



# Service Scope

USEFUL INFORMATION FOR USERS OF TEKTRONIX INSTRUMENTS

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## NEW TRIGGER-CIRCUIT ADJUSTMENT METHOD

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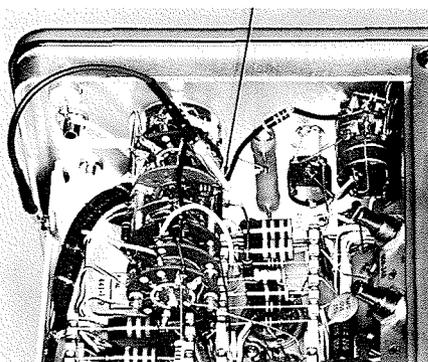
We present here a new method of adjusting the trigger circuits in the Tektronix Type 530/540 and Type 530A/540A Series Oscilloscopes having a PRESET position for the STABILITY control. It is fast, simple and accurate and requires a minimum of equipment (a screwdriver, and one or two jumper leads). Normally it does not require any "adjust this while tweaking that for minimum this." It also provides a check on the tubes in the circuit. Try it; we think you'll become a convert.

This method also works on the Type 316, s/n's 1298 and up; Types RM16 and RS 16, s/n's 900 and up; Type 317, s/n's 900 and up; Type 516, 551, 555, all s/n's; and Type 515A, s/n's 5309 and up. It will not work on a trigger circuit which has no Trig. Sens. adjustment.

In the procedure that follows, the completely capitalized terminology refers to controls or switches located on the front panel of the instrument. Terminology with only the first letter of each word capitalized refers to adjustment controls located within the instrument.

1. Set the PRESET ADJUST by the standard method. (Set the TRIGGERING MODE to AUTO and the TIME /CM switch to .1 millisc. Set the STABILITY to the PRESET position. Set the PRESET ADJUST control halfway between the points where the trace first appears and where it brightens.) Position this trace to the vertical center of the graticule, you'll need it there later. Leave the STABILITY control in the PRESET position for the rest of this procedure.
2. Set the trigger controls to EXT., either + or -, and AC. Ground the junction of the two resistors in the time base trigger circuit as indicated in the following chart:
 

Oscilloscope Type	Resistors
530/540 Series	R16 and R17
530A/540A Series	R19 and R20
551	R19 and R20
555	R19 and R20
316	R426 and R427
317	R426 and R427
515A	R24 and R25
516	R20 and R21
3. Turn the TRIGGERING LEVEL control fully clockwise. You may or may not get a trace on the crt screen.



In the figure above the arrow points to the junction of the two resistors and shows the grounding jumper referred to in step 2. (Instrument: Type 533A. Resistors: R19 and R20).

4. Set the Trig. Level Centering adjustment to the center of the region which makes a trace appear on the screen. (If you can't get a trace by manipulating the Trig. Level Centering adjustment, the trigger Schmitt circuit is not working properly.)
5. Turn the TRIGGER SLOPE switch (TRIGGER SELECTOR on some instruments) between + EXT. and - EXT. and readjust the Trig. Level Centering adjustment, if necessary, to get a trace in both the + and - positions. If you can't, the trigger amplifier circuit is not operating properly (probable cause; a gassy tube).
6. Set the triggering controls to INT., either + or -, and DC. The trace will probably disappear.
7. Set the Int. Trig. DC Level adjustment to the center of the region which makes the trace appear on the screen. This region will probably be very narrow.
8. Remove the grounding strap you connected in step 2, and position the TRIGGERING LEVEL control until the trace reappears. The white spot on the knob should then be at or very near the top (opposite the "O" on the front panel). If it is not, loosen the Allen set screw in the knob and position the knob properly.
9. Turn the Trig. Sens. adjustment counterclockwise until the trace just disappears and then about 45 degrees further counterclockwise. This will

provide adequate triggering capabilities for most uses and will probably put the scope within factory triggering specifications. If you want to make sure, go on to steps 10 and 11.

