SECTION V
MAINTENANCE

5-1. ALIGNMENT AND ADJUSTMENT PROCEDURE

a. TEST EQUIPMENT AND SPECIAL TOOLS - Test equipment that is needed for each Test/Alignment will be listed as needed.

b. SPECIAL JIGS - There are no special Test Jigs used in the Testing/Alignment of this receiver.

c. ALIGNMENT AND ADJUSTMENT PROCEDURE

(1) Alignment and Adjustment RF Tuner TN-525/FRR

A. Prealignment Instructions

This procedure is designed to align and adjust the circuits of RF Tuner TN 525/FRR. The procedure may be followed sequentially, or individual circuit boards may be adjusted. In the case of individual non-sequential alignments, information is provided as to the other circuit boards which must be aligned and in place. A non inductive alignment tool must be used for all variable indicator alignments. Care should be taken with variable inductor: the slugs are brittle and should not be forced with metal tools. If the unit is bench aligned and not interconnected in a system, the following jacks on the rear apron should be terminated with resistive 50 ohm dummy loads:

J6: 1 mc OUTPUT

J7: 250 KC output

J8: I. F. output

J10: I. F. MONITOR

Stability of internally generated frequencies will depend on the time that power has been applied.

1. List of Applicable Figures:

Schematic Wiring	Figure 5-2 (3 sheets)
Frequency Readout Schematic	Figure 5-8 (2 sheets)

Section or Card	ASSEMBLY NUMBER	ASSY. FIG. SCHEMATIC FIG.
Power Supply (1A2)		5-18
Counter Input-Standard Module 1A1A1		5-10
Phase Detector Driver 1A1A2		5-12
Gate Generator and Counting Register 1A1A4		5-16
Local Oscillator Offset and Band Divider 1A1A3		5-14
Sub-Synthesizer 1A6		5-24
Local Oscillator Divider 1A8		5-28
First Mixer-Amp and First I. F. 1A9		5-30
Second Mixer and I. F. 1A7		5-26
Automatic Freq. Control 1A3		5-20
Phase Detector 1A5		5-22
AC Filter 1A13		5-36

B. Test Equipment Required:

VOM: AN/PSM-4C, or equivalent

Signal Generator: HP-606B, or equivalent (2 required)

Oscilloscope: AN/USM-281A, or equivalent

Frequency Counter: AN/USM-207, or equivalent

RF VTVM: ME-303/U, or equivalent

AC VTVM: AN/USM-106A or equivalent

C. Initial Control Settings:

1. TN-525/FRR

(a) POWER: ON

(b) FUNCTION: LOCAL

(c) RF GAIN: FULLY CCW (AGC)

(d) COUNTER MODE: REC

(e) SILENCER: OFF

(f) BAND SWITCH: (2-4)

(g) METER FUNCTION: RF HIGH

(h) INPUT ATTENUATOR: DOWN (OUT)

(i) TUNE FINE TUNE: NOT SIGNIFICANT AT THIS TIME

2. OTHER LIMITS: All Control Optional

D. Alignment Procedures.

1. Power Supply (1A2) (A4663) (Figure 5-18)

(1. 1) Other Boards Required: NONE

Note: Under normal circumstances it is expected that ordinary fixed items such as attenuator 1A11 and RF tuner/oscillator assembly 1A10 will be fixed in place and connected.

(1. 2) Equipment required:

VOM: AN/PSM-4C, or equivalent

(1. 3) Turn power OFF. Place 1A2 power supply card with extender into proper chassis slot.

(1. 4) Turn R4, R13 and R22 maximum CCW.

(1. 5) Turn power ON.

(1. 6) Connect VOM on +50 volt DC range between TP-3 and TP-2. Adjust R-8 for +24 volts DC.

(1. 7) Connect VOM on +10 volt DC range from TP-6 to TP-5.

(1. 8) Adjust R-17 for +5 volts DC. If +5 volts cannot be obtained, leave R-17 at about mid-range.

(1. 9) Connect VOM on -50 volt DC range from TP-9 to TP-8.

(1. 10) Adjust R26 for -24 volts DC.

(1. 11) Turn power OFF.

(1. 12) Connect VOM on 10 AMP range to TP-3 (+) and TP-2 (-). (Meter switch in +DC position)

(1. 13) Turn power ON.

(1. 14) Adjust R-4 for 750 milliamperes.

(1. 15) Turn power OFF.

(1. 16) Connect VOM on 10 AMP scale to TP-6 (+) and TP-5 (-). (VOM switch in +DC position)

(1. 17) Turn power ON. Adjust R-13 for 1. 5 amperes.

(1. 18) Turn power OFF.

(1. 19) Connect VOM on 100 milliampere DC range, meter switch in (-) position, between TP-9 (+) and TP-8 (-). Turn power ON.

(1. 20) Adjust R-22 for 65 milliamperes.

(1. 21) Turn power OFF. Remove VOM. Return VOM to +DC position.

(1. 22) Turn power ON. Repeat steps 1. 5 through 1. 21. All required voltages and currents should now be obtained.

(1. 23) Turn power OFF. Remove VOM.

(1. 24) Place 1A2 power supply card directly into proper chassis slot.

2. RF Tuner Oscillator 1A10A1: No attempt should be made to align this section. This unit is a non reparable item and must be returned to the factory for work.

3. RF Tuner section:

This section is a non reparable item, which operates in conjunction with oscillator 1A10A1. A functional system test of the RF section is also described in Section 4.

4. Counter input standard module (1A1A1) (A4658) (Figure 5-10)

(4. 1) Other boards required: 1A2.

(4. 2) Equipment required:

VOM: AN/PSM-4C, or equivalent.

Signal Generator: HP 606B or equivalent.

Oscilloscope: AN/USM-281A or equivalent.

Frequency Counter: AN/USM-207 or equivalent.

50 ohm resistor dummy load (BNC)

(4. 3) Turn power OFF. Insert the 1A1A1 card into the A4A3 extender card and insert in the proper chassis slot.

(4. 4) Set counter mode switch to REC, FUNCTION switch to LOCAL, and Bandswitch to 2-4 mcs.

(4. 5) Turn power ON.

(4. 6) Use VOM to check the following DC voltages:

TP-6: +5 VOLTS DC

PIN 2: +5 VOLTS DC

PIN 26: +24 VOLTS DC

(4. 7) Connect scope and counter to TP-4. A 1 mc sine wave at 4 to 6 volts P-P should be displayed.

(4. 8) Connect scope and counter to pin 17, 1A1A1. Turn power OFF. (Unless otherwise indicated, counter means external counter in this procedure.)

(4. 9) Remove 1A8 card. Place A4A1 empty extender card in 1A8 socket. Connect a T connector to the RF output jack of the signal generator. Terminate one arm with a 50 ohm resistive load. With coax cable, connect the other arm of the T to pin 2 of the 1A4A1 extender, with ground load to pin 1. Set the signal generator to 21 mcs, 500 millivolts. Turn power ON.

(4. 10) Adjust the signal generator until the external counter indicates 21. 0000 mcs at pin 17, 1A1A1.

(4. 11) Connect scope and counter to TP-2. A 21. 0000 mc signal, of from 2. 8 to 4. 2 volts P-P, should be observed.

(4. 12) Connect scope and counter to TP-3. A 1. 0500 mc signal, from 3 to 4 volts P-P, should be observed.

(4. 13) Disconnect the scope, counter and signal generator. Disconnect the 50 ohm termination at the signal generator.

(4. 14) Connect the signal generator to the receiver counter input jack on front panel of TN-525/FRR. Set signal generator for 100 KC, 250 millivolts.

(4. 15) Place COUNTER MODE switch in HIGH position.

(4. 16) Connect scope and counter to TP-1. Tune signal generator until the signal at TP-1 is exactly 100 KC. The amplitude will be about 5 volts P-P.

(4. 17) Connect scope and counter to TP-2. A 100 KC signal from 2. 8 to 4. 2 volts P-P, should be displayed.

(4. 18) Connect scope and counter to TP-3. A 5 KC signal at about 3 to 4 volts P-P, should be displayed.

(4. 19) Connect scope and counter to TP-1 and tune the signal generator to 35. 0000 mcs. The signal generator output should be 100 millivolts. The scope amplitude will be about 5 volts P-P.

(4. 20) Connect scope and counter to TP-2, a 35. 0000 mc signal from 2. 8 to 4. 2 volts PP, should be observed.

(4. 21) Connect scope and counter to TP-3. A 1. 7500 mc signal at 3 to 4 volts P-P, should be displayed at TP-3.

(4. 22) Place COUNTER MODE switch in LOW position. A 17. 50000 mc signal at 3 to 4 volts P-P should be displayed at TP-3.

(4. 23) Turn power OFF. Place 1A1A1 card directly into its proper chassis slot.

5. Phase Detector Driver (1A1A2) (A4659) (Figure 5-12)

(5. 1) Other boards required: (1A2)

(5. 2) Equipment required:

VOM: AN/PSM-4C, or equivalent

Signal Generator: HP-606B or equivalent (TWO)

Oscilloscope: AN/USM-281A, or equivalent

Frequency Counter: AN/USM-207 or equivalent

50 ohm resistive dummy load.

(5. 3) Turn power OFF. Insert 1A1A2 card into 1A4A3 extender and insert into proper chassis slot.

(5. 4) Turn power ON. Place FUNCTION switch to LOCAL. Place bandswitch to 2-4 mc position.

(5. 5) With VOM, measure DC voltage at following points:

TP-1: +5 VOLTS DC

TP-7: +24 VOLTS DC

(5. 6) Connect scope and counter to TP-6. (Unless otherwise indicated, "counter" referred to is an external counter.) A 1 mc signal from 6 to 8 volts P-P should be observed.

(5. 7) Place FUNCTION switch to AFC. The signal indicated in step (5. 6) should be observed.

(5. 8) Place FUNCTION switch to SYN. There should be no signal at TP-6.

(5. 9) Place FUNCTION switch to SYN. Connect one signal generator to 1J6 (EXT 1MC IN) on rear apron. Set signal generator to 1 mc, at 0. 5 volts (RMS).

(5. 10) With scope and counter at TP-6, a 1 mc signal from 6 to 8 volts P-P should be observed.

(5. 11) Connect scope and counter to pin F. A 1 mc signal from 5 to 6 volts P-P should be displayed.

(5. 12) Repeat step (5. 11) for pin 10.

(5. 13) Repeat step (5. 11) for pin R.

(5. 14) Disconnect signal generator, scope and counter. Turn power OFF. Insert EMPTY 1A4A1 extender card into 1A8 socket. Turn power ON.

(5. 15) Connect a T connector to the signal generator output. One arm of the T, terminate with a 50 ohm load. From the other arm, connect a cable to pin 2 of the A4A1 extender card, with ground lead to pin 1.

(5. 16) Set signal generator to 29 mc at 0. 5 volts RMS.

(5. 17) Connect scope and counter to TP-2. Adjust signal generator carefully for a 362. 5 KC square wave at TP-2. The amplitude should be between 3 and 4 volts P-P.

(5. 18) Connect scope and counter to TP-3. Negative spikes at 362. 5 KC, about 5 volts P-P should be observed.

(5. 19) Connect scope and counter to pin W. A 362. 5 KC signal, between 0. 6 and 0. 8 volts P-P, should be seen.

(5. 20) Connect a second signal generator to 1J2, (SYN IN) on rear apron of tuner. Set generator for 2. 4 mc, 1. 0 volts RMS.

(5. 21) Connect scope and counter to TP-8 and adjust the signal generator for precisely 2. 40000 mcs at TP-8. The amplitude should be about 4. 0 volts P-P.

(5. 22) Connect scope and counter to TP-9. Rotate the bandswitch as indicated, for the resultant frequencies at TP-9:

BAND SWITCH	FREQUENCY
2-4 mc	2. 40000 mc
4-8 mc	1. 20000 mc
8-16 mc	. 60000 mc
16-32 mc	. 30000 mc

(5. 23) With the bandswitch at 16-32 mc, and both signal generators operating as previously directed, connect scope and counter to TP-11. A 300 KC signal, between 150 and 250 millivolts P-P, should be seen.

(5. 24) Slowly tune signal generator #1 (connected at pin 2 of extender card) lower in frequency until the signal at TP-11 drops sharply in amplitude. Then measure the

the signal generator frequency at that time. It should be approximately 24 mcs.

(5. 25) Turn power OFF. Remove signal generators, scope and counter. Place 1A1A2 card directly into its proper chassis slot.

6. Gate Generator and Counting Register (1A1A4) (A4661) (Figure 5-16)

(6. 1) Other boards required: 1A2, 1A1A1, 1A1A2.

(6. 2) Equipment required:

VOM: AN/PSM-4C, or equivalent

Signal Generator: HP 606B or equivalent

Oscilloscope: AN/USM-281A, or equivalent

Frequency Counter: AN/USM-207 or equivalent

50 ohm resistive load (BNC connector)

(6. 3) Turn power OFF. Insert 1A1A4 into the 1A4A2 and 1A4A3 extender cards and plug into 1A1A4 chassis slot.

(6. 4) Set COUNTER MODE switch to REC. Set FUNCTION switch to LOCAL. Place bandswitch to 2-4 mc position.

(6. 5) Turn power ON.

(6. 6) With VOM, measure DC voltage at TP-6. It should be +5 volts DC.

(6. 7) Connect scope and counter to TP-1. (Unless otherwise indicated, counter will mean external counter.) A 1 mc signal at 1. 5 to 2 volts P-P should be displayed.

(6. 8) Connect signal generator to TP-5, with ground lead to TP-2.

(6. 9) Set signal generator to 300 KC at 0. 5 volts RMS.

(6. 10) Connect scope and counter to TP-5. Tune the signal generator for precisely 300, 000 cycles, as indicated on the counter.

(6. 11) Connect scope and counter to TP-3. Negative spikes, with a 225 millisecond period, at an amplitude of from 3 to 4 volts P-P should be displayed.

(6. 12) Connect scope and counter to TP-4. Positive spikes with a 225 millisecond period, from 3 to 4 volts P-P should be displayed.

(6. 13) The counter readout on front panel of TN-525/FRR should indicate 06. 3600.

(6. 14) Connect scope and counter to TP-5. Tune signal generator for 94. 335 KC, as displayed on the external counter. The counter readout on the front panel of the TN-525/FRR should read 02. 0000.

(6. 15) Slowly and carefully adjust the signal generator frequency while monitoring the readout on the front panel of TN-525/FRR. Begin by watching the 100 cycles digit to insure that it reads out digits 0 to 9 as the signal generator frequency is changed. Check, sequentially, the 1 KC readout, 10 KC readout, 100 KC readout, and the 1 mc readout. Check the 10 mc readout for digits 0 to 3.

(6. 16) Tune the signal generator to display 32. 0000 on the front panel readout. The external counter should read 1, 509, 400 cycles at this time.

(6. 17) Tune power OFF. Place 1A1A4 card directly into its proper chassis slot.

7. Local Oscillator Offset and Band Divider: (1A1A3) (A4660) (Figure 5-14)

(7. 1) Other boards required: 1A2, 1A1A1, 1A1A2, 1A1A4.

(7. 2) Equipment required:

VOM: AN/PSM-4C, or equivalent

Signal Generators: HP 606B or equivalent (TWO)

Oscilloscope: AN/USM-281A, or equivalent

50 ohm resistive load (BNC connector)

FREQUENCY COUNTER:
AN/USM-207 or equivalent

(7. 3) Turn power OFF. Insert 1A1A3 card into the 1A4A2 extender and insert into 1A1A3 chassis slot.

(7. 4) Set COUNTER MODE switch to REC. Set FUNCTION switch to LOCAL. Place bandswitch in 2-4 mc position. Turn power ON.

(7. 5) With VOM, measure the voltage at TP-5. It should be +5 volts DC.

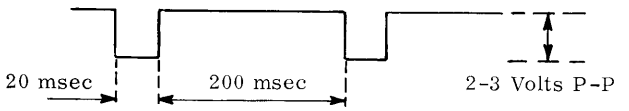
(7. 6) Connect a T connector to the signal generator output. On one T arm, connect the 50 ohm dummy load. Connect the other arm to coax cable with test leads.

(7. 7) Place empty 1A4A1 extender card into the 1A8 socket of tuner TN-511/URR. Connect signal generator to pin 2 with ground lead to pin 1, of extender.

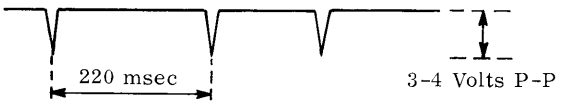
(7. 8) Set signal generator to 21 mcs at at 500 millivolts RMS.

(7. 9) Connect scope and counter to TP-2, 1A1A3. (Unless otherwise indicated, "counter" means external counter.) Observe at TP-2 a square wave at a level of 3 to 4 volts P-P.

(7. 10) Connect scope and counter to TP-1. The following waveform should be observed.



(7. 11) Connect scope and counter to pin M: The following waveform should be observed:



(7. 12) Connect scope and counter to TP-4. In each position of the bandswitch, a signal at about 3 volts P-P should be observed. Leave bandswitch in 2-4 mc position.

(7. 13) Connect scope and counter to TP-2. Carefully adjust the signal generator for 1, 050, 000 cycles. The front panel readout should indicate 02. 0000.

(7. 14) Place bandswitch in 4-8 mc position. The front panel readout should indicate 04. 0000.

(7. 15) Place bandswitch in 8-16 position. The front panel readout should indicate 08. 0000.

(7. 16) Place bandswitch in 16-32 position. The front panel readout should indicate 16. 0000.

(7. 17) Connect the second signal generator to the counter input jack (BNC) on front panel of TN-525/FRR. Set generator for 100 KC, at . 25 volt RMS.

(7. 18) Place COUNTER MODE switch to HIGH. The front panel readout should indicate 00. 1000.

(7. 19) Turn power OFF. Remove test equipment. Place 1A1A3 card directly into its proper chassis slot.

8. Sub-synthesizer (1A6) (A4669) (Figure 5-24)

(8. 1) Other boards required:

A2, (A7 for loading)

(8. 2) Equipment required:

VOM: AN/PSM-4C, or equivalent

Oscilloscope: AN/USM-281A, or equivalent

Frequency Counter: AN/USM-207, or equivalent

Low capacity alignment tool.

(8. 3) Turn power OFF. Place 1A6 card into A4A1 extender and place in proper chassis slot. Turn power ON.

(8. 4) Connect VOM to TP-8. The measurement should be +24 volts DC.

(8. 5) Connect scope and counter to TP-1. A 1 mc signal at about 8 volts P-P, should be observed.

(8. 6) Connect VOM to TP-3 on +50 volts DC scale. With the bandswitch in 2-4 position, the reading should be about +22 volts DC. Change the bandswitch to (4-8) (8-16) and (16-32). The

voltage should drop to zero. Leave the bandswitch at (4-8).

(8.7) Connect the VOM to TP-4. With the bandswitch in (4-8) position the reading should be about +22 volts DC. In all other positions the reading should be zero volts. Leave the bandswitch in (8-16) position.

(8.8) Connect the VOM to TP-5. With the bandswitch in (8-16) position the reading should be about +22 volts. In all other positions the reading should be zero volts. Leave the bandswitch in (16-32) position.

(8.9) Connect the VOM to TP-6. With the bandswitch in (16-32) position the reading should be about +22 volts. In all other positions the reading should be zero volts.

Note: In steps (8.6) through (8.9), under certain circumstances, +22 volts max appear at the appropriate test point in AUTO position of the bandswitch.

(8.10) Place the bandswitch to (2-4) position. Connect the scope and counter to TP-7. A square wave at 500 KC, at about 2.5 volts P-P, should be observed.

(8.11) Connect scope and counter to TP-13. Adjust C-91 for maximum 7 mc signal (4-5 volts P-P).

(8.12) Place bandswitch in (4-8) position. Connect scope and counter to TP-12. A 3 mc signal at 4-5 volts P-P, should be observed.

(8.13) Place bandswitch in (8-16) position. Connect scope and counter to TP-11. Adjust C32 for maximum 5.5 mc signal (4 to 5 volts P-P).

(8.14) Place bandswitch in (16-32 position. Connect scope and counter to TP-10. Adjust C-9 for maximum 10.5 mc signals (4-5 volts P-P).

(8.15) Connect scope and counter to TP-19. Adjust the indicated controls for the desired voltage on the appropriate bandswitch, as indicated below:

BANDSWITCH	CONTROL	FREQUENCY	AMPLITUDE
2-4	R-110	875 KC	2 Volts P-P
4-8	R-79	1.5 MC	2 Volts P-P
8-16	R-45	2.75 MC	2 Volts P-P
16-32	R-20	5.25 MC	1.5 Volts P-P

(8.16) Turn power OFF. Disconnect test equipment. Place 1A6 card directly into its proper chassis slot.

9. Local Oscillator Divider: (1A8) (A4671) (Figure 5-28)

(9.1) Other boards required: A2, (A9 for loading) counter cards 1A1A1, 1A1A2, 1A1A3, 1A1A4.

(9.2) Equipment required:

VOM: AN/PSM-4C, or equivalent

Oscilloscope: AN/USM-281A, or equivalent

RF VTVM: ME-303/U or equivalent

(9.3) Turn power OFF. Insert 1A8 card into riser and plug into proper chassis slot. Turn power ON.

(9.4) With VOM, measure the DC voltage at the following points:

TP3: +24 Volts DC

TP17: +5 Volts DC

(9.5) The front panel readout should be reading the frequency to which the receiver is tuned. Connect RF VTVM to TP-1, ground lead to TP-9. The voltage should be between 0.5 and 1.5 volts RMS.

(9.6) Connect scope and counter to TP-7, ground leads to TP-6. Place bandswitch to (2-4) position. Adjust receiver TUNE control for a reading of 02.0000 on the front panel readout. At TP-7, a signal at 2.625 MC, 1.5 volts P-P, should be displayed.

(9. 7) Place bandswitch to (4-8) position. Connect scope and counter to TP-10, with ground lead to TP-6. Adjust receiver TUNE control for a reading of 04. 0000 on front panel readout. At TP-10 a frequency of 5. 25 MC, 1. 5 volts P-P, should be observed.

(9. 8) Place bandswitch to (8-16) position. Connect scope and counter to TP-16, with ground lead to TP-6. Adjust receiver TUNE control for a reading of 08. 0000 on the front panel readout. At TP-16 a frequency of 10. 5 MC, 1. 5 volts P-P, should be observed.

(9. 9) Place bandswitch to (16-32) position. Adjust receiver TUNE control for a reading of 16. 0000 on front panel readout. Connect scope and counter to TP-20, with ground lead to TP-9. A signal at 21. 0000 MC, 1. 5 volts P-P, should be observed.

(9. 10) Turn power OFF. Remove 1A1A1 counter card, and insert into 1A4A3 extender card. Plug assembly into the 1A1A1 chassis slot. Turn power ON.

(9. 11) Connect external frequency counter to TP-1 of 1A1A1. Place bandswitch to (2-4). Adjust receiver TUNE control for a reading of 02. 0000 on front panel readout. The external counter should read 21. 0000 MC.

(9. 12) Move the receiver TUNE control clockwise so that the front panel readout increases from 02. 0000 to 04. 0000. The external counter should change from 21. 0000 MC to 37. 0000 MC.

Note: At any time, the external counter should read: (FRONT PANEL READOUT X8) +5 MCS.

(9. 13) Without disturbing the final readings at 04. 0000 and 37. 0000 MC, remove the external counter and connect the RF VTVM to TP-2, 1A1A1. Adjust the receiver TUNE control counter-clockwise, decreasing the front panel readout from 04. 0000 to 02. 0000. The RF voltage at TP-2 should remain at approximately 1. 5 volts RMS.

(9. 14) Turn power OFF. Remove test equipment. Insert 1A1A1 and 1A8 cards directly into their proper chassis slots.

10. First Mixer-Amplifier and First IF Amplifier

(1A9) (A4672) (Figure 5-30)

(10. 1) Other boards required:

A2, A7, A8, 1A1A1, 1A1A2, 1A1A3, 1A1A4. (A7 not necessarily aligned)

(10. 2) Equipment required:

VOM: AN/PSM-4C, or equivalent

Oscilloscope: AN/USM-281A, or equivalent

Counter: AN/USM-207 or equivalent

Signal Generator H. P. 606B, or equivalent

VTVM: AN/USM-106A, or equivalent.

(10. 3) Turn power OFF. Place 1A9 card into extender and insert in proper chassis slot. Turn power ON.

(10. 4) With VOM, check DC voltage at TP-1 (TP-7 GND). It should be +24 volts.

(10. 5) Place bandswitch to (2-4) position. Connect scope and counter to TP-2. Adjust TUNE control for 03. 0000 on front panel readout. Adjust R-9 for maximum 3. 625 MC signal (about 1. 5 volts P-P).

(10. 6) Place bandswitch to (4-8) position. Connect scope and counter to TP-4. Adjust TUNE control for 06. 0000 on front panel readout. Adjust R-33 for maximum 7. 25 MC signal (about 1. 5 volts P-P).

(10. 7) Place bandswitch to (8-16) position. Connect scope and counter to TP-10. Adjust receiver TUNE control for 12. 0000 on front panel readout. Adjust R-82 for maximum

14. 5 MC signal (about 1. 5 volts P-P).

(10. 8) Place bandswitch to (16-32) position. Connect scope and counter to TP-8. Adjust TUNE control for 24. 0000 on front panel readout. Adjust R-58 for maximum 29 MC signal (about 1. 0 volt P-P).

(10. 9) Place bandswitch to (2-4) position. Adjust TUNE control for 03. 0000 on front panel readout.

(10. 10) Connect signal generator at 3, 000, 000 cycles, 300 uv, to receiver antenna jack. Connect AN/USM-106A and counter to TP-6.

(10. 11) Adjust L2, L3 for maximum signal. When signal is sufficient to activate external counter, adjust generator for 625 KC at TP-6.

(10. 12) Adjust L2, L3 for maximum 625 KC signal. The signal generator must be carefully adjusted to obtain 625 KC. Use R-24 to adjust the signal amplitude as necessary. Keep the signal amplitude at 40 millivolts (RMS).

(10. 13) Carefully vary the signal generator so that the signal at TP-6 varies from 615 KC to 635 KC (20 KC swing). The signal at TP-6 should remain constant in amplitude. If it does not, repeat steps (10. 12) and (10. 13) making slight alterations in the settings of L2 and L3 until the required specification is met.

(10. 14) Adjust R-24 for 30 millivolts RMS at TP-6.

(10. 15) Set bandswitch to (4-8). Adjust TUNE control for 06. 0000 on front panel readout. Set the signal generator to 6. 000 MCS, 300 uv. Adjust L4 and L5 for maximum signal at TP-6. When signal is sufficient to activate counter, adjust the signal generator for 1, 250, 000 cycles at TP-6.

(10. 16) Adjust L4 and L5 for maximum 1. 25 MC signal at TP-6. Use R47 as necessary to keep the signal amplitude at about 40 millivolts RMS.

(10. 17) Carefully vary the signal generator so that the signal at TP-6 varies from 1. 24 MC to 1. 26 MC. The signal at TP-6 should remain constant in amplitude. If it does not, repeat steps (10. 16) and (10. 17) making slight alterations in the settings of L4 and L5 until the required specification is met.

(10. 18) Adjust R-47 for 30 mv RMS at TP-6.

(10. 19) Set bandswitch to (8-16). Adjust receiver TUNE control for 12 MCS on the front panel readout. Set the signal generator to 12 MCS, 300 uv. Adjust L8 and L9 for maximum signal at TP-6. When the signal is sufficient to activate the counter, adjust the signal generator for 2, 500, 000 cycles at TP-6. Use R-96 to keep amplitude from exceeding 40 millivolts.

(10. 20) Adjust L8, L9 for maximum signal. Carefully vary the signal generator so that the signal at TP-6 varies from 2. 49 MC to 2. 5 MC. The signal at TP-6 should remain constant in amplitude. If it does not, repeat steps (10. 19) and (10. 20), making slight alterations in the settings of L8 and L9 until the required specification is met.

(10. 21) Adjust R96 for 30 millivolts RMS at TP-6.

(10. 22) Set the bandswitch to (16-32). Adjust the TUNE control for 24. 0000 on the front panel readout.

(10. 23) Set the signal generator for 24 MC at 300 uv. Adjust L6 and L7 for maximum signal at TP-6. Use R-72 to control the signal amplitude. When sufficient signal level has been reached to activate the counter, adjust the signal generator for 5, 000, 000 cycles at TP-6.

(10. 24) Adjust L6 and L7 for maximum 5 MC signal at TP-6. Carefully vary the signal generator so that the signal at TP-6 varies from 4. 99 MC to 5. 01 MC. The signal at TP-6 should remain constant. If it does not, repeat steps (10. 23) and (10. 24), making slight alterations in the settings

of L6 and L7 until the required specification is met.

(10. 25) Adjust R-72 for 30 millivolts RMS at TP-6.

(10. 26) Turn power OFF. Insert 1A9 card directly into its proper chassis slot.

11. Second Mixer and I. F.: (1A7) (A4670) (Figure 5-26)

(11. 1) Other boards required:

A2, A6, A8, A9, 1A1A1, 1A1A2, 1A1A3, 1A1A4. (A3 will be utilized later in the procedure)

(11. 2) Equipment required:

VOM: AN/PSM-4C, or equivalent

Oscilloscope: AN/USM-281A, or equivalent

Counter: AN/USM-207, or equivalent

Alignment screwdriver

Signal Generator: HP-606B or equivalent

Note: Very slowly changing AGC and signal voltages are present. When the procedure indicates an unhurried adjustment, WAIT UNTIL AGC AND/OR SIGNAL HAS STABILIZED.

(11. 3) Turn power OFF. Place SILENCER switch to OFF. Insure that RF GAIN control is full CCW (AGC). Place 1A7 card into extender and plug into proper chassis slot. Turn power ON.

(11. 4) With VOM, measure the DC voltages at these points:

TP-5: +24 VOLTS

TP-22: -24 VOLTS

(11. 5) Place bandswitch to 2-4 position. Adjust TUNE control for 03. 0000 on front panel readout.

(11. 6) Connect scope and counter at TP-2. Adjust R-4 for maximum 875 KC signal (2 volts P-P).

(11. 7) Connect a signal generator to the antenna input at 3. 000 MCS, 500 uv.

(11. 8) Connect the VOM on (—) 10 VOLT DC Range to TP-20. Adjust R-106 VERY SLOWLY until the voltage falls to zero on (—) 2. 5 VOLT scale. Remove VOM.

(11. 9) Connect scope and counter to TP-1. Adjust the signal generator for a 250 KC signal at TP-1. The amplitude should be about 100 mv, P-P.

(11. 10) Reduce the signal generator output to 300 uv; this should result in about 84 mv P-P at TP-1. Record the amplitude at TP-1.

(11. 11) Connect scope and counter to TP-3. Readjust R-4 for maximum 250 KC signal (about 50 mv P-P).

(11. 12) Connect scope and counter to TP-4. The signal should be 250 KC, about 35 mv P-P.

(11. 13) Connect scope and counter to TP-6. Adjust R-40, R-33, for maximum 250 KC signal. If the resultant signal exceeds that noted in step (11. 10), adjust R-33 for the voltage recorded in step (11. 10) (about 84 mv P-P).

(11. 14) Throw front panel attenuator switch up and down. In the UP position, the signal at TP-6 should drop 20 db. Leave the attenuator switch down (OUT).

(11. 15) Adjust the signal generator for 250 KC, 100 mv (P-P) at TP-6. The 100 mv P-P at TP-6 should be obtained with 500 uv or less from the signal generator.

(11. 16) SLOWLY, adjust R-106, watching for the AGC action to "GRAB" the 250 KC signal at TP-6. Make this adjustment in small steps. The purpose of this adjustment is to cause the 250 KC signal at TP-6 to finally stabilize at the amplitude obtained in step (11. 10): (about 84 mv P-P).

Note: The 250 KC signal at TP-6 should remain within 4 db of 30 mv RMS (84 mv P-P) when the signal generator output is changed from 500 uv to 30 mv. First, be assured that the signal at TP-6 is 250 KC, 84 mv P-P with 500 uv from the signal generator. Wait for conditions to stabilize, then record the amplitude at TP-6.

EXAMPLE

SIG GEN	TP-6
500 uv	30 mv RMs, 84 mv P-P
30 mv	32 mv RMS, 90 mv P-P

The DB change in this case is +0.9. The maximum allowable signal at TP-6 with 30 mv from the signal generator is 133 mv P-P or 47 mv RMS or +4 DB.

(11.17) Return the signal generator to 500 uv. Turn power OFF. Insert 1A3 board if not already in place. Turn power ON.

(11.18) With scope and counter at TP-6 of 1A7, wait for signal to stabilize at 250 KC, 84 mv P-P. Then turn RF GAIN control maximum clockwise. The signal at TP-6 should be at least ten times 84 mv P-P, or 840 mv P-P. Return the RF GAIN control to maximum CCW position.

(11.19) Connect scope and counter to TP-15 of A7. The signal should be 84 mv, P-P, 250 KC.

(11.20) Connect scope and counter to TP-16 of A7. The signal should be 250 KC, about 200 mv P-P.

(11.21) Turn power OFF. Remove 1A3 card. Turn power ON.

(11.22) With the signal generator at 3 mc, 300 mv, connect scope and counter to TP-6. Adjust the generator for 250 KC at TP-6.

(11.23) Under the conditions of step (11.22) check, with the VOM, the DC voltage at TP-23. It should be -24 volts.

(11.24) SLOWLY adjust R-130 until the voltage at TP-23 falls to zero. (CRITICAL ADJUSTMENT)

(11.25) Decrease the signal generator output to zero. Then slowly increase the signal generator output in very small increments, watching the signal at TP-6 for AGC to "catch up." When the signal level from the generator reaches about 30 mv, the DC voltage at TP-23 should drop to zero.

(11.26) Remove VOM. Set meter function switch to HIGH. Set the signal generator for 3 MC, 300 mv. Then adjust R-131 for full scale reading at "HI" on RF/AFC LEVEL meter.

(11.27) Turn power OFF. Remove test equipment. Insert A7 card directly into its chassis slot.

12. Automatic Frequency Control:

(1A3) (A4664) (Figure 5-20)

(12.1) Other boards required:

A2, A6, A7, A8, A9, 1A1A1, 1A1A2, 1A1A3, 1A1A4

(12.2) Equipment required:

VOM: AN/PSM-4C, or equivalent

Oscilloscope: AN/USM-281A, or equivalent

Counter: AN/USM-207, or equivalent

Alignment screwdriver

Signal Generator: HP-606B, or equivalent

(12.3) Turn power OFF. Insert 1A3 card in extender and plug into proper chassis slot. Turn power ON.

(12.4) Set FUNCTION switch to AFC. Set meter function switch to AFC CARRIER.

(12.5) Locate TWO 47K OHM resistors just below the two right hand relays (R66, R67). Ground the

left side of the upper resistor. In lieu of this arrangement, pin 7 on the card or riser may be grounded. Listen for relay click when grounding.

(12. 6) With VOM, check DC voltages as follows:

a) TP-1: +24V DC

b) TP-19: +10V DC

c) TP-20: -10V DC

(12. 7) Connect scope and counter to TP-6. Adjust R-34 for 250, 000 cycles. Amplitude about . 5V P-P.

(12. 8) Connect scope and counter to TP-7. Signal should be 250 KC, at about . 5V P-P.

(12. 9) Connect scope and counter to TP-8. Adjust T-44, T-1, for maximum 250 KC signal. Then connect scope and counter to TP-3 and adjust R-44 for zero signal. Re-check the signal at TP-8: From 2 to 3 V P-P.

(12. 10) Connect scope and counter to TP-10. Adjust R-57, T-2, for maximum 250 KC signal. Then connect scope and counter to TP-4 and adjust R-57 for zero signal. Re-check signal at TP-10: From 2 to 3 V P-P.

(12. 11) Turn power OFF. Connect ohmmeter on RX1 scale between TP-16 and ground. Adjust R-3 for maximum resistance. Remove ohmmeter. Turn power ON.

(12. 12) Connect a signal generator between TP-16 and ground. Set generator to 250 KC ±10 CYCLES, 100 uv. Connect scope and counter to TP-2. Adjust L2, L3, L4, L5 for maximum signal. Change amplitude of the generator to avoid exceeding . 5V P-P at TP-2.

Note: Connect scope and counter to TP-10 and check frequency of 250, 000 cycles per second; adjust oscillator if necessary.

(12. 13) Remove signal generator from TP-16 and connect to antenna jack at 3. 000 mcs, 10 uv. Adjust receiver TUNE control for 03. 0000 mc on receiver counter. Carefully adjust Receiver Fine Tune Control for a Peak as displayed on scope and for a frequency of 250 KC ±10 CPS at 1V P-P at TP-2.

(12. 14) Reduce the signal generator output to 1 uv. Disregard any apparent noise on the scope at TP-2. Adjust R-78 until RF/ AFC carrier level meter reads between RED and GREEN.

(12. 15) Increase signal generator output to 10 uv. Adjust carefully for 250 KC ±10 CPS at TP-2.

(12. 16) With junction of R-66, R-67 grounded, carefully adjust receiver FINE TUNE control left and right. The phase difference meter should follow in the same direction, dropping back to zero at each extreme of the scale. If this condition is not met, adjust R44 in small increments, repeating the FINE TUNE adjustments after each change in R-44 until the condition is achieved.

(12. 17) Adjust R-57 so that, under the conditions of step (12. 16), the SYNC indicator is ON when the phase difference meter is "ON SCALE" and OUT when the phase differences meter drops back to zero after each extreme excursion to either side.

(12. 18) Disconnect all test equipment. Turn power OFF. Place A3 card directly into its proper chassis slot. Turn power ON. Remove ground from R-66, R-67.

(12. 19) Move receiver FINE TUNE control fully CW. Depress AFC tune switch and adjust receiver TUNE control carefully until RF/AFC meter indicates in the green and the phase difference meter is at center scale. Record receiver counter indication. Release AFC tune switch.

(12. 20) Carefully and slowly, in small increments, move the receiver FINE TUNE control CCW, allowing the phase difference meter to stabilize after each movement, until SYNC lamp goes out. Depress AFC tune switch and record receiver

counter reading. The second reading must be at least 1 KC below the first reading.

(12. 21) Repeat steps 12. 19 and 12. 20 except that the receiver FINE TUNE control should be moved clockwise during the measurements. The second counter reading should be at least 1 KC higher than the first reading.

(12. 22) Turn power OFF. Insert 1A3 card directly into its proper chassis slot.

13. Phase Detector (1A5) (A4668) (Figure 5-22) and AC Filter (1A13) (A4794) (Figures 5-36)

(13. 1) Other boards required: ALL

(13. 2) Equipment required:

VOM: AN/PSM-4C or equivalent

Oscilloscope: AN/USM-281A, or equivalent

Counter: AN/USM-207, or equivalent

Alignment screwdriver

Signal generator: (TWO) HP-606B or equivalent

(13. 3) Turn power OFF. Place 1A5 card into extender and plug into proper chassis slot. Turn power ON.

(13. 4) Assure that all other cards are in place.

(13. 5) Place A5 card on A4A1 extender and place in A5 chassis slot.

(13. 6) Function SW to SYN.

(13. 7) Turn power ON.

(13. 8) With VOM measure DC voltage at TP-1: +24V DC. Turn Function SW to AFC and LOCAL and VOLTAGE at TP-1 in 0. 0V. Return switch to SYN position.

(13. 9) With VOM, measure DC voltage at TP-2: -24V DC.

(13. 10) Connect one signal generator at 1 mc, 1V RMS, to 1J3 at rear of TN-525/FRR. (If an O-1510/URR synthesizer is available, its 1 mc output may be used.) Connect scope and counter to TP-16. A 1 mc signal at 5-6V P-P should be observed.

(13. 11) Connect second signal generator at 1J2 (rear of TN-525/FRR at 1V RMS, 300 KC. (If an O-1510/URR synthesizer is available, its output may be used; if used, the O-1510/URR frequency selectors should be set to 03. 0000 MC.)

(13. 12) Place bandswitch to 2-4 position. Adjust receiver TUNE control for a reading of 03. 0000 mcs on the receiver counter.

(13. 13) Connect scope and counter to TP-4. A 362. 5 KC signal, from . 7 to 1. 0V P-P should be observed.

(13. 14) Connect scope and counter to TP-5. A distorted signal of about 100 mv P-P, at a frequency of about 300 KC, should be observed.

(13. 15) Connect scope and counter to TP-12. A signal at 62. 5 KC, 2. 5V P-P, should be observed.

(13. 16) Adjust receiver TUNE control for a reading of 02. 5000 mcs on receiver counter.

(13. 17) Connect scope and counter to TP-7. Adjust T-3 for maximum 62. 5 KC signal (8V P-P).

(13. 18) Connect scope, DC FUNCTION at 1V per cm, adjust vertical control so that 0. 0V is center, to TP-10, adjust R-20 and a +2. 0V DC and a -2. 0V DC must be observed. The phase difference meter should go full scale to right and left. Adjust R-20 for 0. 0V DC and the phase difference meter should indicate center scale.

(13. 19) Connect scope and counter to TP-11, adjust T-4 and R-61 for maximum amplitude. A frequency of 62. 500 KC at an amplitude of 6-8V P-P.

(13. 20) Tune the receiver for a frequency of 03. 0000 MC on the TN-525/FRR counter.

(13. 21) Remove the cable connected to 1J2.

(13. 22) Connect the scope and counter to TP-6 and adjust R-7 for a dip in the 362. 5 KC signal.

(13. 23) Reconnect signal generator at 300 KC 1V to 1J2 (or O-1510/URR).

(13. 24) With scope and counter at TP-6, adjust R80 for 4V P-P at 62. 5 KC.

(13. 25) Connect scope and counter TP-8 62. 5 KC 4-5V P-P.

(13. 26) Connect scope and counter TP-13 (R61) 62. 5 KC 4-5V P-P.

(13. 27) With receiver at 03. 0000 and 2 signal generators connected, move receiver tune slowly CW then CCW; phase difference meter should follow in some direction, then fall back toward center scale after each extreme. If this condition can be met, carefully adjust receiver tune control for center scale on phase difference meter.

(13. 28) Adjust R64 until sync lamp just lights.

(13. 29) Then perform step 13. 27, adjusting R61 until sync lamp remains ON when phase difference meter drops back toward center after a full excursion to the left or right.

(13. 30) Connect scope (DC function) 1V CM with 0V at center of scope, with receiver on sync, observe 0V at pin 8 of extender card, tune receiver out of sync, observe +1V at pin 8 of extender card.

(13. 31) Connect scope to (scope to 20V/cm) pin 3 or 7 of extender card and observe +24V in sync, 0V out of sync.

(13. 32) Continuity between 1 and 2 on riser card ohmmeter (RX 1) in sync infinity out of sync, ohms.

(13. 33) 1A13 AC FILTER and DC VOLTAGE into 1A10A1C1.

a. Connect scope DC FUNCTION, at 1V/cm to 1A10A1C1.

b. Observe DC voltage at 1A10A1 C1 when HFRR is in SYNC and phase difference meter is center scale.

c. Slowly detune TN-525/FRR CW until phase difference meter indicates in the red on the left. Listen for relay on 1A13 AC filter to energize and de-energize. Record the DC VOLTAGE at 1A10A1C1. It must be greater than +1. 5V DC.

d. Slowly detune TN-525/FRR CCW until phase difference meter indicates in the red on the left. Listen for relay on 1A13 AC filter to energize and de-energize. Record the DC voltage at 1A10A1C1. It must be greater than -1. 5V DC.

(13. 34) Disconnect all test equipment, turn power OFF. Insert 1A5 into chassis.

(2) DEMULTIPLEXER, TD-969/FRR

A. Prealignment Instructions - Refer to the following schematic diagrams and assembly drawings:

Figure 5-38, TD-969/FRR

Figure 5-43, Power Supply 2A1

Figure 5-47, Sub Carrier Generator 2A3

Figure 5-55, I. S. B. IF Cards 2A7, 2A9, 2A11, 2A13

Figure 5-51, Symmetrical I. F. 2A5

Figure 5-53, I. S. B. Audio Cards 2A6, 2A8, 2A10, 2A12

Figure 5-49, Symmetrical Demodular 2A4

Figure 5-45, Monitor, Diversity 2A2

The purpose of this procedure is the complete alignment of the demultiplexer unit or the individual alignment of a particular card or section in that unit. If a complete alignment is required, the procedure should be followed in sequence. The removal of all circuit boards from the chassis should precede complete unit alignment. The boards will be returned to the chassis as they are aligned and/or as required by the procedure. For individual alignment of a particular card, all cards should be removed from the chassis except those specified in "Other boards required" for that particular card. "Other boards required" for the individual alignment of a particular circuit board, must be in place for that alignment and must be themselves, previously aligned.

All variable inductor and transformer alignments must be carried out with a non-inductive alignment tool.

The following steps should precede alignment of the demultiplexer:

1. Remove four screws holding the unit in the cabinet, and pull the unit out of the cabinet until the slide locks click.

2. Remove the top cover to gain access to the circuit boards.

3. Insure that the "Power" switch is in the off position.

4. Remove all circuit boards if a complete alignment is to be done. Remove all boards except those listed in "Other boards required" for individual alignment of a particular boards.

5. Remove all cables on the rear of Unit 2 except: 2J7 (1 Mcs IN), 2J11 (RF METER), 2J2 (POWER) and J19.

B. Test Equipment Required

1. AC Voltmeter, AN/USM-106A
2. Squarewave Generator, SG-299C
3. Oscilloscope, AN/USM-281A
4. Signal Generator, HP-606B
5. Frequency Counter, AN/PSM-207
6. Multimeter (VOM), AN/PSM-4C
7. Resistive Loads
   - (7.1) 50 ohms
   - (7.2) 600 ohms
   - (7.3) 4 ohms

C. Control Positions

1. On the TN-525/FRR
   - (1.1) "Power" switch to on position.
   - (1.2) "Function" switch to SYN position.
2. On the TD-969/FRR
   - (2.1) "Power" switch to off position.
3. On the O-1510/URR
   - (3.1) "Power" switch to on position.
4. On the KY-661/URR
   - (4.1) "Power" switch to off position.
5. On the CV-2521(V)/URC
   - (5.1) "Power" switch to off position.

D. Alignment Procedure

1. POWER SUPPLY (2A1) (A4627) Figure 5-43
   - (1.1) Other boards required: none
   - (1.2) Equipment required: AN/PSM-4A, or equivalent
   - (1.3) Insert 2A1 card into extender and insert in proper chassis slot.
   - (1.4) Set R8, R17, R26 and R35 mid range.
   - (1.5) Set R4, R13, R22 and R31 fully CCW.
   - (1.6) Turn "Power" switch to on position.
   - (1.7) Connect AN/PSM-4A (using 50vdc range) between ground and the following test points, carefully observing polarity on the meter. At each test point adjust the proper control for the indicated voltage as read on the meter.

TEST POINT	VOLTAGE CONTROL	VOLTAGE
TP-3	R8	+24 vdc
TP-6	R17	+15 vdc
TP-9	R26	+5 vdc
TP-12	R35	-24 vdc

   - (1.8) If the voltage cannot be set to its proper value, it may be necessary to turn the associated current limiting control (R4 - +24, R13 - +15, R22 - +5, R31 - -24) slightly CW and then attempt to set the voltage control.
   - (1.9) On the AN/PSM-4A select the proper current scales ("500 MA" or "10 AMPS") and the proper "DC" function (- or +, as required).

(1. 10) Turn "Power" switch to off position and connect meter between ground and the indicated test points.

(1. 11) Turn "Power" switch to on position and adjust the proper control for the indicated current as read on the AN/PSM-4A.

(1. 12) Repeat steps (1. 10) and (1. 11) for each test point.

TEST POINT	CURRENT CONTROL	CURRENT
TP-3	R4	600 MA
TP-6	R13	230 MA
TP-9	R22	180 MA
TP-12	R31	50 MA

(1. 13) Turn "Power" switch to the off position. Remove meter.

(1. 14) Remove 2A1 board and extender card from chassis socket. Return 2A1 to its proper chassis socket.

2. SUB-CARRIER GENERATOR (2A3) (A4629) Figure 5-47

(2. 1) Other boards required: 2A1

(2. 2) Equipment required:

Oscilloscope, AN/USM-281A, or equivalent

Frequency Counter, AN/USM-207, or equivalent

Signal Generator, HP606-B, or equivalent

(2. 3) Insure that the "Power" switch is in the off position, and insert the 2A3 card into extender and plug into proper chassis slot.

(2. 4) Connect "Vertical Sig. Out" of scope to "AC Signal Input" of counter.

(2. 5) Turn "Power" switch to on position.

(2. 6) Connect the scope probe between ground and TP-1. A 1 mcs sine wave at approximately 2. 8 VP-P should be displayed.

(2. 7) Connect the scope probe between ground and TP-2. A 20 usec pulse occurring at a 10 Kc rate should be displayed. The amplitude of the signal should be approximately 6VP-P.

(2. 8) Connect a low capacity scope probe between the junction of L5 and R21 and ground. Peak C11 for maximum level. The 6. 29 mcs signal displayed should be at approximately 10V P-P.

(2. 9) Once again connect scope probe between TP-2 and ground to verify that the pulse rate is still 10 Kc. It may be necessary to readjust C11 slightly to insure the proper waveform at TP-2. Connect scope probe between TP-4 and ground. A 6. 29 Kc signal should be displayed at approximately 1 VP-P.

(2. 10) Connect scope probe between pin 8 and ground. A 250 Kc signal should be displayed at approximately 1 VP-P. Connect scope probe between pin L and ground. A 250 Kc signal should be displayed at approximately 1 VP-P.

(2. 12) With scope probe still connected to pin L, connect jumper between pin A and ground. The 250 Kc signal display should disappear. Set the HP606B signal generator for a frequency of 250 Kc.

(2. 13) Using a T- connect on the "RF output" of the signal generator, connect a 50 ohm load and an output cable.

(2. 14) Connect the signal generator output cable to the 250 Kc input, J-8 on Unit 2.

(2. 15) A 250 Kc signal at approximately 1 VP-P should once again be displayed at pin L. Remove jumper from pin A.

(2. 16) Connect scope probe between TP6 and ground. A 243. 710 Kc signal should be displayed at a minimum level of .5 VP-P.

(2. 17) Connect scope probe between TP7 and ground. A 256. 290 Kc signal should be displayed at a minimum of . 5 VP-P. Remove scope probe and signal generator.

(2. 18) Turn "Power" switch to off position.

(2. 19) Remove 2A3 board and extender card from chassis socket. Return 2A3 board to its proper chassis socket.

3. ISB IF CARDS (2A7, 2A9, 2A11 and 2A13) (A4633) Figure 5-55

(3. 1) Other boards required: A-1

(3. 2) Equipment required:

Signal Generator, HP606A, or equivalent.

AC Voltmeter, AN/USM-106A, or equivalent.

Oscilloscope, AN/USM-281A, or equivalent.

VOM, AN/PSM-4C, or equivalent.

Square Wave Generator, SG-299C, or equivalent.

(3. 3) On the front panel of the TD-969/FRR set the "AGC Source" switches to closed loop (i. e. A1 Source in A1 position, A2 Source in A2 position, etc.).

(3. 4) Place "Mode" switch to "ISB" position. Place all "AGC Time Constant" switches in the "Medium" position.

(3. 5) On the A-7 card adjust R55 fully CW.

(3. 6) On the A-7 card adjust the following controls to mid-range.

(a) R45
(b) R80
(c) R81
(d) R82
(e) R83
(f) R84
(g) R85

(3. 7) Insuring that the "Power" switch is in the off position, insert 2A7 board with extender card into proper chassis socket.

(3. 8) On the Signal Generator connect a T-connector to the "RF Output" and connect a 50 ohm load and an output cable to the T-connector.

(3. 9) Connect Signal Generator output cable to "IF Input", J9 on the TD-969/FRR.

(3. 10) Turn the "Power" switch to on position. Connect AN/PSM-4A VOM (50 vdc scale) between ground and TP14 of A7. Meter should indicate +24 vdc ±10%.

(3. 11) With VOM still connected place "Mode" switch in the following positions:

AM 2. 5Kc
AM 6Kc
CW 2. 5Kc
CW 6Kc

There should be no voltage indicated in these positions.

(3. 12) Place the "Mode" switch to the "ISB" position and disconnect Simpson meter.

(3. 13) Connect Oscilloscope probe between TP5 and ground on A7.

(3. 14) Set the signal generator output level for 30 mv RMS and at a frequency of approximately 250 Kc.

(3. 15) Tune the signal generator to the approximate center of the filter passband under test, as indicated by a sine

wave display on the oscilloscope (level approximately .03 v P-P).

(3.16) Remove scope probe from TP5.

(3.17) Connect AN/USM-106A VTVM probe between TP9 and ground (TP10).

(3.18) Readjust signal generator output level to 60 Micro Volts, and adjust R45 for a level of 90 mV RMS as indicated on the VTVM at TP9.

(3.19) Set the AGC level by adjusting R55 to the point where the output level at TP9 decreases to 80 mV RMS, as indicated on the VTVM.

(3.20) Decrease the signal generator output level to 30 uv RMS. Gradually increase the signal generator output level. As the level is increased, the level at TP9 should also gradually increase. When the input level reaches 60 uv RMS, the level at TP-9 should be holding at 80 mv RMS. The level a TP-9 should remain within 2 db of 80 mv RMS, as the signal generator level is further increased to 100 mv RMS.

(3.21) Repeat step #8 with "AGC Time Constant" switch in the "fast" position and also in the "slow" position.

(3.22) Place 50 ohm load on J3, "B2 IF Output". Connect AN/USM-106A VTVM across 50 ohm load and ground.

(3.23) Output level should be a minimum of 1 mv RMS as indicated on the meter. Disconnect Meter.

(3.24) AGC Time Constant Alignment. The test set up for this alignment is shown with Table 5-1. The test should be carried out in accordance with Table 5-1.

Test of AGC Time Constant Circuits:

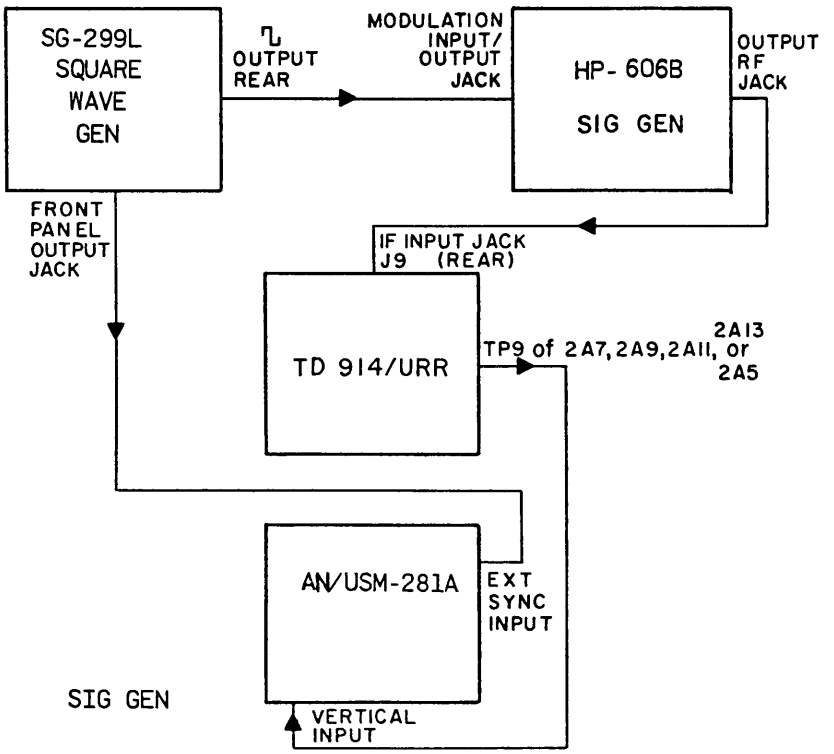


TABLE 5-1. TEST OF AGC TIME CONSTANT CIRCUITS

A. Test Equipment Required:

1. Function Generator Model SG-299L
2. Signal Generator: H. P. 606B, or equivalent.
3. Oscilloscope: AN/USM-281A

B. Preliminary:

1. Function Generator:

   a) With POWER/DIAL MULTIPLIER switch select X1 position.
   b) With MODE switch select the CONT position.
   c) With FUNCTION SELECTOR select the square wave output.
   d) Place OUTPUT ATTENUATOR control full CW.
   e) Place FREQ AZ selector in X1 position.
   f) Place VERNIER in CAL position.
   g) Adjust FREQUENCY DIAL to 1.

2. Hewlett Pachard Model 606 B.

   a) Put range switch in 165-560kc position.
   b) Adjust frequency to approximately 250 kc.
   c) Place MODULATION SELECTOR to EXT DC.
   d) Place ATTENUATOR in . 03V position.
   e) Adjust MODULATION AMPLITUDE control and RF OUTPUT vernier until RF output meter swings between . 3 and 3. Do not heed the % modulation meter.

3. TD-914/URR:

   a) Place all AGC TIME CONSTANT switches to FAST.
   b) Place A1 AGC switch to A1, B1 AGC switch to B1, etc.
   c) Place MODE switch to the ISB position.

C. Test Procedures:

1. Remove external modulating signal from the RF signal generator jack.

2. Tune the signal generator until output frequency of card under test, measured with scope and counter at TP09 15:

   (2. 1) 252 KC for A1
   (2. 2) 255 KC for A2
   (2. 3) 248 KC for B1
   (2. 4) 245 KC for B2
   (2. 5) 250 KC for SYMMETRICAL

   Adjust LINE LEVEL control for channel under test for 0 DBM on line level meter. An audible indication from a monitor speaker may be used

3. Reconnect modulation to HP-606B signal generator.

4. With scope time base, scope sync (+) and scope vertical attenuator controls properly set, the following waveform should be observed

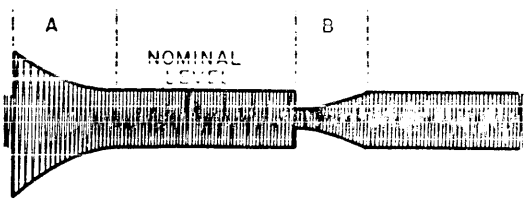
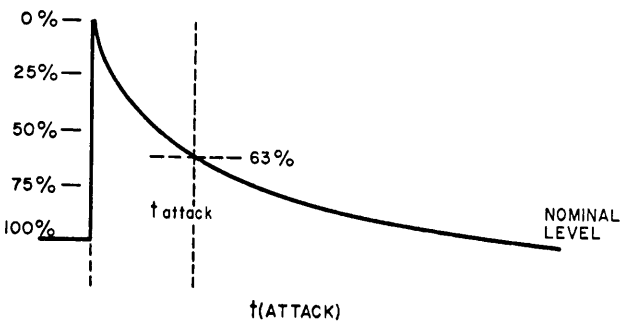


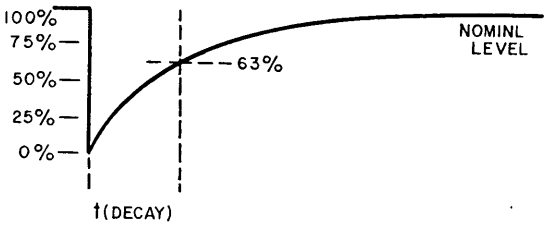
TABLE 5-1. TEST OF AGC TIME CONSTANT CIRCUITS (cont)

5. With scope sync at +, use SYNC, vertical attenuator and vernier, and time base control to expand waveform so that signal during time period A appears as follows:



6. Record the time, t (attack) in milliseconds, for signal to fall from initial peak to about 63%. The time, with Time count out switches on FAST position, should be 20 milliseconds.

7. With scope sync at (-) use sync, vertical attenuator and vernier, and time base control to expand waveform so that signal during time period B appears as follows:



8. Record the time, (t DECAY), in milliseconds, for signal to rise from initial value to about 63%. The time, with time constant switches on FAST position, should be 20 milliseconds.

9. Repeat the tests for medium and SLOW time constant switch positions.

   (1) MEDIUM t attack: 20 ms. t decay: 100 ms.

   (2) SLOW t attack: 40 ms. t decay: 2 seconds.

NOTE:

The function generator frequency may be varied between 1 and 5 cycles, as necessary or convenient.

10. Repeat the tests for the other channels, changing the HP-606B signal generator frequency as required.

(3.25) *Note: If "Attach" time can not be met as in C-6 of table 5-1, the following controls should be adjusted for the following positions of the "AGC Time Constant" switches;

Switch Position	Attach Time Constant Control
"Fast"	R80
"Med."	R83
"Slow"	R85

(3.26) *Note: If "Decay" time can not be met as in step C-8 of table 5-1, the following controls should be adjusted for the following positions of the "AGC Time Constant" switches;

Switch Position	Decay Time Constant Control
"Fast"	R81
"Med."	R82
"Slow"	R84

*Note: A single switch position should be checked at a time (i.e. - "fast", "med", "slow"). The check and adjustment should be made so that both "attack" and "decay" time conditions are met simultaneously in that particular position. Then the test should be performed for the next position.

(3.27) Turn "Power" switch to off position and remove test equipment.

(3.28) Remove 2A7 board and extender card from socket. Return 2A7 card to proper chassis socket.

(3.29) *Complete alignment for 2A9 card is performed by repeating steps 3.1-3.28 for that card.

(3.30) *Complete alignment for 2A11 card is performed by repeating steps 3.1-3.28 for that card.

(3.31) *Complete alignment for 2A13 card is performed by repeating steps 3.1-3.28 for that card.

*Note: The following substitution should be made in step 3.22:

Channel	Card	Jack
B1	2A9	J4
A1	2A11	J5
A2	2A13	J6

4. Symmetrical IF Card (2A5 (A4631) Figure 5-51)

(4.1) Other boards required: A-1

(4.2) Equipment required:

Signal Generator, HP606B, or equivalent.

AC Voltmeter, AN/USM-106A, or equivalent.

Oscilloscope, AN/USM-218A, or equivalent.

VOM, AN/PSM-4A, or equivalent.

(4.3) On the front panel of the TD-969/FRR set the "SYM-B2" "AGC Source" switch in the B2 position.

(4.4) Place "Mode" switch to "AM 2.5KC" position.

(4.5) Place "SYM-B2" "AGC Time Constant" switch in the "Med" position.

(4.6) On the A5 card adjust R68 fully CCW.

(4.7) On the A5 card, adjust the following controls mid-range:

(a) R58
(b) R93
(c) R94
(d) R95
(e) R96
(f) R97
(g) R98

(4.8) Insuring that the "Power" switch is in the off position, insert 2A5 board and extender card in proper chassis socket.

(4.9) On the Signal Generator connect a T-connector to the "RF Output" and an output cable and a 50 ohm load to the T' connector.

(4.10) Connect Signal Generator output to "IF Input", J9 on the TD-969/FRR.

(4.11) "Mode" Switch Operation.

(4.11.1) Connect AN/PSM-4A between ground and pin 13. (+DC, RX1).

(4.11.2) Turn the "Mode" switch through all of its positions.

(4.11.3) The following indications should be read on the meter.

Switch Position	Meter Reading
AM 2.5KC	infinity
AM 6KC	0 ohms
CW 2.5KC	infinity
CW 6KC	0 ohms
ISB	infinity

(4.11.4) Connect AN/PSM-4A meter between ground and TP3 (+DC, RX1).

(4.11.5) Turn the "Mode" switch through all of its positions.

(4.11.6) The following indications should be read on the meter.

Switch Position	Meter Reading
AM 2.5KC	0 ohms
AM 6KC	infinity
CW 2.5KC	0 ohms
CW 6KC	infinity
ISB	infinity

(4.11.7) Connect AN/PSM-4A Meter between ground and TP13 (+DC, 50V scale).

(4.11.8) Turn "Power" switch to "On" position.

(4.11.9) Turn the "Mode" switch through all of its positions.

(4.11.10) The following indications should be read of the Simpson Meter:

Switch Position	Meter Reading
AM 2.5KC	+24 VDC ± 10%
AM 6KC	+24 VDC ± 10%
CW 2.5KC	+24 VDC ± 10%
CW 6KC	+24 VDC ± 10%
ISB	0VDC

(4.11.11) Disconnect Simpson meter.

(4.11.12) Place "Mode" switch in "AM 2.5KC" position.

(4.12) Connect oscilloscope probe between TP4 and ground on 5.

(4.13) Set the signal generator output level for 30 mv RMS and at a frequency of 250 Kc.

(4.14) A sine wave at approximately .13V P-P should be displayed.

(4.15) Remove scope probe from TP4. Connect AN/USM-106A VTVM probe between TP8 and ground (TP9).

(4.16) Readjust signal generator output level to 60 micro volts RMS and adjust R-58 for a level of 90 mV RMS as indicated on the VTVM meter at TP8.

(4.17) Set the AGC level by adjusting R68 to the point where the output level at TP9 decreases to 80 mV RMS as indicated on the VTVM.

(4.18) Decrease the Signal Generator output level to 30 uV RMS. Gradually increase the Signal Generator output level. As the level is increased, the level at TP-8 should also gradually increase. When the input level reaches 60 uV RMS, the level at TP-8 should be holding at 80 mV RMS. The level at TP-8 should remain within 2 db of 80 mV RMS, as the Signal Generator level is further increased to 100 mV RMS.

(4.19) Repeat step #8 with "SYM/B2", "AGC Time Constant" switch in both the "Fast" and "Slow" positions.

(4.20) Repeat step #8 with the "Mode" switch in the "CW 6 KC" position.

(4.21) Connect AS/USM-106A VTVM across 50 ohm load and ground. Output level should be a minimum of 1 mV RMS as indicated on the meter.

(4.22) AGC Time Constant Alignment. Follow procedure in steps (3.24), (3.25) and (3.26) of the procedure.

(4.23) Turn "Power" switch to off position, and remove test equipment.

(4.24) Remove 2A5 board and extender card from chassis socket. Return 2A5 board to proper chassis socket.

5. ISB Audio Cards (2A6, 2A8, 2A10 and 2A12) (A4632) Figure 5-53

(5.1) Other boards required:

for	required
2A6	2A1, 2A7, 2A4, 2A3
2A8	2A1, 2A9, 2A4, 2A3
2A10	2A1, 2A11, 2A4, 2A3
2A12	2A1, 2A13, 2A4, 2A3

(5.2) Equipment required:

Signal Generator, HP606B, or equivalent

AC Voltmeter, AN/USM-106A, or equivalent

Oscilloscope, AN/USM-281A, or equivalent

VOM, AN/PSM-4A, or equivalent

(5.3) On the set the "Mode" switch to "ISB".

(5.4) Set the "AGC Source" switches to closed loop (i.e., A1 Source in A1 position, A2 Source in A2 position).

(5.5) Place all "AGC Time Constant" switches in "Fast" position.

(5.6) Connect a T-connector to the RF output jack of the Signal Generator, and connect an output cable and a 50 ohm load to the T-connector.

(5.7) Connect Signal Generator output to J9, "I.F. In", on the TD-969/FRR.

(5.8) Connect a 600 ohm load across pins E and C of the "Audio Out" jack for the channel card under test and connect pin D to chassis ground.

Channel	Card	Jack Number
B2/SYM	A6	J15
B1	A8	J16
A1	A10	J17
A2	A12	J18

(5.9) Insert extender card in the proper socket of the TD-969/FRR chassis for the channel card under test, and insert the card under test in the extender card socket.

(5.10) Insert the 2A4, Symmetrical Demodulator Card in the 2A4 socket of the TD-969/FRR.

(5.11) Set "Meter Sensitivity" switch to "0" position.

(5.12) Set all "Line Level Adjust" controls fully CCW.

(5.13) Place "Monitor Selector" switch in proper position for channel card under test (A6 - B2 position, A8 - B1 position, A10 - A1 position, and A12 - A2 position).

(5.14) Turn "Power" switch to the "On" position.

(5.15) Connect AN/PSM-4A VOM (+DC, 50V scale) between ground and TP13. Meter should read +24 VDC ±10%. Disconnect VOM. Set Signal Generator frequency to approximately 250 KC.

(5.16) Set Signal Generator output level for 1 mV RMS. Connect Oscilloscope probe between ground and TP3. Level should be at a minimum of .5V P-P as displayed on the scope.

(5.17) Connect Oscilloscope probe between ground and TP-1. Tune Signal Generator to the approximate center of the filter passband being applied to the audio card under test. Level should be approximately .2V P-P as displayed on the scope.

(5.18) Connect scope probe between ground and TP8, and tune the Signal Generator for a sine wave display of approximately 1 KC on the scope.

(5.19) Adjust R26 so that the level at TP8 is 1V P-P as displayed on the scope. Disconnect probe.

(5.20) Connect AN/USM-106A VTVM probe across ground and one end of the 600 ohm load on the proper "Audio Out" jack.

(5.21) Adjust the proper "Line Level Adjust" control for channel under

test until a level of .39 V RMS is indicated on the VTVM. Adjust R48 so that the "Line DBM" meter on Unit 2 reads 0 dbm.

(5.22) Place "Meter Sensitivity" switch in the +10" position.

(5.23) Adjust the "Line Level Adjust" (for the channel under test) until a level of 1.2V RMS is indicated on the AN/USM-106A. "Line DBM" meter on the TD-969/FRR should read 0.

(5.24) Connect scope probe across TP14 and ground. A clean sine wave should be displayed on the scope. Adjust "Line Level Adjust" (for channel under test) until a level of .12V RMS is indicated on the AN/USM-106A meter.

(5.25) Place "Meter Sensitivity" switch in the "-10" position. Meter should read 0.

(5.26) Remove AN/USM-106A probe.

(5.27) Remove scope probe.

(5.28) Turn "Power" switch to off position, and remove test equipment.

(5.29) Remove audio card under test and extender card from chassis socket. Return audio card to proper chassis socket.

(5.30) Test 5 inclusive may be repeated for testing of any or all audio cards (2A6, 2A8, 2A10 or 2A12).

6. Symmetrical Demodulator Card (2A4) (A4630) Figure 5-49

(6.1) Other boards required: All cards except 2A2.

(6.2) Equipment required:

Signal Generator, HP606B, or equivalent

Oscilloscope, AN/USM-281A, or equivalent

Counter, AS/USM-207, or equivalent

VOM, AN/PSM-4A

(6.3) Remove the 2A4 card from the TD-969/FRR chassis.

(6.4) Insert extender card in the 2A4 socket of the TD-969/FRR, and insert 2A4 card in the extender card socket.

(6.5) Set the following controls to mid-range:

(a) R23
(b) R24
(c) R52
(d) R10

(6.6) Connect a T-connector to the RF output of the Signal Generator and a 50 ohm load and output cable to the T-connector.

(6.7) Connect Signal Generator output cable to J9, "I.F. In" on the TD-969/FRR.

(6.8) For "SYM/B2" channel set the "AGC SOURCE" switch to "B2" position, the "AGC TIME CONSTANT" to "MED", and "LINE LEVEL ADJUST" control fully CCW. Set "MODE" switch to "AM 2.5KC" position.

(6.9) Select "SYM" with "Monitor Selector" switch.

(6.10) Connect "Vertical Signal Out" of scope to "AC Signal Input" of Counter.

(6.11) Turn "Power" switch to on position.

(6.12) Connect AN/PSM-4A meter (+DC, 50V scale) between TP-18 on A4 and ground. Meter should read +24 VDC ±10%.

Connect AN/PSM-4A meter (+DC, 50V scale) between TP15 and ground. Rotate the "MODE" switch through all positions. The meter should indicate as follows:

"MODE" Switch Position	Simpson Meter Indication
AM 2.5 KC	+24 VDC ±10%
AM 6 KC	+24 VDC ±10%
CW 2.5 KC	+24 VDC ±10%
CW 6 KC	+24 VDC ±10%
ISB	close to 0 VDC

(6.13) Connect AN/PSM-4A meter between ground and the cathode of DR9. Meter should indicate approximately +12 VDC.

(6.14) Turn "Power" switch to off position.

(6.15) Connect AN/PSM-4A meter (+DC, RX1 scale) between ground and pin N. Rotate the "MODE" switch through all positions. The meter should indicate as follows:

"MODE" Switch Position	Simpson Meter Indication
AM 2.5 KC	0 ohms
AM 6 KC	0 ohms
CW 2.5 KC	infinity
CW 6 KC	infinity
ISB	infinity

(6.16) Connect AN/PSM-4 meter (+DC, RX1 scale) between ground and pin L. Rotate the "MODE" switch through all positions. The meter should indicate as follows:

"MODE" Switch Position	Simpson Meter Indication
AM 2.5 KC	infinity
AM 6 KC	infinity
CW 2.5 KC	0 ohms
CW 6 KC	0 ohms
ISB	infinity

(6.17) Disconnect AN/PSM-4A meter.

(6.18) Turn "Power" switch to on position.

(6.19) BFO Adjustment.

(6.19.1) Connect scope probe to TP8 (Counter should be connected to "Vertical Signal Out" of scope).

(6.19.2) Place "Mode" switch to "CW 2.5 KC" position.

(6.19.3) Rotate "Sync BFO" control fully clockwise ("+ 3 KC") and adjust R23 for a Counter reading of 253.5 KC.

(6.19.4) Rotate "Sync BFO" control fully counter clockwise ("-3 KC") and adjust R24 for Counter reading of 246.5 KC.

(6.19.5) Repeat steps (6.19.3) and (6.19.4) alternately until both frequencies are on within a tolerance of ±500 cps.

(6.19.6) The amplitude of the signal at TP8 should be approximately 8.0 V P-P.

(6.19.7) Remove scope probe.

(6.20) Set the Signal Generator for a frequency of 250 KC and at an amplitude of 30 mv RMS.

(6.21) Connect scope probe between TP1 and ground. A 250 KC sine wave should be displayed at an amplitude of approximately .2 V P-P.

(6.22) Connect scope probe between TP10 and ground. Adjust "Sync BFO" control for a signal of approximately 1 KC.

(6.23) Disconnect scope probe.

(6.24) Connect AN/USM-106A Meter between TP10 and ground and adjust R52 for a level of 420 mv RMS. Remove meter.

(6.25) Set "Meter Sensitivity" switch to "+10".

(6.26) Adjust "Sync B2", "Line Level Adjust" CW until the "Line DBM" meter reads full scale (+2 dbm).

(6.27) Connect AN/USM-106A meter between TP13 and ground.

(6.28) The signal level should be 70 mv RMS ±10%. Remove meter.

(6.29) Place "Mode" switch in "AM 6 KC" position.

(6.30) Modulate the Signal Generator internally with the 1 KC tone at 75%.

(6.31) Connect AN/USM-106A meter between TP10 and ground. Adjust R10 for a level of 410 mv RMS.

(6.32) "Line DBM" meter should be indicating close to full scale.

(6.33) Turn "Sync B2", "Line Adjust" fully CCW. Disconnect AN/USM-106A meter.

(6.34) Turn "Power" switch to off position, and remove test equipment.

(6.35) Remove 2A4 board and extender card from chassis socket, and return 2A4 card to proper chassis socket.

7. Monitor, Diversity (2A2) (A4628) Figure 5-45

(7.1) Other boards required: All cards.

(7.2) Equipment required:

Signal Generator, HP-606B, or equivalent.

Oscilloscope, AN/USM-281A, or equivalent.

VOM, AN/PSM-4A, or equivalent.

(7.3) Meter function switch on the TN-525/FRR should be in "RF Low" position.

(7.4) Preset the following controls on 2A2 to mid-range.

(a) R16
(b) R43
(c) R65
(d) R75
(e) R30
(f) R56
(g) R70

(7.5) Preset the following controls on 2A2 to maximum CW.

(a) R20
(b) R46
(c) R33
(d) R59

(7.6) Insert extender card in the 2A2 socket of the TD-969/FRR and insert the 2A2 card in the extender card socket.

(7.7) Connect a T-connector to the RF output of the Signal Generator, and a 50 ohm load and an output cable to the T-connector.

(7.8) Connect Signal Generator output cable to J9, "I. F. In" on the TD-969/FRR.

(7.9) Connect 4 ohm load across pins B and E of J14 "Speaker".

(7.10) On the TD-969/FRR set all "AGC Source" switches to closed loop (i.e. A1 Source in A1 position, A2 Source in A2 position, etc.).

(7.11) Place all "AGC Time Constant" switches in "Med" position.

(7.12) Set "Local Gain" fully CCW.

(7.13) Place "Mode" switch to "AM 2.5 KC" position.

(7.14) Place "Monitor Selector" switch to "Sym".

(7.15) Set "Meter Sensitivity" switch to "+10" position.

(7.16) Turn "Sym BFO" control maximum CW.

(7.17) All "Line Level Adjust" controls should be set to mid-range.

(7.18) Turn "Power" switch on the TD-969/FRR to on position.

(7.19) Connect AN/PSM-4A meter (+DC, 50 V scale) between TP21 and ground. Meter should read +24 VDC ±10%.

(7.20) Connect AN/PSM-4A meter (+DC, 50V scale) between TP19 and ground. Meter should read +12 VDC ±10%.

(7.21) Connect AN/PSM-4A meter (+DC, 50V scale) between TP3 and ground. Meter should read +15 VDC ±10%.

(7.22) Connect AN/PSM-4A meter (+DC, 50V scale) between TP17 and ground. Meter should read +12 VDC ±10%.

(7.23) Connect AN/PSM-4A meter (-DC, 50V scale) between TP22 and ground. Meter should read -24 VDC ±10%.

(7.24) Connect AN/PSM-4A meter (-DC, 50V scale) between TP20 and ground. Meter should read -12 VDC ±10%.

(7.25) Disconnect AN/PSM-4A meter.

(7.26) Set Signal Generator to a frequency of 250 KC and internally modulate the Signal Generator with 1000 cps tone at 75%.

(7.27) Set Signal Generator output for an amplitude of 30 mV RMS.

(7.28) Connect scope probe to TP1 on A2 card and adjust "Local Gain" control for a signal at 500 mv P-P.

(7.29) Connect scope probe between TP2 and ground. A sine wave should be displayed at approximately 4.4 V P-P.

(7.30) Connect scope probe between TP4 and ground. A sine wave should be displayed at approximately 4.4 V P-P.

(7.31) Connect scope probe across 4 ohm load (ground lead of probe on pin B of J14, "Speaker"). Adjust "Local Gain" control for an output of 5.6 V P-P (2 V RMS) on the scope. A sine wave should be displayed.

(7.32) Remove internal modulation from the Signal Generator by placing it in the CW mode.

(7.33) On Unit 2 place the "MODE" switch in the "CW 6 KC" position.

(7.34) Adjust "Local Gain" for an output of 5.6 V P-P as displayed on the Scope. A sine wave should be displayed.

(7.35) Place "Mode" switch in "ISB" position and "Monitor Selector" in "B2" position.

(7.36) Tune signal generator for an output signal as indicated on the scope (still connected across load on the speaker jack).

(7.37) Adjust "Local Gain" for an output of 5.6 V P-P. A sine wave should be displayed on the scope.

(7.38) Repeat steps 7.35, 7.36, and 7.37 for channels B1, A1, and A2. Remove scope probe.

(7.39) Set the Signal Generator level to 1 mV RMS and to an approximate frequency of 250 KC.

(7.40) With the "Mode" switch still set in "ISB" and the "Monitor Selector" in the "A-2" position, tune the Signal Generator for an output in the A-2 Channel by monitoring the "Line DBM" meter, on the TD-969/FRR. ("Line Level Adjust" and "Meter Sensitivity" switch should be used as required).

(7.41) Adjust R75 on the A2 card so that "RF/AFC Level Meter" on the TN-525/FRR reads slightly higher than mid-scale.

(7.42) Increase the Signal Generator output 10 db. The "RF/AFC Level Meter" should be slightly adjusted and steps 22 through 25 repeated until the "RF Level Meter" does indicate an approximate increase of 10 db.

(7.43) With the Signal Generator level set to 1 mV, adjust R75 so that the "RF/AFC Level Meter" reads 20 db above 1 uV.

(7.44) Select "CW 2.5 KC" with the "Mode" switch, select "Sym" with the "Monitor Selector" switch, and place "Sym BFO" mid-range.

(7.45) Tune the Signal Generator for an output in the approximate center of the symmetrical channel, by monitoring the "Line DBM" meter on the TD-969/FRR ("Line Level Adjust" and "Meter Sensitivity" switch should be used as required.

(7.46) Adjust R65 for 20 db above 1 uV as indicated on the "RF/AFC Level Meter".

(7.47) Turn "Power" switch to off position, and remove all test equipment.

(7.48) Remove 2A2 board and extender card from chassis socket and return 2A2 card to proper chassis socket.

(7.49) Reconnect the TD-969/FRR into the system.

(3) REFERENCE GENERATOR 0-1510/URR

A. Pre-alignment Instructions - Refer to the following diagrams:

Figure 5-59, 0-1510/URR

Figure 5-64, Power Supply 3A2

Figure 5-66, 1MC Distribution 3A3

Figure 5-68, 1 MC Selector 3A4

Figure 5-70, 100 KC Selector 3A5

Figure 5-72, Matrix Distributor 3A6, 3A7

Figure 5-74, Matrix Distributor 3A8

Figure 5-75, Mixer Amplifier 3A9, 3A10, 3A11

Figure 5-78, Mixer Amplifier 3A12

Figure 5-80, Final Mixer/Output 3A13

Component locations, controls, adjustments and other important data will be found on assembly drawings.

The purpose of the alignment section is the adjustment, tuning and peaking of the entire reference generator or any particular section. It is anticipated that the technician will have isolated trouble by means of the Functional Test Data and Servicing Block Diagrams in Section 4 of this manual. In any case, this procedure may be used to completely align a reference generator or to align a reference generator or to align and/or check individual cards. If a complete alignment is desired, follow the procedure in sequence. If an individual board is to be aligned, simply follow the directions for that particular section. Each particular section names the circuit boards for that generator which must be in place and aligned. If all boards are in place and aligned, this cautionary mention may be disregarded.

Observe polarity with the extender card. As the technician faces the front panel, numbers on the extender card are on the right, letters on the left. Only the 3A2 card components face right. On all other cards in the 0-1510/URR the components face left.

All variable inductor and transformer alignments must be carried out with a non-inductive alignment tool. Extreme care should be taken with variable inductor slugs, which are brittle.

Absolute stability and accuracy of internally generated frequencies will depend on time allowed for warmup of the internal 1 mc standard. For absolute measurements of phase comparison of the 1 mc standard, a 24 hour warmup period is required. For general alignment, a 1/2 hour warmup period will suffice.

Insert 50 ohm dummy load terminators in J3, J4, J6 and J7 whenever the 3A13 board is inserted and the 0-1510/URR drawer is "bench" aligned away from the receiver and not interconnected with it.

B. Test Equipment and Tools Required - This paragraph lists all test equipments required for a complete alignment. Each section of the alignment procedure lists the particular equipment and tools required for alignment of that section.

(1) VOM: AN/PSM-4C, or equivalent.

(2) Oscilloscope: AN/USM-281A, or equivalent.

(3) Frequency Counter: AN/USM-207, or equivalent.

(4) Signal Generator: HP-606B, or equivalent.

(5) Non-inductive alignment tool.

C. Initial Control Settings - Covered in alignment procedures.

D. Alignment Procedure

1. Power Supply (3A2) (A4687) Figure 5-64

(1.1) Other boards required: None

(1.2) Equipment required: AN/PSM-4A, or equivalent.

(1.3) Turn power switch to OFF. Insert 3A2 card into extender and insert in proper chassis slot.

(1.4) Set R4, R13, R22 fully CCW.

(1.5) Set R7, R16, R25 to approximately mid position.

(1.6) Connect VOM to TP-2 on +50 volt DC range.

(1.7) Turn power on.

(1.8) Adjust R7 for +25 volts DC.

(1.9) Connect the VOM to TP-5.

(1.10) Adjust R-16 for +16 volts DC.

(1.11) Connect the VOM to TP-8 on +10 volts DC range.

(1.12) Adjust R25 for +5.4 volts DC if no other cards are inserted. If all other cards are inserted, adjust R25 for +5 volts DC.

(1.13) Turn power OFF.

(1.14) Connect the (+) leads of the VOM to TP-2, the (-) lead to TP-3. Set the meter for 10 AMP function.

(1.15) Turn power ON.

(1.16) Adjust R4 for 800 ma.

(1.17) Turn power OFF.

(1.18) Connect (+) lead of VOM to TP-8 and (-) lead to TP-9, with meter set for 10 AMP function.

(1.19) Turn power ON.

(1.20) Adjust R22 for 1.3 amperes.

(1.21) Turn power OFF.

(1.22) Insert A2 board into the chassis, removing the extender card and VOM.

2. One MC Distribution Card (3A3) (A4688) Figure 5-66

(2.1) Other boards required: A2

(2.2) Equipment required:

Oscilloscope, AN/USM-281A, or equivalent.

Frequency Counter, AN/USM-207, or equivalent.

Signal Generator, HP-606B, or equivalent.

Non-inductive alignment tool.

(2.3) Turn power OFF.

(2.4) Insert 3A3 card into extender and plug into proper chassis slot.

(2.5) Turn power ON.

(2.6) Connect scope and counter to TP-2. A 1 MC sine wave from 2.8 to 4.0 volts P-P, should be observed.

(2.7) Remove scope and counter. Turn power OFF.

(2.8) Remove 3A3 temporarily from the extender. Carefully insulate pin 2 with thin electrical tape. Re-insert 3A3 into extender. Turn power ON.

(2.9) Connect signal generator to the left side of the 47 ohm resistor at pin 2 of 3A3. Set the generator to 1 MC ±10 cycles. Connect the scope and counter to TP-2. The signal generator level should be 700 mv (RMS). This corresponds to 2 volts (P-P) on the oscilloscope.

(2.10) Adjust R76 until the INTERNAL standard lamp just lights.

(2.11) Slowly increase the signal generator output. The INTERNAL alarm light should extinguish at approximately 725 mv from the generator.

(2.12) Turn power OFF. Remove tape from pin 2. Disconnect signal generator, scope and counter. Remove 3A3 card into extender. Turn power ON. INTERNAL alarm lamp should be out.

(2.13) Connect signal generator to J5 signal generator to J5 (1 MC EXTERNAL INPUT). Connect scope and counter to TP-1. Adjust generator for 1 MC and 10 cps, 700 mv (RMS).

(2.14) Adjust R61 until EXTERNAL alarm lamp just goes out. (about 650 mv from generator).

(2.15) With signal generator at 1 mc ±10 cps, set PHASE COMPARATOR/FREQUENCY DIFFERENCE switch to FREQUENCY DIFFERENCE.

(2.16) Adjust R30 so that front panel meter oscillates about center scale.

(2.17) With signal generator at 1 mc ±5 cps, adjust R37 so that meter excursions just reach the RED. Readjust R30 as necessary to keep the swing symmetrical about center scale.

(2.18) Move the signal generator about 50 cps from 1 mc. The meter needle should rest near center scale.

(2.19) Connect VOM on +10 volt DC range to TP-8. Adjust R48 for +4.5v.

(2.20) Disconnect the signal generator from J5.

(2.21) Connect VOM on +10v DC range to TP-21. Adjust R56 for +4.5v DC. Remove VOM.

(2.22) Connect scope and counter to TP-14. A 1 mc rectangular waveform at about 2.5v P-P, should be observed.

(2.23) Connect the scope and counter to TP-23. Adjust L-11 for maximum 1 mc sine wave, (about 1.5v P-P).

(2.24) Connect the scope and counter to TP-15. Adjust R89 for 2.8v (P-P) 1 mc signal.

(2.25) Verify with the scope and counter that a 1 mc sine wave is present at TP-16 and TP-17 (about 1.5v P-P).

(2.26) Remove test equipment. Turn power OFF. Remove the 3A3 card from the extender and place it directly into its proper chassis slot.

3. 1 MC Harmonic Generator (3A4) (A4689) Figure 5-68

(3.1) Other boards required: A2, A3.

(3.2) Equipment required:

Oscilloscope, AN/USM-281A, or equivalent.

VOM, AN/PSM-4C, or equivalent.

Frequency Counter, AN/USM-207, or equivalent.

Non Inductive alignment tool.

(3.3) Turn power OFF.

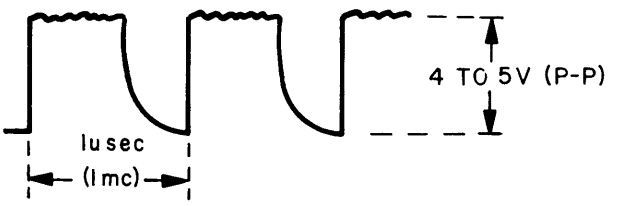
(3.4) Insert 3A4 card with extender into proper chassis slot.

(3.5) Turn power ON.

(3.6) Make the following DC voltage measurements:

TP-1	+15 v DC
TP-3	+ 5 v DC

(3.7) Connect the scope and counter to TP-5. The following waveform should be observed:



(3.8) Connect scope and counter to TP-6. Adjust L3, L4 for maximum 11 mc signal. (0.7-1.0v P-P).

(3.9) Connect scope and counter to TP-12. Adjust L19, L20 for maximum 17 mc signal. (1.0-1.5 v P-P).

(3.10) Connect scope and counter to TP-11. Adjust L16, L17 for maximum 16 mc signal. (1.0-1.5v P-P).

(3.11) Connect scope and counter to TP-9. Adjust L9, L10 for maximum 10mc signal. (1.0-1.5v P-P).

(3.12) Connect scope and counter to TP-10. Adjust L13, L14 for maximum 12 mc signal. (1.0-1.5 v P-P).

(3.13) Connect scope and counter to TP-8. A sine wave of amplitude 0.6-1.5v (P-P), should be observed, as follows:

10 mc Selector	Frequency
0	3 mc
1	4 mc
2	5 mc
3	6 mc

(3.14) Connect scope and counter to TP-13. Adjust L5, L6 for maximum 14 mc signal. (1.5-2.0v P-P).

(3.15) Connect scope and counter to TP-7. A clean sine wave, amplitude 0.5-1.0v P-P should be observed, at 1.4 mc.

(3.16) Remove test equipment. Turn power OFF. Insert 3A4 card directly into proper chassis slot.

4. 100 KC Spectrum Generator (3A5) (A4690) Figure 5-70

(4.1) Other boards required: A2, A3

(4.2) Equipment required:

VOM, Model AN/PSM-4C, or equivalent.

Oscilloscope, AN/USM-281A, or equivalent.

Frequency Counter, AN/USM-207, or equivalent.

Non inductive alignment tool.

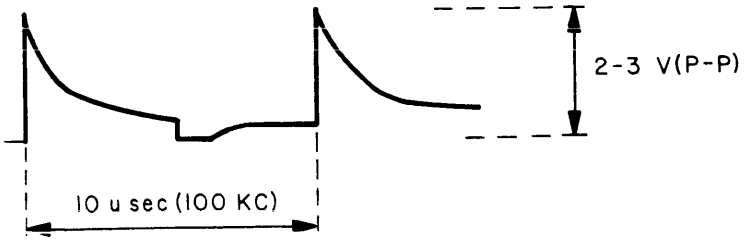
(4.3) Turn power OFF.

(4.4) Insert 3A5 board with extender in proper chassis slot.

(4.5) Turn power ON.

(4.6) With VOM, measure the voltage at TP-2. It should be +15v DC.

(4.7) Connect scope and counter to TP-5. The following waveform should be observed:



(4.8) Connect the scope and counter to the test points indicated below, tuning the designated inductors for maximum signal. The amplitude should be between approximately 0.8 and 1.8 volts P-P.

Test Point	Adjust	Frequency
6	L3, L4	16.2 mc
7	L5, L6	16.6 mc
8	L7, L8	16.9 mc
9	L9, L10	16.4 mc
10	L11, L12	16.1 mc
11	L13, L14	16.5 mc
12	L15, L16	16.8 mc
13	L17, L18	16.3 mc
14	L19, L20	16.7 mc

(4.9) Disconnect test equipment. Turn power OFF. Insert 3A5 card directly into its proper chassis slot.

5. .1KC and 1KC Frequency Selection Matrix (3A6) (A4691) Figure 5-72

(5.1) Other boards required: A2, A3, A4, A5

(5.2) Equipment required:

VOM, AN/PSM-4C, or equivalent.

Oscilloscope, AN/USM-281A, or equivalent.

Frequency Counter, AN/USM-207, or equivalent.

(5.3) Turn power OFF.

(5.4) Insert 3A6 board with extender into proper chassis slot.

(5.5) Turn power ON.

(5.6) With VOM, measure the DC voltage at TP-1. It should be +5 volts DC.

(5.7) Connect scope and counter to TP-3. Rotate the .1 kc selector switch through its ten positions and observe the frequencies listed below. The minimum allowable amplitude in any position is approximately 1.5v P-P.

.1 KC Switch Position	Frequency
0	16.0 mc
1	16.1 mc
2	16.2 mc
3	16.3 mc
4	16.4 mc
5	16.5 mc
6	16.6 mc
7	16.7 mc
8	16.8 mc
9	16.9 mc

(Leave the .1KG selector in position "0".)

(5.8) Connect the scope and counter to TP-4. Rotate the 1 KC selector switch through its ten positions, observing the frequencies indicated below. The minimum allowable amplitude is approximately 1.5v P-P.

1 KC Switch Position	Frequency
0	16.0 mc
1	16.1 mc

1 KC Switch Position	Frequency
2	16.2 mc
3	16.3 mc
4	16.4 mc
5	16.5 mc
6	16.6 mc
7	16.7 mc
8	16.8 mc
9	16.9 mc

(Leave the 1 KC selector in position "0".)

(5.9) Turn power OFF. Remove scope and counter. Insert 3A6 card directly into proper chassis slot.

6. 10 KC and 100 KC Frequency Selection Matrix (3A7) (A4691) Figure 5-72

Note: 3A7 and 3A6 are identical and interchangeable.

(6.1) Other boards required: A2, A3, A4, A5

(6.2) Equipment required:

VOM, AN/PSM-4C, or equivalent

Oscilloscope, AN/USM-281A, or equivalent.

Frequency Counter, AN/USM-207, or equivalent.

(6.3) Turn power OFF.

(6.4) Insert 3A7 card into extender and plug into proper chassis slot.

(6.5) Turn power ON.

(6.6) Measure, with VOM, the voltage at TP-1. It should be +5 volts DC.

(6.7) Connect scope and counter to TP-3. Rotate the 100 KC selector switch through its ten positions, and observe the frequencies indicated below. Minimum amplitude is approximately 1.5v P-P.

100 KC Switch Position	Frequency
0	16.0 mc
1	16.1 mc
2	16.2 mc
3	16.3 mc
4	16.4 mc
5	16.5 mc
6	16.6 mc
7	16.7 mc
8	16.8 mc
9	16.9 mc

(Leave the 100 KC switch in position "0".)

(6.8) Connect the scope and counter to TP-4. Rotate the 10 KC selector switch through its ten positions and observe the frequencies indicated below. Minimum amplitude is approximately 1.5v P-P.

10 KC Switch Position	Frequency
0	16.0 mc
1	16.1 mc
2	16.2 mc
3	16.3 mc
4	16.4 mc
5	16.5 mc
6	16.6 mc
7	16.7 mc
8	16.8 mc
9	16.9 mc

(Leave the 10 KC switch in position "0".)

(6.9) Turn power OFF. Disconnect test equipment. Insert 3A7 card directly into proper chassis slot.

7. 1 MC Frequency Selection Matrix (3A8) (A4692) Figure 5-75

(7.1) Other boards required: A2, A3, A4, A5.

(7.2) Equipment required:

VOM, AN/PSM-4C, or equivalent.

Oscilloscope, AN/USM-281A, or equivalent.

Frequency Counter, AN/USM-207, or equivalent

(7.3) Turn power OFF.

(7.4) Insert 3A8 card into extender and insert into proper chassis slot.

(7.5) Turn power ON.

(7.6) Measure the DC voltage at TP-3. It should be +5 volts.

(7.7) Measure the DC voltage at extender card pin "D". It should be +15 volts.

(7.8) Connect scope and counter to TP-1. Rotate the 1 mc selector switch through its ten positions, observing the frequencies indicated below. The minimum required amplitude in each case is 0.45 volts P-P.

