



Service Scope

USEFUL INFORMATION FOR USERS OF TEKTRONIX INSTRUMENTS

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ACCURATE FREQUENCY MEASUREMENTS

By Jerry Kraxberger, Tektronix Field Engineer

The sweep-time accuracy of most Tektronix Oscilloscopes is specified to be $\pm 3\%$ on any range. Some oscilloscope operators find it necessary, at times, to make time or frequency measurements to much closer tolerances. Faced with these requirements, the oscilloscope operator will most likely rely on the highly accurate and well-known method of using Lissajous patterns to compare an unknown frequency with a standard frequency. This method has two drawbacks; one, it may not be suitable for the oscilloscope at hand; two, it requires considerable set-up time.

You may use a much simpler, yet equally accurate, method provided your oscilloscope possesses—as all Tektronix Oscilloscopes do—a triggered sweep. The accuracy of the instrument does not enter into the measurement and the wave shape of either signal, i.e. sine wave, sawtooth, pulse, etc., is not important.

To use this method, connect one signal to the external-trigger input and the other to the vertical-amplifier input of the oscilloscope. You may use either signal as the standard but you must connect the lower-frequency signal to the external-trigger input. Trigger the sweep in the normal manner. On Tektronix Oscilloscopes, set the TRIGGERING MODE switch to AC or DC. Do not use the AUTOMATIC or HF SYNC modes for this application. Make certain the sweep is not free running by temporarily removing the external-trigger signal. If the sweep is free running, a trace will remain on the crt.

Let's look at a specific application. Suppose you want to adjust a 400-cps signal to an accuracy better than $\pm 0.01\%$. We suggest the use of a triggered-type oscilloscope and a Tektronix Type 180A Time-Mark Generator* since 400 cps is an integer of the time-mark generator's 1-mc ($\pm 0.001\%$) crystal-controlled oscillator frequency.

Here is a suggested procedure: (see block diagram, Fig. 1)

1. Adjust the oscilloscope sweep time to 1 msec/cm.
2. Trigger the oscilloscope externally from the 10-msec marker (100 cps) of the time-mark generator (external-trigger-input of oscilloscope).
3. Connect the 400-cps signal to the vertical-amplifier input of the oscilloscope.
4. Adjust the 400-cps frequency precisely until it does not move horizontally on the screen.

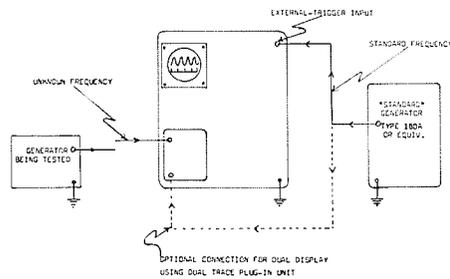


Fig. 1

Since the period of a 400-cps signal is $1/400$ sec or 2.5 msec, you should now have 4 complete cycles of the 400-cps signal displayed in 10 cm horizontally (10 msec of time) on the screen.

If the 400-cps signal does not move horizontally, and if the Time-Mark Generator has zero tolerance, the signal under test will be 400 cps ± 0.0 .

With the Tektronix Time-Mark Generators specified in this article as the standard source, the signal under test can be adjusted to 400 cps $\pm 0.001\%$ or 400 cps ± 0.004 cps.

Note that if the signal were off by ± 0.01 cps, one complete cycle would move past a given point on the crt screen in 10 seconds. When you consider the accuracy of the specified time-mark generators, this would be 400 cps ± 0.104 cps.

You can use the above method of frequency comparison because the 400-cps signal under test and the 1-msec (1 kc) time-mark signals are exact integers of the 1-mc/sec frequency of the time-mark generators crystal-controlled oscillator. Note that the oscilloscope sweep time does not enter into the measurement. It is, however, an aid when making preliminary adjustments of the signal under test.