10. Set the triggering controls to EXT., either + or -, and AC. Set the AMP-LITUDE CALIBRATOR to .2 volts and connect the CAL. OUT to the vertical INPUT. Set the VOLTS/CM switch to .1 or .05.
11. Turn the Trig. Sens. adjustment counterclockwise until the trace disappears and then clockwise just far enough to get proper triggering in both the + and - EXT. positions. If the scope won't trigger in both the + and - positions, touch up the Trig. Level Centering adjustment until it does.

Theory: In step 3, you are setting the trigger Schmitt to free run when the dc voltage on its input grid matches its inherent hysteresis level. In step 4, you are setting this hysteresis level to match the dc level of the trigger-amplifier output plate with both grids at zero volts. In step 5, you are checking the trigger-amplifier tube for gas under much more rigorous conditions than would ever be present in normal scope use (one grid to ground through 1 meg, the other grid to ground through 47 ohms). In step 7, you are setting the Int. Trig. DC Level adjustment to the point where the vertical amplifier places zero volts on the trigger-amplifier grid when the trace is centered on the screen. In step 11, you are adjusting the circuit so that it will trigger on 0.2 volt external but not on much less than that. (The hysteresis gap closes as the Schmitt tube ages; if the Trig. Sens. is set too sensitive, you may be adjusting it again next week.)

## GREASE-OFF

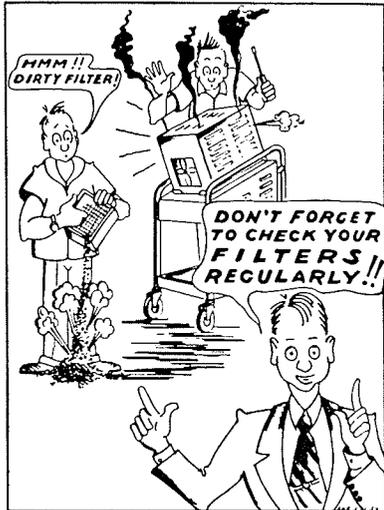
In the August '62 issue of Service Scope we referred to an air-filter cleaning agent called "Grease-Off", a product of the Garden Products Company of Two Rivers, Wisconsin. Several customers have written to us or our Field Offices asking for a more complete address for this concern. Here it is:

Garden Products Company  
3914 Monroe Street  
Two Rivers, Wisconsin

According to Gordon Allison, District Manager at our West Los Angeles Field Office, the West Coast source of supply

for Grease-Off is the American Geophysical and Instrument Company, 16440 South Western Avenue, Gardena, California — Phone 321-2634. Also, according to Gordon, we were misinformed as to the price of Grease-Off. Correct price is \$6.85 per gallon not \$3.85 per gallon as we stated.

## REMINDING YOU



... that you should not operate your Tektronix forced-air-ventilation instruments, for extended periods, with the side panels removed. The panels contain and conduct the flow of air for maximum cooling efficiency. Damage from overheating can occur if the instrument operates for extended periods of time with the side panels removed.

... that to ensure an adequate flow of ventilating air, we recommend a clearance of approximately one foot (sides, top and rear) for the instrument.

... that instruments with dirty air filters cost you money by causing more down time, more maintenance problems, more need for replacement parts and a shorter life expectancy for the instrument.

... that you should clean air filters (see your instrument's instruction manual or the October '59 issue of SERVICE SCOPE) at least every 500 hours of operation—more often under difficult environmental conditions.

## MORE ABOUT PIN POINTING INFORMATION ON POLAROID PRINTS

In an article in the June issue of Service Scope, we described a method for pin pointing information on Polaroid Land Camera prints. We neglected to state that the system works well only after the print's surface has dried a couple of minutes or more after development, and before the preservative coating is applied.

Quite a few of our readers called this oversight to our attention. One of them,

Mr. William R. Hayes, manager of the Electrical Laboratory at Joslyn Manufacturing and Supply Company, offered an alternate method of adding notes to Polaroid prints.

