JERROLD

OPERATING and MAINTENANCE MANUAL NO. 1901

WIDE BAND SWEEP GENERATOR
Model 900-A

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ILLUSTRATIONS

Figure 1 Model 900-A

GENERAL DESCRIPTION

Model 900A

Wide Band Sweep Generator

Designed and engineered for use in the laboratory, production test . . . or wherever *unusual versatility, high stability* and *constancy of output* are essential in accurate sweep frequency measurements.

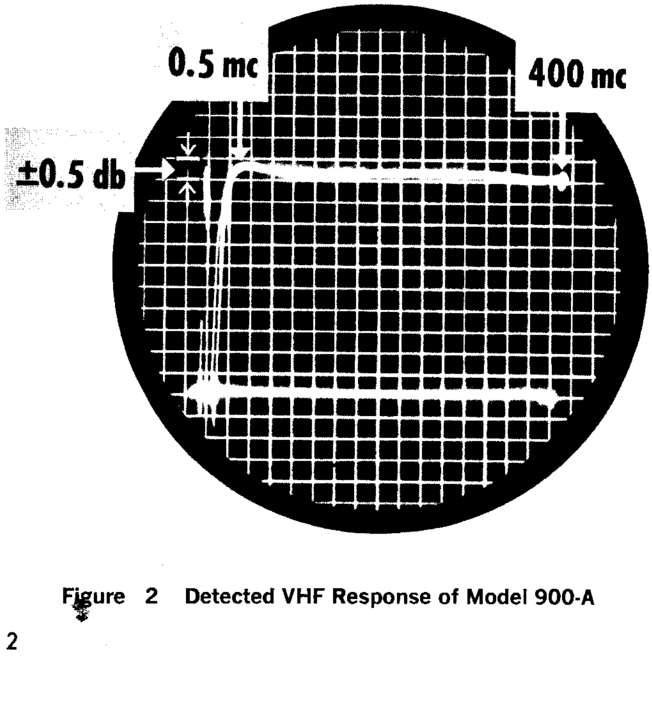


Figure 2 Detected VHF Response of Model 900-A

DESCRIPTION

The JERROLD Model 900 A, Wide Band Sweep Frequency Generator, is an instrument of unusual versatility. In two ranges—"VHF" and "UHF"—the instrument supplies a sweep signal with center at any frequency from 500 kc to 1,000 mc and with sweep widths as broad as 400 mc and as narrow as 100 kc. The RF output—carefully monitored by matched, crystal diodes feeding a two stage, push-pull ALC amplifier—is flat within ±0.5 db up to 800 mc and ±1.5 db from 800 mc to 1,200 mc; at maximum sweep width. The mechanical and electrical stability and the extreme constancy of its output recommend the Model 900 A Generator for use wherever careful and highly accurate sweep frequency measurements are to be made.

FEATURES

MARKER CIRCUITS

A flexible arrangement allows injecting a center frequency marker as well as sideband markers for any of the frequencies to which the sweep can be tuned. The sideband marker arrangement is particularly convenient where it is desired to mark frequencies which are spaced a small distance away from a high, center-frequency. A built-in marker amplifier provides ample gain in the marker channel to ensure clear indications from weak marker signals. The frequency response of the marker amplifier is controlled to give the clearest possible marking with no distortion of the trace.

PLUG-IN DETECTOR

A unique plug-in detector has been supplied with the instrument. The detector is a full-wave, peak-to-peak type and contains crystal diodes that are carefully matched with those in the ALC circuit of the sweep, in order to obtain flat response over the extremely wide band provided in this generator. In equipment test set-ups requiring an accurate detector coupled very close to the unit under test, the detector may be removed from the sweep and used externally. For convenience, a compartment is included on the front panel of the instrument for the detector.

PHASE ADJUSTMENTS

A phase reverse as well as a phasing adjustment control is provided in the horizontal deflection circuit of the sweep for proper adjustment of the oscilloscope pattern. The blanking circuit derives its voltage from the horizontal deflection of the sweep. Either the forward or return trace may be blanked on the oscilloscope.

BUILT-IN FILTERS

A carefully designed filter network is included in the VHF section of the generator to prevent transmission of frequency components other than those desired, thus ensuring that the output voltage measured at the output by an untuned detector, is a true indication of the sweep output.

COMPLETE VOLTAGE REGULATION

All critical voltages and the deflection voltages of the generator are regulated by gaseous, voltage regulating tubes. This ensures absolute stability and freedom from changes in the sweep operation due to line voltage variations.

RUGGED MECHANICAL DESIGN

All parts of the sweep oscillator circuit are precisely machined from rugged, silver plated brass pieces. A slider of unique design moves in a rhodium-plated tube to provide long and trouble-free operation. The entire sweep unit is mounted on shock mounts within the cabinet to prevent transmission of external shocks to the sweep mechanism, as well as to prevent any mechanical hum being transmitted to the work-bench on which the unit is mounted.

SPECIFICATIONS

CENTER FREQUENCY RANGE

VHF . . . . 500 KC TO 400 MC
UHF . . . . 275 MC TO 1,000 MC

SWEEP WIDTH

VHF . . . Min. 100 KC
Max. 400 MC
UHF . . . Min. 100 KC
Max. Depending on Center Frequency Setting:
Sweeps From . . .
225 MC TO 325 MC
300 MC TO 450 MC
400 MC TO 600 MC
500 MC TO 750 MC
600 MC TO 1,000 MC
800 MC TO 1,200 MC

OUTPUT VOLTAGE

VHF . . . 0.25 volts RMS into a 50 ohm load.
UHF . . . 0.5 volts RMS into a 50 ohm load.

OUTPUT VOLTAGE VARIATION

VHF . . . ±0.5 db at maximum sweep width.
UHF . . . ±0.5 db up to 800 MC and ±1.5 db from 800 MC to 1,200 MC; at maximum sweep width.

SPURIOUS BEATS AND HARMONICS

20 DB or more below fundamental output.

SOURCE IMPEDANCE

50 ohms, with a VSWR of less than 1.2.

PLUG-IN DETECTOR

Full-Wave, Peak-to-Peak Type. VSWR less than 1.1. May be unplugged and used externally.

LINEARITY OF FREQUENCY SCALE

Within 5% of Sweep Width (in relation to the horizontal deflection voltage).

FREQUENCY MODULATION

60 Cycle Sinusoidal.

HORIZONTAL DEFLECTION VOLTAGE

2.5 volts Peak-to-Peak, 60 Cycle Sinusoidal.

MARKER INPUT

20 MV or more. Gain of Marker Amplifier variable.

BLANKING

Either Forward or Return Trace, output reduced to zero.

TUBE COMPLEMENT

1 . .	12AT7	Marker Amplifier
2 . .	6AU6	AGC Voltage Amplifier
2 . .	6V6	AGC Output Amplifier
1 . .	12AT7	Blanking Circuit
1 . .	5675	Sweep Oscillator
1 . .	5675	Fixed Oscillator
1 . .	OD3	Voltage Regulator
2 . .	OB3	Voltage Regulator
9 . .	K3A	Silicon Diodes

POWER SUPPLY REQUIREMENTS

105 to 125 volts RMS, @ 60 cycles, 75 watts.

CABINET

10½" H, 23" W, 15½" D. May mount on its standard 8¾" relay rack panel with cabinet omitted.

WEIGHT

63 lbs.

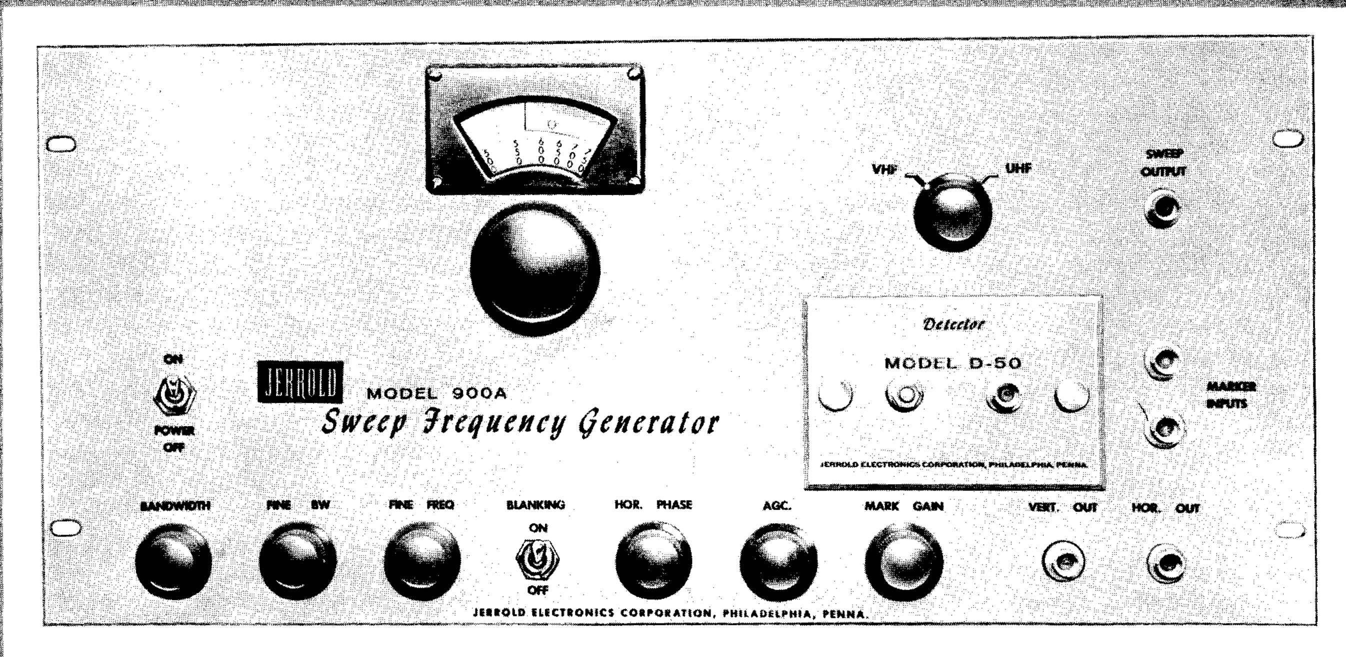


Figure 3 Front Panel—Model 900-A

OPERATION

CONTROLS

Front Panel

The following controls are found on the front panel of the Model 900 A (Figure 3).

- The **POWER SWITCH** which turns the unit on or off.
- A **COARSE** and a **FINE BANDWITH CONTROL** that govern frequency deviation of the sweep.
- A **CENTER FREQUENCY** control that sets the center frequency of the sweep and a **FINE CENTER FREQUENCY** control that allows for small variations around this value.
- A **BLANKING SWITCH** which blanks one of the two traces back to zero output in the ON position, or which allows output during both forward and return trace in the OFF position.
- A **HORIZONTAL PHASE CONTROL** which allows correct adjustment of the horizontal deflection voltage output to the oscilloscope.
- An **ALC CONTROL** which sets the level at which the ALC operates. This is normally set at the maximum output at which the ALC functions properly. The control can also be used as an output control.
- A **MARKER AMPLITUDE** control that controls the gain of the marker channel, and thus the height of the mark on the oscilloscope in relation to the main display.
- The **FREQUENCY SWITCH** which selects either the VHF frequency range or the UHF range.

Back Panel

The **BLANKING PHASE REVERSE SWITCH** which allows reversing the phase of the blanking with respect to the frequency deviation of the sweep.

The **BLANKING PHASE CONTROL** which allows correct adjustment of the blanking with respect to the frequency deviation of the sweep.

CONNECTORS

Front Panel

The following connectors are provided on the front panel:

- **SWEEP OUTPUT.** Used for both the VHF and UHF output. Output range selected by the Frequency Switch.
- **MARKER INPUTS.** Either or both connectors may be used to introduce signals for frequency marking.
- **DETECTOR IN AND OUT.** The plug-in detector unit contains an internal detector circuit bridged across a transmission line having the impedance for which the sweep is designed. A line termination is usually connected to the OUT connector.
- **VERT. OUT.** This connector is the detector output which is connected to the oscilloscope's vertical input.
- **HOR. OUT.** This connector supplies the horizontal deflection voltage to the oscilloscope's horizontal input.

Back Panel

The **WOBBULATOR DRIVE TERMINALS** which allow connection of external drive voltage to be applied to the wobbulator voice coil of the sweep.

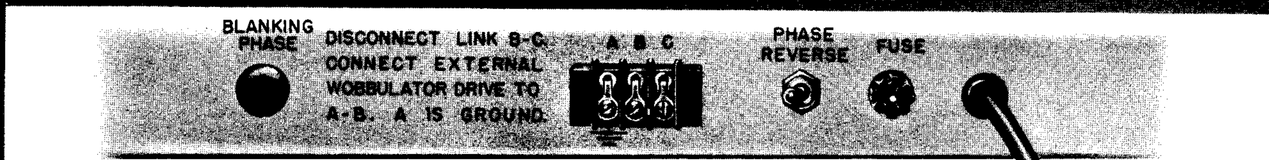


Figure 4 Rear Panel—Model 900-A

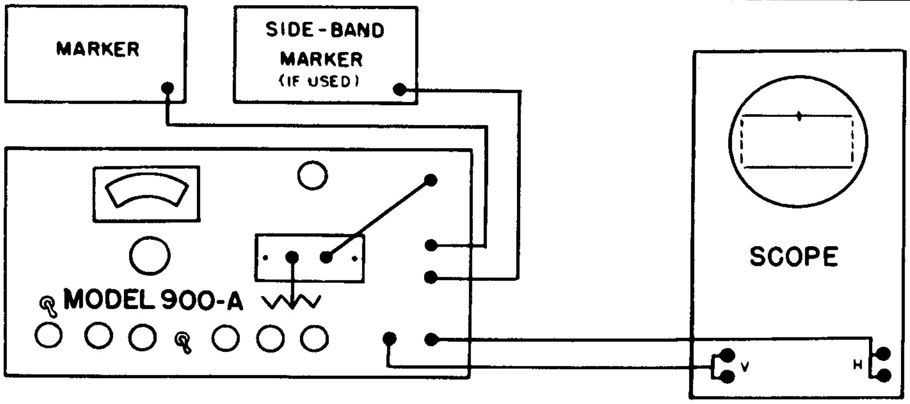


Figure 5 Basic Equipment Set-Up

INITIAL SET-UP AND CHECK OF MODEL 900 A OPERATION

1. Interconnect equipment as follows: connect the **SWEEP OUTPUT** to one connector on the D-50 Detector. Terminate the remaining output of the detector in its characteristic impedance. Connect the **VERTICAL OUTPUT** of the generator to the vertical input of the oscilloscope and the **HORIZONTAL OUTPUT** to the horizontal input of the oscilloscope. Connect a marker generator to one of the **MARKER INPUT** connectors on the sweep generator. Refer to Figure 5.
2. Plug the power cord into the AC power source and turn the unit ON.
3. Turn the **BLANKING SWITCH OFF**, set the **MARKER GAIN** control to minimum (CCW), and set the **ALC CONTROL** to maximum (CCW).
4. Adjust the oscilloscope controls for a full-size pattern centered on the screen. Figure 6.
5. Turn the **MARKER GAIN CONTROL** on the sweep generator part way up; set the marker oscillator for full output; and select a frequency in the band to be swept. As the sweep **CENTER FREQUENCY DIAL** is turned past this frequency, the marker pip will show at two points on the oscilloscope. Figure 7.
6. Adjust the **HOR. PHASE** on the sweep to bring the two traces (and pips) together (Figure 8). Check sweep width by changing the marker frequency so pips move from one end of the trace to the other. Set the **BANDWIDTH CONTROL** so that the sweep covers the desired band. When large changes in the sweep bandwidth are made, it will be necessary to readjust the **HOR. PHASING CONTROL** to keep the traces together.
7. Turn the **ALC CONTROL** CW until the output becomes flattened across the entire band. The output voltage can be varied over a range of 20 db below this setting control. Figure 9.
8. If a single trace with zero output base-line is desired, throw the **BLANKING SWITCH** "ON" and adjust the **BLANKING PHASE REVERSE SWITCH** (located on back chassis) to obtain the desired trace. Either the forward or reverse trace can be blanked.
9. If necessary, adjust the **BLANKING PHASE CONTROL** to make the blanking occur at the extreme edges of the display. Figure 10.

Figure 6

Figure 7

Figure 8

Figure 9

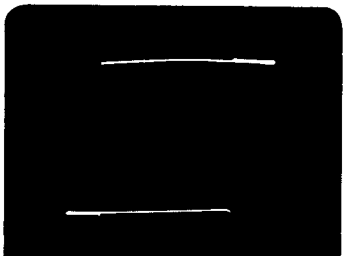


Figure 10 A

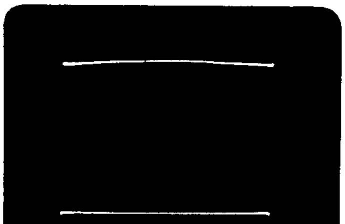


Figure 10 B

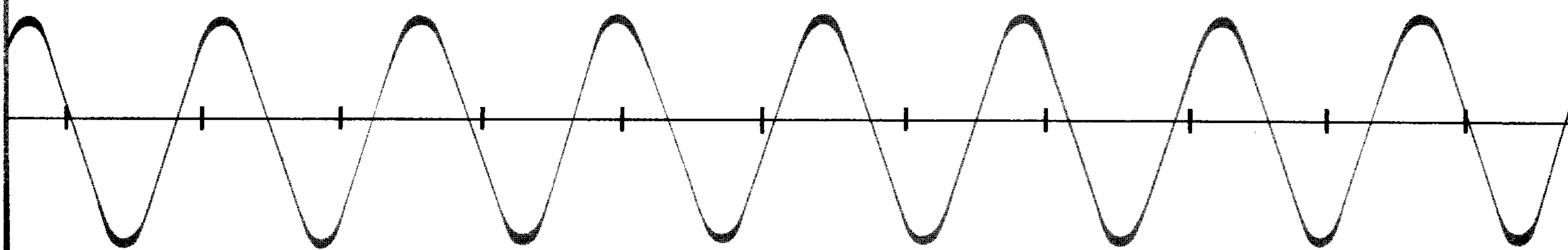
CONDITIONS THAT MAY BE ENCOUNTERED

- **HUM** . . . Hum in the scope or detector used in conjunction with the Model 900 A will make it impossible to bring the two traces together as in step 6. Refer to Figures 11, 12 and 13.

- **EXCESSIVE MARKER** . . . After initial check, turn the **MARKER GAIN CONTROL** down to the lowest level that will give a clearly visible pip; otherwise, it may obscure details in the response curves.

- **POOR LOW FREQUENCY RESPONSE** in the oscilloscope will cause a tilted pattern when the blanking is turned ON, as in step 8. Figure 14.

- **IMPEDANCE MISMATCH** . . . Variations from complete flatness when the **ALC CONTROL** is turned down may be due to using the wrong impedance cable connecting the output of the sweep to the detector, or to the wrong terminating resistor on the other terminal of the detector.



THE EFFECTIVE USE OF THE MARKER CIRCUITS

The Model 900 A is provided with extremely flexible marker circuits. Effective use of these will permit accurate marking of the frequency at any point on the presentation. If excessive marker input or marker gain is used, the trace may be obscured and there may be considerable confusion in determining the correct mark to be used. Since both the output control on the marker oscillator and the marker amplitude control on the Model 900 A affect the height of the pip that is produced on the scope trace, it is important to learn the proper way of arriving at a balance between the two. In general, increasing the input from the marker oscillator and decreasing the marker amplitude by turning down the marker amplitude control will result in distortion in the marker circuit. As a result, frequency marker pips will be produced, not only at the point where the sweep frequency coincides with the setting of the marker oscillator, but also at harmonics of this frequency (as seen in Figure 15). This is not necessarily undesirable. In some cases, it may be convenient to use a marker oscillator in this fashion. Suppose, for example, that frequency of 15, 30 and 45 mc. The use of a single marker oscillator set at 15 mc with its output turned well up, and the marker amplitude control turned down to give a small pip on the trace, will result in three marker pips, one at the fundamental, one at the second harmonic, and one at the third harmonic of the marker frequency. If, on the other hand, a single frequency mark is desired at the point on the trace corresponding to the fundamental frequency setting of the marker oscillator, this can best be obtained by turning the marker amplitude well up and reducing the input from the marker oscillator. This is illustrated in Figure 16.

The marker amplitude control operates over a very wide range so that clear marking signals can be made to show with a wide variety of scope gain settings.

When a high gain oscilloscope is being used, too high a setting of the marker amplitude control should be avoided. In this situation, it is possible for the marker circuits to produce noise which tends to broaden and confuse the oscilloscope trace or to introduce spurious frequency marks.

It will be noted, for example, that, when using high marker amplitude, settings with a high gain scope, marker pips will appear at a number of frequencies near the upper VHF limit of the sweep.

Explanation: In order to obtain the extremely-wide frequency band provided in the VHF position of the Model 900 A, the beat frequency principle is used. An oscillator inside the sweep is fixed at a frequency of 600 mc.

As a result of the mechanics of mixing, there are weak spurious signals at frequencies which are integral sub-multiples of this frequency. The largest of these occurs at ½ the fixed oscillator frequency 300 mc. There is a weaker one at ⅓ of 600 mc or 200 mc and an extremely weak one at ¼ of 600 mc or 150 mc. In normal operation, with reasonably low gain settings in the marker channel, these spurious pips are very small and should cause no trouble.

