

PROBE POWER SUPPLY TYPE 128 INSTRUCTION MANUAL



TEKTRONIX, INC.
MANUFACTURERS OF CATHODE-RAY AND VIDEO TEST INSTRUMENTS

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SPECIFICATIONS

The Type 128 Probe Power Supply is a compact plate and filament power supply designed as a companion unit for the Type P500CF Cathode-Follower Probes. The Type 128 makes it possible to use the cathode-follower probes with those Tektronix instruments not equipped with a probe power supply.



DC Output Voltages

- +120 volts regulated, at 25 milliamperes.*
- +6.3 volts unregulated, at 150 milliamperes.
- +6.3 volts unregulated, at 150 milliamperes.

*If the full rating of the +120-volt supply is to be used for a purpose other than probe power, it is preferable, in the interest of regulation, to connect directly to the +120-volt bus ahead of the isolating resistors R622 and R623.

Regulation

Electronic regulation compensates for line-voltage variations between 105- and 125-volts, or between 210- and 250-volts, and for variations in current demand within the rating of the unit.

Ripple

Ripple on the +120-volt supply is no more than 5 millivolts peak-to-peak, and no more than 75

millivolts, peak-to-peak, on the +6.3-volt supplies.

Power Requirements

105- to 125-volts, or 210- to 250-volts, 50 to 400 cycles ac, 25 watts, using two Type P500CF Probes.

Mechanical Specifications

Finish — Photoetched, anodized panel. Blue wrinkle cabinet.

Dimensions — 4 $\frac{3}{4}$ " wide, 7 $\frac{3}{4}$ " high, 9" overall depth.

Weight — 6 pounds.

Accessories

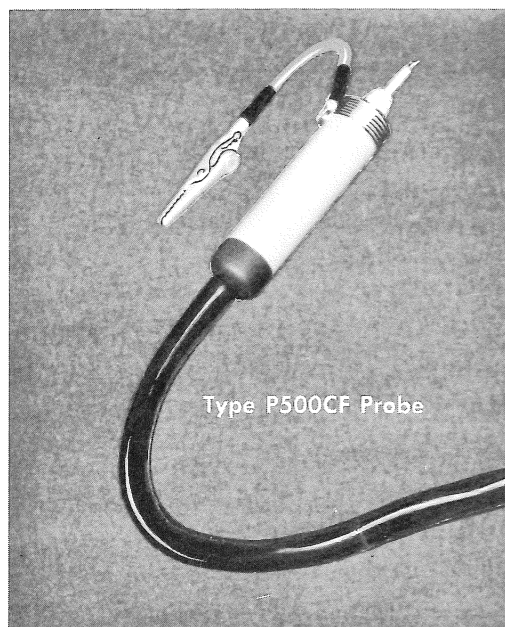
- 1—3 to 2-wire adapter, 103-013
- 1—3-conductor power cord, 161-010
- 2—Instruction Manuals



OPERATING INSTRUCTIONS

WITH TYPE P500CF PROBES

To place the Type 128 into operation, connect the power cord to a 117-volt 60-cycle source and plug in one or two Type P500CF Probes. Connect the probe to the oscilloscope and place the oscilloscope AC-DC switch in the AC position.



Type P500CF Probe

NOTE

The probe output is elevated to about +11 volts, dc, and you will experience difficulty in positioning the display if the plug-in AC-DC switch is not placed in the AC position.

To obtain the best transient response and bandwidth with minimum distortion, the input signal to the Type P500CF Probe should be limited to about 5 volts at 10 megacycles and to about 2 volts at 30 megacycles without the attenuator head, and to 50 volts and 20 volts, respectively, with the 10X attenuator attached.

Under these conditions the probe will cause an additional loss of approximately 0.5 db at 30 megacycles when used with a Tektronix Type 545 Oscilloscope and a Type 53/54K Plug-In Unit. The high-frequency response of the probe is slightly affected by the input capacitance of the oscilloscope. Low-frequency response of the probe is down 3 db at 5 cycles.

To read waveform voltages directly from the crt display, it is first necessary to calibrate the oscilloscope vertical-deflection system. The oscilloscope square-wave calibrator provides a convenient source of waveforms of known amplitude for this purpose and the VARIABLE VOLTS/CM control provides a method for adjusting the vertical-deflection factor.