Here, in Mr. Hayes' own words, is his suggestion: "—For some years now our laboratory has used a faster and simpler method of adding notes to Polaroid prints that takes advantage of the softness of the print's surface just after development. It is so soft in fact, that it is easily scratched; so we scratch out our notes. It is still soft enough to scratch for perhaps an hour after development. If the print has been coated or if it is a long time after development, the surface can be scratched easily by first wetting it with the print coater.

The success of this method however, lies in the nature of the point used to scribe the emulsion. A pin is too sharp and will dig up the surface. A sharpened pencil is too rounded. Something between these is best. Some experimentation with a whetstone and a metal point is necessary. We have made a number of scribes by pointing the head end of a 6-32 stainless screw and inserting the other end into a threaded 1/4" plastic rod about 6 inches long.

These handy instruments have increased our efficiency and accuracy in data recording by immediately scribing sweep times, sensitivities, serial numbers and circuit information on the face of the oscillograms."

Tektronix Field Engineer Earl Williams with our Field Information group suggests a third method: In this method you apply Snopake to selected portions of the Polaroid print. Snopake is a fast-drying correction fluid used in Xerography work. It dries quickly to furnish a snow white surface upon which you may write the required information. Be sure that the preservative coating has been applied to the Polaroid print and allowed to dry thoroughly before using Snopake.

Snopake is readily available through your local business-stationery and office-supplies outlet.

## FOR YOUR INFORMATION

Recently we sent to our Field Offices reprints of the booklet "Fundamentals of Selecting and Using Oscilloscopes." This booklet contains two articles, "Appraising Oscilloscope Specifications and Performance" and "Factors Affecting the Validity of Oscilloscope Measurements" which appeared originally in *Electrical Design News*. John Mulvey, Manager of the Field Information group in the Field Engineering Department of Tektronix, Inc., authored the articles.

"Appraising Oscilloscope Specifications and Performance" intends to clarify the significance of many of the technical terms used to describe oscilloscopes. People who, being responsible for buying or recommending such instruments, feel the need for a better understanding of the relative importance of different features will find this article informative.

"Factors Affecting the Validity of Oscilloscope Measurements," the second article in the booklet, discusses some common limitation and application pitfalls which apply to cathode-ray oscilloscopes. Some easily made performance checks are also included.

Another item of the booklet is a ready-reference chart giving the basic specifications of most Tektronix oscilloscopes.

To obtain a copy of this booklet, contact your local Tektronix Field Engineer or Field Office and ask for "Fundamentals of Selecting and Using Oscilloscopes." If you do not know your local Tektronix Field Engineer or the address of the nearest Field Office, direct your inquiries to: Editor, SERVICE SCOPE, Tektronix, Inc., P. O. Box 500, Beaverton, Oregon. We'll send you the needed names and addresses and see that you receive a copy of the booklet.



We recently received word from our Phoenix Field Office that a Type 310A Oscilloscope, s/n 10023, belonging to U. S. Semcor is missing. Mr. Porter of U. S. Semcor has asked that we request our readers to be on the lookout for this instrument. If you have any information regarding this Type 310A, please contact Mr. Porter. His address is: U. S. Semcor, 3504 West Osborn, Phoenix, Arizona.

The Physics Department of the College of William and Mary notifies us that a Type 503, s/n 000230, disappeared from the college last May and is now presumed to have been stolen.

Dr. Melvin A. Pittman, Chairman of the Department of Physics, will appreciate it if anyone with information on the whereabouts of this instrument will contact him or Mr. John H. Long, Assistant Professor, Department of Physics. Address your information to either man at the College of William and Mary, Williamsburg, Virginia.

## USED INSTRUMENTS WANTED

1 Type 545 Oscilloscope and 1 Type CA Plug-In Unit. George J. Kominiak, 195 Preakness Avenue, Paterson 2, New Jersey.

1 Type 502 Oscilloscope. Ken MacIntosh, Lectour, Inc., 4912 Cordell Avenue, Bethesda 14, Maryland. Telephone OLiver 2-4477.

### USED INSTRUMENTS FOR SALE

1 Type 511 Oscilloscope (s/n not given). J. Greenspan, Process and Instruments Corporation, 15 Stone Avenue, Brooklyn 33, New York.

