



Service Scope

USEFUL INFORMATION FOR USERS OF TEKTRONIX INSTRUMENTS

NUMBER 10

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OCTOBER 1961

PROTECTION OF TYPE 321 VERTICAL AMPLIFIER AGAINST TRANSIENTS

Under certain conditions, the transistor Q443* in the vertical amplifier of the Type 321 Oscilloscope will fail. With the VOLT/DIV switch in the most sensitive (0.01 v/div) position, an inadvertent connecting of the signal input to a high-voltage overload will cause damage to this transistor. Or, with the INPUT switch in the AC position, C401—the AC-input coupling capacitor—can charge to a high negative voltage (150-500 v). If, immediately after reaching this charge, the capacitor should suddenly be discharged by the grounding of the scope input, the transistor will suffer damage. In either instance, the resulting positive surge will cause an excessive B-to-C voltage that will exceed the collector breakdown voltage of Q443.

A germanium diode connected between the cathode of V423 (5718 input CF) and the 6.3-v dc filament supply will protect Q443 against the positive-going surges generated under these conditions. The modification will in no way impair the instrument's performance. We recommend the use of the low-capacitance Type T12G (or equivalent) diode.

To add this protective circuit to the Type 321, connect the recommended diode from the cathode, pin 5, V423, to the +6.3 v (decoupled) source, which supplies filament power to pin 6, V423. The cathode (color-coded) end of the diode should be connected to the filament line so that in normal operation the diode is back-biased by about 5 volts. See figure 1 below.

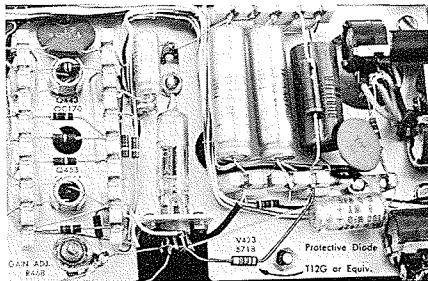


Figure 1

The schematic diagram for the instrument should be modified as shown in figure 2 and the new diode assigned the

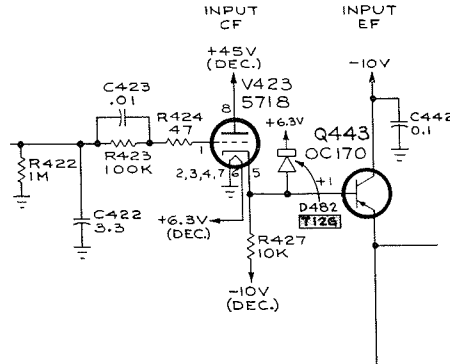


Figure 2

symbol D482 and added to the instrument-manual's parts list.

This modification applies to all Type 321 Oscilloscopes with serial numbers below 479. A factory installed modification protects Type 321's with higher serial numbers.

*This transistor is identified as Q433 on some early schematic diagrams.

FLORIDA OFFICE CONSOLIDATION BENEFITS CUSTOMERS

On September 1, 1961, our St. Petersburg, Florida Field Office consolidated with our Orlando, Florida Field Office. This consolidation will provide larger, more complete facilities and improved service benefits to Tektronix customers in the affected areas.

Among the factors recommending this action several are of particular importance to customers in these areas:

- (1) Recent expansion of facilities at the Orlando Field Office provide an enlarged and more complete emergency repair-parts stock.
- (2) Direct access to an enlarged repair-parts stock by your Tektronix Field Engineer. Also, more readily at his disposal are the field maintenance skills of the enlarged and well-equipped Field Repair Center.
- (3) Installation of special equipment to wash instruments when the need for this treatment is indicated. This equipment includes an oven to dry or bake out residual moisture in washed instruments.
- (4) Improvements in the Florida highway system now permit effective service of the eastern and southern parts of the state from this combined Field Engineering Office and Repair Center.

(5) Greater utilization of Field Office personnel and facilities are made possible under this consolidation. Customers in the affected areas—and this includes the St. Petersburg-Tampa area—will receive improved Field Engineering coverage and service benefits.

Customers in the St. Petersburg-Tampa area may call the Orlando Office toll free by using the telephone number WX2199.

For all others, the telephone number for the Orlando Office is GARDEN 5-3483.

Regular visits by our Field Engineers will continue to provide our Puerto Rico customers with the same service enjoyed by our customers in Florida.

