RCA Rider

CHANALYST

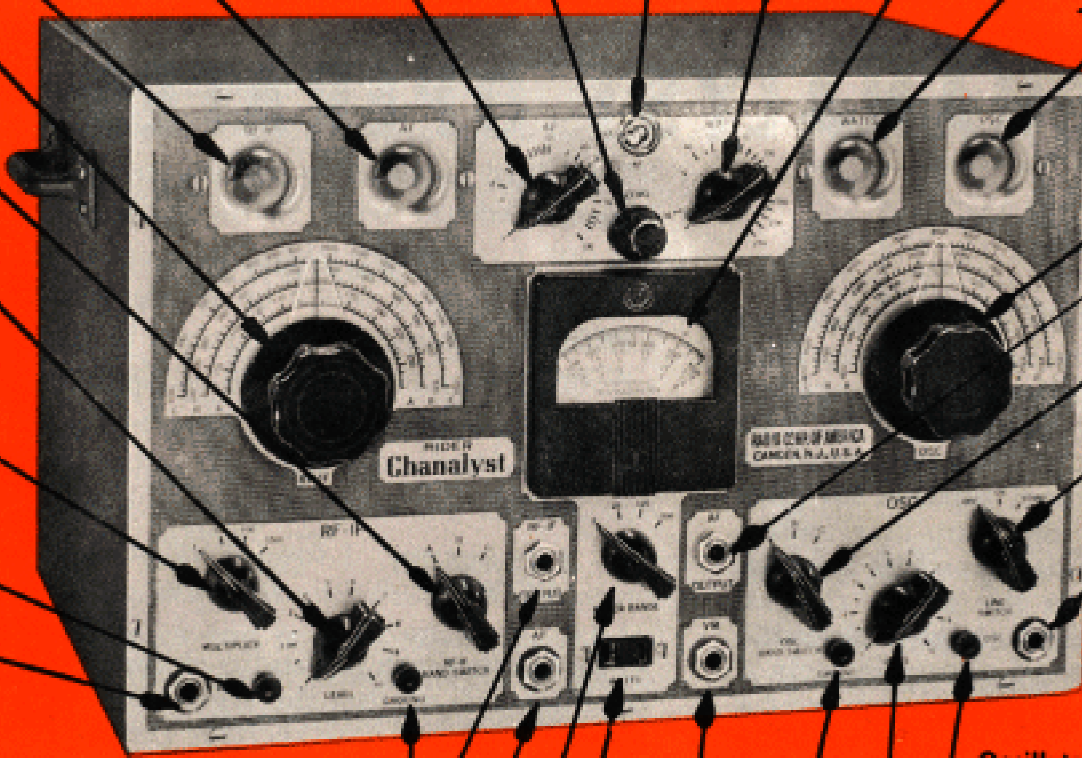
TYPE 162-C

Eliminates Guesswork . .
Puts Extra Hours in Every Service Day

THE GREATEST ADVANCE EVER MADE IN THE HISTORY OF RADIO SERVICE INSTRUMENTS

WHY YOU NEED THE CHANALYST

- It allows the application of the same systematic method of analysis to all receivers, irrespective of age or type.
- You do not have to take anything for granted, but can test every point under suspicion without interfering with the operation of the receiver or being limited by the circuit design.
- It greatly reduces the time required to analyze trouble in any receiver, thereby cutting the cost per job. You can determine conditions at the tube elements while the signal is present without interfering with the operation. This affords *positive identification with the greatest speed.*
- You can check the presence, absence, or character of the signal—the operating and control voltages at any point in the receiver, particularly in places difficult to test heretofore.
- You can check the operation of various types of filter circuits at radio, intermediate, or audio frequencies, thus establishing sources of hum and interaction between circuits.
- You have positive identification of oscillatory conditions.
- You can obtain constant monitoring of the various circuits in the receiver.
- You can locate the source of noise being developed within the receiver.
- You can locate "hard-to-find" troubles in a fraction of the time required by any other method.
- It enables very rapid inspection and estimating of repair costs.
- IT SOLVES THE INTERMITTENT PROBLEM.
- The obsolescence factor is kept at a minimum. The fundamental design of the entire system, being independent of circuit design, tube types, etc., assures many years of successful operation.



The various controls of the Chanalyst are grouped for greatest ease of operation, as may be seen in the illustration at left, the function of each being clearly designated. The electronic indicators are recessed behind the panel enabling easy observation. A stand-by position on the power switch preserves the maximum brilliancy of the electronic indicators allowing the CHANALYST to remain warmed up and ready for instant use.