For example, to calibrate the oscilloscope-probe combination for a vertical-deflection factor of .5 volt/cm, set the calibrator controls for an output of 2 volts, touch the probe tip to the

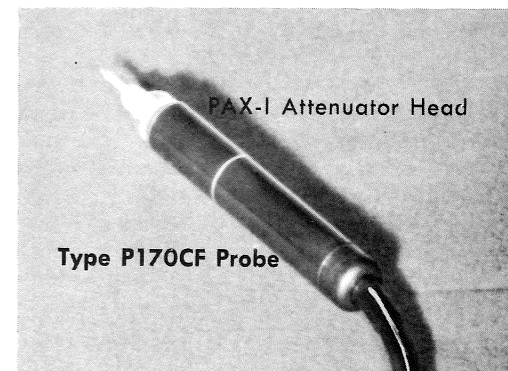


10X Attenuator Head

calibrator output connector, set the VOLTS/CM control to .2 and adjust the VARIABLE control for exactly 4 centimeters of deflection. Adding the 10X attenuator head to the probe after completing this calibration procedure will increase the vertical-deflection factor to 5 volts/cm.

WITH TYPE P170CF PROBES

The Type 128 Probe Power Supply can also be used to supply power for one or two Type P170CF Probes. When using the Type P170CF Probe on other than a Type 517 Oscilloscope, a 170-ohm terminating resistor is required because this probe does not contain a cathode resistor. The Type B170-R Terminating Resistor is recommended. A jumper between the ground terminals of the Type 128 and the oscilloscope is also required to provide a return path for the plate power supply.

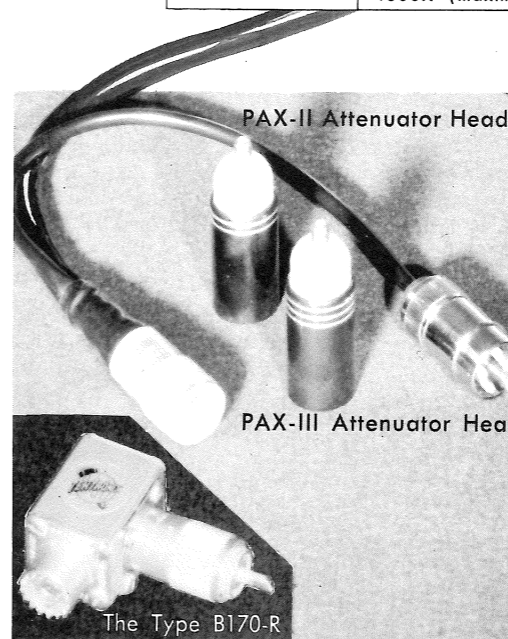


PAX-I Attenuator Head

Type P170CF Probe

TABLE 1
Effect of Attenuator Heads on Type P170CF Probe

Attenuator Type	Attenuation Factor	Input Capacity	Low-Frequency 3-db Point
Probe only	2X (maximum)	5-5.5 $\mu\mu\text{f}$	13 cps
PAX-I	4X (minimum)	5 $\mu\mu\text{f}$	800 cps
	40X (maximum)	1.2 $\mu\mu\text{f}$	1700 cps
PAX-II	40X (minimum)	5 $\mu\mu\text{f}$	150 cps
	400X (maximum)	1.2 $\mu\mu\text{f}$	150 cps
PAX-III	400X (minimum)	3 $\mu\mu\text{f}$	60 cps
	4000X (maximum)	1.1 $\mu\mu\text{f}$	60 cps



PAX-II Attenuator Head

PAX-III Attenuator Head

The Type B170-R

The low-frequency response and the input characteristics of the Type P170CF Probes are altered by the addition of Type PAX-() Attenuator Heads. Table 1 shows the resultant input capacity and the low-frequency 3-db-down point for each attenuator head. Settings of the attenuators between the minimum- and maximum-attenuation settings will result in intermediate values of input capacity and low-frequency response.

CAUTION

Do not try to increase the range of a cathode follower probe by connecting attenuators between the probe and the oscilloscope input connector. The cathode follower will be overdriven and waveform distortion will result.



CIRCUIT DESCRIPTION

General

Plate and filament voltages for the vacuum tubes in the Type 128 Probe Power Supply and the vacuum tubes in the externally connected Cathode Follower Probes are furnished by power transformer T600. The primary of this transformer consists of two equal windings which may be connected in parallel for 105- to 125-volt operation, or in series for 210- to 250-volt operation. The high-voltage secondary output is rectified by V612, to supply dc plate voltage for the internal and external load, and the low voltage is rectified by selenium rectifier SR650 to supply dc filament voltages.