1 MC Switch Position	Frequency
0	17.0 mc
1	16.9 mc
2	16.8 mc
3	16.7 mc
4	16.6 mc
5	16.5 mc
6	16.4 mc
7	16.3 mc
8	16.2 mc
9	16.1 mc

(Leave the 1 mc switch in position "0").

(7.9) Remove test equipment. Turn power OFF. Insert 3A8 card directly into proper chassis slot.

8. Basic Amplifier-Mixer (3A9) (A4693) Figure 5-76

(8.1) Other boards required: A2, A3, A4, A5, A6.

(8.2) Equipment required:

VOM, AN/PSM-4C, or equivalent.

Oscilloscope, AN/USM-281A, or equivalent.

Frequency Counter, AN/USM-207, or equivalent.

Signal Generator, HP-606B, or equivalent.

Non-inductive tuning tool.

(8.3) Turn power OFF.

(8.4) Insert 3A9 card with extender into proper chassis slot.

(8.5) Turn power ON.

(8.6) With VOM measure DC voltage as follows:

TP-1: +15 volts DC
TP-2: +5 volts DC

(8.7) Connect scope and counter to TP-3. Adjust R1 for maximum signal. It should be 1.4 mc, 0.5 to 1.0 volts P-P.

(8.8) Connect scope and counter to TP-4. Adjust L1 for maximum 1.4 mc signal. (about 1.0 volts P-P).

(8.9) Adjust R1 for minimum signal at TP-4.

(8.10) Connect scope and counter to TP-5. Adjust R13 for maximum 11.0 mc signal. (1.0-1.5 volts P-P).

(8.11) Connect scope and counter to TP-15. Adjust L5 and R11 for maximum 11 mc signal. (about 1.0-1.5 volts P-P).

(8.12) Adjust R13 for zero signal at TP-15.

(8.13) Connect a signal generator at 12.4 mcs from TP-6 to TP-22.

Set the generator output initially at 50,000 microvolts. In no case exceed 100,000 microvolts.

(8.14) Connect scope and counter, (highest sensitivity), from TP-8 to TP-21.

(8.15) Adjust carefully and slowly the following components, in the order indicated, for maximum 12.4 mc signal at TP-8: R37, R26, L2, C78, L3, L4. Initially, the signal amplitude may be extremely small. As signal increases, reduce the signal generator output to keep the signal amplitude at TP-8 at about 0.5 volts P-P. Readjust L2, C78, L3, L4 at least twice. Disconnect signal generator from TP-6.

(8.16) Connect scope and counter to TP-4. Adjust R1 for 0.6 volts P-P, 1.4 mc, at TP-4.

(8.17) Connect scope and counter to TP-15. Adjust R13 for .35 volts P-P, 11 mc, at TP-15.

(8.18) Connect scope and counter to TP-8. Adjust T1, C11, C78, L2, L3, L4, R37, R11 for maximum 12.4 mc signal at TP-8.

(8.19) Repeat adjustment of T1, C11, C78, L2, L3 and L4 twice. Signal amplitude should be about 1.5 volts P-P.

(8.20) Adjust R11 for a dip in signal amplitude at TP-8. This is a small dip. If the pot has 360^{O} rotation, do not adjust for zero signal. After dip, signal should be in excess of 1.2 volts P-P.

(8.21) Adjust R26 for zero signal at TP-8.

(8.22) Connect scope and counter to TP-23. Adjust R47 for maximum 1.6 mc signal at TP-23. (At least 1.0 volts P-P). Then adjust R-47 for zero signal at TP-23.

(8.23) Connect a signal generator at 14 mc, 100,000 microvolts, between TP-11 and TP-18. Connect scope and counter to TP-14.

(8.24) Adjust, in order, R56, R37, L6, C79, L7, L8 for maximum 14 mc signal. Reduce signal generator output as necessary to prevent exceeding 0.5 volts P-P at TP-14.

(8.25) Remove signal generator. Connect scope and counter to TP-8. Adjust R26 for 1.2 volts P-P at 12.4 mcs.

(8.26) Connect scope and counter to TP-23. Adjust R47 for 0.8 volts P-P, 1.6 mcs.

(8.27) Connect scope and counter to TP-14. Adjust R37, T2, C3, C79, L6, L7, L8, twice. The signal at TP-14 should be about 1.0 volts P-P.

(8.28) Adjust R37 for a dip in the signal at TP-14. The dip will be small. If the pot has 360^{O} rotation, do not adjust for zero signal.

(8.29) Adjust R56 for 0.8 volts P-P at TP-14.

(8.30) Connect scope and counter to TP-13. Signal should be 0.8 volts P-P, 1.4 mcs.

(8.31) Remove test equipment. Turn power OFF. Insert 3A9 card directly into proper chassis slot.

9. Basic Amplifier-Mixer (3A10)

Use the same procedure as for 3A9 except that the following boards are required: A2, A3, A4, A5, A6, A9.

Have 100 KC, 10 KC, 1 KC and .1 KC selector switches in position "0".

10. Basic Amplifier-Mixer (3A11)

Use the same procedure as for 3A9, 3A10, except that the following boards are required: A2, A3, A4, A5, A6, A7, A9, A10.

Have 100 KC, 10 KC, 1 KC and .1 KC selector switches in position "0".

11. Basic Mixer-Amplifier (3A12) (A4694) Figure 5-78

Use the same procedure as for 3A9, 3A10, 3A11, except that:

(1) Output at TP-13 will be 14 mcs.

(2) Boards required are: A2, A3, A4, A5, A6, A7, A9, A10, A11.

12. Final Mixer and Output Card (3A13) (A4695) Figure 5-80

(12.1) Other board required: ALL

(12.2) Equipment required:

Four 50 ohm dummy loads, (BNC) connected at J3, J4, J6, J7.

VOM, AN/PSM-4C, or equivalent.

Oscilloscope, AN/USM-281A, or equivalent.

Frequency Counter, AN/USM-207, or equivalent.

Non-inductive tuning tool.

(12.3) Turn power OFF. Insert 3A13 into proper chassis slot with extender card. Turn power ON.

(12.4) Turn all frequency selectors to "0".

(12.5) With VOM, measure the DC voltage at the following test points:

TP-1: +15 volts DC
TP-3: +25 volts DC
TP-4: +5 volts DC

(12.6) Connect VOM to TP-17 on +30 volts DC range. Turn 10 mc switch to 3. Adjust R80 for +18 volts DC. Leave VOM at TP-17.

(12.7) Turn 10 mc switch to 0. Adjust R86 for +4 volts DC.

(12.8) Repeat steps 6 and 7 until the prescribed voltage are obtained as the 10 mc switch is moved from 0 to 3.

(12.9) Connect scope and counter to TP-5. Adjust R1 for maximum signal. (.5-10 volts P-P).

(12.10) Connect scope and counter to TP-6. Signal should be about 1.0 volts P-P, with frequency as follows:

10 MC SWITCH	FREQUENCY
0	3 mc
1	4 mc
2	5 mc
3	6 mc

(12.11) Adjust R1 for 0.4 volts P-P on the lowest signal amplitude obtained at the 10 mc switch is related through its four numbered positions.

(12.12) Connect scope and counter to TP-7. Adjust R66 for maximum 14 mc signal. (About 1.0 volts P-P). Turn .1 KC, 10 KC and 100 KC selector to "9". Signal at TP-7 should increase to 14.09999 mc. Leave all frequency selectors at "0".

(12.13) Connect scope and counter to TP-8. Adjust R12 and L2 for maximum 14 mc signal. (More than 1.5 volts P-P).

(12.14) Adjust R66 for 1.5 volts P-P, 14 mc, at TP-8.

(12.15) Turn 10 mc selector to "3" (6 mc). Connect scope and counter to TP-9, highest sensitivity. Adjust T1, L3, R12, for maximum 20 mc signal.

(12.16) Connect scope and counter to TP-10. Adjust R20, L4, L5 for maximum 20 mc signal.

(12.17) Repeat adjustments of T1, L3, L4, L5.

(12.18) Turn 10 mc selector to "0" (3 mc).

(12.19) Connect VOM ON +10 volt DC range to TP-17. Leave scope and counter at TP-10.

(12.20) Adjust R86 slightly for maximum signal at TP-10. The VOM should read about +3.75 volts. Remove the VOM.

(12.21) Adjust C15, C16, C30, C31 for maximum 17 mc signal at TP-10.

(12.22) With 10 mc selector at "3", peak T1, L3, L4, L5. With

10 mc selector at ' 0", peak C15, C16, C31. Repeat until optimum amplitude has been reached in both positions.

(12.23) Connect VOM to TP-17, on +10 volt DC range. Turn 10 mc selector to "1". If 18 mc signal at TP-10 is not equal to amplitudes obtained in switch positions 0 and 3, adjust R85 for maximum signal. The voltage at TP-17 should be about +6.3 volts DC.

(12.24) Turn 10 mc selector to "2". If 19 mc signal at TP-10 is not equal to signal amplitudes obtained in positions 0, 1, 3, adjust R87 for maximum 19 mc signal. The voltage at TP-17 should be about +11.0 volts DC.

Note: The signal amplitude at TP-10 in 10 mc selector positions 0, 1, 2, 3, should be about 1.0 volt P-P.

(12.25) Adjust R12 for a dip (not zero) in the output signal. The dip is very small, and will appear near the point of maximum amplitude.

(12.26) Set front panel selectors to 00.0000. Connect scope and counter to TP-11 (16 mc). Adjust R88 for maximum signal.

(12.27) Move the 1 mc selector through its ten positions; the amplitude should be at least 0.6 volts P-P and the frequency should be as follows:

1 MC SWITCH	FREQUENCY
0	17.0 mc
1	16.9 mc
2	16.8 mc
3	16.7 mc
4	16.6 mc
5	16.5 mc
6	16.4 mc
7	16.3 mc
8	16.2 mc
9	16.1 mc

(12.28) Connect scope and counter to TP-12. Adjust R88 for a signal level of 150 mv P-P. The signal is not expected to be "clean" at this point.

(12.29) Connect scope and counter to TP-14. A clean sine wave in the range 200 KC to 3.2 mc should be observed, at an amplitude of about 1 volt P-P. The frequency at this point is 1/10 of the frequency indicated by the front panel selectors. For example:

FRONT PANEL	FREQUENCY: TP-14:
02.0000	200 KC
05.200	520 KC
10.9999	1.09999 MC
32.0000	3.2000 MC

Note: The range of the unit exceeds in actuality the range of 200 KC-3.2 MC. This procedure is concerned only with the range indicated.

(12.30) Connect scope and counter to TP-15. Adjust R63 for a clean sine wave, in the range .2 to 3.2 mc, at 2.8 volts P-P.

(12.31) Connect scope and counter to TP-16. A clean sine wave, in the range .2-3.2 mc, should be observed. (2.8 volts P-P).

(12.32) Set front panel selectors to 02.0000. Output frequency should be 200,000 cycles.

(12.33) Set front panel selectors to 10.0000. Output frequency should be 1,000,000 cycles.

(12.34) Move the .1 KC, 1 KC, 10 KC, 100 KC selectors in order, to position 9. The output should change in steps to 1,999,990 cycles.

(12.35) Set the front panel selectors to 31,0000. Output frequency should be 3,100,000 cycles. Move the .1 KC, 1 KC, 10 KC selectors, to 31.9999. The output should step to 3,199,990 cycles.

(12.36) Insert 3A13 card directly into proper chassis slot.

(12.37) Turn power OFF.

(4) COMMAND SIGNAL DECODER, KY-661/URR

A. Prealignment Instructions - Refer to the following diagrams:

Figure 5-83, RY-661/URR

Figure 5-108, 4A13 Power Supply

Figure 5-96, 4A5 Stepping Switch Gating Circuit

Figure 5-92, 4A3 Bit Shift Register

Remove the four screws holding the unit in the cabinet and pull it out of the cabinet until the slide locks click.

Remove the top cover to gain access to the Printed Circuit boards.

Before making the only two adjustments in the unit, the Power Supply voltage will be checked first.

There are two adjustments to be made:

1. The readback (clock) timing generator: The timing in milliseconds will depend upon the Baud rate being used in the system. 74.2 Baud is standard causing the pulses out of the timing generator to be 13.5 milliseconds.

2. The fault time delay: The time delay is started as soon as the system drops out of syn which puts a ground connection to the time delay circuit. Refer to figure 4-6.

B. Test Equipment Required

Frequency Counter, AN/USM 207

Multimeter AN/PSM-4C

C. Control Positions

Power switch to ON.

D. Alignment Procedure

1. 4A13 Power Supply Check, Figure 5-108

With the AN/PSM-4C check the voltages listed below on the noted subassembly test points. Be careful to observe polarity on the meter. All voltages will be ±10%.

A12	-30 volts DC
A13	-12 volts DC +12 volts DC
A14	+28 volts DC +5.0 volts DC

2. 4A5 Fault Time Delay Adjustment, Figure 5-96

Turn power switch OFF.

Pull A5 out of its socket and place on a extender card and replace into its socket.

Connect one of a jumper wire to ground.

Turn power switch ON.

Connect the other end of jumper to Printed Circuit board pin "Y" and observe the time it takes for the fault to light. This time should be approximately 20 seconds from the time the ground is applied. If this is to be observed again leave the jumper connected and push the fault lamp to reset the circuit and observe the time from the pushing of the lamp. If necessary adjust 4A5R5 to set time delay to 20 seconds.

Turn power switch OFF.

Remove jumper and extender card. Replace A5.

3. 4A3 Time Generator (clock) Adjustment, Figure 5-92

Connect frequency counter to 4A3TP-2 and observe the time of clock. Adjust 4A3R1 so that counter indicates 27.0 milliseconds ±0.2 milliseconds.

Remove counter.

Replace top cover on unit.

Depress slide fastening buttons and push unit into the cabinet being careful that cable retraction is taking place properly.

Replace 4 screws to hold unit in cabinet.

(5) SIGNAL DATA CONVERTER STORER, CV-2520(V)/URC

A. Pre-alignment Instructions - Refer to the following schematic and assembly drawings:

Figure 5-113, CV-2520(V)/URC

Figure 5-118, 5A1, Isolation Keyer

Figure 5-120, 5A2, Clock Timing Ckt.

Figure 5-130, 5A10, Power Supply

Remove the four screws holding the unit in the cabinet, and pull out unit from cabinet until the slide locks click.

Remove top cover to gain access to the Printed Circuit boards.

When using the extender card, it should be placed in the chassis sockets so that the test points on the extender card face toward the front panel of the unit. Only then will the test point identification coincide with the pin numbers and letters of the printed circuit boards.

The timing in milliseconds for this unit will depend upon the Baud rate being used in the system. The 74.2 Baud is standard, causing the pulses out of the timing generator of this unit to be 13.5 milliseconds. This standard will be used in the alignment and adjustment procedure. The Teletypewriter used should be compatible to this standard and should be connected as shown in figures 4-10 and 4-10A.

B. Test Equipment Required

Oscilloscope, AN/USM-281A

Frequency Counter, AN/USM-207

Multimeter (VOM), AN/PSM-4C

Teletypewriter, TT-176/UG

DC Loop Supply

C. Control Positions

Set "Power" switch in the on position.

D. Alignment Procedure

(All steps in this procedure should be followed in a sequential order).

1. Power Supply Check (5A10) (A4549) Figure 5-130

(1.1) Using the AN/PSM-4C check the following power supply voltages at the corresponding test points, so marked on the 5A10 circuit board. Be careful to observe polarity on the meter. Voltages should be ±10%.

+12 V
-12 V
-27 V

(1.2) Set "Power" switch to off position. With AN/USM-281A in DC function, connect scope probe to "DC RESET" test point. Set "Power" switch to on position observing oscilloscope screen. Observed DC reset level should rise to approximately +3DC and then fall and remain at approximately -5 V DC.

(1.3) Disconnect test equipment and set "Power" switch to off position.

2. Isolation Keyer (5A1) (A4494) Figure 5-118

(2.1) Remove A-2 from socket, place on extender card and return to socket.

(2.2) Set 5A1R4 fully counterclockwise.

(2.3) Externally trigger Oscilloscope, AN/USM-281A, with signal on pin 12 of 5A1.

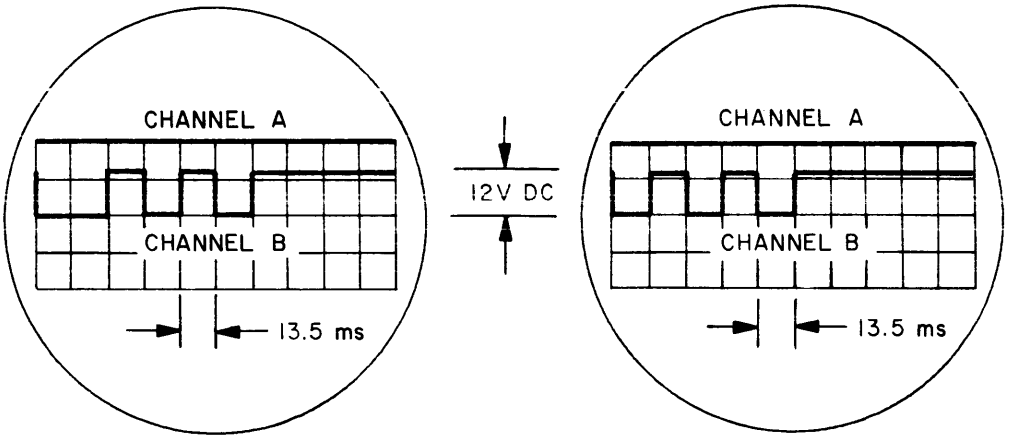
(2.4) Allow a free run trace on the scope by adjusting the "stability" and "triggering level".

(2.5) Set up both Channels on oscilloscope for DC inputs, and set "Volts/cm" on Channels A and B for "10 volts/cm" position with variable in calibrated position. Using "vertical position" controls, set zero references for A and B sweeps. Set Channel A sweep at the top of the screen for zero volts. Set Channel B sweep at center for zero volts.

(2.6) Connect ground lead of scope probe for Channel B to pin 15 of 5A1 and the scope probe to pin 12 of 5A1. The Channel B trace should go to +12 VDC. Reduce the "stability" on scope until trace just disappears.

(2.7) Alternately send R's and Y's on the Teletypewriter keyboard

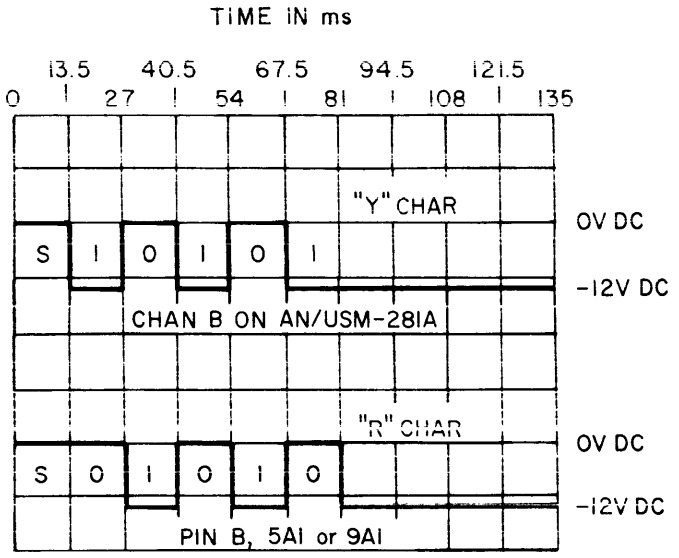
to display their corresponding waveforms on the scope. (It may be necessary to adjust "triggering level" on scope to obtain waveform display.) Adjust the "variable time/cm. of the horizontal sweep on the scope until the pulse duration of a mark or space in the R and Y codes occupies 1cm. The horizontal sweep of the scope is 13.5 millisec./cm. or 135.0 millisec. for the entire horizontal sweep. The following waveforms should be observed.



(2.8) Turn "Power" switch to ON position.

(2.9) Place scope probe for Channel B on pin B of 5A1 (use extender card test point) and ground lead for scope probe to chassis ground. Channel B sweep should be at -12 V.

(2.10) Continue to alternately send R's and Y's on the Teletype-writer keyboard, and adjust R-4 so that the pulse duration for a start, mark, or space pulse occupies 1cm. on the horizontal display of the scope.



(2.11) Remove scope probe and trigger input line from 5A1. Turn "Power" switch to OFF position. Remove 5A1 and extender card from socket, and return 5A1 to its own socket.

(2.12) Disconnect Teletypewriter and DC Loop Supply.

3. Clock Timing Circuit (5A2) (A4565) Figure 5-120

(3.1) Remove 5A3 from chassis socket.

(3.2) Remove 5A2 from socket, place on extender card and return to socket.

(3.3) Connect jumper between pin 4 of 5A2 and TP4 on 5A2.

(3.4) Connect Channel A scope probe to TP6 and ground lead to pin A of 5A2.

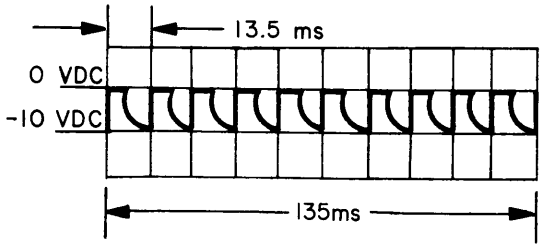
(3.5) Connect "vertical signal output" of Oscilloscope to "AC Signal Input" of Frequency Counter.

(3.6) On the counter set the "function" to "1" "period average", "time base" to "10 microsec.", and "Sensitivity Volts RMS" to ".1".

(3.7) Turn "Power" switch to ON position.

(3.8) Allow a free run trace on scope by adjustment of "stability". The pulse output of the Timing Generator Z2 will be displayed on the scope. The direction time will be displayed on the counter.

(3.9) Adjust 5A2R2 so that the pulse duration time, as displayed on the Counter, is 13.5 millisec and 1 pulse occupies 1 cm, as displayed on the horizontal sweep of the Oscilloscope.



(3.10) Turn "Power" to OFF position. Disconnect test equipment. Remove jumper. Remove 5A2 and extender card from socket. Return 5A2 and 5A3 to their respective chassis sockets.

4. Completion

Replace top cover on unit. Depress slide fastening buttons and push unit into cabinet being careful that cable retraction is taking place properly. Replace 4 screws to hold unit in cabinet.

E. Emergency Maintenance

The following sub-assemblies may be interchanged and will perform the required function without requiring rewiring or replacement of component parts.

TN-525/FRR, RF Tuner

(1) A1A5DS1 and A1A5DS2

(2) A1A50S3 thru A1A50S6

TD-969/FRR, Demultiplexer

(1) A6, A-8, A-10 and A12

(2) A15 thru A18

0-1510/URR, Reference Signal Generator

(1) A6 and A7

(2) A9, A10 and A11

(3) A14 thru A19

KY661/URR Decoder

(1) A6 thru A8

CV2520(V)/URC

(1) A4 and A5

(2) A7 and A8

Spare Fuses and Holders - Each unit contains a spare fuse in the spare fuse holder. These fuses may be used to replace a blown fuse in that unit. The spare fuse holder may be used for a damaged active fuse holder on any unit.

Air Cooling - If it has been determined that a unit has or is failing due to external (room) high temperature, the unit may be pulled out in its extended locked position and with the top cover removed cooled by a external fan or blower. This may also be done if the fan of a unit has failed.

1mc Standard - When a receivers 1mc standard has failed, the standard from another 0-1510/URR may be used to replace it OR any external 1 mc standard from any source with a min. amplitude of 0.7 VRMS may be inserted at the external 1mc input jack.

5.2 REPAIR

a. INTRODUCTION

These methods or procedures apply to assemblies or sub-assemblies whose removal, repair, and/or reassembly is not obvious.

There are no special tools required for the repair of this system. Standard type tuning tools are used for the tuning of tuned circuits.

CAUTION

Care should be taken in tuning coils as the slugs are brittle and may be damaged.

A good low wattage desoldering kit should be used for the removal of Printed Circuit board components. A low melting point solder such as, 60/40% will decrease the possibility of damage to new components due to too much heat being applied.

b. TEST EQUIPMENT AND SPECIAL TOOLS

For the repair, removal and replacement of units, sub-assemblies and components special test equipment and tools ARE NOT required. Although an adequate set of miniature solid state repair tools should be a part of the standard tool box.

c. REPAIR OF CHASSIS COMPONENTS AND WIRING

(1) Transistors, large power type -

Power transistors are mounted on the chassis and heat sinks. When replacing these transistors use a standard type "Thermal Compound" between the transistor and its mounting where the compound was used before.

CAUTION

Be careful in removing transistors from the chassis and heat sinks. Between the transistor and its mounting there may be a mica or other type insulator. The mica/insulator must be used and in position when a new transistor is remounted.

Removal of 3Q 1, 3Q 2, or 3Q 3

Pull out drawer to full extent.

Remove power plug from 3J1 on rear apron.

Remove top cover.

Tilt unit 90°, so that top faces front, and lock.

Remove four corner screws on the rear apron; the entire rear apron can be tiled back, allowing work on Q1, Q2, or Q3.

(2) Wiring

If it is determined that a wire is defective and it cannot be repaired proceed as follows: Determine the origin of both ends of the wire. Disconnect or unsolder one end. With a AN/PSM-4C used as an ohm meter measure the resistance from end to end. It should be "0" ohms. Unsolder or disconnect the other end and measure resistance again between both ends. If this wire is in a harness, remove it if possible. If the wire cannot be removed insulate both ends. Replace the wire along the same path as the original wire and use the same color and type.

CAUTION

Use the same size wire or a size larger, if necessary. Bind the wire to the harness as before.

d. REMOVAL, REPAIR AND REPLACEMENT OF PARTS, SUB-ASSEMBLIES AND UNITS

(1) Printed Circuit Boards -

A. Removal and Replacement

The various boards in this receiver slide into the chassis on tracks, and, when pushed down to the limit engage female plugs and tension spring contacts. It is only necessary to grasp the board on both ends and apply pressure upward to disengage it. When plugging a board in, take care to engage the phenolic card in the guide slots and exert even pressure downward to seat the card firmly. Some boards cannot be removed by finger pressure alone. A tool is supplied to assist in disengaging these cards. In the case of the counter assembly boards in unit #1, a very small screwdriver can be used in the holes at the corners of the cards to pry the ends of the cards up evenly.

B. Repair

Printed Circuit board repair requires special techniques in order to prevent damage to the board and its associated components.

CAUTION

There are transistors mounted on Printed Circuit boards which require heat sinks. If any of these transistors are replaced, reinstall heat sinks.

(2) Stepping Switches -

A. TN-525/FRR Removal of Function Switch, 1A12.

Refer to figure 5-35.

Slide out unit to its full extent and lock.

Remove primary power plug at 1J5.

Remove top and bottom covers.

Remove knob by loosening two allen screws.

Remove cards A3, A4, A5, A6 and A7.

Remove three screws opposite A5, A6, A7 toward the front, which hold the switch bracket.

Remove the three screws (and nuts) opposite A5, A6, A7 toward the front, on the bottom of the same compartment.

Grasp the switch assembly firmly toward the rear and exert pressure downward. The fit is tight but the assembly should come out without the use of excessive force.

Loosen the three screws (on 1/4" spacers) holding the switch and PC board to the holding frame. Switch and PC board will now slide out easily.

Reassemble in the reverse order of removal.

B. TD-969/FRR Removal of Mode Switch and Time Constant Switch.

1. Mode Switch and AGC Time Constant Switch Assembly

Slide unit out to its fullest and lock.

Remove primary power plug at J2.

Remove top and bottom covers.

Remove control knobs by loosening two allen set screws on each of the following: Mode, AGC Time Constants B1, B2, A1 and A2. Tilt front of unit up 45 degrees.

Remove front panel by removing four philip head screws in line with handles.

Lift front panel up to clear switch shafts and let it hang on the cable harness.

Remove desired switch assembly by loosening 3 slotted screws holding assembly to the frame, and with the slightest pressure upward remove assembly with the Printed Circuit board.

Reassemble in the reverse order of removal.

C. 0-1510/URR "Megacycles" Stepping Switches.

Remove of Frequency Selector Switch Assemblies, 3A14 thru A19.

Slide out unit to its full extent and lock.

Remove plug from power jack 3J1.

Remove top cover.

Remove two screws at the extreme front end of switch assembly to be removed. Do not disturb the shock mount assembly.

Tilt unit 90° so that bottom faces technician, and lock.

Remove bottom cover.

Remove the two smaller screws at the extreme rear of switch bracket to be removed. Do not touch the two larger screws.

Tilt and lock unit to horizontal position.

Remove all six selector knobs on the front of unit by loosening allen screws.

Remove four screws holding front panels which are located in line with the drawer handles.

Remove four smaller screws holding front panel. These screws are located on a straight line on the lower half of the front panel.

Have an assistant hold the panel away from the chassis, as the required frequency selector assembly is lifted out.

Reassemble in the reverse order.

D. KY661/URR

Removal of Master Stepping Switch, A15.

Refer to Figure 5-112.

Slide out unit to its fullest extend and lock.

Remove primary power plug at J1.

Remove top and bottom covers.

Remove 2 small bolts and nuts from the left of A15 holding it to the chassis. NOTE: Do not remove bolts and nuts holding shock mounts.

Remove 2 bolts holding the right of A15 from the bottom of unit.

Remove unit by exerting a slight amount of pressure upward removing Printed Circuit board, which is attached, from its socket.

Replace new or repaired unit in reverse order of removal.

(3) Other Non-Repairable Sub-Assemblies -

A. Removal of Counter Assembly, 1A1 (Refer to Figure 5-134).

Slide out the TN 525/FRR to its full extent.

Remove primary power plug 1J5.

Tilt and lock the unit so that the bottom faces the technician.

Remove bottom cover.

With a flat blade screwdriver loosen 1P1 from 1A1J1 and P2 from 1A1J2.

With a phillips screwdriver loosen the ground connection at 1A1J1.

Return and lock the unit to a horizontal position.

Remove top cover.

Remove the four screws surrounding the readout window.

Lift the entire assembly straight up. Do not misplace the plastic window plate.

CAUTION

When replacing the counter assembly, be sure to connect 1P1 to 1A1J1 and 1P2 to 1A1J2.

B. Removal of Filter Assembly 1A13. See Figure 5-134 (3).

Turn power switch to OFF.

Remove all rear interconnect cabling.

Remove unit from cabinet and place on service bench.

Remove top and bottom covers.

Remove two screws in line with the right hand front panel handle.

Remove three screws on a line on the rear apron which hold rear apron to the right side.

Remove four LARGE screws, 2 top, 2 bottom, toward the right hand side, which hold the tuner oscillator assembly.

Remove right hand side, which should now be clear.

Carefully mark and unsolder the connections on the 1A13 Filter Board.

2 COAX with connectors

1 red

1 brown

Remove the four screws holding the 1A13 board to the right side.

Reassemble in reverse order.

C. Removal of 1A11 Antenna/Filter Assembly. See Figure 5-134 (4).

First carry out the steps as required for removal of filter board 1A13.

Carefully mark and unsolder 4 coax cables leading from 1A11 filter to the antenna inputs on the Tuner circuit boards.

Remove the two cable clamps on the bottom, rear, of the unit (under the removable PC board compartment). This step will allow cable slack when rear apron is removed. Refer to Figure 5-134 (3).

Remove three screws in a line on rear apron, at the extreme left side of the unit.

Remove two screws on rear apron which hold the rear apron to the wall holding the side of the RF oscillator assembly opposite the right side. (Parts C of Figure 5-134 (2).)

Remove four screws on the rear apron, holding the four corners of antenna/filter box 1A11. (Parts B of Figure 5-134 (2).)

Lift the 1A11 assembly away (as far as possible) from rear apron.

Carefully mark and unsolder the antenna input lead from the terminal in the 1A11 box. Do not unsolder at J-1. Refer to Figure 5-134 (4).)

Carefully mark and unsolder the following connections on 1A11:

C8 (RED)

C7 (BLUE-WHITE)

C6 (BROWN-WHITE)

C5 (GREY)

C4 (VIOLET)

C3 (RED-WHITE)

C2 (BLUE-WHITE)

C1 (BLUE)

Remove 1A11 assembly.

Reassemble in reverse order.

D. Removal of RF Tuner-Oscillator Assembly 1A10. Refer to Figure 5-134.

Turn Power switch to OFF.

Remove all rear interconnect cabling.

Remove unit from cabinet and place on service bench.

Remove top and bottom covers.

Remove TUNE, FUNCTION and LOCK knobs.

Remove PC cards A2 through A9.

Remove counter assembly as described in section 5 paragraph 4-3a.

On band #1 printed circuit card, carefully mark all cables and wires leaving the card for identification when replacing. Unsolder in the following order:

ANTENNA (COAX)

GROUND (BLACK)

AGC (GREEN)

RF OUTPUT AND GROUND (COAX)

GND (BLACK)

+24 VOLTS (RED)

Repeat the same cable marking and unsoldering procedure for bands 2, 3 and 4 printed circuit cards.

Remove two screws and nuts holding bracket for J14 and its associated plug, located on the right hand side, toward the front. Move this assembly out of the way.

On the bottom of the unit, carefully mark and unsolder the following oscillator connections: (Detail A of Figure 5-134 (3))

C5 (RED)

C4 (COAX)

C3 (COAX)

C1 (COAX)

C2 (3 GROUND LEADS)

CABLE ON STANDOFF between C2 and C4

Remove ground clamp holding shielded cable on side of oscillator assembly.

Unsolder shielded coax cable and ground from oscillator output at XA8.

Remove two screws in line with right hand front panel handle, which hold front panel.

Remove three screws in a line on rear apron, which hold rear apron to right side.

Remove eight large screws, 4 top, 4 bottom, which hold tuner-oscillator assembly in place. Refer to Parts A on Figure 5-134 (3).

Lift up the right side, which should now be clear except for wiring to filter unit board 1A13.

On filter board 1A13 on right side, carefully mark and unsolder

1 brown lead

1 coax lead and ground

1 red lead

Remove the entire RF-oscillator assembly, which should now be clear.

Reassemble in the reverse order.

E. Removal of 1mc standard, 3A1.

Disconnect all wiring from rear of unit.

Slide out unit, unlock, and place on service bench.

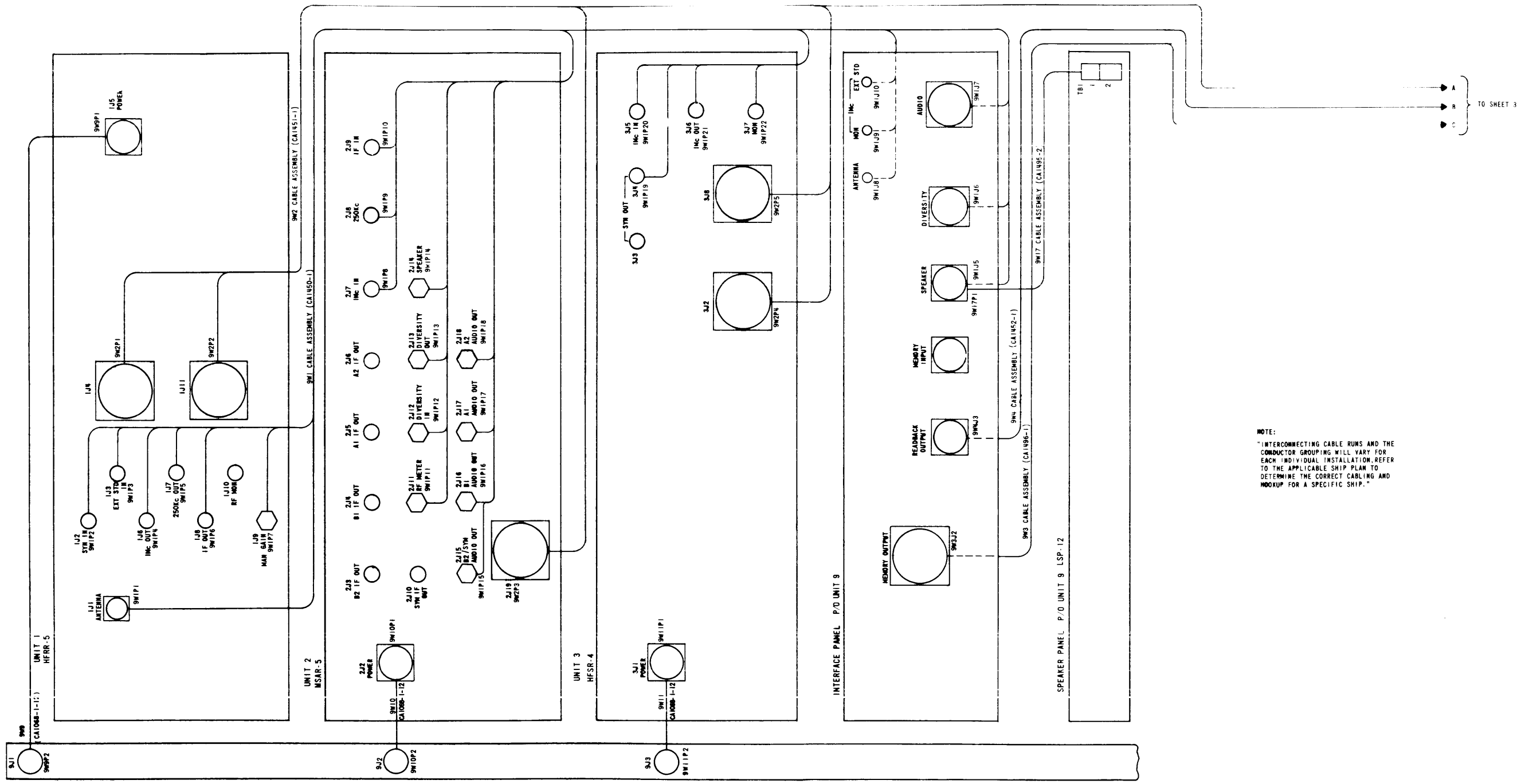
Remove top cover.

Remove 3A2 Power Supply board.

Remove pivot nut and screw from right hand track assembly, and expose two screws holding the 1mc standard bracket. Remove these screws and nuts.

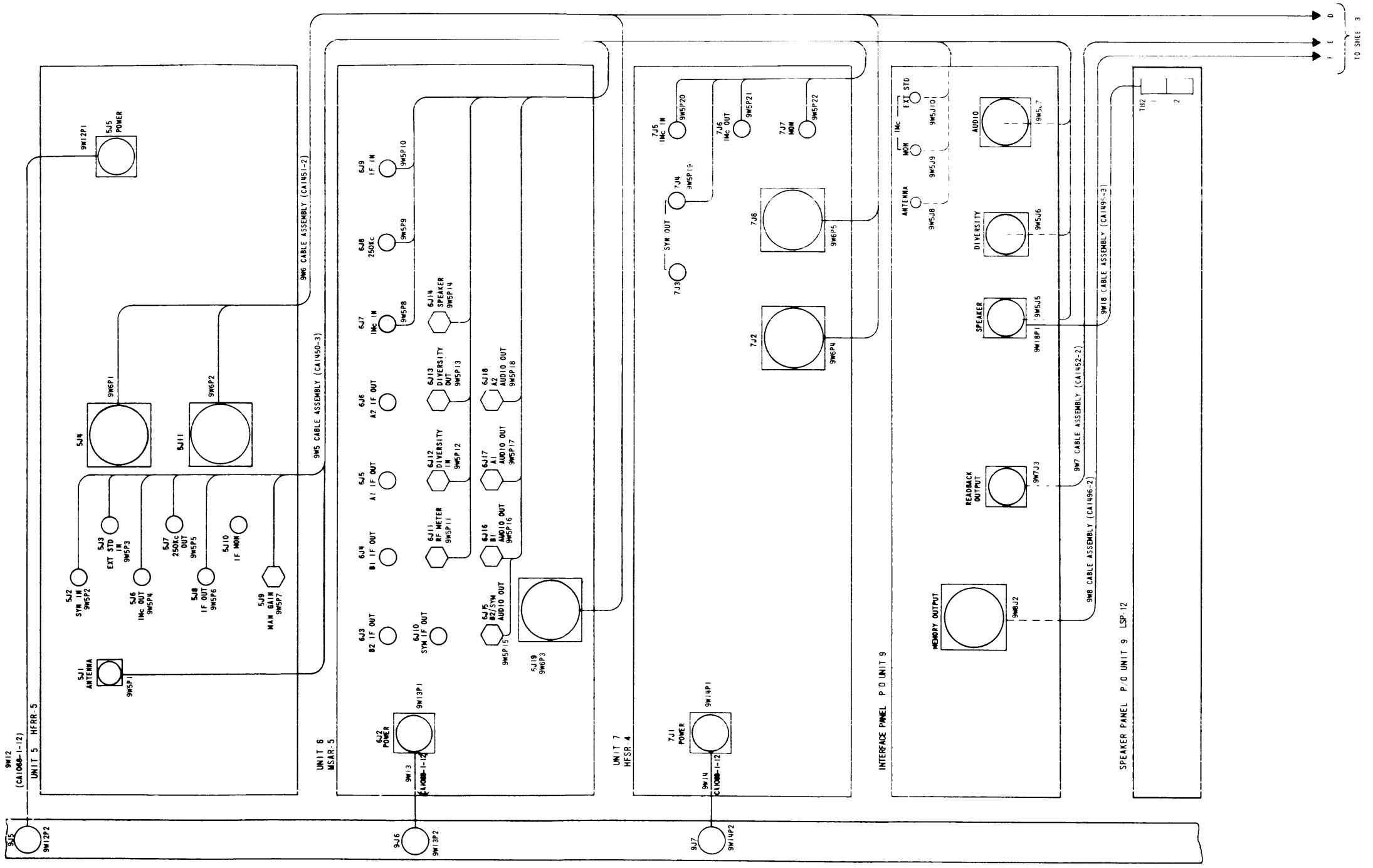
Remove the two screws on the left side of the 1mc standard which hold the 1mc standard bracket.

Slide the 1mc standard out of its octal socket.



CK 1630

Figure 5-1. Rack Cabling Diagram, AN/FRR-85(V)1 (Sheet 1 of 3)



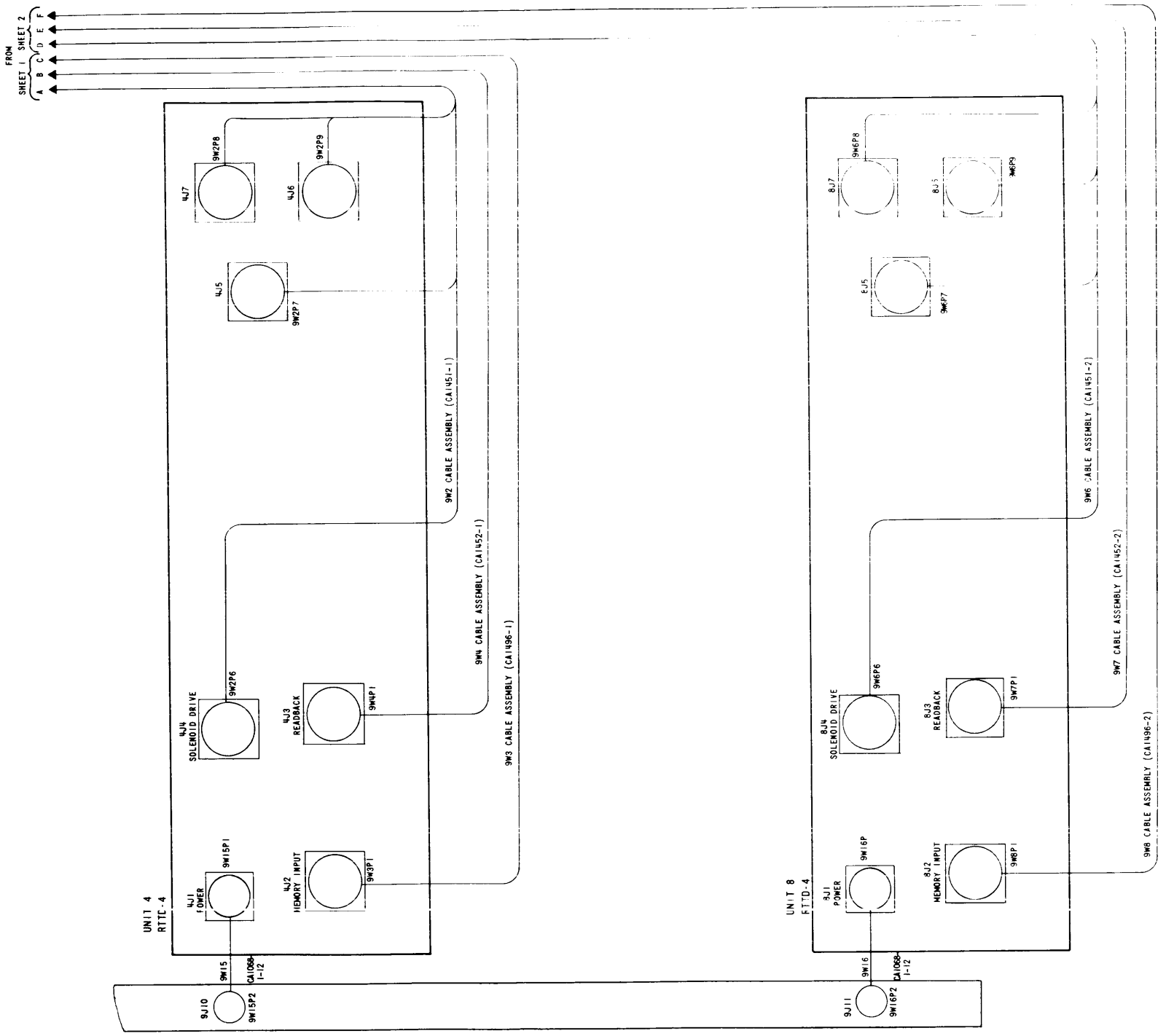
CK 1630

Figure 5-1. Rack Cabling Diagram, AN/FRR-85(V)1 (Sheet 2 of 3)

011690392

NOTE:

"INTERCONNECTING CABLE RUNS AND THE CONDUCTOR GROUPING WILL VARY FOR EACH INDIVIDUAL INSTALLATION. REFER TO THE APPLICABLE SHIP PLAN TO DETERMINE THE CORRECT CABLING AND HOOKUP FOR A SPECIFIC SHIP."



CK 1630

Figure 5-1. Rack Cabling Diagram, AN/FRR-85(V)1 (Sheet 3 of 3)

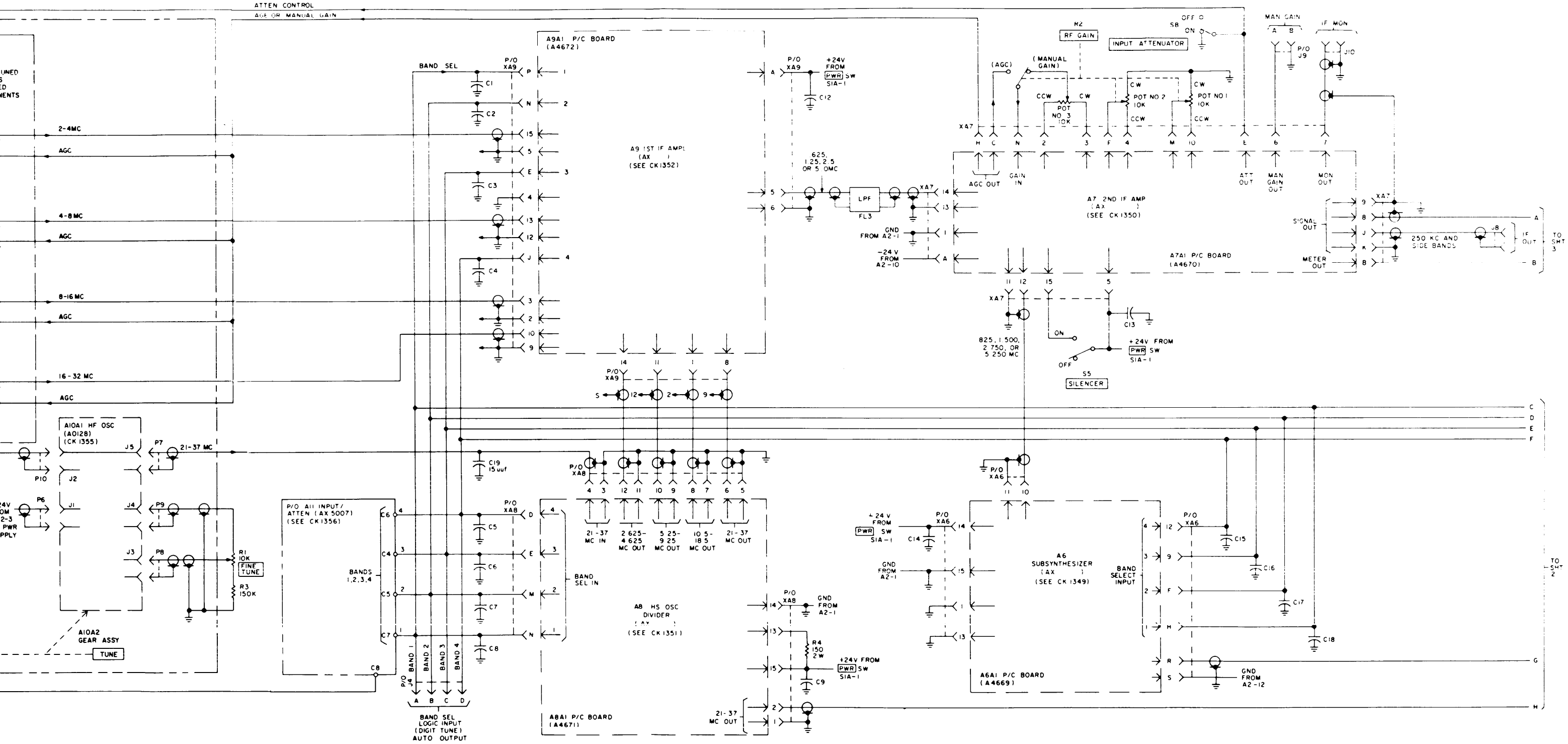
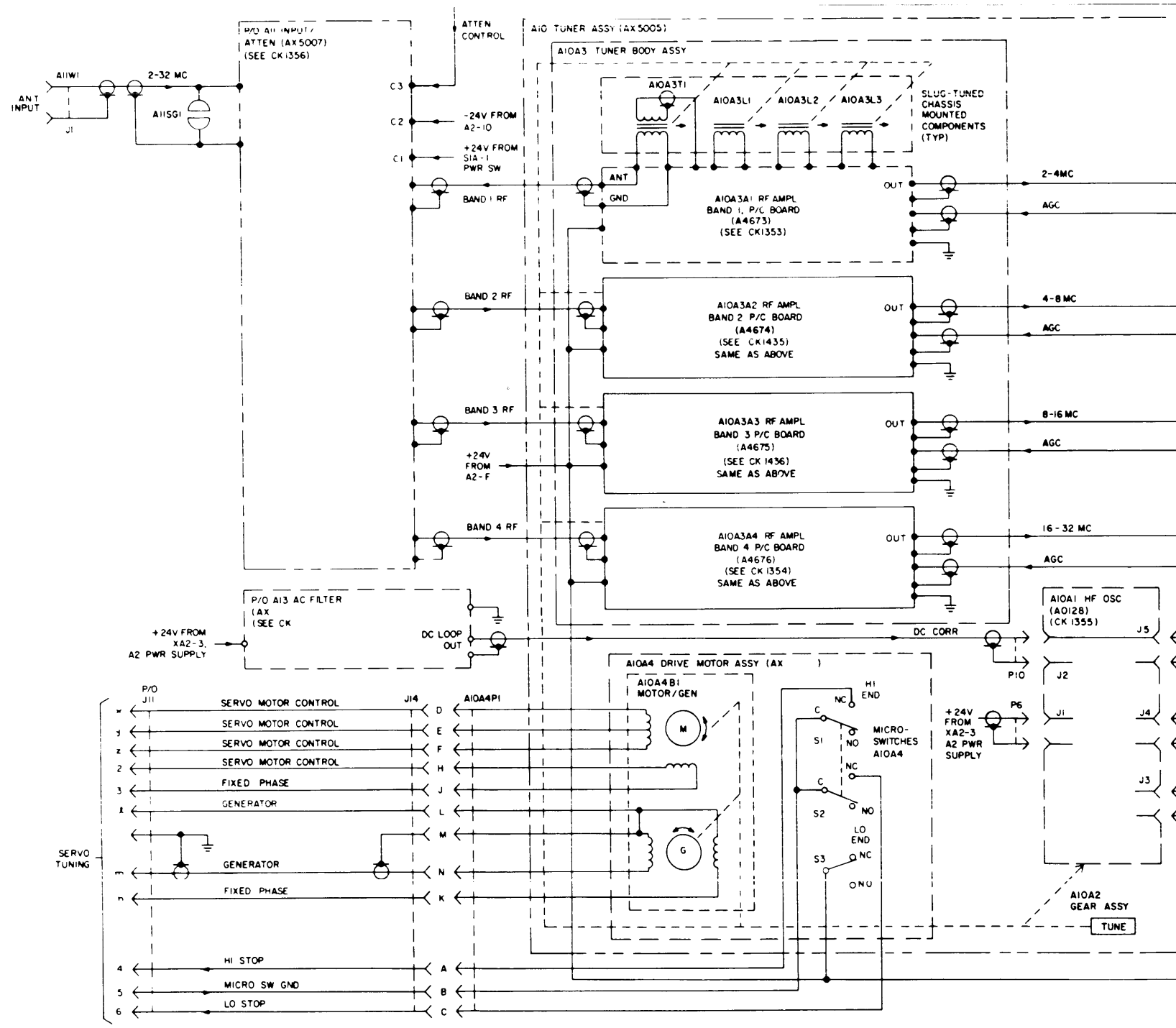


Figure 5-2. Unit 1 (TN-525/FRR), Schematic Diagram (Sheet 1 of 3)


P/O A11 INPUT ATTEN (AX5007) (SEE CK1356)
A11W1
ANT INPUT
J1
2-32 MC
A11SG1
ATTEN CONTROL
A10 TUNER ASSY (AX5005)
A10A3 TUNER BODY ASSY
A10A3T1
A10A3L1
A10A3L2
A10A3L3
SLUG-TUNED CHASSIS MOUNTED COMPONENTS (TYP)
C3
C2
C1
-24V FROM A2-10
+24V FROM SIA-1 PWR SW
BAND 1 RF
ANT
GND
OUT
A10A3A1 RF AMPL BAND 1, P/C BOARD (A4673) (SEE CK1353)
2-4MC
AGC
BAND 2 RF
A10A3A2 RF AMPL BAND 2 P/C BOARD (A4674) (SEE CK1435) SAME AS ABOVE
4-8 MC
BAND 3 RF
A10A3A3 RF AMPL BAND 3 P/C BOARD (A4675) (SEE CK 1436) SAME AS ABOVE
8-16 MC
+24V FROM A2-F
BAND 4 RF
A10A3A4 RF AMPL BAND 4 P/C BOARD (A4676) (SEE CK 1354) SAME AS ABOVE
16-32 MC
P/O A13 AC FILTER (AX (SEE CK
+24V FROM XA2-3, A2 PWR SUPPLY
DC LOOP OUT
DC CORR
A10A1 HF OSC (A0128) (CK 1355)
J5
P10
J2
A10A4 DRIVE MOTOR ASSY (AX)
A10A4B1 MOTOR/GEN
P/O J11
J14
A10A4P1
SERVO MOTOR CONTROL
SERVO MOTOR CONTROL
SERVO MOTOR CONTROL
FIXED PHASE
GENERATOR
SERVO TUNING
GENERATOR
FIXED PHASE
HI STOP
MICRO SW GND
LO STOP
M
G
HI END
NC
C
S1
NO
MICRO-SWITCHES A10A4
S2
LO END
S3
+24V FROM XA2-3 A2 PWR SUPPLY
P6
J1
J4
J3
A10A2 GEAR ASSY
TUNE

CK 1340

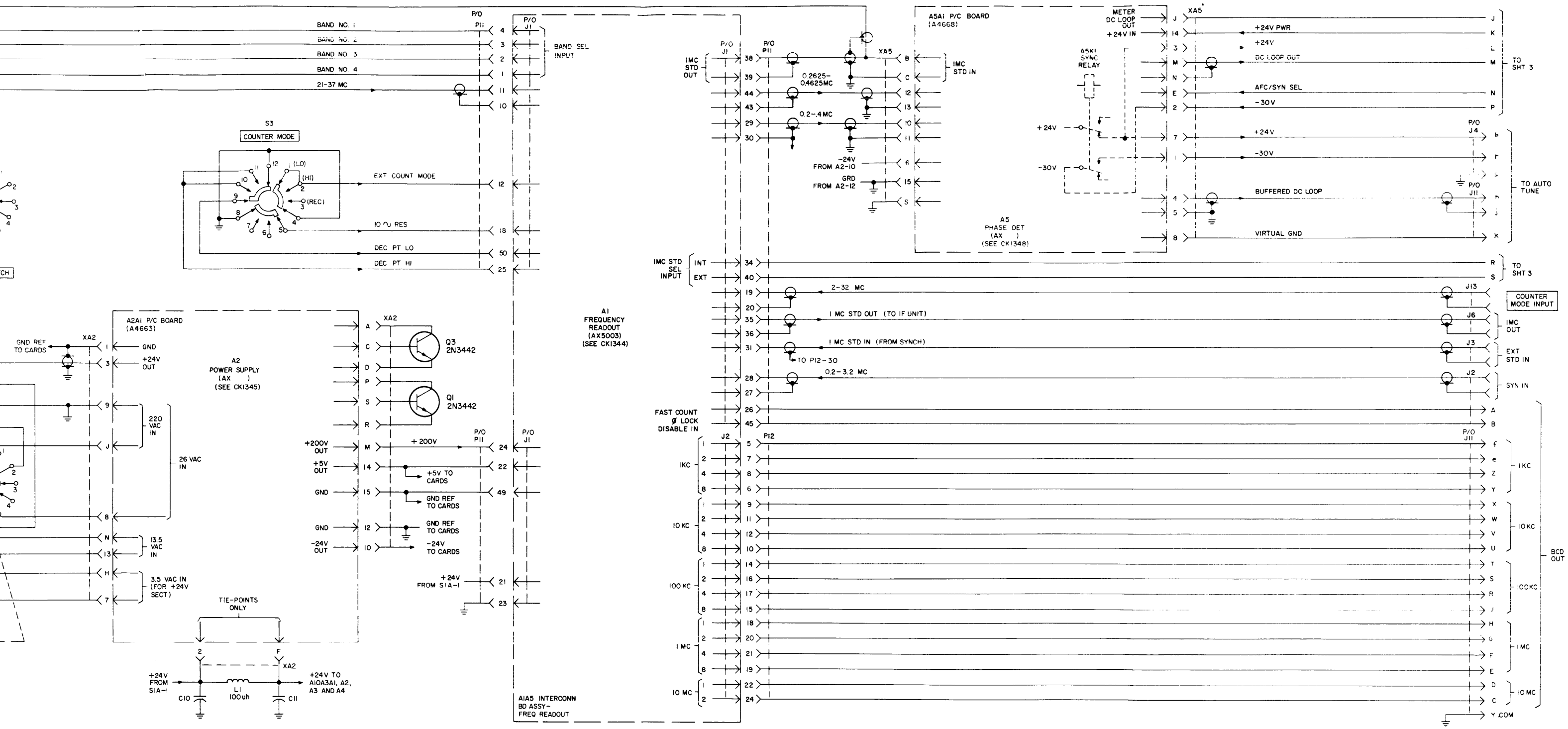
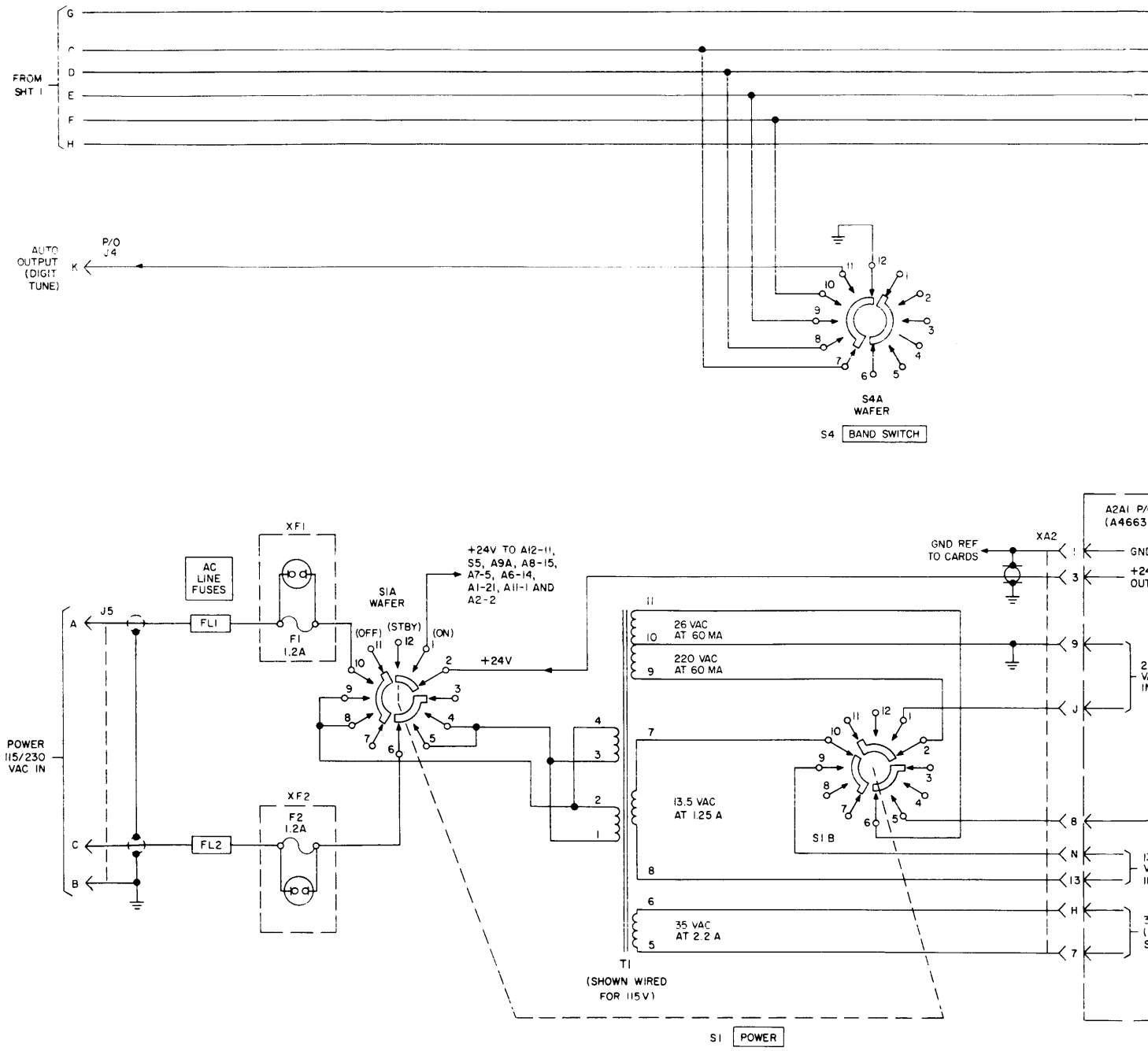
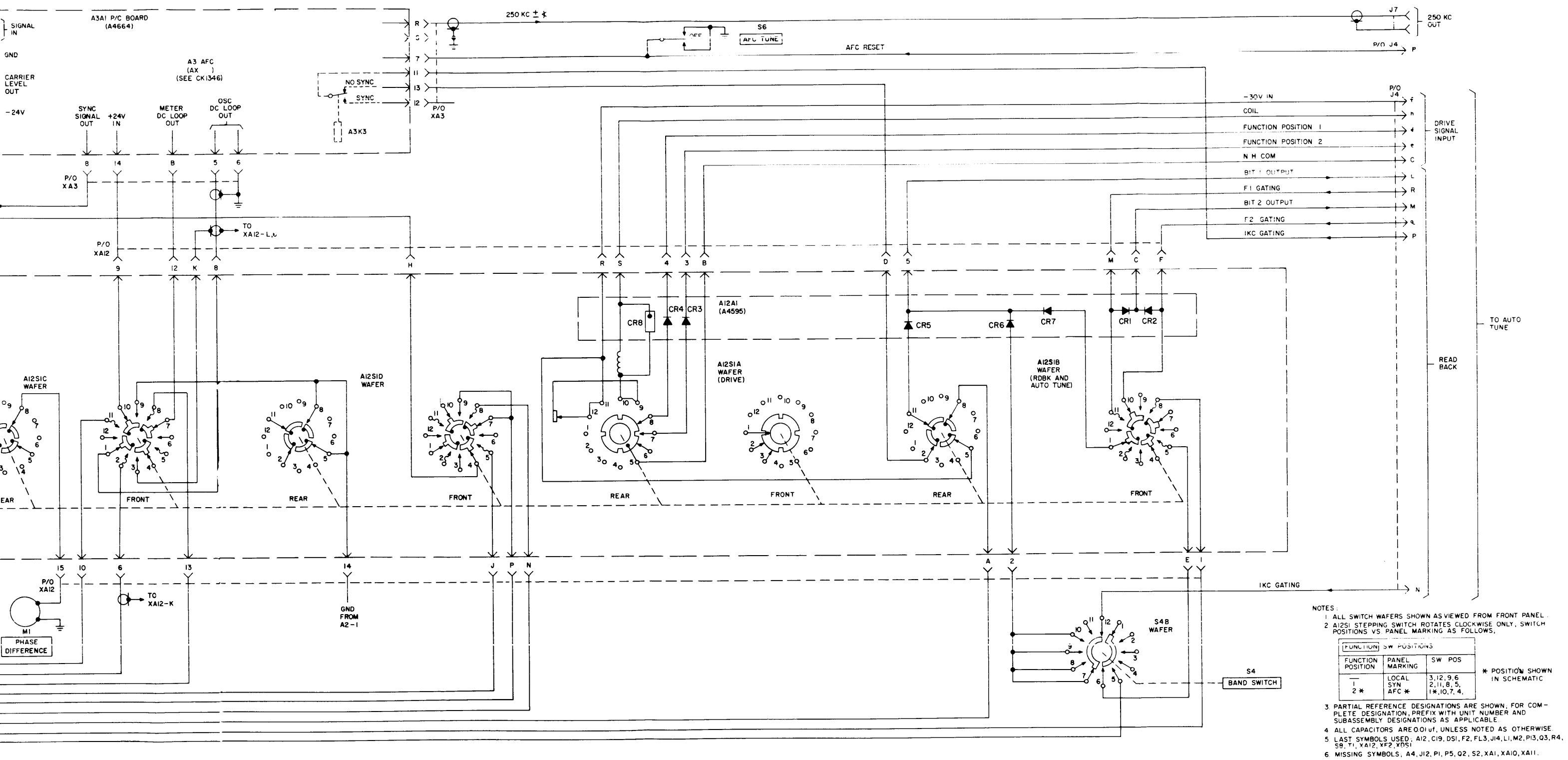


Figure 5-2. Unit 1 (TN-525/FRR), Schematic Diagram (Sheet 2 of 3)


FROM SHT 1
G
C
D
E
F
H
AUTO OUTPUT (DIGIT TUNE)
K
P/O J4
S4A WAFER
S4 BAND SWITCH
XF1
AC LINE FUSES
FL1
F1 1.2A
J5
A
SIA WAFER
(OFF)
(STBY)
(ON)
+24V TO A12-11, S5, A9A, A8-15, A7-5, A6-14, A1-21, A11-1 AND A2-2
+24V
POWER 115/230 VAC IN
C
B
FL2
XF2
F2 1.2A
GND REF TO CARDS
XA2
26 VAC AT 60 MA
220 VAC AT 60 MA
13.5 VAC AT 1.25 A
35 VAC AT 2.2 A
S1B
T1 (SHOWN WIRED FOR 115V)
S1 POWER

CK 1340



NOTES:

1. ALL SWITCH WAFERS SHOWN AS VIEWED FROM FRONT PANEL.
2. A12S1 STEPPING SWITCH ROTATES CLOCKWISE ONLY, SWITCH POSITIONS VS PANEL MARKING AS FOLLOWS,

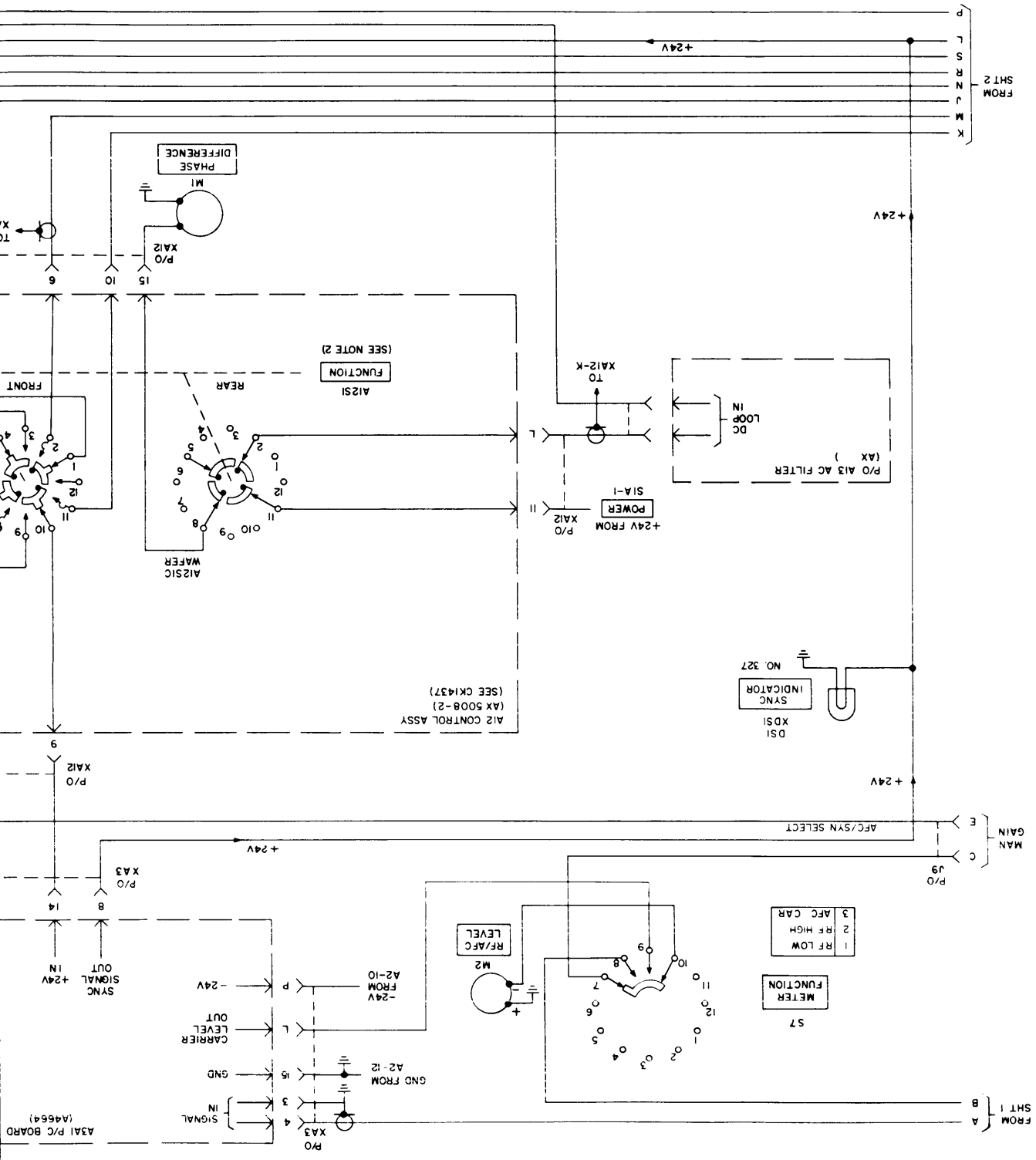
FUNCTION	SW POSITIONS	
FUNCTION POSITION	PANEL MARKING	SW POS
—	LOCAL	3, 12, 9, 6
1	SYN	2, 11, 8, 5,
2 *	AFC *	1*, 10, 7, 4,

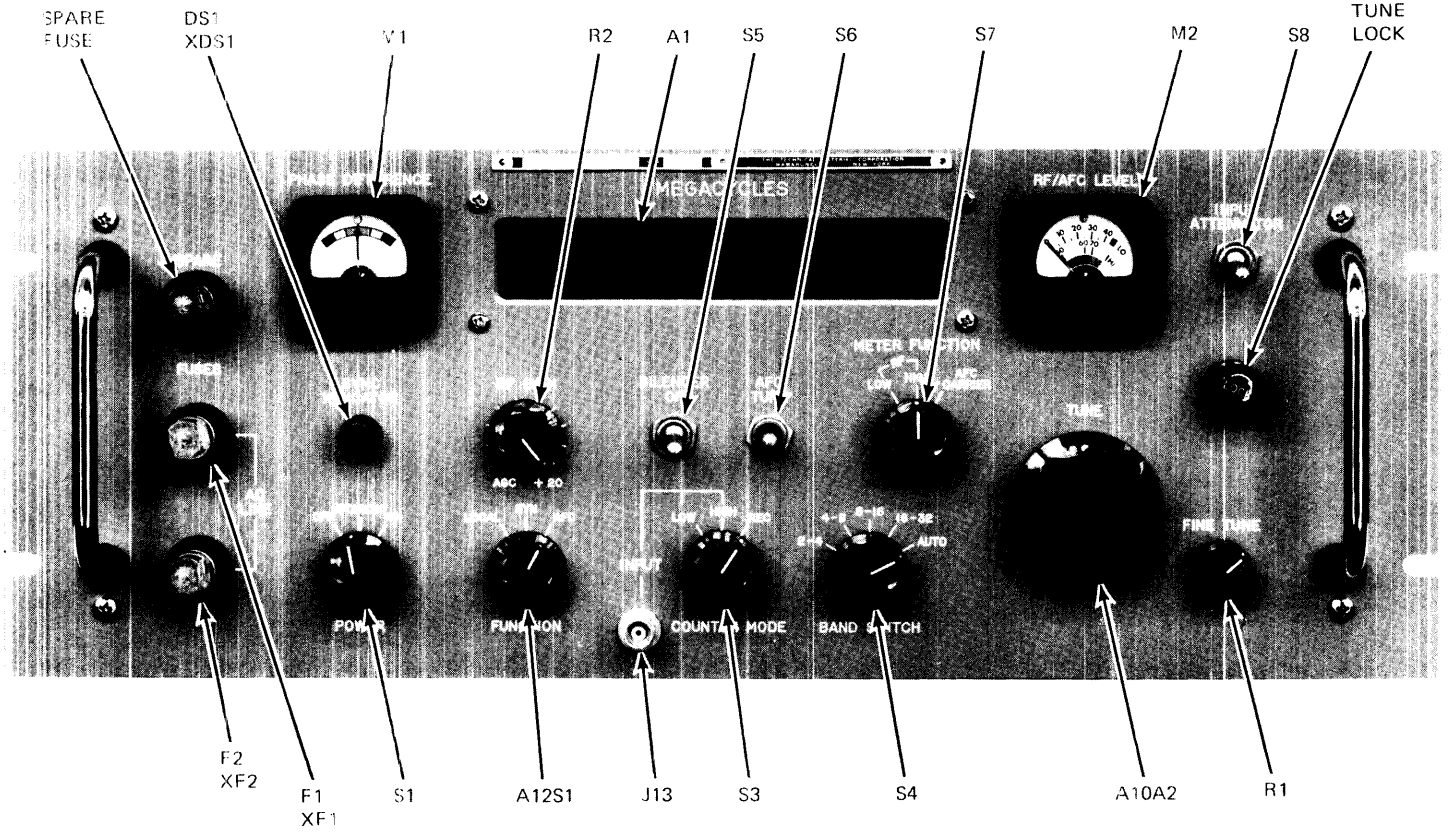
* POSITION SHOWN IN SCHEMATIC

3. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUBASSEMBLY DESIGNATIONS AS APPLICABLE.
4. ALL CAPACITORS ARE 0.01 uf, UNLESS NOTED AS OTHERWISE.
5. LAST SYMBOLS USED: A12, C19, DS1, F2, FL3, J14, L1, M2, P13, Q3, R4, S8, T1, XA12, XF2, XDS1.
6. MISSING SYMBOLS: A4, J12, P1, P5, Q2, S2, XA1, XA10, XA11.

Figure 5-2. Unit 1 (TN-525/FRR), Schematic Diagram (Sheet 3 of 3)

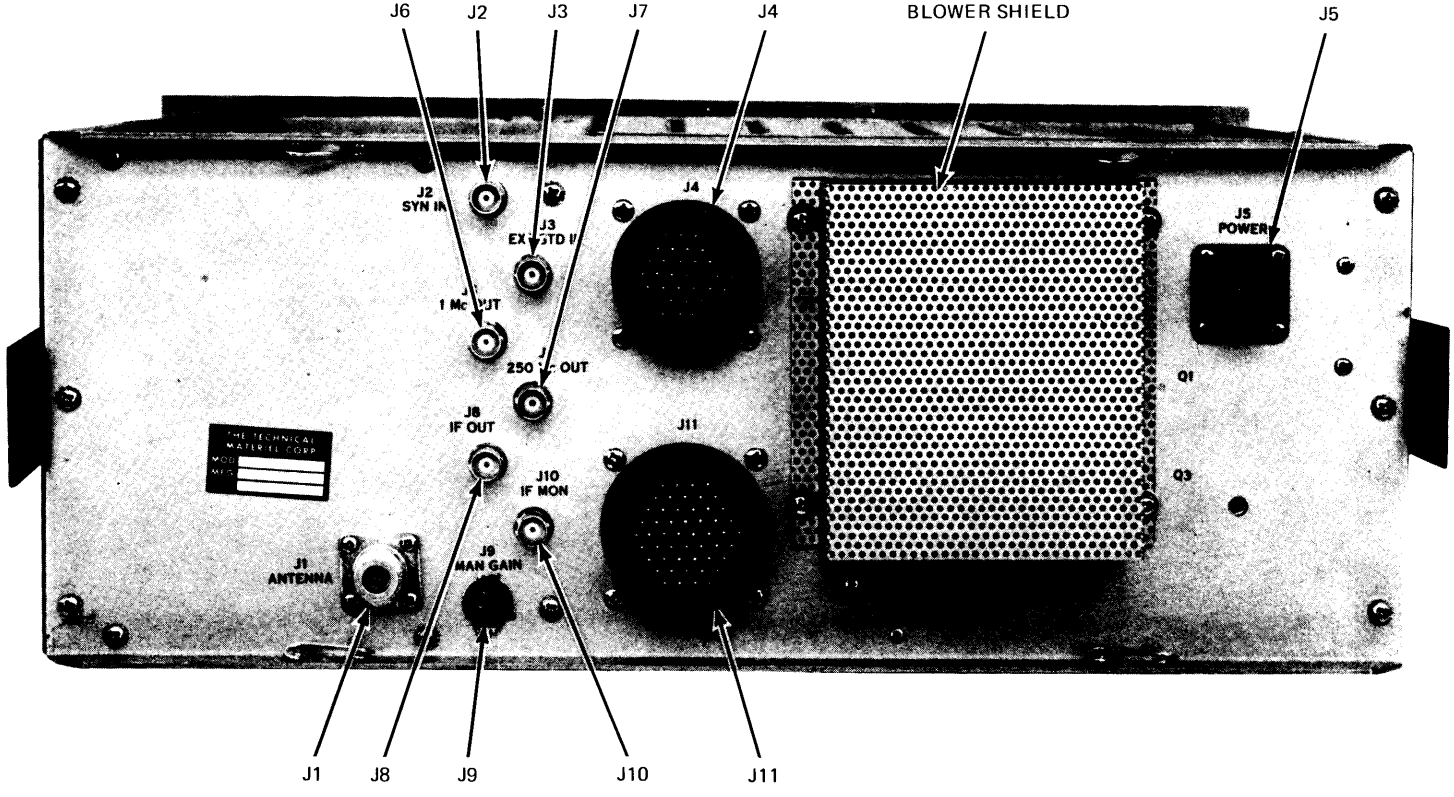
CK 1340


FROM SHT 2
P
L
S
N
R
J
M
K
+24V
M1
PHASE DIFFERENCE
P/O XA12
15
10
6
TO XA12-K
A12SI FUNCTION
(SEE NOTE 2)
REAR
FRONT
A12SIC WAFER
P/O A13 AC FILTER (AX)
DC LOOP IN
L
11
P/O XA12
+24V FROM POWER
S1A-1
DS1 XDS1
SYNC INDICATOR
NO. 327
A12 CONTROL ASSY (AX 5008-2) (SEE CK1437)
9
P/O XA12
AFC/SYN SELECT
MAN GAIN
E
C
P/O J9
B
14
P/O XA3
SYNC SIGNAL OUT
+24V IN
M2
RF/AFC LEVEL
S7
METER FUNCTION
1 RF LOW
2 RF HIGH
3 AFC CAR
-24V FROM A2-10
CARRIER LEVEL OUT
GND FROM A2-12
GND
SIGNAL IN
4
3
P/O XA3
A3A1 P/C BOARD (A4664)
FROM SHT 1
A
B



REF DESIG PREFIX 1
REF DESIG PREFIX 1, 5

Figure 5-3. Unit 1 (TN-525/FRR) Front Panel, Major Component Locations



REF DESIG PREFIX 1
REF DESIG PREFIX 1, 5

Figure 5-4. Unit 1 (TN-525/FRR), Rear Panel, Major Component Locations Diagram

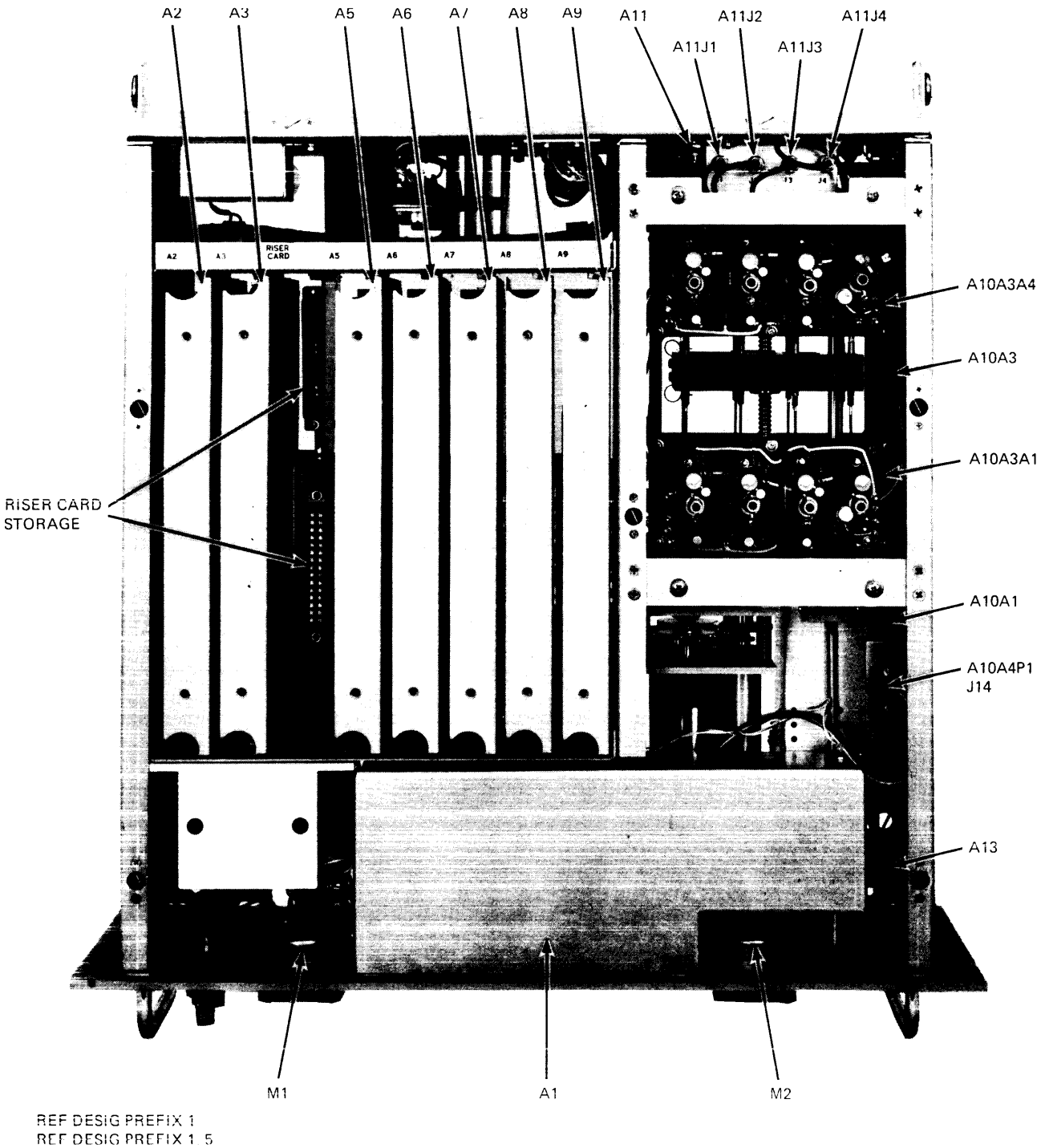


Figure 5-5. Unit 1 (TN-525/FRR), Top View, Major Component Locations Diagram

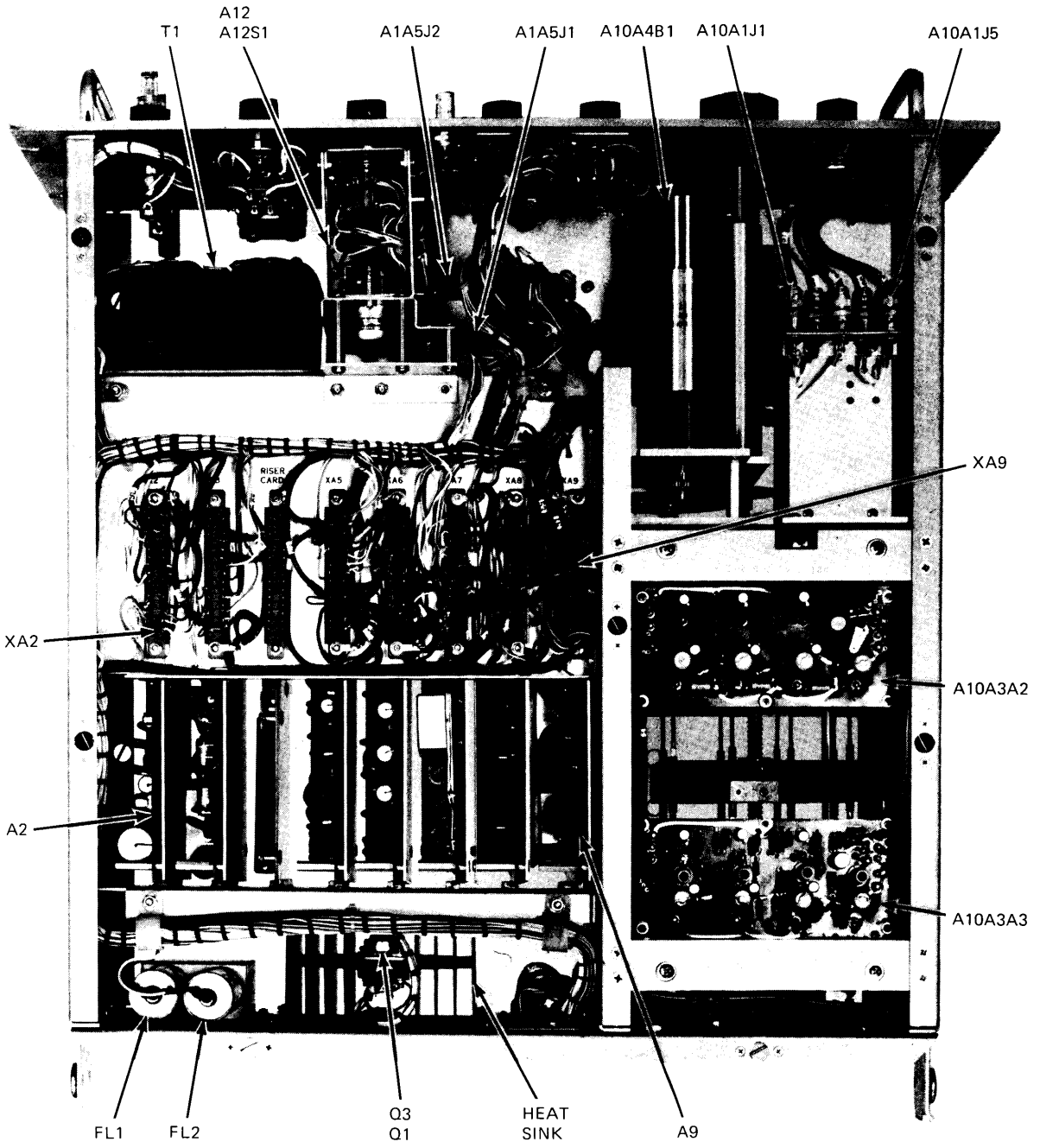
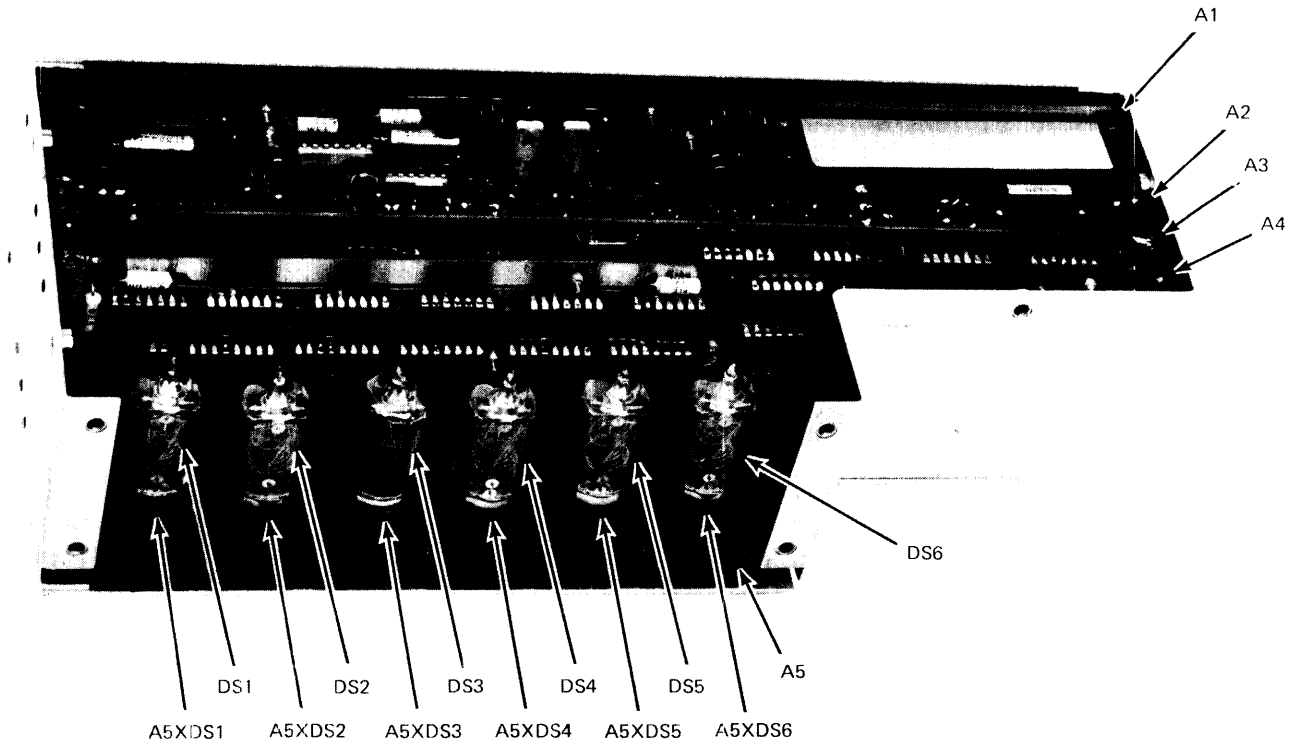
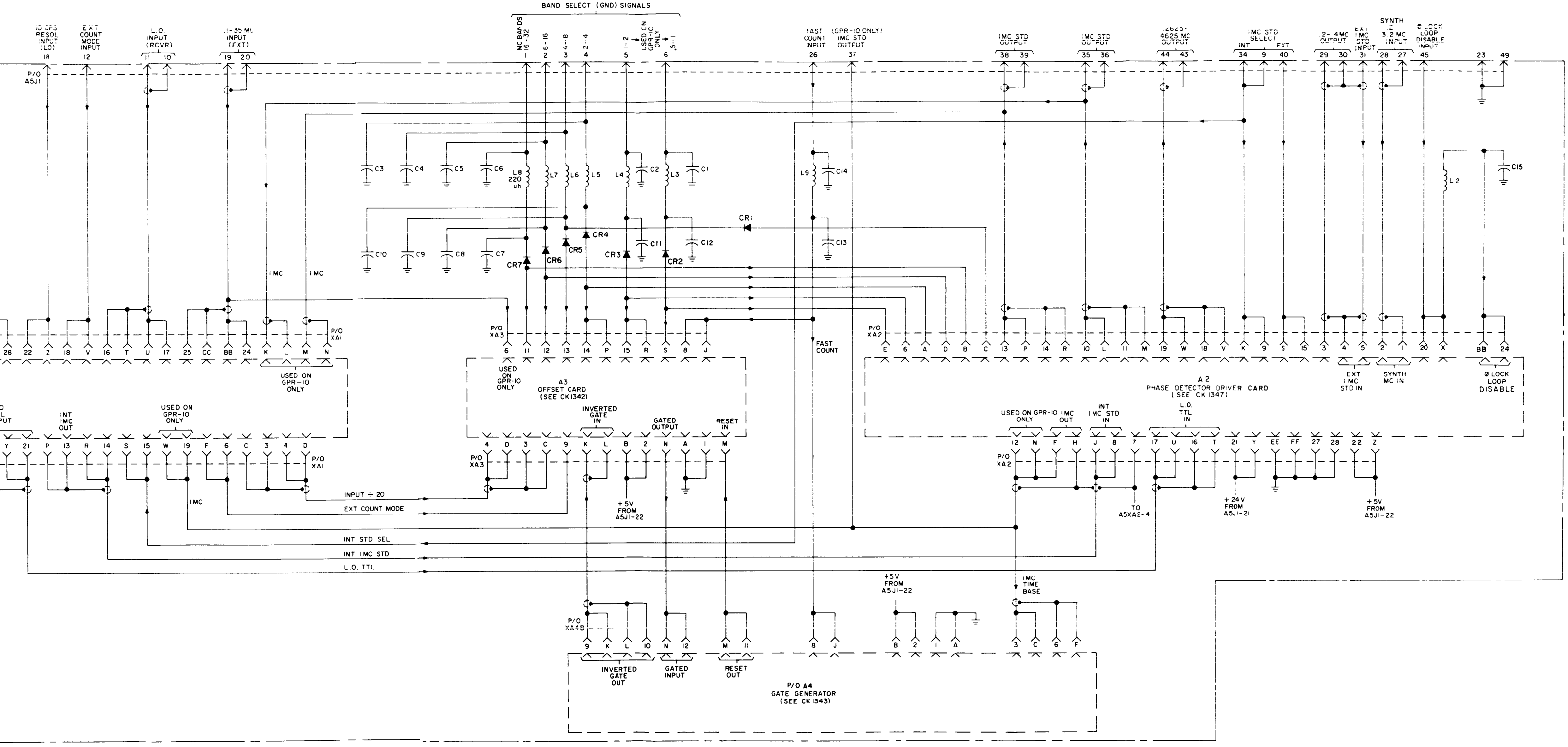


