

CONTAINS 108 PAGES

TECHNICAL MANUAL
FOR
RADIO FREQUENCY SYNTHESIZER
O-1207/URC

Manufactured By
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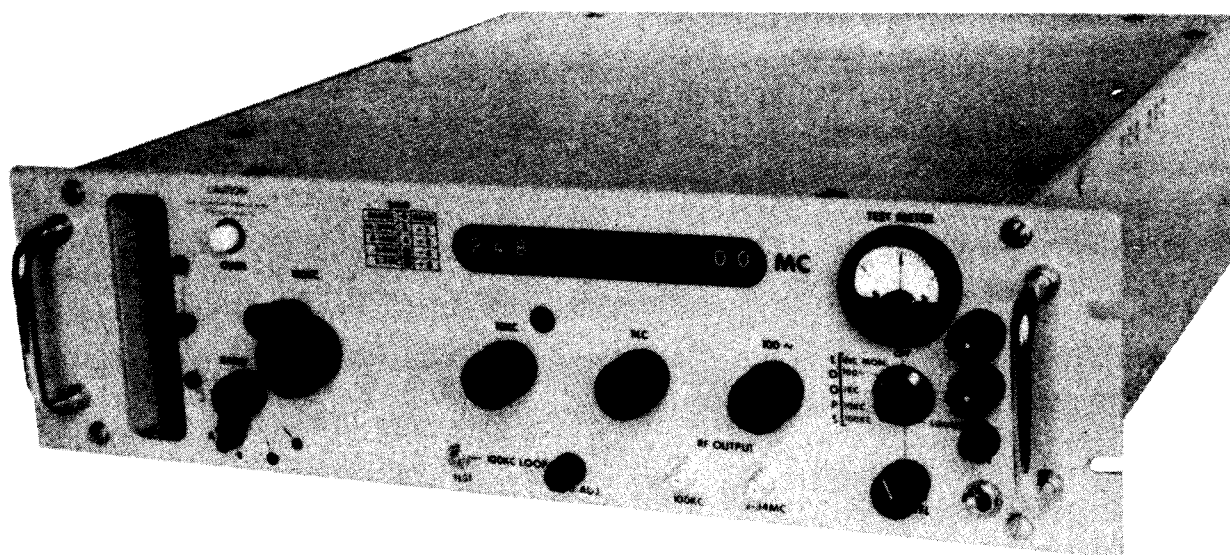


Figure 1-0. Synthesizer, Electrical Frequency, 0-1207/URC

1. INSPECTION AND IDENTIFICATION

1-1. INSPECTION. - If the equipment is found damaged upon delivery, request that an inspection be made by the carrier's agents. The carrier's claim agent will prepare a report which should be sent to Manson Laboratories, Incorporated. We will assist in providing repair or replacement to damaged items.

1-2. IDENTIFICATION. - Include the equipment type and serial number shown on the front cover of any correspondence regarding this equipment and when ordering parts. The serial number on the front cover must match the number that appears on the equipment.

2. DESCRIPTION AND SPECIFICATIONS

2-1. DESCRIPTION. - Radio Frequency Synthesizer Model 274 (hereinafter called "synthesizer") is a precision frequency generator that provides 690,000 output frequencies with a stability of 1 part in 10^8 per day in the range of 2 to 34 mc covered in four bands: 2 to 4 mc, 4 to 8 mc, 8 to 16 mc, and 16 to 34 mc. Auxiliary outputs of 1 mc and 100 kc are also provided.

The synthesizer consists of a main variable frequency oscillator (vfo) that is disciplined by three secondary variable frequency oscillators. All four oscillators are phase locked to a stable (1 part in 10^8), crystal-controlled, 1-mc reference oscillator. As a result, the stability of the synthesizer outputs equals that of the reference oscillator. An external 1-mc standard frequency may be injected to replace the internal reference (if an output stability greater than 1 part in 10^8 per day is required), or to substitute for a defective internal reference oscillator. Two front-panel jacks allow the 2 to 34 mc output frequencies to be checked against a frequency counter using the 100-kc auxiliary output of the synthesizer as the time base. A front-panel meter circuit permits monitoring overall synthesizer performance and individual circuit performance.

2-2. SPECIFICATIONS

OUTPUT FREQUENCY

Range	2 to 34 mc in four bands
Bands and steps	2 to 4 mc in steps of 12.5 cycles 4 to 8 mc in steps of 25 cycles 8 to 16 mc in steps of 50 cycles 16 to 34 mc in steps of 100 cycles
Readout dial	16 to 34 mc in steps of 100 cycles

FREQUENCY STABILITY

1 part in 10^8 per day from a built-in reference standard

OUTPUT LEVEL

Adjustable 0.1 to 2.5 vrms

OUTPUT IMPEDANCE

50 ohms nominal, unbalanced

SPURIOUS SIGNALS

Signals non-related to the output frequencies are down a minimum of 120 db

HARMONIC OUTPUTS

Second harmonic down a minimum of 40 db, all higher order harmonics are negligible

RESETTABILITY ERROR

Zero

REFERENCE FREQUENCY LEVELS

Output 100 kc(1/10 of internal standard)	1 milliwatt into a 500-ohm load
Output 1 mc (internal standard)	50 milliwatts into a 50-ohm load
Input (external 1-mc standard)	20 milliwatts from a 50-ohm load

CRYSTAL

Type of cut	AT
Crystal frequency	999.967 \pm cps
Oscillation frequency	1 mc
Temperature coefficient	0.25 part/ 10^6 /deg C maximum
Operating temperature	75°C

OPERATING AMBIENT TEMPERATURE

0 to 50°C

OPERATING AMBIENT HUMIDITY

0 to 95% RH

INPUT POWER REQUIRED

105/125 vac(pp), 50/60 cycles, single phase.
1.7 amperes drawn at 115 vac

DIMENSIONS
WEIGHT

5-1/4" H x 16-1/2" W x 20" D, nominal
80 lbs

3. INSTALLATION AND OPERATION

3-1. INSTALLATION. - The synthesizer is shipped completely assembled and ready for operation.

The synthesizer is designed to be mounted in a standard 19-inch rack. To rack mount, proceed as follows:

- a. Connect power cable to 115 VAC INPUT jack on rear of synthesizer.
- b. To use the 1-mc output as a reference standard, connect output cable to the 1 MC OUTPUT jack on rear panel. To supply the synthesizer with an external 1-mc reference, connect the reference to the 1 MC INPUT jack on the rear panel and set the INT-EXT switch to EXT.
- c. Place synthesizer in rack and secure in place.
- d. Connect 2 to 34 mc output cable to 2-34 MC jack on front panel.
- e. If desired, connect 100-kc output cable to 100 KC OUTPUT jack on front panel.

3-2. DESCRIPTION OF CONTROLS. - Each control, indicator, and device used to operate the synthesizer is listed in table 3-1 with a description of its function.

3-3. OPERATING PROCEDURE. - To operate the synthesizer, proceed as follows:

- a. Set meter selector switch to INC MON.
- b. Set POWER ON switch to its upper position if the oven has stabilized. (Oven is stabilized when OVEN lamp cycles regularly.) The TEST METER should oscillate for approximately one minute, then remain stationary, indicating that delayed B+ has been applied to the oscillators and that the loops are locked.
- c. Set BAND switch to band containing desired output frequency. Multiply desired output frequency by band factor (table 3-2) to obtain counter frequency.
- d. Using frequency controls, set counter frequency on counter. Ensure that number in circular window is the same as corresponding number on counter.

- e. Set meter selector switch to 100 KC and hold PUSH TO OPERATE switch depressed. Adjust ZERO ADJ control until TEST METER reading is zero. Release PUSH TO OPERATE switch.
- f. Advance meter selector switch to 10 KC position; TEST METER reading should be less than one volt.
- g. Advance meter selector switch to 1 KC position; TEST METER reading should be less than one volt.
- h. Advance meter selector switch to 100 ~ position; TEST METER reading should be less than one volt.
- i. Set meter selector switch to LIMITER position; TEST METER should read at least one volt.
- j. Set meter selector switch to RF LEVEL position (vertically downward). Using RF LEVEL control, set desired output level on TEST METER.
- k. Return meter selector switch to INC MON position, and leave it in this position during operation of the synthesizer. If the meter starts to oscillate, one of the loops has broken lock.

TABLE 3-1. OPERATING CONTROLS AND INDICATORS

CONTROL OR INDICATOR	LOCATION	FUNCTION
POWER ON switch	Lower right	Applies line power to power supply
POWER ON lamp	Lower right	Indicates when line power is applied to power supply
OVEN lamp	Upper left	Indicates when oven is on
BAND switch	Lower left	Selects desired band
100 KC control	Lower left	Selects 100-kc steps of output frequency
10 KC control	Lower center	Selects 10-kc steps of output frequency
1 KC control	Lower center	Selects 1-kc steps of output frequency

TABLE 3-1. OPERATING CONTROLS AND INDICATORS (Continued)

CONTROL OR INDICATOR	LOCATION	FUNCTION
100 ~ control	Lower right	Selects 100-cycle steps of output frequency
PUSH TO OPERATE switch	Lower center	Grounds main-loop error signal when energized
ZERO ADJ control	Lower center	Adjusts main-loop reactance tube so that it is on frequency with no error signal
TEST METER	Upper right	Indicates parameter selected by meter selector switch or BATTERY TEST switch
Meter selector switch	Lower right	Selects parameter indicated by TEST METER
OFF position	---	Meter is disconnected
INC MON	---	Meter indicates whether all loops are locked
100 ~ position	---	Meter indicates d-c error signal in 100-cycle loop
1 KC position	---	Meter indicates d-c error signal in 1-kc loop
10 KC position	---	Meter indicates d-c error signal in 10-kc loop
100 KC position	---	Meter indicates d-c error signal in 100-kc loop
RF LEVEL position (vertically downward)	---	Meter indicates 2 to 34 mc output level
LIMITER position	---	Meter indicates grid current drawn by limiter
RF LEVEL control	Lower right	Controls level of 2-34 mc r-f output
BATTERY TEST switch	Upper right	Connects meter to battery circuit
Counter	Upper center	Indicates output frequency multiplied by band factor

TABLE 3-2. BAND FACTORS

BAND	BAND FACTOR
A	8
B	4
C	2
D	1

4. THEORY

The 16 to 34 mc output of the synthesizer is generated by main loop vfo A6V3, amplified by buffer amplifier A6V2, and divided by output locked divider A3V1. The divided outputs from 2 to 34 mc, in four bands, is amplified by output amplifier A3V2, providing the signal to the output jacks. The remaining circuitry of the synthesizer phase and frequency locks the main loop vfo to the internal 1 mc reference standard.

The stability and accuracy of the synthesizer outputs are derived from 1 mc reference oscillator A8V1, which is temperature regulated by oven A8HR1. The 1 mc output of the oscillator, which has a stability of ± 2 parts in 10^8 per day, is applied to the INT-EXT switch. With the switch in the INT position, the internal 1 mc oscillator is used as the reference for the synthesizer; with the switch in the EXT position, an external 1 mc input can be used. The switch output is fed through 1 mc buffer A8V2 to the 1 MC OUT jack as an auxiliary reference, and is also applied to 10 - kc locked divider A8Q3. The output of the 100 kc locked divider is applied to 100 kc amplifier A8V3. The 100 kc amplifier output is applied to the 100 kc output jack for auxiliary use and is also applied to spectrum generator driver A6V1.

The 100 kc sine wave output from spectrum generator driver is fed through pulse generator A6L2 and converted to 100 kc pulses. These pulses are positively clipped by clipper A6CR1 and are fed to spectrum generator A6C9, and to the phase detectors of the three incremental loops. The 100 kc to 50 mc output of the spectrum generator is fed through bandpass filter A6T1 and A6T2 to produce the 20.4 to 38.4 mc output which is fed to the first mixer of the main loop. The bandpass filter is simultaneously tuned with the spectrum generator to obtain the required output frequency.

The main loop reactance-controlled vfo is tuned by the synthesizer front panel 100 KC and 10 KC controls to within ± 50 kc of the desired frequency in the 16 to 34 mc band. The output of the vfo is amplified by two wide band amplifiers (A13Q1 and A13Q2) and fed to first mixer A11CR1 and A11CR2. The first mixer combines the 16 to 34 mc with the 20.4 to 38.4 mc from the spectrum generator to produce a resultant first i-f output of 4.4000 to 4.3001 mc. The nominal 4.4 mc signal is amplified in the first i-f amplifier and is fed to the second mixer. The second mixer combines this signal with the 4.00 to 3.91 mc signal from the 10 kc loop to produce a 0.4000 to 0.3901 mc second i-f output. The function of the 10 kc loop is to lock the main loop vfo in increments of 10 kc. The second i-f signal is amplified, limited, and applied to the discriminator as one input. The other input to the discriminator is the 0.4000 to 0.3901 mc signal from the 1 kc and 100 cycle loop combiner whose function is to lock the main loop vfo in increments of 1 kc and 100 cycles. Any frequency or phase difference between the two signals produces a d-c correction voltage which is applied to the reactance control. The reactance control changes (corrects) the vfo frequency until the discriminator senses no error or difference between the two input frequencies.

The 10 kc, 1 kc, and 100 cycle (incremental) loops lock the main loop vfo in 10 kc, 1 kc, and 100 cycle steps to the 1 mc reference frequency. Since the three loops are very similar, they will be discussed in general terms. Each incremental loop includes a variable frequency oscillator (vfo), which is tunable in 10 kc steps. The vfo output is fed through a buffer amplifier to a times-ten multiplier. The times-ten multiplier, which is broadband tuned to accommodate the range of vfo frequencies, multiplies the input frequencies by ten so that they are separated by 100 kc (instead of 10 kc) and can be compared with the appropriate harmonic of the 100 kc reference pulses from the spectrum generator. The output of the multiplier is fed through a tuned amplifier and a tuned phase detector driver to a phase detector. The second input to the phase detector consists of the 100 kc pulses

(and harmonics) from the spectrum generator. The output of the phase detector is a varying d-c voltage whose polarity and level are proportional to the frequency and phase offset of the inputs. This locks the vfo on frequency through a reactance control. When the vfo is phase locked, it is maintained within 90 degrees relative to the 1 mc reference oscillator.

NOTE

The amount of frequency deviation over which the vfo can be maintained in phase lock is defined as "hold-in;" the amount of frequency error over which the vfo will drift out of lock and be brought back into phase lock is defined as "pull-in."

The reactance control acts as a varying capacitance output across the vfo tank, which changes the vfo frequency and phase locks the oscillator to the reference. A sweep multivibrator extends the pull-in range of the phase detector and operates only when the vfo breaks phase lock and cannot be controlled by the phase detector.

The 5.00 to 4.91 mc signal from 100 cycle loop buffer amplifier A4V14 is applied to the 500 kc locked divider A2Q2, which reduces the 10 kc increments to 1 kc increments. The 0.500 to 0.491 mc divided output is fed to the third mixer which combines this signal with a 3.50 to 3.41 mc signal from 1 kc loop vfo buffer amplifier A4V10. The resultant output of the two combined frequencies is a 4.000 to 3.901 mc signal. This signal varies in increments of 100 cycles (100 cycle loop vfo has 10 kc increments, 500 kc locked divider reduces these to 1 kc increments, 400 kc locked divider reduces these to 100 cycle increments) and 1 kc (1 kc loop vfo has 10 kc increments, 400 kc locked divider reduces these to 1 kc increments). The signal is fed through discriminator driver A4V16 to the main loop discriminator, where it locks the main loop in increments of 1 kc and 100 cycles.

5. SERVICE

5-1. TEST EQUIPMENT AND SPECIAL TOOLS. - The test equipment listed below, or its equivalent, is required to tune, align, and adjust the synthesizer.

NAME	MANUFACTURER	MODEL	SHORT NAME
Heterodyne Frequency Meter		AN/URM-82	Frequency Meter
Electronic Multimeter		AN/USM-116	Multimeter
1-Megohm Decoupling Resistor			Decoupling Resistor
High Frequency Signal Generator		AN/URM-25F	Signal Generator
Output Termination	Hewlett-Packard	hp 11507A	50-ohm load
Crystal Frequency Standard	Manson Laboratories	CFS-180A	Frequency Standard
Phase Comparator	Manson Laboratories	STS-1	Phase Comparator
Short Wave Receiver	Hallicrafters Inc.	SX-100	WWV Receiver

The test equipment required to perform each procedure is indicated by an X in the box formed by the intersection of the procedure-row and the test equipment-column.

TUNING, ADJUSTMENT OR ALIGNMENT PROCEDURE		TEST EQUIPMENT (SHORT NAME)					
		FREQUENCY METER	MULTIMETER	DECOUPLING RESISTOR	SIGNAL GENERATOR	50 OHM LOAD	EITHER FREQUENCY STANDARD AND PHASE COMPARATOR OR WWV RECEIVER
PARAGRAPH 5-2	SHORT TITLE						
a	100-kc Divider	X	X				
b	10-kc Vfo	X					
c	10-kc Loop		X	X	X		
d	1-kc Vfo	X					
e	1-kc Loop		X	X	X		
f	100-cycle Vfo	X					
g	100-cycle Loop		X	X	X		
h	500-kc Divider	X					
i	400-kc Divider	X					
j	Spect Gen	X	X		X		
k	Main Loop Disc	X	X				
l	Vfo and Counter	X					
m	Main Loop Disc	X	X				
n	Main Loop Vfo	X	X				
o	Output Divider	X					
p	Counter	X				X	
q	Output Amplifier					X	
r	Reference Osc						X
s	First Mixer		X				
t	Power Supply		X				

The special tools required, but not supplied, to perform the procedures, are contained within model STK-1 Tool Kit, manufactured by Manson Laboratories, Inc.

5-2. TUNING. - To facilitate maintenance, tuning instructions for each circuit are complete within themselves, and, with few exceptions are independent of other procedures. As a result, each circuit can be tuned after repair, without having to completely retune the synthesizer. Where a procedure is not independent, adequate references are made within that procedure. If the synthesizer must be completely retuned, perform the procedures in the presented order.

When reference is made to setting a control to a position (for example: set 10 KC control to position 5) adjust the control so that the position number is displayed on the counter associated with the control. Test points, such as TP1, TP2, etc., are shown on the schematic diagrams.

a. Tuning Reference Chassis Locked Divider and 100-kc Buffer. - To tune the reference chassis locked divider and 100-kc buffer, proceed as follows:

- (1) Ground junction of resistor A8R8 and transformer A8T2.
- (2) Loosely couple frequency meter to 100-kc amplifier tube A8V3.

Set frequency meter to 100 kc.

(3) Energize synthesizer, frequency meter, and multimeter; allow to warm up for at least 10 minutes.

WARNING

Be extremely careful when making test connections because synthesizer remains connected to power at all times.

- (4) Tune inductor A8L1 for zero beat on frequency meter.
- (5) Slightly detune frequency meter for clear audio tone.
- (6) Remove ground.
- (7) Tune inductor A8L1 clockwise until loss of clear audio tone indicates divider has broken lock. Then, very slowly retune counterclockwise until return of clear audio tone indicates reestablishment of lock.

- (8) Ground junction of resistor A8R8 and transformer A8T2.
- (9) Tune frequency meter for zero beat and record frequency.
- (10) Remove ground.
- (11) Slightly detune frequency meter for clear audio tone.
- (12) Tune inductor A8L1 counterclockwise until loss of clear audio tone indicates divider has broken lock. Then, very slowly retune clockwise until return of clear audio tone indicates reestablishment of lock.
- (13) Ground junction of resistor A8R8 and transformer A8T2.
- (14) Tune frequency meter for zero beat and record frequency.
- (15) Determine average value of frequencies obtained in steps (9) and (14) by adding frequencies and dividing by 2, and set frequency meter to this frequency.
- (16) Tune inductor A8L1 for zero beat on frequency meter.
- (17) Remove ground and uncouple frequency meter.
- (18) Connect multimeter to 100 KC OUT jack.
- (19) Tune inductor A8L2 for maximum reading on multimeter.
- (20) Disconnect multimeter.

b. Tuning 10-kc Loop VFO Trimmer Capacitors. - To tune the 10-kc loop vfo trimmer capacitors proceed as follows:

- (1) Ground junction of capacitors A4C3 and A4C23. Loosely couple frequency meter to vfo buffer tube A4V8.
- (2) Energize synthesizer and frequency meter; allow to warm up for at least 10 minutes.

WARNING

Be extremely careful when making test connections because synthesizer remains connected to power at all times.

NOTE

Whenever synthesizer frequency is changed, PUSH TO OPERATE switch must be depressed momentarily.

