SUPPLEMENT

TECHNICAL MANUAL

RADIO RECEIVER
R-1051B/URR
AND
R-1051C/URR

F34601-72-D-0655

THIS PUBLICATION REPLACES T.O. 31R2-2URR-221-1, VOLUMES I AND II, DATED 9 FEBRUARY 1968 AND SUPPLEMENTS T.O. 31R2-2URR-221 DATED 4 FEBRUARY 1964. A SUITABLE REFERENCE TO THIS SUPPLEMENT WILL BE MADE ON THE TITLE PAGE OF THE BASIC PUBLICATION.

PUBLISHED UNDER AUTHORITY OF THE SECRETARY OF THE AIR FORCE

15 MAY 1972

1. PURPOSE.

This supplement is issued to amend the basic publication.

2. INSTRUCTIONS.

a. Make the following changes:

Application: Modification from 500-cps to 100-cps tuning increments.

Circuits Affected: 500-cps Synthesizer A2A6A4 and Spectrum Generator A2A6A5.

Controls Affected: CPS Switch (S6).

AIR FORCE - 23-6-72 - 250

R-1051/URR	R-1051C/URR
A2A6A4 500cps Synthesizer	A2A6A4 100cps Synthesizer
A1 - 7.1 Mixer	A1 - Preset Divider-Divide-by-Ten
A2 - Divide-by-Ten	A2 - 100cps Oscillator A2A2 - Phase Detector
A3 - 500cps Oscillator and Phase Detector	A3 - 7.1mc Mixer
A2A6A5 Spectrum Generator	A2A6A5 Spectrum Generator
A4 - 5kc Spectrum Generator	A4 - 1kc Pulse Inverter
CPS Switch A2S6 Positions	CPS Switch A2S6 Positions
000, 500	000, 100, 200, 300, 400, 500, 600, 700, 800, 900

b. The legend "R-1051/URR" wherever it appears throughout the manual is to be replaced with the legend "R-1051C/URR".

c. The following changes are to be made in the manual:

PAGE V

1. Paragraphs 4-291 and 4-294. Delete 5KC Spectrum Generator and replace with 1KC Pulse Inverter.

2. Paragraphs 4-296 and 4-309. Delete 500CPS and replace with 100CPS.

PAGE VI

3. Paragraph 5-14. Delete 500CPS and replace with 100CPS.

PAGE VIII

4. Figure 4-42. Delete 5KC Spectrum Generator and replace with 1KC Pulse Inverter.

5. Figures 4-43 and 4-44. Delete 500CPS and replace with 100CPS.

6. Figure 4-45. Delete Phase Detector Vector Diagram and replace with the following:

   Phase Detector Simplified Schematic Diagram and Output Waveforms.

7. Figure 4-46. Delete Divide-by-Ten Multivibrator, Simplified Schematic Diagram and replace with the following:

   Decade Divider, Simplified Schematic Diagram.

8. Figure 4-47. Delete Divide-by-Ten Multivibrator, Timing Diagram and replace with the following:

Divide-by-Ten Multivibrator, Simplified Schematic Diagram.

PAGE IX

9. Figures 4-58, 5-9 and 5-20. Delete 500CPS and replace with 100CPS.

PAGE XII

10. Figures 5-89, 5-91, 5-92 and 5-93. Delete 500CPS and replace with 100CPS.

11. Figure 5-99. Delete 5KC Spectrum Generator and replace with 1KC Pulse Inverter.

PAGE 1-1

12. Table 1-1, Line 10. Replace 500CPS Synthesizer with 100CPS Synthesizer.

PAGE 1-2

13. Figure 1-2 is replaced with new Figure 1-2, see page 4 of this supplement.

14. Paragraph 1-13, Line 3. Delete 56,000 and replace with 280,000.

PAGE 1-4

15. Paragraph 1-15.a. Delete 2 to 29.995 mc in 0.5-kc increments and replace with 2 to 29.995 mc in 0.1-kc increments.

PAGE 3-1

16. Paragraph 3-3, Column 1, Line 11. Delete AN/WRC-1 (AN/WRC-1) and replace with Radio Set AN/GRC-157.

17. Paragraph 3-9, Column 2, Lines 2 and 3. Replace AN/WRC-1 with Radio Set AN/GRC-157.

PAGE 3-2

18. Figure 3-1 is replaced with new Figure 3-1, see page 6 of this supplement.

PAGE 3-5

19. Table 3-1, Reference Designation S6. Delete Switch Position 500 and Equipment Response information and replace with the following:

Switch Position 100 to 900 and Equipment Response-R-1051C/UUR is tuned 100 to 900cps above frequency indicated by MCS and KCS digit indicators.

PAGE 4-2

20. Paragraph 4-16. Delete sentences 5 and 6 and replace with the following:

The Front panel switch allows the operating frequency to be changed in 100-cps increments. This tuning provides 280,000 discrete frequencies in which the receiver is locked to a very accurate frequency standard.

PAGE 4-3, 4-4

21. Figure 4-1 is replaced with new figure 4-1, see page 7 of this supplement.

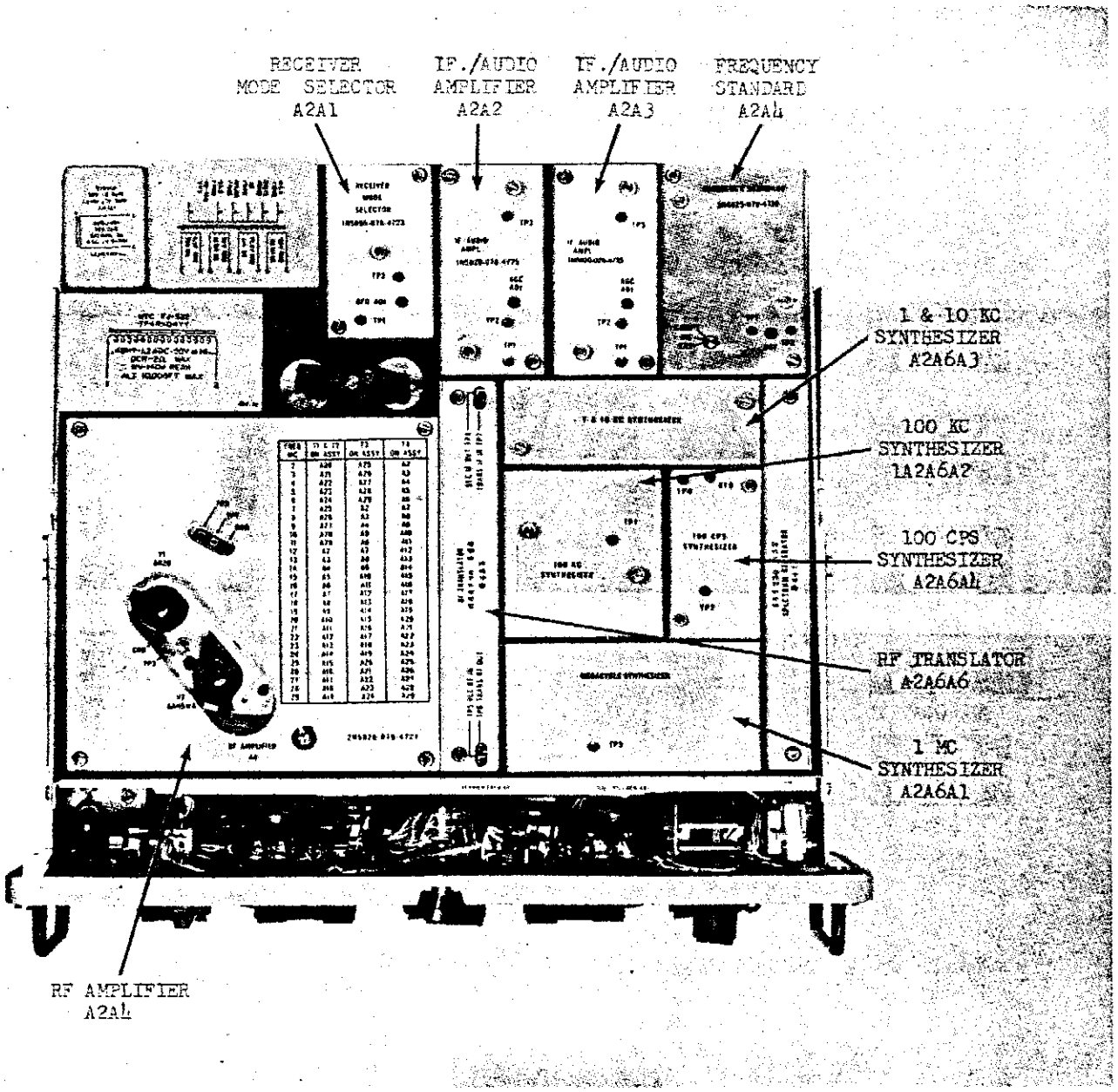


Figure 1-2. Radio Receiver R-1051C/URR, Top View, Case Removed

PAGE 4-7

22. Paragraph 4-35. Delete sentences 6, 7 and 8 and replace with the following:

The 1 KC Spectrum generator also produces 1 kc pulses which are applied to the 1kc pulse inverter. The 1kc pulse output from the inverter is in turn applied to the phase detector to derive the control voltage for phase locking the 100cps oscillator. For the purpose of the error cancellation discussion, assume that the front panel switch is in the 000 position: The output of the 100-cps phase locked oscillator then is at 110kc.

PAGE 4-8

23. Paragraph 4-36 is deleted and replaced as follows:

The R-1051C/URR can be tuned in 0.1 kc increments using the CPS switch, as well as any frequency in between using the VERNIER position of the CPS switch and the VERNIER control, both located on the front panel. The phase-locked oscillator in the 100 CPS Synthesizer uses a preset divider in the feedback loop along with a binary phase detector. This oscillator is locked from 110 to 119 kc in 1 kc increments with the divider preset to divide by a factor of 110 to 119, respectively. The output from the preset divider is therefore 1 kc, which is compared in the binary phase detector with the 1 kc pulses from the Spectrum Generator Electronic Assembly A2A6A5. The voltage from the phase detector is filtered and used as the control to maintain the oscillator in-lock for the desired preset division ratio. The output of the 100 cps oscillator is divided by ten and mixed with the 7.089 mc error frequency from the 1 and 10 kc Synthesizer Electronic Assembly A2A6A3 before being sent on to the 100 kc Synthesizer Electronic Subassembly A2A6A2. Since the 100 cps step displacements in the nominal 7.1 mc error frequency signal is injected, unlike the errors in the 1 and 10 kc oscillators, into only one path of the error cancellation loop previously described in paragraph 4-35, no cancellation of the 100 cps displacements takes place; thus permitting tuning of the receiver in 100-cps increments. In the VERNIER mode, the phase lock loop is disabled and the 100 CPS oscillator is "varicap" tuned by a variable dc bias voltage from the front panel VERNIER control.

PAGE 4-9

24. Figure 4-2. Delete data in columns 6 thru 11 and replace with new data from Figure 4-2, see page 10 of this supplement.

PAGE 4-78

25. Paragraph 4-287, Line 9. Delete 500cps and replace with 100cps.

26. Paragraph 4-288, Line 23. Delete 500cps and replace with 100cps.

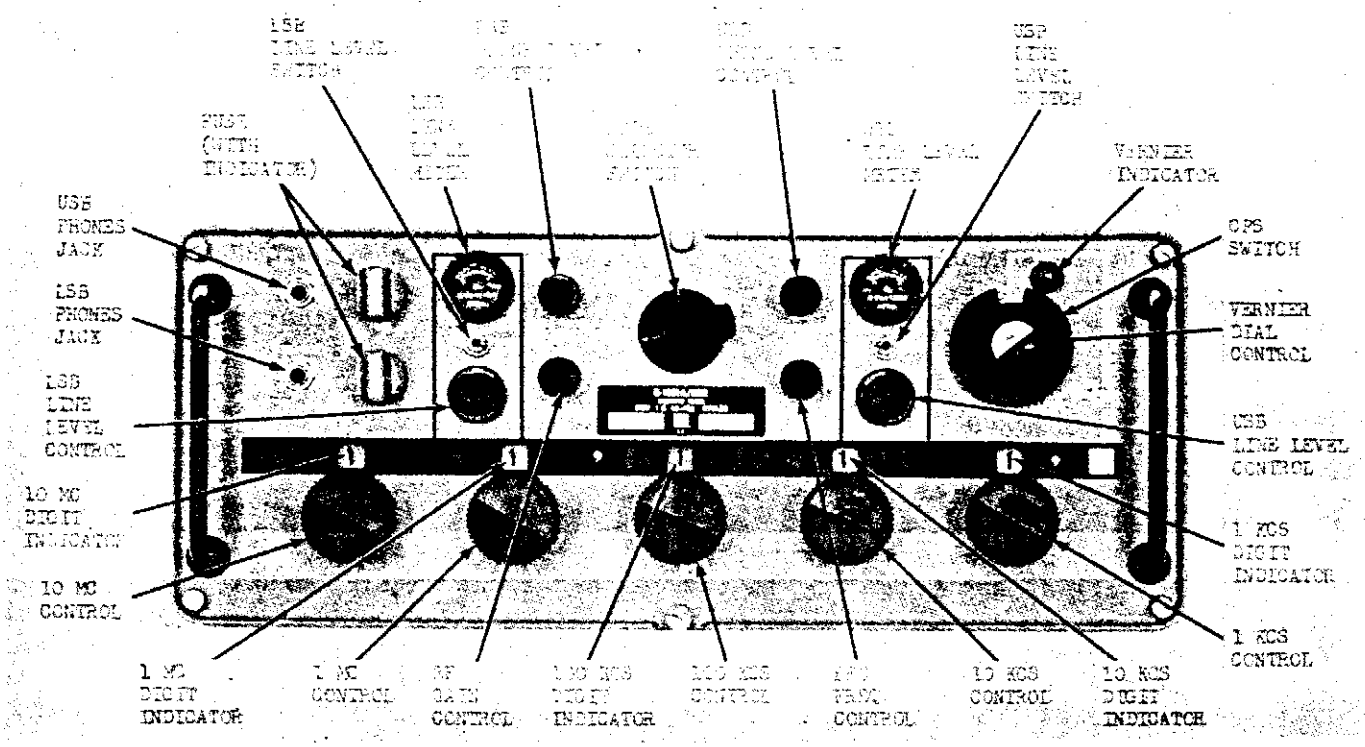


Figure 3-1. Radio Receiver R-1051C/URR, Operating Controls, Indicators, and Connectors

PAGE 4-79

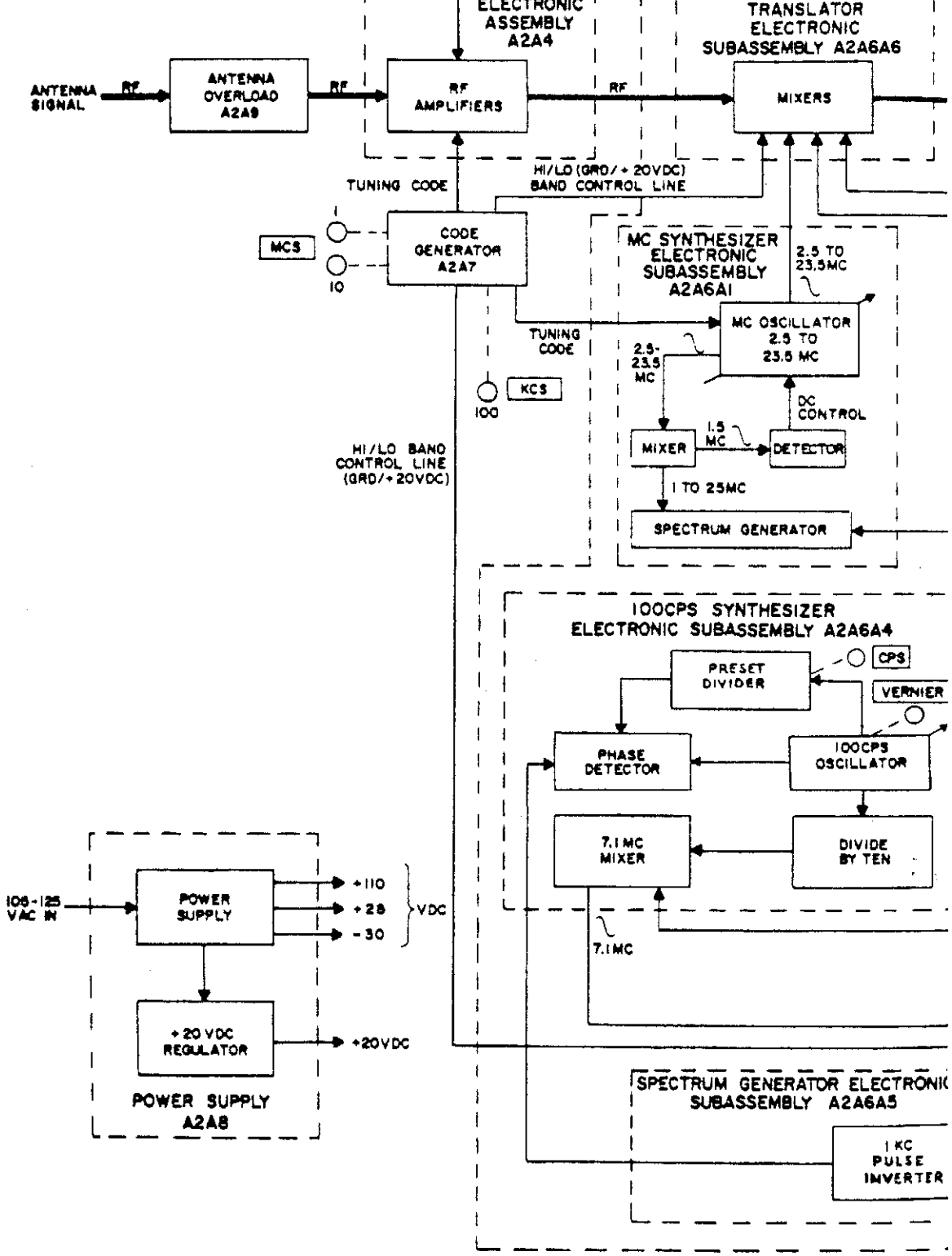
27. Paragraph 4-291. Delete 5KC SPECTRUM GENERATOR, FUNCTIONAL CIRCUIT DESCRIPTION and replace with 1KC PULSE INVERTER, FUNCTIONAL CIRCUIT DESCRIPTION.

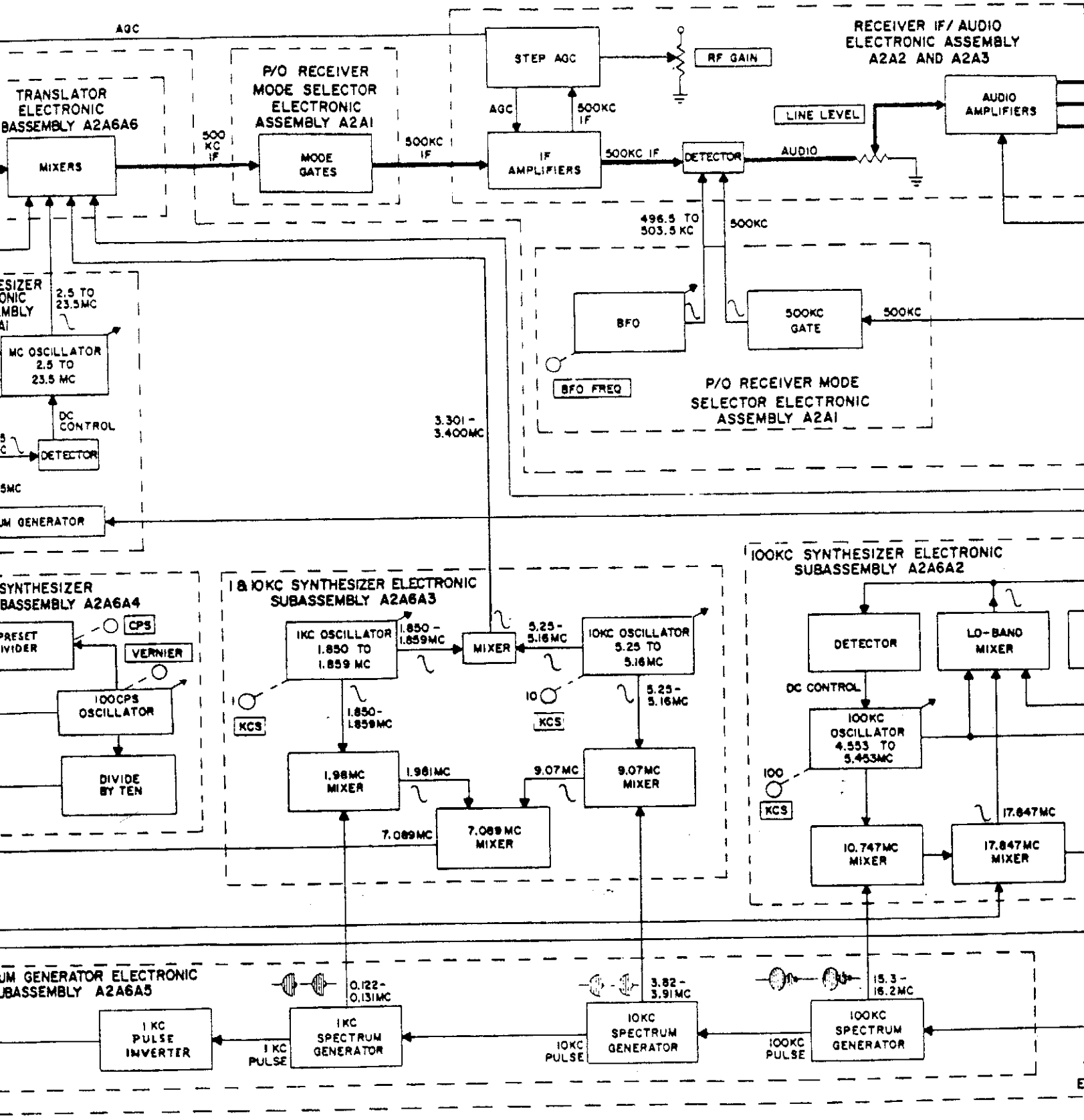
28. Paragraph 4-292 is deleted and replaced as follows:

The 1 kc pulse inverter (figure 4-42) consists of an overdriven amplifier (Q1). This amplifier is a part of Spectrum Generator Electronic Subassembly A2A6A5 and supplies accurate 1 kc reference pulses required by the phase detector A2A6A4A2A2 to phase lock the 100 cps oscillator. The 1 kc pulse inverter is used in all modes of operation. The following paragraphs describe the operation of the 1 kc pulse inverter in detail.

29. Paragraph 4-293 is deleted and replaced as follows:

The input to the 1 kc pulse inverter is the 1 kc pulse output of the divide-by-five multivibrator (Q3 and Q4) in the 1 kc spectrum generator A2A6A5A3. The 1 kc pulses are coupled to the base of the pulse amplifier Q1 through isolation resistor R4 in order to reduce the amplifier loading on the divide-by-five multivibrator. Resistor R4, in conjunction with resistor R5, also forms a voltage divider to supply base bias for amplifier Q1. Resistors R2 and R3 form a voltage divider to furnish a low collector voltage and a relatively stiff collector voltage source to


AGC
RF AMPLIFIER ELECTRONIC ASSEMBLY A2A4
TRANSLATOR ELECTRONIC SUBASSEMBLY A2A6A6
ANTENNA SIGNAL
RF
ANTENNA OVERLOAD A2A9
RF AMPLIFIERS
MIXERS
TUNING CODE
HI/LO (GRD/+20VDC) BAND CONTROL LINE
MCS
10
CODE GENERATOR A2A7
MC SYNTHESIZER ELECTRONIC SUBASSEMBLY A2A6A1
2.5 TO 23.5MC
MC OSCILLATOR 2.5 TO 23.5 MC
2.5-23.5 MC
DC CONTROL
100
KCS
MIXER
1.5 MC
DETECTOR
1 TO 25MC
SPECTRUM GENERATOR
HI/LO BAND CONTROL LINE (GRD/+20VDC)
100CPS SYNTHESIZER ELECTRONIC SUBASSEMBLY A2A6A4
PRESET DIVIDER
CPS
VERNIER
PHASE DETECTOR
100CPS OSCILLATOR
7.1 MC MIXER
DIVIDE BY TEN
7.1MC
105-125 VAC IN
POWER SUPPLY
+110
+28
-30
VDC
+20 VDC REGULATOR
+20VDC
POWER SUPPLY A2A8
SPECTRUM GENERATOR ELECTRONIC SUBASSEMBLY A2A6A5
1 KC PULSE INVERTER


AGC
TRANSLATOR ELECTRONIC BASSEMBLY A2A6A6
MIXERS
500 KC IF
P/O RECEIVER MODE SELECTOR ELECTRONIC ASSEMBLY A2AI
MODE GATES
500KC IF
STEP AGC
AGC
500KC IF
IF AMPLIFIERS
500KC IF
DETECTOR
AUDIO
RF GAIN
LINE LEVEL
RECEIVER IF/ AUDIO ELECTRONIC ASSEMBLY A2A2 AND A2A3
AUDIO AMPLIFIERS
496.5 TO 503.5 KC
500KC
BFO
500KC GATE
500KC
BFO FREQ
P/O RECEIVER MODE SELECTOR ELECTRONIC ASSEMBLY A2AI
2.5 TO 23.5MC
MC OSCILLATOR 2.5 TO 23.5 MC
DC CONTROL
DETECTOR
3.301 - 3.400MC
UM GENERATOR
SYNTHESIZER BASSEMBLY A2A6A4
PRESET IVIDER
CPS
VERNIER
100CPS OSCILLATOR
DIVIDE BY TEN
1 & 10KC SYNTHESIZER ELECTRONIC SUBASSEMBLY A2A6A3
IKC OSCILLATOR 1.850 TO 1.859 MC
1.850 - 1.859MC
MIXER
5.25 - 5.16MC
10KC OSCILLATOR 5.25 TO 5.16MC
1
KCS
1.850 - 1.859MC
10
KCS
5.25 - 5.16MC
1.98MC MIXER
1.981MC
9.07MC
9.07MC MIXER
7.089MC
7.089 MC MIXER
100KC SYNTHESIZER ELECTRONIC SUBASSEMBLY A2A6A2
DETECTOR
LO-BAND MIXER
DC CONTROL
100KC OSCILLATOR 4.553 TO 5.453MC
100
KCS
17.647MC
10.747MC MIXER
17.647MC MIXER
UM GENERATOR ELECTRONIC UBASSEMBLY A2A6A5
0.122 - 0.131MC
3.82 - 3.91MC
15.3 - 16.2MC
1 KC PULSE INVERTER
1 KC PULSE
1 KC SPECTRUM GENERATOR
10KC PULSE
10KC SPECTRUM GENERATOR
100KC PULSE
100KC SPECTRUM GENERATOR

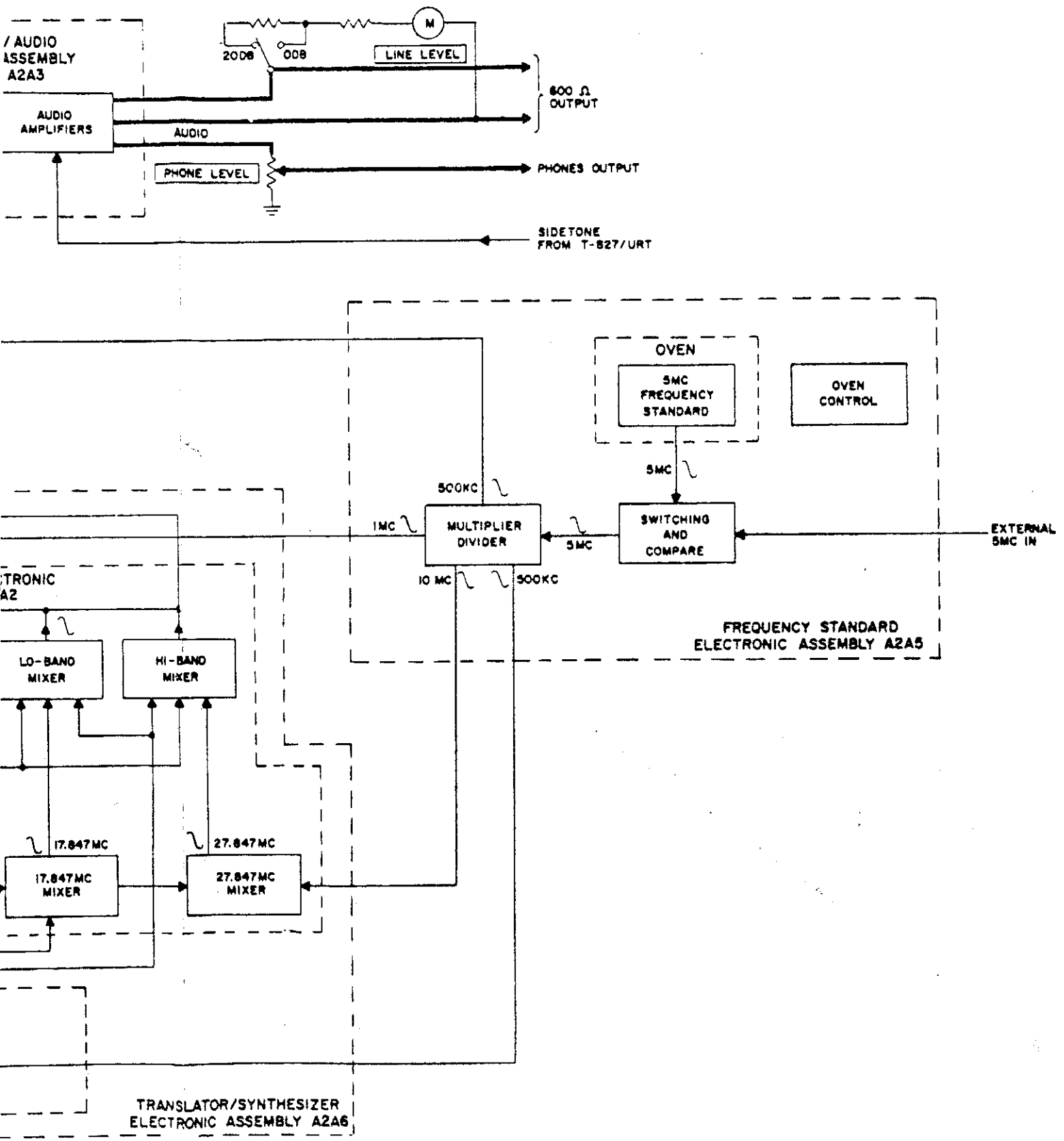


Figure 4-1. Radio Receiver R-1051C/URR, Functional Block Diagram

insure that amplifier Q1 is always driven into saturation by the input pulses, thus improving output amplitude uniformity and pulse waveform. Resistor R1 and capacitor C1 form the decoupling network for the collector voltage source. The output of the 1 kc pulse inverter is applied to the 100 CPS Synthesizer Electronic Subassembly A2A6A4.

