



Service Scope

USEFUL INFORMATION FOR USERS OF TEKTRONIX INSTRUMENTS

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OSCILLOSCOPE PHOTOGRAPHY AND FILM STORAGE

It's smart business to check the expiration date of the film you are using when you engage in oscilloscope photography. Those who attempt to photograph waveform phenomena that tax the writing rate of the oscilloscope and, or, the film should give an attentive ear to this advice. All film, packet or individual roll, carries a definite date stamped on the box. For best results, film should be used before this date.

Also, all sensitized photographic materials are perishable and can sustain damage if not properly stored. The following information appeared originally in the "POLAROID POINTERS", a pamphlet published by the Customers Service department of the Polaroid Corporation. It should be helpful to those who attempt to keep a supply of film on hand.



Storage and the Effects of Temperature: Excellent pictures can be obtained over a wide temperature range. From near freezing to 100° F, the camera and rolls give good results. However, since all sensitized photographic materials are perishable and can be damaged by high temperature and high relative humidity, care should be taken to handle and store the film as recommended below, with as much protection as possible against heat and moisture and away from X-rays, radioactive materials, and chemical fumes.

Protection Before Using: The wrappers in which all Polaroid Land* picture rolls are packaged will provide ample protection to withstand, through the expiration date printed on the box, normal handling in the humidities encountered in most places in the U.S.A. This wrapper does not provide protection against heat and therefore Polaroid Land picture rolls (and any sensitized photographic material, for that matter) should not be stored or left near radiators, hot pipes or other unventilated areas where the temperature may climb. The glove compartment, trunk and back deck of automobiles may reach very high temperatures (in excess of 200°F) in the hot sun. Excessive heat may damage the film, resulting in fogged (or flat and gray) pictures or a collection of developing reagent on the positive print.

If you are in the habit of keeping a number of picture rolls on hand during the summer heat or in tropical areas, it is good practice to store your picture rolls (unopened) in the refrigerator. Wherever possible, store the film under these conditions:

| For Storage | Keep Temperature |
|-------------|------------------|
| Up to— | Below— |
| 2 months | 70°F |
| 6 months | 55°F |
| 9 months | 50°F |

Generally speaking, there is no low temperature limit for storing Polaroid Land film, and this means that it can be frozen (or stored in a deepfreeze) for long periods of time. However, before using film that has been stored below 60°F, it must be brought back to room temperature before opening the foil wrapper.

If the foil wrapper on a tray of 4x5 packets has been broken, and only a few packets are to be stored under refrigeration, wrap the packets in a good brand of aluminum foil—a sandwich-type wrapping with the ends firmly closed.

Protection After Opening: Once the moisture-vapor-barrier wrapper is opened, the picture roll loses its protection against moisture. Under humid or high temperature conditions, use the roll as soon as practicable and do not allow the roll to remain in the camera longer than necessary. Protect your loaded camera and picture rolls from direct sunlight as the temperature inside the camera or the carrying case may rise extremely high even when the weather is temperate. On long trips through high temperature regions an insulated container will provide protection to your film.

All type 4x5 film packets can be damaged by exposure to humidity over 75%

R.H. at 75°F or above. To provide protection, each box of 12 packets includes a polyethylene bag. After removing the foil wrap from the box, the tray of packets should be immediately inserted in the bag and the end of the bag folded over several times to seal out moisture. When humidity is high, packets should be developed within 15 minutes after removing them from the polyethylene bag.

Once the protective wrapper is removed, care should be taken to keep the film away from formaldehyde, industrial gases, motor exhausts, solvents, mercury and radiation in any form.

*Polaroid is a registered trade-mark of the Polaroid Corporation

LOCATING TROUBLE IN TV COAXIAL CABLES

John Unruh, Jr., Tektronix Field Engineer with our Orange, California Field Office, calls on a company which uses a Tektronix Type 317 Oscilloscope to locate trouble in a coaxial cable system. This company picks up a TV signal on a nearby mountain top and relays it into subscribers' homes via this coaxial-cable system. Occasionally a trouble such as an open circuit, short circuit or connectors with water in them will develop. When this happens they can, with the aid of the Type 317, determine within a few feet (and sometimes precisely) the area of the cable within which the trouble lies. This customer happens to use a Type 317. However, any Tektronix oscilloscope with a passband of 10 mc (or better) will also accomplish this purpose. In fact, the faster the risetime of the oscilloscope the more precisely you can pinpoint the difficulty.

