INSTRUCTION MANUAL

Serial Number ______________

5A15N AMPLIFIER

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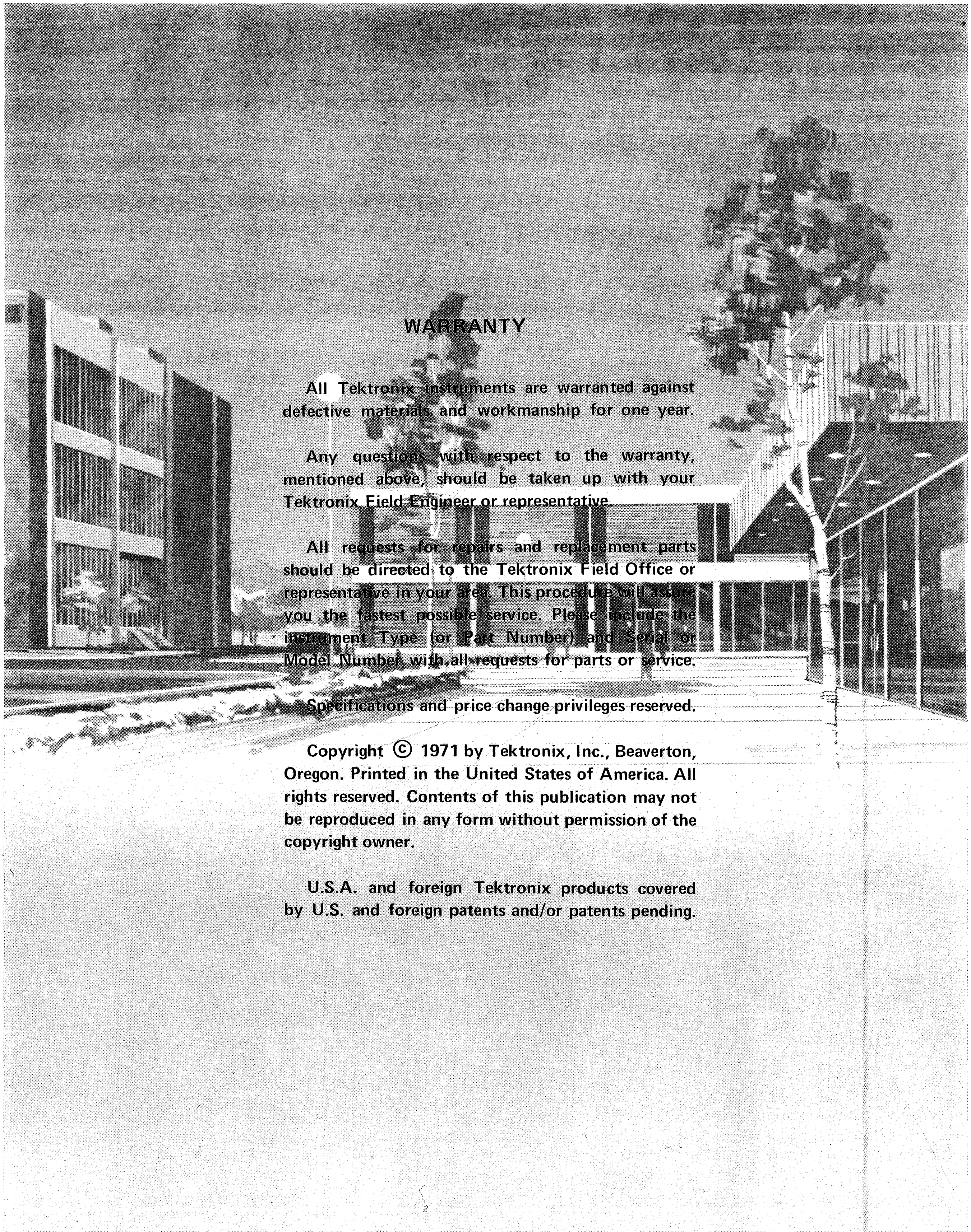


WARRANTY

All Tektronix instruments are warranted against defective materials and workmanship for one year.

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

All requests for repairs and replacement parts should be directed to the Tektronix Field Office or representative in your area. This procedure will assure you the fastest possible service. Please include the instrument Type (or Part Number) and Serial or Model Number with all requests for parts or service.

Specifications and price change privileges reserved.

U.S.A. and foreign Tektronix products covered by U.S. and foreign patents and/or patents pending.

TABLE OF CONTENTS

Abbreviations and symbols used in this manual are based on or taken directly from IEEE Standard 260 "Standard Symbols for Units", MIL-STD-12B and other standards of the electronics industry. Change information, if any, is located at the rear of this manual.

Fig. 1-1. 5A15N Amplifier.

SECTION 1 SPECIFICATION

Change information, if any, affecting this section will be found at the rear of this manual.

Introduction

The 5A15N Amplifier is a general-purpose amplifier plug-in unit for use with Tektronix 5100-series oscilloscopes. The unit features solid-state circuitry and simplicity of front-panel controls, which include a lighted knob skirt to provide a direct readout of calibrated deflection factor. The 5A15N has calibrated deflection factors from one millivolt per division to five volts per division and a bandwidth from DC to at least two megahertz. While designed primarily for use as a vertical amplifier, the unit can be operated in association with the horizontal deflection system of the oscilloscope for X-Y displays.

The following electrical characteristics apply over an ambient temperature range of 0°C to +50°C. Refer to the 5100-series Oscilloscope System manual for environmental characteristics.

In this manual the word Volts/Div or division refers to major graticule division.

TABLE 1-1

ELECTRICAL CHARACTERISTICS

Characteristic	Performance Requirement	Supplemental Information
Deflection Factor		
Calibrated Range	1 millivolt/division to 5 volts/division	12 steps in a 1-2-5 sequence
Accuracy	Within 2%	
Step Attenuator Balance		Adjustable for one division or less trace movement as VOLTS/DIV is rotated throughout its range.
Uncalibrated (Var) Range		At least 2.5:1.
Frequency Response		
Bandwidth (8 Div Reference)		
DC (Direct) Coupled	DC to at least 2 megahertz.	
AC (Capacitive) Coupled	2 hertz or less to at least 2 megahertz.	
Step Response (Displayed)		
Aberrations	±2% of pulse amplitude.	
Inputs		
Resistance	1 megohm, within 1%.	Time constant normalized for 47 microseconds, within 3%.
Capacitance	≈47 picofarads	
Maximum Safe Input Voltages		
DC (Direct) Coupled	350 V (DC + Peak AC)	
AC (Capacitive) Coupled	350 VDC	
POSITION Range		At least + and −10 divisions from graticule center.

SECTION 2 OPERATING INSTRUCTIONS

Change information, if any, affecting this section will be found at the rear of this manual.

Introduction

The 5A15N Amplifier Plug-in operates with a Tektronix 5100-series oscilloscope. An understanding of the 5A15N operation and capabilities is essential for obtaining best results. This section of the manual gives a brief functional description of the front-panel controls and connectors, a familiarization procedure, and general operating information.

PLUG-IN INSERTION AND REMOVAL

The 5A15N is calibrated and ready for use as it is received. It can be installed in any compartment of the 5100-series oscilloscope, but it is intended for principal use in vertical compartments (the center and left compartments). For X-Y operation, the 5A15N may also be installed in the horizontal (right) compartment (refer to the 5100N Oscilloscope System Instruction Manual for information on X-Y operation).

NOTE

If the oscilloscope system receives no DISPLAY ON logic levels from the vertical plug-ins, it is designed to display the unit in the left compartment.

To install, align the upper and lower rails of the 5A15N with the plug-in compartment tracks and fully insert it (the plug-in panel must be flush with the oscilloscope panel). To remove, pull the release latch to disengage the 5A15N from the oscilloscope.

CONTROLS AND CONNECTORS

This is a brief description of the function or operation of the front-panel controls and connectors. More detailed information is given under General Operating Information.

DISPLAY ON	Applies and removes logic levels to the oscilloscope system to enable or disable plug-in operation. The switch functions only when the plug-in is operated in one of the vertical plug-in compartments.
POSITION	Positions display.
VOLTS/DIV	Volts per major graticule division. Selects calibrated deflection factors from 1 mV/Div to 5 V/Div; 12 steps in a 1-2-5 sequence. Knob skirt is illuminated to indicate deflection factor.
Variable Volts/Div	Provides uncalibrated, continuously variable deflection factor between calibrated steps; extends range to 12.5 V/Div.
STEP ATTEN BAL	Balances the input amplifier for minimum trace shift throughout the VOLTS/DIV gain-switching range.
Input Coupling Pushbuttons	AC-DC: Button pushed in selects capacitive coupling of input signal; button out selects direct coupling of input signal. GND: Disconnects the input signal and provides ground reference to the amplifier input stage. PRE CHG: Both AC-DC and GND buttons pushed in allows precharging of the coupling capacitor. Release GND for measurement.
Input Connector	BNC connector for application of external voltage signals. Includes a coded-probe input ring for activation of X10 readout.

BASIC OPERATION

Preparation

The first few steps of the following procedure are intended to help quickly obtain a trace on the screen and prepare the instrument for immediate use. The remainder of the steps demonstrate some of the basic functions of the 5A15N. Operation of other instruments in the system is described in the instruction manuals for those units.

1. Insert the unit all the way into the oscilloscope system plug-in compartment.

2. Turn the oscilloscope Intensity control fully counterclockwise and turn the oscilloscope system Power ON. Pre-

set the time-base and triggering controls for a 2-millisecond/division sweep rate and automatic triggering.

3. Set the 5A15N front-panel controls as follows:

DISPLAY	ON (deflection factor illuminated)
POSITION	Midrange
VOLTS/DIV	.1 V Calibrated
STEP ATTEN BAL	Midrange
Input Coupling	DC, GND

4. Adjust the Intensity control for normal viewing of the trace. The trace should appear near the graticule center.

5. Move the trace two divisions below the graticule centerline with the POSITION control.

6. Apply a 400-millivolt peak-to-peak signal (available at the oscilloscope Calibrator loop) through a test lead or 1X probe to the input connector.