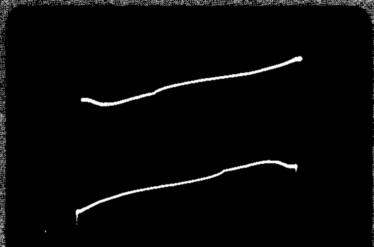


Figure 11

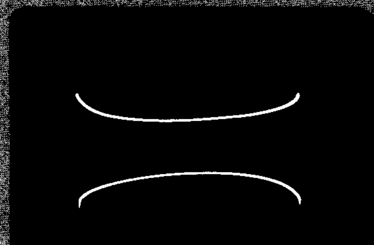


Figure 12

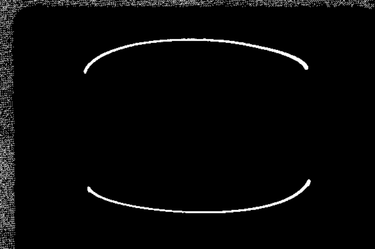


Figure 13

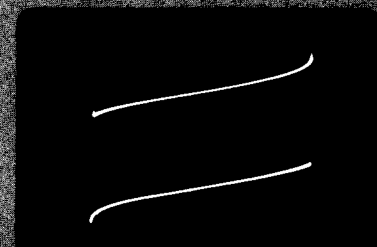
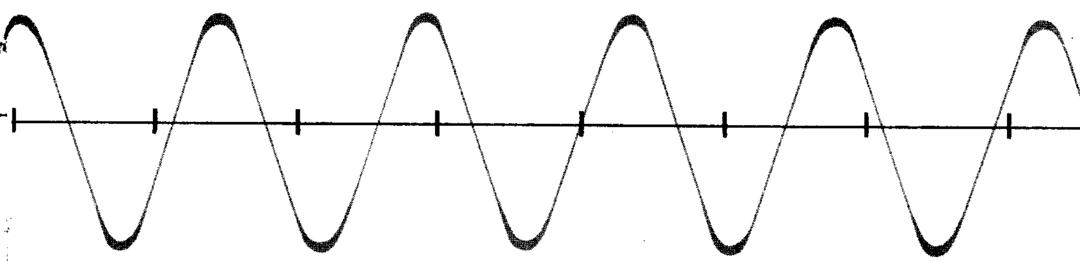


Figure 14



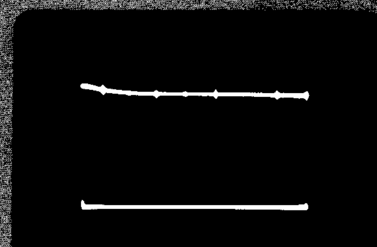


Figure 15

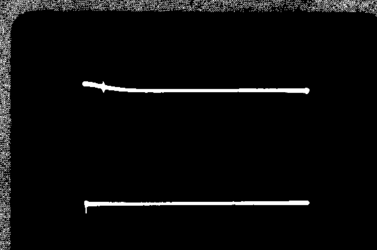


Figure 16

THE USE OF SIDE BAND MARKERS

In cases where a bandpass response is to be observed, it is often convenient to provide frequency markers at the center, the upper and the lower frequency limits of the desired band. This can be accomplished with the Model 900 A by using two marker oscillators, one having a frequency equal to the center of the band to be observed, the output of this marker being connected to one of the two marker inputs, and a second marker generator having a frequency equal to one-half of the bandwidth of the band to be observed, connected to the other marker input jack. By proper setting of the two oscillator output controls and the marker amplitude adjustment on the sweep, it is possible to get three marker pips at the center frequency and at the upper and lower limits. Figure 17 shows the output of the sweep set at 60 mc with about 4 mc sweep width and a single marker at 60 mc. Figure 18 illustrates the effect of adding a second marker oscillator tuned to 1.5 mc, thereby adding sideband markers 1.5 mc above and below 60 mc.

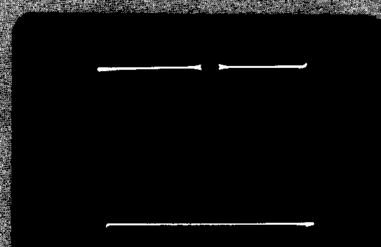


Figure 17

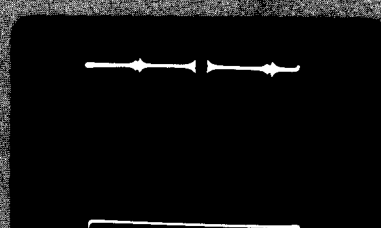


Figure 18

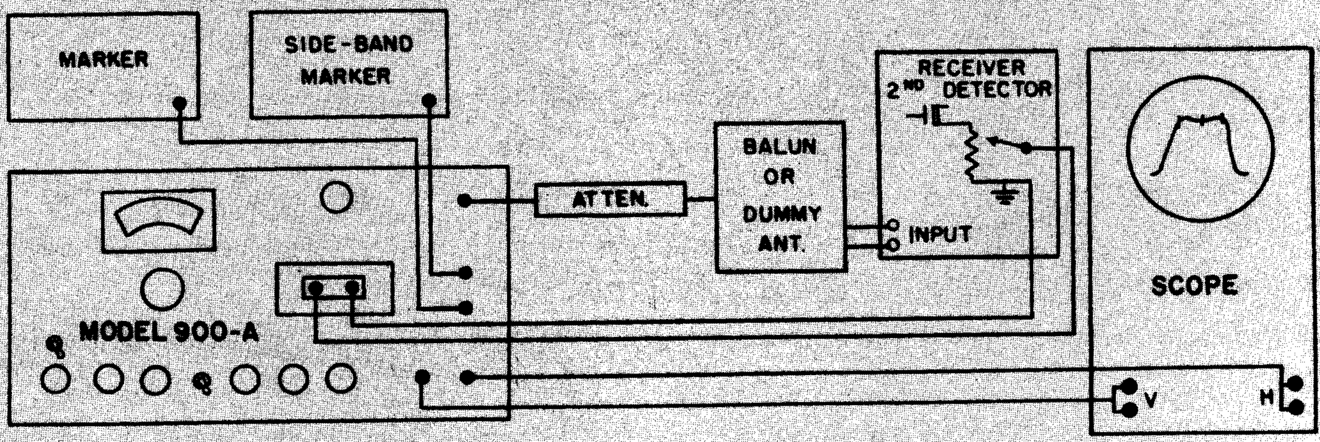


Figure 19 Block Diagram of Equipment Set-Up for Testing a Complete Receiver

APPLICATIONS

Note: When the manufacturer's instructions are available for aligning a receiver, best results will be obtained by following them carefully.

1—TESTING THE COMPLETE RECEIVER (See Figure 19)

a. Connect the Generator output to the receiver input terminals through an attenuator (i.e., Jerrold Model AV-50 or AV-75) and an appropriate balun, dummy antenna or matching pad (when the receiver is designed to work from an impedance other than that of the sweep and attenuator).

b. To obtain injection of marker signals, unplug the D-50 detector from the sweep generator and using "General Radio" plugs (type 274-MB) connect the receivers detected output to the sweep generator at the point where the D-50 normally plugs in. Connect the marker generators, to the sweep using marker inputs #1 and #2. Connect the vertical and horizontal outputs of the generator to the oscilloscope.

c. If the receiver uses ALC, disable it and substitute manually-variable gain control.

d. Use weak input signal and high scope gain to avoid overload (to test for overload, decrease input signal 5 or 10 db; if response shape changes, overload is present).

e. Set sweep and receiver to same center frequency, and sweep width just wide enough to show the entire response curve. Note that weak responses will be seen when the receiver is tuned to a harmonic of the sweep, or when the sweep is at the image frequency of the receiver. If there is doubt, the strongest response is probably the right one.

f. For band-center and band-edge markers, set marker generator at center frequency and side-band marker at a frequency equal to ½ the bandwidth of the receiver. Where pix and sound carrier markers are wanted (on a television receiver), set marker generator at pix carrier, side-band marker at 4.5 mc.

g. When there are sudden changes in the response of the receiver (as, for example, when very selective traps are used to remove certain frequencies) the sweep may move past these too fast for the second detector to follow accurately. To get a more accurate response, decrease the sweep width and shift center-frequency to cover only this section of the response.

2—TESTING THE RF SECTION OF A RECEIVER

a. Connect Model 900-A output to receiver input terminals as when testing complete receiver.

b. Connect scope vertical input to the DC load of the mixer (see Figure 20). This connection is often provided as a test point by the manufacturer.

c. Use high-level input with only enough attenuation to ensure a good impedance match (6 to 10 db is enough).

d. Distortion of the response curve, preventing matching of forward and return trace, can be caused by hum due either to the local oscillator (which can be temporarily disabled to check this) or to the method of connecting the scope vertical input. In general, this test should be made with the local oscillator running since its excitation affects the input impedance of the mixer, and thus the shape of the RF response curve.

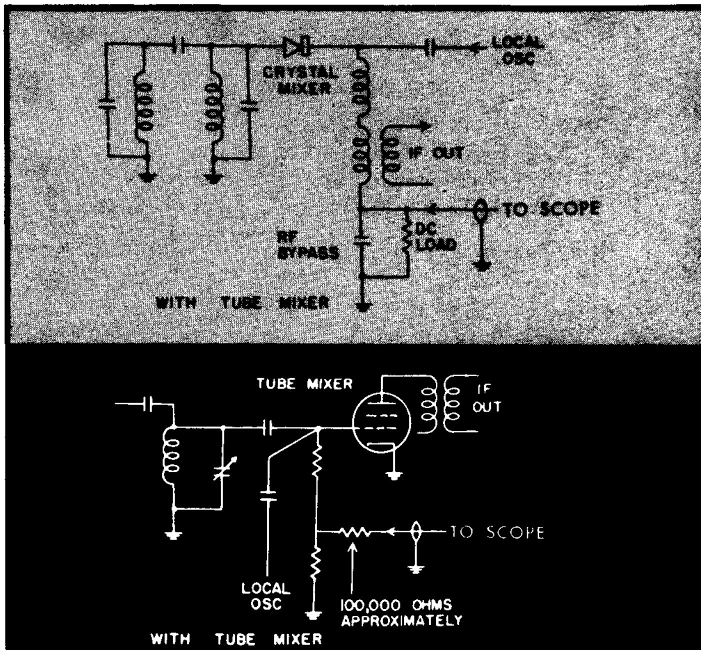


Figure 20 Schematic Diagram of Scope Connections to Test the RF Section of a Receiver

3—TESTING THE IF SECTION OF A RECEIVER

a. Connect the second detector output to the oscilloscope vertical input.

b. The output of the sweep should be introduced into the mixer circuit in some way that will give reasonably uniform response without changing the output impedance of the mixer. One way of doing this is shown in Figure 21. The output of the sweep is connected to a terminating resistor near the output terminal of the mixer, and is coupled to the mixer output loosely enough to avoid changing the tuning of the mixer output circuit.

c. It is important to introduce the IF signal from the sweep in a way that does not result in added overall feed-back in the IF circuits. The outer shield of the cable from the sweep should be carefully grounded to the chassis near the mixer. With IF's above 10 mc or so, it is preferable to attach the cable with a connector which brings it through the chassis. The presence of this type of feed-back is indicated if the IF response curve differs markedly from the overall curve (with the usual broadly-tuned RF circuits).

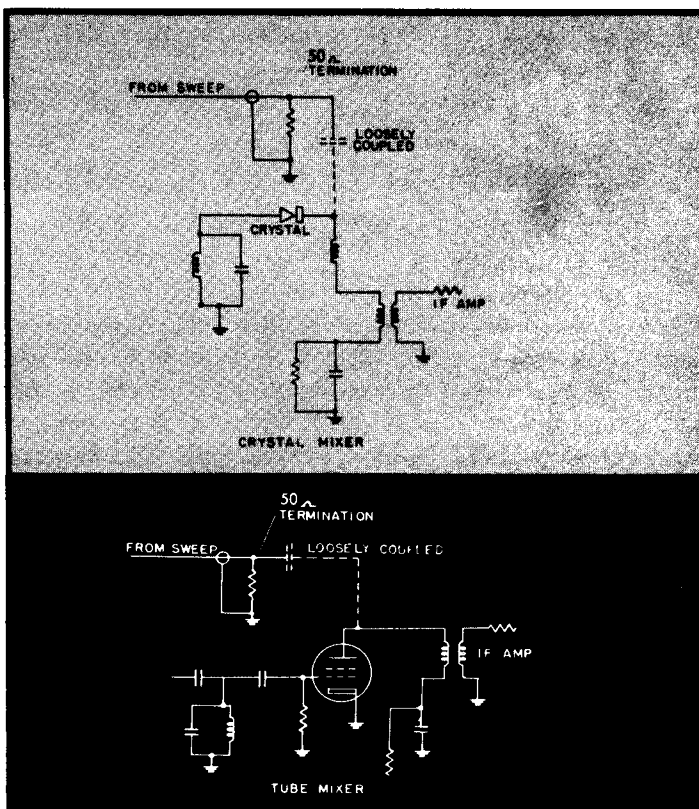


Figure 21 Schematic Diagram of Input Connections to Test the IF Section of a Receiver

4—TESTING THE FREQUENCY RESPONSE OF AMPLIFIERS (See Figure 22)

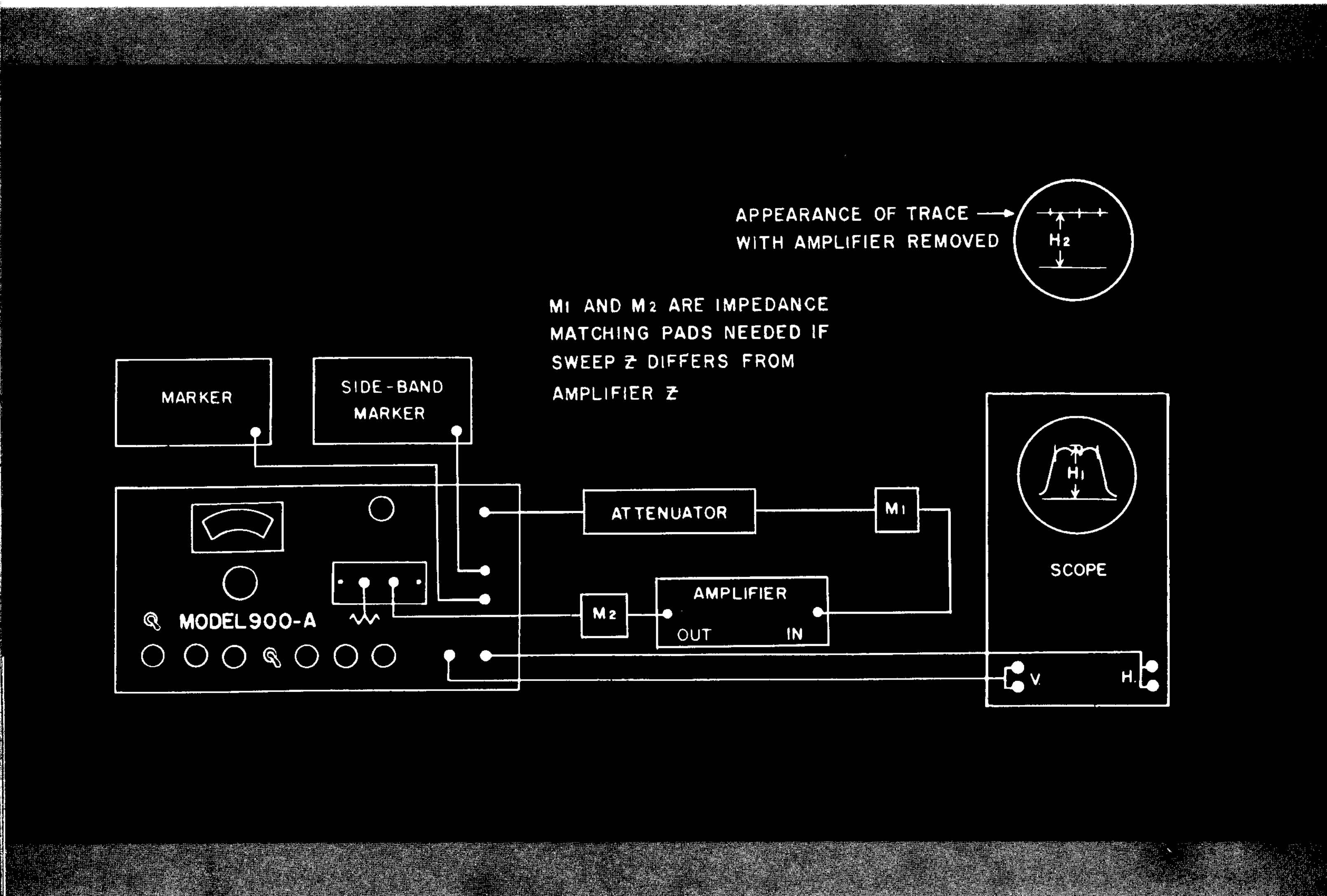


Figure 22 Block Diagram of Equipment Set-Up to Test Frequency Response of an Amplifier

a. When testing an amplifier, the output of the sweep is connected to the amplifier through a variable attenuator to reduce the level. When the source impedance from which the amplifier is designed to operate differs from sweep's output impedance, a matching pad is required.

b. The amplifier output is connected to the input of the sweep's built-in detector, through a second matching pad if its normal load differs from the sweep's impedance.

c. When the amplifier bandwidth is extremely wide, one marker can be used to mark the low-frequency end of the response, another being used for the high end. For example; if markers were wanted when testing a distributed amplifier having response from 2 to 200 mc, a low frequency signal generator connected to the #1 marker input could mark the 2 mc end, while a high frequency generator connected to the #2 marker input could mark the 200 mc end.

d. For narrower bandwidth, the center-frequency marker plus the side-band marker is more convenient. For example, a 54-88 mc amplifier response curve could be marked with a 71 mc marker, with 17 mc side-bands.

e. To measure the amplifier's gain, use blanking to establish a base line. Note height of curve H1 on diagram and attenuator setting. Now remove amplifier and connect output of M1 (or attenuator, if no matching pad is used) to input of M2 (or detector if no matching pad is used). Find attenuator setting required to make "feed-thru" height H2 equal to curve height H1. The amplifier's gain is the amount of attenuation removed from the circuit to make the two heights equal.

5—TESTING FILTERS AND TRANSFORMERS (See Figure 23)

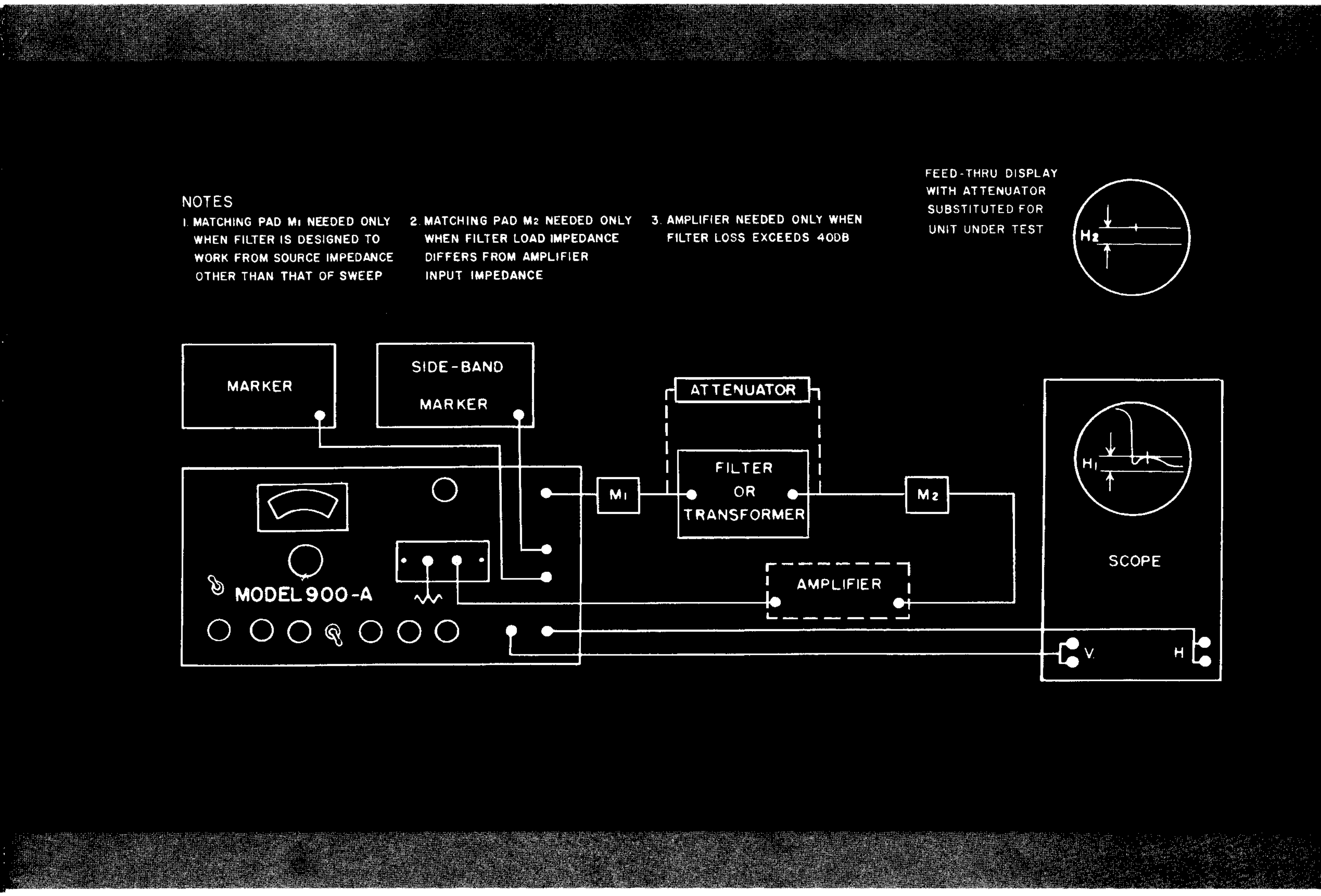


Figure 23 Block Diagram of Equipment Set-Up to Test Filters and Transformers

a. When testing filters, transformers, or other passive circuit elements with the Model 900A, the loss of the unit being tested will frequently reduce the output voltage to the point where it does not give enough deflection.

b. The use of a Jerrold Oscilloscope Preamplifier, Model SPR-100 allows testing with much weaker signals from DC to 250 MC. If still more gain or a wider bandwidth is needed, follow the unit being tested with an amplifier having the required pass-band. This will increase the level sufficiently to make the curve visible.

c. The response curve of this amplifier should either be extremely flat, or should be taken into account in judging the result. A quick way to accomplish the latter is to substitute, for the matching pads and the unit under test, a variable attenuator permitting inspection of the response curve alone.

d. Unless the input impedance of the amplifier is well-matched, the loss of the second matching pad (M2) should be great enough so that its input impedance is unaffected by the amplifier's mismatch.

e. To determine the loss at a given point on the filter's response curve, use the blanking to provide a zero base-line. Measure the distance, H1, on the scope screen from the baseline to the point at which the loss is desired. Now substitute a variable attenuator for the unit under test (dashed lines) and adjust it until the height of the "feed-thru", H2, is the same as H1. The attenuator setting is now equal to the loss of the filter at the desired point on the curve.

6—TESTING A SINGLE INTERSTAGE IN AN AMPLIFER

In development work, or in receiver testing, it's sometimes useful to be able to sweep the frequency response of a single amplifier interstage. To accomplish this, it is necessary to introduce the signal from the sweep and to take off the output in some way that does not materially affect the response of the interstage.