30. Paragraph 4-294. Delete 5KC SPECTRUM GENERATOR and replace with 1 KC PULSE INVERTER.

31. Paragraph 4-295, Line 2. Delete 5 kc spectrum generator and replace with 1 kc pulse inverter.

32. Figure 4-42 is replaced with new Figure 4-42, see page 12 of this supplement.

PAGE 4-80

33. Paragraph 4-295.d. Delete 5 KC Spectrum Generator and replace with 1 KC Pulse Inverter.

34. Paragraph 4-295.f. is deleted.

35. Paragraph 4-296. Delete 500 CPS and replace with 100 CPS.

36. Paragraph 4-297 is deleted and replaced as follows:

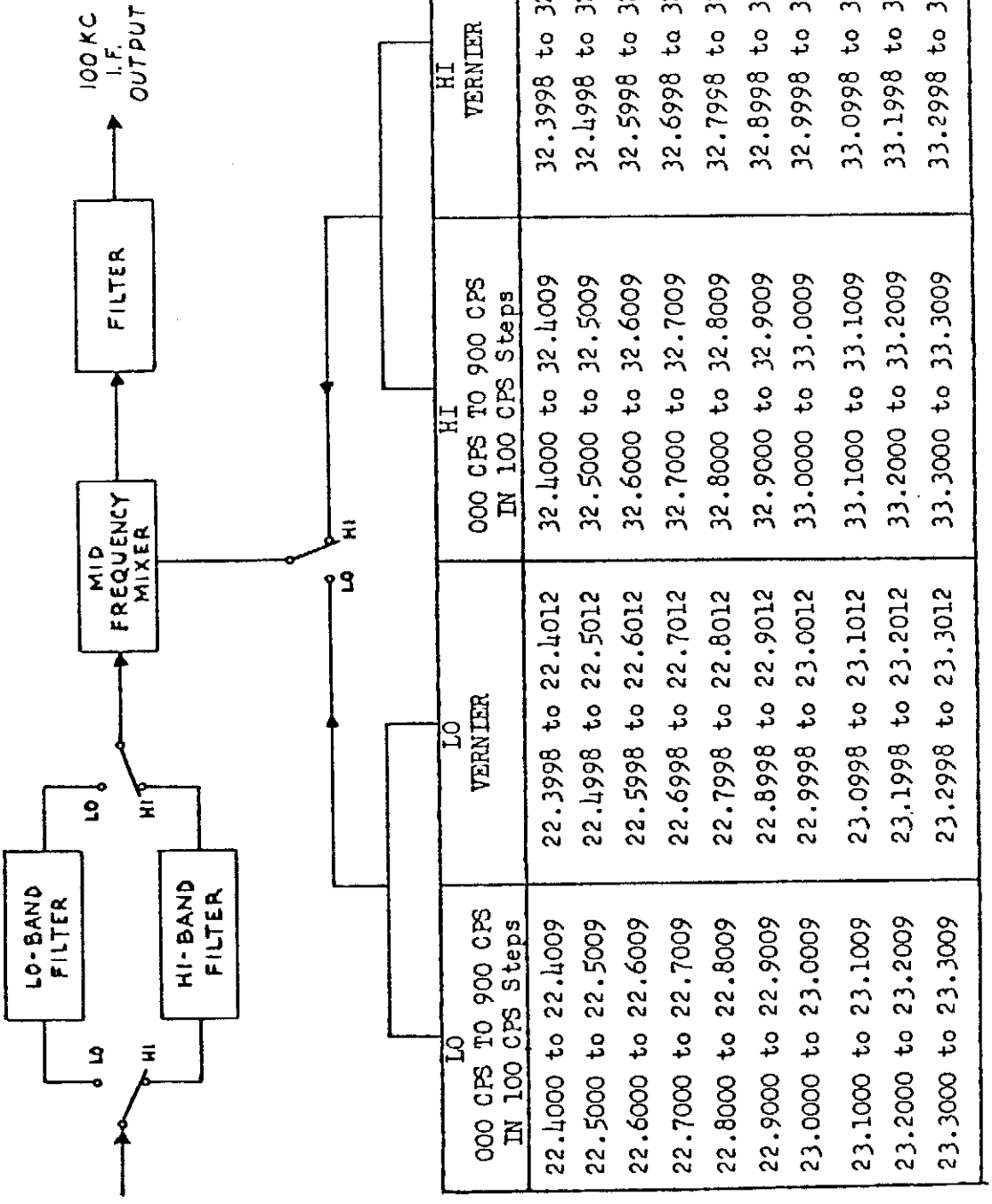
The oscillator (figure 4-43) utilized to generate the 100 cps increments and vernier frequency is a modified Colpitts (Clapp) Oscillator tuning from 110 to 119 kc in 1 kc steps, and the vernier tuning from approximately 108 to 122 kc is accomplished by a reactance control circuit using the voltage variable-capacitors A2CR7, A2CR8, A2CR9. When locked 100 cps steps are required, the phase detector A2A2Q1 and A2A2Q2 furnishes necessary control voltages. For vernier tuning, the phase detector and the preset counter A1A5 through A1A12 are disabled by removing the supply voltage. Voltage to the voltage variable-capacitors A2CR7, A2CR8, and A2CR9 is then obtained from the manually controlled potentiometer R7. The oscillator A2Q2 is coupled to a buffer amplifier A2Q3 whose output is stabilized by a set of limiting diodes A2CR5 and A2CR6. The buffer amplifier A2Q3 supplies an input to the pulse shaper A1Q5 and A1Q6.

37. Paragraph 4-298, Line 2. Delete 500 cps and replace with 100 cps. Line 8, delete Capacitors C2 and C3 filter and replace with Capacitors C1 filters.

38. Paragraph 4-299 is deleted and replaced as follows:

The tank circuit of the Clapp oscillator A2Q2 consists of capacitors A2C9, C10, C11, C13, C14, C15, C5 and the voltage variable-capacitors A2CR7, CR8, and CR9. Capacitor A2C14 is selected to adjust the intial frequency of oscillator A2Q2. The voltage variable-capacitors A2CR7, A2CR8 and A2CR9 provide the required pulling range for the phase-lock loop. Capacitor A2C15 has a negative temperature coefficient to compensate for temperature changes in the oscillator A2Q2. The parallel and series combination of these capacitors is identified by the single variable capacitor

Replace "LO, 000 CPS", "LO, 500 CPS", "LO VERNIER", "HI, 000 CPS", "HI, 500 CPS" and "HI, VERNIER", columns with the following:



LO 000 CPS TO 900 CPS IN 100 CPS Steps	LO VERNIER	HI 000 CPS TO 900 CPS IN 100 CPS Steps	HI VERNIER
22.4000 to 22.4009	22.3998 to 22.4012	32.4000 to 32.4009	32.3998 to 32.4012
22.5000 to 22.5009	22.4998 to 22.5012	32.5000 to 32.5009	32.4998 to 32.5012
22.6000 to 22.6009	22.5998 to 22.6012	32.6000 to 32.6009	32.5998 to 32.6012
22.7000 to 22.7009	22.6998 to 22.7012	32.7000 to 32.7009	32.6998 to 32.7012
22.8000 to 22.8009	22.7998 to 22.8012	32.8000 to 32.8009	32.7998 to 32.8012
22.9000 to 22.9009	22.8998 to 22.9012	32.9000 to 32.9009	32.8998 to 32.9012
23.0000 to 23.0009	22.9998 to 23.0012	33.0000 to 33.0009	32.9998 to 33.0012
23.1000 to 23.1009	23.0998 to 23.1012	33.1000 to 33.1009	33.0998 to 33.1012
23.2000 to 23.2009	23.1998 to 23.2012	33.2000 to 33.2009	33.1998 to 33.2012
23.3000 to 23.3009	23.2998 to 23.3012	33.3000 to 33.3009	33.2998 to 33.3012

Figure 4-2. Frequency Translation, Functional Block Diagram

C1, in the AC equivalent oscillator circuit of figure 4-44. This circuit, supplied as an aid to analyzing the oscillator tank circuit, shows that capacitor C1 and the primary of transformer T1 form a parallel resonant tank circuit for oscillator Q2.

39. Paragraph 4-300 is deleted and replaced as follows:

The regulated 15 vdc present at Zener diode A2CR1 is filtered by A2C1 and applied to the VERNIER control on the front panel. The regulated 4 vdc present at Zener diode A2CR2 is filtered by A2C2 and applied to the divider circuit, A1A1 through A1A4, and the pulse shaper A1Q5 and A1Q6.

PAGE 4-81, 4-82

40. Figure 4-43 is replaced with new Figure 4-43, see page 14 of this supplement.

PAGE 4-83

41. Figure 4-44 is replaced with new Figure 4-44, see page 15 of this supplement.

42. Paragraph 4-301 is deleted and replaced as follows:

When operating voltage is applied to oscillator Q2, the oscillator produces an output of approximately 110 to 119 kc, depending upon the CPS switch setting. These output frequencies only approximate the desired operating frequencies until the phase-lock loop is closed. Output from oscillator Q2 is limited by diodes CR5 and CR6. The negative-going limit of the signal is established by the anode bias minus the forward drop across diode CR6. The positive-going limit of the signal is established by the cathode bias plus the forward drop across diode CR5.

43. Paragraph 4-302 is deleted and replaced as follows:

The output of oscillator Q2 is applied directly to the base of amplifier Q3, which in turn develops the signal across resistor R20. Amplifier Q3 provides oscillator isolation, preventing the succeeding stages from loading the oscillator. The output of amplifier Q3 is coupled to the base of pulse shaper Q6 by capacitor C13. A small amount of degeneration is developed by the unbypassed emitter resistor R19 to increase the stability of amplifier Q3.

44. Paragraph 4-303 is deleted and replaced as follows:

The pulse shaper A1Q5 and A1Q6 is a Schmitt trigger circuit developing a negative output pulse having a sharp leading edge. The output drives the divide-by-ten circuit A1A1 through A1A4, and the present divider circuit A1A5 through A1A12. The pulse shaper consists of transistors A1Q5 and A1Q6.

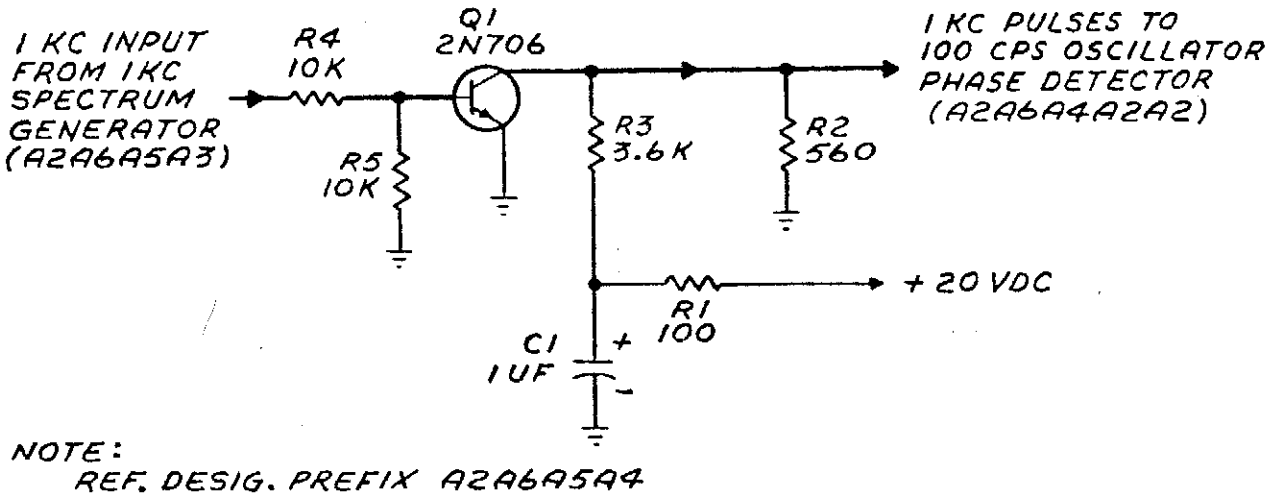


Figure 4-42. 1 KC Pulse Inverter, Simplified Schematic Diagram

45. Paragraph 4-304 is deleted and replaced as follows:

The 1 kc pulse output from the spectrum generator is coupled to phase detector A2A2Q1 and A2A2Q2 by capacitor A2C6. The output of the preset dividers A1A5 through A1A12 is coupled to the phase detector by capacitors A2A2C3 and A2A2C4. The phase detector output voltage is applied to amplifier A2Q1 by a network consisting of resistor A2R3 and capacitor A2C3. The output is filtered and controls the frequency of the oscillator A2Q2.

46. Paragraph 4-305 is deleted and replaced as follows:

The preset divider A2A6A4A1 is a digital circuit composed of flip-flop circuits A1A5 through A1A12 and coded from switch S6 on the front panel. When a preselected count is reached, the coincident gate triggers a circuit to reset the dividers. The preset dividers are reset to zero and a count is initiated by pulses derived from the oscillator A1Q2. The count continues until coincidence is reached at some digitally preselected count originated by the position of S6, then reset is inaugurated. The counter reset-to-zero time must be shorter than the incoming pulses. When the counter is reset, a trigger is also generated for the binary phase-detector A2A2Q1 and Q2. (This frequency is divided by ten for 100 cps increments.) If the oscillator frequency is precisely the frequency for which the preset divider is coded, the reset circuit output will be exactly 1 kc. If, however, there is a 0.5 per cent error in the oscillator frequency, the reset trigger output frequency to the phase detector will contain the same per cent error, or 5 cps. When this signal is compared by the phase detector against the 1 kc derived from the frequency standard, a phase-detector correction voltage is generated. This voltage, by means of A2CR7 through A2CR9, corrects the oscillator frequency so that the divider output is 1 kc, thus maintaining the oscillator in lock with the frequency standard. A1A5 thru A1A12 is a decade divider which may be coded to divide by any number between 110-119. Therefore, any oscillator A2Q2 frequency between 110-119 kc may be divided down to 1 kc for phase comparison in the phase detector A2A2Q1 and A2A2Q2 with the standard reference pulse. This produces increments from 110 to 119 kc. A series divider chain is used with one significant divider group providing a coded count that is representative of the corresponding frequency digit. This divider chain consists of a decade divider group A1A5 through A1A8 and a divide-by-eleven group A1A9 through A1A12, of four flip-flops each.

In order to accomplish division by ten using binary elements, feedback must be employed within the decade divider which consists of a binary divider followed by three binary dividers in a divide-by-five configuration. The feedback which is actually in the divide by five is accomplished by means of a diode steering gate (see figure 4-46A). The preset dividers A1A5 through A1A8 have been designed to divide by a maximum of ten, but may be programmed by switch S6 on the front panel to divide by any integer less than ten. The four flip-flops in the decade are arranged to generate a binary code. This is accomplished by diode coding gates which, when energized, contribute to the generation of a reset pulse. The table included in figure 4-46A indicates the combination of coding leads to be energized in order to achieve the desired divider counting. Figure 4-46B indicates the method of programming a decade of the preset divider. The absence of a coding voltage at any one of the four gates effectively removes the flip-flop corresponding to that gate

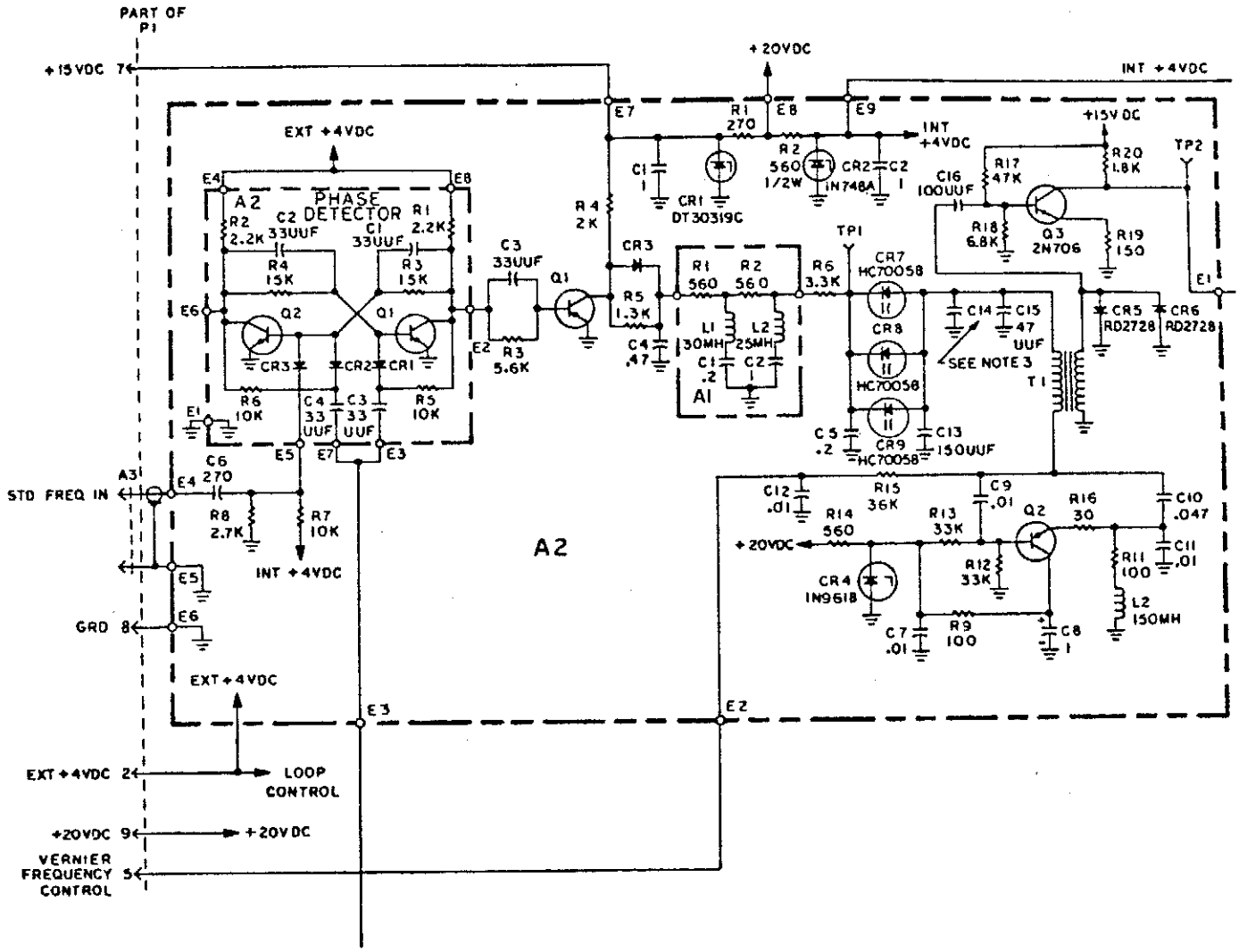


Figure 4-43. 100 CPS Oscillator, Simplified Schematic Diagram

from the coincidence circuit. By selectively energizing 0, 1, 2, and 3 lines-per-decade, the coding from 0 to 9 is accomplished.

The decade divider's output is fed to four cascade flip-flops, three of which have fixed coding gates, and one with no coding gate. This arrangement provides a divide-by-eleven function. The gates being energized at all times place the three flip-flops in the coincident circuit.

The gate outputs from the decade and the divide-by-eleven are summed to provide control voltage for the reset pulser. When the entire programmed count is reached, the disappearance of control voltage at the output gates initiates the reset pulse.

47. Paragraph 4-306 is deleted and replaced as follows:

The reset pulse is applied to the common input terminal of a Binary Phase Detector A2A2Q1 and A2A2Q2. The Binary Phase Detector is basically a flip-flop (figure 4-45A). Reset pulses are applied to the input while

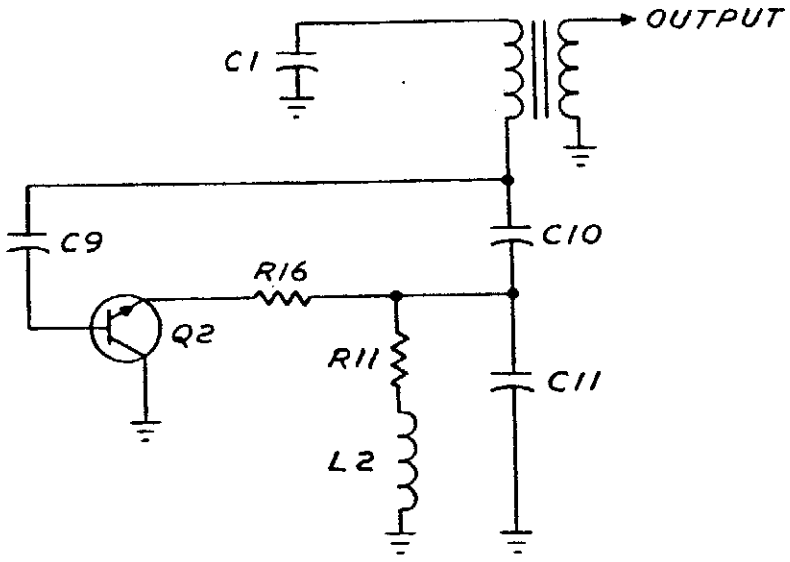


Figure 4-44. 100 CPS Oscillator, AC Equivalent Circuit, Schematic Diagram

the 1 kc Standard Frequency Reference pulse is applied to the base of A2A2Q2 by means of A2C6 and A2A2CR3. Therefore, the output will be a pulse with a duration equal to the time between the input reference and the preset divider output, if the input frequencies are both equal. If the output is a symmetrical waveform, the triggers are 180 degrees out of phase. When a low-pass filter is employed, the flip-flop output provides an average voltage which is a linear function of the phase difference. Thus, for the case where the phase detector output is a symmetrical waveform (180 degree phase relationship), the average voltage from the filter will be one-half of the peak-to-peak phase detector output. This circuit permits up to 360 degrees of control in phase between two signals, whereas the usually sinusoidal type of phase detector permits only 180 degrees of control. If the frequency of one signal is different from the other, the triggers will pass each other in time, and the average output from the circuit will be a sawtooth. These cases are shown in figure 4-45B for $f_1 = f_2$, f_2 f_1, and f_1 f_2. In the feedback loop, the filter network is designed to have a roll-off at 50 cps. Consequently, the capture range is equal to hold-in range. Traps at 1 kc and 2 kc (A2A1) are provided to suppress the ripple due to the phase detector circuit. The filtered dc output is then applied to the voltage variable capacitors A2CR7, A2CR8, and A2CR9 which execute reactance control of the oscillator A2Q2, tuning it to a frequency that is preset into the divider chain.

48. Paragraph 4-307 is deleted and replaced as follows:

Assume that the output of the oscillator is 110.2 kc. The desired oscillator frequency is 110 kc. The oscillator output of 110.2 is coupled to the pulse shaper circuit. This output is coupled to the preset dividers and divided down by a factor of 110 to a frequency of 1.02 kc. This output is applied to the phase detector by capacitors A2A2C3 and A2A2C4. A 1 kc pulse from the frequency dividers is also coupled to the phase detector by capacitor A2C6. The two inputs, 1 kc and 1.02 kc, are compared and an ac voltage is developed. This output is coupled to amplifier A2Q1 and filtered in the filter network A2A1. The voltage is then

applied to the voltage variable-capacitors A2CR7, A2CR8, and A2CR9, thus sweeping the oscillator frequency. Since the loop is closed, the frequency decreases with time due to the decrease of the oscillator output frequency as it is being swept. After this sweep frequency has been decreased to a frequency within the pull-in range of the oscillator, the oscillator pulls-in and locks at the desired 110 kc. At this time, the output of the phase detector is the dc reference level. If the phase of the oscillator begins to drift, the phase difference is detected by the phase detector circuit and the dc output is shifted accordingly to correct the oscillator drift. The network A2A1 server a filter for the output of the phase detector circuit.

PAGE 4-84 and 4-85

49. Paragraph 4-308 is deleted and replaced as follows:

The reset pulser consists of a pair of overdriven amplifiers A1Q1 and A1Q2 which shape the pulse suitable to trigger the 2 microsecond delay multivibrator (DMV) A1Q3 and A1Q4. The DMV generates a 2 microsecond negative pulse which is applied to the reset diodes of all the multivibrators in the preset counters A1A5 through A1A12. The count is now complete and a new identical sequence follows.

50. Figure 4-45 is replaced with new Figure 4-45, see page 17 of this supplement.

PAGE 4-86

51. Paragraph 4-309. Delete 500 KC and insert 100 CPS.

52. Paragraph 4-310, Line 2. Delete 500 cps and insert 100 cps.

53. Paragraph 4-310.b., Line 1. Delete 500 cps and insert 100 cps.

54. Paragraph 4-310.c., Line 1. Delete 500 cps and insert 100 cps.

55. Paragraph 4-310.d., Line 1. Delete 500 cps and insert 100 cps.

56. Paragraph 4-310.e., Line 1. Delete 500 cps and insert 100 cps.

57. Paragraph 4-310.g. is deleted.

58. Paragraph 4-312 is deleted and replaced as follows:

The divide-by-ten multivibrator circuit (figure 4-47) consists of a pulse shaper (Q5 and Q6), and a divide-by-five circuit (A1A1, A1A3, and A1A4). These circuits, which form a part of 100 CPS Synthesizer Electronic Subassembly A2A6A4, divide the 100 to 119 kc output from the 100 cps oscillator A2A6A4A2 by ten to provide the 11 to 11.9 kc signal required for mixing in the 7.1 mc mixer A2A6A4A3. These circuits are used in all modes of operation. The following paragraphs describe the operation of the divide-by-ten multivibrators in detail.

