



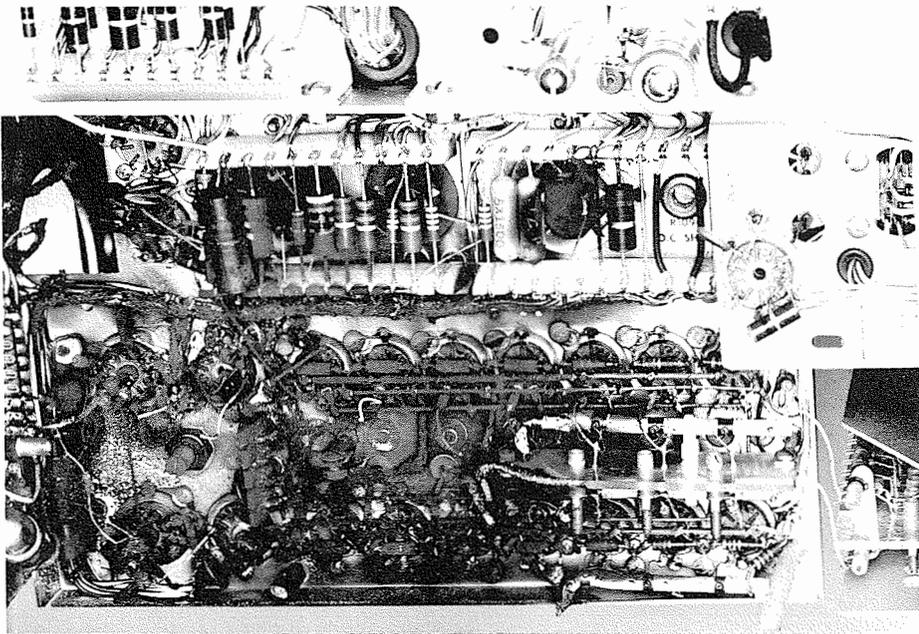
# Service Scope

USEFUL INFORMATION FOR USERS OF TEKTRONIX INSTRUMENTS

NUMBER 6

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FEBRUARY 1961



Damage caused in the distribution amplifier of a Type 545A Oscilloscope as a result of a shorted crt lead.

## NOTICE! IMPORTANT INFORMATION

A seriously damaged distributed amplifier CAN occur in any of the following oscilloscopes:

Type 541, all serial numbers above 6565  
Type RM41, all serial numbers above 111  
Type 545, all serial numbers above 9720  
Type RM45, all serial numbers above 132  
Type 541A, all serial numbers  
Type RM41A, all serial numbers  
Type 543, all serial numbers  
Type RM43 all serial numbers  
Type 545A, all serial numbers  
Type RM45A, all serial numbers  
Type 551, all serial numbers  
Type 555 all serial numbers

In these instruments, certain types of short circuits (such as a crt lead becoming disconnected and shorting to ground) will cause the terminating resistor to burn. Secondary effects caused by the burning of these resistors can result in extensive damage as shown in the picture above. Repairs in such an event are costly, both in money and down-time for the instrument. This is indeed a regrettable situation, but one that only time and experience in the field with the instrument could have brought to light. Since becoming aware of the difficulty, we have

developed a field modification kit that protects the distributed amplifier from damage due to these short circuits. We offer this modification kit free of charge.

We earnestly recommend that owners of these instruments consider the installation of this modification a must.

Order the modification kit through your Tektronix Field Engineer. For Type 551 and Type 555 Oscilloscopes, order: Field Modification Kit—"Fuse for Protection of the Distributed Amplifier", Tek number 040-226.

For all other instruments listed above, order: Field Modification Kit—"Fuse for Protection of the Distributed Amplifier", Tek number 040-227.

Immediate steps are being taken at Tektronix plants to incorporate this modification in all affected production instruments. The Type of oscilloscope and the serial number at which the modification become effective will be announced in a future issue of SERVICE SCOPE. For the present, please consult your Tektronix Field Engineer to determine if instruments you have on order or have recently received are affected by this notice.