For this application, you connect the + GATE of the oscilloscope to the INPUT through a differentiating circuit (see Figure 1). An UHF "T" connector makes a convenient housing for this circuit. The other

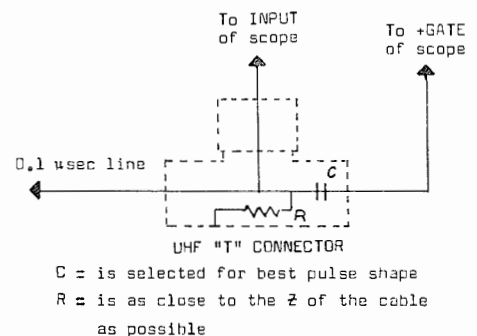


Figure 1

end of the "T" connector you connect to a cable with a predetermined delay time (John's customer uses a length of cable with a 0.1 microsec delay time). With this hook-up, by free running the oscilloscope sweep, you produce a pulse on the crt screen. When the cable you wish to check is connected to the 0.1 microsec cable, any irregularities are immediately visible on the screen. Should the cable be open, then a positive reflection will show on the screen sometime after the initial pulse. A short in the cable will show as a negative reflection. Connectors used to couple sections of cables together will appear as a small "bump" similar to a termination bump. Any connectors making a poor connection or ones with water in them will also appear as a bump but will show considerable more + or - amplitude than those produced by normal connectors.

To determine the distance to the defective portion of the cable, you merely determine the time between the initial pulse and the reflected pulse, being sure to measure in microseconds from the start of the rise of each pulse. From this total-time-between-pulses, subtract the 0.1 microsec of the small length of cable used to connect the output of the "T" connector to the cable under test. Multiply the remainder by the multiplying factor for the type of cable under test and you have the distance to the fault in feet.

John's customer uses the following chart:

| CABLE TYPE | PROPAGATION FACTOR | MULTIPLYING FACTOR |
|------------|--------------------|--------------------|
| Solid Poly | .66 | 325 |
| Foam Poly | .82 | 404 |
| ½" Styro | .89 | 439 |
| ¾" Styro | .90 | 443 |

The multiplying factor of a given cable is determined by multiplying the figure for the speed of light (983.5 ft. per μsec) down one foot of the cable by the propagation factor of the cable and dividing by two since the pulse must travel twice the distance to the fault before showing up as an echo. John says that according to his figures the multiplying figure for solid poly should be closer to 320. However, his customer has been using this chart for sometime and hasn't been too far off yet.

When the cable under test is less than 30 or 40 feet, then an additional hundred feet should be inserted. Otherwise, the reflection returns so fast it rides on the top of the initial pulse.

This method is currently being used on cables with lengths up to 2,000 feet. Reportedly, it may be used on lengths upwards of a mile provided the cable is of a low loss type.

THAT OLD BUGABOO "CATHODE INTERFACE"

Tektronix Canada, Ltd. Field Engineer Gordon Dickson (Montreal) called on a customer to find him struggling with the transient response of a Type 545 Oscilloscope. The customer stated that he had spent two days in sporadic attempts to

bring the vertical response of the instrument within specifications. He claimed that each time he endeavored to touch up the high frequency peaking and the delay line, the transient response showed a change from the last time he had worked on it.

Immediately suspecting the cause of the difficulty, Gordon connected the instrument to its power source through a variable-voltage transformer. A quick check confirmed his suspicions. The customer had been battling a condition that no amount of tweaking and adjusting would overcome—cathode interface. Cathode interface is a condition that can develop in the vertical-amplifier tubes of any oscilloscope—some tubes being more offensive than others. It will cause degeneration of all but high frequency signal components . . . leaving an overshoot on the leading edge of fast-rise (0.2 μsec or less) squarewaves.

