Service Scope

USEFUL INFORMATION FOR USERS OF TEKTRONIX INSTRUMENTS

DECEMBER 1960

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TIMING THE TYPE 530A/540A SERIES OSCILLOSCOPES

Here is a procedure that will save the technician, generally familiar with the Type 530A/540A Series Oscilloscopes, considerable time when calibrating the sweep circuits of these instruments. This procedure is not recommended for the technician attempting such calibration for the first time. Technicians in this category will do well to adhere to the instructions as outlined in the factory recommended calibration procedure, copies of which can be obtained through your Tektronix Field Engineer.

This procedure requires the use of a Tektronix Type 180A Time-Mark Generator or any other frequency generator accurate to within 1%. Remember, while timing, position top of marks near the graticule horizontal center line and focus carefully.

Mechanically presetting of the controls as shown in the sketch is the key to saving time in this shortcut procedure. Positions of the controls after final adjustment will not vary appreciably from those shown in the diagram unless tubes or other components are not up to standard. Substandard tubes or components should be located and replaced.

The sketch as shown looks into the instrument with the side panel removed and from a position to the right and slightly above the instrument.

After setting the SWP. CAL. and MAG. GAIN in the normal manner, mechanically preset the identified controls as shown in the sketch. See Fig. 1.

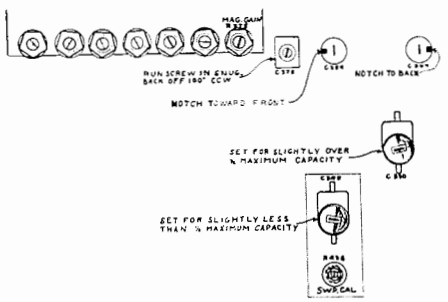


Fig. 1.

Step 1 Set the TIME/CM switch to .1 millisec/cm, 5X MAGNIFIER to ON. Apply 10 μsec markers to the VERTICAL INPUT. Place first mark near the center vertical graticule line. Rotate the TIME/CM switch between the .1 millisec and the 50 μsec positions and adjust C330 for no shift of the start of sweep.

Step 2 Set 5X MAGNIFIER to OFF, TIME/CM switch to 10 μsec/cm. Apply 10 μsec markers to VERTICAL INPUT. Position start of sweep on first vertical graticule line and adjust C160E for one mark per centimeter between the second and tenth vertical graticule lines, (disregard the first and tenth centimeter divisions). See Fig. 2.

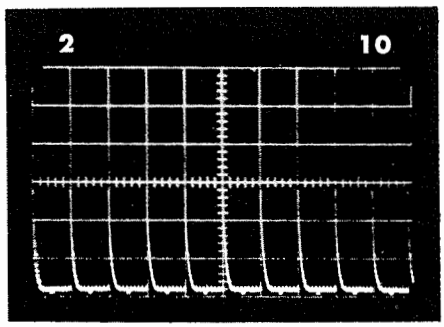


Fig 2.

Step 3 Set TIME/CM switch to 1 μsec/cm. Apply 1 μsec markers to the VERTICAL INPUT and adjust C160C for one mark per cm between the second and tenth vertical graticule lines.

Step 4 Set TIME/CM switch to .5 μsec/cm. Apply 1 μsec markers to VERTICAL INPUT. Adjust C160A for 1 mark per 2 cm using the third and ninth vertical graticule lines. See Fig. 3.

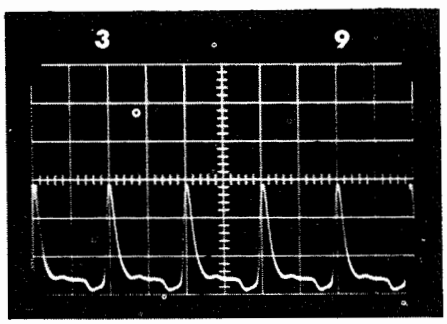


Fig. 3.

