

PROVEN IN USE BY MORE THAN 5,000 NRI MEN

# The CONAR Model 250 5-Inch WIDE BAND TV OSCILLOSCOPE



For servicing black and white and color TV receivers, AM-FM radio receivers, high fidelity amplifiers, industrial electronic equipment.

**CONAR**  
DEVELOPED



APPROVED

**BUILD IT YOURSELF!**

- Fun to assemble
- Gain valuable experience
- You save money

ORDER BLANK ON BACK

With many features found only in higher priced laboratory-type oscilloscopes

**KIT**

Model 250UK

**\$99.90**

**PAY AS**

**LITTLE**

**AS**

**\$5**

**A MONTH**

**WIRED**

Model 250WT

**\$139.50**

CONAR IS A DIVISION OF NATIONAL RADIO INSTITUTE.

# LOOK AT ITS FEATURES

## IT'S EASY TO ASSEMBLE

YOU can build the outstanding CONAR Model 250 Oscilloscope in just a few evenings. All parts are supplied including two etched circuit boards which greatly simplify and speed-up wiring. Step-by-step assembly instructions—read the step, perform the operation, check it off. It's just that simple.

## IT'S IMPRESSIVE

The cabinet is of sturdy heavy-gauge construction, dimensions 19" x 13 1/2" x 15 1/2". Panel is brushed aluminum with easy-to-read lettering, red and black control knobs, and time-saving "3-way" binding posts. Rubber feet are provided on bottom of cabinet to prevent marring table or bench. Strong steel carrying handles. Truly professional appearance as well as operation.

Many improvements and features incorporated in the Model 250 cannot be found in scopes costing several times as much. We have not spared time or money in bringing you what we believe to be one of the finest servicing Oscilloscopes available.

## YOU LEARN BY DOING

EASY to follow pictorial diagrams clearly show where each and every part belongs. You gain valuable practical experience plus a substantial dollar savings assembling this scope. You will agree it's a superb servicing instrument, professional in appearance and performance. Designed to meet your needs as a serviceman.

## Full Year Warranty On Parts And Labor

**DESIGNED** for your complete satisfaction. For color, black-white TV Servicing; AM-FM and transistor radios; high fidelity; industrial electronics.

**HIGH SENSITIVITY**—.023 (RMS) volts per inch; but not noisy. **READ PEAK-TO-PEAK VOLTAGES** directly. No calculations required.

**RUGGED CONSTRUCTION**; built to last. Truly professional appearance. **WIDE BAND RESPONSE**. No wave distorting transients. Actually shows 3.58 color burst.

**USES PHASE INVERTER TUBES** in horizontal and vertical push-pull output stages.

**SYNCS AND LOCKS EASILY**—with positive action—on any TV receiver signal. Traces TV signals; locates defective sync circuits.

**ACCURATELY MEASURES RIPPLE OUTPUT** of any power supply. Checks auto radio vibrators, yokes, coils, flybacks.

**VERTICAL AMP RESPONSE**—flat 13 cps to 2.5 mc down 1.5 db at 3.58 mc. **SWEEP RANGE**—10 cycles to 500 kc. Uses special CONAR linearity circuit.

**PLENTY OF BRIGHTNESS**. No need to turn off or dim lights to see trace. **PERFECT FOR SQUARE WAVE ANALYSIS** AND FM-TV alignment with a sweep generator.

## PROFESSIONAL PROBE SET



**\$17.70**

Even though most scope observations and tests can be made with ordinary test leads, special probes are necessary to get maximum use from an Oscilloscope. This Deluxe Probe Set, designed especially for use with the new Model 250, includes complete instructions, a sturdy convenient roll-up carrying case, detachable shielded cable, interchangeable probe tips and three probes: (1) High impedance—low capacity probe, (2) Crystal demodulator probe, (3) Resistive isolating probe, and (4) Shielded direct probe.



- Detailed assembly and operating instructions
- Clear-cut pictorial diagrams

## ADDITIONAL SPECIFICATIONS

### Vertical

**Sensitivity**: .023 VRMS after internal calibration is adjusted.

**Frequency response**: Flat from 13 CPS to 2.5 mc. Down .05DB at 11 CPS. Down 1.5DB at 3.58mc (color burst frequency). Down 3.5DB at 4.5mc.

