

INSTRUCTION MANUAL

Serial Number _____



5A18N DUAL-TRACE AMPLIFIER



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TABLE OF CONTENTS

	Page		Page
SECTION 1 SPECIFICATION		SECTION 4 CALIBRATION	
Introduction	1-1	Introduction	4-1
Table 1-1, Electrical Characteristics	1-1	Instrument Maintenance	4-1
SECTION 2 OPERATING INSTRUCTIONS		Services Available	4-1
Introduction	2-1	Test Equipment Required	4-1
Plug-In Insertion and Removal	2-1	Calibration Equipment Alternatives	4-1
Controls and Connectors	2-1	Special Calibration Fixtures	4-1
Basic Operation	2-2	Test Instruments	4-1
Preparation	2-2	Accessories	4-1
Step Attenuator Balance		Short-Form Procedure and Index	4-2
(Both Channels)	2-2	Calibration Procedure	4-2
Gain Check		SECTION 5 PARTS LISTS AND DIAGRAMS	
(Both Channels)	2-3	Symbols and Reference Designators	5-1
General Operating Information	2-3	Parts List Abbreviations	5-2
Applying Signals	2-3	Schematic Diagrams	
Input Coupling	2-3	Component Board Locations	
Deflection Factor	2-4	Electrical Parts List	
Display Mode	2-4	Mechanical Parts List	
Trigger Source	2-4		
Oscilloscope Applications	2-4		
Repackaging for Shipment	2-4		
SECTION 3 CIRCUIT DESCRIPTION		CHANGE INFORMATION	
Introduction	3-1	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.	
Plug-In Logic	3-1		
Input Coupling	3-1		
Input Attenuator	3-1		
Amplifier	3-1		
Channel Switching	3-2		
Channel Switching Control	3-2		
Probe Sensing	3-2		

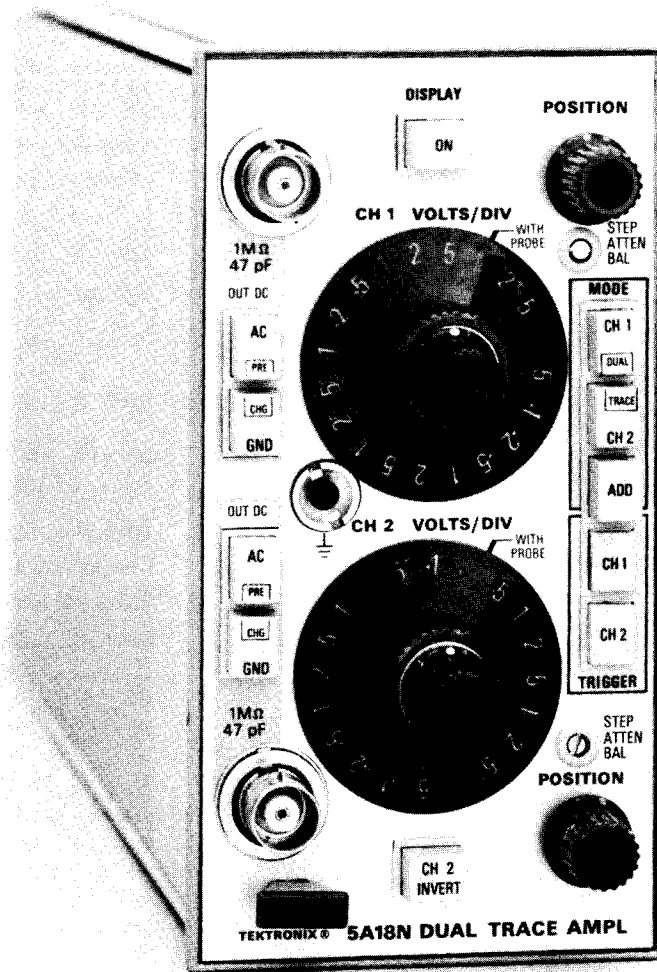


Fig. 1-1. 5A18N Dual Trace Amplifier.

SECTION 1

SPECIFICATION

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

Introduction

The 5A18N Dual-Trace Amplifier is a general-purpose dual-trace amplifier plug-in unit for use with Tektronix 5100-series oscilloscopes. The unit contains two independent amplifier channels with identical characteristics, and features solid-state circuitry and simplicity of front-panel controls. The VOLTS/DIV knob skirts are lighted to provide a direct readout of calibrated deflection factor. Either channel may be used to produce a single-channel display. Both channels may be used simultaneously to produce an algebraically added display, or the two channels may be electronically switched to produce dual-trace displays. Channel 2 invert allows a differential input. Each

channel 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%.	Within 3% with P6060 probe.
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. (DC to at least 1.5 megahertz in ADD mode.)	
AC (Capacitive) Coupled	2 hertz or less to at least 2 megahertz. (2 hertz or less to at least 1.5 megahertz in ADD mode.)	
Step Response (Displayed)		
Aberrations	+2%, -2% or less, total of 3% or less of pulse amplitude.	

TABLE 1-1 (cont)

Characteristic	Performance Requirement	Supplemental Information
Inputs		
Resistance	1 megohm, within 1%.	Time constant normalized for 47 micro-seconds.
Capacitance	≈47 picofarads.	
Maximum Safe Input Voltages		
DC (Direct) Coupled	350 volts (DC + peak AC).	
AC (Capacitive) Coupled	350 volts DC.	
Invert Trace Shift		Less than 3 divisions.
Position Range		At least + and – 10 divisions from graticule center.
Channel Isolation		
One Trace Displayed		0.1 division with an 8 division signal source or 50 dB, whichever is greater.
Two Traces Displayed		0.1 division with an 8 division signal source or 50 dB, whichever is greater.

SECTION 2

OPERATING INSTRUCTIONS

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

Introduction

The 5A18N Dual Trace Amplifier Plug-in operates with a Tektronix 5100-series oscilloscope. An understanding of the 5A18N 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 5A18N 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 use primarily in vertical compartments (the center and left compartments). For X-Y operation, the 5A18N may also be installed in the horizontal (right) compartment (refer to a 5100-series 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 5A18N 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 5A18N 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 (CH 1 and CH 2)

Positions display.

VOLTS/DIV (CH 1 and CH 2)

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. Readout is automatically scaled when readout-coded 10X probe is installed.

Variable Volts/Div (CH 1 and CH 2)

Provides uncalibrated, continuously variable deflection factor between calibrated steps; extends range to 12.5 V/Div.

STEP ATTEN BAL (CH 1 and CH 2)

Balances the input amplifier for least trace shift throughout the VOLTS/DIV gain-switching range.

Input Coupling Push-buttons (CH 1 and CH 2)

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 pre-charging of the coupling capacitor. Refer to General Operating Information.

