

A4 COMBINER ASSEMBLY

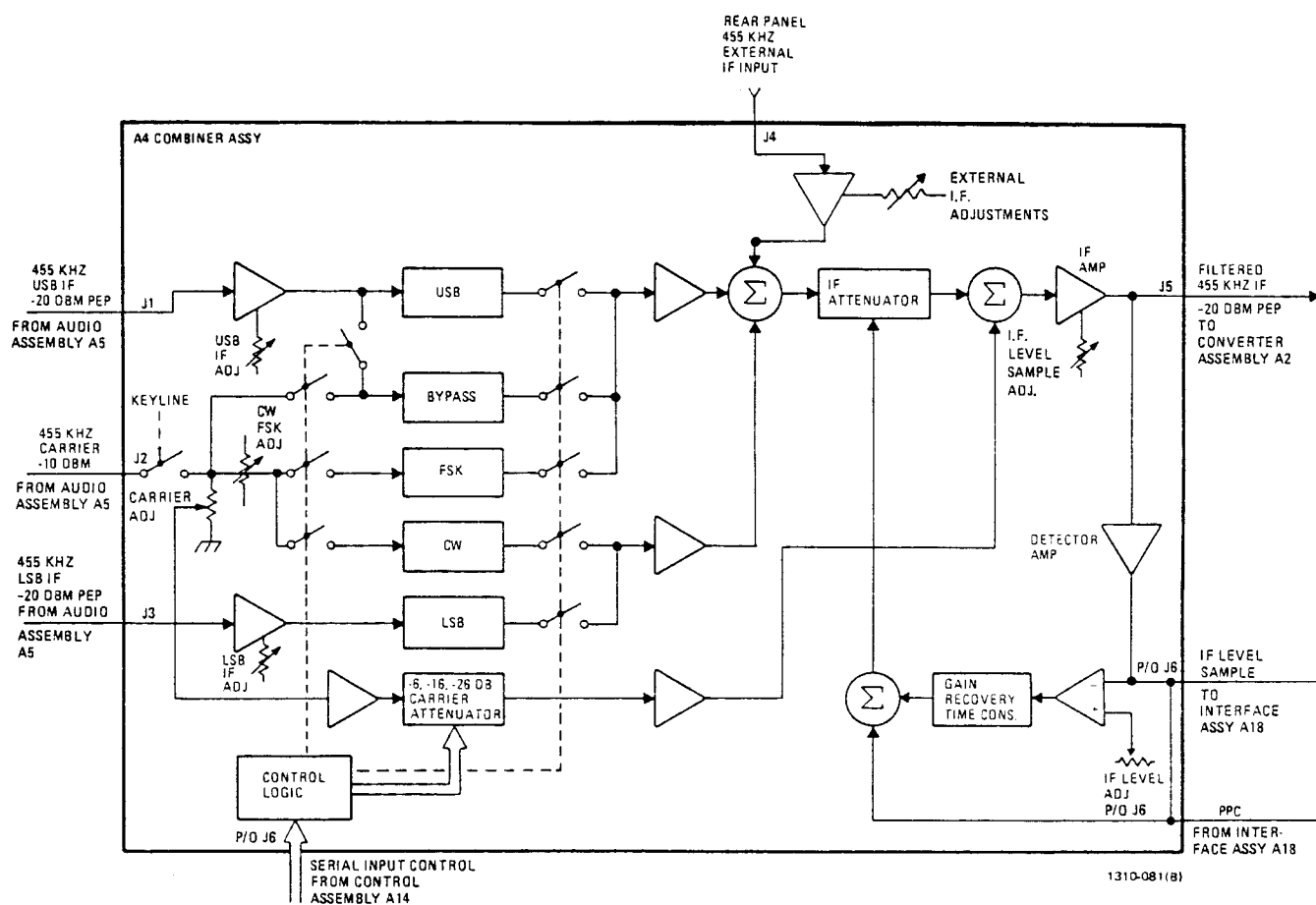


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COMBINER ASSEMBLY A4

1. GENERAL DESCRIPTION

Combiner Assembly A4, shown in figure 1, performs IF (455 kHz) filtering in the USB, LSB, FSK, and CW signal paths. The PWB accepts four filters. USB and LSB filters are always installed while CW and FSK filters are optional. The A4 assembly also performs 455 kHz carrier reinsertion in AM and reduced carrier modes. USB and LSB IF inputs are supplied by Audio 2 Assembly A5A2, each consisting of DSB suppressed carrier signals centered on 455 kHz. The 455 kHz carrier input is generated by Carrier Generator Assembly A11 and sent to Combiner Assembly A4 via the A5A2 assembly. An External IF Input is included, allowing postfilter injection of externally derived IF signal sources. The A4 assembly output is a -20 dBm PEP signal formed by selective combination of the USB IF, LSB IF, 455 kHz carrier, and EXT IF signal inputs. The exciter mode of transmission determines which input signals are combined to yield the composite output. The output level is maintained at -20 dBm PEP by an IF leveling loop circuit.

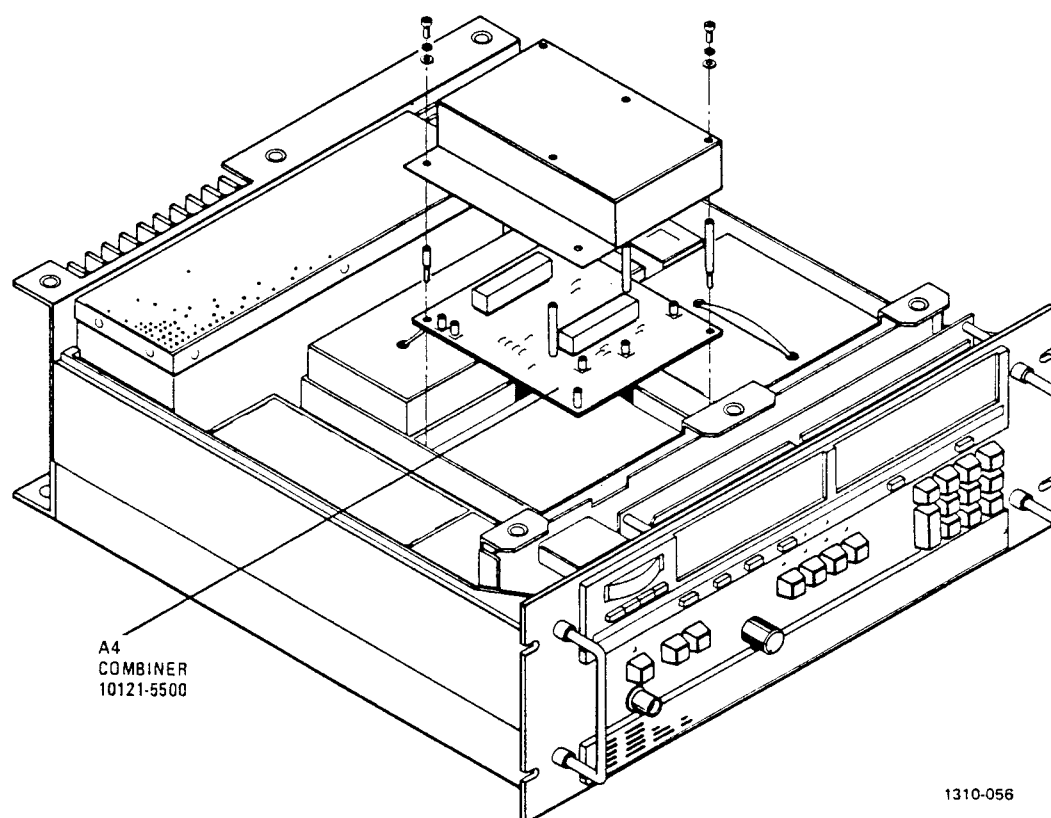


Figure 1. Combiner Assembly A4 Location

Several versions of Combiner Assembly A4 exist. The versions differ in the number and type of IF filters installed on the PWB as well as in associated parts which accommodate the various filter combinations.

2. INTERFACE CONNECTIONS

Table 1 details the various input/output connections and other relevant data.

Table 1. Combiner Assembly A4 Interface Connections

Connector	Function	Characteristics
J1	USB IF Input	-20 dBm PEP, DSB suppressed, 455 kHz carrier
J2	Carrier Input	455 kHz, -10 dBm nominal
J3	LSB IF Input	-20 dBm PEP, DSB suppressed, 455 kHz carrier
J4	External IF Input	-20 dBm PEP
J5	Combiner Output	-20 dBm PEP
J6-1	Rear Serial Data	Logic; 0 V, + 5 V
J6-2	Rear Serial Clock	Logic; 0 V, + 5 V
J6-3	Serial Check	Logic; 0 V, + 5 V
J6-4	Serial Enable	Logic; 0 V, + 5 V
J6-5	IF Envelope	4.5 Vdc at full PA Output
J6-6	PPC Control	0 to -5 Vdc, -5 Vdc yields 45 dB gain reduction
J6-7	Internal Keyline	0 V = active, + 5 Vdc = inactive
J6-8"	Ground	
J6-9	Index Key	
J6-10	Combiner ID	Fixed voltage between 0 and + 5 Vdc
J6-11	Spare	
J6-12	Power, + 5 V, unregulated	+ 8 Vdc, nominal
J6-13	Power, + 15 Vdc	
J6-14	Power, -15 Vdc	

3. CIRCUIT DESCRIPTION

The circuit descriptions of Combiner Assembly A4 are grouped and described as follows:

- a. Filter Circuits
 - USB
 - LSB
 - CW
 - FSK
- b. USB/LSB Combiner

- c. Leveling Loop Circuit
- d. Carrier Reinsertion Circuit
- e. First IF Input
- f. PPC Control
- g. Combiner PWB Function Control

3.1 Filter Circuits

The beginning of the Combiner Assembly A4 signal path consists of four selectable filter paths; the USB, LSB, CW, and FSK paths. Table 2 lists the signal path/mode selection data. Various paths are enabled depending upon exciter MODE selection and are shown in figure 2.

Table 2. T1 Combiner Modes and Inputs

Mode	Q2 Output (to T1)	Q3 Output (to T1)
CW	None	Keyed 455 kHz Carrier (via FL3)
AFSK	AFSK Tones (via FL1)	None
AME	LSB portion of USB DSB input (via FL1)	None
AM	Nonfiltered USB DSB input (Bypass)	None
USB	LSB portion of USB DSB input (via FL1)	None
LSB	None	USB portion of LSB DSB input (via FL4)
ISB	LSB portion of USB DSB input (via FL1)	USB portion of LSB DSB input (via FL4)
FM	455 kHz FM signal (Bypass)	None
FSK	FSK Tones (via FL2)	None
MCW	LSB portion of USB DSB input (via FL1)	None

3.1.1 USB Filter Circuit

The USB filter circuit provides signal paths for USB, AM, AME, MCW, and FM modes of transmission. In each of these modes, the IF signal reaches buffer Q2 by different paths. The following paragraphs describe the path for each mode.

