

TEKTRONIX®

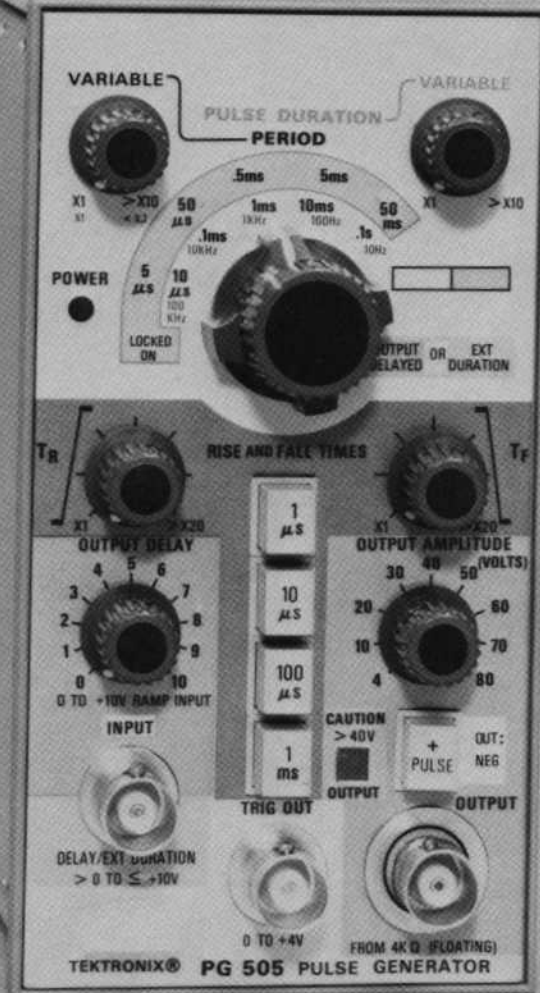
PG 505

PULSE GENERATOR

INSTRUCTION MANUAL

TABLE OF CONTENTS

SECTION 1	OPERATING INSTRUCTIONS	Page
	Introduction	1-1
	Installation	1-1
	Operating Considerations	1-2
	Output Connections	1-2
	Risetime and Falltime	1-2
	Operating Modes	1-2
	Normal	1-2
	Output Locked On	1-2
	External Duration	1-2
	Output Delayed	1-2
	Custom Period and Pulse Duration	1-3
	Functions Available at Rear Connector	1-4
	Definitions of Pulse Characteristics	1-4
	Electrical Characteristics	1-5
	Table 1-1 Output Signals	1-5
	Table 1-2 Control Ranges	1-6
	Table 1-3 Special Operating Modes	1-6
	Table 1-4 Miscellaneous	1-7
	Table 1-5 Environmental	1-7
SECTION 2	SERVICE INFORMATION	
	Symbols and Reference Designators	2-1
	Electrical Parts List	2-2
	Controls, Connectors & Rear Connector Pin Assignment	
	Adjustments (backside of foldout)	
	Adjustments	
	Parts Location Grid & Theory of Operation	
	Diagram 1 (backside of foldout)	
	Delay Pickoff/Trigger Comparator, and	
	Period & Duration Generator 1	
	Theory of Operation	
	Diagram 2 (backside of foldout)	
	Rise & Falltime, and Output Amplifier 2	
	Theory of Operation	
	Diagram 3 (backside of foldout)	
	Power Supplies and Cam Switch Logic 3	
	Mechanical Parts List	
	Fig. 1 Exploded	
	Fig. 2 Accessories & Repackaging	
	 OPTIONS	
	 CHANGE INFORMATION	



OPERATING INSTRUCTIONS

INTRODUCTION

The PG 505 Pulse Generator is designed to operate in a TM 500 Series Power Module. The generator is a compact 100 kHz, 80 V, general-purpose pulse generator. Controls are provided for selection of a specific pulse period, duration, risetime, falltime, amplitude and output polarity. A special function control permits an output time with relationship to a voltage level on an input ramp. A custom position on the pulse period and pulse duration controls permits a special pulse period and duration by adding internal capacitors.

on the Power Module. Check that the POWER indicator on the PG 505 front panel comes on.

CAUTION

Installation

The PG 505 is calibrated and ready to use as received. Referring to Fig. 1-1, install the Pulse Generator and turn

Turn the Power Module off before inserting the plug-in; otherwise, damage may occur to the plug-in circuitry.

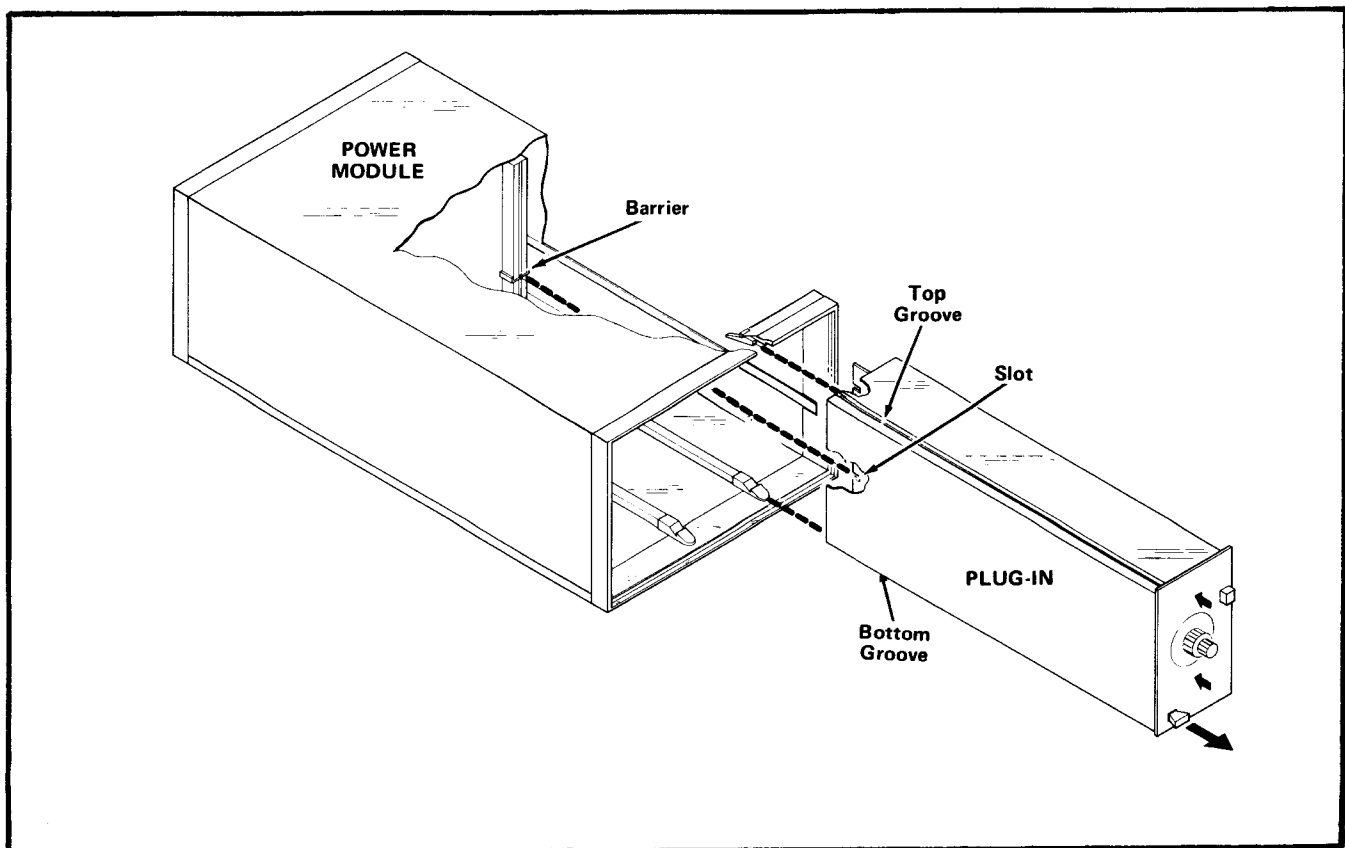


Fig. 1-1. Plug-In installation and removal.

OPERATING CONSIDERATIONS

Output Connections

The output of the PG 505 is designed to operate as a voltage source through a 4 k Ω load.

Pulse characteristics can be preserved by observing the following precautions:

1. Use high quality coaxial cables and connectors.
2. Make all connections tight and as short as possible.
3. Use high quality attenuators, if necessary, to reduce the pulse amplitude to sensitive circuits.
4. Use terminators or impedance matching devices to avoid reflections.
5. Ensure that attenuators, terminations, etc., have adequate power handling capabilities for the output pulse. Power output is determined by the duty factor of output pulse current.

NOTE

The PG 505 has been designed so that the output BNC connector may be floated for floating-common operation, remove the wire connecting the BNC shell to the ground lug located at the front bottom circuit board mounting screw. If the output is to be elevated to a dangerous potential, or if local safety regulations prohibit use of floating BNC connectors, replace the BNC output connector. A suitable connector and mating plug are the Tektronix 131-1011-00 and

131-1012-00. The PG 505 may be ordered with this connector factory installed by specifying Mod 818C.

Risetime and Falltime

If the output pulse from the PG 505 is used for measuring the rise and falltime of a device, the risetime characteristics of associated equipment may have to be considered. If the risetime of the device under test is at least 10 times longer than the combined risetimes of the PG 505 plus the monitoring oscilloscope and associated cables, the error introduced will not exceed 1% and generally can be ignored. If the rise or falltime of the test device, however, is less than 10 times as long as the combined risetimes of the testing system, the actual risetime of the device will have to be determined from the risetime of each component making up the system. This equals the square root of the sum of the squares of the individual risetimes. Conversely, the risetime of the device under test can be found from the same relationship if the actual risetimes in the system are known, except that of the device under test.

If there is a DC voltage across the output load, the output pulse amplitude will be compressed, or in some cases, the output may be shortened. To prevent this from occurring, the output must be coupled through a DC blocking capacitor to the load. The time constant, of the coupling capacitor and load, must be long enough to maintain pulse flatness.

OPERATING MODES

Normal

In the normal mode, the period generator free runs at the rate selected by the PERIOD switch and VARIABLE control. The duration of the output pulse (see Definitions of Pulse Characteristics) is selected by the PULSE DURATION switch and its associated VARIABLE control. Amplitude is set by the AMPLITUDE control. The pulse polarity from a reference is selected by the + PULSE push-push button. The PERIOD and PULSE DURATION selectors are mechanically coupled so the duty factor cannot exceed 50% with the VARIABLE controls in the X1 position.

Output Locked On

When the PULSE DURATION selector is in the LOCKED ON position, the output remains locked at a DC level selected by the AMPLITUDE control and the + PULSE push-push button (< 4 to 80 V).

External Duration

When the PULSE DURATION switch is in the EXT DURATION position, the period generator is disabled. The output pulse is now turned on by applying a positive-going signal greater than 2 V to the INPUT connector. The output will turn on when the external signal amplitude goes above about +2 V and turn off when the signal amplitude drops below about 2 V. The period and duration of the output pulse is dependent on the period and duration of the external signal (see Fig. 1-2).

Output Delayed

The period generator is disabled when the PERIOD switch is in the OUTPUT DELAYED position. The start of the pulse duration is controlled by picking a voltage point, with the OUTPUT DELAY control, on a 0 to +10 V ramp waveform connected via the INPUT connector. The duration of the output pulse is selected by the PULSE

DURATION switch and its associated VARIABLE control, while the period is dependent on the repetition rate of the ramp (see Fig. 1-3).

Custom Period and Pulse Duration

A special position is provided on the PERIOD and PULSE DURATION switches that provides a unique (custom selected) period and/or pulse duration. The electrical characteristics in this section define the period and pulse duration limits. The location of the added capacitors is shown in Fig. 1-4.

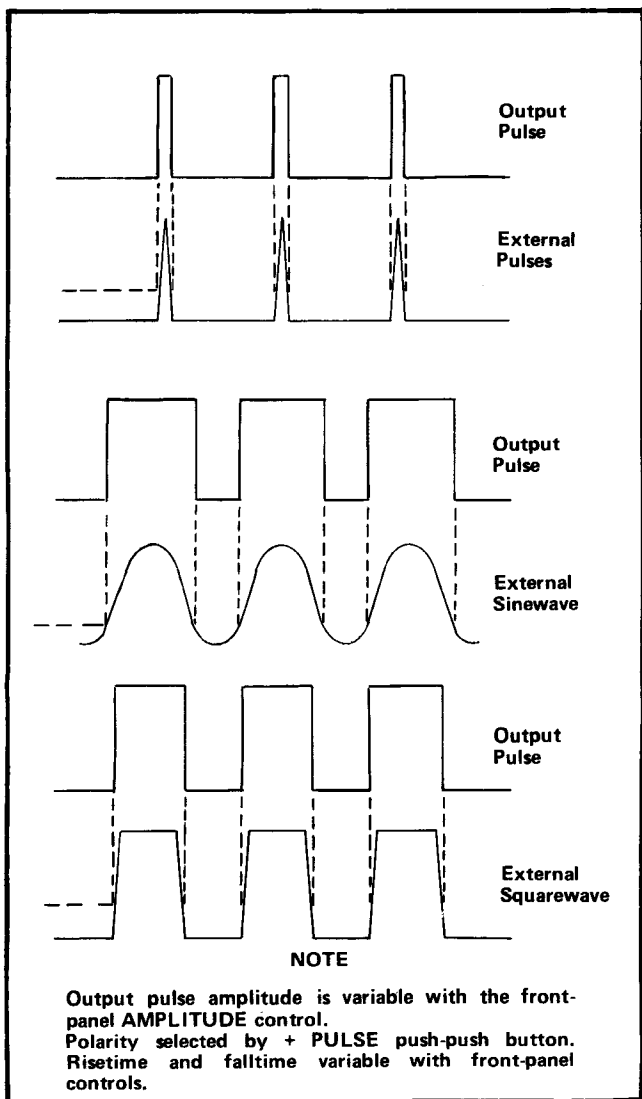


Fig. 1-2. Pulse duration and period being controlled by various external signals.

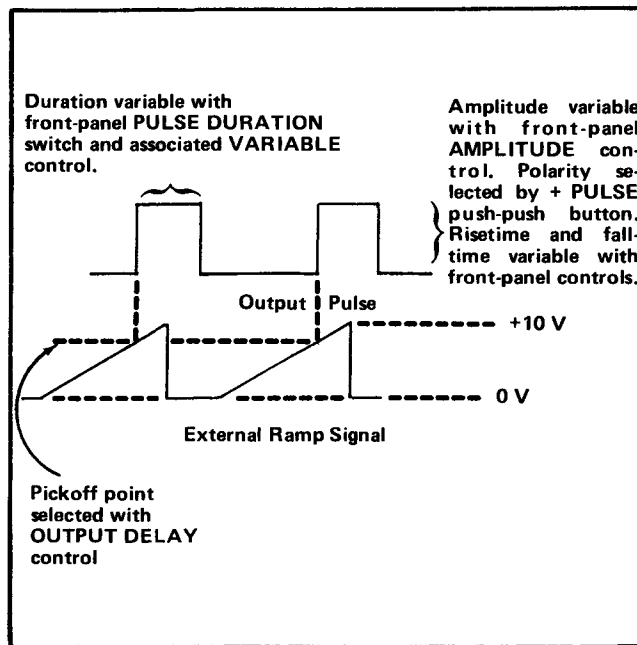


Fig. 1-3. Start of output pulse being controlled by selected pick-off voltage point on ramp signal.

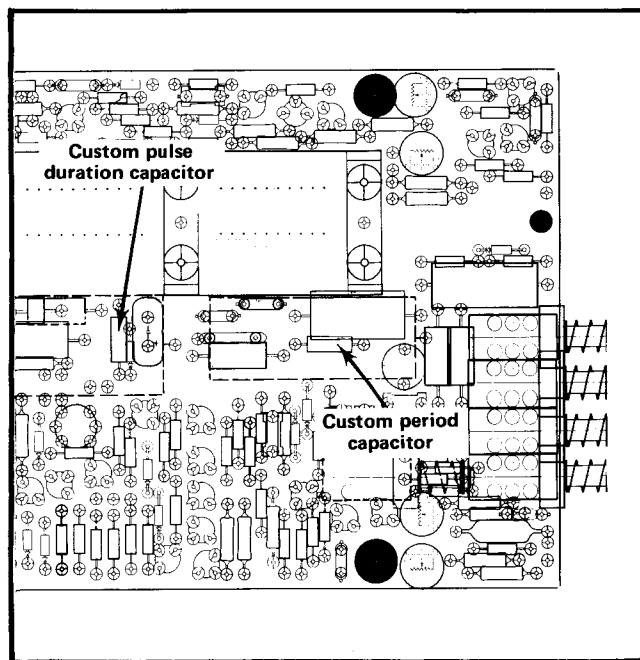


Fig. 1-4. Location of added custom period and pulse duration capacitors.

FUNCTIONS AVAILABLE AT REAR CONNECTOR

Unassigned pins are available at the rear connector for routing signals to and from the PG 505 for specialized applications (see Rear Connector Pin Assignments in Section 2). One or more compartments of a multi-plug-in

Power Module can be wired with barriers installed to provide specific functions between compartments. See Power Module instruction manual for additional information.

DEFINITIONS OF PULSE CHARACTERISTICS

The following is a glossary of common pulse characteristics used in this manual. They are also illustrated in Fig. 1-5.

Amplitude—The maximum absolute peak value of a pulse, regardless of sign excluding unwanted aberrations or overshoot, from the zero axis. Measured between a point that is 50% of the pulse duration (pulse top) to a baseline reference that is 50% of the off time (pulse period minus pulse duration).

Aberration—Unwanted deviations or excursions in the pulse shape from an ideal square corner and flat top, i.e., overshoot, undershoot or rounding, ringing, and tilt or slope.

Baseline—The quiescent DC voltage reference level of the pulse waveform.

Duty Factor—Sometimes referred to as duty cycle. The ratio of pulse duration to period or the product of pulse duration and pulse repetition rate. Duty factor % = Duration/Period X 100.

Falltime—The time interval, at the pulse trailing edge, for the pulse amplitude to fall from the 90% amplitude level to the 10% amplitude level.

Flatness—The absence of long term variations to the pulse top; excluding overshoot, ringing or pulse rounding. Sometimes referred to as tilt or slope.

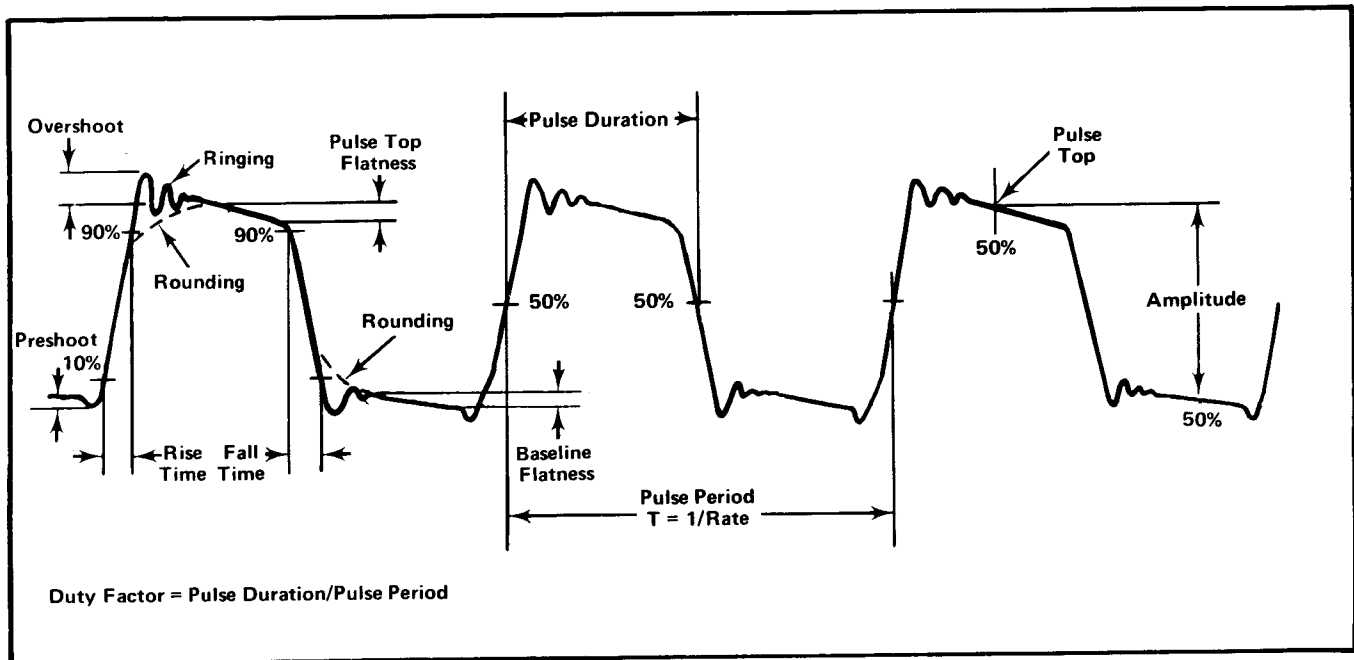


Fig. 1-5. Pulse characteristics.

Overshoot—The short-term pulse excursion (or transient) above the pulse top or below the baseline that is simultaneous to the leading and trailing edge of the pulse.

Period—The time interval for a full pulse cycle. Inverse of frequency or repetition rate. Interval between corresponding pulse amplitudes of two consecutive undelayed or delayed pulses. Generally measured between the 50% amplitude levels of two consecutive pulses.

