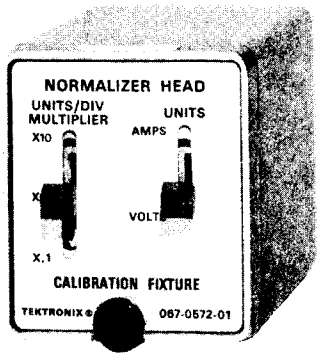
067-0572-01 CALIBRATION FIXTURE

Normalizer Head

Serial Number_____

067-0572-01 CALIBRATION FIXTURE

Normalizer Head



The TEKTRONIX Type 067-0572-01 CALIBRATION FIXTURE is a NORMALIZER HEAD designed for use with all Tektronix vertical sampling plug-in units that utilize sampling heads.

Primarily, the Normalizer is an accurate pulse source used to check or calibrate the memory gain and gate width of the sampling unit. Correct adjustment of the memory gain and gate width assures unity dot response when different sampling heads are used in the sampling unit. The Normalizer Head is also used to check the readout function of digital units when used in a sampling system with programmable vertical sampling plug-in units. A pulse source is provided for checking the risetime of the plug-in unit trigger amplifier.

CONTENTS

SECTION 1

CHARACTERISTICS

Electrical
(As measured at the output of the Normalizer)

Characteristics	Performance Requirement	Supplemental Information
Pulse Output		Pulse shaped for same characteristics as the output of Sampling Heads
Amplitude	400 mV P-P within 2%	
Duration	At least 400 ns	
Risetime	100 ns within 25% with Type 3S2	
Trigger Output		
Amplitude	At least 70 mV Peak	
Width	Within 60 to 100 ns	
Risetime	300 ps or less	

Mechanical

Characteristics	Requirement	Supplemental Information
Construction		
Housing	Extruded aluminum alloy with blue-vinyl finish	
Panel	Anodized aluminum with case aluminum alloy bezel	
Circuit Board	Glass-Epoxy Laminate	
Overall Dimensions		
Height	≈1-15/16 inches	
Width	≈1-3/4 inches	
Depth	≈4-1/8 inches	
Weight	≈8 ounces	

Environmental

Characteristics	Requirement	Supplemental Information
Temperature		
Operating Range	0°C to +50°C	Calibrated at 20°C to 30°C
Warmup Time	5 minutes at 25°C	

FRONT PANEL SWITCHES

UNITS/DIV MULTIPLIER

Three-position switch selects X10, X1, or X.1 multiplier positions for checking the units/division readout of Digital Units.

UNITS

Two-position switch selects AMPS or VOLTS position for checking the unit readout of Digital Units.

REAR PANEL CONNECTORS

Circuit Board Contacts

The contact area on the rear of the driver board plugs into the Plug-In Unit under test. The board contacts provide power to the Normalizer Head, plus the signal input and output requirements for operation.

Trigger Output

A coax connector on the rear of the Normalizer Head plugs into the connector mounted on the Plug-In Unit.

SECTION 2

OPERATING INSTRUCTIONS

The following procedure describes the operation of the Normalizer Head when used in a calibrated Vertical Sampling Plug-In Unit. Detailed information for calibrating the sampling unit using the Normalizer Head is described in the Instruction Manual supplied with the sampling unit.

The Normalizer Head is installed in the sampling unit, with the units/div switch set at 100. In the case of dual-trace plug-in units, the Normalizer is installed in the channel under test, with the mode switch in the appropriate position. The sweep unit is adjusted for a free-running trace. A series of alternate dots will be displayed on the indicator, appearing as two separate traces. The distance between traces is used as a reference for adjusting the memory gate width and memory gain of the sampling unit. First, the memory gate width is adjusted for maximum separation between traces. Next, the memory gain capacitor is adjusted for exactly 5 major divisions of separation between traces with the dot response control set to electrical center. These adjustments assure unit dot response operation when different sampling heads are used in the same sampling unit.

The switches on the front panel of the Normalizer Head are used to check the units and units/division readout of Digital Units such as the Type 230, when used in sampling systems utilizing Programmable Sampling Units such as the Type 3S5. The switches are also used to check readout circuitry of 7-series sampling units such as the Type 7S11. The risetime capability of the sampling unit trigger amplifier is checked by monitoring the trigger out connector on the front panel with a separated sampling system.

SECTION 3

CIRCUIT DESCRIPTION

The Normalizer Head has three basic circuits, each occupying one circuit board. These are the Driver, Regenerator, and Trigger. The Trigger and Regenerator boards also contain the circuitry required for checking the readout function of the Programmable Plug-In Units when used in Digital Readout Oscilloscopes.

Driver Board

The strobe drive pulse from the Plug-In Unit is applied to the Normalizer Head through Pin H to the binary input CP of the bistable multivibrator U21. The output of the multivibrator is fed through a DC level correction network (R23, R24, D25, and R26) to the complementary AND circuit consisting of Q28 and Q29. The transistors are turned on alternately. The conducting transistor is held on (the other off) by the integrator C24 for at least 5 μs after the multivibrator U21 is triggered by the strobe drive pulse.

At this point, the output pulse from the Regenerator board (a balanced signal of fixed pulse width) is combined with the base signal, to form the complementary AND function and feed the output drivers, Q30 and Q35. The drive is sufficient to saturate Q30 or Q35 to within a few millivolts of collector voltage. The amplitude of the output signal is determined by the saturation voltage, the plug-in unit power supply accuracy (-50 V, +50 V) and the resistor divider network R30, R31, R32, R36 and R37. Pulse shape is determined by the values of C33, C38, and R38, plus the offset feedback input resistor, R32 and offset feedback voltage. The emitter-follower Q39, along with C39, form the low-impedance output. C39 also removes the DC voltage loading to the sampling unit. R4, R6, R20 and D6 establish the trigger input biasing. D21, a zener diode, provides the 4 V operating voltage for the IC, U21. R38 and R39 bias Q39.