If you use a dual-trace preamplifier (Type C-A for example)** in the oscilloscope vertical channel, you can observe both signals on the crt screen simultaneously. To do this, run another jumper from the time-mark generator's 1-msec output to the dual-trace preamplifier's B channel. Set the preamplifier MODE switch to the ALTERNATE, CHOPPED, or ADDED ALTERNATE position. The 1-msec markers will remain stationary on the crt screen but the 400-cps signal will travel to the right or to the left if it is not exact.

To insure the accuracy of the Type 180A Time-Mark Generator, you can compare or calibrate its frequency with the Bureau of Standards' WWV station as follows: Tune a short-wave receiver to station WWV. Add a short length of wire to the 1- μ sec output of the Type 180A Time-Mark Gen-

erator. The generator's 1-mc signal will beat with the incoming WWV signal in the short-wave receiver's A.M. detector. The difference frequency in cycles will be a measure of the time-mark generator's accuracy in parts per million. You can minimize this difference by adjusting the variable-trimmer capacitor across the oscillator crystal in the time-mark generator. Monitor this difference signal right off the detector of the short-wave receiver. Use an oscilloscope to do this. One cannot hear the low-frequency zero beat. Besides, the low-frequency response of the receiver's audio system may not be good.

* The following Tektronix Time-Mark Generators may also be used for this application; Type 180 with a Type 180 Crystal Oven Mod Kit (Tek No. 040-252) installed. Type 181 and Type RM 181 with Crystal-Oven Combination accessory (Tek No. 158-007) installed.

** Tektronix instruments on which you may observe these signals simultaneously are; Type 502 Dual-Beam Oscilloscope and Type 516 Dual-Trace Oscilloscope. Any Type 530, Type 540, Type 550-Series Oscilloscope with a multiple-trace, letter-type, Plug-In Preamplifier in the plug-in compartment (this would also include the Type 580 Series Oscilloscopes with a Type 81 Plug-In Adapter). Type 560 or Type 561 Oscilloscopes with a Type 72 Dual-Trace Plug-In Unit.

SHIPPING BLOCKS AND INSTRUMENT PACKAGING

A continuing problem for both Tektronix and our customers is the damage suffered by instruments in transit.

The most foolproof container a customer can use when shipping a Tektronix instrument is the original carton in which it was received. These cartons and their attendant packing materials are the result of much research and some sad experiences. An instrument, properly housed in one of these containers, will come through a normal shipping ordeal in excellent condition.

We earnestly recommend that, whenever possible, the original Tektronix shipping carton along with the dunnage and any shipping blocks be retained and stored for future use.

We would also like to make the following suggestions for packaging Tektronix instruments for shipment:

If you do not have the original shipping carton, contact your Tektronix Field Engineer. He very probably will be able to supply you with a factory-approved carton.

If the instrument has a shock-mounted

chassis, be sure the original shipping blocks are put in place. When these blocks are not available, make substitutes of corrugated paper, sponge rubber, styrofoam or similar material. Customers quite often send a shock-mounted-chassis instrument to us without the shipping blocks or a suitable substitute in place. Almost invariably the instrument will suffer some shipping damage because of the omission.

All instruments should be completely wrapped in kraft paper or other pliable dust-resistant material. Set the wrapped instrument in the original carton and place the dunnage around it. Close carton and seal with gummed tape.

If the original carton is not available, use a container of corrugated paper, wood, or metal construction. The container should be large enough to allow a minimum of one and one-half inches clearance around the instrument—top, sides, bottom and ends. Fill this clearance area with some type of compressible material, and do not use wooden blocks to support the instrument rigidly in the carton. Rubberized hair, wood excelsior or paper excelsior are preferred materials. Float the instrument so as to completely surround it with an even thickness of this protective material. In the absence of these materials, sheets of corrugated paper cut from other cartons will make an acceptable substitute filler. Most instruments so packed will survive ordinary shipping conditions in good shape. It takes a very resolute and satanically-minded shipping-agent employee to successfully damage an instrument packed in this manner.

If your copy of SERVICE SCOPE did not carry your correct address, we would like to know so that we can remedy the error. Also, if your friends or associates would like to receive their own copies, please tell them to write us—or you can send us their names, titles, and addresses.