Preshoot—A transient excursion that precedes the step function. It may be of the same or opposite polarity as the pulse.

Pulse Duration—The time interval between the leading and trailing edge of a pulse at which the instantaneous amplitude reaches 50% of the peak pulse amplitude.

Polarity—The direction from the baseline of the pulse excursion. Either positive-going (+) or negative-going (–).

Ringings—Periodic aberrations that dampen in time, following the overshoot.

Risetime—The time interval, at the step function leading edge, for the pulse to rise from the 10% to 90% amplitude levels.

Rounding or Undershoot—The rounding of the pulse corners at the edges of a step function.

Tilt or Slope—A distortion of an otherwise flat-topped pulse, characterized by either a decline or a rise of the pulse top. (See Flatness.)

ELECTRICAL CHARACTERISTICS

Performance Conditions

The electrical characteristics are valid only if the PG 505 has been calibrated at an ambient temperature between

+20°C and +30°C and is operating at an ambient temperature between 0°C and +50°C unless otherwise noted.

TABLE 1-1

OUTPUT SIGNALS

Characteristics	Performance Requirements	Supplemental Information
Pulse Output		
Amplitude	±4 V or less to at least ±80 V from a 4 kΩ source.	
Aberrations	≤ 5% peak to peak at full amplitude into 4 kΩ, 20 pF load.	
Residual DC Offset	≤ 0.5% at full amplitude.	
Isolation	±200 V DC from chassis ground.	Through internal 100 kΩ to ground. 100 kΩ resistor may be removed with some degradation of performance.
Caution Indicator	On at 40 V; off at 20 V.	
Risetime and Faltime		
Measurement Interval		
1 μs	Between 10% and 90% points	
10 μs, 100 μs and 1 ms	Between 0% and 100% points	
Accuracy	Within 5% of indicated time when T_R or T_F control is set to X1 position.	
Trigger Output	0 to > +4 V into 10 kΩ; 0 to > +3 V into 600 Ω.	

TABLE 1-2
CONTROL RANGES

Characteristics	Performance Requirements	Supplemental Information
Pulse Duration (Width)	5 μ s or less to 50 ms (5 μ s to 5 ms within 5%, 50 ms within 20%) in decade steps with the VARIABLE control fully ccw (X1). VARIABLE extends duration to at least 0.5 s in fully cw position (X10).	Stated limits apply over a temperature range of +15°C to +35°C. An additional 3% tolerance must be added to the stated limits over the temperature range of 0°C to +50°C.
Duty Factor (Pulse Duration/Pulse Period)	0 to 100%	
Pulse Period (Repetition Rate)	10 μ s (100 kHz) or less to 100 ms (10 Hz), within 5%, in decade steps with the VARIABLE control fully ccw (X1). VARIABLE extends period to at least 1 s (1 Hz) in fully cw position (X10).	
Pulse Risetime and Faltime	1 μ s or less to 1 ms in decade steps with the T_R or T_F control fully ccw (X1). T_R or T_F control extends time to at least 20 ms in fully cw position (X20).	

TABLE 1-3
SPECIAL OPERATING MODES

Characteristics	Performance Requirements	Supplemental Information
Delay Mode		
Delay Range (With Respect to Delay Signal)	0 to 10 V within 5%.	
Delay Jitter	$\leq 0.02\%$ of ramp period with a 0 V to +10 V ramp input signal.	Measured between 5 and 95% points on a 10 V input ramp.
External Duration		
Input Amplitude	≥ 0.5 V (TTL) into $>, 10$ k Ω .	EXT DURATION mode always over-rides OUTPUT DELAYED mode.

TABLE 1-4
MISCELLANEOUS

Characteristics	Performance Requirements	Supplemental Information
Custom Pulse Duration Range		5 μ s and slower, depending upon capacitor and setting of PULSE DURATION VARIABLE.
Custom Pulse Period Range		10 μ s and slower, depending upon capacitor and setting of PERIOD VARIABLE.

TABLE 1-5
ENVIRONMENTAL

Characteristics	Performance Requirements	Supplemental Information
Temperature		
Operating	0°C to +50°C	
Storage	-40°C to +75°C	
Altitude		
Operating	To 15,000 feet	
Storage	To 50,000 feet	
Vibration		
Operating and Non-Operating	With the instrument complete and operating, vibration frequency swept from 10 to 50 to 10 Hz at 1 minute per sweep. Vibrate 15 minutes in each of the three major axes at 0.015" total displacement. Hold 3 minutes at any major resonance, or if none, at 50 Hz. Total time, 54 minutes.	
Shock		
Operating and Non-Operating	30 g's, 1/2 sine, 11 ms duration, 2 shocks in each direction along 3 major axes, for a total of 12 shocks.	
Transportation	Qualified under National Safe Transit Committee Test Procedure 1A, Category II.	

SERVICE INFORMATION

SYMBOLS AND REFERENCE DESIGNATORS

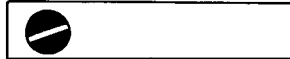
Electrical components shown on the diagrams are in the following units unless noted otherwise:

- Capacitors = Values one or greater are in picofarads (pF).
Values less than one are in microfarads (μF).
- Resistors = Ohms (Ω)

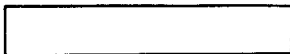
Symbols used on the diagrams are based on ANSI Y32.2 – 1970.

Logic symbology is based on MIL-STD-806B in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

The following special symbols are used on the diagrams:



External Screwdriver adjustment.



External control or connector.



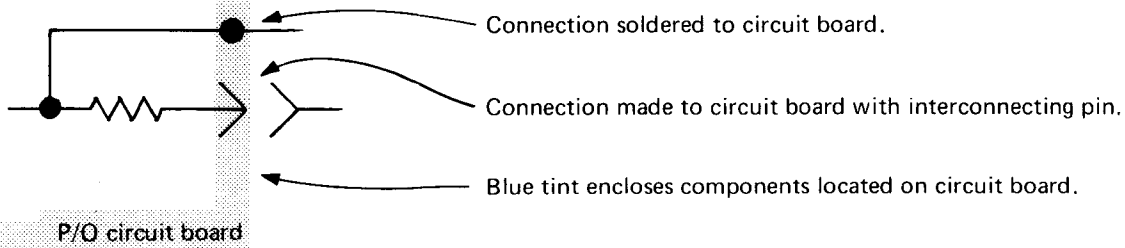
Clockwise control rotation in direction of arrow.



Refer to diagram number indicated in diamond.



Refer to waveform number indicated in hexagon.



Connection soldered to circuit board.

Connection made to circuit board with interconnecting pin.

Blue tint encloses components located on circuit board.

REPLACEABLE ELECTRICAL PARTS

PARTS ORDERING INFORMATION

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

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, instrument type or number, serial number, and modification number if applicable.

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

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number

00X Part removed after this serial number

ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

ABBREVIATIONS

ACTR	ACTUATOR	PLSTC	PLASTIC
ASSY	ASSEMBLY	QTZ	QUARTZ
CAP	CAPACITOR	RECP	RECEPTACLE
CER	CERAMIC	RES	RESISTOR
CKT	CIRCUIT	RF	RADIO FREQUENCY
COMP	COMPOSITION	SEL	SELECTED
CONN	CONNECTOR	SEMICOND	SEMICONDUCTOR
ELCTLT	ELECTROLYTIC	SENS	SENSITIVE
ELEC	ELECTRICAL	VAR	VARIABLE
INCAND	INCANDESCENT	WW	WIREWOUND
LED	LIGHT EMITTING DIODE	XFMR	TRANSFORMER
NONWIR	NON WIREWOUND	XTAL	CRYSTAL

CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
01121	ALLEN-BRADLEY CO.	1201 2ND ST. SOUTH	MILWAUKEE, WI 53204
02735	RCA CORP., SOLID STATE DIVISION	ROUTE 202	SOMERVILLE, NY 08876
04713	MOTOROLA, INC., SEMICONDUCTOR PRODUCTS DIV.	5005 E. MCDOWELL RD.	PHOENIX, AZ 85036
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS ST.	MOUNTAIN VIEW, CA 94042
07910	TELEDYNE SEMICONDUCTOR	12515 CHADRON AVE.	HAWTHORNE, CA 90250
08806	GENERAL ELECTRIC CO., MINIATURE LAMP PRODUCTS DEPT.	NELA PK.	CLEVELAND, OH 44112
11237	CTS KEENE, INC.	COMMERCE DRIVE	PASO ROBLES, CA 93446
12040	NATIONAL SEMICONDUCTOR CORP.	1710 S. DEL MAR AVE.	DANBURY, CT 06810
14752	ELECTRO CUBE INC.	811 E. ARQUES	SAN GABRIEL, CA 91776
18324	SIGNETICS CORP.		SUNNYVALE, CA 94086
22229	SOLITRON DEVICES, INC., DIODES, INTEGRATED CIRCUITS AND CMOS	8808 BALBOA AVE.	SAN DIEGO, CA 92123
24931	SPECIALTY CONNECTOR CO., INC.	3560 MADISON AVE.	INDIANAPOLIS, IN 46227
56289	SPRAGUE ELECTRIC CO.	1142 W. BEARDSLEY AVE.	NORTH ADAMS, MA 01247
71450	CTS CORP.		ELKHART, IN 46514
72136	ELECTRO MOTIVE CORP., SUB OF INTERNATIONAL ELECTRONICS CORP.	SOUTH PARK AND JOHN STREETS	WILLIMANTIC, CT 06226
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
73138	BECKMAN INSTRUMENTS, INC., HELIPOT DIV.	2500 HARBOR BLVD.	FULLERTON, CA 92634
75042	TRW ELECTRONIC COMPONENTS, IRC FIXED RESISTORS, PHILADELPHIA DIVISION	401 N. BROAD ST.	PHILADELPHIA, PA 19108
80009	TEKTRONIX, INC.	P. O. BOX 500	BEAVERTON, OR 97077
90201	MALLORY CAPACITOR CO., DIV. OF P. R. MALLORY CO., INC.	3029 E. WASHINGTON ST.	INDIANAPOLIS, IN 46206
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NB 68601
91836	KINGS ELECTRONICS CO., INC.	40 MARBLEDALE ROAD	TUCKAHOE, NY 10707
99942	CENTRALAB SEMICONDUCTOR, CENTRALAB ELECTRONICS, DIV. OF GLOBE-UNION, INC.	4501 N. ARDEN DR.	EL MONTE, CA 91734

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscnt	Name & Description	Mfr	
					Code	Mfr Part Number
A1	670-2927-00			CKT BOARD ASSY:--MAIN	80009	670-2927-00
C100	281-0600-00			CAP.,FXD,CER DI:35PF,10%,500V	72982	308-000COG0350K
C120	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	56289	40C626
C126	283-0660-00			CAP.,FXD,MICA D:510PF,2%,500V	72136	DM15F511G0500
C128	283-0695-00			CAP.,FXD,MICA D:4440PF,1%,300V	72136	DM19F4441F0300
C129	283-0660-00			CAP.,FXD,MICA D:510PF,2%,500V	72136	DM15F511G0500
C130	285-1066-00			CAP.,FXD,PLSTC:0.05UF,1%,200V	14752	230B1C503F
C132	285-1067-00			CAP.,FXD,PLSTC:0.5UF,1%,200V	14752	230B1C504F
C134	285-1068-00			CAP.,FXD,PLSTC:5UF,1%,200V	14752	230B1C505F
C156	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	56289	40C626
C175	281-0550-00			CAP.,FXD,CER DI:120PF,10%,500V	72982	301-000X5P0121K
C180	290-0531-00			CAP.,FXD,ELCTLT:100UF,20%,10V	90201	TDC107M010CL
C182	285-1052-00			CAP.,FXD,PLSTC:10UF,1%,100V	14752	230B1C106F
C184	285-1051-00			CAP.,FXD,PLSTC:1UF,1%,200V	14752	230B1C105F
C186	285-1050-00			CAP.,FXD,PLSTC:0.1UF,1%,200V	14752	230B1C104F
C188	285-1049-00			CAP.,FXD,PLSTC:0.01UF,1%,200V	14752	230B1C103F
C198	281-0519-00			CAP.,FXD,CER DI:47PF,+/-4.7PF,500V	72982	308-000COG0470K
C210	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	56289	40C626
C250	281-0092-00			CAP.,VAR,CER DI:9-35PF	72982	538-011 D9-35
C252	281-0549-00			CAP.,FXD,CER DI:68PF,10%,500V	72982	301-000U2J0680K
C254	285-0918-00			CAP.,FXD,PLSTC:0.001UF,5%,200V	56289	LP66A1C102J002
C256	285-1049-00			CAP.,FXD,PLSTC:0.01UF,1%,200V	14752	230B1C103F
C258	285-1050-00			CAP.,FXD,PLSTC:0.1UF,1%,200V	14752	230B1C104F
C334	281-0542-00			CAP.,FXD,CER DI:18PF,10%,500V	72982	301-002COG0180K
C340	281-0658-00			CAP.,FXD,CER DI:6.2PF,+/-0.25PF,500V	72982	301-000COH0629C
C350	281-0542-00			CAP.,FXD,CER DI:18PF,10%,500V	72982	301-002COG0180K
C360	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	56289	20C205A1
C370	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	56289	20C205A1
C386	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	56289	40C626
C390	283-0057-00			CAP.,FXD,CER DI:0.1UF,+80-20%,200V	56289	274C10
C514	281-0546-00			CAP.,FXD,CER DI:330PF,10%,500V	72982	301-000X5P0331K
C534	290-0525-00			CAP.,FXD,ELCTLT:4.7UF,20%,50V	56289	196D475X0050KA1
C545	290-0525-00			CAP.,FXD,ELCTLT:4.7UF,20%,50V	56289	196D475X0050KA1
C550	290-0525-00			CAP.,FXD,ELCTLT:4.7UF,20%,50V	56289	196D475X0050KA1
C555	290-0585-00			CAP.,FXD,ELCTLT:350UF,+75-10%,75V	56289	68D10492
C557	290-0585-00			CAP.,FXD,ELCTLT:350UF,+75-10%,75V	56289	68D10492
C564	281-0546-00			CAP.,FXD,CER DI:330PF,10%,500V	72982	301-000X5P0331K
C566	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	56289	40C626
C580	290-0194-00			CAP.,FXD,ELCTLT:10UF,+50-10%,100V	56289	30D106F100DC4
C598	290-0525-00			CAP.,FXD,ELCTLT:4.7UF,20%,50V	56289	196D475X0050KA1
C610	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
C620	290-0525-00			CAP.,FXD,ELCTLT:4.7UF,20%,50V	56289	196D475X0050KA1
C640	290-0159-00			CAP.,FXD,ELCTLT:2UF,+50-10%,150V 2UF,	56289	30D205F150BB4
CR100	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	CD8220
CR102	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	CD8220
CR120	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	CD8220
CR122	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	CD8220
CR154	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	CD8220
CR180	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	CD8220
CR220	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	CD8220
CR222	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	CD8220
CR232	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	CD8220

Electrical Parts List—PG 505

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
CR234	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR236	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR238	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR240	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR244	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR280	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR282	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR320	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR324	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR382	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR530	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR542	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR550	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR555	152-0066-00		SEMICON D DEVICE: SILICON, 400V, 7 50MA	02735	1N3194
CR557	152-0066-00		SEMICON D DEVICE: SILICON, 400V, 7 50MA	02735	1N3194
CR566	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR576	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR580	152-0107-00		SEMICON D DEVICE: SILICON, 375V, 400MA	80009	152-0107-00
CR640	152-0107-00		SEMICON D DEVICE: SILICON, 375V, 400MA	80009	152-0107-00
DS390	150-0030-00		LAMP, GLOW:	08806	NE2V
DS540	150-0048-00		LAMP, INCAND: 5V, 60MA	08806	683
J100	131-0955-00		CONNECTOR, RCPT, :BNC, FEMALE	24931	28JR200-1
J170	131-0955-00		CONNECTOR, RCPT, :BNC, FEMALE	24931	28JR200-1
J340	131-0274-00		CONNECTOR, RCPT, :BNC	91836	KC79-67
Q100	151-0342-00		TRANSISTOR: SILICON, PNP	07263	2N4249
Q102	151-0342-00		TRANSISTOR: SILICON, PNP	07263	2N4249
Q115	151-0432-00		TRANSISTOR: SILICON, NPN	12040	SM07391
Q140	151-0192-00		TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q142	151-0192-00		TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q144	151-0301-00		TRANSISTOR: SILICON, PNP	04713	2N2907A
Q160	151-0432-00		TRANSISTOR: SILICON, NPN	12040	SM07391
Q164	151-0302-00		TRANSISTOR: SILICON, NPN	04713	2N2222A
Q190	151-0432-00		TRANSISTOR: SILICON, NPN	12040	SM07391
Q200	151-0432-00		TRANSISTOR: SILICON, NPN	12040	SM07391
Q212	151-0432-00		TRANSISTOR: SILICON, NPN	12040	SM07391
Q214	151-0432-00		TRANSISTOR: SILICON, NPN	12040	SM07391
Q220	151-0342-00		TRANSISTOR: SILICON, PNP	07263	2N4249
Q230	151-0342-00		TRANSISTOR: SILICON, PNP	07263	2N4249
Q240	151-0432-00		TRANSISTOR: SILICON, NPN	12040	SM07391
Q260A, B	151-1054-00		TRANSISTOR: SILICON, JFE, N-CHANNEL, DUAL	22229	FD1644
Q262	151-0342-00		TRANSISTOR: SILICON, PNP	07263	2N4249
Q280	151-0432-00		TRANSISTOR: SILICON, NPN	12040	SM07391
Q286	151-0432-00		TRANSISTOR: SILICON, NPN	12040	SM07391
Q288	151-0342-00		TRANSISTOR: SILICON, PNP	07263	2N4249
Q290	151-0432-00		TRANSISTOR: SILICON, NPN	12040	SM07391
Q300	151-0432-00		TRANSISTOR: SILICON, NPN	12040	SM07391
Q310	151-0432-00		TRANSISTOR: SILICON, NPN	12040	SM07391
Q316	151-0350-00		TRANSISTOR: SILICON, PNP	04713	SPS6700
Q320	151-0350-00		TRANSISTOR: SILICON, PNP	04713	SPS6700
Q330	151-0347-00		TRANSISTOR: SILICON, NPN	04713	2N5551
Q346	151-0347-00		TRANSISTOR: SILICON, NPN	04713	2N5551
Q354	151-0350-00		TRANSISTOR: SILICON, PNP	04713	SPS6700

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
Q360	151-0350-00		TRANSISTOR:SILICON,PNP	04713	SPS6700
Q370	151-0347-00		TRANSISTOR:SILICON,NPN	04713	2N5551
Q382	151-0347-00		TRANSISTOR:SILICON,NPN	04713	2N5551
Q390	151-0350-00		TRANSISTOR:SILICON,PNP	04713	SPS6700
Q394	151-0347-00		TRANSISTOR:SILICON,NPN	04713	2N5551
Q520	151-0432-00		TRANSISTOR:SILICON,NPN	12040	SM07391
Q530	151-0342-00		TRANSISTOR:SILICON,PNP	07263	2N4249
Q550	151-0301-00		TRANSISTOR:SILICON,PNP	04713	2N2907A
Q566	151-0347-00		TRANSISTOR:SILICON,NPN	04713	2N5551
Q576	151-0342-00		TRANSISTOR:SILICON,PNP	07263	2N4249
Q580	151-0335-00		TRANSISTOR:SILICON,PNP	04713	SJE917
Q590	151-0301-00		TRANSISTOR:SILICON,PNP	04713	2N2907A
Q592	151-0432-00		TRANSISTOR:SILICON,NPN	12040	SM07391
Q610	151-0301-00		TRANSISTOR:SILICON,PNP	04713	2N2907A
Q620	151-0342-00		TRANSISTOR:SILICON,PNP	07263	2N4249
Q622	151-0302-00		TRANSISTOR:SILICON,NPN	04713	2N2222A
Q642	151-0429-00		TRANSISTOR:SILICON,PNP	80009	151-0929-00
Q646	151-0342-00		TRANSISTOR:SILICON,PNP	80009	151-0342-00
R100	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R102	315-0203-00		RES.,FXD,COMP:20K OHM,5%,0.25W	01121	CB2035
R105	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R106	321-0214-00		RES.,FXD,FILM:1.65K OHM,1%,0.125W	75042	CEATO-1651F
R108	321-0222-00		RES.,FXD,FILM:2K OHM,1%,0.125W	75042	CEATO-2001F
R110	311-1460-00		RES.,VAR,NONWIR:10K OHM,20%,1W	01121	11M028
R112	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R114	315-0393-00		RES.,FXD,COMP:39K OHM,5%,0.25W	01121	CB3935
R116	315-0150-00		RES.,FXD,COMP:15 OHM,5%,0.25W	01121	CB1505
R118	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R120	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R122	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R124	315-0473-00		RES.,FXD,COMP:47K OHM,5%,0.25W	01121	CB4735
R126	315-0243-00		RES.,FXD,COMP:24K OHM,5%,0.25W	01121	CB2435
R128	321-0241-00		RES.,FXD,FILM:3.16K OHM,1%,0.125W	75042	CEATO-3161F
R130	311-1483-00		RES.,VAR,NONWIR:100K OHM,20%,1W	01121	11M109
R132	321-0289-00		RES.,FXD,FILM:10K OHM,1%,0.125W	75042	CEATO-1002F
R135	311-1560-00		RES.,VAR,NONWIR:5K OHM,5%,0.50W	73138	91A-5000M
R136	321-0301-00		RES.,FXD,FILM:13.3K OHM,1%,0.125W	75042	CEATO-1332F
R138	315-0512-00		RES.,FXD,COMP:5.1K OHM,5%,0.25W	01121	CB5125
R142	315-0152-00		RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R146	321-0239-00		RES.,FXD,FILM:3.01K OHM,1%,0.125W	75042	CEATO-3011F
R148	321-0301-00		RES.,FXD,FILM:13.3K OHM,1%,0.125W	75042	CEATO-1332F
R150	311-1557-00		RES.,VAR,NONWIR:25K OHM,20%,0.50W	73138	91A-25001M
R151	321-0243-00		RES.,FXD,FILM:3.32K OHM,1%,0.125W	75042	CEATO-3321F
R152	321-0289-00		RES.,FXD,FILM:10K OHM,1%,0.125W	75042	CEATO-1002F
R154	315-0561-00		RES.,FXD,COMP:560 OHM,5%,0.25W	01121	CB5615
R156	315-0332-00		RES.,FXD,COMP:3.3K OHM,5%,0.25W	01121	CB3325
R160	315-0391-00		RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R164	315-0100-00		RES.,FXD,COMP:10 OHM,5%,0.25W	01121	CB1005
R166	315-0201-00		RES.,FXD,COMP:200 OHM,5%,0.25W	01121	CB2015
R168	315-0201-00		RES.,FXD,COMP:200 OHM,5%,0.25W	01121	CB2015
R176	315-0300-00		RES.,FXD,COMP:30 OHM,5%,0.25W	01121	CB3005
R180	311-1563-00		RES.,VAR,NONWIR:1K OHM,20%,0.50W	73138	91A-10000M
R185	311-1220-00	B010100 B019999	RES.,VAR,NONWIR:20K OHM,30%,0.25W	71450	200-YA5547