Input Connector (CH 1 and CH 2)

BNC connector for application of external voltage signals. Includes a coded-probe input ring for activation of X10 readout.

MODE Pushbuttons

CH 1: The Channel 1 signal is displayed.

CH 2: The Channel 2 signal is displayed.

DUAL TRACE: (both the CH 1 and CH 2 buttons pushed in): Permits dual-trace displays in

Operating Instructions—5A18N

MODE Pushbuttons (cont) either Alternate or Chop modes (selected at the time-base unit). In the Alternate mode, the display is switched at the end of each sweep. In the Chop mode, rapid switching between channels permits Channel 1 and 2 displays to be viewed simultaneously. Between-channel switching rates are determined by the oscilloscope mainframe.

ADD: Channel 1 and Channel 2 signals are algebraically added and the sum is displayed on the CRT.

TRIGGER Pushbuttons CH 1: Selects Channel 1 as the source of the internal triggering signal for the time-base unit.

CH 2: Selects Channel 2 as the source of the internal triggering signal for the time-base unit.

CH 2 INVERT Inverts the Channel 2 display when pushed in.

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 5A18N. Operation of other instruments in the system are 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 Power On. Preset the time-base and triggering controls for a 2-millisecond/division sweep rate and automatic triggering.

3. Set the 5A18N front-panel controls as follows:

DISPLAY	ON (deflection factor illuminated)
MODE	DUAL TRACE
TRIGGER	CH 1
CH 1 and CH 2 POSITION	Midrange
VOLTS/DIV	.1 V Calibrated
STEP ATTEN BAL	Midrange
Input Coupling	DC, GND
CH 2 INVERT	Normal (button out)

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

5. Set the MODE to CH 1 and move the trace two divisions below the graticule centerline with the CH 1 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 CH 1 and CH 2 input connectors (use a T connector and patch cord as required).

7. Release the CH 1 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. Adjust Trigger Level, if necessary, to attain a stable display. 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. Set the MODE to DUAL TRACE and set both VOLTS/DIV switches to .2 V/Div. Release the CH 2 GND button and observe two square-wave displays, each two divisions in amplitude.

9. Push the CH 2 INVERT button to display the opposite polarity of the Channel 2 square wave. Return the display to its normal attitude by pushing and releasing the INVERT button.

10. Set the MODE to ADD. Note that the two displays algebraically add together, becoming a single square-wave display four divisions in amplitude. Verify the algebraic addition by pushing the CH 2 INVERT and observing a straight line as the two signals cancel each other.

11. Set the MODE switch to CH 1.

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

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

Step Attenuator Balance (Both Channels)

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 (Both Channels)

The vertical and horizontal deflection systems of the 5100-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 5A18N gain can be checked and, if necessary, adjusted. Refer to calibration procedure, Section 4.

This completes the basic operating procedure for the 5A18N. 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 5A18N 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 5A18N. 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 5A18N is designed for compatibility with coded probes, such as the Tektronix P6060 and P6062B Passive Probes. The input connector has an outer ring to which the coding ring on the probe connector makes a 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 5A18N 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 5A18N. The shield of a coaxial cable or ground strap of a signal probe provides an 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 test lead or 1X probe, use the AC-DC and GND pushbuttons to take advantage of the pre-charging circuit incorporated in the unit. The pre-charging circuit permits charging the coupling capacitor to the DC source voltage when the AC and GND buttons are pressed in, and also limits surge current to the coupling capacitor from the signal source. The procedure for using this circuit is as follows:

a. Before connecting the 5A18N 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.

Operating Instructions—5A18N

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 deflection factors indicated by the VOLTS/DIV switch are calibrated only when the Variable control is rotated fully clockwise into the detent (CAL) 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.

Display Mode

CH 1 or CH 2. To display a single channel (single-trace operation), apply the signal to either the CH 1 or CH 2 input and set the MODE switch to either CH 1 or CH 2 to display the corresponding channel.

DUAL TRACE. To display both channels (dual-trace operation), push in both the CH 1 and CH 2 buttons.

ADD. The ADD button associated with the MODE switch is pressed to display the algebraic sum of two signals. The CH 2 INVERT button can be used in conjunction with the ADD button to provide a differential input. Also, the ADD mode is used for DC offset (applying a DC voltage to one channel to offset the DC component of a signal on the other channel). The overall deflection factor in the Add Mode is difficult to determine from the CRT display. If both VOLTS/DIV switches are at the same setting, the deflection factor is that indicated by either switch. If the VOLTS/DIV switches are set to different deflection factors, the voltage amplitude of the resultant display is best determined if the amplitude of one of the input signals is known.

CH 2 INVERT. Pushing this button inverts the Channel 2 display; that is, the Channel 2 display is opposite in polarity to the Channel 1 display. Since the inversion occurs before the signal reaches the MODE switching, the CH 2 INVERT can be used in conjunction with the ADD button to remove an undesired common-mode signal.

Trigger Source

The internal trigger signal for the time-base plug-in unit is obtained from either the Channel 1 or Channel 2 display. Select the trigger source by pushing either the CH 1 or CH 2 button.

Oscilloscope Applications

Refer to the Operating Instructions section of the 5100N Oscilloscope System manual for basic oscilloscope applications, including peak-to-peak AC voltage measurements, instantaneous DC voltage measurements, comparison measurements, time-duration measurements, determining frequency, risetime measurements, X-Y measurements, etc.

Repackaging for Shipment

If the Tektronix instrument is to be shipped to a Tektronix Service Center for service or repair, attach a tag showing: owner (with address) and the name of an individual at your firm that can be contacted, complete instrument serial number and a description of the service required.

Save and re-use the package in which your instrument was shipped. If the original packaging is unfit for use or not available, repackage the instrument as follows:

Surround the instrument with polyethylene sheeting to protect the finish of the instrument. Obtain a carton of corrugated cardboard of the correct carton strength and having inside dimensions of no less than six inches more than the instrument dimensions. Cushion the instrument by tightly packing three inches of dunnage or urethane foam between carton and instrument, on all sides. Seal carton with shipping tape or industrial stapler.

The carton test strength for your instrument is 200 pounds.

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 5A18N Dual-Trace Amplifier unit. A complete schematic diagram is given on a pullout page at the back of the manual.

Since the two channels are identical (except for the CH 2 INVERT button) only Channel 1 is described.

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 lamps, indicating the ON mode.