THE THEORY BEHIND THE CHANALYST

The RCA Chanalyst is possessed of tremendous capabilities, but the theory behind the instrument is nevertheless easy to understand. It is based upon one thing that every receiver—old, new, yet to come—has in common, and that is the signal itself. . . . No matter how you view the situation, you will find that the signal is the one fundamental factor—the common denominator of every receiver, be it T-R-F or Superheterodyne.

When a receiver is not functioning as it should and the signal has been affected in some way . . . perhaps the signal is distorted—perhaps hum has been superimposed upon the signal because of a defect in the receiver—perhaps the sensitivity is low—a loss of control—or the receiver is dead and there is no signal . . . no matter what the trouble, you can readily see that the signal alone, is the all-important factor.

Since the signal is the all-important factor . . . since the signal is the common denominator . . . since the normal passage or control of the signal through the receiver is impaired by the defect—it is logical to establish the signal as a fundamental base upon which testing can be predicated. If we can establish how far a normal signal passes through the receiver—the place or point where it no longer is normal in level, becomes distorted or has been changed in character—that is the point at which trouble exists or is related to the trouble. . . . This reasoning is simple, logical, and practical and represents the basis of the systematic method of testing made possible by the Chanalyst.

Associated with the tracing of the signal are certain voltage tests. These are the control voltages developed by the signal itself and related to the control of the signal. Thus a part of the theory underlying the application of the Chanalyst is a means of measuring the control voltages at the points where the signal exists, without interfering with the operation of the receiver. Of course, the voltmeter measuring system must also embrace all of the operating voltages and must be applicable irrespective of the complex nature of the circuit.

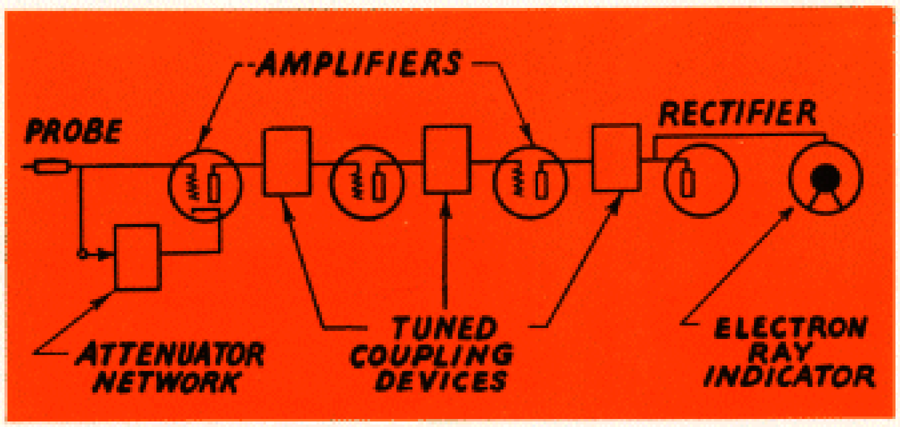
What has been stated represents the theory behind the Chanalyst—the service instrument which has made the ideal method of trouble analysis or localization a practical reality.

HOW THE CHANALYST OPERATES

The RF-IF CHANNEL

Five tubes are employed in the RF-IF channel; three as high-gain tuned amplifiers, the fourth as a diode rectifier, and the fifth as an electron-ray indicator. The amplifier covers three frequency bands: 600 kc to 1,700 kc; 240 kc to 630 kc, and 95 kc to 260 kc. The input circuit is calibrated, thereby making the channel suitable for gain measurements. The sensitivity of the amplifier, when used with a test oscillator, is sufficient to test the antenna input circuit of any receiver within the above ranges. The pickup for the channel is made through a shielded cable, terminating in a capacitance of approximately 1 micromicrofarad. Attenuation of the input circuit over a ratio of 10,000 to 1 is provided by a continuously variable resistive attenuator and a four-step capacitive attenuator.

A three-step switch se'ects the frequency band. A jack in the indicator circuit permits the output of the amplifier to be fed through the audio channel to headphones or an oscillograph so that the signal can be heard or its wave form examined. The rectifier circuit is so designed that the output depends upon the carrier voltage and not the modulation component; therefore the indication does not depend on the percentage of modulation.



WHAT IT WILL DO . . .

Identify an oscillating r-f, mixer or i-f stage by checking the signal being generated within the tube.

Trace feedback into the r-f stage of the receiver.