For sale or trade 1 Type 105 Square-Wave Generator, s/n 4348. Would consider trade for good Frequency Meter to cover Marine to Business Radio Band. Dan J. Mooney, Communications Equipment Company, P.O. Box 35, Handsboro, Mississippi.

1 Type 503 Oscilloscope, s/n not given but instrument is less than one year old and in "mint condition." Asking \$540.00. Bernie Markam, Cabinart Inc., 35 Geysers Street, Haledon, New Jersey.

1 Type 105 Square Wave Generator, s/n 2970, Autoelectronics, Inc., Attention: Allan Sicks, 6207 Braemore Road, Indianapolis 20, Indiana. Telephone CL 3-6100.

1 Type 541 Oscilloscope, s/n not given. Al Browdy, KCOP TV, 915 La Brea, Los Angeles 38, California. Telephone OL 6-6050, Ext. 305.

1 Type 517 Oscilloscope, s/n not given. Mr. Osborne, 153-13 Northern Boulevard, Flushing, New York.

1 Type 502, MOD 407 Oscilloscope, s/n 5531, complete with accessories and polarized viewer. Instrument has been used less than six months. Asking \$825.00. Bob Briggs, Geosonic, Inc., Box 22166, Houston 27, Texas. Telephone: Sunset 2-2250.

2 Type 581 Oscilloscopes, s/n's 163 and 167. 2 Type 80 Plug-In Preamplifiers, s/n's not given. 1 Type 517A, s/n 1680, with a Type 500A Scopemobile. John Ivimey, 595 5th Avenue, New York 17, New York. Telephone: PLaza 2-1144.

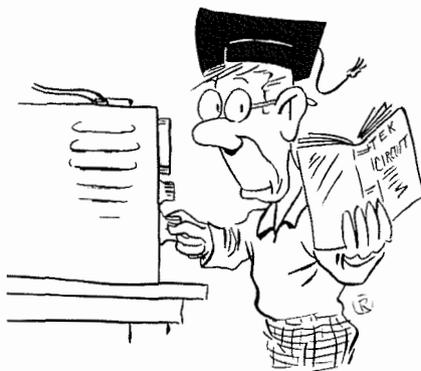
1 Type 515A Oscilloscope, s/n 3979. Webster Enterprises, 795 Marin Drive, Mill Valley, California.

1 Type 512 Oscilloscope, s/n 3317. Ken Goodman, Chief Engineer, Engineered Electronics, P. O. Box 659, Santa Ana, California.

1 Type 561 Oscilloscope, s/n 646; 1 Type 72 Dual-Trace Amplifier, s/n 409; 1 Type 67 Time-Base Unit, s/n 719, and 1 Type 201 Scopemobile. Henry Petheridge, Electronics, Inc., 2440 Maryland Avenue, Willow Grove Industrial Park, Willow Grove, Penna. Telephone: OL 9-6666.

1 Type 72 Dual-Trace Plug-In Amplifier (no serial number given). Price: \$200.00. Dr. Dick Tuttle, Masonic Research Laboratory, Utica, New York. Telephone: RE 5-2217.

### "TYPICAL OSCILLOSCOPE CIRCUITRY"



"... Manipulation of the front panel controls of an oscilloscope can be learned by rote. To use the instrument to its fullest capabilities a knowledge of oscilloscope circuitry is essential..." These words help to introduce the reader to a new book, "Typical Oscilloscope Circuitry," published by Tektronix Incorporated.

"The purpose of this book," as the preface explains, "is to provide a basic understanding of the functioning of those fundamental circuits that appear most often in Tektronix instruments. It is aimed at the man who maintains and calibrates instruments. But a knowledge of the information that is in this book will also help the instrument user to appreciate the characteristics, performance and limitations of his instrument... The treatment throughout is essentially nonmathematical. Some of the most elementary ideas of algebra and trigonometry (sine waves) are used. A few calculus symbols appear but these are applied only graphically and no knowledge of calculus operation is needed. The purpose of using these calculus symbols is one of brevity..."