Step 5 Set TIME/CM switch to .1 μsec/cm. Apply a 10 mc sine wave to VERTICAL INPUT. Apply 10 μsec markers to the TRIGGER INPUT. Set TRIGGER SLOPE switch to + or — EXT. Adjust C348 for one cycle per cm between the second and tenth vertical graticule lines (C375 should not be adjusted at this time).

Step 6 Set TIME/CM switch to .5 μsec/cm. Apply a 50 mc sine wave to VERTICAL INPUT. Apply 10 μsec markers to the TRIGGER INPUT. Set TRIGGER SLOPE to + or — EXT. Place start of trace on first vertical graticule line. Turn 5X MAGNIFIER to ON. Adjust C384 for maximum space between cycles of the display. Now adjust C364 precisely for one cycle per cm between the second and tenth vertical graticule lines. If timing will not adjust precisely, reverse the order of adjustment of C384 and C364 above. If this does not allow accurate timing, interchange the two horizontal-output 6DJ8 tubes. As a last resort try replacing **one at a time** the 6DJ8 output tubes. If the instrument still will not come into adjustment, refer to the trouble shooting section of the particular instrument's instruction manual.

Step 7 Using the HORIZONTAL POSITION control, place the "fifth cycle in" from the left hand side of the trace on the second vertical graticule line and observe the timing between the second and tenth vertical graticule lines. Tolerance is 3%. Check the right hand side of the sweep in the same manner using the "fifth from last cycle" and placing it on the tenth vertical graticule line.

This procedure is used to good advantage by the Field Training and Customer Training Department here at the factory in their training course. We are indebted to Tom Smith of this department for the procedure and for his assistance in bringing it to you.

TYPE 517 SWEEP LOCKOUT MODIFICATION KIT

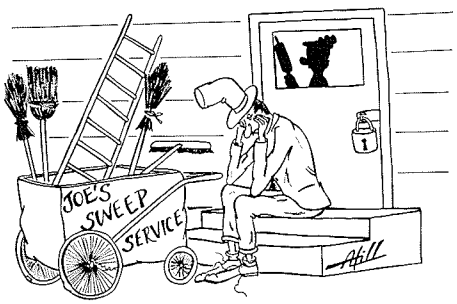
The Sweep Lockout feature, standard on all Type 517A Oscilloscopes, can be

added to your older model Type 517 instruments. Installation of the Type 517 Sweep Lockout Modification Kit will accomplish this. This feature makes possible the study of one-shot phenomena with the Type 517 Oscilloscopes. All Type 517 instruments with serial numbers above 926 will accept this modification. Type 517 instruments below serial number 926 require the installation of another modification (Duty Cycle Limiter Mod*) before the Type 517 Sweep Lockout Modification can be installed.

The Type 517 Sweep Lockout Mod Kit contains the necessary components, wired chassis, step-by-step instructions, schematic, photos and parts list.

Order from your Tektronix Field Office or Engineer. Specify Type 517 Sweep Lockout Mod Kit, Tek number 040-203. Price is $45.00.

* To obtain this kit, order Type 517 Duty Cycle Limiter Field Mod Kit, Tek number 040-107. Price is $10.00.



TYPE 502 SWEEP LOCKOUT MODIFICATION KIT

Your Type 502 (all serial numbers) can be modified for the study of one-shot phenomena by installation of a Type 502 Sweep Lockout Mod Kit.

The Sweep Lockout feature permits you to arm the sweep to fire on the next trigger to arrive. After firing once, the sweep is locked out and cannot fire again until rearmed by pressing a RESET button.

The modification kit converts your Type 502 Oscilloscope for this type of operation and retains the original features of the instrument. The kit includes a wired chassis assembly, new panel, necessary components, photo, schematic, step-by-step instructions and parts list.

Order from your Tektronix Field Office or Engineer. Specify Type 502 Sweep Lockout Mod Kit, Tek number 040-209. Price is $45.00.