7. Release the GND pushbutton. The display should be square waves four divisions in amplitude, with the bottom of the display at the reference established in step 5. Rotate the Variable control throughout its range, observing a reduction of the display amplitude. Return the Variable control to the CAL detent (calibrated Volts/Div) position.

8. To demonstrate AC-coupled operation, re-position the display with the POSITION control to place the bottom of the display at the graticule centerline.

9. Push in the AC button and note that the display shifts downward about two divisions to its average level.

Step Attenuator Balance

If the STEP ATTEN BAL control is not properly adjusted, the CRT zero reference point (trace or spot) will shift vertically due to differential DC imbalance in the amplifier as the VOLTS/DIV switch is rotated throughout its range. The shift is more noticeable on the most sensitive positions.

a. With the instrument operating, ground the input (GND button pushed in) and set the VOLTS/DIV switch to 5 V. Move the trace to the graticule center with the POSITION control.

b. Rotate the VOLTS/DIV switch throughout its range and adjust the STEP ATTEN BAL control for minimum trace shift.

Gain Check

The vertical and horizontal deflection systems of the 5100N-series oscilloscopes are gain-standardized to permit a plug-in to be moved from one oscilloscope to another (or from one compartment to another within the oscilloscope) without the need to recheck the calibration each time. However, the 5A15N gain can be checked and, if necessary, adjusted.

This completes the basic operating procedure for the 5A15N. Instrument operations not explained here or those that need further explanation are discussed under General Operating Information.

GENERAL OPERATING INFORMATION

Applying Signals

When measuring DC voltage, use the largest deflection factor (5 V/Div) when first connecting the 5A15N to an unknown voltage source. If the deflection is too small to make the measurement, switch to a lower deflection factor.

In general, probes offer the most convenient method of connecting a signal to the input of the 5A15N. Tektronix probes are shielded to prevent pickup of electrostatic interference. A 10X attenuator probe offers a high input impedance and allows the circuit under test to perform very close to normal operating conditions. The 5A15N is designed for compatibility with coded probes, such as the Tektronix P6060 and P6052 Passive Probes. The input connector has an outer ring to which the coding ring on the probe connector makes contact. This type of probe allows the vertical deflection factor indicated by the readout to correspond with the actual deflection factor at the probe tip, eliminating the need to consider the attenuation factor of the probe when measuring the signal amplitude on the graticule scale. See your Tektronix, Inc., catalog for characteristics and compatibility of probes for use with this system.

Sometimes unshielded test leads can be used to connect the 5A15N to a signal source, particularly when a high-level, low-frequency signal is monitored at a low-impedance point. However, when any of these factors is missing, it becomes increasingly important to use shielded signal cables. In all cases, the signal-transporting leads should be kept as short as practical. Be sure to establish a common ground connection between the device under test and the 5A15N. The shield of a coaxial cable or ground strap of a signal probe provides adequate common ground connection.

Input Coupling

The AC-DC pushbutton switch allows a choice of input coupling. The type of display desired will determine the coupling used.

DC coupling (button out) can be used for most applications. However, if the DC component of the signal is much larger than the AC component, AC coupling (button in) will probably provide a better display. DC coupling should be used to display AC signals below about 2 hertz as they will be attenuated in the AC position.

In the AC position, the DC component is blocked by a capacitor in the input circuit. The low-frequency response in the AC position is about 2 hertz (−3 dB point). Therefore, some low-frequency attenuation can be expected near this frequency limit. Distortion will also appear in square waves which have low-frequency components.

The GND pushbutton provides a ground reference at the amplifier input. The signal applied to the input connector is presented with a one-megohm load, while the amplifier input is grounded. This eliminates the need to externally ground the input to establish a DC ground reference.

Pre-charging. To minimize surge currents in the circuit under test when using deflection factors of 50 mV/Div through 1 mV/Div and a 1X probe, use the AC-DC and GND pushbuttons to take advantage of the pre-charging circuit incorporated inthe unit. The pre-charging circuit permits charging the coupling capacitor to the DC source voltage when the AC and GND buttons are pressed in. The procedure for using this circuit is as follows:

a. Before connecting the 5A15N to a signal containing a DC component, push in the AC and GND buttons. Then connect the input to the circuit under test.

b. Wait about one second for the coupling capacitor to charge.

c. Remove the ground from the coupling capacitor (GND button out). The display will remain on-screen and the AC component can be measured in the usual manner.

Deflection Factor

The amount of trace deflection produced by a signal is determined by the signal amplitude, the attenuation factor (if any) of the probe, the setting of the VOLTS/DIV switch, and the setting of the Variable control. The calibrated deflection factors are indicated by the VOLTS/DIV switch only when the Variable control is rotated fully clockwise into the detent position.

The range of the Variable control is at least 2.5:1. It provides uncalibrated deflection factors covering the full range between the fixed settings of the VOLTS/DIV switch. The control can be set to extend the deflection factor to at least 12.5 volts/division.

SECTION 3
CIRCUIT DESCRIPTION

Change information, if any, affecting this section will be found at the rear of this manual.

Introduction

This section contains an electrical description of the circuits in the 5A15N Amplifier unit. A complete schematic diagram is given on a pullout page at the back of the manual.

Plug-in Logic

When the DISPLAY ON button, S199, is pressed, a logic level is applied to the electronic switching circuit in the oscilloscope to enable plug-in operation (this button has no effect when the plug-in is inserted in a horizontal plug-in compartment). Power is applied to illuminate the front-panel knob-skirt readout lamp, indicating the ON mode.

Input Coupling

Signals applied to the front-panel input connector may be capacitive coupled (AC), direct coupled (DC), or internally disconnected (GND). Provision is made to precharge (or discharge) the input capacitor to protect delicate circuitry under test. When both the AC and GND buttons are pressed, the input to the amplifier is grounded and input capacitor C101 is precharged through R102 to the level of the applied input signal.

Input Attenuator

The deflection factor of the plug-in is set by a combination of gain switching in the amplifier and input attenuation.

The input attenuator is a frequency-compensated voltage divider that provides 100X attenuation in the 0.1 V to 5 V positions of the VOLTS/DIV switch. At DC and for low-frequency signals, the divider is essentially resistive (attenuation ratio determined by the resistance ratio of R107 and R108). At higher frequencies, the capacitive reactance becomes effective and the attenuation ratio is determined by the impedance ratio. In addition to providing constant 100X attenuation throughout the bandwidth of the amplifier, the input attenuator maintains a constant input RC characteristic (one megohm paralleled by about 47 pF) for 0.1 V to 5 V settings of the VOLTS/DIV switch.

Amplifier

The input amplifier consists of two identical feedback amplifiers connected in a paraphase configuration. Quiescently, the two sides of the amplifier are balanced by the STEP ATTEN BAL adjustment R116 so there is no current through the gain-setting resistor (R123 through R128). See Fig. 3-1 for a simplified diagram. An input signal is developed across the gain-setting resistor, shifting the current through Q134 and Q138 by the amount established through R123-R128, and developing a push-pull output signal across R134 and R138. The gain of this amplifier

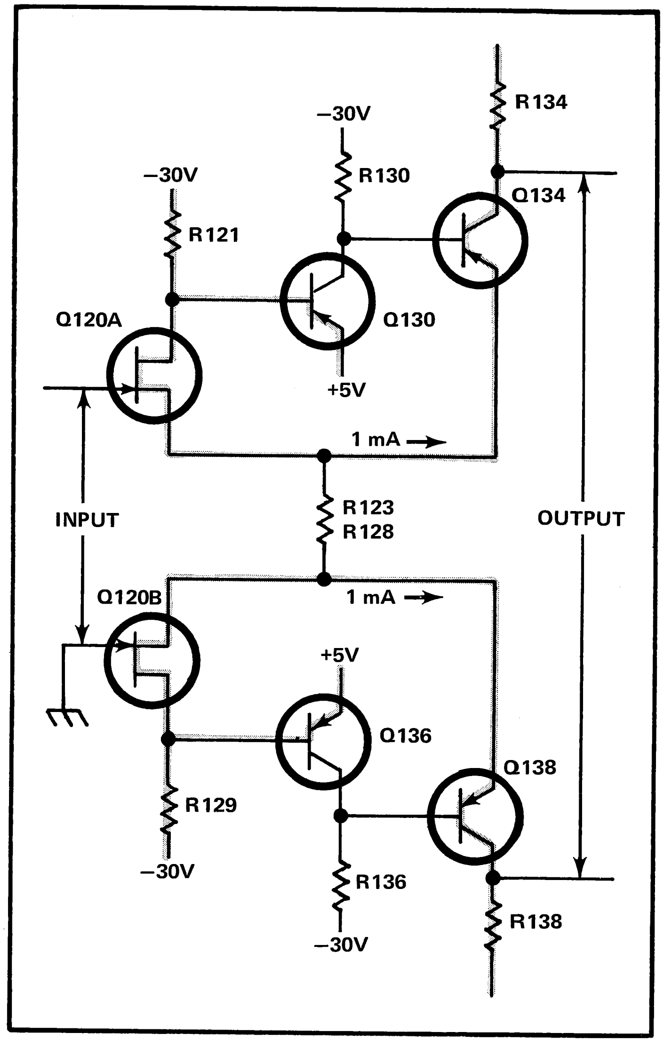


Fig. 3-1. Input amplifier partial diagram showing quiescent current paths.

ranges from about one to fifty, and is primarily determined by the ratio of R123 to the sum of R134 and R138.

The push-pull signal voltage from Q134 and Q138 collectors then passes through emitter followers Q142 and Q146 and is transformed to a signal current by Q160 and Q162. Q177 and Q178 provides positioning current.

The Variable Volts/Div potentiometer R168, and the Gain-setting potentiometer R166, reduce the gain in the Q160-Q162 stage by developing an adjustable amount of signal voltage between their emitters.

Q150, Q156 and Q158 receive the push-pull signal and provide a single-ended trigger signal out.