Electrical Parts List—PG 505

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
R185	311-0170-00	B020000	RES.,VAR, NONWIR:20K OHM,10%		
R186	321-0173-00		RES.,FXD,FILM:619 OHM,1%,0.125W	75042	CEATO-6190F
R190	315-0331-00		RES.,FXD,COMP:330 OHM,5%,0.25W	01121	CB3315
R192	315-0471-00		RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R196	321-0201-00		RES.,FXD,FILM:1.21K OHM,1%,0.125W	75042	CEATO-1211F
R198	321-0314-00		RES.,FXD,FILM:18.2K OHM,1%,0.125W	75042	CEATO-1822F
R200	321-0319-00		RES.,FXD,FILM:20.5K OHM,1%,0.125W	75042	CEATO-2052F
R202	315-0473-00		RES.,FXD,COMP:47K OHM,5%,0.25W	01121	CB4735
R204	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R208	315-0242-00		RES.,FXD,COMP:2.4K OHM,5%,0.25W	01121	CB2425
R210	315-0153-00		RES.,FXD,COMP:15K OHM,5%,0.25W	01121	CB1535
R212	315-0122-00		RES.,FXD,COMP:1.2K OHM,5%,0.25W	01121	CB1225
R218	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R220	315-0122-00		RES.,FXD,COMP:1.2K OHM,5%,0.25W	01121	CB1225
R222	315-0133-00		RES.,FXD,COMP:13K OHM,5%,0.25W	01121	CB1335
R224	315-0752-00		RES.,FXD,COMP:7.5K OHM,5%,0.25W	01121	CB7525
R230	311-1365-00		RES.,VAR, NONWIR:50K OHM,20%,1W	01121	11M164
R232	321-0216-00		RES.,FXD,FILM:1.74K OHM,1%,0.125W	75042	CEATO-1741F
R234	321-0252-00		RES.,FXD,FILM:4.12K OHM,1%,0.125W	75042	CEATO-4121F
R236	321-0309-00		RES.,FXD,FILM:16.2K OHM,1%,0.125W	75042	CEATO-1622F
R240	311-0580-00		RES.,VAR, NONWIR:50K OHM,20%,0.50W	11237	41695
R242	321-0216-00		RES.,FXD,FILM:1.74K OHM,1%,0.125W	75042	CEATO-1741F
R244	321-0252-00		RES.,FXD,FILM:4.12K OHM,1%,0.125W	75042	CEATO-4121F
R246	321-0309-00		RES.,FXD,FILM:16.2K OHM,1%,0.125W	75042	CEATO-1622F
R260	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R262	315-0511-00		RES.,FXD,COMP:510 OHM,5%,0.25W	01121	CB5115
R264	315-0620-00		RES.,FXD,COMP:62 OHM,5%,0.25W	01121	CB6205
R266	301-0332-00		RES.,FXD,COMP:3.3K OHM,5%,0.50W	01121	EB3325
R268	315-0470-00		RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705
R270	311-1095-00		RES.,VAR, NONWIR:10K OHM,20%,0.50W	11237	300SF-3P1631
R272	315-0511-00		RES.,FXD,COMP:510 OHM,5%,0.25W	01121	CB5115
R280	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R282	315-0203-00		RES.,FXD,COMP:20K OHM,5%,0.25W	01121	CB2035
R284	315-0512-00		RES.,FXD,COMP:5.1K OHM,5%,0.25W	01121	CB5125
R286	315-0470-00		RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705
R288	315-0470-00		RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705
R292	321-0256-00		RES.,FXD,FILM:4.53K OHM,1%,0.125W	75042	CEATO-4531F
R294	315-0150-00		RES.,FXD,COMP:15 OHM,5%,0.25W	01121	CB1505
R296	315-0202-00		RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R300	315-0133-00		RES.,FXD,COMP:13K OHM,5%,0.25W	01121	CB1335
R302	315-0303-00		RES.,FXD,COMP:30K OHM,5%,0.25W	01121	CB3035
R304	315-0163-00		RES.,FXD,COMP:16K OHM,5%,0.25W	01121	CB1635
R306	321-0268-00		RES.,FXD,FILM:6.04K OHM,1%,0.125W	75042	CEATO-6041F
R308	321-0256-00		RES.,FXD,FILM:4.53K OHM,1%,0.125W	75042	CEATO-4531F
R310	315-0150-00		RES.,FXD,COMP:15 OHM,5%,0.25W	01121	CB1505
R314	315-0362-00		RES.,FXD,COMP:3.6K OHM,5%,0.25W	01121	CB3625
R316	315-0302-00		RES.,FXD,COMP:3K OHM,5%,0.25W	01121	CB3025
R320	315-0751-00		RES.,FXD,COMP:750 OHM,5%,0.25W	01121	CB7515
R324	315-0822-00		RES.,FXD,COMP:8.2K OHM,5%,0.25W	01121	CB8225
R326	315-0152-00		RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R330	315-0751-00		RES.,FXD,COMP:750 OHM,5%,0.25W	01121	CB7515
R334	315-0150-00		RES.,FXD,COMP:15 OHM,5%,0.25W	01121	CB1505
R336	315-0470-00		RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705

Ckt No.	Tektronix Part No.	Serial/Model No.		Name & Description	Mfr Code	Mfr Part Number
		Eff	Dscont			
R340	321-0314-00			RES., FXD, FILM: 18.2K OHM, 1%, 0.125W	75042	CEATO-1822F
R342	308-0293-00			RES., FXD, WW: 4K OHM, 5%, 3W	91637	RS2B-B40000J
R346	315-0470-00			RES., FXD, COMP: 47 OHM, 5%, 0.25W	01121	CB4705
R350	315-0150-00			RES., FXD, COMP: 15 OHM, 5%, 0.25W	01121	CB1505
R354	315-0103-00			RES., FXD, COMP: 10K OHM, 5%, 0.25W	01121	CB1035
R359	321-0243-00			RES., FXD, FILM: 3.32K OHM, 1%, 0.125W	75042	CEATO-3321F
R360	311-1560-00			RES., VAR, NONWIR: 5K OHM, 5%, 0.50W	73138	91A-5000M
R361	321-0331-00			RES., FXD, FILM: 27.4K OHM, 1%, 0.125W	75042	CEATO-2742F
R369	321-0243-00			RES., FXD, FILM: 3.32K OHM, 1%, 0.125W	75042	CEATO-3321F
R370	311-1560-00			RES., VAR, NONWIR: 5K OHM, 5%, 0.50W	73138	91A-5000M
R371	321-0331-00			RES., FXD, FILM: 27.4K OHM, 1%, 0.125W	75042	CEATO-2742F
R380	315-0223-00			RES., FXD, COMP: 22K OHM, 5%, 0.25W	01121	CB2235
R382	315-0434-00			RES., FXD, COMP: 430K OHM, 5%, 0.25W	01121	CB4345
R386	315-0563-00			RES., FXD, COMP: 56K OHM, 5%, 0.25W	01121	CB5635
R388	315-0563-00			RES., FXD, COMP: 56K OHM, 5%, 0.25W	01121	CB5635
R390	315-0334-00			RES., FXD, COMP: 330K OHM, 5%, 0.25W	01121	CB3345
R392	315-0563-00			RES., FXD, COMP: 56K OHM, 5%, 0.25W	01121	CB5635
R396	315-0104-00			RES., FXD, COMP: 100K OHM, 5%, 0.25W	01121	CB1045
R500	307-0093-00			RES., FXD, COMP: 1.2 OHM, 5%, 0.50W	01121	EB1265
R510	315-0150-00			RES., FXD, COMP: 15 OHM, 5%, 0.25W	01121	CB1505
R512	315-0621-00			RES., FXD, COMP: 620 OHM, 5%, 0.25W	01121	CB6215
R514	315-0132-00			RES., FXD, COMP: 1.3K OHM, 5%, 0.25W	01121	CB1325
R516	315-0132-00			RES., FXD, COMP: 1.3K OHM, 5%, 0.25W	01121	CB1325
R518	321-0252-00			RES., FXD, FILM: 4.12K OHM, 1%, 0.125W	75042	CEATO-4121F
R520	311-1564-00			RES., VAR, NONWIR: 500 OHM, 20%, 0.50W	73138	91A-5000M
R522	321-0222-00			RES., FXD, FILM: 2K OHM, 1%, 0.125W	75042	CEATO-2001F
R528	315-0822-00			RES., FXD, COMP: 8.2K OHM, 5%, 0.25W	01121	CB8225
R530	315-0470-00			RES., FXD, COMP: 47 OHM, 5%, 0.25W	01121	CB4705
R532	315-0150-00			RES., FXD, COMP: 15 OHM, 5%, 0.25W	01121	CB1505
R534	315-0102-00			RES., FXD, COMP: 1K OHM, 5%, 0.25W	01121	CB1025
R540	315-0150-00			RES., FXD, COMP: 15 OHM, 5%, 0.25W	01121	CB1505
R542	315-0132-00			RES., FXD, COMP: 1.3K OHM, 5%, 0.25W	01121	CB1325
R545	301-0104-00			RES., FXD, COMP: 100K OHM, 5%, 0.5W	01121	EB1045
R550	315-0132-00			RES., FXD, COMP: 1.3K OHM, 5%, 0.25W	01121	CB1325
R552	315-0472-00			RES., FXD, COMP: 4.7K OHM, 5%, 0.25W	01121	CB4725
R555	315-0104-00			RES., FXD, COMP: 100K OHM, 5%, 0.25W	01121	CB1045
R557	315-0104-00			RES., FXD, COMP: 100K OHM, 5%, 0.25W	01121	CB1045
R560	315-0150-00			RES., FXD, COMP: 15 OHM, 5%, 0.25W	01121	CB1505
R562	315-0621-00			RES., FXD, COMP: 620 OHM, 5%, 0.25W	01121	CB6215
R564	315-0472-00			RES., FXD, COMP: 4.7K OHM, 5%, 0.25W	01121	CB4725
R566	315-0243-00			RES., FXD, COMP: 24K OHM, 5%, 0.25W	01121	CB2435
R568	321-0343-00			RES., FXD, FILM: 36.5K OHM, 1%, 0.125W	75042	CEATO-3652F
R570	311-1562-00			RES., VAR, NONWIR: 2K OHM, 20%, 0.50W	73138	91A-20000M
R572	321-0343-00			RES., FXD, FILM: 36.5K OHM, 1%, 0.125W	75042	CEATO-3652F
R574	301-0133-00			RES., FXD, COMP: 13K OHM, 5%, 0.50W	01121	EB1335
R576	315-0470-00			RES., FXD, COMP: 47 OHM, 5%, 0.25W	01121	CB4705
R578	315-0150-00			RES., FXD, COMP: 15 OHM, 5%, 0.25W	01121	CB1505
R579	303-0162-00			RES., FXD, COMP: 1.6 OHM, 5%, 1W	01121	GB1625
R580	315-0150-00			RES., FXD, COMP: 15 OHM, 5%, 0.25W	01121	CB1505
R590	305-0621-00			RES., FXD, COMP: 620 OHM, 5%, 2W	01121	HB6215
R592	315-0102-00			RES., FXD, COMP: 1K OHM, 5%, 0.25W	01121	CB1025
R594	321-0301-00			RES., FXD, FILM: 13.3K OHM, 1%, 0.125W	75042	CEATO-1332F
R596	321-0289-00			RES., FXD, FILM: 10K OHM, 1%, 0.125W	75042	CEATO-1002F

Electrical Parts List—PG 505

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R598	315-0393-00			RES.,FXD,COMP:39K OHM,5%,0.25W	01121	CB3935
R610	315-0512-00			RES.,FXD,COMP:5.1K OHM,5%,0.25W	01121	CB5125
R611	301-0182-00			RES.,FXD,COMP:1.8K OHM,5%,0.5W	01121	EB1825
R612	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R614	321-0268-00			RES.,FXD,FILM:6.04K OHM,1%,0.125W	75042	CEAT0-6041F
R615	311-1562-00			RES.,VAR,NONWIR:2K OHM,20%,0.50W	73138	91A-20000M
R617	321-0326-00			RES.,FXD,FILM:24.3K OHM,1%,0.125W	75042	CEAT0-2432F
R620	315-0393-00			RES.,FXD,COMP:39K OHM,5%,0.25W	01121	CB3935
R624	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	75042	CEAT0-1002F
R626	321-0301-00			RES.,FXD,FILM:13.3K OHM,1%,0.125W	75042	CEAT0-1332F
R628	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R630	308-0314-00			RES.,FXD,WW:680 OHM,5%,3W	91637	RS2B-B680R0J
R640	308-0314-00			RES.,FXD,WW:680 OHM,5%,3W	91637	RS2B-B680R0J
R642	307-0114-00			RES.,FXD,COMP:6.2 OHM,5%,0.25W	01121	CB6625
R644	315-0470-00			RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705
R646	315-0362-00			RES.,FXD,COMP:3.6K OHM,5%,0.25W	01121	CB3625
R648	315-0562-00			RES.,FXD,COMP:5.6K OHM,5%,0.25W	01121	CB5625
R650	315-0472-00			RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R652	301-0562-00			RES.,FXD,COMP:5.6K OHM,5%,0.50W	01121	EB5625
R656	321-0256-00			RES.,FXD,FILM:4.53K OHM,1%,0.125W	75042	CEAT0-4531F
R658	311-1562-00			RES.,VAR,NONWIR:2K OHM,20%,0.50W	73138	91A-20000M
R660	321-0343-00			RES.,FXD,FILM:36.5K OHM,1%,0.125W	75042	CEAT0-3652F
S130A,B	263-1015-00			ACTR ASSY,CAM S:PERIOD/PULSE DURATION	80009	263-1015-00
S250	260-1607-00	B010100	B020649	SWITCH,PUSH:1US/10US/100US/1MS	80009	260-1607-00
S250	260-1423-00	B020650		SWITCH,PUSH:1US/10US/100US/1MS	80009	260-1423-00
S290	260-1445-00			SWITCH,PUSH:++ PULSE	80009	260-1445-00
T190	120-0900-00			XMFR.TOROID:TWO 6 TURN WINDINGS	80009	120-0900-00
U175	156-0081-00			MICROCIRCUIT LI:SGL RETRIGGERABLE MV	07263	9601PC — 74122
U610	156-0158-00			MICROCIRCUIT LI:DUAL OPERATIONAL AMPLIFIER	18324	S5558V
VR112	152-0279-00			SEMICONV DEVICE:ZENER,0.4W,5.1V,5%	07910	1N751A
VR120	152-0278-00			SEMICONV DEVICE:ZENER,0.4W,7.5V,5%	07910	1N4372A
VR210	152-0282-00			SEMICONV DEVICE:ZENER,0.4W,30V,5%	04713	1N972B
VR220	152-0514-00			SEMICONV DEVICE:ZENER,0.4W,1W,10%	99942	R4763
VR222	152-0514-00			SEMICONV DEVICE:ZENER,0.4W,1W,10%	99942	R4763
VR520	152-0280-00			SEMICONV DEVICE:ZENER,0.4W,6.2V,5%	04713	1N753A
VR534	152-0168-00			SEMICONV DEVICE:ZENER,0.4W,12V,5%	04713	1N963B
VR542	152-0279-00			SEMICONV DEVICE:ZENER,0.4W,5.1V,5%	07910	1N751A
VR550	152-0280-00			SEMICONV DEVICE:ZENER,0.4W,6.2V,5%	04713	1N753A
VR610	152-0282-00			SEMICONV DEVICE:ZENER,0.4W,30V,5%	04713	1N972B
VR646	152-0282-00			SEMICONV DEVICE:ZENER,0.4W,30V,5%	04713	1N972B
VR650	152-0461-00			SEMICONV DEVICE:ZENER,0.4W,6.2V,5%	04713	1N821

REAR CONNECTOR PIN ASSIGNMENTS

TABLE 2-1

	B		A	
Not Used	28		28	Not Used
Trigger Out	27		27	Not Used
Not Used	26	Signal source barrier slot	26	Not Used
Not Used	25		25	Not Used
External Delay Input	24		24	Not Used
Not Used	23		23	Not Used
Not Used	22		22	Not Used
External Gating Input	21		21	Not Used
Not Used	20		20	Not Used
Not Used	19		19	Not Used
Not Used	18		18	Not Used
Not Used	17		17	Not Used
Not Used	16		16	Not Used
Not Used	15		15	Not Used
Not Used	14		14	Not Used
25 VAC Winding	* 13		13 *	25 VAC Winding
+33.5 V Filtered DC	12		12 *	+33.5 V Filtered DC
Collector of Series Pass Transistor	* 11		11 *	Base of Series Pass Transistor
Transformer Shield	10		10 *	Emitter of Series Pass Transistor
33.5 V Common	9	TM 500 barrier slot	9 *	33.5 V Common
-33.5 V Filtered DC	* 8		8	-33.5 V Filtered DC
Collector of Series Pass Transistor	* 7		7 *	Emitter of Series Pass Transistor
Not Used	6		6 *	Base of Series Transistor
17.5 VAC Winding	5		5	17.5 VAC Winding
+11.5 V Common	* 4		4	+11.5 V Common
+11.5 V Common	* 3		3	+11.5 V Common
+11.5 V Filtered DC	2		2 *	+11.5 V Filtered DC
25 VAC Winding	* 1		1 *	25 VAC Winding
	B		A	

Rear-view of plug-in

Assignments listed for pins 1A-13A and 1B-13B are available in all power modules; however only those pins marked with an asterisk (*) are used by the PG 505.

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(A)

CONTROLS AND CONNECTORS

PERIOD Switch

Switch concentric with PULSE Duration switch, which selects pulse periods from 10 μ s to .1 s in 5 decade steps. Mechanically coupled to PULSE DURATION switch so the period is always greater than the duration when both VARIABLE controls are in the X1 position. Also selects output delayed and custom pulse period modes.

VARIABLE (Period) Control

Provides continuously variable selection of pulse period between calibrated steps. Extends period to at least 1 s in fully cw (> X10) position.

VARIABLE (Pulse Duration) Control

Provides continuously variable selection of pulse duration between calibrated steps. Extends duration to at least 0.5 s in the fully cw (> X10) position.

PULSE DURATION Switch

Switch concentric with PERIOD switch, which selects pulse duration from 5 μ s to 50 ms in 5 decade steps. Mechanically coupled to PERIOD selector so the duration is always less than the period when both VARIABLE controls are in the X1 position. Also selects output locked on, external duration and custom pulse duration modes.

POWER Indicator

Lights when power is applied to the PG 505.

T_R (RISETIME) Control

Provides continuously variable selection of risetime between the decade steps of the RISE AND FALLTIMES push buttons, independent of the T_F control. Extends the risetime to at least 20 ms in the fully cw (X20) position.

T_F (Falltime) Control

Provides continuously variable selection of falltime between the decade steps of the RISE AND FALLTIMES push buttons, independent of the T_R control. Extends the falltime to at least 20 ms in the fully cw (X20) position.

OUTPUT DELAY Control

Provides continuously variable selection of DC level pickoff point (start of pulse duration) from 0 volts to +10 volts on the input signal. Control is used only when PERIOD switch is in output delayed mode.

RISE AND FALLTIMES Pushbuttons

Four self-canceling buttons that select risetime and falltime of individual pulses from 10% to 90% amplitude level and from 90% to 10% level respectively. Four calibrated risetimes or falltimes when T_R and T_F are in fully ccw (X1) position.