From Puerto Rico call—Orlando, Florida, GArden 5-3483 or write to:

Tektronix, Inc.
205 East Colonial Drive
Orlando, Florida.

TEKTRONIX POLARIZED VIEWER FOR TEKTRONIX 5" OSCILLOSCOPES

To people who must view oscilloscope traces under high ambient light conditions, the problem of light reflections is an irritating one.

Interpreting an oscilloscope display under these conditions is always difficult and sometimes well nigh impossible. Even with the intensity turned up to maximum brightness this is true. And here one encounters another hazard.

There is always the possibility of permanent damage to the crt phosphor when the INTENSITY control is set to give maximum trace brightness. This is particularly true when the instrument is operated at the slower sweep speeds.

The new Tektronix Polarized Viewer was designed to overcome these problems stemming from high ambient light conditions. Installed on your oscilloscope, it will reduce light reflection problems to a negligible factor and eliminate the need for dangerous intensity settings at slow sweep speeds.

The pictures shown below were taken in a well lighted office with large windows and a southern exposure. The day was very bright and sunny. These factors combined to give an extremely high ambient light condition.

Both pictures were taken without altering the position of the oscilloscope or camera. This fact is attested to by comparing the pattern of front panel light

reflections. Close scrutiny will also disclose that the position of the front panel controls are the same in both pictures.

Figure 1 shows the oscilloscope without the Polarized Viewer. The Amplitude Calibrator waveform being displayed on the crt was barely discernable to the naked eye and does not show in the photograph at all. Figure 2 with the Polarized Viewer in place eliminates reflection from the crt and the Amplitude Calibrator waveform is readily visible.

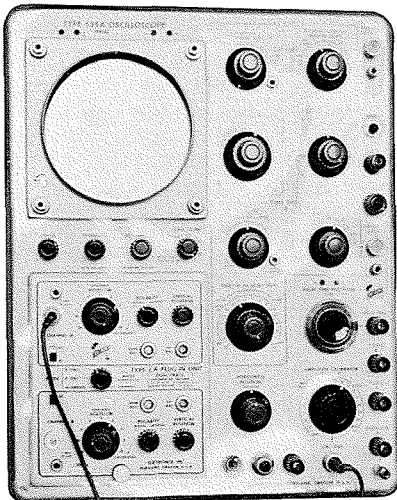


Figure 1

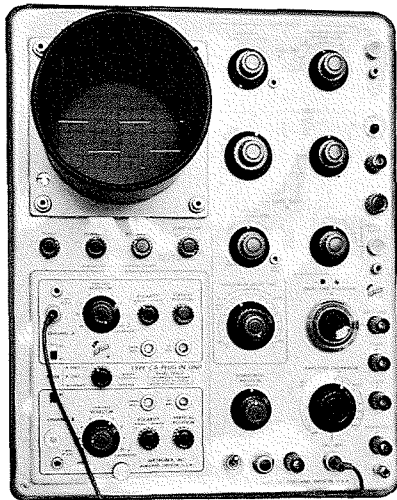


Figure 2

The Viewer slips on or off the oscilloscope in a matter of seconds. There are no nuts or bolts to loosen or tighten.

Ask your Tektronix Field Engineer for a demonstration of the Polarized Viewer. Tek part number is 016-035. Price is \$10.00.

NEW FIELD MODIFICATION KITS

SILICON-RECTIFIER MODIFICATION KIT

For Type 532, s/n 101 to 6921, and Type RM32 Oscilloscopes, s/n 101 to 449.

This modification replaces the selenium rectifiers with silicon rectifiers which offer more reliability and longer life.

The kit includes a prewired chassis with silicon diodes mounted, step-by-step installation instructions, photo, parts list and schematic.

Approximate installation time by a trained technician is 30 minutes.

Order through your Tektronix Field Engineer. Specify Type 532 Silicon Rectifier Mod Kit, Tek. No. 040-218. The price is \$12.00.

PRESET-STABILITY MODIFICATION KIT

For Type 532 Oscilloscopes, s/n 5420 to 5665.

This modification installs a new potentiometer and preset switch to enable the operator to quickly switch to a preset-stability setting.

The kit includes a Stability-Potentiometer-and-Preset-Switch assembly, step-by-step installation instructions, parts list and schematic.

Approximate installation time by a trained technician is one hour.

Order through your Tektronix Field Engineer. Specify Type 532 Preset-Stability Mod Kit, Tek. No. 040-244. Price is \$6.50.