Check for signal leakage across r-f chokes.

Check antenna pickup over the broadcast band.

Permit the RF-IF channel to be used as a comparison receiver substantially free from distortion.

Check gain or loss in r-f or i-f tubes.

Check gain or loss in r-f or i-f transformers.

Check signal voltage across entire or part of primary or secondary of r-f transformer.

Check for distortion in r-f, mixer, and i-f circuits by listening to the rectified signal taken out at either control grid or plate of tubes.

Check for noise in r-f, mixer, or i-f portion of receiver by proceeding from primary to secondary windings and from grid to plate of tubes, while listening to the signal. This identifies noisy volume and sensitivity controls and tubes.

Check noise pickup at antenna by using instrument as a comparison receiver.

Check signal at antenna coil.

Check signal at tube elements. (Open or shorted tuning condensers and coils.)

Check operation of r-f link circuits in triple-tuned transformers.

Check operation of antenna compensating condensers.

Check operation of oscillator control tube in AFC circuits.

Check presence of oscillator signal at mixer and oscillator coupling unit between separate oscillator and mixer tubes.

Check operation of oscillator circuit over r-f band in modern receivers with very low oscillator output. (Separate oscillator channel also serves to check oscillator circuits.)

Approximate frequency setting and check drift in oscillator circuits over the rf-if band.

Check for open rf-if by-pass condensers without removing the unit from the receiver chassis.

Check open coupling condensers in rf-if transformers.

Check for presence of more than one signal in r-f system.

Check for leakage of r-f signals into circuits where they do not belong.

Feed signal from r-f section of receiver to oscillograph for visual tests.

Check the frequency of the i-f signal being generated in a mixer tube when the receiver oscillator frequency is incorrect.

Determine the intermediate frequency when it is unknown.

Identify if the i-f system is out of alignment.

Check for signal leakage across i-f filter resistors and by-pass circuits.

Use instrument as a comparison i-f channel.

Check and adjust i-f wave-traps with accuracy.

Check for leakage of i-f signal into r-f or a-f.

Check operation of each winding of triple-tuned transformers.

Check i-f signal being fed to tuning indicator circuit, thereby establishing condition of coupling elements and rectifiers when used.

Check i-f signal being fed to AVC tube diodes or control grid.

Check discriminator transformer in AFC circuits.

Check by-pass condensers and filter circuits feeding tuning indicators. (Flutter in tuning indicators.)

Check signal level at i-f tube grids.

Check for leakage of i-f signal into AVC circuits and operation of AVC by-pass condensers. (Open condensers and poor grounds.)

Check operation of fidelity controls in i-f circuits.

Feed i-f signal to oscillograph for visual observation.

Check distortion in second detector or demodulator.

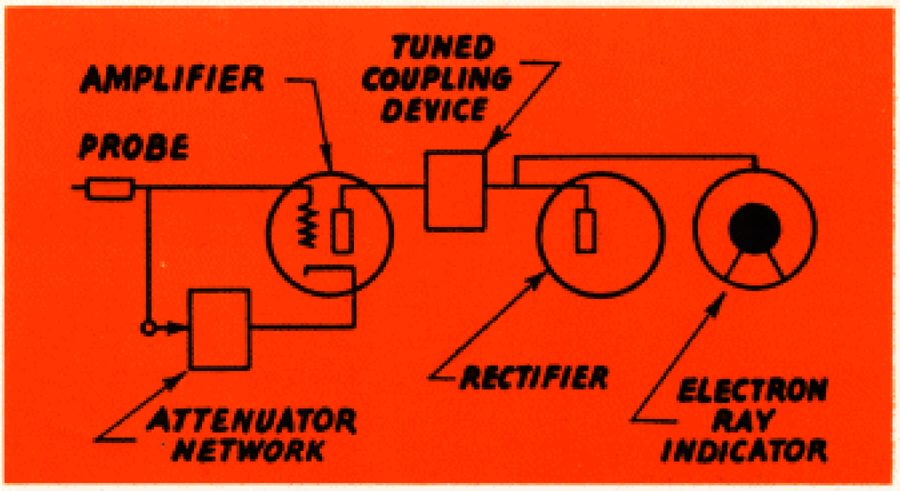
Check leakage of i-f signal into a-f circuit. (Hash and overloading.)

Strange as it may seem, the testing of open by-pass condensers without removing them from the receiver as mentioned in the list is not difficult. Neither is the test for poor ground connections a difficult one to make.

