WG-299D, WG-300B, WG-301A, WG-302A
PROBES AND CABLES

This bulletin describes two probes and cables and two accessory slip-on probes for use with various RCA VoltOhmysts* and Oscilloscopes. They are as follows: WG-299D DC/AC-Ohms Probe and Cable and the WG-301A Crystal-Diode Probe for VoltOhmysts, and the WG-300B Direct/Low-Capacitance Probe and Cable and the WG-302A RF-IF-VF Signal-Tracing Probe for oscilloscopes.

WG-299D DC/AC - Ohms Probe and Cable

Note: The WG-299D Probe and Cable replaces the earlier models WG-299 A,B,C. However, all four types can be used interchangeably.

The WG-299D is a sturdy, sealed probe and cable designed for and supplied with the RCA series WV-87 and WV-98 VoltOhmysts. This probe can be used for measuring either resistance or AC and DC voltage. The build-in fingertip switch on the WG-299D provides instant selection of either the "DC" or the "AC/OHMS" function. An accessory Crystal Diode Probe, WG-301A, is available for use in conjunction with the WG-299D.

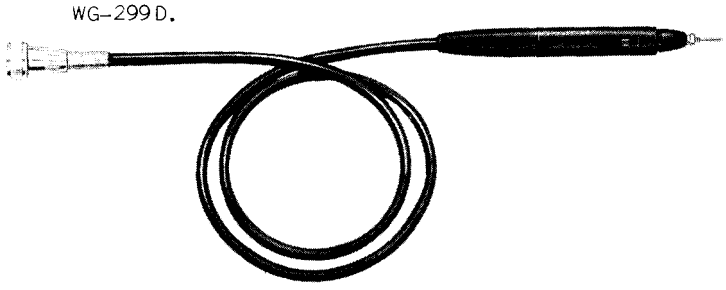

Figure 1. WG-299D DC/AC-Ohms Probe and Cable.

When the sliding switch on the WG-299D is set forward to the "DC" position, a built-in 1-megohm resistor is placed in series with the probe tip and the input to the VoltOhmyst. This resistor acts to isolate the instrument from the circuit under test and is part of the overall input resistance of the voltmeter. The switch should always be set to the "DC" position for dc-voltage measurements.

When the sliding switch is set to the rear or "AC-OHMS" position, the isolating resistor is shorted out to connect the probe tip directly to the input of the voltmeter. The switch should always be set to the "AC-OHMS" position when resistance or ac-voltage measurements are made and when the accessory WG-301A Crystal-Diode Probe is used.

WG-301A Crystal-Diode Probe

The RCA WG-301A Crystal-Diode Probe is a slip-on accessory for use with the WG-299D for measurements of sine waves at frequencies up to 250 Mc.

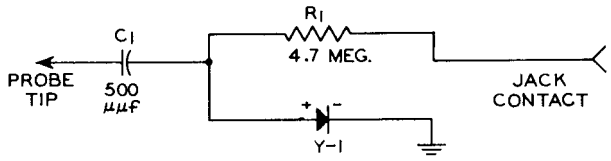

Figure 2. Schematic Diagram of WG-301A.

The WG-301A probe contains a crystal diode, which functions as a half-wave rectifier, and an rf filter, as shown in Figure 2. The circuit develops a dc output voltage proportional to the peak value of a sinusoidal waveform.

When the WG-301A is used with a VoltOhmyst, the rms value of the sine wave is read from the dc-voltage scales of the instrument. For example: A reading of 5 volts dc indicates that the sine wave being measured has an rms value of 5 volts. The peak value of this voltage may be obtained by multiplying the 5-volt meter reading by 1.41. The probe may be used in circuits having dc voltages up to 250 volts and where the ac voltages do not exceed 20 rms volts or 28 peak volts.

OPERATION

To use the WG-301A Crystal-Diode Probe with a VoltOhmyst, slip the probe onto the front end of the WG-299D. Set the DC/AC-OHMS switch to the "AC-OHMS" position.

