INSTRUCTION MANUAL

TYPE RM567 READOUT OSCILLOSCOPE

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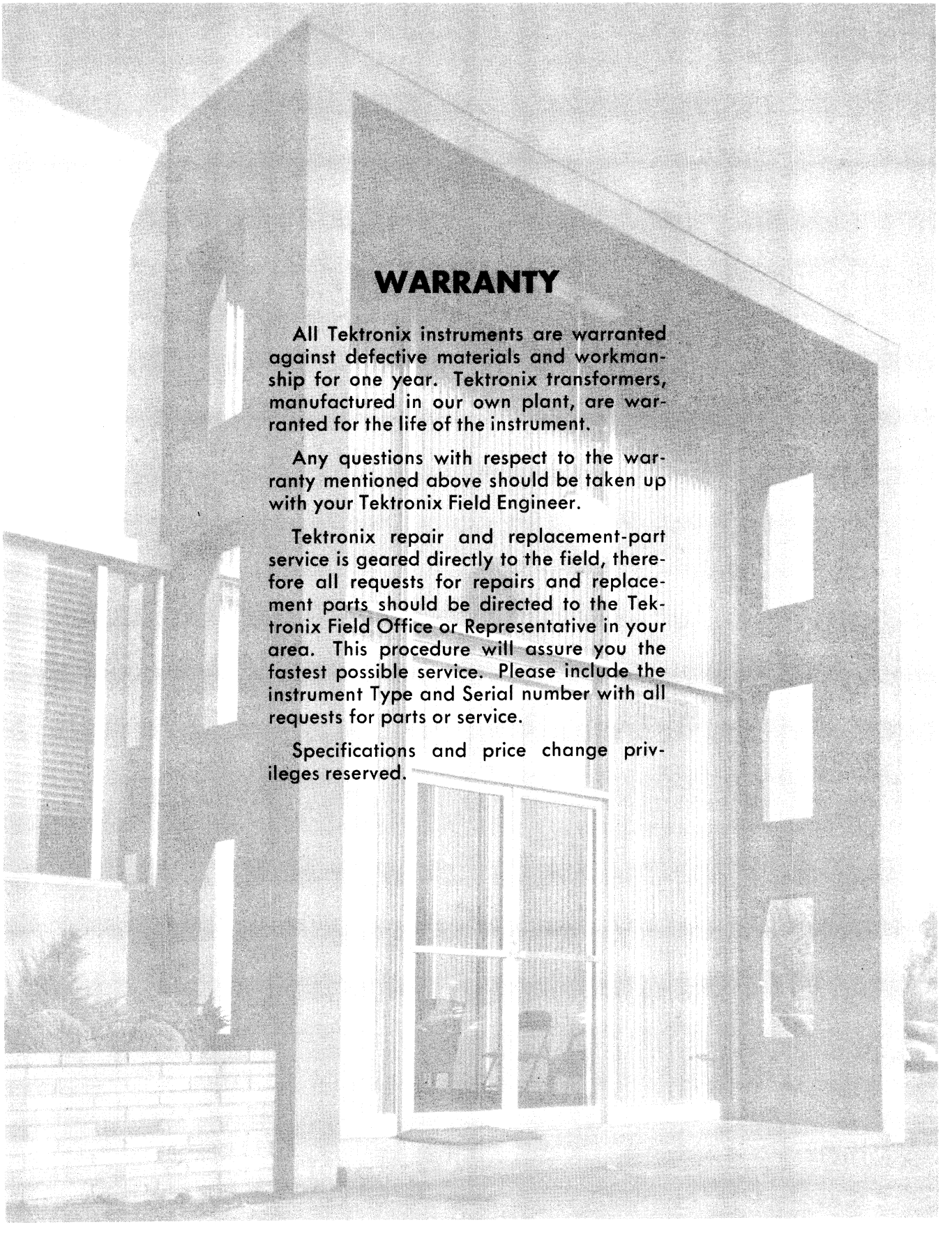


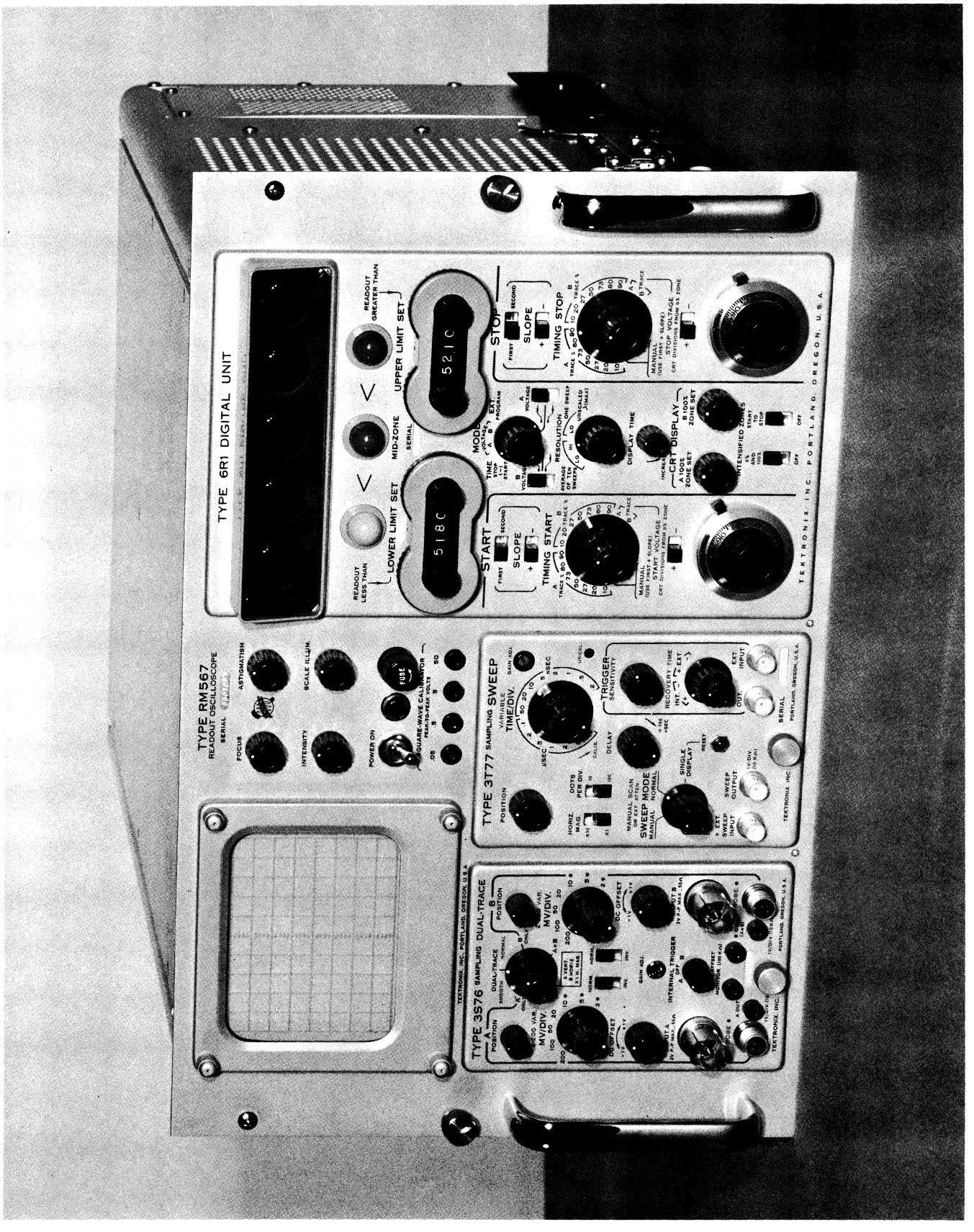
WARRANTY

All Tektronix instruments are warranted against defective materials and workmanship for one year. Tektronix transformers, manufactured in our own plant, are warranted for the life of the instrument.

Any questions with respect to the warranty mentioned above should be taken up with your Tektronix Field Engineer.

Tektronix repair and replacement-part service is geared directly to the field, therefore all requests for repairs and replacement parts should be directed to the Tektronix Field Office or Representative in your area. This procedure will assure you the fastest possible service. Please include the instrument Type and Serial number with all requests for parts or service.

Specifications and price change privileges reserved.



The Type RM567 Readout Oscilloscope, including the Type 3S76 Sampling Dual-Trace Unit, the Type 3T77 Sampling Sweep Unit, and the Type 6R1 Digital Unit.

Section 1
Characteristics

General Information

The Tektronix Type RM567 Readout Oscilloscope is essentially a power supply and indicator with provision for three plug-in units. The two smaller plug-in cells accept units that produce oscilloscope characteristics of either the conventional voltage-time display or a sampling-equivalent time display of repetitive signals. With a readout unit in the large cell, the oscilloscope reads out its own display. With the readout, human error and interpolation problems are eliminated. Since the oscilloscope provides an output in computer language, it can initiate "go" or "no-go" actions directly, and can be programmed automatically.

Cathode-Ray Tube

Type—T503R.

Phosphors—P2 standard, others available on request.

Unblanking—Deflection type, dc coupled.

Accelerating potential—3.5 kv.

Usable viewing area—8 cm vertical by 10 cm horizontal.

Deflection plate sensitivity (nominal at 3.5 kv):

Vertical—22.8 volts/cm.

Horizontal—18.4 volts/cm.

Graticule

Illumination—Variable edge lighting.

Markings—Marked in 8 vertical and 10 horizontal 1-centimeter divisions with 2-millimeter markings on the centerlines.

Calibrator

Waveform—Square waves at line frequency.

Output voltage—0.05, 0.5, 5, and 50 volts, peak-to-peak.

Accuracy—Peak-to-peak amplitude of square waves within 3% of indicated voltage.

Risetime—Typically 4 microseconds.

Power Supplies

Electronically regulated for stable operation with widely varying line voltages and loads.

Line voltage requirements—105 to 125 volts, or 210 to 250 volts, rms, 50 to 60 cps, single-phase ac.

Line fuse—4A Fast-Blow for 117 volts, 2A Fast-Blow for 234 volts.

Ventilation

Forced, filtered air. Thermal relay interrupts instrument power if internal temperature rises above a safe level.

Construction

Aluminum-alloy chassis and cabinet.

Photo-etched anodized panel.

Cabinet dimensions—Height 12⅛", width 16⅞", depth 22".

Front-panel dimensions—Height 12¼", width 19".

Weight—55½ pounds with Chassis-Trak slides (plug-in units not included).

Accessories Included

1 — 3-conductor power cord.
1 — 3- to 2-conductor power cord adapter.
1 — Tinted filter.
1 — Pair Chassis-Trak slides.
2 — Instruction manuals.

Other Characteristics

Bandpass, Risetime, Vertical Deflection Factor, Input Impedance, and Sweep Rates are functions of the plug-in units used.

NOTES

Section 2
Installation Instructions

General

The Type RM567 can be mounted in a cabinet rack as a permanent installation. Chassis-Trak slides, supplied with the instrument, allow the Type RM567 to be pulled out of the cabinet and tilted up or down for servicing.

Power Requirements

The Type RM567 Oscilloscope can be operated from 110, 117, or 124 volts, or 220, 234, or 248 volts. The only changes necessary to convert from one operating voltage to another are in the wiring of the power transformer primary and the fan motor. The power transformer used in the Type RM567 uses two separate windings plus two 6% boost-buck windings. The primary windings are connected in parallel for 117-volt operation, or in series for 234-volt operation. Proper connections for each line voltage are shown on the side of the power transformer and on the Power Supply schematic.

A small metal tag near the power receptacle at the rear of the instrument indicates the line voltage for which the instrument was wired at the factory. If wired for 117 volts, the instrument will operate properly with line voltages between approximately 105 and 125 volts. If wired for 234 volts, the instrument will operate properly from approximately 210 to 250 volts.

To change the power transformer connections for operation on another line voltage, change the location of the bare wire straps at the primary terminals. It is not necessary to move any of the plastic insulated wires. Place the new straps in accordance with the markings on the tag located on the power transformer side.

If you change from one nominal operating range to the other, be sure to change the fan connections as shown in Fig. 2-1.

Fuse Requirements

A 4-amp fast-blowing type line fuse is used for 117-volt operation, and a 2-amp fast-blowing type fuse is used for 234-volt operation.

The —12.2 and the +20-volt power supplies have overload protection fuses. A 5-amp fast-blowing type fuse is used in the —12.2-volt supply, and a 1-amp fast-blowing type fuse is used in the +20-volt supply.

Ventilation

The Type RM567 is forced-air cooled by a fan which draws air into the rear of the instrument and blows it over the components. Since the dust covers direct the air flow, they should be left in place to assure proper circulation.

A thermal relay protects the Type RM567 from overheating. If the internal temperature of the instrument should rise above a safe level, the relay will interrupt the power (the fan will continue to run in instruments operated from a 117-volt line). When the internal temperature returns to normal, the thermal relay reapplies power to the instrument.

Choosing the Location

The Type RM567 should be located where air can circulate freely through the instrument. Do not mount it in a closed cabinet rack without ventilation provisions. Allow at least 3 inches of space behind the air filter. Overall dimensions of the Type RM567 are shown in Fig. 2-2.

For maintenance purposes, allow 3 to 4 feet of space directly in front of the cabinet rack. This space is necessary so that the instrument can be pulled out of the rack to the fully-extended position.

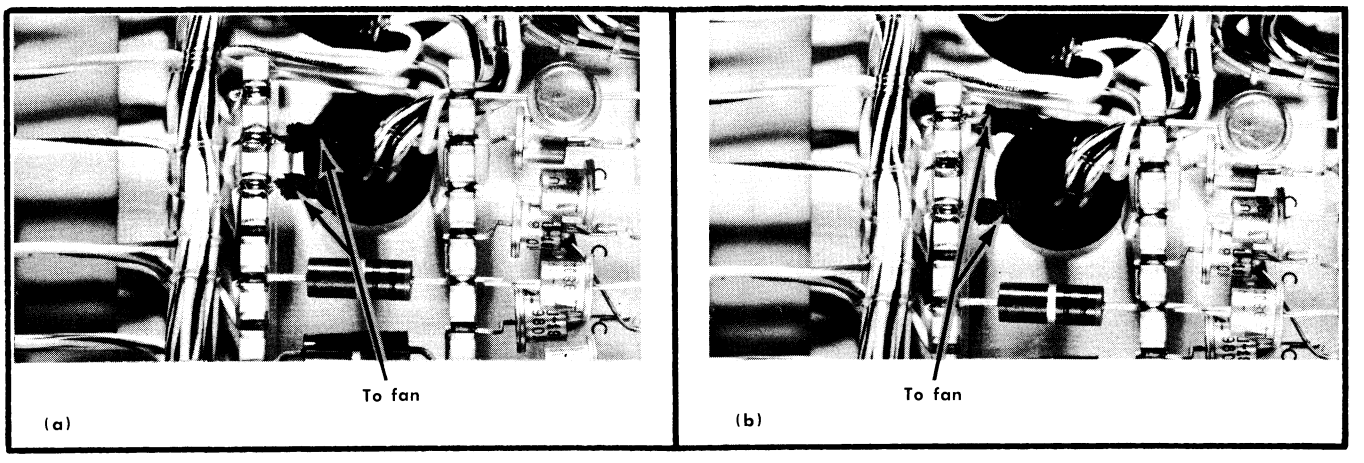


Fig. 2-1. Fan connections: (a) 117-volt line; (b) 234-volt line.

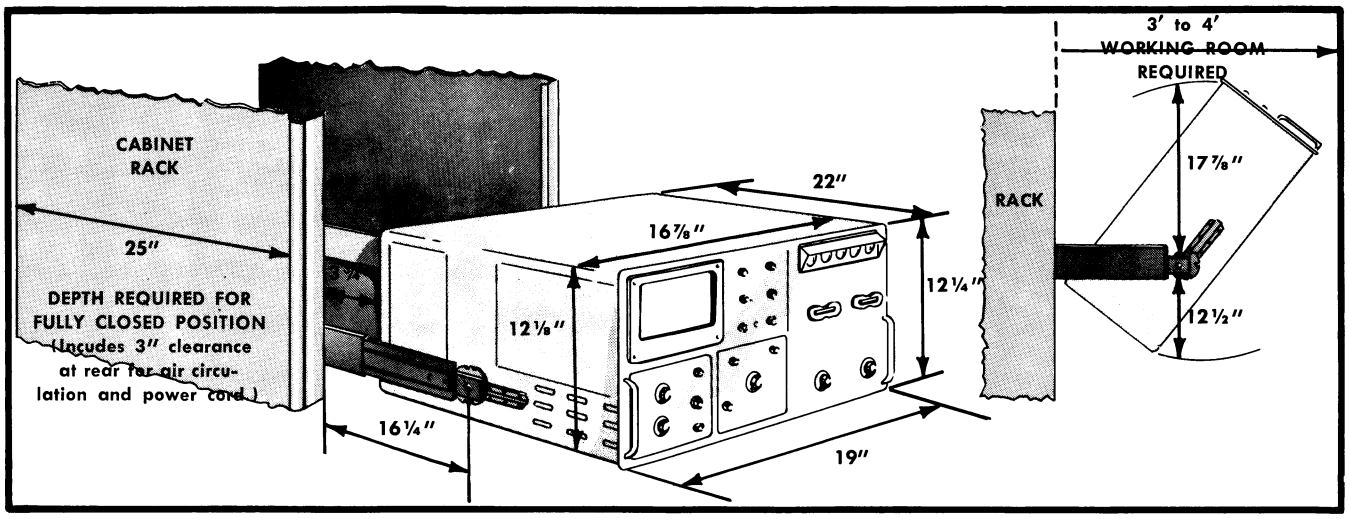


Fig. 2-2. Type RM567 mounting dimensions.

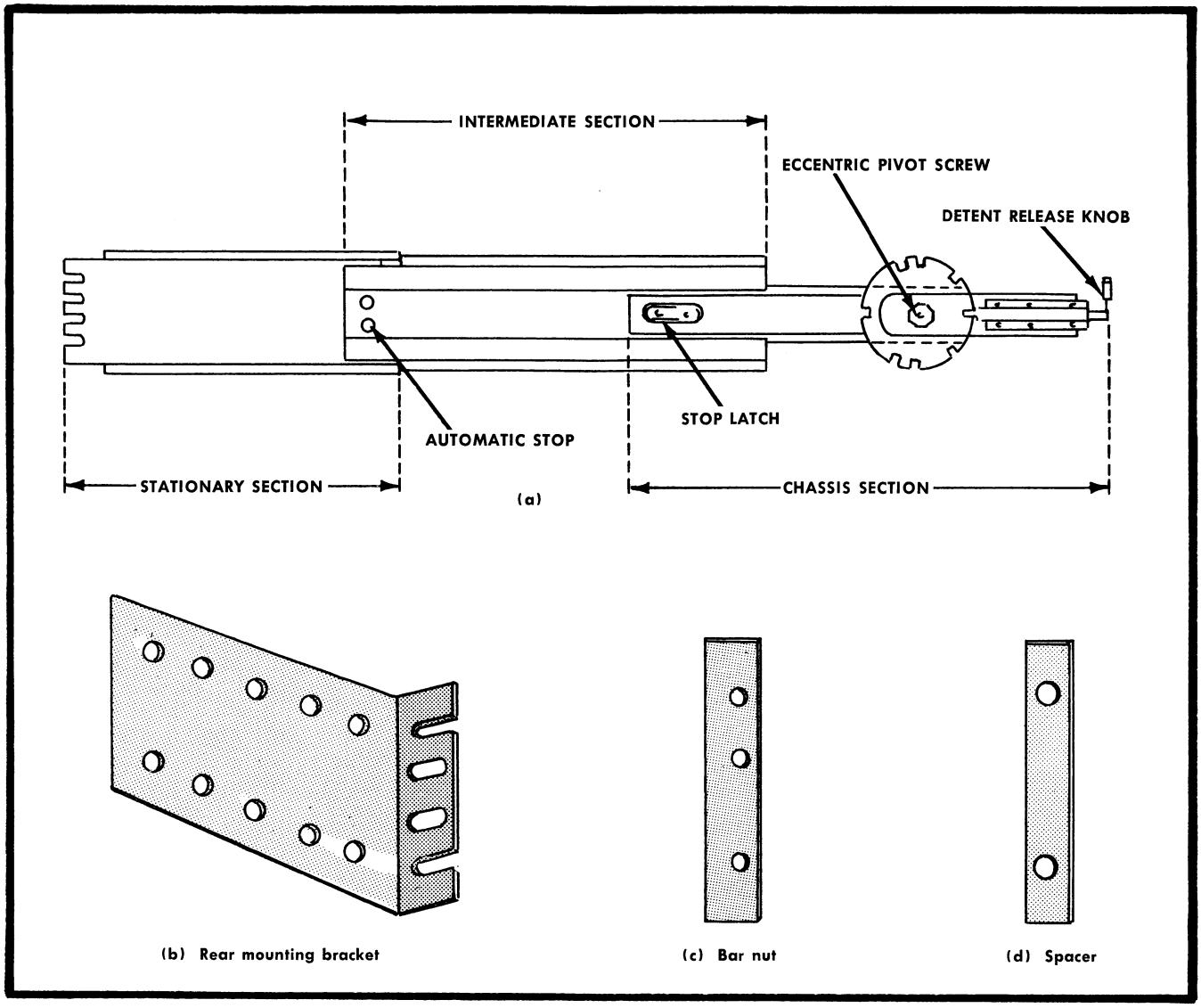


Fig. 2-3. Chassis-Trak slide assembly.

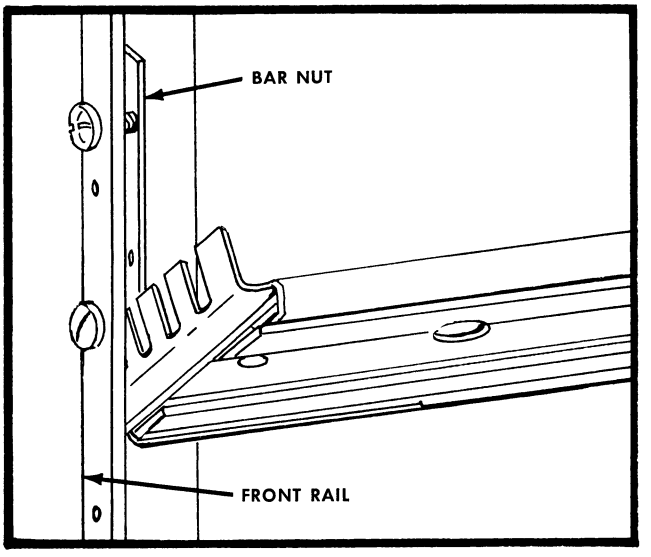


Fig. 2-4. Mounting the Chassis-Trak stationary section to the front rail of the cabinet rack.

Installation

Fig. 2-3 shows the parts that make up one set of Chassis-Trak slides. The Type RM567 is shipped with the chassis sections installed. The stationary and intermediate sections are a matched set and should be installed and treated as such.

The Type RM567 fits all cabinet racks that meet EIA specifications. With the hardware supplied, the instrument will fit racks 18 1/8" to 24 7/8" between the front and rear rail.

The following mounting instructions are for the left-hand Chassis-Trak slide. Mount the right-hand slide in the same manner.

To install the Type RM567 in a cabinet rack that meets EIA specifications, proceed as follows:

1. Mark a point on the front, left rail of the cabinet rack to indicate the top of the front panel. Make a second mark 8 7/8" below the first mark. This mark should fall in the center of a mounting hole as this is the location of the upper mounting screw. If it does not fall on a hole, move down to the next hole.

   To mount the Type RM567 above another instrument, make a mark 3 5/16" from the top of the mounted panel. This mark should fall in the center of a mounting hole, as this is the location of the upper mounting screw. If it does not fall on a hole, move up to the next hole.

2. Place a BHS screw through the hole found in step 1 and into the top hole of a bar nut. Notice that the holes in the bar nut are offset (see Fig. 2-3c). Position the bar nut so the holes are offset toward the instrument opening of the cabinet rack. Insert another BHS screw through the front rail and into the bottom hole of the bar nut. Leave the screws loose.

NOTE

If the screws do not slip through the holes in the rail, enlarge the holes to provide proper clearance.

3. Slip the stationary section mounting flange between the front rail and the bar nut so that both mounting screws hold it in place (see Fig. 2-4). Tighten the screws so the stationary section is held firmly to the front rail.

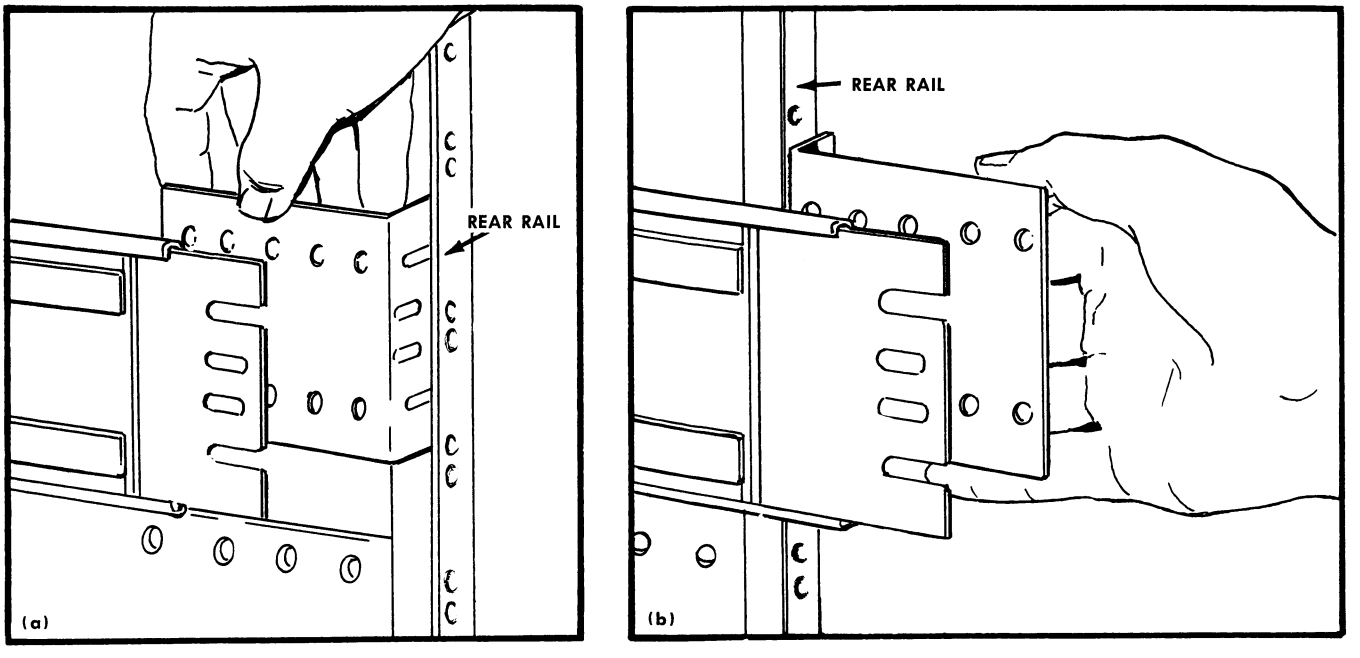


Fig. 2-5. Determining the mounting position of the Chassis-Trak stationary section on the rear rail: (a) normal position, inside the rear rail; (b) reverse position, outside the rear rail.