59. Paragraphs 4-313 is deleted and replaced as follows:

The operating voltage for the divide-by-ten multivibrators is the positive 4 vdc output from Zener diode CR2. Zener diode CR2 provides a regulated 4 vdc power source by drawing enough current, in addition to the

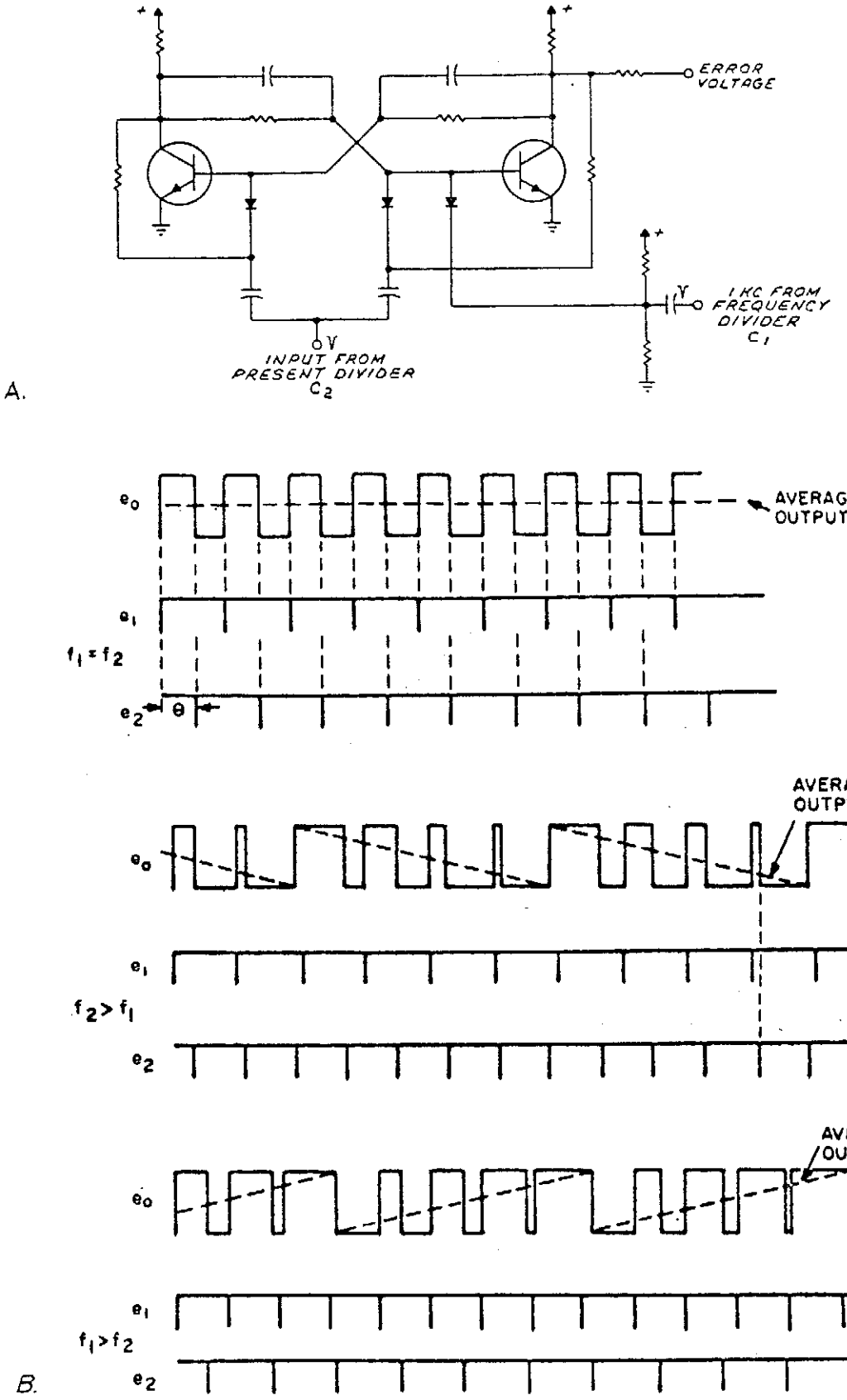


Figure 4-45. (A) Phase Detector, Simplified Schematic; (B) Phase Detector Waveforms

load current, through resistor R2 to drop the positive 10 vdc output from the main frame power supply A2A8 to 4 vdc.

60. Paragraph 4-314. Delete first three sentences and replace as follows:

The sinusoidal output from the 100 cps oscillator is the input signal for the divide-by-ten multivibrators. This signal is coupled to the base of pulse shaper A1Q5 and A1Q6 by capacitor C13. Resistors R27 through R31 comprise a resistive network for developing the required operating voltages for pulse shaper A1Q5 and A1Q6.

61. Paragraph 4-315 is deleted.

62. Paragraph 4-316 is deleted.

PAGE 4-87

63. Figure 4-46 is replaced by new Figures 4-46A and 4-46B, see page 19 of this supplement.

PAGE 4-88

64. Figure 4-47 is replaced by new Figure 4-47, see page 20 of this supplement.

PAGE 4-89

65. Table 4-1 is deleted.

66. Paragraph 4-319.b., Line 1. Delete 500 CPS and insert 100 CPS.

67. Paragraph 4-319.c., Line 1. Delete 500 CPS and insert 100 CPS.

68. Paragraph 4-321, Line 5. Delete 500 CPS and insert 100 CPS. Line 8, delete A2A6A2 and insert A2A6A4A1.

PAGE 4-90

69. Figure 4-48 is replaced by new Figure 4-48, see page 21 of this supplement.

PAGE 4-91

70. Paragraph 4-328.b., Line 1. Delete 500 CPS and insert 100 CPS.

71. Paragraph 4-328.c., Line 1. Delete 500 CPS and insert 100 CPS.

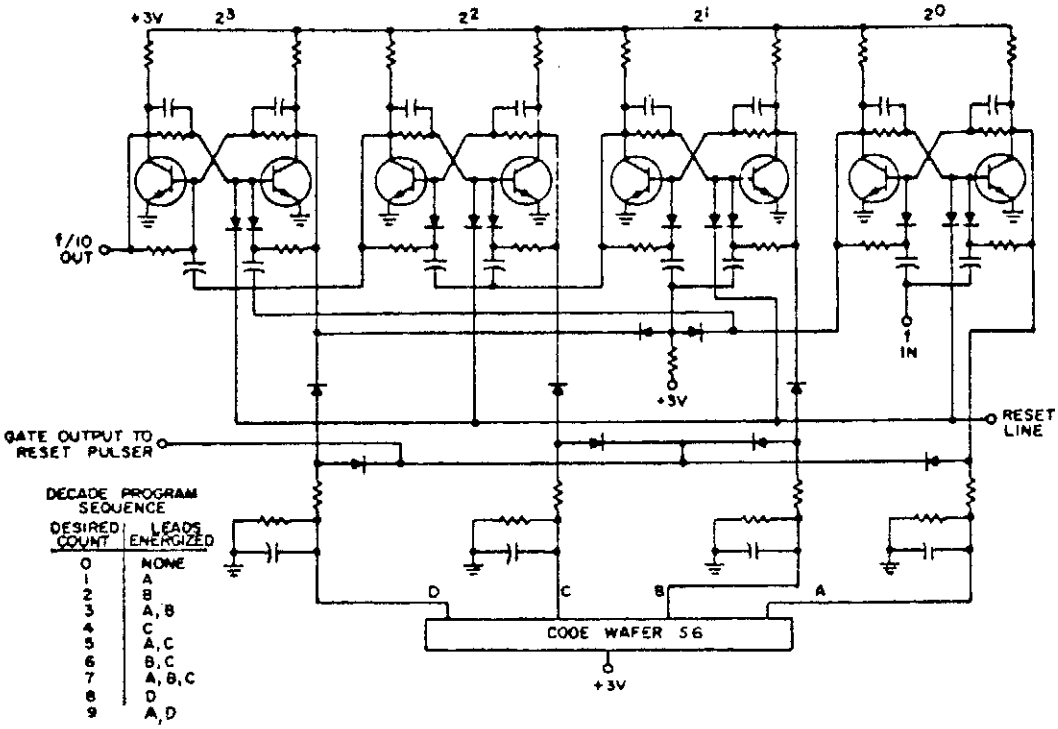
PAGE 4-103, 4-104

72. Figure 4-51 is replaced by new Figure 4-51, see page 23 of this supplement.

PAGE 4-115, 4-116

73. Figure 4-57 is replaced with new Figure 4-57, see page 25 of this supplement.

A.



B.

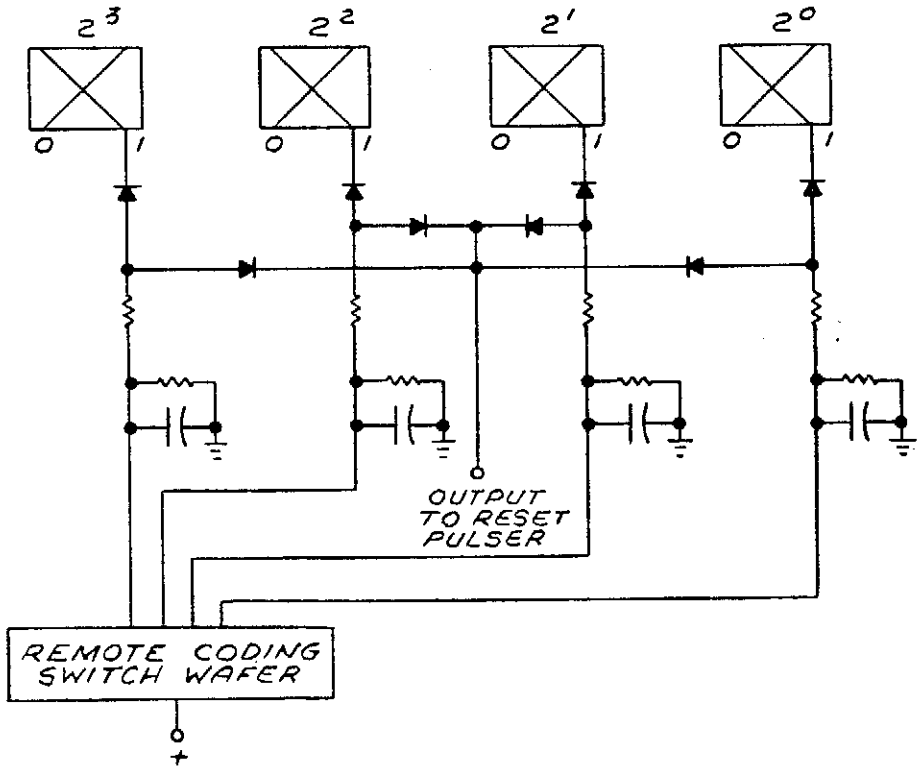


Figure 4-46. (A) Decade Divider, Simplified Schematic; (B) Decade Switch Coding Scheme

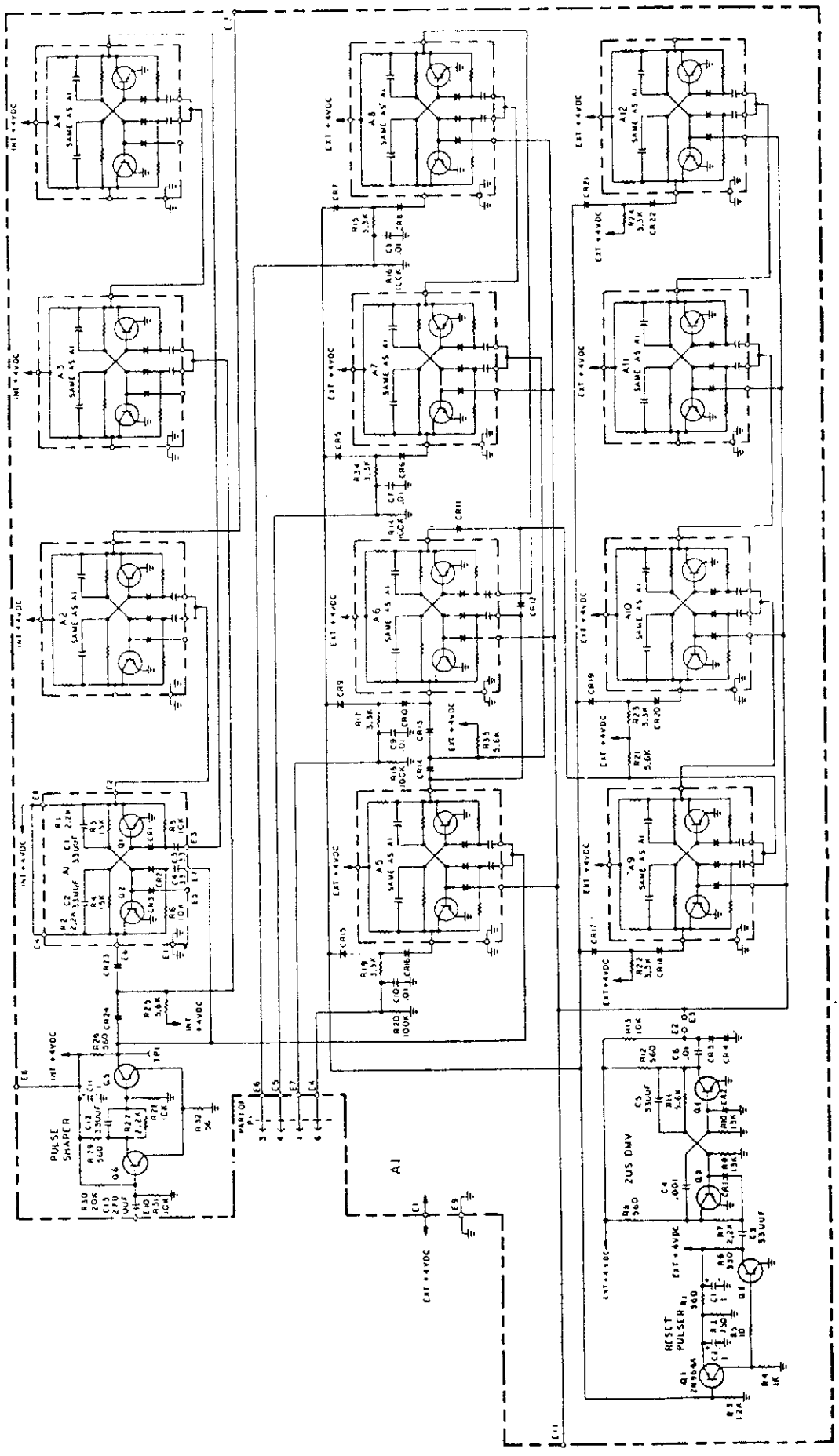


Figure 4-47. Divide-by-Ten Multivibrator, Simplified Schematic Diagram

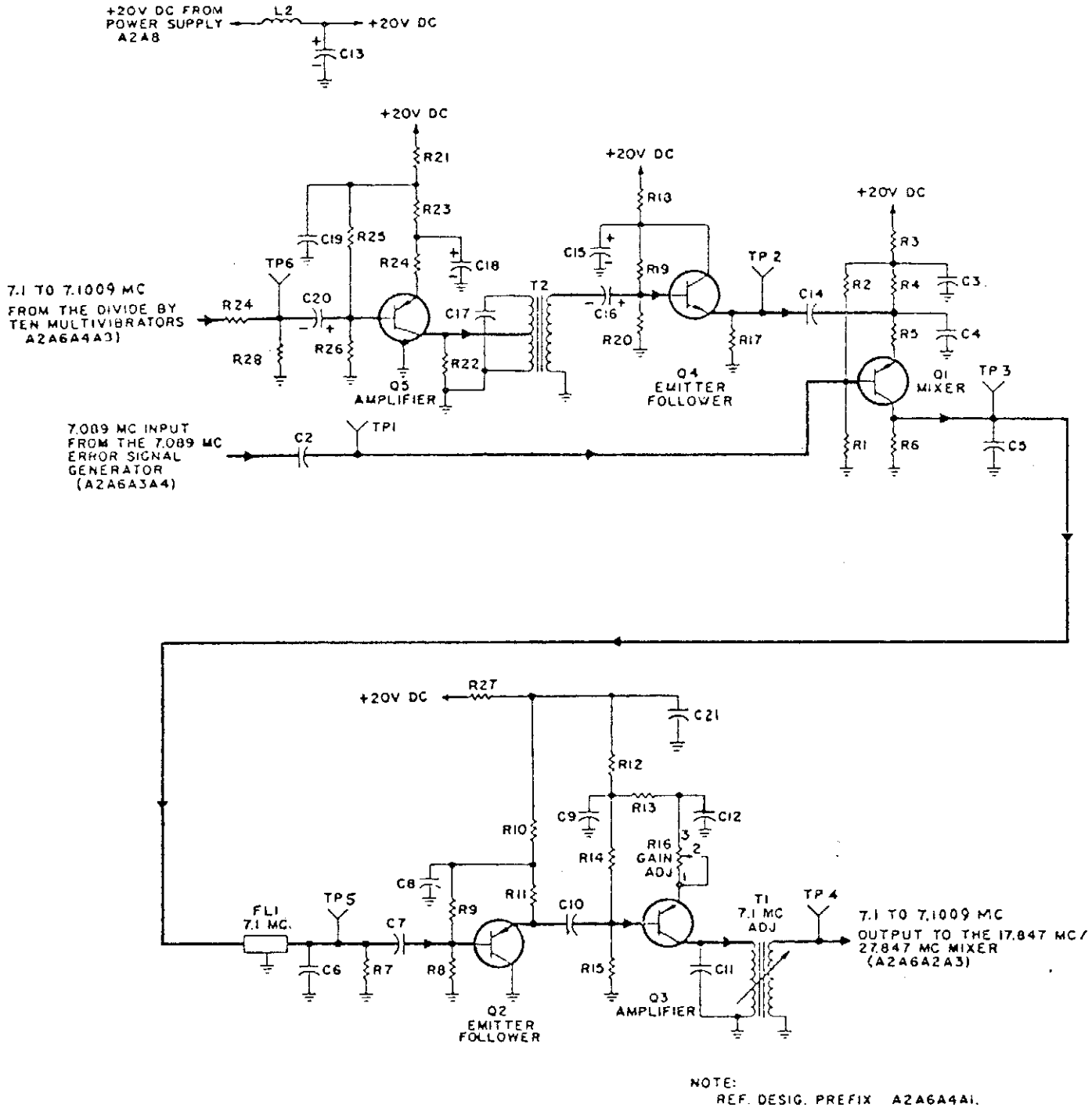


Figure 4-48. 7.1 MC Mixer, Simplified Schematic Diagram

PAGE 4-117, 4-118

74. Figure 4-58 is replaced with new Figure 4-58, see page 27 of this supplement.

PAGE 4-119, 4-120

75. Figure 4-59, Lower Right at J7. Delete 500 CPS Synthesizer and insert 100 CPS Synthesizer.

PAGE 4-121, 4-122

76. Figure 4-60, Left Center at A1. Delete 500 CPS Synthesizer and insert 100 CPS Synthesizer.

PAGE 5-13, 5-14

77. Figure 5-1 (Sheet 2 of 2). Incorporate Figure 5-1 (Sheet 2 of 2), see page 29 of this supplement.

PAGE 5-25, 5-26

78. Figure 5-7, Left Center at A1. Delete 500 CPS Synthesizer and insert 100 CPS Synthesizer.

PAGE 5-27, 5-28

79. Figure 5-8, Lower Right at J7. Delete 500 CPS Synthesizer and insert 100 CPS Synthesizer.

PAGE 5-29, 5-30

80. Figure 5-9 is replaced by new Figure 5-9, see page 31 of this supplement.

PAGE 5-31, 5-32

81. Figure 5-10 is replaced by new Figure 5-10, see page 33 of this supplement.

PAGE 5-39

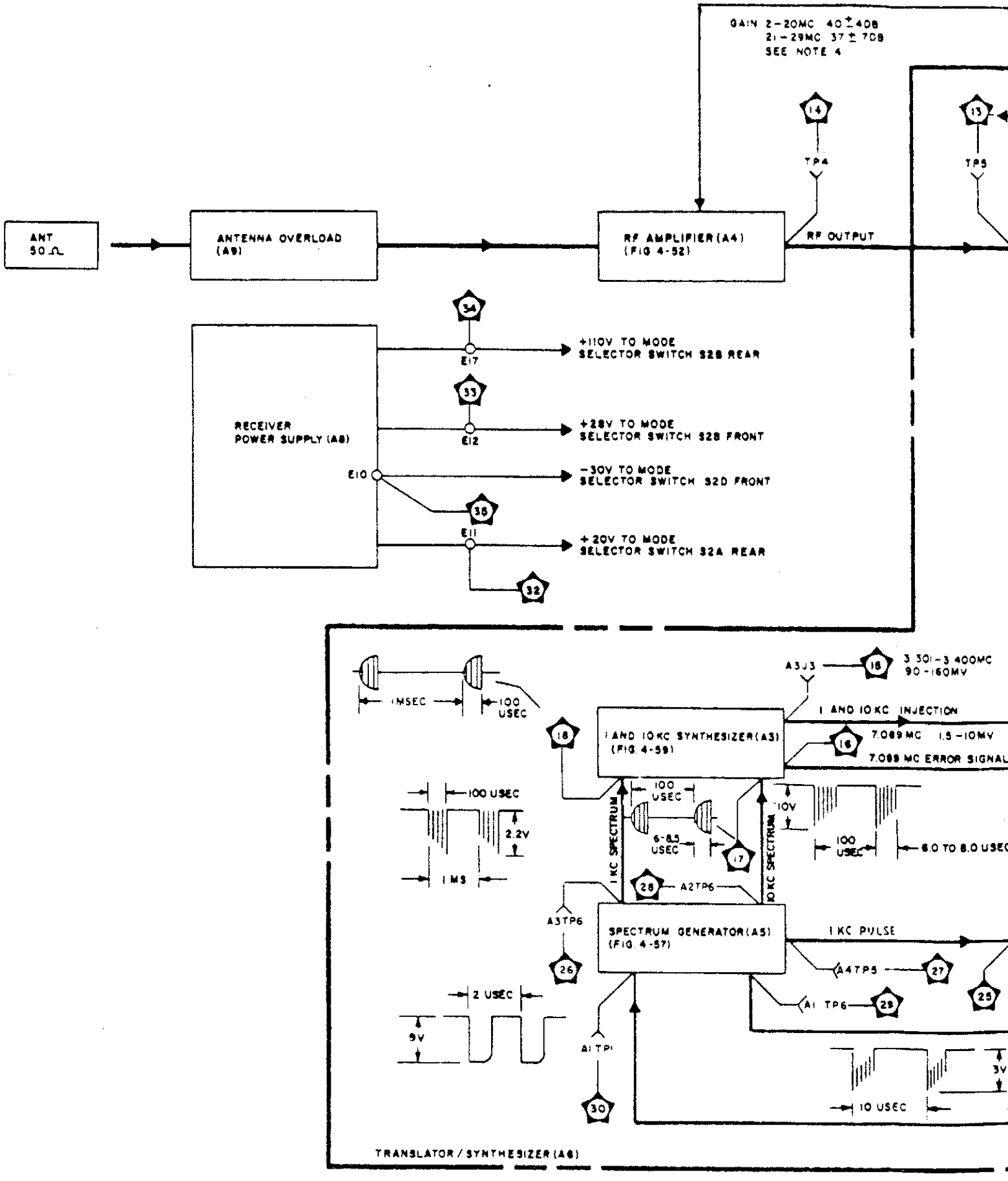
82. Figure 5-14 is replaced by new Figure 5-14, see page 35 of this supplement.

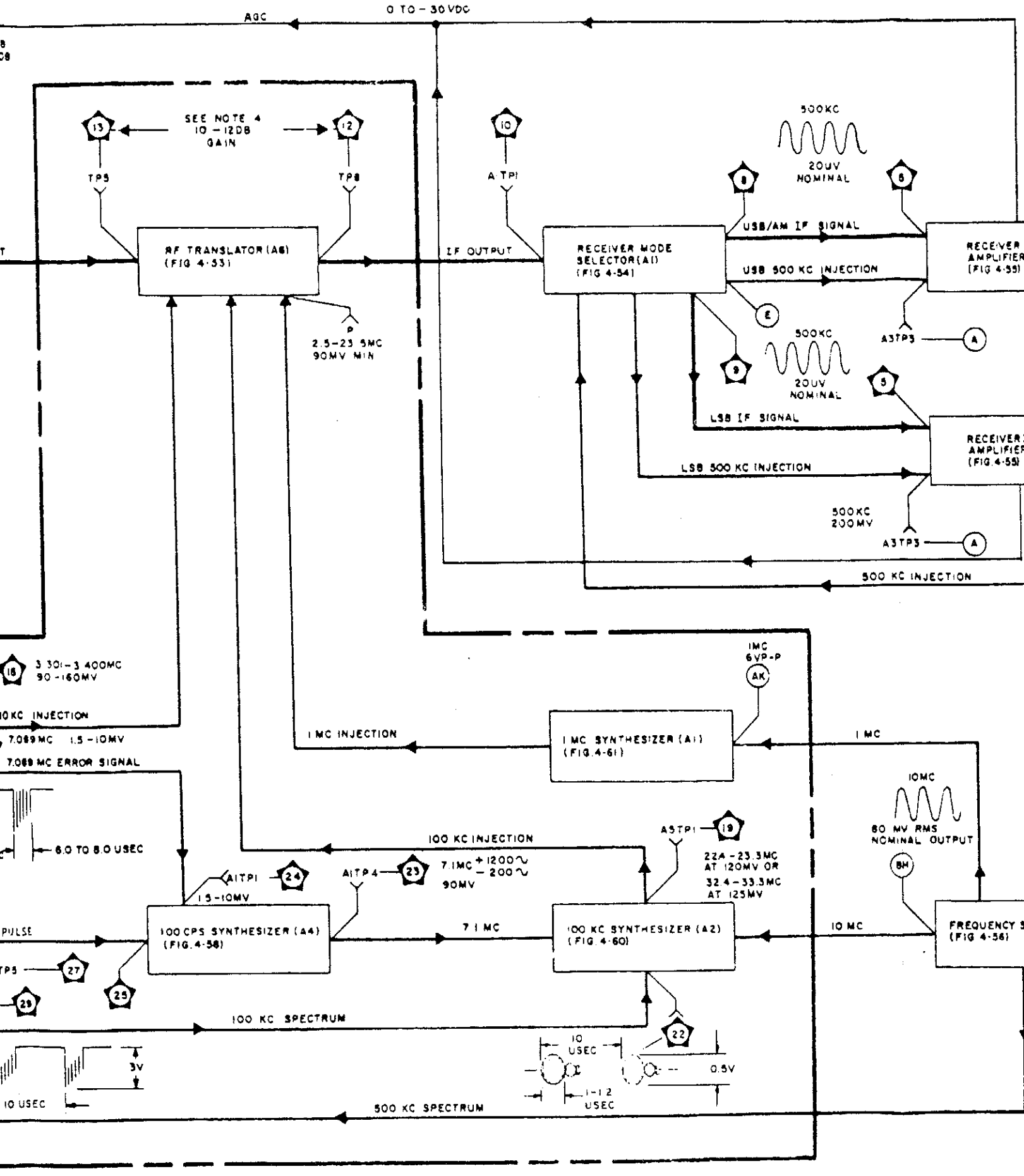
PAGE 5-47

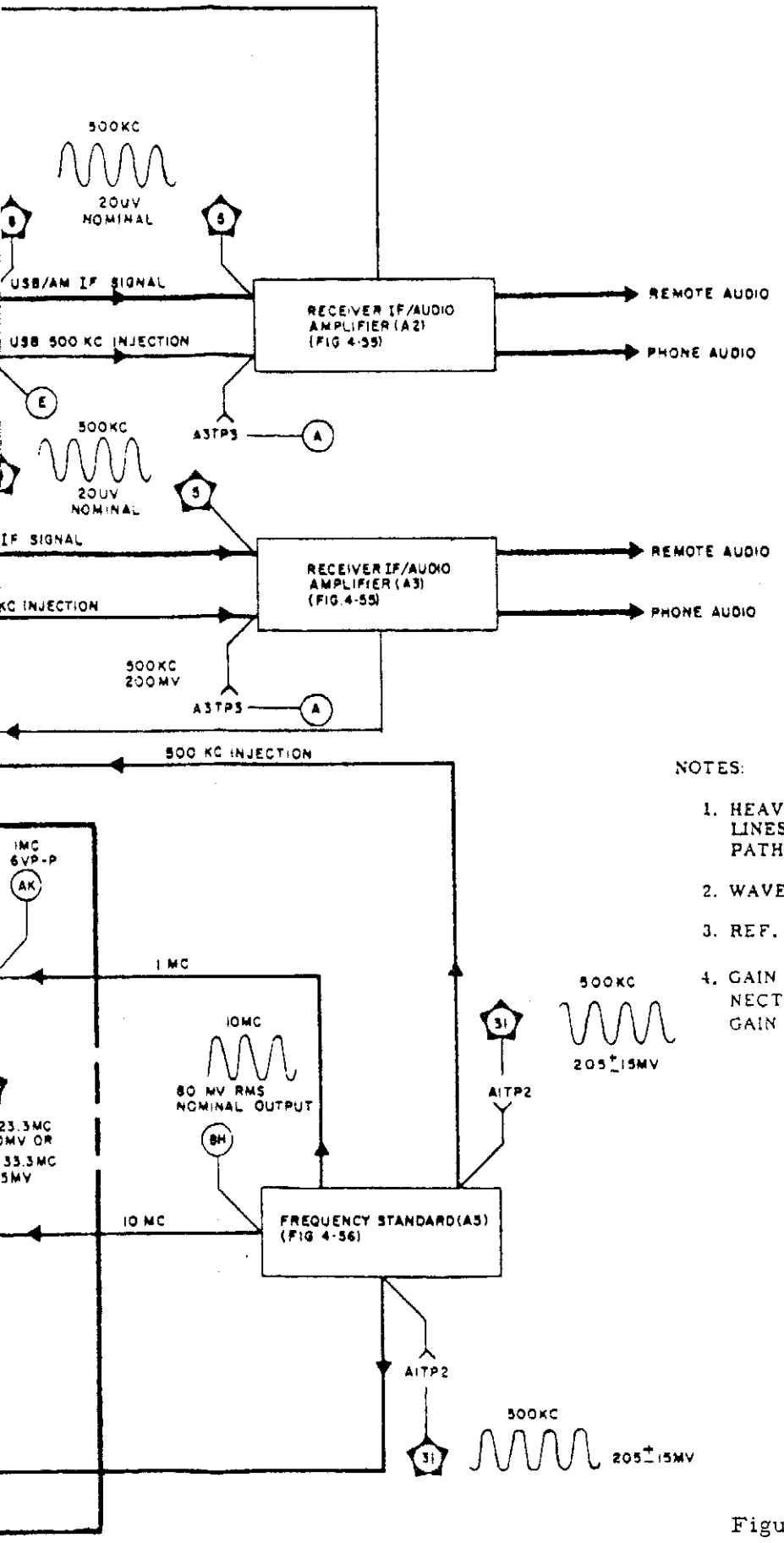
83. Figure 5-20 is replaced by new Figure 5-20, see page 36 of this supplement.

