



Service Scope

USEFUL INFORMATION FOR USERS OF TEKTRONIX INSTRUMENTS

AUGUST 1960

COPYRIGHT 1959 TEKTRONIX, INC.

PRINTED IN U. S. A.

DOES THE SQUARE WAVE RESPONSE OF YOUR SCOPE LOOK LIKE THIS?

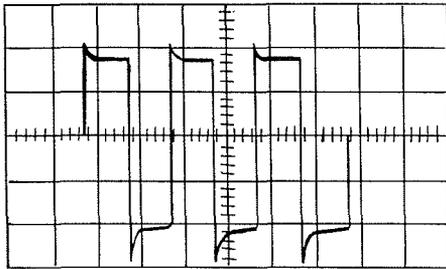


Fig. 1

OR LIKE THIS?

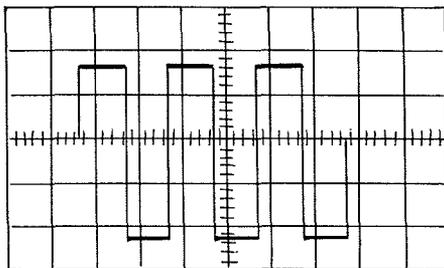


Fig. 2

Unless the squarewave response of your scope resembles the waveform shown in Fig. 2....better keep reading!

A condition known as cathode interface can gradually develop in the vertical amplifier tubes of any oscilloscope, causing degeneration of medium and low frequencies....leaving an overshoot on the leading edge of fast-rise (2 μ sec or less) squarewaves (see Fig. 1).

Low frequency degeneration is caused by the series resistance (50 ohms or more) of an interface layer of chemical impurities that forms between cathode sleeve and the barium oxide cathode coating.

Leading edge overshoot is caused from the by-passing effect of the capacitance (.005 μ f or greater) between oxide coating and cathode sleeve.

NOTE: In a true sense, this is not a pure capacitance, as the electronic action within the interface layer (serving as the dielectric) is highly complex.

The rate at which an interface layer forms within a tube is a function of cathode temperature, number of hours the tube is used, average cathode current, and the amount of impurities originally present in the cathode sleeve material. For example, high cathode temperature, long hours of operation, a high percentage of impurities in the nickel used to make the

cathode sleeve, and a low cathode current flow will hasten the formation of the impurities layer...in many tubes the time required is less than 500 hours.

However, a sizable current flow through the tube tends to minimize the effective formation of an interface layer by penetrating the accumulated impurities with random low resistance current paths (holes) between nickel sleeve and barium oxide coating.

Evidently, interface will manifest itself in any instrument employing vacuum tubes to either display or generate fast-rise square waves. We can assume that since a tube in operation can form an interface layer in less than 500 hours, instruments in operation 8 hours a day should be checked for evidence of this defect every 30 to 60 days, or at least every 500 hours of operation.

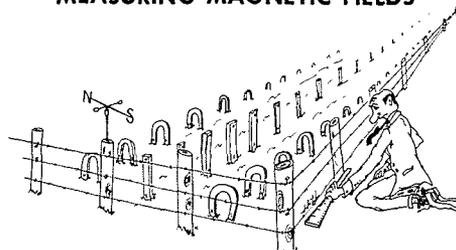
To check the vertical amplifier of an oscilloscope for indications of cathode interface, feed in a fast-rising square wave of about 500 kc. Set the sweep rate to display several cycles. If an overshoot of about $\frac{1}{2}$ microsecond time constant is apparent, some of the vertical amplifier tubes have probably developed cathode interface. For absolute proof, plug the oscilloscope into an ac power source with a variable control. An increase in the output voltage of the power source will increase heater voltage and **reduce** overshoot caused by cathode interface. A decrease in the output voltage of the power source will decrease heater voltage and **increase** overshoot due to cathode interface.

The only cure for the problem caused by cathode interface is replacement of the offending tubes.

The entire instrument should be checked and recalibrated at least every six months. Only through periodic maintenance, can the full usefulness, accuracy, and dependability built into Tektronix oscilloscopes be realized.

Earl Anderson
Customer Service Staff
Tektronix, Inc.

MEASURING MAGNETIC FIELDS



Suggested reading for those people interested in the measuring of magnetic

fields, is the article "Wavemeter, Oscilloscope Measure Magnetic Field By Paramagnetic Resonance". This informative article, which appeared in the December 1959 issue of ELECTRICAL DESIGN NEWS, claims an accuracy of ± 0.06 percent in measuring the gap flux density of a magnet by the method described in the article. A further advantage claimed for this new technique over conventional methods is the speed with which these measurements can be made.

TYPE 502 TRIGGER AMPLIFIER TUBE PROTECTION

Here is a simple modification to protect the Type 502 trigger amplifier tube (V24) from high amplitude signals when used with external trigger input.

Locate R10, a 1-meg, $\frac{1}{2}$ -watt, 10% resistor. This resistor runs from ground to a point on the TRIGGER SELECTOR switch. From this point a wire strap connects to the PLUS-MINUS switch. Replace this strap with a 470-k, $\frac{1}{2}$ -w, 10% resistor shunted by a .001- μ f, 500-v discap.

Type 502's with serial numbers above 623 do not require this change.

SUGGESTED READING

For an excellent discussion on the connection between bandwidth and frequency response, composition of rise-time and other details associated with square wave testing, see Vol. 18, Radiation Laboratory Series, "Vacuum Tube Amplifiers" (McGraw-Hill)

HOT SCOPE!