(3) Set synthesizer to 16.00 mc (band D: 16,000,000 on counter); set frequency meter to 4.000 mc.

(4) Remove sweep multivibrator tube A5V6.

(5) Tune vfo transformer A4T4 for zero beat on frequency meter.

(6) Uncouple frequency meter, remove ground, and replace tube.

c. Tuning 10-kc Loop Inductors and Capacitors. - To tune the 10-kc loop inductors and capacitors proceed as follows:

(1) Set 10 KC control to position 5.

(2) Remove sweep multivibrator tube A5V6.

(3) Connect multimeter to pin 7 of multiplier tube A4V3 through 1 megohm decoupling resistor and ground junction of capacitors A4C3 and A4C23. Energize synthesizer, signal generator, and multimeter; allow to warm up for at least 10 minutes. Then, momentarily depress PUSH TO OPERATE switch.

WARNING

Be extremely careful when making test connections because synthesizer remains connected to power at all times.

(4) Tune capacitor A4C50 for maximum reading of at least 20 vdc negative on multimeter.

NOTE

Whenever synthesizer frequency is changed, PUSH TO OPERATE switch must be depressed momentarily.

(5) Repeat step (4) for equal voltages (balance) at positions 0 and 9 of 10 KC control.

(6) Set 10 KC control to position 5 and connect multimeter to pin 7 of phase detector driver tube A4V1 through 1 megohm decoupling resistor.

(7) Remove vfo buffer tube A4V8.

(8) Set signal generator to 39.5 mc at 0.1 volts, and connect to pin 7 of multiplier tube A4V3.

(9) Tune inductors A4L3 and A4L2 for maximum reading on multimeter.

(10) Disconnect signal generator and replace tube A4V8.

(11) Retune inductor A4L2 for a minimum reading of 8 to 10 vdc on the multimeter. If necessary, retune inductors A4L2 and A4L3 so voltages at positions 0 and 9 of 10 KC control are balanced at 4.5 vdc minimum and are within 0.6 vdc of each other; however, maximum voltage should always occur at position 5.

NOTE

It is more important to obtain balanced (equal) voltages than to maintain a minimum reading of 8 to 10 vdc.

(12) Set 10 KC control to position 5 and connect multimeter to junction of capacitors A4C1 and A4C2.

(13) Tune phase detector driver capacitor A4C10 for a maximum reading on multimeter. If necessary, retune capacitor A4C10 so voltages at positions 0 and 9 of 10 KC control are balanced at 7 vdc negative minimum and are within 0.6 vdc of each other.

(14) Remove ground.

(15) Ground pin 7 of phase detector driver tube A4V1 and set 10 KC control to position 5.

(16) Tune pulse driver inductor A6L1 for maximum reading of at least 13 to 15 vdc negative on multimeter.

(17) Replace tube A5V6, remove ground, and disconnect multimeter.

d. Tuning 1-kc Loop Vfo Trimmer Capacitor. - To tune the 1-kc loop vfo trimmer capacitor, proceed as follows:

(1) Ground junction of capacitors A4C3 and A4C23. Loosely couple frequency meter to vfo buffer tube A4V10.

(2) Energize synthesizer and frequency meter; allow to warm up for at least 10 minutes.

WARNING

Be extremely careful when making test connections because synthesizer remains connected to power at all times.

NOTE

Whenever synthesizer frequency is changed, PUSH TO OPERATE switch must be depressed momentarily.

(3) Set synthesizer to 16.00 mc (band D: 16,000,000 on counter); set frequency meter to 3.500 mc.

(4) Remove sweep multivibrator tube A5V5.

(5) Tune vfo transformer A4T5 for zero beat on frequency meter.

(6) Uncouple frequency meter, remove ground, and replace tube.

e. Tuning 1-kc Loop Inductors and Capacitors. - To tune the 1-kc loop inductors and capacitors proceed as follows:

(1) Set 1 KC control to position 5.

(2) Remove sweep multivibrator tube A5V5.

(3) Connect multimeter to pin 7 of multiplier tube A4V6 through

1 megohm decoupling resistor and ground junction of capacitors A4C3 and A4C23. Energize synthesizer, signal generator, and multimeter; allow to warm up for at least 10 minutes. Then momentarily depress PUSH TO OPERATE switch.

WARNING

Be extremely careful when making test connections because synthesizer remains connected to power at all times.

(4) Tune capacitor A4C61 for maximum reading of at least 20 vdc negative on multimeter.

NOTE

Whenever synthesizer frequency is changed, PUSH TO OPERATE switch must be depressed momentarily.

(5) Repeat step (4) for equal voltages (balance) at positions 0 and 9 of 1 KC control.

(6) Set 1 KC control to position 5 and connect multimeter to pin 7 of phase detector driver tube A4V6 through 1 megohm decoupling resistor.

(7) Remove vfo buffer tube A4V10.

(8) Set signal generator to 34.5 mc at 0.1 volts and connect to pin 7 of multiplier tube A4V6.

(9) Tune inductors A4L5 and A4L6 for maximum reading on multimeter.

(10) Disconnect signal generator and replace tube A4V10.

(11) Retune inductor A4L5 for minimum reading of 8 to 10 vdc on the multimeter. If necessary, retune inductors A4L5 and A4L6 so voltages at positions

0 and 9 of 1 KC control are balanced at 4.5 vdc minimum and are within 0.6 vdc of each other; however, maximum voltage should always occur at position 5.

NOTE

It is more important to obtain balanced (equal) voltages than to maintain a minimum reading of 8 to 10 vdc.

(12) Set 1 KC control to position 5 and connect multimeter to junction of capacitors A4C21 and A4C22.

(13) Tune phase detector driver capacitor A4C29 for a maximum reading on multimeter. If necessary, retune capacitor A4C29 so voltages at positions 0 and 9 of 1 KC control are balanced at 7 vdc negative minimum and are within 0.6 vdc of each other.

(14) Remove ground.

(15) Ground pin 7 of phase detector driver tube A4V4 and set 1 KC control to position 5.

(16) Tune pulse driver inductor A6L1 for maximum reading of at least 13 to 15 vdc negative on multimeter.

(17) Replace tube A5V5, remove ground, and disconnect multimeter.

f. Tuning 100-cycle Loop Vfo Trimmer Capacitors. - To tune 100-cycle loop vfo trimmer capacitors, proceed as follows:

(1) Ground junction of capacitors A4C3 and A4C23. Loosely couple frequency meter to vfo buffer tube A4V14.

(2) Energize synthesizer and frequency meter; allow to warm up for at least 10 minutes.

WARNING

Be extremely careful when making test connections because synthesizer remains connected to power at all times.

NOTE

Whenever synthesizer frequency is changed, PUSH TO OPERATE switch must be depressed momentarily.

(3) Set synthesizer to 16.00 mc (band D: 16,000,000 on counter); set frequency meter to 5.000 mc.

(4) Remove sweep multivibrator tube A5V4.

(5) Tune vfo transformer A4T8 for zero beat on frequency meter.

(6) Uncouple frequency meter, remove ground, and replace tube.

g. Tuning 100-cycle Loop Inductors and Capacitors. - To tune the 100-cycle loop inductors and capacitors, proceed as follows:

(1) Set 100-cycle control to position 5.

(2) Remove sweep multivibrator tube A5V4.

(3) Connect multimeter to pin 7 of multiplier tube A5V3 through 1 megohm decoupling resistor and ground junction of capacitors A4C3 and A4C23. Energize synthesizer, signal generator, and multimeter; allow to warm up for at least 10 minutes. Then momentarily depress PUSH TO OPERATE switch.

WARNING

Be extremely careful when making test connections because synthesizer remains connected to power at all times.

(4) Tune capacitor A4C81 for a maximum reading of at least 20 vdc negative on multimeter.

NOTE

Whenever synthesizer frequency is changed, PUSH TO OPERATE switch must be depressed momentarily.

- (5) Repeat step (4) for equal voltages (balance) at positions 0 and 9 of 100 cycle control.
- (6) Set 100 cycle control to position 5 and connect multimeter to pin 7 of phase detector driver tube A5V1 through 1 megohm decoupling resistor.
- (7) Remove vfo buffer tube A4V14.
- (8) Set signal generator to 49.5 mc at 0.1 volts and connect to pin 7 of multiplier tube A5V3.
- (9) Tune inductors A5L2 and A5L3 for maximum reading on multimeter.
- (10) Disconnect signal generator and replace tube A4V14.
- (11) Retune inductor A5L2 for a minimum reading of 8 to 10 vdc on the multimeter. If necessary, retune inductors A5L2 and A5L3 so voltages at positions 0 and 9 of 100 cycle control are balanced at 4.5 vdc minimum and are within 0.6 vdc of each other; however, maximum voltage should always occur at position 5.

NOTE

It is more important to obtain balanced (equal) voltages than to maintain a minimum reading of 8 to 10 vdc.

- (12) Set 100 cycle control to position 5 and connect multimeter to junction of capacitors A5C1 and A5C2.
- (13) Tune phase detector driver capacitor A5C9 for a maximum reading on multimeter. If necessary, retune capacitor A5C9 so voltages at positions 0 and 9 of 100 cycle control are balanced at 7 vdc negative minimum and are within 0.6 vdc of each other.
- (14) Remove ground.
- (15) Ground pin 7 of phase detector driver tube A5V1 and set 100 cycle control to position 5.

(16) Tune pulse driver inductor A6L1 for a maximum reading of at least 13 to 15 vdc negative on multimeter.

(17) Replace tube A5V4, remove ground, and disconnect multimeter.

h. Tuning 500-kc Locked Divider. - To tune the 500-kc locked divider, proceed as follows:

(1) Loosely couple frequency meter to third mixer tube A12V1. Remove buffer amplifier tube A4V10.

NOTE

Perform steps (2) through (19) for pair A (see table 5-1); then repeat steps for pairs B, C, D, and E, respectively. Make sure to use applicable frequencies, positions, and capacitors as listed in table 5-1.

TABLE 5-1. 500 KC LOCKED DIVIDER TUNING DATA

PAIR	PART	100 CYCLE CONTROL POSITION	CENTER FREQUENCY KC	TRIMMER CAPACITOR
A	HIGH	0	500	A4C42
	LOW	1	499	
B	HIGH	2	498	A4C43
	LOW	3	497	
C	HIGH	4	496	A4C44
	LOW	5	495	
D	HIGH	6	494	A4C45
	LOW	7	493	
E	HIGH	8	492	A4C46
	LOW	9	491	

(2) Insure that 100 cycle control is in high position; energize synthesizer and frequency meter; allow to warm up for at least 10 minutes. Then, momentarily depress PUSH TO OPERATE switch.

WARNING

Be extremely careful when making test connections because synthesizer remains connected to power at all times.

NOTE

Whenever synthesizer frequency is changed, PUSH TO OPERATE switch must be depressed momentarily.

- (3) Ground junction of resistors A4R70 and A4R90.
- (4) Tune frequency meter to high center frequency.
- (5) Tune trimmer capacitor for zero beat on frequency meter.
- (6) Remove ground.
- (7) Slightly detune frequency meter for a clear audio tone.
- (8) Determine one end of lock-in range by tuning trimmer capacitor clockwise until loss of clear audio tone indicates divider has broken lock. Then, very slowly retune capacitor counterclockwise until return of clear audio tone indicates reestablishment of lock.
 - (9) Ground junction of resistors A4R70 and A4R90.
 - (10) Tune frequency meter for zero beat and record frequency.
 - (11) Remove ground.
 - (12) Tune frequency meter for zero beat at high center frequency and slightly detune for a clear audio tone.
 - (13) Determine other end of lock-in range by tuning trimmer capacitor counterclockwise until loss of clear audio tone indicates divider has broken lock. Then, very slightly retune capacitor clockwise until return of clear audio tone indicates reestablishment of lock.

- (14) Ground junction of resistors A4R70 and A4R90.
- (15) Tune frequency meter for zero beat and record frequency.
- (16) Advance 100 cycle control to low position.
- (17) Perform steps (6) through(15), but substitute low position and frequency.
- (18) Determine frequency range where overlap occurs between lock-in ranges for high and low parts, and set frequency meter to center of this overlap.
- (19) Adjust trimmer capacitor for zero beat on frequency meter.

NOTE

After procedure is repeated for pairs B, C, D, and E, remove ground, uncouple frequency meter, and replace buffer amplifier tube A4V10.

i. Tuning 400-kc Locked Divider. - To tune the 400-kc locked divider, proceed as follows:

- (1) Loosely couple frequency meter to driver tube A4V16.

NOTE

Perform steps (2) through (19) for pair A (see table 5-2); then repeat steps for pairs B, C, D, and E respectively. Make sure to use applicable frequencies, positions, and capacitors as listed in table 5-2.

TABLE 5-2. 400 KC LOCKED DIVIDER TUNING DATA

PAIR	PART	1 KC CONTROL POSITION	CENTER FREQUENCY KC	TRIMMER CAPACITOR
A	HIGH	0	400	A4C20
	LOW	1	399	

TABLE 5-2. 400 KC LOCKED DIVIDER TUNING DATA (Continued)

PAIR	PART	1 KC CONTROL POSITION	CENTER FREQUENCY KC	TRIMMER CAPACITOR
B	HIGH	2	398	A4C22
	LOW	3	397	
C	HIGH	4	396	A4C24
	LOW	5	395	
D	HIGH	6	394	A4C26
	LOW	7	393	
E	HIGH	8	392	A4C28
	LOW	9	391	

(2) Insure that 1 KC control is in high position; energize synthesizer and frequency meter; allow to warm up for at least 10 minutes. Then momentarily depress PUSH TO OPERATE switch.

WARNING

Be extremely careful when making test connections because synthesizer remains connected to power at all times.

NOTE

Whenever synthesizer frequency is changed, PUSH TO OPERATE switch must be depressed momentarily.

- (3) Ground junction of resistor A12R7 and capacitor A2C18.
- (4) Tune frequency meter to high center frequency.
- (5) Tune trimmer capacitor for zero beat on frequency meter.

- (6) Remove ground.
- (7) Slightly detune frequency meter for a clear audio tone.
- (8) Determine one end of lock-in range by advancing trimmer capacitor clockwise until loss of clear audio tone indicates divider has broken lock. Then, very slowly retune capacitor counterclockwise until return of clear audio tone indicates reestablishment of lock.
 - (9) Ground junction of resistor A12R7 and capacitor A2C18.
 - (10) Tune frequency meter for zero beat and record frequency.
 - (11) Remove ground.
 - (12) Tune frequency meter for zero beat at high center frequency and slightly detune for a clear audio tone.
- (13) Determine other end of lock-in range by tuning trimmer capacitor counterclockwise until loss of clear audio tone indicates divider has broken lock. Then, very slightly retune capacitor clockwise until return of clear audio tone indicates reestablishment of lock.
 - (14) Ground junction of resistor A12R7 and capacitor A2C18.
 - (15) Tune frequency meter for zero beat and record frequency.
 - (16) Advance 1 KC control to low position.
 - (17) Perform steps (6) through (15), but substitute low position and frequency.
- (18) Determine frequency range where overlap occurs between lock-in ranges for high and low parts, and set frequency meter to center of this overlap.
- (19) Adjust trimmer capacitor for zero beat on frequency meter.

NOTE

After procedure is repeated for pairs B, C, D, and E, remove ground and uncouple frequency meter.

j. Tuning First Mixer, Spectrum Generator, and Bandpass Filter Transformers and Capacitors. - To tune the first mixer, spectrum generator, and bandpass filter transformers and capacitors, proceed as follows:

- (1) Set signal generator to 4.345 mc and connect it to pin 7 of first mixer tube A4V11.
- (2) Connect multimeter to TP5.
- (3) Loosely couple frequency meter to vfo buffer tube A6V2. Set frequency meter to 16.000 mc.
- (4) Energize synthesizer, signal generator, frequency meter, and multimeter; allow to warm up for at least 10 minutes. Then momentarily depress PUSH TO OPERATE switch.

WARNING

Be extremely careful when making test connections because synthesizer remains connected to power at all times.

NOTE

Whenever synthesizer frequency is changed, PUSH TO OPERATE switch must be depressed momentarily.

- (5) Set signal generator output level to 0.1 volt.
- (6) Tune i-f transformers A4T3 and A4T6 for maximum reading on multimeter.
- (7) Disconnect signal generator from pin 7 of mixer tube A4V11, and set synthesizer to 16.000 mc (band D: 16,000,000 on counter).
- (8) Tune frequency meter for zero beat; if zero beat is obtained at 16,000,000 mc on frequency meter, proceed to step (9); otherwise follow procedures described in paragraph 1.

- (9) Set synthesizer to 16.0050 mc (band D: 16,005,000 on counter).
- (10) Tune first mixer transformers A11T2 and A11T3 for maximum reading on multimeter.
- (11) Set synthesizer to 16.055 mc (band D: 16,055,000 on counter).
- (12) Tune bandpass filter transformer A6T2 for maximum reading on multimeter.
- (13) Tune spectrum generator transformer A6T1 for maximum reading on multimeter.
- (14) Tune i-f transformers A4T3 and A4T6 for maximum reading on multimeter.
- (15) Set synthesizer to 34 mc (band D: 34,000,000 on counter); set frequency meter to 17 mc and loosely couple to vfo buffer tube A6V2.
- (16) Tune trimmer capacitor A6C28 for zero beat on frequency meter.
- (17) Set synthesizer to 33.955 mc (band D: 33,955,000 on counter); tune spectrum generator trimmer capacitor A6C7 and bandpass filter trimmer capacitor A6C14 for maximum reading on multimeter.
- (18) Repeat steps (12) and (13) to make sure that capacitor adjustment has not affected transformer adjustment.
- (19) Disconnect multimeter and uncouple frequency meter.

k. Tuning Main Loop Discriminator Transformers. - To tune the main loop discriminator transformers, proceed as follows:

- (1) Loosely couple frequency meter to vfo buffer tube A6V2.
- (2) Energize synthesizer, multimeter, and frequency meter; allow to warm up for at least 10 minutes.

WARNING

Be extremely careful when making test connections because synthesizer remains connected to power at all times.

NOTE

Whenever synthesizer frequency is changed, PUSH TO OPERATE switch must be depressed momentarily.

(3) Set synthesizer to 16 mc (band D: 16,000,000 on counter); set frequency meter to 16 mc.

(4) Tune frequency meter for zero beat; if zero beat is obtained at 16 mc on frequency meter, proceed to step (5); otherwise follow procedures described in paragraph 1.

(5) Set discriminator trimmer capacitor A2C1 to center of its mechanical range (approximately 14 turns from either extreme).

(6) Set 1 KC control to position 5; ground pin 7 of limiter tube A4V15.

(7) Connect multimeter alternately to pins 1 and 3 of discriminator transformer A4T7. The voltage on both pins should be equal and should be at least 2 vrms. If they are not equal, tune the secondary of A4T7; if they are less than 2 vrms, tune transformer A4T9.

(8) Repeat step (7) for positions 0 through 9 of 1 KC control.

(9) Disconnect multimeter and remove ground.

(10) Connect multimeter, set to zero center range, to TP1.

(11) Tune secondary of transformer A4T7 for zero reading on multimeter while holding PUSH TO OPERATE switch depressed.

(12) Check synthesizer to insure that it is locked on frequency by noting error voltage reading on TEST METER with meter selector switch in 100 KC position; error voltage should be less than 1 volt, and should be adjustable to zero with ZERO ADJ control when PUSH TO OPERATE switch is held depressed.

(13) Disconnect multimeter and uncouple frequency meter.

1. Tuning Vfo and Counter. - To tune the vfo and counter, proceed as follows:

NOTE

Do not perform this procedure unless the requirements in procedure j, step (8), or in procedure k, step (4) can not be met.

- (1) Loosely couple frequency meter to vfo buffer tube A6V2.
- (2) Energize synthesizer and frequency meter; allow to warm up for at least 10 minutes.

WARNING

Be extremely careful when making test connections because synthesizer remains connected to power at all times.

NOTE

Whenever synthesizer frequency is changed, PUSH TO OPERATE switch must be depressed momentarily.

- (3) Set synthesizer to 16 mc (band D: 16,000,000 on counter). Set frequency meter to 16 mc.
- (4) Loosen mechanical coupling nearest vfo (ganged) tuning capacitor A6C26, making sure that counter reading remains at 16,000,000 mc.
- (5) While holding PUSH TO OPERATE switch depressed, tune vfo tuning capacitor A6C26 for zero beat on frequency meter. (Make sure capacitor A3C9 remains stationary.) Release PUSH TO OPERATE switch and tighten coupling.
- (6) Uncouple frequency meter.

m. Tuning Main Loop Discriminator Trimmer Capacitors. - To tune the main loop discriminator trimmer capacitors, proceed as follows:

(1) Connect multimeter, set to zero center range, to TP1. Loosely couple frequency meter to vfo buffer tube A6V2.