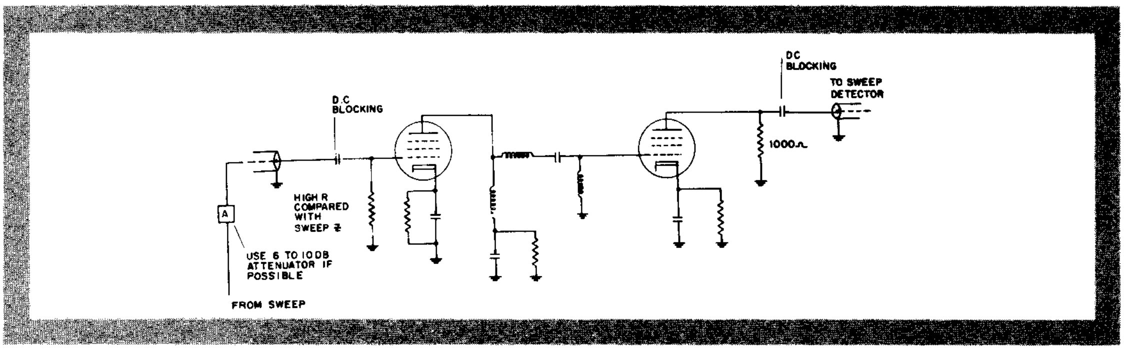


Figure 24 Method 1: Schematic Diagram of Connections to Test Frequency Response of an Interstage

METHOD 1

One way to accomplish this, assuring good sensitivity and requiring no auxiliary amplifier, is illustrated in Figure 24. The RF signal from the sweep is connected directly to the grid of the tube preceding the circuit to be tested, with minimum length connections. With no termination at the grid, this connection gives an input voltage which is constant out to about 200 mc (with 10 mmf input C, 50 ohm sweep, and minimum lead inductance). A small (6 to 10 db) attenuator pad inserted in the cable from the sweep will, in general, improve the accuracy of the response. A similar connection at the plate of the second tube gives an output voltage proportional to its grid voltage over a similar range.

For critical work, the effect of the coupling capacitors, bypass capacitors, and connections can be checked by connecting to the plate of the first tube in the same way as shown for the second and observing any variation in the response of this much of the circuit.

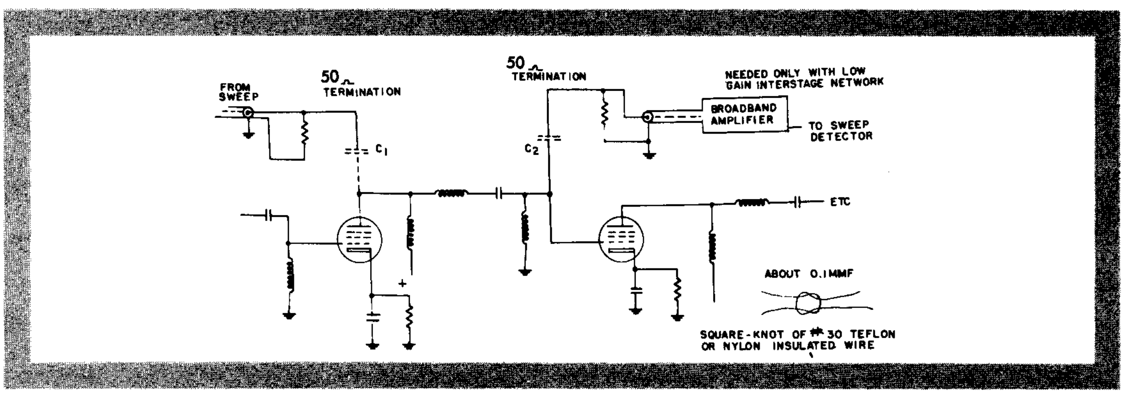


Figure 25 Method 2: Schematic Diagram of Connections to Test Frequency Response of an Interstage

METHOD 2

For some purposes a disadvantage of Method 1 is that the observed response does not include any effects due to feed-back around either of the two tubes, or from other stages in the amplifier. A second method gets around this difficulty, by the addition of an auxiliary amplifier whose response is flat beyond the response of the stage being tested.

The connections are diagrammed in Figure 25.

The coupling capacitors C1 and C2 must be small enough to have negligible effect on the capacity and loading at these points, but large enough to give a response curve. One technique that gives a capacity in the order of 0.1 mmf, is to tie a square knot between two pieces of #30 wire having low-loss insulation like Teflon or nylon.

NOTE: Any method of coupling signals in or out that depends on capacity coupling can be used only with narrow-band amplifiers (10% of center-frequency or less). In wider band amplifiers, the change of coupling with frequency introduces a deceptive tilt to the response curve.

With this connection, the effects of feed-back can be quickly checked. Varying the gain of the first tube, or shorting its grid circuit, will show whether there is any feed-back to earlier sections of the amplifier. Varying the gain of the second tube, or shorting its plate circuit will show whether there is feed-back from later sections of the amplifier.

7—IMPEDANCE TESTING WITH A DELAY LINE

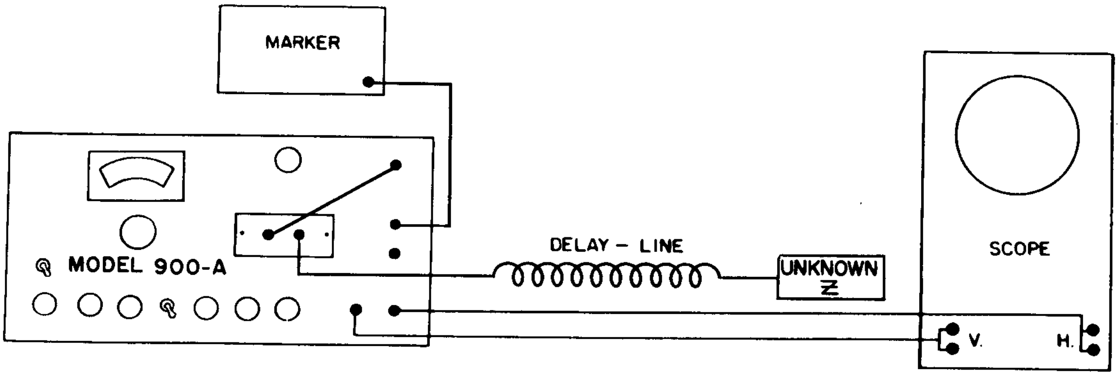


Figure 26 Block Diagram of Equipment Set-Up to Test Impedance with a Delay Line

One of the most useful applications of a sweep is the testing of impedances to determine the degree to which they match a transmission line. Figure 26 illustrates the connections. A 10 db pad is required between the sweep output and the diode detector since the impedance presented to the sweep by the input end of a mismatched delay line varies so rapidly and over such extreme values, as to make proper ALC action difficult.

Figures 27 to 30 inclusive show typical patterns obtained with this technique. With the sweep covering the 50 MC-100 MC range and a thirty-three foot section of RG-11/U serving as the delay line an open circuit at the end of the line gives maximum ripple height as shown in Figure 27. Short-circuiting pattern, Figure 28. A broad band termination gives a minimum ripple across the band, Figure 29. The degree of match is indicated by the ripple height at each frequency. Adjustments made to minimize ripple height will result in best match at the corresponding frequencies. Figure 30 shows the pattern with a load that matches only over a 6 MC section of the band being swept. The spacing between adjacent peaks in the ripple pattern is determined by the length of the delay line; long lines having closely-spaced ripples are most useful for testing narrow-band circuits. The spacing between peaks in megacycles can be calculated from the following:

$f = \frac{333}{\text{length in feet}}$	$f = \frac{492}{\text{length in feet}}$
For solid polyethylene cables.	For air dielectric cables.

The height of the ripple pattern, for a given degree of mismatch, is determined by the total attenuation of the cable. When very long delay lines are used to test narrow-band circuits they must be made from low-loss cable.

For a more accurate and detailed report on impedance measurements, using the delay line technique, refer to Jerrold Technical Newsletter, volume 1, numbers 1 and 2.

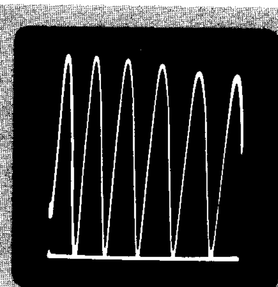


Figure 27

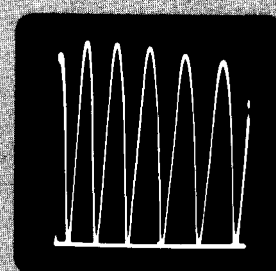


Figure 28

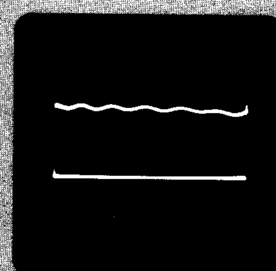


Figure 29

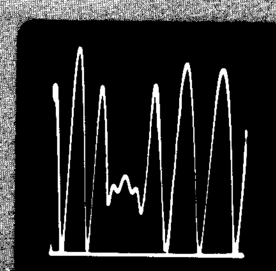


Figure 30

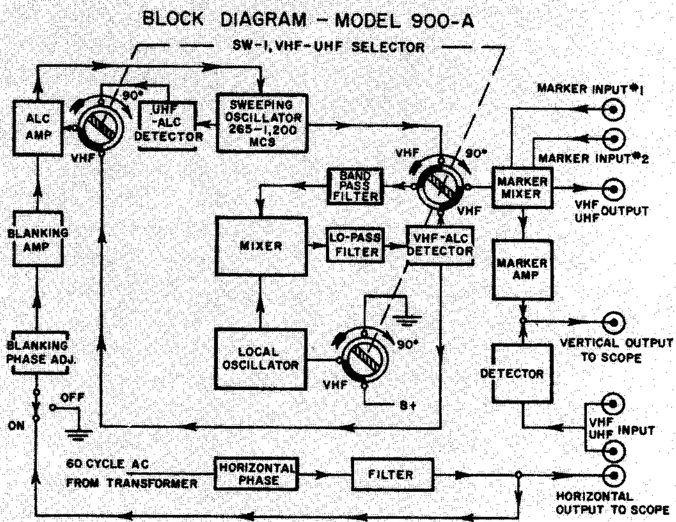


Figure 31 Block Diagram of Model 900-A

The block diagram in Figure 31 may be referred to throughout this circuit description, while schematic details are reproduced wherever they serve to clarify the explanation.

CIRCUIT DESCRIPTION

THE UHF SWEEP OSCILLATOR

The heart of the Jerrold Model 900 A is the UHF sweep oscillator, diagrammed in Figure 32. A section of air-dielectric coaxial line forms the inductance in the oscillator's tuned circuit. Its inductance is varied by a short-circuiting plunger whose position is controlled by the setting of the center-frequency control on the front panel. This governs the effective length of the line and, thus, the center-frequency of the oscillator which can be varied from below 275 MC to above 1000 MC. The line is carefully machined out of rugged brass stock and is Rhodium plated internally to ensure long and trouble-free operation. The shorting plunger is of unique design, providing uniform contact and a minimum of residual inductance. The capacity across this line, and thus the frequency of the oscillator, is varied at a 60-cycle rate by a wobbulator capacitor which is driven by a precision voice coil mechanism. Since this capacitor has two stators meshing with the moving capacitor plates, it needs no pigtail connection to the moving plates. Thus, there is no maintenance problem associated with a vibrating connecting strip. The pencil triode oscillator tube is used in a grounded grid circuit in which the plate is connected to the high end of the resonant circuit. The grid is grounded for RF by a grid capacitor disc and the cathode is floated above ground on UHF chokes that provide a high impedance path from cathode to ground over the entire frequency range of the oscillator. A small feed-back capacitor is provided between plate and cathode to provide ample feedback coupling over the frequency range. The plate of the oscillator is grounded to the chassis for DC. The cathode is connected to the negative power supply through a 6V6, ALC (Automatic Level Control) amplifier. Varying the grid voltage of the 6V6 varies the oscillator DC current, and thus its output, permitting ALC of the unit. Supply leads are carefully by-passed where they come through the wall of the oscillator compartment and all joints are carefully bonded with "electronic weatherstripping" to prevent any possibility of radiation from this source.

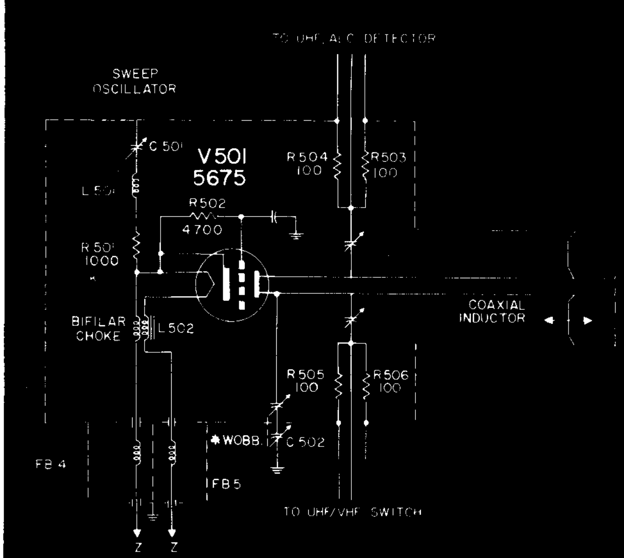


Figure 32 Schematic Diagram of UHF Oscillator

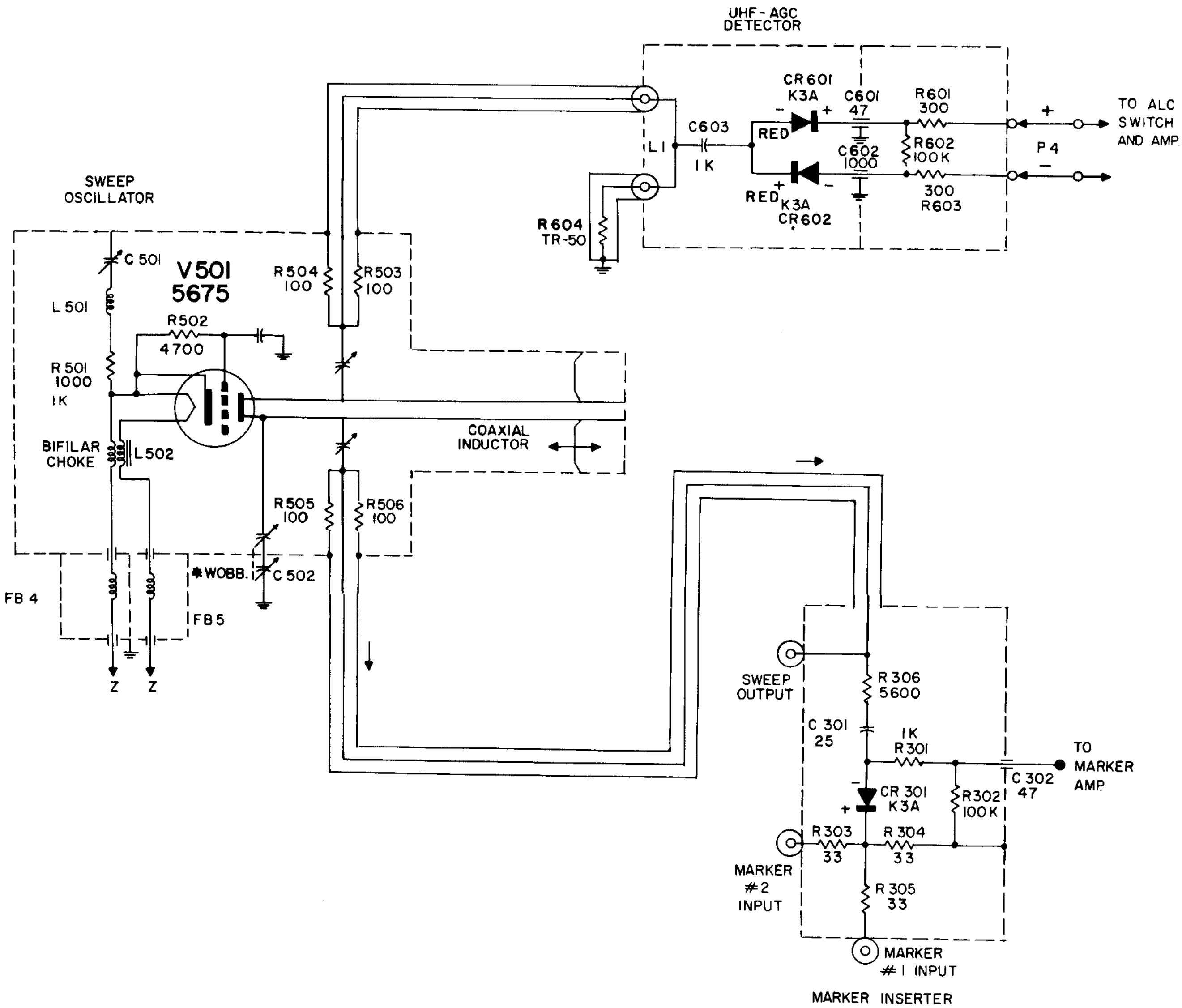


Figure 33 Schematic Diagram of UHF Circuits

THE UHF CIRCUITS

Figure 33 shows the circuits in use when the output switch is in the "UHF" position. A probe, capacitively coupled to the sweep oscillator plate, couples energy from the oscillator to the UHF ALC detector. The coaxial cable interconnecting the oscillator and ALC detector is accurately terminated at both ends for flattest frequency response. The ALC detector rectifies the UHF voltage, providing a DC output to the ALC amplifier proportional to the UHF level.

The action of the ALC circuits serves to keep the Sweep Oscillator oscillating at a constant level as it sweeps over a band of frequencies, thus the UHF voltage picked up by the output probes is held effectively constant. The two probes are mechanically identical and are both back-terminated for flattest response. When the output switch is in its UHF position its coaxial section switches the energy picked up by the Output probe through the Marker Mixer to the Output Connector; the other section switches the ALC Detector output to the ALC amplifier.

THE VHF CIRCUITS (Refer to Figure 34)

When the Output switch is thrown to "VHF" position the unit becomes a beat frequency oscillator. The output of the Sweeping Oscillator, which is operated between 600 and 1050 MC, is combined in a Crystal Diode Mixer with the output of a 600 MC Fixed Oscillator. The difference frequency beat, which varies from a low frequency (below 200 KC) where the two oscillators lock in, up to 450 MC when the Sweep Oscillator moves up to 1050 MC, is filtered out and connected to the Output.

The Fixed Oscillator is mounted in a separate shield box with all supply leads filtered and all joints "weather-stripped" to minimize radiation. A Pencil Triode is used in a grounded-grid circuit, the plate and cathode tuned circuits being formed of rigid metal straps and teflon-insulated capacitors for maximum frequency stability. Its output is coupled through a capacitive probe and a short length of coaxial line to one input of the mixer. This probe is unterminated, the coaxial cable is cut to a critical length which resonates with the probe capacity to the oscillator frequency providing efficient coupling and filtering to eliminate harmonics.

The VHF Mixer box contains three filters, the Mixer Diodes and the VHF ALC Detector. When the Output switch is in the VHF position its coaxial section connects the Sweep Oscillator output to the sweep input of the mixer. A triple-tuned band-pass filter with flat response from 600 to 1050 MC, couples the sweep input to the mixer diodes. A balanced 600 MC resonant circuit couples the output of the Fixed Oscillator to the Mixer Diodes. To obtain beat output at low video frequencies the two oscillators must operate at very nearly the same frequency without locking in. This means that, although each oscillator must be efficiently coupled to the mixer diodes, there must be very little energy transferred from one oscillator to the other. This isolation is accomplished by a hybrid arrangement in which the fixed oscillator output is coupled in balanced to one end of the diodes, and the sweep output is coupled in unbalanced to the other ends; the two circuits being separated by a shield partition.

The beat output from the diodes is fed through a low-pass filter which cuts off at about 500 MC. At the output end a choke provides a DC return for the diodes and protects them from DC or low-frequency AC shocks which might be introduced through the output connector. The VHF ALC detector monitors the voltage at this point, and with the ALC amplifier acts to hold it constant. Holding the voltage constant provides essentially zero source impedance, and a terminated source is obtained by inserting a suitable resistor between this point and the output connector.

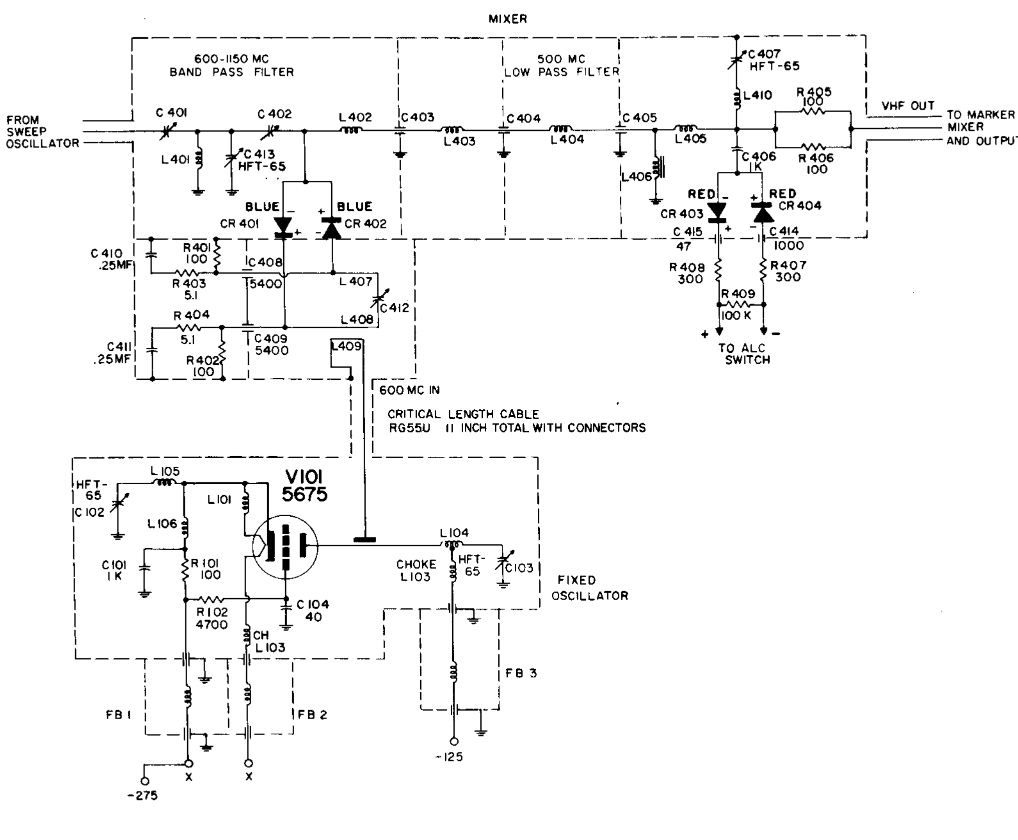


Figure 34 Schematic Diagram of VHF Circuits

THE ALC CIRCUITS (Refer to Figure 35)

Automatic Level Control is accomplished by an inverse feedback circuit which amplifies the DC output of the ALC detector and applies it with reversed phase to the Sweep Oscillator, reducing its output as the detector output increases. Variations in detector output are reduced as the gain of the amplifier is increased, so high gain is desirable. The ALC amplifier is a high-gain, two-stage, direct coupled amplifier using 6AU6 pentodes in the first stage and 6V6 beam power tubes in the second. A balanced circuit is used to minimize the effects of supply voltage variation. The screen-cathode voltage and reference voltage in the grid circuit of the first stage are stabilized with a voltage regulator tube.