INPUT Connector

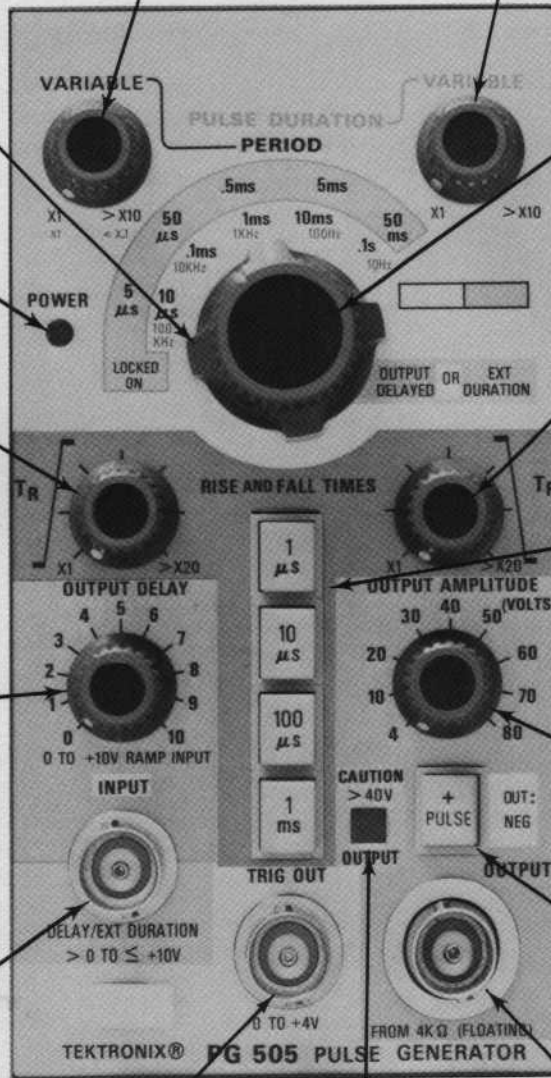
BNC connector for applying an input signal, which in conjunction with the OUTPUT DELAY control, determines the start of the pulse duration when the PERIOD switch is in the output delayed mode. If the PULSE DURATION switch is set to EXT DURATION, the input signal enables an output pulse from the duration generator only for the time that the input signal exceeds +2 volts.

AMPLITUDE Control

Provides continuously variable pulse amplitude from approximately 4 volts to at least 80 volts when output is not terminated.

+ PULSE Pushbutton

A push-push switch that selects either positive-going or negative-going output pulse.



TRIG OUT Connector

BNC connector that provides a +4 volt pulse coinciding with the pulse duration.

CAUTION Indicator

Lights when output pulse amplitude exceeds 40 volts.

OUTPUT Connector

BNC connector providing a floating DC-coupled output pulse signal whose characteristics are determined by the front-panel controls.

CONTROLS, CONNECTORS & REAR CONNECTOR PIN ASSIGNMENTS

ADJUSTMENTS

ADJUSTMENTS

Adjustment is generally required after a repair has been made, or after long time intervals in which normal aging of components may affect instrument accuracy.

Before complete calibration, thoroughly clean and inspect this instrument as outlined in the service section of the Power Module manual. The Power Module manual also contains information for general maintenance of this instrument, including preventive maintenance, component identification and replacement, etc.

Services Available

Tektronix, Inc. provides complete instrument repair and calibration at local Field Service Centers and at the Factory Service Center. Contact your local Tektronix Field Office or representative for further information.

WARNING

Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Disconnect power before cleaning the instrument or replacing parts.

Equipment Required

1. TM 500-Series Power Module having three or more compartments.

2. Variable Auto-transformer. Must be capable of supplying sufficient wattage (depends on what plug-in modules are installed) over a range of 90 to 132 VAC or 180 to 264 VAC. Auto transformer must also have an AC voltmeter to indicate output voltage.

3. Plug-in Extension. Tektronix Calibration Fixture 067-0645-01.

4. DC voltmeter having an accuracy within $\pm 0.1\%$ and a measurement range of + and - 100 volts. For example, a DM 501 Digital Multimeter (operates in a TM 500-Series Power Module), or any DC voltmeter may be used.

5. Function generator having (1) A ramp output signal going between -0.1 V and +10.5 V at a 500 Hz rate and (2) A square wave output signal going between -0.1 V and +1 V at a rate between 0.1 s and 10 μ s. For example, a FG 501 Function Generator (operates in a TM 500-Series Power Module), or any generator having the required functions may be used.

6. Digital counter having (1) A frequency measuring capability from 950 Hz to 105 kHz within ± 5 Hz and (2) A period measuring capability from 10.5 ms to 95 ms within 0.05 ms. For example, a DC 503 Universal Counter (operates in a TM 500-Series Power Module), or any digital counter meeting the above requirements.

7. Test Oscilloscope. Must have a minimum bandpass of 1 MHz and a deflection factor of 0.5 V/div with a 10X probe. For example, a 5103N/D10 Oscilloscope with 5B10N Time Base/Ampl and a 5A18N Dual Trace Amplifier plug-ins and a P6060 Probe, or any oscilloscope -10X probe that will meet the listed requirements may be used.

8. 50 ohm Termination. Connectors, BNC; accuracy within 1%.

9. 'T' Adapter, Connectors, BNC.

10. (3 ea) 50 ohm Coaxial Cables, Connectors, BNC.

Preliminary Procedure

NOTE

The performance of this instrument can be checked at any temperature within the 0°C to +50°C range. Make any adjustment at a temperature of +25°C, ±5°C.

a. Check that the correct nominal line selector block (110 VAC or 220 VAC) has been installed on the line selector pins and that the regulating range selected includes the input line voltage, see Installation section of Power Module manual.

b. Connect Power Module to the variable auto transformer and the auto transformer to the line voltage source.

c. Remove the PG 505 side covers and connect the Pulse Generator to the Power Module, using the plug-in extension.

d. Apply power to the PG 505 by setting the auto transformer to the nominal line voltage that the PG 505 line selector is set to.

e. Connect a 50 ohm termination to the OUTPUT connector.

f. Set the following controls:

PULSE DURATION VARIABLE	50 μ s Fully ccw
PERIOD VARIABLE	1 ms Fully ccw
T_R	Fully ccw
T_F	fully cw
RISE AND FALL TIME Pushbuttons	All buttons out
OUTPUT DELAY	Fully ccw
OUTPUT AMPLITUDE	Fully cw
+ PULSE Pushbutton	Out position

1. Ground Referenced +20 Volt Adjustment R520

Connect the precision DC voltmeter between the +20 V test point and ground. Adjust R529 +20 V Adj for a voltmeter reading of +20 volts, ± 0.1 volt.

2. Ground Referenced Power Supply Voltage Checks

Connect the precision DC voltmeter between each voltage test point and ground. Check that each supply is within the tolerance listed below.

Supply	Tolerance
+12 V	+11 V to +13 V
+5 V	+4.8 V to +5.4 V
-6 V	-5.8 V to -6.6 V

3. Floating Ground + and - 48 Volt Adjustments R570 and R658

Connect the precision DC voltmeter between each test point and floating ground. Adjust R658. -48 V Adj, and R570 +48 V Adj, respectively, for voltmeter readings of exactly 48 volts, ± 0.1 volt.

4. Floating Ground Power Supply Voltage Checks

Connect the precision DC voltmeter between each voltage test point and floating ground. Check that each supply is within the tolerance listed below.

Supply	Tolerance
-20 V	-19.5 V to -20.5 V

5. Power Supply Regulation Checks

Connect a precision DC voltmeter between floating ground and the +48 V test point. Note actual power supply voltage. Vary the auto-transformer output voltage from the lower through the upper line voltage regulating range (see Power Module manual). Output power supply voltage must remain within ± 0.2 V of voltage noted above as line voltage is varied.

Repeat test using chassis ground and the +20 V ground referenced supply test point.

Set auto-transformer to nominal line voltage when check is complete.

ADJUSTMENTS

6. Output Balance Adjustment R615, R370 R360

Set the following controls:

PULSE DURATION	5 μ s
PERIOD	.1 s
VARIABLE	Fully cw

Remove the 50 ohm termination from the OUTPUT connector. Connect a DC voltmeter between the outer (shield) and inner (center) conductors of the OUTPUT BNC connector. Note the voltmeter reading.

Set the OUTPUT AMPLITUDE control to its fully ccw position. Adjust R615, Amp. Bal until the voltmeter reading is the same as previously noted.

With the voltmeter still connected to the OUTPUT connector, adjust R360, + Output Bal for a voltmeter reading of 0 V. Depress the + PULSE pushbutton and adjust R370, - Output Bal for a voltmeter reading of 0 V.

Repeat this step to remove any interaction.

7. Output Frequency Checks and Adjustments, and Output Risetime Checks R135, R150 and R180

Set the following controls:

PULSE DURATION	.5 ms
PERIOD	1 ms
VARIABLE	Fully ccw
OUTPUT AMPLITUDE	Fully ccw
+ PULSE Pushbutton	In position

To the PG 505 OUTPUT connector, connect a 50 ohm termination and a BNC 'T' connector. From the BNC 'T', connect a coaxial cable to the input connector on the digital counter. Connect a second coaxial cable from the BNC 'T' to a vertical input connector on the oscilloscope.

Turn the PG 505 OUTPUT AMPLITUDE control cw until at least a 1 V peak-to-peak oscilloscope display is obtained. Check that the aberrations on the oscilloscope display are not greater than 5% of the signal amplitude. Adjust R135, 1 ms Adj for a digital counter reading of exactly 1000 Hz and R180, .5 ms Adj for an oscilloscope displayed pulse width of exactly 0.5 ms.

Set the PG 505 PULSE DURATION switch to 5 μ s and the PERIOD switch to 10 μ s. Adjust R150, 10 μ s Adj for a digital counter reading of exactly 100 kHz. Check that the oscilloscope displayed pulse width is between 4.75 and 5.25 μ s.

Check the remaining PULSE DURATION and PERIOD switch positions.

PULSE DURATION Switch	PERIOD Switch	Digital Counter Reading Limits	Oscilloscope Displayed Pulse Duration Limits
5 μ s	10 μ s	Adjusted	4.75-5.25 μ s
50 μ s	.1 ms	9.5-10.5 kHz	47.5-52.5 μ s
.5 ms	1 ms	Adjusted	Adjusted
5 ms	10 ms	9.5-10.5 ms	4.75-5.25 ms
50 ms	.1 s	95-105 ms	40-60 ms

Set the controls as indicated and fall times are within their

PULSE DURATION Switch	PERIOD Switch
5 μ s	10 μ s
50 μ s	.1 ms
.5 ms	1 ms
5 ms	10 ms

Leave the PG 505-digital for step 8.

8. Check T_R and T_F

Set the following PULSE DURATION PERIOD RISE AND FALL TIMES Pushbu

With the PG 505 set up the same as T_R control to its oscilloscope display 200 μ s. Return T_R position after check.

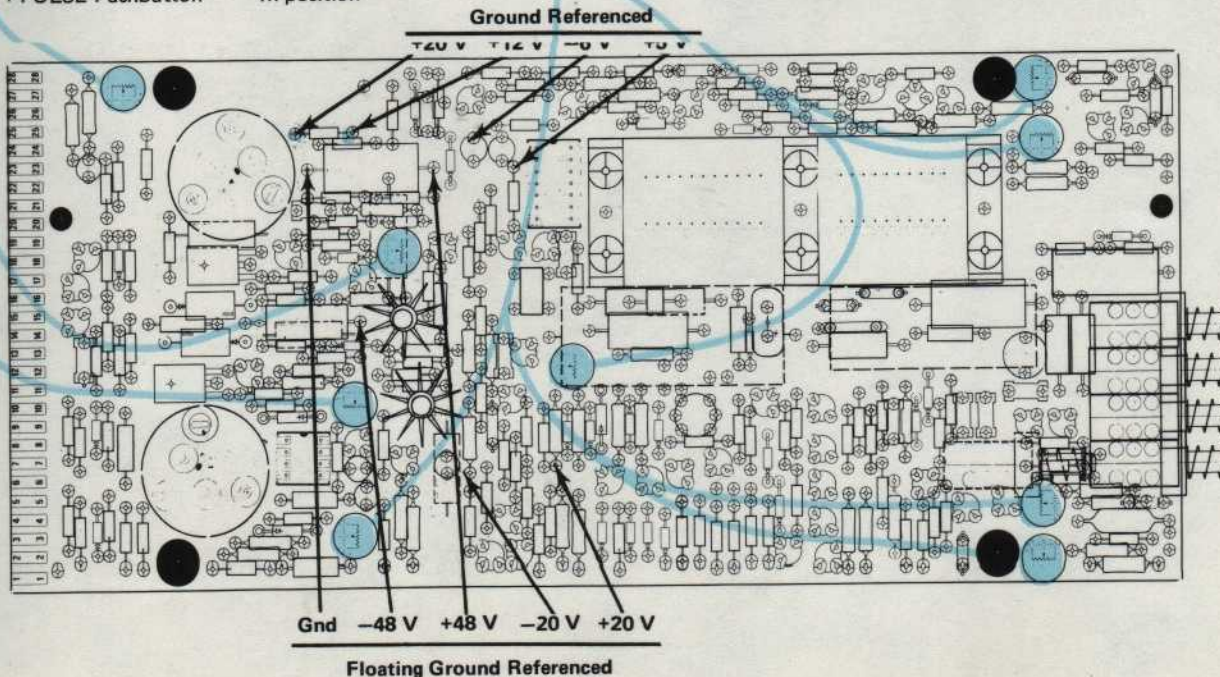
Turn T_F control check oscilloscope at least 200 μ s. Return position after check.

Leave PG 505-d connected for step 9.

9. Check PERIOD DURATION VARIABLE

Set the following PULSE DURATION PERIOD RISE AND FALL TIMES Pushbu

With PG 505-digital set up the same as in step 8 of about 1000 Hz pulse width of about



controls as indicated below and check that the rise times are within their limits.

PERIOD Switch	RISE AND FALL TIMES Pushbutton Depressed	Oscilloscope Displayed Rise and Fall Time Limits
10 μ s	1 μ s	0.95–1.05 μ s
.1 ms	10 μ s	9.5–10.5 μ s
1 ms	100 μ s	95–105 μ s
10 ms	1 ms	0.95–1.05 ms

the PG 505-digital counter-oscilloscope connected

8. Check T_R and T_F Variable Control Range

Set the following controls:

PULSE DURATION	.5 ms
PERIOD	1 ms
RISE AND FALL TIMES Pushbuttons	10 μ s button depressed

With the PG 505-digital counter-oscilloscope set up the same as in step 7, turn the PG 505 T_R control to its fully cw position. Check oscilloscope display for a risetime of at least 200 μ s. Return T_R control to its fully ccw position after check.

Turn T_F control to its fully cw position. Check oscilloscope display for a falltime of at least 200 μ s. Return T_F control to its fully ccw position after check.

Leave PG 505-digital counter-oscilloscope connected for step 9.

9. Check PERIOD VARIABLE And PULSE DURATION VARIABLE Ranges

Set the following controls:

PULSE DURATION	50 μ s
RISE AND FALL-TIMES Pushbuttons	1 μ s

With PG 505-digital counter-oscilloscope set up the same as in step 8, note counter reading of about 1000 Hz and oscilloscope displayed pulse width of about 50 μ s.

Turn PERIOD VARIABLE to its fully cw position and check for a counter reading of at least 10.0 ms. Return PERIOD VARIABLE control to its fully ccw position.

Turn PULSE DURATION VARIABLE to its fully cw position and check oscilloscope display for a pulse width of at least 500 μ s. Return PULSE DURATION VARIABLE control to its fully ccw position.

Disconnect the test equipment from the PG 505.

10. Check Front-Panel External Input and Output Connectors

To the function generator output connector connect a BNC 'T' connector. From the BNC 'T' connect a coaxial cable to the PG 505 INPUT connector. Connect a second coaxial cable from the BNC 'T' to a vertical input channel connector on the oscilloscope. From the PG 505 OUTPUT connector, connect a 50 ohm termination and a coaxial cable to the remaining vertical input channel connector on the oscilloscope.

Adjust the function generator to produce a ramp at about a 500 Hz rate which runs from -0.1 V to +10.5 V. Turn the PG 505 OUTPUT AMPLITUDE control cw until at least a 1 V peak to peak oscilloscope display is obtained. Adjust the oscilloscope triggering controls to trigger on the function generator waveform.

Set the PG 505 PERIOD switch to OUTPUT DELAYED. Check that the pulse output from the PG 505 starts when the function generator ramp passes its 0 V point. Change the PG 505 OUTPUT DELAY control to 10 and check that the PG 505 pulse now does not start until the function generator ramp passes through its +10 V point. Set the PG 505 OUTPUT DELAY control fully ccw.

Adjust the function generator to produce a square wave at about a 500 Hz rate which will go from -0.1 V to at least +1 V. Trigger the oscilloscope on the function generator signal.

Set the PG 505 PULSE DURATION switch to EXT DURATION. Check that the PG 505 pulse is a positive-going (+ PULSE pushbutton in) pulse whose duration is the same as the duration of the positive-going part of the function generator square wave.

Disconnect the test equipment from the PG 505.

With the 50 ohm termination removed from the PG 505 OUTPUT connector, connect a 10X probe from the oscilloscope to the OUTPUT connector. The probe ground lead must connect to the outer (shield) part of the connector. Set the PULSE DURATION switch to 50 μ s, the PERIOD switch to 0.1 ms and the OUTPUT AMPLITUDE control fully cw.

Check the oscilloscope display for a pulse of at least 80 V in amplitude. Change the + PULSE pushbutton to its OUT position and again check for at least an 80 V pulse.

Disconnect the test equipment.

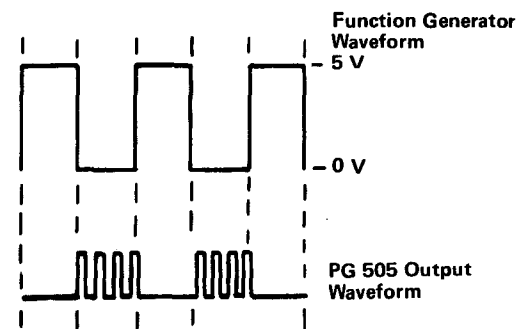
11. Check External Gating (Optional Check)

Set the PG 505 controls as they were at the completion of step 10. From the PG 505 OUTPUT connector connect a 50 ohm termination and a coaxial cable to the vertical input connector on the oscilloscope.

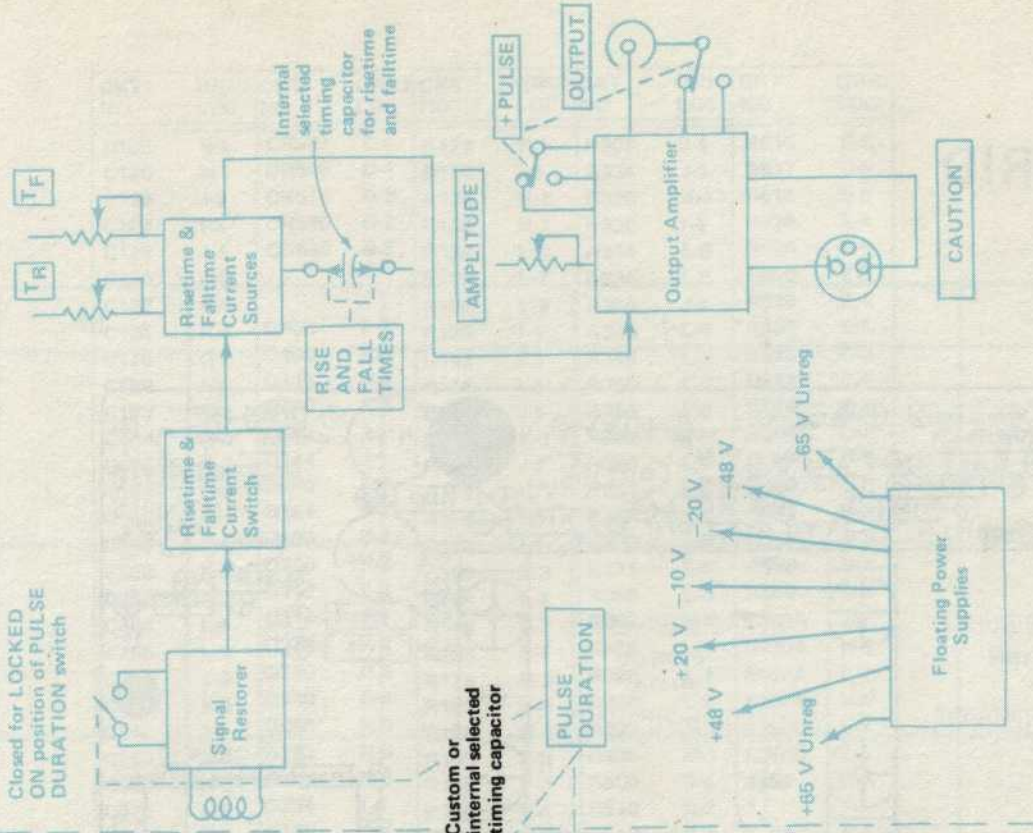
Connect the function generator output connector to the PG 505 rear interface connector, pin 21B (center coaxial conductor) and ground (shield of coaxial cable).

Adjust the function generator to produce a square wave at about a 100 Hz rate which will go from 0 V to +5 V.