(2) Energize synthesizer, multimeter, and frequency meter; allow to warm up for at least 10 minutes.

WARNING

Be extremely careful when making test connections because synthesizer remains connected to power at all times.

NOTE

Whenever synthesizer frequency is changed, PUSH TO OPERATE switch must be depressed momentarily.

(3) Set synthesizer to 16 mc (band D: 16,000,000 on counter).

(4) Tune frequency meter for a zero beat at 16 mc and slightly detune for a clear audio tone.

(5) Determine error voltage of one end of lock-in range by tuning trimmer capacitor A6C28 clockwise until loss of clear audio tone indicates divider has broken lock. Then, very slowly retune counterclockwise until return of clear audio tone indicates reestablishment of lock. Note and record error voltage reading on multimeter.

(6) Determine error voltage of other end of lock-in range by tuning trimmer capacitor A6C28 counterclockwise until loss of clear audio tone indicates divider has broken lock. Then, very slowly retune clockwise until return of clear audio tone indicates reestablishment of lock. Note and record error voltage reading on multimeter.

(7) Tune discriminator trimmer capacitor A2C1 so that pull-in range (recorded in steps (5) and (6)) is symmetrical within 1 vdc. If necessary, adjust secondary of discriminator transformer A4T7 for improved symmetry.

(8) Advance 1 KC control one step clockwise and repeat steps (5) and (6).

(9) Tune discriminator trimmer capacitor A2C3 for symmetry of lock-in range of capacitor A6C28.

(10) Tune discriminator trimmer capacitors A2C4 through A2C15 as described above for capacitor A2C3 (steps (5), (6) and (9)). Advance 1 KC control clockwise and check symmetry of capacitor A6C28 lock-in range at each position.

(11) Uncouple frequency meter and disconnect multimeter.

n. Tuning Main Loop Vfo Capacitors. - To tune the main loop vfo capacitors, proceed as follows:

- (1) Loosely couple frequency meter to vfo buffer tube A6V2.
- (2) Connect multimeter, set to zero center range, to TP1.
- (3) Set synthesizer to 16 mc (band D: 16,000,000 on counter).
- (4) Energize synthesizer, frequency meter, and multimeter; allow to warm up for at least 10 minutes. Then momentarily depress PUSH TO OPERATE switch.

WARNING

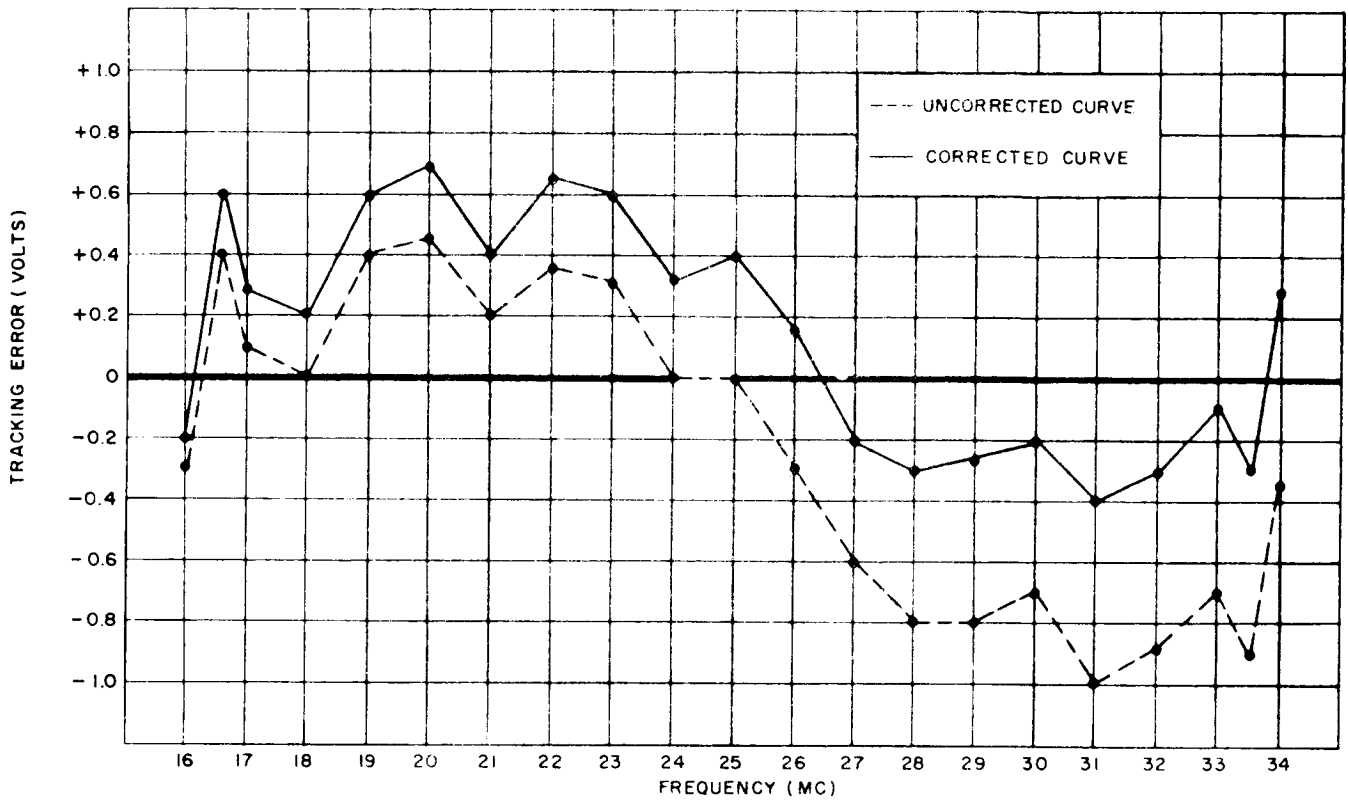
Be extremely careful when making test connections because synthesizer remains connected to power at all times.

- (5) Rotate ZERO ADJ control to clockwise and counterclockwise extremes to determine full electrical range indicated on multimeter. Then set control to electrical center of range.

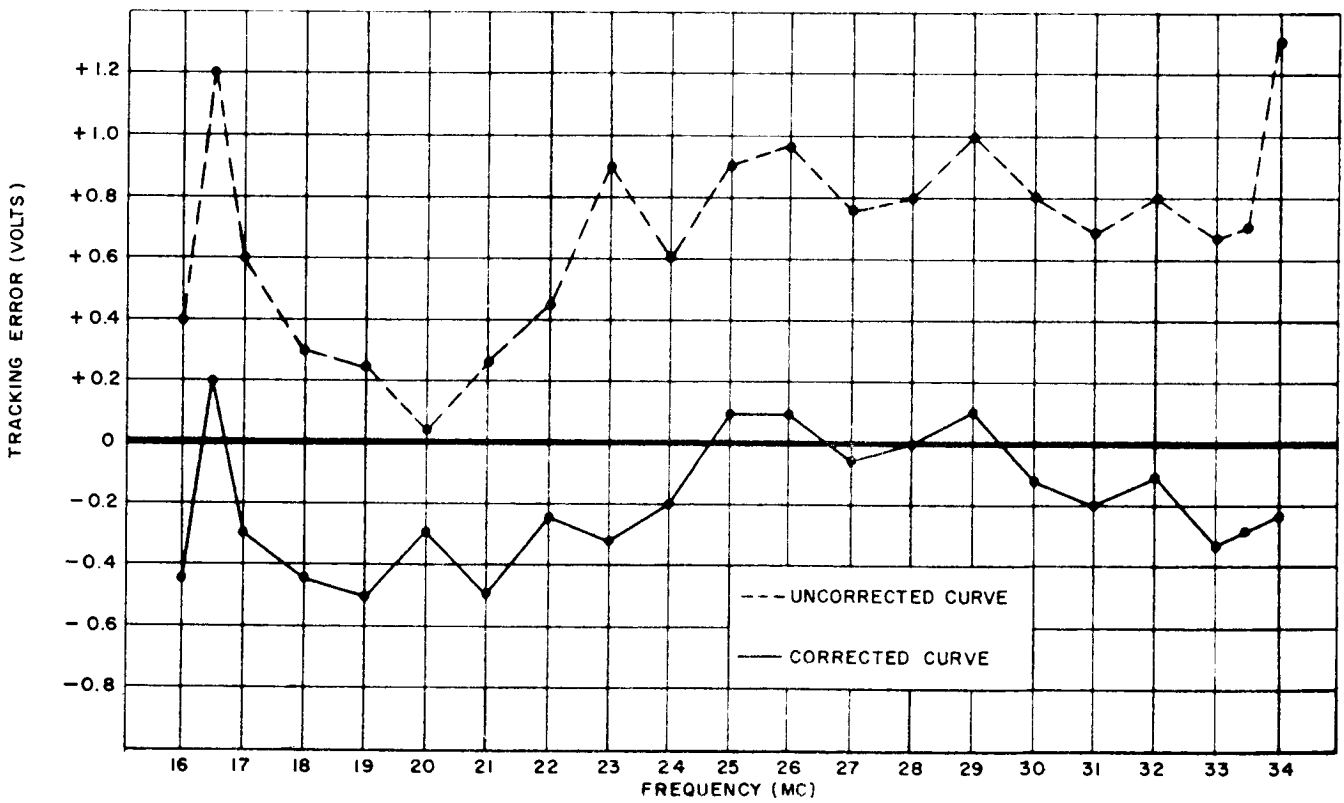
NOTE

Whenever synthesizer frequency is changed, PUSH TO OPERATE switch must be depressed momentarily.

- (6) Record voltage (tracking error) reading on multimeter for each frequency from 16,000,000 to 34,000,000 on counter, in increments of 1 mc, making sure not to adjust ZERO ADJ control. Plot tracking curve (see figure 5-1).



(a) COMPENSATED AT HIGH END BY CAPACITOR AGC28



(b) COMPENSATED AT BOTH ENDS BY CAPACITORS AGC28 AND AGC26

Figure 5-1. Typical Vfo Tracking Curves

(7) If examination of tracking curve shows tracking error voltage to be less than 1 volt between 16 mc and 20 mc, proceed as follows:

NOTE

A locked main loop vfo is indicated by either a deflection in TEST METER reading with meter selector switch in LIMITER position when PUSH TO OPERATE switch is depressed momentarily, or a clear audio tone in frequency meter tuned approximately to vfo frequency and loosely coupled to vfo buffer tube A6V2.

(a) Tune vfo trimmer capacitor A6C28, at frequency nearest that where main loop vfo breaks lock or has too high an error voltage, so that the tracking error voltage is less than 1 volt on multimeter (set to zero center range).

(b) Recheck high end of band to insure that main loop vfo remains locked.

(c) Replot tracking curve to ascertain that tracking error voltage does not exceed ± 1 volt at any frequency.

(8) If examination of tracking curve shows tracking error voltage greater than ± 1 volt at all frequencies, and rapidly increasing with frequency, proceed as follows:

(a) Set frequency meter to 16 mc; set synthesizer to 16 mc (band D: 16,000,000 on counter) and momentarily depress PUSH TO OPERATE switch.

(b) Connect multimeter, set to zero center range, to TP1. Loosely couple frequency meter to vfo buffer tube A6V2 and slightly detune for a clear audio tone.

(c) Loosen mechanical coupling nearest main loop vfo tuning capacitor A6C26, making sure that counter reading remains at 16,000,000 mc.

(d) Slightly slip capacitor A6C26 so that tracking error voltage at 16 mc decreases, and check frequency meter for clear audio tone indicating that main loop vfo has not broken lock. (Make sure that capacitor A3C9 remains stationary.) Tune capacitor A6C26 for tracking error voltage reading of less than 0.3 to 0.4 vdc negative on multimeter.

(e) Lock coupling.

(f) Set synthesizer to 34 mc (band D: 34,000,000 on counter) and momentarily depress PUSH TO OPERATE switch; tune frequency meter for zero beat at 17 mc.

(g) Tune capacitor A6C28 for tracking error voltage reading of less than 0.3 to 0.4 vdc positive on multimeter. Tuning capacitor A6C28 should not change main loop vfo output frequency and vfo must remain locked.

(h) Replot tracking curve to ascertain that tracking error voltage does not exceed ± 1 volt at any frequency.

o. Tuning Output Locked Divider. - To tune the output locked divider, proceed as follows:

(1) Energize synthesizer and frequency meter; allow to warm up for at least 10 minutes.

WARNING

Be extremely careful when making test connections because synthesizer remains connected to power at all times.

NOTE

Whenever synthesizer frequency is changed, PUSH TO OPERATE switch must be depressed momentarily.

(2) Set synthesizer to 2.050,000 mc (band A: 16,400,00 on counter). Connect 50-ohm load to 2-34 MC jack.

- (3) Record reading of last six digits of counter.
- (4) Loosely couple frequency meter to 50-ohm load and tune frequency meter for zero beat. If output frequency is not eight times that of counter, perform procedure p. Otherwise proceed to step (5).
- (5) Loosen mechanical coupling between main loop vfo capacitor A3C26 and divider capacitor A3C9, making sure that counter reading remains at preset frequency.
- (6) Depress PUSH TO OPERATE switch and hold depressed whenever 100 KC or 10 KC controls are being used.
- (7) Making sure that capacitor A3C26 remains absolutely stationary, slowly turn 100 KC control clockwise until loss of clear audio tone indicates divider has broken lock. Then, very slowly retune counterclockwise until return of clear audio tone indicates reestablishment of lock.
- (8) Subtract reading of last six digits on counter from first reading obtained, divide difference by eight to obtain positive portion of divider lock-in range, and record result.

NOTE

Hold PUSH TO OPERATE switch depressed during step (9).

- (9) Repeat steps (7) and (8), varying 100 KC control in opposite directions. Recorded result is negative portion of divider lock-in range.
- (10) Lock coupling.
- (11) Tune frequency meter to 2.250,000 mc, set synthesizer to 2.250,000 mc (band A: 18,000,000 on counter) and record reading of last six digits of counter.
- (12) Repeat steps (5) through (10).
- (13) Repeat steps (3) and (5) through (10) for each of the following frequencies:

FREQUENCY METER

SYNTHESIZER

2.500,000 mc

2.500,000 mc (band A: 20,000,000 on counter)

4.000,000 mc

4.000,000 mc (band A: 32,000,000 on counter)

4.250,000 mc

4.250,000 mc (band A: 34,000,000 on counter)

(14) Set synthesizer to 4.100,000 mc (band B: 16,400,000 on counter); tune frequency meter for zero beat, then slightly detune for clear audio tone.

(15) Repeat steps (3) and (5) through (10).

(16) Retune frequency meter to 4.5 mc; set synthesizer to 4.500,000 mc (band B: 18,000,000 on counter) and record reading of last six digits of counter.

(17) Repeat steps (5) through (10).

(18) Repeat steps (3) and (5) through (10) for each of the following frequencies:

FREQUENCY METER

SYNTHESIZER

5.000,000 mc

5.000,000 mc (band B: 20,000,000 on counter)

8.000,000 mc

8.000,000 mc (band B: 32,000,000 on counter)

8.500,000 mc

8.500,000 mc (band B: 34,000,000 on counter)

(19) Set synthesizer to 8.200,000 mc (band C: 32,400,000 on counter); tune frequency meter for zero beat, then detune for clear audio tone.

(20) Repeat steps (3) and (5) through (10).

(21) Retune frequency meter to 9.000,000 mc and set synthesizer to 9.000,000 mc (band C: 18,000,000 on counter); record reading of last six digits of counter.

(22) Repeat steps (5) through (10).

(23) Repeat steps (3) and (5) through (10) for each of the following frequencies:

FREQUENCY METER	SYNTHESIZER
10.000,000 mc	10.000,000 mc (band C: 20,000,000 on counter)
16.000,000 mc	16.000,000 mc (band C: 32,000,000 on counter)
17.000,000 mc	17.000,000 mc (band C: 34,000,000 on counter)

(24) Set synthesizer to 16.400,000 mc (band D: 16,400,000 on counter); tune frequency meter for zero beat, then detune for clear audio tone.

(25) Repeat steps (3) and (5) through (10).

(26) Retune frequency meter to 18.000,000 mc; set synthesizer to 18.000,000 mc (band D: 18,000,000 on counter) and record reading of last six digits of counter.

(27) Repeat steps (5) through (10).

(28) Repeat steps (3) and (5) through (10) making sure to retune frequency meter and synthesizer to the following frequencies:

FREQUENCY METER	SYNTHESIZER
20.000,000 mc	20.000,000 mc (band D: 20,000,000 on counter)
32.000,000 mc	32.000,000 mc (band D: 34,000,000 on counter)
34.000,000 mc	34.000,000 mc (band D: 34,000,000 on counter)

(29) Examine lock-in ranges for all frequencies. Lock-in range for each frequency in each band should be as follows: band A, ± 8 kc; band B, ± 18 kc; band C, ± 40 kc; band D, ± 80 kc. Both portions of lock-in range should be symmetrical, and total lock-in range should not be down by 50 percent or more (such as lock-in range of ± 20 kc or less, in band C). If this is not obtained, replace tube A3V1 and recheck lock-in range on each band. If symmetry is still not

obtained, but unbalance is less than 2:1 (such as +12 kc and -7 kc in band A, or +60 kc and -35 kc in band C), make no adjustments. However, if unbalance is greater than 2:1 (such as +26 kc and -10 kc in band B), locked divider requires tuning; proceed to step (30).

(30) Examine results for each band. If all bands are not within specified tolerance, proceed to step (31). If one or two bands are not within specified tolerances, adjust applicable capacitor and transformer to obtain symmetry of positive and negative portions, respectively. For band A, tune A3T4 and A3C12; for band B, tune A3T3; for band C, tune A3T2 and A3C6; for band D, tune A3T1 and A3C4; alternately tune these components until there is no interaction. Then recheck lock-in range of tuned band to make sure it is within specified tolerance.

(31) If lock-in range for each band is not within specified symmetry, set frequency meter to 2.050,000 mc and set synthesizer to 2.050,000 mc (band A: 16,400,000 on counter).

(32) Loosen mechanical coupling nearest main loop vfo tuning capacitor A6C26, making sure that counter reading remains at 16,000,000 mc.

(33) Very carefully tune divider capacitor A3C9 for zero beat, making sure vfo capacitor A3C26 remains stationary.

(34) Lock coupling.

(35) Perform procedure described in paragraph p but keep synthesizer at 2.050,000 mc (band A: 16,400,000 on counter) in step (3).

(36) Recheck lock-in range on all bands by repeating steps (1) through (30).

p. Aligning Counter. - To align counter, proceed as follows:

NOTE

Perform this procedure only when the counter reading is not the same as: the output frequency in band D; 2 times the output frequency in band C; 4 times the output frequency in band B; 8 times the output frequency in band A.

- (1) Connect 50-ohm load to 2-34 MC jack.
- (2) Energize synthesizer and frequency meter; allow to warm up for at least 10 minutes.

WARNING

Be extremely careful when making test connections because synthesizer remains connected to power at all times.

NOTE

Whenever synthesizer frequency is changed, PUSH TO OPERATE switch must be depressed momentarily.

- (3) Set synthesizer to 16,000,000 mc (band D: 16,000,000 on counter), and loosely couple frequency meter to 50-ohm load.
- (4) Loosen coupling between output divider and amplifier (ganged) tuning capacitors A3C9 - A3C14, and gear box.

NOTE

Make sure that capacitors A3C9 and A3C14 remain absolutely stationary during step (5).

- (5) Turn 100 KC and 10 KC controls until reading on counter, with controls in detent position, agrees with frequency meter.
- (6) Tighten coupling.
- (7) Uncouple frequency meter and disconnect 50-ohm load.

q. Tuning Output Amplifier. - To tune the output amplifier, proceed as follows:

- (1) Energize synthesizer; allow to warm up for at least 10 minutes.

WARNING

Be extremely careful when making test connections because synthesizer remains connected to power at all times.

NOTE

Whenever synthesizer frequency is changed, PUSH TO OPERATE switch must be depressed momentarily.

- (2) Set BAND switch to position D; connect 50-ohm load to 2-34 MC jack.
- (3) Set meter selector switch to RF LEVEL position and adjust RF LEVEL control for maximum reading on TEST METER. If TEST METER reading is less than 2.5 vdc, proceed to step (4); otherwise proceed to step (6).
- (4) Set synthesizer to low end of band D and tune transformer A3T5 for maximum reading on TEST METER.
- (5) Set synthesizer to high end of band D and tune capacitor A3C19 for maximum reading on TEST METER.
- (6) Repeat steps (3), (4), and (5), for bands C, B, and A adjusting the appropriate transformer and capacitor as in table 5-3.
- (7) Disconnect 50-ohm load.