3.1.1.1 USB Mode

Double sideband (DSB) suppressed carrier input from Audio 2 Assembly A5A2 enters J1 at a -20 dBm PEP level. R1 variably attenuates this input and applies it to amplifier Q1 which provides a nominal 8 dB gain. The amplified output at the Q1 collector is passed through FL1 which passes only the lower sideband content of the DSB input signal. In USB mode, the USB path control line is active (-15 V). This allows the filtered signal (output of FL1) to pass through CR5 to buffer Q2.

3.1.1.2 AM Mode

As in the USB mode described above, an amplified DSB signal is present at the Q1 collector. In the AM mode, both sidebands of the DSB input signal are passed (no filtering); therefore, FL1 is bypassed. The amplified DSB input signal is presented to switch CR1, CR2, and CR3. In the AM mode, the AM path control line is active (-15 V) providing a signal path through CR1 and CR3 to attenuator pad R14, R15, and R16. The BYPASS AM path control line is active (-15 V) in AM. This provides a signal path from the attenuator pad, through CR7 to buffer Q2.

3.1.1.3 AME Mode

The AME signal path is identical to the USB mode path (through FL1). USB is active in AME and the signal passes to Q2 via CR5. The carrier injection required in AME mode is described in paragraph 3.4.

3.1.1.4 MCW Mode

The MCW signal path is identical to the signal path for the USB mode. Refer to paragraph 3.1.1.1 for the signal path description.

3.1.1.5 FM Mode

The FM signal enters at 455 kHz Carrier Input J2. For FM transmission, BYPASS and BYPASS AM path control lines are active (-15 V) yielding an FM signal path through CR11, CR12, CR13, attenuator pad R14, R15, R16, and CR7 to buffer Q2.

3.1.2 LSB Filter Circuit

The LSB filter circuit path is used only in LSB mode. The LSB DSB IF input signal at J3 is variably attenuated by R75 and amplified by Q4. Q4 provides a nominal 8 dB gain. The amplified DSB signal at the Q4 collector passes through FL4 which passes only the upper sideband portion of the double sideband input signal. In the LSB mode, the LSB path control line is active (-15 V), and provides a signal path through CR25 to buffer Q3.

3.1.3 CW Filter Circuit

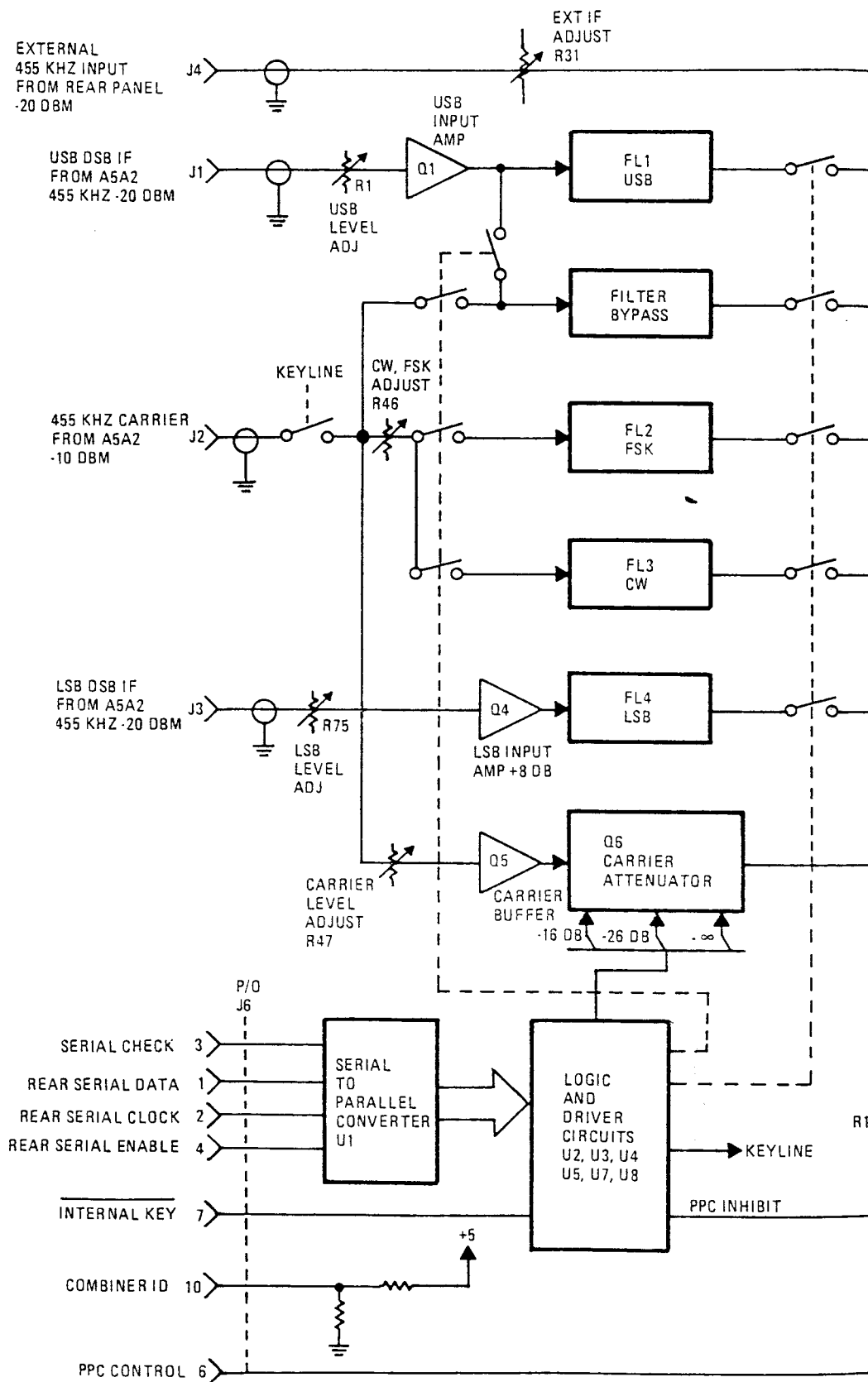
The 455 kHz carrier enters J2 with a level of -10 dBm. CW keying of the carrier is accomplished by switching CR11 on and off in response to INTERNAL KEYLINE. The keyline waveform is modified by R48, R49, CR15, CR16, and C39 to yield proper CW output waveform shaping. When CR11 is ON (INTERNAL KEYLINE low, exciter keyed), the 455 kHz carrier passes through CR11 to CR21. In CW mode, the CW path control line is active (-15 V). This provides a signal path through CR21, FL3, and CR23 to buffer Q3. If FL3 is not installed, pad R127, R128, and R129 substitutes for the filter.

3.1.4 FSK Filter Circuit

FSK tones enter J2 at a level of -10 dBm. INTERNAL KEYLINE remains active (0 V) throughout the FSK transmission, providing a signal path through CR11 to CR17. In FSK mode, the FSK path control line is active (-15 V) and provides a signal path through CR17, FL2, and CR20 to buffer Q2. If FL2 is not installed, pad R124, R125, and R126 substitutes for the filter.

3.2 First Combiner

T1 combines the outputs of buffers Q2 and Q3 to form a composite signal which is sent to the IF leveling loop circuit. In ISB mode, both buffers supply input to T1. In the other modes, only one (Q2 or Q3) supplies input. Table 2 lists the T1 inputs for the various modes of transmission.



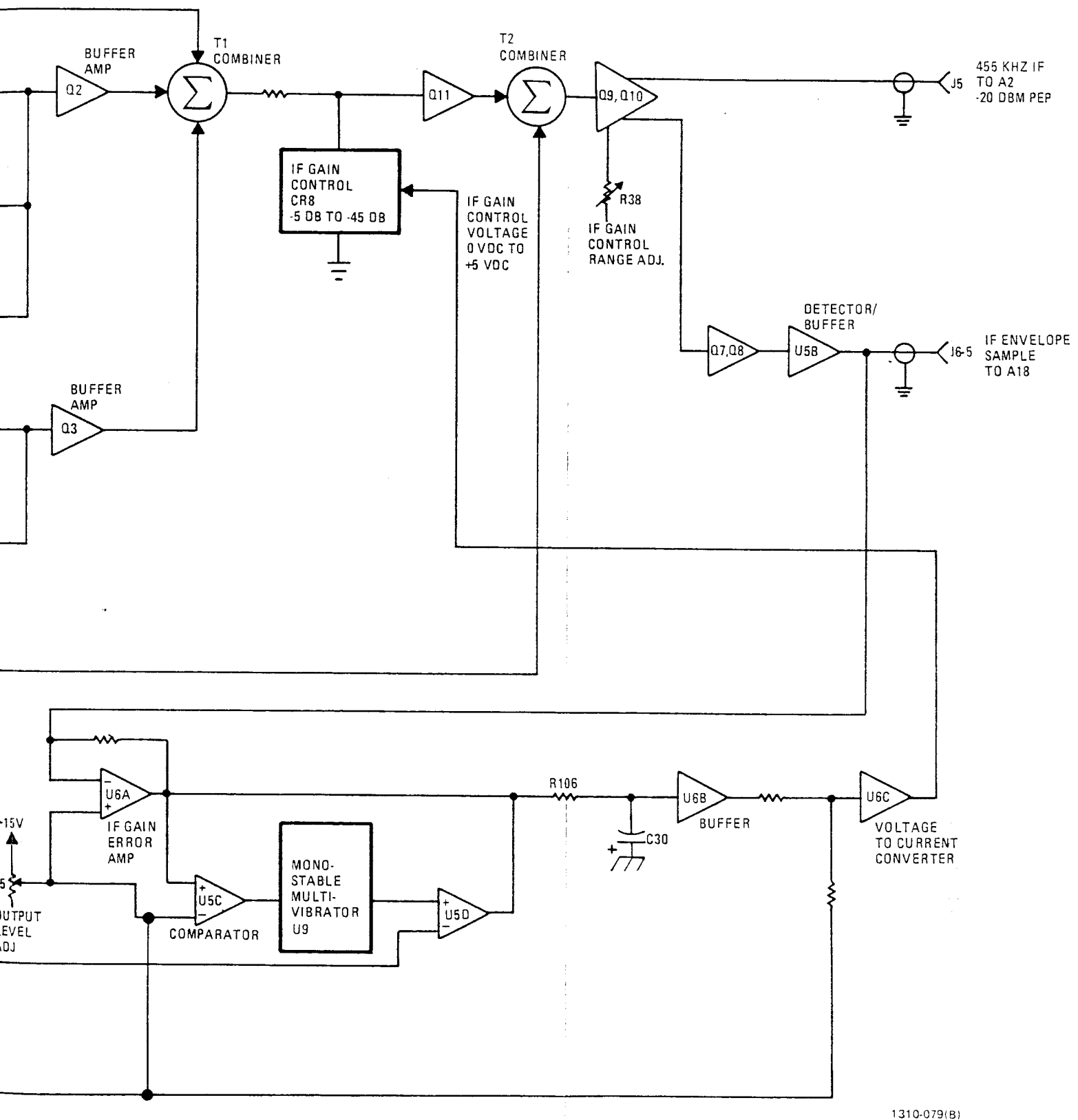


Figure 2. Combiner Assembly A4 Functional Block Diagram

3.3 Leveling Loop Circuit

Combiner Assembly A4 output is maintained at -20 dBm PEP, regardless of transmission mode, through action of an active hang-type gain control loop circuit. The circuit detects the Combiner output level and dynamically attenuates the T1 combiner output to maintain a proper output level at J5.