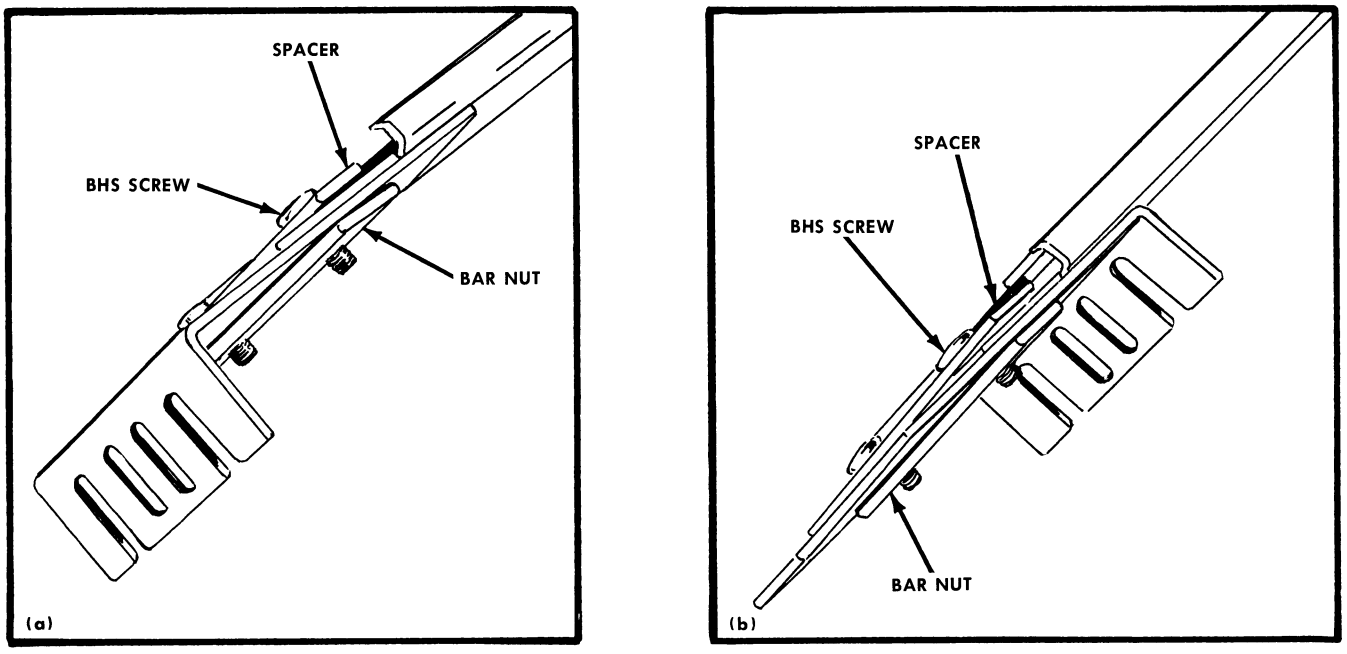


Fig. 2-6. Mounting the rear bracket on the stationary section: (a) normal position; (b) reverse position.

4. Determine the correct mounting position for the rear bracket (see Fig. 2-5). If the rear bracket is mounted in the normal position, place it on the inside of the rear rail. If the reverse position is used, mount the rear bracket on the outside of the rear rail.

5. Hold the Chassis-Trak stationary section perpendicular to the rails of the cabinet rack. Determine the holes in the rear rail for mounting the rear bracket. If there are no holes in the rail, mark two points that match the holes in the rear bracket and drill $^{13}/_{64}$" holes for mounting.

6. Fasten the rear mounting bracket to the rear rail with two BHS screws. Place the mounting bracket on the flat side of the stationary section as shown in Fig. 2-5.

7. Fasten the rear mounting bracket to the stationary section with two BHS screws, a spacer, and a bar nut (see Fig. 2-6).

8. Pull out the Chassis-Trak intermediate sections to the fully extended position. Be sure the automatic stops hold the intermediate sections in this position.

9. IMPORTANT—Before mounting the Type RM567 in the cabinet rack, check the alignment of the Chassis-Trak chassis sections. They should be parallel with the bottom of the instrument. The eccentric pivot screw (see Fig 2-3) moves the end of the chassis section up or down in relation to the instrument. Loosen the nut inside the frame and adjust the pivot screw until the slide is parallel to the bottom of the instrument. Hold the pivot screw in this position and tighten the nut.

10. Slide the chassis sections on the Type RM567 into the Chassis-Trak intermediate sections. Depress the stop latches on both chassis sections (see Fig. 2-3) and push the instrument into the cabinet rack. Align the front-panel Securing Screws with the front-rail holes before pushing the Type RM567 completely into the rack.

NOTE

Check the stability of the cabinet rack when mounting the Type RM567. If the rack is unstable with the instrument in the fully-extended position, add a counter-weight at the rear of the rack, or bolt the rack to the floor.

11. To adjust the Chassis-Trak slides for easy operation, pull the Type RM567 out of the cabinet rack until the pivot screws are even with the front rail of the rack. Loosen the screws that hold both stationary sections to the front rail and allow the slides to adjust to the instrument and the rack. Tighten the screws and push the instrument into the cabinet rack. Then, loosen the screws that hold both rear brackets to the rear rail. Again allow the slides to adjust to the instrument and the rack. Tighten the screws.

    If the Chassis-Trak slides bind or catch as they slide into the intermediate sections, check the adjustment of the pivot screw as described in step 9.

    The Chassis-Trak stationary sections allow some vertical and horizontal adjustment of the Type RM567 in the cabinet rack. To move the front panel up or down about $^1/_{16}$", pull the Type RM567 out of the rack until the pivot screws are even with the front rail of the rack. Loosen the screws holding the Chassis-Trak stationary sections to the front rail and move the instrument in the direction that you want the front panel to go. Tighten the screws in this position and slide the instrument back into the rack.

To center the Type RM567 in the cabinet rack, pull the instrument out of the rack until the pivot screws are even with the front rail of the rack. Loosen the screws holding the Chassis-Trak stationary sections to the front rail and center the instrument in the cabinet rack. Tighten the screws in this position and slide the instrument back into the rack.

Connect the power cord to the Type RM567 through the rear of the cabinet rack. When pushing the instrument into the rack, take care not to catch the power cord between the Type RM567 and the rear of the cabinet or other instruments in the cabinet rack.

When the Type RM567 is in the fully extended position, the Chassis-Trak tilt-lock feature can be used. Pull both detent release knobs (see Fig. 2-3) and tilt the instrument in the direction desired. The instrument can be locked in any one of seven positions—normal, or 45°, 90°, or 105° above and below normal.

The various tilt-lock positions allow easy access to the rear of the instrument as well as the top and bottom. A plug-in extension can be used for access to the plug-in units when the instrument is in the cabinet rack (see the Accessories section of this manual).

To remove the instrument from the rack, pull the Type RM567 out of the cabinet rack to the fully extended position. Apply direct finger pressure to the stop latches on the chassis sections and pull the instrument out of the Chassis-Trak intermediate sections.

NOTES

Section 3
Operating Instructions

General Information

The Type RM567 is a specially designed oscilloscope for producing readout display of information which must be obtained from the crt on an ordinary oscilloscope. The readout system can be made to display either voltage or time, and may be used for such applications as measuring the peak-to-peak amplitude of a waveform or its risetime. If dual-trace plug-in units are used with the Type RM567, the readout system can be used to obtain both voltage and time measurements on either trace. In addition, the readout system will make time measurements between signals in a dual-trace display.

The Type RM567 and associated units are relatively easy to operate once the basic operating procedures are understood. It is the purpose of this section and similar sections in the plug-in unit manuals to establish the proper operating techniques. This manual covers instructions for the Type RM567 only. Operating instructions for the plug-in units are covered in the applicable instruction manuals.

Plug-In Installation

Place the desired vertical plug-in unit (for example, the Type 3S76) in the left plug-in compartment of the oscilloscope (see Fig. 3-1.) Place the horizontal plug-in unit (for example, the Type 3T77) in the center compartment. Finally, place the readout unit (for example, the Type 6R1) in the right compartment of the oscilloscope. Make certain all units are properly inserted and locked in place before operating the oscilloscope. The horizontal and vertical plug-in units are locked in place by turning the front-panel locking knobs clockwise.

The readout unit is locked in place with securing fasteners at the rear of the readout compartment. To install the readout unit, pull the instrument out of the cabinet rack, disconnect the instrument power, and remove the right, rear access panel. Tilt the instrument up to the 90° position. Then, insert the readout unit firmly into the compartment to engage the interconnecting plugs. Reach through the access opening and tighten the securing fasteners. Replace the access panel and the power cord.

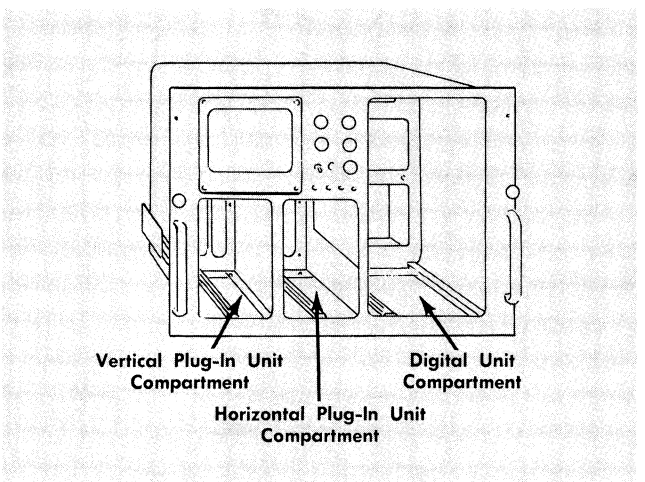


Fig. 3-1. Type RM567 Oscilloscope with plug-in cells identified.

NOTE

Although the Type RM567 Oscilloscope can be used with any of the Tektronix Type 50 through Type 79 or series '2' and '3' Plug-In Units, only certain of these plug-in units will operate the readout unit. If used with plug-in units that do not operate the readout unit, the Type RM567 operates as a conventional oscilloscope.

Checking Plug-In Unit Accuracy

The accuracy of measurements made with the Type RM567 depends to a large extent on the accuracy of the plug-in units used. For this reason, the gain and sweep timing of the plug-in units should be checked frequently, particularly when plug-in units are changed in the oscilloscope.

Gain checks on conventional plug-in units can be made with the SQUARE-WAVE CALIBRATOR signals. (Gain checks on sampling plug-ins require special equipment; refer to the applicable instruction manual.) Connect the output from one of the SQUARE-WAVE CALIBRATOR jacks to the input of the vertical plug-in unit. Adjust the gain of the plug-in unit to produce an appropriate amount of vertical deflection. Sweep timing adjustments require the use of a time-mark generator or timing standard. Complete procedures for adjusting the gain or sweep timing of a plug-in unit are contained in the instruction manual for that unit.

Intensity Control

The INTENSITY control is used to adjust the brightness of the oscilloscope display. After turning on the instrument and waiting a few minutes for warmup, free-run the oscilloscope sweep. Then adjust the INTENSITY control for a suitable trace intensity.

Do not leave a bright, sharply focused spot on the crt screen for a prolonged period. An excessively bright stationary spot may damage the crt phosphor.

Focus and Astigmatism Controls

The FOCUS and ASTIGMATISM controls are used in conjunction with each other to produce a well-focused display on the oscilloscope screen. Because changes in the setting of the INTENSITY control may affect focus slightly, the trace should be focused with the actual waveform displayed and with the desired intensity setting. Refer to the appropriate plug-in manuals for instructions for applying a signal to the oscilloscope and obtaining a stable display. With a signal displayed, carefully adjust the FOCUS and ASTIGMA-

TISM controls alternately for best possible focus over the entire display. There is an intensity level above which a good focus is impossible to attain.

Scale Illumination Control

The oscilloscope graticule is edge-lighted by two small lamps at the bottom. The lighting can be adjusted to suit the ambient light conditions by means of the SCALE ILLUM. control. Rotating the control clockwise increases the brightness of the graticule scale markings. The graticule is marked with eight 1-centimeter divisions vertically and ten 1-centimeter divisions horizontally, with 2-millimeter markings on the centerlines.

Graticules used with the Type RM567 are supplied with red inserts in the illumination holes near the bottom. These inserts make the graticule markings appear red. For photographic and some other applications, white graticule markings are more satisfactory than red. For such applications the red inserts should be removed.

Under high ambient light conditions, the tinted filter supplied with the instrument will increase trace visibility. To install the filter, remove the graticule cover and the graticule-lamp inserts. Place the filter directly over the graticule and replace the graticule cover.

Changing Plug-In Units

Horizontal and vertical plug-in units used in the Type RM567 may be changed at any time. However, it is recommended that the instrument be turned off while a change is made. This affords maximum protection to the oscilloscope and other plug-in units against sudden transients and load changes.

Whenever a horizontal or vertical plug-in unit is changed, it is important that you check both the gain and timing of the oscilloscope. This will insure accurate measurements.

Skeleton Plug-In Units

Skeleton plug-in units for the vertical and horizontal sections are available for all of the Tektronix Type 560-series oscilloscopes, including the Type RM567 (none available for the large plug-in area used for readout). Skeleton units permit you to build your own plug-in circuitry for use in the RM567. If you use your own circuitry, provision may be made for operating the readout circuits, although it is not necessary to do so. Order the skeleton chassis as Modification Kit number 040-245 from your local Tektronix Field Office.

Power Supply Capabilities

The total dc power available for vertical and horizontal plug-in use is 93 watts divided between four regulated supplies. The remaining power available must be reserved for the Type 6R1 or other readout unit. Use of current from any of the unregulated dc supply leads is not recommended.

The four regulated dc supplies listed in Table 3-1 are employed by the X and Y axis amplifiers.

TABLE 3-1

TYPE RM567 POWER SUPPLY CURRENT CAPABILITIES FOR X AND Y PLUG-IN UNITS

SUPPLY	MAX. TOTAL CURRENT	CONNECTOR TERMINALS
Reg. —100 vdc	130 ma	23— to 9 ground
Reg. —12.2 vdc	1.5 amps	16— to 5 ground
Reg. +125 vdc	150 ma	15+ to 9 ground
Reg. +300 vdc	150 ma	10+ to 9 ground
Unreg. 6.3 vac	5 amps per plug-in	1 — 2
Line 117 vac†	6 amps* total or 5 amps** per plug-in	7 — 8
Line 234 vac	Zero	7 — 8

† In cases of 234-volt line, do not use power transformer as an autotransformer to obtain 117 volts for plug-in.

* Total of 10 amps limited to power cord; 6 amps for plug-ins, 4 amps for power transformer.

** Total of 5 amps per plug-in limited by interconnecting plug at rear of each plug-in unit.

Since the Type RM567 employs two plug-in units to operate the X and Y axis of the crt, currents listed in Table 3-1 are normally divided between them. However, a single plug-in can be used, such as a vertical amplifier, with moving-film recording used instead of a horizontal sweep. In such a case it will be necessary to elevate the crt horizontal deflection plates to approximately +180 to +210 volts dc to permit proper focus and astigmatism control.

The limit of how much power can be dissipated in one plug-in unit is based primarily upon the ambient temperature and amount of ventilation supplied. Vacuum tubes should not be operated with envelope temperatures above 150°C when the ambient temperature is at 25°C, or above 175°C when the ambient temperature is at 50°C. The Type RM567 can be operated in rack temperatures up to 43°C.

Suggested Power-Supply Shunt Resistor Values

To make efficient use of the Type RM567 power supply, the load currents and maximum or minimum load values must be known.

The nature of series-regulated power supplies permits obtaining more current from them than can normally be handled by the series tube alone (providing the power transformer and rectifiers can supply more current). By placing a shunt resistor of appropriate value across the series

regulator tube, additional current can be made available for the load. The correct value shunt resistor must be chosen to permit the regular system to deliver current with low ripple, and the resistor must have a power rating high enough to carry its share of current without overheating.

To permit the best selection of shunt resistors, Table 3-2 lists current limits for three conditions of the —100-volt, +125-volt and +300-volt dc supplies. The currents listed are one-half the total available, based upon the total current being divided between two plug-ins. Do not shunt any other supply.

Separate terminals are provided for the ground return of the —12-volt regulated heater supply. When using this supply in your own plug-in design, it is best to run two leads to the heater terminals so that the ground lead can be connected directly to terminal 5, thus eliminating ground currents.

Use of shunt resistor values suggested in Table 3-2 will lead to a minimum of total power required, and give lowest plug-in temperature. It is the simplest method that will not overtax supplies, either for regulation or temperature. However, if Table 3-2 does not meet your design needs, refer to the curves of Figs. 3-2, 3-3 or 3-4 to aid your choice of individual power supply shunt resistors. Always plan the shunt to permit lowest plate dissipation in the series regulator tube consistent with proper regulation and ripple values.

A portion of the power supply schematics has been reproduced in Fig. 3-5, identifying interconnecting plug terminals specified in Table 3-3. J11 and J21 are the horizontally-mounted interconnecting plugs at the rear of the vertical and horizontal plug-in cells, respectively. Do not use shunt resistors in the digital cell at J31.

TABLE 3-2

RECOMMENDED TYPE RM567 REGULATED POWER SUPPLY SHUNT RESISTORS*

SHUNT RESISTOR VALUES	—100 v	+125 v	+300 v
No Shunt	0 to 25 ma	0 to 45 ma	0 to 40 ma
2000 Ω, 5 w between proper terminals of power connector.	20 to 45 ma	25 to 60 ma	35 to 67 ma
SHORT, between proper terminals of power connector.	40 to 65 ma	50 to 75 ma	65 to 75 ma

* Currents listed are one-half total available, based on two plug-in units being used.

Table 3-3 lists the proper plug-in interconnecting plug terminals for connection of power supply shunt resistors.

TABLE 3-3

PLUG-IN INTERCONNECTING PLUG TERMINALS FOR REGULATED SUPPLY SHUNT RESISTORS IN X AND Y AMPLIFIERS

SUPPLY	TERMINALS
—100	22 — 9 return
+125	20 — 15 return
+300	6 — 10 return

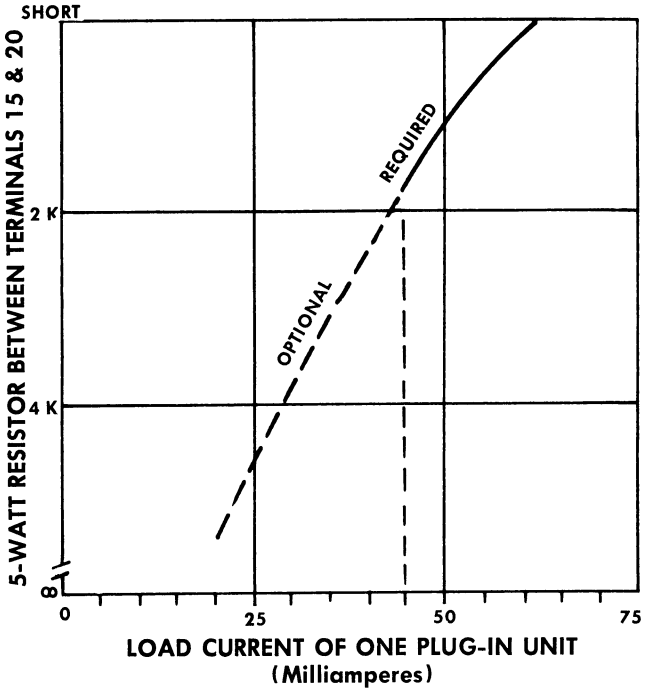


Fig. 3-2. —100-volt supply shunt.

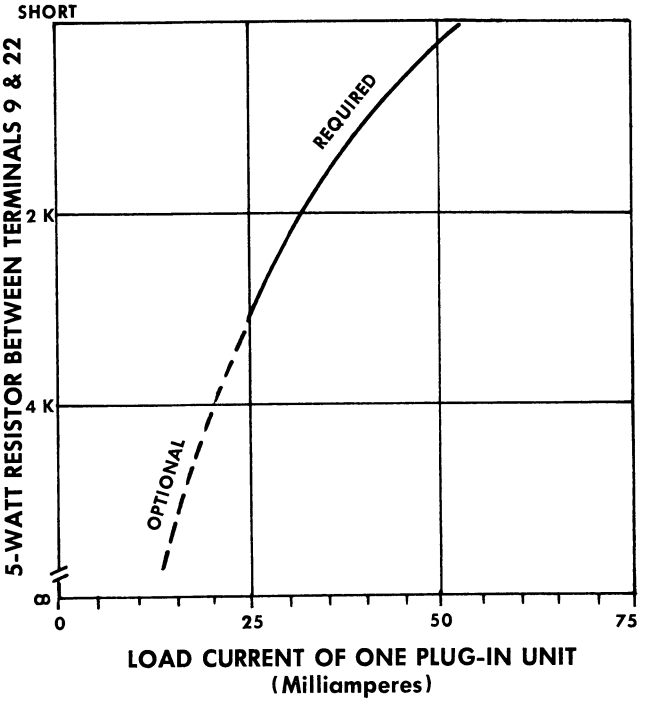


Fig. 3-3. +125-volt supply shunt.

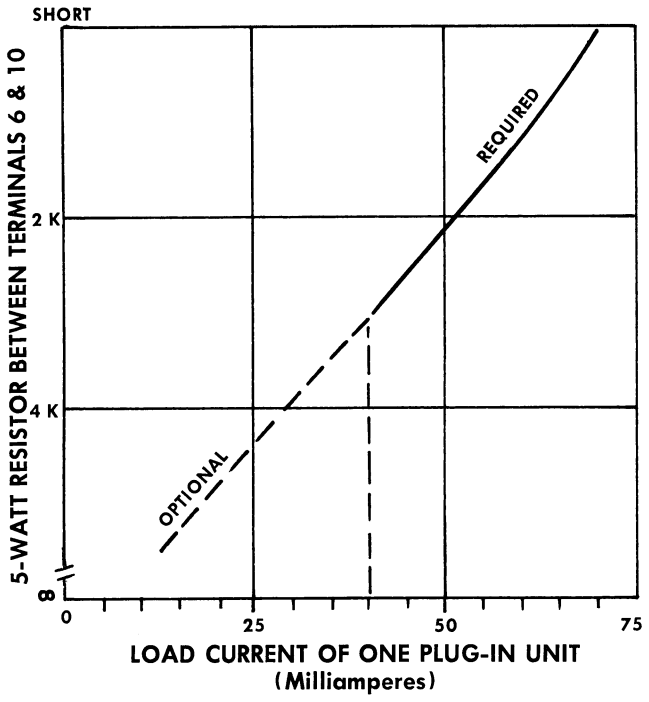


Fig. 3-4. +300-volt supply shunt.

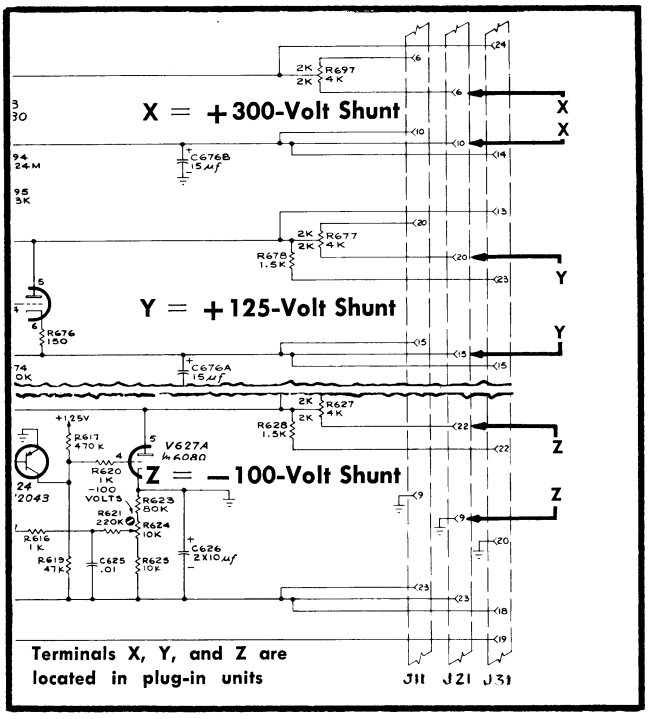


Fig. 3-5. Power supply shunt resistor connections.

Section 4
Circuit Description

General Information

The Type RM567 Oscilloscope consists of three major parts: the low-voltage power supplies, the crt circuits, and the calibrator. The oscilloscope is essentially an indicator and power supply for the plug-in units used with the instrument. Vertical and horizontal plug-in units drive the deflection plates of the crt directly, and also drive the readout circuits.

The low-voltage power supplies provide outputs of —100, —12.2, +20, +125, and +300 volts.

The crt circuits contain the high-voltage power supply and crt. The high-voltage supply provides the 3.3-kv potential for the crt cathode.

The calibrator generates square waves with calibrated amplitudes at the power-line frequency. The calibrator square waves are used as a convenient signal source and to verify the calibration of the vertical and sweep plug-in units.