Input Coupling

Signals applied to the front-panel input connectors 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 the input capacitor is pre-charged through a one-megohm resistor 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, 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. 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 ranges from about one to fifty,

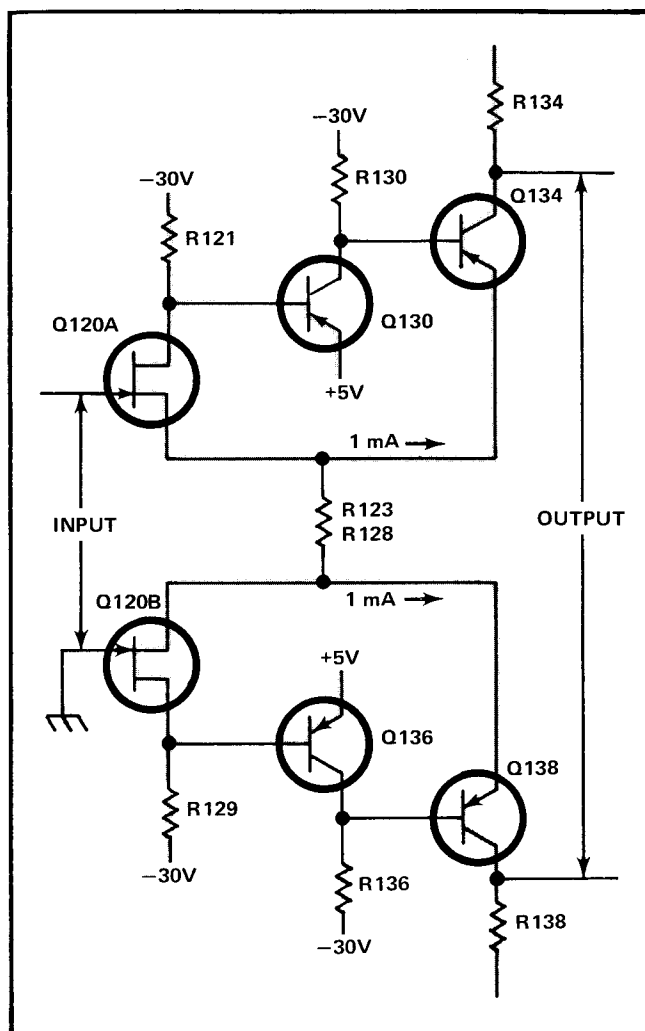


Fig. 3-1. Input amplifier partial diagram showing quiescent current paths.

Circuit Description—5A18N

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.

The Variable Gain 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. Q177 and Q178 provide positioning current.

Channel Switching

When only the CH 1 button (S198A) is pressed, Q301 is biased off, turning on Channel 1 switches Q180 and Q182, allowing signal to pass.

When only the CH 2 button (S198B) is pressed in, Q301 is biased on, switching Q308 off. This action turns Channel 2 switches Q280 and Q282 on.

When both CH 1 and CH 2 buttons are pressed (dual-trace mode) the state of Q301 and Q308 is determined by the channel switching signal generated in the oscilloscope mainframe. The form of this signal is selected on the sweep plug-in by the Alternate-Chopped Mode button.

Channel Switching Control

When the ADD button S198C is pressed, Q301 and Q308 are both turned off. This turns on both channels, which are interconnected through the mainframe and added algebraically across load resistors R287 and R289.

Probe Sensing

Either of two lamps located behind the VOLTS/DIV knob skirt illuminates the selected deflection factor to provide a direct readout. Normally, DS 191 is lit; connection of a readout-coded 10X probe extinguishes DS 191 and lights DS 192. This changes the knob skirt readout by a factor of 10 to reflect the probe attenuation, eliminating possible operator error.

SECTION 4 CALIBRATION

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

Introduction

This section of the manual contains a procedure to return the circuits of the 5A18N 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 5A18N. Specifications given for the test equipment are the

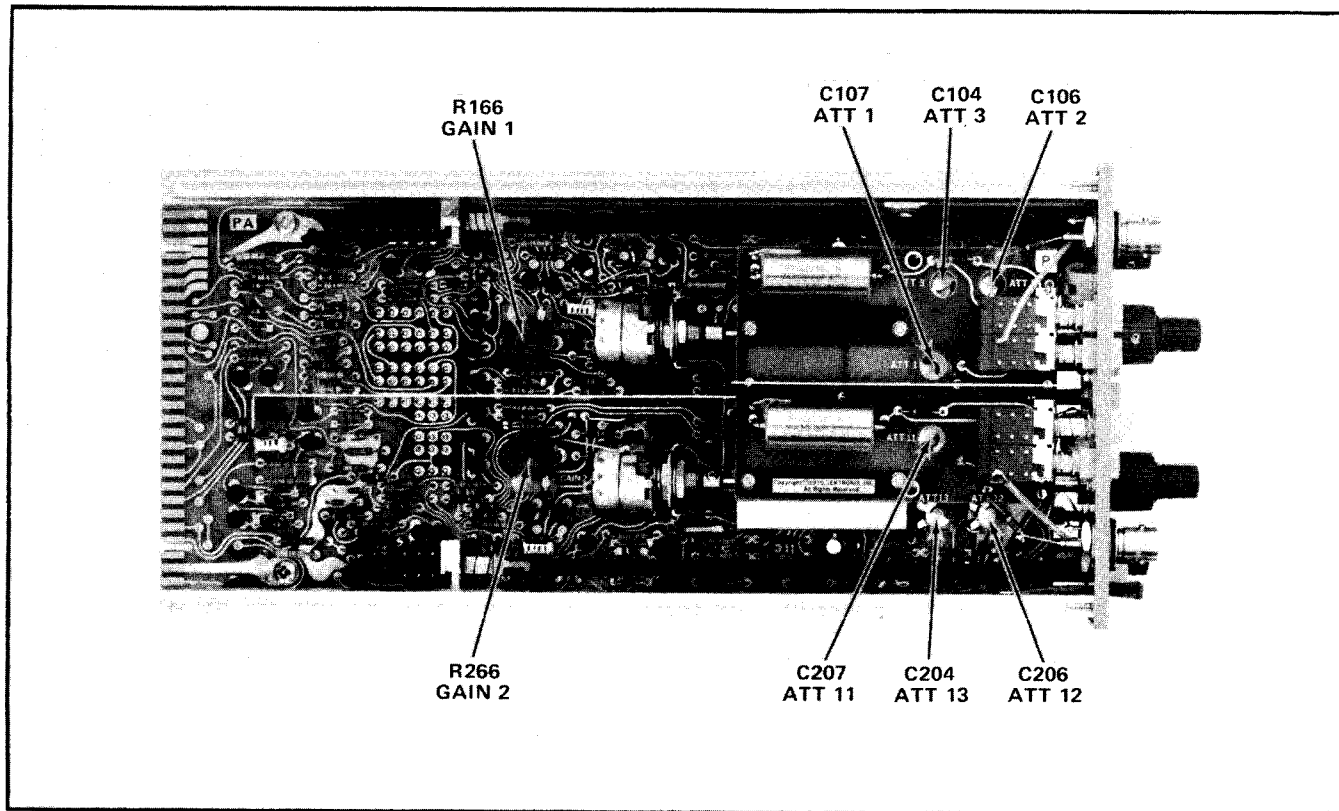


Fig. 4-1. Location of internal controls in the 5A18N.

