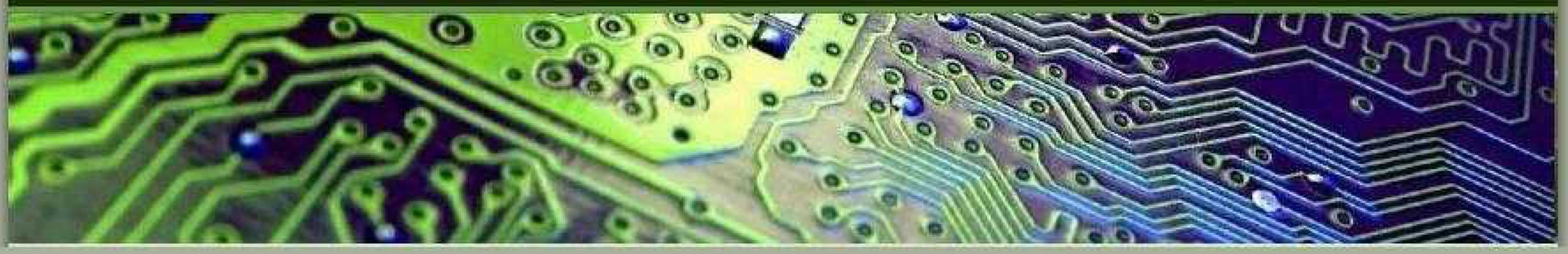
PRICE 50 CENTS

RCA TV SWEEP GENERATOR

Type WR-59C

- Operation
- Applications
- Specifications
- Maintenance

RADIO CORPORATION of AMERICA
TEST AND MEASURING EQUIPMENT HARRISON, N. J.

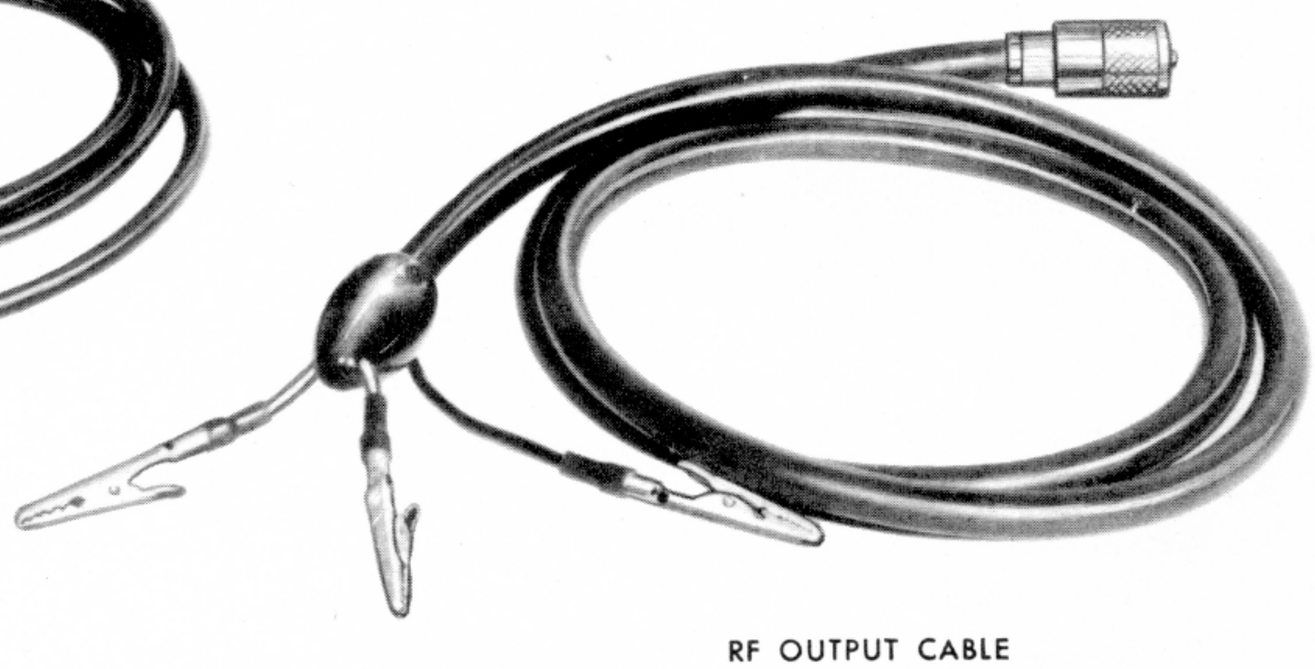


Items Supplied with the WR-59C

Tubes: 1 RCA-6AS6, 1 RCA-6AT6, 1 RCA-6C4, 2 RCA-6J6, 1 RCA-6X4
2 Binding-Post Pin Plugs
IF/VF Output Cable
RF Output Cable
Instruction Booklet
Warranty Certificate
Registration Card

The information contained in this instruction booklet applies also to WR-59B instruments. For reference, see Specifications on page 4, Schematic Diagram, pages 10 and 11, and footnotes under Replacement Parts List, pages 14 and 15.

IF/VF OUTPUT CABLE



RF OUTPUT CABLE

Cables Supplied with the WR-59C

TEST AND MEASURING EQUIPMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

INSTR. WR-59C (4) 6-56
Photolithographed
in U.S.A.

TELEVISION SWEEP GENERATOR

Type WR-59C

Contents

Safety Precautions

An important point to remember is that there is always danger inherent in testing electrical equipment which operates at hazardous voltages. Therefore, the operator should thoroughly familiarize himself with the equipment under test before working on it, bearing in mind that high voltages may appear at unexpected points in defective equipment. Additional precautions which experience in the industry has shown to be important are listed below.

1. It is good practice to remove power before connecting test leads to high-voltage points. If this is impractical, be especially careful to avoid accidental contact with equipment racks and other objects which can provide a ground. Working with one hand in your pocket and standing on a properly insulated floor lessens the danger of shock.

2. Filter capacitors may store a charge large enough to be hazardous. Therefore, discharge filter capacitors before attaching test leads.

3. Remember that leads with broken insulation provide the additional hazard of high voltages appearing at exposed points along the leads. Check test leads for frayed or broken insulation before working with them.

4. To lessen the danger of accidental shock, disconnect test leads immediately after test is completed.

5. Remember that the risk of severe shock is only one of the possible hazards. Even a minor shock can place the operator in hazard of more serious risks such as a bad fall or contact with a source of higher voltage.

6. The experienced operator continuously guards against injury and does not work on hazardous circuits unless another person is available to assist in case of accident.

Specifications

Electrical

Output Frequency:

RF Positions	Channels 2-6	54-88 Mc
	Channels 7-13	174-216 Mc
IF Position	Continuously variable	0.05-50 Mc#

Output Voltage (rms):

RF Positions	Channel 2	0.15 volt
	Channels 3-10	0.12 volt
	Channels 11-13	0.1 volt
IF Position		0.1 volt

Maximum Sweep Width:

RF Positions, IF Position	Continuously Variable	12 Mc†

Output Termination (at terminals of output cables):

RF Positions	300 ohms (balanced to ground)*
IF Position	100 ohms

Maximum Attenuator Ratio:

RF Positions	20000 to 1
IF Position	4000 to 1

Tube Complement:

1 RCA-6AS6, 1 RCA-6AT6, 1 RCA-6C4, 2 RCA-6J6, 1 RCA-6X4

Maximum Amplitude Variation of Sweep Envelope at Maximum Sweep Width (load attached):**

RF Positions	Within ±1 db
IF Position	Within ±1 db

Sinusoidal Sweep Output for Oscilloscope:

Output Voltage	(approx.) 2.0 rms volts
Phase Adjustment Range	(approx.) 160°
Frequency	Power-line frequency

Power Supply:

Voltage Rating	105-125 volts
Frequency Rating	50-60 cps
Power Consumption	36 watts

Mechanical

Dimensions:

Length	13½ inches
Height	9¾ inches
Depth	7½ inches
Weight	20 pounds
Finish	Blue-gray hammeroid case, satin-aluminum panel

For WR-59C instruments having code numbers without the letter "A", the frequency range in the "IF" position is 0.3-50 Mc.

†For WR-59B instruments with serial numbers below 3001, maximum sweep width is 10 Mc.

*RF Output-Cable termination can be modified to give 150-ohm balanced, 75-ohm unbalanced, or 50-ohm unbalanced outputs.

**For WR-59B instruments having serial numbers below 3001, amplitude variation is within ±1 db on channels 2 to 10 inclusive and within ±1.5 db on channels 11 to 13 inclusive. In the if position, amplitude variation is within ±1.5 db.

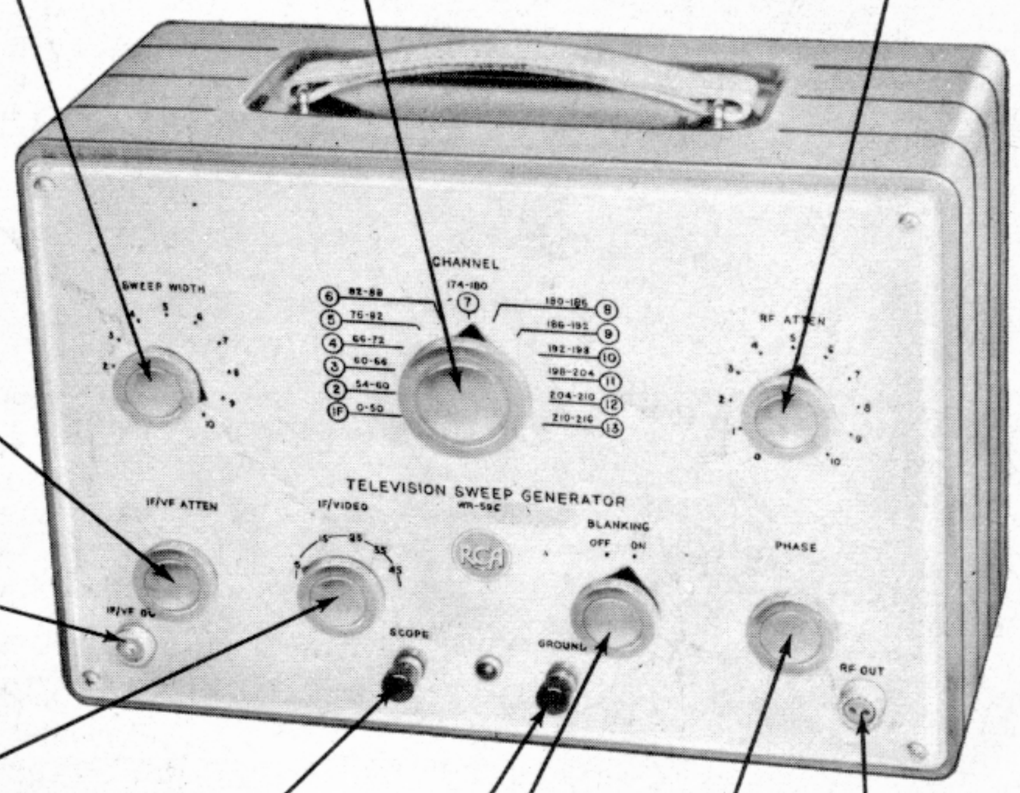
Functions of Controls and Terminals

CHANNEL selector—Switch to the desired TV channel or to intermediate-frequency range. When this selector is at positions "2" through "13", the rf-output voltage appears at the RF OUT terminal. When the selector is at "IF" position, the output if and video frequencies are determined by the IF/VIDEO control and are obtained at the IF/VF OUT terminal.

SWEEP WIDTH control—Has two functions; turns the power on between positions "OFF" and "1", and adjusts the sweep width of the output voltage.

RF ATTEN control—Determines the amplitude of the rf output (at RF OUT terminal) when the CHANNEL selector is at positions "2" through "13".

IF/VF ATTEN control—Permits continuous adjustment of the amplitude of the if/vf output (at IF/VF OUT terminal) when the CHANNEL selector is at "IF" position.



IF/VF OUT terminal—The if/vf output voltage appears at this terminal when the CHANNEL selector is at "IF" position.

IF/VIDEO control—Tunes the variable-frequency oscillator to produce the desired if and video frequencies at the IF/VF OUT terminal with the CHANNEL selector at "IF" position.

SCOPE terminal—A sinusoidal voltage of line frequency, which can be applied to the horizontal-input terminals of an oscilloscope, appears across this terminal and the GROUND terminal. The phase relationship of this sweep voltage and the output of the WR-59C can be adjusted by means of the PHASE control to produce a single pattern on the oscilloscope.

RF OUT terminal—The rf output voltage appears at this terminal when the CHANNEL selector is at positions "2" through "13"

PHASE control—Used only if the voltage across the SCOPE and GROUND terminals is applied to an oscilloscope. It adjusts the phase of this voltage with respect to the output voltage of the WR-59C, so that a single pattern will appear on the oscilloscope.

GROUND terminal—Is directly connected to the chassis of the instrument; serves as a common ground for the chassis of the equipment under test and associated test instruments.

BLANKING switch—At "ON" position, provides a zero-reference line which is useful for checking the response curve of the circuit under test.

General Description

The RCA WR-59C Television Sweep Generator is designed for the aligning and the general servicing of television and FM receivers. Used with an oscilloscope, this instrument will provide a pattern representing the response curve of the circuit under test on the oscilloscope screen.

The WR-59C Television Sweep Generator will furnish a wide-band frequency-modulated signal to cover each of the 12 standard television channels as well as all other frequencies between 50 Kc and 50 Mc. The width of the sweep can be controlled on each channel. Used in conjunction with the WG-295A Video Multi-Marker, the WR-59C provides a convenient means for checking and alignment of color television video and chrominence circuits.

The rf signal from the RCA WR-59C is frequency-modulated at the fundamental frequency by a precision-type vibrating capacitor. This capacitor is of a design which insures long life as well as a wide sweep range. The signal is essentially flat over all sweep ranges, and the output is free from spurious responses and other frequency components such as are characteristic of the output of harmonic generators and beat-frequency oscillators.

In addition, the WR-59C features a blanking circuit which produces a zero-reference line on an oscilloscope. This base line, the point of zero signal from the Sweep Generator, is exceedingly helpful in aligning television and FM discriminator circuits, in checking phase adjustments, and in determining the slope of the frequency-response curve.

The WR-59C also provides a phase-controlled sinusoidal sweep voltage at power-line frequency, which may be applied to oscilloscopes lacking a phase-controlled line sweep.

The RCA WR-59C Television Sweep Generator is a lightweight, compact, and versatile instrument. It can be employed in any application which requires a frequency-modulated signal of approximately 0.1-volt amplitude and within the frequency range of the WR-59C. Used in conjunction with the RCA WR-39C Television Calibrator and the RCA WO-88A Cathode-Ray Oscilloscope, it will provide outstanding facilities for aligning and servicing television and FM receivers.

Operation

To prepare the instrument for use, connect the power cord at the rear of the instrument to an ac outlet supplying 105-125 volts at 50-60 cycles. Connect the RF Output Cable to the RF OUT terminal and the IF/VF Output Cable to the IF/VF OUT terminal. (The if/vf cable should be disconnected when the rf cable is in use, since some rf energy is radiated from the lead at the end of the if/vf cable.) Turn the SWEEP WIDTH control fully clockwise from its "OFF" position, and allow a few minutes for the temperature of the equipment to stabilize. Turn the BLANKING switch to "OFF" position. The instrument is now ready for use.