—100-Volt Power Supply

Line voltage is applied through fuse F601 and the thermal cutout relay TK601 to the primary windings of T601. This energizes the secondary windings of T601. Terminals 19 and 20 of T601 apply power to a full-wave bridge rectifier consisting of D602, A, B, C, and D. The unregulated output of the rectifier circuit is applied to the —100-volt regulator circuit and through the interconnecting plugs to the plug-in units.

Voltage regulator tube V609 maintains the grid of V616B at approximately —85 volts. The voltage at the grid of V616A is obtained from a divider between ground and the —100-volt output of the regulator. V616 is a cathode-coupled difference amplifier which compares the voltage at the grid of V616A against the fixed —85 volts at the grid of V616B. Potentiometer R624 sets the output of the power supply at —100 volts.

If the output voltage tends to change from —100 volts, a sample of the change is applied through the divider to the grid of V616A. This error signal is amplified by V616A and applied to the base of Q624. Q624 amplifies the error signal and applies it to the grid of series regulator V627A. The change in grid voltage of V627A changes the voltage drop across the tube and causes the output voltage to return to normal.

Capacitor C625 increases the ac loop gain of the regulator circuit. Its function is to quickly compensate for rapid changes in the output voltage. The higher ac loop gain provided by C625 also reduces ripple at the output of the regulator. C626 aids in reducing the ac impedance of the —100-volt supply.

The other low-voltage supplies are all referenced to the —100-volt supply. In addition, the accuracy of the readout unit is related to the accuracy of the —100-volt supply.

—12.2-Volt Power Supply

The —12.2-volt regulator is similar to the —100-volt regulator except that it uses transistors instead of tubes. A full-wave rectifier consisting of D632, A and B, provides unregulated dc voltage to the regulator. A divider between —100 volts and ground is used to provide a constant —12 volts for the base of Q634. The output voltage of the regulator, appearing at the emitter of Q634, is compared to the voltage at the base. Because of this circuit arrangement, the voltage at the base of Q634 sets the output voltage of the supply.

Normally the voltage at the emitter and base of Q634 will be nearly the same. If the voltage at the emitter changes because of a change in the supply output voltage, this changes the current through the transistor. This in turn produces a change in the collector voltage of Q634 and in the base voltage of Q644. The change at the base of Q644 is amplified at the collector and applied to the base of the series regulator transistor Q647. The change in base voltage of Q647 changes the voltage drop across Q647 in such a direction as to compensate for the change in output voltage, and the output then returns to normal.

As an example, if the output of the supply starts to go more negative, this causes Q634 to conduct more heavily. This produces a drop in the voltage at the collector of Q634 and at the base of Q644. The drop in voltage at the base of Q644 also causes this transistor to conduct more heavily causing its collector voltage to change in the positive direction. The more positive voltage at the base of Q647 increases the voltage drop across Q647 thereby decreasing the output voltage of the supply to normal.

Fuse F647 is used to protect Q647 in the event the output is accidentally overloaded. Capacitor C646 reduces ripple voltage at the output of the regulator circuit.

+125-Volt Power Supply

A full-wave bridge rectifier circuit from terminals 33 and 34 of T601 supplies power to the +125-volt regulator circuit and to the plug-in units through the interconnecting plugs. A voltage divider between the regulator output and —100-volts supplies a voltage near ground to the grid of V664. If the output voltage from the regulator changes, a portion of this change is applied through the divider to the grid of error amplifier V664. The error signal is amplified by V664 and applied to the grids of series regulator V677. The change in voltage at the grids of V677 changes the voltage drop across V677 and compensates for the change in output voltage.

The screen supply for V664 is obtained primarily from the output of the regulator circuit. R665 applies ripple from the unregulated bus to the screen as a signal voltage. The ripple is amplified and helps to reduce ripple appearing on the output.

Capacitor C674 is used to increase the ac loop gain of the regulator circuit. This allows the circuit to recover rapidly from sudden changes in output voltage. The increased ac loop gain also helps to reduce the ripple at the output

of the regulator. C676A reduces the ac impedance of the +125-volt supply. Resistors R671 and R676 in the cathodes of the series regulator V677 tend to balance the current through the two sections of the tube.

Other Low-Voltage Power Supplies

The other low-voltage power supplies are similar to the ones described previously. Each utilizes a reference voltage obtained from one of the other supplies. The output of the regulated supply is then compared to this reference. If an error exists, this error is amplified and used to control the operation of a series regulator which compensates for the error.

High-Voltage Power Supply

Unregulated +400 volts from the +300-volt power supply is applied to the high voltage oscillator, V800. V800 and its associated circuitry is a modified Hartley Oscillator. C802 and the primary winding of T801 form the tuned circuit in the plate of V800. The oscillator operates at approximately 35 kc. High-voltage transformer T801 provides the high voltages and heater voltages for the rectifiers.

One secondary winding of T801 and rectifier V822 form a half-wave rectifier circuit which supplies approximately —3.3 kv to the cathode of the crt. A separate secondary winding of T801 and V832 supply voltage for the control grid of the crt.

A voltage divider between the —3.3-kv output of V822 and +300 volts supplies voltage to the focusing grid of the crt and also applies a sample of the power supply output to the high voltage regulator circuit. Potentiometer R841 sets the high voltage. If the output voltage changes from this set value, a portion of the change appears at the grid of V814B as an error signal. The error signal is amplified by V814B and V814A and applied to the screen grid of the High Voltage Oscillator V800. The change in screen voltage on the oscillator causes either an increase or a decrease in the amplitude of the oscillations. The change in amplitude of the oscillations is always in a direction to compensate for the error in the output voltage.

The output voltage from V832 is not regulated directly, but is regulated indirectly by the operation of the V800 screen grid regulator loop.

Capacitor C842 greatly increases the ac loop gain of the high voltage regulator circuit. This permits the regulator to quickly compensate for rapid changes in the output voltage.

CRT Circuits

Voltage for the control grid of the crt is obtained from R834 and R833 at the output of the control grid power supply. By varying the setting of the INTENSITY control R834, the voltage at the control grid relative to the cathode can be changed to provide the desired display brightness.

Voltage for the focus grid of the crt is obtained from potentiometer R845. The Astigmatism element receives its voltage from potentiometer R864. Varying both R845 and R864 affects the crt spot size.

The presence and intensity of the crt beam is controlled by signals from each of the three plug-in units used with the Type RM567. The oscilloscope uses deflection unblanking during the sweep interval. In this method an additional pair of deflection plates in the crt electron gun deflects the beam off the screen except during the sweep. When the horizontal sweep is triggered, the unblanking signal is applied from the time base unit through terminal 13 of J21 to one of the unblanking deflection plates. The unblanking signal then moves the electron beam rapidly on screen for the duration of the sweep. The beam is then deflected off screen again until time for the next sweep.

Chopped mode blanking signals from a multi-trace vertical plug-in unit are applied through terminal 24 of J11 to the cathode of the crt. These blanking signals are used to blank switching transients which result when the plug-in unit is operated in the chopped mode. Chopped blanking prevents the chopping transients from being displayed on the crt at normal intensity.

Intensity brightening of the crt trace by either the readout unit or a two-sweep time-base unit is accomplished by coupling brightening signals to the reference voltage for the crt grid voltage supply (V832). The brightening signal from the readout unit changes the overall grid supply voltage through terminal 15 of J32. The brightening signal from the two-sweep timing unit changes the overall grid supply voltage through terminal 14 of J21. Two diodes, D836 and D837, provide a low-impedance return for the crt grid circuit, reducing intensity modulation caused by any normal power supply ripple. Diode D835 disconnects +125 volts applied to terminal 14 of J21 by some plug-in units.

Sharply differentiated blanking pulses from the vertical sampling unit are applied to the crt cathode through terminal 24 of J11 to turn off the crt beam between sampling dots. Thus the crt beam is blanked between dots, avoiding possible display confusion. Diode D852 acts as a dc restorer so that after each blanking pulse the average charge of C854 is returned to the correct value.

A beam rotator coil around the crt is used to align the oscilloscope trace with the horizontal graticule markings. The magnetic field set up by the coil deflects the electron beam up on one side of the crt and down on the other. By varying the strength and direction of the field with the CRT BEAM ROTATOR control the trace can be aligned with the graticule markings.

Calibrator

The calibrator consists of a bistable multivibrator, V884A and V884B, which is triggered at the line frequency by a 6.3-volt ac signal applied to the cathode of V884A. The signal at the cathode of V884A switches the multivibrator between its two states. When V884A is conducting, the low voltage at its plate cuts off V884B. Or, when V884B is conducting, its low plate voltage lowers the grid voltage of V884A sufficiently to cut V884A off. Thus both tubes do not conduct at the same time.

When V884A is cut off, the voltage at the control grid and cathode of V884B is determined by the setting of the CAL. AMPL. control, R871. This determines the maximum voltage level reached by the square-wave output. The square waves start at ground at the time V884B is cut off and reach the maximum amplitude established by R871 when V884A is cut off. The CAL. AMPL. control is adjusted to give the appropriate output square-wave amplitudes.

Section 5
Maintenance and Calibration

MAINTENANCE

PREVENTIVE MAINTENANCE

Air Filter

The Type RM567 Oscilloscope is cooled by air drawn through a washable filter located at the rear of the instrument. The filter is constructed of adhesive-coated aluminum wool. If the filter becomes excessively dirty, it will restrict the flow of air and may cause overheating. High internal temperatures will not only reduce the lifetime of the instrument components but may also cause the thermal cutout to open at inconvenient times. If the oscilloscope is wired for 117 volts, the fan motor continues to run when the thermal cutout opens but all other power in the instrument is disconnected. If the instrument is wired for 234 volts, all power in the instrument including the fan is disconnected when the cutout opens. Any time that the thermal cutout opens, the filter should be checked immediately. When the interior temperature of the instrument has returned to normal, the thermal cutout will close to reapply power to the instrument.

The filter should be visually checked every few weeks. It should be cleaned at least every three or four months and more often if required. To clean the filter, first remove loose dirt from the filter by tapping it gently on a hard surface. Then wash the filter thoroughly with hot soapy water. After rinsing and allowing to dry, coat the filter with an adhesive such as "Handi-Koter" or "Filtercoat" (products of the Research Products Corporation). These products are generally available from air-conditioning suppliers. Allow the filter coating to dry before replacing the filter in the instrument.

Cleaning the Interior

Although air entering the Type RM567 is filtered, some dust may still penetrate into the interior of the instrument. This dust should be removed occasionally to prevent instrument failure due to the conductivity of the dust under high humidity conditions. Perhaps the best way to keep the interior of the instrument clean is to blow dust off using dry compressed air. A very high velocity air stream should be avoided, however, to prevent damage to some of the components. Persistent dirt can be removed using a damp cloth or a small paint brush.

Special attention should be given to the high-voltage circuits for the crt. This is where dust is most likely to cause trouble. If dust accumulates on the parts, it should be removed since excessive dust combined with high humidity can produce arcing and possible high voltage failures.

Visual Inspection

Many potential and existent troubles can be detected by a visual inspection of the instrument. For this reason, you should perform a complete visual check every time that the instrument is calibrated or repaired. Visual checks should also be made during other routine maintenance work.

Defects which may be detected visually include such things as loose or broken connections, loose set screws in the knobs or shaft couplers, loose or damaged connectors, improperly seated tubes or transistors, scorched or burned parts, and broken terminal strips. The remedy for most of these troubles is apparent. However, particular care must be taken when heat-damaged components are detected. Overheating of parts is often the result of other, less apparent defects in the circuit. It is essential that you determine the cause of overheating before replacing heat-damaged parts.

Recalibration

The Type RM567 Oscilloscope is a stable instrument that will provide many hours of trouble-free operation. However, to insure the reliability of measurements we suggest that you recalibrate the instrument and associate units after each 500 hours of operation (or every six months if used intermittently). A complete step-by-step calibration procedure is given in the Calibration section of this manual.

Fan Motor

Fan motor bearings have been lubricated at the factory and should not require further lubrication more often than about every six months. A few drops of light machine oil on the bearings is adequate.

REMOVAL AND REPLACEMENT OF PARTS

General Information

Most parts in the Type RM567 Oscilloscope can be replaced without detailed instructions. Other parts, however, can best be removed if a definite procedure is followed. Instructions for the removal of some of these parts are contained in the following paragraphs. Because of the nature of the instrument, replacements of certain parts will require that you recalibrate portions of the oscilloscope to insure proper operation. Refer to the Calibration portion of this section (page 5-6) for the applicable calibration steps.

Replacement of the Cathode-Ray Tube

To replace the crt, first remove the graticule cover and the graticule. Then remove the top and left-access panel of the instrument. Loosen the crt socket clamp, and disconnect the crt socket and deflection plate leads. The crt can now be removed through the front panel of the oscilloscope.

The new crt can be put in place by reversing the order of removal. After the crt is in place, the trace should be

aligned with the horizontal graticule markings with the CRT BEAM ROTATOR. The plug-in vertical deflection factor and sweep timing should then be checked and reset if necessary.

WARNING

Care should be exercised when handling a crt to avoid striking it on any object which might cause it to crack and implode. Use of safety glasses or a plastic face mask is recommended.

Soldering and Ceramic Strips

Many components in Tektronix instruments are mounted on ceramic terminal strips. The notches in these strips are lined with a silver alloy. Repeated use of excessive heat, or use of ordinary tin-lead solder, will break down the silver-to-ceramic bond. Occasional use of tin-lead solder will not break the bond if excessive heat is not applied.

If you are responsible for the maintenance of Tektronix instruments, we recommend that you keep on hand a stock of solder containing about 3% silver. A sample of this solder is included with the Type RM567 in the holder on the readout plug-in bulkhead. This type of solder is generally available from radio-supply houses. If you prefer, you can order the solder directly from Tektronix in one-pound rolls; order by part number 251-514.

Because of the shape of the terminals on the ceramic strips it is advisable to use a wedge-shaped tip on your soldering iron when you install or remove parts from the strips. File smooth all surfaces of the iron which will be tinned. This prevents solder from building up on rough spots where it can quickly oxidize.

When removing or replacing components mounted on the ceramic strips you will find that satisfactory results are obtained if you proceed in the manner outlined below.

1. Use a soldering iron of 40- to 60-watt rating.

2. Tin the tip with solder containing about 3% silver.

3. Apply one corner of the tip to the notch where you wish to solder (see Fig. 5-1).

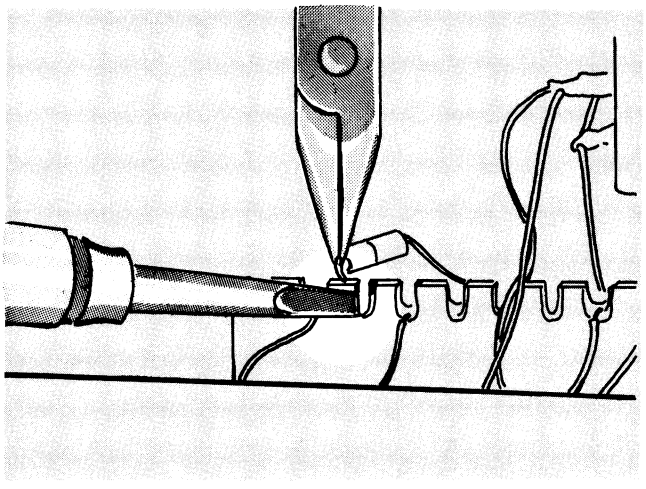


Fig. 5-1. Correct method of applying heat when unsoldering or soldering to a ceramic strip.

4. Apply only enough heat to make the solder flow freely.

5. Do not attempt to fill the notch on the strip with solder; instead apply only enough solder to cover the wires adequately, and to form a slight fillet on the wire as shown in Fig. 5-2. If the lead extends beyond the solder joint,

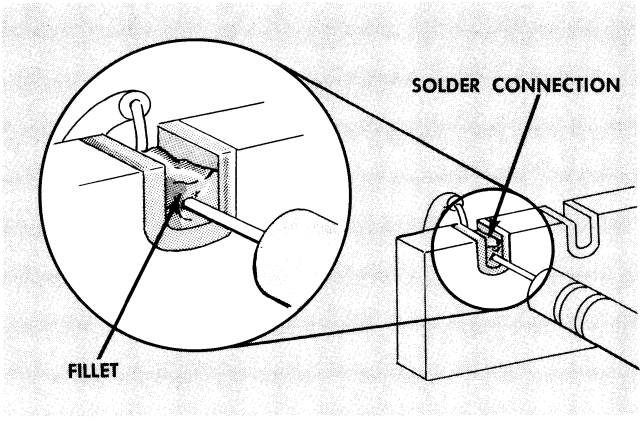


Fig. 5-2. A slight fillet of solder is formed around the wire when heat is applied correctly.

clip the excess as close to the joint as possible. Remove all wire clippings from the chassis.

In soldering to metal terminals (for example, pins on a tube socket) a slightly different technique should be employed. Prepare the iron as described, and apply the iron to the part to be soldered. Use only enough heat to allow the solder to flow freely along the wire so that a slight fillet will be formed.

General Soldering Considerations

Occasionally it may be necessary to hold a bare wire in place as it is being soldered. A handy device for this purpose is a short length of wooden dowel, with one end shaped as shown in Fig. 5-3. In soldering to terminal pins

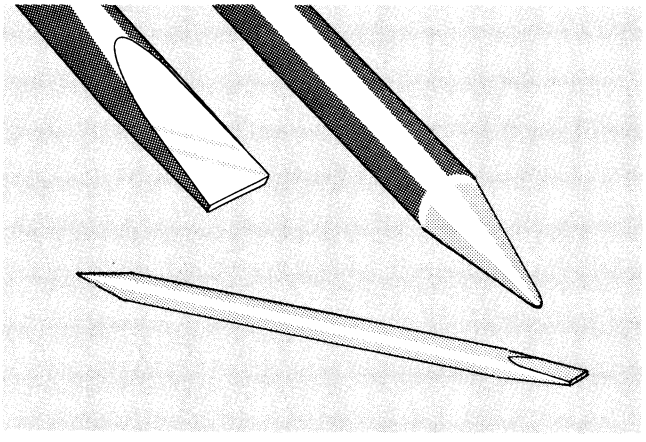


Fig. 5-3. Soldering aid constructed from a 1/4-inch dowel.

mounted in plastic rods it is necessary to use some form of "heat sink" to avoid melting the plastic. A pair of long-nose pliers (see Fig. 5-4) makes a convenient tool for this purpose.

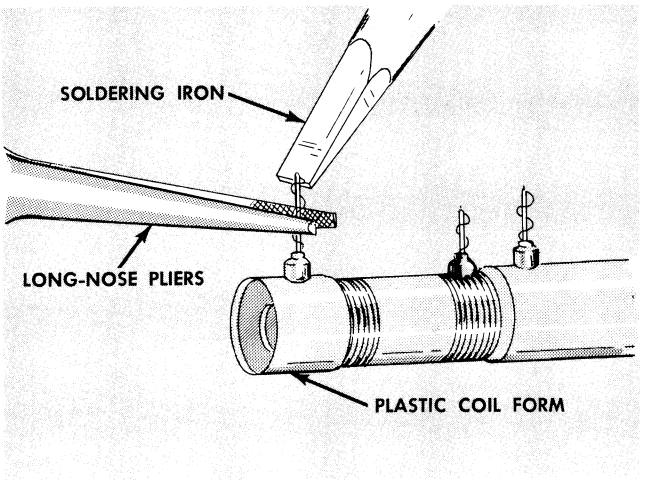


Fig. 5-4. Soldering to a terminal mounted in plastic. Note the use of long-nose pliers between the tip and coil form to absorb the heat.

Replacement of Ceramic Terminal Strips

Damaged ceramic terminal strips are most easily removed by unsoldering all connections, then knocking the yokes out of the chassis with a plastic or hard rubber mallet (hit the ends of the yokes protruding through the chassis). The strip with the two yokes can then be removed as a unit. The spacers will probably come out with the yokes. If not, the spacers can be pulled out separately.

Another way of removing the terminal strip is to use diagonal cutters and cut off the side of the yoke holding the strip. This method permits the strip to be removed from a difficult area where the mallet cannot be used effectively. The remainder of the yoke and the spacers can be pulled out separately after the removel of the strip. Since a replacement strip is supplied with yokes attached, the old yokes need not be saved. However, the old spacers may be reused if desired. If new spacers are required, be sure to specify the spacer size. When ordering new strips, give the strip size and the number of notches on the strip.

When the damaged strip and yoke assembly has been removed, place the spacers into the holes in the chassis, and set the ends of the yoke pins into the spacers. Then press or tap lightly directly above the yokes to drive the yoke pins down through the spacers. Be certain that the yoke pins are driven completely through the spacers. Then cut off the portion of the yoke pin protruding through the spacers with diagonal cutters. Fig. 5-5 shows how the ceramic strip parts fit together.

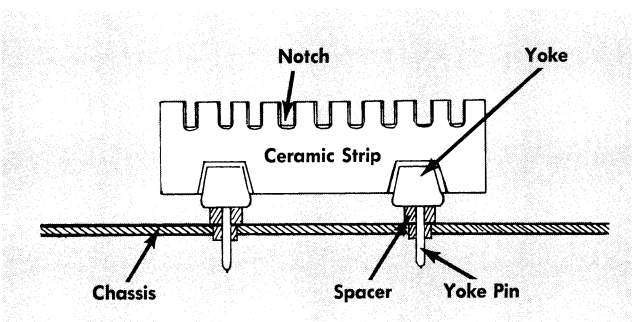


Fig. 5-5. Installation of a ceramic terminal strip.

TROUBLESHOOTING

General Troubleshooting Information

The information in this portion of the manual will enable you to efficiently troubleshoot the Type RM567 in the event that trouble develops.

If trouble occurs in the instrument, an attempt should be made to isolate the trouble by quick operational and visual checks. First check the settings of all controls on the oscilloscope and plug-in units. Then operate the front-panel controls to see what effect, if any, they have on the trouble. The normal or abnormal operation of the various controls may help you establish the trouble symptoms.

Most of the troubles likely to occur will be located in one of the three plug-in units used with the Type RM567. The first step required in troubleshooting the system is to determine if the trouble is in the Type RM567 or one of the plug-in units. The best way to determine this is by substituting other plug-in units in the oscilloscope. If other plug-in units are not available, a quick check can be made by measuring the output and ripple voltages of each regulated power supply and by checking the operation of the crt circuit. If the regulated power supplies and the crt circuit appear to be working properly, the trouble is most likely located in one of the plug-in units. In this case, refer to the appropriate plug-in unit instruction manual for troubleshooting information. If the regulated power supplies or the crt circuit are not operating correctly, the trouble is probably in the Type RM567.

Most troubles occurring in Tektronix instruments result from the failure of vacuum tubes or transistors. Therefore, if trouble occurs, tubes and transistors should be checked as one of the first steps. It is preferable to check them by substitution rather than with a tester since testers frequently fail to indicate certain troubles which can affect oscilloscope performance. When a tube developes shorted elements, associated components can be damaged. Look for burned resistors, etc., when replacing defective tubes.

To aid in troubleshooting the Type RM567, typical circuit voltages are indicated on the circuit diagrams. These voltages may vary slightly from instrument to instrument but should be quite close to the indicated values.

All wiring used in the Type RM567 is color coded to facilitate circuit tracing. In addition, all regulated power supply leads are coded with specific color combinations for easy identification. In general, three stripes are placed on the wires of the regulated supplies. The first color (widest

stripe) indicates the first number in the voltage on that lead, using the standard EIA number-color equivalencies. The second color indicates the second number in the lead voltage and the third color is a multiplier. The method is similar to the color coding of resistors. Thus the —100-volt leads are coded brown, black, brown. The voltage is positive if the main color of the wire is white and negative if the main color of the wire is dark. Four colors would be required to give all the digits plus a multiplier for the +125-volt leads. To avoid this the +125 leads are coded as +120; brown, red, brown on a white base.

Reference voltages for the low-voltage power supplies (except the —100-volt supply itself) are obtained from the —100-volt supply. Therefore, if the —100-volt supply is not operating properly, operation of the other low-voltge supplies will be affected. For this reason it is important, when trouble is detected in the low-voltage power supply, that the —100-volt supply be checked first. If the output of the —100-volt supply is normal, then troubleshoot the power supply where the trouble was first evident.

If the instrument is not operating, check the obvious things first. Check that the instrument is plugged in and that there is power at the socket. Check that the pilot lamp and tube heaters are lit. If necessary check the line fuse. When the obvious indications and troubles have been checked, proceed to a more detailed analysis of the trouble.

Circuit Troubleshooting

As an aid to relating troubles and their probable causes, Table 5-1 is included. This table lists the troubles which are most likely to occur in the instrument and the instructions for correcting the troubles. When trouble occurs in the instrument, the trouble symptoms can be used to find the appropriate section of Table 5-1.

Voltages listed in the table were obtained with the Type RM567 operated with the 3S76, 3T77, and 6R1 units.

TABLE 5-1

TROUBLE	PROBABLE CAUSES	CHECKS TO MAKE
	—100-Volt Power Supply	
1. Output voltage slightly higher or lower than normal but regulates with changes in line voltage. (May not regulate over full range of 105 to 125 volts.)	Improper setting of R624. Abnormal voltage across V609. R623 or R625 changed value.	1. Use the —100 VOLTS control to try to set the output voltage to normal. 2. Check for regulation with line voltage varied from 105 to 125 volts. Check output ripple voltage. If normal, trouble is corrected. 3. Check for approximately 85 volts across V609.
2. Output voltage appreciably higher than normal. Output voltage does not regulate with changes in line voltage.	V609 open V616B not conducting. R616 open. V627 shorted. R625 open.	1. Check that V609 is glowing. 2. Check for approximately 85 volts across V609; if not present, check R609. 3. Check that heater of V616 is glowing. 4. Check voltage at plate of V616A; should be approximately —0.5 volt.
3. Output voltage appreciably lower than normal. Output voltage does not regulate with changes in line voltage.	Q624 shorted. V627 open. V616A not conducting. Low output from rectifier. R619, R621, R623, or R624 open. C626 or C602 shorted.	1. Measure dc voltage across C602; should be approximately 180 volts. 2. Replace V627 and V616. Output voltage should return to normal. 3. Collector of Q624 should be at about —27 volts.
4. Excessive ripple on output.	C602, C625, or C626 open.	Check capacitors. Ripple should be about 4 mv.
	—12.2-Volt Power Supply	
1. Output voltage slightly higher or lower than normal but regulates with changes in line voltage. (May not regulate over full range of 105 to 125 volts.)	—100 VOLTS control improperly set. R633 or R634 changed in value.	1. Check output of —100-volt supply; should be exactly —100-volts. 2. Check R633 or R634. Use an accurate resistance measuring bridge. 3. Set the output of the —100-volt supply and recheck the output of the —12.2-volt supply.