The limitation on the amount of gain that can be used in the ALC amplifier is set by a tendency to break into audio oscillations when the gain is too high. This tendency is minimized by the RC combination connected from the output plate to ground. High gain alone is not enough to ensure flat output. Another major factor is the degree of distortion in the output voltage. Harmonics or spurious beats present in the output voltage add differently to the fundamental at the ALC detector than at the measuring detector, resulting in variations in RF output even though the ALC system holds the DC output of the ALC detector constant. Harmonic output in the UHF condition is minimized by careful placement and shielding of the probes.

In the VHF condition it is minimized by adjusting drive levels and bias on the diode mixer.

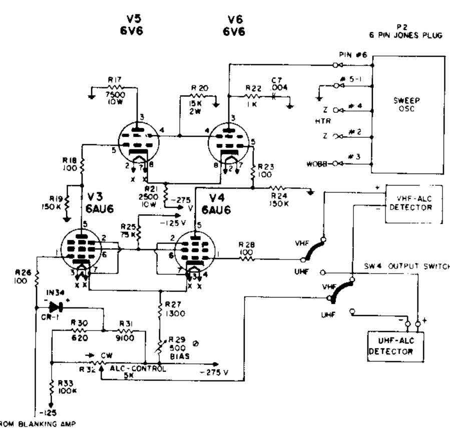


Figure 35 Schematic Diagram of ALC Circuits

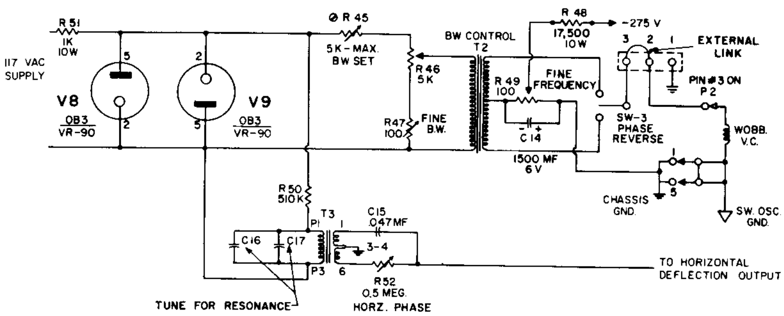


Figure 36 Schematic Diagram of Wobbulator Drive and Horizontal Deflection Circuits

THE WOBBULATOR DRIVE AND HORIZONTAL DEFLECTION CIRCUITS

(Refer to Figure 36)

The capacitor plates that vary the frequency of the Sweep Oscillator are mounted on a voice-coil driven loudspeaker mechanism. To vary the amplitude of motion, and thus the sweepwidth over an extreme range (over 1000 to 1) the drive voltage to the voice coil is varied. Smooth control with low drive impedance is obtained by using a high resistance potentiometer followed by a step-down transformer. This voltage is stabilized by the use of two voltage regulator tubes connected in opposition across the supply. They break down on alternate peaks of the AC voltage holding these to an essentially constant peak voltage. Since the moving system is mechanically resonant near the driver frequency the voice coil motion is sinusoidal in spite of a small distortion in the drive voltage. A vernier adjustment on center frequency, effective at very narrow sweepwidths is obtained by allowing a small DC current, varied by a low resistance potentiometer, to flow through the voice coil.

To obtain a pure sine-wave voltage for horizontal deflection, from that which is regulated against line voltage changes, some of the regulated voltage across the two VR tubes is applied to the primary of a resonant transformer. A capacitor is connected across this primary to tune it to the drive frequency, and thus make its output voltage purely sinusoidal. Due to the mechanical characteristics of the drive motor, the phase of the voice coil motion in respect to the line voltage shifts somewhat with changes in sweepwidth. To allow matching forward and reverse traces on the scope a wide-range RC phase shifter is provided between the secondary of the resonant transformer and the deflection output terminal.

THE BLANKING CIRCUITS (Refer to Figure 37)

For some sweep applications it is desirable to have the sweep output "blanked"; reduced to zero on one of the two traces to show on the scope screen the voltage corresponding to zero output. The blanking phase should be such as to key off at one edge of the screen, and on again at the other. Since the edges of the screen always correspond to the peaks of the horizontal deflection voltage, blanking phase will be correct if it is driven from the horizontal deflecting voltage.

The horizontal deflecting voltage is connected to the input of a cathode-coupled driven multivibrator through an isolating RC combination. The constants of the multivibrator are selected to produce a properly phased 60 cycle square wave when so driven. A small range of phase variation is provided by a variable grid resistor mounted on the rear apron of the sweep. The output of the multivibrator is applied to one input of the ALC amplifier, with a 1N34 clamping diode to keep the voltage at this point constant during the "ON" trace. A switch in the cathode of one triode in the multivibrator stops operation and removes blanking.

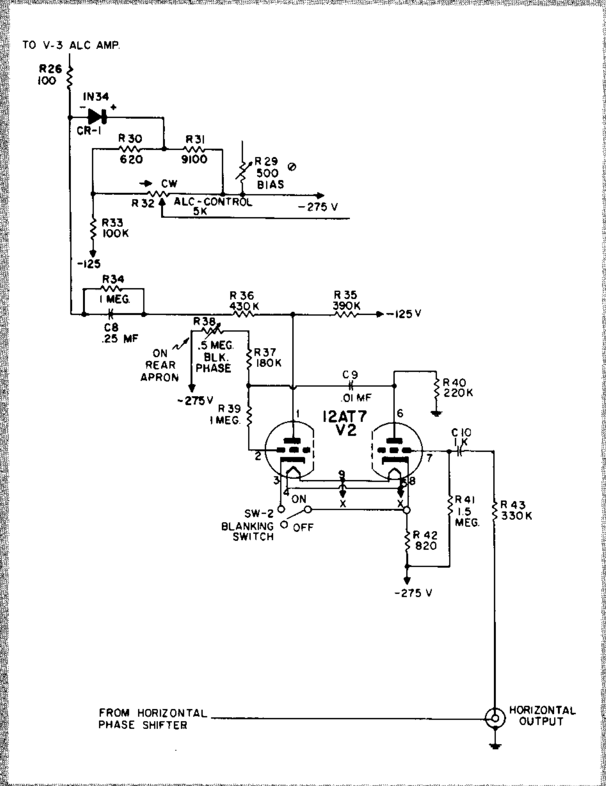


Figure 37 Schematic Diagram of Blanking Circuits

THE FREQUENCY MARKER CIRCUITS

To provide for accurate and convenient frequency calibration of response curves obtained with the Model 900 A, frequency marker injection circuits are built in. Figure 38 shows a diagram of these circuits. The input from either or both of two marker oscillators is applied to one side of the marker mixer diode. The other side is loosely coupled to the sweep output. As the frequency of the sweep passes the frequency of one of the marker oscillators a beat is produced in the output of the diode, sweeping from a few hundred KC (limited by various shunt capacities) down through zero beat and back up again. These beat signals are amplified in a two-stage amplifier with a response showing a resonant peak (due to the tuned circuit in the second plate circuit) at about 50 KC. Since the beat goes through 50 KC twice (once as the sweep approaches zero beat, and again as it goes away) each marker frequency is marked on the trace by two closely-spaced pips. These are so close together (100 KC) that they appear as one mark except at the narrowest sweep-width settings. The output of this amplifier is coupled to the scope vertical input.

The reason for using a peaked amplifier is chiefly that it has very little response to the lower frequency (60 cycles and up) components in the sweep output. If it were not peaked these would come through the marker amplifier and cause distortion of the response curve.

The marker gain control governs the gain of the amplifier, and thus the height of the marker pips.

THE PLUG-IN DETECTOR (Refer to Figure 39)

A detector is required with a sweep generator for all tests not involving receivers with built-in detectors. For measuring the response of passive circuits or amplifiers, for impedance matching with a delay line, and for checking the sweep output, a detector is essential. If the display is to show a flat output, particularly at the higher frequencies, it is essential that the detector have characteristics as nearly like the ALC detector as possible. The plug-in detector provided with the 900 A sweep is mechanically the same as the UHF ALC detector. The diodes in these units, and all other diodes in the sweep, are point-contact type K3A silicon diodes; found by extensive test to exhibit exceptionally high rectification efficiency and flat frequency response. The detectors use a full-wave circuit which discriminates against even-order harmonics and provides twice the DC output of a single diode. RC filter networks are carefully designed to give a good compromise between carrier filtering and audio response.

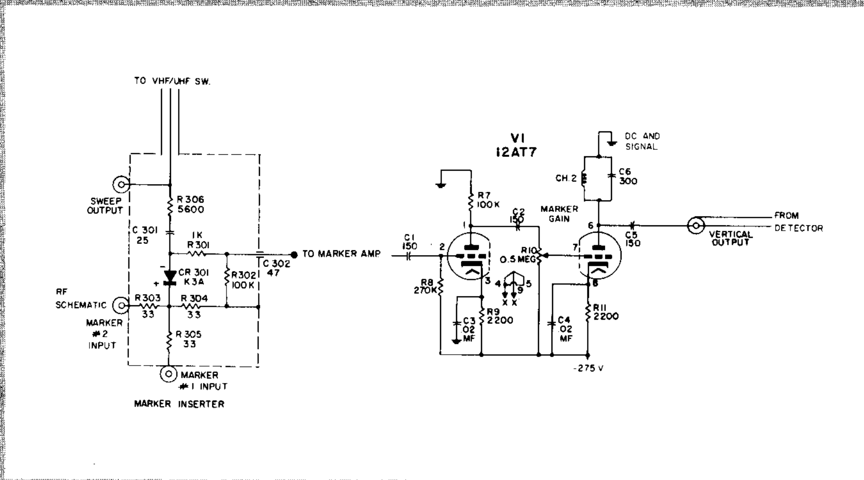


Figure 38 Schematic Diagram of Marker Circuits

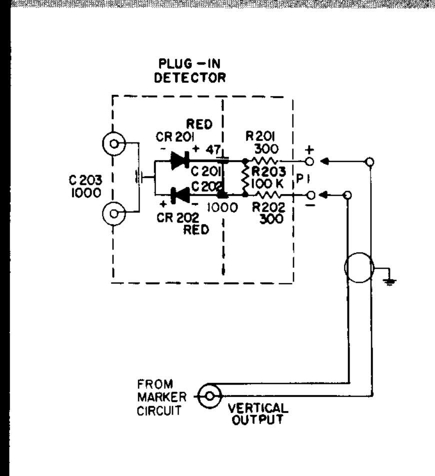


Figure 39 Schematic Diagram of Detector Circuits

THE POWER SUPPLY (Refer to Figure 40)

The power supply uses a straightforward full-wave silicon-diode rectifier with choke-capacitor filter. Because the sweep-oscillator plate is connected to chassis ground for best high-frequency operation, all circuits are operated below ground, and the positive terminal of the supply is grounded.

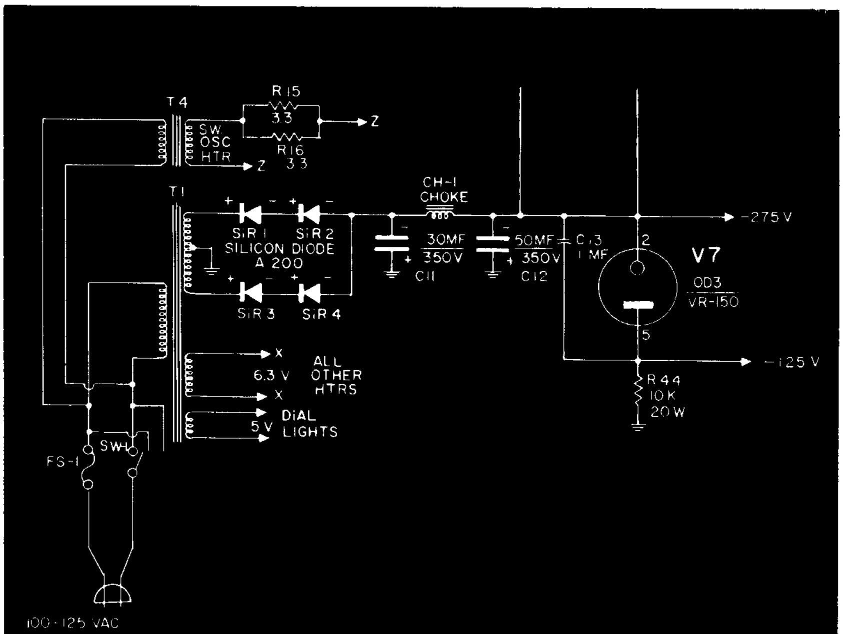


Figure 40 Schematic Diagram of Power Supply

GENERAL:

The two schematics located in this section serve to identify all of the components in the Model 900-A. A list of parts with their descriptions accompanies these schematic diagrams. To aid in the service of the instrument, photographs, voltage and resistance charts, and alignment information on the fixed oscillator and mixer are included.

SERVICE:

In the event you feel the equipment is not functioning properly, you should immediately contact our Instrument Service Dept., mentioning the serial number and outlining all characteristics of the trouble. Information will be promptly given as to how to correct the trouble, or authorization will be given to return the equipment to the factory.

All equipment returned to Jerrold should be shipped, carefully packed, via express prepaid; in addition, it should be identified with a tag. Unidentified equipment is a serious source of error and delay.