Reference Voltage

A reference voltage for the +120-volt supply is established by the Voltage-Reference Tube V639. This tube maintains a fixed potential of about +33 volts at the grid of V646B, one half of a Difference Amplifier.

Note: Removal of the type 5641 tube, V639, will allow the +120-volt supply to increase to a value in excess of 200 volts. This is sufficient to damage filter capacitor C621 and to overload the cathode-follower tubes in the probes.

Difference Amplifier

The grid potential for the other half of the Difference Amplifier, V646A, is obtained from a voltage divider, consisting of R645 and R646, connected from the +120-volt bus to ground. Voltage variations in the +120-volt supply will result in a proportional voltage change at the grid of V646A. This changing voltage causes an error voltage to exist between the two grids of the Difference Amplifier.

The error voltage is amplified by V646B, which is dc-coupled to the grid of the Series Tube V627. The amplified error voltage appearing at the grid of the Series Tube will change the voltage drop across this tube in the proper direction to compensate for the change in output voltage. C631 improves the ac gain of the feedback loop, and thus increases the response of the circuit to sudden changes in output voltage.

A voltage divider, consisting of R640 in conjunction with R641 and R642, feeds a portion of the unregulated plate supply voltage to the screen of V646B. This signal, appearing at the screen (acting as an injector grid), will produce a component at the grid of V627 of opposite polarity to that appearing at the plate. This out-of-phase component will aid in reducing the ripple content and will improve the regulation of the +120-volt supply.

Filament Power

A single winding on T600 supplies filament power for all of the tubes in the Type 128. A voltage divider consisting of R601 and R602 elevates this winding to approximately +60 volts. Elevation of the filament supply reduces the filament-to-cathode potential to a value well within the ratings of the tubes.

Two low-voltage dc supplies are incorporated in the Type 128 to provide a separate filament-voltage source for each probe. Center-tapped windings on T600 are connected to the two sections of the selenium rectifier, SR650, and the filtered outputs are connected to the corresponding probe power connections.

MAINTENANCE

Troubleshooting

The high-voltage power supply in the Type 128 is a straight-forward regulated power supply and you should not experience any difficulty in locating troubles. If you are unfamiliar with regulated power supplies of this type, a few minutes studying the circuit description will be time well spent.

The most probable source of trouble in the Type 128 is tube failure. A preliminary check for heater glow in the filament-type tubes and for the characteristic orange glow in the Type 5651 is a good first step in troubleshooting. If this does not produce results, you can replace the tubes one at a time with tubes known to be in good condition. Be careful, though, about removing V639. As explained in the circuit description, removal of this tube can cause serious damage to the instrument.

Another preliminary step in troubleshooting, particularly if there is no output voltage or if the instrument blows fuses, is to visually inspect the interior for damaged components or wiring. Quite often, the trouble can be located quicker in this manner than with conventional circuit tracing techniques.

To help you localize troubles with a voltmeter, operating voltages are marked on the schematic diagram. These are nominal voltages, however, and may vary as much as 10%.

Replacement Parts

Replacement parts can be obtained from Tektronix at current net prices. However, since most of the components are standard electronic parts, they can generally be obtained locally in less time than required to obtain them from the factory. Before ordering or purchasing parts, be sure to consult the Parts List to determine the exact description of the part.

Parts-Ordering Information

You will find a serial number on the front-piece of this manual. It is the serial number of the instrument for which the manual was prepared. Be sure that the number on the manual matches the serial number of the instrument when ordering parts.

Each component in your instrument has been assigned a 6-digit Tektronix part number. This number, together with the description of the part, will be found in the Parts List. When ordering parts, be sure to include both the description and the part number. For example, a resistor would be ordered as follows: R601, 100k, 1/2 watt, fixed, composition, 10%, Part Number 302-104 for Type 128 Probe Power Supply, Serial Number 080.

PARTS LIST

For an explanation of the abbreviations used in this parts list, see the indexed sheet marked **ABBREVIATIONS**.