Table 5-1 (Cont.)

TROUBLE	PROBABLE CAUSES	CHECKS TO MAKE
2. Output voltage appreciably higher than normal. Output voltage does not regulate with changes in line voltage.	C640 Shorted. Q634 or Q644 open. R633 open.	1. Check base voltage of Q644; should be +2.7 to 3 volts. 2. Check Q634 and R633. If R633 is open, Q634 may be shorted. 3. Short between collector and emitter of Q644. The power supply output voltage should drop.
3. Output voltage appreciably lower than normal. Output voltage does not regulate with changes in line voltage.	F647 open. Q647 shorted. Q634 or Q644 shorted. R634 open. Low output from recifiers.	1. Check fuse F647. If open, replace. If fuse blows again, proceed to check 2. 2. Check Q644 for short. If shorted, replace. Replace F647. The fuse should not blow. 3. Check for shorts in power supply output. 4. Check Q647 for short. If shorted, this is cause of F647 blowing. 5. Check voltage across C632; should be approximately 18 volts. 6. Check D632A and B and C630, C631, and C632. 7. Check voltage across Q634; should be near 12 volts. 8. Check voltage across Q644; should be 3 volts or less.
4. Excessive ripple on output.	C630, C631, C632 or C646.	Check capacitors.
Other Power Supplies		
Symptoms and troubleshooting techniques for the +20-, +125-, and +300-Volt Power Supplies are similar to those described for the —100- and —12.2-Volt Power Supplies.		
1. No high voltage to crt cathode.	Oscillator not operating. T801 defective. V822 defective. C822 shorted. R849 or R852 open.	1. Check heaters of V822 and V832. If heaters are glowing, the oscillator is operating. 2. Check the voltage at the plate of V822; should be approximately —3.3 kv. 3. Check R849 and R852. 4. Check V822 and C822. If necessary, check the secondary winding of T801. 5. Check plate voltage of V800; should be approximately +400 volts. 6. Check C802, C807, R807, and R804. Also check primary winding of T801.
2. No high voltage to crt control grid.	T801 defective. V832 defective. C824, C825, or C837 shorted. R825, R834, R831, or R833 open.	Check voltage at the plate of V832; should be approximately —3.4 kv.
3. High voltage outputs do not regulate with change in line voltage, or cannot be set to proper level.	V814 inoperative. R840, R841, R843, R845, R847, R815, R816, or R803 open. C841, C842, C816, or C803 shorted.	1. Check to see if trace or spot on screen can be focused. 2. Check V814, R815, R816, R803 and C841. 3. Check R840, R841, R843, R845, R847, C803, C842, and C816.

Table 5-1 (Cont.)

TROUBLE	PROBABLE CAUSES	CHECKS TO MAKE
4. Spot or trace does not focus properly.	Incorrect outputs from High Voltage Supplies. R845 defective. R864 defective.	Check outputs of both High Voltage Supplies. Each should supply approximately —3.3 kv to the resistance dividers.
5. Insufficient display brightness.	Defective crt. Low outputs from High Voltage Supplies. R831 or R834 changed value.	1. Check outputs from High Voltage Supplies; should be approximately —3.3 kv. 2. Check R831 and R834. If they are normal, replace crt.
6. Trace will not align with horizontal graticule markings.	Defective Beam Rotator Coil L860. R860 or R861 defective. Loose crt base clamp.	1. Check R860 and R861. Check physical location of Beam Rotator Coil. Change any defective components. It should be possible for the trace to be aligned with the graticule markings. 2. Check L860. Check crt base clamp.
Calibrator		
1. No square waves from calibrator.	V884 defective. Open resistor.	1. Check dc voltage at Calibrator 50-volt jack. Voltage will probably be either 0 or +50 volts. If +50 volts proceed to check 3. If 0 volts, replace V884 and if necessary proceed to check 2. 2. Check plate voltage of V884B; should be approximately +290 volts. 3. Check cathode resistor of V884B. Check grid resistors of V884B. Check for 6.3 vac at the cathode of V884A. 4. Check R883. 5. Check R878 and R879. 6. Check R877 and R876.
2. Incorrect square-wave amplitude from all calibrator jacks.	Improper setting of R871. Wrong value for divider resistor in cathode of V884B.	1. Check setting of CAL AMPL. control, R871. It should be possible to adjust for correct output. 2. Check resistors in cathode of V884B.

CALIBRATION

Introduction

The information in this portion of the manual will enable you to calibrate and check the operation of the Type RM567 Oscilloscope. This portion may also be used as an aid in isolating troubles occurring within the unit.

Since the number of adjustment controls in the Type RM567 is small, only a short time is required to calibrate the instrument. A minimum of test equipment is required.

Care should be taken in adjusting either the —100-volt output or the high voltage. The output of the —100-volt supply affects the output of the other supplies. Changes in power supply voltages may require additional adjustments in the Type RM567 and associated plug-in units to bring the system into proper calibration. Do not adjust the —100-VOLTS control (step 1) unless the supply output is other than —100 volts.

Changes in high voltage will cause a change in the deflection factors of the crt. This will in turn affect gain and timing adjustments. Therefore, unless the high voltage is more than 2% from its nominal level, no adjustment of the HIGH VOLTAGE control (step 5) should be made. An exception is when a complete calibration of the Type RM567 and plug-in units is to be made.

TEST EQUIPMENT REQUIRED

The following equipment is required to calibrate and check the operation of the Type RM567. The test oscilloscope listed under (1) is not required unless you wish to

measure ripple voltage on the power supply outlets. Also, the capacitance meter listed in (2) is not required unless the capacitance of the crt deflection plates is to be standardized. This is not usually required unless the crt has been replaced, since the adjustment made at the factory should not have to be changed.

(1) Test oscilloscope with a minimum of 10 millivolts per division sensitivity and ×1 probe. Oscilloscope is used to measure the ripple voltage at the output of the regulated power supplies. Tektronix Type 504 or equivalent recommended.

(2) Capacitance meter, used to standardize the crt deflection-plate capacitance. Tektronix Type 130 or equivalent recommended.

(3) DC voltmeter with known corrected readings to within 1% at —100, —12.2, +20, +125, and +300 volts and to within 2% at —3.3 kv.

(4) One horizontal plug-in unit and one vertical plug-in unit, plus the Type 6R1 Digital Unit for the Type RM567.

(5) Variable autotransformer. Should vary output from 105 to 125 volts (or 210 to 234 volts). Used to check power supply regulation with varying line voltage.

(6) Miscellaneous hand tools.

PRELIMINARY PROCEDURE

Install all plug-in units in the Type RM567. Remove the top panel. Connect the Type RM567 to the output of the variable autotransformer. Switch on the power and allow the instrument to warmup for several minutes. Set the output of the autotransformer at 117 (or 234) volts.

ADJUSTMENT PROCEDURE

1. Set —100 Volts

Connect the dc voltmeter between the —100-volt test point shown in Fig. 5-6 and ground. Set the —100 VOLTS control for **exactly** —100 volts from the power supply.

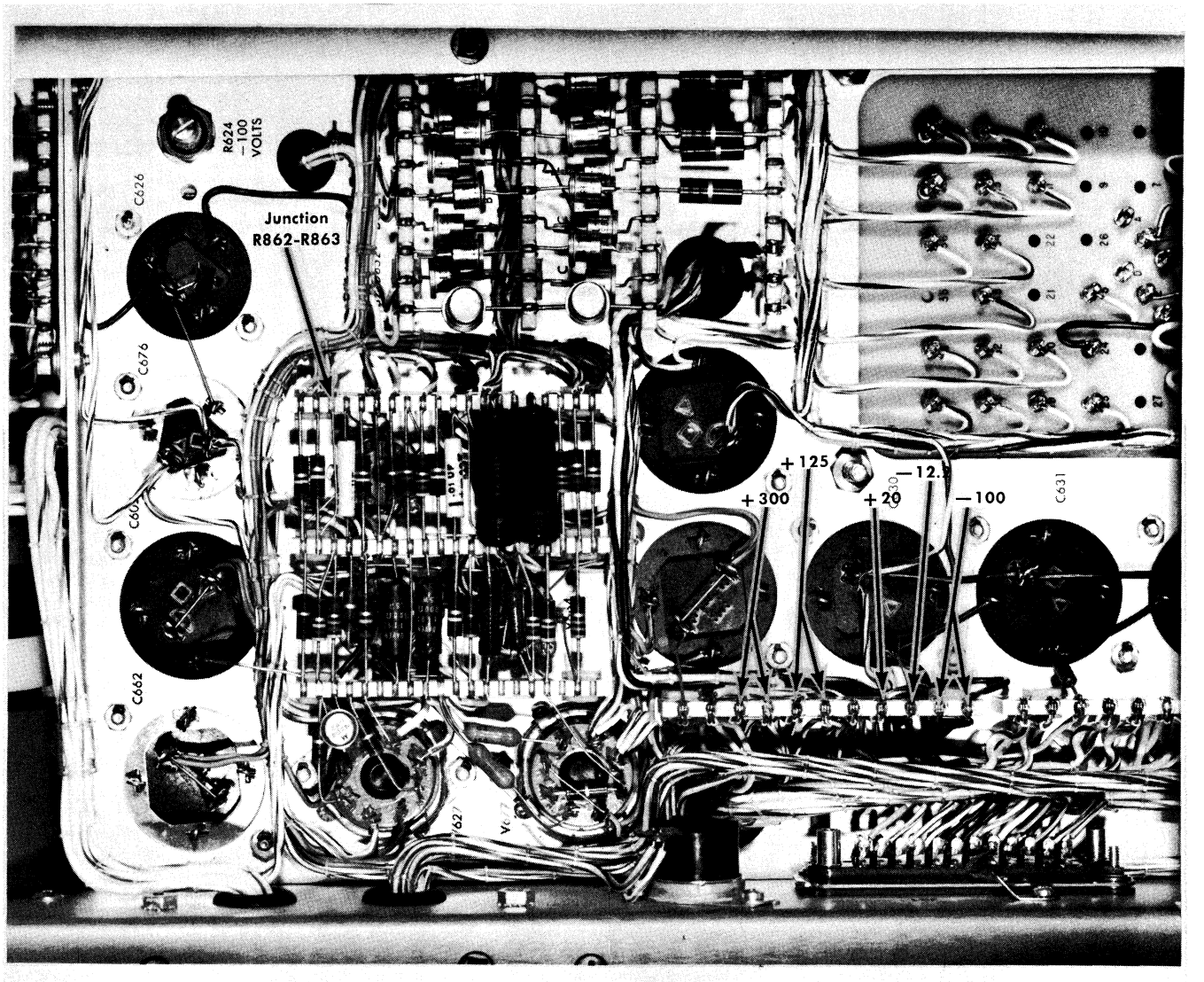


Fig. 5-6. Low-voltage power-supply test points.

2. Check Outputs From Other Low-Voltage Power Supplies

Use the dc voltmeter to check the output voltage of each of the regulated low-voltage power supplies. All voltages should be within 3% of their nominal value.

3. Check Power Supply Regulation

Use the dc voltmeter to monitor the output of each supply while varying the line voltage between 105 and 125 volts (or 210 and 250 volts) with the autotransformer. All supplies should remain in regulation.

4. Check Ripple Voltage

Use the test oscilloscope and ×1 probe to observe the peak-to-peak ripple on each of the low-voltage supplies. Turn off the sweep. Use the conditions and switch settings shown on the schematic diagrams. Peak-to-peak ripple voltages for each of the power supplies should be approximately the same as the values shown on the schematic diagram.

5. Set High Voltage

Set the output of the variable autotransformer at 117 (or 234) volts. Switch off the oscilloscope and connect the dc voltmeter between the HV TEST POINT and ground. Switch on the instrument and adjust the HIGH VOLTAGE control for —3.3 kv. Switch off the oscilloscope and disconnect the voltmeter leads.

6. CRT Beam Rotator

Free-run the sweep and obtain a well-focused trace on the crt. Adjust the CRT BEAM ROTATOR control until the trace lines up with a horizontal graticule line.

7. Set Calibrator Output

Use a jumper lead to ground the cathode of V884A (pin 8). Connect the dc voltmeter to the cathode of V884B (pin 7) and ground. Adjust the CAL. AMPL. control for a reading of 100 volts. Disconnect the jumper lead and the voltmeter.

8. Set CRT Deflection-Plate Capacitance

The effective deflection-plate capacitance of the crt as seen by the plug-in units can be adjusted by means of C760 and C761. This capacitance has been set at the factory to provide a standard effective deflection-plate capacitance of 16 pf. If C670 or C761 has been inadvertently misadjusted, or if the crt has been changed, the effective capacity between one or both pairs of plates may be altered slightly. This has an adverse affect primarily when using a wideband plug-in unit near the upper limit of its bandpass.

Since the effective deflection-plate capacitance of the crt is that capacitance seen by the plug-in unit when the deflection plates are driven push-pull, it cannot be measured directly with a capacitance meter. However, the circuit capacitances which make up the effective deflection-plate capacitance of each set of plates can be measured with a capacitance meter. The capacitances may be represented schematically as shown in Fig. 5-7. *C1* and C2 in the figure represent the capacitance between each plate and ground. *C3* represents the total capacitance between the plates. Since the deflection plates are driven push-pull, the effective deflection-plate capacitance, C_{eff} may be expressed in terms of *C1*, *C2*, and *C3* as follows:

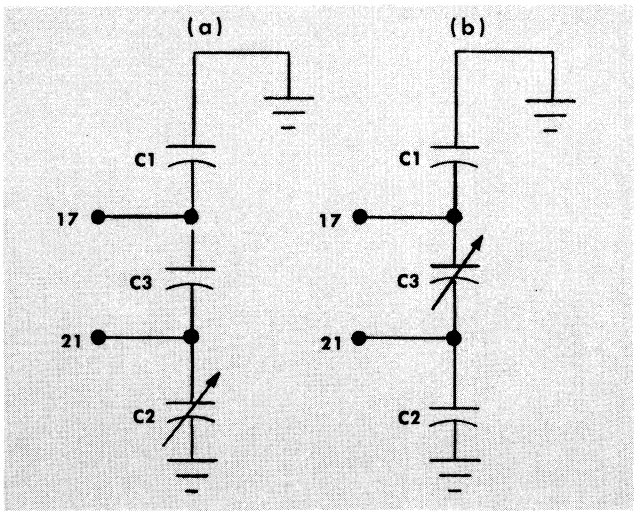


Fig. 5-7. Schematic representation of effective deflection-plate capacity: (a) vertical system; (b) horizontal system.

$$C_{eff} = \frac{C1 + C2}{2} + 2C3.$$

C1 and *C3* are fixed for the vertical system. C2 is adjustable by means of C760. Setting C_{eff} equal to 16 picofarads and solving for C2:

$$C2 = 32\,pf - (C1 + 4C3).$$

Thus, by meansuring *C1* and *C3* you can determine the desired value of C2 for the vertical system. You can obtain this value by adjusting *C760*. Proceed as follows:

1. Disconnect the power cord and isolate the oscilloscope from ground.

2. Either plug a spare 24-pin connector into the vertical plug-in connector or insert any plug-in unit into the vertical opening and unsolder the leads from terminals 17 and 21 in the unit.

3. Connect the capacitance meter guard voltage to pin 21 of the plug-in connector and measure the capacity between pin 17 and the oscilloscope chassis. This is *C1*.

4. Connect the guard voltage to the oscilloscope chassis and measure the capacity between pins 17 and 21 of the plug-in connector. This is C3.

5. Substitute the measured values of *C1* and *C3* into the equation and solve for C2.

6. Connect the guard voltage to pin 17 and measure the capacity between pin 21 and the oscilloscope chassis. This is C2.

7. Adjust C760 until the measured capacity in step 6 equals the value for C2 obtained in step 5.

8. Disconnect the capacitance meter and resolder any unsoldered leads.

C1 and C2 are fixed for the horizontal system, but vary slightly among instruments. *C3* is adjustable by means of C761. Setting C_{eff} equal to 16 picofarads (the factory standard) and rearranging terms:

$$C3 = 8\,pf - \frac{C1 + C2}{4}.$$

Thus, by measuring *C1* and C2, you can determine the desired value of C3. You can obtain this value of *C3* by adjusting C761.

NOTES

Section 6
Accessories

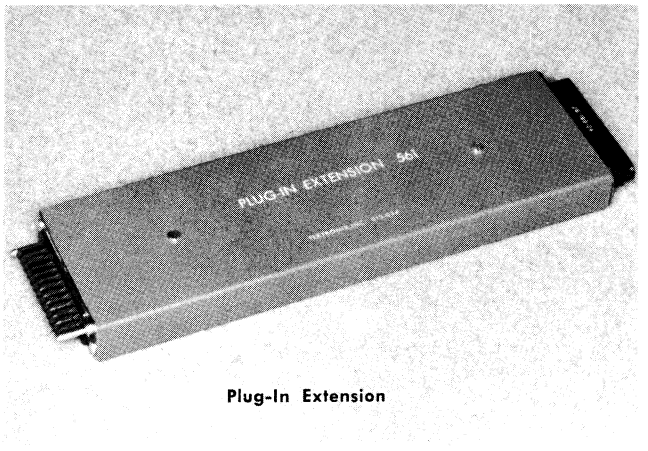
The Type RM567 Oscilloscope will fit many measurement applications and systems through use of standard and special accessories listed in this section. Accessories should be ordered by type or part number through your local Tektronix Field Office.

Additional plug-in units and other accessories will be made available as new applications develop. If you are faced with a measurement problem which is not solved adequately by existing Tektronix plug-in units or combinations of plug-in units and amplifiers, consult your local Tektronix Field Engineer.

PLUG-IN EXTENSION

Maintenance of 560-series plug-in units can be made easier by using the Plug-In Extension pictured here. Fits all 560-series indicators and plug-in units except Types 3S76, 3T77, and 6R1.

Order part number 013-034



Plug-In Extension

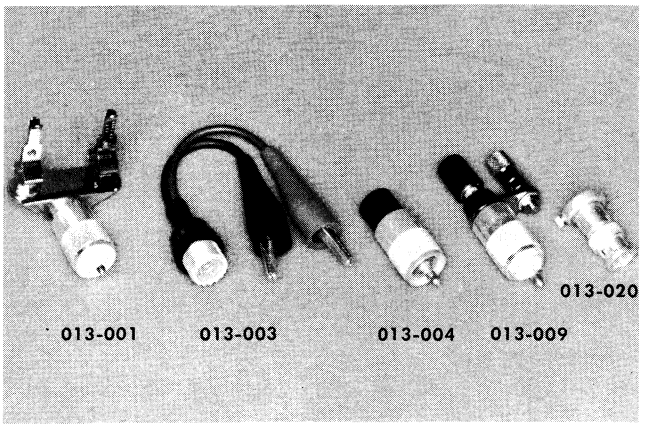
COAXIAL CONNECTOR ADAPTERS

Some electronic equipment is designed with coaxial connectors different from those provided on Tektronix oscilloscopes. Tables 6-1 and 6-2 list adapters that permit joining many of the modern connector styles to your Tektronix signal amplifier. Also, the adapters may be used to mate other systems using dissimilar coaxial connectors.

TABLE 6-1
COAXIAL CONNECTOR ADAPTERS

Description	Part Number
Component test fixture. Intended for use with Type 130 L-C Meter. Fitted with UHF Plug.	013-001
Clip leads fitted with UHF Jack.	013-003
Single Binding Post fitted with UHF Plug.	013-004
Dual Binding Post fitted with UHF Plug.	013-009
P6000 Probe Adapter. Fitting, BNC Plug.*	013-020
BNC Jack to UHF Plug. Fits BNC Plug and UHF Jack.	103-015
UHF Coupling. Jack on each end. Fits UHF Plug on each end.	103-025
UHF T Connector. Fits one UHF Jack to two UHF Plugs.	103-026
UHF Elbow. Fits UHF Jack to UHF Plug. (Not shown)	103-027
BNC Coupling. Jack on each end. Fits BNC Plug on each end.	103-028
BNC Coupling. Plug on each end. Fits BNC Jack on each end.	103-029
BNC T Connector. Fits one BNC Jack to two BNC Plugs.	103-030
BNC Elbow. Fits BNC Jack to BNC Plug.	103-031
BNC Plug to UHF Jack. Fits BNC Jack and UHF Plug.	103-032
Single Binding Post fitted with BNC Plug	103-033

* The BNC Probe Adapter permits connecting a BNC coaxial system to any P6000 or P6017 series probe. If cable requires termination, see Table 6-6 for proper BNC termination unit. Items of Tables 6-1 and 6-2 permit a probe to be fitted to almost any coaxial system.



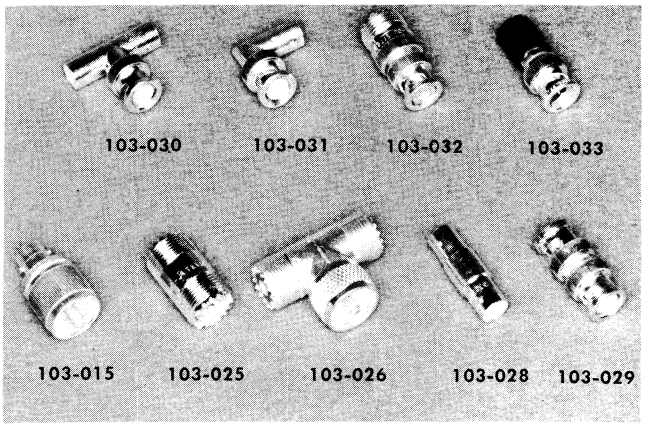
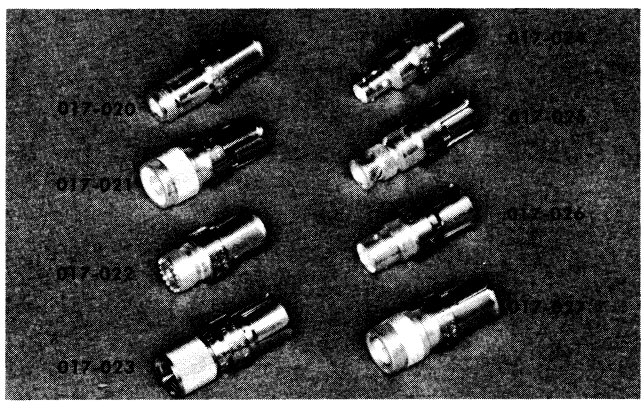


TABLE 6-2
50 Ω GR TYPE 874-Q ADAPTERS

Description *	Part Number
Type 874 connector and Type N Jack. (GR Type 874-QNJ) Fits Type N Plug.	017-020
Type 874 connector and Type N Plug. (GR Type 874-QNP) Fits Type N Jack.	017-021
Type 874 connector and Type UHF Jack. (GR Type 874-QUJ) Fits Type UHF Plug.	017-022
Type 874 connector and Type UHF Plug. (GR Type 874-QUP) Fits Type UHF Jack.	017-023
Type 874 connector and Type BNC Jack. (GR Type 874-QBJ) Fits Type BNC Plug.	017-024
Type 874 connector and Type BNC Plug. (GR Type 874-QBP) Fits Type BNC Jack.	017-025
Type 874 connector and Type C Jack. (GR Type 874-QCJ) Fits Type C Plug.	017-026
Type 874 connector and Type C Plug. (GR Type 874-QCP) Fits Type C Jack.	017-027

* Typical vswr for two connectors, paired, to 2000 megacycles: Type BNC, less than 1.07; Type N, less than 1.04; Type C, less than 1.04.



COAXIAL CABLES

Coaxial cables with several connector styles are listed in Table 6-3. (Signals take nominally 5 nsec to pass through 40" of 50-ohm cable.)

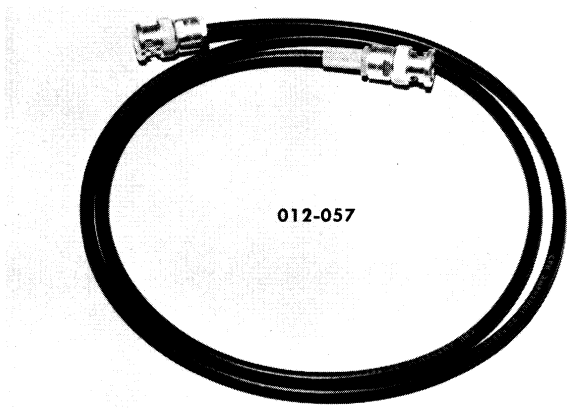
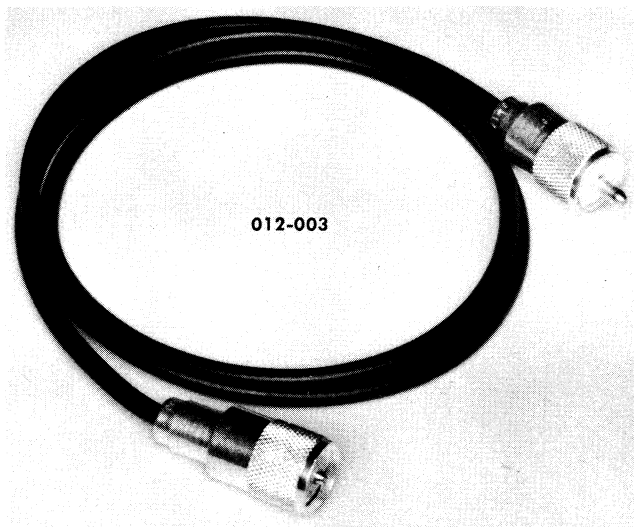


TABLE 6-3
COAXIAL CABLES

Description	Part Number
Two UHF plug connectors. 50 Ω nominal impedance. 42" long. RG-58A/U.	012-001
Two UHF plug connectors. 75 Ω nominal impedance. 42" long. RG-59A/U.	012-002
Two UHF plug connectors. 93 Ω nominal impedance. 42" long. RG-62A/U.	012-003
Two UHF plug connectors. 93 Ω nominal impedance terminated with 93 Ω, ½-watt resistor in unpainted end. 42" long.	012-005
Two UHF plug connectors. 170 Ω nominal impedance. 42" long.	012-006
Two UHF plug connectors. 170 Ω nominal impedance. 60" long.	012-034
Two BNC plug connectors. 50 Ω nominal impedance. 42" long. RG-58A/U.	012-057
Two GR 874 connectors. 50 Ω nominal impedance. 80", 10-nsec delay RG-58A/U	017-501
Two GR 874 connectors. 50 Ω nominal impedance. 40", 5-nsec delay. RG-8A/U.	017-502
One GR 874 connector, other end pigtail. 50 Ω nominal impedance. 8", 1-nsec delay. RG-58A/U.	017-503
Two GR 874 connectors. 50 Ω nominal impedance. 160", 20-nsec delay. RG-8A/U.	017-504
Two GR 874 connectors. 50 Ω nominal impedance. 16", 2-nsec delay. RG-58A/U.	017-505



INTERCONNECTING LEADS

Several types of interconnecting leads are listed in Table 6-4. These are valuable when patching between circuits or between panel connectors of Tektronix oscilloscopes.