SECTION 4
CALIBRATION

Change information, if any, affecting this section will be found at the rear of this manual.

Introduction

This section of the manual contains a procedure to return the circuits of the 5A15N to within their designed operating capabilities. Calibration is generally required after a repair has been made, or after long time intervals in which normal aging of components may affect instrument accuracy. Locations of internal adjustments are shown in Figure 4-1.

For initial inspection to verify instrument operation, the Basic Operation procedure in Section 2 should be used (the instrument is checked with its covers on, using a minimum of peripheral equipment).

Instrument Maintenance

Before complete calibration, thoroughly clean and inspect this instrument as outlined in the Maintenance section of the Oscilloscope System manual. Also, the system manual 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.

TEST EQUIPMENT REQUIRED

General

The following test equipment and accessories, or their equivalents, are required for complete calibration of the 5A15N. Specifications given for the test equipment are the

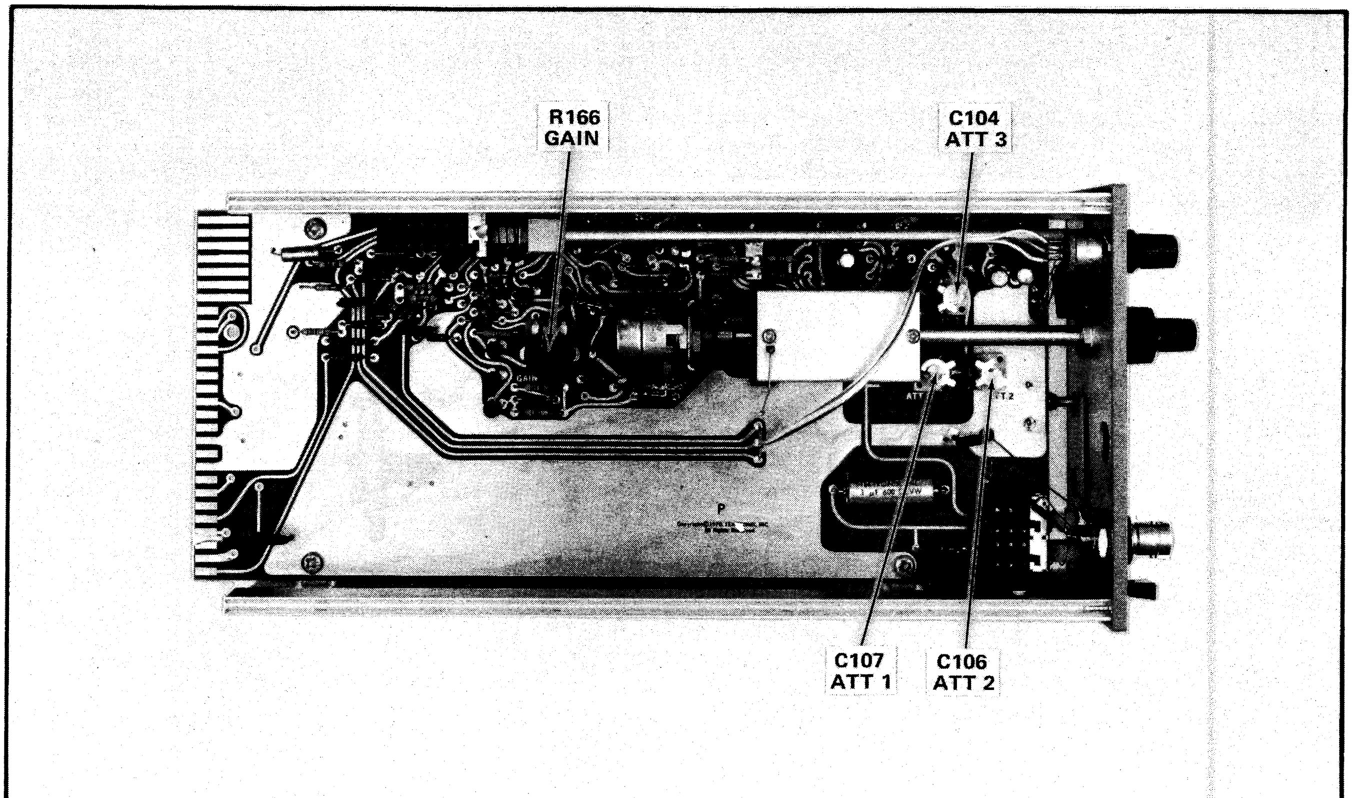


Fig. 4-1. Location of internal controls.

minimum necessary for accurate calibration. Therefore, some of the specifications listed here may be less rigorous than the actual performance capabilities of the test equipment. All test equipment is assumed to be correctly calibrated and operating within the listed specifications.

Calibration Equipment Alternatives

All of the test equipment is required to completely check and adjust this instrument. If other equipment is substituted, control settings or calibration setup may need altering to meet the requirements of the equipment used. Detailed operating instructions for the test equipment are not given in this procedure. Refer to the instruction manual for the test equipment if more information is needed.

Special Calibration Fixtures

Special Tektronix calibration fixtures are used in this procedure only where they facilitate instrument calibration. These special calibration fixtures are available from Tektronix, Inc. Order by part number through your local Tektronix Field Office or representative.

Test Instruments

1. 5100-N Series Oscilloscope. For this procedure, a 5103N/D10 with a 5B10N time base is used.

2. Standard amplitude calibrator. Output signal, 1 kHz square wave; output amplitude, 5 mV to 20 V; amplitude accuracy, within 0.25%. Tektronix calibration fixture 067-0502-01 recommended.

3. Constant-amplitude sine-wave generator. Frequency, 2 Hz to 2 MHz; output amplitude, from about 0.5 V to 40 V peak-to-peak. For example, General Radio 1310-B Oscillator (use a General Radio Type 274 QBJ Adapter to provide BNC output).

Accessories

4. Coaxial cable, Impedance, 50 Ω; length, 42 inches; BNC connectors. Tektronix Part No. 012-0057-01.

5. Input RC Normalizer. RC time constant 47 ms (1 MΩ X 47 pF); BNC connectors. Tektronix Calibration Fixture 067-0541-00.

6. In-line termination. Impedance, 50 Ω; accuracy, ±2%, BNC connectors. Tektronix Part No. 011-0049-01.

SHORT-FORM PROCEDURE and INDEX

5A15N Serial No. ____________________

Calibration Date ____________________

Calibrated by ____________________

CALIBRATION PROCEDURE

Preparation

NOTE

This instrument should be adjusted at an ambient temperature between +25°C and +30°C (between +68°F and +86°F) for best overall accuracy.

1. Remove the left side plug-in cover and install the 5A15N in the left plug-in compartment of the 5100-Series Oscilloscope.

2. Turn the power on and preset the controls as indicated below:

5A15N

DISPLAY	ON
Input coupling	GND
VOLTS/DIV	0.1 V
Variable	Cal
POSITION	midrange

5B10N

Display	Alternate
Position	Midrange
Seconds/Div	0.5 ms
Swp Mag	Out (normal)
Triggering Level	cw
Triggering Source	Left
Auto Trig	In
AC Coupl	In
Singl Swp	Out

MAINFRAME

Set Focus and Intensity for a normal trace.

1. Adjust STEP ATTEN BAL

a. ADJUST—STEP ATTEN BAL control for no trace shift while switching the VOLTS/DIV switch between 0.1 V and 50 mV. Keep the trace on screen with the POSITION control.

b. CHECK—For less than one division trace shift while rotating the Variable VOLTS/DIV control.

2. Adjust Input Compensation and Attenuator Compensation

a. Set the VOLTS/DIV switch to 0.1 V and the input coupling selectors to DC (both buttons out).

b. Apply a 0.5 V square wave from the standard amplitude calibrator directly to the input through the coaxial cable. Adjust the time-base Level control for stable triggering.

c. ADJUST—Att 1 for a square leading corner on the square-wave display.

d. Insert a 47 pF normalizer between the cable and input connector.

e. Set the VOLTS/DIV switch to 50 mV.

f. ADJUST—Att 2 for a square leading corner on the square-wave display.

g. Set the VOLTS/DIV switch to 0.1 V.

h. ADJUST—Att 3 for a square leading corner on the square-wave display.

i. Remove the normalizer.

3. Adjust Amplifier Gain and Check VOLTS/DIV switch Accuracy

ADJUST GAIN

a. Set the VOLTS/DIV switch to 10 mV. Apply a 50-mV standard amplitude calibrator square wave to the input.

b. ADJUST—Gain potentiometer for a five-division display.

c. CHECK—VOLTS/DIV switch accuracy, using the VOLTS/DIV and standard amplitude calibrator switch settings given in Table 4-1.

TABLE 4-1

VOLTS/DIV Switch Setting	Standard Amplitude Calibrator Output	CRT Display (Vertical Deflection)
5 V	20 volts	4 div, ±0.08 div
2 V	10 volts	5 div, ±0.1 div
1 V	5 volts	5 div, ±0.1 div
.5 V	2 volts	4 div, ±0.08 div
.2 V	1 volt	5 div, ±0.1 div
.1 V	.5 volt	5 div, ±0.1 div
50 mV	.2 volt	4 div, ±0.08 div
20 mV	.1 volt	5 div, ±0.1 div
10 mV	50 mV	5 div, ±0.1 div
5 mV	20 mV	4 div, ±0.08 div
2 mV	10 mV	5 div, ±0.1 div
1 mV	5 mV	5 div, ±0.1 div

d. Remove the connections from the input.

4. Check Amplifier Bandwidth

LOW-FREQUENCY −3 dB POINT

a. Apply a six-division 1 kHz signal from the low-frequency constant-amplitude sine-wave generator to the input.

b. Change the input frequency to 2 Hz and check for a six-division signal.

c. CHECK—For a signal of at least 4.2 divisions when the upper button is pressed to AC-couple the input.

d. Set the input coupling back to DC.

HIGH-FREQUENCY −3 dB POINT

e. Apply a six-division 50 kHz signal from the low-frequency constant-amplitude sine-wave generator through a 50-ohm termination to the input.

f. CHECK—For a display of at least 4.2 divisions when the generator frequency is changed to 2 MHz.