Calibration—5A18N

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-series oscilloscope. For this procedure, a 5110 Oscilloscope with a 5B10N Time-Base/Amplifier is used.

2. Standard amplitude calibrator. Output signal, one-kilohertz square wave; output amplitude, 5 millivolts to 20 volts; amplitude accuracy, within 0.25%. Tektronix PG 506 Calibration Generator recommended (requires a TM 500-series power module).

3. Sine-wave generator. Frequency, 2 hertz to 2 megahertz. Tektronix FG 503 Function Generator recommended (requires a TM 500-series power module).

4. Square-wave Generator. Tektronix FG 503 recommended (requires a TM 500-series power module).

Accessories

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

6. Dual-input cable. Provides matched signal paths to the inputs; BNC connectors. Tektronix Calibration Fixture 067-0525-01.

7. Input RC Normalizer. RC time constant 47 microseconds (1 Megohm X 47 pF); BNC connectors. Tektronix Calibration Fixture 067-0541-00.

8. In-line termination. Impedance, 50 ohms; accuracy, $\pm 2\%$, BNC connectors. Tektronix Part No. 011-0049-01.

SHORT-FORM PROCEDURE and INDEX

5A18N, Serial No. _____

Calibration Date _____

Calibrated by _____

- | | |
|--|----------|
| 1. Adjust STEP ATTEN BAL | Page 4-3 |
| 2. Adjust Input Compensation and Attenuator Compensation | Page 4-3 |
| 3. Adjust Amplifier Gain and Check VOLTS/DIV Switch Accuracy | Page 4-3 |
| 4. Check Amplifier Bandwidth | Page 4-4 |
| 5. Check Dual-Trace Display Mode and Trigger Selectors | Page 4-5 |

CALIBRATION PROCEDURE

Preparation

NOTE

This instrument should be adjusted at an ambient temperature between $+25^{\circ}\text{C}$ and $+30^{\circ}\text{C}$ (between $+68^{\circ}\text{F}$ and $+86^{\circ}\text{F}$) for best overall accuracy.

1. Remove the left side plug-in cover and install the 5A18N in the center plug-in compartment of the 5100-series oscilloscope. Leave the left plug-in compartment vacant to provide access to the 5A18N adjustments.

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

5A18N	
DISPLAY	ON
MODE	CH 1
TRIGGER	CH 1
Input coupling (both channels)	GND
CH 2 INVERT	OUT (normal)
VOLTS/DIV (both)	0.1 V
Variable (both)	CAL
POSITION (both)	midrange

5B10N

Display	Alternate
Position	Midrange
Seconds/Div	0.5 ms
Swp Mag	Out (normal)
Triggering Level	Cw
Triggering Source	Right
Auto Trig	In
AC Coupl	In
+Slope	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.

c. Press the CH 2 MODE button and repeat the step for Channel 2.

2. Adjust Input Compensation and Attenuator Compensation

a. Press the CH 1 MODE button.

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

c. Connect a coaxial cable from the square-wave generator through a 50 ohm termination to the CH 1 input. Set the generator for 1 kHz and five divisions of display. Adjust the time-base Level control for stable triggering.

d. ADJUST—Att 1 (channel 1) or Att 11 (channel 2) for a square leading corner of the square-wave display.

e. Insert a 47 pF normalizer between the termination and input connector.

f. Set the VOLTS/DIV switches to 50 mV and adjust the generator output to maintain five divisions of display through this step.

g. ADJUST—Att 2 (channel 1) or Att 12 (channel 2) for a square leading corner of the square-wave display.

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

i. ADJUST—Att 3 (channel 1) or Att 13 (channel 2) for a square leading corner of the square-wave display.

j. Press the CH 2 MODE and TRIGGER buttons and repeat the step for Channel 2.

k. Disconnect the signal setup. Connect the standard amplitude calibrator directly to Channel 1 input with a coaxial cable and press the CH 1 MODE and TRIGGER buttons.

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

ADJUST GAIN

a. Set the VOLTS/DIV switch to 10 mV. Set the standard amplitude calibrator for an output of 50 mV.

b. ADJUST—Channel 1 Gain potentiometer for a five-division display.

c. Press the ADD and CH 2 INVERT buttons.

d. With both VOLTS/DIV switches in the 10 mV positions, apply a 50-mV signal from the standard amplitude calibrator to both inputs, using the dual-input cable.

e. ADJUST—Channel 2 Gain potentiometer for a straight line. Check to see that the trace is movable with both POSITION controls.

CHECK VOLTS/DIV SWITCH ACCURACY

f. Set MODE to DUAL TRACE (both CH 1 and CH 2 buttons pushed in) and CH 2 INVERT to normal (out).

g. CHECK—VOLTS/DIV switch accuracy, using the VOLTS/DIV (both channels) and standard amplitude calibrator switch settings given in Table 4-1.

TABLE 4-1

VOLTS/DIV	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 volts	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

h. Remove the connections from the inputs, and press the CH 1 MODE button.

4. Check Amplifier Bandwidth

LOW-FREQUENCY —3 dB POINT

a. Connect a coaxial cable from the sine-wave generator through a 50 ohm termination to the appropriate input. Set the generator for 1 kHz and six divisions of display.

b. Change the input frequency to 2 Hz.

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.

e. Press the CH 2 MODE button and repeat the step.

HIGH-FREQUENCY —3 dB POINT

f. Set the generator for 50 kHz and six divisions of display.

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

h. Press the CH 1 Mode button and repeat parts f and g.

i. Press the ADD MODE button, apply a 50 kHz signal from the generator to both inputs, and adjust the generator for a six-division display.

j. CHECK—For a display of at least 4.2 divisions when the generator frequency is changed to 1.5 MHz.

k. Remove the connections from the input.

5. Check Dual-Trace Display Mode and Trigger Selectors

a. Set the MODE to DUAL TRACE (both CH 1 and CH 2 buttons pushed in) and position the two traces near the center of the display area.

b. Set the Channel 2 VOLTS/DIV switch to 5 V and apply a 20 V, 1 kHz sine wave to both inputs.

c. Push the CH 1 TRIGGER button.

d. CHECK—For loss of stable display on channel 2 when the signal is removed from channel 1.

e. Re-apply the signal to channel 1 and push the CH 2 TRIGGER button.

f. CHECK—For loss of stable display on channel 1 when the signal is removed from channel 2.