Regenerator Board

The regenerator circuit, consisting mainly of Q10, D8, and T13, is driven by the strobe drive pulse from the plug-in unit. The incoming pulse is fed to the base of Q10 through the diode D8. The pulse is amplified and shaped by the combination of Q10 and the transformer, T13. D8 passes only the negative portion of the strobe pulse, leaving some charge on the base of Q10, as determined by the biasing network R4, R6, R20 and D6. Q10 is driven into saturation, applying approximately 12.2 V to the primary of T13. The balanced output of the secondary is fed through R15 and R17 to Q28 and Q19 on the driver board, forming the complementary AND circuit. The width of the regenerator pulse is determined by the core-saturation time of T13. R13 and C13 serve as a filter network, with R13 limiting the current through T13 and Q10 after the transformer core reaches saturation. C50 blocks the DC collector voltage from Q10 to the trigger circuit.

Regenerator Board (cont)

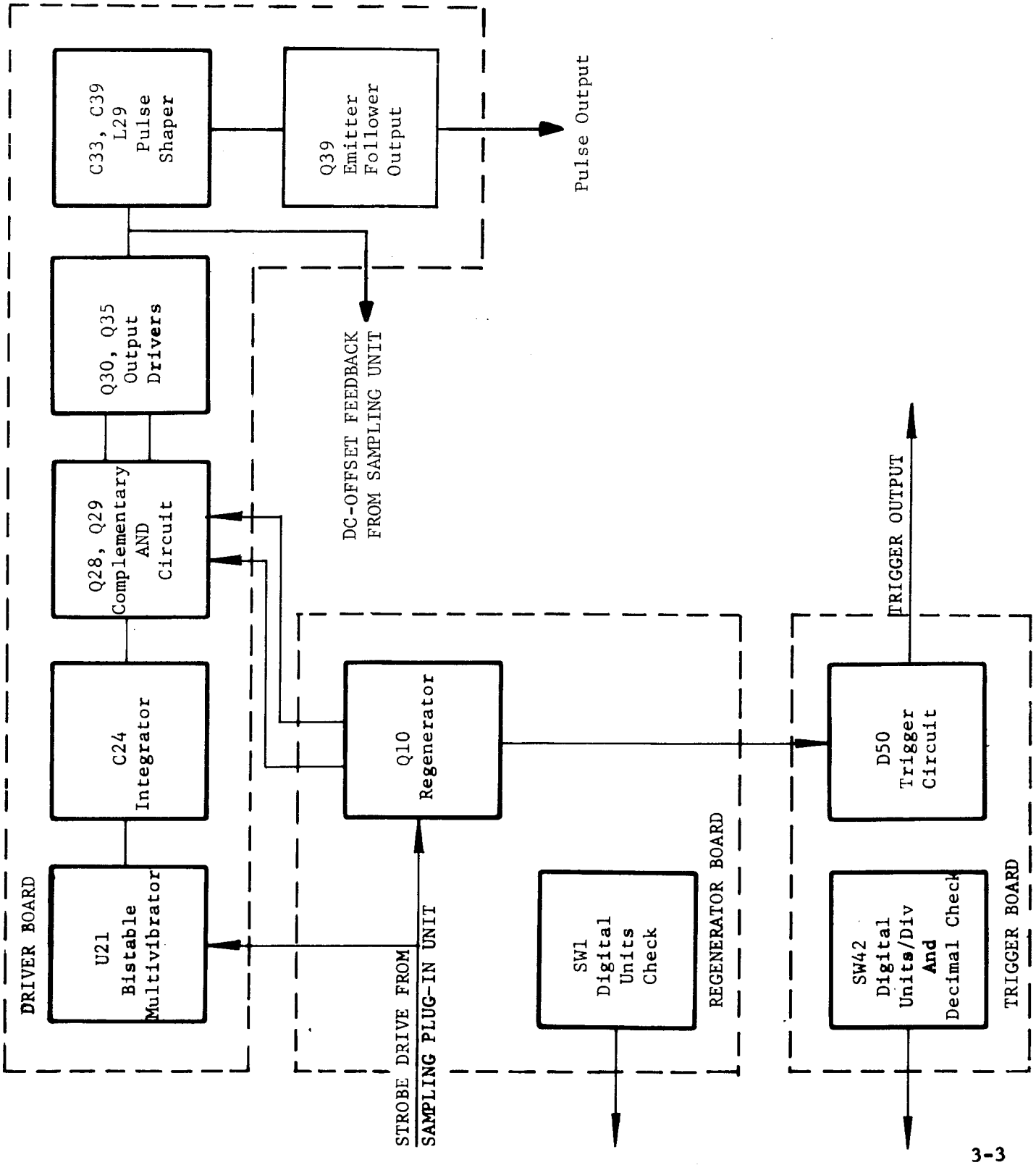
The circuitry required to check the digital oscilloscope readout in units is also located on the regenerator board. A DC level is applied to C1 which in turn provides a DC level to the digital readout of the oscilloscope via the Type 3S5 or 3S6 Programmable Sampling Plug-In Unit. When the switch SW1 is in the AMPS position, a positive voltage controls the readout logic and an "A" (amperes) is read on the indicator. With the switch in the VOLTS position, a zero volt level controls the logic, and a "V" (volts) is read on the indicator. The capacitor C1 also provides the ground return loop for the strobe drive pulse.