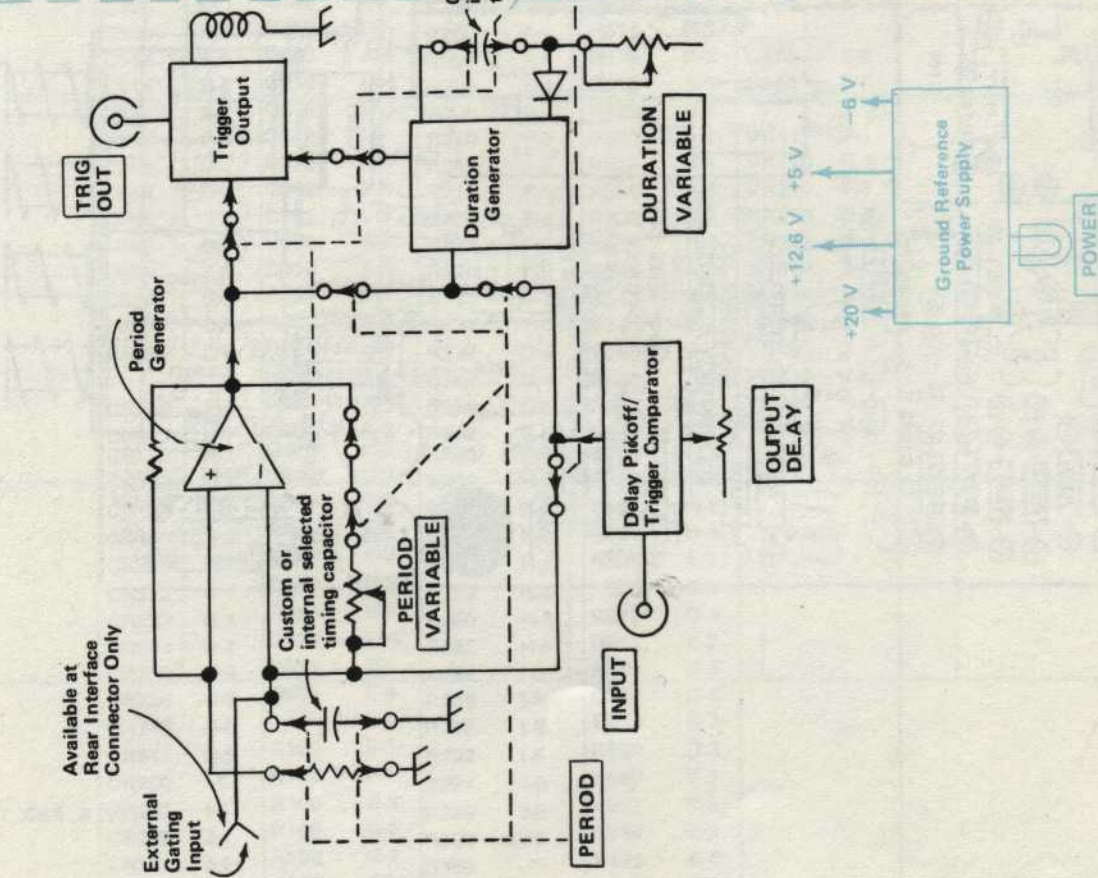
Check the oscilloscope for a display showing groups of PG 505 pulses during the time the function generator square wave is at 0 V and no output pulses when the square wave is at 5 V.



FLOATING CIRCUITRY



NON-FLOATING CIRCUITRY



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THEORY OF OPERATION

DIAGRAM 1

DELAY PICKOFF TRIGGER COMPARATOR

The delay pickoff trigger comparator is composed of differential amplifier Q100-Q102, OUTPUT DELAY control R110, and switching transistor Q115.

Delayed Output

To use this circuit for a delayed output, the PERIOD switch is set to its OUTPUT DELAYED position. The INPUT connector J100 or rear interface pin 24B connects the input signal (usually a ramp) to the base of Q100.

The reference voltage for the differential amplifier is supplied to the base of Q102 from the OUTPUT DELAY control. As long as the signal at the base of Q100 is more negative than the reference voltage at the base of Q102, Q100 and Q115 conducts. As soon as the base of Q100 becomes more positive than the base of Q102, Q100 and Q115 turn off. This applies a high to pin 3 of U175, triggering the duration generator one-shot multivibrator.

External Duration

Set the PULSE DURATION switch to EXT DURATION to use this circuit for an externally controlled duration. The INPUT connector J100 or rear interface pin 24B connects the input signal (usually a pulse) to the base of Q100.

The reference voltage for the differential amplifier is supplied to the base of Q102 from the OUTPUT DELAY control. As long as the signal at the base of Q100 is more negative than the reference voltage at the base of Q102, Q100 and Q115 conduct. With Q115 conducting, the period generator output, and therefore the PG 505 output is low. As soon as the base of Q100 becomes more positive than the base of Q102, Q100 and Q115 turn off. This causes the period generator to go high and stay high as long as Q115 is turned off.

PERIOD GENERATOR

The period generator is a free-running multivibrator that consists of operational amplifier Q140-Q142-Q144, timing capacitors C126 through C134, and timing resistors R128 through R136 and R148 through R152.

The period generator free-runs in all positions of the PERIOD switch and in all but the EXT DURATION position of the PULSE DURATION switch. The period generator sets the basic timing for the pulse generator.

The PULSE DURATION and PERIOD switches are interlocked to prevent the period from exceeding the duration.

In the EXT DURATION position of the PULSE DURATION switch, the negative input to the period generator (base of Q140) is connected to either the INPUT connector J100 or pin 24B of the rear interface connector. The period generator timing components and the output of the duration generator are disconnected. The output of the period generator and therefore the PG 505 output goes high and stays high only as long as Q115 remains turned off.

When the PERIOD switch is set to , a selected capacitor may be connected between two circuit board pads to obtain a custom period.

The free-running period generator can be gated off by applying a 5 volt positive-going pulse whose duration is the same as the off time desired. The +5 volt input pulse at pin 21B of the rear interface connector causes CR122 to be forward biased. With CR122 forward biased, Q140 base is held at about a +2.5 V level, thus stopping the free-running generator.

Using the external gating circuit described above, may cause some time distortion to the first and last pulse of a pulse-string.

DURATION GENERATOR

The duration generator is a retriggerable one-shot multivibrator consisting of integrated circuit U175, timing capacitors C180 through C188, and timing resistors R176 through R186.

A high applied to pin 3 of U175 triggers the one-shot multivibrator to produce a single, positive-going pulse at pin 8. The width of the pulse is determined by the timing capacitors and resistors. When the PULSE DURATION switch is set to , a selected capacitor may be connected between two circuit board pads to obtain a custom duration.

A low from the delay pickoff comparator disables the duration generator until the input ramp causes the output of the delay pickoff comparator to switch to its high state. The high at pin 3 of U175 enables the duration generator. The duration generator now operates as it would normally. The period of the pulse is determined by the repetition rate of the input signal to the delay pickoff comparator.

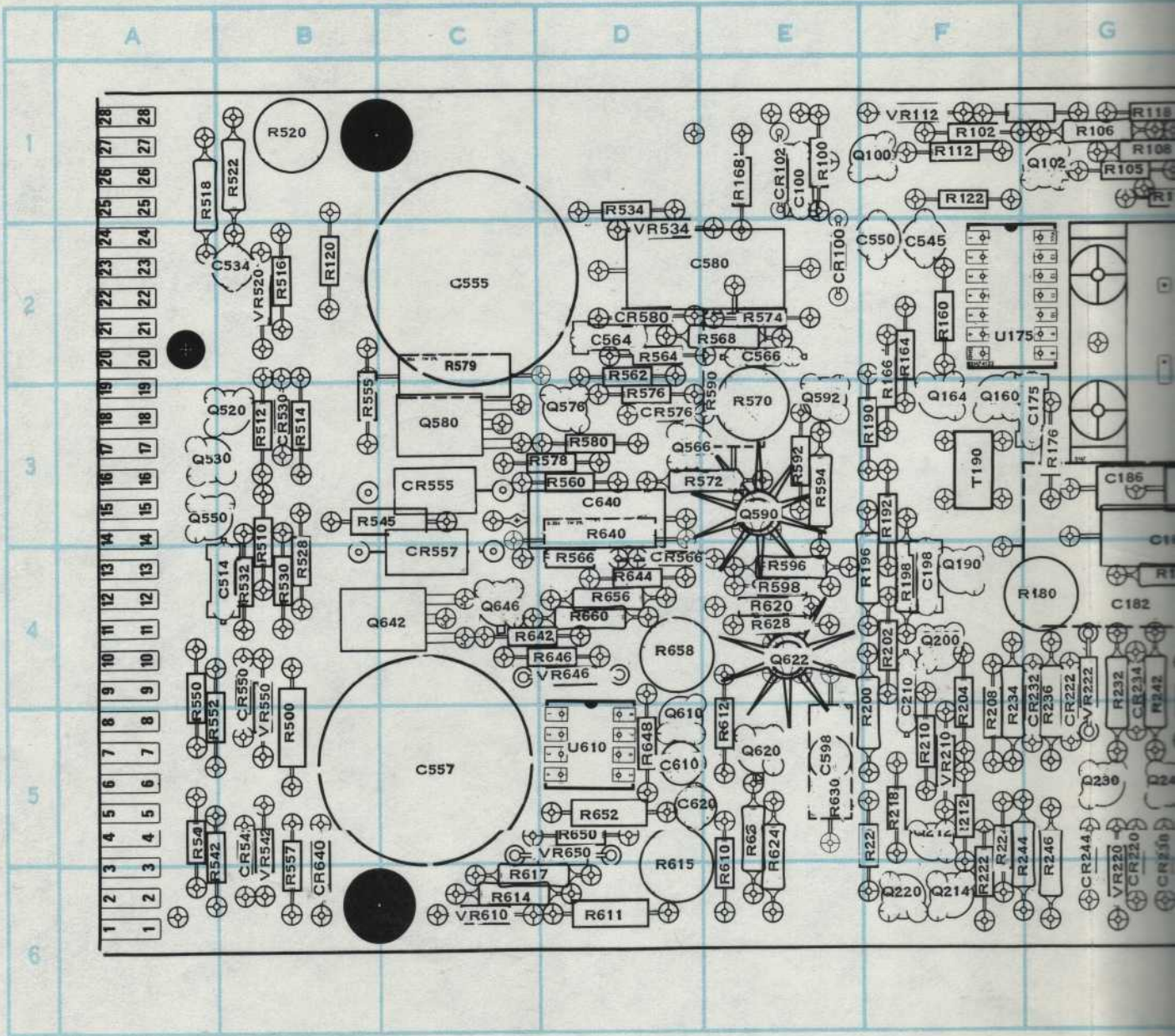
The duration generator output is disconnected from the remainder of the PG 505 circuitry in the EXT DURATION position of the PULSE DURATION switch.

TRIGGER OUTPUT

Emitter follower Q164, inverter-amplifier Q160, and one-half of coupling transformer T190 compose the trigger output. Q164 provides a low impedance point for the trigger output signal from either the front panel TRIG OUT J170 connector or pin 27B on the rear interface.

Q160 is inserted into the circuit (to invert the output of the period generator) whenever the PULSE DURATION switch is set to its EXT DURATION position.

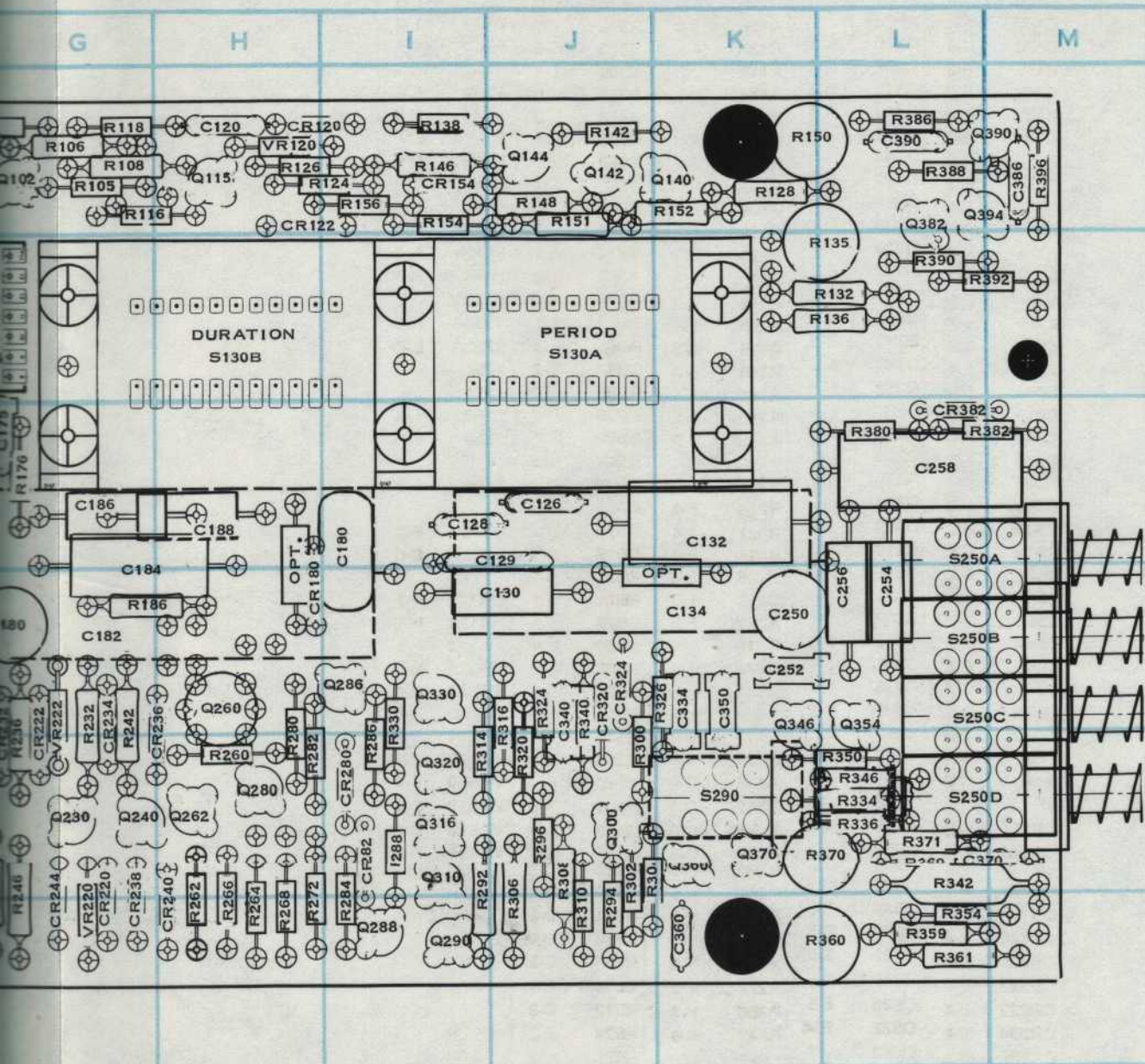
PARTS LOCATION



Located on back of board.

R579 R114
C156

LOCATION GRID



REV. B, FEB. 1975



CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C100	E-1	CR557	C-4	R122	F-1	R320	J-4	R615	D-6
C120	H-1	CR566	D-4	R124	I-1	R324	J-4	R617	C-6
C126	J-3	CR576	D-3	R126	H-1	R326	K-4	R618	E-5
C128	I-3	CR580	D-2	R128	K-1	R330	I-4	R620	E-4
C129	J-3	CR640	B-5	R132	L-2	R334	L-5	R624	E-5
C130	J-4			R135	L-2	R336	L-5	R626	E-5
C132	K-3			R136	L-2	R340	J-4	R628	E-4
C134	K-4	Q100	F-1	R138	I-1	R342	L-5	R630	E-5
C175	G-3	Q102	G-1	R142	J-1	R346	L-5	R640	D-3
C180	I-3	Q115	H-1	R146	I-1	R350	L-5	R642	C-4
C182	G-4	Q140	K-1	R148	J-1	R354	L-6	R644	D-4
C184	G-4	Q142	J-1	R150	K-1	R359	L-6	R646	D-4
C186	G-3	Q144	J-1	R151	J-1	R360	L-6	R648	D-5
C188	H-3	Q160	F-3	R152	K-1	R361	L-6	R650	D-5
C198	F-4	Q164	F-3	R154	I-1	R369	L-5	R652	D-5
C210	F-4	Q190	F-4	R156	I-1	R370	L-5	R656	D-4
C250	K-4	Q200	F-4	R160	F-2	R371	L-5	R658	D-4
C252	K-4	Q212	F-5	R164	F-2	R380	L-3	R660	D-4
C254	L-4	Q214	F-6	R166	F-2	R382	M-3	S130A	J-2
C256	L-4	Q220	F-6	R168	E-1	R386	L-1	S130B	H-2
C258	L-3	Q230	G-5	R176	G-3	R388	L-1	S250A	L-4
C334	K-4	Q240	G-5	R180	G-4	R390	L-2	S250B	L-4
C340	J-4	Q260	H-4	R186	G-4	R392	M-2	S250C	L-4
C350	K-4	Q262	H-5	R190	F-3	R396	M-1	S250D	L-5
C360	K-6	Q280	H-5	R192	F-3	R500	B-5	S290	K-5
C370	L-5	Q286	I-4	R196	F-4	R510	B-3		
C386	M-1	Q288	I-6	R198	F-4	R512	B-3	T190	F-3
C390	L-1	Q290	I-6	R200	F-4	R514	B-3		
C545	F-2	Q300	J-5	R202	F-4	R516	B-2	U175	F-2
C514	B-4	Q310	I-5	R204	F-4	R518	A-1	U610	D-5
C534	B-2	Q316	I-5	R208	F-4	R520	B-1		
C550	F-2	Q320	I-5	R210	F-5	R522	B-1	VR112	F-1
C555	C-2	Q330	I-4	R212	F-5	R528	B-4	VR120	H-1
C564	D-2	Q346	K-4	R218	F-5	R530	B-4	VR210	F-5
C566	E-2	Q354	L-4	R220	F-5	R532	B-4	VR220	G-5
C580	D-2	Q360	K-5	R222	F-6	R534	D-1	VR222	G-4
C598	E-5	Q370	K-5	R224	F-5	R540	A-5	VR520	B-2
C610	D-5	Q382	L-1	R232	G-4	R542	A-5	VR534	D-2
C620	D-5	Q390	M-1	R234	F-4	R545	B-3	VR542	B-5
C640	D-3	Q394	M-1	R236	G-4	R550	A-4	VR550	B-4
		Q520	B-3	R242	G-4	R552	A-5	VR610	C-6
CR100	E-2	Q530	A-3	R244	G-5	R555	B-3	VR646	D-4
CR102	E-1	Q550	A-3	R246	G-5	R557	B-5	VR650	D-5
CR120	H-1	Q566	D-3	R260	H-5	R560	D-3		
CR122	H-1	Q576	D-3	R262	H-5	R562	D-2		
CR154	I-1	Q580	C-3	R264	H-5	R564	D-2		
CR180	H-4	Q590	E-3	R266	H-5	R566	D-4		
CR220	G-6	Q592	E-3	R268	H-5	R568	E-2		
CR222	G-4	Q610	D-5	R272	H-5	R570	E-3		
CR232	G-4	Q620	E-5	R280	H-4	R572	D-3		
CR234	G-4	Q622	E04	R282	H-5	R574	E-2		
CR236	H-4	Q642	C-4	R284	I-5	R576	D-3		
CR238	G-5	Q646	C-4	R286	I-5	R578	D-3		
CR240	H-5			R288	I-5	R579	C-2		
CR244	G-5	R100	E-1	R292	I-5	R580	D-3		
CR280	I-5	R102	F-1	R294	J-6	R590	E-3		
CR282	I-5	R105	G-1	R296	J-5	R592	E-3		
CR320	J-4	R106	G-1	R300	J-5	R594	E-3		
CR324	J-4	R108	G-1	R302	J-5	R596	E-4		
CR382	L-3	R112	F-1	R304	J-5	R598	E-4		
CR530	B-3	R114	G-1	R306	J-5	R610	E-5		
CR542	B-5	R116	G-1	R308	J-5	R611	D-6		
CR550	B-4	R118	G-1	R310	J-5	R612	E-5		
CR555	C-3	R120	B-2	R314	I-5	R614	C-6		
				R316	J-4				

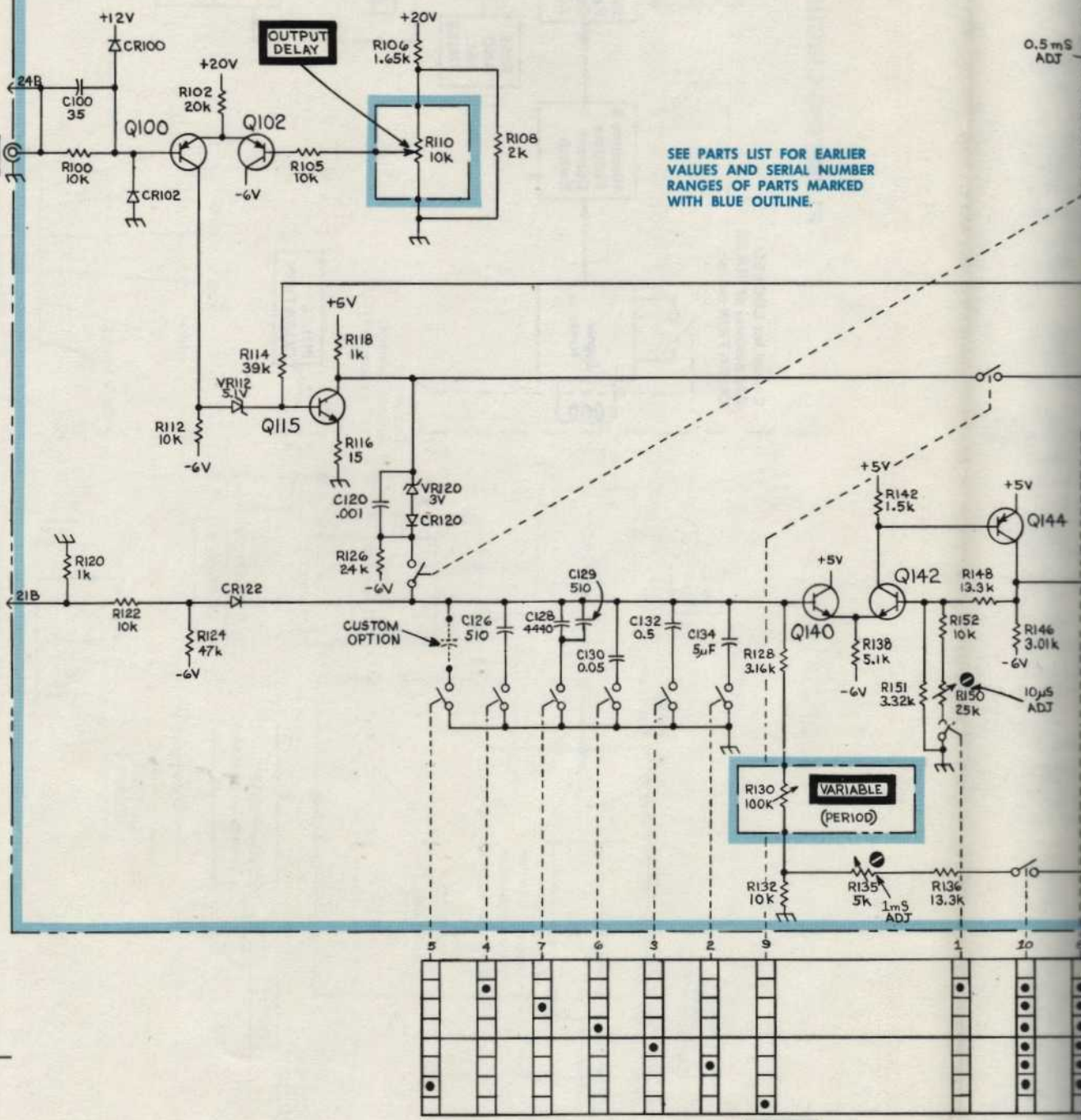
PULSE DURATION
(REAR) S130B

J100
DELAY/EXT
DURATION

OUTPUT
DELAY

SEE PARTS LIST FOR EARLIER
VALUES AND SERIAL NUMBER
RANGES OF PARTS MARKED
WITH BLUE OUTLINE.