NEW FIELD MODIFICATION KITS

TYPE 524 FOUR-POSITION VERTICAL SELECTOR SWITCH MODIFICATION KIT (with Revised IRE Response Network.)*

For Type 524D Television Oscilloscopes, s/n's 101 to 1399 inclusive except those instruments that have had the older Mod Kit, Tek No. 040-057, installed.

This modification kit installs a four-position vertical switch and an access panel to provide the following improvements:

- a. A FLAT vertical response to 5 megacycles within 1%. This passband is necessary for measuring the radio-frequency "burst" used in color TV.
- b. A new IRE Response Network which changes the roll off characteristics to conform with the Standard '58 IRE 23.S1, as amended July 1, 1961.

Order through your local Tektronix Field Engineer or Field Office. Specify Type 524D Four-Position Vertical Selector Switch Mod Kit, Tek. No. 040-271. Price is \$17.25.

*This new modification kit replaces the old Type 524 Mod Kit Tek No. 040-057 which installed a four-position vertical selector

switch and access panel but did not include the Revised-IRE-Response Network.

To install the IRE-Response Network in instruments that have been modified with Mod Kit No. 040-057, see Type 524AD Modification Kit described elsewhere in this column.

TYPE 524AD IRE NETWORK MODIFICATION KIT

For Type 524AD Television Oscilloscopes s/n's 1400 to 6584 inclusive and for Type 524D Television Oscilloscopes below s/n 1400 that have been modified (Field Mod Kit, Tek No. 040-057) to include a four-position Vertical Response switch and access panel.

This modification installs a new IRE Response Network in the Type 524AD Oscilloscope. This network changes the roll-off characteristics to conform with the Revised Standard '58 IRE 23.S1 as amended July 1, 1961.

The kit includes a Vertical-Amplifier-Response Selector switch, drawings, schematic and step-by-step installation instructions.

Order through your local Tektronix Field Engineer or Field Office. Specify Type 524AD IRE Response Network Mod Kit, Tek. No. 040-263. Price is \$12.20.

TYPE 525 IRE RESPONSE NETWORK MODIFICATION KIT

For Type 525 Waveform Monitor s/n's 101 to 1299 inclusive.

This modification changes the IRE Response characteristics in the Type 525 to conform with the Revised Standard '58 IRE 23.S1, as amended July 1, 1961.

The kit contains all the necessary components, drawings, schematic and step-by-step installation instructions.

Order through your local Tektronix Field Engineer or Field Office. Specify Type 525 IRE Response Network Mod Kit, Tek No. 040-265. Price is \$4.50.

TYPE 527 IRE RESPONSE NETWORK MODIFICATION KIT

For Type 527 Waveform Monitors s/n's 101 to 269 inclusive and Type RM527 Waveform Monitors, s/n's 101 to 331 inclusive.

This modification changes the IRE Response characteristics to conform with the revised Standard '58 IRE, as amended July 1, 1961. It also improves the transient response of the instrument when the Vertical-Selector switch is in the IRE position.

The kit contains all necessary components, drawings, schematic and step-by-step installation instructions.

Order through your local Tektronix Field Engineer or Field Office. Specify Type 527 IRE Response Network Mod Kit, Tek No. 040-266. Price is \$3.00.

TYPE 531A/TYPER 541A SWEEP LOCK-OUT MODIFICATION KIT

For Type 531A, Type RM31A, Type 541A and Type RM41A Oscilloscopes, all serial numbers.

This modification converts the above oscilloscopes for study of one-shot phenomena.

The mod kit includes a wired-chassis as-

sembly, tags, schematic, parts list and step-by-step installation instructions.

Order through your local Tektronix Field Engineer or Field Office, Specify Type 531A/541A Sweep Lockout Mod Kit, Tek No. 040-235. Price is \$47.00.