Figure 5-6. Unit 1 (TN-525/FRR), Bottom View, Major Component Locations Diagram



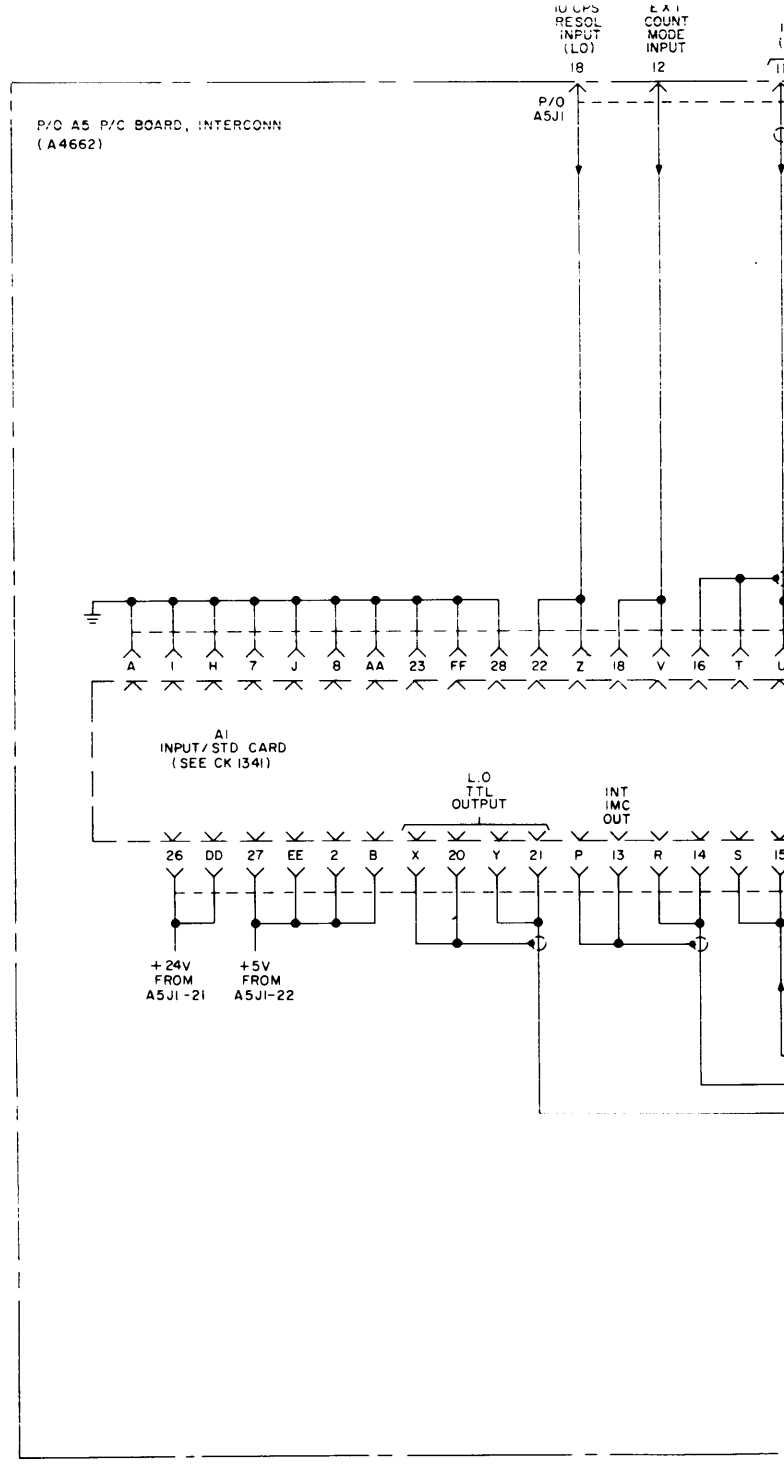
REF DESIG PREFIX 1A1
REF DESIG PREFIX 1A1, 5A1

Figure 5-7. 1A1, Top View, Major Component Locations Diagram

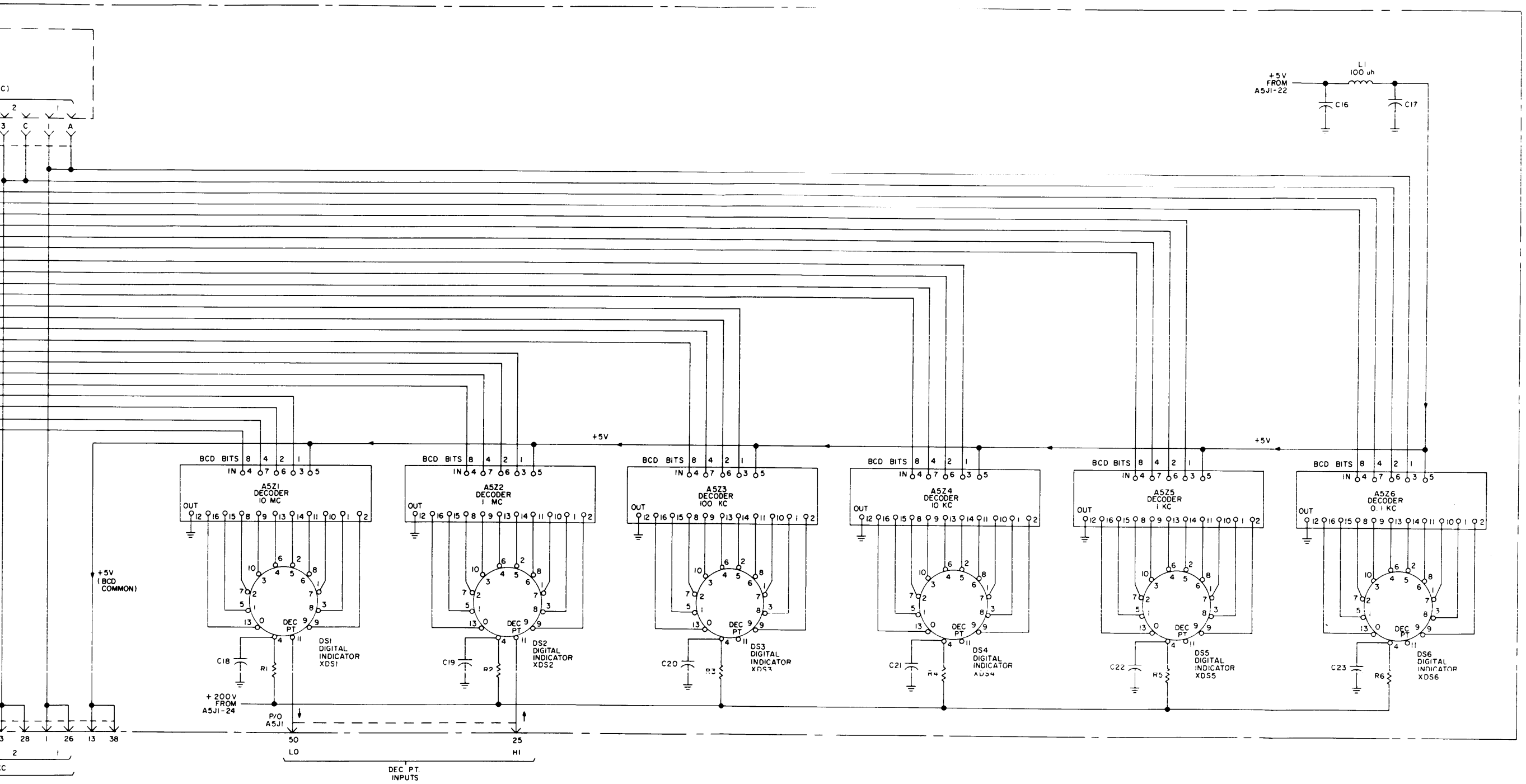


CK 1344

Figure 5-8. Frequency Readout Assembly 1A1, Schematic Diagram (Sheet 1 of 2)


RESOL INPUT (LO)
18
COUNT MODE INPUT
12
P/O A5J1
P/O A5 P/C BOARD, INTERCONN (A4662)
A
1
H
7
J
8
AA
23
FF
28
22
Z
18
V
16
T
A1 INPUT/STD CARD (SEE CK 1341)
L.O TTL OUTPUT
INT IMC OUT
26
DD
27
EE
2
B
X
20
Y
21
P
13
R
14
S
+24V FROM A5J1-21
+5V FROM A5J1-22

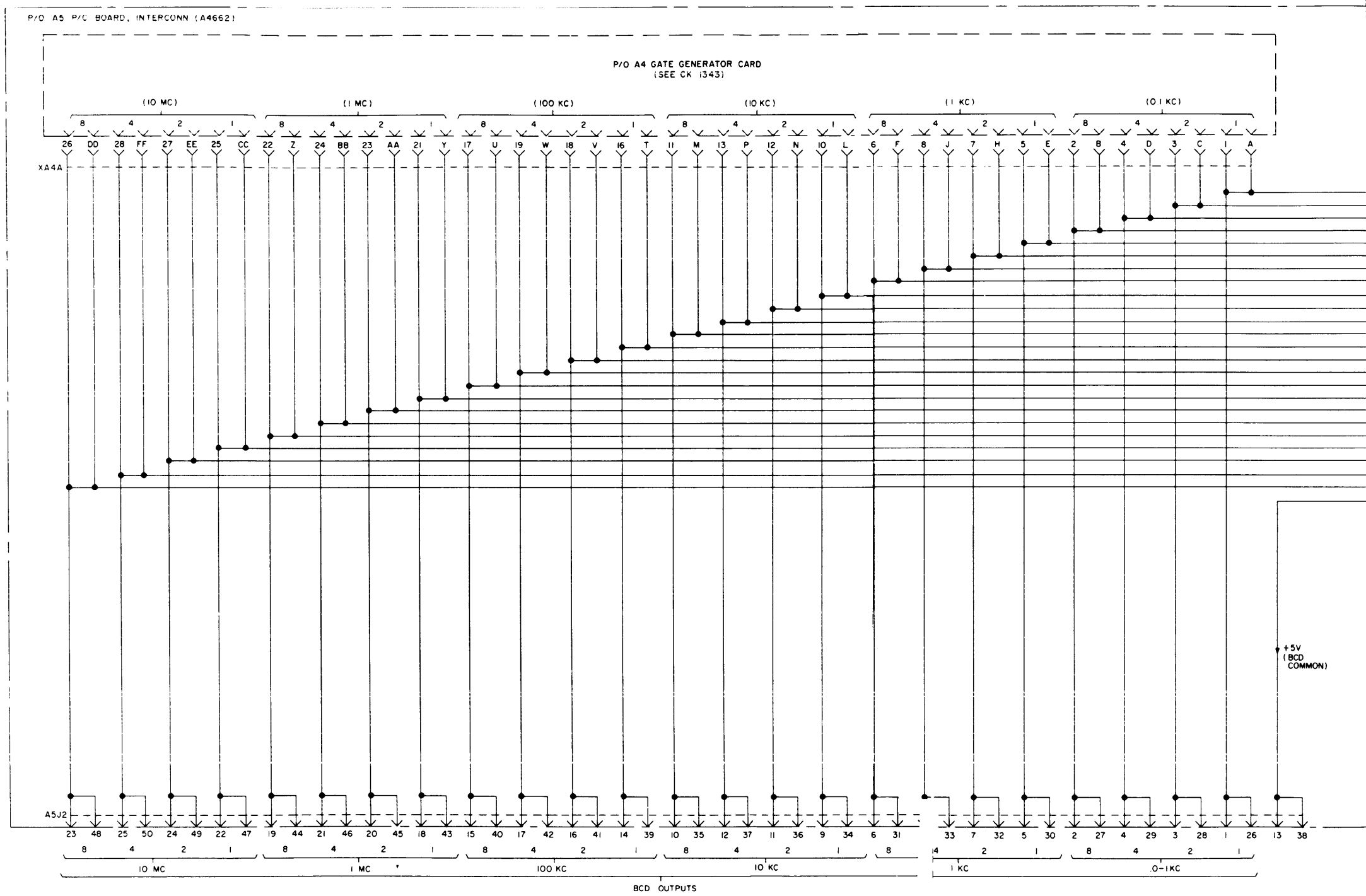
CK 1344



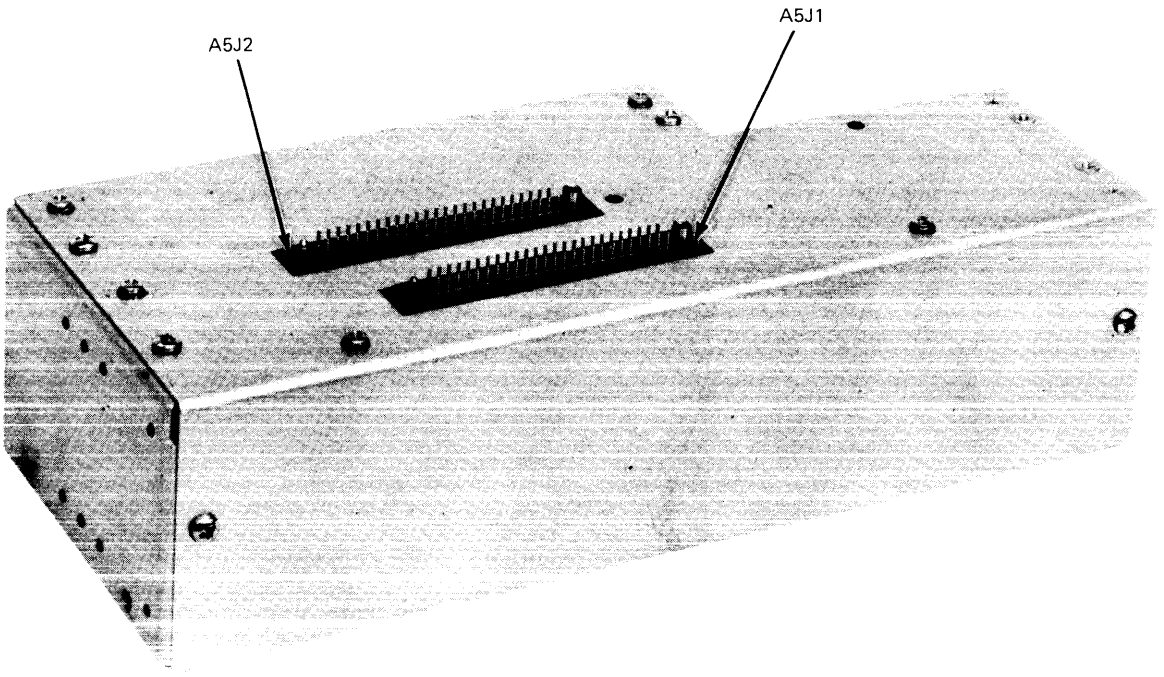
NOTES:

1. ALL CAPACITORS ARE .01uf, ALL COILS ARE 220 uh, ALL RESISTORS ARE 39K, ¼ ALL DIODES ARE IN914 UNLESS SPECIFIED AS OTHERWISE.
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUBASSEMBLY DESIGNATIONS AS APPLICABLE.
3. LAST SYMBOLS USED: A5, A5C23, A5CR7, A5L9, A5R6, A5XA4B, A5XDS6, A5Z6, DS6.

Figure 5-8. Frequency Readout Assembly 1A1, Schematic Diagram (Sheet 2 of 2)
011690392

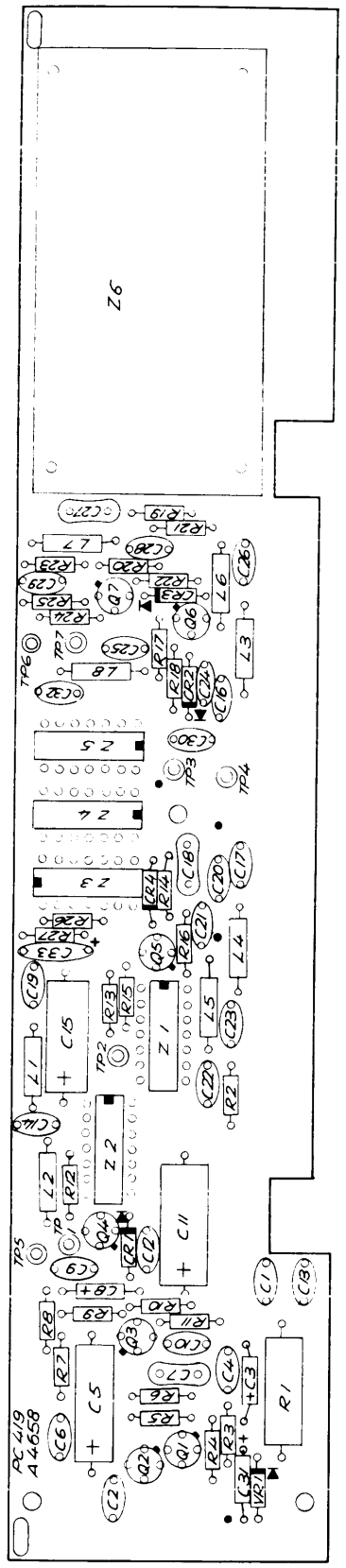

P/O A5 P/C BOARD, INTERCONN (A4662)
P/O A4 GATE GENERATOR CARD
(SEE CK 1343)
(10 MC)
(1 MC)
(100 KC)
(10 KC)
(1 KC)
(0.1 KC)
8 4 2 1
26 DD 28 FF 27 EE 25 CC 22 Z 24 BB 23 AA 21 Y 17 U 19 W 18 V 16 T 11 M 13 P 12 N 10 L 6 F 8 J 7 H 5 E 2 B 4 D 3 C 1 A
XA4A
+5V
(BCD
COMMON)
A5J2
23 48 25 50 24 49 22 47 19 44 21 46 20 45 18 43 15 40 17 42 16 41 14 39 10 35 12 37 11 36 9 34 6 31 33 7 32 5 30 2 27 4 29 3 28 1 26 13 38
8 4 2 1 8 4 2 1 8 4 2 1 8 4 2 1 8 4 2 1 8 4 2 1
10 MC
1 MC
100 KC
10 KC
1 KC
.0-1 KC
BCD OUTPUTS

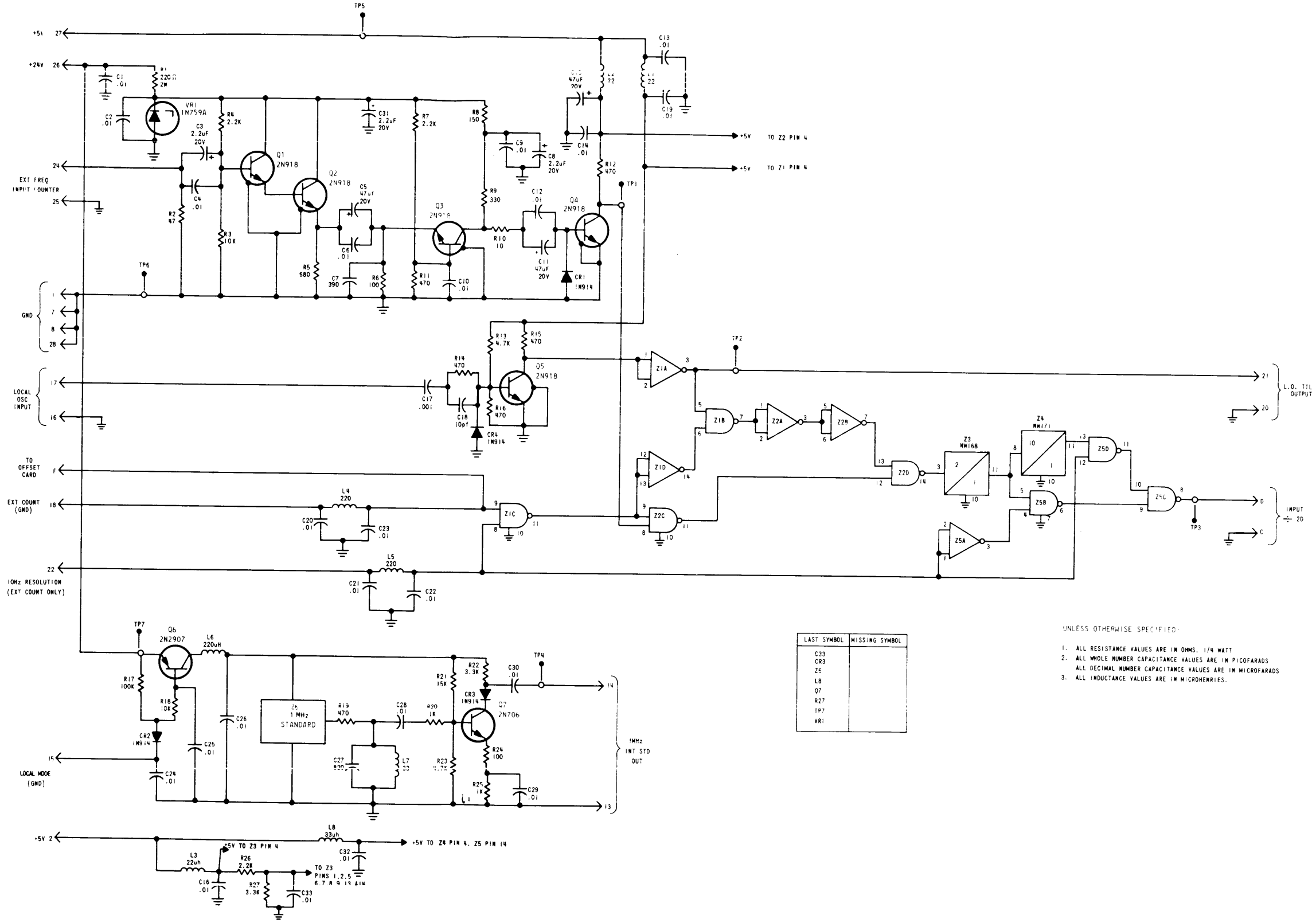
CK 1344



REF DESIG PREFIX 1A1
REF DESIG PREFIX 1A1, 5A1

Figure 5-9. 1A1, Bottom View, Major Component Locations Diagram



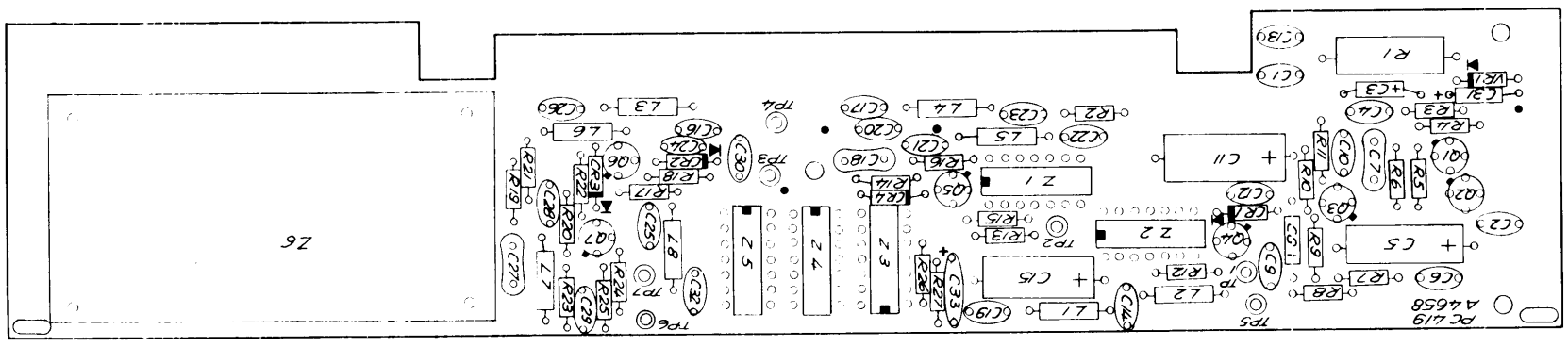


LAST SYMBOL	MISSING SYMBOL
C33	
CR3	
Z5	
L8	
Q7	
R27	
TP7	
VR1	

UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTANCE VALUES ARE IN OHMS, 1/4 WATT
2. ALL WHOLE NUMBER CAPACITANCE VALUES ARE IN PICOFARADS
   ALL DECIMAL NUMBER CAPACITANCE VALUES ARE IN MICROFARADS
3. ALL INDUCTANCE VALUES ARE IN MICROHENRIES.

Figure 5-10/5-11. Input/Std 1A1A1, Schematic/Component Locations Diagram


PC 419
A4658
Z6
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C16
C17
C18
C19
C20
C21
C22
C23
C24
C25
C26
C27
C28
C29
C30
C31
C32
C33
C34
L1
L2
L3
L4
L5
L6
L7
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
R20
R21
R22
R23
R24
R25
R26
R27
R28
R29
R30
R31
R32
R33
R34
R35
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Z1
Z2
Z3
Z4
Z5
Z6
Z7
Z8
VR1
TP1
TP2
TP3
TP4
TP5
TP6
TP7

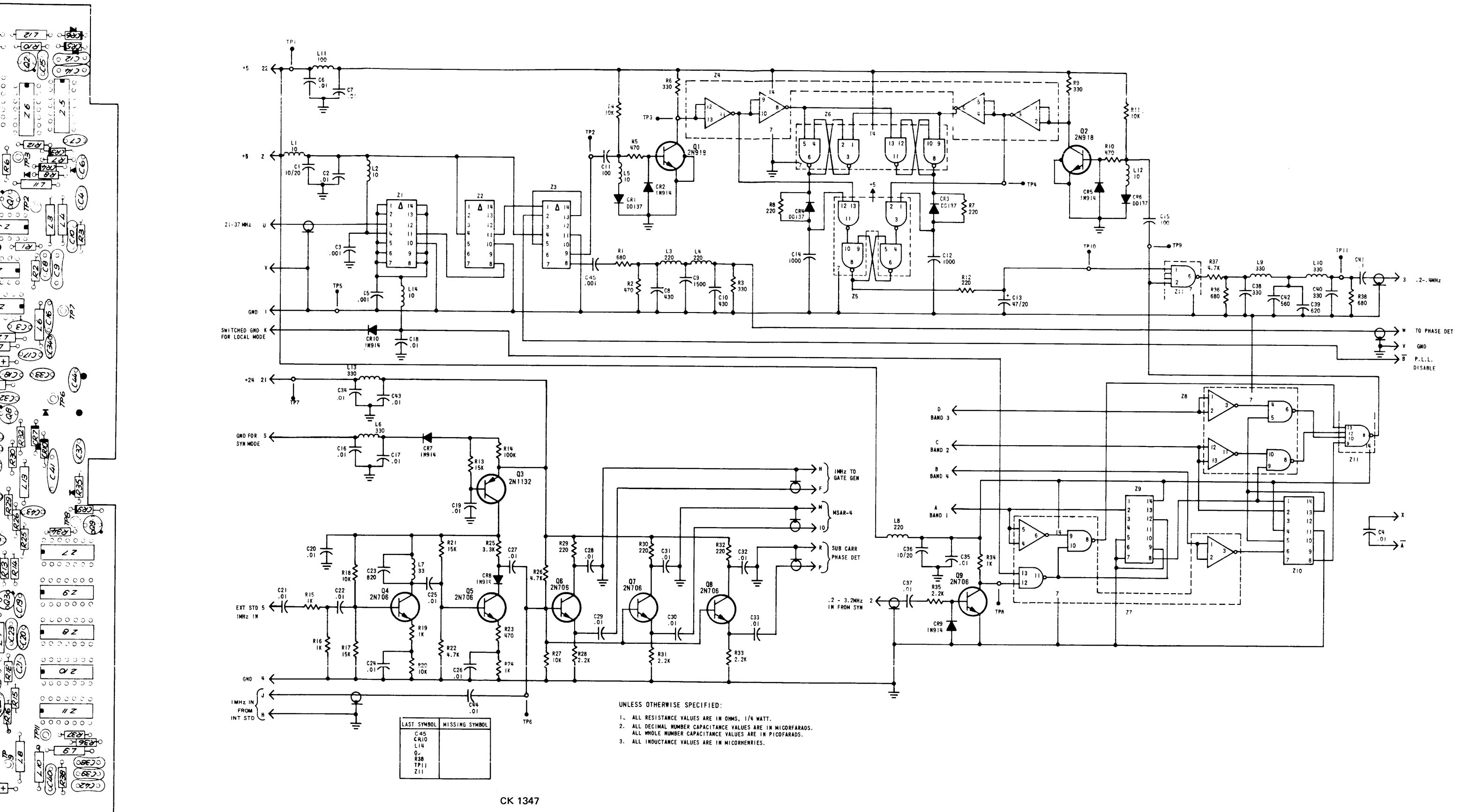
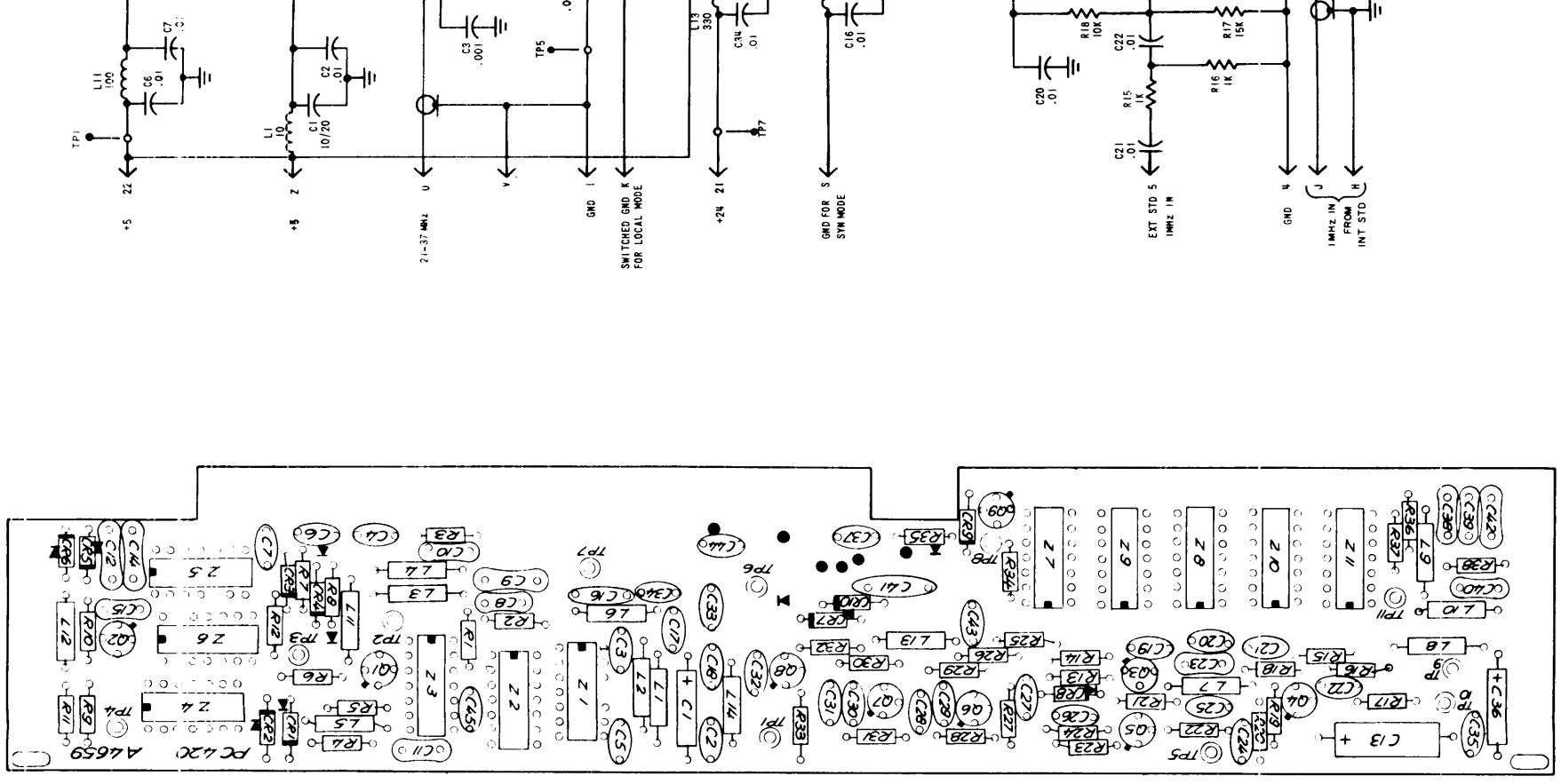
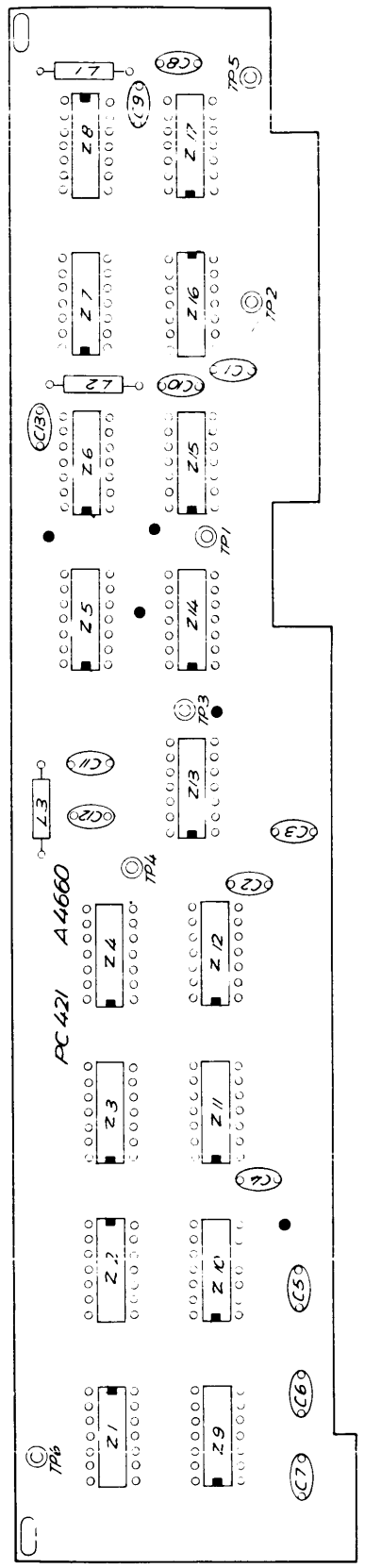
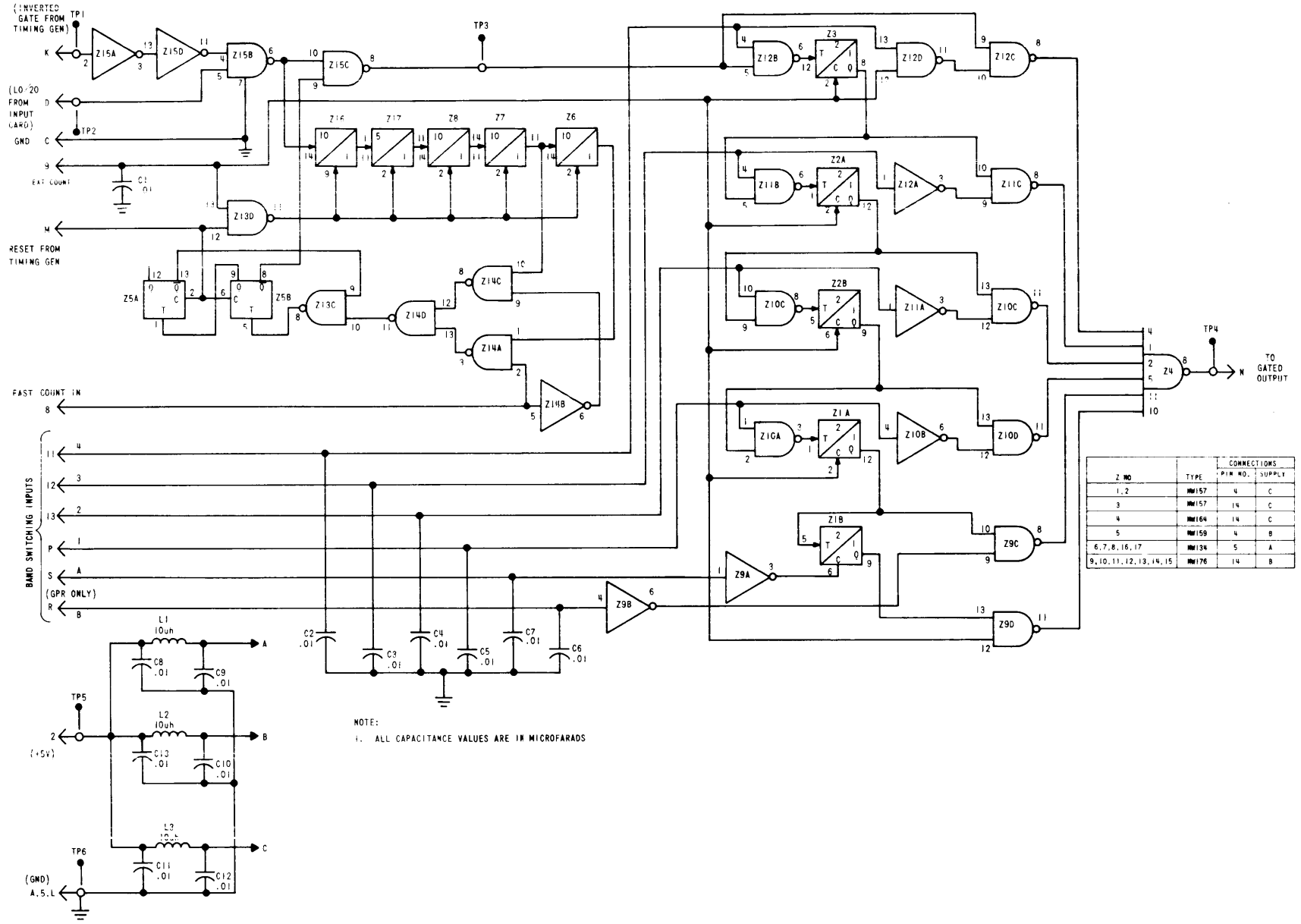


Figure 5-12/5-13. Phase Detector Driver 1A1A2, Schematic/Component Locations Diagram


TP1
L11 100
C7 .01
C6 .01
L1 10
C1 10/20
C2 .01
C3 .001
TP5
L13 330
C34 .01
C16 .01
R18 10K
C22 .01
R17 15K
C20 .01
R15 1K
R16 1K
C21 .01
22 +5
Z +5
U 21-37 MHz
V
GND 1
SWITCHED GND K FOR LOCAL MODE
21 +24
S GND FOR SYN MODE
5 EXT STD 1MHz IN
4 GND
J 1MHz IN FROM INT STD
H
A4659 REV 2C



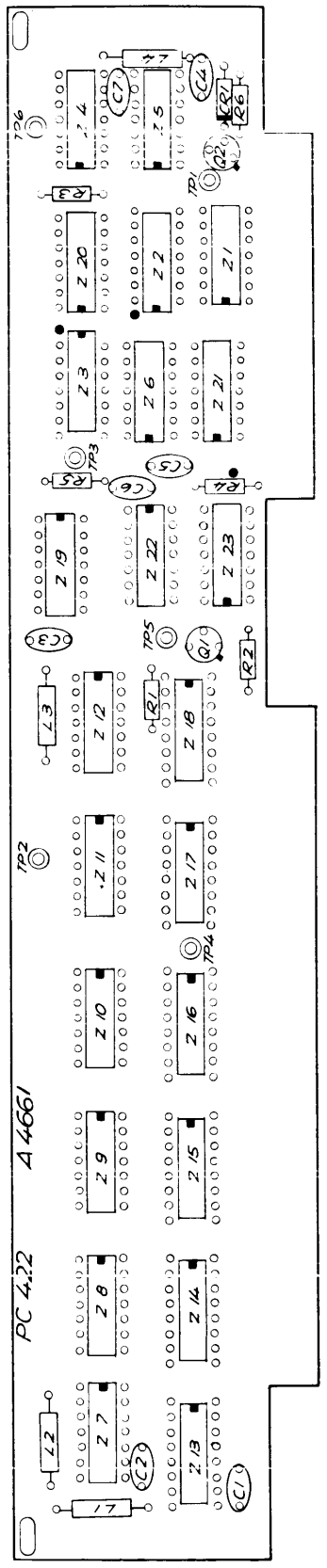


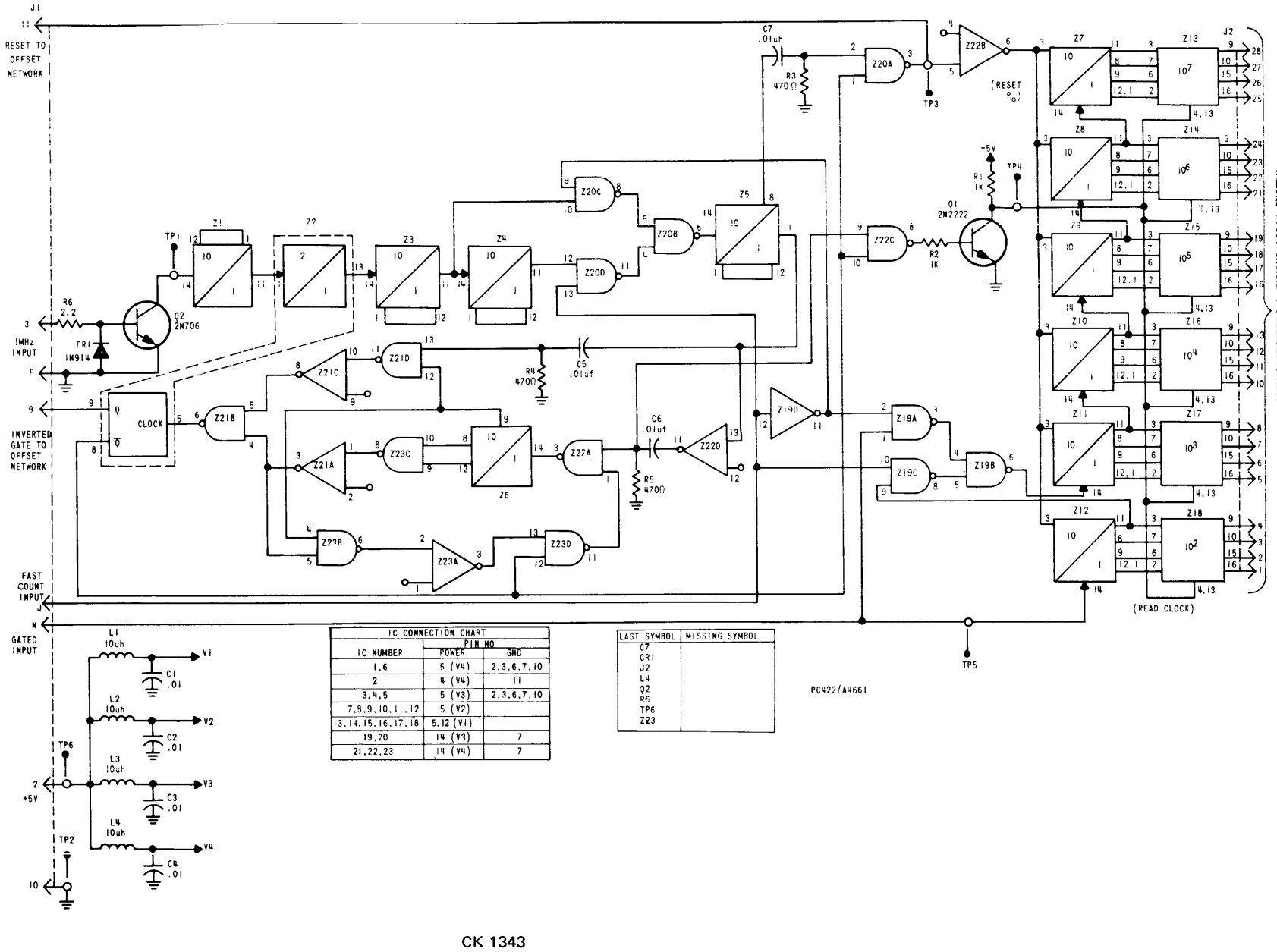
Z NO	TYPE	CONNECTIONS PIN NO.	SUPPLY
1, 2	MM157	4	C
3	MM157	14	C
4	MM164	14	C
5	MM159	4	B
6, 7, 8, 16, 17	MM134	5	A
9, 10, 11, 12, 13, 14, 15	MM176	14	B

NOTE:
1. ALL CAPACITANCE VALUES ARE IN MICROFARADS

CK 1342

Figure 5-14/5-15. Offset 1A1A3, Schematic/Component Locations Diagram





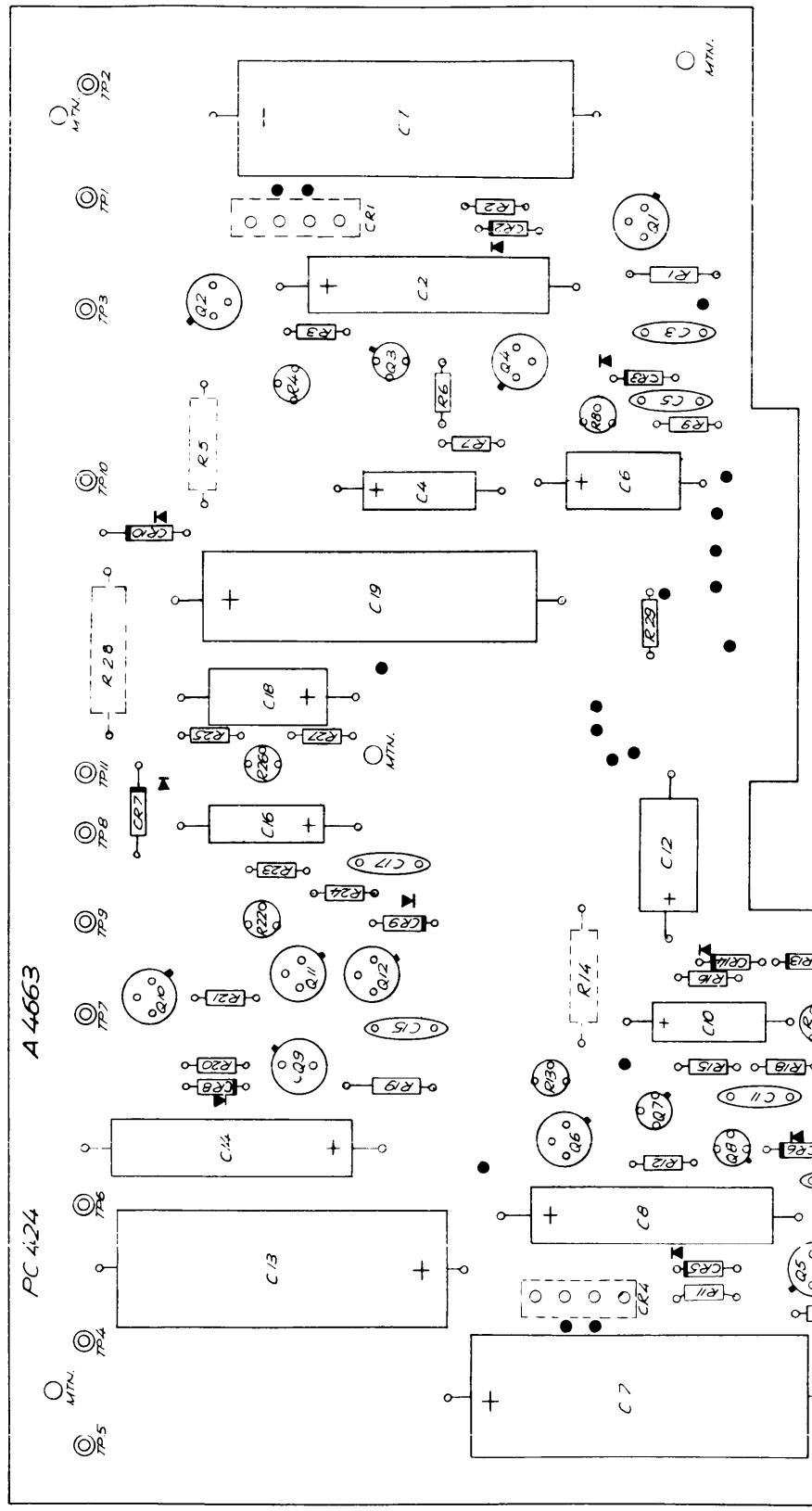
IC CONNECTION CHART

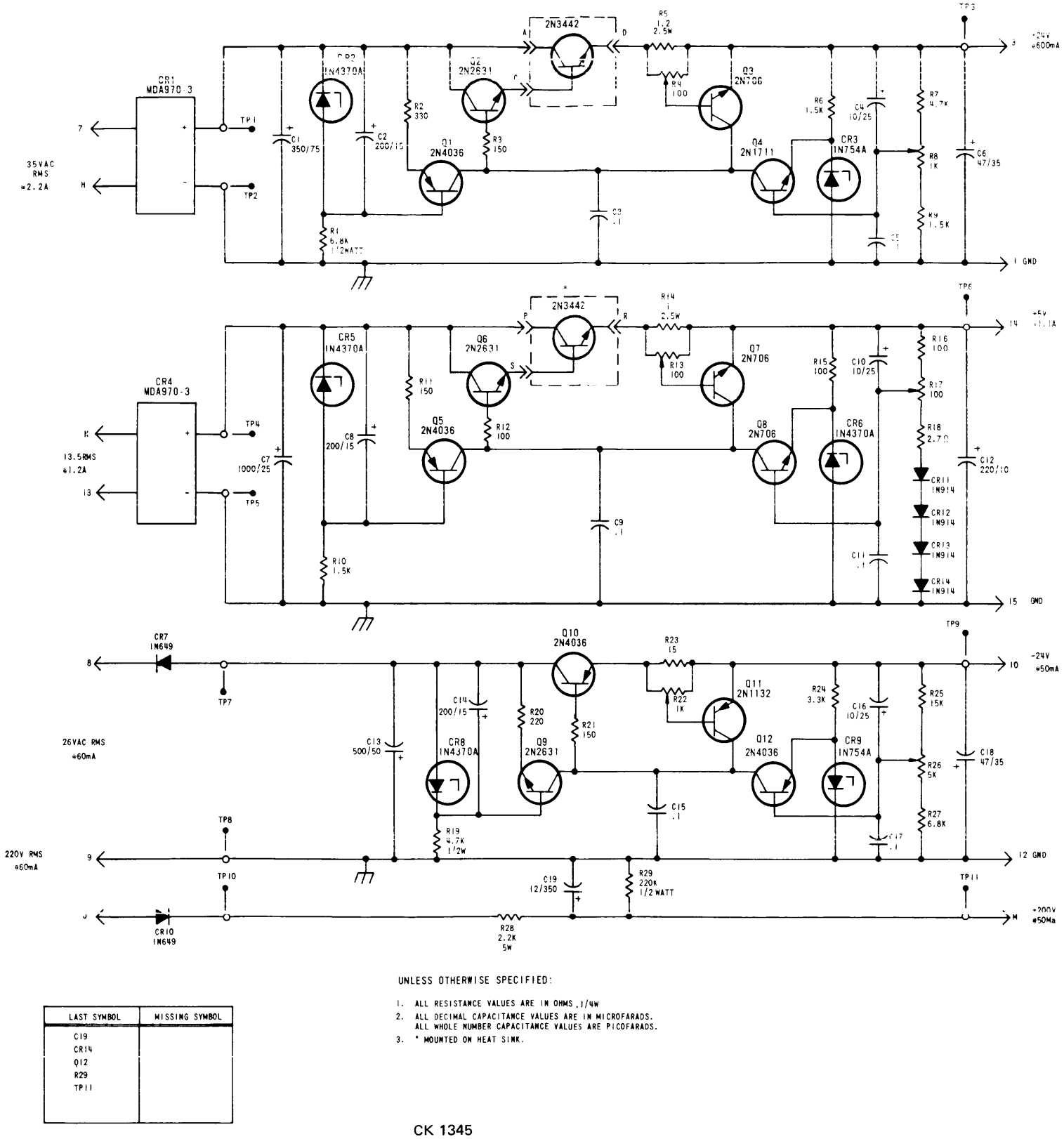
IC NUMBER	PIN NO POWER	PIN NO GND
1,6	5 (V4)	2,3,6,7,10
2	4 (V4)	11
3,4,5	5 (V3)	2,3,6,7,10
7,8,9,10,11,12	5 (V2)	
13,14,15,16,17,18	5,12 (V1)	
19,20	14 (V3)	7
21,22,23	14 (V4)	7

LAST SYMBOL	MISSING SYMBOL
Q7	
CR1	
J2	
L4	
Q2	
R6	
TP6	
Z23	

CK 1343

Figure 5-16/5-17. Gate Generator/Counter 1A1A4, Schematic/Component Locations Diagram





LAST SYMBOL	MISSING SYMBOL
C19	
CR14	
Q12	
R29	
TP11	

UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTANCE VALUES ARE IN OHMS, 1/4W
2. ALL DECIMAL CAPACITANCE VALUES ARE IN MICROFARADS. ALL WHOLE NUMBER CAPACITANCE VALUES ARE PICOFARADS.
3. * MOUNTED ON HEAT SINK.

CK 1345

Figure 5-18/5-19. Power Supply 1A2, Schematic/Component Locations Diagram

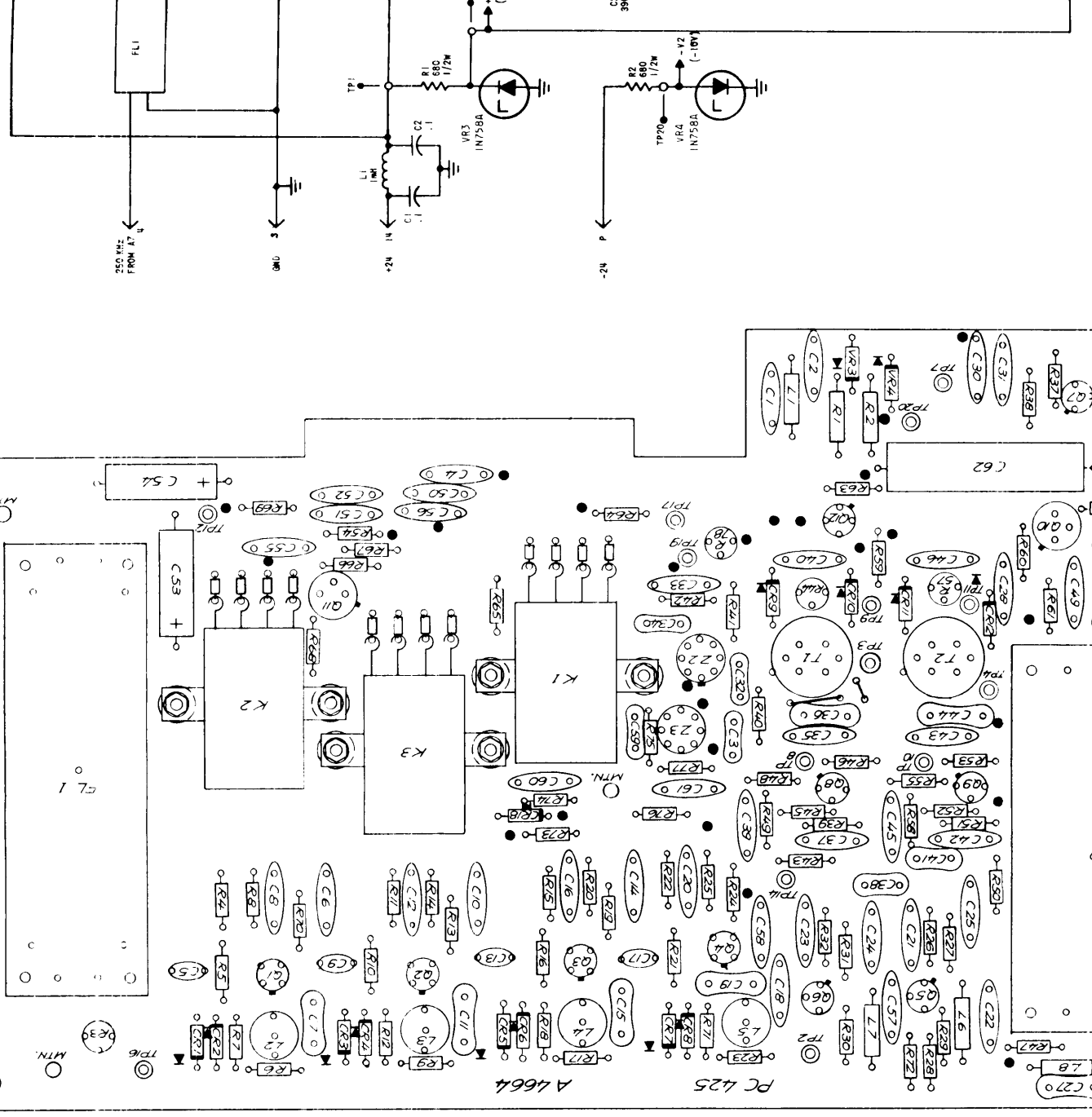
LAST SYMBOL	MISSING SYMBOL
C62	
CR18	CR13,14,15
IC3	
K3	
L8	
Q12	
R78	R54,67
T2	
Z4	
TP20	

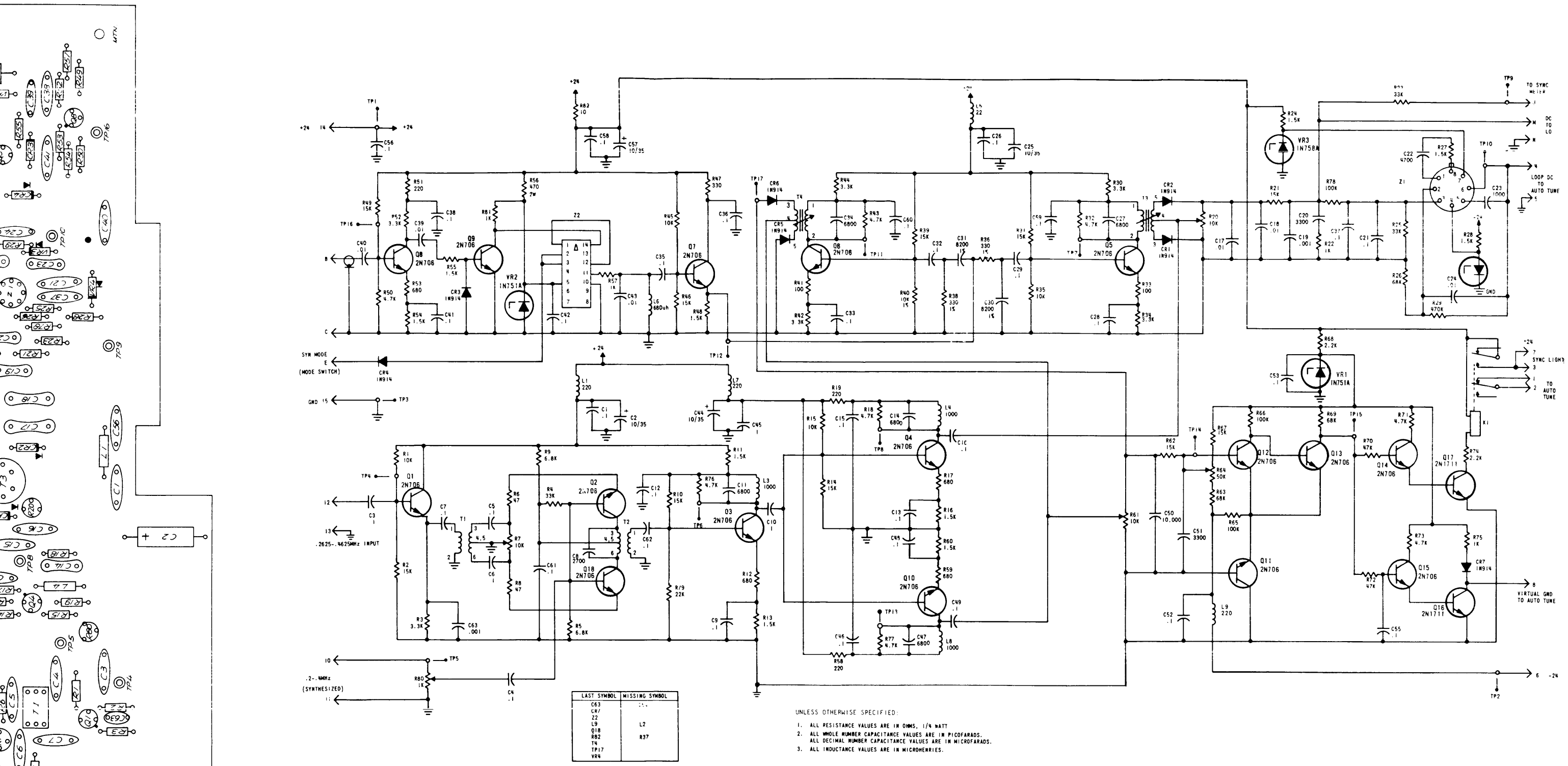
UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTANCE VALUES ARE IN OHMS, 1/4 WATT
2. ALL WHOLE NUMBER CAPACITANCE VALUES ARE IN PICOFARADS
   ALL DECIMAL NUMBER CAPACITANCE VALUES ARE IN MICROFARADS
3. ALL INDUCTANCE VALUES ARE IN MICROHENRIES

CK 1346

Figure 5-20/5-21. AFC 1A3, Schematic/Component Locations Diagram


FL1
250 MHz FROM A7
GND
+24
-24
R1 680 1/2W
R2 680 1/2W
VR3 IN758A
VR4 IN758A
- V2 (-10V)
TP1
TP2
TP3
TP4
TP5
TP6
TP7
TP8
TP9
TP10
TP11
TP12
TP13
TP14
TP15
TP16
TP17
TP18
TP19
TP20
MTN.
K1
K2
K3
T1
T2
TCX VCO
PC 425
A4664

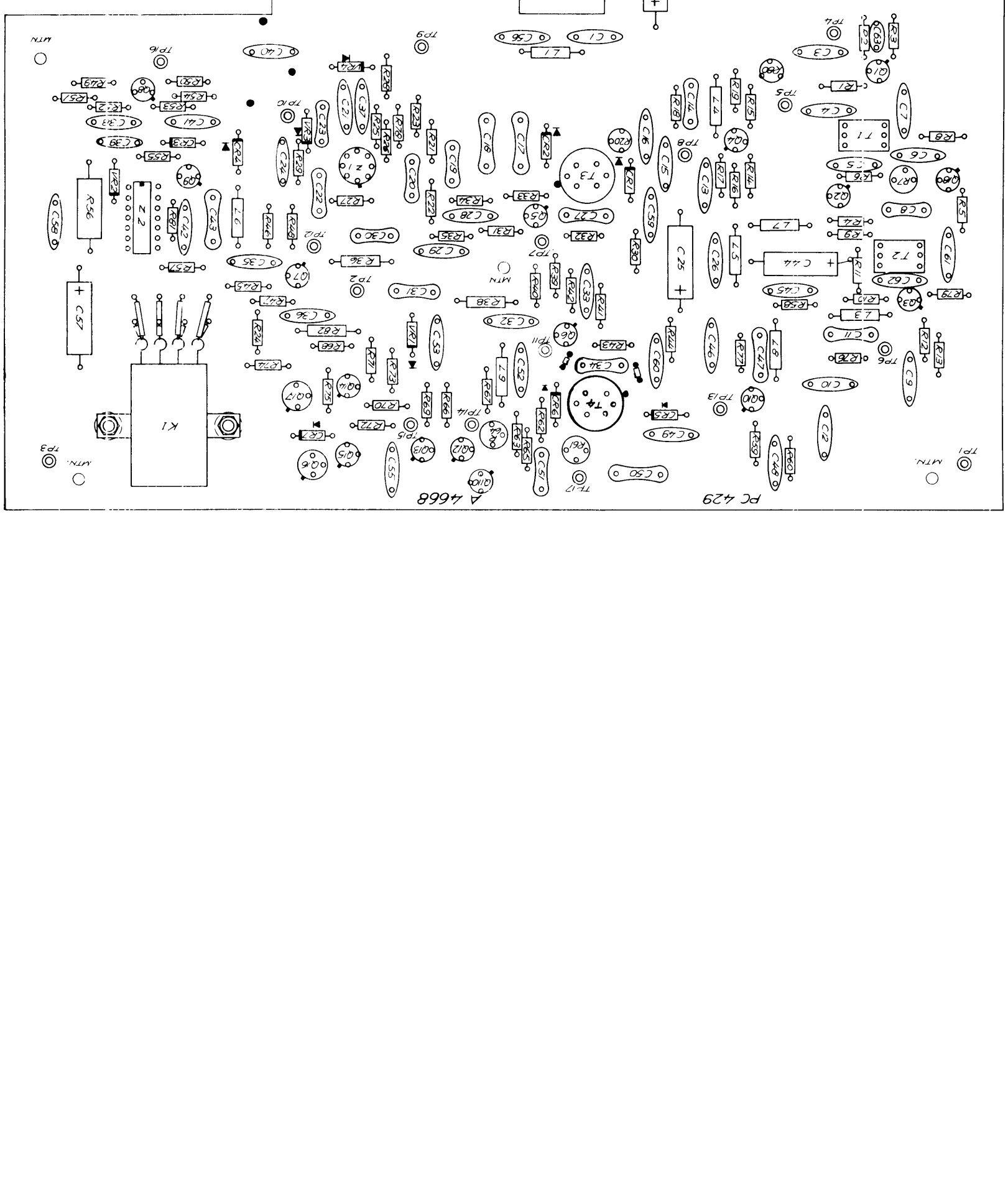


LAST SYMBOL	MISSING SYMBOL
C63	C54
CR7	
Z2	
L9	L2
Q18	R37
R82	
T4	
TP17	
VR4	

UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTANCE VALUES ARE IN OHMS, 1/4 WATT
2. ALL WHOLE NUMBER CAPACITANCE VALUES ARE IN PICOFARADS. ALL DECIMAL NUMBER CAPACITANCE VALUES ARE IN MICROFARADS.
3. ALL INDUCTANCE VALUES ARE IN MICROHENRIES.

Figure 5-22/5-23. Phase Detector 1A5, Schematic/Component Locations Diagram


A 4668
PC 429

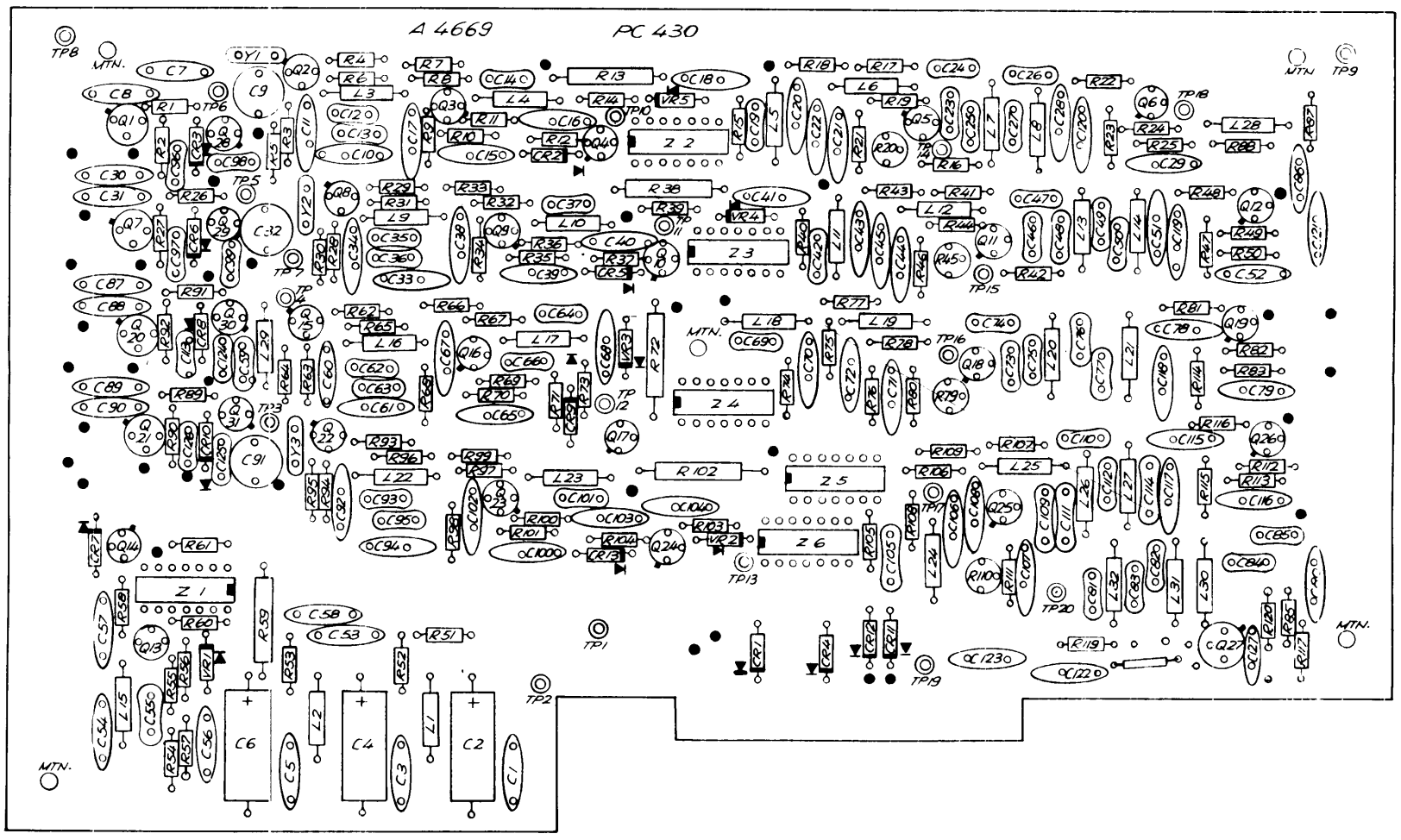
UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTANCE VALUES ARE IN OHMS, 1/4 WATT
2. ALL WHOLE NUMBER CAPACITANCE VALUES ARE IN PICOFARADS
   ALL DECIMAL NUMBER CAPACITANCE VALUES ARE IN MICROFARADS
3. ALL INDUCTANCE VALUES ARE IN MICROHENRIES

LAST SYMBOL	MISSING SYMBOL
C127	
CR13	
L32	
Q31	
R120	K64,65,66
Z6	
TP20	
VR5	
Y3	

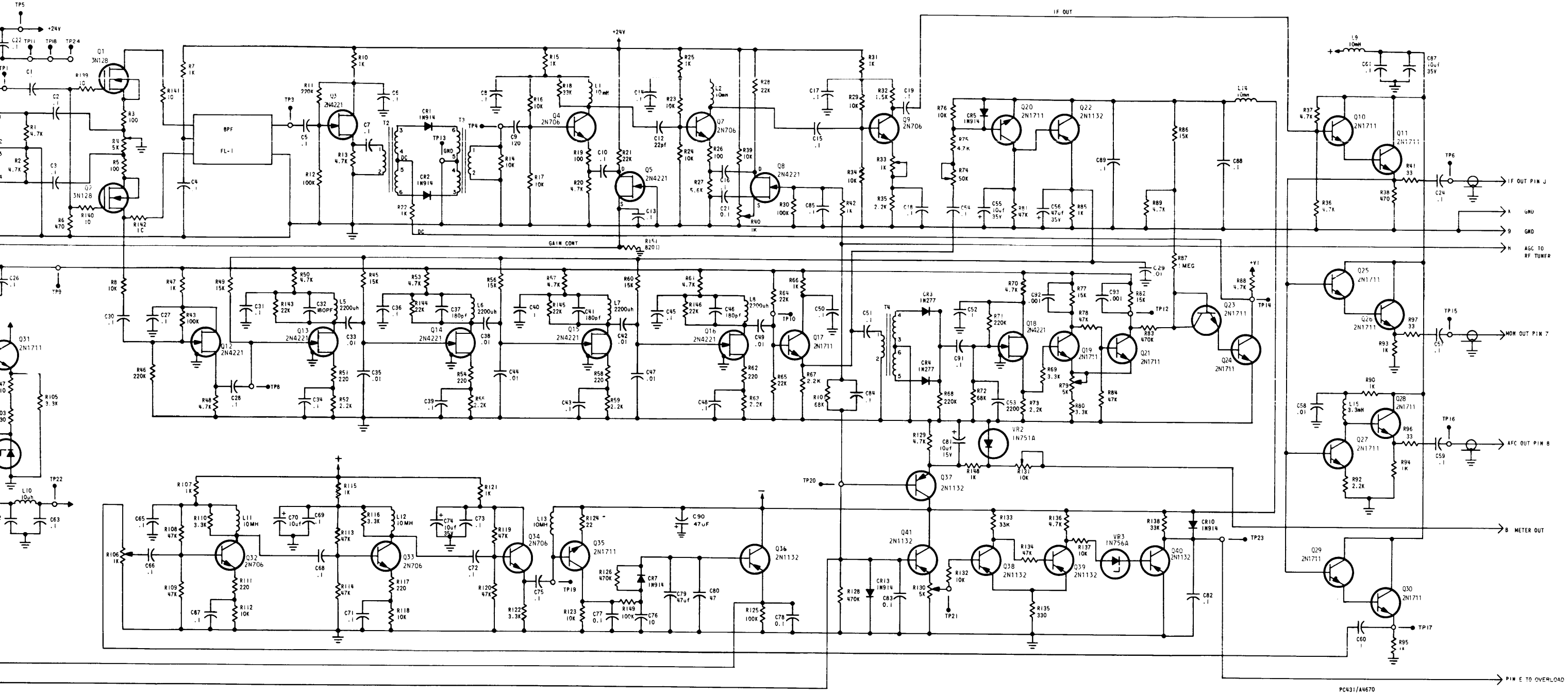
CK 1349

Figure 5-24/5-25. Subsynthesizer 1A6, Schematic/Component Locations Diagram



R55 22K
R53 22K
C54
R61 4.7K
R57 1.5K
TP1
C5
C4 47/35
L2 100
C3
L1 100
C2 47/35
C1
+24 14
GND 15

A 4669
PC 430
MTN.
TP8
TP9
Z 1
Z 2
Z 3
Z 4
Z 5
Z 6



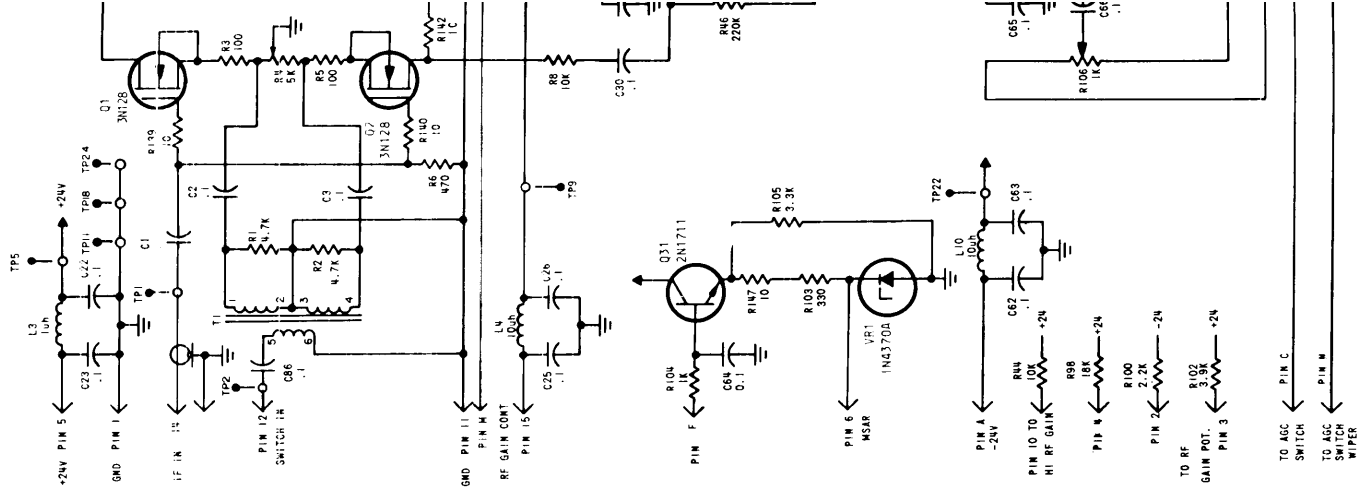
UNLESS OTHERWISE SPECIFIED:

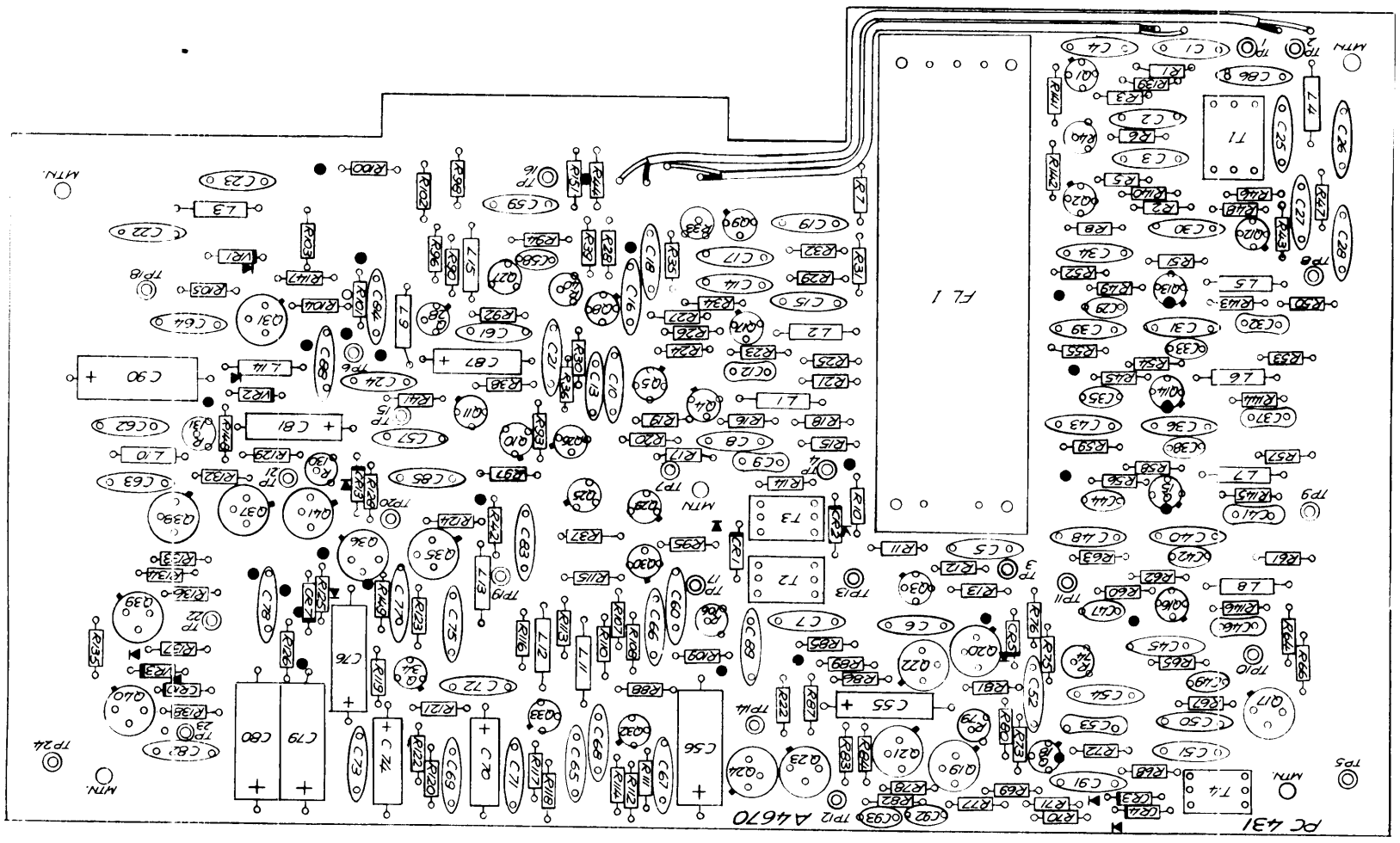
1. ALL RESISTANCE VALUES ARE IN OHMS, 1/4W.
2. ALL DECIMAL NUMBER CAPACITANCE VALUES ARE IN MICROFARADS
   ALL WHOLE NUMBER CAPACITANCE VALUES ARE IN PICOFARADS
3. ALL INDUCTANCE VALUES ARE IN MICROHENRIES

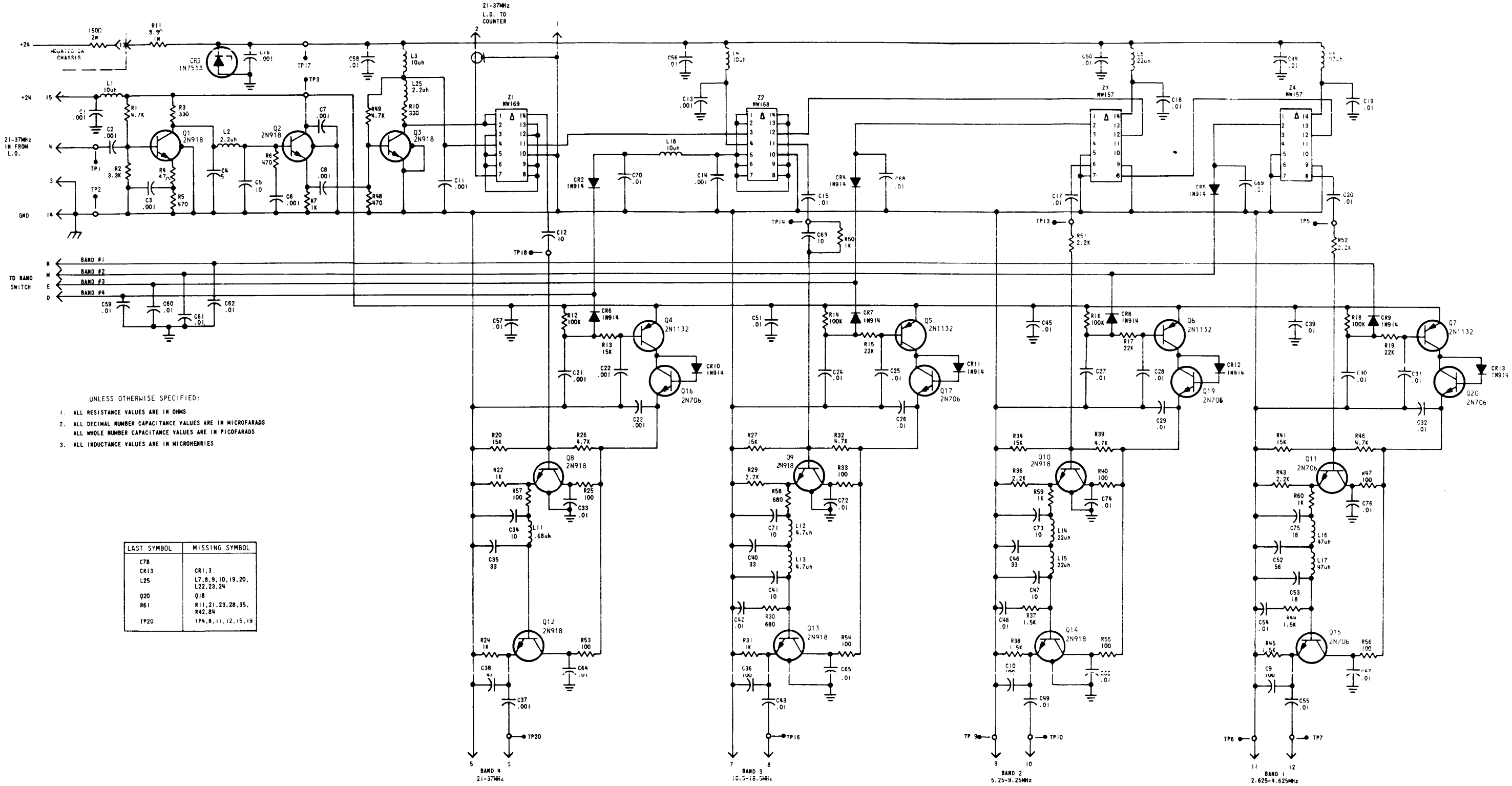
LAST SYMBOL	MISSING SYMBOL
C93	C11,20,79
CR13	CR6,8,9,11,12
FL1	
L15	
Q41	Q6
R151	R9,91,99,127 R150
T4	
TP24	
VR3	

Figure 5-26/5-27. Second IF Amplifier 1A7, Schematic/Component Locations Diagram

011690392


Q1 2N128
Q2 2N128
Q31 2N1711
VR1 1N4370A
T1
L3 1uh
L4 100uh
L10 100uh
TP1
TP2
TP5
TP9
TP18
TP22
TP24
C1
C2 .1
C3 .1
C23 .1
C24 .1
C25 .1
C26 .1
C62 .1
C63 .1
C64 0.1
C65 .1
C66 .1
C86 .1
R1 4.7K
R2 4.7K
R3 100
R4 5K
R5 100
R6 470
R8 10K
R98 18K
R100 2.2K
R102 3.9K
R103 330
R104 1K
R105 3.3K
R106 1K
R107 10
R139 10
R140 10
R142 1K
RN4 220K
RN6 220K
RN44 10K
+24V
-24V
PIN 5
PIN 1
PIN 12
PIN 11
PIN 15
PIN F
PIN 6
PIN A
PIN 10
PIN 9
PIN 2
PIN 3
PIN C
PIN M
GND
IF IN
SWITCH IN
RF GAIN CONT
MSAR
HI RF GAIN
TO RF
GAIN POT.
TO AGC SWITCH
TO AGC SWITCH WIPER


A4670
PC 431
MTN.
FL1
T1
T2
T3
T4
TP12
TP24
TP5
TP9
TP10
TP11
TP13
TP18
TP22
TP23
C90 +
C87 +
C81 +
C79
C80
C56
C55 +
L1
L2
L3
L4
L5
L6
L7
L8
L10
Q1
Q2
Q19
Q20
Q21
Q23
Q24
Q31
Q35
Q36
Q37
Q39
Q40
Q41



UNLESS OTHERWISE SPECIFIED:

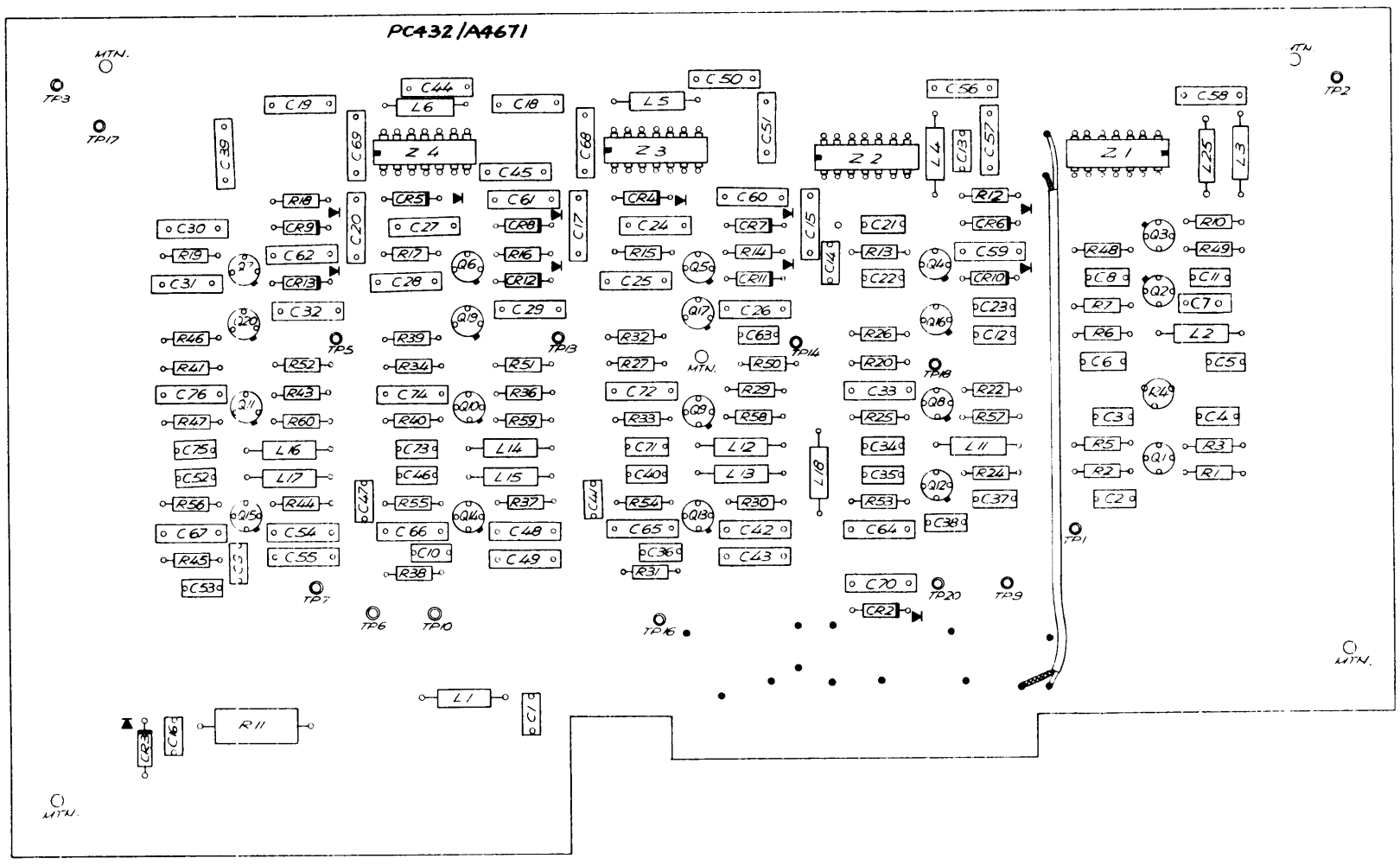
1. ALL RESISTANCE VALUES ARE IN OHMS
2. ALL DECIMAL NUMBER CAPACITANCE VALUES ARE IN MICROFARADS
   ALL WHOLE NUMBER CAPACITANCE VALUES ARE IN PICOFARADS
3. ALL INDUCTANCE VALUES ARE IN MICROHENRIES

LAST SYMBOL	MISSING SYMBOL
C78	
CR13	CR1,3
L25	L7,8,9,10,19,20, L22,23,24
Q20	Q18
R61	R11,21,23,28,35, R42,84
TP20	TP4,8,11,12,15,19

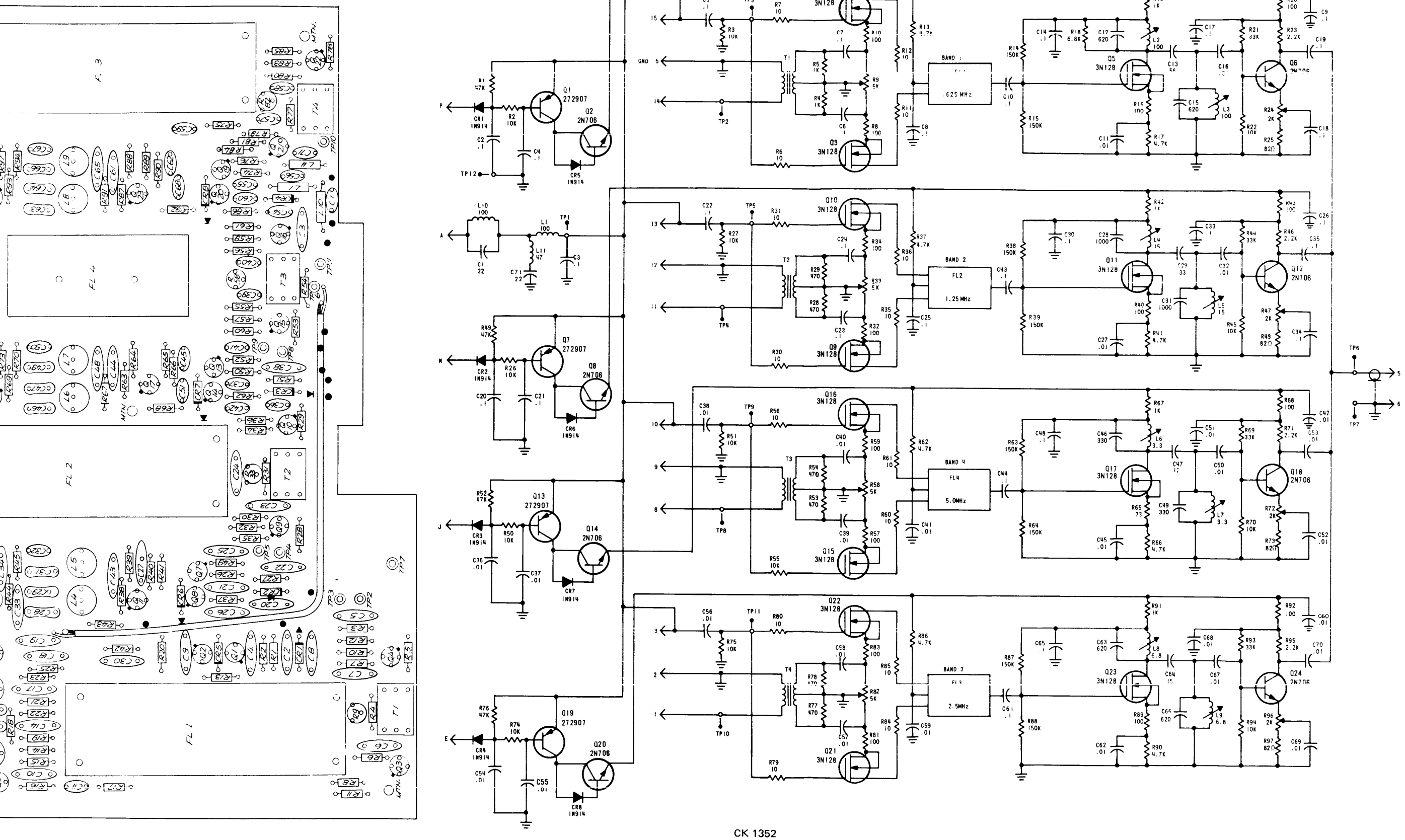
CK 1351

Figure 5-28/5-29. Local Oscillator Divider 1A8, Schematic/Component Locations Diagram

011690392


PC432/A4671
MTN.
TP3
TP17
C19
C44
L6
C18
C50
L5
C56
C58
C39
C69
Z4
C45
C68
Z3
C51
Z2
L4
C133
C57
Z1
L25
L3
TP2
R18
CR5
C61
CR4
C60
R12
C30
CR9
C27
C24
CR7
C15
C21
R10
R19
C62
R17
Q6
R16
R15
Q5
R14
R13
Q4
C59
R48
Q3
R49
C31
CR13
C28
C25
CR11
C4
C22
CR10
C8
Q2
C11
C7
C20
C17
C32
Q17
C26
C23
R7
R6
L2
TP5
TP13
TP14
TP18
C63
C12
R46
R39
R51
R32
R26
C6
C5
R41
R34
R36
R27
R50
R29
R22
R24
C76
C74
R40
R59
C72
R33
R58
C33
Q8
R57
R47
Q10
Q9
Q11
C3
C4
C75
L16
C73
L14
C71
L12
C34
L11
C52
L17
C46
L15
C40
L13
C35
R5
R3
R56
R44
R55
R37
R54
R30
R53
R2
R1
C47
C49
C67
C54
C66
C48
C65
Q13
C42
Q12
C37
C2
C10
C36
C64
C38
TP1
C55
C43
R45
R38
R31
C53
C70
TP20
TP9
TP7
TP6
TP10
TP16
CR2
L1
C13
R11
C46
CR3
MTN.

