocking capacitor C2. Transistor Q1 is the first of two gain-controlled stages. Both semiconductors are dual IGFETs. Gain of each stage is controlled by applying a negative-going voltage to gate 2 of the IGFET.

When the output amplifier is to operate in the linear mode, the input to AGC amplifier U2 is grounded. Transistors Q1 and Q2 then operate at nominal gain. In this mode, the voltage on gate 2 is derived from the voltage drop across R5 (R13), R3 (R14), and CR1 (CR2). When the amplifier is to be operated in the logarithmic mode, the control input at E7 is removed from ground and connected through external switching to the output of U3 at E8. Then AGC amplifier U2 provides a logarithmic AGC characteristic. Integrated circuit U2 is utilized as a dc amplifier. Resistors R29 and R35 control the initial negative feedback for the AGC amplifier. As the output from U2 reaches -1.8 V, diodes CR3, CR4, and CR5 conduct and insert R21 and R28 into the feedback determining network. It is at this point that the gain curve becomes logarithmic. Potentiometer R28 is used to calibrate the overall LOG range of the entire IF amplifier. Resistor R31 returns the non-inverting input (pin 3) of U2 to ground to balance current flow through both IC inputs.

Drain load for stage Q2 is a single-tuned resonant circuit consisting of variable inductor L1 and capacitors C9 and C10. Resistor R20 is a parasitic suppressor. IF output signals from the capacitive voltage divider are applied to linear IF amplifier U1. There are two gain-calibration networks associated with U1. The logarithmic gain calibration circuit consists of diode CR6, capacitor C12, and potentiometer R24. Diode CR7, capacitor C17, and potentiometer R25 make up the linear-gain calibration network. These circuits are energized, respectively, when front panel switch S2 is placed in either the LOG or LIN position. The operation of the gain calibration circuits is identical. The LOG network will be explained as an example. With front panel switch S2 in the LOG position the cathode (pin E3) of CR6 is grounded; therefore, the +18 V through resistor R18 forward biases diode CR6. The gain circuit is now coupled through dc-blocking capacitor C18 to pin 2 of U1 which is the emitter of the input amplifier transistor of the IC. Emitter bias is provided through resistor R33 from the negative supply voltage. With R24 in its extreme clockwise position, capacitors C18 and C12 provide almost a short circuit ac path to ground which causes maximum gain of the input transistor in U1. As potentiometer R24 is rotated counterclockwise, series resistance is added to the emitter ac ground path which increases the emitter degeneration. This reduces the gain of the stage. A single-tuned circuit, L2 and C22, is the load for the output of U1.

The 12.7 MHz IF output from U1 is coupled to detector CR8 by dc-blocking capacitor C23. Signals from the detector are coupled to the non-inverting input (pin 3) of output amplifier U3. A matching network consisting of resistors R36, R39, R40, and R41, and diode CR9 is connected to the inverting input (pin 2) of U3. This network provides the same amount of current flow through diode CR9 as there is through detector CR8 during periods of no signal input (noise only). Therefore, U3, which is a differential amplifier, will produce a zero volt output for a zero volt input. The detected output from CR8 is amplified by integrated circuit U3 and applied to output level set potentiometer R47 (pin E9).

A.5.5 TYPE 824002 CONTROL BOARD (A2A2)

Refer to **Figure A-25** for the schematic diagram of this board. Three major functional groups of circuits appear on this board: a ramp voltage generator and associated inverter stage, an amplifier stage for driving vertical deflection plates of the CRT, and a horizontal amplifier stage for driving the horizontal deflection plates of the CRT. Vertical amplifiers consist of transistors Q6, Q7, Q8, and Q9. They make up a differential amplifier supplying the vertical deflection plates of the CRT with a pair of balanced voltages to maintain the electron beam at the desired vertical location. R34 establishes the exact location of the electron beam in the vertical plane. A recurring voltage applied to a pair of horizontal deflection plates causes the electron beam to sweep across the tube thereby producing a horizontal base line on the tube.

Signals are made to appear on the CRT face when the vertical deflection plates move the electron beam up and then back down to its base line position as the electron beam is moving across the face of the tube. This produces the characteristic pip used to indicate signals. The dc signal voltage used to unbalance the steady state condition of the vertical deflection plates appears at vertical input E10. This voltage couples through vertical gain potentiometer R27 to the base of transistor Q6. As the signal voltage goes positive, Q6 increases conduction causing its collector voltage to decrease. This reduces the conduction of Q7, and its collector voltage increases. Thus vertical output E13 receives an increasing vertical deflection voltage for an increasing signal input at E10.

Bias current for Q6 flows through resistor R35, which is also shared with the other half of the differential amplifier. When Q6 draws more current because of the signal input, R35 must supply the current. Directly related to an increase in current flow through R35 is an increase in voltage developed. The emitter of Q9 reacts to this attempted increase in voltage by lowering the conduction of the transistor. That is, as the voltage on the emitter of Q9 attempts to increase, a corresponding decrease in current flow occurs that just maintains a state of equilibrium for total current through R35.

With the conduction of Q9 reduced, its collector voltage rises which in turn reduces the collector voltage of vertical output transistor Q8. For the same vertical input signal at E10, vertical output E13 provides an increased voltage, and vertical output E14 provides a decreased vertical output voltage. This push-pull arrangement provides the required deflection for the electron beam to indicate the presence of signals.

The base of Q9 receives a signal from a resistive divider connected between the two horizontal deflection outputs at E8 and E9. This additional input to the differential amplifier at the base of Q9, provides a "tilt" control for making the base line horizontal behind the graticule base line. Potentiometer R52 establishes balance and level of the horizontal deflection voltage coupled to the input of the vertical deflection amplifier at Q9.

The ramp voltage for driving the horizontal deflection plates and the sweep oscillator originates with Q1 and Q2. Transistor Q2 provides a constant current, as determined by R54, to charge capacitor C1. This capacitor charges until the firing voltage of unijunction Q1 is reached, then the capacitor is suddenly discharged through Q1, and the recharge cycle begins again. This recurring ramp voltage (sawtooth) couples to the non-inverting input of operational amplifier U1 which acts as a buffer and amplifier. Sweep calibration potentiometer R9 establishes the slope of the ramp voltage applied to the horizontal width control and the sweep output at E5.

Differential amplifier Q3-Q4 maintains a dynamic voltage to keep the electron beam on the face of the CRT in the presence of the ramp voltage which drives the electron beam across the CRT. Horizontal position potentiometer R25 balances the two voltages and shifts the sweep range, determined by the horizontal width control, left or right. This action will align the center of the sweep range to the center of the screen.

The ramp voltage applied to the base of Q3 appears at the collector, amplified and inverted. Transistor Q4 receives its driving signal on the emitter so no inversion occurs with the amplified signal at the collector. Constant current source Q5 provides common mode rejection to maintain stability of the horizontal trace.

Sweep output E5 routes through the front panel sweep width potentiometer and couples back into the board at sweep inverter input E11. After processing in operational amplifier U2, this ramp voltage is applied to a varactor in Sweep Oscillator (A2A3A1), and the frequency is made to change slowly as the ramp voltage increases. Then, when the ramp voltage suddenly returns to its initial level, the oscillator follows to its initial frequency and begins to track the ramp voltage again. Either a positive-going or a negative-going ramp voltage can be applied to the oscillator, depending on the direction which the frequency must track. This tracking depends on the mixer conversion involved with tuners and IF converters in units external to the signal monitor. If the total conversion process has inverted the order of the signals applied to the signal monitor, reversing the sweep effectively restores their position in the spectrum.

Sweep inverter U2 receives the ramp voltage on both input resistors. FET Q10 pulls the signal applied to the non-inverting input to ground when the ramp voltage is to be inverted. Under this condition, resistors R43 and R46 establish unity gain for the ramp voltage. Diodes CR3 and CR4 provide a breakpoint for the sawtooth voltage developed across the series output resistor.

When Q10 does not pull the non-inverting input to ground, the ramp voltage applied to the inputs appears at the output with an identical level and slope. With the ramp voltage applied to both inputs, as in this situation, the effect is to oppose each other. However, the non-inverting input of an operational amplifier in this configuration maintains a gain equal to the gain of the inverting input (the ratio of R43 and R46) plus one. For this circuit, R43 and R46 establish unity gain; so the non-inverting input has a gain of two. With both inputs receiving the same signal, the unity gain of the inverting input opposes the gain-of-2 associated with the non-inverting input. The net effect is a gain-of-1 for the output ramp, and it is in phase with the input ramp. The ramp from the sweep inverter output at E15 is applied to Sweep Oscillator (A2A3A1).

A.5.6 TYPE 774007-1 OSCILLATOR ASSEMBLY (A2A3)

Refer to **Figure A-26** for the schematic diagram of this assembly. Two printed circuit boards are contained within this assembly. Marker Oscillator (A2A3A2) provides an output signal at 21.4 MHz when 15 Vdc is applied to input C12. Sweep oscillator (A2A3A1) maintains an output frequency of 34.1 ±1.5 MHz at sweep oscillator output J1. This frequency is controlled by a center frequency voltage applied to C5 and a sweep (ramp) voltage applied to C4. All power and sweep voltage leads are filtered to prevent oscillator signals from leaving the assembly.

A.5.7 PART 270521-1 REFERENCE MARKER (A2A3A2)

Refer to **Figure A-26** for the schematic diagram of this assembly. With front panel MARKER switch off, diode CR2 is forward biased in the Reference Marker circuit and CR1 is reverse biased and will not pass the input from J2. When the MARKER switch is ON CR2 becomes reverse biased and CR1 forward biased, this allows the 10.7 MHz reference signal to pass to crystal Y1 from J2. Y1 passes the second harmonic at 21.4 MHz. C14 couples the signal to output connector J3.

A.5.8 PART 280915-1 SWEEP OSCILLATOR (A2A3A1)

Refer to **Figure A-27** for the schematic diagram of this circuit. Sweep oscillator Q1 is basically a Clapp circuit that has its output frequency swept across a maximum range of 4 MHz. The oscillator center frequency is 34.1 MHz. The tuned frequency is controlled by voltage-variable capacitor (varactor) CR1 whose capacitance varies inversely with the reverse voltage applied across its terminals. Thus, as the voltage across CR1 increases, its capacitance decreases; a decrease in voltage increases the capacitance. The varactor diode is connected in parallel with the oscillator tank circuit. Inductor L1 and CR1 form the basic tuning elements of the oscillator tank. Capacitor C7 is a padder and C14 is a trimmer. These two components shape the oscillator output frequency. Inductors L2 and L3 are RF chokes. They, in conjunction with the associated capacitors, prevent leakage of oscillator frequencies through the varactor bias circuits. Feedback to sustain oscillation is taken from the emitter of Q1 and coupled to the junction of C3 and C4 through R5. Capacitors C3 and C4 provide the necessary impedance step-up to sustain oscillation. Bias voltage for the varactor (applied through pin E4) is obtained from the front-panel CENTER FREQ control. This control is used to set the oscillator center frequency to 34.1 MHz. The ramp voltage applied to the anode of the varactor diode is a modified sawtooth waveform to compensate for the non-linear changes in capacity of the varactor with respect to the applied voltage. The applied non-linear sawtooth voltage linearly varies the sweep oscillator frequency. The shaping network displays signals of 19.3 MHz and 23.4 MHz (4-MHz bandwidth) equidistant from the center frequency of 21.4 MHz with the SWEEP WIDTH control fully clockwise. As the SWEEP WIDTH control is rotated counterclockwise, the ramp voltage amplitude applied to E3 decreases. This reduces the voltage variations on the anode of varactor diode CR1, thus reducing the sweep width. Output of the sweep oscillator is taken at the junction of capacitors C5 and C7, and coupled through R7 to the base of emitter-follower Q2.

The sweep signal couples from emitter follower Q2 to the base of buffer amplifier Q3. Collector load for Q3 is a single-tuned circuit consisting of variable capacitor C16 and transformer T1. This circuit is broadly tuned to the oscillator center frequency of 34.1 MHz.

A.5.9. TYPE 794099-1 FOCUS AND INTENSITY CONTROL (A2A4)

Refer to **Figure A-28** for the schematic diagram of this assembly. High voltage appearing at E3 originates at the front panel INTENSITY control. High voltage input E1 receives -1500 Vdc which connects to a resistive divider containing the INTENSITY and FOCUS controls.

A.5.10 TYPE 764006-1 DC-DC CONVERTER

Refer to **Figure A-29** for the schematic diagram of this assembly. Transistors Q1 and Q2 act as a multivibrator to create an oscillating current in the primary windings of transformer T1. Input from E2 turns Q2 on to produce high current in the windings between pins 6 and 3. Q2 saturates and the feedback loop creates a positive voltage causing Q1 to turn on and Q2 to turn off. When Q1 is conducting it produces a high current in the windings between pins 6 and 1. The high current saturates Q1 and the feedback loop creates a positive voltage at Q2 to once again turn on Q2. The cycle repeats. Diodes CR6, CR7, CR8 and CR9 prevent inductive kickback.

The changing current in the primary windings of T1 produces an ac voltage in the secondary windings. Doubler rectifier CR2 and CR3 increase the voltage and C5, C6, and R6 filter the ripple to output -1500 Vdc at E3. Full wave rectifier CR10 and CR11 changes the ac output from T1 to a positive going dc with C7 smoothing the 200 Vdc output at E4.

A.5.11 TYPE 794103-1 SIGNAL MONITOR MAIN CHASSIS ASSEMBLY (A2)

Refer to **Figure A-30** for the schematic diagram of the main chassis wiring. All power and a sweep reverse voltage enter the Signal Monitor from connector P1. IF input J2 receives 21.4 MHz signals from the receiver. These signals are routed to the IF amplifier assembly at J1. Also supplied to the IF amplifier assembly are a swept frequency centered on 34.1 MHz and a marker centered on 21.4 MHz. These two signal inputs originate in the oscillator assembly, and enter the IF amplifier at J3 and J1 respectively. The IF amplifier processes these various inputs and provides a detected output at E3 which routes to the control board for amplification.

Front panel CENTER FREQ control provides for shifting the sweep response to center the trace behind the graticule. When the front panel MARKER switch applies 15 Vdc to the oscillator assembly, a marker appears at 21.4 MHz. LOG-LIN switch S2 establishes the gain mode for the IF amplifier assembly.

Oscillator Assembly (A2A3) receives a sawtooth voltage at C4 to sweep the oscillator to either side of its 34.1 MHz center frequency. This voltage originates in the Control Board (A2A2). The center frequency voltage applied to the oscillator assembly originates with the 15 Vdc supply. Diode VR1 and heat sensitive resistor RT1 act to stabilize the center frequency voltage applied to A2A3C5.

Control board A2 supplies the CRT with bias voltages and signals which maintain the electron beam on the screen. The trace is made to deflect horizontally by push-pull sawtooth outputs E8 and E9. For vertical deflection, signals entering at E10 receive amplification, before being applied to outputs E13 and E14, also push-pull voltages. Output E6 supplies 100 Vdc derived from the 200 Vdc line.

A.6 MAINTENANCE

The Signal Monitor has been conservatively designed to operate for extended periods of time with little or no routine maintenance. An occasional cleaning and inspection are the only preventive maintenance operations recommended. Intervals for the operations should be based on the operating environment. Should trouble occur, repair time will be minimized if the maintenance technician is familiar with **Section A.5** of this manual, in which the circuits are described; and with the schematic diagrams. Reference should also be made to the troubleshooting and maintenance procedures contained in this section. A complete parts list and illustrations showing parts locations can be found in **Section A.7.** Figure numbers are given at some steps in the procedures.

A.6.1 CLEANING AND LUBRICATION

The unit should be kept free of dust, moisture, grease, and other foreign matter to ensure trouble-free operation. If available, use low-pressure compressed air to remove accumulated dust from the exterior and interior. A clean dry cloth, a soft bristled brush, or a cloth saturated with cleaning solution may also be used.

A.6.2 INSPECTION FOR DAMAGE OR WEAR

Many potential or existing troubles can be detected by a visual inspection of the unit. For this reason, a complete visual inspection should be made for indications of mechanical and electrical defects on a periodic basis, or whenever the unit is being checked for a reported trouble. Electronic components that show signs of deterioration should be checked and a thorough investigation of the associated circuitry should be made to verify proper operation. Mechanical parts should be inspected for excessive wear, looseness, misalignment, corrosion, and other signs of deterioration.

A.6.3 TEST EQUIPMENT REQUIRED

A table of recommended test equipment appears in this section (**Table A-1**), the equipment recommended have been chosen for their wide availability and general knowledge of their operating characteristics. For a more exact indication of the required operating characteristics, rely on the required characteristics column. These specifications do not reflect the actual characteristics of the recommended equipment, but instead are the minimum requirements needed to perform the maintenance. Procedures have been written so that substitutions of test equipment may be made with a minimum of trouble to the maintenance technician.

Table A-1. Signal Monitor Test Equipment

Item	Equipment Type	Required Characteristics	Recommended Equipment
1	Digital Multimeter	Input voltage: 0-250 Vdc 0-10 Vac	Fluke Model 8100A
2	Frequency Counter	Input frequency: 10-40 MHz Sensitivity: 50 mV	Hewlett-Packard Model 5381A
3	Oscilloscope	Bandwidth: dc-500 kHz Vert. Sens.: 3 mV/cm Horiz. input: for sweep sawtooth	Tektronix Models: 5403 Mainframe D40 Display Unit 5A15N Vert. Amp. 5B10N Horiz. Amp.
4	Signal Generator	Output Freq.: 12-35 MHz Output level: 5 μV-500 mV Modulation: cw only	Hewlett-Packard Model 608E
5	Sweep Generator	Output Freq.: 10-25 MHz Output level: -70 dBm to -10 dBm	Hewlett-Packard Models: 8690B Mainframe 8698B Plug-in
6	High Voltage Probe	Input voltage: 500-1500 Vdc	Fluke Model 80F-5
7	System Interconnection	Compatible with WJ-8618B	
8	Assorted Test Cables and Connectors	Depends on the test equipment used for maintenance	As required

A.6.4 SIGNAL MONITOR TROUBLESHOOTING

Table A-2 provides Signal Monitor troubleshooting procedures.

Table A-2. Signal Monitor Troubleshooting

Symptom	Probable Cause	Isolation Procedure
No trace on CRT	INTENSITY control	Rotate clockwise
	Power circuits	See **paragraph A.6.5.1**
	Vertical deflection amplifiers	See **paragraph A.6.6.1**
	Horizontal deflection amplifiers	See **paragraph A.6.6.1**
	Sawtooth generator	Test for sawtooth at A2A2U1.
No signal pips on CRT screen	Input Amplifier A2A1A2	Inject 12.7 MHz cw signal into A2A1A2. Baseline should move vertically.
	Sweep oscillator	Turn marker on and inject 34.1 MHz signal into A2A1J3. Base line should move vertically.
	IF Amplifier A2A1A2	Inject 12.7 MHz cw signal into A2A1A3. Baseline should move vertically.
	Output Amplifier A2A1A3	Inject 1 Vdc into A2A2E10. Baseline should move vertically to about full scale.
		Turn marker on and inject 34.1 MHz signal into A2A1J3. Base line should move vertically.
No horizontal trace on CRT, but single dot present which deflects vertically in presence of signals	No sawtooth to A2A2Q3	Use oscilloscope to test for sawtooth at base of A2A2Q3.
No marker pips on CRT, switch ON	MARKER switch S1	Check for 15 Vdc at A2A3A2C1.

Table A-2. **Signal Monitor Troubleshooting** (Continued)

Symptom	Probable Cause	Isolation Procedure
Center frequency drifts	Thermal resistor RT1 defective	Replace.
	Voltage regulator diode VR1 defective	Replace.
	Sweep Oscillator A3A2A1 defective	Substitute tank circuit components; replace sweep oscillator assembly.
Overloads on strong signals	AGC circuits on A2A1A1	Check A2A1A1Q1 for AGC voltage at pin 2 high level signal input to signal monitor.
Spurious signals on CRT	Poor IF rejection	Check tuning of 12.7 MHz IF trap on input of IF Amplifier A2A1A1 (L1, C1, C3).
Only LOG mode defective	A2A1A3U2 defective or not receiving an input; A2A1C13 not being grounded	Check for input signal at A2A1C15; verify ground at A2A1C13 in LOG mode; replace A2A1A3U2.
Only LIN mode defective	A2A1C14 not being grounded	Verify ground at A2A1C14 in LIN mode.

A.6.5 SIGNAL MONITOR PERFORMANCE TESTS

These tests can be used to determine if the Signal Monitor operates properly as part of regularly scheduled maintenance or when a problem is thought to exist. If the performance tests are being used to isolate a problem, also refer to the troubleshooting information to obtain additional guides.

Tests in this sequence include sweep width, sweep linearity, marker oscillator frequency, and resolution. Proceed as follows:

(1) Connect the equipment as shown in **Figure A-1.**

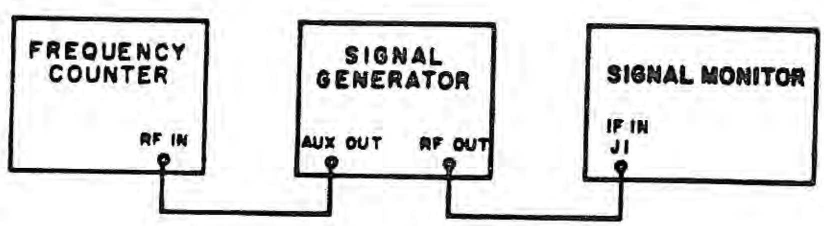


Figure A-1. Test Setup, Signal Monitor Performance Tests

(2) Set the signal generator controls for a 21.4 MHz cw output. Set the output level to approximately -81 dBm (20 μV).

(3) Set the Signal Monitor controls as follows:

a. SWEEP WIDTH: maximum clockwise
b. LOG-LIN: to LIN
c. GAIN: maximum counterclockwise
d. MARKER: ON
e. INTENSITY: for a visible trace
f. FOCUS: for a sharp trace
g. SWEEP RATE: maximum clockwise

(4) Use the CENTER FREQ control to position the marker under the center graticule mark.

(5) Turn the MARKER switch off.

(6) Adjust the GAIN control for a full-scale deflection of the input signal.

(7) Decrease the signal generator output frequency until the pip on the CRT is centered behind the graticule mark to the extreme left of the CRT. Record the frequency counter indication.

(8) Increase the output frequency until the pip is centered behind the graticule mark to the extreme right of the CRT. Record the frequency counter indication.

(9) Subtract the frequency recorded in **step 7** from the frequency recorded in **step 8** to determine the maximum sweep width. The frequency difference should be in the range of 4.0 MHz to 4.4 MHz.

(10) To verify the proper sweep linearity, the frequency recorded in **step 7** should be in the range of 19.200 MHz to 19.600 MHz; in **step 8** it should be in the range of 23.200 MHz to 23.600 MHz.

(11) Turn the signal monitor GAIN control maximum counterclockwise. Turn the MARKER switch ON.

(12) Use the CENTER FREQ control to align the marker pip behind the middle graticule mark.

(13) Use the SWEEP WIDTH control to expand the base of the marker pip until it is two divisions wide.

(14) Rotate the signal monitor GAIN control clockwise until the signal generator pip is the same height as the marker pip. Turn the marker off and then on again to observe the two heights.

(15) Adjust the signal generator frequency for a zero beat with the marker.

(16) The indication on the frequency counter at zero beat should be 21.4 MHz ±3 kHz. This assures that the marker oscillator frequency is within tolerance. Record the frequency for use in **steps 17** and **19.**

(17) With the 21.4 MHz marker two divisions wide at the base, tune the signal generator frequency until the dip between the 21.4 MHz marker and the signal generator signal is 0.5 of the peak signals as shown in **Figure A-2.**

(18) Record the frequency counter indication.

(19) Subtract the frequency recorded in **step 16** and the frequency recorded in **step 17.** This difference should be less than 10 kHz to assure that the signal monitor has proper resolution.

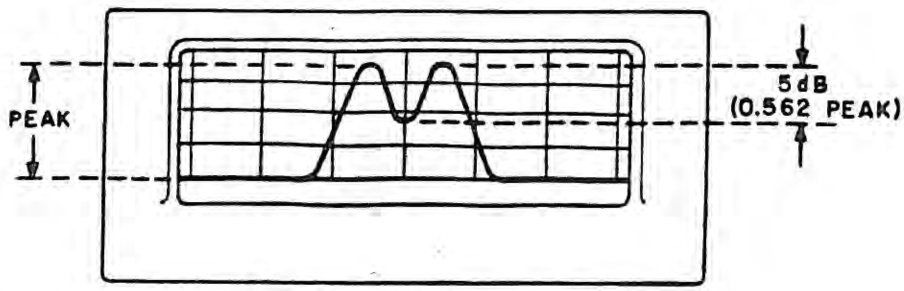


Figure A-2. Typical Response, Signal Monitor Resolution Test

(20) Perform **steps 21** through **28** to determine if Signal Monitor gain and response flatness are within specification.

(21) Set the SWEEP WIDTH and SWEEP RATE maximum clockwise, the LOG/LIN switch to LIN, the MARKER switch off, and the GAIN maximum clockwise.

(22) Set the signal generator output level for a pip that is about 3/4 height on the screen.

(23) Tune the signal generator through the range of 19.4 MHz to 23.4 MHz while observing for minimum and maximum heights of the pip.

(24) Set the signal generator frequency so the pip is at the maximum height point noted. Adjust the output level for full scale deflection of the pip and record the signal generator level in dB.

(25) Set the signal generator output frequency so the pip is at the minimum level noted in **step 23.** Adjust the signal generator output level so the pip is at full scale.

(26) The output level established in **step 25** should be a maximum of 3 dB greater than the level recorded in **step 24.**

(27) Set the front panel switch to LOG and repeat **steps 22** through **26** except that the maximum difference should be no greater than 4 dB.

(28) Return the LOG/LIN switch to LIN, set the signal generator to -81 dBm (20 µV) and observe that the pip is at full scale or greater. This completes the Signal Monitor tests.

A.6.6 SIGNAL MONITOR ALIGNMENT

These procedures assume that the signal monitor requires a complete alignment. If this is true, the trace may not be present on the CRT because the horizontal and vertical deflection amplifiers are misadjusted. As a starting point, the alignment procedure begins by obtaining a trace on the CRT. Proceed as follows:

A.6.6.1 Deflection Amplifiers Initial Adjustment

This procedure is required only for units not having a trace on the screen. For all other units, continue to **A.6.6.2.**

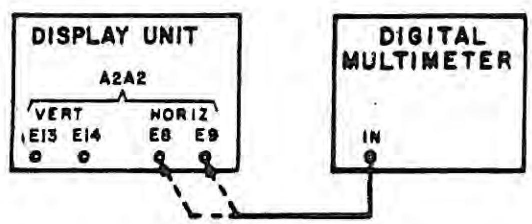


Figure A-3. Test Setup, Signal Monitor Deflection Amplifier Initial Alignment

(1) Set the Signal Monitor front panel controls as follows:

a. FOCUS: to midrange
b. INTENSITY: fully clockwise (see warning)
c. MARKER: to OFF
d. LIN-LOG: LIN
e. CENTER FREQ: to midrange
f. GAIN: fully counterclockwise
g. SWEEP WIDTH: anywhere
h. SWEEP RATE: fully clockwise

WARNING

Never leave the INTENSITY control at full brilliance when the trace is concentrated in a single area on the CRT. Permanent damage may occur to the phosphor.

(2) On Control Board A2A2, set vertical control potentiometers R34 and R52, and vertical gain potentiometer R27 to midrange.

(3) Set the digital multimeter to measure 200 Vdc. Then on Control Board A2A2 adjust horizontal width potentiometer R13 to obtain an identical voltage level at horizontal outputs E8 and E9.

(4) With horizontal and vertical outputs balanced, and with the intensity at full level, a trace should be present; if not, refer to the troubleshooting section.

A.6.6.2 **Sweep Rate Balance and Calibration Adjustments**

This procedure establishes the sawtooth repetition rate generated by transistors Q1 and Q2 on Control Board (A2A2), and provides for the adjustment of sweep balance R6 and sweep calibrate R9. Proceed as follows:

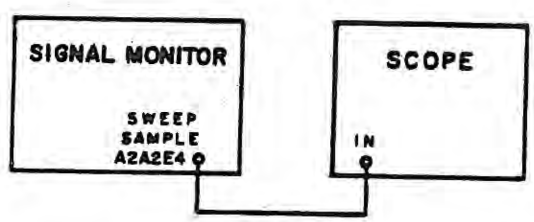


Figure A-4. Test Setup, Sweep Rate Calibrate

(1) Connect the equipment as shown in Figure A-4 and set front panel SWEEP RATE control fully clockwise.

(2) Adjust sweep rate calibrate potentiometer R54 on the control board to obtain a 2.5 Hz sawtooth waveform on the oscilloscope.

(3) Ground the oscilloscope input and establish a zero volt reference on the x axis. Then, establish a vertical sensitivity sufficient to observe a 10 V p-p waveform.

(4) Obtain the sawtooth waveform on the oscilloscope; then, on Control Board (A2A2), adjust sweep balance R6 and sweep calibrate R9 to obtain a 10 V p-p sawtooth centered on the zero reference established on the x axis.

(5) Adjust the horizontal width control R13 on the control board to obtain a trace that extends just beyond the full width of the CRT screen. This completes this series of adjustments.

A.6.6.3 Vertical Stages 12.7 MHz IF Amplifier Alignment

Use this procedure to align vertical IF amplifiers from the output of the mixer in Input Amplifier (A2A1A1) to the detector in Output Amplifier (A2A1A3). Proceed as follows:

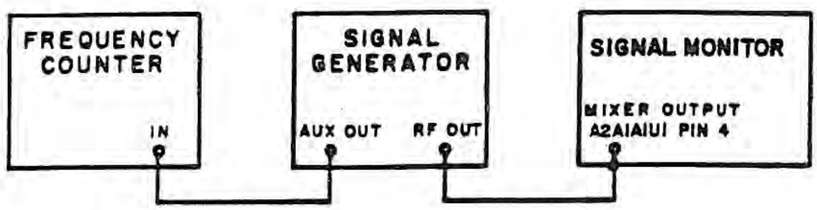


Figure A-5. Test Setup, 12.7 MHz IF Amplifier Alignment

(1) Connect the equipment as shown in **Figure A-5.**

(2) Set the Signal Monitor front panel controls as follows:

a. MARKER: turned off
b. LOG-LIN: to LIN
c. CENTER FREQ: anywhere
d. GAIN: fully counterclockwise
e. SWEEP WIDTH: anywhere
f. SWEEP RATE: fully clockwise

(3) Remove the local oscillator input cable at A2A1J3.

(4) Set the signal generator to 12.7 MHz, cw, at a level just sufficient to cause the baseline on the CRT to shift upward about half scale.

(5) Adjust the following components for maximum vertical deflection of the baseline while reducing the signal generator output level to maintain the trace on the screen. Readjust to obtain maximum gain.

a. Output Amplifier (A2A1A3): coils L1 and L2
b. 8 kHz BW IF Amplifier (A2A1A2): coils L1 and L2
c. Input Amplifier (A2A1A1): capacitor C21.

(6) Reconnect the local oscillator cable to A2A1J3. This completes these adjustments.

A.6.6.4 **Vertical Stages 21.4 MHz IF Amplifier Alignment**

Touch-up alignment of this wideband stage can be performed by tuning a signal generator on either side of 21.4 MHz while observing the pip height on the CRT. If completely misaligned, this stage may require sweep alignment to regain optimum performance. Proceed as follows:

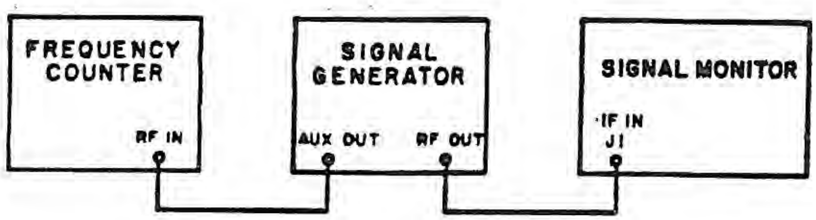


Figure A-6. Test Setup, 21.4 MHz IF Amplifier Touch-Up Alignment

(1) Connect the equipment as shown in **Figure A-6.**

(2) Set the Signal Monitor front panel controls as follows:

a. MARKER: to ON
b. LOG-LIN: to LIN
c. CENTER FREQ: to center marker
d. GAIN: fully clockwise
e. SWEEPWIDTH: fully clockwise
f. SWEEPRATE: fully clockwise

(3) After the marker is centered on the CRT, turn it off.

(4) Set the signal generator to 21.4 MHz at a level to give a pip at about 3/4 scale.

(5) Tune the signal generator through the range of 20.4 MHz to 22.4 MHz observing for symmetry, and the minimum and maximum pip heights.

(6) Set the signal generator frequency so the pip is at the maximum-height point noted. Adjust the signal generator output level for full-scale deflection of the pip. Then record the output level in dB.

(7) Set the signal generator frequency so the pip is at the minimum-height point noted in **step 5**. Increase the output level so the pip is at full scale.

(8) The output level should have increased no more than 3 dB from the level recorded in **step 6.** If this specification is met, the wideband stage of the input amplifier does not require alignment. Otherwise proceed to **step 9.**

(9) If the 3 dB flatness specification in step 8 was not met, set the signal generator output level to obtain a mid-gain pip height of 3/4 scale.

(10) Tune the signal generator from 19.4 MHz to 23.4 MHz while making adjustments to the following coils on Input Amplifier (A2A1A1) to obtain a symmetrical, nearly flat response. Roll off should be observed at the two band edges.

a. L1 at the low end
b. L4 at midband
c. L3 at the high end

(11) Repeat **steps 4** through **8** to measure flatness of the response: if this touch-up procedure does not bring the response within tolerance, proceed to the sweep alignment in **paragraph A.6.6.5.**

A.6.6.5 <u>Vertical Stages 21.4 MHz IF Amplifier Sweep Alignment</u>

Perform this alignment when the touch-up method in **paragraph A.6.6.4** fails. Proceed as follows:

(1) Connect the equipment as shown in **Figure A-7.** Solder the hi-Z detector directly to the junction of C15 and R14 on the input amplifier board.

(2) Tune the signal generator to 21.4 MHz, cw, at a level to produce a convenient marker.

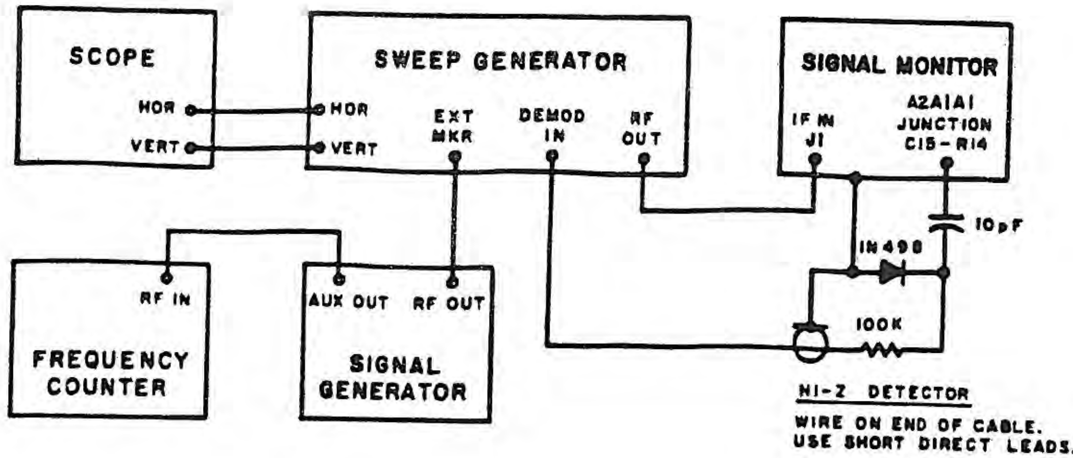


Figure A-7. Test Setup, 21.4 MHz IF Amplifier Sweep Alignment

(3) Tune the sweep generator center frequency to 21.4 MHz, at a level of -25 dBm (12 mV). Establish a sweep width of about 5 MHz.

(4) Set the oscilloscope for viewing a sweep response.

(5) Adjust coils L1, L3, and L4 on Input Amplifier (A2A1A1) to obtain a detector response like that shown in **Figure A-8.** Then disconnect the high impedance detector.

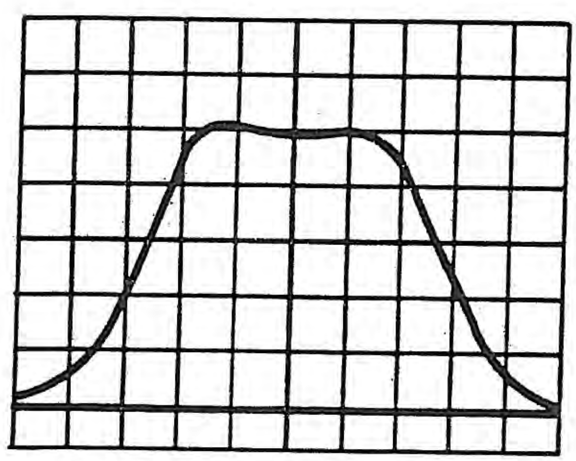


Figure A-8. Typical Response, 21.4 MHz Vertical Amplifier

(6) Perform **steps 1** through **8** of **paragraph A.6.6.4** to determine if the response is sufficiently flat to meet specifications. If not, continue with that procedure to touch up the response. Otherwise, this sweep alignment procedure is complete.

A.6.6.6 **Sweep Oscillator and Frequency Linearity Adjustments**

Perform these adjustments to ensure that the sweep oscillator centers at 34.1 MHz with the sawtooth properly shaped to provide linear response.

(1) Connect the equipment as shown in **Figure A-9,** and set the signal generator output to a low level until a marker is required.

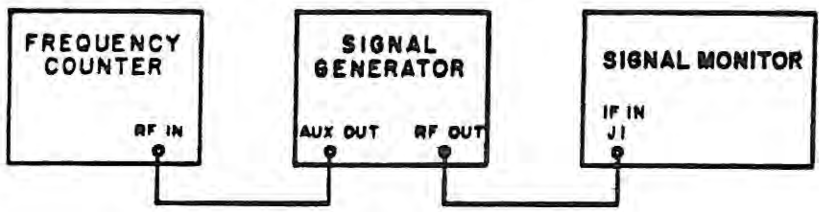


Figure A-9. Test Setup, Sweep Oscillator and Frequency Linearity Adjustments

(2) Set the Signal Monitor front panel controls as follows:

a. MARKER: to ON
b. LOG-LIN: to LIN
c. CENTER FREQ: to midrange
d. GAIN: fully clockwise
e. SWEEP WIDTH: fully clockwise
f. SWEEP RATE: fully clockwise

(3) Slowly rotate the SWEEP WIDTH control counterclockwise while adjusting A2A3A1C14 to maintain the frequency marker aligned behind the middle graticule line.

(4) Alternately, set the signal generator to 19.4 MHz while adjusting the SWEEP WIDTH control to establish a 4 MHz sweep width.

(5) Turn the marker off and set the signal generator to 19.4 MHz. Increase the frequency in steps of 500 kHz while observing for the pip behind each graticule line.

(6) Adjust sawtooth shaper A2A2R48 to establish best linearity of the 500 kHz interval pips behind the graticule. Repeat **steps 4** through **6** to minimize the interaction. Otherwise, this ends the procedure.

A.6.6.7 Signal Monitor Overall Gain Adjustments

This procedure establishes the overall gain for the vertical related circuits in the signal monitor.

(1) Set the Signal Monitor front panel controls as follows:

a. MARKER: to OFF
b. LOG-LIN: to LIN
c. CENTER FREQ: to midrange
d. GAIN: fully clockwise
e. SWEEP WIDTH: fully clockwise
f. SWEEP RATE: fully clockwise

(2) Inject 1 Vdc at A2A2E10, the control board vertical input.

(3) Adjust vertical gain potentiometer A2A2R27 for a full scale deflection of the CRT base line.

(4) Connect the equipment as shown in **Figure A-1**; set the signal generator to 21.4 MHz, cw, at a level of -87 dBm (10 µV).

(5) On 8 kHz IF Amplifier (A2A1A2), rotate gain control potentiometer R8 fully clockwise for maximum gain, then back it off about one-eighth turn.

(6) On Output Amplifier (A2A1A3), rotate output level set potentiometer R47 fully clockwise for maximum output, then set linear gain potentiometer R25 to obtain a full scale deflection of the signal generator pip.

(7) Set the LOG-LIN switch to LOG.

(8) Set the signal generator output level to -95 dBm (4 µV).

(9) On Output Amplifier (A2A1A3), set logarithmic gain control potentiometer R24 for a signal pip height at the first horizontal graticule line up from the base line.

(10) Set the signal generator output level to -65 dBm (128 µV).

(11) On Output Amplifier (A2A1A3), set logarithmic gain control potentiometer R28 for a signal pip height at full scale.

(12) Repeat steps 8 through 11 until the interaction is minimized.

(13) If the previous conditions cannot be met, make slight adjustment to vertical gain potentiometer A2A2R27, IF Amplifier (A2A1A2) gain control potentiometer R8, and Output Amplifier (A2A1A3) potentiometer R47.

A.7 REPLACEMENT PARTS LIST

The replacement parts lists for Type 794103-1 Signal Monitor are listed in paragraphs A.7.1 through A.7.6.1.

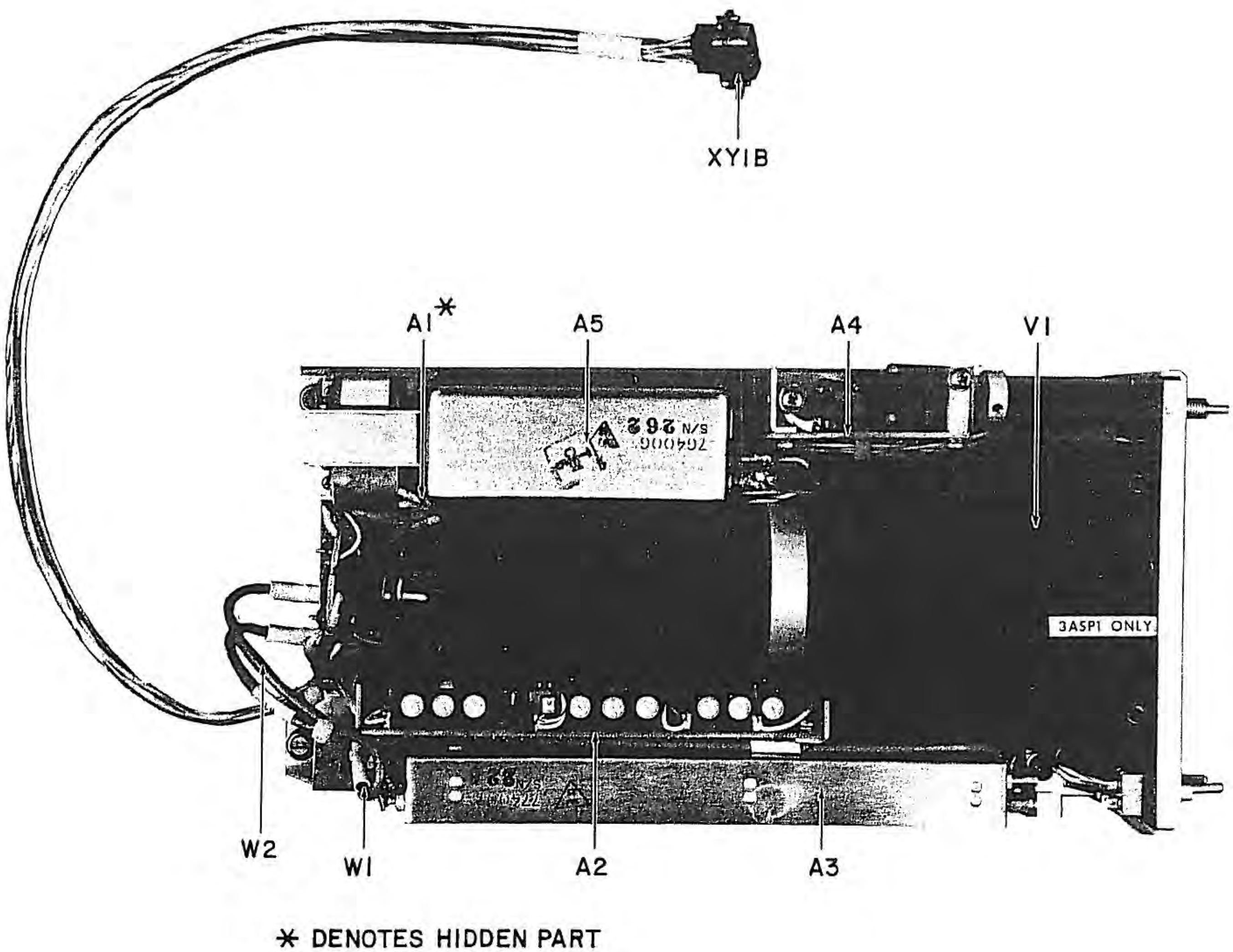
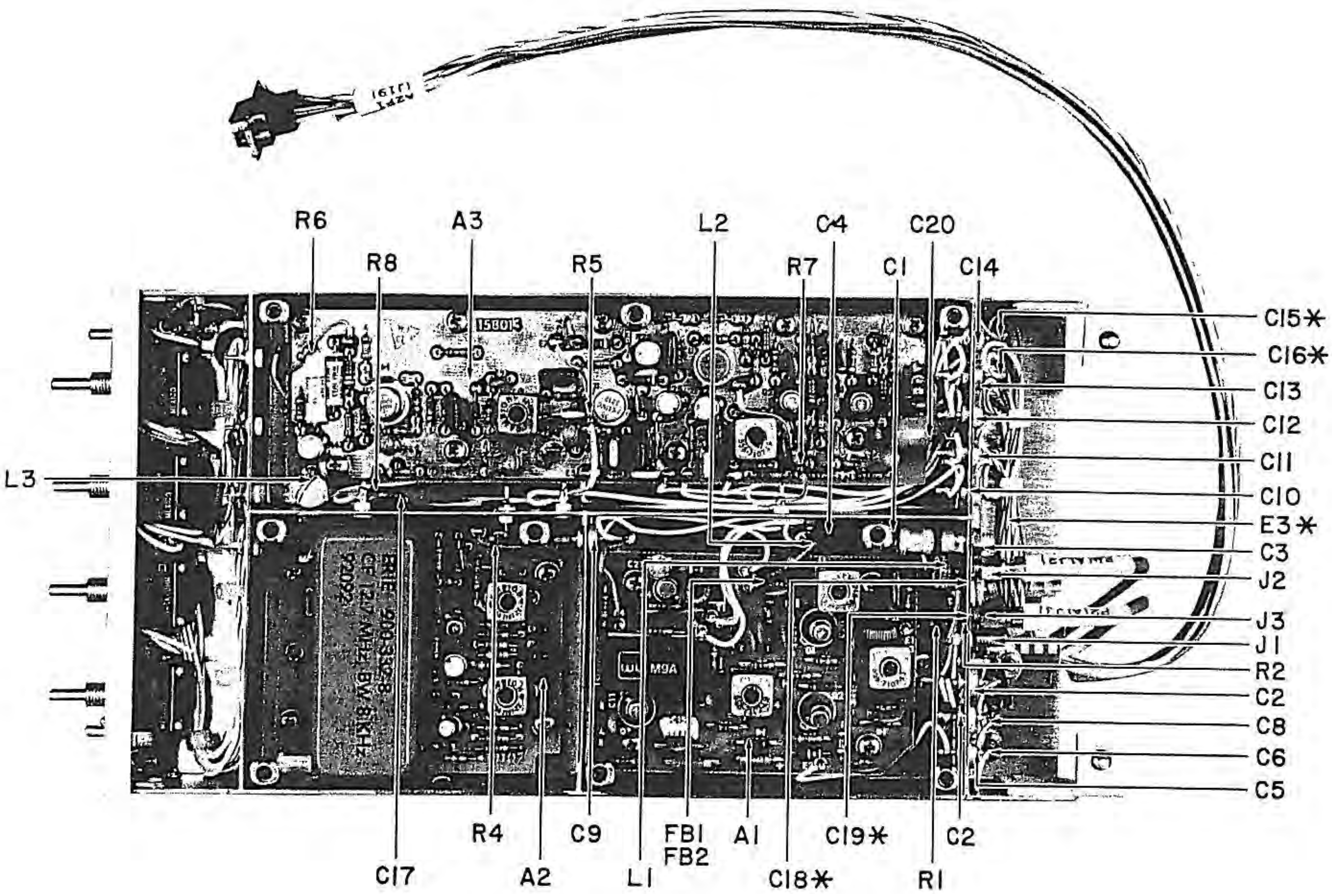


Figure A-10. Type 794103-1 Signal Monitor (A2), Top View, Location of Components

A.7.1 TYPE 794103-1 SIGNAL MONITOR REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision M				
A1	IF Amplifier	1	724005-1	14632	
A2	Control Board	1	824002-1	14632	
A3	Oscillator Assembly	1	774007-1	14632	
A4	Focus and Intensity Control	1	794099-1	14632	
A5	DC/DC Converter	1	764006-1	14632	
C1	Capacitor, Ceramic, Disc: 1000 pF, 500 V	1	5925U102P	91418	
P1	Connector, Plug	1	205204-1	00779	
R1	Resistor, Variable, Composition: 5 kΩ, 10%, 1 W	1	70A3N048L502U	01121	
R2	Not Used				
R3	Resistor, Variable, Composition: 10 kΩ, 10%, 1 W	3	70A3N048L103U	01121	
R4	Resistor, Fixed, Film: 2.4 kΩ, 5%, 1/4 W	1	CF1/4-2.4K/J	09021	
R5	Resistor, Fixed, Film: 2.2 kΩ, 5%, 1/4 W	1	CF1/4-2.2K/J	09021	
R6	Resistor, Fixed, Film: 2.94 kΩ, 1%, 1/4 W	1	RN60D2941F	81349	
R7	Resistor, Fixed, Film: 510Ω, 5%, 1/4 W	1	CF1/4-510 OHMS/J	09021	
R8	Same as R3				
R9	Resistor, Fixed, Film: 82 kΩ, 5%, 1/4 W	1	CF1/4-82K/J	09021	
R10	Same as R3				
S1	Switch, Toggle, DPDT	2	7201-S-Y4-Z-Q-E	09353	
S2	Same as S1				
T1	Transformer	1	170218-1	14632	
V1	Tube, CRT	1	3ASP1	93332	
VR1	Diode, Zener: 5.6 V Silicone	1	1N753A	80131	
W1	Cable Assembly	1	17300-191-1	14632	
W1P1	Connector, Plug	2	50-328-3875-91	98291	
W1P2	Connector, Plug: SMC	2	50-024-3875-91	98291	
W2	Cable Assembly	1	17300-191-2	14632	
W2P3	Same as W1P1				
W2P4	Same as W1P2				
XV1A	Socket, Crystal	1	9859-2	00629	
XV1B	Contact, Beryllum	1	8379-2	04435	



* DENOTES HIDDEN PART

Figure A-11. Type 724005-1 IF Amplifier (A2A1), Top View, Location of Components

A.7.2 TYPE 724005-1 IF AMPLIFIER REF DESIG PREFIX A2A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision L				
A1	Input Amplifier	1	18106-2	14632	
A2	8.0 kHz IF Amplifier	1	18107-1	14632	
A3	Output Amplifier	1	15801-2	14632	
C1	Capacitor, Mica, Dipped: 33 pF, ±2%, 500 V	1	CM05ED330G03	81349	
C2	Capacitor, Ceramic, Feedthru: 470 pF, ±20%, 500 V	11	54-794-009-471M	33095	
C3	Capacitor, Variable, Glass: 1-28 pF, 1000 V	1	GER28000	52769	
C4	Capacitor, Ceramic, Disc: 5000 pF, ±20%, 100 V	5	C023B101E502M	56289	
C5	Same as C4				
C6	Same as C2				
C7	Same as C4				
C8 Thru C16	Same as C2				
C17	Capacitor, Ceramic, Disc: 0.01 μF, ±20%, 200 V	1	8131A200Z5U103M	72982	
C18	Same as C4				
C19	Same as C4				
C20	Capacitor, Electrolytic, Tantalum: 100 μF, 20%, 35V	1	MTP107M035P1C	76055	
E1	Terminal, Feedthru	3	SFU16Y	1DM30	
E2	Same as E1				
E3	Same as E1				
FB1	Ferrite Bead	4	56-590-65-4A	02114	
FB2 Thru FB4	Same as FB1				
J1	Connector, Receptacle	2	1004-7511-002	19505	
J2	Same as J1				
J3	Connector, Plug	1	UG1468U	80058	
L1	Inductor	1	22295-4	14632	
L2	Coil, Fixed: 30 μH, 5%	1	1537-50	99800	
L3	Coil, Fixed: 100 μH, 10%	1	553-3635-61	71279	
R1	Resistor, Fixed, Film: 300Ω, 5%, 1/4 W	1	CF1/4-300 OHMS/J	09021	
R2	Resistor, Fixed, Film: 18Ω, 5%, 1/4 W	1	CF1/4-18 OHMS/J	09021	
R3	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	1	CF1/4-100 OHMS/J	09021	
R4	Resistor, Fixed, Film: 2.7Ω, 5%, 1/4 W	4	CF1/4-2.7 OHMS/J	09021	
R5 Thru R7	Same as R4				
R8	Resistor, Fixed, Composition: 5.1 kΩ, 5%, 1/4 W	1	RCR07G512JS	81349	
R9*	Resistor, Fixed, Film: 240Ω, 5%, 1/4 W	1	CF1/4-240 OHMS/J	09021	

*Nominal Value - Final Value Factory Selected.

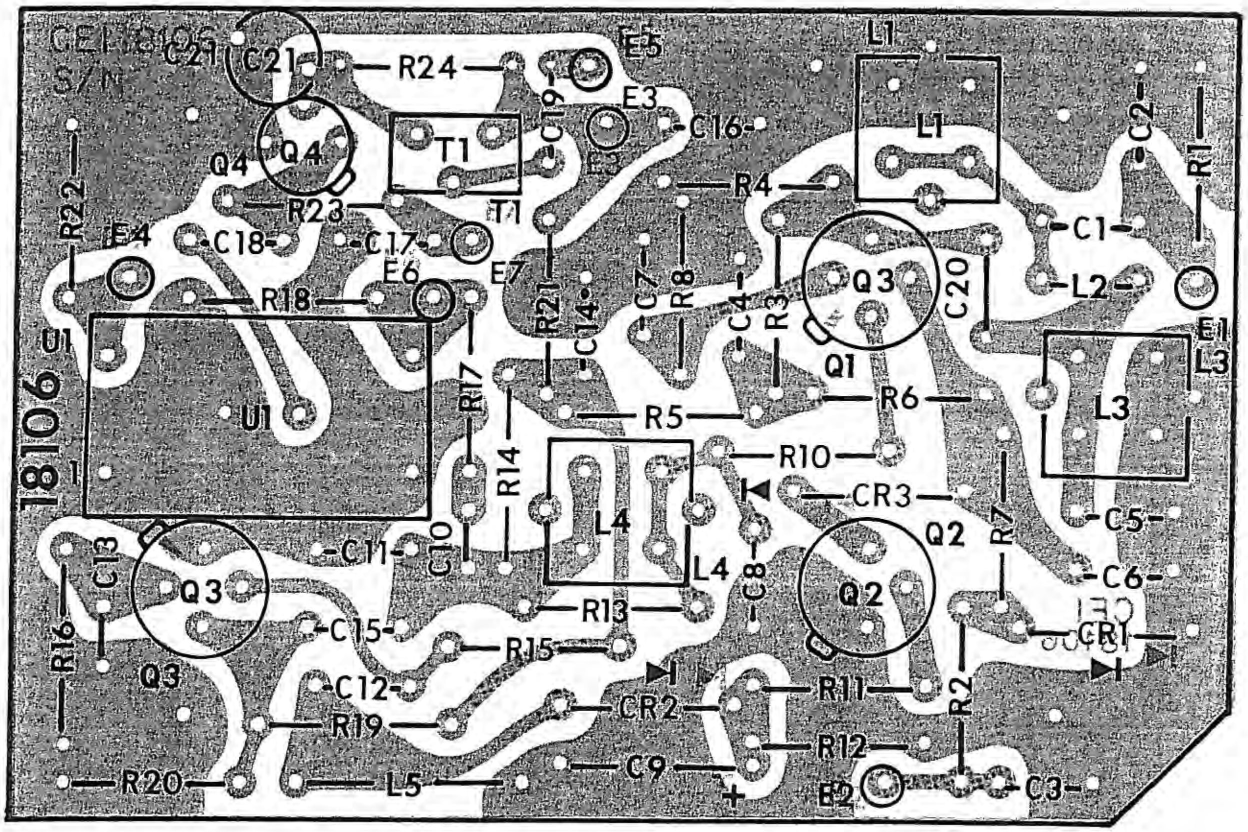


Figure A-12. Part 18106-2 Input Amplifier (A2A1A1), Location of Components

A.7.2.1 **Part 18106-2 Input Amplifier** REF DESIG PREFIX **A2A1A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision G				
C1	Capacitor, Mica, Dipped: 82 pF, 2%, 500 V	1	CM05ED820G03	81349	
C2	Capacitor, Mica, Dipped: 180 pF, 2%, 500 V	1	CM05FD181G03	81349	
C3	Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V	10	C023B101E502M	56289	
C4	Same as C3				
C5	Capacitor, Mica, Dipped: 51 pF, 2%, 500 V	1	CM05ED510G03	81349	
C6	Same as C3				
C7	Same as C3				
C8	Capacitor, Mica, Dipped: 12 pF, 5%, 500 V	1	CM05CD120J03	81349	
C9	Capacitor, Electrolytic, Tantalum: 1.0 µF, 10%, 35 V	1	CS13BF105K	81349	
C10	Capacitor, Ceramic, Disc: 1000 pF, 500 V	2	59Z5U102P	91418	
C11	Capacitor, Mica, Dipped: 91 pF, 2%, 500 V	1	CM05FD910G03	81349	
C12	Same as C3				
C13	Same as C10				
C14	Same as C3				
C15	Capacitor, Ceramic, Tubular: 22 pF, 0.5 pF, 500 V	1	301-000C0G0-220J	59660	
C16 Thru C19	Same as C3				
C20	Capacitor, Mica, Dipped: 22 pF, 5%, 500 V	1	CM05ED220J03	81349	
C21	Capacitor, Variable, Ceramic: 5-25 pF, 100 V	1	518-000A5-25	72982	
CR1	Diode	1	1N462A	80131	
CR2	Diode	2	1N198A	80131	
CR3	Same as CR2				
L1	Coil, Variable: 0.9-1.1 µH	2	558-7107-13	71279	
L2	Coil, Fixed	1	20681-277	14632	
L3	Same as L1				
L4	Coil, Variable: 2.97-3.63 µH	1	558-7107-19	71279	
L5	Coil, Fixed: 47 µH, 5%	1	1537-60	99800	
L6	Not Used				
Q1	Transistor	1	841001-1	14632	
Q2	Transistor	1	2N930	80131	
Q3	Transistor	1	2N3478	80131	
Q4	Transistor	1	U310	17856	
R1	Resistor, Fixed, Film: 300Ω, 5%, 1/4 W	1	CF1/4-300 OHMS/J	09021	
R2	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/4 W	1	CF1/4-4.7K/J	09021	
R3	Resistor, Fixed, Film: 130 kΩ, 5%, 1/4 W	1	CF1/4-130K/J	09021	
R4	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	1	CF1/4-10K/J	09021	
R5	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	2	CF1/4-100 OHMS/J	09021	
R6	Resistor, Fixed, Film: 51 kΩ, 5%, 1/4 W	1	RCR07G513JS	81349	
R7	Resistor, Fixed, Film: 24 kΩ, 5%, 1/4 W	1	CF1/4-24K/J	09021	
R8	Resistor, Fixed, Film: 150Ω, 5%, 1/4 W	3	CF1/4-150 OHMS/J	09021	
R9	Not Used				

REF DESIG PREFIX **A2A1A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R10	Resistor, Fixed, Film: 47Ω, 5%, 1/4 W	1	CF1/4-47 OHMS/J	09021	
R11	Resistor, Fixed, Film: 47 kΩ, 5%, 1/4 W	1	CF1/4-47K/J	09021	
R12	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	1	CF1/4-100K/J	09021	
R13	Resistor, Fixed, Film: 3.9 kΩ, 5%, 1/4 W	1	CF1/4-3.9K/J	09021	
R14	Same as R8				
R15	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/4 W	2	CF1/4-1.0K/J	09021	
R16	Same as R15				
R17	Resistor, Fixed, Film: 39Ω, 5%, 1/4 W	1	CF1/4-39 OHMS/J	09021	
R18	Same as R8				
R19	Resistor, Fixed, Film: 16 kΩ, 5%, 1/4 W	1	CF1/4-16K/J	09021	
R20	Resistor, Fixed, Film: 6.2 kΩ, 5%, 1/4 W	1	CF1/4-6.2K/J	09021	
R21	Same as R5				
R22	Resistor, Fixed, Film: 56Ω, 5%, 1/4 W	1	CF1/4-56 OHMS/J	09021	
R23	Resistor, Fixed, Film: 1.8 kΩ, 5%, 1/4 W	1	CF1/4-1.8K/J	09021	
R24	Resistor, Fixed, Film: 12 kΩ, 5%, 1/4 W	1	CF1/4-12K/J	09021	
T1	Transformer	1	21428-100	14632	
U1	Mixer	1	WJ-M9A	27956	

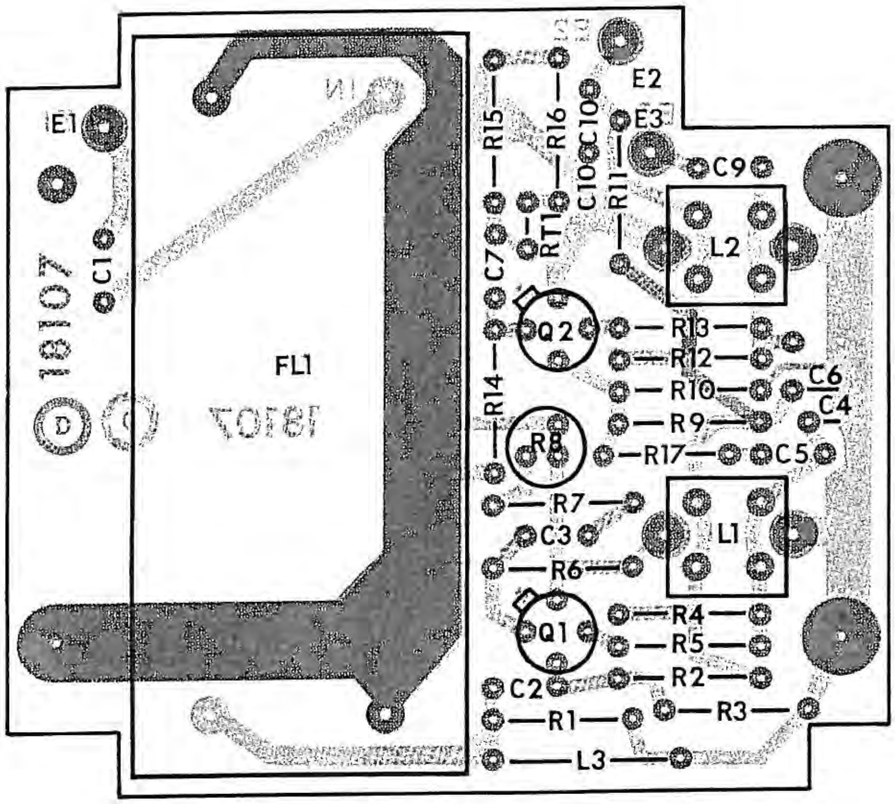


Figure A-13. Part 18107-1 8.0 kHz Amplifier (A2A1A2), Location of Components

A.7.2.2 **Part 18107-1 8.0 kHz IF Amplifier** REF DESIG PREFIX **A2A1A2**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision F				
C1	Capacitor, Ceramic, Disc: 0.01 µF, 20%, 200 V	8	8131A200Z5U103M	72982	
C2	Same as C1				
C3	Same as C1				
C4	Capacitor, Mica, Dipped: 12 pF, 5%, 500 V	1	CM04CD120J03	81349	
C5 Thru C7	Same as C1				
C8	Not Used				
C9	Same as C1				
C10	Same as C1				
FL1	Filter, Crystal	1	92092	14632	
L1	Coil, Variable: 5.04 - 6.16 µH	2	558-7107-22	71279	
L2	Same as L1				
L3	Coil, Fixed: 10 µH, 10%	1	1537-36	99800	
Q1	Transistor	2	2N3478	80131	
Q2	Same as Q1				
R1	Resistor, Fixed, Film: 240Ω, 5%, 1/4 W	1	CF1/4-240 OHMS/J	09021	
R2	Resistor, Fixed, Film: 8.2 kΩ, 5%, 1/4 W	1	CF1/4-8.2K/J	09021	
R3	Resistor, Fixed, Film: 2.2 kΩ, 5%, 1/4 W	2	CF1/4-2.2K/J	09021	
R4	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/4 W	2	CF1/4-4.7K/J	09021	
R5	Resistor, Fixed, Film: 33Ω, 5%, 1/4 W	2	CF1/4-330 OHMS/J	09021	
R6	Resistor, Fixed, Film: 470Ω, 5%, 1/4 W	1	CF1/4-470 OHMS/J	09021	
R7	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	3	CF1/4-100 OHMS/J	09021	
R8	Resistor, Trimmer, Film: 100Ω, 10%, 1/2 W	1	62PR100	73138	
R9	Same as R4				
R10	Same as R3				
R11	Same as R7				
R12	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/4 W	1	CF1/4-1K/J	09021	
R13	Same as R5				
R14	Resistor, Fixed, Film: 330Ω, 5%, 1/4 W	2	CF1/4-330 OHMS/J	09021	
R15	Same as R14				
R16	Same as R7				
R17	Resistor, Fixed, Film: 47Ω, 5%, 1/4 W	1	CF1/4-47 OHMS/J	09021	
RT1	Thermistor, 1 kΩ	1	2D102	04239	

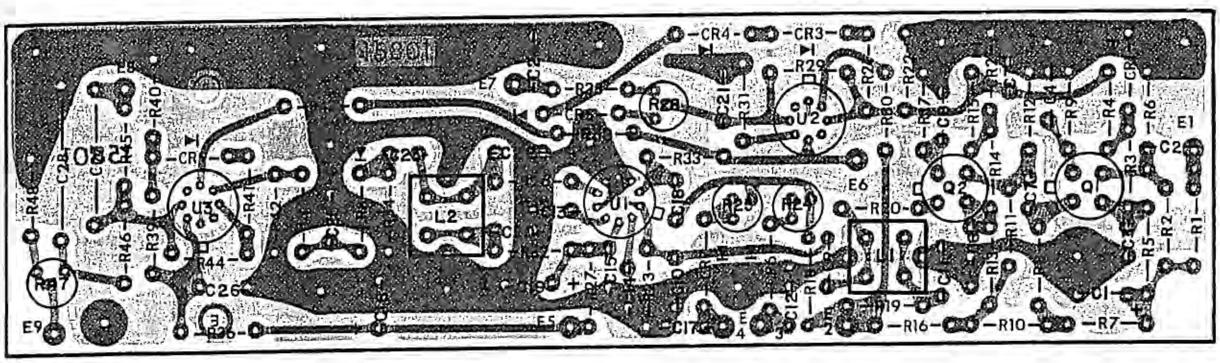


Figure A-14. Part 15801-3 Output Amplifier (A2A1A3), Location of Components

A.7.2.3 **Part 15801-2 Output Amplifier** REF DESIG PREFIX A2A1A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision C				
C1	Capacitor, Electrolytic, Tantalum: 27 µF, 10%, 35 V	4	199D276X9035FE4	56289	
C2	Capacitor, Mica, Dipped: 470 pF, 5%, 500 V	1	DM15-471J	72136	
C3	Capacitor, Ceramic, Disc: 1000 pF, GMV, 500 V	5	59Z5U102P	91984	
C4	Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V	4	C023B101E502M	56289	
C5 Thru C7	Same as C3				
C8	Same as C4				
C9	Capacitor, Mica, Dipped: 56 pF, 2%, 500 V	1	CM05ED560G03	81349	
C10	Capacitor, Mica, Dipped: 270 pF, 2%, 500 V	1	CM05FD271G03	81349	
C11	Same as C4				
C12	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 100 V	4	RPE122-Z5U104M100V	72982	
C13	Same as C12				
C14	Same as C12				
C15	Capacitor, Ceramic, Disc: 0.01 µF, 20%, 200 V	3	8131A200Z5U103M	72982	
C16	Same as C1				
C17	Same as C12				
C18	Same as C15				
C19	Same as C1				
C20	Same as C15				
C21	Capacitor, Mica, Dipped: 33 pF, 2%, 500 V	1	CM05FD330G03	81349	
C22	Capacitor, Mica, Dipped: 24 pF, 5%, 500 V	1	CM05ED240J03	81349	
C23	Same as C3				
C24	Same as C4				
C25	Capacitor, Mica, Dipped: 15 pF, 5%, 500 V	1	CM05CD150J03	81349	
C26	Same as C1				
C27	Capacitor, Fixed, Plastic: 3300 pF, 10%, 100 V	1	WMF1D33	14655	
C28	Capacitor, Plastic, Tubular: 0.022 µF, 5%, 100 V	1	663UW223-5-1W	84411	
CR1	Diode	5	1N462A	80131	
CR2 Thru CR5	Same as CR1				
CR6	Diode	2	1N4449	80131	
CR7	Same as CR6				
CR8	Diode	2	5082-2800	28480	
CR9	Same as CR8				
E1	Terminal, Forked	9	140-1941-02-01	71279	
E2 Thru E9	Same as E1				
L1	Coil, Variable: 2.97 - 3.63 µH	1	558-7107-19	71279	
L2	Coil, Variable: 5.04 - 6.16 µH	1	558-7107-22	71279	
Q1	Transistor	2	SK3065	14632	
Q2	Same as Q1				
R1	Not Used				
R2	Resistor, Fixed, Film: 120 kΩ, 5%, 1/4 W	2	CF1/4-120K/J	09021	
R3	Resistor, Fixed, Film: 33 kΩ, 5%, 1/4 W	2	CF1/4-33K/J	09021	

REF DESIG PREFIX **A2A1A3**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R4	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/4 W	3	CF1/4-4.7K/J	09021	
R5	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	5	CF1/4-100K/J	09021	
R6	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	6	CF1/4-10K/J	09021	
R7	Resistor, Fixed, Film: 10Ω, 5%, 1/4 W	2	CF1/4-10 OHMS/J	09021	
R8	Resistor, Fixed, Film: 620Ω, 5%, 1/4 W	1	CF1/4-620 OHMS/J	09021	
R9	Resistor, Fixed, Film: 330Ω, 5%, 1/4 W	2	CF1/4-330 OHMS/J	09021	
R10	Same as R7				
R11	Same as R2				
R12	Same as R6				
R13	Resistor, Fixed, Film: 68 kΩ, 5%, 1/4 W	1	CF1/4-68K/J	09021	
R14	Same as R3				
R15	Same as R4				
R16	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	3	CF1/4-100 OHMS/J	09021	
R17	Same as R9				
R18	Resistor, Fixed, Film: 2.7 kΩ, 5%, 1/4 W	2	CF1/4-2.7K/J	09021	
R19	Same as R16				
R20	Resistor, Fixed, Film: 47Ω, 5%, 1/4 W	3	CF1/4-47 OHMS/J	09021	
R21	Same as R6				
R22	Resistor, Fixed, Film: 6.2 kΩ, 5%, 1/4 W	1	CF1/4-6.2K/J	09021	
R23	Same as R18				
R24	Resistor, Trimmer, Film: 500Ω, 10%, 1/2 W	2	62PR500	73138	
R25	Same as R24				
R26	Same as R20				
R27	Resistor, Fixed, Film: 1.2 kΩ, 5%, 1/4 W	1	CF1/4-1.2K/J	09021	
R28	Resistor, Trimmer, Film: 20 kΩ, 10%, 1/2 W	1	62PR20K	73138	
R29	Resistor, Fixed, Film: 1.0 MΩ, 5%, 1/4 W	2	CF1/4-1.0M/J	09021	
R30	Resistor, Fixed, Film: 2.7Ω, 5%, 1/4 W	3	CF1/4-2.7 OHMS/J	09021	
R31	Same as R6				
R32	Same as R16				
R33	Resistor, Fixed, Composition: 5.1 kΩ, 5%, 1/4 W	3	RCR07G512JS	81349	
R34	Same as R6				
R35	Same as R33				
R36	Same as R20				
R37	Same as R5				
R38	Same as R30				
R39	Same as R29				
R40	Same as R6				
R41	Same as R5				
R42	Same as R5				
R43	Same as R30				
R44	Same as R5				

REF DESIG PREFIX A2A1A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R45	Same as R33				
R46	Resistor, Fixed, Film: 680Ω, 5%, 1/4 W	1	CF1/4-680 OHMS/J	09021	
R47	Resistor, Trimmer, Film: 1 kΩ, 10%, 1/2 W	1	62PR1K	73138	
R48	Same as R4				
U1	Integrated Circuit, RF-IF Amplifier	1	1550/BIA	04713	
U2	Integrated Circuit, OP Amplifier	2	741HC	07263	
U3	Same as U2				

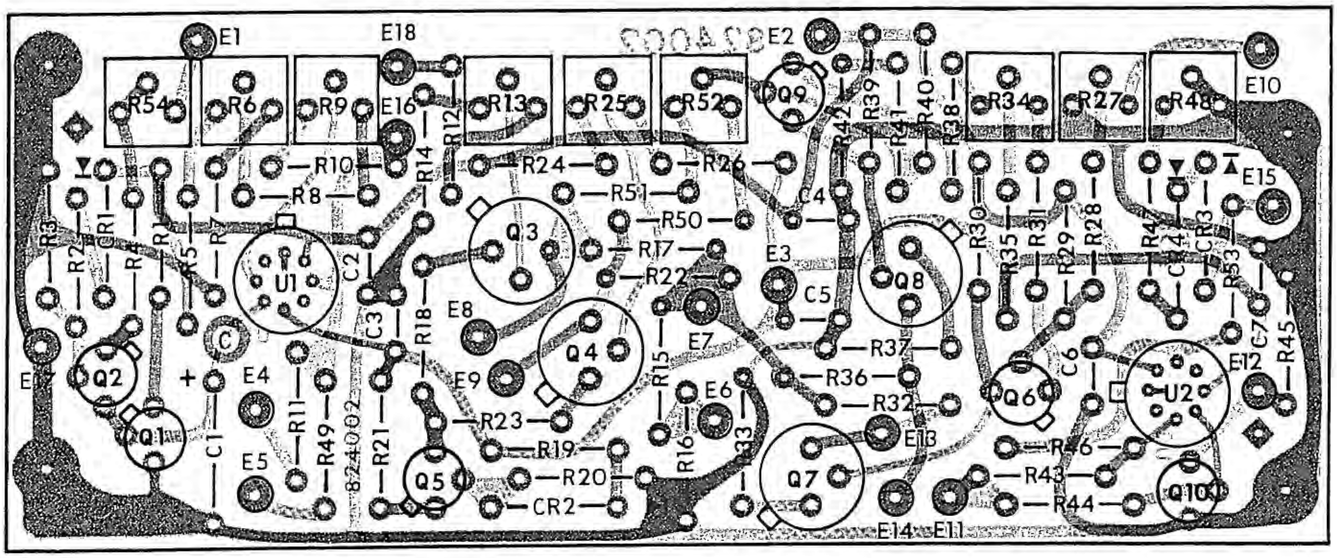


Figure A-15. Type 824002-1 Control Board (A2A2), Location of Components

A.7.3 TYPE 824002-1 CONTROL BOARD

REF DESIG PREFIX A2A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision M				
C1	Capacitor, Electrolytic, Tantalum: 1.0 µF, 10%, 35 V	1	CS13BF105K	81349	
C2	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 100 V	6	RPE122-Z5U104M100V	72982	
C3 Thru C7	Same as C2				
CR1	Diode	4	1N462A	80131	
CR2 Thru CR4	Same as CR1				
Q1	Transistor	1	2N2646	80131	
Q2	Transistor	1	2N3251	80131	
Q3	Transistor	4	2N3440	80131	
Q4	Same as Q3				
Q5	Transistor	1	2N929	80131	
Q6	Transistor	2	2N2222A	80131	
Q7	Same as Q3				
Q8	Same as Q3				
Q9	Same as Q6				
Q10	Transistor	1	U1899E	15818	
R1	Resistor, Fixed, Film: 680Ω, 5%, 1/4 W	1	CF1/4-680 OHMS/J	09021	
R2	Resistor, Fixed, Film: 2.2 kΩ, 5%, 1/4 W	1	CF1/4-2.2K/J	09021	
R3	Resistor, Fixed, Film: 22 kΩ, 5%, 1/4 W	1	CF1/4-22K/J	09021	
R4*	Resistor, Fixed, Composition: 3.9 kΩ, 5%, 1/4 W	1	RCR07G392JS	81349	
R5	Resistor, Fixed, Film: 240Ω, 5%, 1/4 W	1	CF1/4-240 OHMS/J	09021	
R6	Resistor, Trimmer, Film: 1 kΩ, 10%, 1/2 W	2	62PAR1K	73138	
R7	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/4 W	3	CF1/4-1.0K/J	09021	
R8	Resistor, Fixed, Film: 47 kΩ, 5%, 1/4 W	5	CF1/4-47K/J	09021	
R9	Resistor, Trimmer, Film: 100 kΩ, 10%, 1/2 W	2	62PAR100K	73138	
R10	Same as R8				
R11	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	2	CF1/4-10K/J	09021	
R12	Same as R8				
R13	Same as R9				
R14	Resistor, Fixed, Film: 47Ω, 5%, 1/4 W	1	CF1/4-47 OHMS/J	09021	
R15*	Resistor, Fixed, Film: 120 kΩ, 5%, 1/4 W	1	CF1/4-120K/J	09021	
R16	Resistor, Fixed, Film: 180 kΩ, 5%, 1/4 W	1	CF1/4-180K/J	09021	
R17	Resistor, Fixed, Film: 220 kΩ, 5%, 1/4 W	4	CF1/4-220K/J	09021	
R18	Resistor, Fixed, Film: 6.8 kΩ, 5%, 1/4 W	2	CF1/4-6.8K/J	09021	
R19	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/4 W	3	CF1/4-4.7K/J	09021	
R20	Same as R11				
R21	Same as R19				
R22	Same as R17				
R23	Same as R18				
R24	Same as R8				

REF DESIG PREFIX A2A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R25	Resistor, Trimmer, Film: 50 kΩ, 10%, 1/2 W	1	62PAR50K	73138	
R26	Same as R8				
R27	Same as R6				
R28	Resistor, Fixed, Film: 220Ω, 5%, 1/4 W	2	CF1/4-220 OHMS/J	09021	
R29	Resistor, Fixed, Film: 3.0 MΩ, 5%, 1/4 W	2	CF1/4-3.0M/J	09021	
R30	Resistor, Fixed, Film: 15 kΩ, 5%, 1/4 W	2	CF1/4-15K/J	09021	
R31	Resistor, Fixed, Film: 2.0 kΩ, 5%, 1/4 W	1	CF1/4-2.0K/J	09021	
R32	Same as R17				
R33	Resistor, Fixed, Film: 18 kΩ, 5%, 1/4 W	2	CF1/4-18K/J	09021	
R34	Resistor, Trimmer, Film: 500Ω, 10%, 1/2 W	1	62PAR500	73138	
R35	Resistor, Fixed, Film: 12 kΩ, 5%, 1/4 W	1	CF1/4-12K/J	09021	
R36	Same as R17				
R37	Same as R33				
R38	Resistor, Fixed, Film: 1.8 kΩ, 5%, 1/4 W	1	CF1/4-1.8K/J	09021	
R39	Same as R30				
R40	Same as R29				
R41	Same as R28				
R42	Same as R7				
R43	Resistor, Fixed, Film: 47.5 kΩ, 1%, 1/10 W	3	RN55C4752F	81349	
R44	Same as R43				
R45	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	1	CF1/4-100K/J	09021	
R46	Same as R43				
R47*	Same as R7				
R48	Resistor, Trimmer, Film: 20 kΩ, 10%, 1/2 W	1	62PAR20K	73138	
R49	Resistor, Fixed, Film: 1.6 kΩ, 5%, 1/4 W	1	CF1/4-1.6K/J	09021	
R50	Resistor, Fixed, Film: 1.0 MΩ, 5%, 1/4 W	2	CF1/4-1.0M/J	09021	
R51	Same as R50				
R52	Resistor, Trimmer, Film: 1 MΩ, 10%, 1/2 W	1	62PAR1M	73138	
R53	Same as R19				
R54	Resistor, Trimmer, Film: 2 kΩ, 10%, 1/2 W	1	62PAR2K	73138	
R55	Same as R31				
U1	Integrated Circuit	2	741HC	07263	
U2	Same as U1				

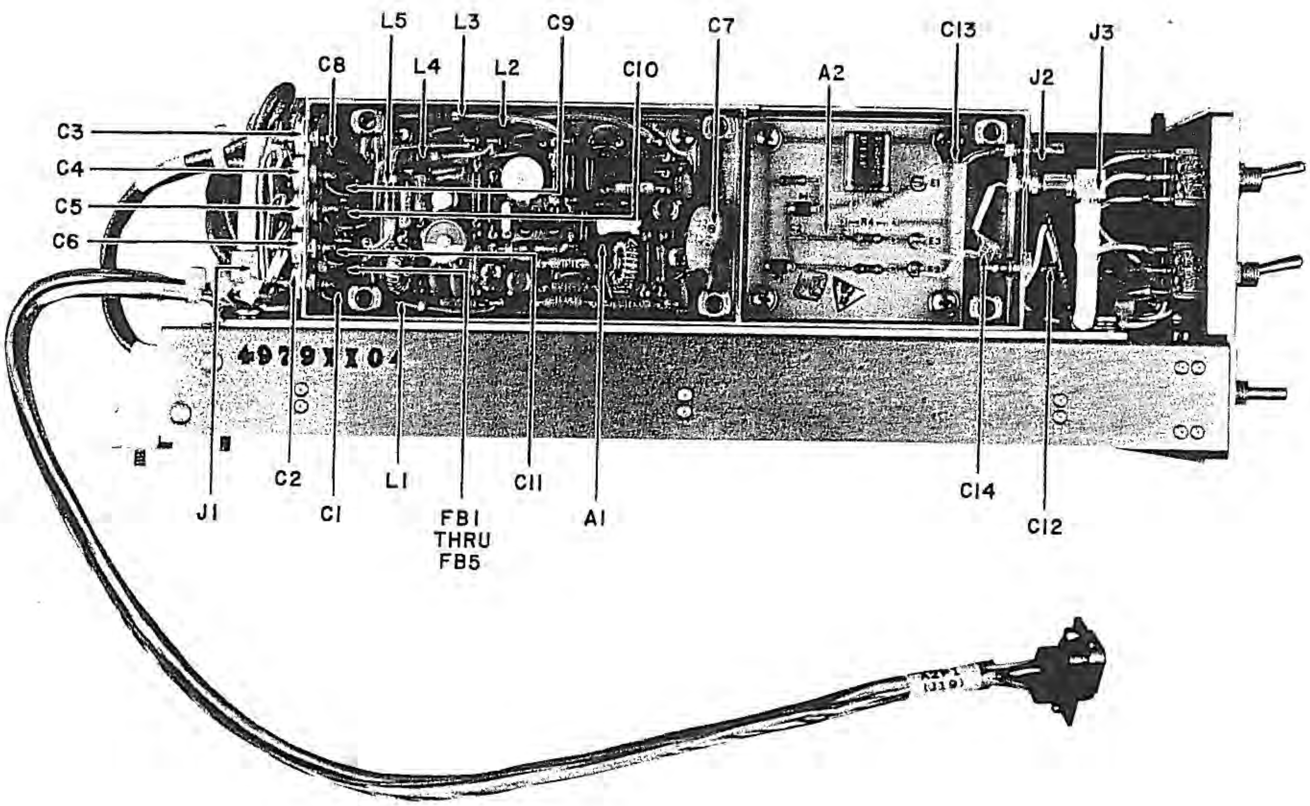


Figure A-16. Type 774007-1 Oscillator Assembly (A2A3), Location of Components

A.7.4 TYPE 774007-1 OSCILLATOR ASSEMBLY REF DESIG PREFIX A2A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision F				
A1	Sweep Oscillators	1	280915-1	14632	
A2	Reference Marker	1	270521-1	14632	
C1	Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V	5	C023B101E502M	56289	
C2	Capacitor, Ceramic, Feedthru: 470 pF, 20%, 500 V	5	54-794-009-471M	33095	
C3 Thru C6	Same as C2				
C7	Capacitor, Electrolytic, Tantalum: 27 µF, 10%, 35 V	1	196D276X9035TE4	56289	
C8 Thru C11	Same as C1				
C12	Capacitor, Ceramic, Feedthru: 1000 pF, GMV, 500 V	1	54-794-009-102W	33095	
C13	Capacitor, Mica, Dipped: 30 pF, 2%, 500 V	1	CM04ED300G03	81349	
C14	Capacitor, Ceramic, Disc: 1000 pF, 500 V	1	5925U102P	91984	
FB1	Ferrite Bead	5	56-590-65-4A	02114	
FB2 Thru FB5	Same as FB1				
J1	Connector, Receptacle	3	1004-7511-002	19505	
J2	Same as J1				
J3	Same as J1				
L1	Coil, Fixed: 62 µH, 5%	1	1537-66	99800	
L2	Coil, Fixed: 30 µH, 5%	4	1537-50	99800	
L3 Thru L5	Same as L2				

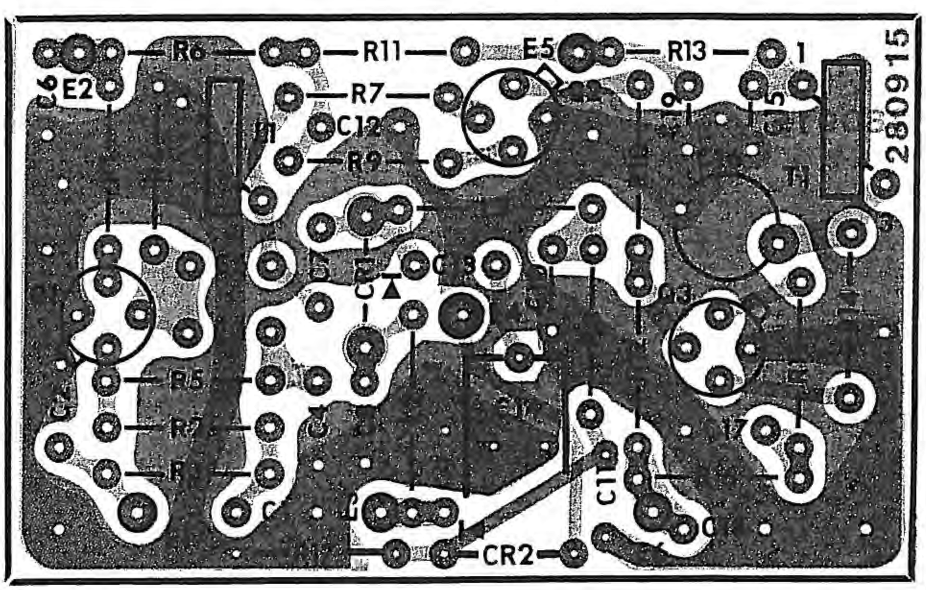


Figure A-17. Part 280915-1 Sweep Oscillator Assembly (A2A3A1), Location of Components

A.7.4.1 **Part 280915-1 Sweep Oscillator Assembly** REF DESIG PREFIX A2A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision C				
C1	Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V	10	C023B101E502M	56289	
C2	Same as C1				
C3	Capacitor, Mica, Dipped: 22 pF, 5%, 500 V	2	CM05ED220J03	81349	
C4	Same as C3				
C5	Capacitor, Ceramic, Tubular: 6.8 pF, ±.5 pF, 500 V	1	301-000U2J0-689D	59660	
C6	Same as C1				
C7	Capacitor, Mica, Dipped: 30 pF, 2%, 500 V	1	CM05ED300G03	81349	
C8	Capacitor, Mica, Dipped: 430 pF, 5%, 500 V	1	DM15-431J	72136	
C9	Same as C1				
C10	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 100 V	1	RPE122-Z5U104M100V	72982	
C11	Same as C1				
C12	Same as C1				
C13	Capacitor, Mica, Dipped: 47 pF, 2%, 500 V	1	CM05ED470G03	81349	
C14	Capacitor, Variable, Air: .6-6 pF, 250 V	1	5701	91293	
C15	Same as C1				
C16	Capacitor, Variable, Ceramic: 5.5-18 pF, 350 V	1	538-011A5.5-18	72982	
C17 Thru C19	Same as C1				
CR1	Diode, Varicap	1	KV3901	52673	
CR2	Diode	1	1N4449	80131	
L1	Coil	1	20681-180	14632	
L2	Inductor: 4.0 µH, 10%	2	1537-26	99800	
L3	Same as L2				
Q1	Transistor	1	2N2857/JAN	81350	
Q2	Transistor	2	2N3478	80131	
Q3	Same as Q2				
R1	Resistor, Fixed, Film: 20Ω, 1%, 1/4 W	2	RN60D20R0F	81349	
R2	Resistor, Fixed, Film: 4.22 kΩ, 1%, 1/4 W	1	RN60D4221F	81349	
R3	Resistor, Fixed, Film: 619Ω, 1%, 1/4 W	1	RN60D6190F	81349	
R4	Resistor, Fixed, Film: 47.5 kΩ, 1%, 1/4 W	1	RN60D4752F	81349	
R5	Resistor, Fixed, Film: 33.2Ω, 1%, 1/10 W	1	RN55D33R2F	81349	
R6	Resistor, Fixed, Film: 1.82 kΩ, 1%, 1/4 W	1	RN60D1821F	81349	
R7	Resistor, Fixed, Film: 8.45 kΩ, 1%, 1/4 W	1	RN60D8451F	81349	
R8	Resistor, Fixed, Film: 56.2 kΩ, 1%, 1/4 W	1	RN60D5622F	81349	
R9	Resistor, Fixed, Film: 51.1Ω, 1%, 1/4 W	4	RN60D51R1F	81349	
R10	Same as R9				
R11	Same as R9				
R12	Resistor, Fixed, Film: 15.0 kΩ, 1%, 1/4 W	1	RN60D1502F	81349	
R13	Resistor, Fixed, Film: 100Ω, 1%, 1/4 W	1	RN60D1000F	81349	
R14	Same as R9				
R15	Same as R1				
R16	Resistor, Fixed, Film: 3.57 kΩ, 1%, 1/10 W	1	RN55C3571F	81349	

REF DESIG PREFIX **A2A3A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R17	Resistor, Fixed, Film: 1.0MΩ, 5%, 1/4 W	1	CF1/4-1M/J	09021	
T1	Coil	1	21428-62	14632	

A.7.4.2 **Part 270521-1 Reference Marker Assembly** REF DESIG PREFIX **A2A3A2**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision E				
CR1	Diode	2	5082-3188	28480	
CR2	Same as CR1				
E1	Terminal, Forked	3	140-1941-02-01	71279	
E2	Same as E1				
E3	Same as E1				
R1	Resistor, Fixed, Composition: 51Ω, 5%, 1/4 W	1	RCR07G510JS	81349	
R2	Resistor, Fixed, Film: 1 kΩ, 5%, 1/4 W	1	CF1/4-1K/J	09021	
R3	Resistor, Fixed, Film: 3 kΩ, 5%, 1/4 W	1	CF1/4-3K/J	09021	
Y1	Crystal, Quartz	1	96402-1	14632	

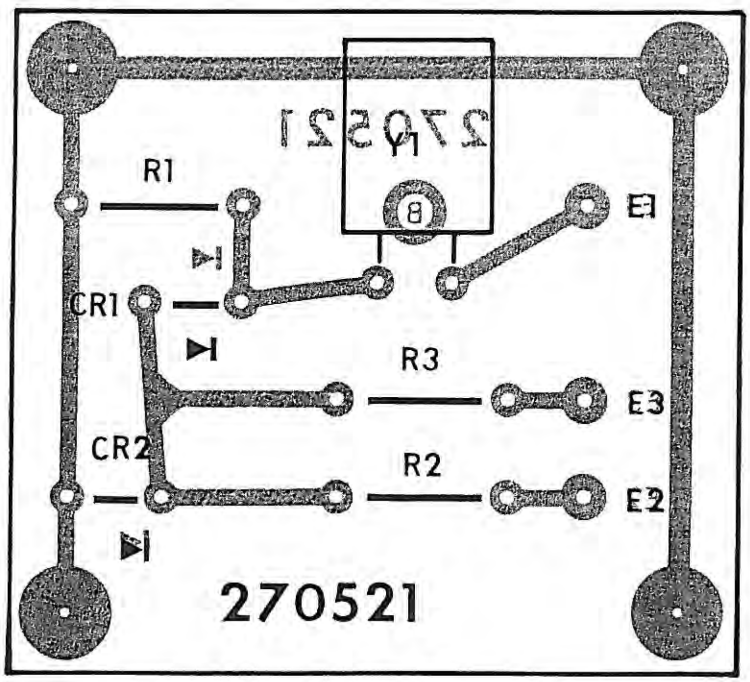


Figure A-18. Part 270521-1 Reference Marker Assembly (A2A3A2), Location of Components

A.7.5 TYPE 794099-1 FOCUS AND INTENSITY CONTROL REF DESIG PREFIX A2A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision E				
C1	Capacitor, Ceramic, Disc: 0.05 µF, 20%, 100 V	1	TGS-50	56289	
E1	Terminal, Forked	4	140-1941-02-01	71279	
E2 Thru E4	Same as E1				
R1	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	1	CF1/4-100K/J	09021	
R2	Resistor, Variable, Composition: 500 kΩ, 10%, 1 W	1	72M1N048S504U	01121	
R3	Resistor, Fixed, Composition: 3.3 MΩ, 5%, 1/2 W	1	RCR20G335JS	81349	
R4	Resistor, Variable, Composition: 2.5 MΩ, 10%, 1 W	1	72M1N048S255U	01121	
R5	Resistor, Fixed, Composition: 3.9 MΩ, 5%, 1/2 W	1	RCR20G395JS	81349	
R6	Resistor, Fixed, Composition: 4.7 MΩ, 5%, 1/2 W	1	RCR20G475JS	81349	

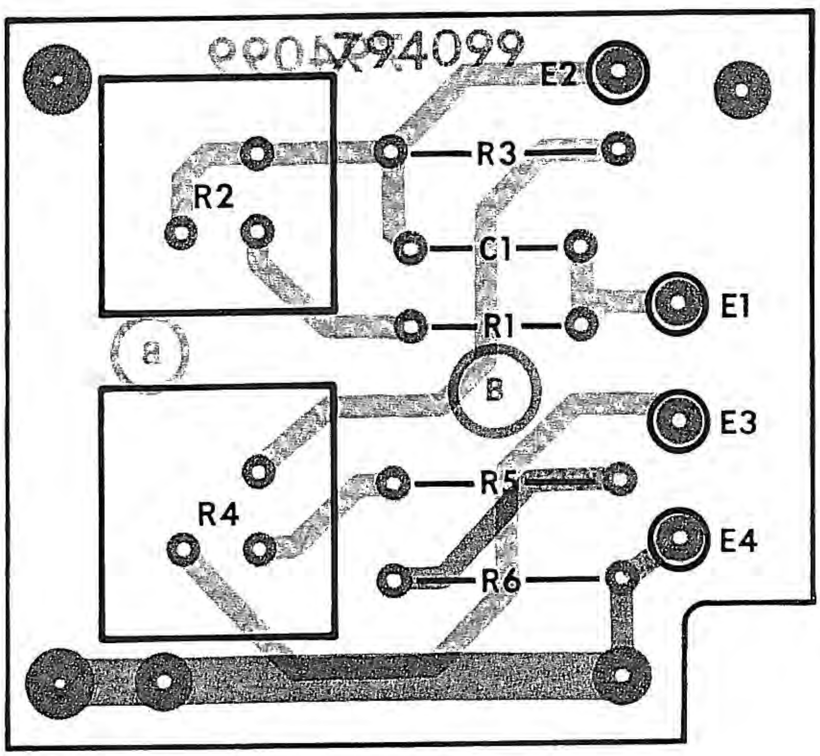


Figure A-19. Type 794099-1 Focus and Intensity Control (A2A4), Location of Components

A.7.6 TYPE 764006-1 DC/DC CONVERTER REF DESIG PREFIX A2A5

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision C				
A1	DC/DC Converter	1	16533-1	14632	

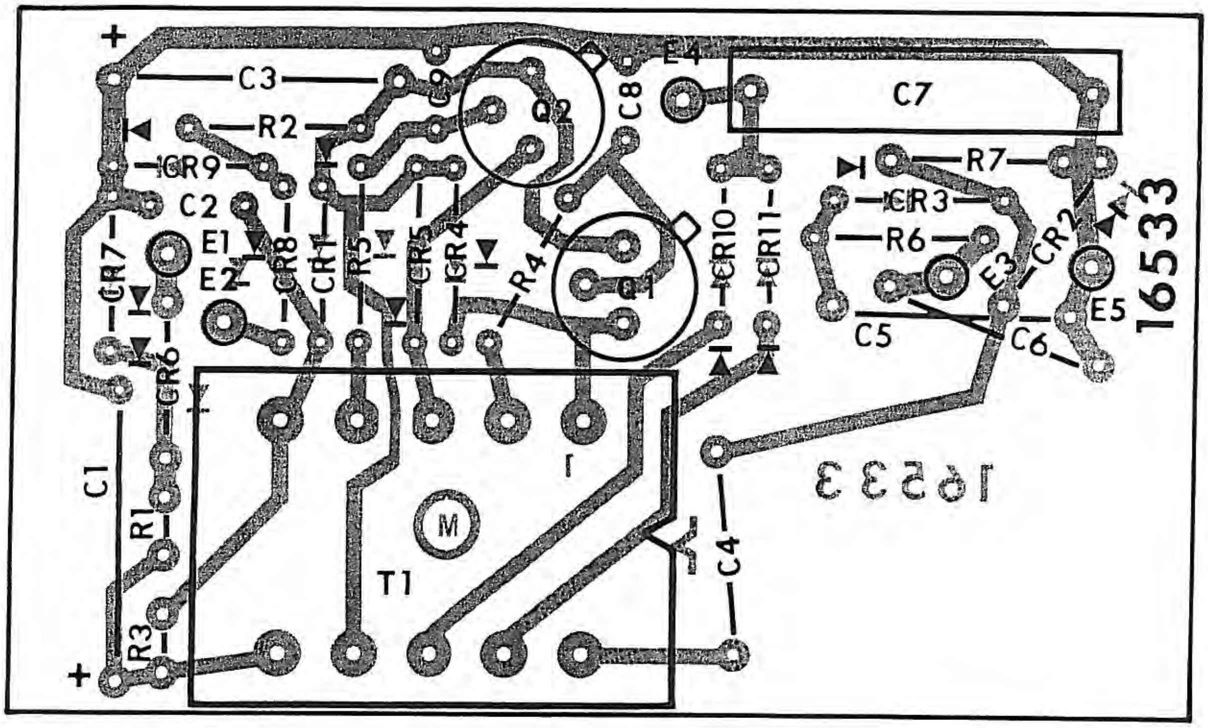


Figure A-20. Part 16533-1 DC/DC Converter (A2A5A1), Location of Components

A.7.6.1 **Part 16533-1 DC-DC Converter** REF DESIG PREFIX A2A5A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision N				
C1	Capacitor, Electrolytic, Tantalum: 45 μF, 20%, 30 V	2	MTP456M030P1B	76055	
C2	Capacitor, Ceramic, Disc: 0.1 μF, -20+80, 25 V	1	DFJ3	73899	
C3	Same as C1				
C4	Capacitor, Ceramic, Disc: 0.01 μF, GMV, 2000 V	3	2KV.01UFP	91418	
C5	Same as C4				
C6	Same as C4				
C7	Capacitor, Mylar, Dipped: 0.22 μF, 20%, 400 V	1	B32234B6224M	25088	
C8	Capacitor, Ceramic, Disc: 0.01 μF, 20%, 200 V	2	8131A200Z5U103M	72982	
C9	Same as C8				
CR1	Diode	1	1N4446	80131	
CR2	Diode	2	M20	14099	
CR3	Same as CR2				
CR4	Diode	2	1N458A	80131	
CR5	Same as CR4				
CR6	Diode	4	1N4003	80131	
CR7 Thru CR9	Same as CR6				
CR10	Diode	2	1N4004	80131	
CR11	Same as CR10				
Q1	Transistor	2	2N2102	80131	
Q2	Same as Q1				
R1	Resistor, Fixed, Film: 10Ω, 5%, 1/4 W	2	CF1/4-100 OHMS/J	09021	
R2	Same as R1				
R3	Resistor, Fixed, Film: 22 kΩ, 5%, 1/4 W	1	CF1/4-22K/J	09021	
R4	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/4 W	2	CF1/4-1.0K/J	09021	
R5	Same as R4				
R6	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	1	CF1/4-100K/J	09021	
R7	Resistor, Fixed, Film: 10 MΩ, 5%, 1/4 W	1	CF1/4-10M/J	09021	
T1	Transformer	1	16559	14632	

NOTE:
1. UNLESS OTHERWISE SPECIFIED:
a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
b) CAPACITANCE IS IN pF.
2. NOMINAL VALUE, FINAL VALUE FACTORY SELECTED.

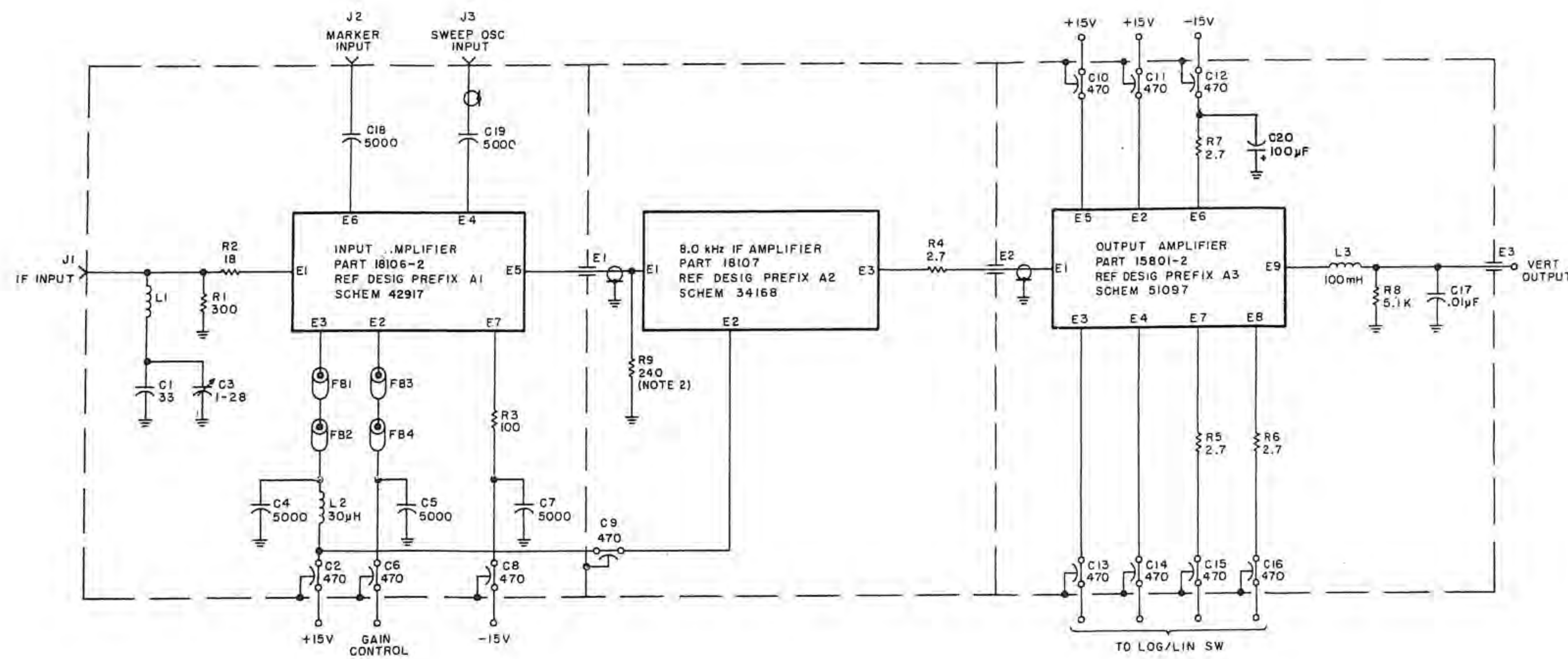


Figure A-21. Type 724005-1, IF Amplifier Assembly (A2A1), Schematic Diagram 470156 (G)

NOTES

1. UNLESS OTHERWISE SPECIFIED.
   a) RESISTANCE IS IN OHMS, ± 5%, 1/4W.
   b) CAPACITANCE IS pF
2. DIFFERENCE BETWEEN TYPES IS LISTED IN TABLE A.

TABLE A

TYPE NO	C2	C15	R24
18106-1	160	6.0	1.8K
18106-2	180	22	12K

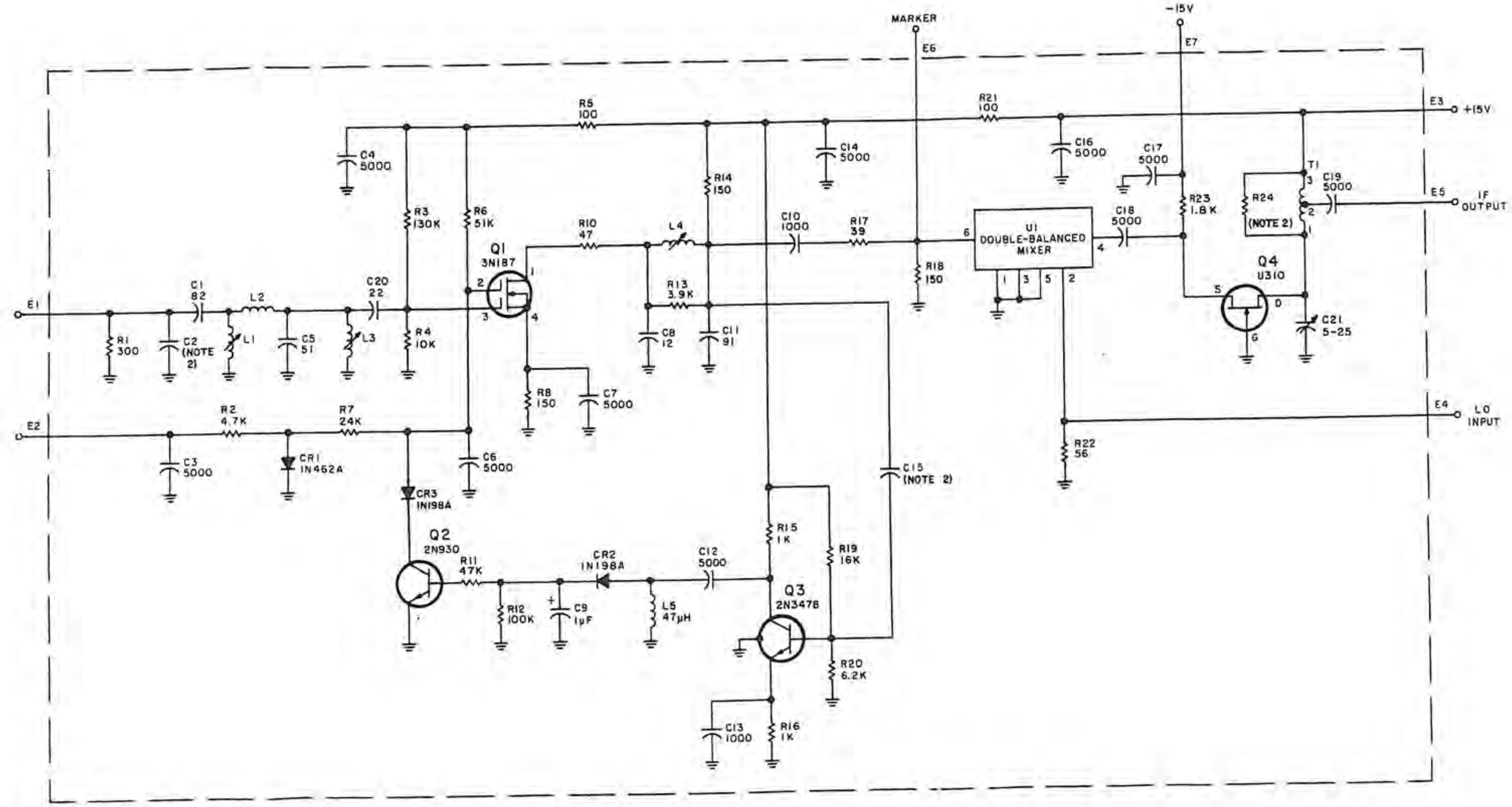


Figure A-22. Part 18106-2. Input Amplifier (A2A1A1), Schematic Diagram 42917 (F)

NOTE:
UNLESS OTHERWISE SPECIFIED:
RESISTANCE IS IN OHMS, ±5%, 1/4 W;
CAPACITANCE IS IN μF.

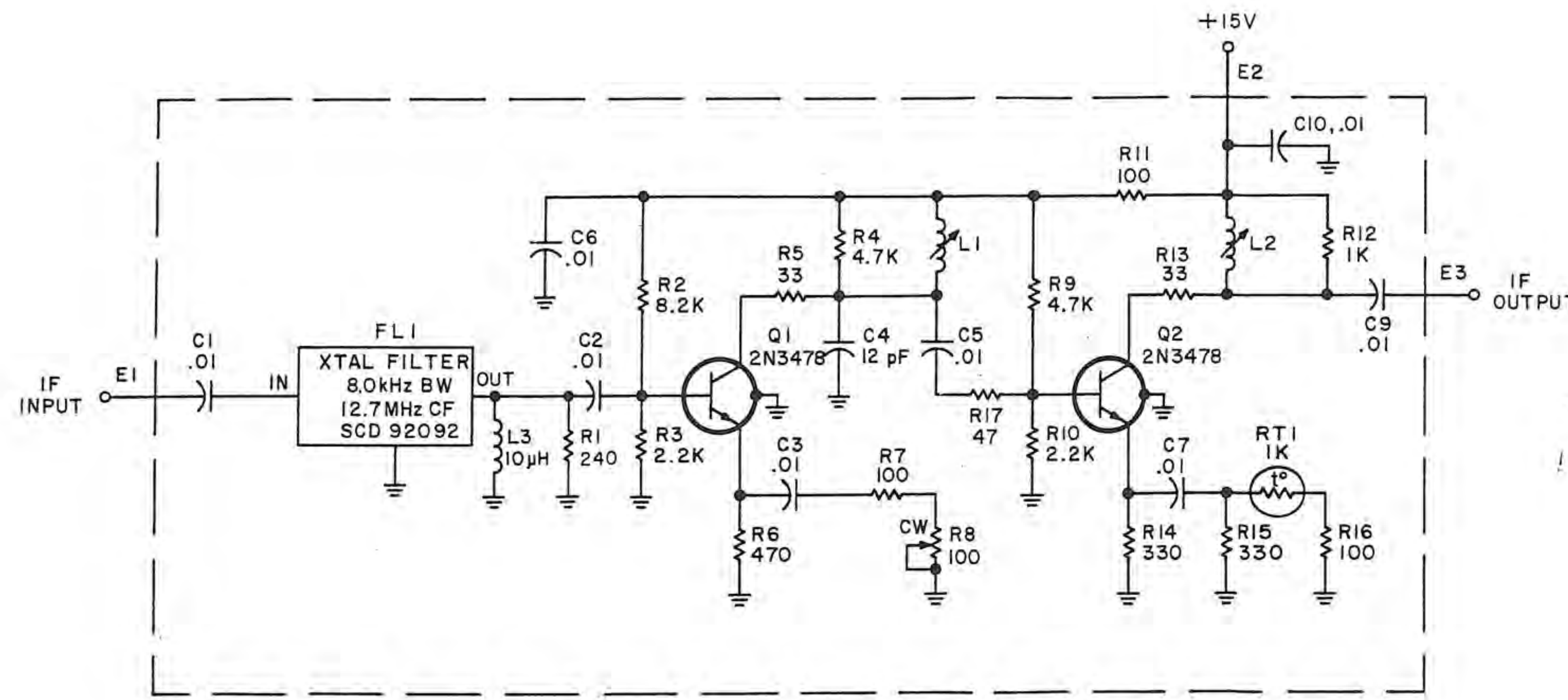


Figure A-23. Part 18107-1, 8.0 kHz IF Amplifier (A2A1A2), Schematic Diagram 34168 (C)

NOTES:
1. UNLESS OTHERWISE SPECIFIED.
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS pF.
2. CW ON POTENTIOMETERS INDICATES FULL CLOCKWISE POSITION OF ACTUATOR.
3. LEAD ARRANGEMENT FOR U2 & U3 IS SHOWN IN DETAIL A.
4. LEAD ARRANGEMENT FOR U1 IS SHOWN IN DETAIL B.
5. DIFFERENCE BETWEEN TYPES IS LISTED IN TABULATION

DETAIL A

DETAIL B

TABULATION

PART NO.	C1	C16	C19	C26	R1	R46	R47	R48	R28
15801-2	27μF	27μF	27μF	27μF	NU	680	1K	4.7K	20K
15801-3	22μF	22μF	22μF	22μF	NU	680	1K	4.7K	20K
15801-4	27μF	27μF	27μF	27μF	1.2K	560	5K	220	20K
15801-5	27μF	27μF	27μF	27μF	1.2K	560	5K	1.8K	50K

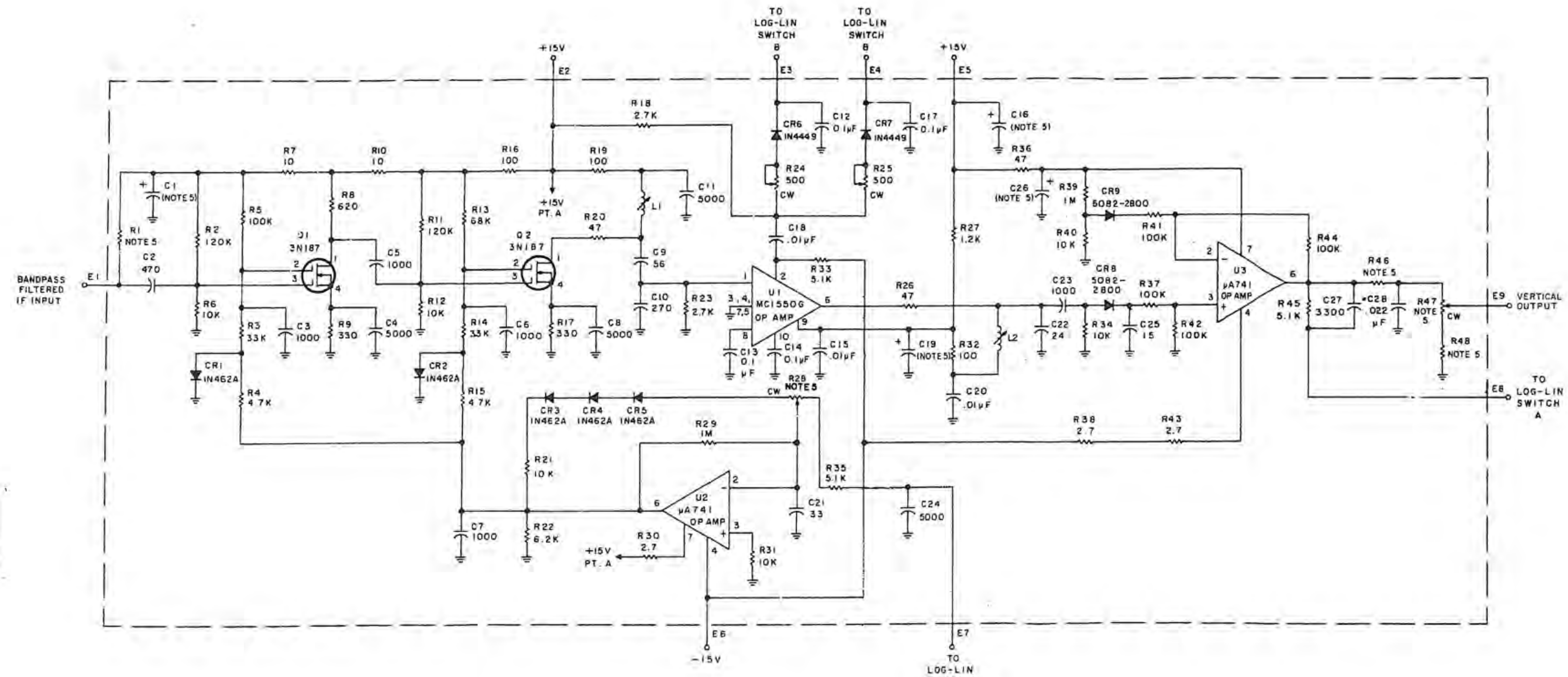


Figure A-24. Part 15801-3. Output Amplifier (A2A1A3), Schematic Diagram 51097 (D)

NOTES:
1. UNLESS OTHERWISE SPECIFIED, RESISTANCE IS IN OHMS, ±5%, 1/4 W.
2. U1, U2 LEAD ARRANGEMENT IS SHOWN IN DETAIL A.
3. CW AT POTENTIOMETERS INDICATES FULL CLOCKWISE POSITION OF ACTUATOR.
4. NOMINAL VALUE, FINAL VALUE FACTORY SELECTED.

DETAIL A

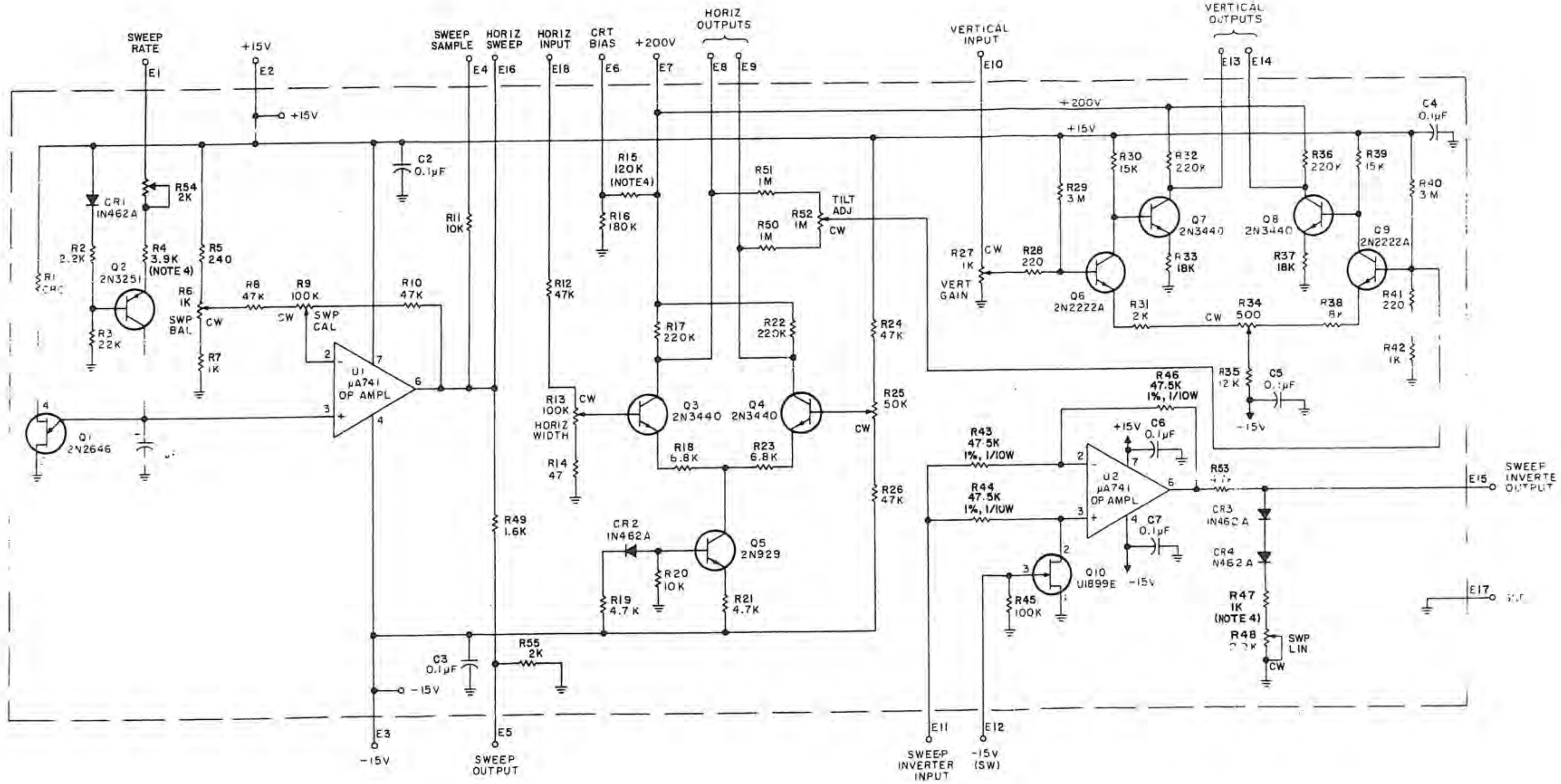


Figure A-25. Type 824002-1, Control Board (A2A2) Schematic Diagram 470227 (L)

NOTE:
UNLESS OTHERWISE SPECIFIED:

a) CAPACITANCE IS IN pF.
b) INDUCTANCE IS IN μH.
c) RESISTANCE IS IN OHMS ±5%, 1/4 W.

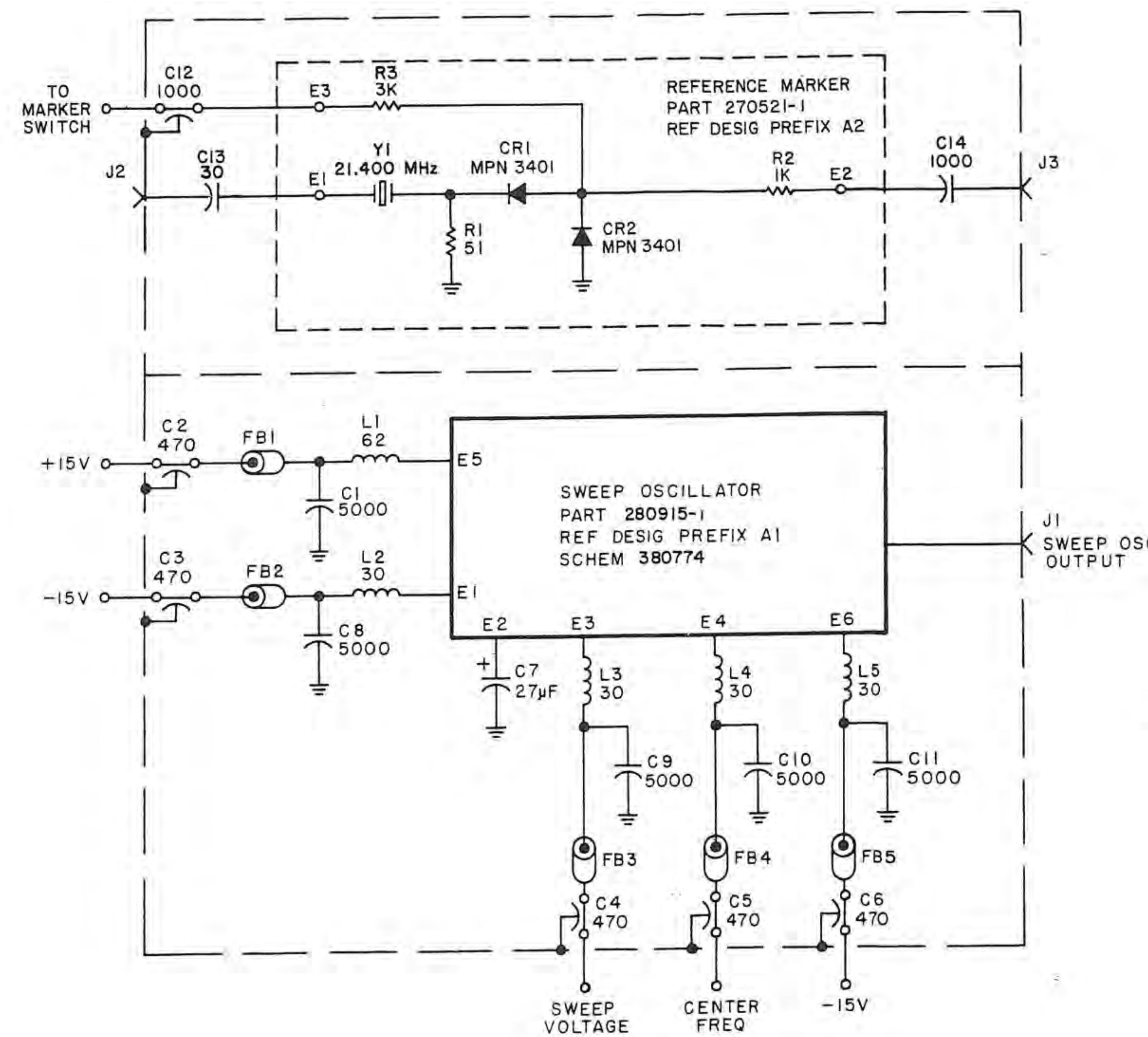


Figure A-26. Type 774007-1, Oscillator (A2A3), Schematic Diagram 370315 (D)

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±1%, 1/4W.
   b) CAPACITANCE IS IN pF.
   c) INDUCTANCE IS IN μH.

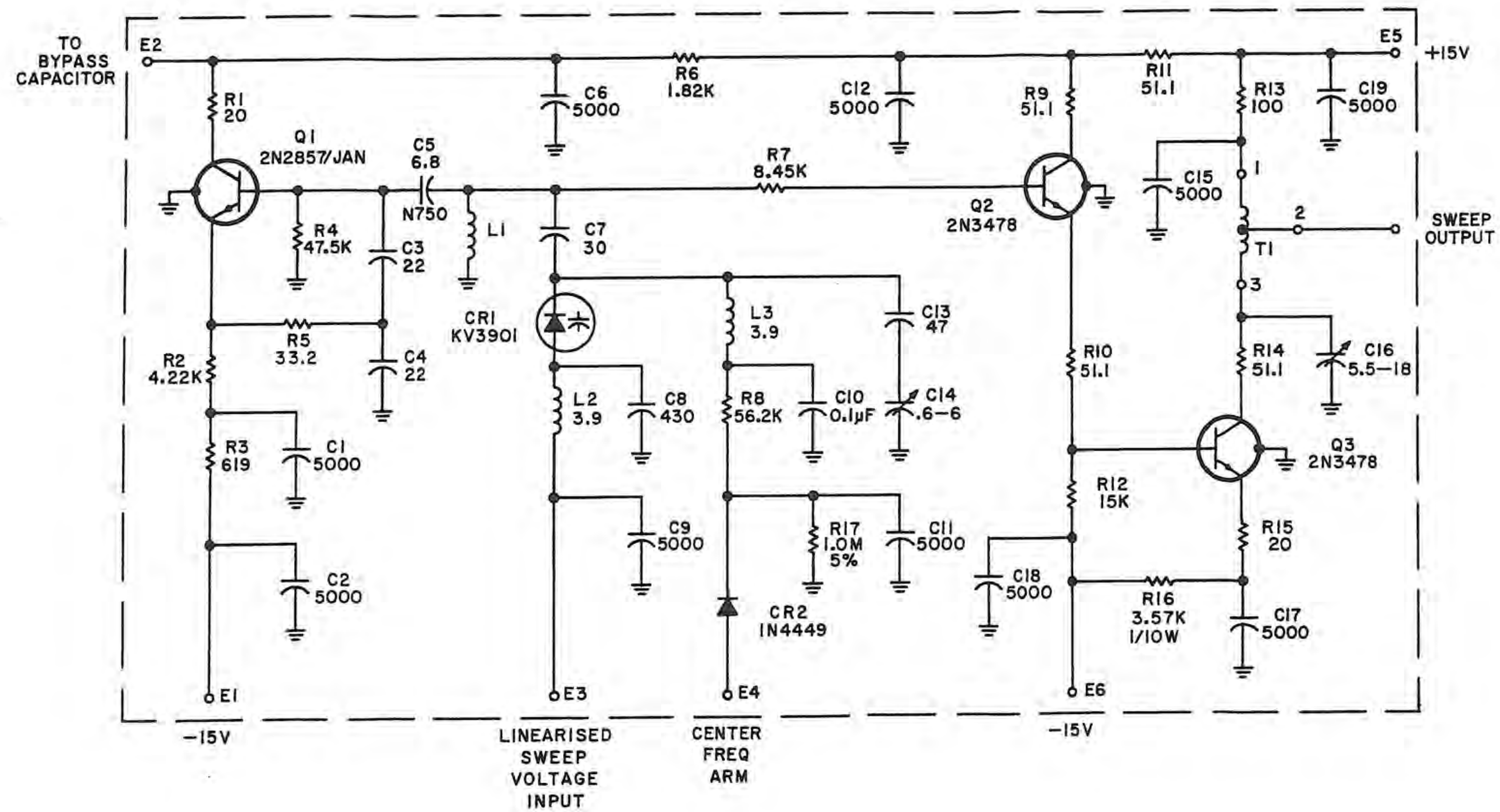


Figure A-27. Part 280915-1, Sweep Oscillator Assembly (A2A3A1), Schematic Diagram 380774 (B)

NOTES:
1. UNLESS OTHERWISE SPECIFIED, RESISTANCE IS IN OHMS, ± 5%, 1/4W.
2. CW AT POTENTIOMETERS INDICATES FULL CLOCKWISE POSITION OF ACTUATOR.
3. ▭ INDICATES FRONT PANEL CONTROL.