Note: Predecessor models of the above instruments were the Type 531, Type RM31, Type 541 and Type RM41. These instruments may also be converted for the study of one-shot phenomena. To convert these instruments, order Type 531/Type 541 Sweep Lockout Mod Kit, Tek No. 040-118. Price is \$47.00.

TYPE 555 OSCILLOSCOPE CRADLE-MOUNT MODIFICATION KIT

For Type 555 Oscilloscopes Indicator and Power Supply. All serial numbers.

This modification allows the rack mounting of the Type 555 Oscilloscope Indicator and Power Supply. The installation will require approximately 34" of vertical height in a standard rack mount.

The kit includes all the necessary parts, hardware and step-by-step installation instructions, including photographs.

Order through your local Tektronix Field Engineer or Field Office. Specify Type 555 Cradle Mount Mod Kit, Tek No. 040-251. Price is \$85.00.

MISSING INSTRUMENTS

Shell Development Company of Emeryville, California, advises us that a shipment of Tektronix instruments consigned to them disappeared. These instruments were not taken from their premises, but from a truck during transit. The truck was parked in San Francisco, California overnight and the entire load disappeared.

Following is a list of the Tektronix instruments that were lost:

2—Type 163 Pulse Generators, s/n's 3300 & 3301

1—Type 162 Waveform Generator, s/n 6323

1—Type 160A Power Supply, s/n 5567

If you have any information on the whereabouts of these instruments, please contact the nearest office of the Federal Bureau of Investigation. Since this loss involves an interstate shipment, the F.B.I. is concerned in the case.

City College of San Francisco reports; that between September 15 and 18, of this year, a Type 515A Oscilloscope, s/n 6135 disappeared and is presumed to be stolen. Anyone with information on the whereabouts of this instrument should contact Roy Edmison, City College of San Francisco, California.

A Type 512 Oscilloscope, s/n 288, disappeared from the Benson Polytechnic High School in Portland, Oregon, during the summer vacation. A survey of authorized personnel failed to turn up the instrument, so it is presumed to have been stolen. Anyone with information on this instrument should contact Mr. Arnold Grant, Benson

Polytechnic High School, 546 N.E. 12th Avenue, Portland, Oregon.

The Bear Creek Mining Company of Denver, Colorado has asked us to keep an eye open for their Type 531, s/n 1960 and Type 53/54D, s/n 1351. These instruments disappeared and are thought to be stolen. If you see these instruments or have any knowledge of their present location, please contact your local Tektronix Field Office or the Bear Creek Mining Company, 1498 South Lipon Street, Denver 23, Colorado.

The University of Washington notifies us that a Type 504 Oscilloscope, s/n 214, appears to be stolen from one of their laboratories. If you have any information on this instrument, please contact Mr. R.W. Moulton, Executive Officer, University of Washington, Department of Chemical Engineering, Seattle 5, Washington.

USED INSTRUMENTS FOR SALE

- 1 Type 127 William H. Read
Continental Leasing Co.
5215 Hollywood Blvd.
Los Angeles 27, California
Phone: HO 9-5371
- 1 Type 570, Brooks Research Corp.
s/n 381 Attn.: Mr. Dallas Schuttts
Rochester, New York or
contact Ray Lisiecki
Tektronix, Inc.
961 Maryvale Drive
Buffalo 25, New York
- 1 Type 517 Seller wishes to remain
anonymous. Tektronix
Field Engineer Dick Pater-
son, 2605 Westgrove Lane,
Houston 27, Texas will
serve as a contact.
- 1 Type 512, Marty Arnold
s/n 118 Leesona Moos
90—28 Van Wyck Blvd.
Jamaica 18, New York
- 3 Type 511AD, James H. Kennedy
s/n's 1666, Technitrol, Inc,
2723, and 1952 East Allegheny Ave.
3637 Philadelphia 34, Penn.
- 2 Type 514AD, Phone: GARfield 6-9105
s/n's 1332
and 3080
- 1 Type 517, Ian Isdale
s/n 625. 825 Tall Timber Road
Has duty Orange, Connecticut
Cycle Mod
Kit installed
and extra
crt's.
Price : \$995.