This completes the calibration procedure.

SECTION 5

DIAGRAMS AND PARTS LISTS

Symbols and Reference Designators

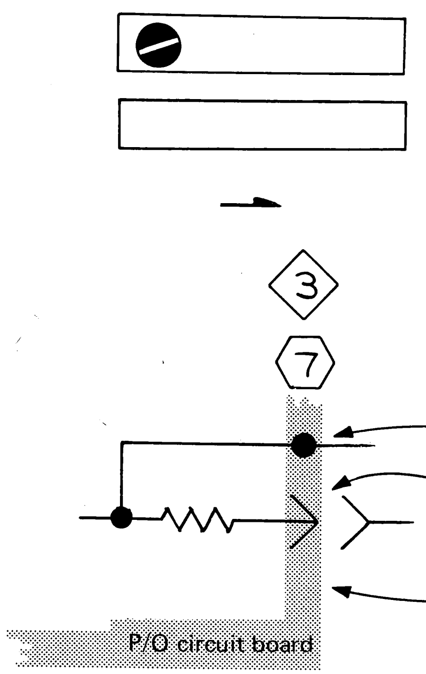
Electrical components shown on the diagrams are in the following units unless noted otherwise:

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 USA Standard Y32.2-1967.

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.

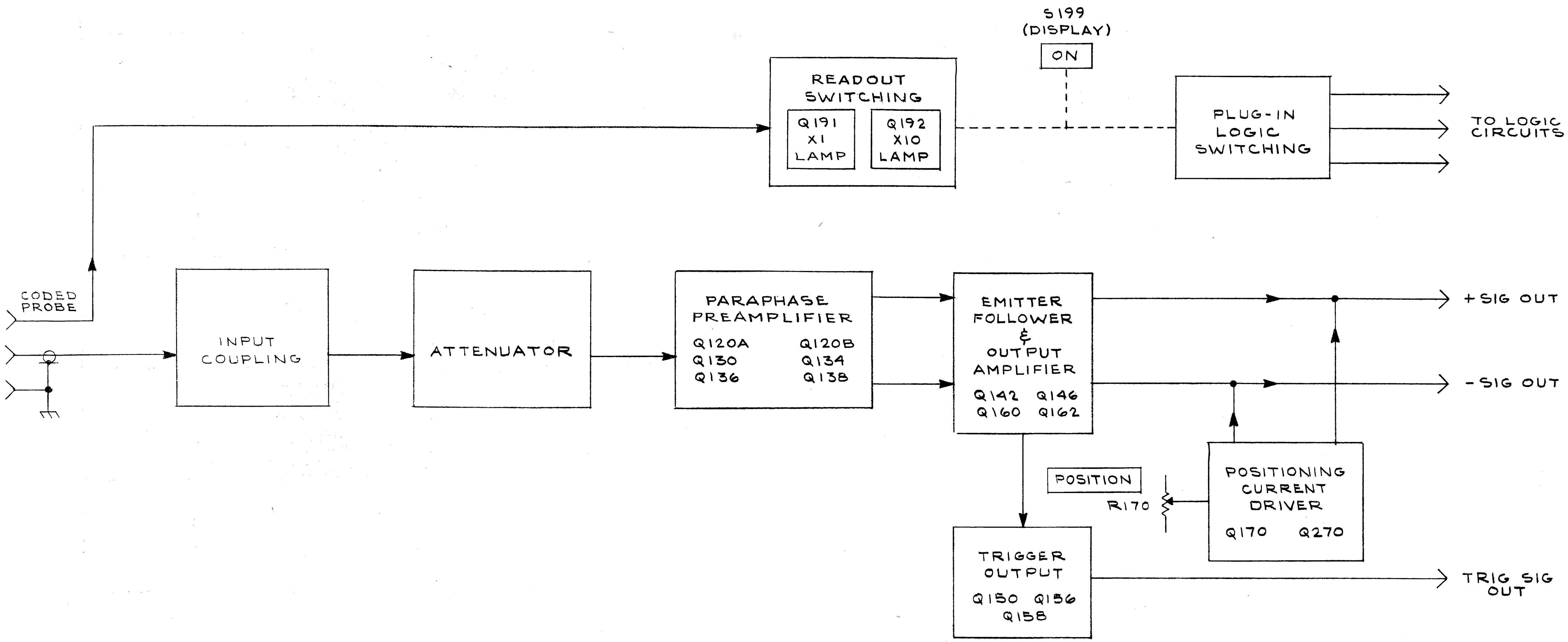
Blue tint encloses components located on circuit board.

The following prefix letters are used as reference designators to identify components or assemblies on the diagrams.

A	Assembly, separable or repairable (circuit board, etc.)
AT	Attenuator, fixed or variable
B	Motor
BT	Battery
C	Capacitor, fixed or variable
CR	Diode, signal or rectifier
DL	Delay line
DS	Indicating device (lamp)
F	Fuse
FL	Filter
H	Heat dissipating device (heat sink, heat radiator, etc.)
HR	Heater
J	Connector, stationary portion
K	Relay
L	Inductor, fixed or variable
LR	Inductor/resistor combination
M	Meter
Q	Transistor or silicon-controlled rectifier
P	Connector, movable portion
R	Resistor, fixed or variable
RT	Thermistor
S	Switch
T	Transformer
TP	Test point
U	Assembly, inseparable or non-repairable (integrated circuit, etc.)
V	Electron tube
VR	Voltage regulator (zener diode, etc.)
Y	Crystal

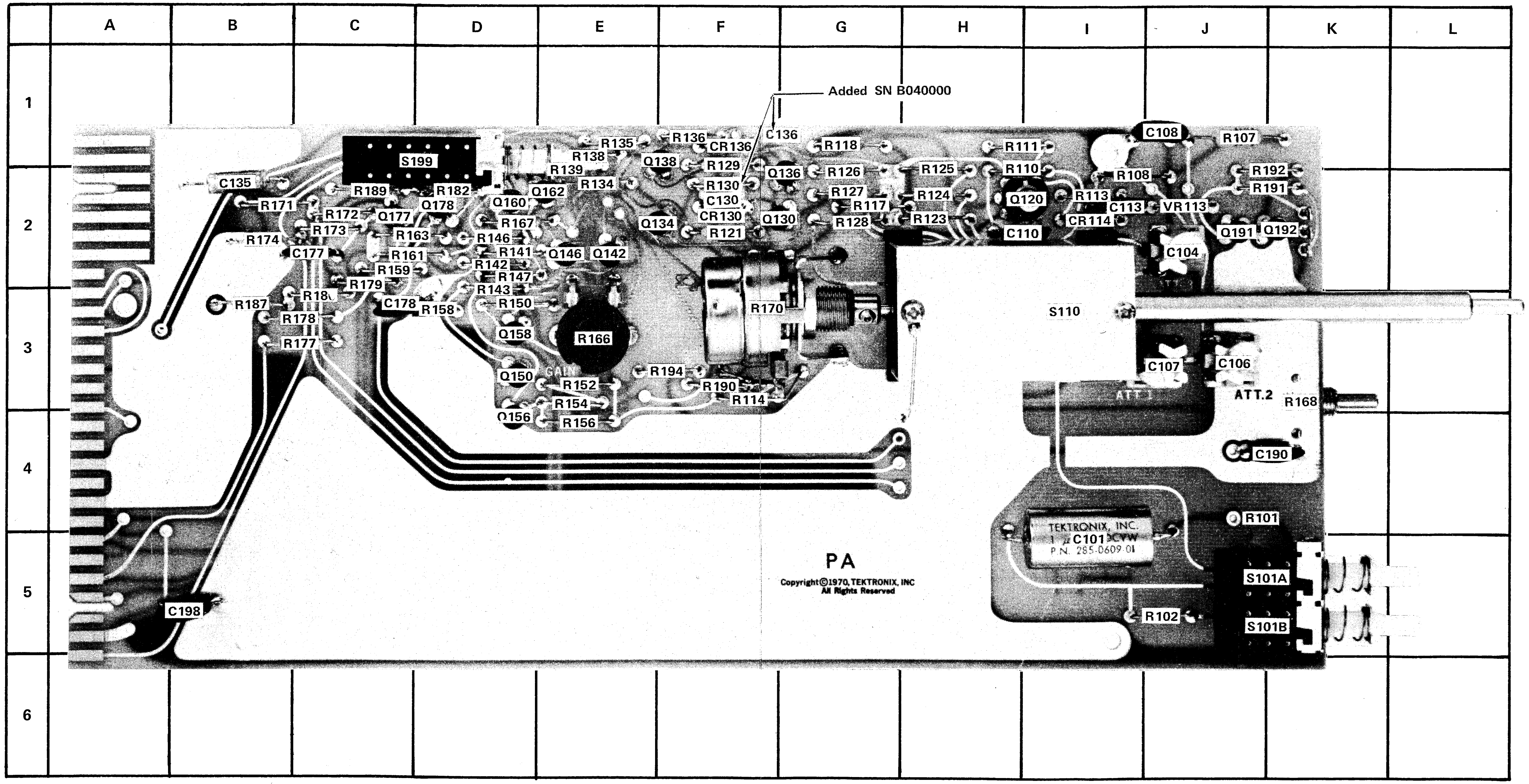
PARTS LIST ABBREVIATIONS

BHB	binding head brass
BHS	binding head steel
cap.	capacitor
cer	ceramic
comp	composition
conn	connector
CRT	cathode-ray tube
csk	countersunk
DE	double end
dia	diameter
div	division
elect.	electrolytic
EMC	electrolytic, metal cased
EMT	electrolytic, metal tubular
ext	external
F & I	focus and intensity
FHB	flat head brass
FHS	flat head steel
Fil HB	fillister head brass
Fil HS	fillister head steel
h	height or high
hex.	hexagonal
HHB	hex head brass
HHS	hex head steel
HSB	hex socket brass
HSS	hex socket steel
ID	inside diameter
inc	incandescent
int	internal
lg	length or long
met.	metal
mtg hdw	mounting hardware
OD	outside diameter
OHB	oval head brass
OHS	oval head steel
P/O	part of
PHB	pan head brass
PHS	pan head steel
plstc	plastic
PMC	paper, metal cased
poly	polystyrene
prec	precision
PT	paper, tubular
PTM	paper or plastic, tubular, molded
RHB	round head brass
RHS	round head steel
SE	single end
SN or S/N	serial number
S or SW	switch
TC	temperature compensated
THB	truss head brass
thk	thick
THS	truss head steel
tub.	tubular
var	variable
w	wide or width
WW	wire-wound