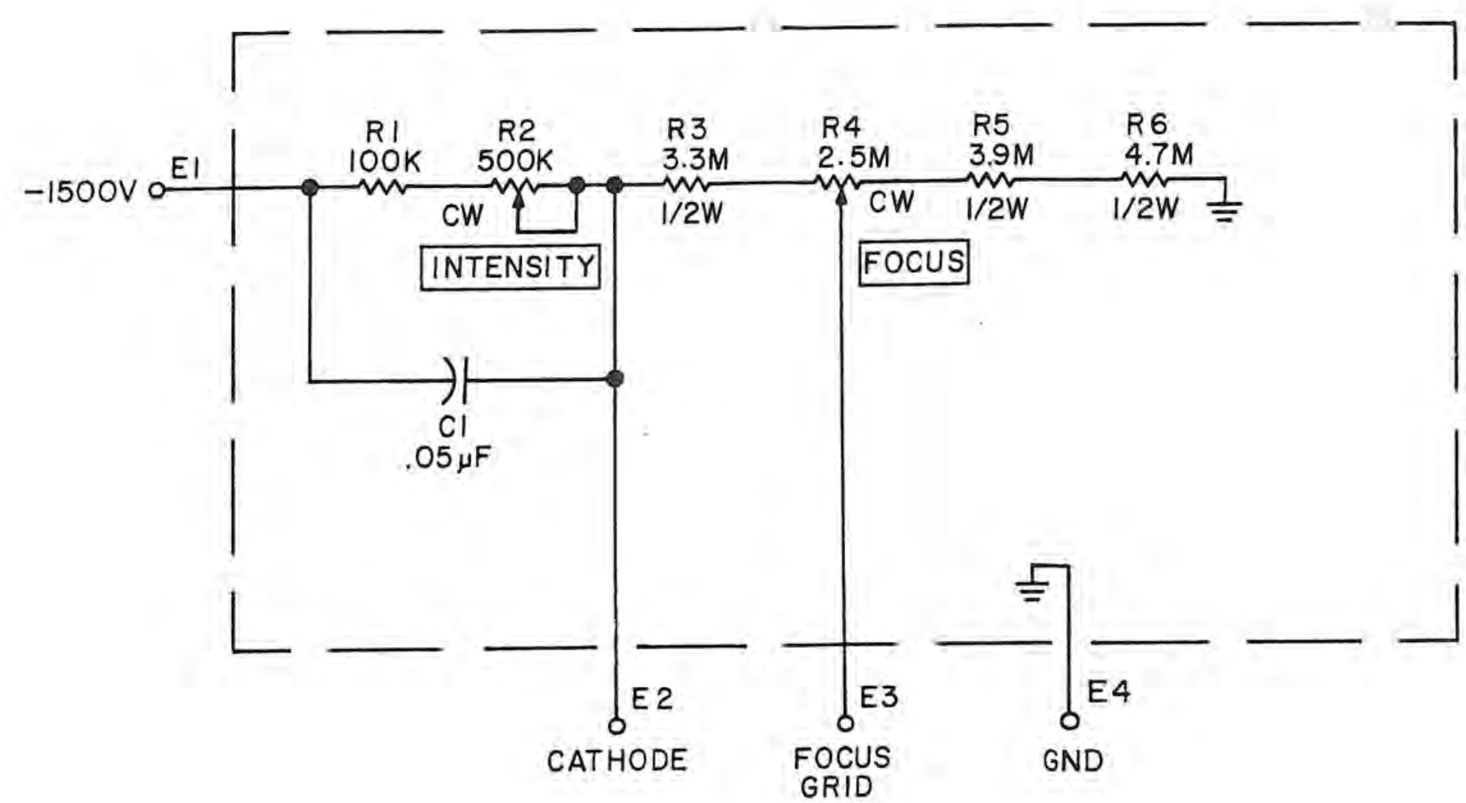


Figure A-28. Type 794099-1, Focus And Intensity Control (A2A4), Schematic Diagram 270343 (A)

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   (a) RESISTANCE IS IN OHMS, 1/4W, 5%.
   (b) CAPACITANCE IS IN μF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS
3. DIFFERENE BETWEEN TYPES IS MECHANICAL ONLY

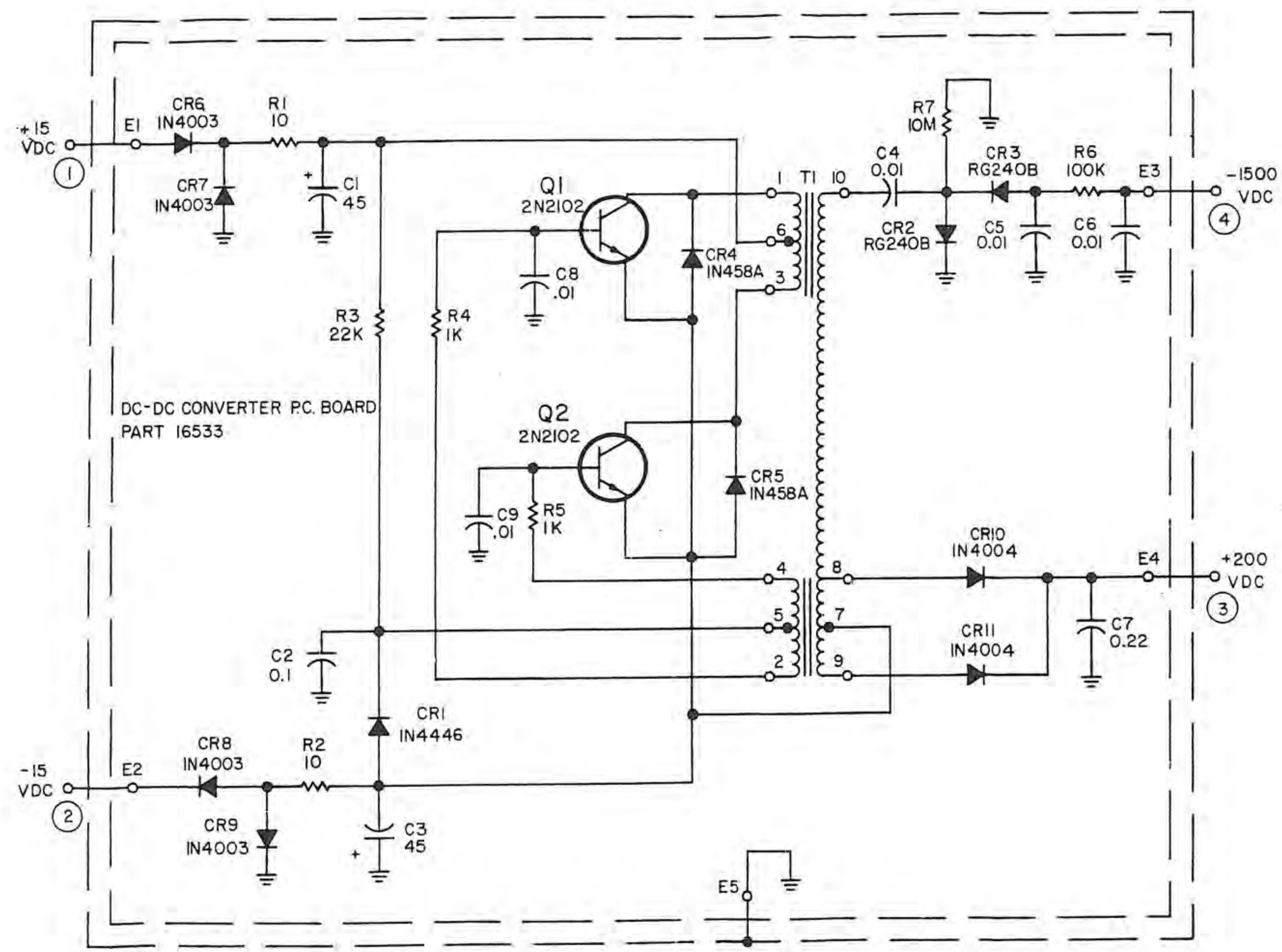


Figure A-29. Type 764006-1, DC-DC Converter (A2A5), Schematic Diagram 32874 (N)

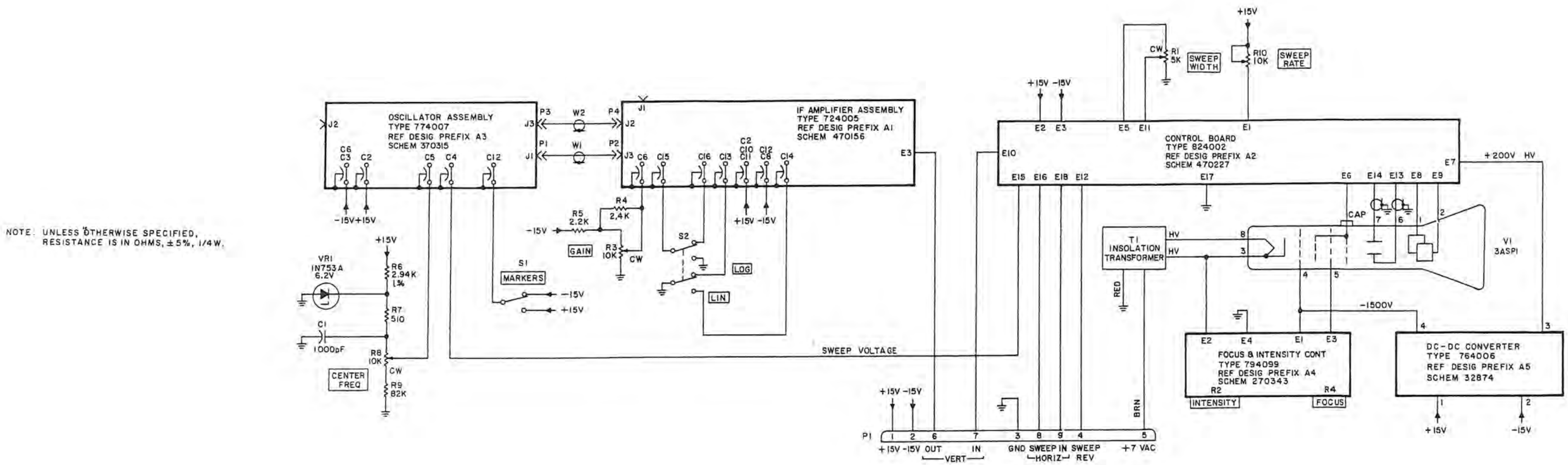


Figure A-30. Type 794103-1, Signal Monitor Assembly (A2), Schematic Diagram 470212 (F)

WJ-861X RECEIVER

APPENDIX B

WJ-861XB FREQUENCY EXTENDER (FE AND FEX) OPTIONS

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

November 1990

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

PROPRIETARY STATEMENT

TABLE OF CONTENTS

APPENDIX B

LIST OF TABLES

LIST OF ILLUSTRATIONS

TABLE OF CONTENTS (Continued)

LIST OF ILLUSTRATIONS (Continued)

APPENDIX B

FREQUENCY EXTENDER (FE AND FEX) OPTIONS

B.1 GENERAL

The 500-1100 MHz Frequency Extender (FE) is comprised of the Type 796414-1 UHF Preselector (A3A1), Type 796415-1 UHF Preamplifier/Mixer (A3A2) and the Type 798079-2 UHF LO Synthesizer (A3A22). These subassemblies install into existing slots on the RF/IF Motherboard and extend the receivers operating range to 1100 MHz. The 500-1200 MHz Frequency Extender (FEX) is comprised of the Type 796414-3 UHF Preselector (A3A1), Type 796415-3 UHF Preamplifier/Mixer (A3A2), and the Type 798079-2 UHF LO Synthesizer (A3A22). These subassemblies install into existing slots on the RF/IF Motherboard and extend the receiver's operating range to 1200 MHz. When the receiver is tuned to frequencies in the 500 to 1100 MHz range with the FE or to frequencies in the 500 to 1200 MHz range with the FEX, the incoming signal is mixed with one of four fixed LO frequencies down converting the signal to a difference frequency within the VHF tuning range of the receiver. The receiver is then tuned to this difference frequency.

B.2 INSTALLATION

Installation of the FE or FEX Option consists of inserting the three FE subassemblies into the appropriate slots on the RF/IF Motherboard and interconnecting the subassemblies with the receiver circuitry, utilizing the supplied cables. When the option components are properly installed, switch S1 on the Synthesizer Interface (A5A2) must also be reconfigured permitting the receiver software to recognize the presence of the 500-1100 MHz Frequency Extender or the 500- 1200 MHz Frequency Extender. This is accomplished by placing switch position #6 of A5A2S1 into the open position.

The cable connections required for the installation of the FE or FEX Option are as follows:

1) Connect P1 of cable A3A1W1 from the UHF Preselector to J4 of the receiver Antenna Switch (A8).

2) Connect P2 of cable A3A1W2 from the UHF Preselector to J1 of the UHF Preamplifier/Mixer (A3A2).

3) Remove cable A3W1 which is presently installed between J3 of Antenna Switch (A8) and J3 of the VHF High-Band Preselector (A3A3). Locate cable A3W7 (supplied) and install P15 of this cable at J3 of the Antenna Switch. Install P16 of A3W7 at J2 of the UHF Preamplifier/Mixer (A3A2).

4) Locate cable A3W1 and connect P2 of this cable at J4 of the UHF Preamplifier/Mixer (A3A2) and connect P3 at J3 of the VHF High-Band Preselector (A3A3).

5) Locate cable A3W6 and connect P14 at J3 of the UHF Preamplifier/Mixer (A3A2). Connect P13 of A3W6 at U1J1 of the UHF LO Synthesizer (A3A22).

6) Locate cable W25 and connect R55 of this cable at feed-thru connector J9 (on dividing wall of the receiver chassis). Connect P56 of W25 at J2 of the UHF LO Synthesizer (A3A22).

7) Recheck the installation to verify that all connections are correct. Refer to the RF/IF Motherboard (**Figure 6-1**) and the Receiver Main Chassis (**Figure 6-32**) schematic diagrams as a reference.

CAUTION

When installing the Frequency Extender (FE) Option, special precautions should be taken to prevent the possibility of damaging the UHF Preselector and UHF Preamp/Mixer subassemblies. Two different versions of the FE Option exist. Subassemblies from one version type MUST NOT be mixed with the other version type. Use only Type 794111-1 UHF Preselector (A3A1) with Type 798075-1 UHF Preamp/Mixer (A3A2) or Type 796414-1 UHF Preselector (A3A1) with Type 796415-1 Preamp/Mixer (A3A2) or Type 796414-3 UHF Preselector (A3A1) with Type 796415-3 Preamp/Mixer (A3A2). Interchanging the different version types could result in physical damage to the subassemblies.

B.3 CIRCUIT DESCRIPTION

B.3.1 FE OPTION FUNCTIONAL DESCRIPTION

With the FE Option installed, the 20-500 MHz output from the Antenna Switch (A8) is applied to a VHF/UHF select switch in the Type 796415-1 UHF Preamplifier/Mixer (A3A2), and the 500-1100 MHz Antenna Switch output is applied to the input of the UHF Preselector (A3A1).

When the receiver is tuned to frequencies above 500 MHz, the incoming signals are applied from the 500-1100 MHz output of the Antenna Switch to the input of the UHF Preselector (A3A1). The UHF Preselector divides the 500 to 1100 MHz RF frequency range into 3 bands of 500 to 700, 700 to 900 and 900 to 1100 MHz. Switching between bands is accomplished by a PIN diode switching network which applies the signal through the appropriate bandpass filter, in accordance with the tuned frequency. The control signals from the UHF LO Synthesizer (A3A22) provide bias current to the PIN diode switching network to accomplish switching between the preselector bands as the UHF LO Synthesizer is tuned.

From the UHF Preselector, the RF signal is applied to the UHF Preamplifier/Mixer (A3A2), where the signal is amplified and mixed with a LO signal provided by the UHF LO Synthesizer (A3A22) producing an output frequency within the VHF frequency range. A voltage controlled attenuator (U2) within UHF Preamplifier/Mixer provides automatic gain control (AGC) for this subassembly. U2 receives a dc bias voltage from the AGC subassembly (A3A8) which varies with respect to the strength of the received signal, thus controlling the overall gain of the FE Option. The amount of attenuation introduced by U2 varies directly with the strength of the tuned signal providing a relatively constant signal to the mixer (U3). From the mixer, the down converted signal is applied to the receiver via the UHF/VHF select switch in the output circuitry of the UHF Preamplifier/Mixer.

When the receiver is tuned to 500 MHz or less, the UHF/VHF switch, at the output of the UHF Preamplifier, switches to provide a signal path from the 20-500 MHz Antenna Switch output to the VHF section of the receiver. At this time, the output from the UHF section is cut off.

B.3.2 FEX OPTION FUNCTIONAL DESCRIPTION

With the FEX Option installed, the 20-500 MHz output from the Antenna Switch (A8) is applied to a VHF/UHF select switch in the Type 796415-3 UHF Preamplifier/Mixer (A3A2), and the 500-1200 MHz Antenna Switch output is applied to the input of the UHF Preselector (A3A1).

When the receiver is tuned to frequencies above 500 MHz, the incoming signals are applied from the 500-1200 MHz output of the Antenna Switch to the input of the UHF Preselector (A3A1). The UHF Preselector divides the 500 to 1200 MHz RF frequency range into 3 bands of 500 to 700, 700 to 900 and 900 to 1200 MHz. Switching between bands is accomplished by a PIN diode switching network which applies the signal through the appropriate bandpass filter, in accordance with the tuned frequency. The control signals from the UHF LO Synthesizer (A3A22) provide bias current to the PIN diode switching network to accomplish switching between the preselector bands as the UHF LO Synthesizer is tuned.

From the UHF Preselector, the RF signal is applied to the UHF Preamplifier/Mixer (A3A2), where the signal is amplified and mixed with a LO signal provided by the UHF LO Synthesizer (A3A22) producing an output frequency within the VHF frequency range. A voltage controlled attenuator (U2) within UHF Preamplifier/Mixer provides automatic gain control (AGC) for this subassembly. U2 receives a dc bias voltage from the AGC subassembly (A3A8) which varies with respect to the strength of the received signal, thus controlling the overall gain of the FEX Option. The amount of attenuation introduced by U2 varies directly with the strength of the tuned signal providing a relatively constant signal to the mixer (U3). From the mixer, the down converted signal is applied to the receiver via the UHF/VHF select switch in the output circuitry of the UHF Preamplifier/Mixer.

When the receiver is tuned to 500 MHz or less, the UHF/VHF switch, at the output of the UHF Preamplifier, switches to provide a signal path from the 20-500 MHz Antenna Switch output to the VHF section of the receiver. At this time, the output from the UHF section is cut off.

B.3.2.1 Type 796414-1 and 796414-3 UHF Preselector (A3A1)

The reference designation for this subassembly is A3A1. Refer to **Figure B-1** for the Type 796414-1 and 796414-3 UHF Preselector schematic diagram.

The Type 796414-1 or 796414-3 UHF Preselector (A3A1) provides the first stage of RF preselection for the 500-1100 MHz or 500-1200 MHz UHF signals. Either subassembly utilizes three bandpass filters (FL1 through FL3) dividing the UHF spectrum into bands of 500-700, 700-900 and 900-1100 or 900-1200 MHz. Each bandpass filter is flat over its specified frequency and passes these frequencies with little attenuation (0.5 dB). Frequencies out of the filter bandpass are attenuated, thus improving image frequency and IF rejection. The RF signal enters the UHF preselector via P1 of cable W1 and is coupled by C1 to a PIN diode switching network comprised of CR1 through CR14. This switching network applies the signal of interest through the appropriate bandpass filter in accordance with the tuned frequency of the receiver. From the filter, the RF signal is coupled through C12 to the output (P2 of W2).

Switching of the RF signal through the proper filter is controlled by the UHF/VHF and the Band A*, B*, and C* select inputs. During UHF operation, the UHF/VHF select input is at +5 Vdc, placing a positive potential at the anodes of series input (CR1, CR5 and CR9) and series output (CR4, CR8 and CR12) diodes. Dependent on the frequency tuned, the Band A*, B*, or C* select is placed at -10 Vdc providing a current-sink through its respective series input and output PIN diodes. When conducting, the diodes provide a minimum impedance path for the RF signal through the filter installed in that branch. The remaining select inputs are held at +5 Vdc which provides a current source for the shunt diodes in their switch branch. The series diodes in these branches are cut off, thus blocking the RF signal path. The select inputs required to activate each filter branch is illustrated in the UHF Preselector Bandpass Selection Table **(Table B-1)**. Each of the select inputs are provided by the Digital Control Section automatically selecting the proper filter for the frequency tuned.

Table B-1. UHF Preselector Bandpass Selection Table

Select UHF/VHF	C*	B*	A*	Active Filter	Bandpass (MHz)
0	1	1	1	---	---
1	1	1	0	FL1	500 - 700
1	1	0	1	FL2	600 - 900
1	0	1	1	FL3	900 - 1100
OR					
1	0	1	1	FL3	900 - 1200

0 = -10 Vdc
1 = +5 Vdc

Inductors L1 through L8, ferrite beads FB1 through FB12, resistors R1 through R13 and capacitors C2 through C11 and C13 through C18 function as decoupling components. These components prevent RF signals from exiting the UHF Preselector via the select inputs of the subassembly.

B.3.2.2 Type 796415-1 and 796415-3 UHF Preamplifier/Mixer (A3A2)

The reference designation for this subassembly is A3A2. Refer to **Figure B-2** for the Type 796415-1 or 796415-3 UHF Preamplifier/Mixer schematic diagram.

The RF signal from the UHF Preselector (A3A1) enters the UHF Preamplifier/Mixer (A3A2) via RF input connector J1 and is applied to the input of preamplifier U1. U1, a broadband amplifier, provides +15.5 dB of gain to the RF signal increasing the signal to a sufficient level to drive the mixer. Decoupling of the +15 Vdc input to U1 (pin 1) is accomplished by L3 and C5. The output of U1 (pin 4) is then applied to PIN diode attenuator U2 via FL1. FL1 in the FE Option is a 1100 MHz low-pass filter, installed in the signal path to attenuate frequencies above 1100 MHz thus reducing image noise from U1. FL1 in the FEX Option is a 1200 MHz low-pass filter, installed in the signal path to attenuate frequencies above 1200 MHz, thus reducing image noise from U1. The voltage controlled attenuator U2, presents a constant impedance at the output of FL1 and provides a means of limiting the signal level to the mixer under strong signal conditions. The amount of attenuation presented by U2 is dependent on the AGC voltage provided by the AGC Amplifier (A3A8) at terminal 49 of the UHF Preamplifier/Mixer subassembly. This voltage varies from +10 Vdc with weak signals present to +2 Vdc under strong signal conditions. The attenuation presented by U2 varies between -20 dB, with an AGC voltage of +2 Vdc, to -1.75 dB, with an AGC voltage of +10 Vdc. Operating bias is supplied by +15 Vdc applied to pin 1 via the decoupling network comprised of L4 and C6. Control is supplied by the AGC voltage applied to pin 5. L9, C16 and C17 provide decoupling of the AGC input line.

Double balanced mixer U3 receives the RF signal from U2 and mixes it with an LO signal provided by the UHF LO Synthesizer (A3A22) providing a difference frequency within the VHF range. The UHF LO Synthesizer applies four different fixed frequencies to the mixer to divide the UHF frequency range into four frequency bands as illustrated in the UHF Tuning Table **(Table B-2)**. The Digital Control Section then tunes the VHF section of the receiver to the mixer output frequency, thus permitting the signal of interest to be further processed. The mixer output from pin 1 of U3 is coupled across dc blocking capacitor C22 and is then applied through a low-pass filter comprised of L10, C26 and C27. This filter suppresses high order harmonics of the UHF LO preventing their radiation from the VHF input (J2). From the low-pass filter the RF signal is applied to the UHF branch of the UHF/VHF switch.

Table B-2. UHF Tuning Table

RF Tuned Freq. (MHz)	LO FREQ. (MHz)	Mixer Output Freq. (MHz)
500 - 599	848	348 - 249
600 - 699	944	344 - 240
700 - 899	1144	444 - 245
900 - 1100*	1344	444 - 244
900 - 1200**	1344	444 - 144

* FE option
** FEX option

The UHF/VHF switch, comprised of CR3 through CR6, selects the converted UHF signal from the UHF mixer or the VHF signal from the Antenna Switch (A8), entering at J2. Switching is controlled by the UHF/VHF input (terminal 53) provided by the Digital Control Section. This switching input is at logic "1" (+5 Vdc) when the receiver is tuned to 500 MHz or above and at logic "0" (0 Vdc) when tuned below 500 MHz. The UHF/VHF select signal from terminal 53 is applied, via R11, to the inverting input of switch driver U8B and to the non-inverting input of U8A. These switch drivers switch between +15 Vdc and -10 Vdc providing bias current for the PIN diodes in the UHF/VHF switch. When a frequency of 500 MHz or higher is tuned, the +5 Vdc level causes the output of U8A to switch to +15 Vdc. This provides a current-source for CR4, causing it to conduct and provide a current path for the converted UHF signal to the output of the subassembly (J4). At this time the output of U8B is at -10 Vdc, providing a current-sink for CR6. This causes CR6 to conduct and series diode CR5 to be cut off, preventing the VHF signal from passing through the switch. When frequencies below 500 MHz are tuned, the outputs of U8A and U8B are reversed, causing a signal path for the VHF signal through CR5 and blocking the UHF path by cutting off CR4. The voltage divider formed by R5 and R3 provides a switching reference level of approximately 1.5 Vdc.

Integrated circuits U6 and U7 function as switch drivers for the band select circuitry of the UHF Preselector (A3A1). These switch drivers receive the UHF/VHF and the 2^0 and 2^1 UHF select inputs from the Digital Control Section and decode these inputs to select the proper preselector filter as the UHF LO Synthesizer is tuned. The UHF select inputs are applied to the A, B and C inputs of decoder U4, which in turn provides a logic "1" level to the inverting input of appropriate switch driver (U7B, U6A or U6B). The UHF/VHF input is also applied directly to the non-inverting input of U7A causing the output of U7A to be held at +15 Vdc whenever UHF is selected by the UHF/VHF select input. The remaining drivers switch according to the logic levels provided at the 2^0 and 2^1 UHF select inputs.

When the receiver is tuned between 500 and 599 MHz, 2^0 and 2^1 are both at logic "0," causing the Q4 output of U4 to be placed at a logic "1." This level is applied at pin 6 of U6B, via CR2, causing the A select output to be switched to -15 Vdc. At frequencies of from 500 to 699 MHz, 2^0 is at logic "1" and 2^1 is at logic "0." This condition causes the Q5 output of U4 to be placed at a logic "1" level. This level is applied at pin 6 of U6B, via CR1, causing the A select output to be switched to -15 Vdc. At tuned frequencies of from 700 to 899 MHz, 2^0 is at logic "0" and 2^1 is at logic "1," causing the Q6 output of U4 to be placed at logic "1." The Q6 output level is applied to the inverting input of U6A, causing the B output to be switched to -15 Vdc. When frequencies between 900 and 1200 MHz are tuned, both the 2^0 and 2^1 select inputs are at a logic "1" state. This causes the Q7 output of U4 to be placed at a logic "1" state. The Q7 output is applied to the inverting input of U7B, causing the C output to be switched to -15 Vdc.

The LO signal provided by the UHF LO Synthesizer is applied to the mixer (U3) via J3 and buffer amplifier U5. U5 receives the LO signal at a level of -3 dBm and provides amplification of +10 dB increasing the signal to a sufficient level to drive mixer U3. L5 and C7 function as decoupling components maintaining a signal ground potential on the +9 Vdc source.

B.3.2.3 Type 798079-2 UHF LO Synthesizer (A3A22)

The reference designation for this subassembly is A3A22. Refer to **Figure B-3** for the Type 798079-2 UHF LO Synthesizer schematic diagram.

This subassembly consists of the UHF Variable Divider (A3A22A1) and the UHF VCO (A3A22U1) which together comprise the phase locked loop of the UHF LO Synthesizer. The inputs consists of the 1 MHz reference, provided by the Synthesizer Section at J2 and the UHF and UHF SEL (2^1, 2^0) select inputs provided by the Digital Control Section. The output provided consists of a fixed LO frequency of 848, 944, 1144 or 1344 MHz at J1 of the 848-1344 MHz Oscillator (U1).

B.3.2.3.1 Part 390421-1 UHF Variable Divider (A3A22A1)

The Part 390421-1 UHF Variable Divider (A3A22A1) provides the tuning control for the 848-1134 MHz Oscillator, (U1). This subassembly decodes the UHF, 2^0 and 2^1 select lines, provided by the Digital Control Section, and utilizes the decoded data to select the oscillator frequency band and to preset the divide-by-n counters in the phase-locked-loop circuitry.

Control inputs to the Part 390421-1 UHF Variable Divider consist of the UHF 2^0 and 2^1 select input, provided at terminals E1, E2 and E3. The UHF input line, which is set to logic "1" whenever the receiver is tuned above 500 MHz, is applied to the G input of U8 and to the cathode of CR1 enabling the Variable Divider circuitry. The 2^0 and 2^1 inputs are applied to the A and B inputs of U8 and to gates A and B of U9. U8 and U9 then decode the select inputs selecting the oscillator frequency band and to preset binary counters U7 and U6. Comparator U5 monitors the output lines of U8 and compares the logic level at each line with a +2.5 Vdc reference, provided by the voltage divider formed by R1 and R2. Each comparator in U5 provides +15 Vdc to the appropriate band select input of oscillator U1 when its respective input (from U8) goes low, causing the desired oscillator band to be selected. The remaining outputs of U5 are held at -15 Vdc, due to the logic "1" at their inverting inputs.

A sample of the output frequency of A3A22U1 enters the Variable Divider at E9 and is applied to the input of amplifier U4 via the pad formed by R9, R10 and R11. U4 amplifies the oscillator frequency and applies the signal to the input of U3, via C12. Integrated circuits U3 and U2 provide divide factors of 4 and 2, respectively, providing a total prescaling factor of 8. The prescaled output is then applied to the input of a two modulus counter which further divides the signal by a factor of 10 or 11, as determine by the CRY output of counter U6. When the CRY output is at logic "0", U1 divides by 11 and when the output is at logic "1," U1 divides by 10. The output of U1 is then applied as a TTL clock to counters U7 and U6.

Presettable binary counters U7 and U6 function with the two modulus counter U1 providing division factors of 106, 118, 143 or 168. U7 and U6 are preset by the decoded outputs of U8 and U9 and count up from the preset until the maximum count is reached. When the maximum count is reached, a pulse is provided to the phase detector U10 and the CRY output of U7 reloads the counters restarting the count sequence. U7 determines the total number of counts in each count sequence and U6 determines the number of times U1 divides by 11 or 10.

For example, when a LO frequency of 848 MHz is selected, U7 is preset to "6" and U6 is preset to "9." The total count sequence continues until U7 counts up from "6" to its maximum of "15" and then resets (10 counts). Simultaneous with the count of U7, U6 counts up from its preset of "9" to its maximum of "15" (6 counts). When U6 reaches "15" the CRY output is set to 1 and U6 counting halts until the preset is reloaded. During the first 6 counts (while U6 is counting) U1 divides by a factor of 11. For the remaining 4 counts (until U7 reaches its maximum count) U1 divides by a factor of 10. The total count sequence provides a divide factor of 106 (11x6) + (10x4) . This combined with the division factor of 8 by the prescaler divides the oscillator output frequency by a factor of 848.

The output of U7 is applied to the phase detector (U10), where the divided signal is compared with the 1 MHz reference signal, provided by the Synthesizer Section of the receiver. The phase detector compares the frequency and phase of the two signals and generates an output representing the difference between the signals. This output is integrated by the loop filter, comprised of Q1, Q2 and associated components to produce a tuning voltage which retunes the oscillator until the divided signal and the reference are equal in frequency and phase. R18 and C22 determine the bandwidth of the loop filter, and C21 and R19 permit bandwidth adjustment.

B.4 PARTS LIST

B.4.1 TYPE 796414-X UHF PRESELECTOR

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision D				
C1	Capacitor, Ceramic, Chip: 470 pF, 10%, 100 V	2	C1210C471K1GAC	31433	
C2 Thru C5	Not Used				
C6	Capacitor, Ceramic, Monolithic: 220 pF, 5% 100 V	6	8121-100-C0G0-221J	72982	
C7 Thru C11	Same as C6				
C12	Same as C1				
C13	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 50 V	3	34475-1	14632	
C14	Capacitor, Ceramic, Disc: 1000 pF, 500 V	3	59Z5U102P	91984	
C15	Same as C13				
C16	Same as C14				
C17	Same as C13				
C18	Same as C14				
C19	Capcitor, Variable, Air: 1-4.5 pF, 250 V	2	9410-0	91293	
C20	Same as C19				
CR1	Diode	12	841320	14632	
CR2 Thru CR9	Same as CR1				
CR10	Diode	2	MA47201	96341	
CR11	Same as CR10				
CR12 Thru CR14	Same as CR1				
E1	Connector, Terminal	2	55-039-3875-91	98291	
E2	Same as E1				
E3	Terminal, Forked	6	140-1941-02-01	71279	
E4 Thru E8	Same as E3				
E9	Not Used				
E10	Not Used				
FB1	Not Used				
FB2	Not Used				
FB3	Ferrite Bead	10	56-590-65-4A	02114	
FB4 Thru FB12	Same as FB3				
FL1	Filter Band-pass: 600 MHz CF	1	92222	50140	
FL2	Filter Band-pass: 800 MHz CF	1	92223	50140	
FL3	See Table B-3				
L1	Coil, Fixed	8	170134-1	14632	

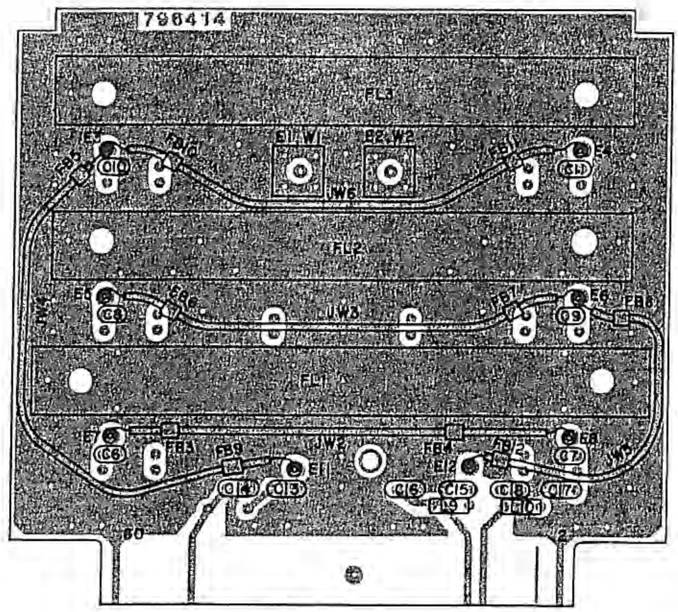


Figure B-1. Type 796414-1 UHF or 796414-3 Preselector (A3A1), Component Side, Location of Components

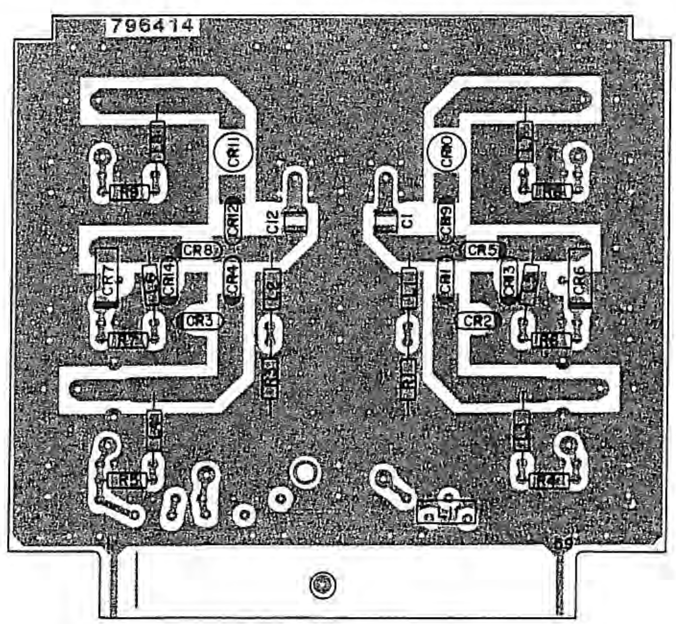


Figure B-2. Type 796414-1 or 796414-3 UHF Preselector (A3A1), Circuit Side, Location of Components

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
L2 Thru L8	Same as L1				
L9	Coil, Fixed	3	190187-1	14632	
L10	Same as L9				
L11	Same as L9				
P1	Connector, Plug	1	50-024-3875-91	98291	
P2	Connector, Plug	1	50-328-3875-91	98291	
R1	See Table B-3				
R2	Not Used				
R3	See Table B-3				
R4	Resistor, Fixed, Composition: 470Ω, 5%, 1/8 W	6	RCR05G471JS	81349	
R5 Thru R9	Same as R4				
W1	Cable Assembly	1	17300-188-3	14632	
W2	Cable Assembly	1	17300-188-4	14632	

Table B-3. Type 796414-X Component Differences

Option	Type	FL3	R1, R3
FE	796414-1	Filter 92225	Resistor, Fixed, Film 1.2 kΩ, 5%, 1/4 W CF1/4-1.2K/J
FEX	796414-3	Filter 92390	Resistor, Fixed, Film 1.2 kΩ, 5%, 1/4 W CF1/4-1.2K/J

B.4.2 TYPE 796415-X UHF PREAMPLIFIER/MIXER REF DESIG PREFIX A3A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision G				
C1	Capacitor, Electrolytic, Tantalum: 4.7 µF, 20%, 35 V	2	196D475X0035JE3	56289	
C2	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 50 V	15	34475-1	14632	
C3	Same as C1				
C4 Thru C15	Same as C2				
C16	Capacitor, Ceramic, Monolithic: 470 pF, 5%, 100 V	3	8121-100C0G0-471J	72982	
C17	Same as C16				
C18	Same as C2				
C19	Same as C2				
C20	Capacitor, Ceramic, Disc: 1000 pF, 10%, 100 V	2	8121-100X7R0-102K	72982	
C21	Same as C20				
C22	Capacitor, Ceramic, Chip: 220 pF, 10%, 50 V	1	C1210C221K5GAH	05397	
C23	Capacitor, Ceramic, Chip: .05 pF, 10%, 50 V	2	1210-050-X7R-503KS	55969	
C24	Same as C23				
C25	Same as C16				
C26	Capacitor, Ceramic, Chip: 4.3 pF, ±0.5 pF, 500 V	2	ATC700B4R3DP500X	29990	
C27	Same as C26				
C28	Capacitor, Ceramic, Chip: 470 pF, 10%, 100 V	1	C1210E471K1GAH	31433	
C29	Capacitor, Variable, Air: 0.6-4.5 pF, 500 V	1	M5F	18736	
CR1	Diode	2	1N4446	80131	
CR2	Same as CR1				
CR3	Diode	4	841320	14632	
CR4	Same as CR3				
CR5	Same as CR3				
CR6	Diode	1	5082-3040	28480	
CR7	Not Used				
CR8	Same as CR3				
FL1	Filter, LP (See Table B-4)				
J1	Connector, Receptacle, Connector	4	1009-7511 000	19505	
J2 Thru J4	Same as J1				
L1	Coil, Fixed	6	16209-12	14632	
L2 Thru L5	Same as L1				
L6	Coil, Fixed	2	170134-1	14632	
L7	Coil, Fixed	2	190187-1	14632	
L8	Same as L6				
L9	Same as L1				
L10	Coil, Fixed	1	170189-1	14632	
L11	Same as L7				

REF DESIG PREFIX **A3A2**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R1	Not Used				
R2	Not Used				
R3	See **Table B-1**				
R4	Resistor, Fixed, Film: 47 kΩ, 5%, 1/8 W	1	CF1/8-47K/J	09021	
R5 Thru R8	See **Table B-1**				
R9	Resistor, Fixed, Film: 18 kΩ, 5%, 1/8 W	4	CF1/8-18K/J	09021	
R10 Thru R12	Same as R9				
R13	See **Table B-1**				
U1	Amplifier	1	A12	14482	
U2	Attenuator	1	G1	27956	
U3	Mixer, Balanced	1	M2A	27956	
U4	Integrated Circuit	1	CD4028AE	02735	
U5	See **Table B-1**				
U6	Integrated Circuit	3	LM358N	27014	
U7	Same as U6				
U8	Same as U6				
VR1	See **Table B-1**				

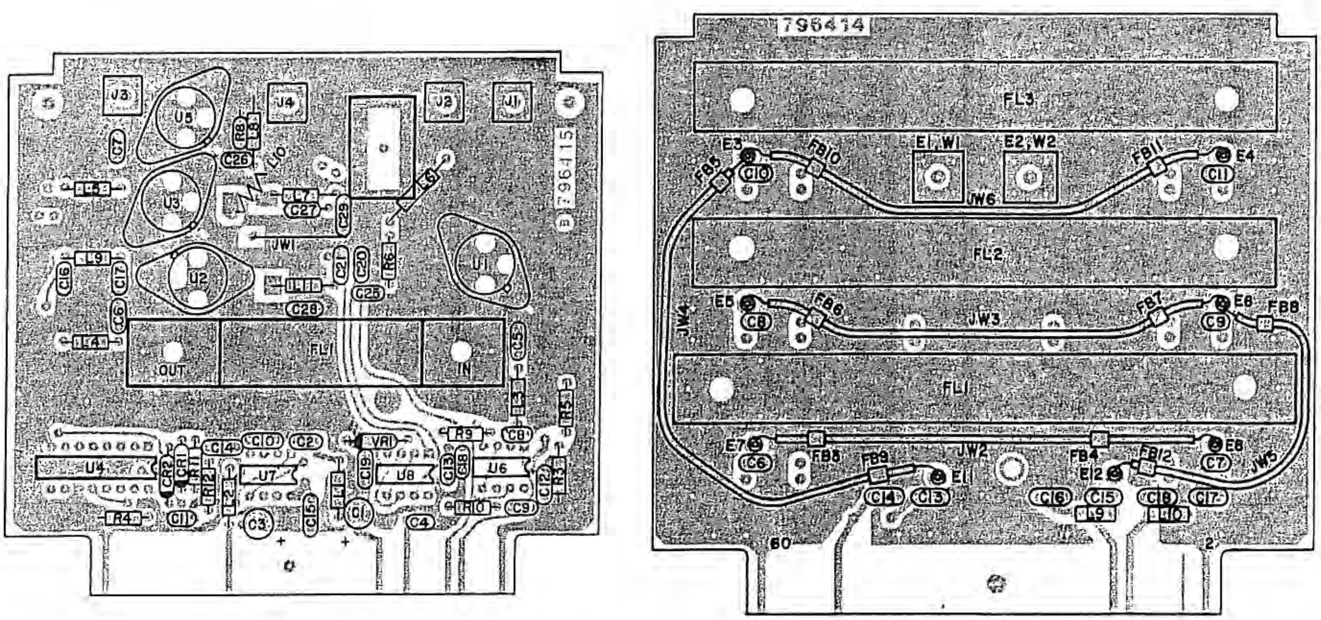


Figure B-3. Type 796415-1, UHF Preamplifier Mixer (A3A2), Location of Components

Table B-4. Type 796415-X Component Differences

	FL1	R3	R5	R6	R7	R8	R13	U5	VR1
796415-1	Filter 92225 50140	Res/Fixed/Film 1.8k, 5%, 1/8 W CF1/8-1.8K/J 09021	Res/Fixed/Film 12k, 5%, 1/8 W CF1/8-12K/J 09021	Res/Fixed/Film 680Ω, 5%, 1/8 W CF1/8-680 Ohms/J 09021	Same as R6	Res/Fixed/Film 1.2k, 5%, 1/8 W CF1/8-1.2K/J 09021	Same as R3	Amp. 10-1500 MHz A28 27956	Diode 5.1 V IN751A 80131
796415-2	Filter 92225 50140	Res/Fixed/Film 1.5k, 5%, 1/8 W CF1/8-1.5K/J 09021	Res/Fixed/Film 10k, 5%, 1/8 W CF1/8-10K/J 09021	Res/Fixed/Film 560Ω, 5%, 1/8 W CF1/8-560 Ohms/J 09021	Same as R6	Res/Fixed/Film 1.0k, 5%, 1/8 W CF1/8-1.0K/J 09021	Res/Fixed/Film 1.2k, 5%, 1/8 W CF1/8-1.2K/J 09021	Amp. 10-1500 MHz A28-2 14482	Diode 3.3 V IN746A 80131
796415-3	Low pass 92389 14632	Res/Fixed/Film 1.8k, 5%, 1/8 W CF1/8-1.8K/J 09021	Res/Fixed/Film 12k, 5%, 1/8 W CF1/8-12K/J 09021	Res/Fixed/Film 680Ω, 5%, 1/8 W CF1/8-680 Ohms/J 09021	Same as R6	Res/Fixed/Film 1.2k, 5%, 1/8 W CF1/8-1.2K/J 09021	Same as R3	Amp. 10-1500 MHz A28 27956	Diode 5.1 V IN751A 80131

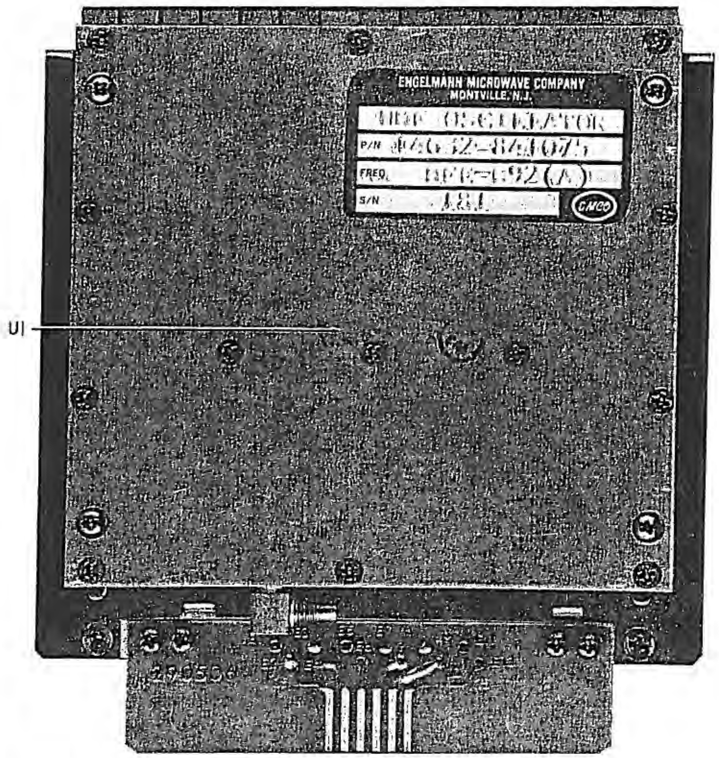


Figure B-4. Type 798079-2, UHF LO Synthesizer (A3A22), Location of Components

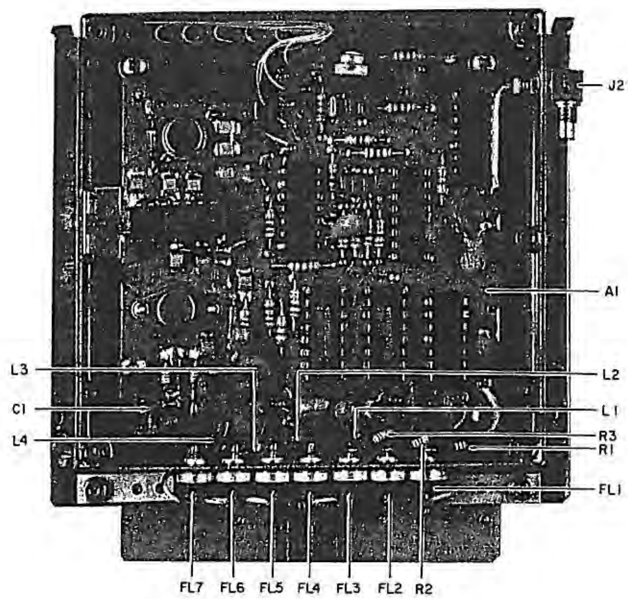


Figure B-5. Type 798079-2 UHF LO Synthesizer (A3A22), Location of Components

B.4.3 TYPE 798079-2 UHF LO SYNTHESIZER

REF DESIG PREFIX A3A22

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision E				
A1	UHF Variable Divider	1	390421-1	14632	
A2	UHF Variable Divider	1	796719-1	14632	
C1	Capacitor, Ceramic, Monolithic: 1.0 pF, ±.1, 100 V	1	100-100-NPO-109B	51642	
FB1	Ferrite Bead	12	56-590-65/4A	02114	
FB2 Thru FB12	Same as FB1				
FL1	Filter, Modified	7	33728-18	14632	
FL2 Thru FL7	Same as FL1				
J1	Not Used				
J2	Connector, Receptacle	1	1012-1511-000	19505	
L1	Coil, Fixed	4	16209-4	14632	
L2 Thru L3	Same as L1				
L4	Same as L1				
R1	Resistor, Fixed, Film: 270Ω, 5%, 1/8 W	3	CF1/8-270 OHMS/J	09021	
R2	Same as R1				
R3	Same as R1				
R4	Resistor, Fixed, Film: 100Ω, 5%, 1/8 W	1	CF1/8-100 OHMS/J	09021	

B.4.3.1 **Part 390421-1 UHF Variable Divider** REF DESIG PREFIX A3A22A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision R				
C1	Capacitor, Ceramic, Disc: 470 pF, 20%, 200 V	7	CK05BX471K	81349	
C2	Same as C1				
C3	Same as C1				
C4	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	6	34453-1	14632	
C5 Thru C7	Same as C4				
C8	Capacitor, Electrolytic, Tantalum: 4.7 µF, 20%, 35 V	5	196D475X0035JE3	56289	
C9	Same as C8				
C10	Capacitor, Ceramic, Disc: .1 µF, 20%, 50 V	1	34475-1	14632	
C11	Capacitor, Ceramic, Chip: 470 pF, 10%, 100 V	9	C1210E471K1GAH	31433	
C12 Thru C18	Same as C11				
C19	Capacitor, Ceramic, Disc: .47 µF, 20%, 50 V	2	34452-1	14632	
C20	Same as C8				
C21	Same as C19				
C22	Same as C4				
C23	Same as C1				
C24	Capacitor, Electrolytic, Tantalum: 22 µF, 20%, 10 V	1	196D226X0010JE3	56289	
C25	Same as C1				
C26	Same as C8				
C27	Same as C8				
C28	Same as C1				
C29	Same as C1				
C30	Same as C4				
C31	Same as C11				
CR1	Diode	1	GC4211-15	50101	
L1	Inductor, Air Core	1	22292-170	14632	
Q1	Transistor	2	2N3904	80131	
Q2	Same as Q1				
R1	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	7	CF1/4-10K/J	09021	
R2 Thru R6	Same as R1				
R7	Resistor, Fixed, Film: 27Ω, 5%, 1/4 W	1	CF1/4-27 OHMS/J	09021	
R8	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	2	CF1/4-100 OHMS/J	09021	
R9	Resistor, Fixed, Film: 68Ω, 5%, 1/8 W	1	CF1/8-68 OHMS/J	09021	
R10	Resistor, Fixed, Film: 47Ω, 5%, 1/8 W	1	CF1/8-47 OHMS/J	09021	
R11	Resistor, Fixed, Film: 100Ω, 5%, 1/8 W	1	CF1/8-100 OHMS/J	09021	
R12	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/4 W	2	CF1/4-1K/J	09021	
R13	Resistor, Fixed, Film: 15 kΩ, 5%, 1/4 W	1	CF1/4-15K/J	09021	

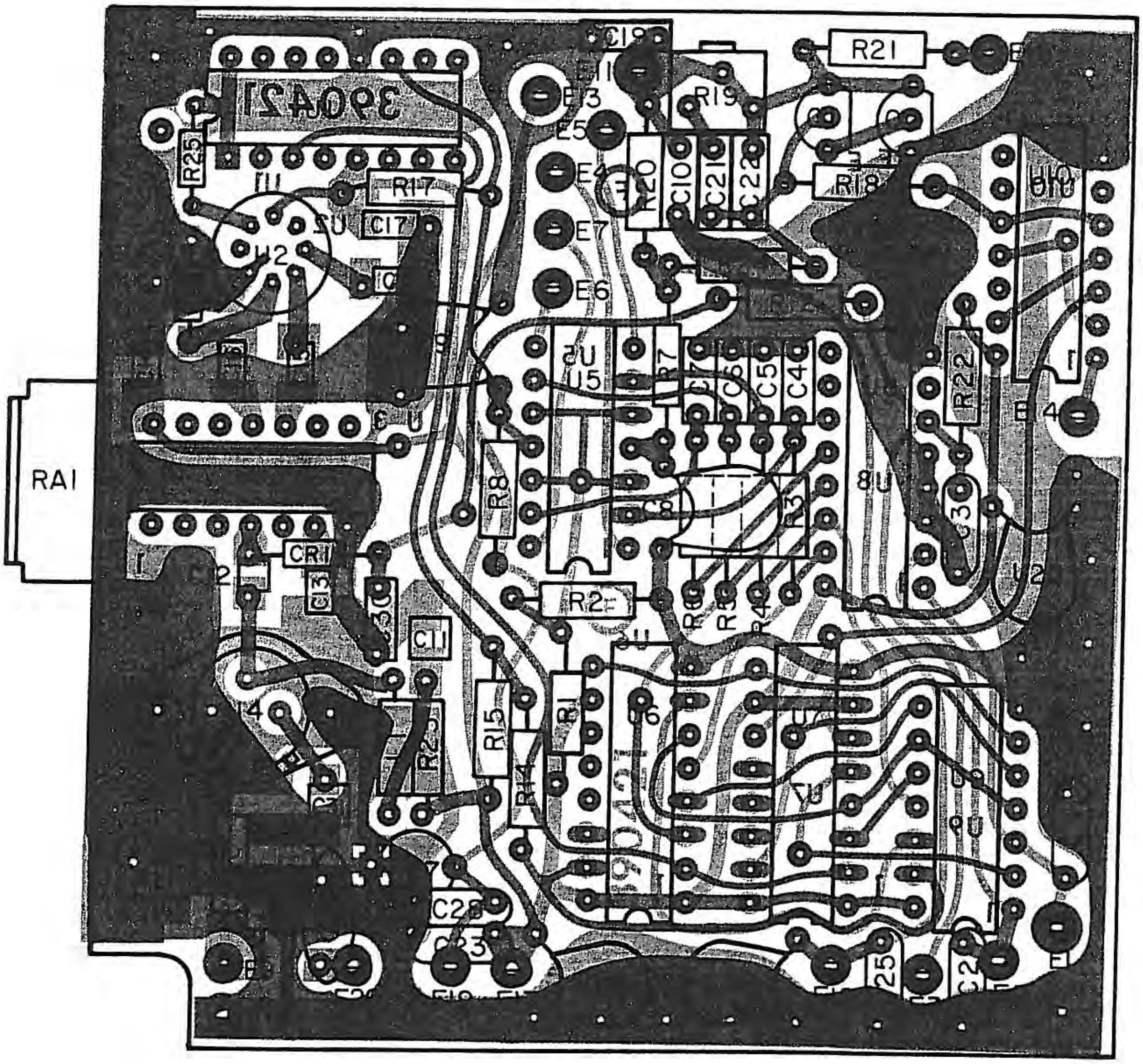


Figure B-6. Type 390421-UHF Variable (A3A22A1), Location of Components

REF DESIG PREFIX A3A22A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R14	Resistor, Fixed, Film: 3.6 kΩ, 5%, 1/4 W	1	CF1/4-3.6K/J	09021	
R15	Resistor, Fixed, Film: 1.5 kΩ, 5%, 1/4 W	1	CF1/4-1.5K/J	09021	
R16	Not Used				
R17	Resistor, Fixed, Film: 330Ω, 5%, 1/4 W	1	CF1/4-330 OHMS/J	09021	
R18	Same as R12				
R19	Resistor, Trimmer, Film: 2 kΩ, 10%, 1/2 W	1	62PAR2K	09021	
R20	Resistor, Fixed, Film: 3.3 kΩ, 5%, 1/4 W	1	CF1/4-3.3K/J	09021	
R21	Same as R1				
R22	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/4 W	1	CF1/4-4.7K/J	09021	
R23	Same as R8				
R24	Resistor, Fixed, Film: 4.7 MΩ, 5%, 1/4 W	1	CF1/4-4.7M/J	09021	
RA1	Heat Sink, Integrated Circuit	1	290509-1	14632	
R25	Resistor, Fixed, Film: 180Ω, 5%, 1/8 W	1	CF1/8-180 OHMS/J	09021	
U1	Integrated Circuit	1	SP8695B/DG	52648	
U2	Integrated Circuit	1	SP8602B/CM	52648	
U3	Integrated Circuit	1	SP8611B/DG	52648	
U4	Amplifier	1	GPD-410	24539	
U5	Integrated Circuit	1	HA1-4741-5	34371	
U6	Integrated Circuit	2	SN74LS161AN	01295	
U7	Same as U6				
U8	Integrated Circuit	1	SN74LS138N	01295	
U9	Integrated Circuit	1	SN74LS04N	01295	
U10	Integrated Circuit	1	MC4044P	04713	

B.4.3.2 Type 796719-1 UHF Variable Divider REF DESIG PREFIX A3A22A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
A1	UHF Oscillator PC Assembly	1	381473-1	14632	
C1	Capacitor, Feedthru, EMI: 1000 pF, 100 V, 10A	6	54-790-018	33095	
C2 Thru C6	Same as C1				
E1	Terminal, Feedthru	1	001-1007-000-479	98291	
J1	Connector, Receptacle	1	1012-1511-000	19505	
R1	Resistor, Fixed, Film: 22 kΩ, 5%, 1/8 W	4	CF1/8-22K/J	09021	
R2 Thru R4	Same as R1				

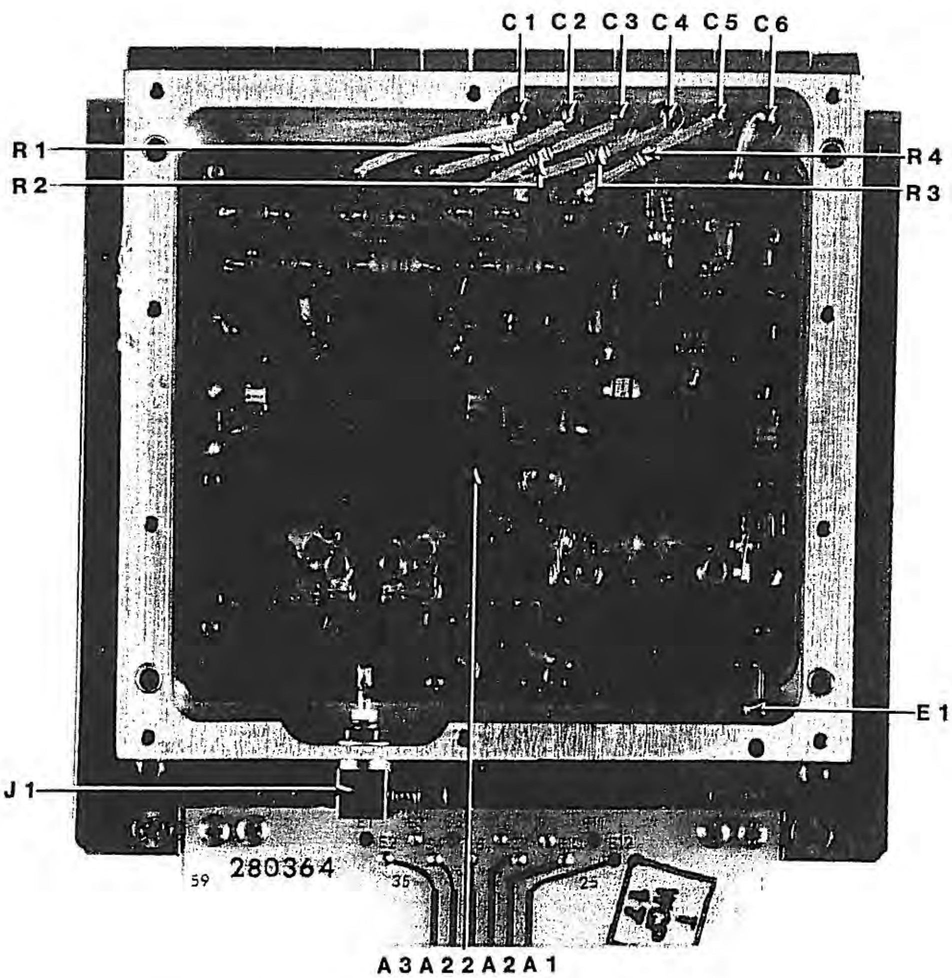


Figure B-7A. Type 796719-1 UHF Variable Divider (A3A22A2) Location of Components

B.4.3.2.1 **Type 381473-1 UHF Oscillator Assembly** REF DESIG PREFIX A3A22A2A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
C1	Capacitor Pad (P/O PC Artwork)	4			
C2	Capacitor, Ceramic: 1.5 pF, ±.1 pF, 500 V	3	ATC175B1R5BP500X	29990	
C3	Capacitor, Variable, Air: .4-2.5 pF, 500 V	4	27283	91293	
C4	Capacitor, Ceramic: 5.6 pF, ±.1 pF, 500 V	2	ATC175B5R6BP500X	29990	
C5	Same as C1				
C6	Same as C2				
C7	Same as C3				
C8	Same as C4				
C9	Same as C1				
C10	Same as C2				
C11	Same as C3				
C12	Capacitor, Ceramic: 4.7 pF, ±.1 pF, 500 V	1	ATC175B4R7BP500X	29990	
C13	Same as C1				
C14	Capacitor, Ceramic: 1 pF, ±.1 pF, 500 V	1	ATC175B1R0BP500X	29990	
C15	Same as C3				
C16	Capacitor, Ceramic: 3.9 pF, ±.1 pF, 500 V	1	ATC175B3R9BP500X	29990	
C17	Capacitor, Electrolytic, Tantalum: 22 µF, 20%, 15 V	1	TMM-S-226M-015R	04222	
C18	Capacitor, Ceramic, Monolithic: 2.0 pF, ±.1 pF, 100 V	2	100-100-NPO-209B	51642	
C19	Capacitor, Ceramic, Monolithic: 2.4 pF, ±.1 pF, 100 V	1	100-100-NPO-249B	51642	
C20	Capacitor, Ceramic, Monolithic: 1.0 pF, ±.1 pF, 100 V	2	100-100-NPO-109B	51642	
C21	Same as C20				
C22	Same as C18				
C23	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	1	34453-1	14632	
CR1	Tuning Varactor	4	MA-45240-31	96341	
CR2 Thru CR4	Same as CR1				
CR5	Diode	1	1N4449	80131	
L1	Coil, Fixed	9	190187-1	14632	
L2 Thru L9	Same as L1				
L10	Coil, Fixed	3	180683-1	14632	
L11	Same as L10				
L12	Same as L10				
Q1	Transistor	4	MMBT2222ALT1	04713	
Q2	Transistor	4	841269	14632	
Q3	Same as Q2				
Q4	Same as Q1				
Q5	Same as Q2				
Q6	Same as Q1				

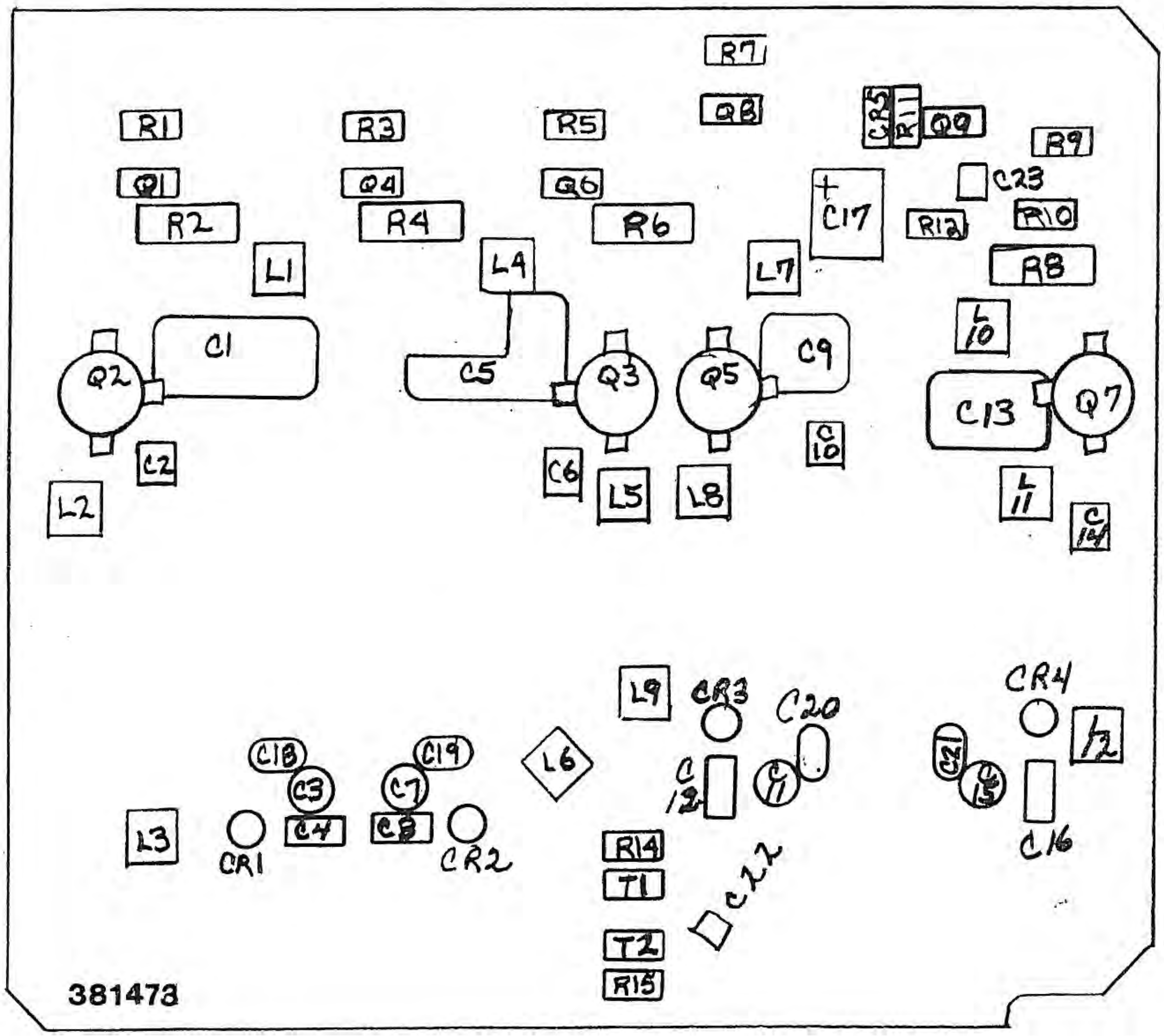


Figure B-7B. Type 381473-1 UHF Oscillator Assembly (A3A22A2A1)
Location of Components

REF DESIG PREFIX **A3A22A2A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
Q7	Same as Q2				
Q8	Same as Q1				
Q9	Transistor	1	MMBT-3906	04713	
R1	Resistor, Fixed, Film: 1.8 kΩ, 5%, 1/8 W	6	C3-1.8K-5PCT	24546	
R2	Resistor, Fixed, Film: 130Ω, 5%, 1/4 W	1	CF1/4-130 OHMS/J	09021	
R3	Same as R1				
R4	Resistor, Fixed, Film: 150Ω, 5%, 1/4 W	1	CF1/4-150 OHMS/J	09021	
R5	Same as R1				
R6	Resistor, Fixed, Film: 180Ω, 5%, 1/4 W	1	CF1/4-180 OHMS/J	09021	
R7	Same as R1				
R8	Resistor, Fixed, Film: 110Ω, 5%, 1/4 W	1	CF1/4-110 OHMS/J	09021	
R9	Same as R1				
R10	Resistor, Fixed, Film: 3.3 kΩ, 5%, 1/8 W	1	C3-3.3K-5PCT	24546	
R11	Same as R1				
R12	Resistor, Fixed, Film: 18 kΩ, 5%, 1/8 W	1	C3-18K-5PCT	24546	
R13	Not Used				
R14	Resistor, Fixed, Film: 10Ω, 5%, 1/8 W	2	C3-100R-5PCT	24546	
R15	Same as R14				
T1	Power Divider	2	281926-1	14632	
T2	Same as T1				

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4 W.
   b) CAPACITANCE IS IN pF.
   c) INDUCTANCE IS IN μH.
2. DIODES CR10, CR11 ARE MA-47201;
   CR1 THRU CR9, CR12 THRU CR14 ARE 841320.
3. FOR DIFFERENCES BETWEEN DASH NUMBERS, SEE TABLE A. DASH (1 & 4) AND (3 & 5) ARE SAME EXCEPT FOR P1.
4. SWITCHING CODES SEE TABLE B

TABLE A

TYPE NO.	R1, R3	FL3
796414-1	1.2K	92224
796414-2	910	92224
796414-3	1.2K	92390
796414-4	1.2K	92224
796414-5	1.2K	92390

TABLE B

BAND	FILTERS	$\overline{A}$	$\overline{B}$	$\overline{C}$
900-1100	FL3	1	1	0
700-900	FL2	1	0	1
500-700	FL1	0	1	1
900-1200	FL3	1	1	0

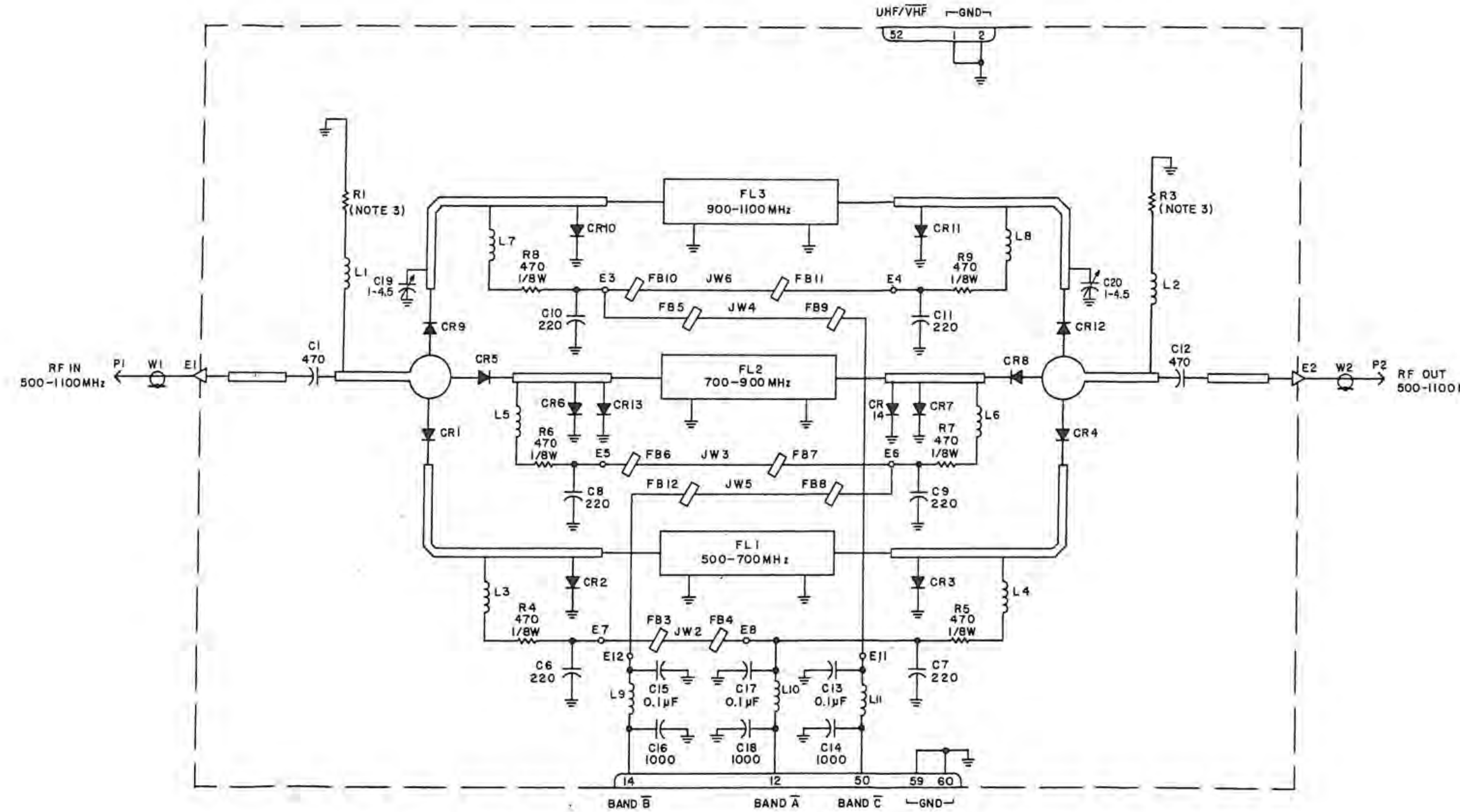


Figure B-8. Type 796414-X, UHF Preselector (A3A1), Schematic Diagram 480604 (E)

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS ±5%, 1/8W.
   b) CAPACITANCE IS IN μF.
2. DIFFERENCE BETWEEN TYPE NO'S IS SHOWN IN TABLE A.

TABLE A

TYPE NO.	JW2	R3	R5	R6	R7	R8	R13	U5	VR1	+V	−V	FL1
796415-1	1-2	1.8K	12K	680	680	1.2K	1.8K	A28	1N751A 5.1V	+15V	−15V	92225
796415-2	1-3	1.5K	10K	560	560	1K	1.2K	A28-2	1N746A 3.3V	+12V	−12V	92225
796415-3	1-2	1.8K	12K	680	680	1.2K	1.8K	A28	1N751A 5.1V	+15V	−15V	92389

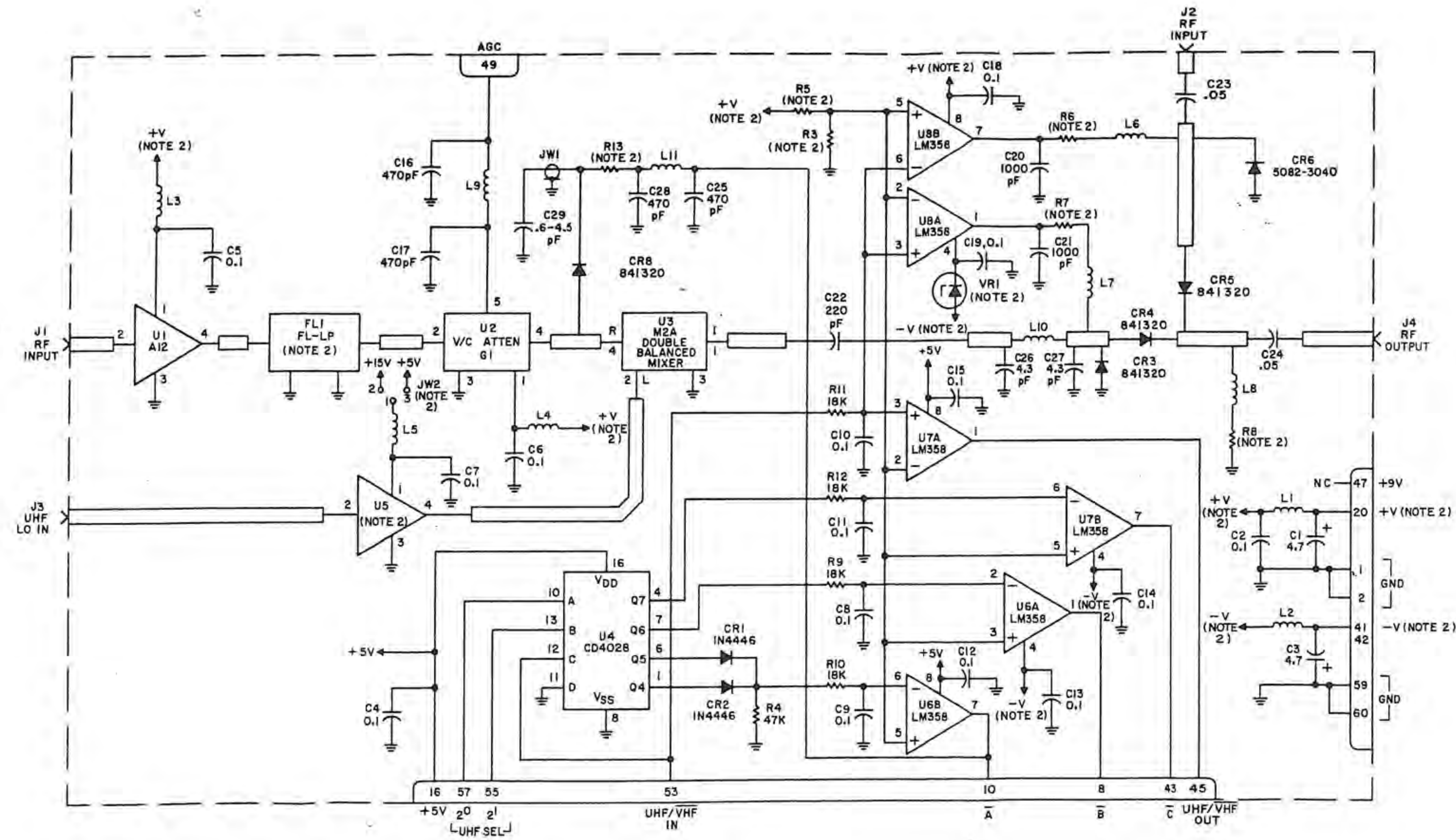


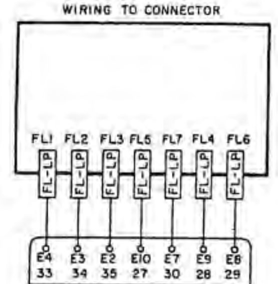
Figure B-9. Type 796415-X, UHF Preamplifier/Mixer (A3A2), Schematic Diagram 480592 (F)

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN pF.
2. DIFFERENCE BETWEEN TYPES IS MECHANICAL ONLY

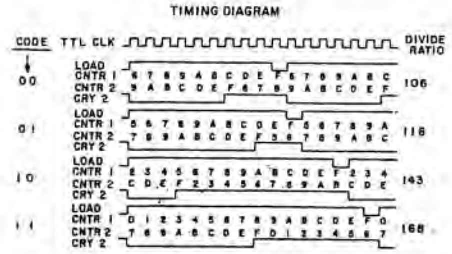
TABLE 1

INPUTS UHF 2^1 2^0		CONTR 1 D C B A	CONTR 2 D C B A
1 0 0	→	0 1 1 0	1 0 0 1
1 0 1	→	0 1 0 1	0 1 1 1
1 1 0	→	0 0 1 0	1 1 0 0
1 1 1	→	0 0 0 0	0 1 1 1

DETAIL A
WIRING TO CONNECTOR



TIMING DIAGRAM



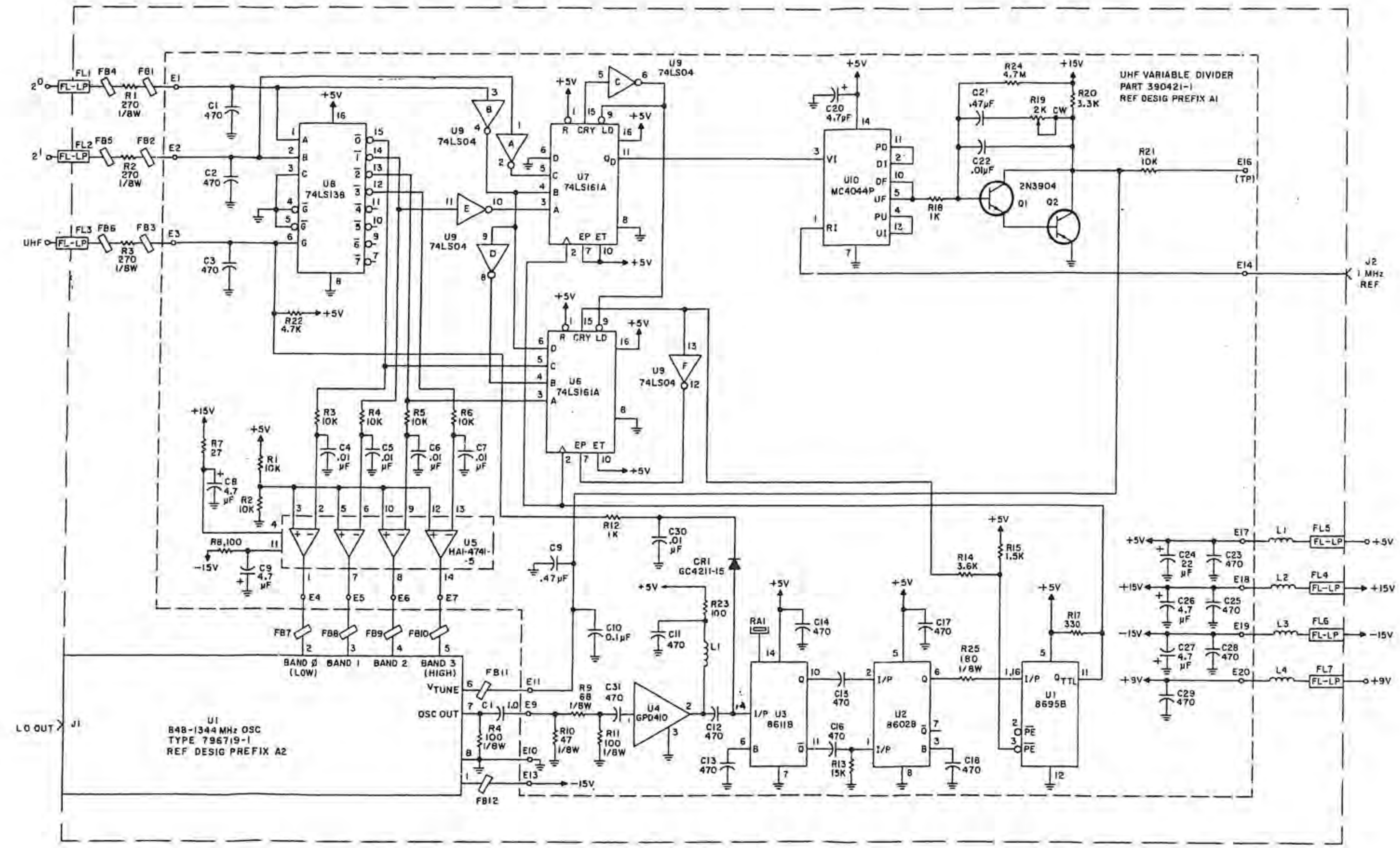


Figure B-10. Type 798079-2, UHF LO Synthesizer (A3A22), Schematic Diagram 590163 (N)

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
b) CAPACITANCE IS IN pF.
c) INDUCTANCE IS IN µH.
2. CR1 THRU CR4 ARE TYPE MA-45240-31.

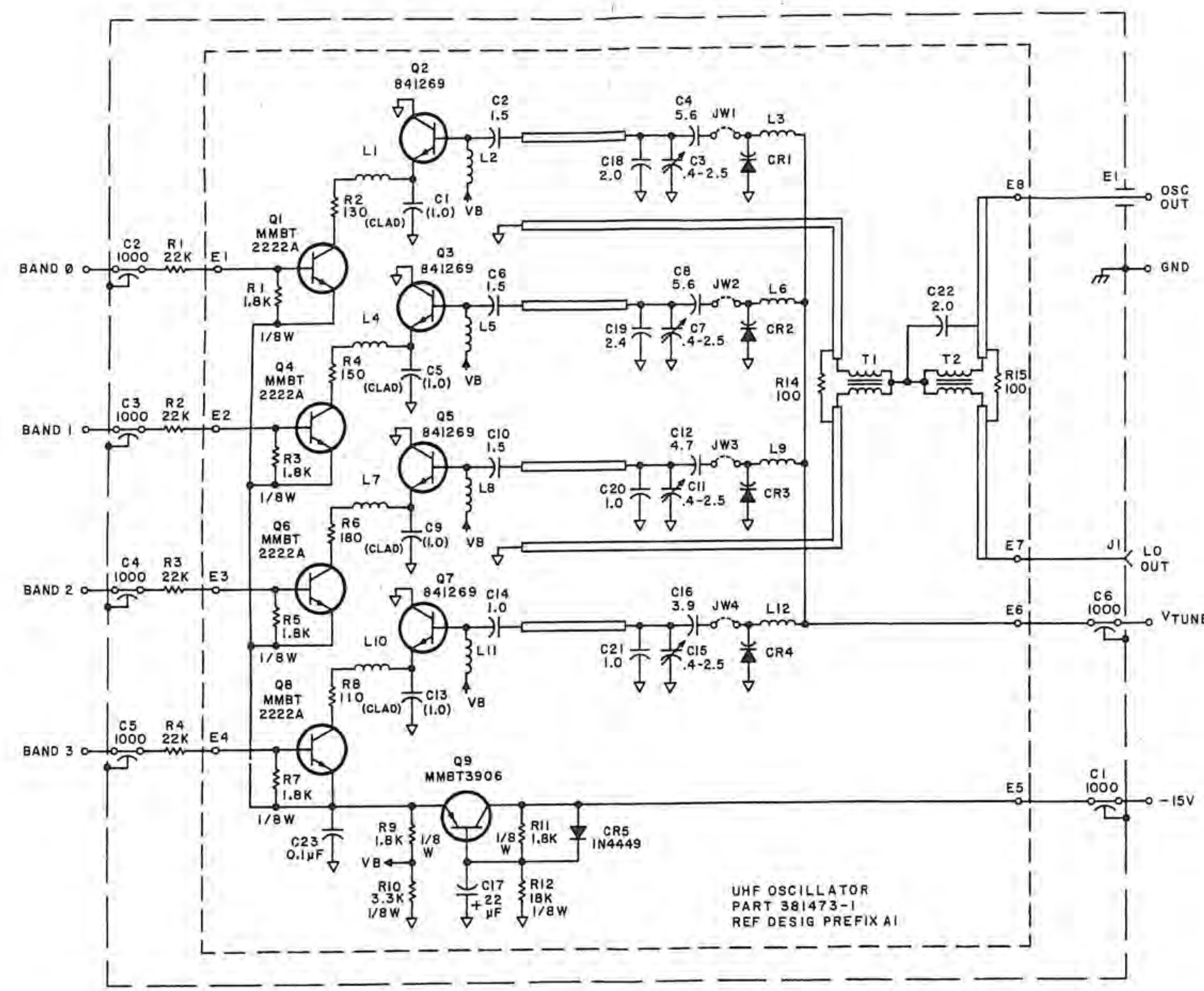


Figure B-11. Type 796719-1, UHF Variable Divider (A3A22A2), Schematic Diagram 481200 (A)

WJ-861X RECEIVER

APPENDIX C

WJ-861X DIGITAL REFRESHED DISPLAY OPTION

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

November 1990

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

PROPRIETARY STATEMENT

TABLE OF CONTENTS

APPENDIX C

LIST OF ILLUSTRATIONS

APPENDIX C

DIGITAL REFRESHED DISPLAY (DRD) OPTION

C.1 GENERAL DESCRIPTION

The Type 796217-1 Digital Refreshed Display (DRD) option is operational in the Scan mode and provides a signal strength vs frequency plot of the frequency band being scanned. To utilize this option, the receiver must be equipped with the Signal Monitor option (SM) or an external display. As the receiver scans, the signal strength is sampled at 256 equally spaced points throughout the Scan and the signal strength data is stored in an on-board memory. The memory locations are then stepped through at a higher rate of speed by an on-board counter reading the stored data and supplying the display with the horizontal and vertical signals needed to generate the signal strength plot. The signal strength data is displayed in ascending frequency order, with the start frequency at the extreme left of the display and the stop frequency at the extreme right.

C.2 INSTALLATION

Most of the connections required by the DRD option are provided at the Option Slot 2 connector of the Digital I/O Motherboard (A5). Generally, installation consists of inserting the board into the slot and making one additional plug connection.

Installation is performed as follows:

1. Remove the top and bottom covers from the receiver.

2. Insert the Type 796217-1 Digital Refresh Display circuit board into Option Slot 2 on the Digital I/O Motherboard (A5). Orient the circuit board such that pin 1 of the board mates with pin 1 of Option Slot 2.

3. (Perform this step when the SM option is installed in the receiver.) From the underside of the receiver, remove plug P38 from J5 (on the Digital Motherboard) and install P38 to the pins of Option Slot 2. Orient the plug such that pin 2 of P38 mates with pin 4 of Option Slot 2 and pin 6 of P38 mates with Option Slot 2 pin 12.

4. If an external display is utilized, check the operating manual of the display unit to determine the polarity of the blanking pulse required (Z axis). The standard receiver chassis is wired to provide a negative blanking pulse. If a positive pulse is required, remove the wire-wrap connection from pin 21 of Option Slot 2 and install at pin 22.

C.3 CIRCUIT DESCRIPTION

C.3.1 FUNCTIONAL DESCRIPTION

When Scan is initiated, the microprocessor divides the Scan band into 256 equal segments and provides the signal strength data obtained in each segment to the DRD memory (U4 and U7). As the first segment is scanned, the signal strength data acquired is written into the DRD memory at address 0. The output of the DRD circuitry is then enabled and the memory is then stepped through at a rapid rate producing the first segment of the signal strength vs frequency trace. When the second segment of the frequency band is scanned, the DRD output is disabled and the signal strength data acquired during the second segment of the Scan is written into memory address 1. The DRD output is again enabled and the on-board counter again steps through the memory locations producing the first and second segments of the signal strength vs frequency trace. This sequence continues until the entire 256 segments have been scanned or until the Scan is halted, due to the acquisition of a signal greater than the programmed COR level or until the receiver is placed into the Scan continue mode of operation. At that time, the memory locations are continuously stepped through by the counter providing a continuous trace of the signals acquired up to that point. When the receiver is returned to the manual operating mode, the DRD output is disabled and the standard signal monitor trace is provided to the display (when the SM option is installed in the receiver).

C.3.2 DETAILED CIRCUIT DESCRIPTION

C.3.2.1 Type 796217-1, Digital Refreshed Display (DRD)

The option designation for this subassembly is DRD. Refer to **Figure C-1** for the Type 796217-1 Digital Refresh Display schematic diagram.

The Type 796217-1 Digital Refreshed Display is comprised of a 1024-byte memory (U10 and U11), a 12-bit binary counter (U12) and two Digital-to-Analog Converters to provide X axis (U14) and Y axis (U13) signals to the display unit. The remaining circuitry comprises the switching circuits to control the DRD operation, under the direction of the microprocessor. Integrated circuits U10 and U11 form the DRD random-access-memory, which is capable of storing up to 1024 8-bit data words. With the standard receiver software, only the first 256 memory locations are utilized providing a single output trace. When data is written into memory, address bus lines A0 through A7 are applied to the memory address inputs, via the switching circuit comprised of U7, U8 and U9. The R/W select input to the W (write enable) input of each memory chip, placing the memory into the write mode, is enabled via decoder U4. Data representing the strength of the acquired signal is then placed on the memory data input lines via octal buffer U1. After the signal data is stored in memory, the microprocessor causes the memory address inputs to be switched from the address bus to the on-board binary counter (U12). U12 then continuously steps through each of the memory locations recalling the data stored at each address. The outputs of U12 are also provided to the data inputs are of D/A converter U14, generating a linear voltage sawtooth that causes the display trace to track horizontally across the CRT face. Since the data recall and the horizontal trace are both synchronized to the outputs of U12, the signal data appears as a vertical deflection at the proper time relationship with the sweep. The output data from the memory is applied to D/A converter U13 producing an analog voltage that is proportional to the magnitude of the data byte. This analog voltage is then applied to the vertical circuitry of the display producing a vertical deflection that is proportional to the signal strength of the signal.

D/A converter U14 produces an output current sink at pin 1 that is capable of sinking from 0 mA, when the inputs at pins 4 through 11 are all at logic "0", to approximately 2 mA, when the inputs are all at logic "1." Each binary input between these two extremes produces a current change that is equal to 1/256 of the total current range. Potentiometer R10 provides a voltage reference for the current amplifier within U14. The output is converted to a voltage sawtooth that varies from -10 V to +10 V by U16B. Resistor R21 controls the offset at the output. Potentiometer R22 adjusts the offset controlling the horizontal placement of the CRT trace and potentiometer R10 adjusts the peak-to-peak output of the sawtooth adjusting the horizontal width of the trace. This output is applied, via U17, to the H output (connector pin 4) and to the EH output (pin 47), via the voltage divider formed by R16, R25 and R19. This voltage divider drops the output voltage to a 1 V peak-to-peak level to be compatible with an external display. The D/A converter and the output circuit comprised of U13 and U16A is identical to the circuitry of U14, except that this circuit produces short duration pulses that range from -.5 V, when the data inputs are all at logic "0", to +.5 V, when the data inputs are all at logic "1". Potentiometer R5 adjusts the vertical amplitude and R7 adjusts the vertical offset controlling the vertical placement of the CRT trace.

Binary counter U12 receives a 31.25 kHz signal from the microprocessor sub-assembly (CLK 5) and utilizes this clock to produce a continuous binary count of from 0 to 1023. The CA0 through CA7 outputs are utilized to step through the DRD memory and to produce a sawtooth output voltage, which drives the display trace. These outputs continuously count from 0 to 255, every 8 msec. The CA7 output of U12 is also utilized to produce a retrace blanking pulse every time the counter passes its maximum count of 255. Integrated circuit U15A is strobed on the 256th count providing a pulse to pin 22 as the +Z output. The inverted blanking pulse provided as a negative going pulse at the -Z output (pin 21).

Integrated circuit U4 decodes the logic levels of inputs A10 and R/W controlling the DRD inputs and outputs. This decoder is enabled when the OE input is "0" and the DBE clock is at "1", to enable the appropriate switching circuits. When A10 and R/W are "0", U4 enables U1 permitting data from the data bus to be written into memory. With A10 at "0" and R/W at "1", U1 is enabled placing data from the DRD memory on the data bus. This permits the microprocessor to read data from the DRD memory, as required. U4 enables control register U2 when the microprocessor is in the write mode (R/W="0") and A10 is at logic "1". A "0" transition at pin 11 of U4 causes the data present on the D0, D1 and D2 data bus lines to be latched at the Q outputs of U2. D0 enables (1) or disables (0) the DRD output and D1 enables (1) or disables (0) the standard signal monitor trace (when installed in the receiver). D2 is provided to enable U3A and U3B when the receiver software utilized contains the capability of a four trace display.

C.4 ALIGNMENT PROCEDURES

Alignment of the Type 796217-1 Digital Refreshed Display consists of setting the offset and gain of the DRD output circuits, as follow:

1. Remove the receiver top cover to provide access to the DRD adjustment potentiometers.

2. Set the receiver to scan between 20 and 30 MHz. Set the COR level to "--" providing a continuous Scan.

3. Connect the HP-8640B signal generator to the ANT 1 input and set the generator to produce a 25 MHz CW output. Adjust the output level to minimum.

4. Adjust R22, on the DRD subassembly centering the trace horizontally on the signal monitor CRT.

5. Adjust R10 until the trace just touches the scale markings at the extreme left and right of the CRT face.

6. Adjust the vertical position of the trace by rotating R7 until the trace is directly under the bottom line of the CRT scale.

7. Increase the signal generator output level until a signal pip, one division in amplitude, is present on the trace.

8. Increase the generator output level by 30 dB and adjust R5 for a pip amplitude of exactly four divisions.

9. If an external display is utilized, adjust R25 to obtain the desired sweep width on the CRT of the display.

C.5 PARTS LIST

C.5.1 TYPE 796217-1 DIGITAL REFRESHED DISPLAY

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision F				
C1	Capacitor, Electrolytic, Tantalum: 10 µF, 20%, 20 V	2	196D106X0020JE3	56289	
C2	Same as C1				
C3	Capacitor, Ceramic, Disc: .1 µF, 20%, 50 V	10	34475-1	14632	
C4	Capacitor, Ceramic, Disc: 2200 pF, 10%, 200 V	1	CK06BX222K	81349	
C5	Capacitor, Mica, Dipped: 47 pF, 2%, 500 V	1	CM04ED470G03	81349	
C6	Capacitor, Electrolytic, Tantalum: 47 µF, 20%, 20 V	3	196D476X0020PE4	56289	
C7	Same as C6				
C8	Same as C6				
C9 Thru C16	Same as C3				
C17	Not Used				
C18	Same as C3				
C19	Capacitor, Mica, Dipped: 470 pF, 2%, 500 V	1	DMLS-471G	72136	
CR1	Diode	2	5082-2811	28480	
CR2	Same as CR1				
R1	Resistor, Fixed, Film: 3.3 kΩ, 5%, 1/8 W	4	CF1/8-3.3 K/J	09021	
R2	Same as R1				
R3	Resistor, Fixed, Film: 2.2 kΩ, 5%, 1/8 W	1	CF1/8-2.2 K/J	09021	
R4	Resistor, Fixed, Film: 470Ω, 5%, 1/8 W	1	CF1/8-470 OHMS/J	09021	
R5	Resistor, Trimmer, Film: 10 kΩ, 10%, 1/2 W	2	62PAR10K	73138	
R6	Resistor, Fixed, Film: 33 kΩ, 5%, 1/8 W	2	CF1/8-33 K/J	09021	
R7	Resistor, Trimmer, Film: 200 kΩ, 10%, 1/2 W	2	62PAR200K	73138	
R8	Resistor, Fixed, Film: 560Ω, 5%, 1/4 W	1	CF1/4-560 OHMS/J	09021	
R9	Resistor, Fixed, Film: 2.4 kΩ, 5%, 1/4 W	1	CF1/4-2.4 K/J	09021	
R10	Same as R5				
R11	Resistor, Fixed, Film: 680Ω, 5%, 1/8 W	2	CF1/8-680 OHMS/J	09021	
R12	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	2	CF1/4-100 OHMS/J	09021	
R13	Resistor, Fixed, Film: 100 kΩ, 5%, 1/8 W	1	CF1/8-100 K/J	09021	
R14	Same as R11				
R15	Same as R12				
R16	Resistor, Fixed, Film: 8.2 kΩ, 5%, 1/8 W	2	CF1/8-8.2 K/J	09021	
R17	Resistor, Fixed, Film: 120 kΩ, 5%, 1/8 W	1	CF1/8-120 K/J	09021	
R18	Same as R16				
R19	Resistor, Fixed, Film: 150Ω, 5%, 1/8 W	1	CF1/8-150 OHMS/J	09021	
R20	Same as R1				
R21	Resistor, Fixed, Film: 22 kΩ, 5%, 1/8 W	1	CF1/8-22 K/J	09021	
R22	Same as R7				
R23	Same as R6				
R24	Resistor, Fixed, Film: 15 kΩ, 5%, 1/8 W	1	CF1/8-15K/J	09021	
R25	Resistor, Trimmer, Film: 500Ω, 10%, 1/2 W	1	62PAR500	73138	
R26	Same as R1				

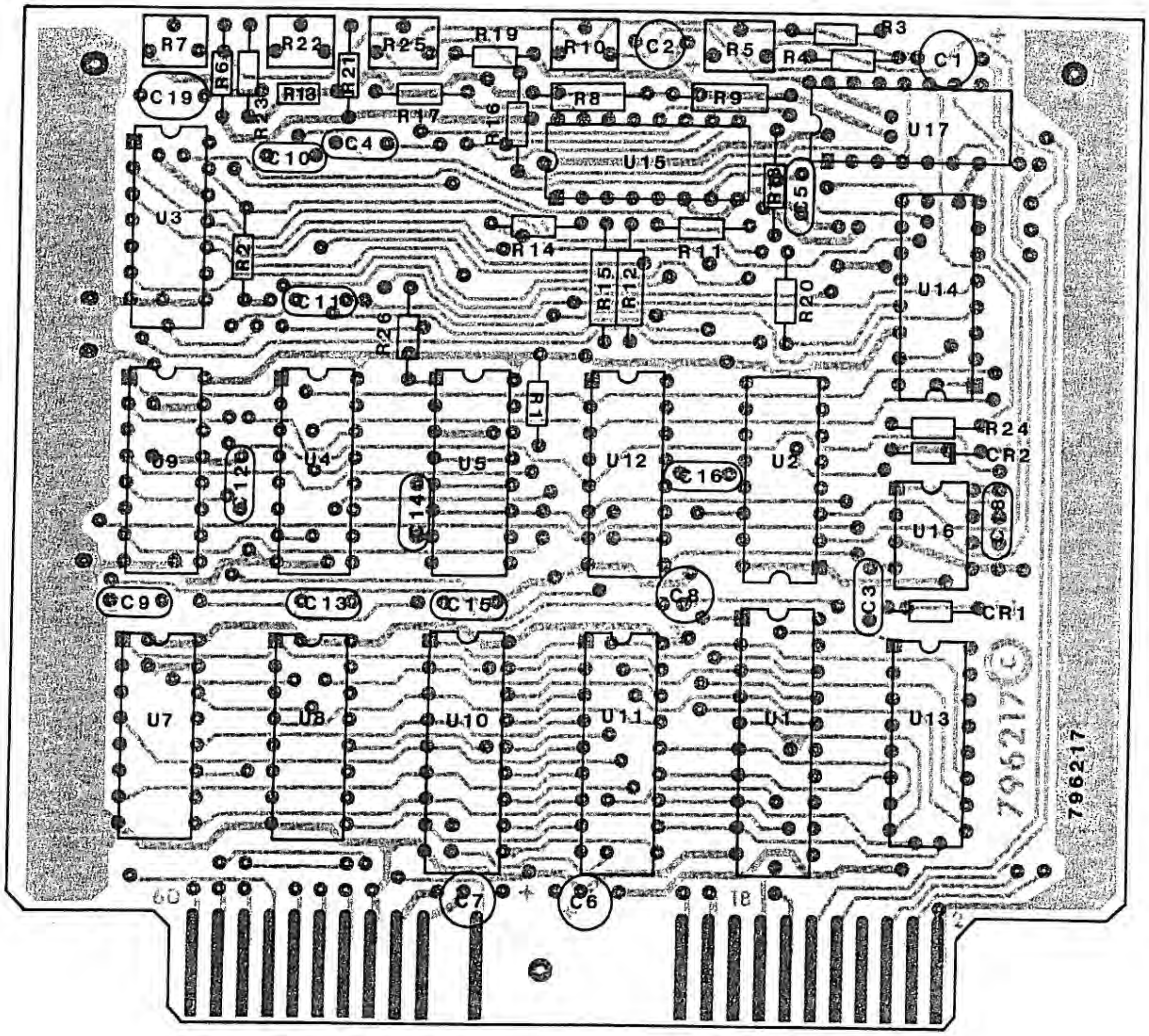


Figure C-1. Type 796217-1 Digital Refreshed Display (Option 2), Location of Components

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
U1	Integrated Circuit	1	MM74HCT245N	27014	
U2	Integrated Circuit	1	MM74C175N	27014	
U3	Integrated Circuit	1	SN74LS02N	01295	
U4	Integrated Circuit	1	SN74LS139N	01295	
U5	Integrated Circuit	1	SN74LS161AN	01295	
U6	Not Used				
U7	Integrated Circuit	3	SN74ALS157N	01295	
U8	Same as U7				
U9	Same as U7				
U10	Integrated Circuit	2	P2114AL4	34649	
U11	Same as U10				
U12	Integrated Circuit	1	CD4040BE	02735	
U13	Integrated Circuit	2	AD7524JN	24355	
U14	Same as U13				
U15	Integrated Circuit	1	SN74LS123N	01295	
U16	Integrated Circuit	1	MC1458N	18324	
U17	Integrated Circuit	1	DG302CJ	17856	

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

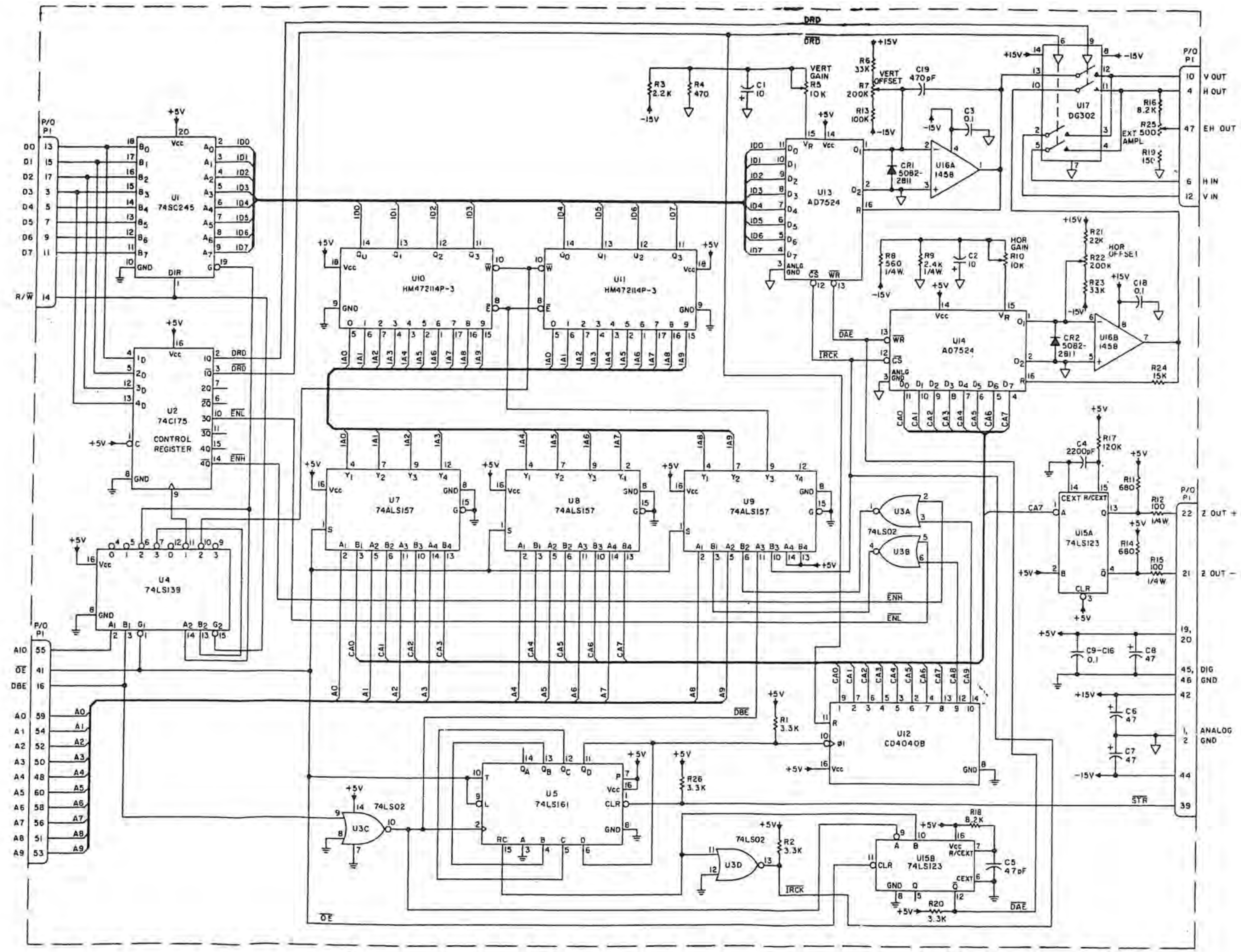


Figure C-2. Type 796217-1, Digital Refresh Display (DRD)
Schematic Diagram 580165 (E)

WJ-861X RECEIVER

APPENDIX D

WJ-861X IEEE-488 REMOTE INTERFACE OPTION

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

November 1990

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

PROPRIETARY STATEMENT

TABLE OF CONTENTS

APPENDIX D

LIST OF TABLES

LIST OF ILLUSTRATIONS

APPENDIX D
IEEE-488 REMOTE INTERFACE OPTION

D.1 GENERAL DESCRIPTION

The IEEE-488 Remote Interface provides talk and listen capabilities between the receiver and external equipment, such as calculators, minicomputers or other IEEE-488 device, utilizing sixteen interconnection lines. These lines consist of eight bi-directional data bus lines, three data byte transfer lines and five management lines. Data or address information is transferred between devices, utilizing the data bus lines. The data byte transfer lines indicate: the availability and validity of the information on the data bus lines; if the devices are ready to accept data; and if the data has been accepted. The interface management lines: specify whether the data bus lines are carrying data or address information; request service; clear the interface; and indicate the end of a transfer sequence. Refer to **Figure D-1.** The capabilities of the IEEE-488 Interface include:

- SH1 Source handshake fully implemented
- AH1 Acceptor handshake fully implemented
- T6 Basic talker with serial poll
- L4 Basic listener with serial poll
- SR1 Service request fully implemented
- DC1 Device clear implemented
- RL0 No remote local capability
- PP0 No parallel polling capability
- C0 No controller capabilities implemented
- DT0 No device trigger capability

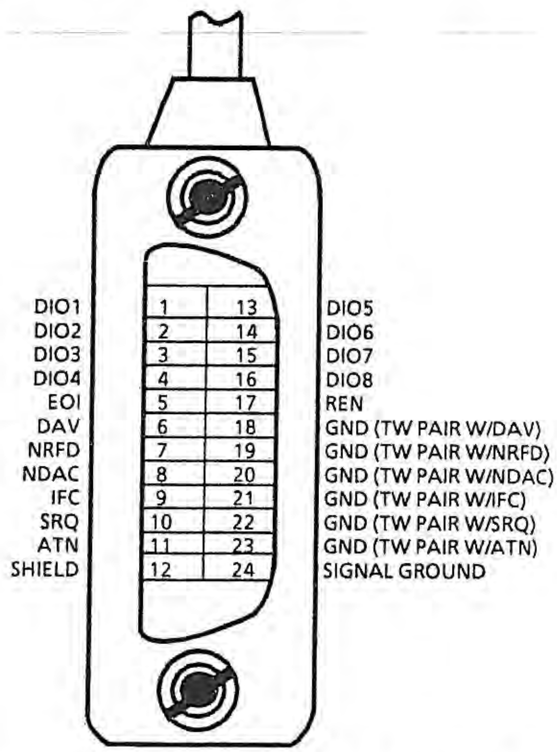


Figure D-1. Configuration of IEEE-488 Data Bus

Essentially, this means that the receiver can talk or listen when commanded by the controller. It can also issue a service request to notify the controller when it needs service. To be compatible, the controller should have the following capabilities:

C1,	C2,	C4,	C27	System controller - single controller system.
AH1,	SH1,	T3,	L1	

Up to fourteen 488 equipped receivers can interface with a single controller, with the controller having the ability to address each receiver individually. A six position DIP switch located on each 488 card is used to set the address of the receiver. Switch positions #1 through #5 allow address settings from 0 (00000) to 30 (11110). 31 (11111) is not a valid address and should not be used. An open switch indicates a logic "1" state and a closed switch indicates a logic "0" state. Switch position #6 should be set to the logic "0"' (closed) position. The address set by the DIP switch is a default position. The address of the receiver may also be set via the front panel. By pressing upper case remote key (488 ADDR), the current address is displayed. The tuning wheel then allows this address to be changed. The last entry changed, either the DIP switch or the front panel, is the actual address that is used. Changing the address with the DIP switch requires the receiver power to be turned off and back on again before the new address is read by the Microprocessor.

D.2 INTERFACE OPERATION

Two types of data transfer are supported on the WJ-861XB Receiver. One type of data transfer on the IEEE-488 interface bus in ASCII. This type of transfer utilizes ASCII mnemonics to control the receiver. The termination may be CR, LF (Carriage Return, Line Feed) or LF (Line Feed) or EOI (End or Identify) set on the last character of the transfer. These mnemonics may be strung together using a semicolon. Another type of data transfer supported by the WJ-861XB Receiver is binary. This type of data transfer allows single information bytes to control the receiver. In the binary operation, each command must end with with EOI (End or Identify) set on the last byte of the command. Commands may not be strung with a semicolon or terminated with CR (Carriage Return) or LF (Line Feed). The ASCII operation format tends to be self-documenting and easy to understand. Binary, on the other hand lessens the number of bytes that must be transferred and has a faster execution speed. In the ASCII format, the message consists of a series of data bytes that form one of the mnemonics listed in **Table D-1.** Each byte is one ASCII character of the mnemonic. When the mnemonic contains a variable value, the mnemonic is followed by a number representing that value. Each digit of the number is comprised of a separate ASCII character. In the binary format, the mnemonic is one 8-bit byte containing the hexadecimal code corresponding to the mnemonic. When a variable value is to be included in the message, it is sent as one or more additional data bytes, representing the binary or hexadecimal value.

In the ASCII mode of operation, the WJ-861XB Remote Interface can accept data at a time of 300 μsec per byte. The overall time to send the message to the receiver is determined by: the number of characters in the message times 300 μsec (or: the number of bytes times the byte transfer time of the controller, whichever is greater). Once the last message byte (line feed) is accepted, the receiver carries out the command within 2 msec. A message such as RFG (n) could take significantly longer due to the receiver's method of updating this parameter. The time required could vary from 2 msec to 20 msec. When a message such as **FRQ?** is sent, the receiver will begin to return data within 2.0 msec of the time that the last message byte was sent. The response is returned at a maximum time of 70 μsec per byte. This time will vary with the speed that the controller can accept the data provided. A typical response to an **FRQ?** is 3.0 msec or less.

The Binary mode of operation permits a faster transfer of data. The interface can accept data at a time of 250 μsec per byte and the message length is considerably shorter. Processing of the message by the receiver is also shorter in this mode. After the last byte of the command is accepted the receiver carries out the message within 1.5 msec.

In both the binary and ASCII modes of the interface, the time lapse from the time the receiver acquires or loses a signal to the time that SRQ (Service Request) is set is determined by the receivers operating mode. When the receiver is at a fixed frequency and a signal comes up above the programmed COR level, the SRQ bit will be set within 2 msec. A loss of the signal causes the receiver to verify that the signal is no longer present. The SRQ is set within 10 msec of signal loss. If the receiver is tuned to a frequency where a signal is present, it sets SRQ in 15 msec. IF it is tuned from an existing signal to a frequency where no signal is present, the SRQ is set in 25 msec.

Table D-1. Table of Mnemonics

Mnemonic	Hex	Dec	Description	Refer to Table
AFC	42	66	Turn AFC on	D-5
AFC/	43	67	Turn AFC off	D-5
AFC?	44	68	Request AFC mode	D-5
AGC	45	69	Turn AGC on	D-5
AGC/	46	70	Turn AGC off	D-5
AGC?	47	71	Request AGC mode	D-5
AM	48	72	Select AM detection mode	D-4
AM?	4A	74	Request AM modulation (0-68)	D-7
ANT(a)	4B(b)	75(b)	Select antenna (1,2)	D-5
ANT?	4D	77	Request selected antenna	D-5
AUD(a)	9F(b)	159(b)	Set audio gain level (0 to 255)*	D-8
AUD?	A1	161	Request audio gain level*	D-8
AUL?	F5	245	Request audio signal level*	D-8
BFO(f)	39(p)	57(p)	Set BFO frequency (±7.99 kHz)*	D-8
BFO?	3B	59	Request BFO frequency*	D-8
BIC?	AA	170	Request reading of error*	D-8
BIN			Causes all future commands to be in binary.	D-2
	55	85	Causes all future commands to be in ASCII	D-2
BIT	A5	165	Cause BITE to start/continue*	D-8
BIT?	A7	167	Request BITE error number*	D-8
BW(a)	4E(b)	78(b)	Select BW slot (1-5) (1-10)*	D-3

(a) - Utilized in a command as an ASCII number or a group of numbers.
(b) - A single byte of binary information.
(f) - Utilized in a command as a group of ASCII numbers representing a frequency. This should not exceed 10 characters, including sign and decimal. Leading and trailing zeroes need not be sent.
(p) - Eight packed BCD digits in four bytes of information.
(__) - Represents the default mode.
(*) - Receiver must have appropriate option for command to be supported.

Table D-1. **Table of Mnemonics** (Continued)

Mnemonic	Hex	Dec	Description	Refer to Table
BW?	50	80	Request BW slot selected	D-3
BWC?	9C	156	Request BW size	D-3
CLM	6C	108	Clear receiver & memory	D-5
CLR	51	81	Clear receiver	D-5
COR(a)	57(b)	87(b)	Set COR level 0-40/or NRT level 00-20*	D-5
COR?	59	89	Request COR level/or NRT level*	D-5
CST?	9B	155	Request COR status	D-5
CW	5A	90	Select CW detection mode	D-4
DET?	5F	95	Request detection mode selected	D-4
DWL(a)	60(b)	96(b)	Select DWELL time period	D-5
DWL?	62	98	Request DWELL number	D-5
ERR?	65	101	Request Error number	D-2
EXC	66	102	Execute current parameters	D-6
FBW	D8	216	Take full bandwidth steps in SCAN	D-3
<u>FBW/</u>	D9	217	Take 1/2 bandwidth steps in SCAN	D-3
FBW?	DA	218	Request selected bandwidth mode	D-3
FM	69	105	Select FM detection mode	D-4
FM?	6B	107	Request FM modulation 0-100	D-7
FMO?	AD	173	Request reading of offset 0-255	D-7
FRQ(a)	3C(p)	60(p)	Set tuned frequency in MHz	D-5
FRQ?	3E	62	Request tuned frequency	D-5
GEN	E1	225	Turn BITE signal generator on*	D8
<u>GEN/</u>	E2	226	Turn BITE signal generator off*	D8
GEN?	E3	227	Request status of BITE generator*	D8
LCK	94	148	Lock-Out current parameters	D-6
LGV?	71	113	Request reading of Log Video	D-7
LLO	F9	249	Enable local lockout of front panel	D-2
<u>LLO/</u>	FA	250	Disable local lockout	D-2
LLO?	FB	251	Request local lockout status	D-2
LSB	72	114	Select LSB detection mode*	D-4
<u>MAN</u>	75	117	Select Manual operation	D-6
MOD?	B3	179	Request operation mode	D-6

(a) - Utilized in a command as an ASCII number or a group of numbers.
(b) - A single byte of binary information.
(p) - Eight packed BCD digits in four bytes of information.
(__) - Represents the default mode.
(*) - Receiver must have appropriate option for command to be supported.

Table D-1. Table of Mnemonics (Continued)

Mnemonic	Hex	Dec	Description	Refer to Table
NRT	B4	180	Select NRT mode*	D-8
NRT/	B5	181	Disable NRT mode*	D-8
NRT?	B6	182	Request NRT status*	D-8
OPT?	DD	221	Request options installed	D-8
PLS	78	120	Select Pulse detection mode	D-4
RCL(a)	7B(b)	123(b)	Select Recall operation	D-6
RCL?	7D	125	Request current channel;	D-6
RFG(a)	7E(b)	126(b)	Enter RF Gain (0-255)	D-5
RFG?	80	128	Request RF Gain	D-5
RLG	FC	252	Enable RLOG*	D-8
RLG/	FD	253	Disable RLOG*	D-8
RLG?	FE	254	Request RLOG status*	D-8
RMT	81	129	Select Remote operation	D-2
RMT/	82	120	Disable Remote	D-2
RMT?	83	131	Request control mode	D-2
SCN(a)	84(b)	132(b)	Select Scan operation	D-6
SS?	89	137	Request Signal Strength in dBm	D-7
STO(a)	8A(b)	138(b)	Store current parameters	D-6
STP(a)	8D(b)	141(b)	Select Step operation	D-6
STS(a)	90(b)	144(b)	Sets status byte	D-2
STS?	92	146	Request device status	D-2
TIM(hh:mm)	AE(b)(b)	174(b)(b)	Set Time function*	D-8
TIM?	B0	176	Request Time setting*	D-8
USB	93	147	Select USB detection mode*	D-4
VER?	E0	224	Request Software version	D-5
VID(a)	A2(b)	162(b)	Set Video level (0 to 255)*	D-8
VID?	A4	164	Request Video level*	D-8
VIL?	F8	248	Request Video Signal level*	D-8

(a) - Utilized in a command as an ASCII number or a group of numbers.
(b) - A single byte of binary information.
(p) - Eight packed BCD digits in four bytes of information.
(__) - Represents the default mode.
(*) - Receiver must have appropriate option for command to be supported.

D.2.1 DEVICE DEPENDENT COMMANDS

The tables (**Tables D-2** through **D-8**) that follow provide a more detailed description of the commands listed in **Table D-1.** The commands and responses are grouped according to their command category and are provided with their ASCII, Hexidecimal and Decimal equivalents.

The command columns list messages that can be applied to the WJ-861XB Receiver as an active listener. Responses returned are messages returned when the receiver is a talker. ASCII messages may be applied with embedded spaces or any combination of upper and lower case characters. Refer to **paragraph D-1,** for specific requirements of IEEE-488 operation.

The receiver must be in the remote mode of operation to accept commands that will change operations. Queries are valid in both local and remote modes or operation.

Table D-2. WJ-861XB Configuration Commands and Responses

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
BIN						Causes all future expected commands to be in binary.
	55	85				Causes all future expected commands to be in ASCII. (default)
ERR?	65	101	ERR(b)	63(b)	99(b)	Returns a number (0-99) representing the two least significant digits of the error code. Zero indicates no error. Reading this register clears it.
LLO	F9	249				Causes front panel to be locked out from operator. A power-up or return to local operation will cancel LLO.
LLO/	FA	250				Cancel LLO.
LLO?	FB	251	LLO LLO/	F9 FA	249 250	Request Local Lockout status.
RMT	81	129				Select remote operation. Allows the receiver to accept commands that change operating parameters.
RMT/	82	130				Activate local operation. Only queries are allowed in this mode.
RMT?	83	131	RMT RMT/	81 82	129 130	Requests control mode (Remote/Local).
STS(a)	90(b)	144(b)				Sets status byte to cause receiver reactions in accordance with the variable (a) sent. Variables are ORED together when multiple STS(a) commands are sent. STS0 must be sent to reset status byte. STS 0 is the default. a = 0 - Resets all bits of Status byte to 0.

(a) - Utilized in a command as an ASCII number or a group of numbers.
(b) - A single byte of binary information.
(__) - Represents the default mode.
* - Receiver must have appropriate option for this command to be supported.

Table D-2. WJ-861XB Configuration Commands and Responses (Continued)

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
						a = 1 - Send SRQ on signal acquisition. a = 2 - Cause AGC dump on new frequencies.* a = 4 - Cause receiver to enter into Scan Continue or Step Continue mode on signal acquisition. a = 8 - Cause receiver to enter into Scan Continue mode at the end of a Scan sequence.
STS?	92	146	STS(a)	90(b)	144(b)	Request device status command. Note this command does not respond with the value sent in STS. This command provides information contained in the serial poll status byte. Bit — Function 0 — Signal above COR level. 1 — Unit power-up or IEEE-488 DCL OR SDC activated SRQ. 2 — BITE activated SRQ. (Cleared by BIT?). 3 — Indicates end of scan sequence (Reset by serial poll followed SCN) 4 — Receiver responding to query. 5 — Unit error activated SRQ. (Cleared by ERR?) 6 — SRQ activated by this unit. (Cleared by serial poll followed by STS?) 7 — Not Utilized.

(a) - Utilized in a command as an ASCII number or a group of numbers.
(b) - A single byte of binary information.
(__) - Represents the default mode.
* - Receiver must have appropriate option for this command to be supported.

IF bandwidths for the receiver are controlled using the following commands and responses.

Table D-3. WJ-861XB Bandwidth Commands and Responses

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
BW(a)	4E(b)	78(b)				Select BW slot 1-5. 1-10 in 10 bandwidth receivers*. (WJ-861XB does not allow selection of empty BW slot).
BW?	50	80	BW(a)	4E(b)	(78(b)	Request which slot is selected. (BW 1 is default)
BWC?	9C	156	BWC(c)	9A(b)(b)	154(b)(b)	Request size of selected BW. (number returned in ASCII is in kHz). (Number returned in binary is a 2 byte (16 bit) binary number representing kHz). 6.4 kHz is returned as 6 kHz; 3.2 kHz is returned as 3 kHz.
FBW	D8	216				Select full bandwidth increments in SCAN. (truncated to kHz)
FBW/	D9	217				Select 1/2 bandwidth increments in SCAN. (truncated to kHz)
FBW?	DA	218	FBW FBW/	D8 D9	216 217	Request bandwidth mode selected.

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data represenitng a number.

(b) - A single byte of binary information.
(c) - Utilized in a response as 4 bytes of ASCII data representing a number.
(__) - Represents the default mode.
* - Receiver must have appropriate option for this command to be supported.

Detection modes for the receiver are selected using the following commands and responses.

Table D-4. WJ-861XB Detection Commands and Responses

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
<u>AM</u>	48	72				Select AM detection mode.
CW	5A	90				Select CW detection mode.
FM	69	105				Select FM detection mode.
PLS	78	120				Select PULSE detection mode.
LSB	72	114				Select LSB detection mode.*
USB	93	147				Select USB detection mode.*
DET?	5F	95	<u>AM</u>	48	72	Request mode of detection selected.
			CW	5A	90	
			FM	69	105	
			PLS	78	120	
			LSB	72	114	*
			USB	93	147	*

(__) - Represents the default mode.
* - Receiver must have appropriate option for this command to be supported.

Miscellaneous control of the receiver is applied using the following commands and responses.

Table D-5. WJ-861XB Miscellaneous Control Commands and Responses

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
AFC	42	66				Turn AFC on.
AFC/	43	67				Turn AFC off.
AFC?	44	68	AFC/ AFC	42 43	66 67	Request AFC mode.
AGC	45	69				Turn AGC on.
AGC/	46	70				Turn AGC off.
AGC?	47	71	AGC AGC/	45 46	69 70	Request AGC mode.
ANT(a)	4B(b)	75(b)				Select antenna. (1, 2)
ANT?	4D	77	ANT(a)	4B(b)	75(b)	Request the selected antenna. (ANT 1 is default)
CLR	51	81				Clear receiver. All conditions to default. Memory not affected.
CLM	6C	108				Clear receiver. All conditions to default. Memory cleared.
COR(a)	57(b)	87(b)				Set COR level (0-40 = on, 41 = off). Level is ≈ 1 dB steps starting at noise floor of selected IF BW. (COR 0 is default)
COR?	59	89	COR(a)	57(b)	87(b)	Request the COR level.
CST?	9B	155				What is COR status?
			CST CST/	99 9A	153 154	Signal is above COR. Signal is below COR.

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.

(__) - Represents the default mode.

Table D-5. WJ-861XB Miscellaneous Control Commands and Responses (Continued)

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
DWL(a)	60(b)	96(b)				Select the Dwell time for scan or step operation. This may be pre or post Dwell based on internal receiver configuration. The range of Dwell is from 0-2 seconds represented by a number from (0-255). Actual time is represented by $(2^{a/32}x8)-8$ in ms.
DWL?	62	98	DWL(a)	60(b)	96(b)	Request Dwell number. (DWL 0 is default).
FRQ(f)	3C(p)	60(p)				Set the tuned frequency in MHz. (0-1100 in .0001 MHz steps.) (Binary mode is packed BCD always 4 bytes.) (Upper limit 500 MHz without FE option.)* (Lower limit is 20 MHz without HFE, LFE or ELF.)*
FRQ?	3E	62	FRQ(f)	3C(p)	60(p)	Request tuned frequency. (20 MHz is default.)
RFG(a)	7E(b)	126(b)				Enter RF Gain number (0-255). 0 = minimum gain, 255 = maximum gain.
RFG?	80	128	RFG(a)	7E(b)	126(b)	Request RF Gain number. (0-255) (The RF Gain 0 is default.)
VER?	E0	224	VER - 861XB ---- X.X.X ----	DE'VER -861XB ---- X.X.X ----		The version response includes model and software revision. Response in binary mode is a HEX DE followed by ASCII data string terminated with EOI.
VID(a)	A2(b)	162(b)				Set Video Gain level (0 to 255).*
VID?	A4	164	VID(a)	A2(b)	162(b)	Request Video gain level.*

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.

(f) - Utilized in a command as a group of ASCII numbers representing a frequency. This should not exceed 10 characters, including sign and decimal. Leading and trailing zeros need not be sent.

(p) - Eight packed BCD digits in four bytes of information.

(__) - Represents the default mode.

* - Receiver must have appropriate option for this command to be supported.

Control of the receiver is applied using the following commands and responses.