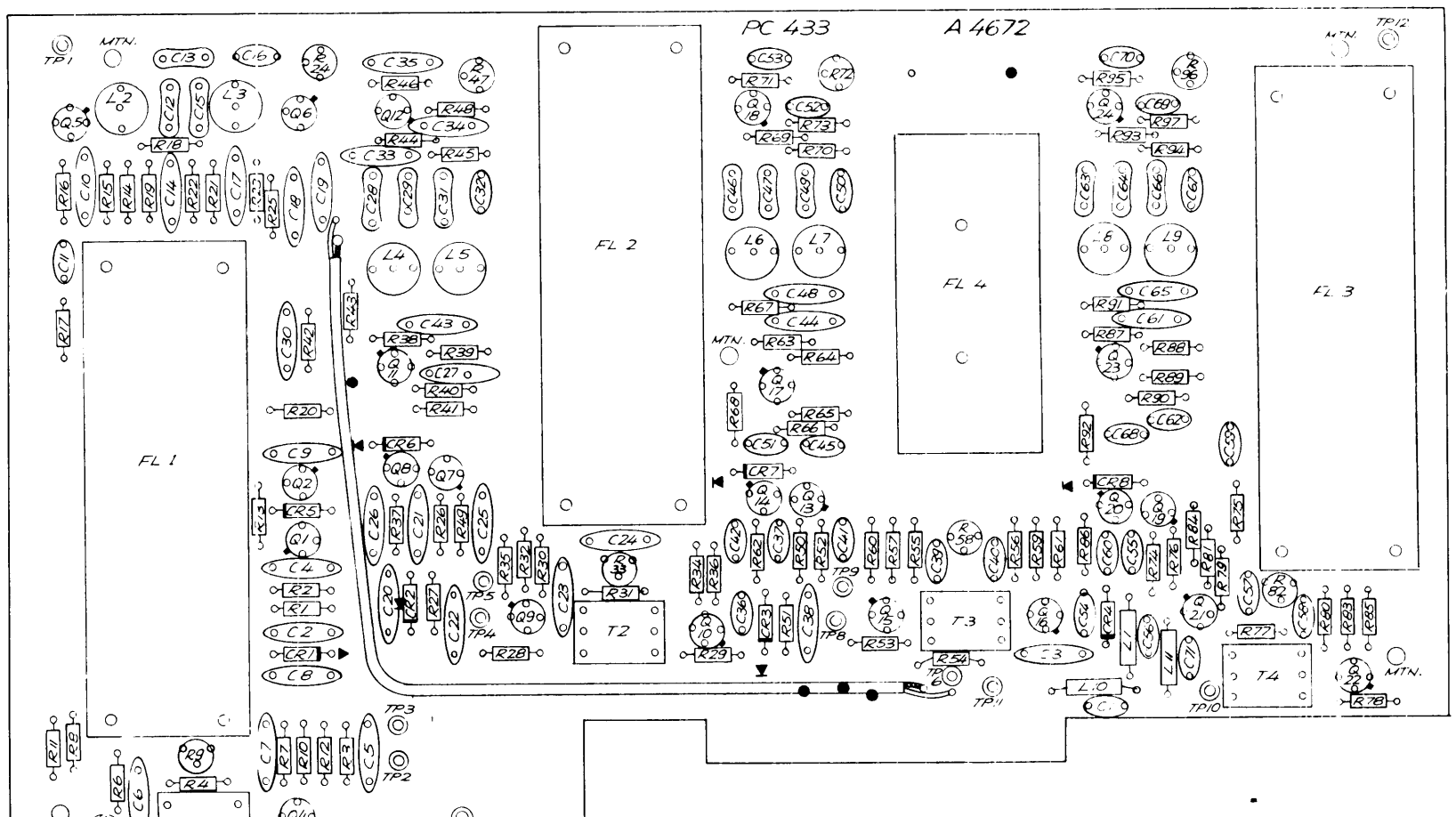
TO BAND SWITCH
GND
21-37MHz IN FROM L.O.
+24
+24

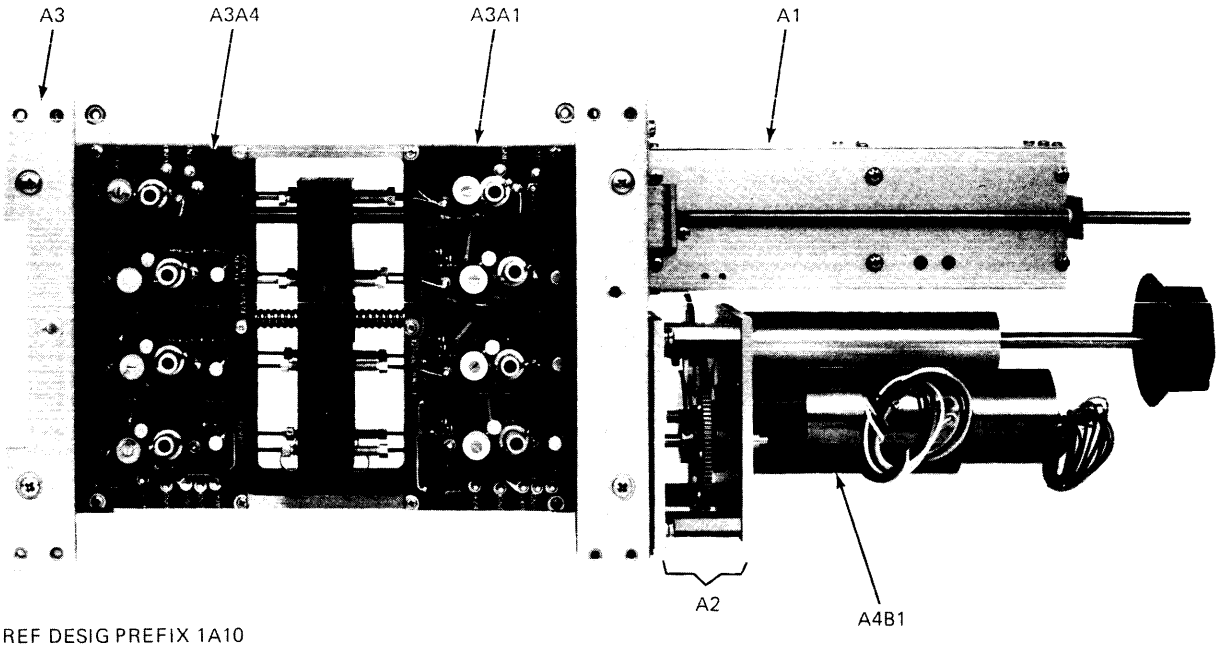


LAST SYMBOL	MISSING SYMBOL
C70	
CR8	
L15	
Q24	
R97	
T4	

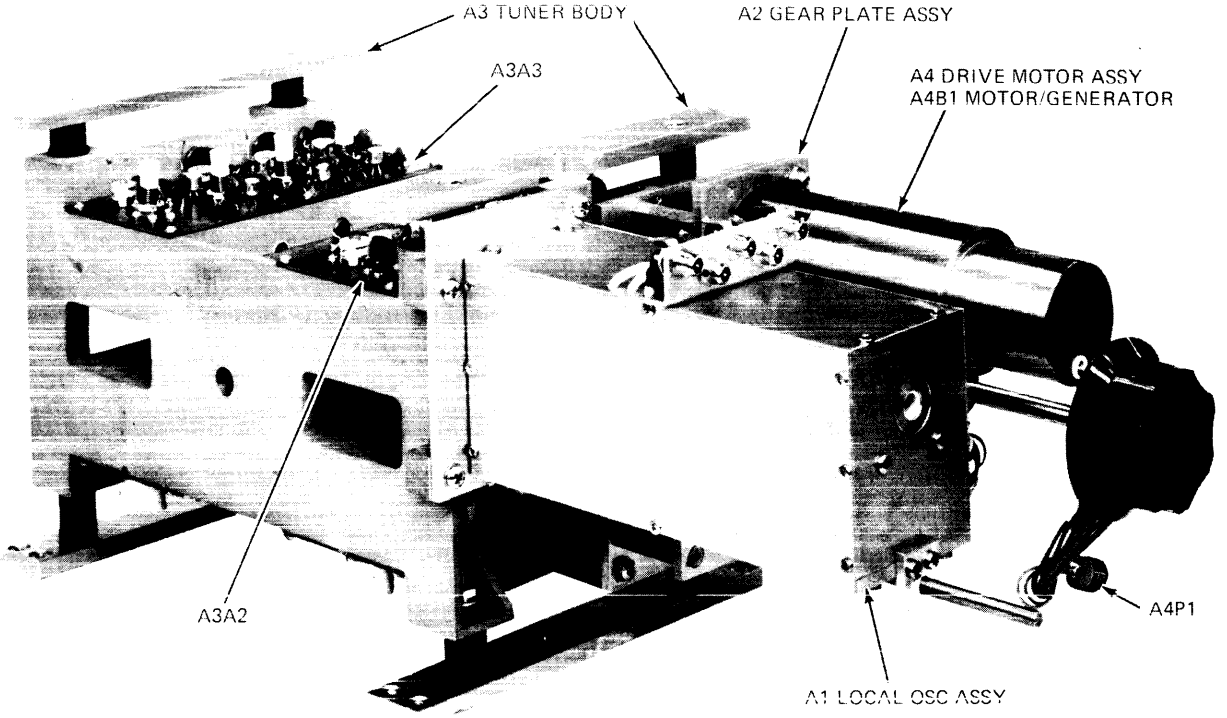
CK 1352

Figure 5-30/5-31. First IF Amplifier 1A9, Schematic/Component Locations Diagram


PC 433
A 4672
MTN.
TP1
TP12
FL 1
FL 2
FL 3
FL 4
T2
T3
T4
TP2
TP3
TP4
TP5
TP8
TP9
TP10
TP11

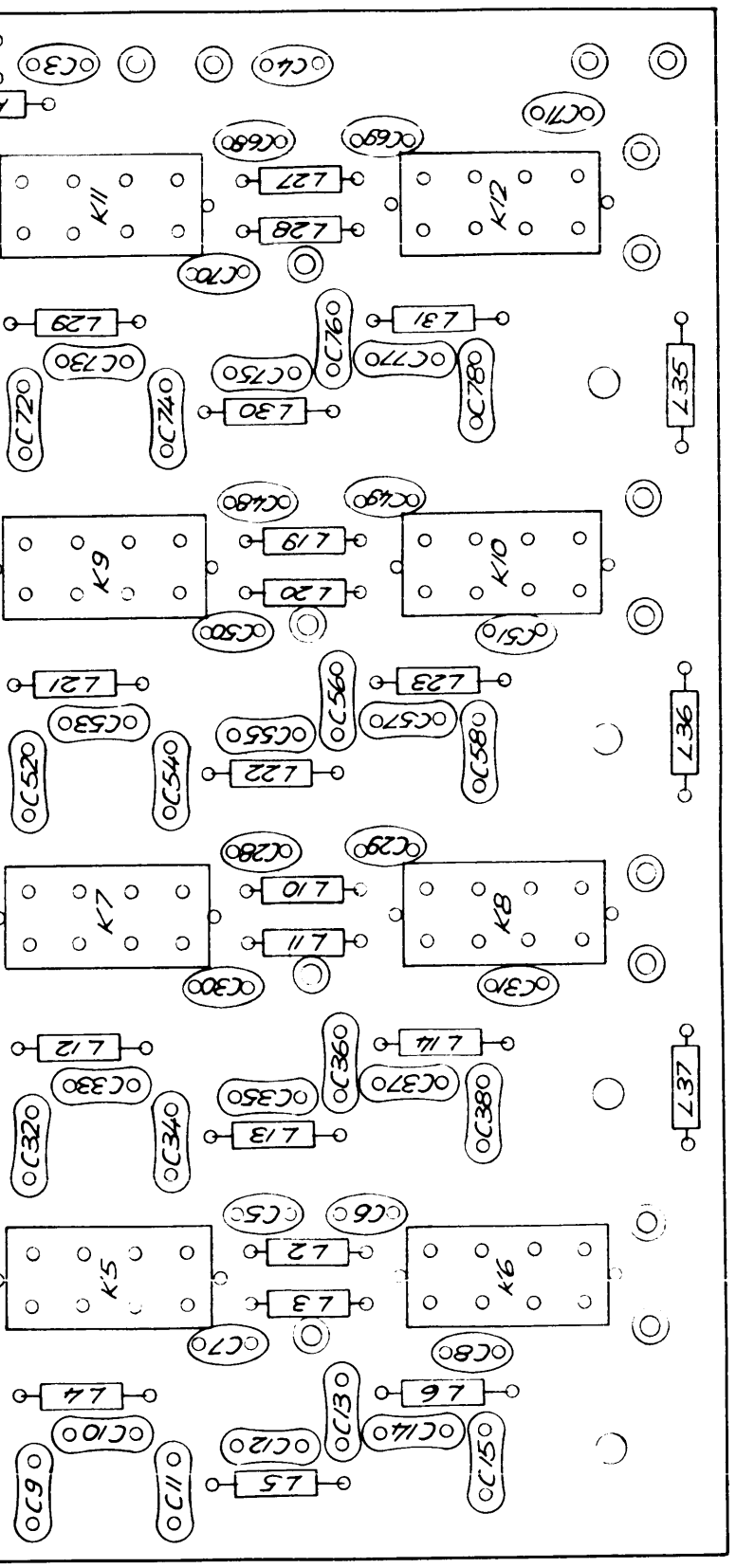


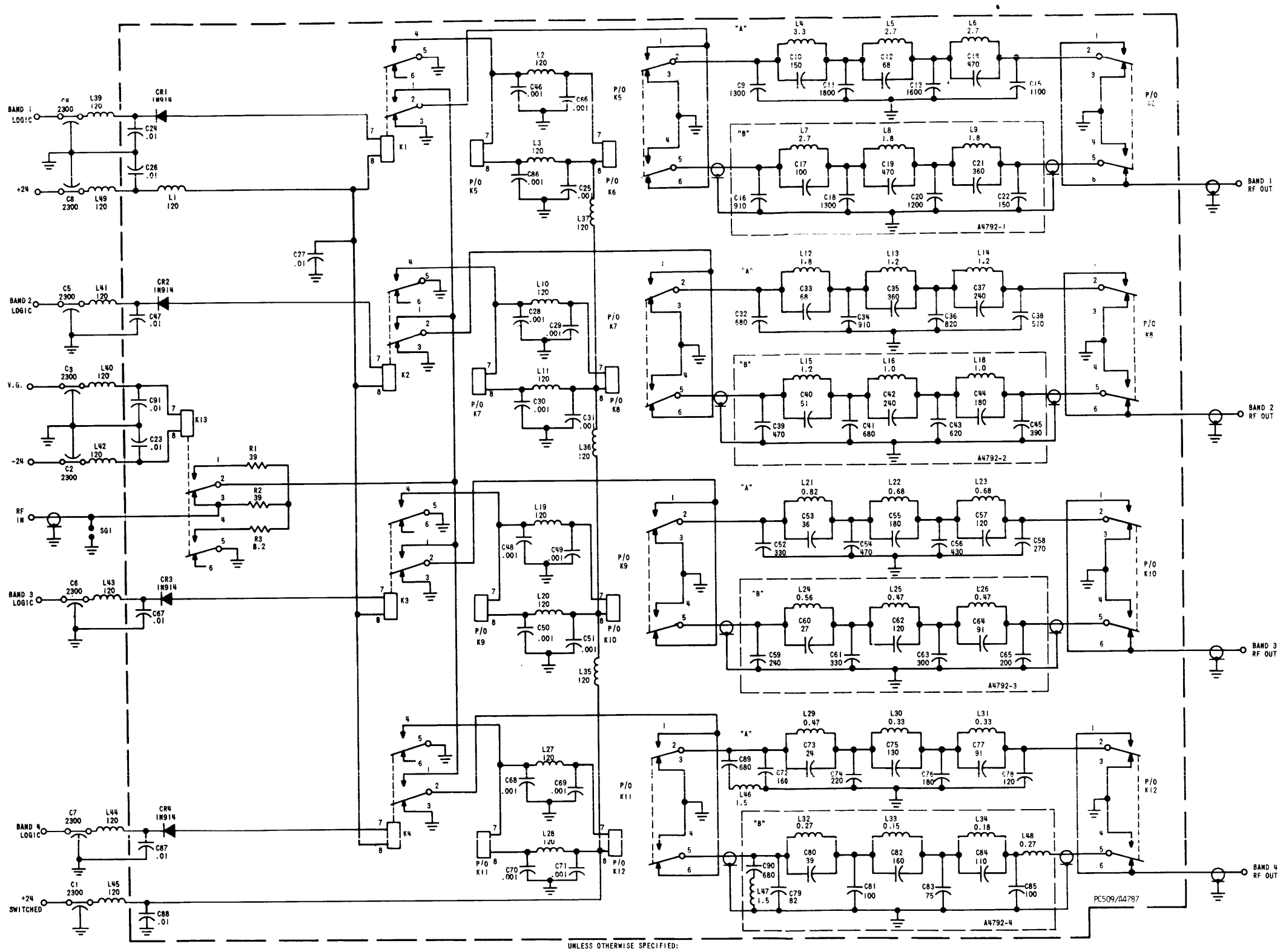
REF DESIG PREFIX 1A10
REF DESIG PREFIX 1A10, 5A10



REF DESIG PREFIX 1A10
REF DESIG PREFIX 1A10, 5A10

Figure 5-32. Tuner Assembly 1A10, Major Component Locations Diagram





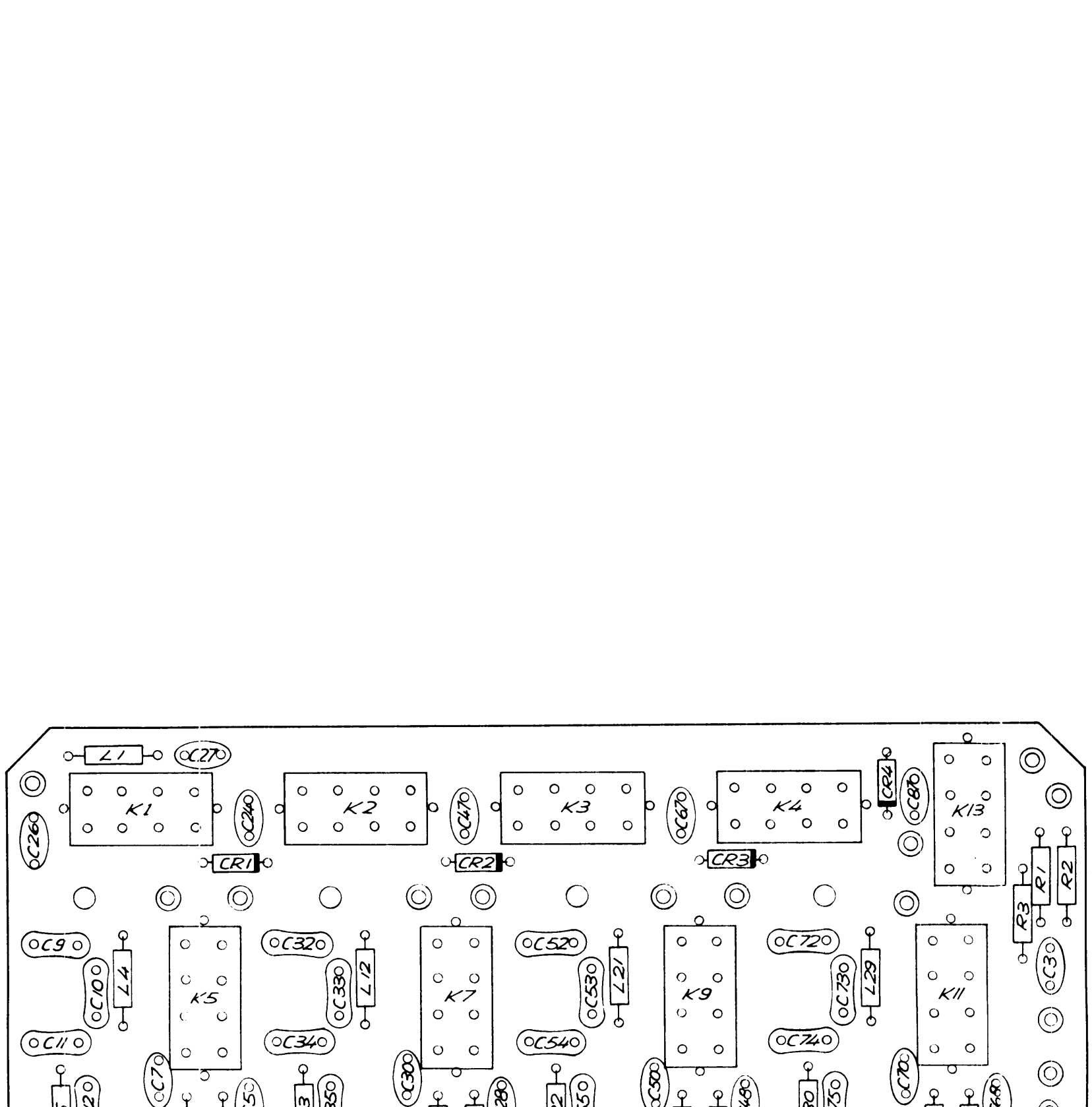
LAST SYMBOL	MISSING SYMBOL
C91	L17
CR4	
K13	
L48	
R3	
SG1	

UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTANCE VALUES ARE IN OHMS, 1/4 WATT
2. ALL DECIMAL NUMBER CAPACITANCE VALUES ARE IN MICROFARADS
   ALL WHOLE NUMBER CAPACITANCE VALUES ARE IN PICROFARADS
3. ALL INDUCTANCE VALUES ARE IN MICROHENRIES
4. FILTER "B" IS MOUNTED ON SUB-ASSEMBLY

CK 1633

Figure 5-33/5-34. Input/Attenuator 1A11, Schematic/Component Locations Diagram


L1
C270
K1
C260
C240
CR1
K2
C470
CR2
K3
C670
CR3
K4
CR4
C870
K13
R1
R2
R3
C3
C9
C10
C11
L4
K5
C7
C5
C320
C330
C340
L12
K7
C300
C280
C520
C530
C540
L21
K9
C500
C480
C720
C730
C740
L29
K11
C700
C680
C660
C5
C12
C13
C350
C22
C550
C30
C750

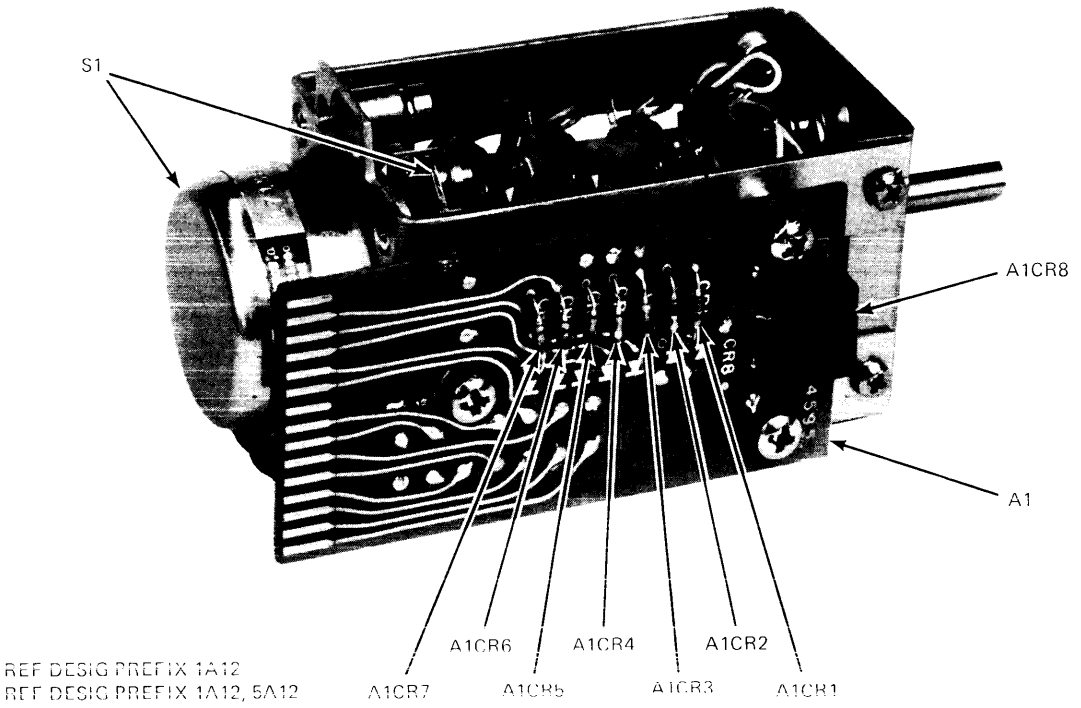
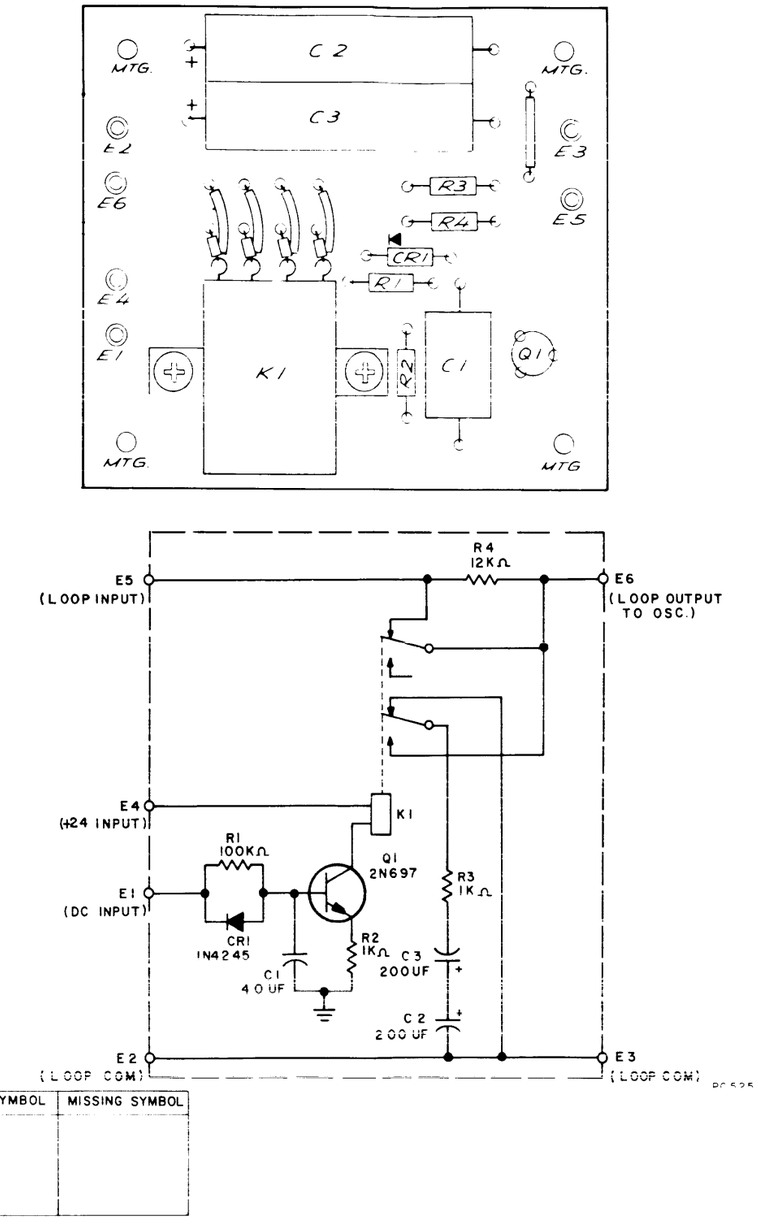


Figure 5-35. FUNCTION Stepping Switch Assembly 1A12, Component Locations Diagram



LAST SYMBOL	MISSING SYMBOL
C3	
CR1	
E6	
K1	
Q1	
R4	

CK 1634

Figure 5-36/5-37. A-C Filter 1A13, Schematic/Component Locations Diagram

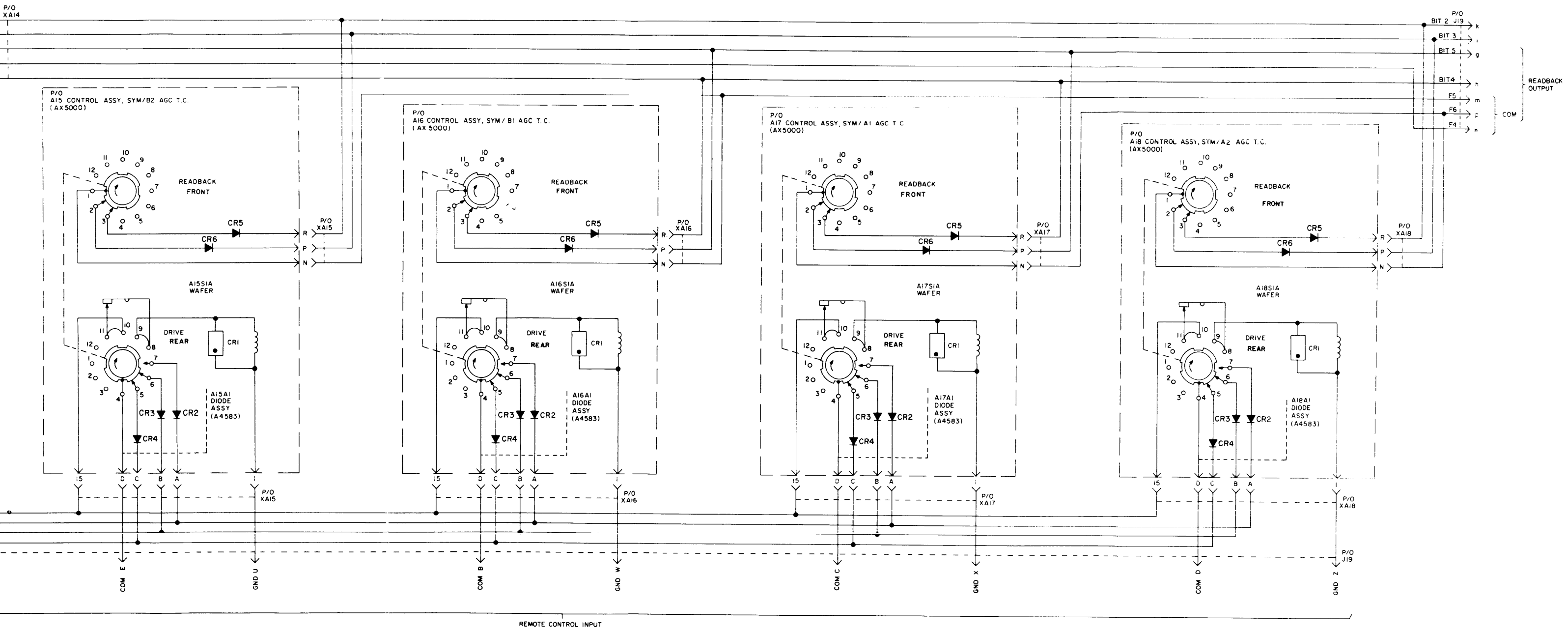
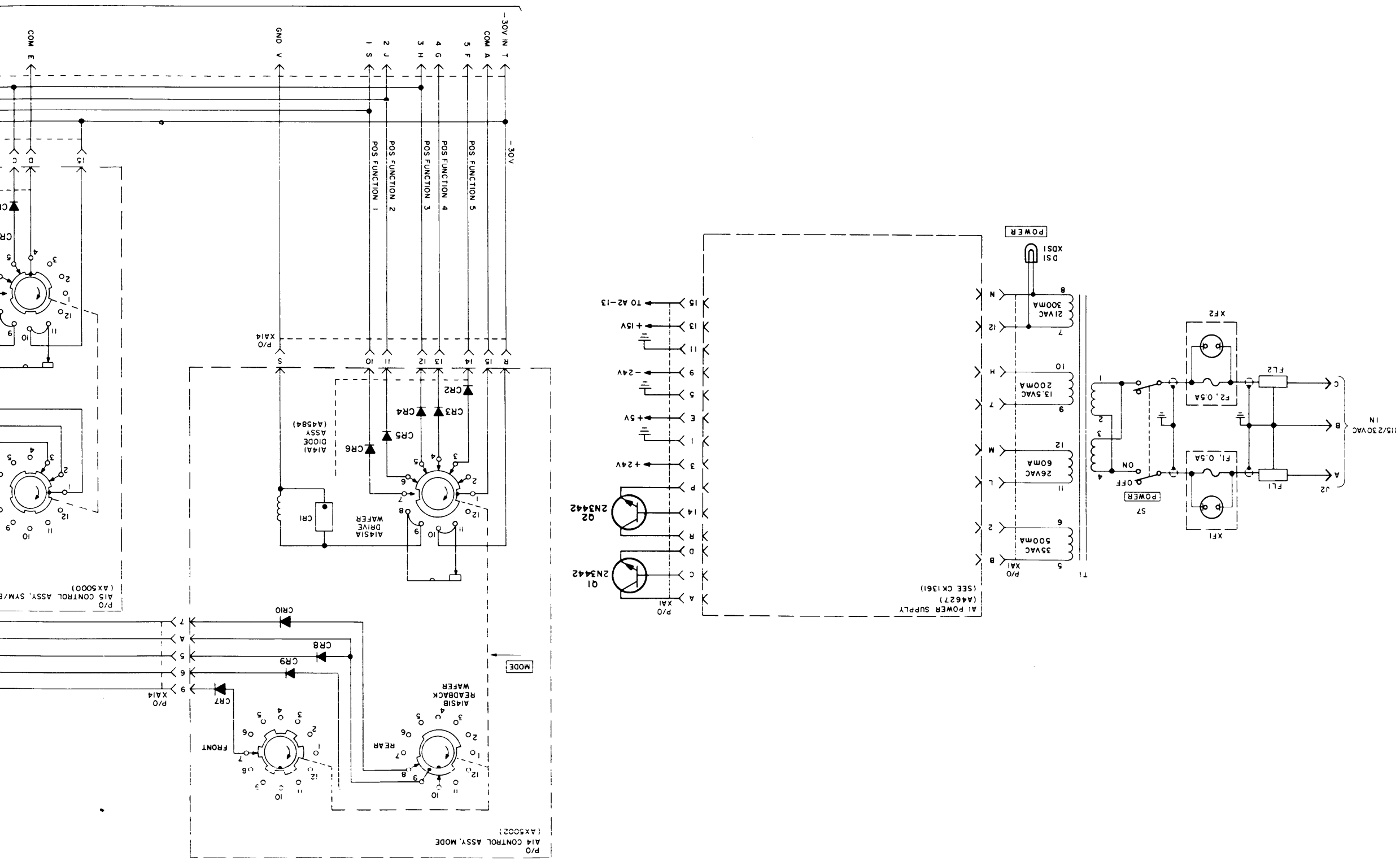


Figure 5-38. Unit 2 (TD-969/FRR), Schematic Diagram (Sheet 1 of 3)

CK 1360


A1 POWER SUPPLY
(A4627)
(SEE CK1361)
P/O XA1
A
C
D
R
P
14
3
L
M
7
H
9
5
E
I
+5V
11
9
-24V
13
+15V
15
TO A2-13
Q1
2N3442
Q2
2N3442
T1
POWER
D51
XD51
N
12
21VAC
300MA
10
13.5VAC
200MA
26VAC
60MA
35VAC
500MA
P/O XA1
B
2
6
S7
POWER
ON
OFF
XF1
XF2
FL1
FL2
F1, 0.5A
F2, 0.5A
J2
115/230VAC
IN
A
B
C
GND V
-30V IN T
COM A
5 F
4 G
3 H
2 J
1 S
COM E
-30V
POS FUNCTION 1
POS FUNCTION 2
POS FUNCTION 3
POS FUNCTION 4
POS FUNCTION 5
P/O XA14
S
R
15
14
13
12
11
10
CR1
CR2
CR3
CR4
CR5
CR6
A14A1
DIODE
ASSY
(A4584)
A14S1A
DRIVE
WAFER
P/O
A14 CONTROL ASSY, MODE
(AX5002)
MODE
CR7
CR8
CR9
CR10
A14S1B
READBACK
WAFER
FRONT
REAR
P/O XA14
P/O
A15 CONTROL ASSY, SYM/F
(AX5000)

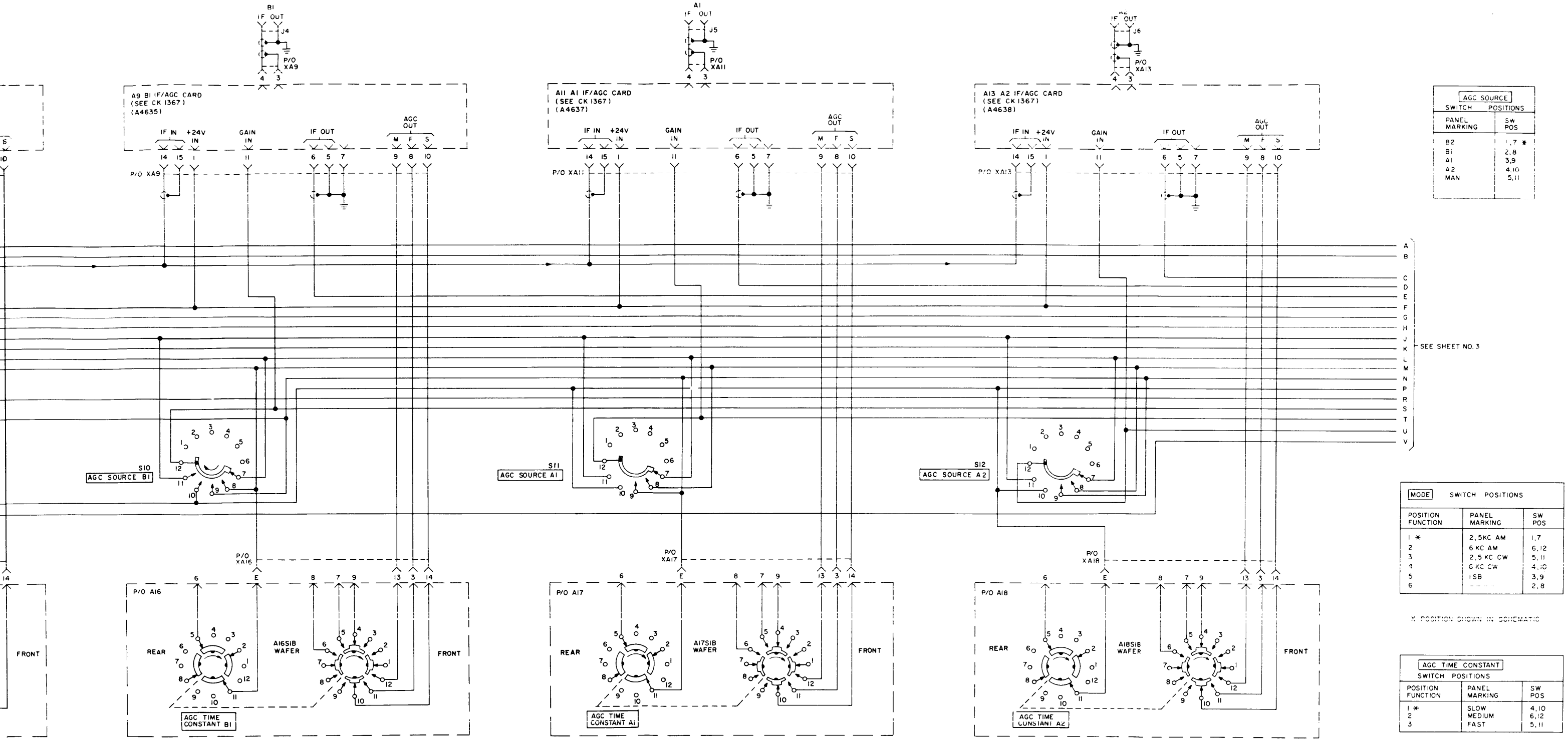
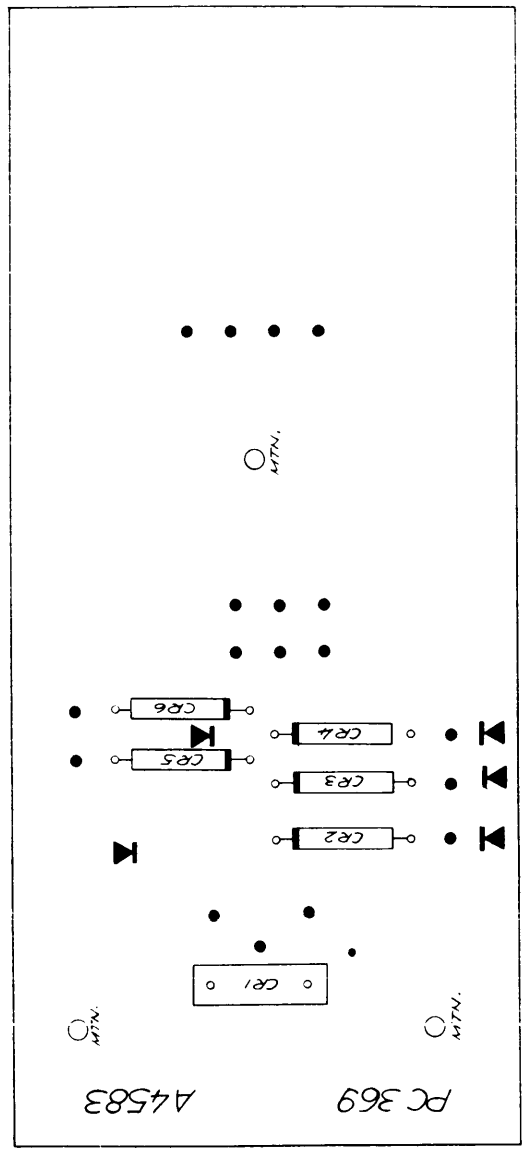
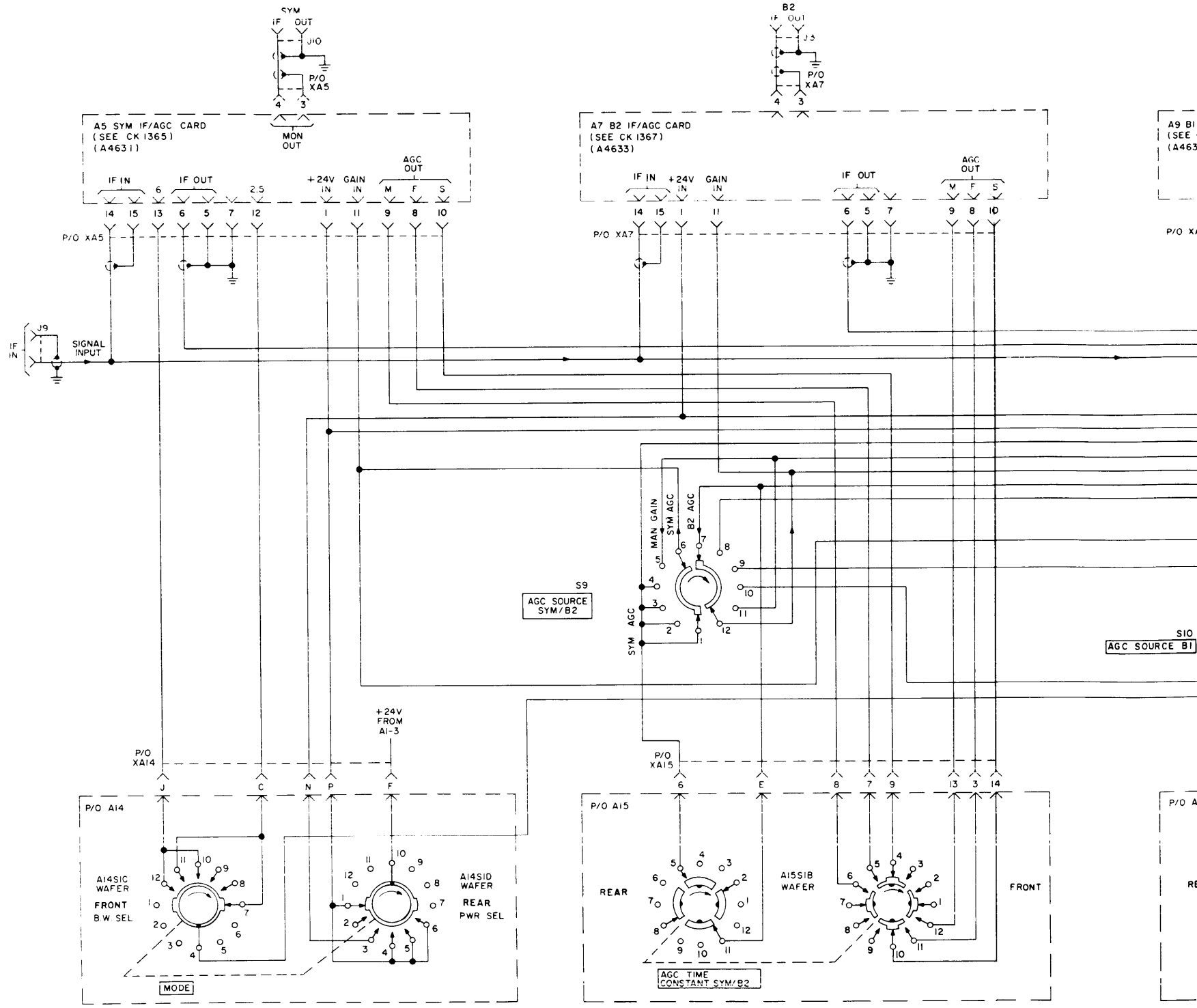


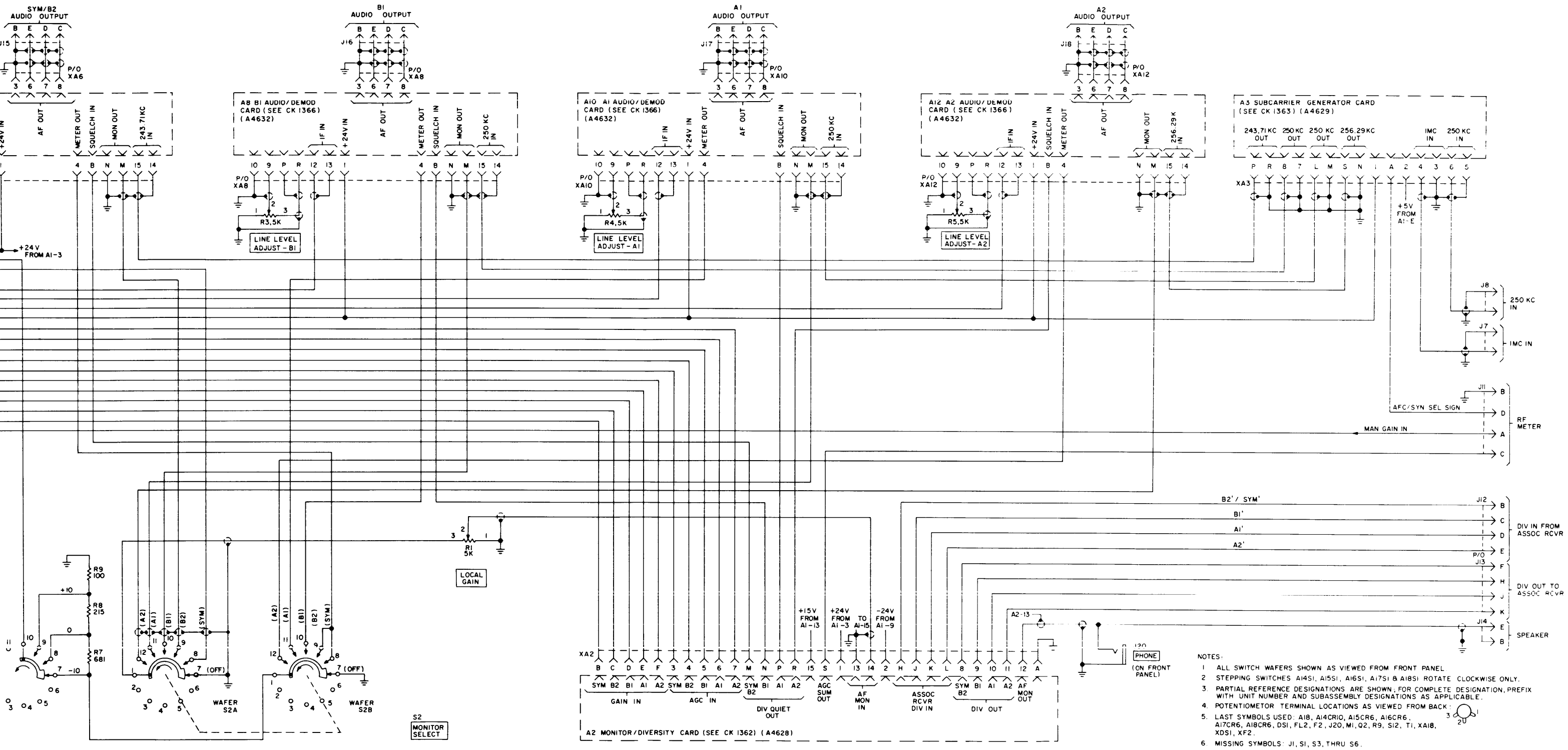
Figure 5-38. Unit 2 (TD-969/FRR), Schematic Diagram (Sheet 2 of 3)

011690392


PC 369
A4583
CR1
CR2
CR3
CR4
CR5
CR6


A5 SYM IF/AGC CARD
(SEE CK 1365)
(A4631)
A7 B2 IF/AGC CARD
(SEE CK 1367)
(A4633)
SYM
B2
J10
J5
P/O XA5
P/O XA7
MON OUT
IF IN
IF OUT
+24V IN
GAIN IN
AGC OUT
P/O XA5
P/O XA7
J9
SIGNAL INPUT
MAN GAIN
SYM AGC
B2 AGC
S9
AGC SOURCE SYM/B2
SYM AGC
S10
AGC SOURCE B1
+24V FROM A1-3
P/O XA14
P/O XA15
P/O A14
P/O A15
A14S1C WAFER
FRONT B.W SEL
A14S1D WAFER
REAR PWR SEL
MODE
REAR
A15S1B WAFER
FRONT
AGC TIME CONSTANT SYM/B2

CK 1360

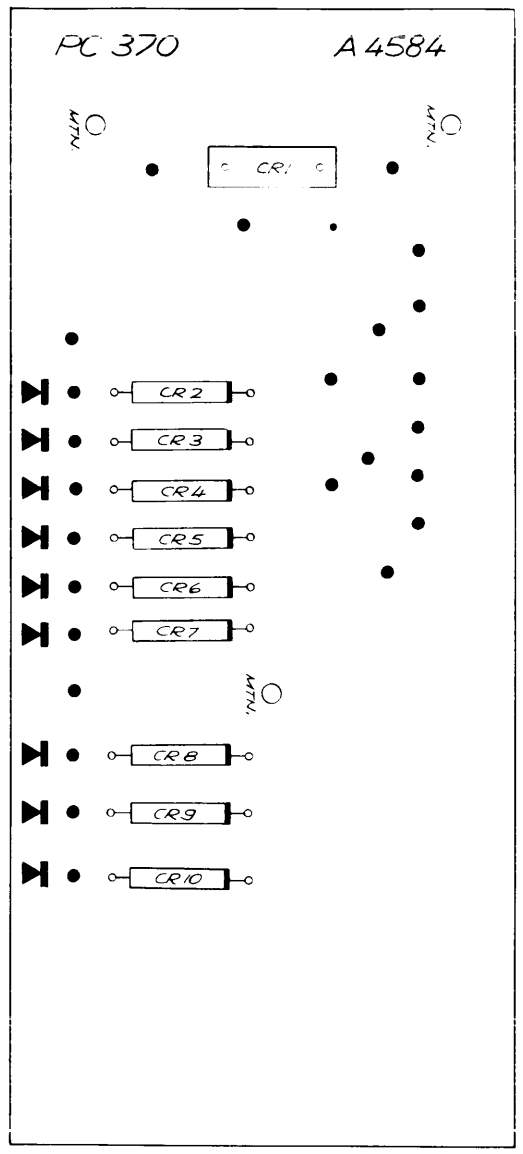


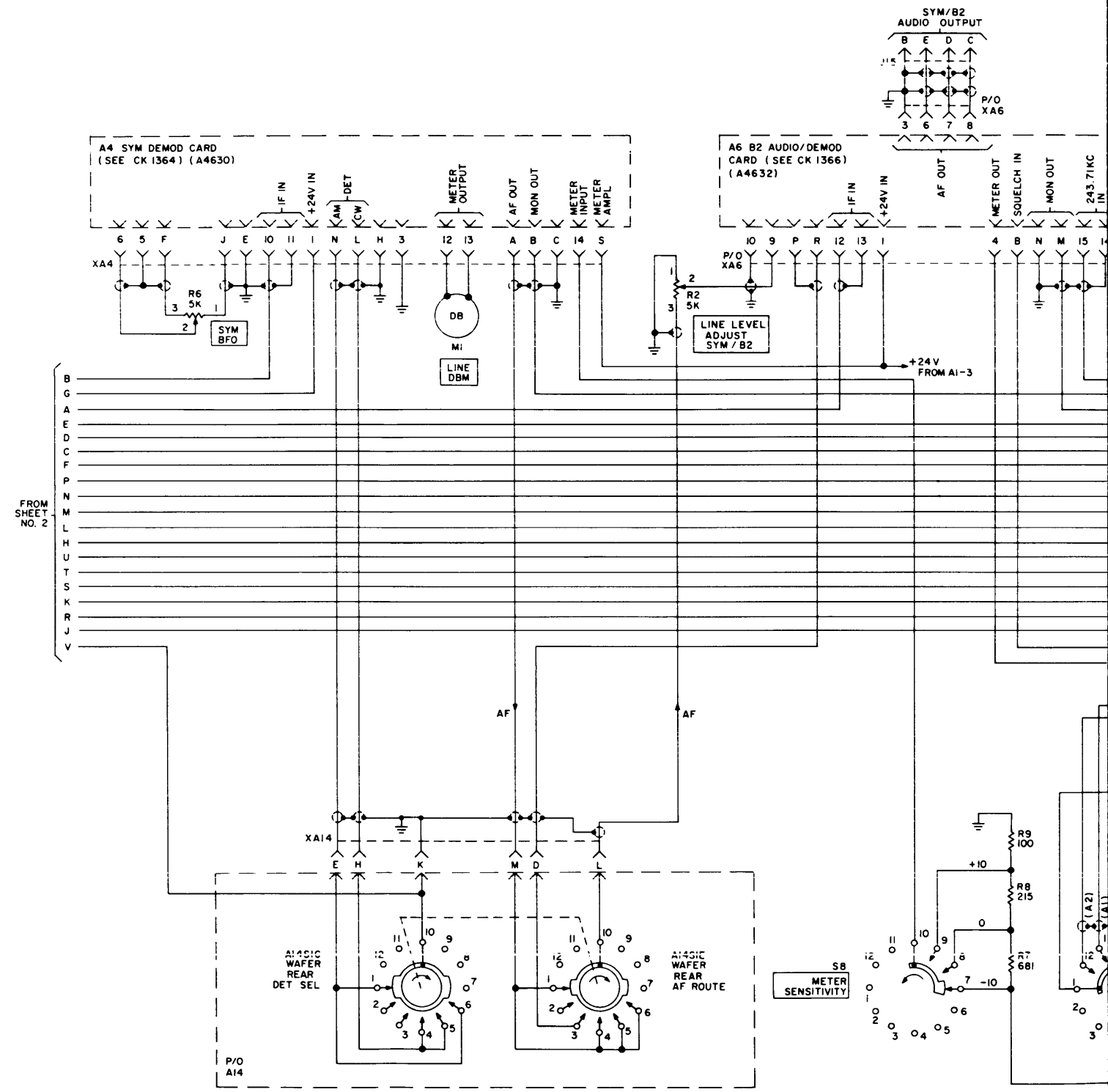
NOTES:

1. ALL SWITCH WAFERS SHOWN AS VIEWED FROM FRONT PANEL
2. STEPPING SWITCHES A14S1, A15S1, A16S1, A17S1 & A18S1 ROTATE CLOCKWISE ONLY.
3. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUBASSEMBLY DESIGNATIONS AS APPLICABLE.
4. POTENTIOMETOR TERMINAL LOCATIONS AS VIEWED FROM BACK:
5. LAST SYMBOLS USED: A18, A14CR10, A15CR6, A16CR6, A17CR6, A18CR6, DS1, FL2, F2, J20, M1, Q2, R9, S12, T1, XA18, XDS1, XF2.
6. MISSING SYMBOLS: J1, S1, S3, THRU S6.

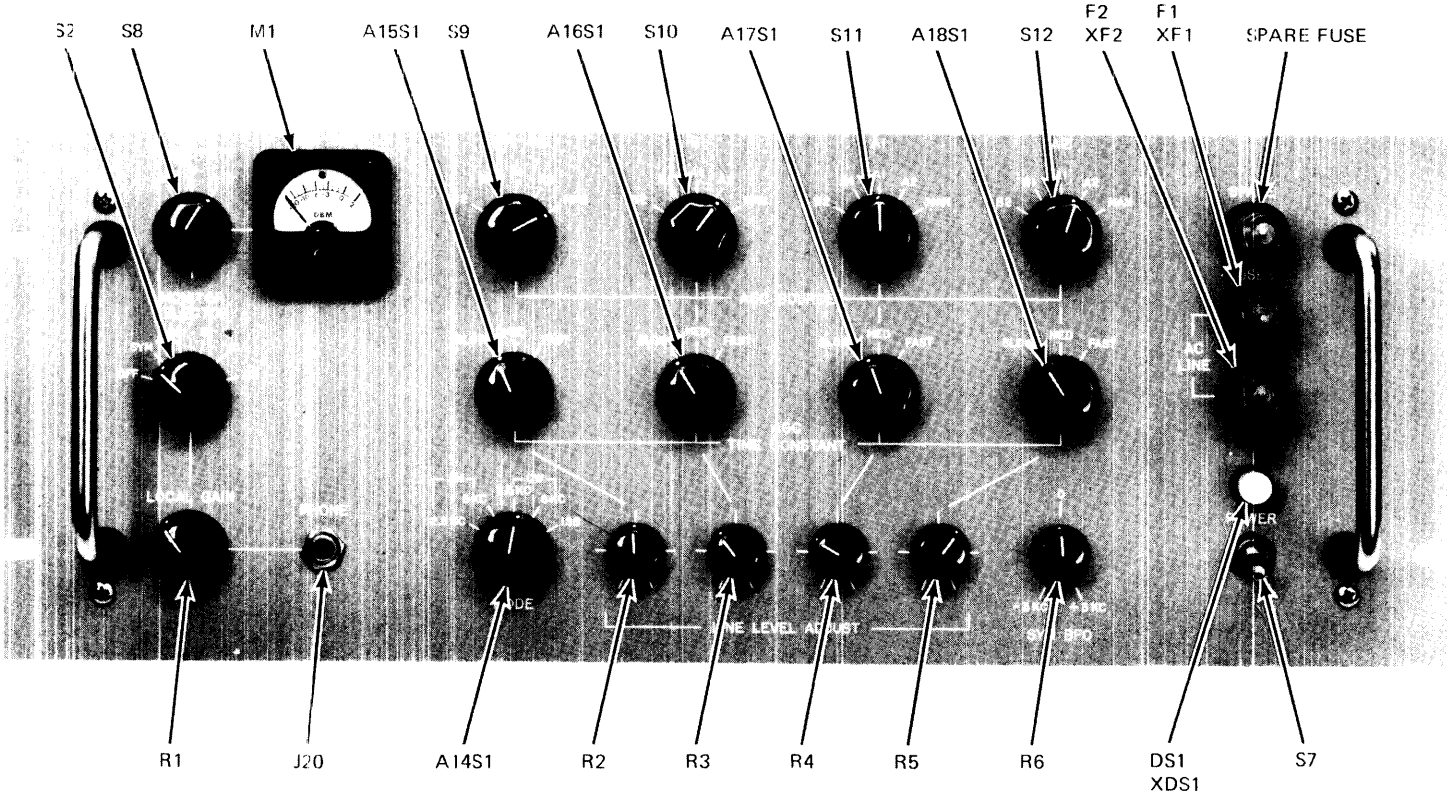
Figure 5-38. Unit 2 (TD-969/FRR), Schematic Diagram (Sheet 3 of 3)

011690392


PC 370
A4584
CR1
CR2
CR3
CR4
CR5
CR6
CR7
CR8
CR9
CR10

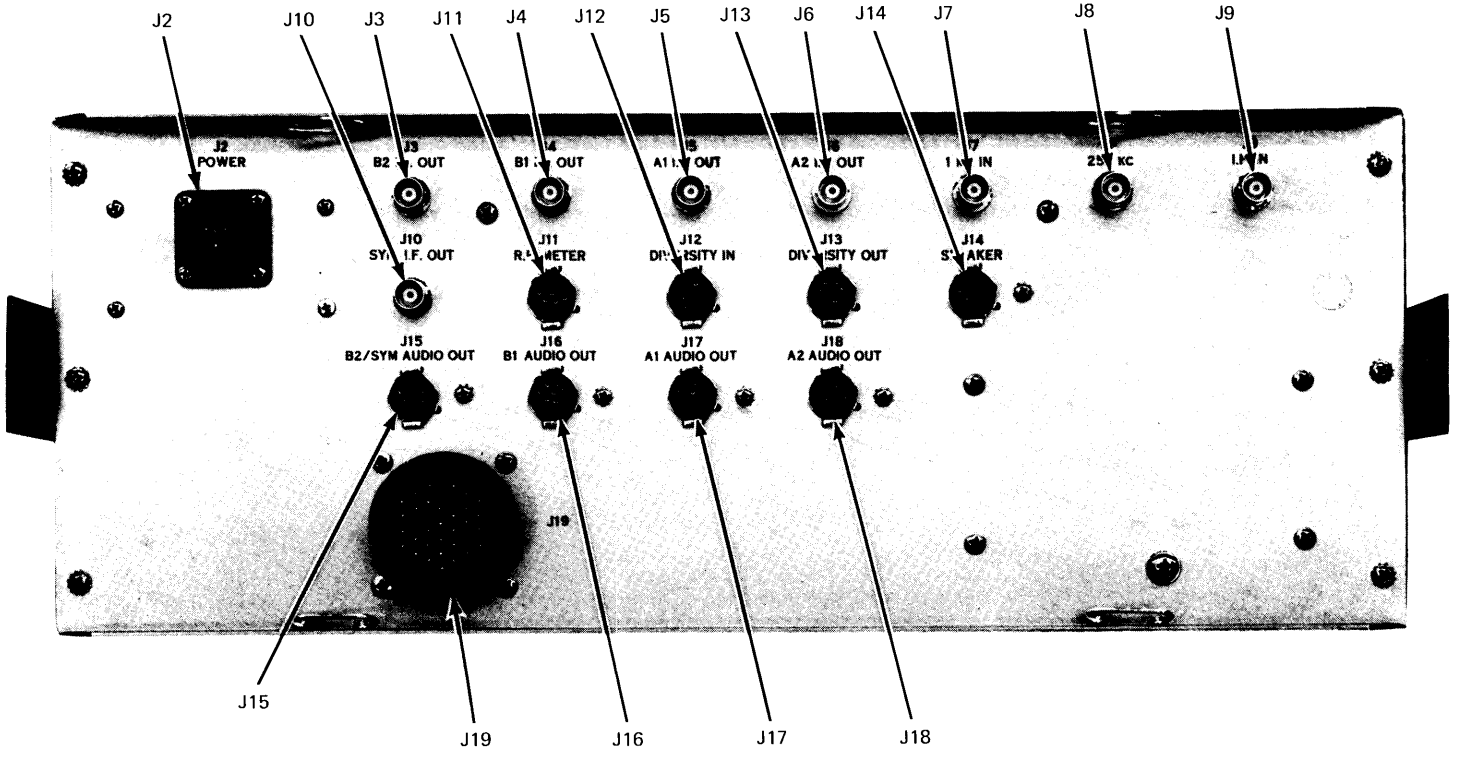

SYM/B2 AUDIO OUTPUT
P/O XA6
A4 SYM DEMOD CARD (SEE CK 1364) (A4630)
A6 B2 AUDIO/DEMOD CARD (SEE CK 1366) (A4632)
XA4
P/O XA6
SYM BFO
R6 5K
R2 5K
LINE LEVEL ADJUST SYM/B2
DB
M1
LINE DBM
+24V FROM A1-3
FROM SHEET NO. 2
AF
XA14
ALADIC WAFER REAR DET SEL
ALADIC WAFER REAR AF ROUTE
P/O A14
S8
METER SENSITIVITY
R9 100
R8 215
R7 681

CK 1360



REF DESIG PREFIX 2
REF DESIG PREFIX 2, 6

Figure 5-39. Unit 2 (TD-969/FRR), Front Panel, Major Component Locations Diagram



REF DESIG PREFIX 2
REF DESIG PREFIX 2, 6

Figure 5-40. Unit 2 (TD-969/FRR), Rear Panel, Major Component Locations Diagram

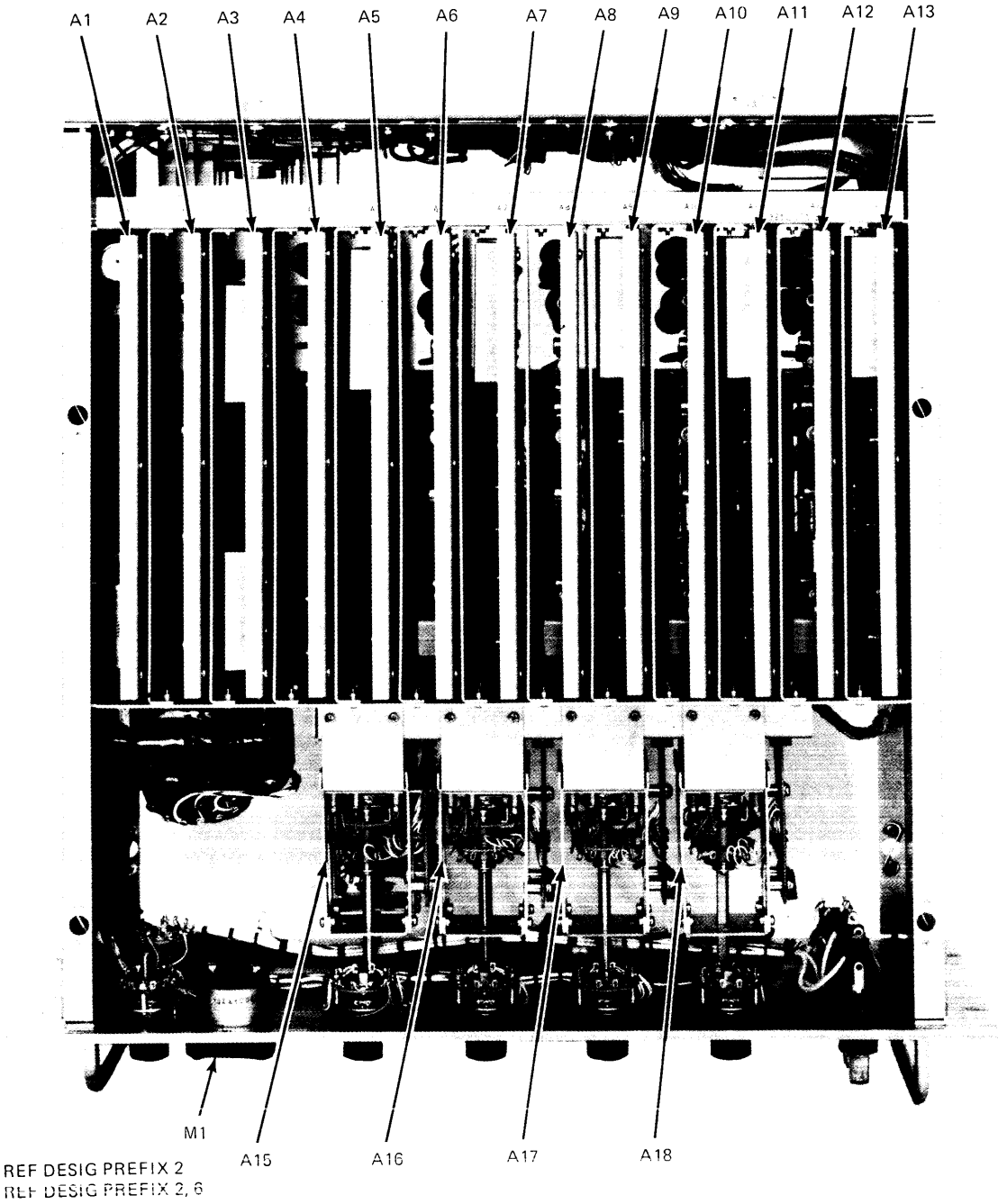
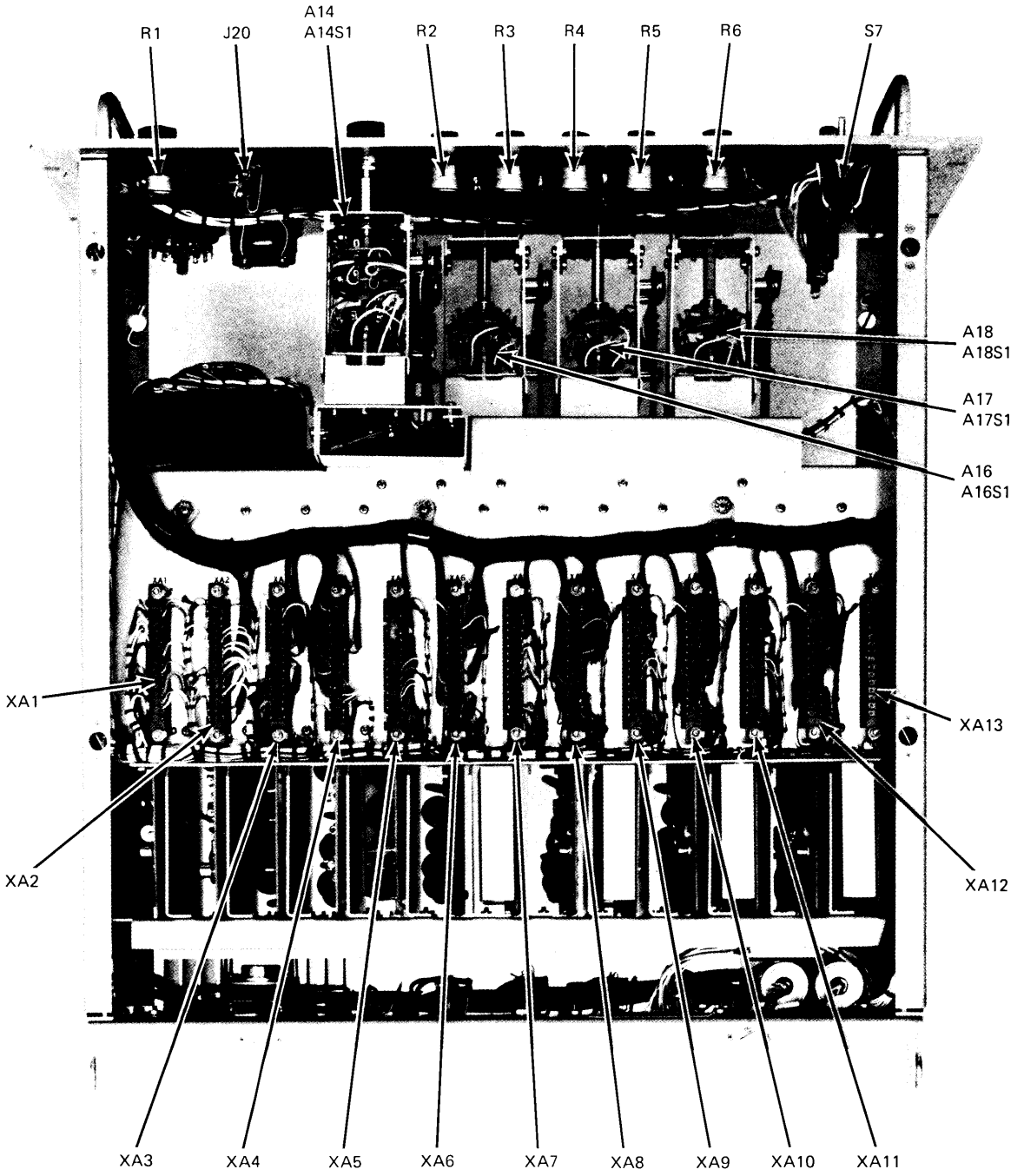
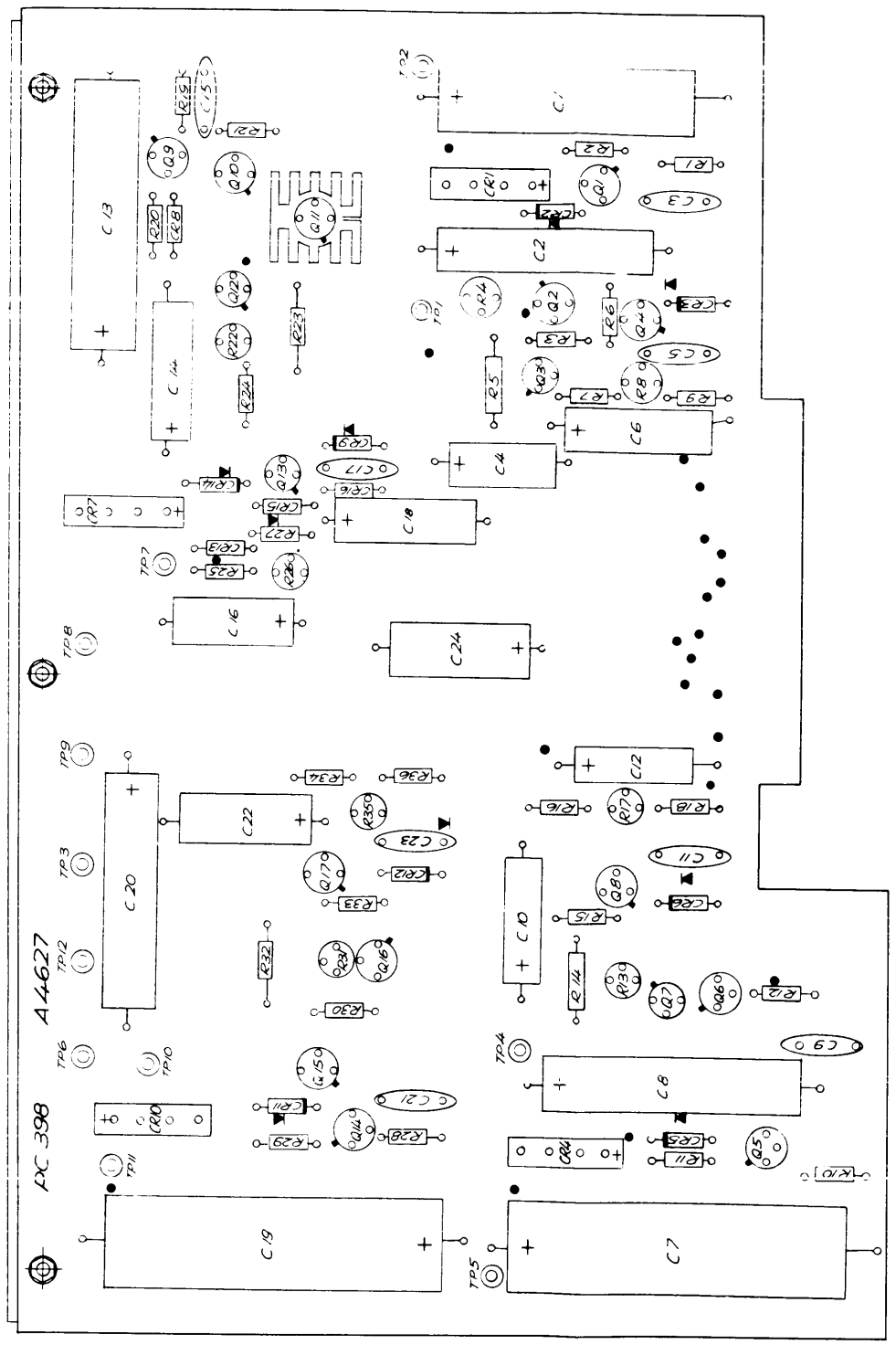


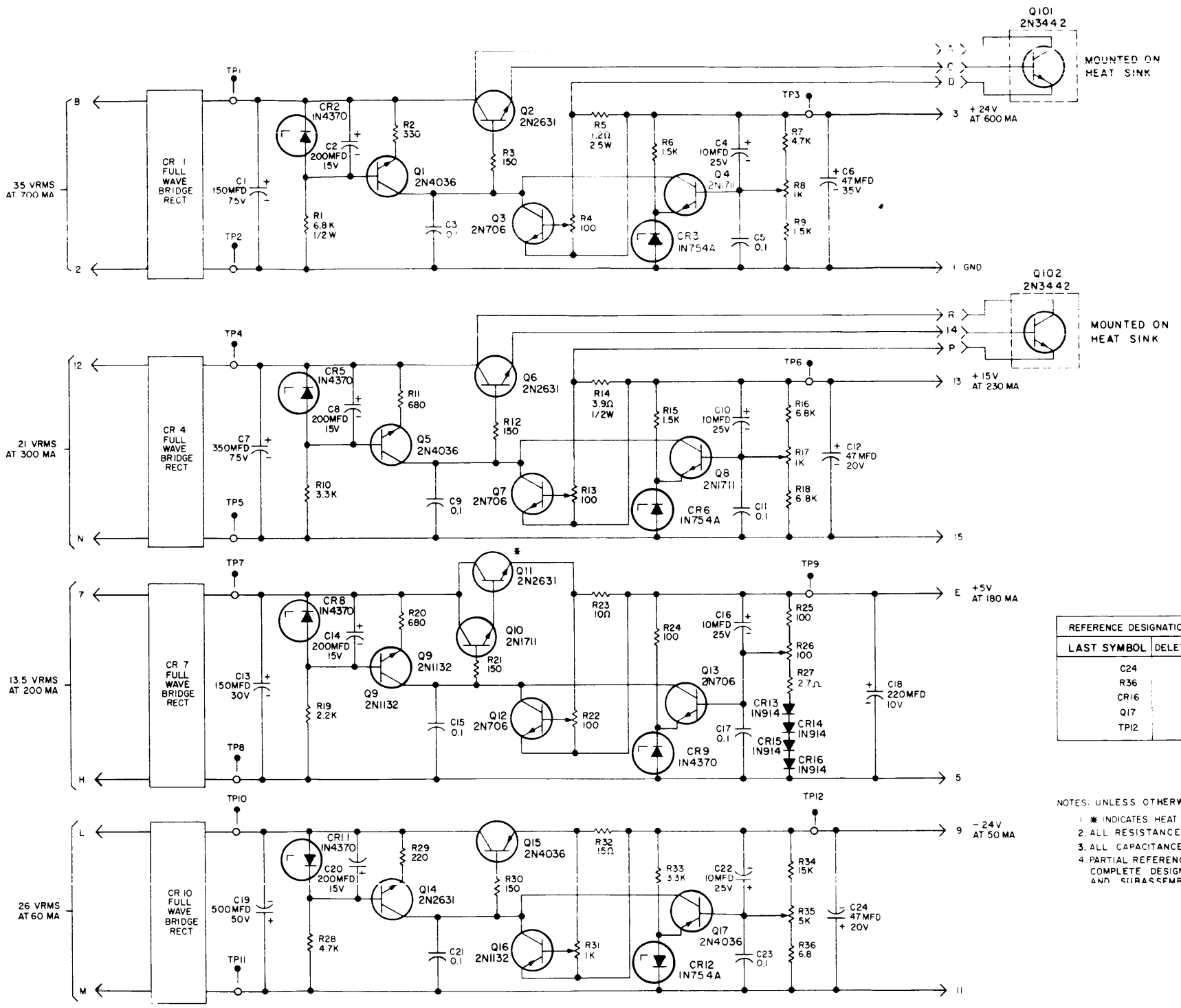
Figure 5-41. Unit 2 (TD-969/FRR), Top View, Major Component Locations Diagram



REF DESIG PREFIX 2
REF DESIG PREFIX 2, 6

Figure 5-42. Unit 2 (TD-969/FRR), Bottom View, Major Component Locations Diagram





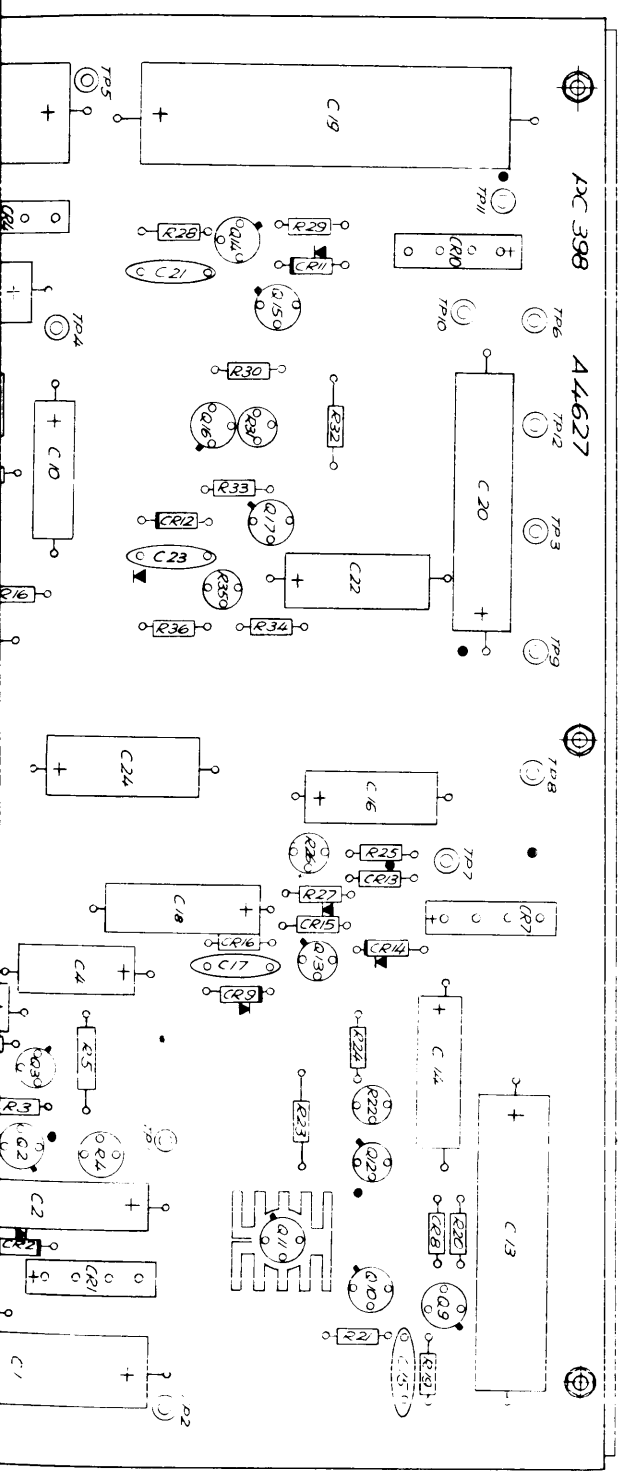
REFERENCE DESIGNATION	
LAST SYMBOL	DELETED
C24	
R36	
CR16	
Q17	
TP12	

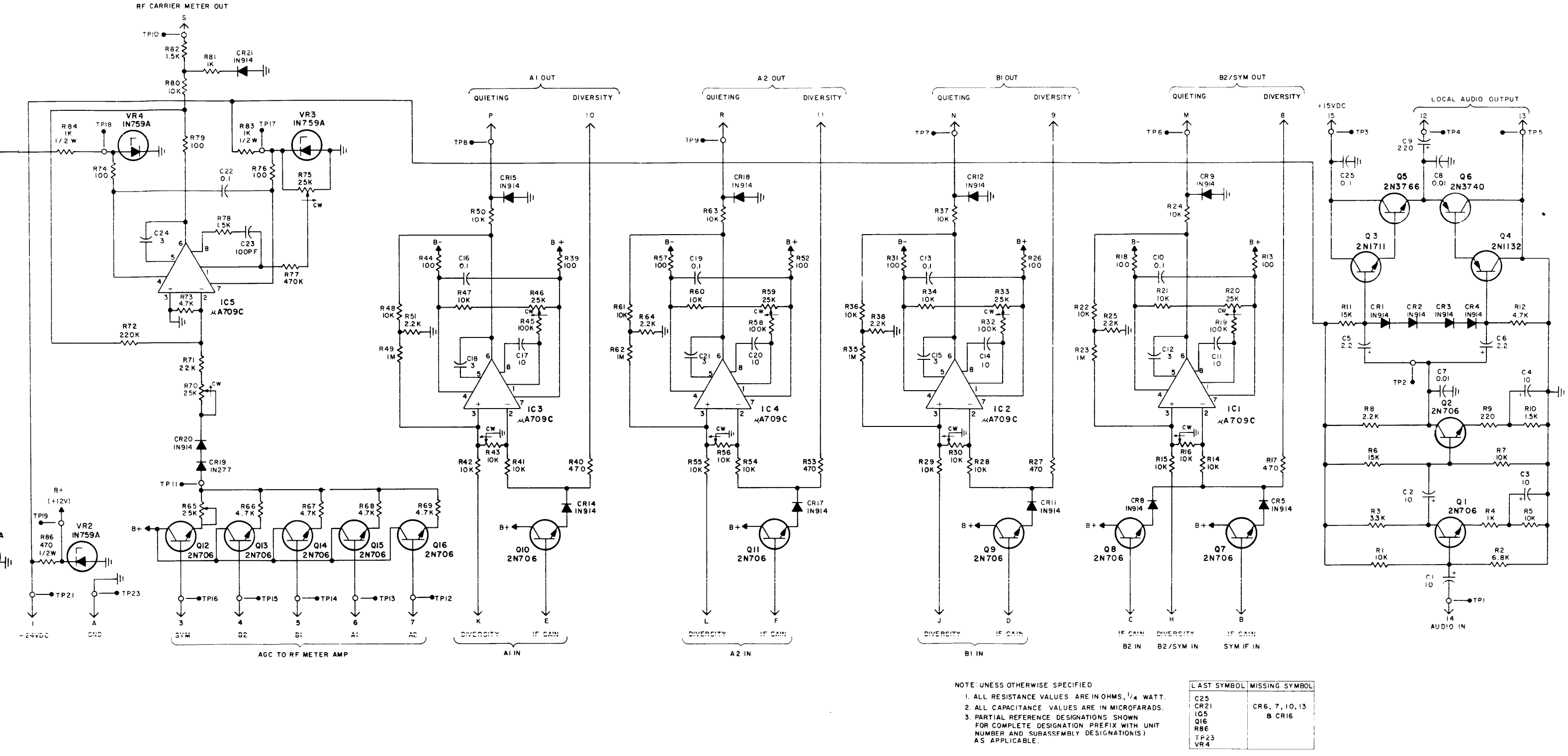
NOTES: UNLESS OTHERWISE SPECIFIED

1. * INDICATES HEAT RADIATOR.
2. ALL RESISTANCE VALUES ARE IN OHM, ¼ WATT.
3. ALL CAPACITANCE VALUES ARE IN MICROFARADS.
4. PARTIAL REFERENCE DESIGNATIONS SHOWN, FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER AND SUBASSEMBLY DESIGNATION AS APPLICABLE

CK 1361

Figure 5-43/5-44. Power Supply 2A1, Schematic/Component Locations Diagram


RXC 398
A4627
TP5
TP4
TP6
TP10
TP12
TP3
TP9
TP8
TP7
TP11
TP1
TP2
C19
C21
C10
C20
C22
C23
C24
C16
C18
C17
C4
C14
C2
C1
C13
R26
R29
R30
R32
R33
R35
R36
R34
R25
R27
R24
R31
R3
R22
R23
R21
CR10
CR12
CR13
CR15
CR16
CR9
CR14
CR11
CR2
CR8
Q6
Q7
Q8
Q9
Q10
Q11
Q12
Q13
Q14
Q15
Q16
Q17
Q18
Q19
Q20
Q21
Q22
Q23
Q24
Q25
Q26
Q27
Q28
Q29
Q30
Q31
Q32
Q33
Q34
Q35
Q36
Q37
Q38
Q39
Q40
Q41
Q42
Q43
Q44
Q45
Q46
Q47
Q48
Q49
Q50
Q51
Q52
Q53
Q54
Q55
Q56
Q57
Q58
Q59
Q60
Q61
Q62
Q63
Q64
Q65
Q66
Q67
Q68
Q69
Q70
Q71
Q72
Q73
Q74
Q75
Q76
Q77
Q78
Q79
Q80
Q81
Q82
Q83
Q84
Q85
Q86
Q87
Q88
Q89
Q90
Q91
Q92
Q93
Q94
Q95
Q96
Q97
Q98
Q99
Q100



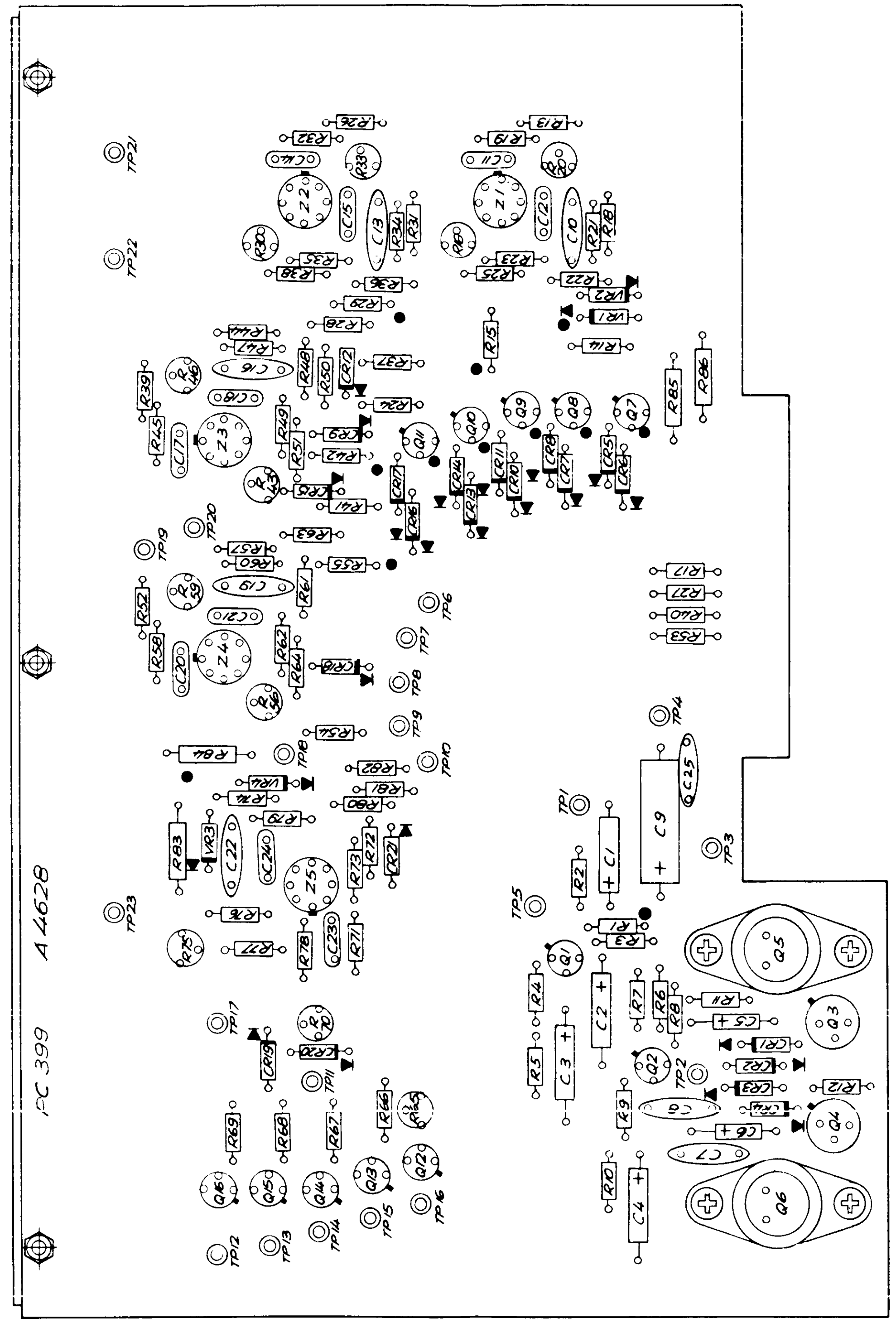
NOTE: UNESS OTHERWISE SPECIFIED

1. ALL RESISTANCE VALUES ARE IN OHMS, 1/4 WATT.
2. ALL CAPACITANCE VALUES ARE IN MICROFARADS.
3. PARTIAL REFERENCE DESIGNATIONS SHOWN FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER AND SUBASSEMBLY DESIGNATION(S) AS APPLICABLE.

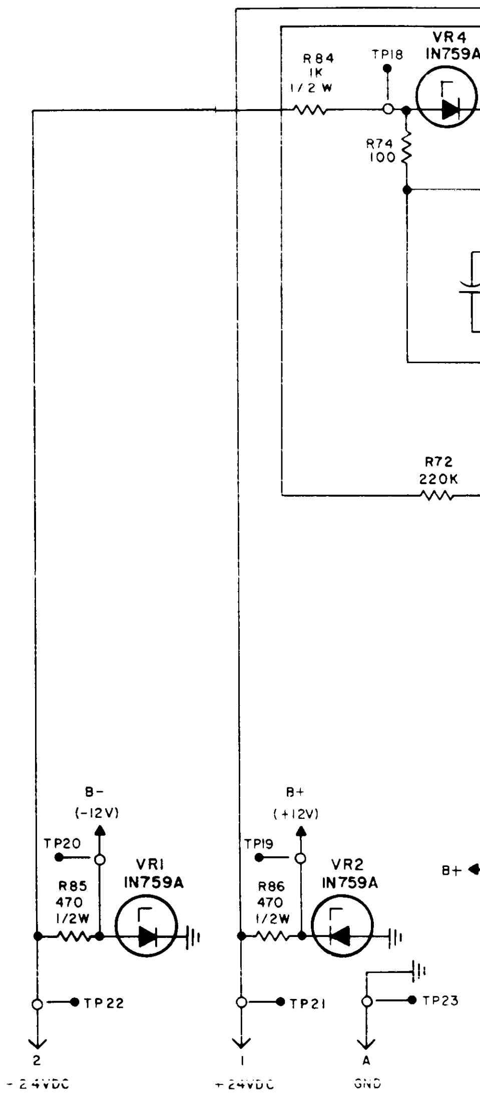
LAST SYMBOL	MISSING SYMBOL
C25	
CR21	CR6, 7, 10, 13
IC5	& CR16
Q16	
R86	
TP23	
VR4	

CK 1362

Figure 5-45/5-46. Monitor/Diversity 2A2, Schematic/Component Locations Diagram


PC 399 A 4628

RF


VR4
IN759A
TP18
R84
1K
1/2 W
R74
100
R72
220K
B-
(-12V)
TP20
R85
470
1/2W
VR1
IN759A
TP22
2
-24VDC
B+
(+12V)
TP19
R86
470
1/2W
VR2
IN759A
TP21
1
+24VDC
TP23
A
GND
B+

CK 13

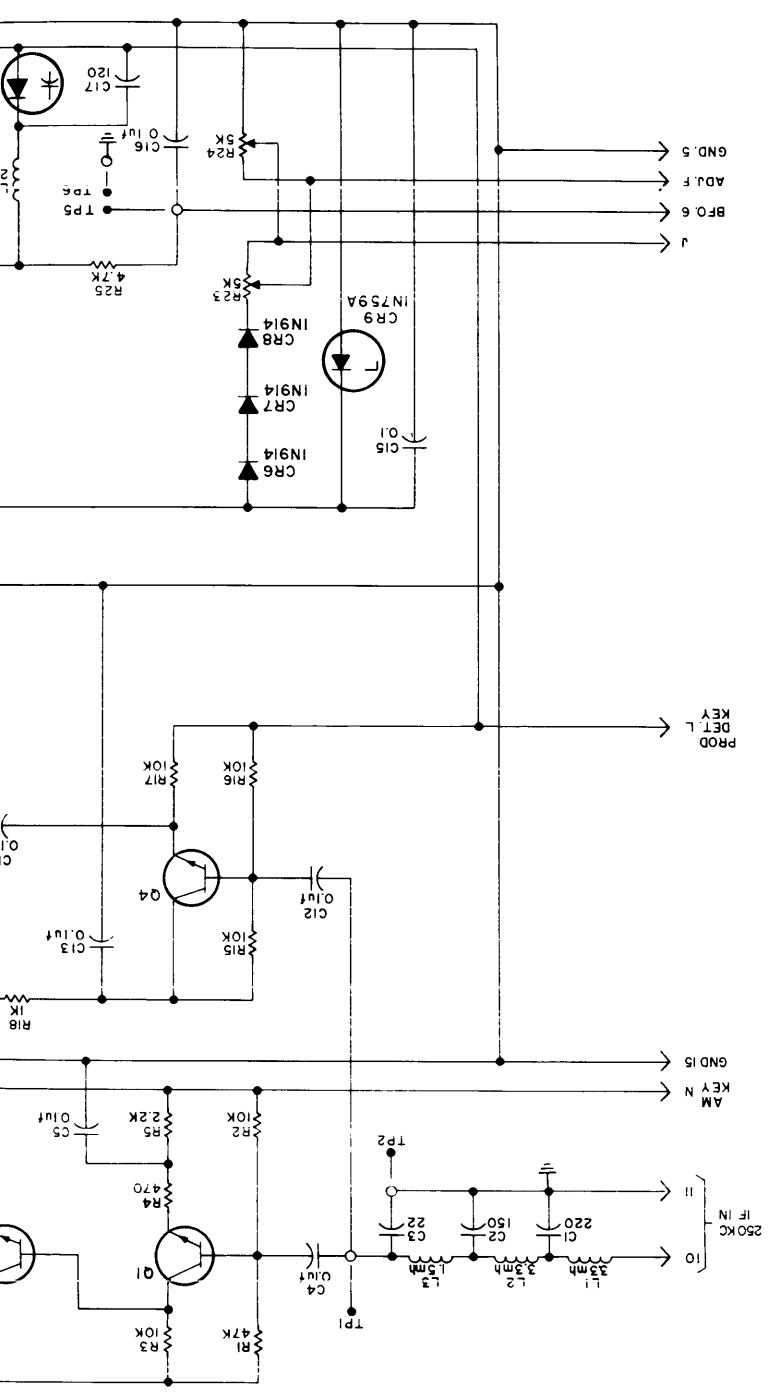
NOTES UNLESS OTHERWISE SPECIFIED.