PAGE 5-128

84. Figure 5-89 is replaced by new Figure 5-89, see page 37 of this supplement.


GAIN 2-20MC 40±4DB
21-29MC 37±7DB
SEE NOTE 4
ANT
50Ω
ANTENNA OVERLOAD
(A9)
RF AMPLIFIER (A4)
(FIG 4-52)
RF OUTPUT
TP4
TP5
RECEIVER
POWER SUPPLY (A8)
E17
E12
E10
E11
+110V TO MODE
SELECTOR SWITCH S2B REAR
+28V TO MODE
SELECTOR SWITCH S2B FRONT
-30V TO MODE
SELECTOR SWITCH S2D FRONT
+20V TO MODE
SELECTOR SWITCH S2A REAR
A3J3
3.301-3.400MC
90-160MV
1 AND 10KC INJECTION
1 AND 10KC SYNTHESIZER (A3)
(FIG 4-59)
7.089MC 1.5-10MV
7.089 MC ERROR SIGNAL
1MSEC
100 USEC
100 USEC
2.2V
1 MS
1KC SPECTRUM
10KC SPECTRUM
6-8.5 USEC
10V
100 USEC
8.0 TO 8.0 USEC
A2TP6
A3TP6
SPECTRUM GENERATOR (A5)
(FIG 4-57)
1KC PULSE
A4TP5
A1 TP6
2 USEC
9V
A1TP1
10 USEC
3V
TRANSLATOR / SYNTHESIZER (A6)


AGC
0 TO -30 VDC
SEE NOTE 4
10 - 12DB
GAIN
TP5
TP8
RF TRANSLATOR (A6)
(FIG 4-53)
2.5-23.5MC
90MV MIN
A1TP1
IF OUTPUT
RECEIVER MODE
SELECTOR (A1)
(FIG 4-54)
500KC
20UV
NOMINAL
USB/AM IF SIGNAL
USB 500 KC INJECTION
A3TP3
500KC
20UV
NOMINAL
LSB IF SIGNAL
LSB 500 KC INJECTION
500KC
200MV
A3TP3
500 KC INJECTION
3.301-3.400MC
90-160MV
10KC INJECTION
7.089MC 1.5-10MV
7.089 MC ERROR SIGNAL
6.0 TO 8.0 USEC
1MC
6VP-P
1 MC INJECTION
1 MC SYNTHESIZER (A1)
(FIG.4-61)
1 MC
10MC
80 MV RMS
NOMINAL OUTPUT
100 KC INJECTION
A1TP1
1.5-10MV
A1TP4
7.1MC +1200~ -200~
90MV
A3TP1
22A-23.3MC
AT 120MV OR
32.4-33.3MC
AT 125MV
100 CPS SYNTHESIZER (A4)
(FIG.4-58)
7.1 MC
100 KC SYNTHESIZER (A2)
(FIG.4-60)
10 MC
FREQUENCY
(FIG 4-56)
PULSE
TP5
100 KC SPECTRUM
3V
10 USEC
10
USEC
0.5V
1-1.2
USEC
500 KC SPECTRUM

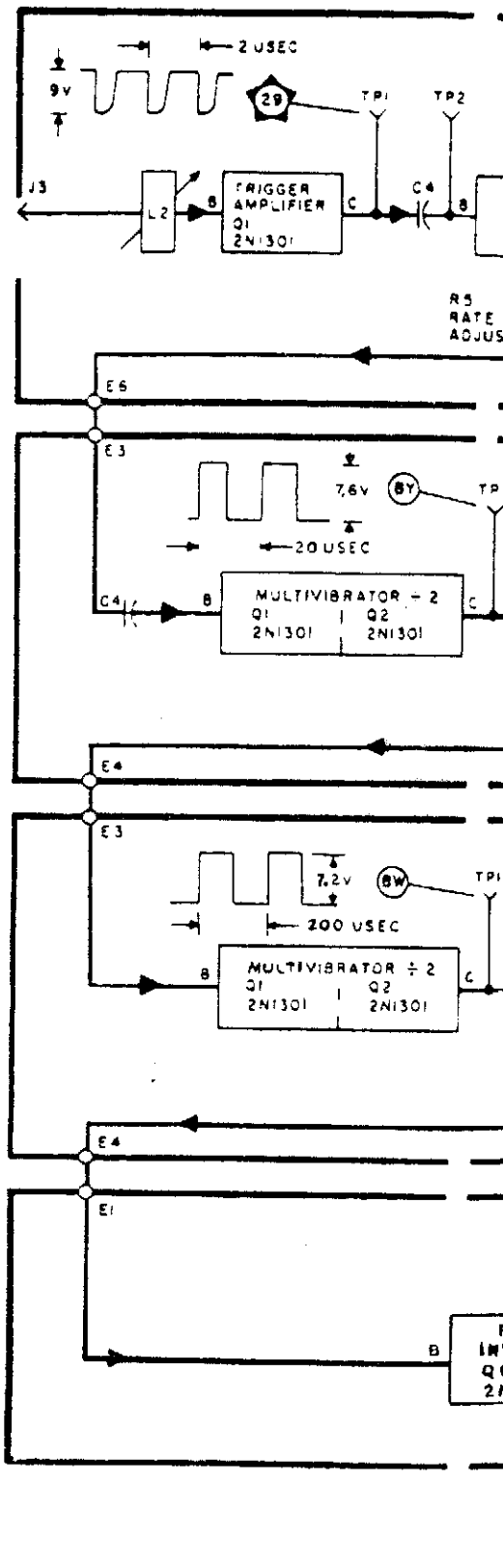


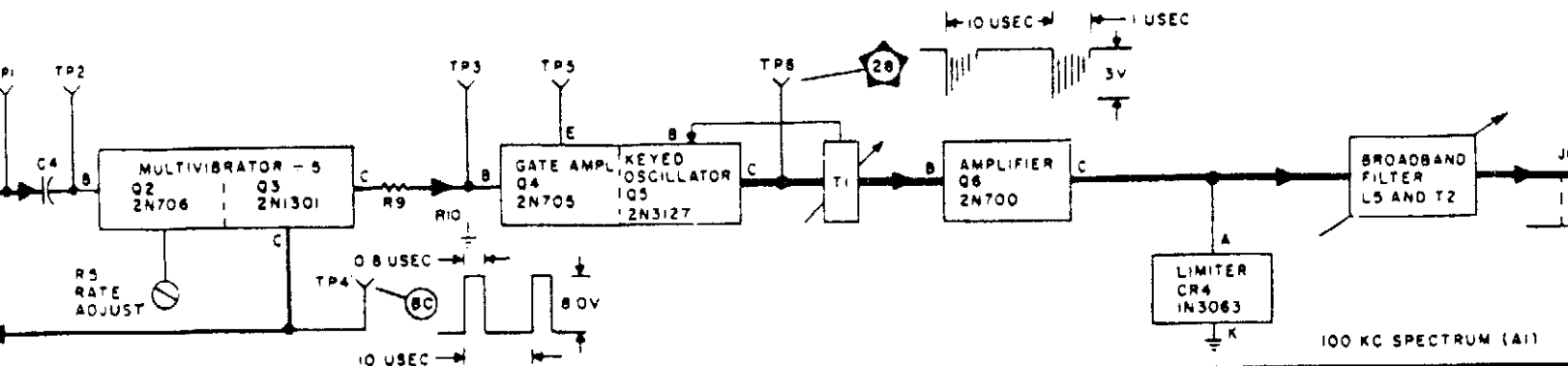
NOTES:

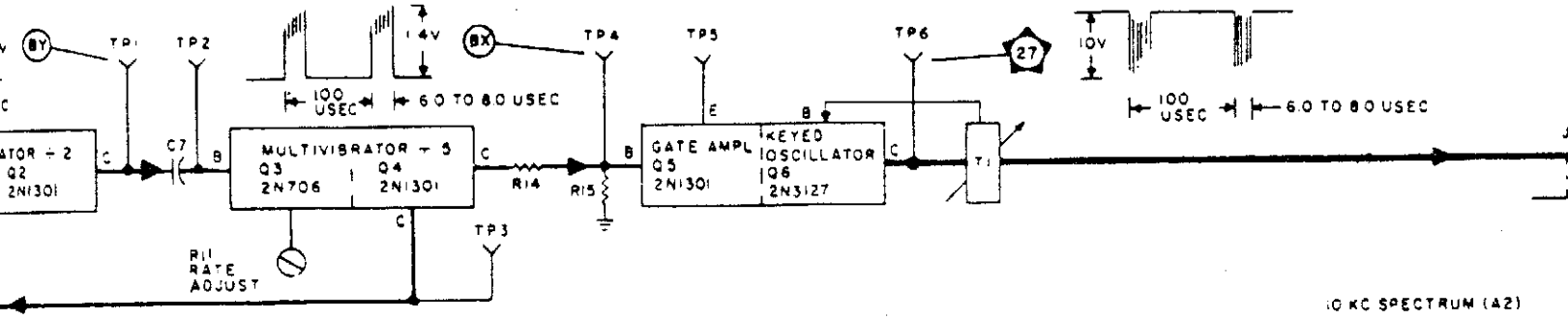
1. HEAVY LINES INDICATE MAIN SIGNAL PATHS; LIGHT LINES INDICATE AUXILIARY OR SECONDARY SIGNAL PATHS.
2. WAVEFORMS RECORDED ON OSCILLOSCOPE AN/USM-105A.
3. REF. DESIG. PREFIX A2.
4. GAIN MEASURED EASIER WITH AGC VOLTAGE DISCONNECTED REMOVE RECEIVER MODE SELECTOR (A1)). GAIN EXPRESSED AS DB ABOVE PREVIOUS STAGE.

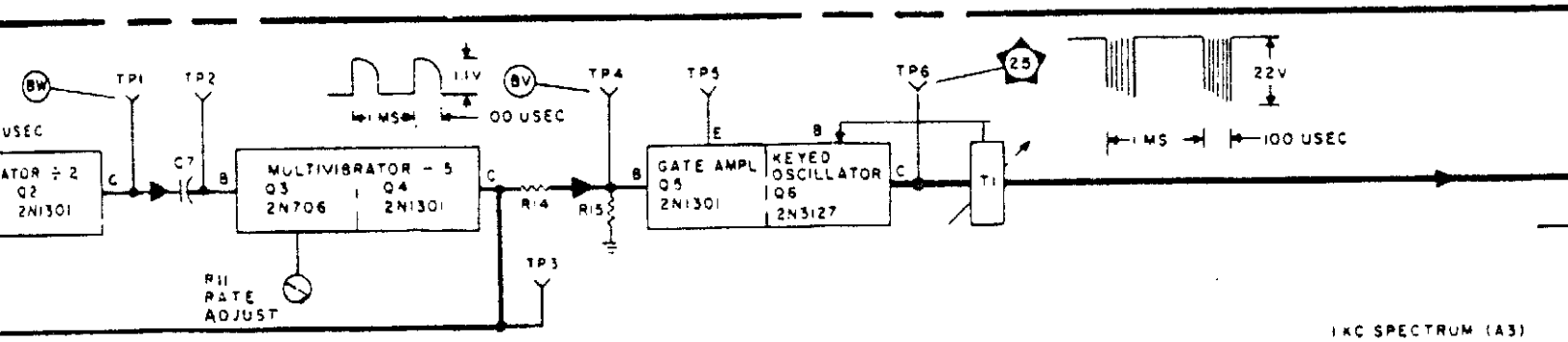
Figure 4-51. Radio Receiver R-1051C/URR, Overall Servicing Block Diagram

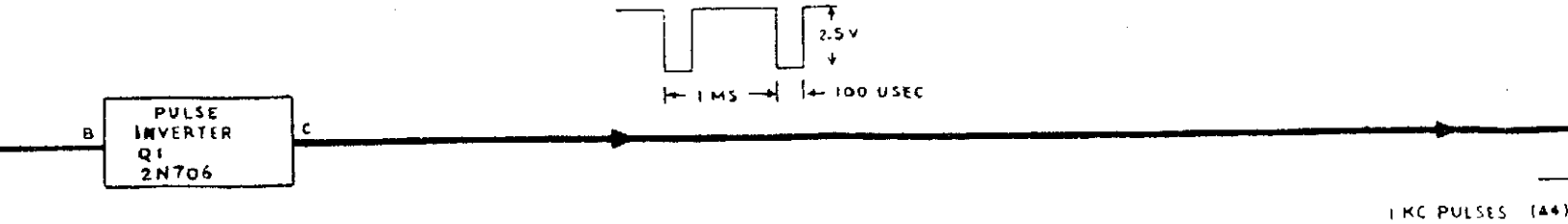
0.2V RMS 500 KC FROM FREQUENCY STANDARD ELECTRONIC ASSEMBLY (A2A5)

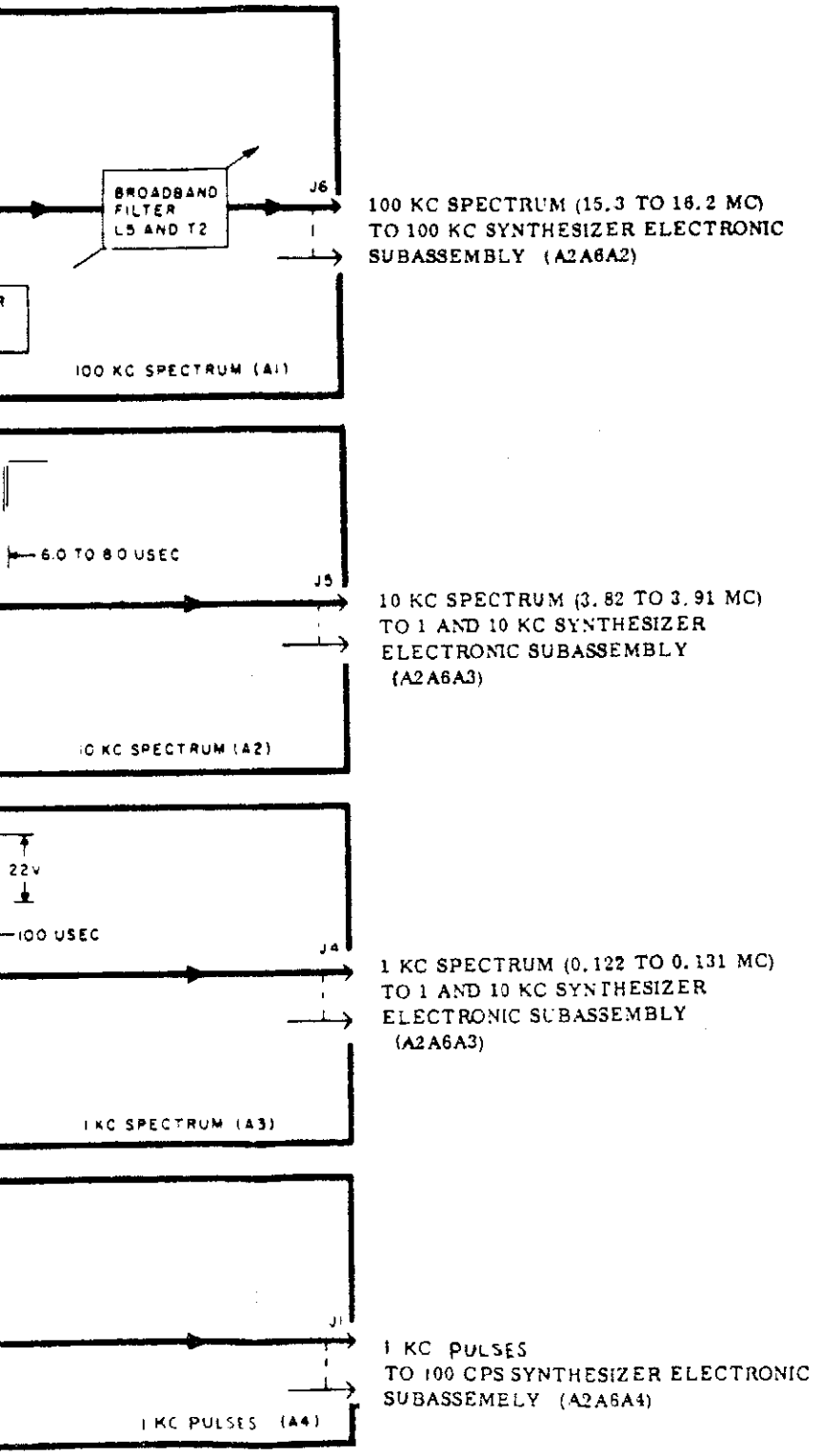



TP2
C4
MULTIVIBRATOR ÷ 5
Q2
2N706
Q3
2N1301
R9
R10
TP3
TP5
GATE AMPL
Q4
2N705
KEYED OSCILLATOR
Q5
2N3127
TP6
28
10 USEC
1 USEC
3V
T1
AMPLIFIER
Q6
2N700
BROADBAND FILTER
L5 AND T2
LIMITER
CR4
1N3063
R5
RATE
ADJUST
TP4
8C
0.8 USEC
8.0V
10 USEC
100 KC SPECTRUM (A1)


8Y
TP1
TP2
1.4V
8X
TP4
TP5
TP6
27
10V
100 USEC
6.0 TO 8.0 USEC
÷ 2
Q2
2N1301
C7
MULTIVIBRATOR ÷ 5
Q3
2N706
Q4
2N1301
R14
R15
GATE AMPL
Q5
2N1301
KEYED OSCILLATOR
Q6
2N3127
T1
TP3
R11
RATE
ADJUST
10 KC SPECTRUM (A2)


8W
TP1
TP2
1.1V
1 MS
00 USEC
8V
TP4
TP5
TP6
25
22V
1 MS
100 USEC
÷ 2
Q2
2N1301
C7
MULTIVIBRATOR ÷ 5
Q3
2N706
Q4
2N1301
R14
R15
GATE AMPL
Q5
2N1301
KEYED OSCILLATOR
Q6
2N3127
T1
TP3
R11
RATE
ADJUST
1 KC SPECTRUM (A3)

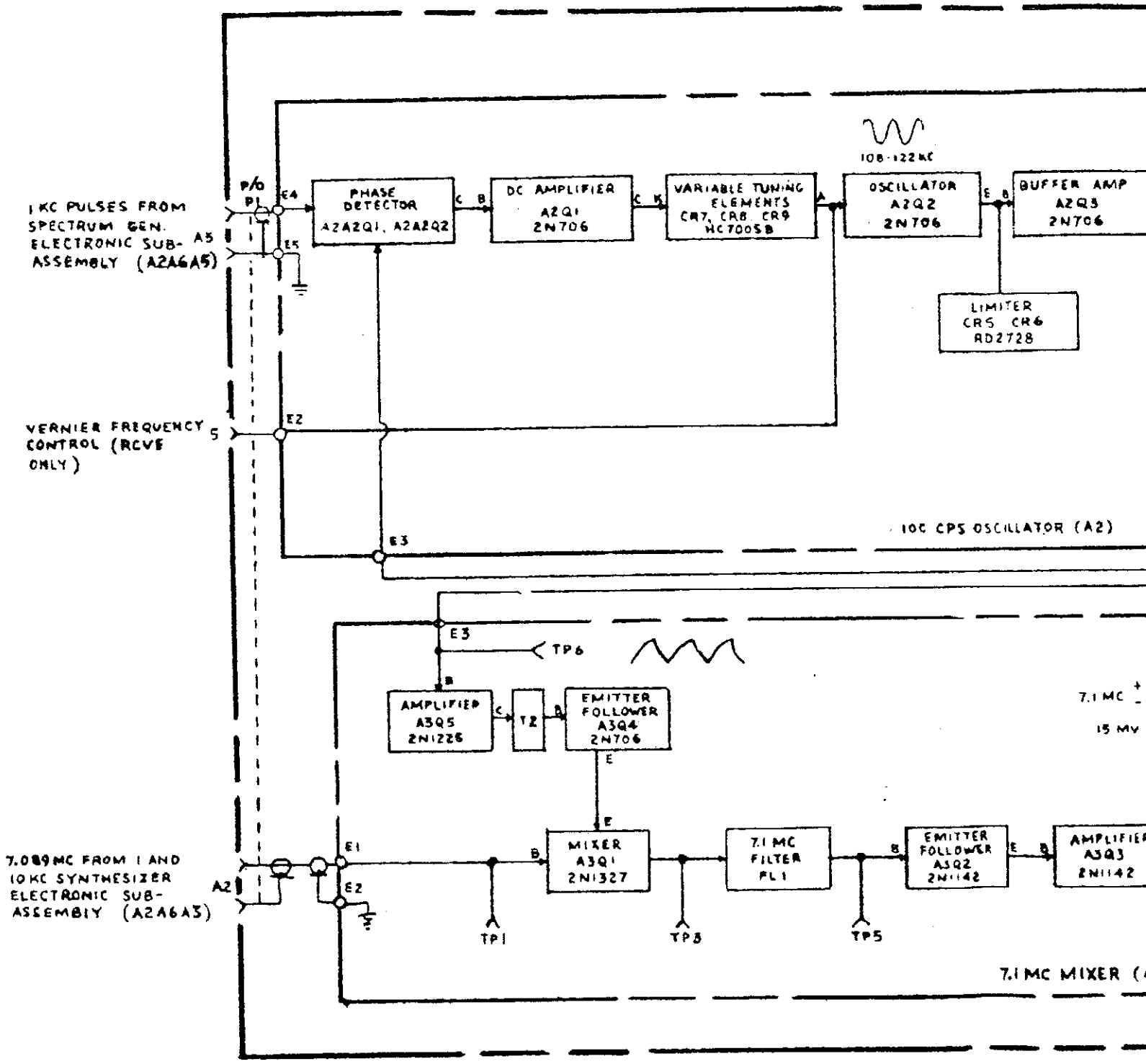

2.5 V
1 MS
100 USEC
PULSE INVERTER
Q1
2N706
1 KC PULSES (A4)

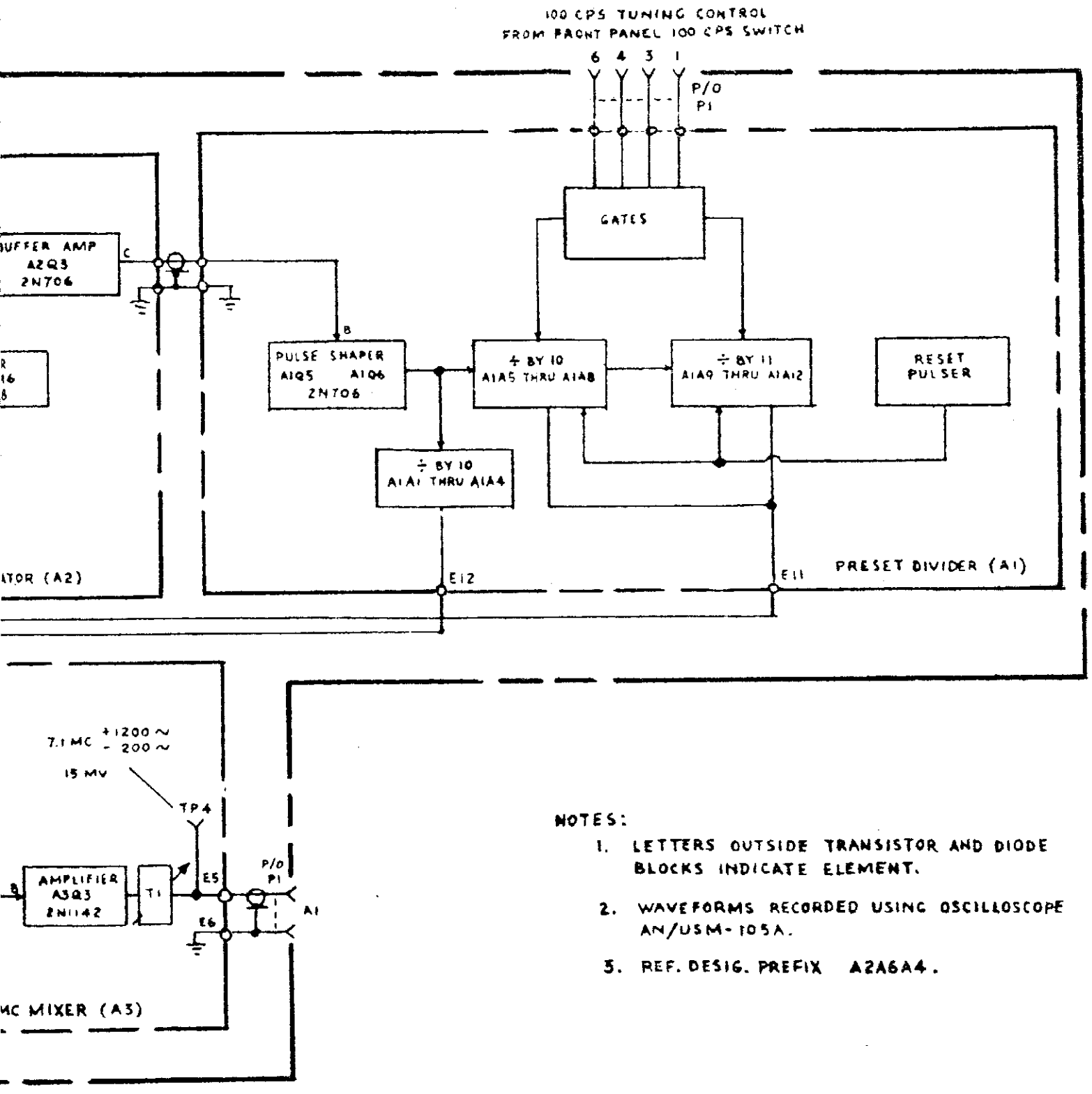


NOTES:

1. HEAVY LINES INDICATE MAIN SIGNAL PATHS; LIGHT LINES INDICATE AUXILIARY OR SECONDARY SIGNAL PATHS.
2. LETTERS OUTSIDE TRANSISTOR AND DIODE BLOCK INDICATE ELEMENTS.
3. WAVEFORMS RECORDED USING OSCILLOSCOPE AN USM-105A.
4. REF. DESIG. PREFIX A6A5.