Turn on the instrument and set the SELECTOR switch to the "-DC" position. Set the RANGE switch to the desired dc-voltage range. Connect the ground clip of the WG-301A probe to the ground or negative side of the voltage source to be measured and touch the probe tip to the positive side of the voltage source. CAUTION: See "Maximum Input" in the specifications below. The rms value of the sine wave should be read from the dc-voltage scale selected by the RANGE switch.

* Trade Mark "VoltOhmyst" Reg. U.S. Pat. Off.

[1] The WG-299D may be used with the WV-77A and WV-77B as a replacement for the probe and cable supplied with this instrument. The WG-299D may also be used with models number WV-87A, WV-97A, 170, 170A, 195, and 195A for dc and ac measurements. These models do not require the "ohms" function of the probe because they are supplied with a separate ohms probe and cable. The WG-299D cannot be used with 165 and 165A Junior VoltOhmysts.

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WG-300B Direct/Low-Capacitance Probe & Cable

NOTE: The types WG-300A and WG-300B probes and cables differ in their internal construction and electrical characteristics. Although their application is the same, it is not recommended that they be used interchangeably. The WG-300A contains a built-in trimmer capacitor which can

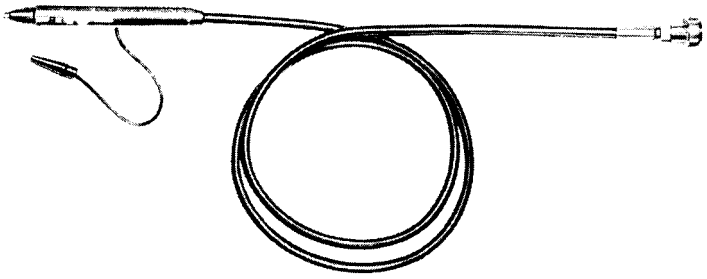

Figure 3. WG-300B Direct/Low-Capacitance Probe and Cable.

be adjusted as described below to match the input characteristics of the oscilloscope. The WG-300B, however, utilizes a fixed capacitor in the probe, and compensation is made by means of a small trimmer capacitor in the oscilloscope.

The WG-300B is designed for use with RCA models WO-56A, WO-78A, WO-78B, WO-88A, and WO-91A oscilloscopes which are especially equipped with trimmer capacitors in the vertical-input circuits to permit compensating for the capacitance of the WG-300B probe and cable. Not all of these scopes contain this trimmer capacitor. The capacitor (5-25 $\mu\mu$f, RCA Replacement Parts Stock No. 204811) may be

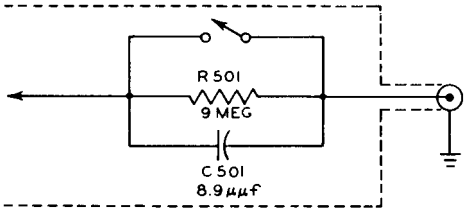

Figure 4. Schematic Diagram of WG-300B.

added to the scopes as described below. The adjustment of the trimmer in all scopes is the same, as described under "Adjustment of the WG-300B".

WO-56A -- Connect a 5-25 $\mu\mu$f ceramic trimmer capacitor under the chassis from the V INPUT connector lead to the ground lug on the terminal board located behind the GND terminal. If necessary, add a short length of stiff wire between the capacitor and the ground lug.

WO-78A -- Add a solder lug under the GND terminal on the underside of the chassis and connect a 5-25 $\mu\mu$f ceramic trimmer capacitor from the V INPUT lead to the new ground lug. If necessary, add a short length of stiff wire between the capacitor and the ground lug.

WO-88A -- Remove the vertical metal shield alongside the input-attenuator switch and drill a hole for a 6-32 screw in the shield. Mount the screw, washer, nut, and ground lug on the shield and reinstall in the scope. Connect a 5-25 $\mu\mu$f ceramic trimmer capacitor from the V INPUT lead to the new ground lug.