## TYPE 530/540 OR TYPE 530A/540A SERIES OSCILLOSCOPES AND COMPOSITE VIDEO SIGNALS

### Part I

Several TV Broadcast Studios have been using Type 530/540 or Type 530A/540A Oscilloscopes and trying to trigger on a nonintegrated composite video signal. There are three different pulse trains, all very close in amplitude, at the start of a composite video signal. Most oscilloscopes, when presented with this signal, will try to trigger on each pulse of the three trains. The result is an unstable display.

Television engineers generally will prefer the Type 524AD over other oscilloscopes for viewing the composite video signal. This instrument, specifically designed for television broadcast studio requirements, contains carefully planned trigger separator and sync separator circuits that enable the instrument to trigger reliably on composite video signals. It also provides other characteristics desirable for the maintenance and adjustment of television transmitter and studio equipment. The Type 524AD enables the engineer to observe any portion of the television picture—from complete frames to small portions of individual lines.

However, the Type 530/540 or 530A/540A Series Oscilloscopes give usable results if an integrator circuit is employed. A suitable integrator circuit consists of a 10 k resistor and a 0.01  $\mu$ d capacitor.

To use this circuit with these instruments, patch the VERT SIG OUT of the oscilloscope to the TRIGGER INPUT via the integrator circuit.

For the Type 531, 532, 533, 541, and 543 or Type 531A, and 541A proceed as follows:

- Step 1. Use a wide band Plug-In Pre-amplifier in the oscilloscope and apply the composite video signal to the INPUT. Adjust the VOLTS/CM to give 3 or 4 centimeters of vertical deflection.
- Step 2. Patch the VERT SIG OUT to the TRIGGER INPUT via the integrator circuit. See fig. 1.
- Step 3. Set the TIME/CM switch to 5 MILLISEC.
- Step 4. Set the TRIGGER SLOPE switch to -EXT for negative-going signals or +EXT for positive-going signals and the TRIGGER MODE switch to AC or AC SLOW.
- Step 5. Turn the STABILITY and

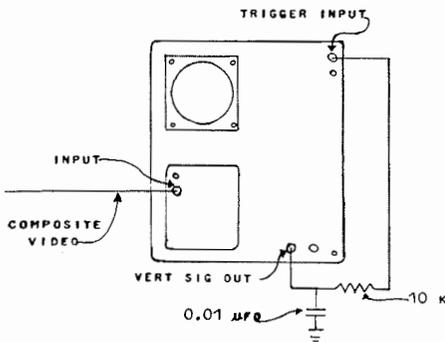


FIG. 1

TRIGGERING LEVEL controls full right.

Step 6. Turn the STABILITY control to the left until the sweep ceases to operate. Continue to turn the control to the left for several more degrees.

Step 7. Turn the TRIGGERING LEVEL control to the left until a stable display is obtained.

On instruments for which this procedure is intended, the operator can view either a field or line presentation. Limitations of these instruments, however, will not permit the operator to select the line to be presented.

Editors note: Part II of this article will appear in the next (April) issue of SERVICE SCOPE. The procedure for viewing composite video signals on the Type 535, 545, 535A, and 545A will be given at that time.

### HELP IN USING AND UNDERSTANDING YOUR TYPE 535A OR TYPE 545A OSCILLOSCOPE

The Type 535A and Type 545A Oscilloscopes are extremely versatile instruments. To fully utilize their capabilities, an operator must be completely familiar with each control and its function. The new operator, the partially informed operator, or even the experienced operator will find the booklet "Using Your Oscilloscope Type 535A or Type 545A" a great aid in acquiring this desired degree of familiarity with these instruments.