Tektronix Field Engineer Hal Dosch reports he has received word from Naval Intelligence that a Tektronix Type 515A Oscilloscope, S/N 3645 is missing from the U.S. Navy Electronics Laboratory at San Diego and has apparently been stolen.

If you should see this instrument, know of its whereabouts, or have any information regarding it, contact the nearest office of the Naval Intelligence Department immediately.

TYPE 536 AMPLIFIER MODIFICATION

A modification kit, to convert the type 5894 tubes in the Type 536 vertical and horizontal circuits to type 6340's is available. This conversion, which provides improved reliability and simplifies tube

Tektronix, Inc.
P. O. Box 500
Beaverton, Oregon

USERS OF TEKTRONIX INSTRUMENTS
USEFUL INFORMATION FOR

Service Scope

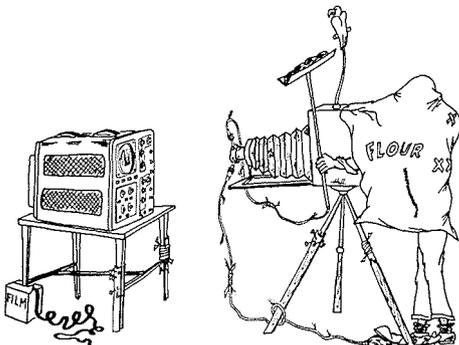


BULK RATE
U. S. POSTAGE
PAID
Portland, Oregon
Permit No. 740

replacement, is applicable to instruments with serial numbers below 615. Instruments with serial numbers above 614 have been factory converted to use the type 6340 tubes. The kit contains: two wired tube socket mounting-plate assemblies, one step-by-step check-off instruction booklet with photos, schematic and parts list, all other components and hardware required in the conversion.

Ask your Tektronix Field Engineer for Type 536 VA-HA Tube Conversion Modification Kit No. 040-192.

OSCILLOSCOPE PHOTOGRAPHY



A bulletin intended as a practical guide to the photography of traces on the cathode-ray tube of Tektronix 5-inch oscilloscopes is available. This is a revised and up-dated edition of a former bulletin many oscilloscope users found helpful. Suggestions are offered and some of the topics discussed are: Polaroid-Land* films, exposure guides and how to photograph different types of traces.

Ask your Tektronix Field Engineer for FIP-3, "Notes on The Practical Photography of Oscilloscope Displays."

*Polaroid is a registered trademark of the Polaroid Corporation.

THIS 'N THAT

Occasionally the graticule studs on a Tektronix 5" oscilloscope work loose. You can replace these with a tapped stud

Ask your Tektronix Field Engineer for:

Tek No.	Description	Price
355-043	Replacement graticule stud	N/C
212-507	Screw, 10-32x3/8" BHS	N/C
210-010	Lockwasher	N/C

We do not recommend the operation of a Tektronix Plug-In Oscilloscope with the side panels removed. The fan will not distribute air properly to the plug-in pre-amplifier area when the side panels are not in place. Continued operation of the instrument under these conditions will decrease tube reliability.

Sometimes on the older Type 524 instruments it is difficult to time the .1 μ sec/cm sweep range. Tektronix Field Engineer Hal Dosch offers this suggestion to correct the difficulty: Be sure the horizontal sweep amplifier is properly compensated. Then, if adjusting the variable capacitor C231A will not bring the .1 μ sec/cm sweep into range, try reducing or shorting out R274. This 1.5-k, $\frac{1}{2}$ -w, 10% resistor is in series with C231A.

USED INSTRUMENTS WANTED

1 Type 524	Larry Hine 120 Elmwood Place Shearill, N. Y.
1 Type 310 or 310A	J. M. Gottschalk 108 Charles Drive B-2 Bryn Mawr, Penn.
1 Type 541 or 541A and CA Plug-in Unit	D. A. Nina Elion Instruments 701 Canal Street Bristol, Pa.
1 Type 515A or 503	Jack Holcomb MacLeod Instrument Corp. Micro-Dyne Division 4250 N.W. 10th Avenue Ft. Lauderdale, Fla. Phone: LO. 4-8518

1 Type 515 or 535/CA	Norm Haugen Communitronics 2012 Longwood Road West Palm Beach, Fla. Phone: TE. 3-8320
1 Type 530 Series or preferably 540 Series	John Sutherland 2706 21st Avenue S. Seattle, Wash.
1 Type 524	James Scharman Alvarado TV Co., Inc. Albuquerque, New Mexico
1 Type 514	H. L. Ziegler 275 Middle Street East Weymouth, Mass.
1 Type 511 or 514	Jim Williams 4424 Juniper Avenue Wichita 16, Kansas
1 Type 514	E. J. Crossen 81 Cherry Lane Levittown, Penn.
1 Type 514 or 531	Herbert L. Rosenblatt Dept. 694, Burroughs Corp. Great Valley Labs. Paoli Penn.
1 Type 514 or 531	H. Stuart Dodge Reliability Dept. Burroughs Corp. Great Valley Labs. Paoli, Penn.

USED INSTRUMENTS FOR SALE

2 Type 511AD S/N 3690 and 3692	C. W. Penque Sperry Products Co. Danbury, Conn.
1 Type 511A S/N 4544	Larry Garcey Electronic Transiston North Bergen, New Jersey
1 Type 515A S/N 2298	Gilbert Levy Semi-Con Electronics River Road Edgewater, New Jersey