MAINTENANCE

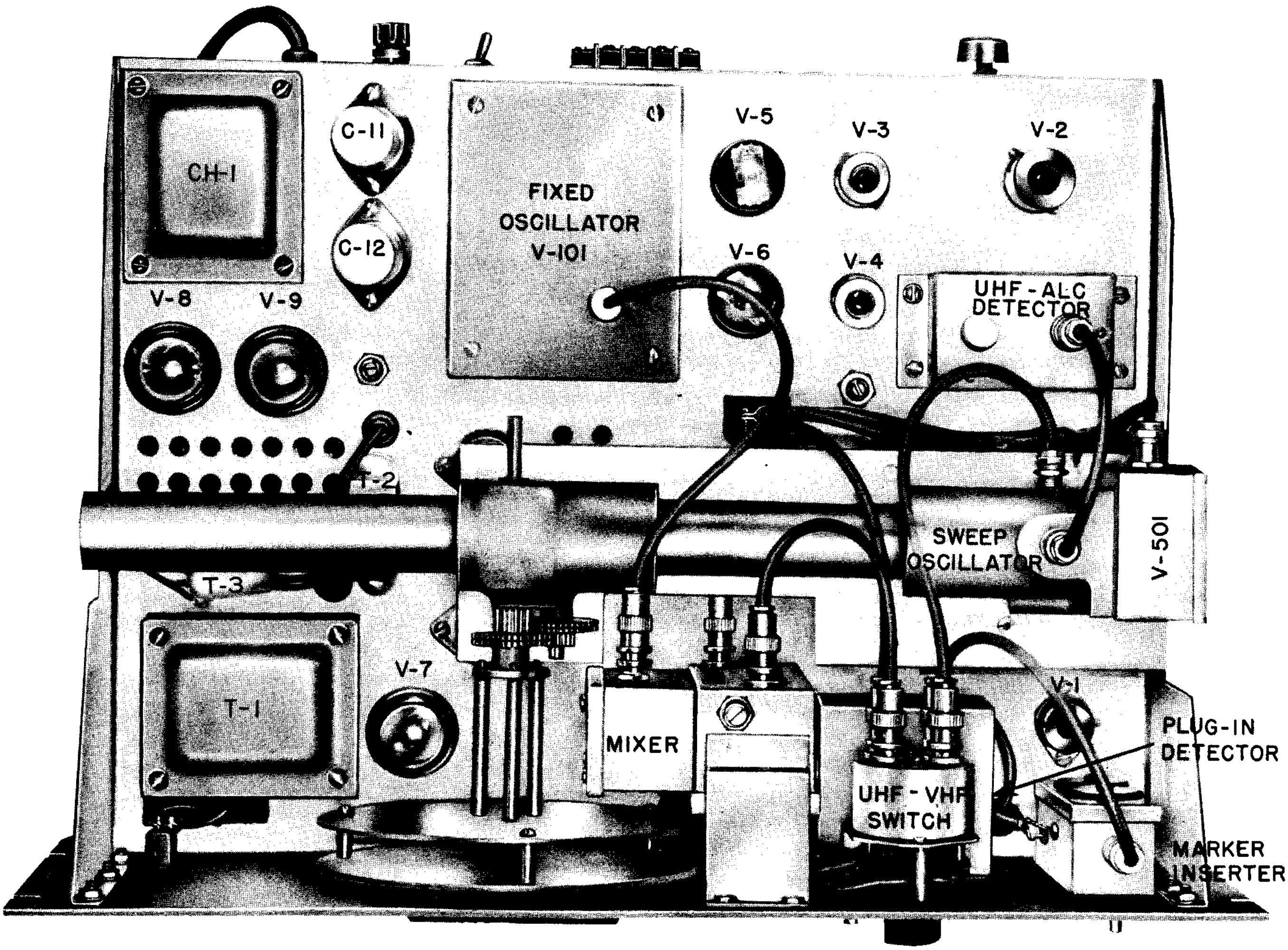


Figure 41 Full Top View of Model 900-A

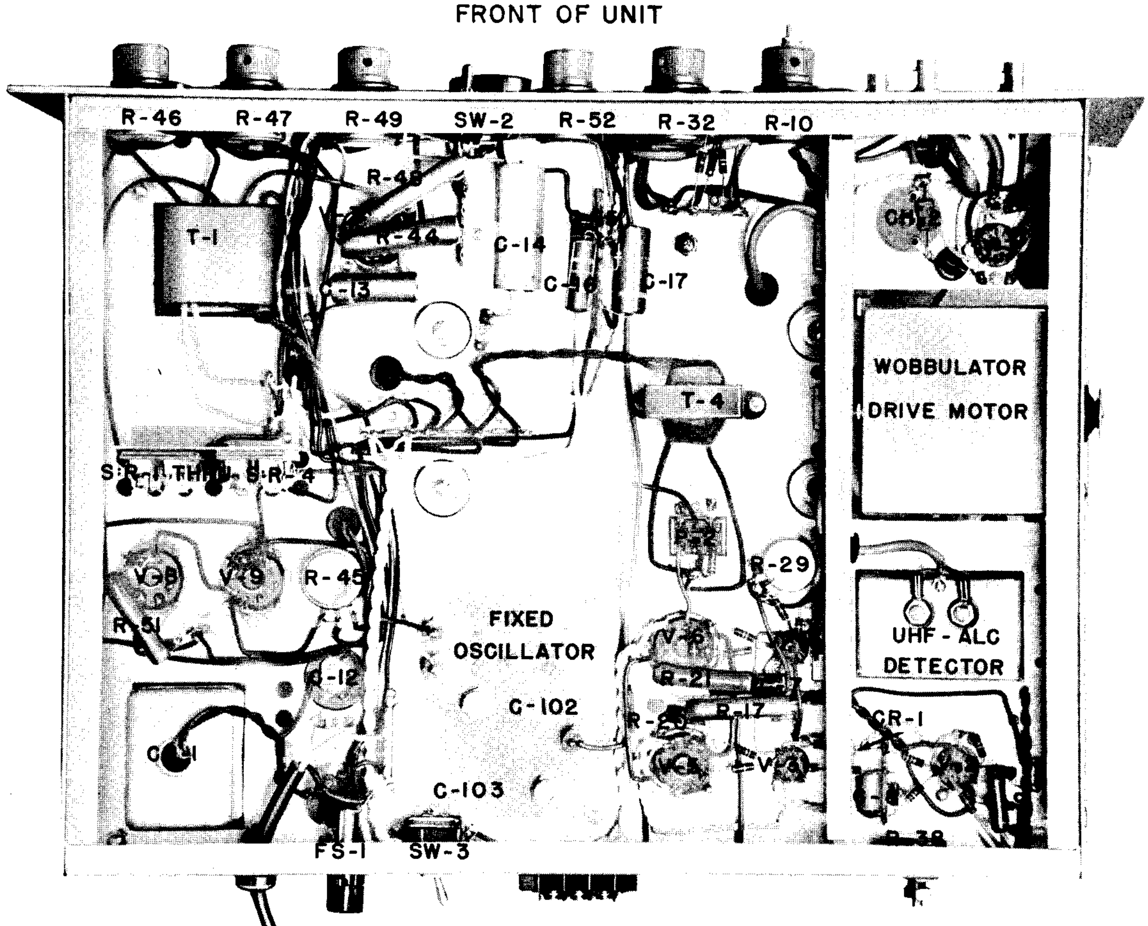


Figure 42 Full Bottom View of Model 900-A

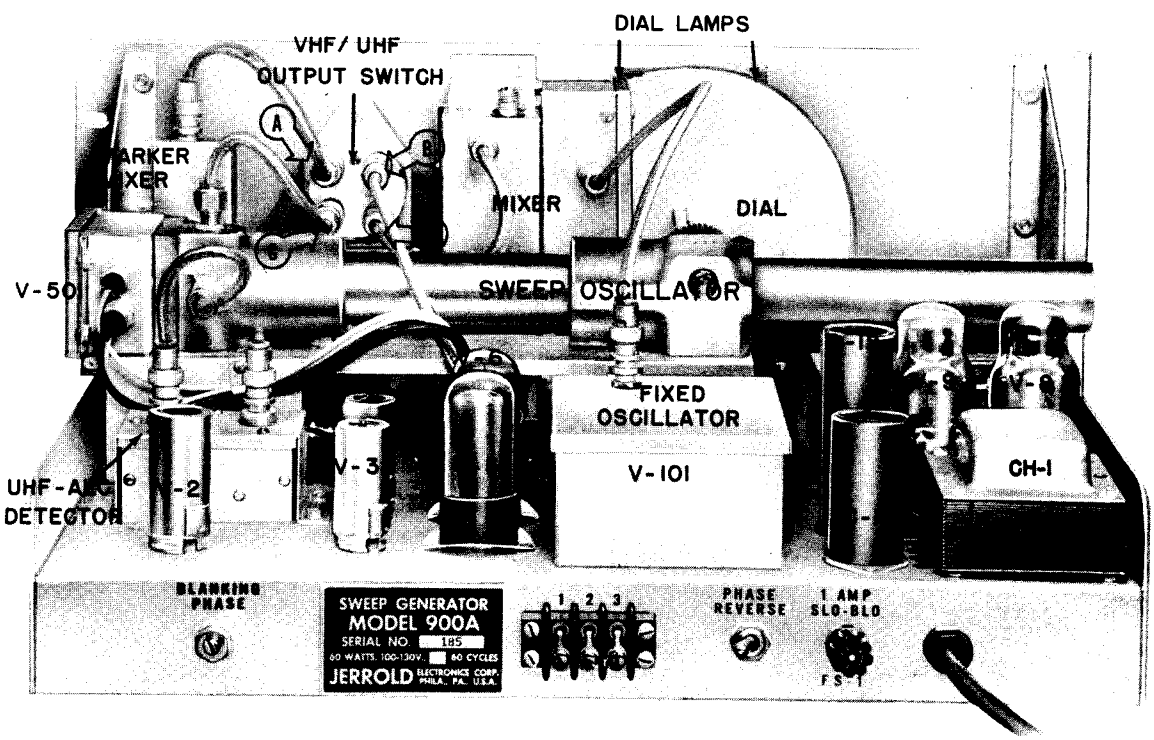
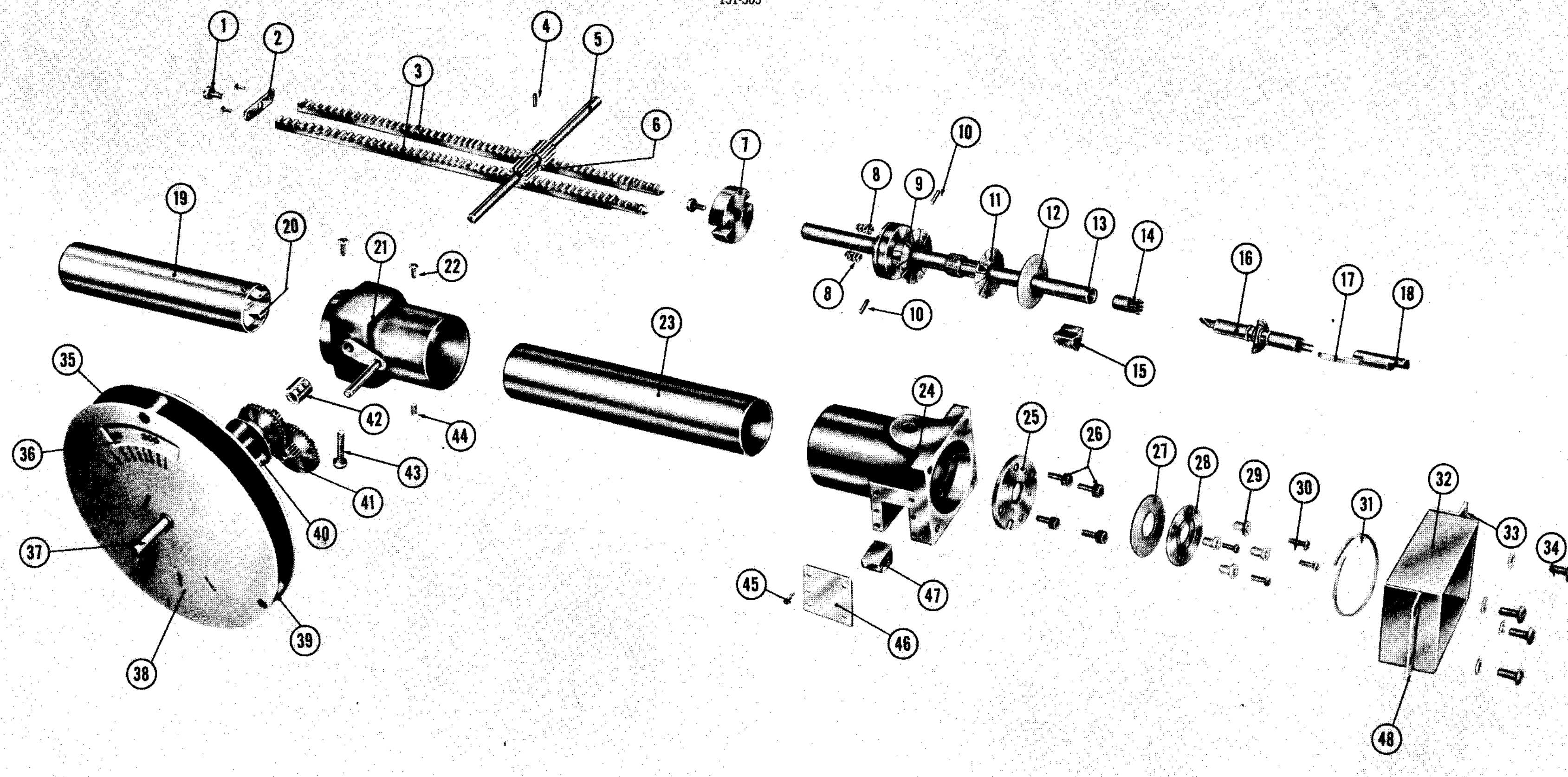


Figure 43 Full Back View of Model 900-A

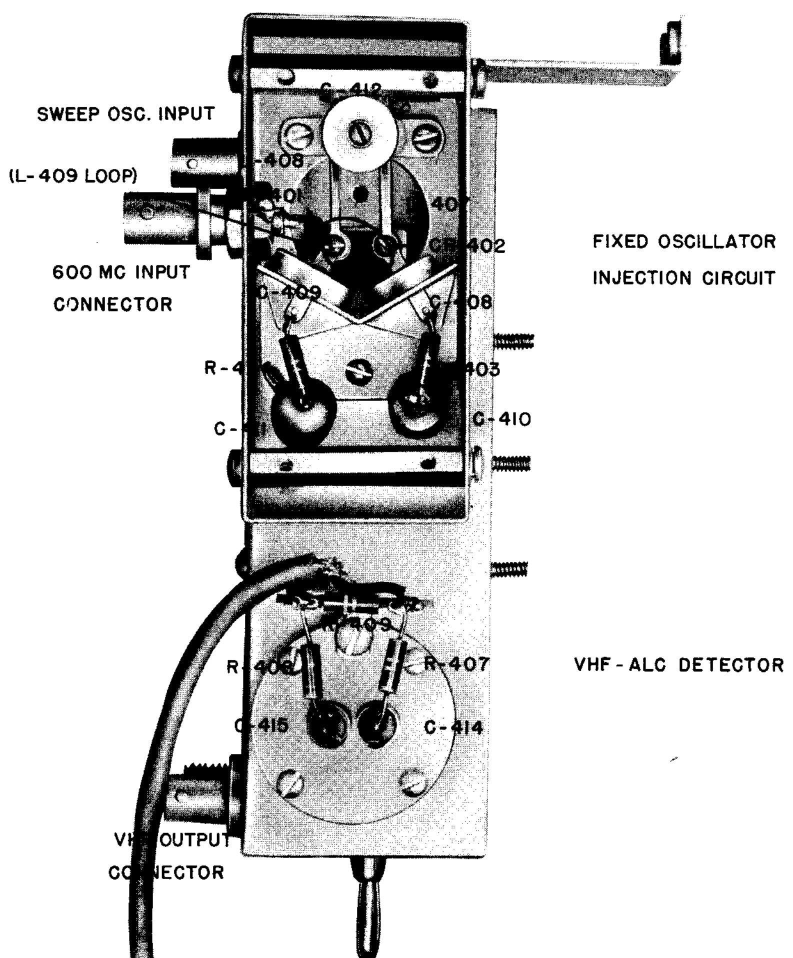
PART DESCRIPTION

1. Inner Stop 214-103
2. Rack Spacer
3. Rack (2) 278-020
4. Shaft Pin
5. Pinion Shaft 226-010
6. Pinion Gear 278-019
7. Inner Rod Support 221-096
8. Coil Springs 224-014
9. Outer Slider 221-094
10. Rack Pin
11. Inner Slider 221-095
12. End Cap 238-148
13. Inner Rod 229-111
14. Tube Plate Contact Spring 224-020
15. Plate Condenser 128-203
16. Tube—5675 w/cut Grid Flange 131-503
17. Feed Back Tab w/Teflon Spaghetti
18. Cathode Sleeve 229-112
19. Rack Cover 229-110
20. Rack Support Spring 224-013
21. Rear Block 228-102
22. Locking Screw
23. Cavity Tube 229-109
24. Front Block 228-101
25. Grid Flange 221-098
26. Cap Screw (4)
27. Teflon Grid Insulator 238-146
28. Grid Clamp 221-099
29. Teflon Tube Clamp (4) 231-125
30. Screw (4)
31. R. F. Gasket
32. Sweep Osc. Housing 212-144
33. Bracket RH 214-087
34. Housing Screws (4)
35. Dial Carrier 213-245
36. VHF Dial 219-176
37. Shaft Extension Tuning 226-009
38. UHF Dial Plate 219-175
39. Short Dial Spacer (3) 225-007
40. Long Dial Spacer (3) 225-006
41. Gear Hub 221-063
42. Shaft Coupling 221-107
43. Outer Stop 704-002
44. Locking Screw
45. Plate Screws (6)
46. Inspection Cover Plate
47. Grid Condenser 128-204
48. Bracket LH 214-088



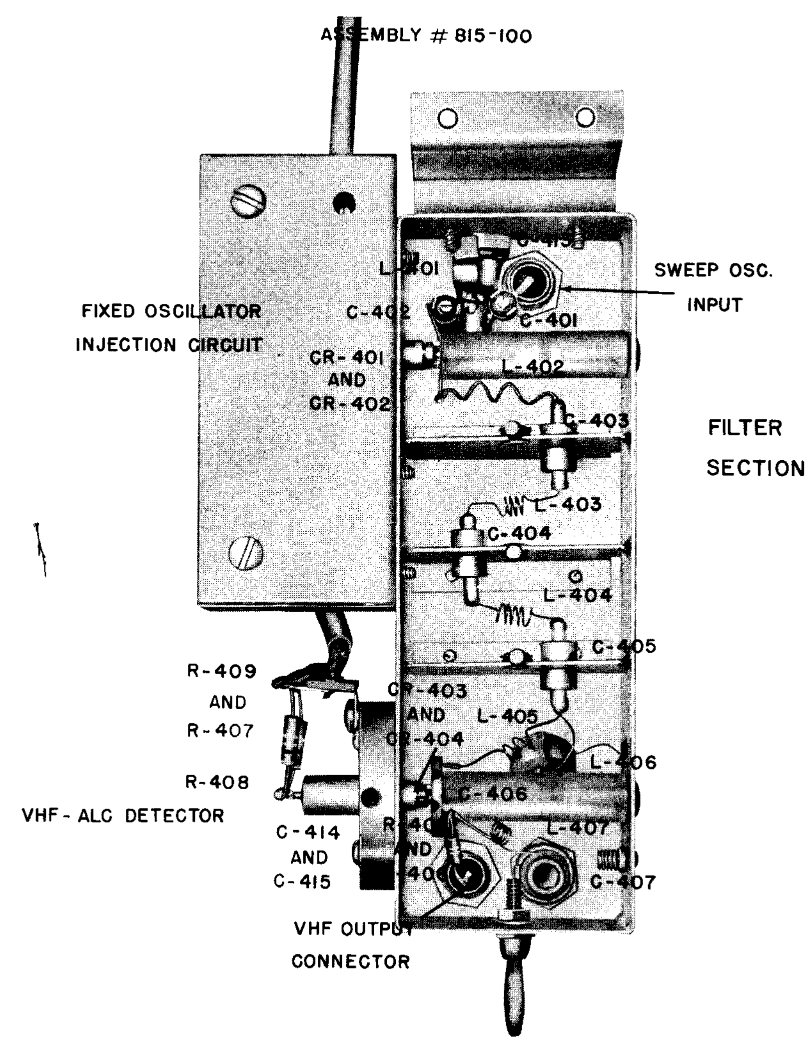
NOTE This exploded view is not to scale and is intended for illustrative purposes only. It is not recommended that the sweep oscillator assembly be repaired in the field due to the critical tolerances involved in its assembly. Replacement oscillators are available on request.

Figure 44 Exploded View of Sweep Oscillator Assembly



MIXER, FIXED OSCILLATOR INJECTION CIRCUIT - COVER REMOVED

Figure 45 **Interior View of Mixer-Filter Section**



MIXER, FILTER SECTION - COVER REMOVED

Figure 46 **Interior View of Mixer-Injection Section**

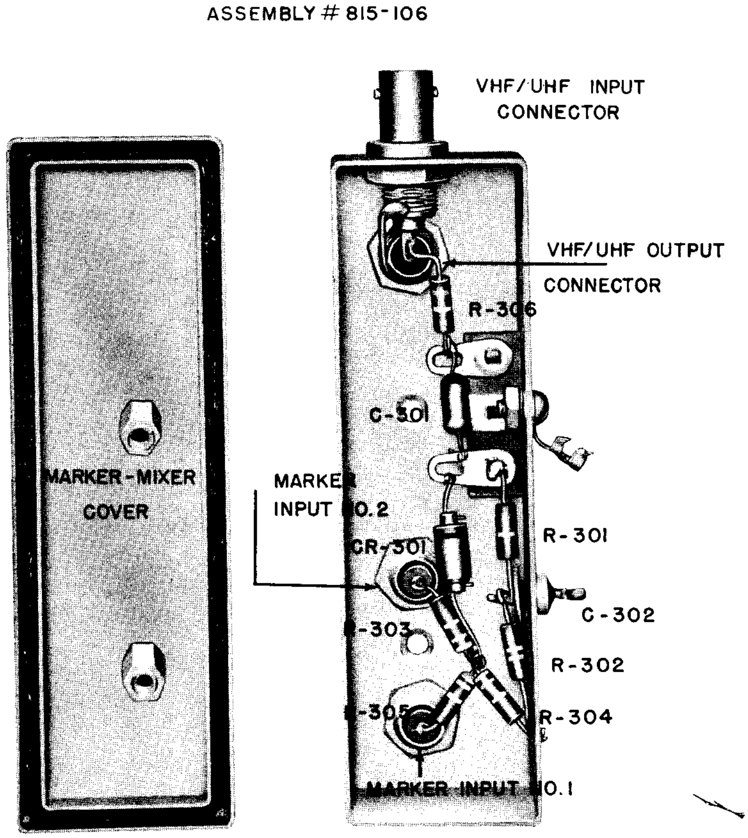
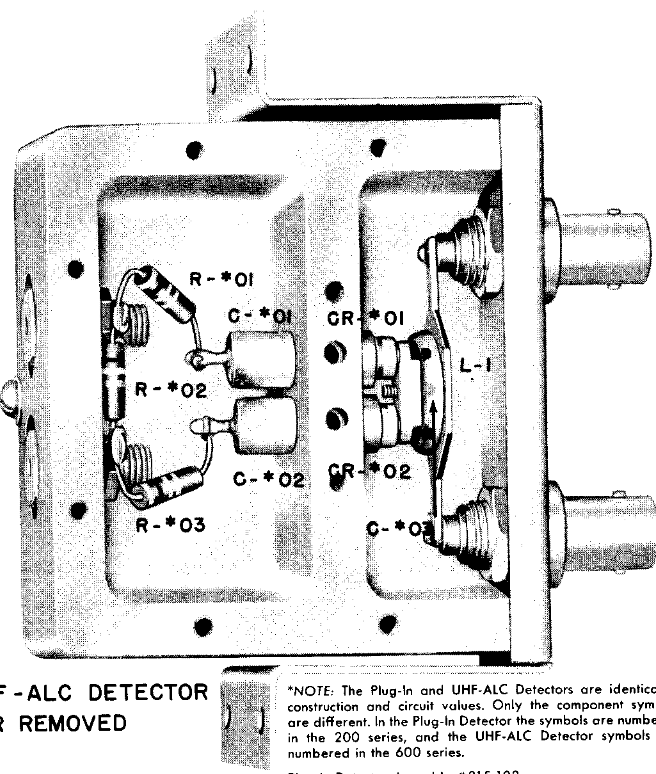


Figure 47 Interior View of Marker Mixer



NOTE: The Plug-In and UHF-ALC Detectors are identical in construction and circuit values. Only the component symbols are different. In the Plug-In Detector the symbols are numbered in the 200 series, and the UHF-ALC Detector symbols are numbered in the 600 series.

Plug-In Detector Assembly #815-102
UHF-ALC Detector Assembly #815-103

Figure 48 Interior View of Detector

A—TESTING POWER SUPPLY SECTION

TESTING ALC CIRCUIT

1. A cold resistance check from tube socket pins to ground on the ALC tubes is recommended as the ALC amplifier is DC coupled and voltages are dependent on correct parts. If one resistor is wrong, all the voltages on both stages will be off with the result of burning up tubes. Refer to Figure 49.

   It is not feasible to check voltages after the unit is on because the tubes will become damaged before the measurements can be made.

2. After the cold resistance checks have been made, the Power Supply may be turned on and voltage checks made on the Power Supply as well as ALC tubes. Refer to Figure 50.

RESISTANCE MEASUREMENTS

Tube	ALC				Blanking	Marker
Pin	6AU6 V4	6AU6 V3	6V6 V5	6V6 V6	V2 12AT7	V1 12AT7
1	*7000Ω	350K	NC	NC	330K	150K
2	1800Ω	1800Ω	0	0	1.7 meg	275K
3	0	0	16K	INF.	820 ohm	2200 ohm
4	0	0	20K	20K	0	0
5	160K	160K	160K	160K	0	0
6	85K	85K	NC	INF.	225K	5000 ohm
7	1800Ω	1800Ω	0	0	1.5 meg	500K
8					820 ohm	2200 ohm
9					0	0

*Depends on ALC Det. Crystals

NOTE: All measurements taken with a 20,000 ohm per volt meter from B-275 V to indicated pin.

Figure 49 Resistance Chart

VOLTAGE MEASUREMENTS

ALC Control—CC
For DC Measurements
Meter Negative Lead Attached to B-275 V
Positive Lead to Indicated Pins

NOTE: All DC measurements taken with a 20,000 ohm per voltmeter. AC filament taken with Dynamometer type meter—117 Volt AC input.

Tube	ALC Amp.				Blanking	Marker Amp.	VR-150 OD3
Pin	6AU6 V4	6AU6 V3	6V6 V5	6V6 V6	V2 12AT7	V1 12AT7	V7 OD3
1	1	2	NC	NC	60	130	0
2	4	4	6.3 AC	6.3 AC			0
3	6.3 V	6.3 V	185	185	.8 V	2.5 V	0
4	AC	AC	165	165	6.3 V AC to	6.3 V AC to	0
5	80	40	80	40	Pin 9	Pin 9	150 V
6	75	75	NC	185	60	265	0
7	4	4	6.3 AC	6.3 AC			0
8					.8 V	4.6 V	0
9					6.3 V AC	6.3 V AC	

Figure 50 Voltage Chart

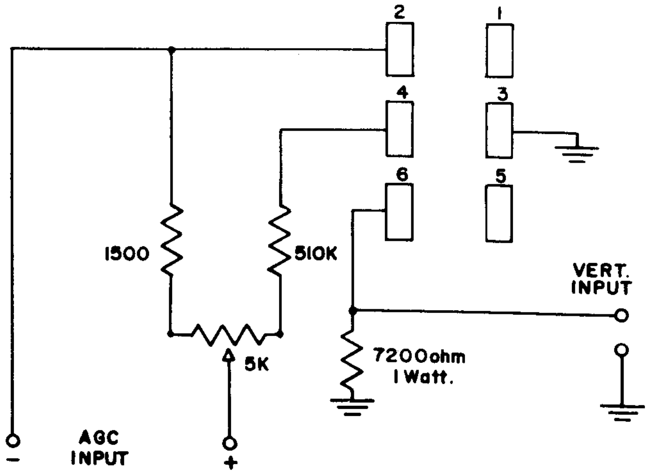


Figure 51 ALC Test Jig

3. The test jig in Figure 51 should be plugged into the Jones plug on the chassis. While viewing the scope, the front panel ALC control is turned till a slanted line pattern appears. This pattern represents input versus output of the ALC amplifier and the object is to adjust the bias of the 6AU6 tubes to give a straight steep slope. It is not important if the line bends on top or bottom as only the straight portion is used in the actual operation. The test jig furnishes more drive voltage than the ALC crystals. The pattern should be similar to Figure 52.

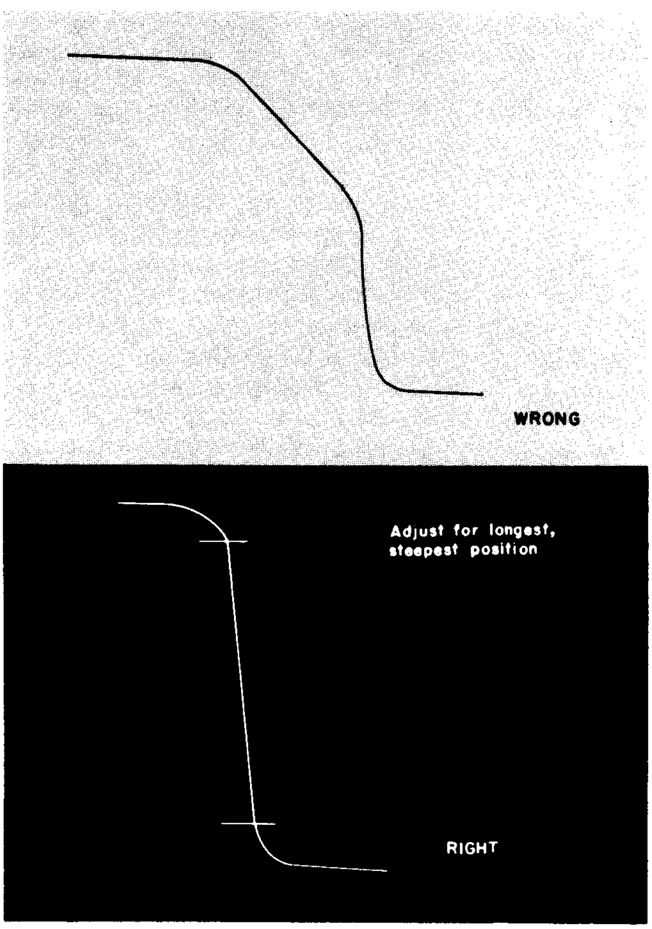


Figure 52 ALC Response

TESTING THE BLANKING CIRCUIT

The blanking tube is a multivibrator keyed by 60 cycle input. After it is shaped properly, it is applied to the ALC tube alternately cutting it off thereby cutting the voltage feeding the Sweep Oscillator tube.

Test should be made using a VM to read voltages and oscilloscopes to determine if the multivibrator is functioning properly.

Using Hewlett Packard #400D Voltmeter following voltages were taken from operating unit; 12 AT7 Tube, V2

Pin #6—Plate of first section 20 volts RMS

Pin #1—Plate of second section 44 volts RMS

Grid of 6AU6, V3 5 volts RMS

TESTING THE HORIZONTAL OUTPUT & RESONATING THE TRANSFORMER

In order to secure the most horizontal drive voltage, plus proper wave shape, to the oscilloscope, it is necessary to resonate the transformer in the horizontal circuit (T3).

This is accomplished as follows:

1. Connect a VTVM A.C. meter or oscilloscope to the horizontal output connector on the panel.

2. Connect a capacitor decade across the primary of transformer. This decade will parallel the capacitors already there.

3. With the sweep power supply turned on, a voltage will be indicated on the meter or scope. Alter the capacity decade to get maximum voltage.