The T1 combiner output is shunted by PIN diode attenuator CR8 and applied to buffer Q11. T2 combines the Q11 output with a reduced carrier or external IF signal if either are present. The composite T2 output is amplified by feedback pair Q9 and Q10 which supply two outputs. The first, a high gain output, is applied to amplifiers Q7 and Q8. The second, a low gain output, is the Combiner Assembly A4 output, J5. CR31 detects the high gain output yielding a dc voltage at U5-10 proportional to the output level. U5B buffers the detected dc voltage into IF gain error amplifier U6A and to IF envelope J6-5. The IF envelope signal, J6-5, is sent to System Interface Assembly A18A2 where it serves as a reference voltage in the exciter/PA output gain control loop. Error amplifier U6A compares the detected dc level to an adjustable dc reference voltage at U6-12. Any detected IF level greater than the reference voltage is amplified by U6A, whose output negatively charges C30. The voltage developed across C30 is buffered by U6B and converted to a control voltage that is applied to PIN attenuator CR8. CR8 attenuates the T1 output signal in proportion to the dc control voltage applied to it. Transmitter PPC Control via CR38 will lower the threshold voltage, causing the U6A Amplifier to act sooner, thus reducing the module output.

An increase or decrease in the Combiner Assembly output (J5) yields a corresponding change in the detected dc output. This yields a change in the error voltage at C30 and therefore the current applied to PIN attenuator CR8. The Combiner Assembly output (J5) is maintained at a constant PEP level determined by the adjustable (R105) reference voltage at U6-12. R105 is normally adjusted to yield a combiner output level of -20 dBm PEP.

U5C, U9, and U5D form a hang-type gain recovery circuit. This circuit, after a delay, reduces the attenuation inserted in response to a sustained A4 output signal decrease. The circuit has a built-in 0.15-second delay called the hangtime. The action of the gain recovery circuit reduces the negative charge on C30 built up during the period of high signal level.

U5C compares the U6A output voltage to the reference voltage supplied by R105 and Transmitter PPC. A drop in the A4 output signal level will cause the U6A output to go to +15 volts. This changes the U5C output from -15 volts to +15 volts and triggers monostable multivibrator U9, thus starting the 0.150 second timing cycle.

The output of U9, pin 7, goes low (0 V). After 0.15-seconds, U9 resets to cause U5D to forward bias CR35 and forces C30 to discharge. This action reduces the voltage applied to CR8 and the signal attenuation. As the A4 assembly output signal level increases, U6A will start to detect amplitude above the threshold, invert it, and charge C30 in a negative direction through CR33.

3.4 Carrier Reinsertion Circuit

Reinsertion of the 455 kHz carrier in AM, AME, and reduced carrier modes occurs at combining transformer T2. Buffer Q11 supplies the sideband (intelligence) input to T2 and Q6 supplies the carrier input to T2 via CR29. In modes requiring carrier reinsertion, the 455 kHz carrier at J2 passes through switch CR11 to buffer Q5. R47 adjusts the nominal carrier level presented to Q5. The output of Q5 is presented to two selectable attenuating networks, R90, R93, and R94, R95. The networks are individually switched into the circuit by activating the -16 and -26 control lines which turn on CR27 and CR28, respectively. The R90, R93 network yields a carrier attenuation of -16 dB and the R94, R95 network yields a -26 dB attenuation. Q6 buffers the output of the attenuator network and outputs the carrier to T2 via switch CR29. CR29 is ON for all modes requiring carrier insertion.

Carrier attenuation levels other than -16 dB and -26 dB are achieved by appropriate changes of resistor values in the attenuator networks. Carrier attenuation levels of -16 dB and -26 dB are standard. The PWB can be

modified to change the levels to -10 dB and -20 dB. The Combiner ID signal (J6-10) tells Control Board Assembly A14 which levels are being used. The Control Board Assembly then sends the appropriate carrier display information to the front panel. A voltage divider made up of R116 and R117 is used to set the dc voltage of the Combiner ID signal at a level proportional to the selected attenuation levels.

3.5 External IF Input

Externally supplied 455 kHz signals may be injected into the A4 assembly signal path via access provided at the exciter rear panel. Such signals enter Combiner Assembly A4 at J4 and are injected at Q11 via R34. Externally injected IF signals should be nominally -20 dBm, 50 ohms.

3.6 PPC Control

In most transmitting systems peak power control is required. A gain controlling dc voltage is applied at the PPC INPUT (J6-6). This dc voltage is derived by sampling the system output level, current and voltage protection circuits, or other parameters. The voltage at J6-6 will change from 0 volts to -7 volts. The first portion (0 to -3 volts dc) is applied to threshold voltage through CR38 (6.8 V Zener diode). Control voltage beyond -4 volts dc is applied directly to the voltage-to-current converter (U6C), which in turn controls attenuator CR8. Attenuation of the A4 assembly output varies from 0 dB to -35 dB for the PPC input voltages of 0 to -7 volts dc respectively.

3.7 Combiner PWB Function Control

The microprocessor of Control Board Assembly A14 controls the functions of the A4 assembly by transmitting a serial data stream appearing at J6-1, Rear Serial Data. The data stream is decoded into an eight-bit control word by serial-to-parallel converter U1. The eight outputs of U1 are converted from their 0 V, 5 V logic levels to -15 V, +15 V control voltages by comparators U2, U3, and U4. The resultant ± 15 V control signals and their effects on function selection throughout the Combiner Assembly circuitry are listed in table 3.

Table 3. Assembly Path Control Lines

Control Signal	-15 Volt	+15 Volt	Active (-15 V) in the following modes
$\overline{\text{LSB}}$, U3-8	Enables FL4 signal path	Disables FL4 signal path	LSB, ISB
$\overline{\text{FSK}}$, U3-1	Enables FL2 signal path	Disables FL2 signal path	FSK
$\overline{\text{CW}}$, U3-14	Enables FL3 signal path	Disables FL3 signal path	CW
$\overline{\text{-16}}$, U2-14	Selects -16 dB car. reinsertion level	Deselects -16 dB car. reinsertion level	-16
$\overline{\text{-26}}$, U2-1	Selects -26 dB car. reinsertion level	Deselects -26 dB car. reinsertion level	-26
$\overline{\text{BYPASS}}$, U2-8	Enables path from J2 to pad R14, R15, R16	Disables path from J2 to pad R14, R15, R16	FM
$\overline{\text{USB}}$, U4-1	Enables FL1 signal path	Disables FL1 signal path	USB, AME, MCW
$\overline{\text{AM}}$, U4-14	Enables path from J1 to pad R14, R15, R16	Disables path from J1 to pad R14, R15, R16	AM
$\overline{\text{CAR}}$ $\overline{\text{RNSRT}}$, U4-7	Enables carrier insertion at T2	Disables carrier insertion at T2	AM, AME, 16 and -26
$\overline{\text{BYPASS}}$ $\overline{\text{AM}}$	Enables path from pad R14, R15, R16 to Q2	Disables path from pad R14, R15, R16 to Q2	AM and FM

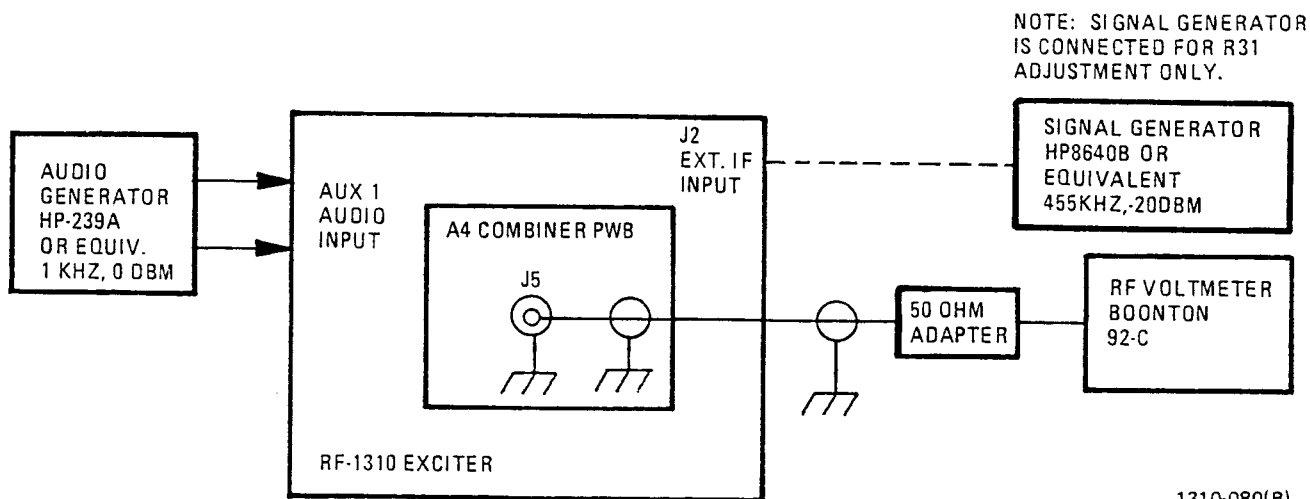
The position of JMP1 determines selection of AM (DSB, full carrier) versus AME (SSB, full carrier).

4. MAINTENANCE

The following adjustments should not be made as part of a routine maintenance procedure, but only when a failure indicates a definite need. Unless otherwise specified, the following adjustments are to be performed with all assemblies in normal electrical contact.

4.1 Output Level Adjustment

- a. Set up the equipment as shown in figure 3. Set the exciter function switch to OFF.
- b. Set R2, R76, R105, R31, R47, and R46 fully clockwise (cw position).
- c. Set R38 fully counterclockwise (ccw).
- d. Set exciter front panel controls as follows:
 - FUNCTION: NORM
 - MODE: CW
 - RF PWR: -00
 - FREQ: 2.0000 MHz
 - CLIP: OFF



1310-080(B)

Figure 3. Combiner PWB Assembly Maintenance Setup

- e. CW key the exciter and momentarily short across CR34 to ensure there is no charge on C30. Adjust R46 for -20 dBm at J5.
- f. Adjust R38 for 5.75 volts at TP4.
- g. Adjust R46 for -17 dBm at J5. Unkey CW keyline.
- h. Set exciter MODE switch to USB and AUDIO switch to AUX 1.
- i. Key PTT line and adjust R2 for -17 dBm at J5. Unkey PTT line.
- j. Set exciter MODE switch to LSB and AUDIO switch to AUX 1.
- k. Key PTT line and adjust R76 for -17 dBm at J5. Unkey PTT line.
- l. Remove brown sleeved cable attached to J1. Set exciter MODE switch to AM.
- m. Key PTT line and adjust R47 for -26 dBm at J5.
- n. Reconnect brown sleeved cable to J1.
- o. Apply a -20 dBm external IF signal (455 kHz) to J2 at the rear panel of exciter. Adjust R31 for -17 dBm at J5. Disconnect external IF signal, supplied by the signal generator from J2.
- p. Set exciter MODE switch to CW.
- q. Key CW keyline and adjust R105 for -20 dBm at J5.
- r. Adjustment procedure is complete. Set up the normal connection to J5.