This booklet is a revised and up-dated version of one originally written for operators of the old Type 535 and Type 545 instruments\*. It is written in two parts. Part 1, "Getting Acquainted", describes the effect of each front-panel control, explains in detail the unique Tektronix features: Delayed Trigger, Delayed Sweep and Single Sweep modes of operation (that give to these instruments their high degree of flexible versatility), and outlines some of the more frequently encountered oscilloscope operations.

Part 2 of the booklet includes the information in the "Getting Acquainted" section, in condensed form for easy reference, plus simple, easily-understood instructions on other applications of the oscilloscopes.

To obtain a copy of this booklet, ask your Tektronix Field Engineer for FIP-8

"Using Your Oscilloscope Type 535A or Type 545A".

\*A limited number of the booklets for the Type 535 and Type 545 are still available. Ask your Tektronix Field Engineer for FIP-1, "Using Your Type 535 or Type 545 Oscilloscope."

### TEKTRONIX FIELD MAINTENANCE FACILITIES AND SERVICES

The Field Maintenance Facilities and Services available through your Tektronix Field Engineer are described in a recently published booklet. Also in the booklet are some pictures of a typical maintenance facility and a map of the United States showing the location of Tektronix Field Offices. Those Field Offices having a Repair Center are identified and they, their addresses and telephone numbers are listed for ready reference.

For your copy just call your Tektronix Field Engineer and ask him for the Field Maintenance Facilities and Services booklet.

### QUESTIONS FROM THE FIELD

1. Q. What is the risetime of the P500CF Probe?
  - A. We used the following equipment: a Type 545A Oscilloscope with Type K Plug-In (Passband of this combination was 30.5 mc), a Type 108 Fast-Rise Mercury Pulser, and a P500CF Probe. Risetime figures obtained under these conditions were as follows:
    - P500CF (with no attenuation) 13.0 nsec.
    - P500CF (with 10X attenuator) 17.5 nsec.
2. Q. Do you have any drift figures on the Type 503 Oscilloscope?
  - A. We have never quoted any drift specifications for the Type 503. However, we ran some checks on ten production Type 503's. After an initial warm-up period to allow the instruments to stabilize, the following drift figures were recorded at a sensitivity of 1 mv/cm. Remember, these are only typical figures and are not to be considered drift specifications for the Type 503.
    - Average drift 1.5 cm/hr.
    - Minimum drift 0.5 cm/hr.
    - Maximum drift 3.0 cm/hr.
 The input 6DJ8's have the greatest effect on drift. Also, the two 2N544 transistors designated Q454 and Q464 in the vertical amplifier affect the drift.
3. Q. In the Type 580 Series Oscilloscopes can a signal be connected directly to the vertical deflection plates of the CRT?
  - A. According to Vaughn Weidel (Engineering), we have not developed an acceptable method for inserting signals directly into the vertical deflection plates of the crts in these

instruments. The problem is to match the signal source to the approximate 900-ohm impedance of the distributed plates. If any matching device such as a transformer is used, much ringing and distortion occurs.

4. Q. Can you suggest a device for coupling the output of a sine-wave or square-wave generator to the P6016 Current Probe when testing the passband or square wave response of the probe?
  - A. A 1½" piece of No. 18 solid wire, formed into a question mark, in series with a small 50 Ω—1% resistor and soldered to a female uhf connector will do the trick. (See fig. 2). This test jig has a VSWR

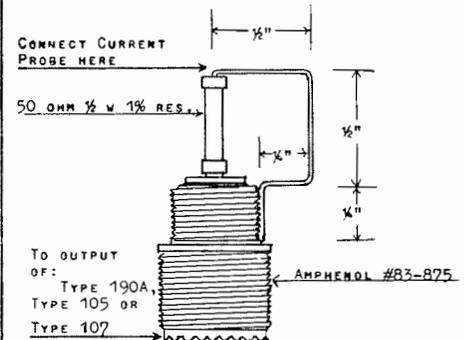


Fig. 2

of 1.05 at 20 mc and can be used with a Tektronix Type 190A Constant Amplitude Signal Generator for passband response, and a Type 105 or Type 107 Square Wave Generator for square wave response.