Figure 4-57. Spectrum Generator Electronic Subassembly, Servicing Block Diagram

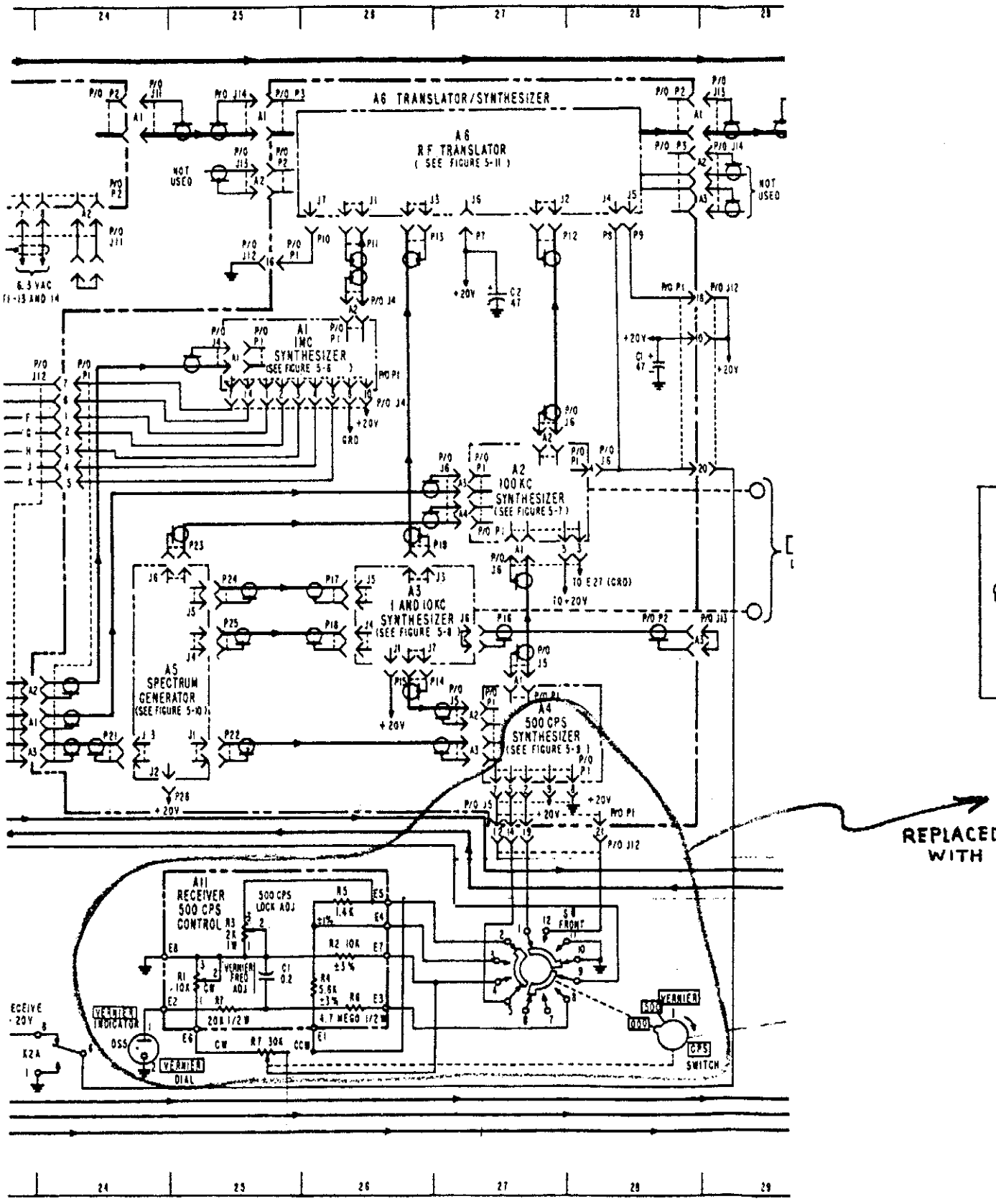

1 KC PULSES FROM SPECTRUM GEN. ELECTRONIC SUB-ASSEMBLY (A2A6A5)
A5
P/O P1
E4
E5
PHASE DETECTOR A2A2Q1, A2A2Q2
DC AMPLIFIER A2Q1 2N706
VARIABLE TUNING ELEMENTS CR7, CR8, CR9 HC700SB
108-122 KC
OSCILLATOR A2Q2 2N706
BUFFER AMP A2Q3 2N706
LIMITER CR5 CR6 RD2728
VERNIER FREQUENCY CONTROL (RCVR ONLY)
5
E2
E3
100 CPS OSCILLATOR (A2)
TP6
AMPLIFIER A3Q5 2N1226
T2
EMITTER FOLLOWER A3Q4 2N706
7.1 MC
15 MV
7.089 MC FROM 1 AND 10 KC SYNTHESIZER ELECTRONIC SUB-ASSEMBLY (A2A6A3)
A2
E1
E2
MIXER A3Q1 2N1327
7.1 MC FILTER FL1
EMITTER FOLLOWER A3Q2 2N1142
AMPLIFIER A3Q3 2N1142
TP1
TP3
TP5
7.1 MC MIXER



NOTES:

1. LETTERS OUTSIDE TRANSISTOR AND DIODE BLOCKS INDICATE ELEMENT.
2. WAVEFORMS RECORDED USING OSCILLOSCOPE AN/USM-105A.
3. REF. DESIG. PREFIX A2A6A4.

Figure 4-58. 100 CPS Synthesizer Electronic Subassembly, Service Block Diagram


A6 TRANSLATOR/SYNTHESIZER
A6 RF TRANSLATOR (SEE FIGURE 5-11)
NOT USED
6.3 VAC
A1 1MC SYNTHESIZER (SEE FIGURE 5-6)
A2 100 KC SYNTHESIZER (SEE FIGURE 5-7)
A3 1 AND 10KC SYNTHESIZER (SEE FIGURE 5-8)
A4 500 CPS SYNTHESIZER (SEE FIGURE 5-9)
A5 SPECTRUM GENERATOR (SEE FIGURE 5-10)
+20V
GRD
TO E27 (CRO)
A11 RECEIVER 500 CPS CONTROL
500 CPS LOCK ADJ
VERNIER FREQ ADJ
VERNIER INDICATOR
VERNIER DIAL
VERNIER
CPS SWITCH
REPLACED WITH

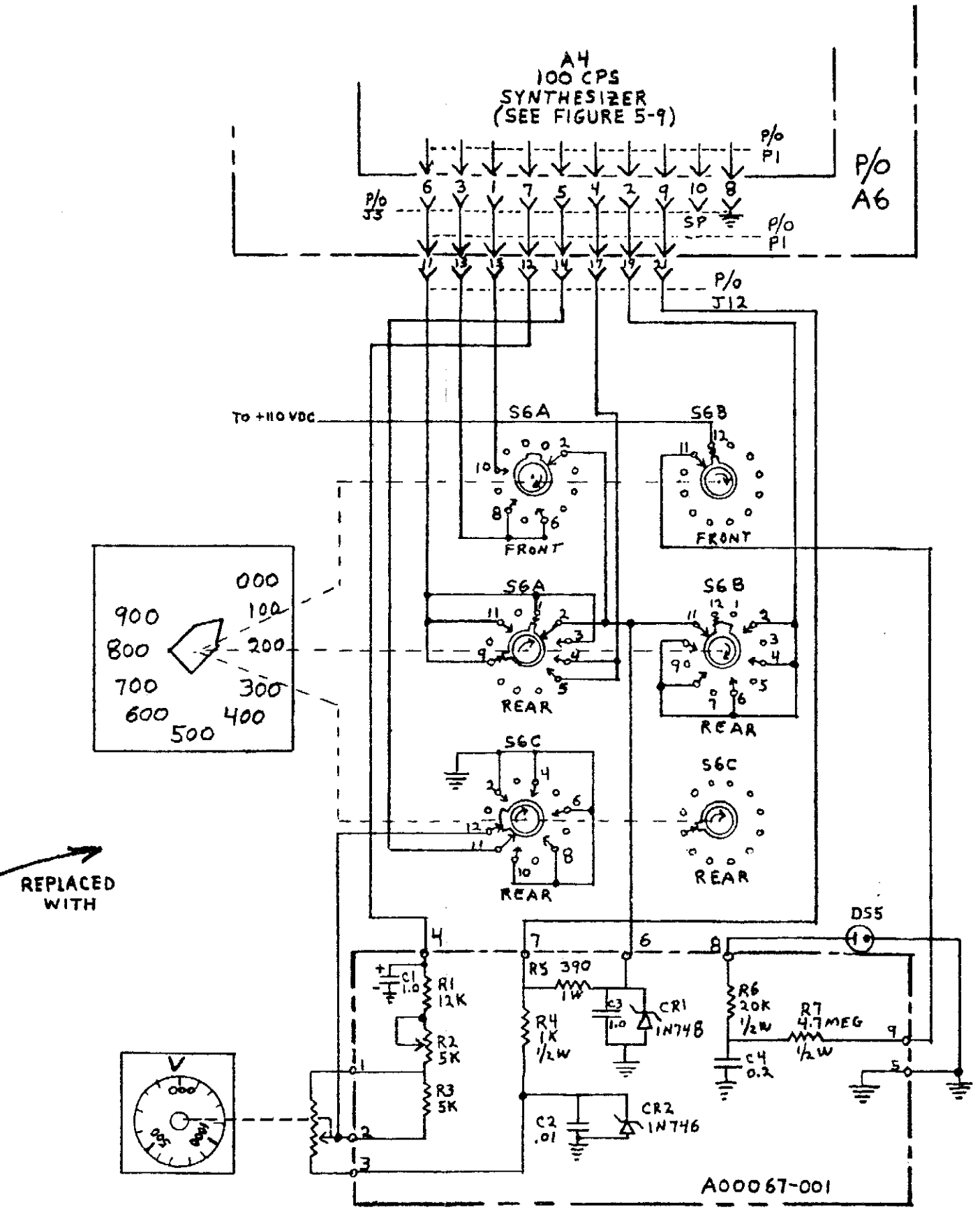
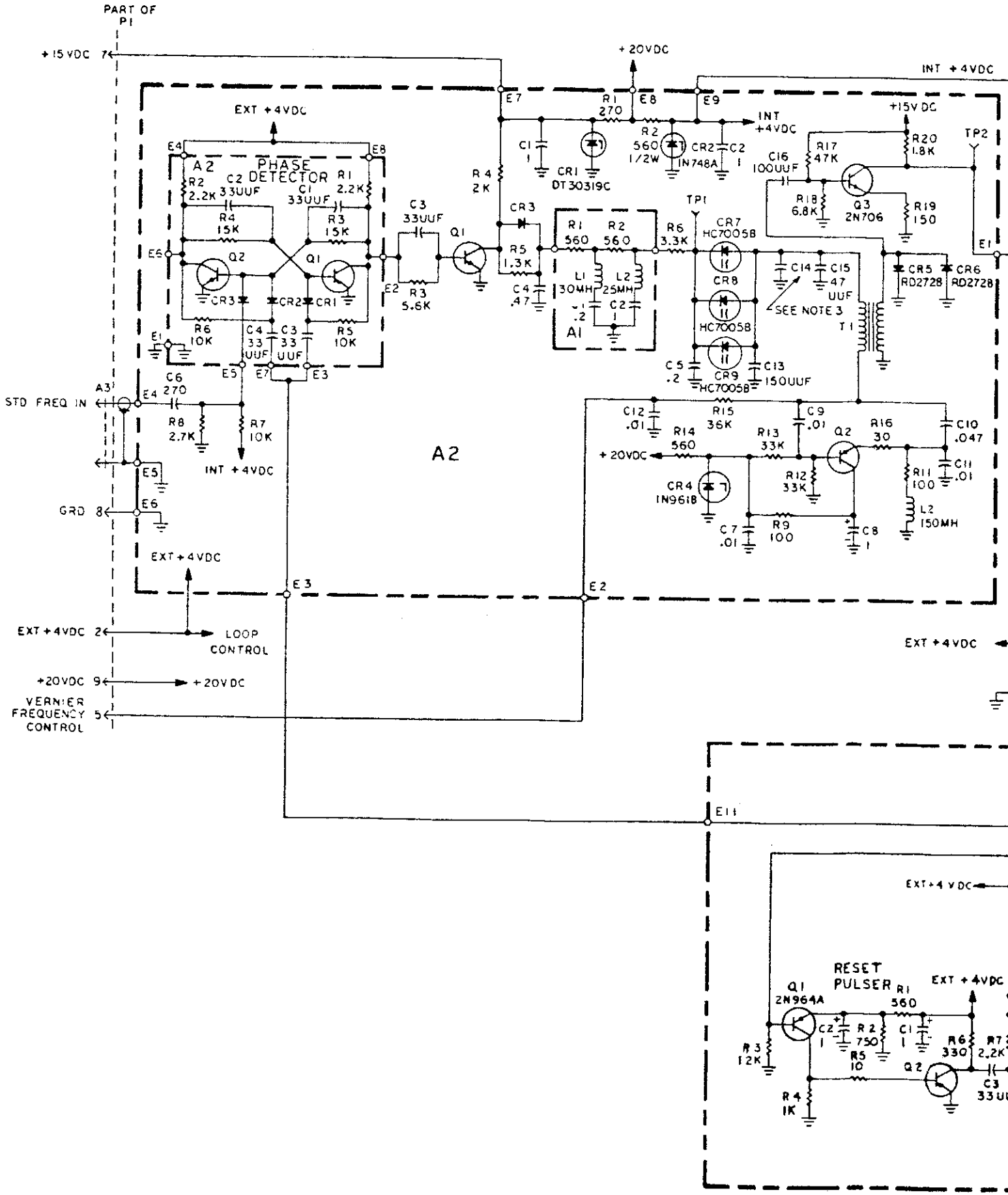
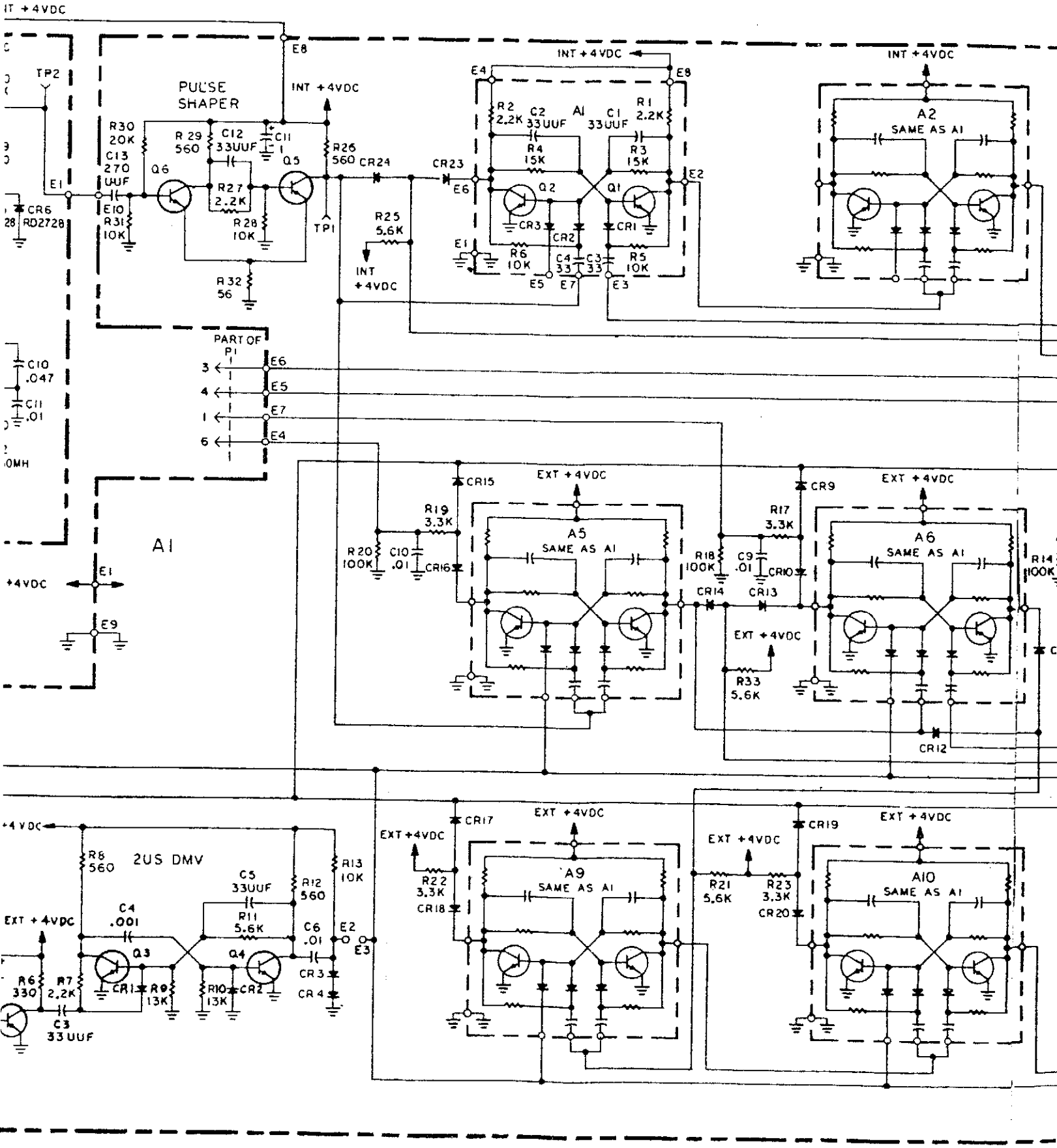
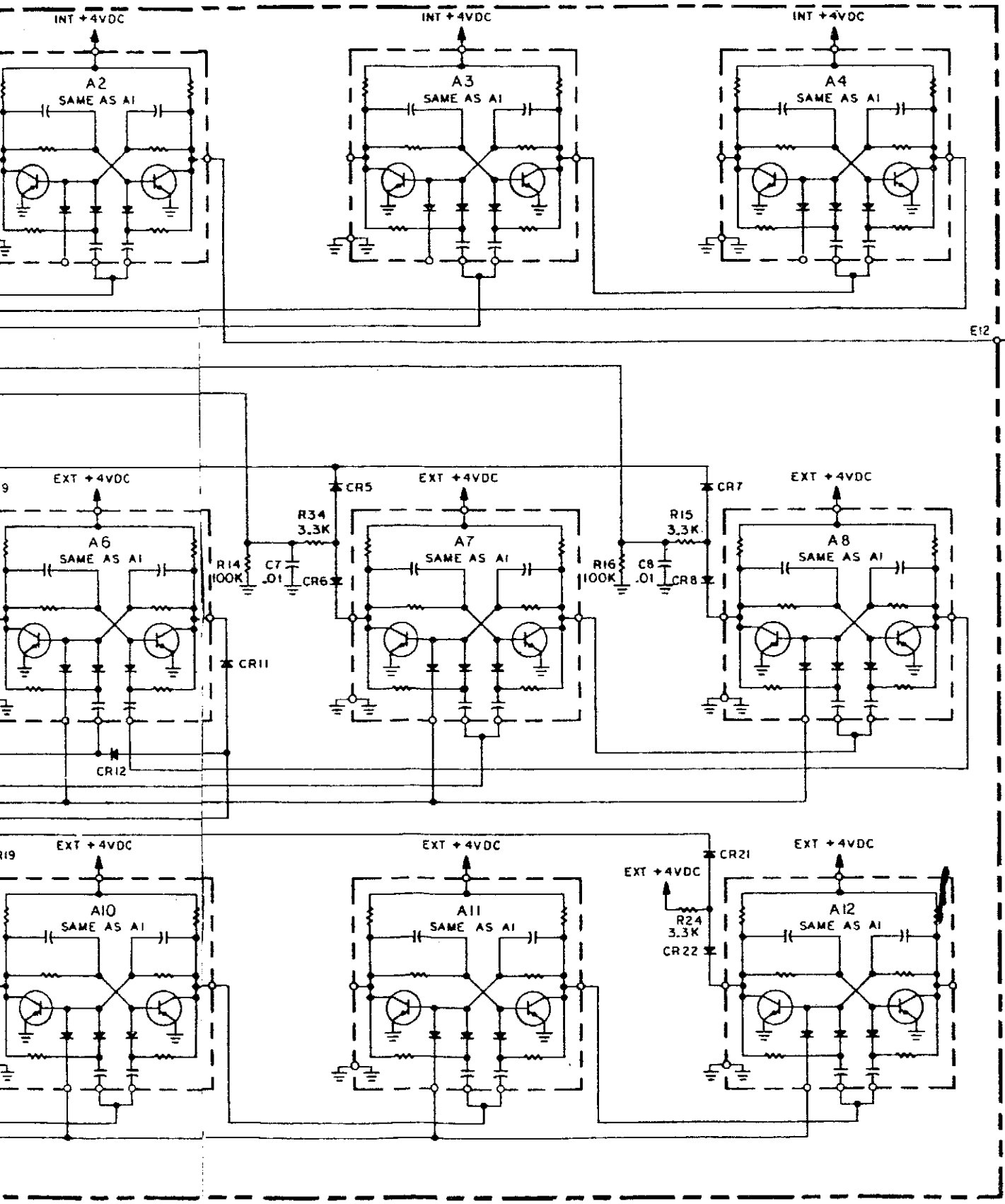
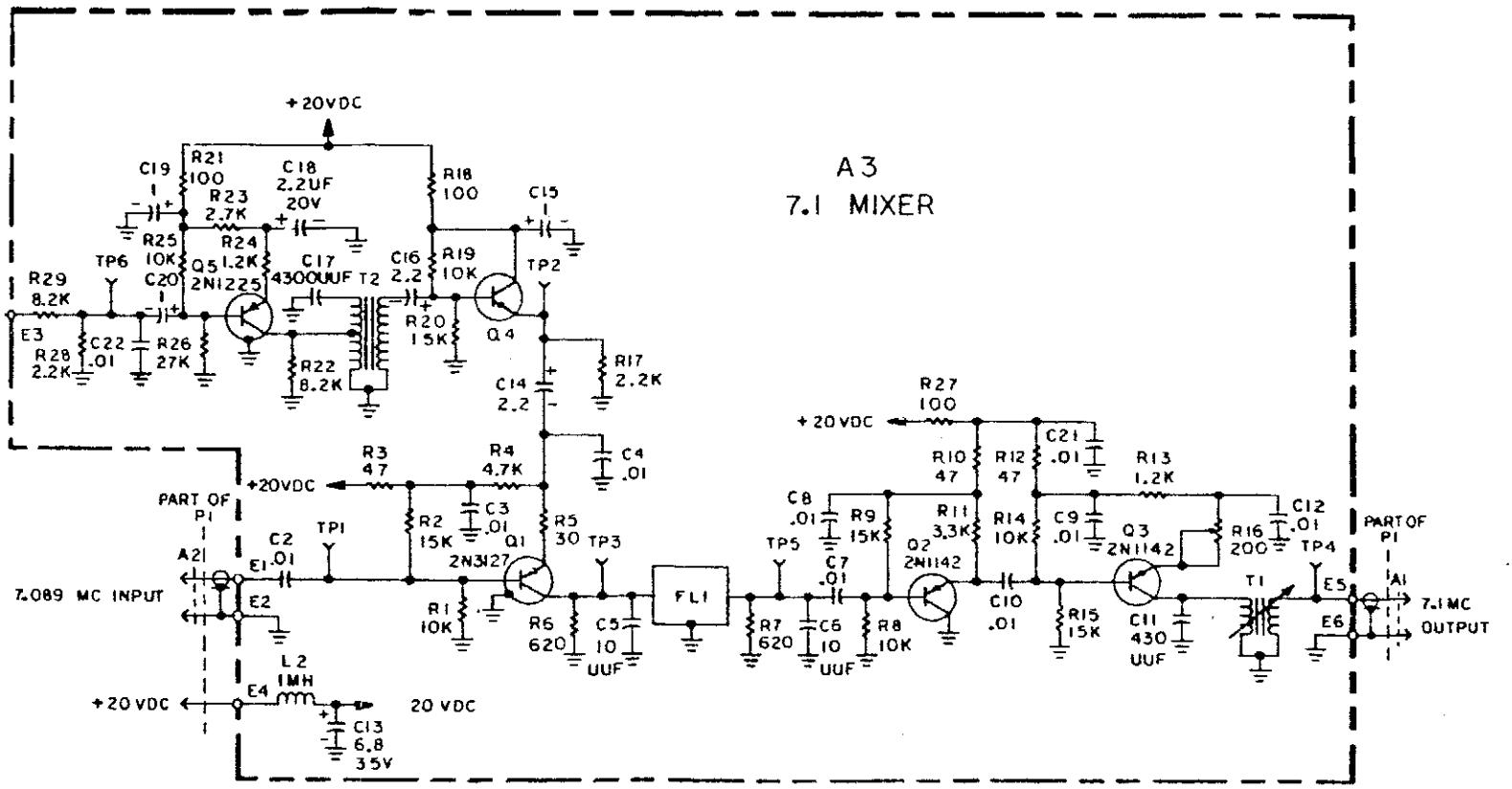


Figure 5-1. Radio Receiver R-1051C/URR, Chassis and Main Frame, Schematic Diagram (Sheet 2 of 2)


PART OF P1
+15 VDC 7
+20VDC
INT +4VDC
EXT +4VDC
A2 PHASE DETECTOR
R2 2.2K
C2 33UUF
C1 33UUF
R1 2.2K
R4 15K
R3 15K
Q2
Q1
CR3
CR2
CR1
R6 10K
C4 33 UUF
C3 33 UUF
R5 10K
E4
E8
E5
E7
E3
E1
E2
C3 33UUF
R3 5.6K
Q1
R4 2K
CR3
R5 1.3K
C4 .47
C1 1
CR1 DT30319C
R1 270
R2 560 1/2W
CR2 IN748A
C2 1
E7
E8
E9
INT +4VDC
R1 560
R2 560
L1 30MH
L2 25MH
C1 .2
C2 1
A1
R6 3.3K
TP1
CR7 HC7005B
CR8 HC7005B
CR9 HC7005B
C5 .2
C13 150UUF
C14
C15 47 UUF
SEE NOTE 3
T1
R17 47K
C16 100UUF
R18 6.8K
Q3 2N706
R19 150
R20 1.8K
TP2
+15V DC
CR5 RD2728
CR6 RD2728
E1
A3
STD FREQ IN
E4
C6 270
R8 2.7K
R7 10K
INT +4VDC
E5
GRD 8
E6
A2
C12 .01
R15 36K
C9 .01
R14 560
R13 33K
Q2
R16 30
C10 .047
+20VDC
CR4 IN9618
R12 33K
C11 .01
R11 100
L2 150MH
C7 .01
R9 100
C8 1
EXT +4VDC
E3
E2
EXT +4VDC 2
LOOP CONTROL
+20VDC 9
+20VDC
VERNIER FREQUENCY CONTROL 5
EXT +4VDC
E11
EXT +4 VDC
RESET PULSER
Q1 2N964A
R1 560
EXT +4VDC
C2 1
R2 750
C1 1
R3 12K
R5 10
R6 330
R7 2.2K
Q2
C3 33U
R4 1K


INT +4VDC
TP2
PULSE SHAPER
E8
INT +4VDC
R30 20K
R 29 560
C12 33UUF
C11 1
R26 560
CR24
CR23
C13 270 UUF
Q6
Q5
E1
E10
R31 10K
R27 2.2K
R28 10K
TP1
R25 5.6K
INT +4VDC
R32 56
CR6 RD2728
C10 .047
C11 .01
.0MH
PART OF P1
3
4
1
6
E6
E5
E7
E4
A1
+4VDC
E1
E9
E4
E8
R2 2.2K
C2 33UUF
A1
C1 33UUF
R1 2.2K
R4 15K
R3 15K
Q2
Q1
E6
E2
CR3
CR2
CR1
E1
R6 10K
C4 33
C3 33
R5 10K
E5
E7
E3
INT +4VDC
A2
SAME AS A1
CR15
EXT +4VDC
R19 3.3K
R20 100K
C10 .01
CR16
A5
SAME AS A1
CR9
EXT +4VDC
R17 3.3K
R18 100K
C9 .01
CR10
A6
SAME AS A1
CR14
CR13
EXT +4VDC
R33 5.6K
CR12
+4 VDC
R8 560
2US DMV
C5 33UUF
R12 560
R13 10K
EXT +4VDC
C4 .001
R11 5.6K
C6 .01
E2
E3
Q3
Q4
R6 330
R7 2.2K
CR1
R9 13K
R10 13K
CR2
CR3
CR4
C3 33UUF
EXT +4VDC
CR17
EXT +4VDC
R22 3.3K
CR18
A9
SAME AS A1
EXT +4VDC
CR19
EXT +4VDC
R21 5.6K
R23 3.3K
CR20
A10
SAME AS A1


INT +4VDC
A2
SAME AS A1
INT +4VDC
A3
SAME AS A1
INT +4VDC
A4
SAME AS A1
E12
R29
8.2K
TP6
E3
R28
2.2K
C22
.01
EXT +4VDC
A6
SAME AS A1
CR5
R34
3.3K
R14
100K
C7
.01
CR6
EXT +4VDC
A7
SAME AS A1
CR7
R15
3.3K
R16
100K
C8
.01
CR8
EXT +4VDC
A8
SAME AS A1
CR11
CR12
EXT +4VDC
A10
SAME AS A1
EXT +4VDC
A11
SAME AS A1
CR21
EXT +4VDC
R24
3.3K
CR22
EXT +4VDC
A12
SAME AS A1