The OSCILLATOR CHANNEL

The oscillator channel employs three tubes; a tuned amplifier, a diode rectifier and the electron-ray indicator. Coverage of oscillator operation extends as high as 70 megacycles. The tuned amplifier used in the channel operates over three frequency bands: 600 kc to 1,700 kc; 1,650 kc to 4,900 kc, and from 4,800 kc to 15,000 kc. Pickup to the circuit is through a shielded cable which terminates in a capacitance of approximately 1 micro-microfarad. The input circuit is equipped with a gain control. (When checking for operation of oscillator systems without regard to frequency of the output, the electronic voltmeter channel is used.)

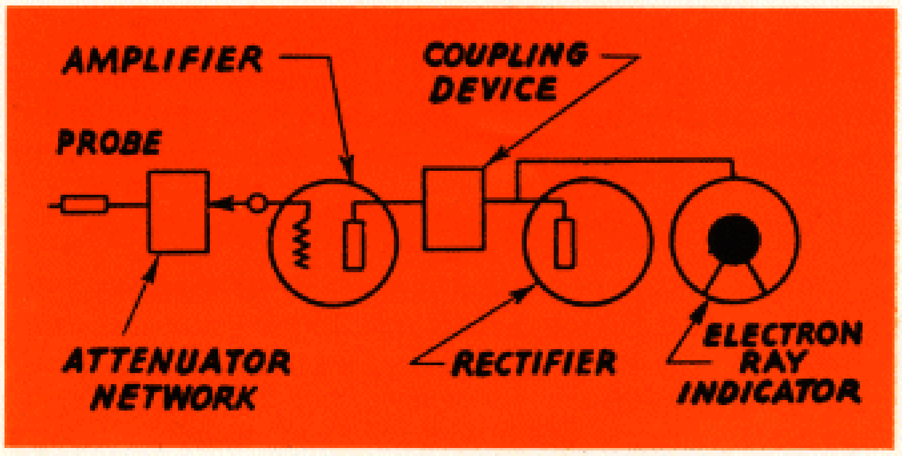
The oscillator channel supplements the RF-IF channel for checking of oscillators and is used when the RF-IF channel is in use, as in the case of intermittents or when it is desired to check oscillator circuits operating over the range of from 600 kc to 15,000 kc.



WHAT IT WILL DO...

Check level of oscillator output.
Approximate frequency of oscillator output.
Check operation of oscillator.
Check oscillator drift.

The AUDIO CHANNEL



The a-f channel employs three tubes: an amplifier, a diode rectifier and an electron-ray indicator. It is resistance-capacity coupled and flat over a frequency range of 50 to 50,000 cycles. The sensitivity of the amplifier is .1 volt for full indication and is operative over an input voltage range from .1 to 1,000 volts. A jack is provided in the output circuit of the amplifier so that the signal output can be fed to headphones or to an oscillograph for aural or visual observation. The continuously variable attenuator and a switch-controlled, single-step attenuator provides attenuation over a ratio of about 10,000 to 1.

The design of the channel is such that any pair of high-impedance phones may be plugged into the a-f channel jack. When a plug is inserted into this jack, the electron ray visual indicator is disconnected.

WHAT IT WILL DO...

Check hum and locate point of origin.

Check presence or absence of a-f voltages at any point in the audio amplifier.

Check distortion by picking off signal at any point and listening to signal through headphones or feeding it to oscillograph.

Check gain or loss in amplifier tubes.

Check gain or loss in coupling units.

Check level of signal at control grid or plate of amplifier tubes.

Check signal output of phase inverter tubes.

Check balanced input to pushpull stage. Signal voltage across each half.

Check balanced output from pushpull stage. Signal voltage across each half.

Permit channel to be used as output indicator.

Permit channel to be used as separate voltage amplifier.

Identify oscillating audio stage.

Check for noise in variable controls.

Check for noise in windings.

Check degenerative signal feedback.

Check open or shorted by-pass condensers in audio circuits.

Check poor ground connections.