5. Q. We have noticed a spurious pulse on a Type 575 Transistor-Curve Tracer. This is a positive pulse which occurs between each normal cycle for P-N-P transistors). The pulse length is about 5 milliseconds and about 4 volts in amplitude when the base current is set for 1 milliampere per step. Could this pulse damage transistors having a low reverse rating between base and emitter? If so, how can it be eliminated?
  - A. The transistor is driven from a constant-current source. If the Step Zero is set so that the first base step occurs when the transistor is cut off, the maximum voltage capabilities of the Base Step Generator will be present at the base terminal of the transistor under test. Since the first step current is limited to the scale setting, there is small chance of damage to the transistor under test. The Step Zero control can be set to eliminate this pulse if desired.
6. Q. Can a Type 502 Dual-Beam Oscilloscope be modified to provide variable controls on the vertical amplifiers?
  - A. Yes, a field modification kit is available to accomplish this. The kit

adds a VARIABLE VOLTS/CM control to the front panel for both the UPPER and LOWER beam vertical amplifiers. It includes a complete set of components, parts list, schematic, photos, and step-by-step installation instructions. Order the kit from your Tektronix Field Office. Specify; Type 502 Variable Volts/cm Mod. Kit, Tek part number 040-222. The price is \$10.50.

#### USED INSTRUMENTS FOR SALE

- 1 Type 315 Eric Vaughan  
s/n 198 Superior Electric Co.
- 2 Type 512 83 Laurel Street  
s/n's 1817 & Bristol, Connecticut  
2717
- 1 Type 524 Boco Wu  
Livingstone, New Jersey  
Tel. Wy 2-4790
- 1 Type 514D Walt Jannsons  
s/n 2615 Isomet Corporation  
Palisades Park,  
New Jersey  
Tel. Windsor 4-3070
- 1 Type 512 Gus Winston  
s/n 1111 227 Marina Way  
Pacifica, California

#### USED INSTRUMENTS WANTED

- 1 Type 310A Milton D. Post  
460 N.W. 30th Terrace  
Ft. Lauderdale, Florida
- 1 Type 517 G. Connell  
212 Wensley Lane  
East Islip, Long Island,  
New York
- 1 Type 535 Purcell Robinson  
or Type 545 1442 North 62nd Street  
Philadelphia 31, Penna.
- 1 Type 511 or Weaver County School  
Type 524 District  
L. O. Keys  
Salt Lake City, Utah  
Elgin 9-7691
- 1 Type 535 or Robert Sinn  
535A Ultronics
- 1 Type CA 118 North 3rd St.
- 1 Type C Camden, New Jersey  
Woodlawn 4-4664
- 1 Type 530 or Professor George C. New-  
540 Series ton, Jr.  
with a Type Electronic Systems  
53/54C or Laboratory  
CA Plug-In Massachusetts Institute  
of Technology  
Cambridge 39, Mass.
- 1 Type 112 Westinghouse Electric  
Preamp- Corp.  
fier Cletus Hostetler  
P. O. Box 284  
Elmira, New York
- 1 Type 531 or Richard Van Lunen  
Type 535 9203 Alcona Street  
Lanham, Maryland
- 1 Type 530 Leonard M. DeBall  
Series or 5247 S. Avers Avenue

Type 540 Chicago, Illinois  
Series or  
Type 550  
Series  
1 Type CA,  
or K, or L  
Plug-In

#### MORE LOST OR STOLEN SCOPES

Tektronix Field Engineer Ron Bell reports that a Type 316S1, serial number 902, is missing from the Goodyear Aircraft Corporation in Akron, Ohio. If you have any information on this instrument notify the Goodyear Aircraft Corporation.

Tektronix Field Engineer Duncan Doane reports the disappearance of a Type 310A, serial number 011213, from the Electronic Specialty Company, 5121 San Fernando Road, Los Angeles 39, California. If you run across this scope in your area, notify the Electronic Specialty Company by collect wire, or phone, Chapman 5-3771.