At Gordon's suggestion, the customer replaced the offending tubes and then easily recalibrated the vertical amplifier to bring transient response of the instrument within specifications.

In the August 1960 issue of SERVICE SCOPE we published an article that dealt at some length on this problem of cathode interface. Those who maintain a back-issue file of SERVICE SCOPE may wish to review that article. The title—"Does The Square Wave Response of Your Scope Look Like This."

If you do not maintain a back-issue file of SERVICE SCOPE you can obtain a copy of the August 1960 issue by contacting your Tektronix Field Engineer or local Field office.

OSCILLOSCOPE LITERATURE RACK

A DO-IT-YOURSELF PROJECT

This idea for a literature-holding rack (see Figure 1 and 2) comes to us from one of our readers, Anthony J. Kalilich of the NASA in Cleveland, Ohio. Tony uses this rack to hold manuals for easy, ready reference during instrument calibration. He and other engineers at NASA also use it to hold their reference data during various tests. Having this material off the bench but still handily available, tends to minimize the time spent searching under papers and manuals for tools or components. This in turn contributes to a more efficient utilization of the engineer or technician's time.

Fabrication of the rack requires only about 15 minutes of time and most laboratories or maintenance facilities will contain the necessary materials. Suggested materials are two 10/32 female banana jacks and two 30" lengths of buss wire or copper-clad welding rod. The diameter of the buss wire or welding rod should be such that it will fit into the female end of the banana jacks. About ¼" from one end of each wire or rod length make a 90° bend. Insert the end of the ¼" section into a banana jack and solder it to the jack. Now insert the two banana jacks into the two top graticule stud bolts of your Tektronix (5" crt) oscilloscope and bend the wire or rod as shown

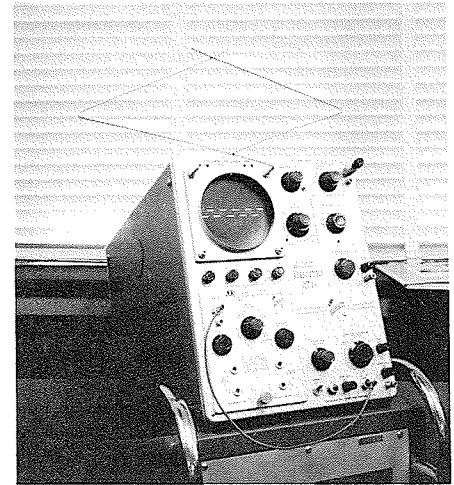


Figure 1

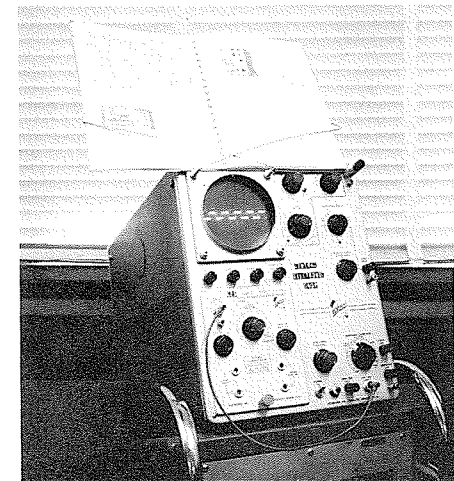


Figure 2

in Figure 1. Solder the two wires or rods together at the two points where they cross. The degree of the angle thus formed by each wire or rod is not critical. However, for appearances sake they should match. If you solder the wires or rods together so that the distance between the two points of the two V's is approximately 18½", the rack will accommodate an opened Tektronix instrument manual as shown in Figure 2.

That's all there is to it. We thought it was quite simple and with only the pictures as a guide.

USED INSTRUMENTS FOR SALE

Type 524D Oscilloscope, s/n 179. Asking \$500. Gene Phelps, KPTV, 735 S.W. 20th Place, Portland, Oregon. Phone: Capitol 2-9921.

Type 310A Oscilloscope, s/n 7142. Price \$575. Dr. Leonard Rose, 2311 N.W. Northrup Street, Portland 10, Oregon.