NOTES:

1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER OR SUBASSEMBLY DESIGNATIONS
2. UNLESS OTHERWISE SPECIFIED:
   a. ALL RESISTORS ARE IN OHMS, 1/4W, ±5%
   b. ALL CAPACITORS ARE IN MICROFARADS
   c. ALL DIODES ARE IN3064
   d. ALL TRANSISTORS ARE 2N706
3. FOR VALUE OF A2C14 SEE TEST SPECIFICATION A00034

Figure 5-9. 100 CPS Synthesizer Electronic Subassembly, Schematic Diagram

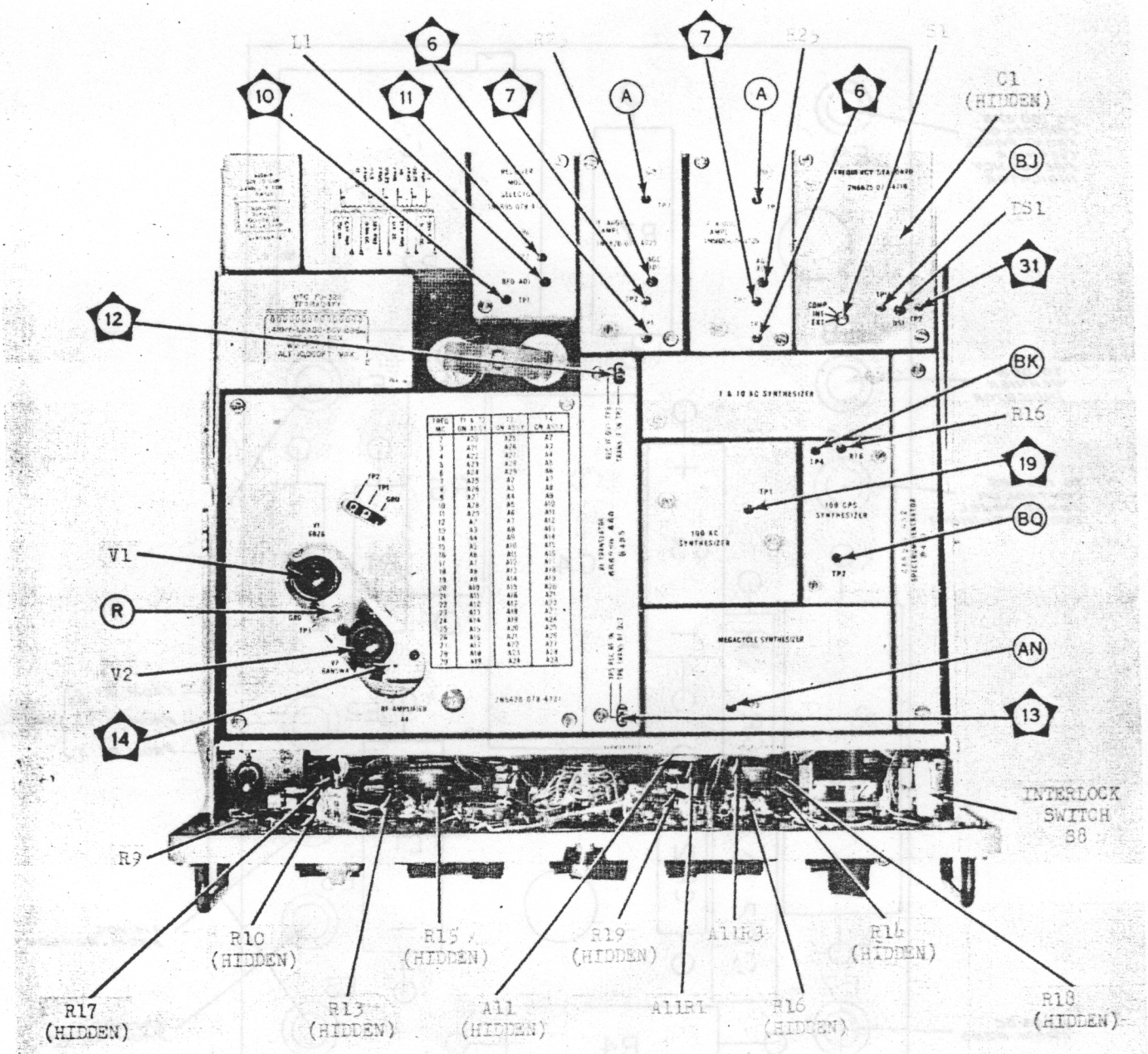


Figure 5-14. Radio Receiver R-1051C/URR, Top View, Case Removed, Component and Test Point Location

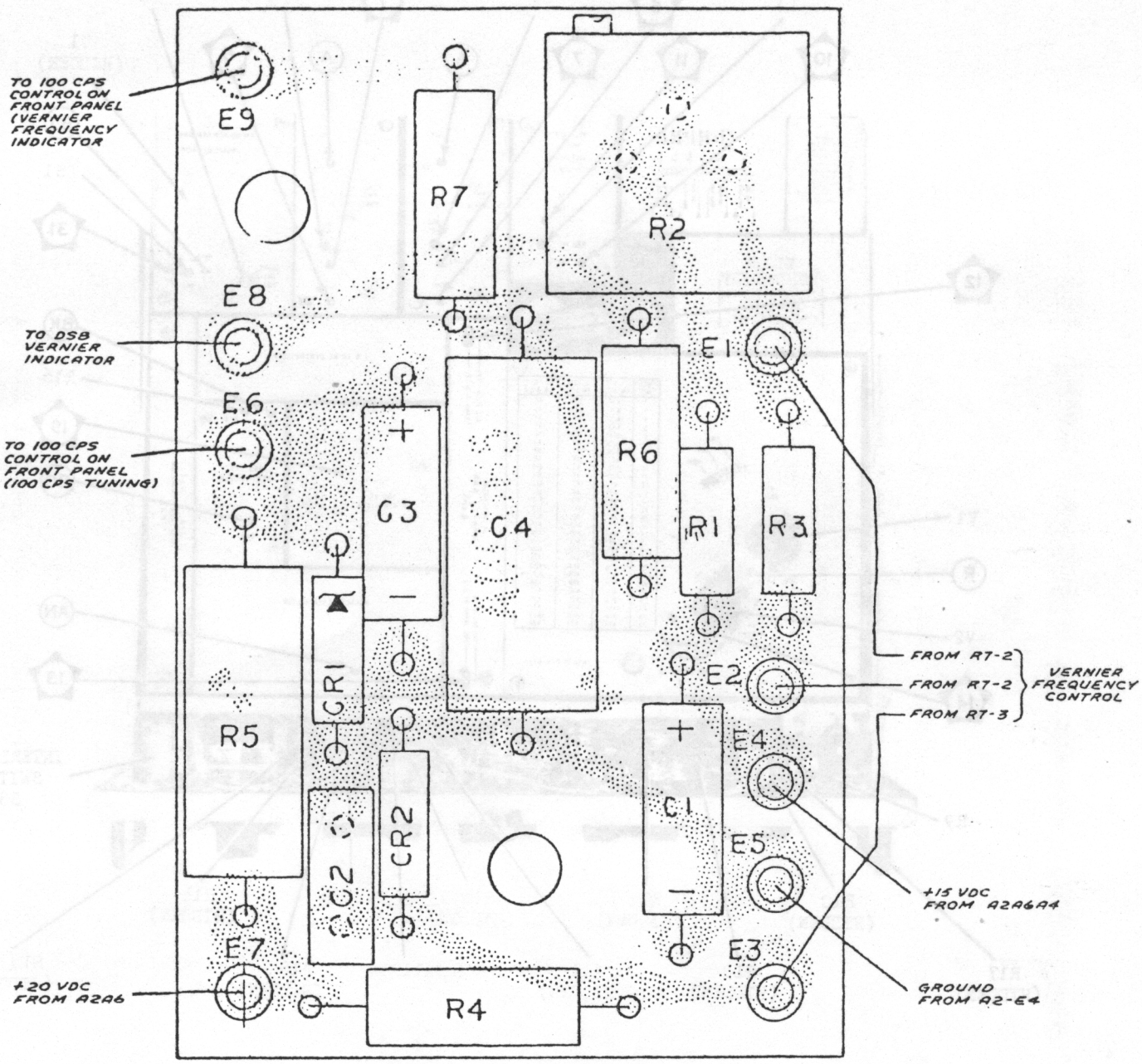


Figure 5-20. Receiver 100 CPS Control (Foil Side Up), Component Location

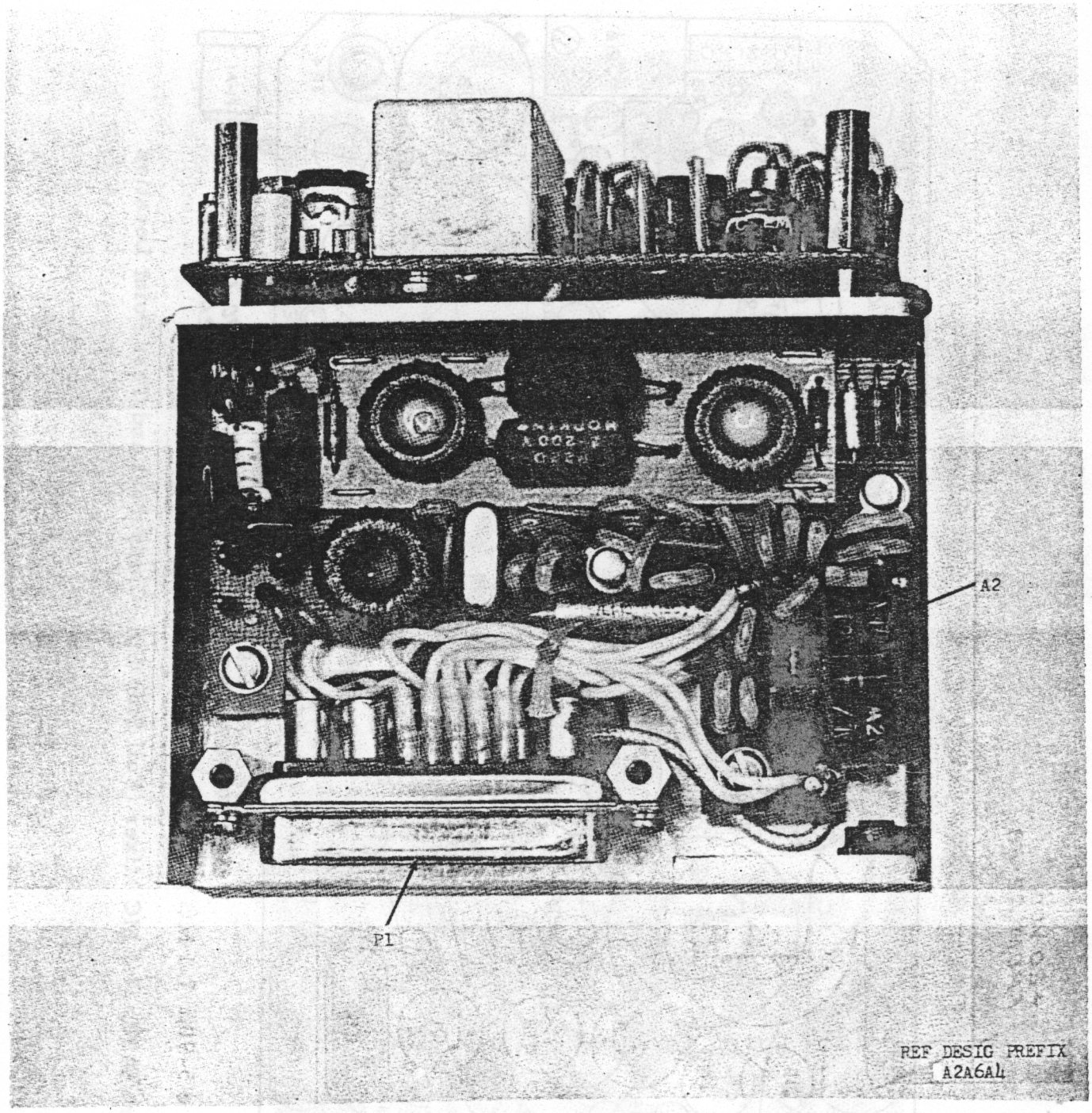


Figure 5-89. 100 CPS Synthesizer Electronic Subassembly, Left Side, Component Location

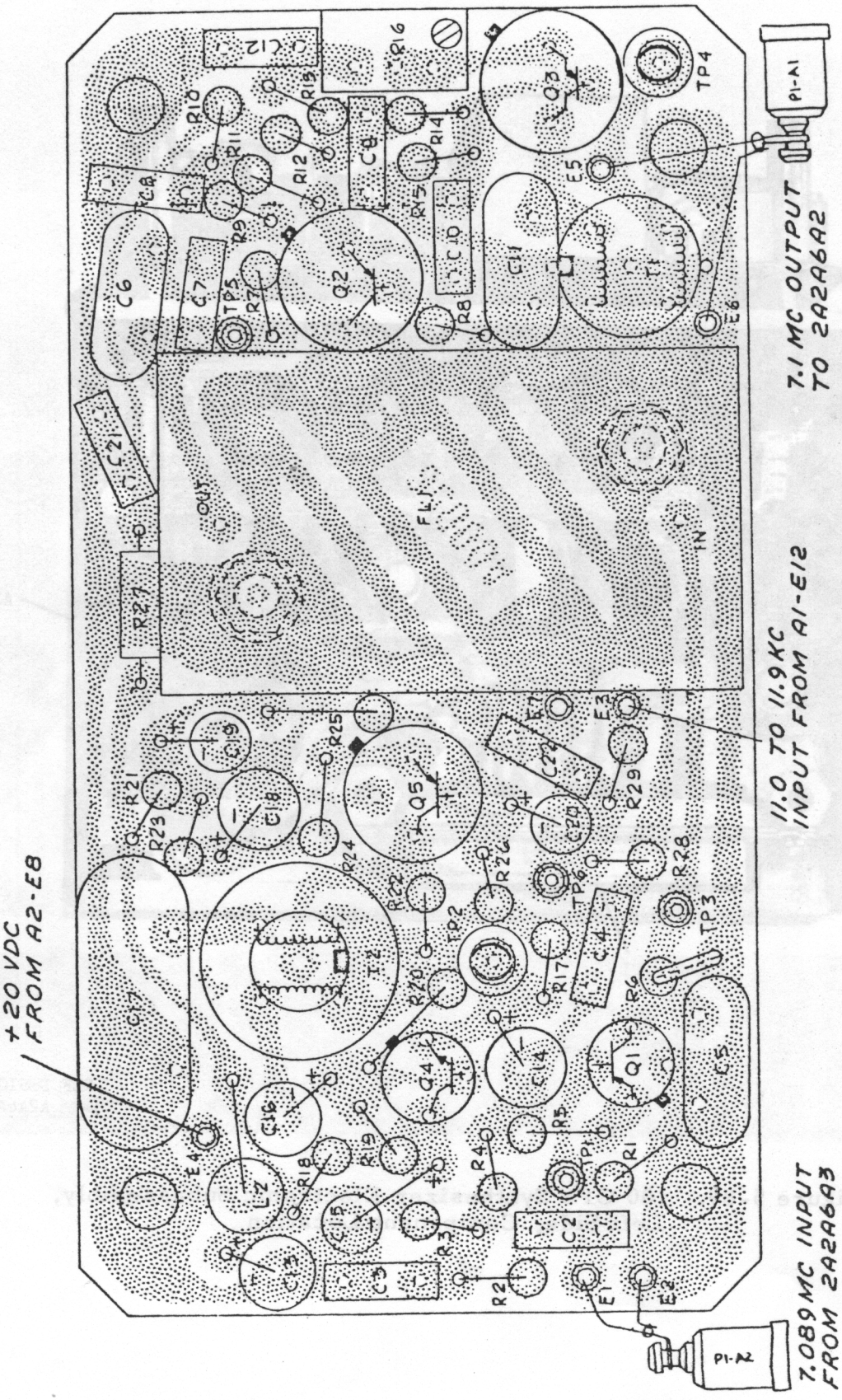


Figure 5-90. 7:1 MC Mixer (Foil Side Up), Component and Test Point Location

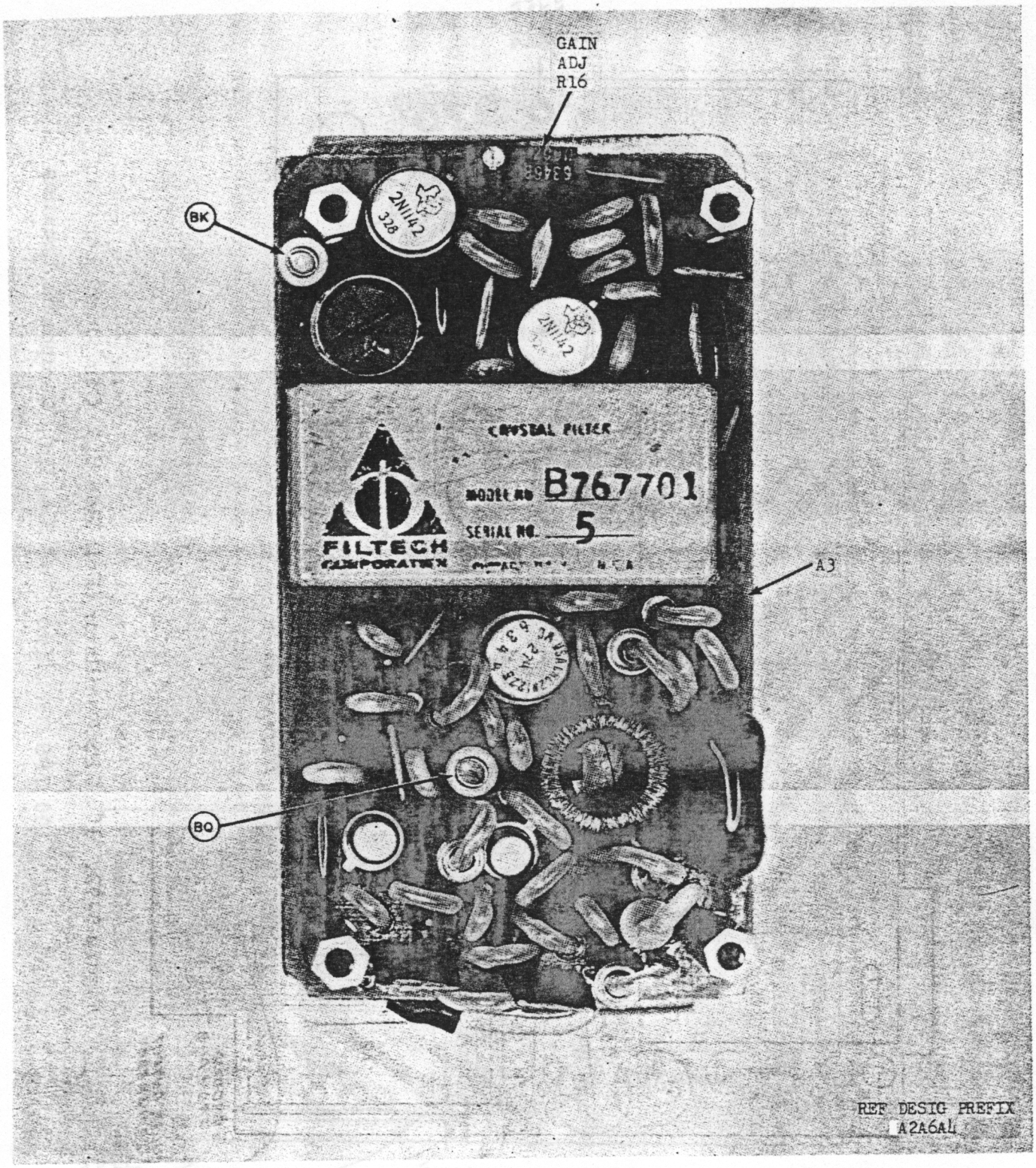


Figure 5-91. 100 CPS Synthesizer Electronic Subassembly, Front View, Component and Test Point Location

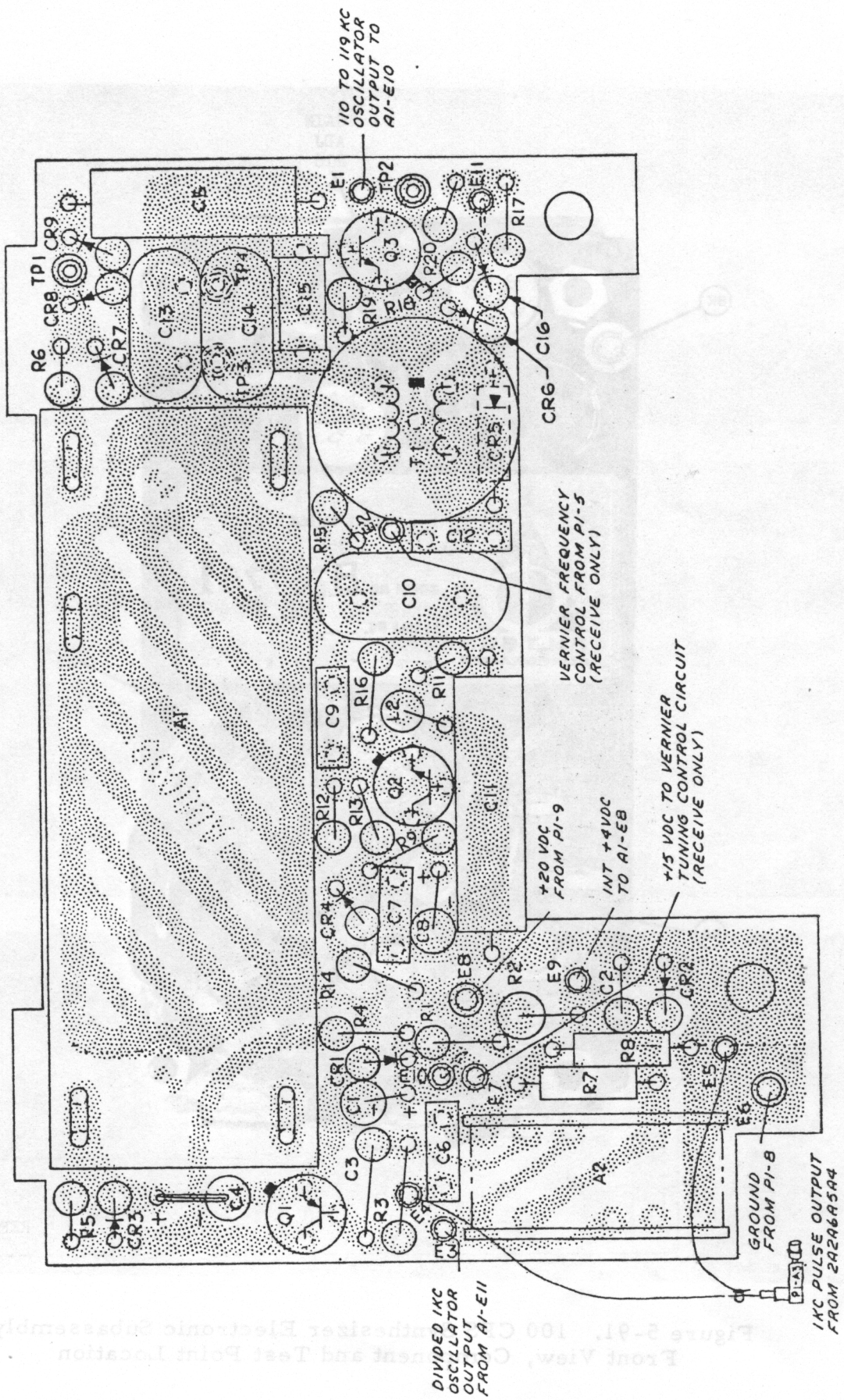


Figure 5-92. 100 CPS Oscillator (Foil Side Up), Component Location

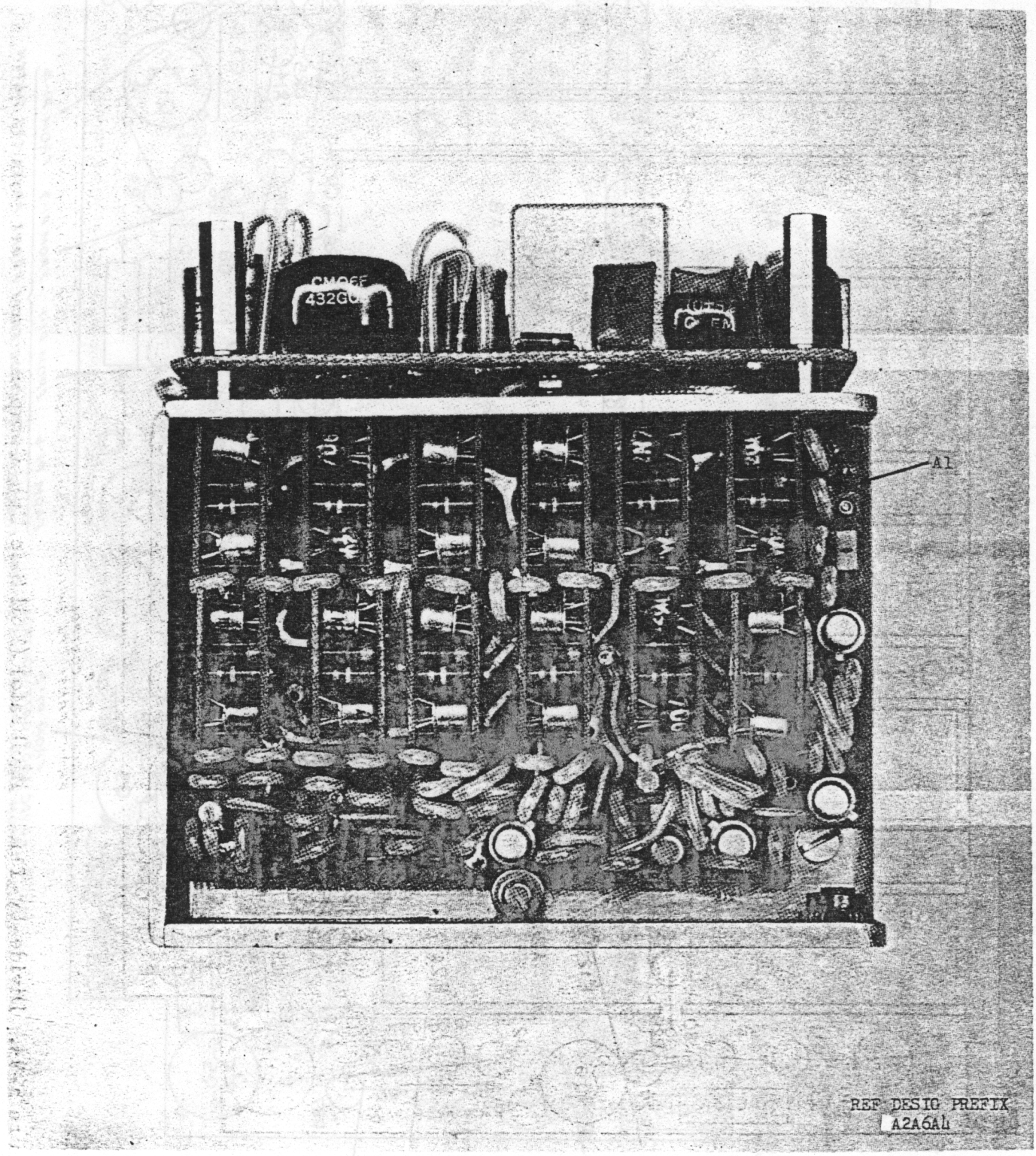


Figure 5-93. 100 CPS Synthesizer Electronic Subassembly, Right Side, Component Location