						Order parts by number
Lamps						
B600	Incandescent, G.E. Type 12					150-018
Capacitors						
C611A,B,C	3x20 μ f	EMC	Fixed	250 v		290-080
C621A,B	2x40 μ f	EMC	Fixed	150 v		290-066
C631	.01 μ f	PTM	Fixed	400 v	20%	285-510
C645	.01 μ f	PTM	Fixed	400 v	20%	285-510
C650A,B	2x1000 μ f	EMC	Fixed	15 v		290-050
C651A,B	2x1000 μ f	EMC	Fixed	15 v		290-050
Fuses						
F600	Type 3AG, 1/2 amp, Fast Blo (117 v operation) Type 3AG, 0.3 amp, Fast Blo (234 v operation)					159-025
Selenium Rectifier						
SR650	4 100-ma plates/stack					106-040
Resistors						
R601	100 k	1/2 w	Fixed	Comp.	10%	302-104
R602	100 k	1/2 w	Fixed	Comp.	10%	302-104
R611	150 Ω	1/2 w	Fixed	Comp.	10%	302-151
R613	220 k	1 w	Fixed	Comp.	10%	304-224
R621	1 meg	1/2 w	Fixed	Comp.	10%	302-105
R622	220 Ω	1/2 w	Fixed	Comp.	10%	302-221
R623	220 Ω	1/2 w	Fixed	Comp.	10%	302-221
R631	12 k	1/2 w	Fixed	Comp.	10%	302-123
R640	100 k	1/2 w	Fixed	Comp.	10%	302-104
R641	39 k	1/2 w	Fixed	Comp.	10%	302-393
R642	47 k	1/2 w	Fixed	Comp.	10%	302-473
R643	470 k	1/2 w	Fixed	Comp.	10%	302-474
R644	10 k	1/2 w	Fixed	Comp.	10%	302-103
R645	150 k	1/2 w	Fixed	Prec.	1%	309-049
R646	56.5 k	1/2 w	Fixed	Prec.	1%	309-040



Resistors (continued)

R647	470 k	1/2 w	Fixed	Comp.	10%	302-474
R650	12 Ω	1 w	Fixed	Comp.	10%	304-120
R651	12 Ω	1 w	Fixed	Comp.	10%	304-120

Switch

SW600	Single-pole, single-throw, toggle:	POWER ON	260-134
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Vacuum Tubes

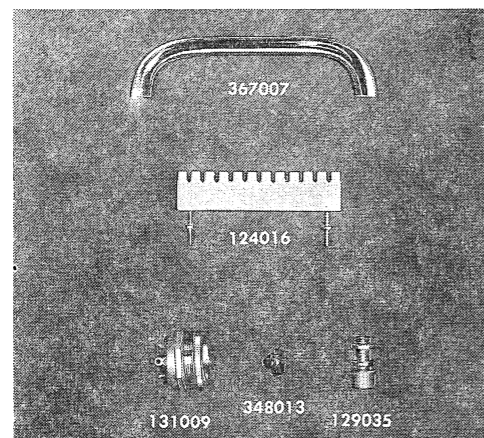
V612	6X4	Full-Wave Rectifier	154-035
V627	12B4	Series Tube	154-044
V639	5651	Voltage-Reference Tube	154-052
V646A,B	6AN8	Difference Amplifier	154-078