Type 310 Oscilloscope, s/n 3350. Mr. La Douceur, American Motor Corp., 14250 Plymouth Road, Detroit 32, Michigan.

Type CA Plug-In Unit. Deictron Electronics Corp., 850 Shepherd Avenue, Brooklyn 8, New York. Phone: NI 9-8110.

Type 105 Square Wave Generator, s/n 5875. Price: \$325. Type 110 Pulse Generator and Trigger Takeoff, s/n 600. Price: \$525. Type 113 Delay Cable, s/n 294. Price: \$150. Type N Plug-In Unit, s/n 683. Price: \$475. Bernard H. Shuman, General Manager, Morris Cooper Corp., 3832 Terrace Street, Philadelphia 28, Pa.

Type 122 Preamplifier, s/n 3289. Colonel Hoxie, Lind Instruments, 2294 Mora Drive, Mountain View, California. Phone: 968-0083.

Type 180 Time-Mark Generator, s/n 207. Landy Garman, National Aeronautical Corp., Commerce Drive, Fort Washington, Pennsylvania. Phone: MI 6-2900, xtn. 41.

Type 517A Oscilloscope, s/n 622. Sam Cooper, Rutherford Electronics, 8944 Lindblade Avenue, Culver City, California. Phone: UP 0-7393.

Type 551 Oscilloscope, s/n 369. Type 535 Oscilloscope, s/n 1173. Type 53C Plug-In Unit, s/n 1143. Engineering Dept., Richard D. Brew & Co., 90 Airport Road, Concord, New Hampshire.

Type 533 Oscilloscope, s/n 515. Price: \$775. Type 53/54E Plug-In Unit, s/n 2090. Price: \$125.

Type 53/54C Plug-In Unit, s/n 20261. Price: \$175. Type RM181 Time-Mark Generator, s/n 1034. Has a crystal oven. Price: \$195. Type 500A Scope-mobile. Price: \$70. Cradle Mount for rack mounting a Type 533 scope. Price: \$20. Miscellaneous small accessories including probes, connectors, and other small items will be included with the appropriate units. Joseph M. Edelman, M. D., 4550 North Boulevard, 204 Medical Center, Baton Rouge 6, Louisiana.

1 Type 517 Oscilloscope, s/n 161. Price: \$1500. Needs work. Armond Piscopo, 1546 Slater Street, Toledo 12, Ohio.

USED INSTRUMENTS WANTED

1 Type 124 Television Adapter. Purchasing Agent, Owen-Illinois Technical Center, 1700 N. Westwood, Toledo, Ohio.

1 Type 575 Transistor Curve Tracer. L. Bachhuber, Appleton Mills Co., 614 S. Oneida Street, Appleton, Wisconsin. Phone: Regent 4-9876.

2 Type 535 or Type 545 Oscilloscopes. J. R. Halchak, E. G. & G., Inc., 160 Brookline Ave., Boston 15, Mass.

1 Type 531 and 1 Type 533 Oscilloscopes. Harry Applebay, 902 West Pedragosa, Santa Barbara, Calif.

1 Type 310 or 310A Oscilloscope. Steve Karapti, National Aeronautical Corp., Commerce Drive, Fort Washington, Penn.

1 Type 541 Oscilloscope and 1 Type CA Plug-In. Joe Gaon, 64-50 229th Street, Bayside, N. Y.

1 Type 531A, Type 533A, Type 541A or Type 543A Oscilloscope. A. R. Shelby, President, Production Electronics, Inc., 525 Lehigh Avenue, Union, New Jersey.

1 Type 515A Oscilloscope. John Harshbarger, Systems Research Laboratories, Inc., 500 Woods Drive, Dayton 32, Ohio. Phone: CH 4-4051.

1 Type 531A Oscilloscope with a Plug-In Preamplifier (Type CA preferred). 1 Type 516 Oscilloscope. 1 Type 524AD Oscilloscope. Charles Hanavich, 712 Grandview Drive, Alexandria, Virginia.