### Horizontal

**Sensitivity**: 1.0VRMS.

**Frequency response**: Flat from 20CPS to 90 kc. Down .8DB at 12 CPS. Down 3DB at 250 kc.

**Uses 10 tubes**, many dual, giving equivalent of 19 tubes. Rise Time .05 ms.

**Sweep Frequency**: 10 CPS or less to 500 kc or more.

**Push-Pull on-off switch** (does not upset brightness, focus, or astigmatism adjustments). Operates from 110-120 volts 60 cycles and is fused. Cannot be operated from DC or on 25 cycle sources.

# CONTAINS BUILT-IN FLYBACK CHECKER

## YOU SAVE \$40 TO \$70

The CONAR Model 250 scope can be used by itself to check the horizontal output transformer, yoke, width coil, linearity coil or ringing coil while a TV receiver is turned off. Troubles in these parts are often difficult to spot. An open can of course be checked with an ohmmeter but a shorted turn, a shorted layer or a resin joint present a problem which cannot be conclusively solved with an ohmmeter. The usual procedure is to install a new part which is not only expensive but time consuming, or you could use a separate flyback tester which sells for from \$40 to \$70.

If a short duration pulse is supplied to the part in question it will be shock excited into oscillation and a damped wave will be set up in the part. This may be seen with an oscilloscope.

coupling capacity required. There will be no danger of a shock if you touch the Z AXIS post and the metal scope panel. To check horizontal coils, yokes and output transformers, connect a lead (a length of solder will serve) between the Z AXIS and vertical input posts. Clip the ground lead of the scope to one end of the part and a lead from the vertical binding post to the other end of the part. Adjust the Sweep Selector, Fine Frequency, Vertical Attenuator, and Gain controls to produce a damped wave on the screen of the CRT. If the component is good you will see a wave like the one in Fig. 1A. If the part is defective but not open, the wave shape will appear as shown in Fig. 1B. If the part is completely shorted there will be no vertical deflection—only a horizontal line. Adjust the horizontal

## ADVANCED DESIGN NEW CIRCUITRY

CONAR ENGINEERS worked more than a year perfecting the design of the Model 250. We went to great lengths to produce just another outstanding kit, a copy of a manufacturer made or duplicate of some of the best service men find trouble was thoroughly investigated, and many errors were not set in stone earlier work.

We used characteristics, exceptionally features, and corrected them in designing the Model 250.

Here are the constructor's most important alterations to many current kit and manufacturer flaws which we have worked out and which make it the Model 250.

1. The traces produced on most scopes are light and specifically disappear under normal bench lighting conditions when the sweep frequency, the vertical gain or the horizontal gain increase. The average kit or manufacturer scope sets less than 1000 volts on the deflection ray tube. Scopes designed this way will not be able to handle the high voltages of the other portion. It is required to give the necessary deflection of the beam.

We solved this in the Model 250 by using 2000 volts on the CRT and decreasing our own new vertical and horizontal amplifiers. The CRT trace will not disappear with increase in sweep frequency or vertical/horizontal expansion. It's not necessary to adjust the CRT trace when lighting—on many scopes using lower CRT voltages.

2. The only satisfactory way to measure peak to peak voltages and know you are checking the correct wave shape is with an oscilloscope. It is impossible for any VTVM to measure a portion of a complicated wave shape and compare it to another peak or valley of the same wave. With the average scope built by a manufacturer can become a cumbersome, time consuming procedure. This can be done cheaply, remove the front probes from the set and the scope, feed a special measuring signal into the scope, adjust the vertical gain control to give a trace of a predetermined height. Now you measure the probe, read off the set and in the scope and adjust the attenuator only to prevent a deflection of one inch or so. This procedure must be followed each time you wish to measure a voltage with the average oscilloscope. The measurement of the deflection of the scope vertical gain which means the full gain of each scope need not be the same.

This problem was solved by calibrating the vertical gain control for 5000T readings of peak to peak voltages.

To measure peak to peak voltage of a signal with the Model 250 the vertical gain control and the vertical attenuator are adjusted to produce any deflection up to 2 inches. A one inch deflection completes another new feature.

For example, with a 1 inch deflection the vertical gain control may be at 2 and the vertical attenuator may be at 200. The voltage you are measuring is 2 x 2 x 100 = 400 volts peak to peak—that's all there is to it. With a deflection of 1.8 inches the peak-to-peak voltage would be 1.8 x 2 x 100 = 360 volts.