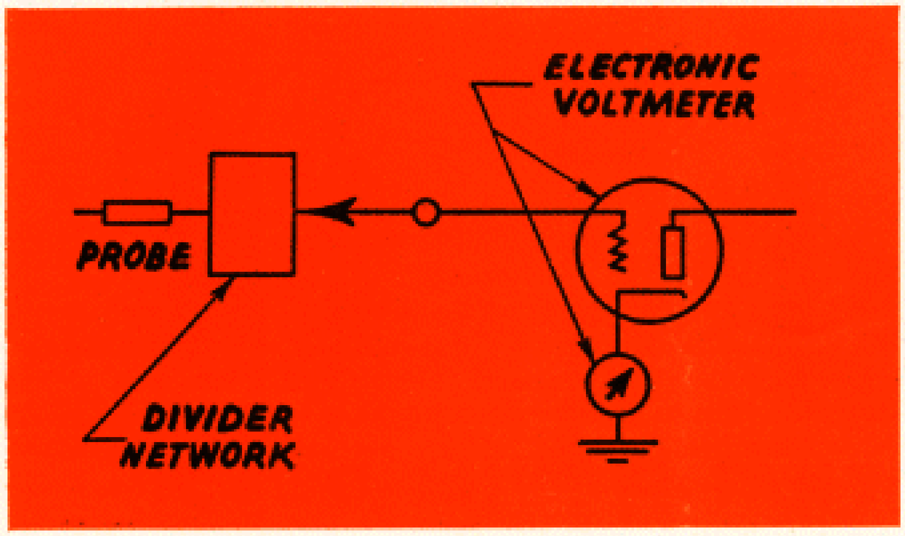
Check operation of audio filters.

Check operation of tone control.

Check operation of frequency compensation circuits.

The audio channel employs a single probe and this probe is placed in contact with the various points in the audio amplifier system. Of course, all the tests outlined are not made as regular procedure. Those which relate to the passage of the signal, such as level and character, are the routine operations. The rest are applied as the occasion demands.

The ELECTRONIC VOLTMETER



This voltmeter employs a tube and a meter-type indicator. As a result of design, it has a number of special features not found in other instruments. The meter has a center zero and indicates both positive and negative voltages with respect to ground. The range of voltages covered by the meter is as follows: −5 to 0 to +5; −25 to 0 to +25; −100 to 0 to +100; and −500 to 0 to +500. Each range is selected by means of a four-position switch. The input resistance of the instrument on all scales is 10,000,000 ohms, which means that on the low-voltage scale the resistance is equal to 2,000,000 ohms per volt. The over-all accuracy of the voltmeter is approximately 6 per cent. of the full-scale deflection. A single probe lead provides contact between the voltmeter and the point being checked. All d-c operating and control voltages may be measured with the instrument, thus making it possible to measure r-f, i-f, a-f, and oscillator voltages directly at the grid and plate without loading the circuit or interfering with the operation of the receiver. The voltmeter is thoroughly protected against damage from overload.

WHAT IT WILL DO . . .

Measure bias voltage applied to control grid of AFC control tube during operation.

Indicate alignment of discriminator transformer in AFC systems without breaking into any circuits.

Check characteristics and level of discriminator output voltage.

Measure AVC bias voltages direct at the control grid of controlled tubes with signal present in the circuit.

Check control characteristic of AVC circuit.

Measure rectified voltage in diode circuits.

Check for leakage in by-pass condensers along AVC bus.

Measure voltages in tuning flasher circuits with signal applied.

Measure all cathode voltages.

Measure leakage in coupling or blocking condensers.

Measure rectified voltage in triode and tetrode type AVC circuits.

Serve as output meter for alignment purposes.

Serve as indicator for signal input comparison.

Measure d-c power supply voltages up to 500 volts of either negative or positive polarity with respect to ground.

Measure bias cell voltages accurately. (*On 5-volt range resistance of meter is 2,000,000 ohms per volt.*)

Measure rectified voltage fed to tuning meter tubes.

Check overloading in audio circuits by measuring d-c voltage developed in grid circuit as the result of grid current.

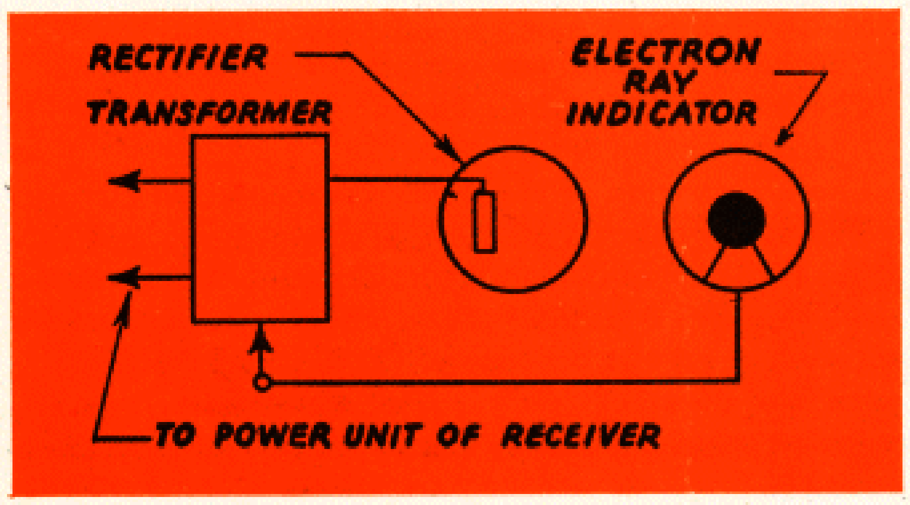
Measure distribution of AVC voltage along AVC bus.