Trigger Board

The trigger circuit is comprised of a tunnel diode, D50 and biasing resistors R51 and R52. The TD receives the trigger pulse from Q10 at Pin F, through a current limiting resistor, R11. C50, on the regenerator board, blocks the DC collector voltage. The trigger output signal is differentiated by the combination of C53 and the 50 Ω impedance of the Sampling Plug-In Unit trigger circuitry. R54, R55, and C55 establish the correct bias to the trigger amplifier of the Sampling Plug-In Unit.

The circuitry required to check the oscilloscope readout in units/div is also located on the trigger board. The switch, SW42, applies DC levels to the capacitor C42. Each level controls the digital logic for the oscilloscope readout via the Type 3S5 or 3S6 Programmable Sampling Plug-In Unit; a positive level for the X10, ground level for X1, and a negative level for X0.1. The capacitor C42 also completes the ground return for the output pulse of the driver board.

BLOCK DIAGRAM



SECTION 4

MAINTENANCE

GENERAL INFORMATION

Introduction

This portion of the manual contains a complete calibration procedure for the Calibration Fixture. The instrument will not often require a complete start-from-scratch calibration, but will need occasional adjustments as components age or are replaced.

Calibration is a valuable part of preventive maintenance, since many types of minor troubles may be discovered and corrected before they become serious enough to disable the instrument. Also, certain troubles can be easily isolated to a particular section of the instrument by attempting calibration.

This section includes a list of all instruments required to calibrate the Calibration Fixture, a check out list, and a step-by-step calibration procedure. The check out list is, essentially, a short form calibration check; it has the same sequence of steps and the same limits on checks or adjustments as the calibration procedure. This list may be used to quickly check performance or locate faulty circuits.

It will be assumed in this manual that appropriate interconnections and necessary adapters are available.

It will also be assumed that a control will be left in the position indicated on the previous step unless otherwise indicated.

All front-panel control labels of the Calibration Fixture or test instrument are in capital letters(TIME/CM), etc. Internal adjustment labels are identified by an R or C number (C33).

Visual Inspection

The instrument should be visually inspected occasionally for such defects as poor connections, broken or damaged parts, improperly seated transistors, and heat damaged parts. The remedy for most of these defects is not obvious. A heat damaged part is usually the symptom of some defect that is not obvious. The cause of overheating should be determined and corrected before the part is replaced, otherwise the damage may be repeated.

Transistor Checks

Periodic preventive maintenance checks on the transistors are not recommended. Safisfactory operation of the instrument in all respsects is adequate assurance that the transistors are performing properly.

Recalibration

To insure that the Calibration Fixture maintains its accuracy, check the calibration after each 500 hours of operation or every six months if used intermittently. Complete calibration instructions appear later in this section.

The calibration procedure can also be helpful in isolating troubles in the instrument. Also, minor troubles in the instrument that may not be apparent during normal operation may be revealed and corrected during calibration.

Ordering Parts

Many of the components are stardard electronic parts that may be purchased locally. However, all standard parts in the instrument can be obtained from Tektronix through your local Tektronix Field Engineer or Field Office. Before ordering, consult the parts list of this manual to determine the value, tolerance, and rating required. Some of the parts used are not standard parts and may or may not be available for replacement. Consult any particular replacement with your local Tektronix Field Engineer or Field Office.

CHECK OUT LIST

For the following performance checks, the Normalizer Head is connected to extender cable and the housing removed.

- ☐ 1. Remove transistors Q28 and Q29.
- ☐ 2. Check base drive to Q28 for at least +800 mV.
- ☐ 3. Check base drive to Q29 for at least -800 mV.
- ☐ 4. Replace Q28 and Q29.
- ☐ 5. Check rise and falltime of base drive for 7 µs within 1.5 µs.
- ☐ 6. Check drive-pulse duration at pins K and L for at least 500 ns at the 500 mV level.
- ☐ 7. Check the saturation voltage of Q30 and Q35 for 5 mV or less.
- ☐ 8. Check the P-P amplitude of the output pulse for at least 400 mV.
- ☐ 9. Check the duration of the output pulse at zero level for at least 400 ns.
- ☐ 10. Check the risetime of the output pulse for 100 ns within 25%.
- ☐ 11. Check the peak amplitude of the trigger pulse for at least 70 mV.
- ☐ 12. Check the trigger pulse width for 60 to 100 ns at the 50% level.
- ☐ 13. Check the risetime of the trigger pulse for less than 300 ps.

For the remaining checks, the Normalizer Head is plugged into Sampling Plug-In Unit, with the housing installed.

- ☐ 14. Check the Normalizer Head for proper operation, as observed on the sampling oscilloscope display, and by measuring the memory gain and memory gate width of the sampling unit.
- ☐ 15. Check the operation of the unit/div multiplier and unit readout function.