The WR-59C Television Sweep Generator is used with an oscilloscope for a visual analysis of the circuit under test. The rf sweep oscillator in the WR-59C is frequency-modulated at the power-line frequency. If the oscilloscope has no phase-controlled sinusoidal sweep of line frequency, it will be necessary to connect the SCOPE and GROUND terminals of the Television Sweep Generator to the horizontal-input ter-

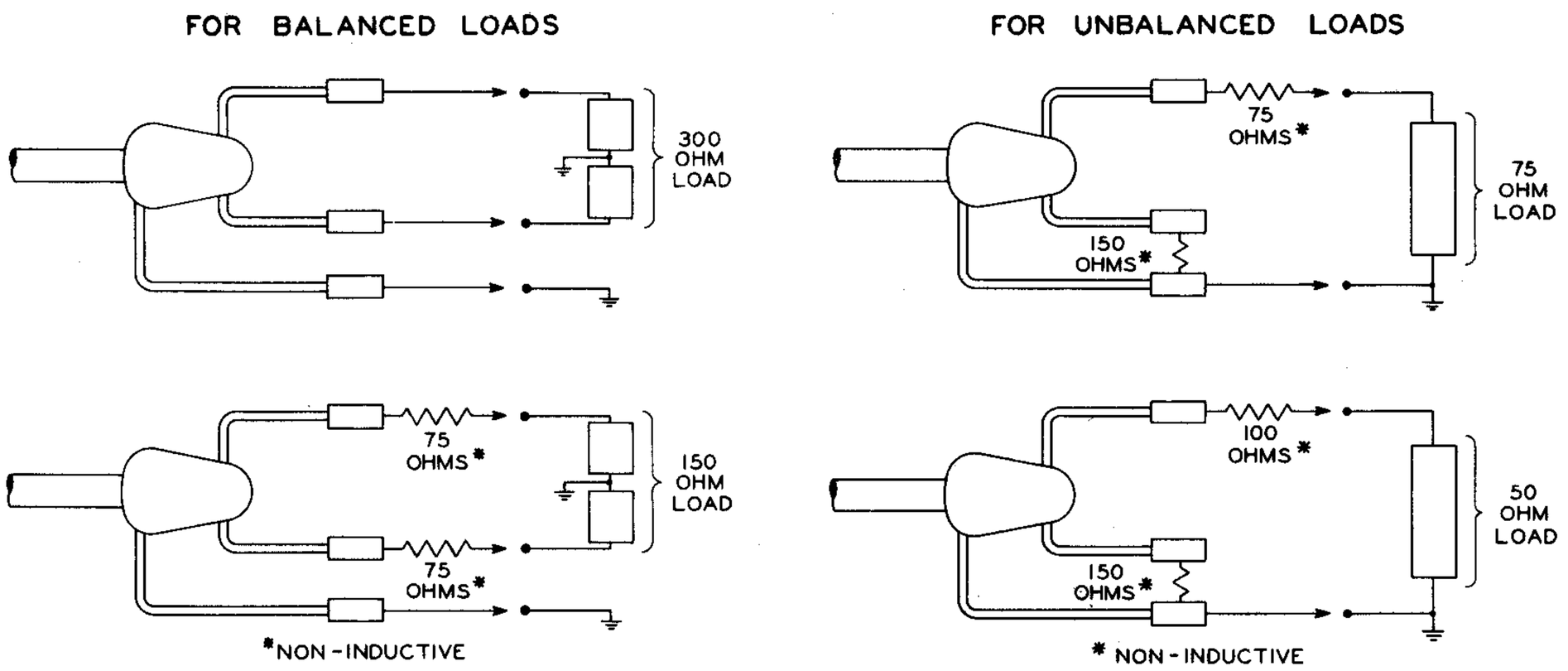


Figure 1. RF Output-Cable Terminations

minals of the oscilloscope and set the oscilloscope for external horizontal input. The phase of the sweep voltage supplied by the WR-59C is adjusted with the PHASE control to produce a single pattern on the oscilloscope screen. Turning the BLANKING switch to "ON" position produces a zero-reference line on the screen.

The operating frequency is selected by means of the CHANNEL selector. When the selector is set at position "IF", the output frequency is determined by adjusting the IF/VIDEO control, and the output from the Sweep Generator is taken from the IF/VF Output Cable. When the CHANNEL selector is set at positions "2" through "13", the output is taken from the RF Output Cable.

The rf cable is correctly terminated when connected to a resistive load of 300 ohms balanced to ground. The cable may also be terminated in other loads, as illustrated in Figure 1.

The output of the circuit under test is applied to the vertical-input terminals of an oscilloscope. Generally, this output can conveniently be taken from the detector circuit of the receiver. When the receiver output is taken from stages preceding the detector, or from stages which are fed directly by the WR-59C following the detector, this output should be applied to the oscilloscope through an external detector circuit. The external detector circuit should be of such design that it will not appreciably alter the impedance of the circuit across which it is connected.

A suitable blocking capacitor should be used whenever either output cable of the WR-59C is connected to a point of dc potential.

Applications

General

The alignment and general servicing of television receivers requires use of techniques which differ from those used in general radio servicing. Fortunately, a familiarity with the problems of FM receivers has served as a stepping-stone to the more complicated task of maintaining the television receiver. Although the television receiver is more complex than the conventional radio, the servicing of these receivers is greatly simplified by the availability of television test equipment. The WR-59C Television Sweep Generator, in conjunction with the RCA WO-88A Cathode-Ray Oscilloscope, the WR-39C Television Calibrator and the WV-97A VoltOhmyst*, will provide outstanding facilities for the television service bench.

Figure 2 illustrates a test setup for aligning a television receiver. A block diagram of a typical television receiver is shown. (For the sake of simplicity, the deflection circuit and power supply are not shown since they do not enter into the discussion of alignment.) Although practically all receivers in use can be represented by such a diagram, in practice many different circuit variations will be found. This is especially true in the picture-if amplifier circuits, where the stages may be over-coupled, stagger-tuned, or combinations of these arrangements. Therefore, when aligning a television receiver, it is necessary to follow closely the manufacturer's service notes. The information which follows will enable the serviceman to adapt his Television Sweep Generator to the receiver under test. The reader is cautioned that the aligning of any portion of a television receiver should not be attempted unless analysis of the difficulty showns alignment to be necessary.

*Trademark "VoltOhmyst" Reg. U.S. Pat. Off.

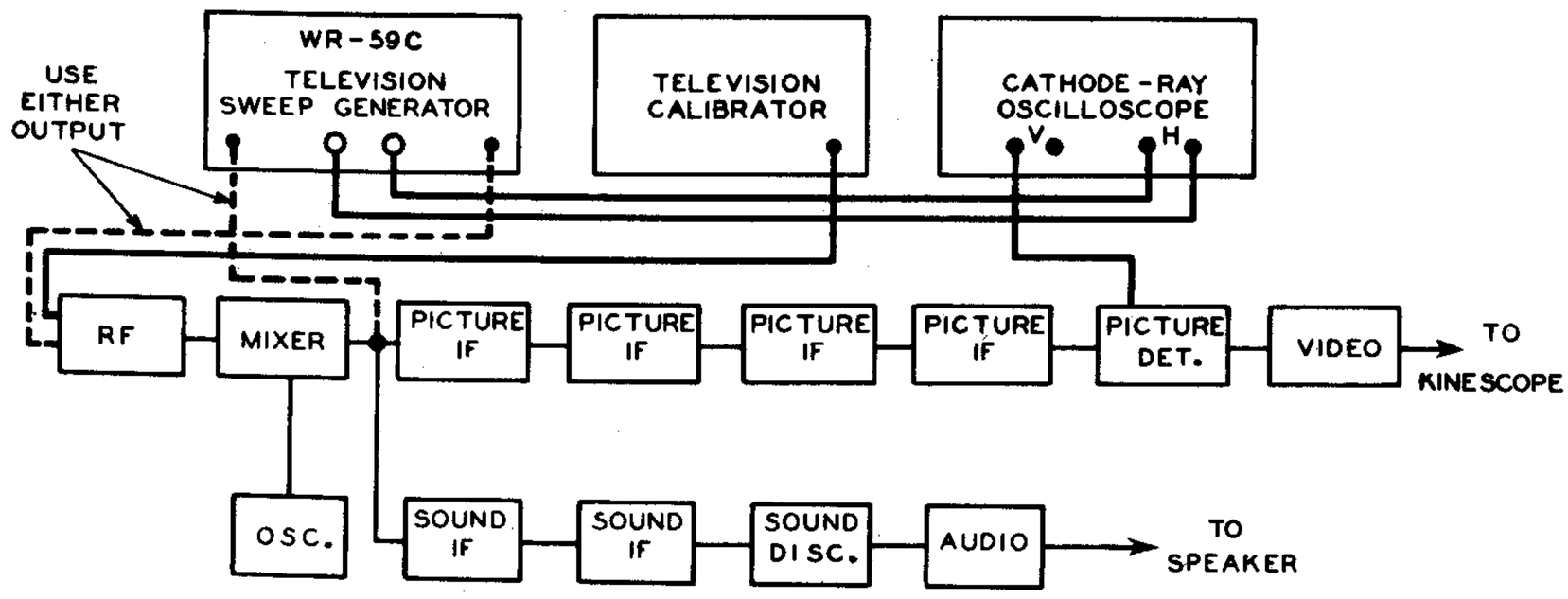


Figure 2. Television-Alignment Setup

If the television receiver is overloaded with too large an output from the Sweep Generator, the response curves will be distorted. For this reason, the circuits should be aligned with approximately the same signal input and gain-control setting they will receive under

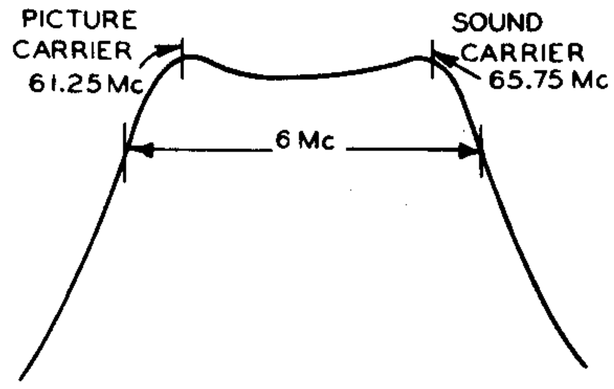


Figure 3. RF Response

normal operating conditions. The WR-59C has attenuators in both the rf and if/vf circuits, a feature which makes it possible to align the television receiver at any point from minimum to maximum contrast. The relative gain-per-stage can be accurately estimated on the screen of a cathode-ray oscilloscope.

The initial alignment of stagger-tuned if systems is generally achieved with an unmodulated rf source, each circuit being peaked at the frequency recommended by the manufacturer; final alignment can be achieved with the RCA Television Sweep Generator. Most of the other types of if systems can be aligned stage by stage, using the Sweep Generator and an oscilloscope, and working back from the picture second detector.

The alignment of the sound channel in the television receiver is accomplished in the same manner as in conventional FM practice, a procedure described below under "Sound IF and Discriminator Stages".

RF Alignment

By comparing the rf-response curve of the television receiver under test with the response curve illustrated in the manufacturer's service notes, the service man can readily determine the circuit adjustments necessary for proper rf alignment. The procedure outlined below is a typical method of adapting the Television Sweep Generator to the receiver under test to produce an rf-response curve.

Figure 3 shows a response curve for the rf stages of a typical television receiver which, for purposes of illustration, is tuned to channel 3. Note the 4.5-Mc separation between the sound and picture carriers. Since the rf portion of the receiver must pass both sound and picture signals, a band-pass of approximately 6 Mc is required.

1. Connect the RF Output Cable of the Sweep Generator to the antenna terminals of the receiver.
2. Loosely couple the output from the television calibrator to the input circuit of the receiver. This can usually be done by connecting the ground clip of the calibrator to the receiver chassis and placing the "hot" lead near the antenna circuit of the receiver.
3. Connect the vertical-input circuit of the oscilloscope to an appropriate point in the receiver for viewing the rf response. This connection will vary with different receivers; reference should be made to the manufacturer's service notes. In some sets it may be possible to pick up the signal directly from the converter (or mixer) grid-bias circuit, while in others it may be necessary to modify the converter (or mixer) circuit temporarily in order to obtain the signal.

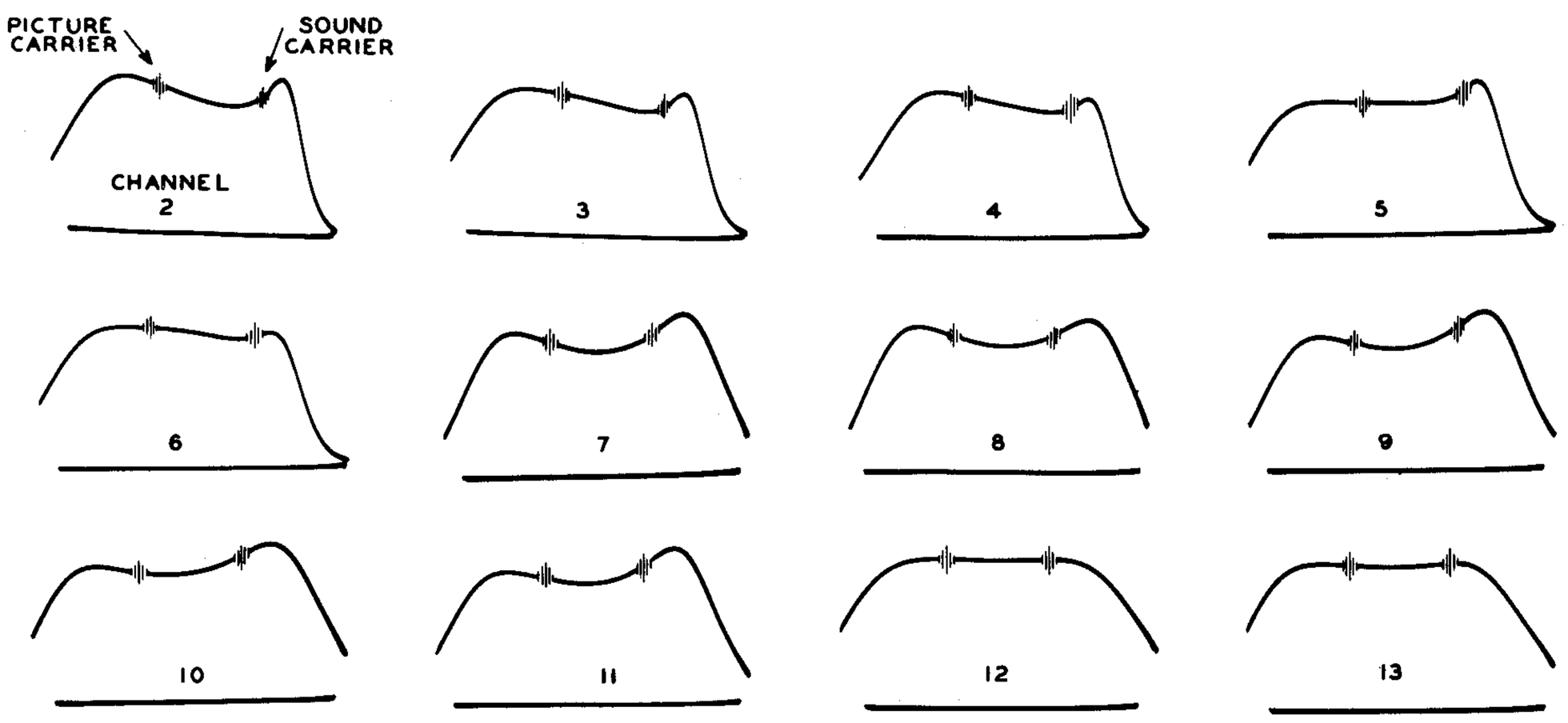


Figure 4. RF Response of Channels 2-13

4. Connect the SCOPE and GROUND jacks of the Sweep Generator to the horizontal-input terminals of the oscilloscope. If the oscilloscope employed has a phase-controlled sinusoidal sweep of power-line frequency, this connection will not be necessary; the line sweep of the oscilloscope may be used.
5. Tune the receiver and Sweep Generator to an rf channel, proceeding in the order recommended by the manufacturer, and adjust the Sweep Generator and the oscilloscope to obtain a response curve on the oscilloscope screen. Adjust the PHASE control of the Sweep Generator (or of the oscilloscope) to obtain a single pattern on the oscilloscope screen.
6. The picture-carrier and sound-carrier pips from the television calibrator should appear within the flat-topped portion of the response curve of each channel, at points indicated in Figure 4.

Picture-IF and Video Stages

General

In order to provide the proper signal amplification for correct picture definition, the picture-if system of a television receiver must pass a frequency band of at least 4 Mc in width. Two kinds of picture-if systems are generally used to give the necessary band width. In the over-coupled system, both the primary and the secondary of the coupling transformers are tuned to the same frequency, and the transformers are over-coupled to pass the 4 Mc band. In the stagger-tuned system, successive if stages are stagger-tuned to different frequencies, producing a final over-all if response of the proper band width. The reader is referred to the manufacturer's service notes so that he can determine which system has been used in the receiver under test.

The idealized response curve for the picture-if channel of a typical television receiver is shown in Figure 5. In this case, the receiver employs a picture intermediate frequency of 25.75 Mc and is tuned to channel 3. The frequency relation of sound carrier to picture carrier is reversed in the if amplifiers since the local oscillator operates at a higher frequency than the carrier. (Note that the sound component has been sharply attenuated.) The picture channel will ordinarily have a bandpass of from 3 to 4 Mc in width, the wider characteristic resulting in increased picture definition.

The following two characteristics of the picture-if response curve should be noted: (1) The picture carrier frequency is set at approximately 50% of maximum response, and (2) the sound carrier frequency must be at 1.0% or less of maximum response. The picture carrier is placed at approximately 50% of maximum response because of the nature of vestigial side-band transmission, the system used in transmitting television signals. If the circuit is adjusted to put the picture carrier too high on the response curve, the effect will be a general decrease in picture quality caused by the resulting low-frequency accentuation; placing the picture carrier too low on the curve will cause loss of the low-frequency video response and result in poor definition. Loss of blanking and proper synchronization may also occur.