USED INSTRUMENTS WANTED

- 1 Type 514D R.B. Haigh
or Type Bendix Corporation

514AD Bendix Mishawaka Div.
400 S. Beiger Street
Mishawaka, Indiana
Phone: BL 5-2111, ext. 329

1 Type 315D Scott M. Overstreet
or Type 310 515 "Q" Central Avenue
Mountain View, California

1 Type 535 Dr. John F. McNall
or Type Phoenix Engineering and
535A Computing Service
2462 Hubbard Avenue
Middleton, Wisconsin

GREENSBORO FIELD OFFICE NOW SERVING SOUTHWEST VIRGINIA

As of September 15, 1961, the Tektronix Field Office in Greensboro, North Carolina increased its field office coverage. This move brings Tektronix Field Engineering services closer to the Southwest Virginia region.

That portion of Virginia lying within the area outlined by the following counties now comes under the jurisdiction of our Greensboro Office: Lee, Wise, Dickinson, Buchanan, Tazwell, Bland, Giles, Monroe, Greenbrier, Alleghany, Rockbridge, Nelson, Buckingham, Cumberland, Prince Edward, Lunenburg, and Mecklenburg. Customers in this area who formerly were served through our Washington, D.C. Field Office, should direct future inquiries to: Tektronix, Inc., 1838 Banking Street, Greensboro, North Carolina. The telephone number is 274-4647, TWX—GN 540.



Tektronix Field Engineer Rick Ennis of our Greensboro Office will provide field engineering services for customers in this area.

GRATICULE MOUNTING PROBLEMS

Tom Smith, Field Engineer with our Philadelphia Field Office, informs us that some of his customers have a problem. They are confused about the proper sequence for the installation of components over the face of crt's in Tektronix oscilloscopes.

We offer the following information in an effort to clear up some of this confusion.

Except for some instruments (which we will designate later), the light filter is shipped unmounted and as an accessory to

the oscilloscope.

We ship all oscilloscopes employing a 5" -crt with a black plastic (Royal-lite) light shield installed. This shield has a 5" opening with a 1/2" flange at right angle to the opening. The face of the shield is slightly smaller than the graticule cover and contains seven holes. The edge with the four holes is the top. This shield is installed by inserting the flanged portion between the crt and the surrounding mu-metal shield. Properly installed, the light shield fits flush against the instrument panel. The four holes in each corner allow the graticule studs to protrude.

The two inner holes at the top permit the graticule lights to show through the light shield. The seventh hole, located in the lower left-hand corner and just above the graticule stud, permits access to the cam-adjust fitting on instruments containing the cam-adjust feature.

Over this light shield, we install the graticule making sure the etched-line side faces to the crt. The red-rimmed holes in the graticule are positioned at the top and surround the graticule lights.

On each graticule stud, we install a rubber washer. The graticule cover then goes over the whole assembly and the graticule-stud nuts hold all firmly in place. When installing the graticule cover, make sure the small hole in the circular flange of the cover is at the top. Placement in this position permits correct attachment of the Tektronix Viewing Hood with molded-rubber eyepiece (Tek No. 016-001) or the Tektronix Polarized Viewer (Tek No. 016-035).

Instruments shipped with the green light filter installed are; Type 524 AD Television Oscilloscope, Type 525 Television Waveform Monitor, Type 526 Color-Television Vector-scope, Type 527 Waveform Monitor, Type 575 Transistor-Curve Tracer, and all instruments ordered with a P-1 phosphor crt.

Installation of components around and over the face of the crt in these instruments differs from the foregoing instructions in only two respects: (1) We install the green light filter between the black light shield and the graticule. (2) We do not use the four rubber washers between the graticule and the graticule cover.

On oscilloscopes employing 3" crt's we do not install a light shield. The light filter is shipped unmounted as an accessory (unless the oscilloscope is ordered with a P-1 phosphor). Three-inch oscilloscopes do not have the cam-adjust feature. In all other ways, installation of components over the crt follow the foregoing instructions for 5" oscilloscopes.