S199
(DISPLAY)
ON
READOUT SWITCHING
Q191 X1 LAMP
Q192 X10 LAMP
PLUG-IN LOGIC SWITCHING
TO LOGIC CIRCUITS
CODED PROBE
INPUT COUPLING
ATTENUATOR
PARAPHASE PREAMPLIFIER
Q120A Q130 Q136
Q120B Q134 Q138
EMITTER FOLLOWER & OUTPUT AMPLIFIER
Q142 Q146 Q160 Q162
+SIG OUT
-SIG OUT
POSITION
R170
POSITIONING CURRENT DRIVER
Q170 Q270
TRIGGER OUTPUT
Q150 Q156 Q158
TRIG SIG OUT

COMPONENT LOCATIONS

5A15N PARTS LOCATION GRID



CKT NO.	GRID LOC.	CKT NO.	GRID LOC.	CKT NO.	GRID LOC.	CKT NO.	GRID LOC.	CKT NO.	GRID LOC.	CKT NO.	GRID LOC.	CKT NO.	GRID LOC.	CKT NO.	GRID LOC.	CKT NO.	GRID LOC.	CKT NO.	GRID LOC.
C101	I-5	C190	K-4	Q120	I-2	Q177	C-2	R101	K-4	R123	H-2	R139	E-2	R161	C-2	R179	C-2	S101	K-5
C104	J-2	C198	B-5	Q130	G-2	Q178	D-2	R102	J-5	R124	H-2	R141	D-2	R163	C-2	R180	C-3	S110	I-3
C106	J-3			Q134	F-2	Q191	J-2	R107	J-1	R125	H-2	R142	D-2	R166	E-3	R182	D-2	S199	D-1
C107	J-3	CR114	I-2	Q136	G-2	Q192	K-2	R108	I-2	R126	G-2	R143	D-2	R167	D-2	R187	B-3		
C108	J-1	CR130	F-2	Q138	F-1			R110	I-1	R127	G-2	R146	D-2	R168	F-3	R189	C-2		
C110	I-2	CR136	F-1	Q142	E-2			R111	I-1	R128	G-2	R147	D-2			R190	F-3		
C113	I-2			Q146	E-2			R113	I-2	R129	F-1	R150	D-3	R171	B-2	R191	K-2		
C130	F-2	VR113	J-2	Q150	D-3			R114	F-3	R130	F-2	R152	E-3	R172	C-2	R192	K-2		
C135	B-2			Q156	D-4			R116	K-3	R134	E-2	R154	E-3	R173	C-2	R194	F-3		
C136	F-1			Q158	D-3			R117	G-2	R135	E-1	R156	E-4	R174	B-2				
C177	C-2			Q160	D-2			R118	G-1	R136	F-1	R158	D-3	R177	C-3				
C178	C-3			Q162	E-2			R121	F-2	R138	E-1	R159	C-2	R178	C-3				

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

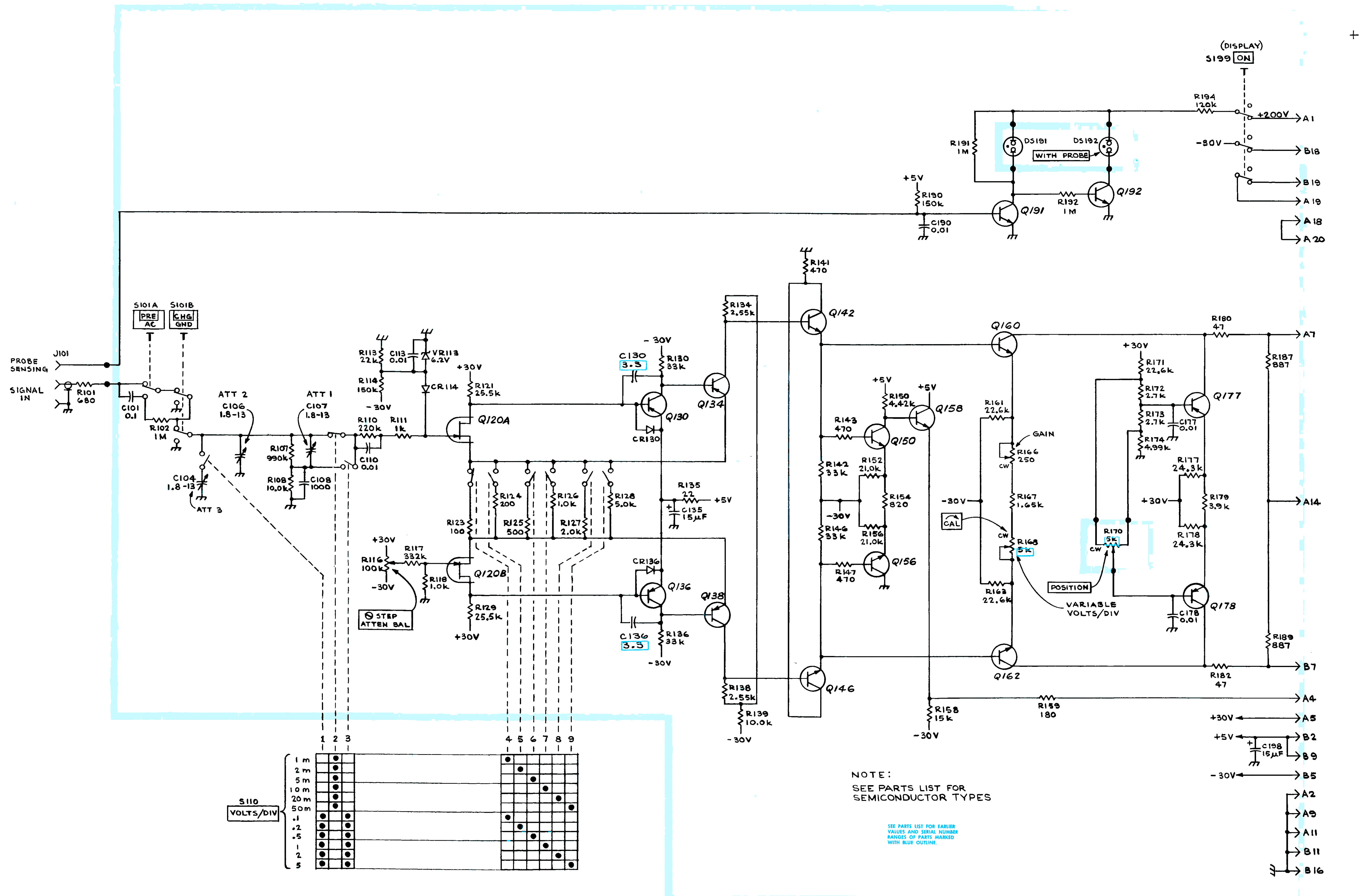
ACTR	ACTUATOR	PLSTC	PLASTIC
ASSY	ASSEMBLY	QTZ	QUARTZ
CAP	CAPACITOR	RECP	RECEPTACLE
CER	CERAMIC	RES	RESISTOR
CKT	CIRCUIT	RF	RADIO FREQUENCY
COMP	COMPOSITION	SEL	SELECTED
CONN	CONNECTOR	SEMICOND	SEMICONDUCTOR
ELCTLT	ELECTROLYTIC	SENS	SENSITIVE
ELEC	ELECTRICAL	VAR	VARIABLE
INCAND	INCANDESCENT	WW	WIREWOUND
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
00853	SANGAMO ELECTRIC CO., S. CAROLINA DIV.	P. O. BOX 128	PICKENS, SC 29671
01121	ALLEN-BRADLEY CO.	1201 2ND ST. SOUTH	MILWAUKEE, WI 53204
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
12697	CLAROSTAT MFG. CO., INC.	LOWER WASHINGTON ST.	DOVER, NH 03820
24931	SPECIALTY CONNECTOR CO., INC.	3560 MADISON AVE.	INDIANAPOLIS, IN 46227
29604	STACKPOLE COMPONENTS CO.	P.O. BOX 14466	RALEIGH, NC 27610
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
74970	JOHNSON, E. F., CO.	299 10TH AVE. S. W.	WASECA, MN 56093
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
81483	INTERNATIONAL RECTIFIER CORP.	9220 SUNSET BLVD.	LOS ANGELES, CA 90069
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NB 68601