This completes the calibration procedure.

PARTS LISTS AND DIAGRAMS

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).

Graphic symbols and class designation letters are based on ANSI Standard Y32.2-1975.

Logic symbology is based on ANSI Y32.14-1973 in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

The overline on a signal name indicates that the signal performs its intended function when it goes to the low state.

Abbreviations are based on ANSI Y1.1-1972.

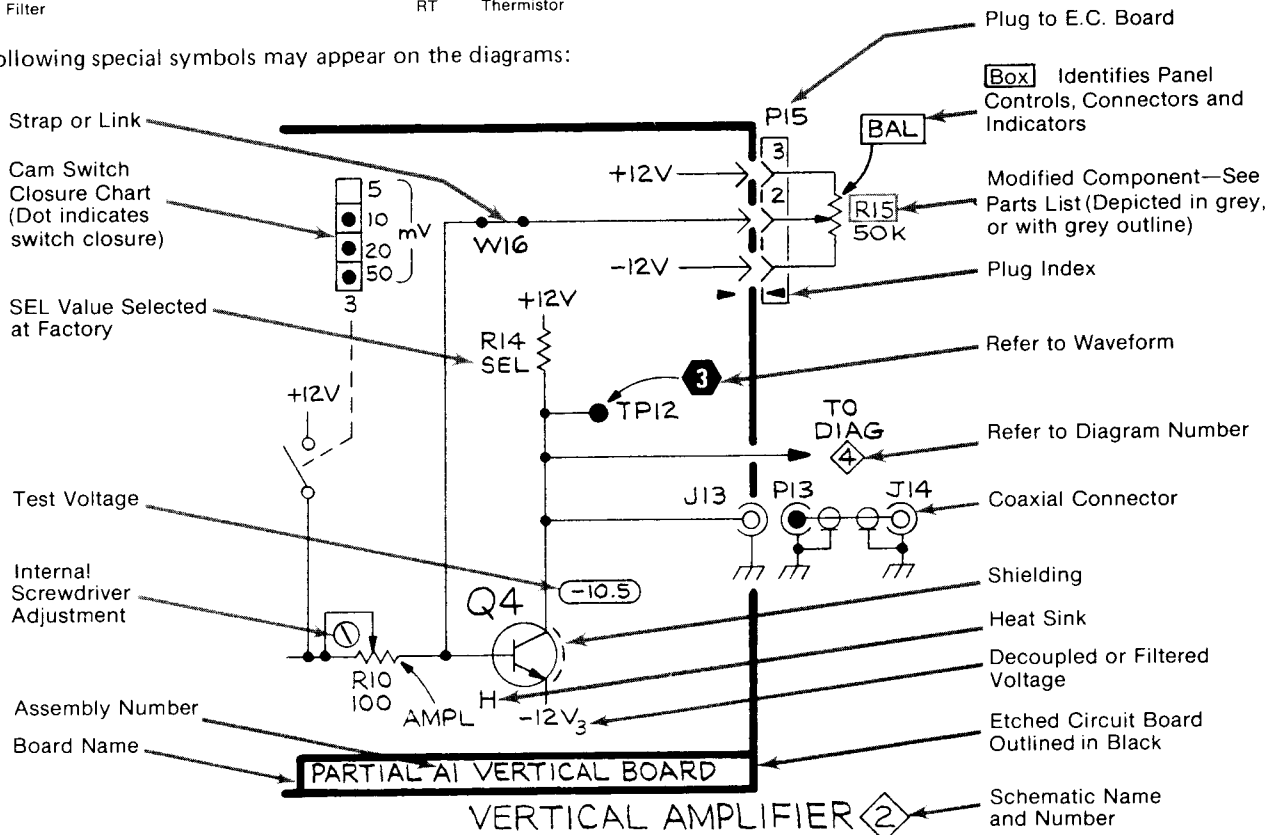
Other ANSI standards that are used in the preparation of diagrams by Tektronix, Inc. are:

- Y14.15, 1966 Drafting Practices.
- Y14.2, 1973 Line Conventions and Lettering.
- Y10.5, 1968 Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering.

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

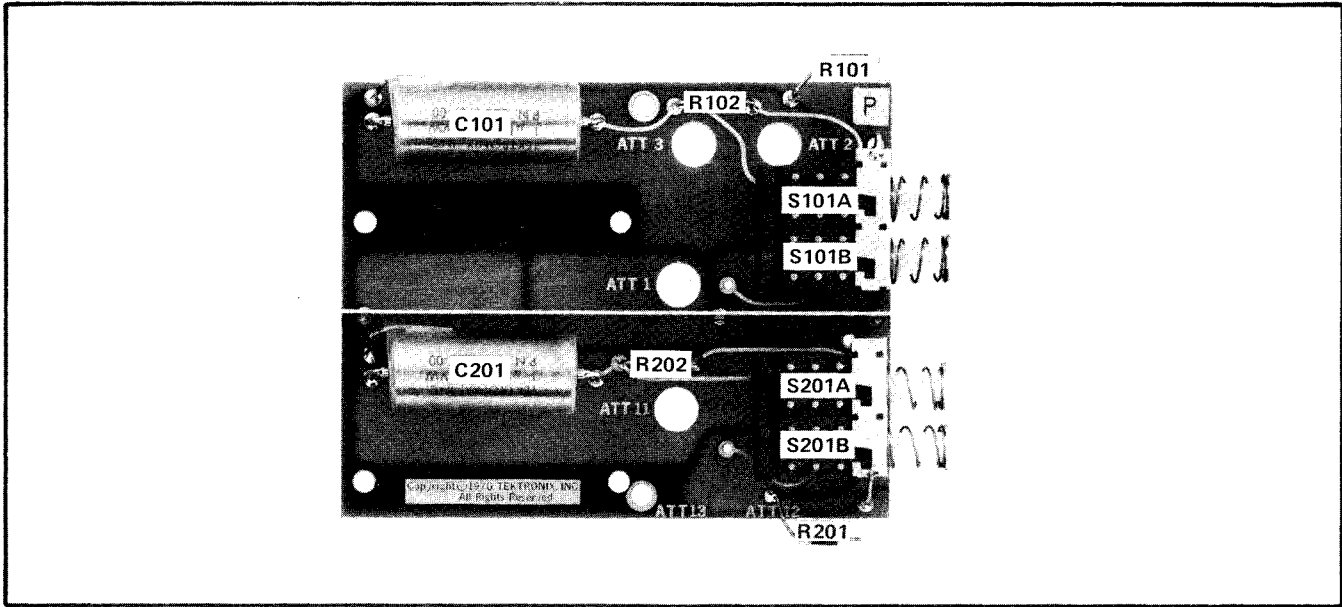
A	Assembly, separable or repairable (circuit board, etc)	H	Heat dissipating device (heat sink, heat radiator, etc)	S	Switch or contactor
AT	Attenuator, fixed or variable	HR	Heater	T	Transformer
B	Motor	HY	Hybrid circuit	TC	Thermocouple
BT	Battery	J	Connector, stationary portion	TP	Test point
C	Capacitor, fixed or variable	K	Relay	U	Assembly, inseparable or non-repairable (integrated circuit, etc.)
CB	Circuit breaker	L	Inductor, fixed or variable	V	Electron tube
CR	Diode, signal or rectifier	M	Meter	VR	Voltage regulator (zener diode, etc.)
DL	Delay line	P	Connector, movable portion	W	Wirestrap or cable
DS	Indicating device (lamp)	Q	Transistor or silicon-controlled rectifier	Y	Crystal
E	Spark Gap, Ferrite bead	R	Resistor, fixed or variable	Z	Phase shifter
F	Fuse	RT	Thermistor		
FL	Filter				