4. Read proper capacity to add and solder in place.

TESTING THE MARKER AMPLIFIER

1. Feed a signal generator (tunable from 40 to 60 KC) into the input of the marker amplifier through the 150uuf capacitor.

2. Connect a meter or oscilloscope to the "vertical output" connector on the front panel.

3. Vary the signal generator frequency and output to find the resonant frequency of the amplifier. It should be 50 KC ± 10 KC.

4. The normal gain of the marker amplifier is 100-125 times. Measurements made with H.P. 400D meter @ 45 KC (Resonant frequency of the particular unit).

B—REPLACEMENT OF FIXED OSCILLATOR TUBE

ASSEMBLY # 815-101

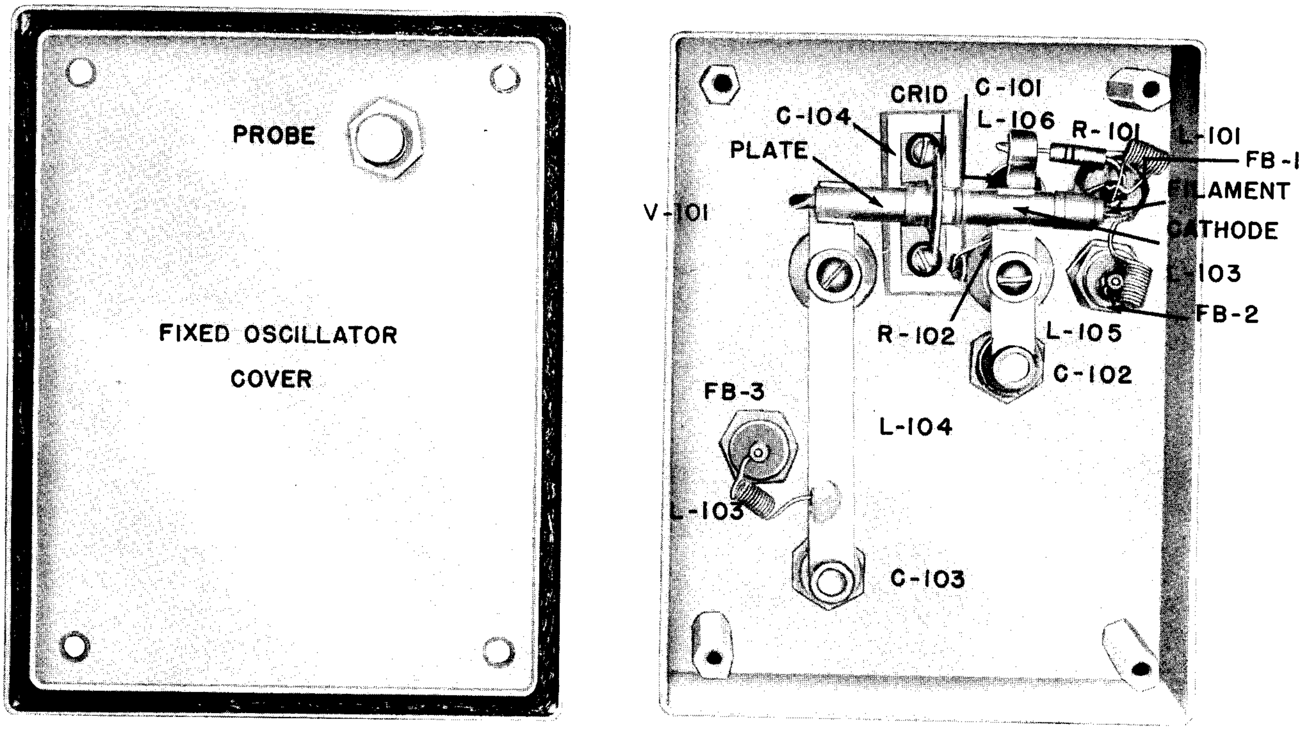


Figure 53 Interior View of Fixed Oscillator

1. Remove the fixed oscillator compartment cover by removing four screws. The tube will be seen mounted in the horizontal position. Refer to Figure 53.

2. The plate end of the tube will be seen as having a metal tip and the filament end as having a socket. Grasp the tube at the plate and filament ends and carefully remove it from its mounting clips. Be careful, in this procedure, not to distort the filament chokes as the tube comes free.

3. When the tube is free from its mounting clips, cautiously pull the filament socket from the tube.

4. Insert the filament pins of the new 5675 into the filament socket.

5. Carefully insert the new tube into its mounting clips being very careful that the grid flange of the tube is lined up correctly with the grid clip before pushing the tube gently, but firmly, in place.

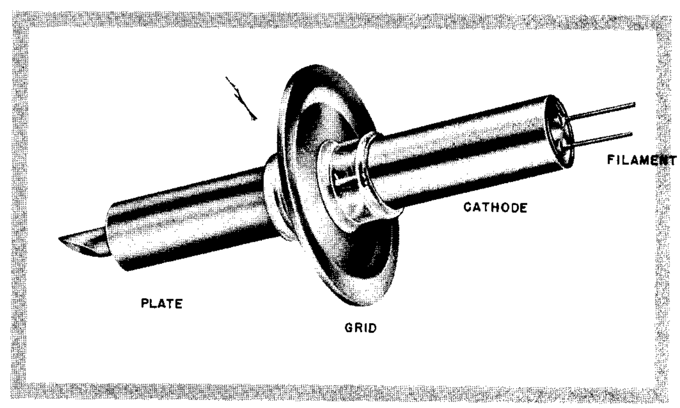


Figure 54 Illustration of a 5675 Type Tube

6. Replace cover being sure that the probe is over the plate of the tube.

7. Check the alignment of the fixed oscillator referring to section F, under maintenance.

c—REPLACEMENT OF VARIABLE SWEEP OSC. TUBE

1. Remove chassis from cabinet.

2. Remove four screws from sheet metal end cover of Sweep Osc. housing and take off cover.

3. Unsolder leads from filament wires of tube using a small soldering iron. Notice that one filament wire is directly connected to the cathode sleeve. Swing the bifilar coil towards the opening and fold back out of the way.

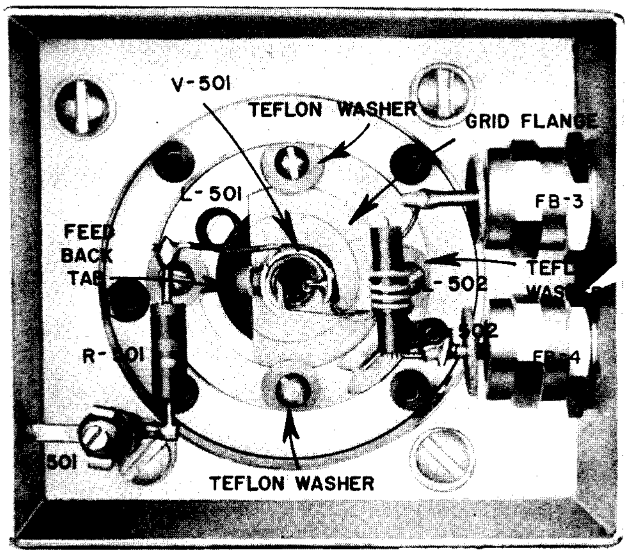


Figure 55 Interior View of Sweep Oscillator Tube Compartment

4. Unsolder the four turn coil from the cathode sleeve and fold the coil and resistor towards the opening of the box and out of the way.

5. Examine the three teflon insulated shoulder washers that hold the grid flange of the tube in place. Early models have completely round shoulders while the later models have a flat side on the shoulder of the teflon. If completely round, it will be necessary to remove the screws and teflon washers completely in order to remove the tube. However, if the teflon washer has a flat side, it is necessary only to loosen the screws slightly and turn the teflon washer until the flat portion is in a position to allow the grid flange of the tube to pass.

6. It will be noticed that a fourth screw and washer is positioned on the flange but this need not and should not be removed or loosened.

7. Gently withdraw the tube straight out by grasping the cathode sleeve with two fingers.

8. At this point, an examination will reveal a spring contact cylinder inside the center rod. Before a new tube is inserted, it is important to push this in with the finger to make sure it seats properly. Failure to do this will prevent the new tube from going in fully and might result in breakage when tightened down.

9. When looking into the cavity, the open part of the spring contact cylinder should be at a 9 o'clock position.

10. The new 5675 tube is furnished complete with cathode sleeve and feed-back tab attached. It should be gently inserted plate end first into the spring finger contact being careful that the feed-back tab is positioned so as to feed into the opening of the spring contacts. It should be pushed straight in and gently but firmly seated. If the grid flange of the tube does not set flush on the metal ring, it usually indicates that the spring contact cylinder was not pushed in far enough before the tube was inserted.

11. On early models the teflon shoulder washers should be re-inserted together with the three screws and

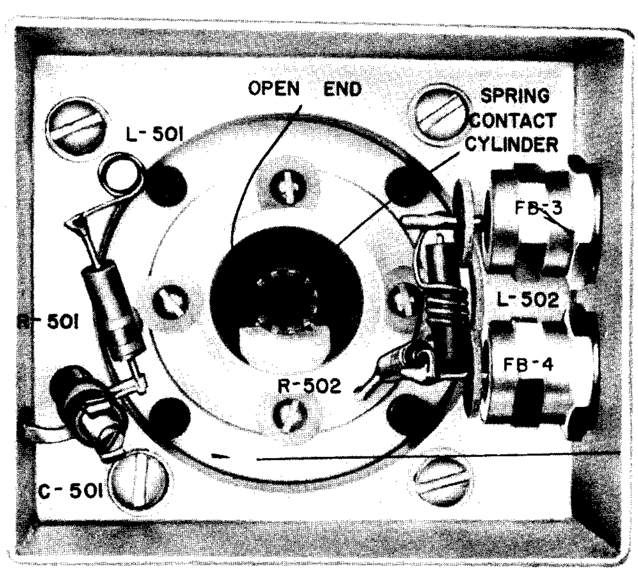


Figure 56 Interior View of Sweep Oscillator Compartment —Tube Removed

gently tightened. Tighten the screws alternately so as to distribute the pressure and never over-tighten, just a firm sensible tightness. If no "crack" is heard up to this point, it can be assumed that the tube did not break. With the later models, after the tube is inserted the teflon insulator washers should be turned to lock the grid flange and the screws tightened gently. It must be emphasized that the entire operation is critical and any undue strain imposed on the tube at any time will break the tube at the metal-glass seals. As a rule, breakage usually occurs at the seal on the plate side of the grid disc and since this cannot be seen, it is a good idea to listen carefully at all times during assembly for a distinct but faint "crack".

12. Resolder wires from bifilar coil to tube. The white wire going to the filament wire and the colored wire going to the cathode sleeve. Also resolder the four turn coil to the cathode sleeve.

13. At this point an operating check should be made at UHF. The top frequency at max. bandwidth should be about 1250 MC before the oscillator stops. If it does not go this high, an adjustment of the feed-back tab will be necessary. An insulated small diameter rod should be used to gently push the feed-back tab (inside the hole) towards the tube plate. Watching the Oscilloscope display will show immediately if any good is being done. Do not apply too much pressure, otherwise the tube may break. The idea is to position the feed-back tab (teflon insulated copper tab) closer to the plate of the tube. The plate end being the end inside the cavity. The tab should be bent only the amount necessary to accomplish the top frequency specification and not more, as too much feed-back will cause other troubles.

14. Replace cover on Osc. housing.

FIELD MODIFICATION OF THE SWEEP OSCILLATOR TUBE—V-501

The Sweep Oscillator Tube is a modified 5675 type tube. The tube includes a modified grid flange, a cathode sleeve and a plate-to-cathode feed-back capacitor. The tube and complete assembly can be ordered from Jerrold by part number 815-107. The following instructions are included for those occasions when the Generator is in critical need and it is not possible to obtain a modified 5675 in a short period of time.

1. Place a good 5675 tube in a vise as shown in Figure 57. Caution must be observed that the vise jaws are tightened only on the circular, flat ring of the grid flange. Do not apply excess pressure on the grid flange with the vise.

2. Hold the opposite end of the grid flange, as illustrated, to stabilize the tube when sawing off the grid flange.

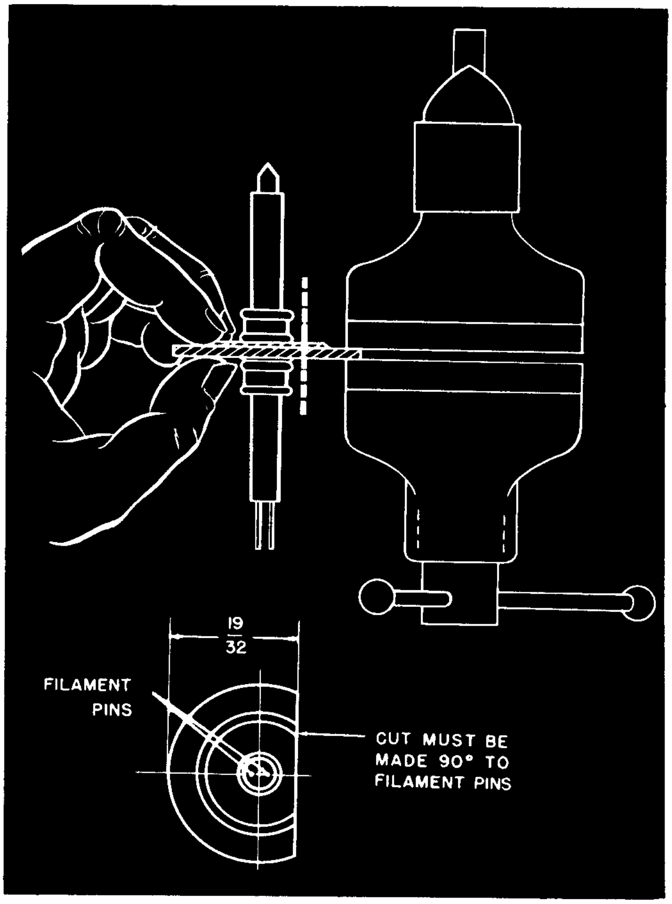
3. Using a jeweler's saw, carefully cut the grid flange at the point illustrated by the dotted line. The grid flange should be cut off to within 1/16" of the glass portion of the tube. Sawing of the flange should be done slowly and cautiously.

4. After the flange has been removed from the good tube it should be inspected for any cracks in the glass seal or other damage. With a knife or fine file, remove all burrs from the grid flange which will be the result of the sawing operation. This is very important. Next, proceed with the removal of the defective Sweep Oscillator Tube as prescribed in steps 1 to 7 under Replacement of Sweep Osc. Tube.

5. After the defective tube has been removed from the Generator, the cathode sleeve should be removed from the tube by unsoldering the filament lead connected to it and sliding it from the tube.

6. Take the cathode sleeve and carefully slide it on the new tube as it was on the defective one. Solder the filament lead on the cathode sleeve. The modification of the tube is complete. Install it in the Generator following steps 8 to 14 under Replacement of Sweep Osc. Tube.

Illustration of a 5675 Tube Vise-Mounted for Modification



NOTE: This drawing is for illustrative purposes only and is not to scale.

Figure 57 Modification Procedure of a 5675 Type Tube

D—REPLACEMENT OF WOBBULATOR DRIVE MOTOR

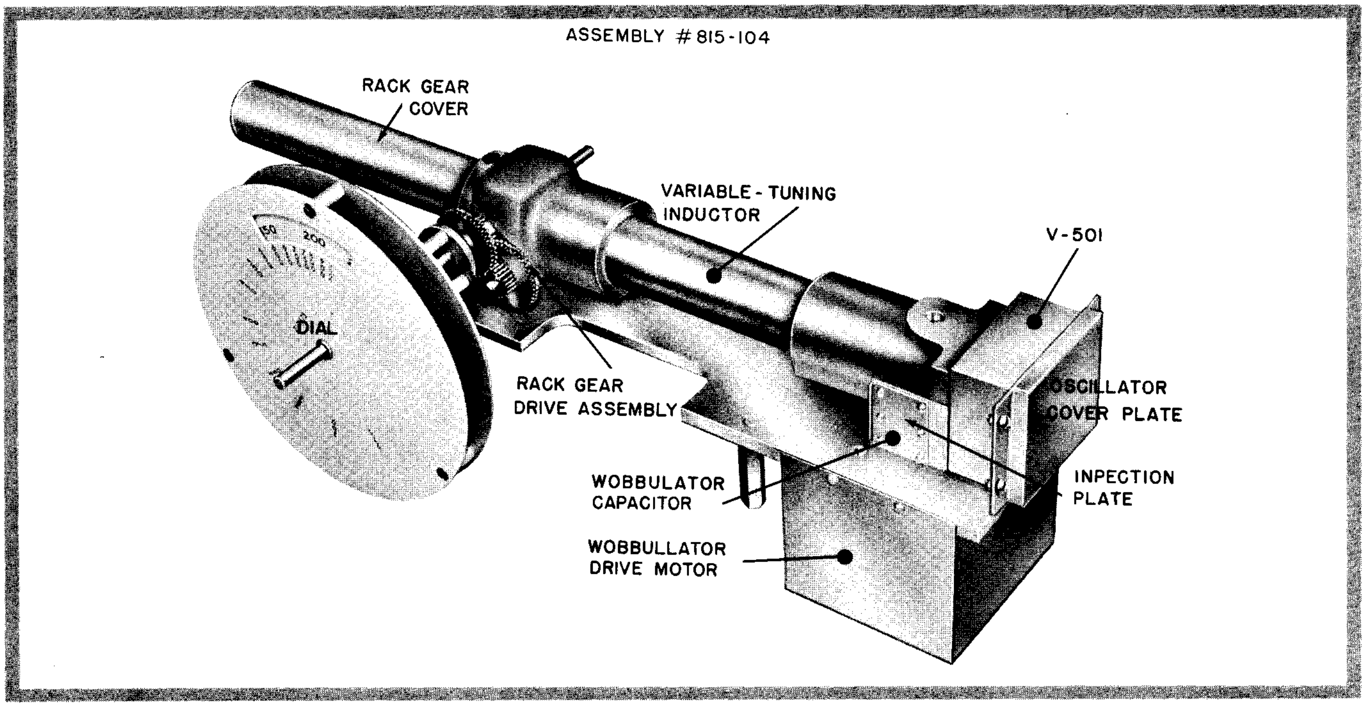


Figure 58 Sweep Oscillator Assembly Removed for Generator

1. Remove chassis from cabinet by taking out 4 panel screws and 2 screws in rear of cabinet.

2. Remove Sweep Head Assembly.

   (a) Remove cables to mixer which pass over sweep head.

   (b) There are two cables connected to the sweep head, these should be disconnected at the opposite ends, one at the ALC detector and the other at the coaxial switch.

   (c) Loosen set screw (one nearest the panel) on the shaft coupling of the main tuning shaft.

   (d) Loosen set screw on VHF dial plate hub (this is the middle dial).

   (e) Shaft with knob can be drawn out front panel at this point.

   (f) Remove 4—# 8 x 1" machine screws from shock mounts (under side of chassis).

   (g) Remove 1—# 8 x 1" machine screw from end shock mount (side panel).

   (h) Remove sweep head power plug from chassis receptacle.

   (i) Lift sweep unit straight up and off chassis.

   (j) Wobbulator motor is inside sheet metal housing, remove 8 screws that attach this housing to the base plate.

   (k) Remove cover gently as a wire will have to be unsoldered from the wobbulator motor terminal to fully release shield can. Also unsolder other wire (ground lead).

   (l) Remove three screws attaching the wobbulator motor to the adjustable capstans.

   (m) Lift wobbulator motor away. Do not lose the 3 washers that fall off.

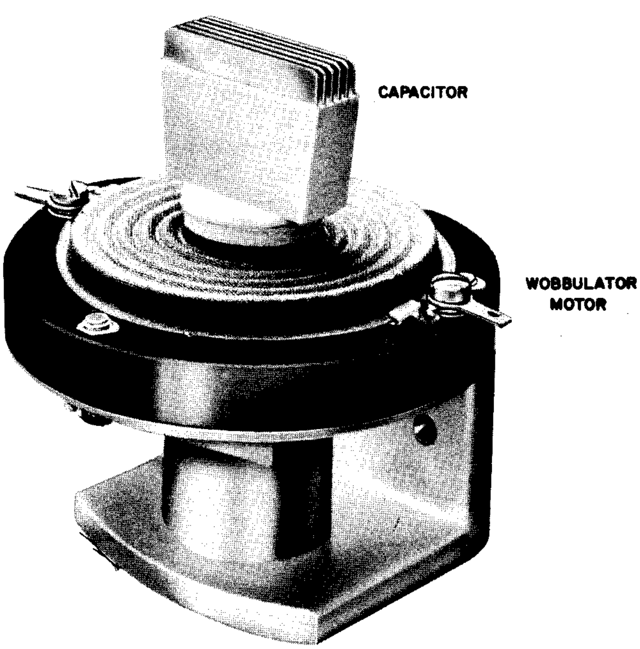


Figure 59 Wobbulator Motor Assembly

REASSEMBLY

(A) Turn capstans tight, then turn back three flats (not turns).

(B) Carefully position wobbulator motor in place on the 3 capstans, making certain the brass washers are in position, the flat side to the washer facing towards the diaphragm. The capacitor plates should mesh with the fixed plates inside the cavity. If necessary, the side cover plate can be removed (6 screws) to provide an inspection hole.

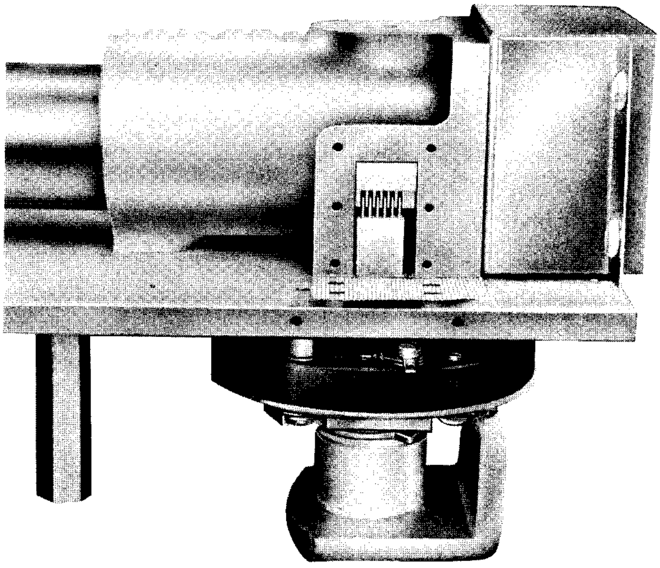


Figure 60 Wobbulator Motor Assembly in Position

(C) This is a very difficult task, namely to adjust the capacitor plates on the wobbulator motor so they center between the capacitor plates mounted within the cavity.