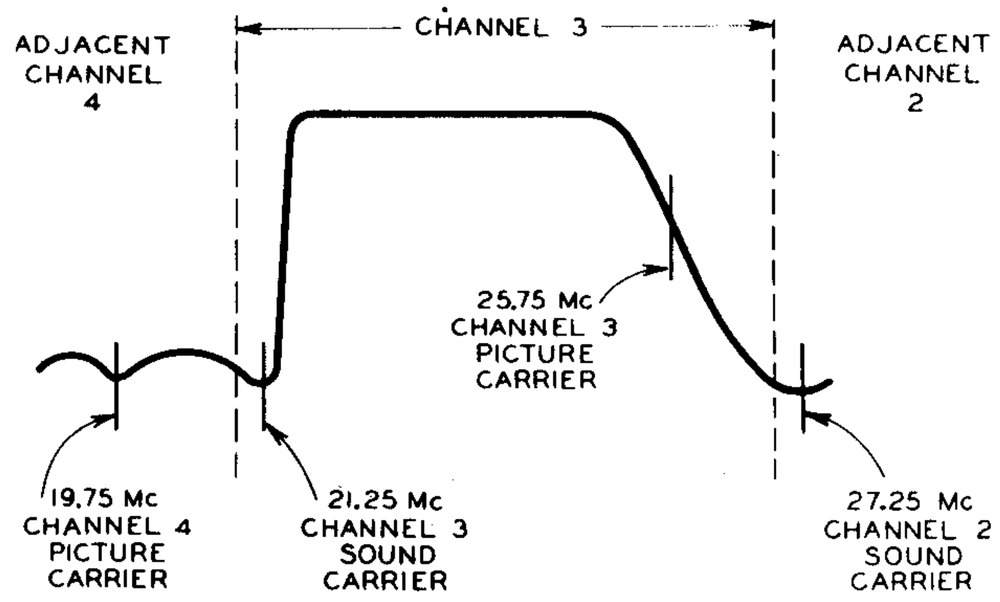


Figure 5. Picture-IF Response

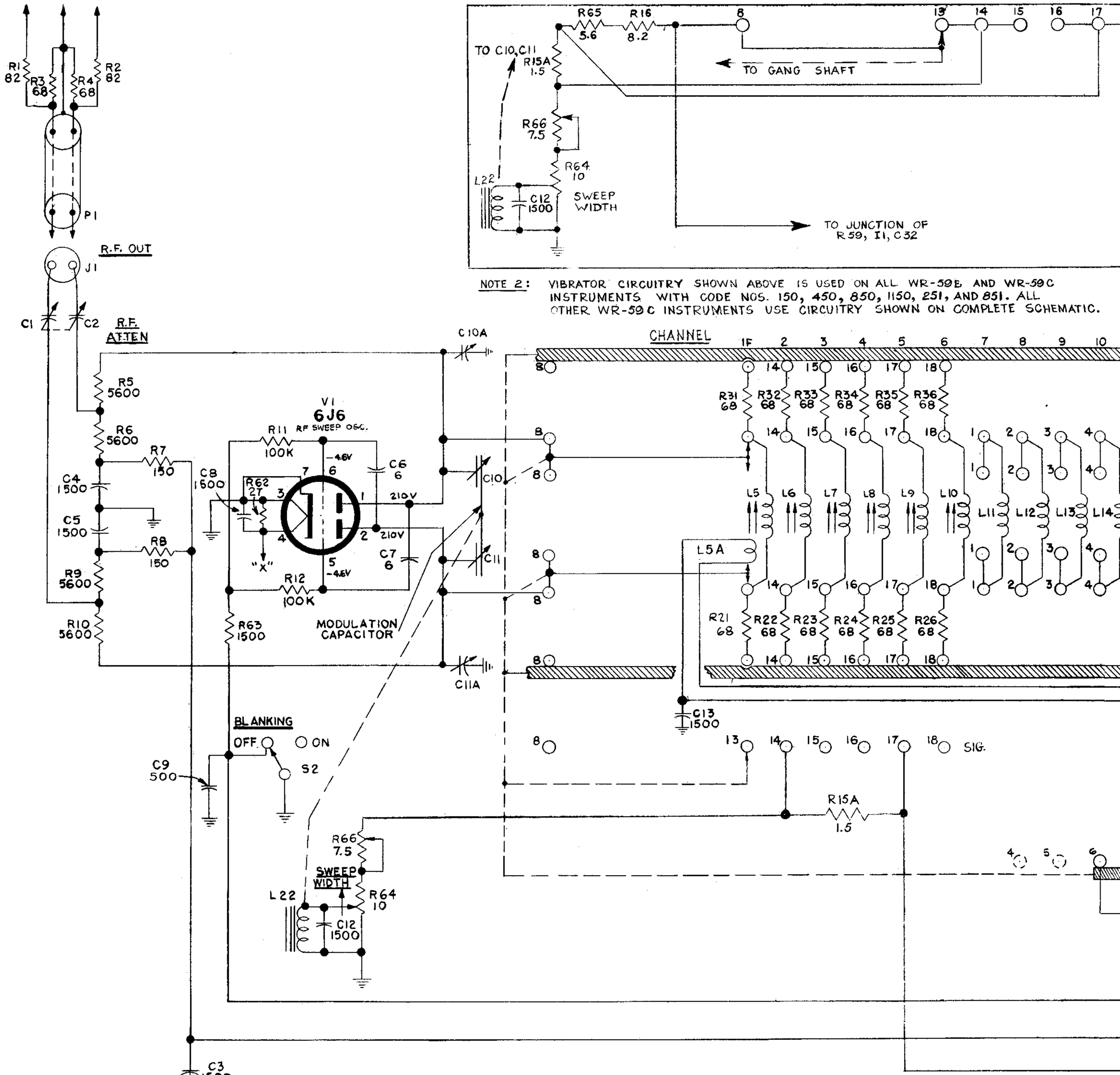
The skirt selectivity of the picture-if curve is made sharp enough to reject the sound component of the composite signal. In order to achieve this selectivity, it is conventional to use an absorption circuit (trap) tuned to the sound intermediate frequency. Some receivers include additional traps tuned to the higher adjacent-channel picture carrier and to the lower adjacent-channel sound carrier. These traps, when included in the circuit, will modify the shape of the response curve. Figure 5 illustrates a typical picture-if response for a receiver using trap circuits tuned to the adjacent-channel frequencies.

Over-Coupled Picture-IF Circuits

The following procedure is suggested:

1. Tune the Sweep Generator to the intermediate frequency of the receiver under test.
2. Connect the IF/VF Output Cable to the input of the if system. Once again, it is necessary to refer the reader to the manufacturer's service data to determine the exact point of signal injection for if alignment. The signal may sometimes be fed

(Continued on Page 15)



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NOTE 2: VIBRATOR CIRCUITRY SHOWN ABOVE IS USED ON ALL WR-59B AND WR-59C INSTRUMENTS WITH CODE NOS. 150, 450, 850, 1150, 251, AND 851. ALL OTHER WR-59C INSTRUMENTS USE CIRCUITRY SHOWN ON COMPLETE SCHEMATIC.

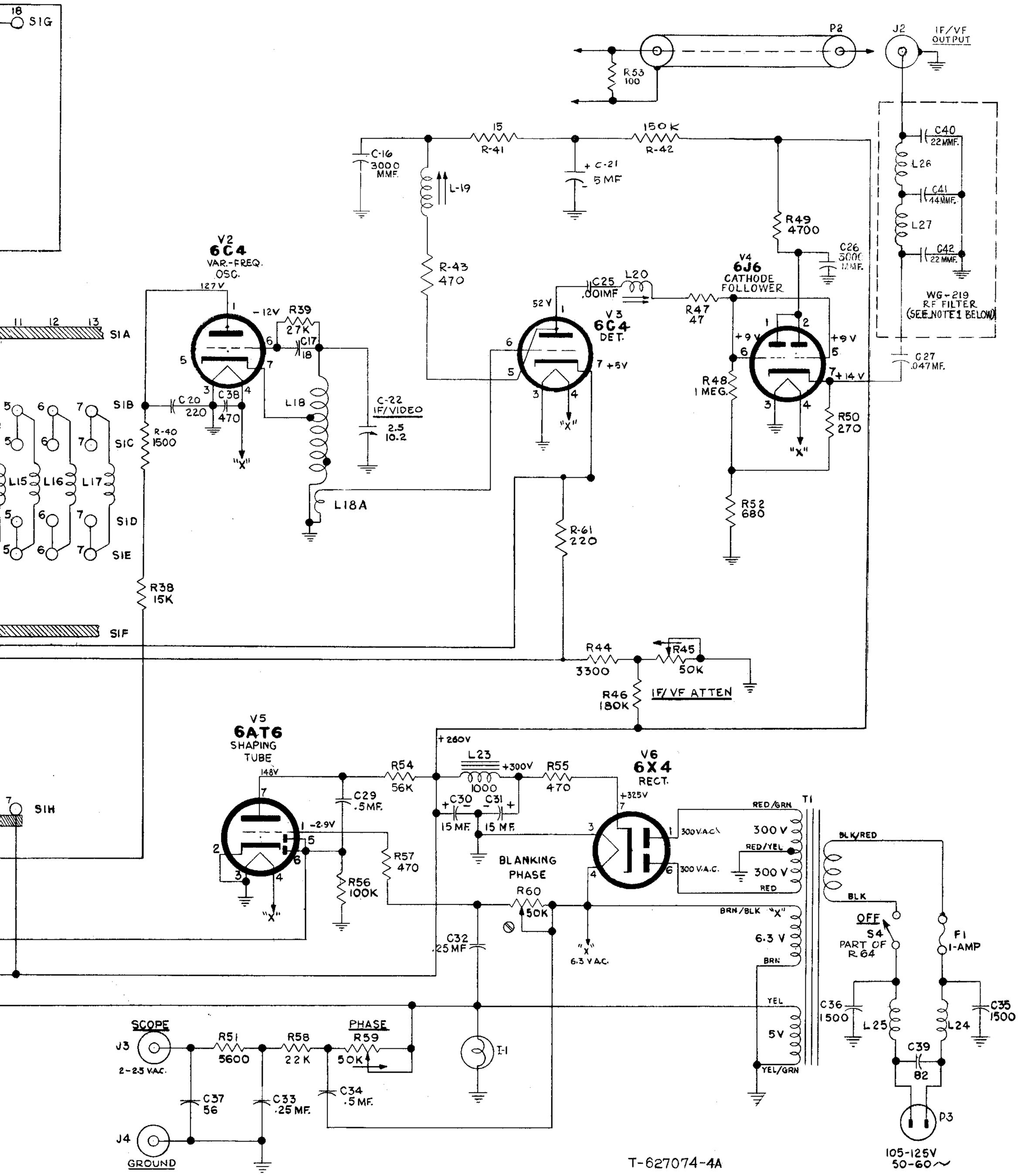
CONDITIONS FOR VOLTAGE MEASUREMENT
117 V. AC LINE, CHANNEL IF, BLANKING & ALL OTHER CONTROLS IN CLOCKWISE POSITION
VOLTAGES READ WITH R.C.A. "VOLTOHMYST"

→ INDICATES C/W ROTATION

NOTE 1

THE INFORMATION BELOW APPLIES ONLY TO WR-59B INSTRUMENTS.
THE WG-219 RF FILTER SUPPRESSES ALL FREQUENCIES ABOVE 75 Mc, ALLOWING ONLY THOSE FREQUENCIES BELOW 75 Mc TO PASS UNATTENUATED. THIS FILTER, ADDED IN SERIES WITH THE IF/VF OUTPUT LEAD AT J2, IS INCORPORATED IN ALL INSTRUMENTS HAVING SERIAL NUMBERS 3501 AND ABOVE. THE WG-219 IS AVAILABLE ON SEPARATE ORDER FOR INSTALLATION IN INSTRUMENTS HAVING SERIAL NUMBERS 3500 AND BELOW.

Figure 6. Schematic Diagra instruments without code



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m of WR-59B and WR-59C
numbers preceded by "A"

NOTE 2: VIBRATOR CIRCUITRY SHOWN ABOVE IS USED ON ALL WR-59B AND WR-59C INSTRUMENTS WITH CODE NOS. 150, 450, 850, 1150, 251, AND 851. ALL OTHER WR-59C INSTRUMENTS USE CIRCUITRY SHOWN ON COMPLETE SCHEMATIC.

CONDITIONS FOR VOLTAGE MEASUREMENT
117 V. AC LINE, CHANNEL 1F, BLANKING & ALL OTHER CONTROLS IN CLOCKWISE POSITION
VOLTAGES READ WITH R.C.A. "VOLTOHMYST"

→ INDICATES C/W ROTATION

NOTE 1

THE INFORMATION BELOW APPLIES ONLY TO WR-59B INSTRUMENTS.

THE WG-219 RF FILTER SUPPRESSES ALL FREQUENCIES ABOVE 75 Mc, ALLOWING ONLY THOSE FREQUENCIES BELOW 75 Mc TO PASS UNATTENUATED. THIS FILTER, ADDED IN SERIES WITH THE IF/VF OUTPUT LEAD AT J2, IS INCORPORATED IN ALL INSTRUMENTS HAVING SERIAL NUMBERS 3501 AND ABOVE. THE WG-219 IS AVAILABLE ON SEPARATE ORDER FOR INSTALLATION IN INSTRUMENTS HAVING SERIAL NUMBERS 3500 AND BELOW.

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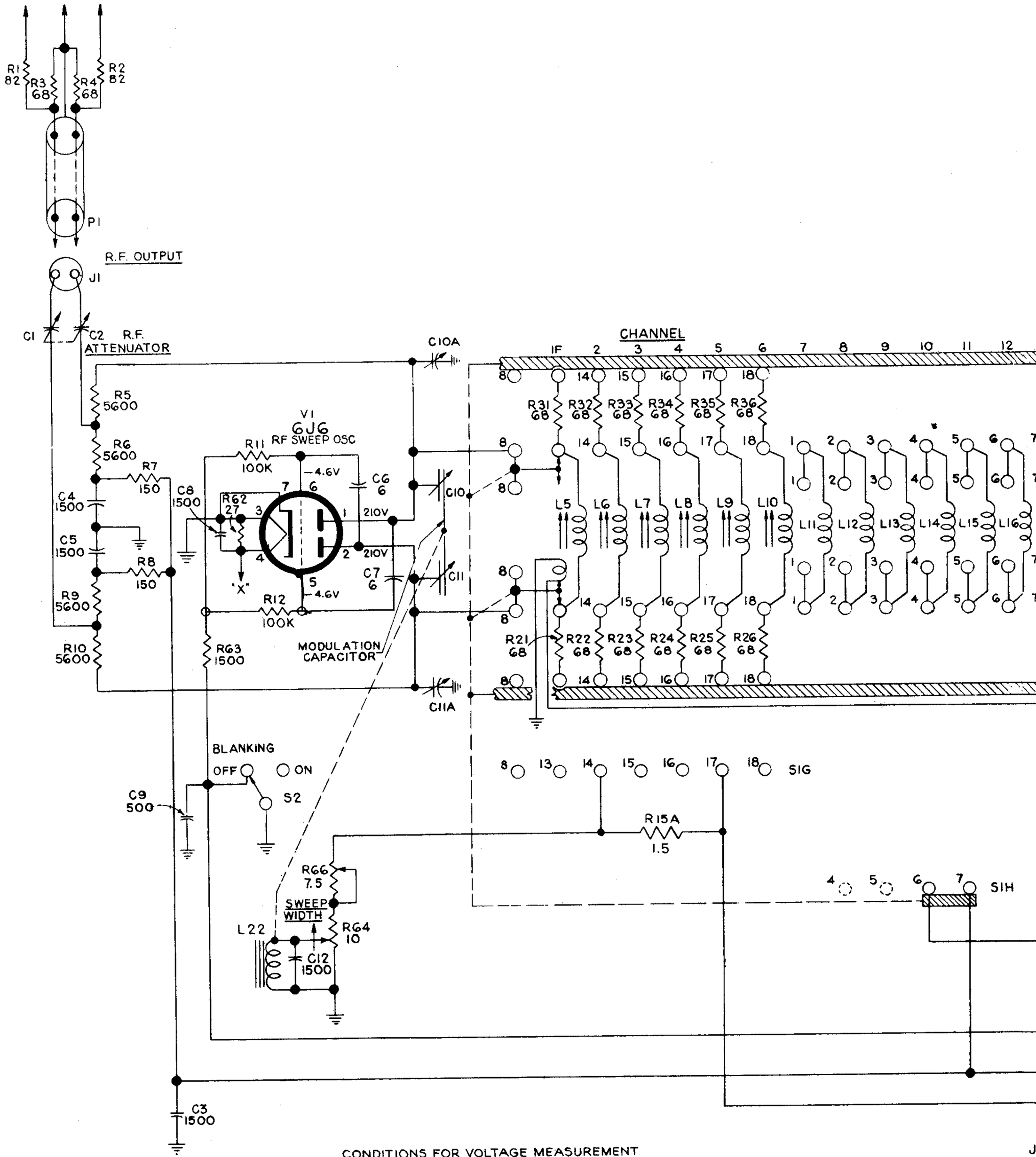
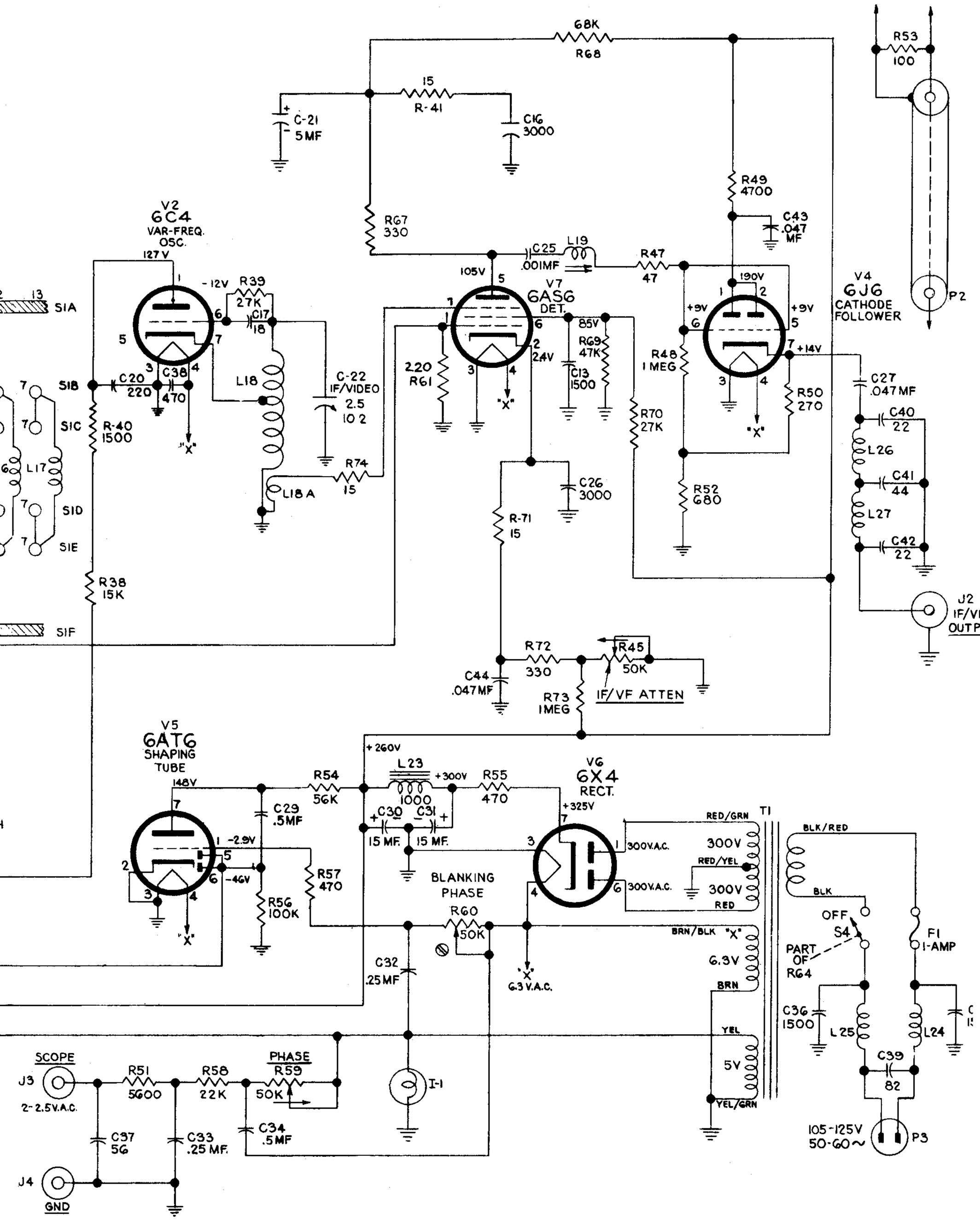
Figure 6. Schematic Diagram of WR-59B and WR-59C instruments without code numbers preceded by "A"