TABLE 5-3. OUTPUT AMPLIFIER TUNING DATA

BAND	LOW END (TRANSFORMER)	HIGH END (CAPACITOR)
D	A3T5	A3C19
C	A3T6	A3C20
B	A3T7	A3C21
A	A3T8	A3C22

r. Tuning and Calibration of Reference Oscillator. - The 1-mc reference oscillator is stable to 1 part per 10^8 per day; after prolonged operation, the oscillator must be reset to the 1-mc frequency. This may be performed by calibrating the oscillator against an external local frequency standard, or by calibrating the oscillator against a transmitted reference. Both methods are described below.

(1) To calibrate the oscillator against a frequency standard, proceed as follows:

(a) Energize synthesizer and allow to warm up for at least 1 hour.

(b) Connect 1-mc output of frequency standard to phase comparator, such as Manson model STS-1 or equivalent.

(c) Connect 1-mc output of synthesizer, from 1 MC OUT jack, to phase comparator.

(d) Set INT-EXT switch on synthesizer to EXT.

(e) When internal and external 1-mc frequencies are in phase, the phase comparator reading is zero. Any difference between the two frequencies causes the phase comparator meter to cycle from left to right as the frequencies go in and out of phase. One full cycle of needle is from center scale to maximum right, back to center scale, to maximum left and return to center scale. Timing the cycles of the needle provides the following information regarding the frequency difference between the external and internal 1-mc oscillators:

(1) 1 cycle per second = frequency difference of 1 part in 10^6 .

(2) 1 cycle per 10 seconds = frequency difference of 1 part in 10^7 .

(3) 1 cycle per 100 seconds = frequency difference of 1 part in 10^8 .

(f) Tune capacitor A8C2 until cycling of meter needle is minimum.

NOTE

The position of the meter needle is of no importance; it must move as slowly as possible.

- (2) To calibrate the oscillator against a transmitted reference, proceed as follows:
- (a) Energize synthesizer and allow to warm up for at least 1 hour.
 - (b) Tune WWV receiver to any WWV frequency (preferably a higher frequency such as 15 or 20 mc) and record S meter reading.
 - (c) Disconnect WWV input to receiver.

NOTE

Whenever synthesizer frequency is changed, PUSH TO OPERATE switch must be depressed momentarily.

- (d) Tune synthesizer to WWV frequency as follows:

WWV FREQUENCY	SYNTHESIZER
2.5 mc	band A: 20,000,000 on counter
5 mc	band B: 20,000,000 on counter
10 mc	band C: 20,000,000 on counter
15 mc	band C: 30,000,000 on counter
20 mc	band D: 20,000,000 on counter
25 mc	band D: 25,000,000 on counter
30 mc	band D: 30,000,000 on counter

WARNING

Be extremely careful when making test connections because synthesizer remains connected to power at all times.

- (e) Loosely couple synthesizer output to receiver input.
- (f) Vary coupling of synthesizer output and front panel RF LEVEL control on synthesizer until S meter reading is same as that recorded with WWV in step (b).
- (g) Reconnect WWV input so that receiver has two inputs, WWV and synthesizer.
- (h) Tune capacitor A8C2 until cycling of S meter is minimum.

s. First Mixer Adjustment. - To adjust the first mixer, proceed as follows:

- (1) Set synthesizer to 16 mc (band D: 16,000,000 on counter).
- (2) Connect multimeter, set to zero center range, to pin 4 of transformer A11T1.
- (3) Energize synthesizer and multimeter; allow to warm up for at least 10 minutes.

WARNING

Be extremely careful when making test connections because synthesizer remains connected to power at all times.

- (4) Adjust resistor A11R3 for a zero reading on multimeter.
- (5) Disconnect multimeter.

t. Power Supply Voltage Adjustment. - After replacing any components in the power supply, check and, if necessary, adjust the output voltage as follows:

WARNING

Be extremely careful when making test connections because synthesizer remains connected to power at all times.

- (1) Connect multimeter to output of power supply.
- (2) Energize synthesizer and multimeter; allow to warm up for at least 10 minutes.
- (3) Adjust resistor A9R20 for reading of 180 vdc on multimeter.
- (4) Disconnect multimeter.

5-3. TEST MEASUREMENTS

Tables 5-4 through 5-11 indicate normal test measurements. Use these values to determine defective components. All voltages are positive dc to ground with a multimeter. Tolerance is ± 20 percent unless otherwise specified. Voltages with asterisk (*) are rf. Voltages with double asterisks (**) are taken with a 1-megohm resistor in series with test lead. All resistances are taken using the multimeter and are with respect to ground. Resistance values have a tolerance of ± 20 percent unless otherwise specified. No resistance readings have been given for transistor circuits because transistor damage can result from making such readings.

NOTE

Before any test measurements are taken, make sure that operation procedures in section 3 are followed and that the power supply output voltage is 180 vdc.

TABLE 5-4. GEAR BOX CHASSIS TEST DATA

TUBE OR TRANSISTOR		PIN							
		1 (E)	2 (B)	3 (C)	4	5	6	7	8
V1 6BE6	E	*1.3	1.2	6.3 vac	6.3 vac	160	92	*1.9	
	R	27K	100	INF.	INF.	6K	14K	100K	
Q1 2N916	E	7.4	7	25					
	R								
Q2 2N916	E	7.4	7	25					
	R								

TABLE 5-5. OUTPUT LOCKED DIVIDER CHASSIS TEST DATA

TUBE		PIN							
		1	2	3	4	5	6	7	8
V1 6021	E	120	*1.3	6.3 vac	3	3	6.3 vac		
	R	17K	220	INF.	220	220	INF.		

TABLE 5-5. (Continued)

TUBE	PIN								
		1	2	3	4	5	6	7	8
V2 5639	E	*2.5	3	6.3 vac	3	160	6.3 vac	75	3
	R		150	INF.	150	5.5K	INF.	30K	150

TABLE 5-6. FRONT IF CHASSIS TEST DATA

TUBE	PIN								
		1	2	3	4	5	6	7	8
V1 5702	E	80	80	6.3 vac	6.3 vac	0	0	-3	
	R	35K	35K	INF.	INF.	0	0	1 Megohm	
V2 5702	E	140	120	6.3 vac	6.3 vac	2	2	**0	
	R	15K	40K	INF.	INF.	220	220	47K	
V3 5702	E	150	55	6.3 vac	6.3 vac	55	0	**-.25	
	R	14.5K	110K	INF.	INF.	110K	0	27K	
V4 5702	E	84	84	6.3 vac	6.3 vac	0	0	**-.7.8	
	R	35K	35K	INF.	INF.	0	0	1 Megohm	
V5 5702	E	140	126	6.3 vac	6.3 vac	2	2	**0	
	R	15K	40K	INF.	INF.	220	220	47K	
V6 5702	E	150	58	6.3 vac	6.3 vac	58	0	**-.25	
	R	14.5K	110K	INF.	INF.	110K	0	27K	
V7 5703	E	58		6.3 vac	6.3 vac	**-.3.5	0		
	R	42K		INF.	INF.	47K	0		
V8 5702	E	130	130	6.3 vac	6.3 vac	2	2	*2.5	
	R	11K	11K	INF.	INF.	220	220	47K	
V9 5703	E	58		6.3 vac	6.3 vac	**-.3.5	0		
	R	42K		INF.	INF.	47K	0		
V10 5702	E	140	140	6.3 vac	6.3 vac	2	2	*2.5	
	R	11K	11K	INF.	INF.	220	220	47K	

TABLE 5-6. (Continued)

TUBE		PIN							
		1	2	3	4	5	6	7	8
V11 5702	E	120	120	6.3 vac	6.3 vac	1.2	1.2	0	
	R	9K	9K	INF.	INF.	100	100	39K	
V12 5702	E	136	136	6.3 vac	6.3 vac	0.7	0.7	2	
	R	11K	11K	INF.	INF.	100	100	500	
V13 5703	E	58		6.3 vac	6.3 vac	-4.0	0		
	R	42K		INF.	INF.	47K	0		
V14 5702	E	130	130	6.3 vac	6.3 vac	2	2	*3.5	
	R	11K	11K	INF.	INF.	220	220	47K	
V15 5702	E	100	100	6.3 vac	6.3 vac	0	0	*3.5	
	R	28K	28K	INF.	INF.	0	0	1.1 Megohm	
V16 5702	E	130	130	6.3 vac	6.3 vac	2	2	*1	
	R	9K	9K	INF.	INF.	220	220	47K	

TABLE 5-7. REAR IF CHASSIS TEST DATA

TUBE		PIN							
		1	2	3	4	5	6	7	8
V1 5702	E	85	85	6.3 vac	6.3 vac	0	0	** -2.7	
	R	35K	35K	INF.	INF.	0	0	1 Megohm	
V2 5702	E	130	130	6.3 vac	6.3 vac	2	2	**0	
	R	15K	40K	INF.	INF.	220	220	47K	
V3 5702	E	150	60	6.3 vac	6.3 vac	0	0	** -23	
	R	14.5K	110K	INF.	INF.	0	0	27K	
V4 6021	E	60	0.3	6.3 vac	2.5	2.5	6.3 vac	0	75
	R	500K	150K	INF.	15K	15K	INF.	0	175K
V5 6021	E	62	0.3	6.3 vac	2.5	2.5	6.3 vac	0	75
	R	500K	150K	INF.	15K	15K	INF.	0	175K
V6 6021	E	72	-0.3	6.3 vac	2.5	2.5	6.3 vac	0	75
	R	500K	150K	INF.	15K	15K	INF.	0	175K

TABLE 5-8. VFO AND SPECTRUM GENERATOR CHASSIS TEST DATA

TUBE		PIN							
		1	2	3	4	5	6	7	8
V1 5639	E	*2.3	3	6.3 vac	3	150	6.3 vac	90	3
	R	47K	180	INF.	180	7.5K	INF.	35K	180
V2 5702	E	140	90	6.3 vac	6.3 vac	0	0	*0.6	
	R	7.5K	35K	INF.	INF.	0	0	47K	
V3 5703	E	60		6.3 vac	6.3 vac	-3	0		
	R	13K		INF.	INF.	40K	0		
V4 5702	E	60	105	6.3 vac	6.3 vac	2	2	1	
	R	13K	12K	INF.	INF.	680	680	150K	

TABLE 5-9. REFERENCE CHASSIS TEST DATA

TUBE OR TRANSISTOR		PIN							
		1 (E)	2 (B)	3 (C)	4	5	6	7	8
V1 6AH6	E	0	1	6.3 vac	6.3 vac	165	70	1	
	R	2	68	INF.	INF.	5.5K	50K	68	
V2 6AK5	E	*0.6	1.5	6.3 vac	6.3 vac	160	85	1.5	
	R	47K	180	INF.	INF.	6K	35K	180	
V3 6AK5	E	*2.8	2.3	6.3 vac	6.3 vac	130	130	2.3	
	R	47K	180	INF.	INF.	9K	9K	180	
Q3 2N560	E	7.8	5.2	26					

TABLE 5-10. POWER SUPPLY TEST DATA

TRANSISTOR		(E)	(B)	(C)
Q1 2N1547	E	-61	-62	-85
Q2 2N1547	E	-19.5	-20	-54

TABLE 5-10. (Continued)

TRANSISTOR		(E)	(B)	(C)	
Q3 2N1547	E	0	-0.18	-19.5	
Q5 2N11842	E	-0.18	-0.32	-19.5	
Q6 2N335	E	-0.32	0.3	2.5	
Q7 2N335	E	0.3	0.8	2.5	
Q8 2N1026	E	12	11.5	0.8	
Q9 2N1026	E	12	11.5	0	

TABLE 5-11. WIDE BAND AMPLIFIER CHASSIS TEST DATA

TRANSISTOR		(E)	(B)	(C)	
Q1 2N916	E	6.8	7.4	20	
Q2 2N916	E	11	10	25	

5-4. TYPICAL TROUBLES. - Table 5-12 lists some typical troubles, together with their symptoms and causes.

TABLE 5-12. TYPICAL TROUBLES

TROUBLE	SYMPTOMS	CAUSES
Main loop locked at wrong frequency. Synthesizer cannot be energized.	Wrong output frequencies. Line fuses continuously blow.	Failure to: depress PUSH TO OPERATE switch after changing frequency. Line filter A1 FL1 or A1 FL2 shorted to ground.

TABLE 5-12. (Continued)

TROUBLE	SYMPTOMS	CAUSES
Output frequencies unstable.	No TEST METER reading in LIMITER position of meter selector switch with PUSH TO OPERATE switch depressed.	Defective pulse coil A6L2; capacitor A6C7 improperly tuned.
Output frequencies are not locked in band A.	Unstable frequencies in band A.	Trimmer capacitor A3C4 improperly tuned.
Output frequencies are not locked in band B.	Unstable frequencies in band B.	Trimmer capacitor A3C6 improperly tuned.
Output frequencies are not locked in band C.	Unstable frequencies in band C.	Transformer A3T3 improperly tuned.
Output frequencies are not locked in band D.	Unstable frequencies in band D.	Trimmer capacitor A3C12 improperly tuned.
Synthesizer is not tracking properly.	Abnormally high error voltage in 100 KC position of meter selector switch at low end of band D.	Capacitor A6C26 improperly tuned.
	Abnormally high error voltage in 100 KC position of meter selector switch at high end of band D.	Capacitor A6C28 improperly tuned.
Output divider not operating properly.	In band B synthesizer locks at 4.005 mc when counter is set for 32,000,000; all other bands operate properly.	Transformer A3T2 requires tuning.
Main loop not locked in position 5 of 1-KC tuning control.	Abnormally high error voltage in 100 KC position of meter selector switch.	Defective or dirty contacts of switch A2S1.
	Abnormally high error voltage in 10 KC position of meter selector switch.	Defective transformer A4T1; open connection between inductor A4L3 and tube A4V2; transformer A4T4 tuned to wrong frequency.

TABLE 5-12. (Continued)

TROUBLE	SYMPTOMS	CAUSES
10-KC loop breaks lock.	With meter selector switch in 10 KC position, TEST METER reading is zero.	Defective phase detector diodes A4CR1 and A4CR2; transformer A4T1 defective.
10 KC loop breaks lock from position 5 through 9.	With meter selector switch in 10 KC position, TEST METER reading is high.	Transformer A4T4 tuned to incorrect frequency.
1-KC loop breaks lock.	With meter selector switch in 1 KC position, TEST METER reading is zero.	Defective phase detector diodes A4CR3 and A4CR4; transformer A4T2 defective.
100-cycle loop breaks lock.	With meter selector switch in 100 cycle position, TEST METER reading is zero.	Defective phase detector diodes A5CR1 and A5CR2; transformer A5T1 defective.
10-KC loop cannot be locked.	Positive voltage on pin 2 of sweep multivibrator tube A5V6.	Transformer A4T1 shorted from primary to secondary.
10-KC multivibrator not sweeping in all positions of 10 KC tuning control.	10-KC loop not locked in all positions of 10 KC control, and with meter selector switch in 10 KC position, TEST METER reading is high.	Defective sweep multivibrator tube A5V6.
1-KC loop intermittently breaks lock.	With meter selector switch in 1 KC position, TEST METER reading is high.	Inductor A4L6 improperly tuned; defective vfo tube A4V6; dirty or defective wiper contact of switch A2S3.
With 1-KC control in detent position, 1-KC loop is not continuously locked.	With meter selector switch in 1 KC position, TEST METER reading drifts occasionally.	Transformer A4T5 requires tuning.
1-KC loop not locked in position 1 of 1 KC control.	With meter selector switch in 1 KC position, TEST METER reading is high.	Defective inductor A2L10.
1-KC loop cannot be locked.	Low pull in voltage recorded on TEST METER.	Defective 1-KC sweep multivibrator tube A5V5 or capacitor A5C27.
1-KC loop locked at wrong frequency.	Synthesizer output frequencies in band D are in error by 1 KC.	Transformer A4T5 in 1-KC loop vfo circuit requires retuning.

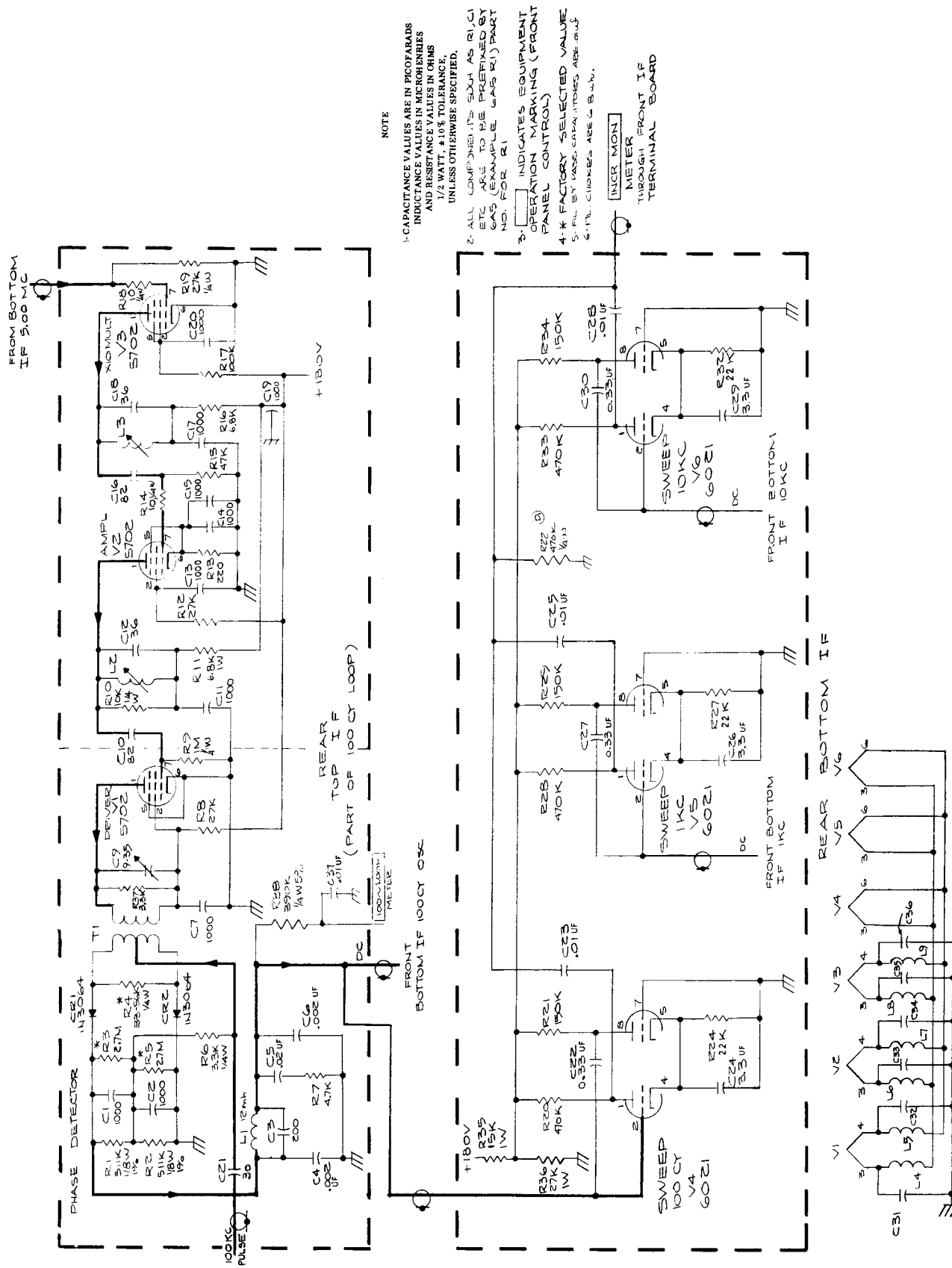
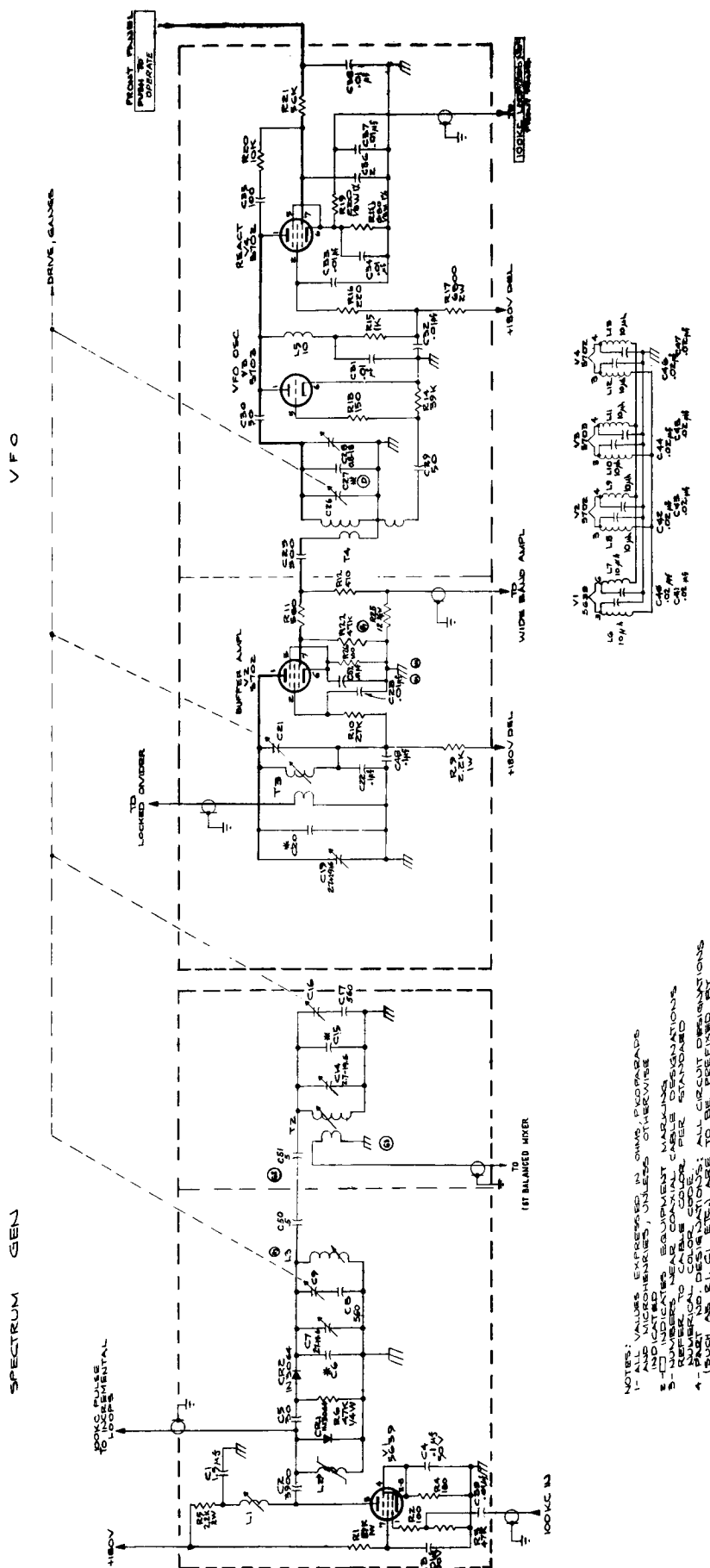