EQUIPMENT REQUIRED:

TEKTRONIX Instruments

1 TYPE 547 Oscilloscope
1 TYPE W Plug-In Unit
1 TYPE 568 Oscilloscope
1 TYPE 230 Digital Unit
1 TYPE 3S5 Programmable Sampling Unit
1 TYPE 3T5 Programmable Sampling Sweep
1 TYPE 561A Oscilloscope
1 TYPE 3S2 Dual-Trace Sampling Unit
1 TYPE 3T2 Random Sampling Sweep Unit
1 TYPE S-2 Sampling Head

Accessories

1 Sampling Head Extender Cable, PN 012-0124-00
1 TYPE 568 to 230 Interconnecting Cable, PN 012-0119-00
1 BNC 50 Ω Cable, PN 012-0057-01
1 BSM to BNC 50 Ω Cable, PN 012-0127-00
1 TYPE P6034 10X Probe, PN 010-0110-00
2 TYPE P6028 1X Probes, PN 010-0074-00

CALIBRATION PROCEDURE

☐ 1. PRESET THE CONTROLS AND CONNECT CABLES

a. Set the Type 547/W Unit controls as follows:

TYPE 547

INTENSITY	midrange
FOCUS	optimum
SCALE ILLUMINATION	CW
ASTIGMATISM	optimum
HORIZONTAL DISPLAY	A
TIME BASE A TRIGGER	
MODE	AUTO
SLOPE	+
COUPLING	AC
SOURCE	NORM
LEVEL	0
TIME/CM	50 µs
VARIABLE	CAL
SWEEP MAGNIFIER	X1
HORIZONTAL POSITION	midrange

W UNIT

V_C RANGE	0
Input A	GND
Input B	GND
INPUT ATTEN	10
DISPLAY	A-V_C
POSITION and DC Balance	Adjusted so that trace remains at graticule center when MILLIVOLTS/CM switch is rotated over entire range.
MILLIVOLTS/CM	20
VARIABLE	CALIB

CALIBRATION (cont)

b. Set the Type 568/3S5/3T5/230 controls as follows:

TYPE 568

INTENSITY	midrange
FOCUS	optimum
SCALE ILLUMINATION	CW

TYPE 3S5

Mode Switch	CH A
DC OFFSET (CH A & B)	0 V
Units/div (CH A & B)	100

TYPE 3T5

HORIZONTAL POSITION	midrange
TIME/DIV DECADE	6
MULTIPLIER	2
SAMPLES/SWEEP	1000
DELAY	0000
PROGRAM SELECTOR	INT
SENSITIVITY	CW
RECOVERY TIME	CCW
TRIGGER MODE	EXT

TYPE 230

CH A REFERENCE ZONES	
POSITIONS	0-0
WIDTH	10 CM - 10 CM
MEASUREMENT MODE	A VOLT
DISPLAY TIME	approximately 9 o'clock
TRIG MEASUREMENT	OFF
UPPER LIMIT	+0510
LOWER LIMIT	+0490

CALIBRATION (cont)

c. Set the Type 561A/3S2/3T2 controls as follows:

Type 561A

INTENSITY	midrange
FOCUS	optimum
SCALE ILLUMINATION	CW

TYPE 3S2

Display Mode	CH B
TRIG OUT	B
DOT RESPONSE (B)	adjust for Unity gain
Units/Div	20
B DELAY	CW
DC OFFSET (B)	midrange
POSITION (B)	midrange

TYPE 3T2

TIME POSITION	CW	
RANGE	100 ns	500 ps/div
DISPLAY MAG	X1	500 ps/div
TIME MAGNIFIER	X20	500 ps/div
HORIZ POSITION	midrange	
DISPLAY MODE	MANUAL	
MANUAL SCAN	midrange	
TRIG SENSITIVITY	CW	
RECOVERY TIME	CCW	
POLARITY	+	
SOURCE	EXT	

d. Install the interconnecting cable 012-0119-00 between J101 of the Type 568 to J101 of the Type 230. Connect the BSM to BNC cable 012-0127-00 from the Type 3S2 TRIG OUT to the Type 3T2 50 Ω TRIGGER INPUT. Plug the sampling head extender cable 012-0124-00 into CH A of the Type 3S5. Remove the housing from the Normalizer Head and connect the Head to the extender cable. Connect the P6028 Probe to the A input of the Type W unit.

CALIBRATION (cont)

☐ 2. CHECK Q28 AND Q29 BASE DRIVE

Remove transistors Q28 and Q29 from the Normalizer Head. Attach the P6028 Probe tip to the base of Q28 on the driver board (at the junction of Q28 and D25). Set the Type W unit A input at DC, V_C RANGE at +1.1, and COMPARISON VOLTAGE at 0000. Make sure the W unit is properly balanced. Adjust the Type 547 trigger LEVEL control for a stable display. Move the top of the waveform to graticule center using the COMPARISON VOLTAGE control. The COMPARISON VOLTAGE dial should read at least +0800.

Move the probe to the base of Q29 (the other side of D25). Set the V_C RANGE at -1.1. Adjust the trigger LEVEL control to obtain a stable display. Move the bottom of the waveform to graticule center using the COMPARISON VOLTAGE control. The dial should read at least -0800.

☐ 3. CHECK RISE AND FALLTIME OF BASE DRIVE

Turn the Type 568/3S5/3T5 off. Install the transistors Q28 and Q29 and turn instrument back on. With the probe connected as before (at the base of Q29), set the Type W unit A input at AC, V_C RANGE at 0, and MILLIVOLTS/CM at 10. Using the VARIABLE and POSITION controls, obtain a 5 cm squarewave display. Set the Type 547 TIME/CM control for a 2 µs sweep and adjust triggering for a stable display. Check the 10% to 90% risetime for 7 µs within 1.5 µs. Switch the trigger SLOPE to - and check the 10% to 90% falltime for 7 µs within 1.5 µs.

☐ 4. CHECK DRIVE-PULSE DURATION

Disconnect the Probe from the junction of Q29 - D25, and connect to socket K on the regenerator board. Set the Type W unit MILLIVOLT/CM switch at 50, VARIABLE at CALIB. Set the Type 547 trigger SLOPE at + and, using the trigger level control, obtain a stable display. Set the TIME/CM at 0.1 µs and check the pulse width at the +500 mV level for at least 500 ns. Move the probe to socket L, switch the trigger SLOPE to -, and check the pulse width at the -500 mV level for at least 500 ns.