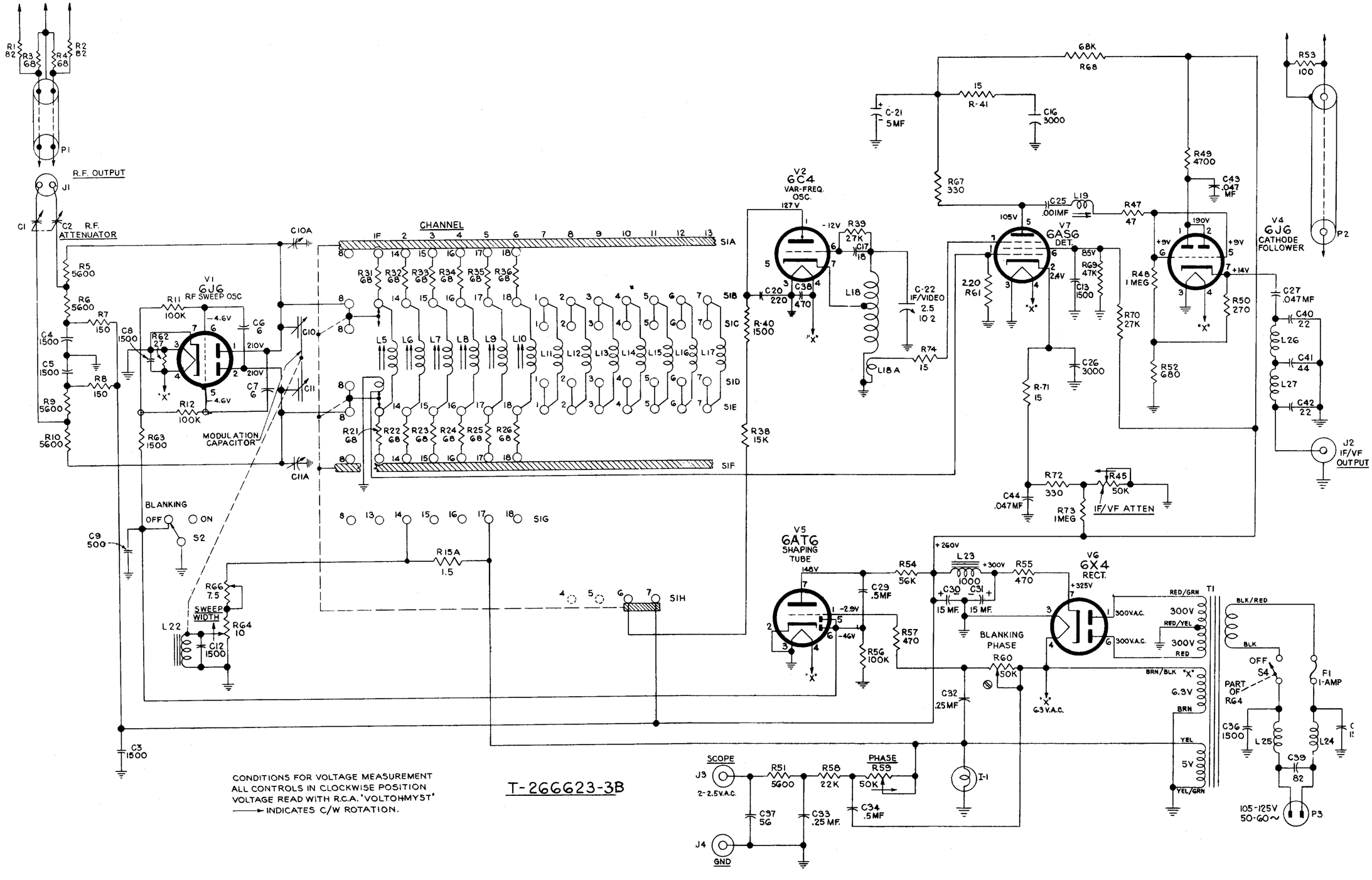
CONDITIONS FOR VOLTAGE MEASUREMENT
ALL CONTROLS IN CLOCKWISE POSITION
VOLTAGE READ WITH R.C.A. 'VOLTOHMYST'
⟶ INDICATES C/W ROTATION.

T-266623-3B

Figure 6 A. Schematic D



ic Diagram of WR-59C



CONDITIONS FOR VOLTAGE MEASUREMENT
ALL CONTROLS IN CLOCKWISE POSITION
VOLTAGE READ WITH R.C.A. 'VOLTOHMYST'
⟶ INDICATES C/W ROTATION.

T-266623-3B

Figure 6 A. Schematic Diagram of WR-59C

Replacement Parts List

Type WR-59C

When ordering replacement parts, include serial number and code number of instrument. Parts should be ordered through a local RCA tube and parts distributor.

Symbol No.	Description	Stock No.
	Capacitors, Fixed and Variable	
C1 C2	Attenuator assembly	55286
C3 C4 C5	High "K" type: 1500 μμf ±20%, 350 volts	57404
C6 C7	Ceramic: 6 μμf ±5%	55322
C8	Same as C3	——
C9	High "K" type: 500 μμf ±20%, 350 volts	55300
C10 C11	Vibrating assembly (Incl. L 22)	98601
C10A	Plate: capacitor	56242
C11A	Same as C10A	——
C12	Same as C3	——
C13	Same as C3	——
C16	High "K" type: 3000 μμf ±20%	55317
C17	Ceramic: 18 μμf ±10%	55323
C20	Mica: 220 μμf ±10%, 500 volts	39636
C21	Electrolytic: 5-15-15 μf, 450 volts	19806
C22	Variable: 2.5 to 10 μμf	59372
C25	Mica: .001 μf ±10%, 300 volts	53300
C26	Same as C16	——
C27	Paper: .047 μf ±10%, 200 volts	73558
C29	Paper: 0.5 μf ±10%, 400 volts	70619
C30 C31	Part of C21	——
C32 C33	Paper: 0.25 μf ±10%, 100 volts	70618
C34	Same as C29	——
C35 C36	Same as C3	——
C37	Mica: 56 μμf ±10%, 500 volts	55327
C38	Mica: 470 μμf ±20%, 500 volts	39644
C39	Mica: 82 μμf ±10%, 500 volts	55328
C40 (a)	Ceramic: stand-off; 22 μμf ±5%, 300 volts	93682
C41 (a)	Ceramic: stand-off; 44 μμf ±5%, 300 volts	93683
C42	Same as C40	——
C43 (b)	Paper .047 μf ±10%, 400 volts	73553
C44 (b)	Same as C27	——
	Fuse and Pilot Lamp	
F1	Fuse: 1 amp	14133
I1	Lamp: pilot, 6-8 volts, 0.25 amp	11891
	Connectors	
J1	2 contact, female, rf output	55006
J2	Single contact, male, IF/VF Output	54695
J3 (c)	Single contact, Scope, (red)	55238 93875
J4 (c)	Single contact, Ground, (blue)	55239 93858
P1	For RF Output Cable	55282
P2	For IF/VF Output Cable	48982
P3	Cord: power, 6 ft., with male plug	70392
	Inductors	
L5 L5A	Coil, oscillator, band IF/VF	59368
L6	Coil, oscillator, band 2	59373
L7	Coil, oscillator, band 3	59374
L8	Coil, oscillator, band 4	59375
L9	Coil, oscillator, band 5	59376
L10	Coil, oscillator, band 6	94376
L18 L18A	Coil, oscillator, for VFO	59369
L19	Coil, shunt filter, 30 Mc	59366
L20 (d)	Coil, series filter, 30 Mc	——
L22	(Part of vibrator assembly C10, C11)	——
L23	Reactor, filter, 13.35 hy	54701
L26 L27 (a)	Coil, choke, 42 μh	93684

Symbol No.	Description	Stock No.
	Resistors, Fixed and Variable	
R1 R2	Composition: 82 ohms ±5%, ½ watt, for RF Output Cable	502082
R3 R4	Composition: 68 ohms ±5%, ½ watt, for RF Output Cable	34763
R5 R6	Composition: 5600 ohms ±5%, ½ watt	502256
R7 R8	Composition: 150 ohms ±10%, ½ watt	502115
R9 R10	Same as R5	——
R11 R12	Composition: 100,000 ohms ±5%, ½ watt	502410
R15A	Wire wound: 1.5 ohms ±10%, 2 watts	57183
R16 (e)	Wire wound: 8.2 ohms ±5%, 1 watt	55321
R21 R22 R23 R24 R25 R26	Composition: 68 ohms ±20%, ½ watt	34763
R31 R32 R33 R34 R35 R36	Same as R21	——
R38	Composition: 15,000 ohms ±10%, ½ watt	36714
R39	Composition: 27,000 ohms ±10%, ½ watt	502327
R40	Composition: 1500 ohms ±5%, ½ watt	30654
R41	Composition: 15 ohms ±10%, ½ watt	502015
R42 (d)	Composition: 150,000 ohms ±10%, ½ watt	502415
R43 (d)	Composition: 470 ohms ±5%, ½ watt	30499
R44 (d)	Composition: 3300 ohms ±10%, ½ watt	30733
R45	Variable: 50,000 ohms ± 20%	55290
R46 (d)	Composition: 180,000 ohms ±10%, ½ watt	11959
R47	Composition: 47 ohms ±10%, ½ watt	502047
R48	Composition: 1 megohm ±10%, ½ watt	502510
R49	Composition: 4700 ohms ±10%, 1 watt	512247
R50	Composition: 270 ohms ±10%, ½ watt	30929
R51	Same as R5	——
R52	Composition: 680 ohms ±10%, ½ watt	502168
R53	Composition: 100 ohms ±5%, ½ watt for IF/VF Output Cable	502110
R54	Composition: 56,000 ohms ±10%, ½ watt	502356
R55	Composition: 470 ohms ±10%, 2 watts	522147
R56	Composition: 100,000 ohms ±10%, ½ watt	502410
R57	Composition: 470 ohms ±10%, ½ watt	30499
R58	Composition: 22,000 ohms ±10%, ½ watt	58239
R59	Same as R45	——
R60	Variable: 50,000 ohms ±20%	90126
R61	Composition: 220 ohms ±10%, ½ watt	502122
R62	Composition: 27 ohms ±10%, 2 watts	59096
R63	Composition: 1500 ohms ±10%, ½ watt	502215

Symbol No.	Description	Stock No.
	Switches	
R64	Variable: wire wound, 10 ohms ±10%, with switch	57181
R65 (*e*)	Wire wound: 5.6 ohms ±5%, ½ watt	57182
R66	Adjustable wire wound: 7.5 ohms 10 watts	57659
R67 (*b*)	Carbon film: 330 ohms ±1%, ½ watt	95324
R68 (*b*)	Composition: 68,000 ohms ±10%, 1 watt	512368
R69 (*b*)	Composition: 47,000 ohms ±10%, 1 watt	512347
R70 (*b*)	Composition: 27,000 ohms ±10%, 2 watts	522327
R71 (*b*)	Same as R41	——
R72 (*b*)	Composition: 330 ohms ±10%, 1 watt	76084
R73 (*b*)	Same as R48	——
R74 (*b*)	Same as R41	——
	Switches	
S1A S1B S1C S1D S1E S1F	Rotary, (Range), 13 positions, 4 sections	94471
S1G S1H	1 wafer only, 13 positions	94472
S2	Rotary, S.P.D.T. (blanking)	55293
S4	Part of R64	——
	Transformer	
T1	Power: 117 volts, 50/60 cps	53476

Symbol No.	Description	Stock No.
	Miscellaneous	
	Board: fuse, with fuse clips	55316
	Cable: RF Output, 4 ft. long incl. Twinax connector and 3 clips	55280
	Cable: IF/VF Output, 4 ft. long incl. coaxial connector and 2 clips	59343
	Cable: Twinax, from rf out. to attenuator (incl. rf output connector)	59709
	Clip: alligator, for RF and IF/VF Output Cables	35262
	Jewel: pilot light (red)	54660
	Knob: control, large, for channel switch, with pointer and screws	55297
	Knob: control, small, blue, for sweep-width, RF Atten., IF/VF Atten., IF/VF selector, Blanking, and Phase controls	53683
	Pointer: for small control knob	53684
	Post: binding, pin-plug type (black)	93855
(*c*)		47062
	Shaft: flexible tuning assembly	55281
(*f*)	Shell: termination, for RF Output Cable (2)	55283
	Shell: termination, for IF/VF Output Cable (2)	47452
	Socket: pilot light	57760
	Socket: tube; miniature saddle, mica filled, 6 contacts	56382

FOOTNOTES

(*a*) Part of WG-219 RF Filter. The WG-219 is installed in all instruments with serial numbers 3501 and above. The complete filter is available on separate order and may be installed on WR-59B instruments which have serial numbers below 3501.

(*b*) Used only in instruments with code numbers preceded by a letter "A".

(*c*) For WR-59B instruments having serial numbers below 4501, this stock number should be used.

(*d*) Used in all instruments except those with code numbers preceded by a letter "A"

(*e*) See note 2 on schematic diagram.

(*f*) For internal clamp assembly, which is supplied separately, order stock number 95552.

(Continued from Page 9)

to the converter (or mixer) grid, or the recommended feed point may be shifted progressively from the input of the last stage back to the converter (or mixer). The design of some receivers is such that visual alignment of the if system is achieved only by feeding into the antenna circuit a signal which has been frequency-modulated at the channel frequency.