WO-91A -- NOTE: Some WO-91A instruments having Code No. 655 are equipped with a 1.5-7 $\mu\mu$f ceramic trimmer capacitor which may not provide a sufficient range of adjustment to accommodate the WG-300B. If the WG-300B cannot be compensated for by means of this capacitor, replace it with a 5-25 $\mu\mu$f ceramic trimmer. In WO-91A instruments which are not equipped with a capacitor, connect a 5-25 $\mu\mu$f ceramic trimmer across the two lugs of the terminal board in back of the V INPUT connector.

Adjustment of the WG-300B

Adjustment of the oscilloscope trimmer capacitor for the WG-300B probe and cable requires use of a square-wave generator. Procedure is as follows:

1. Apply power to the scope and the square-wave generator. Set the input-attenuator switch on the scope to its most sensitive position.

2. Tune the generator to deliver a 10-kc square wave.

3. Set the sliding switch on the WG-300B to the "DIRECT" position. Adjust the scope sweep and sync controls and the scope gain and generator output control to produce two locked-in waveforms approximately two inches high on the screen.

4. Set the sliding switch to "LOW CAP" and increase the generator output to produce the same amplitude as observed in step 3.

5. Adjust the trimmer capacitor in the scope to produce a square wave of the same shape as observed in step 3.

When the switch on the WG-300B is set to the "Direct" position, the test signal is fed directly to the vertical-input terminal of the oscilloscope. When the switch is set to the "LOW CAP x 10" position a built-in high-impedance network is connected in series with the test point and the probe cable. This network permits measurements in high-impedance circuits, such as those found in TV-sync-separator and video-amplifier stages, which would not operate properly if loaded down by a conventional probe and cable.

When the probe is used in its low-capacitance position, the input capacitance of the instrument is reduced to approximately 11 $\mu\mu$f and the input resistance is raised to 11 megohms. (See Figure 4.) This high input resistance attenuates the signal by a factor of ten. Therefore, the

indicated voltage should be multiplied by 10 to obtain the actual value.

Adjustment of the WG-300A

The WG-300A is provided with a trimmer capacitor to permit adjustment of the square-wave response. The adjustment procedure is as follows:

1. With the WG-300A connected to the vertical input terminal of the oscilloscope, set the probe switch to "LOW CAP".

2. Obtain a trace of a clean horizontal-sync pulse from a television receiver by connecting the oscilloscope across the second detector load. A square-wave generator set to 1000 cps may be used instead of the sync pulse.

3. Loosen the threaded nut on the tip of the probe. Slowly rotate the probe tip for the best square-wave pattern on the oscilloscope screen. Tighten the nut.

NOTE: On WO-78A oscilloscopes it may be necessary to add a small trimmer capacitor (3-12 $\mu\mu$f) inside the instrument to compensate for the effects of the WG-300A Probe and Cable. Connect the trimmer from the V INPUT terminal to the nearest ground point. The capacitor should be added to all WO-56A oscilloscopes.

WG-302A RF-IF-VF Signal-Tracing Probe

The WG-302A RF-IF-VF Signal-Tracing Probe is a slip-on accessory for use with the WG-300A and WG-300B for signal tracing. The accessory probe contains a crystal diode and an rf filter housed in a plastic case. When the WG-302A is used, the switch on the WG-300 should be set to the "Direct" position.

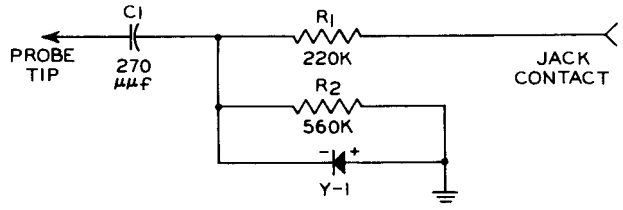

Figure 5. Schematic Diagram of WG-302A.

The time-constant of the rectifier circuit in such that when the WG-302A is used in high-frequency circuits, the low-frequency modulation is separated from the amplitude-modulated rf carrier. The low-frequency component is then fed to the input of the oscilloscope through the WG-300A or WG-300B. The waveform is centered vertically on the zero axis of the screen when an ac RC-coupled oscilloscope is used. When a direct-coupled oscilloscope is used, the waveform is displaced vertically a distance proportional to the dc voltage resulting from the rectification of the rf carrier.