Figure 5-5. I-f Chassis, Rear, Schematic Diagram (C-216-005-001)



NOTES:
 1- ALL VALUES EXPRESSED IN OHMS, MICROHARADS AND MICROHENRIES, UNLESS OTHERWISE SPECIFIED.
 2- TO INDICATE EQUIPMENT MARKING.
 3- TO INDICATE EQUIPMENT MARKING.
 4- TO INDICATE EQUIPMENT MARKING.
 5- TO INDICATE EQUIPMENT MARKING.
 6- TO INDICATE EQUIPMENT MARKING.

Figure 5-6. Vfo, Spectrum Generator, Ganged Capacitor, Chassis Schematic Diagram (D-216-006-001)

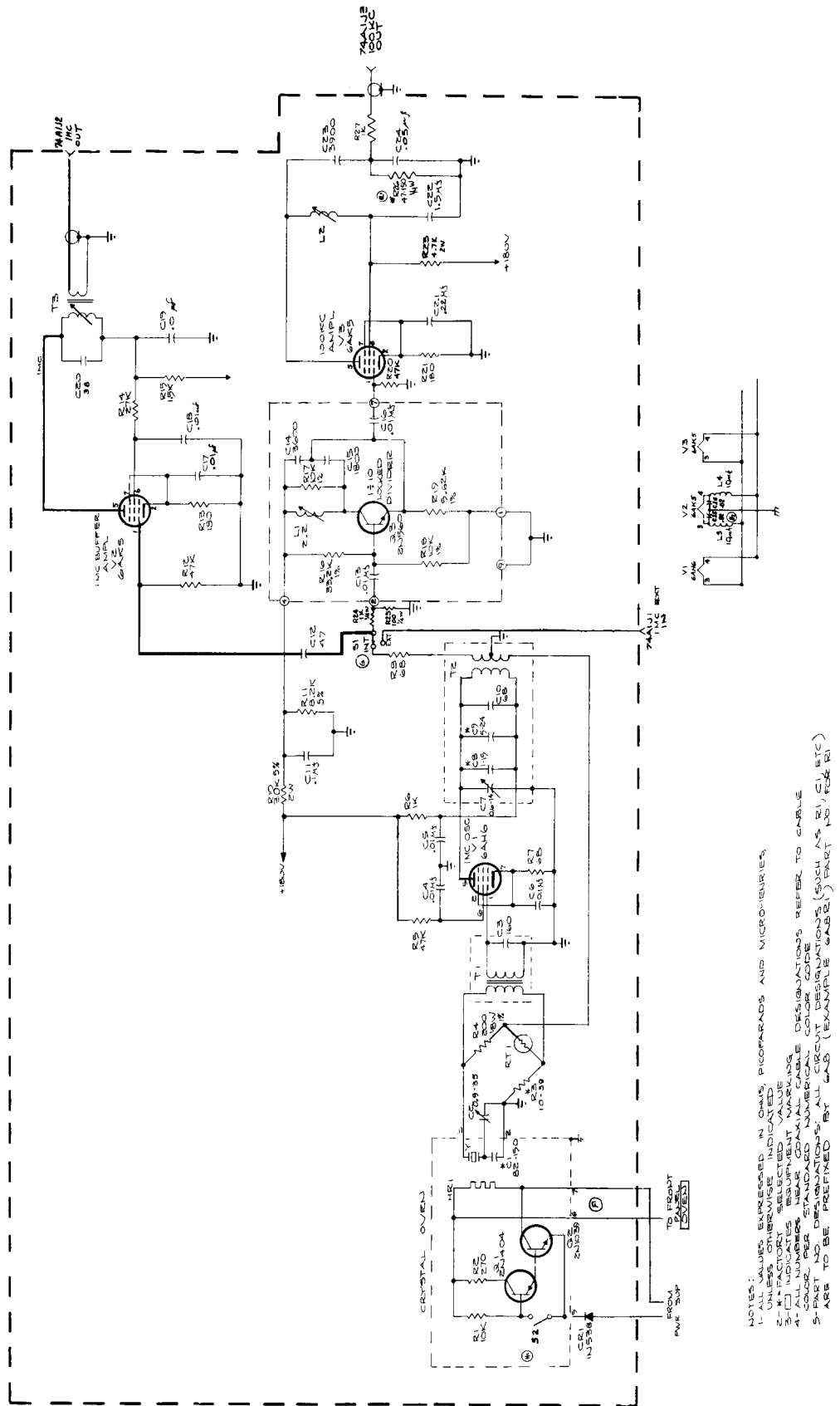


Figure 5-7. Reference Chassis, Schematic Diagram (D-216-008-001)

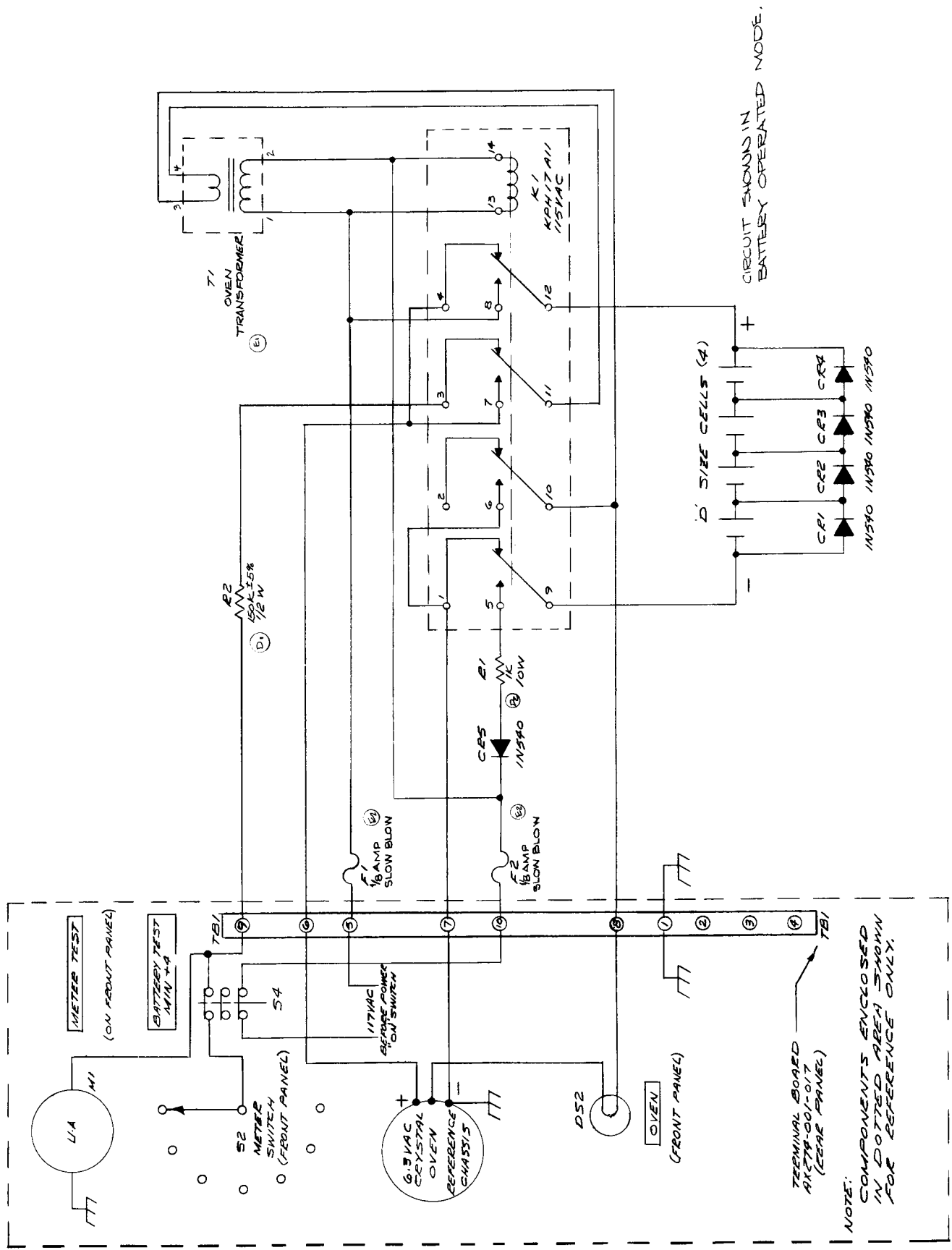
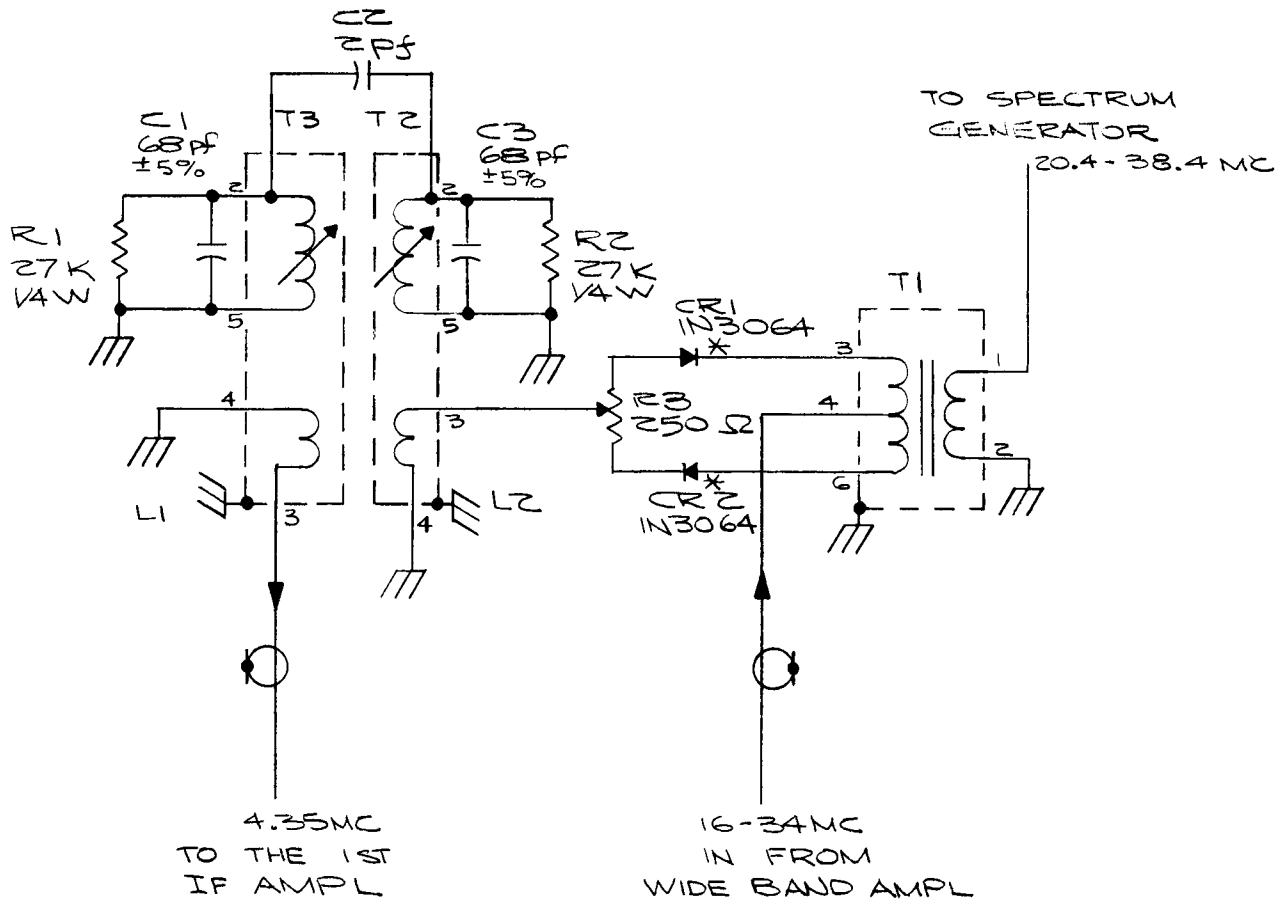


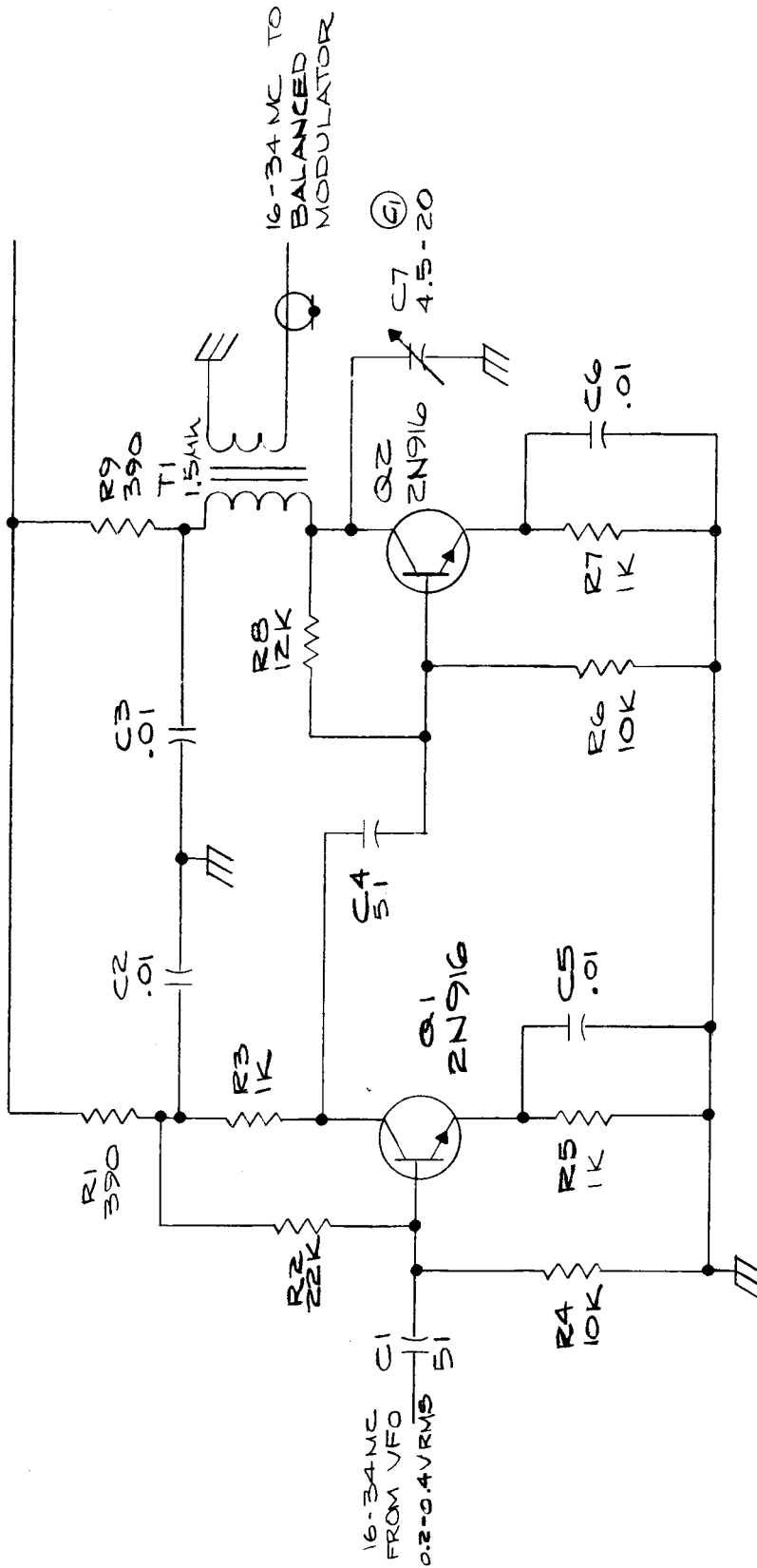
Figure 5-8. Emergency 6-vac Oven Supply Schematic Diagram (C-274-014-001)



NOTE:

- 1 - * INDICATES FACTORY SELECTED PAIR
- 2 - ALL COMPONENTS, SUCH AS R1, C1 ETC ARE TO BE PREFIXED BY 16A11 (EXAMPLE 16A11R1) PART NO. FOR R1

Figure 5-9. First Balanced Mixer, Schematic Diagram (B-216-011-001)

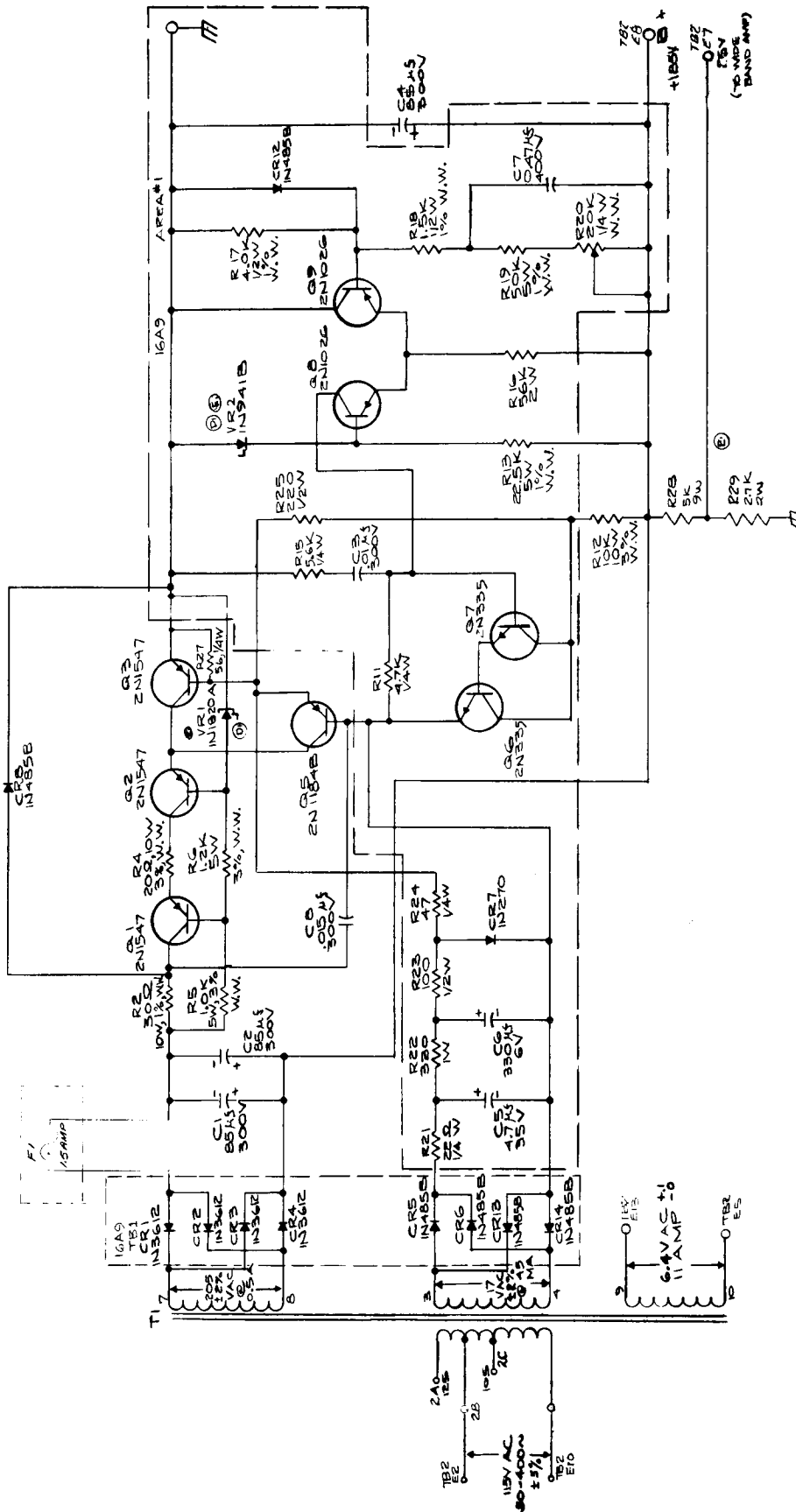


NOTE

CAPACITANCE VALUES ARE IN PICOFARADS
 INDUCTANCE VALUES IN MICROHENRIES
 AND RESISTANCE VALUES IN OHMS
 1/4 WATT, ±10% TOLERANCE,
 UNLESS OTHERWISE SPECIFIED.