5. PARTS LIST, COMPONENT LOCATION, AND SCHEMATIC DIAGRAM

All replaceable components of the standard Combiner Assembly A4 are listed in table 4. (The standard Combiner Assembly supplied with RF-1310 is the 10121-5500-03.) Component substitutions for optional configurations are listed in tables 5 and 6. Figure 4 shows the locations of all components in the assembly. Figure 5 is a schematic diagram of Combiner Assembly A4.

Table 4. Combiner Assembly A4 Parts List

Ref. Desig.	Part Number	Description
A4	10121-5500-03	COMBINER ASSEMBLY
C1	M39014/02-1310	CAP .1UF 10% 100V CER-R
C2	M39014/02-1310	CAP .1UF 10% 100V CER-R
C3	M39014/02-1310	CAP .1UF 10% 100V CER-R
C4	M39014/02-1310	CAP .1UF 10% 100V CER-R
C5	M39014/02-1310	CAP .1UF 10% 100V CER-R
C6	M39014/02-1310	CAP .1UF 10% 100V CER-R

Table 4. Combiner Assembly A4 Parts List (Cont.)

Ref. Desig.	Part Number	Description
C7	M39014/02-1310	CAP .1UF 10% 100V CER-R
C8	M39014/02-1310	CAP .1UF 10% 100V CER-R
C9	M39014/02-1310	CAP .1UF 10% 100V CER-R
C10	M39014/02-1310	CAP .1UF 10% 100V CER-R
C11	M39014/02-1310	CAP .1UF 10% 100V CER-R
C12	M39014/02-1310	CAP .1UF 10% 100V CER-R
C13	M39014/02-1310	CAP .1UF 10% 100V CER-R
C15	M39014/02-1310	CAP .1UF 10% 100V CER-R
C16	M39014/02-1310	CAP .1UF 10% 100V CER-R
C17	M39014/02-1310	CAP .1UF 10% 100V CER-R
C18	M39014/02-1310	CAP .1UF 10% 100V CER-R
C19	M39014/02-1310	CAP .1UF 10% 100V CER-R
C20	M39014/02-1310	CAP .1UF 10% 100V CER-R
C21	M39014/02-1310	CAP .1UF 10% 100V CER-R
C22	M39014/02-1310	CAP .1UF 10% 100V CER-R
C23	M39014/02-1310	CAP .1UF 10% 100V CER-R
C24	M39014/02-1310	CAP .1UF 10% 100V CER-R
C25	M39014/02-1310	CAP .1UF 10% 100V CER-R
C26	M39014/02-1310	CAP .1UF 10% 100V CER-R
C27	C26-0025-339	CAP 3.3UF 20% 25V TANT
C28	M39014/02-1310	CAP .1UF 10% 100V CER-R
C29	CK06BX472K	CAP 4700PF 10% 200V CER
C30	C26-0025-100	CAP 10UF 20% 25V TANT
C33	CK06BX223K	CAP .022UF 10% 100V CER
C34	C26-0035-159	CAP 1.5UF 20% 35V TANT
C35	C26-0035-339	CAP 3.3UF 20% 35V TANT
C36	M39014/02-1310	CAP .1UF 10% 100V CER-R
C37	M39014/02-1310	CAP .1UF 10% 100V CER-R
C38	M39014/02-1310	CAP .1UF 10% 100V CER-R
C39	C26-0025-479	CAP 4.7UF 20% 25V TANT
C40	M39014/02-1310	CAP .1UF 10% 100V CER-R
C41	M39014/02-1310	CAP .1UF 10% 100V CER-R
C42	M39014/02-1310	CAP .1UF 10% 100V CER-R
C43	M39014/02-1310	CAP .1UF 10% 100V CER-R
C44	M39014/02-1310	CAP .1UF 10% 100V CER-R
C45	M39014/02-1320	CAP .47UF 10% 50V CER-R
C46	C26-0025-100	CAP, TANT, 10 UF, 25 VDC
C47	M39014/02-1310	CAP .1UF 10% 100V CER-R
C48	M39014/02-1310	CAP .1UF 10% 100V CER-R
C49	M39014/02-1310	CAP .1UF 10% 100V CER-R
C50	M39014/02-1310	CAP .1UF 10% 100V CER-R
C51	M39014/02-1310	CAP .1UF 10% 100V CER-R
C52	M39014/02-1310	CAP .1UF 10% 100V CER-R
C53	M39014/02-1310	CAP .1UF 10% 100V CER-R
C54	M39014/02-1310	CAP .1UF 10% 100V CER-R
C55	M39014/02-1310	CAP .1UF 10% 100V CER-R
C56	M39014/02-1310	CAP .1UF 10% 100V CER-R
C57	M39014/02-1310	CAP .1UF 10% 100V CER-R

Table 4. Combiner Assembly A4 Parts List (Cont.)

Ref. Desig.	Part Number	Description
C58	M39014/02-1310	CAP .1UF 10% 100V CER-R
C61	M39014/02-1310	CAP .1UF 10% 100V CER-R
C62	M39014/02-1310	CAP .1UF 10% 100V CER-R
C63	M39014/02-1310	CAP .1UF 10% 100V CER-R
C64	M39014/02-1310	CAP .1UF 10% 100V CER-R
C65	M39014/02-1310	CAP .1UF 10% 100V CER-R
C66	M39014/02-1310	CAP .1UF 10% 100V CER-R
C67	M39014/02-1310	CAP .1UF 10% 100V CER-R
C68	M39014/02-1310	CAP .1UF 10% 100V CER-R
C69	C26-0025-339	CAP 3.3UF 20% 25V TANT
C70	M39014/02-1310	CAP .1UF 10% 100V CER-R
C71	M39014/02-1310	CAP .1UF 10% 100V CER-R
C72	M39014/02-1310	CAP .1UF 10% 100V CER-R
C73	M39014/02-1310	CAP .1UF 10% 100V CER-R
C74	M39014/02-1310	CAP .1UF 10% 100V CER-R
C75	M39014/02-1310	CAP .1UF 10% 100V CER-R
C76	M39014/02-1310	CAP .1UF 10% 100V CER-R
C77	M39014/02-1310	CAP .1UF 10% 100V CER-R
C78	C26-0025-339	CAP 3.3UF 20% 25V TANT
C79	M39014/02-1310	CAP .1UF 10% 100V CER-R
C80	M39014/02-1310	CAP .1UF 10% 100V CER-R
C81	C26-0035-470	CAP 47UF 20% 35V TANT
C82	M39014/02-1310	CAP .1UF 10% 100V CER-R
C83	M39014/02-1310	CAP .1UF 10% 100V CER-R
C84	C26-0035-470	CAP 47UF 20% 35V TANT
C86	CM05FD271J03	CAP 270PF 5% 50V
C87	CM05FD271J03	CAP 270PF 5% 50V
C92	CM05FD271J03	CAP 270PF 5% 50V
C93	CM05FD271J03	CAP 270PF 5% 50V
C94	M39014/02-1310	CAP .1UF 10% 100V CER-R
C96	M39014/02-1310	CAP .1UF 10% 100V CER-R
C97	M39014/02-1310	CAP .1UF 10% 100V CER-R
C98	M39014/02-1310	CAP .1UF 10% 100V CER-R
C99	M39014/02-1310	CAP .1UF 10% 100V CER-R
CR1	1N4454	DIODE 200mA 75V SW
CR2	1N4454	DIODE 200mA 75V SW
CR3	1N4454	DIODE 200mA 75V SW
CR4	1N4454	DIODE 200mA 75V SW
CR5	1N4454	DIODE 200mA 75V SW
CR6	1N4454	DIODE 200mA 75V SW
CR7	1N4454	DIODE 200mA 75V SW
CR8	D12-0007-001	DIODE 1W 75V PIN SW
CR9	1N4454	DIODE 200mA 75V SW
CR10	1N4454	DIODE 200mA 75V SW
CR11	D10-3500-000	DIODE .25W 35V PIN BSW
CR12	1N4454	DIODE 200mA 75V SW
CR13	1N4454	DIODE 200mA 75V SW

Table 4. Combiner Assembly A4 Parts List (Cont.)

Ref. Desig.	Part Number	Description
CR14	1N4454	DIODE 200mA 75V SW
CR15	1N4454	DIODE 200mA 75V SW
CR16	1N4454	DIODE 200mA 75V SW
CR17	1N4454	DIODE 200mA 75V SW
CR18	1N4454	DIODE 200mA 75V SW
CR19	1N4454	DIODE 200mA 75V SW
CR20	1N4454	DIODE 200mA 75V SW
CR21	1N4454	DIODE 200mA 75V SW
CR22	1N4454	DIODE 200mA 75V SW
CR23	1N4454	DIODE 200mA 75V SW
CR24	1N4454	DIODE 200mA 75V SW
CR25	1N4454	DIODE 200mA 75V SW
CR26	1N4454	DIODE 200mA 75V SW
CR27	D10-3500-000	DIODE .25W 35V PIN BSW
CR28	D10-3500-000	DIODE .25W 35V PIN BSW
CR29	D10-3500-000	DIODE .25W 35V PIN BSW
CR30	D10-3500-000	DIODE .25W 35V PIN BSW
CR31	1N6263	DIODE .40W 60V HOT CARR
CR32	1N4454	DIODE 200mA 75V SW
CR33	1N4454	DIODE 200mA 75V SW
CR34	1N4454	DIODE 200mA 75V SW
CR35	1N4454	DIODE 200mA 75V SW
CR36	1N4454	DIODE 200mA 75V SW
CR38	1N5228B	DIODE 3.9V 5% .5W ZENER
CR39	1N4454	DIODE 200mA 75V SW
CR40	1N5235B	DIODE ZENER 6.8V
CR41	1N4454	DIODE 200mA 75V SW
CR42	1N4004	DIODE RECTIFIER
CR43	1N4454	DIODE 200mA 75V SW
FL1	10073-7300	FILTER, MECH., 455 KHZ LSB
FL4	10073-7301	FILTER, MECH., 455 KHZ USB
J1	J-0031	CONN SMB VERT PCB F
J2	J-0031	CONN SMB VERT PCB F
J3	J-0031	CONN SMB VERT PCB F
J4	J-0031	CONN SMB VERT PCB F
J5	J-0031	CONN SMB VERT PCB F
J6	J46-0032-014	CONN 14 PIN
JMP1	J65-0008-103	PLUG SHORTING 2-PIN FEM
L1	10073-7033	INDUCTOR, 10MH
L2	MS75085-13	COIL 330UH 10% FXD RF
L3	MS75085-19	COIL 1000UH 10% FXD RF
L5	10073-7033	INDUCTOR, 10MH
L7	10073-7033	INDUCTOR, 10MH
L10	MS75085-13	COIL 330UH 10% FXD R
L11	10073-7033	INDUCTOR, 10MH
L12	MS75085-13	COIL 330UH 10% FXD RF
L13	MS75085-13	COIL 330UH 10% FXD RF
L14	MS75085-7	COIL 100UH 10% FXD RF

Table 4. Combiner Assembly A4 Parts List (Cont.)