We place the etched side of the graticules whenever possible next to the face of the crt. This avoids parallax and thus errors in reading oscilloscope measurements.

There is little to be gained by placing the light filter over the graticule. The graticule lines will not show through the filter sufficiently enough to be useable.

Should you prefer white graticule lines (such as when taking pictures of oscilloscope traces) you may, on the 5" oscilloscopes only, rotate the graticule 180°. Remember keep the etched side next to the face of the crt. On 3" oscilloscopes the

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USERS OF TEKTRONIX INSTRUMENTS
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Field Engineering Offices

graticule cannot be rotated in this manner. Only by removing the red plastic from around the graticule-light holes in the graticule can you obtain white lines on these instruments. Some solve this problem by keeping two graticules on hand. One for red lines, the other for white lines.

If you use the Tektronix Bezel*, Tek number 014-001, (for mounting cameras, other than Tektronix types, on Tektronix 5" oscilloscopes), it takes the place of the graticule cover in the above instructions.

We recommend the removal of the light filter and the use of white graticule lines when taking pictures of oscilloscope traces.

*Note: The Tektronix Type C-12, Type C-13 and Type C-19 Cameras have a hinged adapter and four coin-slotted graticule nuts. The adapter and its four nuts replace the standard graticule cover and graticule nuts. The cameras fit snugly into the hinged fittings, yet lift in and out with ease. Supported in this manner, the cameras have a swing-away action. This feature allows an unobstructed view of the crt without complete removal of the camera.