☐ 5. CHECK SATURATION VOLTAGE OF Q30 and Q35

Disconnect the probe from socket L and connect it to the collector of Q30. Set the Type W unit A input at DC, MILLIVOLTS/CM at 10, Vc RANGE at +1.1, and COMPARISON VOLTAGE at 0000. Make sure the W unit is properly balanced. Adjust the Type 547 trigger LEVEL control for a stable display. Using the COMPARISON VOLTAGE control, reposition the bottom of the negative-going pulse at the center graticule line. The COMPARISON VOLTAGE dial should read less than +0050 (ignore the ringing on the pulse bottom; take the average at the center of the negative pulse width).

CALIBRATION (cont)

CHECK SATURATION VOLTAGE OF Q30 and Q35 (cont)

Move the probe from the collector of Q30 to the collector of Q35. Set the Type W unit V_c RANGE at -1.1. Set the trigger SLOPE at +, and adjust the trigger LEVEL control for a stable display. Using the COMPARISON VOLTAGE control, reposition the top of the positive-going pulse at the center graticule line. The COMPARISON VOLTAGE dial should read less than -0050 (ignore the ringing on the pulse top; take the average at the center of the positive pulse width).

6. CHECK THE OUTPUT PULSE AMPLITUDE, WIDTH AND RISETIME

Remove the extender cable from CH A of the Type 3S5/3T5/568, and install it in CH B of the Type 3S2/3T2/561A.

Disconnect the probe from the collector of Q35 and connect it to TP161 of the Type 3S2. Connect a second P6028 Probe from the Type 547 TRIGGER input to TP535 of the Type 3S2. Set the trigger SOURCE switch at EXT and adjust the trigger LEVEL control for a stable display as shown in Fig. 1. Set the Type W unit MILLIVOLT/CM at 10, A input at AC, and V_c RANGE at 0. Check the P-P amplitude of the pulse for 400 mV within 2% as shown in Fig. 1A. Ignore ringing.

Check the pulse width at the zero level, starting at the first negative spike, for at least 400 ns as shown in Fig. 1B. Check the risetime for 100 ns, within 25%, as shown in Fig. 1C.

Disconnect the triggering probe from TP 535 and switch trigger SOURCE to INT. Move the signal probe from TP161 to TP535. Adjust R50 in the Type 3S2 for maximum trace separation as indicated on the Type 561. Measure the memory-gate width as observed on the Type 547 for 175 ns within 10 ns. NOTE: USE SHORT GROUNDLEADS

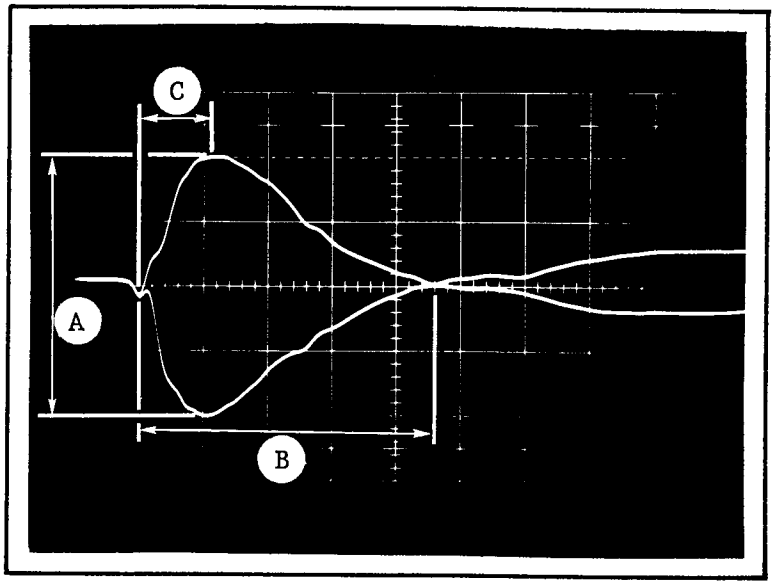


Fig. 1. Normalizer Head Output Pulse

CALIBRATION (cont)

☐ 7. CHECK THE TRIGGER PULSE AMPLITUDE AND WIDTH

Check pulse amplitude at the junction of C53 and R54. Set the Type W unit MILLIVOLTS/CM at 5, Type 547 trigger SOURCE at NORM. Adjust the trigger LEVEL control for a stable display. Check the peak amplitude of the pulse for at least 70 mV. Check the pulse width for 60 to 100 ns at the 50% level.

☐ 8. CHECK TRIGGER-PULSE RISETIME

Disconnect the P6028 Probe from the junction of C53 and R54. Install a Type S-2 Sampling Head in CH A of the Type 3S5. Connect a Type P6034 10X Probe to the input of the S-2. Connect a BNC cable, 012-0057-01, from the PULSE OUT connector on the Type 3T2 to the trigger INPUT connector on the Type 3T5. Set the Type 3S5 units/div at 50. Set the Type 3T5 DELAY at 0000, TIME/DIV DECADE at 0, and MULTIPLIER at 2. Set the TRIGGER MODE at EXT, POLARITY at -, and SENSITIVTY CCW. Set the Type 3T2 DISPLAY MODE at MANUAL, TIME POSITION CW, and RANGE at 100 ns. Set the 3T2 DISPLAY MAG at X1 and the TIME MAGNIFIER at X1, and adjust the TRIG SENSITIVITY for a free-running trace. Obtain a stable display on the Type 568 and adjust the Type 3S5 VARIABLE units/div for 5 vertical divisions. Use the MANUAL SCAN control on the Type 3T2 to horizontally position the display on the Type 568. Check the 10% to 90% risetime for 300 ps or less at the point where the trigger output cable is soldered to the trigger board. Do not use a probe ground lead. Ground the collar on the probe barrel to the ground plane on the printed board.

