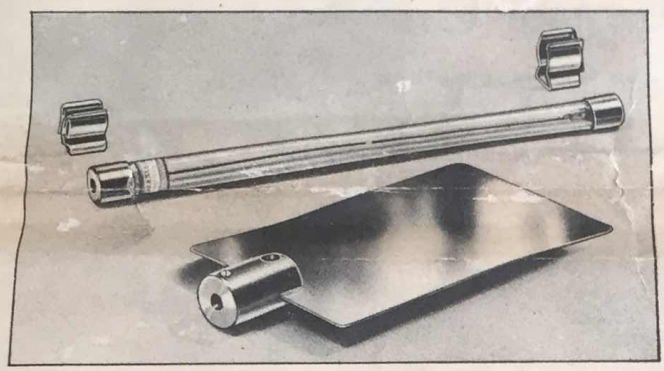
DIRECTIONS

NEON OSCILLOSCOPE TATTELITE

"tells the tale"



FULL DIRECTIONS FOR BUILDING and OPERATING THE OSCILLOSCOPE will be found on the inside pages of this folder in the reprint from QST, October, 1935 issue.

It is difficult to give dimensional data about the box for housing the oscilloscope without knowing the size of the motor which will be used. As a rule, the user will want to use a motor that is readily available and make the box of materials on hand. The resourceful "ham" will have little difficulty in planning these parts to suit his own particular needs. Any series motor may be used, but very small "flea-power" motors do not give a good uniform speed which is important. The variable resistance for speed control should be about twice the resistance of the motor.

The adapter is made of brass and has a 1/4" diameter motor shaft hole. It can easily be drilled out to as much as 1/2" if necessary.

If it is desired to use the oscilloscope for viewing wave form of equipment having low power output, such as radio receivers, a small audio transformer in series with the plate of the last tube is necessary. In using the tube alone for other purposes, the operating voltage must be at least equal to the breakdown voltage of the tube, and the current should be limited by resistance or impedance to about 10 milliamperes. See Data and Characteristics on inside page.

Manufactured by

SUNDT ENGINEERING CO.

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A Simple Neon-Tube Oscilloscope for Amateur Use

An Inexpensive Means for Checking 'Phone Modulation

By D. H. Vollmer,* W6CQH

REALIZING that the QRM conditions in the amateur bands could be improved a lot if a means was provided for the fellows actually to see their signals (particularly the 'phones) with apparatus that would not cost too much, a simple oscilloscope was designed which would respond to *all* of the required frequencies, without using an expensive cathode-ray tube.

Knowing that a neon tube responds to voltage changes with negligible lag, and that the so-called "Tunalite" (neon column tube) would serve the purpose if it would only show both sides of the wave, a neon tube was made up which would start its glow in the center and increase the glow both ways from center in proportion to the r.f. voltage rise. Fig. 1-A is a drawing of the tube. It has a diameter of ⅜ inch, length 4 inches. The electrodes entering from each end are slightly separated at the center. Now when this tube is connected to the output tank of a transmitter, as in Fig. 1-B, any change in carrier amplitude will cause corresponding changes in the height of the glowing column. But the trouble here is that, though the glow column is constantly changing, it appears to the eye not to be changing, because the changes up and down are on top of each other. To get around this trouble, it was found that by viewing the neon tube in a mirror rotating on an axis parallel to the axis of the tube, the image of the tube would appear to slide across the mirror (which might be called the screen), giving a sort of linear sweep. This solved the problem.

The speed of the rotating mirror required was surprising when actually tested, because it does not need to turn nearly as fast as at first thought, four or five hundred revolutions per minute being fast enough for checking even the highest audio frequencies. Synchronizing is a simple matter of adjusting the mirror driving-motor speed.

The photographs and diagram of Fig. 2 illustrate the construction and arrangement of the unit. The upright that holds the tube is a piece of ¾-inch wooden dowel, the front panel is Pressdwood (Masonite), the rest of the cabinet is sheet metal. The neon tube is mounted about 1½ inches from the side of the metal cabinet; thus the metal does not disturb the operation of the tube.