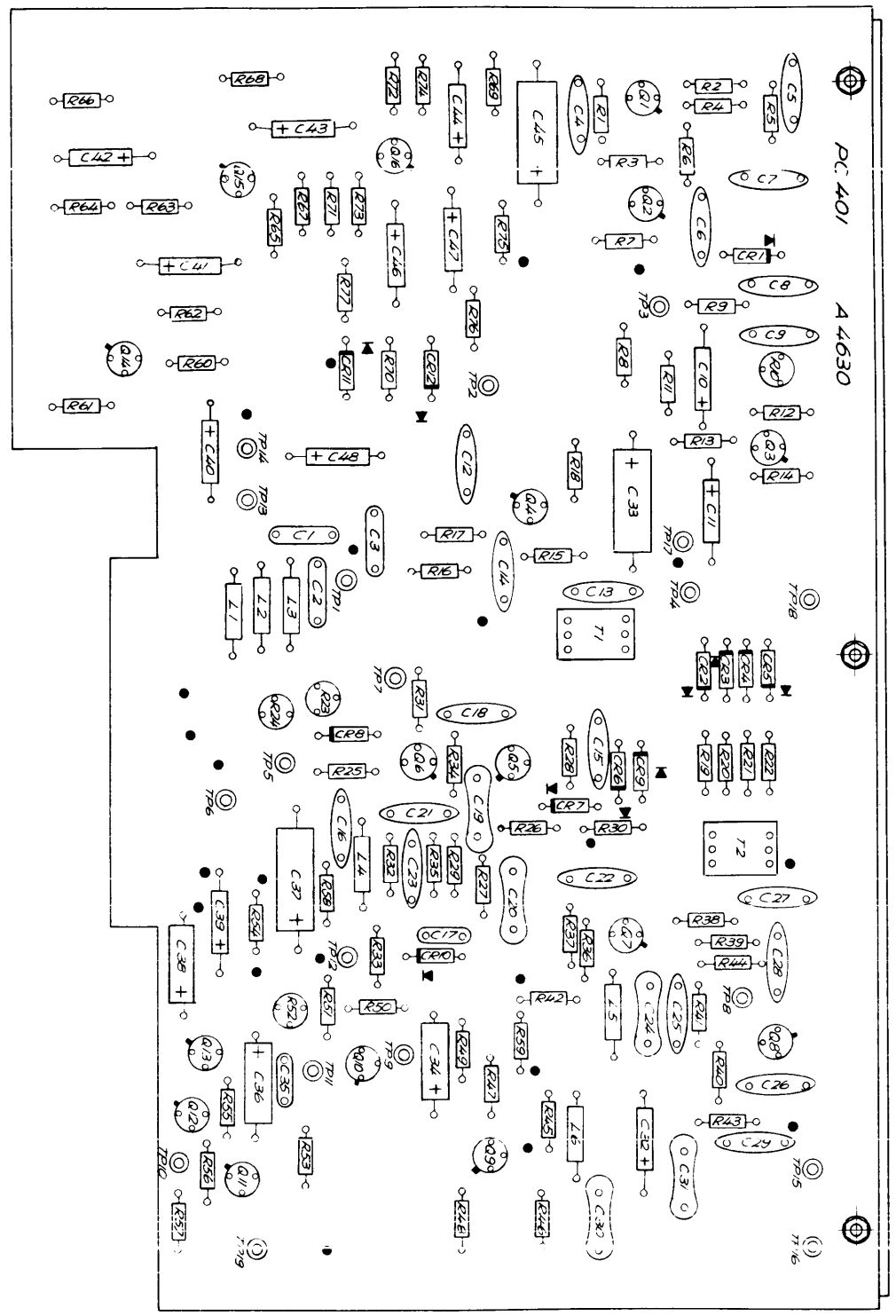
1. ALL TRANSISTORS ARE 2N706
2. ALL CAPACITORS ARE IN pf
3. ALL RESISTORS ARE IN OHMS 1/4 WATT.
4. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER AND SUBASSEMBLY DESIGNATION(S) AS APPLICABLE.

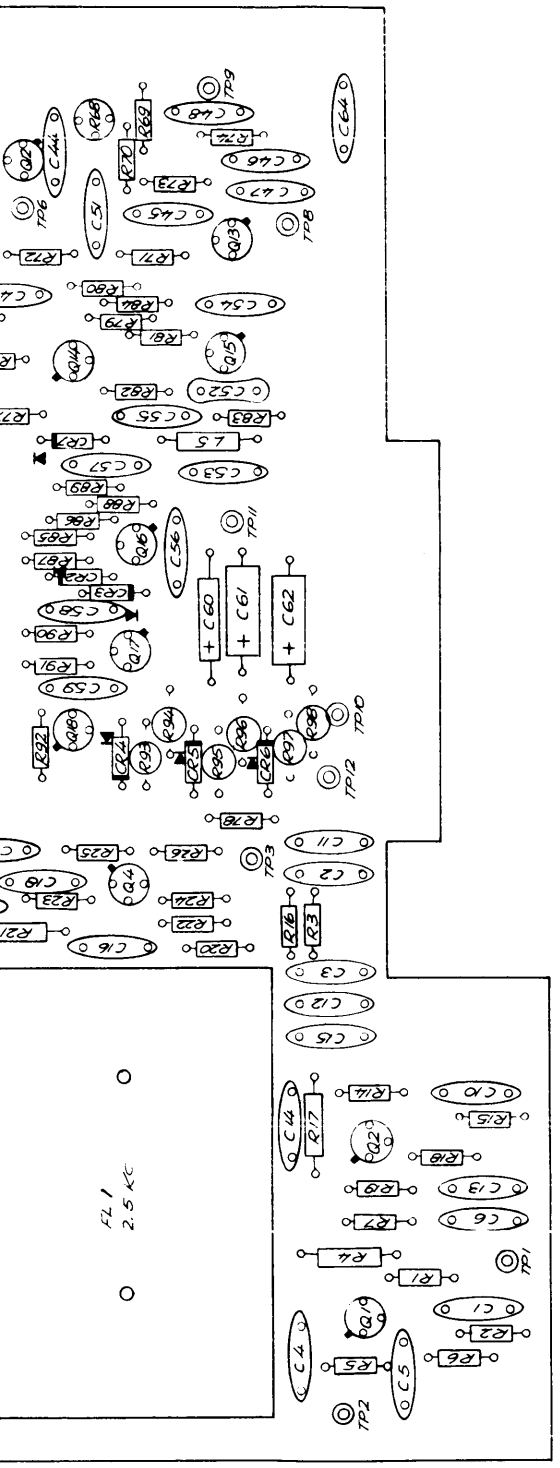
REFERENCE DESIGNATIONS	
LAST	DELETED
C48	
R77	
Q16	
L6	
CR12	
TP19	
T2	

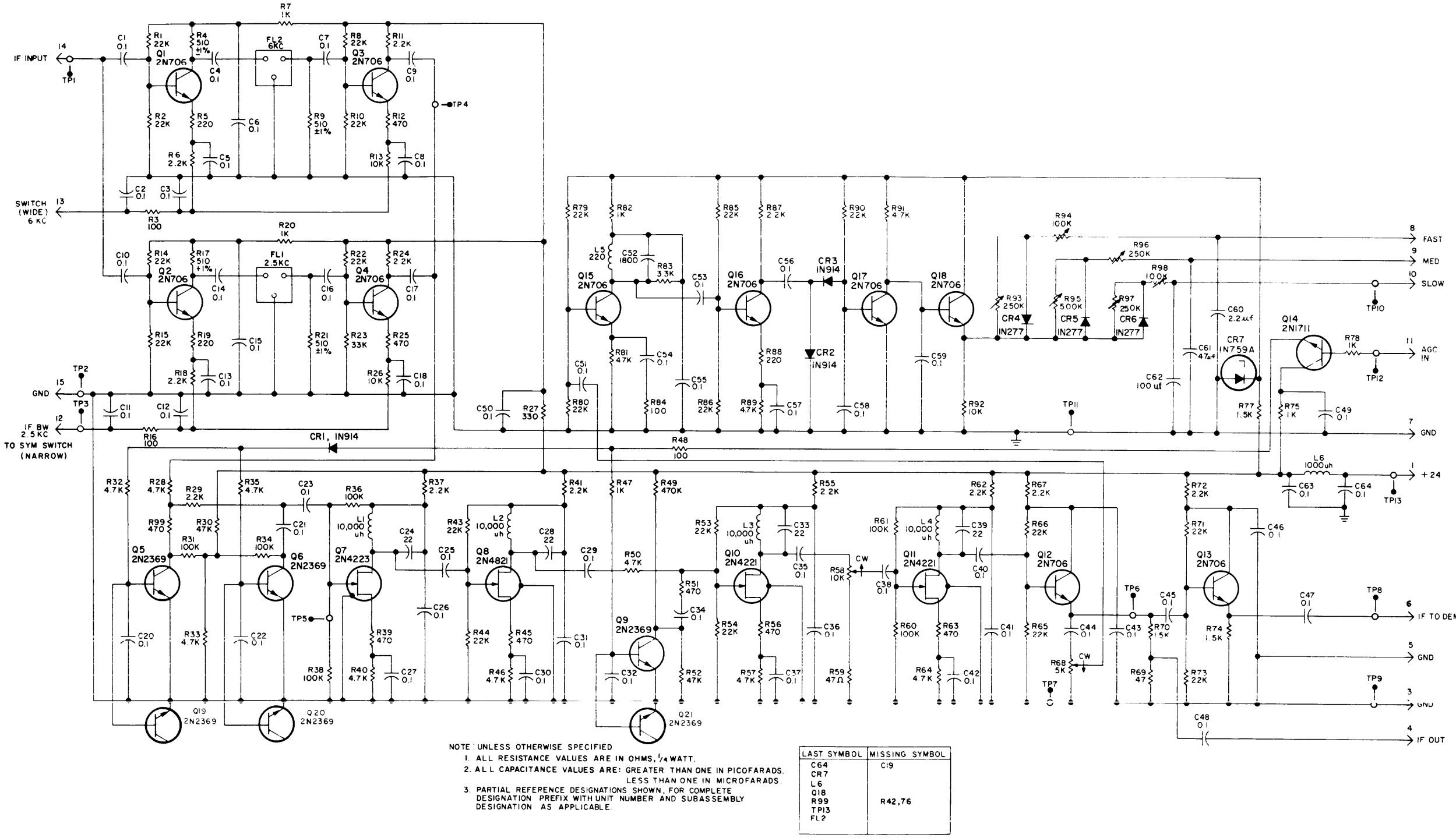
Figure 5-47/5-48. Subcarrier Generator 2A3, Schematic/Component Locations Diagram 011690392

CK 1364


GND 5
AD. F
BFO. 6
J
TP5
C17 120
C16 0.1uf
R24 5K
R25 4.7K
R23 5K
CR9 1N759A
CR8 1N914
CR7 1N914
CR6 1N914
C15 0.1
PROD DET L KEY
R16 10K
R17 10K
Q4
C12 0.1uf
C13 0.1uf
R15 10K
R18 1K
GND 15
AM KEY N
R2 10K
R5 2.2K
C5 0.1uf
R4 470
Q1
C4 0.1uf
R3 10K
R1 47K
TP2
TP1
10
11
250KC IF IN
C3 22
C2 150
C1 220
L3 1.5mh
L2 3.3mh
L1 33mh


PC 401
A 4630





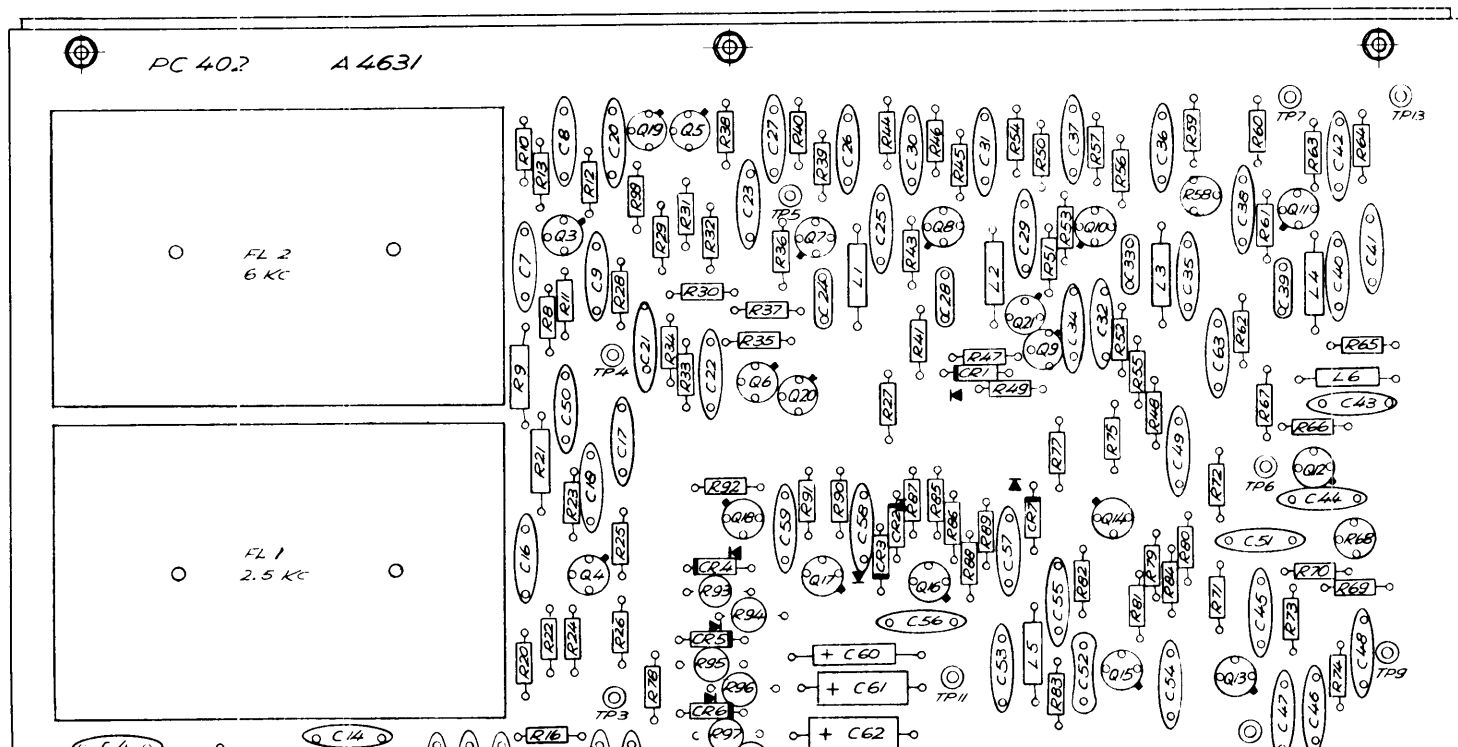
NOTE: UNLESS OTHERWISE SPECIFIED

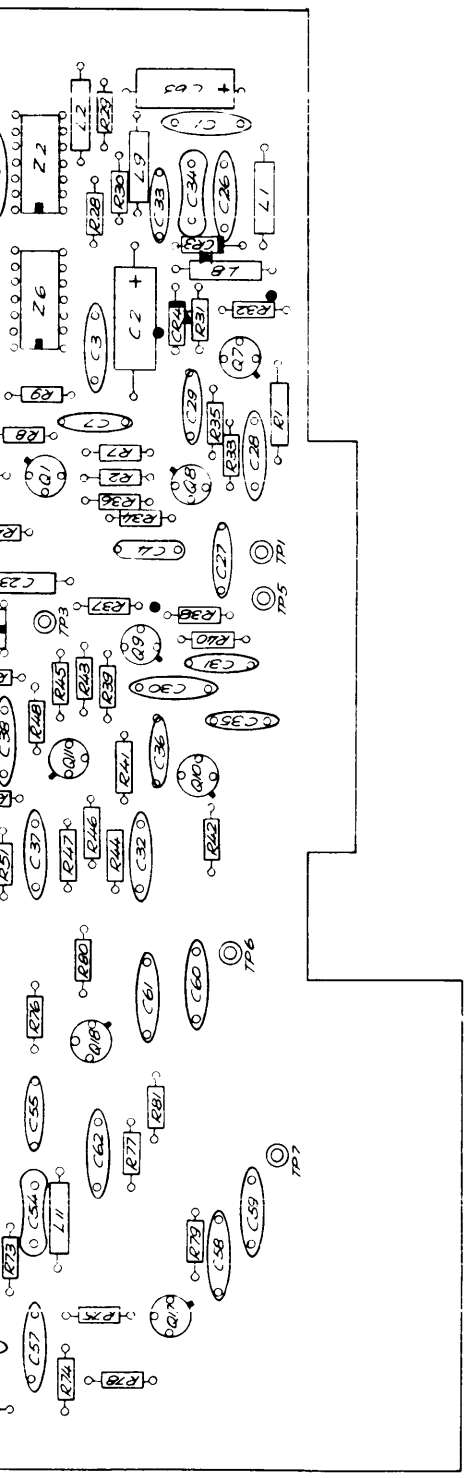
1. ALL RESISTANCE VALUES ARE IN OHMS, 1/4 WATT.
2. ALL CAPACITANCE VALUES ARE: GREATER THAN ONE IN PICOFARADS. LESS THAN ONE IN MICROFARADS.
3. PARTIAL REFERENCE DESIGNATIONS SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER AND SUBASSEMBLY DESIGNATION AS APPLICABLE.

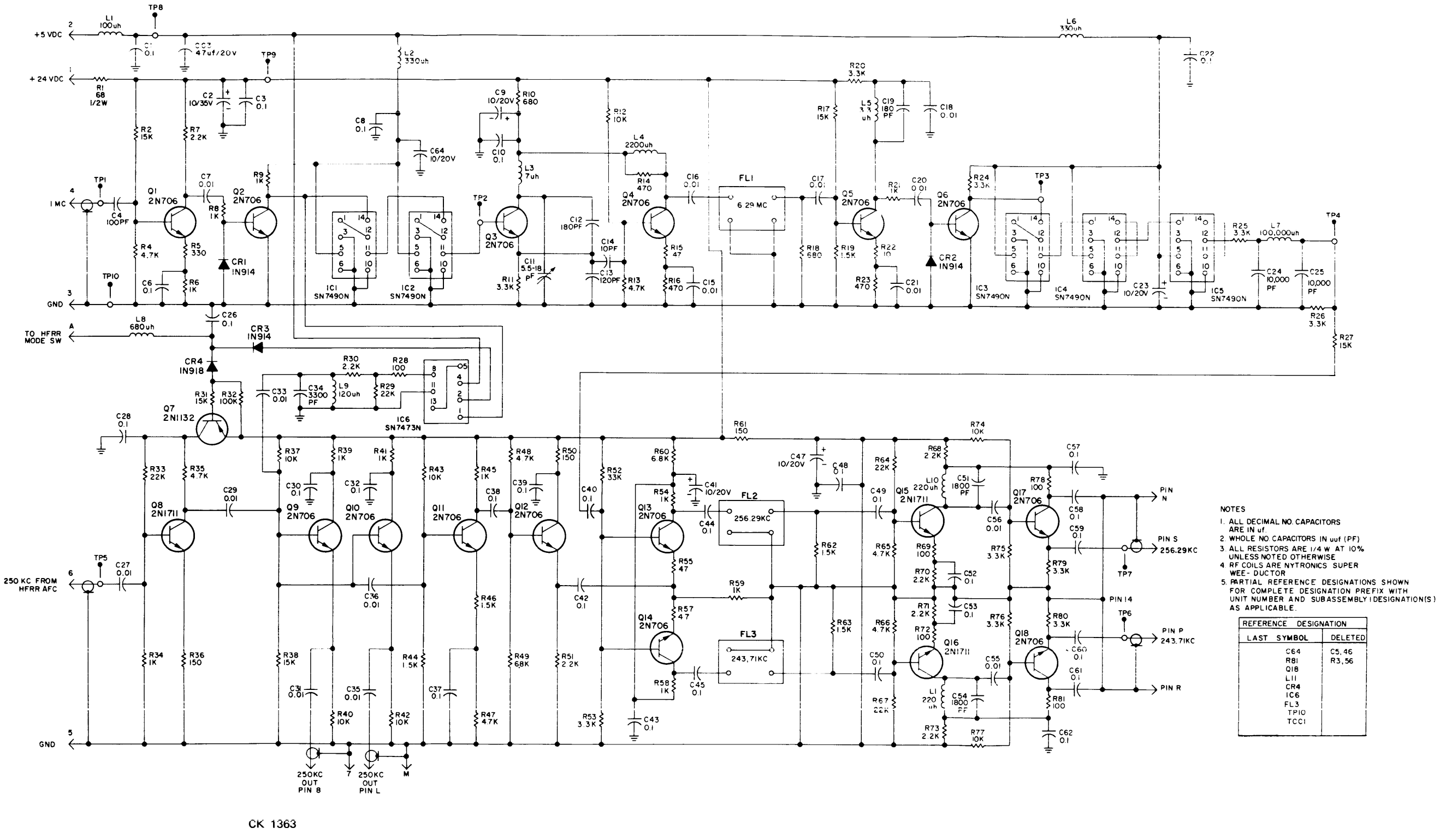
LAST SYMBOL	MISSING SYMBOL
C64	C19
CR7	
L6	
Q18	
R99	R42,76
TP13	
FL2	

CK 1365

Figure 5-49/5-50. Symmetrical Demodulator 2A4, Schematic/Component Locations Diagram


PC 40.?
A 4631
FL 2
6 KC
FL 1
2.5 KC
+ C60
+ C61
+ C62
TP3
TP4
TP5
TP6
TP7
TP9
TP11
TP13





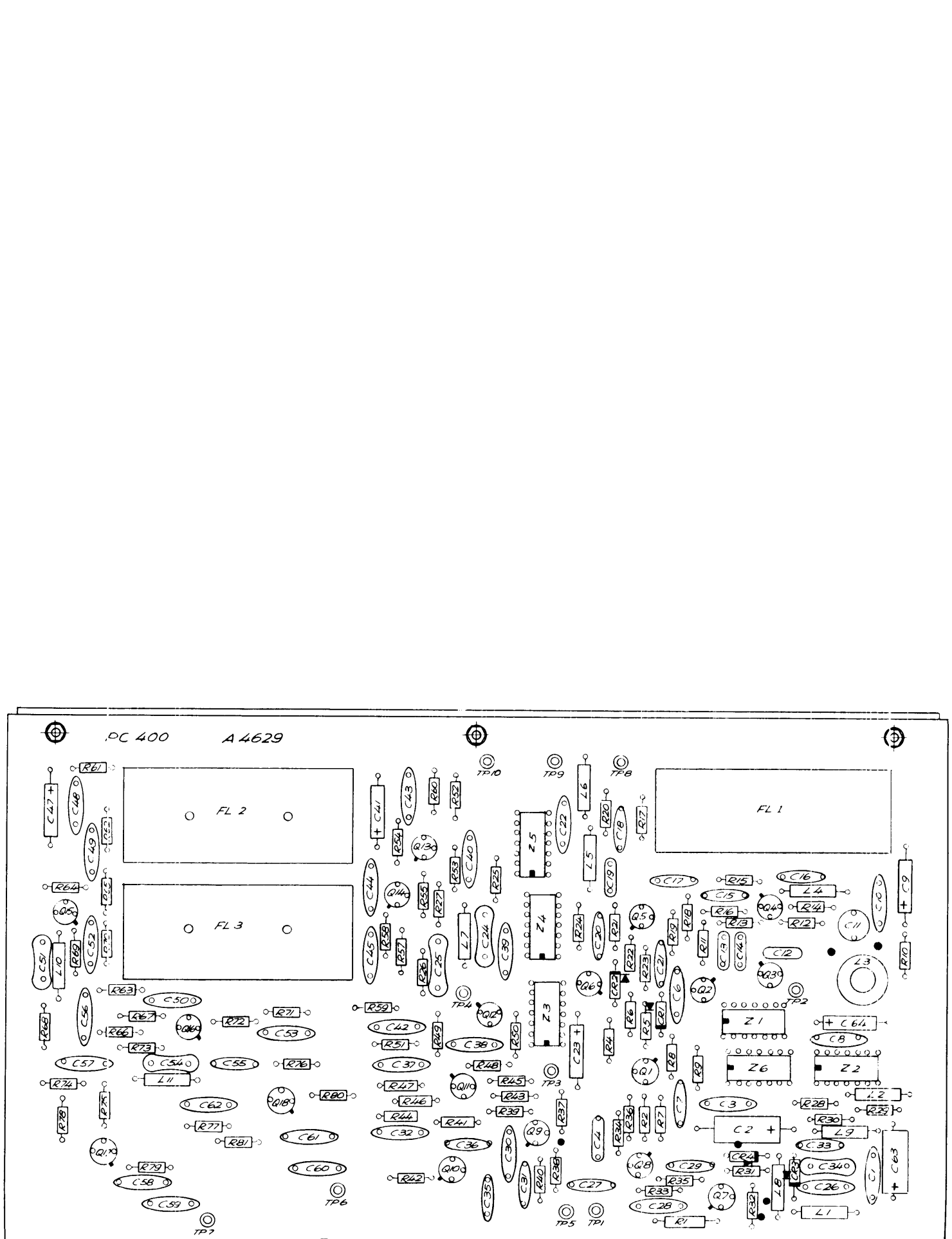
NOTES
1. ALL DECIMAL NO. CAPACITORS ARE IN uf.
2. WHOLE NO CAPACITORS IN uuf (PF)
3. ALL RESISTORS ARE 1/4 W AT 10% UNLESS NOTED OTHERWISE
4. RF COILS ARE NYTRONICS SUPER WEE-DUCTOR
5. PARTIAL REFERENCE DESIGNATIONS SHOWN FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER AND SUBASSEMBLY DESIGNATION(S) AS APPLICABLE.

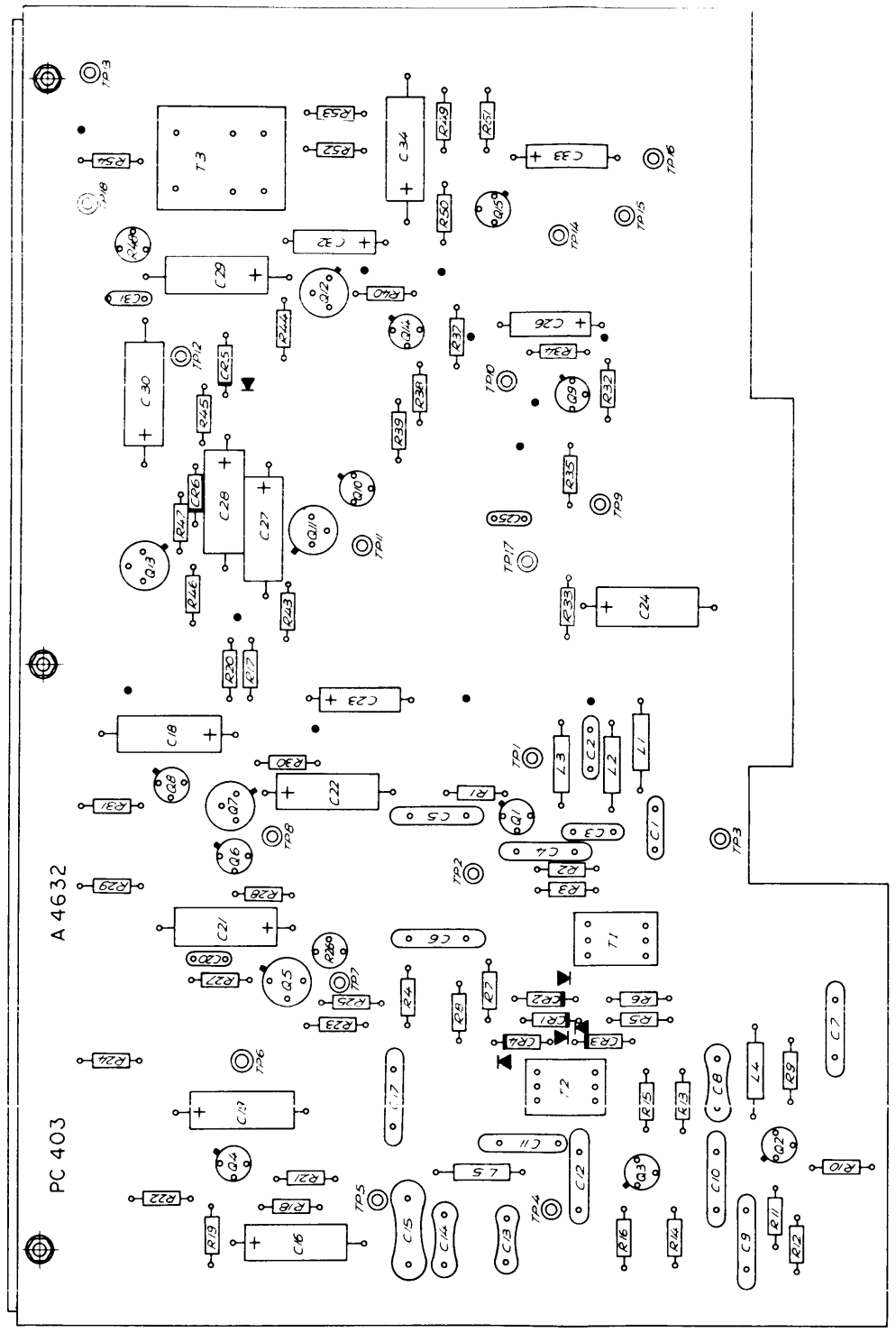
REFERENCE DESIGNATION	
LAST SYMBOL	DELETED
C64	C5, 46
R81	R3, 56
Q18	
L11	
CR4	
IC6	
FL3	
TP10	
TCC1	

CK 1363

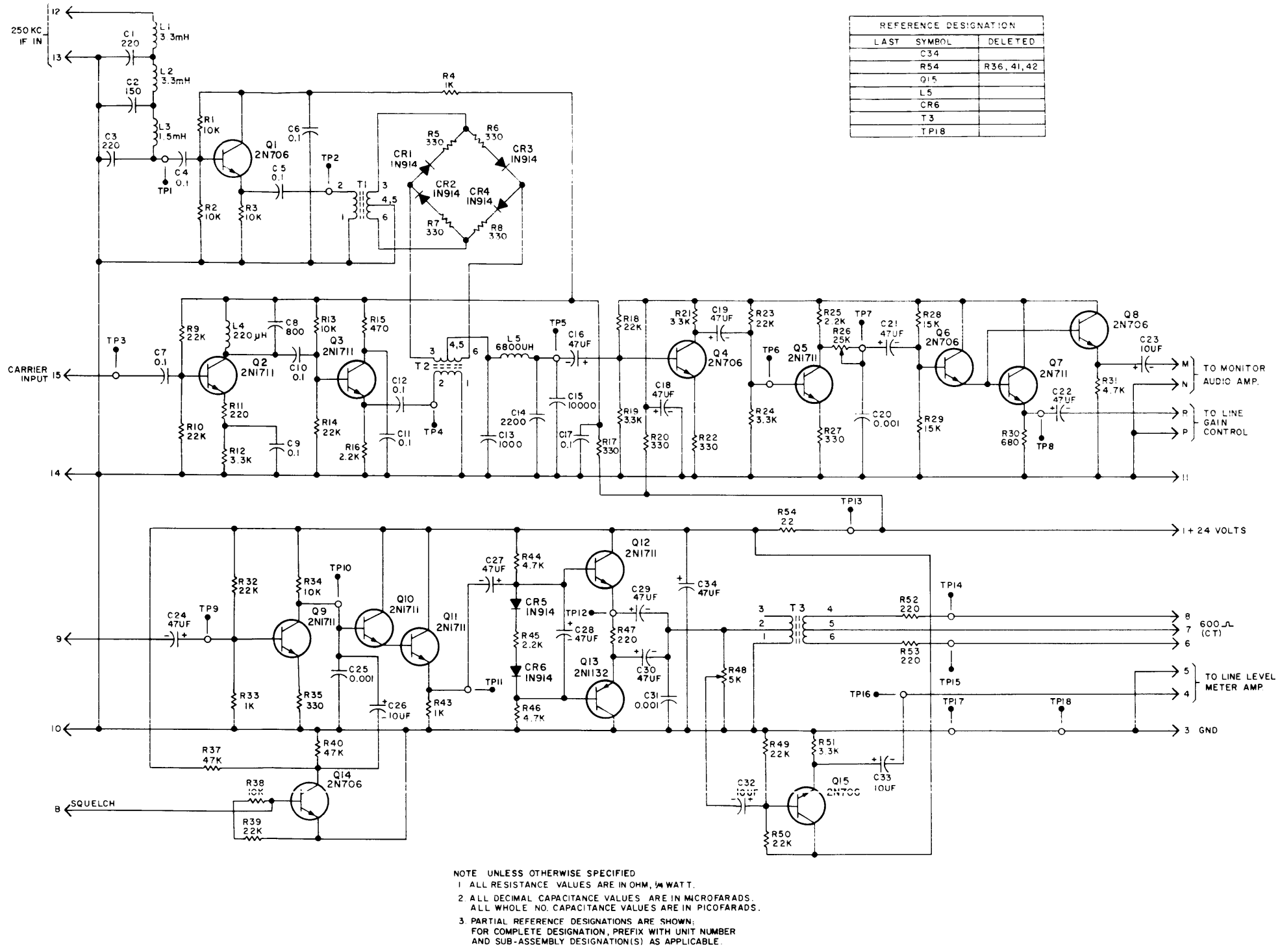
Figure 5-51/5-52. Symmetrical IF/AGC 2A5, Schematic/Component Locations Diagram

011690392


PC 400
A 4629
FL 1
FL 2
FL 3
TP1
TP2
TP3
TP4
TP5
TP6
TP7
TP8
TP9
TP10



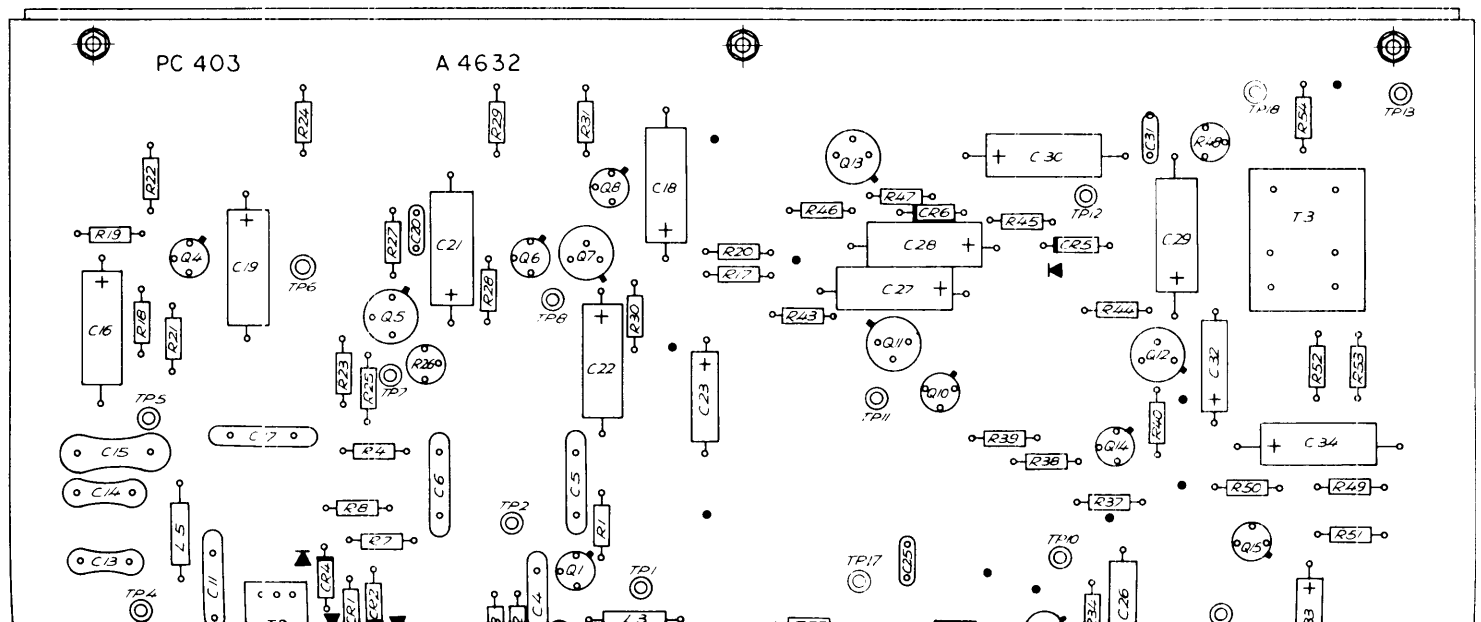
REFERENCE DESIGNATION	
LAST SYMBOL	DELETED
C34	
R54	R36, 41, 42
Q15	
L5	
CR6	
T3	
TP18	

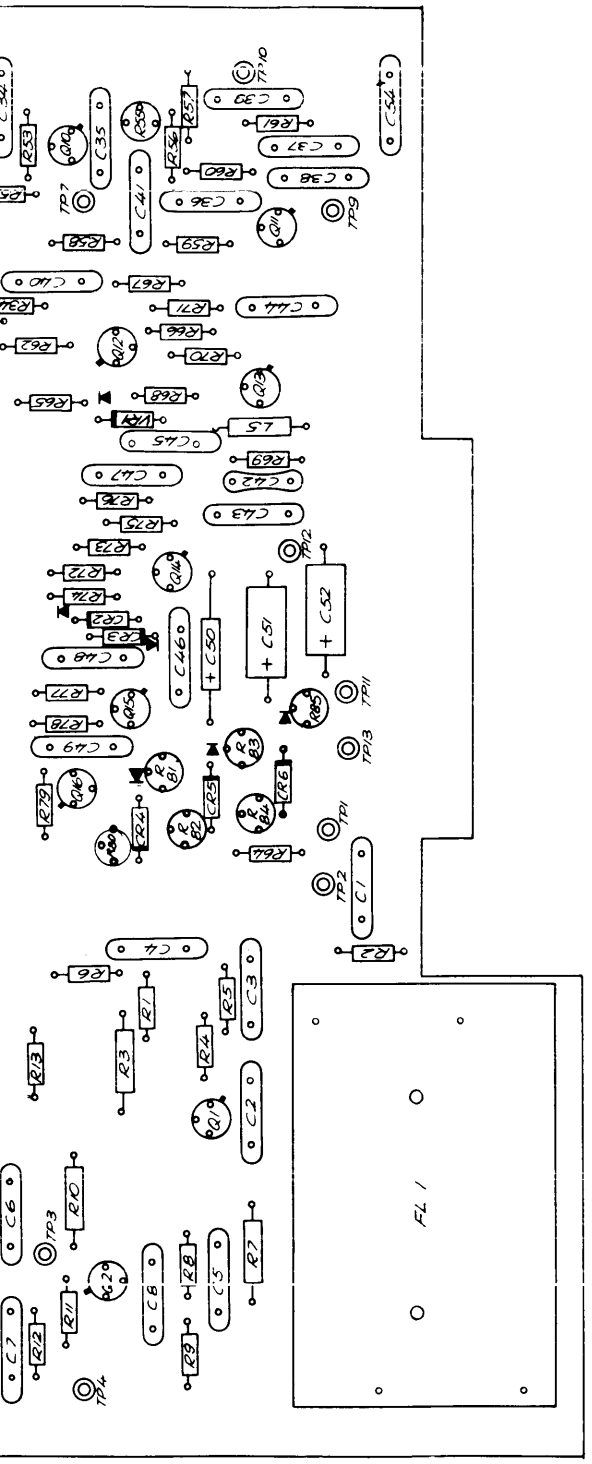


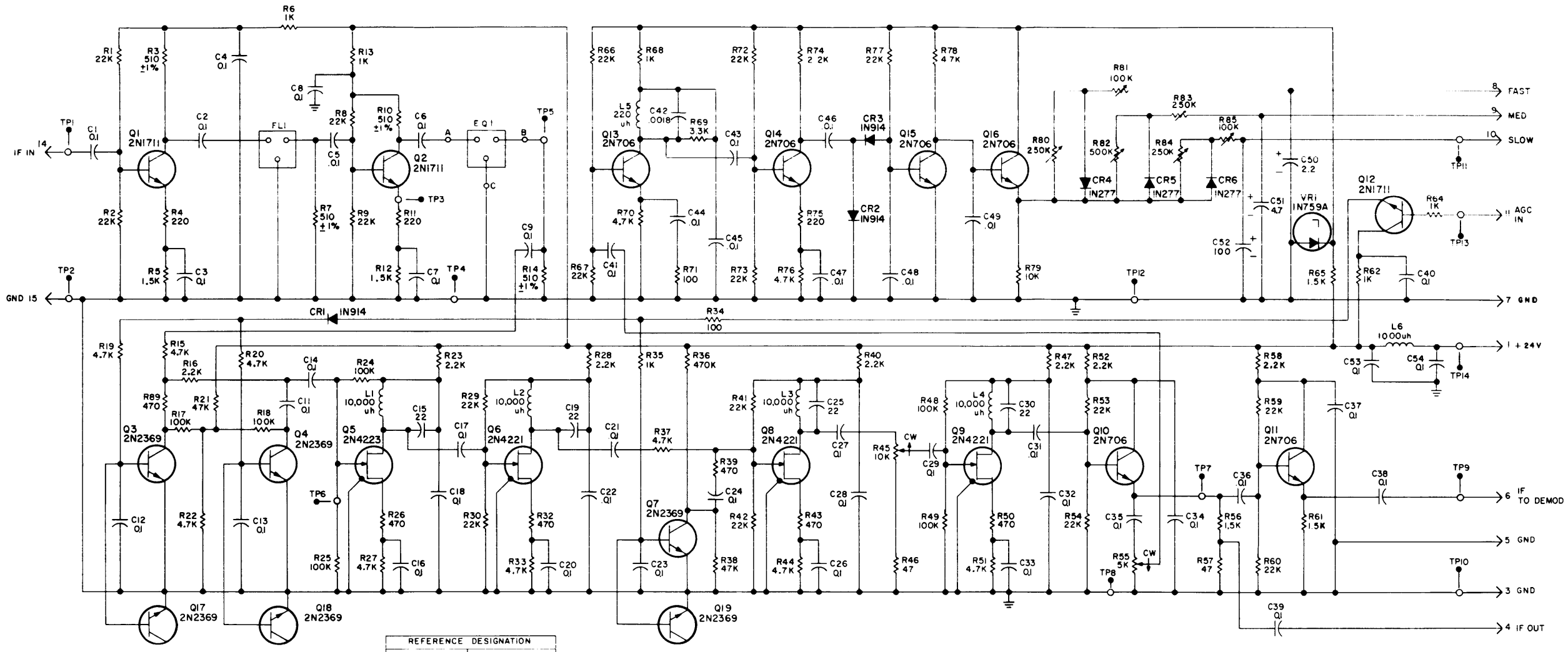
NOTE UNLESS OTHERWISE SPECIFIED
1. ALL RESISTANCE VALUES ARE IN OHM, ¼ WATT.
2. ALL DECIMAL CAPACITANCE VALUES ARE IN MICROFARADS. ALL WHOLE NO. CAPACITANCE VALUES ARE IN PICOFARADS.
3. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION(S) AS APPLICABLE.

CK 1366

Figure 5-53/5-54. Audio/Demodulator, ISB, 2A6, 8, 10, 12, Schematic/Component Locations Diagram


PC 403
A 4632
R24
R29
R31
C18
Q13
C 30
R47
R46
CR6
R45
C28
C27
R43
C29
T 3
R54
TP13
R22
R19
Q4
C19
TP6
C21
R27
CR20
Q5
R28
Q6
Q7
TP8
R20
R17
Q8
C16
R26
R21
R23
R25
TP7
R26B
C22
R30
C23
Q11
Q10
TP11
TP12
R48
CR5
R44
Q12
C32
R52
R53
TP5
C15
C 7
R4
C6
C5
R1
C14
R8
R7
TP2
C13
L5
C11
R24
R2
R3
C4
Q1
TP1
TP4
TP17
CR50
TP10
R39
R38
Q14
C 34
R50
R49
R37
R51
Q15
C26
R33

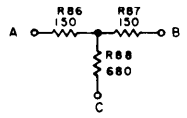




REFERENCE DESIGNATION	
LAST SYMBOL	MISSING SYMBOL
C54	C10
CR6	R31,63
L6	
Q19	
R89	
[illegible]	
EQ1	
TP14	
VR1	

NOTE: UNLESS SPECIFIED OTHERWISE

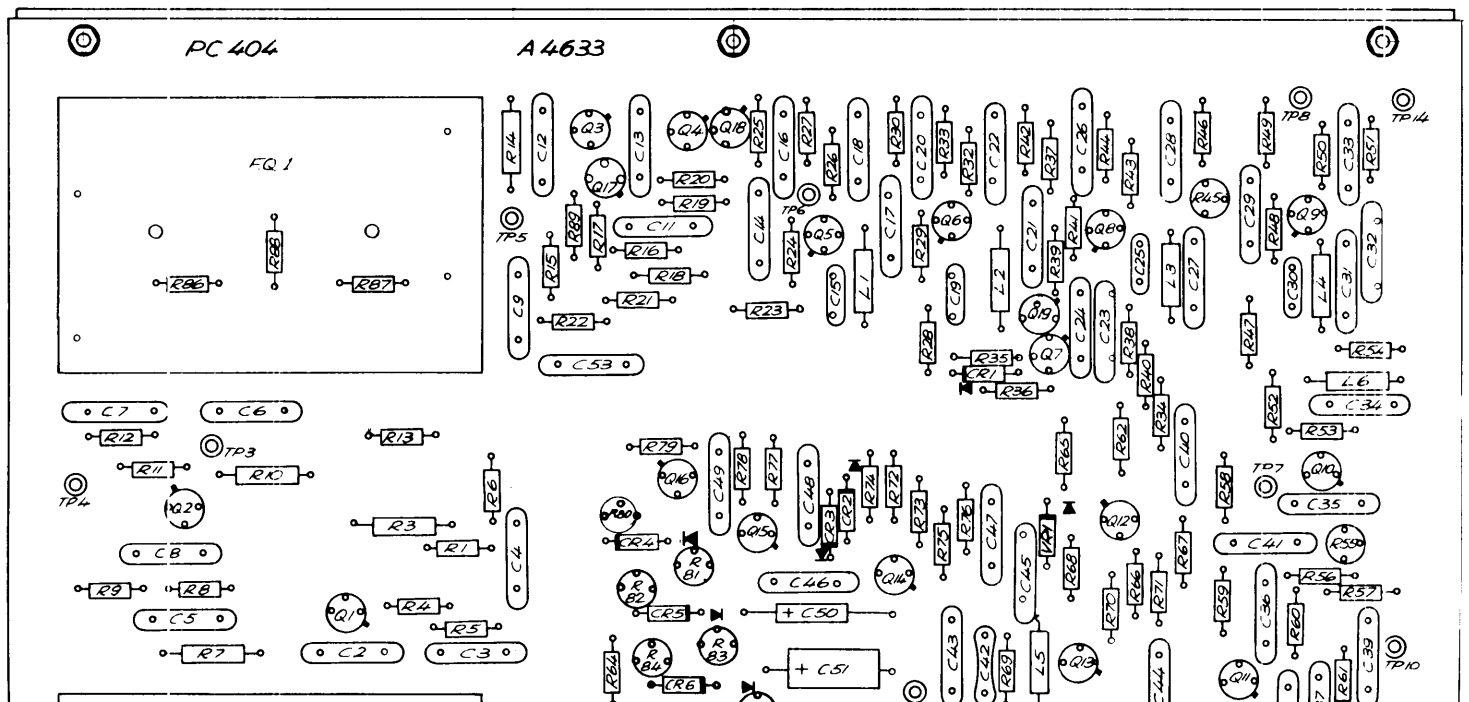
1. ALL RESISTANCE VALUES ARE IN OHMS, 1/4 WATT.
2. ALL CAPACITANCE VALUES ARE IN MICROFARADS.
3. COMPONENTS R86, R87, & R88 ARE LOCATED AS SHOWN WHEN DELAY EQUALIZER IS NOT INSTALLED.



4. PARTIAL REFERENCE DESIGNATIONS SHOWN FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER AND SUBASSEMBLY DESIGNATION(S) AS APPLICABLE.

CK 1367

Figure 5-55/5-56. IF/AGC, ISB, 2A7, 9, 11, 13, Schematic/Component Locations Diagram


PC 404
A 4633
FQ 1
TP3
TP4
TP5
TP6
TP8
TP10
TP14
+ C50
+ C51

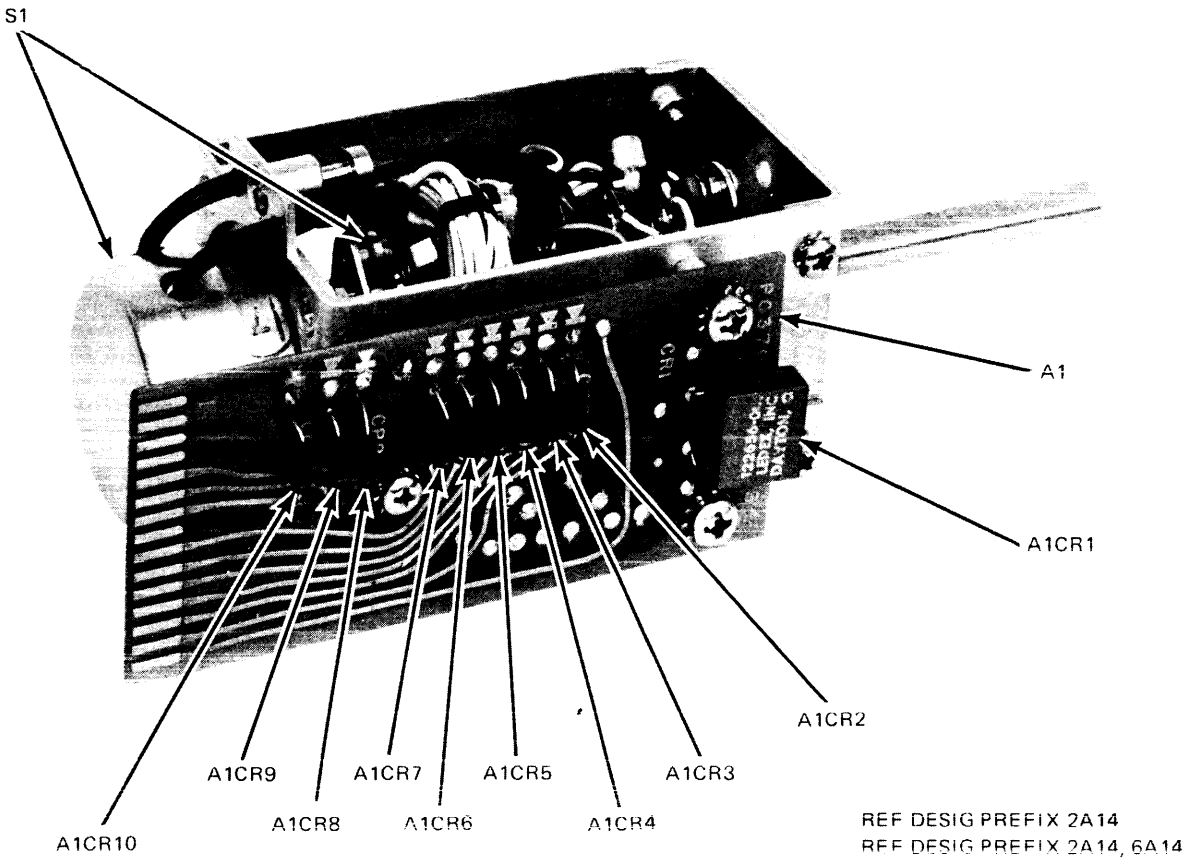
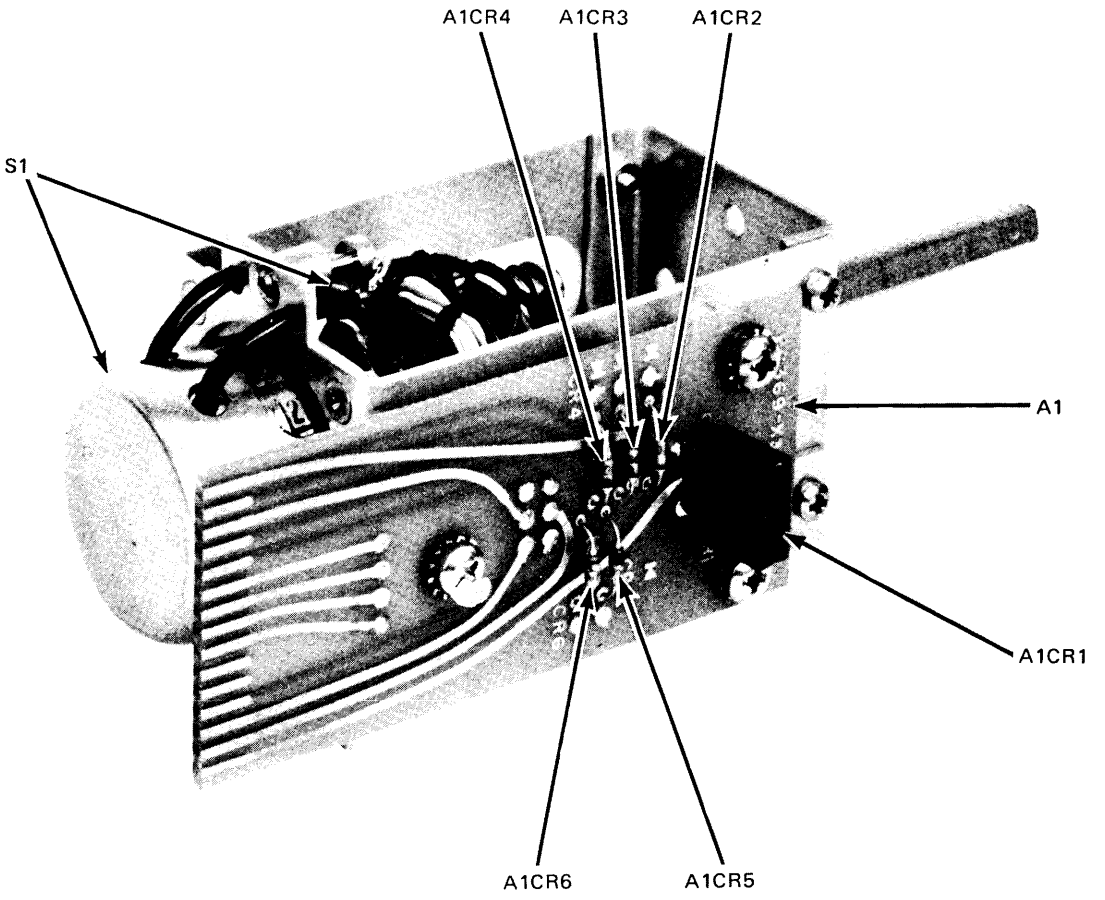


Figure 5-57. MODE Stepping Switch Assembly 2A14, Component Locations Diagram



REF DESIG PREFIX 2A15, 2A16, 2A17, 2A18
REF DESIG PREFIX 2A15, 2A16, 2A17, 2A18, 6A15, 6A16, 6A17, 6A18

Figure 5-58. AGC TIME CONSTANT Stepping Switch Assemblies 2A15, 16, 17, 18, Component Locations Diagram

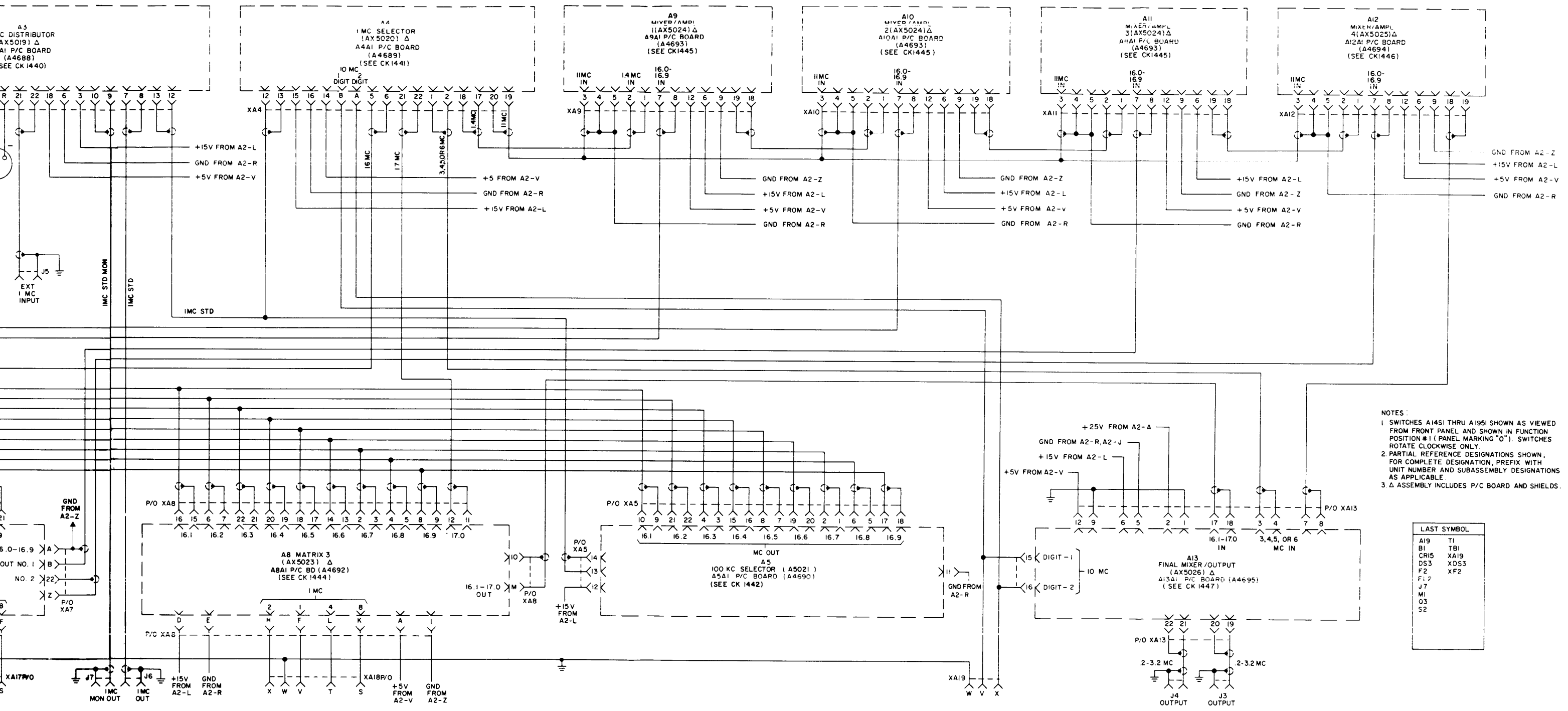
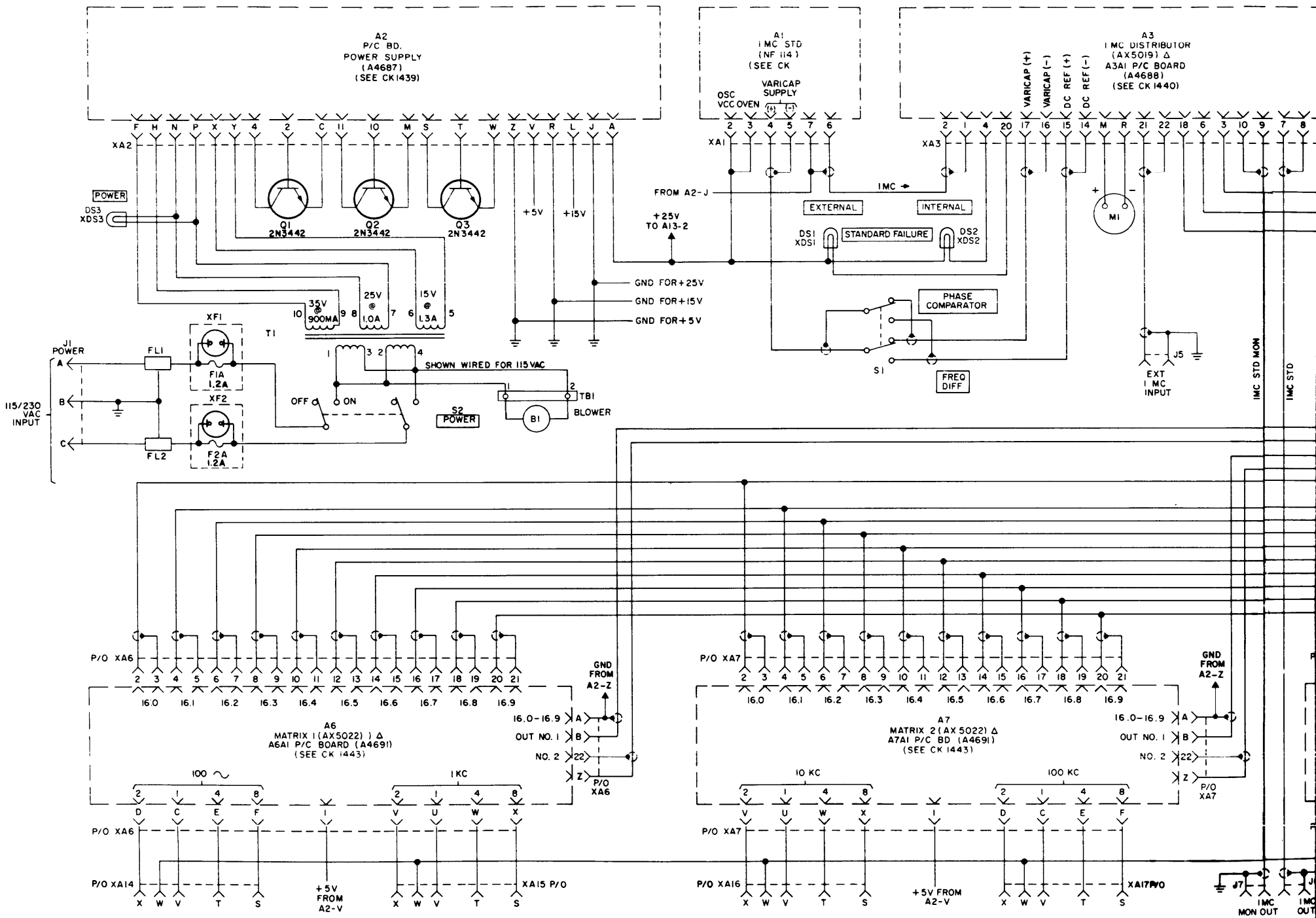
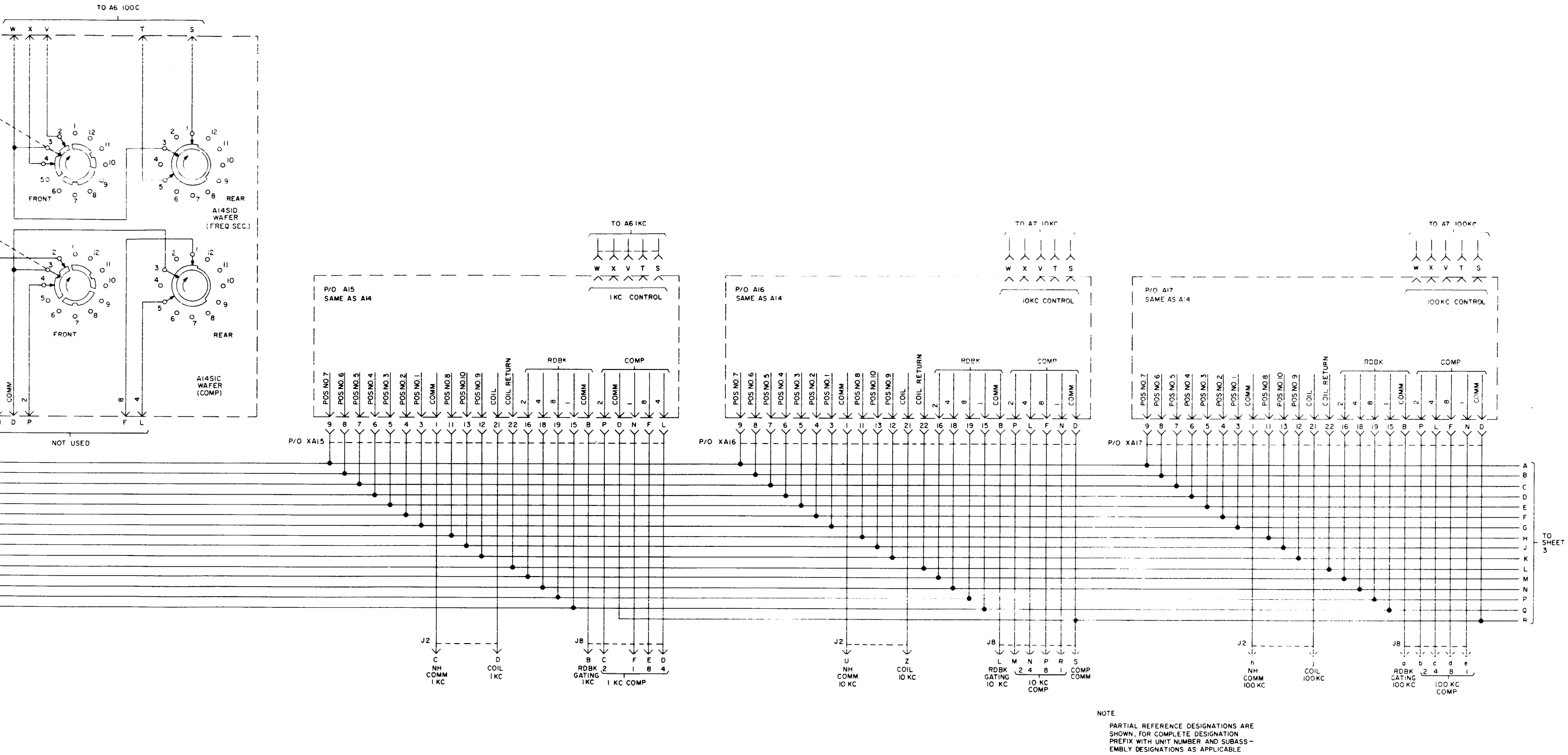


Figure 5-59. Unit 3 (0-1510/URR), Schematic Diagram (Sheet 1 of 3)

011690392


A2
P/C BD.
POWER SUPPLY
(A46687)
(SEE CK1439)
A1
IMC STD
(NF 114)
(SEE CK
OSC
VCC OVEN
VARICAP
SUPPLY
A3
IMC DISTRIBUTOR
(AX5019) Δ
A3A1 P/C BOARD
(A4688)
(SEE CK1440)
VARICAP (+)
VARICAP (-)
DC REF (+)
DC REF (-)
XA2
XA1
XA3
POWER
DS3
XDS3
Q1
2N3442
Q2
2N3442
Q3
2N3442
+5V
+15V
+25V
TO A13-2
FROM A2-J
IMC
EXTERNAL
INTERNAL
DS1
XDS1
STANDARD FAILURE
DS2
XDS2
M1
GND FOR+25V
GND FOR+15V
GND FOR+5V
35V
@
900MA
25V
@
1.0A
15V
@
1.3A
T1
PHASE
COMPARATOR
S1
FREQ
DIFF
J5
EXT
IMC
INPUT
J1
POWER
A
B
C
115/230
VAC
INPUT
FL1
FL2
XF1
XF2
F1A
1.2A
F2A
1.2A
SHOWN WIRED FOR 115VAC
OFF
ON
S2
POWER
TB1
BLOWER
B1
IMC STD MON
IMC STD
P/O XA6
P/O XA14
P/O XA15 P/O
+5V
FROM
A2-V
A6
MATRIX 1 (AX5022) Δ
A6A1 P/C BOARD (A4691)
(SEE CK 1443)
GND
FROM
A2-Z
P/O
XA6
100 ~
1 KC
P/O XA7
P/O XA16
P/O XA17
A7
MATRIX 2 (AX5022) Δ
A7A1 P/C BD (A4691)
(SEE CK 1443)
10 KC
100 KC
J7
IMC
MON OUT
IMC
OUT

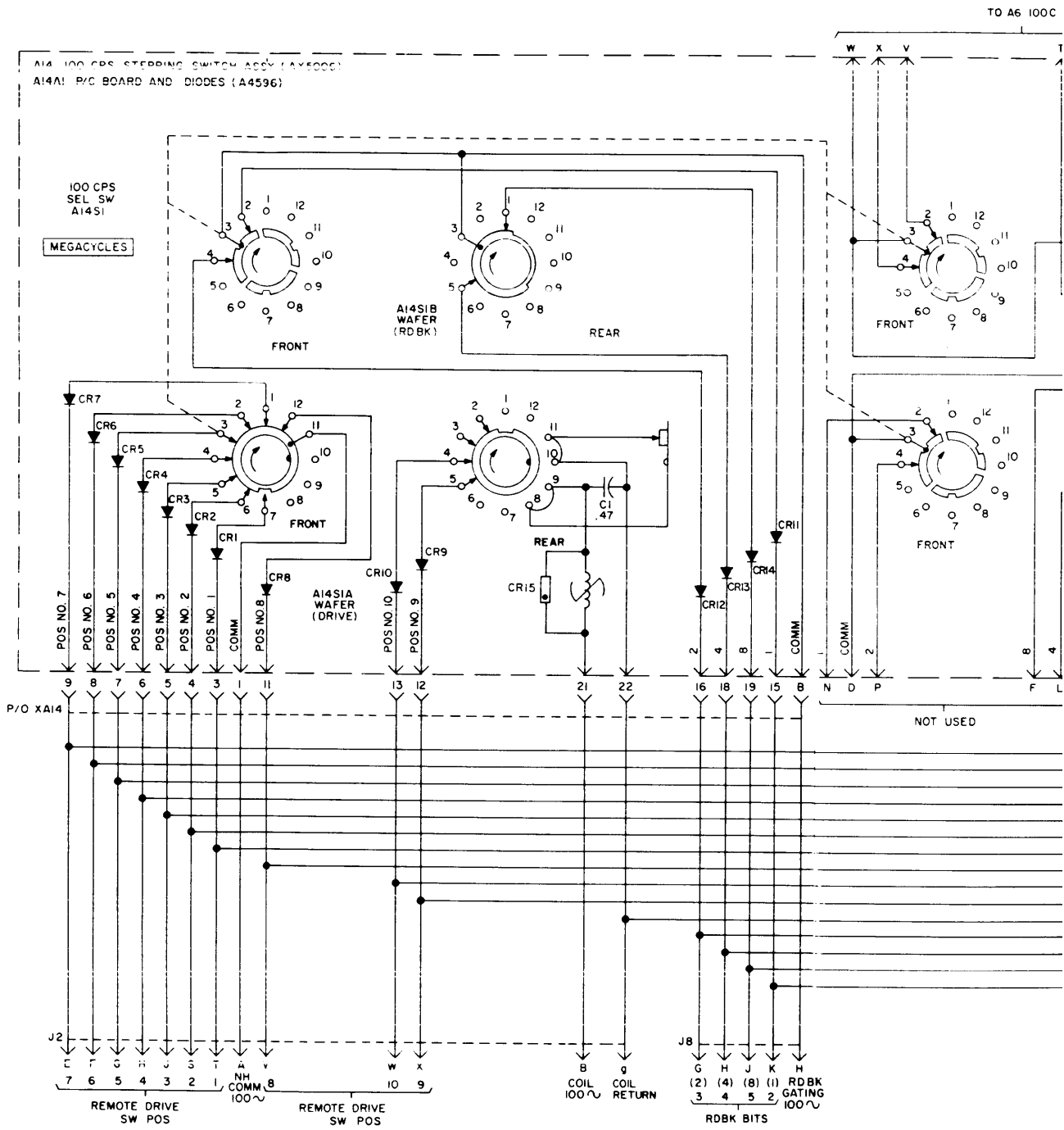
CK 1418



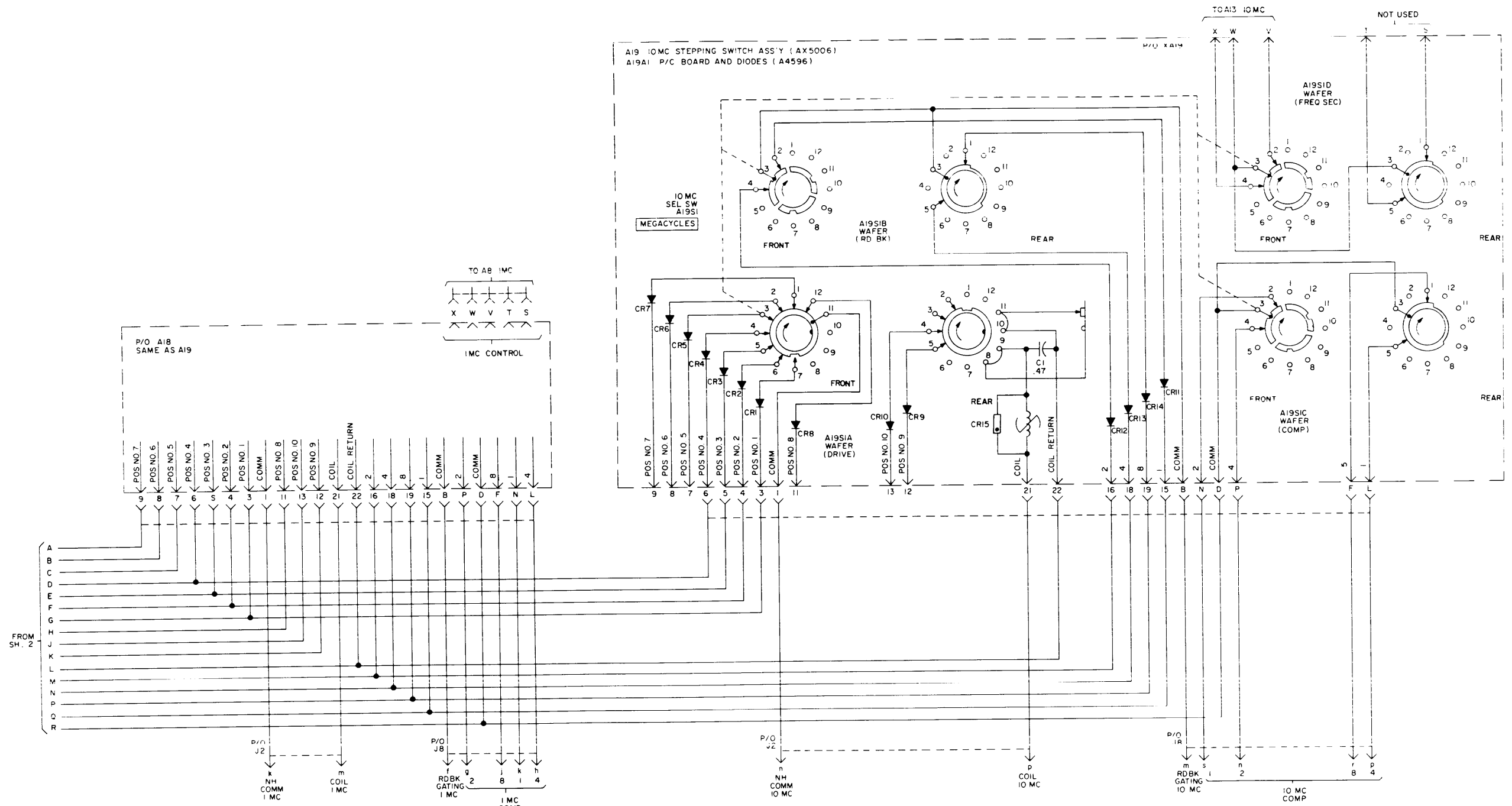
NOTE

PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER AND SUBASSEMBLY DESIGNATIONS AS APPLICABLE.

Figure 5-59. Unit 3 (0-1510/URR), Schematic Diagram (Sheet 2 of 3)


TO A6 100C
A14A1 P/C BOARD AND DIODES (A4596)
100 CPS SEL SW A14S1
MEGACYCLES
A14S1B WAFER (RDBK)
FRONT
REAR
A14S1A WAFER (DRIVE)
CR1
CR2
CR3
CR4
CR5
CR6
CR7
CR8
CR9
CR10
CR11
CR12
CR13
CR14
CR15
C1 .47
POS NO. 7
POS NO. 6
POS NO. 5
POS NO. 4
POS NO. 3
POS NO. 2
POS NO. 1
COMM
POS NO. 8
POS NO. 10
POS NO. 9
2
4
8
P/O XA14
NOT USED
J2
REMOTE DRIVE SW POS
NH COMM 100~
REMOTE DRIVE SW POS
B COIL 100~
g COIL RETURN
J8
(2) (4) (8) (1)
RDBK BITS
RDBK GATING 100~

CK 1418



CK 1418

Figure 5-59. Unit 3 (0-1510/URR), Schematic Diagram (Sheet 3 of 3)

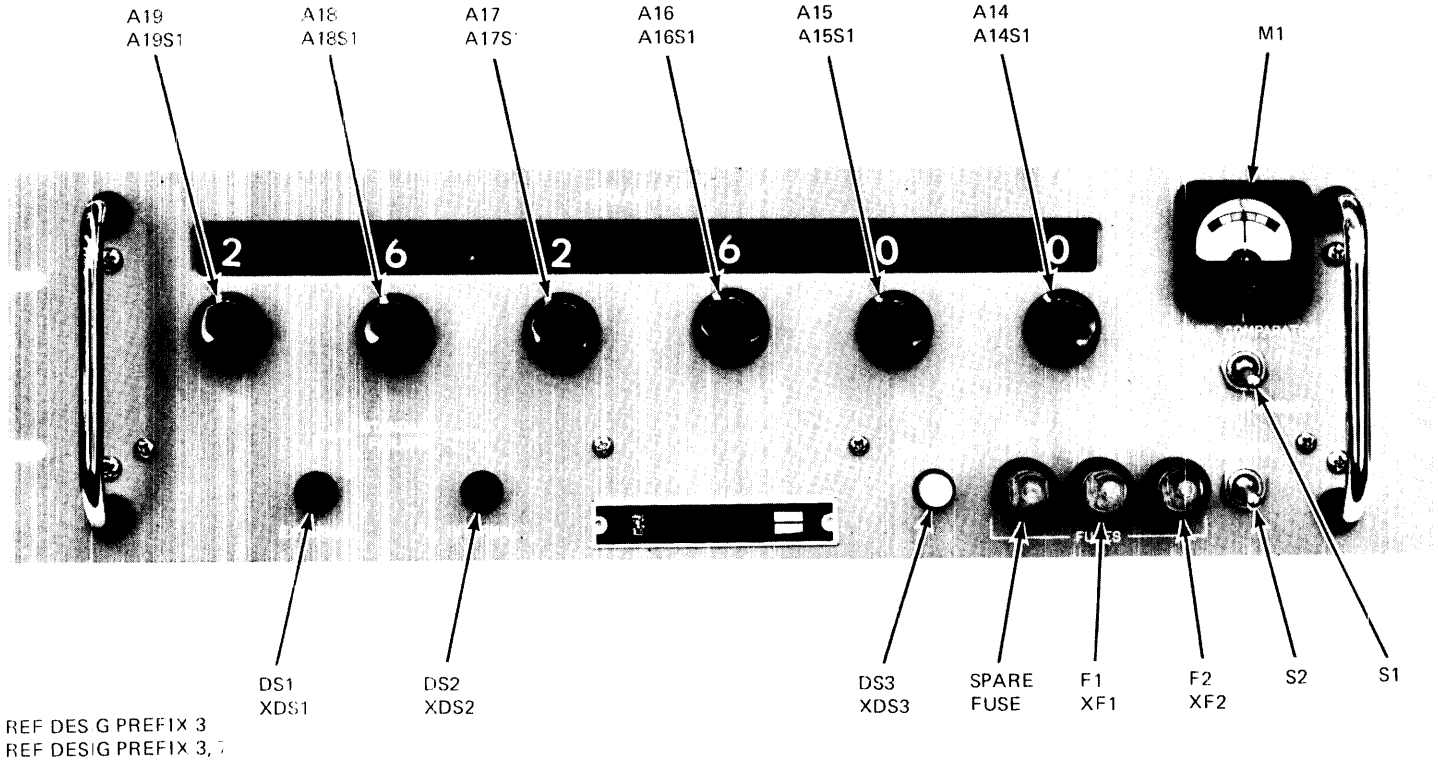


Figure 5-60. Unit 3 (0-1510/URR), Front Panel, Major Component Locations Diagram

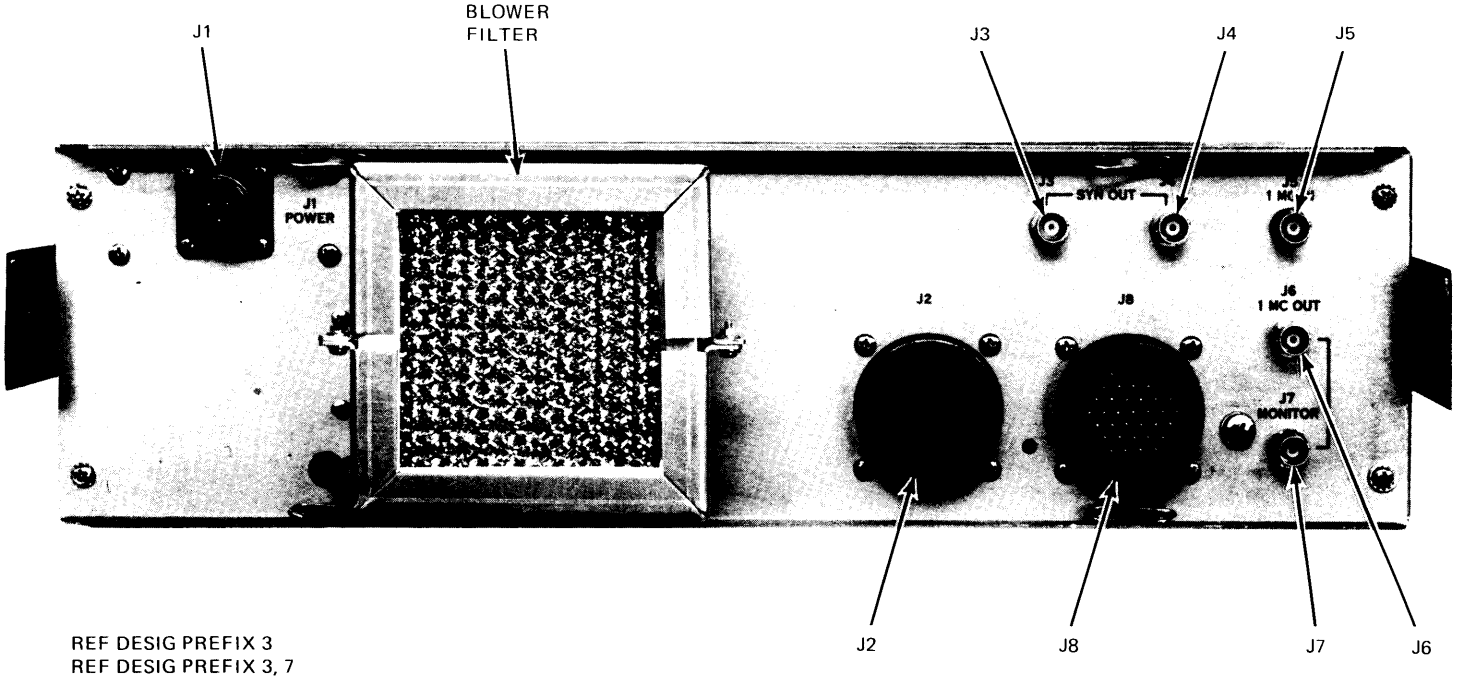


Figure 5-61. Unit 3 (0-1510/URR), Rear Panel, Major Component Locations Diagram

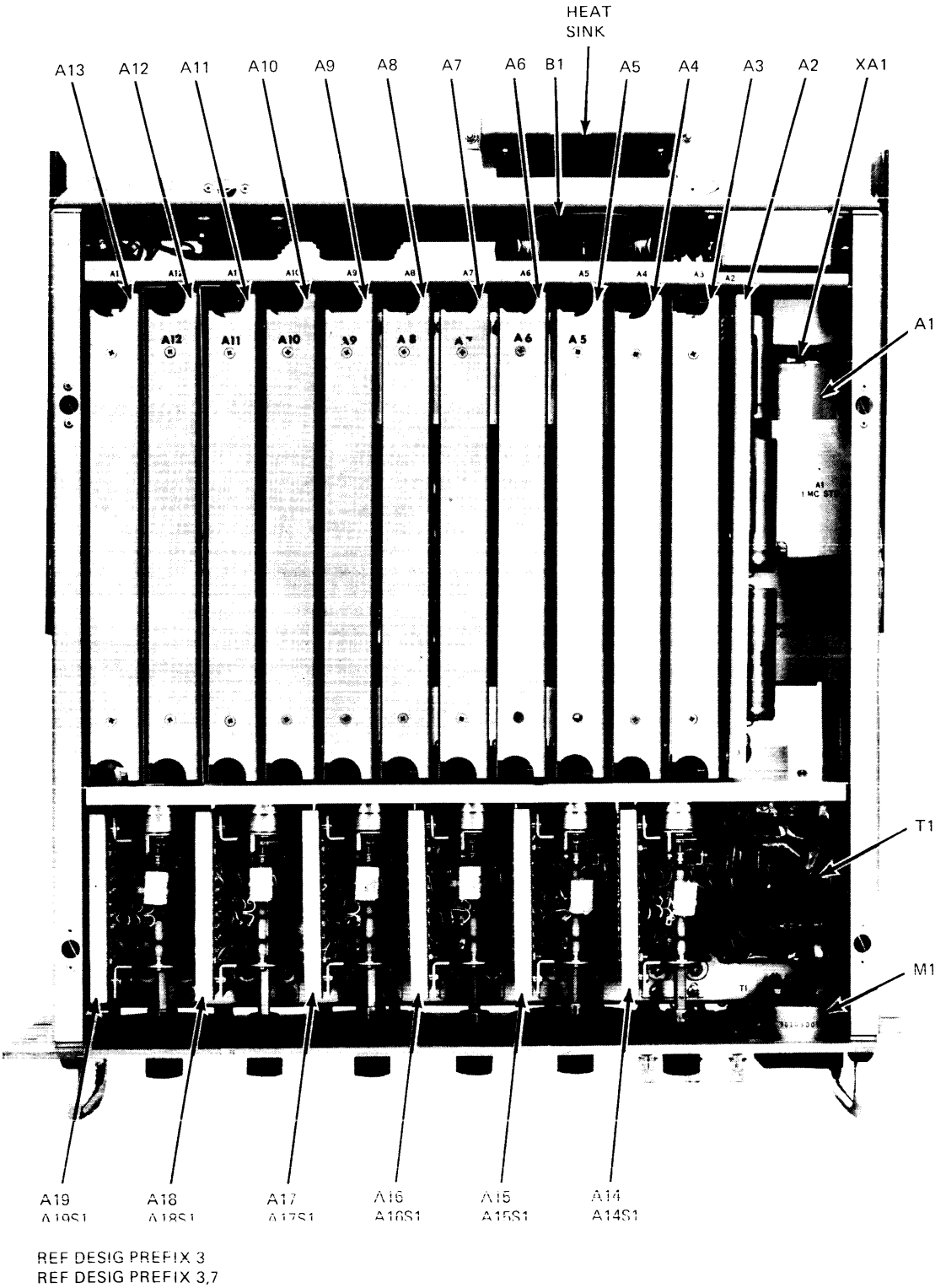


Figure 5-62. Unit 3 (0-1510/URR), Top View, Major Component Locations Diagram

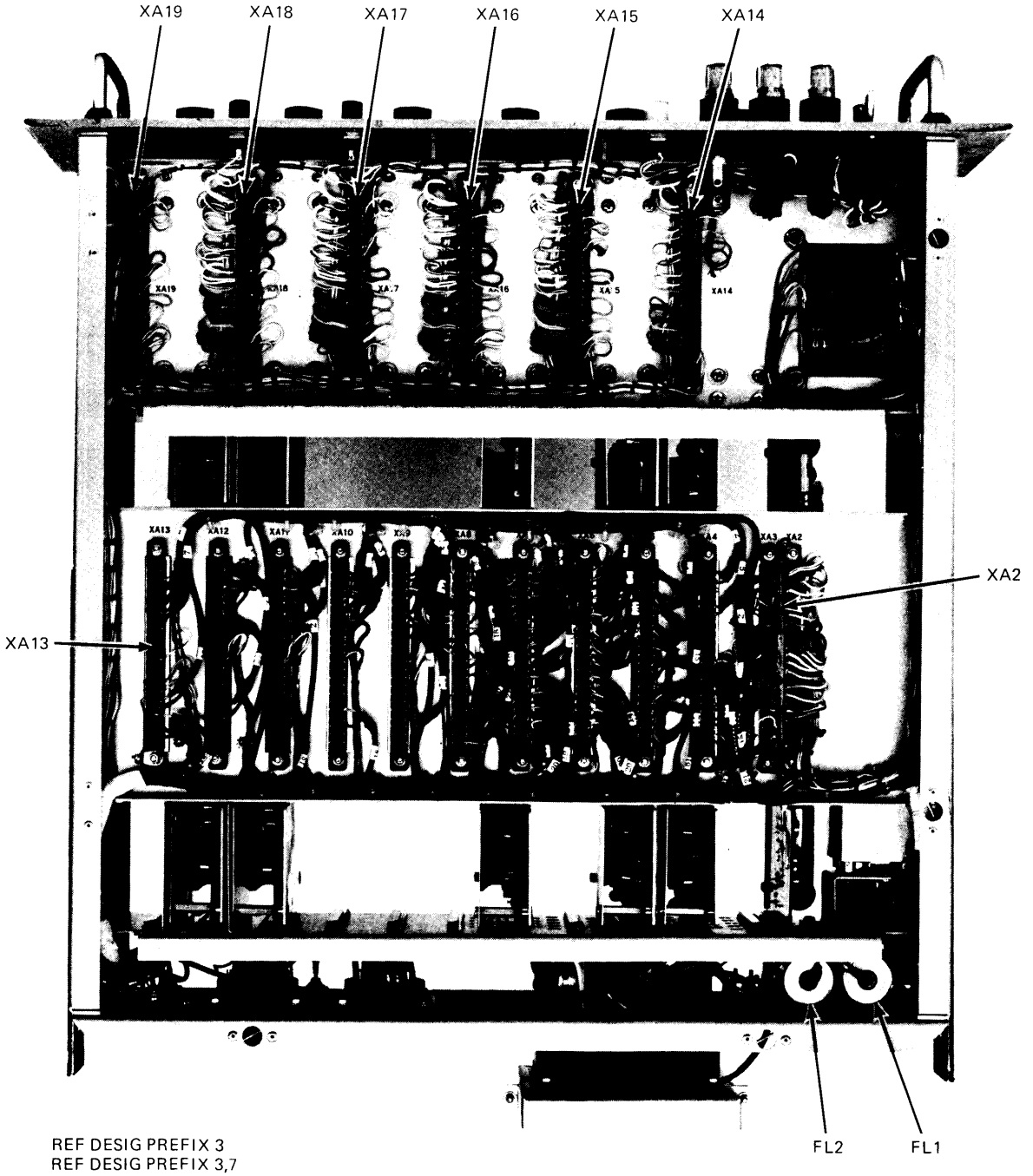
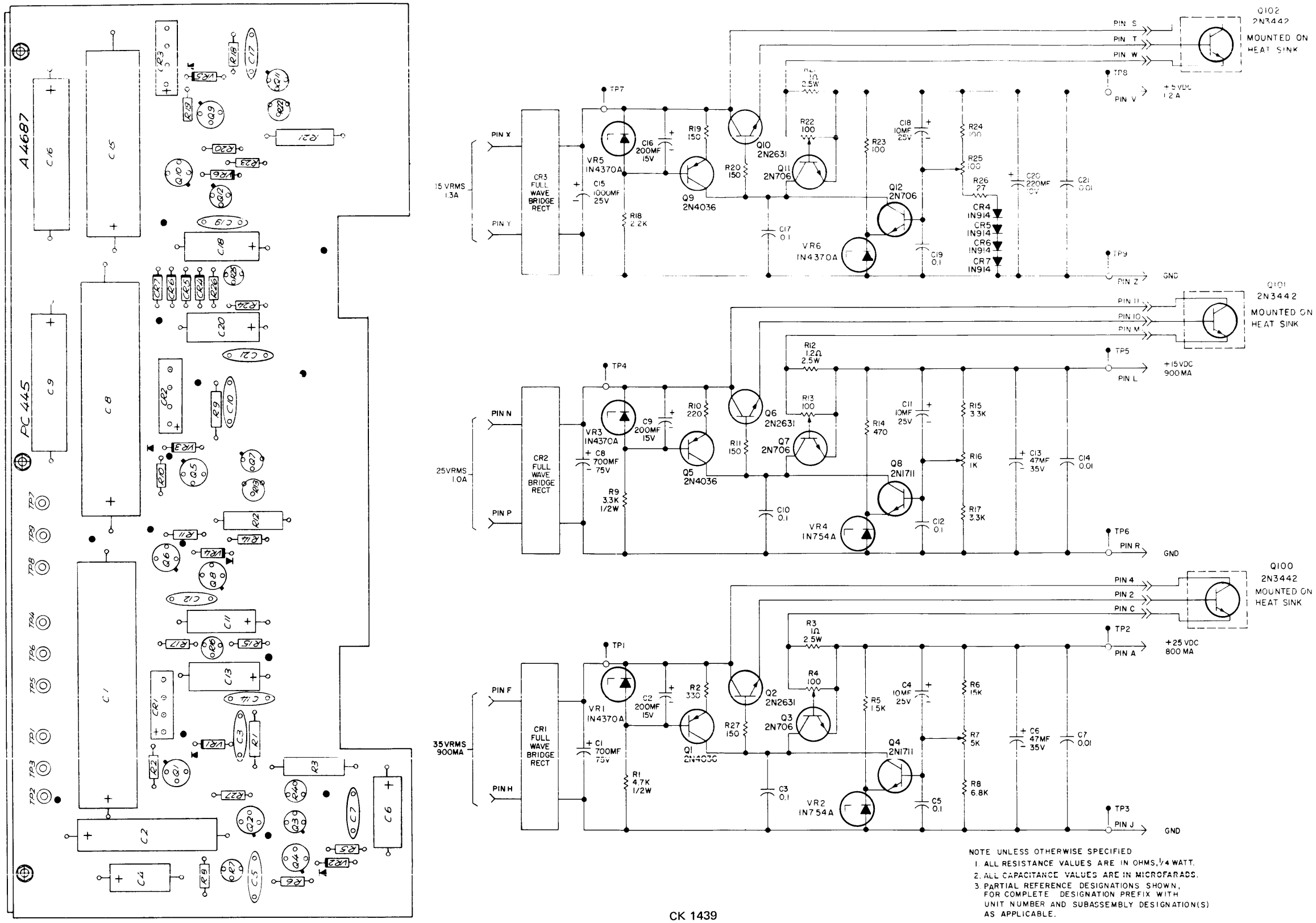
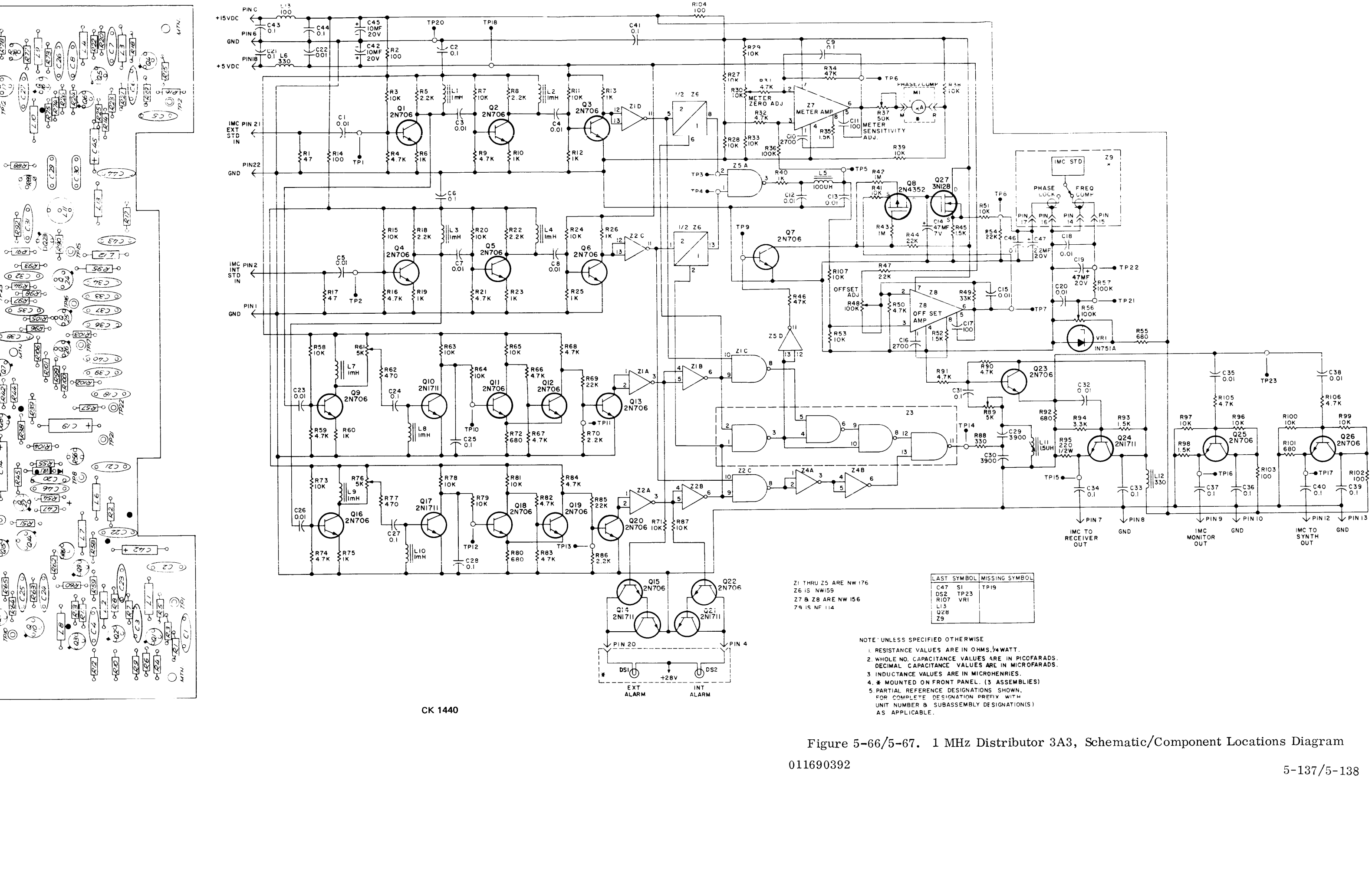


Figure 5-63. Unit 3 (0-1510/URR), Bottom View, Major Component Locations Diagram



REFERENCE DESIGNATION			
LAST		DELETED	
C21	VR6		
CR7			
Q102		Q13-99	
R27			
TP9			

Figure 5-64/5-65. Power Supply 3A2, Schematic/Component Locations Diagram



CK 1440

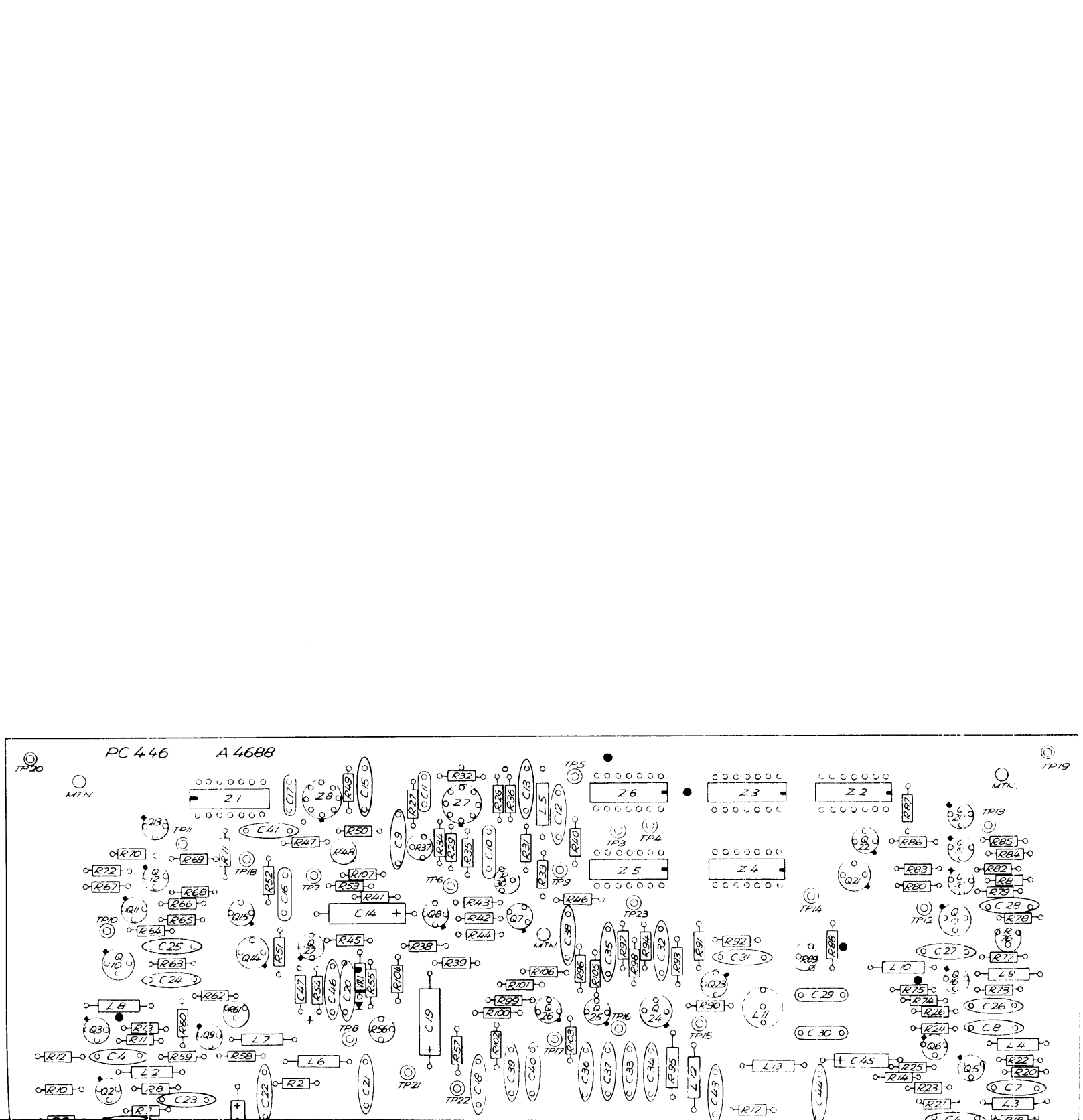
Z1 THRU Z5 ARE NW176
Z6 IS NW159
Z7 & Z8 ARE NW156
Z9 IS NF114

LAST SYMBOL	MISSING SYMBOL
C47 S1	TP19
DS2 TP23	
R107 VR1	
L13	
Q28	
Z9	

NOTE: UNLESS SPECIFIED OTHERWISE

1. RESISTANCE VALUES ARE IN OHMS, ¼ WATT.
2. WHOLE NO. CAPACITANCE VALUES ARE IN PICOFARADS. DECIMAL CAPACITANCE VALUES ARE IN MICROFARADS.
3. INDUCTANCE VALUES ARE IN MICROHENRIES.
4. * MOUNTED ON FRONT PANEL. (3 ASSEMBLIES)
5. PARTIAL REFERENCE DESIGNATIONS SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER & SUBASSEMBLY DESIGNATION(S) AS APPLICABLE.