The following special symbols may appear on the diagrams:

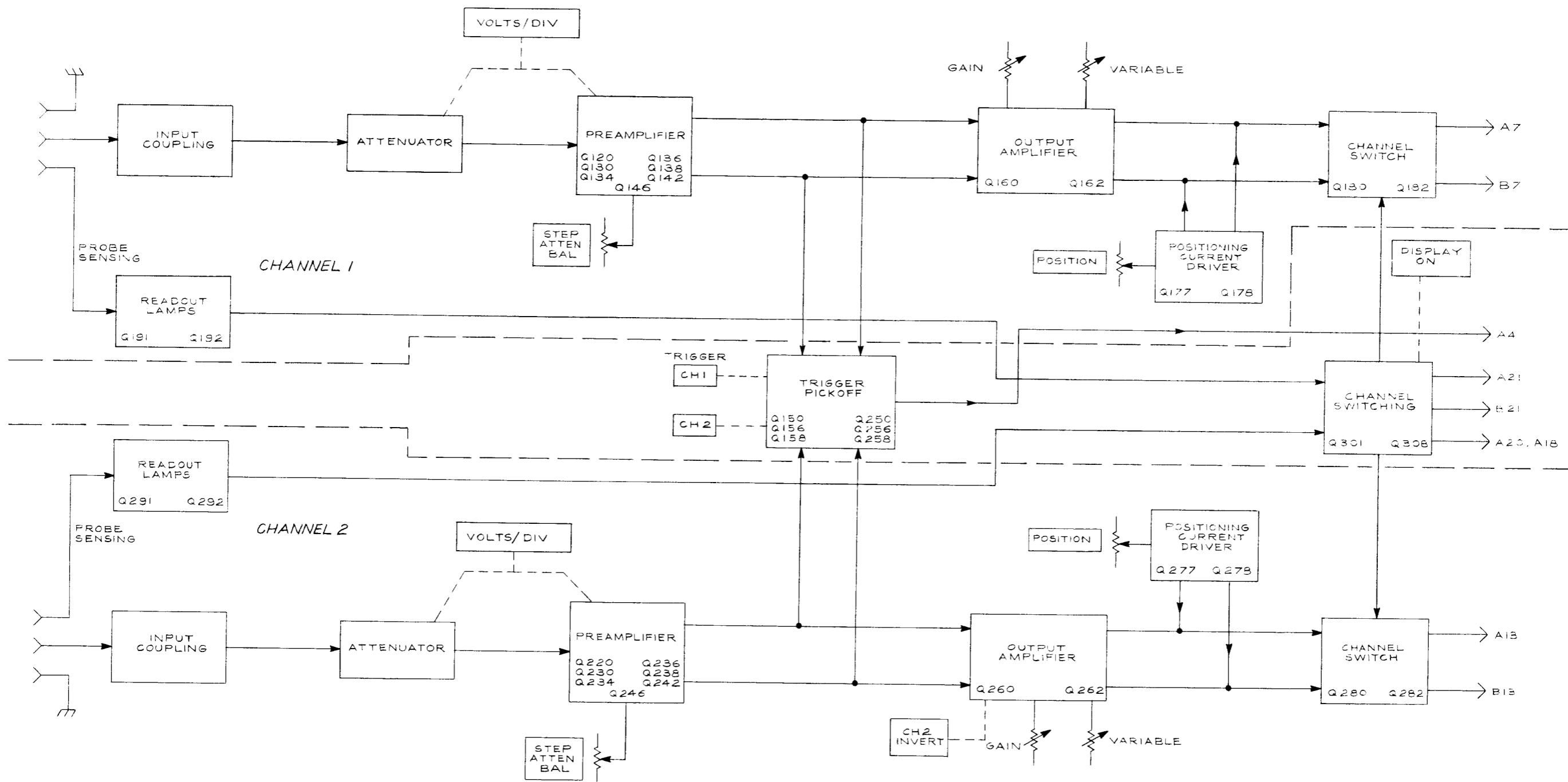


PARTS LIST ABBREVIATIONS

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



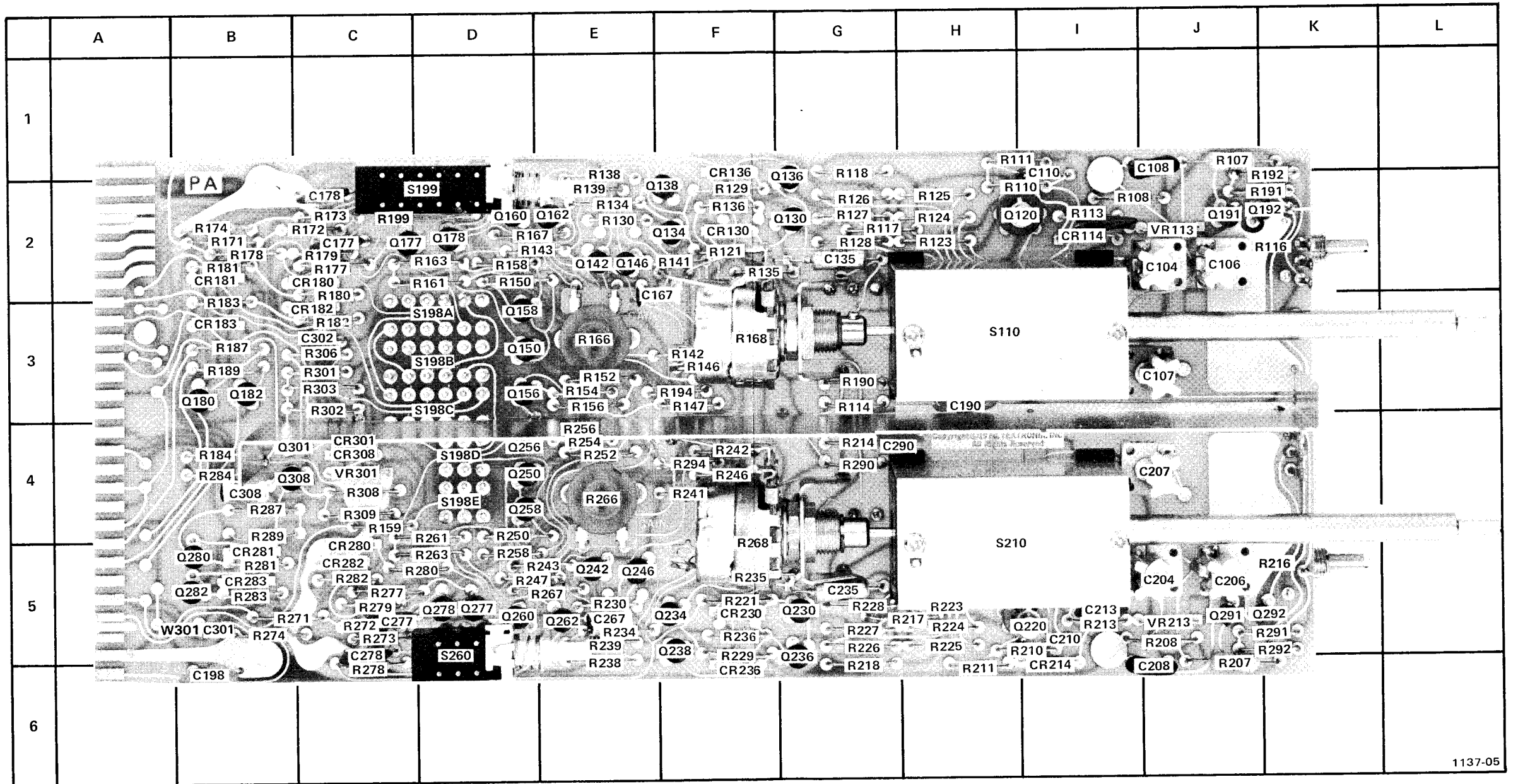
A2 Input circuit board assembly.



5A18N

(A)

BLOCK DIAGRAM



1137-05

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	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC		
C104	J-2	C213	I-5	CR114	I-2	Q120A,B	I-2	Q230	G-5	R107	J-1	R130	E-2	R161	D-2	R187	B-3	R224	H-5	R250	D-4	R280	D-5	S110	H-3	VR113	J-2
C106	J-2	C235	G-5	CR130	F-2	Q130	G-2	Q234	F-5	R108	I-1	R134	E-2	R163	D-2	R189	B-3	R225	H-5	R252	E-4	R281	B-5	S198A†	D-3	VR213	J-5
C107	J-3	C267	E-5	CR136	F-1	Q134	F-2	Q236	G-5	R110	H-2	R135	F-2	R166	E-3	R190	G-3	R226	G-5	R254	E-4	R282	C-5	S198B†	D-3	VR301	C-4
C108	J-1	C277	C-5	CR180	C-2	Q136	G-2	Q238	F-5	R111	H-1	R136	F-2	R167	D-2	R191*	K-3	R227	G-5	R256	E-4	R283	B-5	S198C†	D-3		
C110	I-1	C278	C-5	CR181	B-2	Q138	F-2	Q242	E-5	R113	I-2	R138	E-1	R168	F-3	R192	K-2	R228	G-5	R258	D-5	R284	B-4	S198D†	D-4	W301*	B-5
C113	I-2	C290	H-4	CR182	C-3	Q142	E-2	Q246	E-5	R114	G-3	R139	E-2	R171	B-2	R194	F-3	R229	F-5	R261	D-4	R287	B-4	S198E†	D-4		