The following instruments have disappeared from the custody of the Philco Corporation, Government and Industrial Group, 4700 Wissahickon Avenue, Philadelphia, Penna.

- 1 Type 541A Oscilloscope s/n 20379
- 1 Type CA Plug-In Preamplifier s/n 10031
- 1 Type L Plug-In Preamplifier s/n 5235
- 1 Type 107 Square-Wave Generator s/n 625

If you know the whereabouts or have any information on these instruments, please contact the Philco Corporation, Computer Division, Test Equipment Control Section, Willow Grove, Pennsylvania, Oldfield 9-7700, Extension 537.

The Florida Power Corporation at Winter Park, Florida, reports that their Type 310S2 Oscilloscope s/n 6674 is missing and may have been stolen. Please contact them if you have any information on this instrument.

#### DO YOU UNDERSTAND THE SWEEP DELAY FEATURE OF YOUR TEKTRONIX OSCILLOSCOPE?

The Sweep Delay\* is an important feature of the Type 535A, 545A, 555 and 585 Oscilloscopes. However, some users of these instruments are completely unaware of the flexibility this feature provides or the many applications made possible by it.

It is not within the scope of this publication to explain the Sweep Delay feature—space will not permit it—but we can tell you how you can have it explained and demonstrated to you. Call your Tektronix Field Engineer!

The explanation and demonstration, if you desire, can be given before a group of your technicians and engineers at a convenient time and place.

You will find your Tektronix Field Engineer to be a competent instructor with a minimum of six months factory training in the use and service of Tektronix instruments. Furthermore, he is keenly and genuinely interested in your scope

related problems and anxious to help in their solution.

This is an economical program offered on a no charge basis. The only thing we ask you to spend is your time!

\*In the Type 535 and 545 this feature is known as the Delaying Sweep.

#### ORIGINAL PRODUCTION OSCILLOSCOPE RETURNS TO TEKTRONIX



In July of 1947 Tektronix shipped its first production oscilloscope—a Type 511, serial number 101. Dr. A. R. Tunturi; Director of Navy Acoustic Research at the University of Oregon Medical School in Portland, Oregon, took delivery on this instrument for the purchaser, the U. S. Navy.

For 13½ years this Type 511 aided in providing Dr. Tunturi with reliable information in his research work—electronic mapping of the brain. Knowledge gained in this research is valuable in the diagnosis and treatment of neurological diseases and for the possible importance of applying how the brain works to the development of a mechanical brain for guided missiles. During this time installation of several factory-developed improvement modifications aided this Type 511 to keep abreast of Dr. Tunturi's oscilloscope requirements. The instrument remained, however, essentially a Type 511 while Dr. Tunturi's work continued to advance. Eventually the need for a more sophisticated oscilloscope became undeniable.

Rudy Vuksich of the Tektronix Advertising Department could see reciprocal benefits in Dr. Tunturi's need for a more advanced oscilloscope and the Tektronix desire to return their original production instrument to its place of origin.

Accordingly, he assisted in working out a mutually beneficial agreement between the interested parties. In exchange for the Type 511, serial number 101, Dr. Tunturi accepted for the U. S. Navy a Tektronix Type 515 Oscilloscope, an instrument admirably suited to his present oscilloscope requirements.

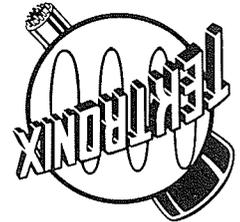
Type 511, serial number 101 now stands proudly on display in the reception area of the Tektronix factory in Beaverton, Oregon. Every Tektronix employee expresses his thanks to the U. S. Navy and Dr. Tunturi for their co-operation in returning this instrument to us. We are proud of our "first born"!