3. Most scopes have poor linearity of low frequencies. Improved linearity in the Model 250 gives good reproduction of low frequencies and does not limit the production of high frequency sweep signals.

4. It is difficult to spot many scopes on TV receiver signals and even more difficult to get the traces to stay locked in. Often, the sweep frequency and sync control of the set are adjusted at the same time and the operator must keep his hand constantly on the sync control, restricting to some the display set still. This is a sign of the constructor's major headaches in using a scope.

Again, CONAR engineers solved the design problem. We have since made others of the 250 TV Oscilloscope to show the horizontal sync pulses and video signals produced at the set, given at the same time and in color. These pulses are the most difficult to lock in. Switching from one channel to another, the signal repeated on the scope screen without fiddling with the CONTROLS.

5. On some service type oscilloscopes, the traces line often show and confuse the display at high frequencies.

We corrected this by using a fine stage before blanking amplifier which gives 100% waveform blanking of all frequencies produced by the 250 sweep generator.

6. Model 250 "Push-Pull" outputs are balanced by means of three transformer leads in both the horizontal and vertical amplifiers.

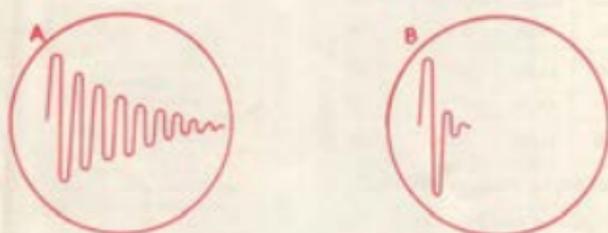


Fig. 1. Waveform produced by a good component, A; and waveform produced by a defective component, B.

If there is a shorted turn or other defect in a coil which has continuity only a few cycles of the wave train will exist. If the part is open the scope will just pick up and exhibit a 60-cycle signal.

More service men would test, rather than blindly replace TV horizontal parts, but most owning a scope do not have a device which will produce a sharp pulse of the correct frequency to shock excite the part under test. Many do not feel that a large investment for a fly-back yoke tester is justified.

Owners of the Model 250 scope are indeed fortunate since with a slight modification they can obtain exactly the right pulse from the Z AXIS binding post on the front panel of the scope.

The Z AXIS post must be capacity coupled. Instead of wired, to the output of the blanking amplifier at terminal 11. This straight wire connection is shown by dotted lines in the scope schematic. If the circuit is wired-in, remove the wire. Connect four inches of insulated hookup wire to the Z AXIS solder lug and another four-inch length of insulated hookup wire to terminal 11. Twist the free insulated ends together. Clip off any excess over three or four turns. There should be no strain on these leads due to the twist connection. Do not let the bare ends touch each other. The twisted leads give the small

sweep frequency of the oscilloscope according to the following table.

COMPONENT	SWEEP RATE
Width coil	1-10 kc
Horizontal linearity coil	1-10 kc
Horizontal output transformer	100-1 kc
Deflection yoke	1-10 kc
Receiver deflection circuit with yoke connected	1-10 kc
Receiver deflection circuit with yoke disconnected	100-1 kc

The Fine Frequency will be set to show the individual cycles of the damped wave train. The Sync should be set to + or -. The complete horizontal deflection system of a TV receiver can be checked by removing the plate cap of the horizontal output tube and connecting the oscilloscope probe (use direct probe if you own the probe set) to the cap lead of the transformer. The grounded lead of the probe is clipped to the receiver chassis (B— in AC-DC sets). One shorted turn in any of the horizontal sweep components will produce the short damped waveform in Fig. 1B which is characteristic of a defective component. The effect of a shorted turn can be seen by shorting the filament winding of the horizontal output transformer while observing the wave shape on the scope. Remember, the receiver must be turned off while making these tests.

**USE THIS CONVENIENT BLANK TO ORDER YOUR OSCILLOSCOPE**

**CONAR** instruments, division of  3939 Wisconsin Avenue, Washington, D. C. 20016

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	250 wired with Probe	157.20	16.00	12.00	15.00	8.00	23.00
	250 Probe only	17.70	Cash Only (add 75¢ for Postage & Handling)				

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