MISSING INSTRUMENTS

MISSING

INSTRUMENTS



Our Long Island Field Office advises us that a Type 533 Oscilloscope, serial number 1202, and a Type CA Plug-In Unit (serial number not available) are missing from the Alternating Gradient Synchrotron at Brookhaven National Laboratory, Upton, New York. These instruments are the property of the United States Government and unauthorized possession of them is a federal offense. Officials consider this a serious matter and the Federal Bureau of Investigation has been called in on the case.

Persons with information on the above instrument should contact Mr. Herb Lutz at the Brookhaven National Laboratory. Telephone number is: area code 516, number 924-6262, extension 2193. Or, you may contact the nearest Federal Bureau of Investigation office.

Mr. Sternberg, with the Department of Entomology at the University of Illinois in Urbana, Illinois, reports that his Type 502 Oscilloscope, serial number 901, disappeared on August 6, 1962. This instrument was not in working condition. Suspected trouble was a crt or high voltage problem. All instrument repair centers and technicians are asked to be on the alert should a Type 502 with these symptoms of trouble be presented for repair.

Mr. Sternberg would appreciate hearing from persons with information regarding this instrument. They may contact him at the address given above.

The Deer Valley Park plant of General Electric Company asks that our readers

keep an eye out for a Type 535A Oscilloscope, serial number 27884 and two Type CA Plug-In Units, serial numbers 41577 and 45244. These instruments have disappeared from this facility and they would like very much to recover them. Direct any information you may have on the whereabouts of these instruments to the General Electric Company, 13430 North Black Canyon Highway, Phoenix, Arizona. Attention: C. H. Worlock, Mgr., Product Service Administration.

NEW FIELD MODIFICATION KITS

TYPE 180 TIME-MARK GENERATOR OR CRYSTAL OVEN MOD KIT—For Type 180 instruments with serial number 951 to 5000 inclusive.

This modification installs a temperature-stabilized crystal oven in the Type 180. Frequency-stability characteristics will be improved to three (3) part per million over a 24 hour period. Time required for installation is approximately one and one-half hours*.

Order through your local Tektronix Field Engineer or Field Office. Specify Tektronix part number 040-285. Price: \$49.50.

A previously announced Crystal Oven Mod Kit installs a temperature stabilized crystal oven in Type 180 Time-Mark Generators with serial numbers below 951. For this modification order Tektronix part number 040-252. Price: \$50.75.

TYPE 532 AND TYPE RM32 OSCILLOSCOPES CHOPPED-TRANSIENT BLANKING MOD KIT. All serial numbers.

Installation of this modification adds blanking to the crt cathode to eliminate switching transients when using the Type 53/54C, 53C, CA, or M Plug-In Units in the CHOPPED Mode. Time required for installation is approximately two and one-half hours*.

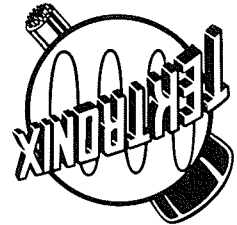
Order through your local Tektronix Field Engineer or Field Office. Specify Tektronix part number 040-283. Price: \$70.00.

TYPE 517 AND TYPE 517A THERMAL PROTECTION MOD KIT—For serial numbers 101 through 1739.

When installed, this modification provides thermal cutouts for both the Indicator and Power Supply units. In instruments wired for normal line voltages (i.e. 105 to 125 v), should the chassis temperature reach approximately 137° F, the cut-out will turn the affected unit off. The fan will continue to operate as an aid to cooling the unit to a safe operating temperature. In those instruments wired for 210 to 250 v line voltages, the cutouts will operate in the same manner with one exception—the fan will not operate during the cooling off period. Time required for installation is approximately two and one-half hours*.

Order through your local Tektronix Field Engineer or Field Office. Specify Tektronix part number 040-291. Price: \$58.00.

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



USERS OF TEKTRONIX INSTRUMENTS

USEFUL INFORMATION FOR

Service Scope

CRT SCREW ALIGNMENT MOD KIT

This modification provides a more satisfactory means for adjusting the crt alignment. A new bracket, with rotator and clamp assembly, replaces the old support bracket and clamp assembly at the base of the crt. This new assembly features a finger-operated screw adjustment for easy and precise rotation of the crt. Another feature is an adjustment to minimize parallax between the phosphor surface and the graticule. Time required for installation is approximately 30 minutes*.