Figure 5-66/5-67. 1 MHz Distributor 3A3, Schematic/Component Locations Diagram


PC 446 A 4688
TP20
MTN.
Z1
Z8
Z7
Z6
Z3
Z2
Z5
Z4
TP19
TP5
TP3
TP4
TP11
TP18
TP7
TP6
TP9
TP23
TP14
TP13
TP12
TP10
TP8
TP16
TP15
TP17
TP21
TP22
C14
C19
C45
C41
C25
C24
C23
C4
C22
C2
C1
C46
C20
C47
C39
C40
C36
C37
C33
C34
C31
C32
C35
C27
C29
C30
C28
C26
C8
C7
C3
C9
C10
C12
C13
C11
C17
C18
L1
L2
L3
L4
L5
L6
L7
L8
L9
L10
L11
L12
L13
L14
L15
L16
L17
L18
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
R20
R21
R22
R23
R24
R25
R26
R27
R28
R29
R30
R31
R32
R33
R34
R35
R36
R37
R38
R39
R40
R41
R42
R43
R44
R45
R46
R47
R48
R49
R50
R51
R52
R53
R54
R55
R56
R57
R58
R59
R60
R61
R62
R63
R64
R65
R66
R67
R68
R69
R70
R71
R72
R73
R74
R75
R76
R77
R78
R79
R80
R81
R82
R83
R84
R85
R86
R87
R88
R89
R90
R91
R92
R93
R94
R95
R96
R97
R98
R99
R100
R101
R102
R103
R104
R105
R106
R107
R108
R109
R110
R111
R112
R113
R114
R115
R116
R117
R118
R119
R120
R121
R122
R123
R124
R125
R126
R127
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
Q12
Q13
Q14
Q15
Q16
Q17
Q18
Q19
Q20
Q21
Q22
Q23
Q24
Q25
Q26
Q27
Q28
Q29
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Q997
Q998
Q999
Q1000

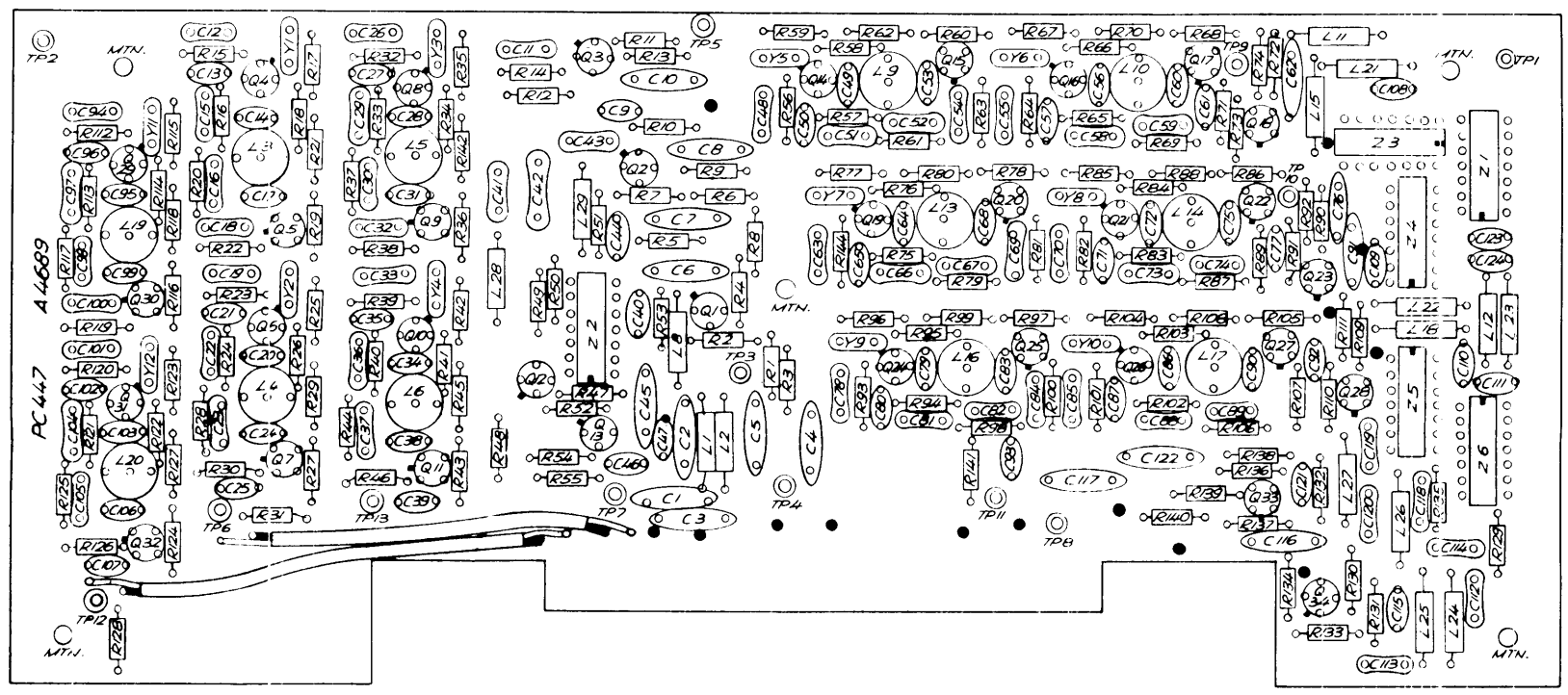
LAST SYMBOL	MISSING SYMBOL
C122	C 7
Z6	
L24	
Q34	
R142	
TP13	
T11	

NOTE: UNLESS SPECIFIED OTHERWISE
1. ALL RESISTANCE VALUES ARE IN OHMS, 1/4 W.
2. ALL WHOLE NO. CAPACITANCE VALUES ARE PF. ALL DECIMAL CAPACITANCE VALUES ARE UF.
3. ALL INDUCTANCE VALUES ARE mH.
4. PARTIAL REFERERENCE DESIGNATIONS SHOWN, FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER AND SUBASSEMBLY DESIGNATION AS APPLICABLE.

CK 1441

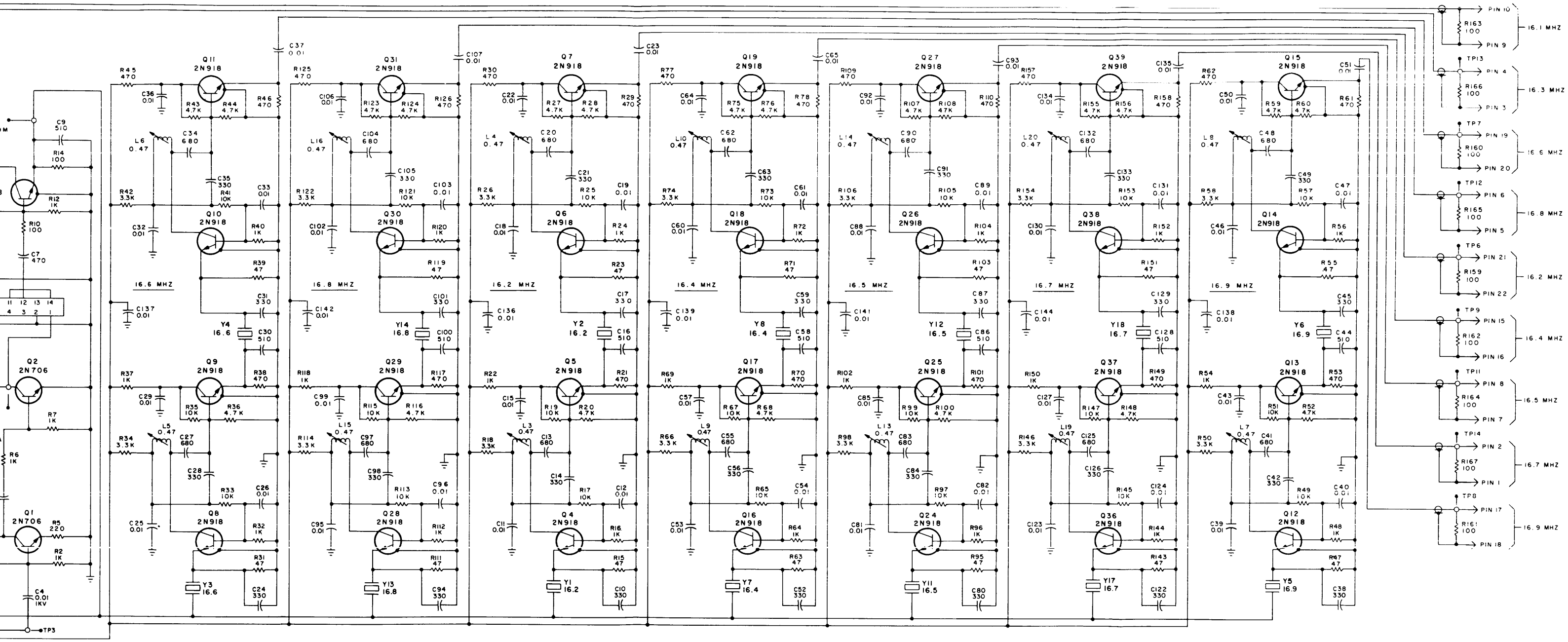
Figure 5-68/5-69. 1 MHz Selector 3A4, Schematic/Component Locations Diagram

011690392



ASSEMBLY NOTES :

1. TO MOUNT COMPONENTS, INSERT LEADS THROUGH PLATED THRU - HOLES.
2. CAUTION, WHEN APPLYING HEAT AND SOLDER TO LEAD AND FOIL.
3. CLEAN AND INSPECT AS PER SPEC. S 676.
4. FOR ELECTRICAL COMPONENT PART NUMBERS REFER TO NPL A 4689
5. USE SYMBOL NUMBERS FOR ASSEMBLY REFERENCE.

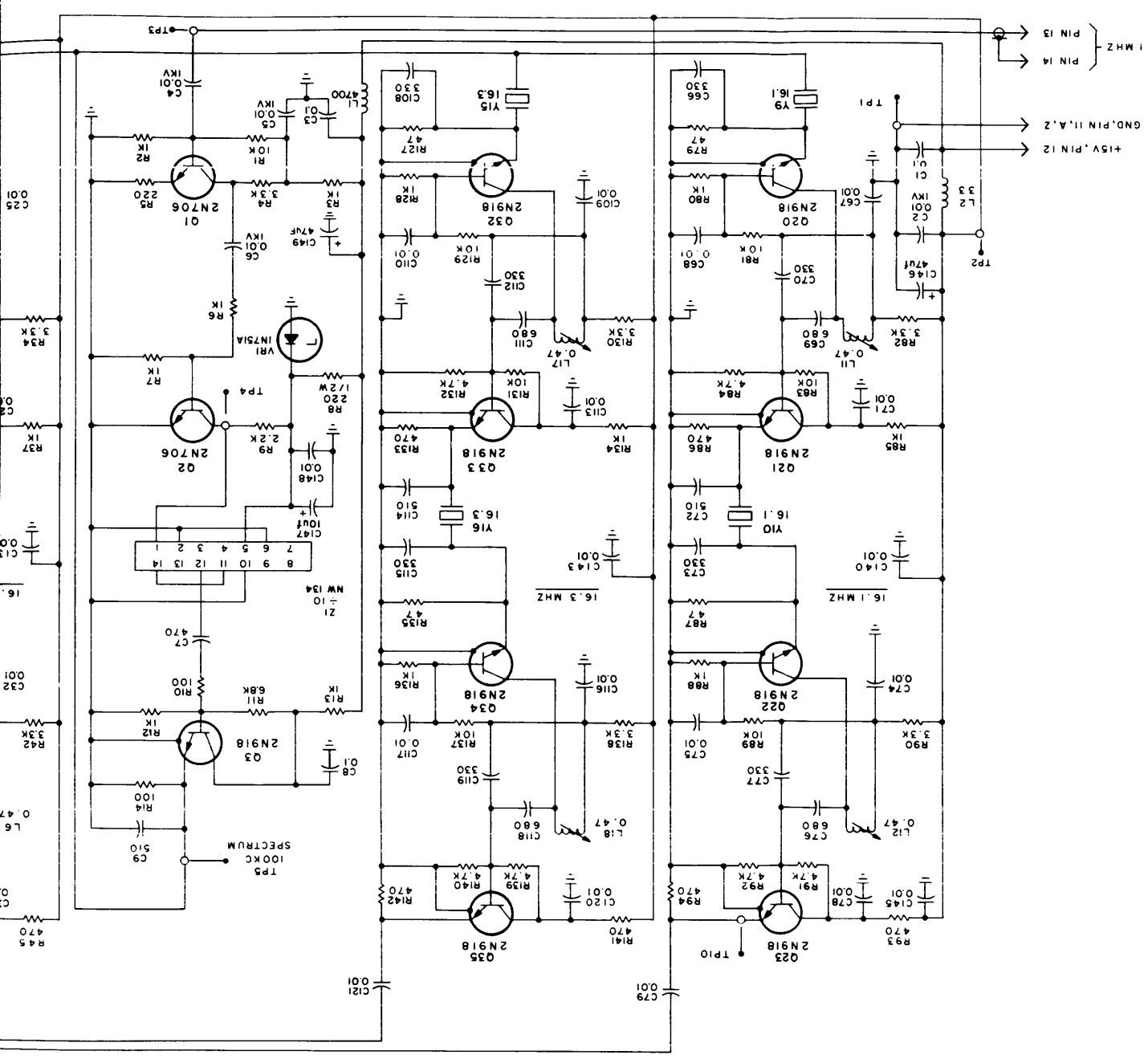


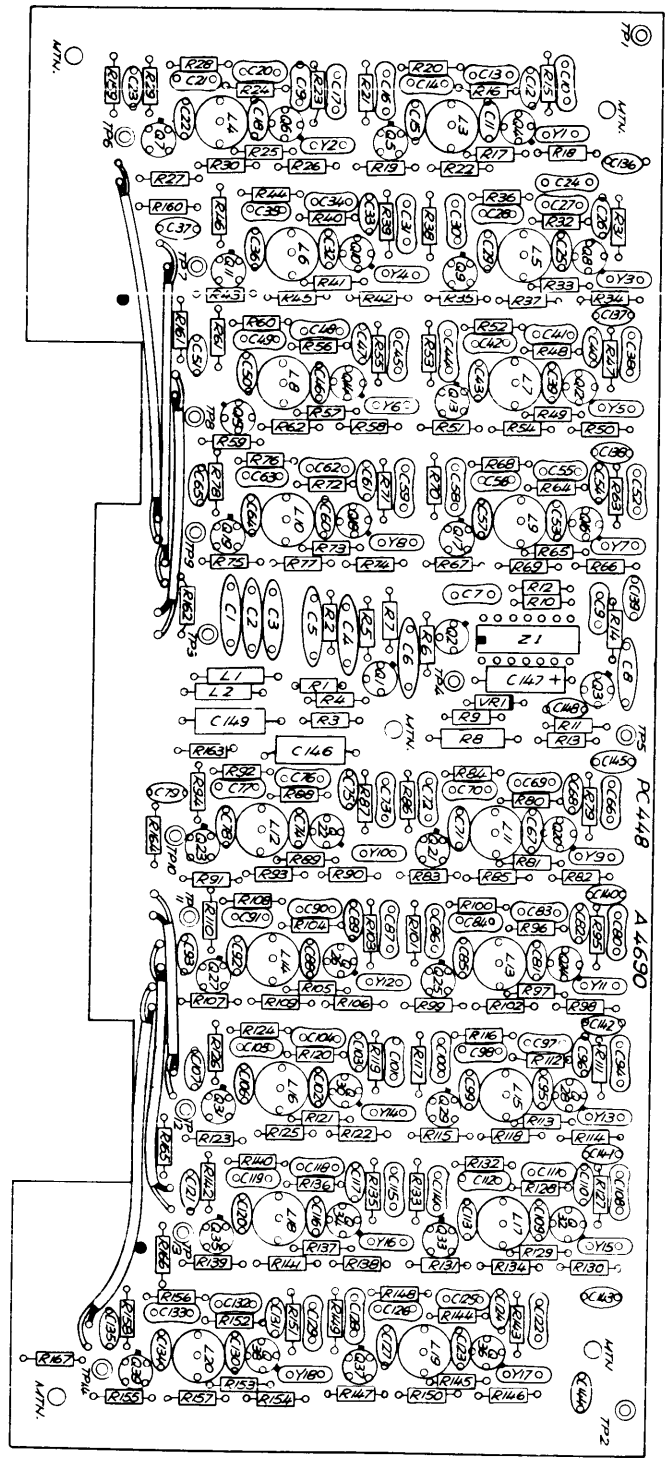
NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTORS IN OHMS.
2. ALL INDUCTORS IN MICROHENRIES.
3. ALL DECIMAL VALUE CAPACITORS IN M.F. ALL OTHERS IN MMF (PF).
4. PARTIAL REFERENCE DESIGNATIONS SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER AND SUBASSEMBLY DESIGNATION AS APPLICABLE.

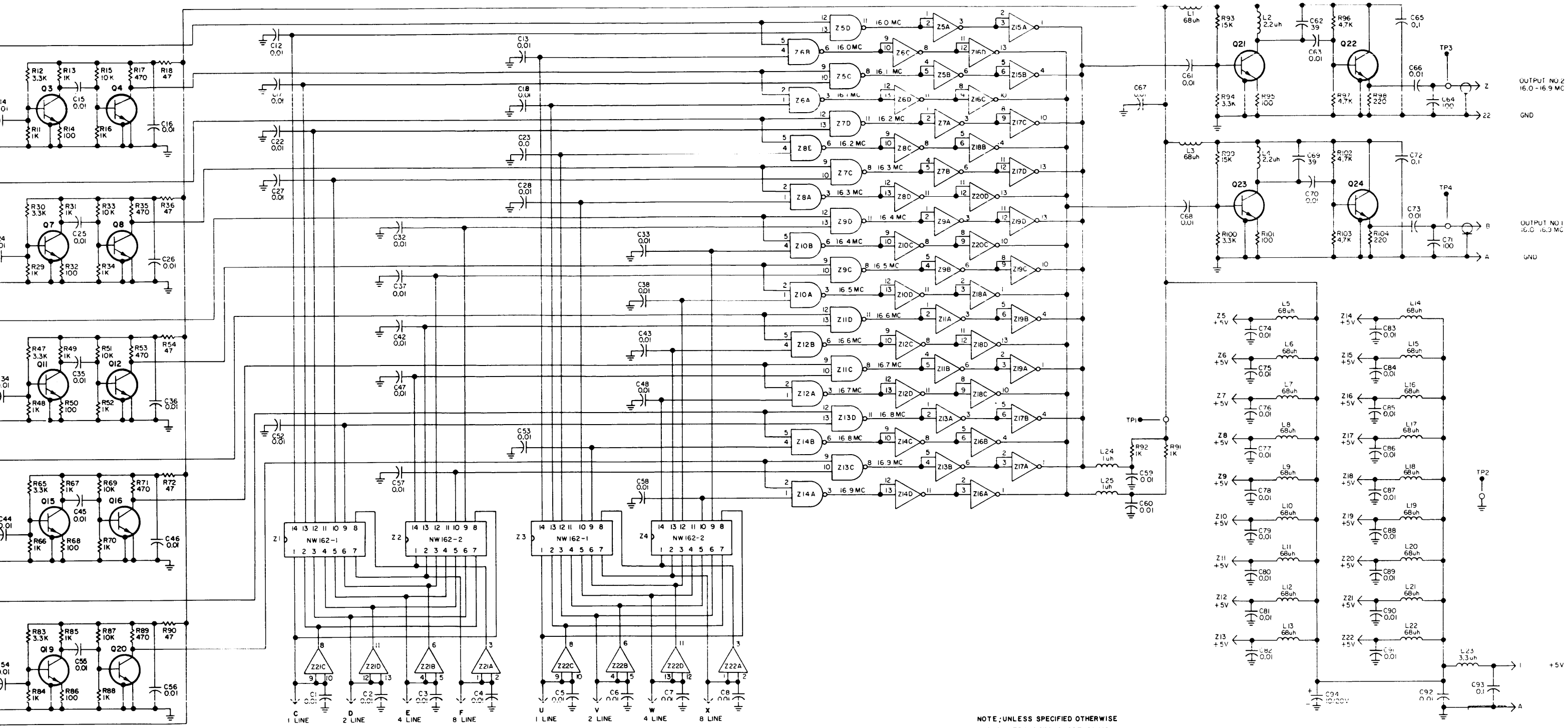
LAST SYMBOL	MISSING SYMBOL
C148	
IC1	
VR1	
L20	
Q39	
R167	
TP14	
Y18	

Figure 5-70/5-71. 100 KHz Selector 3A5, Schematic/Component Locations Diagram 011690392

CK 1442


+15V, PIN 12
GND, PIN 11, 4, 2
1 MHZ
PIN 14
PIN 13
TP1
TP2
TP3
TP4
TP5
TP10
Q1 2N706
Q2 2N706
Q3 2N918
Q21 2N918
Q22 2N918
Q23 2N918
Q32 2N918
Q33 2N918
Q34 2N918
Q35 2N918
16.1 MHZ
16.3 MHZ
Z1 ÷10
NW 134
SPECTRUM
VR1 1N754A


PC 448
A 4690



NOTE; UNLESS SPECIFIED OTHERWISE

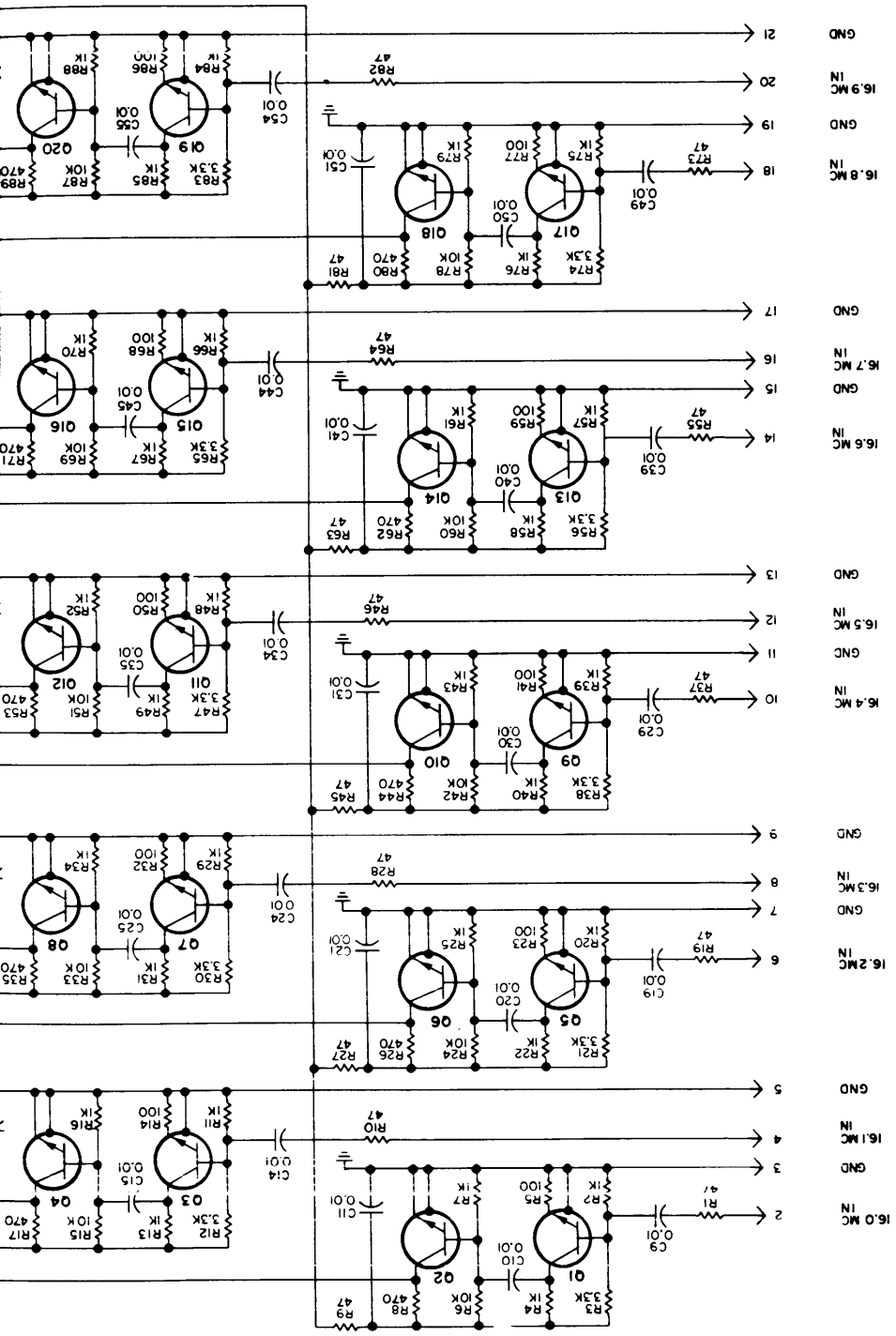
1. ALL TRANSISTORS ARE 2N918.
2. RESISTANCE VALUES ARE IN OHMS, 1/4 WATT.
3. WHOLE NO. CAPACITANCE VALUES ARE PF. DECIMAL CAPACITANCE VALUES ARE IN UF.
4. PARTIAL REFERENCE DESIGNATIONS SHOWN FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER AND SUBASSEMBLY DESIGNATIONS AS APPLICABLE.
5. Z5 THRU Z14 ARE NW176.
6. Z15 THRU Z20 ARE NW167.
7. Z21 & Z22 ARE NW176

LAST SYMBOL	MISSING SYMBOL
C94	
L25	
Q24	
R104	
TP4	
Z22	

Figure 5-72/5-73. Matrix Distributor 3A6, 7, Schematic/Component Locations Diagram

011690392

CK 1443


GND
16.8 MC IN
GND
16.9 MC IN
GND
16.7 MC IN
GND
16.6 MC IN
GND
16.5 MC IN
GND
16.4 MC IN
GND
16.3 MC IN
GND
16.2 MC IN
GND
16.1 MC IN
GND
16.0 MC IN
Q18
Q19
Q20
Q16
Q17
Q14
Q15
Q12
Q13
Q10
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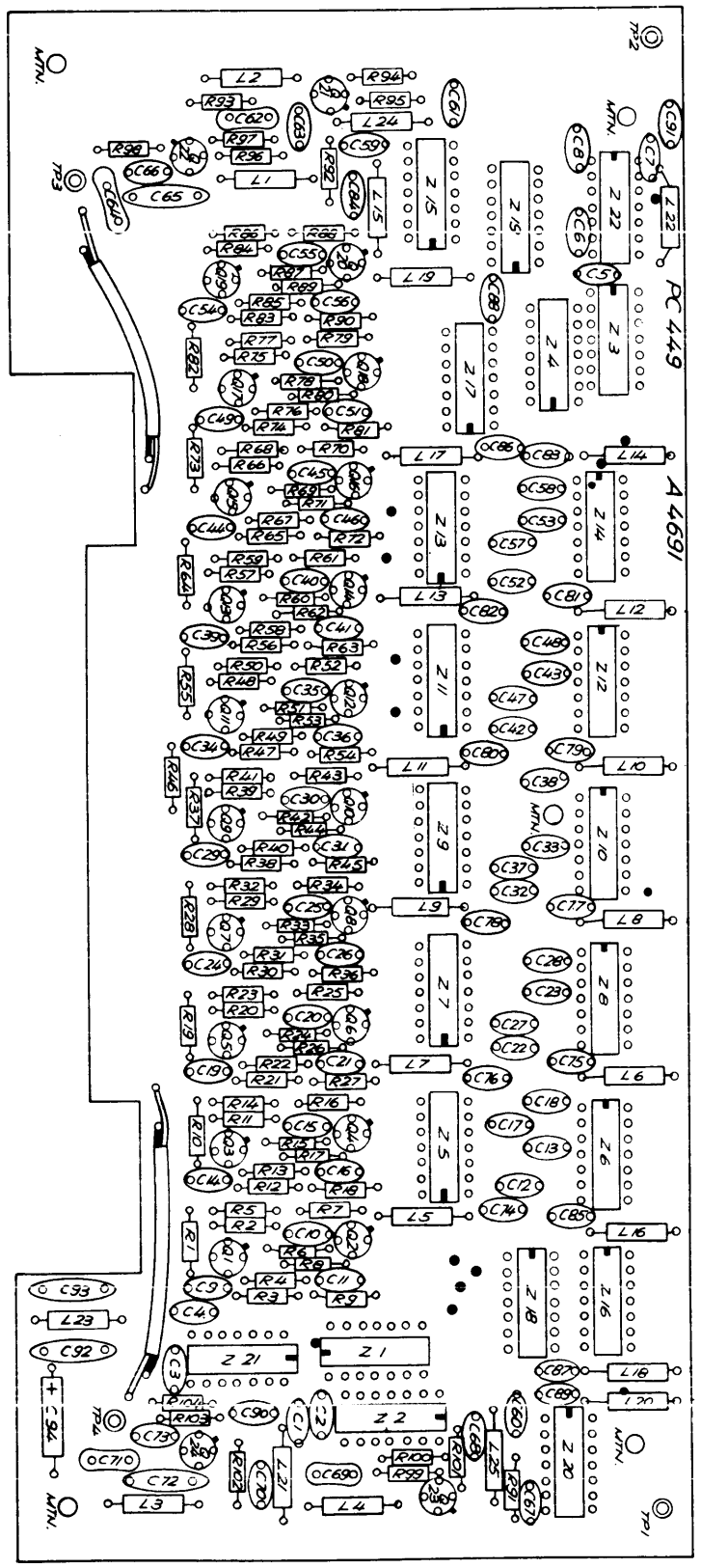
Q08
Q09
Q06
Q07
Q04
Q05
Q02
Q03
Q01


PC 449
A 4691

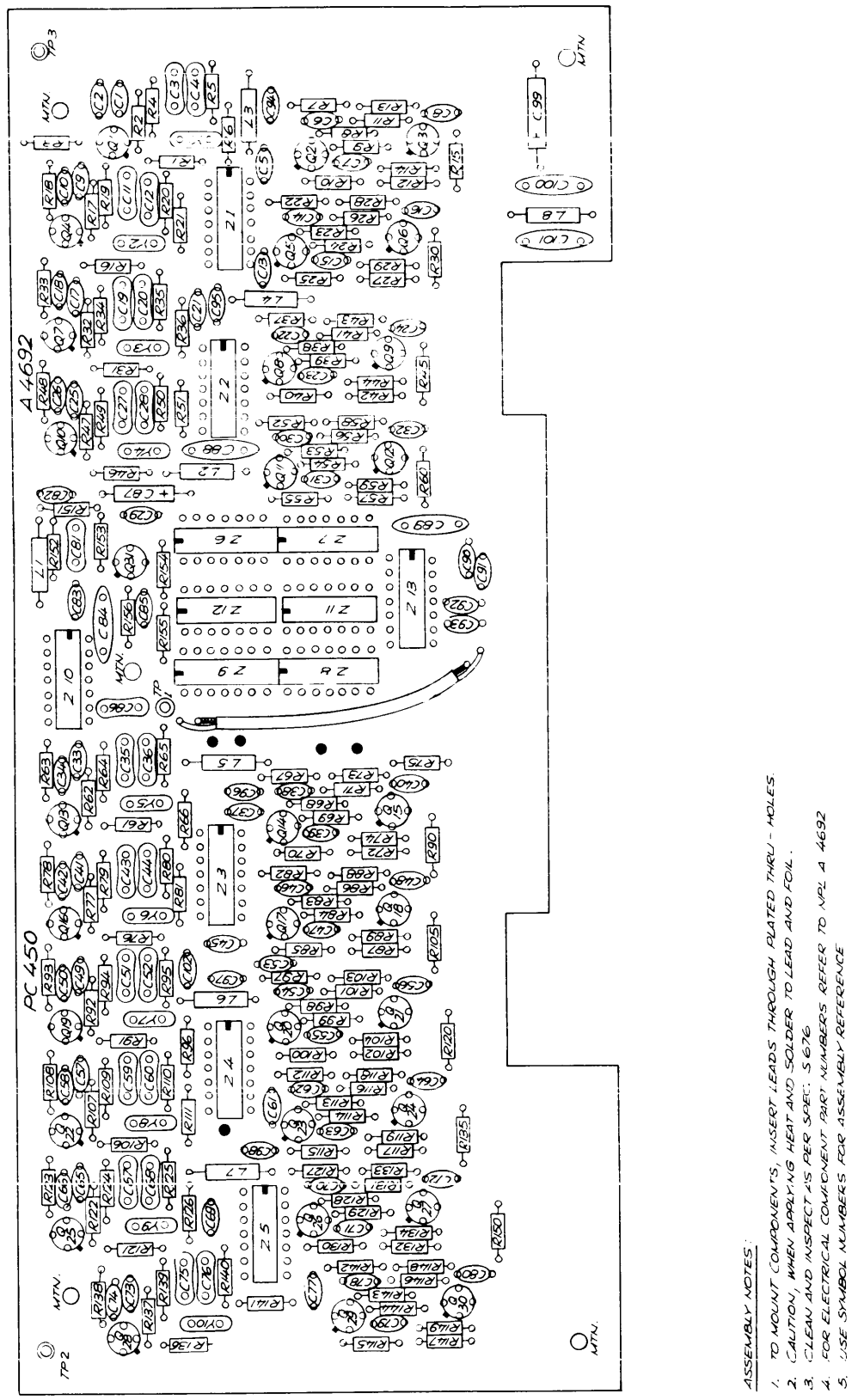
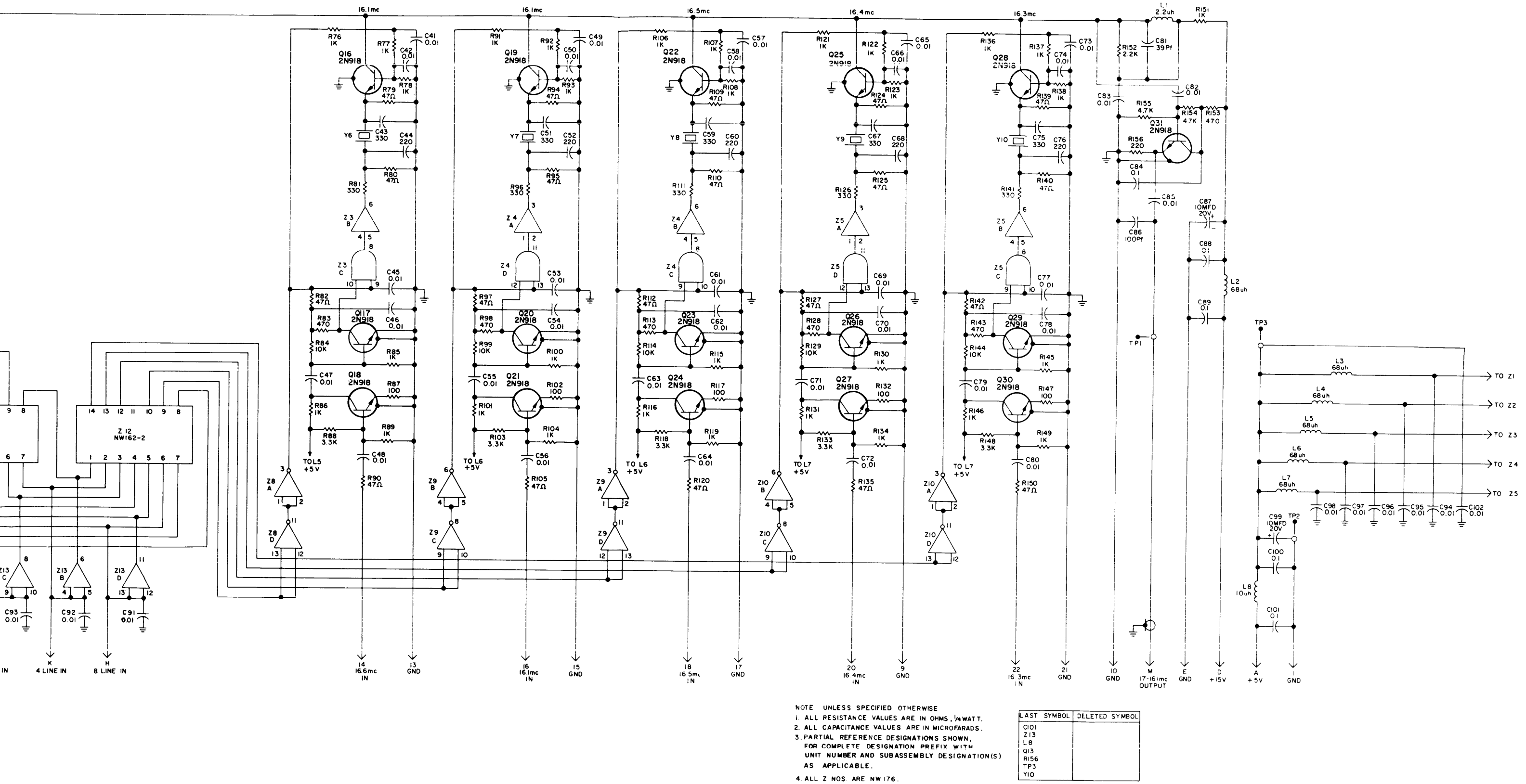


Figure 5-74. Matrix Distributor 3A8, Component Locations Diagram



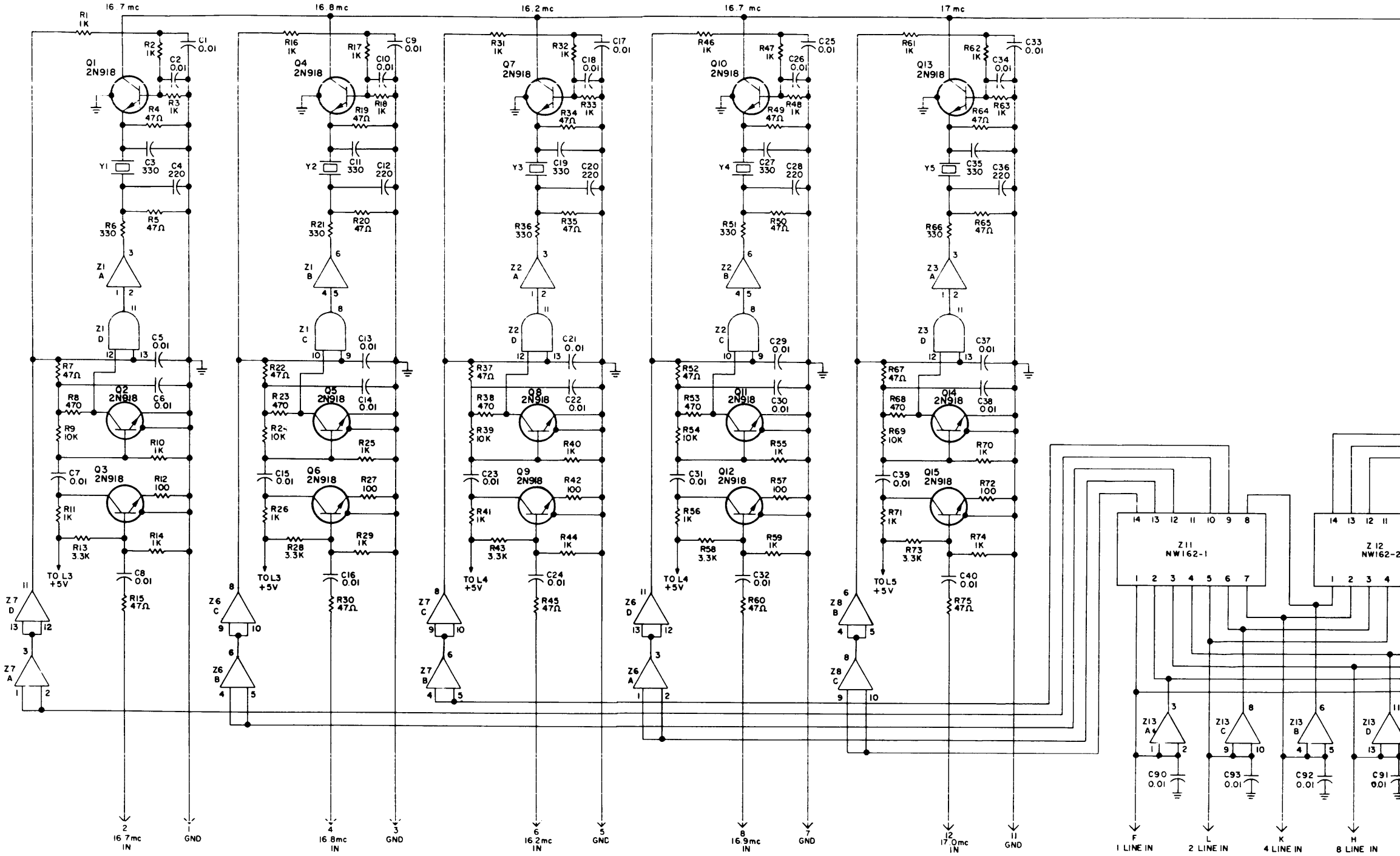
NOTE UNLESS SPECIFIED OTHERWISE

1. ALL RESISTANCE VALUES ARE IN OHMS, 1/4 WATT.
2. ALL CAPACITANCE VALUES ARE IN MICROFARADS.
3. PARTIAL REFERENCE DESIGNATIONS SHOWN, FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER AND SUBASSEMBLY DESIGNATION(S) AS APPLICABLE.
4. ALL Z NOS. ARE NW176.

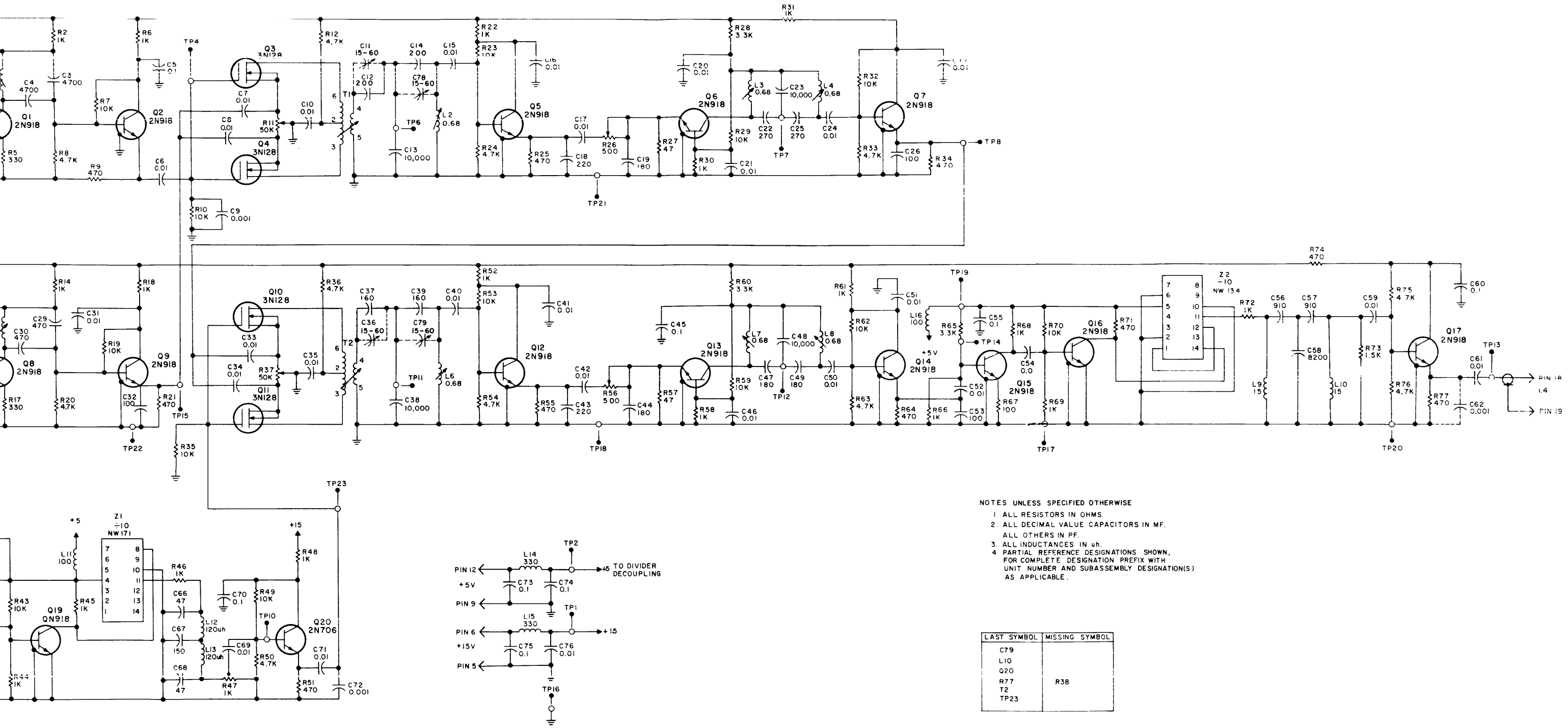
LAST SYMBOL	DELETED SYMBOL
C101	
Z13	
L8	
Q13	
R156	
TP3	
Y10	

Figure 5-75. Matrix Distributor 3A8, Schematic Diagram

011690392


16.7mc
16.8mc
16.2mc
16.7mc
17mc
Q1 2N918
Q2 2N918
Q3 2N918
Q4 2N918
Q5 2N918
Q6 2N918
Q7 2N918
Q8 2N918
Q9 2N918
Q10 2N918
Q11 2N918
Q12 2N918
Q13 2N918
Q14 2N918
Q15 2N918
Y1
Y2
Y3
Y4
Y5
TO L3 +5V
TO L3 +5V
TO L4 +5V
TO L4 +5V
TO L5 +5V
Z11 NW162-1
Z12 NW162-2
2 16.7mc IN
1 GND
4 16.8mc IN
3 GND
6 16.2mc IN
5 GND
8 16.9mc IN
7 GND
12 17.0mc IN
11 GND
F 1 LINE IN
L 2 LINE IN
K 4 LINE IN
H 8 LINE IN

CK 1444



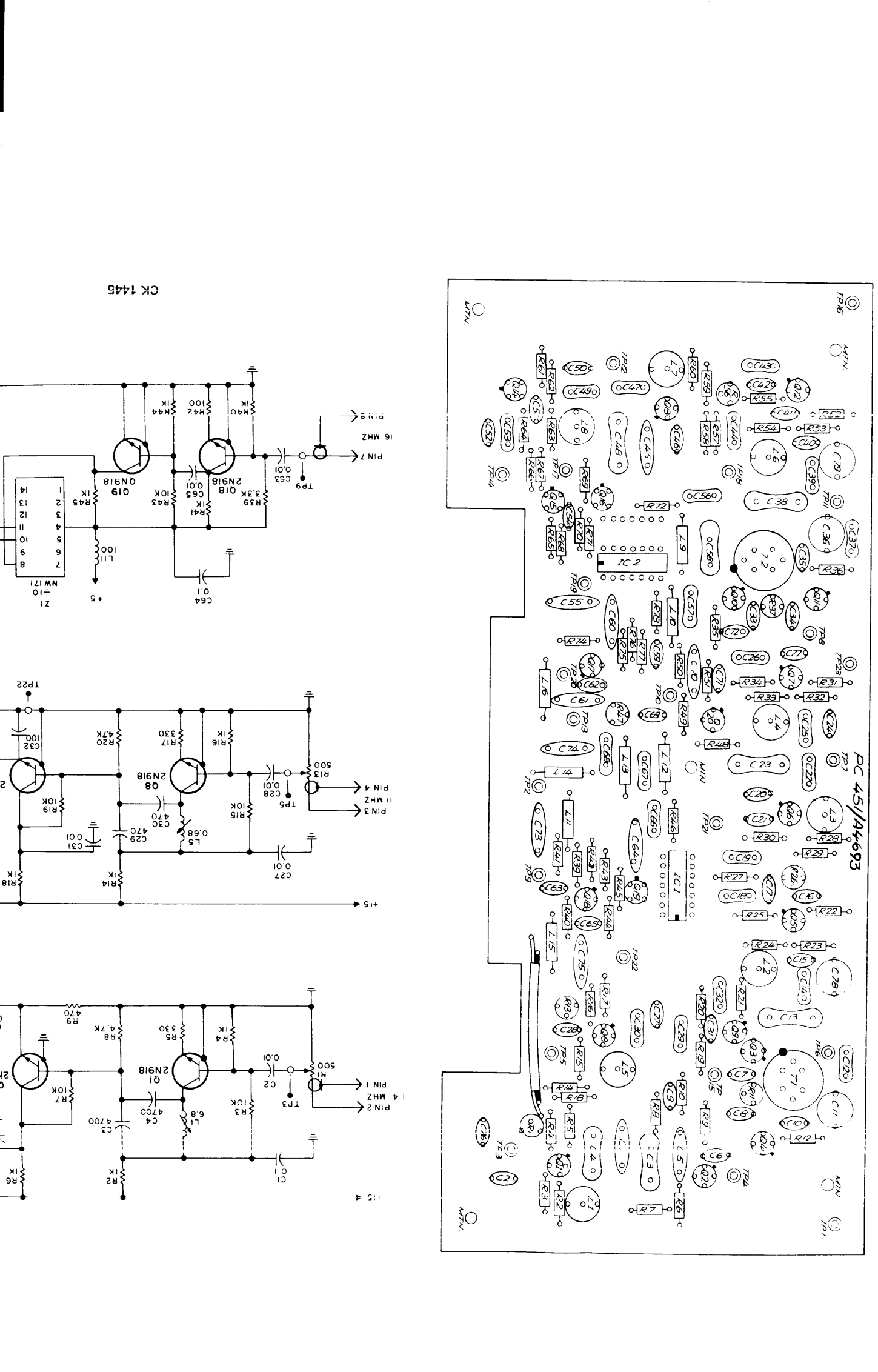
CK 1445

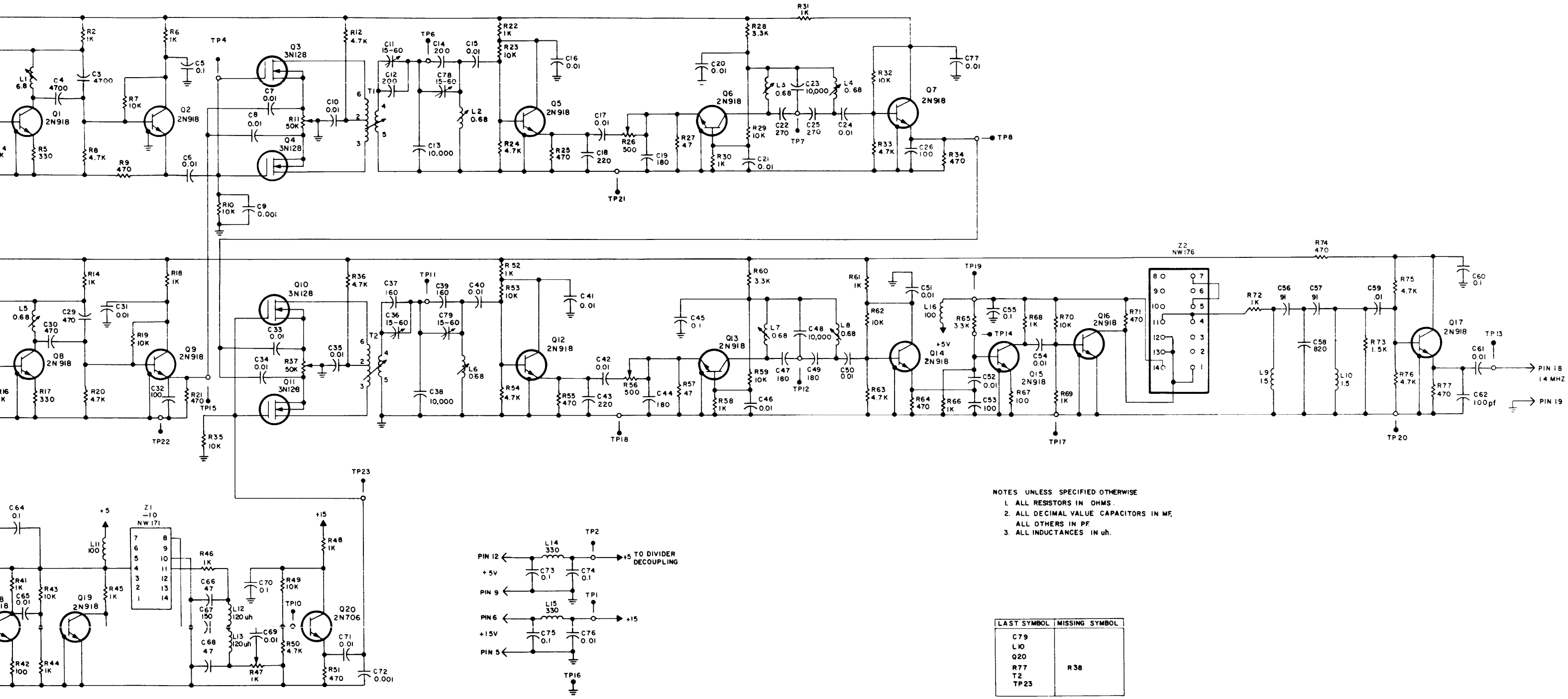
NOTES UNLESS SPECIFIED OTHERWISE

1. ALL RESISTORS IN OHMS.
2. ALL DECIMAL VALUE CAPACITORS IN MF. ALL OTHERS IN PF.
3. ALL INDUCTANCES IN uh.
4. PARTIAL REFERENCE DESIGNATIONS SHOWN, FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER AND SUBASSEMBLY DESIGNATION(S) AS APPLICABLE.

LAST SYMBOL	MISSING SYMBOL
C79	
L10	
Q20	
R77	R38
T2	
TP23	

Figure 5-76/5-77. Mixer/Amplifier 3A9, 10, 11, Schematic/Component Locations Diagram 011690392


CK 1445
Z1
÷10
NW171
+5
C64
0.1
L11
100
R45
1K
Q19
QN918
R43
10K
C65
0.01
R41
1K
Q18
2N918
R39
3.3K
C63
0.01
TP9
16 MHZ
PIN 7
R40
1K
R42
100
R44
1K
PIN 8
TP22
C32
100
R20
4.7K
R17
330
R16
1K
R13
500
C28
0.01
TP5
PIN 4
11 MHZ
PIN 3
Q8
2N918
R19
10K
C31
0.01
C30
470
C29
470
L5
0.68
R15
10K
C27
0.01
R18
1K
R14
1K
+15
R9
470
R8
4.7K
R5
330
R4
1K
R1
500
C2
0.01
TP3
PIN 1
4 MHZ
PIN 2
Q1
2N918
R7
10K
C4
4700
C3
4700
L1
6.8
R3
10K
R6
1K
R2
1K
C1
0.1
+15
PC 451/AP4693

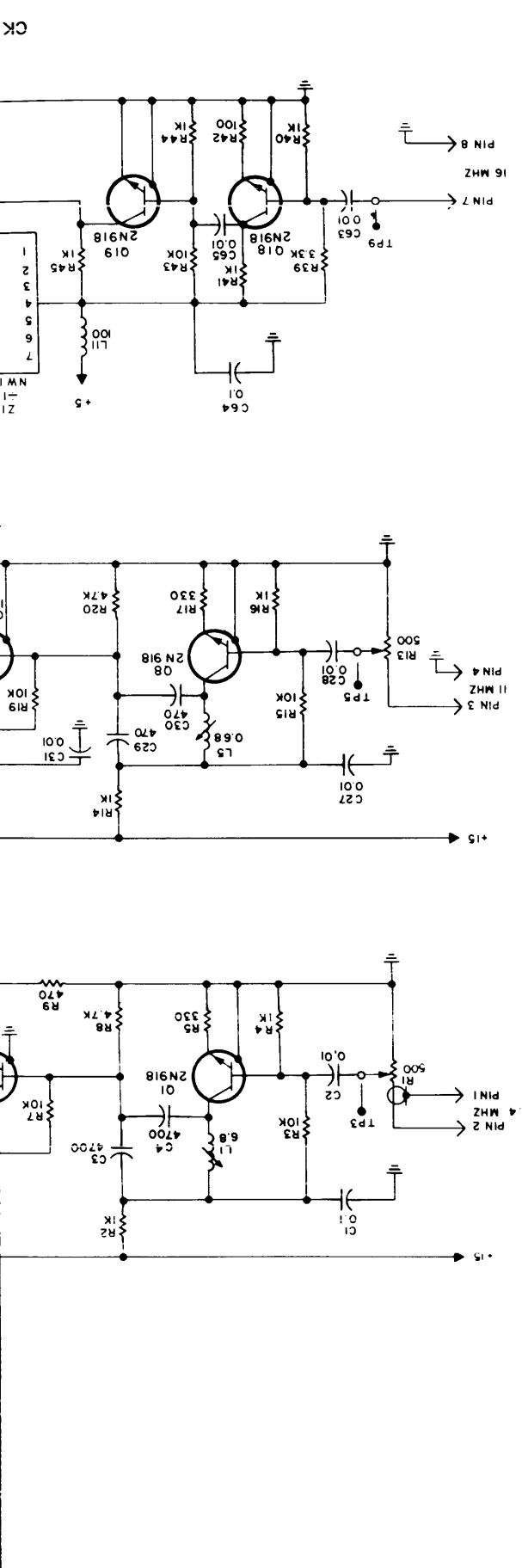


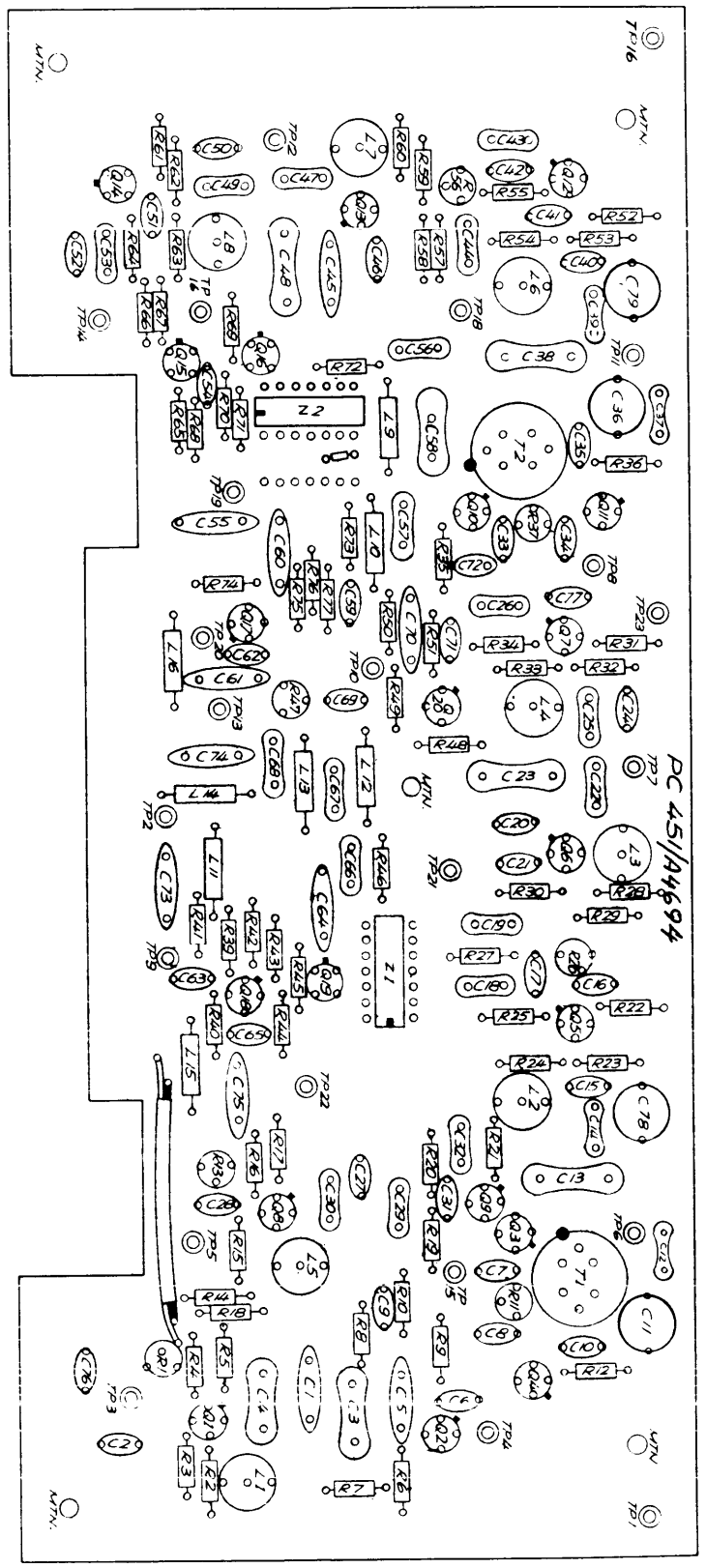
CK 1446

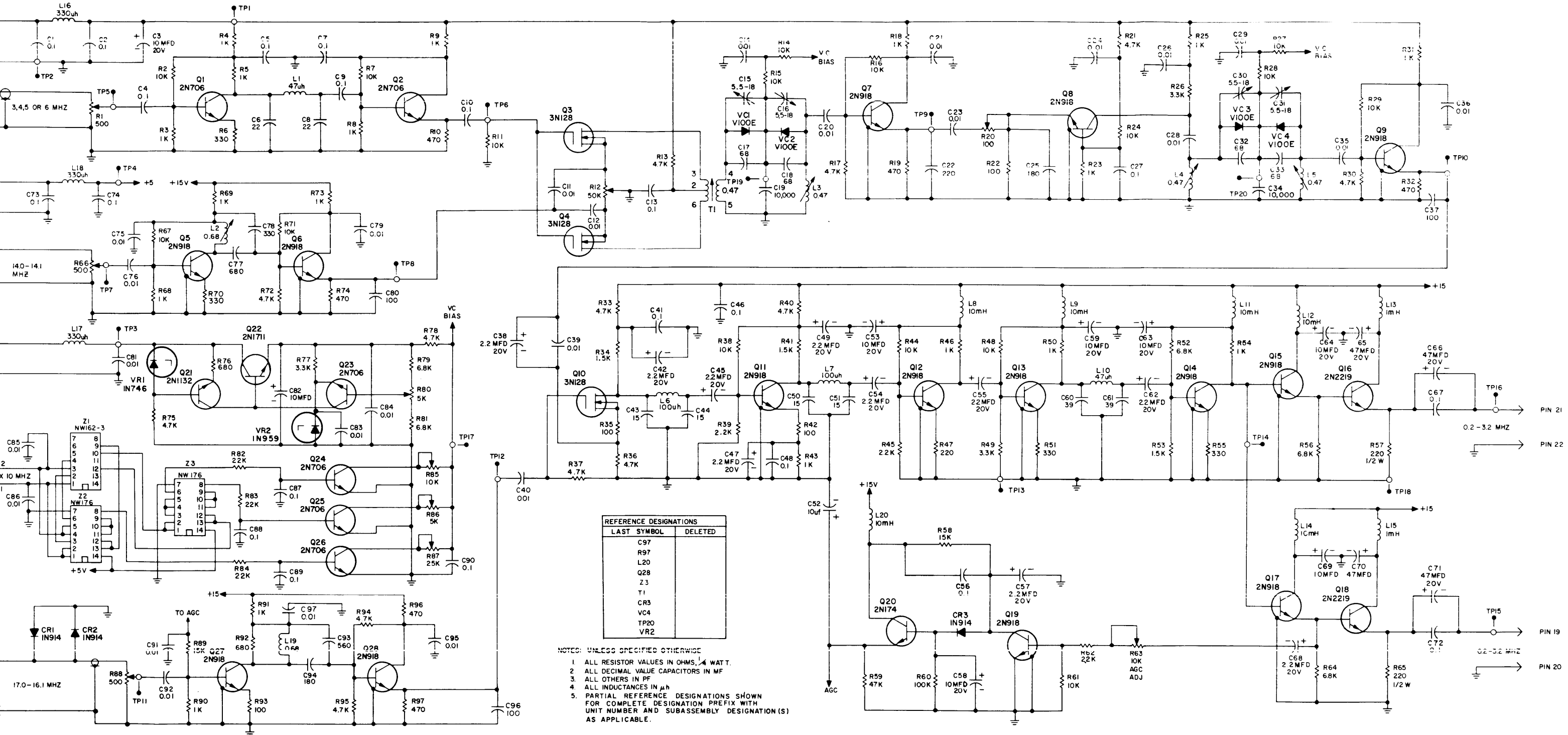
NOTES UNLESS SPECIFIED OTHERWISE
1. ALL RESISTORS IN OHMS.
2. ALL DECIMAL VALUE CAPACITORS IN MF, ALL OTHERS IN PF.
3. ALL INDUCTANCES IN uh.

LAST SYMBOL	MISSING SYMBOL
C79	
L10	
Q20	
R77	R38
T2	
TP23	

Figure 5-78/5-79. Mixer/Amplifier 3A12, Schematic/Component Locations Diagram


CK
PIN 8
16 MHZ
PIN 7
TP9
C63
0.01
Q19
2N918
R44
1K
R42
100
R40
1K
Q18
2N918
R39
3.3K
R41
1K
C65
0.01
R43
10K
R45
1K
L11
100
+5
C64
0.1
PIN 5
11 MHZ
PIN 3
TP5
C28
0.01
Q8
2N 918
R20
4.7K
R17
330
R16
1K
R19
10K
C31
0.01
C29
470
C30
470
L5
0.68
R15
10K
C27
0.01
R14
1K
+15
PIN 4
1.4 MHZ
PIN 2
TP3
C2
0.01
Q1
2N918
R8
4.7K
R5
330
R4
1K
R7
10K
C3
4700
C4
4700
L1
6.8
R3
10K
C1
0.1
R2
1K
-15
PIN 1
R9
470
R1
500


PC 451/4494

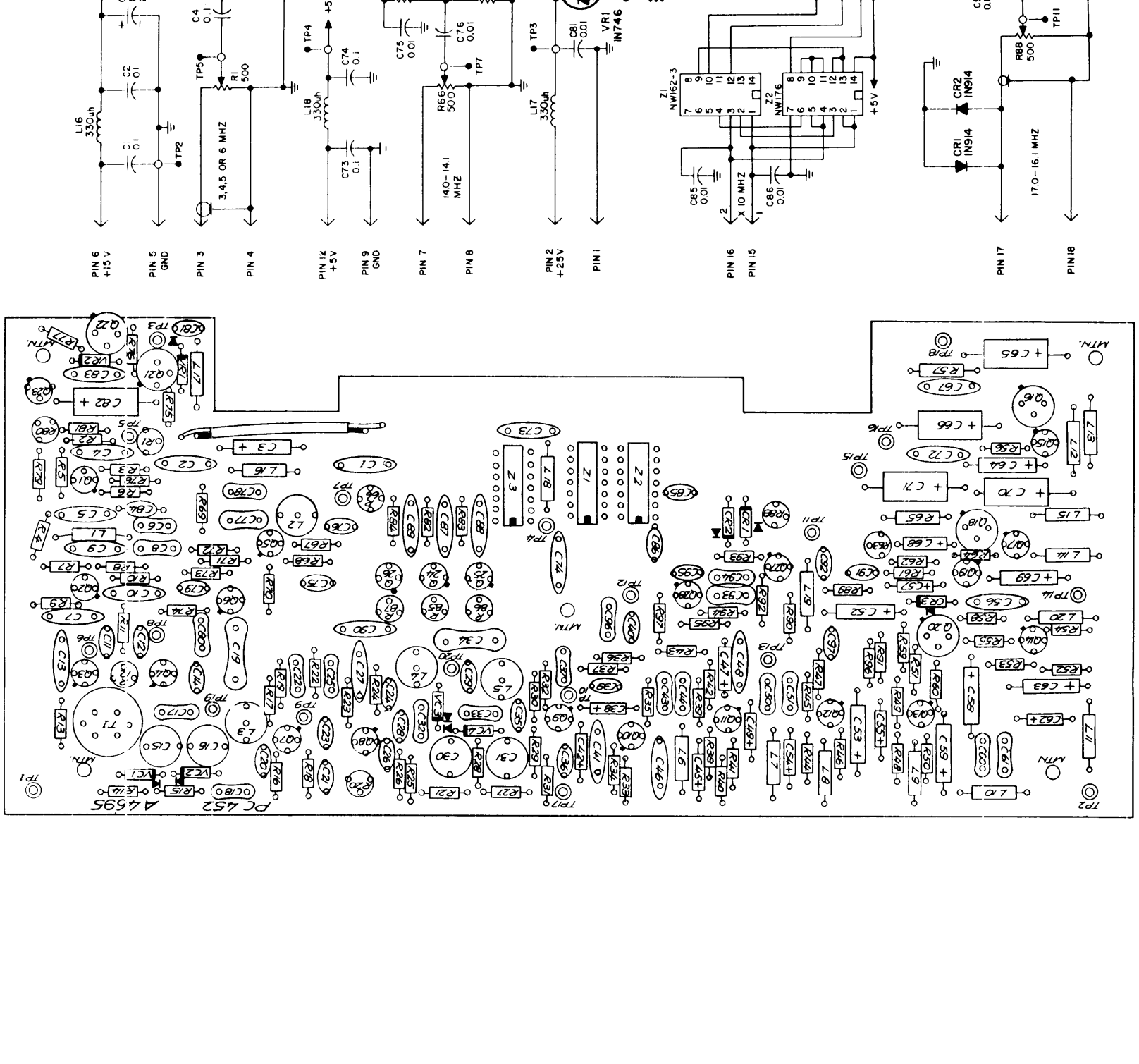


REFERENCE DESIGNATIONS	
LAST SYMBOL	DELETED
C97	
R97	
L20	
Q28	
Z3	
T1	
CR3	
VC4	
TP20	
VR2	

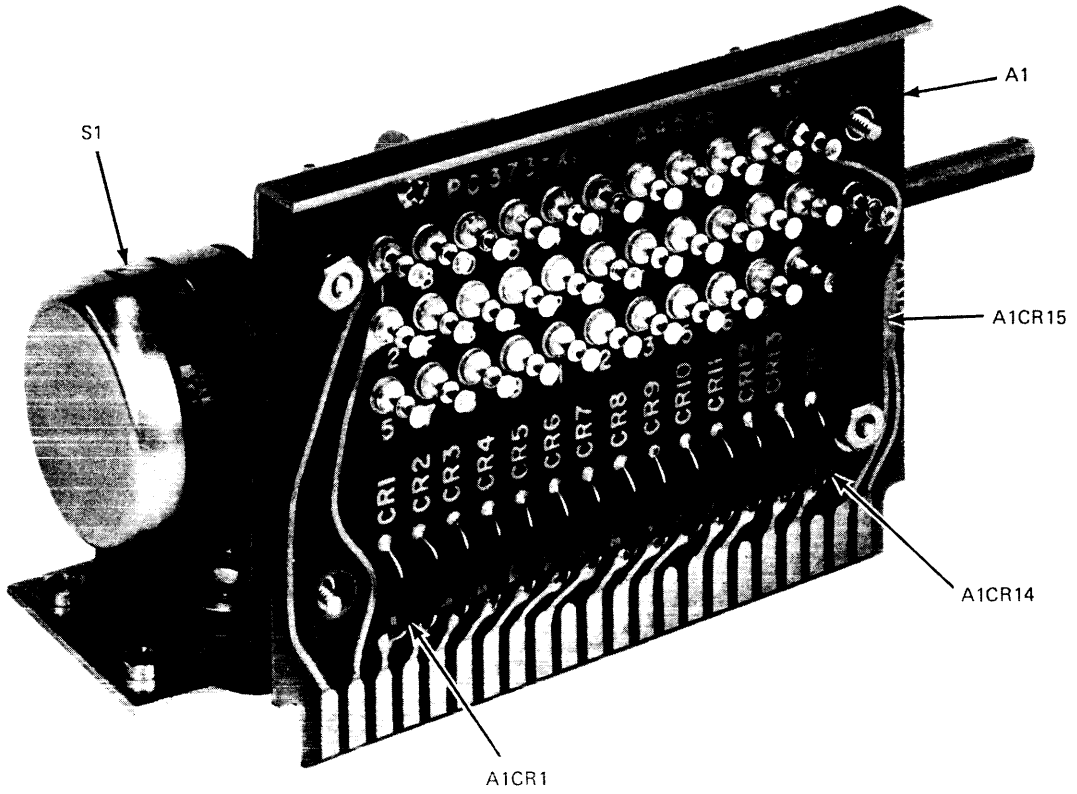
NOTES: UNLESS SPECIFIED OTHERWISE
1. ALL RESISTOR VALUES IN OHMS, 1/4 WATT.
2. ALL DECIMAL VALUE CAPACITORS IN MF
3. ALL OTHERS IN PF
4. ALL INDUCTANCES IN μh
5. PARTIAL REFERENCE DESIGNATIONS SHOWN FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER AND SUBASSEMBLY DESIGNATION(S) AS APPLICABLE.

CK 1447

Figure 5-80/5-81. Final Mixer/Output 3A13, Schematic/Component Locations Diagram 011690392

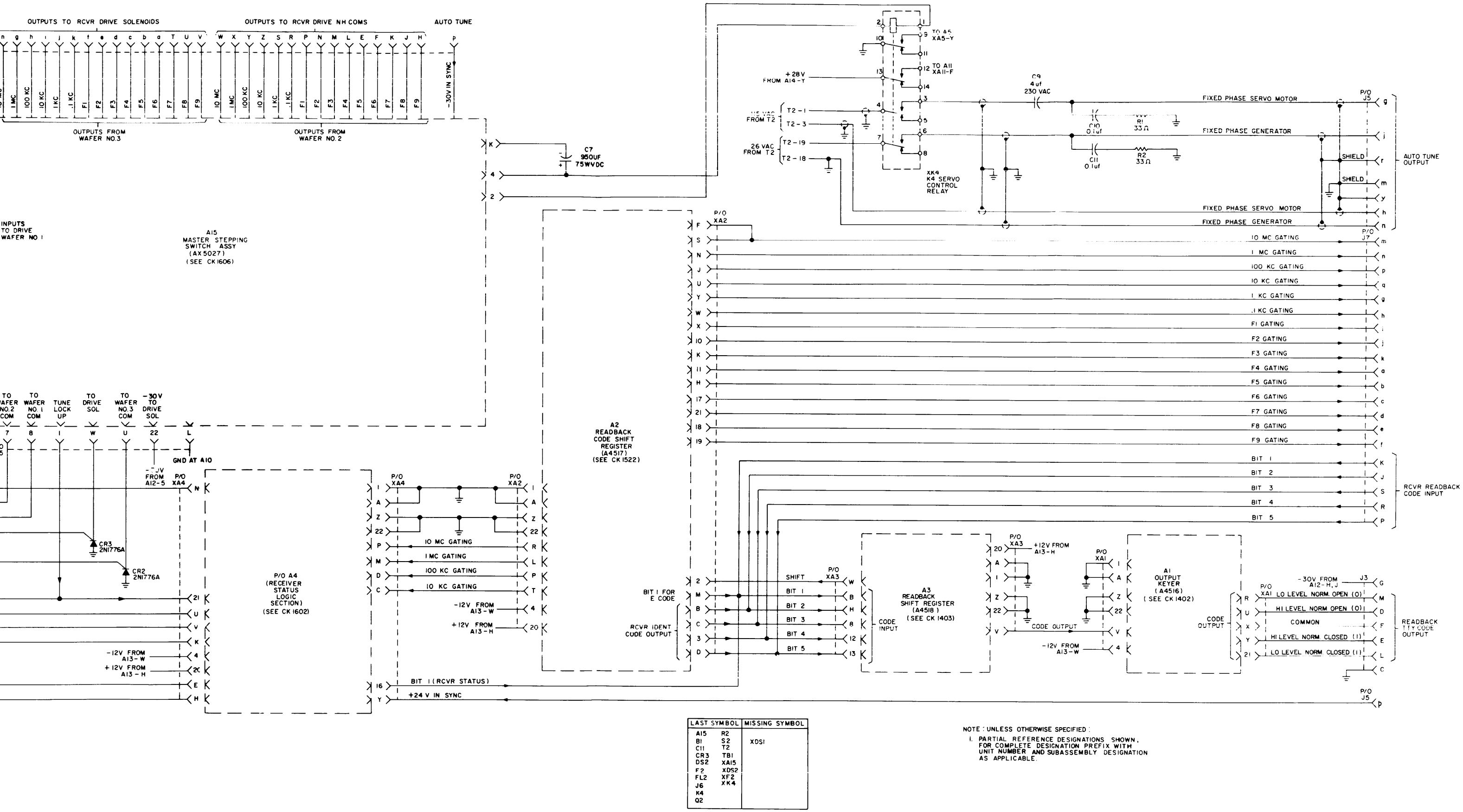

PIN 6 +15 V
PIN 5 GND
PIN 3
PIN 4
PIN 12 +5V
PIN 9 GND
PIN 7
PIN 8
PIN 2 +25V
PIN 1
PIN 16
PIN 15
PIN 17
PIN 18
L16 330uh
L18 330uh
L17 330uh
3,4,5 OR 6 MHZ
140-141 MHZ
17.0-16.1 MHZ
X 10 MHZ
+5V
CR1 IN914
CR2 IN914
VR1 IN746
Z1 NW162-3
Z2 NW176
R1 500
R66 500
R88 500
C1 0.01
C2 0.01
C4 0.1
C73 0.1
C74 0.1
C75 0.01
C76 0.01
C81 0.001
C85 0.01
C86 0.01
TP1
TP2
TP3
TP4
TP5
TP7
TP11

PC 452
A4695



REF DESIG PREFIX 3A14 THRU 3A19
REF DESIG PREFIX 3A14 THRU 3A19, 7A14 THRU 7A19

Figure 5-82. MEGACYCLES Stepping Switch Assemblies 3A14 thru 3A19, Component Locations Diagram

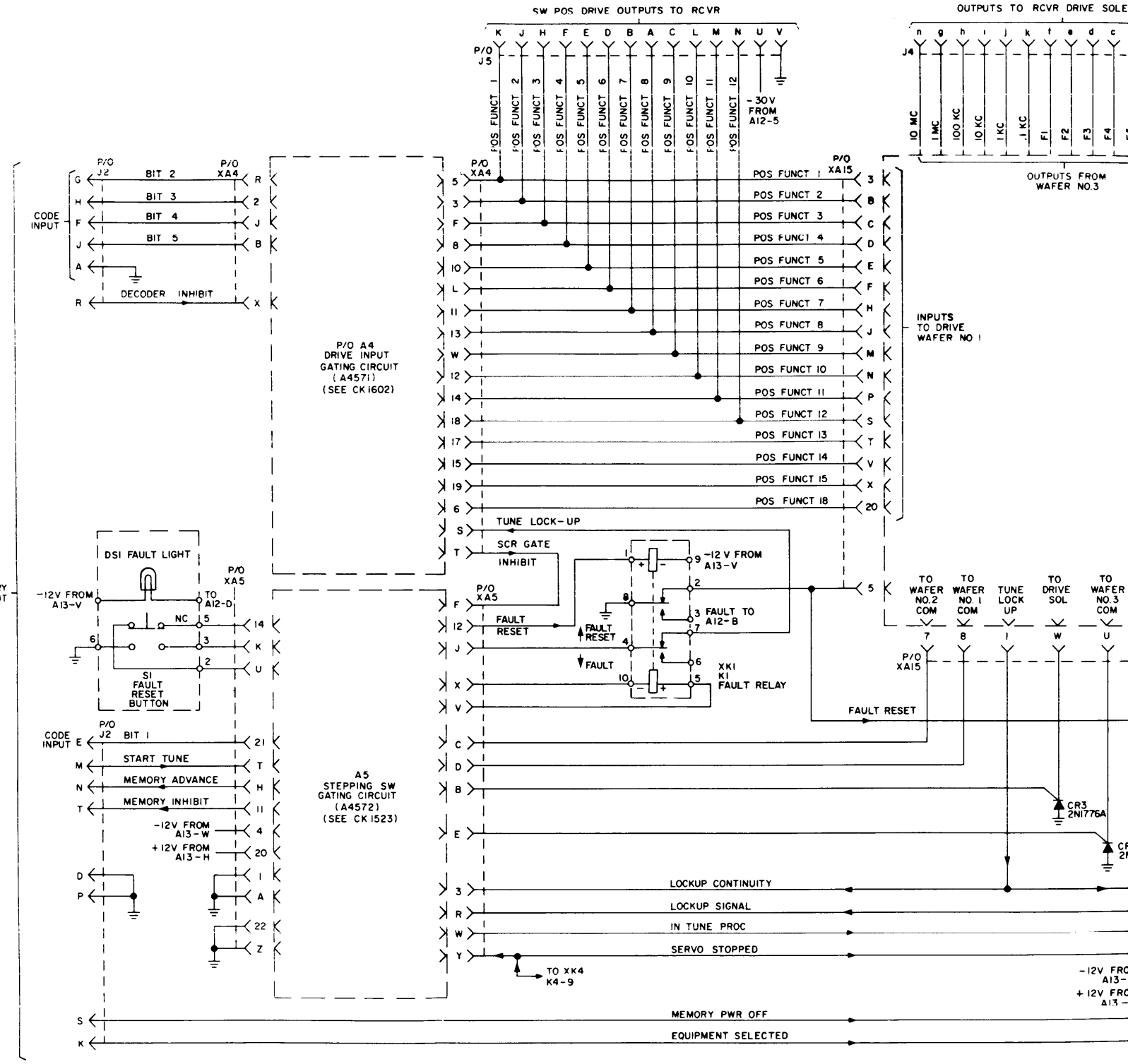


LAST SYMBOL	MISSING SYMBOL
A15 R2 B1 S2 C11 T2 CR3 TB1 DS2 XA15 F2 XDS2 FL2 XF2 J6 XK4 K4 Q2	XDS1

NOTE: UNLESS OTHERWISE SPECIFIED:

1. PARTIAL REFERENCE DESIGNATIONS SHOWN, FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER AND SUBASSEMBLY DESIGNATION AS APPLICABLE.