IMPORTANT: Give serial number of your instrument so new panel can be numbered at factory.

TYPE 575 COLLECTOR CURRENT MULTIPLIER MODIFICATION KIT

This modification increases the current range of the vertical axis of the early models (serial numbers below 862) Type 575 Transistor Curve Tracer. The addition of a X-2 and a X-0.1 push button Collector Current Multiplier controls provides a means of multiplying by 2 or dividing by 10 the 24 calibrated steps of the Vertical Current or Voltage/Division switch. This increases the current range of the switch from 1000 — 0.01 ma per division to 2000 — 0.001 ma per division.

Included in the modification kit is a .8 amp circuit breaker to replace the 1 amp fuse in the collector sweep, a wired Collector Current per Division switch, step-by-step instructions for drilling the front panel and for installation of the switch and other parts, and a parts list.

Order from your Tektronix Field Office or Engineer. Specify Type 575 Collector Current Multiplier Mod Kit, Tek number 040-197. Price is $35.00.

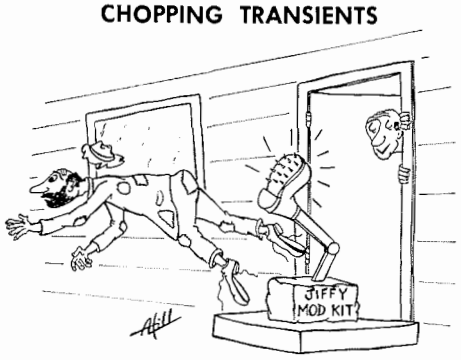
AN ENVIABLE PERFORMANCE RECORD

Recently, we received a report from Tektronix Field Engineer Howard King attesting to a remarkable reliability performance by eight Type 502 Oscilloscopes. These instruments are a permanent part of the Bevatron control system at the University of California Radiation Laboratory. Here they are subjected to a periodic maintenance inspection and a thorough recalibration every six months. Except for the time required to make these inspections and recalibrations, these instruments have been in continuous operation since their installation in March of 1959. The group in charge of this installation has kept very complete maintenance and failure charts. A check of these charts reveals a truly phenomenal record—only 14 failures in a total of almost 100,000 hours of operation. All except two failures were from tubes. Of these exceptions, one was from a defective high voltage transformer, the other from a shorted lead to a tube socket.