Check operation of oscillator tubes by measuring rectified voltage developed across oscillator grid leak and ground. (*Voltmeter probe is placed upon control grid of oscillator tube.*)

Measure d-c operating potentials upon all elements of vacuum tubes without interfering with receiver operation.

In connection with the above mentioned measurements, one probe is used in conjunction with a common ground. Change in polarity does not require switching of voltmeter leads. Also the ground lead may be connected to a point other than ground when the measurement so requires.

The WATTAGE INDICATOR



The wattage indicator employs two tubes: a diode rectifier and an electron-ray indicator. It is calibrated to indicate the power consumption of the receiver under test and covers a range from 25 to 250 watts. This unit is automatically connected into the circuit when the receiver is plugged into the receptacle provided for that purpose. To obtain the amount of power consumed, the watt level pointer is turned until the shadow in the watt indicator is a minimum, the eye is just closed. The wattage then is read directly off the scale engraved on the panel.

INTERMITTENT RECEPTION • •

We all know that many aggravating hours are spent by servicemen in the effort to locate intermittent troubles in a receiver. The Chanalyst solves this problem by accomplishing that about which servicemen have dreamed for years—namely, knowledge of how far the signal is passing through the receiver when the intermittent develops.

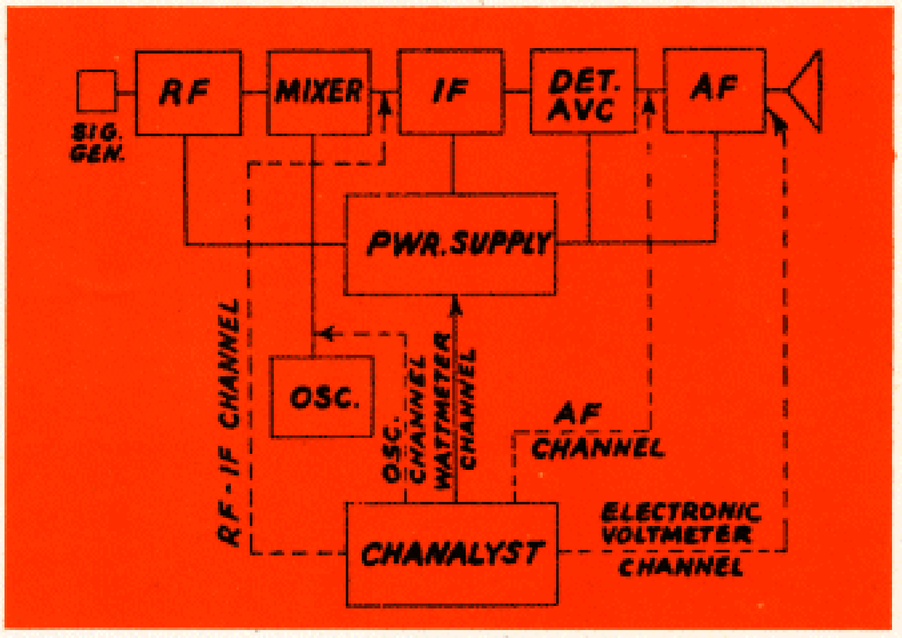
Speaking in generalities, the process of solving an intermittent is to divide the receiver into five major divisions and to monitor these divisions, as shown in the accompanying sketch. For example, the wattage indicator takes care of the power supply. The RF-IF channel can be used to monitor the r-f signal at the mixer or the i-f signal at the second detector or at one of the i-f tubes, if more than one is used. The oscillator channel monitors the receiver oscillator. The AF channel monitors the audio signal at the output of the second detector, which may be the volume control or the control grid of the first audio tube. The speaker is the second audio monitor. The Electronic Voltmeter can be used to monitor any one of the operating voltages or a control voltage, depending upon the symptoms being displayed by the receiver.

