RADIO TEST EQUIPMENT
MICROWAVE TEST SETS
J68392A TRANSMITTER-RECEIVER TEST SET
KS-19975 IF OSCILLATOR
MAINTENANCE

This section contains adjustment procedures and circuit voltage information for maintaining and troubleshooting the KS-19975 IF oscillator. The normal operating adjustments and routine maintenance requirements for this unit are provided in Section 104-415-501. The description of the IF oscillator is contained in Section 104-415-100. The schematic for the IF oscillator is shown in Fig. 3.

CHART — PAGE

CHART 1

POWER OUTPUT ADJUSTMENT

STEP	PROCEDURE
1	Prepare the test set in accordance with Fig. 1.
2	Set the OUTPUT control on the IF oscillator to midrange and adjust R39 until the power meter indicates -2.0 ±0.2. This corresponds to +10 dBm at the IF OUT jack.
3	If R39 has insufficient range, set it for a maximum power indication on the power meter, and adjust the OUTPUT control until the power meter indicates -2.0 ±0.2.
4	If both the OUTPUT control and R39 have insufficient range, check and if necessary, replace any of, or the entire combination of, tubes V3, V4, V5, and V6.
5	If the power output requirement still cannot be met, check and if necessary, replace tubes V1 and/or V2. ***Note:*** Access to V1 and V2 is obtained by removing the two shield covers enclosing the IF circuits of the oscillator. If V1 and/or V2 require replacement, Chart 2 must be performed.

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PREPARATION FOR TEST

1. Set ATTEN 2 to 12 dB.

2. Set the controls on the test set as follows:

UNIT	CONTROL	POSITION
Control panel	FUNCTION IF SWEEP WIDTH IF CENTER FREQ IF MARKER AMPLITUDE CTR	IF – IF Maximum clockwise Midrange Midrange MKR FREQ
Oscilloscope time base	POSITION MAGNIFIER SWEEP TIME VERNIER SINGLE-NORMAL	Midrange X10 EXT Midrange NORMAL
Oscilloscope differential amplifier	POSITION BANDWIDTH AMPLIFIER SENSITIVITY VERNIER AC-DC-OFF (+ INPUT) AC-DC-OFF (– INPUT)	Midrange 4 DC 2 MV/CM Midrange DC OFF
Power meter	INPUT CHANNEL POWER RANGE DBM	IF 0

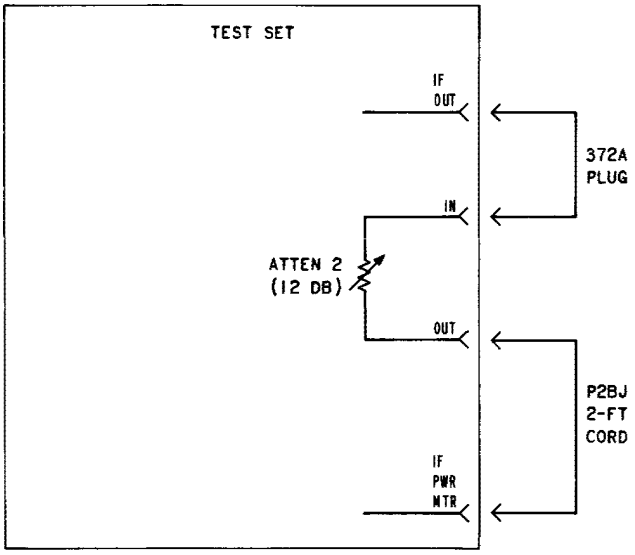


Fig. 1—Power Output Adjustment

CHART 1 (Cont)

STEP	PROCEDURE
	Caution: Care should be taken to return V1 and V2 to the sockets from which they were removed if the tubes are found to be good. Interchanging the tubes can significantly affect the harmonic output of the oscillator, thereby requiring that the tests outlined in Chart 2 be performed.
6	If the power output requirement still cannot be met, it will necessary to troubleshoot the unit. Use Chart 3 as a guide.

CHART 2

ADJUSTMENT OF HARMONIC CONTENT

In this test, the harmonic output of the oscillator is measured when the oscillator is operating in the 50-MHz region. A 578A filter is connected to the output of the oscillator to make this measurement. The filter provides high loss to the 50-MHz signal but passes the harmonics at 100 MHz and above. The test procedure measures the harmonic output in dB relative to the 50 MHz fundamental frequency.

APPARATUS:

1—J68392A Transmitter-Receiver Test Set

STEP	PROCEDURE
1	Prepare for test in accordance with Fig. 2. ***Requirement:*** The bottom of the U-shaped portion of the test trace shall be below the reference trace. If the requirement is met, the test indicates that the harmonic content is at least 40 dB below the fundamental frequency and no further testing is necessary. If the requirement is not met, proceed with Step 2.
2	Adjust the CUR BAL control on the IF oscillator to bring the test trace down to its minimum at 50 MHz. ***Requirement:*** The bottom of the U-shaped portion of the test trace shall be below the reference trace. If the requirement is met, no further testing is necessary. If the requirement is not met, proceed with Step 3.