When the WG-302A is used with an oscilloscope such as the WO-91A and a sweep generator is employed to sweep the picture or sound if amplifier of a television receiver, it is possible to observe the response characteristic of individual amplifier stages without upsetting the performance of the high-frequency stage. With this combination of equipment, it is possible to observe the re-

SPECIFICATIONS

	WG-299A WG-299B WG-299C WG-299D *(For use with models WV-77A, WV-77B, WV-77C, WV-87A#, WV-87B, WV-97A#, WV-98A, 195 and 195A VoltOhmysts and models 170 and 170A Chanalysts and similar instruments.)*		WG-300A WG-300B *(For use with models WO-56A, WO-78A, WO-78B, WO-88A, WO-91A, and similar oscilloscopes.)*		WG-301A *(For use with WG-299A, WG-299B, and WG-299C probes and cables.)*	WG-302A *(For use with WG-300A and WG-300B probes and cables.)*
	"DC" OPERATION	"AC-OHMS" OPERATION	"DIRECT" OPERATION	"LOW CAP" OPERATION		
INPUT FREQUENCY RESPONSE RANGE	*	30 cps to 3 Mc across 100-ohm source	*	Flat to 10 Mc (Probe and cable only)	±0.75 db 50 Kc to 250 Mc	±1 db 100 Kc to 250 Mc
INPUT RESISTANCE	11 megohms total with VoltOhmyst)	Depends upon VoltOhmyst	1 megohm (Scope Input Resistance)	10 megohm (with 'scope)	*	*
INPUT CAPACITANCE	Less than 4 $\mu\mu$f	Depends upon VoltOhmyst	Less than 100 $\mu\mu$f	Less than 13 $\mu\mu$f	Less than 3 $\mu\mu$f	Less than 3.75 $\mu\mu$f
MAXIMUM INPUT VOLTAGE DC	1500V	Combined dc and ac peak = 2000V	600V	600V	250V	250V
MAXIMUM INPUT VOLTAGE AC	1000V rms	1500V rms (sine wave)	600V peak-to-peak	600V peak-to-peak	20V rms	20V rms
DEMODULATION RANGE	*	*	*	*	*	30 to 2000 cps

* Does not apply

\# Has separate ohms cable. WG-299 used only for AC & DC functions.

sponse curves of picture and sound if amplifiers, video amplifiers, tuners, and overall response curves in all high-frequency sections of the television receiver.

An input capacitance of only 3 $\mu\mu$f for the probe permits its use in these critical circuits and without seriously detuning the amplifiers. Because the capacitance of the WG-302A is less than that of the kinescope grid circuit, the probe may also be connected to the output of the video amplifier with negligible effect on the circuit.

The WG-302A extends the range of the oscilloscope of 50 Mc. This range covers the if and video frequency sections of television receivers. The connection of a short ground lead between the probe and the low side of the circuit under test will extend the usable range of 250 Mc for signal tracing in tuners. To add the ground lead, remove the nylon screw in the body of the case, and connect a 3-inch ground lead by means of a metal screw. Insulate the screw head.

The WG-302A RF-IF-VF Signal-Tracing Probe is designed to be used as an indicating device rather than a voltage-measuring instrument. If the WG-302A is used for voltage measurments, the probe and the oscilloscope can be calibrated against a known voltage.

Replacement Parts Lists

When ordering replacement parts, include the stock number and description of the part, as well as the type number of the probe. Parts should be ordered through a local RCA tube and parts distributor.