TYPE "N" PROBE-POWER FIELD MODIFICATION KIT

For Type N Plug-In Units, s/n 101 to 220.

This modification kit installs a probe-power socket on the front panel of the Type N Plug-In unit. It permits the use of the P6025 Cathode-Follower Probe* - a high impedance probe designed for use with the Tektronix Type N Plug-In Unit.

The kit includes a probe-power socket, necessary hardware, tags, photos and step-by-step installation instructions.

Approximate installation time by a trained technician is one hour.

Order through your Tektronix Field Engineer. Specify Type "N" Probe-Power Field Mod Kit. Price is \$8.65.

* The P6025 Cathode-Follower Probe will be in full production by December 1961.

EXTERNAL-TIME-SWEEP MODIFICATION KIT

For Type N Plug-In Units, s/n 101 to 220.

This modification installs an External-Time-Sweep socket on the front panel of the Type N Plug-In Unit to permit the use of two N Units in the Type 551 or Type 555 Oscilloscopes.

The kit includes all the necessary hardware, tag, photo and step-by-step installation instructions.

Approximate installation time by a trained technician is 30 minutes.

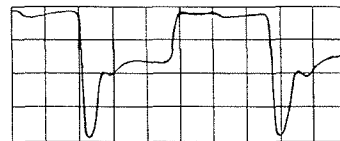
Order through your Tektronix Field Engineer. Specify Type "N" External-Time-Sweep Mod Kit, Tek. No. 040-246. Price is \$3.10.

SERVICING HINTS

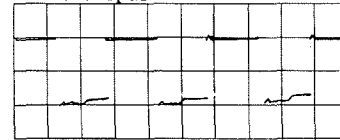
TYPE 107 WAVEFORM DISTORTION

Some Type 107 Square-Wave generators prior to s/n 1450 may produce distorted waveforms. We find that high-gain 12BY7's in V45 and V55 positions of the affected instruments produce oscillations which result in poor risetime and cause a step in the negative portion of the square wave (see Figure 1; a, b, c.).

a. Pin 7 V45



b. Output



c. Output @ 10 nsec/cm

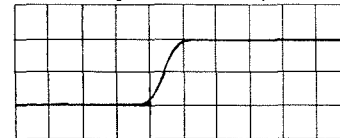
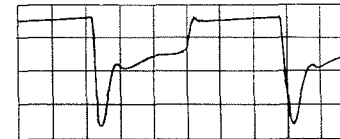
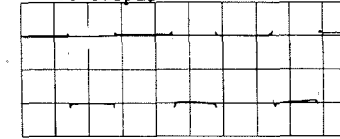


Figure 1

a. Pin 7 V45



b. Output



c. Output @ 10 nsec/cm



Figure 2

When viewed on a Type 585 scope, the risetime of the affected Type 107's ranged from 4.0 to 8.0 nanoseconds, depending upon the particular tubes used. In less extreme cases of oscillation, the risetime varied with frequency.

To correct this condition in your instrument, dress coupling capacitors C57 and C67 down close to the filament buss line. Relocate C49 and C59 directly over the tube sockets, and with leads as short as possible. Connect these capacitors between pins 1 and 8 of their respective sockets. C49 and C59 should be dressed

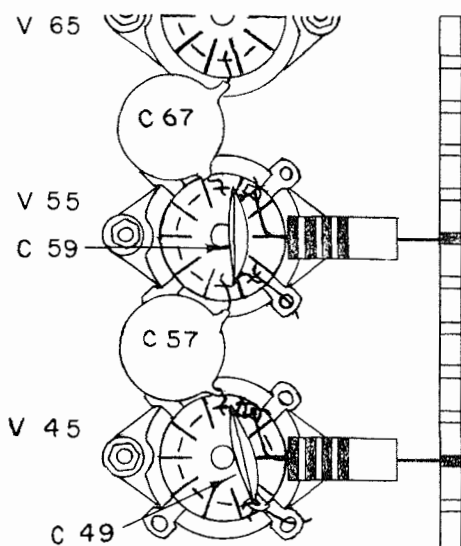


Figure 3

in an upright position (see Figure 3 for proper parts layout).

Type 107's from s/n 1450 on are modified at the factory and should not have this problem. (Figure 2; a, b, c, shows waveforms of a properly working Type 107).

TEKTRONIX TYPE 545 CALIBRATION AND MAINTENANCE PROCEDURE ERROR.