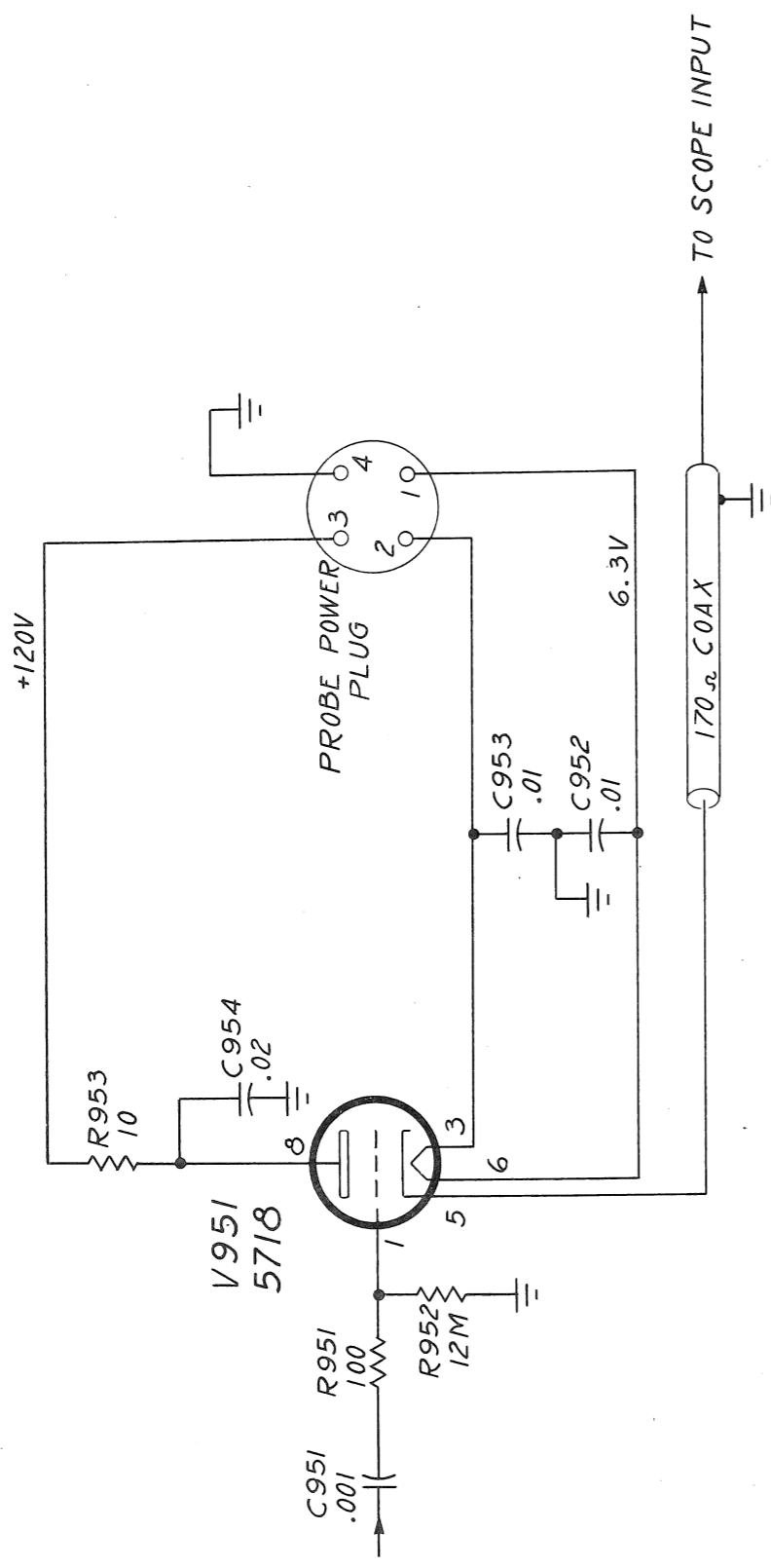
Transformer

T600	Power Transformer	120-059
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Miscellaneous Hardware