Table D-6. WJ-861XB Receiver Mode Control Commands and Responses

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
EXC	66	102				Execute current parameters (only valid in Recall mode).
LCK	94	148				Lockout current frequency using bandwidth size, for lockout width.
LCK?	96	150	LCK LCK/	94 95	148 149	Request Lockout status of last recalled channel. If the recalled channel was a lockout the response is LCK. If not a lockout response is LCK/.
<u>MAN</u>	75	117				Select Manual operation (to exit Scan or Step, send MAN command twice).
MOD?	B3	179				Request mode of operation.
			<u>MAN</u>	75	117	Manual
			RCL	7B	123	Recall
			SCN	84	132	Scanning
			SCM	B2	178	Scan Continue
			STP	8D	141	Stepping
			STM	B1	177	Step Continue
			BIT	A5	165	Bite Mode
			BIM	A6	166	BITE manual indicates BITE has halted because of a failure.
STO(a)	8A(b)	138(b)				Store current parameters in channel (0-95).
RCL(a)	7B(b)	123(b)				Select Recall operation. Recall parameters in channel (0-95).
RCL?	7D	125	RCL(a)	7B(b)	123(b)	Request current channel number.
SCN	84	132				Cause active Scan to be advanced if the receiver has stopped on a signal. If the mode is SCM the SCN command will cause the receiver to return to the SCN mode.

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.

(__) - Represents the default mode.

Table D-6. WJ-861XB Receiver Mode Control Commands and Responses (Continued)

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
SCN(a)	84(b)	132(b)				Scan the channels indicated in the argument. If the channel number is odd the Scan is from the frequency in the preceding even channel to the frequency in the specified channel. If the channel number is even a sector scan is performed for each channel pair starting with zero ending with the specified channel.
STP	8D	141				Cause an active Step to be advanced if the receiver has stopped on a signal. If the mode is STM the STP command will cause the receiver to return to the STP mode.
STP(a)	8D(b)	141(b)				Select Step operation. Start with channel 0 and step to channel number in STP command.

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.

(__) - Represents the default mode.

Signal information for the receiver is applied using the following commands and responses.

Table D-7. **WJ-861XB Signal Information Commands and Responses**

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
AM?	4A	74	AM(a)	48(b)	72(b)	Request reading from AM modulation. 000-068 Range
FM?	6B	107	FM(a)	69(b)	105(b)	Request reading from FM modulation. 000-100 Range
FMO?	AD	173	FMO(a)	AB(b)	171(b)	Request reading of FM offset. 000-255 Range
LGV?	71	113	LGV(a)	6F(b)	111(b)	Request reading of Log Video. 000-080 Range
SS?	89	137	SS(a)	87(b)	135(b)	Request reading of Signal Strength in dBm. (In manual, gain represents % of AM Detector (000-100).)

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.

Optional commands are applied to the receiver using the following commands and responses.

Table D-8. WJ-861XB Optional Commands and Responses

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
OPT?	DD	221	OPT (a),(a), (a)	DB (b)(b)(b)		Requests the options in the receiver. The response is returned as 3 byte encoded numbers. Each number has a range from 0 to 255. The bit values are indicated below: BIT BYTE 1 BYTE 2 BYTE 3 VALUE 0 RTC LFE PSS 1 1 EM HFE 488 2 2 LCK FEX 232 4 3 TPC FE ASO 8 4 RLOG SSB DAV 16 5 CUR VBFO MX 32 6 M/S BIT - 64 7 SLO NRT - 128
<u>BITE Option</u>						
BIT	A5	165				This command enables BITE mode. It starts BITE if current operating mode is other than BITE. It continues the BITE operation if the current mode is BITE active.
BIT?	A7	167	BIT(a)	A5(b)	165(b)	This command returns the current BITE test number. If a 0 is returned it indicates BITE has completed. Reading this register causes bit 2 of the status byte (STS?) to be cleared.

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.

(f) - Utilized in a command as group of ASCII numbers representing a frequency. This should not exceed 10 characters, including sign and decimal. Leading and trailing zeros need not be sent.

(p) - Eight packed BCD digits in four bytes of information.

(_) - Represents default mode.

Table D-8. **WJ-861XB Optional Commands and Responses** (Continued)

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
BIC?	AA	170	BIC(a)	A8(b)	168(b)	This command returns the last A/D reading used for a failed BITE test. Refer to the BITE option manual for the range of the returned number and its meaning.
GEN	E1	225				This command allows the BITE Signal Generator to be turned on while in manual mode.
GEN/	E2	226				Turn Bite signal generator off.
GEN?	E3	227	GEN GEN/	E1 E2	225 226	Request status of BITE generator.
BFO Option						
BFO(f)	39(p)	57(p)				Set BFO frequency in kHz. (-7.99 to +7.99). Binary is sent as four packed BCD bytes. The sign is bit 3 of second byte. First and last byte are zeros. Byte 2 is kHz, Byte 3 is 100s of Hz, and 10s of Hz.
BFO?	3B(p)	59	BFO(-)(f)	39(p)	57(p)	Request BFO frequency. (0 kHz is default)
DAV Option						
AUD(a)	9F(b)	159(b)				Set audio gain level (0-255).
AUD?	A1	161	AUD(a)	9F(b)	159(b)	Request audio gain level.
AUL?	F5	245	AUL(a)	F3(b)	243(b)	Request the audio signal level. The number returned is between 0 and 99. Zero represents no audio energy and 99 maximum audio energy.

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.

(f) - Utilized in a command as a group of ASCII numbers representing a frequency. This should not exceed 10 characters, including sign and decimal. Leading and trailing zeros need not be sent.

(p) - Eight packed BCD digits in four bytes of information.

(_) - Represents default mode.

Table D-8. WJ-861XB Optional Commands and Responses (Continued)

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
VID(a)	A2(b)	162(b)				Sets video gain level (0-255).
VID?	A4	164	VID(a)	A2(b)	162(b)	Request video gain level.
VIL?	F8	248	VIL(a)	F6(b)	246(b)	Request the video signal level. The number returned is between 0 and 99. Zero represents no video energy and 99 maximum.
<u>NRT Option</u>						
NRT	B4	180				Enables NRT.
NRT/	B5	181				Disables NRT.
NRT?	B6	182	NRT NRT/	B4 B5	180 181	Requests NRT status.
COR(a)	57(b)	87(b)				Sets NRT level (0-20).
COR?	59	89				Requests set NRT level.
<u>RTC Option</u>						
TIM (HH: MM)	AE(b) (b)	174(b) (b)				Set time in hours and minutes. Seconds are set to 0 upon receiving this command. (ASCII format is HH:MM) (Binary is 2 packed BCD bytes, the first byte is hours and the second byte is minutes.)
TIM?	B0	176	TIM (HH:M M:SS)	AE(b) (b)(b)	174(b) (b)(b)	Request time. Returns hours, minutes and seconds. (ASCII format is HH:MM:SS) (Binary is 3 packed BCD bytes, hours, minutes and seconds.)

(a) - Utilized in a command as an ASCII number or a group of numbers.
 - Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.
(b) - A single byte of binary information.
(f) - Utilized in a command as group of ASCII numbers representing a frequency. This should not exceed 10 characters, including sign and decimal. Leading and trailing zeros need not be sent.
(p) - Eight packed BCD digits in four bytes of information.
(_) - Represents default mode.
* - Receiver must have appropriate option for this command to be supported.

Table D-8. **WJ-861XB Optional Commands and Responses** (Continued)

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
RLOG Option						
*RLG	FC	252				Enables RLOG mode.
*RLG/	FD	253				Disables RLOG mode.
*RLG?	FE	254	RLG RLG/	FC FD	252 253	Requests RLOG status.

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.

(f) - Utilized in a command as group of ASCII numbers representing a frequency. This should not exceed 10 characters, including sign and decimal. Leading and trailing zeros need not be sent.

(p) - Eight packed BCD digits in four bytes of information.

(_) - Represents default mode.

* - Receiver must have appropriate option for this command to be supported.

The response to an **AM?** mnemonic is a number from 000 to 068 representing the level of AM Video present at the output of the receiver. Each unit increment represents approximately 13 mV rms of AM Video. For **FM?**, the response is a number ranging from 000 to 100, representing the percentage of FM modulation. Each unit increment represents a 1 percent increment with 100 equaling 100% modulation and 000 equaling no modulation. For **FMO?**, the response is a number from 0-255, representing the FM Discriminator offset. The number 127 represents a signal at tuned frequency. For tuned frequencies of 500 MHz or less, received signals greater than the tuned frequency produce returned values less than 127 and for received signals less than the tuned frequency, returned values are greater than 127. However, if the Frequency Extender option is installed and the receiver tuned frequency is greater than 500 MHz, the returned values are reversed. Thus, when the receiver is tuned to 600 MHz and the received signal frequency is greater than the tuned frequency the returned number is greater than 127 and when the signal frequency is less than the tuned frequency, the returned number is less than 127.

LGV? provides a number from 000 to 080 representing the Log video level of the receiver. This number represents the signal level above the theoretical noise floor of the receiver, with each unit increment representing approximately a 0.5 dB change. 000 represents the theoretical noise floor and 080 represents 40 dB above that level.

The response to **SS?** provides a signal strength number in dBm from -125 to -20. In manual gain this number represents the level of the AM detector from 0-100%.

The WJ-861XB Receiver is capable of activating the SRQ line indicating controller service is required. Four different stimuli cause the receiver to set the SRQ line indicating the reasons for this assertion. These include: errors, power-up, clear and signal activity. If an error occurs during operation of the receiver, it sets the SRQ line and bits 5 and 6 of the status byte. If the BITE option is installed, the completion of BITE or upon an error acquisition, SRQ is set with bits 2 and 6 of the status byte. When the receiver is powered-up or sent SDC or DCL commands, it sets SRQ and bits 1 and 6 of the status byte.

The remaining stimuli that cause the SRQ line to become active is the acquisition or loss of a signal (signal level above or below COR level). This sets bit 6 of the status byte. Signal activity SRQ must be enabled by sending STS 1 to enable this interrupt.

A serial poll clears the SRQ line as defined by the IEEE-488 specification. The status byte read by the computer while doing the serial poll is defined in **Table D-9.**

Table D-9. SRQ Status Byte

Bit	Set Indicates	Cleared Indicates	Cleared By
0	Signal above COR	No signal above COR	Non-latched indicator
1	Unit Power-up SRQ		Requesting receiver status (device dependent command)
2	BITE complete or error found		Requesting BITE status (device dependent command)
3	End of Scan sequence (when status byte previously set with STS 8)		Reset by serial poll followed by SCN
4	Responding to request for data		Non-latched indicator
5	Error condition occurred	Error condition cleared	Requesting Error status (device dependent command)
6	SRQ has occurred	SRQ not active from this device	Requesting Receiver status or Error status (device dependent command)

As a response to an **STS?** instruction or serial poll, a status byte is returned to indicate the receiver status. This response is a three-digit decimal number that corresponds to the binary number contained in the returned byte (0 = 00000000; 127 = 01111111).

D.2.2 EXAMPLES OF REMOTE OPERATION

The examples that follow (**Tables D-10** through **D-15** provide examples of control operations, using an HP85 as a controlling device. These examples are shown in the ASCII and binary modes. Similar type messages will use a similar format.

Table D-10. Sending a Tuned Frequency of 25 MHz to the WJ-861XB Using as HP85 (WJ-861XB Device #6)

Message: Send tuned frequency of 25.0000 MHz

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 706 using "K"; "FRQ25" ASCII message may have leading zeros. Total none blank character count 15, for single commands. Exponential format is not supported. IE: "FRQ 0025.0000 is valid message. EOI may be terminator.	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
	3	1	0	26		861XB LISTEN
	4	0	0	46	F	
	5	0	0	52	R	DATA TO
	6	0	0	51	Q	WJ-861XB
	7	0	0	32	2	
	8	0	0	35	5	
	9	0	0	0D	(CR)	
	10	0	0	0A	(LF)	TERMINATOR

Binary Mode	#	ATN	EOI	HEX	DEC	Comment
*Print using "B"; 60, 0, 37, 0, 0 All bytes must be sent with no spaces or terminator characters.	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
	3	1	0	26		861XB LISTEN
	4	0	0	36	60	FREQ CODE
	5	0	0	00	0	BYTE 1
	6	0	0	25	37	BYTE 2
	7	0	0	00	0	BYTE 3
	8	0	1	00	0	BYTE 4

*Control Statement: Control 7,16; 128 (sets HP85 to EOI terminator for printer messages).
Printer is 706 (directs print statements to WJ-861XB).

Table D-11. Sending a COR "OFF" Command

Message: Send COR off (41)

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 706 using "K"; "COR 41"	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
	3	1	0	26		861XB LISTEN
	4	0	0	43	C	DATA TO
	5	0	0	4F	O	WJ-861XB
	6	0	0	52	R	
	7	0	0	34	4	
	8	0	0	31	1	
	9	0	0	0D	(CR)	
	10	0	0	0A	(LF)	TERMINATOR
Binary Mode	**#**	**ATN**	**EOI**	**HEX**	**DEC**	**Comment**
*Print using "B"; 87, 41	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
	3	1	0	26		861XB LISTEN
	4	0	0	57	87	COR CODE
	5	0	1	29	41	VALUE

*Control Statement: Control 7,16; 128 (sets HP85 to EOI terminator for printer messages).
Printer is 706 (directs print statements to WJ-861XB).

Table D-12. Sending a Frequency Request

Message: Request Frequency (assume 25 MHz last sent)

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 706 using "K"; "FRQ"	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
Instruct WJ-861XB to prepare to output frequency information when made a talker.	3	1	0	26		861XB LISTEN
	4	0	0	46	F	
	5	0	0	52	R	DATA TO
	6	0	0	51	Q	WJ-861XB
	7	0	0	3F	?	
	8	0	0	0D	(CR)	
	9	0	0	0A	(LF)	TERMINATOR
Enter 706; A$	10	1	0	3F		UNLISTEN
	11	1	0	35		HP85 LISTEN
	12	1	0	46		861XB TALK
	13	0	0	46	F	
	14	0	0	52	R	
	15	0	0	51	Q	DATA FROM
A $ will contain "FRQ 0025.0000".	16	0	0	20		WJ-861XB
	17	0	0	30	0	
	18	0	0	30	0	
	19	0	0	32	2	
Frequency response is always 15 characters.	20	0	0	35	5	
	21	0	0	2E	.	
	22	0	0	30	0	
	23	0	0	30	0	
	24	0	0	30	0	
	25	0	0	30	0	
	26	0	0	0D	(CR)	
	27	0	1	0A	(LF)	TERMINATOR

Table D-12. Sending a Frequency Request (Continued)

Binary Mode	#	ATN	EOI	HEX	DEC	Comment
*Print using "B"; 62	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
	3	1	0	26		861XB LISTEN
	4	0	1	3E		REQUEST FREQUENCY
Enter 706 using "#%, #%K"; A$	1	0	3F			UNLISTEN
	1	0	35			HP85 LISTEN
Image causes enter to terminate on EOI only.	1	0	46			861XB TALK
	0	0	3C	60		FREQ CODE
	0	0	00	0		BYTE 1
A$ will contain frequency data in packed BCD.	0	0	25	37		BYTE 2
	0	0	00	0		BYTE 3
	0	1	00	0		BYTE 4

*Control Statement: Control 7,16; 128 (sets HP85 to EOI terminator for printer messages).
Printer is 706 (directs print statements to WJ-861XB).

Table D-13. Sending a Bandwidth Size Request

Message: Request size of selected IF bandwith (assume 10 kHz)

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 706 using "K"; "BWC?"	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
Instruct 861XB to output size of selected BW in kHz when made an active talker.	3	1	0	26		861XB LISTEN
	4	0	0	42	B	
	5	0	0	57	W	DATA TO
	6	0	0	43	C	WJ861XB
	7	0	0	3F	?	
	8	0	0	0D	(CR)	
	9	0	0	0A	(LF)	TERMINATOR
Enter 706; A$	10	1	0	3F		UNLISTEN
A$ will contain "BWC 10".	11	1	0	35		HP85 LISTEN
	12	1	0	46		861XB LISTEN
	13	0	0	42	B	
	14	0	0	57	W	DATA FROM
	15	0	0	43	C	WJ-861XB
	16	0	0	20		
	17	0	0	20		
	18	0	0	31	1	
	19	0	0	30	0	
	20	0	0	0D	(CR)	
	21	0	1	0A	(LF)	TERMINATOR
			(Assume 4 MHz)			
Enter 706; A$	10	1	0	3F		UNLISTEN
	11	1	0	35		HP85 LISTEN
A$ will contain "BWC 4000".	12	1	0	46		861XB TALK
	13	0	0	42	B	
	14	0	0	57	W	DATA FROM
	15	0	0	43	C	WJ-861XB
	16	0	0	34	4	
	17	0	0	30	0	
	18	0	0	30	0	
	19	0	0	30	0	
	20	0	0	0D	(CR)	
	21	0	1	0A	(LF)	TERMINATOR

Table D-13. Sending a Bandwidth Size Request (Continued)

Binary Mode	#	ATN	EOI	HEX	DEC	Comment
*Print using "B"; 158	1	1	0	3F		UNLISTEN
	2	1	0	55		HP TALK
	3	1	0	26		861XB LISTEN
	4	0	1	9E	158	BW SIZE REQUEST
Enter 706 using "#%, #%K"; A$	5	1	0	3F		UNLISTEN
	6	1	0	B5		HP85 LISTEN
	7	1	0	46		861XB TALK
A$ will contain binary BW size information.	8	0	0	9C	156	BW CODE
	9	0	0	00	0	BINARY CODED
	10	0	1	0A	10	BANDWIDTH IN kHz
			(Assume 4 MHz)			
Enter 706 using "#%, #%K"; A$	5	1	0	3F		UNLISTEN
Byte 1, Byte 2	6	1	0	35		HP85 LISTEN
A$ will contain binary BW size information.	7	1	0	46		861XB TALK
	8	0	0	9C	156	BW CODE
	9	0	0	0F	15	BINARY CODED
	10	0	1	A0	160	BANDWIDTH IN kHz

*Control Statement: Control 7,16; 128 (sets HP85 to EOI terminator for printer messages).
Printer is 706 (directs print statements to WJ-861XB).

Table D-14. Sending a Detection Mode Request (Cont'd.)

(Assume current detection mode is AM)

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 706 using "K"; "DET?"	1	1	0	3F		UNLISTEN
	2	1	0	55		HP TALK
	3	1	0	26		861XB LISTEN
	4	0	0	44	D	
	5	0	0	45	E	DATA TO
	6	0	0	54	T	WJ-861XB
	7	0	0	3F	?	
	8	0	0	0D	(CR)	
	9	0	0	0A	(LF)	TERMINATOR
Enter 706; A$	10	1	0	3F		UNLISTEN
	11	1	0	35		HP85 LISTEN
A$ will contian "AM."	12	1	0	46		861XB TALK
	13	0	0	41	A	
	14	0	0	4D	M	DATA FROM
	15	0	0	20		WJ-861XB
	16	0	0	0D	(CR)	
	17	0	1	0A	(LF)	TERMINATOR
			(Assume PLS)			
Enter 706; A$	10	1	0	3F		UNLISTEN
	11	1	0	35		HP85 LISTEN
A$ will contian "PLS."	12	1	0	46		861XB TALK
	13	0	0	50	P	
	14	0	0	4C	L	DATA FROM
	15	0	0	53	S	WJ-861XB
	16	0	0	0D	(CR)	
	17	0	1	0A	(LF)	TERMINATOR

Table D-14. Sending a Detection Mode Request (Cont'd.)

Binary Mode	#	ATN	EOI	HEX	DEC	Comment
*Print using "B"; 95	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
	3	1	0	26		861XB LISTEN
	4	0	1	5F		REQUEST DETECTION MODE
	5	1	0	3F		UNLISTEN
	6	1	0	35		HP85 TALK
Enter 706; using "#%, #%K"; A$	7	1	0	46		861XB LISTEN
A$ will contain 1 byte binary information.	8	0	1	48		AM CODE
			(Assume PLS)			
	5	1	0	3F		UNLISTEN
	6	1	0	35		HP85 TALK
Enter 706; using "#%, #%K"; A$	7	1	0	46		861XB LISTEN
A$ will contain 1 byte binary information.	8	0	1	78		PLS CODE

*Control Statement: Control 7, 16; 128 (sets HP85 to EOI terminator for printer messages).
Printer is 706 (directs print statements to WJ-861XB)

Table D-15. Sending a COR Level Request (Cont'd.)

Message: Request COR level, (assume off)

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 706 using "K"; "COR?"	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
	3	1	0	26		861XB LISTEN
	4	0	0	43	C	
	5	0	0	4F	O	DATA TO
	6	0	0	52	R	WJ-861XB
	7	0	0	3F	?	
	8	0	0	0D	(CR)	
	9	0	0	0A	(LF)	TERMINATOR
Enter 706; A$	10	1	0	3F		
	11	1	0	35		
	12	1	0	46		
	13	0	0	43	C	
A$ will contain "COR 041".	14	0	0	4F	O	
	15	0	0	52	R	
	16	0	0	20		
	17	0	0	30	0	
	18	0	0	34	4	
	19	0	0	31	1	
	20	0	0	0D	(CR)	
	21	0	1	0A	(LF)	TERMINATOR
Binary Mode	**#**	**ATN**	**EOI**	**HEX**	**DEC**	**Comment**
		1	0	3F		UNLISTEN
*Print using "B"; 89		1	0	55		HP85 TALK
		1	0	26		861XB LISTEN
		0	1	59	89	REQUEST COR
Enter 706 using "#%, #%K"; A$		1	0	3F		UNLISTEN
		1	0	35		HP85 LISTEN
A$ will contain 2 bytes binary		1	0	46		861XB TALK
information.		0	0	57	87	COR CODE
		0	1	29	41	VALUE

*Control Statement Control 7, 16; 128 (sets HP85 to EOI terminator for printer messages).
Printer is 706 (directs print statements to WJ-861XB)

D.3 PARTS LIST

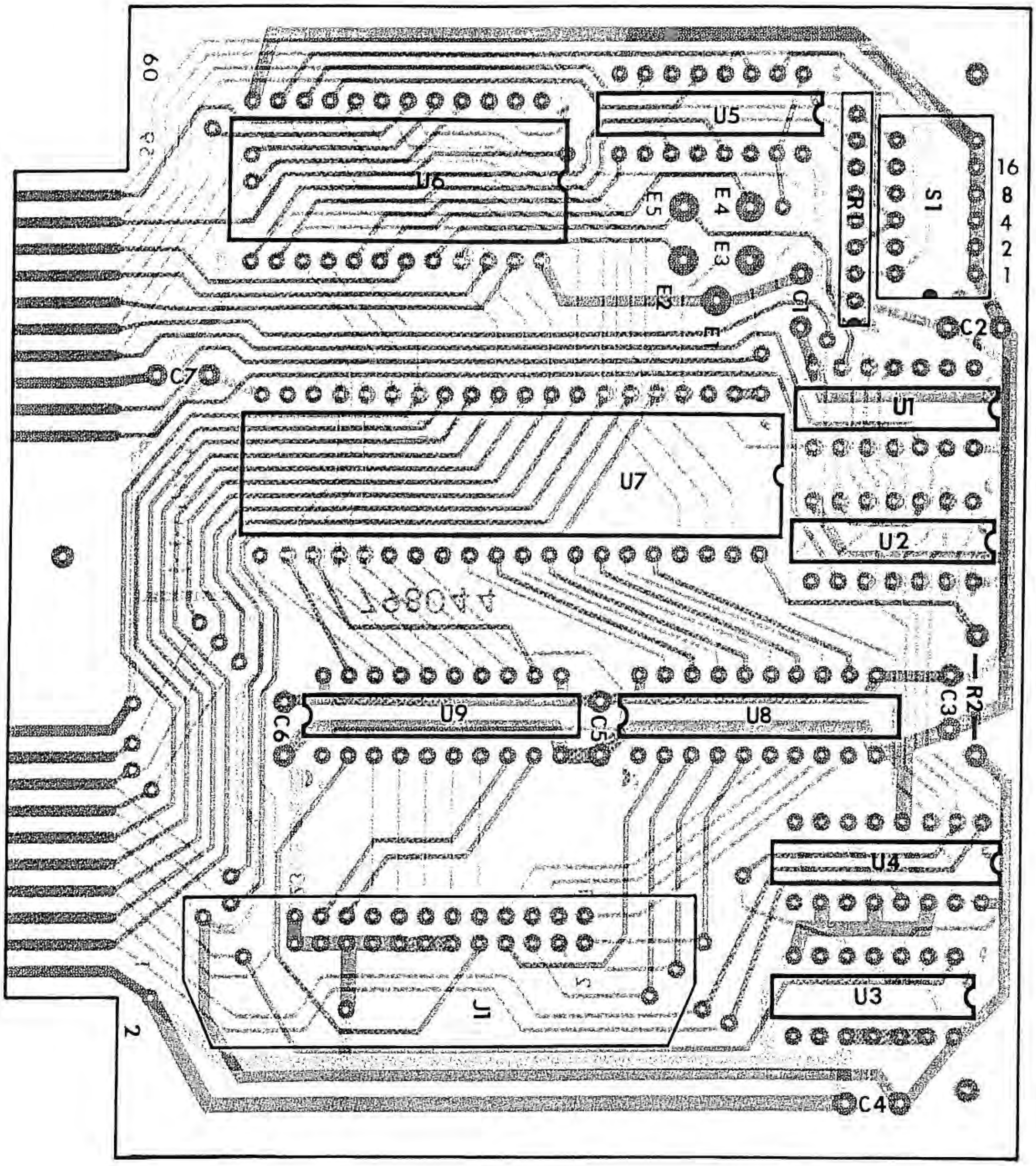
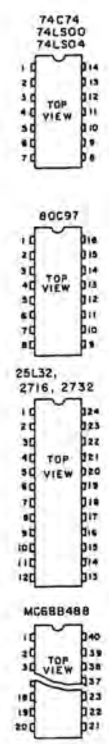


Figure D-2. Type 798044-1 IEEE-488 Interface (Option 4), Location of Components

D.3.1 TYPE 798044-1 IEEE-488 INTERFACE

REF DESIG PREFIX OPT 4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision B				
C1	Capacitor, Ceramic, Disc: 0.01 µF, 20%, 50 V	7	34453-1	14632	
C2 Thru C7	Same as C1				
J1	Connector, Receptacle, Multipin: 24 pins	1	102160-5	00779	
R1	Resistor, Network: 47 kΩ	1	4308R-101-473	80294	
R2	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	1	CF1/4-10K/J	09021	
S1	Switch, Toggle	1	76PSB06S	81073	
U1	Integrated Circuit	1	SN74LS00N	01295	
U2	Integrated Circuit	1	SN74LS04N	01295	
U3	Integrated Circuit	1	MM74C74N	27014	
U4	Integrated Circuit	2	MM80C97N	27014	
U5	Same as U4				
U6	Integrated Circuit	1	190169-21	14632	
U7	Integrated Circuit	1	MC68B488	04713	
U8	Integrated Circuit	1	841137-1	14632	
U9	Integrated Circuit	1	841137-2	14632	



NOTE:
1. UNLESS OTHERWISE SPECIFIED.
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN μF.
2. DIFFERENCES BETWEEN TYPE NO.'S IS SHOWN IN TABLE I.

TABLE I

TYPE	U6	JUMPERS JW1	JUMPERS JW2	WHERE USED REF
798044-1	190169-21	E1 – E2	E3 – E4	WJ-861XA WJ-861XB
798044-2	2716	E1 – E2	E4 – E5	—
798044-3	190169-22	E1 – E2	E3 – E4	WJ-8616A-4 (KARACAL)
798044-4	190169-23	E1 – E2	E3 – E4	861XA/150 (TRQ-32)
798044-5	190169-24	E1 – E2	E3 – E4	8618/ECO-2
798044-6	190169-44	E1 – E2	E3 – E4	WJ-8617B-4 (KARACAL)
798044-7	190169-69	E1 – E2	E3 – E4	WJ-8617B-5 (TRQ-23)
798044-8	190169-80	E1 – E2	E3 – E4	WJ-8617B-6
798044-9	190169-85	E1 – E2	E3 – E4	WJ-8618B-2
798044-10	190169-88	E1 – E2	E3 – E4	WJ-8617B-7
798044-11	190169-93	E1 – E2	E3 – E4	WJ-8618B-1
798044-12	190169-98	E1 – E2	E3 – E4	WJ-8617B-10
798044-13	190169-107	E1 – E2	E3 – E4	WJ-8618B-8
798044-14	NOT USED	NOT USED	NOT USED	WJ-8618B(S1) WJ-8617B(S1) WJ-8618B-14

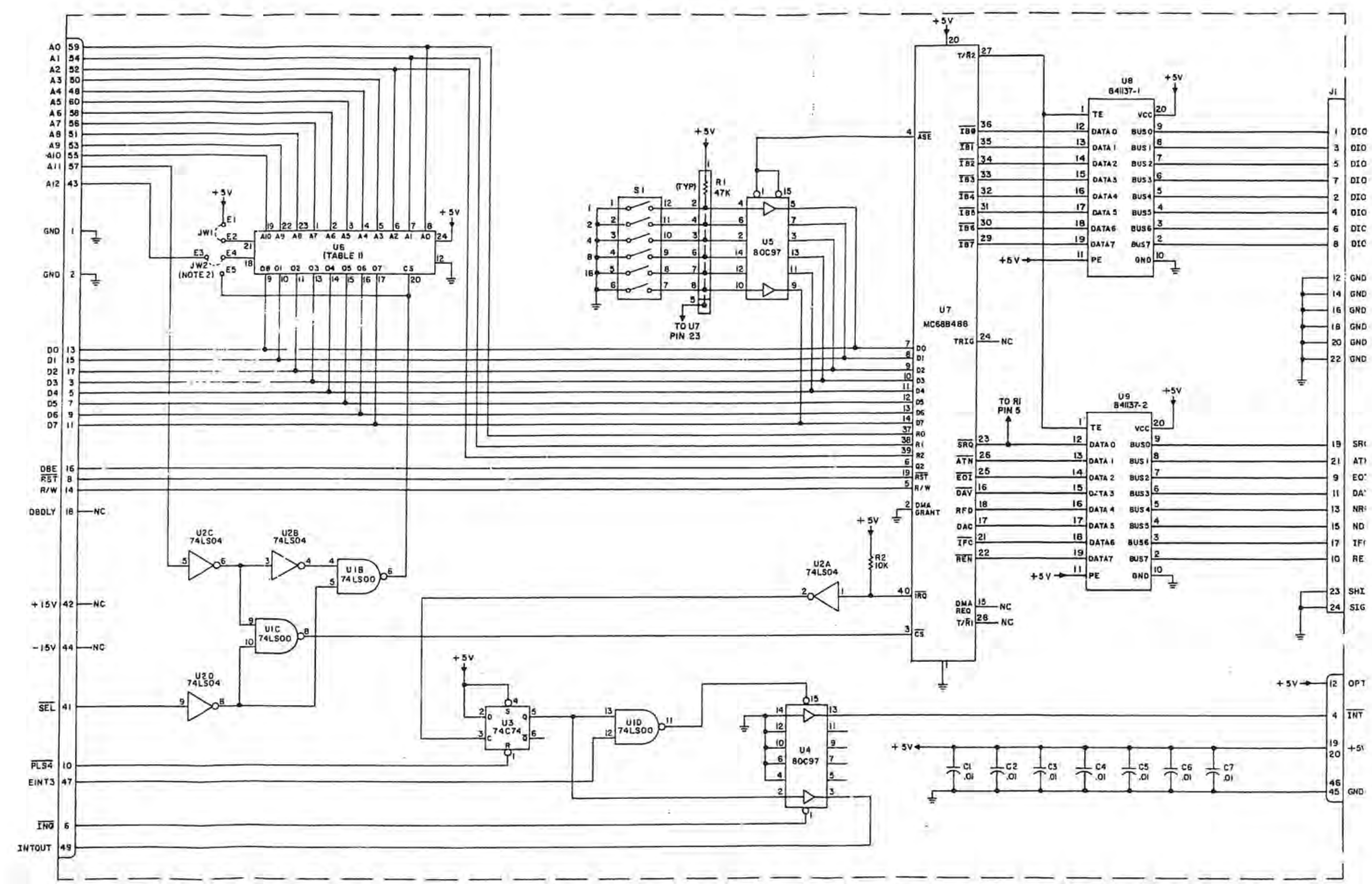


Figure D-3. Type 798044-X, IEEE-488 Interface Schematic Diagram 590120 (G)

WJ-861X RECEIVER

APPENDIX E

WJ-861X AUDIO SCAN OUTPUT (ASO) OPTION

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

November 1990

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

PROPRIETARY STATEMENT

TABLE OF CONTENTS

APPENDIX E

LIST OF ILLUSTRATIONS

APPENDIX E

WJ-861X AUDIO SCAN OUTPUT (ASO) OPTION

E.1 GENERAL DESCRIPTION

The Audio Scan Output (ASO) option provides a choice of audio frequency output or dc voltage output representative of the receiver's tuned frequency. In the Manual or Step mode the frequency output is 10^{-5} of the tuned RF frequency: 200 Hz is output when the receiver is tuned for 20 MHz, and 5 kHz when the receiver is tuned to 500 MHz. The dc voltage outputs are from 0 Vdc corresponding to 20 MHz to 5 Vdc corresponding to 500 MHz. In the Scan mode, the ASO provides an output relative to the selected start and stop frequencies. For example, a start frequency of 30 MHz is represented as 200 Hz (0 V) and a stop frequency of 30.2 MHz is represented as 11 kHz (10 V open circuit, source impedance is 10 kΩ) and all other frequencies and voltage level outputs are scaled to this relationship.

E.2 INSTALLATION

The ASO option is a plug-in module that inserts into receiver option slot 5.

E.3 OPERATION

Switch S1 on the ASO option board selects audio or dc level output. The Receiver rear panel connection SCAN OUT J5 provides ASO data output.

E.4 FUNCTIONAL DESCRIPTION

With the ASO option board enabled, digital frequency data is connected to latches U1, U2, and U3 via the data bus. Frequency data is input as 8-bit and 5-bit data words and converted by the logic to a 12-bit frequency data word and input to digital-to-analog converter U5. The voltage level output of U5 provides the dc voltage level output of the board when selected by S1. When S1 selects audio output, the signal is applied through amplifiers U6 and U7 to waveform generator U8 which converts the voltage levels to a sine wave. The sweep output of U8 is applied through amplifier U9 and connected to S1.

E.5 DETAILED CIRCUIT DESCRIPTION

Refer to **Figure E-2**, the schematic diagram for the ASO when reading the circuit descriptions.

E.5.1 LATCHES U1, U2, U3

Digital frequency data from the data bus is input to latches U1 and U2. When the Option Enable input OPT to pin 4 is low, decoder U3 is enabled. With the decoder enabled, the digital input from A3 sets either U1 or U2. If the input to U3 pin 1 is low, a low output at pin 15 applies a clock pulse to U1 and pin 11 setting the frequency until it receives another clock pulse.

U1 applies the stored frequency data through logic gates U4A and U4B to make a 12-bit input to digital-to-analog converter U5.

E.5.2 DIGITAL-TO-ANALOG CONVERTER, U5

Digital frequency data is input to digital-to-analog converter U5 at pins 1 through 12. U5 converts the digital logic to analog voltages output at pin 15. The voltage at E1 is 0 to 10 Vdc depending on the digital frequency input from the data bus. The dc voltage output is routed through R15 to S1. With dc level selected on S1, this dc voltage level is output from the board at pin 6. S1 can also be switched to select an audio output.

E.5.3 AMPLIFIERS U6 AND U7

The output voltages from U5 through E1 enter amplifier U6 at the inverting terminal. Offset adjust resistor R2 forms a feedback loop. U6 output voltages at E2 range from 0 through -2.0 V. The output of U6 is input to unity gain amplifier U7. The output of U7 is applied to waveform generator U8.

E.5.4 WAVEFORM GENERATOR, U8

Waveform generator U8 with its associated circuitry forms a linear voltage controlled oscillator. Pin 8, connected with 6.2 V zener diode VR1 is the sweep input. Resistor R9 adjusts the frequency range (200 Hz to 11 kHz) and duty cycle inputs at pins 5 and 4 respectively. Timing capacitor C13 is connected to pin 10. Adjustable resistor R12 adjusts the LF symmetry and R13 adjusts for sine wave distortion. The sine wave output is applied through amplifier U9 to E3 and S1. With audio output selected on S1, the 200 Hz to 11 kHz signal is output to pin 6.

E.6 MAINTENANCE

The ASO has been designed to operate with little or no routine maintenance. An occasional cleaning and inspection are the only preventive maintenance operations recommended. Should trouble occur, repair time is minimized if the maintenance technician is familiar with **Section E.5** of this manual and with the schematic diagram (**Figure E-2**).

E.6.1 TEST EQUIPMENT REQUIRED

The following test equipment is recommended:

a. Digital Multimeter: Fluke Model 8100A

b. Frequency Counter: Hewlett-Packard Model 5381A

c. Oscilloscope: Tektronix 5403 Mainframe Display Unit

E.6.2 ALIGNMENT

The ASO contains five adjustable resistors that require alignment. The alignment procedures are as follows:

E.6.2.1 R2, Offset Adjustment; R4, Gain Adjustment

1. Set adjustable resistors R9, R12, and R13 to mid-position.
2. Tune the receiver to 20 MHz in the Manual mode.
3. Adjust R4 to obtain a 200 Hz output on the frequency counter.
4. Tune the receiver to 500 MHz (1100 MHz with the 500-1100 MHz Frequency Extender installed).
5. Adjust R2 to obtain a 5 kHz output on the frequency counter (11 kHz with the 500-100 MHz Frequency Extender installed).
6. Repeat steps 2 through 5 ensuring interaction effects have not disturbed high and low frequency limits.

E.6.2.2 Symmetry & Distortion Alignment, R9, R12 and R13

1. Tune the receiver to 20 MHz in the Manual mode.
2. With the output connected to an oscilloscope adjust R12 so that the sine wave is symmetrical on the positive and negative sides of the curve.
3. Tune the receiver to 500 MHz (1100 MHz with the 500-1100 MHz Frequency Extender installed).
4. Adjust R13 so that the sine wave is symmetrical on the positive and negative sides of the curve.
5. Adjust R13 so that the sine wave is free of distortion, ensuring that the positive and negative portions of the sine wave are identical. Vary the input frequency and ensure that the sine wave is distortion free at all frequencies.

E.6.3 PERFORMANCE TESTS

The ASO board contains three test points to ensure proper voltage and frequency level throughout the board.

a. Test Point E1

   1. Connect the voltmeter to E1.

2. Observe a voltage of 0 V when the receiver is tuned to 20 MHz. Observe a voltage of 5 V when the receiver is tuned to 500 MHz. If the 500-1100 MHz Frequency Extender is installed in the receiver, observe a voltage of 10 V when the receiver is tuned to 1100 MHz.

b. Test Point E2

1. Connect the voltmeter to E2

2. Observe a voltage of 0 V when the receiver is tuned to 20 MHz. Observe a voltage of -1.0 V when the receiver is tuned to 500 MHz. If the 500-1100 MHz Frequency Extender is installed in the receiver, observe a voltage of -2.0 V when the receiver is tuned to 1100 MHz.

c. Test Point E3

1, Connect the frequency counter to E3.

2. Observe a frequency of 200 Hz when the receiver is tuned to 20 MHz. Observe a frequency of 5 kHz when the receiver is tuned to 500 MHz. If the 500-1100 MHz Frequency Extender is installed, observe a frequency of 11 kHz when the receiver is tuned to 1100 MHz.

E.7 PARTS LIST

E.7.1 TYPE 794150-1 AUDIO SCAN OUTPUT REF DESIG PREFIX OPT 5

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision H				
C1	Capacitor, Electrolytic, Tantalum: 1 µF, 20%, 35 V	3	196D105X0035HE3	56289	
C2	Capacitor, Ceramic, Disc: 0.01 µF, 20%, 50 V	4	34453-1	14632	
C3	Same as C1				
C4	Same as C2				
C5	Same as C1				
C6	Same as C2				
C7	Same as C2				
C8	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 50 V	7	34475-1	14632	
C9 Thru C11	Same as C8				
C12	Capacitor, Ceramic, Disc: 1000 pF, 500 V	1	59Z5U102P	91418	
C13	Capacitor, Mica, Dipped: 3900 pF, 20%, 500 V	1	CM06FD392G03	81349	
C14	Same as C8				
C15	Capacitor, Electrolytic, Tantalum: 47 µF, 20%, 20 V	4	196D476X0020PE4	56289	
C16	Same as C8				
C17	Same as C8				
C18 Thru C20	Same as C15				
CR1	Diode	2	1N4449	80131	
CR2	Same as CR1				
R1	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	2	CF1/4-10K/J	09021	
R2	Resistor, Trimmer, Film: 10 kΩ, 10%, 3/4 W	1	89PR10K	73138	
R3	Resistor, Fixed, Film: 1 kΩ, 5%, 1/4 W	4	CF1/4-1K/J	09021	
R4	Resistor, Trimmer, Film: 1 kΩ, 10%, 3/4 W	1	89PR1K	73138	
R5 Thru R7	Same as R3				
R8	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/4 W	2	CF1/4-4.7K/J	09021	
R9	Resistor, Trimmer, Film: 500Ω, 10 %, 1/2 W	1	62PAR500	73138	
R10	Same as R8				
R11	Resistor, Fixed, Film: 1 MΩ, 5%, 1/4 W	1	CF1/4-1M/J	09021	
R12	Resistor, Trimmer, Film: 100 kΩ, 10%, 1/2 W	2	62PAR100K	73138	
R13	Same as R12				
R14	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	1	CF1/4-100K/J	09021	
R15	Same as R1				
S1	Switch	1	TSS11DG-1-PC	76854	
U1	Integrated Circuit	1	MM74C174N	27014	
U2	Integrated Circuit	1	MM74C374N	27014	
U3	Integrated Circuit	1	SN74LS138N	01295	
U4	Integrated Circuit	1	SN74LS08N	01295	
U5	Integrated Circuit	1	ADDAC80-CCD-V	27014	

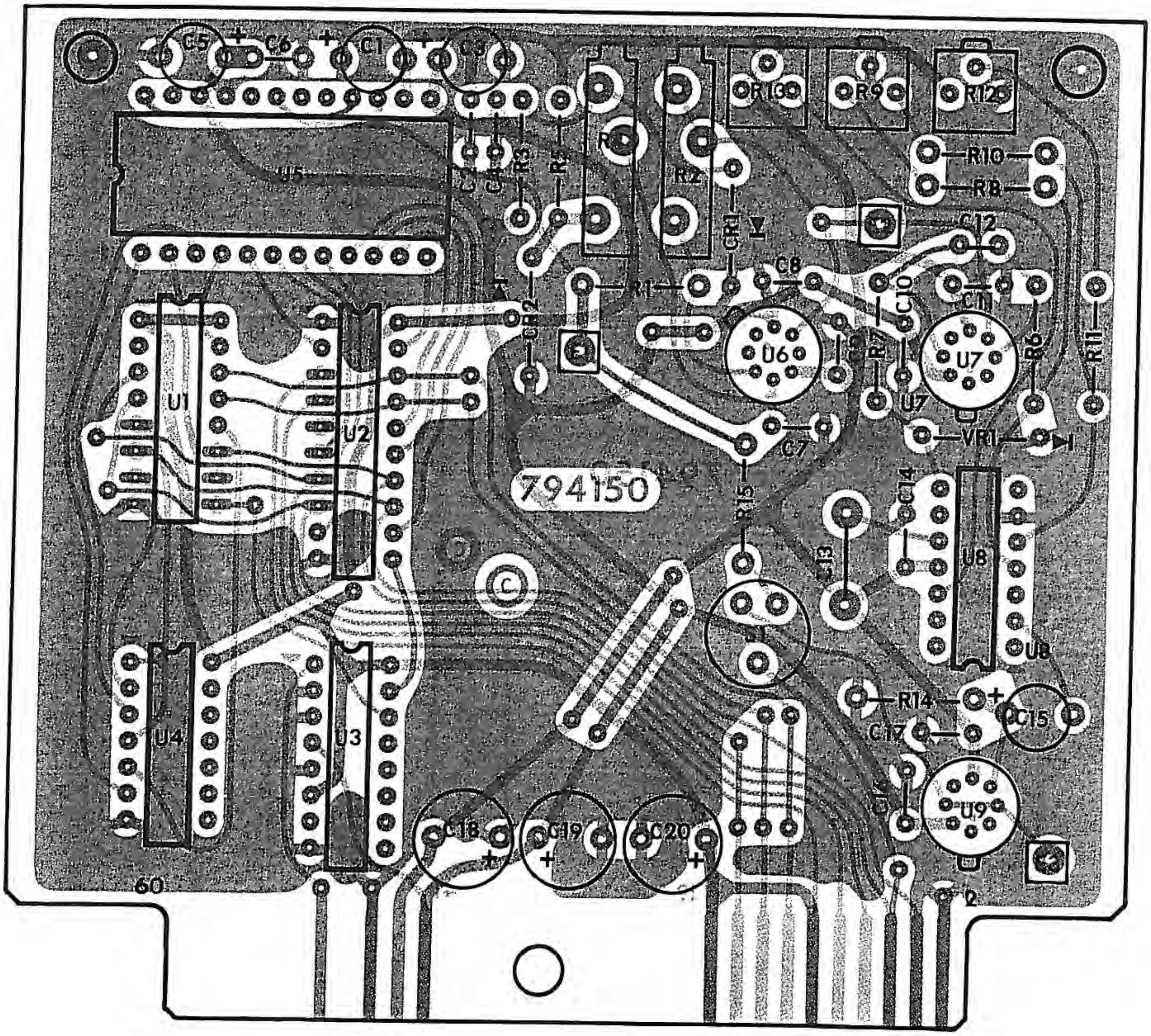


Figure E-1. Type 794150-1 Audio Scan Output (Option 2), Location of Components

REF DESIG PREFIX OPT 5

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
U6	Integrated Circuit	3	741HC	07263	
U7	Same as U6				
U8	Integrated Circuit	1	ICL8038CCPD	32293	
U9	Same as U6				
VR1	Voltage Regulator: 6.2 V	1	1N753A	80131	

NOTE:
UNLESS OTHERWISE SPECIFIED:
a) RESISTANCE IS IN OHMS, ± 5%, 1/4 W.
b) CAPACITANCE IS IN μF.

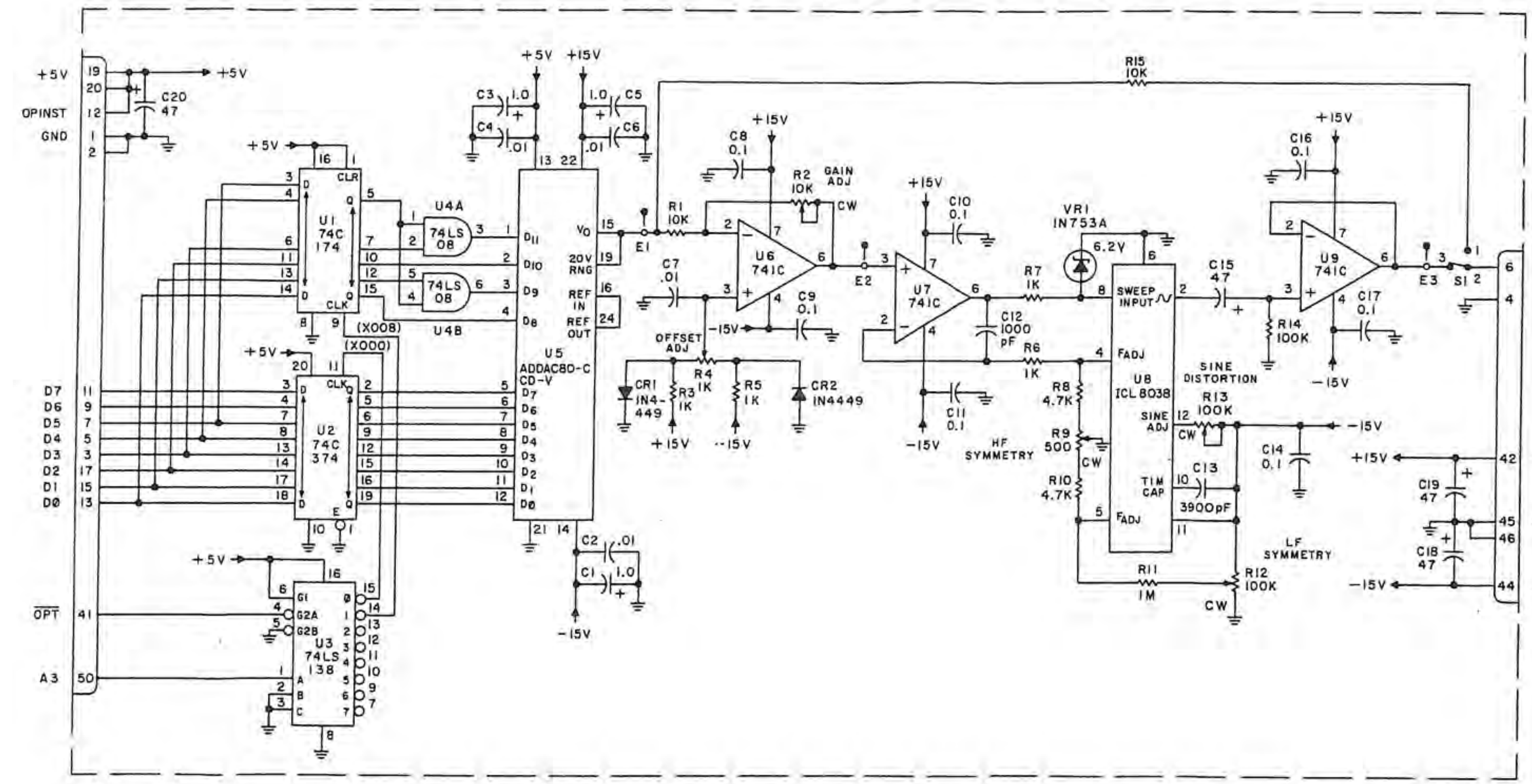


Figure E-2. Type 794150-1, Audio Scan Output Schematic Diagram 470251 (D)

WJ-861X RECEIVER

APPENDIX F

WJ-861X WIDEBAND IF OUTPUT AMPLIFIER (WBO) OPTIONS

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

November 1990

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

PROPRIETARY STATEMENT

TABLE OF CONTENTS

APPENDIX F

LIST OF ILLUSTRATIONS

APPENDIX F

WJ-861X WIDEBAND IF OUTPUT AMPLIFIER (WBO) OPTIONS

F.1 GENERAL DESCRIPTION

The Wideband IF Output Amplifier (WBO) option provides the 21.4 MHz IF signal at the rear panel connector J20. There are two types of WBO options. The output signal of Type 724013-1, associated with the WJ-861X/WBO option, has a constant bandwidth of at least 4.0 MHz, regardless of the selected IF bandwidth. The output signal of Type 724013-2, associated with the WJ-861X/WBO-2 option, has a bandwidth of 6 MHz minimum, regardless of the selected IF bandwidth. The output level for both types is maintained at -30 dBm into a 50Ω load. Internal automatic gain control (AGC) circuitry provides 40 dB of gain control. This enables the WBO level, at J20, to be maintained at -30 dBm ±6 dB with input level changes of up to 40 dB.

F.2 INSTALLATION

The Type 724013-1 or 724013-2 Wideband IF Output Amplifier mounts in the compartment directly below the Signal Monitor compartment, on the underside of the receiver. Four mounting screws secure the module to the receiver deck and three cables provide all electrical connections. Installation of the Type 724013-1 or 724013-2 Wideband IF Output Amplifier is performed as follows:

1. Remove the bottom cover of the receiver exposing the compartment that accepts the Wideband IF Amplifier. This is the compartment directly forward of the receiver Power Distribution circuitry (A1).

2. Disconnect P71 of cable W31 and P69 of cable W30 from connector CP1.

3. Connect P69 of cable W30 to connector J2 of the Wideband IF Output Amplifier module.

4. Connect P71 of cable W31 to connector J1 of the Wideband IF Output Amplifier module.

5. Position the Wideband IF Output Amplifier against the receiver deck and align the four mounting holes on the module with the four threaded studs on the deck. Using 4-40 X 1/4 machine screws and appropriate flat and lock washers, secure each of the four mounting points to the receiver deck.

6. Plug connector A9P1 of the Wideband IF Output Amplifier to J2B, on the RF/IF Motherboard (A3). Position the connector such that pin 1 of A9P1 mates with J2B pin 4 and A9P1 pin 3 mates with J2B pin 6.

7. Re-install the receiver bottom cover.

F.3 OPERATION

The Type 724013-1 or 724013-2 Wideband IF Output Amplifier is operational at all times, when the receiver is powered. No additional operating procedures are required.

F.4 CIRCUIT DESCRIPTION

F.4.1 FUNCTIONAL DESCRIPTION

The input to the Type 724013-1 or 724013-2 Wideband IF Output Amplifier (A9) is taken from the receiver's 2nd Converter (A3A7) prior to band-limiting by the 21.4 MHz IF Amplifier. This 6 MHz wide signal band enters the Wideband IF Amplifier at connector J2. The signal is then amplified by a gain-controlled amplifier (Q1) and a 20 dB fixed-gain amplifier (U1). From the output of the amplification stages, the signal is applied to the output of the subassembly via an RFI filter. This filter passes a frequency spectrum of at least 3.5 MHz, about the 21.4 MHz IF center frequency for the Type 724013-1 board and a frequency spectrum of at least 6 MHz for the Type 724013-2 board.

The output level of the module, at connector J1, is maintained at a level of -30 dBm by an on-board AGC circuit. A sample of the output signal is amplified by a 20 dB amplifier (U2) and applied to the detection circuitry of U3. This AGC circuit provides a dc voltage ranging from +.7 to -6.3 Vdc, controlling the gain of the input amplifier (Q1). The AGC loop permits the output to be maintained at -30 dBm ±6 dB with input level changes of up to 40 dB at the input to the module (J2).

F.4.2 DETAILED CIRCUIT DESCRIPTION

F.4.2.1 Type 724013-1 and 724013-2 Wideband IF Output Amplifier (A9)

The reference designation for this subassembly is A9. Refer to **Figure F-3** for the Type 724013-1 and Type 724013-2 Wideband IF Output Amplifier schematic diagram.

The wideband IF signal, centered about 21.4 MHz enters this subassembly at input connector J2 and is coupled across C1 to gate #1 (pin 3) of transistor Q1. Resistors R7 and R3 form a voltage divider to bias gate #1. Gate #2 (pin 2) of Q1 receives bias from the voltage divider formed by R6, R2 and CR1, with resistor R5 providing a means of injecting the AGC voltage to alter the bias at gate #2 for control of module gain. At low signal levels, the divider formed by R6, R2 and forward biased diode CR1 sets the bias at gate #2 to approximately +4 Vdc, causing Q1 to operate at maximum gain. With increases in signal level, the AGC circuitry applies a negative-going voltage to the anode of CR1, via R5. This voltage varies from 0, when the input signal is at AGC threshold, to -6.3 Vdc, when the signal level is at 40 dB above AGC threshold. When the AGC voltage is sufficiently negative overcoming the forward bias on CR1, CR1 cuts off and is effectively removed from the circuit. The bias at pin 2 of Q1 is then determined by the voltage divider comprised of R6, R2 and R5, connected between the +15 Vdc supply and the output of the AGC circuitry. This arrangement permits the bias on Q1 to be varied between its +4 Vdc maximum gain point to a slightly negative voltage setting the gain of Q1 to minimum, in accordance with the level of the incoming signal. The output of Q1 is developed across the tank circuit comprised of L1, C5 and R10. L1 and C5 center the output response about the 21.4 MHz IF center frequency and R10 lowers the "Q" of the tuned circuit broadening the bandwidth of the tank. Capacitor C21 prevents the flow of dc current through R10.

From the output circuitry of Q1, the signal is applied, via C6, to the input of broadband amplifier U1. This amplifier provides a gain of approximately 20 dB and applies the signal, via R14, to the output of the subassembly and via C22 to the AGC detector circuitry. The operating voltage for U1 is provided at pin 2 of U1 via VR1. VR1 drops the +15 Vdc supply voltage to 6.8 Vdc. Bias at pin 7 is provided by the voltage divider formed by R12 and potentiometer R11, with R11 permitting adjustment of the gain of U1. The output signal at U1 pin 3, is coupled across C9 and developed across output load resistor R13.

The output of U1 is applied to the output connector (J1) via resistor R14 and the bandpass filter comprised of C3 through C10 and inductors L1, L2 and L3. L1, along with capacitors C3, C4 and C5, form a parallel-resonant circuit with a 21.4 MHz center frequency. The input to this circuit is applied at the junction of C3, C4 and C5 matching the input impedance of the tank circuit to the output of U1. The signal is then applied, via the 21.4 MHz series-resonnant circuit comprised of L2 and C6, to a second parallel-resonant tank. In the Type 724013-1, this second parallel-resonant tank consists of L3 and C7 through C10. In the Type 724013-2, this second parallel tank consists of L3 and C8 thru C10. This combination of tank circuits form a bandpass filter which provides a 3.5 MHz (minimum) 3 dB bandwidth about the 21.4 MHz center frequency in the Type 724013-1 and a 6 MHz 3 dB bandwidth about 21.4 MHz with the Type 724013-2. The output is taken from the junction of C8, C9 and C10 providing an output impedance, at J1, of 50Ω.

A sample of the output of U1 is applied to the AGC circuitry of the Wideband IF Output Amplifier controlling the gain of the subassembly. This signal is coupled across C22 and is applied to the amplifier U2. U2 provides 20 dB of amplification, as determined by the voltage divider formed by resistors R15 and R16, and applies its amplified output to the primary of transformer T1. The signal is then coupled across T1 and applied to the detector circuit comprised of CR2, C17 and R20. This circuit strips the 21.4 MHz component from the signal and produces a video signal impressed on a dc level that is representative of the strength of the input signal. Integrated circuit U3A amplifies the detected signal and applies the signal to a peak detector comprised of CR3, C18, R26 and R23. The fast charge and slow discharge time of this detector produces a dc level that is representative of the peak amplitude of the received signal. This dc level is then applied to inverter amplifier U3B producing the gain-control voltage for the subassembly.

The voltage divider formed by R25 and potentiometer R24 sets the point at which the AGC voltage begins controlling the subassembly gain. When the detected voltage at pin 6 of U3B increases above the level at pin 5, the output of U3B begins to produce a negative-going output voltage. This output voltage is then applied to transistor Q1 decreasing the subassembly gain to provide the proper output level. Resistor R21 and regulator VR3 limit the extremes of the AGC voltage to between +.7 and -6.3 Vdc. Under strong signal conditions, VR3 permits the AGC voltage to increase until it reaches its maximum of -6.3 Vdc. At that point VR3 begins conducting to prevent any further AGC voltage increase. Under weak signal conditions, the output of U3B is a positive voltage which is felt at the anode of VR3. VR3 is forward biased at this time and prevents the AGC voltage from increasing to more than 0.7 Vdc.

F.5 ALIGNMENT PROCEDURE

When performing the following alignment procedure, the Wideband IF Output Amplifier mounting screws should be removed permitting access to the adjustments on the underside of the subassembly. The alignment should be performed utilizing the test equipment listed or equivalents.

Equipment	Description	Type
Sweep Generator	0-1200 MHz	Wavetek 2001
Step Attenuator	0-80 dB	TF-10141 (WJ CET)
Detector	50 ohm	HP-423A
Oscilloscope	DC to 35 MHz	Tektronic T935
20 dB amplifier	6 MHz minimum bandwidth	Boonton 92B
RF Millivoltmeter	Probe	Boonton 91-12F
	"T" Adapter	Boonton 91-14A
	50 ohm Termination	Boonton 91-15A

F.5.1 TYPE 724013-1 AND 724013-2 WIDEBAND IF OUTPUT AMPLIFIER ALIGNMENT

1. Remove the cover from the subassembly and disconnect the jumper from between terminals E3 and E1.

2. Connect the test equipment as illustrated, with the 20 dB amplifier connected at terminal E3.

3. Set the sweep generator to sweep at least 6 MHz about a 21.4 MHz center frequency at an output level of -10 dBm. Activate the 21.4 MHz marker.

4. Set the attenuator for 55 dB of attenuation.

5. Preset R11 to midrange and R24 to its maximum CW position.

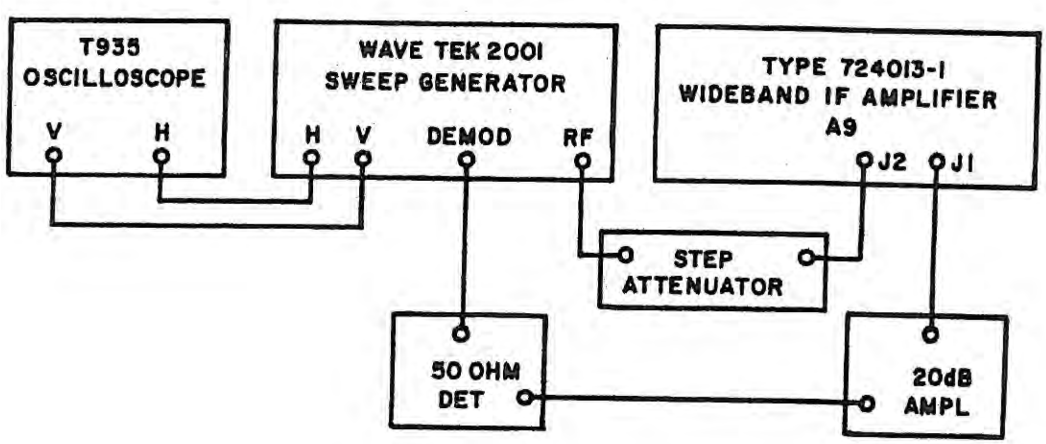


Figure F-1. Wideband IF Output Amplifier Alignment Equipment Connections

6. Adjust the oscilloscope controls to produce a suitable display of the output response, with the 21.4 MHz marker at the center of the display.

7. Adjust C5 centering the wideband response about the 21.4 MHz marker.

8. Disconnect the 20 dB amplifier from E3 and reconnect the jumper between E1 and E3.

9. Temporarily replace the subassembly cover and attach the 20 dB amplifier to output connector J1.

10. Activate the 1 MHz markers on the sweep generator.

11. From the underside of the Type 724013-1 subassembly, adjust L1, L2 and C7 to obtain the following response:

Center Frequency:	21.4 MHz
3 dB Bandwidth:	3.5 MHz, minimum; 5 MHz typical
Ripple:	1 dB or less

From the underside of the Type 724013-2 subassembly, adjust L1, L2 and L3 to obtain the following response:

Center Frequency:	21.4 MHz
3 dB Bandwidth:	6.0 MHz, minimum
Ripple:	1 dB or less

12. Remove the module cover and disconnect the 20 dB amplifier from J1.

13. Set the generator to produce a fixed 21.4 MHz CW output.

14. Connect the RF millivoltmeter and 50Ω load at J1.

15. On Type 724013-1 boards, adjust R11 to produce a -31 dBm indication on the RF millivoltmeter. On Type 724013-2 boards, adjust R11 to produce a -30 dBm (±3 dB) indication on the RF millivoltmeter.

16. Adjust R24 CCW until the indication on the millivoltmeter just begins to decrease. When adjusting R24, the meter indication may rapidly decrease and then spring back. Continue adjusting R24 until no spring back occurs and set R24 to the point where the level just began to decrease.

17. Set the attenuator for -15 dB of attenuation, while observing the RF millivoltmeter indication. The level should not change by more than 6 dB from the level set in step 15. If a change of greater than 6 dB is observed, repeat step 16.

18. Reinstall the subassembly cover and install the subassembly into the receiver.

F.6 PARTS LIST

F.6.1 **TYPE 724013-1, WIDEBAND IF OUTPUT AMPLIFIER** REF DESIG PREFIX A9

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision D				
A1	Wideband IF Output Amplifier	1	270465-1	14632	
C1	Capacitor, Ceramic, Feedthru: 1000 pF, GMV, 500 V	2	54-794-009-102W	33095	
C2	Same as C1				
C3	Capacitor, Mica, Dipped: 300 pF, 2%, 500 V	2	CM05FD301G03	81349	
C4	Capacitor, Ceramic, Standoff: 100 pF, 10%, 500 V	2	54-803-009-101K	33095	
C5	Capacitor, Mica, Dipped: 510 pF, 2%, 500 V	1	DM15-511G	72136	
C6	Capacitor, Ceramic, Tubular: 7.5 pF, ±0.5 pF, 500 V	1	301-000C0H0-759D	72982	
C7	Capacitor, Variable, Air: 0.8-10 pF, 250 V	1	5202	91293	
C8	Capacitor, Mica, Dipped: 430 pF, 2%, 500 V	1	DM15-431G	72136	
C9	Same as C3				
C10	Same as C4				
J1	Connector, Receptacle	1	1012-1511-000	19505	
J2	Connector, Receptacle	1	1004-7511-002	19505	
L1	Coil, Variable	1	558-7107-06	71279	
L2	Coil, Variable	1	558-7107-24	71279	
L3	Coil, Fixed	1	21210-74	14632	
P1	Plug, Assembly	1	370434-4	14632	

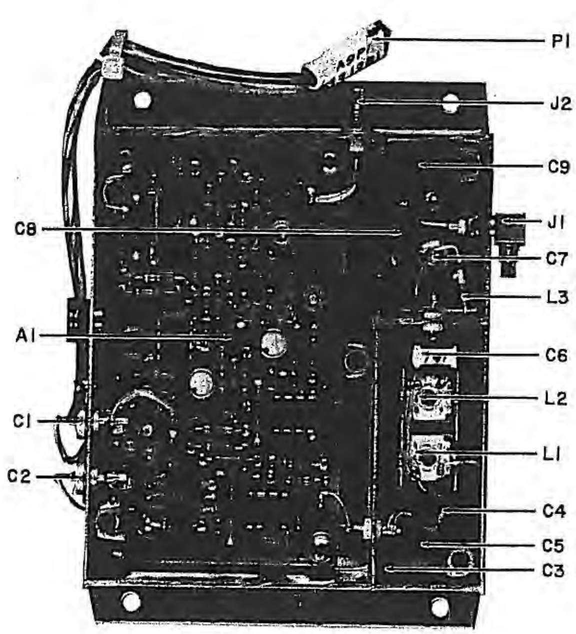


Figure F-2. Type 724013-1, -2 Wideband IF Output Amplifier, (A9), Location of Components

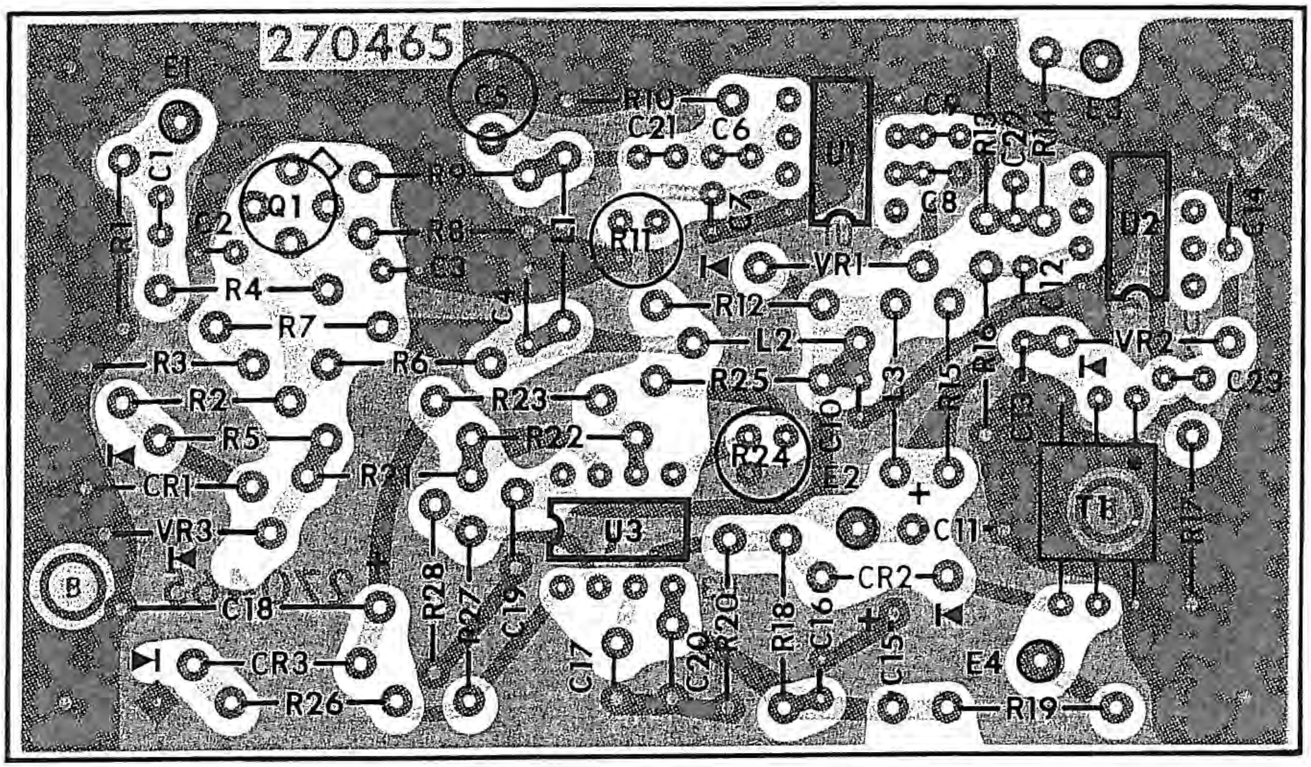


Figure F-3. Part 270465-1 Wideband IF Output Amplifier (A9A1), Location of Components

F.6.1.1 **Part 270465-1, Wideband IF Output Amplifier** REF DESIG PREFIX A9A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision E				
C1	Capacitor, Ceramic, Disc: 4700 pF, 20%, 50 V	13	8121-050-651-472M	59660	
C2	Same as C1				
C3	Same as C1				
C4	Capacitor, Ceramic, Disc: 0.1 μF, 20%, 50 V	1	34475-1	14632	
C5	Capacitor, Variable, Ceramic: 5-25 pF, 100 V	1	518-000A5-25	59660	
C6 Thru C10	Same as C1				
C11	Capacitor, Electrolytic, Tantalum: 2.2 μF, 20%, 35 V	2	199D225X0035BE3	56289	
C12	Same as C1				
C13	Same as C1				
C14	Capacitor, Ceramic, Disc: 0.01 μF, 20%, 50 V	1	34453-1	14632	
C15	Same as C11				
C16	Same as C1				
C17	Capacitor, Mica, Dipped: 330 pF, 2%, 100 V	1	CM04FA331G03	81349	
C18	Capacitor, Electrolytic, Tantalum: 22 pF, 10%, 15 V	1	CS13BD226K	81349	
C19	Capacitor, Ceramic, Disc: 0.47 Fp, 20%, 50 V	2	34452-1	14632	
C20	Same as C19				
C21	Same as C1				
C22	Capacitor, Ceramic, Monolithic: 47 pF, ±2%, 100 V	1	150-100-NPO-470G	51642	
C23	Same as C1				
CR1	Diode	2	1N462A	80131	
CR2	Diode	1	5082-2800	28480	
CR3	Same as CR1				
L1	Coil, Fixed: 1.8 pH, 10%	1	1025-26	99800	
L2	Coil, Fixed: 18 pH, 10%	2	1025-50	99800	
L3	Same as L2				
Q1	Transistor	1	MFE211	04713	
R1	Resistor, Fixed, Film: 47Ω, ±5%, 1/4 W	3	CF1/4-47 OHMS/J	09021	
R2	Resistor, Fixed, Film: 33 kΩ, 5%, 1/4 W	1	CF1/4-33K/J	09021	
R3	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	2	CF1/4-10K/J	09021	
R4	Same as R1				
R5	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/4 W	2	CF1/4-4.7K/J	09021	
R6	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	2	CF1/4-100K/J	09021	
R7	Resistor, Fixed, Film: 68 kΩ, 5%, 1/4 W	1	CF1/4-68K/J	09021	
R8	Resistor, Fixed, Film: 120Ω, 5%, 1/4 W	1	CF1/4-120 OHMS/J	09021	
R9	Resistor, Fixed, Film: 33Ω, 5%, 1/4 W	1	CF1/4-33 OHMS/J	09021	
R10	Resistor, Fixed, Film: 360Ω, 5%, 1/4 W	1	CF1/4-360 OHMS/J	09021	
R11	Resistor, Trimmer, Film: 5 kΩ, 10%, 1/2 W	1	62PR5K	73138	
R12	Resistor, Fixed, Film: 22 kΩ, 5%, 1/4 W	3	CF1/4-22K/J	09021	
R13	Resistor, Fixed, Film: 270Ω, 5%, 1/4 W	1	CF1/4-270 OHMS/J	09021	

REF DESIG PREFIX **A9A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R14	Same as R1				
R15	Same as R12				
R16	Resistor, Fixed, Film: 3.3 kΩ, 5%, 1/4 W	1	CF1/4-3.3K/J	09021	
R17	Resistor, Fixed, Film: 220 kΩ, 5%, 1/4 W	1	CF1/4-220K/J	09021	
R18	Resistor, Fixed, Film: 150 kΩ, 5%, 1/4 W	1	CF1/4-150K/J	09021	
R19	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	1	CF1/4-100 OHMS/J	09021	
R20	Same as R5				
R21	Resistor, Fixed, Film: 1 kΩ, 5%, 1/4 W	1	CF1/4-1K/J	09021	
R22	Resistor, Fixed, Film: 620 kΩ, 5%, 1/4 W	1	CF1/4-620K/J	09021	
R23	Same as R6				
R24	Resistor, Trimmer, Film: 100 kΩ, 10%, 1/2 W	1	62PR100K	73138	
R25	Same as R12				
R26	Resistor, Fixed, Film: 2.2 kΩ, 5%, 1/4 W	1	CF1/4-2.2K/J	09021	
R27	Resistor, Fixed, Film: 43 kΩ, 5%, 1/4 W	1	CF1/4-43K/J	09021	
R28	Same as R3				
T1	Transformer	1	T4-1	15542	
U1	Integrated Circuit	2	SL1611C/DP	52648	
U2	Same as U1				
U3	Integrated Circuit	1	MC1458N	18324	
VR1	Voltage Regulator: 8.2 V	2	1N756A	80131	
VR2	Same as VR1				
VR3	Voltage Regulator: 6.3 V	1	1N753A	80131	

F.6.2 TYPE 724013-2, WIDEBAND IF OUTPUT AMPLIFIER

REF DESIG PREFIX A9

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
A1	Wideband IF Output Amplifier (see **Paragraph F.6.1.1**)	1	270465-1	14632	
C1	Capacitor, Ceramic, Feedthru: 1000 pF, GMV, 500 V	2	54-794-009-102W	33095	
C2	Same as C1				
C3	Capacitor, Mica, Dipped: 100 pF, 2%, 500 V	2	CM05FD101G03	81349	
C4	Capacitor, Ceramic, Standoff: 100 pF, 10%, 500 V	2	54-803-009-101K	33095	
C5	Capacitor, Mica, Dipped: 200 pF, 2%, 500 V	2	CM05FD201G03	81349	
C6	Capacitor, Ceramic, Tubular: 7.5 pF, ±0.5 pF, 500 V	1	301-000C0H0-759D	72982	
C7	Not Used				
C8	Same as C5				
C9	Same as C3				
C10	Same as C4				
E1	Terminal, Fedthru	2	SFU16Y	1DM30	
E2	Same as E1				
J1	Connector, Receptacle	1	1012-1511-000	19505	
J2	Connector, Receptacle	1	1004-7511-002	19505	
L1	Coil, Variable: 0.504-0.616 µH	2	558-7107-10	71279	
L2	Coil, Variable: 7.38-9.02 µH	1	558-7107-24	71279	
L3	Same as L1				
P1	Plug, Assembly	1	370434-4	14632	

NOTES:
UNLESS OTHERWISE SPECIFIED:
a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
b) CAPACITANCE IS IN pF.
c) INDUCTANCE IS IN μH.

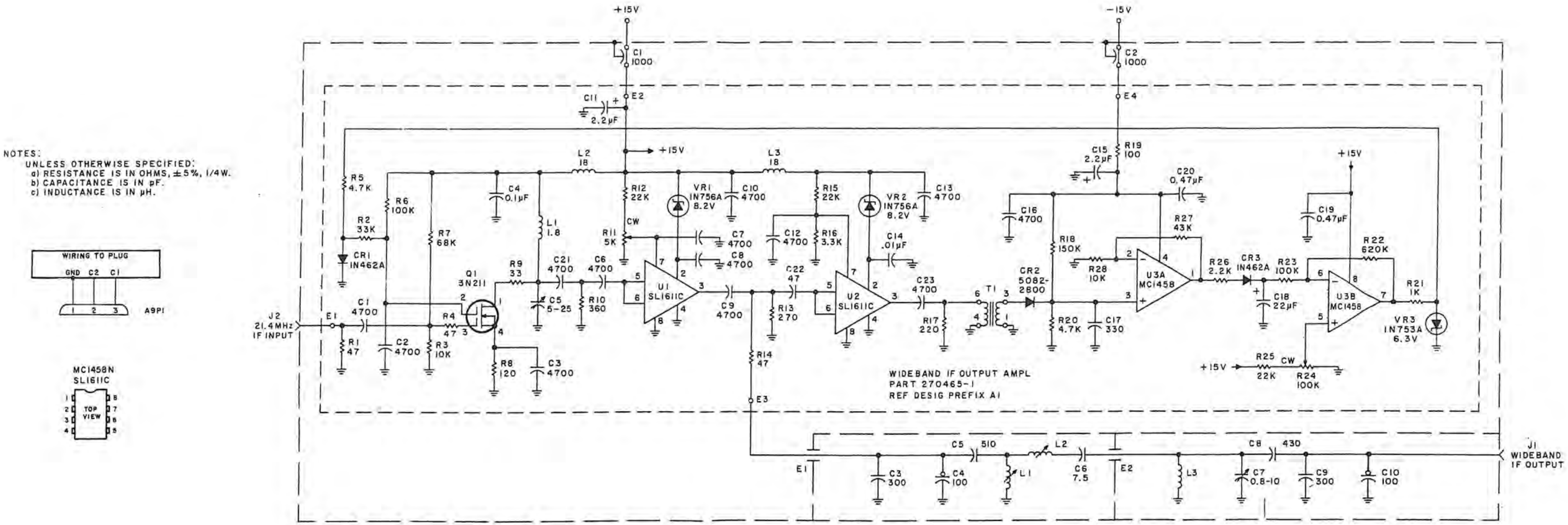


Figure F-4. Type 724013-1, Wideband IF Output Amplifier (A9), Schematic Diagram 470247 (D)

WJ-861X RECEIVER

APPENDIX G

WJ-861X SINGLE SIDEBAND DEMODULATOR OPTION

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

November 1990

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

PROPRIETARY STATEMENT

TABLE OF CONTENTS

APPENDIX G

LIST OF ILLUSTRATIONS

APPENDIX G

TYPE 794188-1 SINGLE SIDEBAND DEMODULATOR (SSB) OPTION

G.1 GENERAL DESCRIPTION

The Type 794188-1 Single Sideband (SSB) Demodulator option installs in place of the SSB Bypass subassembly (A3A14) on the RF/IF Motherboard of the receiver. This subassembly utilizes the 32.1 and 10.7 MHz signals, provided by the receiver's SSB BFO subassembly, to demodulate Upper and Lower sideband signals. For optimum performance, it is suggested that #1 IF bandwidth slot contain an IF bandwidth of 10 kHz or less (6 kHz is preferred). Whenever the receiver is placed into the SSB detection mode, the receiver automatically switches to IF bandwidth #1 and the remaining bandwidth pushbuttons are deactivated.

Selection of the SSB mode of operation is accomplished by depressing the SSB pushbutton. This places the receiver into either the Upper or Lower sideband mode and activates IF bandwidth #1. Each additional depression of the SSB pushbutton causes the detection mode to be switched between USB and LSB. A letter "U" for upper Sideband or an "L" for lower Sideband illuminates on the digital display indicating which SSB mode is active. Selecting any other detection mode pushbutton deactivates SSB and activates the newly selected mode.

G.2 INSTALLATION

Installing the SSB option into the standard receiver is performed as follows:

1. Remove the receiver top cover.
2. Remove the Type 798074-1 SSB Bypass from the A3A14 slot on the RF/IF Motherboard and replace with the Type 794188-1 SSB Demodulator.
3. Remove the blank pushbutton from right DETECT MODE pushbutton bank on the receiver front panel and replace with the supplied SSB button.
4. Reconfigure switch A5A2S1 on the Synthesizer Interface to permit the receiver software to recognize the presence of the SSB Demodulator. This is accomplished by placing switch position #5 of A5A2S1 into the open position.

G.3 CIRCUIT DESCRIPTION

G.3.1 TYPE 794188-1 SSB DEMODULATOR (A3A14)

The reference designation for this subassembly is A3A14. Refer to **Figure G-2** for the Type 794188-1 SSB Demodulator schematic diagram.

The 21.4 MHz SSB signal enters this subassembly at connector pin 55 and is coupled, via C4, to U1. U1 splits the signal and applies it to the 21.4 MHz IF Output, via the 3 dB pad formed by R3, R4 and R5 and also applies the signal to modulator U2. The signal is coupled to the signal input of U2 via the RC coupling network comprised of C7 and R9.

Modulator U2 mixes the 21.4 MHz input signal with a 32.1 MHz signal from the SSB BFO providing an output that consists of the SSB signal impressed on a 10.7 MHz carrier. Resistors R6 and R7 provide bias at the inputs of U2 and R11 controls gain. R8, R9 and R10 set the input impedance to 50 ohms. Coils L1 and L2 provide the collector loads for the output transistors contained in U2. The output signal taken from U2 pin 6 is developed across L2 and is applied to amplifier Q1, via the 10.7 MHz tuned circuit comprised of L3, C11 and C13. Transistor Q1 amplifies the 10.7 MHz signal and applies the amplified signal to the USB and LSB filters at its output. Resistors R14 and R15 provide bias for gate #1 of Q1 (pin 3) and R17 and R18 provide bias for gate #2 (pin 2). R16 is installed to suppress parasitics. The output of Q1 is developed across L5 and is coupled, via C16 and R21, to the USB/LSB selection circuitry.

Selection of the upper or lower sideband is controlled by the PIN diode switching network comprised of CR1 through CR4 and switch driver U3A. This network applies the signal through FL1, when upper sideband is selected, or through FL2 when lower sideband is selected. The control input, at connector pin 15, is provided by the Digital Control Section of the receiver. When Upper Sideband is selected, the control input is at logic "1," causing the output of U3A to switch to +15 V. This output places +15 V at the anodes of CR1 and CR3, causing them to be forward biased. CR2 and CR4 receive the +15 V output of U3A at their cathodes, causing them to be reverse biased. The signal then passes through the forward biased CR1 to the USB filter FL1. FL1 permits signals above 10.7 MHz to pass, causing only the Upper Sideband signal to appear at its output. The Upper Sideband signal is then coupled across C22 and through CR3 to the next stage. When Lower Sideband is selected, the control input (pin 15) is at logic "0," causing the output U3A to switch to -15 V. At this time, CR2 and CR4 are forward biased, causing the signal to be applied to FL2.

The output of FL1 or FL2 is then coupled across transformer T1 to U5. Integrated circuit U5 functions as the SSB Demodulator. This circuit mixes the modulated 10.7 MHz SSB signal with a fixed 10.7 MHz signal, provided by the SSB BFO, producing the video output. Resistors R31 and R32 provide bias at the inputs of U5 and R38 and R39 act as collector loads for the output transistors within U5. R33 provides a 50 ohm load for the 10.7 MHz signal provided by the SSB BFO. The gain of U5 is set by R36. The output of U5 is developed across R39 and is applied to the output amplifier (U3B) via the low pass filter comprised of R41, C35 and C36. This filter strips any residual 10.7 MHz component from the video signal. The video signal is amplified by U3B and is then applied, via R46, to output pin 11. The gain of U3B is set by the voltage divider formed by R43, R44 and R45.

The SSB Demodulator provides an SSB Detector output at connector pin 1 that is utilized by the receiver generating AGC voltages when in the SSB mode. This output is generated by amplifier U4 and the detector circuitry comprised of CR6, CR5 C28 and R30. A sample of the output of the SSB filters, FL1 or FL2, is coupled to U4, via C25. This signal is amplified and applied to the detector. The detector then rectifies the signal providing a DC level proportional to the strength of the received signal. The output at pin 1 varies from 0 when no signal is present, to -1.25 Vdc, when the signal level is at -10 dBm (with AGC on).

G.4 ALIGNMENT PROCEDURES

1. Connect the HP-8640B Signal Generator to the Antenna 1 input of the receiver and connect the HP-400EL AC Voltmeter and 93 ohm load to the switched Video Output (J4).

2. Set the receiver to 25.0000 MHz, AGC ON, and select the LSB detection mode.

3. Set the signal generator to produce a 24.9990 MHz CW signal, at an output level of -50 dBm.

4. Adjust C13, on the Type 794188-1 SSB Demodulator (A3A14), for the maximum output level, as indicated on the AC voltmeter.

5. Adjust R44, on the SSB Demodulator, to produce an output level of .235 V rms, as indicated on the AC voltmeter.

G.5 PARTS LIST

G.5.1 TYPE 794188-1 SSB DEMODULATOR

REF DESIG PREFIX A3A14

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision C				
C1	Capacitor, Electrolytic, Tantalum: 2.2 µF, 20%, 35 V	2	196D225X0035JE3	56289	
C2	Same as C1				
C3	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	24	34453-1	14632	
C4 Thru C9	Same as C3				
C10	Capacitor, Ceramic, Disc: 1000 pF, 5%, 100 V	5	8121-100COGO-102J	59660	
C11	Capacitor, Mica, Dipped: 47 pF, 2%, 500 V	1	CM04ED470G03	81349	
C12	Not Used				
C13	Capacitor, Variable, Ceramic: 2.5-11 pF, 350 V	1	538-006B2.5-11	59660	
C14	Same as C10				
C15	Same as C3				
C16	Same as C3				
C17	Same as C10				
C18 Thru C24	Same as C3				
C25	Same as C10				
C26	Same as C3				
C27	Same as C3				
C28	Same as C10				
C29 Thru C32	Same as C3				
C33	Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V	3	C023B101E502M	56289	
C34	Same as C3				
C35	Same as C33				
C36	Same as C33				
C37	Same as C3				
C38	Capacitor, Ceramic, Disc: .1 µF, 20%, 50 V	1	8131-050-651-105M	59660	
CR1	Diode	4	5082-3188	28480	
CR2 Thru CR4	Same as CR1				
CR5	Diode	2	5082-2800	28480	
CR6	Same as CR5				
FL1	Filter: Upper Sideband	1	92217	14632	
FL2	Filter: Lower Sideband	1	92218	14632	
L1	Coil, Fixed: 100 µH, 10%	2	1025-68	99800	
L2	Same as L1				
L3	Coil, Fixed: 15 µH, 10%	1	1025-48	99800	
L4	Coil, Fixed: 3.9 µH, 10%	1	1025-34	99800	
L5	Coil, Fixed: 27 µH, 10%	1	1025-54	99800	
Q1	Transistor	1	3N211	80131	

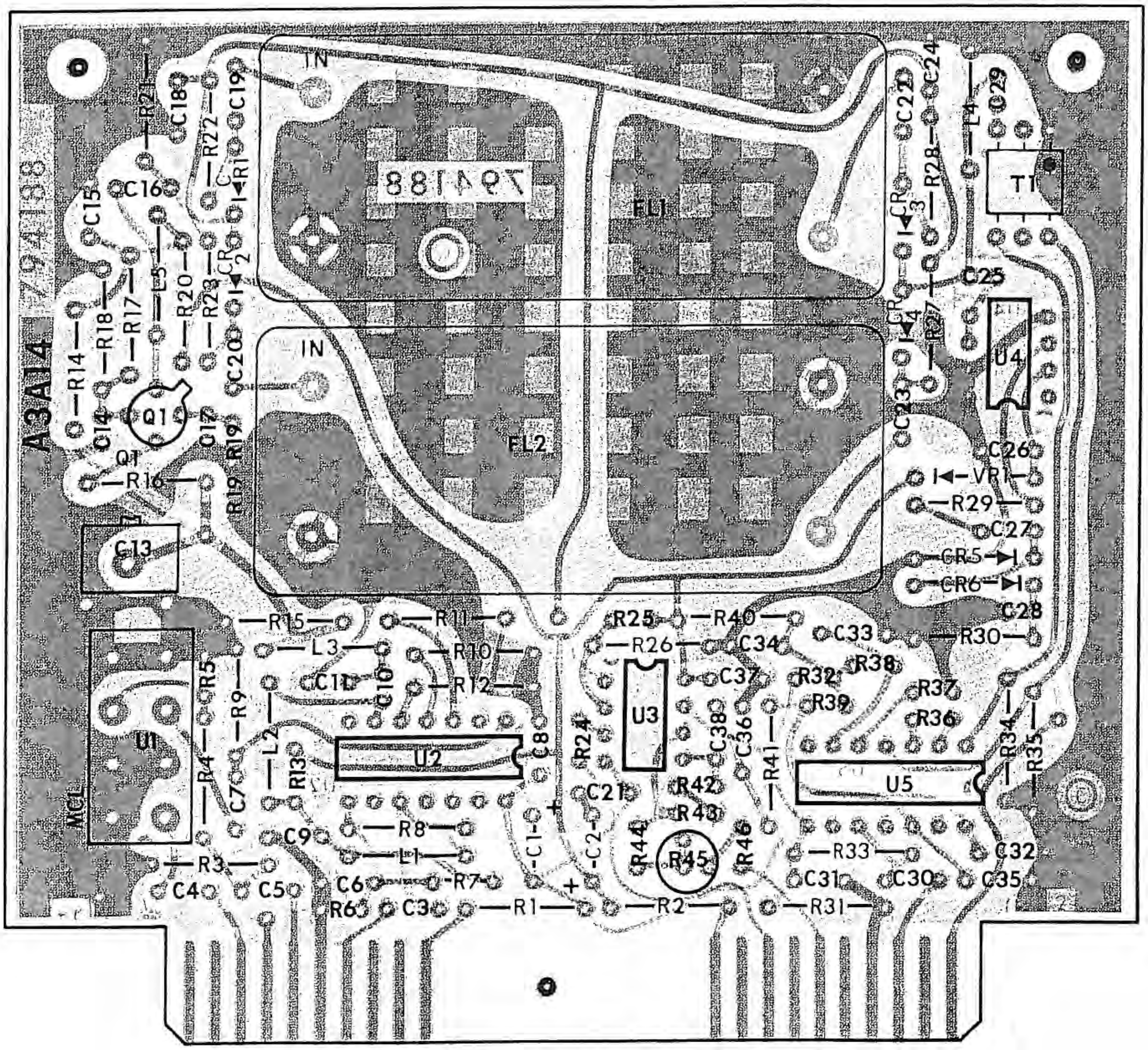


Figure G-1. Type 794188-1 SSB Demodulator (A3A14), Location of Components

REF DESIG PREFIX **A3A14**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R1	Resistor, Fixed, Film: 10Ω, 5%, 1/4 W	2	CF 1/4-10 OHMS/J	09021	
R2	Same as R1				
R3	Resistor, Fixed, Film: 300Ω, 5%, 1/4 W	2	CF 1/4-300 OHMS/J	09021	
R4	Resistor, Fixed, Film: 18Ω, 5%, 1/4 W	1	CF 1/4-18 OHMS/J	09021	
R5	Same as R3				
R6	Resistor, Fixed, Film: 1.8 kΩ, 5%, 1/4 W	2	CF 1/4-1.8K/J	09021	
R7	Same as R6				
R8	Resistor, Fixed, Composition: 51Ω, 5%, 1/4 W	4	RCR07G510JS	81349	
R9	Same as R8				
R10	Same as R8				
R11	Resistor, Fixed, Film: 620Ω, 5%, 1/4 W	1	CF 1/4-620 OHMS/J	09021	
R12	Resistor, Fixed, Film: 12 kΩ, 5%, 1/4 W	2	CF 1/4-12K/J	09021	
R13	Resistor, Fixed, Film: 22Ω, 5%, 1/4 W	3	CF 1/4-22 OHMS/J	09021	
R14	Resistor, Fixed, Film: 68 kΩ, 5%, 1/4 W	1	CF 1/4-68K/J	09021	
R15	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	1	CF 1/4-10K/J	09021	
R16	Resistor, Fixed, Film: 47Ω, 5%, 1/4 W	2	CF 1/4-47 OHMS/J	09021	
R17	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	2	CF 1/4-100K/J	09021	
R18	Resistor, Fixed, Film: 56 kΩ, 5%, 1/4 W	1	CF 1/4-56K/J	09021	
R19	Resistor, Fixed, Film: 120Ω, 5%, 1/4 W	1	CF 1/4-120 OHMS/J	09021	
R20	Same as R13				
R21	Resistor, Fixed, Film: 200Ω, 5%, 1/4 W	1	CF 1/4-200 OHMS/J	09021	
R22	Resistor, Fixed, Composition: 5.6 kΩ, 5%, 1/4 W	5	RCR07G562JS	81349	
R23	Same as R22				
R24	Resistor, Fixed, Film: 120 kΩ, 5%, 1/4 W	1	CF 1/4-120K/J	09021	
R25	Resistor, Fixed, Film: 270 kΩ, 5%, 1/4 W	1	CF 1/4-270K/J	09021	
R26	Resistor, Fixed, Film: 47 kΩ, 5%, 1/4 W	1	CF 1/4-47K/J	09021	
R27	Same as R22				
R28	Same as R22				
R29	Same as R16				
R30	Same as R17				
R31	Resistor, Fixed, Film: 1.1 kΩ, 5%, 1/4 W	1	CF 1/4-1.1K/J	09021	
R32	Reisitor, Fixed, Film: 2.7 kΩ, 5%, 1/4 W	1	CF 1/4-2.7K/J	09021	
R33	Same as R8				
R34	Resistor, Fixed, Film: 3.0 kΩ, 5%, 1/4 W	2	CF 1/4-3.0K/J	09021	
R35	Same as R34				
R36	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/4 W	2	CF 1/4-1.0K/J	09021	
R37	Same as R12				
R38	Resistor, Fixed, Film: 3.3 kΩ, 5%, 1/4 W	2	CF 1/4-3.3K/J	09021	
R39	Same as R38				
R40	Same as R13				
R41	Same as R36				

REF DESIG PREFIX A3A14

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R42	Resistor, Fixed, Film: 20 kΩ, 5%, 1/4 W	2	CF 1/4-20K/J	09021	
R43	Same as R22				
R44	Resistor, Fixed, Film: 22 kΩ, 5%, 1/4 W	1	CF 1/4-22K/J	09021	
R45	Resistor, Trimmer, Film: 20 kΩ, 10%, 1/2 W	1	62PR20K	73138	
R46	Resistor, Fixed, Film: 470Ω, 5%, 1/4 W	1	CF 1/4-470 OHMS/J	09021	
T1	Transformer	1	T9-1	15542	
U1	Power Divider	1	PSC2-1	15542	
U2	Integrated Circuit	2	MC1496P	04713	
U3	Integrated Circuit	1	MC1458N	18324	
U4	Integrated Circuit	1	SL1611C/DP	52648	
U5	Same as U2				
VR1	Diode Zener: 8.2 V	1	1N756A	80131	

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN μF.
   c) INDUCTANCE IS IN μH.
2. C12 IS NOT USED.
3. NOMINAL VALUE, FINAL VALUE FACTORY SELECTED.

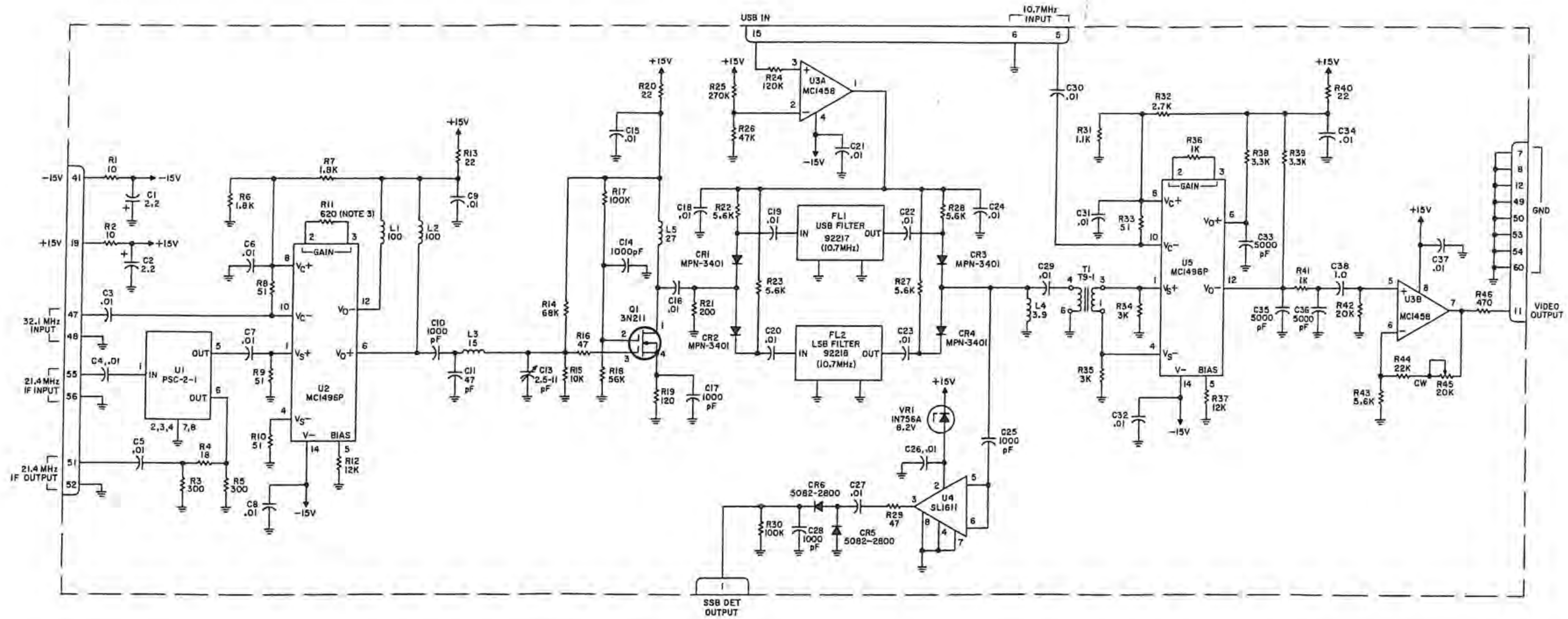


Figure G-2. Type 794188-1, SSB Demodulator (A3A14), Schematic Diagram 570169 (B)

WJ-861X RECEIVER

APPENDIX H

TYPE 798069-1, NOISE RIDING THRESHOLD, (NRT)

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

November 1990

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

PROPRIETARY STATEMENT

TABLE OF CONTENTS

APPENDIX H

LIST OF TABLES

LIST OF ILLUSTRATIONS

APPENDIX H
TYPE 798069-1, NOISE RIDING THRESHOLD, (NRT)

H.1 GENERAL

The Noise Riding Threshold (NRT) option measures the ratio of a signal carrier level to the IF background noise and activates the audio and COR (carrier operated relay) outputs when the operator selected threshold is exceeded. The circuitry has a threshold adjustment range of 0-to-20 dB that is set using the NRT/COR UP/DOWN pushbuttons on the receiver front panel or by using the COR command to set NRT remotely. The NRT LEVEL display provides a number from 00 to 20 that represents the NRT threshold in decibels. The NRT module board is inserted in option slot 6. The DAV option is excluded when the NRT option is selected.

H.2 INSTALLATION

NRT is installed by plugging Type 798069-1 Noise Riding Threshold module into option slot 6. Refer to the decal on the receiver top dust cover for the location of option slot 6. Ensure that the Audio/Video/COR (A3A15) module installed in the receiver is Type 796233-1. Set switch S2 Portion #3 on the Synthesizer Interface (A5A2) board to the closed position to enable the NRT option (1 is open; 0 is closed).

H.3 OPERATION

Refer to **Table H-1** for a list of the controls and indicators used by the Noise Riding Threshold option. The NRT option is selected by first pressing the FUNCTION (F↑) key to illuminate the LED on this key. With the FUNCTION key LED illuminated, the receiver front panel is placed in the uppercase operating mode. In the uppercase mode, press the NRT key to illuminate the LED on this key. The Noise Riding Threshold operating mode is now enabled. The NRT level is visible in the display below the NRT LEVEL label on the front panel display. The NRT increment (↑) and NRT decrement (↓) keys are used to vary the level visible in the NRT display. This value is selectable between 00 to 20. A NRT setting of 00 has a noise riding threshold level of zero dB. Using the NRT increment key (↑) a level of up to 20 may be selected. A NRT value of 02 requires a 2 dB carrier-to-noise level (C+N/N) before the NRT output is forced to a TTL level High, indicating that the set NRT level has been exceeded. Exceeding the set NRT level causes the LED on the decrement key (↓) to illuminate.

NRT can only be selected when the 10 kHz, 20 kHz, 50 kHz or 100 kHz IF bandwidths are selected. If an IF bandwidth other than these four bandwidths is selected, NRT is not able to be selected. NRT may be disabled by pressing the NRT key to extinguish the LED below the NRT label on the front panel. With NRT disabled, the receiver returns to the COR operating mode.

During remote operation, the COR "n" command is used to set the NRT level (where "n" is a value between 00 and 20) when NRT is enabled. The COR? query is used to determine the NRT set level, when the NRT mode is enabled. IF NRT is not enabled, the COR mnemonics affect the COR operation.

Table H-1. NRT Controls and Indicators

Control/Indicator	Function
F ↑	Must be pressed before NRT can be turned on or off.
NRT	Initiates NRT function. If NRT is already selected, NRT disables NRT and selects COR.
NRT/COR	Increases or decreases NRT threshold when NRT is selected.
NRT LEVEL	Displays NRT threshold, 1 increment per 1 dB of carrier-to-noise ratio.
COR "n"	Sets the NRT level when NRT is enabled (n = 00 -20)
COR?	Requests the NRT level when NRT is enabled.
NRT	Enables NRT
NRT/	Disables NRT

H.4 CIRCUIT DESCRIPTIONS

The following paragraphs provide circuit descriptions for the subassemblies required for NRT.

H.4.1 TYPE 798069-1 NOISE RIDING THRESHOLD (A5NRT)

Refer to **Figure H-8** for the Type 798069-1 Noise Riding Threshold schematic diagram. The NRT board is installed in option slot 6 of the Digital Motherboard.

The FM signal is input from the FM discriminator to U10 and U12 and their associated circuitry which function as an active high-pass filter with selectable cutoff frequencies which correspond to the selected IF bandwidths. The bandwidth select lines, input pins 4 and 6, digitally determine the cutoff frequency of the filter. Feedback resistors R2 through R17 in conjunction with C1 and C2, and C5 and C6 create the time constants to filter the signal. The cutoff frequency is slightly greater than one-half of the selected IF bandwidth, this provides immunity from modulation and allows good noise sensitivity. The filtered output of U12 is applied to noise amplifier and detector U7. Associated with U7 is a feedback network consisting of CR1, CR4, R20, R52, and R54. For a positive input to U7 the gain is very low, for a negative input there is high gain. The noise amplifier and detector is a non-linear device, whose gain output depends on the level of the input signal. A detected noise voltage is at the output of U7.

Monostable multivibrators U1 and U2 provide timing for the circuit. The bandwidth select lines are input through logic gates U3 to the inverting inputs of flip-flops U1A, U1B, U2A, and U2B. The Q output of U2A acts as a clock for U4B and the Q* (Low) output of U2A sets U1A, U1B, and U2B. Logic gates U8A through U8D receive inputs from the microprocessor at connector pins 14 and 41. When the receiver is in the Scan or Step mode, U8 resets U1A, U1B, and U2B after each step or scan increment. This recycles the integration process and continues the scan or step sequence.

The output of U7 through R21 is a dc voltage proportional to the noise level; with no RF signal present, the noise input at connector pin 49 is maximum. U7 applies its maximum positive voltage. This detected noise voltage is applied to U6 along with the bandwidth select lines. Variable resistors R22 through R29, resistors R30 through R33, capacitor C13, and amplifier U11B make up an integrator. The resistors that are to be included are determined by the bandwidth select lines. The charging of C13 is determined by the sum of the detected noise voltage at R21 and the current at S1 of U6. If the current at R21 is higher than S1, C13 produces a sawtooth wave with a maximum amplitude of -15V; if the U6 S1 current is higher than the current through R21, C13 charges toward +15V. The duration of the charging is 5 or 12 msec, depending on whether the output of U1A, U1B, U2B is selected by the bandwidth select lines. At the end of the 5 or 12 msec period Q2, is made to conduct by a .5 msec pulse from U2A, this discharges C13 and resets the integrator. The output of U11B is input to comparator U5. The programmed COR level, from 0 to 5V, is input to U11C and applied to U5. The output of U5 is +5V if the output of U11C exceeds that of U11B, or 0V if the output of U11B exceeds the output of U11C. The TTL output of U5 is applied to flip-flop U4B. The Q output of U4B is applied to connector pin 47, and Q* (Low) output is applied through inverter U9B and then applied to connector pin 11 to update the microprocessor on the COR status.

H.5 MAINTENANCE

Performance tests and alignment procedures are provided for the subassemblies required for NRT.

H.5.1 PERFORMANCE TESTS

H.5.1.1 Audio/Video/COR Performance Tests

H.5.1.1.1 Video Output

1. Connect the test equipment as illustrated in **Figure H-1,** and remove the FM Demodulators from their slots on the RF/IF Motherboard.

2. Set the receiver to AM detection and select the 10 kHz bandwidth.

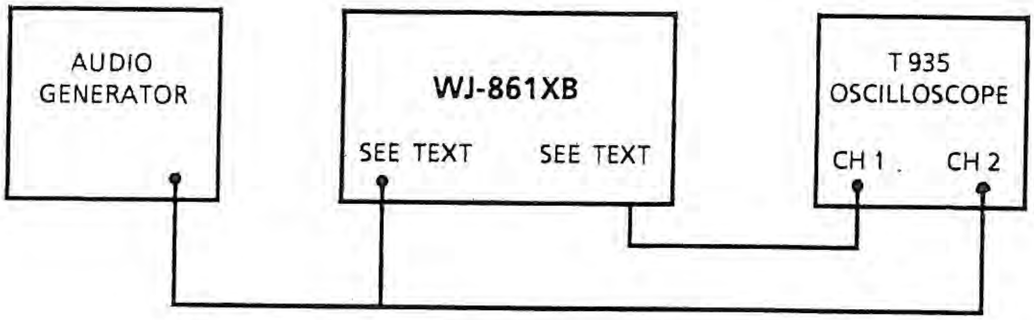


Figure H-1. Audio/Video/COR Performance Test, Equipment Connections

3. Connect the audio signal generator and the channel B input of the oscilloscope to pin 3 of connector XA15. Adjust the generator to produce a 1 kHz signal at 2 V peak-to-peak amplitude, as observed on channel B of the oscilloscope. Remove the oscilloscope probe.

4. Connect the channel A input of the oscilloscope, and 93 Ω termination to J2 (FM MON) on the receiver rear panel. Observe that the signal at J2 is 2 V peak-to-peak.

5. Move the channel A input of the oscilloscope and the 93 Ω termination to J4 (Switched Video) on the receiver rear panel. Observe no AM video is present.

6. Move the input signal from the signal generator to pin 1 of XA15. Observe a 2 V peak-to-peak signal displayed on the A trace of the oscilloscope.

7. Connect the channel B input of the oscilloscope and 600 Ω termination to the J3 (Audio) output on the receiver.

8. Rotate the LINE AUDIO fully CW and observe the output reaches an amplitude of at least 7 V peak-to-peak with no clipping present.

9. Select the 20 kHz bandwidth and repeat steps 3 through 8. Connect the signal generator to pin 5 of XA15 in step 3 and to pin 7 of XA15 in step 6.

10. Select the 50 kHz bandwidth and repeat steps 3 through 8. Connect the signal generator to pin 9 of XA15 in step 3 and to pin 11 in step 6.

11. Select the 100 kHz bandwidth and repeat steps 3 through 8. Connect the signal generator to pin 13 of XA15 in step 3 and to pin 15 in step 6.

H.5.1.1.2 **COR Operation**

1. Connect the test equipment as illustrated in **Figure H-2.**

2. Adjust the signal generator for a 255.5550 MHz CW signal, with the output level set to minimum. Set the HP-6216A power supply output for 24 V and adjust the current limit for 100 mA maximum.

3 Set the receiver to the standard test set-up described in **Table 4-3** with the NRT LEVEL set to 00 and observe that the NRT LED is illuminated. Observe the milliammeter on the power supply reads 100 mA.

4. Depress the NRT UP pushbutton and increase the NRT level until the NRT LED extinguishes. This level is typically 05 or less. Observe the milliammeter on the power supply reads near 0 mA.

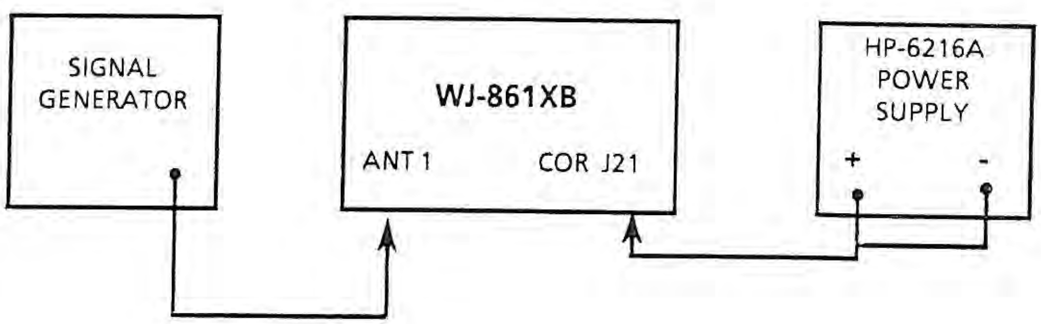


Figure H-2. COR Circuit Test, Equipment Connections

H.5.1.2 **Noise Riding Threshold (NRT), Performance Test**

1. Tune the receiver to the standard test setting listed in **Table 4-3,** except set NRT to 05 and AGC OFF.

H.5.1.2.1 **NRT Threshold Range**

1. Set the receiver to a 10 kHz bandwidth and NRT to 05. Set the signal generator to -145 dBm.

2. Connect the test equipment as shown in **Figure H-3.**

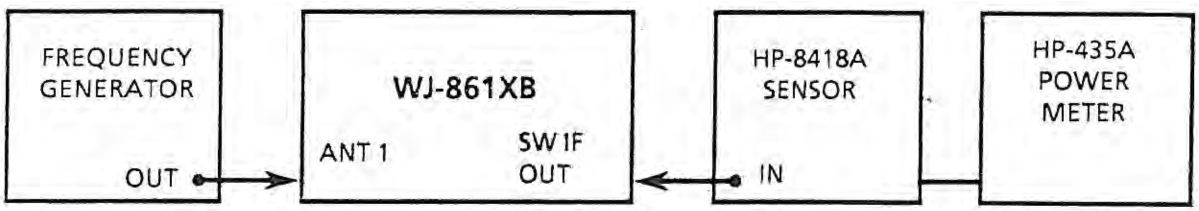


Figure H-3. NRT Threshold Test Configuration

3. Terminate the receiver with 50 ohms. Measure the noise level of the receiver at IF OUT with the RF power meter.

4. Increase the signal generator amplitude until a 3 dB rise in the noise level is noted at IF OUT. Use this as a reference.

5. Increase the signal generator until the NRT LED illuminates. The NRT LED should illuminate at 5, ±1 dB above the reference level established in **step 4.**

6. Set NRT to 20. Increase the signal generator amplitude until the NRT LED illuminates. The NRT LED should illuminate at 20, ±1 dB above the reference level established in **step 4.**

H.5.2 **ALIGNMENT PROCEDURES**

H.5.2.1 **Audio/Video/COR (A3A15), Alignment**

1. The following test requires that the IF bandwidth slot (A3A9) contain an IF Amplifier with a 10 kHz bandwidth. A matching FM Demodulator must be installed in slot A3A17.

2. Connect the test equipment as illustrated in **Figure H-4.**

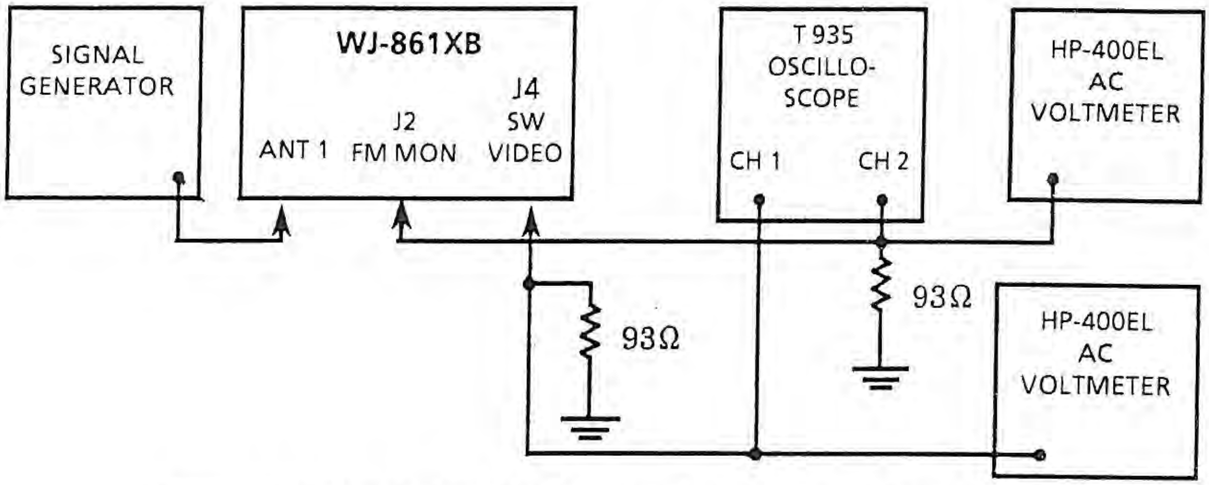


Figure H-4. Audio/Video/COR Alignment, Equipment Connections

3. Tune the receiver to 20.0000 MHz and select AGC on, 10 kHz Bandwidth, FM Detection and Antenna 1.

4. Set the signal generator to produce a 20.000 MHz signal, modulated at a 400 Hz rate. Set the peak deviation to 30%. Adjust the output level of the generator to 104 dBm as listed.

5. Set R4, R12, and R47 to midrange.

6. Adjust R4 for a 2.5 V peak-to-peak signal on channel 2 of the oscilloscope (approximately .884 Vrms) on the voltmeter.

7. Observe the switched video output level on the AC voltmeter, connected to Channel 1 of the oscilloscope and adjust R47, to decrease this level by 8 dB. Note the level indicated on the AC voltmeter (approximately .350 Vrms).

8. Select AM modulation on the signal generator and set the modulation for 50% at a 400 Hz rate. Select AM Detection on the receiver.

9. Adjust R12 for the same AC voltmeter level noted in **step 7.**

10. Adjust the signal generator output level to the level set in **step 4.**

11. Adjust the rear panel Line Audio control for 2.45 Vrms (6.93 V peak-to-peak).

H.5.2.2 **Noise Riding Threshold (NRT), Alignment**

1. Connect the test equipment as illustrated in **Figure H-5.**

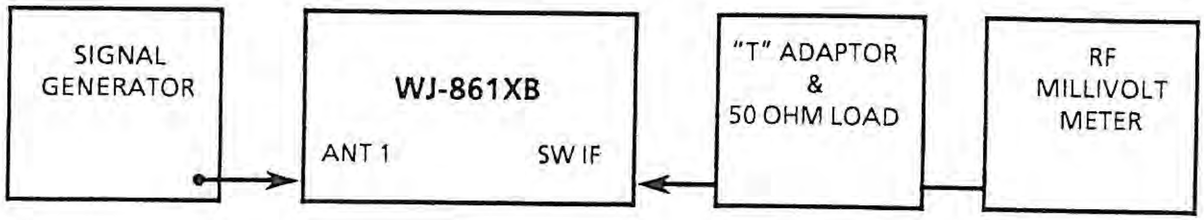


Figure H-5. NRT Alignment, Equipment Connection

2. Set the HP-8640B Signal Generator to produce a 255.5550 MHz CW signal. Set the output level to minimum.

3. Tune the receiver to 255.5550 MHz. Select 10 kHz Bandwidth, FM, AGC off. Rotate RF/IF Gain control fully CW. Set NRT LEVEL to 05.

4. With the HP-8640B Signal Generator output set to minimum, note the level present at the switched IF Output connector (J1). Slowly increase the signal generator output level until a 3 dB increase is noted. The level indicated on the signal generator is the noise floor of the selected bandwidth.

5. Increase the generator output level by 5 dB and adjust R22 until the NRT LED just illuminates.

6. Increase the NRT Level to obtain a display reading of 20. Increase the generator output level 15 dB (20 dB above the noise floor obtained in **step 4**).

7. Adjust R26 until the NRT LED just illuminates.

8. Repeat **steps 4** through **7** to minimize interaction between adjustments. The adjustment in **step 5** should cause the NRT LED to illuminate at exactly 5 dB above the noise floor and the adjustment in **step 6** should cause the NRT LED to illuminate at exactly 20 dB above the noise floor.

9. Select 20 kHz bandwidth and determine the noise floor using the procedure described in **step 4.**

10. Repeat **steps 5** through **8,** except, adjust R23 in **step 5** and R27 in **step 7.**

11. Select bandwidth #3 and determine the noise floor using the procedure described in **step 4.**

12. Repeat **steps 5** through **8,** adjust R24 in **step 5** and R28 in **step 6.**

13. Select bandwidth #4 and determine the noise floor **as described** in **step 4.**

14. Repeat **steps 5** through **8,** adjusting **R25** in **step 5 and R29** in **step 7.**

H.6 REPLACEMENT PARTS LIST

The following list of manufacturers, parts list, and schematic diagrams supplement the Receiver Instruction Manual, and are to be used in conjunction with applicable sections of that manual.

Mfr. Code	Name and Address	Mfr. Code	Name and Address
04099	Capco, Incorporated P.O. Box 2164 Grand Junction, CO	88245	Litton Industries USECO Division 81501 Van Nuys, CA 91409

H.6.1 TYPE 798069-1 NOISE RIDING THRESHOLD REF DESIG PREFIX A5

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision F				
C1	Capacitor, Mica, Dipped: 330 pF, 20%, 500 V	4	CM05FD331G03	81349	
C2	Same as C1				
C3	Capacitor, Electrolytic, Tantalum: 1 µF, 20%, 35 V	4	196D105X0035HE3	56289	
C4	Same as C3				
C5	Same as C1				
C6	Same as C1				
C7	Same as C3				
C8	Same as C3				
C9	Capacitor, Polycarbonate: .47 µF, 2%, 50 V	2	MPCW-474-.5-2	04099	
C10	Same as C9				
C11	Capacitor, Polycarbonate: .1 µF, 2%, 50 V	1	MPCW-105-.5-2	04099	
C12	Capacitor, Polycarbonate: .1 µF, 2%, 100 V	1	MPCW-104-1-2	04099	
C13	Capacitor, Polycarbonate: .01 µF, 2%, 100 V	1	MPCW-103-1-2	04099	
C14	Capacitor, Electrolytic, Tantalum: 22 µF, 20%, 15 V	3	196D226X0015KE3	56289	
C15	Same as C14				
C16	Same as C14				
C17	Capacitor, Ceramic Disc: .1 µF, 20%, 50 V	3	34475-1	14632	
C18	Same as C17				
C19	Same as C17				
C20	Capacitor, Ceramic Disc: .1 µF, 10%, 100 V	1	CK06BX104K	81349	
CR1	Diode	4	1N4444	80131	
CR2 Thru CR4	Same as CR1				
Q1	Transistor	1	2N2907/JAN	81350	
Q2	Transistor	1	U1899E	15818	
R1	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	6	CF1/4-10K/J	09021	
R2	Resistor, Fixed, Film: 15 kΩ, 1%, 1/10 W	3	RN55C1502F	81349	
R3	Resistor, Fixed, Film: 7.5 kΩ, 1%, 1/10 W	2	RN55C7501F	81349	
R4	Resistor, Fixed, Film: 3.01 kΩ, 1%, 1/10 W	2	RN55C3011F	81349	
R5	Resistor, Fixed, Film: 1.5 kΩ, 1%, 1/10 W	2	RN55C1501F	81349	
R6	Resistor, Fixed, Film: 100 kΩ, 1%, 1/10 W	3	RN55C1003F	81349	
R7	Resistor, Fixed, Film: 49.9 kΩ, 1%, 1/10 W	2	RN55C4992F	81349	
R8	Resistor, Fixed, Film: 20 kΩ, 1%, 1/10 W	2	RN55C2002F	81349	
R9	Resistor, Fixed, Film: 10 kΩ, 1%, 1/10 W	5	RN55C1002F	81349	
R10	Same as R2				
R11	Same as R3				
R12	Same as R4				
R13	Same as R5				
R14	Same as R6				
R15	Same as R7				
R16	Same as R8				
R17	Same as R9				

REF DESIG PREFIX A5

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R18	Resistor, Fixed, Film: 1 kΩ, 1%, 1/10 W	1	RN55C1001F	81349	
R19	Same as R1				
R20	Resistor, Fixed, Film: 750 kΩ, 1%, 1/4 W	1	MF4C/750KF	80031	
R21	Resistor, Fixed, Film: 4.75 kΩ, 1%, 1/10 W	1	RN55C4751F	81349	
R22	Resistor, Variable, Film: 20 kΩ, 10%, 1/2 W	2	62PAR20K	73138	
R23	Resistor, Variable, Film: 10 kΩ, 10%, 1/2 W	2	62PAR10K	73138	
R24	Same as R23				
R25	Same as R22				
R26	Resistor, Variable, Film: 50 kΩ, 10%, 1/2 W	4	62PAR50K	73138	
R27 Thru R29	Same as R26				
R30	Resistor, Fixed, Film: 301 kΩ, 1%, 1/10 W	1	RN55C3013F	81349	
R31	Resistor, Fixed, Film: 121 kΩ, 1%, 1/4 W	1	MF4C/121K/F	80031	
R32	Same as R6				
R33	Resistor, Fixed, Composition: 147 kΩ, 1%, 1/10 W	1	RN55C1473F	81349	
R34	Same as R9				
R35	Same as R9				
R36	Resistor, Fixed, Film: 12.1 kΩ, 1%, 1/10 W	1	RN55C1212F	81349	
R37	Resistor, Fixed, Film: 4.75 kΩ, 1%, 1/10 W	2	RN55C4751F	81349	
R38	Resistor, Fixed, Composition: 4.7 kΩ, 5%, 1/4 W	1	RCR07G472JS	81349	
R39	Resistor, Fixed, Composition: 1 MΩ, 5%, 1/4W	1	RCR07G105JS	81349	
R40	Resistor, Fixed, Composition: 3.3 kΩ, 5%, 1/4 W	1	RCR07G332JS	81349	
R41	Same as R1				
R42	Resistor, Fixed, Film: 6.19 k,Ω 1%, 1/10 W	2	RN55C6191F	81349	
R43	Resistor, Fixed, Film: 56.2 kΩ, 1%, 1/10 W	1	RN55C5622F	81349	
R44	Resistor, Fixed, Composition: 100 kΩ, 5%, 1/4 W	1	RCR07G104JS	81349	
R45	Same as R1				
R46	Same as R1				
R47	Same as R42				
R48	Same as R2				
R49	Resistor, Fixed, Film: 4.32 kΩ, 1%, 1/10 W	1	RN55C4321F	81349	
R50	Same as R9				
R51	Resistor, Fixed, Composition: 1 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	
R52	Resistor, Fixed, Film: 3.92 kΩ, 1%, 1/10 W	1	RN55C3921F	81349	
R53	Same as R37				
R54	Resistor, Fixed, Film: 634 kΩ, 1%, 1/10 W	1	RN55C6340F	81349	
R55	Same as R1				
R56	Resistor, Fixed, Composition: 8.2 kΩ, 5%, 1/4 W	1	RCR07G822JS	81349	
R57	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/8 W	1	CF1/8-1.0K/J	09021	
U1	Integrated Circuit	2	MM74C221N	27014	
U2	Same as U1				
U3	Integrated Circuit	1	MM74C32N	27014	

REF DESIG PREFIX **A5**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
U4	Integrated Circuit	1	MM74C74N	27014	
U5	Integrated Circuit	1	734DC	07263	
U6	Integrated Circuit	3	DG509CJ	17856	
U7	Integrated Circuit	1	LM318N	27014	
U8	Integrated Circuit	1	SN74LS00N	01295	
U9	Integrated Circuit	1	MM80C98N	27014	
U10	Same as U6				
U11	Integrated Circuit	1	HA1-4741-5	37371	
U12	Same as U6				

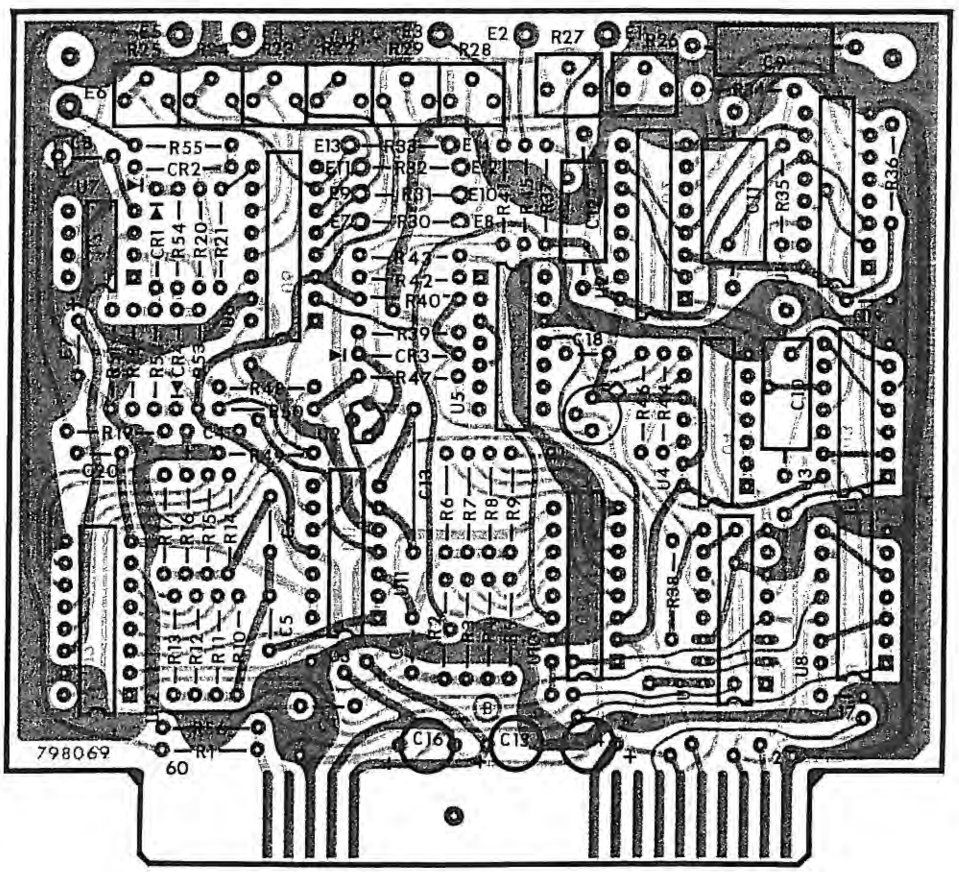


Figure H-6. Type 798069-1 Noise Riding Threshold, (Option H-NRT), Location of Components

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
a) RESISTANCE IS IN OHMS, ±1%, 1/10W.
b) CAPACITANCE IS IN µF.
2. NOMINAL VALUE, FINAL VALUE FACTORY SELECTED.