For example, if the intermittent seems to affect the control of the signal, then a control voltage at one of the control grids can be monitored. If the intermittent seems to affect the signal strength, then one of the operating voltages can be monitored. A signal is fed into the receiver from a test oscillator at some frequency, say 600 or 700 kc and the Chanalyst controls adjusted while the receiver is in operation.

When the intermittent develops, the Chanalyst indicators will show the status of the wattage consumption, the operating or control voltage at the point monitored, the r-f, i-f, oscillator and a-f signals. Interpretation of these indications will show how far the signal gets through the receiver. It may be necessary to move the r-f, i-f or a-f probe from one stage to the next after a fade—that is, when more than one r-f, i-f or a-f stage is used—but this can be done with the receiver in the intermittent state—and definite conclusions arrived at.

No doubt you will be interested in a specific example of how intermittents were located.

The receiver performed normally when first turned on. After 10 minutes the signal would fade out. If the receiver



was turned "off" for a few minutes and then turned "on" again, it performed normally and then, after 10 minutes, the signal would fade again . . . and so on.

The receiver was turned on and a 600 kc signal fed to the antenna. The r-f at the mixer was monitored. The oscillator circuit, a-f circuit, wattage consumption and the highest d-c voltage at the output tube of the receiver were monitored. The controls were adjusted and then we waited for the fade.

Ten minutes elapsed and as if by clockwork, the signal heard in the receiver faded out. The Chanalyst showed that the r-f signal at the mixer was normal. The wattage consumption was normal and the same was true of the d-c voltage at the screen of the output tube. . . . However, the "oscillator" indicator on the Chanalyst showed *no oscillator signal.* Then we checked the oscillator to establish if it was oscillating, by shifting the voltmeter probe from the output tube to the control grid of the oscillator. We found that the oscillator tube was oscillating, yet the Chanalyst indicator shadow was open. This meant one thing: the oscillator was functioning at a different frequency and the trouble was oscillator drift.

The time elapsed to make these tests after the first fade did not consume more than five or six minutes.

SPECIFICATIONS

• RF-IF CHANNEL
- Frequency Range . . . . 96 kc. to 1,700 kc.
- Frequency Calibration . . . . ±2%
- Circuit . . . . 3-stage T.R.F. Amplifier

• OSCILLATOR CHANNEL
- Frequency Range . . 600 kc. to 15,000 kc.
- Frequency Calibration . . . . ±2%
- Circuit . . . . T.R.F. Amplifier

• AUDIO FREQUENCY CHANNEL
- Frequency Range (calibrated control) . . . . 150 to 50,000 cycles
- Sensitivity . . . . 0.1 volt

• ELECTRONIC VOLTMETER CHANNEL
- Voltage Ranges . . 0-5, 25, 125, 500 D.C.
- Scale . . . . . . zero center with positive and negative deflection
- Input Impedance . . . . . . 11,000,000 ohms

• WATTAGE INDICATOR CHANNEL
- Output Indicator . . . . . . Magic Eye Tube
- Input Range . . . . . . 30 watts to 250 watts
- Accuracy . . . . . . ±15% (assuming 80% power factor of load)

• POWER SUPPLY 105 volts to 125 volts, 50-60 cycles, 60 watts

• TUBE COMPLEMENT
2 6K7; 1 6H6; 4 6E5; 1 76; 1 6X5GT; 1 6Q7GT; 1 6SK7; 1 6AC7.

• SIZE . . . . 9" x 16" x 10¾"

• SHIPPING WEIGHT . . . . 28 lbs.