☐ 9. CHECK READOUT TEST FUNCTION FOR PROPER OPERATION

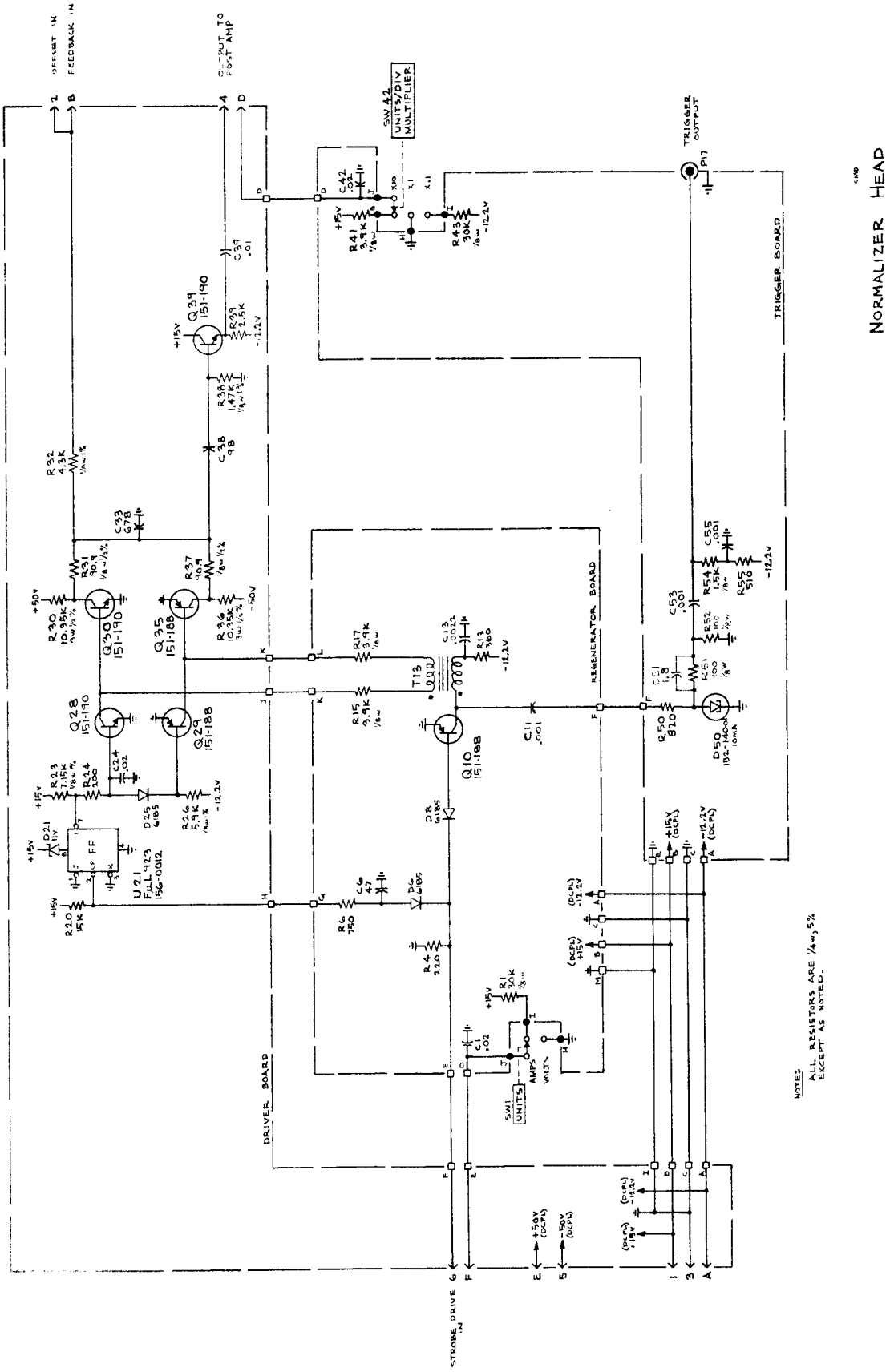
Set up 3S5/3T5/568/230 as outlined in section 1b.

Remove the extender cable from the Type 3S2 and disconnect the Normalizer Head. Install the head in its housing and plug it into CH A of the 3S5. Set the Type 3S5 CH A units/div at 100, DC OFFSET at 0. Set the Normalizer Head UNITS/DIV MULTIPLIER at X1 and UNITS at VOLTS. Obtain a free-running, dual-trace display on the Type 568. Use the CH A DC OFFSET control of the Type 3S5 to vertically position the display on screen, if necessary. The Type 230 digital readout should read 500 mV within 2%, and the "Within Limit" light should be on. Switch the UNITS/DIV MULTIPLIER to X10. The readout numbers should be within 3% of those noted in the X1 position, with the correct decimal placement and units symbol (i.e. 5.00 V). Switch the UNITS/DIV MULTIPLIER to X0.1. The readout numbers should be within 3% of those noted in the X1 position, with the correct decimal placement and units symbol (i.e. 50.0 V).

Switch the UNITS/DIV MULTIPLIER to X1. Switch the UNITS to AMPS and check the Type 230 readout for a mA or m_ indication.