Ref. Desig.	Part Number	Description
L15	MS75085-7	COIL 100UH 10% FXD RF
L17	MS75085-17	COIL 680UH 10% FXD RF
Q1	2N4123	XSTR SS/GP NPN TO-92
Q2	Q35-0003-000	XSTR U310 JFET HIGH GM
Q3	Q35-0003-000	XSTR U310 JFET HIGH GM
Q4	2N4123	XSTR SS/GP NPN TO-92
Q5	2N4123	XSTR SS/GP NPN TO-92
Q6	2N4123	XSTR SS/GP NPN TO-92
Q7	2N4123	XSTR SS/GP NPN TO-92
Q8	2N4123	XSTR SS/GP NPN TO-92
Q9	2N4123	XSTR SS/GP NPN TO-92
Q10	2N4123	XSTR SS/GP NPN TO-92
Q11	2N4123	XSTR SS/GP NPN TO-92
Q12	2N4123	XSTR SS/GP NPN TO-92
Q13	2N4123	XSTR SS/GP NPN TO-92
Q14	2N4123	XSTR SS/GP NPN TO-92
R1	R65-0003-680	RES,68 5% 1/4W CAR FILM
R2	R-2204	RES,VAR,PCB 200 .5 20%
R3	R65-0003-103	RES,10K 5% 1/4W CAR FILM
R4	R65-0003-512	RES,5.1K 5% 1/4W CAR FILM
R5	R65-0003-222	RES,2.2K 5% 1/4W CAR FILM
R6	R65-0003-101	RES,100 5% 1/4W CAR FILM
R7	R65-0003-152	RES,1.5K 5% 1/4W CAR FILM
R8	R65-0003-101	RES,100 5% 1/4W CAR FILM
R9	R65-0003-362	RES,3.6K 5% 1/4W CAR FILM
R10	R65-0003-102	RES,1.0K 5% 1/4W CAR FILM
R11	R65-0003-512	RES,5.1K 5% 1/4W CAR FILM
R12	R65-0003-512	RES,5.1K 5% 1/4W CAR FILM
R13	R65-0003-512	RES,5.1K 5% 1/4W CAR FILM
R14	R65-0003-153	RES,15K 5% 1/4W CAR FILM
R15	R65-0003-392	RES,3.9K 5% 1/4W CAR FILM
R16	R65-0003-153	RES,15K 5% 1/4W CAR FILM
R17	R65-0003-512	RES,5.1K 5% 1/4W CAR FILM
R18	R65-0003-104	RES,100K 5% 1/4W CAR FILM
R19	R65-0003-201	RES,200 5% 1/4W CAR FILM
R20	R65-0003-101	RES,100 5% 1/4W CAR FILM
R21	R65-0003-201	RES,200 5% 1/4W CAR FILM
R22	R65-0003-102	RES,1.0K 5% 1/4W CAR FILM
R23	R65-0003-620	RES,62 5% 1/4W CAR FILM
R24	R65-0003-202	RES,2.0K 5% 1/4W CAR FILM
R25	R65-0003-101	RES,100 5% 1/4W CAR FILM
R26	R65-0003-273	RES,27K 5% 1/4W CAR FILM
R27	R65-0003-203	RES,20K 5% 1/4W CAR FILM
R28	R65-0003-103	RES,10K 5% 1/4W CAR FILM
R29	R65-0003-201	RES,200 5% 1/4W CAR FILM
R30	R65-0003-102	RES,1.0K 5% 1/4W CAR FILM
R31	R-2204	RES,VAR,PCB 200 .5 20%
R32	R65-0003-201	RES,200 5% 1/4W CAR FILM

Table 4. Combiner Assembly A4 Parts List (Cont.)

Ref. Desig.	Part Number	Description
R33	R65-0003-101	RES,100 5% 1/4W CAR FILM
R34	R65-0003-680	RES,68 5% 1/4W CAR FILM
R35	R65-0003-101	RES,100 5% 1/4W CAR FILM
R36	R65-0003-620	RES,62 5% 1/4W CAR FILM
R37	R65-0003-103	RES,10K 5% 1/4W CAR FILM
R38	R30-0008-102	RES,VAR,PCB 1K 1/2W 10%
R39	R65-0003-182	RES,1.8K 5% 1/4W CAR FILM
R40	R65-0003-101	RES,100 5% 1/4W CAR FILM
R41	R65-0003-271	RES,270 5% 1/4W CAR FILM
R42	R65-0003-302	RES,3.0K 5% 1/4W CAR FILM
R43	R65-0003-512	RES,5.1K 5% 1/4W CAR FILM
R44	R65-0003-202	RES,2.0K 5% 1/4W CAR FILM
R45	R65-0003-560	RES,56 5% 1/4W CAR FILM
R46	R30-0008-503	RES,VAR,PCB 50K .5 20%
R47	R-2205	RES,VAR,PCB 500 .5 20%
R48	R65-0003-332	RES,3.3K 5% 1/4W CAR FILM
R49	R65-0003-332	RES,3.3K 5% 1/4W CAR FILM
R50	R65-0003-102	RES,1.0K 5% 1/4W CAR FILM
R51	R65-0003-152	RES,1.5K 5% 1/4W CAR FILM
R52	R65-0003-472	RES,4.7K 5% 1/4W CAR FILM
R53	R65-0003-102	RES,1.0K 5% 1/4W CAR FILM
R54	R65-0003-104	RES,100K 5% 1/4W CAR FILM
R55	R65-0003-104	RES,100K 5% 1/4W CAR FILM
R56	R65-0003-512	RES,5.1K 5% 1/4W CAR FILM
R57	R65-0003-102	RES,1.0K 5% 1/4W CAR FILM
R58	R65-0003-102	RES,1.0K 5% 1/4W CAR FILM
R59	RN55D3011F	RES,3010 1% 1/8W MET FLM
R60	RN55D4752F	RES,47.5K 1% 1/8W MET FLM
R61	RN55D1821F	RES,1820 1% 1/8W MET FLM
R62	RN55D2742F	RES,27.4K 1% 1/8W MET FLM
R64	R65-0003-103	RES,10K 5% 1/4W CAR FILM
R65	R65-0003-102	RES,1.0K 5% 1/4W CAR FILM
R66	R65-0003-152	RES,1.5K 5% 1/4W CAR FILM
R67	R65-0003-472	RES,4.7K 5% 1/4W CAR FILM
R68	R65-0003-104	RES,100K 5% 1/4W CAR FILM
R69	R65-0003-331	RES,330 5% 1/4W CAR FILM
R70	R65-0003-222	RES,2.2K 5% 1/4W CAR FILM
R71	R65-0003-512	RES,5.1K 5% 1/4W CAR FILM
R72	R65-0003-104	RES,100K 5% 1/4W CAR FILM
R73	R65-0003-201	RES,200 5% 1/4W CAR FILM
R74	R65-0003-101	RES,100 5% 1/4W CAR FILM
R75	R65-0003-680	RES,68 5% 1/4W CAR FILM
R76	R-2204	RES,VAR,PCB 200 .5 20%
R77	R65-0003-103	RES,10K 5% 1/4W CAR FILM
R78	R65-0003-512	RES,5.1K 5% 1/4W CAR FILM

Table 4. Combiner Assembly A4 Parts List (Cont.)

Ref. Desig.	Part Number	Description
R79	R65-0003-152	RES,1.5K 5% 1/4W CAR FILM
R80	R65-0003-101	RES,100 5% 1/4W CAR FILM
R81	R65-0003-222	RES,2.2K 5% 1/4W CAR FILM
R82	R65-0003-362	RES,3.6K 5% 1/4W CAR FILM
R83	R65-0003-512	RES,5.1K 5% 1/4W CAR FILM
R84	R65-0003-102	RES,1.0K 5% 1/4W CAR FILM
R85	R65-0003-243	RES,24K 5% 1/4W CAR FILM
R86	R65-0003-622	RES,6.2K 5% 1/4W CAR FILM
R87	R65-0003-621	RES,620 5% 1/4W CAR FILM
R88	R65-0003-621	RES,620 5% 1/4W CAR FILM
R89	R65-0003-101	RES,100 5% 1/4W CAR FILM
R90	R65-0003-391	RES,390 5% 1/4W CAR FILM
R91	R65-0003-392	RES,3.9K 5% 1/4W CAR FILM
R92	R65-0003-392	RES,3.9K 5% 1/4W CAR FILM
R93	R65-0003-151	RES,150 5% 1/4W CAR FILM
R94	R65-0003-102	RES,1.0K 5% 1/4W CAR FILM
R95	R65-0003-750	RES,75 5% 1/4W CAR FILM
R96	R65-0003-203	RES,20K 5% 1/4W CAR FILM
R97	R65-0003-682	RES,6.8K 5% 1/4W CAR FILM
R98	R65-0003-621	RES,620 5% 1/4W CAR FILM
R99	R65-0003-681	RES,680 5% 1/4W CAR FILM
R100	R65-0003-182	RES,1.8K 5% 1/4W CAR FILM
R101	R65-0003-510	RES,51 5% 1/4W CAR FILM
R102	R65-0003-392	RES,3.9K 5% 1/4W CAR FILM
R103	R65-0003-104	RES,100K 5% 1/4W CAR FILM
R104	R65-0003-432	RES,4.3K 5% 1/4W CAR FILM
R105	R-2210	RES,VAR,PCB 20K .5 20%
R106	R65-0003-222	RES,2.2K 5% 1/4W CAR FILM
R107	R65-0003-333	RES,33K 5% 1/4W CAR FILM
R108	R65-0003-473	RES,47K 5% 1/4W CAR FILM
R109	R65-0003-683	RES,68K 5% 1/4W CAR FILM
R110	R65-0003-104	RES,100K 5% 1/4W CAR FILM
R111	R65-0003-154	RES,150K 5% 1/4W CAR FILM
R112	R65-0003-102	RES,1.0K 5% 1/4W CAR FILM
R113	R65-0003-302	RES,3.0K 5% 1/4W CAR FILM
R117	R65-0003-103	RES,10K 5% 1/4W CAR FILM
R118	R65-0003-101	RES,100 5% 1/4W CAR FILM
R119	R65-0003-473	RES,47K 5% 1/4W CAR FILM
R120	R65-0003-473	RES,47K 5% 1/4W CAR FILM
R121	R65-0003-473	RES,47K 5% 1/4W CAR FILM
R122	R65-0003-821	RES,820 5% 1/4W CAR FILM
R123	R65-0003-101	RES,100 5% 1/4W CAR FILM
R124	R65-0003-153	RES,15K 5% 1/4W CAR FILM

Table 4. Combiner Assembly A4 Parts List (Cont.)