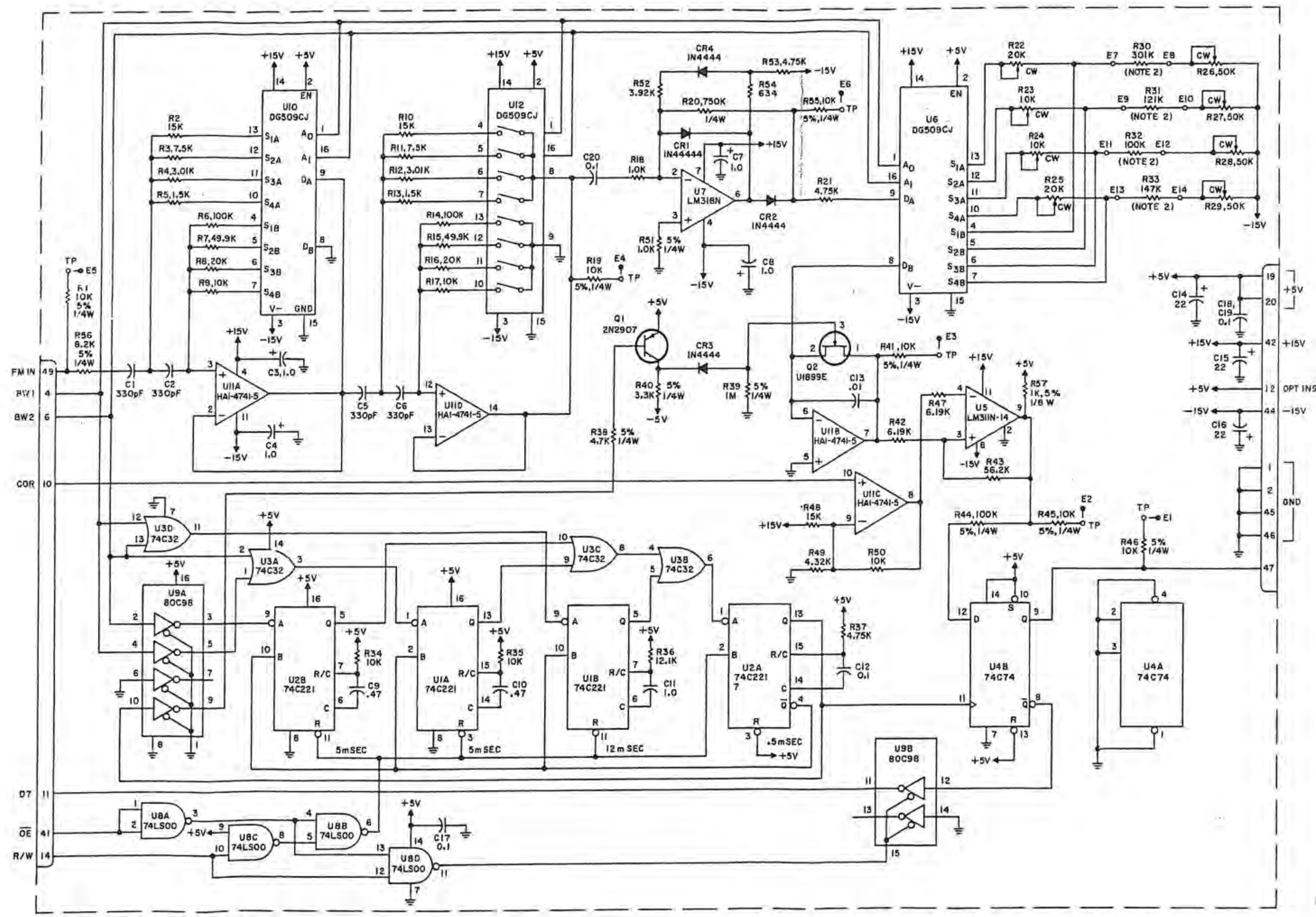


Figure H-7. Type 798069-1, Noise Riding Threshold Schematic Diagram 590166 (D)

WJ-861X RECEIVER

APPENDIX I

WJ-861X 60 dB LOG VIDEO OPTION

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

November 1990

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

PROPRIETARY STATEMENT

This document and subject matter disclosed herein are proprietary items to which Watkins-Johnson Company retains the exclusive right of dissemination, reproduction, manufacture and sale.

This document is provided to the individual or using organization for their use alone in the direct support of the associated equipment unless permission for further disclosure is expressly granted in writing.

TABLE OF CONTENTS

APPENDIX I

LIST OF ILLUSTRATIONS

APPENDIX I

60 dB LOG VIDEO (LOG) OPTION

I.1 GENERAL DESCRIPTION

The 60 dB LOG Video option (LOG) provides a LOG Video output at the receiver rear panel. It supplies a DC voltage of from +0.4 Vdc to approximately +7.7 Vdc that varies with the strength of the received signal. Input signals at the noise floor of the receiver produce a +0.4 Vdc LOG Video output, with the output increasing by approximately .125 Vdc for each 1 dB increase in signal strength. At 60 dB above the receiver noise floor, the LOG Video output produces an output of +7.7 Vdc.

I.2 INSTALLATION PROCEDURE

Installation of the 60 dB LOG Video option is accomplished as illustrated in **Figure I-3,** using the following procedures:

1. Remove the top and bottom covers from the receiver.
2. From the top of the receiver, remove the standard AM Demodulator/IF Output Amplifier from the A3A16 slot on the RF/IF Motherboard.
3. Install the Type 726004-1 AM Demodulator/IF Output Amplifier (60 dB LOG Video) subassembly into the A3A16 slot.
4. From the under side of the receiver, install plug LOG-P1 of LOG W1 onto the XA16 connector pins of the RF/IF Motherboard (A3). Orient LOG-P1 such that pin 1 of LOG-P1 mates with XA16-pin 20 and pin 3 of LOG-P1 mates with XA16-pin 16.
5. Route LOG-W1 to the rear of the receiver and mount LOG-J1 of this cable to the receiver rear panel at the AUX connector mounting hole.
6. Install the LOG VIDEO OUT decal on the rear panel to identify the LOG-J1 output.
7. Installation of the LOG option may require realignment of the Type 726004-1 AM Demodulator/IF Output Amplifier (60 dB LOG Video) and the AGC Amplifier (A3A8) to provide the proper signal strength display. Refer to **paragraphs 4.7.1.7** and **4.7.1.9** in **Section IV** of the receiver manual for the required alignment procedures.

I.3 OPERATION

The LOG VIDEO output is utilized when the receiver is in the manual gain control mode, with the RF/IF GAIN control set in the fully clockwise position. This will provide a full 60 dB of range at the output. When the receiver is in the AGC gain mode, an accurate output is provided from the receiver noise floor to 40 dB above noise. Signal levels greater than 40 dB above noise cause the AGC action to affect the receiver gain, thus affecting the LOG VIDEO output.

I.4 CIRCUIT DESCRIPTION

I.4.1 TYPE 726004-1 AM DEMODULATOR/IF OUTPUT AMPLIFIER (60 dB LOG VIDEO)

The reference designation for this subassembly is LOG-A1. Refer to **Figure I-3** for the Type 726004-1 AM Demodulator/IF Output Amplifier (60 dB LOG VIDEO) schematic diagram.

With the exception of the circuitry comprised of U5 through U8, this subassembly functions identically to the Type 724016-1 AM Demodulator described in **paragraph 3.3.2.15** of the receiver manual. The difference between subassemblies is in the LOG IF Amplifier components used to provide 60 dB of Log Video range.

The 21.4 MHz IF signal, provided by the input switching network of the subassembly, is taken from the wiper of potentiometer R5 and is provided via R62 and C60 to the LOG IF Amplifier strip, comprised of U5 through U7. U5 through U7 are all wideband log amplifiers. U5 and U6 each provide approximately 24 dB of gain and U7 provides approximately 13 dB of gain. The three amplifiers are then cascaded to provide an overall range greater than 60 dB. The amplified IF signal, at the output of each of these IF amplifiers, is output at pin 3 of the integrated circuit and directed to the input of the next stage. The output of the final stage (U7) is developed across the output load, C67 and R76. Pin 4 of each integrated circuit provides a dc bias current which varies logarithmically with the output level of its respective amplifier. These bias outputs are summed together by the summing network comprised of R66 through R70, R78 and RT1 and are then provided to U8 for voltage amplification. The summing network components, along with feedback resistors R72 and R73 set the gain of U8. From pin 6 of U8, the LOG IF Output is passed via R74 to connector pin 20 to provide the LOG video output to the required circuits.

I.5 PARTS LIST

I.5.1 TYPE WJ-861XB/LOG REF DESIG PREFIX LOG

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision D				
A1	AM Demodulator/IF Output Amplifier (60 dB Log Video)	1	726004-1	14632	
FL1	Filter, Jack, EMI	1	1240-030-0060	72982	
J1	Part of FL1				
W1	Cable Assembly	1	380325-1	14632	
	Decal	1	180111	14632	

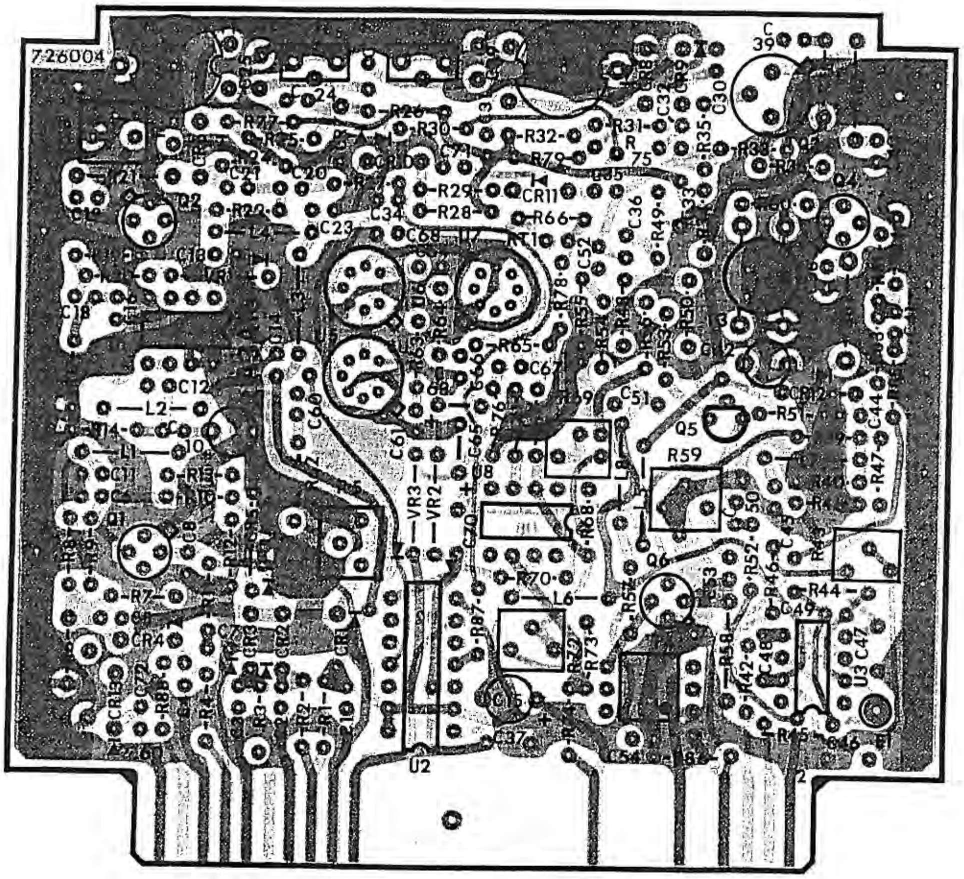


Figure I-1. Type 726004-1 AM Demodulator/IF Output Amplifier (60 dB LOG Video) (Option I - LOG), Location of Components

I.5.1.1 Type 726004-1 AM Demodulator/IF Output Amplifier (60 dB LOG Video)

REF DESIG PREFIX LOG-A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision F				
C1	Capacitor, Ceramic, Disc: 4700 pF, 20%, 50 V	41	8121-050-651-472M	59660	
C2 Thru C8	Same as C1				
C9	Capacitor, Variable, Ceramic: 5-25 pF, 100 V, N750	1	518-000A5-25	59660	
C10 Thru C14	Same as C1				
C15	Capacitor, Electrolytic, Tantalum: 2.2 µF, 20%, 35 V	1	196D225X0035JE3	56289	
C16 Thru C21	Same as C1				
C22	Not Used				
C23	Same as C1				
C24	Same as C1				
C25	Capacitor, Mica, Dipped: 91 pF, 2%, 500 V	2	CM04FD910G03	81349	
C26	Capacitor, Variable, Ceramic: 5-25 pF, 100 V, NP0	2	518-002A5-25	59660	
C27	Capacitor, Ceramic, Disc: 1.8 pF, ±0.1 pF, 100 V	1	8101-100C0K0-189B	59660	
C28	Same as C26				
C29 Thru C31	Same as C1				
C32	Same as C1				
C33	Capacitor, Ceramic, Disc: 0.01 µF, 20%, 50 V	2	34453-1	14632	
C34	Same as C1				
C35	Same as C1				
C36	Capacitor, Ceramic, Monolithic: 8.2 pF, ±.5 pF, 100 V	2	8101-100C0H0-829D	59660	
C37	Capacitor, Ceramic, Disc: 0.47 µF, 20%, 50 V	4	34452-1	14632	
C38 Thru C41	Same as C1				
C42	Capacitor, Variable, Ceramic: 1-3 pF, 100 V	1	518-000A1-3	59660	
C43	Not Used				
C44	Capacitor, Ceramic, Disc: 4.7 pF, ±.25 pF, 100 V	3	8101-100C0H0-479C	59660	
C45	Same as C44				
C46	Same as C37				
C47	Same as C37				
C48	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 50 V	1	34475-1	14632	
C49	Same as C44				
C50	Same as C1				
C51	Same as C33				
C52	Same as C36				
C53	Same as C1				
C54	Same as C1				

REF DESIG PREFIX LOG-A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C55 Thru C59	Not Used				
C60	Same as C1				
C61	Same as C1				
C62	Not Used				
C63	Capacitor, Electrolytic, Tantalum: 22 µF, 20%, 10 V	2	196D226X0010FE3	56289	
C64	Same as C1				
C65	Same as C63				
C66	Same as C1				
C67	Same as C1				
C68	Capacitor, Ceramic, Disc: 470 pF, 5%, 100 V	1	8121-100-C0G0-471J	59660	
C69	Not Used				
C70	Same as C37				
C71	Same as C1				
C72	Same as C1				
C73	Capacitor, Ceramic, Monolithic: 2200 pF, ±2%, 100 V	1	200-100-NPO-222G	51642	
CR1	Diode	11	5082-3188	28480	
CR2 Thru CR4	Same as CR1				
CR5	Diode	1	1N462A	80131	
CR6 Thru CR11	Same as CR1				
CR12	Diode	1	5082-2800	28480	
CR13	Same as CR1				
L1	Coil, Fixed: 2.2 µH, 10%	1	1025-28	99800	
L2	Coil, Fixed: 27 µH, 10%	4	1025-54	99800	
L3	Same as L2				
L4	Same as L1				
L5	Same as L2				
L6	Coil, Fixed: 18 µH, 10%	1	1025-50	99800	
L7	Coil, Fixed: 39 µH, 10%	1	1537-56	99800	
L8	Same as L2				
Q1	Transistor	1	3N211	80131	
Q2	Transistor	3	2N2857	80131	
Q3	Transistor	1	2N5109	80131	
Q4	Same as Q2				
Q5	Transistor	1	2N3904	80131	
Q6	Same as Q2				
R1	Resistor, Fixed, Film: 3.3 kΩ, 5%, 1/8 W	8	CF1/8-3.3K/J	09021	

REF DESIG PREFIX LOG-A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R2 Thru R4	Same as R1				
R5	Resistor, Trimmer, Film: 100Ω, 10%, 1/2 W	1	62PAR100	73138	
R6	Resistor, Fixed, Film: 39 kΩ, 5%, 1/8 W	1	CF1/8-39K/J	09021	
R7	Resistor, Fixed, Film: 47Ω, 5%, 1/8 W	3	CF1/8-47 OHMS/J	09021	
R8	Resistor, Fixed, Film: 130 kΩ, 5%, 1/8 W	1	CF1/8-130K/J	09021	
R9	Resistor, Fixed, Film: 100 kΩ, 5%, 1/8 W	5	CF1/8-100K/J	09021	
R10	Resistor, Fixed, Film: 33 kΩ, 5%, 1/8 W	3	CF1/8-33K/J	09021	
R11	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/8 W	7	CF1/8-4.7K/J	09021	
R12	Resistor, Fixed, Film: 120Ω, 5%, 1/8 W	1	CF1/8-120 OHMS/J	09021	
R13	Resistor, Fixed, Film: 33Ω, 5%, 1/8 W	4	CF1/8-33 OHMS/J	09021	
R14	Resistor, Fixed, Film: 220Ω, 5%, 1/8 W	4	CF1/8-220 OHMS/J	09021	
R15	Not Used				
R16	Not Used				
R17	Resistor, Fixed, Film: 150Ω, 5%, 1/8 W	2	CF1/8-150 OHMS/J	09021	
R18	Not Used				
R19	Resistor, Fixed, Film: 6.8 kΩ, 5%, 1/8 W	4	CF1/8-6.8K/J	09021	
R20	Same as R17				
R21	Resistor, Fixed, Film: 750Ω, 5%, 1/4 W	1	CF1/4-750 OHMS/J	09021	
R22	Resistor, Fixed, Film: 100Ω, 5%, 1/8 W	4	CF1/8-100 OHMS/J	09021	
R23	Resistor, Variable, Film: 200Ω, 10%, 1/2 W	1	62PAR200	73138	
R24	Resistor, Fixed, Film: 2.7 kΩ, 5%, 1/8 W	2	CF1/8-2.7K/J	09021	
R25	Same as R10				
R26	Same as R9				
R27	Same as R1				
R28	Same as R1				
R29*	Resistor, Fixed, Film: 300Ω, 5%, 1/8 W	1	CF1/8-300 OHMS/J	09021	
R30	Same as R1				
R31	Same as R10				
R32	Same as R9				
R33	Same as R11				
R34	Same as R11				
R35	Resistor, Fixed, Film: 330Ω, 5%, 1/8 W	1	CF1/8-330 OHMS/J	09021	
R36	Resistor, Fixed, Film: 22Ω, 5%, 1/8 W	1	CF1/8-22 OHMS/J	09021	
R37	Resistor, Fixed, Film: 180Ω, 5%, 1/4 W	1	CF1/4-180 OHMS/J	09021	
R38	Resistor, Fixed, Film: 39Ω, 5%, 1/8 W	1	CF1/8-39 OHMS/J	09021	
R39	Resistor, Fixed, Film: 200 kΩ, 5%, 1/8 W	1	1/8-200K/J	09021	
R40	Resistor, Fixed, Film: 8.2 kΩ, 5%, 1/8 W	3	CF1/8-8.2K/J	09021	
R41	Same as R40				
R42	Resistor, Fixed, Composition: 470Ω, 5%, 1/8 W	3	RCR05G471JS	81349	

REF DESIG PREFIX LOG-A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R43	Resistor, Trimmer, Film: 50 kΩ, 10%, 1/2 W	1	62PR50K	73138	
R44	Resistor, Fixed, Film: 10 kΩ, 5%, 1/8 W	2	CF1/8-10K/J	09021	
R45	Same as R22				
R46	Resistor, Fixed, Film: 18 kΩ, 5%, 1/8 W	1	CF1/8-18K/J	09021	
R47	Same as R7				
R48	Same as R44				
R49	Same as R19				
R50	Same as R22				
R51	Same as R42				
R52	Same as R13				
R53	Same as R22				
R54	Same as R19				
R55	Resistor, Fixed, Film: 22 kΩ, 5%, 1/8 W	1	CF/1/8-22K/J	09021	
R56	Same as R19				
R57	Same as R14				
R58	Resistor, Fixed, Film: 1.0Ω, 5%, 1/4 W	1	CF1/4-1.0K/J	09021	
R59	Resistor, Trimmer, Film: 500Ω, 10%, 1/2 W	1	62PAR500	73138	
R60	Not Used				
R61	Not Used				
R62	Same as R7				
R63	Resistor, Fixed, Film: 10Ω, 5%, 1/8 W	3	CF1/8-10 OHMS/J	09021	
R64	Same as R63				
R65	Same as R63				
R66	Same as R14				
R67	Same as R11				
R68	Resistor, Fixed, Film: 910Ω, 5%, 1/8 W	1	CF1/8-910 OHMS/J	09021	
R69	Resistor, Trimmer, Film: 5 kΩ, 10%, 5 W	1	62PAR5K	73138	
R70	Same as R40				
R71	Resistor, Fixed, Film: 2.2 kΩ, 5%, 1/8 W	1	CF1/8-2.2K/J	09021	
R72	Resistor, Trimmer, Film: 10 kΩ, 10%, 1/2 W	1	62PAR10K	73138	
R73	Resistor, Fixed, Film: 15 kΩ, 5%, 1/8 W	1	CF1/8-15K/J	09021	
R74	Same as R13				
R75	Same as R24				
R76	Same as R11				
R77	Same as R9				
R78	Resistor, Fixed, Film: 270Ω, 5%, 1/8 W	1	CF1/8-270 OHMS/J	09021	
R79	Same as R9				
R80	Same as R13				
R81	Same as R42				
R82	Resistor, Fixed, Film: 330Ω, 5%, 1/4 W	1	CF1/4-330 OHMS/J	09021	
R83	Same as R11				

REF DESIG PREFIX LOG-A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R84	Same as R11				
R85	Same as R14				
R86	Resistor, Fixed, Film: 56Ω, 5%, 1/8 W	1	CF1/8-56 OHMS/J	09021	
R87	Resistor, Fixed, Film: 680Ω, 5%, 1/8 W	1	CF1/8-680 OHMS/J	09021	
R88	Same as R1				
RT1	Resistor, Thermal: 1 kΩ	1	2D102	50157	
RT2	Thermistor: 100 kΩ, ±10%	1	4D101	50157	
T1	Transformer	2	390452-1	14632	
T2	Same as T1				
T3	Transformer	1	22295-71	14632	
T4	Transformer	1	T4-1	15542	
U1	Integrated Circuit	2	SL1611C/DP	52648	
U2	Integrated Circuit	1	DG301ACJ	17856	
U3	Integrated Circuit	2	LM318N	27014	
U4	Not Used				
U5	Integrated Circuit	2	SL1523C	52648	
U6	Same as U5				
U7	Integrated Circit	1	SL1521C	52648	
U8	Same as U3				
VR1	Voltage Regulator: 8.2 V	2	1N756A	80131	
VR2	Voltage Regulator: 4.3 V	2	1N749A	81131	
VR3	Same as VR1				
VR4	Same as VR2				

NOTES
1. UNLESS OTHERWISE SPECIFIED
a) RESISTANCE IS IN OHMS, ± 5%, 1/8W.
b) CAPACITANCE IS IN pF.
c) INDUCTANCE IS IN μH.
2. NOMINAL VALUE, FINAL VALUE FACTORY SELECTED.

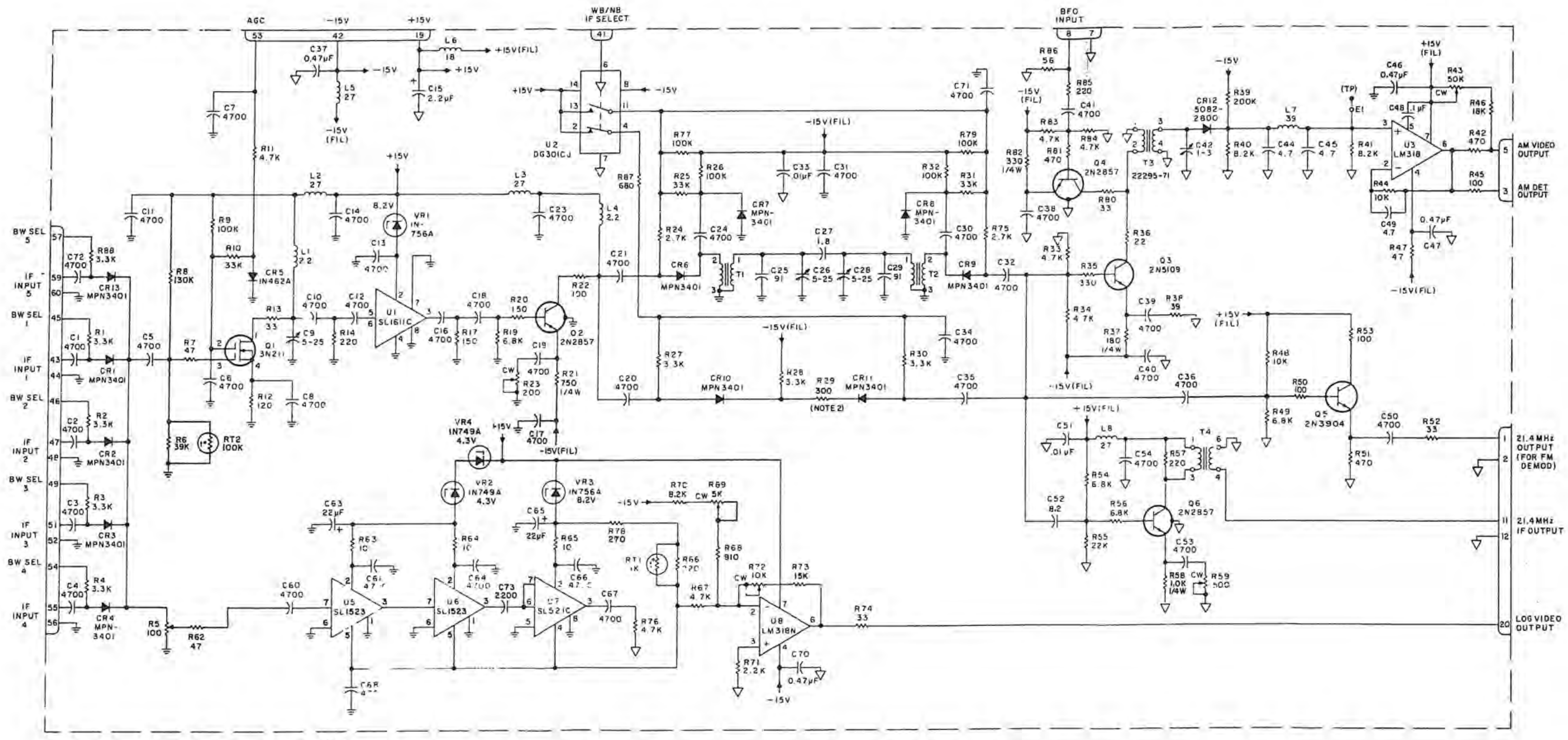
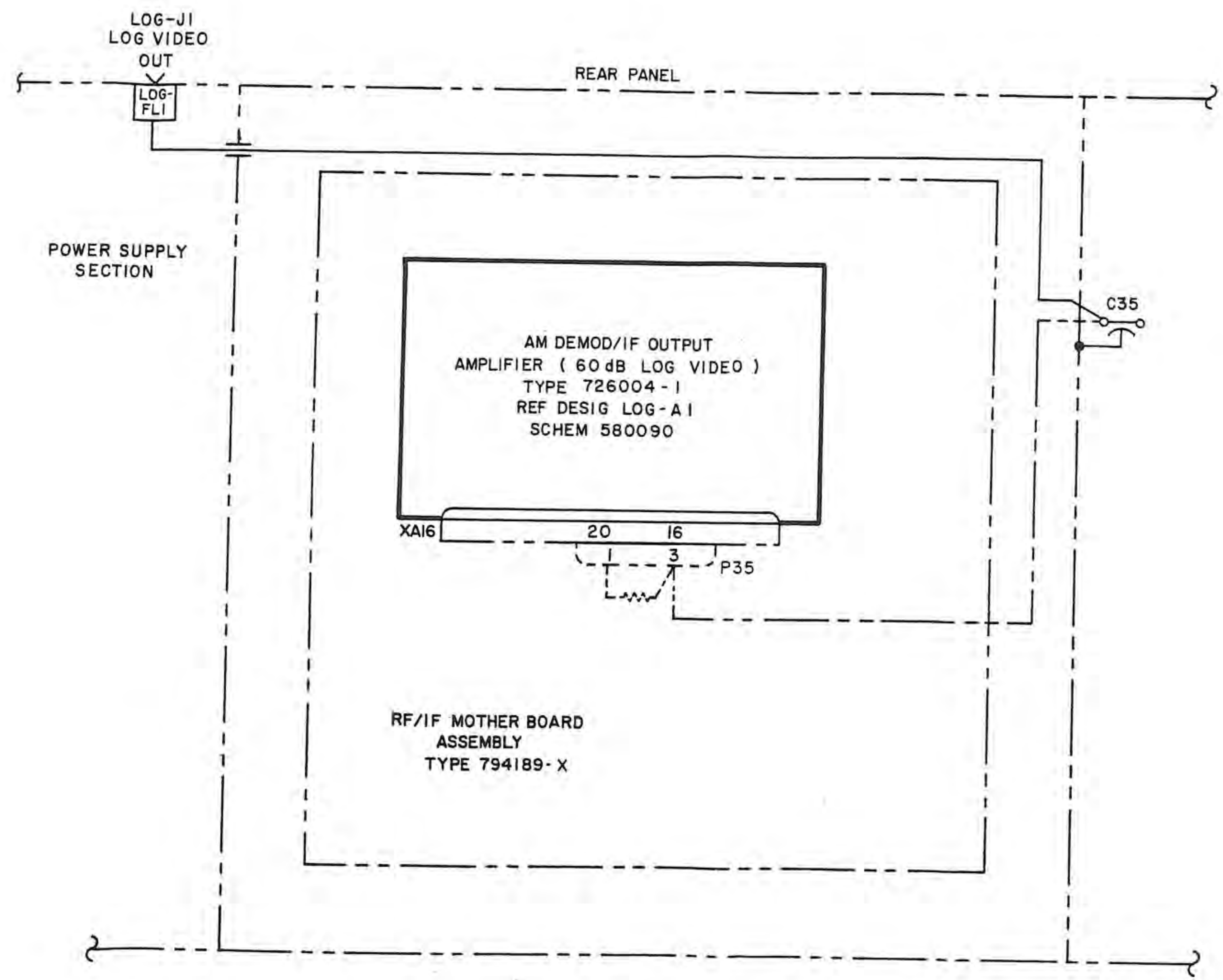


Figure I-2. Type 726004-1, AM Demod/IF Output Amplifier Schematic Diagram 580090 (D)



NOTES:
1. DASHED LINES INDICATE PARTS OF EXISTING UNIT.
2. INSTALL DECAL, PART NO. 180679 ON REAR PANEL ADJACENT TO "LOG-J1" CONNECTOR POSITION.

Figure I-3. Type WJ-861XB/Log Video (60dB) Schematic Diagram 380320 (C)

WJ-861X RECEIVER

APPENDIX J

WJ-861XB(S1) RECORD LOGGING (RLOG) OPTION

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

January 1992

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

PROPRIETARY STATEMENT

TABLE OF CONTENTS

APPENDIX J

LIST OF TABLES

LIST OF ILLUSTRATIONS

APPENDIX J

RECORD LOGGING (RLOG) OPTION

J.1 GENERAL DESCRIPTION

The Record Logging (RLOG) option provides the WJ-861XB Receiver with the capability of logging signal contacts on an external line printer or on a computer terminal. RLOG allows the generation of a running log of signals encountered. In addition to the frequency of the signal contacted, the receiver operating parameters, selected during the signal contact, are also provided. If the receiver is equipped with the Real-Time Clock (RTC) option, the time of day of signal contact is also provided as an item in the running log. Three modes of logging are available. Logging may consist of:

- Front Panel Log
- Manual Log
- Auto Log

The front panel log provides an indication of the receiver front panel operating parameters. Manual logging allows the receiver to step or to scan through the programmed frequencies stored in memory, to halt, and to log the data when a signal exceeds the set COR level. Auto logging allows the receiver to step or to scan until the receiver encounters a signal greater than COR, to pause momentarily, to log the data, and to resume its selected operation.

Two DIP switches (S1 and S2), located on the RLOG assembly, control the data byte structure (switch S1) and the baud rate (switch S2). For the setting of these switches, refer to **Table J-1** for the setting of switch S1 and refer to **Table J-2** for the setting of switch S2.

These switches should be set prior to inserting the RLOG assembly into the receiver. If these switches are set after the RLOG assembly is installed in the receiver, power must be cycled off and on again before the new switch settings are recognized.

J.2 INSTALLATION

When field installing the RLOG option into the receiver, the following material are required:

Receiver	Description	Part No.	Qty.
WJ-8617B	RLOG Interface	796617-1	1
WJ-8618B	Cable Assembly	380334-1	1
	RLOG Decal	180148-1	1

Table J-1 Switch S1 Data Byte Structure

Switch Position						Selected Structure		
1	2	3	4	5	6	Data Bits	Parity	Stop Bits
0	0	0	X	X	X	8	Even	1
1	0	0	X	X	X	8	Odd	1
0	1	0	X	X	X	8		1
1	1	0	X	X	X	8		2
0	0	1	X	X	X	7	Odd	1
1	0	1	X	X	X	7	Even	1
0	1	1	X	X	X	7	Odd	2
1	1	1	X	X	X	7	Even	2
X	X	X	X	X	*0	Automatic Logging Selected		
X	X	X	X	X	*1	Manual Logging Selected		

NOTES:
1 = CLOSED
0 = OPENED
X = DOESN'T CARE
* Required only with Type 796109-X Microprocessors

Table J-2. Switch S2 Baud Rate Selection

Switch Position							Baud Rate (in Hz)
1	2	3	4	5	6	7	
1	0	0	0	0	0	0	300
0	1	0	0	0	0	0	600
0	0	1	0	0	0	0	1200
0	0	0	1	0	0	0	2400
0	0	0	0	1	0	0	4800
0	0	0	0	0	1	0	9600
0	0	0	0	0	0	1	19200

NOTES:
1 = CLOSED
0 = OPEN

Depending on the WJ-861XB Receiver configuration and options installed, a multipin connector may be used for RLOG or a triaxial connector may be used.

J.2.1 RLOG OPTION INSTALLATION WITH MULTI-CONNECTOR

To install the RLOG option into the WJ-8617B Receiver using the multipin connector (J5), proceed according to the following steps:

1. Turn the receiver power off and remove the receiver top protective cover that is secured by quarter-turn fasteners.
2. Remove option assemblies installed in option slots 3 and 4 of the receiver, if necessary, to allow access to multipin connector J5 located on the rear panel.
3. Refer to **Figure J-1** for the installation of the three pins of the RLOG cable (RLOG-W1) into connector J5. Insert the three pins into the back side of connector J5. Press the pins in straight and apply firm pressure until the pins are properly seated in the connector. Insert the three wires according to the following steps:

   a. Insert the Orange wire into pin 8 of connector J5.
   b. Insert the Brown wire into pin 7 of connector J5.
   c. Insert the Red wire into pin 6 of connector J5.

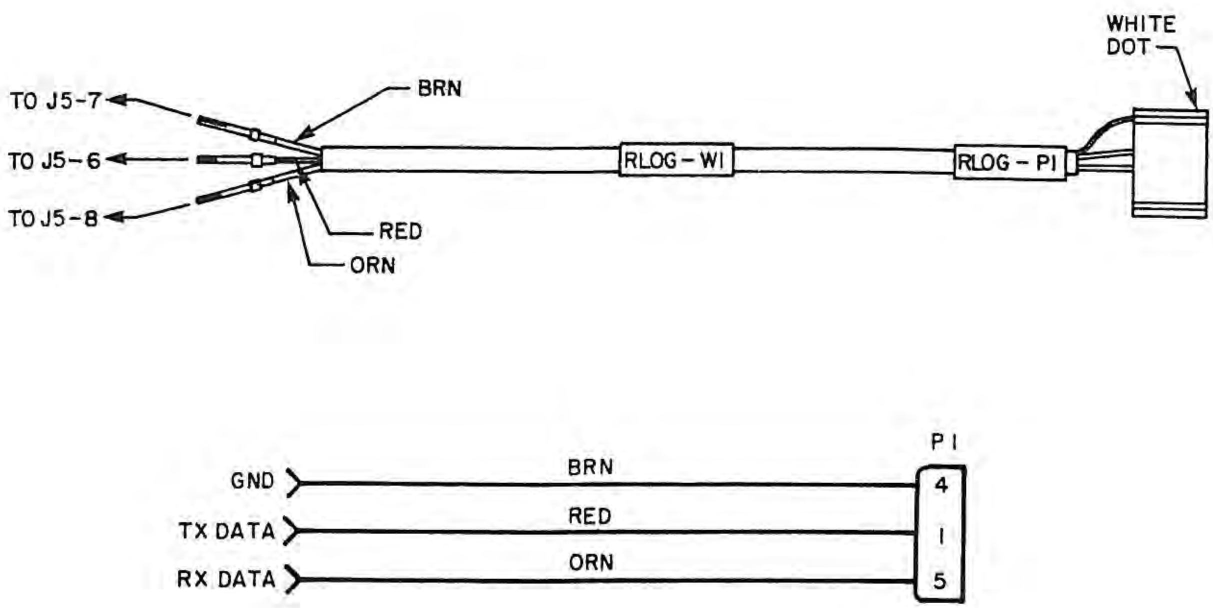


Figure J-1. RLOG Cable Pin Configuration

4. With the pins properly installed into connector J5, connect P1 of the RLOG cable to J1 of the RLOG assembly. Pin 1 of P1 aligns with pin 1 of J1 on the RLOG assembly.

5. Refer to **Table J-1** and **Table J-2** for the setting of the two DIP switches on the RLOG assembly. Set these switches to ensure proper operation of the RLOG, as required by the printer or terminal used.

6. Insert the Type 796619-1 RLOG assembly into Option Slot 5 of the Digital Motherboard (A5) and connect the RLOG cable to J1 of the RLOG assembly. Pin 1 of the RLOG assembly mates with pin 1 of the connector receptacle.

7. Replace EPROM U4 on Microprocessor A5A3 in order to support the addition of the RLOG option.

NOTE

When ordering the RLOG field installation kit the following information should have been supplied to Watkins-Johnson Company to ensure that the proper EPROM was supplied.

- Receiver Type
- Receiver Serial Number
- Software Revision Level (written on the Microprocessor EPROMs U4 or U5)
- Options Installed
- IF Bandwidths Installed

8. Replace and properly secure the top protective cover.

9. If the receiver front panel is not etched with AUTO LOG and MAN LOG above the STO and MAN pushbuttons, place the RLOG decal (part 180148-1) above the STO pushbutton.

J.2.2 INSTALLING THE RLOG OPTION WITH A TWINAXIAL CONNECTOR

To install the RLOG option with a twinaxial connector perform the following steps:

1. Turn the receiver power off and remove the receiver top protective cover that is secured by quarter-turn fasteners.

2. Remove option assemblies installed in option slots 3 and 4 of the receiver, if necessary, to allow access to multipin connector J5 located on the rear panel.

3. On the receiver rear panel, remove the hex retaining nut from the SCAN OUT connector (J5) from the outside of the receiver. Then remove the two Phillips-head screws securing the decal to the rear panel and remove the SCAN OUT decal.

4. Pull the ASO cable inside the receiver main chassis. Secure the ASO cable to the rear panel of the receiver with a tie wrap or other suitable fastener.

5. Insert the RLOG connector J1 through the connector hole in the receiver rear panel.

6. Slide the RLOG decal (part 290374-1) over the connector and secure the decal to the rear panel with the two screws.

7. Connect P1 of the RLOG cable to connector J1 of the Type 796261-3 Asynchronous Interface assembly.

8. Insert the Type 796617-1 RLOG assembly into Option Slot 5 of the Digital Motherboard (A5) and connect the RLOG cable to J1 of the RLOG assembly. Pin 1 of the RLOG assembly mates with pin 1 of the connector receptacle.

9. Replace EPROM U4 on Microprocessor A5A3 in order to support the addition of the RLOG option.

NOTE

When ordering the RLOG field installation kit the following information should have been supplied to Watkins-Johnson Company to ensure that the proper EPROM was supplied.

- Receiver Type
- Receiver Serial Number
- Software Revision Level (written on the Microprocessor EPROMs U4 or U5)
- Options Installed
- IF Bandwidths Installed

10. Replace and properly secure the top protective cover.

J.2.3 RLOG EXTERNAL LOGGING DEVICE INTERFACE

The 861X/RLOG option interfaces with RS-232 compatible line printers or computer terminals. The RLOG option is configured as a data terminal device (DTE) to provide a one way data link from the receiver to the external logging device. **Figure J-2** illustrates a typical interface cable required for connecting the receiver to a line printer. Connect the TX DATA line from the receiver to the RX DATA line of the printer and connect the receiver RX DATA line to the printer TX DATA line. Ground the cable shield at the receiver end and the printer end. A

Type 205204-1 accessory item (AI-6) is available that mates receiver connector J5 with a standard 25-pin D-Type connector. Refer to **Figure J-2** for an illustration of a typical receiver-to-printer interconnection.

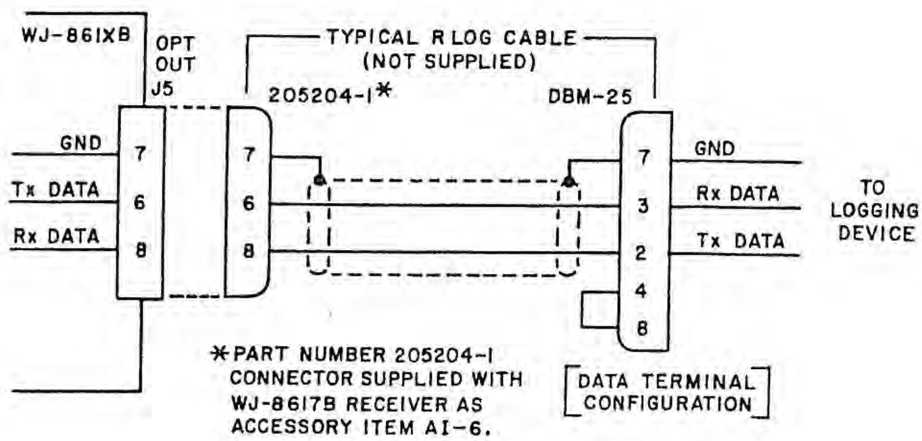


Figure J-2. Typical Receiver/Printer Interconnect Cable

J3. OPERATING PROCEDURES

The following paragraphs describe the various modes of RLOG operation and the steps required to operate the receiver RLOG mode of operation.

NOTE

If the receiver memory is lost, the default RLOG operating mode is AUTO LOG. Clearing the receiver memory (pressing the CLR pushbutton three times) does not change the selected RLOG operating mode.

J.3.1 RLOG DUMP

An RLOG Dump allows the receiver operating parameters to be logged by the external device connected to J5 of the receiver. The following steps are required to initiate an RLOG Dump.

1. Press the FUNCTION key (F↑) to place the receiver front panel into the upper case operating mode. The LED on the FUNCTION key is illuminated in the upper case mode.

2. Press the MAN pushbutton to dump the receiver operating parameters. These parameters include:

Parameter	Display	Range
Tuned Frequency	FREQ	20.0000-500.0000
Time	TIME	00:00:00-23:59:59
Signal Strength	SS	-127 to 000
IF Bandwidth Selected	BW	1-10
Detection Mode Selected	DET	AM, FM, CW, PL
Antenna Selected	ANT	1 or 2
AGC Status	AGC	ON or OFF
AFC Status	AFC	ON or OFF
COR Setting	COR	00-40
RF IF Gain Level	RFIFGN	000-255
BFO Frequency	BFO	+7.99--7.99
% FM Modulation	FM	000-100
% AM Modulation	AM	000-100
Modulation	MOD	AM, FM, CW, PL, ??

The RLOG Dump feature allows a single dump of the receiver operating parameters. This may be performed even though the receiver is not in the step or scan mode of operation. After an RLOG Dump has been performed, the receiver front panel returns to lower case operation.

J.3.2 MANUAL LOGGING

Manual logging is performed during the step or scan mode. Manual logging allows the receiver to step or to scan through the operator defined memory channels that have been stored in the receiver memory one time and then to halt. Manual logging performs the selected operation (step or scan) only one time. The receiver either steps through the selected frequencies once or scans the selected frequency spectrum once and then halts. If during manual logging a signal is encountered that exceeds the COR level stored in memory, the step or scan is halted, the data is logged, and the receiver remains on the signal until the COR threshold is not exceeded or until the scan or step is resumed by pressing the STEP or SCAN Key.

Select manual logging by performing the following steps:

1. Press the FUNCTION (F↑) key

2. Observe the LEDs above the STO (AUTO LOG) and MAN (MAN LOG) pushbuttons.

3. If neither LED is illuminated, press the STO key to enter the manual logging mode of operation. Pressing the STO key returns the front panel to lower case operation.

4. Verify that the manual logging mode of operation is selected by pressing the FUNCTION key and observing that the LED on the MAN (MAN LOG) key is illuminated.

5. Press the STEP or SCAN key to begin the step or scan operation. For either operation to be performed, parameters must have been previously stored in the memory channels.

If the step operating mode is selected by pressing the STEP key, the following information is logged to the external device before the step operation is initiated:

- STEP
- FREQ
- BW
- DET
- ANT
- AGC
- AFC
- COR
- RFIFGN
- BFO

Using this information as a header, each step frequency and operating parameter is listed for the step memory channels. A separate line of data is logged for each step memory channel, using the headers at the top of the columns. Thus, if five memory channels are being stepped through, there would be five rows of data following the step logging header listed above.

If the scan operating mode is selected by pressing the SCAN key, the following information is logged to the external device before the scan operation is initiated:

- STRT-FRQ
- STOP-FRQ
- BW
- DET
- ANT
- AGC
- AFC
- COR
- RFIFGN
- BFO

If a signal is encountered in either mode of operation that exceeds the set COR threshold level, the receiver halts and a log is sent to the external device. The following information is sent to the logging device:

- FREQ
- TIME
- SS
- FM
- AM MOD

The receiver remains locked onto the frequency until either the receiver operation is resumed by manually pressing the STEP or SCAN pushbutton or the signal level drops below the set COR threshold level. Either of these conditions will cause the receiver to resume its mode of operation. If no signal activity is encountered that exceeds the COR set level, the receiver halts at the end of its step or scan operation. Another step or scan is initiated by pressing the STEP or SCAN pushbutton.

J.3.3 AUTO LOGGING

Auto logging allows the receiver to step or scan through the selected frequencies or frequency range in the search for signal activity. If a signal that is greater than the set COR threshold is encountered, the receiver halts its selected operation, logs the data, and resumes its operation. A running log is generated of each signal contact.

Auto logging is selected by performing the following steps:

1. Press the FUNCTION (F↑) key
2. Observe the LEDs above the STO (AUTO LOG) and MAN (MAN LOG) pushbuttons.
3. If neither LED is illuminated, press the STO key to enter the manual logging mode of operation. Pressing the STO key returns the front panel to lower case operation.
4. Press the FUNCTION key again and verify the LED on the MAN key is illuminated. Press the STO key again to enter the auto logging mode of operation.
5. Verify the auto logging mode of operation is selected by pressing the FUNCTION key and observing that the LED on the MAN (MAN LOG) key and STO (AUTO LOG) keys are illuminated.
6. Press the STEP or SCAN key to begin the step or scan operation. For either operation to be performed, parameters must have been previously stored in the memory channels.

The logging headers used and the data logged are identical as those for the manual logging operation. However, auto logging resumes its selected mode of operation after the signal data has been logged. The step or scan operation will be continuously repeated, only pausing to log encountered signal data.

The setting of the DWELL control knob varies the rate at which the selected scan or step operation is performed.

J.4 CIRCUIT DESCRIPTION

J.4.1 TYPE 796617-1 RLOG INTERFACE

The Type 796617-1 RLOG Interface assembly installs into Option Slot 5 of the Digital Motherboard (A5). Refer to **Figure J-4** for the schematic diagram of the Type 796617-1 RLOG Interface assembly. NOTE 2 on the schematic lists the differences between existing versions of the RLOG Interface.

Control of the RLOG Interface assembly is performed by the receiver Microprocessor (A5A3) using the Address bus lines (A0, A2, and A12) and the data bus lines (D0-D7). The address lines are used to enable different outputs from decoder/demultiplexer U3. Depending on the address bus status, a different output of U3A or U3B is enabled. Enabling the different outputs of these devices allows the associated device to be addressed. When addressed, the device provides an output to the data bus. Enabling HEX buffer U12 allows the status of data byte structure switch S1 to be applied to the data bus. This allows the Microprocessor and asynchronous communications interface adapter (ACIA) U8, to know the selected data structure.

Enabling U8 allows parallel data on the data bus to be converted to serial form for transmission to an external device. The rate at which data is transferred between the receiver and the external device is controlled by the setting of jumper JP1.

A logging operation performs the following sequence of events. The microprocessor applies a low to connector P1 pin 41, the Enable line (OE*). This applies a low to decoder/ demultiplexer U3. U3A and U3B decode address lines A2 and A12. U3A provides a low chip select signal to U8, which allows it to read the data on its data input lines. U3A's low output signal, at pin 5, enables HEX buffer U3 to output its contents. This data constitutes the data byte structure, which is configured by setting S1. The low output from U3 is applied to HEX buffer U12 and to ACIA U8.

After addressing the RLOG assembly, data is applied to the data bus (D0-D7). The logic level of the read/write line (connector P1 pin 14) determines the direction of data on the data bus. When this line is High, the data is read from U8 and when the line is low, data is written to U8. With this line low, data on the data bus is transferred into U8 at the clock rate determined by the frequency of DBE (connector P1 pin 16). U8 converts the parallel data from the data bus into serial form for transmission. Serial data from U8 is applied out pin 6, across jumperwire 1 (JW1) and inverted through line driver U2 to pin 1 (TX DATA) of connector J1. Line driver U2 is used to convert the logic data "1" to an output less than -3 Vdc and converts the logic "0" to an output greater than +3 Vdc for use by the external printer.

The rate at which data is transmitted is determines by the setting of jumper JP1. Jumper JP1 determines the baud rate. Baud rates are selectable from 150 to 19.2K. The output from 4.9152 crystal oscillator Y1 is applied to the oscillator input of CMOS clock generator U1. U1 provides a buffered 4.9152 MHz output frequency. This frequency is applied to the clock input of binary counter U4.

Binary counter U4 divides the input frequency by different rates to allow the different baud rate selections, determined by the setting of DIP switch S2. The input frequency is divided by: 2, 4, 8, 16, 32, 64, 128, and 256 for baud rates between 9600 and 150. U8 divides the clock input frequency at pins 3 and 4 by a factor of 64 to produce the baud rates between 150 and 19.2K. The selected baud rate determines the rate at which data is transmitted to the external device attached to connector J1.

U8 sets the interrupt request line (IRQ) low when the internal transmit data register is empty or when the data carrier detect line is high. By setting the IRQ line low, the microprocessor unit operation is interrupted. The Microprocessor then can poll the interrupts to determine what condition or device set the interrupt. When the transmit data register empty (TDRE) condition occurs, additional data may be applied to U8.

J.5 PARTS LISTS

J.5.1 **TYPE 861XB(S1)/RLOG, LOGGING OPTION** REF DESIG PREFIX **RLOG**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision B				
RLOG-A1	RLOG Interface	1	796617-1	14632	
RLOG-P1	Connector, Receptacle	1	102241-6	00779	
RLOG-W1	Cable Assembly	1	380334-1	14632	
RLOG	RLOG Decal	1	180148-1	14632	

J.5.1.1 Type 796617-1 RLOG, Interface

REF DESIG PREFIX RLOG - A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision C1				
C1	Capacitor, Ceramic, Disc: .1 µF, 20%, 50 V	7	34475-1	14632	
C2	Capacitor, Ceramic, Monolithic: 18 pF, 2%, 50 V	2	100-100-NPO-180G	51642	
C3	Same as C2				
C4	Capacitor, Electrolytic, Tantalum: .47 µF, 10%, 35 V	2	CS13BF474K	81349	
C5	Same as C1				
C6	Same as C4				
C7	Capacitor, Ceramic, Monolithic: 100 pF, 2%, 100 V NPO	1	200-100-NPO-101G	51642	
C8	Capacitor, Ceramic, Monolithic: 30 pF, 2%, 100 V NPO	2	150-100-NPO-300G	51642	
C9	Same as C8				
C10	Capacitor, Ceramic, Disc: 1 µF, 20%, 100 V	3	RPE114-Z5U105M100V	72982	
C11	Capacitor, Electrolytic, Tantalum: 220 µF, 20%, 10 V	1	CS13BC227K	81349	
C12 Thru C16	Same as C1				
C17	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	6	34453-1	14632	
C18 Thru C22	Same as C17				
C23	Same as C10				
C24	Same as C10				
CR1	Diode	2	1N746A	80131	
CR2	Same as CR1				
J1	Header	1	102203-5	00779	
J2	Connector, Receptacle	1	65610-116	22526	
J3	Connector	1	1010-7511-001	19505	
J4	Header	1	102203-1	00779	
JP1	Connector, Plug	1	ML-100S	51167	
JW1*	Wire, Electrolytic, Buss	AR	8021 22 AWG BUSSWIRI	70903	
JW2*	Same as JW1				
JW3*	Not Used				
R1	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/8 W	1	CF1/8-1.0K/J	09021	
R2	Resistor, Fixed, Film: 15 kΩ, 1/8 W	2	CF1/8-15K/J	09021	
R3	Same R2				
R4	Resistor, Fixed, Film: 330 Ω, 5%, 1/4 W	1	CF1/4-330 OHMS/J	09021	
R5	Resistor, Fixed, Film: 10 kΩ, 1/8 W	2	CF1/8-10K/J	09021	
R6	Not Used				
R7	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/8 W	1	CF1/8-4.7K/J	09021	
R8	Resistor, Fixed, Film: 47 kΩ, 5%, 1/8 W	3	CF1/8-47K/J	09021	
R9	Same as R5				

REF DESIG PREFIX **RLOG - A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R10	Resistor, Fixed, Film: 3.9 kΩ, 5%, 1/8 W	1	CF1/8-3.9K/J	09021	
R11	Resistor, Fixed, Film: 56 kΩ, 5%, 1/8 W	2	CF1/8-56K/J	09021	
R12	Same as R8				
R13	Resistor, Fixed, Film: 68 kΩ, 5%, 1/8 W	1	CF1/8-68K/J	09021	
R14	Resistor, Fixed, Film: 33 kΩ, 5%, 1/8 W	1	CF1/8-33K/J	09021	
R15	Resistor, Fixed, Film: 22 kΩ, 5%, 1/8 W	3	CF1/8-22K/J	09021	
R16	Same as R15				
R17	Resistor, Fixed, Film: 100 kΩ, 5%, 1/8 W	2	CF1/8-100K/J	09021	
R18	Same as R15				
R19	Same as R11				
R20	Same as R8				
R21	Same as R17				
R22	Resistor, Fixed, Film: 100 Ω, 5%, 1/8 W	1	CF1/8-100 OHMS/J	09021	
S1	Switch, Dip	1	76PSB08S	81073	
TP1	Pin, Test Point	8	460-2976-02-0400	71279	
TP2 Thru TP8	Same as TP1				
U1	Integrated Circuit	1	ICM 7209-1-PA	32293	
U2	Integrated Circuit	1	SN75150P	01295	
U3	Integrated Circuit, DCDR	1	MM74HCT139N	27014	
U4	Integrated Circuit, Center	1	MM74HC4040N	27014	
U5	Integrated Circuit, Buffer	1	MM74HCT04N	27014	
U6	Integrated Circuit	1	SN75154N	01295	
U7	Not Used				
U8	Integrated Circuit	1	MC68B50P	04713	
U9	Not Used				
U10	Integrated Circuit	1	MM74HCTOON	27014	
U11	Not Used				
U12	Integrated Circuit, Latch	1	MM74HCT373N	27014	
U13	Resistor, Nework: 47 Ω	1	4310R-101-473	80294	
U14	Integrated Circuit	1	MM80C98N	27014	
U15	Not Used				
U16	Integrated Circuit	1	MC1458N	18324	
Y1	Crystal, Quartz: 4.91520 MHz	1	MP042	75378	
T2	Not Used				

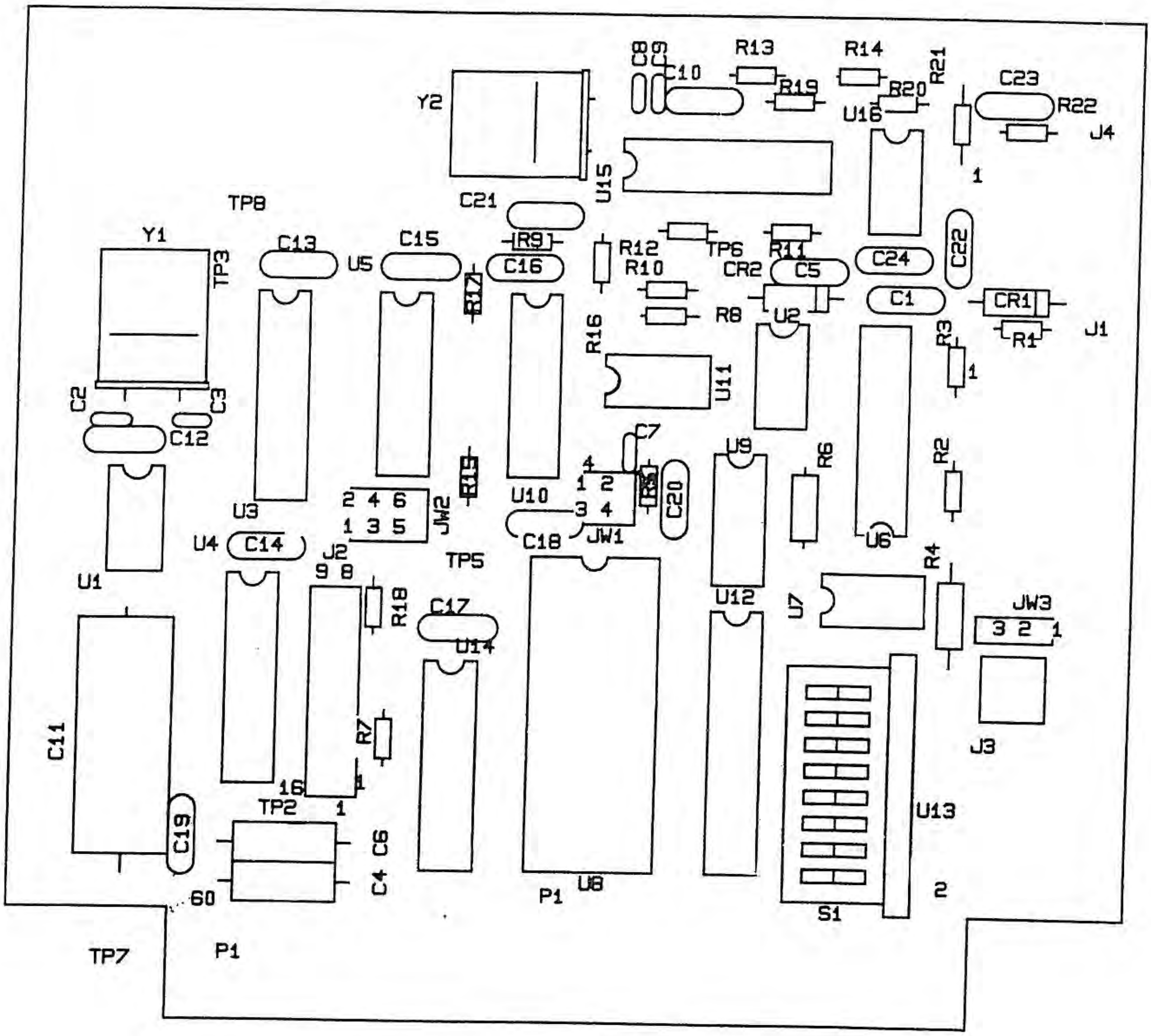


Figure J-3. Type 796617-1 RLOG, Interface (Option J - RLOG), Location of Components

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/8W.
   b) CAPACITANCE IS IN μF.
2. DIFFERENCE BETWEEN TYPES IS SHOWN IN TABLE I.

TABLE I

TYPE	USED WITH INTERFACE	JW1	JW2	JW3	U7	U9	U11	U15	Y2	R6
796617-1	RS-232C/LOGGING	1-2	1-4	N/A	N/U	N/U	N/U	N/U	N/U	N/U
-2	MIL-STD-188C/LOGGING	2-3	1-2	N/A	N/U	N/U	N/U	N/U	N/U	N/U
-3	WJ-9073-2 COAX	1-4	N/A	1-2	N/U	LH0002	SN75140	N/U	N/U	20 1/4W
-4	WJ-9073-2 FIBER OPTIC	1-4	N/A	2-3	SN75453P	N/U	N/U	N/U	N/U	N/U
-5	TAPE LOGGING	1-2	1-5	N/A	N/U	N/U	N/U	TCM3105	4.4336MHz	N/U
-6	WJ-9075 COAX	3-4	1-3	1-2	N/U	LH0002	SN75140	N/U	N/U	47 1/4W

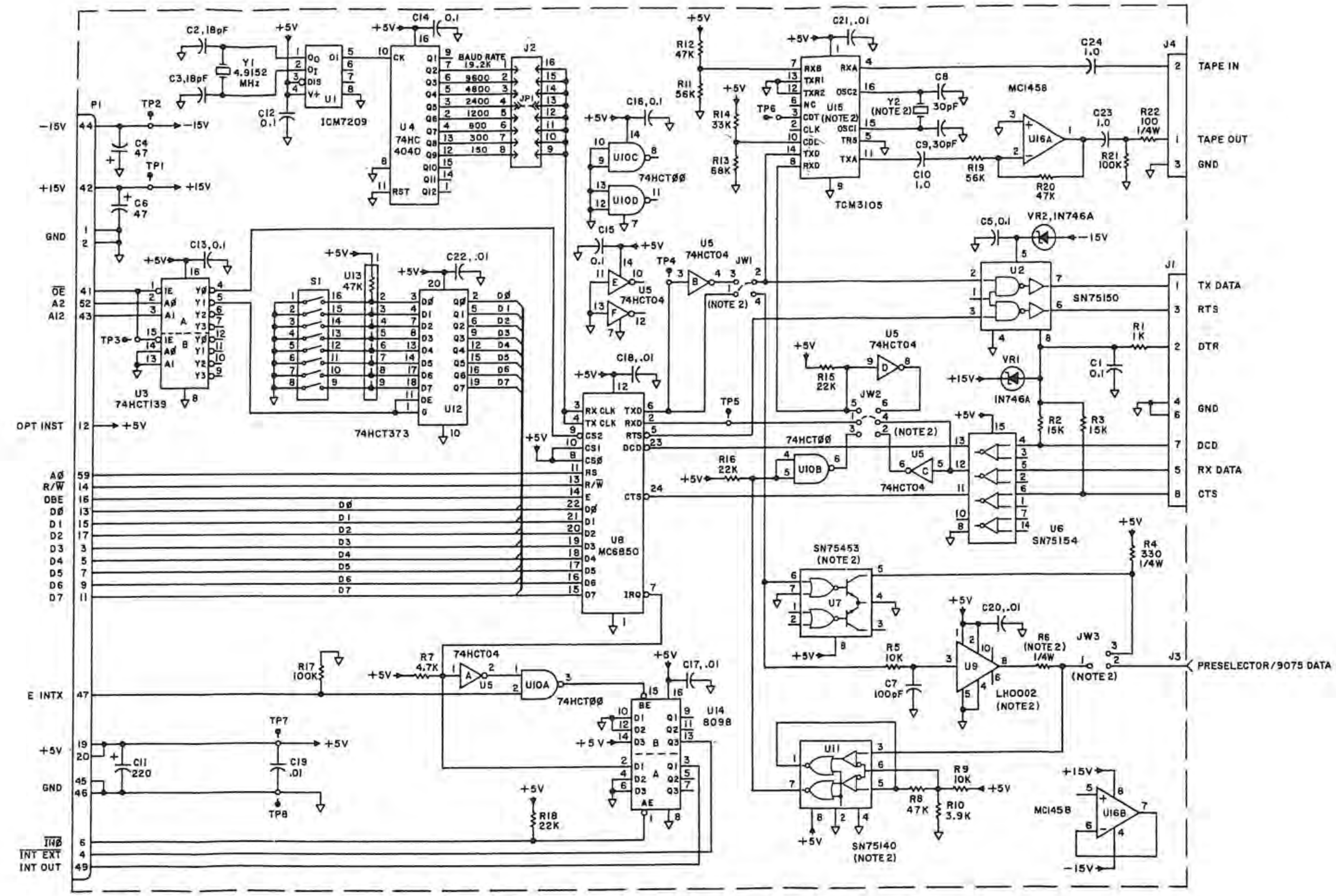


Figure J-4. Type 796617-1, Serial Interface (RLOG), Schematic Diagram 580723 (C)

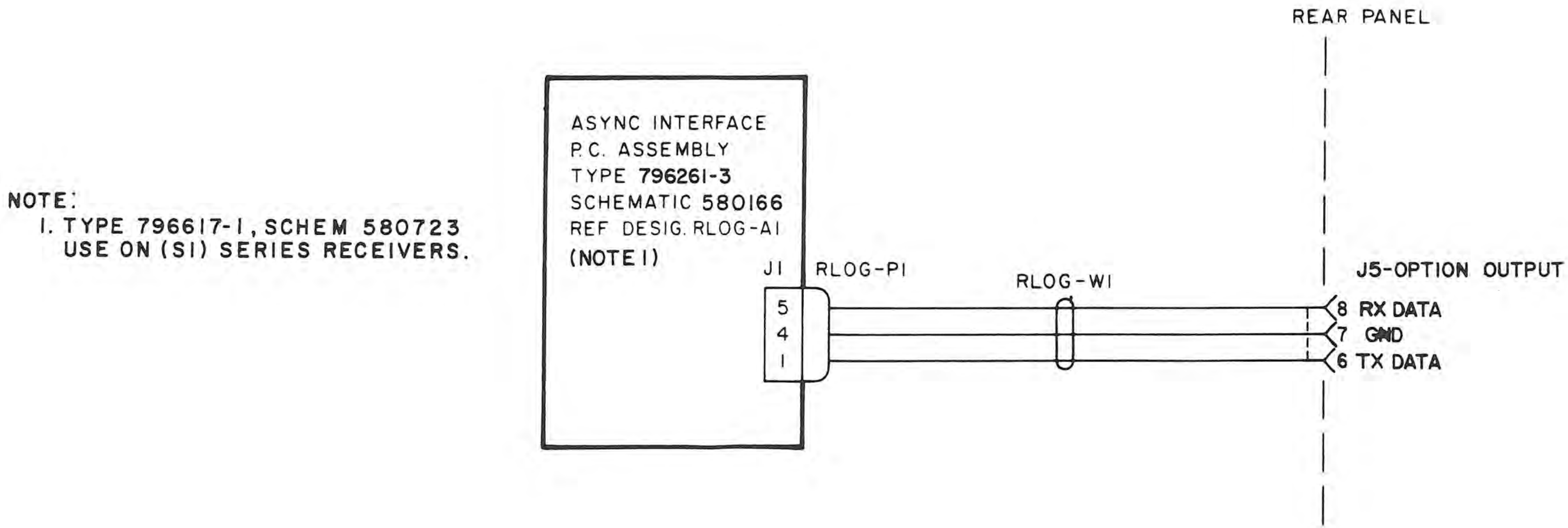


Figure J-5. Type WJ-861XB(S1) Record Logging Option (RLOG), Schematic Diagram 280332 (E)

WJ-861X RECEIVER

APPENDIX K

WJ-861X HIGH & LOW FREQUENCY EXTENSION OPTIONS

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

November 1990

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

PROPRIETARY STATEMENT

TABLE OF CONTENTS

APPENDIX K

LIST OF TABLES

LIST OF ILLUSTRATIONS

APPENDIX K

WJ-861X 2-500 MHz HIGH FREQUENCY EXTENSION (HFE) OPTIONS

WJ-861X .5-500 MHz LOW FREQUENCY EXTENSION (LFE) OPTIONS

K.1 GENERAL DESCRIPTION

The 2-500 MHz HF Frequency Extension (HFE) option enables the receiver to be tuned from 2 MHz to 500 MHz. The .5-500 MHz LF Frequency Extension (LFE) option enables the receiver to be tuned from 500 kHz to 500 MHz. Tuning capability of from .5 MHz to 1100 MHz is acquired utilizing the FE option. Modifications to the Preselector subassembly enable it to tune down to .5 MHz or 2 MHz. Software modifications have also been made to the 1st LO Synthesizer and to the microprocessor. Performance deviation over the lower range varies from the present specifications as follows:

a. Noise Figure .... 25 dB, 0.5 to 2 MHz
16 dB, 2 to 5 MHz
12 dB, 5-20 MHz
(11 dB is present maximum for
20-1100 MHz, 9.5 dB typical)

b. 3rd Order Intercept Point ...... -8 dBm, 0.5 to 2 MHz
0 dBm, 2-20 MHz
(+3 dBm present specification for
20-500 MHz, +5 dBm typical)

c. 2nd Order Intercept Point ...... 10 dBm, 0.5 to 2 MHz
+15 dBm, 2-20 MHz
(+50 dBm present specification for
20-1100 MHz)

K.2 INSTALLATION

The HFE and LFE options are factory installable options. Installation consists of modifying the microprocessor software and replacing the EPROM in the 1st LO Synthesizer. This modification is available only for receivers with software versions 2.1 or greater. The Preselector subassembly occupies slot XA3A4 on the RF/IF Motherboard and connects to the receiver circuitry via the board terminals and two interconnecting cables. When the HF or LF Preselector is properly installed, switch S1 on the Synthesizer Interface subassembly (A5A2) must also be reconfigured permitting the receiver software to recognize the presence of the Frequency Extender options. This is accomplished by placing switch position #5 of A5A2S1 in the closed position.

The following cable connections are required for the installation of the HF or LF Options:

1. Connect P9 of cable A3W4 to J1 of the HF or LF options.

2. Connect P7 of cable A3W3 to J2 of the HF or LF options.

NOTE

The receiver front panel is capable of displaying 0 MHz. However, severe performance deviation should be expected.

K.3 CIRCUIT DESCRIPTION

K.3.1 FUNCTIONAL DESCRIPTION

The Type 794095-2 Preselector (HFE) option divides the 2 to 120 MHz frequency range into four bands of 2 to 30 MHz, 30 to 47 MHz, 47 to 75 MHz and 75 to 120 MHz. The Type 794095-3 Preselector (LFE) Option divides the .5 to 120 MHz frequency range into four bands of .5 to 30 MHz, 30 to 47 MHz, 47 to 75 MHz and 75 to 120 MHz. Switching between frequency bands is controlled by the VHF HI/LO and VHF select signals (FPLA3 through FPLA6) supplied by the Digital Control Section. The tuning range of the 1st LO Synthesizer is 552 to 1051 MHz.

K.3.2 DETAILED CIRCUIT DESCRIPTION

The reference designation for this option is A3A4. Refer to **Figure K-2** for the Type 794095 VHF Low-Band Preselector schematic diagram.

The Type 794095-2 VHF Low-Band Preselector provides RF preselection for the frequency range of from 2 to 120 MHz. This frequency range is divided into four bands of 2 to 30 MHz (band #1), 30 to 47 MHz (band #2), 47 to 75 MHz (band #3) and 75 to 120 MHz (band #4). The Type 794095-3 VHF Low-Band Preselector provides RF preselection for the frequency range of from .5 to 120 MHz. This frequency range is divided into four bands of .5 to 30 MHz (band #1), 30 to 47 MHz (band #2), 47 to 75 MHz (band #3) and 75 to 120 MHz (band #4). The preselector for the HF and LF options and the existing preselector are identical with the exception of frequency range already described.

K.4 ALIGNMENT PROCEDURE

K.4.1 PERFORMANCE TESTS

The performance tests for the Type 794095-2 and Type 794095-3 VHF Low-Band Preselector (HFE and LFE) options are identical to the Type 794095-1 VHF Low-Band Preselector found in **Section IV** except for the differences described below:

1. Tune the receiver to 2.2 MHz.

2. Differences in **Table 4-6** are shown here in **Table K-1.**

Table K-1. RF Preselector Passband Corrections

Center Frequency (MHz)	Lower Frequency (MHz)	Upper Frequency (MHz)	Upper Frequency 2 (MHz)	Lower Frequency x2 (MHz)
14.0	2.0 (HFE) 0.5 (LFE)	30	15	4.0 (HFE) 1.0 (LFE)

K.4.2 ALIGNMENT PROCEDURES

Control words on the Type 794110-1 Synthesizer Interface (A5A2) are changed as described below:

1. Select the 1 MHz Tuning Rate pushbutton on the front panel and set the receiver to the frequencies listed in **Table K-2.** Only 1 MHz and above tuning steps are being tested at this time. (The digits below 1 MHz will not affect the results.) Utilizing the oscilloscope, observe the logic levels at the XA2 connector pins listed in the table.

2. The results observed in step 1 should yield BCD words equivalent to the 1st LO frequency. The decimal equivalent of the BCD words will be equal to the tuned frequency +552. As seen in the table, the most significant digit is omitted when the decimal equivalent is above 1000.

Table K-2. 1st LO Synthesizer Control Words

Tuned Frequency	100 MHz Control				10 MHz Control				10 MHz Control				Decimal Equivalent
	A18	A26	A16	A24	A10	A6	A22	A28	A14	A8	A12	A4	
.5 MHz	0	1	0	1	0	1	0	1	0	0	1	0	552 (LFE)
2.X MHz	0	1	0	1	0	1	0	1	0	1	0	0	554 (HFE)
20.X MHz	0	1	0	1	0	1	1	1	0	0	1	0	572
25.X MHz	0	1	0	1	0	1	1	1	0	1	1	1	577
35.X MHz	0	1	0	1	1	0	0	0	0	1	1	1	587
50.X MHz	0	1	1	0	0	0	0	0	0	0	1	0	602
250.X MHz	1	0	0	0	0	0	0	0	0	0	1	0	802
456.X MHz	0	0	0	0	0	0	0	0	1	0	0	0	008

3. Tune the receiver to the frequencies listed in **Table K-3** and observe the logic levels present at XA2 connector pins listed in the table. These logic levels form a digital code which selects UHF or VHF operation, activates the appropriate RF preselector and selects the correct UHF LO frequency. Frequencies above 500 MHz require the 500-1100 MHz Frequency Extender to be installed on the RF/IF Motherboard.

4. Select AGC OFF and rotate the RF/IF gain control to its full CCW position.

5. Connect the DVM to pin B5 of XA2 and adjust the RF/IF Gain between its maximum CCW to maximum CW position. Observe that the DVM reading continuously decreases from 5.0 to 0 Vdc ±10%.

6. Connect the DVM to pin B7 of XA2 and set the COR LEVEL Display to 00, using the front panel COR pushbuttons.

7. Step the COR LEVEL up to 40 while observing DVM. The voltage should increase from 0 ±.1 to 5.0 ±.4 Vdc in steps of approximately .125 Vdc.

Table K-3. RF Preselector and UHF VCO Control

	UHF2 A34	UHF1 A36	UHF/VHF A32	UHF3 A3	VHF2 A7	VHF1 A5	Comments
25.0000	0	0	0	0	0	0	.5-30 MHz preselector (LFE)
25.0000	0	0	0	0	0	0	2-30 MHz preselector (HFE)
35.0000	0	0	0	0	0	1	30-47 MHz preselector
60.0000	0	0	0	0	1	0	47-75 MHz preselector
100.0000	0	0	0	0	1	1	75-120 MHz preselector
150.0000	0	0	0	1	0	0	120-187 MHz preselector
250.0000	0	0	0	1	0	1	187-292 MHz preselector
350.0000	0	0	0	1	1	0	292-382 MHz preselector
450.0000	0	0	0	1	1	1	382-500 MHz preselector
550.0000	0	0	1	1	1	0	500-700 MHz preselector UHF VCO = 848 MHz
650.0000	0	1	1	1	1	0	500-700 MHz preselector UHF VCO = 944 MHz
800.0000	1	0	1	1	1	0	700-900 MHz preselector UHF VCO = 1144 MHz
1000.0000	1	1	1	1	1	0	900-1100 MHz preselector UHF VCO = 1344 MHz

K.5 PARTS LIST

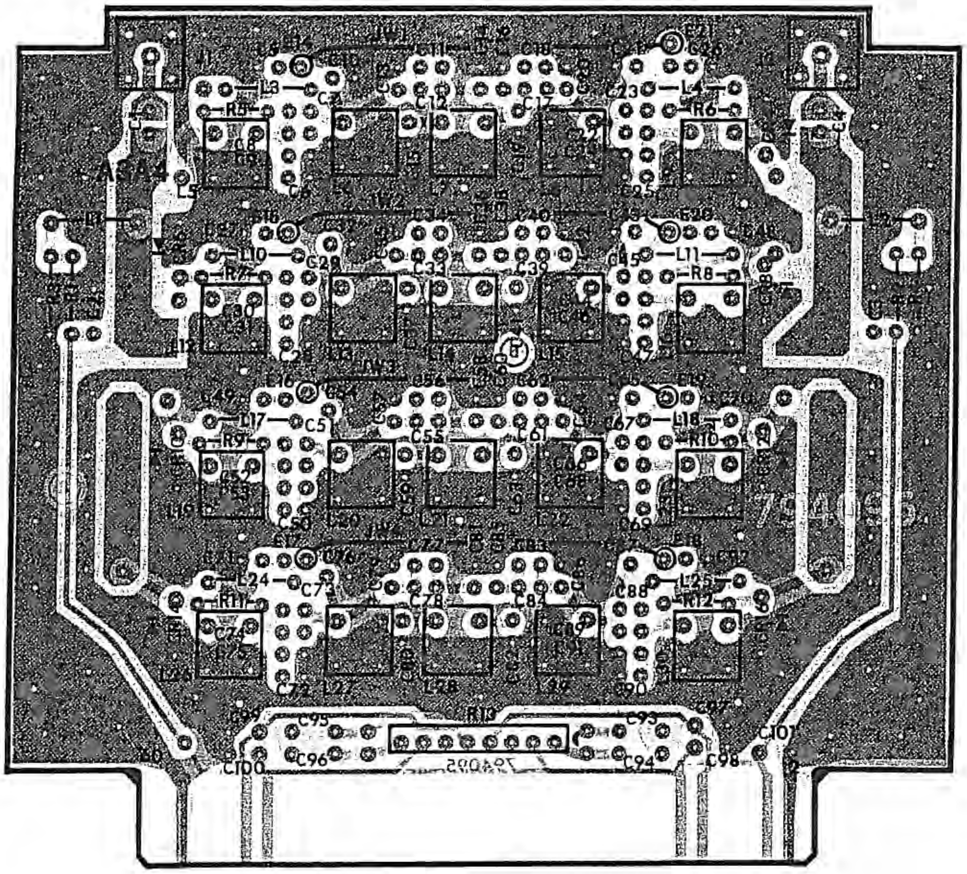


Figure K-1. Type 794095-2, 2-500 MHz Frequency Extension (Option K - HF), Location of Components

K.5.1 TYPE 794095-2 VHF LOW-BAND PRESELECTOR REF DESIG PREFIX A3A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision D				
C1	Capacitor, Ceramic, Disc: .022 µF, 10%, 100 V	2	8121-100-X7R0-223K	59660	
C2	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 50 V	6	34475-1	14632	
C3	Same as C2				
C4	Same as C1				
C5	Capacitor, Ceramic, Disc: 0.01 µF, 10%, 100 V	8	8121-100-W5R0-103K	72982	
C6	Not Used				
C7	Capacitor, Ceramic, Disc: 82 pF, 2% 100 V	2	200-100-NPO-820G	51642	
C8	Capacitor, Ceramic, Disc: 1100 pF, 2%, 100 V	2	150-100-NPO-112G	51642	
C9	Not Used				
C10	Capacitor, Ceramic, Monolithic: 100 pF, 2%, 100 V	2	200-100-NPO-101G	51642	
C11	Not Used				
C12	Capacitor, Ceramic, Monolithic: 1000 pF, 2%, 100 V	1	150-100-NPO-102G	51642	
C13	Capacitor, Ceramic, Disc: 39 pF, 2%, 100 V	2	150-100-NPO-390G	51642	
C14 Thru C17	Not Used				
C18	Capacitor, Ceramic, Monolithic: 2200 pF, 2%, 100 V	1	200-100-NPO-222G	51642	
C19	Not Used				
C20	Same as C13				
C21	Same as C10				
C22	Same as C7				
C23	Same as C8				
C24	Not Used				
C25	Not Used				
C26	Same as C5				
C27	Same as C5				
C28	Capacitor, Ceramic, Monolithic: 3.3 pF, ±.1 pF, 100 V	14	8101-100-COJO-339B	59660	
C29	Same as C28				
C30	Capacitor, Ceramic, Monolithic: 15 pF, 5%, 100 V	6	100-100-NPO-150G	51642	
C31	Same as C30				
C32	Same as C28				
C33	Capacitor, Ceramic, Monolithic: 4.7 pF, .1 pF, 100 V	4	100-100-NPO-479B	51642	
C34	Capacitor, Ceramic, Disc: 18 pF, 5%, 100 V	4	8111-100-COGO-180J	59660	
C35	Capacitor, Ceramic, Monolithic: 22 pF, 5%, 100 V	2	100-100-NPO-220J	51642	
C36	Same as C33				
C37	Same as C34				
C38	Same as C34				
C39	Same as C33				
C40	Same as C34				
C41	Same as C33				

REF DESIG PREFIX **A3A4**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C42	Same as C35				
C43	Same as C28				
C44	Same as C28				
C45	Same as C30				
C46	Same as C30				
C47	Same as C28				
C48	Same as C5				
C49	Same as C5				
C50	Not Used				
C51	Capacitor, Ceramic, Disc: 1.5 pF, ±0.1 pF, 100 V	2	8101-100-COKO-159B	59660	
C52	Capacitor, Ceramic, Monolithic: 10 pF, ±0.5 pF, 100V	4	100-100-NPO-100J	51642	
C53	Same as C52				
C54	Same as C28				
C55	Capacitor, Ceramic, Disc: 2.2 pF, ±.1 pF, 100 V	6	8101-100-COJO-229C	59660	
C56	Capacitor, Ceramic, Monolithic: 12 pF, 5%, 100 V	4	100-100-NPO-120J	51642	
C57	Same as C30				
C58	Not Used				
C59	Same as C56				
C60	Same as C56				
C61	Same as C55				
C62	Same as C56				
C63	Not Used				
C64	Same as C30				
C65	Same as C28				
C66	Same as C51				
C67	Same as C52				
C68	Same as C52				
C69	Not Used				
C70	Same as C5				
C71	Same as C5				
C72	Same as C55				
C73	Same as C28				
C74	Capacitor, Ceramic, Disc: 3.9 pF, ±0.25 pF, 100 V	4	8101-100-COJO-399C	59660	
C75	Same as C74				
C76	Same as C28				
C77	Same as C28				
C78	Capacitor, Ceramic, Monolithic: 5.6 pF, .25 pF, 100 V	4	8101-100-COHO-569D	59660	
C79	Capacitor, Ceramic, Disc: 6.8 pF, .25 pF, 100 V	2	8101-100-COHO-689D	59660	
C80	Same as C55				
C81	Same as C78				

REF DESIG PREFIX A3A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C82	Same as C78				
C83	Same as C28				
C84	Same as C78				
C85	Same as C55				
C86	Same as C79				
C87	Same as C28				
C88	Same as C28				
C89	Same as C74				
C90	Same as C74				
C91	Same as C55				
C92	Same as C5				
C93 Thru C96	Same as C2				
C97	Capacitor, Ceramic, Disc: 1000 pF, 500 V	5	5925U102P	91984	
C98 Thru C101	Same as C97				
CR1	Diode	16	5082-3188	28480	
CR2 Thru CR16	Same as CR1				
J1	Connector, Receptacle	2	1009-7511-000	19505	
J2	Same as J1				
L1	Coil, Fixed: 47 μH, 10%	10	1025-60	99800	
L2 Thru L4	Same as L1				
L5	Coil, Variable: .33 μH	2	6740-7	04213	
L6	Coil, Variable: 2.8 μH	2	7067	04213	
L7	Coil, Variable: .58 μH	1	7066	04213	
L8	Same as L6				
L9	Same as L5				
L10	Same as L1				
L11	Same as L1				
L12	Coil, Variable: 22 mH	2	6740-9	04213	
L13	Coil, Variable: 15 mH	2	6740-8	04213	
L14	Coil, Variable: 6.8 mH	1	6740-12	04213	
L15	Same as L13				
L16	Same as L12				
L17	Same as L1				
L18	Same as L1				
L19	Coil, Variable: .323 μH	2	6807	04213	

REF DESIG PREFIX **A3A4**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
L20	Coil, Variable: .232 μH	2	6808	04213	
L21	Coil, Variable: 0.522 μH	1	6809	04213	
L22	Same as L20				
L23	Same as L19				
L24	Same as L1				
L25	Same as L1				
L26	Coil, Variable: 0.202 μH	2	6810	04213	
L27	Coil, Variable	2	7221	04213	
L28	Coil, Variable: 0.326 μH	1	7220	04213	
L29	Same as L27				
L30	Same as L26				
R1	Resistor, Fixed, Film: 2.2 kΩ, 5%, 1/8 W	4	CF1/8-2.2K/J	09021	
R2 Thru R4	Same as R1				
R5	Resistor, Fixed, Film: 1 kΩ, 5%, 1/8 W	8	CF1/8-1.0K/J	09021	
R6 Thru R12	Same as R5				
R13	Resistor Network: 100Ω, 2%, .3 W	1	4308R-102-101	80294	

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ± 5%, 1/8W.
   b) CAPACITANCE IS IN pF.
2. C6, C9, C11, C14, C15, C16, C17, C19, C24, C50, C58, C63, & C69 ARE TO BE SHOWN BUT DOCUMENTED AS NOT USED.

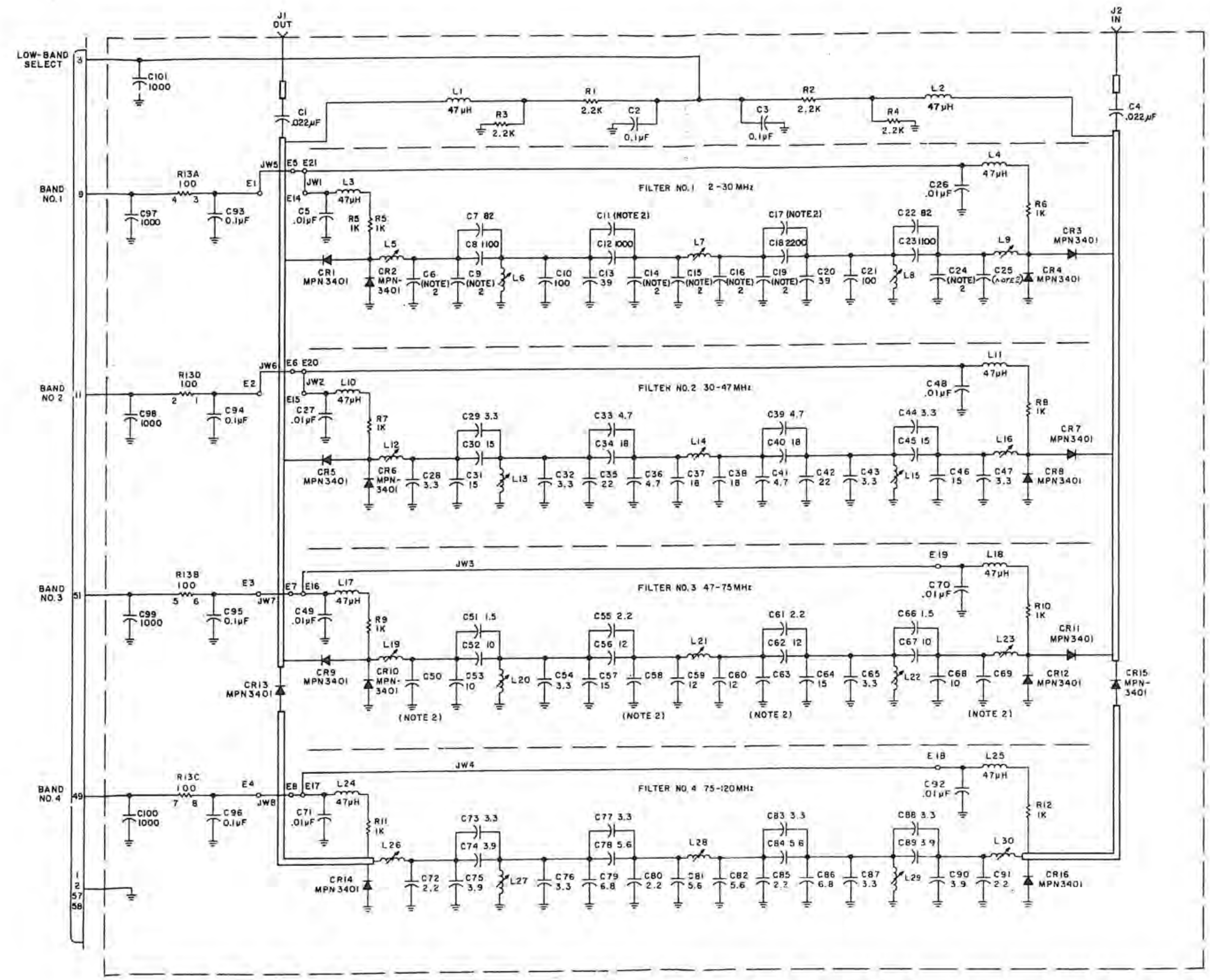


Figure K-2. Type 794095-2, 2-500 MHz Frequency Extension (Option K-HF) Schematic Diagram 580179 (A)

WJ-861X RECEIVER

APPENDIX L

WJ-861X BITE OPTION

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

November 1990

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

PROPRIETARY STATEMENT

TABLE OF CONTENTS

APPENDIX L

LIST OF TABLES

TABLE OF CONTENTS (Continued)

LIST OF ILLUSTRATIONS

APPENDIX L
BITE OPTION

L.1 GENERAL DESCRIPTION

Built-In Test (BITE) Option performs up to 16 operational receiver tests. Two types of BITE are available: BITE and Extended BITE. Both types of BITE can be performed in one of three different modes: AUTO TEST, SINGLE TEST and SINGLE STEP. Both types of BITE are stand alone test routines; however, the BITE routine is duplicated within the Extended BITE routine. BITE performs 13 test routines without making any external connections. Extended BITE performs all of the same tests as BITE, plus three additional tests. Extended BITE is intended to be used during scheduled maintenance or after BITE has been performed and the operator still suspects the receiver may have a problem. Extended BITE requires the BITE cable (W2) to be attached from the BITE Output (J27) to ANT 2. Extended BITE also requires an IF bandwidth between 100 kHz and 500 kHz to be installed. Each BITE test is indicated by a Test Number (00-15), displayed in the COR LEVEL display window. Within each Test Number are Step Numbers, which are displayed in the MEMORY SELECT window. Step Numbers are used for the different steps performed within a test. Runs indicate the number of times each Step Number is repeated. A multiple run is a Step that is performed more than once. When entering BITE for the first time and BITE is running, the front panel COR LEVEL display indicates the present Test Number selected and the MEMORY SELECT window displays a **P** and the last passed Step Number or an **F** and the failed Step Number.

When the BITE operation is in progress, each receiver bandwidth location is sequentially selected during many of the tests. If a bandwidth location is encountered that does not have a bandwidth card present, error code 814 is displayed in the frequency window on the front panel. This error code remains displayed until the BITE routine accesses a bandwidth location that is occupied, at which time, normal BITE operation will resume. If EXTENDED BITE is activated, the receiver MUST contain an IF bandwidth that is between 100 kHz and 500 kHz. If this requirement is not met, successful completion of EXTENDED BITE operation will not be possible.

BITE is designed to check receiver performance quickly without removing the covers. Tests performed in BITE and Extended BITE include:

Power Supply	1st LO Synthesizer	2nd LO Synthesizer
IF BW Position	FM BW Position	FM Discriminator CF
FM Quieting	FM Audio Threshold	AM Quieting
AM DEMOD	AM Audio Threshold	AM Audio Path
COR Status	FM Discriminator Noise	Audio Squelch
	RF Front End S/N Ratio	

L.2 INSTALLATION

The Type 794151-X Built-In Test (BITE) Option is a field installable option, using the following components and procedure:

Part No.	Description	Qty.
794151-X	Built-In Test Module	1
280263-1	Cable Assembly (BITE W1)	1
280264-1	Cable Assembly (BITE W2)	1
280216-1	BITE Decal (If necessary)	1

The following procedure describes the steps for installing the BITE Option into the WJ-861XB Receiver:

1. Disconnect line power from the receiver and remove the top protective cover.
2. Remove the round metal cover from the rear panel, located at J27. Bend the cover's tabs inward to remove the tab.
3. Insert J1, of BITE cable W1, through the rear panel opening and secure it to the back panel with the supplied hardware.
4. Connect P1, of BITE cable W1, to J1 of the BITE module. Install the BITE module into the Digital Motherboard (A5) in Option Slot 3. Ensure pin 1 of the BITE module is aligned with pin 1 of the motherboard Option Slot.
5. Reinstall the top protective cover and secure it to the receiver. Reconnect line power to the receiver.
6. Install the BITE decal on the front panel above the AM pushbutton, if necessary.
7. Install the BITE cable W2, between J27 and ANT 2, and terminate ANT 1 when in Extended BITE mode.

NOTE

BITE requires the use of Microprocessor Type 796353-X with software version 3.1.0 or greater in order to properly support the BITE testing.

L.3 MODE SELECTION AND OPERATION

Three different BITE modes (Auto Test, Single Test, and Single Step) are available. Auto Test performs the entire series of BITE tests, from 00-12 for BITE and from 00-15 for Extended BITE. **Auto Test** performs the tests sequentially, without operator assistance. **End** is displayed on the front panel when Auto Test is successfully completed. Auto Test provides an overall receiver check to determine serviceability of the receiver. Auto Test allows an operator to perform a go, no go test of the receiver. Once started, Auto Test continues to the end of the BITE test sequence or until a failure is detected. **Single Test** performs only one Test Number at a time. Single Test permits the operator or maintenance personnel to test one single Test Number. The selected Test Number is visible in the COR LEVEL display window. Initiating Single Test for the displayed Test Number allows the runs (multiple runs) to be performed automatically. Single Test can be used to retest a Test Number after alignment or repair, to verify a particular receiver function. **Single Step** mode requires the operator to select the Test Number and Step Number to be performed. Single Step mode requires extensive operator interactions in order to advance through the run of the certain selected Test Numbers. Single Step allows the Analog-to-Digital value to be displayed for each Step Number, where applicable.

Before performing BITE, make sure that the MASTER/SLAVE operation is not enabled.

When the receiver is in the MASTER/SLAVE operation, the BITE function is inhibited. To operate BITE, the receiver must be in the local manual condition with MASTER/SLAVE operation disabled. To set the receiver up to run BITE, perform the following steps:

1. Turn Receiver "ON"
2. Press the "FUNCTION" key (↑F), then the "REM" key to examine the "Slave" state.
3. See if an "S" is present in the upper right-hand corner of the frequency display (indicating Slave mode).
4. The "Master/Slave" key may be used to toggle Slave activity ON or OFF. Toggle "OFF". ("S" will be extinquished from display.)
5. Press "REM" to return to normal receiver operating mode.

NOTE

After Pass or Fail, the "Step" key will move to the next test.

BITE is exited by halting the BITE test in progress via pressing any front panel key, with the exception of the REM key, and then pressing the FUNCTION key.

L.3.1 AUTO TEST

After enabling the BITE option, via pressing the FUNCTION pushbutton, Auto Test is selected via pressing the AM pushbutton. Pressing the AM key causes 00 to be displayed in the COR LEVEL display window. Auto Test starts with Test Number 00 and continues through each Test Number (13 for BITE or 16 for Extended BITE), until all tests and steps are completed. A successful Auto Test is indicated via **End** displayed in the FREQUENCY display. Auto Test performs each Test Number and every Run without interruption, if tests are successful.

NOTE

Test Number 0 is performed almost immediately, thus #00 is displayed on the front panel only <u>briefly</u>.

Auto Test stops when a failure is detected during any step or when a halt command is detected. When a failure is detected, an **F** is displayed as the left character in the MEMORY SELECT window. The right character displays the Step Number that failed. A halt command is initiated by pressing any front panel key (except REM), which will allow completion of the test in progress before halting Auto Test. Pressing the BITE ("AM") key allows the test in progress to be completed before the Auto Test stops. This allows each test to be performed, providing no failures are detected, and display a **P** in the MEMORY SELECT display after the last run is completed. If a failure is detected during a multiple run test, the test run is halted on the step where the failure is detected. The front panel MEMORY SELECT displays **F** and the Step Number that failed. Pressing the BITE (AM) key again allows Auto Test to resume at the same run, of the same Test Number. This allows the run to be completed and provides an overall picture of receiver serviceability before failures are rerun to determine the cause of failure.

After successful completion of Auto Test (in local mode), the front panel displays **End** in the FREQUENCY window.

L.3.2 SINGLE TEST

Single test (Single Test mode) of course requires more time and attention of the operator than the Automatic Test mode. To operate the Single Test mode, use the following steps:

1. Press BITE (upper-case "AM").
2. Halt operation by pressing any key except the "REM" key.
3. Press the "STEP" key.
4. Continue to press "STEP" for each subsequent step.

NOTE

After Pass or Fail, the "Step" key will move to the next test.

Single Test allows the operator to perform only one Test Number at a time. This allows operator selection of the test to be performed. Pressing the STEP key causes the receiver to step through one Test Number once. If the displayed Test Number requires multiple runs, all test runs use the frequency or bandwidth data specified for each run number. The COR LEVEL increment and decrement keys are used to select the desired Test. Pressing either the increment or decrement key changes the displayed Test Number. The displayed Step Number is also changed when the Test Number is changed. The Step Number displayed in the MEMORY SELECT is changed to **-0**. If the MEMORY SELECT displays a **P** - , pressing the STEP key causes the next higher run to be performed. The P- in the MEMORY SELECT indicates the displayed Test Number has been completed successfully without any failures. Pressing the STEP key starts the Single Test at the next higher step. To repeat the displayed Test Number again, press the COR LEVEL increment key and then press the decrement key to display the desired Test Number. Halting a Single Test is accomplished via pressing any front panel key, except REM. Pressing a front panel key halts the BITE program. Pressing the STEP key resumes the Step Number at the next higher step. Likewise, if a failure is detected for a Test Number having more than one Run, pressing the STEP key resumes the testing but at the next higher Run. However, if a failure is detected on the last Run, pressing the STEP key causes a Single Test to be performed on the next higher Test Number.

With Single Test mode halted, pressing the MEMORY SELECT decrement key resets the displayed **F** or **P** to a - , allowing the Single Test to be started over again.

L.3.3 SINGLE STEP

Single Step mode permits the operator to advance manually through the individual steps for the selected Test Number. With BITE enabled and halted, Single Step is selected via pressing the MEMORY SELECT decrement key. Pressing the decrement key causes **-0** to be displayed in the MEMORY SELECT window. Pressing the increment key allows each step to be performed one at a time. Each time the MEMORY SELECT increment key is pressed, the next Step Number of the selected Test Number is performed. This step-by-step procedure allows the operator to determine the status and Analog-to-Digital value (if displayed) for each step. Thus, if a Step Number fails, the operator can walk the receiver through each step to determine which step fails.

Single Step can be used by a technician to determine which module caused a particular failure. As an aid to the technician, applicable Analog-to-Digital data is displayed in the SIGNAL STRENGTH window. If the A/D value has a limit, an **F** or a **P** is displayed in the MEMORY SELECT display to indicate a fail or pass. The A/D value gives an indication of whether the step failed totally or just slightly. This information can be used to indicate whether alignment or repair is necessary.

When the left MEMORY SELECT digit is blanked, the BITE program is in progress. The result of the Step Number (**F** or **P**) is displayed after the test is completed.

During Single Step mode, only the MEMORY SELECT increment and decrement keys can be used to step through the selected Test Number. To return the Single Step mode back to the beginning of the selected Test Number, press the MEMORY SELECT decrement key and then press the increment key. The Single Step is at the beginning of the Test Number again.

L.3.4 BITE PARAMETER SETTINGS

BITE operation sets the receiver operating parameters as listed in **Table L-1**, for BITE. The standard operating parameters (SOP) are used to establish certain receiver functions for the purpose of the BITE program.

Operating parameters not listed in **Table L-1**, such as tuned frequency, IF bandwidth, gain settings and other parameters are listed in the first step of each Test Number.

Table L-1. Standard Operating Parameters

Function	Setting
DET MODE	AM
AGC	ON
AFC	OFF
ANT 2	ON
COR LEVEL	00

During BITE, current operating parameters are retained, in memory, for the Test Number and Step Number being performed, until the next Step Number is started.

L.4 <u>BITE OPERATION</u>

NOTE

Before performing BITE, verify that the receiver MASTER/SLAVE operation is not enabled.

BITE is selected via pressing the FUNCTION key and pressing the BITE (uppercase AM) key. Test Numbers for BITE are from 00-12. Refer to **Table L-2** for the BITE Test Number and the function tested.

Figure L-1 provides an overall receiver block diagram and the Test Number(s) that passes through each module. Modules with more than one Test Number listed may result in more than one failure indication. Using combinations of Test Numbers, troubleshooting can quickly be localized to one section of the receiver.

Table L-2. BITE Tests

Test #	Function Tested
Test #0	Positive and Negative 15 Volt Power Supply
Test #1	1st LO Synthesizer Lock Test
Test #2	2nd LO Synthesizer Lock Test
Test #3	IF Bandwidth Verification Test
Test #4	FM Demodulator Verification Test
Test #5	FM Discriminator Center Frequency Test
Test #6	FM Quieting Test at FM MONITOR Output
Test #7	FM Audio Threshold Test at BITE Card
Test #8	AM Quieting Test at AM DETECTOR Output
Test #9	AM Audio Threshold Test at BITE Card
Test #10	AM DEMODULATOR Test Using BFO and CW Carrier
Test #11	AM Audio Signal Path Test at BITE Card
Test #12	Audio Squelch Test

L.5 EXTENDED BITE OPERATION

Extended BITE is selected via holding the FUNCTION key pressed in while turning receiver power on, pressing the FUNCTION key again and then pressing the BITE key. Extended BITE selects BITE Tests 00-12 and three additional tests, 13-15, unique to Extended BITE. **Table L-3** lists all of the Extended BITE tests.

Table L-3. Extended BITE Tests

Test #	Function Tested
Test #0	Positive and Negative 15 Volt Power Supply
Test #1	1st LO Synthesizer Lock Test
Test #2	2nd LO Synthesizer Lock Test
Test #3	IF Bandwidth Verification Test
Test #4	FM Demodulator Verification Test
Test #5	FM Discriminator Center Frequency Test
Test #6	FM Quieting Test at FM MONITOR Output
Test #7	FM Audio Threshold at BITE Card
Test #8	AM Quieting Test at AM DETECTOR Output
Test #9	AM Audio Threshold Test at BITE Card
Test #10	AM DEMODULATOR Test Using BFO and CW Carrier
Test #11	AM Audio Signal Path Test at BITE Card
Test #12	Audio Squelch Test
Test #13	COR Status Test
Test #14	FM Discriminator Noise Test
Test #15	RF Front End Signal-to-Noise Ratio Test

L.6 BITE TEST DESCRIPTIONS

The following paragraphs describe an overview of each BITE test. The software sequence performed for each Test Number and for each Step Number is also listed. The Step Numbers are listed to help describe the mechanics of the test being performed. The parameter settings are performed via software and are included to provide information on what the test settings are for each step and how the tests are performed.

L.6.1 TEST #0 POWER SUPPLY TEST

Test #0 checks the positive and negative 15 V power supplies at the BITE module. This test verifies the absolute magnitude of each supply voltage is greater than 14 Vdc.

Step #0 Sets the receiver to the parameters listed in **Table L-1.** Selects IF BW #1 and tunes the receiver to 20 MHz. Reads pin 7 (D5 line) on the BITE module.

A) If the line is HIGH, continues to next step; displays a **P** if in Single Step Mode.

B) If the line is LOW, then halts and displays an **F.**

Step #1 Reads pin 3 (D3 line) on the BITE module.

A) If the line is HIGH, continues to next test number; displays a **P** if in Single Test or Single Step mode.

B) If the line is LOW, then halts and displays an **F.**

L.6.2 TEST #1 1st LO SYNTHESIZER LOCK TEST

Test #1 checks for proper lock-up of the 1st LO Synthesizer. This test exercises the 1st LO over its entire design range (552-1052 MHz) in 1 MHz steps resulting in 501 runs. A different Run is assigned to each frequency. This test verifies that the synthesizer has achieved phase lock and that the lock time was less than 20 mS.

Step #0 Sets receiver to the standard operating parameters listed in **Table L-1.** Selects IF bandwidth #1 and tunes receiver to XXX.0000 MHz. Waits 20 mS before reading pin 13 (D0 line) of the BITE module.

A) If D0 line is HIGH, continues to next Run. Displays a **P** if in Single Step mode.

B) If D0 line is LOW, then halts and displays an **F.**

L.6.3 **TEST #2 2nd LO SYNTHESIZER TEST**

This test checks for proper lock-up of the two phase-lock loops used in the 2nd LO Synthesizer. Test #2 exercises the 2nd LO over its tuning range (529.6001-530.6000 MHz). This test is repeated, tuning from 500.9999 MHz down to 500.0099 MHz in 10 kHz increments. The lock-up is repeated using 100 Hz steps to tune from 500.0099 MHz down to 500.0000 MHz. These multiple-run tests verify that both synthesizers are phase-locked and that the phase lock occurs within 20 mS of receiving a frequency change command.

Step #0 Sets the receiver to the standard operating parameters listed in **Table L-1.** Selects IF bandwidth #1 and tunes the receiver to 500.XXXX MHz. Waits 20 mS after tuning the receiver and then reads pin 15 (D1 line) of the BITE module.

A) If D1 line is HIGH, continues to the next Run, thus selecting and testing the next frequency.

B) Displays a **P** if in Single Step mode. If D1 line is LOW, halts and displays an **F.**

L.6.4 **TEST #3 IF BANDWIDTH VERIFICATION TEST**

This test checks the passband and stopband characteristics of the IF filter for the selected IF bandwidth (#1). Test #3 tunes the receiver to several frequencies near 0 MHz to produce a test signal, from the down-converted 1st LO, to measure the filter transmission characteristics. The signal strength circuitry is used to provide level detection for the test. This multiple-run test has one run for each bandwidth and is repeated for each bandwidth.

Step #0 Sets the receiver to the standard operating parameters listed in **Table L-1,** with the exception of selecting Manual Gain (not AGC). Sets the manual gain control to 000, selects IF bandwidth #1 and tunes the receiver to 35 MHz. Waits 2 seconds before reading the value of the Signal Strength line on the Receiver Interface (IN2 of U15). Divides this A/D value by 2 and stores this value in memory.

A) If the A/D value is less than or equal to 30, then continues to the next step. Displays a **P** and the A/D value, if in the Single Step mode.

B) If the A/D value is greater than 30, it halts and displays an **F.** Displays the value if in Single Step mode.

Step #1 Tunes the receiver to 00.0000 MHz and reads the A/D value of the Signal Strength line (IN2 of U15) and divides this A/D value by 2.

A) If the A/D value is greater than or equal to 120, leaves the manual gain control set at 000 and continues to the next Step Number. (Displays a **P** and the value, if in the Single Step mode.)

B) If the A/D value is less than 120, increases the manual gain control until the A/D value is 121 (±1), and continues to next Step Number. (Displays a **P** and the value, if in the Single Step mode.)

C) If the A/D value is less than 120, it halts and displays an **F**. Displays the maximum value obtained, (if in the Single Step mode).

Step #2 Tunes the receiver to a frequency equal to 1/3 of the displayed IF bandwidth (for the selected IF bandwidth number). Reads the signal strength line value (IN2 of U15) and divides this A/D value by 2.

A) If the A/D value is greater than or equal to 60, it continues to the next Step Number. Displays a **P** and the value, (if in the Single Step mode).

B) If the A/D value is less than 60, then halts and displays an F and the A/D value, (if in Single Step mode).

Step #3 Tunes the receiver to a frequency equal to 3/4 of the IF bandwidth (displayed).

A) If the A/D value is less than or equal to the value noted for step #0 plus 5, then continues to next Run Number by selecting the next IF bandwidth number for testing. (Displays a **P** and this value, if in the Single Step mode.)

B) If the A/D value is greater than the value noted in Step #0, it halts and displays an **F**. (Displays the value, if in Single Step mode.)

L.6.5 TEST #4 FM DEMODULATOR VERIFICATION TEST

This test verifies proper matching of the FM Demodulator module with the selected IF bandwidth module. This is accomplished via measuring the FM discriminator sensitivity and verifying that the sensitivity corresponds to the required sensitivity for the displayed IF bandwidth. The receiver frequency is tuned to a fractional IF bandwidth above 0 MHz. This tuned frequency is used to down convert the 1st LO for use as a calibrated offset signal. This test is a multiple run test repeated for each IF bandwidth.

Step #0 — Sets receiver to standard operating parameters listed in **Table L-1**, with the exception of FM detection (not AM), and tunes the receiver to 00.0000 MHz. Selects the first IF bandwidth and tests the dc component value for the FM DET line on the Receiver Interface module (IN2 of U15). Divides this A/D value by 2 and stores this value for later use. Continues to next step. If in Single Step mode, displays the A/D value.

Step #1 — Tunes the receiver to 1/5 of the selected IF bandwidth. Reads the dc component value on the FM DET line (IN4 of U15), divides this A/D value by 2, and stores this value. Continue to next step.

Step #2 — Subtracts the A/D value noted in Step 0 from the value obtained in Step 1.

- A) If the difference is 11 (±4), continues to next Step Number. Displays a **P** and this difference value, if in the Single Step mode.
- B) If the difference is not within the value of 11 (±4), halts and displays an **F**. Displays the difference value if in the Single Step mode.

Step #3 — Tunes the receiver to 2/5 of the selected IF bandwidth for the selected IF bandwidth. Reads the value of the dc component on the FM DET line (IN4 of U15), and notes this value. If in Single Step mode, displays the A/D value.

Step #4 — Subtracts the A/D value noted in step 1 from the value noted in step 3.

- A) If this difference is 11 (±4), continues to next Run Number, and selects and tests the next IF bandwidth. If in the Single Step mode, displays a **P** and the difference value.
- B) If the difference value is not within 11 (±4), halts and displays an **F**. If in the Single Step mode, displays the difference value.

L.6.6 TEST #5 FM DISCRIMINATOR CENTER FREQUENCY TEST

This test checks the center tuning of the FM discriminator circuit on the FM Demodulator module. Tuning the receiver to 0 MHz causes the 1st LO to be down converted to 21.4 MHz, for use as a calibrated signal to measure the discriminator offset. This is a multiple-run test and is to be repeated for each IF bandwidth.

Step #0 Sets the receiver to the standard operating parameters listed in **Table L-1**, with the exception of selecting FM detection mode (instead of AM). Tunes the receiver to 00.0000 MHz, selects IF bandwidth #1, and reads the dc component value at the FM DET line (IN4 and U15) on the Receiver Interface module.

A) If the A/D value is 66 (±10), then continues to the next Run Number (selecting and testing the next IF bandwidth). (If in the Single Step mode, displays a P and the 2 A/D value.)

B) If the A/D value is not 66 (±10), halts and displays an F, also displays the divided A/D value, (if in the Single Step mode).

L.6.7 TEST #6 FM QUIETING TEST

This test verifies that the ultimate noise quieting in the FM demodulator circuitry is correct. The receiver is tuned to 0 MHz and the down-converted 1st LO is used as a high level unmodulated test signal. This test measures the peak value of the ac component on the demodulated signal coming from the FM detector output. If this ac component exceeds the established limit, the FM demodulator circuitry may be defective or the incidental FM of the LOs may be excessive. This is a multiple run test that is repeated for each IF bandwidth.

Step #0 Sets the receiver to the standard operating parameters listed in **Table L-1**, except selects FM detection mode. Tunes the receiver to 00.0000 MHz and selects IF bandwidth #1. Reads the value of the ac component on the FM DET line (IN7 of U15) and divides this A/D value by 2.

A) If the A/D value is less than or equal to 2, it continues to the next run (selects and tests the next IF bandwidth). (If in the Single Step mode, displays a P and the A/D value.)

B) If the value is greater than 2, halts and displays an F. (If in Single Step mode, displays the A/D value.)

L.6.8 TEST #7 FM AUDIO THRESHOLD TEST

This test uses the same procedure as the FM quieting to check for the absence of signal activity on the AUDIO OUTPUT line on the BITE module. This is a multiple-run test and is repeated for each IF bandwidth.

Step #0 Sets the receiver to the standard operating parameters listed in **Table L-1**, with the exception of selecting FM detection mode. Tunes the receiver to 00.0000 MHz and reads pin 9 (the D6 line) on the BITE module.

A) If the line is LOW, then continues to next Run Number (selecting and testing the next IF bandwidth #). (Displays a **P** if in the Single Step mode.)

B) If the line is HIGH, halts and displays an **F**.

L.6.9 TEST #8 AM QUIETING TEST

This test checks for ultimate AM quieting in the AM detector circuitry. The receiver is tuned to zero frequency and uses the down-converted 1st LO as a high level unmodulated test signal. The test measures the peak value of the ac component of the AM DET circuitry. If this ac component exceeds a certain limit the AM demodulator circuitry may be defective, or the LOs may have excessive amplitude noise, or the IF circuitry may be excessively noisy. The test is run for each available IF BW and therefore is a multiple-run test.

Step #0 Sets the receiver to the standard operating parameters listed in **Table L-1**, tunes the receiver to 00.0000 MHz, and selects IF BW#1. Reads the ac component value on AM DET line at the Receiver Interface module (IN3 of U15) and divides this A/D value by 2.

A) If the A/D value is less than 2, then continues to next Run Number (selecting and testing the next IF BW). (Displays a **P** and the A/D value if in Single Step mode.)

B) If the value is greater than 2, halts and displays an **F**. (Displays the A/D value, if in the Single Step Mode.)

L.6.10 TEST #9 AM AUDIO THRESHOLD TEST

This test uses the same setup as the previous AM quieting test, but tests for an absence of signal on the AUDIO OUTPUT line at the BITE module. The test verifies that with an unmodulated carrier for the test signal, the peak value of the demodulated AM audio does not exceed a preset threshold on the BITE module. This is a multiple-run type test which is repeated for each available IF BW.

Step #0 Sets receiver to the standard operating parameters listed in **Table L-1** and tunes the receiver to 00.0000 MHz, then reads the D6 line (pin 9) on the BITE module.

A) If the line is LOW, it continues to the next run, selecting and testing the next IF BW. (Displays a **P** and the A/D value if in the Single Step mode.)

B) If this line is HIGH, halts and displays an **F.**

L.6.11 TEST #10 AM DEMODULATOR TEST

This test checks for proper operation of the AM detector (plus BFO) circuitry by tuning the receiver to 00.0010 MHz, and turning on the BFO. (If the radio has VBFO option installed it must remain set to zero offset frequency.) The BFO mixes with the down-converted 1st LO at the AM DEMOD circuitry, resulting in a waveform exhibiting an amplitude-modulated envelope. This waveform is detected and output as a 1 kHz video signal. This test measures the peak value of the detected waveform on the Receiver Interface module and should be approximately equal to a 50% modulated signal, at or above the rated sensitivity level, when in AGC.

Step #0 Sets receiver to the standard operating parameters listed in **Table L-1**, except BFO is turned on (i.e., selects CW). Tunes the receiver to 00.0010 MHz and selects IF BW#1. Reads the ac value at the AM DET line on the Receiver Interface module (IN3 of U15). Divides this A/D value by 2.

A) If the A/D value is 35 (±25), test continues to next run, selecting and testing the next IF BW. (Displays a **P** and the divided A/D value, if in Single Step mode.)

B) If value is not within limit, halts the test and displays an **F.** (If in the Single Step mode, displays the A/D value.)

L.6.12 TEST #11 AM AUDIO SIGNAL PATH TEST

This test uses the same set up as the preceding AM DEMOD test, except that it checks for the presence of a signal on the AUDIO OUTPUT line at the BITE card. The test verifies that at the peak value the demodulated AM audio exceeds a preset threshold on the BITE card. The test checks continuity of the AM video signal path starting at the AM detector, through the AM video filter on the FM demodulator module, and then through circuitry on the AUDIO, VIDEO/COR module. The test is a multiple-run type, which is repeated for each available IF BW.

Step #0 Sets the receiver to the standard operating parameters listed in **Table L-1**, except BFO is turned on. Tunes the receiver to 00.0010 MHz, and selects IF BW #1. Reads line D6 (pin 9) on the BITE module.

A) If the line is HIGH, continues to next Run Number. (Displays a **P**, if in the Single Step Mode.)

B) If the line is LOW, halts and displays an **F**.

L.6.13 TEST #12 AUDIO SQUELCH TEST

This test checks for proper operation of the AUDIO SQUELCH circuit by ensuring the audio threshold operates properly at 40 and - -. With the COR LEVEL set to 40 and - - respectively, the audio threshold is checked at the BITE card.

Step #0 Sets receiver to CW, sets COR LEVEL to 40, and tunes receiver to 00.0010 MHz. Then reads D6 line (pin 9) on BITE card.

A) If the line is HIGH, then continues to next Step Number. (Displays a **P** if in Single Step Mode.)

B) If the line is LOW, then halts and displays an **F**.

Step #1 Sets COR LEVEL to --; then reads D6 line (Pin 9) on BITE Card.

A) If line is LOW, then continues to next run, selecting and testing next IF BW. (Displays a **P**, if in the Single Step Mode.)

B) If the line is HIGH, then halts and displays an **F**.

L.6.14 TEST #13 COR STATUS TEST

This test checks for proper operation of the COR circuit with and without input signals. With no input signal present (i.e., with comb generator turned off), the COR LEVEL is set to 15 and the COR status must indicate no activity. With an input signal from the LOs, the COR LEVEL is set for 40 and the COR status must indicate activity. This is a multiple-run type test and is repeated for each available IF BW.

Step #0 Sets the receiver to the standard operating parameters listed in **Table L-1**, except sets COR LEVEL to 15, tunes the receiver to 25.0000 MHz, and then reads the COR Status.

A) If COR is not active, then continues to next Step Number. (Displays a **P** if in Single Step Mode.)

B) If COR is active, then halts and displays an **F**.

Step #1 Sets COR LEVEL to 40, tunes the receiver frequency to 00.0010 MHz, and reads the COR Status.

A) If COR is active, then it continues to next Run Number, and selects and tests the next IF BW. (Displays a **P**, if in Single Step Mode.)

B) If COR is not active, it halts and displays an **F**.

L.6.15 TEST #14 FM DISCRIMINATOR NOISE TEST

This test checks the level of discriminator noise at the output of each FM demodulator module when no input signal is present. This test measures the peak ac component on the FM DET line at the Receiver Interface module. This test requires that no undesired input signals be present; therefore, this test is included in the Extended BITE series tests, requiring the unused antenna input (ANT 1) to be terminated with a 50 ohm load to ensure reliable results. The pass-fail limits for this test are IF bandwidth dependent. This multiple-run test is repeated for each available IF BW#.

Step #0 Sets the receiver to the standard operating parameters listed in **Table L-1**, except selects FM instead of AM, tunes the receiver to 25.0000 MHz and selects ANT 1. Reads the ac value component of FM DET line on the Receiver Interface module (IN7 of U15) and then divides the A/D value by 2.

A) If the A/D value is greater than or equal to the test limit value listed for the selected bandwidth ranges, it continues to next run, and selects and tests the next IF BW. (Displays a **P** and the value, if in Single Step Mode.)

B) If this value is less than the test limit, it halts and displays an **F**. (Displays the A/D value, if in the Single Step Mode.)

IF Bandwidth Range	Test Limits
3-30 kHz	8
40-100 kHz	18
200-500 kHz	8
1-2 MHz	1
4-8 MHz	0

L.6.16 TEST #15 RF FRONT END SIGNAL-TO-NOISE RATIO TEST

This test checks the RF front end of the receiver for proper operation at three frequencies within each RF preselector band. These frequencies are located at approximately the upper edge, lower edge, and middle of each band. The test compares the LOG IF voltage on the Receiver Interface module, with no signal present, to the voltage with the comb generator turned on at each test frequency. This is a multiple-run type test which is repeated for each required test frequency.

Step #0 Sets the receiver to the standard operating parameters listed in **Table L-1,** except selects Manual Gain Control (MGC). Sets MGC to 255, selects narrowest available IF BW between 100 kHz and 500 kHz, tunes receiver frequency to XXX (see **Table L-4** for required test frequencies), then reads value of LOG IF line on the Receiver Interface module (IN5 pin 3 of U15). Divides this A/D value by 2 and stores it in memory temporarily.

A) If the A/D value is less than or equal to 10, then continues to next Step Number. (Displays a **P** and the A/D value, if in the Single Step Mode.)

B) If the A/D value is greater than 10, then halts and displays an **F.** (Displays the A/D value, if in the Single Step Mode.)

Step #1 Turns on comb generator (no modulation), and again reads LOG IF value. Divides this A/D value by 2 and stores it in memory. Displays divided A/D value, if in the Single Step Mode. Subtracts A/D value obtained in Step # 0 from that obtained in Step # 1.

A) If the difference is greater than 11, then continues to next run, selects next frequency and retests. (Displays a **P** and the divided A/D result, if in the Single Step Mode.)

B) If the difference is less than 11, then halts and displays an **F.** (Displays the divided A/D value if in Single Step Mode.)

Table L-4. Test Frequencies

5.0000*	20.0000	120.0000	505.0000**
10.0000*	25.0000	150.0000	550.0000**
15.0000*	29.9999	185.0000	595.0000**
	30.0000	190.0000	600.0000**
	40.0000	240.0000	650.0000**
	45.0000	290.0000	695.0000**
	50.0000	330.0000	700.0000**
	65.0000	380.0000	800.0000**
	74.9999	385.0000	895.0000**
	75.0000	440.0000	1000.0000**
	100.0000	500.0000	1100.0000**
	119.9999		

* Only When HFE or LFE Option is Installed
** Only When FE Option is Installed

L.7 REMOTE OPERATION

Remote operation of the functions of BITE is provided via the Remote Interface connector on the rear panel of the receiver. With the use of a suitable controller, the mnemonics given in **Table L-5** will provide control of the BITE operation. Extended BITE operation is not permitted in remote operation. Refer to **Table L-5** for the BITE mnemonics and descriptions.

Table L-5. Command Mnemonics and Descriptions for BITE Operation

ASCII MNEMONIC	BINARY HEX	DESCRIPTION	RESPONSE
RMT	81	Places the receiver in Remote mode of operation.	
BIT	A5	Enables BITE mode, starting BITE, or resuming BITE if in BITE manual mode.	
BIT?	A7	Request current Test number.	BITE Test Number returned. 000 indicates BITE is completed. Any other BITE test number indicates the test number is in progress. Clears Bit 2 of the Status Byte set by the failed test. In binary returns A5xx where xx is Test Number.
MOD?	B3	Queries operating mode.	Returns BIT if enabled and no detected faults. (HEX returns A5.) Returns BIM, if failure detected or if BITE is halted (HEX A6).
MAN	75	Stops BITE operation. Sending MAN again exits BITE.	
CLR	51	Exits BITE after last Test Number is completed.	
BIC?	AA	Request last A/D value.	Returns last A/D, if applicable. (HEX A8 xx, where xx is last A/D reading.

Utilizing the preceding remote mnemonics, BITE operation can be controlled and queried to determine the BITE status. While in BITE, the controller is able to interact with the receiver. If a failure is detected during BITE or if BITE is successfully completed, the receiver sets bit two and bit six of the Status Byte. The operator can have the controller perform a serial poll to determine the problem. A set Bit two indicates failure of the BITE test. The Serial poll clears the SRQ. Sending BIT? clears status bit two and the controller is informed of the failed Test Number or bit 000 if BITE has completed its tests. During remote operation, BITE does not cause END to be displayed at the completion of the BITE program.

Pressing any front panel key, except REM, will have no effect during BITE operation.

NOTE

When Master/Slave receiver operation is enabled, BITE cannot be enabled.

L.8 CIRCUIT DESCRIPTION

The option designation for this subassembly is BITE. It installs in Option Slot 3. Refer to **Figure** L-3 for the schematic diagram of the Type 794151-1 Built-in Test (BITE) subasssembly.

Power is applied to this subassembly via the circuit board connector. Connector pins 44 and 42 apply -15 Vdc and +15 Vdc respectively to a voltage divider and to a comparator. From this comparator, the voltage levels are applied to another voltage divider. Pins 19 and 20 provide +5 Vdc for the components within this subassembly. Connector pins 11, 9, 7, 5, 3, 17, 15 and 13 are the data bus lines. The address bus lines consist of pins 50 through 60, 43 and 48. Read/Write line (pin 14) is applied to a flip-flop network which is enabled by the OPT* line, connector pin 41. In the read mode, this subassembly reads information from the data bus via the data register U13 and comparator circuit. The write mode enables information to be written onto the data bus via data register U13. The DBE line, connector pin 16 enables the data bus.

Pins 44 and 42, -15 Vdc and +15 Vdc are applied to a voltage divider and to a comparator. These are the first tests of this subassembly. The voltage comparator, U14, must have +2.4 Vdc (pin 6), +2.7 Vdc (pin 11) and +2.5 Vdc (pins 4, 7, 8 and 10) present at these pins to operate properly. Synthesizer tests include the Lock lines, LOCK 1, connector pin 10 and LOCK 2, connector pin 6. These lock lines are applied through networks utilizing D flip-flops and op-amps for monitoring the condition of the Lock lines. Lock line 1 is from the 1st LO Synthesizer, which is responsible for the 1 MHz tuning resolution. Lock line 2 is from the 2nd LO Synthesizer, which is responsible for the 100 Hz tuning resolution. Pin 4 is related to the Audio portion of the BITE test sequence. This signal is applied to an amplifier and to a detector. It is then compared before being applied to the data bus. A 5 MHz internal crystal oscillator is utilized to produce signals in the form of a comb of frequencies to drive the receiver from approximately 5 MHz to 1100 MHz. The output of this oscillator circuit is applied through two NAND gates and an amplifier to a step recovery diode. This diode creates a large comb of RF energy, which is applied to the voltage variable attenuator. Attenuation from 2 dB to 25 dB is obtainable, forming a modulation envelope which is applied to connector J1 and is utilized to apply these signals through the receiver to test receiver parameters.

L.9 ALIGNMENT PROCEDURE

Alignment of the Type 794151-X Built-In Test subassembly requires a dual trace oscilloscope, such as a Tektronix T935, and a properly calibrated spectrum analyzer, such as an HP-141T, or their equivalent. Utilizing this equipment, proceed as follows:

1. Turn off power, remove the top protective cover and place the Built-In Test module on an extender card. Install the extender card in Option Slot 3.

2. Adjust the spectrum analyzer to place 500 MHz at the center of the display. Connect the BITE cable (W2) with P2 connected to connector J27 and P3 connected to the spectrum analyzer RF input.

3. Enable EXTENDED BITE via holding the FUNCTION pushbutton pressed in, while turning receiver power ON. Using the COR LEVEL increment pushbutton, select Test Number 15. Press the BITE (AM) pushbutton to activate Auto Test. MEMORY SELECT displays an **F 1** indicating Step Number 1 failed.

4. Adjust R34 on the BITE subassembly to produce a -80 dBm signal level at the center of the spectrum analyzer display (500 MHz).

5. Disable BITE by pressing the FUNCTION key.

6. Tune the receiver to 25.000 MHz and select an IF bandwidth between 20 and 250 kHz. A narrow bandwidth is preferred. Connect Channel 1 of the oscilloscope (in the DC coupled mode) to the FM MONITOR (J2) connector on the receiver rear panel.

7. Set the signal generator to 25.000 MHz with an output amplitude 20 dB greater than the rated sensitivity for the IF bandwidth selected.

8. Set the oscilloscope trace to a convenient reference point on the gradicule. Decrease the signal generator frequency by 10 kHz and verify that the trace moves at least one (1) division vertically. If not, adjust the Channel 1 Volts/Div as necessary. Note the position of the trace and retune the signal generator to 25.000 MHz.

9. Connect the external trigger input of the oscilloscope to connector pin A41 of the Microprocessor (A5A3). This point is marked "READY 1" on the schematic.

10. Set up the receiver to step between 24.000 and 25.000 MHz. Adjust the oscilloscope trigger for a stable display of the FM Monitor signal.

11. Connect Channel 2 of the oscilloscope (in the DC coupled mode) to U4 pin 15 on the BITE module. Adjust R16 so the signal on U4 pin 15 goes high when the signal from the FM Monitor output indicates the receiver first local oscillator has settled to within 10 kHz of 25.000 MHz. The settling is within 10 kHz when the trace from the FM Monitor is within the limits established in step 8.

12. Connect the oscilloscope external trigger input to test point TP 10 on the Microprocessor (A5A3). This point is marked "READY 2" on the schematic. Connect Channel 2 of the oscilloscope to U4 pin 8 on the BITE card.

13. Set the receiver to step between 24.9999 and 25.0000 MHz. Adjust R20 until the signal on U4 pin 8 goes high when the signal from the FM Monitor output falls within the 10 kHz limit established in step 8.

14. Disconnect all test equipment connections.

15. Connect channel 1 of the oscilloscope to U14 pin 14. Enable BITE by pressing the FUNCTION (F↑) button and then pressing the BITE (AM) pushbutton. Immediately press the AM pushbutton again. Select Test Number 11 via pressing the COR Increment button. Initiate Single Step Test by pressing the MEMORY SELECT Increment key. Adjust R11 fully clockwise (CW) and observe a 0 Volt level on the oscilloscope. Adjust R11 counterclockwise (CCW) until the trace on the oscilloscope is a constant +5 Volt level. Continue rotating R11 CCW approximately 1/8 of a turn.

16. Select the next run and ensure the oscilloscope indicates +5 Volts. If there is a need to readjust the +5 Volt level, repeat step 15.