Ⓐ

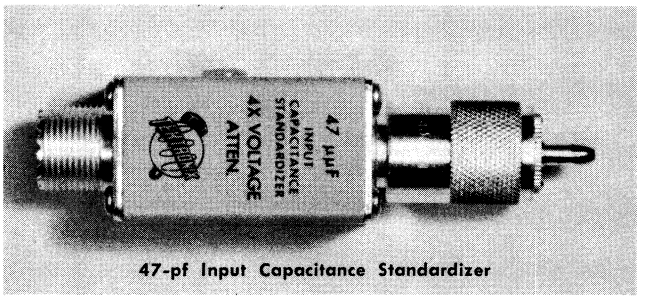
TABLE 6-4
INTERCONNECTING LEADS

Description	Part Number
Type W130B. Black, 30" flexible output lead with banana plug at one end and alligator clip at other.	012-014
Type W130R. Same as Type W130B except colored red.	012-015
Type PC-6B. Black, 6" flexible cord with combination plug and jack banana-type connectors on each end.	012-023
Type PC-6R. Same as Type PC-6B except colored red.	012-024
Type PC-18R. Similar to Type PC-6B except 18" long and colored red.	012-031
Type W531B. Black, 6" flexible cord with plug banana-type connectors on each end.	012-028
Type W531R. Same as Type W531B except colored red.	012-029

SIGNAL AMPLIFIER INPUT CAPACITANCE STANDARDIZER

Standardization of real-time signal amplifier input capacitance is important when exchanging attenuator probes between units. The overall amplifier attenuator plus probe frequency response is degraded if all input time constants are not equal. Standardizer for 1-megohm, 47-pf input plug-in units, 4× attenuation.

Order part number 011-021



47-pf Input Capacitance Standardizer

1000-MEGACYCLE ATTENUATORS AND TERMINATION WITH GR TYPE 874 50-OHM CONNECTORS

The units listed in Table 6-5 provide high fidelity in-line attenuators, or end-line termination. Each unit is fitted with hermaphroditic GR Type 874 connectors for easy connection to other connectors or adapters of the same type. The attenuator vswr is less than 1.1 to 1000 megacycles.

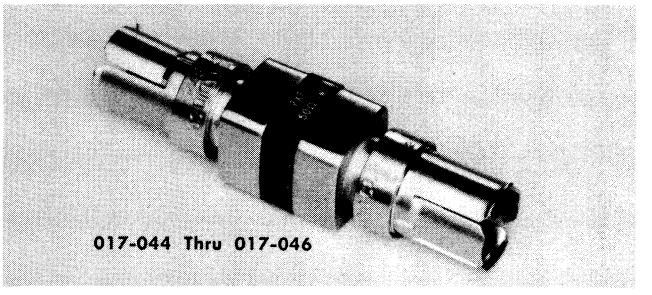
Intended for use with Tektronix Sampling Systems, these high performance T attenuators can be inserted directly into a 50-ohm system. Since the Tektronix Sampling Systems have internal 50-ohm terminations, no in-line termination is required with the attenuators.

Observe the power ratings stamped on the case of each unit. Power dissipation in excess of the rating may destroy the resistance element. Replacement element stock numbers are included in Table 6-5.

If your application requires pulsing attenuators or terminations with voltages above their rms ratings, refer to "Power-Time Relationships", Fig. 3, page 802, 4th Edition I T and T Reference Data for Radio Engineers. The "Power-Time Relationships" chart will aid you in using the attenuators or terminations within their safe power dissipation limits.

TABLE 6-5
50 Ω GR CONNECTOR ATTENUATORS AND TERMINATIONS

Description	Part Number	
10 × T Attenuator, 1 watt.	Unit: Element:	017-044 307-064
5 × T Attenuator, 1 watt.	Unit: Element:	017-045 307-065
2 × T Attenuator, 1 watt.	Unit: Element:	017-046 307-066
50 Ω End-Line Termination, 2 watts.	Unit: Element:	017-047 307-077


017-044 Thru 017-046

HIGH FREQUENCY BNC CONNECTOR TERMINATIONS AND ATTENUATORS

Tektronix offers a series of terminating resistors and attenuators, having a BNC Plug on one end and a BNC Jack on the other. The attenuators have a vswr of less than 1.1, when properly terminated, to 100 megacycles. Table 6-6 lists the BNC group.

Any of the BNC terminations and attenuators may be used with a Tektronix 560-series oscilloscope by adding the proper adapter (listed in Table 6-1). For example, to adapt a BNC Plug to a UHF Jack, select part number 103-015.

It is often necessary to terminate a coaxial system when connecting it to the input of an oscilloscope. Proper termination with a resistance equal to the cable characteristic impedance will prevent signal reflections and avoid measurement errors.

If the signal requires attenuation at the oscilloscope input, a 10:1 T attenuator of the correct impedance can be used. However, a T attenuator alone is not a correct cable termination and must be followed by the proper termination resistor.

Observe the power rating stamped on the case of the terminations and attenuators. Power dissipation in excess of the rating may destroy the resistance element inside the unit. Replacement resistor part numbers are included in Table 6-6. If the resistors are damaged, the unit disassembly can be accomplished simply by unscrewing first the jack end, and then the plug end. Place the new resistors in the unit identically as the old ones were located.

TABLE 6-6
BNC TO BNC COAXIAL TERMINATIONS AND ATTENUATORS
Fittings: One BNC Plug — One BNC Jack

Description	Part Numbers
50 Ω Cable Termination, ½ watt.	Unit: 010-313 Element: 1,319-019
50 Ω 10:1 T Attenuator, ½ watt.	Unit: 010-314 Elements: 1,318-026 1,318-027 1,319-020
75 Ω Cable Termination, ½ watt.	Unit: 010-315 Element: 1,319-021
75 Ω 10:1 T Attenuator, ½ watt.	Unit: 010-316 Elements: 1,318-028 1,318-029 1,319-022
93 Ω Cable Termination, ½ watt.	Unit: 010-317 Element: 1,319-023
93 Ω 10:1 T Attenuator, ½ watt.	Unit: 010-318 Elements: 1,318-030 1,318-031 1,319-024
50 Ω to 75 Ω Minimum Loss L Attenuator, 1 watt.	Unit: 010-319 Elements: 1,319-025 1,319-026
50 Ω to 93 Ω Minimum Loss L Attenuator, 1 watt.	Unit: 010-320 Elements: 1,319-027 1,319-030

010-313 Thru 010-320

UHF SYSTEM ATTENUATORS AND TERMINATIONS

When working with UHF coaxial systems in the range of 100 megacycles and below, the attenuators listed in Table 6-7 will function properly when terminated with a termination resistor of the same value. Termination resistors listed in Table 6-8 will also perform to 100 mc except where noted.

Replacement resistance elements are listed with the units. To disassemble, remove the four screws from the plug end, unsolder the lead in the plug center conductor and remove the plug. Then the jack can be removed with the resistors attached. Place the new resistors exactly like the old ones were located.

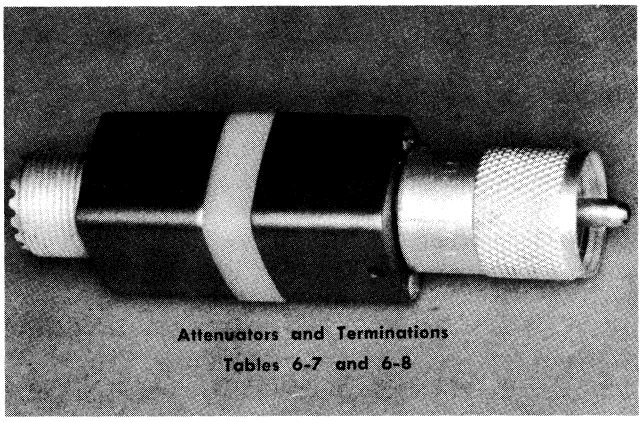

Attenuators and Terminations
Tables 6-7 and 6-8

TABLE 6-7
UHF SYSTEM ATTENUATORS
Fittings: One UHF Plug — One UHF Jack

Description	Part Numbers
50 Ω 10:1 T Attenuator, 1.5 watts.	Unit: 011-031 Elements: 2,310-138 2,319-048
50 Ω 5:1 T Attenuator, 1.5 watts.	Unit: 011-032 Elements: 2,310-039 2,319-049
75 Ω 10:1 T Attenuator, 1.5 watts.	Unit: 011-033 Elements: 1,310-135 2,319-045 1,309-363
75 Ω 5:1 T Attenuator, 1.5 watts.	Unit: 011-034 Elements: 1,310-134 2,319-044 1,309-362
93 Ω 10:1 T Attenuator, 1.5 watts.	Unit: 011-035 Elements: 1,310-137 2,319-047 1,309-365
93 Ω 5:1 T Attenuator, 1.5 watts.	Unit: 011-036 Elements: 1,310-136 2,310-046 1,309-364
50 Ω to 75 Ω Minimum Loss Attenuator, 1.5 watts.	Unit: 011-041 Replaces: 011-004 Elements: 1,310-140 2,309-366
50 Ω to 93 Ω Minimum Loss Attenuator, 1.5 watts.	Unit: 011-042 Replaces: 011-014 Elements: 1,310-141 2,309-367
50 Ω to 170 Ω Minimum Loss Attenuator, 1.5 watts.	Unit: 011-043 Replaces: 011-005 Elements: 1,309-368 2,319-050

TABLE 6-8
UHF SYSTEM TERMINATIONS
Fittings: One UHF Plug — One UHF Jack

Description	Part Numbers
50 Ω Termination Resistor, 1.5 watts.	Unit: 011-045 Replaces: 011-001 Elements: 2, 309-372
75 Ω Termination Resistor, 1.5 watts.	Unit: 011-046 Replaces: 011-007 Elements: 2, 309-374
93 Ω Termination Resistor, 1.5 watts.	Unit: 011-047 Replaces: 011-011 Elements: 2, 309-374
170 Ω Termination Resistor, 0.5 watt. Vswr, 1.25 at 30 mc.	Unit: 011-048 Replaces: 011-016 Element: 1, 309-360

PROBES

The most common method of connecting signals to an oscilloscope vertical amplifier is to use a probe of appropriate attenuation. An attenuator probe significantly reduces the loading on the circuit being measured below the loading value of the signal amplifier input terminals. An attenuator probe can be used effectively on either a standard 1-megohm input amplifier, or a Sampling System 50-ohm signal amplifier.

TYPE P6026 Passive Probe—The P6026 Passive Probe is designed for use with 50-ohm input Sampling Systems. Its frequency response is such that it does not alter the frequency response of a 600-megacycle sampling system more than ±3%. Seven attenuators provide attenuation ratios of 5 through 500, either ac or dc coupled.

The P6026 Probe consists of: a GR Type 874 50-ohm connector to probe adapter, a dc-coupled 50-ohm termination, an ac-coupled 50-ohm termination, plus attenuator heads of ×5, ×10, ×20, ×50, ×100, ×200 and ×500, a removeable ground clip, and a 50-ohm nominal surge impedance RG-58A/U 10-nsec cable. All attenuators must be used with the 50-ohm termination either ac- or dc-coupled in order to attain the stated attenuation. It is not possible to stack attenuator heads to obtain other values of attenuation.

The resistors used throughout the P6026 Passive Probe system are ±1% values. Thus the input resistance when using the P6026 with a Tektronix 50-ohm sampling system is within 2%.

All Attenuator Head attenuation ratings are within 2% of that stated on the individual head.

(NOTE: The P6026 will degrade the highest frequency performance of the Type 3S76 Sampling Unit in the form of a slight rounding off of a fast rise pulse. Higher performance probes with fixed attenuation are in the development stage at the time of this printing. Consult your local Tektronix Field Engineer for details.)

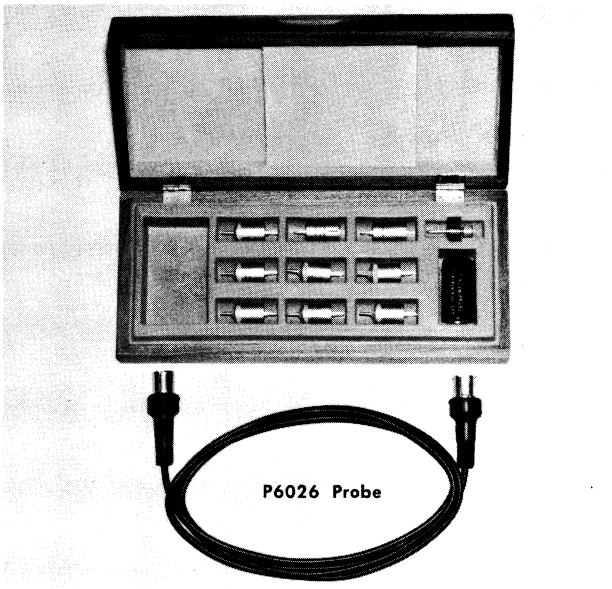


TABLE 6-9
PROBE SPECIFICATIONS

Probe and Connector	Cable Length	Atten. Ratio	Input Impedance: Resistance Meg Ω	Input Impedance: Capacitance—pf Min. *	Input Impedance: Capacitance—pf Max. **	Voltage Rating (Max.) †	Part Number UHF	Part Number BNC
	42 inch	10	10	14	14	600	010-038	010-064
P6017-UHF	6 foot	10	10	17	17	600	010-056	010-066
P6022-BNC	9 foot	10	10	20	20	600	010-057	010-067
	12 foot	10	10	23	23	600	010-058	010-068
	42 inch	1	1	67	94	600	010-070	010-074
P6027-UHF	6 foot	1	1	94	120	600	010-071	010-075
P6028-BNC	9 foot	1	1	120	147	600	010-072	010-076
	12 foot	1	1	146	173	600	010-073	010-077
	42 inch	100	9.1	2.5	2.8	2000	010-024	010-029
P6002-UHF	6 foot	100	9.1	2.8	3.25	2000	010-034	010-050
P6005-BNC	9 foot	100	9.1	3.5	4.0	2000	010-043	010-051
	12 foot	100	9.1	3.8	4.0	2000	010-044	010-052

* When connected to instruments with 20-pf input capacitance.

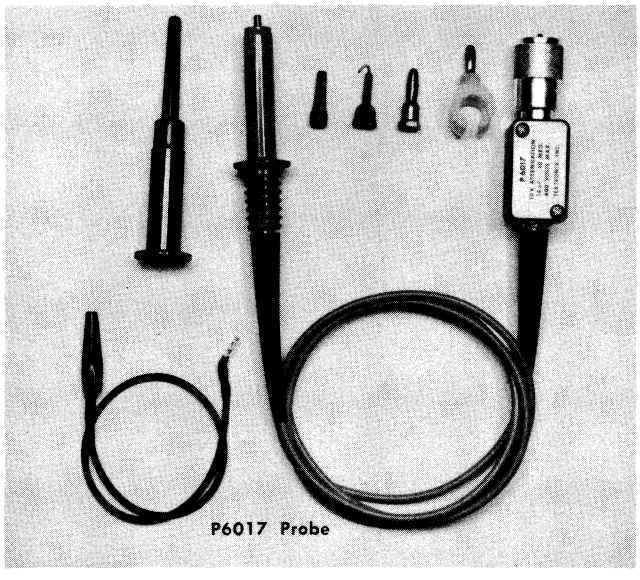
** When connected to instruments with input capacitance up to 50 pf.

† See derating information.

P6017-Series Probes—The P6017-series of probes preserves the transient response of Tektronix 560-series 1-megohm input resistance instruments. The 42-inch cable length P6017 and P6022 Probes provides uniform amplitude response with no overshoot or ringing. Average bandpass characteristics show the P6017 and P6022 Probes, with 42-inch cables, to be down between 0 and 1 db at 30 megacycles. 12-foot cables reduce bandpass to 3 db down between 16 and 20 megacycles.

Voltage derating with frequency for all but the 12-foot cable length probes must be observed. The 42-inch length P6017 and P6022 will operate at 600 volts peak-to-peak to 1.5 mc, dropping to 400 volts peak-to-peak at 3 mc, 200 volts peak-to-peak at 6 mc, 135 volts peak-to-peak at 10 mc, and 90 volts peak-to-peak at 30 mc.

Four interchangeable tips—spring, hooked, pincher, and banana tip—are included with the probe. A 12-inch ground lead is also included.



P6017 Probe

TYPE P6032 Cathode Follower Probe—(Not illustrated) The P6032 Cathode Follower Probe is designed for use with 50-ohm Sampling Oscilloscopes with performance to above 1000 megacycles. The probe has a high impedance dc-coupled input, permitting the use of plug-on attenuator heads with attenuation from 10 to 1000. Ac-coupling is accomplished by the use of a capacitor plug-on head having a low-frequency cutoff of approximately 20 cps.

The P6032 Probe has a cable length of 4½ feet, and is shipped with seven attenuator heads, a capacitor coupler head, and a grounding clip.

Input characteristics are: Dc resistance: 10 megohms.

	Input Capacitance		
10×	3.5 pf	100×	1.5 pf
20×	2.6 pf	200×	1.3 pf
50×	1.8 pf	500×	1.3 pf
	1000×	1.3 pf	

The cathode follower gain error due to linearity limits is less than 5% over a ±100 mv output voltage range.

Type P6033 Trigger Probe—(Not illustrated) The P6033 Trigger Probe is a trigger-coupling probe for external triggering of Tektronix sampling system timing units. The Type P6033 accepts triggering signals with risetimes as fast as about 1.2 nanosecond, or sine wave frequencies up to about 300 megacycles. When terminated by a 50 Ω external trigger circuit, it provides a nominal 1000 Ω input impedance, minimizing circuit loading.

Voltage rating of the probe with the output dc-coupled is ±15 volts dc or 15 volts rms. When the output is ac coupled, the voltage rating is ±400 volts dc or 15 volts rms.

Three interchangeable tips—pincher, hooked, and banana tip—are included with the probe. A 5-inch and 12-inch ground lead are also included.
Order part number 010-100

100× Probes—Probes having an attenuation ratio of 100 are also listed in Table 6-9. These probes are provided in the event you require very small capacitive loading when measuring signals of high impedance, or if it is necessary to measure voltages higher than 600 volts. They will perform with uniform amplitude response without overshoot or ringing on any of the 560-series signal amplifiers. No voltage vs frequency derating is necessary.

Physical dimensions of the probe body are 7/16 inch in diameter and 3⅝ inches in length without the tip. The standard cable length is 42 inches.

Four interchangeable tips—spring, hooked, BNC, and banana tip—are included with the probe. A 5-inch and a 12-inch ground lead are also included.

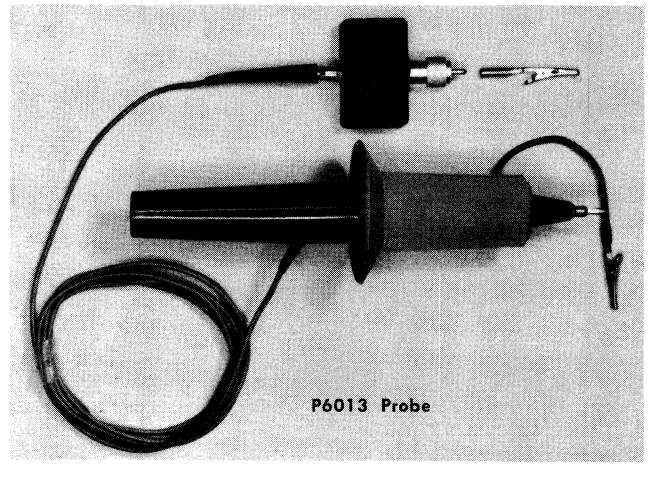
P6013 High Voltage Probe—The P6013 High Voltage Probe provides a means of observing waveforms of high amplitude. Voltage rating for dc and pulses: ±12 kv with proper derating above 100 kc.

Attenuation Ratio—1000.

Frequency Response—Dc to over 30 mc with proper derating.

Input Impedance—100 megohms and 3 pf.

Voltage vs Frequency Derating—±12 kv to 100 kc, dropping to ±5 kv at 1 mc, ±1.5 kv at 10 mc, and ±500 volts at 30 mc.



P6013 Probe

A compensating box at the oscilloscope end of the probe cable enables the P6013 to be properly compensated to any oscilloscope having an input resistance of one megohm and a capacitance of 20 to 47 pf. The probe introduces no ringing or overshoot.

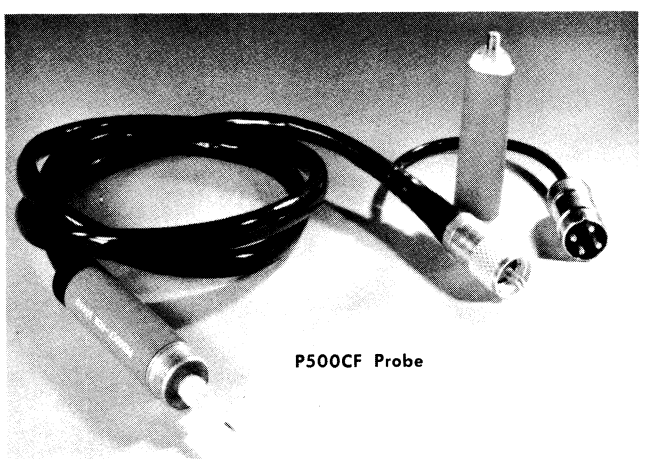
Probe body length is 12 inches, coaxial cable length is 10 feet (up to 25 feet on special order).

Accessories include 2 banana-plug tips, an alligator-clip assembly, and an attached 7½-inch ground lead.

Order part number, 10-ft cable 010-106

P500CF Cathode-Follower Probe—Presents low capacitance with minimum attenuation. Input impedance is 40 megohms paralleled by 4 pf. Gain: 0.8 to 0.85. Input to probe is ac-coupled, limiting its low-frequency response to 5 cps. Amplitude distortion is less than 3% on unidirectional signals to 5 volts. 10× attenuator head is included with probe, and should be used on signals exceeding a few volts to minimize amplitude distortion. With the attenuator head attached, the probe input impedance is approximately 10 megohms paralleled by 2 pf. Probe output level is 11 v positive, making it necessary to use the ac-coupled position of the oscilloscope AC-DC switch. Probe cable is 42" long.

Order part number 010-105



P500CF Probe

Type 128 Probe Power Supply—Probe power supply for the P500CF cathode-follower probe. The Type 128 supplies the necessary plate and heater voltages for one or two probes, making it possible to use P500CF probes with signal amplifiers not equipped with a probe-power outlet.

DC Output Voltages—+120 v regulated, at 25 ma; two +6.3 v unregulated, at 150 ma.

Voltage Ripple—+120-v supply, not more than 5 mv peak-to-peak; +6.3-v supplies, not more than 75 mv peak-to-peak.

Power Requirements—105 to 125 v or 210 to 250 v, 50 to 60 cycles, 25 watts using two P500CF Probes.

Dimensions—4¾" wide, 7¾" high, 9" overall depth.

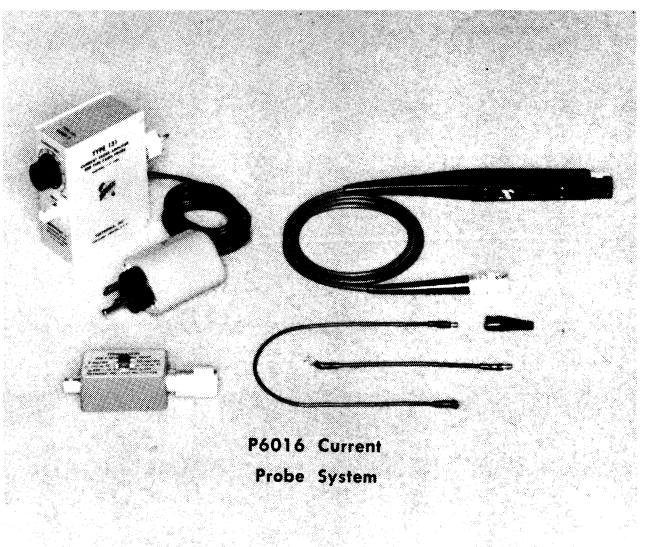
Weight—6 lbs.

P6016 AC Current Probe System—The P6016 Current Probe with the Type 131 Current Probe Amplifier or the Passive Termination constitute an ac current detecting system for use with any oscilloscope. The system provides accurate displays for observation and measurement of ac current waveforms. Current range extends from less than one milliampere to 15 amperes.

Use of the Current Probe and Amplifier system with any of the 560-series signal amplifiers, other than sampling types, will result in an upper-frequency limit similar to that of the plug-in unit used; this will be less than the upper-frequency limit of the probe system alone.