Figure 5-83. Unit 4 (KY-661/URR), Schematic Diagram (Sheet 1 of 2)


SW POS DRIVE OUTPUTS TO RCVR
OUTPUTS TO RCVR DRIVE SOLE
P/O J5
K J H F E D B A C L M N U V
POS FUNCT 1 2 3 4 5 6 7 8 9 10 11 12
-30V FROM A12-5
J4
n g h i j k f e d c
10 MC 1 MC 100 KC 10 KC 1 KC .1 KC F1 F2 F3 F4
OUTPUTS FROM WAFER NO.3
P/O J2
P/O XA4
BIT 2
BIT 3
BIT 4
BIT 5
CODE INPUT
DECODER INHIBIT
P/O A4 DRIVE INPUT GATING CIRCUIT (A4571) (SEE CK1602)
POS FUNCT 1
POS FUNCT 2
POS FUNCT 3
POS FUNCT 4
POS FUNCT 5
POS FUNCT 6
POS FUNCT 7
POS FUNCT 8
POS FUNCT 9
POS FUNCT 10
POS FUNCT 11
POS FUNCT 12
POS FUNCT 13
POS FUNCT 14
POS FUNCT 15
POS FUNCT 18
P/O XA15
INPUTS TO DRIVE WAFER NO 1
TUNE LOCK-UP
SCR GATE INHIBIT
DSI FAULT LIGHT
P/O XA5
MEMORY INPUT
-12V FROM A13-V
TO A12-D
NC
SI FAULT RESET BUTTON
FAULT RESET
FAULT
-12 V FROM A13-V
FAULT TO A12-B
XK1 K1 FAULT RELAY
TO WAFER NO.2 COM
TO WAFER NO 1 COM
TUNE LOCK UP
TO DRIVE SOL
TO WAFER NO.3 COM
FAULT RESET
CODE INPUT
BIT 1
START TUNE
MEMORY ADVANCE
MEMORY INHIBIT
-12V FROM A13-W
+12V FROM A13-H
A5 STEPPING SW GATING CIRCUIT (A4572) (SEE CK1523)
CR3 2N1776A
LOCKUP CONTINUITY
LOCKUP SIGNAL
IN TUNE PROC
SERVO STOPPED
TO XK4 K4-9
MEMORY PWR OFF
EQUIPMENT SELECTED

CK 1562

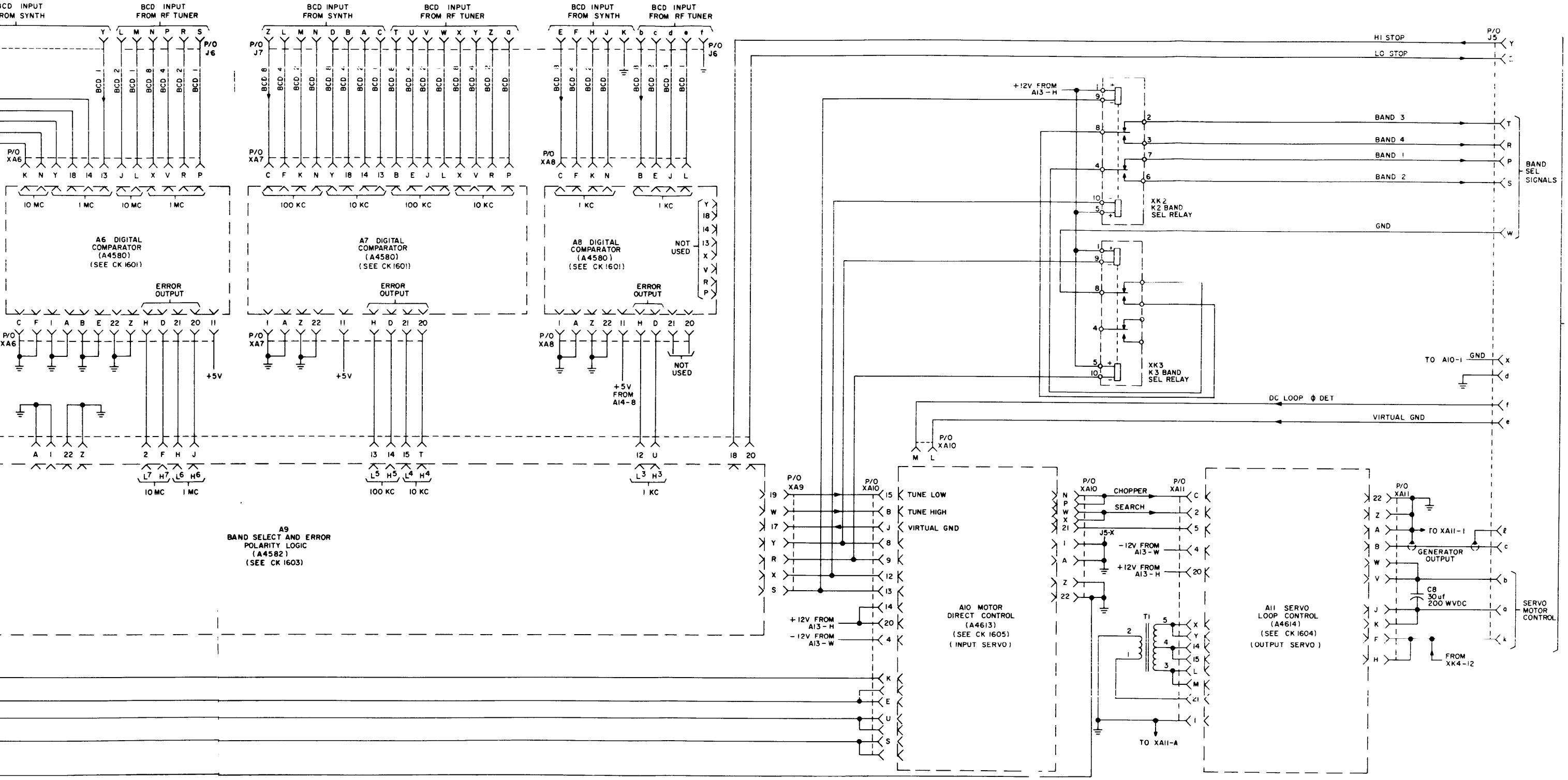
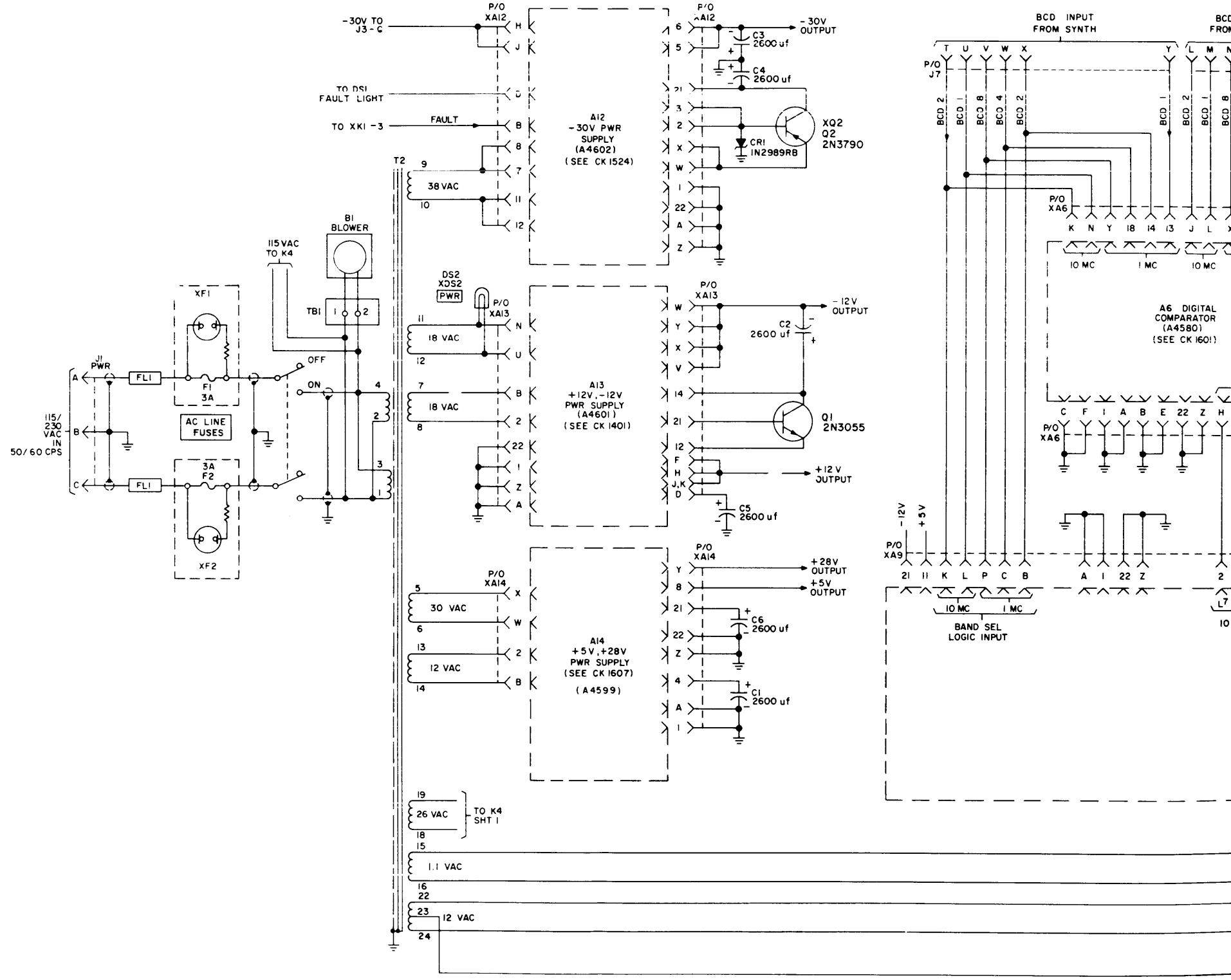


Figure 5-83. Unit 4 (KY-661/URR), Schematic Diagram (Sheet 2 of 2)

011690392


-30V TO J3-C
P/O XA12
TO DS1 FAULT LIGHT
TO XK1-3
FAULT
A12 -30V PWR SUPPLY (A4602) (SEE CK1524)
C3 2600 uf
C4 2600 uf
-30V OUTPUT
XQ2 Q2 2N3790
CR1 1N2989RB
T2
38 VAC
B1 BLOWER
115 VAC TO K4
TB1
XF1
J1 PWR
FL1
F1 3A
AC LINE FUSES
115/230 VAC IN 50/60 CPS
OFF
ON
3A F2
XF2
DS2 XDS2 PWR
18 VAC
A13 +12V,-12V PWR SUPPLY (A4601) (SEE CK 1401)
C2 2600 uf
-12V OUTPUT
Q1 2N3055
+12V OUTPUT
C5 2600 uf
30 VAC
12 VAC
A14 +5V,+28V PWR SUPPLY (SEE CK 1607) (A4599)
+28V OUTPUT
+5V OUTPUT
C6 2600 uf
C1 2600 uf
26 VAC
TO K4 SHT 1
1.1 VAC
12 VAC
BCD INPUT FROM SYNTH
P/O J7
BCD 2
BCD 1
BCD 8
BCD 4
BCD 2
BCD 1
P/O XA6
10 MC
1 MC
A6 DIGITAL COMPARATOR (A4580) (SEE CK 1601)
P/O XA9
BAND SEL LOGIC INPUT

CK 1562

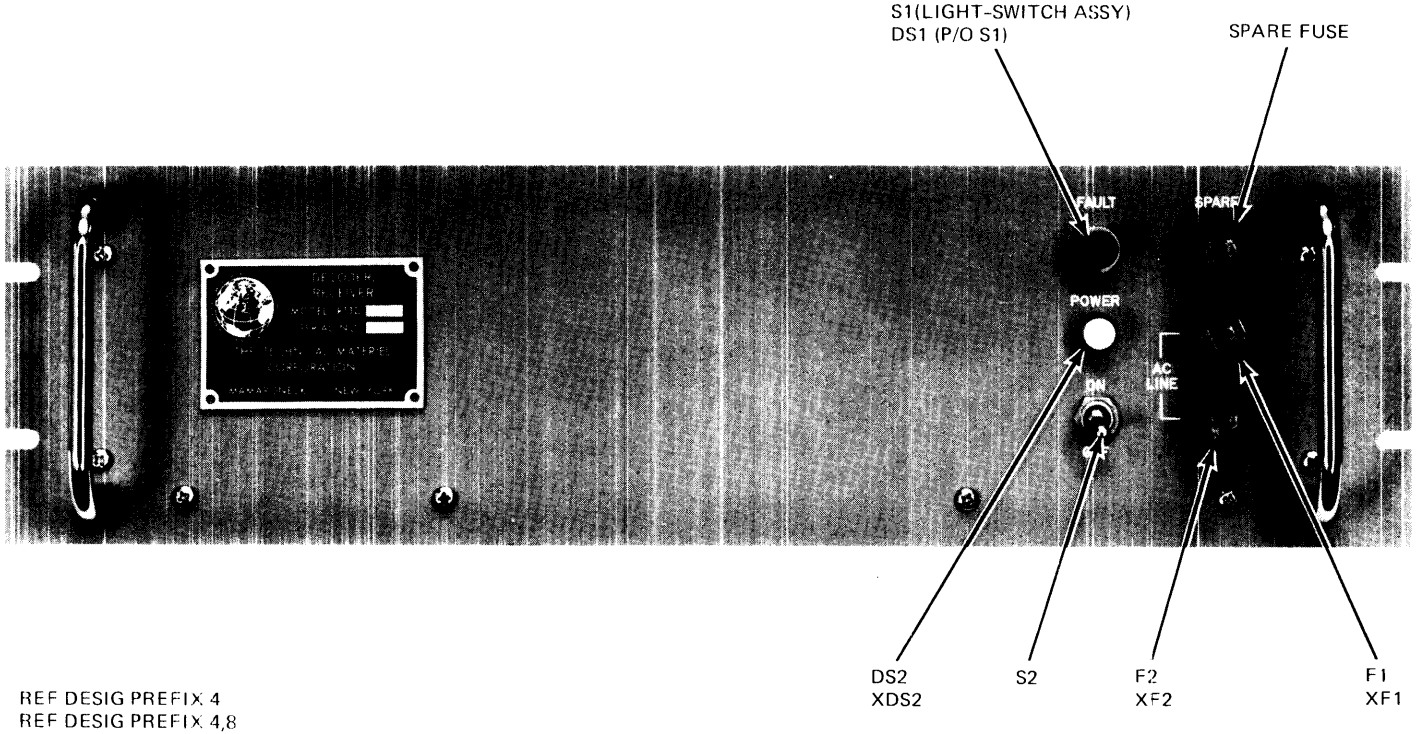
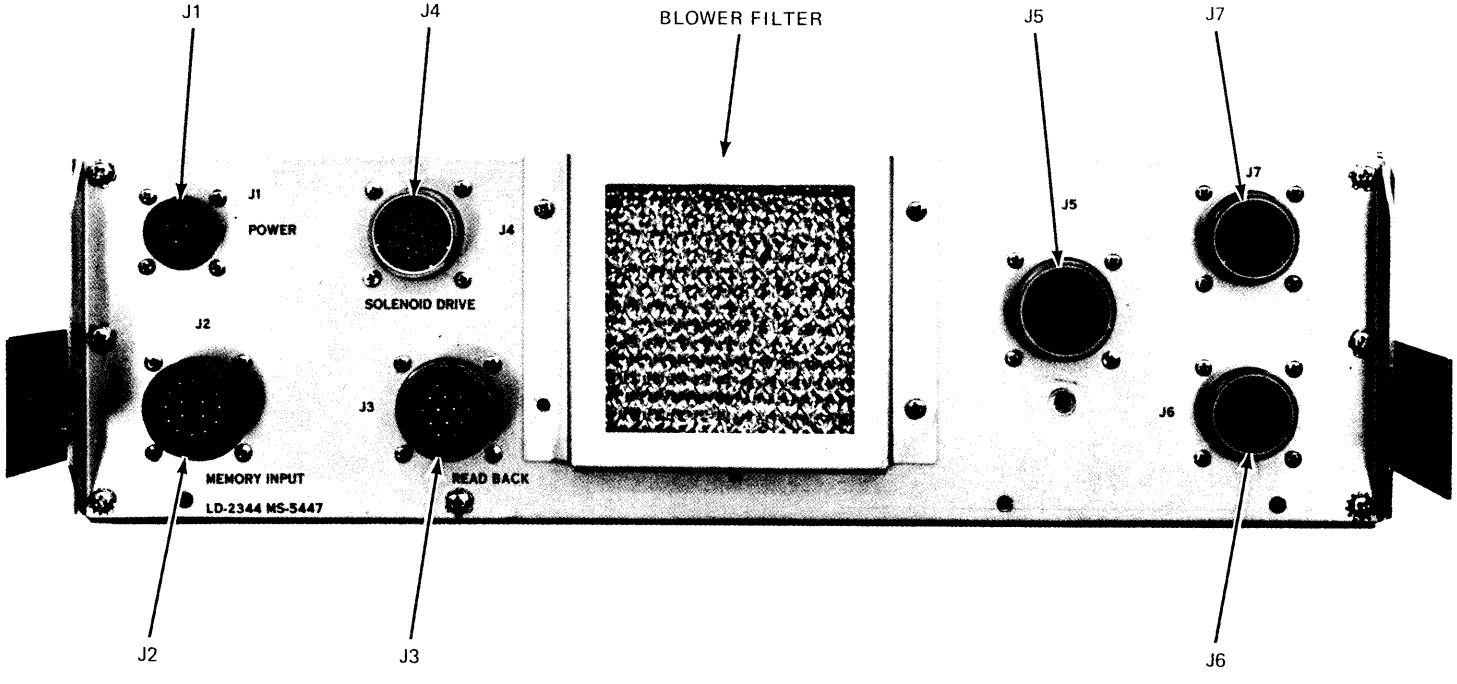
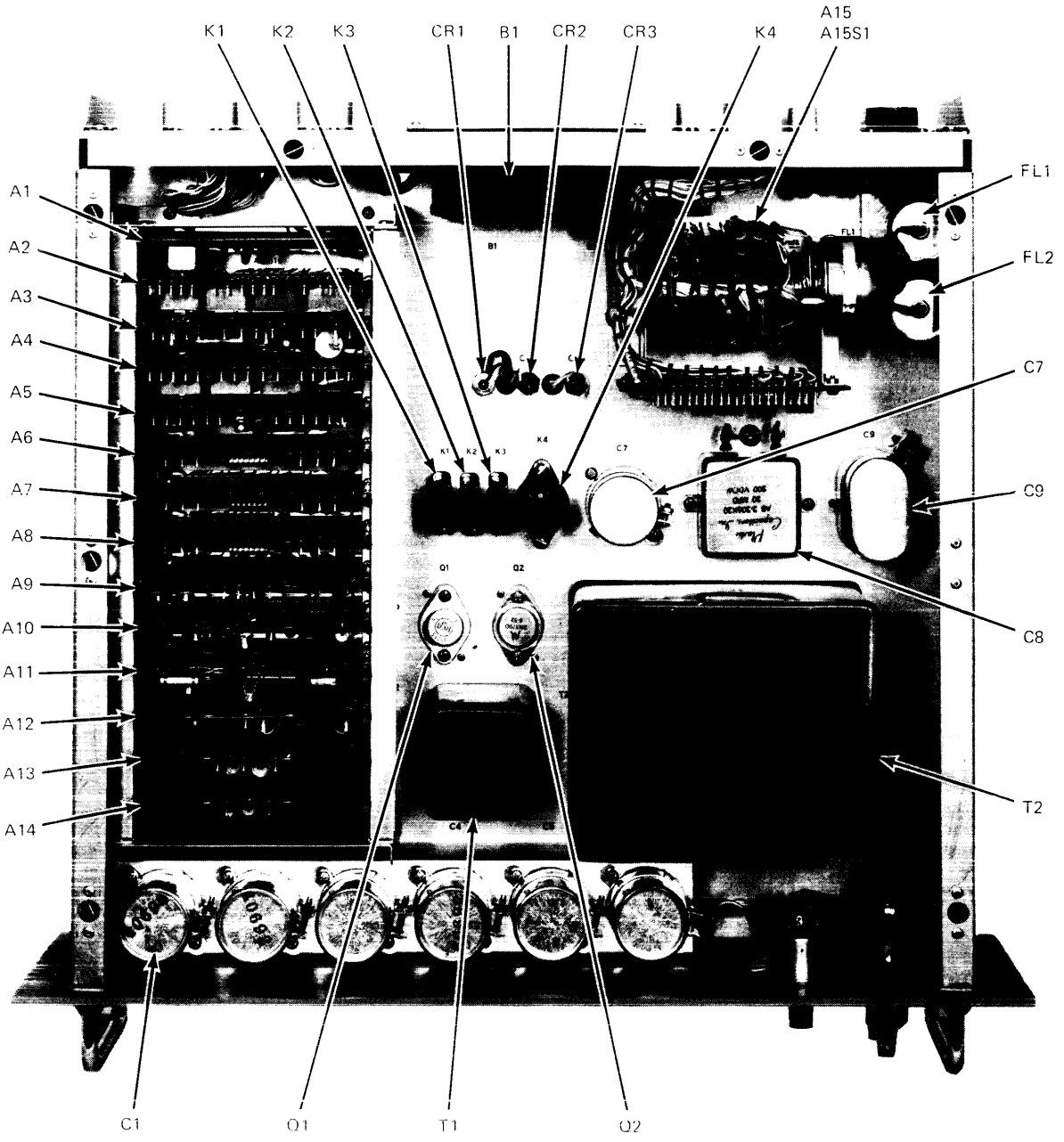


Figure 5-84. Unit 4 (KY-661/URR), Front Panel, Major Component Locations Diagram



REF DESIG PREFIX 4
REF DESIG PREFIX 4,8

Figure 5-85. Unit 4 (KY-661/URR), Rear Panel, Major Component Locations Diagram



REF DESIG PREFIX 4
REF DESIG PREFIX 4, 8

Figure 5-86. Unit 4 (KY-661/URR), Top View, Major Component Locations Diagram

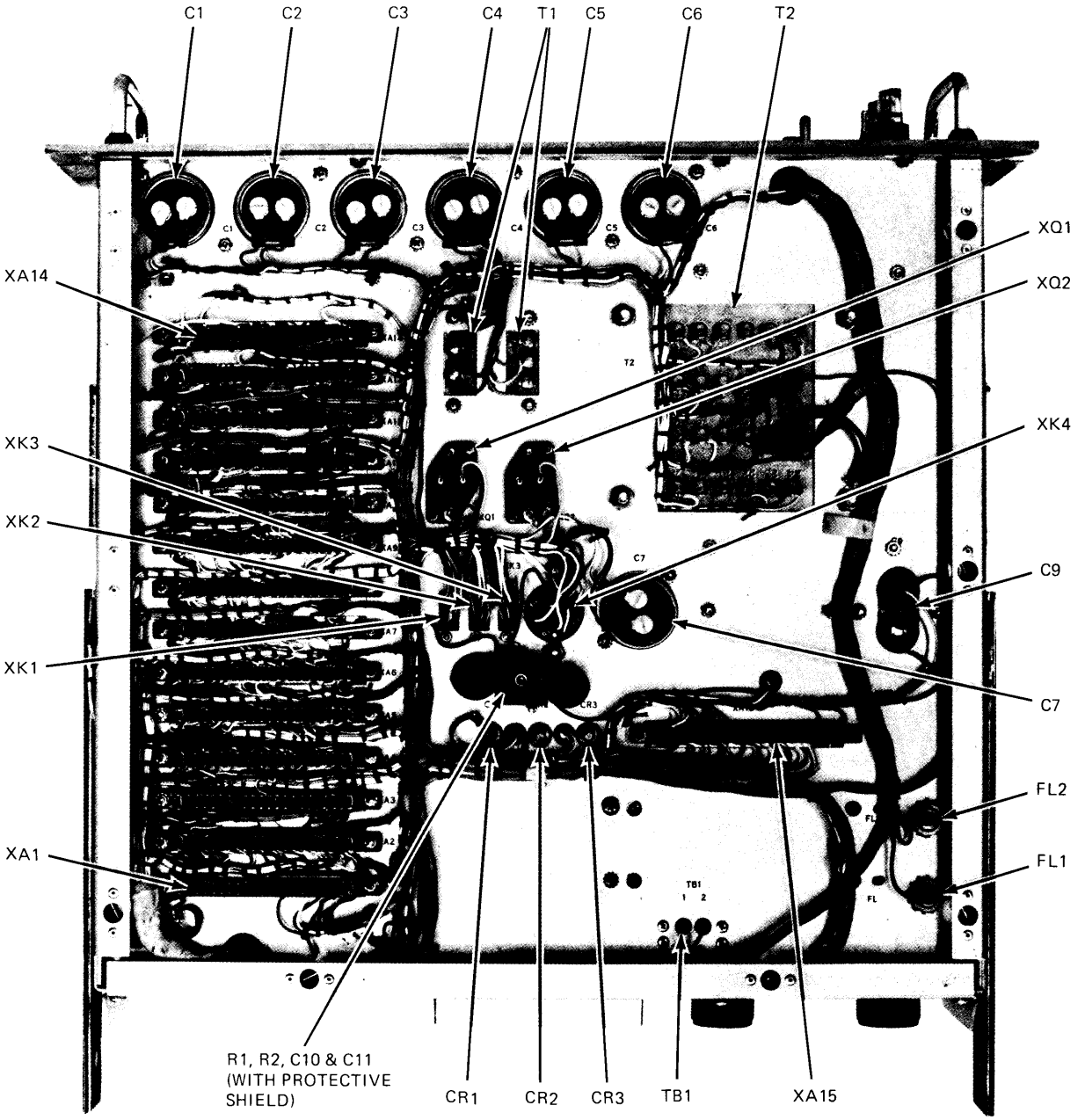
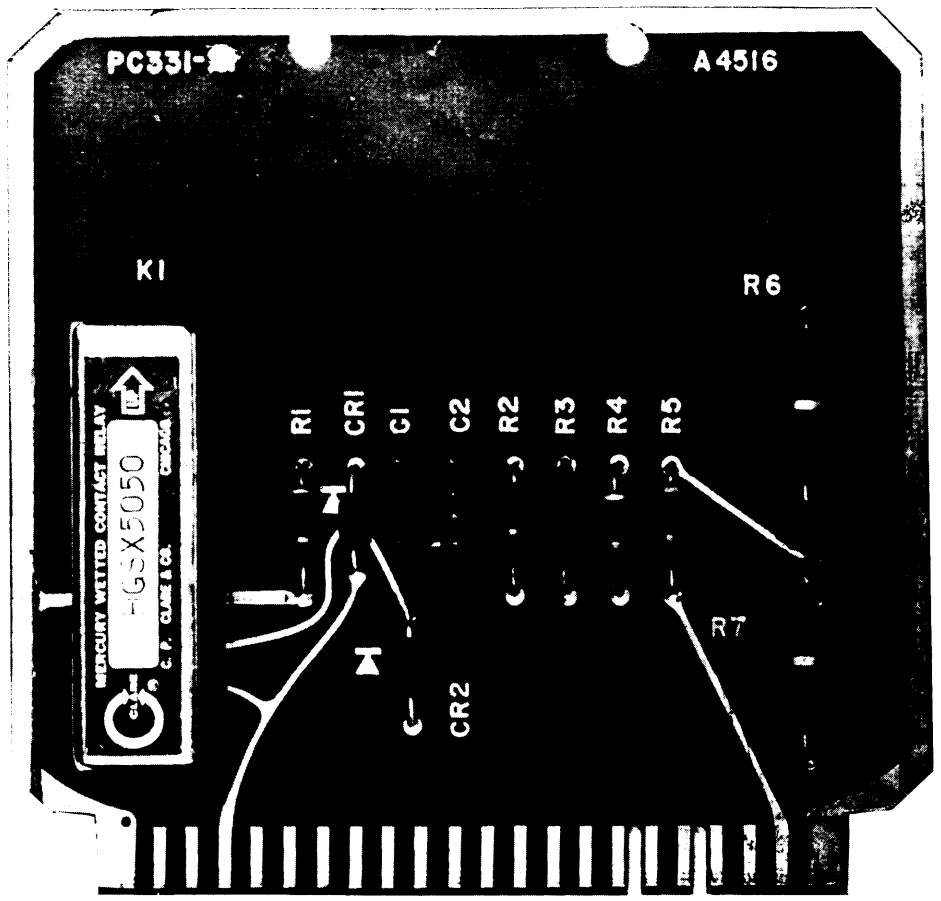
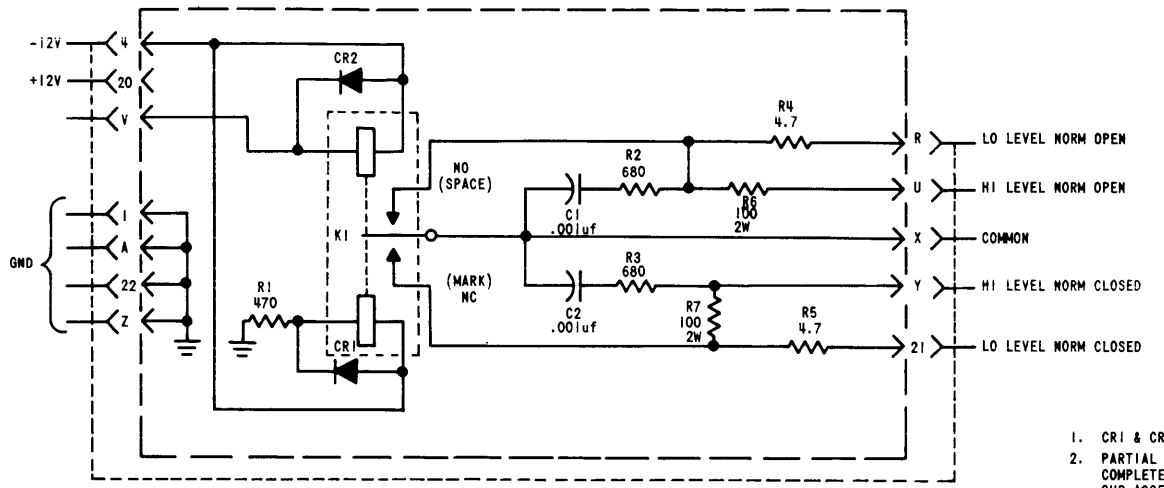


Figure 5-87. Unit 4 (KY-661/URR), Bottom View, Major Component Locations Diagram





NOTES

1. CR1 & CR2 ARE TYPE 1N4245
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER & SUB-ASSEMBLY DESIGNATION(S) AS APPLICABLE

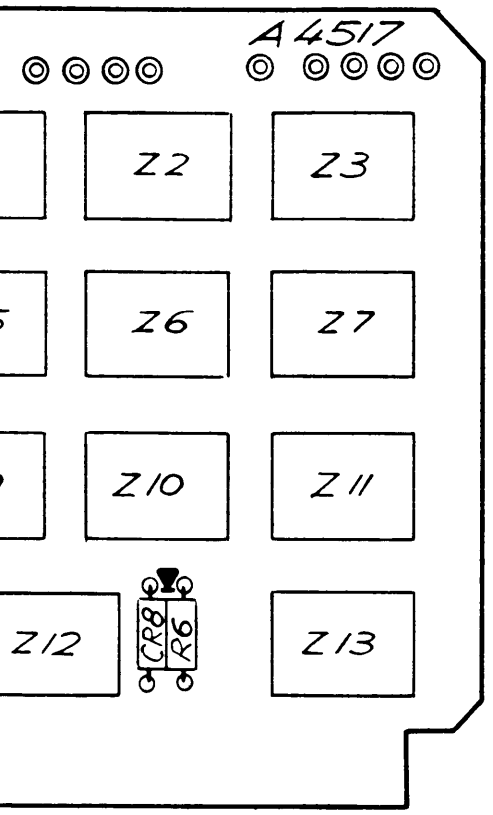
UNLESS OTHERWISE SPECIFIED

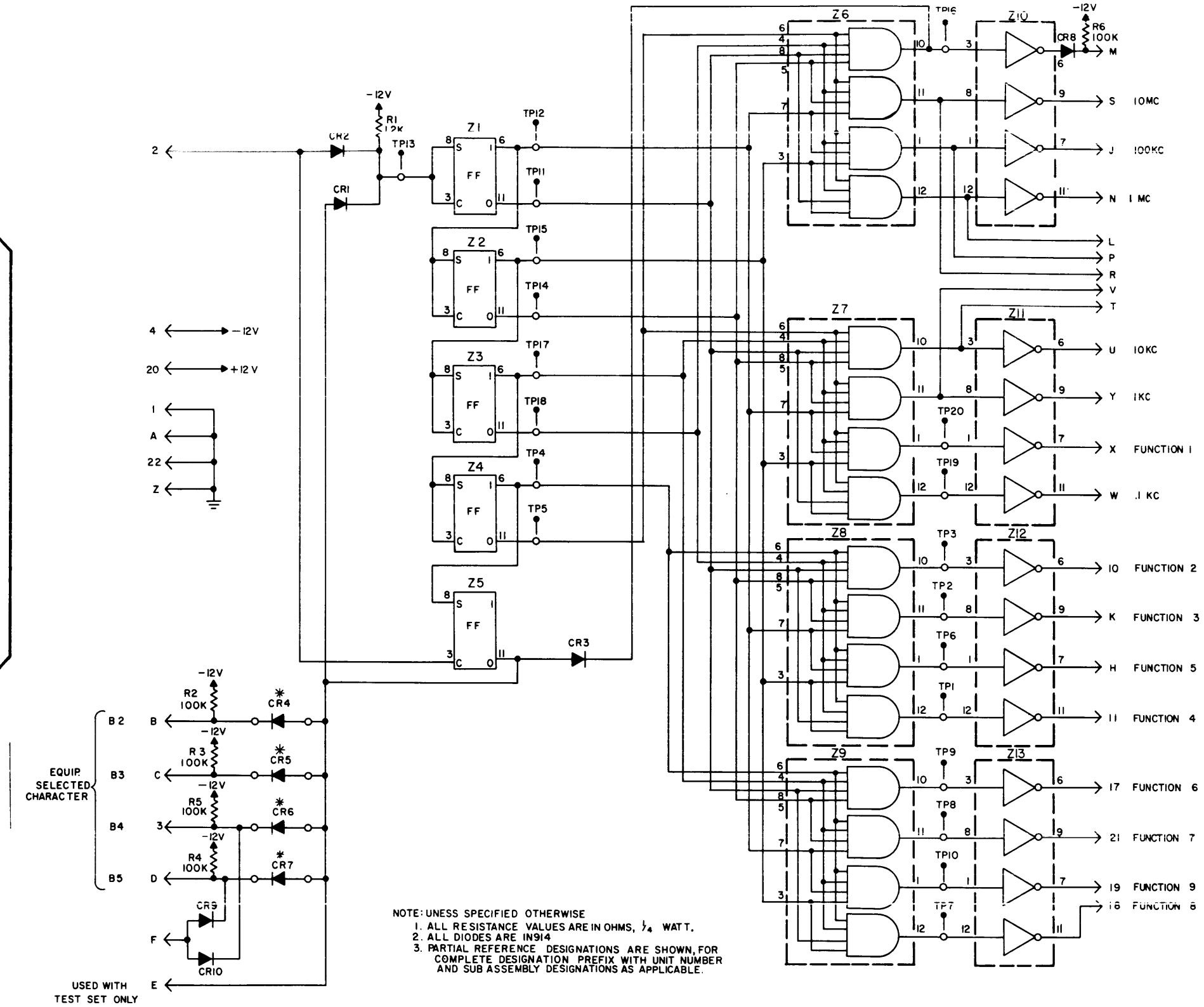
1. ALL RESISTORS ARE IN OHMS, 1/2 WATT

LAST SYMBOLS	MISSING SYMBOLS
C2	
CR2	
K1	
R7	

CK 1402

Figure 5-88/5-89. Output Keyer 4A1, Schematic/Component Locations Diagram





NOTE: UNESS SPECIFIED OTHERWISE
1. ALL RESISTANCE VALUES ARE IN OHMS, ¼ WATT.
2. ALL DIODES ARE IN914
3. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN, FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER AND SUB ASSEMBLY DESIGNATIONS AS APPLICABLE.

CK 1522

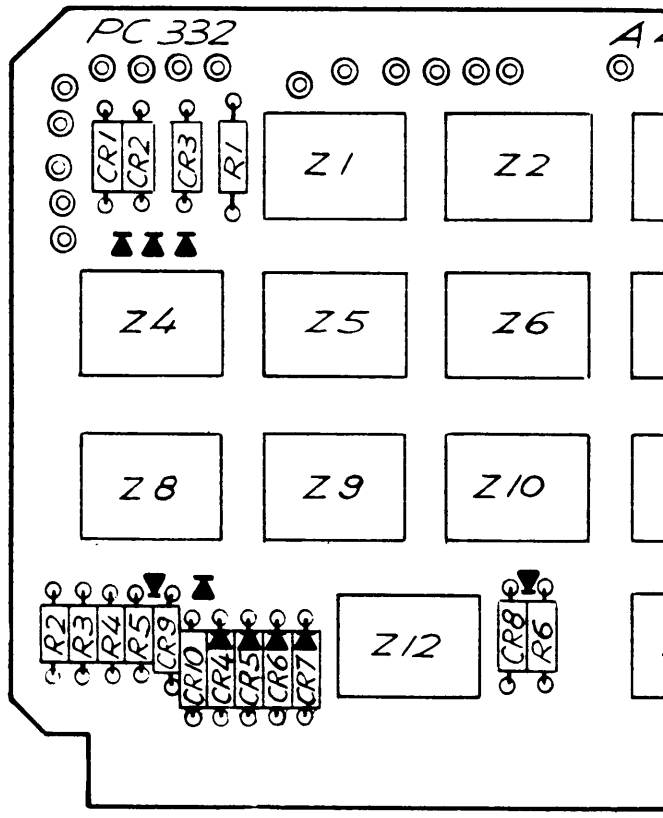
* FOR EQUIPMENT CODED A THRU E USE THIS CHART FOR DIODE SELECTION

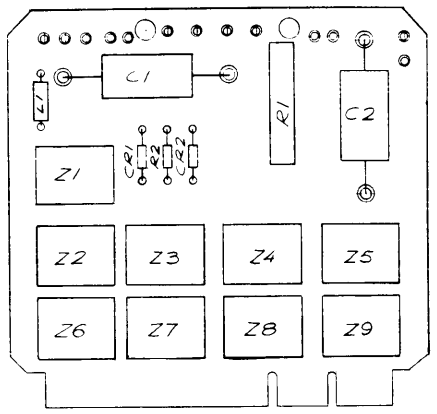
A THRU E -	CR4	CR5	CR6	CR7
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

LAST SYMBOL	MISSING SYMBOL
CR10	
R6	
TP20	
Z13	

MODULE VOLTAGE & GND CHART			
SYMBOL	PIN CONNECTION		
	+12V	-12V	GND
Z1 THRU Z5	10	2	5
Z6 THRU Z9		2	
Z10 THRU Z13	10		5

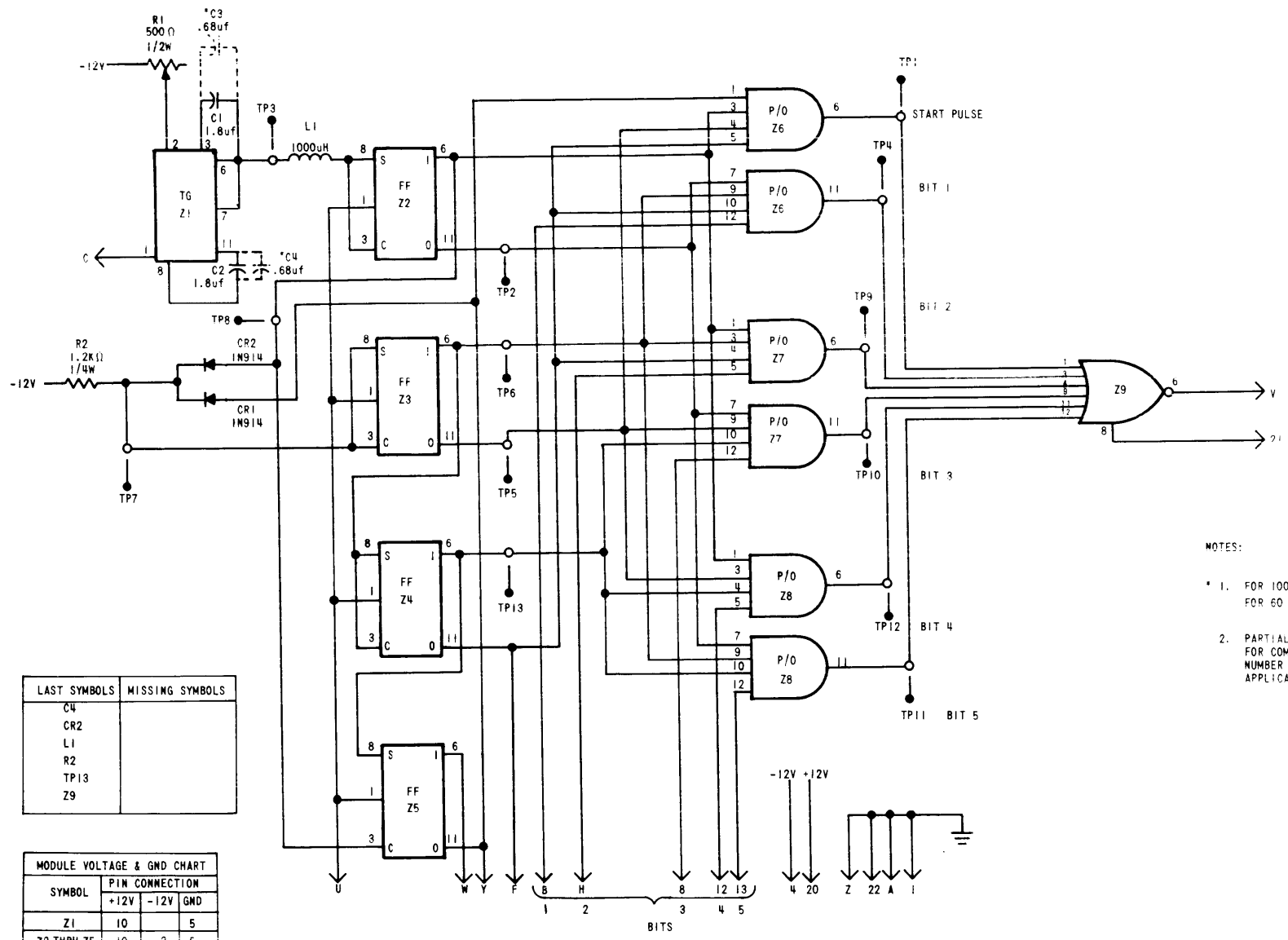
Figure 5-90/5-91. Code Shift Register 4A2, Schematic/Component Locations Diagram


PC 332
CR1
CR2
CR3
R1
Z1
Z2
Z4
Z5
Z6
Z8
Z9
Z10
R2
R3
R4
R5
CR9
CR10
CR4
CR5
CR6
CR7
Z12
CR8
R6



LAST SYMBOLS	MISSING SYMBOLS
C4	
CR2	
L1	
R2	
TP13	
Z9	

MODULE VOLTAGE & GND CHART			
SYMBOL	PIN CONNECTION		
	+12V	-12V	GND
Z1	10		5
Z2 THRU Z5	10	2	5
Z6,7,8		2	
Z9	10	2	5



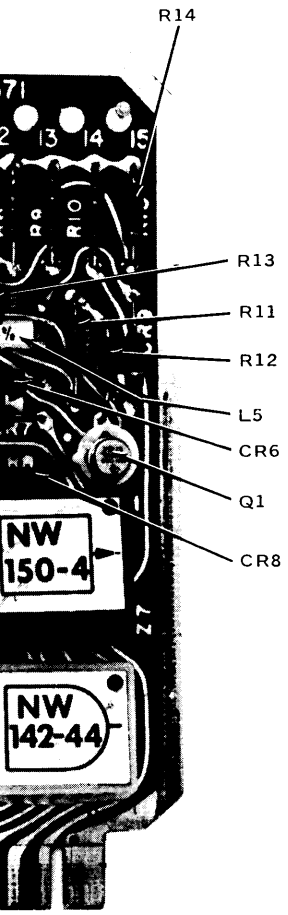
NOTES:

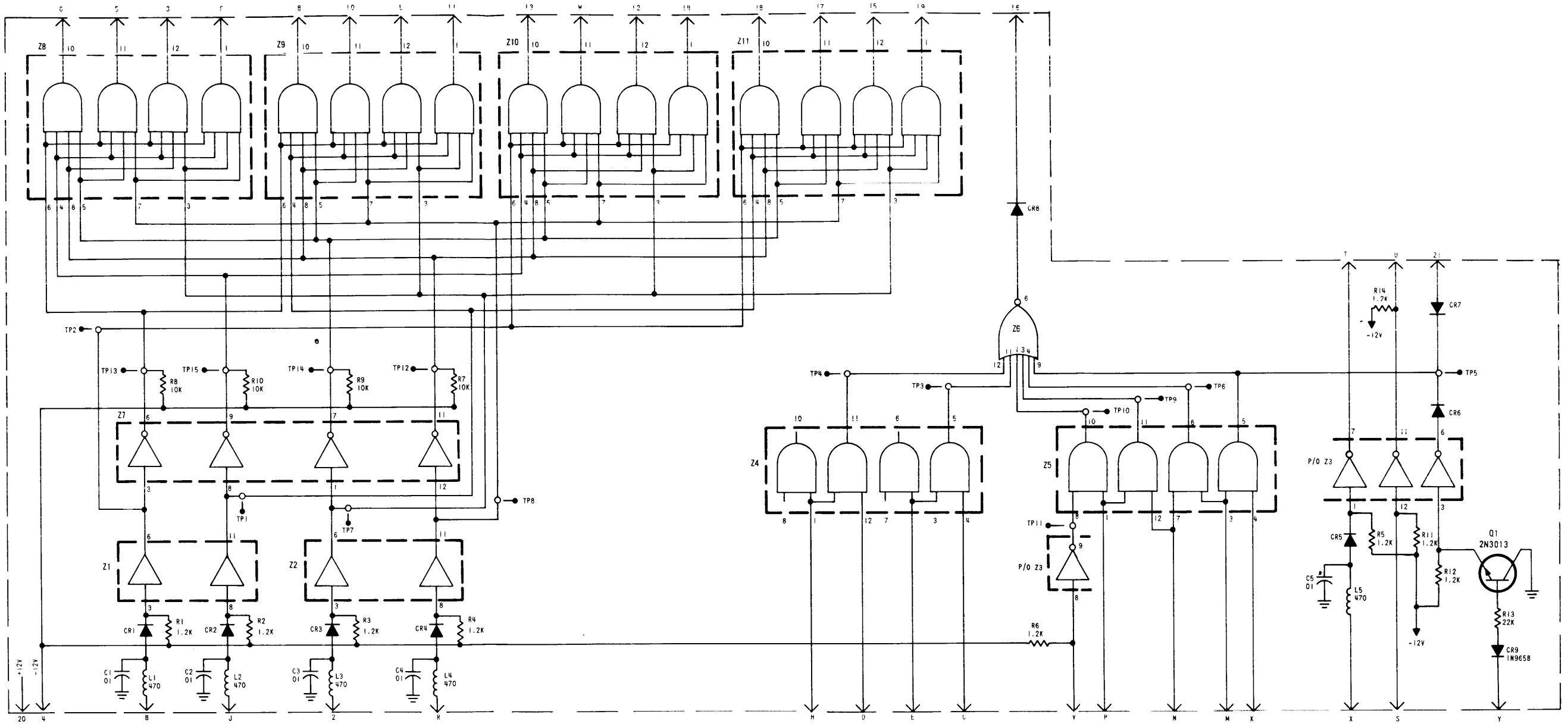
* 1. FOR 100 WPM OPERATION, DELETE C3 & C4
FOR 60 WPM OPERATION, ADD C3 & C4

2. PARTIAL REFERENCE DESIGNATION ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION(S) AS APPLICABLE

CK 1403

Figure 5-92/5-93. Bit Shift Register 4A3, Schematic/Component Locations Diagram





UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTANCE VALUES ARE IN OHMS, 1/4 WATT
2. ALL CAPACITANCE VALUES ARE IN MICROFARADS
3. ALL INDUCTANCE VALUES ARE IN MICROHENRIES
4. ALL DIODES ARE IN914

NOTE:

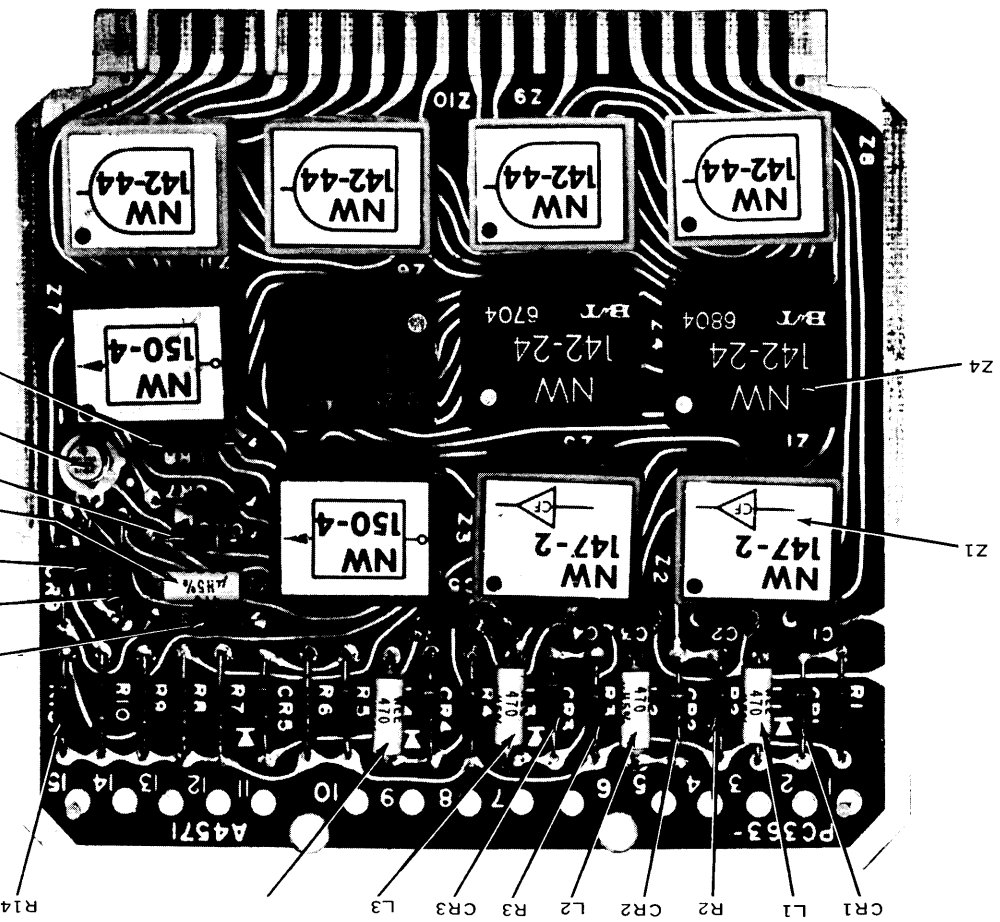
1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN: FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION(S) AS APPLICABLE

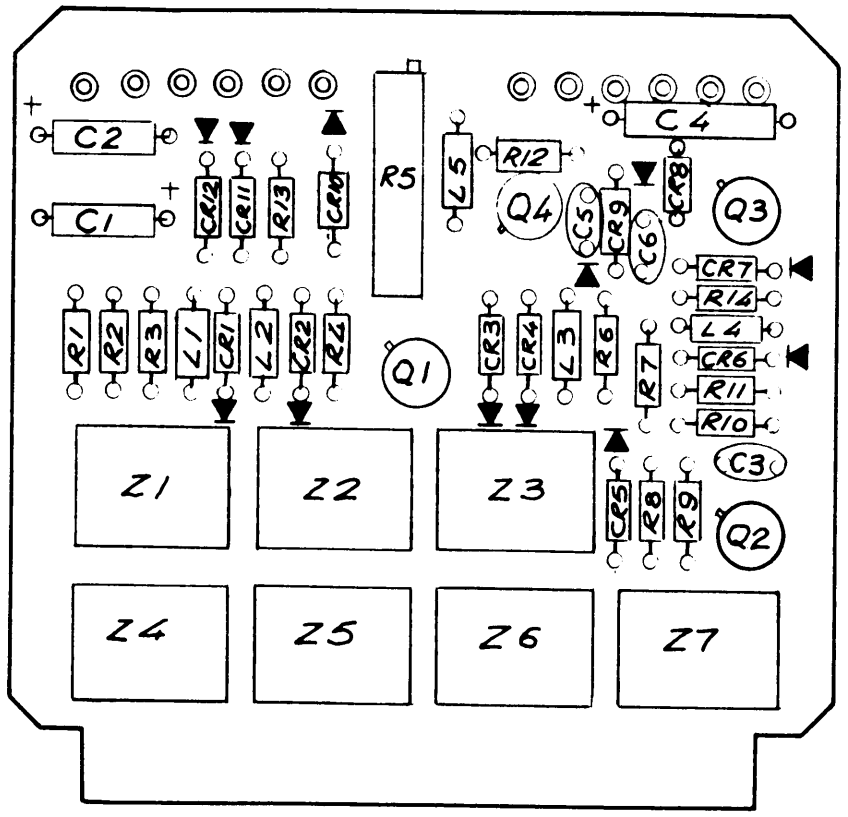
MODULE VOLTAGE & GND CHART			
SYMBOL	PIN CONNECTIONS +12V	-12V	GND
Z1,Z2		2	5
Z3,Z7	10		5
Z4,Z5		2	
Z6	10	2	5
Z8 THRU Z11		2	

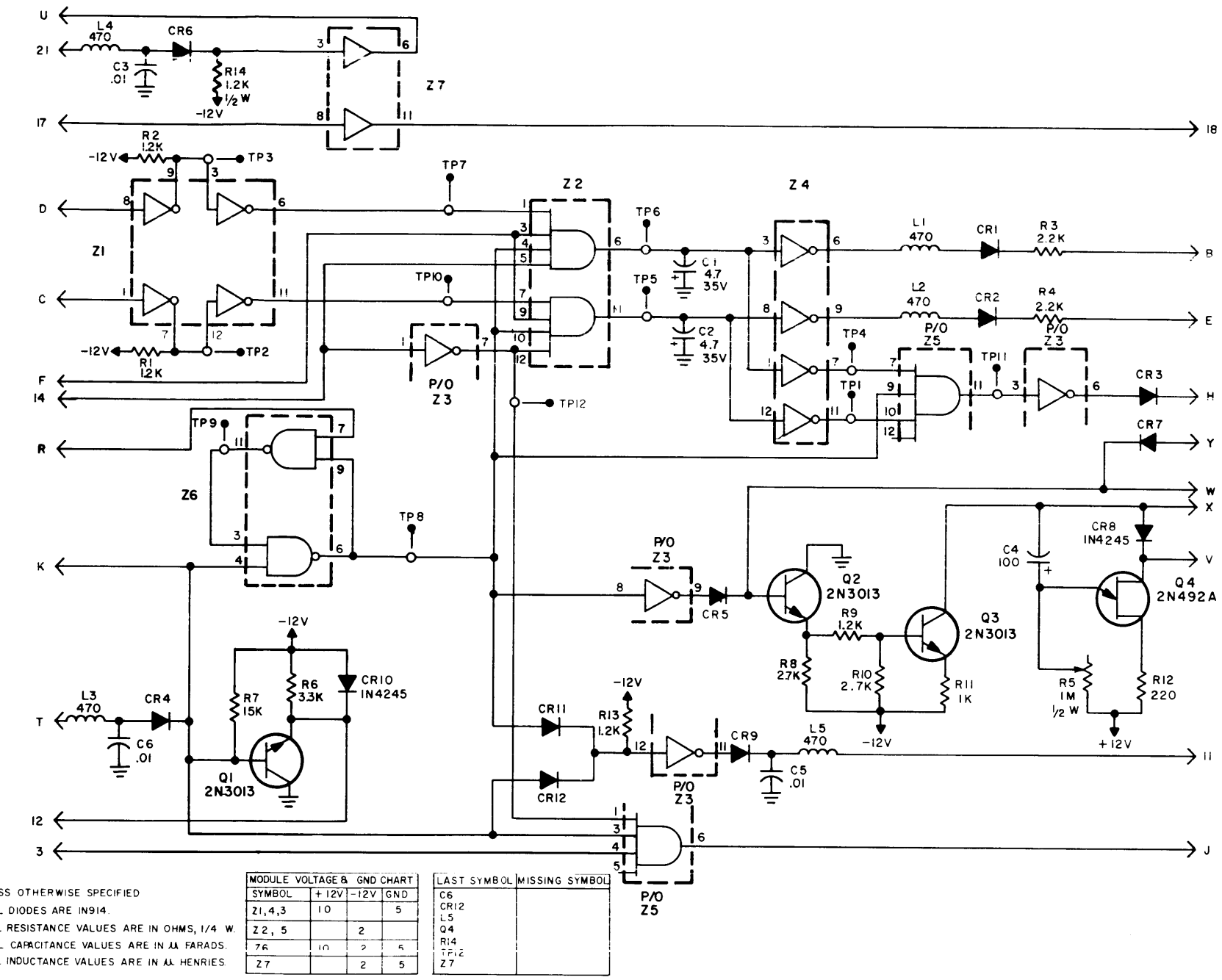
LAST SYMBOL	MISSING SYMBOL
C5	
CR9	
L5	
R14	
TP15	
Z11	

CK 1602

Figure 5-94/5-95. Drive Input Gating Circuit 4A4, Schematic/Component Locations Diagram 011690392


Z10
Z9
Z8
Z7
NW 142-44
NW 142-44
NW 142-44
NW 142-44
NW 142-24
B/T 6804
B/T 6704
NW 142-24
B/T 6804
B/T 6704
NW 150-4
NW 150-4
NW 147-2
NW 147-2
A4571
PC353-
Z4
Z1
CR8
Q1
CR6
L5
R12
R11
R13
R14
CR1
L1
R2
CR2
L2
R3
CR3
L3





UNLESS OTHERWISE SPECIFIED

1. ALL DIODES ARE IN914.
2. ALL RESISTANCE VALUES ARE IN OHMS, 1/4 W.
3. ALL CAPACITANCE VALUES ARE IN µF FARADS.
4. ALL INDUCTANCE VALUES ARE IN µH HENRIES.

MODULE VOLTAGE & GND CHART			
SYMBOL	+12V	-12V	GND
Z1,4,3	10		5
Z2, 5		2	
Z6	10	2	5
Z7		2	5

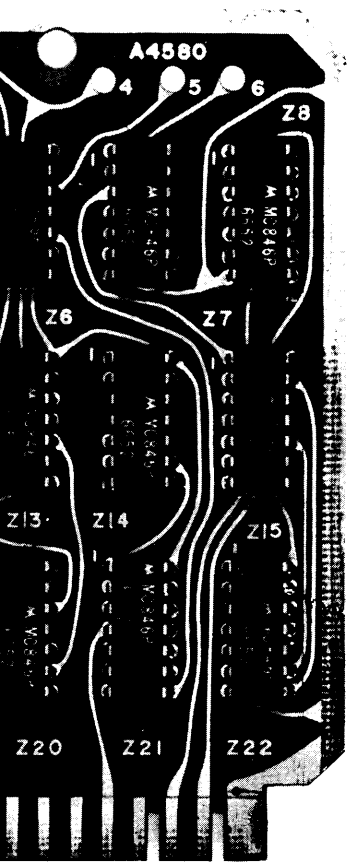
LAST SYMBOL	MISSING SYMBOL
C6	
CR12	
L5	
Q4	
R14	
TP12	
Z7	

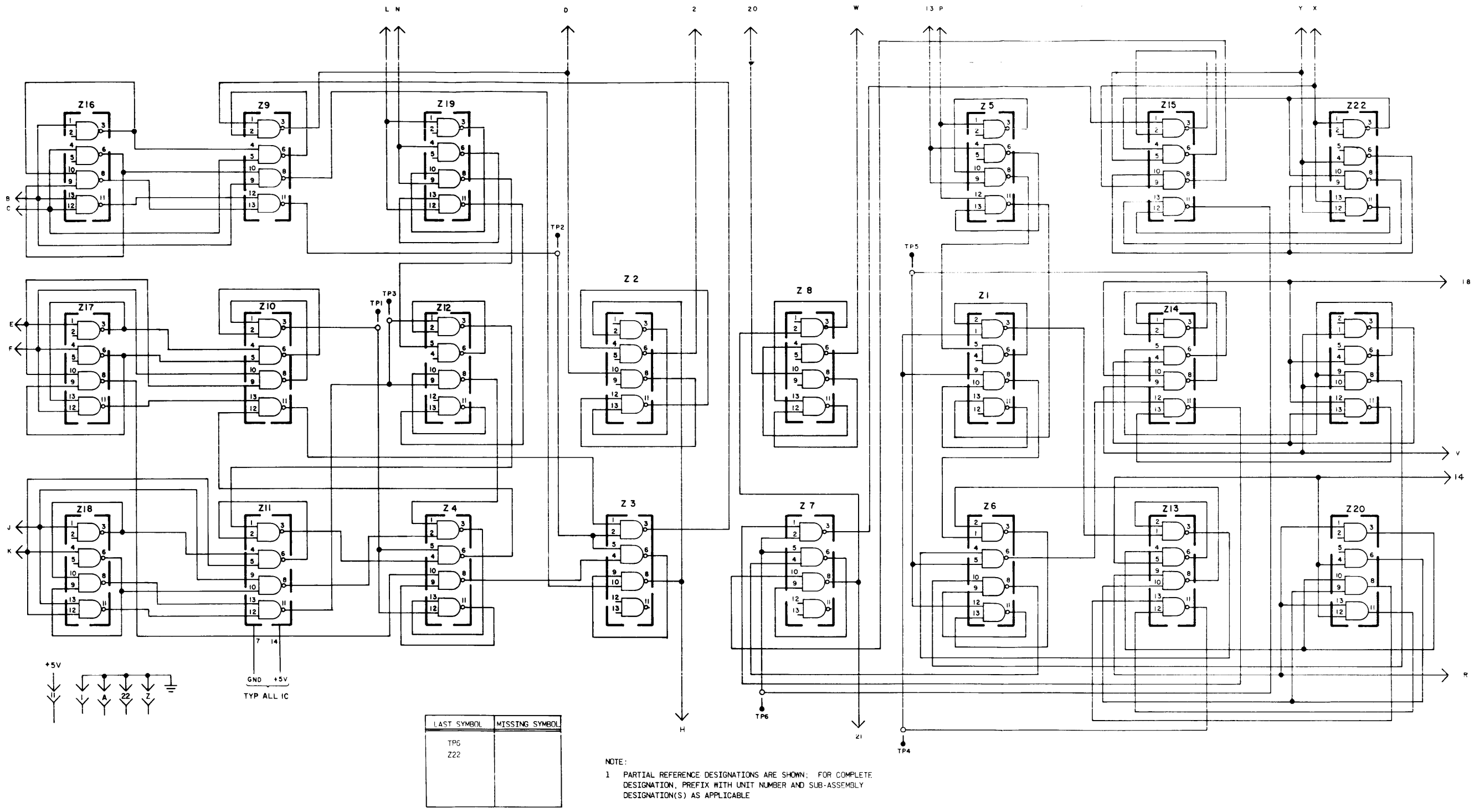
NOTE:
PARTIAL REFERENCE DESIGNATIONS SHOWN, FOR COMPLETE DESIGNATIONS PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION(S) AS APPLICABLE.

CK 1523

Figure 5-96/5-97. Stepping Switch Gating Circuit 4A5, Schematic/Component Locations Diagram

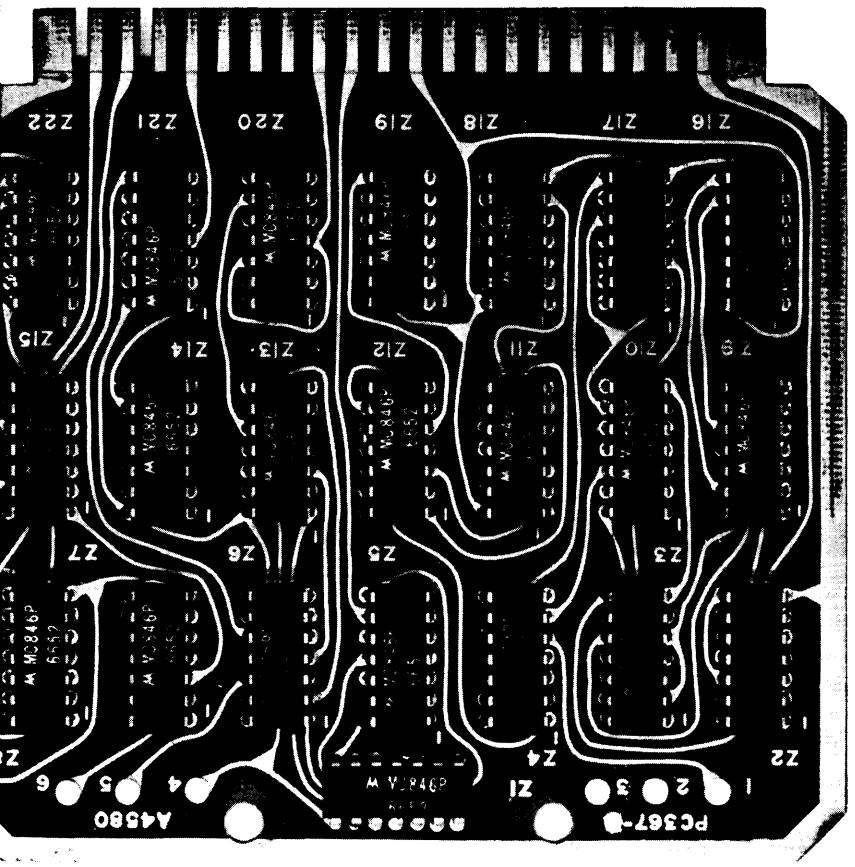
011690392

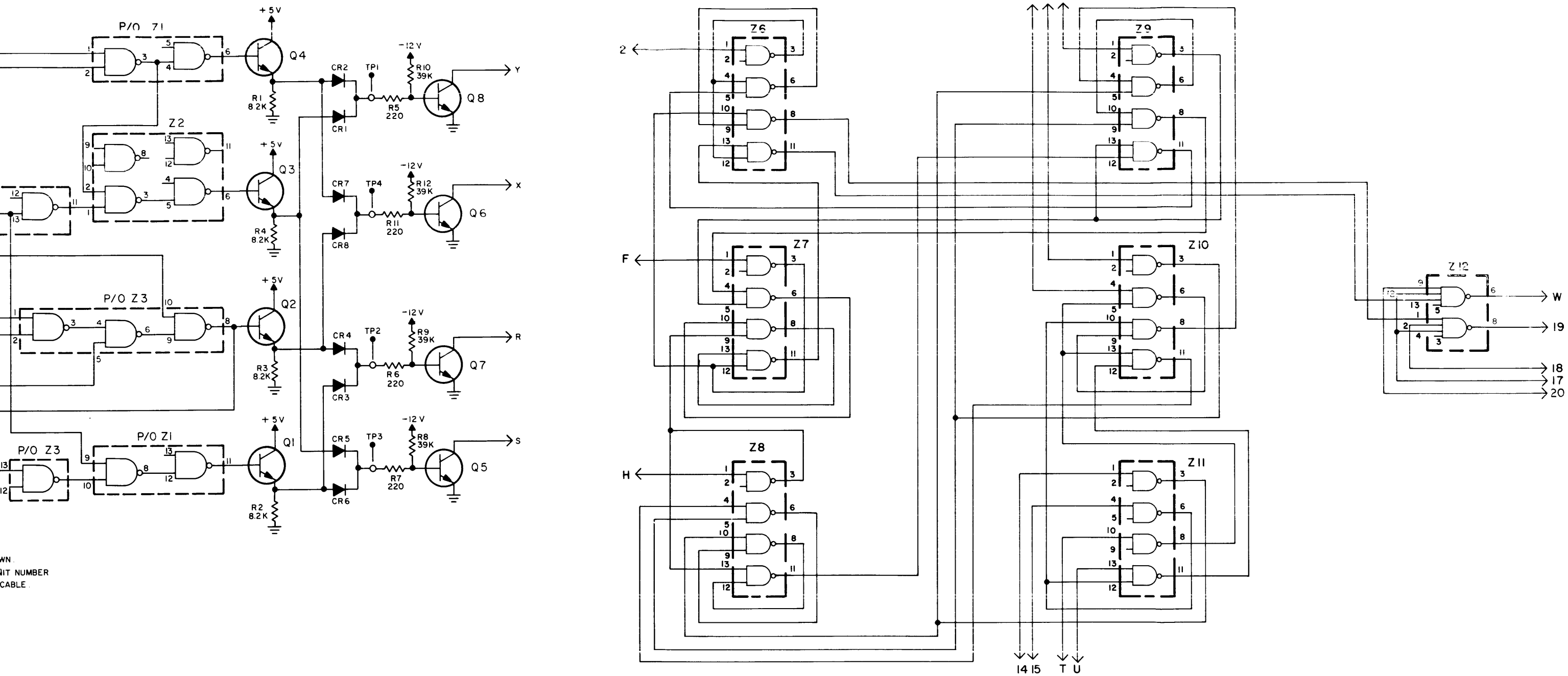




CK 1601

Figure 5-98/5-99. Digital Comparator 4A6, 7, 8, Schematic/Component Locations Diagram

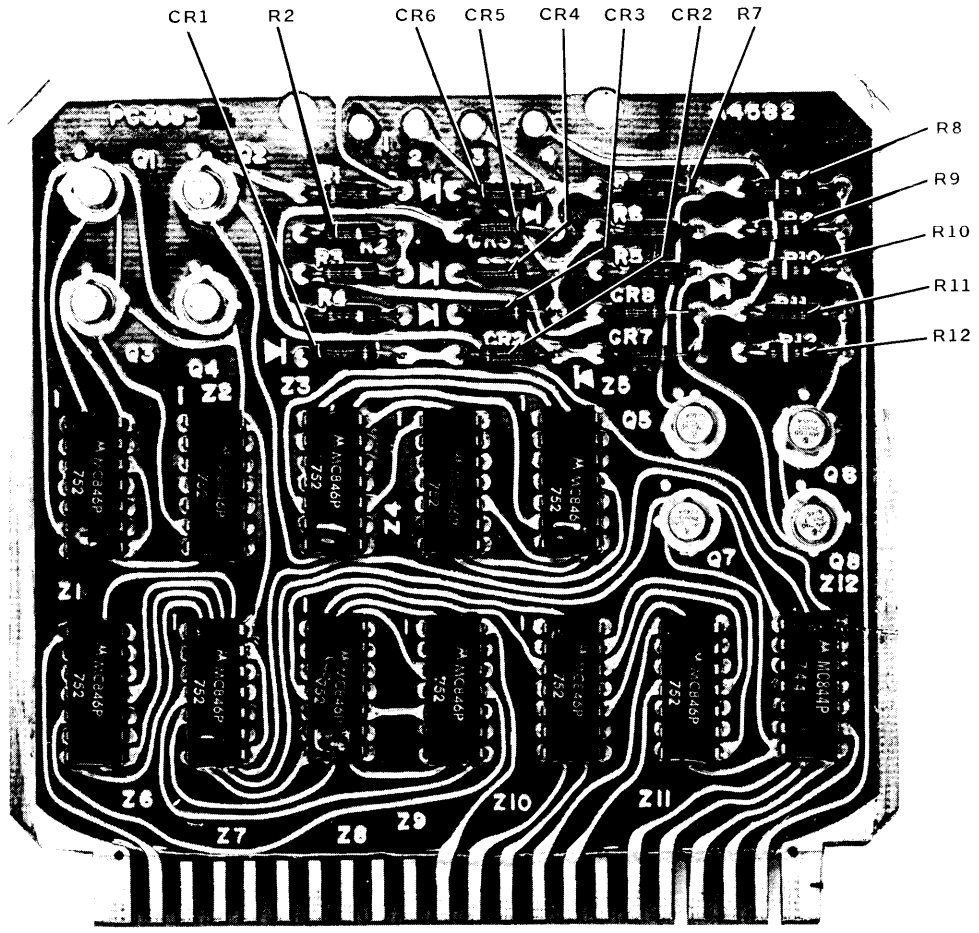

Z16
Z17
Z18
Z19
Z20
Z21
Z22
Z15
Z14
Z13
Z12
Z11
Z10
Z9
Z7
Z6
Z5
Z3
Z4
Z2
Z1
1
2
3
4
5
6
A4580
PC367-B

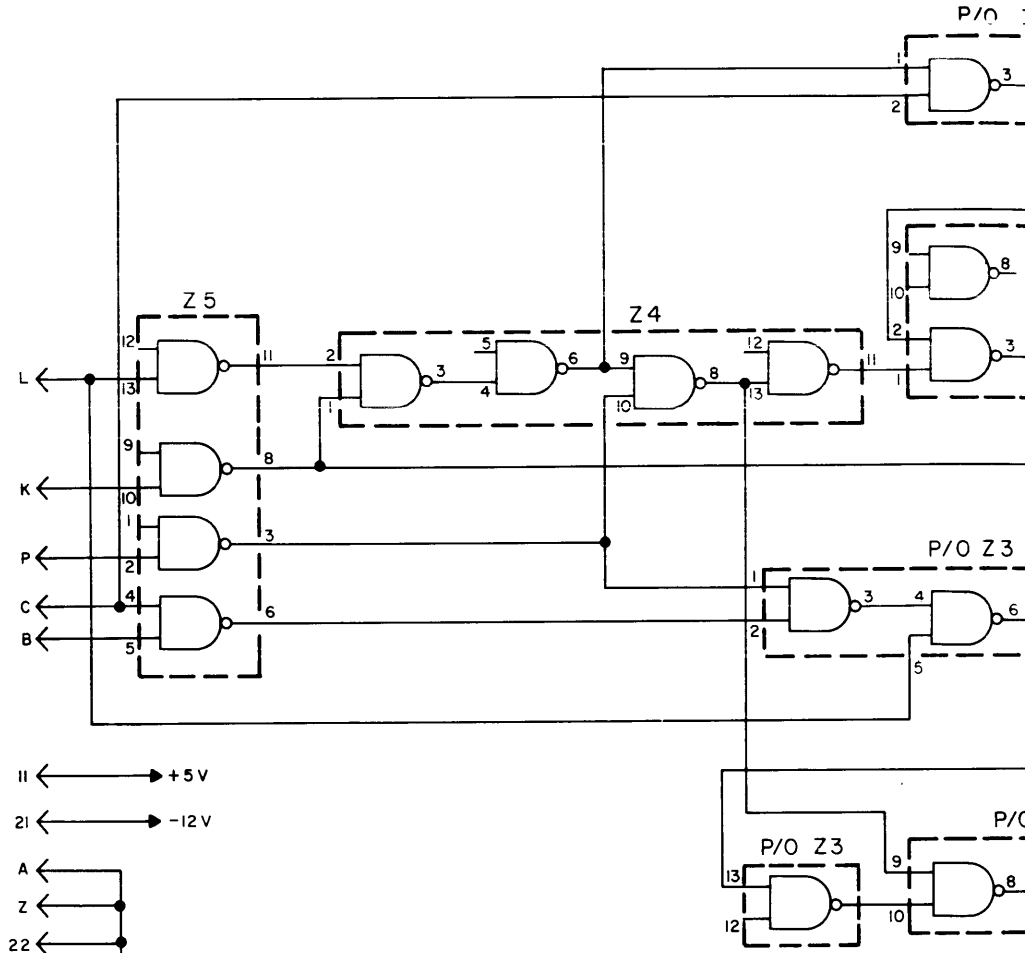


CK 1603

Figure 5-100/5-101. Band Select/Error Polarity Logic 4A9, Schematic/Component Locations Diagram

011690392



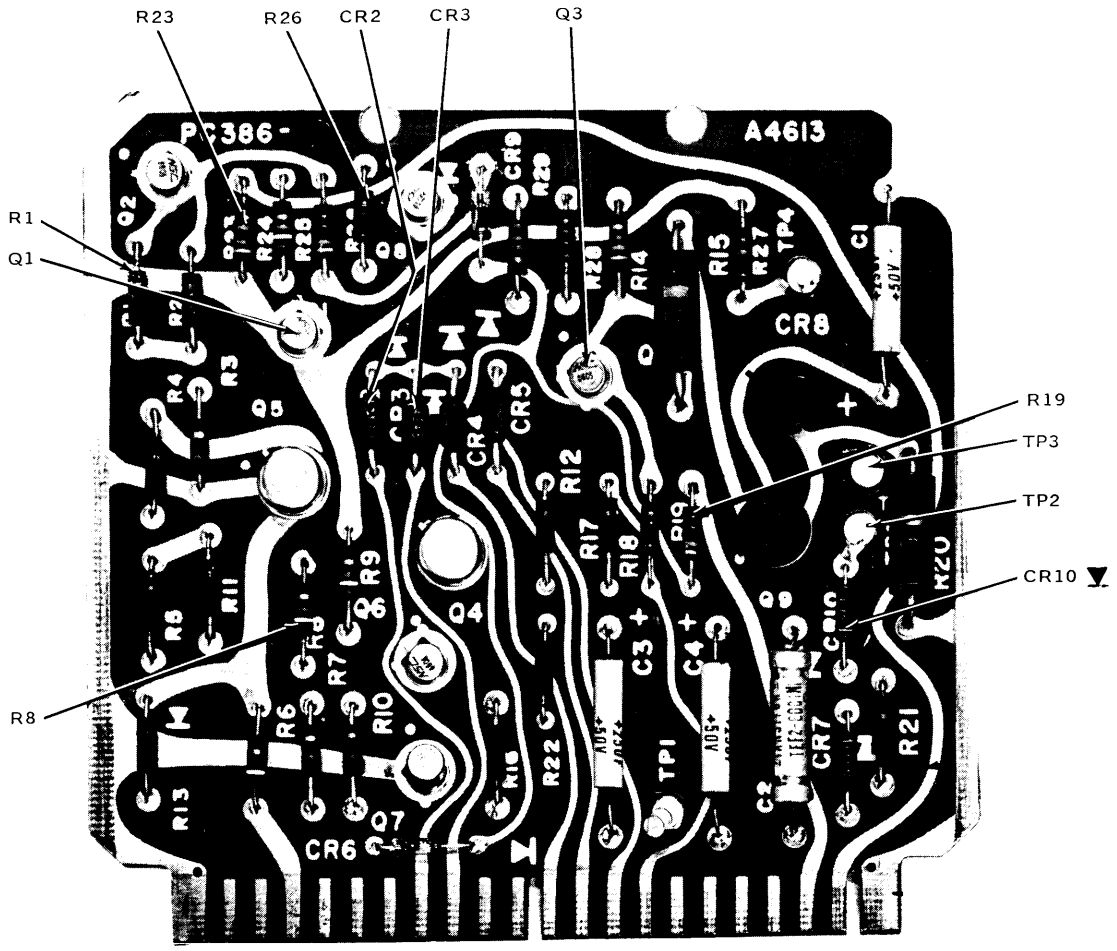


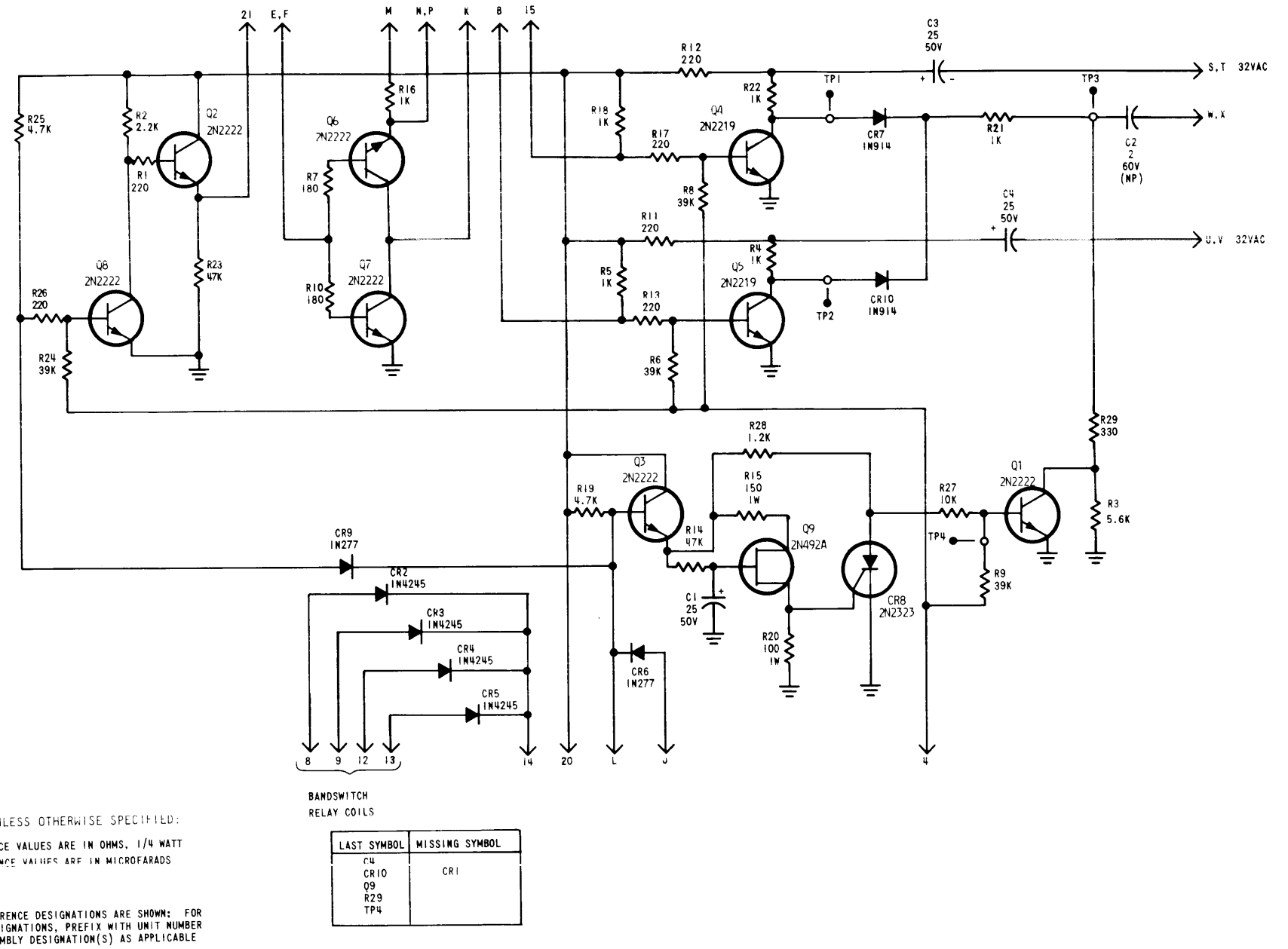
UNLESS OTHERWISE SPECIFIED:
1. ALL RESISTORS ARE IN OHMS 1/4 W
2. ALL DIODES ARE 1N914
3. ALL TRANSISTORS ARE 2N3013

PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER AND SUBASSEMBLY DESIGNATIONS AS APPLICABLE.

LAST SYMBOLS	MISSING SYMBOLS
Q8 R12 CR8 Z12	

MODULE VOLTAGE & GND CHART		
	PIN CONNECTION	
SYMBOL	+5V	GND
Z1 THRU Z12	14	7





LAST SYMBOL	MISSING SYMBOL
C4	CR1
CR10	
Q9	
R29	
TP4	

UNLESS OTHERWISE SPECIFIED:

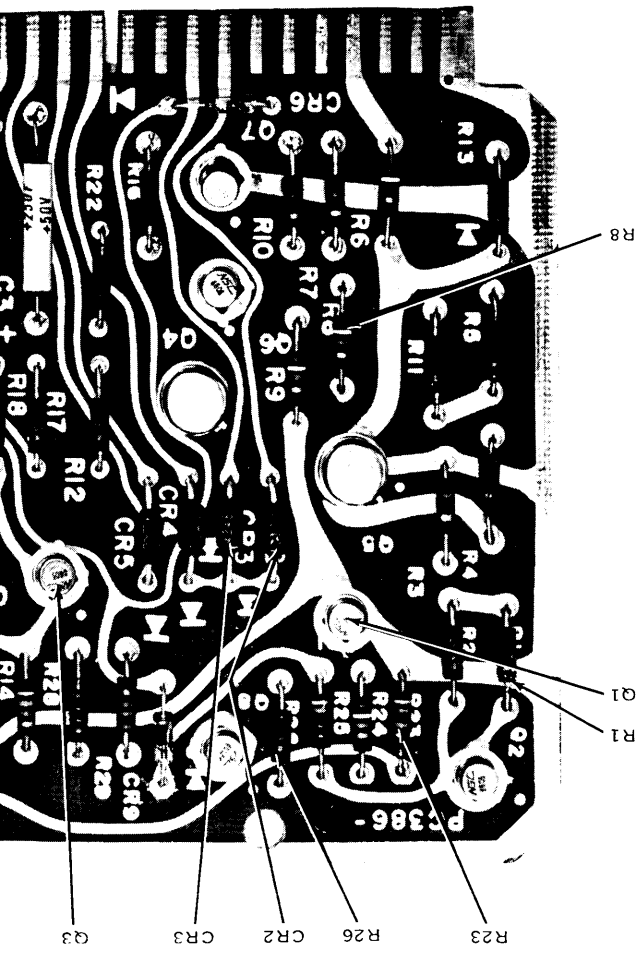
1. ALL RESISTANCE VALUES ARE IN OHMS, 1/4 WATT
2. ALL CAPACITANCE VALUES ARE IN MICROFARADS

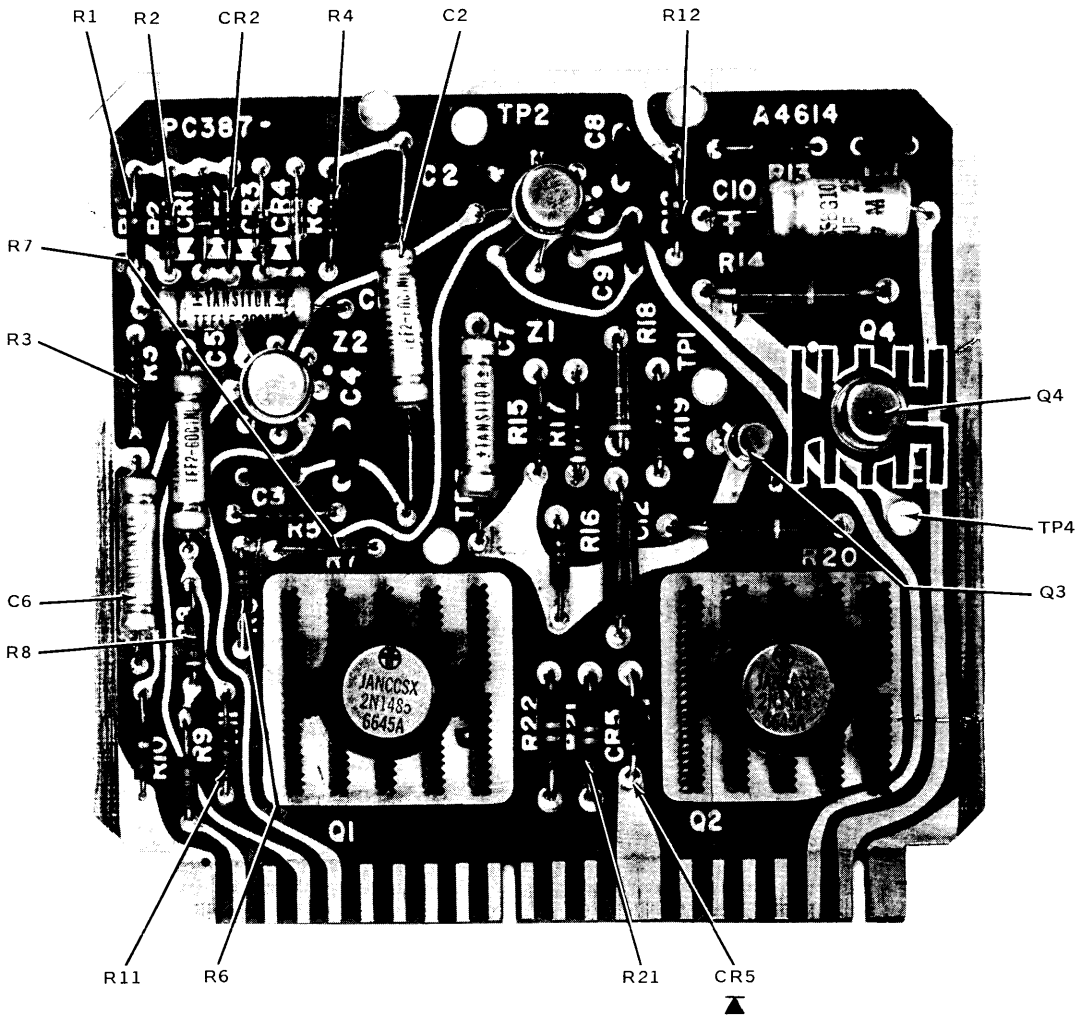
NOTE:

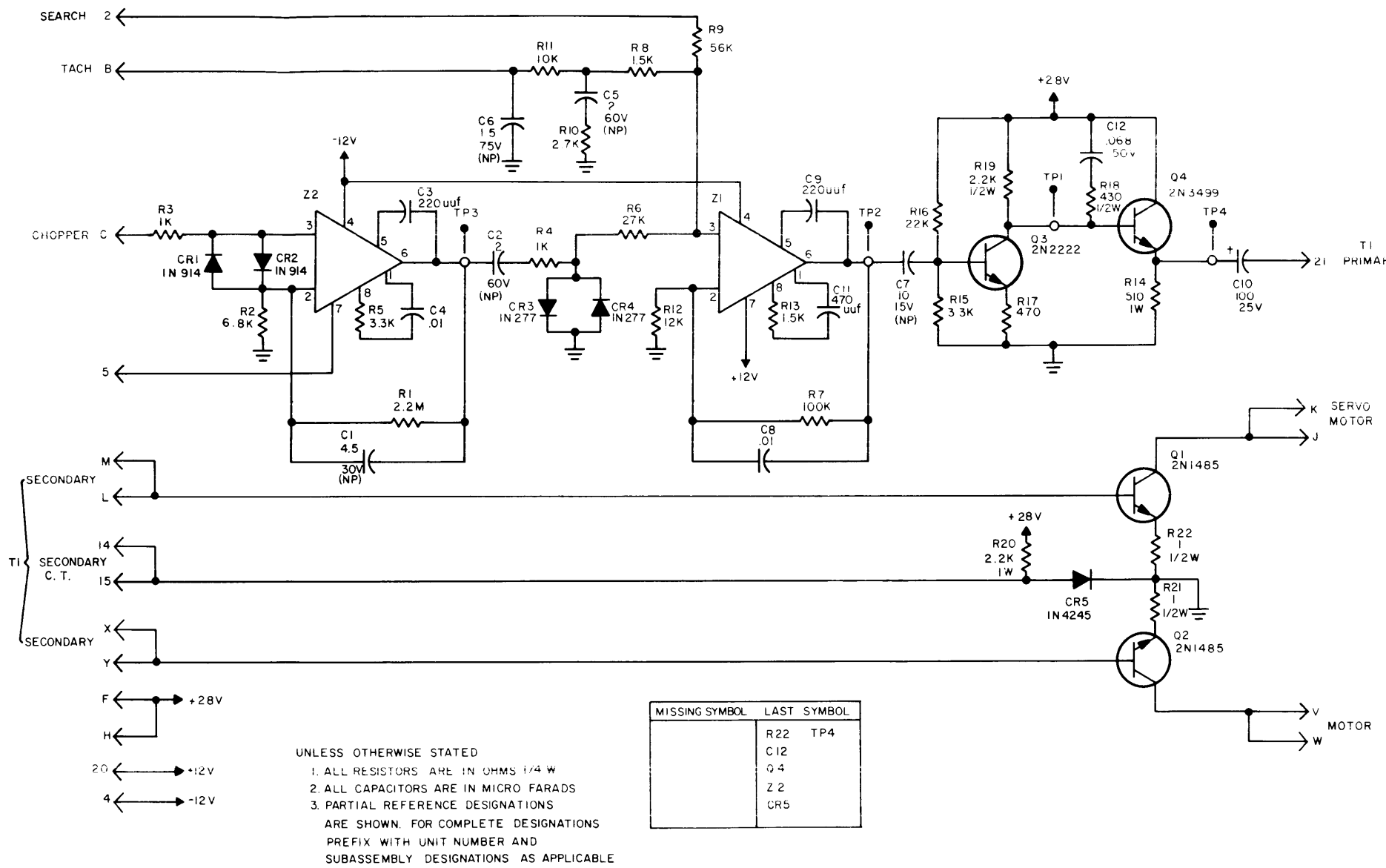
1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN: FOR COMPLETE DESIGNATIONS, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION(S) AS APPLICABLE

CK 1605

Figure 5-102/5-103. Motor Direct Control 4A10, Schematic/Component Locations Diagram


R8
Q1
R1
R23
R26
CR2
CR3
Q3



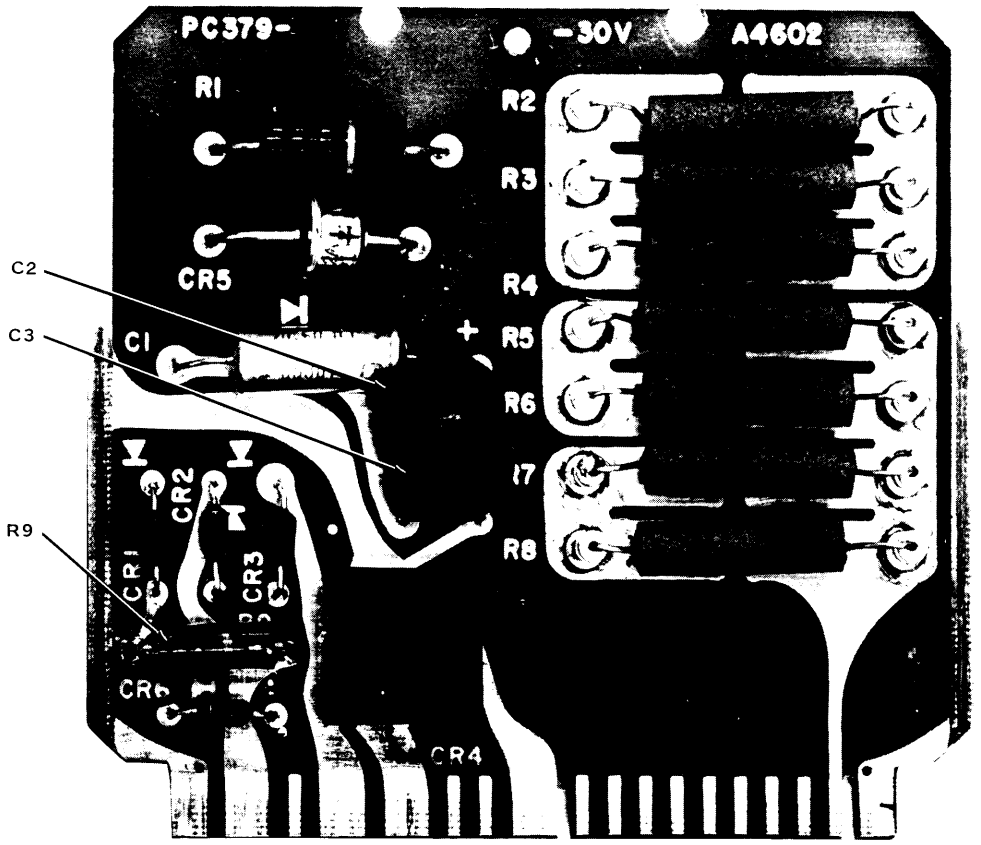


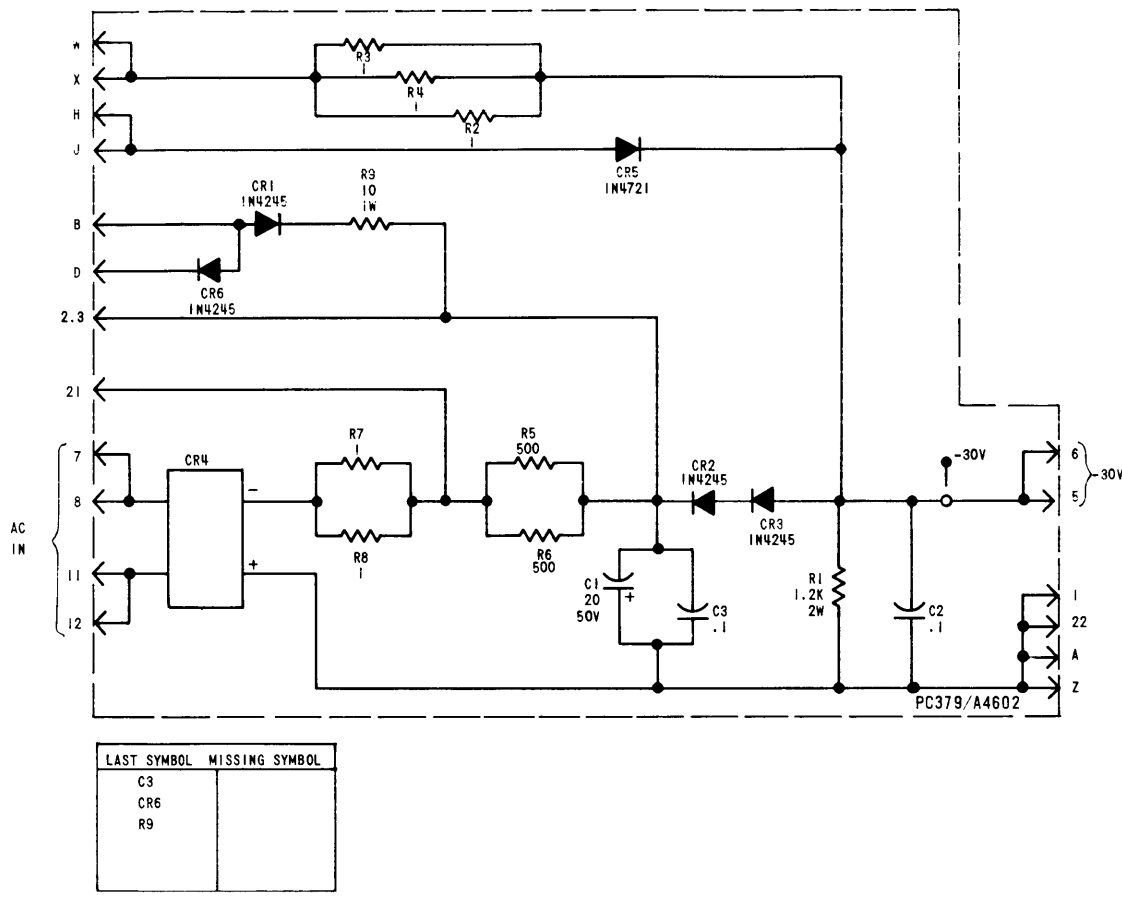
UNLESS OTHERWISE STATED
1. ALL RESISTORS ARE IN OHMS 1/4 W
2. ALL CAPACITORS ARE IN MICRO FARADS
3. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATIONS PREFIX WITH UNIT NUMBER AND SUBASSEMBLY DESIGNATIONS AS APPLICABLE

MISSING SYMBOL	LAST SYMBOL
	R22 TP4
	C12
	Q4
	Z2
	CR5

CK 1604

Figure 5-104/5-105. Servo Output 4A11, Schematic/Component Locations Diagram





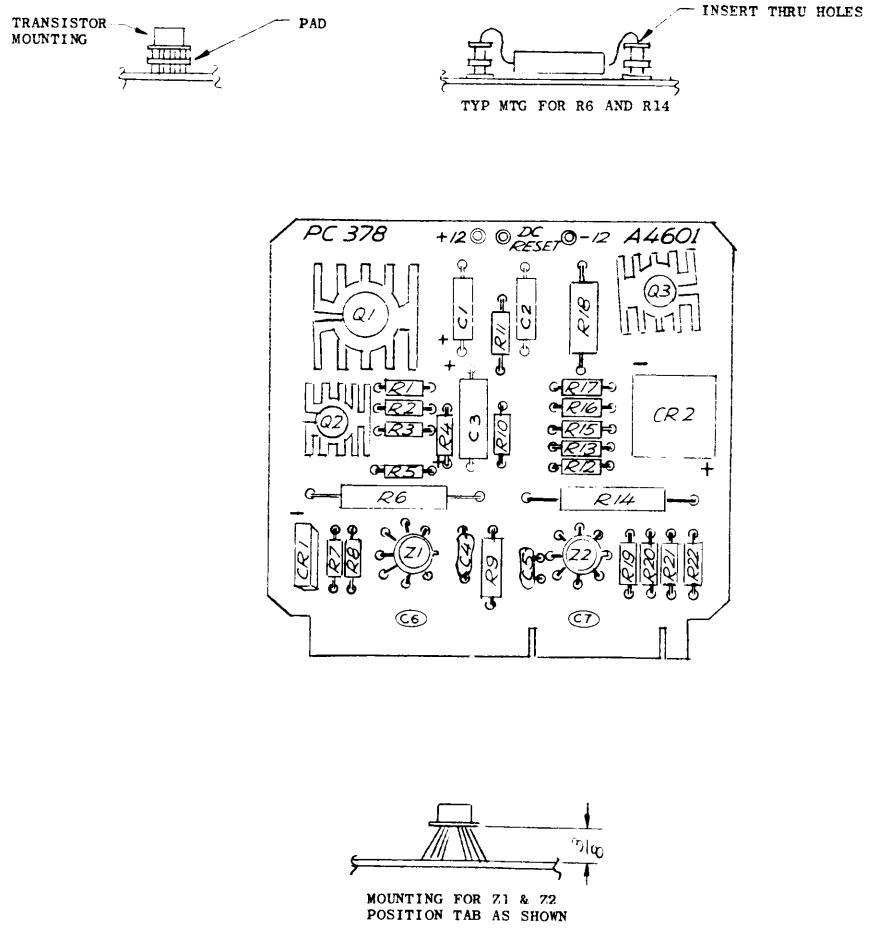
LAST SYMBOL	MISSING SYMBOL
C3	
CR6	
R9	

UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTANCE VALUES ARE IN OHMS, 5WATT
2. ALL CAPACITANCE VALUES ARE IN MICROFARADS
3. PARTIAL REFERENCE DESIGNATION ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION(S) AS APPLICABLE

CK 1524

Figure 5-106/5-107. -30V Power Supply 4A12, Schematic/Component Locations Diagram



LAST SYMBOLS	MISSING SYMBOLS
C7	
CR2	
Q3	
R22	
Z2	

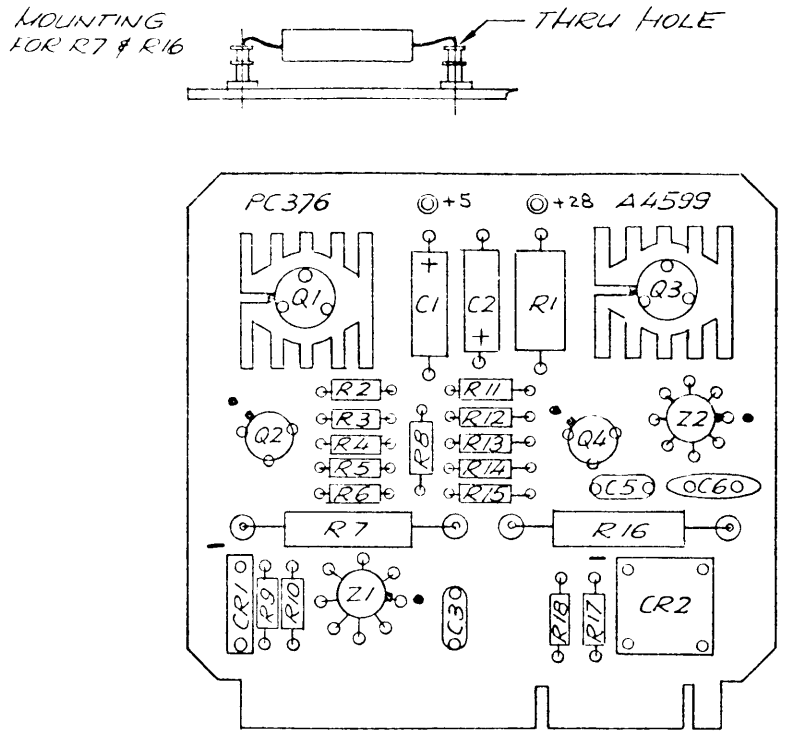
UNLESS OTHERWISE SPECIFIED:

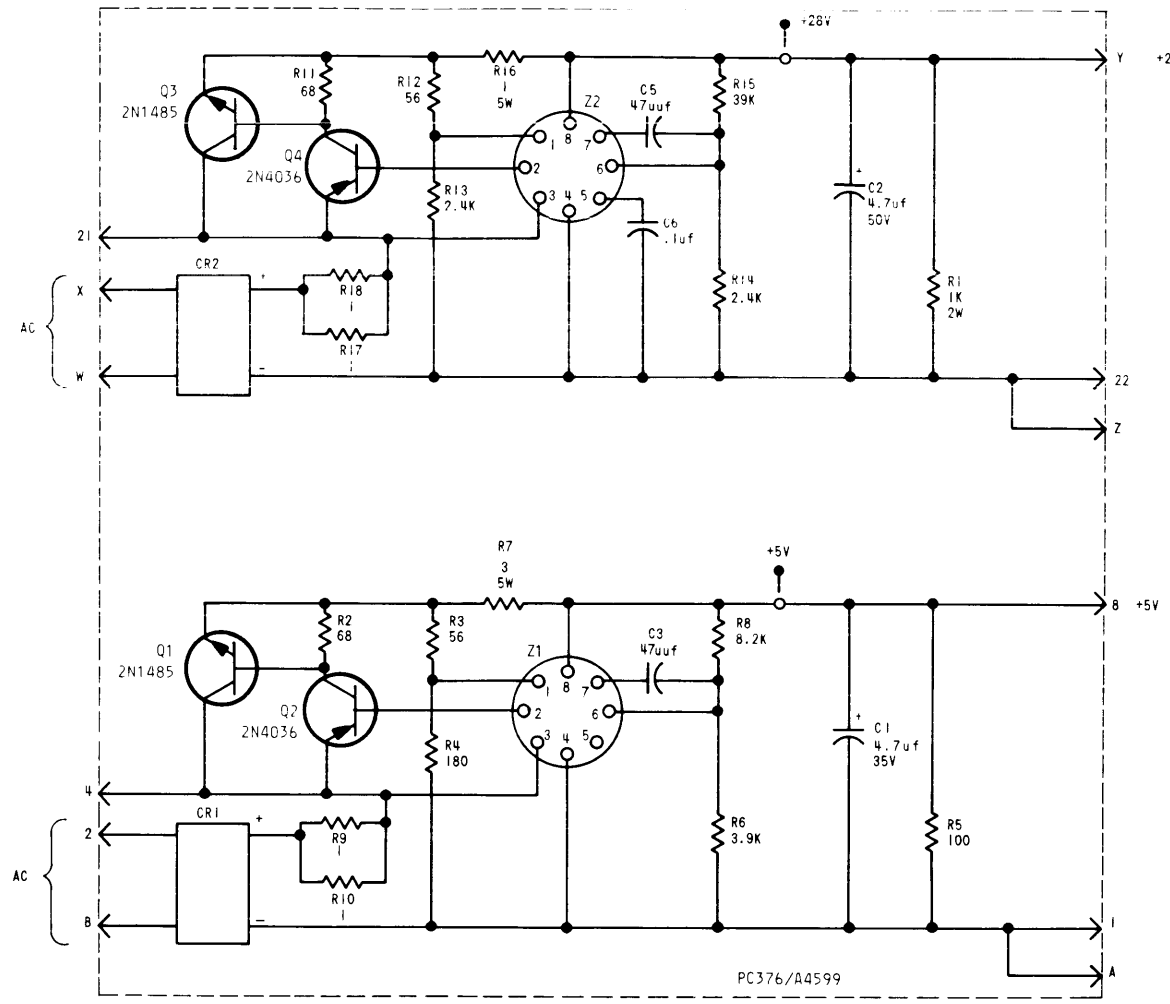
1. ALL RESISTANCE VALUES ARE IN OHMS, 1/2W
2. ALL CAPACITANCE VALUES ARE IN MICROFARADS
3. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION(S) AS APPLICABLE

CK 1401

Figure 5-108/5-109. +12V/-12V Power Supply 4A13, Schematic/Component Locations Diagram

011690392





LAST SYMBOL	MISSING SYMBOL
C6	C4
CR2	
Q4	
R18	
Z2	

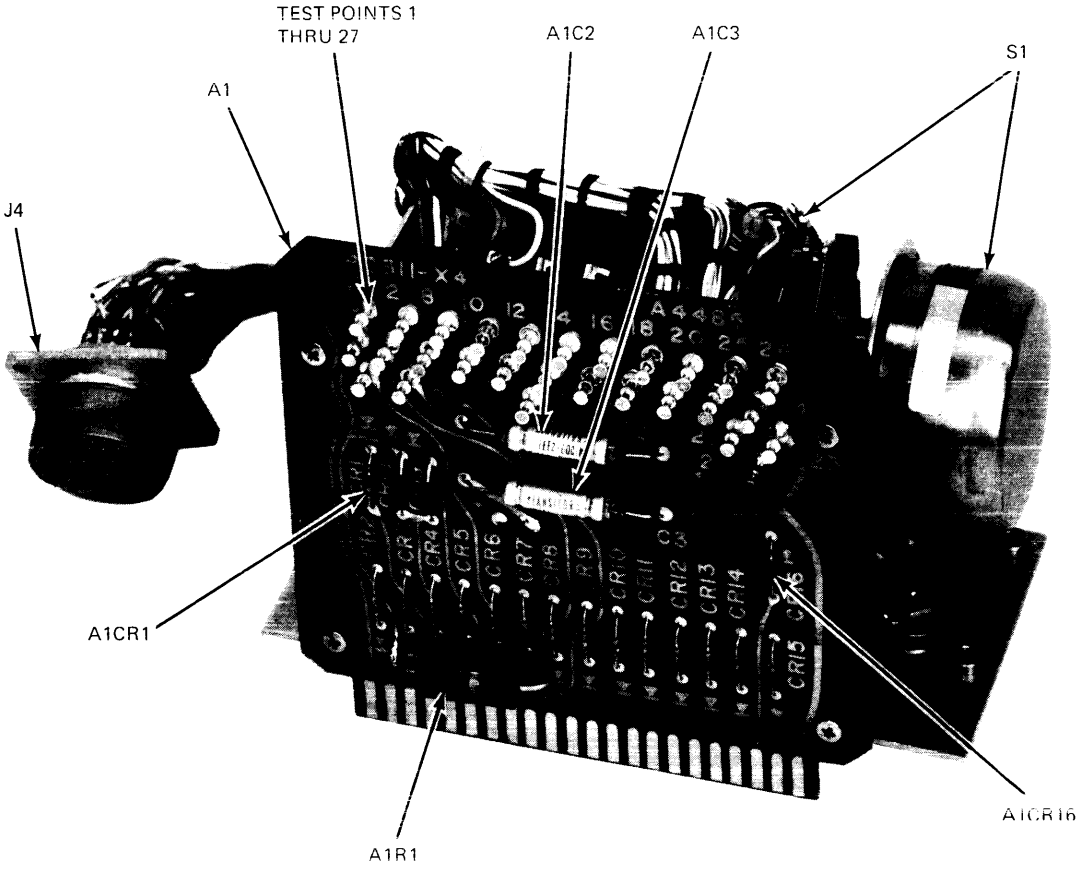
UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTANCE VALUES ARE IN OHMS, 1/2 WATT
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION(S) AS APPLICABLE.