Order through your Tektronix Field Engineer or Field Office. Specify for the following instruments Tektronix part number 040-292. Price: \$4.75.

| SCOPE TYPE | SERIAL NUMBER |
|------------|---------------|
| 531/531A | 5001-20409 |
| 532 | 5001-6519 |
| 533 | 101-1469 |
| 535/535A | 5001-21349 |
| 536 | 101-1089 |
| 541/541A | 5001-20469 |
| 543 | 101-1249 |
| 545/545A | 5001-22059 |

For these following instruments, specify Tektronix part number 040-293. Price: \$4.75.

| SCOPE TYPE | SERIAL NUMBER |
|------------|---------------|
| RM31/RM31A | 101-1059 |
| RM32 | 101-330 |
| RM33 | 101-139 |
| RM35/RM35A | 101-1229 |
| RM41/RM41A | 101-1029 |
| RM43 | 101-111 |
| RM45/RM45A | 101-1199 |

TYPE 127 SILICON RECTIFIER MOD KIT—For Type 127 Pre-amplifier Power Supplies.

This modification replaces the selenium rectifiers used in the Type 127 with silicon diodes. Silicon diodes offer greater reliability and longer life. Time required for install-

ation is approximately one and one-half hours*.

Two kits, each restricted to a certain serial number range, are offered. In ordering, care must be exercised to be sure that you order the kit for the serial-number range in which your instrument's serial number falls.

Order through your Tektronix Field Engineer or Field Office. For instruments with serial numbers 101 through 358, specify Tektronix part number 040-217. Price: \$29.50. For instruments with serial numbers 359 and up, specify Tektronix part number 040-282. Price: \$34.00.

*Quoted installation times are for first-time installations by a trained technician familiar with Tektronix instruments.

DON'T LET THIS HAPPEN TO YOU

One of the prime purposes of the Tektronix Field Office and its Field Engineers is to help customers select the instruments best suited to their present and future needs. To prepare himself for this task, the Field Engineer spends at least six months in training—at the factory—and returns periodically for further training and indoctrination on new instruments.

The following incident illustrates what can happen when a customer, not completely familiar with Tektronix instruments, places an order without availing himself of a Tektronix Field Engineer's counsel and advice.

A certain company makes solenoid-operated, fast-response valves for a special application. These valves must open or close within several milliseconds of the application of current to the solenoid.

One of this company's customers suggested that this response time can be measured with a Tektronix Type 551 Dual-Beam, Dual-Plug-In Oscilloscope. The company ordered one, regrettably not through the Tektronix Field Office that should serve them.

When the instrument was delivered, they found that they did not have an end-use instrument—they had not ordered Plug-Ins.

Duncan Doane, of our Encino, California Field Office, was the Tektronix Field Engineer finally called on for help. When he determined the company's actual application, he informed them that a less sophisticated oscilloscope could do the job for them and at a considerable savings. He offered to take back the Type 551 and replace it with a less expensive oscilloscope.

Possibly to show their appreciation for Tektronix efforts to be agreeable and fair, they declined the offer. However, they did ask Dunc if he would advise them on what they must do to make the measurement.

Here was a natural for the Tektronix Type Q Transducer and Strain Gage Plug-In Unit and Dunc so advised them. They will use a Stratham P-27 pressure transducer with it. To fill in the other vertical plug-in compartment of the Type 551, Dunc suggested a Type A Plug-In unit to monitor the current build up through the solenoid. They will use the drop-in-potential method across a series resistor.

Remember, your Tektronix Field Engineer can be your best source of help—before, during, and after delivery of your Tektronix instruments.

SERVICE HINTS

VERTICAL DRIFT IN TYPE 503 OSCILLOSCOPES

The flange-mounted electrolytic capacitors C652 and C654 affect the output voltage of the -12, +100 and +250 volt supplies in the Type 503. These supplies are only indirectly regulated. In cases of vertical drift, not attributable to tubes, try cinching down the flange-mounting screws of these capacitors.

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.