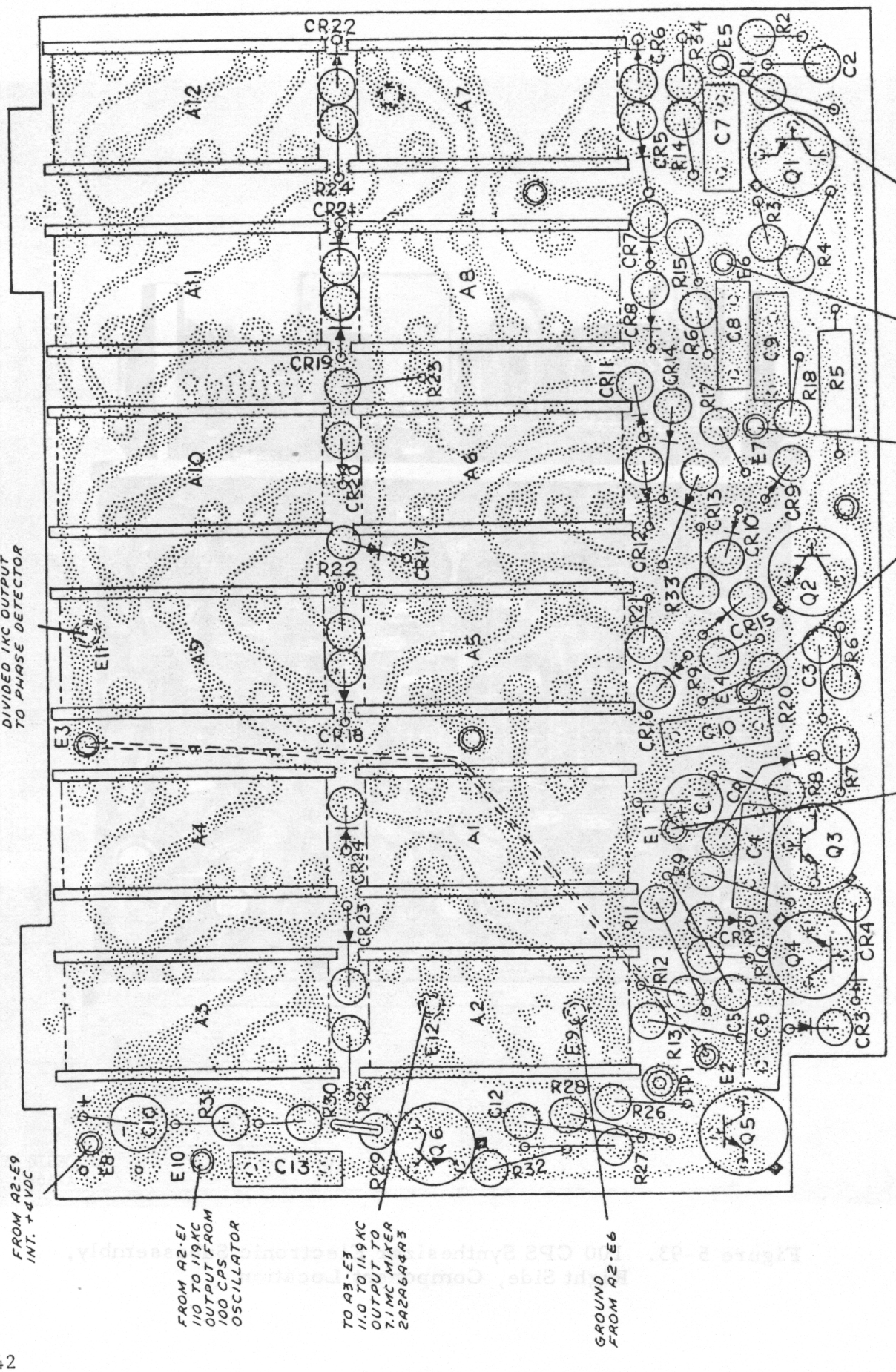


Figure 5-94. Divide-by-Ten Multivibrator (Foil Side Up), Component and Test Point Locations

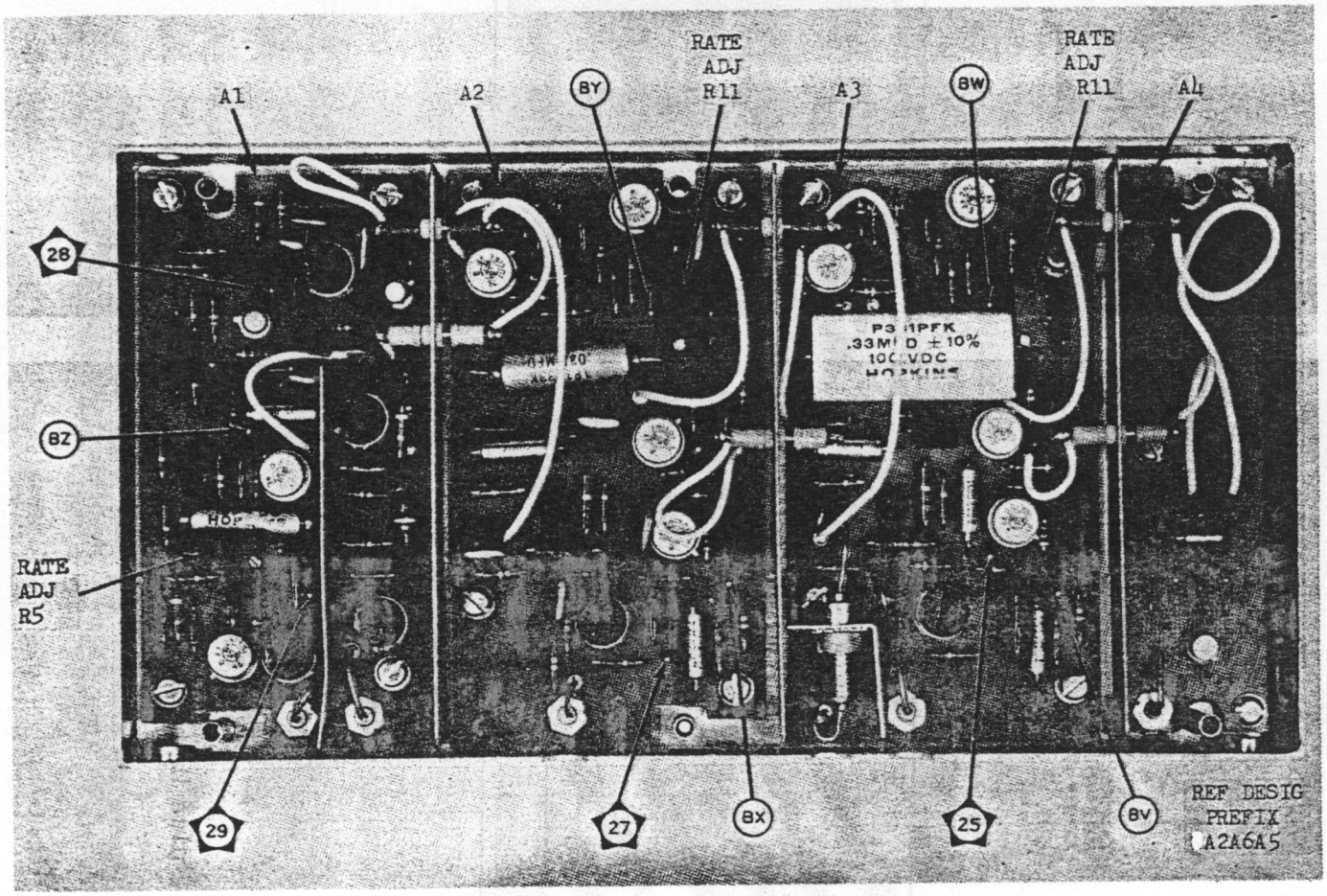


Figure 5-95. Spectrum Generator Electronic Subassembly, Component Location

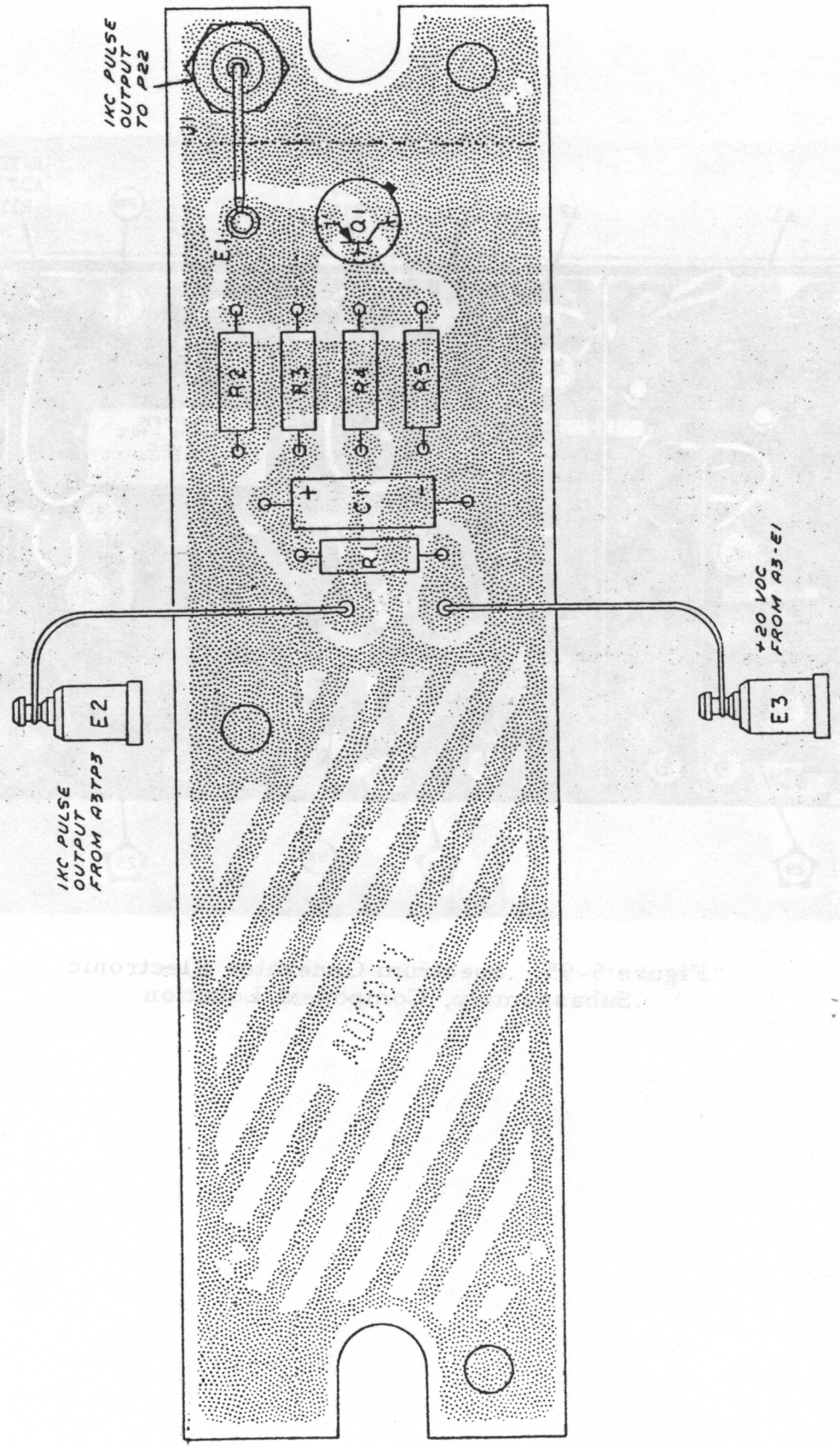


Figure 5-99. 1 Kc Pulse Inverter (Foil Side Up), Component Location

PAGE 5-129, 5-130

85. Figure 5-90 is replaced by new Figure 5-90, see page 38 of this supplement.

PAGE 5-131, 5-132

86. Figure 5-91 is replaced by new Figure 5-91, see page 39 of this supplement.

PAGE 5-133, 5-134

87. Figure 5-92 is replaced by new Figure 5-92, see page 40 of this supplement.

PAGE 5-135, 5-136

88. Figure 5-93 is replaced by new Figure 5-93, see page 41 of this supplement.

PAGE 5-137, 5-138

89. Figure 5-94 is replaced by new Figure 5-94, see page 42 of this supplement.

PAGE 5-139, 5-140

90. Figure 5-95 is replaced by new Figure 5-95, see page 43 of this supplement.

PAGE 5-147, 5-148

91. Figure 5-99 is replaced by new Figure 5-99, see page 44 of this supplement.

PAGE 6-3

92. Table 6-2 is changed as follows:

Ref Desig	Name and Description	Fig & Index
A2A2A1T1	Transformer, Variable RF Mfr 58189, P/N 666231-368	5-28
A2A2A1T2	Transformer, Variable RF Mfr 58189, P/N 666231-369	5-28
A2A2A2T1	Transformer, Variable RF Mfr 58189, P/N 666231-364	5-31
A2A2A2T2	Transformer, Variable RF Mfr 58189, P/N 666231-365	5-31
A2A2A2T3	Transformer, Variable RF Mfr 58189, P/N 666231-366	5-31

Ref Desig	Name and Description	Fig & Index
A2A2A2T4	Transformer, Variable RF Mfr 58189, P/N 666231-367	5-31
A2A3A1T1	Transformer, Variable, Radio Frequency Mfr 58189, P/N 666231-368	5-28
A2A3A1T2	Transformer, Variable, Radio Frequency Mfr 58189, P/N 666231-369	5-28
A2A3A2R9	Resistor, Mil Type RC07GF471J	5-31
A2A3A2T1	Transformer, Variable, Radio Frequency Mfr 58189, P/N 666231-364	5-31
A2A3A2T2	Transformer, Variable, Radio Frequency Mfr 58189, P/N 666231-365	5-31
A2A3A2T3	Transformer, Variable, Radio Frequency Mfr 58189, P/N 666231-366	5-31
A2A3A2T4	Transformer, Variable, Radio Frequency Mfr 58189, P/N 666231-367	5-31
A2A3A2T5	Transformer, Audio Frequency Mfr 58189, P/N 810000-989	5-31
A2A3A3L1	Transformer, Variable, Radio Frequency Mfr 58189, P/N 666231-750	5-29
A2A3T1	Transformer, Radio Frequency Mfr 58189, P/N 666162-424	5-27
A2A4A2T1	Transformer, Variable RF Mfr 58189, P/N 666230-324	5-50
A2A4A2T2	Transformer, Variable RF Mfr 58189, P/N 666230-352	5-50
A2A4A2T3	Transformer, Variable RF Mfr 58189, P/N 666230-375	5-50
A2A4A2T4	Transformer, Variable RF Mfr 58185, P/N 666230-398	5-50
A2A4A3T1	Transformer, Variable RF Mfr 58189, P/N 666230-325	5-34
A2A4A3T2	Transformer, Variable RF Mfr 58189, P/N 666230-352	5-34
A2A4A3T3	Transformer, Variable RF Mfr 58189, P/N 666230-396	5-34

Ref Desig	Name and Description	Fig & Index
A2A4A3T4	Transformer, Variable RF Mfr 58189, P/N 666230-399	5-34
A2A4A4T1	Transformer, Variable RF Mfr 58189, P/N 666230-326	5-35
A2A4A4T2	Transformer, Variable RF Mfr 58189, P/N 666230-354	5-35
A2A4A4T3	Transformer, Variable RF Mfr 58189, P/N 666230-376	5-35
A2A4A4T4	Transformer, Variable RF Mfr 58189, P/N 666230-400	5-35
A2A4A5T1	Transformer, Variable RF Mfr 58189, P/N 666230-267	5-36
A2A4A5T2	Transformer, Variable RF Mfr 58189, P/N 666230-355	5-36
A2A4A5T3	Transformer, Variable RF Mfr 58189, P/N 666230-377	5-36
A2A4A5T4	Transformer, Variable RF Mfr 58189, P/N 666230-401	5-36
A2A4A6T1	Transformer, Variable RF Mfr 58189, P/N 666230-328	5-37
A2A4A6T2	Transformer, Variable RF Mfr 58189, P/N 666230-356	5-37
A2A4A6T3	Transformer, Variable RF Mfr 58189, P/N 666230-378	5-37
A2A4A6T4	Transformer, Variable RF Mfr 58189, P/N 666230-402	5-37
A2A4A7T1	Transformer, Variable RF Mfr 58189, P/N 666230-329	5-37
A2A4A7T2	Transformer, Variable RF Mfr 58189, P/N 666230-357	5-37
A2A4A7T3	Transformer, Variable RF Mfr 58189, P/N 666230-379	5-37
A2A4A7T4	Transformer, Variable RF Mfr 58189, P/N 666230-403	5-37
A2A4A8T1	Transformer, Variable RF Mfr 58189, P/N 666230-330	5-36

Ref Desig	Name and Description	Fig & Index
A2A4A8T2	Transformer, Variable RF Mfr 58189, P/N 666230-358	5-36
A2A4A8T3	Transformer, Variable RF Mfr 58189, P/N 666230-380	5-36
A2A4A8T4	Transformer, Variable RF Mfr 58189, P/N 666230-404	5-36
A2A4A9T1	Transformer, Variable RF Mfr 58189, P/N 666230-331	5-38
A2A4A9T2	Transformer, Variable RF Mfr 58189, P/N 666230-359	5-38
A2A4A9T3	Transformer, Variable RF Mfr 58189, P/N 666230-381	5-38
A2A4A9T4	Transformer, Variable RF Mfr 58189, P/N 666230-405	5-38
A2A4A10T1	Transformer, Variable RF Mfr 58189, P/N 666230-332	5-39
A2A4A10T2	Transformer, Variable RF Mfr 58189, P/N 666230-360	5-39
A2A4A10T3	Transformer, Variable RF Mfr 58189, P/N 666230-382	5-39
A2A4A10T4	Transformer, Variable RF Mfr 58189, P/N 666230-406	5-39
A2A4A11C5	Capacitor, Fixed Mfr 72136, P/N DM15F1460E0-500V	5-40
A2A4A11T1	Transformer, Variable RF Mfr 58189, P/N 666230-333	5-40
A2A4A11T2	Transformer, Variable RF Mfr 58189, P/N 666230-361	5-40
A2A4A11T3	Transformer, Variable RF Mfr 58189, P/N 666230-383	5-40
A2A4A11T4	Transformer, Variable RF Mfr 58189, P/N 666230-407	5-40
A2A4A12T1	Transformer, Variable RF Mfr 58189, P/N 666230-334	5-41
A2A4A12T2	Transformer, Variable RF Mfr 58189, P/N 666230-362	5-41

Ref Desig	Name and Description	Fig & Index
A2A4A12T3	Transformer, Variable RF Mfr 58189, P/N 666230-384	5-41
A2A4A12T4	Transformer, Variable RF Mfr 58189, P/N 666230-408	5-41
A2A4A13T1	Transformer, Variable RF Mfr 58189, P/N 666230-335	5-41
A2A4A13T2	Transformer, Variable RF Mfr 58189, P/N 666230-363	5-41
A2A4A13T3	Transformer, Variable RF Mfr 58189, P/N 666230-385	5-41
A2A4A13T4	Transformer, Variable RF Mfr 58189, P/N 666230-409	5-41
A2A4A14T1	Transformer, Variable RF Mfr 58189, P/N 666230-336	5-35
A2A4A14T2	Transformer, Variable RF Mfr 58189, P/N 666230-364	5-35
A2A4A14T3	Transformer, Variable RF Mfr 58189, P/N 666230-386	5-35
A2A4A14T4	Transformer, Variable RF Mfr 58189, P/N 666230-410	5-35
A2A4A15T1	Transformer, Variable RF Mfr 58189, P/N 666230-337	5-40
A2A4A15T2	Transformer, Variable RF Mfr 58189, P/N 666230-365	5-40
A2A4A15T3	Transformer, Variable RF Mfr 58189, P/N 666230-387	5-40
A2A4A15T4	Transformer, Variable RF Mfr 58189, P/N 666230-411	5-40
A2A4A16T1	Transformer, Variable RF Mfr 58189, P/N 666230-338	5-40
A2A4A16T2	Transformer, Variable RF Mfr 58189, P/N 666230-366	5-40
A2A4A16T3	Transformer, Variable RF Mfr 58189, P/N 666230-388	5-40

Ref Desig	Name and Description	Fig & Index
A2A4A16T4	Transformer, Variable RF Mfr 58189, P/N 666230-412	5-40
A2A4A17T1	Transformer, Variable RF Mfr 58189, P/N 666230-339	5-42
A2A4A17T2	Transformer, Variable RF Mfr 58189, P/N 666230-367	5-42
A2A4A17T3	Transformer, Variable RF Mfr 58189, P/N 666230-389	5-42
A2A4A17T4	Transformer, Variable RF Mfr 58189, P/N 666230-413	5-42
A2A4A18T1	Transformer, Variable RF Mfr 58189, P/N 666230-340	5-43
A2A4A18T2	Transformer, Variable RF Mfr 58189, P/N 666230-368	5-43
A2A4A18T3	Transformer, Variable RF Mfr 58189, P/N 666230-390	5-43
A2A4A18T4	Transformer, Variable RF Mfr 58189, P/N 666230-414	5-43
A2A4A19T1	Transformer, Variable RF Mfr 58189, P/N 666230-341	5-44
A2A4A19T2	Transformer, Variable RF Mfr 58189, P/N 666230-369	5-44
A2A4A19T3	Transformer, Variable RF Mfr 58189, P/N 666230-397	5-44
A2A4A19T4	Transformer, Variable RF Mfr 58189, P/N 666230-415	5-44
A2A4A20C1	Capacitor, Fixed Mfr 58189, P/N 552169-045	5-45
A2A4A20T1	Transformer, Variable RF Mfr 58189, P/N 666230-314	5-45
A2A4A20T2	Transformer, Variable RF Mfr 58189, P/N 666230-342	5-45
A2A4A20T3	Transformer, Variable RF Mfr 58189, P/N 666230-391	5-45
A2A4A20T4	Transformer, Variable RF Mfr 58189, P/N 666230-416	5-45

Ref Desig	Name and Description	Fig & Index
A2A4A21C1	Capacitor, Fixed Mfr 58189, P/N 552169-041	5-46
A2A4A21C2	Capacitor, Fixed Mfr 72136, P/N DM20F12470E0-300V	5-46
A2A4A21T1	Transformer, Variable RF Mfr 58189, P/N 666230-315	5-46
A2A4A21T2	Transformer, Variable RF Mfr 58189, P/N 666230-343	5-46
A2A4A21T3	Transformer, Variable RF Mfr 58189, P/N 666230-392	5-46
A2A4A21T4	Transformer, Variable RF Mfr 58189, P/N 666230-417	5-46
A2A4A22T1	Transformer, Variable RF Mfr 58189, P/N 666230-316	5-35
A2A4A22T2	Transformer, Variable RF Mfr 58189, P/N 666230-344	5-35
A2A4A22T3	Transformer, Variable RF Mfr 58185, P/N 666230-393	5-35
A2A4A22T4	Transformer, Variable RF Mfr 58189, P/N 666230-418	5-35
A2A4A23T1	Transformer, Variable RF Mfr 58189, P/N 666230-419	5-41
A2A4A23T2	Transformer, Variable RF Mfr 58189, P/N 666230-394	5-41
A2A4A23T3	Transformer, Variable RF Mfr 58189, P/N 666230-345	5-41
A2A4A23T4	Transformer, Variable RF Mfr 58189, P/N 666230-317	5-41
A2A4A24T1	Transformer, Variable RF Mfr 58189, P/N 666230-318	5-47
A2A4A24T2	Transformer, Variable RF Mfr 58189, P/N 666230-346	5-47
A2A4A24T3	Transformer, Variable RF Mfr 58189, P/N 666230-395	5-47

Ref Desig	Name and Description	Fig & Index
A2A4A24T4	Transformer, Variable RF Mfr 58189, P/N 666230-420	5-47
A2A4A25T1	Transformer, Variable RF Mfr 58189, P/N 666230-319	5-48
A2A4A25T2	Transformer, Variable RF Mfr 58189, P/N 666230-347	5-48
A2A4A25T3	Transformer, Variable RF Mfr 58189, P/N 666230-370	5-48
A2A4A25T4	Transformer, Variable RF Mfr 58189, P/N 666230-421	5-48
A2A4A26T1	Transformer, Variable RF Mfr 58189, P/N 666230-320	5-49
A2A4A26T2	Transformer, Variable RF Mfr 58189, P/N 666230-348	5-49
A2A4A26T3	Transformer, Variable RF Mfr 58189, P/N 666230-371	5-49
A2A4A26T4	Transformer, Variable RF Mfr 58189, P/N 666230-422	5-49
A2A4A27T1	Transformer, Variable RF Mfr 58189, P/N 666230-321	5-47
A2A4A27T2	Transformer, Variable RF Mfr 58189, P/N 666230-349	5-47
A2A4A27T3	Transformer, Variable RF Mfr 58189, P/N 666230-372	5-47
A2A4A27T4	Transformer, Variable RF Mfr 58189, P/N 666230-423	5-47
A2A4A27T4	Transformer, Variable RF Mfr 58189, P/N 666230-423	5-47
A2A4A28T1	Transformer, Variable RF Mfr 58189, P/N 666230-227	5-47
A2A4A28T2	Transformer, Variable RF Mfr 58189, P/N 666230-285	5-47
A2A4A28T3	Transformer, Variable RF Mfr 58189, P/N 666230-318	5-47
A2A4A28T4	Transformer, Variable RF Mfr 58189, P/N 666230-322	5-47

Ref Desig	Name and Description	Fig & Index
A2A4A29T1	Transformer, Variable RF Mfr 58189, P/N 666230-323	5-36
A2A4A29T2	Transformer, Variable RF Mfr 58189, P/N 666230-351	5-36
A2A4A29T3	Transformer, Variable RF Mfr 58189, P/N 666230-374	5-36
A2A4A29T4	Transformer, Variable RF Mfr 58189, P/N 666230-425	5-36
A2A4K1	Relay Armature, 3 Amps at 26.5V DC Mfr 02289, P/N WKJ6D26-5VDC	5-32
A2A5A1CR1-CR2	Semiconductor Device, Diode Mfr 80131, P/N 1N816	5-62
A2A5A1L1	Coil, Radio Frequency Mfr 82142, P/N 4422-11M	5-62
A2A5A1T1	Transformer, Radio Frequency Mfr 58189, P/N 666163-067	5-62
A2A5A1T2	Transformer, Radio Frequency Mfr 58189, P/N 666163-066	5-62
A2A5A1T3	Transformer, Radio Frequency Mfr 58189, P/N 666163-065	5-62
A2A5A1T4	Transformer, Radio Frequency Mfr 58189, P/N 666163-064	5-62
A2A5A1T5	Transformer, Radio Frequency Mfr 58189, P/N 666163-063	5-62
A2A5A1T6	Transformer, Radio Frequency Mfr 58189, P/N 666163-062	5-62
A2A5A2T1	Transformer, Audio Frequency Mfr 82068, P/N 666163-056	5-63
A2A5A2T3	Transformer, Radio Frequency Mfr 58189, P/N 666163-068	5-63
A2A5C1	Module Assy, Frequency Standard Mfr 58189, P/N 666231-006	5-61
A2A6 A,B,C,	Translator, Synthesizer Mfr 58189, P/N A00023-001	5-65

Ref Desig	Name and Description	Fig & Index
A2A6A1A1	(OMIT) Switch Assy, Synthesizer Mfr 58189, P/N 666231-126	5-66
A2A6A1A1	(CHANGE) Oscillator, Printed Circuit Board with all components assembled for operation. Mfr 58189, P/N 666230-158	5-67
A2A6A1A1C1 thru A2A6A1A1C17	(OMIT) Capacitor Fixed (etc)	5-69 5-66
A2A6A1A1CR3	(CHANGE) UARICATOR, Fixed Mfr 73293, P/N HC7060B	5-67
A2A6A1A1L2-L3	Coil Radio Frequency Mfr 99800, P/N BP1693	5-67
A2A6A1A2L1	Coil, RF, Mfr 58189,P/N 696011-391	5-68
A2A6A1A2L2	Coil, RF, Mfr 58189, P/N 696011-681	5-68
A2A6A1A2L3	Coil, RF, Mfr 58189, P/N 696011-271	5-68
A2A6A1A2L4	Reactor, Mfr 58189, P/N 810000-545	5-68
A2A6A1A2T1	Transformer, Variable RF Mfr 58189, P/N 666231-902	5-68
A2A6A1A2T2	Transformer, Variable RF Mfr 58189, P/N 666163-903	5-68
A2A6A1A3C15	Capacitor, Fixed 300W VDC Mfr 72136, P/N DM15C100D300V	5-70
A2A6A1A3L1	Coil, RF, Mfr 99800, P/N 696011-013	5-70
A2A6A1A3L2	Coil, RF, Mfr 58189, P/N 666163-348	5-70
A2A6A1A3L3	Reactor, Mfr 14100 , P/N 81000-544	5-70
A2A6A1A3L4	Coil, RF, Mfr 58189, P/N 666163-351	5-70
A2A6A1K1	Relay, Armature 3 Amps Mfr 02289, P/N WKJ0626-5VDC	5-69
A2A6A2A2T1	Transformer, Variable RF Mfr 58189, P/N 666231-905	5-78
A2A6A2A2T2	Transformer, Variable RF Mfr 58189, P/N 666231-906	5-78