0.5mS
ADJ

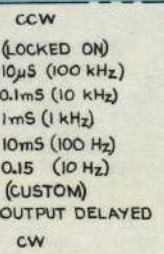
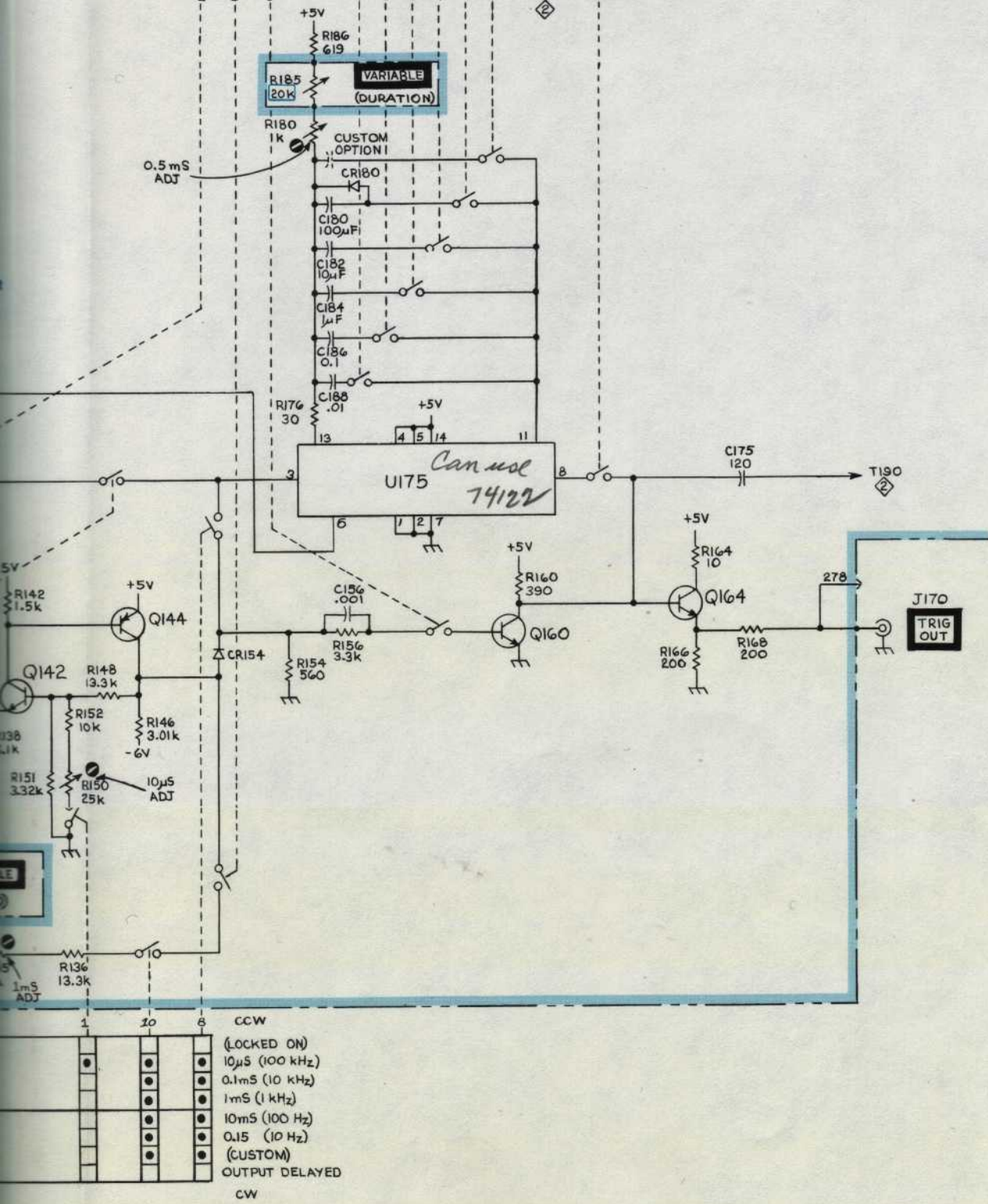
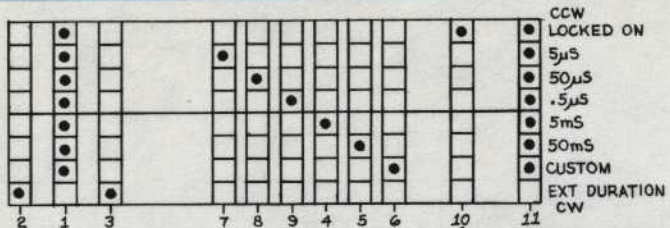


PERIOD

S130A (FRONT)

REV. B, SEPT. 1974

USE DURATION
REAR) S130B



SIGNAL RESTORER

The Signal Restorer circuit is composed of Q190 and Q200, a Schmitt multivibrator.

The alternating, differentiated, positive and negative peaks applied to the base of Q190 result in a square wave at the collector of Q200, since a positive peak at the base of Q190 causes the collector of Q100 to be high, while a low at the base of Q190 causes the collector of Q200 to be low.

In the LOCKED ON position of the PULSE DURATION switch, the base of Q200 is tied to a negative voltage, causing the collector of Q200 to remain high. The output of the PG 505 is now a DC level controlled by the AMPLITUDE control.

RISETIME AND FALLTIME CURRENT SWITCH

Emitter coupled switch Q212-Q214-Q220 make up the risetime and falltime current switch.

The square-wave output of the signal restorer is coupled to the input of the emitter coupled switch, which is an active pull-up, pull-down switch. When the square wave at the base of Q212 is high, Q220 conducts (Q214 is turned off) and the common collector point with Q214 is high. When the square wave goes low at the base of Q212, Q214 conducts (Q220 is now turned off) and the common collector point with Q220 is low.

RISETIME AND FALLTIME CURRENT SOURCES

The risetime and falltime current sources are composed of amplitude limiting Zener diodes VR220-VR222, diode bridge CR234 through CR240, risetime constant current source Q230, T_R control R230, falltime constant current source Q240, and T_F control R240.

VR220 and VR222 limit the square wave to the diode bridge to 20 volts peak to peak. A positive-going 10 volt square wave at the input to the diode bridge forward biases CR238. With CR238 turned on, all the current the falltime constant current source can supply is demanded by Q220. The risetime constant current source now supplies current at a rate determined by T_R control R230, to charge a capacitor (C250 through C258), via CR236, to the same voltage that is at the input to the diode bridge. CR240 acts in this condition to limit the maximum voltage the capacitor can attain. A negative-going 10 volt square wave at the diode bridge input forward biases CR234. All of the risetime constant current source current is now demanded by Q214. The falltime constant current source now supplies current to charge the capacitor via CR240 negatively to the

same voltage that is at the diode bridge input. CR236 in this case acts to limit the maximum capacitor charge voltage.

OUTPUT AMPLIFIER

The output amplifier is composed of source follower Q260, emitter followers Q262-Q280, complementary-symmetry stage Q286-Q288, operational amplifier Q290-Q310-Q316-Q320-Q330-Q346-Q354, constant current source Q300, indicator control transistors, Q382, Q390, and Q394, and output reference supplies Q370 and Q360.

Field effect transistor (FET) Q260A, connected as a source follower, presents a high impedance to the input signal from the current sources and a low impedance to the base of Q262. FET Q260B is connected as a current source; this minimizes DC level shift between the gate and source of Q260A, since both FET halves are alike in characteristics. Q262 and Q280 are both emitter followers; one is a PNP type and the other a NPN type transistor to eliminate any V_{BE} problem. Q286 and Q288 form a complementary-symmetry circuit to drive low input resistances that might be connected to the OUTPUT connector J340.

Q290, Q310, Q316, Q320, Q330, Q346 and Q354 compose an operational amplifier stage whose gain is about 4.0. With the front-panel + PULSE pushbutton pushed in (positive-going pulse output), the feedback resistors for the operational amplifier are R340 and R306, while the effective input resistance is R306 (actual stage input resistor is R292). When the + PULSE pushbutton is in its extended position (negative-going pulse output), the feedback resistor is R340 and R308 is the input resistor. Q346 and Q354 form a complementary-symmetry circuit to drive low input resistances that might be connected to the OUTPUT connector J340.

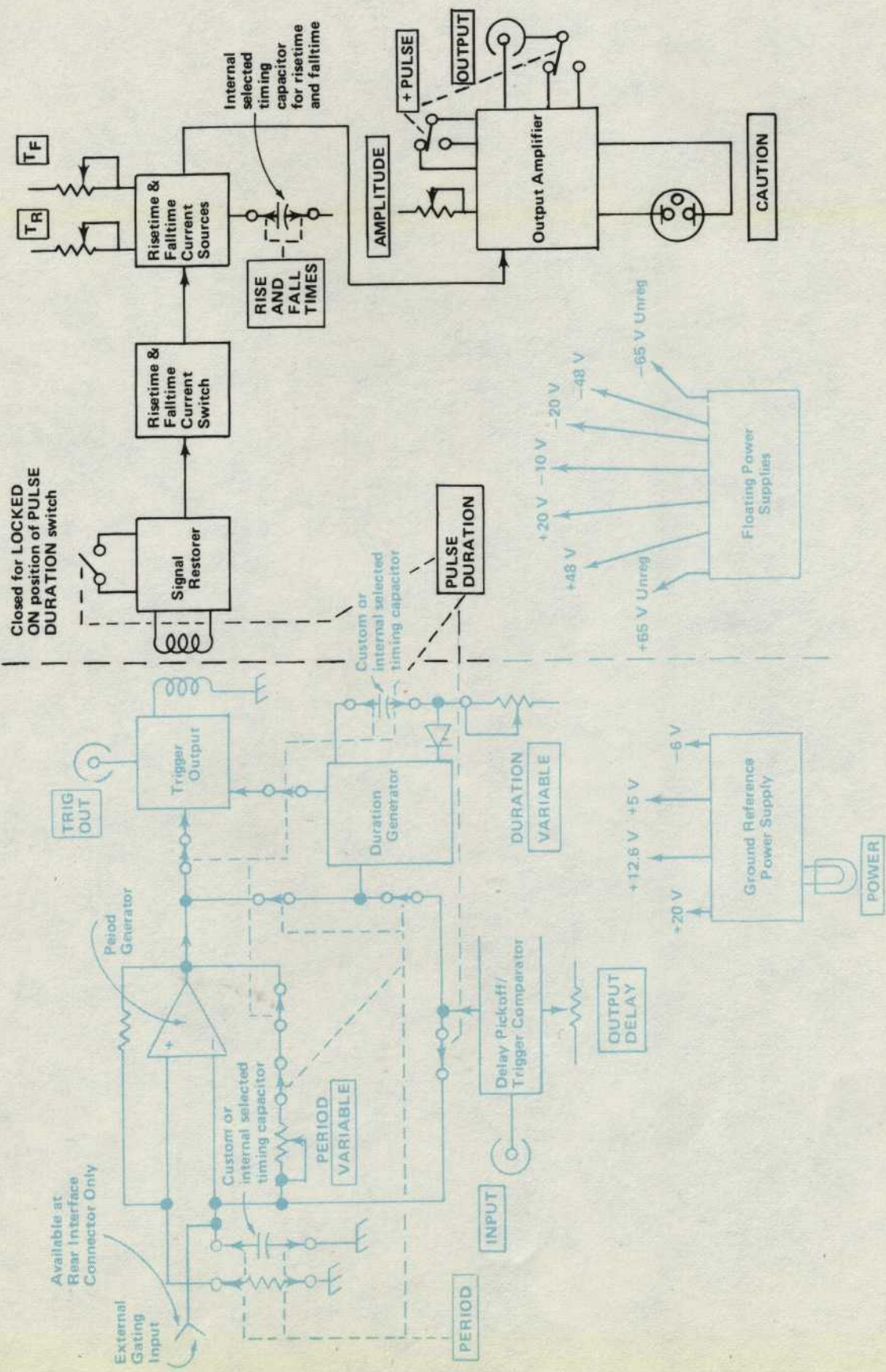
Q300 forms a constant current source that furnishes current to the normal Q290 and invert Q310 inputs to the operational amplifier.

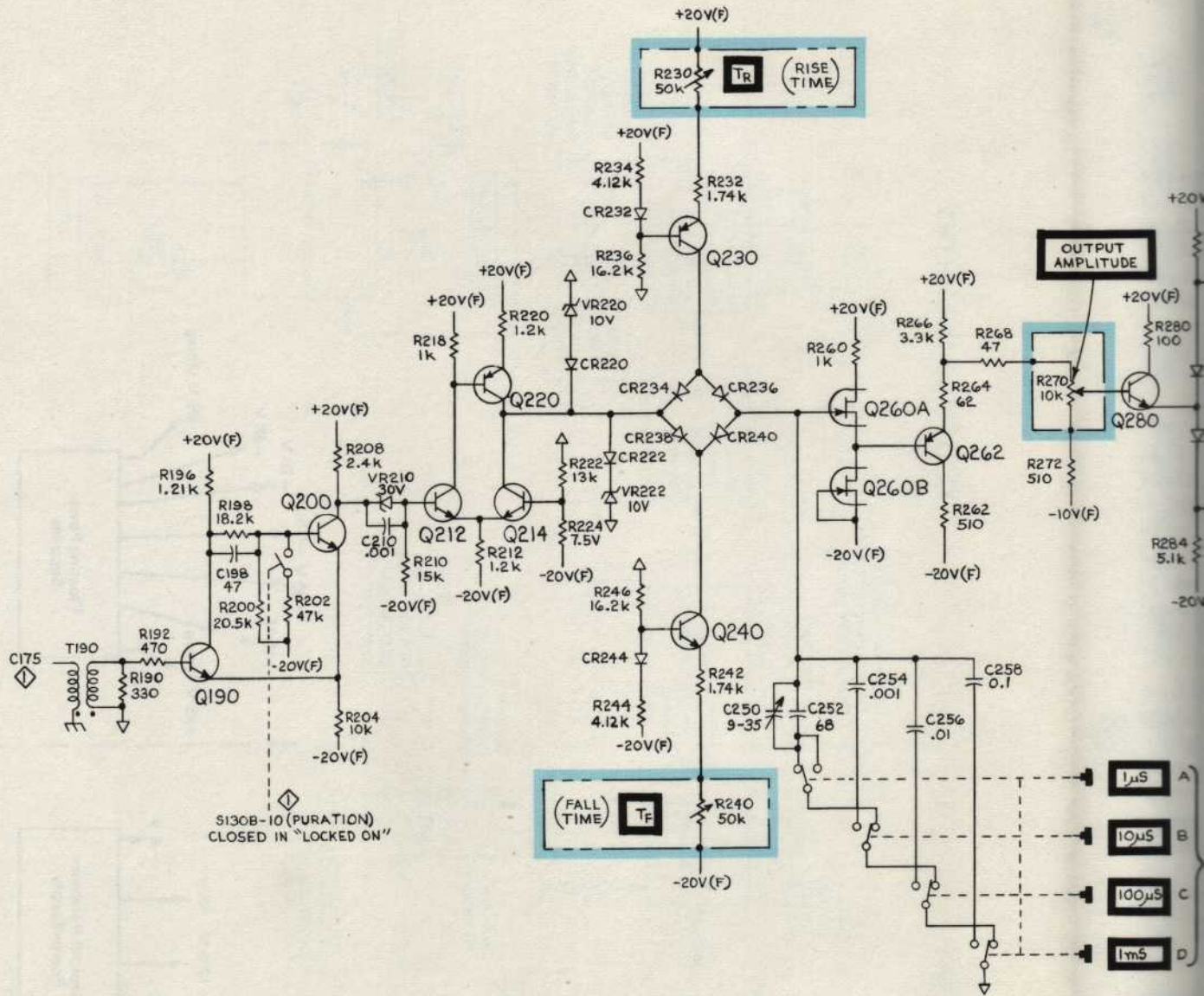
The CAUTION indicator turns on whenever the base of Q382 is at about 0 volts with respect to floating ground, which turns on Q382, Q390 and Q394. The approximate 0 volts at the base of Q382 is equivalent to an output voltage of about 40 volts or more.

To achieve the large amplitude swing required of the amplifier, two reference supplies (referenced to internal floating ground) are used to establish the baseline of the signal. The Q360 emitter follower -48 volt supply is connected to the shield part of OUTPUT connector J340 whenever the + PULSE pushbutton is in for a positive-going pulse. The +48 volt supply is the reference supply for negative-going pulses. The -10 volts that is connected to one end of the AMPLITUDE control offsets the square-wave so it will match the baseline reference voltage at the OUTPUT connector.

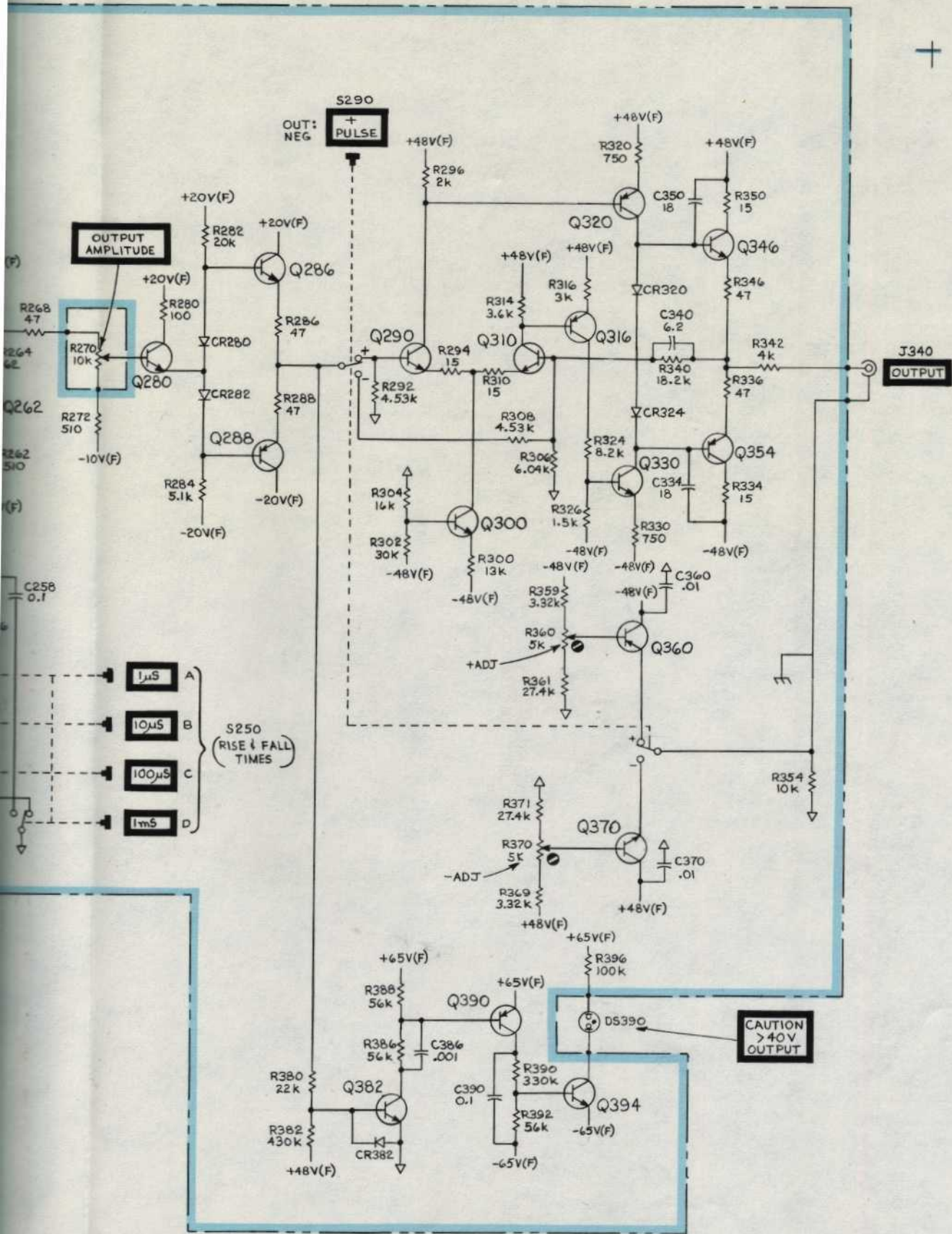
NON-FLOATING CIRCUITRY

FLOATING CIRCUITRY





+



THEORY OF OPERATION

DIAGRAM

3

POWER SUPPLIES

Ground Reference Power Supplies

+20 Volt Supply. The regulator for the +20 volt supply consists of Q520, an error sensing and amplifier transistor, Q530, an error amplifier and regulator transistor, and the series pass transistor that is located in the power module mainframe. The supply voltage is established by comparing the supply voltage sample, which is established by R520 (+20 V cal) at the base of Q520, with the reference voltage established by VR520 at the emitter of Q520. Any difference between the Q520 base and emitter voltage is amplified by Q520 and Q530, and used to change the conduction of the series pass transistor to correct the output voltage. R514 provides current limiting for Q520 in case Q530 fails. C514 prevents regulator oscillation.