The long narrow shape and convenient thumb control make the P6016 Current Probe easy to use. Just place probe slot over the conductor and close slide with thumb—no direct electrical connection is required. Wiping action keeps core surfaces clean. Loading introduced is so slight that it can almost always be disregarded. For increased sensitivity, loop the conductor through the probe slot two or three times.

Order part number (Probe only) 010-037



P6016 Current Probe System

Type 128

P6016 Probe and Type 131 Amplifier

Sensitivity (with 50 mv/div oscilloscope input) 1 ma/div to 1 amp/div in 10 steps. Variable sensitivity control on oscilloscope provides continuous uncalibrated adjustment.

Frequency Range (with 30-mc oscilloscope)—3 db down at 50 cps and approximately 17 mc.

Risetime—20 nsec.

Saturation Ratings—DC, 0.5 amp; AC, 15 amps peak-to-peak decreasing to 8 amps at 400 cps, 400 ma at 50 cps.

Order part number (Probe and Amplifier) 015-030

P6016 Probe and Passive Termination

Sensitivity—2 ma/mv and 10 ma/mv.

Frequency Range (with 30-mc oscilloscope)—3 db down at 850 cps (2 ma/mv), 230 cps (10 ma/mv), and 20 megacycles.

Risetime—18 nsec.

Saturation Ratings—DC, 0.5 amp; AC at 2 ma/mv, 15 amps peak-to-peak decreasing to 8 amps at 1.5 kc, 4 amps at 850 cps; at 10 ma/mv, 15 amps peak-to-peak decreasing to 5 amps at 400 cps, 2.5 amps at 230 cps.

Order part number (Probe and Termination) 011-044

RECALIBRATION TOOLS

The tools shown are handy, and in some cases necessary, for the recalibration of Tektronix instruments. All of the tools except the assembly 003-007 are available through most radio and electronic parts suppliers.

003-001 Jaco No. 125 insulated screwdriver with 7" shank and metal bit. This tool is useful for hard-to-reach adjustments.

003-000 Jaco No. 125 insulated screwdriver. This tool is similar to 003-001 but has a 1½" shank.

003-003 Walsco No. 2519 insulated alignment tool. This double-ended tool is useful for adjusting variable inductors.

003-004 Walsco No. 2503, ¼" insulated hexagonal wrench. This tool is useful for tightening variable inductor lock nuts.

003-006 (Not pictured) Insulated alignment tool suitable for adjusting small capacitors.

003-007 Tektronix recalibration tool assembly. This 4-unit tool assembly provides most of the necessary tools for adjusting variable inductors in Tektronix instruments.

003-301 Walsco No. 2543 double-ended 0.1" hexagonal wrench. This tool is useful for adjusting variable indutors with hexagonal cores.

Alignment tool kit: contains the following tools.

003-001	003-004	003-308
003-000	003-006	003-309
003-003	003-307	003-310

Order part number for kit 003-500

CAMERAS

Type C-12 Camera

Interchangeable Lens—Lens easily changed by loosening two adjustable locknuts. Lenses available are f/1.5, f/1.9, and f/4.5. Object-to-image ratios include 1:1, 1:0.9, 1:0.7, 1:0.5.

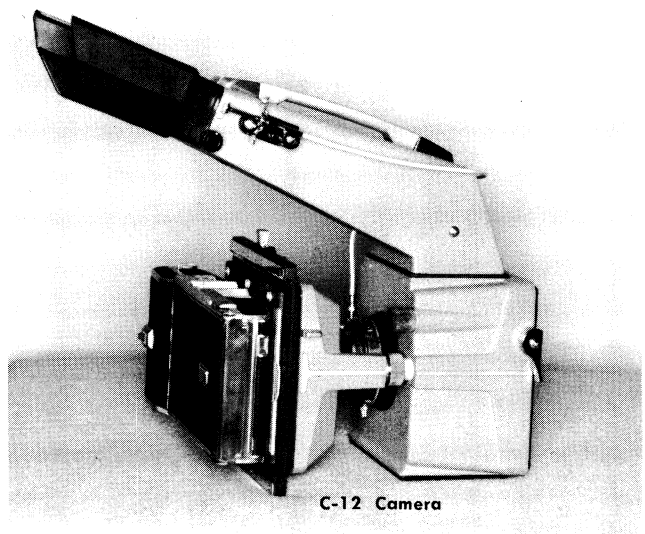
Interchangeable Back—Accepts all standard Graflok accessories. Backs may be interchanged without refocusing.

Binocular Viewing—Orthogonal and undistorted over full 8 × 10 cm area.

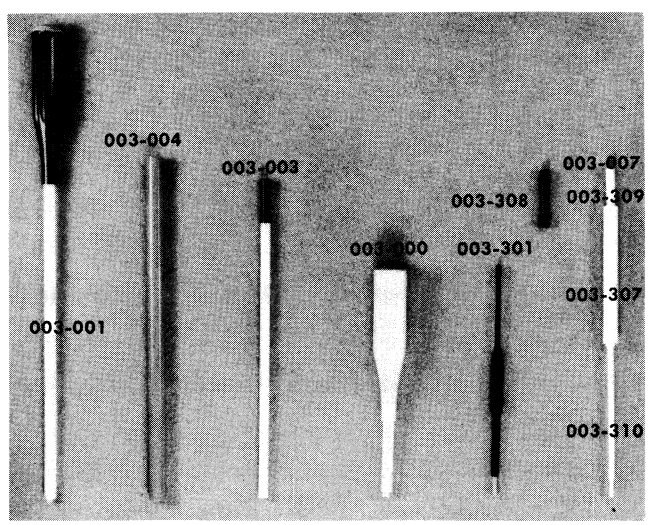
Hinge Mounting—Camera swings away from crt for full visibility, lifts easily out of hinge fittings.

Rotating and Sliding Backs—Rotation through 90° steps. Horizontal or vertical movements of back through five positions.

Standard C-12 Camera shipped with f/1.9 Oscillo-Raptar lens having 1:0.9 object-to-image ratio, focusing 4 × 5 Graflok back, and Polaroid roll-film back.



C-12 Camera

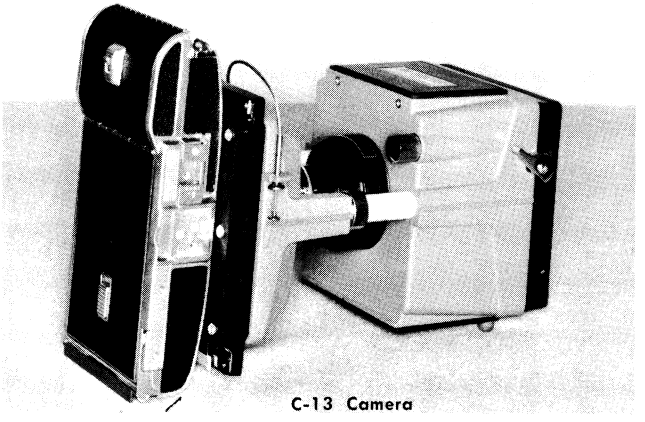


Ⓐ

Type C-13 Camera

Same style as the C-12 except that it does not have the binocular viewing feature. Standard lens supplied with the C-13 Camera is an f/4.5 Oscillo-Amaton which has an object-to-image ratio of 1:0.7. Other lenses currently available from Tektronix will fit the C-13.

Other features of the C-13 Camera are similar to those of the C-12.



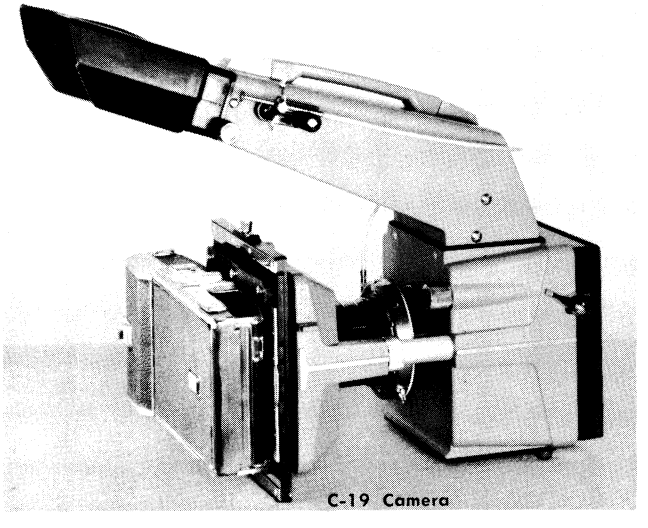
C-13 Camera

Type C-19 Camera

Same style as the C-12 Camera except that it is constructed without a beam-splitting mirror to permit maximum light from the oscilloscope screen to reach the camera lens. This feature in conjunction with the fast f/1.5 lens supplied with the camera make the C-19 particularly suitable for applications requiring extremely high writing rates. Other lenses currently available from Tektronix may be used with the C-19.

Binocular viewing of a 5 cm high by 10 cm wide screen area permits the oscilloscope display to be observed while being photographed.

Other features of the C-19 Camera are similar to those of the C-12.



C-19 Camera

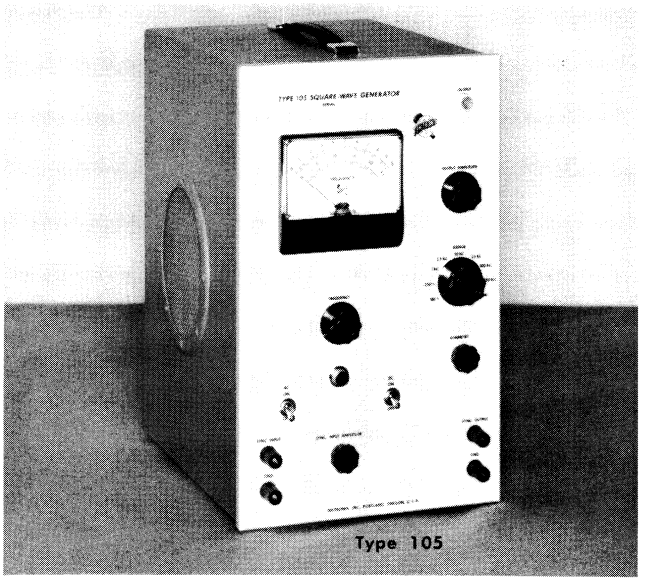
AUXILIARY DEVICES

Type 105 Square-Wave Generator

Risetime—13 nsec, with 50-ohm termination.
Frequency Range—25 cycles to 1 mc, continuously variable.

Frequency Meter—Direct reading, accurate within 3% of full scale.

Output Amplitude—0 to 100 v maximum, 0 to 15 v across 93-ohm load.



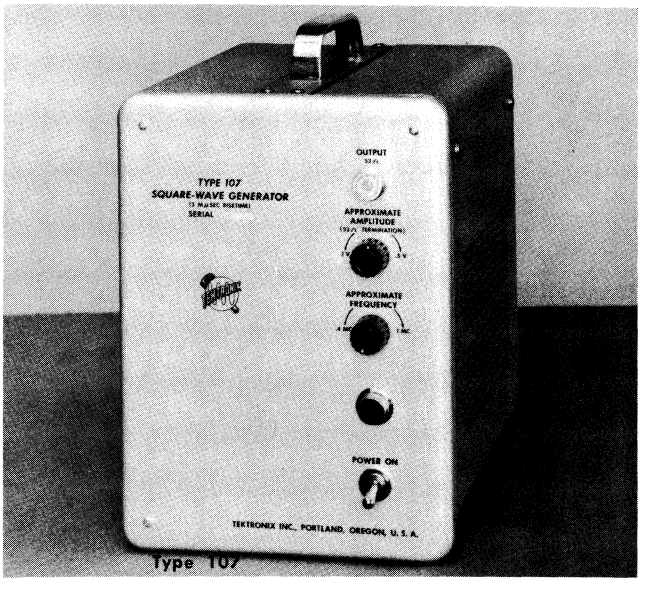
Type 105

Type 107 Square-Wave Generator

Risetime—Less than 3 nsec with 50-ohm internal termination.

Frequency Range—400 kc to 1 mc, uncalibrated.

Output Amplitude—0.1 v to 0.5 v, with 50-ohm terminated cable.



Type 107

Type 109 Pulse Generator

Pulse Risetime—Less than 0.25 nsec.

Pulse Length—Minimum of approximately 0.5 nsec to a maximum of 40 nsec at internal repetition rate. An accessory (shipped with the Type 109) permits generation of long pulses at half the internal rate that tilt down about 10% in 400 nsec.

Pulse Repetition Rate—Internally adjusted to be between 550 and 720 cycles.

Output Impedance—50 ohms.

Alternate Pulses—Unequal charge lines can be used to produce alternate pulses of different time durations.

External Charge voltage permits alternate pulses of different amplitudes and/or polarity.

Type 110 Pulse Generator and Trigger Takeoff

Pulse Risetime—Less than 0.25 nsec.

Pulse Length—Minimum of 0.5 nsec to 300 nsec at half rep rate.

Pulse Output Impedance—50 ohms.

Pulse Repetition Rate—Nominally 720 pulses/sec.

Trigger Systems—50-ohm impedance. Takeoff system where signal is patched into a "loop-through" arrangement and a portion of signal used as a trigger signal. Regenerated trigger system with trigger output ±10-v amplitude, 225 nsec duration, 4-nsec 50% risetime, count down from approximately 100 mc.

Type 111 Pretrigger Pulse Generator

Risetime—0.5 nsec for positive pulse, slightly longer for negative pulse.

Pulse Duration—2 nsec minimum, 100 nsec maximum at low rep rates decreasing to 20 nsec at 100-kc rep rate (obtained with external charge line).

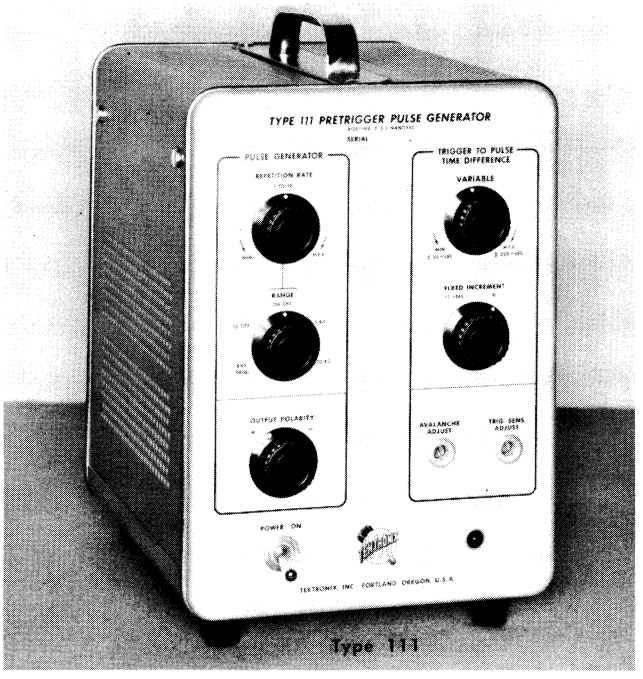
Pulse Repetition Rate—10 pps to 100 kc in 4 ranges with continuously variable control.

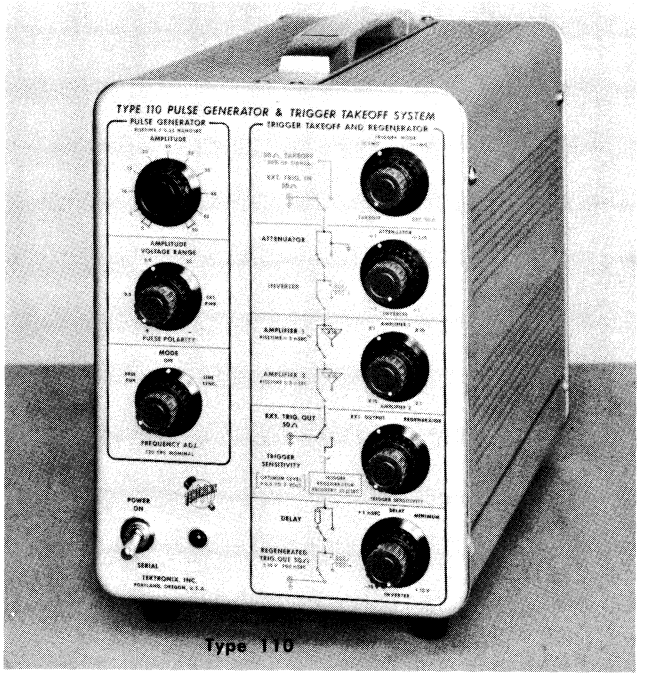
Pulse Amplitude—More than ±5 volts.

Pretrigger Pulse Charateristics—10 volts, 250-nsec duration, half-amplitude risetime about 4 nsec.

Pulse Delay—Continuously variable from 30 to 250 nsec after pretrigger pulse.

Output Impedance—50 ohms.



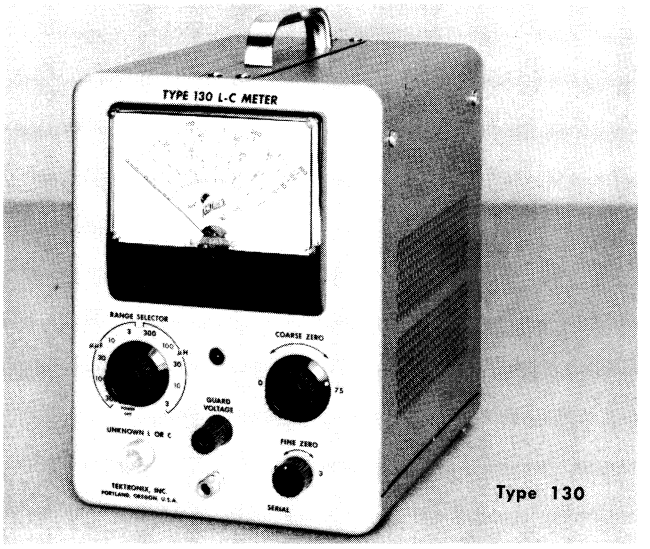


Type 130 L-C Meter

Guard Voltage—Permits measuring an unknown capacitance while eliminating the effects of other capacitances from the measurements.

Five Ranges—Microhenries: 0 to 3, 10, 30, 100, 300. Picofarads: 0 to 3, 10, 30, 100, 300.

Accuracy—Within 3% of full scale.



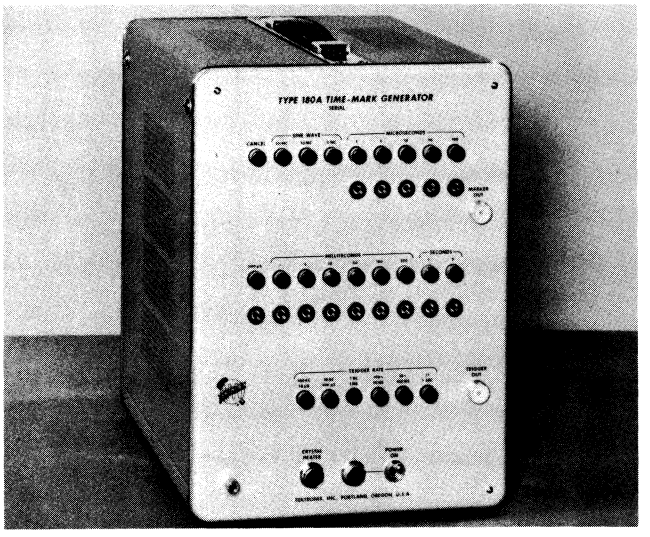
Type 180A Time-Mark Generator

Time-Marks—1, 5, 10, 50, 100, 500 μsec; 1, 5, 10, 100, 500 msec; 1, 5 seconds.

Three Sine-Wave Frequencies—5 mc, 10 mc, and 50 mc.

Six Trigger-Rate Frequencies—1, 10, 100 cycles and 1, 10, 100 kc.

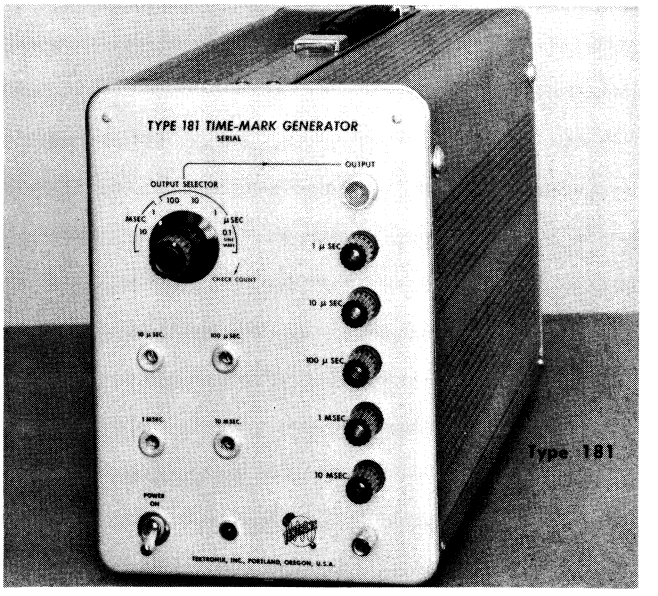
Temperature-Stabilized Crystal—Provides stability of 3 ppm over 24-hour period.



Type 181 Time-Mark Generator

Time-Marks—1, 10, 1000, and 10,000 μsec, plus 10-mc sine wave.

1-Mc Crystal Controlled Oscillator—Accurate within 0.03%.



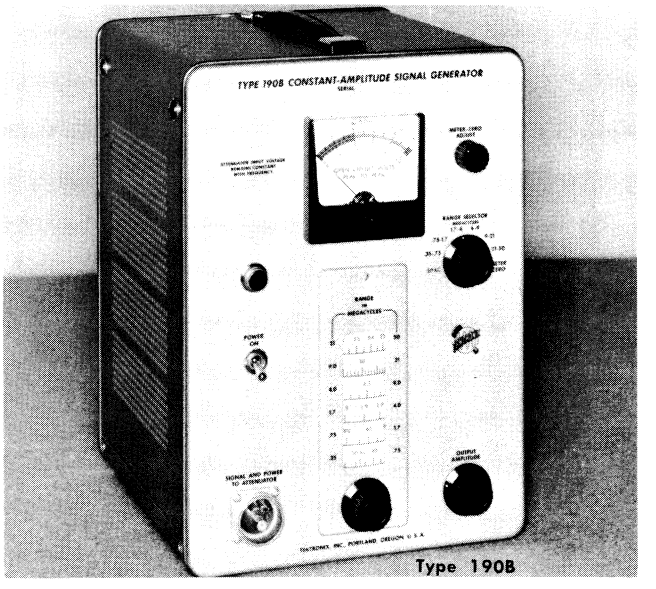
Type 190B Constant-Amplitude Signal Generator

Output Frequency—350 kc to 50 mc, continuously variable, 50-kc reference signal.

Output Amplitude—40 mv to 10 v peak-to-peak, continuously adjustable.

Amplitude Variation—Less than 2% from 50 kc to 30 mc; less than 5% from 30 mc to 50 mc.

Harmonic Content—Typically less than 5%.



Type 1121 Amplifier

Voltage Gain—100 with 9 calibrated attenuator steps to provide net gain from 100 to 0.2.

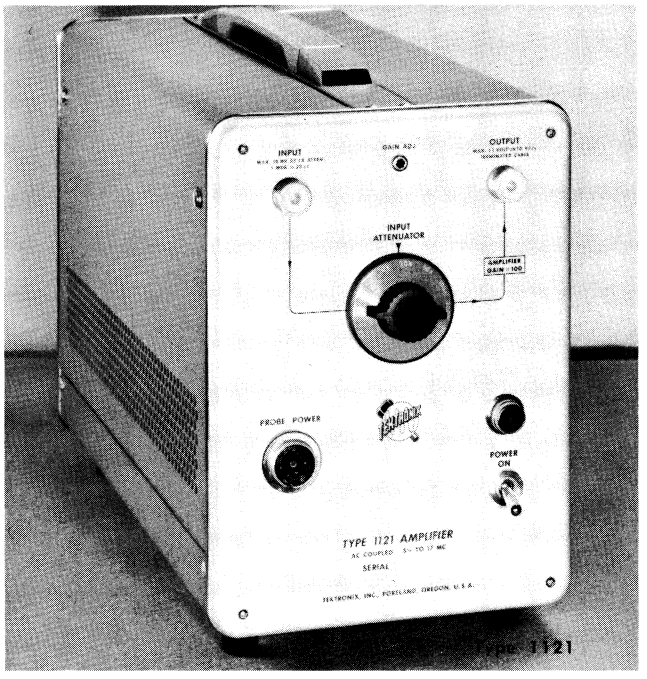
Frequency Response—5 cycles to 17 mc, decreasing slightly with increase in attenuator setting.

Risetime—21 nsec.

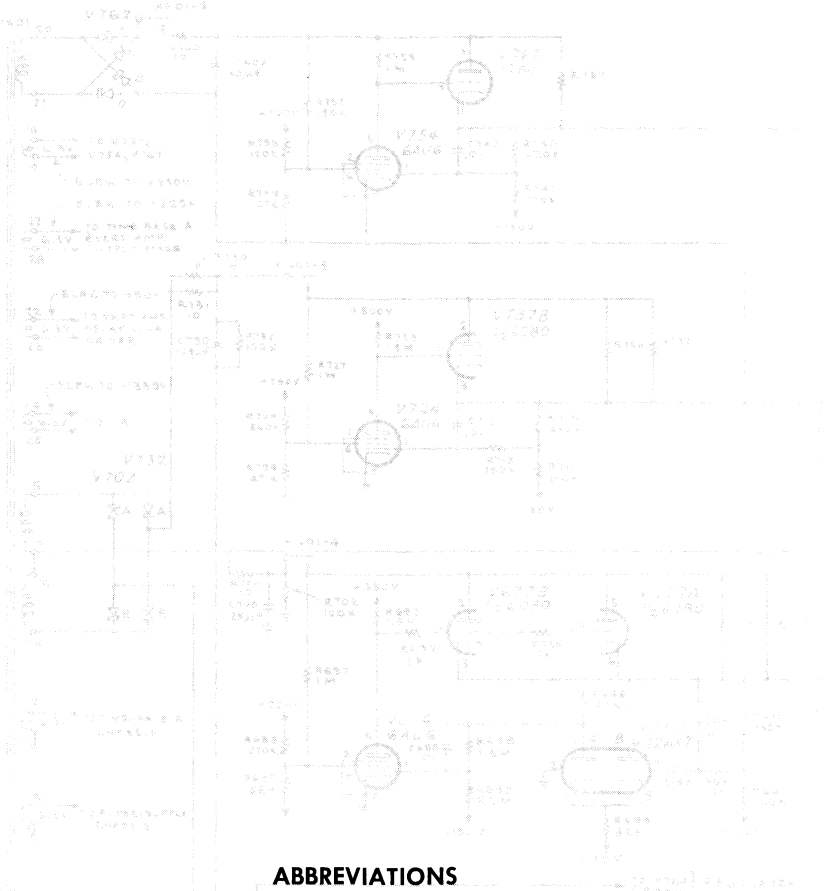
Maximum Output Voltage—±1 v in terminated 93-ohm cable.