17. Remove all test equipment, including the extender card, and reinstall the BITE card into Option Slot 3.

18. Connect cable W2 between BITE Output J27 and ANT 2. Enable BITE by pressing the FUNCTION (F↑) pushbutton and then pressing the BITE (AM) pushbutton.

    Testing continues automatically through 13 different tests. When testing is completed the word End appears in the front panel window. If any failure occurs, investigate the cause to determine whether the failure is related to the receiver or the BITE alignment.

19. Enable Extended BITE by holding the FUNCTION button pressed in while turning receiver power on.

20. Start Extended BITE by pressing the FUNCTION (F↑) pushbutton then pressing the BITE (AM) pushbutton.

    Testing continues automatically through 16 different tests. When testing is completed, End appears in the front panel window. If any failures occur, investigate the cause to determine whether the failure is related to the receiver or the BITE alignment.

L.10 PARTS LIST

L.10.1 **TYPE 861XB(S1)/BITE BUILT-IN TEST** REF DESIGN PREFIX **OPT 3**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
A1	Built-In Test P.C. Assembly	1	794151-3	14632	
W1	Cable Assembly	1	280263-1	14632	
W1J1	Connector, Receptacle	1	1-225398-5	00779	
W1P1	Connector, Plug Straight	1	50-024-3875-91	98291	
W2	Cable Assembly	1	280264-1	14632	
W2P2	Connector, Plug Straight	1	UG88U	80058	
W2P3	Connector, Plug Straight	1	UG536BU	80058	

NOTE

Refer to **Table A,** page L-27 for type differences

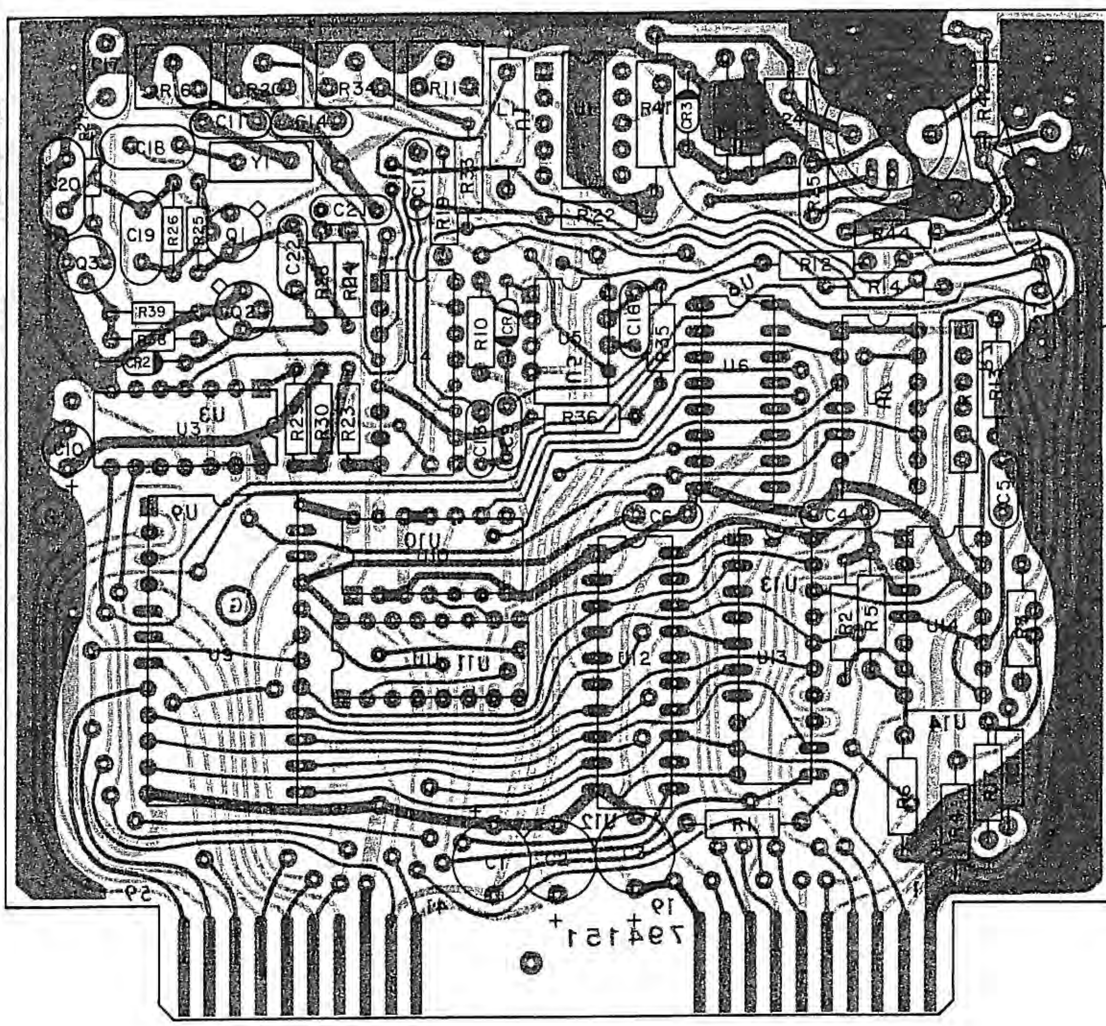


Figure L-2. Type 794151-X, Built-In Test (BITE) (Option L-BITE), Location of Components

L.10.1.1 **Type 794151-3 Built-In Test**

REF DESIG PREFIX **OPT 3-A1**

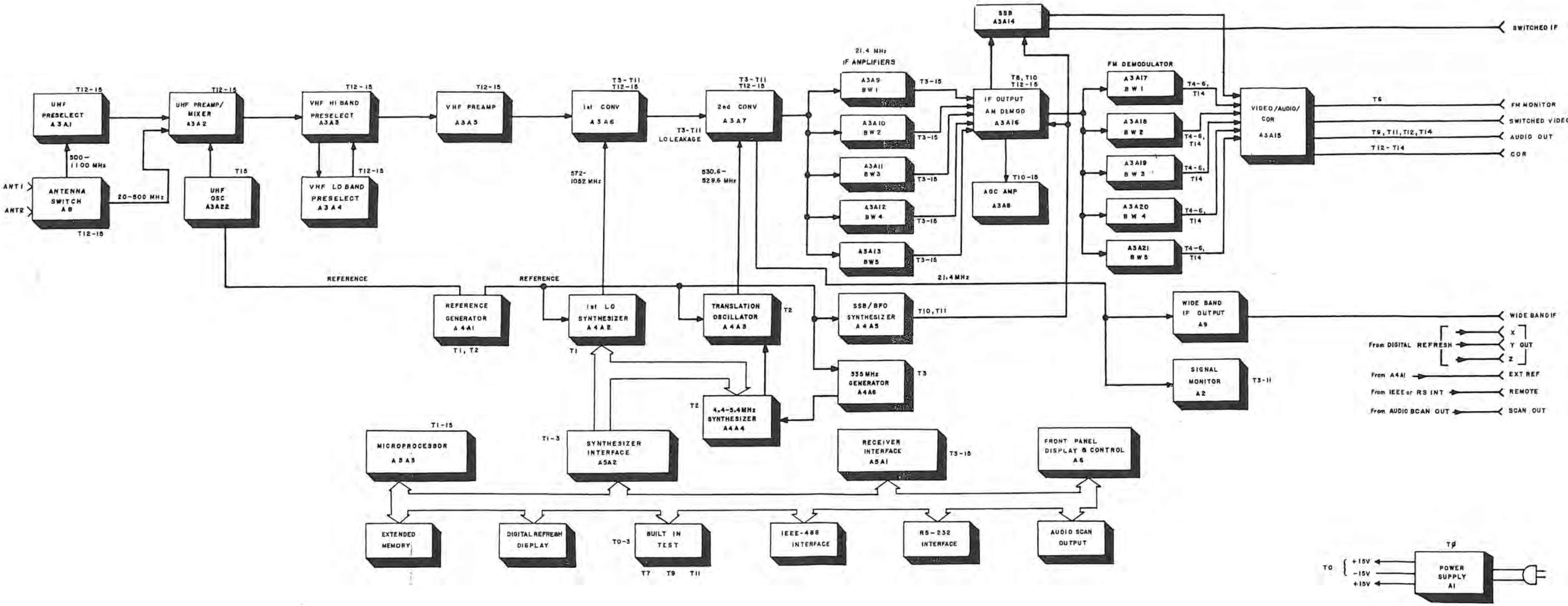
REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
C1	Capacitor, Electrolytic, Tantalum: 22 µF, 20%, 35 V	2	196D226X0035PE4	56289	
C2	Same as C1				
C3	Capacitor, Electrolytic, Tantalum: 47 µF, 20%, 20 V	1	199D476X0020EE4	56289	
C4	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 50 V	6	34475-1	14632	
C5	Capacitor, Ceramic, Disc: .47 µF, 20%, 50 V	3	34452-1	14632	
C6	Same as C4				
C7	Not Used				
C8	Not Used				
C9	Same as C5				
C10	Capacitor, Electrolytic, Tantalum: 3.3 µF, 20%, 35 V	1	196D335X0035JE3	56289	
C11	Same as C4				
C12	Not Used				
C13	Same as C4				
C14	Same as C4				
C15	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	1	34453-1	14632	
C16	Capacitor, Ceramic, Disc: 3300 pF, 10%, 200 V	1	CK06BX332K	81349	
C17	Capacitor, Mica, Dipped: 68 pF, 2%, 500 V	1	CM05ED680G03	81349	
C18	Capacitor, Mica, Dipped: 39 pF, 2%, 500 V	1	CM05FD390G03	81349	
C19	Capacitor, Mica, Dipped: 390 pF, 2%, 500 V	1	CM05FD391G03	81349	
C20	Capacitor, Mica, Dipped: 180 pF, 2%, 500 V	1	CM05FD181G03	81349	
C21	Same as C5				
C22	Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V	2	C023B101E502M	56289	
C23	Not Used				
C24	Capacitor, Ceramic, Tubular: 7.5 pF, .5 pF, 500 V	1	301-000C0H0-759D	72982	
C25	Same as C4				
C26	Not Used				
C27	Same as C22				
CR1	Diode	2	1N4446	80131	
CR2	Same as CR1				
CR3	Diode	1	5082-0153	28480	
J1	Connector, Receptacle	1	1010-7511-001	19505	
L1	Coil, Fixed: 15 µH, 10%	1	1537-40	99800	
Q1	Transistor	2	2N2222A	80131	
Q2	Transistor	1	2N3478	80131	
Q3	Same as Q1				
R1	Resistor, Fixed, Film: 10 kΩ, 1%, 1/10 W	1	RN55C1002F	81349	
R2	Resistor, Fixed, Film: 1.5 kΩ, 1%, 1/10 W	2	RN55C1501F	81349	
R3	Resistor, Fixed, Film: 6.81 kΩ, 1%, 1/10 W	1	RN55C6811F	81349	
R4	Same as R2				
R5	Resistor, Fixed, Film: 562Ω, 1%, 1/10 W	2	RN55C5620F	81349	

REF DESIG PREFIX **OPT 3-A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R6	Same as R5				
R7	Resistor, Network: 33 kΩ	1	4306R-101-333	80294	
R8	Not Used				
R9	Not Used				
R10	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	3	CF1/4-10K/J	09021	
R11	Resistor, Trimmer, Film: 50 kΩ, 10%, 1/2 W	1	62PAR50K	73138	
R12	Resistor, Fixed, Film: 10Ω, 5%, 1/4 W	1	CF1/4-10 OHMS/J	09021	
R13	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	1	CF1/4-100K/J	09021	
R14	Same as R10				
R15	Not Used				
R16	Resistor Trimmer, Film: 20 kΩ, 10%, 1/2 W	2	62PAR20K	73138	
R17	Resistor, Fixed, Film: 47 kΩ, 5%, 1/4 W	5	CF1/4-47K/J	09021	
R18	Not Used				
R19	Same as R17				
R20	Same as R16				
R21	Same as R17				
R22	Not Used				
R23	Same as R17				
R24	Resistor, Fixed, Film: 270Ω, 5%, 1/4 W	2	CF1/4-270 OHMS/J	09021	
R25	Resistor, Fixed, Film: 68 kΩ, 5%, 1/4 W	1	CF1/4-68K/J	09021	
R26	Resistor, Fixed, Film: 8.2 kΩ, 5%, 1/4 W	1	CF1/4-8.2K/K	09021	
R27	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/4 W	2	CF1/4-1.0K/J	09021	
R28	Same as R17				
R29	Same as R24				
R30	Resistor, Fixed, Film: 33Ω, 5%, 1/4 W	1	CF1/4-33 OHMS/J	09021	
R31	Not Used				
R32	Resistor, Fixed, Film: 220Ω, 5%, 1/4 W	1	CF1/4-220 OHMS/J	09021	
R33	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/4 W	2	CF1/4-4.7K/J	09021	
R34	Resistor, Trimmer, Film: 1 kΩ, 10%, 1/2 W	1	62PAR1K	73138	
R35	Same as R10				
R36	Same as R33				
R37	Resistor, Fixed, Film: 47Ω, 5%, 1/4 W	2	CF1/4-47 OHMS/J	09021	
R38	Resistor, Fixed, Film: 10 kΩ, 5%, 1/8 W	1	CF1/8-10K/J	09021	
R39	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/8 W	1	CF1/8-47K/J	09021	
R40	Same as R27				
R41	Same as R37				
R42 Thru R44	Not Used				
U1	Integrated Circuit	1	LH0002CN	27014	
U2	Attenuator	1	G1	27956	
U3	Integrated Circuit	1	SN74LS00N	01295	

REF DESIG PREFIX **OPT 3-A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
U4	Integrated Circuit	1	LH2311D	27014	
U5	Integrated Circuit	1	MC1458N	18324	
U6	Integrated Circuit	1	CD4040BE	02735	
U7	Integrated Circuit	1	8674L00	14632	
U8	Not Used				
U9	Not Used				
U10	Integrated Circuit	1	MM74C74N	27014	
U11	Integrated Circuit	1	SN74LS139N	01295	
U12	Integrated Circuit	2	MM74C374N	27014	
U13	Same as U12				
U14	Integrated Circuit	1	LM339N	27014	
Y1	Crystal, Quartz: 5.00 MHz	1	91805-35	14632	



e L-1. BITE Test Number Block Diagram

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN μF.
2. DIFFERENCE IN TYPE NOS. IS SHOWN IN TABLE A.

TABLE A

TYPE NO.	R40	R42	R43	R44	JW2	U9
-1	1K	N/U	N/U	N/U	#22 AWG BUS	190169-37
-2	N/U	1K	N/U	N/U	N/U	190169-37
-3	1K	N/U	N/U	N/U	#22 AWG	N/U

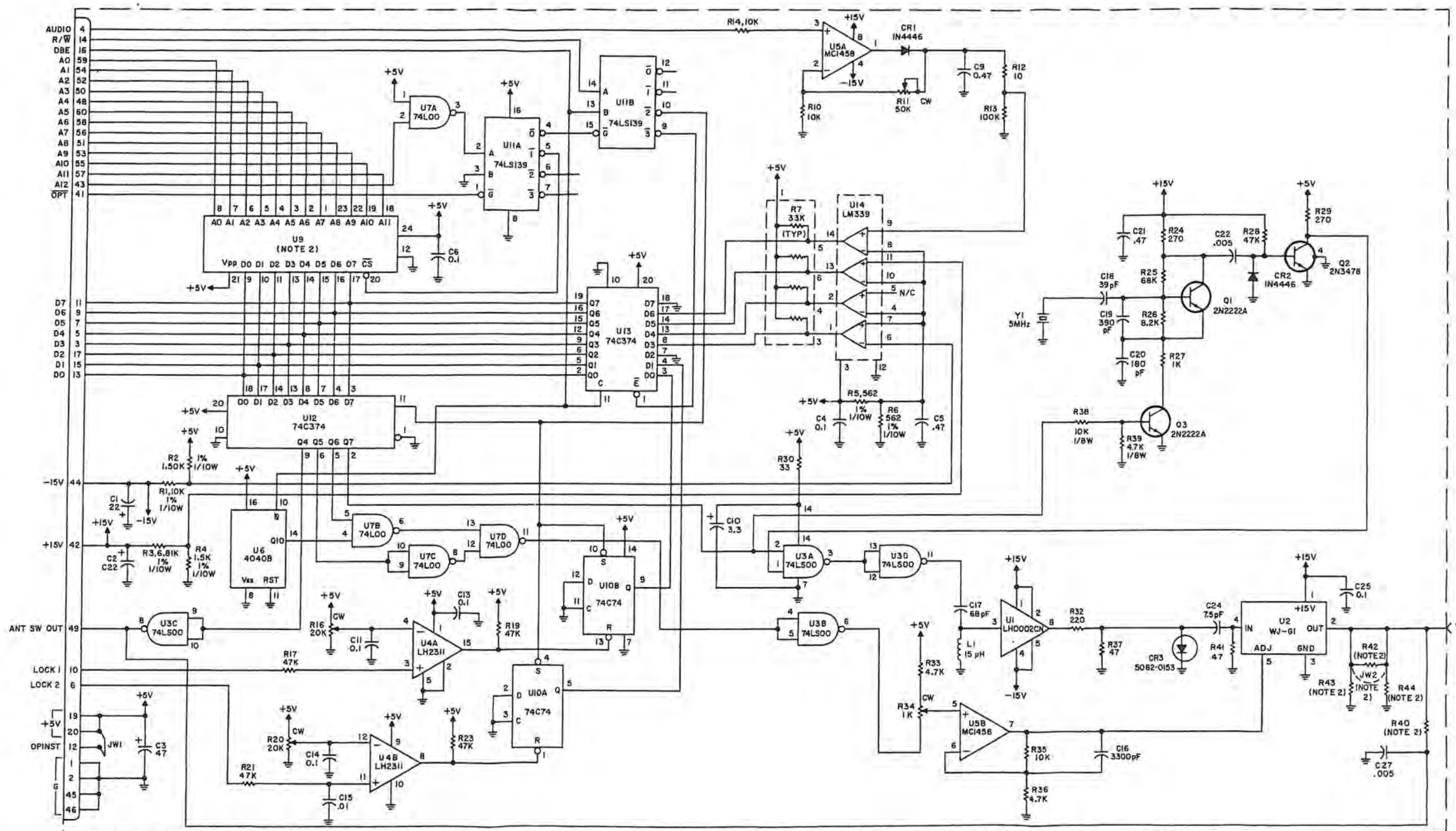


Figure L-3. Type 794151-X, Built-In-Test (BITE), Schematic Diagram 590114 (H)

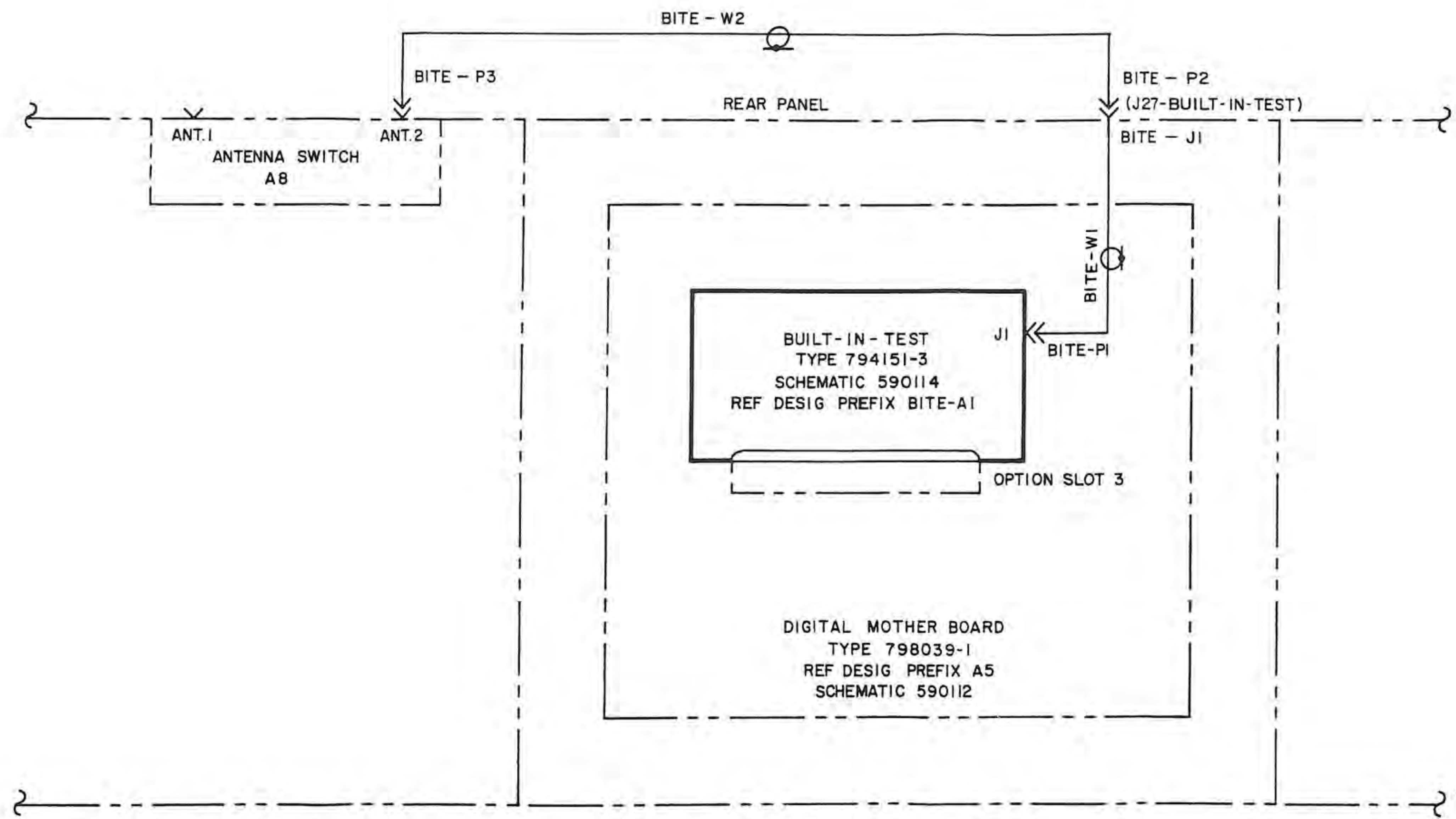


Figure L-4. Type 861XB(S1)/BITE Built-in-Test Schematic Diagram 381688 (A)

WJ-861X RECEIVER

APPENDIX M

WJ-861X REAL TIME CLOCK (RTC) OPTION

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

January 1992

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

PROPRIETARY STATEMENT

This document and subject matter disclosed herein are proprietary items to which Watkins-Johnson Company retains the exclusive right of dissemination, reproduction, manufacture and sale.

This document is provided to the individual or using organization for their use alone in the direct support of the associated equipment unless permission for further disclosure is expressly granted in writing.

TABLE OF CONTENTS

APPENDIX M

LIST OF TABLES

LIST OF ILLUSTRATIONS

APPENDIX M

TYPE 796185-6, REAL-TIME CLOCK (RTC) OPTION

M.1 GENERAL DESCRIPTION

The Real-Time Clock option provides the operator with a 24 hour clock for reference during RLOG (Remote Logging) operation. The Real-Time Clock information is provided as an item in the RLOG data sent to a terminal or printer device. Using the time as a reference of when the signal contacts were made allows the operator to review signal contacts made within the last 24 hours.

M.2 FIELD INSTALLATION

Installation of the Type 796185-6 Real-Time Clock assembly into the receiver is accomplished by performing the following steps.

1) Turn the receiver power off and remove the top protective dust cover. The protective covers are held in place with quick release quarter-turn fasteners.

2) Locate Option Slot 1 on the Digital I/O Motherboard (A5) and insert the Type 796185-6 Real-Time Clock assembly into the vacant Option Slot 1. (Refer to the decal on the bottom of the top cover for the location of Option Slot 1.)

3) Insert the new U4 EPROM in the Microprocessor assembly (A5A3). This EPROM is placed in the U4 socket position. If this EPROM is not replaced, the receiver will not respond properly to the change in receiver configuration.

   Information required for a replacement EPROM are:

   - Receiver Type (WJ-861XB-X)
   - Receiver Serial Number (XXX)
   - Software Revision Level (X.X.X)
   - EPROM location Number (UX)
   - Options Installed
   - IF Bandwidths Installed

4) After installing the RTC assembly and the new EPROM into the Microprocessor assembly, replace and secure the top protective cover.

5) Turn the receiver power on.

M.3 OPERATION

With the Real-Time Clock assembly installed in the receiver, apply power to the unit. After the receiver is operational, perform the following steps to set the RTC time to the current or desired time.

1) Press the FUNCTION key to place the receiver front panel in the upper case mode. In the upper case mode, the LED on the FUNCTION key is illuminated.

2) Press the TIME key (DISABLE) key to display the 24 hour clock time.

3) Press the HOUR (1 MHz) key to highlight the hour LEDs in the FREQUENCY display window.

4) Rotate the TUNING knob to display the desired hour (0 to 23). Clockwise rotation increases the displayed time and counterclockwise rotation decreases the displayed time. Rotating the tuning wheel beyond the upper hour limit (23) cycles the hour back to 0.

5) Press the MINUTE (10 MHz) key to change the displayed minutes. When rotating the TUNING wheel for the hour or minute setting causes the displayed seconds to be reset to zero each time the TUNING wheel is rotated.

6) Press the TIME (DISABLE) key again to return the displayed time to the FREQUENCY display.

The time may also be set remotely by using the **TIM** and **TIM?** mnemonics. Section II of the WJ-861XB Receiver Instruction Manual lists the remote mnemonics. The TIM mnemonic, followed by six ASCII numbers and two colons (HH:MM:SS) is used to set the time. The receiver set time is determined by sending the "TIM?" query. The response to the TIM? query is the same format for setting the time (TIM HH:MM:SS). If the RTC option is not installed, the response will be TIM/.

M.4 CIRCUIT DESCRIPTION

Refer to **Figure M-2** for the Type 796185-6 Real-Time Clock schematic diagram. The reference designation for the Real-Time Clock option is Option M. Table A, located on the RTC schematic diagram, provides a list of the different versions of the Type 796185-X Real-Time Clock assembly. The Type 796185-6 Real-Time Clock assembly provides a real-time clock that provides the time of day.

Inserting the Real-Time Clock option into Option Slot 1 and then turning the receiver power on applies +5 Vdc from connector pin 12 (OPT INST) to the Digital I/O Motherboard (A5). At power-up, the Microprocessor reads the status of this line to determine what options are installed in the receiver and the PFAIL line (connector pin 4) is forced High. RAM VCC at connector pin 6 is applied to real-time clock device U13 to allow constant operation of the clock circuit, even when power is turned off. With the PFAIL line High, data may written to or read from the RTC assembly and when this line is Low, the exchange of data is inhibited.

Using the address lines (A10 to A12), data lines (D0 to D3) and the control lines (R/W, OPT, DBE, and PFAIL), the operation of the RTC assembly can be controlled. The address lines (A11 and A12) are applied to dual 1-of-4 decoder/demultiplexer U6. **Table M-1** illustrates the control line logic levels required to enable certain devices within the RTC assembly.

Table M-1. Type 796185-6 RTC Control Inputs

PFAIL	OPT	A12	A11	A10	R/W	Function
1	0	0	1	0	1	Enables Latch U12 to read Clock data
1	0	0	1	0	0	Enables Latch U13 to Set Clock
1	0	0	1	1	0	Clocks Latch U10 to select U13 Clock counter
X	1	X	X	X	X	Disables the RTC assembly
0	X	X	X	X	X	Disables the RTC assembly

With the DBE line (connector pin 16) High, 1-of-8 decoder/demultiplexer U7 is enabled. Enabling U7 allows latch U7 to be clocked. Clocking U10 allows the data at the D inputs to be transferred to the Q outputs.

Using address lines A10 and A11 and the read/write line, the microprocessor reads data from or writes data to the real-time clock/calendar device (U13). Setting address lines A10 and A11 both High, the microprocessor is able to write data to the real-time clock (U13). When address line A10 is Low and address line A11 is High, the microprocessor reads data from U13.

Before writing data to the real-time clock/calendar (U13), the Q5 output from U10 is forced High. This High inhibits the internal clock of U13 and sets all of the internal counters to their static states, allowing error-free read or write operations.

When the microprocessor writes data to real-time clock device U13, data is placed on the data bus (D0-D3) and the read/write line is set Low. This data is applied to octal flip-flops U10 and U11. Data is applied through flip-flop U10 when the output enable (pin 1) is set Low. This allows data at the D inputs to be directed through U10 to the Q outputs when clocked. Data at the D outputs is applied to address lines A0-A3 of real-time clock U13. These address lines are used to select one of the seven different registers inside of U13. Each register is used to control one separate function of the real-time clock/calendar. Presently, only the hour, minute, and second registers are used. Crystal oscillator Y1 and capacitors C6 and C7 provide the 32.768 kHz reference frequency used by the real time-clock/calendar (U13).

The microprocessor reads data from the RTC assembly by setting the read/write line High. With this line High, data is read from the real-time clock/calendar and applied to 8-bit latch U12. This data is applied through U12 when the output enable (pin 1) is Low. Data applied through U12 is directed to data bus lines D0-D3 for use by the microprocessor. Unused data lines are pulled High by pull-up resistors R3 to R6.

M.5 ALIGNMENT PROCEDURE

The following steps describe the procedure to follow for the alignment of the Type 796185-6 assembly. Refer to **Figure M-1** for the location of terminal E1. A frequency counter capable of measuring period (such as the Fluke 1953A or its equivalent) is required for the following alignment procedure.

1) Turn the receiver power off and remove the top protective dust cover.

2) Place the Type 796185-6 Real-Time Clock assembly on an extender card and turn the receiver power on.

3) Connect the frequency counter to terminal E1 on the Type 796185-6 Real-Time Clock assembly. Adjust the counter controls to display the period of the signal present at E1.

4) Press the front panel CLR push button twice and then press the MAN push button to activate the 1024 Hz test signal.

5) Adjust C7 until the frequency counter displays 976.2625 μsec. Then remove the frequency counter from terminal E1.

6) Remove the RTC assembly from the extender card and insert the RTC assembly into Option Slot 1. Replace and secure the receiver top protective cover.

7) Turn the receiver power on and set the clock to the proper time. Refer to **paragraph M.3** for the procedure for setting the clock time.

M.6 PARTS LIST

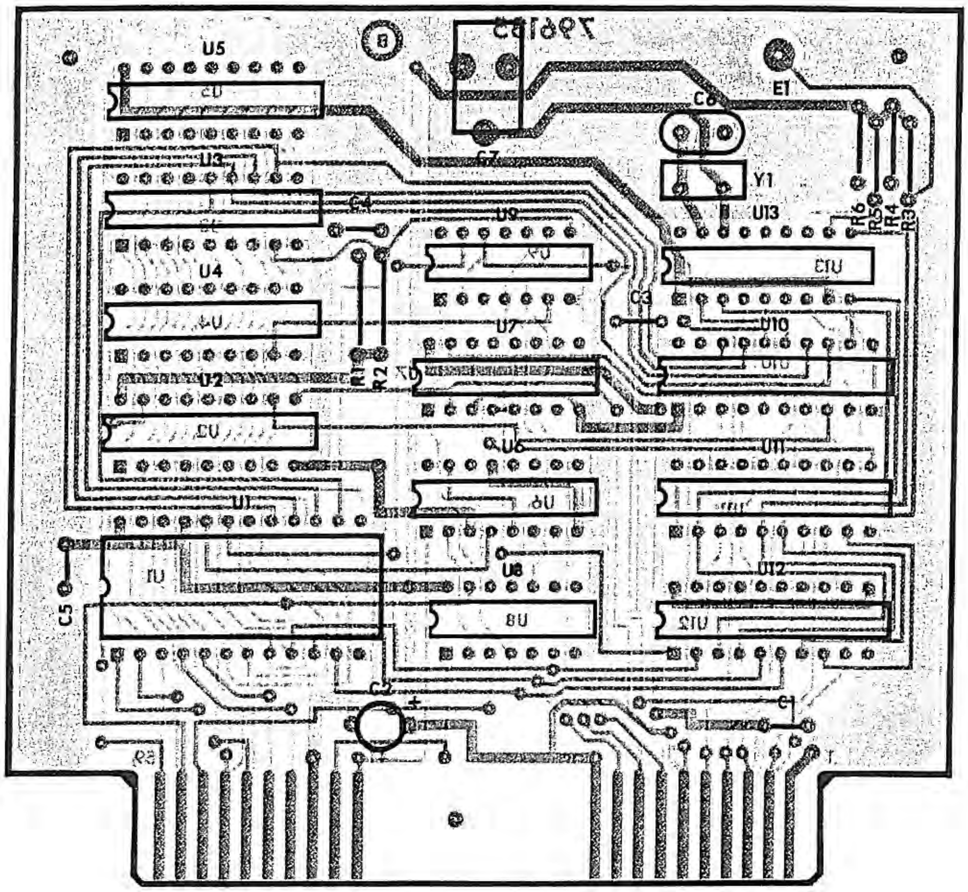


Figure M-1. Type 796185-6 Real Time Clock, (Option M-RTC)
Location of Components

M.6.1 TYPE 796185-6 REAL-TIME CLOCK

REF DESIG PREFIX RTC

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision C				
C1	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 50 V	4	34475-1	14632	
C2	Capacitor, Electrolytic, Tantalum: 4.7 µF, 20%, 35 V	1	199D475X0035CE3	56289	
C3 Thru C5	Same as C1				
C6	Capacitor, Mica, Dipped: 15 pF, 5%, 500 V	1	CM05ED150J03	81349	
C7	Capacitor, Variable, Air: 0.8-10 pF, 250 V	1	5201/W HDW	91293	
R1	Not Used				
R2	Not Used				
R3	Resistor, Fixed, Film: 10 kΩ, 5% 1/8 W	4	CF1/8-10K/J	09021	
R4 Thru R6	Same as R3				
U1 Thru U5	Not Used				
U6	Integrated Circuit	1	SN74LS139N	01295	
U7	Integrated Circuit	1	SN74LS138N	01295	
U8	Integrated Circuit	1	8674L04	14632	
U9	Not Used				
U10	Integrated Circuit	1	MM74HC273N	27014	
U11	Integrated Circuit	1	MM74C374N	27014	
U12	Integrated Circuit	1	MM74C373N	27014	
U13	Integrated Circuit	1	MSM5832	52624	
Y1	Crystal: 32.768 kHz	1	CX-,03	51791	

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN μF.
2. DIFFERENCE IN TYPE NO.'S IS SHOWN IN TABLE A.

TABLE A

TYPE NO.		U1	FUNCTION
796185-1	C6, C7, R3, R4, R5, R6 U10, U11, U12, U13 Y1 NOT USED	190169-38	EM
796185-2	AS SHOWN	190169-39	LOC/CUR/RTC
796185-3	AS SHOWN	190169-64	SPECIAL SEGMENT SCAN
796185-4	C6, C7, R3, R4, R5, R6 U10, U11, U12, U13 Y1 NOT USED	190169-70	LOC
796185-5	AS SHOWN	190169-108	CUR
796185-6	R1, R2, U2, U3, U4, U5, U9 NOT USED	NOT USED	RTC USED WITH MICROPROCESSOR 796353
796185-7	AS SHOWN	190169-134	LOC/RTC
796185-8	AS SHOWN	190169-135	EM/RTC
796185-9	AS SHOWN	190169-136	EM/CUR
796185-10	U2, U3, U4, U5 NOT USED	190169-137	CUR/RTC
796185-11	U2, U3, U4, U5 NOT USED	190169-125	RTC USED WITH MICROPROCESSOR 794109
796185-12	AS SHOWN	190169-138	LOC/CUR

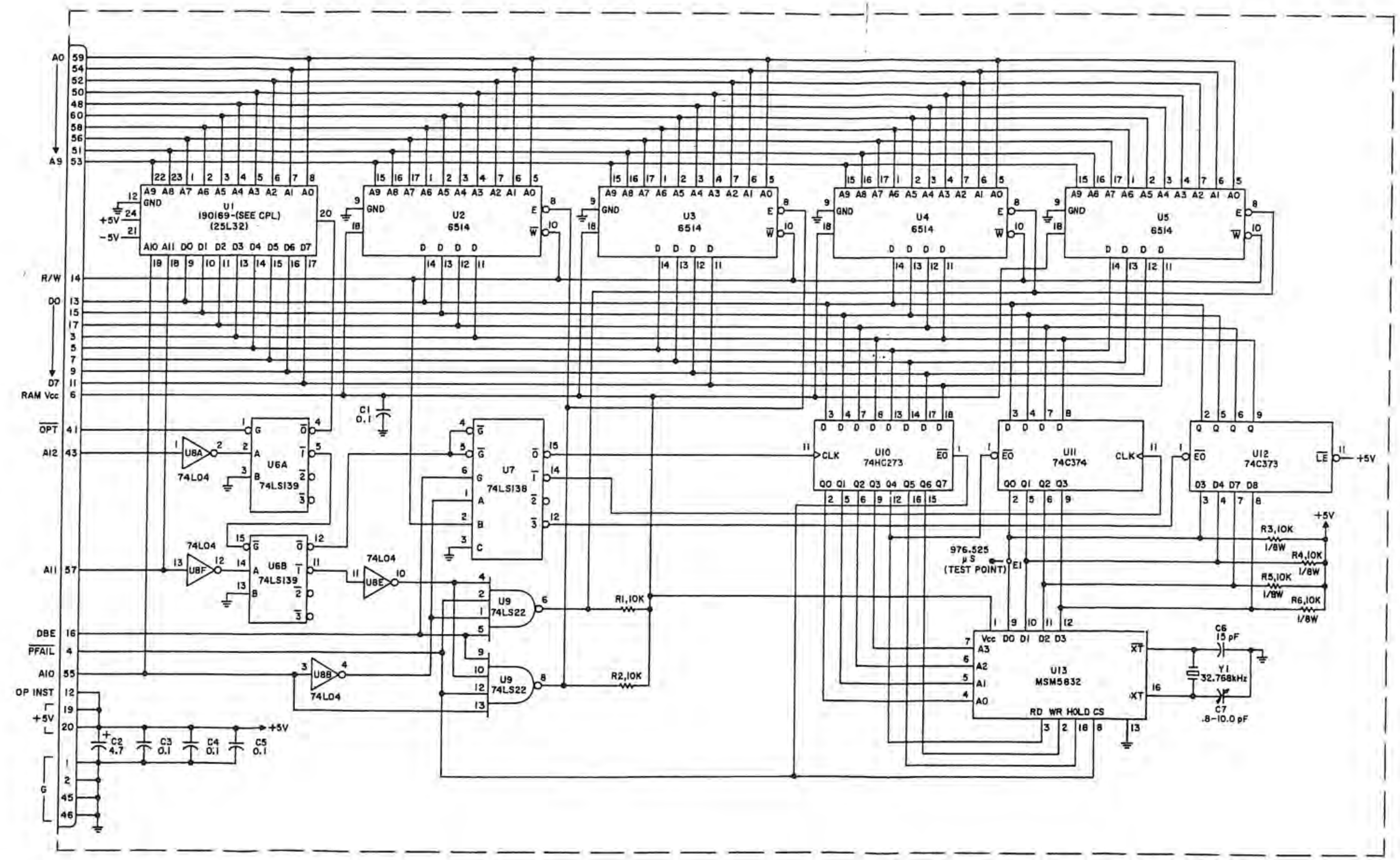


Figure M-2. Type 796185-X, Real Time Clock Schematic Diagram 580079 (C)

WJ-861X RECEIVER

APPENDIX N

WJ-861X DIRECTION FINDER CONTROL (DFC) OPTION

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

November 1990

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

PROPRIETARY STATEMENT

TABLE OF CONTENTS

APPENDIX N

LIST OF ILLUSTRATIONS

APPENDIX N

WJ-861X DIRECTION FINDER CONTROL (DFC) OPTION

N.1 GENERAL DESCRIPTION

The Direction Finder Control (DFC) option provides a control line to the WJ-8971A Series DF. This control line alerts the DF that the receiver has switched phase sense due to a UHF/VHF greater than 500 MHz band change.

N.2 INSTALLATION

Installation of the 861XB/DFC option consists of connecting cable (DFC-W1) to connector (J6A) on the Digital Motherboard. J6A pin 5 is the voltage line and pin 6 is ground. Cable (DFC-W1) is routed to the rear panel and is connected to the Option Out connector (J5) pin 3. Refer to **Figure N-1** for the (DFC-W1) cable diagram.

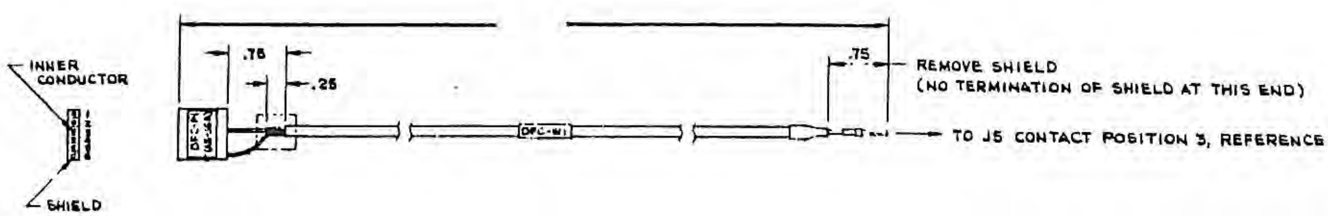


Figure N-1. 861XB/DFC-W1 Cable Diagram

N.3 OPERATION

Operation of the WJ-861XB/DFC Direction Finder Control option is the same as the normal operation of the receiver. When the WJ-8971A Series DF is utilized, the WJ-861XB/DFC option provides a voltage alerting the DF that the receiver has switched phase sense because of a band change over 500 MHz. A nominal voltage of -10 Vdc is present on the DFC line when the receiver is operating at or below 500 MHz (VHF). A nominal 0 Vdc is present on the DFC line when the receiver is operating above 500 MHz (UHF).

N.4 PARTS LIST

N.4.1 TYPE 861XB/DFC DIRECTION FINDER CONTROL

REF DESIG PREFIX DFC

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
DFC-P1	Connector, Plug: 6 Position	1	1-87499-1	00779	
DFC-W1	Cable Assembly	1	380329	14632	

WJ-861X RECEIVER

APPENDIX O

WJ-861X VARIABLE BEAT-FREQUENCY-OSCILLATOR OPTION

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

November 1990

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

PROPRIETARY STATEMENT

TABLE OF CONTENTS

APPENDIX O

LIST OF ILLUSTRATIONS

APPENDIX O

WJ-861X VARIABLE BEAT-FREQUENCY-OSCILLATOR (VBFO) OPTION

O.1 GENERAL DESCRIPTION

The Variable Beat-Frequency-Oscillator (VBFO) option installs in place of the standard BFO subassembly, (A4A5) and provides an operator controllable BFO frequency, during CW operation. The frequency is varied by ±7.99 kHz about a 21.4 MHz center, in 10 Hz steps. In addition to the BFO output, 32.1 MHz and 10.7 MHz outputs are provided, for utilization with the Single-Sideband option, SSB, when incorporated.

When the receiver is set to CW operation, the VBFO subassembly is activated. Depressing the BFO TUN pushbutton permits the BFO frequency to be varied, utilizing the receiver tuning knob. At this time, the BFO offset frequency is displayed in place of the receiver frequency display. By depressing any of the tuning rate pushbuttons, the receiver frequency display and tuning knob are restored to their primary function, but the BFO frequency remains at the selected offset.

O.2 INSTALLATION

Installation of the VBFO option consist of inserting the Type 798029-1 Variable BFO Option into the A4A5 slot on the synthesizer motherboard. A wire-wrap connection must be made from pin 55 of the reference generator connector (A4XA1) to pin 52 of connector A4XA5, to supply a 25 kHz clock to the Variable BFO subassembly. The BFO TUN pushbutton, supplied with the VBFO option, replaces the blank button directly to the right of the memory select pushbuttons, on the receiver front panel.

O.3 CIRCUIT DESCRIPTION

The option designation for this subassembly is VBFO. Refer to **Figure O-3** for the Type 798029-1 Variable BFO option schematic diagram.

This option installs in the XA5 slot of the Synthesizer motherboard (A4) in place of the standard BFO subassembly. It provides a BFO frequency to the AM Demodulator when CW detection mode is selected. This output frequency is operator variable by 7.99 kHz above or below the 21.4 MHz center frequency. A fixed 32.1 MHz and a variable 10.7 MHz ±4 kHz is also available for utilization when the SSB option is in the receiver.

Two input frequencies originating in the Reference Generator (A4A1) are applied to the Type 798029-1 Variable BFO option. The 10.7 MHz reference frequency appearing at connector pin 53 is applied to oscillator subassembly, Part 390343-1, where it is tripled and output at connector pin 12 as a fixed 32.1 MHz signal. This signal is utilized to demodulate single sideband signals when the SSB option is installed in the receiver. The 25 kHz reference frequency appears at connector pin 52 and is divided by a factor of 25 to produce a 1 kHz reference utilized in producing the variable BFO output.

The variable beat frequency oscillator output is generated utilizing fractional frequency synthesis techniques. It utilizes a voltage controlled oscillator which is capable of producing an output frequency of 21.4 MHz ±7.99 kHz that is variable in 10 Hz steps. The output frequency is also divided by 2 providing a variable 10.7 MHz frequency to be utilized with the SSB option. Control over the output frequency is maintained via three BCD digits and a minus (pin 13) control line from the Digital Control Section. These BCD digits control the amount of frequency offset from the 21.4 MHz center frequency and the minus line determines whether the frequency is offset above or below the center frequency. A logic "1" on the minus control line causes the 21.4 MHz output to be offset below 21.4 MHz by the value of the BCD digits at the TH, H and T inputs of the subassembly. A logic "0" causes the offset to be above 21.4 MHz. CW and SSB control inputs (pin 49 and pin 51, respectively) activate the 21.4 MHz output when the CW detection mode is selected or the 10.7 MHz output when Single Sideband detection mode is selected.

O.4 ALIGNMENT PROCEDURE

Alignment of the Type 798029-1 Variable BFO consists of setting the gain and the frequency offset of the VBFO output circuits as follows:

1) Connect a DVM to terminal E20 of the Part 390343-1 Oscillators subassembly (A4A5A1) and set the meter to measure dc voltage.

2) Select CW mode of operation and activate the VBFO tuning function. Set the BFO offset to 0.00 kHz, utilizing the tuning knob.

3) Adjust capacitor C7 to obtain a reading of between +2 Vdc and +4 Vdc at testpoint E20.

4) While monitoring the voltage at E20, set the offset frequency to +7.99 kHz and then to -7.99 kHz. Observe the dc voltage at each tuning extreme. The DVM should indicate approximately +8 Vdc at the positive extreme and approximately -2 Vdc at the negative extreme.

5) Remove the DVM from E20 and connect an oscilloscope. Set the oscilloscope for ac coupling at an input sensitivity sufficient to view the ac ripple present at E20.

6) Tune VBFO between approximately 200 - 400 Hz.

7) Adjust R7 for minimum ripple as observed on oscilloscope.

8) Tune VBFO between approximately 200 - 400 Hz.

9) Adjust R3 for minimum ripple as observed on oscilloscope.

If the SSB option is installed, proceed as follows:

10) Select either Upper or Lower sideband operation.

11) Connect an RF millivoltmeter between connect pins 12 (signal) and ground. Adjust C18 and C20 for maximum indication on the millivoltmeter (typically -10 dBm).

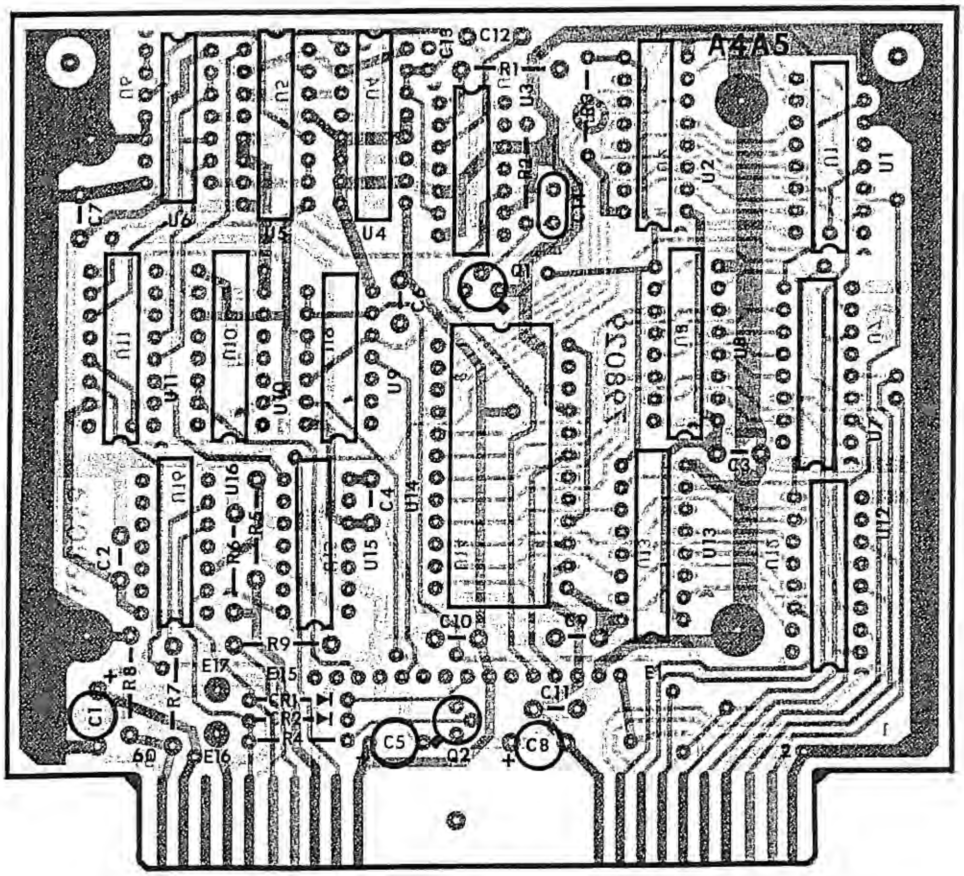


Figure O-1. Type 798029-1, Variable BFO (A4A5)
(Option O - VBFO), Location of Components

O.4.1 TYPE 798029-1 VARIABLE BFO OPTION

REF DESIG PREFIX A4A5

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision E				
A1	Oscillators Assembly	1	390343-1	14632	
C1	Capacitor, Electrolytic, Tantalum: 22 µF, 20%, 10 V	1	196D226X0010JE3	56289	
C2	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 50 V	5	34475-1	14632	
C3	Same as C2				
C4	Same as C2				
C5	Capacitor, Electrolytic, Tantalum: 4.7 µF, 20%, 35 V	2	196D475X0035JE3	56289	
C6	Same as C2				
C7	Same as C2				
C8	Same as C5				
C9	Capacitor, Ceramic, Disc: .47 µF, 20%, 50 V	3	34452-1	14632	
C10	Same as C9				
C11	Same as C9				
C12	Capacitor, Mica, Dipped: 1000 pF, 5%, 100 V	1	DM15-102J	72136	
C13	Capacitor, Ceramic, Monolithic: 470 pF, 5%, 100 V	1	8121-100C0G0-471J	59660	
C14	Capacitor, Mica, Dipped: 47 pF, 2%, 500 V	1	CM04ED470G03	81349	
CR1	Diode	2	1N4446	80131	
CR2	Same as CR1				
Q1	Transistor	2	2N2222A	80131	
Q2	Same as Q1				
R1	Resistor, Fixed, Film: 2 kΩ, 5%, 1/4 W	1	CF1/4-2K/J	09021	
R2	Resistor, Fixed, Film: 47 kΩ, 5%, 1/4 W	1	CF1/4-47K/J	09021	
R3	Resistor, Fixed, Film: 2.2 kΩ, 5%, 1/4 W	1	CF1/4-2.2K/J	09021	
R4	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	1	CF1/4-100K/J	09021	
R5	Resistor, Fixed, Film: 300Ω, 5%, 1/4 W	1	CF1/4-300 OHMS/J	09021	
R6	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	1	CF1/4-100 OHMS/J	09021	
R7	Resistor, Fixed, Film: 1 kΩ, 5%, 1/4 W	1	CF1/4-1K/J	09021	
R8	Resistor, Fixed, Film: 68Ω, 5%, 1/4 W	1	CF1/4-68 OHMS/J	09021	
R9	Resistor, Fixed, Film: 270Ω, 5%, 1/4 W	1	CF1/4-270 OHMS/J	09021	
U1	Integrated Circuit	3	MC14560BCP	04713	
U2	Integrated Circuit	3	MC74C175N	27014	
U3	Integrated Circuit	1	CD4047BE	02735	
U4	Integrated Circuit	3	CD40102BE	02735	
U5	Same as U4				
U6	Integrated Circuit	1	MM74C00N	27014	
U7	Same as U1				
U8	Same as U2				
U9	Integrated Circuit	1	SN74LS02N	01295	
U10	Same as U4				
U11	Integrated Circuit	1	CD40109BE	02735	

REF DESIG PREFIX **A4A5**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
U12	Same as U1				
U13	Same as U2				
U14	Integrated Circuit	1	ADDAC 80CCD-V	27014	
U15	Integrated Circuit	1	SN74LS90N	01295	
U16	Integrated Circuit	1	SN74LS00N	01295	

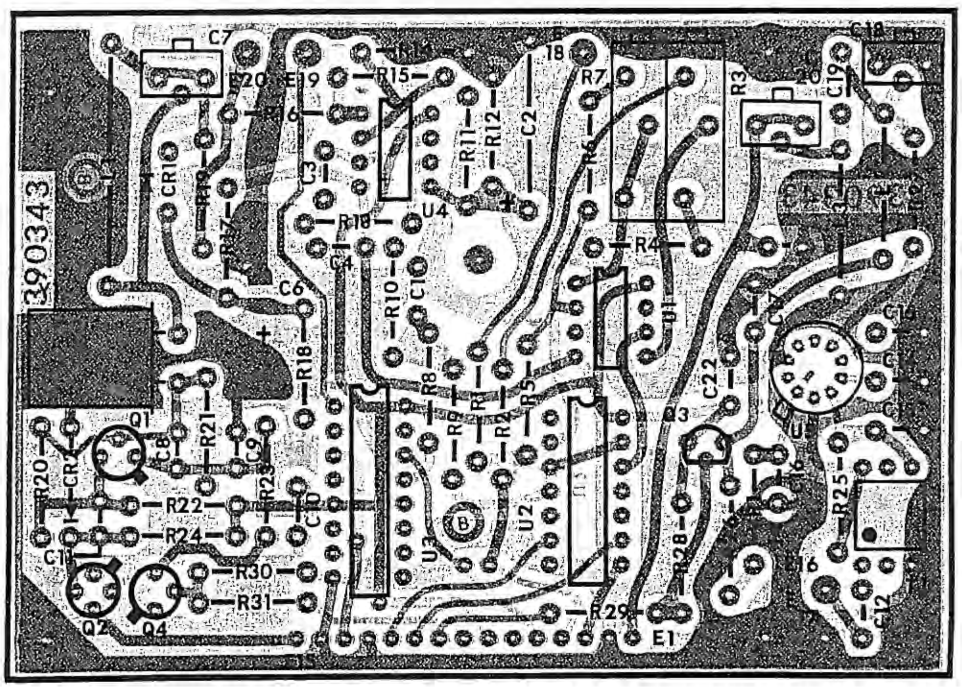


Figure O-2. Part 390343-1, Oscillators (A4A5A1), Location of Components

O.4.1.1 **Part 390343-1 Oscillators Assembly** REF DESIG PREFIX A4A5A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision D				
C1	Capacitor, Ceramic, Disc: 0.47 µF, 20%, 50 V	2	34452-1	14632	
C2	Capacitor, Electrolytic, Tantalum: 15 µF, 10%, 20 V	1	CS13BE156K	81349	
C3	Same as C1				
C4	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 50 V	3	34475-1	14632	
C5	Not Used				
C6	Capacitor, Ceramic, Chip: 1000 pF, 20%, 50 V	1	ATC700B102MP50X	29990	
C7	Capacitor, Variable, Ceramic: 2.5-9 pF, 100 V	1	518-002A2.5-9	59660	
C8	Capacitor, Mica, Dipped: 100 pF, 2%, 500 V	1	CM04FD101G03	99800	
C9	Capacitor, Mica, Dipped: 47 pF, 2%, 500 V	1	CM04ED470G03	81349	
C10	Same as C4				
C11	Capacitor, Ceramic, Disc: 1000 pF, 500 V	1	B-GP1000PFP	91418	
C12	Capacitor, Ceramic, Disc: 0.01 µF, 20%, 50 V	6	34453-1	14632	
C13 Thru C17	Same as C12				
C18	Capacitor, Variable, Ceramic: 7-40 pF, 25 V	2	518-002G7-40	59660	
C19	Capacitor, Ceramic, Tubular: 3.3 pF ±0.25 pF, 500 V	1	301-000COJ0-339C	59660	
C20	Same as C18				
C21	Not Used				
C22	Same as C4				
CR1	Diode, Varicap	1	KV3901	52673	
CR2	Diode	1	1N4446	80131	
L1	Coil, Fixed: 2.7 µH, 10%	1	210-11	99848	
L2	Coil, Fixed, Molded: 0.68 µH, 10%	2	1537-08	99800	
L3	Same as L2				
Q1	Transistor	2	2N222A	80131	
Q2	Transistor	1	2N3478	80131	
Q3	Transistor	1	2N3906	80131	
Q4	Same as Q1				
R1	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	4	CF1/4-10K/J	09021	
R2	Resistor, Fixed, Film: 8.2 kΩ, 5%, 1/4 W	2	CF1/4-8.2K/J	09021	
R3	Resistor, Variable, Film: 1 kΩ, 10%, 3/4 W	2	89PR1K	73138	
R4	Resistor, Fixed, Film: 10Ω, 5%, 1/4 W	1	CF1/4-10 OHMS/J	09021	
R5	Resistor, Fixed, Film: 12 kΩ, 5%, 1/4 W	1	CF1/4-12K/J	09021	
R6	Resistor, Fixed, Film: 270Ω, 5%, 1/4 W	1	CF1/4-270 OHMS/J	09021	
R7	Same as R3				
R8	Resistor, Fixed, Film: 1.8 kΩ, 5%, 1/4 W	3	CF1/4-1.8K/J	09021	
R9	Same as R8				
R10	Same as R8				
R11	Resistor, Fixed, Film: 22 kΩ, 5%, 1/4 W	2	CF1/4-22K/J	09021	
R12	Same as R11				
R13	Resistor, Fixed, Film: 56 kΩ, 5%, 1/4 W	1	CF1/4-56K/J	09021	

REF DESIG PREFIX **A4A5A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R14	Same as R1				
R15	Same as R1				
R16	Resistor, Fixed, Film: 33 kΩ, 5%, 1/4 W	1	CF1/4-33K/J	09021	
R17	Resistor, Fixed, Film: 10 kΩ, 5%, 1/8 W	1	CF1/8-10K/J	09021	
R18	Resistor, Fixed, Composition: 5.6 kΩ, 5%, 1/8 W	1	RCR05G562JS	81349	
R19	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	2	CF1/4-100K/J	09021	
R20	Resistor, Fixed, Film: 68 kΩ, 5%, 1/4 W	1	CF1/4-68K/J	09021	
R21	Same as R2				
R22	Resistor, Fixed, Film: 200Ω, 5%, 1/4 W	1	CF1/4-200 OHMS/J	09021	
R23	Resistor, Fixed, Film: 1 kΩ, 5%, 1/4 W	1	CF1/4-1K/J	09021	
R24	Resistor, Fixed, Film: 47 kΩ, 5%, 1/4 W	1	CF1/4-47K/J	09021	
R25	Resistor, Fixed, Film: 510Ω, 5%, 1/4 W	1	CF1/4-510 OHMS/J	09021	
R26	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	1	CF1/4-100 OHMS/J	09021	
R27	Resistor, Fixed, Film: 220Ω, 5%, 1/4 W	1	CF1/4-220 OHMS/J	09021	
R28	Same as R19				
R29	Resistor, Fixed, Film: 27 kΩ, 5%, 1/4 W	1	CF1/4-27K/J	09021	
R30	Same as R1				
R31	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/4 W	1	CF1/4-4.7K/J	09021	
T1	Transformer, RF	1	T4-1	15542	
U1	Integrated Circuit	2	MC1458N	18324	
U2	Integrated Circuit	1	DG300CJ	17856	
U3	Integrated Circuit	1	CD4046BE	02735	
U4	Same as U1				
U5	Integrated Circuit	1	CA3011	02735	
VR1	Diode, Zener: 3.3 V	1	1N746A	80131	
Y1	Crystal Quartz	1	91805-34	14632	

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS ± 5%, 1/4W.
   b) CAPACITANCE IS μF.
2. 40109B: PIN 8 = GND, PIN 1 = +5V, PIN 16 = +15V
3. CW ON POTENTIOMETERS INDICATES FULL CLOCKWISE POSITION OF ACTUATOR.
4. A1U2 IS SHOWN IN LOGIC STATE 1.
5. NOMINAL VALUE, FINAL VALUE FACTORY SELECTED.

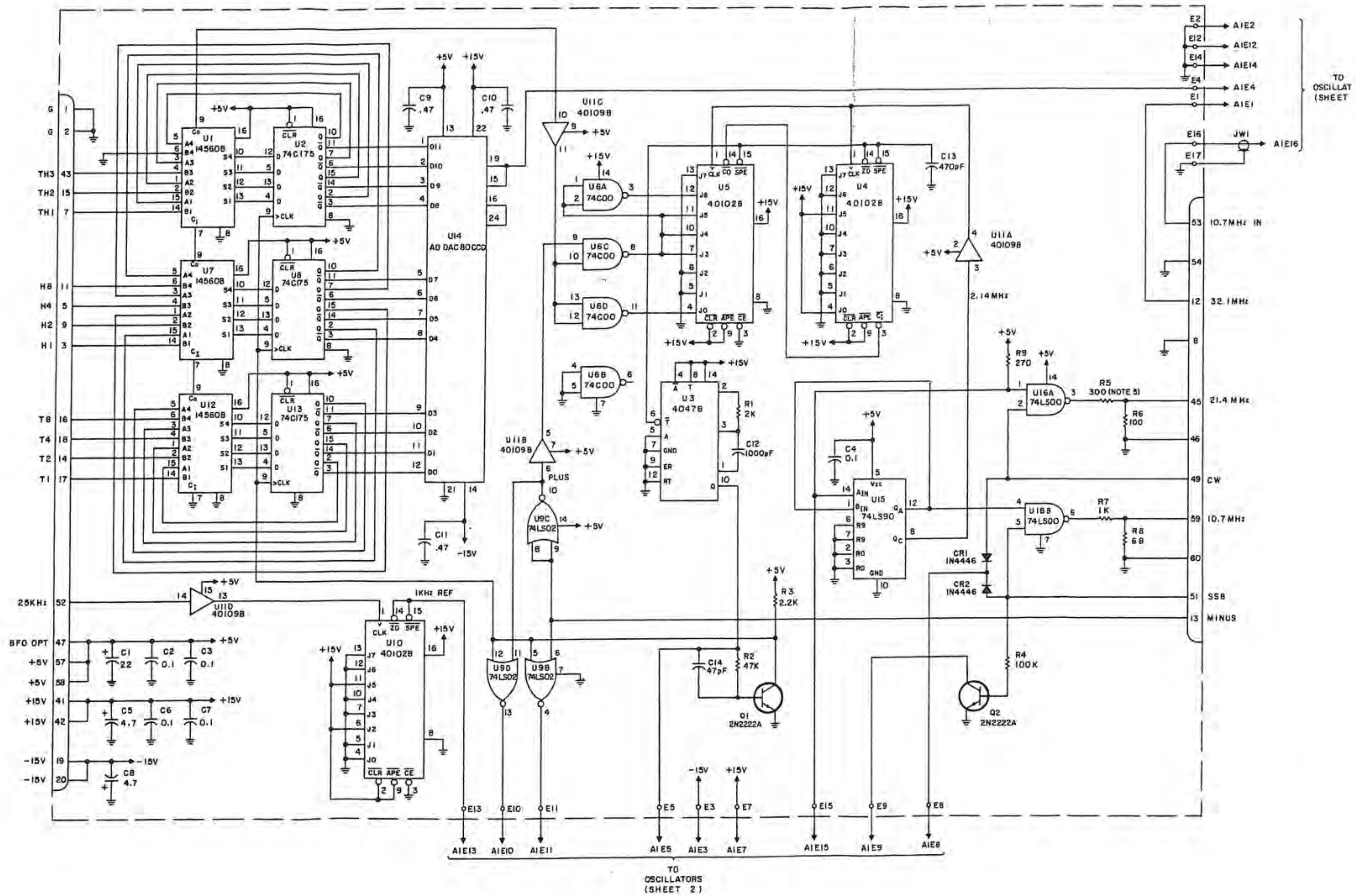


Figure O-3. Type 798029-1, Variable Beat-Frequency-Oscillator (Option O-VBFO), Schematic Diagram 590118 (Sheet 1 of 2) (D)

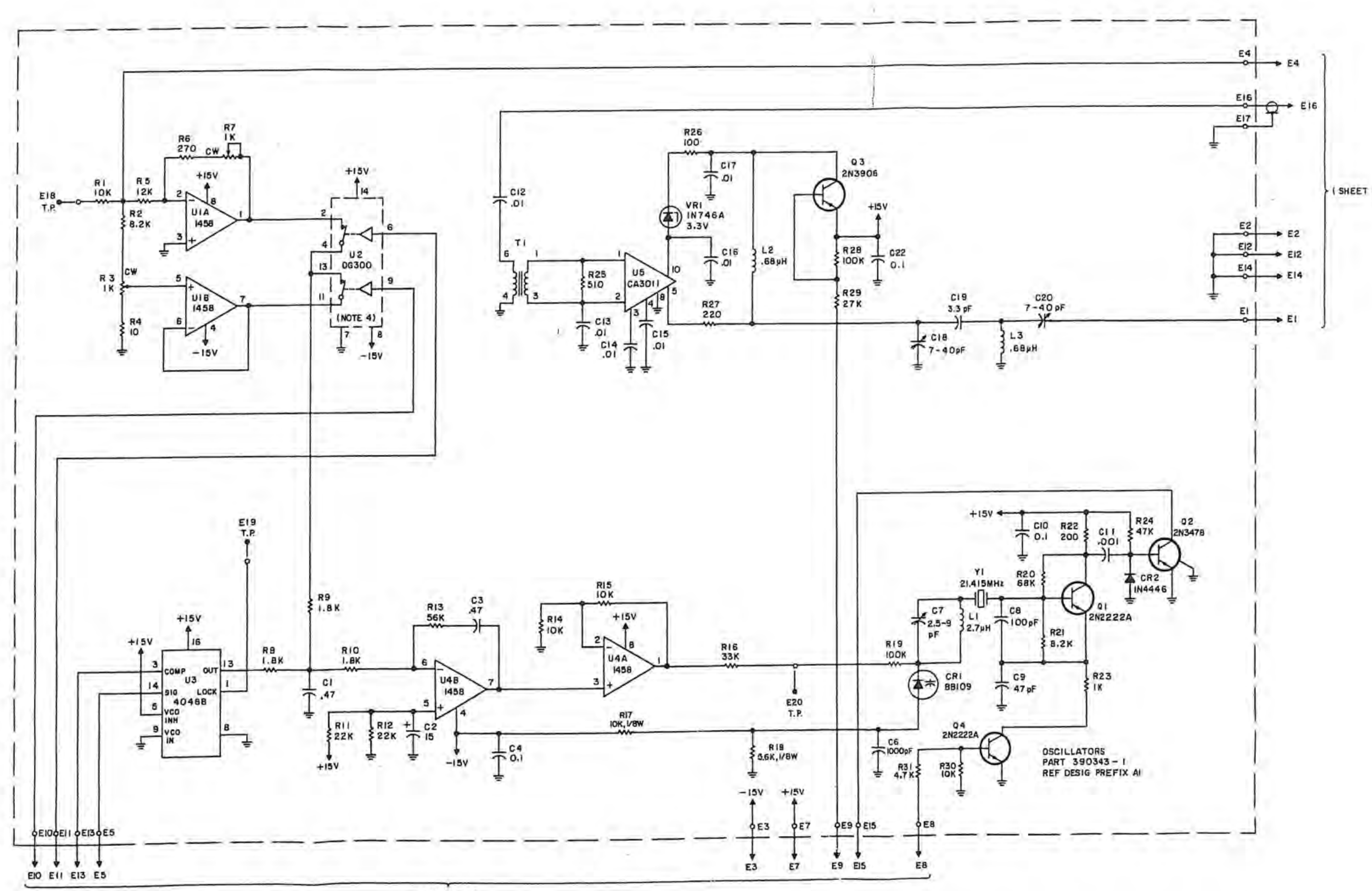


Figure O-3. Type 798029-1, Variable Beat-Frequency-Oscillator (Option O-VBFO), Schematic Diagram 590118 (Sheet 2 of 2) (D)

WJ-861X RECEIVER

APPENDIX P

WJ-861XB/ISB INDEPENDENT SIDEBAND OPTION

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

November 1990

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

PROPRIETARY STATEMENT

TABLE OF CONTENTS

APPENDIX P

LIST OF ILLUSTRATIONS

APPENDIX P
WJ-861XB/ISB, INDEPENDENT SIDEBAND (ISB) OPTION

P.1. GENERAL DESCRIPTION

The Type 861XB/ISB Independent Sideband (ISB) option installs the Type 796304-1 Independent Sideband (ISB) Demodulator in place of the SSB Bypass subassembly (A3A14) on the RF/IF Motherboard of the receiver. This subassembly utilizes the 32.1 and 10.7 MHz signals provided by the ISB BFO subassembly, demodulating Upper, Lower and Both sideband signals. For optimum performance, it is recommended that IF Bandwidth #1 slot contain an IF Bandwidth of 10 kHz or 6 kHz (6 kHz is preferred).

NOTE

If an IF Bandwidth less than 6 kHz is present in position #1, the receiver automatically selects IF Bandwidth #2. For optimum performance, install a 6 kHz IF Bandwidth in position #1.

Whenever the receiver is placed in the ISB detection mode, the receiver automatically switches to IF Bandwidth #1 and the remaining bandwidth pushbuttons are deactivated.

Selection of the ISB mode of operation is accomplished by pressing the SSB pushbutton. This places the receiver into either the Upper, Lower or Both sideband modes and activates IF Bandwidth #1. Each additional press of the SSB pushbutton causes the detection mode to be switched between USB and LSB, while ISB is always present at the rear panel. A letter "U" for Upper Sideband or an "L" for Lower Sideband illuminates on the digital display indicating which ISB mode is active. Selecting any other detection mode pushbutton deactivates ISB and activates the newly selected mode.

P.2 INSTALLATION

Refer to **Figure P-2** for the Type 861XB/ISB Independent Sideband option, (Option P-ISB), schematic diagram. Installing the ISB option into the standard receiver is performed as follows:

1. Remove the top and bottom covers from the receiver by loosening the quarter-turn fasteners.

2. Remove the Type 798074-1 SSB Bypass subassembly from the A3XA14 slot on the RF/IF Motherboard and replace with the Type 796304-1 ISB Demodulator.

3. Remove the blank pushbutton from right DETECT MODE pushbutton bank on the receiver front panel by inserting a small slot-type screwdriver under the pushbutton. Gently pry upward using a slight twisting motion. Exercise care in this procedure to avoid scratching the anodized bezel. Replace this pushbutton with the supplied SSB pushbutton.

4. Reconfigure switch A5A2S1 on the Synthesizer Interface permitting the receiver software to recognize the presence of the ISB Demodulator. This is accomplished by placing switch position #2 of A5A2S1 in the open position.

5. Loosen the fifteen (15) screws holding the back panel to the chassis. (Six (6) screws holding the back panel to the side plates and nine (9) screws, three (3) each securing the back panel to each of the divider bulkheads.) Pivot the back panel loose from the chassis, being careful not to disturb any of the existing wiring.

6. Remove the spare fuse holder from the rear panel by loosening the securing nut and gently pulling the fuse holder forward. Remove connector J20 from its location and reroute it to the spare fuse hole, putting the decal 180335-1, J20 WB IF OUT, on the connector before tightening into place.

7. Gently pry off the auxiliary cap. Take cable ISB-W1 and plug connector ISB-P1 onto A3A14 of the RF/IF Motherboard. Orient cables such that ISB-P1 pin 1 mates with A3A14 pin 18 and ISB-P1 pin 2 mates with A3A14 pin 16. Route cable to the underside of the Motherboard, adjusting cable so it is seated properly. Insert the BNC connector of cable ISB-W1 into the auxiliary hole on the rear panel. Place decal 180333-1, J29 USB OUT, on the connector before tightening into place.

8. Take cable ISB-W3 and plug connector ISB-P4 onto A3A14 of the RF/IF Motherboard. Orient cables such that ISB-P4 pin 1 mates with A3A14 pin 14 and ISB-P4 pin 2 mates with A3A14 pin 12. Route cable to the underside of the Motherboard, adjusting the cable so it is seated properly. Insert the BNC connector of cable ISB-W3 into the original J20 hole on the rear panel. Place decal 180334-1, J28 LSB OUT, on the connector before tightening into place.

9. Carefully replace the back panel on the chassis. Check that none of the wiring interferes with the seating of the back panel. Tighten the fifteen (15) screws securing the back panel to the chassis.

10. Connect cable ISB-W2 to the A3A8 AGC Assembly. Orient cables such that ISB-P2 pin 1 mates with A3A8 pin 17 and ISB-P3 pin 1 mates with A3A8 pin 49.

11. Replace the top and bottom covers to the receiver and tighten the quarterturn fasteners.

P.3 CIRCUIT DESCRIPTION

P.3.1 TYPE 796304-1, ISB DEMODULATOR, (A3A14)

The reference designation for this subassembly is A3A14. Refer to **Figure P-1** for the Location of Components and to **Figure P-3** for the Type 796304-1 ISB Demodulator schematic diagram.

The 21.4 MHz sideband signal enters this subassembly at connector pin 55 and is coupled via C4 to U1. U1 splits the signal and applies it to the 21.4 MHz IF output, via the 3 dB pad formed by R3, R4 and R5 and also applies the signal to amplifier U2. The signal is coupled to the input of U2 via the RC coupling network comprised of C6 and R6. The output of U2 is applied to the primary of T1 through C8 and R11. Then the 21.4 MHz signal is applied to the input of Integrated Circuit U3.

Modulator U3 mixes the 21.4 MHz input signal with a 32.1 MHz signal from the SSB BFO providing an output that consists of the upper and lower sideband signals centered about 10.7 MHz. Resistors R7 and R17 provide bias at the input of U3, and R13 and R14 control the gain. Coils L1 and L2 provide the collector loads for the output transistors contained in U3. The lower sideband signal taken from U3 pin 6 is developed across L1 and is applied to filter FL1, via C13 and R20. The upper sideband signal taken from U3 pin 12 is developed across L2 and is applied to filter FL2, via C14 and R21.

Filter FL1 passes the lower sideband signal and directs it to the signal input of U5 via T2. R24 and R25 provide bias at the input of U5, and R26 and R27 control the gain. This circuit mixes the modulated 10.7 MHz sideband signal with a fixed 10.7 MHz signal, provided by the SSB BFO, producing the lower sideband video output. The output of U5 is developed across R45 and is applied to the output amplifier U7B via the low-pass filter comprised of R46, C30, C29 and R53. This filter strips any residual 10.7 MHz component from the audio signal and allows only signals lower than 10.7 MHz to pass. The audio signal is amplified by U7B and is applied via R67 to the LSB audio output pin 14. The gain of U7B is set by the voltage divider formed by R50, R51 and R52. The video output of U5 is also applied to the output amplifier U7A via the low-pass filter comprised of R47, C33, C32 and R57. This filter strips any residual 10.7 MHz component from the video signal. The gain of U7A is set by the voltage divider formed by R54, R55 and R56. The video signal is amplified by U7A and is applied via U9 and R68 to the switched video output subassembly (pin 11), whenever the LSB detection mode is selected at the receiver front panel.

Filter FL2 passes the upper sideband signal and directs it to the signal input of U6 via T3. R32 and R33 provide bias at the input of U6, and R34 and R35 control the gain. This circuit mixes the modulated 10.7 MHz sideband signal with a fixed 10.7 MHz signal, provided by the SSB BFO, producing the upper sideband video output. The output of U6 is developed across R42 and is applied to the output amplifier U8A via the low-pass filter comprised of R49, C39, C38 and R65. This filter strips any residual 10.7 MHz component from the audio signal and allows only signals greater than 10.7 MHz to pass. The audio signal is amplified by U8A and is applied via R69 to the USB audio output pin 18. The gain of U8A is set by the voltage divider formed by R62, R63 and R64. The video output of U6 is also applied to the output amplifier U8B via the low-pass filter comprised of R48, C36, C35 and R61. This filter strips any residual 10.7 MHz component from the video signal. The gain of U8B is set by the voltage divider formed by R58, R59 and R60. The video signal is amplified by U8B and is applied via U9 and R68 to the switched video output subassembly (pin 11), whenever the USB detection mode is selected at the receiver front panel.

Integrated Circuit U9 is an analog switch which is used to direct either the USB audio signal (U9 pin 2) or the the LSB audio signal (U9 pin 13) to the switched video output subassembly (pin 11). Selection of the USB or LSB signal is made from the front panel of the receiver. If the LSB mode is selected, a logic "0" applied by the Digital Control Section of the receiver through connector pin 15, causes the analog switch between U9 pin 13 and U9 pin 11 to close. This allows the LSB audio to pass through U9 to the switched video output subassembly pin 11. If the USB mode is selected, the control input is at a logic "1", causing the analog switch between U9 pin 2 and U9 pin 4 to close, allowing the USB audio to pass through U9 to the switched video output subassembly pin 11.

The selection of USB and LSB on the front panel only affect the signal present at the switched video output subassembly (pin 11) on the rear of the receiver. LSB Audio Output (pin 14) and USB Audio Output (pin 18) remain unchanged. These signals are directed to the rear panel connectors J28 (LSB OUT) and J29 (USB OUT) and are always present in SSB operation.

P.4 ALIGNMENT PROCEDURES

1. Connect the HP-8640B Signal Generator to the Antenna 1 input of the receiver.

2. Connect the HP-400EL AC Voltmeter and a 93 ohm load to the Switched Video Output (J4).

3. Set the receiver to 25.0000 MHz, AGC on and select LSB detection mode.

4. Set the signal generator to produce a 24.9990 MHz CW signal, at an output level of -50 dBm.

5. Adjust R60 on the ISB Demodulator, to produce an output level of .235 Vrms, as indicated on the AC voltmeter.

P.5 PARTS LIST

P.5.1 TYPE 861XB/ISB, INDEPENDENT SIDEBAND OPTION

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision C				
ISB-A1	ISB Demodulator P.C. Assembly	1	796304-1	14632	
ISB-P1	Connector, Housing	2	87499-3	00779	
ISB-P2	Connector, Plug	2	87499-5	00779	
ISB-P3	Same as ISB-P2				
ISB-P4	Same as ISB-P1				
ISB-W1	Cable Assembly	1	280621-1	14632	
ISB-W2	Cable Assembly	1	180222-1	14632	
ISB-W3	Cable Assembly	1	280621-2	14632	
MP1	Decal (J29 USB OUT)	1	180333-1	14632	
MP2	Decal (J28 LSB OUT)	1	180334-1	14632	
MP3	Decal (J20 WB IF OUT)	1	180335-1	14632	
MP4	Switch Button Engraved (SSB)	1	370314-12	14632	

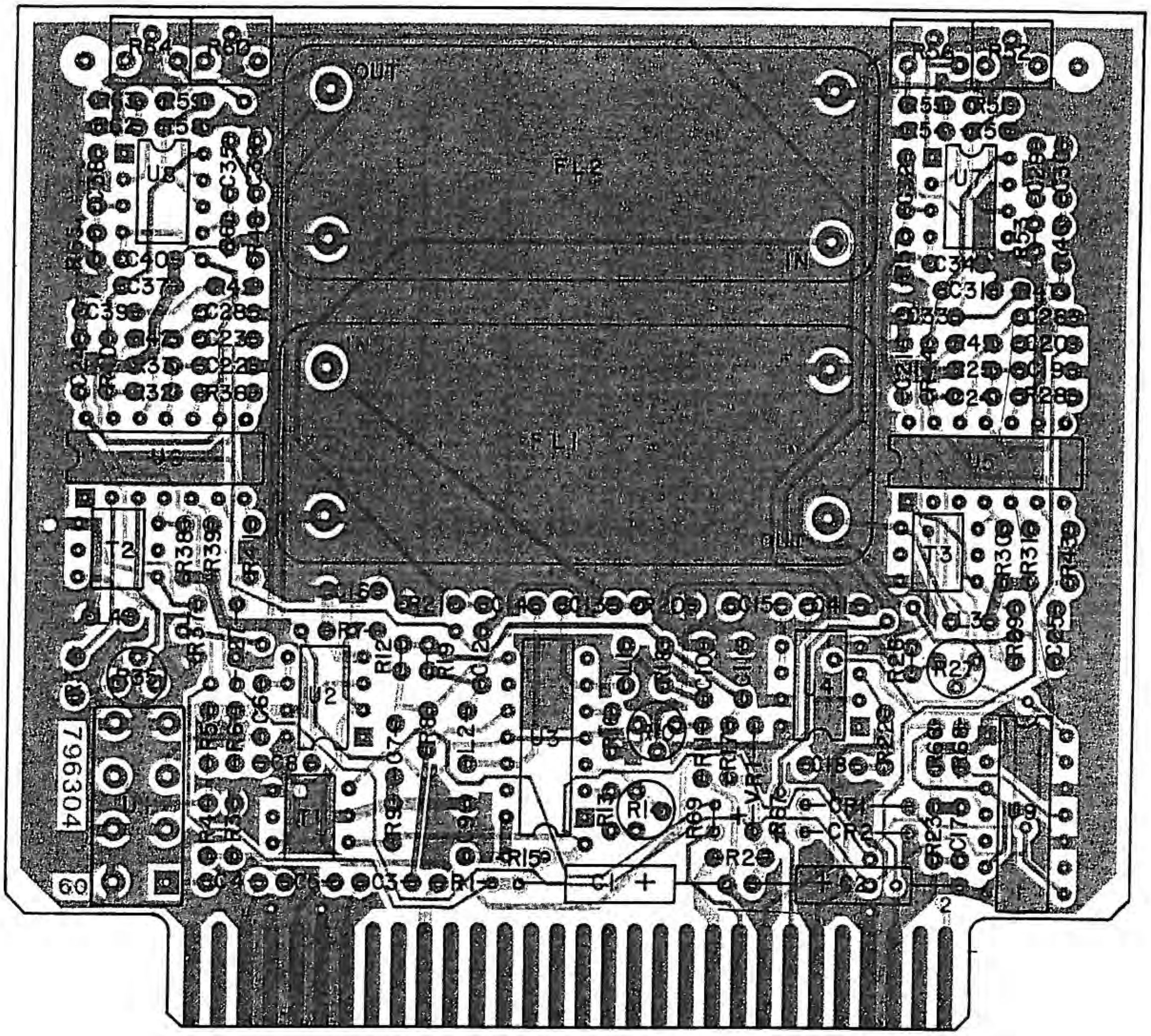


Figure P-1. Type 796304-1, ISB Demodulator (Option P-ISB) Location of Components

P.5.1.1 Type 796304-1, ISB Demodulator REF DESIG PREFIX A3A14

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
C1	Capacitor, Electrolytic, Tantalum: 2.2 µF, 10%, 20 V	2	CS13BE225K	81349	
C2	Same as C1				
C3	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	15	34453-1	14632	
C4	Same as C3				
C5	Same as C3				
C6	Capacitor, Ceramic, Disc: 1000 pF, 10%, 200 V	2	CK05BX102K	81349	
C7	Same as C3				
C8	Same as C6				
C9	Same as C3				
C10	Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V	11	C023B101E502M	56289	
C11	Same as C10				
C12	Same as C10				
C13	Same as C3				
C14	Same as C3				
C15	Not Used				
C16	Same as C3				
C17	Not Used				
C18	Not Used				
C19 Thru C24	Same as C3				
C25 Thru C28	Same as C10				
C29	Capacitor, Ceramic, Disc: .47 µF, 20%, 50 V	8	34452-1	14632	
C30	Same as C10				
C31	Same as C29				
C32	Same as C29				
C33	Same as C10				
C34	Same as C29				
C35	Same as C29				
C36	Same as C10				
C37	Same as C29				
C38	Same as C29				
C39	Same as C10				
C40	Same as C29				
C41	Same as C3				
FL1	Filter	1	92218	14632	
FL2	Filter	1	92217	14632	
L1	Coil, Fixed: 100 µH, 5%	2	1537-76	99800	
L2	Same as L1				
L3	Coil, Fixed: 3.9 µH, 10%	2	1537-26	99800	
L4	Same as L3				

REF DESIG PREFIX A3A14

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R1	Resistor, Fixed, Film: 10Ω, 5%, 1/8 W	2	CF1/8-10 OHMS/J	09021	
R2	Same as R1				
R3	Resistor, Fixed, Film: 300Ω, 5%, 1/8 W	2	CF1/8-300 OHMS/J	09021	
R4	Resistor, Fixed, Film: 18Ω, 5%, 1/8 W	1	CF1/8-18 OHMS/J	09021	
R5	Same as R3				
R6	Resistor, Fixed, Film: 51Ω, 5%, 1/8 W	3	CF1/8-51 OHMS/J	09021	
R7	Resistor, Fixed, Film: 1.8 kΩ, 5%, 1/8 W	6	CF1/8-1.8K/J	09021	
R8	Same as R6				
R9	Resistor, Fixed, Film: 100Ω, 5%, 1/8 W	7	CF1/8-100 OHMS/J	09021	
R10	Same as R9				
R11	Same as R6				
R12	Same as R7				
R13	Same as R9				
R14	Resistor, Trimmer, Film: 1 kΩ, 10%, 1/2 W	3	62PAR1K	73138	
R15	Resistor, Fixed, Film: 47Ω, 5%, 1/8 W	1	CF1/8-47 OHMS/J	09021	
R16	Resistor, Fixed, Film: 12 kΩ, 5%, 1/8 W	3	CF1/8-12K/J	09021	
R17	Resistor, Fixed, Film: 22Ω, 5%, 1/8 W	3	CF1/8-22 OHMS/J	09021	
R18	Resistor, Fixed, Film: 2.7 kΩ, 5%, 1/8 W	2	CF1/8-2.7K/J	09021	
R19	Same as R18				
R20	Resistor, Fixed, Film: 200Ω, 5%, 1/8 W	2	CF1/8-200 OHMS/J	09021	
R21	Same as R20				
R22	Not Used				
R23	Not Used				
R24	Same as R7				
R25	Same as R7				
R26	Same as R9				
R27	Same as R14				
R28	Same as R9				
R29	Resistor, Fixed, Film: 3.0 kΩ, 5%, 1/8 W	4	CF1/8-3.0K/J	09021	
R30	Same as R29				
R31	Same as R16				
R32	Same as R7				
R33	Same as R7				
R34	Same as R9				
R35	Same as R14				
R36	Same as R9				
R37	Same as R29				
R38	Same as R29				
R39	Same as R16				
R40	Same as R17				
R41	Resistor, Fixed, Film: 3.3 kΩ, 5%, 1/8 W	4	CF1/8-3.3K/J	09021	

REF DESIG PREFIX A3A14

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R42	Same as R41				
R43	Same as R41				
R44	Same as R17				
R45	Same as R41				
R46	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/8 W	4	CF1/8-1.0K/J	09021	
R47	Same as R46				
R48	Same as R46				
R49	Same as R46				
R50	Resistor, Fixed, Film: 6.8 kΩ, 5%, 1/8 W	2	CF1/8-6.8K/J	09021	
R51	Resistor, Fixed, Film: 51 kΩ, 5%, 1/8 W	4	CF1/8-51K/J	09021	
R52	Resistor, Trimmer, Film: 50 kΩ, 10%, 1/2 W	4	62PAR50K	73138	
R53	Resistor, Fixed, Film: 100 kΩ, 5%, 1/8 W	5	CF1/8-100K/J	09021	
R54	Resistor, Fixed, Film: 10 kΩ, 5%, 1/8 W	2	CF1/8-10K/J	09021	
R55	Same as R51				
R56	Same as R52				
R57	Same as R53				
R58	Same as R54				
R59	Same as R51				
R60	Same as R52				
R61	Same as R53				
R62	Same as R50				
R63	Same as R51				
R64	Same as R52				
R65	Same as R53				
R66	Same as R53				
R67	Resistor, Fixed, Film: 470Ω, 5%, 1/8 W	3	CF1/8-470 OHMS/J	09021	
R68	Same as R67				
R69	Same as R67				
T1	Transformer	1	T4-1	15542	
T2	Transformer	2	T9-1	15542	
T3	Same as T2				
U1	Integrated Circuit	1	PSC2-1	15542	
U2	Integrated Circuit	1	SL1611C	52648	
U3	Integrated Circuit	3	MC1496P	04713	
U4	Not Used				
U5	Same as U3				
U6	Same as U3				
U7	Integrated Circuit	2	MC1458N	18324	
U8	Same as U7				
U9	Integrated Circuit	1	DG301CJ	17856	
VR1	Diode	1	1N754A	80131	

NOTES:

1. PHANTOM LINES INDICATE PARTS OF EXISTING UNIT.
2. DIFFERENCE BETWEEN TYPE NUMBERS IS SHOWN IN TABLE A.

TABLE A

TYPE NO.	ISB-A1
861XB/ISB	796304-1
861XB/ISB-2	796304-2

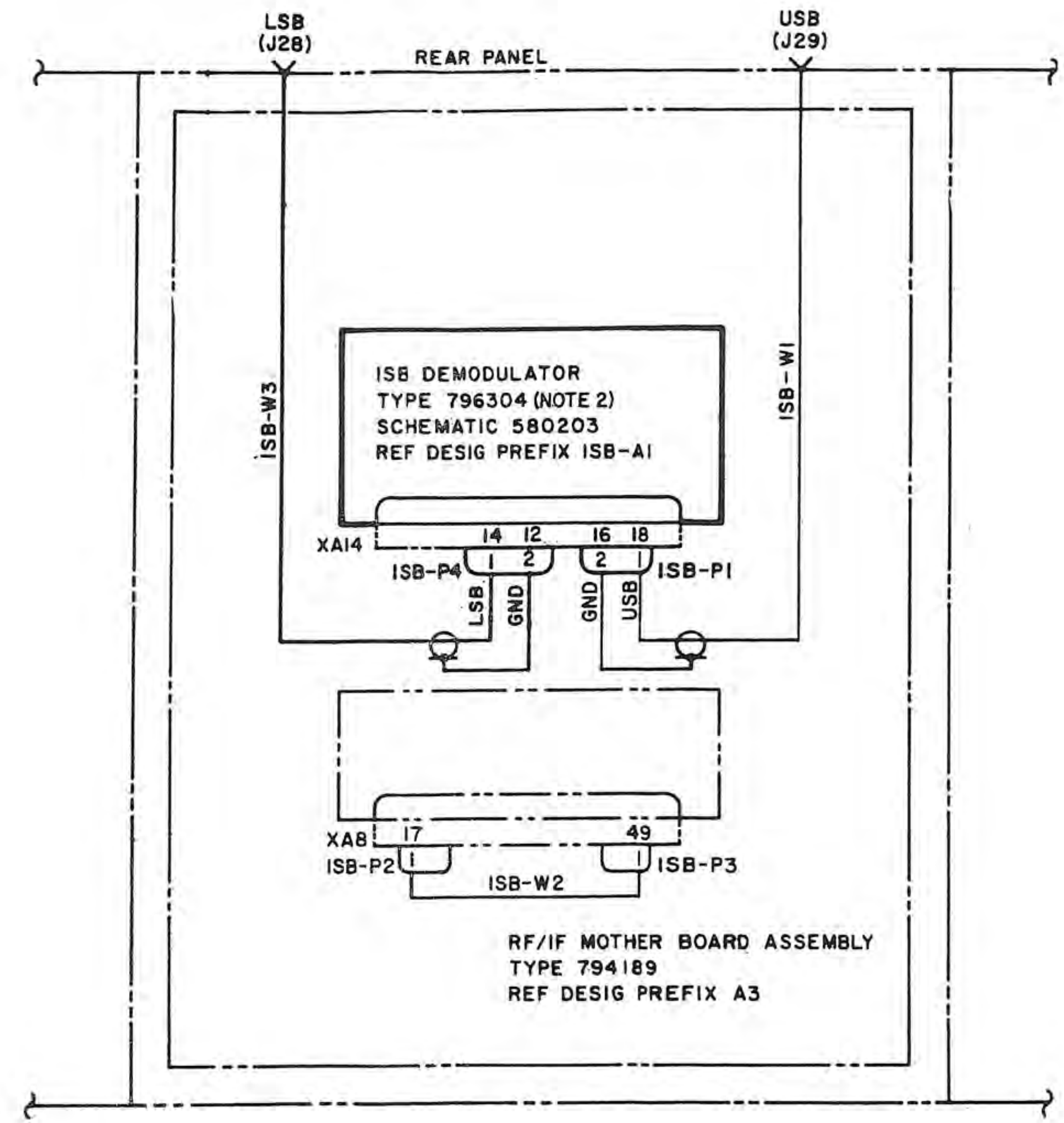


Figure P-2. Type 861X/ISB, Independent Sideband Option Schematic Diagram ?80553 (B)

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) CAPACITANCE IS IN µF.
   b) RESISTANCE IS IN OHMS, ±5%, 1/8 W.
   c) INDUCTANCE IS IN µH.
2. DIFFERENCE BETWEEN TYPE NUMBERS IS SHOWN IN TABLE A.

TABLE A

TYPE NO.	FL1	FL2
796304-1	92218	92217
796304-2	92322	92321

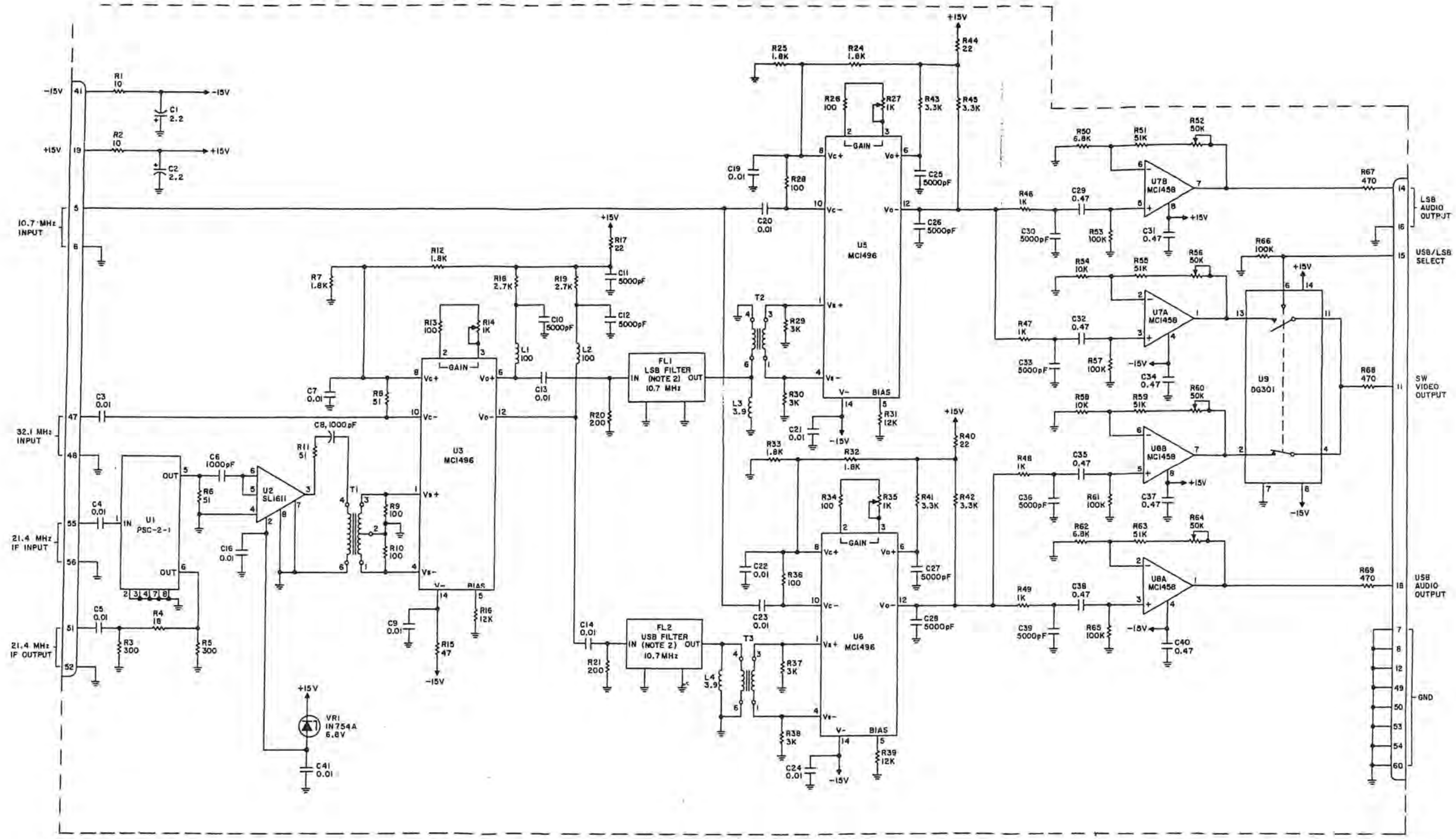


Figure P-3. Type 796304-1, ISB Demodulator Schematic Diagram 580203 (F)

WJ-861X RECEIVER

APPENDIX Q

WJ-861X PLUGGABLE KEYBOARD CONTROL (PKC) OPTION

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

January 1992

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

PROPRIETARY STATEMENT

TABLE OF CONTENTS

APPENDIX Q

LIST OF TABLES

LIST OF ILLUSTRATIONS

APPENDIX Q

WJ-861X PLUGGABLE KEYBOARD CONTROL (PKC) OPTION

Q.1 GENERAL DESCRIPTION

The Pluggable Keyboard (PKC) option, provides a means of rapidly inputting frequency information into the WJ-861XB Receiver. The keyboard plugs into the existing optional tuning connector on the receiver front panel and permits receiver tuning, memory programming and the initiation of lock-out channels.

Q.2 INSTALLATION

Installation of the PKC option requires the Type 796203-1, Keyboard Control. The Keyboard Control, which plugs into the receiver front panel, contains a 16-key keyboard for entering data into the receiver. Refer to **Table Q-1** for a description of the key functions. The Keyboard Control mounting bracket permits the keyboard to be mounted on the receiver handle or it can be detached and operated as a hand-held or table-top controller.

Q.3 OPERATION

Frequency information is entered into the receiver, starting with the most significant digit, using keys 0 through 9 and the decimal key. As the frequency is entered, the receiver displays the keyed in frequency. The actual tuned frequency of the receiver is not changed, from its previous setting, until the TUN, STO, or LCK key is depressed. If the CLR key is depressed, at any time, the receiver display and tuned frequency are reset to 20.0000 MHz. No other parameter or memory location is affected by the keyboard CLR key.

Q.4 CIRCUIT DESCRIPTION

The option designation for this subassembly is PKC. Refer to **Figure Q-2** for a schematic diagram of the Type 796203-1, Keyboard Control.

Power from the Front Panel Display and Control assembly (A6) is applied to this subassembly via P1 which plugs into the front panel connector, J1. +5 volts is applied to the keyboard encoder via pin 20. The actual keyboard is made up of 16 normally open switches arranged as a matrix. This matrix is connected to the keyboard encoder via the X and Y connections. When a pushbutton is depressed, the keyboard encoder determines which pushbutton was depressed causing the AVL line to go high. Each time a normally open pushbutton is depressed, closing the circuit, data output is provided to the receiver microprocessor via connector P1. The microprocessor pulls the OE* line low, enabling the keyboard encoder to output data to the data bus. Note, the binary equivalent of the pushbutton depressed does not appear on the data bus. Refer to **Table Q-2** for the binary code that is present on the data bus. Keyboard encoder, U1 has a capacitor setting its oscillator frequency.

*Indicates active LOW

This frequency is what the chip senses everytime a pushbutton is depressed, closing the circuit. Because of the bouncing nature of mechanical switches, a debounce circuit is incorporated within the keyboard encoder.

Table Q-1. Keyboard Control, Key Functions

Key	Description
0-9	Keys 0 through 9 are utilized to enter the digits of the desired frequency. The frequency is entered, starting with the most significant digit of the number.
decimal	The decimal key is used for entering the fractional MHz component of the tuned frequency. The digits entered after the decimal key is depressed determine the 100 kHz, 10 kHz, 1 kHz and 100 Hz resolution, respectively.
TUN	The TUN key tunes the receiver to the frequency displayed on the receiver frequency display.
STO	The STO key performs the tune function and stores the frequency, along with all other parameters displayed on the front panel, into the memory channel that is displayed in the memory select window. When the STO key is depressed, the number in the memory select window is incremented by 1.
LCK	The LCK key performs the tune function and also creates a lock-out channel. The Lock-Out option must be incorporated in order to create a lock-out channel.
CLR	The CLR key resets the receiver tuned frequency and frequency display to 20.0000 MHz. This key affects only the frequency. All other receiver settings and the memory channels are unaffected.

Table Q-2. Binary Equivalents for each Pushbutton

Switch Position	Data Out				
	A	B	C	D	E
X1, Y1 (7)	0	0	0	0	0
X2, Y1 (8)	1	0	0	0	0
X3, Y1 (9)	0	1	0	0	0
X4, Y1 (TUN)	1	1	0	0	0
X1, Y2 (4)	0	0	1	0	0
X2, Y2 (5)	1	0	1	0	0
X3, Y2 (6)	0	1	1	0	0
X4, Y2 (STO)	1	1	1	0	0
X1, Y3 (1)	0	0	0	1	0
X2, Y3 (2)	1	0	0	1	0
X3, Y3 (3)	0	1	0	1	0
X4, Y3 (LCK)	1	1	0	1	0
X1, Y4 (0)	0	0	1	1	0
X2, Y4 (.)	1	0	1	1	0
X3, Y4 (*)	0	1	1	1	0
X4, Y4 (CLR)	1	1	1	1	0

Q.4.1 TYPE 796203-1 KEYBOARD ASSEMBLY

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
A1	Key Encoder	1	280262-1	14632	
U1	Keyboard	1	190156-1	14632	

400270 -
#

Q.4.1.1 **Part 280262-1 Keyboard Encoder** REF DESIG PREFIX A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
C1	Capacitor, Electrolytic, Tantalum: 4.7 μF, 10%, 35 V	1	CS13BF475K	81349	
C2	Capacitor, Electrolytic, Tantalum: 1 μF, 10%, 35 V	1	CS13BF105K	81349	
C3	Capacitor, Ceramic, Disc: 0.1 μF, 20%, 50 V	1	34475-1	14632	
U1	Integrated Circuit	1	MM74C923N	27014	

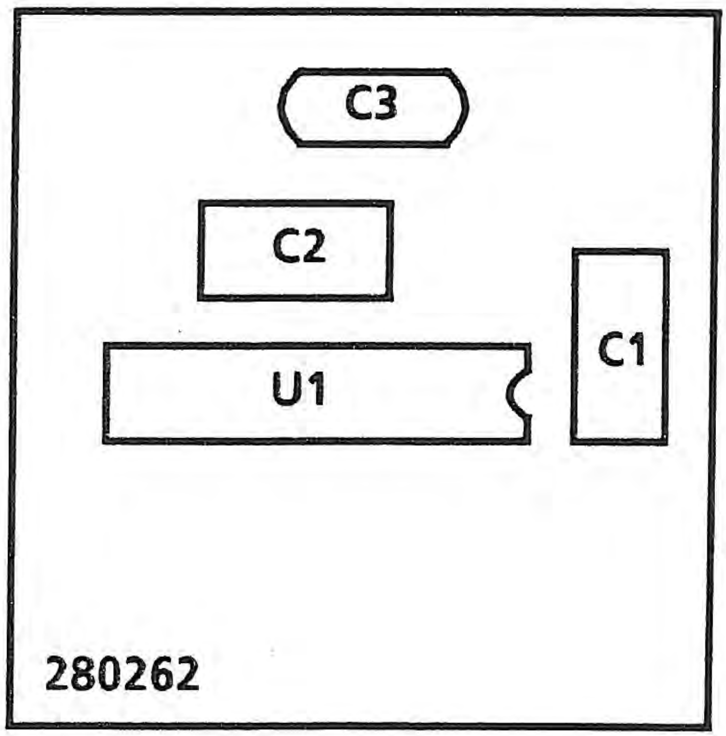


Figure Q-1. Part 280262-1, Keyboard Encoder (Option Q - PKC), Location of Components

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
a) CAPACITANCE IS µF.
2 ☐ INDICATES KEYBOARD FUNCTION.

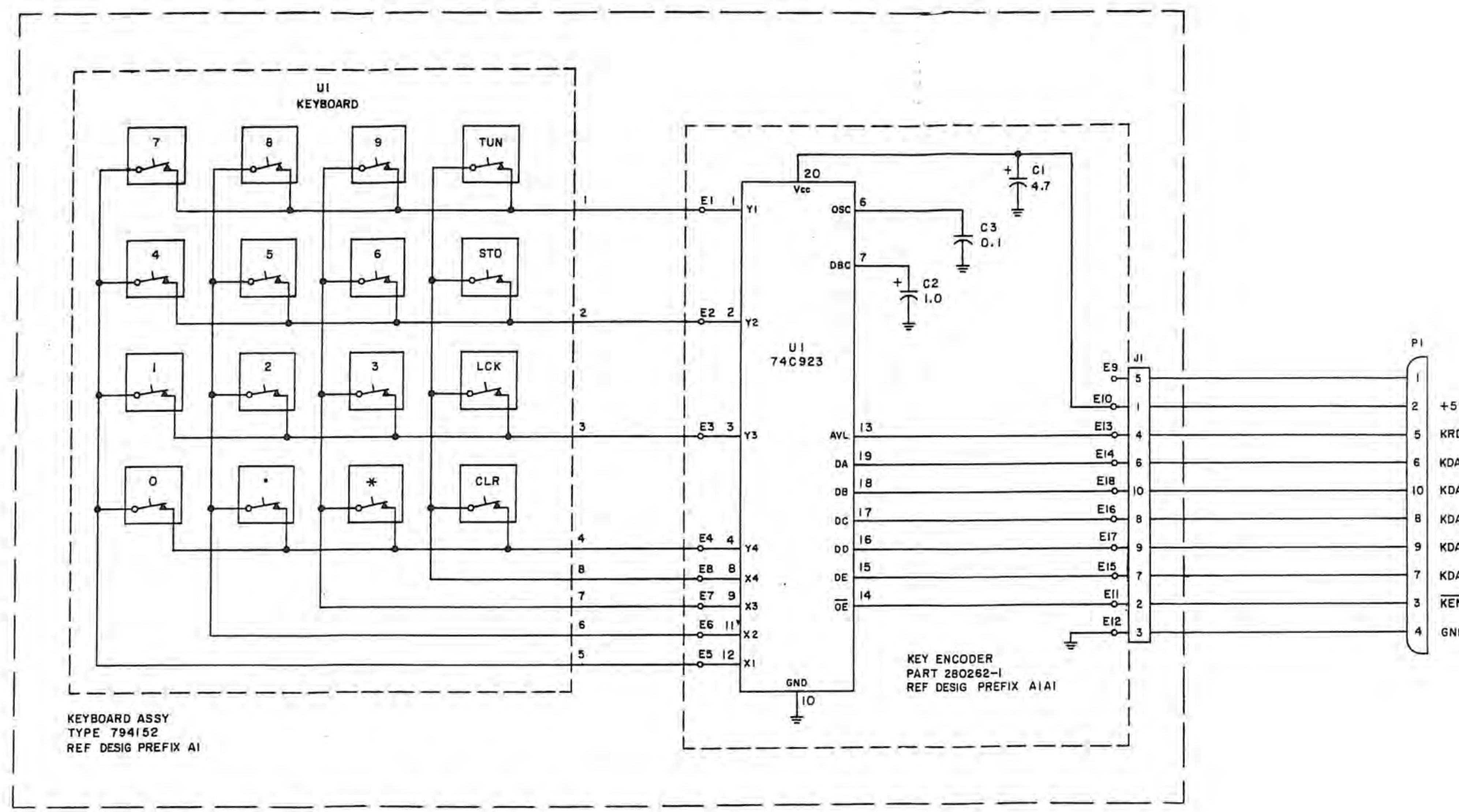


Figure Q-2. Type 796203-1, Pluggable Keyboard Control Schematic Diagram 480273 (A)

WJ-861X RECEIVER

APPENDIX R

WJ-861XB(S1) RS-232 INTERFACE OPTION

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

January 1992

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

PROPRIETARY STATEMENT

TABLE OF CONTENTS

APPENDIX R

LIST OF TABLES

LIST OF ILLUSTRATIONS

APPENDIX R

WJ-861XB(S1) RS-232 INTERFACE OPTION

R.1 GENERAL DESCRIPTION

The RS-232 Remote Interface option provides for the asynchronous transfer of data. Utilizing the mnemonics listed in **Table R-3,** a suitable controller, connected to the REMOTE CONTROL connector, is able to remotely control the WJ-861XB Receiver. Data is transferred via an 11 bit data format. The data structure is automatically controlled by the receiver software. Data is represented either as a mark (+3V to +12V) or a space (-3V to -12V). This 25 pin connector provides for the asynchronous serial transfer of data between the remote controller and the WJ-861X Receiver. **Figure R-1** illustrates the pin configuration used for the REMOTE CONTROL connector.

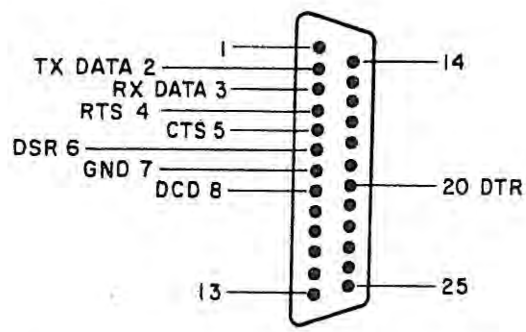


Figure R-1. RS-232 Pin Configuration

This RS-232 interface connector is wired to interface with a standard RS-232 compatible device. This connector provides the signal connections necessary to allow remote control of the receiver. This interface and the associated control software is intended to be used in a one-on-one configuration, consisting of one receiver and one controlling device. The RS-232 interface should not be connected with other devices where addressing is required.

Baud rate for the RS-232 is determined via the switch settings of DIP switch S2, located on the RS-232 module. The data byte structure is determined by the receiver software. Presently the WJ-861X Receiver utilizes an eleven bit data byte. The data structure is as defined below:

Bits	Function
1	Start Bit
8	Data Bits
1	Parity Bit (odd)
1	Stop Bit

Selection of the baud rate is determined via DIP switch S2.

Table R-1 illustrates the switch position settings necessary to select the baud rates listed.

Table R-1. Switch S2 Baud Rate Selection

Switch Position							Baud Rate (in Hz)
7	6	5	4	3	2	1	
1	1	1	1	1	1	0	300
1	1	1	1	1	0	1	600
1	1	1	1	0	1	1	1200
1	1	1	0	1	1	1	2400
1	1	0	1	1	1	1	4800
1	0	1	1	1	1	1	9600
0	1	1	1	1	1	1	19200

1 = OPEN
0 = CLOSED

NOTE

All other switch combinations are invalid.

DIP switch S1, on the RS-232 remote interface, is used to select either the full-duplex or half-duplex mode. Full-duplex allows both devices on the interface bus to transmit data simultaneously. Half-duplex mode allows only one device at a time to transmit data. DIP switch S1, located on the RS-232 module, is utilized to select the duplex mode of operation. Placing S1 switch position 1 to the CLOSED position enables the half-duplex mode. Opening position 1 of switch S1 enables the full-duplex mode.

R.2 INSTALLATION

The WJ-861X/RS-232 Option can be installed in the field. The following list of components are required for installation of the RS-232 Option:

Part No.	Description	Qty.
796617-1	RS-232 Interface	1
290321-1	Cable Assembly (W1)	1

The following procedure describes the steps required to install the RS-232 Option into the receiver.

1. Turn the receiver power off and remove the top protective cover.
2. On the receiver rear panel, remove the six cross head screws from the plate located above the REMOTE CONTROL label.
3. Connect the RS-232 connector cable to J1 of the RS-232 Option module.
4. Install the RS-232 module into Option Slot 4 of the Digital I/O section.
5. Secure the RS-232 cable connector to the receiver rear panel with the six cross head screws and replace the top cover.

R.3 RS-232 INTERFACE OPERATION

Utilizing the mnemonics listed in **Table R-3**, the remote controller can query the status of the receiver. However, only when the receiver is in the remote mode (RMT) can the remote controller change the receiver operating parameters.

Table R-2. Interchange Circuit Categories

Interchange Circuit	CCITT Equipment	Description	Pin
AB	102	Signal Ground/Common Return	7
BA	103	Transmit Data (TxD)	2
BB	104	Receive Data (RxD)	3
CA	105	Request to Send (RTS)	4
CB	106	Clear to Send (CTS)	5
CC	107	Data Set Ready (DSR)	6
CD	108.2	Data Terminal Ready (DTR)	20
CF	109	Receive Line Signal Detector (DLD)	8

R.3.1 PIN FUNCTIONS DESCRIBED

R.3.1.1 Circuit AB - Signal Ground or Common Return

This line establishes the common ground reference potential for all interchange circuits, with the exception of the AA circuit (not used in this configuration), can be connected to the AA circuit, with the data communication device via a wire strap.

R.3.1.2 **Circuit BA - Transmit Data (TxD)**

Signals on this circuit are generated by the data terminal equipment and are transferred to the local transmitting signal converter for transmission of data to remote data terminal equipment. The static condition of this line is a Mark.

Signals on the BA line are: FROM data terminal equipment
TO local transmitting signal converter for transmission
TO remote data terminal equipment

R.3.1.3 **Circuit BB - Receive Data (RxD)**

Signals on the BB line are: FROM the receiving signal converter and allows the remote controller to verify or change the receiver operating status. The static condition of this line, from a controller, must be a Mark.

R.3.1.4 **Circuit CA - Request to Send (RTS)**

The CA line controls the direction of data transmission of the local data transmission communication equipment. This line is always in the ready (space) condition.

R.3.1.5 **Circuit CB - Clear to Send (CTS)**

Signals on the CB line are: FROM data communication equipment. When this line is not connected or is in the space condition, data from the controller can be transmitted.

R.3.1.6 **Circuit CD - Data Terminal Ready (DTR)**

Signals on the CD line control switching of the data communication equipment. This line is always in the ready (space) condition, signifying the receiver is ready to accept data.

R.3.1.7 **Circuit CF - Received Line Signal Detector (DCD)**

Signals on the CF line determine whether the data communication equipment responds to a received signal. This line must be active (space) for the receiver to respond to data on the receive data (RxD) line. If this line is not active, the receiver ignores the RxD line.

Utilizing the pins illustrated in **Figure R-1**, data is transferred between the receiver and the remote controller. RS-232 utilizes voltages more positive than +3V and more negative than -3V to respectively represent spaces and marks. During the transmission of data, the marking condition is used to designate a binary ONE and the spacing condition is used to designate a binary ZERO. Signal levels less than the required mark or space voltages are not reliable and are said to be in transition. The resting state for the TxD or RxD line is the Mark (-12V) condition. At the beginning of data transmission, the start pulse goes to the Space (+12V) condition.

Each of the six signal lines, illustrated in **Figure R-1**, performs a unique function. There are four basic interchange circuits used in RS-232 systems for communication between data terminal equipment and data communication equipment. These basic interchange circuits are:

Ground or Common Return
Data Circuits
Control Circuits
Timing Circuits

Of these four basic interchange circuits, only the timing circuit is not used in this RS-232 configuration. **Table R-2** lists the RS-232 interchange circuit categories and their description.

Data exchanged between the controller and the receiver must be transferred at the same rate and be synchronized. The selected baud rate determines the speed with which data is transferred. **Table R-1** lists the selectable baud rates. Only close one baud rate switch at a time. The data format structure is set automatically by the software.

Data is applied from connector J1 of the RS-232 interface module to the REMOTE CONTROL connector and to the RS-232 Interface bus. **Figure R-2** shows the interconnecting wiring from connector J1 to the REMOTE CONTROL connector. From J1 of the Asynchronous Interface data is applied via W1 to the REMOTE CONNECTOR (J1) on the receiver rear panel.

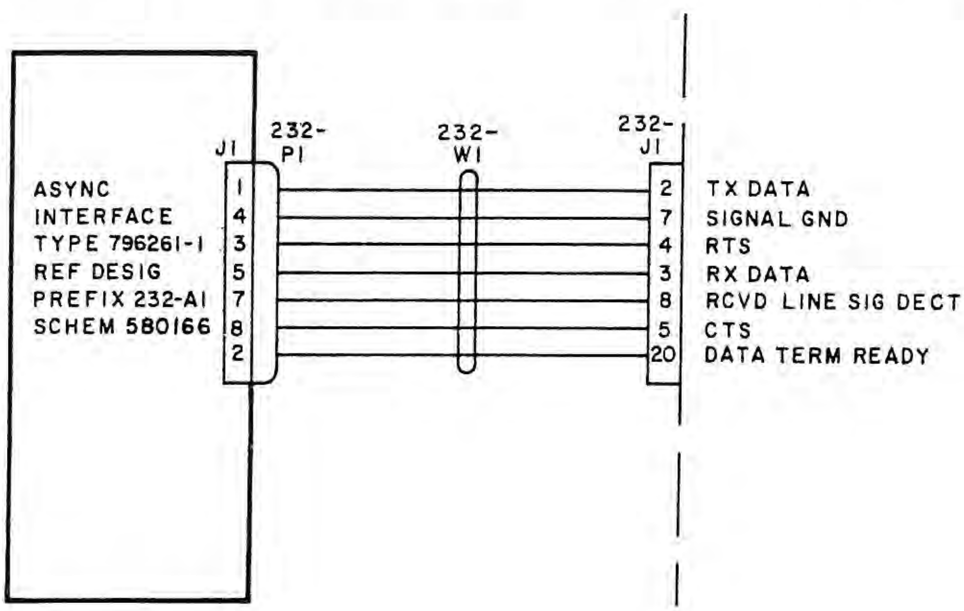


Figure R-2. RS-232 Interconnection

After setting the same baud rates for the receiver and the remote controller, synchronization of data transmission is required. The start bit of the eleven bit data structure synchronizes the data transmission. **Figure R-3** illustrates an RS-232 data transmission byte structure.

Data transmitted is assigned either a Mark (binary 1) or a Space (binary 0) signal level, depending on its binary value. **Figure R-3** illustrates a typical RS-232 data byte. The TX Data line is held in a Mark condition (OFF) until data is to be transmitted. Data on the RxD and TxD lines is indicated by shifting voltage levels. Voltage level changes represent Mark (-Voltage) or Space (+Voltage) data present on the lines.

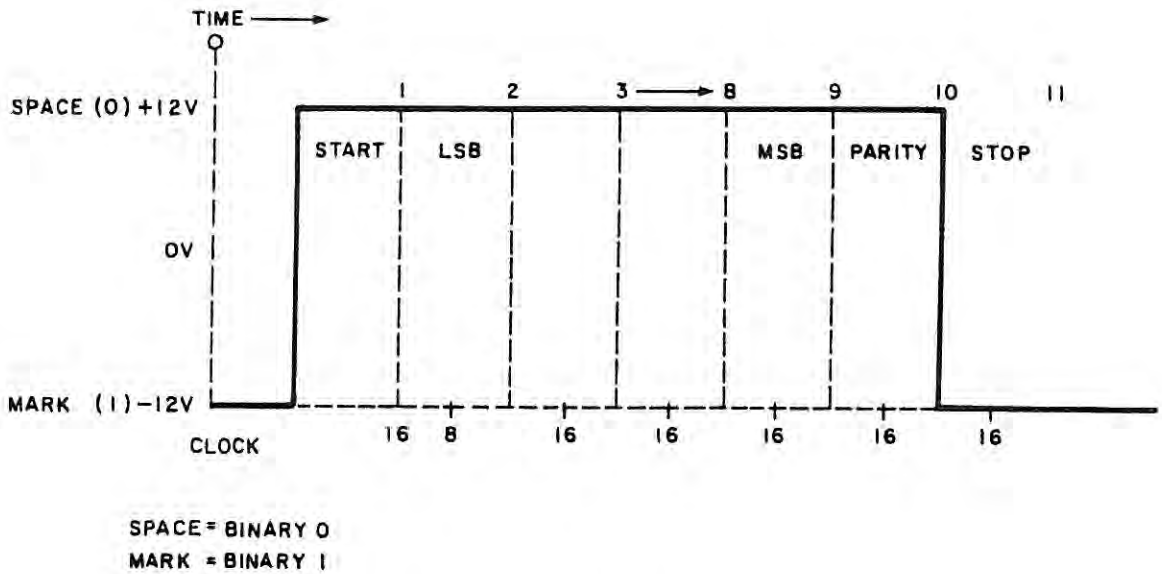


Figure R-3. Typical RS-232 Data Transmission Byte

R.3.2 DUPLEX MODES

When the master receiver wants to transmit data to the slave receiver, the level of connector pin 20 (DTR) is set high. With pin 20 (Data Terminal Ready) set high, the modem (DCE) knows that the receiver (DTE) is requesting a communication link.

If an available data link exists, the DCE (modem) produces a high on pin 6 (Data Set Ready) and on pin 8 (Data Carrier Detect). When the receiver detects the high on pins 6 and 8, it responds by driving pin 4 (Request to Send) high. A high on the RTS line informs the modem (DCE) that it is ready to receive data. If the DCE is ready to receive data, it responds by driving pin 5 (Clear To Send) high. With a high at pin 5, the receiver (DTE) starts transmitting data via the Transmit Data line (TxD), pin 2. The modem receives data via connector pin 3 (RxD) the Receiver Data line.

R.3.2.1 Full-Duplex Mode

When in the full-duplex mode, the Request To Send (RTS) line must always be high. During the time of data transmission, the transmit interrupt must be enabled.

The Clear To Send (CTS) must be low for the IRQ (interrupt request) to be sent.

The Data Carrier Detect (DCD) must be low in order to receive data transmitted from the modem.

A typical terminal-to-modem connection and signal sequence could occur as follows. Signal sequence is indicated in descending order.

DTE	Pin#	Direction	DCE	Pin#
Ground	1		Ground	1
Ground	7		Ground	7
DTR	20	TO DCE	DTR	20
DCD	8	TO DTE	DCD	8
DSR	6	TO DTE	DSR	6
RTS	4	TO DCE	RTS	4
CTS	5	TO DTE	CTS	5
TxD	2	TO DCE	TxD	2
RxD	3	TO DTE	RxD	3

R.3.2.2 Half-Duplex Mode

Half-duplex mode requires that the RTS (Request To Send) line be low for the receiver to output data to the modem. When data is not being sent, the RTS line remains high. The transmit interrupt is disabled, causing the receiver not to send any data. Data is only sent when the RTS line is low and the transmit interrupt is enabled.

Clear To Send is set low in response to the low on the RTS line. When the CTS line is low, an interrupt request (IRQ) is generated. The IRQ is sent to indicate that data is ready to be sent.

R.4 REMOTE OPERATION

Using the mnemonics listed in **Table R-3**, a suitable controller can be used to remotely operate the receiver. When data is sent in ASCII, bit 8 is set to the space condition. The termination for an ASCII command or request is: OD (carriage return), OA (line feed) in HEX. In the Binary mode, the termination is: FF in HEX. Once an input message has been sent to the receiver, another message can not be sent again until the receiver has responded to the first message. The receiver parameter status may be requested by the controller at any time. However, receiver parameter changes can be made via the controller only when the receiver is in the remote (RMT) mode. When a command or query is sent to the receiver, the receiver response is a two byte message: FD FF. The FD FF message returned to the controller indicates that the receiver has processed the query or command and is ready to receive another controller command. If the receiver detects an error in the data from the controller, the receiver outputs a two byte message FE FF and followed by FD FF. Outputting FE FF alerts the controller that an interrupt status exists.

This same hex response (FE FF) is sent to indicate a request for service. The receiver sends a service request to the controller when an error is detected. The following conditions also cause the interrupt status (FE FF) to be sent:

Signal acquisition (if STS1 is set)
power-up
completion of BITE (when installed)

After the request for service has been sent, the controller should send a STS? to determine why the request for service was sent. The receiver responds to the status query (STS?) with a status message. This response is a number between 0 and 254. In ASCII it is a three digit decimal number corresponding to the binary coding of the status. In binary it is a byte corresponding to the binary coding of the status. The binary value of the interrupt is determined by the bits that are set. The interrupt status bits and values are as follows:

Bit	Value	Set Indicates	Cleared Indicates	Cleared By
0	1	Signal above COR	No signal above COR	Non-latched indicator
1	2	Unit Power-up Status		Requesting receiver status (STS?)
2	4	BITE Completed/ error found		Requesting BITE status (BIT?)
3	8	(When status byte previously set with STS8) End of Scan sequence		Requesting Receiver status (STS?)
4	16	Responding to request for data		Non-latched indicator
5	32	Error condition occurred	Error conditioned cleared	(device dependent command) Requesting Error status
6	64	Request for Service (FE FF) Sent	No Interrupt Status	Requesting Receiver status (STS?) or Error status (ERR?)

R.4.1 ERROR CODES

The following error codes are utilized to inform the operator of invalid remote commands.

Remote Error Code	Description
Err 401	Input data buffer is full (message is too long).
Err 402	Less than 2 characters in message.
Err 403	Framing, parity or overrun error.
Err 404	Number is out of range for command.
Err 406	"/" or "?" not valid for this command.
Err 407	Invalid mnemonic or binary code received.
Err 551	All Lock-out channels are in use and the creation of an additional one is attempted.
Err 552	An attempt is made to store data, other than Lock-out data into a channel designated for Lock-out.
Err 810	Attempt to initiate Step or Scan mode and not valid data is stored in the memory locations to be scanned or stepped.
Err 811	Attempt to initiate the Step mode when 00 is displayed in the MEMORY SELECT window. Press the Memory Select Up pushbutton to select a channel greater than 00.
Err 812	Attempt to initiate a Scan and the number of Scan increments required is greater than 65536. The maximum width of a Scan band is equal to the Scan increment times 65536.
Err 813	Scan in initiated and the memory is programmed with the start frequency greater than the stop frequency. The memory must be programmed with the even numbered channel containing the lower frequency with the frequencies in ascending order.
Err 814	An attempt was made to select a non-occupied band width slot.

An error causes the receiver front panel to display ERROR followed by a three digit error code. To remotely request the error code, the controller sends ERR? In response to the error query the receiver returns ERR OXX. The first returned digit of the error code is zero. The next two digits (xx) describe the cause of the error. Attempting an invalid Scan produces ERROR 810 on the receiver front panel. An ERR? from the controller produces a response of ERR 010 on the controller display.

In the binary mode, each command or query is ended with FF and cannot be strung together. In the ASCII mode, commands or queries can be strung together with semicolons (;).

R.4.2 REMOTE MNEMONICS

The following mnemonics tables list the mnemonics utilized to control the receiver remotely. The mnemonics allow the controller to remotely set, change and/or verify the receiver operations.

Table R-3. Table of Remote Mnemonics

Mnemonic	Hex	Dec	Description	Refer to Table
AFC	42	66	Turns AFC on	R-7
AFC/	43	67	Turns AFC off	R-7
AFC?	44	68	Request AFC mode	R-7
AGC	45	69	Turn AGC on	R-7
AGC/	46	70	Turn AGC off	R-7
AGC?	47	71	Request AGC mode	R-7
AM	48	72	Select AM detection mode	R-6
AM?	4A	74	Request AM modulation 0-68	R-9
ANT(a)	4B(b)	75(b)	Select antenna (1,2)	R-7
ANT?	4D	77	Request selected antenna	R-7
AUD(a)	9F(b)	159(b)	Set audio level (0 to 255)*	R-10
AUD?	A1	161	Request audio gain level*	R-10
AUL?	F5	245	Request audio signal level*	R-10
BFO(f)	39(p)	57(p)	Set BFO frequency (±7.99 kHz)*	R-10
BFO?	3B	59	Request BFO frequency*	R-10
BIC?	AA	170	Request reading of error*	R-10
BIN			Causes all future commands to be expected in binary.	R-4
	55	85	Causes all future commands to be expected in ASCII	R-4
BIT	A5	165	Cause BITE to start/continue*	R-10
BIT?	A7	167	Request BITE error number*	R-10
BW(a)	4E(b)	78(b)	Select BW slot (1-5) (1-10)*	R-5
BW?	50	80	Request BW slot selected	R-5
BWC?	9C	156	Request BW size	R-5
CLM	6C	108	Clear receiver & memory	R-7
CLR	51	81	Clear receiver	R-7
COR(a)	57(b)	87(b)	Set COR level 0-40/or NRT level 00-20*	R-7

(a) - Utilized in a command as an ASCII number or a group of numbers.
(b) - A single byte of binary information.
(f) - Utilized in a command as a group of ASCII numbers representing a frequency. This should not exceed 10 characters, including sign and decimal. Leading and trailing zeroes need not be sent.
(p) - Eight packed BCD digits in four bytes of information.
(*) - Receiver must have appropriate option for command to be supported.
(_) - Represents the default mode.