3. Loosely couple the output of the television calibrator to the input circuit of the receiver.
4. Connect the output of the picture second detector to the vertical-input terminals of the oscilloscope.
5. Connect the SCOPE and GROUND jacks of the Sweep Generator to the horizontal-input terminals of the oscilloscope.
6. Adjust the test equipment to give the if-response curve on the oscilloscope screen. With the BLANKING switch of the Sweep Generator at "OFF" position, adjust the PHASE control to produce a single pattern on the screen.
7. Adjust the if tuned circuits in order to obtain the response characteristics discussed above, checking the width of response, the trap positions, and the if-carrier frequencies with the television calibrator.

Stagger-Tuned Circuits

Using a suitable television calibrator (RCA WR-39C, or equivalent), adjust each circuit in the manner suggested by the manufacturer. The Sweep Generator is then employed to give the over-all visual-response curve, and the response curve analyzed to determine the final adjustments necessary.

Adjustment of Trap Circuits

The trap circuits in the television receiver should be adjusted with an accurately calibrated marker generator (RCA WR-39C Television Calibrator, or equivalent) to give minimum reading on the oscilloscope at the trap frequency. An analysis of the over-all response curve obtained on the oscilloscope by means of the Sweep Generator will reveal the final adjustments to be made.

These final adjustments should be made only after careful analysis of the response curve. If, for instance, the response is peaked in the middle and the picture carrier is low on the response curve, the circuit tuned

nearest the picture-carrier frequency should be adjusted to bring the carrier up on the curve. Careful retouching of the adjustments as indicated in the manufacturer's service notes will give the desired pattern.

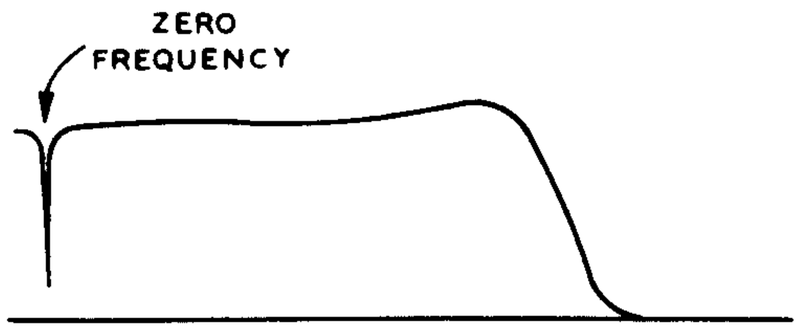


Figure 7. Video Response

Video-Amplifier Circuits

The video-amplifier circuits in a television receiver are normally not adjustable. However, the response curve of this circuit may be studied as an aid in locating faulty components. The procedure outlined below will provide a video-response curve (Figure 7) for an oscilloscope screen:

1. Set the CHANNEL selector to "IF" position and the IF/VIDEO control to the proper intermediate frequency.
2. Set the BLANKING control to "ON".
3. Connect the IF/VF Output Cable across the load resistor of the picture second detector.
4. Connect the output of the video amplifier through a crystal-rectifier circuit to the vertical-input terminals of an oscilloscope. A suggested crystal-rectifier circuit is illustrated in Figure 8.

Sound-IF and Discriminator Stages

The alignment of the sound-if and discriminator stages is generally accomplished in the same manner as in the conventional FM receiver. A typical procedure is outlined below.

Sound-IF Stages

1. Set the CHANNEL selector of the Television Sweep Generator to "IF" position and the IF/VIDEO control to the proper intermediate frequency.
2. Connect the IF/VF Output Cable to the input of the if stage which feeds the limiter.
3. Connect the SCOPE and GROUND jacks to the horizontal-input terminals of an oscilloscope, and adjust the oscilloscope for external horizontal input.
4. Connect the vertical-input terminals of the oscilloscope across the resistor in the grid circuit of the limiter tube. In some receivers, the time constant of the grid r-c circuit of the limiter may be large enough to distort the pattern obtained when the output is taken from the if system at this point. If the pattern is distorted, temporarily remove the capacitor from the r-c circuit, or shunt the resistor with another resistor of suitable value to produce an undistorted output.
5. Adjust the SWEEP WIDTH control for a total deviation of approximately 1 Mc.

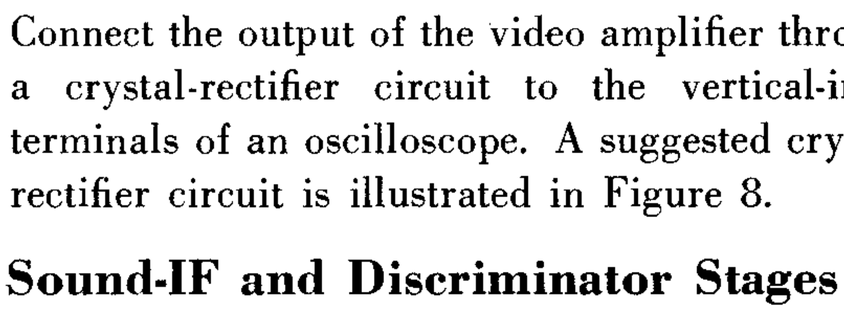


Figure 8. Crystal-Rectifier Circuit

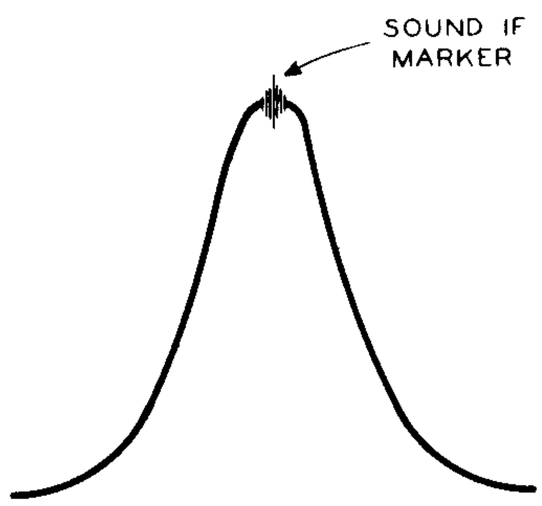


Figure 9. Sound-IF Response

6. Loosely couple the output from a marker generator (RCA WR-39C, or equivalent) to the same point at which the Sweep Generator is connected, and tune the marker generator to the sound if.
7. With BLANKING set to "OFF", a ,ust the PHASE control to obtain a single pattern as illustrated in Figure 9.
8. Adjust the if trimmers for maximum amplitude and symmetry of pattern about the marker.
9. Connect the output from the Sweep Generator to the input of the if stage preceding the one just tuned, and align this circuit according to the above procedure.
10. Continue the alignment working through the if system toward the converter tube.

Discriminator Alignment

After the if stages have been properly aligned, the discriminator circuit can be rapidly and efficiently adjusted by the visual method outlined below:

1. Set the CHANNEL selector of the WR-59C to "IF" position and the IF/VIDEO control to the sound intermediate frequency.
2. Connect the IF/VF Output Cable to the input of the limiter stage feeding the discriminator.

3. Connect the SCOPE and GROUND terminals to the horizontal-input terminals of an oscilloscope, and adjust the oscilloscope for external horizontal input.
4. Loosely couple the output cable from a marker generator to the same point at which the Sweep Generator is connected.
5. Connect the vertical-input terminals of the oscilloscope to the discriminator circuit at points A and B, Figure 10.
6. Adjust the SWEEP WIDTH control for a total deviation of approximately 1 Mc.
7. With the BLANKING switch at "OFF", adjust the PHASE control to obtain a single pattern on the oscilloscope screen.
8. Turn the BLANKING switch to "ON" position, so that the zero-reference line will appear on the oscilloscope screen.

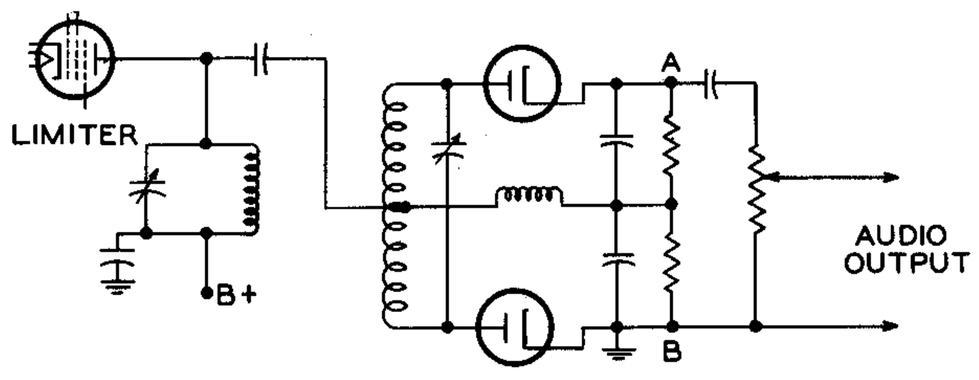


Figure 10. Discriminator

9. The ideal response of a discriminator which has been properly aligned is illustrated in Figure 11. The television calibrator is used to check the points on the curve at which the various sweep frequencies appear. The sound-if point should appea at the intersection of the response curve and the zero-reference line. Tune the primary and secondary of the discriminator transformer for maximum amplitude, maximum linearity between points A and B, Figure 11, and symmetry about the zero-reference line.

Oscillator Alignment

The local oscillator in the television receiver can be rapidly and efficiently aligned by feeding the sound-carrier frequency to the input of the receiver and adjusting the receiver oscillator to obtain zero output from the sound discriminator. This method can only be employed after the sound-if system has been correctly aligned.

In an alternative method, the local oscillator is set with a precision heterodyne-frequency meter, such as the RCA WR-39C Television Calibrator. In this instrument the signal from the oscillator in the receiver is beat against an accurate oscillator which has been tuned to the desired frequency. The frequency of the oscillator in the receiver is then varied until "zero beat" is obtained.

For the detailed procedure to be followed in each case, the reader is referred to the RCA WR-39C Television Calibrator instruction book.

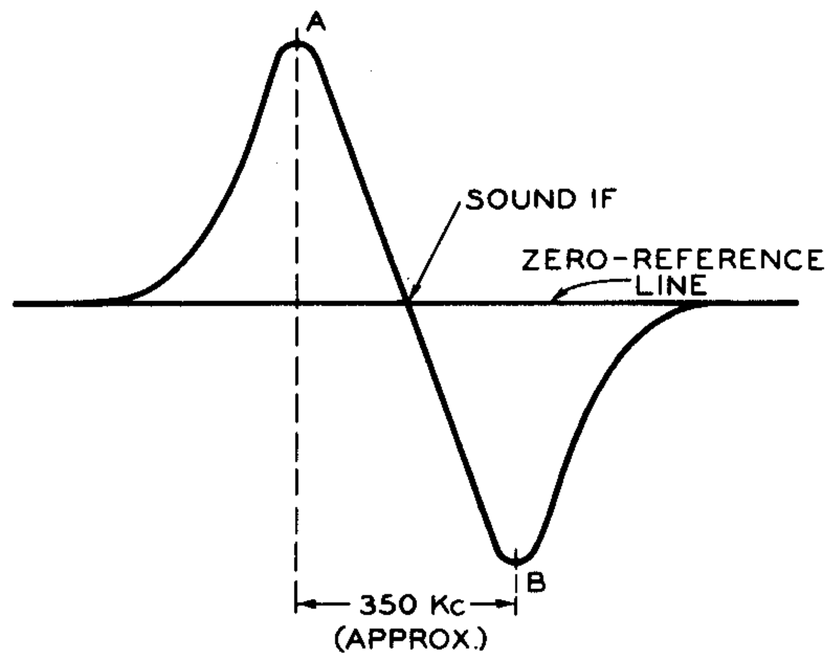


Figure 11. Discriminator Response

Additional Applications

Two additional uses of the WR-59C are given below. However, the RCA Television Sweep Generator may be used in any application which requires a frequency-modulated signal of approximately 0.1-volt amplitude and within the frequency range of the instrument.

IF Alignment of FM Receivers

The if-alignment procedure for FM receivers is the same as described under "Sound IF and Discriminator Stages" above, except that the marker generator is set to 10.7 Mc, the RTMA standard intermediate frequency for FM, instead of the television sound-intermediate frequency.

Color Applications

General

Conventional black-and-white service equipment assumes an even greater importance in the maintenance of color television receivers than it did in black-and-white receivers. This is especially true in the case of alignment equipment because of the necessity for precise alignment of rf, if, and video amplifiers. Before attempting alignment of a color receiver, determine whether alignment is actually required. Defective components or tubes may produce symptoms which resemble those due to misalignment. If alignment is required, follow the procedure outlined in the service notes supplied by the receiver manufacturer.

RF and IF Amplifiers

In black-and-white receivers, it is desirable that the rf-if amplifiers have uniform gain for modulating frequencies up to 4 Mc, as shown in Figure A. But in

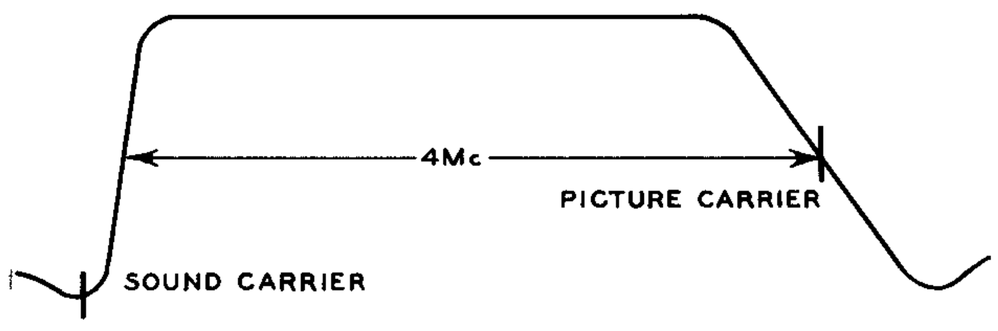


FIGURE A

many black-and-white receivers the overall rf-if response falls off above 2 or 3 Mc, as shown in Figure B. Although this loss of gain above 2 or 3 Mc causes a softening of sharp vertical edges and a loss of small details in the picture, these effects are not readily noticeable.

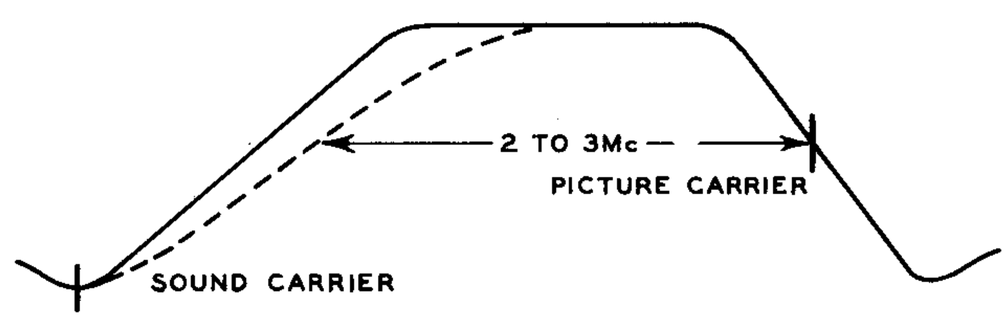


FIGURE B

In color receivers, all of the color information is contained in the region from about 2 Mc to 4.1 Mc on the overall rf-if response curve, as shown in Figure C. Any loss of gain in this region will weaken the color signals. If the loss is appreciable, it may result in poor color sync, poor color "fit" (incorrect registration of color and brightness information on the kinescope), or cross-talk or color contamination between I and Q channels. These effects are very evident.

It should be noted in Figure C that a space of 0.5 Mc is specified between the color subcarrier and the "shoulder" of the overall rf-if response curve. This space is necessary to accommodate the 0.5 Mc I and Q color-signal sidebands. If the response curve is nar-

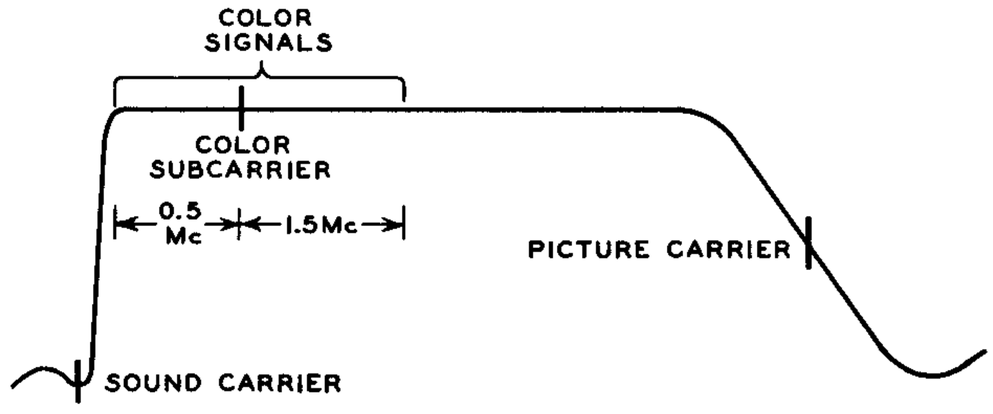


FIGURE C

rowed on this end by as little as 0.1 Mc, it amounts to a 20% reduction in the width of these sidebands, with resulting loss of color detail, and introduction of phase shift that causes cross-talk between I and Q channels.