NOTICE

If you have measurement situations that do not respond to the conventional attack, call Tektronix at your local Field Office. The composite experience of 350 man-years of Field Engineering, solving problems similar to yours, is available to you as a Tektronix Customer. The Field Engineer responsible for your area is always looking for a new challenge.



Section 7
Parts List and Schematics



ABBREVIATIONS

Cer.	Ceramic	p	Pico, or 10^{-12}
Comp.	Composition	PMC	Paper, metal cased
EMC	Electrolytic, metal cased	Poly.	Polystyrene
EMT	Electrolytic, metal tubular	Prec.	Precision
f	Farad	PT	Paper, tubular
F & I	Focus and Intensity	PTM	Paper, tubular, moulded
G	Giga, or 10^{9}	S/N	Serial number
GMV	Guaranteed minimum value	T	Turns
h	Henry	TD	Toroid
K or k	Kilohms, or kilo (10^{3})	Tub.	Tubular
M or meg	Megohms, or mega (10^{6})	v	Working volts DC
μ	Micro, or 10^{-6}	Var.	Variable
m	Milli, or 10^{-3}	w	Watt
n	Nano, or 10^{-9}	w/	With
Ω	Ohm	WW	Wire-wound

SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number.

000X Part removed after this serial number.

*000-000 Asterisk preceding Tektronix Part Number indicates manufactured by or for Tektronix, also reworked or checked components.

Use 000-000 Part number indicated is direct replacement.

HOW TO ORDER PARTS

Replacement parts are available from or through your local Tektronix Field Office.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number including any suffix, instrument type, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Field Office will contact you concerning any change in part number.

ELECTRICAL PARTS LIST

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Description			S/N Range
		BULBS			
B603	136-031	Assembly w/red jewel	Pilot Light		
B604	150-001	Incandescent, G.E. #47	Graticule Light		
B605	150-001	Incandescent, G.E. #47	Graticule Light		
B852	150-009	Neon, NE-2			
B853	150-009	Neon, NE-2			
		CAPACITORS			
		Tolerance ±20% unless otherwise indicated.			
		Tolerance of all electrolytic capacitors are as follows (with exceptions):			
		3 V — 50 V = −10%, +250%			
		51 V —350 V = −10%, +100%			
		351 V —450 V = −10%, +50%			
C600A	281-559	.0015 μf	Cer.	500 v	
C600B	281-559	.0015 μf	Cer.	500 v	
C602	*290-151	2 x 200 μf	EMC	250 v	
C608	285-569	.01 μh	PTM	200 v	
C625	285-569	.01 μh	PTM	200 v	
C626	*290-128	2 x 10 μf	EMC	250 v	
C630	*290-087	2000 μf	EMC	30 v	
C631	*290-087	2000 μf	EMC	30 v	
C632	*290-087	2000 μf	EMC	30 v	
C640	283-026	.2 μf	Disc Type	25 v	
C646	290-015	100 μf	EMT	25 v	
C652	*290-087	2000 μf	EMC	30 v	
C654	283-012	.1 μf	Disc Type	100 v	
C656	290-015	100 μf	EMT	25 v	
C657	283-003	.01 μf	Disc Type	150 v	
C662	*290-132	2 x 125 μf	EMC	350 v	
C674	285-604	.01 μf	PTM	400 v	
C676 A,B	*290-035	2 x 15 μf	EMC	450 v	
C682	*290-133	2 x 125 μf	EMC	350 v	
C694	285-604	.01 μf	PTM	400 v	
C760	281-027	.7-3 pf	Tub. Var.		
C761	281-027	.7-3 pf	Tub. Var.		
C801	283-006	.02 μf	Disc Type	600 v	
C802	283-538	.003 μf	Mica	500 v	10%
C803	283-000	.001 μf	Disc Type	500 v	
C807	285-501	.001 μf	PTM	600 v	
C816	290-149	5 μf	EMT	150 v	
C822	283-036	.0025 μf	Disc Type	6000 v	
C824	283-036	.0025 μf	Disc Type	6000 v	
C825	283-036	.0025 μf	Disc Type	6000 v	
C837	283-036	.0025 μf	Disc Type	6000 v	
C841	283-006	.02 μf	Disc Type	600 v	
C842	283-034	.005 μf	Disc Type	4000 v	
C854	283-036	.0025 μf	Disc Type	6000 v	
C876	290-025	6.25 μf	EMT	300 v	

Capacitors *(continued)*

Ckt. No.	Tektronix Part No.	Description			S/N Range
C878	281-523	100 pf	Cer.	350 v	
C884	281-524	150 pf	Cer.	500 v	

DIODES

D602 A,B,C,D	152-047	1N2862 (or equal)	Silicon	
D632 A,B	152-035	1N1563	Zener	
D652 A,B,C,D	152-047	1N2862 (or equal)	Silicon	
D662 A,B,C,D	152-047	1N2862 (or equal)	Silicon	
D682 A,B,C,D	152-047	1N2862 (or equal)	Silicon	
D835	152-061	175 PIV	Silicon	
D836	152-008	T12G	Germanium	
D837	152-008	T12G	Germanium	
D852	152-061	175 PIV	Silicon	

FUSES

F601	159-017	4 Amp. 3AG Fast-blo	117 v	oper.	
	159-021	2 Amp. 3AG Fast-blo	234 v	oper.	
F647	159-014	5 Amp. 3AG Fast-blo			
F657	159-022	1 Amp. 3AG Fast-blo			

INDUCTORS

L860	*108-228	Beam Rotator on 276-063				

RESISTORS

Resistors are fixed, composition, ±10% unless otherwise indicated.

R600	304-100	10 Ω	1 w			
R603	304-330	33 Ω	1 w			
R604	311-055	50 Ω		Var.	WW	SCALE ILLUM.
R605	308-142	30 Ω	3 w		WW	5%
R608	302-104	100 k	½ w			
R609	302-222	2.2 k	½ w			
R610	302-106	10 meg	½ w			
R611	302-102	1 k	½ w			
R614	302-473	47 k	½ w			
R616	302-102	1 k	½ w			
R617	302-474	470 k	½ w			
R619	302-473	47 k	½ w			
R620	302-102	1 k	½ w			
R621	302-224	220 k	½ w			
R623	308-186	80 k	½ w		WW	1%
R624	311-015	10 k		Var.	WW	—100 VOLTS
R625	308-226	10 k	½ w		WW	1%
R627	308-176	4 k	20 w		WW	5%
R628	308-040	1.5 k	25 w		WW	5%
R633	309-104	2.05 k	½ w		Prec.	1%
R634	310-115	15 k	1 w		Prec.	1%
R637	302-334	330 k	½ w			
R638	302-272	2.7 k	½ w			

Resistors *(continued)*

Ckt. No.	Tektronix Part No.		Description			S/N Range
R640	302-151	150 Ω	½ w			
R644	306-221	200 Ω	2 w			
R646	302-471	470 Ω	½ w			
R653	309-161	106 k	½ w	Prec.	1%	
R654	309-331	20.2 k	½ w	Prec.	1%	
R655	302-154	150 k	½ w			
R656	304-183	18 k	1 w			
R657	302-222	2.2 k	½ w			X140-up
R660	304-100	10 Ω	1 w			
R661	304-100	10 Ω	1 w			
R663	302-273	27 k	½ w			
R664	302-333	33 k	½ w			
R665	302-684	680 k	½ w			
R666	302-474	470 k	½ w			
R669	302-102	1 k	½ w			
R671	308-218	150 Ω	3 w			
R672	302-102	1 k	½ w			
R673	302-474	470 k	½ w			
R674	309-101	330 k	½ w	Prec.	1%	
R675	309-109	250 k	½ w	Prec.	1%	
R676	308-218	150 Ω	3 w	WW	5%	
R677	308-176	4 k	20 w	WW	5%	
R678	308-040	1.5 k	25 w	WW	5%	
R680	304-100	10 Ω	1 w			
R683	302-394	390 k	½ w			
R684	302-333	33 k	½ w			
R685	302-224	220 k	½ w			
R686	302-105	1 meg	½ w			
R689	302-102	1 k	½ w			
R690	302-102	1 k	½ w			
R694	309-156	1.024 meg	½ w	Prec.	1%	
R695	309-139	333 k	½ w	Prec.	1%	
R697	308-176	4 k	20 w	WW	5%	
R699	302-104	100 k	½ w			
R770	302-564	560 k	½ w			
R801	304-331	330 Ω	1 w			
R803	306-333	33 k	2 w			
R804	302-101	100 Ω	½ w			
R806	302-563	56 k	½ w			
R807	302-392	3.9 k	½ w			
R815	302-474	470 k	½ w			
R816	302-222	2.2 k	½ w			
R825	302-104	100 k	½ w			
R828	302-563	56 k	½ w			
R831	310-591	30 meg	2 w	Prec.	5%	
R833	302-105	1 meg	½ w			
R834	311-043	2 meg		Var.	INTENSITY	
R835	301-683	68 k	½ w		5%	
R836	301-242	2.4 k	½ w		5%	
R837	301-242	2.4 k	½ w		5%	
R838	301-104	100 k	½ w		5%	

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Resistors *(continued)*

Ckt. No.	Tektronix Part No.	Description				S/N Range
R839	301-122	1.2 k	½ w		5%	
R840	309-025	2.5 meg	½ w	Prec.	1%	
R841	311-042	2 meg	Var.		HIGH VOLTAGE	
R843	310-592	16.8 meg	1 w	Prec.	5%	
R845	311-121	5 meg	Var.		FOCUS	
R847	310-103	4 meg	1 w	Prec.	1%	
R849	302-223	22 k	½ w			
R852	Use 302-273	27 k	½ w			
R853	302-104	100 k	½ w			
R854	302-225	2.2 meg	½ w			
R860	311-007	2 x 1 k	Var.		CRT BEAM ROTATOR	
R861	302-680	68 Ω	½ w			
R862	302-224	220 k	½ w			
R863	302-104	100 k	½ w			
R864	311-032	250 k	2 w	Var.	ASTIGMATISM	
R870	301-393	39 k	½ w		5%	
R871	311-187	20 k	Var.		CAL. AMPL.	
R872	301-154	150 k	½ w		5%	
R873	301-103	10 k	½ w		5%	
R876	301-153	15 k	½ w		5%	
R877	301-183	18 k	½ w		5%	
R878	301-564	560 k	½ w		5%	
R879	301-124	120 k	½ w		5%	
R880	316-101	100 Ω	¼ w			
R883	305-223	22 k	2 w		5%	
R885	309-100	10 k	½ w	Prec.	1%	
R886	309-235	9 k	½ w	Prec.	1%	
R887	309-236	900 Ω	½ w	Prec.	1%	
R888	309-238	90 Ω	½ w	Prec.	1%	
R889	318-052	10 Ω	⅛ w	Prec.	1%	
R890	309-112	100 Ω	½ w	Prec.	1%	X130-up

SWITCHES

	Unwired	
SW601	260-014	Toggle, POWER ON
TK601	260-246	Thermal Cutout 123°

TRANSFORMERS

T600	*120-164	Toroid 3T TD #12
T601	*120-232	Low Voltage
T801	*120-233	High Voltage

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TRANSISTORS

Ckt. No.	Tektronix Part No.		Description	S/N Range
Q624	151-093	2N2043		
Q634	151-040	2N1302		
Q644	151-042	2N1378		
Q647	151-060	2N1545		
Q653	151-007	2N270		
Q654	151-007	2N270		
Q657	151-001	2N301		

ELECTRON TUBES

V609	154-291	OG3		
V616	154-187	6DJ8		
V627	154-056	6080		
V664	154-022	6AU6		
V677	154-056	6080		
V684	154-022	6AU6		
V800	154-167	6CZ5		
V814	154-046	12BH7		
V822	154-051	5642		
V832	154-051	5642		
V859	*154-320	T503R CRT P2	Standard Phosphor	
V884	154-278	6BL8		

MECHANICAL PARTS LIST

	Tektronix Part Number
Adapter, power cord	103-013
Bar, stiffener, 1/4 x 1/2 x 11	381-196
Bracket, parallax adj.	406-730
Bracket, CRT shield	406-737
Cable, harness, power	179-573
Cable, harness, bulkhead #1	179-574
Cable, harness, bulkhead #2	179-575
Cable, harness, F & I	179-576
Cable, harness, high voltage	179-577
Cable, harness, 110-volt	179-578
Cable, harness, cal. chassis	179-579
Cable, harness, CRT socket	179-596
Cable, harness, regulator	179-604
Cap, fuse	200-015
Cap, pot for Centralab pots	200-247
Chassis, cal.	441-405
Chassis, high voltage	441-406
Chassis, power supply	441-407
Chassis, regulator and trans. support	441-421
Clamp, cable 1/4" plastic	343-003
Clamp, cable 5/16" plastic	343-004
Clamp, cable 5/16" half, plastic	343-042
Connector, chassis mtd., 3 wire Tek motor base, male	131-102
Connector, chassis mtd., 24 contact, female	131-148
Cord, power	161-010
Cover, insulation, fuse holder	200-237
Cover, insulation for Clarostat pots	200-238
Cover, polypropylene, 1.115 dia x 1 15/16	200-269
Cover, graticule	200-272
Cushion, rubber, bulkhead	348-041
Fan, blade	369-007
Fastener, thumb screw	214-239

Mechanical Parts List *(continued)*

	Tektronix Part Number
Filter, air	378-011
Graticule, .125 x 4 13/16 x 5 5/16, 8 cm x 10 cm ruling	331-076
Grommet, rubber, 1/4	348-002
Grommet, rubber, 5/16	348-003
Grommet, rubber, 3/8	348-004
Grommet, rubber, 1/2	348-005
Grommet, rubber, 3/4	348-006
Grommet, rubber 1/2 dia x 1/2 hi	348-008
Grommet, rubber, 5/8	348-012
Grommet, poly, 1/4 x .202 x 3/32	348-031
Guide, rail track, plug-in	351-038
Guide, rail, large plug-in	351-053
Guide, cabinet, 3 3/8 x 22, pr. left & right	351-055
Holder, fuse, single	352-010
Holder, coil form, nylon 3/6 x 3/4 tapped 4-40	352-015
Holder, fuse, dual	352-025
Housing, air filter	380-018
Insert, graticule light	377-064
Knob, charcoal, .675 dia x .525 hi	366-148
Lockwasher, int. #4	210-004
Lockwasher, int. #6	210-006
Lockwasher, int. #8	210-008
Lockwasher, int. #10	210-010
Lockwasher, int. pot. 3/8 x 1/2	210-012
Lockwasher, int. 3/8 x 11/16	210-013
Lug, solder, SE4	210-201
Lug, solder, SE6, w/2 wire holes	210-202
Lug, solder, pot, plain, 3/8	210-207
Lug, solder, 1/4" lock	210-223
Motor, fan	147-001
Mount, fan motor	426-047
Nut, cap, hex, 8-32 x 5/16	210-402
Nut, hex, 4-40 x 3/16	210-406

Mechanical Parts List *(continued)*

	Tektronix Part Number
Nut, hex, 6-32 x 1/4	210-407
Nut, hex, 8-32 x 5/16	210-409
Nut, hex, 10-32 x 5/16	210-410
Nut, hex, 3/8-32 x 1/2	210-413
Nut, hex, 15/32-32 x 9/16	210-414
Nut, knurled, graticule, 10-32 x .515 x 3/8	210-434
Nut, keps, 6-32 x 5/16	210-457
Nut, keps, 8-32 x 11/32	210-458
Nut, hex, 8-32 x 1/2 x 23/64, 25 w resistor mtg.	210-462
Nut, hex, 1/4-32 x 3/8 x 3/32, mini-pot	210-465
Nut, 12 sided, 15/32-32 x 5/64, switch	210-473
Nut, CRT adjustment securing	214-207
Panel, front	333-706
Plate, mica, transistor insul.	386-978
Plate, line filter cap	387-025
Plate, frame plug-in housing, .063 x 12 15/32 x 6 13/32 x 5/8	387-489
Plate, bulkhead	387-492
Plate, frame plug-in housing, .063 x 12 15/32 x 11 13/16 x 5/8	387-494
Plate, right access	387-650
Plate, left access	387-651
Plate, dust cover	387-652
Plate, frame left	387-653
Plate, frame right	387-654
Plate, subpanel rear	387-656
Plate, subpanel front	387-657
Post, terminal, transistor mtg.	129-049
Ring, fan	354-053
Ring, switch locking	354-055
Ring, securing, poly	354-068
Ring, clamping, delrin	354-147
Ring, retaining, truarc	354-175
Rod, delrin, 5/16 x 5/16 w/2 cross holes	385-135
Rod, delrin, 5/16 x 2 1/4 w/3 cross holes	385-137

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Mechanical Parts List *(continued)*

	Tektronix Part Number
Screw, 4-40 x 3/8 BHS	211-012
Screw, 6-32 x 1/4 BHS	211-504
Screw, 6-32 x 5/16 BHS	211-507
Screw, 6-32 x 3/8 BHS	211-510
Screw, 6-32 x 1/2 BHS	211-511
Screw, 6-32 x 5/16 PHS w/lockwasher	211-534
Screw, 6-32 x 5/16 FHS, 100°, CSK, Phillips	211-538
Screw, 6-32 x 1/4 FHS, 100°, CSK, Phillips	211-541
Screw, 6-32 x 5/16 RHS	211-543
Screw, 6-32 x 2 BHS	211-552
Screw, 6-32 x 1 RHS	211-560
Screw, 6-32 x 7/8 socket head cap, black	211-576
Screw, 8-32 x 1/4 BHS	212-001
Screw, 8-32 x 5/16 BHS	212-004
Screw, 8-32 x 3/8 BHS	212-023
Screw, 8-32 x 1 1/4 RHS	212-031
Screw, 8-32 x 1 3/4 FHS	212-037
Screw, 8-32 x 3/8 FHS, 100°, Phillips	212-040
Screw, 8-32 x 1/4 THS, Phillips	212-075
Screw, 10-32 x 5/8 BHS	212-509
Screw, 6-32 x 3/8 THS, thread cutting, Phillips	213-041
Screw, 5-32 x 3/16 Pan HS, thread cutting, Phillips	213-044
Screw, 4-40 x 5/16 Pan HS, self-tapping, Phillips	213-045
Screw, #4 x 1/4 PHS, thread forming, Phillips	213-088
Screw, 2-32 x 5/16 RHS, thread forming, Phillips	213-113
Shield, H.V. 3 9/16 x 15/32 x 3 1/8 x 1 5/8 x 6 21/64	337-474
Shield, CRT	337-495
Slide, Chassis-Trak, 1 pr., left & right, tiltlock	351-039
Spacer, ceramic strip, 1/16	361-007
Spacer, ceramic strip, 5/16	361-009
Spacer, ceramic strip, 3/16	361-008
Spacer, line filter	361-015

Mechanical Parts List *(continued)*

	Tektronix Part Number
Spool, solder	214-210
Socket, STM7G	136-008
Socket, STM8, ground	136-011
Socket, STM9G	136-015
Socket, pilot light, red	136-031
Socket, graticule light, w/ground lug	136-035
Socket, 4 pin, transistor	136-095
Socket, banana jack	136-129
Strap, mounting, transformer	346-001
Strip, ceramic, 3/4 x 9 notches, clip mtd.	124-090
Strip, ceramic, 3/4 x 11 notches, clip mtd.	124-091
Strip, ceramic, 7/16 x 3 notches, clip mtd.	124-092
Strip, ceramic, 7/16 x 7 notches, clip mtd.	124-094
Strip, ceramic, 7/16 x 11 notches, clip mtd.	124-106
Strip, ceramic, 7/16 x 4 notches, clip mtd.	124-120
Strip, felt, gray	124-142
Strip, ceramic, 7/16 x 20 small notches, clip mtd.	124-145
Stud, 10-32 x 2 7/16, 2" under shoulder	355-044
Tag, S/N insert	334-642
Tag, voltage rating	334-649
Washer, steel, 6L x 3/8 x .032	210-803
Washer, steel, 8S x 3/8 x .032	210-804
Washer, steel, 10S x 7/16 x .036	210-805
Washer, brass, 20 w resistor centering	210-808
Washer, brass, 25 w resistor centering	210-809
Washer, steel, .390 x 9/16 x .020	210-840
Washer, neoprene, 7/32 x 3/8 x 5/64	210-844
Washer, brass, 5/32 x 1/2 x 1/16	210-858
Washer, steel, 3/16 x 3/8 x .050	210-864
Washer, rubber, 1/2 x 11/16 x 3/64, for fuse holder	210-873
Washer, poly, .190 x 7/16 x 1/32	210-894
Washer, insulating, shouldered, 3/8 x 1/10	210-895
Washer, bakelite, .129 x 1/2 shouldered 3/8", transistor mtg.	210-900
Washer, brass 9/64 ID x 1/2 OD x 1/16 thick, nickel plated	210-949
Washer, steel, .470 x 21/32 x .030	210-902

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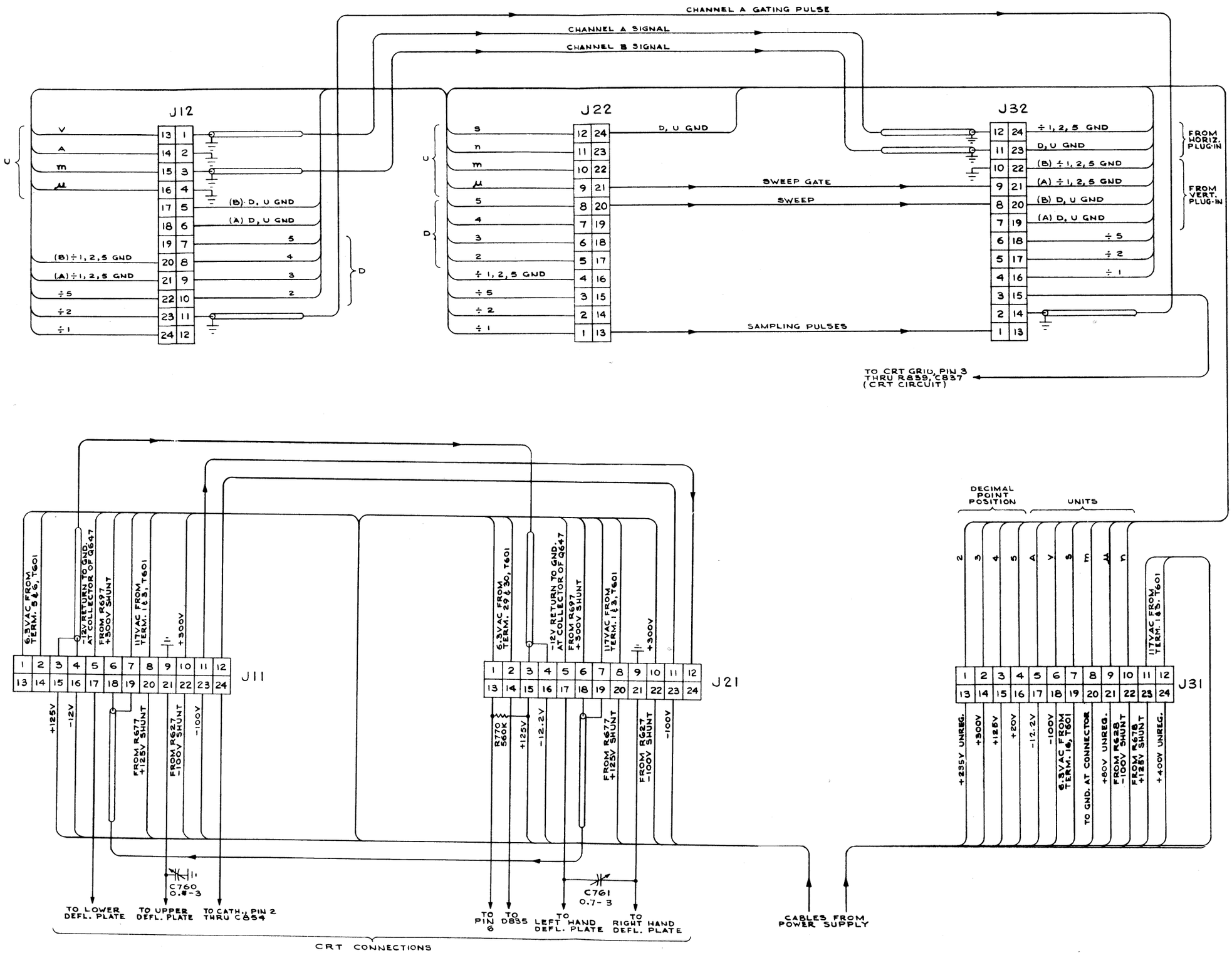
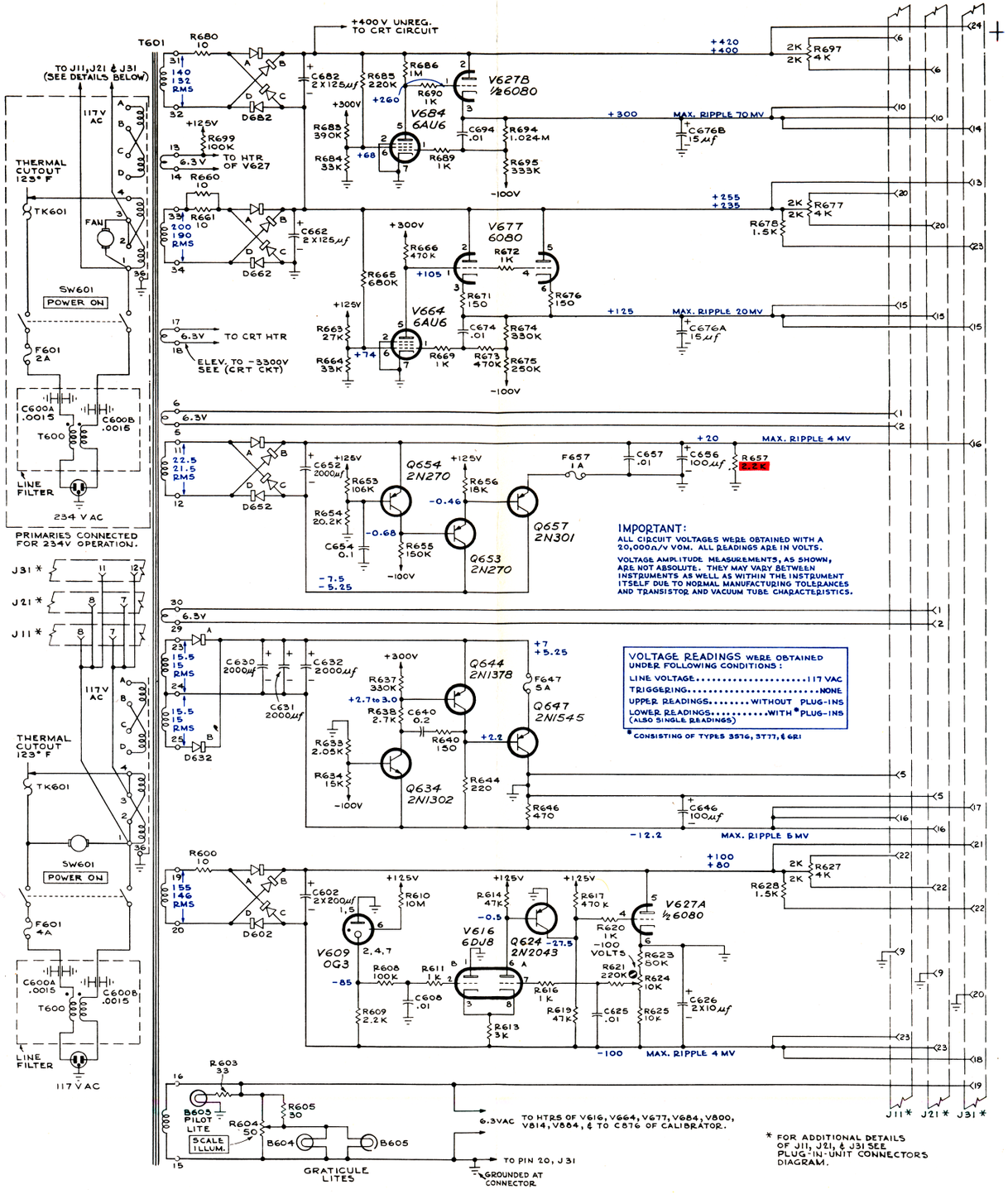