Table R-3. Table of Remote Mnemonics (Continued)

Mnemonic	Hex	Dec	Description	Refer to Table
COR?	59	89	Request COR level/or NRT level*	R-7
CST?	9B	155	Request COR status	R-7
CW	5A	90	Select CW detection mode	R-6
DET?	5F	95	Request detection mode selected	R-6
DWL(a)	60(b)	96(b)	Select DWELL time period	R-7
DWL?	62	98	Request DWELL number	R-7
ERR?	65	101	Request Error number	R-4
EXC	66	102	Execute current parameters	R-8
FBW	D8	216	Take full bandwidth steps in SCAN	R-5
FBW/	D9	217	Take 1/2 bandwidth steps in SCAN	R-5
FBW?	DA	218	Request selected bandwidth mode	R-5
FM	69	105	Select FM detection mode	R-6
FM?	6B	107	Request FM modulation 0-100	R-9
FMO?	AD	173	Request reading of offset 0-255	R-9
FRQ(a)	3C(p)	60(p)	Set tuned frequency in MHz	R-7
FRQ?	3E	62	Request tuned frequency	R-7
GEN	E1	225	Turn BITE signal generator on*	R-10
GEN/	E2	226	Turn BITE signal generator off*	R-10
GEN?	E3	227	Request status of BITE generator*	R-10
LCK	94	148	Lock-Out current parameters	R-8
LCK?	96	150	Request lockout status	R-8
LGV?	71	113	Request reading of Log Video	R-9
LLO	F9	249	Enable local lockout of front panel	R-4
LLO/	FA	250	Disable local lockout	R-4
LLO?	FB	251	Request local lockout status	R-4
LSB	72	114	Select LSB detection mode*	R-6
MAN	75	117	Select Manual operation	R-8
MOD?	B3	179	Request operation mode	R-8
NRT	B4	180	Select NRT mode*	R-10
NRT/	B5	181	Disable NRT mode*	R-10
NRT?	B6	182	Request NRT status*	R-10

(a) - Utilized in a command as an ASCII number or a group of numbers.
(b) - A single byte of binary information.
(p) - Eight packed BCD digits in four bytes of information.
(_) - Represents the default mode.
(*) - Receiver must have appropriate option for command to be supported.

Table R-3. Table of Remote Mnemonics (Continued)

Mnemonic	Hex	Dec	Description	Refer to Table
OPT?	DD	221	Request options installed	R-10
PLS	78	120	Select Pulse detection mode	R-6
RCL(a)	7B(b)	123(b)	Select Recall operation	R-8
RCL?	7D	125	Request current channel	R-8
RFG(a)	7E(b)	126(b)	Enter RF Gain (0-255)	R-7
RFG?	80	128	Request RF Gain	R-7
RLG	FC	252	Enable RLOG*	R-10
RLG/	FD	253	Disable RLOG*	R-10
RLG?	FE	254	Request RLOG status*	R-10
RMT	81	129	Select Remote operation	R-4
RMT/	82	130	Disable Remote	R-4
RMT?	83	131	Request control mode	R-4
SCN(a)	84(b)	132(b)	Select Scan operation	R-8
SS?	89	137	Request Signal Strength in dBm	R-9
STO(a)	8A(b)	138(b)	Store current parameters	R-8
STP(a)	8D(b)	141(b)	Select Step operation	R-8
STS(a)	90(b)	144(b)	Sets status byte	R-4
STS?	92	146	Request device status	R-4
TIM(hh:mm)	AE(b)(b)	174(b)(b)	Set Time function*	R-10
TIM?	B0	176	Request Time setting*	R-10
USB	93	147	Select USB detection mode*	R-6
VER?	E0	224	Request Software version	R-7
VID(a)	A2(b)	162(b)	Set Video level (0 to 255)*	R-10
VID?	A4	164	Request Video level*	R-10
VIL?	FB	248	Request Video signal level*	R-10

(a) - Utilized in a command as an ASCII number or a group of numbers.
(b) - A single byte of binary information.
(_) - Represents the default mode.
(*) - Receiver must have appropriate option for command to be supported.

Table R-4. WJ-861XB(S1) Configuration Commands and Responses

Commands			Responses			
ASCII	Hex	Dec	ASCII	Hex	Dec	Description
BIN						Causes all future expected commands to be in binary.
	55	85				Causes all future expected commands to be in ASCII. (default)
ERR?	65	101	ERR(b)	63(b)	99(b)	Returns a number (0-99) representing the two least significant digits of the error code. Zero indicates no error. Reading this register clears it.
LLO	F9	249				Causes front panel to be locked from operator. A power-up or return to local operation will cancel LLO.
LLO/	FA	250				Cancel LLO
LLO?	FB	251	LLO LLO/	F9 FA	249 250	Request Local Lockout status
RMT	81	129				Select remote operation. Allows the receiver to accept commands that change operating parameters.
RMT/	82	130				Activate local operation. Only queries are allowed in this mode.
RMT?	83	131	RMT	81	129	Requests control mode (Remote/Local)
			RMT/	82	130	
STS(a)	90(b)	144(b)				Sets status byte to cause receiver reactions in accordance with the variable (a) sent. Variables are ORED together when multiple STS(a) commands are sent. STS 0 must be sent to reset status byte. STS 0 is the default. a = 0 - Resets all bits of Status byte to 0. a = 1 - Send SRQ on signal acquisition. a = 4 - Cause AGC dump on new frequencies.* a = 8 - Cause receiver to enter into Scan Continue mode at the end of a Scan sequence.

(a) - Utilized in a command as an ASCII number or a group of numbers.
(b) - A single byte of binary information.
(_) - Represents the default mode.
(*) - Receiver must have appropriate option for this command to be supported.

Table R-4. WJ-861XB(S1) Configuration Commands and Responses (Continued)

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
STS?	92	146	STS(a)	90(b)	144(b)	Request device status command. Note this command does not respond with the values sent in STS. This command provides information contained in the serial poll status byte. Bit — Function 0 Signal above COR level. 1 Unit power-up. 2 BITE activated SRQ. (Cleared by BIT?) 3 Indicates end of scan sequence (Reset by serial poll followed SCN.) 4 Receiver responding to query. 5 Unit error activated SRQ. (Cleared by ERR?) 6 SRQ activated by this unit. (Cleared by serial poll followed by STS?) 7 Not Utilized.

(a) - Utilized in a command as an ASCII number or a group of numbers.
(b) - A single byte of binary information.

Bandwidths for the receiver are applied utilizing the following commands and responses.

Table R-5. WJ-861XB(S1) Bandwidth Commands and Responses

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
BW(a)	4E(b)	78(b)				Select BW slot 1-5. 1-10 in 10 bandwidth receivers.* (WJ-861XB does not allow selection of empty BW slot).
BW?	50	80	BW(a)	4E(b)	78(b)	Request which slot is selected. (BW 1 is default)
BWC?	9C	156	BWC(c)	9A(b)(b)	154(b)(b)	Request size of selected BW. (Number returned in ASCII is in kHz). (Number returned in binary is a 2 byte (16-bit) binary number representing kHz). 6.4 kHz is returned as 6 kHz; 3.2 kHz is returned as 3 kHz.
FBW	D8	216				Select full bandwidth increments in SCAN (truncated to kHz).
FBW/	D9	217				Select 1/2 bandwidth increments in SCAN (truncated to kHz).
FBW?	DA	218	FBW	D8	216	Request bandwidth mode selected
			FBW/	D9	217	

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.
(c) - Utilized in a response as 4 bytes of ASCII data representing a number.
(_) - Represents the default mode.
(*) - Receiver must have appropriate option for this command to be supported.

Detection modes for the receiver are applied utilizing the following commands and responses.

Table R-6. WJ-861XB(S1) Detection Commands and Responses

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
AM	48	72				Select AM detection mode.
CW	5A	90				Select CW detection mode.
FM	69	105				Select FM detection mode.
PLS	78	120				Select PULSE detection mode.
LSB	72	114				Select LSB detection mode.*
USB	93	147				Select USB detection mode.*
DET?	5F	95	AM	48	72	Request mode of detection selected.
			CW	5A	90	
			FM	69	105	
			PLS	78	120	
			LSB	72	114	*
			USB	93	147	*

(_) - Represents the default mode.
(*) - Receiver must have appropriate option for command to be supported.

Miscellaneous control of the receiver is applied utilizing the following commands and responses.

Table R-7. WJ-861XB(S1) Miscellaneous Control Commands and Responses

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
AFC	42	66				Turn AFC on.
AFC/	43	67				Turn AFC off.
AFC?	44	68	AFC/	42	66	Request AFC mode.
			AFC	43	67	
AGC	45	69				Turn AGC on.
AGC/	46	70				Turn AGC off.
AGC?	47	71	AGC	45	69	Request AGC mode.
			AGC/	46	70	

(_) - Represents the default mode.

Table R-7. WJ-861XB(S1) Miscellaneous Control Commands and Responses (Continued)

Commands			Responses			
ASCII	Hex	Dec	ASCII	Hex	Dec	Description
ANT(a)	4B(b)	75(b)				Select antenna. (1, 2)
ANT?	4D	77	ANT(a)	4B(b)	75(b)	Request the selected antenna. (ANT 1 is default)
CLR	51	81				Clear receiver. All conditions to default. Memory not affected.
CLM	6C	108				Clear receiver. All conditions to default. Memory cleared.
COR(a)	57(b)	87(b)				Set COR level (0-40 = on, 41 = off). Level is ≈ 1 dB steps starting at noise floor of selected BW. (COR 0 is default)
COR?	59	89	COR(a)	57(b)	87(b)	Request the COR level.
CST?	9B	155				What is COR status?
			CST	99	153	Signal is above COR.
			CST/	9A	155	Signal is below COR.
DWL(a)	60(b)	96(b)				Select the Dwell time for scan or step operation. This may be pre or post Dwell based on internal receiver configuration. The range of Dwell is from 0-2 seconds represented by a number from (0-255). Actual time is represented by $2^{a/32}$ x 8) -8 in ms.
DWL?	62	98	DWL(a)	60(b)	96(b)	Request Dwell number. (DWL 0 is default).
FRQ(f)	3C(p)	60(p)				Set the tuned frequency in MHz. (0-1100 in .0001 MHz steps). (Binary mode is packed BCD always 4 bytes.) (Upper limit 500 MHz without FE option.)* (Lower limits is 20 MHz without HFE, LFE or ELF.)*

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.

(f) - Utilized in a command as a group of ASCII numbers representing a frequency. This should not exceed 10 characters, including sign and decimal. Leading and trailing zeros need not be sent.

(p) - Eight packed BCD digits in four bytes of information.

(_) - Represents the default mode.

(*) - Receiver must have appropriate option for this command to be supported.

Table R-7. WJ-861XB(S1) Miscellaneous Control Commands and Responses (Continued)

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
FRQ?	3E	62	FRQ(f)	3C(p)	60(p)	Request tuned frequency. (20 MHz is default).
RFG(a)	7E(b)	126(b)				Enter RF Gain number (0-255). 0 = minimum gain, 255 = maximum gain.
RFG?	80	128	RFG(a)	7E(b)	126(b)	Request RF Gain number (0-255). (The RF Gain 0 is default)
VER?	E0	224	VER_ 861XB ———— X.X.X ————	DE'VER 861XB ———— X.X.X. ————		The version response includes model and software revision. Response in binary mode is a HEX DE followed by ASCII data string terminated with EOI.
VID(a)	A2(b)	162(b)				Set Video Gain level (0 to 255).*
VID?	A4	164	VID(a)	A2(b)	162(b)	Request Video Gain level.

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.

(f) - Utilized in a command as a group of ASCII numbers representing a frequency. This should not exceed 10 characters, including sign and decimal. Leading and trailing zeros need not be sent.

(p) - Eight packed BCD digits in four bytes of information.

(_) - Represents the default mode.

(*) - Receiver must have appropriate option for this command to be supported.

Control of the receiver is applied utilizing the following commands and responses.

Table R-8. WJ-861XB(S1) Receiver Mode Control Commands and Responses

Commands			Responses			
ASCII	Hex	Dec	ASCII	Hex	Dec	Description
EXC	66	102				Execute current parameters only valid in Recall mode).
LCK	94	148				Lockout current frequency using bandwidth size for lockout width.
LCK?	96	150	LCK LCK/	94 95	148 149	Request lockout status of last recalled channel. If the recalled channel was a lockout, the response is LCK. If not a lockout, response is LCK/.
MAN	75	117				Select Manual operation (to exit Scan or Step, send MAN command twice.
MOD?	B3	179				Request mode of operation.
			MAN	75	117	Manual
			RCL	7B	123	Recall
			SCN	84	132	Scanning
			SCM	B2	178	Scan Continue
			STP	8D	141	Stepping
			STM	B1	177	Step Continue
			BIT	A5	165	BITE Mode
			BIM	A6	166	BITE manual indicates BITE has halted because of a failure.
STO(a)	8A(b)	138(b)				Store current parameters in channel (0-95).
RCL(a)	7B(b)	123(b)				Select Recall operation. Recall parameters in channel (0-95).
RCL?	7D	125	RCL(a)	7B(b)	123(b)	Request current channel number.
SCN	84	132				Cause active scan to be advanced if the receiver has stopped on a signal. If the mode is SCM the SCN command will cause the receiver to return to the SCN mode.

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.

(_) - Represents the default mode.

Table R-8. WJ-861XB(S1) Receiver Mode Control Commands and Responses (Continued)

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
SCN(a)	84(b)	132(b)				Scan the channel indicated in the argument. If the channel number is odd, the Scan is from the frequency in the preceeding even channel to the frequency in the specified channel. If the channel number is even, a sector scan is performed for each channel pair starting with zero ending with the specified channel.
STP	8D	141				Cause an active Step to be advanced if the receiver has stopped on a signal. If the mode is STM the STP command will cause the receiver to return to the STP mode.
STP(a)	8D(b)	141(b)				Select Step operation. Start with 0 and step to channel number in STP command.

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.

Signal information for the receiver is applied utilizing the following commands and responses.

Table R-9. WJ-861XB(S1) Signal Information Commands and Responses

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
AM?	4A	74	AM(a)	48(b)	72(b)	Request reading from AM modulation. 000-068 Range
FM?	6B	107	FM(a)	69(b)	105(b)	Request reading from FM modulation. 000-100 Range
FMO?	AD	173	FMO(a)	AB(b)	171(b)	Request reading of FM offset. 000-255 range.
LGV?	71	113	LGV(a)	6F(b)	111(b)	Request reading of Log Video. 000-080 Range
SS?	89	137	SS(a)	87(b)	135(b)	Request reading of Signal Strength in dBm. (In manual, gain represents % of AM Detector (000-100).

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.

Optional commands are applied to the receiver utilizing the following commands and responses.

Table R-10. WJ-861XB(S1) Optional Commands and Responses

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
OPT?	DD	221	OPT (a),(a), (a)	DB (b)(b)(b)		Requests the options in the receiver. The response is returned as 3 byte encoded numbers. Each number has a range from 0 to 255. The bit values are indicated below:

Bit	Byte 1	Byte 2	Byte 3	Value
0	RTC	LFE	PSS	1
1	EM	HFE	488	2
2	LCK	FEX	232	4
3	TPC	FE	ASO	8
4	RLOG	SSB	DAV	16
5	CUR	VBFO	MX	32
6	M/S	BIT	-	64
7	SLO	NRT	-	128

ASCII	Hex	Dec	ASCII	Hex	Dec	Description
BITE Option						
BIT	A5	165				This command enables BITE mode. It starts BITE if current operating mode is other than BITE. It continues the BITE operation if the current mode is BITE active.
BIT?	A7	167	BIT(a)	A5(b)	165(b)	This command returns the current BITE test number. If a 0 is returned it indicates BITE has completed. Reading this register causes bit 2 of the status byte (STS?) to be cleared.
BIC?	AA	170	BIC(a)	A8(b)	168(b)	This command returns the last A/D reading used for a failed BITE test. Refer to the BITE option manual for the range of the returned number and its meaning.
GEN	E1	225				This command allows the BITE Signal Generator to be turned on while in manual mode.
GEN/	E2	226				Turn Bite Signal generator off.
GEN?	E3	227	GEN GEN/	E1 E2	225 226	Request status of BITE generator.

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.
(_) - Represents the default mode.

Table R-10. WJ-861XB(S1) Optional Commands and Responses (Continued)

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
BFO Option						
BFO(f)	39(p)	57(p)				Set BFO frequency in kHz. (-7.99 to +7.99). Binary is sent as four packed BCD bytes. (Sign is bit 3 of second byte.) First and last byte are zeros. Byte 2 is kHz, Byte 3 is 100s of Hz, and 10s of Hz.
BFO?	3B(p)	59	BFO(-)(f)	39(p)	57(p)	Request BFO frequency. (0 kHz is default).
DAV Option						
AUD(a)	9F(b)	159(b)				Set audio gain level (0-255).
AUD?	A1	161	AUD(a)	9F(b)	159(b)	Request audio gain level.
AUL?	F5	245	AUL(a)	F3(b)	243(b)	Request the audio signal level. The number returned is between 0 and 99. Zero represents no audio energy and 99 maximum audio energy.
VID(a)	A2(b)	162(b)				Sets video gain level (0-255).
VID?	A4	164	VID(a)	A2(b)	162(b)	Request video gain level.
VIL?	F8	249	VIL(a)	F6(b)	247(b)	Request the video signal level. The number returned is between 0 and 99. Zero represents no video energy and 99 maximum.
NRT Option						
NRT	B4	180				Enables NRT.
NRT/	B5	181				Disables NRT.
NRT?	B6	182	NRT NRT/	B4 B5	180 181	Requests NRT status.
COR(a)	57(b)	87(b)				Sets NRT level (0-20).
COR?	59	89				Requests set NRT level.

(a) - Utilized in a command as an ASCII number or a group of numbers.
(b) - A single byte of binary information.
(f) - Utilized in a command as a group of ASCII numbers representing a frequency. This should not exceed 10 characters, including sign and decimal. Leading and trailing zeos need not be sent.
(p) - Eight packed BCD digits in four bytes of information.

Table R-10. **WJ-861XB(S1) Optional Commands and Responses** (Continued)

Commands(a)			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
RTC Option						
TIM (HH:MM)	AE(b) (b)	174(b) (b)				Set time in hours and minutes. Seconds are set to 0 upon receiving this command. (ASCII format is HH:MM) (Binary is 2 packed BCD bytes, the first byte is hours and the second byte is minutes.)
TIM?	B0	176	TIM (HH:MM: SS)	AE(b) (b)(b)	174(b) (b)(b)	Request time. Returns hours, minutes, and seconds. (ASCII format is HH:MM:SS) (Binary is 3 packed BCD bytes, hours, minutes and seconds.)
RLOG Option						
*RLG	FC	252				Enables RLOG mode
*RLG/	FD	253				Disables RLOG mode
*RLG?	FE	254	RLG RLG/	FC FC	252 253	Requests RLOG status

(b) - A single byte of binary information.
(*) - Receiver must have appropriate option for this command to be supported.

The response to an AM? mnemonic is a number from 000 to 068 representing the level of AM Video present at the output of the receiver. Each digit represents approximately 13 mV rms of AM Video. For FM?, the response is a number ranging from 000 to 100, representing the percentage of FM modulation. Each digit represents a 1 percent increment with 100 equaling 100% modulation and 000 equaling no modulation. For FMO?, the response is a number from 0-254, representing the FM Discriminator offset. The number 127 represents a signal at tuned frequency, greater than 127 means the signal is greater than the tuned frequency, less than 127 means the signal is less than the tuned frequency. For tuned frequencies above 500 MHz greater than 127 means the signal is lower than the tuned frequency and less than 127 means the signal is greater than the tuned frequency.

LGV? provides a number from 000 to 080 representing the Log video level of the receiver. This number represents the signal level above the theoretical noise floor of the receiver, with each number representing a 0.5 dB change. 000 represents the theoretical noise floor and 080 represents 40 dB above that level. The response to SS? provides a signal strength number in dBm from -125 to -20. In manual gain this number represents the level of the AM detector.

The following tables **(Tables R-11 through R-16)** provide examples of commands and data requests. These examples indicated, bit by bit, the RS-232 interface bus status during the data exchange.

Table R-11. Sending a Tuned Frequency of 25 MHz to the WJ-861XB Using an HP85 (WJ-861XB Device #6)

Message: Send tuned frequency of 25.0000 MHz

ASCII Mode	#	HEX	ASCII	Comment
Output 706 using "K"; "FRQ25"				
ASCII message may have leading zeros.	1	46	F	
Total none blank character count 15,	2	52	R	DATA TO
for single commands, exponential	3	51	Q	WJ-861XB
format not supported. IE: "FRQ	4	32	2	
0025.0000 is valid message.	5	35	5	
	6	0D	(CR)	
	7	0A	(LF)	TERMINATOR
Binary Mode	**#**	**HEX**	**DEC**	**Comment**
*Print using "B"; 60, 0, 37, 0, 0, 255				
All bytes must be sent with no spaces	1	36	60	FREQ CODE
or terminator characters.	2	00	0	BYTE 1
	3	25	37	BYTE 2
	4	00	0	BYTE 3
	5	00	0	BYTE 4
	6	FF	255	TERMINATOR

*Control Statement: Assumes the controller RS-232 port has been declared the printer (for HP-80 series computers, the printer is 10) and that the CR and LF terminator, associated with the print command, has been suppressed. Printer is 706 (directs print statements to WJ-861XB).

Table R-12. Sending a COR "OFF" Command

Message: Send COR Off (41)

ASCII Mode	Actual Bus Transfer			
	#	HEX	ASCII	Comment
Output 706 using "K"; "COR 41"	1	43	C	DATA TO
	2	4F	O	WJ-861XB
	3	52	R	
	4	34	4	
	5	31	1	
	6	0D	(CR)	
	7	0A	(LF)	TERMINATOR
Binary Mode	#	HEX	DEC	Comment
*Print using "B"; 87, 41, 255	1	57	87	COR CODE
	2	29	41	VALUE
	3	FF	255	TERMINATOR

*Control Statement: Assumes the controller RS 232 port has been declared the printer (for HP-80 series computers, the printer is 10) and that the CR and LF terminator, associated with the print command, has been suppressed. Printer is 706 (directs print statements to WJ-861XB).

Table R-13. Sending a Frequency Request

Message: Request Frequency (Assume 25 MHz last sent)

ASCII Mode	Actual Bus Transfer			
	#	HEX	ASCII	Comment
Output 706 using "K"; "FRQ?"	1	46	F	
	2	52	R	DATA TO
Instruct WJ-861XB to prepare to output	3	51	Q	WJ-861XB
frequency information when made a talker.	4	3F	?	
	5	0D	CR	
	6	0A	LF	TERMINATOR
Enter 706; A$	7	46	F	
	8	52	R	
	9	51	Q	DATA FROM
A$ will contain "FRQ 0025.0000".	10	20		WJ-861XB
	11	30	0	
	12	30	0	
	13	32	2	
Frequency response is always 15 characters.	14	35	5	
	15	2E	.	
	16	30	0	
	17	30	0	
	18	30	0	
	19	30	0	
	20	0D	CR	
	21	0A	LF	TERMINATOR
	22	FD	253	COMMAND/QUERY
	23	FF	255	PROCESS COMPLETE
Binary Mode	**#**	**HEX**	**DEC**	**Comment**
*Print using "B"; 62, 255	1	3E	62	REQUEST FREQUENCY
	2	FF	255	TERMINATOR
	3	3C	60	FREQ CODE
Enter 706 using "#%, #%K"; A$	4	00	0	BYTE 1
	5	25	37	BYTE 2
Image causes enter to terminate on EOI only.	6	00	0	BYTE 3
	7	00	0	BYTE 4
A$ will contain frequency data in packed BCD.	8	FF	255	TERMINATOR

*Control Statement: Assumes the controller RS-232 port has been declared the printer (for HP-80 series computers, the printer is 10) and that the CR and LF terminator, associated with the print command, has been suppressed. Printer is 706 (directs print statements to WJ-861XB).

Table R-14. Sending a Bandwidth Size Request

Message: Request size of currently selected bandwidth (Assume 10 kHz)

ASCII Mode	#	HEX	ASCII	Comment
Output 706 using "K"; "BWC?"	1	42	B	
	2	57	W	DATA TO
Instruct 861XB to output size of selected BW	3	43	C	WJ-861XB
in kHz when made an active talker.	4	3F	?	
	5	0D	(CR)	
	6	0A	(LF)	TERMINATOR
Enter 706; A$	7	42	B	
	8	57	W	DATA TO
A$ will contain "BWC 10".	9	43	C	WJ-861XB
	10	20		
	11	20		
	12	31	1	
	13	30	0	
	14	0D	CR	
	15	0A	LF	TERMINATOR
	16	FD	253	COMMAND/QUERY
	17	FF	255	PROCESS COMPLETE
			(Assume 4 MHz)	
Enter 706; A$	1	42	B	
	2	57	W	DATA FROM
A$ will contain "BWC 4000".	3	43	C	WJ-861XB
	4	34	4	
	5	30	0	
	6	30	0	
	7	30	0	
	8	0D	(CR)	
	9	0A	(LF)	TERMINATOR
	10	FD	253	COMMAND/QUERY
	11	FF	255	PROCESS COMPLETE
Binary Mode	**#**	**HEX**	**DEC**	**Comment**
*Print using "B"; 158, 255	1	9E	158	BW SIZE REQUEST
	2	FF	255	TERMINATOR
Enter 706 using "#%, #%K"; A$	3	9C	156	BW CODE
A$ will contain binary BW size information.	4	00	0	BINARY CODED
			(Assume 4 MHz)	
	5	0A	10	BANDWIDTH IN kHz
	6	FF	255	TERMINATOR
Enter 706 using "#%, #%K"; A$	1	9C	156	BW CODE
	2	0F	15	BINARY CODED
Byte 1, Byte 2	3	A0	160	BANDWIDTH IN kHz
A$ will contain binary BW size information.	4	FF	255	TERMINATOR

*Control Statement: Assumes the controller RS-232 port has been declared the printer (for HP-80 series computers, the printer is 10) and that the CR and LF terminator, associated with the print command, has been suppressed. Printer is 706 (directs print statements to WJ-861XB).

Table R-15. Sending a Detection Mode Request

ASCII Mode	Actual Bus Transfer			
	#	HEX	ASCII	Comment
Output 706 using "K"; "DET?"	1	44	D	
	2	45	E	DATA TO
	3	54	T	WJ-861XB
	4	3F	?	
	5	0D	(CR)	
	6	0A	(LF)	TERMINATOR
Enter 706; A$	7	41	A	
	8	4D	M	DATA FROM
A$ will contain "AM".	9	20		WJ-861XB
	10	0D	(CR)	
	11	0A	(LF)	TERMINATOR
	12	FD	253	COMMAND/QUERY
	13	FF	255	PROCESS COMPLETE
			(Assume PLS)	
Enter 706; A$	1	50	P	
	2	4C	L	DATA FROM
A$ will contain "PLS".	3	53	S	WJ-861XB
	4	0D	(CR)	
	5	0A	(LF)	TERMINATOR
	6	FD	253	COMMAND/QUERY
	7	FF	255	PROCESS COMPLETE
Binary Mode	**#**	**HEX**	**DEC**	**Comment**
*Print using "B"; 95, 255	1	5F	95	REQUEST DETECTION MODE
	2	FF	255	TERMINATOR
Enter 706 using "#%, #%K"; A$	3	48	72	AM CODE
	4	FF	255	TERMINATOR
A$ will contain 1 byte binary information.				
			(Assume PLS)	
Enter 706 using "#%, #%K"; A$	1	78	120	PLS CODE
	2	FF	255	TERMINATOR
A$ will contain 1 byte binary information.				

*Control Statement: Assumes the controller RS-232 port has been declared the printer (for HP-80 series computers, the printer is 10) and that the CR and LF terminator, associated with the print command, has been suppressed. Printer is 706 (directs print statements to WJ-861XB).

Table R-16. Sending a COR Level Request

Message: Request COR Level, (assume off)

ASCII Mode	Actual Bus Transfer			
	#	HEX	ASCII	Comment
Output 706 using "K"; "COR?"	1	43	C	
	2	4F	O	DATA TO
	3	52	R	WJ-861XB
	4	3F	?	
	5	0D	(CR)	
	6	0A	(LF)	TERMINATOR
Enter 706; A$	7	43	C	
	8	4F	O	DATA FROM
A $ will contain "COR 041".	9	52	R	WJ-861XB
	10	20		
	11	30	0	
	12	34	4	
	13	31	1	
	14	0D	(CR)	
	15	0A	(LF)	TERMINATOR
	16	FD	253	COMMAND/QUERY
	17	FF	255	PROCESS COMPLETE
Binary Mode	**#**	**HEX**	**DEC**	**Comment**
*Print using "B"; 89, 255	1	59	89	REQUEST COR
	2	FF	255	TERMINATOR
Enter 706 using "#%, #%K"; A$	3	57	87	COR CODE
	4	29	41	VALUE
	5	FF	255	TERMINATOR
A$ will contain 2 bytes binary information.				

*Control Statement: Assumes the controller RS-232 port has been declared the printer (for HP-80 series computers, the printer is 10) and that the CR and LF terminator, associated with the print command, has been suppressed. Printer is 706 (directs print statements to WJ-861XB).

R.5 PARTS LIST

R.5.1 TYPE NUMBER 861X/232 RS-232 INTERFACE

REF DESIG PREFIX **RS-232**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision B				
232-A1	Async Interface	1	796617-1	14632	
232-J1	Connector, Receptacle	1	DBM25S	71468	
232-W1	Cable Assembly	1	290321-1	14632	

R.5.1.1 Type 796617-1 RS-232, Interface

REF DESIG PREFIX RS-232-A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision C1				
C1	Capacitor, Ceramic, Disc: .1 µF, 20%, 50 V	7	34475-1	14632	
C2	Capacitor, Ceramic, Monolithic: 18 pF, 2%, 50 V	2	100-100-NPO-180G	51642	
C3	Same as C2				
C4	Capacitor, Electrolytic, Tantalum: .47 µF, 10%, 35 V	2	CS13BF474K	81349	
C5	Same as C1				
C6	Same as C4				
C7	Capacitor, Ceramic, Monolithic: 100 pF, 2%, 100 V NPO	1	200-100-NPO-101G	51642	
C8	Capacitor, Ceramic, Monolithic: 30 pF, 2%, 100 V NPO	2	150-100-NPO-300G	51642	
C9	Same as C8				
C10	Capacitor, Ceramic, Disc: 1 µF, 20%, 100 V	3	RPE114-Z5U105M100V	72982	
C11	Capacitor, Electrolytic, Tantalum: 220 µF, 20%, 10 V	1	CS13BC227K	81349	
C12 Thru C16	Same as C1				
C17	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	6	34453-1	14632	
C18 Thru C22	Same as C17				
C23	Same as C10				
C24	Same as C10				
CR1	Diode	2	1N746A	80131	
CR2	Same as CR1				
J1	Header	1	102203-5	00779	
J2	Connector, Receptacle	1	65610-116	22526	
J3	Connector	1	1010-7511-001	19505	
J4	Header	1	102203-1	00779	
JP1	Connector, Plug	1	ML-100S	51167	
JW1*	Wire, Electrolytic, Buss	AR	8021 22 AWG BUSSWIRE	70903	
JW2*	Same as JW1				
JW3*	Not Used				
R1	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/8 W	1	CF1/8-1.0K/J	09021	
R2	Resistor, Fixed, Film: 15 kΩ, 1/8 W	2	CF1/8-15K/J	09021	
R3	Same R2				
R4	Resistor, Fixed, Film: 330 Ω, 5%, 1/4 W	1	CF1/4-330 OHMS/J	09021	
R5	Resistor, Fixed, Film: 10 kΩ, 1/8 W	2	CF1/8-10K/J	09021	
R6	Not Used				
R7	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/8 W	1	CF1/8-4.7K/J	09021	
R8	Resistor, Fixed, Film: 47 kΩ, 5%, 1/8 W	3	CF1/8-47K/J	09021	
R9	Same as R5				
R10	Resistor, Fixed, Film: 3.9 kΩ, 5%, 1/8 W	1	CF1/8-3.9K/J	09021	
R11	Resistor, Fixed, Film: 56 kΩ, 5%, 1/8 W	2	CF1/8-56K/J	09021	

REF DESIG PREFIX **RS-232-A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R12	Same as R8				
R13	Resistor, Fixed, Film: 68 kΩ, 5%, 1/8 W	1	CF1/8-68K/J	09021	
R14	Resistor, Fixed, Film: 33 kΩ, 5%, 1/8 W	1	CF1/8-33K/J	09021	
R15	Resistor, Fixed, Film: 22 kΩ, 5%, 1/8 W	3	CF1/8-22K/J	09021	
R16	Same as R15				
R17	Resistor, Fixed, Film: 100 kΩ, 5%, 1/8 W	2	CF1/8-100K/J	09021	
R18	Same as R15				
R19	Same as R11				
R20	Same as R8				
R21	Same as R17				
R22	Resistor, Fixed, Film: 100 Ω, 5%, 1/8 W	1	CF1/8-100 OHMS/J	09021	
S1	Switch, Dip	1	76PSB08S	81073	
TP1	Pin, Test Point	8	460-2976-02-0400	71279	
TP2 Thru TP8	Same as TP1				
U1	Integrated Circuit	1	ICM 7209-1-PA	32293	
U2	Integrated Circuit	1	SN75150P	01295	
U3	Integrated Circuit, DCDR	1	MM74HCT139N	27014	
U4	Integrated Circuit, Center	1	MM74HC4040N	27014	
U5	Integrated Circuit, Buffer	1	MM74HCT04N	27014	
U6	Integrated Circuit	1	SN75154N	01295	
U7	Not Used				
U8	Integrated Circuit	1	MC68B50P	04713	
U9	Not Used				
U10	Integrated Circuit	1	MM74HCTOON	27014	
U11	Not Used				
U12	Integrated Circuit, Latch	1	MM74HCT373N	27014	
U13	Resistor, Nework: 47 Ω	1	4310R-101-473	80294	
U14	Integrated Circuit	1	MM80C98N	27014	
U15	Not Used				
U16	Integrated Circuit	1	MC1458N	18324	
Y1	Crystal, Quartz: 4.91520 MHz	1	MP042	75378	
T2	Not Used				

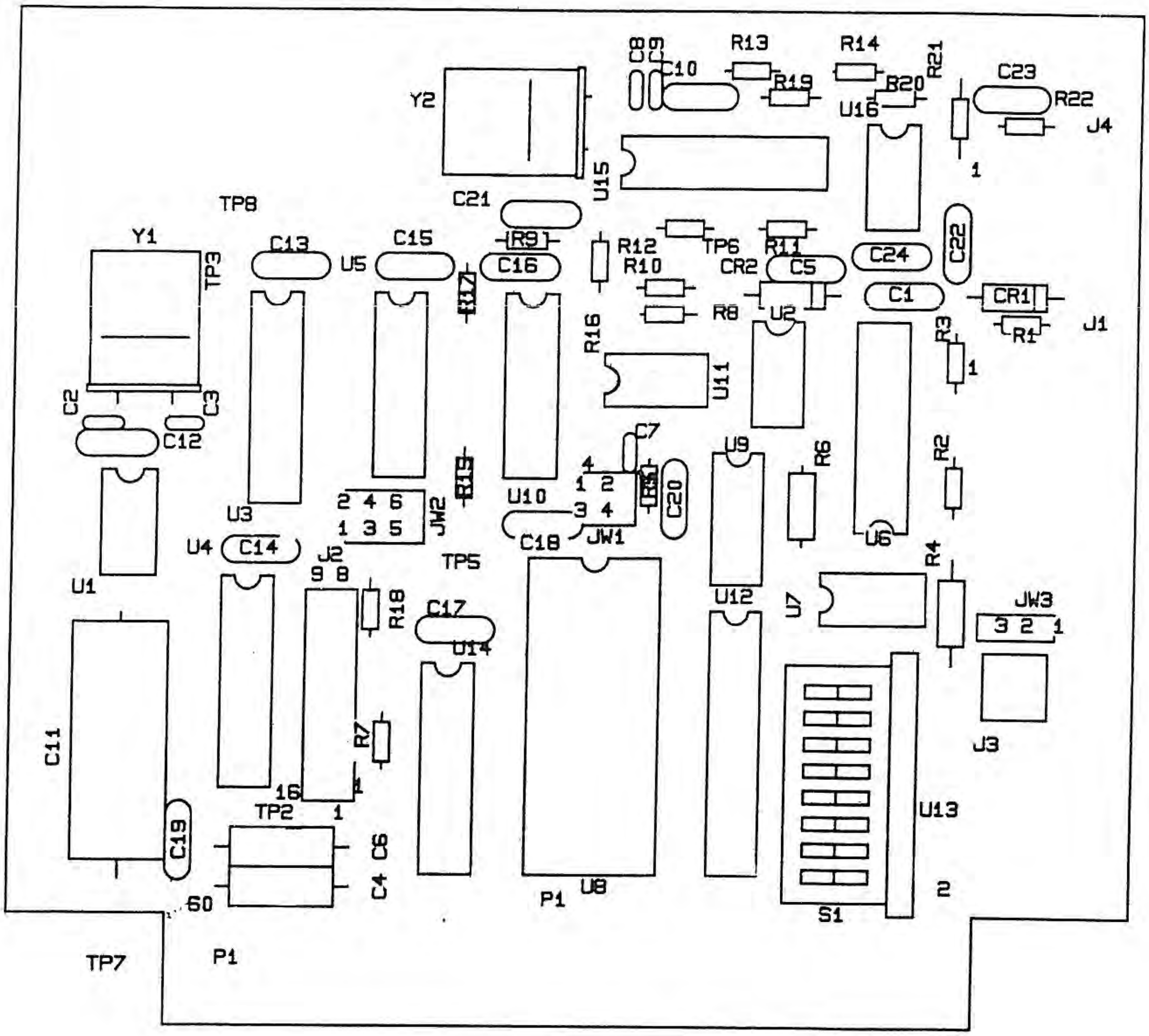


Figure R-4. Type 796617-1 RS-232 Location of Components

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/8W.
   b) CAPACITANCE IS IN μF.
2. DIFFERENCE BETWEEN TYPES IS SHOWN IN TABLE I.

TABLE I

TYPE	USED WITH INTERFACE	JW1	JW2	JW3	U7	U9	U11	U15	Y2	R6
796617-1	RS-232C/LOGGING	1-2	1-4	N/A	N/U	N/U	N/U	N/U	N/U	N/U
-2	MIL-STD-188C/LOGGING	2-3	1-2	N/A	N/U	N/U	N/U	N/U	N/U	N/U
-3	WJ-9073-2 COAX	1-4	N/A	1-2	N/U	LH0002	SN75140	N/U	N/U	20 1/4 W
-4	WJ-9073-2 FIBER OPTIC	1-4	N/A	2-3	SN75453P	N/U	N/U	N/U	N/U	N/U
-5	TAPE LOGGING	1-2	1-5	N/A	N/U	N/U	N/U	TCM3105	4.4336MHz	N/U
-6	WJ-9075 COAX	3-4	1-3	1-2	N/U	LH0002	SN75140	N/U	N/U	47 1/4 W

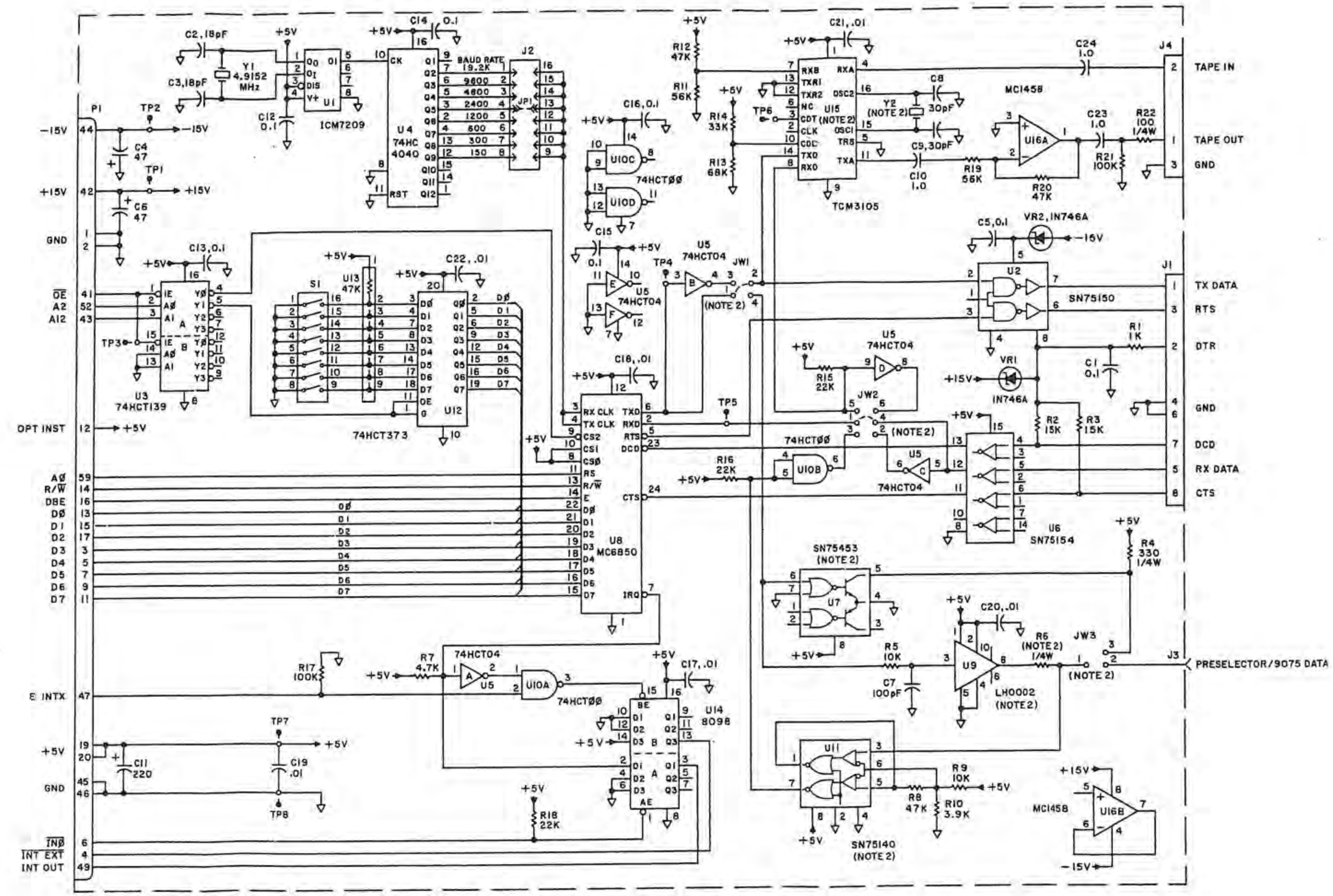


Figure R-5. Type 796617-1, Serial Interface RS-232
Schematic Diagram 580723 (C)

NOTE:
1. TYPE 796617-1, SCHEM 580723
USE ON (S1) SERIES RECEIVERS.

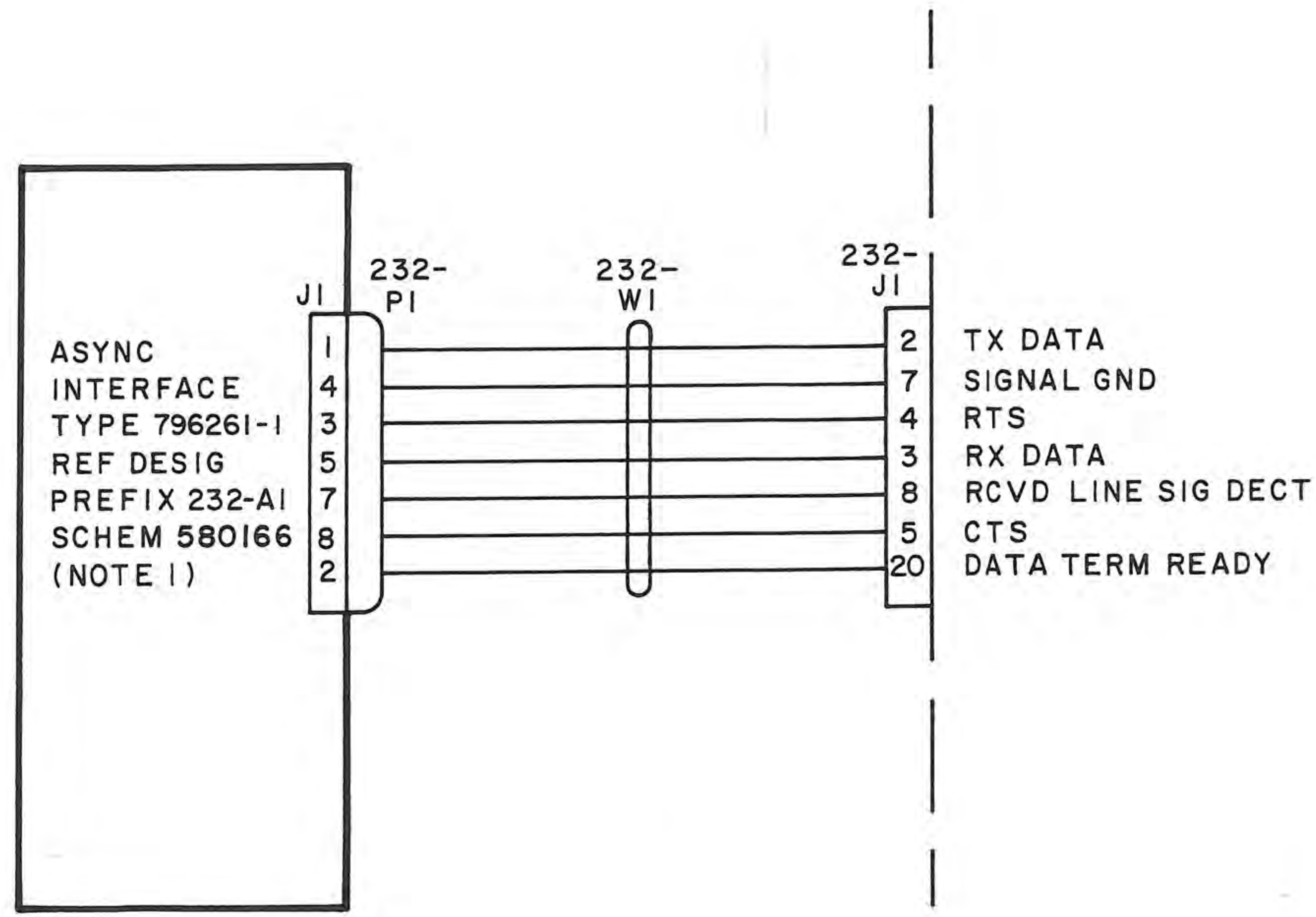


Figure R-6. Type WJ-861XB(S1) RS-232 Interface Bus Schematic Diagram 290320 (E)

WJ-861X RECEIVER

APPENDIX S

WJ-861X IF AMPLIFIER/FM DEMODULATOR BANDWIDTH COMBINATIONS OPTION

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

November 1990

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

PROPRIETARY STATEMENT

This document and subject matter disclosed herein are proprietary items to which Watkins-Johnson Company retains the exclusive right of dissemination, reproduction, manufacture and sale.

This document is provided to the individual or using organization for their use alone in the direct support of the associated equipment unless permission for further disclosure is expressly granted in writing.

TABLE OF CONTENTS

APPENDIX S

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS

APPENDIX S

IF AMPLIFIER/FM DEMODULATOR BANDWIDTH COMBINATIONS OPTION

S.1 GENERAL DESCRIPTION

The WJ-861XB Receiver provides for up to either five or ten IF Amplifiers (A3A9-A3A13) and FM Demodulators (A3A17-A3A21) to be installed, depending on the setting of the DIP switch S1 on the Receiver Interface (A5A2). With switch position 2 CLOSED, the receiver supports 5 IF bandwidths and in the OPEN position, 10 IF bandwidths can be supported. These bandwidths are selectable from those listed in **Table S-1.** In addition to the bandwidths listed in **Table S-1,** additional bandwidths may be available upon special request.

The IF Amplifiers and FM Demodulators are available in either single (5 bandwidth) or dual (10 bandwidth) configurations. In the single configuration, each IF Amplifier (A3A9-A3A13) and FM Demodulator (A3A17-A3A21) contains only one bandwidth. In the dual configuration each module contains two IF Amplifiers (on the A3A9-A3A13 modules) and two FM Demodulators (on the A3A17-A3A21 modules). Dual configuration modules are controlled by pressing the same front panel BANDWIDTH pushbutton. Repeatedly pressing the BANDWIDTH pushbutton of a dual configured receiver toggles the selected bandwidth from one bandwidth to the other.

Selection of one of the receiver's bandwidths is accomplished by pressing the key labeled with the desired bandwidth. Pressing a BANDWIDTH pushbutton enables the selected bandwidth and applies digital control data from the Receiver Interface (A5A2) to the bandwidth decoder (U10) on the AGC module (A3A8). Bandwidth decoder U10 decodes the bandwidth select data from the digital control section and applies the enable data to the 2nd Converter (A3A7). This enable data energizes one of five switches to select the desired IF bandwidth.

The 21.4 MHz IF Amplifier module is provided in two versions, the single amplifier version (Type 724006-X and Type 726013-X) or the dual version (Types 726009-X, 726010-X, and 796337-X). Whether the single or dual IF Amplifier modules are installed in the receiver, circuit operation is essentially the same. Only one additional line is added to the switchable modules to control selection of the dual bandwidth modules.

S.2 INSTALLATION

The 21.4 MHz IF Amplifier modules (A3A9-A3A13) are installed in the RF/IF Motherboard (A3) in the connector slots labeled XA9 through XA13. Refer to **Figure 5-6** of the WJ-861XB Instruction Manual for these connector locations. The FM Demodulator modules (A3A17-A3A21) are installed in the RF/IF Motherboard in connectors XA17 through XA21. For proper operation, the IF Amplifiers and FM Demodulators must be in the same corresponding slots. For example if the 10 kHz IF Amplifier is installed in RF/IF Motherboard connector XA9, then the 10 kHz FM Demodulator must be installed in connector slot XA17.

S.3 OPERATION

With the IF Amplifiers and FM Demodulators installed in the receiver, pressing one of the front panel BANDWIDTH pushbuttons enables the associated IF Amplifier and FM Demodulator module. The selected bandwidth is indicated by the illuminated LED on the pushbutton that was pressed.

Table S-1. Available Bandwidths

SINGLE			DUAL		
IF Bandwidth in kHz ±10%	21.4 MHz IF AMP Type	FM Demod Type	IF Bandwidth in kHz±20%	Switchable IF Amp Type	Switchable FM Demod Type
1.5	724006-22	794106-10	3.2/10	726009-1	796354-1
3.2	724006-16	794106-6	3.2/6.4	726009-17	796354-10
4.0	724006-23	794106-11	6.4/10	726009-5	796354-3
6.0	724006-7	794106-3	10/20	726009-11	796354-7
6.4	724006-18	794106-3	10/25	726009-14	796254-8
10	724006-1	794106-1	10/30	726009-21	796354-11
15	724006-21	794106-8	15/20	726009-6	796354-4
20	724006-2	794106-2	20/30	726009-15	796354-9
25	724006-17	794106-7	20/50	726009-2	796354-2
30	724006-10	794106-5	30/40	726009-7	796354-6
40	724006-8	749107-5	30/50	726009-8	796354-5
50	724006-3	794106-9	50/75	726009-16	796355-6
60	724006-24	794107-13	50/100	796009-12	796355-5
75	724006-9	794107-6	75/100	726009-9	796355-3
100	724006-4	794107-2	100/200	726009-3	796355-1
150	724006-25	794107-14	100/300	726009-4	796355-2
250	724006-5	794107-3	150/200	726009-10	796355-4
300	724006-6	794107-4	150/300	726009-18	796355-7
400	724006-20	794104-2	200/300	726009-20	796355-8
500	726013-1	794104-2	200/400	726009-25	796356-3
1000	726013-2	794104-1	250/500	726009-13	796356-3
2000	726013-3	794105-1	300/500	726009-19	796356-5
4000	726013-4	794105-2	300/1000	726010-7	796356-4
8000	796337-1	794105-4	400/600	726010-1	796356-1
10000	796726-1		500/1000	726010-2	796356-2
			800/1200	726010-13	796356-7
			1000/2000	726010-3	796357-1
			1600/3200	726010-14	796357-7
			2000/4000	726010-4	796357-2
			4000/6000	726010-5	796357-3
			4000/8000	726010-6	796357-4
			4000/10000	726010-8	796357-5
			8000/10000	726010-9	796357-6

With dual IF Amplifiers and Switchable FM Demodulators installed, each BANDWIDTH key can select one of two bandwidths. Pressing the BANDWIDTH pushbutton the first time selects the narrower IF bandwidth. Pressing the same IF bandwidth key again selects the wider IF bandwidth. Repeatedly pressing the same pushbutton toggles the selected bandwidth between the narrower and wider IF bandwidth.

Attempting to select an empty IF bandwidth slot causes **ERROR 814** to be displayed on the front panel. However, for test purposes the receiver may be placed in the Test mode (by holding the FUNCTION key pressed, when power is applied to the receiver) allowing an empty IF bandwidth slot to be selected without generating an **ERROR 814.** The Test mode digitally displays the analog voltage for the selected bandwidth on the front panel. This three-digit display appears to the right of the MEMORY SELECT window. Refer to **Table S-4** for the decimal bandwidth code.

Placing the Receiver Interface (A4A2) switch S1 in the OPEN position also provides a three-digit display of the selected IF bandwidth. These digits are displayed to the right of the MEMORY SELECT window. With the 6.4 kHz IF bandwidth selected, **006** is displayed. Selecting 8000 kHz causes **8E3** to be displayed.

NOTES

The Test mode decimal bandwidth code overrides the three-digit bandwidth display. Test mode is disabled by turning receiver power off and back on again.

Receiver DIP switch settings are only read when the receiver is powered up. Changing the DIP switch settings requires receiver power to be cycled off and on again to affect receiver operation.

"Shrinkage" of IF bandwidths, greater than 2000 kHz in width, is evident when the receiver is tuned near the preselector band breaks.

S.4 FUNCTIONAL DESCRIPTION

The 21.4 MHz IF output from the 2nd Converter (A3A7) is switched to the appropriate 21.4 MHz IF Amplifier by a PIN diode switching network controlled by the BW #1 through BW #5 bandwidth select inputs. The select inputs are supplied by AGC subassembly A3A8. This PIN switch directs the IF signal to the selected IF Amplifier. Each 21.4 MHz IF Amplifier contains an IF Amplifier and a bandpass filter to limit the bandwidth of the IF signal. The WJ-861XB Receiver can accept up to five standard IF bandwidths or ten IF bandwidths, if dual IF modules are used.

The output signal of the selected 21.4 MHz IF Amplifier is applied to the AM Demodulator (A3A16), and is amplified both linearly and logarithmically. Amplifiers Q1 and U1 provide linear amplification of the 21.4 MHz signal. This signal is then applied through a 4 MHz bandpass filter, when wideband IF amplifiers are selected or through a 300 kHz filter when narrowband IF amplifiers are used. The post-filtered IF output is provided to the SWITCHED IF connector (J1) on the rear panel which provides a sample of the band-limited IF signal. This filtered IF signal is also directed to the FM Demodulators for detection of FM video and to the AM Detector for detection of AM video. Logarithmic amplifiers U5, U6 and U7 provide an output that is a dc level that varies logarithmically with signal strength. This dc level is applied to the AGC I/O subassembly where it is summed with a sample of the AM video to provide an indication of the signal strength to the Digital Control Section. The LOG video level is also provided to the Audio/Video/COR subassembly to activate the COR and Squelch circuitry.

Both the 21.4 MHz IF and AM video signals from the AM Demodulator are applied to the FM Demodulators (A3A17 through A3A21). Up to five FM Demodulators can be used with bandwidths corresponding to the 21.4 MHz IF Amplifier bandwidths. Each FM Demodulator is matched in bandwidth to one of the 21.4 MHz IF Amplifiers to provide a full-scale output at the IF signal band-edge. The FM portion of these subassemblies consists of FM detector circuitry to demodulate the 21.4 MHz IF and provide a video signal which is amplified by the video amplifier. The AM portion consists of a low-pass filter for filtering out any 21.4 MHz component present on the AM video signal. The AM and FM video outputs are then applied to the Audio/Video/COR subassembly (A3A15).

S.5 DETAILED CIRCUIT DESCRIPTION

S.5.1 TYPE 724006-X, 21.4 MHZ IF AMPLIFIER (A3A9-A3A13)

The Type 724006-X 21.4 MHz IF Amplifier is produced in several versions to provide IF bandwidths from 1.5 kHz to 300 kHz. Refer to schematic diagram **Figure S-19** as a reference for the following circuit description.

Each version of the Type 724006-X IF Amplifier is identical, with the exception of the band-limiting crystal filter (FL1) and values of some of the components used. Refer to **Table S-1** on the schematic diagram for the specific component values for each IF amplifier version.

When the IF Bandwidth slot selected contains one of these IF Amplifiers, the decoder on the AGC Amplifier (A3A8) applies +15 Vdc to connector pin 15, energizing the subassembly. The input signal from the 2nd Converter is supplied to input transformer T1. A voltage divider, composed of resistors R20, R19, and R18, is connected between +15 Vdc and ground to provide a dc level at connector pins 11 and 12 that represents the subassembly's IF bandwidth code (see **Table S-3**). This dc level, which is set by the adjustment of R19, is provided to the AGC Amplifier and to the Digital Control Section to indicate the IF bandwidth of the subassembly installed in each bandwidth slot. Diode CR1 isolates the voltage divider from the bandwidth code line when the IF Amplifier is not selected.

The 21.4 MHz input signal present at connector pin 1 is applied to the primary of transformer T1. This transformer provides an impedance match between the 2nd Converter and crystal filter FL1. Filter FL1 band-limits the 21.4 MHz IF signal to the stated bandwidth of the IF Amplifier and directs the band-limited signal, through C2 and R21 to pin 3 of FET amplifier Q1. Bias for gate 1 of Q1 (pin 3) is provided by the voltage divider formed by R5, R6 and R7. Bias for gate 2 (pin 2) is provided by the voltage divider formed by R2, R4 and potentiometer R3. Potentiometer R3 adjusts the amplifier gain by varying the gate bias on pin 2. The output of Q1 is developed across the tuned tank circuit formed by C9, C15, L2 and R11. This tank circuit is center tuned to 21.4 MHz and has a bandwidth greater than the tuned tank filter. Resistor R11 loads the tank and lowers the Q of the tank to widen the bandwidth of the tuned circuit and also limit the tank impedance. The value of R11 is selected to provide the proper gain of Q1, and the value of R3 (in the gate 2 circuit) provides the fine gain adjustment.

The output of Q1 is coupled across C10 to emitter follower Q2. This circuit buffers the output of Q1 and provides a low impedance output at connector pin 29. The 21.4 MHz IF output is developed across R15 and is coupled to the output by C12 and R17. Bias for Q2 is provided to the base of the transistor by the voltage divider formed by R12 and R13.

S.5.2 TYPE 726013-X, 21.4 MHZ IF AMPLIFIER (A3A9-A3A13)

The Type 726013-X IF Amplifier is produced in several versions, providing IF bandwidths from 500 kHz to 4 MHz. The only difference between the different versions is the bandpass filter (FL1). **Table A** on the Type 726013-X schematic diagram (**Figure S-20**) lists the filter number for the different IF amplifier type numbers.

When the IF bandwidth slot containing the Type 726013-X 21.4 MHz IF Amplifier is selected, +15 Vdc is applied from the AGC Amplifier (A3A8) bandwidth decoder U10 to connector pin 15 to energize the selected IF Amplifier. With the IF Amplifier energized, the 21.4 MHz IF signal at connector pin 1, from the 2nd Converter (A3A7), is transformer coupled across transformer T1 to bandpass filter (FL1). Crystal filter FL1 limits the IF bandwidth to the stated bandwidth (±10%). This band-limited IF signal is coupled across C5 to the base of amplifier Q1. Resistor R7 provides impedance matching for the output of FL1. Resistors R4, R5, R6 and R8 provide base biasing for transistor Q1. Emitter biasing for Q1 is provided by resistors R11, R12 and R13. Variable resistor R13 controls the gain of Q1. The amplified output from Q1 is directed to the primary of transformer T2. Resistor R9 loads the primary of T2 and along with R10 provides collector biasing for Q1. IF signals from the secondary transformer of T2 are capacitive coupled by C7 to connector pin 29. From pin 29, the 21.4 MHz IF signal is directed to the AM Demodulator/IF Output Amplifier (A3A16).

The +15 Vdc bandwidth select voltage, at connector pin 15, is applied through inductor L1 to provide the supply voltage for transistor Q1. This select voltage is also used by the voltage divider (R1, R2 and R3) to forward bias diode CR1 and provide the bandwidth code voltage to connector pin 11. Variable resistor R2 adjusts the bandwidth code voltage to be within limits for the selected bandwidth. Refer to **Table S-3** for the bandwidth code voltages. When an IF Amplifier is not selected, CR1 is reverse biased to prevent an erroneous voltage from being applied to the bandwidth code line.

Capacitors C1, C2, C3 and C4 provide filtering of any ac variations that may be on the supply voltage lines.

S.5.3 TYPE 796337-1, 21.4 MHZ IF AMPLIFIER (8 MHZ) (A3A9-A3A13)

Refer to **Figure S-21** for the Type 796377-1 schematic diagram.

When the bandwidth slot containing the 8 MHz IF Amplifier is selected, +15 Vdc is supplied to connector pin 15. Resistors R1, R2 and R3 from a voltage divider network to provide a dc voltage at connector pins 11 and 12. Resistor R2 is adjusted to provide the proper bandwidth code to the Digital Control Section and to the AGC Amplifier to indicate that the 8 MHz IF Amplifier is in the active bandwidth slot. Diode CR1 isolates the voltage divider from the bandwidth code lines when the 8 MHz IF Amplifier is not selected.

The input signal entering at connector pin 1 is applied through C1 to a resistive attenuator pad composed of resistors R4, R5 and R6. This resistive pad provides approximately 7 dB of signal attenuation. Attenuated IF signals are capacitively coupled by C4 to connector pin 29 as the 21.4 MHz IF Output.

Capacitors C2 and C3 provide filtering of any ac variations present on the bandwidth select line.

S.5.4 TYPE 726009-X, SWITCHABLE IF BANDWIDTH FILTER AMPLIFIER (A3A9-A3A13)

The Type 726009-X Switchable IF Bandwidth Filter Amplifier is produced in several versions providing IF bandwidths from 3.2 kHz to 300 kHz. Refer to **Figure S-28** for the Type 726009-X, Switchable IF Bandwidth Filter Amplifier schematic diagram.

Each version of the Type 726009-X Switchable IF Bandwidth Filter is identical, with the exception of the band-limiting crystal filters FL1 and FL2, and the values of some of the components. Refer to the **Table 1** on schematic diagram **Figure S-28** for the specific component values for the different IF amplifier versions.

When the IF bandwidth slot containing this subassembly is selected, the decoder on the AGC Amplifier (A3A8) applies +15 Vdc to connector pin 15 to energize the IF subassembly. The input signal from the 2nd Converter is applied from connector of pin 1 to input transformer T1. A voltage divider, composed of R1, R2 and R3, provides a dc level at connector pins 11 and 12 that represents the subassembly's IF bandwidth. This dc level, set by potentiometer R2, is applied to the AGC Amplifier and to the Digital Control Section to determine the IF bandwidth of each filter installed in the selected bandwidth slot. Diode CR1 isolates the voltage divider from the bandwidth code line when this subassembly is not selected. Switching control (BWA/BWB) at connector pin 5 provides switching logic from the Switchable FM Demodulator subassemblies to select the upper (logic "1") or lower (logic "0") IF bandwidth filter. A logic "1" at connector pin 5 turns transistor Q2 on, which in turn grounds Q1 selecting the upper filter when Q3 conducts. A logic "0" selects the lower filter by turning on transistor Q1.

The 21.4 MHz IF signal entering at connector pin 1 is applied to transformer T1. This transformer provides an impedance match between the 2nd Converter and crystal filters FL1 and FL2. These filters band-limit the 21.4 MHz IF signal to the stated bandwidths of this subassembly and apply the band-limited signal through either capacitor C8 or C14 to pin G1 of FET amplifier Q4. Bias for gate 1 of Q4 is provided by the voltage divider formed by R20, R23 and R24. Bias for gate 2 (G2) is provided by the voltage divider formed by R19, R22 and potentiometer R21. Potentiometer R21 provides the gain adjustment of Q4 by varying the bias on gate 2. The output of Q4 is developed across the tuned tank circuit formed by C22, C24, L11 and R28. This tank circuit is center tuned to 21.4 MHz and has a bandwidth greater than that of the crystal filters. Resistor R28 lowers the Q of the tank to widen the bandwidth of the tuned circuit and limit the tank impedance. The value of R28 is selected to provide the proper gain of Q4 with potentiometer R21 (in the gate 2 circuit) providing fine gain adjustment.

The tank circuit output is coupled across C25 to emitter follower Q5. This circuit buffers the output of Q4 and provides a low impedance output at connector pin 29. The 21.4 MHz IF output is developed across R33 and is coupled to the output by C28 and R34. Bias for Q5 is provided to the base of the transistor by the voltage divider formed by R29 and R30.

S.5.5 TYPE 726010-X, SWITCHABLE IF BANDWIDTH FILTER AMPLIFIER (A3A9-A3A13)

The Type 726010-X Switchable IF Bandwidth Amplifier is produced in several versions providing IF bandwidths of from 400 kHz to 10000 kHz. Refer to **Figure S-29** for the Type 726010-X, Switchable IF Bandwidth Filter Amplifier schematic diagram. Each version of the Type 726010-X Switchable IF Bandwidth Filter is identical, with the exception of band-limiting crystal filters FL1 and FL2, and values of some of the components used. Refer to **Table 1** on the schematic diagram for the specific component values for the different IF bandwidth versions.

When the IF bandwidth slot containing this subassembly is selected, the decoder on the AGC Amplifier (A3A8) applies +15 Vdc at connector pin 15 to energize the subassembly. When energized, the input signal from the 2nd Converter is applied to input transformer T1 from connector pin 1. A voltage divider, composed of R16, R17 and R18, provides a dc level to connector pins 11 and 12 that represents the subassembly's IF bandwidth. This dc level is set by potentiometer R17 and is applied to the AGC Amplifier and to the Digital Control Section to determine the bandwidth of each filter installed in the selected IF bandwidth slot. Diode CR9 isolates the voltage divider from the bandwidth code line when this subassembly is not selected. When transistor Q3 conducts, diode CR10 is forward biased and the voltage divider formed by R15, R17 and R18 provides the bandwidth code voltage to connector pins 11 and 12 through diode CR9. When transistor Q1 conducts, diode CR11 is forward biased and the voltage divider formed by R16, R17 and R18 provide the bandwidth code voltage to connector pins 11 and 12 through diode CR9. Logic levels present at connector pin 5 (Switching Control) provide switching logic from the Switchable FM Demodulator subassemblies to select the upper (logic "1") or lower (logic "0") IF bandwidth filters.

A logic "1" at connector pin 5 is used to select the upper filter (FL2). With a logic "1" at connector pin 5, transistor Q2 turns on and grounds the base of transistors Q1 and Q3. This condition turns on Q3 and turns off Q1. When Q3 conducts, the voltage from Q3 is applied through inductors L2 and L3 to forward bias shunt diodes CR2 and CR3 and forward bias series diodes CR5 and CR8. With Q1 cut off, a low voltage from Q1 is applied to shunt diodes CR6 and CR7 and to series diodes CR1 and CR4 reverse biasing them. Under these operating conditions, the IF signal present at connector pin 1 is easily passed through forward biased diode CR5, through the bandpass filter (FL2) and through forward biased diode CR8.

IF signals present at the input of the unselected IF filter path have to first pass through reverse biased diode CR1. Any signals that pass through CR1 are shunted by forward biased diode CR2. If any IF signal is passed through FL1, the filtered output signal is further shunted by forward biased diode CR3. Additional signal attenuation is provided by reverse biased diode CR4. This results in a negligible IF signal level for the unselected IF bandwidth filter.

Applying a logic "0" at connector pin 5 turns off transistor Q2 which also turns off Q3 and turns on Q1. When transistor Q1 conducts, a high voltage from Q1 is applied through inductors L1 and L4 to series diodes CR1 and CR4 and also through inductors L6 and L7 to shunt diodes CR6 and CR7. Under these operating conditions, the IF signal present at connector pin 1 is directed through the FL1 filter signal path and any IF signal applied to the FL2 signal path is greatly attenuated.

After filtering the 21.4 MHz IF signal is applied through either capacitor C8 or C14 to transistor Q4. Bias for Q4 is provided by a voltage divider formed by R19, R20 and R22. The gain of Q4 is adjusted by potentiometer R27 and its output is buffered by the circuitry composed of C20, R23 and R24. A low impedance output at connector pin 29 is provided via transformer T2 and coupling capacitor C21.

S.5.6 TYPE 794106-X, FM DEMODULATOR (A3A17-A3A21)

Type 794106-X FM Demodulator provides FM demodulation and AM filtering of the received signals. These FM Demodulators can be installed in slots A3A17 through A3A21 of the RF/IF Motherboard. Refer to **Figure S-22** for the Type 794106-X FM Demodulator schematic diagram. With the exception of component values, which determine the bandwidth of these subassemblies, the FM Demodulators are identical. Refer to **Table A** on the schematic diagram for the component value differences for the different type numbers.

The detected AM signal, from the AM Demodulator (A3A16), enters at connector pins 15 and 16 and is supplied to pin 16 of U3. U3 functions as a switch to permit the signal to pass when the bandwidth slot containing this FM Demodulator is selected. When selected, a +15 Vdc switching voltage from the AGC Amplifier (A3A8), is provided to pin 15 of U3, closing the switch contacts between pins 16 and 1. The AM signal is then passed through a low-pass filter composed of L5 and C17 and applied to connector pin 13. This filter has a cutoff frequency equal to one-half of the selected bandwidth, thus limiting the bandwidth of the detected AM signal.

The FM portion of this subassembly is composed of U1, U2 and their associated components. Integrated circuit U1 functions as a FM limiter and quadrature detector, with crystal filter Y1 and inductors L1 and L2 forming the quadrature circuit. U1 compares the phase of the 21.4 MHz IF signal from connector pin 27 with the signal developed across the quadrature circuit and provides a demodulated output which represents the phase deviations about 90°. At the 21.4 MHz center frequency, the phase difference is 90°, with the phase difference shifting above and below 90°, with FM modulation.

The demodulated FM signal is then applied, through buffer U2B, to amplifier U2A. Integrated circuit U2A provides amplification of the detected signal to drive the output stages on the Audio/Video/COR subassembly (A3A15). The gain of this circuit is set to provide a 2 volt peak-to-peak output, at full IF deviation, by the ratio of resistor R14 and potentiometer R15. Resistors R11, R13 and potentiometer R12 provide a dc bias to pin 3 of U2A to adjust the offset of the output. Resistor R12 is adjusted to provide a "0" output at the 21.4 MHz IF center frequency. The low-pass filter at the output of U2A, composed of L4 and C11, filters out any IF component present on the detected video signal.

S.5.7 TYPE 794107-X, FM DEMODULATOR (A3A17-A3A21)

The Type 794107-X FM Demodulator is produced in several versions to provide bandwidths of from 50 kHz to 300 kHz. **Table A** on the schematic diagram lists the different versions of this subassembly. With the exception of component value differences, listed in **Table A** on **Figure S-23**, each Type 794107-X FM Demodulator version is identical. Refer to the schematic diagram **Figure S-23** as a reference for the following circuit description.

The AM portion of this subassembly accepts the detected AM video signal from the AM Demodulator (A3A16) and provides band-limiting through a low-pass filter, composed of L4 and C16. The filter cutoff frequency is set to one-half of the selected IF bandwidth. Integrated circuit U4 functions as a switch to permit the AM video signal to pass only when the slot containing this subassembly is selected. When selected, +15 Vdc is provided by the AGC Amplifier at connector pin 25, causing the switch contact between pins 16 and 1 to close.

The FM portion of this subassembly is comprised of U1, U2, U3 and their associated components. The 21.4 MHz IF signal enters at connector pins 27 and 28 and is coupled through capacitor C1 to pin 1 of integrated circuit U1. Integrated circuit U1 provides limiting and demodulation of the IF signal to produce the FM video output. The tank circuit, comprised of R2, C6, C7, C18 and L2, is tuned to 21.4 MHz and is connected in series with inductor L7 to provide the required phase shifted signals to the quadrature detector contained in U1. At the 21.4 MHz center frequency the tank circuit appears as a pure resistance, causing a 90° phased shifted signal to be applied to pin 9 of U1. The IF signal and the 90° phase shifted signal produce a "0" output from the detector. As the IF signal shifts above and below 21.4 MHz, due to FM modulation, the signal phase at pin 9 shifts above and below 90° causing the detector to produce an output equal to the FM modulation. This demodulated output is then applied to output amplifier U3, through buffer U2. U2 provides a voltage gain that is determined by the ratio of resistor R10 and potentiometer R11. Gain of U3 is set by R11 to produce a 2 volt peak-to-peak signal at the output when the FM modulation is equal to the bandwidth of the FM demodulator. A voltage divider formed by R13, R15 and potentiometer R14 provides bias at pin 3 of U3 to adjust the offset of the output signal. From U3, the signal is directed to connector pin 1 through a low-pass filter composed of L3 and C12. This filter removes any residual 21.4 MHz IF component from the demodulated signal.

S.5.8 TYPE 794104-X, FM DEMODULATOR (A3A17-A3A21)

The Type 794104-1 and Type 794104-2 FM Demodulators provide FM demodulation and AM video filtering for IF bandwidths of 1 MHz and 500 kHz, respectively. These subassemblies can be installed into slots A3A17 through A3A21 of the RF/IF Motherboard. Refer to **Figure S-26** for the Type 794104-X FM Demodulator schematic diagram.

The IF input applied to this subassembly enters at connector pin 27 and is coupled through capacitor C1 to integrated circuit U1. U1 is a high gain, wideband amplifier which provides an overdriven output clipping AM variations from the IF signal. The supply voltage for U1 is provided by diodes VR1 and VR2 which combine to drop the +15 Vdc input to approximately +6.5 Vdc.

From limiter U1, the clipped signal is applied through load resistor R2 to a Foster-Seeley discriminator. The primary of transformer T1, L1, R5, and capacitors C6 through C8 form a tank circuit that is tuned to 21.4 MHz by capacitor C8. Capacitor C9 couples and phase shifts a portion of the primary signal to the secondary circuit of T1 for summing with the signal coupled across the transformer. The secondary circuit of T1 is tuned to 21.4 MHz by the secondary of T1, C12, C14 and the adjustment of C10. The secondary circuit senses the phase difference as the FM modulated signal deviates about the IF center frequency. In the secondary circuit, an amplitude-varying signal is created whose amplitude varies with frequency shift. This amplitude varied signal is detected by diodes CR1 and CR2 and is then developed across resistors R7 and R8. Capacitor C15 filters out any IF component from the detected signal.

The detected video signal from the FM discriminator is applied through resistor R11 to output amplifier, U2. Resistors R10, R12, R13, R14 and potentiometer R9 form a voltage divider to provide the bias voltage at pin 2 of U2. Potentiometer R9 adjusts the offset at the output of U2 to provide a "0" output at the 21.4 MHz IF center frequency. Resistor R15 and potentiometer R16 set the gain of U2 to provide the proper peak-to-peak output signal level. At the output of U2, a low-pass filter, comprised of L7 and C21 eliminates any residual IF component and high frequency noise from the output signal.

The AM video signal provided by the AM Demodulator (A3A16) enters this subassembly at connector pin 15. This signal is developed across R18 and is applied to pin 16 of U3. The +15 Vdc BW SEL input from the AGC Amplifier (A3A8) causes U3 to switch on when this subassembly is selected, providing a signal path out of U3 pin 1. Inductor L4 and capacitor C22 comprise a low-pass filter to limit the bandwidth of the video signal. The cutoff frequency of this low-pass filter is equal to one-half of the selected IF bandwidth.

S.5.9 TYPE 794105-X, FM DEMODULATOR (A3A17-A3A21)

Type 794105-X FM Demodulator subassemblies can be installed in slots A3A17 through A3A21 on the RF/IF Motherboard. These subassemblies are identical, except for the component values indicated in **Table 1** on the schematic diagram. Refer to **Figure S-27** for the Type 794105-X, FM Demodulator schematic diagram.

The IF signal is applied to this subassembly at connector pin 27 and is coupled across C15 to amplifier U1. This high gain amplifier provides an overdriven output that clips any AM variation from the IF signal. The supply voltage for U1 is provided through VR1, which drops the +15 Vdc input to approximately +10 Vdc. This voltage is supplied to pin 10 of U1 to provide the operating voltage, and to U1 pin 5, to provide the collector supply voltage for the output.

From the output of U1, the IF signal is applied to a Foster-Seeley discriminator. The primary of transformer T1, L1, C9 and C2 form a tank circuit tuned to 21.4 MHz by capacitor C2. Capacitor C5 couples and phase shifts the primary signal and supplies the phase shifted signal to the secondary circuit of T1 for summing with the signal coupled across the transformer. The secondary circuit of T1 (tuned to 21.4 MHz by the secondary winding of T1, C6, C7 and C10) senses the phase difference as the modulated signal deviates about the IF center frequency, due to FM modulation. In the secondary circuit, an amplitude-varied signal is created, whose amplitude varies with the frequency shift. This signal is detected by diodes CR1 and CR2 and is developed across resistors R4 and R5. Capacitor C8 functions as a filter capacitor to remove any residual IF component from the detected signal.

The detected video signal from the FM discriminator is applied across resistor R2 to output amplifier U2. A voltage divider, formed by R6, R8, R12, R13 and potentiometer R14, provides a dc bias voltage at the inverting input of U2 to adjust the dc offset at the output of the amplifier. Potentiometer R9 adjusts the amplifier gain to provide the proper peak-to-peak output signal amplitude. At the output of U2, the low-pass filter comprised of L3 and C11 provides additional filtering to eliminate residual IF components and high frequency noise.

The AM video signal, provided by the AM Demodulator (A3A16) enters the FM Demodulator at connector pin 15. This signal is developed across resistor R10 and is then applied to pin 16 of U3. The +15 Vdc BW SEL input supplied by the AGC Amplifier (A3A8) causes U3 to switch on when this subassembly is selected, providing a signal path through U3 to the output. Inductor L4 and capacitor C12 comprise a low-pass filter with a cutoff frequency equal to one-half of the selected IF bandwidth. This filter limits the bandwidth of the AM video signal to the proper frequency range.

S.5.10 TYPE 796354-X, SWITCHABLE FM DEMODULATOR (A3A17-A3A21)

The Type 796354-X Switchable FM Demodulator can be installed in slots A3A17 through A3A21 on the RF/IF Motherboard. This demodulator subassembly is produced in several versions and provides bandwidths from 3.2 kHz to 50 kHz. Refer to **Figure S-30** for the Type 796354-X Switchable FM Demodulator schematic diagram. **Table 1** on the schematic diagram lists the component values that are different on the various versions of this subassembly.

The detected AM signal from the AM Demodulator (A3A16) enters at connector pins 15 and 16 and is applied to pin 16 of U2. U2 functions as a switch permitting the signal to pass when the bandwidth slot containing this FM Demodulator is selected. When selected, a +15 Vdc switching voltage, provided by the AGC Amplifier (A3A8), is applied to pin 15 of U2 causing the switch contact between pins 16 and 1 to close. The AM signal is then applied to output connector pin 13 through analog switch U5. A logic "0" from the Digital Control Section applied to connector pin 7 selects the narrow bandwidth and a low-pass filter composed of L6 and C17. A logic "1" selects the wide bandwidth through U5 and a low-pass filter composed of L7 and C18. These filters limit the bandwidth of the detected AM signal to one-half of the selected bandwidth.

The FM portion of this subassembly is composed of U1, U3 and their associated components. Integrated circuit U1 functions as a FM limiter and quadrature detector, with crystal filter Y1 and inductors L1 and L3 forming the quadrature circuit. U1 compares the phase of the 21.4 MHz IF signal with the signal developed across the quadrature circuit and provides a demodulated output which represents the phase deviations about 90°. At the 21.4 MHz center frequency, the phase difference is 90°. This phase difference shifts above and below 90° accordingly with the FM modulation. The demodulated FM signal is then applied through buffer U3B to amplifier U3A. Integrated circuit U3A provides amplification of the detected signal to drive the output stages in the Audio/Video/COR subassembly (A3A15). Amplifier gain is set to provide a 2 volt peak-to-peak output at full IF deviation by the ratio of resistor R16 and potentiometer R17. Resistors R13, R15 and potentiometer R14 provide a dc bias to pin 3 of U3A to adjust the offset of the output. R14 is adjusted to provide a "0" output at the 21.4 MHz IF center frequency. The low-pass filters (L4 and C13 - for logic "0" at connector pin 7 or L5 and C14 - for a logic "1" at connector pin 7) filter out any IF component present on the detected video signal.

S.5.11 TYPE 796355-X, SWITCHABLE FM DEMODULATOR (A3A17-A3A21)

The Type 796355-X Switchable FM Demodulator can be installed in slots A3A17 through A3A21 on the RF/IF Motherboard. This demodulator subassembly is produced in several versions and have bandwidths from 50 kHz to 300 kHz. Refer to **Figure S-31** for the Type 796355-X Switchable FM Demodulator schematic diagram. Component differences between the different version type numbers are listed in **Table 1** on the schematic diagram.

The AM portion of this subassembly accepts the detected AM video signal from the AM Demodulator (A3A16) and provides band-limiting through a low-pass filter, composed of L8 and C16 for the narrow bandwidth (for a logic "0" at connector pin 7) and L9 and C17 for the wider bandwidth (for a logic "1" at connector pin 7). The bandwidth is selected by the control signal logic level applied to analog switch U5 from connector pin 7. The filter cutoff frequency is set to one-half of the selected IF bandwidth. Integrated circuit U3 functions as a switch, permitting the AM video signal to pass only when the slot containing this subassembly is selected. When selected, +15 Vdc is provided by the AGC Amplifier at connector pin 25, to close the switch contacts between pins 16 and 1. This provides an AM signal at pins 3 and 4 of digital switch U5.

A logic "0" at connector pin 7 provides a signal path through low-pass filter L8 and C16. A logic "1" at pin 7 provides a signal path through L9 and C17. These filters limit the AM bandwidth to one-half the selected bandwidth.

The FM portion of this subassembly is composed of U1, U2A, U2B, U4 and their associated components. The 21.4 MHz IF signal enters at connector pins 27 and 28 and is coupled through C1 to integrated circuit U1. Integrated circuit U1 provides limiting and demodulation of the IF signal to produce the FM video output. A tank circuit, composed of R4, C6, C9, C8 and L3, is tuned to 21.4 MHz and is connected in series with L1 providing the required phase shifted signals to the quadrature detector, contained in U1. At the 21.4 MHz center frequency, the tank circuit appears as a pure resistance, causing a 90° phase shifted signal to be present at pin 9 of U1. The IF signal and the 90° phase shifted signal produce a "0" output from the quadrature detector. As the IF signal shifts above and below 21.4 MHz, due to FM modulation, the signal phase at pin 9 shifts above and below 90° causing the detector to produce an output equal to the FM modulation. This demodulated output is then applied to output amplifier U2B, through buffer U2A. U2A provides a voltage gain that is determined by resistor R12 and potentiometer R13. The gain is set by R13 to produce a 2 volt peak-to-peak signal at the output when the FM modulation is equal to the bandwidth of the FM demodulator. A voltage divider formed by resistors R14, R16 and potentiometer R15 provides bias at pin 3 of U2B to adjust the offset of the output signal. From U2B, the signal is applied to the output through a low-pass filter composed of L4 and C12 for the narrow bandwidth or L5 and C13 for the wide bandwidth. Filter selection is controlled by the signal level applied to analog switch U4, at connector pin 7. The low-pass filter removes any residual 21.4 MHz IF component from the demodulated signal.

S.5.12 TYPE 796356-X, SWITCHABLE FM DEMODULATOR (A3A17-A3A21)

The Type 796356-X Switchable FM Demodulator can be installed in slots A3A17 through A3A21 on the RF/IF Motherboard. This demodulator subassembly is produced in several versions having bandwidths from 250 kHz to 1000 kHz. Refer to **Figure S-32** for the Type 796356-X Switchable FM Demodulator schematic diagram. **Table 1** on the schematic lists the component differences between the different versions.

The IF input to this subassembly enters at connector pin 27 and is coupled through capacitor C4 to integrated circuit U1. U1 is a high gain, wideband amplifier that provides an overdriven output in order to clip any AM variations from the IF signal. The supply voltage for U1 is applied through diodes VR1 and VR2 which drop the +15 Vdc input to approximately +6.5 Vdc.

From limiter U1, the clipped signal is applied to a Foster-Seeley discriminator. The primary of transformer T1, L3, R3, C9, C11 and C12 form a tank circuit, tuned to 21.4 MHz by capacitor C12. Capacitor C13 couples and phase shifts a portion of the primary signal to the secondary circuit of T1 for summing with the signal coupled across the transformer. The secondary circuit of T1 (tuned to 21.4 MHz by the secondary of T1, and capacitors C16, C17 and C15) senses the phase difference as the FM modulated signal deviates about the IF center frequency. In the secondary circuit, an amplitude-varying signal is created whose amplitude varies with frequency shift. This amplitude varied signal is then detected by diodes CR1 and CR2 and is developed across R7 and R8. Capacitor C18 filters out any remaining IF component from the detected signal.

The detected video signal from the FM discriminator is coupled across R14 to pin 2 of the output amplifier U2. Resistors R9, R11, R12 and potentiometer R10 form a voltage divider providing bias at pin 2 of U2. The adjustment of R10 varies the offset at the output to provide a "0" output at the 21.4 MHz IF center frequency. Resistor R13 and potentiometer R16 set the gain of U2 to provide the proper peak-to-peak output signal level. At the output of U2, a low-pass filter composed of L5 and C22 for the narrow bandwidth (for a logic "0" at connector pin 7) or L6 and C23 for the wider bandwidth (for a logic "1" at connector pin 7) eliminates any residual IF component and high frequency noise from the output signal. The bandwidth is selected by the control signal logic level applied to analog switch U4 from connector pin 7.

The AM video signal provided by the AM Demodulator (A3A16) enters this subassembly at connector pin 15. This signal is developed across R15 and is applied to pin 16 of U3. The +15 Vdc BW SEL input from the AGC Amplifier (A3A8) causes U3 to close the switch contacts when this subassembly is selected, providing a signal path out of U3, pin 1. A low-pass filter composed of L7 and C24 for the narrow bandwidth (logic "0") or L8 and C25 for the wide bandwidth (logic "1") limits the bandwidth of the video signal. The cutoff frequency of this filter is equal to one-half of the selected IF bandwidth. The bandwidth is selected by the control signal logic level applied to analog switch U5 at connector pin 7.

S.5.13 TYPE 796357-X, SWITCHABLE FM DEMODULATOR (A3A17-A3A21)

The Type 796357-X Switchable FM Demodulator can be installed in slots A3A17 through A3A21 on the RF/IF Motherboard. This demodulator subassembly is produced in several versions having bandwidths from 1000 kHz to 10000 kHz. Refer to **Figure S-33** for the Type 796357-X Switchable FM Demodulator schematic diagram. **Table 1** on the schematic diagram lists the component value differences for each version of this FM demodulator type.

The IF input signal enters this subassembly at connector pin 27 and is coupled across capacitor C3 to amplifier U1. This high gain amplifier provides an overdriven output that clips any AM variation from the IF signal. The supply voltage for U1 is provided through VR1, which drops the +15 Vdc input to approximately +10 Vdc. This voltage is supplied to U1 pin 10, providing the operating voltage, and to U1 pin 5, through T1, L3 and R2 providing the collector supply for the output circuitry of U1.

From the output of U1, the IF signal is applied to a Foster-Seeley discriminator. The primary of transformer T1, L3 and C8 form a tank circuit tuned to 21.4 MHz by the adjustment of capacitor C8. Capacitor C9 couples and phase shifts the primary signal and supplies the phase shifted signal to the secondary circuit of T1 for summing with the signal coupled across the transformer. The secondary circuit of T1 tuned to 21.4 MHz, by the secondary winding of T1, C11 and C12, senses the phase difference as the modulated signal deviates about the IF center frequency, due to FM modulation. In the secondary circuit, an amplitude-varied signal is created, whose amplitude varies with the frequency shift. This signal is detected by diodes CR1 and CR2 and is developed across resistors R4 and R5. Capacitor C13 functions as a filter capacitor to remove any residual IF component from the detected signal.

The detected video signal from the FM discriminator is coupled across resistor R12, to pin 3 of output amplifier U2. A voltage divider formed by R6, R8, R9 and potentiometer R7 provides a dc bias voltage at the inverting input of U2 to adjust the dc offset at the amplifier output. Potentiometer R11 adjusts the amplifier gain to provide the proper peak-to-peak output signal amplitude. At the output of U2, the low-pass filter composed of L5 and C17 for the narrow bandwidth (for a logic "0" at connector pin 7) or L6 and C18 for the wide bandwidth (for a logic "1" at connector pin 7) provides additional filtering to eliminate residual IF components and high frequency noise. The FM bandwidth is selected by the control signal logic level applied to analog switch U4 from connector pin 7.

The AM video signal, from the AM Demodulator (A3A16), enters this subassembly at connector pin 15. This signal is applied to pin 16 of switch U3. The +15 Vdc BW SEL input, supplied by the AGC Amplifier (A3A8), causes U3 to close the switch contacts on when this subassembly is selected, providing a signal path through U3 to switch U5. The low-pass filter composed of L7 and C19 for the narrow bandwidth (logic "0") or L8 and C20 for the wide bandwidth (logic "1") provides a cutoff frequency equal to one-half of the selected FM bandwidth. These filters limit the bandwidth of the AM video signal to the proper frequency range.

S.6 PERFORMANCE TESTS

S.6.1 IF AMPLIFIER PERFORMANCE TESTS

1. Connect the test equipment as illustrated in **Figure S-1.**

2. Set the receiver to the standard test setting described in **Table S-2,** except tune the receiver to 80.0000 MHz and select AGC off.

3. Adjust the signal generator for a 80.0000 MHz CW signal, with the output set to minimum. Set the TF-10141 attenuator for a 3 dB loss.

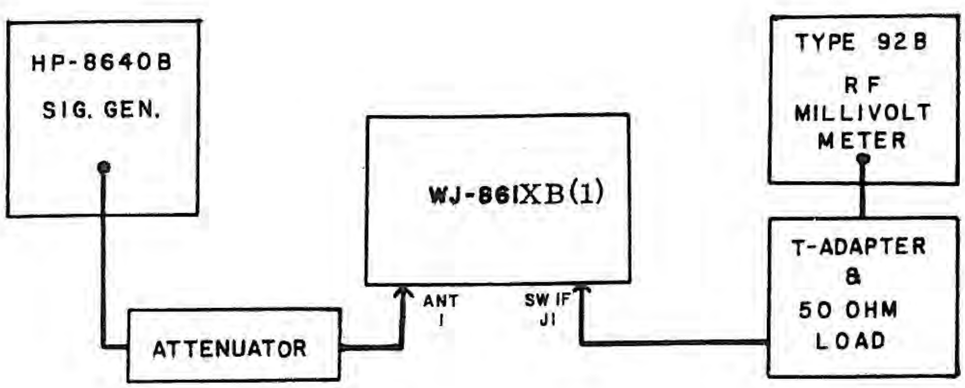


Figure S-1. Amplifier Performance Test, Equipment Connections

Table S-2. Standard Receiver Test Settings

Front Panel	
FREQUENCY	255.5550 MHz
DETECT MODE	AM
AGC	ON
BANDWIDTH	75 kHz (medium)
TUNING RATE	Disabled
AFC	OFF
AUDIO GAIN	Midrange
RF/IFF GAIN	Fully CW
MEMORY SELECT	00
COR LEVEL	00
DWELL	Fully CW
Antenna Selection	ANT 1 (ANT 2 OFF)
Operating Mode	Manual (Local Control)
Rear Panel	
REF SEL (S2)	INT
FL1 S1	120V (or nearest to local line voltage)
LINE AUDIO (R3)	Midrange

4. Increase the signal generator output level (as required) to produce a -30 dBm indication on the Type 92B RF Millivoltmeter.

5. Set the attenuator to 0 dB and increase the signal generator frequency until the RF millivoltmeter again reads -30 dBm. Note the generator frequency.

6. Decrease the signal generator frequency, past 80.0000 MHz, until the millivoltmeter again reaches -30 dBm. Note the generator frequency.

7. Compute the 3 dB bandwidth by subtracting the frequency reading obtained in step 6 from that obtained in step 5. The computed bandwidth should equal the selected bandwidth ±10%.

8. Set the generator frequency for 80.0000 MHz and adjust the output for -30 dBm on the millivoltmeter.

9. Tune the receiver across the IF passband while observing the level variations above and below the -30 dBm reference. The level variations should be no greater than 2.0 dB peak-to-peak.

10. Select the #2 bandwidth and repeat steps 3 through 9.
11. Select the #3 bandwidth and repeat steps 3 through 9.
12. Select the #4 bandwidth and repeat steps 3 through 9.
13. If a 5th IF bandwidth is used, select bandwidth #5 and repeat steps 3 through 9.
14. If the results in steps 3 through 12 are incorrect for any of the selected bandwidths, place the suspected subassembly into a normally operating IF Amplifier slot and retest. If the results are still abnormal, replace the IF Amplifier.

S.6.2 FM DEMODULATOR PERFORMANCE TEST

1. Connect the test equipment as illustrated in **Figure S-2.**
2. Set the receiver to the standard test setting described in **Table S-2**, except, select FM Detection and the #1 bandwidth.
3. Adjust the signal generator to produce a 255.5550 MHz CW signal at an output level of -45 dBm. Set the DVM to measure dc voltage.
4. Observe the dc voltage offset displayed on the DVM. This voltage should be 0.00 ±.20 Vdc.
5. Increase the signal generator frequency by exactly one-half of the selected IF bandwidth and observe the dc voltage reading on the DVM. This voltage should read -2.00 ±.20 Vdc, ± the offset observed in step 4.
6. Return the signal generator frequency to 255.5550 MHz and then decrease the frequency by exactly one-half of the selected IF bandwidth. The voltage displayed on the DVM should read +2.00 ±.20 Vdc, ± the offset observed in step 4.
7. Select IF bandwidth #2 and repeat steps 3 through 6.
8. Select IF bandwidth #3 and repeat steps 3 through 6.
9. Select IF bandwidth #4 and repeat steps 3 through 6.
10. Select IF bandwidth #5 (if used) and repeat steps 3 through 6.
11. If the results obtained in steps 3 through 10 are incorrect for any of the selected IF bandwidths, place the suspected FM Demodulator into one of the normally operating FM Demodulators. (The IF Amplifier associated the suspected bandwidth must also be exchanged.) Retest the subassembly in the new location.

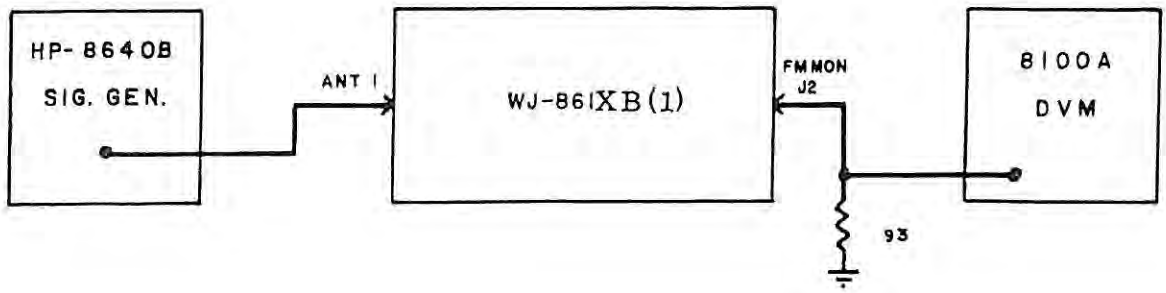


Figure S-2. FM Demodulator Performance Test, Equipment Connections

12. If the results are still abnormal and the IF Amplifier checks normal, per **paragraph S.6.1**, replace the FM Demodulator.

S.6.3 SWITCHABLE IF FILTER AMPLIFIER PERFORMANCE TESTS

1. Connect the test equipment as illustrated in **Figure S-1** of this appendix.

2. Set the receiver to the standard test setting described in **Table S-2**, except tune the receiver to 80.0000 MHz and select AGC off.

3. Adjust the signal generator for a 80.0000 MHz CW signal, with the output level set to minimum. Set the TF-10141 attenuator for a 3 dB loss.

4. Increase or decrease the signal generator output level to produce a -30 dBm indication on the RF millivoltmeter.

5. Set the attenuator to 0 dB and increase the signal generator frequency until the RF millivoltmeter again reads -30 dBm. Note the generator frequency.

6. Decrease the signal generator frequency past 80.0000 MHz until the millivoltmeter again reaches -30 dBm. Note the generator frequency.

7. Compute the 3 dB bandwidth by subtracting the frequency reading obtained in step 4 from that obtained in step 5. The computed bandwidth should equal the selected bandwidth ±10%.

8. Set the generator frequency for 80.0000 MHz and adjust the output for -30 dBm on the millivoltmeter.

9. Tune the receiver across the IF passband while observing the level variations above and below the -30 dBm reference. The level variations should be no greater than 2.0 dB peak-to-peak.

10. Select each of the other nine IF bandwidths and repeat steps 3 through 9.

11. If the results in steps 3 through 10 are incorrect for any of the selected bandwidths, place the suspected subassembly into a normally operating Switchable IF Filter Amplifier slot and retest. If the results are still abnormal, replace the Switchable IF Filter Amplifier.

S.6.4 SWITCHABLE FM DEMODULATOR PERFORMANCE TESTS

1. Connect the test equipment as illustrated in **Figure S-2.**

2. Set the receiver to the standard test setting described in **Table S-2,** except select FM Detection and the #1 bandwidth.

3. Adjust the signal generator to produce a 255.5550 MHz CW signal at an output level of -45 dBm. Set the digital voltmeter (DVM) to measure dc voltage.

4. Observe the dc voltage offset displayed on the DVM. This voltage should be 0.00 ±.10 Vdc.

5. Increase the signal generator frequency by exactly one-half of the selected IF bandwidth and observe the dc voltage reading on the DVM. This voltage should read -1.00 ±.20 Vdc, ± the offset observed in step 4.

6. Return the signal generator frequency to 255.5550 MHz and decrease the frequency by exactly one-half of the selected IF bandwidth. The voltage displayed on the DVM should read +1.00 ±.20 Vdc, ± the offset observed in step 4.

7. Select each of the other nine IF bandwidths and repeat steps 3 through 6.

8. If the results obtained in steps 3 through 7 are incorrect for any of the selected IF bandwidths, place the suspected Switchable FM Demodulator into one of the normally operating Switchable FM Demodulator slots. (The Switchable IF Filter Amplifier associated with the suspected bandwidth must also be exchanged.) Retest the subassembly in the new location.

9. If the results are still abnormal and the Switchable IF Filter Amplifier checks normal, replace the Switchable FM Demodulator.

S.7 ALIGNMENT PROCEDURES

S.7.1 IF AMPLIFIER (A3A9-A3A13), ALIGNMENT

1. Remove the 2nd Converter (A3A7) and the AM Demodulator (A3A16) from their respective slots on the RF/IF Motherboard. Remove the IF Amplifiers installed in slots XA9 through XA13.

2. Insert the appropriate extender card into the XA9 slot of the RF/IF Motherboard and install the IF Amplifier into the extender. Select the #1 IF Bandwidth pushbutton on the receiver front panel.

3. Set the generator to sweep about a 21.4 MHz center frequency, with a bandwidth 20% greater than the IF Amplifier under test.

4. Connect the test equipment as illustrated in **Figure S-3** except, connect the attenuator output to the input of the 50Ω detector.

5. Set the attenuator to 0 dB and set the generator to sweep about a 21.4 MHz center frequency, with a sweep width at least 20% greater than the IF Amplifier under test. Adjust the sweep generator output and the oscilloscope to provide a convenient reference on the CRT.

6. Connect the test equipment as illustrated in **Figure S-3** with the attenuator set to compensate for the gain of the selected IF Amplifier module. Vary the attenuator setting and the signal generator output as required to return the detected display to the reference level set in step 5.

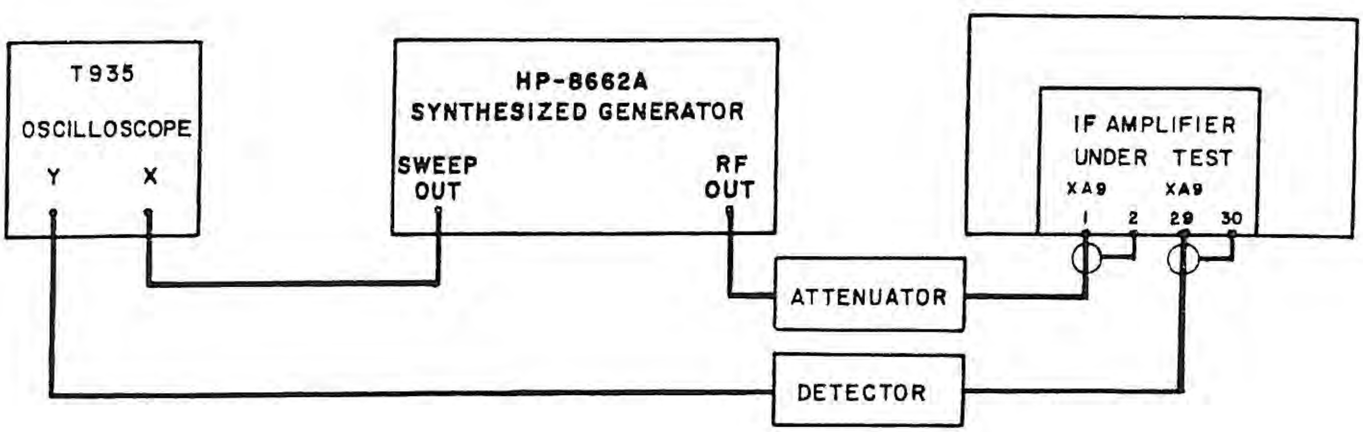


Figure S-3. IF Amplifier Alignment, Equipment Connections

Table S-3. IF Amplifier Response Characteristics

IF Bandwidth Type	3 dB Bandwidth (in kHz)	IF BW Code (Vdc)	Decimal BW Code	Gain Typical (in dB)
724006-22	1.5	0.250	4 - 10	+22
724006-16	3.2	4.500	114 - 127	+22
724006-23	4.0	0.750	17 - 23	+22
724006-18	6.4	0.500	11 - 16	+22
724006-1	10	1.000	24 - 30	+22
724006-21	15	1.500	37 - 43	+20
724006-2	20	2.000	51 - 56	+19
724006-17	25	2.250	57 - 63	+18
724006-10	30	2.500	64 - 70	+17
724006-8	40	2.750	71 - 76	+16
724006-3	50	3.000	77 - 84	+15
724006-24	60	3.250	85 - 91	+14
724006-9	75	3.500	92 - 99	+13
724006-4	100	4.000	100 - 113	+12
724006-25	150	1.750	44 - 50	+10
724006-5	250	5.000	128 - 140	+8
724006-6	300	5.500	141 - 154	+7
724006-20	400	6.500	169 - 181	+6
726013-1	500	6.000	155 - 168	+5
726013-2	1000	7.000	182 - 195	+2
726013-3	2000	8.000	209 - 221	-1
726013-4	4000	9.000	236 - 248	-4
796337-1	8000	8.500	222 - 235	-7
796726-1	10000	9.500	249 - 255	-8

S.7.2 FM DEMODULATOR (A3A17-A3A21), ALIGNMENT

1. Remove the AM Demodulator (A3A16) from Slot XA16 on the RF/IF Motherboard.

2. Connect the test equipment as illustrated in **Figure S-4**, with the sweep generator RF output connected between pin 1 (signal) and pin 2 (shield) of connector XA16. Connect the sweep generator demodulator input at terminal E1 of the FM Demodulator under test.

3. Select the IF bandwidth corresponding to the FM Demodulator to be tested and set the sweep about the 21.4 MHz IF center frequency with a bandwidth slightly greater than the bandwidth of the FM Demodulator under test. Activate the 21.4 MHz marker on the sweep generator.

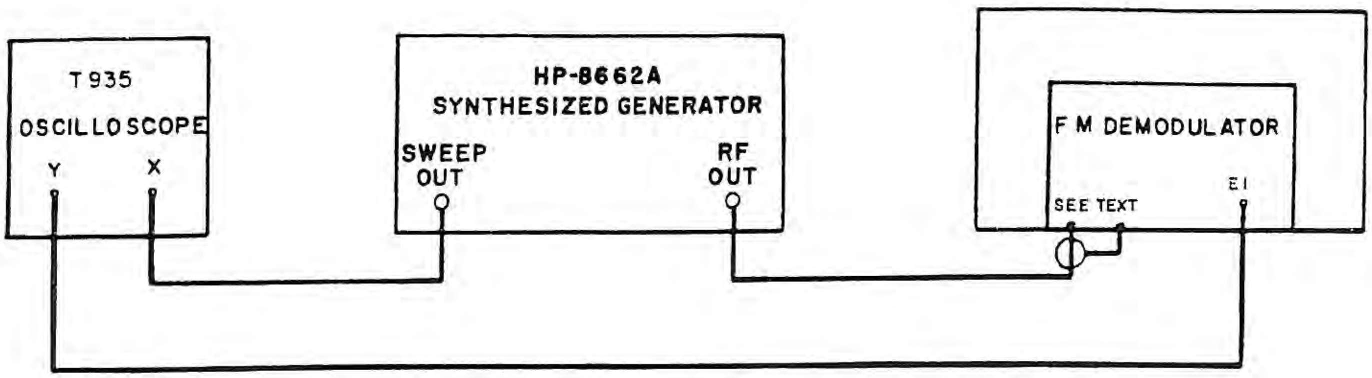


Figure S-4. FM Demodulator Alignment, Equipment Connections

4. Adjust the oscilloscope and sweep generator controls to display an "S" curve as illustrated in **Figure S-5.**

5. For the FM Demodulator under test, adjust the tuning components listed below for the straightest possible line (most linear) extending from the upper and lower band-edges of the FM Demodulator response, with the 21.4 MHz marker at the zero crossing point on the response.

FM Demodulator	Tuning Components
794106-X	L1, L2
794107-X	C18
794104-X	C8, C10
794105-X	C2, C6

6. Disconnect the demodulator input of the sweep generator from terminal E1 of the FM Demodulator and set the generator to produce a fixed 21.4000 MHz output frequency.

7. Connect the DVM to pin 1 of the FM Demodulator under test.

8. For the FM Demodulator under test, adjust the offset potentiometer listed in **Table S-4** for a DVM reading of 0 ±.1 Vdc.

9. Increase the generator output frequency by exactly one-half of the IF Bandwidth. Adjust the gain potentiometer listed in **Table S-4** for a DVM reading of -1.00 ±.10 Vdc (± any offset observed in step 8).

Table S-4. FM Offset and Gain Adjustments

FM Demodulator	Offset Adjustment	Gain Adjustment
794106-X	R12	R15
794107-X	R14	R11
794104-X	R9	R16
794105-X	R14	R9

10. Decrease the generator output frequency to exactly one-half of the IF Bandwidth below the 21.4 MHz center frequency and observe the reading on the DVM. This level should be +1.00 ±.10 Vdc (± any offset observed in step 8).

11. Repeat steps 6 through 10, as required, to obtain a 0 ±.1 Vdc offset at 21.4 MHz and ±1.00 ±.05 Vdc at the band-edge frequencies.

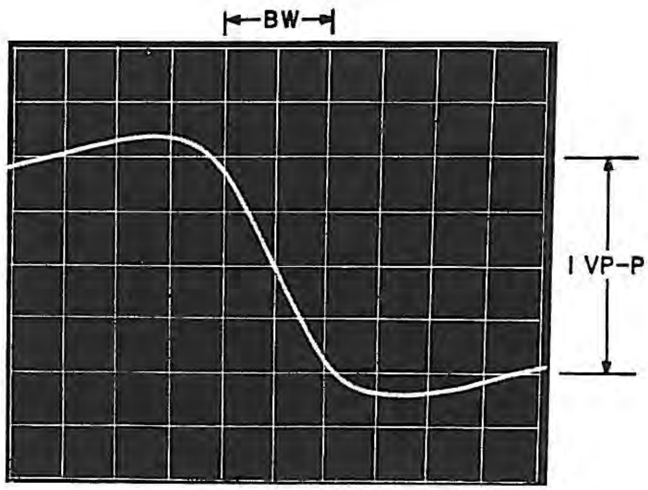


Figure S-5. FM Demodulator "S" Curve

S.7.3 SWITCHABLE IF FILTER AMPLIFIER (A3A9-A3A13), ALIGNMENT

1. Remove the 2nd Converter (A3A7) and the AM Demodulator (A3A16) from their respective slots on the RF/IF Motherboard. Remove the Switchable IF Filter Amplifiers (A3A9 through A3A13) installed in slots XA9 through XA13.

2. Insert the appropriate extender card into the XA9 slot of the RF/IF Motherboard and install the Switchable IF Filter Amplifier into the extender. Select the #1 IF bandwidth position on the receiver front panel.

3. Set the generator to sweep about a 21.4 MHz center frequency, with a bandwidth 20% greater than the switchable IF filter amplifier under test.

4. Connect the test equipment as illustrated in **Figure S-3,** except connect the attenuator output to the input of the 50Ω detector.

5. Set the attenuator to 0 dB. Adjust the sweep generator output and the oscilloscope to produce a convenient reference on the CRT.

6. Connect the detector and attenuator as illustrated in **Figure S-3** and increase the attenuator setting to the dB level listed in the Gain column of **Table S-3,** corresponding to the Switchable IF Filter Amplifier under test.

7. For the Type 726009-X Switchable IF Filter Amplifiers, adjust C24 for the best overall response. Adjust R21 to set the response amplitude equal to within ±1 dB of the reference set in step 5. Connect the DVM between connector pin 12 and ground and adjust R2 to provide the proper IF BW code as indicated in **Table S-3.**

8. For the Type 726010-X Switchable IF Filter Amplifiers, adjust R27 to set the response amplitude equal to within ±1 dB of the reference set in step 5. Connect the DVM between connector pin 12 and ground and adjust R17 to provide the proper IF BW code as indicated in **Table S-3.**

9. Disconnect the test equipment and reinstall the Switchable IF Filter Amplifiers, the 2nd converter and the AM demodulator into their respective slots on the RF/IF Motherboard.

S.7.4 SWITCHABLE FM DEMODULATOR (A3A17 THROUGH A3A21), ALIGNMENT

1. Remove the AM Demodulator (A3A16) from the XA16 slot on the RF/IF Motherboard.

2. Connect the test equipment as illustrated in **Figure S-4,** with the sweep generator RF output connected between pin 1 (signal) and pin 2 (shield) of connector XA16. Connect the sweep generator demodulator input at connector pin 1 of J1 on the Switchable FM Demodulator under test.

3. Select the IF bandwidth corresponding to the Switchable FM Demodulator to be tested and set the sweep about a 21.4 MHz IF center frequency with a bandwidth slightly greater than the bandwidth of the Switchable FM Demodulator under test. Activate the 21.4 MHz marker on the sweep generator.

4. Adjust the oscilloscope and sweep generator controls to display a positive slope "S" curve on the CRT.

5. For the Switchable FM Demodulator under test, adjust the tuning components listed below for the straightest possible line (most linear) extending from the upper and lower band-edges of the Switchable FM Demodulator response, with the 21.4 MHz marker at the zero crossing point on the response.

Switchable FM Demodulator	Tuning Components
796354	L1, L3
796355	C8
796356	C12, C15
796357	C8, C11

6. Disconnect the demodulator input of the sweep generator from J1 pin 1 of the Switchable FM Demodulator and set the generator to produce a fixed 21.40000 MHz output frequency.

7. Connect the DVM to pin 1 of the Switchable FM Demodulator under test.

8. For the Switchable FM Demodulator under test, adjust the offset potentiometer listed as follows for a DVM reading of 0 ±.1 Vdc.

Switchable FM Demodulator	Offset Adjustments	Gain Adjustments
796354	R14	R17
796355	R15	R13
796356	R10	R16
796357	R7	R11

9. Increase the generator output frequency by exactly one-half of the IF bandwidth. Adjust the gain potentiometer listed in step 8 for a DVM reading of -1.00 ±.10 Vdc (± any offset noted in step 8).

10. Decrease the generator output frequency to exactly one-half of the IF bandwidth below the 21.4 MHz center frequency and observe the reading on the DVM. This level should be +1.00 ±.10 (± any offset listed in step 8).

11. Repeat steps 6 through 10 as required, to obtain a 0 ±.1 Vdc offset at 21.4 MHz and +1.00 ±.05 Vdc at the band-edge frequencies.

S.8 REPLACEMENT PARTS LIST

S.8.1 LIST OF MANUFACTURERS

Mfr. Code	Name and Address	Mfr. Code	Name and Address
02735	RCA Corporation Rt. 202 Somerville, NJ 08876	18324	Signetics Corp. 811 East Arques Avenue Sunnyvale, CA 94086
04213	Caddell-Burns Mfg. Co., Inc. 40 E. Second Street Mineola, NY 11501	25120	Piezo Technology, Inc. P.O. Box 7877 2400 Diversified Way Orlando, FL 32804
04713	Motorola, Inc. 5005 East McDowell Road Phoenix, AZ 80058	27014	National Semi-Conductor, Corp. 2950 San Ysidro Way Santa Clara, CA 95051
07263	Fairchild Camera & Instr., Corp. 464 Ellis Street Mountain View, CA 94040	28480	Hewlett-Packard Co. 1501 Page Mill Road Palo Alto, CA 94304
09021	Airco Electronics, Inc. Bradford, PA 17055	32293	Intersil, Inc. 10900 North Tantau Ave. Cupertino, CA 95014
14632	Watkins-Johnson Company 700 Quince Orchard Road Gaithersburg, MD 20878	51642	Centre Engineering 2820 E. College Ave. State College, PA 16801
15542	Mini-Circuits Laboratory 2913 Quintin Road Brooklyn, NY 11229	59660	Tusonix, Inc. 2155 Forbes Blvd., Suite 107 Tucson, AZ 85745
17217	Gore W. L. & Ass., Inc. 555 Paper Mill Road P.O. Box 9206 Newark, DE 19711	70903	Belden Corp. 415 South Kilpatrick Chicago, IL 60644
17856	Siliconix, Inc. 2201 Laurelwood Road Santa Clara, CA 95050	71279	Cambridge Thermionic Corp. 445 Concord Ave. Cambridge, MA 02138

Mfr. Code	Name and Address	Mfr. Code	Name and Address
73138	Beckman Instr., Inc. 2500 Harbor Blvd. Fullerton, CA 92634	81350	Joint Army-Navy Specifications
74306	Piezo Crystal Co. 100 K Street Carlisle, PA 17013	88245	Litton Industries 13536 Saticoy Street Van Nuys, CA 91409
80131	Electronics Industries Ass. 2001 Eye Street, N.W. Washington, DC 2006	91293	Johanson Mfg. Co. P.O. Box 329 Boonton, NJ 07005
80294	Bourns, Inc. 6135 Magnolia Ave. Riverside, CA 92506	94241	Corby Mfg. Co., Inc.
81349	Military Specifications	99800	American Precision Industries 270 Quaker Road East Aurora, NY 14052

S.8.2 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 the 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 S.8** 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 semiconductors 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 lists and schematic diagrams of this manual. However, the semiconductors designated in the manual may be substituted in every case with satisfactory results.