Ref. Desig.	Part Number	Description
R125	R65-0003-392	RES,3.9K 5% 1/4W CAR FILM
R126	R65-0003-153	RES,15K 5% 1/4W CAR FILM
R127	R65-0003-153	RES,15K 5% 1/4W CAR FILM
R128	R65-0003-392	RES,3.9K 5% 1/4W CAR FILM
R129	R65-0003-153	RES,15K 5% 1/4W CAR FILM
R131	R65-0003-103	RES,10K 5% 1/4W CAR FILM
R132	R65-0003-152	RES,1.5K 5% 1/4W CAR FILM
R133	R65-0003-241	RES,240 5% 1/4W CAR FILM
R134	R65-0003-101	RES,100 5% 1/4W CAR FILM
R135	R65-0003-103	RES,10K 5% 1/4W CAR FILM
R136	R65-0003-512	RES,5.1K 5% 1/4W CAR FILM
R137	R65-0003-152	RES,1.5K 5% 1/4W CAR FILM
R138	R65-0003-510	RES,51 5% 1/4W CAR FILM
R139	R65-0003-222	RES,2.2K 5% 1/4W CAR FILM
R140	R65-0003-682	RES,6.8K 5% 1/4W CAR FILM
R141	R65-0003-362	RES,3.6K 5% 1/4W CAR FILM
R142	R65-0003-362	RES,3.6K 5% 1/4W CAR FILM
R143	R65-0003-512	RES,5.1K 5% 1/4W CAR FILM
R144	R65-0003-271	RES,270 5% 1/4W CAR FILM
R145	R65-0003-103	RES,10K 5% 1/4W CAR FILM
R146	R65-0003-101	RES,100 5% 1/4W CAR FILM
R147	R65-0003-102	RES,1.0K 5% 1/4W CAR FILM
R148	R65-0003-152	RES,1.5K 5% 1/4W CAR FILM
T1	10073-7026	TRANSFORMER, RF, FIXED
T2	10073-7026	TRANSFORMER, RF, FIXED
TP0	J-0067	TP PWB BLK TOP ACCS .080"
TP1	J-0071	TP PWB BRN TOP ACCS .080"
TP2	J-0066	TP PWB RED TOP ACCS .080"
TP3	J-0069	TP PWB ORN TOP ACCS .080"
TP4	J-0070	TP PWB YEL TOP ACCS .080"
TP5	J-0068	TP PWB GRN TOP ACCS .080"
U1	I01-0000-156	IC 4094B PLASTIC CMOS
U2	I30-0003-000	IC 324 OP AMP PLASTIC
U3	I30-0003-000	IC 324 OP AMP PLASTIC
U4	I30-0003-000	IC 324 OP AMP PLASTIC
U5	I30-0003-000	IC 324 OP AMP PLASTIC
U6	I30-0003-000	IC 324 OP AMP PLASTIC
U7	I01-0000-005	IC 4002B PLASTIC CMOS
U8	I01-0000-003	IC 4001B PLASTIC CMOS
U9	I01-0000-353	IC 4538B PLASTIC CMOS
VR1	I12-0006-005	IC VR 78L05A + 5V .10A 4%

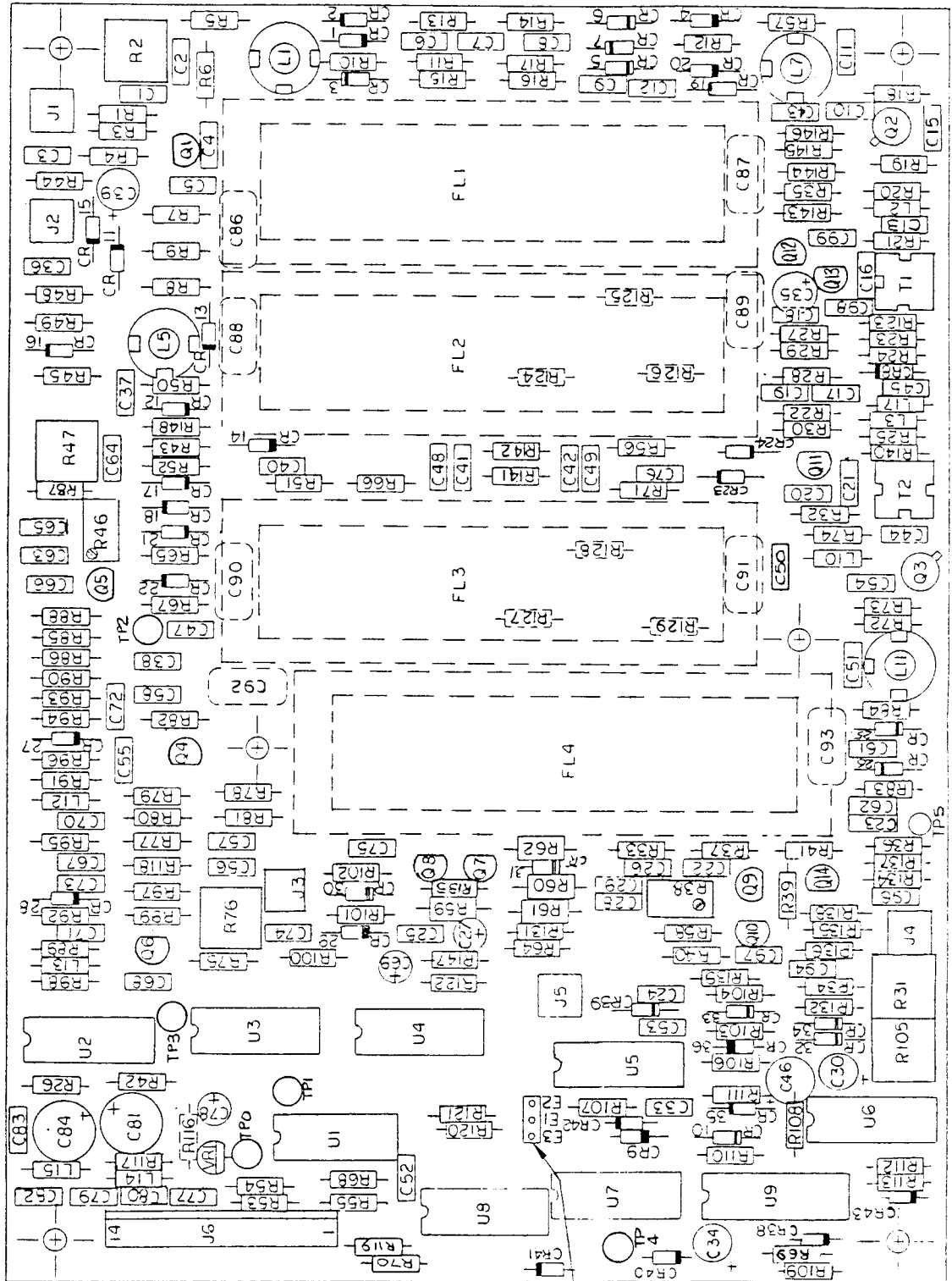
Table 5. Optional Combiner Assembly A4 (10121-5500-01) Part Substitutions

Ref. Desig.	Part Number	Description
A4	10121-5500-01	COMBINER ASSEMBLY
FL1	10073-7311	FILTER,XTAL WIDE DELAY COMP., 455 KHZ LSB
FL4	10073-7310	FILTER,XTAL WIDE DELAY COMP., 455 KHZ USB

Table 6. Optional Combiner Assembly A4 (10121-5500-04) Part Substitutions

Ref. Desig.	Part Number	Description
A4	10121-5500-04	COMBINER ASSEMBLY
FL1	10073-7312	FILTER,XTAL,NARROW DELAY COMP.,455 KHZ LSB
FL4	10073-7313	FILTER,XTAL,NARROW DELAY COMP.,455 KHZ USB

NOTE:
INSTALL JMP-1, AM/AME JUMPER
FROM E1 - E3 FOR AM
FROM E1 - E2 FOR AME.



SEE NOTE

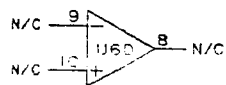
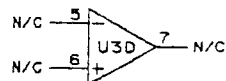
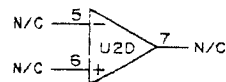
Figure 4. Combiner Assembly A4 Component Location Diagram (10121-5500)

NOTE: UNLESS OTHERWISE SPECIFIED:

1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR A COMPLETE DESIGNATION, PREFIX WITH UNIT NO. AND/OR ASSEMBLY NO. DESIGNATION.
2. ALL RESISTOR VALUES ARE IN OHMS, 1/4W, $\pm 5\%$.
3. ALL CAPACITOR VALUES ARE IN MICROFARADS.
4. VENDOR PART NO. CALLOUTS ARE FOR REFERENCE ONLY. COMPONENTS ARE SUPPLIED PER PART NO. IN PARTS LIST.
5. ALL UNMARKED DIODES ARE 1N4454.
6. SEE PL10121-5500-XX (XX= 01, 02, 03, ETC.) AND 10121-5500 ASSEMBLY DRAWING FOR OPTIONAL CONFIGURATIONS. +5V UNR
7. ALL INDUCTOR VALUES ARE IN MICROHENRYS.