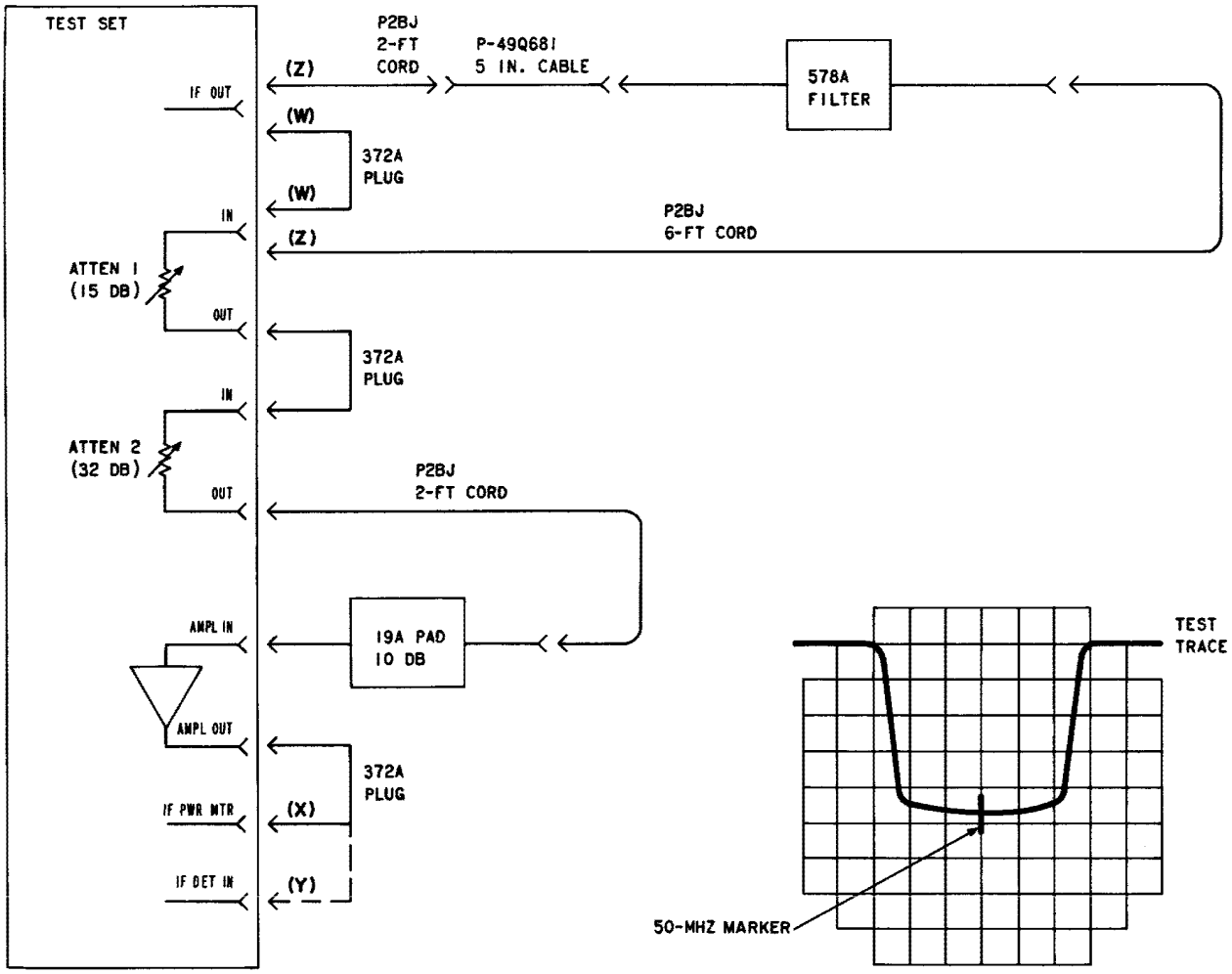


Fig. 2—Adjustment of Harmonic Content

PREPARATION FOR TEST

1. Set attenuators as indicated.
2. Establish test connections using options (W) and (X).
3. Set the test set controls as follows:

UNIT	CONTROL	POSITION
Control panel	FUNCTION	IF – IF
	IF SWEEP WIDTH	Midrange
	IF CENTER FREQ	Midrange
	IF MARKER AMPLITUDE	Midrange
	CTR	MKR FREQ
	AMPL GAIN	Midrange
Oscilloscope time base	POSITION	Midrange
	MAGNIFIER	X10
	SWEEP	EXT
	VERNIER	Midrange
	SINGLE-NORMAL	NORMAL
Oscilloscope differential amplifier	POSITION	Midrange
	BANDWIDTH	4
	AMPLIFIER	DC
	SENSITIVITY	2 MV/CM
	VERNIER	Midrange
	AC-DC-OFF (+ INPUT)	DC
	AC-DC-OFF (– INPUT)	OFF
Power meter	INPUT CHANNEL	IF
	POWER RANGE DBM	–5

4. Adjust the AMPL GAIN control for a –2 indication on the power meter (–7 dBm).
5. Change option (X) to option (Y).
6. Adjust the TEST TRACE controls on the control panel to center the test trace on the oscilloscope.
7. Adjust the SWEEP TIME VERNIER and POSITION controls on the oscilloscope time base unit for a horizontal test trace display of approximately 10 centimeters.
8. Adjust the IF MARKER FREQ control on the control panel for a 50 ±0.1 MHz indication on the counter.
9. Adjust the IF CENTER FREQ control on the control panel to center the 50-MHz marker on the oscilloscope display.
10. Adjust the REF TRACE controls on the control panel to bring the reference trace into coincidence with the test trace at 50 MHz.
11. Increase the attenuation of ATTEN 2 by 10 dB and adjust the SENSITIVITY VERNIER and POSITION controls on the oscilloscope differential amplifier for 1-centimeter deflection between the test trace and reference trace. Return ATTEN 2 to its previous setting. This calibrates the oscilloscope for 10 dB per centimeter.
12. Change option (W) to option (Z).
13. Adjust ATTEN 1 for 0 dB and ATTEN 2 for 7 dB.
14. Adjust the IF SWEEP WIDTH and IF CENTER FREQ controls to obtain the test trace as shown on the left.

Fig. 2 – (Cont)

CHART 2 (Cont)

STEP	PROCEDURE
3	Remove the shield covers from the top of the IF oscillator.
4	Adjust variable capacitors C2 and C3 counterclockwise for minimum capacitance. The adjusting screw protrudes approximately 5/8 inch from its threaded shaft at minimum capacitance.
5	Readjust the IF CENTER FREQ and IF SWEEP WIDTH controls on the control panel to obtain an oscilloscope display similar to the one shown in Fig. 2.
6	Adjust the CUR BAL control on the IF oscillator to bring the test trace down to its minimum at 50 MHz. Note the position of the bottom of the U-shaped portion of the trace.
7	Interchange the two 417A tubes V1 and V2 and readjust the CUR BAL control to bring the test trace down to its minimum at 50 MHz. Note the position of the bottom of the U-shaped portion of the test trace. If the position of the bottom of the U-shaped portion of the test trace is lower than that noted in Step 6, leave V1 and V2 in their present arrangement. If the position of the bottom of the U-shaped portion of the test trace is not as low as that noted in Step 6, interchange V1 and V2.
8	Adjust variable capacitor C2 in the clockwise direction to bring the test trace down to its minimum at 50 MHz. Note the position of the bottom of the U-shaped portion of the curve. Return C2 to its minimum capacitance setting.
9	Adjust variable capacitor C3 in the clockwise direction to bring the test trace down to its minimum at 50 MHz. Note the position of the bottom of the U-shaped portion of the curve. ***Note:*** As capacitors C2 and C3 are adjusted, the frequency of the oscillator may change slightly. It may be necessary to readjust the IF CENTER FREQ and the IF SWEEP WIDTH controls to maintain the curve in the center of the oscilloscope.
10	Determine which capacitor, C2 or C3, positions the bottom of the U-shaped portion of the curve at the lower of the two points noted in Steps 8 and 9.
11	Simultaneously adjust this capacitor and the CUR BAL control to bring the test trace down to its minimum at 50 MHz. ***Note:*** It may be necessary to readjust the IF CENTER FREQ and IF SWEEP WIDTH controls to maintain the curve in the center of the oscilloscope. ***Requirement:*** The bottom of the U-shaped portion of the test trace shall be below the reference trace. If the requirement is met, this indicates that the harmonic content is at least 40 dB below the fundamental frequency, which is acceptable. Proceed to Step 13.

CHART 2 (Cont)

STEP	PROCEDURE
	If the requirement is not met, proceed with Step 12.
12	Replace the two 417A tubes and repeat Steps 4 through 11. If the requirement is now met, proceed to Step 13. If the requirement is not met, it will be necessary to troubleshoot the unit. Use Chart 3 as a guide.
13	Repeat the measurements outlined in Section 104-415-501, Chart 2.