CHANNEL A GATING PULSE
CHANNEL A SIGNAL
CHANNEL B SIGNAL
J12
V
A
m
μ
(B) ÷1, 2, 5 GND
(A) ÷1, 2, 5 GND
÷5
÷2
÷1
(B) D, U GND
(A) D, U GND
5
4
3
2
C
D
J22
s
n
m
μ
5
4
3
2
÷1, 2, 5 GND
÷5
÷2
÷1
D, U GND
SWEEP GATE
SWEEP
SAMPLING PULSES
J32
÷1, 2, 5 GND
D, U GND
(B) ÷1, 2, 5 GND
(A) ÷1, 2, 5 GND
(B) D, U GND
(A) D, U GND
÷5
÷2
÷1
FROM HORIZ. PLUG-IN
FROM VERT. PLUG-IN
TO CRT GRID, PIN 3 THRU R859, C837 (CRT CIRCUIT)
J11
6.3VAC FROM TERM. 5 & 6, T601
-12V RETURN TO GND. AT COLLECTOR OF Q647
FROM R697 +300V SHUNT
117VAC FROM TERM. 1 & 3, T601
+300V
+125V
-12V
FROM R677 +125V SHUNT
FROM R627 -100V SHUNT
-100V
C760 0.8-3
TO LOWER DEFL. PLATE
TO UPPER DEFL. PLATE
TO CATH. PIN 2 THRU C854
J21
6.3VAC FROM TERM. 29 & 30, T601
-12V RETURN TO GND. AT COLLECTOR OF Q647
FROM R697 +300V SHUNT
117VAC FROM TERM. 1 & 3, T601
+300V
R770 560K
+125V
-12.2V
FROM R677 +125V SHUNT
FROM R627 -100V SHUNT
-100V
C761 0.7-3
TO PIN 6
TO D835
TO LEFT HAND DEFL. PLATE
TO RIGHT HAND DEFL. PLATE
CRT CONNECTIONS
CABLES FROM POWER SUPPLY
DECIMAL POINT POSITION
UNITS
J31
2
3
4
5
A
Y
s
m
μ
n
117VAC FROM TERM. 1 & 5, T601
+235V UNREG.
+300V
+125V
+20V
-12.2V
-100V
6.3VAC FROM TERM. 16, T601
TO GND. AT CONNECTOR
+80V UNREG.
FROM R628 -100V SHUNT
FROM R678 +125V SHUNT
+400V UNREG.



TYPE RM567 READOUT OSCILLOSCOPE

A

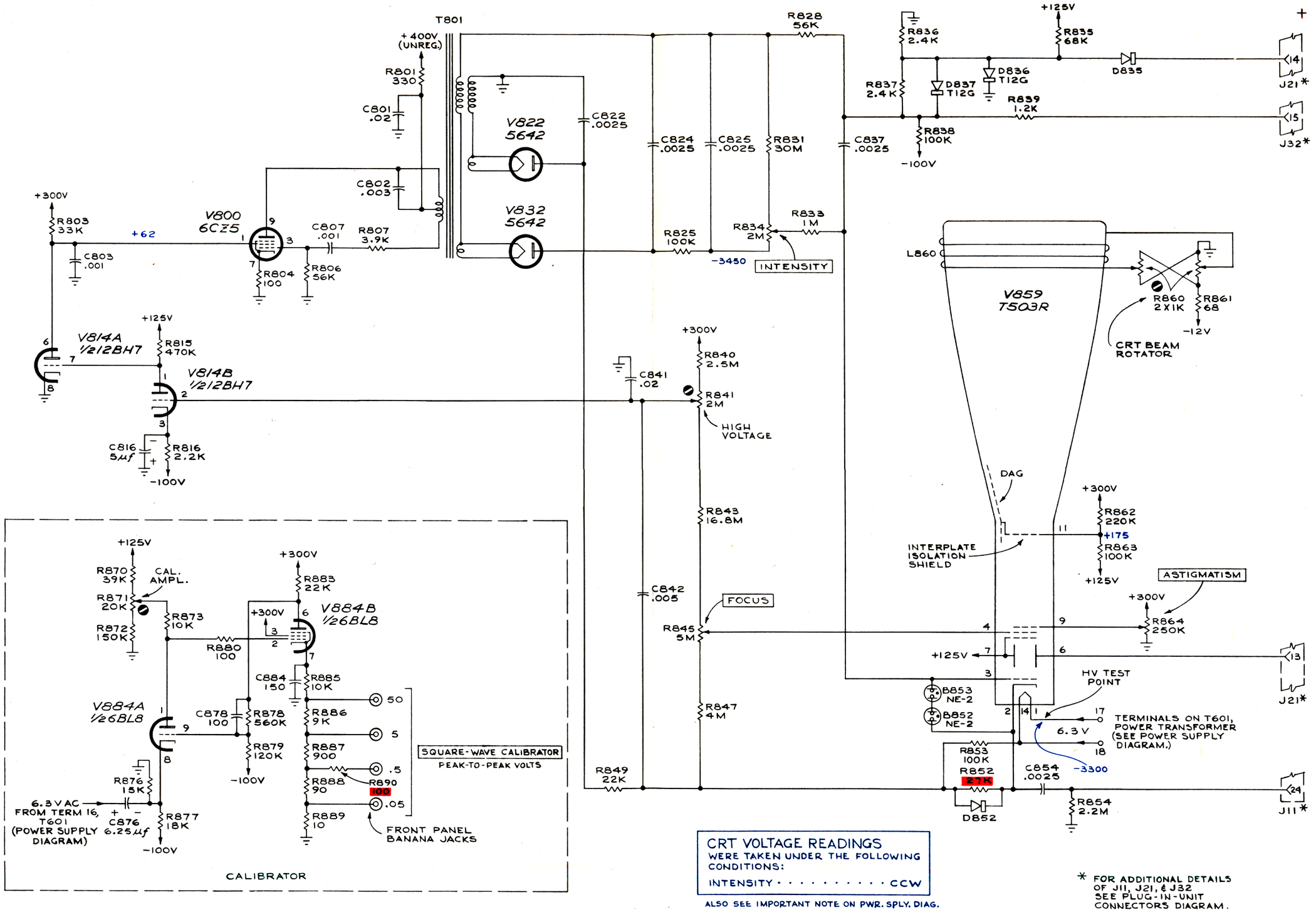
SEE PARTS LIST FOR EARLIER VALUES AND S/N CHANGES OF PARTS MARKED WITH RED TINT BLOCKS

MRH 7-31-62

POWER SUPPLY

CIRCUIT NUMBERS 600 THRU 699

POWER SUPPLY



TYPE RM567 READOUT OSCILLOSCOPE

A

SEE PARTS LIST FOR EARLIER VALUES AND S/N CHANGES OF PARTS MARKED WITH RED TINT BLOCKS

MRH
7-31-62

CRT CIRCUIT & CALIBRATOR

CIRCUIT NUMBERS 800 THRU 899

MANUAL CHANGE INFORMATION

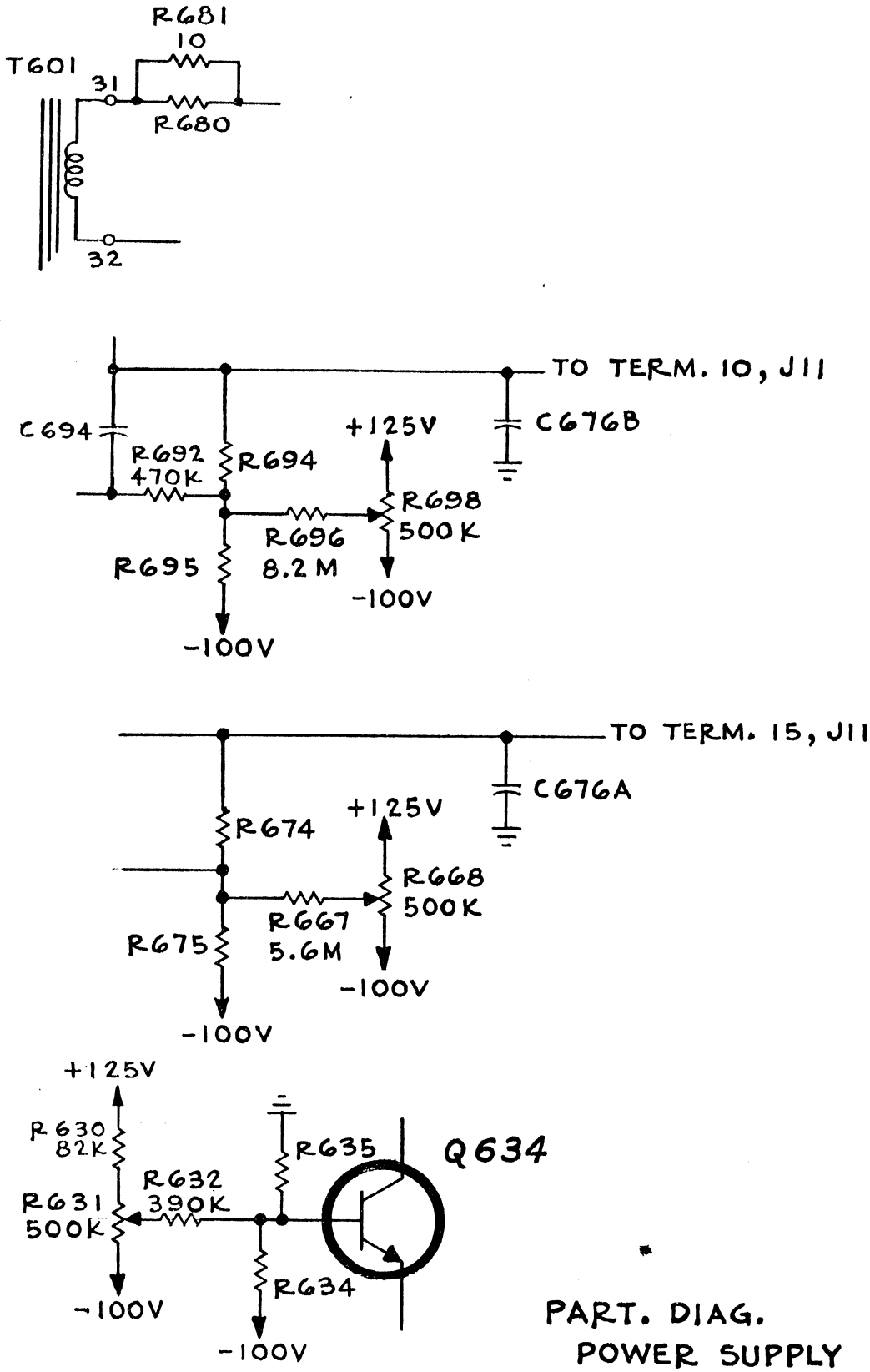
At Tektronix, we continually strive to keep up with latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages. If it does not, your manual is correct as printed.

TYPE 567, RM567
Mod 6463
567, Tent S/N 391
RM567, Tent S/N 146

R630	Add	82K	1/2w	10%	302-823
R631	Add	500K	1/2w	var	311-361
R632	Add	390K	1/2w	10%	301-394
R660	Add	10Ω	2w	10%	306-100
R661	Add	10Ω	2w	10%	306-100
R665	Change to	120K	1/2w	5%	301-124
R667	Add	5.6M	1/2w	10%	302-565
R668	Add	500K	1/2w	var	311-361
R681	Add	10Ω	1w	10%	304-100
R685	Change to	130K	1/2w	5%	301-134
R686	Change to	1.8M	1/2w	5%	301-185
R692	Add	470K	1/2w	10%	302-474
R696	Add	8.2M	1/2w	10%	302-825
R698	Add	500K	1/2w	var	311-361

as per Schematic attached



PART. DIAG.
POWER SUPPLY

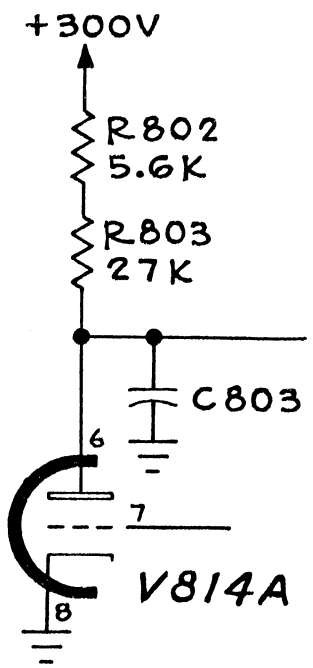
01·63
TR

M-6463

TYPE 567 - RM567 (35)
MOD 5979 - 567 - Tent S/N 330
MOD 5979 - RM567 - Eff S/N 140

R803	Change to	27k	2w	306-373
R802	Add	5.6k	1/2w	302-562

As Per Schematic Attached.

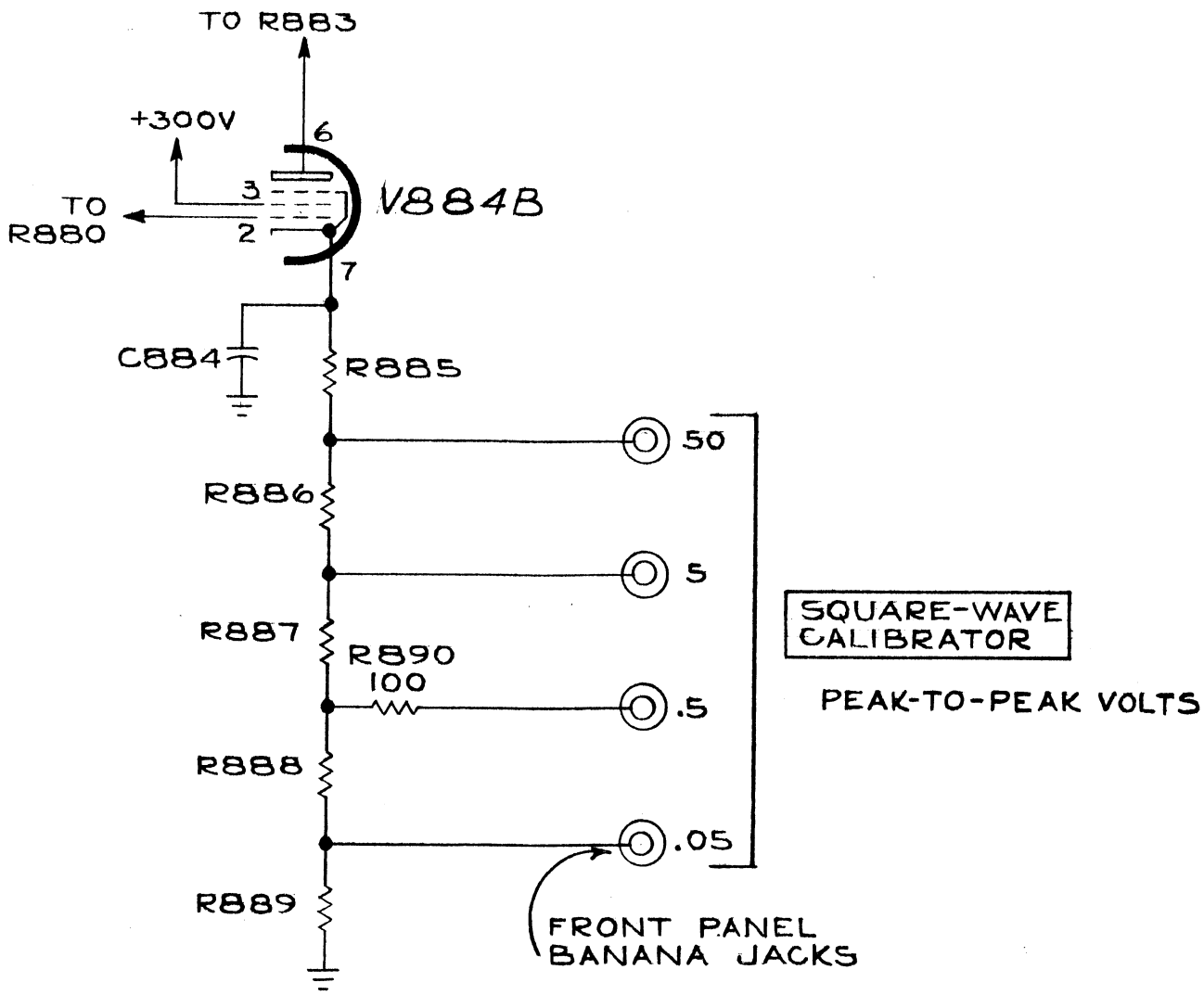


PART. CRT DIAG.
08-62

TYPE 567, RM567
MOD 5880
567 Eff S/N 300
RM567 Eff S/N 130

Add:

R890	309-112	100Ω	1/2w	Prec	1%



PLM
5-62

PART. CRT CIRCUIT & CALIBRATOR

TYPE 567, RM567
MOD 6393 (39)

D835	Change to		Silicon Diode		152-047
D836	Change to		Silicon Diode		152-047
D837	Change to		Silicon Diode		152-047
R829	Add	470Ω	1/2w	10%	302-471
R855	Add	470Ω	1/2w	10%	302-471

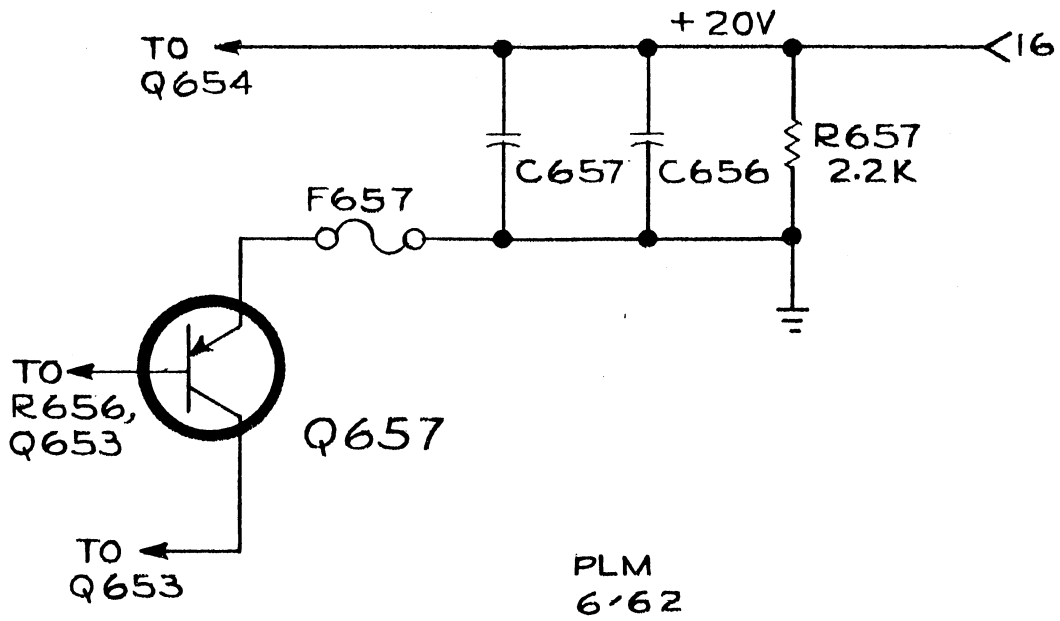
TYPE 561A, 561A-210C, 567, RM567 (36)

MOD 6314 - 561A - Eff S/N 5781
MOD 6314 - 561A-210C - Eff S/N 5781
MOD 6314 - 567 - Eff S/N 317
MOD 6314 - RM567 - Eff S/N 138

D852	Remove from Circuit	Silicon Diode	152-061

TYPE 567, RM567
MOD 5981 - 567- Eff S/N 310
MOD 5981 - RM567 - Eff S/N 140

R657	Add	302-222	2.2k	1/2w	10%



PLM
6-62

PART. POWER SUPPLY DIAG.

TYPE 567 - RM567 (37)

Mod 6068 - Type 567 - Eff S/N 330
Mod 6068 - Type RM567 - Eff S/N 140

T 801	Change to	Transformer HV	120-292

TYPE 567, RM567 (43)
Type 567 - Tent S/N 410 - MOD 6254
Type RM567 - Tent S/N 150 - MOD 6254

C633	Add	100μf	EMC	15v	290-099

From base of Q634 to Ground - Positive to Ground

TYPE 567 - TENT. S/N 506
TYPE RM567 - TENT. S/N 171

PARTS LIST CORRECTIONS

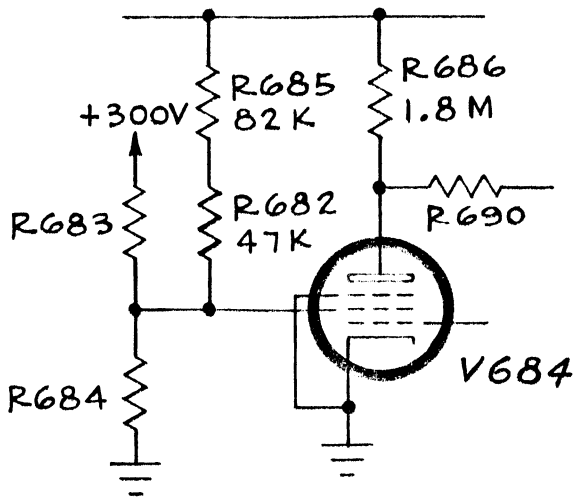
CHANGE TO:

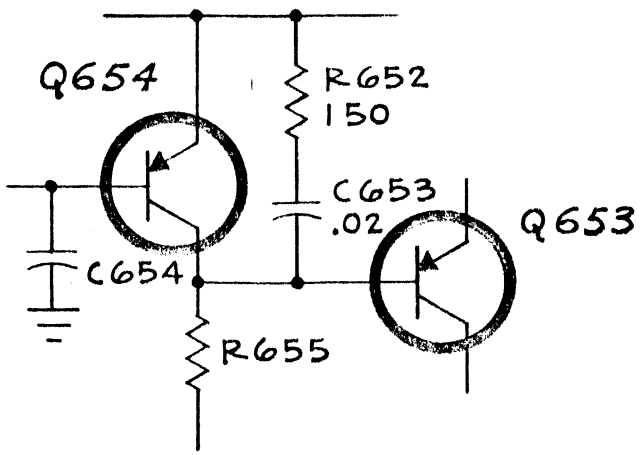
R685	303-823	82k	1w	5%

ADD

C653	283-004	.02μf	Disc Type	150v
R652	302-151	150Ω	1/2w	10%
R682	301-473	47k	1/2w	5%

See attached schematic





763

PART. PWR. SPLY. DIAG.

TYPE 567 - TENT. S/N 650
TYPE RM567 - TENT. S/N 200

PARTS LIST CORRECTIONS

CHANGE TO:

R831	305-565	5.6 meg	2w	5%	(3 used)
	305-685	6.8 meg	2w	5%	(2 used)
R843	305-565	5.6 meg	2w	5%	(3 used)

TYPE 561A - TENT. S/N 9390
TYPE RM561A - TENT. S/N 5730
TYPE 564 - TENT. S/N 1060
TYPE 567 - TENT. S/N 650
TYPE RM567 - TENT. S/N 200

PARTS LIST CORRECTIONS

CHANGE TO:

R879	301-114	110k	1/2w	5%