The figures given in the "Tektronix Type 545 Oscilloscope Calibration and Maintenance Procedure" (Tek. No. 070-282) contain an error. The figures given for the vertical amplifier stage gains (Step 7.7.3.1, page 3-30) are not correct. Corrected pages 3-30 will be distributed to Tektronix Field Offices as soon as possible.

Meanwhile, existing copies should be corrected as follows:

7.7.3.1 Insufficient Gain. Use a regular voltage measurement plug-in in the instrument under test. Check stage gains to assure even phase-splitting ahead of the main vertical-amplifier input. Measure amplitude at each grid comparing gain against the tables below:

	Gain	
	Min.	Normal
12BY7A or 6AW8 (GAIN ADJ. clockwise)	4-4.5	5.5-6
6BQ7/6DJ8 Cathode-Follower Stage*	0.7	0.7
Distributed Amplifier (6CB6's or 6DK6's)	20-22	22-24

* Above serial numbers 9292, 0.7 gain is total for both cathode-follower stages. If input and output stages are at or near minimum gain, tubes in one or both stages may require replacement.

If overall amplifier gain is 70 or more, the trouble is probably not in the amplifier, and may be in crt sensitivity. Recheck high voltage supplies (4.1) and Deflection factor (6.4).

If vertical amplifier tubes are changed, be sure to repeat all parts of Step 7. If tube change does not provide correct gain, check plate-load resistors, screen potentials, decoupling networks, filament lines, etc. Also check calibrator accuracy (Step 8.)

USED INSTRUMENTS WANTED

1 Type 515 or Type 515A or Type 516 R.H. Dempsey
Electronic Services
3648 Harkness Street
Napa, California
Phone: Baldwin
6-7773

1 Type 531 Customer prefers his name be kept confidential. Please direct inquiries to the Tektronix Endicott Field Office, 3214 Watson Blvd., Endwell, New York

1 Type 513D, Type 514 or Type 310 R.H. Cook
1213 Webster
Royal Oak, Michigan

1 Type 541AD or Type 511AD Johny Russell
2870 Ronald Street
Riverside, California
Phone: Overland
6-6119

USED INSTRUMENTS FOR SALE

1 Type 511AD s/n 1821 Dick Stivers
Valor Electronics
13214 Crenshaw
Gardena, California
Phone: Faculty
1-2280

1 Type 531 s/n 2456 Dr. K.L. Cook
University of Utah
Geophysics Department
Salt Lake City, Utah

1 Type 127 s/n 155 Dr. George Czerlincki
Johnson Foundation
University of Pennsylvania
Philadelphia 4, Penn.
Phone: Evergreen
6-0100, Ext. 8796

1 Type 555 s/n 282 S. Olive, Vice-President
R. D. Brew & Co.
90 Airport Road
Concord, New Hampshire

2 Type CA Plug-Ins, s/n's 15262 & 18353

1 Type 512 s/n 2567 Macan Engineering & Mfg. Co.
1564 N. Damen Avenue
Chicago 22, Illinois
Phone: BE 5-3386

1 Type 511AD s/n 5210 Wilbur McBride
Standard Oil Research Laboratory
4440 Warrensville Center Road
Cleveland 28, Ohio

1 Type 511AD s/n 4461 Steve Evans
Price \$200.00 Advanced Instrument Corp.
1475 Powell
Emeryville, California

MISSING OSCILLOSCOPES

Bramco, Inc. of 4501 Belevidere, Detroit 14, Michigan, reports that the following instruments are missing from their plant and are presumably stolen:

- 1 Type 543 Oscilloscope, s/n 158
- 1 Type 535A Oscilloscope, s/n 20235
- 1 Type 53/54C Plug-In Unit, s/n 16971
- 1 Type 53/54L Plug-In Unit, s/n 2745
- 1 Type 53/54L Plug-In Unit, s/n 2745

If you have any knowledge of the whereabouts of these instruments, Bramco, Inc. would appreciate it very much if you would contact them.

CORRECTION

"SOLVING POWER LINE PROBLEMS" (JUNE 1961 SERVICE SCOPE)

The method outlined in the June issue of Service Scope for determining power-line distortion by comparison of filament-line rms and peak-to-peak voltages is not valid for Type 517(A) and Type 555 Oscilloscopes, and—even with other model instruments—should only be taken as a rough indication of the line voltage distortion actually present. Gordon Sloat, Manager of the Tektronix Transformer and Coil Department, points out that the implication in the June article that this method provided more than an approximation of line-voltage distortion is incorrect.