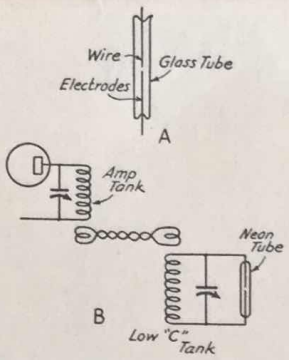
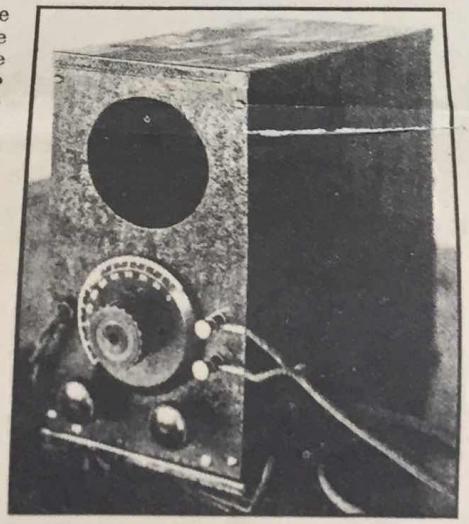


FIG. 1—THE ELECTRODE ARRANGEMENT IN THE SPECIAL NEON TUBE IS SHOWN BY A, WHILE B SHOWS THE CIRCUIT CONNECTIONS FOR R.F CHECKING



CHECKING THE MODULATION OF THE 'PHONE TRANSMITTER IS JUST ONE OF THE JOBS THAT THIS HOME-MADE NEON-TUBE OSCILLOSCOPE CAN DO

The "picture" is viewed through the hole in the front panel. The dial controls the rheostat used to adjust speed of the motor.

The tuning condenser is a Pilot midget (100-μμfd.) mounted inside the coil; the knobs on the panel control an off-on a.c. switch and speed regulating rheostat for the motor. The motor is a "Polar Cub" fan type, but almost any small series motor can be used, even down to one from the lowly electric automobile horn.

In operation, the neon tube's tank is tuned to frequency of transmitter, the amount of coupling (with link) adjusted until the glow

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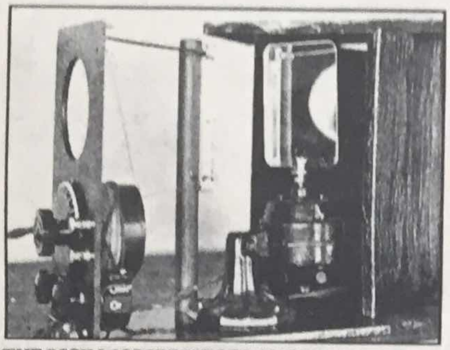
runs about ¾ of an inch each way from center of tube. When viewed in the rotating mirror, the unmodulated carrier wave appears as a ribbon 1½ inches wide. The edges of this ribbon will be very clean-cut and definite, providing no a.c. is



THE OSCILLOSCOPE PULLED OUT FROM ITS CASE, SHOWING THE SPECIAL NEON TUBE MOUNTED SLIGHTLY LEFT OF CENTER

The small fan motor, adapted to driving the mirror, is mounted behind it.

modulating the carrier and neutralizing is complete. A.c., or r.f. and a.f. feed-back, will show up as modulation lumps on the carrier band.

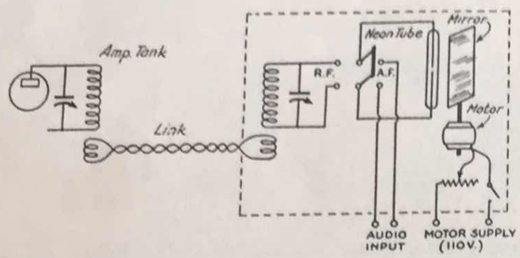


FIG 2—SCHEMATIC ARRANGEMENT OF THE OSCILLOSCOPE UNIT DESCRIBED IN THE TEXT

When audio modulation is applied as in a 'phone, a direct view of the wave form is obtainable, 100% modulation being easily recognized as with a cathode-ray oscilloscope. Insufficient r.f. excitation to the modulated stage is also very apparent.