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C101	285-0609-01			CAP.,FXD,PLSTC:0.1UF,10%,600V	80009	285-0609-01
C104	281-0081-00			CAP.,VAR,AIR DI:1.8-13PF,375VDC	74970	189-6-5
C106	281-0081-00			CAP.,VAR,AIR DI:1.8-13PF,375VDC	74970	189-6-5
C107	281-0081-00			CAP.,VAR,AIR DI:1.8-13PF,375VDC	74970	189-6-5
C108	283-0594-00			CAP.,FXD,MICA D:0.001UF,1%,100V	00853	D151F102F0
C110	283-0002-00			CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
C113	283-0002-00			CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
C130	281-0534-00	XB040000		CAP.,FXD,CER DI:3.3PF,+/-0.25PF,500V	72982	301-000C0J0339C
C135	290-0135-00			CAP.,FXD,ELCTLT:15UF,20%,20V	56289	150D156X0020B2
C136	281-0534-00	XB040000		CAP.,FXD,CER DI:3.3PF,+/-0.25PF,500V	72982	301-000C0J0339C
C177	283-0002-00			CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
C178	283-0002-00			CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
C190	283-0002-00			CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
C198	283-0002-00			CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
CR114	152-0246-00			SEMICOND DEVICE:SILICON,400PIV,200MA	07910	CD12676
CR130	152-0185-00			SEMICOND DEVICE:SILICON,40PIV,150MA	07910	1N4152
CR136	152-0185-00			SEMICOND DEVICE:SILICON,40PIV,150MA	07910	1N4152
DS191	150-0111-00			LAMP,GLOW:NEON,1.2MA	08806	2AC-AT
DS192	150-0111-00			LAMP,GLOW:NEON,1.2MA	08806	2AC-AT
J101	131-0679-00	B010100	B055053	CONNECTOR,RCPT,:BNC W/HARDWARE	24931	28JR168-1
J101	131-0679-02	B055054		CONNECTOR,RCPT,:BNC W/HARDWARE	24931	28JR270-1
Q120A,B	151-1049-00			TRANSISTOR:SILICON,JFE,N CHANNEL	80009	151-1049-00
Q130	151-0220-00	B010100	B029999	TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q130	151-0342-00	B030000		TRANSISTOR:SILICON,PNP	07263	2N4249
Q134	151-0220-00	B010100	B029999	TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q134	151-0342-00	B030000		TRANSISTOR:SILICON,PNP	07263	2N4249
Q136	151-0220-00	B010100	B029999	TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q136	151-0342-00	B030000		TRANSISTOR:SILICON,PNP	07263	2N4249
Q138	151-0220-00	B010100	B029999	TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q138	151-0342-00	B030000		TRANSISTOR:SILICON,PNP	07263	2N4249
Q142	151-0341-00			TRANSISTOR:SILICON,NPN	07263	2N3565
Q146	151-0341-00			TRANSISTOR:SILICON,NPN	07263	2N3565
Q150	151-0341-00			TRANSISTOR:SILICON,NPN	07263	2N3565
Q156	151-0341-00			TRANSISTOR:SILICON,NPN	07263	2N3565
Q158	151-0341-00			TRANSISTOR:SILICON,NPN	07263	2N3565
Q160	151-0341-00			TRANSISTOR:SILICON,NPN	07263	2N3565
Q162	151-0341-00			TRANSISTOR:SILICON,NPN	07263	2N3565
Q177	151-0220-00	B010100	B029999	TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q177	151-0342-00	B030000		TRANSISTOR:SILICON,PNP	07263	2N4249
Q178	151-0220-00	B010100	B029999	TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q178	151-0342-00	B030000		TRANSISTOR:SILICON,PNP	07263	2N4249
Q191	151-0347-00			TRANSISTOR:SILICON,NPN	80009	151-0347-00
Q192	151-0347-00			TRANSISTOR:SILICON,NPN	80009	151-0347-00
R101	316-0681-00			RES.,FXD,CMPSN:680 OHM,10%,0.25W	01121	CB6811
R102	316-0105-00			RES.,FXD,CMPSN:1M OHM,10%,0.25W	01121	CB1051
R107	322-0624-03			RES.,FXD,FILM:990K OHM,0.25%,0.25W	75042	CCAT2-990KC
R108	321-0289-03			RES.,FXD,FILM:10K OHM,0.25%,0.125W	75042	CEAT2-1002C
R110	316-0224-00			RES.,FXD,CMPSN:220K OHM,10%,0.25W	01121	CB2241
R111	316-0102-00			RES.,FXD,CMPSN:1K OHM,10%,0.25W	01121	CB1021
R113	316-0223-00			RES.,FXD,CMPSN:22K OHM,10%,0.25W	01121	CB2231
R114	316-0154-00			RES.,FXD,CMPSN:150K OHM,10%,0.25W	01121	CB1541

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R116	311-0467-01			RES.,VAR,NONWIR:100K OHM,20%,0.50W	80009	311-0467-01
R117	321-0435-00			RES.,FXD,FILM:332K OHM,1%,0.125W	75042	CEATO-3323F
R118	321-0193-03			RES.,FXD,FILM:1K OHM,0.25%,0.125W	75042	CEAT2-1001C
R121	321-0328-00			RES.,FXD,FILM:25.5K OHM,1%,0.125W	75042	CEATO-2552F
R123	321-0097-03			RES.,FXD,FILM:100 OHM,0.25%,0.125%	91637	MFF1816G100R0C
R124	321-0126-03			RES.,FXD,FILM:200 OHM,0.25%,0.125%	75042	CEAT2-200R0C
R125	321-0612-03			RES.,FXD,FILM:500 OHM,0.25%,0.125W	75042	CEAT2-5000C
R126	321-0193-03			RES.,FXD,FILM:1K OHM,0.25%,0.125W	75042	CEAT2-1001C
R127	321-0222-03			RES.,FXD,FILM:2K OHM,0.25%,0.125W	75042	CEAT2-2KC
R128	321-0816-03			RES.,FXD,FILM:5K OHM,0.25%,0.125W	75042	CEAT2-5KC
R129	321-0328-00			RES.,FXD,FILM:25.5K OHM,1%,0.125W	75042	CEATO-2552F
R130	316-0333-00			RES.,FXD,CMPSN:33K OHM,10%,0.25W	01121	CB3331
R134	321-0232-00			RES.,FXD,FILM:2.55K OHM,1%,0.125W	75042	CEATO-2551F
R135	316-0220-00			RES.,FXD,CMPSN:22 OHM,10%,0.25W	01121	CB2201
R136	316-0333-00			RES.,FXD,CMPSN:33K OHM,10%,0.25W	01121	CB3331
R138	321-0232-00			RES.,FXD,FILM:2.55K OHM,1%,0.125W	75042	CEATO-2551F
R139	321-0289-03			RES.,FXD,FILM:10K OHM,0.25%,0.125W	75042	CEAT2-1002C
R141	316-0471-00			RES.,FXD,CMPSN:470 OHM,10%,0.25W	01121	CB4711
R142	316-0333-00			RES.,FXD,CMPSN:33K OHM,10%,0.25W	01121	CB3331
R143	316-0471-00			RES.,FXD,CMPSN:470 OHM,10%,0.25W	01121	CB4711
R146	316-0333-00			RES.,FXD,CMPSN:33K OHM,10%,0.25W	01121	CB3331
R147	316-0471-00			RES.,FXD,CMPSN:470 OHM,10%,0.25W	01121	CB4711
R150	321-0255-00			RES.,FXD,FILM:4.42K OHM,1%,0.125W	75042	CEATO-4421F
R152	321-0320-00			RES.,FXD,FILM:21K OHM,1%,0.125W	75042	CEATO-2102F
R154	316-0821-00			RES.,FXD,CMPSN:820 OHM,10%,0.25W	01121	CB8211
R156	321-0320-00			RES.,FXD,FILM:21K OHM,1%,0.125W	75042	CEATO-2102F
R158	316-0153-00			RES.,FXD,CMPSN:15K OHM,10%,0.25W	01121	CB1531
R159	316-0181-00			RES.,FXD,CMPSN:180 OHM,10%,0.25W	01121	CB1811
R161	321-0323-00			RES.,FXD,FILM:22.6K OHM,1%,0.125W	75042	CEATO-2262F
R163	321-0323-00			RES.,FXD,FILM:22.6K OHM,1%,0.125W	75042	CEATO-2262F
R166	311-1124-00			RES.,VAR,NONWIR:250 OHM,30%,0.25W	29604	HT20R251B
R167	321-0214-00			RES.,FXD,FILM:1.65K OHM,1%,0.125W	75042	CEATO-1651F
R168	311-1127-00	B010100	B049999	RES.,VAR,NONWIR:5K OHM,20%,0.50W	12697	470WS-CM40265
R168	311-1403-00	B050000		RES.,VAR,NONWIR:5K OHM,20%,0.50W	01121	10M422
R170	311-0310-01	B010100	B039999	RES.,VAR,NONWIR:5K OHM,20%,0.5W	01121	W-7350B
R170	311-1368-00	B040000		RES.,VAR,NONWIR:5K OHM,20%,1W	01121	10M043
R171	321-0323-00			RES.,FXD,FILM:22.6K OHM,1%,0.125W	75042	CEATO-2262F
R172	316-0272-00			RES.,FXD,CMPSN:2.7K OHM,10%,0.25W	01121	CB2721
R173	316-0272-00			RES.,FXD,CMPSN:2.7K OHM,10%,0.25W	01121	CB2721
R174	321-0260-00			RES.,FXD,FILM:4.99K OHM,1%,0.125W	75042	CEATO-4991F
R177	321-0326-00			RES.,FXD,FILM:24.3K OHM,1%,0.125W	75042	CEATO-2432F
R178	321-0326-00			RES.,FXD,FILM:24.3K OHM,1%,0.125W	75042	CEATO-2432F
R179	316-0392-00			RES.,FXD,CMPSN:3.9K OHM,10%,025W	01121	CB3921
R180	316-0470-00			RES.,FXD,CMPSN:47 OHM,10%,0.25W	01121	CB4701
R182	316-0470-00			RES.,FXD,CMPSN:47 OHM,10%,0.25W	01121	CB4701
R187	321-0188-00			RES.,FXD,FILM:887 OHM,1%,0.125W	75042	CEATO-8870F
R189	321-0188-00			RES.,FXD,FILM:887 OHM,1%,0.125W	75042	CEATO-8870F
R190	316-0154-00			RES.,FXD,CMPSN:150K OHM,10%,0.25W	01121	CB1541
R191	316-0105-00			RES.,FXD,CMPSN:1M OHM,10%,0.25W	01121	CB1051
R192	316-0105-00			RES.,FXD,CMPSN:1M OHM,10%,0.25W	01121	CB1051
R194	316-0124-00			RES.,FXD,CMPSN:120K OHM,10%,0.25W	01121	CB1241
S101A S101B	260-1207-00			SWITCH,PUSH:2 MODULE	80009	260-1207-00
S110	105-0245-00			ACTR ASSY,CAM S:	80009	105-0245-00
S199	260-1209-00			SWITCH,PUSH:4PDT	80009	260-1209-00
VR113	152-0166-00			SEMICOND DEVICE:ZENER,0.4W,6.2V,5%	81483	69-9035