+12.6 Volt Supply. The +12.6 volt supply is derived from the +20 volt supply. The supply consists of voltage dropping resistor R534, and Zener diode VR534.

+5 Volt Supply. The +5 volt supply is derived from the +20 volt supply. The supply consists of voltage dropping resistor R542, Zener diode VR542, emitter follower transistor (located in the power module mainframe), and the temperature compensation diode CR542.

-6 Volt Supply. The -6 volt supply is derived from the TM 500 Series Power Module -33.5 volt unregulated supply. Zener diode VR550 sets the base voltage of emitter follower Q550 and provides some regulation. CR550 provides temperature compensation.

Floating Power Supplies

-48 Volt Supply. Two 25 volt AC windings are connected in series to supply about 50 volts AC from the TM 500 Series Power Module to the -48 volt regulator. The regulator for the -48 volt supply consists of operational amplifier U610A, series pass transistor Q642, and level shifting Zener diode VR646. The gain of the amplifier is set by R656, R658 and R660. R656 is the input resistor while R658 and R660 are the feedback resistors for the operational amplifier. The gain of the amplifier is set to about eight times by R658 (-48 V cal). The supply voltage is established by comparing the voltage at the negative input of U610A with the voltage reference at the positive

input. Any differences between the negative and positive inputs to U610A causes a change in the conduction of Q642 to correct for the output error. Level shifting Zener diode VR646 allows U610A which has a V_{cc} of 30 volts to be used to regulate a much higher voltage. Q646 protects the supply in the event of a current overload. The overload will cause Q646 to turn on which biases Q642 off, shutting the -48 volt supply off. R640 is a shunt resistor for Q642 to reduce its temperature.

-20 Volt Supply. The -20 volt supply is derived from the -48 volt supply. The supply consists of voltage divider resistors R626-R624 and operational amplifier Q620-Q622. The operational amplifier has a unity gain. The supply voltage is established by comparing the voltage at the collector of Q622 with the reference voltage at the base of Q620. Any differences between the two voltages will cause a change in the output that corrects the output error.

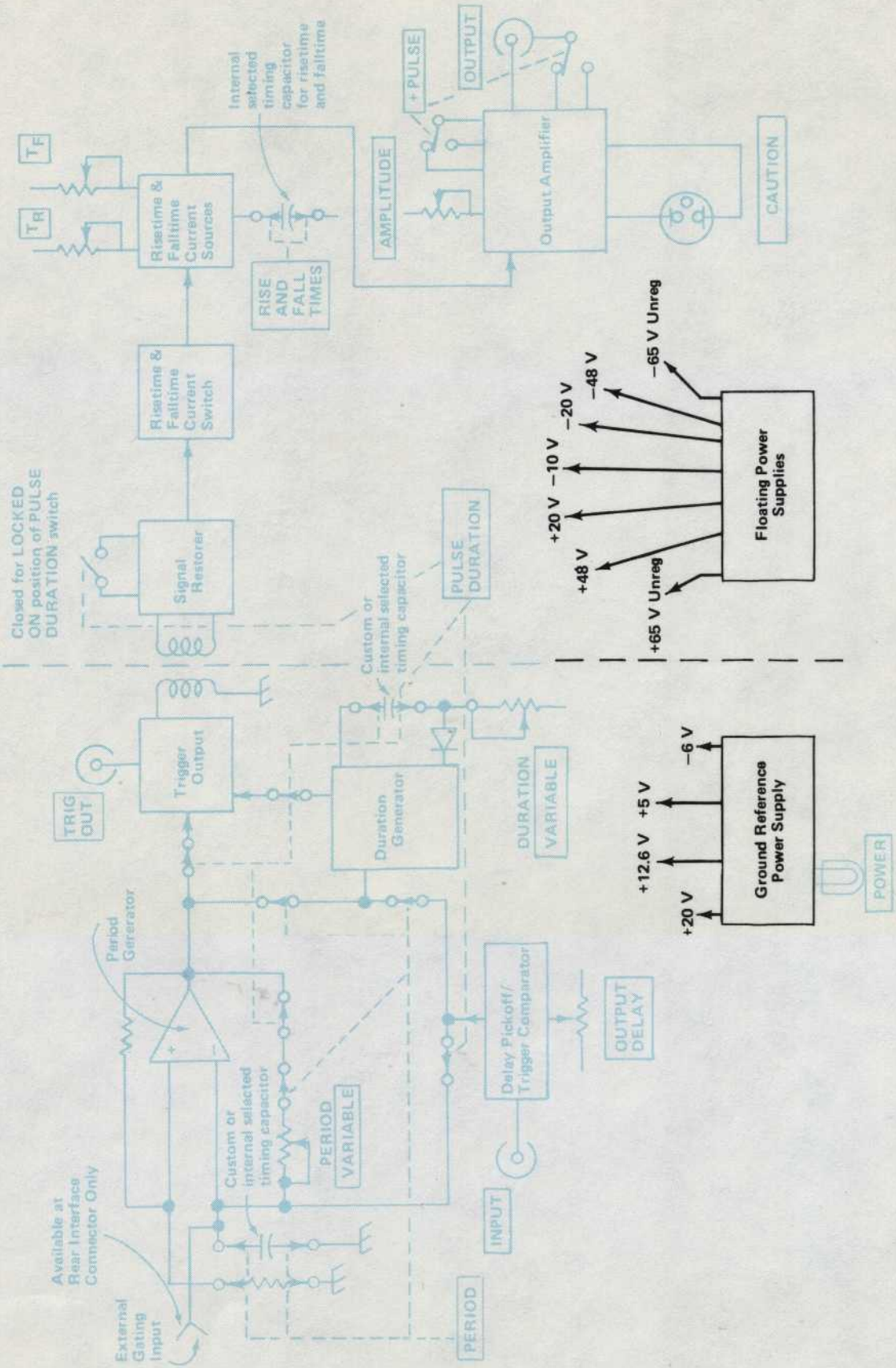
Output Balance Reference. The reference is derived from the -48 volt supply. The reference consists of voltage divider resistors R617-R615-R614, operational amplifier U610B and emitter follower Q610. The operational amplifier has a unity gain. The output balance reference voltage is established by comparing the voltage at the negative input of U610B with the reference voltage at the positive input which is set by R615 (-10 V cal). Any differences between the two inputs of U610B will cause a change in its output so as to correct for the output error.

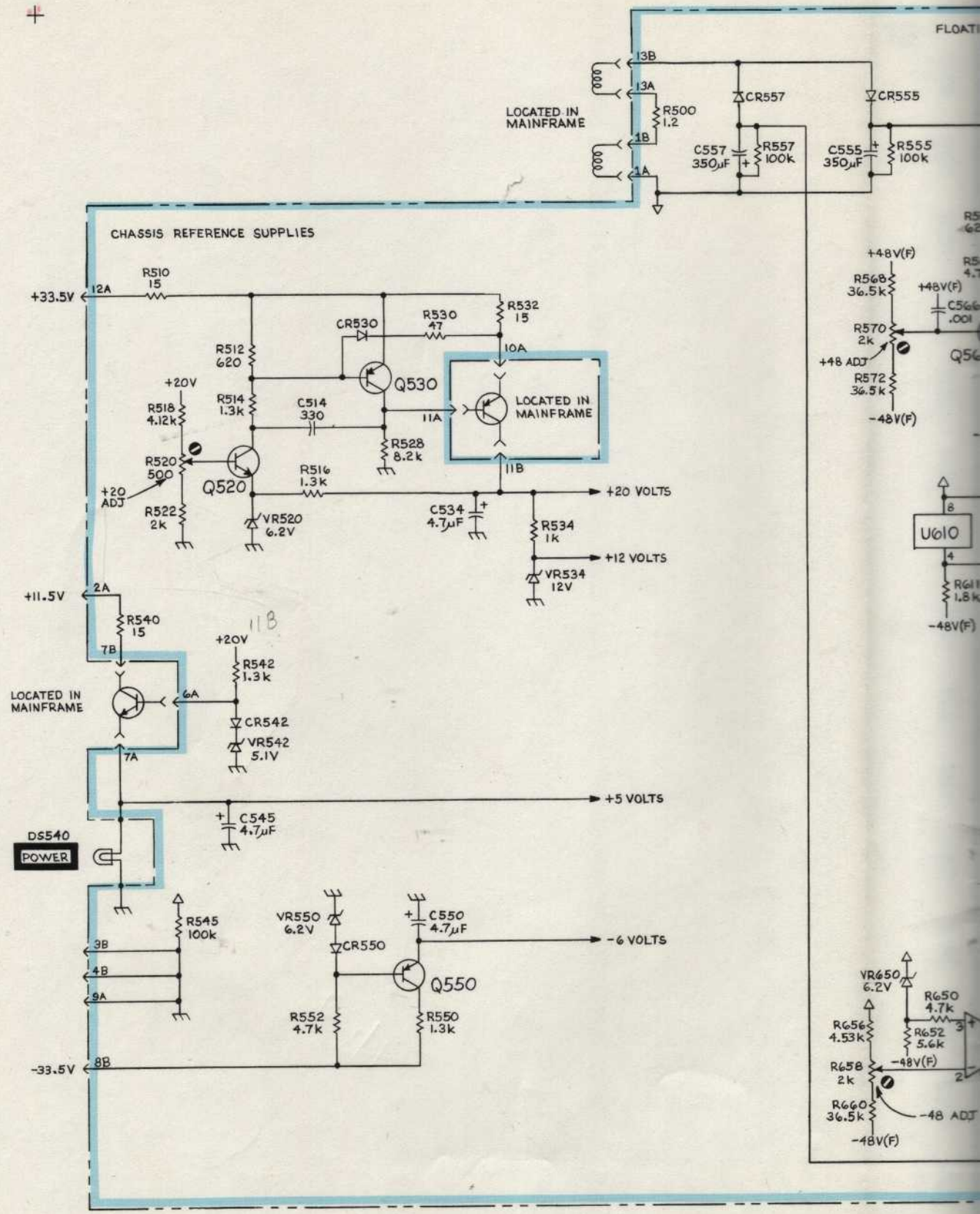
+48 Volt Supply. The regulator for the +40 volt supply consists of Q566 an error sensing and amplifier transistor, Q576 an error amplifier and regulator transistor, and Q580 the series pass transistor. The supply voltage is established by comparing the supply voltage sample, which is established by R570 (+48 V cal), at the base of Q566 with the reference voltage established by the -48 volt supply and diode CR566 at the emitter of Q566. Any difference between ground and the Q566 base and emitter is amplified by Q566 and Q576, and used to change the conduction of Q580 to correct the output voltage. R564 provides current limiting for Q566 in case Q576 fails. C564 prevents regulator oscillation. R579 is a shunt resistor for Q580 to reduce its temperature.

+20 Volt Supply. The +20 volt and -20 volt supplies are similar in operation.

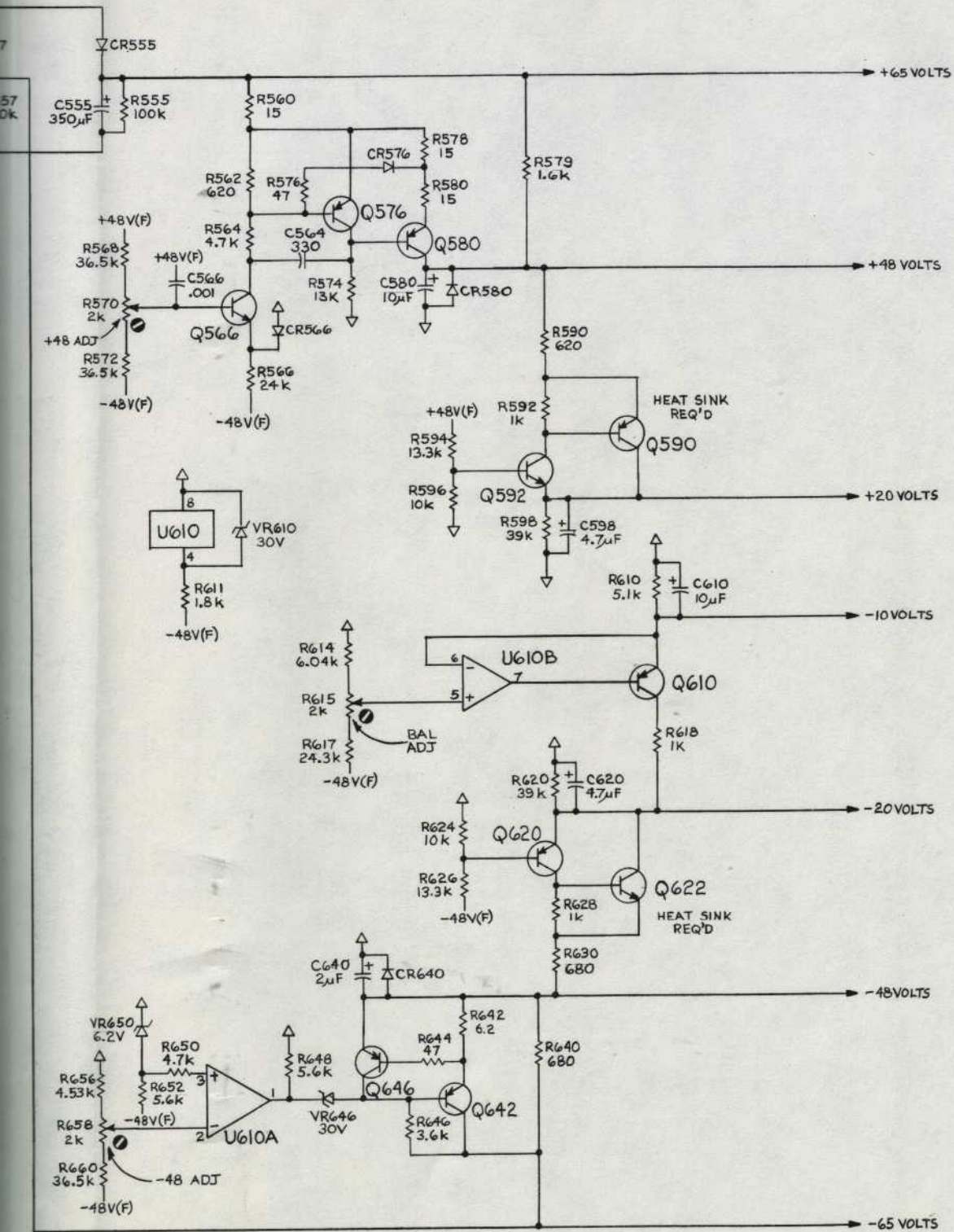
NON-FLOATING CIRCUITRY

FLOATING CIRCUITRY





FLOATING (F) SUPPLIES



REPLACEABLE MECHANICAL PARTS

PARTS ORDERING INFORMATION

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

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, instrument type or number, serial number, and modification number if applicable.

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

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number
00X Part removed after this serial number

FIGURE AND INDEX NUMBERS

Items in this section are referenced by figure and index numbers to the illustrations.

INDENTATION SYSTEM

This mechanical parts list is indented to indicate item relationships. Following is an example of the indentation system used in the description column.

```

1 2 3 4 5           Name & Description
Assembly and/or Component
Attaching parts for Assembly and/or Component
----*----
Detail Part of Assembly and/or Component
Attaching parts for Detail Part
----*----
Parts of Detail Part
Attaching parts for Parts of Detail Part
----*----

```

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. The separation symbol ---*--- indicates the end of attaching parts.

Attaching parts must be purchased separately, unless otherwise specified.

ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

ABBREVIATIONS

#	INCH	ELCTRN	ELECTRON	IN	INCH	SE	SINGLE END
ACTR	NUMBER SIZE	ELEC	ELECTRICAL	INCAND	INCANDESCENT	SECT	SECTION
ADPTR	ACTUATOR	ELCTLT	ELECTROLYTIC	INSUL	INSULATOR	SEMICOND	SEMICONDUCTOR
ALIGN	ADAPTER	ELEM	ELEMENT	INTL	INTERNAL	SHLD	SHIELD
AL	ALIGNMENT	EPL	ELECTRICAL PARTS LIST	LPHLDR	LAMPHOLDER	SHLDR	SHOULDERED
ALUM	ALUMINUM	EQPT	EQUIPMENT	MACH	MACHINE	SKT	SOCKET
ASSEM	ASSEMBLED	EXT	EXTERNAL	MECH	MECHANICAL	SL	SLIDE
ASSY	ASSEMBLY	FIL	FILLISTER HEAD	MTG	MOUNTING	SLFLKG	SELF-LOCKING
ATTEN	ATTENUATOR	FLEX	FLEXIBLE	NIP	NIPPLE	SLVG	SLEEVING
AWG	AMERICAN WIRE GAGE	FLH	FLAT HEAD	NON WIRE	NOT WIRE WOUND	SPR	SPRING
BD	BOARD	FLTR	FILTER	OBD	ORDER BY DESCRIPTION	SQ	SQUARE
BRKT	BRACKET	FR	FRAME or FRONT	OD	OUTSIDE DIAMETER	SST	STAINLESS STEEL
BR	BRASS	FSTNR	FASTENER	OVH	OVAL HEAD	STL	STEEL
BRZ	BRONZE	FT	FOOT	PH BRZ	PHOSPHOR BRONZE	SW	SWITCH
BSHG	BUSHING	FXD	FIXED	PL	PLAIN or PLATE	T	TUBE
CAB	CABINET	GSKT	GASKET	PLSTC	PLASTIC	TERM	TERMINAL
CAP	CAPACITOR	HDL	HANDLE	PN	PART NUMBER	THD	THREAD
CER	CERAMIC	HEX	HEXAGON	PNH	PAN HEAD	THK	THICK
CHAS	CHASSIS	HEX HD	HEXAGONAL HEAD	PWR	POWER	TNSN	TENSION
CKT	CIRCUIT	HEX SOC	HEXAGONAL SOCKET	RCPT	RECEPTACLE	TPG	TAPPING
COMP	COMPOSITION	HLCPS	HELICAL COMPRESSION	RES	RESISTOR	TRH	TRUSS HEAD
CONN	CONNECTOR	HLEXT	HELICAL EXTENSION	RGD	RIGID	V	VOLTAGE
COV	COVER	HV	HIGH VOLTAGE	RLF	RELIEF	VAR	VARIABLE
CPLG	COUPLING	IC	INTEGRATED CIRCUIT	RTNR	RETAINER	W/	WITH
CRG	CATHODE RAY TUBE	ID	INSTEAD DIAMETER	SCH	SOCKET HEAD	WSHR	WASHER
DEG	DEGREE	IDENT	IDENTIFICATION	SCOPE	OSCILLOSCOPE	XFMR	TRANSFORMER
DWR	DRAWER	IMPLR	IMPELLER	SCR	SCREW	XSTR	TRANSISTOR