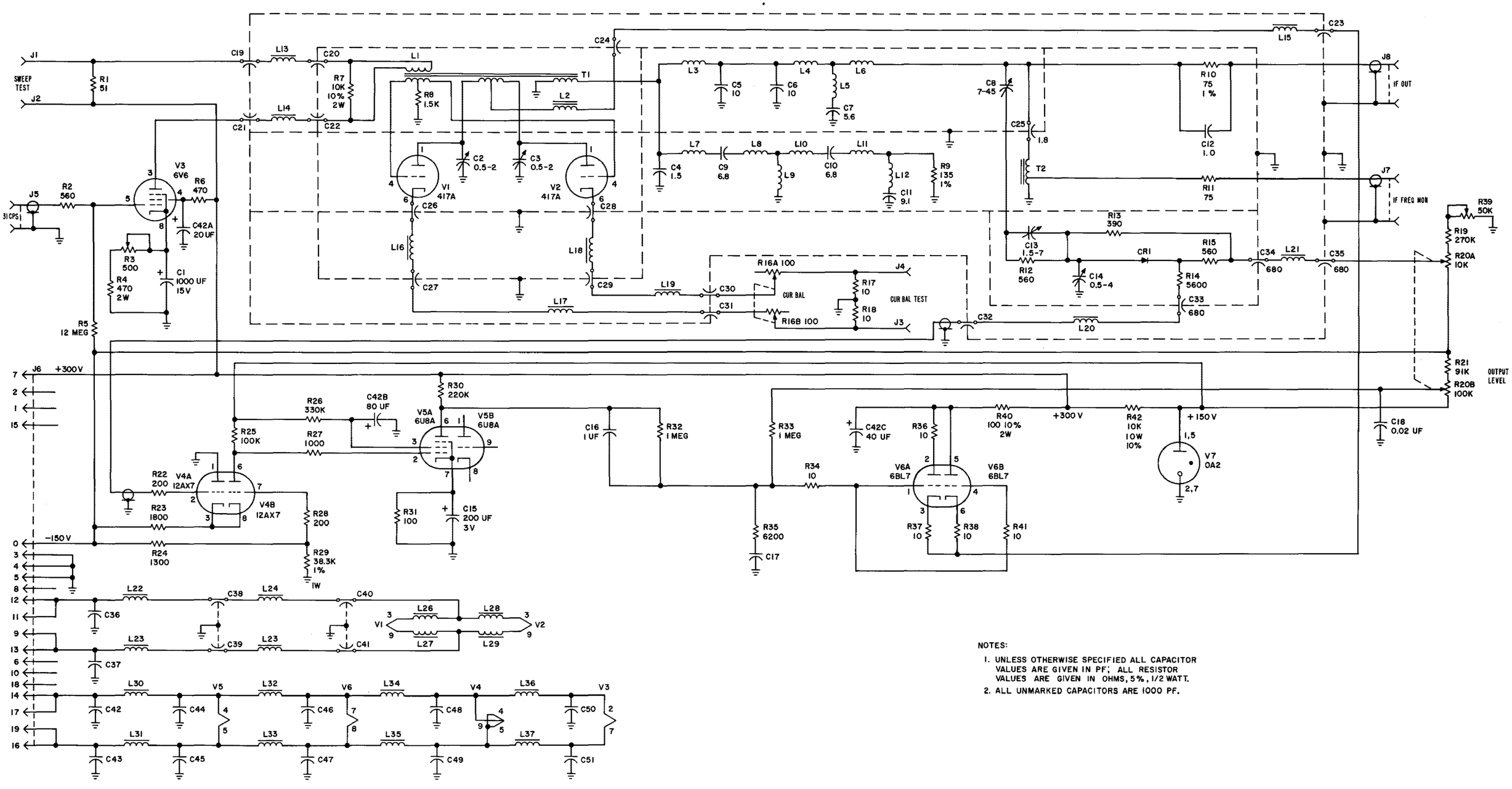
CHART 3

VOLTAGE MEASUREMENTS

STEP	PROCEDURE
1	Measure the dc voltage between the various tube sockets and chassis ground on the IF oscillator.

TUBE	PIN NUMBER								
	1	2	3	4	5	6	7	8	9
V1	95	—	0	—5	—	1	—	—	0
V2	95	—	0	—5	—	1	—	—	0
V3	—	0	280	290	—18	—	0	8	—
V4	0	—140	—140	0	0	—1.4	—140	—140	0
V5	—	—1.4	50	0	0	100	0	—	—
V6	56	280	70	60	280	70	0	0	—
V7	150	0	—	—	150	—	0	—	—

Note: A dash (—) in the column indicates no connection.



NOTES:

1. UNLESS OTHERWISE SPECIFIED ALL CAPACITOR VALUES ARE GIVEN IN PF; ALL RESISTOR VALUES ARE GIVEN IN OHMS, 5%, 1/2 WATT.
2. ALL UNMARKED CAPACITORS ARE 1000 PF.

Fig. 3—KS-19975 IF Oscillator—Typical Schematic Diagram