S.8.2.1 **Type 724006-X 21.4 MHz IF Amplifier** REF DESIG PREFIX A3A9-A3A13

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision M				
C1	Not Used				
C2	Capacitor, Ceramic, Disc: 4700 pF, 20%, 50 V	12	8121-050-651-472M	59660	
C3 Thru C8	Same as C2				
C9	Capacitor, Mica, Dipped: 24 pF, 5%, 500 V	1	CM04ED240J03	81349	
C10 Thru C14	Same as C2				
C15	Capacitor, Variable, Ceramic: 5-25 pF, 100 V	1	518-002A5-25	59660	
CR1	Diode	1	1N462A	80131	
FL1	See Table 5				
L1	Coil, Fixed: 3.3 µH, 10%	1	1537-24 (18130-14)	99800	
L2	See Table 5				
L3	Coil, Fixed: 18 µH, 10%	1	1537-42 (14046-7)	99800	
Q1	Transistor	1	3N211	80131	
Q2	Transistor	1	2N2857/JAN	81350	
R1	Resistor, Fixed, Film: 210Ω, 1%, 1/10 W	1	RN55C2100F	81349	
R2	Resistor, Fixed, Film: 3.9 kΩ, 5%, 1/4 W	1	CF1/4-3.9K/J	09021	
R3	Resistor, Trimmer, Film: 10 kΩ, 10%, 1/2 W	1	62PAR10K	73138	
R4	Resistor, Fixed, Film: 47 kΩ, 5%, 1/4 W	1	CF1/4-47K/J	09021	
R5	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	1	CF1/4-10K/J	09021	
R6	Resistor, Fixed, Film: 68 kΩ, 5%, 1/4 W	1	CF1/4-68K/J	09021	
R7	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	3	CF1/4-100 OHMS/J	09021	
R8	Resistor, Fixed, Film: 120Ω, 5%, 1/4 W	1	CF1/4-120 OHMS/J	09021	
R9	Resistor, Fixed, Film: 47Ω, 5%, 1/4 W	3	CF1/4-47 OHMS	09021	
R10	Same as R7				
R11	See Table 5				
R12	See Table 5				
R13	Resistor, Fixed, Film: 8.2 kΩ, 5%, 1/4 W	1	CF1/4-8.2K/J	09021	
R14	Same as R9				
R15	Resistor, Fixed, Film: 470Ω, 5%, 1/4 W	1	CF1/4-470 OHMS/J	09021	
R16	Same as R7				
R17	Resistor, Fixed, Film: 33Ω, 5%, 1/4 W	1	CF1/4-33 OHMS/J	09021	
R18 R19 R20	See Table 5				
R21	Same as R9				
T1	Transformer	1	T4-1	15542	

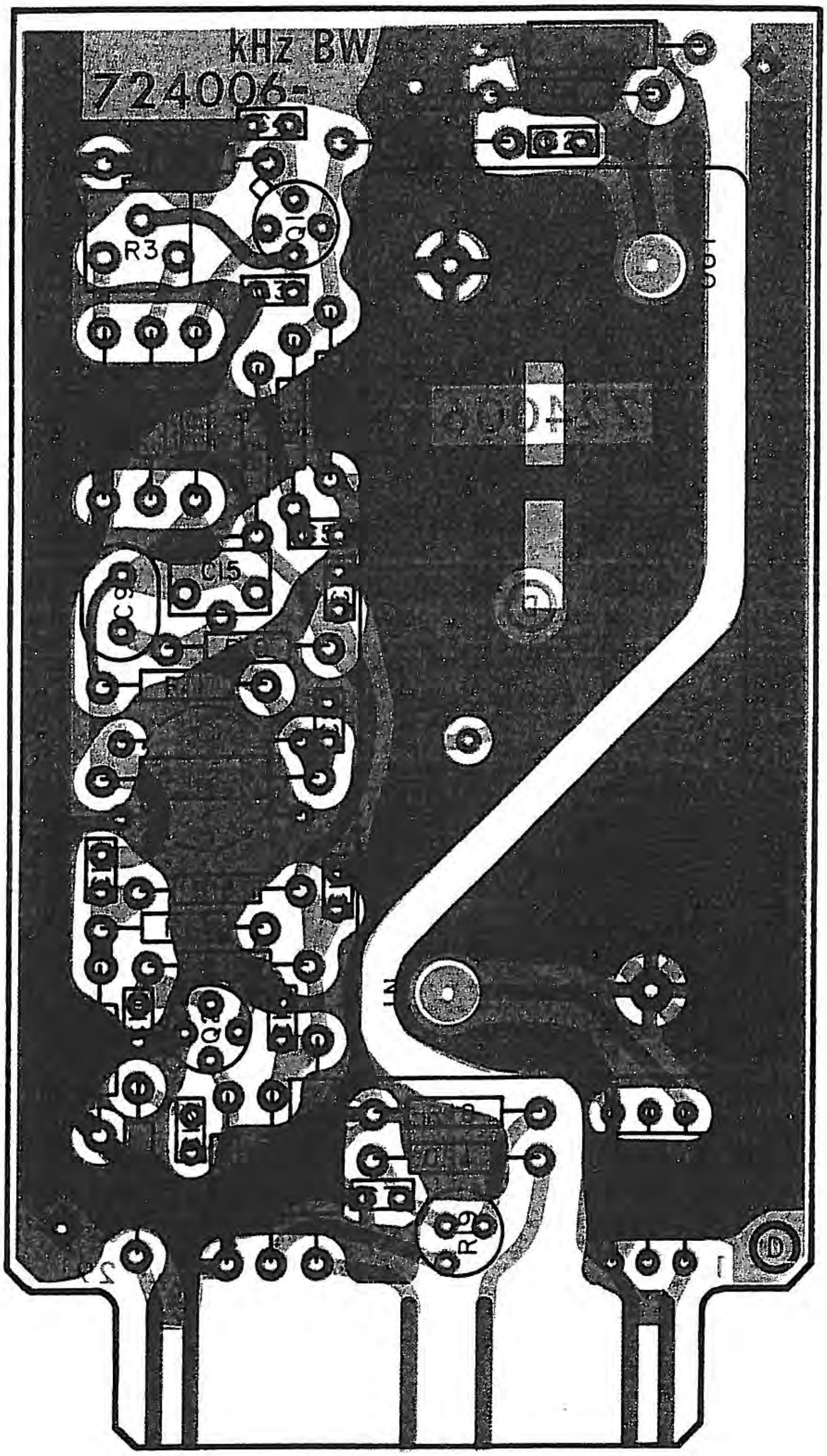


Figure S-6. Type 724006-X 21.4 MHz IF Amplifier (A3A9-A3A13), Location of Components

Table S-5. Type 724006-X Component Differences

Type	FL1 Filter	FL1 Filter ALT. Rev Lev E & above	L2 Coil/Fixed	R11 Res/Fixed/Film	R12 Res/Fixed/Film	R18 Res/Fixed/Film	R19 Res/Trim/Film	R20 Res/Fixed/Film
724006-1 10 kHz	10 kHz 92001 14632	10 kHz 92293 14632	22295-66 14632	N/U	10 k 5% 1/4W CF1/4-10 K/J 09021	100 Ω 5% 1/4W CF1/4-100 OHMS/J 09021	500 Ω 10% 1/4W 62PAR500 73138	3.3 k 5% 1/4W CF1/4-3.3 K/J 09021
724006-2 20 kHz	20 kHz 92002 14632	20 kHz 92294 14632	1.0 μH 1537-12 99800	3.9 k 5% 1/4W CF1/4-3.9 K/J 09021	10 k 5% 1/4W CF1/4-10 K/J 09021	330 Ω 5% 1/4W CF1/4-330 OHMS/J 09021	500 Ω 10% 1/4W 62PAR500 73138	2.7 k 5% 1/4W CF1/4-2.7 K/J 09021
724006-3 50 kHz	50 kHz 92000 14632	50 kHz 92291 14632	1.0 μH 1537-12 99800	1.3 k 5% 1/4W CF1/4-1.3 K/J 09021	10 k 5% 1/4W CF1/4-10 K/J 09021	680 Ω 5% 1/4W CF1/4-680 OHMS/J 09021	500 Ω 10% 1/2W 62PAR1K 73138	2.7 k 5% 1/4W CF1/4-2.7 K/J 09021
724006-4 100 kHz	100 kHz 92024 14632	100 kHz 92292 14632	1.0 μH 1537-12 99800	750 Ω 5% 1/4W CF1/4-750 OHMS/J 09021	10 k 5% 1/4W CF1/4-10 K/J 09021	680 Ω 5% 1/4W CF1/4-680 OHMS/J 09021	1 k 10% 1/4W 62PAR500 73138	2.2 k 5% 1/4W CF1/4-2.2 K/J 09021
724006-5 250 kHz	250 kHz 92186 14632	250 kHz 92317 14632	1.0 μH 1537-12 99800	750 Ω 5% 1/4W CF1/4-750 OHMS/J 09021	10 k 5% 1/4W CF1/4-10 K/J 09021	1 k 10% 1/4W CF1/4-1 K/J 09021	1 k 10% 1/2W 62PAR1K 73138	2.2 k 5% 1/4W CF1/4-2.2 K/J 09021
724006-6 300 kHz	300 kHz 92232 14632	300 kHz 92290 14632	1.0 μH 1537-12 99800	750 Ω 5% 1/4W CF1/4-750 OHMS/J 09021	10 k 5% 1/4W CF1/4-10 K/J 09021	1 k 10% 1/4W CF1/4-1 K/J 09021	1 k 10% 1/2W 62PAR1K 73138	2.2 k 5% 1/4W CF1/4-2.2 K/J 09021
724006-7 6 kHz	6 kHz 92197 .4632	N/A	1.0 μH 1537-12 99800	N/U	10 k 5% 1/4W CF1/4-10 K/J 09021	100 Ω 5% 1/4W CF1/4-100 OHMS/J 09021	500 Ω 10% 1/4W 62PAR500 73138	3.3 k 5% 1/4W CF1/4-3.3 K/J 09021
724006-8 40 kHz	40 kHz 92198 14632	40 kHz 92302 14632	1.0 μH 1537-12 99800	N/U	10 k 5% 1/4W CF1/4-10 K/J 09021	100 Ω 5% 1/4W CF1/4-100 OHMS/J 09021	500 Ω 10% 1/4W 62PAR500 73138	2.7 k 5% 1/4W CF1/4-2.7 K/J 09021
724006-9 75 kHz	75 kHz 92230 14632	75 kHz 92303 14632	22295-66 14632	1 k 10% 1/4W CF1/4-1 K/J 09021	10 k 5% 1/4W CF1/4-10 K/J 09021	680 Ω 5% 1/4W CF1/4-680 OHMS/J 09021	1 k 10% 1/2W 62PAR1K 73138	2.2 k 5% 1/4W CF1/4-2.2 K/J 09021
724006-16 3.2 kHz	3.2 kHz 92272 14632	3.2 kHz 92289 14632	22295-66 14632	N/U	24 k 5% 1/4W CF1/4-24 K/J 09021	100 Ω 5% 1/4W CF1/4-100 OHMS/J 09021	500 Ω 10% 1/4W 62PAR500 73138	1 k 5% 1/4W CF1/4-1 K/J 09021

Table S-5. Type 724006-X Component Differences (Continued)

Type	FL1 Filter	FL1 Filter ALT. Rev Lev E & above	L2 Coil/Fixed	R11 Res/Fixed/Film	R12 Res/Fixed/Film	R18 Res/Fixed/Film	R19 Res/Trim/Film	R20 Res/Fixed/Film
724006-17 25 kHz	25 kHz 92165 14632	25 kHz 92340 14632	1.0 µH 1537-12 99800	3.9 k 5% 1/4W CF1/4-3.9 K/J 09021	10 k 5% 1/4W CF1/4-10 K/J 09021	240 Ω 5% 1/4W CF1/4-24 OHMS/J 09021	500 Ω 10% 1/4W 62PAR500 73138	3 k 5% 1/4W CF1/4-3 K/J 09021
724006-18 6.4 kHz	6.4 kHz 92271 14632	6.4 kHz 92299 14632	22295-66 14632	N/U	10 k 5% 1/4W CF1/4-10 K/J 09021	100 Ω 5% 1/4W CF1/4-100 OHMS/J 09021	500 Ω 10% 1/4W 62PAR500 73138	3.3 k 5% 1/4W CF1/4-3.3 K/J 09021
724006-19 50 kHz	50 kHz 92098 14632	50 kHz 92098 14632	1.0 µH 1537-12 99800	1.3 k 5% 1/4W CF1/4-1.3 K/J 09021	10 k 5% 1/4W CF1/4-10 K/J 09021	680 Ω 5% 1/4W CF1/4-680 OHMS/J 09021	500 Ω 10% 1/4W 62PAR500 73138	2.7 k 5% 1/4W CF1/4-2.7 K/J 09021
724006-20 400 kHz	400 kHz 92238-2 14632	N/A	1.0 µH 1537-12 99800	750 Ω 5% 1/4W CF1/4-750 OHMS/J 09021	10 k 5% 1/4W CF1/4-10 K/J 09021	1 k 10% 1/4W CF1/4-1 K/J 09021	500 Ω 10% 1/4W 62PAR500 73138	2.2 k 5% 1/4W CF1/4-2.2 K/J 09021
724006-21 15 kHz	15 kHz 92296 14632	15 kHz 92300 14632	1.0 µH 1537-12 99800	6.2 k 5% 1/4W CF1/4-6.2 K/J 09021	10 k 5% 1/4W CF1/4-10 K/J 09021	270 Ω 5% 1/4W CF1/4-270 OHMS/J 09021	500 Ω 10% 1/4W 62PAR500 73138	2.7 k 5% 1/4W CF1/4-2.7 K/J 09021
724006-22 1.5 kHz	1.5 kHz 92309 14632	N/A	22295-66 14632	N/U	24 k 5% 1/4W CF1/4-24 K/J 09021	680 Ω 5% 1/4W CF1/4-680 OHMS/J 09021	500 Ω 10% 1/4W 62PAR500 73138	47 k 5% 1/4W CF1/4-47 K/J 09021
724006-23 4 kHz	4 kHz 92318 14632	N/A	1.0 µH 1537-12 99800	N/U	24 k 5% 1/4W CF1/4-24 K/J 09021	470 Ω 5% 1/4W CF1/4-470 OHMS/J 09021	500 Ω 10% 1/4W 62PAR500 73138	6.8 k 5% 1/4W CF1/4-6.8 K/J 09021
724006-24 60 kHz	60 kHz 92319 14632	N/A	1.0 µH 1537-12 99800	1.3 k 10% 1/4W CF1/4-1.3 K/J 09021	10 k 5% 1/4W CF1/4-10 K/J 09021	1 k 10% 1/4W CF1/4-1 K/J 09021	1 k 10% 1/4W 62PAR1K 73138	3.3 k 5% 1/4W CF1/4-3.3 K/J 09021
724006-25 150 kHz	150 kHz 92334 14632	150 kHz 92304 14632	1.0 µH 1537-12 99800	750 Ω 5% 1/4W CF1/4-750 OHMS/J 09021	10 k 5% 1/4W CF1/4-10 K/J 09021	510 Ω 5% 1/4W CF1/4-510 OHMS/J 09021	1 k 10% 1/2W 62PAR1K 73138	5.1 k 5% 1/4W CF1/4-5.1 K/J 09021
724006-26	500 kHz 92288 14632	500 kHz 92277 14632	1.0 µH 1537-12 99800	750 Ω 5% 1/4W CF1/4-750 OHMS/J 09021	10 k 5% 1/4W CF1/4-10 K/J 09021	1.5 k 5% 1/4W CF1/4-1.5 K/J 09021	1 k 10% 1/2W 62PAR1K 73138	1.0 k 5% 1/4W CF1/4-1 K/J 09021

S.8.2.2 Type 726013-X 21.4 MHz IF AMP REF DESIG PREFIX A3A9-A3A13

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: 4700 pF, 20%, 50 V	8	8121-050-651-472M	59660	
C2 Thru C8	Same as C1				
CR1	Diode	1	1N462A	80131	
FL1	See Table 6				
J2	Same as J1				
J3	Same as J1				
L1	Coil, Fixed: 18 μH, 10%	1	1537-42 (14046-7)	99800	
L2	Coil, Fixed: 3.3 μH	1	1025-32 (75084-6)	99800	
Q1	Transistor	1	2N5109	80131	
R1	Resistor, Fixed, Film: 1.9 kΩ, 5%, 1/4 W	1	CF1/4-1K/J	09021	
R2	Resistor, Trimmer, Film: 1 kΩ, 10%, 1/2 W	1	62PR1K	73138	
R3	Resistor, Fixed, Film: 1.5 kΩ, 5%, 1/4 W	1	CF11/4-1.5K/J	09021	
R4	Resistor, Fixed, Film: 6.2 kΩ, 5%, 1/4 W	1	CF1/4-6.2K/J	09021	
R5	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	2	CF1/4-100 OHMS/J	09021	
R6	Resistor, Fixed, Film: 47Ω, 5%, 1/4 W	1	CF1/4-47 OHMS	09021	
R7	Resistor, Fixed, Film: 243Ω, 1%, 1/10 W	1	RN55C2430F	81349	
R8	Resistor, Fixed, Film: 6.8 kΩ, 5%, 1/4 W	1	CF1/4-6.8K/J	09021	
R9	See Table 6				
R10	Same as R5				
R11	Resistor, Fixed, Film: 330Ω, 5%, 1/4 W	1	CF1/4-330 OHMS/J	09021	
R12	Resistor, Fixed, Film: 12Ω, 5%, 1/4 W	1	CF1/4-12 OHMS/J	09021	
R13	Resistor, Fixed, Film: 500Ω, 10%, 1/2 W	1	62PAR500	73138	
T1	Transformer	2	T4-1	15542	
T2	Same as T1				

Table S-6. Type 726013-X Component Differences

Type	FL1 Filter	FL1 Filter Alt.Rev Lev C and above	R9 Res/Fixed/Film
726013-1 500 kHz	500 kHz 92277 14632	500 kHz 92288 14632	820 Ω 5% 1/4 CF1/4-820 OHMS/J 09021
726013-2 1 MHz	1 MHz 92278 14632	1 MHz 92287 14632	220 Ω 5% 1/4 CF1/4-220 OHMS/J 09021
726013-3 2 MHz	2 MHz 92279 14632	2 MHz 92286 14632	220 Ω 5% 1/4 CF1/4-220 OHMS/J 09021
726013-4 4 MHz	4 MHz 92280 14632	4 MHz 92285 14632	220 Ω 5% 1/4 CF1/4-220 OHMS/J 09021

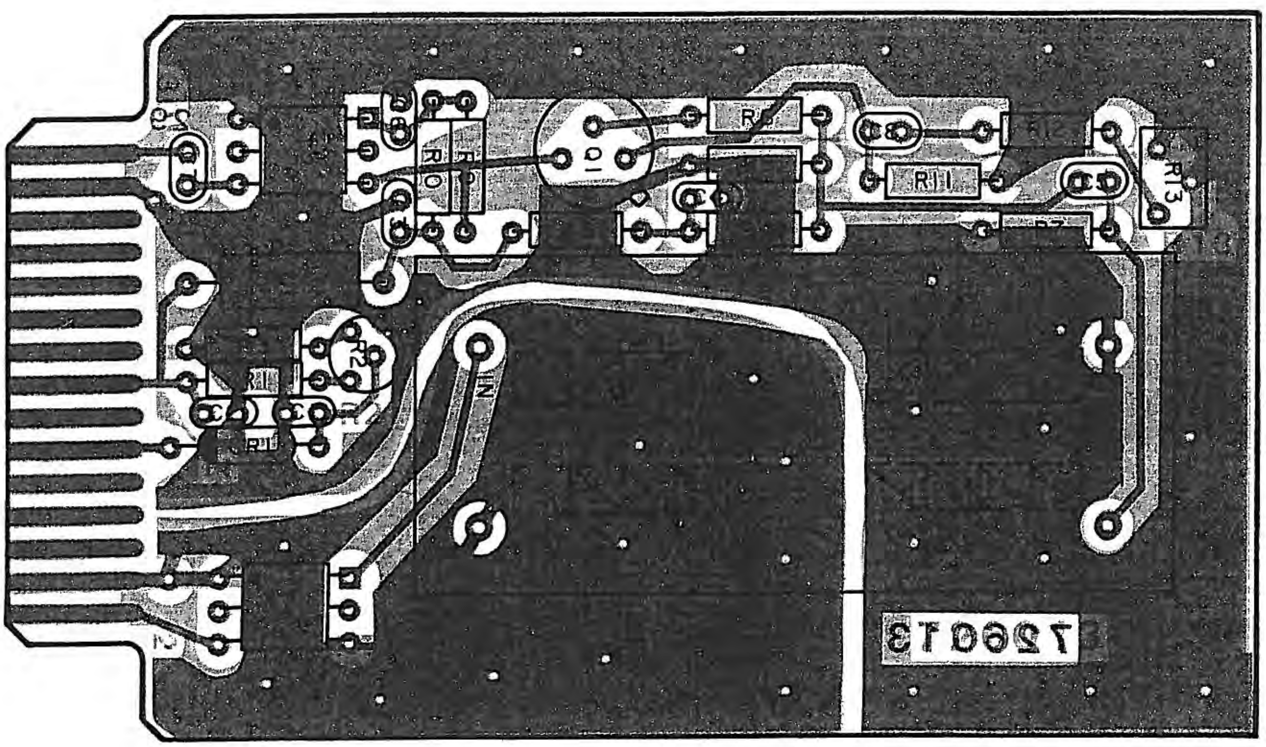


Figure S-7. Type 726013-X 21.4 MHz IF Amplifier (A3A9-A3A13), Location of Components

S.8.2.3 **Type 796337-X 21.4 MHz IF Amplifier** REF DESIG PREFIX **A3A9-A3A13**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: 4700 pF, 20%, 50 V	4	8121-050-651-472M	59660	
C2 Thru C4	Same as C1				
CR1	Diode	1	1N462A	80131	
R1	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/4 W	1	CF1/4-1K/J	09021	
R2	Resistor, Trimmer, Film: 1 kΩ, 10%, 1/2 W	1	62PR1K	73138	
R3	Resistor, Fixed, Film: 2.0 kΩ, 5%, 1/4 W	1	CF1/4-2.0K/J	09021	
R4	Resistor, Fixed, Film: 24Ω, 5%, 1/4 W	1	CF1/4-24 OHMS/J	09021	
R5	Resistor, Fixed, Film: 220Ω, 5%, 1/4 W	2	CF1/4-220 OHMS/J	09021	
R6	Same as R5				

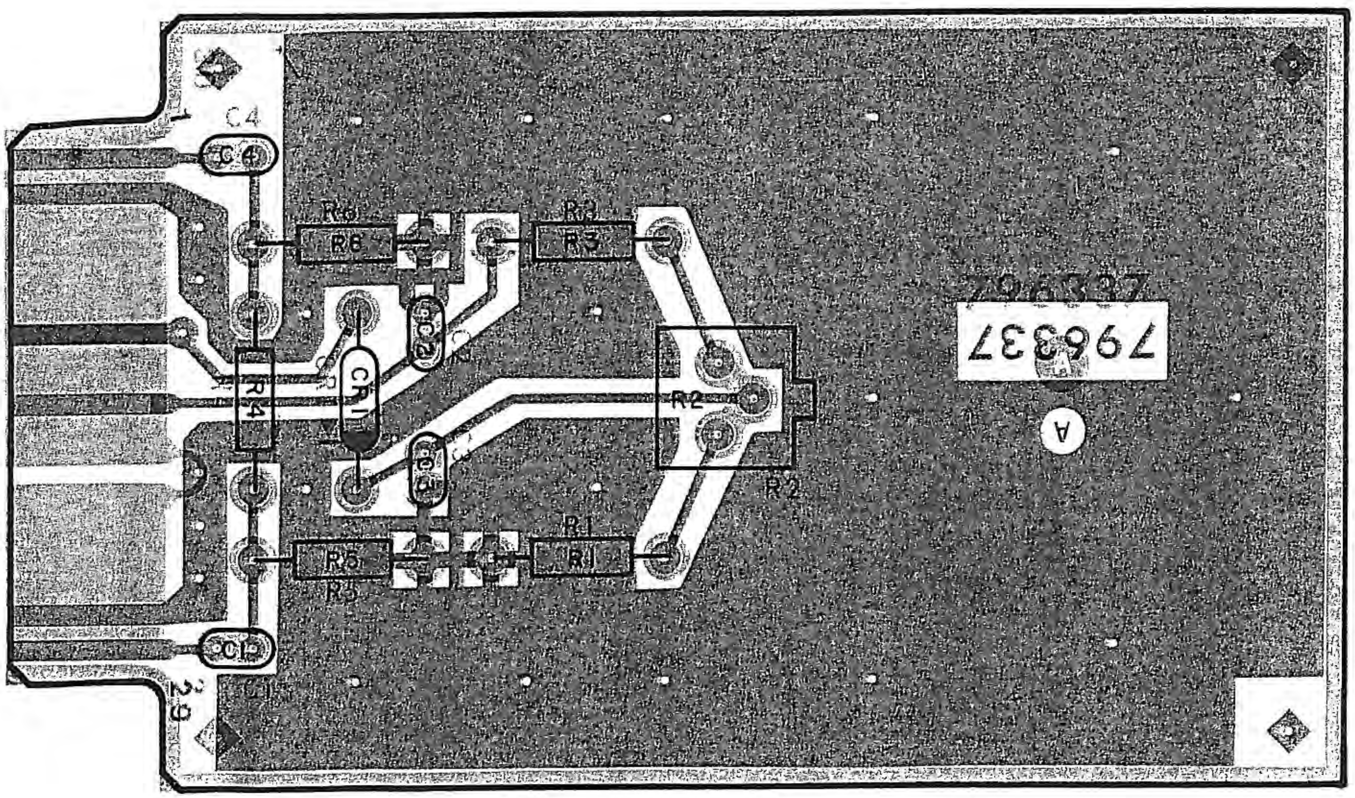


Figure S-8. Type 796337-X 21.4 MHz IF Amplifier (A3A9-A3A13), Location of Components

S.8.2.4 **Type 794106-X FM Demodulator** REF DESIG PREFIX **A3A17-A3A21**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	5	34453-1	14632	
C2 Thru C4	Same as C1				
C5	Capacitor, Ceramic, Tubular: 15 pF, 5%, 500 V	2	301-000U2J0-150J	59660	
C6	See Table 7				
C7	Not Used				
C8	Capacitor, Ceramic, Disc: 4700 pF, 10%, 200 V	1	CK06BX472K	81349	
C9	Capacitor, Ceramic, Disc: .47 µF, 20%, 50 V	2	34452-1	14632	
C10	Same as C9				
C11	See Table 7				
C12	Capacitor, Electrolytic, Tantalum: 2.2 µF, 40%, 35 V	2	196D225X0035JE3	56289	
C13	Same as C12				
C14	See Table 7				
C15	Capacitor, Ceramic, Disc: 4700 pF, 20%, 50 V	1	8121-050-651-472M	59660	
C16	Same as C1				
C17	See Table 7				
L1	Coil, Variable: 2.97-3.63 µH	1	558-7107-19	71279	
L2	Coil, Variable: 2.43-2.97 µH	1	558-7107-18	71279	
L3	Coil, Fixed: 18 µH, 10%	1	1537-42 (14046-7)	99800	
L4	See Table 7				
L5	See Table 7				
L6	Coil, Fixed: 1.2 mH, 10%	2	553-3635-38	71279	
L7	Same as L6				
R1	Resistor, Fixed, Film: 220Ω, 5%, 1/4 W	1	CF1/4-220 OHMS/J	09021	
R2	See Table 7				
R3	See Table 7				
R4	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	1	CF1/4-10K/J	09021	
R5	Resistor, Fixed, Film: 4.75 kΩ, 1%, 1/10 W	1	RN55C4751F	81349	
R6	Resistor, Fixed, Film: 51.1 kΩ, 1%, 1/10 W	1	RN55C5112F	81349	
R7	Resistor, Fixed, Film: 46.4 kΩ, 1%, 1/10 W	3	RN55C4642F	81349	
R8	Same as R7				
R9	Same as R7				
R10	Resistor, Fixed, Film: 2.21 kΩ, 1%, 1/10 W	2	RN55C2211F	81349	
R12	Resistor, Trimmer, Film: 10 kΩ, 10%, 1/2 W	1	62PAR10K	73138	
R13	Same as R11				
R14	Same as R10				
R15	Resistor, Trimmer, Film: 10 kΩ, 10%, 1/2 W	1	62PAR10K	73138	
R16	Resistor, Fixed, Film: 470Ω, 5%, 1/4 W	1	CF1/4-470 OHMS/J	09021	
R17	Resistor, Fixed, Film: 22 kΩ, 5%, 1/8 W	2	CF1/8-22K/J	09021	
R18	Resistor, Fixed, Film: 22Ω, 5%, 1/4 W	1	CF1/4-22 OHMS/J	09021	

REF DESIG PREFIX **A3A17-A3A21**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R19	Same as R17				
R11*	Resistor, Fixed, Film: 26.7 kΩ, 1%, 1/10 W	2	RN55C2672F	81349	
U1	Integrated Circuit	1	CA3089E	02735	
U2	Integrated Circuit	1	MC1458N	18324	
U3	Integrated Circuit	1	1H5040CPE	32293	
Y1	See Table 3				

*Nominal Value, Final Value Factory Selected

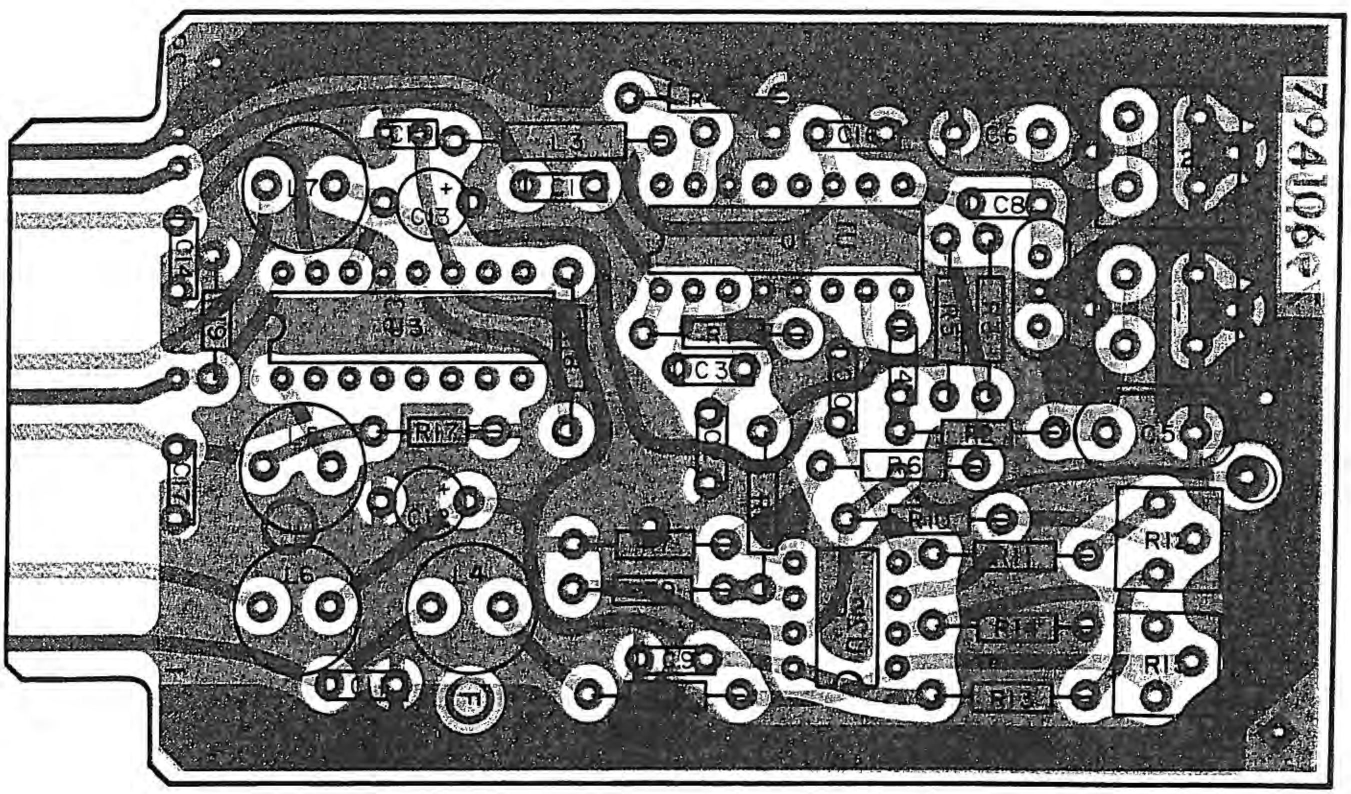


Figure S-9. Type 794106-X FM Demodulatior (A3A17-A3A21), Location of Components

Table S-7. Type 794106-X Component Differences

Type	C6 Cap/Cer/Tub	C11 Cap/Cer/Disc	C17 Cap/Cer/Disc	L4 Coil/Fixed	L5 Coil/Fixed	R2 Res/Fixed/Film	R3 Res/Fixed/Film	Y1 Crystal/DSCRM
794106-1 10 kHz	15 pF 5% 50V 301-000U2JO-150J 59660	.1 µF 20% 50V 34475-1 14632	.068 µF, 10%, 100 V CK06BX683K 81349	22 mH 10% 553-3635-53 71279	15 mH, 10% 553-3635-51 71279	2.37 kΩ 1% 1/10W RN55C2371F 81349	1.37 kΩ 1% 1/10W RN55C1371F 81349	20 kHz 2378F 25120
794106-2 20 kHz	10 pF .5 pF 500V 301-000U2JO-150J 59660	0.056 µF 10% 100V CK06BX563K 81349	Same as C11	10 mH, 10% 553-3635-49 71279	6.8 mH, 10% 553-3635-47 71279	3.65 kΩ 1% 1/10W RN55C3651F 81349	1.62 kΩ 1% 1/10W RN55C1621F 81349	21.4 MHz 2875 74306
794106-3 6 kHz	15 pF 5% 500V 301-000U2JO-150J 59660	.1 µF 20% 50V 34475-1 14632	Same as C11	47 mH, 10% 553-3635-57 71279	22 mH, 10% 553-3635-53 71279	3.37 kΩ 1% 1/10W RN55C2371F 81349	1.37 kΩ 1% 1/10W RN55C1371F 81349	20 kHz 2378F 25120
794106-4 40 kHz	10 pF .5 pF 500V 301-000U2JO-150J 59660	.018 µF 10% 100V CK06BX183K 81349	.012 µF, 10%, 100 V CK06BX123K 81349	4.7 mH, 10% 553-3635-45 71279	Same as L4	2.21 kΩ 1% 1/10W RN55C2211F 81349	Same as R2	21.4 MHz 2875 74306
794106-5 30 kHz	10 pF .5 pF 500V 301-000U2JO-100D 59660	.022 µF 10% 100V CK06B223K 81349	0.018 µF, 10%, 100 V CK06BX183K 81349	6.8 mH, 10% 553-3635-47 71279	Same as L4	2.21 kΩ 1% 1/10W RN55C2211F 81349	Same as R2	21.4 MHz 2875 74306
794106-6 3.2 kHz	15 pF 5% 500V 301-000U2JO-150J 59660	.1 µF 20% 50V 34475-1 14632	Same as C11	22 mH, 10% 553-3635-53 71279	Same as L4	2.37 kΩ 1% 1/10W RN55C2371F 81349	1.37 kΩ 1% 1/10W RN55C1371F 81349	20 kHz 2878F 25120
794106-7 25 kHz	10 pF, 0.5pF, 500V 301-000U2JO-100D 59660	0.039 µF 10% 100V CK06BX393K 81349	Same as C11	8.2 mH, 10% 553-3635-48 71279	6.8 mH, 10% 553-3635-47 71279	3.65 kΩ 1% 1/10W RN55C3651F 81349	1.62 kΩ 1% 1/10W RN55C1621F 81349	21.4 MHz 2875 74306
794106-8 15 kHz	12 pF, 5%, 500V 301-000COGO-120J 59660	0.056 µF 10% 100V CK06BX563K 81349	Same as C11	15 mH, 10% 553-3635-51 71279	10 mH, 10% 553-3635-49 71279	3.01 kΩ 1% 1/10W RN55C3011F 81349	1.5 kΩ 1% 1/10W RN55C1501F 81349	21.4 MHz 2875 74306
794106-9 50 kHz	15 pF, 5%, 500V 301-000U2JO-150J 59660	0.018 µF 10% 100V CK06BX183K 81349	Same as C11	4.7 mH, 10% 553-3635-45 71279	4.7 3.3 mH, 10% 1537-750 99800	2.37 kΩ 1% 1/10W RN55C2371F 81349	9.09 kΩ 1% 1/10W RN55C9091F 81349	35 kHz 3099 74306
794106-10 1.5 kHz	15 pF, 5%, 500V 301-000U2JO-150J 59660	.56 µF 10% 50V M39014/02-1400 81349	Same as C11	150 mH, ±15% 2534-76 99800	Same as L4	2.37 kΩ 1% 1/10W RN55C2371F 81349	1.37 kΩ 1% 1/10W RN55C1371F 81349	20 kHz 2378F 25120
794106-11 4 kHz	15 pF, 5%, 500V 301-000U2JO-150J 59660	.22 µF 10% 50V 8131-050-X7RO-22 56289	Same as C11	47 mH, 10% 553-3635-57 71279	Same as L4	2.37 kΩ 1% 1/10W RN55C2371F 81349	1.37 kΩ 1% 1/10W RN55C1371F 81349	20 kHz 2378F 25120

S.8.2.5 **Type 794107-X FM Demodulator** REF DESIG PREFIX A3A17-A3A21

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	3	34453-1	14632	
C2	Same as C1				
C3	Same as C1				
C4	Not Used				
C5	Capacitor, Ceramic, Disc: 4700 pF, 20%, 50 V	2	8121-050-651-472M	59660	
C6	Capacitor, Ceramic, Tubular: 39 pF, 5%, 500 V	1	301-000-U2J0-390J	59660	
C7	Capacitor, Mica, Dipped: 150 pF, 2%, 500 V	1	CM04FD151G03	81349	
C8	Capacitor, Ceramic, Disc: .47 µF, 20%, 50 V	4	34452-1	14632	
C9 Thru C11	Same as C8				
C12	See Table 8				
C13	Capacitor, Electrolytic, Tantalum: 2.2 µF, 20%, 35 V	2	196D225X0035JE3	56289	
C14	Same as C13				
C15	Capacitor, Ceramic, Disc: .1 µF, 20%, 50 V	1	34475-1	14632	
C16	See Table 8				
C17	Same as C5				
C18	Capacitor, Variable, Air: .8-10.0 pF, 250 V	1	5201/W HDW	91293	
C19	See Table 8				
L1	Coil, Fixed: 18 µH, 10%	1	1537-42-(14046-7)	99800	
L2	Coil, Fixed	1	21210-168	14632	
L3	See Table 8				
L4	See Table 8				
L5	Coil, Fixed: 1.2 mH, 10%	2	553-3635-38	71279	
L6	Same as L5				
L7	Coil, Fixed, Molded: 10 µH	1	1025-44 (75084-12)	99800	
R1	Resistor, Fixed, Film: 220Ω, 5%, 1/4 W	1	CF1/4-220 OHMS/J	09021	
R2	See Table 8				
R3	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	1	CF1/4-10K/J	09021	
R4	See Table 8				
R5	Resistor, Fixed, Film: 51.1 kΩ, 1%, 1/10 W	1	RN55C5112F	81349	
R6	Resistor, Fixed, Film: 46.4 kΩ, 1%, 1/10 W	1	RN55C4642F	81349	
R7	Resistor, Fixed, Film: 75 kΩ, 1%, 1/10 W	2	RN55C7502F	81349	
R8	Same as R7				
R9	Resistor, Fixed, Film: 2.21 kΩ, 1%, 1/10 W	1	RN55C2211F	81349	
R10	Resistor, Fixed, Film: 5.11 kΩ, 1%, 1/10 W	1	RN55C111F	81349	
R11	Resistor, Trimmer, Film: 50 kΩ, 10%, 1/2 W	1	62PAR50K	73138	
R12	Resistor, Fixed, Film: 470Ω, 5%, 1/4 W	1	CF1/4-470 OHMS/J	09021	
R13	Resistor, Fixed, Film: 26.7 kΩ, 1%, 1/10 W	2	RN55C2672F	81349	
R14	Resistor, Trimmer, Film: 5 kΩ, 10%, 1/2 W	1	62PAR5K	73138	
R15	Same as R13				

REF DESIG PREFIX **A3A17-A3A21**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R16	Resistor, Fixed, Film: 22 kΩ, 5%, 1/8 W	2	CF1/8-22K/J	09021	
R17	Resistor, Fixed, Film: 22Ω, 5%, 1/4 W	1	CF1/4-22 OHMS/J	09021	
R18	Same as R16				
U1	Integrated Circuit	1	CA3089E	02735	
U2	See **Table 4**				
U3	Same as U2				
U4	Integrated Circuit	1	1H5040CPE	32293	

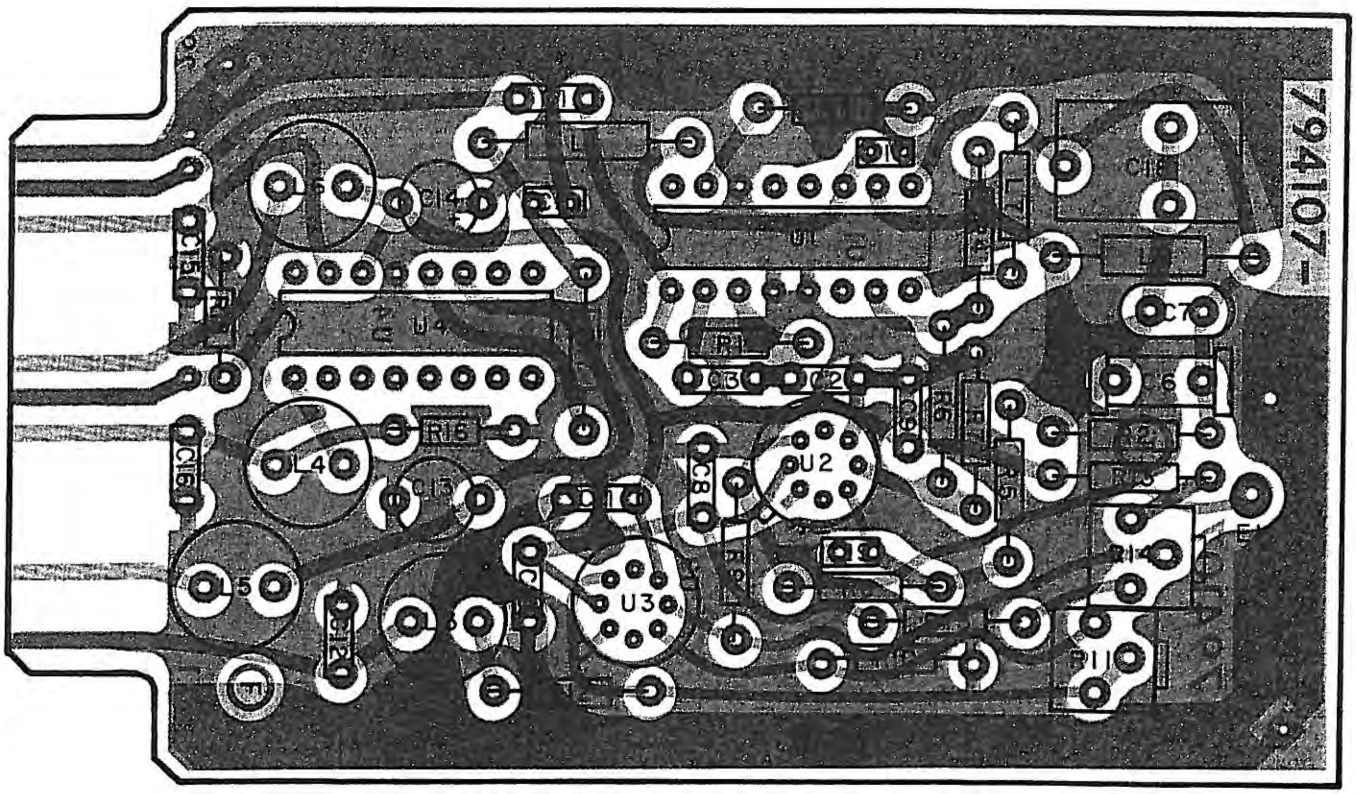


Figure S-10. Type 794107-X FM Demodulator (A3A17-A3A21)

Table S-8. Type 794107-X Component Differences

Type	C12 Cap/Cer/Disc	C16 Cap/Cer/Disc	C19 Cap/Cer/Disc	L3 Coil/Fixed	L4 Coil/Fixed	R2 Res/Fixed/Film	R4 Res/Fixed/Film	U2 Integrated Circuit
794107-1 50 kHz	.018 µH 10% 100V CK06BX183K 81349	.012 µH 10% 100V CK06BX123K 81349	Not Used	4.7 mH 10% 553-3635-45 71279	3.3 mH, 10% 553-3635-43 71279	4.75 k 1% 1/10W RN55C4751F 81349	4.75 k 1% 1/10W RN55C4751F 81349	741HC 07263
794107-2 100 kHz	.01 µH 10% 200V CK06BX103K 81349	6800 pF 10% 200V CK06BX682K 81349	4.7 pF 10% 200V CK06BX682K 81349	2.2 mH 10% 553-3635-41 71279	1.35 mH, 10% 553-3635-39 71279	1.21 k 1% 1/10W RN55C1211F 81349	4.75 k 1% 1/10W RN55C4751F 81349	LM318H 27014
794107-3 250 kHz	3300 pF 10% 200V CK06BX332K 81349	3900 pF 10% 100V CK06BX392K 81349	4.7 pF ±.25 100V 810-100-COHO-479C 59660	1.0 mH 10% 553-3635-37 71279	680 µH, 10% 553-3635-35 71279	453 Ω 1% 1/10 W RN55C4530F 81349	4.75 k 1% 1/10 W RN55C4751F 81349	LM318H 27014
794107-4 300 kHz	2700 pF 10% 200V CK06BX272K 81349	3300 pF 10% 200V CK06BX332K 81349	4.7 pF ±.25 100V 810-100-COHO-479C 59660	820 µH 10% 553-3635-36 71279	560 µH, 10% 553-3635-34 71279	392 Ω 1% 1/10 W RN55C2051F 81349	4.75 k 1% 1/10 W RN55C4751F 81349	LM318H 27014
794107-5 40 kHz	.018 µH 10% 100V CK06BX183K 81349	.012 µH 10% 100V CK06BX123K 81349	Not Used	4.7 mH 10% 553-3635-45 71279	3.3 mH, 10% 553-3635-43 71279	4.75 k 1% 1/10 W RN55C4751F 81349	4.75 k 1% 1/10 W RN55C4751F 81349	741HC 07263
794107-6 75 kHz	.015 µH 10% 100V CK06BX153K 81349	8200 pF 10% 200V CK06BX822K 81349	4.7 pF ±.25 100V 810-100-COHO-479C 59660	3.3 mH 10% 553-3635-43 71279	2.2 mH, 10% 553-3635-41 71279	2.05 k 1% 1/10 W RN55C2051F 81349	4.75 k 1% 1/10 W RN55C4751F 81349	LM318H 21704
794107-13 60 kHz	015 µH 10% 100V CK06BX153K 81349	015 µH 10% 100V CK06BX153K 81349	Not Used	3.3 mH 10% 553-3635-43 71279	3.3 mH 10% 553-3635-43 71279	1.21 k 1% 1/10W RN55C1211F 81349	4.75 k 1% 1/10 W RN55C4751F 81349	LM318H 21704
794107-14 150 kHz	680 pF 10% 200V CK06BX682K 81349	680 pF 10% 200V CK06BX682K 81349	4.7 pF ±.25 100V 810-100-COHO-479C 59660	1.5 mH 10% 553-3635-39 71279	1.5 mH 10% 553-3635-39 71279	1.21 k 1% 1/10W RN55C1211F 81349	4.75 k 1% 1/10 W RN55C4751F 81349	LM318H 21704

S.8.2.6 **Type 794104-1 FM Demodulator** REF DESIG PREFIX **A3A17-A3A21**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision E				
C1	Capacitor, Ceramic, Disc: 4700 pF, 20%, 50 V	7	8121-050-651-472M	72982	
C2 Thru C5	Same as C1				
C6	Capacitor, Ceramic, Tubular: 1.5 pF, ±0.1 pF, 500 V	2	301-000-COKO-159B	72982	
C7	Capacitor, Ceramic, Tubular: 1.5 pF, ±0.25 pF, 500 V	1	301-000-T3KO-159C	72982	
C8	Capacitor, Variable, Ceramic: 2-8 pF, 350 V	1	538-006A2-8	72982	
C9	Capacitor, Ceramic, Tubular: 5.1 pF, ±0.5 pF, 500 V	1	301-000-COHO-519D	72982	
C10	Capacitor, Variable, Air: 0.8-10 pF, 250 V	1	5201/W HDW	91293	
C11	Same as C1				
C12	Same as C6				
C13	Same as C1				
C14	Capacitor, Ceramic, Tubular: 4.7 pF, ±0.25 pF, 500 V	1	301-000-U2JO-479C	72982	
C15	Capacitor, Ceramic, Tubular: 22 pF, 5%, 500 V	1	301-000-COGO-220J	72982	
C16	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 50 V	2	34475-1	14632	
C17	Same as C16				
C18	Capacitor, Ceramic, Disc: 0.47 µF, 20%, 50 V	2	34452-1	14632	
C19	Same as C18				
C20	Capacitor, Electrolytic, Tantalum: 2.2 µF, 20%, 35 V	2	196D225X0035JE3	56289	
C21	Capacitor, Mica, Dipped: 820 pF, 5%, 500 V	1	DM15-821J	72136	
C22	Capacitor, Mica, Dipped: 1000 pF, 5%, 500 V	1	DM15-102J	72136	
C23	Same as C20				
CR1	Diode	2	5082-2800	28480	
CR2	Same as CR1				
L1	Coil Fixed	1	22295-63	14632	
L2	Coil Fixed: 18 µH, 10%	1	1537-42	99800	
L3	Not Used				
L4	Coil, Fixed: 180 µH, 5%	1	1537-88	99800	
L5	Coil, Fixed: 1.2 mH, 10%	2	553-3635-38	71279	
L6	Same as L5				
L7	Coil, Fixed: 220 µH, 5%	1	1537-92	99800	
R1	Resistor, Fixed, Film: 220Ω, 5%, 1/4 W	1	CF1/4-220 OHMS/J	09021	
R2	Resistor, Fixed, Film: 3.3 kΩ, 5%, 1/4 W	1	CF1/4-3.3 K/J	09021	
R3	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	1	CF1/4-100 OHMS/J	09021	
R4	Resistor, Fixed, Film: 10Ω, 5%, 1/4 W	1	CF1/4-10 OHMS/J	09021	
R5	Resistor, Fixed, Film: 18 kΩ, 5%, 1/4 W	1	CF1/4-18K/J	09021	
R6	Resistor, Fixed, Film: 12 kΩ, 5%, 1/4 W	1	CF1/4-12K/J	09021	
R7	Resistor, Fixed, Film: 22 kΩ, 5%, 1/4 W	2	CF1/4-22K/J	09021	
R8	Same as R7				
R9	Resistor, Trimmer, Film: 20 kΩ, 10%, 1/2 W	1	62PAR20K	73138	
R10	Resistor, Fixed, Film: 100 kΩ, 1%, 1/10 W	2	RN55C1003F	81349	
R11	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	3	CF1/4-10K/J	09021	

REF DESIG PREFIX A3A17-A3A21

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R12	Same as R11				
R13	Same as R10				
R14	Same as R11				
R15	Resistor, Fixed, Film: 20 kΩ, 5%, 1/4 W	1	CF1/4-20K/J	09021	
R16	Resistor, Trimmer, Film: 200 kΩ, 10%, 1/2 W	1	62PAR200K	73138	
R17	Resistor, Fixed, Film: 470Ω, 5%, 1/4 W	1	CF1/4-470 OHMS/J	09021	
R18	Resistor, Fixed, Film: 22 kΩ, 5%, 1/8 W	2	CF1/8-22K/J	09021	
R19	Resistor, Fixed, Film: 22Ω, 5%, 1/4 W	1	CF1/4-22 OHMS/J	09021	
R20	Same as R18				
T1	Transformer	1	24608-8	14632	
U1	Integrated Circuit	1	CA3011	02735	
U2	Integrated Circuit	1	LM318N	27014	
U3	Integrated Circuit	1	IH5040CPE	32293	
VR1	Voltage Regulator: 3.3 V	1	1N746A	80131	
VR2	Voltage Regulator: 5.1 V	1	1N751A	80131	

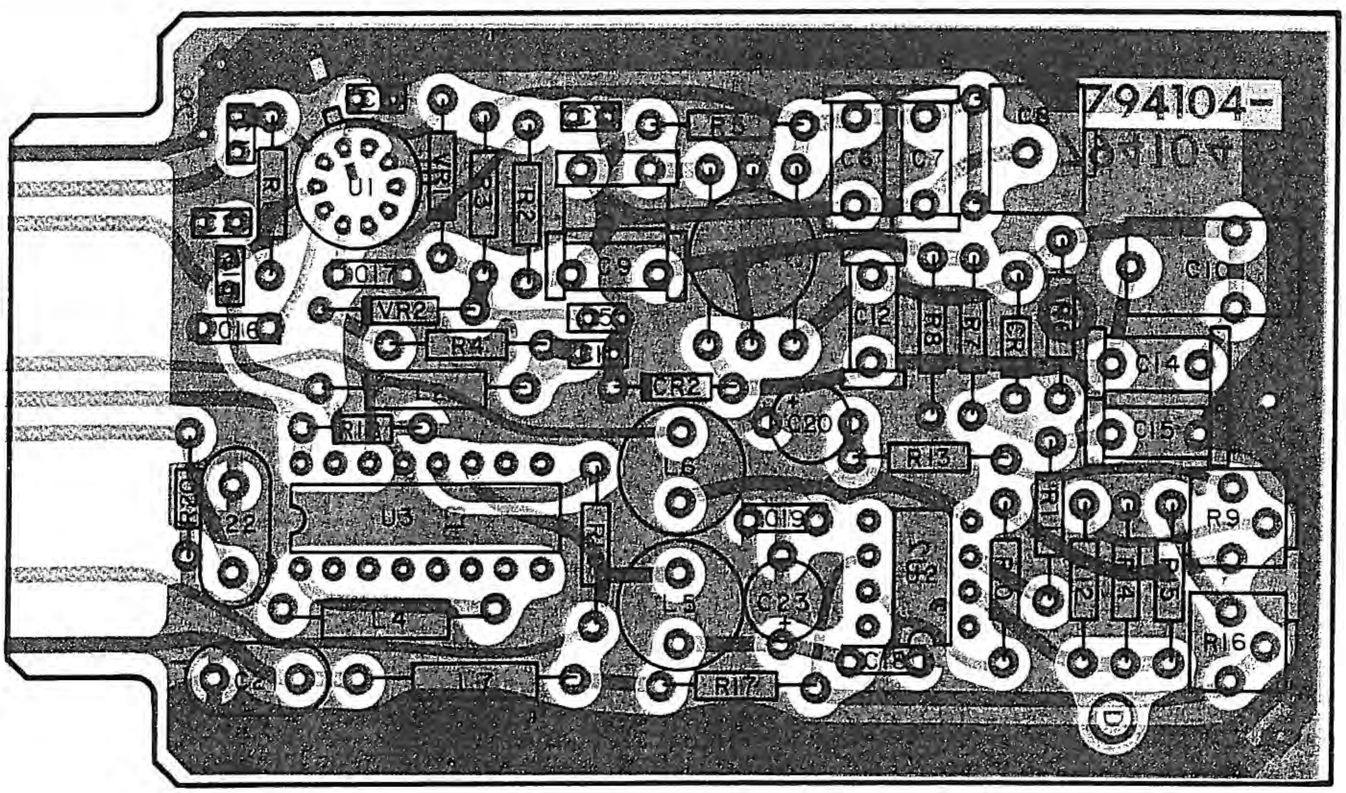


Figure S-11. Type 794104-X FM Demodulator (A3A17-A3A21), Location of Components

S.8.2.7 Type 794104-2 FM Demodulator

REF DESIG PREFIX **A3A17-A3A21**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision E				
C1	Capacitor, Ceramic, Disc: 4700 pF, 20%, 50 V	7	8121-050-651-472M	72982	
C2 Thru C5	Same as C1				
C6	Capacitor, Ceramic, Tubular: 1.5 pF, ±0.1 pF, 500 V	2	301-000-COKO-159B	72982	
C7	Capacitor, Ceramic, Tubular: 1.5 pF, ±0.25 pF, 500 V	1	301-000-T2KO-159C	72982	
C8	Capacitor, Variable, Ceramic: 2-8 pF, 350 V	1	538-006A2-8	72982	
C9	Capacitor, Ceramic, Tubular: 5.1 pF, ±0.5 pF, 500 V	1	301-000-COHO-519D	72982	
C10	Capacitor, Variable, Air: 0.8-10 pF, 250 V	1	5201/W HDW	91293	
C11	Same as C1				
C12	Same as C6				
C13	Same as C1				
C14	Capacitor, Ceramic, Tubular: 4.7 pF, ±0.25 pF, 500 V	1	301-000-U2JO-479C	72982	
C15	Capacitor, Ceramic, Tubular: 22 pF, 5%, 500 V	1	301-000-COGO-220J	72982	
C16	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 50 V	2	34475-1	14632	
C17	Same as C16				
C18	Capacitor, Ceramic, Disc: 0.47 µF, 20%, 50 V	2	34452-1	14632	
C19	Same as C18				
C20	Capacitor, Electrolytic, Tantalum: 2.2 µF, 20%, 35 V	2	196D225X0035JE3	56289	
C21	Capacitor, Ceramic, Disc: 1500 pF, 10%, 200 V	1	CK06BX152K	81349	
C22	Capacitor, Ceramic, Disc: 2200 pF, 10%, 200 V	1	CK06BX222K	81349	
C23	Same as C20				
CR1	Diode				
CR2	Same as CR1				
L1	Coil, Fixed	1	22295-63	14632	
L2	Coil, Fixed: 18 µH, 10%	1	1537-42	99800	
L3	Not Used				
L4	Coil, Fixed: 360 µH, 5%	1	2500-06	99800	
L5	Coil, Fixed: 1.2 mH, 10%	2	553-3635-38	71279	
L6	Same as L5				
L7	Coil, Fixed: 390 µH, 5%	1	2500-08	99800	
R1	Resistor, Fixed, Film: 220Ω, 5%, 1/4 W	1	CF1/4-220 OHMS/J	09021	
R2	Resistor, Fixed, Film: 3.3 kΩ, 5%, 1/4 W	1	CF1/4-3.3 K/J	09021	
R3	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	1	CF1/4-100 OHMS/J	09021	
R4	Resistor, Fixed, Film: 10Ω, 5%, 1/4 W	1	CF1/4-10 OHMS/J	09021	
R5	Resistor, Fixed, Film: 18 kΩ, 5%, 1/4 W	1	CF1/4-18K/J	09021	
R6	Resistor, Fixed, Film: 12 kΩ, 5%, 1/4 W	1	CF1/4-12K/J	09021	
R7	Resistor, Fixed, Film: 22 kΩ, 5%, 1/4 W	2	CF1/4-22K/J	09021	
R8	Same as R7				
R9	Resistor, Trimmer, Film: 20 kΩ, 10%, 1/2 W	1	62PAR20K	73138	
R10	Resistor, Fixed, Film: 100 kΩ, 1%, 1/10 W	2	RN55C1003F	81349	
R11	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	3	CF1/4-10K/J	09021	

S.8.2.8 Type 794105-X FM Demodulator

REF DESIG PREFIX A3A17-A3A21

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: 4700 pF, 20%, 50 V	5	8121-050-651-472M	59660	
C2	Capacitor, Variable, Air: 0.8-10 pF, 250 V	2	5201/W HDW	91293	
C3	Same as C1				
C4	Same as C1				
C5	See Table 9				
C6	Same as C2				
C7	Capacitor, Ceramic, Tubular: 4.7 pF, ±0.25 pF, 500 V	1	301-000U2J0-479C	59660	
C8	Capacitor, Ceramic, Tubular: 3.0 pF, ±0.25 pF, 500 V	1	301-000C0J0-309C	59660	
C9	Not Used				
C10	Not Used				
C11	See Table 9				
C12	See Table 9				
C13	Capacitor, Electrolytic, Tantalum: 2.2 μH, 20%, 35 V	2	196D225X0035JE3	56289	
C14	Same as C1				
C15	Same as C1				
C16	Capacitor, Ceramic, Disc: 0.1 μF, 20%, 50 V	2	34475-1	14632	
C17	Same as C16				
C18	Capacitor, Ceramic, Disc: 0.47 μF, 20%, 50 V	2	34452-1	14632	
C19	Same as C18				
C20	Same as C13				
CR1	Diode	2	5082-2800	28480	
CR2	Same as CR1				
L1	Coil, Fixed	1	22295-67	14632	
L2	Coil, Fixed: 18 μH, 10%	1	1537-42	99800	
L3	See Table 9				
L4	See Table 9				
L5	Coil, Fixed: 1.2 mH, 10%	2	553-3635-38	71279	
L6	Same as L5				
R1	Resistor, Fixed, Film: 220Ω, 5%, 1/4 W	1	CF1/4-220 OHMS/J	09021	
R2	Resistor, Fixed, Film: 1.5 kΩ, 5%, 1/4 W	1	CF1/4-1.5K/J	09021	
R3	Resistor, Fixed, Film: 2.7 kΩ, 5%, 1/4 W	1	CF1/4-2.7K/J	09021	
R4	See Table 9				
R5	Same as R4				
R6	See Table 9				
R7	Resistor, Fixed, Film: 4.7Ω, 5%, 1/4 W	1	CF1/4-4.7 OHMS/J	09021	
R8	See Table 9				
R9	Resistor, Trimmer, Film: 20 kΩ, 10%, 1/2 W	2	62PAR20K	73138	
R10	Resistor, Fixed, Film: 22 kΩ, 5%, 1/8 W	2	CF1/8-22K/J	09021	
R11	Resistor, Fixed, Film: 470Ω, 5%, 1/4 W	1	CF1/4-470 OHMS/J	09021	
R12	Resistor, Fixed, Film: 100 kΩ, 1%, 1/10 W	2	RN55C1003F	81349	
R13	Same as R12				

REF DESIG PREFIX **A3A17-A3A21**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R14	See Table 5				
R15	Resistor, Fixed, Film: 22Ω, 5%, 1/4 W	1	CF1/4-22 OHMS/J	09021	
R16	Same as R10				
T1	Transformer	1	24608-9	14632	
U1	Integrated Circuit	1	CA3011	02735	
U2	Integrated Circuit	1	LM318N	27014	
U3	Integrated Circuit	1	1H5040CPE	32293	
VR1	Voltage Regulator: 5.1 V	1	1N751A	80131	

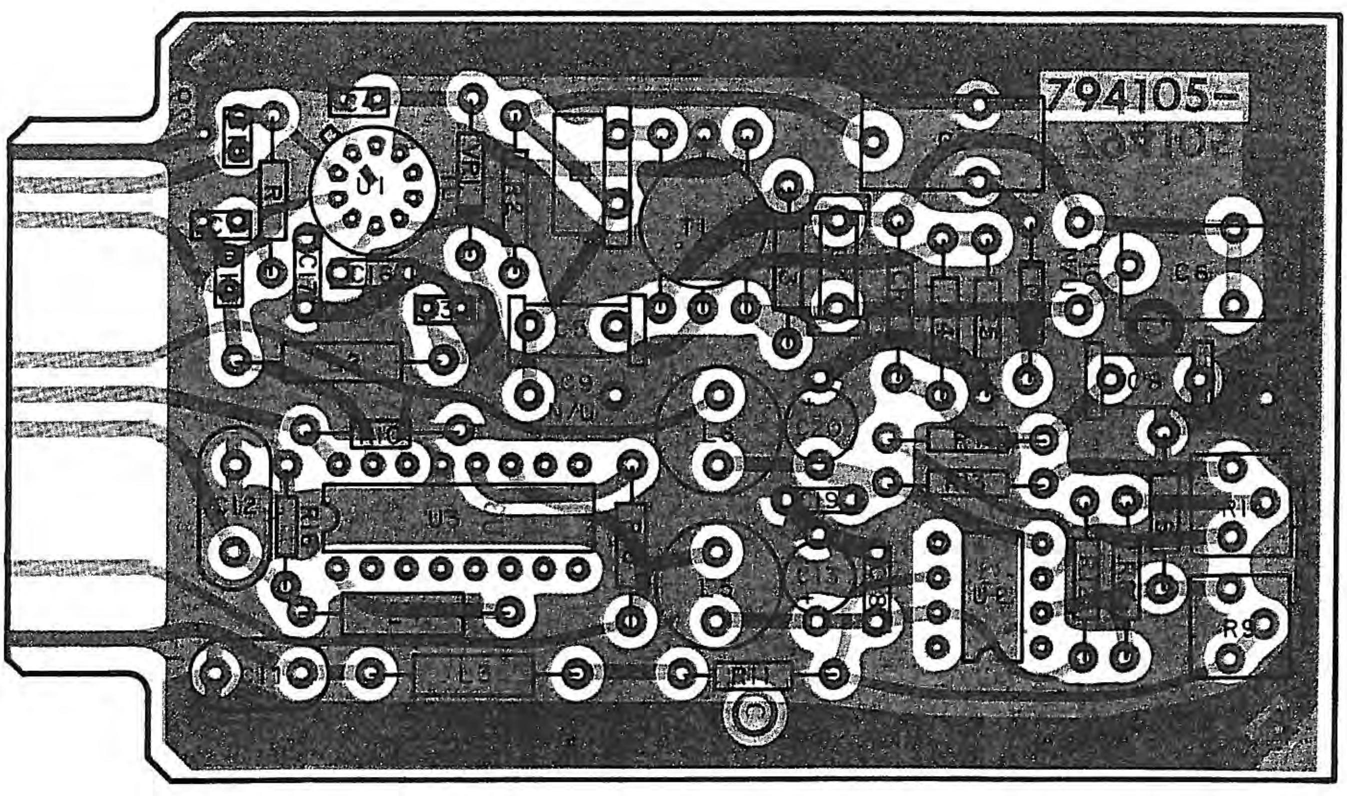


Figure S-12. Type 794105-X FM Demodulator (A3A17-A3A21), Location of Components

Table S-9. Type 794105-4 Component Differences

Type	C12 Cap/Cer/Tub	C11 Cap/Mica/Dipped	C12 Cap/Mica/Dipped	L3 Coil/Fixed	L4 Coil/Fixed	R4 Res/Fixed/Film	R6 Res/Fixed/Film	R8 Res/Fixed/Film	R14 Res/Trim/Film
794105-1 2 MHz	2.5 pF ±.25 pF 500V 301-000GOJO-279C 59660	430 pF 5% 500V DM15-431J 81349	300 pF 2% 500V CM05FD301G03 81349	75 µH 5% 1537-70 99800	100 µH, 5% 1537-76 99800	22 kΩ 5% 1/4W CF1/4-22K 09021	680Ω 5% 1/4W CF1/4-680 OHMS/J 09021	10 kΩ 5% 1/4W CF1/4-10K/J 09021	20 kΩ 10% 1/2W 62PAR20K 73138
794105-2 4 MHz	2.7 pF ±.25 pF 500V 301-000GOJO-279C 59660	130 pF 20% 500V CM05FD131G03 81349	180 pF 2% 500V CM05FD181G03 81349	39 µH 5% 1537-56 99800	47 µH, 5% 1537-60 99800	10 kΩ 5% 1/4W CF1/4-10K/J 09021	1.8 kΩ 5% 1/4W CF1/4-1.8K/J 09021	Same as R4	20 kΩ 10% 1/2W 62PAR20K 73138
794105-3 1 MHz	2.7 pF ±.25 pF 500V 301-000GOJO-279C 59660	820 pF 5% 300V DM15-821J 81349	1000 pF 2% 500V CM06FD102G03 81349	220 µH 5% 1537-92 99800	180 µH, 5% 1537-88 99800	22 kΩ 5% 1/4W CF1/4-22K/J 09021	680 Ω 5% 1/4W CF1/4-680 OHMS/J 09021	10 kΩ 5% 1/4W CF1/4-10K/J 09021	20 kΩ 10% 1/2W 62PAR20K 73138
794105-4 8 MHz	1.0 pF .25 pF 500V 301-000COKO-109C 59660	100 pF 2% 500V CM05FD101G03 81349	300 pF 2% 500V CM05FD301G03 81349	22 µH 10% 1537-44 99800	27 µH, 5% 1537-48 99800	10 kΩ 5% 1/4W CF1/4-10K/J 09021	1.8 kΩ 5% 1/4W CF1/4-1.8K/J 09021	Same as R4	20 kΩ 10% 1/2W 62PAR20K 73138

S.8.2.9 **Type 726009-X Switchable IF BW Filter** REF DESIG PREFIX A3A9-A3A13

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Not Used				
C2	Same as C1				
C3	Capacitor, Ceramic, Monolithic: 5100 pF, ±2%, 100 V	8	300-100-NPO-512G	51642	
C4	Same as C3				
C5	Capacitor, Ceramic, Disc: .1 µF, 20%, 50 V	5	34475-1	14632	
C6	Same as C3				
C7	Same as C5				
C8 Thru C10	Same as C3				
C11	Same as C5				
C12	Same as C3				
C13	Same as C5				
C14	Same as C3				
C15	Same as C5				
C16	Capacitor, Ceramic, Disc: 1, 20%, 50 V	1	8131-050-651-105M	59660	
C17 Thru C21	Same as C1				
C22	Capacitor, Ceramic, Disc: 24 pF, 5%, 50 V	1	8111-050-COGO-240J	59660	
C23	Same as C1				
C24	Capacitor, Variable, Ceramic: 5-25 pF, 100 V	1	518-000A5-25	59660	
C25 Thru C28	Same as C1				
CR1	Diode	1	1N462A	80131	
CR2	Diode	8	5082-3188	28480	
CR3 Thru CR9	Same as CR2				
CR10	Diode	2	1N4449	80131	
CR11	Same as CR10				
FL1	See Table 10				
FL2	See Table 10				
L1	Coil, Fixed: 18 µH, 10%	1	1025-50 (75084-15)	99800	
L2	Coil, Fixed, Molded: 22 µH, 10%	8	1025-52 (75084-16)	99800	
L3 Thru L9	Same as L2				
L10	Coil, Fixed: 2.7 µH, 10%	1	1025-30	99800	
L11	Coil, Fixed, Molded: 1.0 µH, 10%	1	1025-20 (75083-13)	99800	
Q1	Transistor	2	2N2222A	80131	
Q2	Same as Q1				
Q3	Transistor	1	2N2907/JAN	81350	

REF DESIG PREFIX **A3A9-A3A13**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
Q4	Transistor	1	3N211	80131	
Q5	Transistor	1	2N2857/JAN	81350	
R1	See Table 6				
R2	Resistor, Trimmer, Film: 1 kΩ, 10%, 1/2 W	1	62PR1K	73138	
R3	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/8 W	1	CF1/8-1.0K/J	09021	
R4	Resistor, Fixed, Film: 4.3 kΩ, 5%, 1/8 W	4	CF1/8-4.3K/J	09021	
R5	Same as R4				
R6 Thru R8	See Table 10				
R9	Same as R4				
R10	Same as R4				
R11	Resistor, Fixed, Film: 20 kΩ, 5%, 1/8 W	3	CF1/8-20K/J	09021	
R12	Resistor, Fixed, Film: 22 kΩ, 5%, 1/8 W	1	CF1/8-22K/J	09021	
R13	Same as R11				
R14	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/8 W	1	CF1/8-4.7K/J	09021	
R15	Resistor, Fixed, Film: 10 kΩ, 5%, 1/8 W	3	CF1/8-10K/J	09021	
R16	Same as R11				
R17	Resistor, Fixed, Film: 221Ω, 1%, 1/10 W	1	RN55C2210F	81349	
R18	Resistor, Fixed, Film: 47Ω, 5%, 1/8 W	3	CF1/8-47 OHMS?J	09021	
R19	Resistor, Fixed, Film: 33 kΩ, 5%, 1/8 W	1	CF1/8-33K/J	09021	
R20	Resistor, Fixed,Filem: 100Ω, 5%, 1/8 W	3	CF1/8-100 OHMS/J	09021	
R21	Resistor, Trimmer, Film: 10 kΩ, 10%, 1/2 W	1	62PR10K	73138	
R22	Resistor, Fixed, Film: 3.9 kΩ, 5%, 1/8 W	1	CF1/8-3.9K/J	09021	
R23	Resistor, Fixed, Film: 68 kΩ, 5%, 1/8 W	1	CF1/8-68K/J	09021	
R24	Same as R15				
R25	Same as R18				
R26	Resistor, Fixed, Film: 120Ω, 5%, 1/8 W	1	CF1/8-120 OHMS/J	09021	
R27	Same as R20				
R28	See Table 10				
R29	Resistor, Fixed, Film: 8.2 kΩ, 5%, 1/8 W	1	CF1/8-8.2K/J	09021	
R30	Same as R15				
R31	Same as R18				
R32	Same as R20				
R33	Resistor, Fixed, Film: 470Ω, 5%, 1/8 W	1	CF1/8-470 OHMS/J	09021	
R34	Resistor, Fixed, Film: 33Ω, 5%, 1/8 W	1	CF1/8-33 OHMS/J	09021	
R35	See Table 10				
T1	Transformer Assembly	1	180675-1	14632	

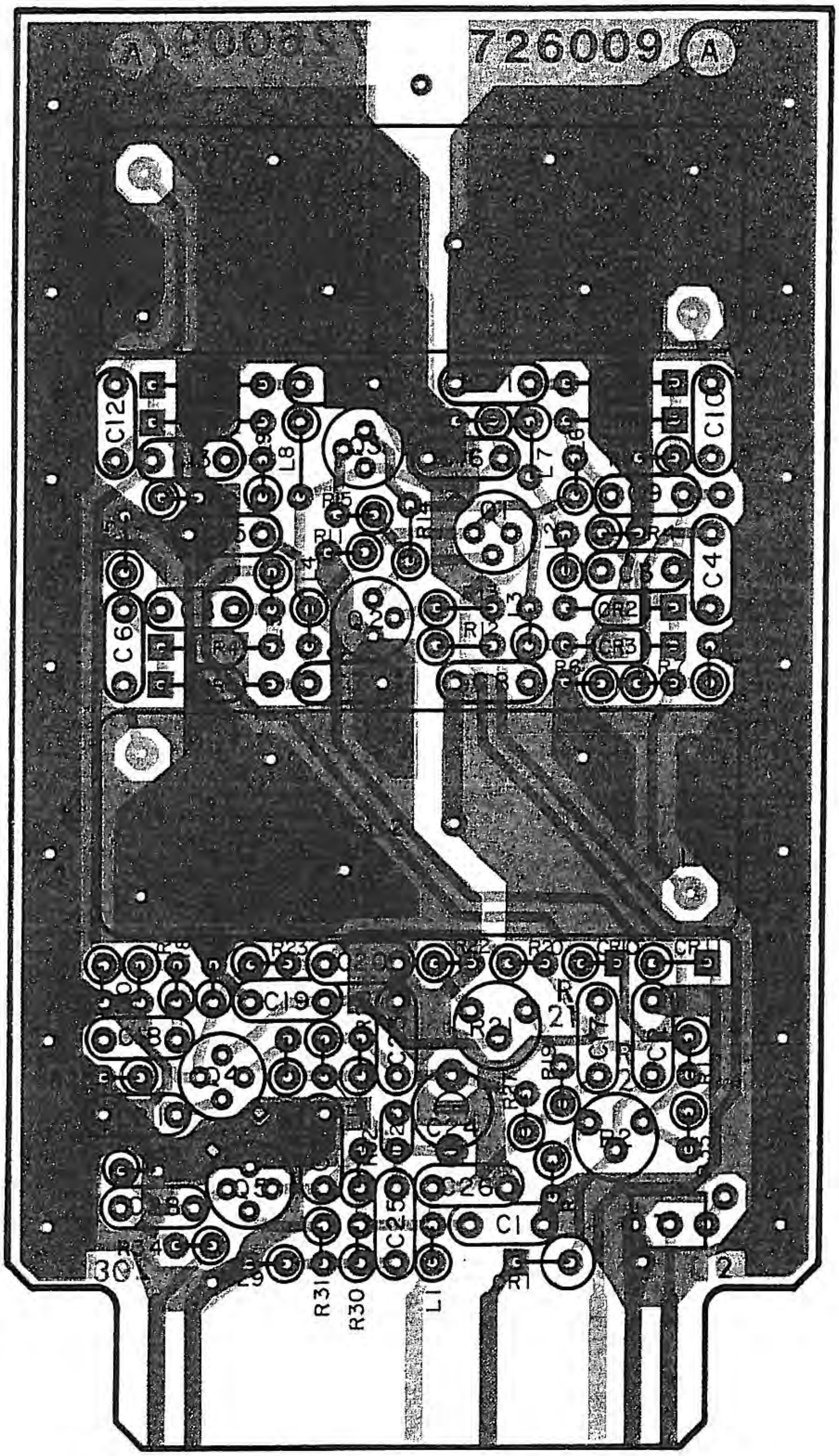


Figure S-13. Type 726009-X Switchable IF BW Filter (A3A17-A3A21), Location of Components

Table S-10. Type 726009-X Component Differences

Type	C29 Cap/Var/ Cer	FL1 Filter	FL2 Filter	L10 Coil/Fixed	R1 Res/Fixed/Film	R6 Res/Fixed/Film	R7 Res/Trim/Film	R8 Res/Fixed/Film	R28 Res/Trim/Film	R35 Res/Fixed/Film
726009-1 3.2/10 kHz	N/U	3.2 kHz 92289 14632	10 kHz 92293 14632	2.7 µH 10% 1025-30 99800	12.1 k 1% 1/10W RN55C1212F 81349	2.4 k 5% 1/8W CF1/8-2.4 K/J 09021	36 Ω 5% 1/8W CF1/8-36 OHMS/J 09021	Same as R6	N/U	1.78 k 1% 1/10W RN55C1781F 81349
726009-2 20/50 kHz	N/U	20 kHz 92294 14632	50 kHz 92291 14632	2.7 µH 10% 1025-30 99800	4.7 pF 1% 1/10W RN55C4751F 81349	910 Ω 5% 1/8W CF1/8-910 OHMS/J 09021	100 Ω 5% 1/8W CF1/8-100 OHMS/J 09021	Same as R6	3.9 k 5% 1/8W CF1/8-3.9 K/J 09021	6.81 k 1% 1/10W RN55C6811F 81349
726009-3 100/200 kHz	N/U	100 kHz 92292 14632	200 kHz 92282 14632	2.7 µH 10% 1025-30 99800	10 k 1% 1/10W RN55C1002F 81349	1.0 k 5% 1/8W CF1/8-1.0 K/J 09021	680 Ω 5% 1/8W CF1/8-680 OHMS/J 09021	Same as R6	1.5 k 5% 1/8W CF1/8-1.5 K/J 09021	2.43 k 1% 1/10W RN55C2431F 81349
726009-4 100/300 kHz	N/U	100 kHz 92292 14632	300 kHz 92290 14632	2.7 µH 10% 1025-30 99800	1.5 k 5% 1/10W RN55C1501F 81349	750 Ω 5% 1/8W CF1/8-750 OHMS/J 09021	100 Ω 5% 1/8W CF1/8-100 OHMS/J 09021	Same as R6	Same as R1	2.43 k 1% 1/10W RN55C2431F 81349
726009-5 6.4/10 kHz	N/U	6.4 kHz 92299 14632	10 kHz 92293 14632	2.7 µH 10% 1025-30 99800	12.1 k 1% 1/10W RN55C1212F 81349	N/U	N/U	N/U	N/U	18.2 k 1% 1/10W RN55C1822F 81349
726009-6 15/20 kHz	N/U	15 kHz 92300 14632	20 kHz 92294 14632	2.7 µH 10% 1025-30 99800	6.81 k 1% 1/10W RN55C6811F 81349	3.3 k 5% 1/8W CF1/8-3.3 K/J 09021	24 Ω 5% 1/8W CF1/8-24 OHMS/J 09021	Same as R6	6.2 k 5% 1/8W CF1/8-6.2 K/J 09021	8.25 k 1% 1/10W RN55C1825F 81349
726009-7 30/40 kHz	N/U	30 kHz 92301 14632	40 kHz 92294 14632	2.7 µH 10% 1025-30 99800	5.62 k 1% 1/10W RN55C5621F 81349	3.3 k 5% 1/8W CF1/8-3.3 K/J 09021	24 Ω 5% 1/8W CF1/8-24 OHMS/J 09021	Same as R6	2.7 k 5% 1/8W CF1/8-2.7 K/J 09021	Same as R1
726009-8 30/40 kHz	N/U	30 kHz 92301 14632	50 kHz 92291 14632	2.7 µH 10% 1025-30 99800	4.75 k 1% 1/10W RN55C4751F 81349	1.8 k 5% 1/8W CF1/8-1.8 K/J 09021	4.7 Ω 5% 1/8W CF1/8-4.7 OHMS/J 09021	Same as R6	2.7 k 1% 1/8W CF1/8-2.7 K/J 09021	5.62 k 1% 1/10W RN55C562F 81349
726009-9 75/100 kHz	N/U	75 kHz 92303 14632	100 kHz 92292 14632	2.7 µH 10% 1025-30 99800	2.43 k 1% 1/10W RN55C2431F 81349	3.3 k 5% 1/8W CF1/8-3.3 K/J 09021	24 Ω 5% 1/8W CF1/8-24 OHMS/J 09021	Same as R6	750 Ω 5% 1/8W CF1/8-750 OHMS/J 09021	2.74 k 1% 1/10W RN55C2741F 81349
726009-10 150/200 kHz	N/U	150 kHz 92304 14632	200 kHz 92282 14632	2.7 µH 10% 1025-30 99800	10 k 1% 1/10W RN55C1002F 81349	3.3 k 5% 1/8W CF1/8-3.3 K/J 09021	240 Ω 5% 1/8W CF1/8-240 OHMS/J 09021	Same as R6	1.5 k 1% 1/8W CF1/8-1.5 K/J 09021	3.65 k 1% 1/10W RN55C3651F 81349
726009-11 10/20 kHz	N/U	10 kHz 92293 14632	20 kHz 92294 14632	2.7 µH 10% 1025-30 99800	5.62 k 1% 1/10W RN55C5621F 81349	1.0 k 5% 1/8W CF1/8-1.0 K/J 09021	680 Ω 5% 1/8W CF1/8-680 OHMS/J 09021	Same as R6	N/U	10 k 1% 1/10W RN55C1002F 81349
726009-12 50/100 kHz	N/U	50 kHz 92291 14632	100 kHz 92292 14632	2.7 µH 10% 1025-30 99800	2.74 k 1% 1/10W RN55C2741F 81349	N/U	N/U	N/U	1.5 k 5% 1/8W CF1/8-1.5 K/J 09021	3.65 k 1% 1/10W RN55C3651F 81349
726009-13 250/500 kHz	N/U	250 kHz 92317 14632	500 kHz 92288 14632	2.7 µH 10% 1025-30 99800	1.33 k 1% 1/10W RN55C1331F 81349	1.5 k 5% 1/8W CF1/8-1.5 K/J 09021	56 Ω 5% 1/8W CF1/8-56 OHMS/J 09021	Same as R6	750 Ω 5% 1/8W CF1/8-750 OHMS/J 09021	1.58 k 1% 1/10W RN55C1581F 81349

Table S-10. Type 726009-X Component Differences (Continued)

Type	C29 Cap/Var/ Cer	FL1 Filter	FL2 Filter	L10 Coil/Fixed	R1 Res/Fixed/Film	R6 Res/Fixed/Film	R7 Res/Trim/Film	R8 Res/Fixed/Film	R28 Res/Trim/Film	R35 Res/Fixed/Film
726009-14 10/25 kHz	N/U	10 kHz 92293 14632	25 kHz 92340 14632	2.7 µH 10% 1025-30 99800	5.11 k 1% 1/10W RN55C5111F 81349	910 Ω 5% 1/8W CF1/8-910 OHMS/J 09021	100 Ω 5% 1/8W CF1/8-100 OHMS/J 09021	Same as R6	N/U	9.53 k 1% 1/10W RN55C9531F 81349
726009-15 20/30 kHz	N/U	20 kHz 92294 14632	30 kHz 92301 14632	2.7 µH 10% 1025-30 99800	4.64 k 5% 1/10W RN55C4641F 81349	1.8 k 5% 1/8W CF1/8-1.8 K/J 09021	47 Ω 5% 1/8W CF1/8-47 OHMS/J 09021	Same as R6	3.9 k 5% 1/8W CF1/8-3.9 K/J 09021	5.11 k 1% 1/10W RN55C5111F 81349
726009-16 50/75 kHz	N/U	50 kHz 92291 14632	75 kHz 92303 14632	2.7 µH 10% 1025-30 99800	3.01 k 1% 1/10W RN55C3011F 81349	N/U	N/U	N/U	1.5 k 5% 1/8W CF1/8-1.5 K/J 09021	3.32 k 1% 1/10W RN55C3321F 81349
726009-17 3.2/6.4 kHz	N/U	3.2 kHz 92289 14632	6.4 kHz 92299 14632	2.7 µH 10% 1025-30 99800	20 k 1% 1/10W RN55C2002F 81349	2.4 k 5% 1/8W CF1/8-2.4 K/J 09021	36 Ω 5% 1/8W CF1/8-36 OHMS/J 09021	Same as R6	N/U	1.78 k 1% 1/10W RN55C1781F 81349
726009-18 150/300 kHz	N/U	150 kHz 92304 14632	300 kHz 92290 14632	2.7 µH 10% 1025-30 99800	1.21 k 1% 1/10W RN55C1211F 81349	2.4 k 5% 1/8W CF1/8-2.4 K/J 09021	36 Ω 5% 1/8W CF1/8-36 OHMS/J 09021	Same as R6	1.5 k 5% 1/8W CF1/8-1.5 K/J 09021	6.04 k 1% 1/10W RN55C6041F 81349
726009-19 300/500 kHz	N/U	300 kHz 92290 14632	500 kHz 92288 14632	2.7 µH 10% 1025-30 99800	1.52 k 1% 1/10W RN55C1151F 81349	1.0 k 5% 1/8W CF1/8-1.0 K/J 09021	82 Ω 5% 1/8W CF1/8-82 OHMS/J 09021	Same as R6	750 Ω 5% 1/8W CF1/8-750 OHMS/J 09021	1.18 k 1% 1/10W RN55C1181F 81349
726009-20 200/300 kHz	N/U	200 kHz 92282 14632	300 kHz 92290 14632	2.7 µH 10% 1025-30 99800	1.4 k 1% 1/10W RN55C1401F 81349	N/U	N/U	N/U	750 Ω 5% 1/8W CF1/8-750 OHMS/J 09021	9.09 k 1% 1/10W RN55C9091F 81349
726009-21 10/30 kHz	N/U	10 kHz 92293 14632	30 kHz 92301 14632	2.7 µH 10% 1025-30 99800	4.32 k 1% 1/10W RN55C4321F 81349	820 Ω 5% 1/8W CF1/8-820 OHMS/J 09021	100 Ω 5% 1/8W CF1/8-100 OHMS/J 09021	Same as R6	N/U	10 k 1% 1/10W RN55C1002F 81349
726009-22 10/50 kHz	N/U	10 kHz 92293 14632	50 kHz 92291 14632	2.7 µH 10% 1025-30 99800	4.75 k 1% 1/10W RN55C4751F 81349	560 Ω 5% 1/8W CF1/8-560 OHMS/J 09021	180 Ω 5% 1/8W CF1/8-180 OHMS/J 09021	Same as R6	N/U	1.33 k 1% 1/10W RN55C1332F 81349
726009-23 10/50 kHz	5-20 pF 250V	10 kHz 92474 14632	50 kHz 92473 14632	1.8 µH 10% 1025-26 99800	4.75 k 1% 1/10W RN55C4751F 81349	560 Ω 5% 1/8W CF1/8-560 OHMS/J 09021	180 Ω 5% 1/8W CF1/8-180 OHMS/J 09021	Same as R6	N/U	1.33 k 1% 1/10W RN55C1332F 81349
726009-24 300/500 kHz	5-20 pF 250V	300 kHz 92472 14632	500 kHz 92471 14632	1.8 µH 10% 1025-30 99800	1.15 k 1% 1/10W RN55C1151F 81349	1.0 k 5% 1/8W CF1/8-1.0 K/J 09021	82 Ω 5% 1/8W CF1/8-82 OHMS/J 09021	Same as R6	750 Ω 5% 1/8W CF1/8-750 OHMS/J 09021	1.18 k 1% 1/10W RN55C1181F 81349
726009-25 200/1400 kHz	N/U	200 kHz 92282 14632	400 kHz 92283 14632	2.7 µH 10% 1025-30 99800	931 Ω 1% 1/10W RN55C9310F 81349	910 Ω 5% 1/8W CF1/8-910 OHMS/J 09021	100 Ω 5% 1/8W CF1/8-100 OHMS/J 09021	Same as R6	750 Ω 5% 1/8W CF1/8-750 OHMS/J 09021	9.09 k 1% 1/10W RN55C9091F 81349
726009-26 25/75 kHz	N/U	25 kHz 92340 14632	75 kHz 92303 14632	2.7 µH 10% 1025-30 99800	3.01 k 1% 1/10W RN55C3011F 81349	820 Ω 5% 1/8W CF1/8-820 OHMS/J 09021	100 Ω 5% 1/8W CF1/8-100 OHMS/J 09021	Same as R6	N/U	4.64 k 1% 1/10W RN55C4641F 81349

Table S-10. Type 726009-X Component Differences (Continued)

Type	C29 Cap/Var/Cer	FL1 Filter	FL2 Filter	L10 Coil/Fixed	R1 Res/Fixed/Film	R6 Res/Fixed/Film	R7 Res/Trim/Film	R8 Res/Fixed/Film	R28 Res/Trim/Film	R35 Res/Fixed/Film
726009-27 40/20 kHz	N/U	6.4 kHz 92299 14632	20 kHz 92294 14632	2.7 µH 10% 1025-30 99800	6.81 k 1% 1/10W RN55C6811F 81349	2.4 k 5% 1/8W CF1/8-2.4 K/J 09021	36 Ω 5% 1/8W CF1/8-36 OHMS/J 09021	Same as R6	N/U	18.2 k 1% 1/10W RN55C1822F 81349
726009-28 50/150 kHz	N/U	50 kHz 92291 14632	150 kHz 92304 14632	2.7 µH 10% 1025-20 99800	7.5 k 1% 1/10W RN55C7501F 81349	Same as R3	68 Ω 5% 1/8W CF1/8-68 OHMS/J 09021	Same as R3	1.5 k 5% 1/8W CF1/8-1.5 K/J 09021	3.65 k 1% 1/10W RN55C3651F 81349
726009-29 300/400 kHz	5-20 pF 250V	300 kHz 92290 14632	400 kHz 92283 14632	1.8 µH 10% 1025-26 99800	931 Ω 1% 1/10W RN55C9310F 81349	Same as R3	82 Ω 5% 1/8W CF1/8-82 OHMS/J 09021	Same as R3	750 Ω 5% 1/8W CF1/8-750 OHMS/J 09021	1.18 k 1% 1/10W RN55C1181F 81349
726009-30 100/150 kHz	N/U	100 kHz 92292 14632	150 kHz 92304 14632	2.7 µH 10% 1025-30 99800	7.5 k 1% 1/10W RN55C7501F 81349	3.3 k 5% 1/8W CF1/8-3.3 K/J 09021	24 Ω 5% 1/8W CF1/8-24 OHMS/J 09021	Same as R6	1.5 k 5% 1/8W CF1/8-1.5 K/J 09021	2.43 k 1% 1/10W RN55C2431F 81349
726009-31 150/200 kHz	N/U	150 kHz 92304 14632	200 kHz 92282 14632	2.7 µH 10% 1025-20 99800	2.21 k 1% 1/10W RN55C2211F 81349	3.3 k 5% 1/8W CF1/8-3.3 K/J 09021	24 Ω 5% 1/8W CF1/8-24 OHMS/J 09021	Same as R6	1.5 k 5% 1/8W CF1/8-1.5 K/J 09021	3.65 k 1% 1/10W RN55C3651F 81349
726009-32 4.0/10 kHz	N/U	4 kHz 92574 14632	10 kHz 92293 14632	2.7 µH 10% 1025-30 99800	11 k 1% 1/10W RN55C1102F 81349	910 Ω 5% 1/8W CF1/8-910 OHMS/J 09021	100 Ω 5% 1/8W CF1/8-100 OHMS/J 09021	Same as R6	N/U	13.3 k 1% 1/10W RN55C1332F 81349
726009-33 3.2/10 kHz	5-20 pF 250V	3.2 kHz 92660 14632	10 kHz 92474 14632	1.8 µH 10% 1025-26 99800	12.1 k 1% 1/10W RN55C1212F 81349	2.4 k 5% 1/8W CF1/8-2.4 K/J 09021	36 Ω 5% 1/8W CF1/8-36 OHMS/J 09021	Same as R6	N/U	1.78 k 1% 1/10W RN55C1781F 81349
726009-34 20/50 kHz	5-20 pF 250V	20 kHz 92661 14632	50 kHz 92472 14632	1.8 µH 10% 1025-26 99800	4.75 k 1% 1/10W RN55C4751F 81349	910 Ω 5% 1/8W CF1/8-910 OHMS/J 09021	100 Ω 5% 1/8W CF1/8-100 OHMS/J 09021	Same as R6	Same as R22	6.81 k 1% 1/10W RN55C6811F 81349
726009-35 100/300 kHz	5-20 pF 250V	100 kHz 92662 14632	300 kHz 92472 14632	1.8 µH 10% 1025-26 99800	1.5 k 1% 1/10W RN55C1501F 81349	750 Ω 5% 1/8W CF1/8-750 OHMS/J 09021	100 Ω 5% 1/8W CF1/8-100 OHMS/J 09021	Same as R6	1.5 k 5% 1/8W CF1/8-1.5 K/J 09021	2.43 k 1% 1/10W RN55C2431F 81349
726009-36 25/34 kHz	N/U	25 kHz 92340 14632	34 kHz 92669 14632	2.7 µH 10% 1025-30 99800	4.64 k 1% 1/10W RN55C4641F 81349	1.2 k 5% 1/8W CF1/8-1.2 K/J 09021	68 Ω 5% 1/8W CF1/8-68 OHMS/J 09021	Same as R6	3.9 k 5% 1/8W CF1/8-3.9 K/J 09021	5.11 k 1% 1/10W RN55C5111F 81349
726009-37 40/50 kHz	N/U	40 kHz 92302 14632	50 kHz 92291 14632	2.7 µH 10% 1025-30 99800	3.65 k 1% 1/10W RN55C3651F 81349	1.8 k 5% 1/8W CF1/8-1.8 K/J 09021	47 Ω 5% 1/8W CF1/8-47 OHMS/J 09021	Same as R6	2.7 k 5% 1/8W CF1/8-2.7 K/J 09021	3.92 k 1% 1/10W RN55C3921F 81349

S.8.2.10 **Type 726010-X Switchable IF BW Filter** REF DESIG PREFIX **A3A9-A3A13**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: .1 µF, 20%, 50 V	1	34475-1	14632	
C2	Capacitor, Ceramic, Disc: 1 µF, 20%, 50 V	1	8131-050-651-105M	59660	
C3	Capacitor, Ceramic, Monolithic: 5100 pF, ±2%, 100 V	12	300-100-NPO-512G	51642	
C4 Thru C14	Same as C3				
C15	Capacitor, Ceramic, Monolithic: 4700 pF, ±2%, 100 V	8	300-100-NPO-472G	51642	
C16 Thru C22	Same as C15				
C23	Not Used				
C24	See Table 11				
CR1	Diode	8	5082-3188	28480	
CR2 Thru CR8	Same as CR1				
CR9	Diode	1	1N462A	80131	
CR10	Diode	2	1N4449	80131	
CR11	Same as CR10				
FL1	See Table 11				
FL2	See Table 11				
L1	Coil, Fixed, Molded: 22 µH, 10%	7	1025-52 (75084-16)	99800	
L2 Thru L7	Same as L1				
L8	See Table 11				
L9	Coil, Fixed: 18 µH, 10%	1	1025-50 (75084-15)	99800	
Q1	Transistor	2	2N2222A	80131	
Q2	Same as Q1				
Q3	Transistor	1	2N2907/JAN	81350	
Q4	Transistor	1	2N2857/JAN	81350	
R1	Resistor, Fixed, Film: 22 kΩ, 5%, 1/8 W	1	CF1/8-22K/J	09021	
R2	Resistor, Fixed, Film: 20 kΩ, 5%, 1/8 W	3	CF1/8-20K/J	09021	
R3	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/8 W	2	CF1/8-4.7K/J	09021	
R4	Resistor, Fixed, Film: 10 kΩ, 5%, 1/8 W	1	CF1/8-10K/J	09021	
R5	Same as R2				
R6	Same as R2				
R7	Resistor, Fixed, Film: 4.3 kΩ, 5%, 1/8 W	4	CF1/8-4.3K/J	09021	
R8	Same as R7				
R9 Thru R11	See Table 11				
R12	Same as R7				
R13	Same as R7				

REF DESIG PREFIX **A3A9-A3A13**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R14	See Table 11				
R15	See Table 11				
R16	See Table 11				
R17	Resistor, Trimmer, Film: 1 kΩ, 10%, 1/2 W	1	62PR1K	73138	
R18	Resistor, Fixed, Film: 1.5 kΩ, 5%, 1/8 W	1	CF1/8-1.5K/J	09021	
R19	Resistor, Fixed, Film: 100Ω, 5%, 1/8 W	2	CF1/8-100 OHMS/J	09021	
R20	Resistor, Fixed, Film: 6.2 kΩ, 5%, 1/8 W	1	CF1/8-6.2K/J	09021	
R21	Resistor, Fixed, Film: 47Ω, 5%, 1/8 W	1	CF1/8-47 OHMS/J	09021	
R22	Resistor, Fixed, Film: 6.8 kΩ, 5%, 1/8 W	1	CF1/8-6.8K/J	09021	
R23	Same as R19				
R24	See Table 11				
R25	Resistor, Fixed, Film: 470Ω, 5%, 1/8 W	1	CF1/8-470 OHMS/J	09021	
R26	See Table 11				
R27	Resistor, Trimmer, Film: 500Ω, 10%, 1/2 W	1	62PR500	7313u8	
R28	Resistor, Fixed, Film: 1.8 kΩ, 5%, 1/8 W	1	CF1/8-1.8K/J	09021	
T1	Transformer	1	180548-1	14632	
T2	Transformer	1	180289-1	14632	

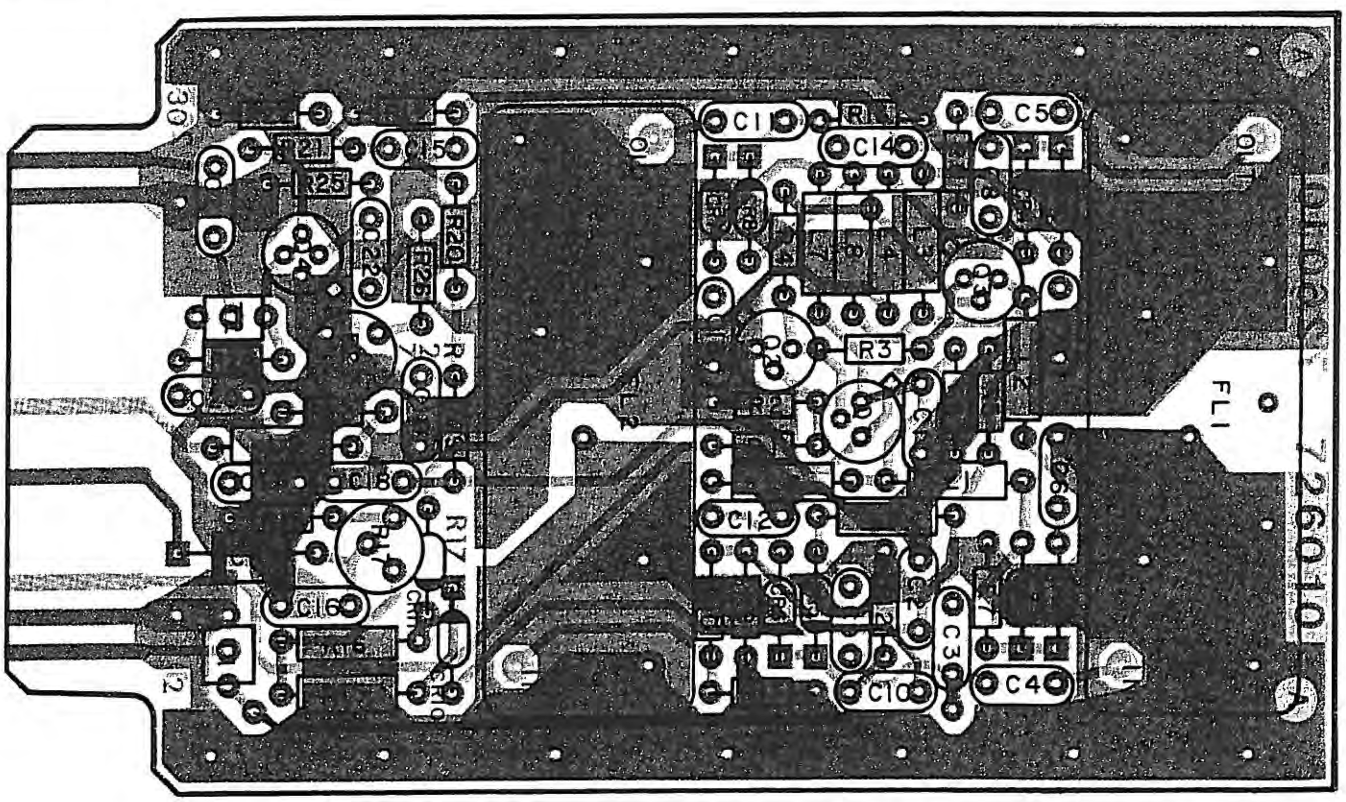


Figure S-14. Type 726010-X Switchable IF BW Filter Amplifier (A3A17-A3A21), Location of Components

Table S-11. Type 726010-X Component Differences

Type	FL1 Filter	FL2 Filter	C24 Cap/Var/Cer	L8 Coil/Fixed	R9 Res/Fixed/Film	R10 Res/Fixed/Film	R11 Res/Fixed/Film	R14 Res/Trim/Film	R15 Res/Fixed/Film	R16 Res/Trim/Film	R24 Res/Fixed/Film	R26 Res/Fixed/Film
726010-1 400/600 kHz	400 kHz 92283 14632	600 kHz 92284 14632	N/U	2.7 µH 10% 1025-30 99800	2.2 k 5% 1/8W CF1/8-2.2 K/J 09021	330 Ω 5% 1/8W CF1/8-330 OHMS/J 09021	2.2 k 5% 1/8W CF1/8-2.2 K/J 09021	270 Ω 5% 1/8W CF1/8-270 OHMS/J 09021	9.09 k 1% 1/10W RN55C9091F 81349	1.1 k 5% 1/8W CF1/8-1.1 K/J 09021	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	10 Ω 5% 1/8W CF1/8-10 OHMS/J 09021
726010-2 500/1000 kHz	500 kHz 92288 14632	1000 kHz 92287 14632	N/U	2.7 µH 10% 1025-30 99800	1.0 k 5% 1/8W CF1/8-1.0 K/J 09021	68 Ω 5% 1/8W CF1/8-68 OHMS/J 09021	910 Ω 5% 1/8W CF1/8-910 OHMS/J 09021	270 Ω 5% 1/8W CF1/8-270 OHMS/J 09021	1.0 k 1% 1/10W RN55C1001F 81349	1.21 k 1% 1/10W RN55C1211F 81349	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	10 Ω 5% 1/8W CF1/8-10 OHMS/J 09021
726010-3 1000/2000 kHz	1 MHz 92287 14632	2 MHz 92296 14632	N/U	2.7 µH 10% 1025-30 99800	1.0 k 5% 1/8W CF1/8-1.0 K/J 09021	68 Ω 5% 1/8W CF1/8-68 OHMS/J 09021	1.0 k 5% 1/8W CF1/8-1.0 K/J 09021	240 Ω 5% 1/8W CF1/8-240 OHMS/J 09021	562 Ω 1% 1/10W RN55C5620F 81349	750 Ω 1% 1/10W RN55C7500F 81349	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	10 Ω 5% 1/8W CF1/8-10 OHMS/J 09021
726010-4 2000/4000 kHz	2 MHz 92286 14632	4 MHz 92285 14632	N/U	3.9 µH 10% 1025-50 99800	1.0 k 5% 1/8W CF1/8-1.0 K/J 09021	68 Ω 5% 1/8W CF1/8-68 OHMS/J 09021	750 Ω 5% 1/8W CF1/8-750 OHMS/J 09021	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	301 Ω 1% 1/10W RN55C3010F 81349	392 Ω 1% 1/10W RN55C3920F 81349	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	15 Ω 5% 1/8W CF1/8-15 OHMS/J 09021
726010-5 4000/6000 kHz	4 MHz 92285 14632	6 MHz 92305 14632	N/U	3.9 µH 10% 1025-50 99800	2.2 k 5% 1/8W CF1/8-2.2 K/J 09021	330 Ω 5% 1/8W CF1/8-330 OHMS/J 09021	N/U	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	221 Ω 1% 1/10W RN55C2210F 81349	301 Ω 1% 1/10W RN55C3010F 81349	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	15 Ω 5% 1/8W CF1/8-15 OHMS/J 09021
726010-6 4000/8000 kHz	4 MHz 92285 14632	8 MHz 92373 14632	N/U	3.9 µH 10% 1025-50 99800	68 Ω 5% 1/8W CF1/8-68 OHMS/J 09021	120 Ω 5% 1/8W CF1/8-120 OHMS/J 09021	3.3 k 5% 1/8W CF1/8-3.3 K/J 09021	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	562 Ω 1% 1/10W RN55C5620F 81349	200 Ω 1% 1/10W RN55C2000F 81349	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	15 Ω 5% 1/8W CF1/8-15 OHMS/J 09021
726010-7 300/1000 kHz	300 kHz 92290 14632	1 MHz 92287 14632	N/U	2.7 µH 10% 1025-30 99800	680 Ω 5% 1/8W CF1/8-680 OHMS/J 09021	120 Ω 5% 1/8W CF1/8-120 OHMS/J 09021	3.3 k 5% 1/8W CF1/8-3.3 K/J 09021	270 Ω 5% 1/8W CF1/8-270 OHMS/J 09021	1.8 k 1% 1/10W RN55C1181F 81349	1.74 k 1% 1/10W RN55C2000F 81349	1.2 k 5% 1/8W CF1/8-1.2 K/J 09021	10 Ω 5% 1/8W CF1/8-10 OHMS/J 09021
726010-8 4000/10000 kHz	4 MHz 92285 14632	N/U	N/U	3.9 µH 10% 1025-50 99800	620 Ω 5% 1/8W CF1/8-620 OHMS/J 09021	120 Ω 5% 1/8W CF1/8-120 OHMS/J 09021	1.8 k 5% 1/8W CF1/8-1.8 K/J 09021	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	2.67 k 1% 1/10W RN55C2670F 81349	200 Ω 1% 1/10W RN55C2000F 81349	1.2 k 5% 1/8W CF1/8-1.2 K/J 09021	10 Ω 5% 1/8W CF1/8-10 OHMS/J 09021
726010-9 8000/10000 kHz	8 MHz 92373 14632	N/U	N/U	3.9 µH 10% 1025-50 99800	3.3 k 5% 1/8W CF1/8-3.3 K/J 09021	150 Ω 5% 1/8W CF1/8-150 OHMS/J 09021	3.3 k 5% 1/8W CF1/8-3.3 K/J 09021	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	274 Ω 1% 1/10W RN55C2740F 81349	365 Ω 1% 1/10W RN55C3650F 81349	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	15 Ω 5% 1/8W CF1/8-15 OHMS/J 09021
726010-10 8000/10000 kHz	8 MHz 92373 14632	N/U	N/U	3.9 µH 10% 1025-50 99800	3.3 k 5% 1/8W CF1/8-3.3 K/J 09021	22 Ω 5% 1/8W CF1/8-22 OHMS/J 09021	3.3 k 5% 1/8W CF1/8-3.3 K/J 09021	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	274 Ω 1% 1/10W RN55C2740F 81349	365 Ω 1% 1/10W RN55C3650F 81349	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	15 Ω 5% 1/8W CF1/8-15 OHMS/J 09021
726010-11 1000/2000 kHz	1 MHz 92470 14632	2 MHz 92469 14632	5-20 pF 250V	1.8 µH 10% 1025-26 99800	1.0 k 5% 1/8W CF1/8-1.0 K/J 09021	68 Ω 5% 1/8W CF1/8-68 OHMS/J 09021	1.0 k 5% 1/8W CF1/8-1.0 K/J 09021	270 Ω 5% 1/8W CF1/8-270 OHMS/J 09021	562 Ω 1% 1/10W RN55C5620F 81349	750 Ω 5% 1/8W CF1/8-750 OHMS/J 09021	240 Ω 5% 1/8W CF1/8-240 OHMS/J 09021	10 Ω 5% 1/8W CF1/8-10 OHMS/J 09021
726010-12 4000/6000 kHz	4 MHz 92468 14632	6 MHz 92467 14632	5-20 pF 250V	1.8 µH 10% 1025-26 99800	2.2 k 5% 1/8W CF1/8-2.2 K/J 09021	33 Ω 5% 1/8W CF1/8-33 OHMS/J 09021	N/U	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	1.1 k 1% 1/10W RN55C1101F 81349	301 Ω 1% 1/10W RN55C3010F 81349	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	15 Ω 5% 1/8W CF1/8-15 OHMS/J 09021
726010-13 800/1200 kHz	800 kHz 92488 14632	92489 14632	N/U	2.7 µH 10% 1025-30 99800	1.2 k 5% 1/8W CF1/8-1.2 K/J 81349	68 Ω 5% 1/8W CF1/8-68 OHMS/J 09021	1.5 k 5% 1/8W CF1/8-1.5 K/J 09021	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	1.15 k 1% 1/10W RN55C1151F 81349	6.98 k 1% 1/10W RN55C6980F 81349	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	10 Ω 5% 1/8W CF1/8-10 OHMS/J 09021

Table S-11. Type 726010-X Component Differences (Continued)

Type	FL1 Filter	FL2 Filter	C24 Cap/Var/Cer	L8 Coil/Fixed	R9 Res/Fixed/Film	R10 Res/Fixed/Film	R11 Res/Fixed/Film	R14 Res/Trim/Film	R15 Res/Fixed/Film	R16 Res/Trim/Film	R24 Res/Fixed/Film	R26 Res/Fixed/Film
726010-14 1600/3200 kHz	92490 14632	92491 14632	N/U	3.9 µH 10% 1025-50 99800	1.2 k 5% 1/8W CF1/8-1.2 K/J 09021	68 Ω 5% 1/8W CF1/8-68 OHMS/J 09021	Same as R9	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	267 Ω 1% 1/10W RN55C2670F 81349	511 Ω 1% 1/10W RN55C5110F 81349	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	10 Ω 5% 1/8W CF1/8-10 OHMS/J 09021
726010-15 4600/6000 kHz	4 MHz 92488 14632	6 MHz 92487 14632	5-20 pF 250V	1.8 µH 10% 1025-26 99800	2.2 k 5% 1/8W CF1/8-2.2 K/J 09021	33 Ω 5% 1/8W CF1/8-33 OHMS/J 09021	Same as R9	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	221 Ω 1% 1/10W RN55C2210F 81349	301 Ω 1% 1/10W RN55C3010F 81349	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	15 Ω 5% 1/8W CF1/8-15 OHMS/J 09021
726010-16 4000/6000 kHz	4 MHz 92285 14632	6 MHz 92305 14632	5-20 pF 250V	1.8 µH 10% 1025-26 99800	2.2 k 5% 1/8W CF1/8-2.2 K/J 09021	33 Ω 5% 1/8W CF1/8-33 OHMS/J 09021	Same as R9	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	1.1 k 1% 1/10W RN55C1101F 81349	301 Ω 1% 1/10W RN55C3010F 81349	Same as R14	15 Ω 5% 1/8W CF1/8-15 OHMS/J 09021
726010-17 1000/1500 kHz	1 MHz 92287 14632	1.5 MHz 92540 14632	N/U	2.7 µH 10% 1025-30 99800	1.8 k 5% 1/8W CF1/8-1.8 K/J 09021	47 Ω 5% 1/8W CF1/8-47 OHMS/J 09021	Same as R9	240 Ω 5% 1/8W CF1/8-240 OHMS/J 09021	93 Ω 1% 1/10W RN55C9310F 81349	9.09 Ω 1% 1/10W RN55C9090F 81349	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	10 Ω 5% 1/8W CF1/8-10 OHMS/J 09021
726010-18 600/1000 kHz	600 kHz 92284 14632	1 MHz 92287 14632	N/U	2.7 µH 10% 1025-30 99800	1.0 k 5% 1/8W CF1/8-1.0 K/J 09021	68 Ω 5% 1/8W CF1/8-68 OHMS/J 09021	Same as R9	270 Ω 5% 1/8W CF1/8-270 OHMS/J 09021	1.21 k 1% 1/10W RN55C1211F 81349	332 Ω 1% 1/10W RN55C3320F 81349	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	10 Ω 5% 1/8W CF1/8-10 OHMS/J 09021
726010-19 800/1000 kHz	800 kHz 92488 14632	1 MHz 92287 14632	N/U	2.7 µH 10% 1025-30 99800	2.2 k 5% 1/8W CF1/8-2.2 K/J 09021	33 Ω 5% 1/8W CF1/8-33 OHMS/J 09021	Same as R9	270 Ω 5% 1/8W CF1/8-270 OHMS/J 09021	1.21 k 1% 1/10W RN55C1211F 81349	698 Ω 1% 1/2W RN55C6980F 81349	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	10 Ω 5% 1/8W CF1/8-10 OHMS/J 09021
726010-20 2000/3200 kHz	2 MHz 92286 14632	2 MHz 92491 14632	N/U	3.9 µH 10% 1025-34 99800	1.0 k 5% 1/8W CF1/8-1.0 K/J 09021	68 Ω 5% 1/8W CF1/8-68 OHMS/J 09021	Same as R9	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	2.67 k 1% 1/10W RN55C2670F 81349	511 Ω 1% 1/10W RN55C5110F 81349	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	10 Ω 5% 1/8W CF1/8-10 OHMS/J 09021
726010-21 4000/10000 kHz	4 MHz 92285 14632	N/U	N/U	3.9 µH 10% 1025-34 99800	330 Ω 5% 1/8W CF1/8-330 OHMS/J 09021	360 Ω 5% 1/8W CF1/8-360 OHMS/J 09021	Same as R9	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	267 k 1% 1/10W RN55C2670F 81349	200 Ω 1% 1/10W RN55C2000F 81349	Same as R14	15 Ω 5% 1/8W CF1/8-15 OHMS/J 09021
726010-22 500/1000 kHz	500 kHz 92471 14632	N/U	5-20 pF 250V	1.8 µH 10% 1025-26 99800	1.0 k 5% 1/8W CF1/8-1.0 K/J 09021	68 Ω 5% 1/8W CF1/8-68 OHMS/J 09021	Same as R9	270 Ω 5% 1/8W CF1/8-270 OHMS/J 09021	1.0 k 1% 1/10W RN55C1001F 81349	1.21 k 1% 1/10W RN55C1211F 81349	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	10 Ω 5% 1/8W CF1/8-10 OHMS/J 09021
726010-23 2000/4000 kHz	2 MHz 92469 14632	4 MHz 92468 14632	5-20 pF 250V	1.8 µH 10% 1025-26 99800	1.0 k 5% 1/8W CF1/8-1.0 K/J 09021	68 Ω 5% 1/8W CF1/8-68 OHMS/J 09021	Same as R9	220 Ω 5% 1/8W CF1/8-220 OHMS/J 09021	301 Ω 1% 1/10W RN55C3010F 81349	392 Ω 1% 1/10W RN55C3920F 81349	Same as R14	15 Ω 5% 1/8W CF1/8-15 OHMS/J 09021

S.8.2.11 Type 796354-X Switchable FM Demod REF DESIG PREFIX A3A17-A3A21

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Monolithic: 4.7 ±.25, 100 V	4	100-100-N1500-479C	51642	
C2	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	5	34453-1	14632	
C3 Thru C6	Same as C2				
C7	Capacitor, Ceramic, Monolithic: 4700 pF, ±2%, 100 V	2	300-100-NPO-472G	51642	
C8	Capacitor, Ceramic, Disc: .1 µF, 20%, 50 V	1	34475-1	14632	
C9	Same as C7				
C10	Same as C1				
C11	Capacitor, Ceramic, Disc: .47 µF, 20 %, 50 V	2	34452-1	14632	
C12	Same as C11				
C13	See Table 12				
C14	See Table 12				
C15	Capacitor, Electrolytic, Tantalum: 2.2 µF, 20%, 35 V	2	196D225X0035JE3	56289	
C16	Same as C15				
C17	Same as C13				
C18	Same as C14				
C19	Same as C1				
C20	Same as C1				
L1	Coil, Variable: 2.2-3.9 µH	1	6740-19	04213	
L2	Coil, Fixed: 18 µH, 10%	1	1025-50 (75084-15)	99800	
L3	Coil, Variable: 2.43-2.97 µH	1	6740-18	04213	
L4	See Table 12				
L5	See Table 12				
L6	Same as L4				
L7	Same as L5				
L8	Coil, Fixed: 1.2 mH, 10%	2	553-3635-38	71279	
L9	Same as L8				
R1	Resistor, Fixed, Film: 220Ω, 5%, 1/8 W	1	CF1/8-220 OHMS/J	09021	
R2	Resistor, Fixed, Film: 2.37 kΩ, 1%, 1/10 W	1	RN55C2371F	81349	
R3	Resistor, Fixed, Film: 10 kΩ, 5%, 1/8 W	1	CF1/8-10K/J	09021	
R4	Resistor, Fixed, Film: 22 kΩ, 5%, 1/8 W	2	CF1/8-22K/J	09021	
R5	Resistor, Fixed, Film: 4.75 kΩ, 1%, 1/10 W	1	RN55C4751F	81349	
R6	See Table 12				
R7	Resistor, Fixed, Film: 46.4 kΩ, 1%, 1/10 W	3	RN55C4642F	81349	
R8	Resistor, Fixed, Film: 51.1 kΩ, 1%, 1/10 W	1	RN55C5112F	81349	
R9	Same as R7				
R10	Resistor, Fixed, Film: 22Ω, 5%, 1/8 W	1	CF1/8-22 OHMS/J	09021	
R11	Same as R7				
R12	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/8 W	2	CF1/8-1.0K/J	09021	
R13	Resistor, Fixed, Film: 26.7 kΩ, 1%, 1/10 W	2	RN55C2672F	81349	
R14	Resistor, Trimmer, Film: 10 kΩ, 10%, 1/2 W	1	860X10K	94271	

REF DESIG PREFIX **A3A17-A3A21**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R15	Same as R13				
R16	Same as R12				
R17	Resistor, Trimmer, Film: 20 kΩ, 10%, 1/2 W	1	860X20K	94271	
R18	Resistor, Fixed, Film: 470Ω, 5%, 1/8 W	1	CF1/8-470 OHMS/J	09021	
R19	See **Table 12**				
R20	See **Table 12**				
R21	Same as R4				
U1	Integrated Circuit	1	CA3089E	02735	
U2	Integrated Circuit	1	1H5040CPE	32293	
U3	Integrated Circuit	1	MC1458N	18324	
U4	Integrated Circuit	2	DG303CJ	17856	
U5	Same as U4				
Y1	See **Table 12**				

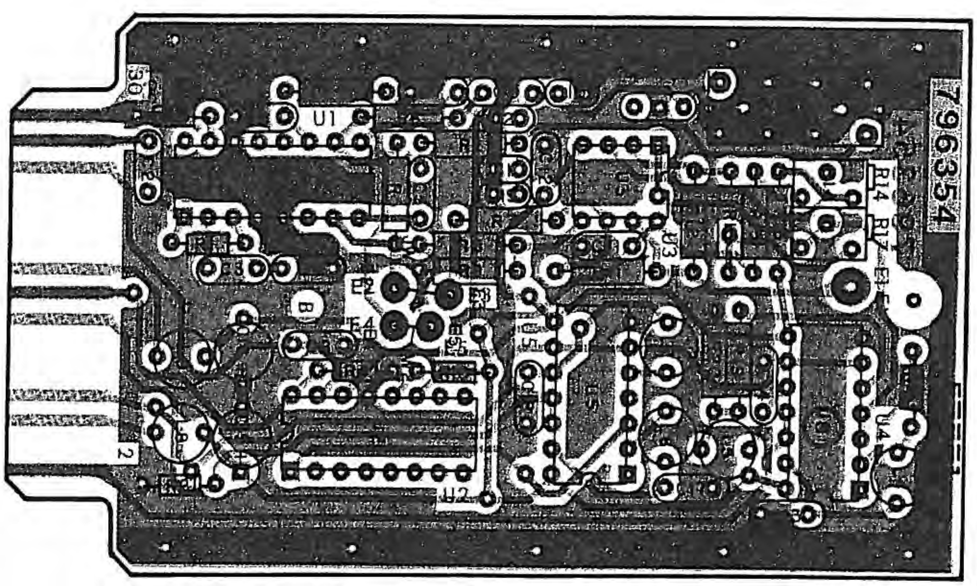


Figure S-15. Type 796354-X Switchable FM Demodulator (A3A17-A3A21), Location of Components

Table S-12. Type 796354-X Component Differences

Type	C13 Cap/Cer/Disc	C14 Cap/Cer/Disc	L4 Coil/Fixed/Molded	L5 Coil/Fixed/Molded	R6 Res/Fixed/Film	R19 Res/Fixed/Film	R20 Res/Fixed/Film	Y1 Crystal/DSCRM
796354-1 3.2/10 kHz	2.7 µF 20% 100V 831M100-651-274M 59660	.68 µF 10% 100V CK06BX683K 81349	56 mH ±15% 2534-66 99800	22 mH ±15% 2534-56 99800	1.21 k 1% 1/10W RN55C2211F 81349	1.47 k 1% 1/10W RN55C1471F 81349	681 k 1% 1/10W RN55C6810F 81349	20 kHz 2378F 25120
796354-2 20/50 kHz	.047 µF 10% 100V CK06BX473K 81349	.01 µF 10% 200V CK06BX103K 81349	10 mH ±10% 2534-48 99800	4.9 mH ±10% 2534-38 99800	9.09 k 1% 1/10W RN55C9091F 81349	1.18 k 1% 1/10W RN55C1181F 81349	787 Ω 5% 1/10W RN55C7870F 81349	35 kHz 3099 74306
796354-3 6.4/10 kHz	.1 µF 20% 50V 34475-1 14632	.1 µF 20% 50V 34475-1 14632	33 mH ±15% 2534-60 99800	22 mH ±15% 2534-56 99800	2.21 k 1% 1/10W RN55C2211F 81349	750 Ω 5% 1/10W RN55C7500F 81349	1.33 k 1% 1/10W RN55C1331F 81349	20 kHz 2378F 25120
796354-4 15/20 kHz	.68 µF 10% 100V CK06BX683K 81349	.047 µF 10% 100V CK06BX473K 81349	15 mH ±15% 2534-52 99800	10 mH ±10% 2534-48 99800	2.21 k 1% 1/10W RN55C2211F 81349	619 Ω 1% 1/10W RN55C6190F 81349	2.0 k 1% 1/10W RN55C2001F 81349	20 kHz 2378F 25120
796354-5 30/50 kHz	.33 µF 10% 100V CK06BX333K 81349	0.22 µF 10% 100V CK06BX223K 81349	6.8 mH ±10% 2534-44 99800	4.7 mH 10% 2534-40 99800	9.09 k 1% 1/10W RN55C9091F 81349	750 Ω 1% 1/10W RN55C7500F 81349	11 k 1% 1/10W RN55C1101F 81349	35 kHz 3099 74306
796354-6 30/40 kHz	.33 µF 10% 100V CK06BX333K 81349	0.22 µF 10% 100V CK06BX223K 81349	6.8 mH ±10% 2534-44 99800	4.7 mH 10% 2534-40 99800	9.09 k 1% 1/10W RN55C9091F 81349	619 Ω 1% 1/10W RN55C6190F 81349	2.0 k 1% 1/10W RN55C2001F 81349	35 kHz 3099 74306
796354-7 10/20 kHz	.68 µF 10% 100V CK06BX683K 81349	.047 µF 10% 100V CK06BX473K 81349	22 mH ±15% 2534-56 99800	10 mH ±10% 2534-48 99800	2.21 k 1% 1/10W RN55C2211F 81349	953 Ω 1% 1W RN55C9350F 81349	953 Ω 1% 1W RN55C9350F 81349	20 kHz 2378F 25120
796354-8 10/25 kHz	.68 µF 10% 100V CK06BX683K 81349	.039 µF 10% 100V CK06BX393K 81349	22 mH ±15% 2534-56 99800	8.2 mH ±10% 2534-46 99800	2.21 k 1% 1/10W RN55C2211F 81349	1.18 k 1% 1/10W RN55C1181F 81349	787 Ω 1% 1W RN55C7870F 81349	20 kHz 2378F 25120
796354-9 20320 kHz	.047 µF 10% 100V CK06BX473K 81349	.33 µF 10% 100V CK06BX333K 81349	10 mH ±10% 2534-48 99800	6.8 mH 10% 2534-44 99800	9.09 k 1% 1/10W RN55C9091F 81349	698 Ω 1% 1W RN55C6980F 81349	14 k 1% 1/10W RN55C1401F 81349	35 kHz 3099 74306
796354-10 3.2/6.4 kHz	2.7 µF 20% 100V 831M100-651-274-M 59660	.1 µF 20% 50V 34475-1 14632	56 mH ±15% 2534-66 99800	33 mH ±15% 2534-06 99800	2.21 k 1% 1/10W RN55C2211F 81349	953 Ω 1% 1W RN55C9530F 81349	953 Ω 1% 1W RN55C9530F 81349	20 kHz 2378F 25120
796354-11 10/30 kHz	.68 µF 10% 100V CK06BX683K 81349	.33 µF 10% 100V CK06BX333K 81349	22 mH ±15% 2534-56 99800	6.8 mH 10% 2534-44 99800	9.09 k 1% 1/10W RN55C9091F 81349	1.33 k 1% 1/10W RN55C1331F 81349	681 Ω 1% 1W RN55C6810F 81349	35 kHz 3099 74306
796354-12 10/50 kHz	.68 µF 10% 100V CK06BX683K 81349	0.22 µF 10% 100V CK06BX233K 81349	22 mH ±15% 2534-56 99800	4.7 mH 10% 2534-40 .99800	9.09 k 1% 1/10W RN55C9091F 81349	2.43 k 1% 1/10W RN55C2431F 81349	562 Ω 1% 1W RN55C5620F 81349	35 kHz 3099 74306

Table S-12. Type 796354-X Component Differences (Continued)

Type	C13 Cap/Cer/Disc	C14 Cap/Cer/Disc	L4 Coil/Fixed/Molded	L5 Coil/Fixed/Molded	R6 Res/Fixed/Film	R19 Res/Fixed/Film	R20 Res/Fixed/Film	Y1 Crystal/DSCRM
796354-13 6.4/20 kHz	.1 µF 10% 100V CK06BX104K 81349	.047 µF 10% 100V CK06BX473K 81349	33 mH ±15% 2534-60 99800	10 mH ±15% 2534-48 99800	2.21 k 1% 1/10W RN55C2211F 81349	1.47 k 1% 1/10W RN55C1471F 81349	681 Ω 1% 1/10W RN55C6810F 81349	20 kHz 2378F 25120
796354-14 4.0/10 kHz	.15 µF 10% 50V CK06BX154K 81349	.068 µF 10% 100V CK06BX683K 81349	56 mH ±15% 2534-66 99800	22 mH ±15% 2534-56 99800	2.21 k 1% 1/10W RN55C2211F 81349	1.18 k 1% 1/10W RN55C1181F 81349	787 Ω 1% 1/10W RN55C7870F 81349	20 kHz 2378F 25120
796354-15 25/34 kHz	.039 µF 10% 100V CK06BX393K 81349	.027 µF 10% 100V M39014/02-1384 81349	8.2 mH ±10% 2534-46 99800	6.8 mH ±10% 2534-44 99800	9.09 k 1% 1/10W RN55C9091F 81349	634 Ω 1% 1/2W RN55C6340F 81349	1.78 k 1% 1/2W RN55C1781F 81349	35 kHz 3099 74306
796354-16 40/50 kHz	.022 µF 10% 100V CK06BX223K 81349	.018 µF 10% 100V CK06BX183K 81349	4.7 mH ±10% 2534-40 99800	Same as L5	9.09 k 1% 1/10W RN55C9091F 81349	604 Ω 1% 1/10W RN55C6040F 81349	2.37 k 1% 1/10W RN55C2371F 81349	35 kHz 3099 74306

S.8.2.12 **Type 796355-X Switchable FM Demod** REF DESIG PREFIX A3A17-A3A21

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: .01 μF, 20%, 50 V	5	34453-1	14632	
C2	Same as C1				
C3	Same as C1				
C4	Capacitor, Ceramic, Monolithic: 4700 pF, ±2%, 100 V	2	300-100-NPO-472G		
C5	Same as C4				
C6	Capacitor, Ceramic, Monolithic: 47 pF, 5%, 100 V	1	150-100-N750-470J	51642	
C7	Capacitor, Ceramic, Disc: .1 μF, 20%, 50 V	1	34475-1	14632	
C8	Capacitor, Variable, Air: .8-10.0 pF, 250 V	1	5201/W HDW	91293	
C9	Capacitor, Ceramic, Monolithic: 120 pF, 2%, 100 V	1	200-100-NPO-121G	51642	
C10	Capacitor, Ceramic, Disc: .47 μF, 20%, 50 V	2	34452-1	14632	
C11	Same as C10				
C12	Same as C1				
C13	See Table 13				
C14	Capacitor, Electrolytic, Tantalum: 2.2 μF, 20%, 35 V	2	196D225X0035JE3	56289	
C15	Same as C14				
C16	Same as C1				
C17	Same as C13				
L1	Coil, Fixed, Molded: 10 μH	1	1025-44 (75084-12)	99800	
L2	Coil, Fixed: 18 μH, 10%	1	1025-50 (75084-15)	99800	
L3	Coil, Fixed: .32 μH	1	21210-168	14632	
L4	Coil, Fixed, Molded: 2.2 mH, ±10%	2	2534-32	99800	
L5	See Table 13				
L6	Coil, Fixed, Molded: 1.2 mH, ±10%	2	2534-26	99800	
L7	Same as L6				
L8	Same as L4				
L9	Same as L5				
R1	Resistor, Fixed, Film: 220Ω, 5%, 1/8 W	1	CF1/8-220 OHMS/J	09021	
R2	Resistor, Fixed, Film: 10 kΩ, 5%, 1/8 W	1	CF1/8-10K/J	09021	
R3	Resistor, Fixed, Film: 22 kΩ, 5%, 1/8 W	2	CF1/8-22K/J	09021	
R4	Not Used				
R5	Resistor, Fixed, Film: 4.75 kΩ, 1%, 1/10 W	1	RN55C4751F	81349	
R6	Resistor, Fixed, Film: 46.4 kΩ, 1%, 1/10 W	1	RN55C4642F	81349	
R7	Resistor, Fixed, Film: 22Ω, 5%, 1/8 W	1	CF1/8-22 OHMS/J	09021	
R8	Resistor, Fixed, Film: 51.1 kΩ, 1%, 1/10 W	1	RN55C5112F	81349	
R9	Resistor, Fixed, Film: 75 kΩ, 1%, 1/10 W	2	RN55C7502F	81349	
R10	Same as R9				
R11	Resistor, Fixed, Film: 5.1 kΩ, 1%, 1/10 W	2	RN55C5111F	81349	
R12	Same as R11				
R13	Resistor, Trimmer, Film: 100 kΩ, 10%, 1/2 W	1	860X-100K	94241	
R14	Resistor, Fixed, Film: 26.7 kΩ, 1%, 1/10 W	2	RN55C2672F	81349	
R15	Resistor, Trimmer, Film: 5 kΩ, 10%, 1/2 W	1	860X-5K	94271	

REF DESIG PREFIX **A3A17-A3A21**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R16	Same as R14				
R17	Resistor, Fixed, Film: 470Ω, 5%, 1/8 W	1	CF1/8-470 OHMS/J	09021	
R18	See Table 13				
R19	See Table 13				
R20	Same as R3				
U1	Integrated Circuit	1	CA3089E	02735	
U2	Integrated Circuit	1	MC1458N	18324	
U3	Integrated Circuit	1	1H5040CPE	32293	
U4	Integrated Circuit	2	DG303CJ	17856	
U5	Same as U4				

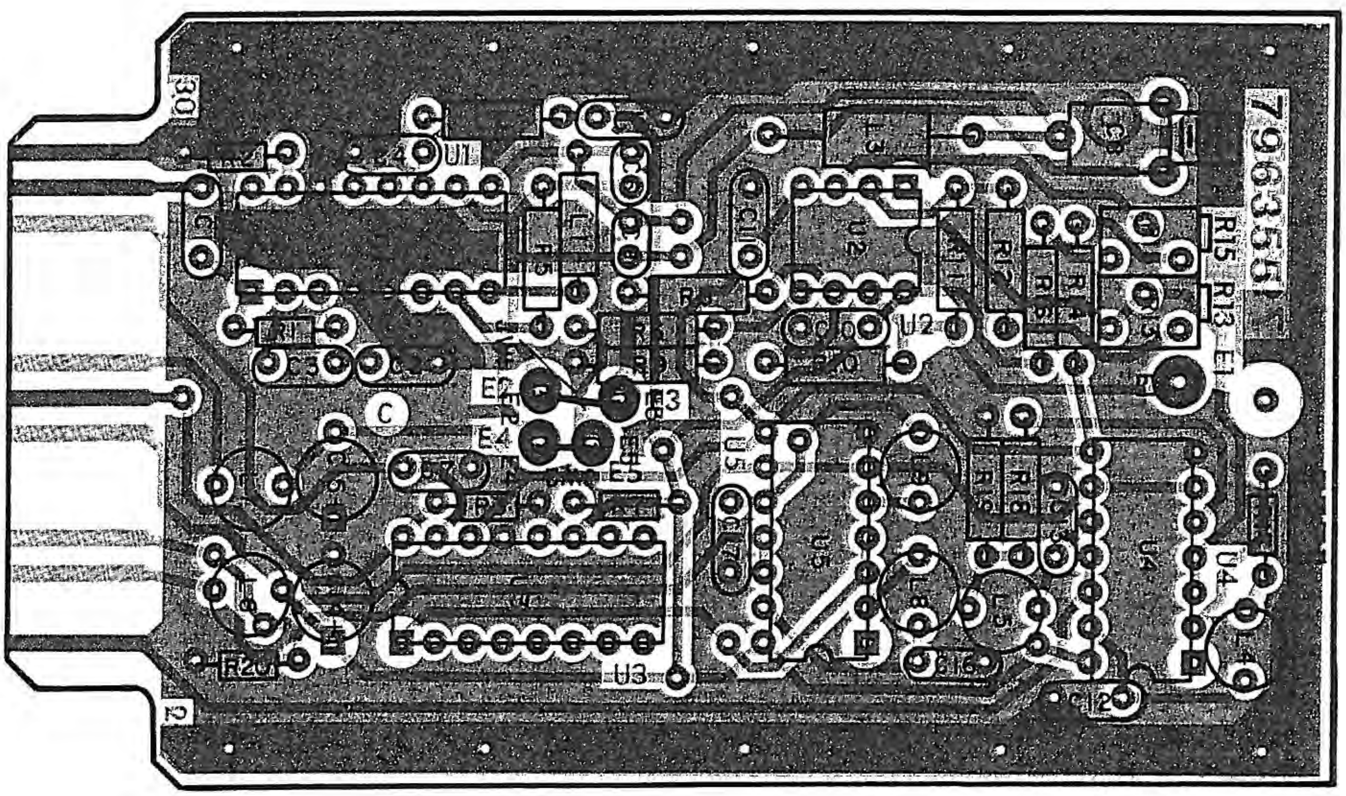


Figure S-16. Type 796355-X Switchable FM Demodulator (A3A17-A3A21), Location of Components

Table S-13. Type 796355-X Component Differences

Type	C13 Cap/Cer/Mono	L5 Coil/Fixed/Molded	R18 Res/Fixed/Film	R19 Res/Fixed/Film
796355-1 100/200 kHz	4700 pF ±2% 100V 300-100-NPO-472G 51642	1.0 mH ±10% 2534-24 99800	953 Ω 1% 1W RN55C9530F 81349	Same as R18
796355-2 100/300 kHz	3300 pF ±2% 100V 200-100-NPO-332G 51642	.68 mH ±10% 2534-20 99800	1.4 kΩ 1% 1/10W RN55C1401F 81349	715 Ω 1% 1/10W RN55C7150F 81349
796355-3 75/100 kHz	10000 pF ±2% 100V 300-100-NPO-103G 51642	2.2 mH ±10% 2534-32 99800	619Ω 1% 1/10W RN55C6190F 81349	1.82 kΩ 1% 1/10W RN55C1821F 81349
796355-4 150/200 kHz	4700 pF ±2% 100V 300-100-NPO-472G 51642	1.0 mH ±10% 2534-25 99800	19Ω 1% 1/10W RN55C6190F 81349	1.82 kΩ 1% 1/10W RN55C1821F 81349
796355-5 50/100 kHz	10000 pF ±2% 100V 300-100-NPO-103G 51642	2.2 mH ±10% 2534-32 99800	953 Ω 1% 1W RN55C9530F 81349	Same as R18
796355-6 50/75 kHz	10000 pF ±2% 100V 300-100-NPO-103G 51642	2.7 mH ±10% 2534-34 99800	6980 Ω 1% 1W RN55C6980F 81349	1.4 kΩ 1/10W RN55C1401F 81349
796355-7 150/300 kHz	3300 pF, ±2% 100V 200-100-NPO-332G 51642	.68 mH ±10% 2534-20 99800	953 Ω 1% 1W RN55C9530F 81349	Same as R18
796355-8 200/300 kHz	3000 pF ±2% 100V 200-100-NPO-302G 51642	.68 mH ±10% 2534-20 99800	680 Ω 1% 1W RN55C6980F 81349	1.4 kΩ 1% 1/10W RN55C1401F 81349
796355-9 50/150 kHz	6200 pF 2% 100V 300-100-NPO-622G 51642	1.5 mH ±10% 2534-26 99800	1.4 k 1% 1/10W RN55C1401F 81349	715Ω 1% 1/10 W RN55C7150F 81349

S.8.2.13 Type 796356-X Switchable FM Demod REF DESIG PREFIX **A3A17-A3A21**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	See Table 14				
C2	Same as C1				
C3	See Table 14				
C4	Same as C3				
C5	Same as C3				
C6	Capacitor, Ceramic, Disc: .1 µF, 20%, 50 V	2	34475-1	14632	
C7	Same as C6				
C8	Same as C3				
C9	Not Used				
C10	Same as C3				
C11	Capacitor, Ceramic, Disc: 1.5 pF, ±.1 pF, 100 V	1	8101-100-COKO-1598	59660	
C12	Capacitor, Variable, Ceramic: 2.5-9 pF, 25 V	2	518-000A2.5-9	59660	
C13	Capacitor, Ceramic, Monolithic: 2.7 pF, ±.1, 100 V	1	100-100-NPO-279B	51642	
C14	Same as C3				
C15	Same as C12				
C16	Not Used				
C17	Capacitor, Ceramic, Monolithic: 4.7 pF, ±0.25 pF, 100 V	1	100-100-N1500-479C	51642	
C18	Capacitor, Ceramic, Monolithic: 22 pF, ±5%, 100 V	1	100-100-NPO-220J	51642	
C19	Same as C3				
C20	Capacitor, Ceramic, Disc: .47 µF, 20%, 50 V	2	34452-1	14632	
C21	Same as C20				
C22	See Table 14				
C23	See Table 14				
C24	Same as C22				
C25	Same as C23				
CR1	Diode	2	5082-2800	28480	
CR2	Same as CR1				
L1	Coil, Fixed, Molded: 1.2 mH, ±10%	2	2534-26	99800	
L2	Same as L1				
L3	Inductor	1	22295-63	14632	
L4	Coil, Fixed: 18 µH, 10%	1	1025-50 (75084-15)	99800	
L5	See Table 14				
L6	See Table 14				
L7	Same as L5				
L8	Same as L6				
R1	Resistor, Fixed, Film: 220Ω, 5%, 1/8 W	1	CF1/8-220 OHMS/J	09021	
R2	Resistor, Fixed, Film: 680Ω, 5%, 1/8 W	1	CF1/8-680 OHMS/J	09021	
R3	Resistor, Fixed, Film: 18 kΩ, 5%, 1/8 W	1	CF1/8-18K/J	09021	
R4	Resistor, Fixed, Film: 100Ω, 5%, 1/8 W	1	CF1/8-100 OHMS/J	09021	
R5	See Table 14				
R6	See Table 14				