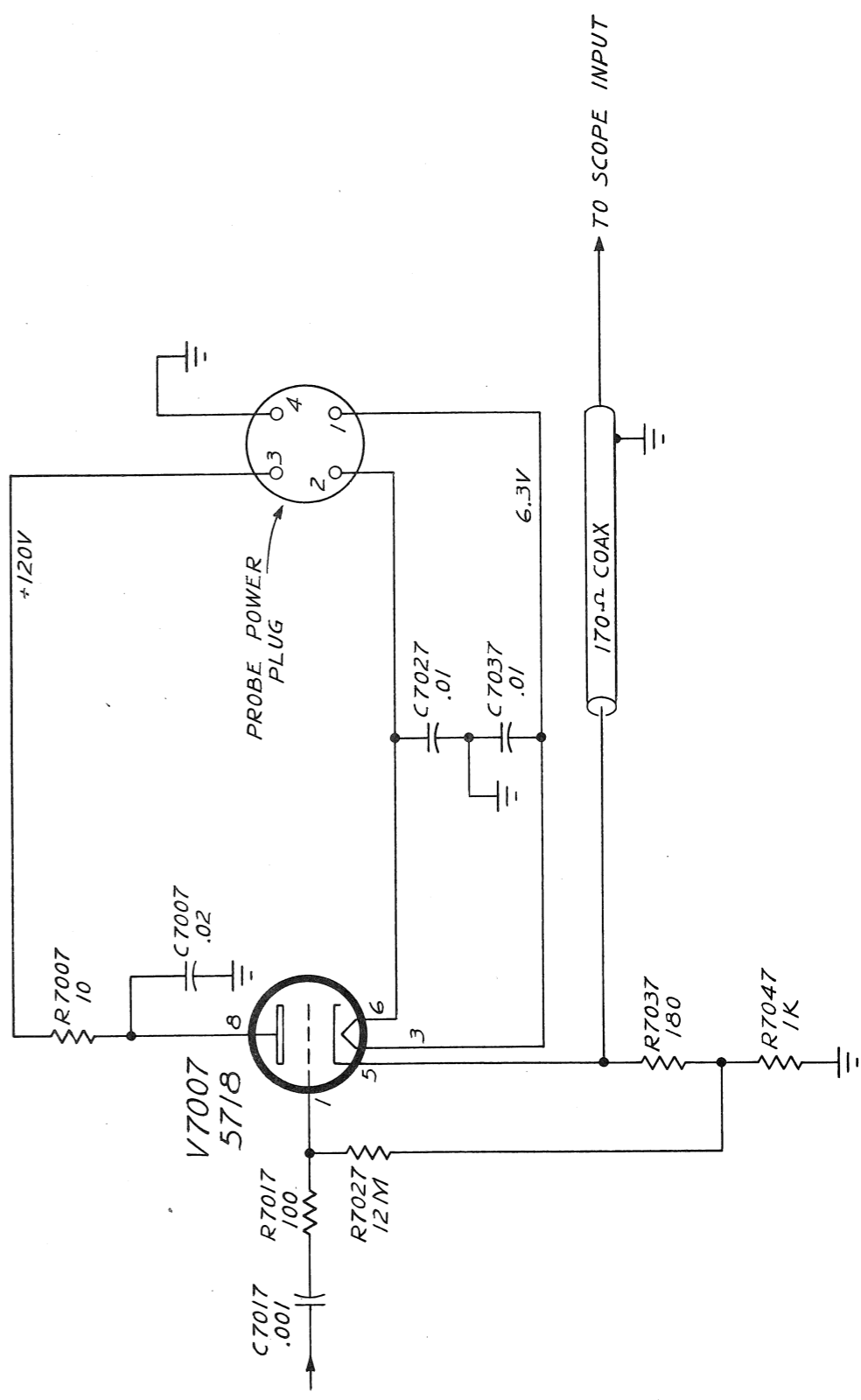
Receptacle, power	131-090
Fuse holder, Type 3AG	352-002
Handle	367-007
Ceramic strip, 11-notch	124-016
Rubber foot, black, 1/2" (order singly)	348-013
Binding post	129-035
Connector, female, 4-contact, chassis mount	131-009





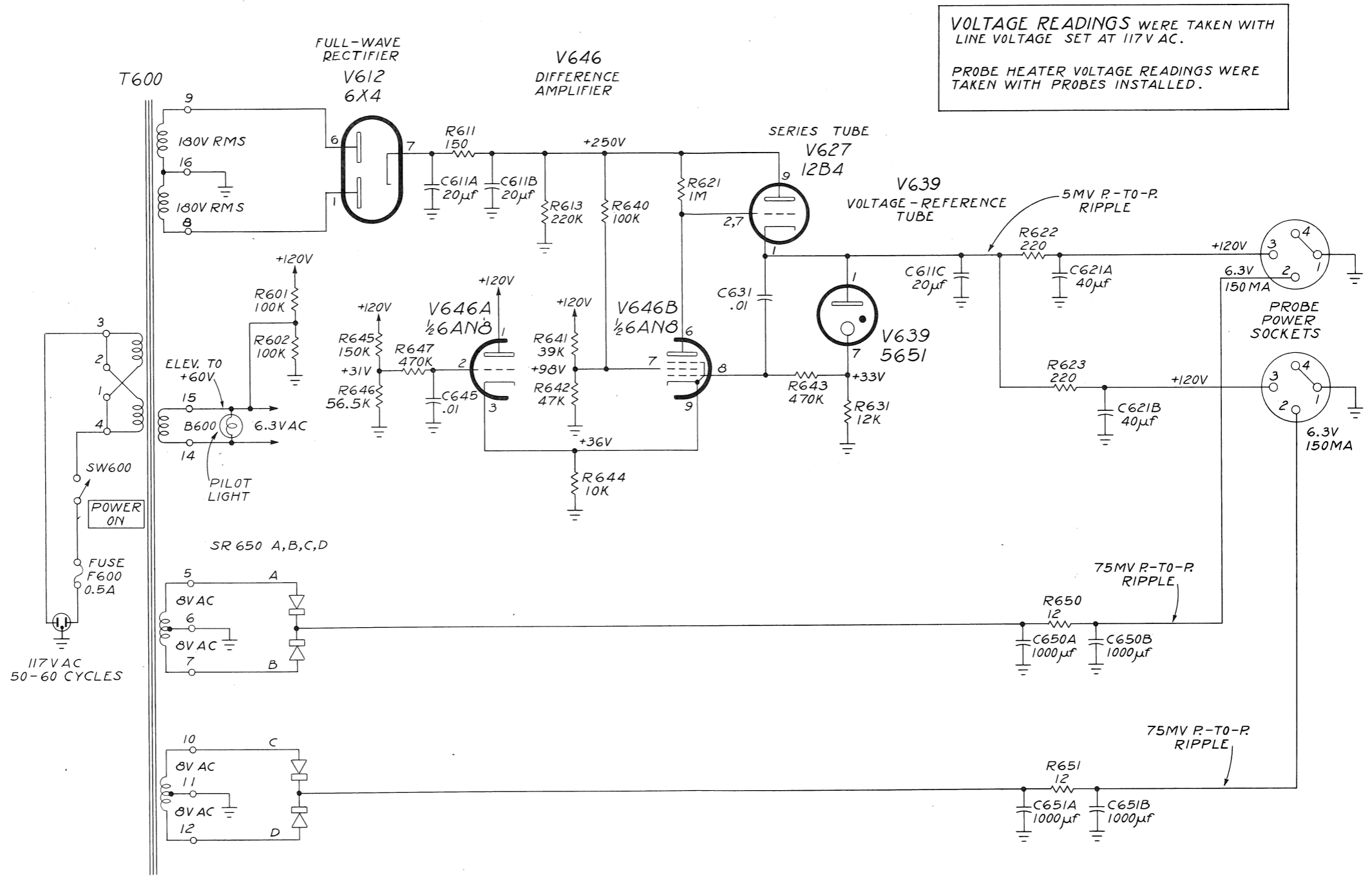
3-13-58
R.O.W.