ALL COMPONENTS, SUCH AS R1, C1 ETC ARE TO BE
 PREFIXED BY GA13 (EXAMPLE GA13R1) PART NO. FOR R1

Figure 5-10. Wideband Amplifier, Schematic Diagram (B-216-013-001)



- NOTES:
- 1- ALL VALUES EXPRESSED IN OHMS, PICOFARADS AND MICROHENRIES, UNLESS OTHERWISE SPECIFIED.
 - 2- PART NUMBER DESIGNATIONS: ALL CIRCUIT DESIGNATIONS (SUCH AS R1, C1, ETC) ARE TO BE PREFIXED BY 7A9 (EXAMPLE 7A9 R1) PART NO. FOR R1.
 - 3- ALL RELAYS AND SWITCHES SHOWN IN DEENERGIZED POSITION.
 - 4- COMPONENTS WITHIN DOTTED AREA LOCATED ON PC BOARD C-216-009-002.

Figure 5-11. Power Supply Chassis, Schematic Diagram (C-274-009-001)

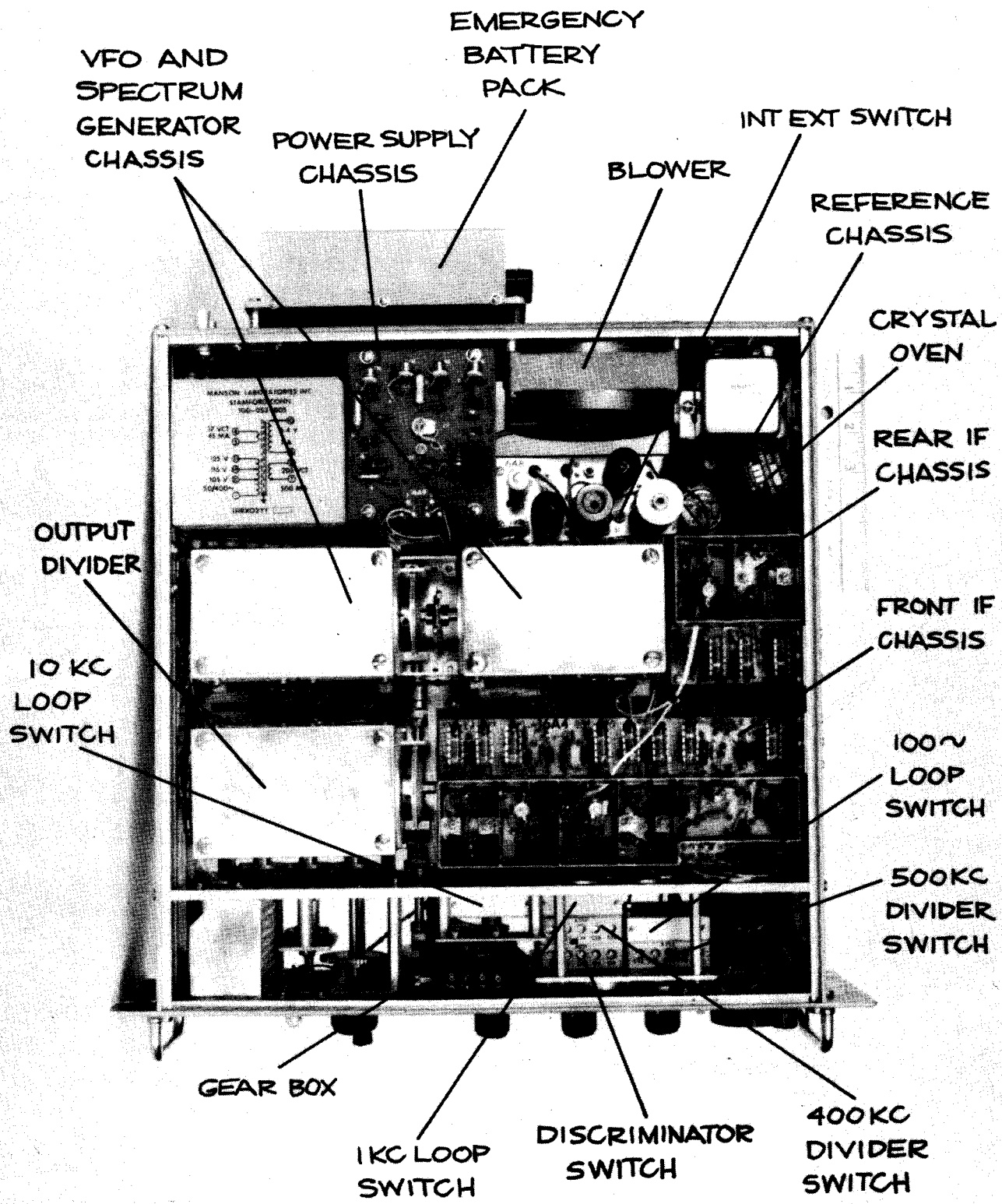


Figure 5-12. Subassembly Location, Top View

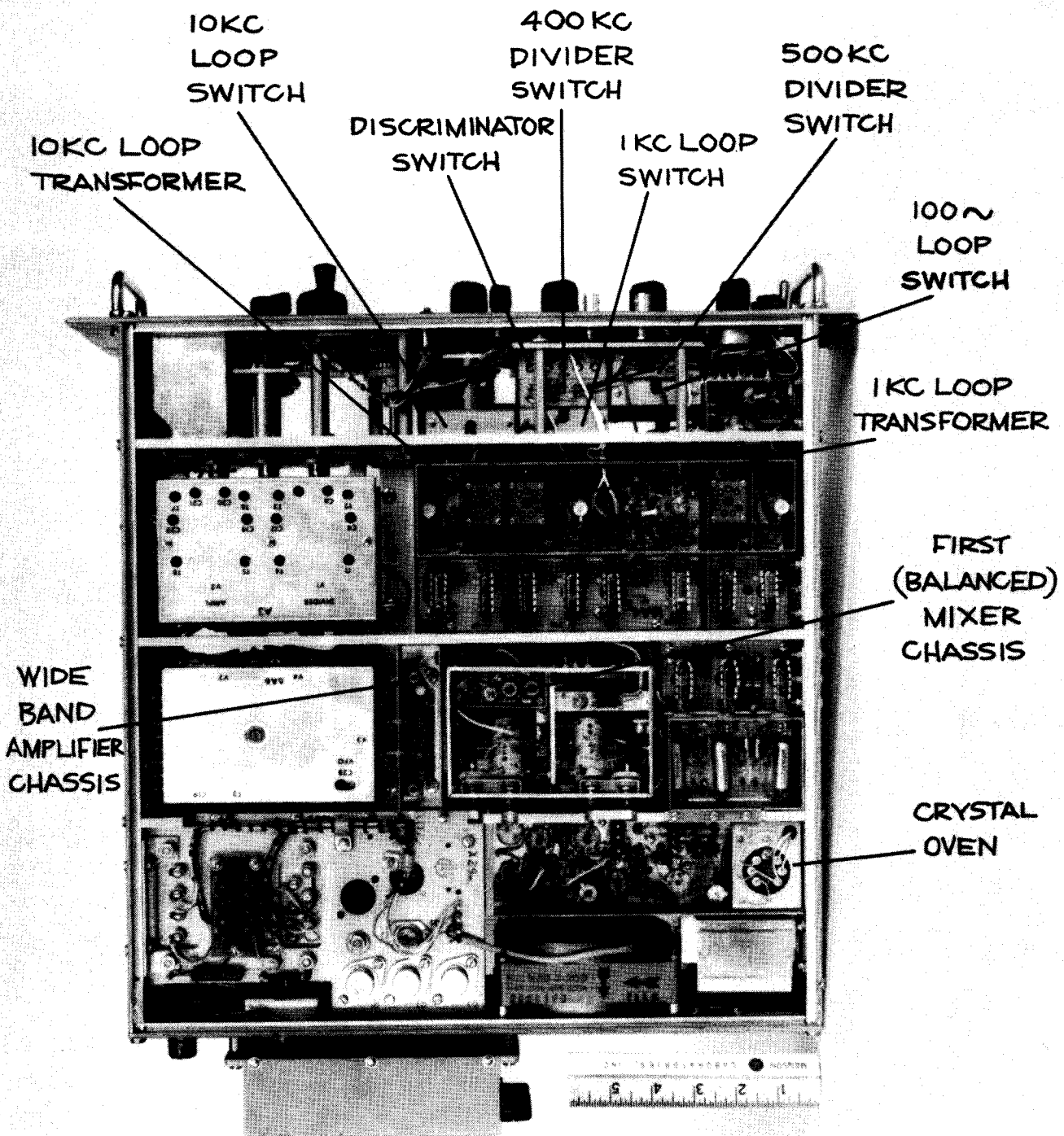


Figure 5-13. Subassembly Location, Bottom View

6. PARTS INFORMATION

6-1. REFERENCE DESIGNATION. - Reference designation (circuit symbols) have been assigned to identify all maintenance parts of the equipment and are included on the schematic diagrams and in the parts list (Table 6-2). The letter of a reference designation indicates the kind of part (generic group) such as resistor, capacitor, transistor, etc. The number differentiates between parts of the same generic group. Parts of the first major subassembly are prefixed with A2; parts of the second subassembly are prefixed with A3, etc. Table 6-1 lists all major subassemblies with their appropriate prefix. Sockets associated with a particular plug-in device, such as a fuse, are identified by a reference designation which includes the reference designation of the plug-in device. For example, the socket for fuse F2 is XF2. Factory selected values of more than one value are preceded by -1, -2, etc.

6-2. MANUFACTURERS. - Manufacturers are identified by a number or abbreviated name. Table 6-3 is a cross reference between the identification in the parts list and the full name of the manufacturer.

6-3. REPETITION. - Where the same part is used in different applications, the part bears a different reference designation and the description includes the word, "Same as..." followed by the reference designation of the part which has the complete applicable description.

TABLE 6-1. LIST OF MAJOR UNITS

REF DES	SUBASSEMBLY
A2	Gear box
A3	Locked Divider
A12	Third Mixer
A4	Front IF

TABLE 6-1. LIST OF MAJOR UNITS (Continued)

REF DES	SUBASSEMBLY
A5	Rear IF
A6	Vfo, Spectrum generator
A11	First mixer
A13	Wide band amplifier
A8	Reference Chassis
A9	Power Supply
A14	Battery pack

TABLE 6-2. MAINTENANCE PARTS LIST

REF DESIG	NAME AND DESCRIPTION
A1	INNER CASE: 93279 Type 274-001-000
A1C1	Capacitor: 56289 Type 144P6M
A1DS2	Lamp: 64959 Type 345
A1F1	Fuse: Mil Type FO2D3R00B
A1F2	Fuse: Same as A1 F1
A1F3	Fuse: Mil Type FO2G1R50A
A1J1	Connector: 74868 Type 17825
A1J2	Connector: Same as A1J1
A1J3	Connector: 91737 Type 11205-1
A1J4	Connector: Same as A1J3
A1J6	Connector: Same as A1J3
A1M1	Ammeter: 93279 Type A-216-001-041
A1S3	Switch: 71590 Type PM8-3PST
A1XDS-2	Lampholder: Mil Type MS25256-8
A1XF1	Fuseholder: 75915 Type 342004
A1XF2	Fuseholder: Same as A1XF1

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A2	Gear Box: 93279 Type 274-002-000
A2C1	Capacitor: STET Type 7s-TRIKO-02
A2C2	Capacitor: MIL Type CC20CH150G
A2C3	Capacitor: Same as A2C2
A2C4	Capacitor: Same as A2C2
A2C5	Capacitor: Same as A2C2
A2C6	Capacitor: Same as A2C2
A2C7	Capacitor: Same as A2C2
A2C8	Capacitor: Same as A2C2
A2C9	Capacitor: Same as A2C2
A2C11	Capacitor: Same as A2C1
A2C13	Capacitor: Same as A2C1
A2C14	Capacitor: Mil Type CC20CH270G
A2C15	Capacitor: Same as A2C1
A2C16	Capacitor: Mil Type CC20CH330G
A2C17	Capacitor: 72136 Type DM19E562J
A2C18	Capacitor: 71590 Type DM103
A2C19	Capacitor: 72136 Type DM15E301J
A2C20	Capacitor: Same as A2C1
A2C21	Capacitor: Mil Type CC20CH100G
A2C22	Capacitor: Same as A2C1
A2C23	Capacitor: Same as A2C1
A2C24	Capacitor: Same as A2C1
A2C25	Capacitor: Same as A2C2
A2C26	Capacitor: Same as A2C1
A2C27	Capacitor: Same as A2C2

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A2C28	Capacitor: Same as M017 A2C18
A2C38	Capacitor: 56289 Type 5C50
A2C39	Capacitor: Same as M017 A2C18
A2C40	Capacitor: 72136 Type DM19E122J
A2C41	Capacitor: 72136 Type DM15E241J
A2C42	Capacitor: Same as A2C1
A2C43	Capacitor: Same as A2C1
A2C44	Capacitor: Same as A2C1
A2C45	Capacitor: Same as A2C1
A2C46	Capacitor: Same as A2C1
A2C47	Capacitor: Same as A2C18
A2C48	Capacitor: Same as A2C38
A2L1	Coil: 93279 Type A-216-002-085-2
A2L2	Coil: 93279 Type A-216-002-085-3
A2L3	Coil: Same as A2L1
A2L4	Coil: Same as A2L2
A2L5	Coil: 93279 Type A-216-002-085-1
A2L6	Coil: Same as A2L2
A2L7	Coil: Same as A2L1
A2L8	Coil: Same as A2L1
A2L9	Coil: 93279 Type A-216-002-085-2
A2L10	Coil: 93279 Type 216-002-096
A2L11	Coil: 93279 Type 216-002-097
A2L12	Coil: Same as A2L10
A2L13	Coil: Same as A2L11
A2L14	Coil: 93279 Type 216-002-094

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A2L15	Coil: 93279 Type 216-002-098
A2L16	Coil: 93279 Type 216-002-093
A2L17	Coil: Same as A2L15
A2L18	Coil: Same as A2L16
A2L19	Coil: 72259 Type WEE470
A2L23	Coil: Same as A2L19
A2L24	Coil: 93279 Type A-216-002-096
A2L25	Coil: 93279 Type A-216-002-097
A2L26	Coil: 93279 Type A-216-002-096
A2L27	Coil: Same as A2L25
A2L28	Coil: 93279 Type A-216-002-094
A2L29	Coil: Same as A2L25
A2L30	Coil: Same as A2L24
A2L31	Coil: Same as A2L25
A2L32	Coil: Same as A2L24
A2Q1	Transistor: 07688 Type 2N916
A2Q2	Transistor: Same as A2Q1
A2R1	Resistor: MIL Type RC32GF333J
A2R2	Resistor: MIL Type RC20GF123J
A2R3	Resistor: MIL Type RN60B2002F
A2R4	Resistor (Factory Selected Value)
A2R5	Resistor: MIL Type RN60B1002F
A2R6	Resistor: MIL Type RN60B5621F
A2R15	Resistor: Same as A2R1
A2R16	Resistor: Same as A2R2
A2R17	Resistor: Same as A2R3

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A2R19	Resistor: Same as A2R6
A2R20	Resistor: Same as A2R5
A2S1	Switch: 93279 B-216-002-086
A2S2	Switch: 93279 B-229-002-008
A2S3	Switch: Same as A2S1
A2S4	Switch: Same as A2S1
A2S5	Switch: Same as A2S1
A2S6	Switch: Same as A2S1

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A3	Lock Divider: 93279 Type 234-003-000
A3A1	Electron Tube Mounting Board: 93279 Type 234-003-000
A3A2	Electron Tube Mounting Board: 93279 Type A-N317-1019
A3C1	Capacitor: 56289 Type 55C32
A3C2	Capacitor: 56289 Type 55C32
A3C3	Capacitor: MIL Type CM15C230J
A3C4	Capacitor: 73899 Type VC21G
A3C5	Capacitor: 72982 Type 301-N3300-020C
A3C6	Capacitor: Same as A3C5
A3C7	Capacitor: 72982 Type 301-N3300-020G
A3C8	Capacitor: Same as A3C1
A3C10-1	Capacitor: 81349 Type CC20CK010C
A3C10-2	Capacitor: 81349 Type CC20CK020C
A3C10-3	Capacitor: 81349 Type CC20CK030C
A3C10-4	Capacitor: 81349 Type CC20CH040C
A3C10-5	Capacitor: 81349 Type CC20CH050C
A3C11	Capacitor: 72982 Type 301-N3300-020C
A3C13	Capacitor: Same as A3C11
A3C12	Capacitor: Same as A3C4
A3C15	Capacitor: 56289 Type 19C241
A3C16	Capacitor: Same as A3C15
A3C17	Capacitor: Same as A3C1
A3C18	Capacitor: Same as A3C1
A3C19	Capacitor: 73899 Type VC23G
A3C20	Capacitor: Same as A3C19
A3C21	Capacitor: Same as A3C19

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A3C22	Capacitor: Same as A3C19
A3C23	Capacitor: Same as A3C15
A3C24	Capacitor: Same as A3C15
A3C27	Deleted
A3C28	Capacitor: Same as A3C10
A3C14	Capacitor: 93279 Type B-234-003-002
A3C9	Capacitor: Same as A3C14
A3CR1	Semiconductor: MIL Type 1N277
A3L1	Coil: 82142 Type 10203-22
A3L2	Coil: Same as A3L1
A3L3	Coil: Same as A3L1
A3L4	Coil: Same as A3L1
A3R1	Resistor: MIL Type RN70B1001F
A3R2	Resistor: MIL Type RN70B1002F
A3R3	Resistor: 91637 Type Rse-2
A3R4	Resistor: MIL Type RN70B2210F
A3R5	Resistor: MIL Type RC20GF101K
A3R6	Resistor: MIL Type RN60B810F
R3R7	Resistor: MIL Type RN60B3920F
A3R8	Resistor: Same as A3R5
A3R9	Resistor: MIL Type RC20GF473K
A3R11	Resistor: MIL Type RC20GF273K
A3R12	Resistor: MIL Type RC32GF102K
A3R13	Resistor: MIL Type RC20GF151K
A3R14	Resistor: MIL Type RC07GF124K
A3R16	Resistor: Same as A3R5
A3R17	Resistor: MIL Type RC07GF821K