QUESTIONS FROM THE FIELD

1. Q. How much can be cut from the cable of the standard P410 probe before running into trouble?
   A. A couple of inches can be cut from the standard P410 cable before overshoot is seen with critical eyes. About four inches can be cut from the eight-foot cable.
2. Q. What is the purpose of the small plastic board, containing four adjustable coils, located in the Type 551 upper beam-vertical amplifier? Why is it sometimes left unconnected?
   A. Normal manufacturing tolerances will sometimes result in a slight delay between vertical amplifiers. These additional coils compensate for this delay and thus offer superior beam registration. Often it is not necessary to use the additional delay.
3. Q. On a Type 517 where is a likely place to look for stray pickup?
   A. A likely place for this is a poor ground connection. This can occur between the grounded portion of the coax input connector and the pre-amplifier sub-chassis. When checking for pickup, the preamp grids should be shorted as close to the tube as possible. This will eliminate pickup between the input connectors and the grids.
4. Q. Can the Collector Sweep of a Type 575 be modified to provide a plus and minus voltage, automatically switched, for viewing symmetrical zenner diodes?
   A. Yes; this can be accomplished by shorting out one of the power diodes in the collector sweep and disconnecting the opposite diodes. This will give a sine wave at the C terminal.
5. Q. On the RM16, what causes the .02-v/div. position to sometimes seem under compensated while the 0.2-v/div. is OK?
   A. C545, a 500-mfd cathode by-pass capacitor, has a mechanical ground through its case. A poor ground connection here can cause apparent under compensation of the .02-v/div. setting.
6. Q. Can the Type 310 Oscilloscope (60 to 800 cycle power supply) be operated on 50 cycle for short periods? If so, how long would external fan cooling help?
   A. We strongly recommend against using the 60 to 800 cycle Type 310 on 50 cycles. Gordon Sloat, of our Transformer Department, says this is equivalent to operating the primary at 145 volts, 60 cycles. External-fan cooling wouldn't help much as heat builds up fast inside the transformer.
7. Q. We have a Type 545A which keeps blowing fuses as soon as the instrument is turned on. Investigation has not revealed a short. Have you any solution to this problem?
   A. Check the silicon rectifiers. Perhaps you have one that has shorted. Because the opposite diode is good, a four-ohm short circuit appears across the winding on one half of the cycle only. The defective diode fuses open completely or becomes intermittently shorted and open. The opposite diode should also be changed since it would be damaged by the high short-circuit current. Either diode could become intermittent if one shorts out.
8. Q. We have run into some oscillation problems in checking 500-megacycle-type transistors on the Type 575. Are there any other tricks besides the use of ferrite beads to eliminate or minimize these oscillations?
   A. Here are two other possible solutions to the problem:
      1. Place a small series RC between collector and emitter at the panel socket. Approximate values of 47 pf and 82 ohms seem to do the job with very little effect on the desired curve. The same RC connected from emitter to ground also does the trick for some transistors.
      2. The simplest method is to plug another transistor into the unused socket. However, this solution doesn't work every time. The dummy transistor need not be a mate to the one being checked.

MODIFICATION KIT FOR BLANKING CHOPPING TRANSIENTS



This modification applies to the Type 531, 535, 541, 545, RM31, RM35, RM41 and RM45 Oscilloscopes. When a Type 53C, Type 53/54C or Type CA Dual Trace Plug-In Unit is operated in its chopped mode with these instruments, transients appear with the trace. If you find these transients objectionable, you can eliminate them by the installation of a modification kit.

This modification supplies a blanking voltage that can be applied to the crt cathode (by means of a switch) when a dual-trace plug-in unit is operated in its chopped mode.

The mod kit includes a complete set of components, parts list, schematic, photos and step-by-step instructions. Please order through your Tektronix Field Office or Engineer by the following description:

For Type 531, 535, 541 and 545 Oscilloscopes, serial numbers 101 through 4999, specify Type 530/540 Series Chopping-Transient-Blanking Mod Kit, Tek number 040-200. Price is $5.25.

For Type 531, 535, 541 and 545 Oscilloscopes, serial numbers 5000 and up, and Type RM31, RM35, RM41 and RM45 Oscilloscopes, all serial numbers, specify Tek number 040-198. Price is $5.25.

TYPE 162 WAVEFORM GENERATOR SOLVES SINGLE SHOT UNBLANKING PROBLEM

A customer, using a Type 536 Oscilloscope to plot plate current against plate voltage in a diode, was having difficulty. He was using a hand-operated mercury switch to pulse the diode. Because of the single shot type of operation plus the fact that the Type 536 has no unblanking for this type of operation, the crt beam was standing in one spot most of the time. A photograph taken under these conditions was worthless. The brightness of the spot completely wiped out the desired information in the trace.

This customer had recently received a Type 162 Waveform Generator. A feature of this instrument is that one of the output waveforms is a 50-volt pulse gate. Tektronix Field Engineer Bill Carter suggested to the customer that he trigger the Type 162 with either the current or voltage waveform of the diode and then use the 50-volt pulse gate of the Type 162 to unblank the Type 536 during the trace period. The duration of the gate pulse could be adjusted for the proper amount of unblanking time by varying the sweep rate of the Type 162.

The customer called Bill the next day and expressed his gratitude saying that this was the only method that had worked on his problem.