SECTION 5

SCHEMATIC DIAGRAMS



SECTION 6

ELECTRICAL PARTS LIST

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description			
				Capacitors			
Tolerance ±20% unless otherwise indicated.							
C1	283-0004-00			0.02 µF	Cer	150 V	
C6	281-0518-00			47 pF	Cer	500 V	
C11	283-0065-00			0.0022 µF	Cer	100 V	10%
C13	283-0028-00			0.022 µF	Cer	50 V	
C24	283-0004-00			0.02 µF	Cer	150 V	
C33	283-0605-00			678 pF	Mica	300 V	1%
C38	283-0599-00	X200		98 pF	Mica	500 V	5%
C39	283-0155-00			0.01 µF	Cer	50 V	10%
C42	283-0004-00		280X	0.02 µF	Cer	150 V	
C51	283-0181-00	X281		1.8 pF	Cer	100 V	
C53	283-0067-00			0.001 µF	Cer	200 V	10%
C55	283-0067-00			0.001 µF	Cer	200 V	10%
				Diodes			
D6	*152-0185-00			Silicon	Replaceable by 1N4152		
D8	*152-0185-00			Silicon	Replaceable by 1N4152		
D21	152-0055-00			Zener	1N962B 400 mW, 11 V 5%		
D25	*152-0185-00			Silicon	Replaceable by 1N4152		
D50	152-0140-01			Tunnel	10 mA, 8 pF		
				Connector			
P17	131-0565-00			Receptacle, electrical, male			
				Transistors			
Q10	151-0188-00			Silicon	2N3906		
Q28	151-0190-00			Silicon	2N3904		
Q29	151-0188-00			Silicon	2N3906		
Q30	151-0190-00			Silicon	2N3904		
Q35	151-0188-00			Silicon	2N3906		
Q39	151-0190-00			Silicon	NPN 2N3904		

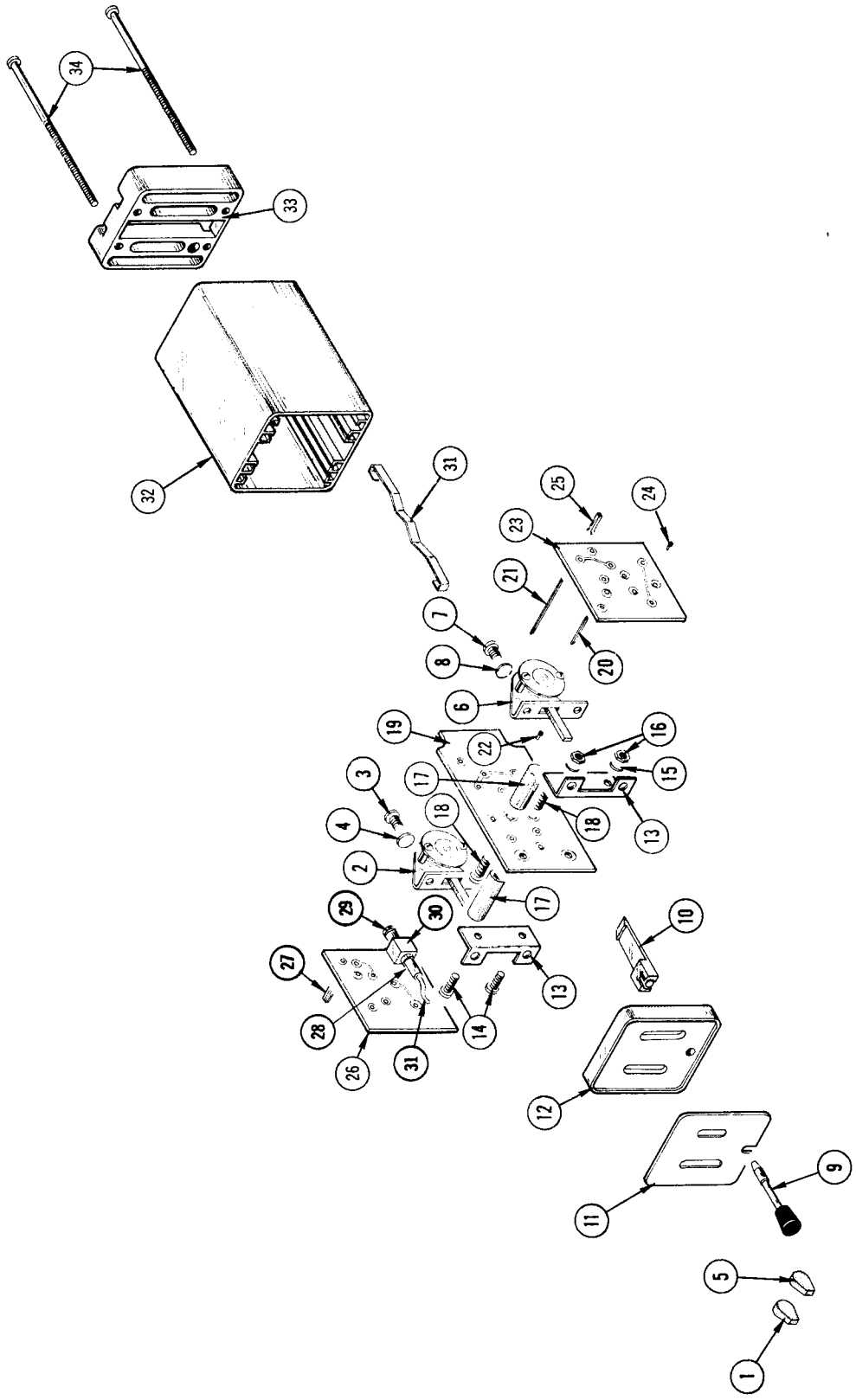
Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description		
				Resistors		
Resistors are fixed, composition, ±10% unless otherwise indicated.						
R1	317-0303-00			30 kΩ	1/8 W	5%
R4	315-0221-00			220 Ω	1/4 W	5%
R6	315-0751-00			750 Ω	1/4 W	5%
R13	315-0361-00			360 Ω	1/4 W	5%
R15	317-0392-00			3.9 kΩ	1/8 W	5%
R17	317-0392-00			3.9 kΩ	1/8 W	5%
R20	315-0153-00			15 kΩ	1/4 W	5%
R23	321-0275-00			7.15 kΩ	1/8 W Prec	1%
R24	315-0241-00			240 Ω	1/4 W	5%
R26	321-0267-00			5.9 kΩ	1/8 W Prec	1%
R30	308-0359-01			10.35 kΩ	3 W WW	1/2%
R31	321-0093-01			90.9 Ω	1/8 W Prec	1/2%
R32	321-0254-00			4.32 kΩ	1/8 W Prec	1%
R36	308-0359-01			10.35 kΩ	3 W WW	1/2%
R37	321-0093-01			90.9 Ω	1/8 W Prec	1/2%
R38	321-0209-00			1.47 kΩ	1/8 W Prec	1%
R39	315-0222-00			2.2 kΩ	1/4 W	5%
R41	317-0392-00			3.9 kΩ	1/8 W	5%
R43	317-0303-00			30 kΩ	1/8 W	5%
R50	315-0821-00			820 Ω	1/4 W	5%
R51	317-0101-00			100 Ω	1/8 W	5%
R52	317-0101-00			100 Ω	1/8 W	5%
R54	317-0152-00			1.5 kΩ	1/8 W	5%
R55	315-0511-00			510 Ω	1/4 W	5%
				Switch		
	Unwired or Wired					
SW1	260-0731-00			Lever	UNITS	
SW42	260-0621-00			Lever	UNITS/DIV MULTIPLIER	