AMPLIFIER DIAGRAM

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

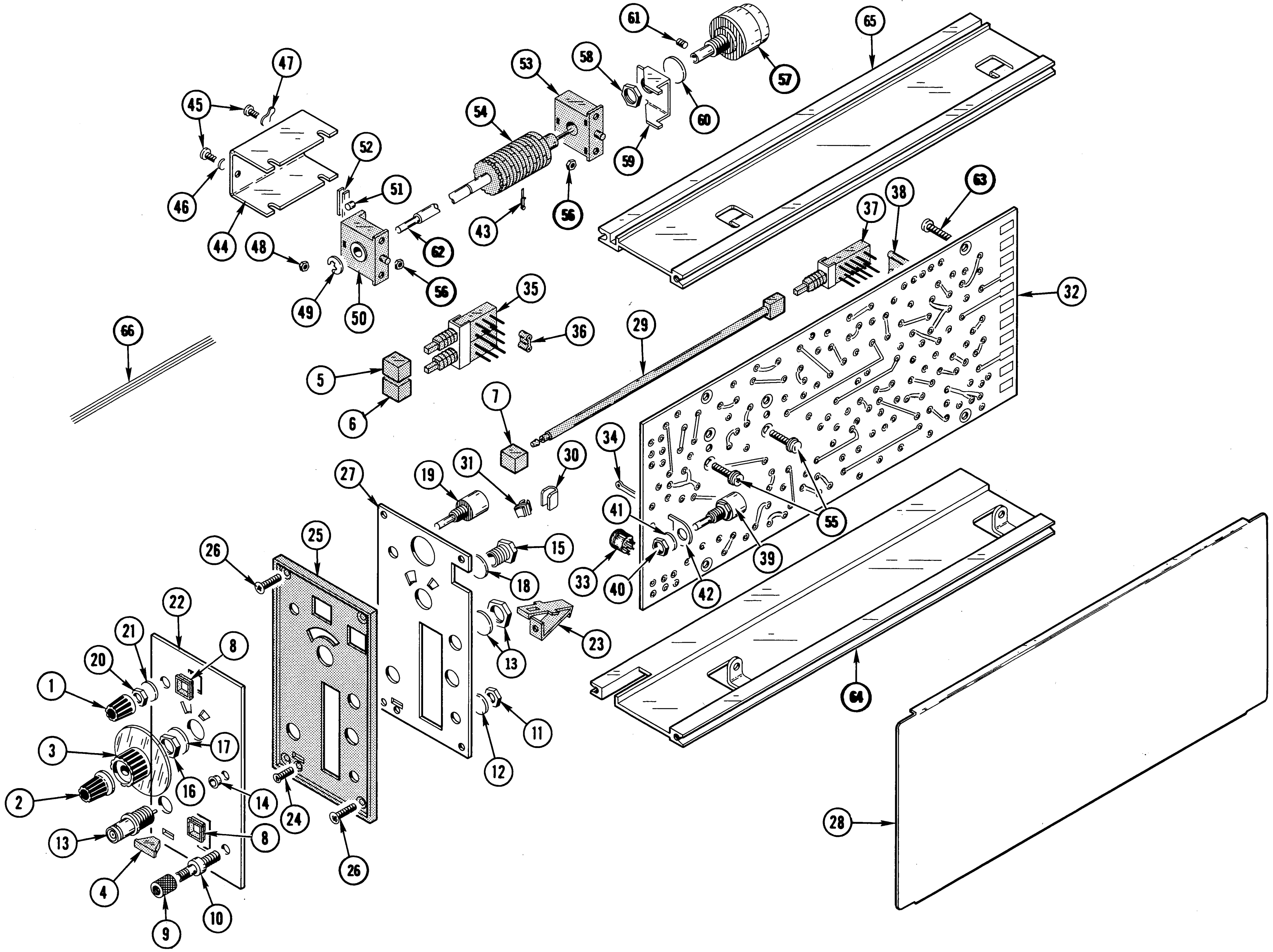
CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
08261	SPECTRA-STRIP CORP.	7100 LAMPSON AVE.	GARDEN GROVE, CA 92642
24931	SPECIALTY CONNECTOR CO., INC.	3560 MADISON AVE.	INDIANAPOLIS, IN 46227
45722	USM CORP., PARKER-KALON FASTENER DIV.	1 PEEKAY DRIVE	CLIFTON, NJ 07014
71785	TRW ELECTRONIC COMPONENTS, CINCH CONNECTOR OPERATIONS	1501 MORSE AVE.	ELK GROVE VILLAGE, IL 60007
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
74445	HOLO-KROME CO.	31 BROOK ST. WEST	HARTFORD, CT 06110
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
78471	TILLEY MFG. CO.	900 INDUSTRIAL RD.	SAN CARLOS, CA 94070
79136	WALDES, KOHINOOR, INC.	47-16 AUSTEL PLACE	LONG ISLAND CITY, NY 11101
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