TRANSISTORIZED CIRCUITRY

If you are interested in transistorized circuitry, you will probably enjoy the article "Battery-Operated Transistor Oscilloscope". This article appeared in the March 18, 1960 issue of ELECTRONICS, a trade magazine devoted to the electronic industry and published by the McGraw-Hill Publishing Company.

Oz Svehaug, Project Design Engineer for the Tektronix Type 321 Transitorized Oscilloscope, and John R. Kobbe, Chief Circuit Design Engineer for Tektronix, co-authored the article. Several circuits of the Type 321 are briefly discussed and schematics of some are included in the article.

If you do not have a copy of the March 18, 1960 issue of Electronics, suggested sources are your firm's technical library or the local community library. Reprints of articles are generally available from the magazine publisher, in this case the McGraw-Hill Publishing Company, Inc., 330 W. 42nd Street, New York 36, New York.

DOES CONTINUOUS OPERATION OF ELECTRONIC-TUBE EQUIPMENT REDUCE THE INCIDENCE OF TUBE FAILURE?

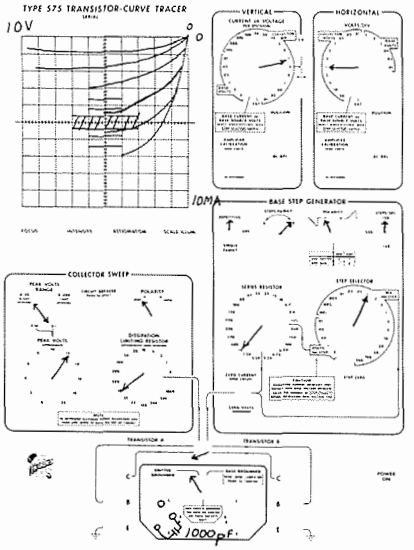
Andy Jackson, Chief Engineer for Station WAVY, Tidewater Teleradio Inc., Portsmouth, Virginia, evidently believes that it does. He told Tektronix Field Engineer Eb Von Clemm that the control equipment at station WAVY is never turned off except for major repairs. Since this equipment has been on this continuous-operation basis, monthly tube expenditures have shown a marked decrease. Mr. Jackson has collected some rather convincing cost data. Before WAVY instituted their 24-hour operation policy, their equipment contained a total of 3200 tube sockets. Tube-replacement costs for this equipment fell between $1500 and $1800 per month. Since these figures were gathered, WAVY has added additional equipment that has increased the tube socket total to 5500. In spite of this increase in tube sockets, tube-replacement costs under the continuous-operation plan have been reduced to an average of around $900 per month. Although the tube replacement potential was increased by 75%, actual tube-replacement costs were reduced up to 50%. Mr. Jackson says he feels that their policy of 24-hour operation was a big factor in this tube-replacement cost reduction.

It would be interesting to know our readers' opinions on this question. Why not drop us a line giving your answer to this question and the reasons for your stand? We will try to evaluate the answers, determine the consensus and publish the results in a future issue of SERVICE SCOPE.

Addess your answers to Walt Dederick, Editor, SERVICE SCOPE, Tektronix Inc., P. O. Box 500, Beaverton, Oregon.

TEST-SETUP CHARTS AVAILABLE FOR FOUR INSTRUMENTS

TYPE 575 TEST SET-UP CHART



COMPONENT: 2N700 151-027

TESTING: BETA SEGREGATION

PROCEDURE: USE SPECIAL SOCKET WITH BY-PASSED BASE LEAD

Test-Setup charts are now available for the Type 502, 503, and 545A Oscilloscopes and the Type 575 Transistor Curve Tracer. The charts provide a ready means of recording instrument control settings for any given test or production setup. A facsimile of the trace resulting from the setup can be drawn on the chart graticule or a photograph of the waveform attached to the chart.