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

USERS OF TEKTRONIX INSTRUMENTS

USEFUL INFORMATION FOR

# Service Scope



## COMPUTER ENGINEERS SAY P6016 CURRENT PROBE A NECESSITY

Tektronix Field Engineer Owen Harrison reports many of the computer engineers he calls on consider the Tektronix P6016 Current Probe a necessity in computer service work. They claim that considerable savings in computer service time can be realized by the use of this probe. Compared to the method where a one ohm resistor must be inserted into the circuitry to obtain readings, the use of a P6016 Current Probe can cut computer service time by as much as 50%.

If you are not acquainted with the Tektronix P6016 Current Probe, call your Tektronix Field Office. A Field Secretary or a Field Engineer will be happy to arrange a demonstration at your convenience. In addition to being informative, the demonstration may aid in solving (or making it easier to solve) some of your engineering or servicing problems.

## TEKTRONIX TOUCH-UP PAINT

Touch-up paint to match the colors and finishes of Tektronix instruments is now available. The paints for touch-up jobs on gray-wrinkle, blue-wrinkle, or blue-vinyl finished cabinets come in 2 ounce jars. Also, the blue-wrinkle and blue-vinyl paints thinned for spraying, are available in 1 quart cans.

Order through your Tektronix Field Engineer or Field Office from the following chart.

TEK NO.	DESCRIPTION	QTY.	PRICE
252-083	Gray Wrinkle Touch-up	2-oz	\$1.10
252-084	Blue Wrinkle Touch-up	2-oz	1.10
252-085	Blue Wrinkle Thinned*	1-qt	3.00
252-086	Blue Vinyl Touch-up	2-oz	1.10
252-087	Blue Vinyl Thinned*	1-qt	2.80

\*These thinned paints are intended for spray-gun application

## FINDING BURIED CABLES



You may easily determine the position of a single conductor, buried eight to 10 feet below the ground surface, by magnetic detection.

A 10 to 15-ampere 60-cycle current passed through a buried conductor will create a strong magnetic field that a simple pickup loop and detector can locate easily.

If two wires of 117 v ac circuit must be located, one of them must be disconnected and an alternate external lead substituted. (A good ground will do.) If both wires are used, the magnetic flux from one will cancel the magnetic flux of the other.

An effective pickup loop consists of four to 10 turns of wire formed into an oval about five feet long and a foot wide. Bypass the two leads from the loop with a .01  $\mu$ f capacitor to reduce any radio frequency energy from broadcast stations.

(If cable near a broadcast antenna is to be located, you may need an additional low-pass filter to keep r-f from reaching the detector.)

The detector needs enough sensitivity to indicate signals at a maximum of about

.05 volts rms. A simple battery-powered transistor amplifier with frequency multiplication will raise both the signal level and the frequency for headphones.

A Tektronix Type 321 battery-powered portable oscilloscope may be used to make a visual measurement. It will do this job without an external preamplifier. Using the 321 with the pickup loop and a .01  $\mu$ f capacitor, you may locate each ground radial of a broadcast antenna while the station is on the air. In this case the signal will be the station's carrier.

You search with the pickup loop flat on the ground. When the loop is on both sides of the buried conductor, it will pick up energy from the conductor.

As the loop passes directly over the conductor, the signal disappears. When it moves past the conductor, the signal reappears.

For cables deeper than 10 feet, increase all dimensions of the coil to maintain the same accuracy.

## CORRECTION

We must call your attention to three errors, one typographical and two of omission, in the article "Timing of the Type 530A/540A Series Oscilloscopes". This article appeared in the December 1960 Service Scope.

In Step 6 of this article the .5  $\mu$ sec/cm setting of the TIME/CM switch should read .1  $\mu$ sec/cm.

Instructions for adjustment of C375 should have followed the instructions for adjusting C364. Here they are: Adjust C375 for best linearity between the 2nd and the 6th vertical graticule lines.

Finally, if it is necessary to replace the two 6DJ8 output tubes, the whole timing procedure should be run through again.

Now, if you don't mind, we will go apply a soothing lotion to a very red face.