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
				Transformer
T13	*120-0582-00			Toroid, 6 turns
				Integrated Circuit
U21	156-0012-00			Clocked J-K Flipflop Replaceable by Fairchild μL923

EXPLODED VIEW



®

SECTION 7

MECHANICAL PARTS LIST

EXPLODED VIEW

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	1 2 3 4 5	Description
1	366-0215-01			1		KNOB, lever, charcoal--UNITS/DIV MULTIPLIER
2	260-0621-00			1		SWITCH, lever--UNITS/DIV MULTIPLIER
	- - - - - -			-		mounting hardware: (not included w/switch)
3	211-0007-00			2		SCREW, 4-40 x 0.188 inch, PHS
4	210-0004-00			2		WASHER, lock, internal, #4
5	366-0215-01			1		KNOB, lever, charcoal--UNITS
6	260-0731-00			1		SWITCH, lever--UNITS
	- - - - - -			-		mounting hardware: (not included w/switch)
7	211-0007-00			2		SCREW, 4-40 x 0.188 inch, PHS
8	210-0004-00			2		WASHER, lock, internal, #4
9	384-0687-00	7205		1		SHAFT, latch
	384-0687-01	7206		1		SHAFT, latch
	214-1226-01			1		SPRING, helical compression (not shown)
10	105-0066-00	7205		1		STRIKE, latch
	105-0066-01	7206		1		STRIKE, latch
11	333-1093-01			1		PANEL, front
12	386-1338-08			1		SUBPANEL, front
13	407-0478-00			2		BRACKET, angle
	- - - - - -			-		mounting hardware: (not included w/bracket
14	211-0008-00			2		SCREW, 4-40 x 0.25 inch, PHS
15	210-0004-00			2		WASHER, lock, internal, #4
16	210-0406-00			2		NUT, hex., 4-40 x 0.188 inch
17	385-0149-00			2		ROD, plastic
	- - - - - -			-		mounting hardware for each: (not included
	- - - - - -			-		w/rod)
18	211-0097-00			1		SCREW, 4-40 x 0.312 inch, PHS
19	670-0197-01			1		CIRCUIT BOARD ASSEMBLY--DRIVER
	- - - - - -			-		circuit board assembly includes:
	388-1034-01			1		CIRCUIT BOARD
20	131-0591-00			5		TERMINAL, pin, short
21	131-0594-00			5		TERMINAL, pin, long
22	136-0252-00			20		SOCKET, pin connector

EXPLODED VIEW (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Serial/Model No. Disc	Qty	1 2 3 4 5	Description
23	670-0198-00			1		CIRCUIT BOARD ASSEMBLY--REGENERATOR
	- - - - - -			-		circuit board assembly includes:
	388-1036-00			1		CIRCUIT BOARD
24	136-0252-00			3		SOCKET, pin connector
25	136-0263-03			10		SOCKET, connector pin
26	670-0199-00			1		CIRCUIT BOARD ASSEMBLY--TRIGGER
	- - - - - -			-		circuit board assembly includes:
	388-1035-00			1		CIRCUIT BOARD
27	136-0263-03			6		SOCKET, connector pin
28	175-0068-01			1		CABLE ASSEMBLY
	- - - - - -			-		cable assembly includes
29	131-0565-00			1		CONNECTOR, receptacle, coaxial
30	352-0133-00			1		HOLDER, connector
31	175-0068-00			ft		CABLE, coaxial, 50 Ω, 1.40 inches long
	- - - - - -			-		
32	131-0555-00			4		CONTACT, electrical, ground spring
33	380-0125-00			1		HOUSING, wrap-around
34	386-1337-10			1		SUBPANEL, rear
	- - - - - -			-		mounting hardware: (not included w/sub panel)
	- - - - - -			-		
35	211-0141-00			4		SCREW, 4-40 x 3.25 inches, PHS

STANDARD ACCESSORIES

	062-1150-00			1		MANUAL, instruction (not shown)