It will be a great help if a small flashlight bulb be inserted in the threaded hole opposite the inspection hole for the wobbulator. This light will enable you to look through the capacitor plates to center them. Without the light it will be necessary to adjust the centering electrically. This requires a patch cord with a male 6-prong Jones plug on one end and a female Jones plug on the other. The cord should be at least 12" long and preferably 18". The power is turned on after the Sweep Osc. Assembly is positioned upside down on the bench. The bandwidth control is set to maximum and with the three mounting screws slightly loose, the Wobbulator Motor is positioned till it runs free with no rubbing noises. If an RF patch cord is connected to the short cable attached to the top of the sweep cavity and then to the coaxial switch connector (that the short cable originally attached to) you will be able to see an RF display on the oscilloscope. Now, if the capacitor plates are rubbing or shorting, it will be observed as a broken-up pattern.

With a marker (about 300 MC) fed in the marker input, sweep set maximum bandwidth on the UHF position and tuned to the low frequency end of the scale, a presentation will be observed and the marker will be seen. At this time the wobbulator motor can be moved around on the capstans. The object is to find a position that the plates of the capacitor do not rub and the marker appearing as far as possible towards the higher frequencies of the sweep pattern. The theory is that when the plates of the wobbulator capacitor are centered, there will be minimum capacity, therefore, highest frequency. When this position is arrived at, the capstan screws may be tightened firmly. There is only one other adjustment to be made to the wobbulator motor and this is to align the dial.

This adjustment is accomplished the following way:

1. Set the sweep controls at narrow bandwidth and reinstall the knob, shaft and VHF dial.

2. Tune the main frequency dial to zero beat (UHF dial at 600 MC).

3. Tighten the set screw on the VHF dial at the point that "0" reads on top of 600 MC.

4. Tune the frequency dial to 450 MC and feed in a 450 MC marker. If the wobbulator motor is set to mesh the right amount of capacity, the dial will track properly and 450 on the dial will agree with the marker, otherwise follow this procedure.

5. Leaving the marker at 450 MC, note the reading of the dial. If it reads below 450, 350 or 400, it indicates too much capacity (that is the wobbulator capacitor is too far in). If this is the case, loosen one capstan screw at a time and back off the capstan *1 flat*. Do this to all three capstans and recheck dial tracking. It may be necessary to do this two or three times. Do not be tempted to back off more than one flat at a time or the wobbulator will become tilted and the capacitor plates will rub.

6. Likewise, if the VHF dial reads *above* 450 or cannot be tuned high enough to see the 450 MC marker, it indicates insufficient capacity at the wobbulator setting. In this case, the capstan screws must be loosened one at a time and the capstan turned *in* one flat.

7. After the dial has been made to track, the capstan screws can be tightened for the last time and the sheet metal cover replaced after resoldering the wire to the wobbulator motor.

The assembly from here is a reversal of the disassembly procedure.

It will be noted that in order to track the dial, the shaft and knob must be put on the sweep unit again, but in order to reassemble into the chassis, the knob and shaft must be again removed. This will cause no concern, however, as only two set screws are involved, the outer shaft coupling screw and the VHF dial screw. When finally assembled, the VHF dial is set to align "0" directly on top of the 600 MC marking on the UHF dial, no further adjustment being needed.

E—CRYSTAL REPLACEMENT

CRYSTAL DIODE REPLACEMENT

There are 8 K3-A crystals used in various circuits in the 900A Sweep Generator that will need replacement from time to time. They are located in the following units:

(a) Removable detector (2 crystals)

(b) UHF ALC Detector (2 crystals)

(c) VHF ALC Detector (2 crystals)

(d) Mixer (2 crystals)

It is very important to replace crystals in the proper polarity position observing black bar on crystal body and calling this + (or positive).

REPLACING CRYSTALS IN REMOVABLE DETECTOR & UHF ALC DETECTOR

1. Remove 8 screws in front panel of detector.
2. Take hold of the panel and withdraw it from the body giving a slight side to side rocking motion. It must be drawn out straight to disengage crystals from their holders.
3. When replacing crystals, observe polarity as indicated on cover and rear of casting.
4. Insert crystal body into clip on panel first before trying to put the panel back onto the body. With the crystals installed in the dual clip on the panel enough of the crystal body will protrude to enable you to see that the crystals are positioned into the shield barrel openings before pushing the panel tight. If any difficulty is experienced in replacing crystals in this fashion, it is permissible to remove the top cover, which will reveal the entire detector. It should not be necessary to disturb the position of the filter barrels.

REPLACING MIXER CRYSTALS

It is necessary to remove the mixer housing to obtain access to these crystals.

1. Remove the two screws that attach the mixer body to the front panel.
2. Disconnect the cables from the connectors on the mixer body noting the color coded connectors.
3. Lift the mixer body straight up from the chassis to disengage banana plug at bottom of mixer body.
4. It will not be necessary to unsolder the two wires attached to the VHF ALC crystal assembly, as there is enough slack in the cable to prop the mixer body and obtain access to it.
5. Remove the 4 screws from the small cover on the UHF mixer portion.
6. It will be observed that inside of this housing there is a sub-assembly plate held in place with 3 screws (two are holding down the insulator and one is located between the fixed capacitors at the other end). Remove these screws.
7. Lift the coupling loop from the connector up and out of the way.
8. Lift the sub-assembly plate enough to disengage the crystals from their clips and maneuver the plate out of the housing.
9. Observe the polarity of the crystals and replace the crystals in the dual clip in the mixer body first (not in the removable plate).
10. Replace the removable plate being careful to see that the crystal clips engage the crystals.
11. Replace the 3 screws using the two longer ones in the insulator and the shorter one between the fixed capacitors.
12. Bend the coupling loop down towards the tuned circuit and adjust the coupling by following the procedure under the section dealing with mixer adjustments.

REPLACING THE VHF ALC CRYSTALS

These crystals are located under the round plate attached to the body of the mixer.

1. Remove the four screws attaching this plate to the mixer body.
2. Gently pry the plate off using a knife or small screwdriver.
3. Observe polarity (plus or bar of crystal towards the red dot on the filter barrel) the other crystal is put in the opposite way.
4. Insert the crystals first in the dual clip inside the mixer body.
5. Replace the round plate being careful to check the RF weather-stripping to see that it is in the machined groove.

If difficulty is encountered replacing crystals in the clips which are inside the mixer body, it is permissible to remove the large cover (3 screws) which will enable the operator to see the clips better.

F—FIXED OSCILLATOR ALIGNMENT

A milliammeter should be connected in series with the plate connection on the underside of the chassis and the current reading observed during adjustment. When the Sweep Generator is turned on, it is a good idea to arbitrarily adjust the plate and cathode trimmers for minimum plate current as this is an indication that the tube is oscillating and will keep the tube from drawing excessive current.

To set this oscillator on frequency, set the sweep to UHF condition and adjust its frequency to 600 MC using an accurate marker to determine the frequency. Set bandwidth narrow, about 1 MC. When the beat marker is in center of scope pattern, turn UHF-VHF switch to VHF. Adjust local fixed oscillator to position zero beat at the same spot as the beat appeared on the UHF range. Upon close observation it will be noticed that an overall beat will appear as the fixed oscillator frequency beats with the marker frequency.

It should be noted that several things affect the frequency of the fixed oscillator such as:

a. The tuning of the UHF tuned circuit in the mixer (this should be tuned at the time the local or fixed oscillator is set on frequency and alternated between).

b. The tightness of coupling or closeness of pickup probe in the fixed oscillator lid.

It is obvious that only after the complete Sweep Generator is operating with Mixer tuned, etc., can a final frequency adjustment be made on the fixed oscillator. However, the preliminary adjustments outlined must be made. Upon adjusting the plate capacitor (which adjusts frequency), it will be necessary to observe the current meter. If the current rises above 20 ma, the cathode capacitor should be immediately adjusted to minimize the plate current thereby assuring maximum oscillation.

If the coupling of the cap. probe is set too tight, it will be impossible to tune the fixed oscillator to frequency especially if the UHF mixer tuned circuit is set properly. The remedy is to loosen up the coupling by screwing out on the coupling probe.

Varying the cathode capacitor to obtain minimum plate current after the plate circuit is tuned to the proper frequency will result in a certain frequency shift. The two adjustments will have to be rocked and adjusted alternately till the right frequency together with minimum plate current is obtained.

Normal plate current after all adjustments will be 8 to 12 ma.

NOTE: *The coaxial cable connecting the fixed oscillator to the mixer is tuned to 600 MC. This includes the loop of #24 teflon wire in the mixer. To check this resonance, unscrew the probe from the fixed oscillator and screw it temporarily into the sweep oscillator cavity leaving the other end connected to the fixed oscillator input connector on the mixer. Connect the Vert. Input of scope to the mixer crystals. Select the UHF range on the panel and tune the sweep head to 600 MC. The picture shown will be the resonance of the lead and the tuned circuit in the mixer as well as the coupling. It is not suggested that this operation be done to set coupling as the coupling will be reset anyway later and it is included here as a reference.*

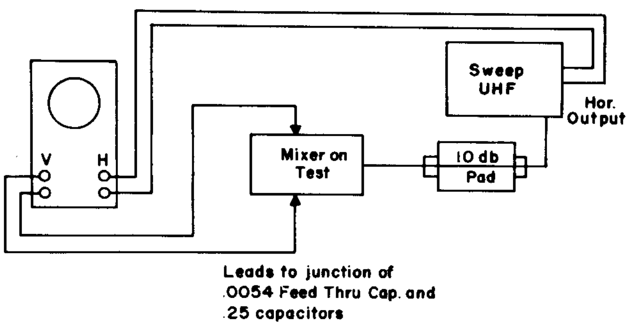


Figure 61 Mixer Test Set-Up

G—MIXER ALIGNMENT

The Mixer Unit consists of the following:

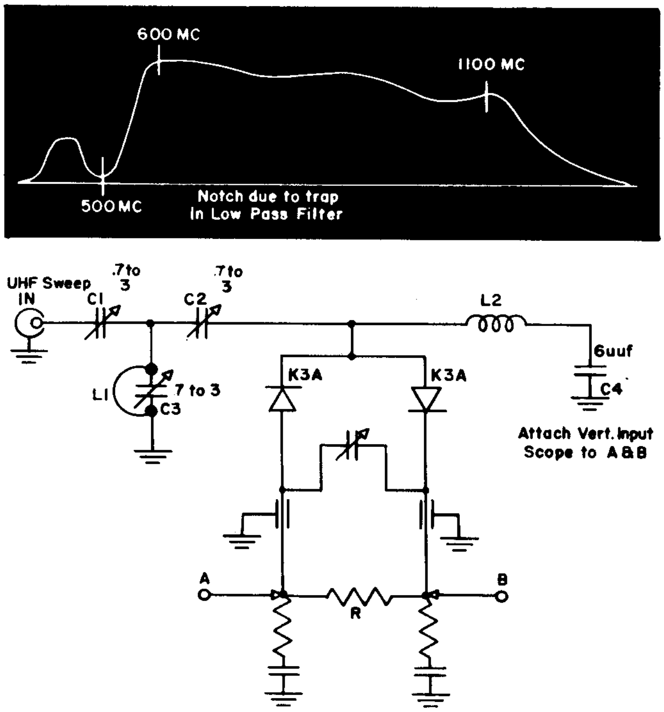
a. High Pass Filter

b. Mixer

c. Low Pass Filter

d. UHF Resonant Circuit

The action of the high pass filter can be observed by feeding a 600-1100 MC signal from the Sweep Output (UHF) of a 900A Sweep Generator to the sweep input connector of the mixer using a 10 db pad. The DC DROP across the mixer diode load resistor is used to provide vertical deflection for the scope.



High Pass Filter Circuit Involved in above response.

C1 – Controls loading of the circuit.
C3 – Controls bandwidth together with L1.
C2 – Tunes for max. response.
L2 – Should resonate at 600 MCS.

Figure 62 Hi-Pass Filter Response and Circuit

The action of the low pass filter can be observed by feeding a signal 0-500 MC into the VHF output connector of the mixer with the mixer crystals connected to the Vert. Input of the Oscilloscope as before.

The response should be similar to the following:

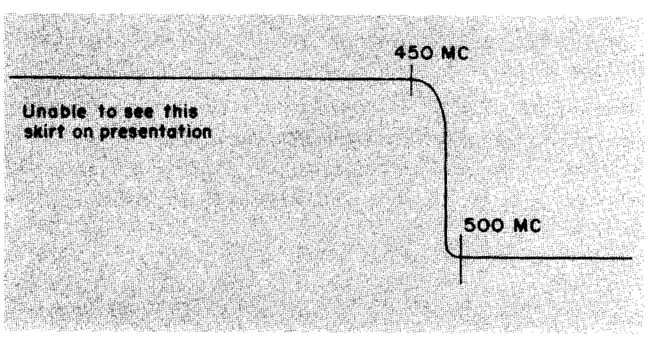


Figure 63 Low-Pass Filter Response

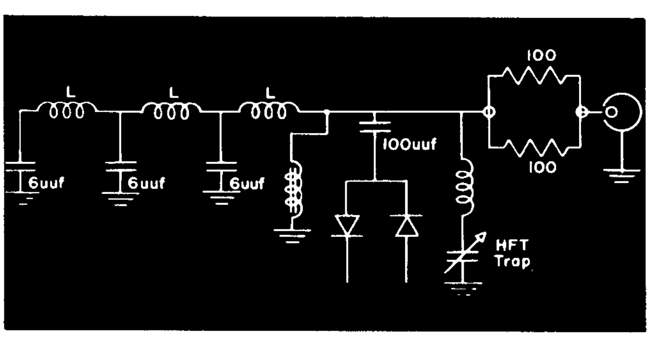


Figure 64 Low-Pass Filter Circuit

All other sections of the Sweep Generator should be operating properly before attempting to align the Mixer. These procedures should be followed:

a. Connect cables to Mixer, leaving both covers off and propping up the Mixer so the adjustments are accessible.

b. Adjust frequency dial to 600 MC (UHF range) narrow bandwidth (about 1 MC).

c. Change to VHF range and some VHF output should appear if scope gain is increased. Also, zero beat will be observed if local oscillator has been previously adjusted.

d. Adjust UHF resonant circuit in Mixer. C-412 (Erie trimmer at end of 2 lines) for max. VHF output, the coupling loop should be adjusted roughly for max. output without overcoupling.

e. Set bandwidth to maximum and tune frequency control to set zero beat at extreme left edge of response. ALC control should be max. counterclockwise or off.

f. A pattern similar to Figure 61 should be found. If the 500 MC trap is tuned low in frequency, the response may have a serious suckout such as in Figure 62.

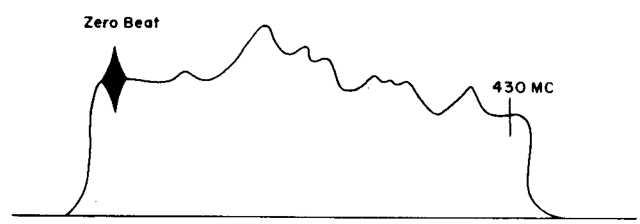


Figure 65 VHF Response

STEPS NECESSARY TO ALIGN MIXER UNIT

Again, preliminary checks can be made on the High Pass Filter and Low Pass Filter before complete alignment is undertaken, or the complete Mixer can be aligned using the displayed VHF frequencies as a final guide.

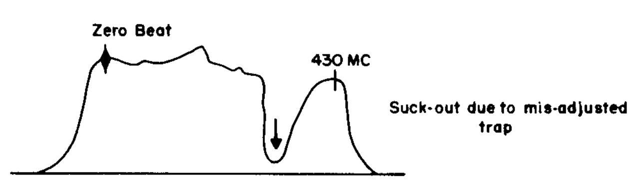


Figure 66 VHF Response Showing "Suck-Out"

g. The trap should be adjusted out of the high end till no effect can be seen, however, it is not desirable to go any higher than necessary in frequency.

h. Referring to Figure 62 adjust C1, C2, and C3 for flattest VHF response consistent with max. amplitude, being careful not to let either low or high frequency end drop off. C3 capacitor should be on the min. side while C2 capacitor should be on the max. side. While adjusting these capacitors, it is desirable to tune the center frequency dial to see the response on the lower side of zero beat, there should not be too much energy here. See Figure 67.

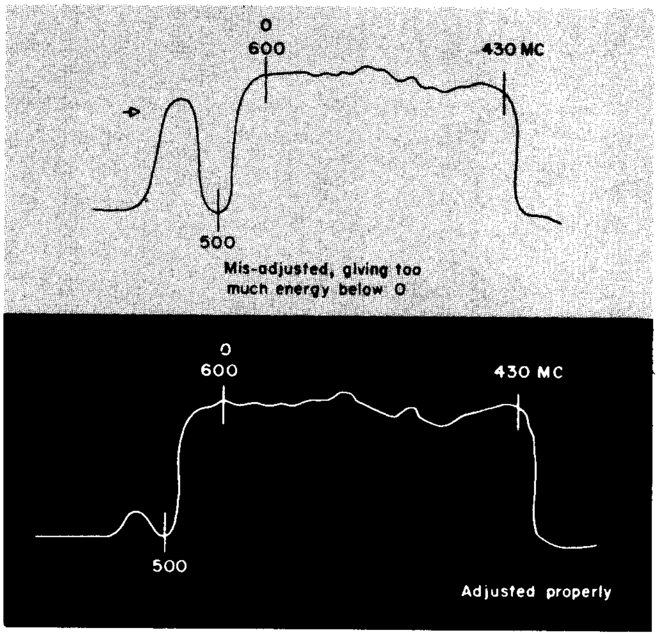


Figure 67 500 MC Trap Adjustment

i. Balancing the Mixer.
Since the Mixer is of balanced construction, when properly balanced, certain beats and harmonics are balanced out in the VHF presentation; to obtain this balance, two adjustments are involved, namely the bias resistance of the mixer crystals and the adjustment of the local oscillator coupling loop.
   1. Adjust bandwidth and frequency to obtain 300 MCS. VHF range at approximately 1 MC bandwidth.
   2. Feed marker in at 300 MCS. Picture will be like Figure 68 if marker is slightly off frequency to either side.

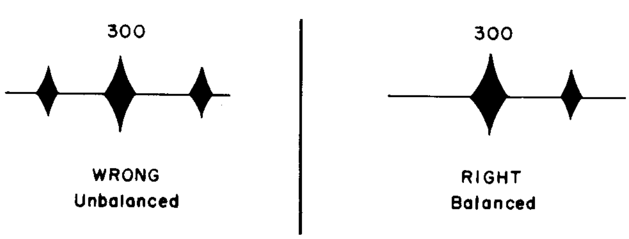


Figure 68 Balance Adjustment

It will be noted that as the external marker is varied above and below 300 MC, two birdies will be seen traveling in opposite directions, meeting at 300 MC and passing through. Select the right one (that is the one that travels higher in frequency as the external marker is adjusted higher). The birdie that is wrong is the one we want to attenuate or eliminate. By proper adjustment of the coupling loop and crystal bias resistor (Jig) this wrong birdie can be made to decrease, almost becoming invisible. When this is achieved, the Mixer can be assumed to be in balance and if the variable resistance jig is replaced with a fixed resistor of the same value, the adjustment will be complete.

NOTE: In adjusting the coupling loop for balance, the object is to direct more or less signal to each crystal, by favoring either crystal with the loop, a mechanical position can be found where balance is present, together with bias adjustment.

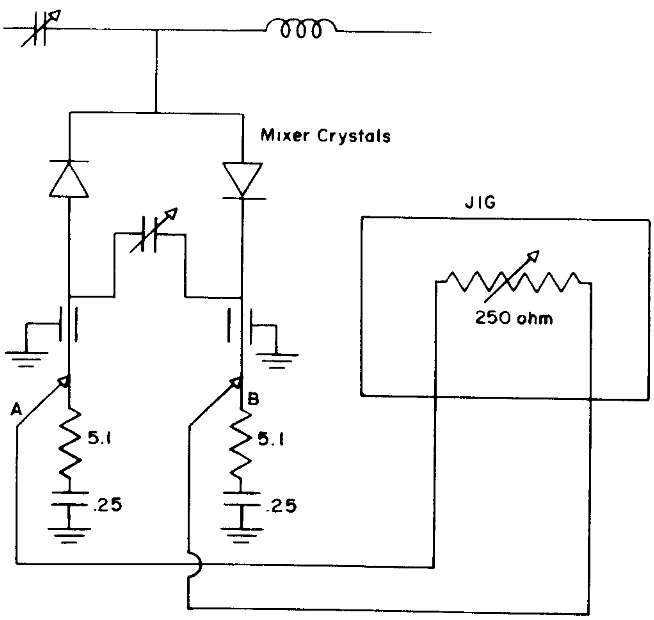
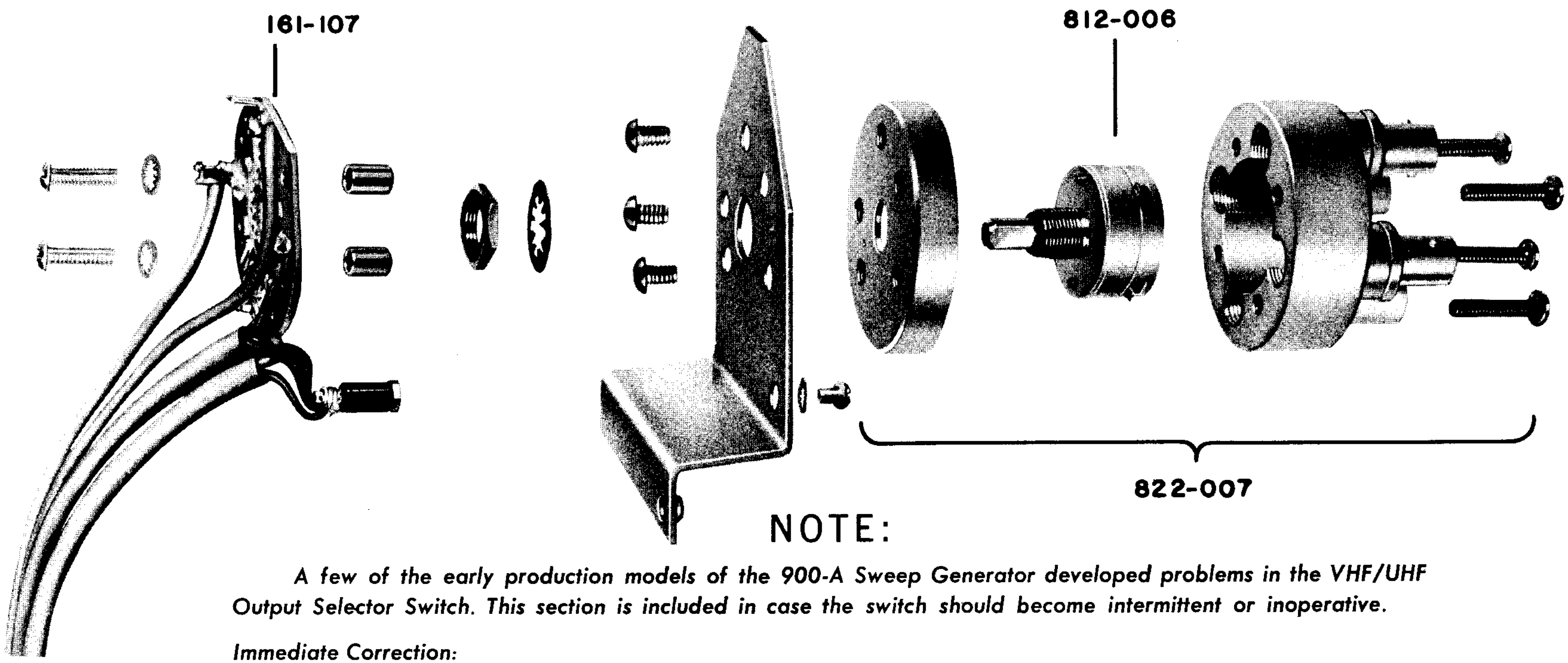


Figure 69 Balance Test Jig

The Jig required is simply a 250 ohm pot mounted and calibrated with two alligator test leads. The leads are clipped to points A & B with no fixed resistor between. Figure 69.

j. If after adjusting the bias resistor for balance, the response does not seem as flat upon increasing bandwidth and recentering pattern, it may be necessary to go over the high pass filter adjustment (Capacitors C1, C2 and C3) to optimize. This is necessary because altering crystal current changes the impedance of the crystal thereby affecting the filter response and must be compensated for.

k. After all adjustments, check ALC operation by applying ALC control to see if the response flattens out to meet specifications. Unflatness at this point can indicate faulty ALC (bad crystals, tubes, etc.), mismatch of VHF output of Mixer (off value termination resistors which are the 2-100 ohm, ½W resistors connected from button capacitor to output VHF connector) or bad detector or terminator on detector.