C135	G-2	C301*	B-5	CR183	B-3	Q146	E-2	Q250	D-4	R116†	K-2	R141	F-2	R172	C-2	R199*	C-2	R230	E-5	R263	D-5	R289	B-4	S199	D-2		
C167	F-2	C302*	C-3	CR214	I-6	Q150	D-3	Q256	D-4	R117	G-2	R142	F-3	R173	C-2	R207	J-6	R234	E-5	R266	E-4	R290	G-4	S210	H-5		
C177	C-2	C308	B-4	CR230	F-5	Q156	D-3	Q258	D-4	R118	G-1	R143	D-2	R174	B-2	R208	J-5	R235	F-5	R267	E-5	R291*	K-5	S260	D-5		
C178	C-2			CR236	F-6	Q158	D-3	Q260	D-5	R121	F-2	R146	F-3	R177	C-2	R210	I-5	R236	F-5	R268	F-4	R292	K-5				
C190	H-3			CR280	C-5	Q160	D-2	Q262	E-5	R123	H-2	R147	F-3	R178	C-2	R211	H-6	R238	E-6	R271	B-5	R301	C-3				
C198	B-6			CR281	B-5	Q162	E-2	Q277	D-5	R124	H-2	R150	D-2	R179	C-2	R213	I-5	R239	E-5	R272	C-5	R302	C-3				
C204	J-5			CR282	C-5	Q177	C-2	Q278	D-5	R125	H-2	R152	E-3	R180	C-2	R214	G-4	R241	F-4	R273	C-5	R303	C-3				
C206	J-5			CR283	B-5	Q178	D-2	Q291	J-5	R126	G-2	R154	E-3	R181	B-2	R216†	K-5	R242	F-4	R274	B-5	R306	C-3				
C207	J-4			CR301	C-4	Q191	J-2	Q292	K-5	R127	G-2	R156	E-3	R182	C-3	R217	H-5	R243	E-5	R277	C-5	R308	C-4				
C208	J-6			CR308	C-4	Q192	K-2	Q301	B-4	R128	G-2	R158	D-2	R183	B-2	R218	G-6	R246	F-4	R278	C-6	R309	C-4				
C210	I-5					Q220A,B	I-5	Q308	B-4	R129	F-2	R159	C-4	R184	B-4	R221	F-5	R247	D-5	R279	C-5						

† Located on back of board.

*See Parts List for serial number ranges.