REF DESIG PREFIX A3A17-A3A21

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R7	Resistor, Fixed, Film: 22 kΩ, 5%, 1/8 W	4	CF1/8-22K/J	09021	
R8	Same as R7				
R9	Resistor, Fixed, Film: 100 kΩ, 1%, 1/10 W	2	RN55C1003F	81349	
R10	Resistor, Trimmer, Film: 20 kΩ, 10%, 1/2 W	1	860X20K	94271	
R11	Same as R9				
R12	Resistor, Fixed, Film: 10 kΩ, 5%, 1/8 W	2	CF1/8-10K/J	09021	
R13	Resistor, Fixed, Film: 20 kΩ, 5%, 1/8 W	1	CF1/8-20K/J	09021	
R14	Same R12				
R15	Same R7				
R16	Resistor, Trimmer, Film: 200 kΩ, 10%, 1/2 W	1	860X200K	94271	
R17	Resistor, Fixed, Film: 22Ω, 5%, 1/8 W	1	CF1/8-22 OHMS/J	09021	
R18	Resistor, Fixed, Film: 470Ω, 5%, 1/8 W	1	CF1/8-470 OHMS/J	09021	
R19	See Table 14				
R20	See Table 14				
R21	Same as R7				
R22	Not Used				
R23	Not Used				
T1	Transformer	1	24608-8	14632	
U1	Integrated Circuit	1	CA3011	02735	
U2	Integrated Circuit	1	LM318N	27014	
U3	Integrated Circuit	1	1H5040CPE	32293	
U4	Integrated Circuit	2	DG303CJ	17856	
U5	Same as U4				
VR1	Diode	1	1N746A	80131	
VR2	Diode	1	1N751A	80131	

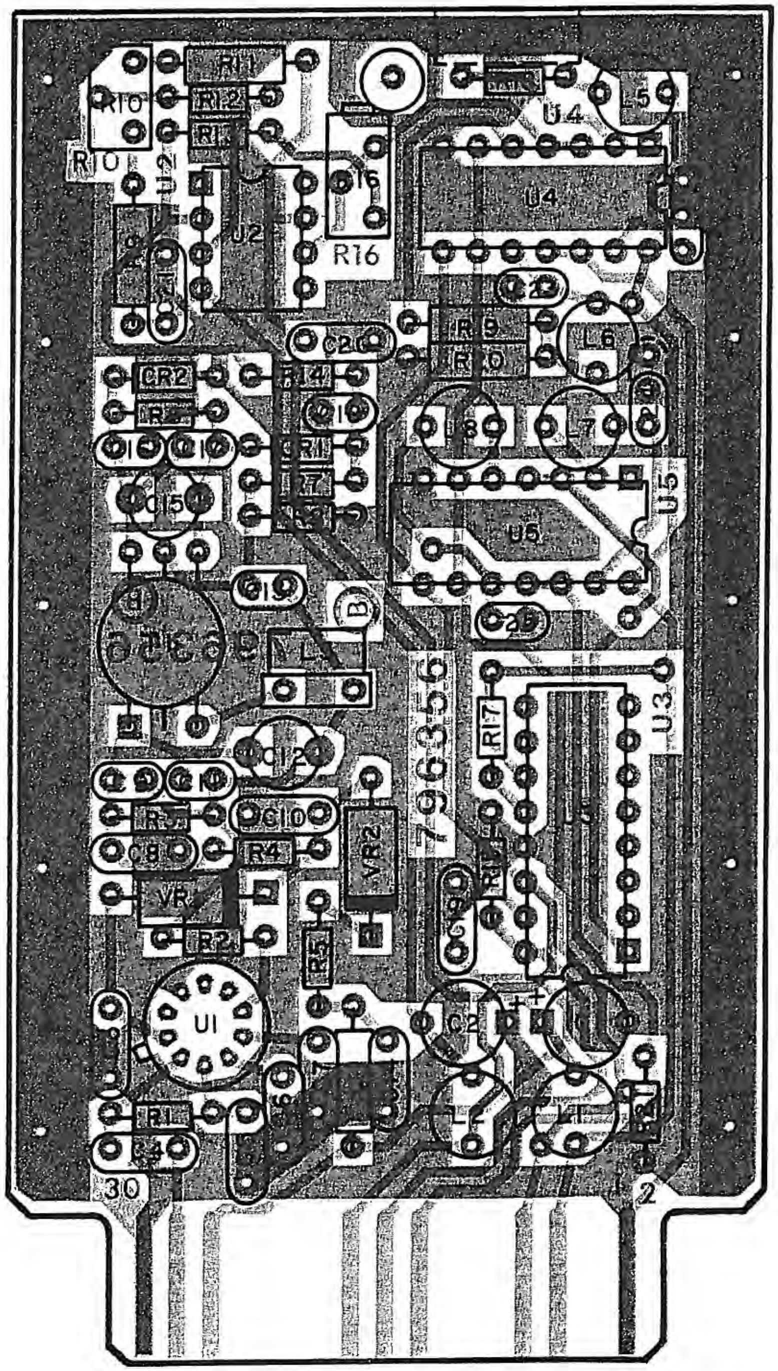


Figure S-17. Type 796356-X Switchable FM Demodulator (A3A17-A3A21), Location of Components

Table S-14. Type 796356-X Component Differences

Type	C1 Cap/Elec/Tant	C3 Cap/Cer/Mono	C22 Cap/Cer/Mono	C23 Cap/Cer/Mono	L5 Coil/Fixed/Molded	L6 Coil/Fixed/Molded	R5 Res/Fixed/Film	R6 Res/Fixed/Film	R19 Res/Fixed/Film	R20 Res/Fixed/Film
796356-1 400/600 kHz	2.2 μF ±20% 35V 196D225X0035JE3 56289	4700 pF ±2% 100V 300-100-NPO-472G 51642	2400 pF ±2% 100V 200-100-NPO-242G 51642	1600 pF ±2% 100V 200-100-NPO-162G 51642	.56 mH 10% 2534-18 99800	.33 mH 10% 2534-12 99800	10 Ω 5% 1/8W CF1/8-10 OHMS/J 09021	12 k 5% 1/8W CF1/8-12 K/J 09021	715 Ω 5% 1/10W RN55C7150F 81349	1.4 k 1% 1/10W RN55C1401F 81349
796356-2 500/1000 kHz	2.2 μF ±20% 35V 196D225X0035JE3 56289	4700 pF ±2% 100V 300-100-NPO-472G 51642	2000 pF ±2% 100V 200-100-NPO-202G 51642	910 pF ±2% 100V 200-100-NPO-911G 51642	.39 mH ±10% 2534-14 99800	.22 mH ±10% 2534-08 99800	10 Ω 5% 1/8W CF1/8-10 OHMS/J 09021	12 k 5% 1/8W CF1/8-12 K/J 09021	953 Ω 1% 1W RN55C9530F 81349	953 Ω 1% 1W RN55C9530F 81349
796356-3 250/500 kHz	2.2 μF ±20% 35V 196D225X0035JE3 56289	4700 pF ±2% 100V 300-100-NPO-472G 51642	3900 pF ±2% 100V 300-100-NPO-392G 51642	2000 pF ±2% 100V 200-100-NPO-202G 51642	.82 mH ±10% 2534-22 99800	.39 mH ±10% 2534-14 99800	10 Ω 5% 1/8W CF1/8-10 OHMS/J 09021	12 k 5% 1/8W CF1/8-12 K/J 09021	953 Ω 1% 1W RN55C9530F 81349	953 Ω 1% 1W RN55C9530F 81349
796356-4 15/20 kHz	100 μF ±20% 20V 196D107XX0020TE4 56289	100 μF ±20% 20V 196D107XX0020TE4 51642	3300 pF ±2% 100V 300-100-NPO-323G 51642	910 pF ±2% 100V 200-100-NPO-911G 51642	.68 mH 10% 2534-20 99800	.22 mH ±10% 2534-08 99800	51 Ω 5% 1/8W CF1/8-51 OHMS/J 09021	120 k 5% 1/8W CF1/8-120 K/J 09021	1.58 k 1% 1/10W RN55C1581F 81349	665 Ω 1% 1W RN55C9530F 81349
796356-5 300/500 kHz	2.2 μF ±20% 35V 196D225X0035JE3 56289	4700 pF ±2% 100V 300-100-NPO-472G 51642	3300 pF ±2% 100V 300-100-NPO-323G 51642	2000 pF ±2% 100V 200-100-NPO-202G 51642	.68 mH 10% 2534-20 99800	.39 mH ±10% 2534-14 99800	10 Ω 5% 1/8W CF1/8-10 OHMS/J 09021	120 k 5% 1/8W CF1/8-120 K/J 09021	787 Ω 1% 1W RN55C7870F 81349	118 k 1% 1/10W RN55C1181F 81349
796356-6 30/40 kHz	2.2 μF ±20% 35V 196D225X0035JE3 56289	4700 pF ±2% 100V 300-100-NPO-472G 51642	4700 pF ±2% 100V 300-100-NPO-472G 51642	2400 pF ±2% 100V 200-100-NPO-242G 51642	1.0 mH 10% 2534-24 99800	.56 mH ±10% 2534-18 99800	10 Ω 5% 1/8W CF1/8-10 OHMS/J 09021	120 k 5% 1/8W CF1/8-120 K/J 09021	953 Ω 1% 1/W RN55C9530F 81349	953 Ω 1% 1W RN55C9530F 81349
796356-7 10/20 kHz	2.2 μF ±20% 35V 196D225X0035JE3 56289	4700 pF ±2% 100V 300-100-NPO-472G 51642	1200 pF ±2% 100V 150-100-NPO-122G 51642	Cap/Cer/Disc 820 pF2% 100V 200-100-NPO–821G 51642	.27 mH 10% 2534-18 99800	.180 mH ±10% 2534-06 99800	10 Ω 5% 1/8W CF1/8-10 OHMS/J 09021	12 k 5% 1/8W CF1/8-12 K/J 09021	698 Ω 1% 1/10W RN55C6980F 81349	1.4 k 1% 1/10W RN55C1401F 81349
796356-8 300/1400 kHz	2.2 μF ±20% 35V 196D225X0C35JE3 56289	4700 pF ±2% 100V 300-100-NPO-472G 51642	3300 pF 2% 100V 200-100-NPO-332G 51642	2400 pF ±2% 100V 200-100-NPO-242G 51642	.68 mH ±10% 2534-20 99800	.56 mH ±10% 2534-18 99800	10 Ω 5% 1/8W CF1/8-10 OHMS/J 09021	12 k 5% 1/8W CF1/8-12 K/J 09021	698 Ω 1% 1/2W RN55C6980F 81349	1.4 k 1% 1/10W RN55C1401F 81349
796356-9 600/1000 kHz	2.2 μF ±20% 35V 196D225X0035JE3 56289	4700 pF ±2% 100V 300-100-NPO-472G 51642	1600 pF 2% 100V 200-100-NPO-162G 51642	910 pF ±2% 100V 150-100-NPO-911G 51642	.33 mH ±10% 2534-12 99800	.22 mH ±10% 2534-08 99800	10 Ω 5% 1/8W CF1/8-10 OHMS/J 09021	12 k 5% 1/8W CF1/8-12 K/J 09021	953 Ω 1% 1/2W RN55C9530F 81349	Same as R19
796356-10 800/1000 kHz	2.2 μF ±20% 35V 196D225X0035JE3 56289	4700 pF ±2% 100V 300-100-NPO-472G 51642	1200 pF 2% 100V 150-100-NPO-122G 51642	910 pF ±2% 100V 150-100-NPO-911G 51642	.27 mH ±10% 2534-10 99800	.22 mH ±10% 2534-08 99800	10 Ω 5% 1/8W CF1/8-10 OHMS/J 09021	120 k 5% 1/8W CF1/8-120 K/J 09021	619 Ω 1% 1/10W RN55C6190F 81349	1.65 k 1% 1/10W RN55C1651F 81349

S.8.2.14 **Type 796357-X Switchable FM Demod** REF DESIG PREFIX A3A17-A3A21

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Electrolytic, Tantalum: 2.2 µF, 20%, 35 V	2	196D225X0035JE3	56289	
C2	Same as C1				
C3	Capacitor, Ceramic, Monolithic: 4700 pF, ±2%, 100 V	5	300-100-NPO-472G	51642	
C4	Same as C3				
C5	Capacitor, Ceramic, Disc: .1 µF, 20%, 50 V	2	34475-1	14632	
C6	Same as C5				
C7	Same as C3				
C8	See Table 15				
C9	See Table 15				
C10	Same as C3				
C11	Capacitor, Variable, Ceramic: 2.5-9 pF, 25 V	1	518-000A2.5-9	59660	
C12	See Table 15				
C13	Capacitor, Ceramic, Monolithic: 3.0 pF, ±.1 pF, 100 V	1	100-100-NPO-309B	51642	
C14	Same as C3				
C15	Capacitor, Ceramic, Disc: .47 µF, 20%, 50 V	2	34452-1	14632	
C16	Same as C15				
C17 Thru C20	See Table 15				
C21	Capacitor, Ceramic, Monolithic: 1.5 pF, ±.25 pF, 100 V	1	100-100-N220-159C	51642	
C22	Capacitor, Ceramic, Monolithic: 27 pF, ±2%, 100 V	1	200-100-NPO-270G	51642	
CR1	Diode	2	5082-2800	28480	
CR2	Same as CR1				
L1	Coil, Fixed, Molded: 1.2 mH, ±10%	2	2534-26	99800	
L2	Same as L1				
L3	Coil, Assembly	1	22295-67	14632	
L4	Coil, Fixed: 18 µH, 10%	1	1025-50 (75084-15)	99800	
L5 Thru L8	See Table 15				
R1	Resistor, Fixed, Film: 220Ω, 5%, 1/8 W	1	CF1/8-220 OHMS/J	09021	
R2	Resistor, Fixed, Film: 1.5 kΩ, 5%, 1/8 W	1	CF1/8-1.5K/J	09021	
R3 Thru R5	See Table 15				
R6	Resistor, Fixed, Film: 100 kΩ, 1%, 1/10 W	2	RN55C1003F	81349	
R7	Resistor, Variable, Film: 20 kΩ, 10%, 1/4 W	1	3262X-1-203	80294	
R8	Same as R6				
R9	Resistor, Fixed, Film: 10 kΩ, 5%, 1/8 W	1	CF1/8-10K/J	09021	
R10	See Table 15				
R11	Resistor, Variable, Film: 50 kΩ, 10%, 1/4 W	1	3262X-1-503	80294	
R12	Resistor, Fixed, Film: 470Ω, 5%, 1/8 W	2	CF1/8-470 OHMS/J	09021	

REF DESIG PREFIX A3A17-A3A21

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R13	Resistor, Fixed, Film: 22 kΩ, 5%, 1/8 W	2	CF1/8-22K/J	09021	
R14	Resistor, Fixed, Film: 22Ω, 5%, 1/8 W	1	CF1/8-22 OHMS/J	09021	
R15	Same as R12				
R16	See Table 15				
R17	See Table 15				
R18	Same as R13				
T1	See Table 15				
U1	Integrated Circuit	1	CA3011	02735	
U2	Integrated Circuit	1	LM318N	27014	
U3	Integrated Circuit	1	1H5040CPE	32293	
U4	Integrated Circuit	2	DG303CJ	17856	
R5	Same as U4				
VR1	Diode	1	1N751A	80131	

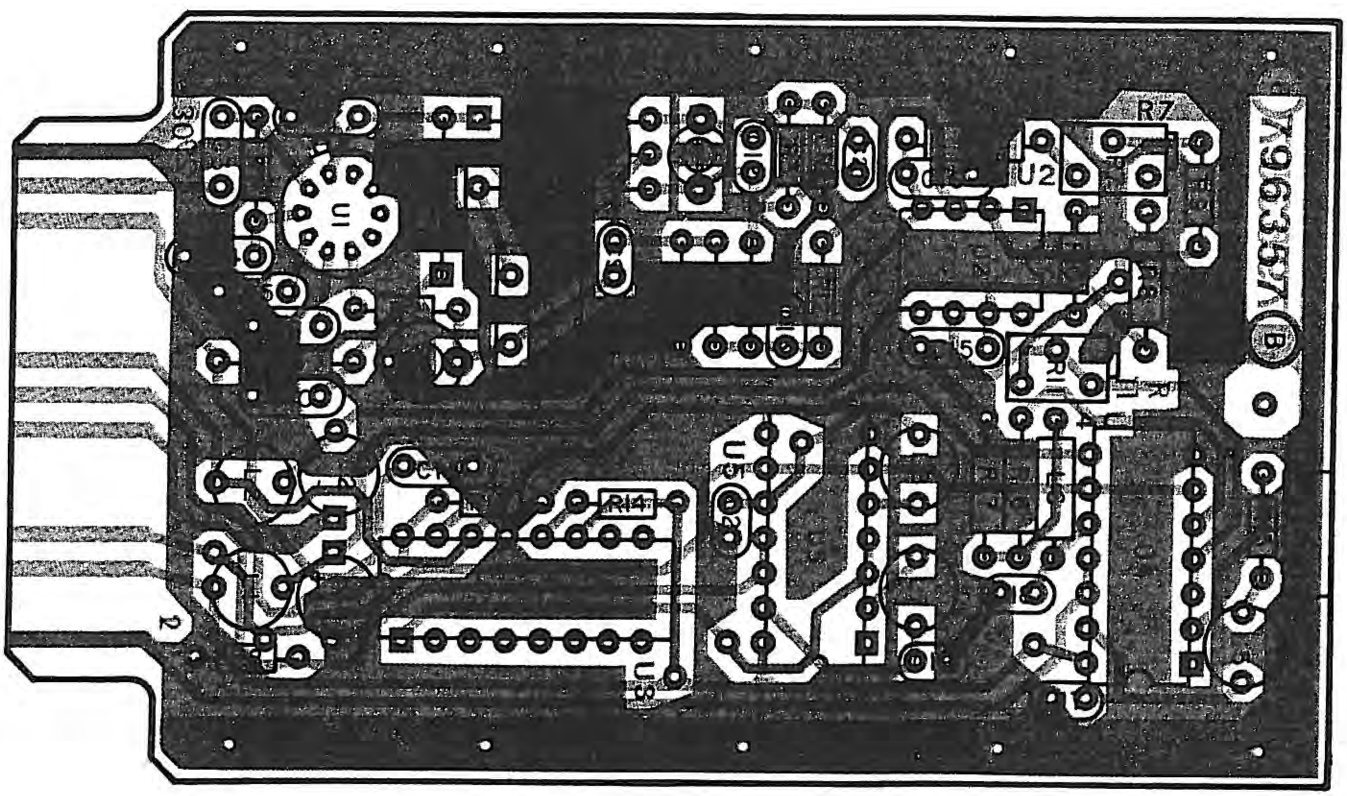


Figure S-18. Type 796357-X Switchable FM Demodulator (A3A17-A3A21), Location of Components

Table S-15. Type 796357-X Component Differences

Type	C8 Cap/Var/Cer	C9 Cap/Cer/Disc	C12 Cap/Cer/Disc	C17 Cap/Cer/Mono	C18 Cap/Cer/Mono	C19 Cap/Cer/Mono	C20 Cap/Cer/Mono	L5 Coil/Fixed/Molded	L6 Coil/Fixed
796357-1 400/600 kHz	5-9 pF 25V 518-000A2.5.9 59660	2.7 pF ±25% pF 100V 8101-100-COJO-279B 59660	3.3 pF ±25% pF 100V 8101-100-COJO-339C 59660	910 pF ±2% 100V 150-100-NPO-911G 51642	510 pF ±2% 100V 150-100-NPO-511G 51642	910 pF ±2% 100V 150-100-NPO-911G 51642	510 pF ±2% 100V 150-100-NPO-511G 51642	.22 mH 10% 2534-08 99800	100 μH ±10% 1025-68 99800
796357-2 2000/4000 kHz	5-9 pF 25V 518-000A2.5.9 59660	2.7 pF ±25% pF 100V 8101-100-COJO-279B 59660	3.3 pF ±25% pF 100V 8101-100-COJO-339C 59660	510 pF ±2% 100V 150-100-NPO-511G 51642	240 pF ±2% 100V 150-100-NPO-241G 51642	510 pF ±2% 100V 150-100-NPO-511G 51642	240 pF ±2% 100V 150-100-NPO-241G 51642	100 μH ±10% 1025-68 99800	56 μH ±10% 1025-62 99800
796357-3 4000/6000 kHz	5-9 pF 25V 518-000A2.5.9 59660	2.7 pF ±25% pF 100V 8101-100-COJO-279B 59660	3.3 pF ±25% pF 100V 8101-100-COJO-339C 59660	240 pF ±2% 100V 150-100-NPO-241G 51642	160 pF ±2% 100V 150-100-NPO-161G 51642	240 pF ±2% 100V 150-100-NPO-241G 51642	160 pF ±2% 100V 150-100-NPO-161G 51642	56 μH ±10% 1025-62 99800	33 μH ±10% 1025-56 99800
796357-4 4000/8000 kHz	5-9 pF 25V 518-000A2.5.9 59660	2.7 pF ±25% pF 100V 8101-100-COJO-279B 59660	3.3 pF ±25% pF 100V 8101-100-COJO-339C 59660	130 pF ±2% 100V 200-100-NPO-131G 51642	47 pF ±2% 100V 150-100-NPO-470G 51642	130 pF ±2% 100V 200-100-NPO-131G 51642	160 pF ±2% 100V 150-100-NPO-161G 51642	39 μH 10% 1025-58 99800	10 μH 10% 1025-44 99800
796357-5 4000/10.000 kHz	5 pF 25V 518-000A2.5 59660	2.7 pF ±25% pF 100V 8101-100-COJO-279B 59660	6.8 pF ±25% pF 100V 8101-100-COHO-689C 59660	130 pF ±2% 100V 200-100-NPO-131G 51642	47 pF ±2% 100V 150-100-NPO-470G 51642	130 pF ±2% 100V 200-100-NPO-161G 51642	160 pF ±2% 100V 150-100-NPO-161G 51642	39 μH 10% 1025-58 99800	10 μH 10% 1025-44 99800
796357-6 8000/10.000 kHz	2-5 pF 100V 518-000A2-5 59660	2.7 pF ±25% pF 100V 8101-100-COJO-279B 59660	6.8 pF ±25% pF 100V 8101-100-COHO-689C 59660	120 pF ±2% 100V 200-100-NPO-121G 51642	47 pF ±2% 100V 150-100-NPO-470G 51642	120 pF ±2% 100V 200-100-NPO-121G 51642	47 pF ±2% 100V 150-100-NPO-470G 51642	27 μH 10% 1025-54 99800	10 μH 10% 1025-44 99800
796357-7 10/20 kHz	2-5 pF 100V 518-000A2-5 59660	5.6 pF ±25% pF 100V 8101-100-COHO-569B 59660	3.3 pF ±25% pF 100V 8101-100-COJO-339C 59660	620 pF ±2% 100V 200-100-NPO-621G 51642	300 pF ±2% 100V 150-100-NPO-301G 51642	120 pF ±2% 100V 200-100-NPO-121G 51642	300 pF ±2% 100V 150-100-NPO-301G 51642	120 μH 10% 1025-70 99800	68 μH 10% 1025-64 99800
796357-8	2.5-9 pF 25V 518-000A2.5-9 59660	2.7 pF ±.1 pF 100V 8101-100-COJO-279B 59660	3.3 pF ±.25% pF 100V 8101-100-COJO-339C 59660	910 pF 100V 150-100-NPO-911G 51642	750 pF 100V 150-100-NPO-751G 51642	Same as C17	Same as C18	.22 mH 10% 2534-08 99800	150 μH 10% 1025-72 99800
796357-9	2.5-9 pF 25V 518-000A2.5-9 59660	2.7 pF ±.1 pF 100V 8101-100-COJO-279B 59660	3.3 pF ±.25% pF 100V 8101-100-COJO-339C 59660	510 pF 100V 150-100-NPO-511G 51642	300 pF 100V 150-100-NPO-301G 51642	Same as C17	Same as C18	.10 mH 10% 2534-00 99800	68 μH 10% 1025-64 99800

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) CAPACITANCE IS IN pF.
   b) INDUCTANCE IS IN μH.
   c) RESISTANCE IS IN OHMS, ±5%, 1/8W.
2. SWITCHES SHOWN IN LOGIC "0" CONDITION. NARROW BAND SELECTED.
3. THE DIFFERENCE BETWEEN TYPES IS SHOWN IN TABLE I.
4. DIODES SHOWN IN PROPER DIRECTION FOR POSITIVE GOING FM VIDEO. FOR NEGATIVE GOING FM VIDEO DIRECTION IS REVERSED AS INDICATED BY DOTTED OUTLINE.

TABLE I

TYPE NO.	BW (KHz)	C22	C23	C24	C25	L5	L6	L7	L8	R19	R20	R6	C1	C2	C3	R5
796356-1	400 / 600	2400	1600	2400	1600	560	330	560	330	715	1.4K	12K	2.2μF	2.2μF	C/C/M 4700	10
796356-2	500/1000	2000	910	2000	910	390	220	390	220	953	953	12K	2.2μF	2.2μF	C/C/M 4700	10
796356-3	250/500	3900	2000	3900	2000	820	390	820	390	953	953	120K	2.2μF	2.2μF	C/C/M 4700	10
796356-4	300/1000	3300	910	3300	910	680	220	680	220	1.58K	665	120K	100μF	100μF	C/E/T 100μF	51
796356-5	300/500	3300	2000	3300	2000	680	390	680	390	787	1.18K	120K	2.2μF	2.2μF	C/C/M 4700	10
796356-6	200/400	4700	2400	4700	2400	1 mH	560	1 mH	560	953	953	120K	2.2μF	2.2μF	4700	10
796356-7	800/1200	1200	820	1200	820	270	180	270	180	698	1.40K	120K	2.2μF	2.2μF	4700	10
796356-8	300/400	3300	2400	3300	2400	680	560	680	560	698	1.40K	12K	2.2μF	2.2μF	4700	10
796356-9	600/1000	1600	910	1600	910	330	220	330	220	953	953	12K	2.2μF	2.2μF	4700	10
796356-10	800/1000	1200	910	1200	910	270	220	270	220	619	1.65K	120K	2.2μF	2.2μF	4700	10

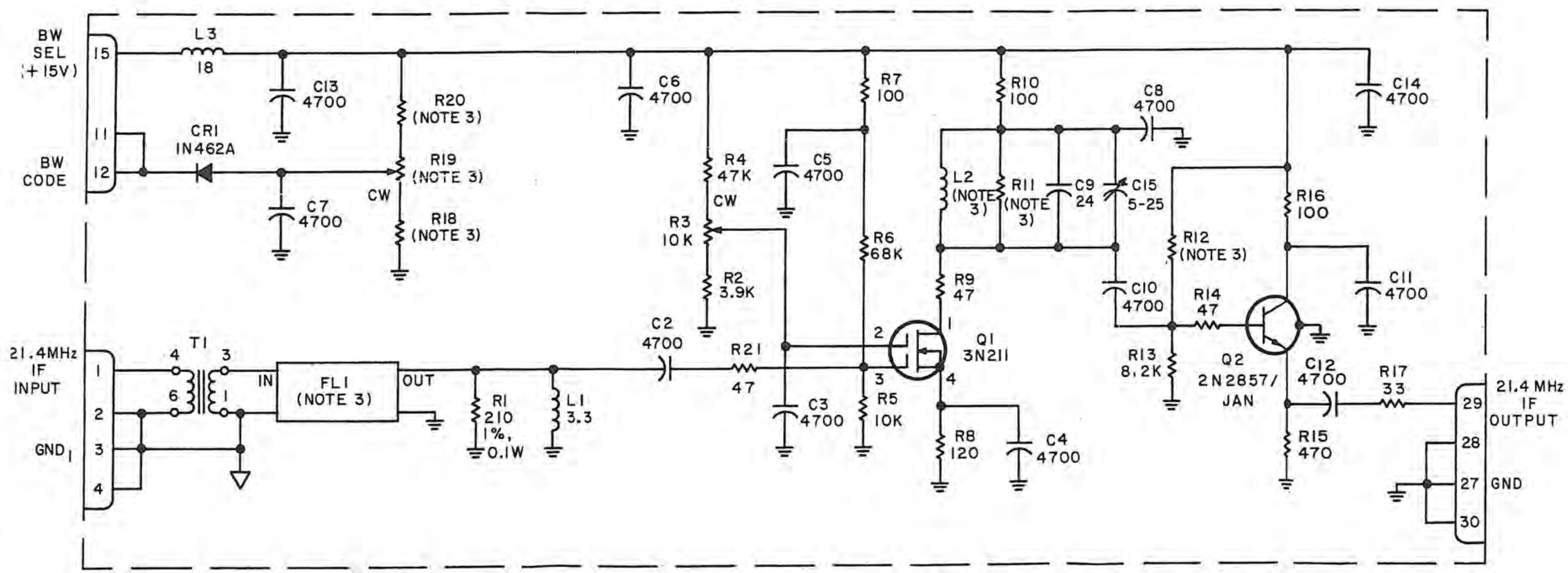


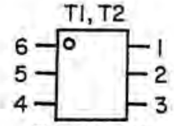
Figure S-19. Type 724006-X, 21.4 MHz IF Amplifier (A3A9-A3A13), Schematic Diagram 381291(D)

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ± 5%, 1/4W.
   b) CAPACITANCE IS IN pF.
   c) INDUCTANCE IS IN μH.
2. DIFFERENCE IN TYPE NO.'S IS SHOWN IN TABLE A (TYPE 726013-1 REPLACED BY TYPE 724006-26).
3. FOR REVISION "C" BOARDS AND ABOVE THE FL1 ALT SHOWN IN TABLE A CAN BE USED FOR AN ALTERNATE SOURCE.

TABLE A

TYPE NO.	IF BW	FL1 (NOTE 3)	R9	FL1 ALT REV. "C" & ABOVE (NOTE 3)
726013-1	500 KHz	92277	820	92288
726013-2	1 MHz	92278	220	92287
726013-3	2 MHz	92279	220	92286
726013-4	4 MHz	92280	220	92285



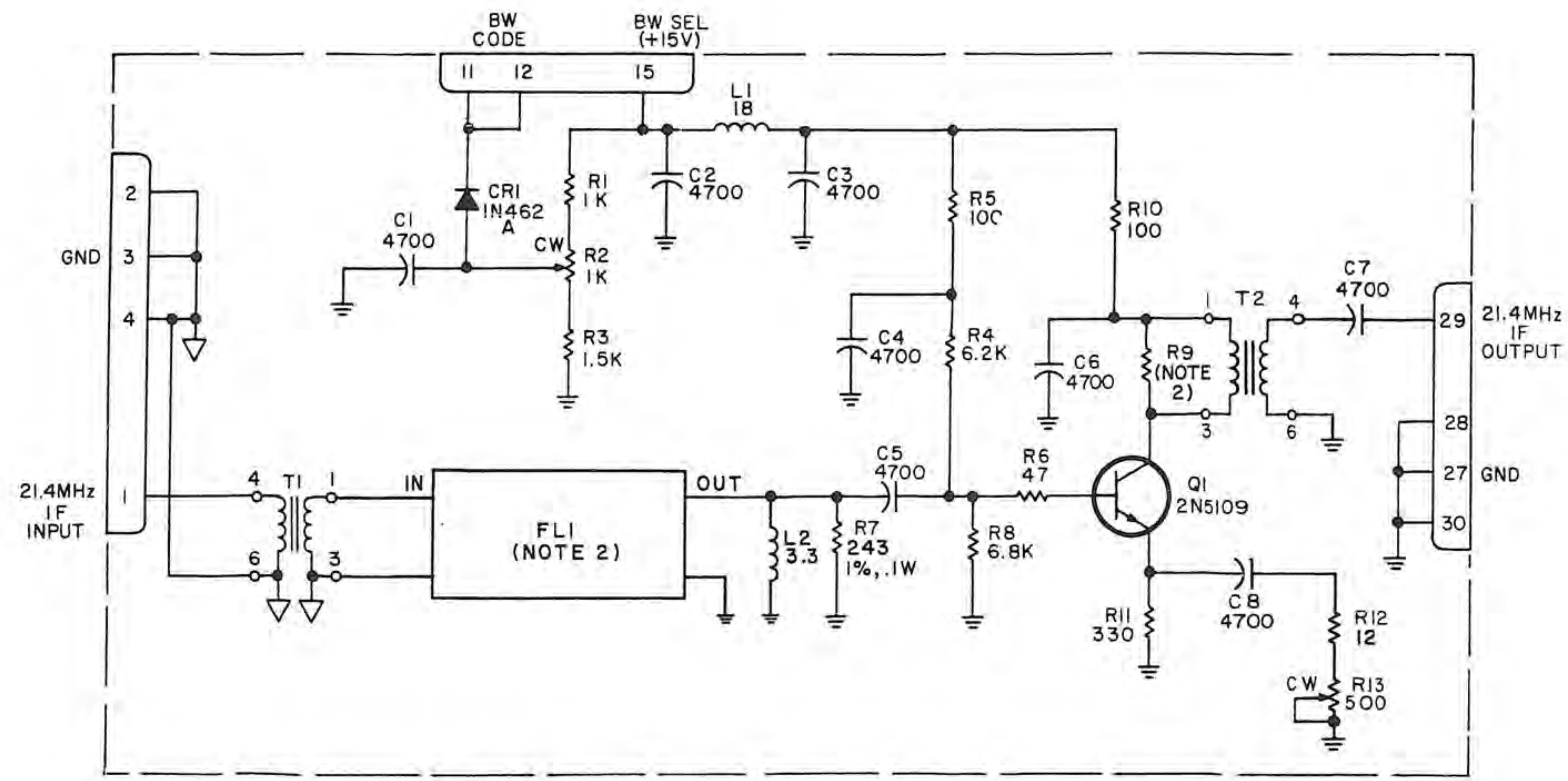


Figure S-20. Type 726013-X, 21.4 MHz IF Amplifier (A3A9-A3A13), Schematic Diagram 380771 (E)

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
b) CAPACITANCE IS IN pF.

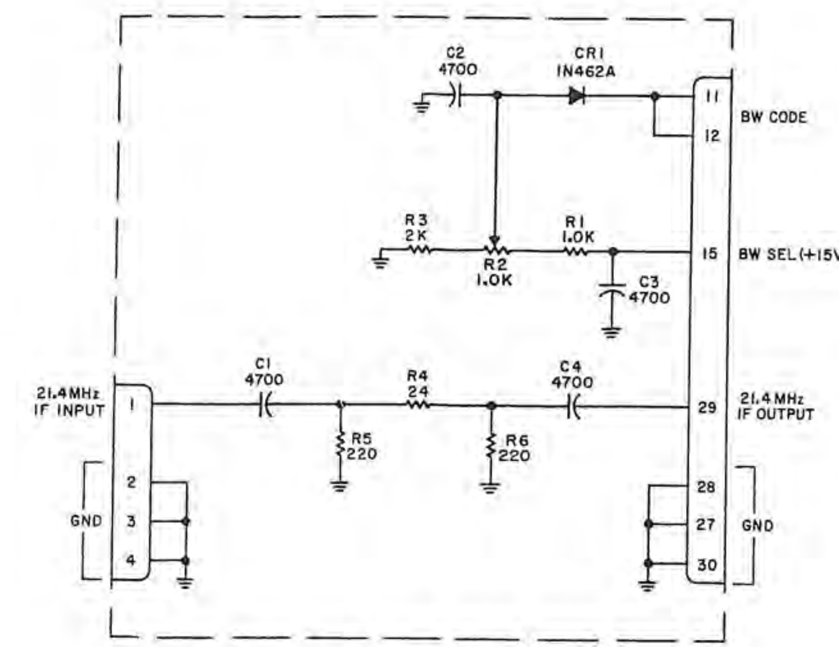


Figure S-21. Type 796337-1, IF Amplifier (8 MHz BW),(A3A9-A3A13), Schematic Diagram 380513 (B)

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a. CAPACITANCE IS IN µF.
   b. INDUCTANCE IS IN mH.
   c. RESISTANCE IS IN OHMS, ± 1%, 1/10 W.
2. NOMINAL VALUE, FINAL VALUE FACTORY SELECTED.
3. FOR TYPE NUMBER DIFFERENCES SEE TABLE A.

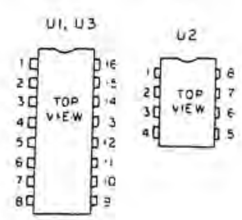


TABLE A

TYPE NO.	BANDWIDTH	C6	C11	C17	L4	L5	R2	R3	Y1	R14	R15
794106-1	10KHz	[illegible]	0.1	0.068	22	15	2.37K	1.37K	2378	2.21K	10K
794106-2	20KHz	10pF	0.056	0.056	10	6.8	3.65K	1.62K	2875	2.21K	10K
794106-3	6KHz	15pF	0.1	0.1	47	22	2.37K	1.37K	2378	2.21K	50K
794106-4	40KHz CRYSTAL	10pF	0.018	0.012	4.7	4.7	2.21K	2.21K	[illegible]	2.21K	10K
794106-5	30KHz CRYSTAL	10pF	0.022	0.018	6.8	6.8	2.21K	2.21K	[illegible]	2.21K	10K
794106-6	3.2KHz	15pF	0.1	0.1	22	22	2.37K	1.37K	2378	1.0K	20K
794106-7	25KHz	10pF	0.039	0.039	8.2	6.8	3.65K	1.62K	2875	2.21K	10K
794106-8	15KHz	12pF	0.056	0.056	15	10	3.01K	1.5K	287[illegible]	2.21K	10K
794106-9	50KHz CRYSTAL	15pF	0.018	0.018	4.7	4.7	2.37K	9.09K	3099	2.21K	20K
794106-10	1.5KHz	15pF	0.56	0.56	150	150	2.37K	1.37K	2378	1.82K	50K
794106-11	4KHz	15pF	0.22	0.22	47	47	2.37K	1.37K	2378	1.0K	20K

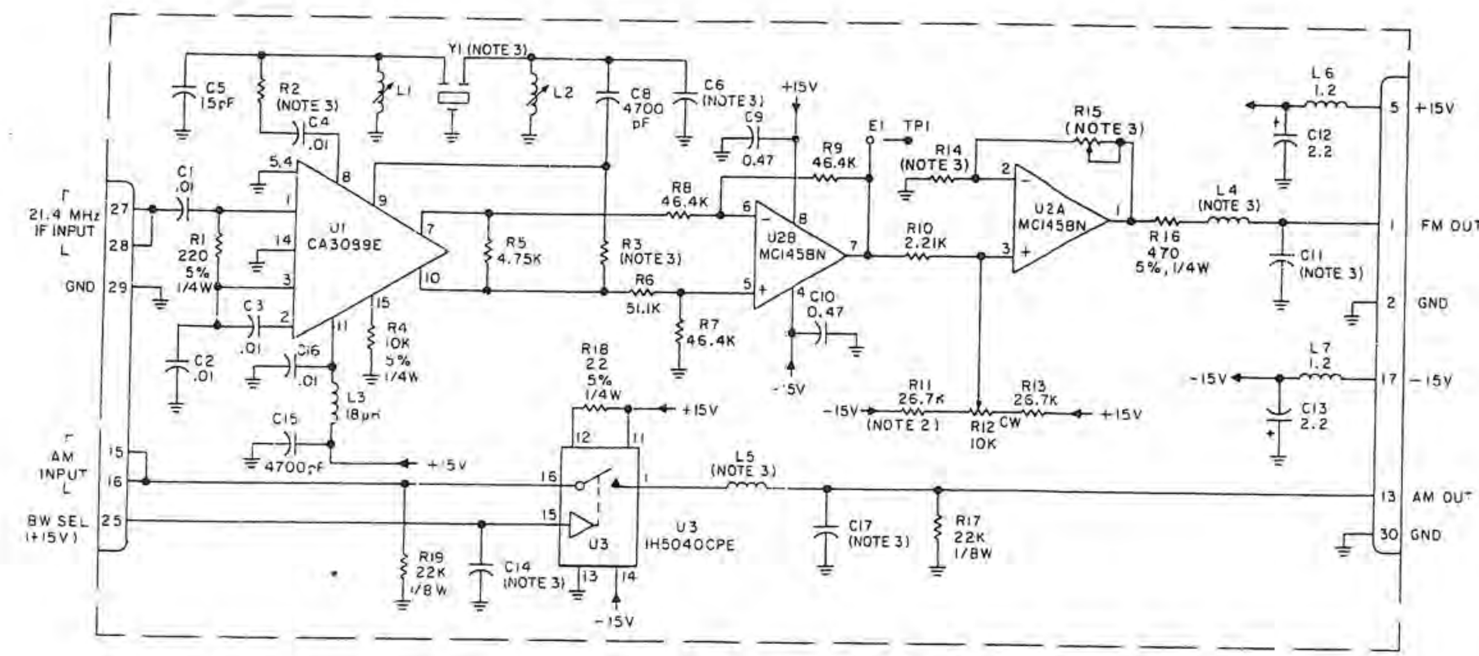


Figure S-22. Type 794106-X, FM Demodulator (A3A17-A3A21), Schematic Diagram 481279 (R)

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN μF.
   c) INDUCTANCE IS IN mH.
2. DIFFERENCE BETWEEN TYPES IS SHOWN IN TABLE A.
3. DASHES IN TABLE A = NOT USED.

TABLE A

TYPE	BW	C12	C16	C19	L3	L4	R2	U2	U3
794107-1	50KHz	.018	.012	—	4.7	3.3	4.75K, 1%, .1W	741HC	741HC
-2	100KHz	.01	6800pF	4.7pF	2.2	1.5	1.21K, 1%, .1W	LM318H	LM318H
-3	250KHz	3300pF	3900pF	4.7pF	1.0	680μH	453	LM318H	LM318H
-4	300KHz	2700pF	3300pF	4.7pF	820μH	560μH	392	LM318H	LM318H
-5	40KHz	.018	.012	—	4.7	3.3	4.75K, 1%, .1W	741HC	741HC
-6	75KHz	.015	8200pF	4.7pF	3.3	2.2	2.05K, 1%, .1W	LM318H	—
-7	—	—	—	—	—	—	—	—	—
-8	—	—	—	—	—	—	—	—	—
-9	—	—	—	—	—	—	—	—	—
-10	—	—	—	—	—	—	—	—	—
-11	—	—	—	—	—	—	—	—	—
-12	—	—	—	—	—	—	—	—	—
-13	60KHz	.015	.015	—	3.3	3.3	4.75K, 1%, .1W	741HC	LM318H
-14	150KHz	6800pH	6800pF	4.7pF	1.5	1.5	1.21K, 1%, .1W	LM318H	LM318H

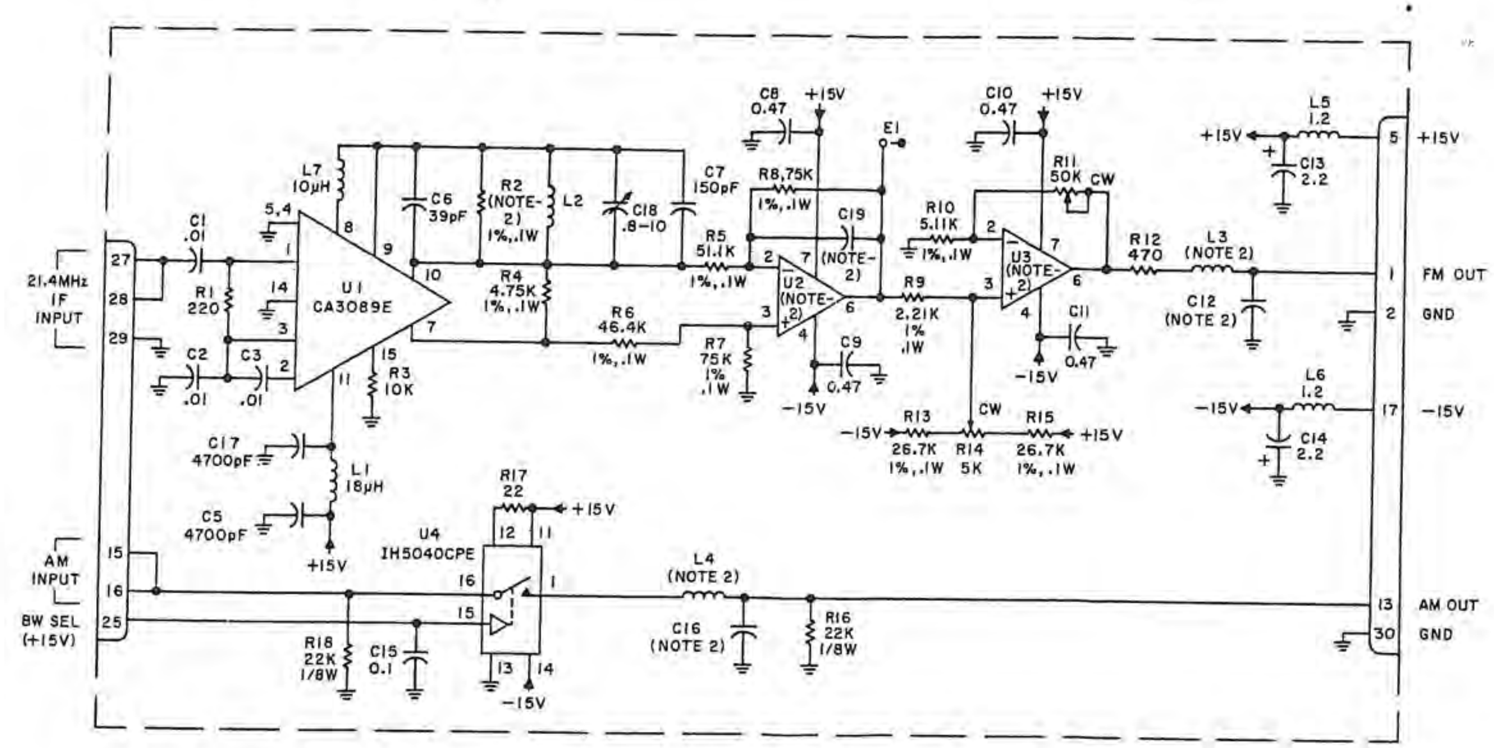
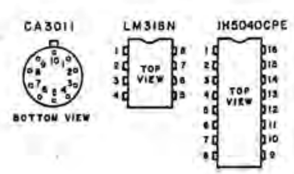


Figure S-23. Type 794107-X, FM Demodulator (A3A17-A3A21), Schematic Diagram 481290 (J)

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ± 5%, 1/4W.
   b) CAPACITANCE IS IN pF.
   c) INDUCTANCE IS IN μH.
2. DIFFERENCE BETWEEN -1, -2 IS LISTED IN TABLE.

TYPE	IF BW	R16	L4	C22	L7	C21
794104-1	1MHz	50K	180	1000	220	820
794104-2	500kHz	200K	360	2200	390	1500



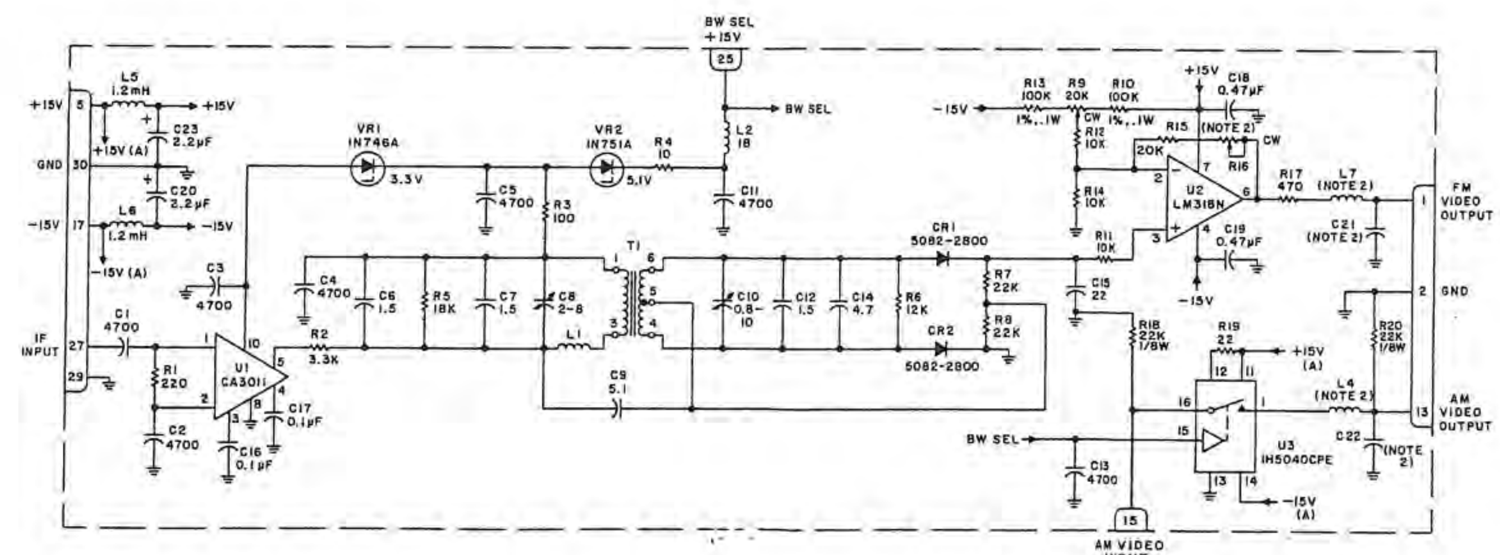


Figure S-24. Type 794104-1, -2, FM Demodulator (A3A17-A3A21), Schematic Diagram 470157 (E)

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN pF.
   c) INDUCTANCE IS IN μH.
2. DIFFERENCE BETWEEN -1,-2,-3,-4 IS LISTED IN TABLE 1.

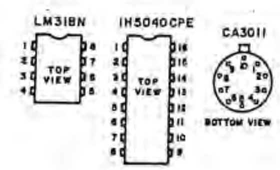


TABLE 1.

TYPE	IF BW	FM BW	R4	C9	C10	C11	C12	L3	L4	R6	R9	R5	T1	C5
794105-1	2MHz	2MHz	22K	N/U	N/U	430	300	75	100	680	20K	22K	24608-9	2.7
794105-2	4MHz	4MHz	10K	N/U	N/U	130	180	39	47	1.8K	20K	10K	24608-9	2.7
794105-3	1MHz	2MHz	22K	N/U	N/U	820	1000	220	180	680	60K	22K	24608-9	2.7
794105-4	8MHz	8MHz	10K	N/U	N/U	100	120	22	27	1.8K	20K	10K	24608-13	1.0

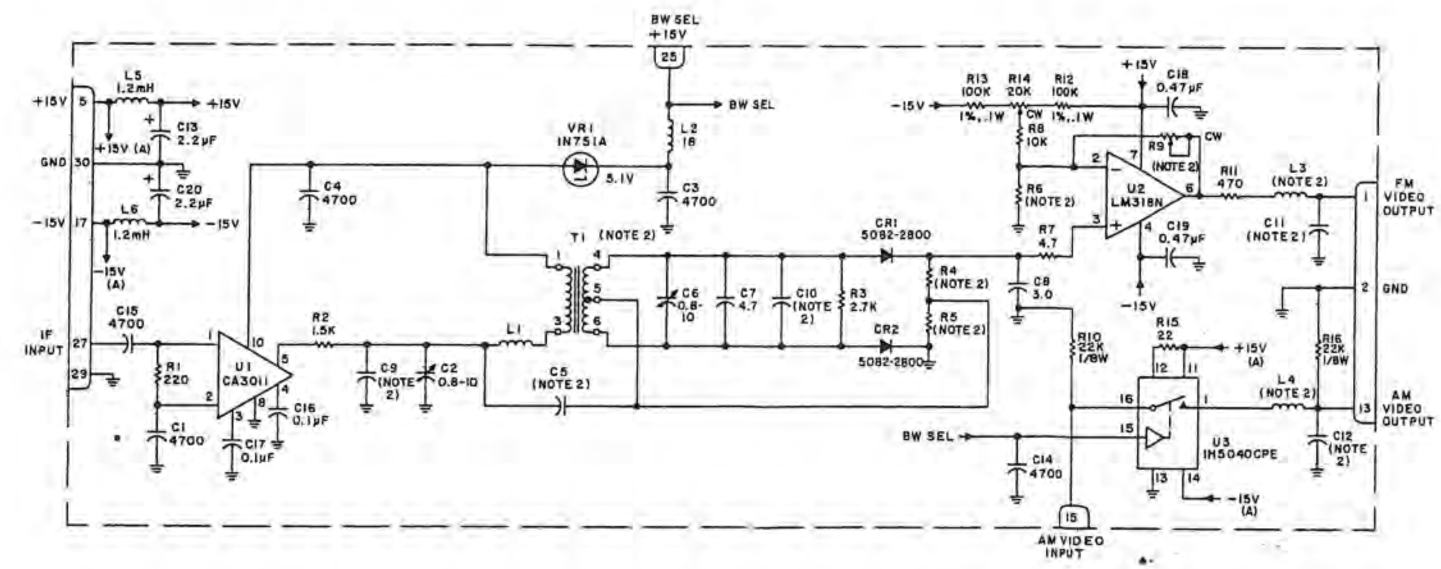


Figure S-25. Type 794105-X, FM Demodulator (A3A17-A3A21), Schematic Diagram 470158 (G)

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) CAPACITANCE IS IN pF.
   b) INDUCTANCE IS IN μH.
   c) RESISTANCE IS IN OHMS, ±5%, 1/8W.
2. THE DIFFERENCE BETWEEN TYPES IS SHOWN IN TABLE I. (SHEET 2)
3. REPLACE R7 WITH JW2 FOR -5, -12 & -16 ASSY.

TABLE I

DASH NO.	BW KHz	FL1	FL2	R1	R6	R7	R8	R28	R35	JW2	C29	L10	L11
726009-1	3.2/10	92289	92293	12.1K	2.4K	36	2.4K	NOT USED	1.78K	NOT USED	N/U	2.7μH	1.03μH
726009-2	20/50	92294	92291	4.75K	910	100	910	3.9K	6.81K	NOT USED	N/U	2.7μH	1.0μH
726009-3	100/200	92292	92282	10.0K	1K	68	1K	1.5K	2.43K	NOT USED	N/U	2.7μH	1.0μH
726009-4	100/300	92292	92290	1.5K	750	100	750	1.5K	2.43K	NOT USED	N/U	2.7μH	1.0μH
726009-5	6.4/10	92299	92293	12.1K	N/U	N/U	N/U	NOT USED	18.2K	USED	N/U	2.7μH	1.03μH
726009-6	15/20	92300	92294	6.81K	3.3K	24	3.3K	6.2K	8.25K	NOT USED	N/U	2.7μH	~~1.0μH~~
726009-7	30/40	92301	92302	5.62K	3.3K	24	3.3K	2.7K	5.62K	NOT USED	N/U	2.7μH	1.0μH
726009-8	30/50	92301	92291	4.75K	1.8K	47	1.8K	2.7K	5.62K	NOT USED	N/U	2.7μH	1.0μH
726009-9	75/100	92303	92292	2.43K	3.3K	24	3.3K	1.5K	2.74K	NOT USED	N/U	2.7μH	1.0μH
726009-10	150/200	92304	92282	10.0K	3.3K	24	3.3K	1.5K	3.65K	NOT USED	N/U	2.7μH	1.0μH
726009-11	10/20	92293	92294	5.62K	1K	68	1K	N/U	10K	NOT USED	N/U	2.7μH	1.03μH
726009-12	50/100	92291	92292	2.74K	NOT USED	NOT USED	NOT USED	1.5K	3.65K	USED	N/U	2.7μH	1.0μH
726009-13	250/500	92317	92288	1.33K	1.5K	56	1.5K	750	1.58K	NOT USED	N/U	2.7μH	1.0μH
726009-14	10/25	92293	92340	5.11K	910	100	910	N/U	9.53K	NOT USED	N/U	2.7μH	1.03μH
726009-15	20/30	92294	92301	4.64K	1.8K	47	1.8K	3.9K	5.11K	NOT USED	N/U	2.7μH	1.0μH
726009-16	50/75	92291	92303	3.01K	NOT USED	NOT USED	NOT USED	1.5K	3.32K	USED	N/U	2.7μH	1.0μH
726009-17	3.2/6.4	92289	92299	20K	2.4K	36	2.4K	NOT USED	1.78K	NOT USED	N/U	2.7μH	1.03μH
726009-18	150/300	92304	92290	1.21K	2.4K	36	2.4K	1.5K	6.04K	NOT USED	N/U	2.7μH	1.0μH
726009-19	300/500	92290	92288	1.15K	1K	82	1K	750	1.18K	NOT USED	N/U	2.7μH	1.0μH
726009-20	200/300	92282	92290	1.40K	NOT USED	NOT USED	NOT USED	750	9.09K	USED	N/U	2.7μH	1.0μH
726009-21	10/30	92293	92301	4.32K	820	100	820	N/U	10K	NOT USED	N/U	2.7μH	1.03μH
726009-22	10/50	92293	92291	4.75K	560	180	560	N/U	13.3K	N/U	N/U	2.7μH	1.03μH
726009-23	10/50	(GAUSSIAN) 92474	(GAUSSIAN) 92473	4.75K	560	180	560	N/U	13.3K	N/U	5-20pF	1.8μH	1.03μH
726009-24	300/500	(GAUSSIAN) 92472	(GAUSSIAN) 92471	1.15K	1K	82	1K	750	1.18K	N/U	5-20pF	1.8μH	1.0μH
726009-25	200/400	92282	92283	931	910	100	910	750	9.09K	N/U	N/U	2.7μH	1.0μH
726009-26	25/75	92340	92303	3.01K	820	100	820	N/U	4.64K	N/U	N/U	2.7μH	1.0μH
726009-27	6.4/20	92299	92294	6.81K	2.4K	36	2.4K	N/U	18.2K	N/U	N/U	2.7μH	1.03μH
726009-28	50/150	92291	92304	7.5K	1K	68	1K	1.5K	3.65K	N/U	N/U	2.7μH	1.0μH
726009-29	300/400	92290	92283	931	1K	82	1K	750	1.18K	N/U	5-20pF	1.8μH	1.0μH
726009-30	100/150	92292	92304	7.5K	3.3K	24	3.3K	1.5K	2.43K	N/U	N/U	2.7μH	1.0μH
726009-31	150/200	92304	92282	2.21K	3.3K	24	3.3K	1.5K	3.65K	N/U	N/U	2.7μH	1.0μH
726009-32	40/10	92574	92293	11.0K	910	100	910	N/U	13.3K	N/U	N/U	2.7μH	1.03μH
726009-33	3.2/10	(GAUSSIAN) 92660	(GAUSSIAN) 92474	12.1K	2.4K	36	2.4K	N/U	1.78K	N/U	5-20pF	1.8μH	1.03μH
726009-34	20/50	(GAUSSIAN) 92661	(GAUSSIAN) 92473	4.75K	910	100	910	3.9K	6.81K	N/U	5-20pF	1.8μH	1.0μH
726009-35	100/300	(GAUSSIAN) 92662	(GAUSSIAN) 92472	1.5K	750	100	750	1.5K	2.43K	N/U	5-20pF	1.8μH	1.0μH
726009-36	25/34	92340	92669	4.64K	1.2K	68	1.2K	3.9K	5.11K	N/U	N/U	2.7μH	1.0μH
726009-37	40/50	92302	92291	3.65K	1.8K	47	1.8K	2.7K	3.92K	N/U	N/U	2.7μH	1.0μH

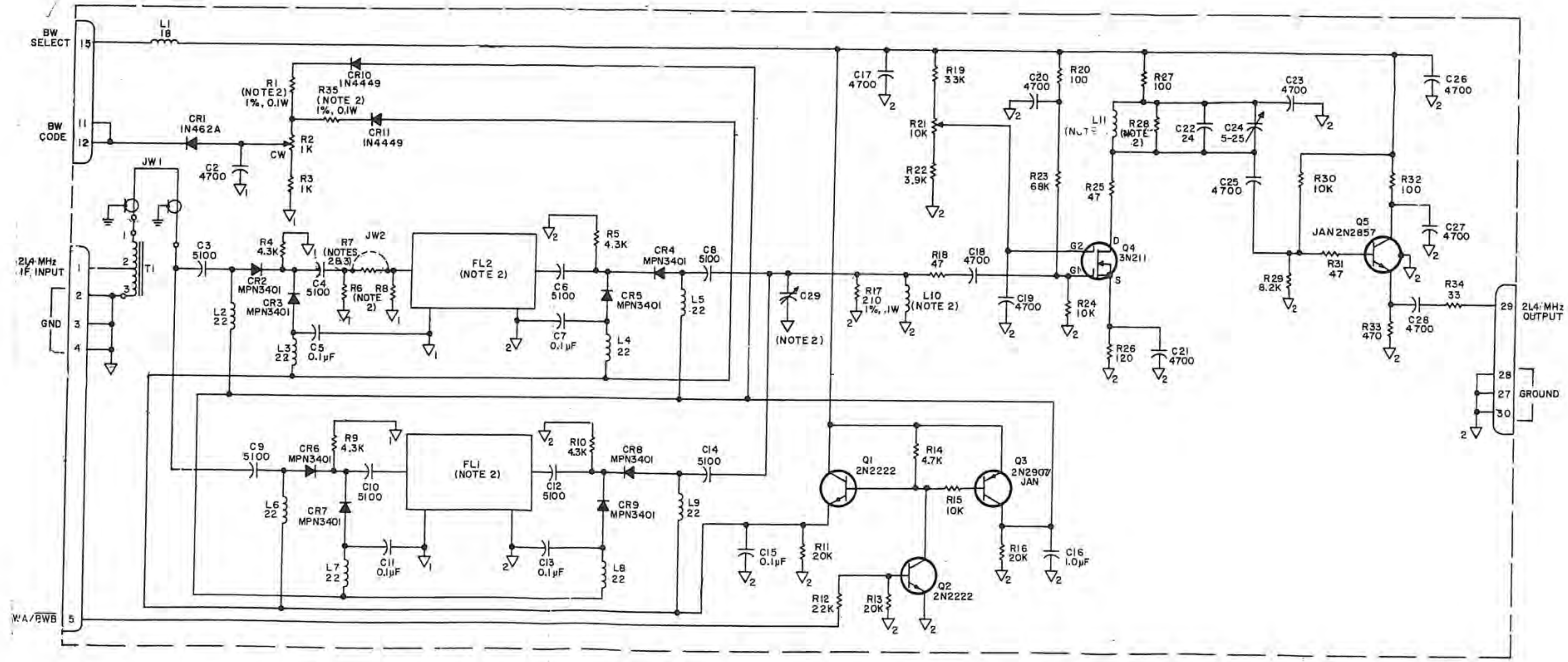


Figure S-26. Type 726009-X, Switchable IF BW Filter (A3A9-A3A13), Schematic Diagram 480506 (U)

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) INDUCTANCE IS IN μH.
   b) CAPACITANCE IS IN pF.
   c) RESISTANCE IS IN OHMS, ±5%, 1/8W.
2. THE DIFFERENCE BETWEEN TYPES IS SHOWN IN TABLE 1.

TABLE 1

	BW KHz	FL1	FL2	R9	R10	R11	R15	R16	R26	JW2	L8	R24	R14	C24
-1	400/600	92283	92284	2.2K	33	2.2K	562	1.1K	10	N/U	2.7	220	270	N/U
-2	500/1000	92288	92287	1K	68	1K	1.0K	1.21K	10	N/U	2.7	220	270	N/U
-3	1000/2000	92287	92286	1K	68	1K	562	750	10	N/U	2.7	220	240	N/U
-4	2000/4000	92286	92285	1K	68	1K	301	392	15	N/U	3.9	220	220	N/U
-5	4000/6000	92285	92305	2.2K	33	2.2K	221	301	15	N/U	3.9	220	220	N/U
-6	4000/8000	92285	92373	680	120	680	562	200	15	N/U	3.9	220	220	N/U
-7	300/1000	92290	92287	680	120	680	1.18K	1.74K	10	N/U	2.7	1.2K	270	N/U
-8	4000/10000	92285	N/U	620	150	620	267	200	15	USED	3.9	220	220	N/U
-9	8000/10000	92373	N/U	3.3K	22	3.3K	274	365	15	USED	3.9	220	220	N/U
-10	8000/10000	(GAUSSIAN) 92466	N/U	3.3K	22	3.3K	274	365	15	USED	3.9	220	220	N/U
-11	1000/2000	(GAUSSIAN) 92470	(GAUSSIAN) 92469	1K	68	1K	562	750	10	N/U	1.8	220	270	5-20pF
-12	4000/6000	(GAUSSIAN) 92468	(GAUSSIAN) 92467	2.2K	33	2.2K	1.1K	301	15	N/U	1.8	220	220	5-20pF
-13	800/1200	92488	92489	1.2K	68	1.2K	1.15K	698	10	N/U	2.7	220	270	N/U
-14	1600/3200	92490	92491	1.2K	68	1.2K	267	511	10	N/U	3.9	220	220	N/U
-15	4000/600C	(GAUSSIAN) 92468	(GAUSSIAN) 92467	2.2K	33	2.2K	221	301	15	N/U	1.8	220	220	5-20pF

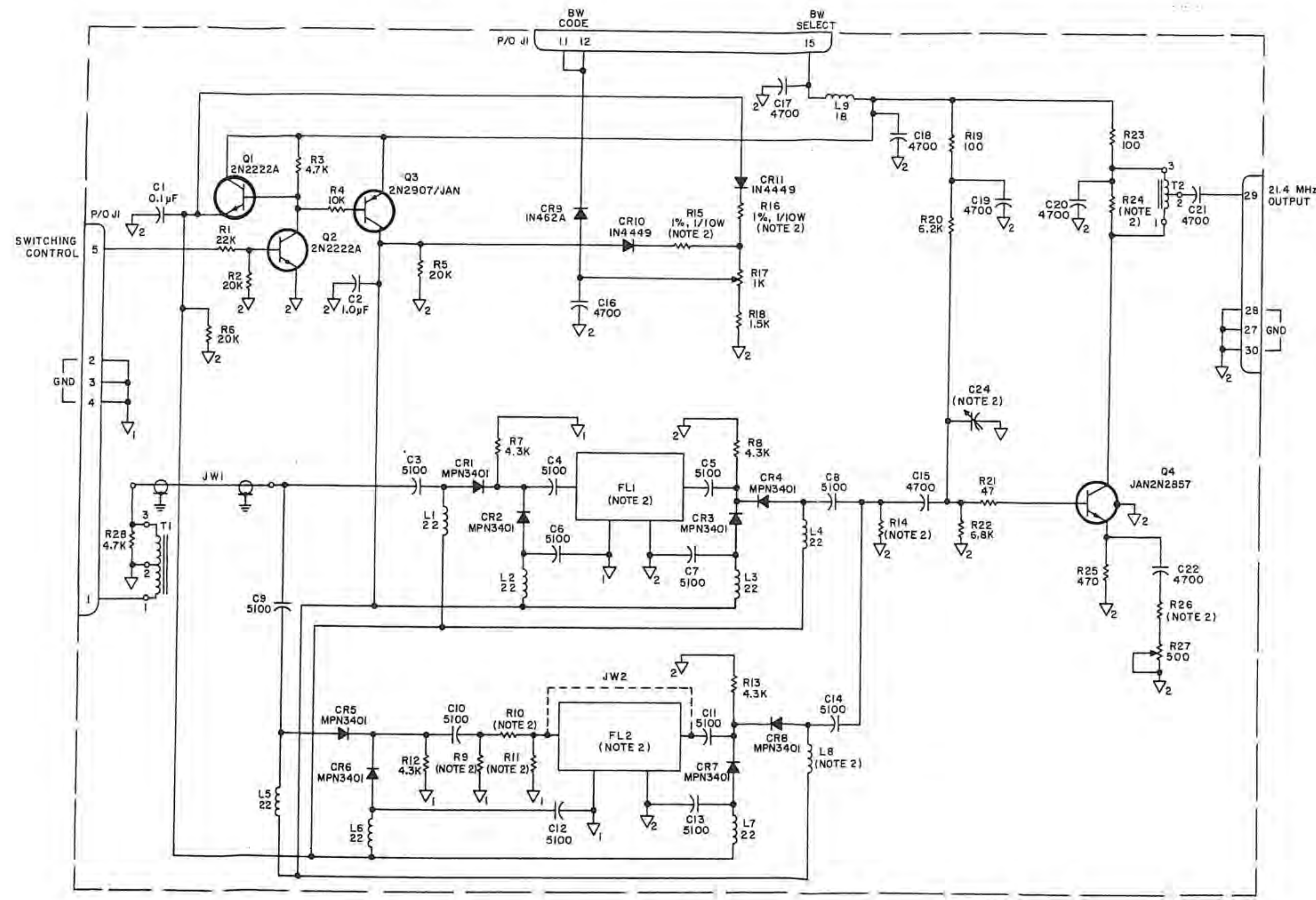


Figure S-27. Type 726010-X, Switchable IF BW Filter (A3A9-A3A13), Schematic Diagram 480507 (N)

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±1%, 1/10W.
   b) CAPACITANCE IS IN pF.
   c) INDUCTANCE IS IN mH.
2. SWITCHES SHOWN IN LOGIC "O" CONDITION, NARROW BAND SELECTED.
3. NOMINAL VALUE, FINAL VALUE FACTORY SELECTED.
4. THE DIFFERENCE BETWEEN TYPES IS SHOWN IN TABLE I.
5. CONNECT JUMPERS AS SHOWN IN TABLE 2 FOR POSITIVE OR NEGATIVE GOING FM VIDEO.

JUMPERS		
JW1	JW2	
E2 - E3	E4 - E5	POSITIVE
E2 - E5	E4 - E3	NEGATIVE

TYPE NO.	B.W. KHz	C13	C14	C17	C18	L4	L5	L6	L7	R6	R19	R20	Y1
796354-1	3.2/10	.27	.068	.27	.068	56	22	56	22	2.21K	1.47K	681	2378F
-2	20/50	.047	.01	.047	.01	10	3.9	10	3.9	9.09K	1.18K	787	3099
-3	6.4/10	.1	.1	.1	.1	33	22	33	22	2.21K	750	1.33K	2378F
-4	15/20	.068	.047	.068	.047	15	10	15	10	2.21K	619	2.0K	2378F
-5	30/50	.033	.022	.033	.022	6.8	4.7	6.8	4.7	9.09K	750	1.1K	3099
-6	30/40	.033	.022	.033	.022	6.8	4.7	6.8	4.7	9.09K	619	2.0K	3099
-7	10/20	.068	.047	.068	.047	22	10	22	10	2.21K	953	953	2378F
-8	10/25	.068	.039	.068	.039	22	8.2	22	8.2	2.21K	1.18K	787	2378 F
-9	20/30	.047	.033	.047	.033	10	6.8	10	6.8	9.09K	698	1.40K	3099
-10	3.2/6.4	.27	.1	.27	.1	56	33	56	33	2.21K	953	953	2378F
-11	10/30	.068	.033	.068	.033	22	6.8	22	6.8	9.09K	1.33K	681	3099
-12	10/50	.068	.022	.068	.022	22	4.7	22	4.7	9.09K	2.43K	562	3099
-13	6.4/20	0.1	.047	0.1	.047	33	10	33	10	2.21K	1.47K	681	2378F
-14	4.0/10	0.15	.068	0.15	.068	56	22	56	22	2.21K	1.18K	787	2378F
-15	25/34	.039	.027	.039	.027	8.2	6.8	8.2	6.8	9.09K	634	1.78K	3099
-16	40/50	.022	.018	.022	.018	4.7	4.7	4.7	4.7	9.09K	604	2.37K	3099

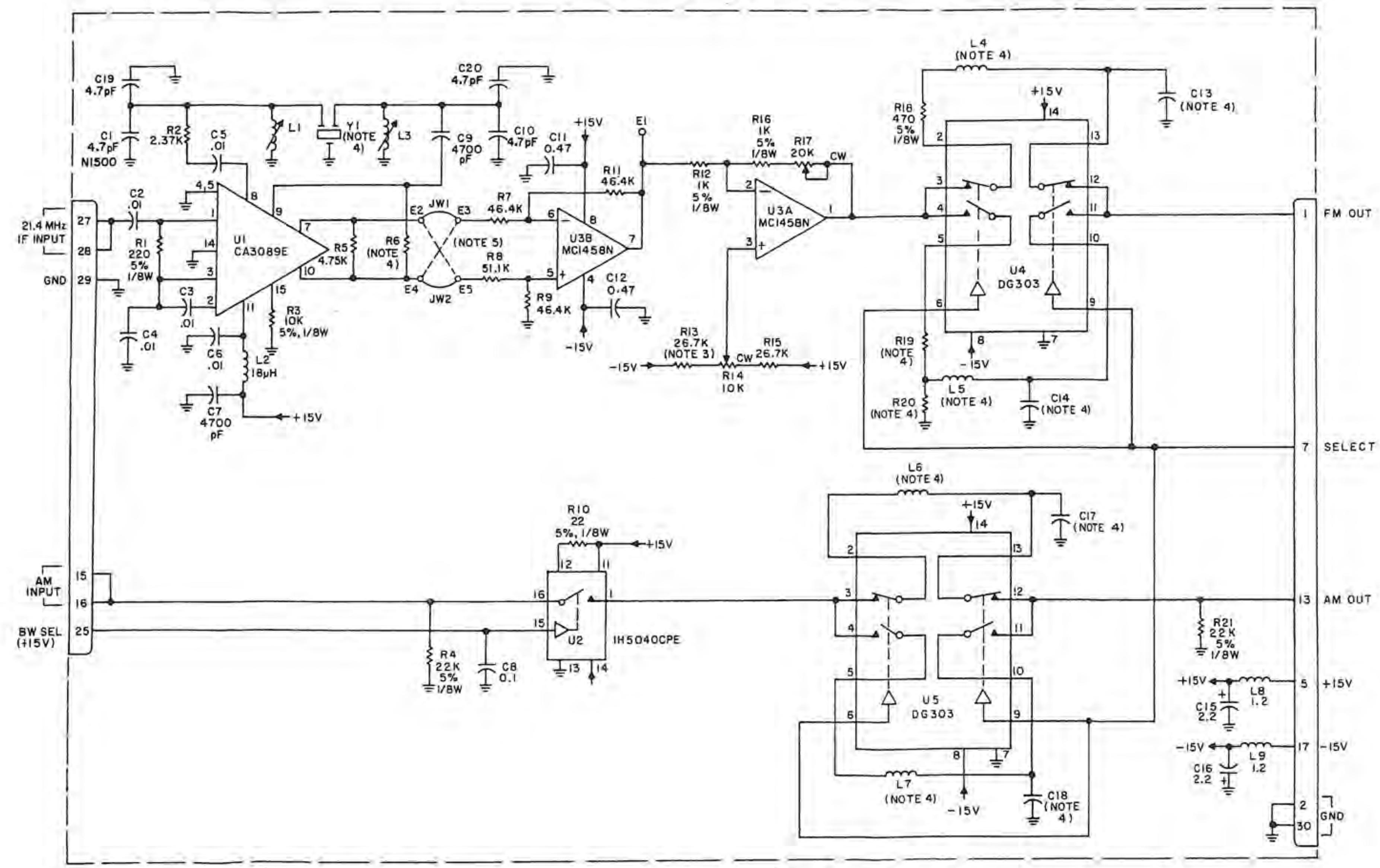


Figure S-28. Type 796354-X, Switchable FM Demodulator (A3A17-A3A21), Schematic Diagram 480549 (G)

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) CAPACITANCE IS IN µF
   b) INDUCTANCE IS IN mH
   c) RESISTANCE IS IN OHMS ±1%, 1/10 W
2. SWITCHES SHOWN IN LOGIC "O" CONDITION, NARROW BAND SELECTED
3. THE DIFFERENCE BETWEEN TYPES IS SHOWN IN TABLE 1.
4. CONNECT JUMPERS AS SHOWN IN TABLE 2 FOR POSITIVE OR NEGATIVE GOING FM VIDEO

TABLE 1

TYPE NO.	BW (KHz)	C12, C16	C13, C17	L4, L8	L5, L9	R18	R19
796355-1	100/200	.01µF	4700pF	2.2mH	1.0mH	953	953
796355-2	100/300	.01µF	3300pF	2.2mH	680µH	1.40K	715
796355-3	75/100	.01µF	.01µF	2.2mH	2.2mH	619	1.82K
796355-4	150/200	6200pF	4700pF	1.5mH	1mH	619	1.82K
796355-5	50/100	.018µF	.01µF	3.9mH	2.2mH	953	953
796355-6	50/75	.018µF	.01µF	3.9mH	2.7mH	698	1.40K
796355-7	150/300	6200pF	3300pF	1.5mH	680µH	953	953
796355-8	200/300	4700pF	3000pF	1.0mH	680µH	698	1.40K

TABLE 2

JUMPERS		
JW1	JW2	
E2-E3	E4-E5	POSITIVE
E2-E5	E4-E3	NEGATIVE

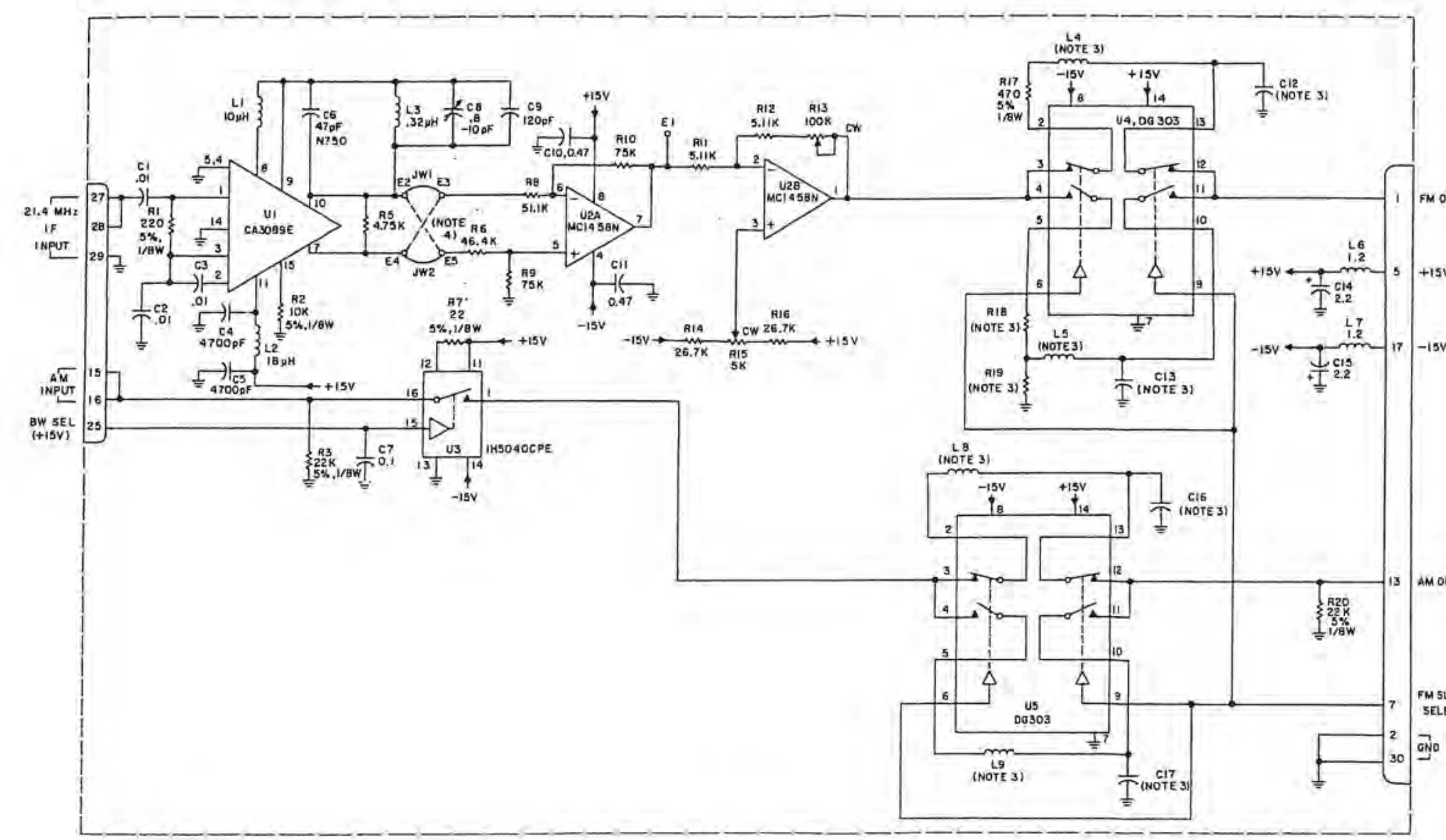


Figure S-29. Type 796355-X, Switchable FM Demodulator (A3A17-A3A21), Schematic Diagram 480546 (E)

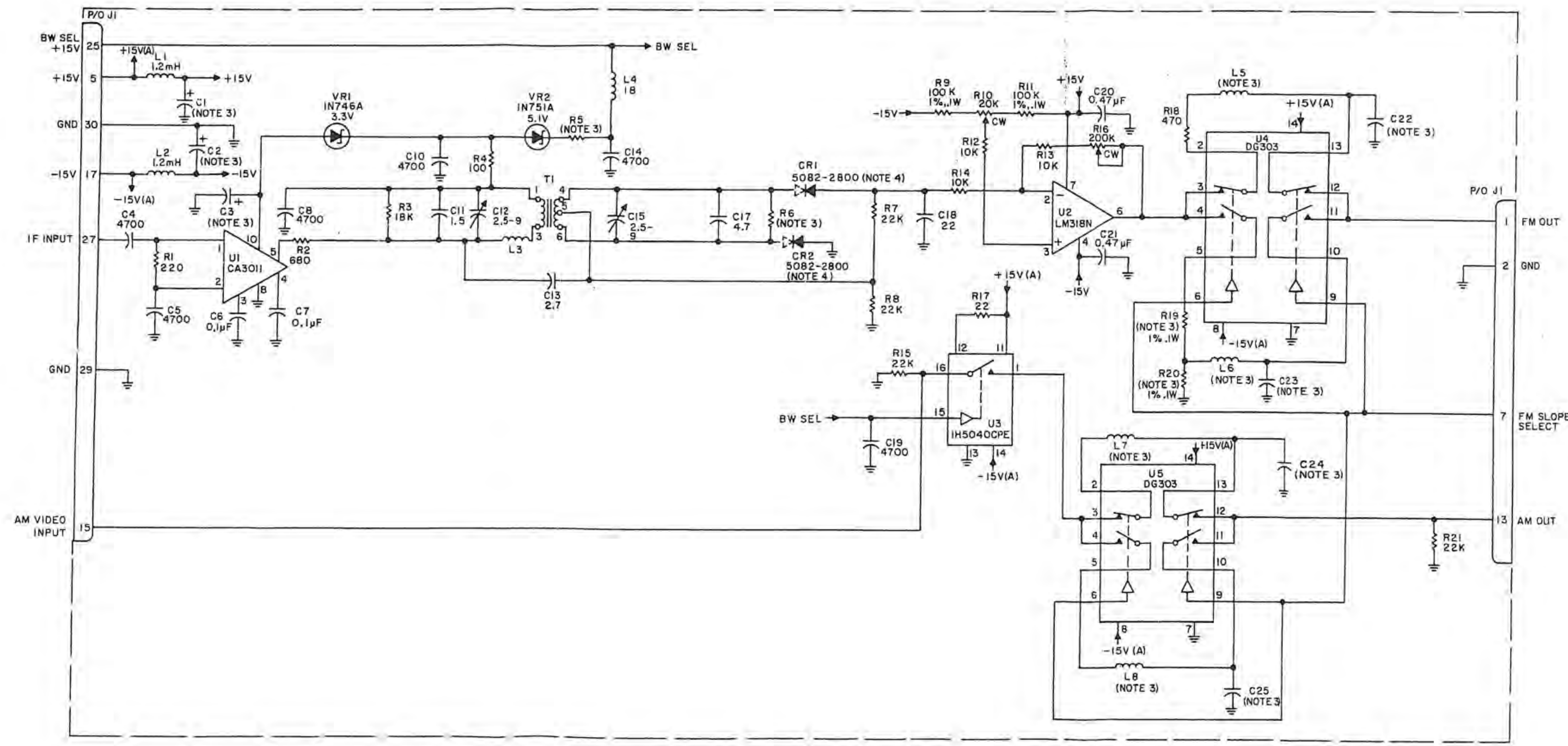


Figure S-30. Type 796356-X, Switchable FM Demodulator (A3A17-A3A21), Schematic Diagram 480518

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) CAPACITANCE IS IN pF.
   b) INDUCTANCE IS IN µH.
   c) RESISTANCE IS IN OHMS, ±5%, 1/8 W.
2. SWITCHES SHOWN IN LOGIC "0" CONDITION, NARROW BAND SELECTED.
3. THE DIFFERENCE BETWEEN TYPES IS SHOWN IN TABLE I.
4. DIODE SHOWN IN PROPER DIRECTION FOR POSITIVE GOING FM VIDEO. FOR NEGATIVE GOING FM VIDEO, DIRECTION IS REVERSED AS INDICATED BY DOTTED OUTLINE.

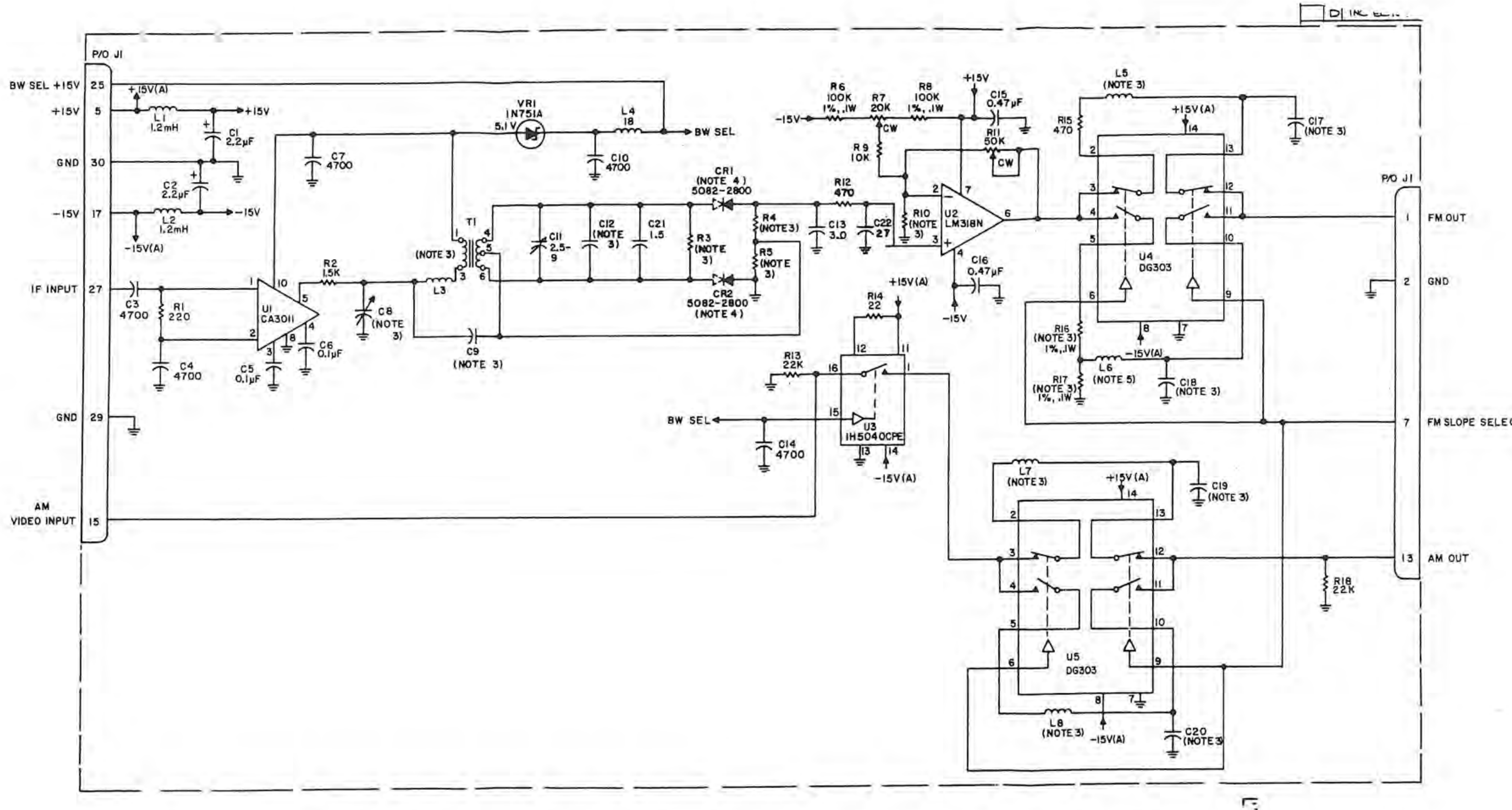
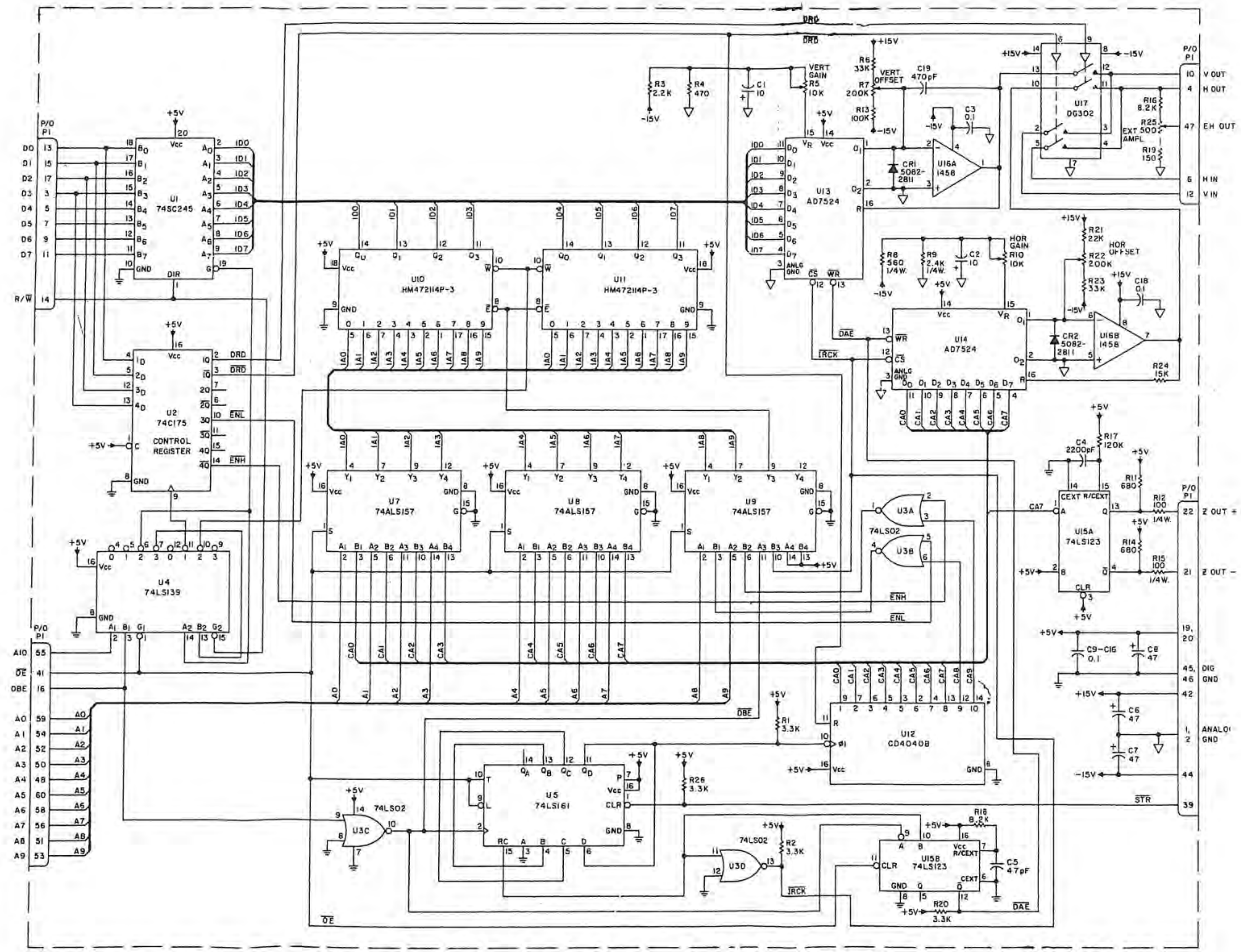


TABLE I

TYPE NO.	BW (KHz)	R4, R5	R10	L5, L7	L6, L8	C17, C19	C18, C20	T1	C8	C9	C12	R3	R16	R17
796357-1	1000/2000	22K	1.2 K	220µH	100µH	910pF	510 pF	24608-9	2.5-9pF	2.7pF	3.3pF	2.7K	953	953
796357-2	2000/4000	10K	2.7 K	100 µH	56 µH	510pF	240pF	24608-9	2.5-9pF	2.7pF	3.3pF	2.7K	953	953
796357-3	4000/6000	10K	4.32K	56 µH	33 µH	240pF	160 pF	24608-9	2.5-9pF	2.7pF	3.3pF	2.7K	750	1.50K
796357-4	4000/8000	10K	2.7K	39µH	10 µH	130pF	47 pF	24608-13	2.5-9pF	2.7pF	3.3pF	1.8 K	953	953
796357-5	4000/10000	10K	2.7K	39µH	10 µH	130 pF	47 pF	24609-19	2-5pF	3.6pF	6.8pF	1.0K	1.1K	750
796357-6	8000/10000	10K	2.7K	27µH	10µH	120pF	47 pF	24609-19	2-5pF	3.6pF	6.8pF	1.0K	619	2.43K
796357-7	1600/3200	10K	2.0K	120µH	68µH	620pF	300pF	24608-9	2.5-9pF	2.7pF	3.3pF	2.7K	953	953
796357-8	1000/1500	22K	1.2K	220µH	150µH	910pF	750pF	24608-9	2.5-9pF	2.7pF	3.3pF	2.7K	750	1.50K
796357-9	2000/3200	10K	2.0K	100µH	68µH	510pF	300pF	24608-9	2.5-9pF	2.7pF	3.3pF	2.7K	750	1.50K

Figure S-31. Type 796357-X, Switchable FM Demodulator (A3A17-A3A21), Schematic Diagram 480522 (F)



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

Figure T-4. Type 796217-1, Digital Refresh Display Schematic Diagram 580165 (E)

WJ-861X RECEIVER

APPENDIX T

WJ-861XB/PSM, PANORAMIC/SECTOR MARKER DISPLAY OPTION

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

November 1990

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

PROPRIETARY STATEMENT

TABLE OF CONTENTS

APPENDIX T

LIST OF TABLES

LIST OF ILLUSTRATIONS

APPENDIX T

WJ-861XB/PANSEC, PANORAMIC/SECTOR MARKER DISPLAY (PSM) OPTION

T.1 GENERAL DESCRIPTION

The Panoramic/Sector Marker Display (PSM) Option produces digitally-refreshed X, Y, and Z outputs for display of two traces on an external X-Y-Z CRT, as illustrated in **Figure T-1.** The PSM Option provides the receiver with an additional scanning mode, enhancing the search capabilities of the WJ-861XB Receiver. During PANSEC operation, the lower CRT plot displays the PAN Scan trace. It provides a visual indication of the signal activity within the programmed start and stop frequencies of the scan. Located above the PAN Scan trace is the SECTOR trace which displays a selected portion of the PAN trace for higher resolution viewing. The center frequency and the frequency width of the SECTOR trace are operator controllable utilizing the tuning wheel and DWELL control, respectively, permitting any portion of the receiver frequency spectrum to be expanded in the SECTOR trace. The Sector Position Indicator, directly below the PAN trace, underscores the portion of the spectrum that is displayed on the SECTOR trace. During the PANSEC Scan mode, rotation of the tuning wheel controls the positioning of the Sector Position Indicator and displays the center frequency of the SECTOR trace in the FREQUENCY window. Selecting the PANSEC Decay mode of operation improves the operator's ability to locate and note transient signals. PANSEC Decay provides a reduction (by 1/2) of the displayed Sector Scan signal amplitude, after signal transmission ceases, each time the Sector Scan trace is refreshed. If the signal returns, the displayed signal amplitude increases to display the signal amplitude. Rotation of the DWELL knob (WIDTH) controls the width of the Sector Scan segment that is viewed. The Width control range is from 2 times the selected PAN IF bandwidth to the full width of the PAN display.

When in the Scan Continue mode, the external CRT provides a frozen display of all signal activity present during the last PANSEC scan. A Marker, directly above the SECTOR trace, is available to the operator, during Scan Continue, to aid in tuning signals that are displayed on the SECTOR trace. Rotation of the tuning wheel positions the frequency marker over the desired signal and the signal frequency of the marker is displayed in the FREQUENCY window of the receiver. Pressing the MSTR/SLAVE pushbutton produces a data "handoff" and a set marker on the external signal monitor. The set marker indicates the tuned frequency of the slave receiver.

T.2 INSTALLATION

To incorporate the PSM Option into the receiver, the software utilized must be revision level **3.0** or greater. The revision level is indicated on a label attached to the EPROM on the Microprocessor (A5A3). Software revision levels less than 2.0 require hardware changes in addition to the software revision change.

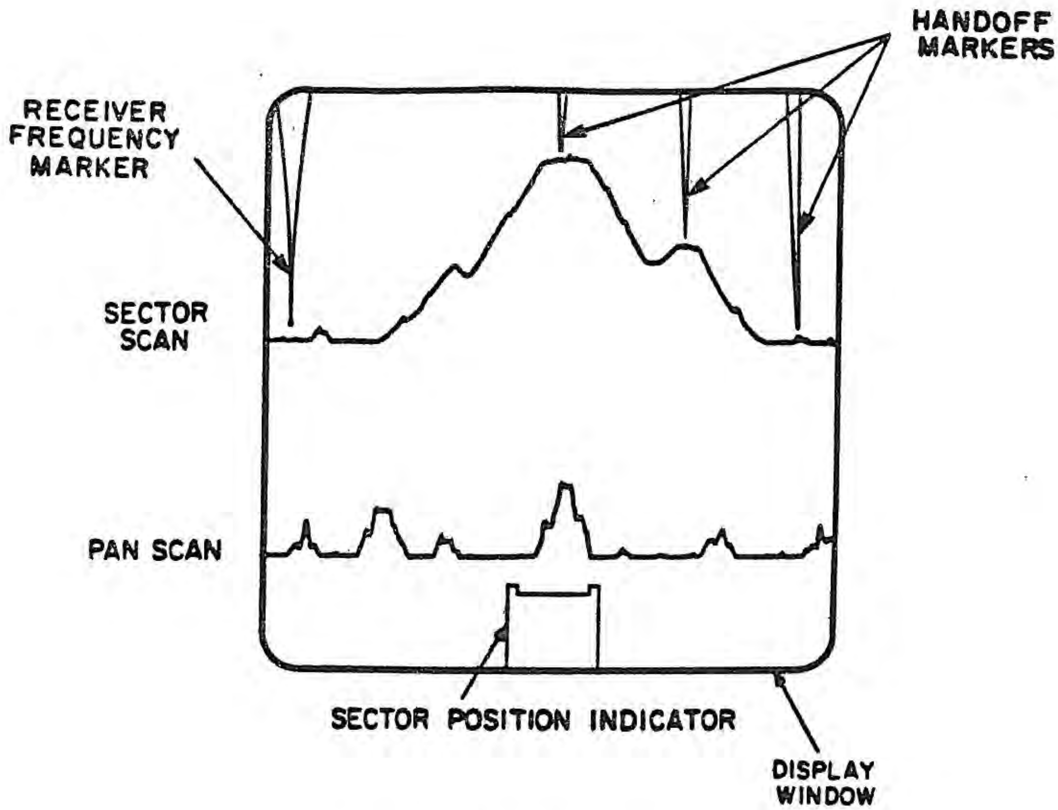


Figure T-1. PAN Scan Display

To facilitate incorporation of the PSM Option; remove the top and bottom covers from the receiver. Visually inspect the Microprocessor type number. If it is Type 796353-X verify a software revision level of **3.0** or greater for U4 and U5. If the Microprocessor is Type 794109-X check the following modules for the same software revision level (**2.2** or greater).

Nomenclature	Location	EPROM Location
Microprocessor	A5A3	U3,U4,U5,U6
*BITE (Option L)	Opt. Slot 3	U9
488 (Option D)	Opt. Slot 4	U6
*RLOG (Option J) Master/Slave	Opt. Slot 5	U9

*Present only if the receiver is configured with this option.

Install the following modules into their designated option slot.

Nomenclature	Location	Type Number
DRD (Option C)	Opt. Slot 2	796217-1
EM (Option M)	Opt. Slot 1	796185-X*

*EM Option Type Number 794137-X is NOT compatible for PANSEC operation.

NOTE

With Microprocessor A5A3 Type 796353-X only EPROM U4 and U5 are required. The BITE, 488 and RLOG require no EPROMs. The EM Option is not required, except when used with RLOG for the Real-Time Clock (RTC) Type 796185-11.

On the bottom of the receiver verify the connection of plug P38, on the A5 Digital I/O Motherboard, for PANSEC operation connect P38 to J5B. Ensure a wire wrap jumper (#30 insulated wire) is from J5B pin 3 to Option Slot 2 pin 6 and another jumper wire from J5B pin 6 to Option Slot 2 pin 12 (install it missing). Ensure R8 of the Receiver Interface (A5A1), Type 794018-X is 150 ohms. If not, install a 150Ω, 5%, 1/8 W resistor (P/N RCR05G151JS).

The PSM Option requires the utilization of an external X-Y-Z CRT. Connect the X OUT (J6), the Y OUT (J7) and Z OUT (J22) to the external monitor. Refer to **Figure T-2** for the placement of the upper case function decals (SECTOR WIDTH, PANSEC, WIDTH, PANSEC DECAY, 488 ADDR, and FBW SCAN). Place the PANSEC DECAY decal above the STEP key.

T.3 OPERATION

To place the receiver into PANSEC operation the unit must be in Manual Operation (the MAN key LED illuminated). With the receiver in the Manual mode, press the FUNCTION key (F↑). The F LED illuminates indicating the receiver front panel is in the upper case operation mode. In the upper case mode, the BFO key becomes the PANSEC Selector/Indicator. Refer to **Table T-1** for an explanation of the PANSEC upper case keys and their functions. If the LED on the BFO key is illuminated, during upper case operation, the receiver is in the PANSEC mode. If the BFO LED is extinguished, in the upper case mode (not in PANSEC) pressing the BFO key places the unit into PANSEC operation, returning the front panel in the lower case operation mode (F↑ key LED extinguished) and setting the receiver to Manual operation.

Programming the receiver to operate properly during PANSEC Scan is explained briefly here and in more detail in **paragraph T.3.2.** When in Manual PANSEC operation, enter the following parameters into the desired memory location (00 through 95). Memory locations are selected via pressing the Memory Up/Down keys, beneath the MEMORY SELECT window. Into the Even memory location (00, 02, 04 . . .94), enter the following parameters for the PAN Scan display:

Start FREQUENCY (of PAN display)
IF BANDWIDTH (for PAN Scan)

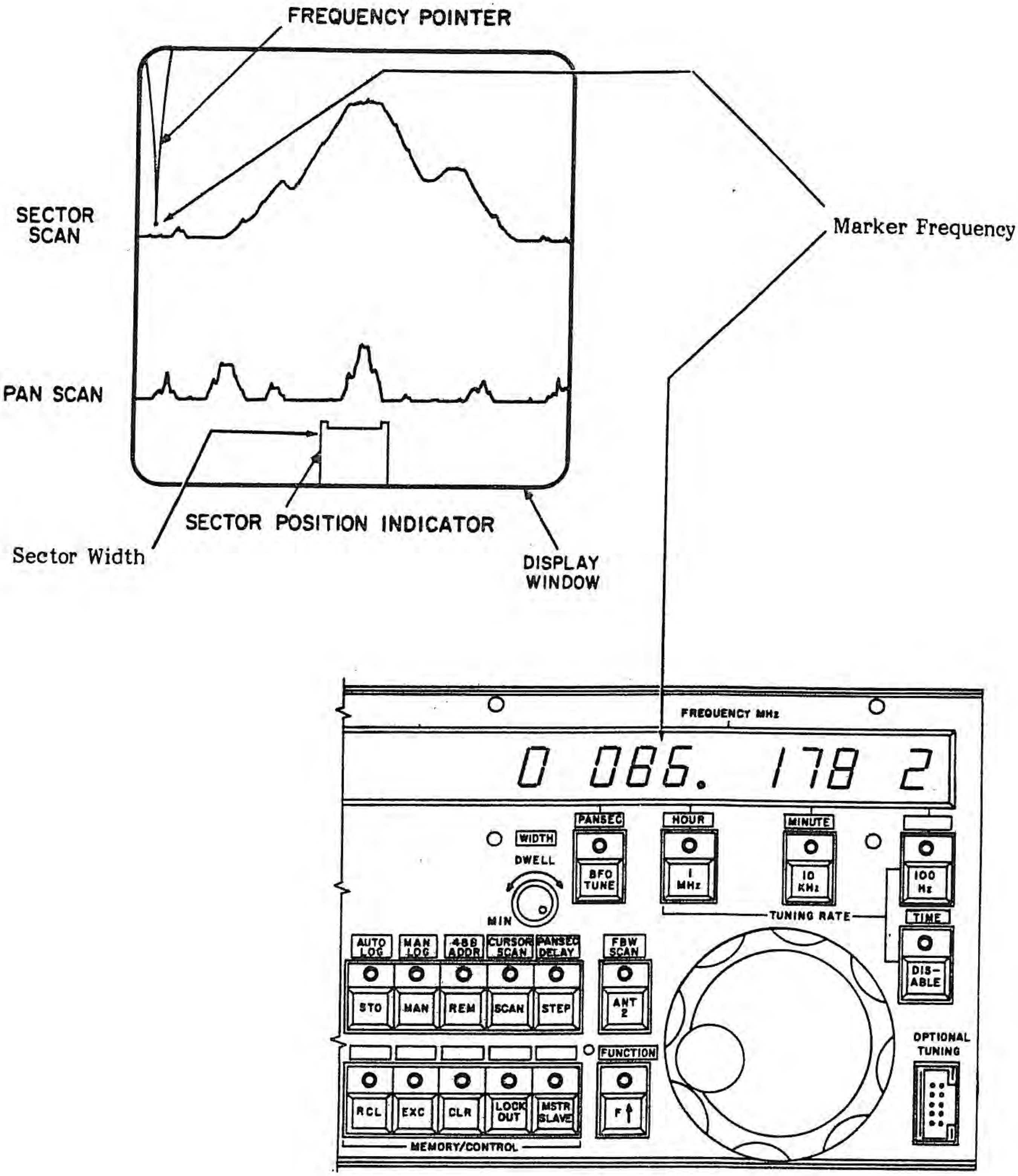


Figure T-2. Front Panel and Scan Continue Display

Table T-1. **PANSEC Functional Control**

Control	Selection	Operation
F↑	Function	Selects upper case Operation.
BFO TUNE	PANSEC	Selects PANSEC mode of operation (BFO ON).
ANT 2	BW Step Size	Selects either Full BW steps (ANT 2 ON) or Half BW Steps (ANT 2 OFF) of the Bandwidth selected.
DWELL	Sector Position Indicator Bandwidth	Varies the bandwidth of the Sector Position Indicator.
TUNING	Sector Position Indicator and Marker	In PANSEC Scan - the tuning wheel varies the Sector Position Indicator location. The frequency displayed on the front panel indicates the center frequency of the Sector Scan trace. In Scan Continue - the tuning wheel varies the marker position. The frequency displayed on the front panel indicates the RF frequency of the signal pip positioned under the marker frequency.
RF/IF GAIN	Gain Level	Varies the gain of the signal level displayed on the Sector Scan display during PANSEC Scan.
BANDWIDTH	Sector Scan Resolution	Changes the bandwidth of the displayed Sector Scan trace. (Must be less than PAN BW.)
STEP	Delayed Sector Display Decay	Provides a delayed Scan signal decay when in Scan operation. When a displayed signal is no longer present, the amplitude of the signal on the Sector Scan trace decreases by 1/2 each time the trace is refreshed, indicating a signal interruption to the viewer.

The chosen parameters are entered into the memory location displayed in the MEMORY SELECT window via pressing the STO key. When the parameters are entered into memory the MEMORY SELECT is automatically incremented by one. Into this successive memory location, the Odd memory location, enter the following parameters for Sector Scan:

Stop FREQUENCY (of PAN display)
IF BANDWIDTH (Sector IF BW PAN BW)
DETECTION MODE
COR LEVEL (00 through 40)
AFC (if desired)
AGC or RF/IF GAIN Setting

The Start frequency must be less (lower in frequency) than the Stop frequency. These frequencies are selected via rotating the tuning wheel, and selecting the TUNING RATE key, to produce the desired frequencies.

The COR level is selectable from the theoretical noise floor level (00) to approximately 40 dB above the noise floor (40). COR LEVEL is controlled via the COR Up/Down keys located beneath the COR LEVEL display. A COR LEVEL of "--" indicates COR is disabled. The COR level entered for Sector is utilized during Scan Continue for audio switching. When AGC is not selected, the RF/IF GAIN control knob varies the signal amplitude displayed on the PAN Scan. Pressing the STO key enters these selected parameters into the Odd memory location.

Prior to selecting PANSEC operation the receiver must be correctly programmed to avoid errors and produce the desired scan. Improper receiver programming causes error codes to be generated when Continuous Scan is attempted (refer to the WJ-861X Receiver Instruction Manual for the ERROR CODES). Error code **815** indicates that the BANDWIDTH selected for the Stop frequency parameter is equal to or greater than the Start frequency bandwidth.

Selecting PANSEC Scan, via depressing the SCAN key, allows the PAN Scan display to be continuously refreshed. After the PAN Scan trace has been updated, the Sector Scan display is then updated. Rotating the tuning wheel varies the position of the Sector Position Indicator below the PAN Scan trace. Varying the width of the Sector Position Indicator, via the DWELL control, and the position of the Sector Position Indicator, via the tuning wheel, allows different portions of the PAN Scan trace to be displayed on the Sector Scan trace. While in PANSEC Scan, the sector bandwidth may be varied and RF/IF Gain may be varied to adjust the Sector Scan display.

The DWELL control is utilized to control the width of the Sector Position Indicator. Rotating the DWELL control counterclockwise (CCW), towards MIN, decreases the Sector Position Indicator width and increases the signal resolution. Rotating the DWELL control clockwise (CW), towards MAX, increases the width of the Sector Position Indicator and decreases signal resolution. The width of the indicator is adjustable between 10 kHz and 9.99 MHz. The Sector Position Indicator width is variable from a minimum width of 2 times the selected BANDWIDTH (1 times the BANDWIDTH in 1/2 BW step) to a maximum width of the entire PAN display.

While in PANSEC Scan mode of operation, PANSEC Decay may be selected via the following process. Select the Scan Continue mode by depressing the MAN key. Depress the F↑ key, placing the front panel into upper case operation, and then depress the STEP key PANSEC DECAY). The displayed Sector Scan trace signal level indicates the refreshed signal level. When the received signal is no longer present, each time the Sector Scan is refreshed the signal amplitude decreases by 1/2. As long as the signal does not return, the displayed signal level decreases until the signal disappears into the noise floor. Pressing the SCAN key again selects the PANSEC Scan operating mode.

Selecting Scan Continue allows the PAN Scan to continue displaying frozen signal levels while storing the signal information that was present on the Sector Scan trace at the time Scan Continue was selected. By retaining the signal information displayed on the Sector Scan, transient signals may be stored in order to determine their frequency. When in Scan Continue, the frequency of the stored signals may be determined by rotating the tuning wheel until the marker is centered above the desired signal response. Once the pointer is centered over the desired signal the FREQUENCY MHz displays the frequency of that signal (refer to **Figure T-2**).

PANSEC with markers enhances the PANSEC mode of operation. Scan Continue mode provides a marker on the top trace of the external signal monitor. When first entering into the Scan Continue mode, the marker is visible at the far left side of the signal monitor. The marker is an inverted pip, extending from the top of the CRT down to any signal activity on the Sector trace. Rotating the tuning wheel clockwise moves the marker from its lefthand starting position, across the monitor display from left to right. The marker frequency is displayed in the FREQUENCY window.

Once the tuning wheel has centered the marker over the desired signal, displayed on the external signal monitor, pressing the MSTR/SLAVE pushbutton dumps the master receiver parameters to the slave receiver address displayed in the MEMORY SELECT window. Device addresses are selectable from 00 to 14. Memory addresses 00-14 are set aside for marker memory. With the MEMORY SELECT window displaying number 00, pressing the MSTR/SLAVE key produces a marker on the monitor trace and dumps receiver data to device address 00. The marker visually indicates that signal data has been sent to another receiver on the IEEE-488 bus. Rotating the tuning wheel moves one marker, while the other marker remains at the handoff frequency. Up to 15 markers may be set, one marker for each device address on the IEEE-488 bus, and displayed on the PANSEC display.

After having set several markers on the PANSEC display, to determine which device corresponds to what marker, rotate tuning wheel and select the tuning resolution until the variable marker is centered directly over the set marker. Superimposing the variable marker on the set marker displays the slave device address in the MEMORY SELECT window. This allows the operator to determine the device that had received the frequency handoff data. Each time the variable marker is exactly centered upon a set marker, the address displayed in the MEMORY SELECT window changes to display the device address to which the data was sent.

With PANSEC enabled (upper case BFO) and Scan Continue selected (LEDs on MAN and SCAN keys illuminated) rotating the tuning wheel moves the marker position. The marker is seen as an inverted pip, extending down from the top of the external monitor to stop within approximately one fourth of an inch from the Sector Scan trace. The length of the marker is determined by the signal activity displayed on the Sector Scan trace. Rotating the variable marker across the displayed trace, the marker amplitude varies as it encounters signal activity. Once a marker has been set, and the data handed off, the amplitude of the marker does not vary. If the receiver is returned to the PANSEC Scan mode, and the signal that was present when the marker was set is not visible, the marker still indicates the signal frequency and the relative signal strength.

Scan Continue allows the operator to freeze a portion of the RF spectrum and set slave receivers to specific tuned frequencies, and then allows the operator to resume monitoring real-time signals. Any signal activity occurring at the handoff frequencies is detected by the receiver tuned to that specific frequency. Thus the operator can monitor greater portions of the RF spectrum and not miss specific signal activity occurring at the set marker frequencies.

Markers are set when the receiver is in the Scan Continue mode. Selecting the Scan Continue mode for the first time produces a marker at the far left of the external monitor display, extending down from the top of the CRT. Rotating the tuning wheel clockwise (CW) moves the marker across the monitor display, from left to right, in frequency steps determined by the selected TUNING RATE. Once the variable marker is centered above the desired signal, pressing the MSTR/SLAVE pushbutton outputs the receiver operating parameters and creates a marker on the signal monitor display. Receiver operating parameters are dumped to the slave device address displayed in the MEMORY SELECT window. After a handoff has occurred, the device address should be manually incremented to prevent the possibility of overwriting previous data. Performing a handoff to the same device address causes previously sent data to be replaced with the data sent last. A second handoff, to the same device address, causes the previously set marker to disappear from the monitor display and to be reset at the presently tuned frequency.

Frequency separation between the set markers is determined by the Sector Scan width and the selected tuning resolution. Setting several markers close together, while in Scan Continue, can appear as one wide pulse during PANSEC Scan by increasing the Sector width. A wide marker pulse is created via decreasing signal resolution. Reducing the Sector width produces the individual set markers instead of one wide pulse.

Deletion of set markers is accomplished by pressing the CLR (Clear) pushbutton twice, clearing all of the set markers. Another method is to set all the device addresses (00-14) to the same tuned frequency. This results in having only one set marker displayed. The set markers may also be eliminated by exiting the PANSEC mode and then re-entering the PANSEC mode.

During Scan Continue, if the marker points to a displayed signal that exceeds the selected COR LEVEL, the COR ON LED illuminates. An audio signal can be heard by connecting a compatible headset to the PHONES jack connector and varying the AUDIO GAIN control. When AFC is enabled, during Scan Continue, the Frequency Pointer automatically centers above the signal (when within 1/2 of the selected BANDWIDTH) and tunes the displayed frequency to correspond to the new position of the pointer.

When PANSEC is disabled the external CRT displays the standard signal monitor trace, if this option is present in the receiver.

After the Installation Procedure has been completed and an external monitor is connected, the following PANSEC general operating procedures may be performed.

T.3.1 PANSEC SELECTION

a. Press the MAN key once (or twice if necessary) to place the unit into Manual operation.

b. Press the F↑ key to place the front panel keys into the upper case function. (The LED on the F↑ key illuminates to indicate upper case operation.)

c. Observe the BFO key, (if the LED is illuminated the receiver is in PANSEC) if the LED is not illuminated press the BFO key. Pressing the BFO key causes:

   1. The F↑ key LED to be extinguished.

   2. The receiver is now in the PANSEC mode, Manual operation, Full BW Step, and the front panel is in lower case function.

T.3.2 PANSEC PROGRAMMING

a. In Manual operation Press the Memory Select Up/Down keys to select the desired memory location from 00 to 95.

b. In an EVEN numbered Memory Select location:

   1. Enter the desired Start frequency by rotating the Tuning knob. (Tuning resolution may be varied by pressing the desired TUNING RATE key: 1 MHz, 10 kHz or 100 Hz.)

   2. Select the desired PAN bandwidth via pressing the respective BANDWIDTH key.

c. Press the STO (store) key to enter the preceding parameters into the selected memory location.

   1. The STO key LED illuminates momentarily.
   2. The parameters are entered into Memory Select.
   3. The Memory Select numerical display increments by one.

d. In this ODD numbered Memory Select, enter the following parameters:

   1. The desired Stop frequency, (greater in frequency than the Start frequency) via the tuning wheel.

   2. A Sector BANDWIDTH narrower than the bandwidth selected for the Start frequency (the EVEN Memory Select).

   3. The desired Sector DETECTION MODE.

   4. Enter the desired Sector COR LEVEL via the Up/Down COR keys (00-40).

   5. AGC enabled, if desired, by pressing the AGC key. If not selected, set RF/IF GAIN control knob for desired signal amplitude.

   6. AFC enabled, if desired, by pressing the AFC key.

e. Press the STO key, thus entering the selected parameters into memory.

T.3.3 OPERATION OF PANSEC

a. Set the receiver MEMORY SELECT to the EVEN numbered memory location containing the Scan Start frequency. Press the SCAN key placing the receiver in Scan mode. Pressing the Scan key produces the following indications:

1. The SCAN key LED is illuminated.

2. The receiver is scanning from the Start frequency to within 1 BANDWIDTH (1/2 BANDWIDTH during Half BW Step) of the Stop frequency.

3. The COR LEVEL alternately flashes "--" and the selected COR LEVEL entered into the ODD Memory Select.

b. Rotate the Tuning knob, moving the Sector Position Indicator in Full BW steps (or Half BW steps) to center it under the desired portion of the PAN Scan displayed trace.

c. Rotate the RF/IF GAIN control, on the front panel, to adjust the signal level amplitude displayed on the Sector Scan trace.

d. Depress the MAN key to store the signal displayed on the Sector Scan trace. Pressing the MAN key produces the following conditions:

1. The MAN key LED is illuminated.

2. The SCAN key LED is illuminated.

3. The receiver PAN Scan trace continues to be refreshed and the external CRT PAN Scan and Sector Scan display signal data that was present at the time Scan Continue was selected.

4. Rotating the Tuning knob moves the Frequency Pointer across the top of the Sector Scan trace.

5. The front panel frequency display now represents the frequency of the Frequency Pointer and is displayed at the center of the receiver's signal monitor.

e. Depressing either the MAN key, disabling the PANSEC Manual scan operation and returns the unit to Manual control, or the SCAN key, returning the receiver to Scan Continue operation and allowing the signal information on the Sector Scan trace to be refreshed.

NOTE

M/S (Master/Slave) works as a single dump while PANSEC is enabled. It sends all the front panel information in one burst to a slave unit. RLOG is functional while in Scan Continue, if this option is present in the receiver.

T.3.4 EXITING PANSEC MODE

To exit the PANSEC mode of operation and return the receiver to normal scan operation:

1. Press the F↑ key to place the front panel to upper case operation.
2. Press the BFO key to extinguish the LED on the BFO key, disabling PANSEC and returning the front panel to standard operation.

T.3.5 TYPE 861XB/PSM

REF DESIG PREFIX

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
A1	Digital Refresh Display Assembly	1	796217-1	14632	

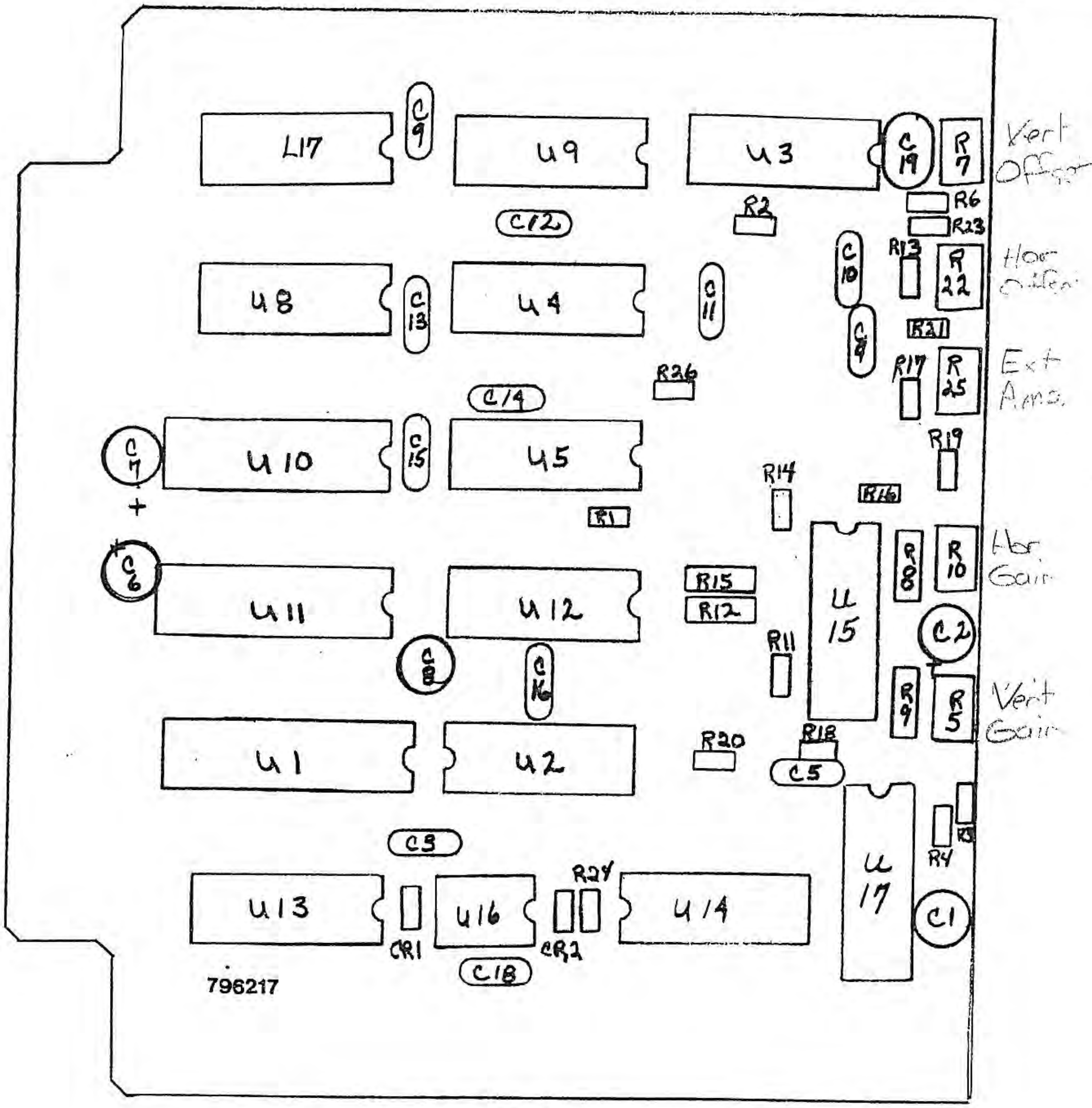


Figure T-3. Type 796217-1, Digital Refresh Display Assembly (A1), Location of Components

T.3.5.1 Type 796217-1 Digital Refresh Display Assembly

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision F				
C1	Capacitor, Electrolytic, Tantalum: 10 µF, 20%, 20 V	2	199D106X0020CE3	56289	
C2	Same as C1				
C3	Capacitor, Ceramic, Disc: .1 µF, 20%, 50 V	10	34475-1	14632	
C4	Capacitor, Ceramic, Disc: 2200 pF, 10%, 200 V	1	CK06BX222K	81349	
C5	Capacitor, Mica, Dipped: 47 pF, 2%, 500 V	1	CM04ED470G03	81349	
C6	Capacitor, Electrolytic, Tantalum: 47 µF, 20%, 20 V	3	199D476X0020EE4	56289	
C7	Same as C6				
C8	Same as C6				
C9 Thru C16	Same as C3				
C17	Not Used				
C18	Same as C3				
C19	Capacitor, Mica, Dipped: 470 pF, 2%, 500 V	1	DM15-471G	72136	
CR1	Diode	2	5082-2811	28480	
CR2	Same as CR1				
R1	Resistor, Fixed, Film: 3.3 kΩ, 5%, 1/8 W	4	CF1/8-3.3K/J	09021	
R2	Same as R1				
R3	Resistor, Fixed, Film: 2.2 kΩ, 5%, 1/8 W	1	CF1/8-2.2K/J	09021	
R4	Resistor, Fixed, Film: 470Ω, 5%, 1/8 W	1	CF1/8-470 OHMS/J	09021	
R5	Resistor, Trim, Film: 10 kΩ, 10%, 1/2 W	2	62PAR10K	73138	
R6	Resistor, Fixed, Film: 33 kΩ, 5%, 1/8 W	2	CF1/8-33K/J	09021	
R7	Resistor, Trim, Film: 200 kΩ, 10%, 1/2 W	2	62PAR200K	73138	
R8	Resistor, Fixed, Film: 560Ω, 5%, 1/4 W	1	CF1/4-560 OHMS/J	09021	
R9	Resistor, Fixed, Film: 2.4 kΩ, 5%, 1/4 W	1	CF1/4-2.4K/J	09021	
R10	Same as R5				
R11	Resistor, Fixed, Film: 680Ω, 5%, 1/8 W	2	CF1/8-680 OHMS/J	09021	
R12	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	2	CF1/8-100 OHMS/J	09021	
R13	Resistor, Fixed, Film: 100 kΩ, 5%, 1/8 W	1	CF1/8-100K/J	09021	
R14	Same as R11				
R15	Same as R12				
R16	Resistor, Fixed, Film: 8.2 kΩ, 5%, 1/8 W	2	CF1/8-8.2K/J	09021	
R17	Resistor, Fixed, Film: 120 kΩ, 5%, 1/8 W	1	CF1/8-120K/J	09021	
R18	Same as R16				
R19	Resistor, Fixed, Film: 150Ω, 5%, 1/8 W	1	CF1/8-150 OHMS/J	09021	
R20	Same as R1				
R21	Resistor, Fixed, Film: 22 kΩ, 5%, 1/8 W	1	CF1/8-22K/J	09021	
R22	Same as R7				
R23	Same as R6				
R24	Resistor, Fixed, Film: 15 kΩ, 5%, 1/8 W	1	CF1/8-15K/J	09021	
R25	Resistor, Trimmer, Film: 500Ω 10%, 1/2 W	1	62PAR500	73138	

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R26	Same as R1				
U1	Transceiver	1	MM74HCT245N	27014	
U2	Quad D-type Flip-flop	1	MM74C175N	27014	
U3	Quad 2-input NOR Gate	1	SN74LS02N	01295	
U4	Decoder/Demultiplexer	1	SN74LS139N	01295	
U5	Binary Counter	1	SN74LS161AN	01295	
U6	Not Used				
U7	Data Selector	3	SN74ALS157N	01295	
U8	Same as U7				
U9	Same as U7				
U10	RAM	2	P2114AL4	34649	
U11	Same as U10				
U12	Binary Counter	1	CD4040BE	02735	
U13	Digital/Analog Converter	2	AD7524JN	24355	
U14	Same as U13				
U15	Multivibrator	1	SN74LS123N	01295	
U16	Op Amplifier	1	MC1458N	18324	
U17	Analog Switch, DPST	1	DG302CJ	17856	
XU10	Socket, Integrated Circuit, 18 pins	2	518AG10D	91506	
XU11	Same as XU10				

WJ-861X RECEIVER

APPENDIX U

MISCELLANEOUS WJ-861X OPTIONS

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

November 1990

TABLE OF CONTENTS

APPENDIX U

APPENDIX U

MISCELLANEOUS WJ-861X OPTIONS

U.1 WJ-861XB/FP Fan Attachment Option

The WJ-861XB/FP Fan Attachment Option provides cooling for the receiver in installations where a rack blower is not possible. This option contains two fans which blow air directly onto the receiver's rear panel. This option attaches to the rear of the receiver and adds three inches to the overall length.

U.2 WJ-861XB/RCS Rotating Chassis Slides Option

The WJ-861XB/RCS Rotating Chassis Slides Option contains slides that attach to the sides of the receiver. This option permits the receiver to slide out from the equipment rack and be tilted up or down.

U.3 WJ-861XB/SCS Straight Chassis Slides Option

The WJ-861XB/SCS Straight Chassis Slides Option contains slides that attach to the sides of the receiver. This option permits the receiver to slide straight out from the equipment rack.