Proper alignment of the rf and if amplifiers is essential for a good color picture. The bandpass of these amplifiers should be flat to 4.1 Mc, as shown in Figure C.

Video Amplifiers

In black-and-white receivers, the video-frequency section is relatively simple, consisting of a one-stage or two-stage amplifier with no tunable peaking adjustments. For this reason there is seldom any need for checking the response of the video amplifier in black-and-white receivers, except as a quick check for narrowing down troubles that cause poor picture quality. In color receivers however, there are a number of video-frequency sections, including the video amplifier, the band-pass amplifier, the I and Q channels, and the green, red and blue matrix networks including the adders and output stages. The WR-59C in conjunction with the WG-295A MultiMarker, provides an accurate means of checking these sections.

WG-295A Video MultiMarker

The RCA WG-295A Video MultiMarker is an absorption-type marker device which will provide five simultaneous reference markers on a sweep response curve at factory-set frequencies in the video range. Designed especially for use in the sweep alignment and trouble-shooting of color television receivers, the MultiMarker connects directly to the IF/VF output connector of a WR-59C vhf sweep generator. Connection to the sweep generator is made by means of a coaxial cable approximately 15 inches long which is attached to the Multi-

Marker. The IF/VF Output Cable of the WR-59C is connected to the output connector of the WG-295A.

The five absorption circuits of the WG-295A consist of high-Q tuned circuits loosely coupled to the output circuit of the sweep generator. The tuned circuits absorb a small amount of the sweep signal, thus producing a dip or notch in the sweep trace. This technique has the advantage of freedom from spurious markers which might otherwise make it difficult to identify the desired marker. Insertion loss throughout the video range is only 1 db or less.

The markers are narrow and distinct and appear on the video response curve as "suck-out" or absorption-type pips which point downward from the top of the sweep trace. The markers are set at 0.5, 1.5, 2.5, 3.58, and 4.5 Mc; these are useful frequencies for checking the Q filter, I filter, bandpass filter, color subcarrier circuitry, and the sound trap of the color tv receiver.

The five "touch terminals"—one for each marker—are located on the top of the MultiMarker case. The markers, which are all present on the sweep trace, may be identified by touching the terminal marked with the desired frequency. When one or more of the terminals is touched, the corresponding marker or markers on the sweep trace will disappear.

The WG-295A is designed for use in the video frequency range up to 4.5 Mc. The insertion loss and mismatch caused by the MultiMarker are very low throughout this range. If the WR-59 is used at video frequencies above 4.5 Mc, the WG-295A should be disconnected from the WR-59 to avoid the possibility of amplitude distortion.

Circuit Description

RF Output

In the rf portion of the circuit, an RCA 6J6 (V1) is employed as a push-pull rf sweep oscillator which is frequency-modulated directly at power-line frequency by the mechanical motion of the capacitor plates (C10 and C11). These plates are driven by a precision moving-coil type drive assembly. The degree of frequency-modulation is determined by the SWEEP WIDTH control which sets the voltage applied to the coil (L22) of the driver; the greater the degree of modulation, the wider the range of frequencies swept.

The channel frequency of the rf sweep oscillator is determined by the setting of the CHANNEL selector, and the output of the oscillator appears at the RF OUT terminal on the front panel of the instrument. A piston-type variable capacitor (C2, RF ATTEN) in the rf output circuit controls the amplitude of the output signal.

IF/VF Output

When the CHANNEL selector is set at "IF" position and the SWEEP WIDTH control at "10", the rf sweep oscillator sweeps from 99 to 109 Mc, approximately. This output is fed to a 6AS6 detector tube (V7). The output from a 6C4 variable-frequency oscillator tube (V2) is also fed to the detector. The difference frequency produced by the heterodyne action in the detector stage is applied to a 6J6 cathode-follower tube (V4) and finally appears at the IF/VF OUT terminal as the if/vf output of the WR-59C.

The frequency of the if/vf output is varied by means of the IF/VIDEO control (C22), which determines the frequency of the variable-frequency oscillator. The IF/VF ATTEN control, the gain control in the cathode circuit of the detector, determines the amplitude of the if/vf output.

Blanking and the Zero-Reference Line

When the BLANKING switch is at "ON" position, a blanking voltage is applied to the grid of the rf sweep oscillator tube (V1). This blanking voltage, a square wave at power-line frequency, alternately drives the grids of V1 below and above cutoff, so that the rf sweep oscillator is alternately non-oscillating and oscillating. The phase relationship of the blanking voltage and the modulating voltage, determined by means of the blanking-phase control (R60), is such that the oscillator begins operating when the frequency-modulated output is at the low-frequency point and is cut off when the output is at the high-frequency point.

Since both the blanking voltage and the horizontal-deflection, or sweep, voltage applied to an oscilloscope are at power-line frequency, the output of the WR-59C will appear on the oscilloscope screen as an indication of signal voltage when the sweep trace is traveling in one direction and as a zero indication for the return trace. The return trace is used as the zero-reference line.

Power Supply

The power supply utilizes an RCA-6X4 (V6) as a conventional full-wave rectifier. A fully self-contained unit, this circuit provides all the necessary operating voltages of the WR-59C.

Maintenance

General

The WR-59C is manufactured and tested in accordance with high engineering standards. Since the instrument has been properly aligned and adjusted at the factory, no further servicing is normally required. However, after long continued use, the Sweep Generator may require tube replacement or other servicing.

The performance of the WR-59C, like that of any other precision instrument, is dependent upon the rating and quality of its components. If it should become necessary to replace a component part, the stock number can be found in the Replacement Parts List in this book. Only RCA replacement parts, or parts having equivalent specifications, should be used.

Fuse

A small 1-ampere cartridge fuse (F1, Figure 12) protects the power-supply system; it should not be short-circuited or replaced with one of higher rating. The fuse is accessible when the rear panel of the instrument is removed.

Fuse failures should be carefully investigated before replacement since a fuse of good quality fails only under conditions of overload. The fuse clips should be kept clean and in secure contact with the fuse at all times.

Tube Replacement and Tube-Socket Voltages

When the instrument is removed from the case, all tubes except the rf oscillator tube (6J6) are readily available for checking or replacement. The 6J6 may be reached by removing the snap-on cover of the rf oscillator shield.

The normal voltages appearing at the tube-socket terminals with respect to chassis ground are shown in the schematic diagram. These values are indicative of the proper operating conditions of the circuit and should not vary in excess of ±20%. Circuit defects ordinarily will be found in cases of greater variation.

An RCA VoltOhmyst was used to measure the voltages indicated in the schematic diagram. Checks should be made with this instrument or a unit having similar characteristics.

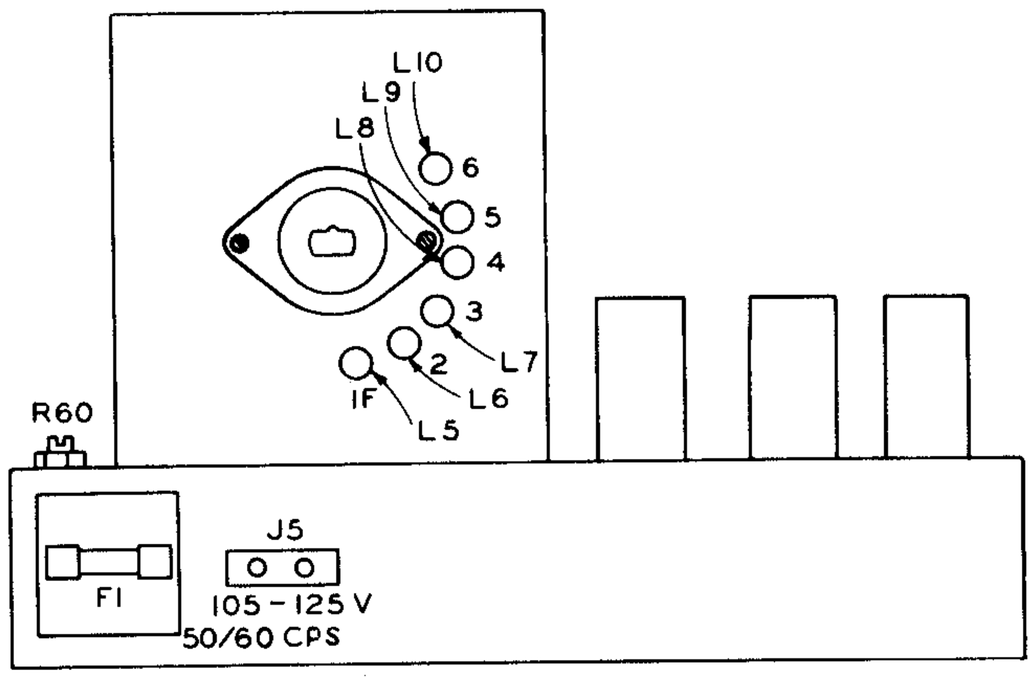


Figure 12. Rear View of WR-59C Chassis

Phase Adjustments

At each setting of the CHANNEL selector, the output of the WR-59C sweeps over a band of frequencies. When this output is applied to an oscilloscope through a detector circuit, as in Figure 13, the band of frequencies appears as a straight line, each frequency within the band located at successive points along the line. The lowest frequency within each band should be situated at one extreme end of the straight line, the subsequent frequencies located progressively along the line, and the highest frequency at the other end of the line.

Unless the proper phase relationship exists among the modulating voltage, the blanking voltage, and the horizontal-deflection voltage for an oscilloscope, the band frequencies will not appear in proper sequence on the oscilloscope screen. To adjust the phase of these three voltages, proceed in the following manner:

1. Set the CHANNEL selector to any channel between "2" and "6".
2. Connect the rf output of the WR-59C to the input of a detector, and the output of the detector to the vertical-deflection terminals of an oscilloscope, as illustrated in Figure 13.
3. Connect the SCOPE and GROUND terminals of the WR-59C to the horizontal-input terminals of the oscilloscope (Figure 13), and set the oscilloscope for external horizontal input.
4. Set the BLANKING switch to "OFF"
5. Turn the SWEEP WIDTH control fully clockwise. A horizontal line will appear on the oscilloscope screen.
6. Connect the WR-39C Television Calibrator, or equivalent marker generator, as illustrated in Figure 13, and tune the calibrator to the center frequency of the channel to which the WR-59C is set. One of two markers should appear on the horizontal line.
7. If two markers appear, adjust the PHASE control until the two markers are superimposed, as in Figure 14A.
8. Vary the output frequency of the Television Calibrator until the marker moves to one end of the trace (Figure 14B).
9. Turn the BLANKING control to "ON". Both the rectified WR-59C output and the zero-reference line should be viewed on the oscilloscope screen, with the blanking action occurring at the end of the rectified-rf trace (Figure 14C).
10. If the blanking action does not occur at the end of the rectified-rf trace, adjust the blanking phase control R60 (Figure 15) until the output appears as illustrated in Figure 14C on the oscilloscope screen.

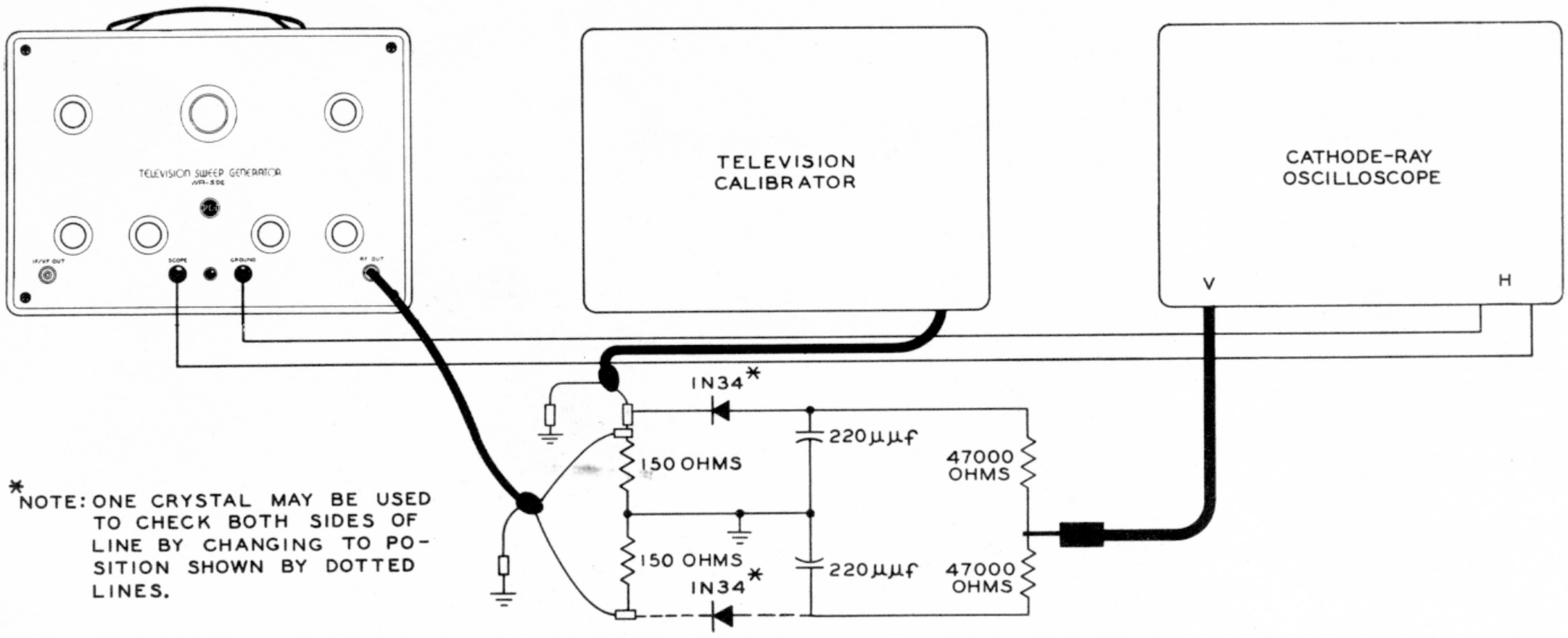


Figure 13. Setup for RF Alignment of the WR-59C

RF Alignment

Before attempting rf alignment, the reader should make any phase adjustments which may be necessary, proceeding as outlined above under "Phase Adjustments".

The following procedure for the rf alignment of the Sweep Generator is suggested:

1. Connect the Sweep Generator, a television calibrator, an oscilloscope and a detector circuit as illustrated in Figure 13.
2. Set the CHANNEL selector to channel 10, and tune the television calibrator to 195 Mc.
3. Back the capacitor plates C10A and C11A (Figure 15) all the way out. C10A and C11A are the two small screws near the stator-plate lips of the modulation capacitor.
4. Set the SWEEP WIDTH control for maximum sweep.
5. Turn in C10A and C11A by equal amounts until the marker appears in the center of the trace.
6. Set the SWEEP WIDTH control to minimum, and readjust C10A and C11A by equal amounts until the marker is again in the middle of the trace. CAUTION: Do not turn C10A or C11A down tightly against C10 or C11 since this may short-circuit the "B" supply.
7. Set the CHANNEL selector to channel 2, and tune the television calibrator to the center frequency of this channel (lowest channel frequency + 3 Mc). NOTE: The iron-core tuning slugs of coils L6, L7, L8, L9, and L10, associated with channels 2 through 6, respectively, are accessible at the rear of the oscillator compartment. (See Figure 12.) Adjustments can be made when the rear panel of the case is removed.
8. With BLANKING switch at "OFF" position, adjust L6 (channel 2 tuning slug) until the marker is in the middle of the screen.
9. Reduce the width of the sweep, by means of the SWEEP WIDTH control, until the marker is situated at one end of the trace.
10. Readjust L6 to return the marker to the middle of the trace.
11. Repeat steps 9 and 10 until the marker is at the center of the trace with the SWEEP WIDTH control set for minimum sweep width.
12. Repeat steps 7 through 11 for channels 3 to 6, inclusive, adjusting the tuning coil associated with each channel