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A3R15	Resistor: 01121 Type RC07GF104K
A3S1	Switch: 93279 Type A-N317-1018
A3S2	Switch: 93279 Type A-N317-1017
A3T1	Transformer: 93279 Type B-N317-505
A3T2	Transformer: 93279 Type B-N317-504
A3T3	Transformer: 93279 Type B-N317-503
A3T4	Transformer: 93279 Type B-N317-502
A3T5	Transformer: 93279 Type B-N317-507
A3T6	Transformer: 93279 Type B-N317-508
A3T7	Transformer: 93279 Type B-N317-509
A3T8	Transformer: 93279 Type B-N317-506
A3V1	Electron Tube: Same as A5V4
A3V2	Electron Tube: MIL Type JAN5639

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A4	Front IF 93279 Type 216-004-000
A4A1	3.5 Mc Incremental Oscillator 93279 Type C-216-004-028-1
A4A2	4.0 Mc Incremental Oscillator 93279 Type C-216-004-028-2
A4A3	5.0 Mc Incremental Oscillator 93279 Type C-216-004-028-3
A4A4	35 Mc Phase Detector 93279 Type B-225-004-014
A4A5	40 Mc Phase Detector 93279 Type B-229-004-031
A4C4	Capacitor: 72136 Type DM15E201J
A4C5	Capacitor: 56289 Type 19C203A
A4C6	Capacitor: 56289 Type 55C26
A4C7	Capacitor: Same as A4C5
A4C9	Capacitor: 56289 Type BH240
A4C11	Capacitor: MIL Type CM15E820J
A4C12	Capacitor: Same as A4C9
A4C13	Capacitor: MIL Type CY10C470J
A4C14	Capacitor: Same as A4C9
A4C15	Capacitor: Same as A4C9
A4C16	Capacitor: Same as A4C11
A4C17	Capacitor: Same as A4C9
A4C18	Capacitor: MIL Type CM15E470J
A4C19	Capacitor: Same as A4C9
A4C20	Capacitor: Same as A4C11
A4C24	Capacitor: Same as A4C4)
A4C25	Capacitor: Same as A4C5
A4C26	Capacitor: Same as A4C6
A4C27	Capacitor: Same as A4C5
A4C31	Capacitor: Same as A4C11

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A4C32	Capacitor: Same as A4C9
A4C33	Capacitor: Same as A4C13
A4C34	Capacitor: Same as A4C9
A4C35	Capacitor: Same as A4C9
A4C36	Capacitor: Same as A4C11
A4C37	Capacitor: Same as A4C9
A4C38	Capacitor: Same as A4C18
A4C39	Capacitor: Same as A4C9
A4C40	Capacitor: Same as A4C11
A4C44	Capacitor: Same as A4C9
A4C49	Capacitor: 56289 Type 19C371
A4C50	Capacitor: 72982 Type 538-000-94R
A4C51	Capacitor: Same as A3C15
A4C60	Capacitor: Same as A4C49
A4C61	Capacitor: Same as A4C50
A4C63	Capacitor: 56289 Type 33C41
A4C64	Capacitor: MIL Type CC20CH200G
A4C65	Capacitor: Same as A3C1
A4C67	Capacitor: MIL Type CM15E360J
A4C69	Capacitor: Same as A3C10-1
A4C70	Capacitor: Same as A4C63
A4C71	Capacitor: Same as A3C1
A4C80	Capacitor: Same as A4C60
A4C81	Capacitor: Same as A4C50
A4C82	Capacitor: MIL Type CM15E820J
A4C83	Capacitor: MIL Type CM15E151J
A4C84	Capacitor: Same as A3C15

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A4C85	Capacitor: MIL Type CM15E101J
A4C86	Capacitor: Same as A4C82
A4C87	Capacitor: Same as A4C49
A4C88	Capacitor: Same as A4C49
A4C90	Capacitor: Same as A4C83
A4C91	Capacitor: Same as A4C83
A4C92-1	Capacitor: 72982 Type 301-N2200-010C
A4C92-2	Capacitor: 72982 Type 301-N3300-010C
A4C92-3	Capacitor: 72982 Type 301-N2200-020C
A4C92-4	Capacitor: Same as A3C11
A4C92-5	Capacitor: 72982 Type 301-N2200-030C
A4C92-6	Capacitor: 72982 Type 301-N3300-030C
A4C92-7	Capacitor: 72982 Type 301-N2200-040C
A4C92-8	Capacitor: 72982 Type 301-N3300-040C
A4C92-9	Capacitor: 72982 Type 301-N2200-050C
A4C92-10	Capacitor: 72982 Type 301-N3300-050C
A4C93	Capacitor: MIL Type CM15E511J
A4C94	Capacitor: Same as A4C93
A4C95	Capacitor: Same as A2C2
A4C96	Capacitor: Same as A3C1
A4C97	Capacitor: Same as A3C10-5
A4C98	Capacitor: Same as A3C10-5
A4C99	Capacitor: Same as A4C83
A4C101	Capacitor: Same as A4C49
A4C102	Capacitor: Same as A4C4
A4C103	Capacitor: Same as A4C49
A4C104	Capacitor: Same as A3C1
A4C105	Capacitor: Same as A4C63

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A4C107	Capacitor: 56289 Type 19C233A2
A4C108	Capacitor: Same as A4C107
A4C109	Capacitor: Same as A4C107
A4C110	Capacitor: Same as A4C107
A4C111	Capacitor: Same as A4C107
A4C112	Capacitor: Same as A4C107
A4C113	Capacitor: Same as A4C107
A4C114	Capacitor: Same as A4C107
A4C115	Capacitor: Same as A4C107
A4C116	Capacitor: Same as A4C107
A4C117	Capacitor: Same as A4C107
A4C118	Capacitor: Same as A4C107
A4C119	Capacitor: Same as A4C107
A4C120	Capacitor: Same as A4C107
A4C121	Capacitor: Same as A4C107
A4C122	Capacitor: Same as A4C107
A4C123	Capacitor: Same as A4C107
A4C124	Capacitor: Same as A4C107
A4C125	Capacitor: Same as A4C107
A4C126	Capacitor: Same as A4C107
A4C127	Capacitor: Same as A4C107
A4C128	Capacitor: Same as A4C107
A4C129	Capacitor: Same as A4C107
A4C130	Capacitor: Same as A4C107
A4C131	Capacitor: Same as A4C107
A4C132	Capacitor: Same as A4C107
A4C133	Capacitor: Same as A4C107
A4C134	Capacitor: Same as A4C107

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A4C136	Capacitor: Same as A4C107
A4C137	Capacitor: Same as A4C107
A4C138	Capacitor: Same as A4C107
A4CR7	Semiconductor: MIL Type 1N3064
A4CR9	Semiconductor: MIL Type 1N661
A4CR10	Semiconductor: Same as A4CR9
A4L1	Coil: 72259 Type WEE12000
A4L2	Coil: 93279 Type A-100-051-001
A4L3	Coil: Same as A4L2
A4L4	Coil: Same as A4L1
A4L5	Coil: Same as A4L2
A4L6	Coil: Same as A4L2
A4L8	Coil: 72259 Type WEE33
A4L10	Coil: Same as A4L8
A4L12	Coil: 72259 Type WEE15
A4L13	Coil: 93279 Type A-N317-544-2
A4L14	Coil: Same as A4L1
A4L15	Coil: Same as A4L1
A4L16	Coil: 93279 Type A-N317-551
A4L17	Coil: Same as A4L16
A4L18	Coil: Same as A4L16
A4L19	Coil: Same as A4L16
A4L20	Coil: Same as A4L16
A4L21	Coil: Same as A4L16
A4L22	Coil: Same as A4L16
A4L23	Coil: Same as A4L16
A4L24	Coil: Same as A4L16

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A4L25	Coil: Same as A4L16
A4L26	Coil: Same as A4L16
A4L27	Coil: Same as A4L16
A4L28	Coil: Same as A4L16
A4L29	Coil: Same as A4L16
A4L30	Coil: Same as A4L16
A4L31	Coil: Same as A4L16
A4L32	Coil: Same as A4L16
A4L33	Coil: Same as A4L16
A4L34	Coil: Same as A4L16
A4L35	Coil: Same as A4L16
A4L36	Coil: Same as A4L16
A4L37	Coil: Same as A4L16
A4L38	Coil: Same as A4L16
A4L39	Coil: Same as A4L16
A4L40	Coil: Same as A4L16
A4L41	Coil: Same as A4L16
A4L42	Coil: Same as A4L16
A4L43	Coil: Same as A4L16
A4L44	Coil: Same as A4L16
A4L45	Coil: Same as A4L16
A4L46	Coil: Same as A4L16
A4L47	Coil: Same as A4L16
A4L48	Coil: Same as A4L16
A4R6	Resistor: MIL Type RC20GF472K
A4R7	Resistor: Same as A3R11
A4R8	Resistor: MIL Type RC20GF105K
A4R9	Resistor: MIL Type RC32GF682K

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A4R10	Resistor: Same as A3R11
A4R11	Resistor: MIL Type RC20GF221K
A4R12	Resistor: 01121 Type RC07GF473K
A4R13	Resistor: MIL Type RC20GF682K
A4R14	Resistor: MIL Type RC20GF104K
A4R15	Resistor: Same as A3R11
A4R21	Resistor: Same as A3R11
A4R22	Resistor: Same as A4R8
A4R23	Resistor: Same as A4R9
A4R24	Resistor: Same as A3R11
A4R25	Resistor: Same as A4R11
A4R26	Resistor: Same as A4R12
A4R27	Resistor: Same as A4R13
A4R28	Resistor: Same as A4R14
A4R29	Resistor: Same as A3R11
A4R30	Resistor: Same as A4R6
A4R38	Resistor: 01121 Type RC07GF101K
A4R39	Resistor: Same as A4R12
A4R40	Resistor: Same as A4R11
A4R41	Resistor: MIL Type RC32GF562K
A4R42	Resistor: 01121 Type RC07GF394J
A4R50	Resistor: Same as A4R38
A4R51	Resistor: Same as A4R12
A4R52	Resistor: Same as A4R11
A4R53	Resistor: 01121 Type RC07GF100K
A4R54	Resistor: Same as A4R41
A4R55	Resistor: MIL Type RC20GF393K

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A4R56	Resistor: Same as A3R5
A4R57	Resistor: Same as A4R41
A4R58	Resistor: MIL Type RC20GF471K
A4R59	Resistor: Same as A4R55
A4R60	Resistor: Same as A3R5
A4R68	Resistor: Same as A4R38
A4R69	Resistor: Same as A4R12
A4R70	Resistor: MIL Type RC20GF181K
A4R71	Resistor: Same as A4R53
A4R72	Resistor: Same as A4R41
A4R73	Resistor: Same as A4R58
A4R74	Resistor: 01121 Type RC07GF105K
A4R75	Resistor: 01121 Type RC07GF205J
A4R76	Resistor: MIL Type RC20GF223K
A4R77	Resistor: Same as A3R9
A4R78	Resistor: Same as A4R12
A4R79	Resistor: Same as A4R12
A4R80	Resistor: Same as A4R41
A4R81	Resistor: MIL Type RC20GF184K
A4R83	Resistor: Same as A4R11
A4R84	Resistor: Same as A4R53
A4R85	Resistor: Same as A4R42
A4R86	Resistor: Same as A4R42
A4R87	Resistor: Same as A4R42
A4R88	Resistor: Same as A4R41
A4R89	Resistor: 01121 Type RC07GF103K
A4R90	Resistor: (Factory Selected Value)

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A4T3	Transformer: 93279 Type B-N317-543-1
A4T6	Transformer: 93279 Type A-N317-543-2
A4T7	Transformer: 93279 Type B-N317-543-3
A4V1	Electron Tube: MIL Type JAN5702
A4V2	Electron Tube: Same as A4V1
A4V3	Electron Tube: Same as A4V1
A4V4	Electron Tube: Same as A4V1
A4V5	Electron Tube: Same as A4V1
A4V6	Electron Tube: Same as A4V1
A4V7	Electron Tube: MIL Type JAN5703
A4V8	Electron Tube: Same as A4V1
A4V9	Electron Tube: Same as A4V7
A4V10	Electron Tube: Same as A4V1
A4V11	Electron Tube: Same as A4V1
A4V12	Electron Tube: Same as A4V1
A4V13	Electron Tube: Same as A4V7
A4V14	Electron Tube: Same as A4V1
A4V15	Electron Tube: Same as A4V1
A4V16	Electron Tube: Same as A4V1
A4XV1	Socket, Electron: 71785 Type 131-17-12-038
A4XV2	Socket, Electron: Same as A4XV1
A4XV3	Socket, Electron: Same as A4XV1
A4XV4	Socket, Electron: Same as A4XV1
A4XV5	Socket, Electron: Same as A4XV1
A4XV6	Socket, Electron: Same as A4XV1
A4XV8	Socket, Electron: Same as A4XV1
A4XV10	Socket, Electron: Same as A4XV1

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A4XV11	Socket, Electron: Same as A4XV1
A4XV12	Socket, Electron: Same as A4XV1
A4XV14	Socket, Electron: Same as A4XV1
A4XV15	Socket, Electron: Same as A4XV1
A4XV16	Socket, Electron: Same as A4XV1
A5	Rear IF : 93279 Type 216-005-000
A5A1	100 Cycle Phase Detector: 93279 Type B-216-005-016
A5C1	Capacitor: 56289 Type 40C214A
A5C2	Capacitor: Same as A5C1
A5C3	Capacitor: 72136 Type DM10F201J
A5C4	Capacitor: Same as A4C5
A5C5	Capacitor: Same as A4C60
A5C6	Capacitor: Same as A4C5
A5C7	Capacitor: Same as A4C5
A5C10	Capacitor: MIL Type CM15C820J
A5C11	Capacitor: Same as A4C9
A5C12	Capacitor: MIL Type CY10C360J
A5C13	Capacitor: Same as A4C9
A5C14	Capacitor: Same as A4C9
A5C15	Capacitor: Same as A4C9
A5C16	Capacitor: Same as A4C11
A5C17	Capacitor: Same as A4C9
A5C18	Capacitor: Same as A4C67
A5C19	Capacitor: 01121 Type FB2B102M
A5C20	Capacitor: Same as A4C9
A5C22	Capacitor: 56289 Type 121P3345254
A5C23	Capacitor: Same as A3C15
A5C24	Capacitor: 56289 Type 150D335X5035B2

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A5C25	Capacitor: Same as A3C15
A5C26	Capacitor: Same as A5C24
A5C27	Capacitor: Same as A5C22
A5C28	Capacitor: Same as A3C15
A5C29	Capacitor: Same as A5C24
A5C30	Capacitor: Same as A5C22
A5C31	Capacitor: Same as A4C107
A5C32	Capacitor: Same as A4C107
A5C33	Capacitor: Same as A4C107
A5C34	Capacitor: Same as A4C107
A5C35	Capacitor: Same as A4C107
A5C36	Capacitor: Same as A4C107
A5C37	Capacitor: Same as A3C15
A5L1	Coil: Same as A4L1
A5L2	Coil: Same as A4L2
A5L3	Coil: Same as A4L2
A5L4	Coil: Same as A3L1
A5L5	Coil: Same as A3L1
A5L6	Coil: Same as A3L1
A5L7	Coil: Same as A3L1

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A5L8	Coil: Same as A3L1
A5L9	Coil: Same as A3L1
A5R7	Resistor: Same as A4R6
A5R8	Resistor: Same as A3R11
A5R9	Resistor: Same as A4R74
A5R10	Resistor: MIL Type RC20GF103K
A5R11	Resistor: Same as A4R9
A5R12	Resistor: Same as A3R11
A5R13	Resistor: Same as A4R11
A5R14	Resistor: Same as A4R53
A5R15	Resistor: Same as A3R9
A5R16	Resistor: Same as A4R13
A5R17	Resistor: Same as A5R14
A5R18	Resistor: Same as A4R53
A5R19	Resistor: MIL Type RC07GF273K
A5R20	Resistor: MIL Type RC20GF474K
A5R21	Resistor: MIL Type RC20GF154K
A5R22	Resistor: 01121 Type RC07GF474K
A5R24	Resistor: MIL Type RC20GF153K
A5R27	Resistor: Same as A5R24
A5R28	Resistor: Same as A5R22
A5R29	Resistor: Same as A5R21
A5R32	Resistor: Same as A5R24
A5R33	Resistor: Same as A5R22
A5R34	Resistor: Same as A5R21
A5R35	Resistor: MIL Type RC32GF153K

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A5R36	Resistor: MIL Type RC32GF273K
A5R38	Resistor: Same as A4R42
A5V1	Electron Tube: Same as A4V1
A5V2	Electron Tube: Same as A4V1
A5V3	Electron Tube: Same as A4V1
A5V4	Electron Tube: MIL Type JAN6021
A5V5	Electron Tube: Same as A5V4
A5V6	Electron Tube: Same as A5V4
A5XV1	Socket: 71785 Type 132-18-12-001
A5XV2	Socket: Same as A5XV1
A5XV3	Socket: 71785 Type 132-18-12-011
A5XV4	Socket: Same as A4XV1
A5XV5	Socket: Same as A4XV1
A5XV6	Socket: Same as A4XV1
A6	VFO/SPECTRUM GENERATOR: 93279 Type 234-006-000
A6C1	Capacitor: 56289 Type 118P15502T15
A6C2	Capacitor: 72136 Type DM19F392J
A6C3	Capacitor: Same as A3C1
A6C4	Capacitor: Same as A4C63
A6C5	Capacitor: MIL Type CM15C300J
A6C6	Capacitor: Same as A4C64
A6C7	Capacitor: 74970 Type 160-110
A6C8	Capacitor: MIL Type CM20E561J
A6C9	Capacitor: 93279 Type B-234-006-002
A6C14	Capacitor: Same as A6C7
A6C15	Capacitor: Same as A4C64
A6C17	Capacitor: Same as A6C8
A6C19	Capacitor: Same as A6C7
A6C20	Capacitor: Same as A2C2

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A6C22	Capacitor: 56289 Type 41C92
A6C23	Capacitor: 56289 Type 19C385
A6C25	Capacitor: MIL Type CM15C501J
A6C28	Capacitor: Same as A3C19
A6C29	Capacitor: MIL Type CC30CH510G
A6C30	Capacitor: Same as A6C29
A6C31	Capacitor: Same as A6C23
A6C32	Capacitor: Same as A6C23
A6C33	Capacitor: Same as A6C23
A6C34	Capacitor: Same as A6C23
A6C35	Capacitor: MIL Type CM15C101J
A6C37	Capacitor: Same as A6C23
A6C39	Capacitor: Same as A3C1
A6C40	Capacitor: 56289 Type 29C37
A6C41	Capacitor: Same as A6C40
A6C42	Capacitor: Same as A4C49
A6C43	Capacitor: Same as A4C49
A6C44	Capacitor: Same as A4C49
A6C45	Capacitor: Same as A4C49
A6C46	Capacitor: Same as A4C49
A6C47	Capacitor: Same as A4C49
A6C48	Capacitor: Same as A6C22
A6C49	Capacitor: Same as A6C35
A6C52	Capacitor: Same as A4C107
A6CR1	Semiconductor: MIL Type 1N3064
A6CR2	Semiconductor: MIL Type 1N3064
A6L1	Coil: 71279 Type X2060-10
A6L2	Coil: 93279 Type A-216-006-009

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A6L3	Coil: 93279 Type B-N317-513
A6L5	Coil: 93279 Type A-N317-519
A6L6	Coil: 82142 Type 2150-24
A6L7	Coil: Same as A6L6
A6L8	Coil: Same as A6L6
A6L9	Coil: Same as A6L6
A6L10	Coil: Same as A6L6
A6L11	Coil: Same as A6L6
A6L12	Coil: Same as A6L6
A6L13	Coil: Same as A6L6
A6R2	Resistor: Same as A4R38
A6R3	Resistor: Same as A4R26
A6R4	Resistor: Same as A4R70
A6R5	Resistor: MIL Type RC42GF222K
A6R6	Resistor: Same as A4R26
A6R9	Resistor: MIL Type RC32GF222K
A6R10	Resistor: Same as A3R11
A6R11	Resistor: MIL Type RC20GF561K
A6R12	Resistor: Same as A4R58
A6R13	Resistor: Same as A3R13
A6R14	Resistor: Same as A4R55
A6R15	Resistor: MIL Type RC20GF102K
A6R16	Resistor: Same as A4R11
A6R17	Resistor: MIL Type RC42GF682K
A6R18	Resistor: MIL Type RN60B6800F
A6R19	Resistor: MIL Type RN60B2200F
A6R20	Resistor: Same as A5R10
A6R21	Resistor: MIL Type RC20GF563K
A6R22	Resistor: Same as A3R9