- ALBUQUERQUE* Tektronix, Inc., 509 San Mateo Blvd. N. E., Albuquerque, New Mexico TWX—AQ 96 AMherst 8-3373
Southern New Mexico Area: Enterprise 678
- ATLANTA* Tektronix, Inc., 467 Armour Circle, N.E., Atlanta 9, Georgia TWX—AT 358 873-5708
Huntsville, Alabama Area: WX 2000
- BALTIMORE* Tektronix, Inc., 724 York Road, Towson 4, Maryland TWX—TOWS 535 Valley 5-9000
- BOSTON* Tektronix, Inc., 442 Marrett Road, Lexington 73, Massachusetts TWX—LEX MASS 940 VOLunteer 2-7570
- BUFFALO Tektronix, Inc., 961 Moryvale Drive, Buffalo 25, New York TWX—WMSV 2 NF 3-7861
- CHICAGO* Tektronix, Inc., 400 Higgins Road, Park Ridge, Illinois PK RG 1395 TAlcott 5-6666
- CLEVELAND Tektronix, Inc., 1503 Brookpark Road, Cleveland 9, Ohio TWX—CV 352 Florida 1-8414
Pittsburgh Area: ZENith 0212
- DALLAS* Tektronix, Inc., 6211 Denton Drive, P. O. Box 35726, Dallas 35, Texas TWX—DL 264 Fleetwood 7-9128
- DAYTON Tektronix, Inc., 3601 South Dixie Drive, Dayton 39, Ohio TWX—DY 363 AXminster 3-4175
- DENVER Tektronix, Inc., 2120 South Ash Street, Denver 22, Colorado TWX—DN 879 SKYline 7-1249
Salt Lake Area: Zenith 381
- DETROIT* Tektronix, Inc., 27310 Southfield Road, Lathrup Village, Michigan TWX—SFLD 938 Elgin 7-0040
- ENDICOTT* Tektronix, Inc., 3214 Watson Blvd., Endwell, New York TWX—ENDCT 290 Pioneer 8-8291
- GREENSBORO Tektronix, Inc., 1838 Banking Street, Greensboro, North Carolina TWX—GN 540 274-4647
- HONOLULU Kentron Hawaii, Ltd., 1140 Waimanu Street, Honolulu 14, Hawaii Telex: MHU 0093 Phone: 53975
- HOUSTON Tektronix, Inc., 2605 Westgrove Lane, Houston 27, Texas TWX—HO 743 MOhawk 7-8301, 7-8302
- INDIANAPOLIS Tektronix, Inc., 3937 North Keystone Ave., Indianapolis 5, Indiana TWX—IP 361X Liberty 6-2408, 6-2409
- KANSAS CITY Tektronix, Inc., 5920 Nall, Mission, Kansas TWX—KC KAN 1112 Hdrick 2-1003
St. Louis Area: ENterprise 6510
- LOS ANGELES AREA
 - East L. A. Tektronix, Inc., 5441 East Beverly Blvd., East Los Angeles 22, California TWX—MTB 3855 RAYmond 3-9408
 - Encino Tektronix, Inc., 17418 Ventura Blvd., Encino California TWX—VNY5 5441 State 8-5170
 - *West L. A. Tektronix, Inc., 11681 San Vicente Blvd., West Los Angeles 49, California GRanite 3-1105
TWX: W L A 6698 From Los Angeles telephones call BRadshaw 2-1563
- MINNEAPOLIS Tektronix, Inc., 3307 Vera Cruz Ave. North, Suite 102, Minneapolis 22, Minnesota TWX—MP 983 533-2727
- MONTREAL Tektronix, Inc., 3285 Cavendish Blvd., Suite 160, Montreal 28, Quebec, Canada HUInter 9-9707
- NEW YORK CITY AREA
 - *New York City and Long Island served by:
 - Tektronix, Inc., 840 Willis Avenue, Albertson, L. I., New York TWX—G CY NY 1416 Pioneer 7-4830
 - Westchester County, Western Connecticut, Hudson River Valley served by:
 - Tektronix, Inc., 1122 Main Street, Stamford, Connecticut TWX—STAM 350 DAVIS 5-3817
 - *Northern New Jersey served by:
 - Tektronix, Inc., 400 Chestnut Street, Union, New Jersey TWX—UNVL 82 MURdack 8-2222
- ORLANDO* Tektronix, Inc., 205 East Colonial Drive, Orlando, Florida TWX—OR 7008 GARDen 5-3483
(also serves Puerto Rico)
- PHILADELPHIA* Tektronix, Inc., 7709 Ogontz Ave., Philadelphia 50, Pennsylvania TWX—PH 930 WAverly 4-5678
- PHOENIX* Tektronix, Inc., 7000 E. Camelback Road, Scottsdale, Arizona TWX—SCSDL 52 WHitney 6-4273
- PORTLAND Tektronix, Inc., P. O. Box 500, Beaverton, Oregon MITchell 6-1926
- POUGHKEEPSIE* Tektronix, Inc., 8 Raymond Avenue, Poughkeepsie, New York TWX—POUGH 5063 GRover 1-3620
- SAN DIEGO Tektronix, Inc., 3045 Rosecrans Street, San Diego 10, California TWX—SD 6341 ACademy 2-0384
- SAN FRANCISCO BAY AREA
 - Lafayette Tektronix, Inc., 3530 Golden Gate Way, Lafayette, California TWX: LAF CAL 1639 YELLOWstone 5-6101
From Oakland, Berkeley, Richmond, Albany and San Leandro CLifford 4-5353
 - *Palo Alto Tektronix, Inc., 3944 Fabian Way, Palo Alto, California TWX—PAL AL 112 DAVenport 6-8500
- SEATTLE Tektronix, Inc., 236 S.W. 153rd St., Seattle 66, Washington TWX—SE 47 CHerry 3-2494
- SYRACUSE* Tektronix, Inc., East Molloy Road and Pickard Drive, P. O. Box 155, Syracuse 11, New York
TWX—SS 423 Glenview 4-2426
- TORONTO* Tektronix, Inc., 4A Finch Ave., West, Willowdale, Ontario, Canada Toronto, 225-1138
- WASHINGTON D. C.* Tektronix, Inc., 9619 Columbia Pike, Annandale, Virginia TWX—F CH VA 760 CLeerbrook 6-7411
- *ALSO REPAIR CENTERS
Norfolk, Portsmouth and Hampton, Virginia Area: Enterprise 741

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