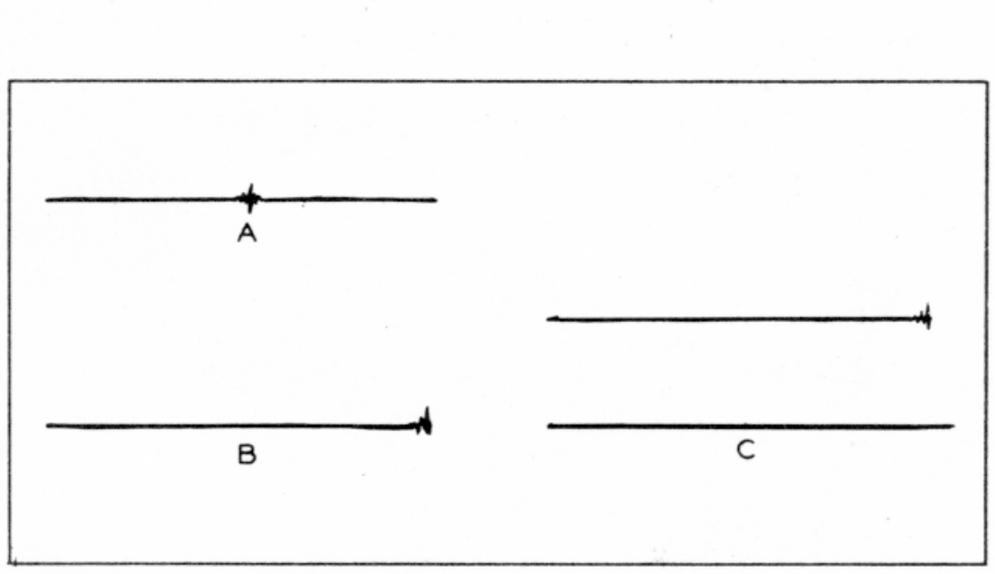


Figure 14. Phase Adjustment Traces

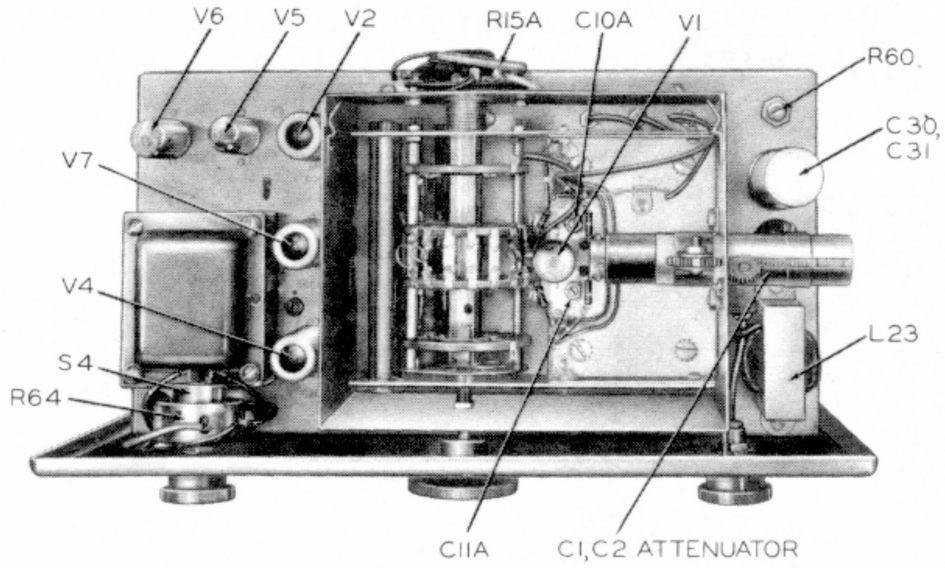


Figure 15. Top View of WR-59C Chassis

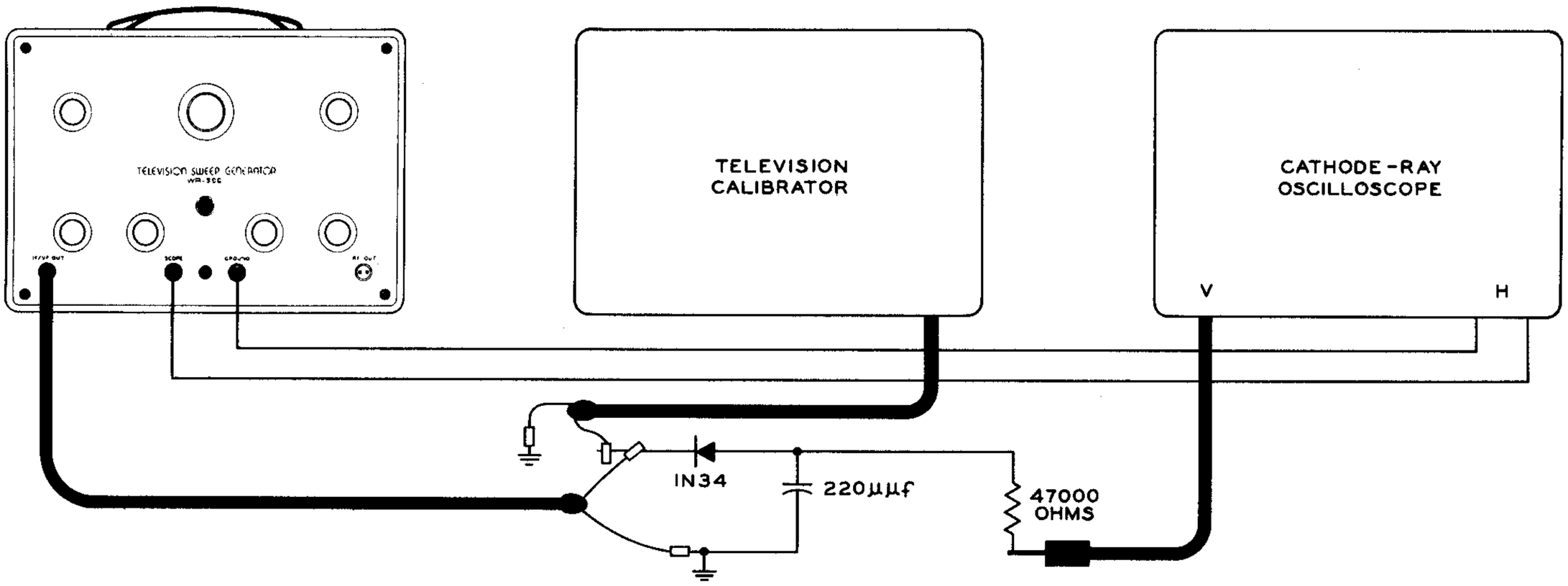


Figure 16. Setup for IF/VF Alignment of the WR-59C

under alignment. (See Figure 12 for physical location of coils.)

13. The small coils associated with channels 7, 8, 9, 11, and 12, and the coil arch associated with channel 13 are located on the CHANNEL selector. Channels 7, 8, 9, 11, and 12 can be aligned by opening or closing their respective coils; channel 13 can be aligned by flattening or opening its coil arch. The general procedure to be followed is the same as that outlined above for channels 2 through 6.

IF/VF Alignment

Before attempting if/vf alignment, the reader should make any phase adjustments which may be necessary, proceeding as outlined above under "Phase Adjustments".

The following procedure for the if/vf alignment of the Sweep Generator is suggested:

1. Set the CHANNEL selector to position "IF".
2. Using the setup illustrated in Figure 13, adjust L5 (Figure 12) until the rf sweep oscillator sweeps from 99 to 109 Mc, approximately, with the SWEEP WIDTH control in its maximum position.
3. Remove the RF Output Cable.
4. Rearrange the setup as illustrated in Figure 16. Note that the two 150-ohm resistors across the input to the detector have been removed and the IF/VF Output Cable is used in this setup.
5. Tune the television calibrator to 50 Mc.
6. Readjust L5 so that the unused portion of the curve beyond zero beat is approximately equal to the portion of the curve above the 50-Mc "pip", as illustrated in Figure 17. The curve in Figure 17 will not appear in its entirety on the screen of the cathode-ray oscilloscope. However, by rotating the IF/VIDEO control over its entire range of frequencies, the reader can view the curve a portion at a time.
7. With the BLANKING switch at "OFF" position, adjust the PHASE control for a single pattern of the response curve on the oscilloscope screen. Turn the BLANKING switch to "ON" position.
8. Adjust inductance L19 to produce the flattest possible response over the entire frequency range of the IF/VIDEO control. For those instruments which utilize the circuit shown in Figure 6, page 10, adjust inductances L19 and L20 to produce the flattest response over the entire frequency range of the IF/VIDEO control.

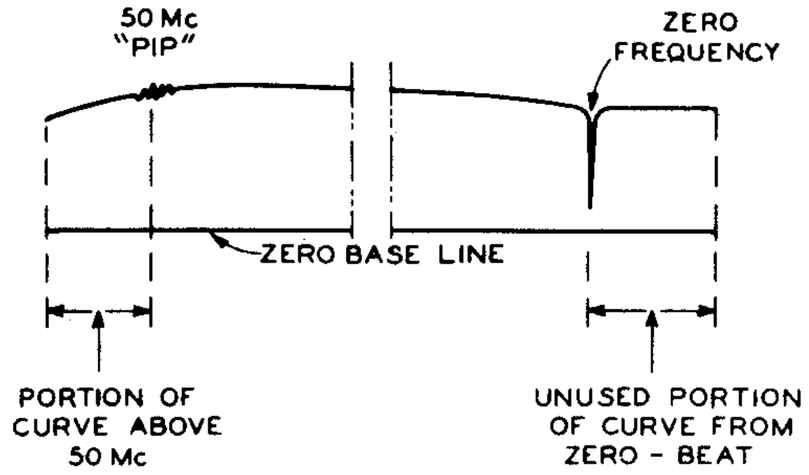


Figure 17. IF/VF Response of the WR-59C

RCA Repair Service

If the WR-59C fails to function properly, a visual inspection first should be made followed by an electrical check according to the procedure described above.

In the event the difficulty remains, the instrument may be returned to RCA for repairs. Information regarding RCA repair service may be obtained by writing to the RCA Service Company, Camden, N. J.


RCA

Modification of WR-59-Series TV Sweep Generators to Provide a Sweep-Sample Voltage

This bulletin describes the correct procedure for modifying RCA WR-59-series TV Sweep Generators to provide a fixed-voltage sample of the rf-sweep signal. A sample voltage is required in addition to the regular rf voltage available at the RF OUT connector when the generator is used with marker-adder units, such as the RCA WR-70A RF/IF/VF/ Marker Adder, in sweep alignment of TV receivers.

With the marker-adder system of alignment, it is necessary that two sweep-output voltages be available from the generator. The sample voltage, which is fixed and, therefore, independent of the setting of the output attenuator, is fed directly to the marker-adder unit. The output signal from the RF OUT connector, which must be adjustable by means of the attenuator, is fed to the receiver under test.

The modification is relatively simple and straightforward. The suggested procedure is as follows:

NOTE: Make sure the sweep generator is in proper working condition before attempting modification.

1. Locate and drill a 3/8" hole in the lower right-hand corner of the panel 2-1/4" in from the right-hand edge and 1-1/16" in from the bottom edge.

2. Install a microphone-type connector (Amphenol type 75-PCIM) in the hole. Attach one end of a 10-1/2" length of type RG-58/U coaxial cable to the connector. Be sure to provide a good ground connection for the braided shield of the cable. Use of an Amphenol type 82-1275 Shield Grounding Lug is recommended.

3. Push the free end of the coaxial cable up into the vibrator compartment to a position between the front wafer of the channel-selector switch and the vibrator mounting plate.

4. Install a two-terminal mounting strip (one ground lug and one insulated lug) under the left-front mounting screw of the vibrator inside the oscillator compartment.

5. Connect the cable shield to the grounded lug and connect the inner conductor to the insulated lug.

6. Connect one end of a 2-1/2" length of No. 10 to 14 gauge bus wire to the insulated lug. Bend the lug toward the left so that it projects approximately midway between the first two wafers of the channel-selector switch. Position the bus approximately 3/4" above the vibrator mounting shelf. The bus will act as a pickup lead and supply an adequate sample voltage for the RCA WR-70A Marker Adder.

Printed in U.S.A.

ICE-159 8-56

TEST AND MEASURING EQUIPMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TV SWEEP GENERATOR
TYPE WR-59C

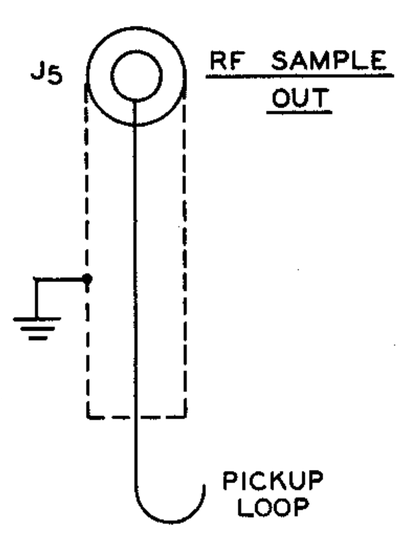
The following data apply to all WR-59C TV Sweep Generators having Code No. 756.

All WR-59C TV Sweep Generators having Code No. 756 are equipped with an rf-sample voltage connector on the front panel to permit use of the WR-59C with marker-adder units, such as the RCA WR-70A RF/IF/VF Marker Adder, in rf-sweep alignment of TV receivers. The rf-sample voltage is taken directly from the rf-sweep-oscillator section in the generator.

With the marker-adder system of alignment, it is necessary that two rf-output voltages be available from the generator. The rf-sample voltage, which is fixed and, therefore, independent of the setting of the output attenuator, is fed directly to the marker-adder unit. The output signal from the RF OUT connector remains adjustable by means of the attenuator and is fed to the receiver under test.

Detailed instructions for using the WR-59C in a marker-adder type of test setup are provided in the instruction booklet for the RCA WR-70A RF/IF/VF Marker Adder.

The wiring arrangement of the rf-sample circuit shown below should be added to the schematic diagram of the WR-59C shown on page 10 of the instruction booklet.



TEST AND MEASURING EQUIPMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

Supp.1 WR-59C (4) 8-56
Printed in U.S.A.

Modification of
WR-59B and WR-59C TV Sweep Generators
to Provide a 50 Kc IF/VF Output

All WR-59C Sweep Generators which have code numbers preceded by a letter "A" have an IF/VF sweep output which extends down to 50 Kc. Video sweep at this low frequency is necessary for alignment of the Q channel in color television receivers.

WR-59B instruments and WR-59C instruments which do not have the "A" code have an IF/VF range covering from 300 Kc to 50 Mc. WR-59A instruments have an IF/VF range covering from 100 Kc to 10 Mc.

The RCA Service Company is prepared to modify all instruments of the WR-59 series so that they incorporate the performance features of the latest WR-59C. The prices, subject to change at our discretion, include labor and material costs for the modification only and do not include charges for transportation, repairs, or replacement of defective parts. Three plans are available:

Plan No. 1 - Conversion of the WR-59A to incorporate features of the latest WR-59C instruments including a 50 Kc to 50 Mc IF/VF output. Price $65

Plan No. 2 - Conversion of the WR-59A to incorporate features of the WR-59B and early WR-59C instruments, including a 300 Kc to 50 Mc IF/VF output. Price $35

Plan No. 3 - Conversion of the WR-59B and early WR-59C instruments to include a 50 Kc to 50 Mc IF/VF output. Price $30

Instructions for shipping instruments to the RCA Service Company are given on page 3 of this bulletin.

MODIFICATION PROCEDURE

For those who wish to modify WR-59B and early WR-59C instruments, the step by step procedure is given below. The additional parts required are listed on page 3. These instructions do not apply to WR-59A instruments because the modification of the WR-59A involves extensive mechanical and electrical changes.

1. Remove 4 corner screws from the front panel.
2. Remove 4 screws from the bottom of the case. Remove the instrument from the case.
3. Remove all tubes.
4. Take off the front bracket only by removing the two screws on each side.
5. Drill 3 holes as indicated on the chassis layout, Figure 1. Use care in drilling to avoid possible damage to components and to keep metal particles out of the vibrator unit.

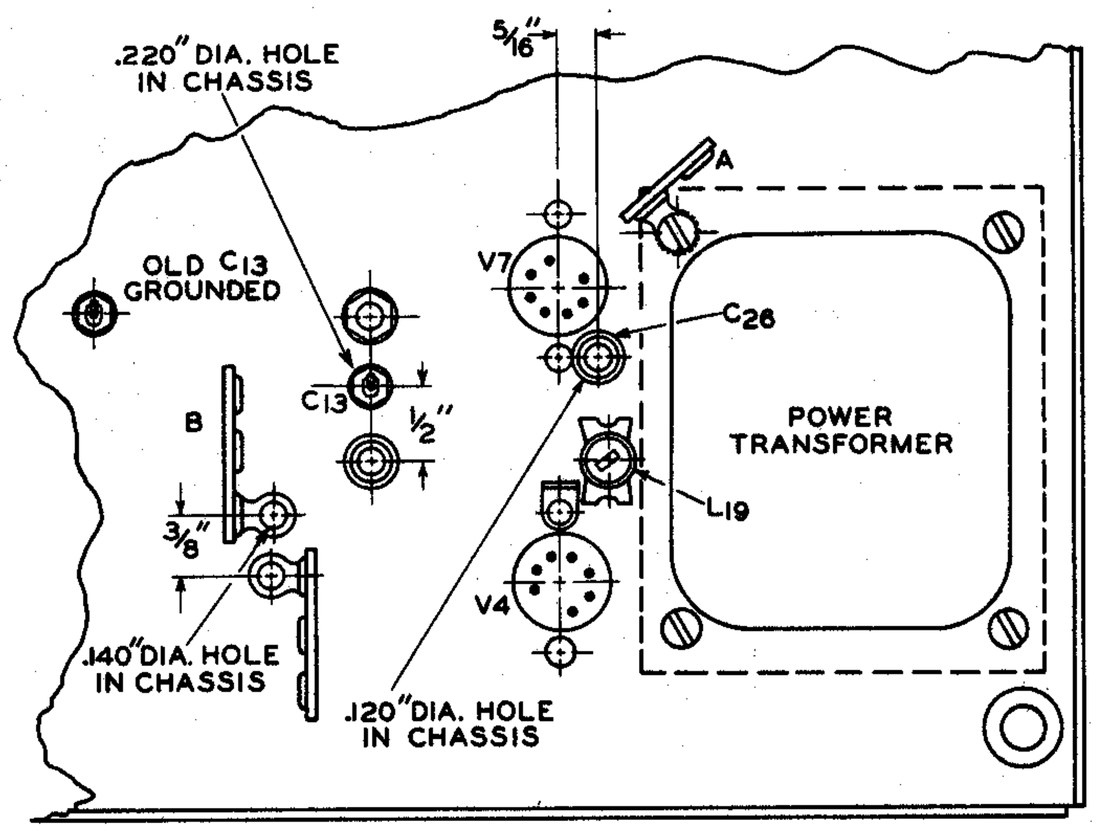


Fig. 1 - Chassis Layout

6. Remove and discard L20, R42, R43, R44, and R46 (See Figures 2 and 3).
7. Remove L19, C25, C26, R41, and R61 (See Figure 2). Do not discard. These parts will be used in the modification.
8. Install the two terminal strips, A and B, in the locations indicated on the chassis layout, Figure 1. Use a self-tapping screw to mount the 3-lug terminal strip (B).
9. Transfer lead from middle lug of old 3-lug terminal strip to middle lug of new 3-lug terminal strip (B).
10. Ground the original C13 feed-through capacitor by soldering the terminal (underside of the chassis) to the body of the screw.
11. Install L19, new C13, and C26 in the locations indicated on the chassis layout, Figure 1.