The Types 517(A) and 555 Oscilloscopes employ a peak-limiting saturable reactor to provide regulation of the indicator unit filament lines, and the distortion on the filament lines in these instruments will not be representative of the line-voltage waveform. A typical VOM may show only 5.8 volts for a true rms of 6.3 volts on one of these regulated filament lines.

In other instruments, a certain amount of filament-line distortion may be introduced in the transformer because of the filament-winding positions and other transformer design parameters. Since these winding locations and parameters may vary considerably between serial ranges of instruments and between instrument types, Gordon has suggested that the technique of using filament-line distortion as an indicator of power-line

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Beaverton, Oregon

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USEFUL INFORMATION FOR

Service Scope



distortion should not be relied on heavily.

Comparison of the actual peak-to-peak versus true rms-power-line voltages is preferred as a much more accurate method of determining the suitability of the power-line waveform for proper B+ regulation.

For the peak-to-peak measurement, the V-O-M adapter suggested in the June 1961 issue of Service Scope, or an accurate peak-to-peak reading voltmeter are recommended; for rms readings, an iron-vane or thermocouple meter will give the most accurate results.

A TIP FOR CLEANING TIPS

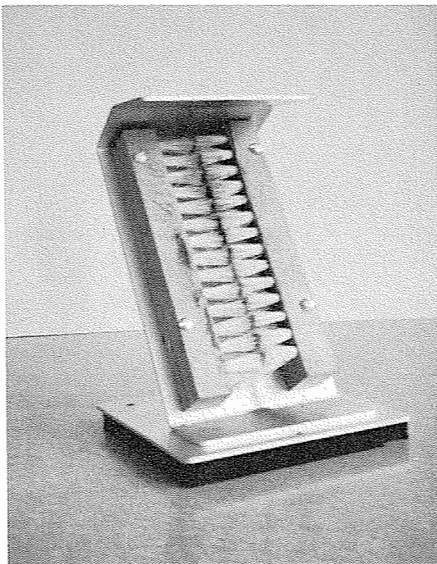


Figure 1

Figure 1 above shows a handy-dandy unit for keeping soldering-iron tips clean.

We find this cleaner, much more efficient, and quicker than the old wipe-on-a-cloth method.

Easy to construct and simple to use, it does an excellent job. To use it, just draw the soldering-iron tip down through the brush bristles as shown in figure 2.



Figure 2

We used 0.064" aluminum in constructing the unit shown here. Base dimensions are 4" x 4". The bracket, in which the brushes are mounted is, in this instance, spot welded to the base. You could just as easily mount the bracket to the base with two flat-head bolts counter sunk flush with the bottom side of the base. Locate the bracket $\frac{3}{8}$ " from the front edge of the base.

Form the bracket for the brushes from a piece of aluminum 3" x 8". One inch from the end of this material make a

60° bend. Five inches from this bend make a 45° bend. One and one quarter inches from the 45° bend make a 30° bend. Be sure you make each bend in the direction as shown in the picture.

On the five inch section of this bracket, $\frac{7}{16}$ " in from each side and $1\frac{1}{4}$ " up from the 60° bend, drill four holes (two holes to a side) on three inch centers. Use a #27 drill. If you wish to be real fancy you can make slots about $\frac{1}{2}$ " long and as wide as the holes. Then as the brush bristles wear you can readjust the brushes close to each other.

The brush portion of the cleaner can be purchased at almost any hardware store. Ask for a white tampico hand brush. Dimensions of the brush should be $4\frac{3}{4}$ " long by $1\frac{1}{2}$ " wide. One brush will be all you require per unit.

One and one eighth inches from one end of the wood handle and $\frac{1}{4}$ " down from the top, drill two holes on three inch centers. Use a #14 drill. Now saw the handle through the center lengthwise. This will give you two brushes $4\frac{3}{4}$ " long by $\frac{7}{16}$ " wide. Mount the brushes as shown in the pictures and you have a quick, convenient and efficient soldering-iron-tip cleaner.

You may mount the cleaner permanently in a convenient location by drilling holes in the base plate and securing the unit with screws or bolts. The one shown has sponge rubber strips $\frac{1}{2}$ " wide by $\frac{1}{4}$ " thick cemented to the base. They hold the cleaner in place when it is used and have the added advantage of making the unit portable.

The metal extending out on the top of the cleaner (formed by making the 30° bend) is important. It deflects downward and away from the operator any hot solder or tip flakes dislodged by the cleaning brushes.