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A6R23	Resistor: MIL Type RC20GF220K
A6R24	Resistor: Same as A6R23
A6R26	Resistor: Same as A3R5
A6T1	Deleted
A6T2	Transformer: 93279 Type B-N317-515
A6T3	Transformer: 93279 Type B-216-006-018
A6T4	Transformer: 93279 Type B-N317-514
A6V1	Electron Tube: Same as A3V2
A6V3	Electron Tube: Same as A4V7
A6V4	Electron Tube: Same as A4V1
A8	REFERENCE CHASSIS: 93279 Type 216-008-000
A8A1	CRYSTAL OVEN: 93279 Type RD-134
A8A2	FREQUENCY DIVIDER: 93279 Type 216-008-011
A8C2	Capacitor: 91293 Type 1951
A8C4	Capacitor: 56289 Type 55C32
A8C5	Capacitor: Same as A3C4
A8C6	Capacitor: Same as A6C22
A8C8-1	Capacitor: Same as A4C92-10
A8C8-2	Capacitor: 72982 Type 301-N3300-100F
A8C8-3	Capacitor: 72982 Type 301-N3300-150F
A8C8-4	Capacitor: 72982 Type 301-N3300-200F
A8C9-1	Capacitor: Same as A3C10-5
A8C9-2	Capacitor: MIL Type CC20CH100C
A8C9-3	Capacitor: MIL Type CC20CH150C
A8C9-4	Capacitor: MIL Type CC20CH200C
A8C11	Capacitor: Same as A6C22
A8C12	Capacitor: MIL Type CM15C470J
A8C17	Capacitor: Same as A4C107
A8C18	Capacitor: Same as A8C4

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A8C19	Capacitor: Same as A8C4
A8C20	Capacitor: MIL Type CM15C360J
A8C21	Capacitor: 56289 Type 5C52
A8C22	Capacitor: Same as A6C1
A8C23	Capacitor: 72136 Type DM20E392J
A8C24	Capacitor: 72136 Type MPD
A8L2	Coil: Same as A6L6
A8L4	Coil: Same as A6L6
A8RT1	Lamp: 64959 Type E-1
A8R3-1	Resistor: MIL Type RC20GF100K
A8R3-2	Resistor: MIL Type RC20GF120K
A8R3-3	Resistor: MIL Type RC20GF150K
A8R3-4	Resistor: MIL Type RC20GF180K
A8R3-5	Resistor: Same as A6R23
A8R3-6	Resistor: MIL Type RC20GF330K
A8R3-7	Resistor: MIL Type RC20GF390K
A8R4	Resistor: MIL Type RN60B2000F
A8R5	Resistor: Same as A3R9
A8R6	Resistor: Same as A6R15
A8R7	Resistor: MIL Type RC20GF680K
A8R8	Resistor: Same as A8R7
A8R10	Resistor: MIL Type RC42GF303J
A8R11	Resistor: MIL Type RC20GF822J
A8R12	Resistor: Same as A3R9
A8R13	Resistor: Same as A4R70
A8R14	Resistor: Same as A3R11
A8R15	Resistor: MIL Type RC20GF152J
A8R20	Resistor: Same as A4R12
A8R21	Resistor: Same as A4R70

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A8R23	Resistor: MIL Type RC42GF472K
A8R24	Resistor: MIL Type RC07GF102K
A8R25	Resistor: Same as A4R38
A8R26-1	Resistor: MIL Type RC07GF470K
A8R26-2	Resistor: MIL Type RC07GF560K
A8R26-3	Resistor: MIL Type RC07GF680K
A8R26-4	Resistor: MIL Type RC07GF820K
A8R26-5	Resistor: MIL Type RC07GF101K
A8R26-6	Resistor: MIL Type RC07GF121K
A8R26-7	Resistor: MIL Type RC07GF151K
A8R27	Resistor: Same as A6R15
A8S1	Switch: 40228 Type 1RA1
A8T1	Transformer: 93279 Type B-N317-523
A8T3	Transformer: 93279 Type B-N317-546-3
A8V1	Electron Tube: MIL Type JAN6AH6
A8V2	Electron Tube: MIL Type JAN6AK5
A8V3	Electron Tube: Same as A8V2
A8XA2	Socket: 91662 Type TS103C01
A8XV1	Socket: 91662 Type TS102C01
A8XV2	Socket: Same as A8XV1
A8XV3	Socket: Same as A8XV1
A9	POWER SUPPLY: 93279 Type 274-009-000
A9C1	Capacitor: 93279 Type A-N317-55
A9C2	Capacitor: Same as A9C1
A9C3	Capacitor: 56289 Type 158P10393
A9C4	Capacitor: Same as A9C1
A9C5	Capacitor: 56289 Type 150D475X0035B2
A9C6	Capacitor: 56289 Type 150D337X0006S2
A9C7	Capacitor: 56289 Type 121P47494T15
A9C8	Capacitor: 56289 Type 158P15393
A9C9	Capacitor: 71590 Type DD30-502

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A9CR1	Semiconductor: MIL Type 1N3612S
A9CR2	Semiconductor: Same as A9CR1
A9CR3	Semiconductor: Same as A9CR1
A9CR4	Semiconductor: Same as A9CR1
A9CR5	Semiconductor: MIL Type 1N485B
A9CR6	Semiconductor: Same as A9CR5
A9CR7	Semiconductor: MIL Type 1N270
A9CR8	Semiconductor: Same as A9CR5
A9CR12	Semiconductor: Same as A9CR5
A9CR13	Semiconductor: Same as A9CR5
A9CR14	Semiconductor: Same as A9CR5
A9K1	Relay: 93279 Type B-N317-530-1
A9K2	Relay: 93279 Type B-N317-538-1
A9Q1	Transistor: MIL Type 2N1547
A9Q2	Transistor: Same as A9Q1
A9Q3	Transistor: Same as A9Q1
A9Q5	Transistor: MIL Type 2N1184B
A9Q6	Transistor: MIL Type 2N335
A9Q7	Transistor: Same as A9Q6
A9Q8	Transistor: MIL Type 2N1206
A9Q9	Transistor: Same as A9Q8
A9R2	Resistor: MIL Type RH10G300F
A9R4	Resistor: MIL Type RH10G200H
A9R5	Resistor: MIL Type RW57G102H
A9R6	Resistor: MIL Type RW57G122H
A9R11	Resistor: 01121 Type RC07GF472K
A9R12	Resistor: MIL Type RH10G103H
A9R13	Resistor: 91637 Type RS-5-5W
A9R14	Resistor: 01121 Type RC07GF102K
A9R15	Resistor: 01121 Type RC07GF562K
A9R16	Resistor: MIL Type RC42GF563K

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A9R17	Resistor: 91637 Type MRS-1/2
A9R18	Resistor: Same as A9R17
A9R19	Resistor: Same as A9R13
A9R20	Resistor: 80294 Type 200L-1203
A9R21	Resistor: 01121 Type RC07GF220K
A9R22	Resistor: MIL Type RC32GF331K
A9R23	Resistor: Same as A3R5
A9R24	Resistor: 01121 Type RC07GF470J
A9R25	Resistor: Same as A4R11
A9R26	Resistor: MIL Type RC42GF273K
A9R27	Resistor: 01121 Type RC07GF560K
A9R28	Resistor: 05591 Type HS-7
A9R29	Resistor: MIL Type RC42GF272J
A9T1	Transformer: 93279 Type C-100-052-005
A9VR1	Semiconductor: 07688 Type 1N1820A
A9VR2	Semiconductor: 07688 Type 1N941
A11	BALANCED MIXER: 93279 Type 216-011-000
A11C1	Capacitor: MIL Type CY10C680J
A11C2	Capacitor: MIL Type CC20CK020G
A11C3	Capacitor: Same as A11C1
A11CR1	Semiconductor: Same as A4CR7
A11CR2	Semiconductor: Same as A4CR7
A11R1	Resistor: Same as A5R19
A11R2	Resistor: Same as A5R19
A11R3	Resistor: 81349 Type RV6LAYS251A
A11T1	Transformer: 93279 Type A-216-001-008
A11T2	Transformer: 93279 Type A-216-011-003-1
A11T3	Transformer: 93279 Type A-216-011-003-2

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A12	THIRD MIXER: 93279 Type 216-012-000
A12C29	Capacitor: 72136 Type DM15E101K
A12C30	Capacitor: MIL Type CC20CJ030C
A12C31	Capacitor: Same as A12C29
A12C32	Capacitor: Same as A6C22
A12C33	Capacitor: Same as A4C63
A12C34	Capacitor: Same as A3C1
A12C35	Capacitor: Same as A4C107
A12C36	Capacitor: Same as A4C107
A12L20	Coil: 93279 Type B-N317-544-1
A12L21	Coil: Same as A4L1
A12L22	Coil: Same as A4L1
A12R7	Resistor: MIL Type RC20GF560K
A12R8	Resistor: 01121 Type RC07GF333K
A12R9	Resistor: MIL Type RC32GF152K
A12R10	Resistor: Same as A12R8
A12R11	Resistor: Same as A3R15
A12R12	Resistor: Same as A3R5
A12R13	Resistor: Same as A8R26
A12R14	Resistor: MIL Type RC42GF822K
A12T1	Transformer: 93279 Type B-N317-544-3
A12V1	Electron Tube: MIL Type JAN6BE6
A12XV1	Socket: Same as A8XV1
A13	BROADBAND AMPLIFIER 93279 Type 216-013-000
A13C1	Capacitor: MIL Type CY10C510J
A13C2	Capacitor: Same as A4C107
A13C7	Capacitor: Same as A2C1
A13Q1	Transistor: Same as A2Q1

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NAME AND DESCRIPTION
A13R1	Resistor: MIL Type RC07GF391K
A13R2	Resistor: MIL Type RC07GF223K
A13R3	Resistor: Same as A8R24
A13R4	Resistor: Same as A4R89
A13R8	Resistor: MIL Type RC07GF123K
A13T1	Transformer: 93279 Type 216-013-006
A14	EMERGENCY OVEN SUPPLY: 93279 Type 274-014-000
A14BT1	Battery: 55933 Type S-108
A14BT2	Battery: Same as A14BT1
A14BT3	Battery: Same as A14BT1
A14BT4	Battery: Same as A14BT1
A14CR1	Semiconductor: MIL Type 1N540
A14CR2	Semiconductor: Same as A14CR1
A14CR3	Semiconductor: Same as A14CR1
A14CR4	Semiconductor: Same as A14CR1
A14CR5	Semiconductor: Same as A14CR1
A14F1	Fuse: 75915 Type F02DR125B
A14F2	Fuse: Same as A14F1
A14K1	Relay: 03615 Type KHP17A11
A14R1	Resistor: MIL Type RH10
A14R2	Resistor: MIL Type RC20GF151J
A14T1	Transformer: 93279 Type B-N317-553
A14XF1	Fuseholder: 75915 Type 342004
A14XF2	Fuseholder: Same as A14XF1

TABLE 6-3. LIST OF MANUFACTURERS

MFR. CODE	MANUFACTURER'S NAME
Stet	Stettner & Company, Germany
01121	Allen-Bradley Co., Chicago, Illinois
03615	Ohmite Manufacturing Co., Los Angeles, California
05591	General Resistance, Inc., New York, New York
07688	Joint Electronic Tube Engineering Council
40228	Micro Switch Division of First Industrial Corporation, Freeport, Ill.
55933	Sonotone Corp., Elmsford, New York
56289	Sprague Electric Company, North Adams, Mass.
64959	Western Electric Co., New York, New York
71279	Cambridge Thermionic Corp., Cambridge, Mass.
71590	Centralab, Milwaukee, Wisconsin
71785	Cinch Manufacturing Co., Chicago, Illinois
72136	Electro-Motive Manufacturing Co., Willimantic, Conn.
72982	Erie Resistor Corporation, Erie, Pennsylvania
73899	JFD Electronics Corp., Brooklyn, New York
74868	Industrial Products Company, Danbury, Conn.
74970	E. F. Johnson, Co., Waseca, Minnesota
75915	Littelfuse, Inc., Des Plaines, Ill.
80294	Bourns Laboratories, Inc., Riverside, California
91637	Dale Products, Inc., Columbus, Nebraska
91662	Elco Company, Philadelphia, Pennsylvania
91737	Greomar Manufacturing Co., Inc., Wakefield, Mass.
93279	Manson Laboratories, Wilton, Connecticut

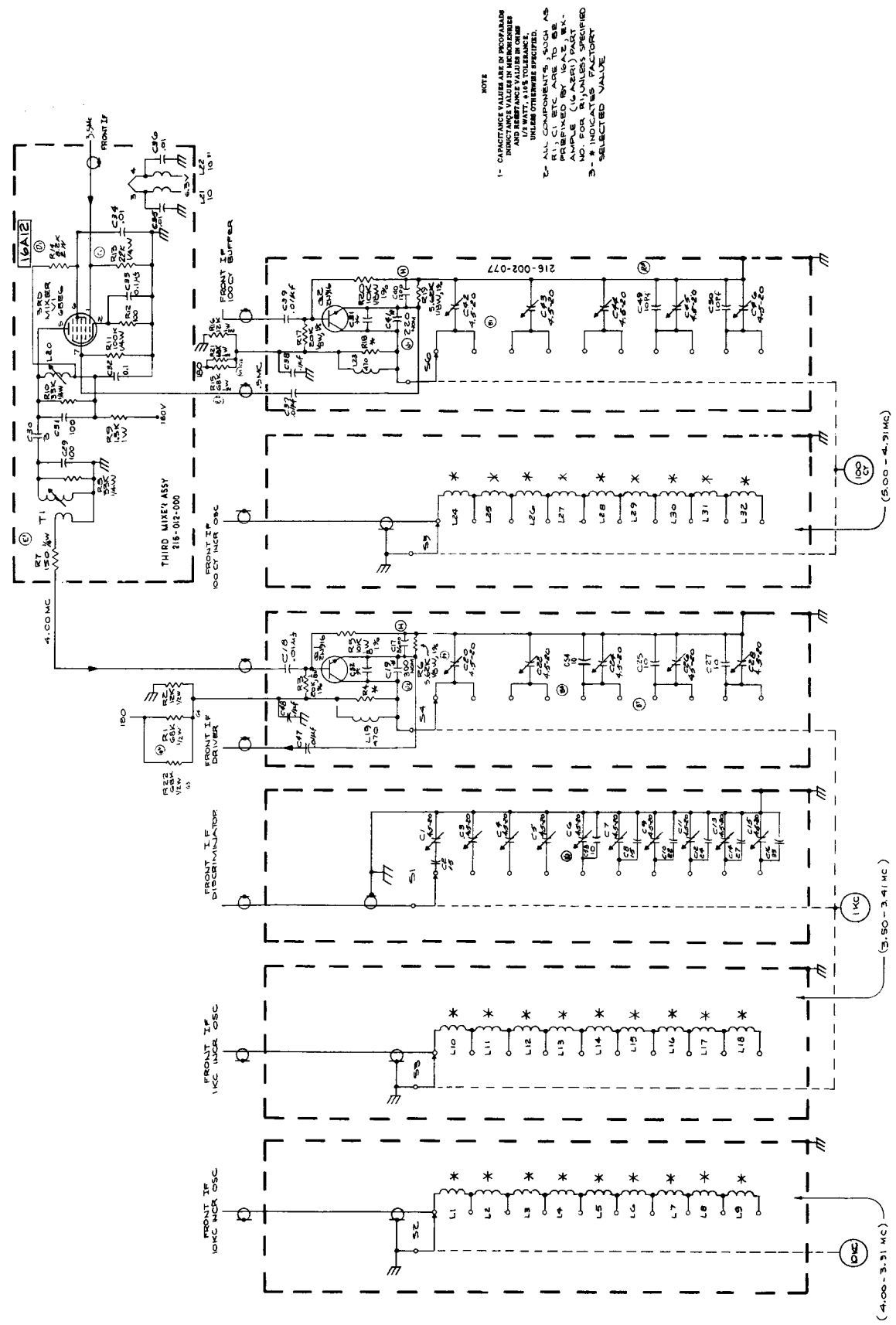


Figure 5-3. Gear Box, Electrical Component, Schematic Diagram (D-216-002-077)

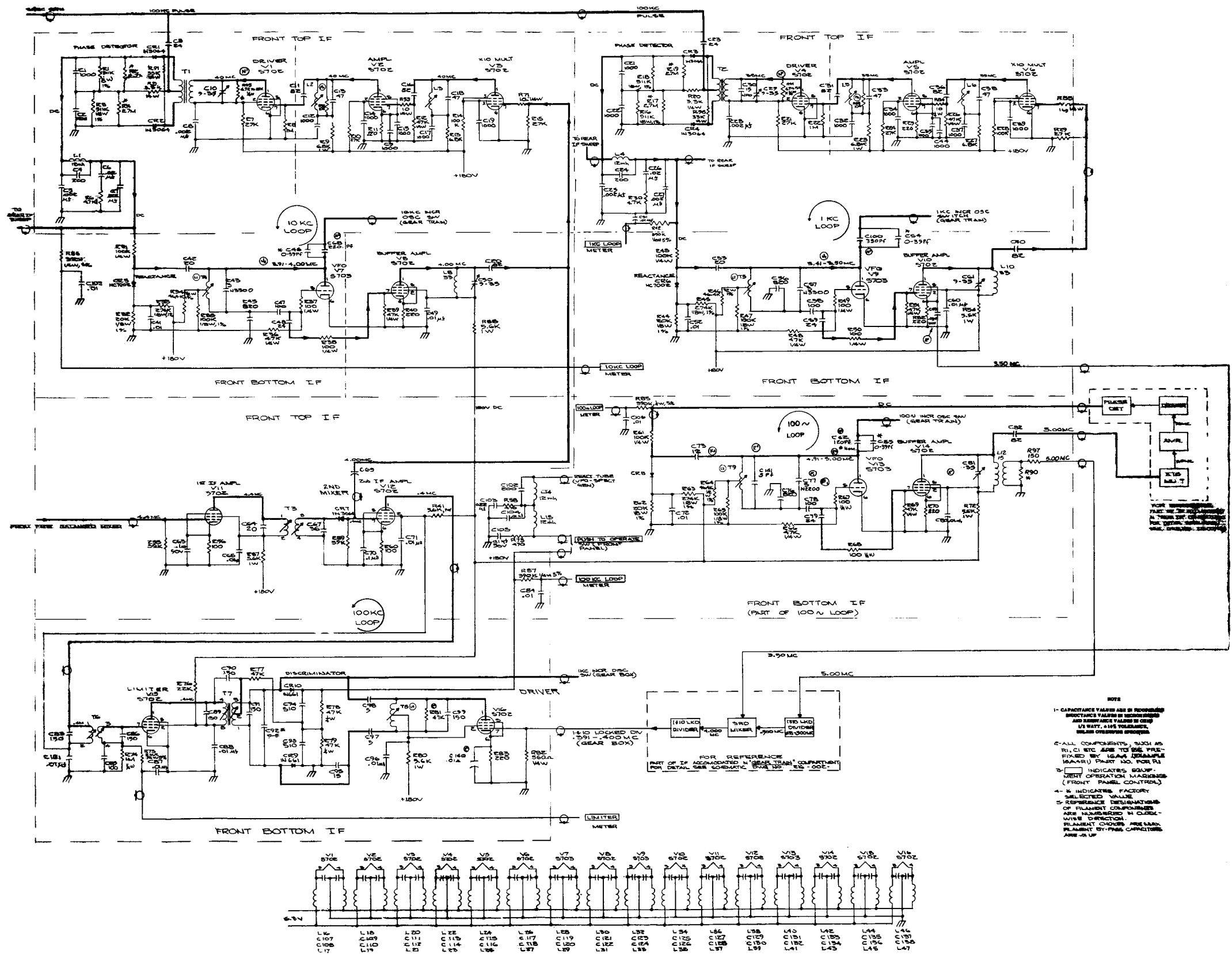


Figure 5-4. I-f Chassis, Front, Schematic Diagram (E-216-004-001)