We think you will find that the order of subject presentation plus the clear, concise wording of the subject explanations accomplishes the stated purpose of this book and with a minimum of confusion for the reader.

Price of the book is \$5.00. Copies may be ordered through your Tektronix Field Engineer or local Field Office. Specify Tektronix part number 070-253.

### SERVICE HINTS

#### SERVICING HIGH-VOLTAGE POWER SUPPLIES

Ron Bell, Tektronix Field Engineer with our Pittsburgh Field Office, uses this trick quite frequently when trouble-shooting the high-voltage power supply of Tektronix oscilloscopes: He removes the cover from the high-voltage supply and inspects the filaments of the type 5642 tubes. Should he find the filaments of one tube glowing brighter than the others, he replaces that tube on suspicion.

The type 5642 tube has a direct heated cathode. The filament or heater wires are coated with an emitting material and this material acts as the cathode for the tube. Over a period of time sublimation of this

material takes place and the cathode emits fewer and fewer electrons, finally reaching a point where electron emission is too low for the tube to function properly. This low emission is one of most common causes of faulty performance in these high voltage power supplies.

Ron claims that it takes only a few minutes to whip off the cover and replace a faulty tube and it can save hours of frustration in trying to trouble-shoot with a meter.

Other difficulties can develop in the power supply that will cause the filaments of one or more of the 5642 tubes to glow unnaturally. A replaced 5642 tube whose filaments continue to glow too brightly indicates the need for a more thorough investigation of the high voltage supply. Also, reoccurrence of unnatural filament brightness in replaced 5642's after only a relatively short period of operation (50 to 100 hours) suggests the need for this more comprehensive investigation.

#### TYPE 60 AMPLIFIER—INSTRUCTION MANUAL CORRECTION

Starting with serial number 432, the Type 60 Plug-In was modified to operate V434 and V444 from the regulated dc-filament supply, and to delete HUM BALANCE control R493.

Information concerning the modification was inadvertently omitted from the Type 60 Instruction Manual until serial number 480, when the omission was discovered and the manual corrected.

Owners of Type 60 Plug-In above serial number 432 whose manuals do not agree with the instruments circuitry may order updated schematics. Tektronix number for the schematic is 061-374. Order through your nearest Tektronix Field Office or overseas representative. There is no charge for one or two copies.

#### TYPE 502MOD104 OSCILLOSCOPE--INCREASING NEON LIFE

You can extend the life expectancy of the "READY" neon in this instrument by removing the strap, located between the neon and ground on the SINGLE SWEEP toggle switch, and installing a 27 k, ½ watt, 10% resistor mounted between the neon and the detent plate of the TRIGGER SELECTOR switch.

#### TYPE 504 AND TYPE RM504 OSCILLOSCOPE—DECREASING TUBE SELECTION

You can decrease the necessity of tube selection for V24 in these instruments by making the following changes:

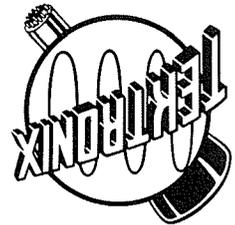
- (1). Remove R26, a 100 k ½ watt, 10% resistor and replace it with a 120 k, ½ watt, 1% precision resistor.
- (2). Remove R28, a 33 k, 1 watt, 10% resistor and replace it with a 33 k, 1 watt, 1% precision resistor.

This modification applies to Type 504 instruments with serial numbers below 530 and Type RM504 instruments with serial numbers below 550. Instruments with higher serial numbers have this modification incorporated at the factory.