Make the following connections:

12. New C13 to pin 6 of V7.
13. C16 to middle lug of the old 3-lug terminal strip.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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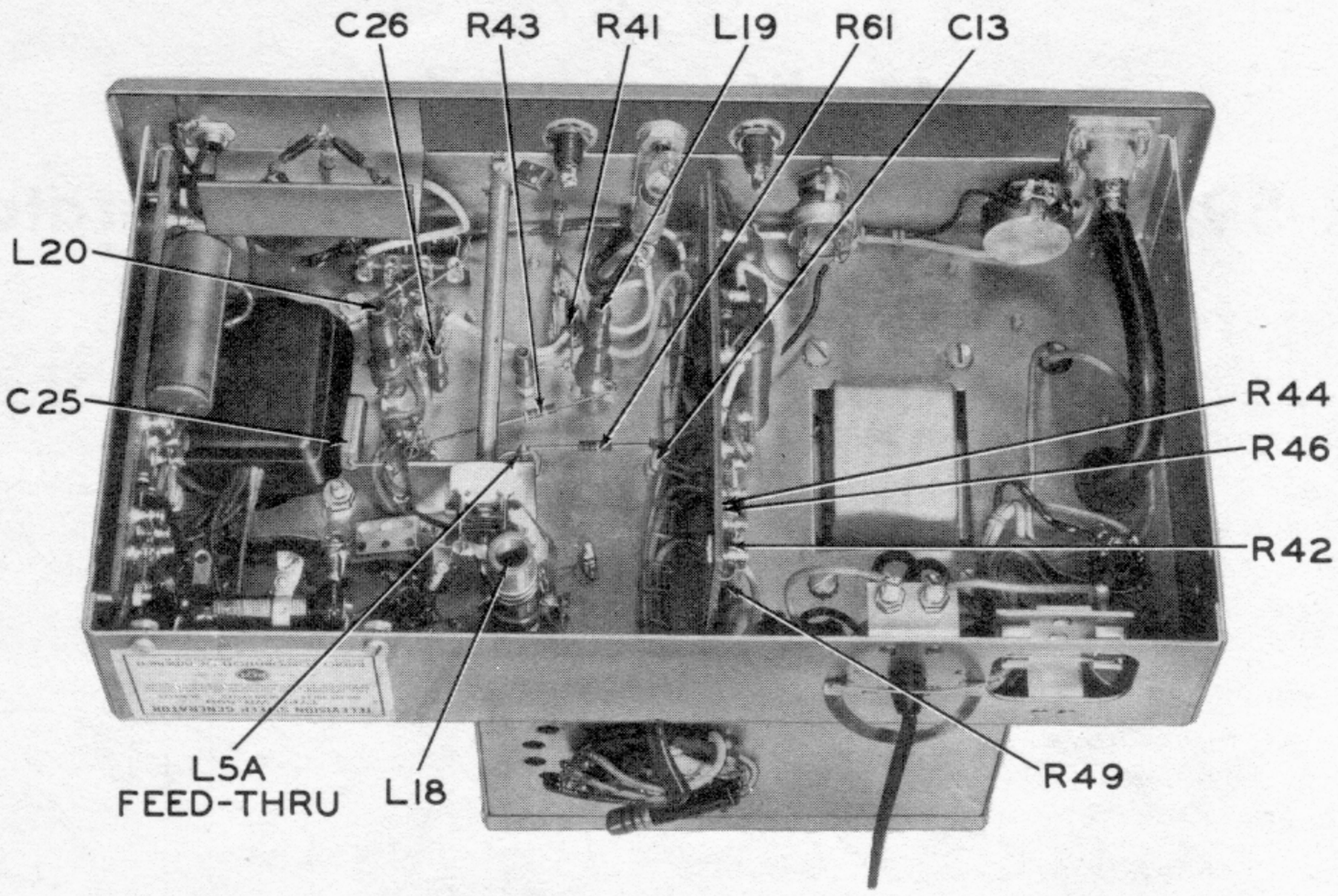

Fig. 2 - Bottom View of WR-59C

14. C25 from pin 5 of V7 to one terminal of L19.
15. C26 to pin 2 of V7.
16. C43 from pins 1 and 2 of V4 to the ground lug of the old 3-lug terminal strip.
17. C44 from the ground lug of V6 socket to the insulated lug on new 2-lug terminal strip (A).
18. L19 to R47.
19. R41 from middle terminal of old 3-lug terminal strip to middle lug of new 3-lug terminal strip (B).
20. R61 from L5A feed-through to L18A ground lug.
21. R67 from pin 5 of V7 to middle lug of new 3-lug terminal strip (B).
22. R68 from bottom (B+) terminals to lug adjacent to end resistor R49 on large terminal board. (See Figure 3).
23. R69 from C13 (underside of chassis) to ground lug of old 3-lug terminal strip.
24. R70 from C13 to end lug of new 3-lug terminal strip (B).
25. R71 from pin 2 of V7 to insulated lug of new 2-lug terminal strip (A).
26. R72 on large terminal board in series with R73. (See Figure 3, and step 27).
27. R73 from bottom (B+) terminals to the middle terminal adjacent to R68 on large terminal board. (See Figure 3).
28. R74 from pin 7 of V7 to lower terminal of L18A. Dress lead around near end of capacitor mounting plate.
29. New wire from top of R72 to insulated lug of new 2-lug terminal strip (A). Dress wire around panel end of the large terminal board. (See Figure 3).

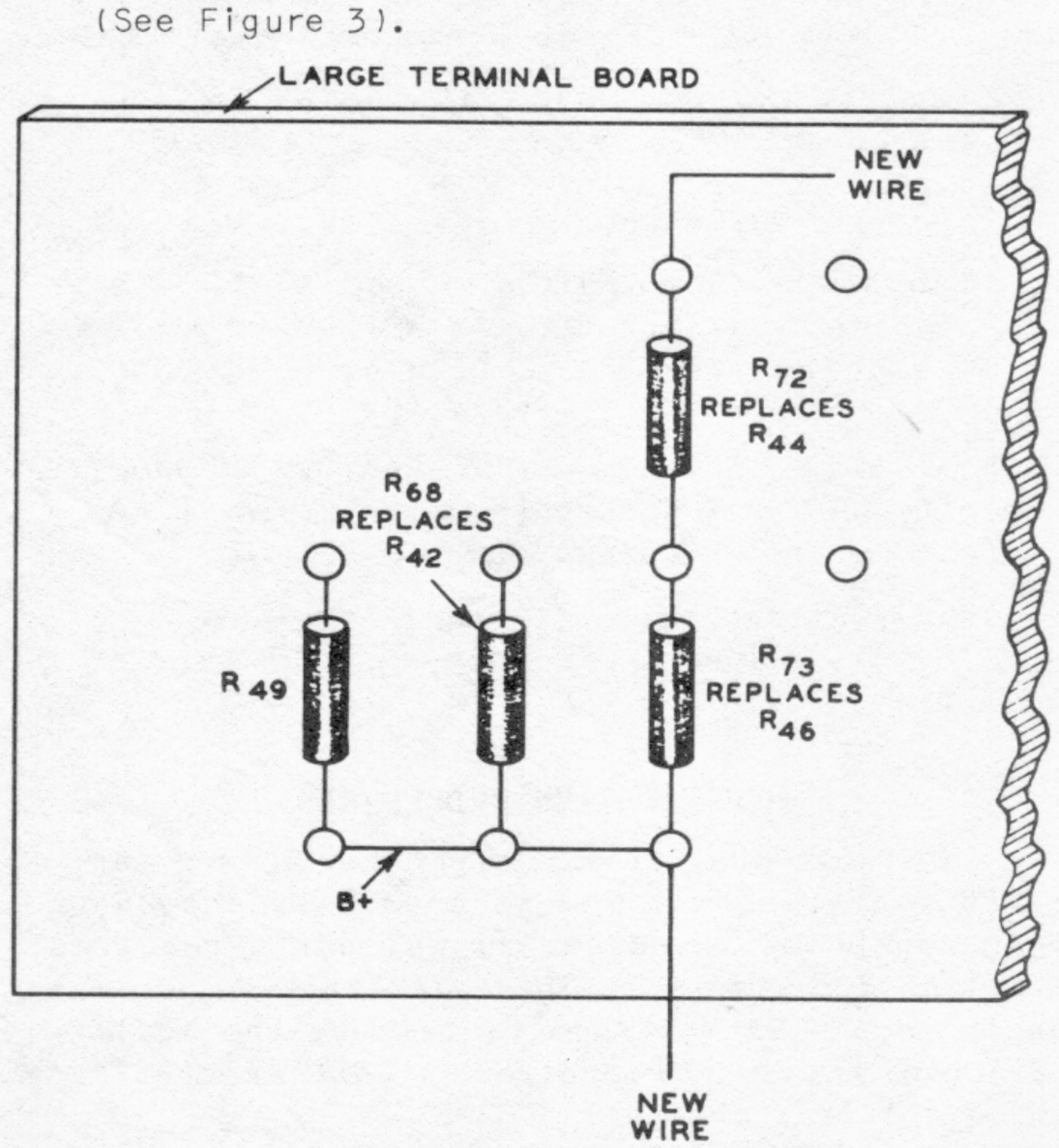

Fig. 3 - Locations of Parts on Large Terminal Board

30. New wire from common junction of R49, R68, and R73 (B+) on the bottom of the large terminal board to end lug of new 3-lug terminal strip (B). (See Figure 3).
31. New wire from pin 1 of V7 to L5A feed-through.

Before reassembling the instrument check all wiring against the Schematic Diagram, Figure 4. After reassembling the instrument it may be necessary to align the IF/VF section. If alignment is required, follow the procedure indicated on page 19 of the instruction booklet, except that step 8 should be changed to read "Adjust L19 to produce the flattest possible response over the entire frequency range of the IF/VIDEO control".

PARTS REQUIRED FOR MODIFICATION

Symbol No.	Description	Stock No.
	Capacitors	
C13	High "K" type: 1500 μμf, 20%, 350 volts.	57404
C43	Paper: 0.047 μf, ±10%, 400 volts .	73553
C44	Paper: 0.047 μf, ±10%, 200 volts .	73558
	Resistors	
R67	Carbon film: 330 ohms ±1%, 1/2 watt	95324
R68	Composition: 68,000 ohms, ±10%, 1 watt	512368
R69	Composition: 47,000 ohms, ±10%, 1 watt	512347
R70	Composition: 27,000 ohms, ±10%, 2 watts.	522327
R71	Composition: 15 ohms, ±10%, 1/2 watt	502015
R72	Composition: 330 ohms, ±10%, 1 watt	76084
R73	Composition: 1 megohm, ±10%, 1/2 watt	502510
R74	Same as R71	------
	Miscellaneous	
A	2-lug terminal strip	
B	3-lug terminal strip	
V7	RCA-6AS6	
	#6 sheet metal screw	
	#6 lockwasher	

SHIPPING INSTRUCTIONS

To avoid delay, fill out the following form and enclose it with the returned instrument.

Be sure to enclose all test leads with instrument.

Pack carefully to avoid damage in shipment; test equipment is delicate.

Do *not* ship by parcel post. Use railway express or motor freight. Ship instrument prepaid to:

RCA Service Co., Inc.
Return Apparatus Control
Building 8-2
Camden, New Jersey

- -

Modification of the WR-59-series Sweep Generators

Name_____

Street_____

City_____ **Zone**_____ **State**_____

Model Number of Instrument_____ **Serial No.**_____ **Code No.**_____

Type of Modification (check one):

☐ **Plan No. 1** ☐ **Plan No. 2** ☐ **Plan No. 3**

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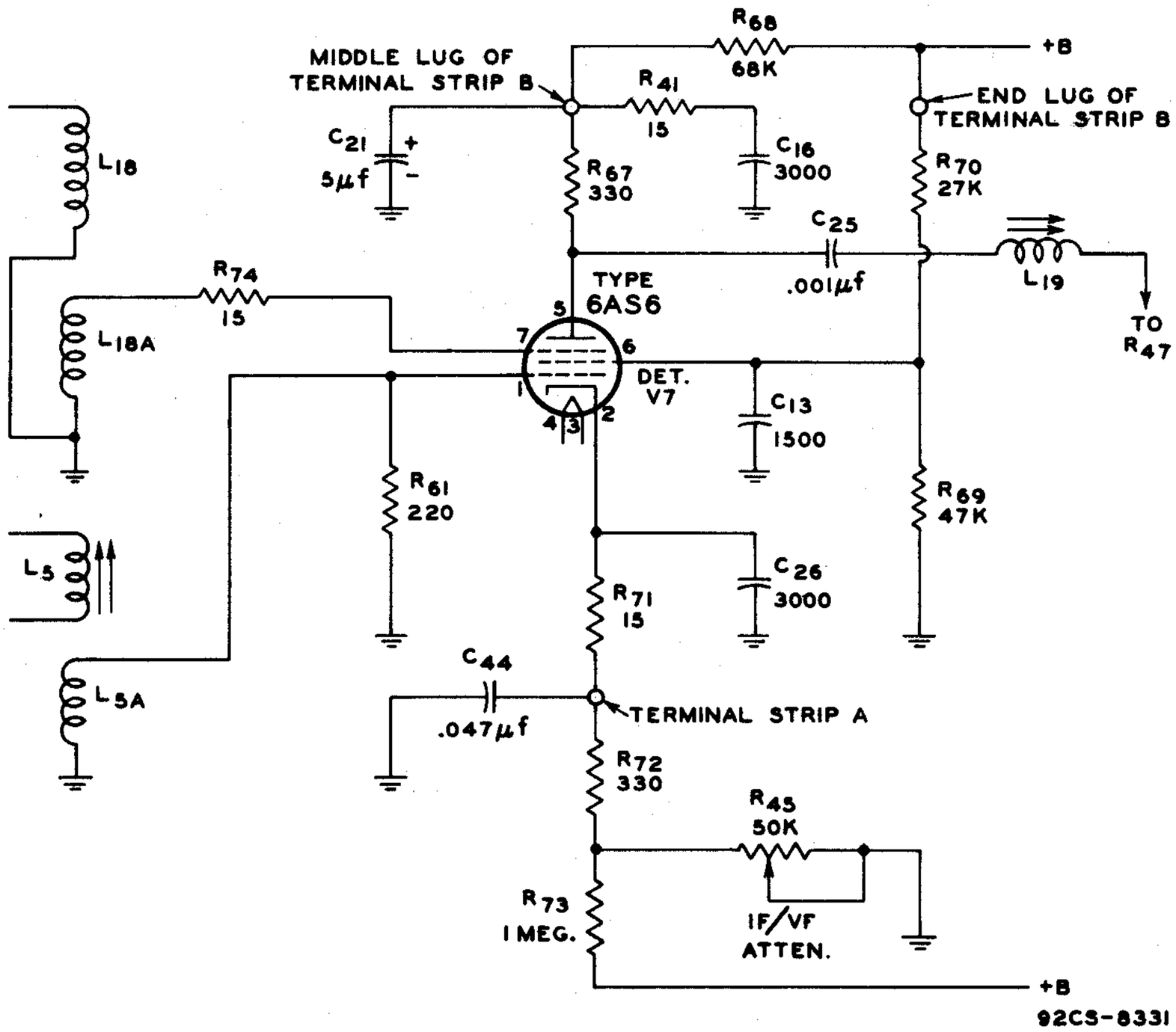

Fig. 4 - Schematic Diagram of the Modified Detector Stage of WR-59B and WR-59C Instruments.