Instructions for building this type of oscilloscope have been passed around to several Southern California hams, who have them in operation now and say that it has their complete indorsement, and that they would not take 50 bucks for theirs if they could not get another.

THE OSCILLOSCOPE TATTELITE TUBE

Miscellaneous Data and Characteristics:

Overall length 6 inches.

Total electrode length, both sides, 4" approx.

Color - Neon Red.

Breakdown or firing voltage on DC about 200 V. Breakdown on AC depends on wave form, and on sine wave is about .7 of DC value. The tube glows on much lower voltages above about 5,000 cycles per second. Very low r.f. voltages produce a glow. Only the negative electrode glows on DC.

Maximum current-steady load-10 m.a. Limit current to this value on experimental work by either a series resistor or impedance. If the color of the tube should be spoiled by overheating, it may be aged back to color by applying 5 to 10 mils A.C. through the tube for 3 or 4 hours.

Life - about 1,000 hours. Continuous overloading will greatly shorten the life of the tube. Overloading will also cause sputtering and darkening of the glass.

IMPORTANT:

This is a special item, and continued production is not anticipated. Orders filled in the order received. Early action is advised to secure delivery within one week.

IF YOUR JOBBER CANNOT SUPPLY YOU, THE ORDER BLANK BELOW IS FOR YOUR CONVENIENCE.

- -

To: LITTELFUSE LABORATORIES,
4238 Lincoln Ave., Chicago, Ill.

Gentlemen:

Please enter my order for ______ Oscilloscope Tattelite Kits, complete, with mounting clips and mirror at $2.00 each, amateur's net price, prepaid, and for which I enclose $________. (See note below.) Ship to address on reverse side. My call letters are____________.

I am remitting by: money order; check; cash.

Note: $1.00 deposit must accompany C.O.D. orders and postage will be added to order. Personal checks, not certified, will be allowed to clear bank before shipment is released.

USING YOUR OSCILLOSCOPE

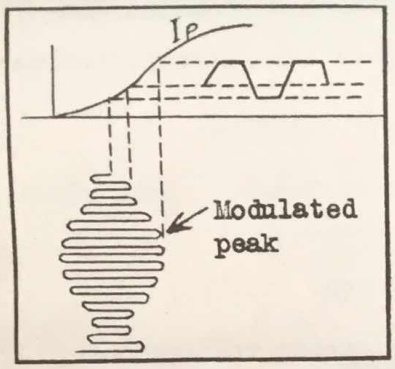


Fig. A. Showing distortion due to excessive signal strength or poor tubes.

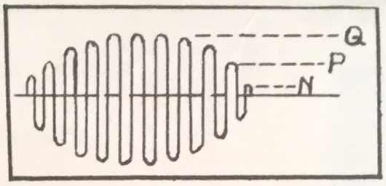


Fig. B. Showing 100% modulation.
Q = Max. carrier current.
P = Normal unmodulated current.
N = Lowest peak current.

For 100% modulation NQ should equal twice NP.

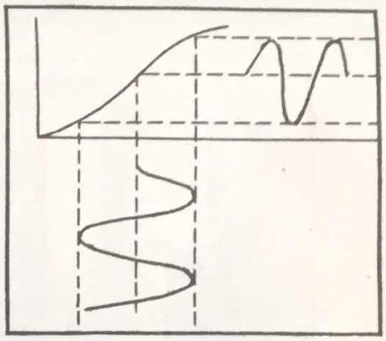


Fig. C. Showing too low grid bias. Distortion appears as one side of cycle longer than the other.

HINTS ON OPERATING THE OSCILLOSCOPE.

Best results are obtained by using low motor speeds.

Mount motor securely to avoid vibration which produces blur.

Due to fan action of the mirror, it should be enclosed; external air currents will vary the motor speed.

Very tight or misaligned clips may cause tube breakage, due to strain. Snug, but not loose, is best.

Have a good motor control.

Practice makes perfect.

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ANNOUNCEMENT

NEON OSCILLOSCOPE
TATTELITE KIT

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