TABLE 1	
MODE	JUMPER 1
AME	E1 TO E2
AM	E1 TO E3

UNUSED GATES



SER C

COMBINER

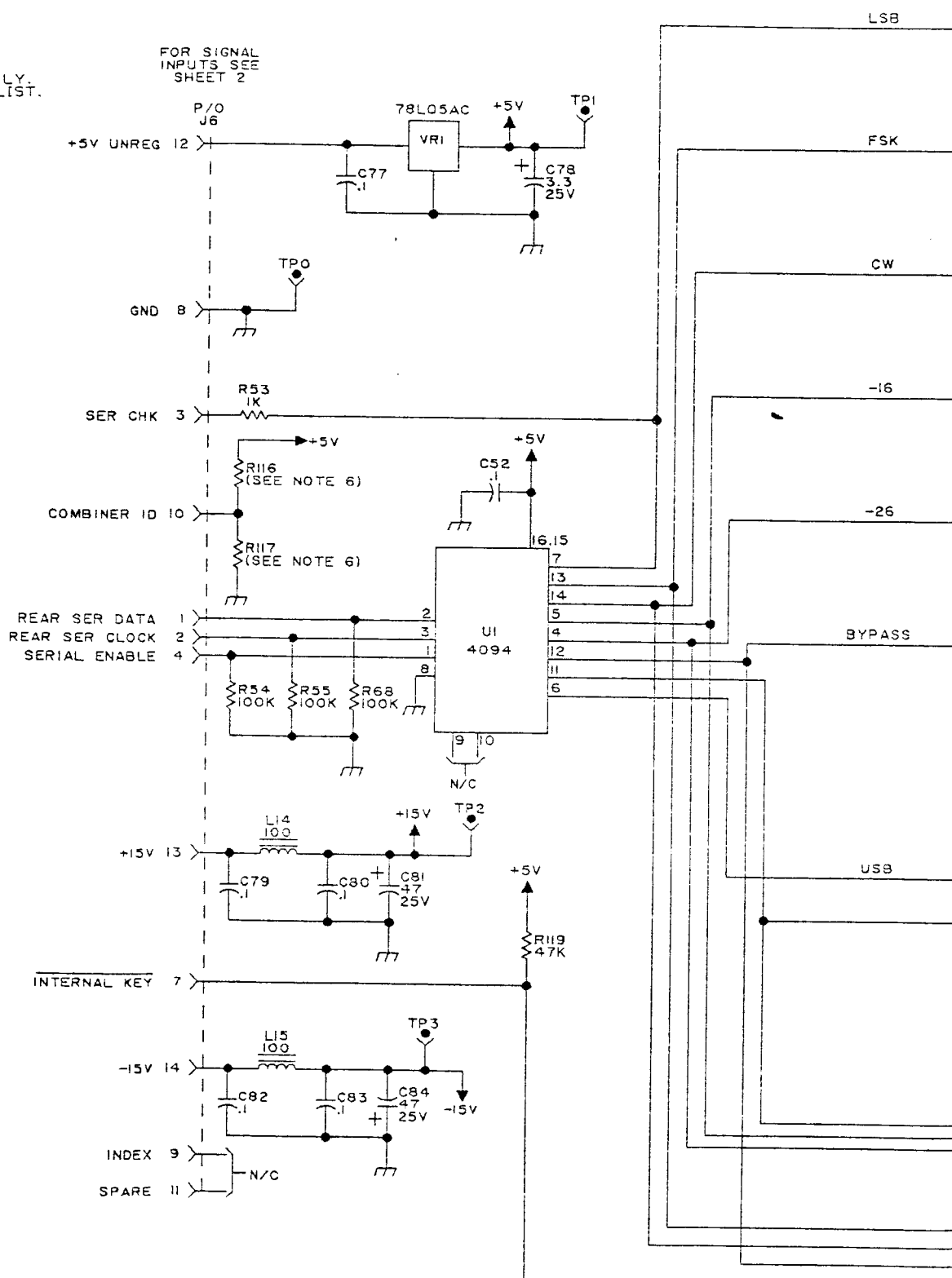
REAR SER DA
REAR SER CLO
SERIAL ENAB

INTERNAL K

IND
SPA

RANCE DESIGNATIONS ARE SHOWN.
 RE DESIGNATION, PREFIX WITH
 R ASSEMBLY NO. DESIGNATION.
 VALUES ARE IN OHMS, 1/4W, ±5%.
 R VALUES ARE IN MICROFARADS.
 NO. CALLOUTS ARE FOR REFERENCE ONLY.
 RE SUPPLIED PER PART NO. IN PARTS LIST.
 DIODES ARE IN4454.

VALUES ARE IN MICROHENRYS.



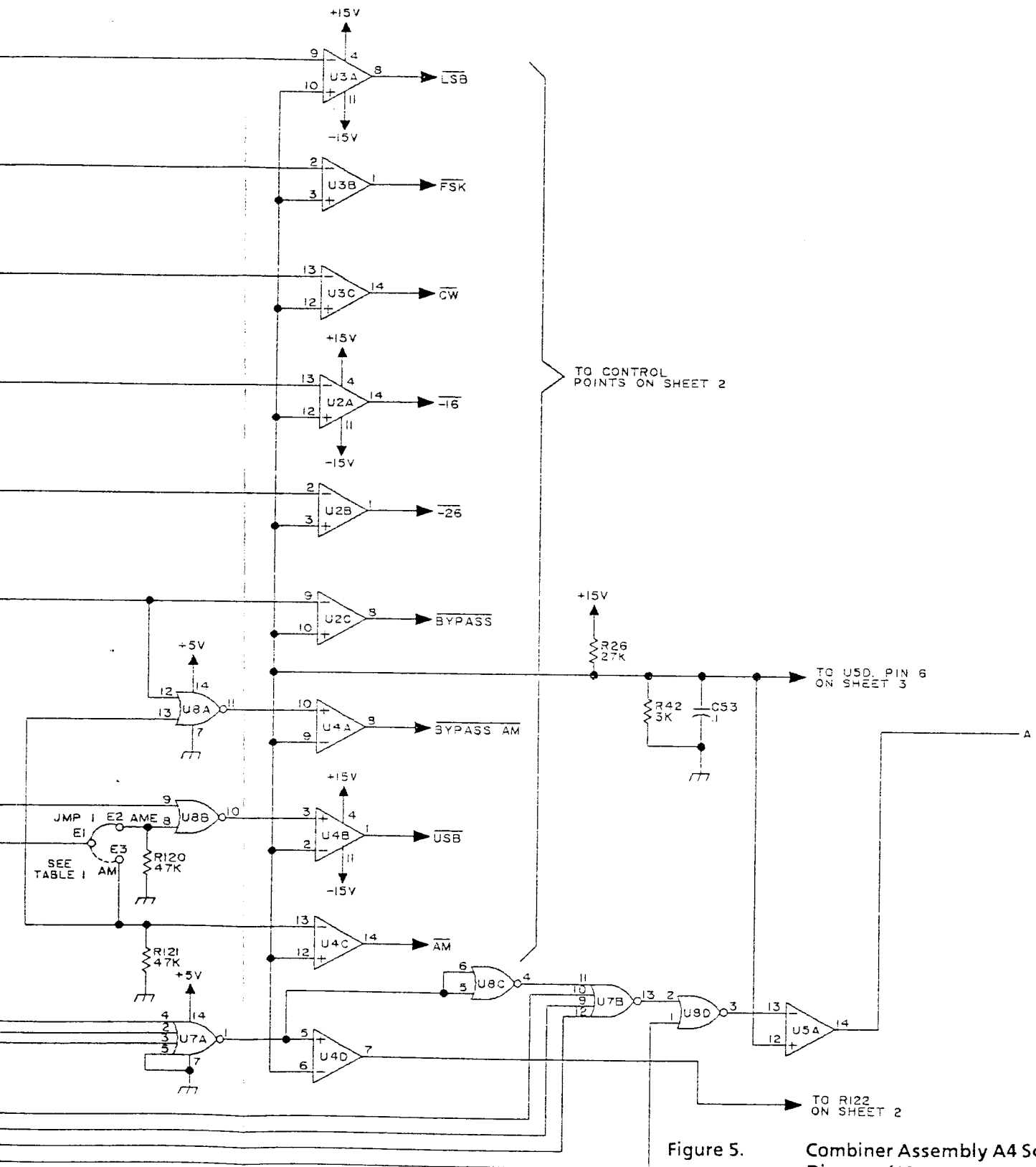
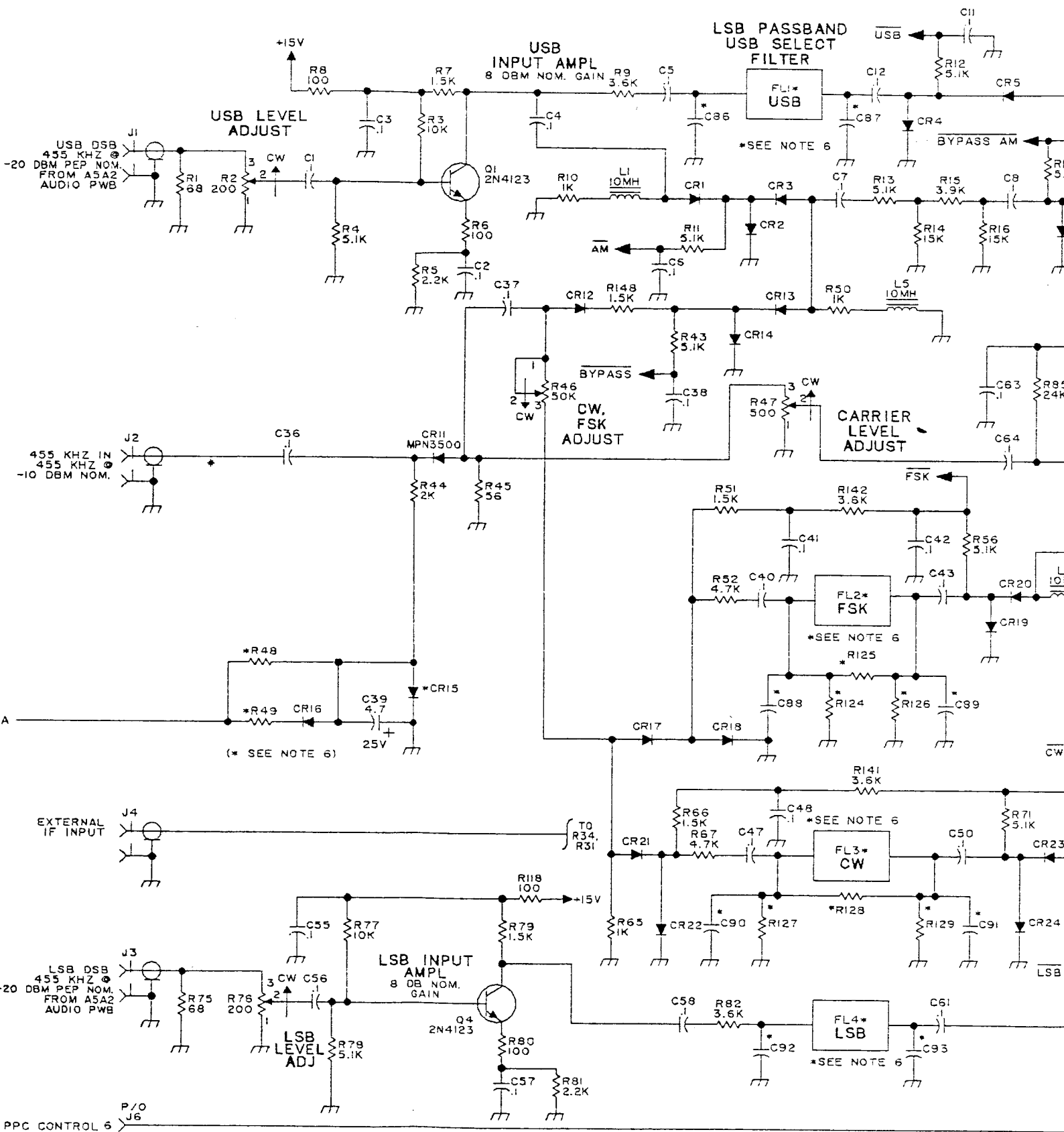


Figure 5. Combiner Assembly A4 Schematic Diagram (10121-5501 Rev. J) (Sheet 1 of 3)