CK 1607

Figure 5-110/5-111. +5V/+28V Power Supply 4A14, Schematic/Component Locations Diagram

011690392



REF DESIG PREFIX 4A15
REF DESIG PREFIX 4A15, 8A15

Figure 5-112. Master Stepping Switch Assembly 4A15, Component Locations Diagram

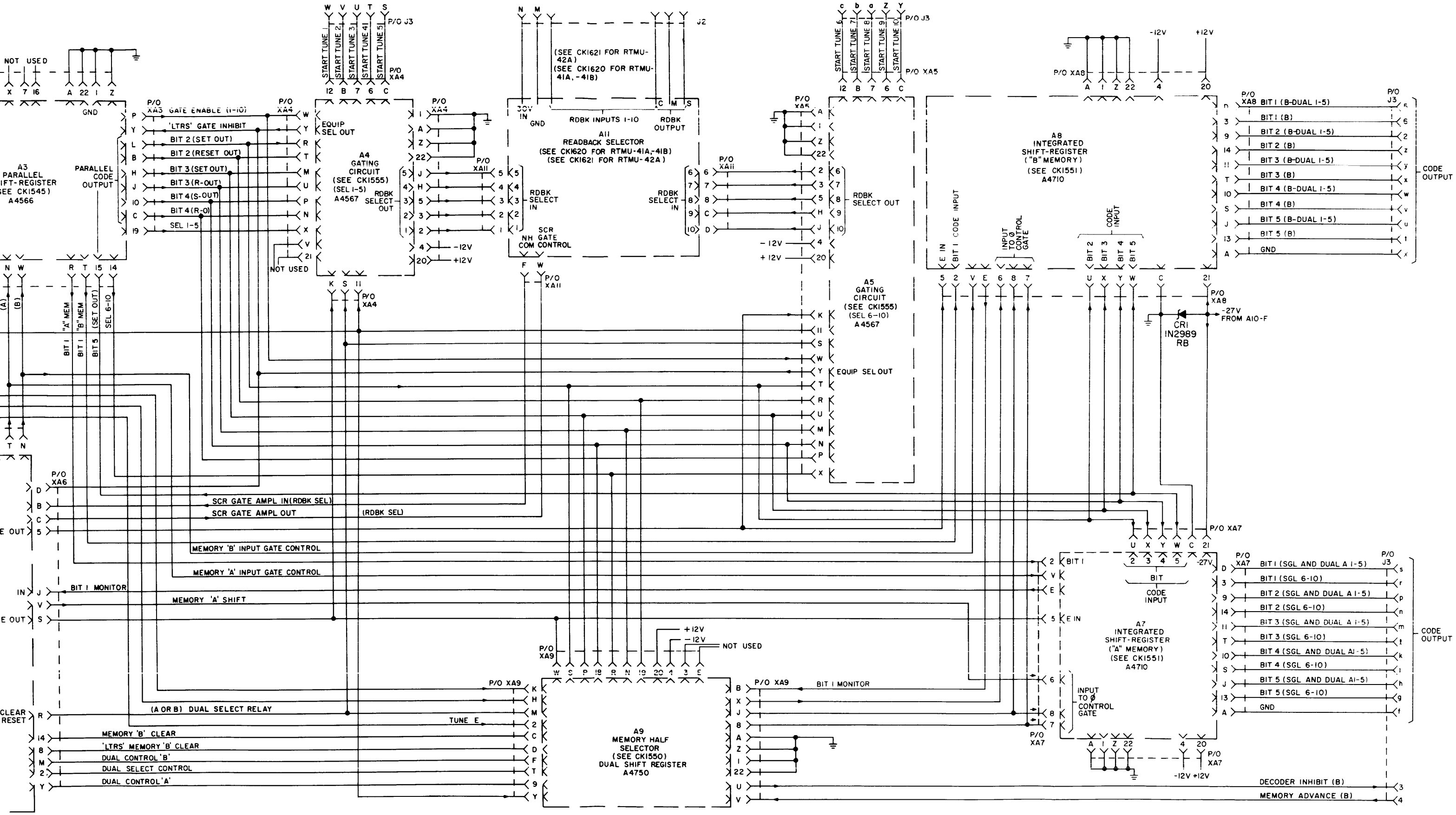
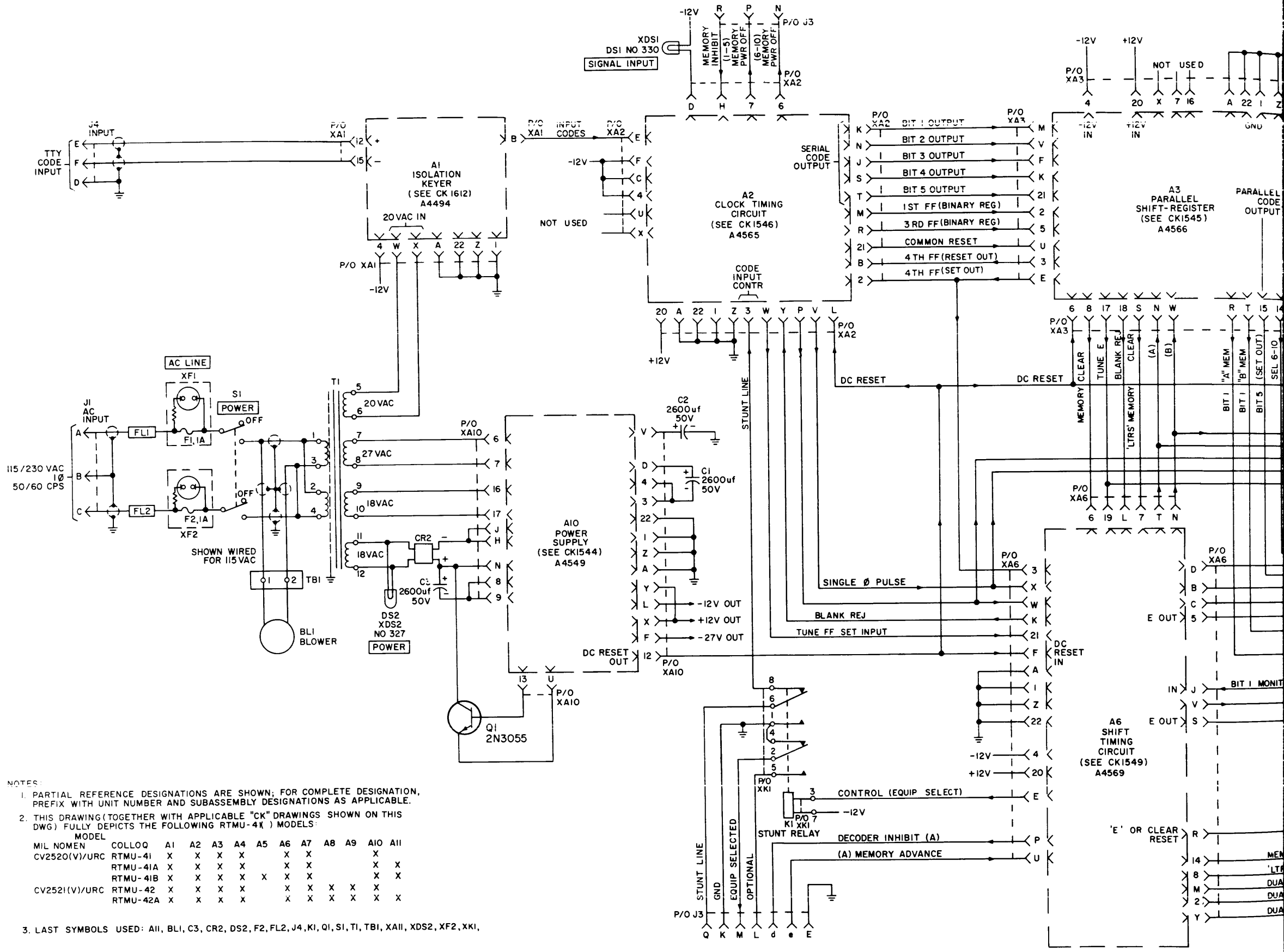


Figure 5-113. Unit 5 (CV-2520(V)/URC), Schematic Diagram

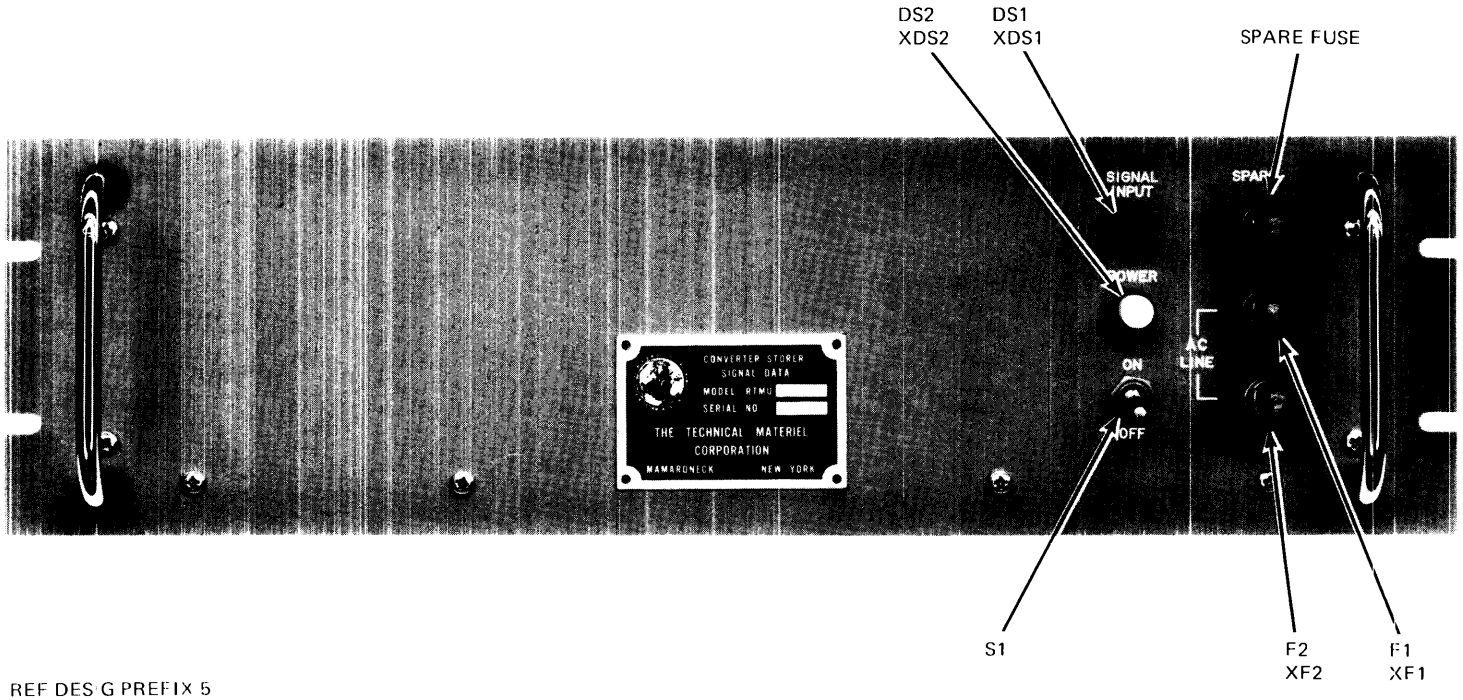


NOTES:

1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUBASSEMBLY DESIGNATIONS AS APPLICABLE.
2. THIS DRAWING (TOGETHER WITH APPLICABLE "CK" DRAWINGS SHOWN ON THIS DWG) FULLY DEPICTS THE FOLLOWING RTMU-4( ) MODELS:

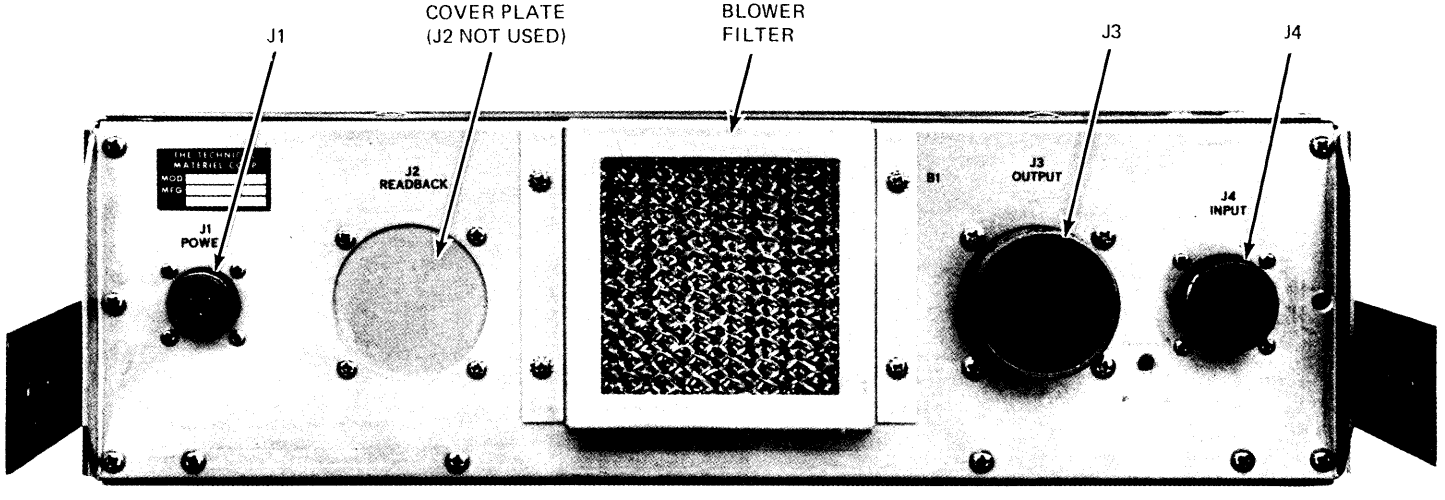
MODEL MIL NOMEN	COLLOQ	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11
CV2520(V)/URC	RTMU-41	X	X	X	X		X	X			X	
	RTMU-41A	X	X	X	X		X	X			X	X
	RTMU-41B	X	X	X	X	X	X	X			X	X
CV2521(V)/URC	RTMU-42	X	X	X	X		X	X	X	X	X	
	RTMU-42A	X	X	X	X		X	X	X	X	X	X

3. LAST SYMBOLS USED: A11, BL1, C3, CR2, DS2, F2, FL2, J4, K1, Q1, S1, T1, TB1, XA11, XDS2, XF2, XK1,



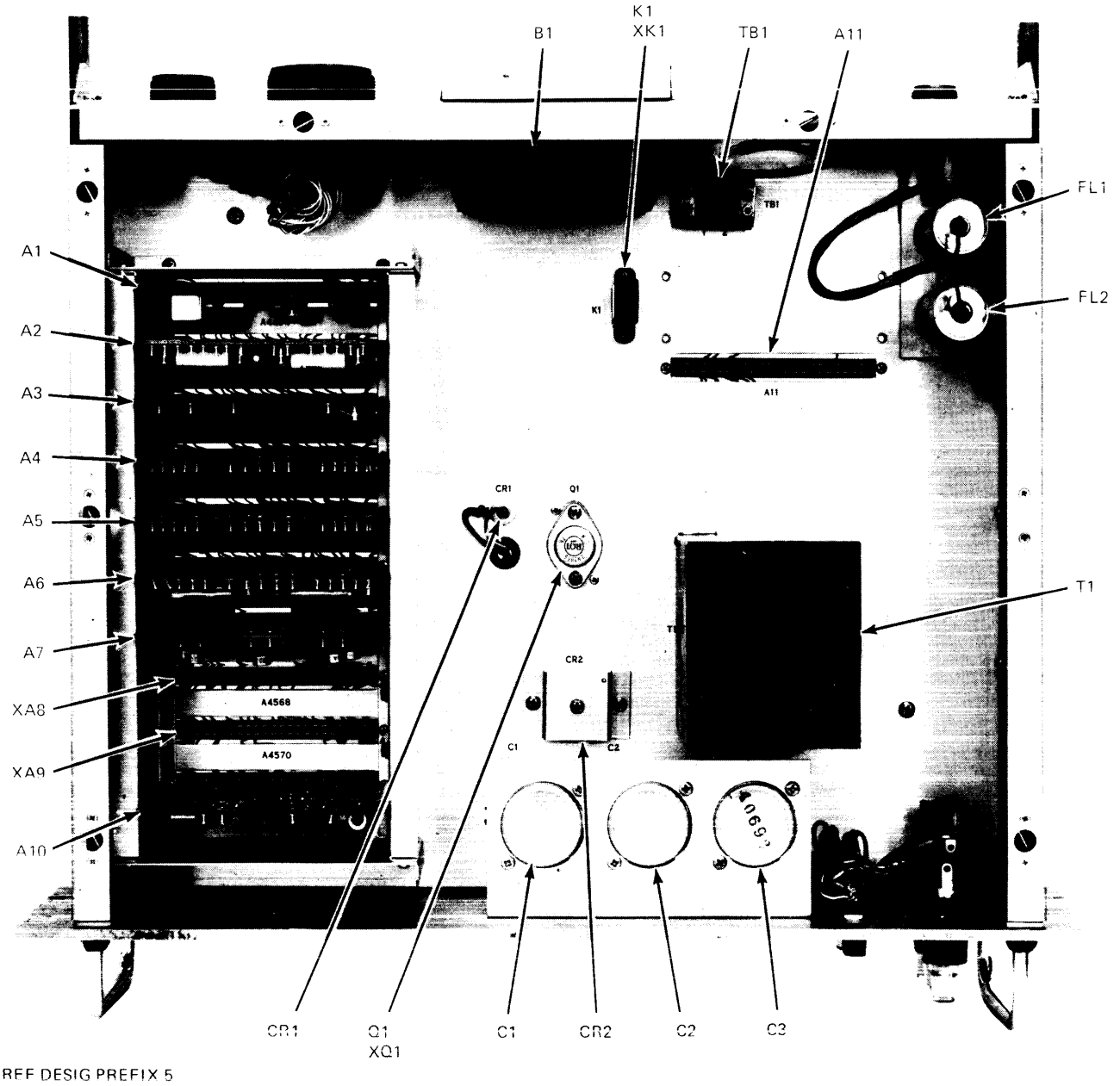
REF DES G PREFIX 5
REF DES G PREFIX 9

Figure 5-114. Unit 5 (CV-2520(V)/URC), Front Panel, Major Component Locations Diagram



REF DESIG PREFIX 5
REF DESIG PREFIX 9

Figure 5-115. Unit 5 (CV-2520(V)/URC), Rear Panel, Major Component Locations Diagram



REF DESIG PREFIX 5

Figure 5-116. Unit 5 (CV-2520(V)/URC), Top View, Major Component Locations Diagram

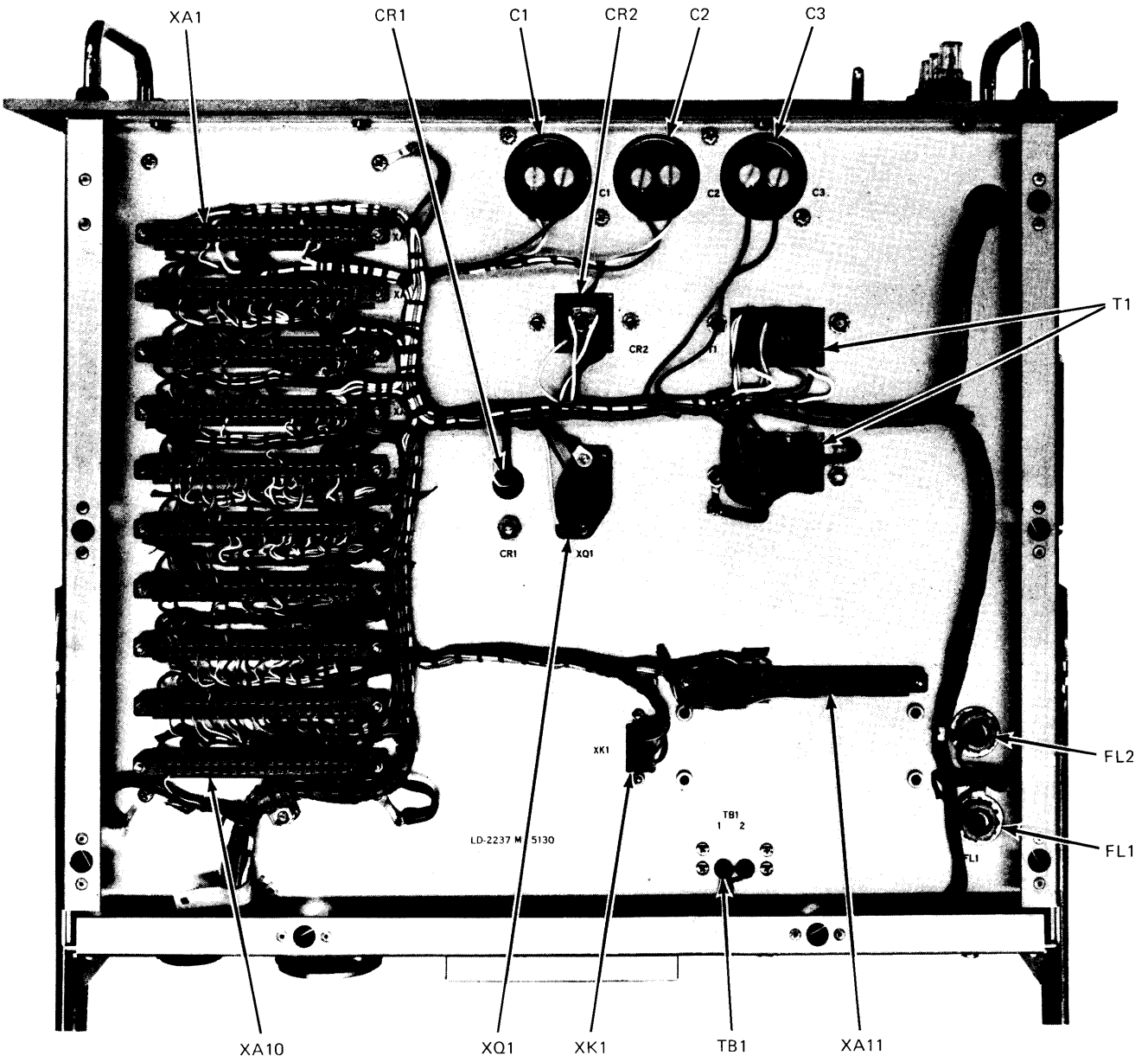
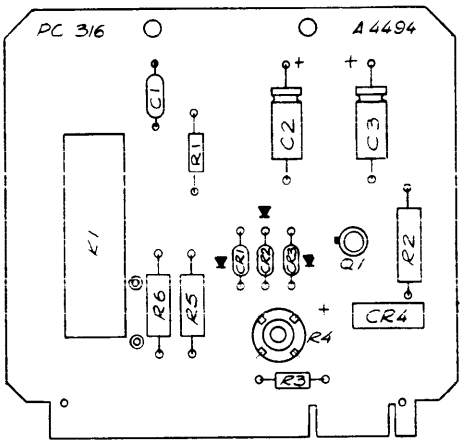
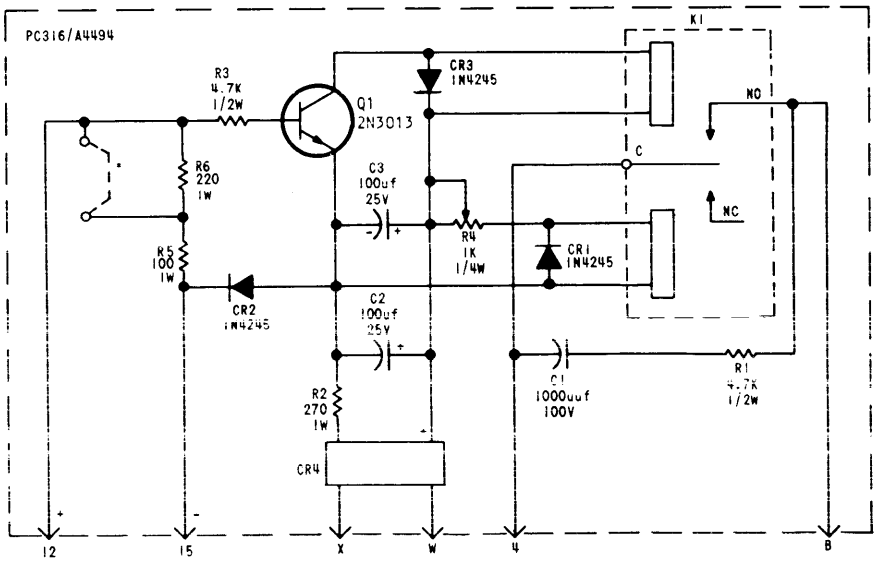


Figure 5-117. Unit 5 (CV-2520(V)/URC), Bottom View, Major Component Locations Diagram





LAST SYMBOL	MISSING SYMBOL
R6 C3 CR4 K1 Q1	

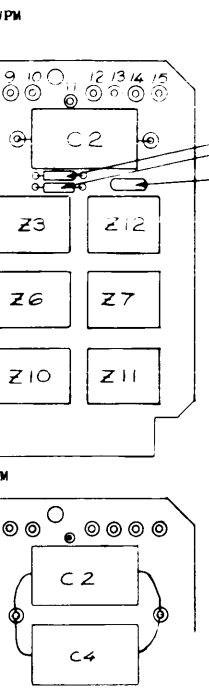
NOTES

1. PARTIAL REFERENCE DESIGNATIONS AS SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION (S) AS APPLICABLE

* 2 STRAP IS INCLUDED WHEN 60mA LOOP IS USED
STRAP IS NOT INCLUDED WHEN 20mA OR 6 VOLT LOOPS ARE USED.

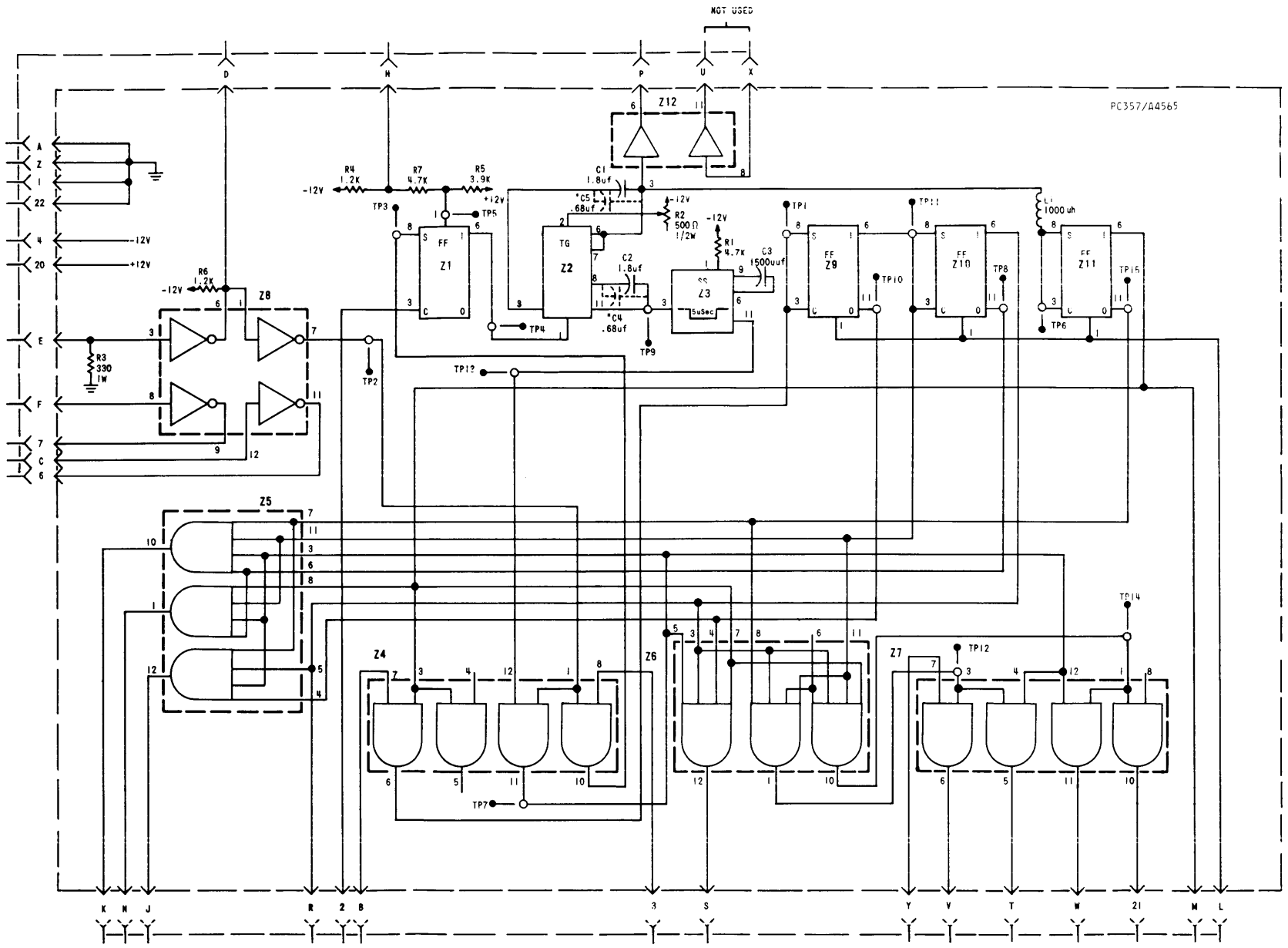
CK 1612

Figure 5-118/5-119. Isolation Keyer 5A1, Schematic/Component Locations Diagram



FOR 100 WPM OPERATION ASSEMBLE C1 & C2
AS SHOWN IN UPPER PICTORIAL

FOR 60 WPM OPERATION ASSEMBLE C1,C5 & C2,C4
AS SHOWN IN LOWER PICTORIAL



CK 1546

MODULE VOLTAGE AND GND CHART

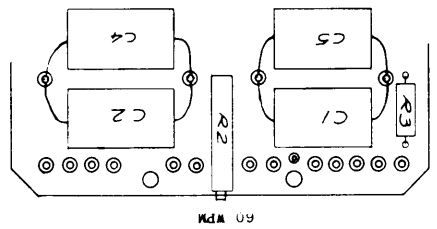
SYMBOL	PIN CONNECTIONS		
	+12V	-12V	GND
Z1,3,9,10,11	10	2	5
Z4,5,6,7		2	
Z2,8	10		5
Z12		2	5

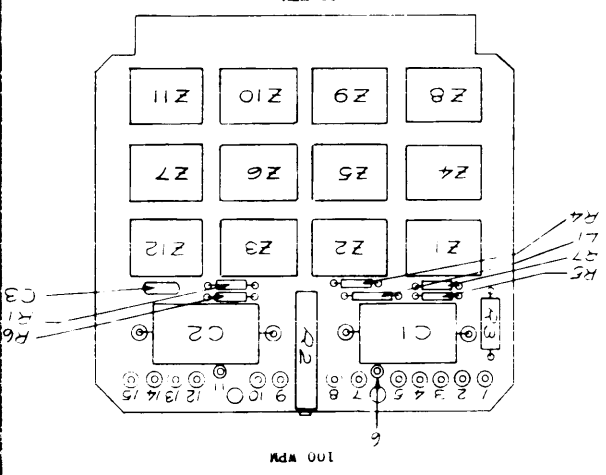
LAST SYMBOL	MISSING SYMBOL
C5	
L1	
R7	
TP15	
Z12	

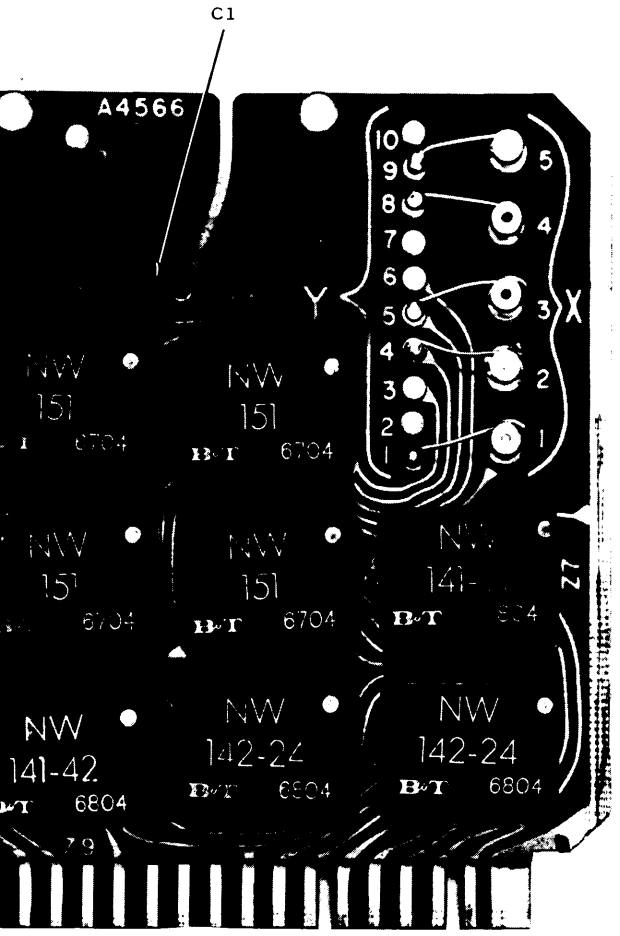
UNLESS OTHERWISE SPECIFIED:

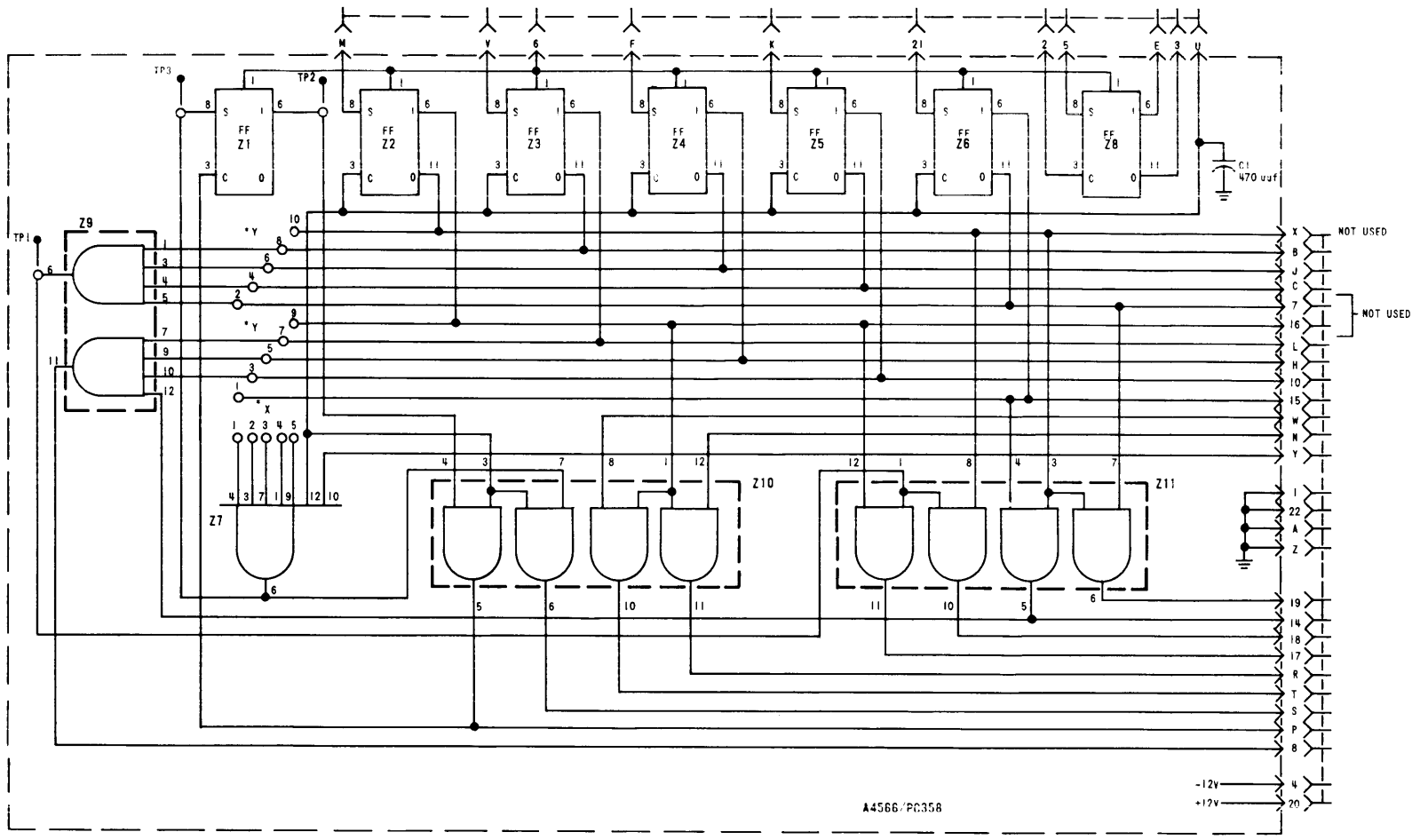
1. ALL RESISTOR VALUES ARE IN OHMS, 1/4W.
* 2. FOR 100 WPM DELETE C4 AND C5
FOR 60 WPM ADD C4 AND C5
3. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION (S) AS APPLICABLE

Figure 5-120/5-121. Clock Timing Circuit 5A2, Schematic/Component Locations Diagram


C4
C5
C2
C1
R2
R3
60 MIN


Z11
Z10
Z9
Z8
Z7
Z6
Z5
Z4
Z12
Z3
Z2
Z1
C2
C1
R2
R3
C3
R6
R4
R5
C7
C1
R4
100 MIN





MODULE VOLTAGE & GND CHART

SYMBOL	PIN CONNECTIONS		
	+12V	-12V	GND
Z1 THRU Z6, Z8	10	2	5
Z10, Z11		2	
Z7		2	
Z9		2	

LAST SYMBOL	MISSING SYMBOL
C1 TP3 Z11	

*EQUIPMENT SELECTION JUMPER GUIDE

EQUIPMENT	JUMPER X				
	1	2	3	4	5
A	Y1		Y4	Y5	Y8 Y9
B	Y1		Y4	Y5	Y7 Y10
C	Y1		Y3	Y6	Y7 Y10
D	Y1		Y3	Y6	Y8 Y9
E	Y1		Y4	Y6	Y7 Y9

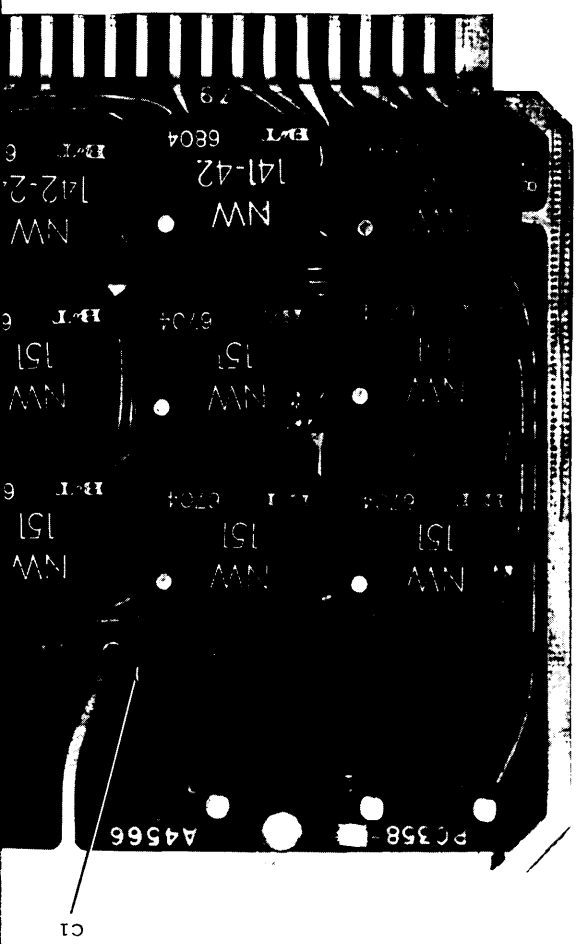
NOTE:

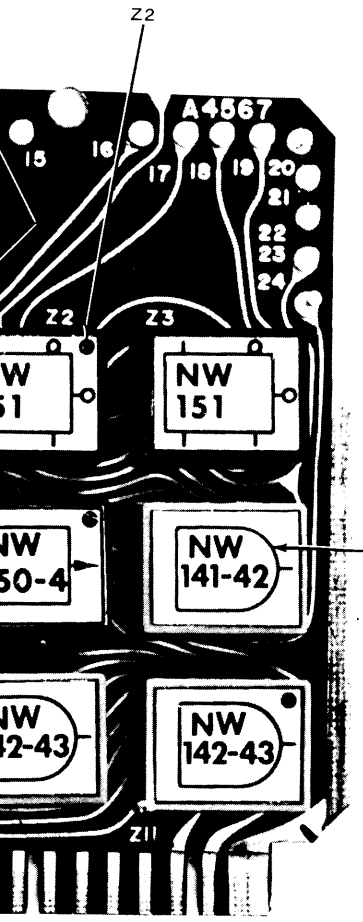
PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION (S) AS APPLICABLE

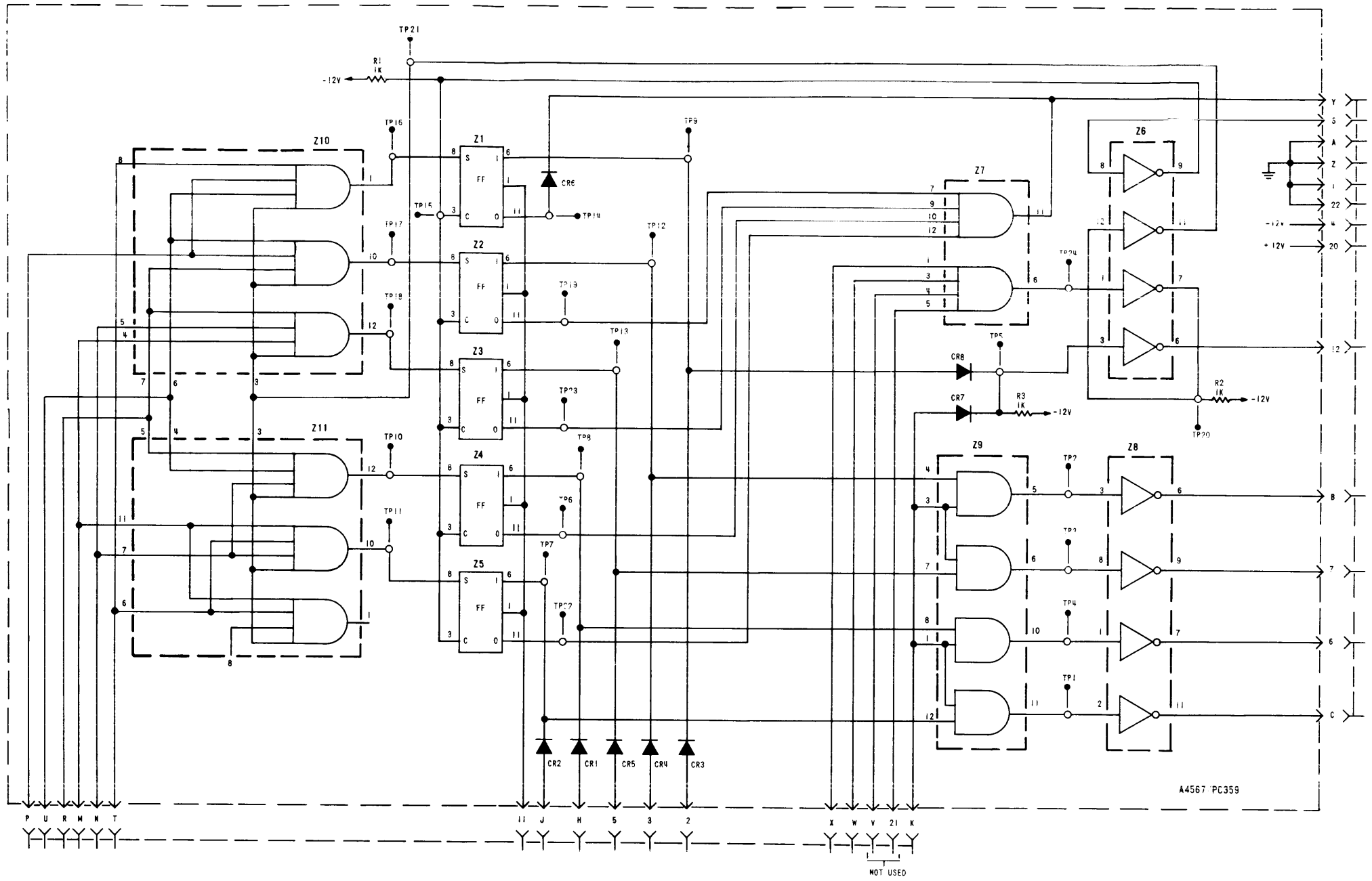
CK 1545

Figure 5-122/5-123. Parallel Shift Register 5A3, Schematic/Component Locations Diagram

011690392


NW
151
141-42
6804
A4566
C1





CK 1555

MODULE VOLTAGE AND GND CHART

SYMBOL	PIN CONNECTIONS		
	+12V	-12V	GND
Z1 THRU Z5	10	2	5
Z6, Z8	10		5
Z7,Z9,Z10,Z11		2	

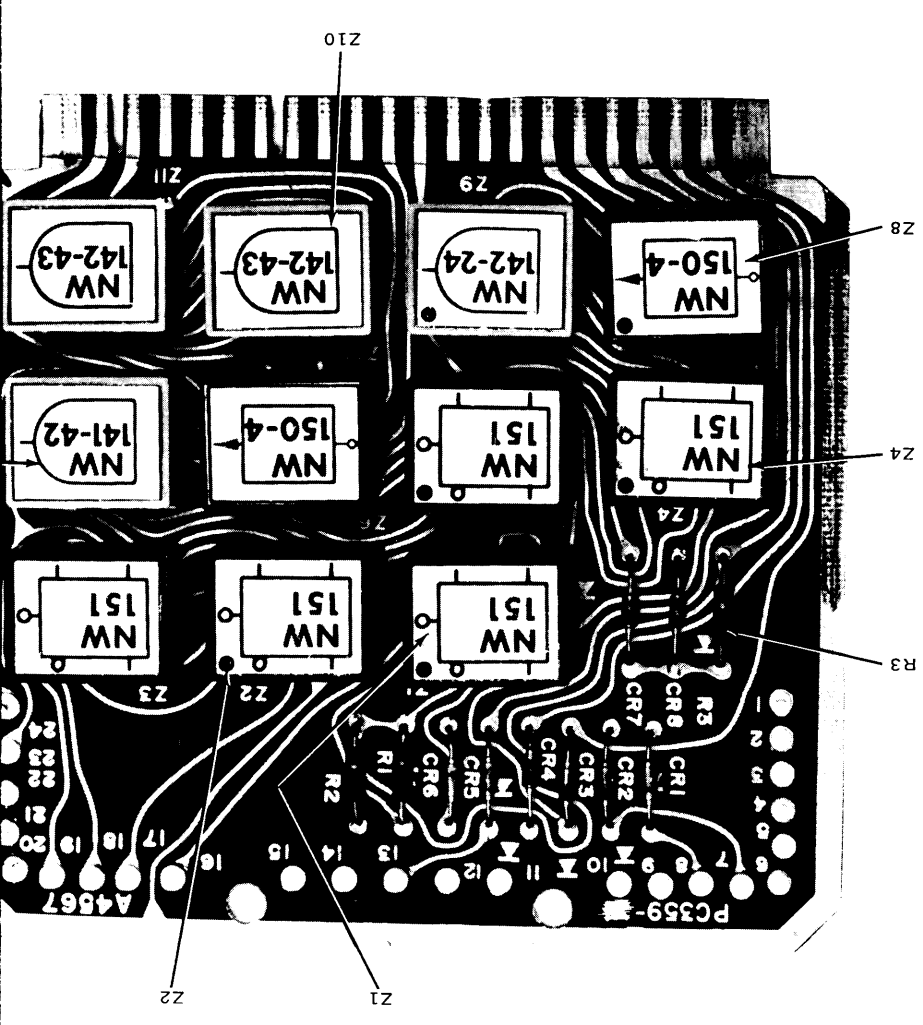
LAST SYMBOL	MISSING SYMBOL
CR8	
R3	
TP24	
Z11	

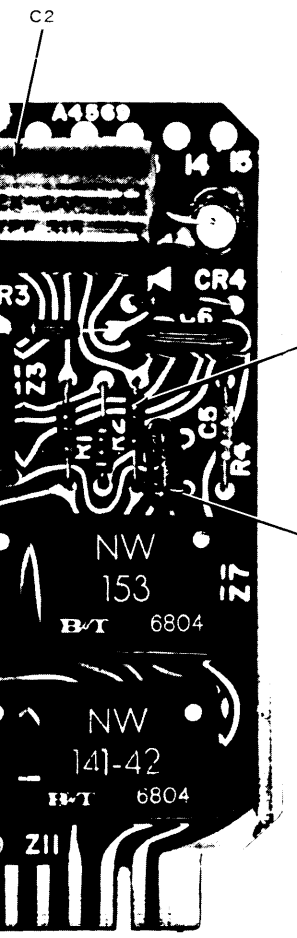
UNLESS OTHERWISE SPECIFIED.

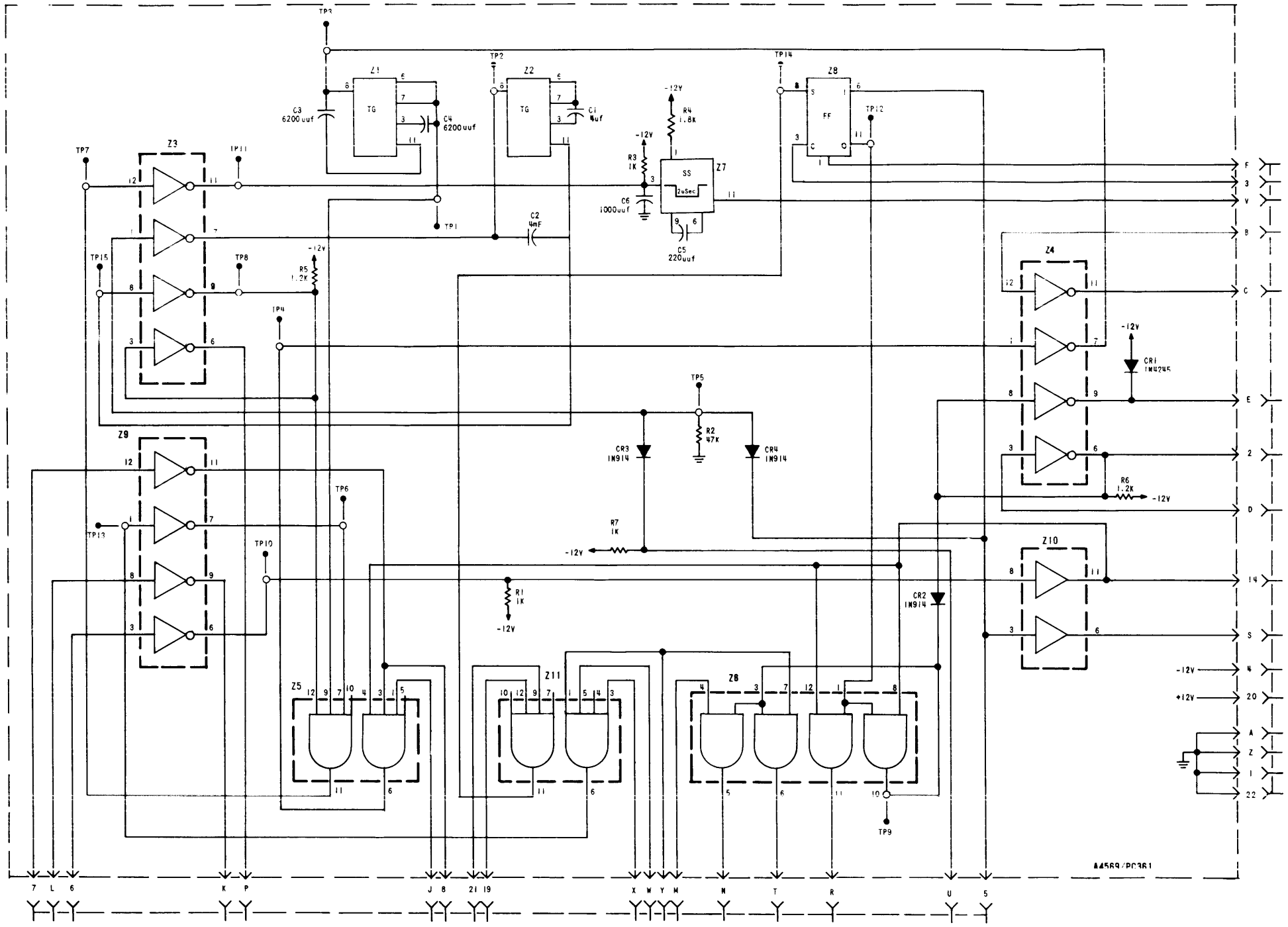
1. ALL RESISTOR VALUES ARE IN OHMS, 1/4W.
2. ALL DIODE VALUES ARE 1N914
3. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION (S) AS APPLICABLE

Figure 5-124/5-125. Gating Circuit 5A4, 5A5, Schematic/Component Locations Diagram

011690392


Z10
Z11
Z9
Z8
NW 150-4
NW 142-24
NW 142-43
NW 141-42
NW 150-4
NW 151
NW 151
NW 151
NW 151
NW 151
NW 151
Z4
Z3
Z2
Z1
R3
R2
R1
CR7
CR6
CR5
CR4
CR3
CR2
CR1
A4567
PC359-





CK 1549

MODULE VOLTAGE AND GND CHART

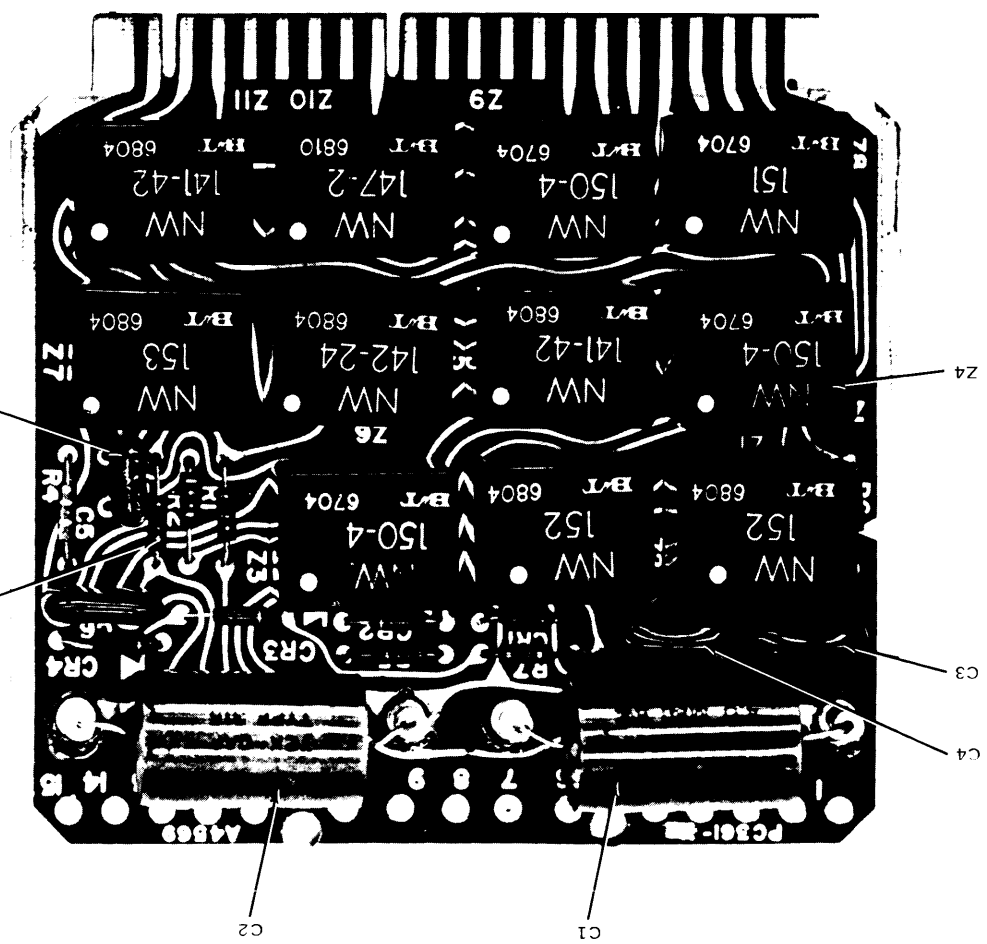
SYMBOL	PIN CONNECTIONS		
	+ 12V	-12V	GND
Z1.Z2.Z7.Z8	10	2	5
Z3.Z4.Z9	10		5
Z5.Z6.Z11		2	
Z10		2	5

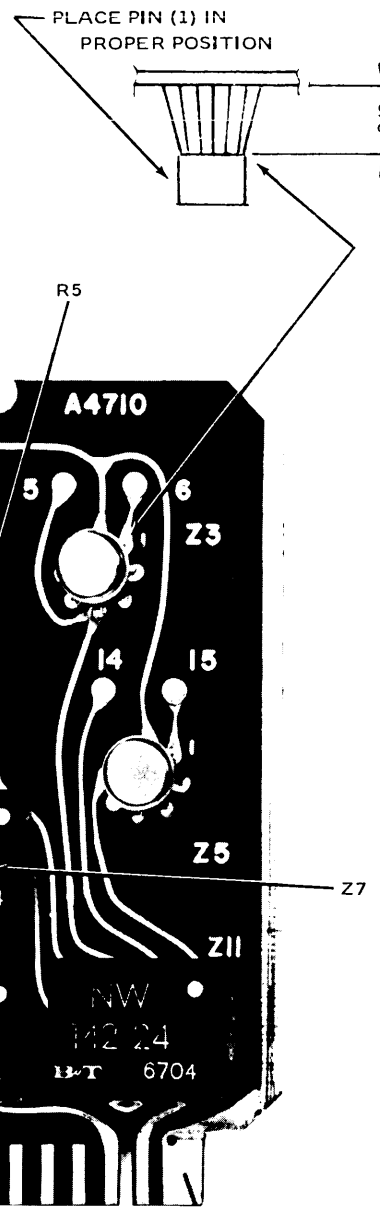
LAST SYMBOL	MISSING SYMBOL
C6	
CR4	
TP15	
Z11	
R7	

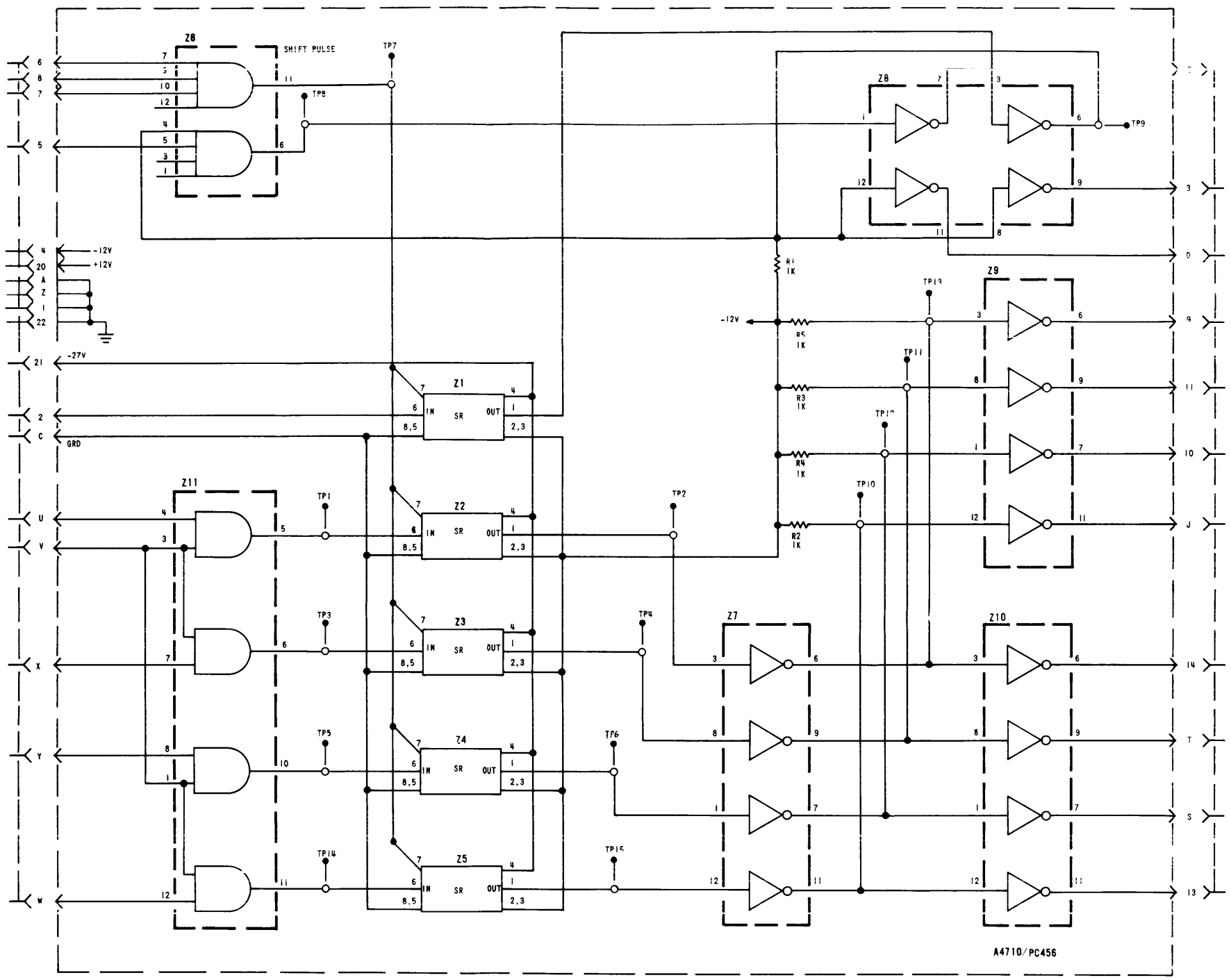
UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTOR VALUES ARE IN OHMS, 1/4W
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION(S) AS APPLICABLE

Figure 5-126/5-127. Shift Timing Circuit 5A6, Schematic/Component Locations Diagram


Z9
Z10 Z11
NW
151
150-4
147-2
141-42
BT 6704
BT 6704
BT 6810
BT 6804
Z6
NW
152
150-4
141-42
142-24
153
BT 6704
BT 6804
BT 6804
BT 6804
Z7
Z4
C3
C4
C1
C2





CK 1551

MODULE VOLTAGE & GND CHART

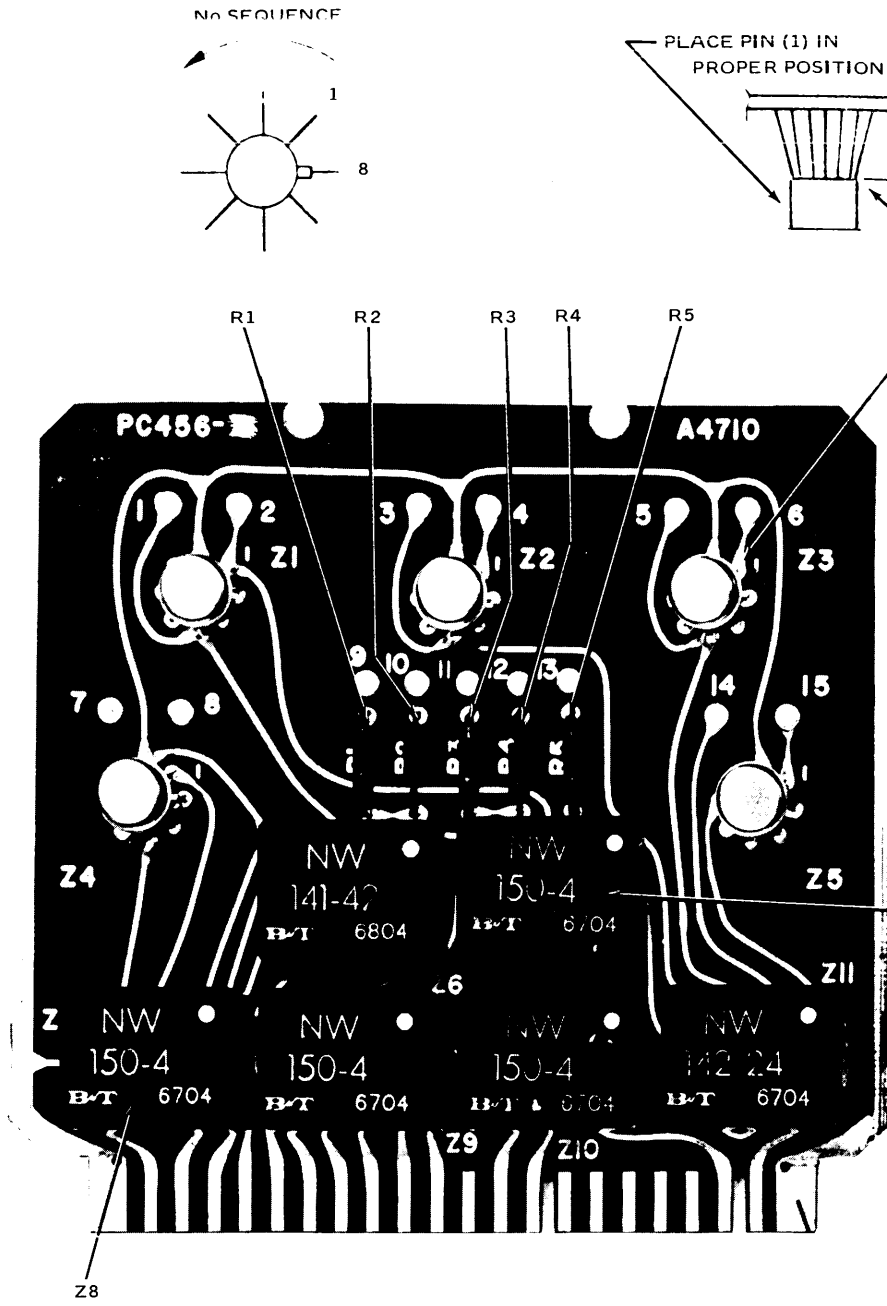
SYMBOL	PIN CONNECTIONS			
	+12V	-12V	GND	-27V
Z1 THRU Z5		2,3	5,8	4
Z6, Z11		2		
Z7,Z8,Z9,Z10	10		5	

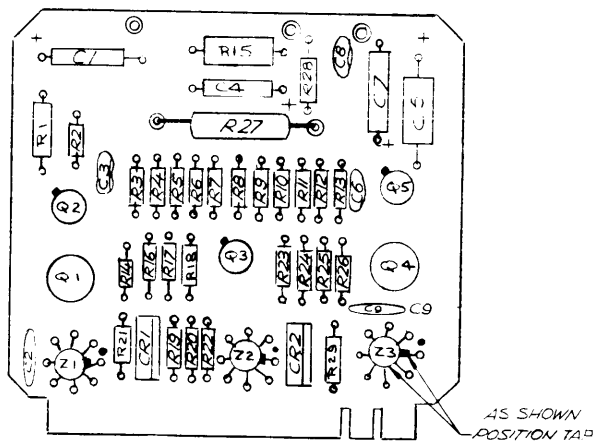
LAST SYMBOL	MISSING SYMBOL
R5 TP15 Z11	

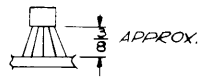
UNLESS OTHERWISE SPECIFIED:

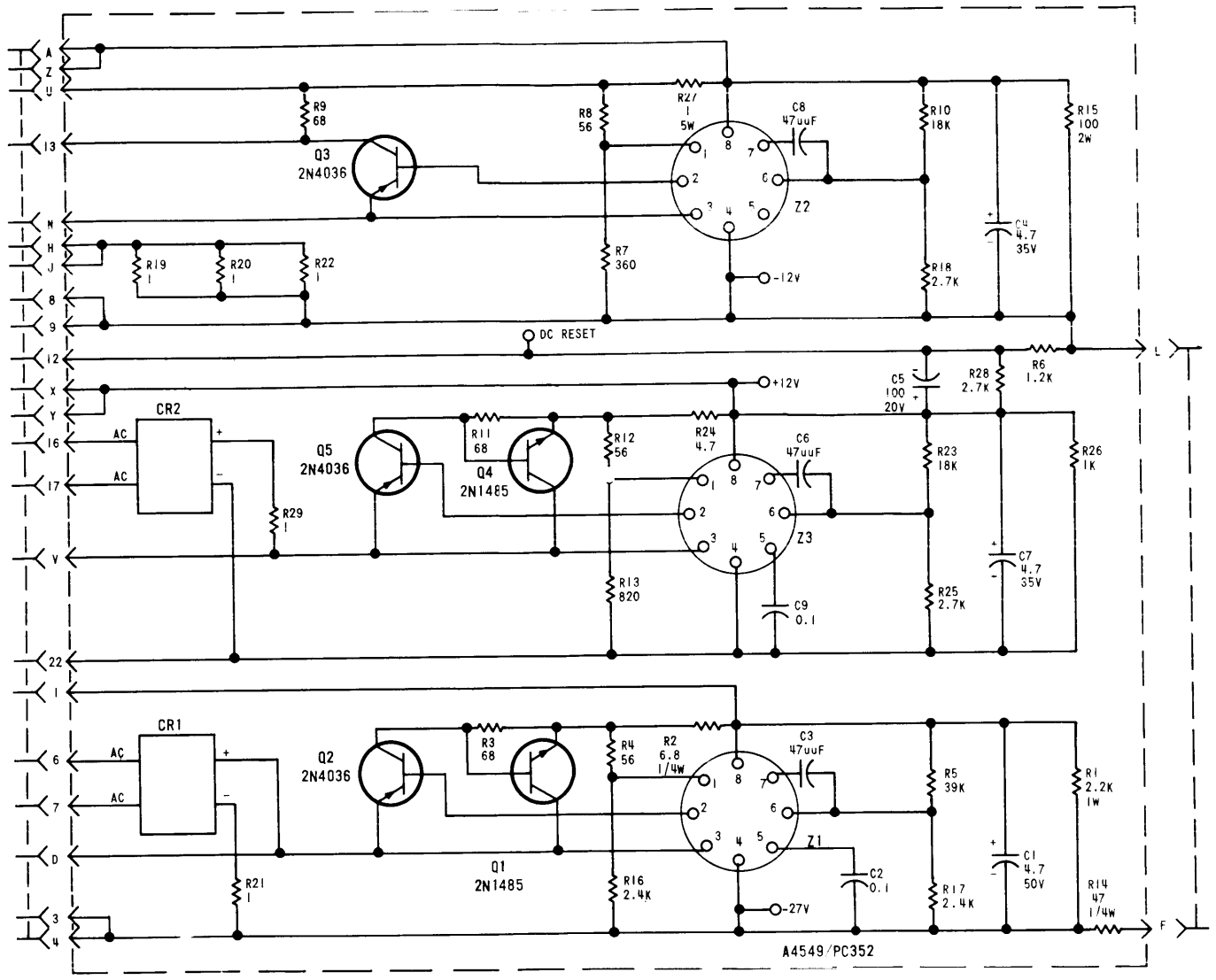
1. ALL RESISTOR VALUES ARE IN OHMS, 1/4W.
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION (S) AS APPLICABLE

Figure 5-128/5-129. Integrated Shift Register 5A7, Schematic/Component Locations Diagram


No SEQUENCE
1
8
PLACE PIN (1) IN
PROPER POSITION
R1
R2
R3
R4
R5
PC456-
A4710
Z1
Z2
Z3
Z4
Z5
Z6
Z7
Z8
Z9
Z10
Z11
NW
141-42
B-T 6804
NW
150-4
B-T 6704
NW
150-4
B-T 6704
NW
150-4
B-T 6704
NW
142 24
B-T 6704







LAST SYMBOL	MISSING SYMBOL
C9	
CR2	
Q5	
R29	
Z3	

UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTOR VALUES ARE IN OHMS. 1/2 WATT.
2. ALL CAPACITOR VALUES ARE IN MICROFARADS.
3. PARTIAL REFERENCE DESIGNATION ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION(S) AS APPLICABLE.

CK 1544

Figure 5-130/5-131. Power Supply 5A10, Schematic/Component Locations Diagram

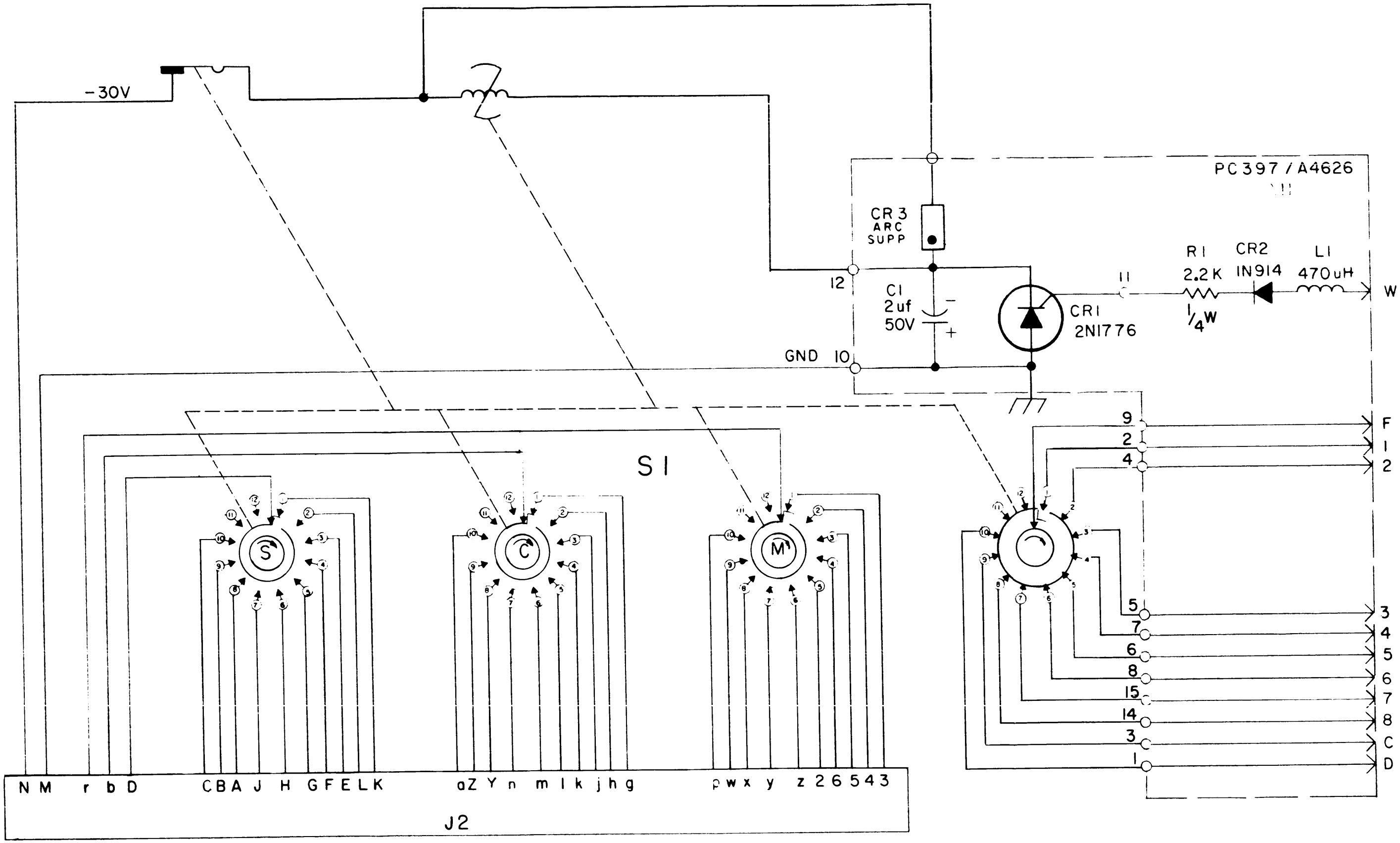
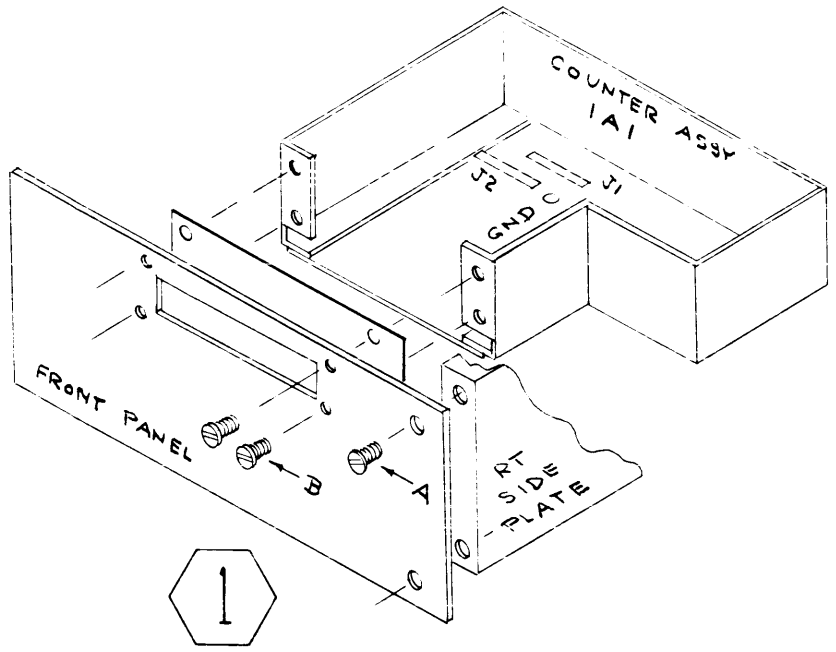
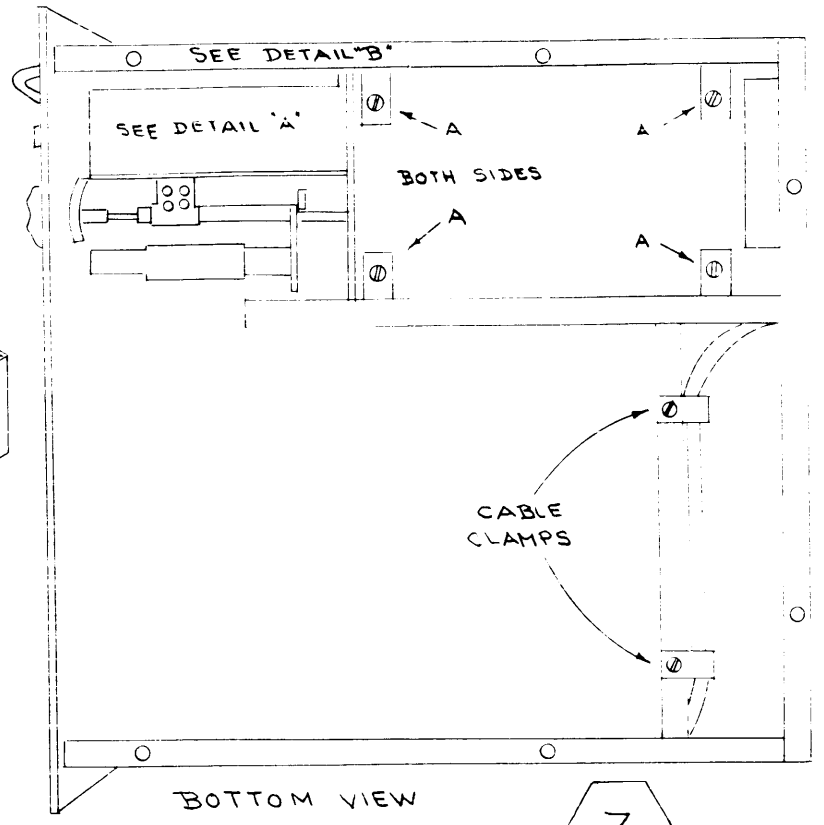
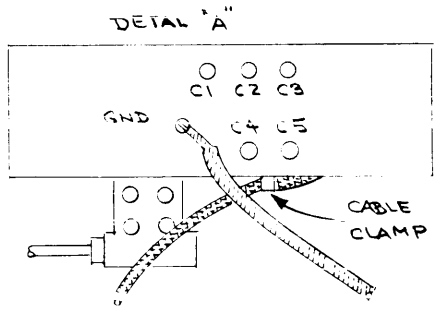
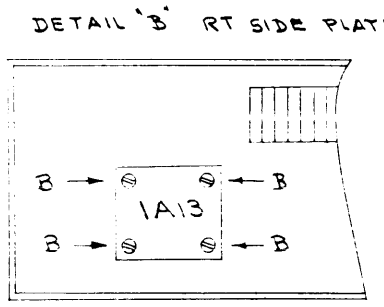


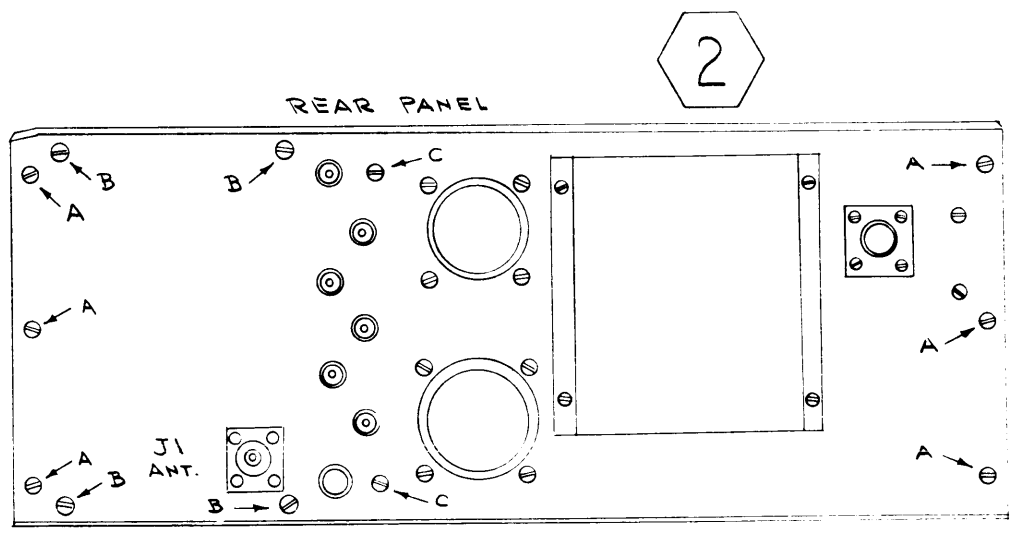
Figure 5-132/5-133. Readback Selector 5A11, Schematic/Component Locations Diagram











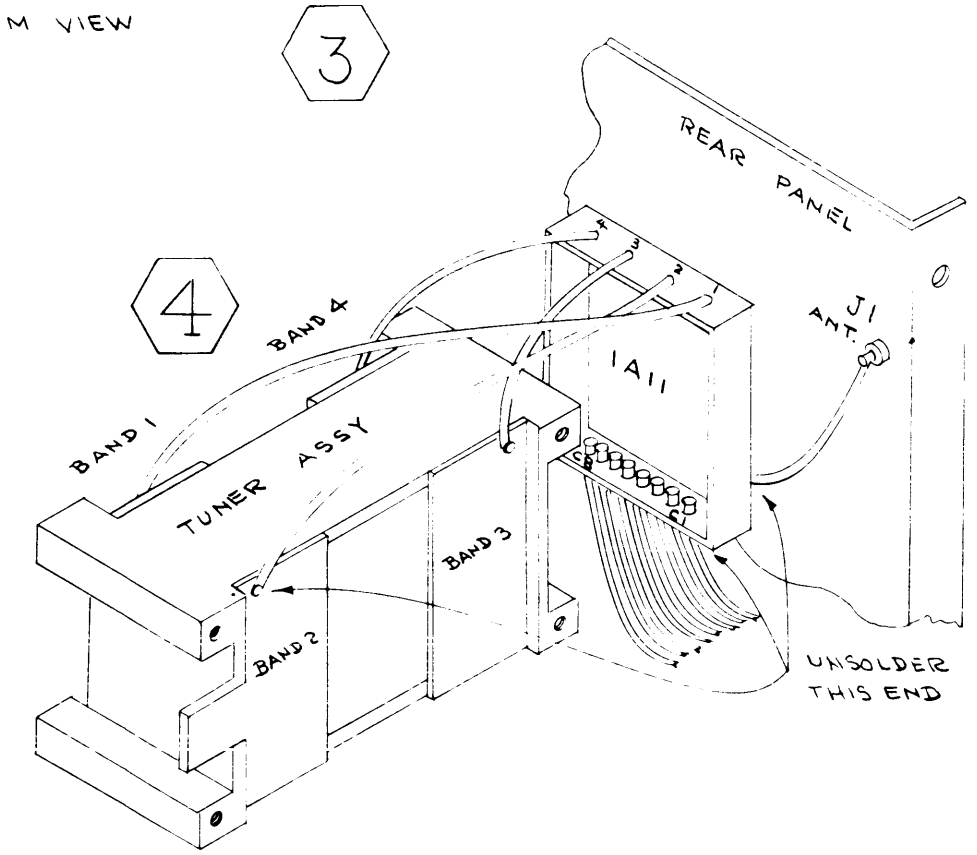


Figure 5-134. Removal of R.F. Tuner and Counter Assemblies