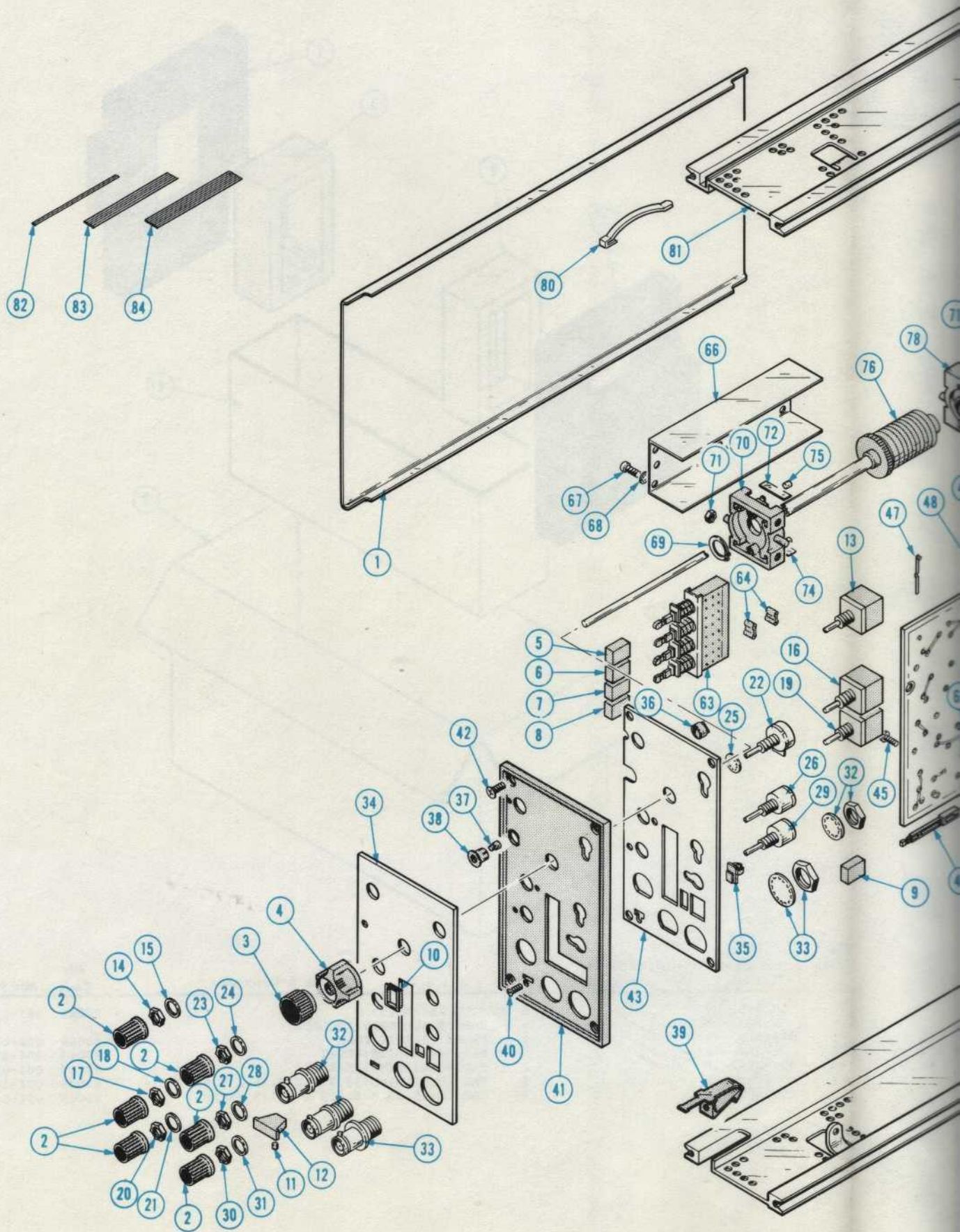
CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
05820	WAKEFIELD ENGINEERING, INC.	AUDUBON ROAD	WAKEFIELD, MA 01880
08261	SPECTRA-STRIP CORP.	7100 LAMPSON AVE.	GARDEN GROVE, CA 92642
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
23499	GAVITT WIRE AND CABLE, DIVISION OF RSC INDUSTRIES, INC.	455 N. QUINCE ST.	ESCONDIDO, CA 92025
24931	SPECIALTY CONNECTOR CO., INC.	3560 MADISON AVE.	INDIANAPOLIS, IN 46227
45722	USM CORP., PARKER-KALON FASTENER DIV.	1 PEEKAY DRIVE	CLIFTON, NJ 07014
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
73803	TEXAS INSTRUMENTS, INC., METALLURGICAL MATERIALS DIV.		ATTLEBORO, MA 02703
74445	HOLO-KROME CO.	31 BROOK ST. WEST	HARTFORD, CT 06110
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
79807	WROUGHT WASHER MFG. CO.	2100 S. O BAY ST.	MILWAUKEE, WI 53207
80009	TEKTRONIX, INC.	P. O. BOX 500	BEAVERTON, OR 97077
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153
91836	KINGS ELECTRONICS CO., INC.	40 MARBLEDALE ROAD	TUCKAHOE, NY 10707
97464	INDUSTRIAL RETAINING RING CO.	57 CORDIER ST.	IRVINGTON, NJ 07111

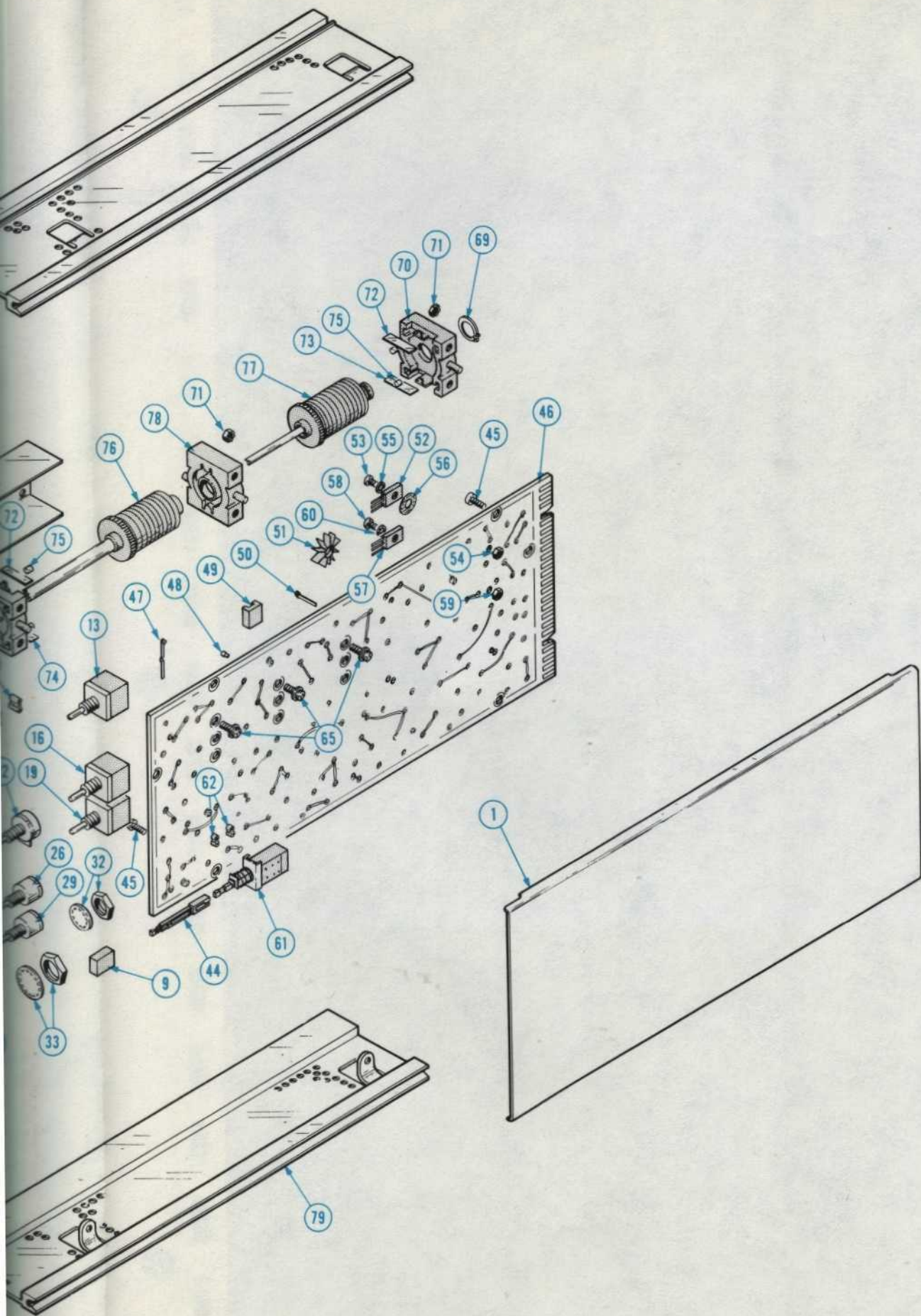
Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscnt	Qty	1	2	3	4	5	Name & Description	Mfr	Mfr Part Number
											Code	
-1	337-1399-00			2						SHLD,ELECTRICAL:SIDE	80009	337-1399-00
-2	366-0494-00			6						KNOB:GRAY WITH SETSCREW	80009	366-0494-00
	213-0153-00			6						. SETSCREW:5-40 X 0.125 INCH,HEX SOC.STL	74445	OBD
-3	366-1201-00			1						KNOB:GRAY WITH SETSCREW	80009	366-1201-00
	213-0153-00			1						. SETSCREW:5-40 X 0.125 INCH,HEX SOC.STL	74445	OBD
-4	366-1202-00			1						KNOB:GRAY WITH SETSCREW	80009	366-1202-00
	213-0153-00			1						. SETSCREW:5-40 X 0.125 INCH,HEX SOC.STL	74445	OBD
-5	366-1257-51			1						PUSH BUTTON:GRAY--1US	80009	366-1257-51
-6	366-1257-60			1						PUSH BUTTON:GRAY--10US	80009	366-1257-60
-7	366-1257-50			1						PUSH BUTTON:GRAY--100US	80009	366-1257-50
-8	366-1257-49			1						PUSH BUTTON:GRAY--1MS	80009	366-1257-49
-9	366-1489-56			1						PUSH BUTTON:GRAY-- + PULSE	80009	366-1489-56
-10	426-0681-00			5						FR,PUSH BUTTON:GRAY PLASTIC	80009	426-0681-00
-11	214-1840-00			1						PIN,KNOB SECRC:	80009	214-1840-00
-12	366-1422-01			1						KNOB:LATCH 80009 366-1422-01		
-13	-----			1						RESISTOR,VAR:(SEE R130 EPL)		
										(ATTACHING PARTS)		
-14	210-0583-00			1						NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20319-402
-15	210-0940-00			1						WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
										-----*-----		
-16	-----			1						RESISTOR,VAR:(SEE R230 EPL)		
										(ATTACHING PARTS)		
-17	210-0583-00			1						NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20319-402
-18	210-0940-00			1						WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
										-----*-----		
-19	-----			1						RESISTOR,VAR:(SEE R110 EPL)		
										(ATTACHING PARTS)		
-20	210-0583-00			1						NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20319-402
-21	210-0940-00			1						WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
										-----*-----		
-22	-----			1						RESISTOR,VAR:(SEE R185 EPL)		
										(ATTACHING PARTS)		
-23	210-0583-00			1						NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20319-402
-24	210-0940-00			1						WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
-25	210-0046-00			1						WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL	78189	1214-05-00-0541C
										-----*-----		
-26	-----			1						RESISTOR,VAR:(SEE R240 EPL)		
										(ATTACHING PARTS)		
-27	210-0583-00			1						NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20319-402
-28	210-0940-00			1						WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
										-----*-----		
-29	-----			1						RESISTOR,VAR:(SEE R270 EPL)		
										(ATTACHING PARTS)		
-30	210-0583-00			1						NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20319-402
-31	210-0940-00			1						WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
										-----*-----		
-32	131-0955-00			2						CONN,RCPT,ELEC:BNC,FEMALE	24931	28JR200-1
-33	131-0274-00			1						CONN,RCPT,ELEC:BNC,FEMALE	91836	KC79-67TR-5
-34	333-1768-00			1						PANEL,FRONT:PG505	80009	333-1768-00
-35	378-0703-00			1						LENS,LIGHT:HOLDER,CLEAR	80009	378-0703-00
-36	200-0935-00			1						BASE,LAMPHOLDER:0.29 OD X 0.19" L,BK PLSTC	80009	200-0935-00
-37	378-0602-00			1						LENS,LIGHT:GREEN	80009	378-0602-00
-38	352-0157-00			1						LAMPHOLDER:WHITE PLASTIC	80009	352-0157-00
-39	214-1513-01			1						LCH,PLUG-IN RET:	80009	214-1513-01
										(ATTACHING PARTS)		
-40	213-0254-00			1						SCR,TPG,THD CTG:2-56X0.25"100 DEG,FLH STL	45722	OBD
										-----*-----		
-41	386-2643-00			1						SUBPANEL,FRONT:PLASTIC	80009	386-2643-00
										(ATTACHING PARTS)		
-42	213-0229-00			4						SCR,TPG,THD FOR:6-20X0.375 100 DEG,FLH STL	83385	OBD
										-----*-----		

Mechanical Parts List—PG 505

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Model No. Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
-43	337-1848-00			1						SHLD,ELECTRICAL:FRONT SUBPANEL	80009	337-1848-00
-44	384-1099-00			1						EXTENSION SHAFT:PUSH BUTTON,1.54 INCH LONG	80009	384-1099-00
	672-0431-00			1						CKT BOARD ASSY:WITH CAM SWITCH	80009	672-0431-00
										(ATTACHING PARTS)		
-45	213-0146-00			3						SCR,TPG,THD FOR:6-20 X 0.313 INCH,PNH STL	83385	OBD
	211-0507-00			1						SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
	210-0202-00			1						TERMINAL,LUG:SE #6	78189	2104-06-00-2520N
	210-0407-00			1						NUT,PLAIN,HEX.:6-32 X 0.25 INCH,BRS	73743	3038-0228-402
										- - - * - - -		
										. . . CKT BOARD ASSY W/CAM SWITCH INCLUDES:		
-46				1						. . . CKT BOARD ASSY:--MAIN(SEE A1 EPL)		
										. . . CKT BOARD ASSY INCLUDES:		
-47	131-0604-00			21						. . . CONTACT,ELEC:0.025 SQ X 0.365 INCH LONG	80009	131-0604-00
-48	136-0252-04			20						. . . SOCKET,PIN CONN:0.188 INCH LONG	22526	75060-001
-49	136-0514-00			1						. . . SOCKET,IC:8 PIN INLINE	73803	C930802
-50	214-0579-00			5						. . . TERM,TEST PT:0.40 INCH LONG	80009	214-0579-00
-51	214-0498-00			2						. . . HEAT SINK,ELEC:	05820	201AB
-52				1						TRANSISTOR:(SEE Q580 EPL)		
										(ATTACHING PARTS)		
-53	211-0008-00			1						. . . SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-54	210-0406-00			1						. . . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-55	210-1122-00			1						. . . WASHER,LOCK:DISHED,0.12 ID X 0.375"OD STL	78189	4704-04-02
-56	210-0921-00			1						. . . WASHER,MICA:0.50 X 0.141 X 0.005 INCH THK	80009	210-0921-00
										- - - * - - -		
-57				1						. . . TRANSISTOR:(SEE Q642 EPL)		
										(ATTACHING PARTS)		
-58	211-0008-00			1						. . . SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-59	210-0406-00			1						. . . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-60	210-1122-00			1						. . . WASHER,LOCK:DISHED,0.12 ID X 0.375"OD STL	78189	4704-04-02
										- - - * - - -		
-61	260-1445-00			1						. . . SWITCH,PUSH:SINGLE	80009	260-1445-00
-62	361-0384-00			2						. . . SPACER,PB SW:0.133 INCH LONG	80009	361-0384-00
-63				1						. . . SWITCH,PUSH:(SEE S250 EPL)		
-64	361-0383-00			8						. . . SPACER,PB SW:CHARCOAL,0.33INCH LONG	80009	361-0383-00
	263-1015-00			1						. . . ACTUATOR ASSY,CAM S:PULSE	80009	263-1015-00
										(ATTACHING PARTS)		
-65	211-0116-00			6						. . . SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
										- - - * - - -		
										. . . ACTUATOR ASSY INCLUDES:		
-66	200-1623-00			1						. . . COVER CAM SW:	80009	200-1623-00
										(ATTACHING PARTS)		
-67	211-0008-00			6						. . . SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-68	210-0004-00			6						. . . WASHER,LOCK:INT,0.12 ID X 0.26" OD,STL	78189	1204-00-00-0541C
										- - - * - - -		
-69	354-0391-00			2						. . . RING,RETAINING:0.395"FREE IDX 0.025"STL	97464	3100-43-CD
-70	401-0081-02			2						. . . BEARING,CAM SW:FRONT	80009	401-0081-02
-71	210-0406-00			12						. . . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-72	214-1139-03			2						. . . SPRING,FLAT:RED COLORED	80009	214-1139-03
-73	214-1139-02			1						. . . SPRING,FLAT:GREEN COLORED	80009	214-1139-02
-74	214-1139-00			1						. . . SPRING,FLAT:GOLD COLORED	80009	214-1139-00
-75	214-1127-00			4						. . . ROLLER,DETENT:0.125 DIA X 0.125 INCH L	80009	214-1127-00
-76	105-0514-00			1						. . . DRUM CAM SWITCH:(PERIOD)	80009	105-0514-00
-77	105-0515-00			1						. . . DRUM CAM SWITCH:(DURATION)	80009	105-0515-00
-78	401-0115-00			1						. . . BEARING,CAM SW:CENTER	80009	401-0115-00
-79	426-0724-04			1						FR SECT,BOTTOM:	80009	426-0724-04
-80	214-1061-00			1						SPRING,GROUND:FLAT	80009	214-1061-00
-81	426-0725-05			1						FRAME SECT,TOP:	80009	426-0725-05
-82	175-0825-00			FT						WIRE,ELECTRICAL:2 WIRE RIBBON	23499	TEK-175-0825-00
-83	175-0828-00			FT						WIRE,ELECTRICAL:5 WIRE RIBBON	23499	TEK-175-0828-00
-84	175-0830-00			FT						WIRE,ELECTRICAL:7 WIRE RIBBON	08261	TEK-175-0830-00



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ACCESSORIES

Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Qty						Name & Description	Mfr Code	Mfr Part Number
		Eff	Dscont		1	2	3	4	5			
	070-1583-00			1						MANUAL, TECH: SERVICE	80009	070-1583-00

Fig. & Index No.	
2-	065
-1	000
-2	000
-3	000
-4	000
-5	000

REPACKAGING

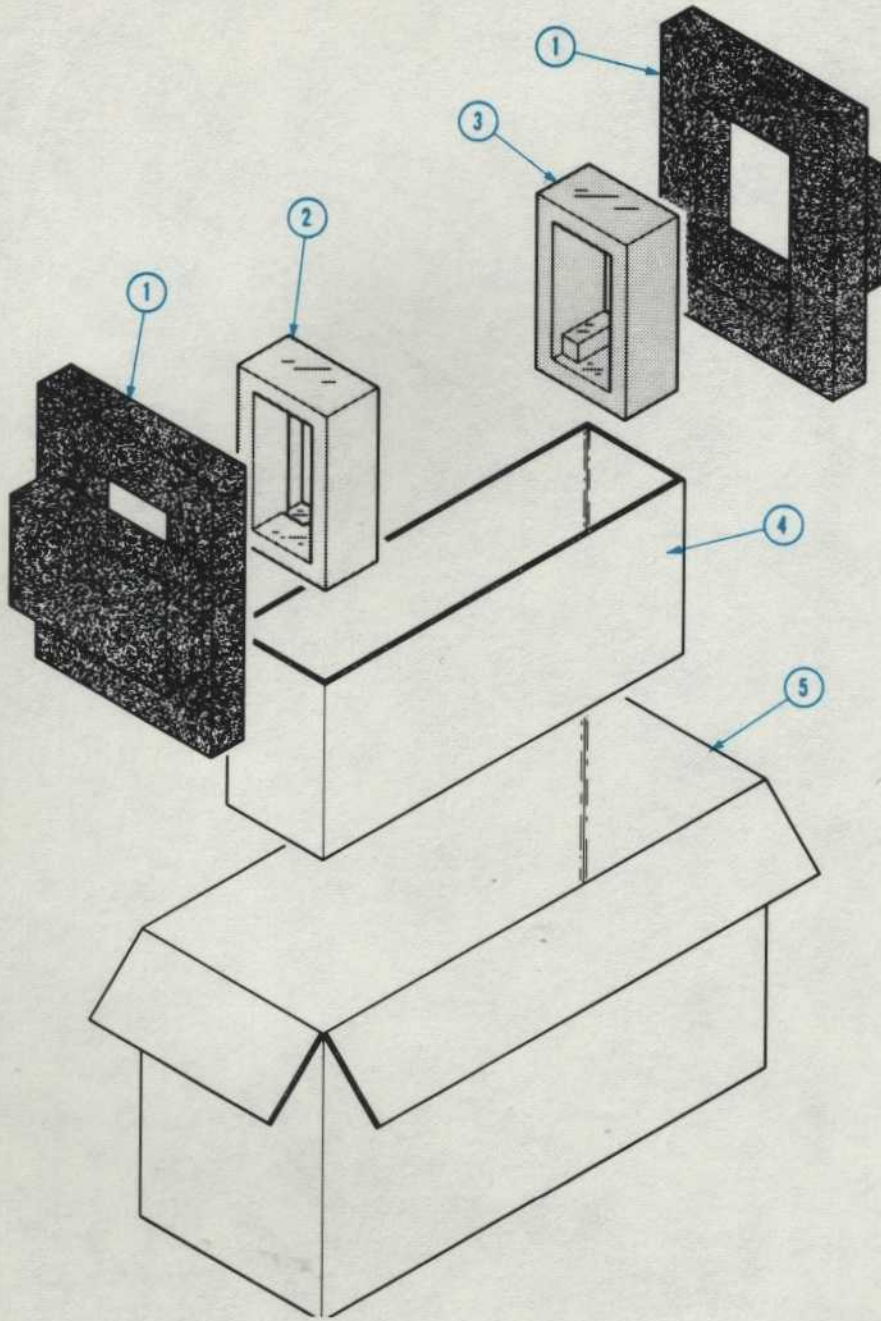


Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Qty	Name & Description	Mfr Code	Mfr Part Number
		Eff	Dscont				
2-	065-0151-00			1	CARTON ASSEMBLY:	80009	065-0151-00
-	-			-	CARTON ASSEMBLY INCLUDES:		
-1	004-0282-00			2	FRAME:PLASTIC FOAM	80009	004-0282-00
-2	004-0243-00			1	PAD,CUSHIONING:FRONT	80009	004-0243-00
-3	004-0242-00			1	PAD,CUSHIONING:REAR	80009	004-0242-00
-4	004-1093-00			1	PAD,CUSHIONING:13.375 X 3.25 X 5.625"	80009	004-1093-00
-5	004-0612-00			1	CARTON:16.50 X 6.625 X 9.125 INCHES	80009	004-0612-00