REV. E FEB. 1976

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
1-1	366-0494-00			1	KNOB:GRAY	80009	366-0494-00
	213-0153-00			1	. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-2	366-1317-00			1	KNOB:RED	80009	366-1317-00
	213-0153-00			1	. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-3	366-1316-00			1	KNOB:GRAY,W/SKIRT	80009	366-1316-00
	213-0153-00			2	. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-4	366-1286-00	B010100	B039999	1	KNOB:LATCH,GRAY	80009	366-1286-00
	366-1286-03	B040000		1	KNOB:LATCH,SILVER	80009	366-1286-03
	214-1840-00	XB040000		1	PIN,KNOB SECRG:	80009	214-1840-00
-5	366-1257-11			1	PUSH BUTTON:GRAY--AC PRE	80009	366-1257-11
-6	366-1257-12			1	PUSH BUTTON:GRAY--CHG GND	80009	366-1257-12
-7	366-1257-14			1	PUSH BUTTON:GRAY--ON	80009	366-1257-14
-8	426-0681-00			3	FR,PUSH BUTTON:GRAY PLASTIC	80009	426-0681-00
	129-0103-00			1	POST,BDG,ELEC:ASSEMBLY	80009	129-0103-00
-9	200-0103-00			1	. NUT,PLAIN,KNURL:0.25-28 X 0.375" OD,BRASS	80009	200-0103-00
-10	129-0077-00			1	. STUD,SHOULDERED:0.938 INCH LONG,BRASS	80009	129-0077-00
					(ATTACHING PARTS)		
-11	210-0583-00			1	. NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20224-402
-12	210-0046-00			1	. WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL	78189	1214-05-00-0541
					- - - * - - -		
-13	131-0679-00	B010100	B055053	1	CONNECTOR,RCPT,:BNC W/HARDWARE	24931	28JR168-1
	131-0679-02	B055054		1	CONNECTOR,RCPT,:BNC W/HARDWARE	24931	28JR270-1
					(ATTACHING PARTS)		
	220-0497-00	XB055054		1	NUT,PLAIN,HEX.:0.5-28 X 0.562 INCH HEX,BRS	73743	OBD
	210-1039-00	XB055054		1	WASHER,LOCK:INT,0.521 ID X 0.625 INCH OD	24931	OBD
					- - - * - - -		
-14	358-0378-00			1	BUSHING,SLEEVE:PRESS MOUNT	80009	358-0378-00
-15	358-0029-00			1	BSHG,MACH.THD:HEX,0.375-32 X 0.438"LONG	80009	358-0029-00
					(ATTACHING PARTS)		
-16	210-0590-00			1	NUT,PLAIN,HEX.:0.375 X 0.438 INCH,STL	73743	2X28269-402
-17	210-0978-00	B010100	B031463	1	WASHER,FLAT:0.375 ID X 0.50 INCH OD,STL	78471	OBD
	210-0012-00	B031464		1	WASHER,LOCK:INTL,0.375 ID X 0.50" OD STL	78189	1220-02-00-0541C
-18	344-0195-01	B010100	B031463X	1	CLIP,ELECTRICAL:CAM SHAFT	80009	344-0195-01
					- - - * - - -		
-19	----- -----			1	RESISTOR,VAR:POSITION,(SEE R170 EPL)		
					(ATTACHING PARTS)		
-20	210-0583-00			1	NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20224-402
-21	210-0940-00			1	WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
					- - - * - - -		
-22	333-1385-00			1	PANEL,FRONT:	80009	333-1385-00
-23	214-1513-00	B010100	B039999	1	LCH,PLUG-IN RET:	80009	214-1513-00
	214-1513-01	B040000		1	LCH,PLUG-IN RET:	80009	214-1513-01
					(ATTACHING PARTS)		
-24	213-0254-00			1	SCR,TPG,THD CTG:2-56X0.25"100 DEG,FLH STL	45722	OBD
					- - - * - - -		
-25	386-1914-00			1	SUBPANEL,FRONT:AMPLIFIER	80009	386-1914-00
					(ATTACHING PARTS)		
-26	213-0229-00			4	SCR,TPG,THD FOR:6-20 X0.375"100 DEG,FLH STL	83385	OBD
					- - - * - - -		
-27	337-1396-00			1	SHLD,ELECTRICAL:REAR	80009	337-1396-00
-28	337-1399-00			2	SHLD,ELECTRICAL:SIDE	80009	337-1399-00
-29	384-1059-00			1	EXTENSION SHAFT:6.58 INCH LONG	80009	384-1059-00
-30	337-1430-00			2	SHIELD,LIGHT:LAMP	80009	337-1430-00
-31	136-0429-00			2	LIGHT,INDICATOR:CAM SWITCH	80009	136-0429-00
-32	670-1342-00	B010100	B049999	1	CKT BOARD ASSY:MAIN	80009	670-1342-00
	670-1342-01	B050000		1	CKT BOARD ASSY:MAIN	80009	670-1342-01
-33	136-0235-00			1	. SOCKET,PLUG-IN:6 CONTACT,ROUND	71785	133-96-12-062
-34	214-0579-00			3	. TERM.,TEST PT:0.40 INCH LONG	80009	214-0579-00
-35	----- -----			1	. SWITCH,PUSH:AC/GND,(SEE S101A,S101B EPL)		
					(ATTACHING PARTS)		
-36	361-0384-00			4	. SPACER,PB SW:0.133 INCH LONG	80009	361-0384-00
					- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
1-37	----- -----			1	. SWITCH,PUSH:DISPLAY ON,(SEE S199 EPL)		
					(ATTACHING PARTS)		
-38	361-0383-00			2	. SPACER,PB SW:CHARCOAL,0.33 INCH LONG	80009	361-0383-00
					- - - * - - -		
-39	----- -----			1	. RESISTOR,VAR:STEP/ATTEN BAL(SEE R116 EPL)		
					(ATTACHING PARTS)		
-40	210-0583-00			1	. NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20224-402
-41	210-0940-00			1	. WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
-42	387-0794-00			1	. PLATE,CMPNT MTG:VAR RESISTOR	80009	387-0794-00
					- - - * - - -		
-43	131-0604-00			9	. CONTACT,ELEC:0.025 SQ X 0.365 INCH LONG	80009	131-0604-00
	105-0245-00			1	. ACTR ASSY,CAM S:	80009	105-0245-00
-44	200-1193-00			1	. . COVER,CAM SW:	80009	200-1193-00
					(ATTACHING PARTS)		
-45	211-0022-00			2	. . SCREW,MACHINE:2-56 X 0.188 INCH,PNH STL	83385	OBD
-46	210-0001-00			1	. . WASHER,LOCK:INTL,0.092 ID X 0.18"OD,STL	78189	1202-00-00-0541C
-47	210-0259-00			1	. . TERMINAL,LUG:0.099"ID INT TOOTH,SE	80009	210-0259-00
-48	210-0405-00	B010100	B031463X	2	. . NUT,PLAIN,HEX.:2-56 X 0.188 INCH,BRS	73743	2X12157-402
	220-0636-00	XB031464		2	. . NUT,PLAIN,HEX.:2-56 X 0.188 INCH,BRS	73743	OBD
	131-1219-00	XB031464		1	. . CONTACT,ELEC:GROUNDING	80009	131-1219-00
					- - - * - - -		
-49	354-0219-00			1	. . RING,RETAINING:FOR 0.25 INCH SHAFT	79136	5103-25-MD-R
-50	401-0057-00			1	. . BEARING,CAM SW:FRONT	80009	401-0057-00
-51	214-1127-00			1	. . ROLLER,DETENT:0.125 DIA X 0.125 INCH L	80009	214-1127-00
-52	214-1139-02	B010100	B030829X	1	. . SPRING,FLAT:GREEN COLORED	80009	214-1139-02
	214-1139-03			1	. . SPRING,FLAT:RED COLORED	80009	214-1139-03
-53	401-0056-00			1	. . BEARING,CAM SW:REAR	80009	401-0056-00
-54	105-0220-00			1	. . ACTR,CAM SW:	80009	105-0220-00
					(ATTACHING PARTS FOR ACTR ASSY)		
-55	211-0116-00			4	. SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
-56	210-0406-00			4	. NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
					- - - * - - -		
-57	----- -----			1	. RESISTOR,VAR:CAL,(SEE R168 EPL)		
					(ATTACHING PARTS)		
-58	210-0590-00	B010100	B049999X	1	. NUT,PLAIN,HEX.:0.375 X 0.438 INCH,STL	73743	2X28269-402
-59	407-0894-00	B010100	B049999X	1	. BRKT,VAR RES:	80009	407-0894-00
-60	210-0012-00	B010100	B049999X	1	. WASHER,LOCK:INTL,0.375 ID X 0.50" OD STL	78189	1220-02-00-0541C
	376-0050-00	XB050000		1	. CPLG,SHAFT,FLEX:FOR 0.081/0.125 INCH SHAFTS	80009	376-0050-00
	213-0022-00			4	. . SETSCREW:4-40 X 0.188 INCH,HEX. SOC,STL	74445	OBD
					- - - * - - -		
-61	213-0048-00	B010100	B049999X	1	. SETSCREW:4-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-62	384-0255-00	B010100	B049999	1	. EXTENSION SHAFT:0.08/0.125 DIA X 5.594" L	80009	384-0255-00
	384-1193-00	B050000		1	. EXTENSION SHAFT:5.422 INCH LONG	80009	384-1193-00
					(ATTACHING PARTS FOR CKT BD ASSY)		
-63	213-0146-00			4	SCR,TPG,THD FOR:6-20 X 0.313 INCH,PNH STL	83385	OBD
					- - - * - - -		
-64	426-0724-00			1	FR SECT,PLUG-IN:BOTTOM	80009	407-0724-00
-65	426-0725-00			1	FR SECT,PLUG-IN:TOP	80009	407-0725-00
-66	175-0826-00			FT	WIRE,ELECTRICAL:3 WIRE RIBBON,11 INCHES LONG	08261	TEK-175-0826-00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Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
	070-1136-00			1	MANUAL:INSTRUCTION(NOT SHOWN)	80009	070-1136-00

ACCESSORIES

MANUAL CHANGE INFORMATION

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

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

A single change may affect several sections. Since the change information sheets are carried in the manual until all changes are permanently entered, some duplication may occur. If no such change pages appear following this page, your manual is correct as printed.

SERVICE NOTE

Because of the universal parts procurement problem, some electrical parts in your instrument may be different from those described in the Replaceable Electrical Parts List. The parts used will in no way alter or compromise the performance or reliability of this instrument. They are installed when necessary to ensure prompt delivery to the customer. Order replacement parts from the Replaceable Electrical Parts List.

CALIBRATION TEST EQUIPMENT REPLACEMENT

Calibration Test Equipment Chart

This chart compares TM 500 product performance to that of older Tektronix equipment. Only those characteristics where significant specification differences occur, are listed. In some cases the new instrument may not be a total functional replacement. Additional support instrumentation may be needed or a change in calibration procedure may be necessary.

Comparison of Main Characteristics

DM 501 replaces 7D13		
PG 501 replaces 107	PG 501 - Risetime less than 3.5 ns into 50 Ω.	107 - Risetime less than 3.0 ns into 50 Ω.
108	PG 501 - 5 V output pulse; 3.5 ns Risetime.	108 - 10 V output pulse; 1 ns Risetime.
111	PG 501 - Risetime less than 3.5 ns; 8 ns Pretrigger pulse delay.	111 - Risetime 0.5 ns; 30 to 250 ns Pretrigger Pulse delay.
114	PG 501 - ±5 V output.	114 - ±10 V output. Short proof output.
115	PG 501 - Does not have Paired, Burst, Gated, or Delayed pulse mode; ±5 V dc Offset. Has ±5 V output.	115 - Paired, Burst, Gated, and Delayed pulse mode; ±10 V output. Short-proof output.
PG 502 replaces 107		
108	PG 502 - 5 V output	108 - 10 V output.
111	PG 502 - Risetime less than 1 ns; 10 ns Pretrigger pulse delay.	111 - Risetime 0.5 ns; 30 to 250 ns Pretrigger pulse delay.
114	PG 502 - ±5 V output	114 - ±10 V output. Short proof output.
115	PG 502 - Does not have Paired, Burst, Gated, Delayed & Undelayed pulse mode; Has ±5 V output.	115 - Paired, Burst, Gated, Delayed & Undelayed pulse mode; ±10 V output. Short-proof output.
2101	PG 502 - Does not have Paired or Delayed pulse. Has ±5 V output.	2101 - Paired and Delayed pulse; 10 V output.
PG 506 replaces 106	PG 506 - Positive-going trigger output signal at least 1 V; High Amplitude output, 60 V.	106 - Positive and Negative-going trigger output signal, 50 ns and 1 V; High Amplitude output, 100 V.
067-0502-01	PG 506 - Does not have chopped feature.	0502-01 - Comparator output can be alternately chopped to a reference voltage.
SG 503 replaces 190,		
190A, 190B	SG 503 - Amplitude range 5 mV to 5.5 V p-p.	190B - Amplitude range 40 mV to 10 V p-p.
191	SG 503 - Frequency range 250 kHz to 250 MHz.	191 - Frequency range 350 kHz to 100 MHz.
067-0532-01	SG 503 - Frequency range 250 kHz to 250 MHz.	0532-01 - Frequency range 65 MHz to 500 MHz.
TG 501 replaces 180,		
180A	TG 501 - Marker outputs, 5 sec to 1 ns. Sinewave available at 5, 2, and 1 ns. Trigger output - slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	180A - Marker outputs, 5 sec to 1 μs. Sinewave available at 20, 10, and 2 ns. Trigger pulses 1, 10, 100 Hz; 1, 10, and 100 kHz. Multiple time-marks can be generated simultaneously.
181	TG 501 - Marker outputs, 5 sec to 1 ns. Sinewave available at 5, 2, and 1 ns.	181 - Marker outputs, 1, 10, 100, 1000, and 10,000 μs, plus 10 ns sinewave.
184	TG 501 - Marker outputs, 5 sec to 1 ns. Sinewave available at 5, 2, and 1 ns. Trigger output - slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	184 - Marker outputs, 5 sec to 2 ns. Sinewave available at 50, 20, 10, 5, and 2 ns. Separate trigger pulses of 1 and .1 sec; 10, 1, and .1 ms; 10 and 1 μs. Marker amplifier provides positive or negative time marks of 25 V min. Marker intervals of 1 and .1 sec; 10, 1, and .1 ms; 10 and 1 μs.
2901	TG 501 - Marker outputs, 5 sec to 1 ns. Sinewave available at 5, 2, and 1 ns. Trigger output - slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	2901 - Marker outputs, 5 sec to 0.1 μs. Sinewave available to 50, 10, and 5 ns. Separate trigger pulses, from 5 sec to 0.1 μs. Multiple time-marks can be generated simultaneously.

NOTE: All TM 500 generator outputs are short-proof. All TM 500 plug-in instruments require TM 500-Series Power Module.