NOTE:

A few of the early production models of the 900-A Sweep Generator developed problems in the VHF/UHF Output Selector Switch. This section is included in case the switch should become intermittent or inoperative.

Immediate Correction:

If it is desired to use the Generator immediately, the switch can be temporarily by-passed. To accomplish this refer to Figure 43. Connect Cable A to Cable B and connect Cable C to Cable D, using UG-914/U type BNC adapters, for operation of the VHF range. For operation of the UHF range, connect Cable A to Cable C.

Permanent Correction:

Notify the Jerrold Electronics Corp., Industrial Products Division, 15th and Lehigh Ave., Phila. 32, Pa., that you have a defective VHF/UHF Output Switch, Jerrold Part Number 822-007, and a new switch will be forwarded to you immediately for replacement purposes.

Figure 70 Exploded View of VHF/UHF Output Switch Assembly.

REPLACEMENT PARTS LIST–MODEL 900-A

SECTION 1

DC AND SIGNAL SECTION

SYMBOL SHOWN ON SCHEMATIC	DESCRIPTION	JERROLD PART NO.
	CAPACITORS	
C-1	Ceramic—150uuf, 10%, 600V—GP-2-331	123-107
C-2	Ceramic—150uuf, 10%, 600V—GP-2-331	123-107
C-3	Ceramic Disc—.02uf, 600V—GMV—Aero. BPO—Erie 817	124-034
C-4	Ceramic Disc—.02uf, 600V—GMV—Aero. BPO—Erie 817	124-034
C-5	Ceramic—150uuf, 10%, 600V—GP-2-331	123-107
C-6	Mica—330uuf, 5%, 500V—Arco CM-15-E-301	126-022
C-7	Paper Molded—.004uf, 600V	125-006
C-8	Met. Paper—.25uf, 200V	125-008
C-9	Paper Molded—.01uf, 400V	125-013
C-10	Ceramic—1,000uuf, 20%, 600V—GP-2-332	123-115
C-11	Elect. Twist Lock Can w/sleeve and Fibre Mounting Plate—30uf, 350V—C.D.-A0370	127-504
C-12	Elect. Twist Lock Can w/sleeve and Fibre Mounting Plate—50uf, 350V C.D.-A0390	127-503
C-13	Paper Molded—.1uf, 400V	125-003
C-14	Elect. Tub. w/pigtails, 1500uf, 6V—TD-1500-6	127-008
C-15	Paper Molded—.047uf, 400V	125-001
C-16	Determined in Test	———
C-17	Paper Molded—.1uf, 400V	125-003
C-201	Feed-Thru, 47uuf—AB #FA-5C-4701	129-202
C-202	Feed-Thru, 1,000uuf—AB #FA-5C-102W	129-200
C-203	Mica Button, 1,000uuf—Erie 4700CH	129-153
	CHOKES	
CH-1	Filter Choke, 10 henries, 140ma, D.C. Resistance, 200 ohm	143-102
CH-2	30uh, 100ma—Miller #692	143-111
	CRYSTALS	
CR-1	1N34 w/leads	139-100
CR-201	Kemtron K3A w/out leads	139-106
CR-202	Kemtron K3A w/out leads	139-106
	DIAL LAMPS	
DL-1	G.E. #328 Lamp Bulb, 6V @ 0.2 A.	102-004
DL-2	G.E. #328 Lamp Bulb, 6V @ 0.2 A.	102-004
	FUSE	
FS-1	1 Amp. Slo-Blo, 125 volts, 3AG	101-344
	KNOB	
KNOB	Knobs for Controls, Grey, w/skirt, knurled—Jerrold	239-015
	RESISTORS	
R-7	Fixed—100,000 ohm, ½W, ±10%	112-614
R-8	Fixed—270,000 ohm, ½W, ±10%	112-668
R-9	Fixed—2,200 ohm, ½W, ±10%	112-404
R-10	Pot., .5 meg—CU-5041—⅜" Bush., ½" Shaft	118-028

SYMBOL SHOWN ON SCHEMATIC	DESCRIPTION	JERROLD PART NO.
R-11	Fixed—2,200 ohm, ½W, ±10%	112-404
R-15	Fixed—3.3 ohm, ½W, ±5%	112-009
R-16	Fixed—3.3 ohm, ½W, ±5%	112-009
R-17	Fixed W.W., 7,500 ohm, 10W, ±10%	113-012
R-18	Fixed—100 ohm, ½W, ±10%	112-236
R-19	Fixed—150,000 ohm, ½W, ±10%	112-635
R-20	Fixed—15,000 ohm, 2W, ±10%	112-511
R-21	Fixed W.W.—2,500 ohm, 10W, ±10%	113-010
R-22	Fixed—1,000 ohm, ½W, ±10%	112-362
R-23	Fixed—100 ohm, ½W, ±10%	112-236
R-24	Fixed—150,000 ohm, ½W, ±10%	112-635
R-25	Fixed—75,000 ohm, ½W, ±5%	112-599
R-26	Fixed—100 ohm, ½W, ±10%	112-236
R-27	Fixed—1,300 ohm, ½W, ±5%	112-377
R-28	Fixed—100 ohm, ½W, ±10%	112-236
R-29	Pot., 500 ohm w/slot. shaft and locknut	118-005
R-30	Fixed—620 ohm, ½W, ±5%	112-335
R-31	Fixed—9,100 ohm, ½W, ±5%	112-482
R-32	Pot., 5,000 ohm, CU-5021—⅜" Bush., ½" Shaft	118-012
R-33	Fixed—100,000 ohm, ½W, ±10%	112-614
R-34	Fixed—1.0 meg, ½W, ±10%	112-740
R-35	Fixed—390,000 ohm, ½W, ±10%	112-689
R-36	Fixed—430,000 ohm, ½W, ±5%	112-692
R-37	Fixed—180,000 ohm, ½W, ±5%	112-644
R-38	Pot., .5 meg, 2W w/slot. shaft and locknut—CLU-5041	118-038
R-39	Fixed—1.0 meg, ½W, ±10%	112-740
R-40	Fixed—220,000 ohm, ½W, ±10%	112-656
R-41	Fixed—1.5 meg, ½W, ±10%	112-761
R-42	Fixed—820 ohm, ½W, ±5%	112-350
R-43	Fixed—330,000 ohm, ½W, ±10%	112-677
R-44	Fixed W.W., 10,000 ohm, 20W, ±10%	113-019
R-45	Pot., 5,000 ohm w/slot. shaft and locknut—CLU-5021	118-023
R-46	Pot., 5,000 ohm—CU-5021—⅜" Bush., ½" Shaft	118-012
R-47	Pot., 100 ohm, ⅜" Bush., ½" Shaft—AB CU-1011 "J"	118-013
R-48	Fixed W.W., 17,500 ohm, 10W, ±10%	113-027
R-49	Pot., 100 ohm, ⅜" Bush., ½" Shaft—AB CU-1011 "J"	118-013
R-50	Fixed—510,000 ohm, ½W, ±5%	112-704
R-51	Fixed W.W., 1,000 ohm, 10W, ±10%	113-005
R-52	Pot., .5 meg—CU-5041—⅜" Bush., ½" Shaft	118-028
R-201	Fixed—300 ohm, ½W, ±5%	112-293
R-202	Fixed—300 ohm, ½W, ±5%	112-293
R-203	Fixed—100,000 ohm, ½W, ±10%	112-614

SYMBOL SHOWN ON SCHEMATIC	DESCRIPTION	JERROLD PART NO.
	RECTIFIERS	
SiR-1	Silicon—200ma—Audio Devices A-200	137-702
SiR-2	Silicon—200ma—Audio Devices A-200	137-702
SiR-3	Silicon—200ma—Audio Devices A-200	137-702
SiR-4	Silicon—200ma—Audio Devices A-200	137-702
	SWITCHES	
SW-1	SPST Toggle—Carling T110B	162-001
SW-2	SPST Toggle—Carling T110B	162-001
SW-3	SPDT Toggle—½" Bat, 15/32 Stem. Carling 112-63	162-007
SW-4	Internal Assembly—Coaxial Section, Jerrold	812-006
	Wafer Section, Jerrold	161-107

SYMBOL SHOWN ON SCHEMATIC	DESCRIPTION	JERROLD PART NO.
	TRANSFORMERS	
T-1	Power	141-104
T-2	Filament—Thordarson 21F-08	141-116
T-3	Audio Output—Stancor A-3250	141-118
T-4	Filament—Stancor P-6465	141-126
	TUBES	
V-1	12AT7	131-400
V-2	12AT7	131-400
V-3	6AU6	131-308
V-4	6AU6	131-308
V-5	6V6	131-322
V-6	6V6	131-322
V-7	OD-3/VR-150	132-101
V-8	OC-3/VR-90	132-103
V-9	OC-3/VR-90	132-103
WOBB.	Wobbulator Motor Assembly—includes capacitor, Jerrold	822-004

SECTION 2
RF SECTION

	CAPACITORS	
C-101	Mica Button—1,000uuf, 10%, 500V—Erie 370FA	129-155
C-102	Special Trimmer—Jerrold HFT-65A	812-004
C-103	Special Trimmer—Jerrold HFT-65A	812-004
C-301	Ceramic—25uuf, 10%, 600V—GP-1-331	123-101
C-302	Feed-Thru—47uuf, 10%—AB #FA-5C-4701	129-202
C-401	Trimmer—.7-3uuf, 350V—Erie 535	128-505
C-402	Trimmer—.7-3uuf, 350V—Erie 535	128-505
C-403	Special, Jerrold, 6uuf	811-123
C-404	Special, Jerrold, 6uuf	811-123
C-405	Special, Jerrold, 6uuf	811-123
C-406	Feed-Thru—1,000uuf, 500V—Erie 4700CH	129-153
C-407	Special Trimmer—Jerrold HFT-65A	812-004
C-408	Feed-Thru—.0054uf, 500V—Erie 4700CB	129-150
C-409	Feed-Thru—.0054uf, 500V—Erie 4700CB	129-150
C-410	Paper Molded—.25uf, 200V—Aero. P-82	125-008
C-411	Paper Molded—.25uf, 200V—Aero. P-82	125-008
C-412	Trimmer—.7-3uuf, 350V—Erie 535	128-505
C-413	Special Trimmer—Jerrold HFT-65A	812-004
C-414	Feed-Thru—1,000uuf—AB #FA-5C-102W	129-200
C-415	Feed-Thru—47uuf—AB #FA-5C-4701	129-202
C-501	Trimmer—.7-3uuf, 350V—Erie 535	128-505
C-601	Feed-Thru—47uuf—AB #FA-5C-4701	129-202
C-602	Feed-Thru—1,000uuf—AB #FA-5C-102W	129-200
C-603	Mica Button—1,000uuf—Erie 4700CH	129-153
	CRYSTALS	
CR-301	Kemtron K3A w/leads	139-102
CR-401	Kemtron K3A w/out leads	139-107
CR-402	Kemtron K3A w/out leads	139-107

CR-403	Kemtron K3A w/out leads	139-106
CR-404	Kemtron K3A w/out leads	139-106
CR-601	Kemtron K3A w/out leads	139-106
CR-602	Kemtron K3A w/out leads	139-106
	COILS	
L-1	Detector Inductor—50 ohm BNC	218-008
L-101	Coil, Air	156-089
L-102	Coil, Air	156-089
L-103	Coil, Air	156-089
L-104	Plate Inductor Ass'y	811-121
L-105	Cathode Inductor Ass'y	811-120
L-106	Copper Ribbon (Tab. on 215-101)	215-124
L-501	Coil, Air	156-166
L-502	Coil, Bifilar	156-117
	RESISTORS	
R-101	Fixed—100 ohm, ½W, ±10%	112-236
R-102	Fixed—4,700 ohm, ½W, ±10%	112-446
R-301	Fixed—1,000 ohm, ½W, ±10%	112-362
R-302	Fixed—100,000 ohm, ½W, ±10%	112-614
R-303	Fixed—33 ohm, ½W, ±10%	112-299
R-304	Fixed—33 ohm, ½W, ±10%	112-299
R-305	Fixed—33 ohm, ½W, ±10%	112-299
R-306	Fixed—5,600 ohm, ½W, ±10%	112-458
R-401	Fixed—100 ohm, ¼W, ±5%	112-950
R-402	Fixed—100 ohm, ¼W, ±5%	112-950
R-403	Fixed—5.1 ohm, ½W, ±5%	112-030
R-404	Fixed—5.1 ohm, ½W, ±5%	112-030
R-407	Fixed—300 ohm, ½W, ±5%	112-293
R-408	Fixed—300 ohm, ½W, ±5%	112-293
R-409	Fixed—100,000 ohm, ½W, ±10%	112-614
R-501	Fixed—1,000 ohm, ½W, ±10%	112-362
R-502	Fixed—4,700 ohm, ½W, ±5%	112-443
R-601	Fixed—300 ohm, ½W, ±5%	112-293
R-602	Fixed—100,000 ohm, ½W, ±10%	112-614
R-603	Fixed—300 ohm, ½W, ±5%	112-293
R-604	Fixed—51 ohm, ½W, ±5%	112-200
	TUBES	
V-101	5675	131-501
V-501	5675—Special Modification includes feed-back Tab. and cathode sleeve, Jerrold	815-107

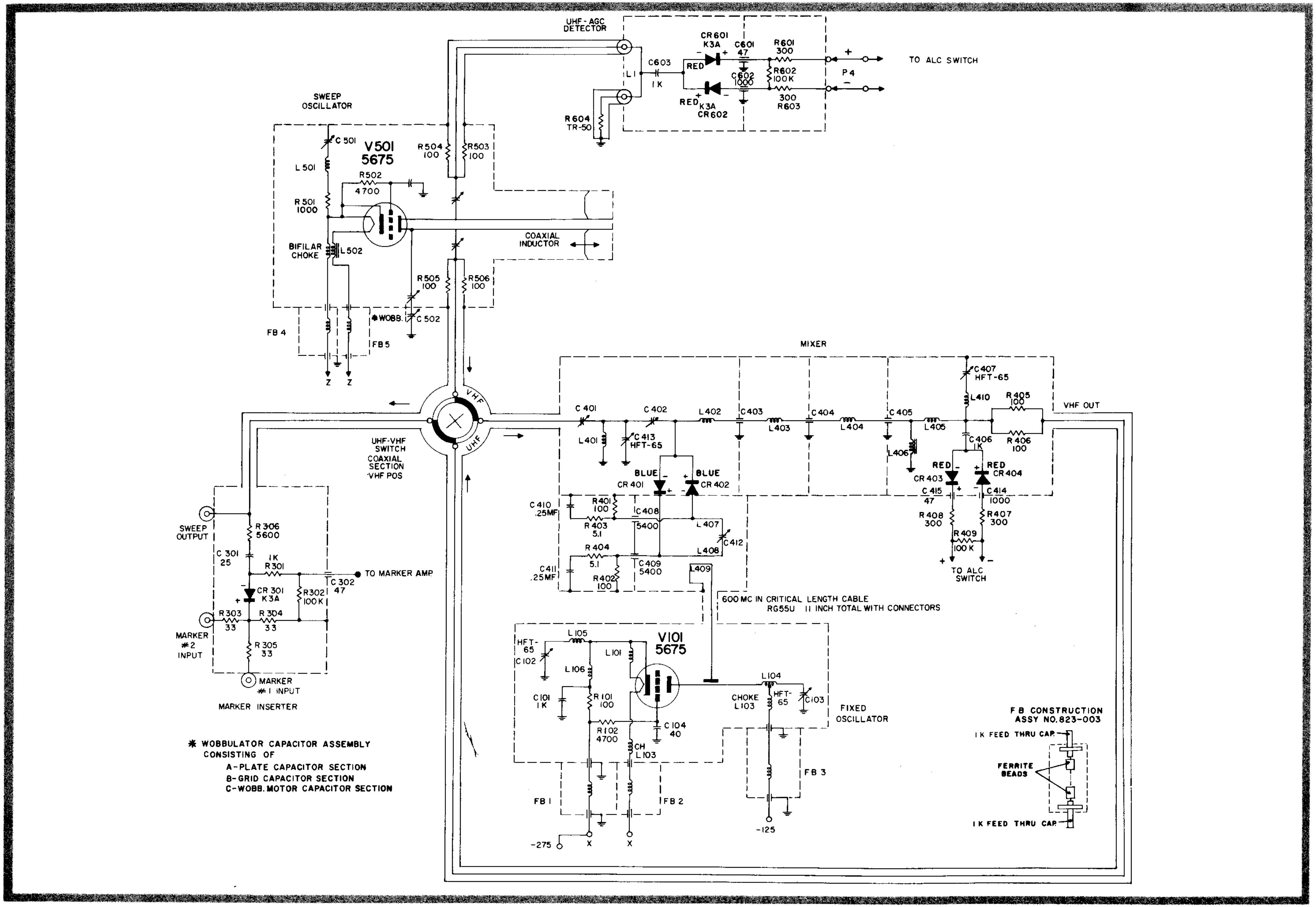


Figure 71 Schematic Diagram of RF Section—Model 900-A

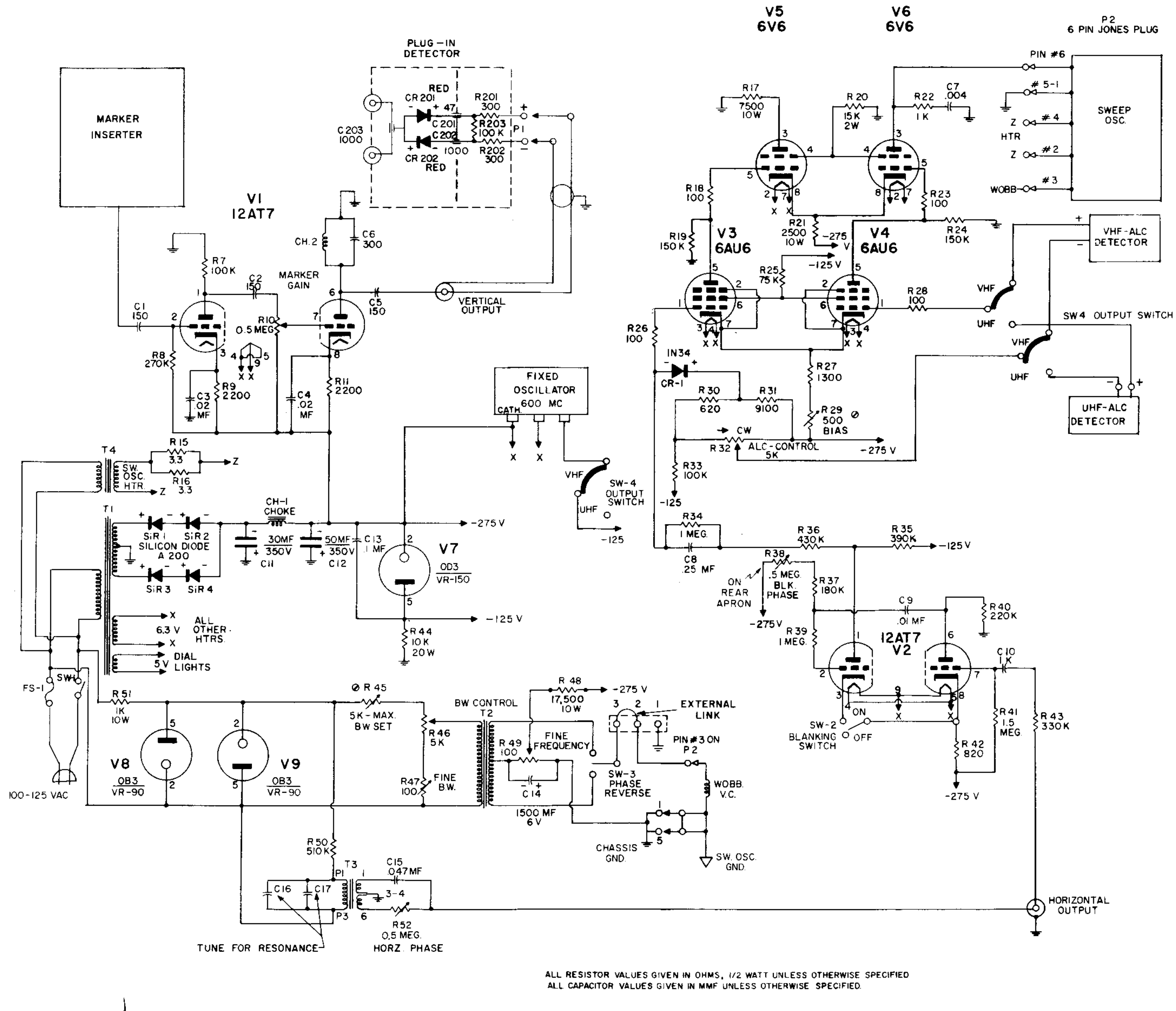


Figure 72 Schematic Diagram of DC and Signal Section—Model 900-A