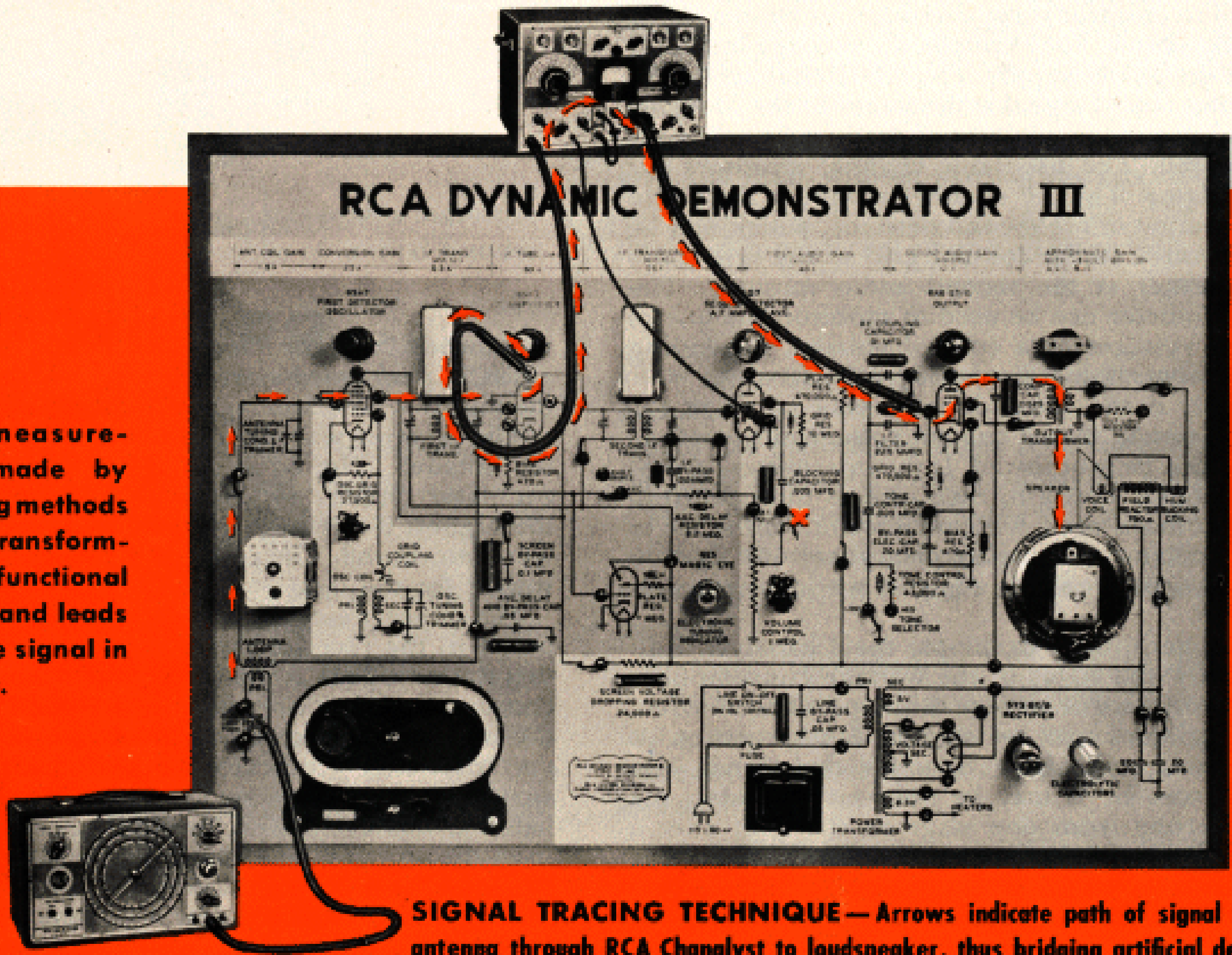
TYPE NO. 162-C

NET PRICE

$107.50

F. O. B. Camden, N. J.

With the CHANALYST
YOU CAN HEAR THE SIGNAL
anywhere in the set!



Dynamic gain measurements readily made by signal-level tracing methods—through tubes, transformers, etc. Permits functional checking of parts and leads for presence of the signal in all circuit sections.

SIGNAL TRACING TECHNIQUE—Arrows indicate path of signal from antenna through RCA Chanalyst to loudspeaker, thus bridging artificial defect.

If you want to listen to the signal in ANY part of the radio receiver, you can do so with the RCA Chanalyst. Simply plug in a pair of high-impedance headphones . . . or connect the output of the audio channel to the last receiver tube and speaker and you will be able to HEAR the signal picked up by the Chanalyst probes. By tuning in a local broadcast station and following its signal through the receiver you can locate quickly the precise stage where distortion first appears. You do not interfere with the operation of the set when you make these tests, no matter where you place the test probe. You do not introduce distortion by loading the circuit you test. You hear the signal just as it is wherever you test. You can hear and recognize distortion where it first becomes evident and thus localize the trouble. The headphones likewise may be used for localizing hum.

"Only RCA Builds the CHANALYST"

RCA TESTING AND MEASURING EQUIPMENT

RADIO CORPORATION OF AMERICA

RCA VICTOR DIVISION **CAMDEN, N. J.**

Trade Mark "Chanalyst" registered U. S. Pat. Off.

Form 1J8473 Rev. Printed in U. S. A.