Ref Desig	Name and Description	Fig & Index
A2A6A2A2T3	Transformer, Variable RF Mfr 58189, P/N 666163-368	5-78
A2A6A2A3T1	Transformer, Variable RF Mfr 58189, P/N 666231-909	5-72
A2A6A2A3T1	Transformer, Variable RF Mfr 58189, P/N 666163-371	5-72
A2A6A2A3T3	Transformer, Variable RF Mfr 58189, P/N 666163-372	5-72
A2A6A2A3T4	Transformer, Variable RF Mfr 58189, P/N 666163-373	5-72
A2A6A2A4L1	Coil, RF, Mfr 58189, P/N 666163-340	5-76
A2A6A2A4L2	Coil, RF, Mfr 58189, P/N 666163-341	5-76
A2A6A2A4L3	Coil, RF, Mfr 58189, P/N 666163-342	5-76
A2A6A2A4L4	Coil, RF, Mfr 58189, P/N 666163-343	5-76
A2A6A2A4L5	Coil, RF, Mfr 58189, P/N 666163-344	5-76
A2A6A2A4L6	Coil, RF, Mfr 58189, P/N 666273-076	5-76
A2A6A2A4T1	Transformer, Variable RF Mfr 58189, P/N 666163-336	5-76
A2A6A2A4T1	Transformer, Variable RF Mfr 58189, P/N 666163-365	5-76
A2A6A3A2T1	Transformer, Variable RF Mfr 58189, P/N 666231-907	5-83
A2A6A3A3CR7	Semiconductor Device, Diode Mfr 03508, P/N HD6730	5-86
A2A6A3A3L5	Transformer, Coil RF Mfr 58189, P/N 666163-904	5-86
A2A6A3A3L6-L7	Transformer, Coil RF Mfr 58189, P/N 666163-902	5-86
A2A6A3A3T3	Transformer, Variable RF Mfr 58189, P/N 666163-901	5-86
A2A6A3A4C9	Capacitor, Fixed Mfr 72136, P/N DM15E680G300V	5-84
A2A6A3A4T1	Transformer, Radio Frequency Mfr 58189, P/N 666163-369	5-84

Ref Desig	Name and Description	Fig & Index
A2A6A3A4T3	Transformer, RF Mfr 58189, P/N 666163-544	5-84
A2A6A3A4T4	Transformer, RF Mfr 58189, P/N 666163-543	5-84
A2A6A3C26	Capacitor, Fixed Mfr 02777, P/N P052DS	5-81
A2A6A4	Synthesizer, Electrical Frequency-100 CPS, Mfr 58189, P/N A00024-001	5-89
A2A6A4A1	Counter Assembly Preset MFR 58189 , P /N A00050-001	5-92
A2A6A4A1	Mixer Assembly, Printed Circuit Board Mfr 58189, P/N A00058-001	5-90
A2A6A4A1A1	Flip - Flop Module Mfr 58189, P/N A00055-001	5-92
A2A6A4A1A1C1	Capacitor - MIL Type MC70330AK	5-92
A2A6A4A1MC2	Same as 2A2A6A4A1A1C1	5-92
A2A6A4A1A1C3	Same as 2A2A6A4A1A1C1	5-92
A2A6A4A1A1C4	Same as 2A2A6A4A1A1C1	5-92
A2A6A4A1A1CR1	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1A1CR2	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1A1CR3	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1A1CR4	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1A1E1	Printed circuit board Mfr 58189, P/N A00054-001	5-92
A2A6A4A1A1E2	Printed circuit board Mfr 58189, P/N A00053-001	5-92
A2A6A4A1A1Q1	Same as 2A2A6A4A1Q2	5-92
A2A6A4A1A1Q2	Same as 2A2A6A4A1Q2	5-92
A2A6A4A1A1R1	Same as 2A2A6A4A1R7	5-92
A2A6A4A1A1R2	Same as 2A2A6A4A1R7	5-92
A2A6A4A1A1R3	Resistor - MIL Type RC07GF153J	5-92

Ref Desig	Name and Description	Fig & Index
A2A6A4A1A1R4	Same as 2A2A6A4A1A1R3	5-92
A2A6A4A1A1R5	Same as 2A2A6A4A1R5	5-92
A2A6A4A1A1R6	Same as 2A2A6A4A1R5	5-92
A2A6A4A1A2	Same as 2A2A6A4A1A1	5-92
A2A6A4A1A3	Same as 2A2A6A4A1A1	5-92
A2A6A4A1A4	Same as 2A2A6A4A1A1	5-92
A2A6A4A1A5	Same as 2A2A6A4A1A1	5-92
A2A6A4A1A6	Same as 2A2A6A4A1A1	5-92
A2A6A4A1A7	Same as 2A2A6A4A1A1	5-92
A2A6A4A1A8	Same as 2A2A6A4A1A1	5-92
A2A6A4A1A9	Same as 2A2A6A4A1A1	5-92
A2A6A4A1A10	Same as 2A2A6A4A1A1	5-92
A2A6A4A1A11	Same as 2A2A6A4A1A1	5-92
A2A6A4A1A12	Same as 2A2A6A4A1A1	5-92
A2A6A4A1C1	Capacitor - MIL Type CS13AF010M	5-92
A2A6A4A1C2	Same as 2A2A6A4A1C1	5-92
A2A6A4A1C3	Capacitor, Fixed, ceramic dielectric-33 uuf P/M 10%, 100 VDCW. AXIAL wire lead Terminals, 0.260 in. X 0.100 in. dim, Mfr 00656 Type MC-70G330AK	5-92
A2A6A4A1C4	Capacitor - MIL Type CK05W102K	5-92
A2A6A4A1C5	Same as 2A2A6A4A1C3	5-92
A2A6A4A1C6	Capacitor, Fixed, ceramic dielectric, Flat-plate construction, phenolic coating, wax impregnation, radial wire leads, 0.01 uf P/M 20%, 75 VDVW, 0.340 in. X 0.480 in. X 0.125 in., Mfr 72136, P/N SSM- .01-88	
A2A6A4A1C7	Same as 2A2A6A4A1C6	5-92
A2A6A4A1C8	Same as 2A2A6A4A1C6	5-92
A2A6A4A1C9	Same as 2A2A6A4A1C6	5-92

Ref Desig	Name and Description	Fig & Index
A2A6A4A1C10	Same as 2A2A6A4A1C6	5-92
A2A6A4A1C11	Same as 2A2A6A4A1C1	5-92
A2A6A4A1C12	Same as 2A2A6A4A1C3	5-92
A2A6A4A1C13	Capacitor - MIL Type CK05CW271K	5-92
A2A6A4A1CR1	Semi-Conductor device diode MIL-Type Navy 1N3064	5-92
A2A6A4A1CR2	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1CR3	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1CR4	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1CR5	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1CR6	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1CR7	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1CR8	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1CR9	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1CR10	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1CR11	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1CR12	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1CR13	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1CR14	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1CR15	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1CR16	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1CR17	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1CR18	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1CR19	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1CR20	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1CR21	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1CR22	Same as 2A2A6A4A1CR1	5-92

Ref Desig	Name and Description	Fig & Index
A2A6A4A1CR23	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1CR24	Same as 2A2A6A4A1CR1	5-92
A2A6A4A1E1	Printed circuit board. Mfr 58189, P/N A0049-002	5-92
A2A6A4A1Q1	Transistor - MIL Type Navy 2N964A	5-92
A2A6A4A1Q2	Transistor - MIL Type JAN2N706	5-92
A2A6A4A1Q3	Same as 2A2A6A4A1Q2	5-92
A2A6A4AQ4	Same as 2A2A6A4A1Q2	5-92
A2A6A4A1Q5	Same as 2A2A6A4A1Q2	5-92
A2A6A4A1R1	Resistor - MIL Type RC07GF561J	5-92
A2A6A4A1R2	Resistor - MIL Type RC07GF751J	5-92
A2A6A4A1R3	Resistor - MIL Type RC07GF123J	5-92
A2A6A4A1R4	Resistor - MIL Type RC07GF102J	5-92
A2A6A4A1R5	Resistor - MIL Type RC07GF103J	5-92
A2A6A4A1R6	Resistor - MIL Type RC07GF331J	5-92
A2A6A4A1R7	Resistor - MIL Type RC07GF222J	5-92
A2A6A4A1R8	Same as 2A2A6A4A1R1	5-92
A2A6A4A1R9	Resistor - MIL Type RC07GF133J	5-92
A2A6A4A1R10	Same as 2A2A6A4A1R9	5-92
A2A6A4A1R11	Resistor - MIL Type RC07GF562J	5-92
A2A6A4A1R12	Same as 2A2A6A4A1R5	5-92
A2A6A4A1R13	Same as 2A2A6A4A1R5	5-92
A2A6A4A1R14	Resistor - MIL Type RC07GF104J	5-92
A2A6A4A1R15	Resistor - MIL Type RC07GF332J	5-92
A2A6A4A1R16	Same as 2A2A6A4A1R14	5-92
A2A6A4A1R17	Same as 2A2A6A4A1R15	5-92
A2A6A4A1R18	Same as 2A2A6A4A1R14	5-92
A2A6A4A1R19	Same as A2A6A4A1R19	5-92

Ref Desig	Name and Description	Fig & Index
A2A6A4A1R20	Same as 2A2A6A4A1R114	5-92
A2A6A4A1R21	Same as 2A2A6A4A1R11	5-92
A2A6A4A1R22	Same as 2A2A6A4A1R15	5-92
A2A6A4A1R23	Same as 2A2A6A4A1R15	5-92
A2A6A4A1R24	Same as 2A2A6A4A1R15	5-92
A2A6A4A1R25	Same as 2A2A6A4A1R11	5-92
A2A6A4A1R26	Same as 2A2A6A4A1R1	5-92
A2A6A4A1R27	Same as 2A2A6A4A1R7	5-92
A2A6A4A1R28	Same as 2A2A6A4A1R5	5-92
A2A6A4A1R29	Same as 2A2A6A4A1R1	5-92
A2A6A4A1R30	Resistor - MIL Type RC07GF203J	5-92
A2A6A4A1R31	Same as 2A2A6A4A1R5	5-92
A2A6A4A1R32	Resistor - MIL Type RC07GF560J	5-92
A2A6A4A1R33	Same as 2A2A6A4A1R11	5-92
A2A6A4A1R34	Same as 2A2A6A4A1R15	5-92
A2A6A4A1T1	Transformer, Variable RF Mfr 58189, P/N 666231-908	5-90
A2A6A4A1T2	Transformer, Variable RF Mfr 58189, P/N 666231-911	5-90
A2A6A4A1TP1	Terminal, Feed-Thru, Teflon, Terminal brass, 5.5 ampere rating, 750 VRMS, 60CPS, 0.140 in. X 0.093 in. dia. Mfr 98291, P/N FT-MM-16L2 RED	5-92
A2A6A4A2	Oscillator Assembly Mfr 58189, P/N A00061-001	5-90
A2A6A4A2A1	Filter, Audio reject, at, 1KC, and, 2KC, DC resistance, 1120 ohms, 2.22 in. X 0.78 in. X 0.62 in. Mfr 58189, P/N A00064-001	5-90
A2A6A4A2A2	Same as 2A2A6A4A1A1	5-90
A2A6A4A2C1	Capacitor MIL Type CS13AF101M	5-90

Ref Desig	Name and Description	Fig & Index
A2A6A4A2C2	Same as 2A2A6A4A2C1	5-90
A2A6A4A2C3	Capacitor - MIL Type MC70A330AK	5-90
A2A6A4A2C4	Capacitor - MIL Type CS13AFR47M	5-90
A2A6A4A2C5	Capacitor fixed paper, phenolic coating 0.2 MFD, P/M 20%, 200 VDCW, 0.170 in. X 0.260 in. X 0.625 in. Mfr 58189, P/N 666164-914	5-90
A2A6A4A2C6	Same as 2A2A6A4A1C13	5-90
A2A6A4A2C7	Same as 2A2A6A4A1C6	5-90
A2A6A4A2C8	Same as 2A2A6A4A2C1	5-90
A2A6A4A2C9	Same as 2A2A6A4A1C6	5-90
A2A6A4A2C10	Capacitor, Fixed, Film dielectric, hermetically sealed, radial wire lead terminals, 0.047 uf P/M 10%, 50 VDCW, 0.560 in. X 0.575 in. X 0.235 in. Mfr Good-All, Type No. 605	5-90
A2A6A4A2C11	Capacitor - MIL Type WL1-103ELSC	5-90
A2A6A4A2C12	Same as 2A2A6A4A1C6	5-90
A2A6A4A2C13	Capacitor, Fixed, Mica dielectric, 150 uuf, P/M 2%, 300 VDCW, 0.450 in. X 0.358 in. X 0.174 in. Mfr 72136, P/N DM15E150F300V	5-90
A2A6A4A2C14	Capacitor - MIL Type CM05C050K03	5-90
A2A6A4A2C14	Capacitor - MIL Type CM05C060K03	5-90
A2A6A4A2C14	Capacitor - MIL Type CM05C070K03	5-90
A2A6A4A2C14	Capacitor - MIL Type CM05C080K03	5-90
A2A6A4A2C14	Capacitor - MIL Type CM05C100K03	5-90
A2A6A4A2C14	Capacitor - MIL Type CM05C120K03	5-90
A2A6A4A2C14	Capacitor - MIL Type CM05C180K03	5-90
A2A6A4A2C14	Capacitor - MIL Type CM05E200J03	5-90
A2A6A4A2C14	Capacitor - MIL Type CM05E220J03	5-90
A2A6A4A2C14	Capacitor - MIL Type CM05E240J03	5-90

Ref Desig	Name and Description	Fig & Index
A2A6A4A2C14	Capacitor - MIL Type CM05E270G03	5-90
A2A6A4A2C14	Capacitor - MIL Type CM05E300G03	5-90
A2A6A4A2C14	Capacitor - MIL Type CM05E330G03	5-90
A2A6A4A2C14	Capacitor - MIL Type CM05E360G03	5-90
A2A6A4A2C14	Capacitor - MIL Type CM05E390G03	5-90
A2A6A4A2C14	Capacitor - MIL Type CM05E430G03	5-90
A2A6A4A2C14	Capacitor - MIL Type CM05E470G03	5-90
A2A6A4A2C15	Capacitor, Fixed, ceramic dielectric, radial, wire lead terminals, 47 uuf, P/M 20%, 500 VDC, 0.400 in. X 0.200 in. Mfr 72982, P/N 301-S3B-470M	5-90
A2A6A4A2C16	Capacitor - MIL Type CK12AX101K	5-90
A2A6A4A2CR1	Semiconductor device diode, Mfr 58189, P/N 810000-582	5-90
A2A6A4A2CR2	Semiconductor device diode, MIL Type Navy 1N748AM	5-90
A2A6A4A2CR3	Same as 2A2A6A4A1CR1	5-90
A2A6A4A2CR4	Semiconductor device diode MIL Type Navy 1N758A	5-90
A2A6A4A2CR5	Semiconductor device diode, Mfr 58189, P/N 810000-584	5-90
A2A6A4A2CR6	Same as 2A2A6A4A2CR5	5-90
A2A6A4A2CR7	Semiconductor device diode Mfr 58189, P/N 810000-583	5-90
A2A6A4A2CR8	Same as 2A2A6A4A2CR7	5-90
A2A6A4A2CR9	Same as 2A2A6A4A2CR7	5-90
A2A6A4A2E1	Printed circuit board Mfr 58189, P/N A00060-002	
A2A6A4A2L2	Coil, RF, 150000 uh, P/M 20%, DC resistance 750 ohms 0.410 in. X 0.187 in. Mfr 03550, P/N 7875	
A2A6A4A2Q1	Same as 2A2A6A4A1Q2	5-90

Ref Desig	Name and Description	Fig & Index
A2A6A4A2Q2	Same as 2A2A6A4A1Q2	5-90
A2A6A4A2Q3	Same as 2A2A6A4A1Q2	5-90
A2A6A4A2R1	Resistor - MIL Type RC07GF271J	5-90
A2A6A4A2R2	Same as 2A2A6A4A1R1	5-90
A2A6A4A2R3	Same as 2A2A6A4A1R11	5-90
A2A6A4A2R4	Resistor - MIL Type RC07GF202J	5-90
A2A6A4A2R5	Resistor - MIL Type RC07GF132J	5-90
A2A6A4A2R6	Same as 2A2A6A4A1R15	5-90
A2A6A4A2R7	Same as 2A2A6A4A1R5	5-90
A2A6A4A2R8	Resistor - MIL Type RC07GF272J	5-90
A2A6A4A2R9	Resistor - MIL Type RC07GF101J	5-90
A2A6A4A2R11	Same as 2A2A6A4A2R9	5-90
A2A6A4A2R12	Resistor - MIL Type RC07GF333J	5-90
A2A6A4A2R13	Same as 2A2A6A4A2R12	5-90
A2A6A4A2R14	Same as 2A2A6A4A1R1	5-90
A2A6A4A2R15	Resistor - MIL Type RC07GF363J	5-90
A2A6A4A2R16	Resistor - MIL Type RC07GF300J	5-90
A2A6A4A2R17	Resistor - MIL Type RC07GF473J	5-90
A2A6A4A2R18	Resistor - MIL Type RC07GF682J	5-90
A2A6A4A2R19	Resistor - MIL Type RC07GF151J	5-90
A2A6A4A2R20	Resistor - MIL Type RC17GF182J	5-90
A2A6A4A2T1	Transformer	5-90
A2A6A4A2TP1	Terminal, Feed-Thru, Teflon Terminal brass, Mfr 98291, P/N	5-90
A2A6A4A2TP2	Same as 2A2A6A4A2TP1	5-90
A2A6A4A2TP3	Same as 2A2A6A4A2TP1	5-90
A2A6A4A2TP4	Same as 2A2A6A4A2TP1	5-90

Ref Desig	Name and Description	Fig & Index
A2A6A4A3	Mixer assembly 7.1 MC Mfr 58189 P/N A0058-001	5-91
A2A6A4A3C2	Same as 2A2A6A4A1C6	5-91
A2A6A4A3C3	Same as 2A2A6A4A1C6	5-91
A2A6A4A3C4	Same as 2A2A6A4A1C6	5-91
A2A6A4A3C5	Capacitor, fixed, mica dielectric, 10 uuf, P/M 1%, 500 VDCW, 0.450 in. X 0.360 in. X 0.170 in. Mfr 72136, P/N DM15C010F500V	5-91
A2A6A4A3C6	Same as 2A2A6A4A3C5	5-91
A2A6A4A3C7	Same as 2A2A6A4A1C6	5-91
A2A6A4A3C8	Same as 2A2A6A4A1C6	5-91
A2A6A4A3C9	Same as 2A2A6A4A1C6	5-91
A2A6A4A3C10	Same as 2A2A6A4A1C6	5-91
A2A6A4A3C11	Capacitor, Fixed, ceramic dielectric, 430 uuf, P/M 2%, 3.00 VDCW, 0.458 in. X 0.366 in. X 0.193 in. Mfr 72136, P/N DM15E430G300V	5-91
A2A6A4A3C12	Same as 2A2A6A4A1C6	5-91
A2A6A4A3C13	Capacitor - MIL Type CS13AF6R8M	5-91
A2A6A4A3C14	Capacitor - MIL Type CS13AF2R2M	5-91
A2A6A4A3C15	Same as 2A2A6A4A1C1	5-91
A2A6A4A3C16	Same as 2A2A6A4A3C14	5-91
A2A6A4A3C17	Capacitor, Fixed, ceramic dielectric, 4300 uuf, P/M 2%, 100 VDCW, 0.760 in. X 0.525 in. X 0.285 in. Mfr 72136, P/N DM20F43006100V	5-91
A2A6A4A3C18	Same as 2A2A6A4A3C14	5-91
A2A6A4A3C19	Same as 2A2A6A4A1C1	5-91
A2A6A4A3C20	Same as 2A2A6A4A1C1	5-91
A2A6A4A3C21	Same as 2A2A6A4A1C6	5-91
A2A6A4A3C22	Same as 2A2A6A4A1C6	5-91

Ref Desig	Name and Description	Fig & Index
A2A6A4A3E	Printed circuit board Mfr 58189, P/N A00057-002	5-91
A2A6A4A3FL1	Filter, crystal, band pass, center Frequency 7.1 MC, minimum band, 2.200 CPS, 600 ohms impedence, 1.500 in. X 0.750 in. 0.375 in. Mfr 58189, P/N 810001-278	5-91
A2A6A4A3L2	Coil, RF, 1000 uh, P/M 10%. 0.410 in. X 0.187 in. Mfr 99800, P/N 1537-744	5-91
A2A6A4A3Q1	Same as 2A2A6A4A1Q2	5-91
A2A6A4A3Q2	Same as 2A2A6A4A1Q2	5-91
A2A6A4A3Q3	Transistor - MIL Type Navy 2N1142	5-91
A2A6A4A3Q4	Same as 2A2A6A4A1Q2	5-91
A2A6A4A3Q5	Transistor - MIL Type SIG2N1225	5-91
A2A6A4A3R1	Same as 2A2A6A4A1R5	5-91
A2A6A4A3R2	Same as 2A2A6A4A1A1R3	5-91
A2A6A4A3R3	Resistor - MIL Type RC07GF470J	5-91
A2A6A4A3R4	Same as 2A2A6A4A2R17	5-91
A2A6A4A3R5	Same as 2A2A6A4A2R16	5-91
A2A6A4A3R6	Resistor - MIL Type RC07GF621J	5-91
A2A6A4A3R7	Same as 2A2A6A4A3R6	5-91
A2A6A4A3R8	Same as 2A2A6A4A1R5	5-91
A2A6A4A3R9	Same as 2A2A6A4A1A1R3	5-91
A2A6A4A3R10	Same as 2A2A6A4A3R3	5-91
A2A6A4A3R11	Same as 2A2A6A4A1R15	5-91
A2A6A4A3R12	Same as 2A2A6A4A3R3	5-91
A2A6A4A3R13	Resistor - MIL Type RC07GF122J	5-91
A2A6A4A3R14	Same as 2A2A6A4A1R5	5-91
A2A6A4A3R15	Same as 2A2A6A4A1A1R3	5-91

Ref Desig	Name and Description	Fig & Index
A2A6A4A3R16	Resistor, variable, wire wound, 200 ohms, P/M 5%, 1 watt, Mfr 80294, P/N 3280W-1-201	5-91
A2A6A4A3R17	Same as 2A2A6A4A1R7	5-91
A2A6A4A3R18	Same as 2A2A6A4A2R9	5-91
A2A6A4A3R19	Same as 2A2A6A4A1R5	5-91
A2A6A4A3R20	Same as 2A2A6A4A1A1R3	5-91
A2A6A4A3R21	Same as 2A2A6A4A2R9	5-91
A2A6A4A3R22	Resistor - MIL Type RC07GF822J	5-91
A2A6A4A3R23	Same as 2A2A6A4A2R8	5-91
A2A6A4A3R24	Same as 2A2A6A4A3R13	5-91
A2A6A4A3R25	Same as 2A2A6A4A1R5	5-91
A2A6A4A3R26	Resistor - MIL Type RC07GF273J	5-91
A2A6A4A3R27	Same as 2A2A6A4A2R9	5-91
A2A6A4A3R28	Resistor - MIL Type RC07GF471J	5-91
A2A6A4A3R29	Same as 2A2A6A4A1R7	5-91
A2A6A4A3T1	Transformer, radio frequency, for, printed, circuit, mounting, Mfr 58189, P/N 809000-244	5-91
A2A6A4A3T2	Transformer, radio freuqency, for, printed, circuit, mounting, Mfr 58189, P/N 809000-430	5-91
A2A6A4A3TP1	Same as 2A2A6A4A1TP1	5-91
A2A6A4A3TP2	Jack tip, nylon, contacts, beryllium copper, silver plated, 5/16 in. X 3/16 in. Mfr E. F. Johnson, P/N 105-751 white	5-91
A2A6A4A3TP3	Same as 2A2A6A4A1TP1	5-91
A2A6A4A3TP4	Same as 2A2A6A4A3TP2	5-91
A2A6A4A3TP5	Same as 2A2A6A4A1TP1	5-91
A2A6A4A3TP6	Same as 2A2A6A4A1TP1	5-91
A2A6A4P1	Same as 2A2J15	5-89

Ref Desig	Name and Description	Fig & Index
A2A6A5	Spectrum Generator Assy Mfr 58189, P/N A00022-001	5-92
A2A6A5A1J3	Connector, Receptacle, Elect Mfr 14100, P/N 55-9998-078	5-96
A2A6A5A1L2	Coil Radio Frequency Mfr 58189, P/N 666163-353	5-96
A2A6A5A1L5	Transformer, Variable RF Mfr 58189, P/N 666231-901	5-96
A2A6A5A1T1	Transformer, Variable RF Mfr 58189, P/N 666163-354	5-96
A2A6A5A1T2	Transformer, Variable RF Mfr 58189, P/N 666231-900	5-96
A2A6A5A2C7	Capacitor, Fixed 500 WVDC Mfr 72136, P/N CM05F100J03	5-97
A2A6A5A2T1	Transformer, RF Mfr 58189, P/N 666163-358	5-97
A2A6A5A3J2	PROD, TEST Mfr 58189, P/N 696299-014	5-98
A2A6A5A3T1	Transformer, RF Mfr 58189, P/N 666231-140	5-98
A2A6A5A4	PULSE INVERTER, Mfr 58189, P/N A00073-001	5-99
A2A6A5A4C1	Same as A2A6A4A1C1	5-99
A2A6A5A4E1	PRINTED, CIRCUIT BOARD, Mfr 58189 P/N A0072-002	5-99
A2A6A5A4J1	CONNECTOR, RECEPTACAL, 19/32 in. X 0.14 in. Dia., Mfr 98291, P/N 3102	5-99
A2A6A5A4Q1	Same as A2A6A4A1Q2	5-99
A2A6A5A4R1	Same as A2A6A4A2R9	5-99
A2A6A5A4R3	RESISTOR - MIL Type RC07GF362J	5-99
A2A6A5A4R4	Same as A2A6A4A1R5	5-99
A2A6A5A4R5	Same as A2A6A4A1R5	5-99

Ref Desig	Name and Description	Fig & Index
A2A6A6A1J7	PROD TEST Mfr 58189, P/N 696465-513	5-101
A2A6A6A1L9	Coil, Radio Frequency Mfr 82142, P/N 10100-32	5-101
A2A6A6A1R38	Resistor, Mfr 01121, P/N CB5R15	5-101
A2A6A6A1T1	Transformer, Radio Frequency Mfr 58189, P/N 666163-360	5-101
A2A8	Power Supply, Printed Circuit Board Mfr 58189, P/N 666230-755	5-19
A2A11	Vernier and 4 VDC supply Mfr 58189, P/N A00067-001	5-20
A2A11C1	Capacitor - MIL Type CS13AF010M	5-20
A2A11C2	Same as A2A6A4A1C6	5-20
A2A11C3	Same as A2A11C1	5-20
A2A11C4	Same as A2A6A4A2C5	5-20
A2A11CR1	Semiconductor device diode MIL Type, USN 1N748AM	5-20
A2A11CR2	Semiconductor device diode, MIL Type USN 1N746AM	5-20
A2A11E	Printed circuit board Mfr 58189, A00066-002	5-20
A2A11R1	Resistor - MIL Type RC07GF1235	5-20
A2A11R2	Resistor, Variable MIL Type RT22C2P502	5-20
A2A11R3	Resistor MIL Type RC07GF512J	5-20
A2A11R4	Resistor MIL RC20GF102J	
A2A11R5	Resistor MIL Type RC32GF391J	5-20
A2A11R6	Resistor MIL Type RC20GF203J	5-20
A2A11R7	Resistor MIL Type RC20GF475J	5-20
A2R7	Resistor, Variable, linear, precision, wirewound, bushing mounting, 30K ohms, ± 5%, 2.0 watts, Mfr 58189, P/N 810000-561	5-15

Ref Desig	Name and Description	Fig & Index
A2S6	Switch, Vernier, Assembly Mfr 58189, P/N A00010-001	5-15
A2S6A	Switch, section, rotary, wafer, single section, 2 poles, 12 position, 30 degrees between positions Mfr 58189, P/N 810001-216	5-15
A2S6B	Switch, section, rotary, wafer, single section, 2 poles, 12 positions, 30 degrees between positions, Mfr 58189, P/N 810001-217	5-15
A2S6C	Same as A2S6B	5-15