P170-CF PROBE



3-11-58
KF

P500-CF PROBE



VOLTAGE READINGS WERE TAKEN WITH
LINE VOLTAGE SET AT 117V AC.
PROBE HEATER VOLTAGE READINGS WERE
TAKEN WITH PROBES INSTALLED.

POWER SUPPLY

TYPE 128

B₃

PROBE POWER SUPPLY

5-31-61
R.O.W.

ABBREVIATIONS USED IN OUR PARTS LISTS

Cer.	ceramic	m	milli
Comp.	composition	Ω	ohm
EMC	electrolytic, metal cased	Poly.	polystyrene
EMT	electrolytic, metal tubular	Prec.	precision
f	farad	PT	paper tubular
h	henry	Tub.	tubular
k	thousands of ohms	v	working volts dc
meg	megohms	Var.	variable
μ	micro	w	watt
$\mu\mu$	micromicro	WW	wire wound
	GMV		guaranteed minimum value

ABBREVIATIONS USED IN OUR CIRCUIT DIAGRAMS

Resistance values are in ohms. The symbol k stands for thousands. A resistor marked 2.7 k has a resistance of 2,700 ohms. The symbol M stands for million. For example, a resistor marked 5.6 M has a resistance of 5.6 megohms.

Unless otherwise specified on the circuit diagram, capacitance values marked with the number 1 and numbers greater than 1 are in $\mu\mu\text{f}$. For example, a capacitor marked 3.3 would have a capacitance of 3.3 micromicrofarads. Capacitance values marked with a number less than 1 are in μf . For example, a capacitor marked .47 would have a capacitance of .47 microfarads.

Inductance values marked in mh are in millihenrys. Inductance values marked in μh are in microhenrys.

Your instrument **WARRANTY** appears on the reverse side of this sheet.

SERIAL NO. 671

IMPORTANT

Include the INSTRUMENT TYPE and the above SERIAL NUMBER in any correspondence regarding this instrument. The above serial number must match the instrument serial number if parts are to be ordered from the manual. Your help in this will enable us to answer your questions or fill your order with the least delay possible.



WARRANTY

All Tektronix instruments are fully guaranteed against defective materials and workmanship for one year. Should replacement parts be required, whether at no charge under warranty or at established net prices, notify us promptly, including sufficient details to identify the required parts. We will ship them prepaid (via air if requested) as soon as possible, usually within 24 hours.

Tektronix transformers, manufactured in our own plant, carry an indefinite warranty.

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