SYMBOL No.	DESCRIPTION	STOCK No.
	WG-299A DC/AC Ohms Probe and Cable	
	Probe sub-assembly - Consisting of the following parts: - Probe shell, shield, bushing and insulator, probe tip, switch and 1 megohm resistor....	211400
	Bushing - Probe tip bushing.....	210196
	Shell - Front molding.....	210195
	Shell - Rear molding, blue.....	210202
	Spring : Probe tip bushing tension spring.....	210197
	Connector - Cable, female.....	203574
	Connector - Cable internal connector..	210190
	WG-299B DC/AC-Ohms Probe and Cable	
	Bushing, tip: for front housing.....	212161
	Connector: internal, brass for cable...	210190-A
	Connector, cable: female, with set screw.....	203574
	Shell: front end, blue.....	210195
	Shell: middle section, with shield, bushing, and insulator.....	212159
	Shell: rear section, blue.....	210202-A
	Spring, coil: for front end.....	210197
	Spring, switch: with insulator.....	212162
	Tip, probe: with switch slide and 1-meg. resistor.....	212160
	Washer, tip:.....	212163
	WG-299C DC/AC-Ohms Probe and Cable	
	Bushing, tip: for front housing.....	213257
	Connector: internal, brass, for cable.	210190-A
	Connector, cable: female with set screw.....	203574
	Shell: front end, blue.....	210195-A
	Shell: middle section, with shield, bushing, and insulator.....	213664
	Shell: rear section, blue.....	210202-A
	Spring, coil: for front end.....	210197
	Spring, switch: with insulator.....	213665
	Tip, probe; with switch slide and 1-meg. resistor.....	212160
	Washer, tip:	213271
	WG-299D DC/AC-OHMS probe and cable sealed unit, cannot be disassembled.	
	WG-300A Direct/Low-Capacitance Probe and Cable	
	Bushing: for probe tip.....	210196
	Clip: alligator clip.....	210207
	Connector: probe cable internal connector (rear).....	210201
	Insulator: alligator clip cover.....	210209
	Insulator: probe insulator and bushing with Buss wire and lug terminal.....	211691
	Ring: probe ground ring.....	210205
	Shell: center, includes 2 shields, bushing and insulator.....	2116B8
	Shell: probe, tip molding, blue.....	210195
	Shell: probe, end molding, blue.....	210202
	Spring: guard spring for cable.....	210208
	Spring: for probe tip.....	210197
	Switch: probe switch slide and spring.	211690
	Tip: probe tip and resistor.....	211689
	WG-300B Direct/Low-Capacitance Probe and Cable	
	Bushing, probe tip: for front end.....	213257
	Clip: for grounding lead.....	210207
	Connector, cable: internal, brass.....	213260
	Connector, cable: female, with set screw	203574
	Insulator, clip.....	210209
	Ring, ground: for center section.....	213262
	Shell: for front section, polystyrene, blue.....	212161
	Shell: for center section, polystyrene, blue, with bushing, insulator, and two shields.....	213256
	Shell: for rear section, polystrene, blue.....	213261
	Spring; coil: for front end.....	210197
	Spring, switch: with insulation and insulator.....	213259
	Tip: silver plated, with switch slide, 1-meg resistor, and capacitor....	213258
	Washer: for probe tip.....	213271
	WG-301A Crystal-Diode Probe	
C1	Capacitor: silver mica 500 $\mu\mu$f ± 5%...	95503
R1	Resistor: carbon film, 4.7 meg. ± 1%, 1/2 w.....	213362
Y1	Crystal: crystal diode.....	54374
	Clip: alligator clip.....	210207
	Insulator & Jack Contact Assembly.....	211374
	Lead: unshielded, black, with alligator clip and terminal.....	211379
	Nut: clip lead nut.....	211378
	Screw: clip lead screw.....	211377
	Shell: probe housing blue.....	211372
	Spring: probe contact spring.....	211373
	Tip: probe.....	211375
	WG-302A RF-IF-VF Signal-Tracing Probe	
C1	Capacitor: silver mica, 270 $\mu\mu$f ± 10%.	95504
R1	Resistor: composition, 220,000 ohm ± 10%, 1/2 w.....	502422
R2	Resistor: composition, 560,000 ohm ± 10%, 1/2 w.....	502456
Y1	Crystal: crystal diode.....	54374
	Clip: alligator clip.....	210207
	Insulator & Jack Contact Assembly.....	211374
	Lead: unshielded, black, with alligator clip and terminal.....	211379
	Nut: clip lead nut.....	211378
	Screw: clip lead screw.....	211377
	Shell: probe housing vlue.....	211380
	Spring: probe contact spring.....	211373
	Tip: probe.....	211375