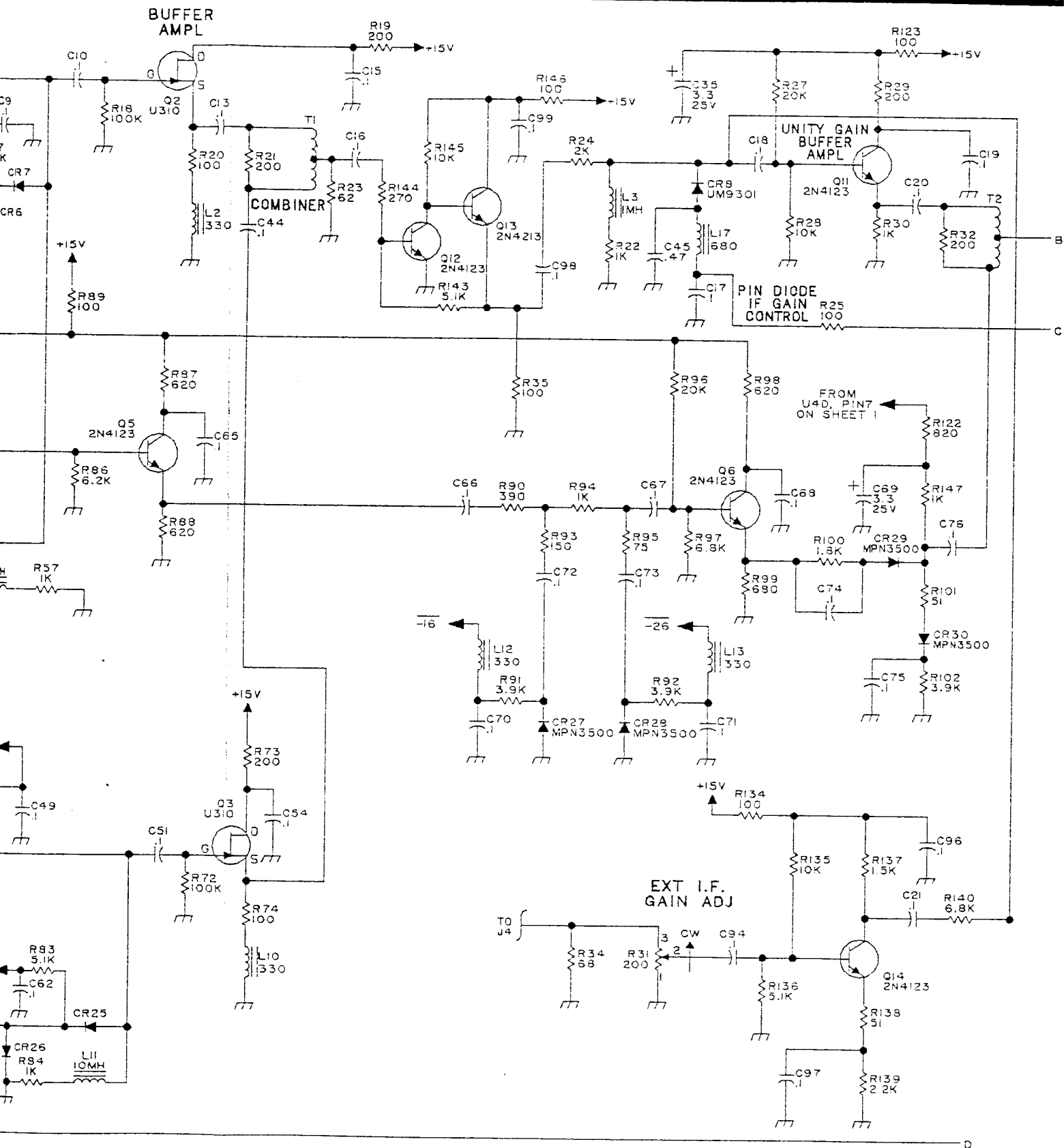
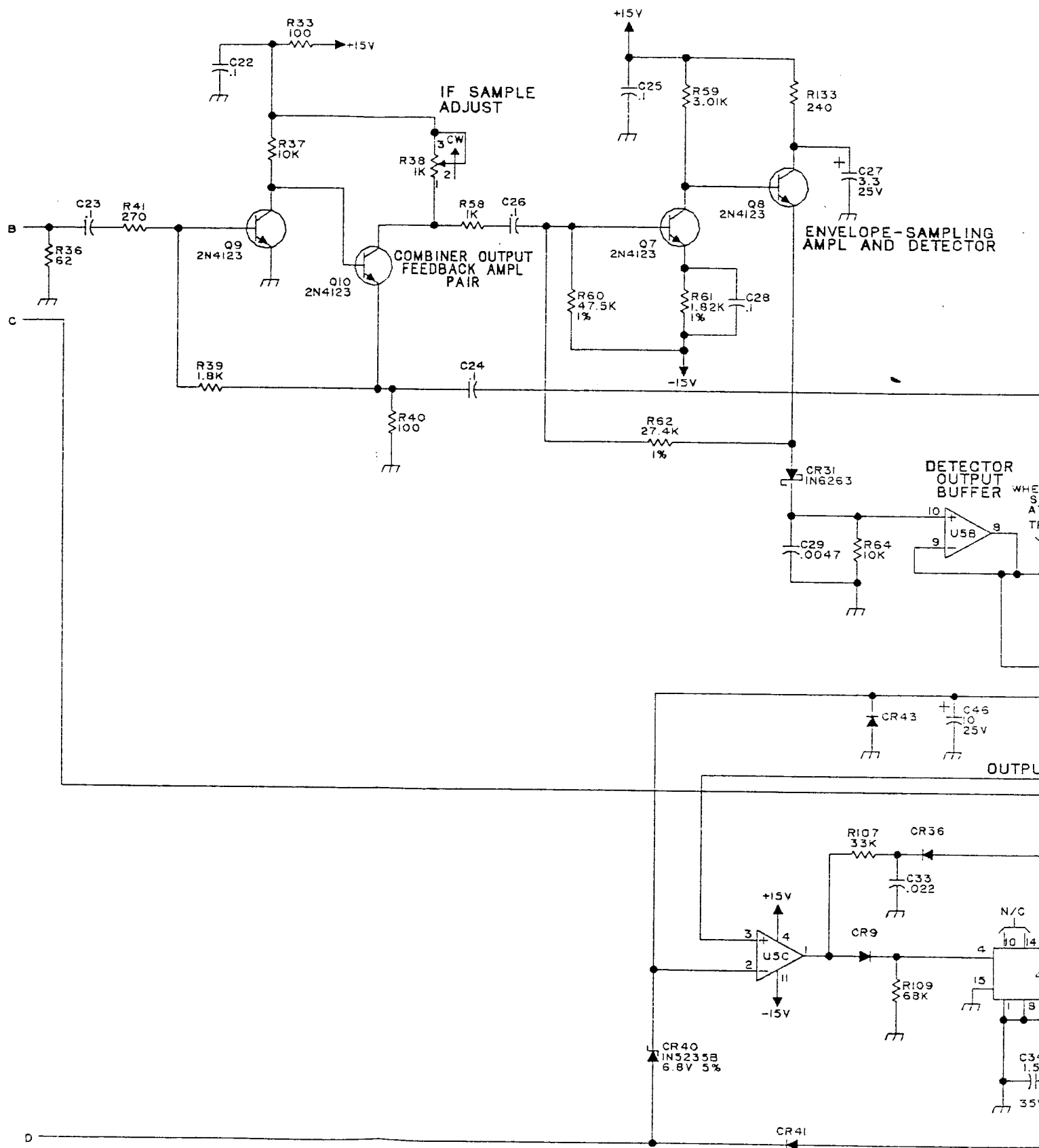


Figure 5. Combiner Assembly A4 Schematic Diagram (10121-5501 Rev. J) (Sheet 2 of 3)



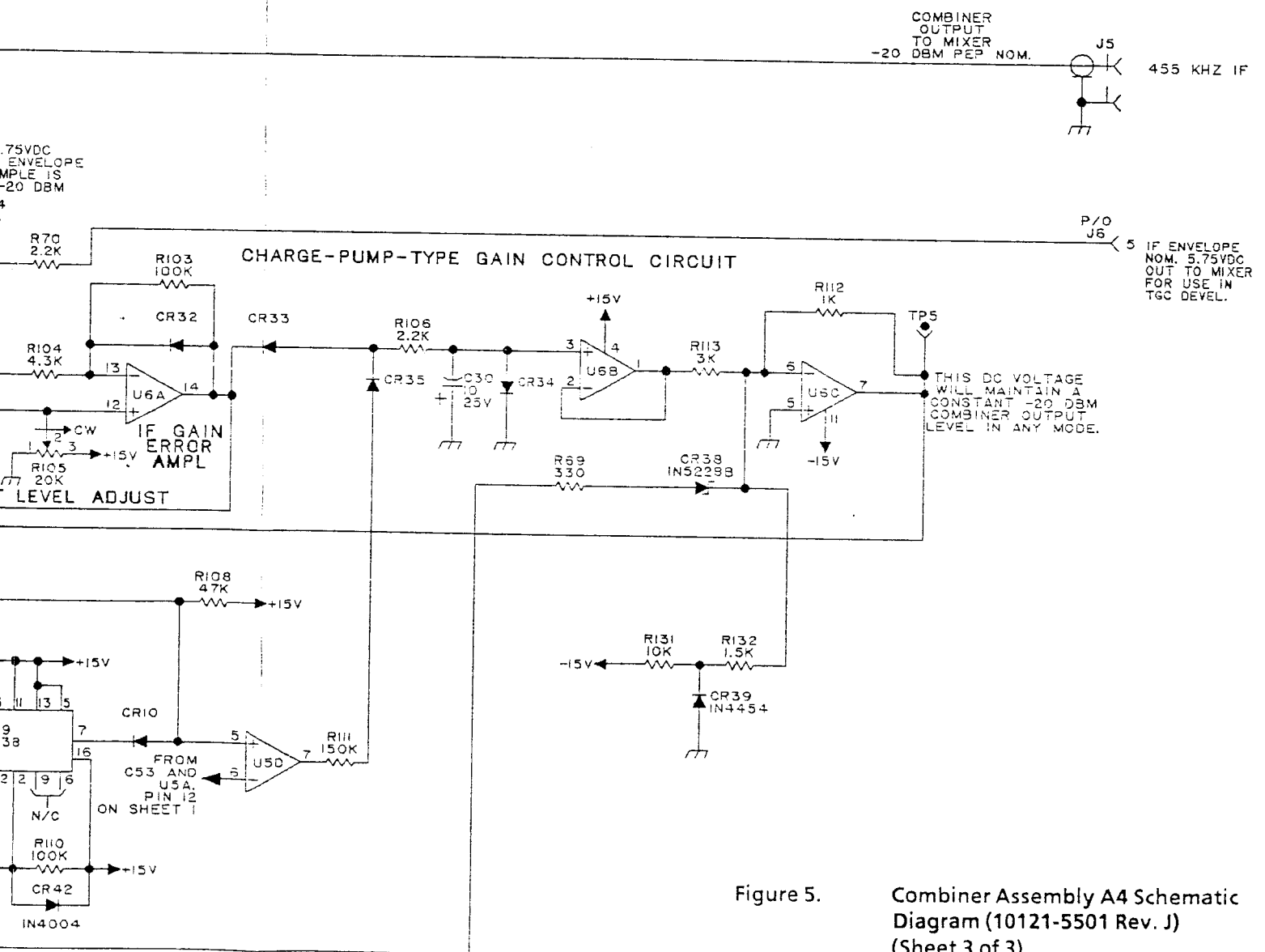


Figure 5. Combiner Assembly A4 Schematic Diagram (10121-5501 Rev. J) (Sheet 3 of 3)