For production testing, an engineer devises the test procedure required to attain the desired result. He then designates the control settings on the chart and draws a picture of the display on the chart graticule, outlining the limits for acceptance or rejection. (If desired, separate instrument graticules for each test can be marked with colored lines or tapes). The production-test facility takes over at this point and performs the test operation with speed and accuracy. Often a non-technical employee can handle this phase and release a highly trained person for more important work.

Your Tektronix Field Engineer will be glad to give you more detailed information on the Test-Setup charts and their uses.

TYPE 575 TEST-SETUP CHART PROVES ITS WORTH

During a recent demonstration on the Type 575 Transistor Curve Tracer, one of the engineers in attendance remarked that engineers could operate the unit without any trouble, but what about the

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Tektronix, Inc.
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Beaverton, Oregon

girls on the line who would be making incoming inspection of transistors? They are all non-technical people. Will they be able to set up and use the Type 575 in their inspection routine?

Tektronix Field Engineer Harvey Worth, who was presenting the demonstration, suggested that one of the girls on the line be brought in. He explained that he felt sure that within five minutes she could set up the instrument from a Test-Setup chart.

Accordingly, one of the girls was brought in and given a previously prepared Test-Setup chart. With very little instruction, she set up the Type 575 and, to the complete satisfaction of the observing engineers, made the incoming inspection check.

USED INSTRUMENTS WANTED

1 Type 531 or preferably Type 533	Russel Jensen 223 E. Dean Ave. Madison 4, Wis.
1 Any Tektronix Scope	Christy Laboratories Mr. Kazarlan 118 St. Clair Cleveland 14, Ohio
1 Type 511, 514 or 524	Carl Smith 5449 Culver Indianapolis, Ind.
1 Type 315D or Type 514	Palo Alto Engineering Co. C. J. Biggerstaff 620 Page Mill Road Palo Alto, Calif.
1 Type 535 or 545	John T. Campbell, III 7906 Pickering St. Philadelphia 50, Pa.
1 Type 535 with Type 53/54C Plug-In Unit (Approx. $800)	John West Tektronix, Inc. 1122 Main Street Stamford, Conn.

USED INSTRUMENTS FOR SALE

1 Type 545A with Type CA Plug-In Unit 1 Type 130 L-C Meter	P. J. Gentile Vamco Machine & Tool, Inc. 2 Sedgwich Street Pittsburgh 9, Pa. Phone TAylor 1-6000
1 Type 524AD	Allan T. Powley Chief Engineer WMAL, WMAL-TV The Evening Star Bcstg. Co. 4461 Connecticut Ave., N.W. Washington 8, D.C.
1 Type 570 s/n 336	Corbett Electronics Henry Corbett 2014 S.W. Jefferson Street Portland, Oregon
2 Type 514D s/n's 2143 and 2144 1 Type 511AD s/n 1375 2 Type 514AD s/n's 4874 and 4895	Cornell University Joe Sanford Lab of Nuclear Studies Ithaca, N. Y.
1 Type 310A s/n 10089	Digitronics, Inc. Mr. Targia Albertson Ave. Albertson, L.I., N.Y.
1 Type 511 s/n 1751	Fred Pack Technical Materiel Corp. 700 Fenimore Road Mamaroneck, N.Y.
1 Type 53/54E (will trade)	Eldema Corporation Dwayne MacDonald 1805 Belcroft Elmonte, California

ANOTHER "HOT" SCOPE

Our Chicago office reports the loss of a Type 321, s/n 200, Transistorized Oscilloscope. This instrument disappeared from a group of instruments waiting to be returned to the Chicago office after the recent N.E.C. show in Chicago.

If you see this instrument or have any information regarding its whereabouts, please contact your Tektronix Field Office or Engineer, or call the factory collect at Beaverton, Oregon. The phone number is MItchell 4-0161. Ask for Walt Dederick.

Tektronix Instrument-Repair Facilities: There is a fully-equipped and properly-staffed Tektronix Instrument Repair Station near you. Ask your Field Engineer about Tektronix Instrument-Repair facilities.