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

USERS OF TEKTRONIX INSTRUMENTS  
USEFUL INFORMATION FOR

# Service Scope

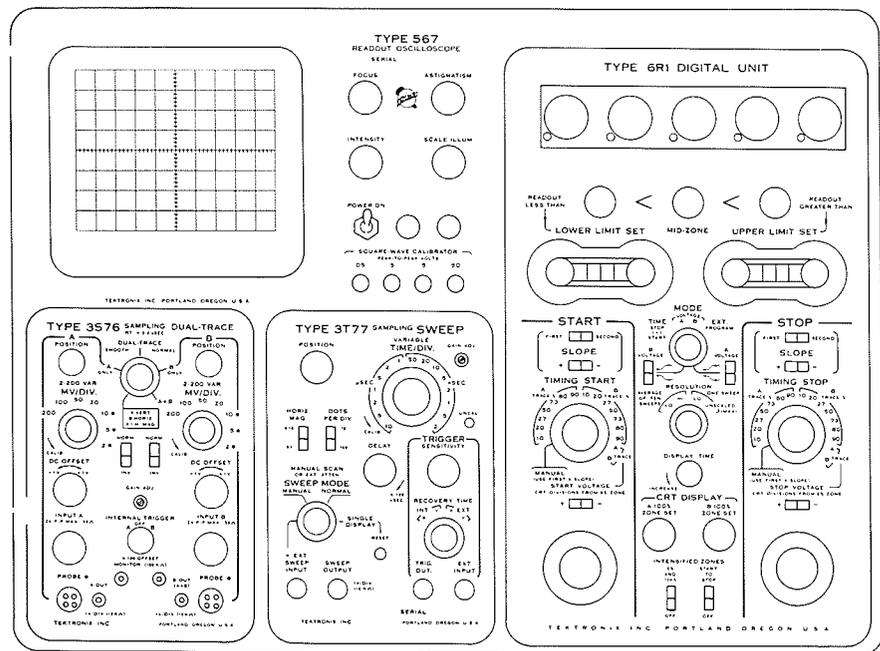


## QUESTIONS FROM THE FIELD

- Q. I've had some trouble with a Type 507 arcing at the crt anode connector. How can I correct this?
- A. Sometimes a conductive coating on the crt glass and anode button will cause the arcing you describe. Try scrubbing the anode button and surrounding glass area with alcohol or acetone. Check the length of the anode brush and trim the brush if it bows. Twist the brush to prevent loose strands.
- In rare cases the crt may be rotated far enough for arcing to occur between button and shield. We've been able to cure this problem with Corona Dope (General Cement No. 47-2 or equivalent). Apply the dope to the inside of the shield. Paint a band about 1.5 inches wide overlapping the seam between the light cap and the crt shield. Apply two coats.

- Q. When viewing 1- $\mu$ sec time markers from the output of the Type 181 Time-Mark Generator, while triggering the scope externally with 100- $\mu$ sec markers from the front panel binding post of the Type 181, we have a spurious pulse of less intensity than the main pulse. How can we get rid of this spurious pulse?
- A. The pulse is actually very regular, but appears spurious when the sweep is triggered at a repetition rate higher than 1 kc. Every 10th 100- $\mu$ sec pulse is loaded by the 1-msec multi, which shifts the time position of every 10th 100- $\mu$ sec mark slightly with respect to the others. When an occasional sweep is started by the "spurious" 100- $\mu$ sec marker, faster pulses will be out of relationship with the majority and will appear to be spurious. The condition is normal in the Type 181, but can be improved by putting a 12 pf capacitor across R170, a 22 k,  $\frac{1}{2}$  w, 10% comp. resistor.

## TYPE 567 TEST SET-UP CHART



**DATA:** This is a Type 567 Test Set-Up Chart. It provides a ready means of recording instrument control settings for any given test or production set up. A facsimile of the trace resulting from the set up can be drawn on the chart graticule or a picture of the waveform attached to the chart. In the "DATA" space, where this message to you is printed, special instructions or pertinent information concerning the test or production set up can be recorded.

Besides the Type 567 Digital Readout Oscilloscope, Test Set-Up Charts are also available for the following instruments: Type 502, Type 503, Type 545A (with CA, R, or Z Plug-In Units), Type 570 and Type 575 Oscilloscopes.

Your Tektronix Field Engineer will be glad to give you more detailed information on these Test Set-Up Charts. Why not call him right now?

TEK 001-826D

TEKTRONIX, INC.