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

Replaceable Electrical Parts—5A18N

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 COMPANY	1201 2ND STREET SOUTH	MILWAUKEE, WI 53204
03508	GENERAL ELECTRIC COMPANY, SEMI-CONDUCTOR PRODUCTS DEPARTMENT	ELECTRONICS PARK	SYRACUSE, NY 13201
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD, PO BOX 20923	PHOENIX, AZ 85036
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS STREET	MOUNTAIN VIEW, CA 94042
07910	TELEDYNE SEMICONDUCTOR	12515 CHADRON AVE.	HAWTHORNE, CA 90250
08806	GENERAL ELECTRIC CO., MINIATURE LAMP PRODUCTS DEPARTMENT	NELA PARK	CLEVELAND, OH 44112
24931	SPECIALTY CONNECTOR CO., INC.	3560 MADISON AVE.	INDIANAPOLIS, IN 46227
53944	ELT INC., GLOW LITE DIVISION	BOX 698	PAULS VALLEY, OK 73075
55210	GETTIG ENG. AND MFG. COMPANY	PO BOX 85, OFF ROUTE 45	SPRING MILLS, PA 16875
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
71450	CTS CORP.	1142 W. BEARDSLEY AVE.	ELKHART, IN 46514
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
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, NE 68601

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A1	670-1343-00	B010100	B063559	CKT BOARD ASSY:MAIN AMPLIFIER	80009	670-1343-00
A1	670-1343-01	B063560	B079198	CKT BOARD ASSY:MAIN AMPLIFIER	80009	670-1343-01
A1	670-1343-02	B079199	B089999	CKT BOARD ASSY:MAIN AMPLIFIER	80009	670-1343-02
A1	670-1343-03	B090000		CKT BOARD ASSY:MAIN AMPLIFIER	80009	670-1343-03
A2	670-1341-00			CKT BOARD ASSY:INPUT	80009	670-1341-00
A1	670-1343-00	B010100	B059999	CKT BOARD ASSY:MAIN AMPLIFIER	80009	670-1343-00
A1	670-1343-01	B060000	B079198	CKT BOARD ASSY:MAIN AMPLIFIER	80009	670-1343-01
A1	670-1343-02	B079199	B089999	CKT BOARD ASSY:MAIN AMPLIFIER	80009	670-1343-02
A1	670-1343-03	B090000		CKT BOARD ASSY:MAIN AMPLIFIER	80009	670-1343-03
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	283-0605-00			CAP.,FXD,MICA D:678PF,1%,300V	00853	D153F6780F0
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
C167	281-0628-00			CAP.,FXD,CER DI:15PF,5%,500V	72982	301-000C0G0150J
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
C204	281-0081-00			CAP.,VAR,AIR DI:1.8-13PF,375VDC	74970	189-6-5
C206	281-0081-00			CAP.,VAR,AIR DI:1.8-13PF,375VDC	74970	189-6-5
C207	281-0081-00			CAP.,VAR,AIR DI:1.8-13PF,375VDC	74970	189-6-5
C208	283-0605-00			CAP.,FXD,MICA D:678PF,1%,300V	00853	D153F6780F0
C210	283-0002-00			CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
C213	283-0002-00			CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
C230	281-0534-00	XB040000		CAP.,FXD,CER DI:3.3PF,+/-0.25PF,500V	72982	301-000C0J0339C
C235	290-0135-00			CAP.,FXD,ELCTLT:15UF,20%,20V	56289	150D156X0020B2
C236	281-0534-00	XB040000		CAP.,FXD,CER DI:3.3PF,+/-0.25PF,500V	72982	301-000C0J0339C
C267	281-0628-00			CAP.,FXD,CER DI:15PF,5%,500V	72982	301-000C0G0150J
C277	283-0002-00			CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
C278	283-0002-00			CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
C290	283-0002-00			CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
C301	283-0000-00	XB079199	B089999X	CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C302	283-0000-00	B010100	B049999X	CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C308	281-0628-00			CAP.,FXD,CER DI:15PF,5%,500V	72982	301-000C0G0150J
CR114	152-0246-00			SEMICONV DEVICE:SILICON,400PIV,200MA	80009	152-0246-00
CR126	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR130	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR180	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR181	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR182	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR183	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR214	152-0246-00			SEMICONV DEVICE:SILICON,400PIV,200MA	80009	152-0246-00
CR230	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR236	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR280	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR281	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152

Replaceable Electrical Parts—5A18N

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
CR282	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR283	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR301	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR308	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
DS191	150-0111-00	B010100	B089999	LAMP,GLOW:NEON,1.2MA	53944	ALB-3
DS191	150-0130-00	B090000		LAMP,INCAND:5V,60MA	08806	2200DX
DS192	150-0111-00	B010100	B089999	LAMP,GLOW:NEON,1.2MA	53944	ALB-3
DS192	150-0130-00	B090000		LAMP,INCAND:5V,60MA	08806	2200DX
DS291	150-0111-00	B010100	B089999	LAMP,GLOW:NEON,1.2MA	53944	ALB-3
DS291	150-0130-00	B090000		LAMP,INCAND:5V,60MA	08806	2200DX
DS292	150-0111-00	B010100	B089999	LAMP,GLOW:NEON,1.2MA	53944	ALB-3
DS292	150-0130-00	B090000		LAMP,INCAND:5V,60MA	08806	2200DX
J101	131-0679-00	B010100	B076974	CONNECTOR,RCPT,:BNC W/HARDWARE	24931	28JR168-1
J101	131-0679-02	B076975		CONNECTOR,RCPT,:BNC W/HARDWARE	24931	28JR270-1
J201	131-0679-00	B010100	B076974	CONNECTOR,RCPT,:BNC W/HARDWARE	24931	28JR168-1
J201	131-0679-02	B076975		CONNECTOR,RCPT,:BNC W/HARDWARE	24931	28JR270-1
Q120A,B	151-1049-00			TRANSISTOR:SILICON,JFE,N-CHANNEL,DUAL	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	80009	151-0342-00
Q134	151-0220-00	B010100	B029999	TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q134	151-0342-00	B030000		TRANSISTOR:SILICON,PNP	80009	151-0342-00
Q136	151-0220-00	B010100	B029999	TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q136	151-0342-00	B030000		TRANSISTOR:SILICON,PNP	80009	151-0342-00
Q138	151-0220-00	B010100	B029999	TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q138	151-0342-00	B030000		TRANSISTOR:SILICON,PNP	80009	151-0342-00
Q142	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q146	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q150	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q156	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q158	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q160	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q162	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q177	151-0220-00	B010100	B029999	TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q177	151-0342-00	B030000		TRANSISTOR:SILICON,PNP	80009	151-0342-00
Q178	151-0220-00	B010100	B029999	TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q178	151-0342-00	B030000		TRANSISTOR:SILICON,PNP	80009	151-0342-00
Q180	151-1005-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	80009	151-1005-00
Q182	151-1005-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	80009	151-1005-00
Q191	151-0347-00	B010100	B089999	TRANSISTOR:SILICON,NPN	80009	151-0347-00
Q191	151-0281-00	B090000		TRANSISTOR:SILICON,NPN	03508	X16P4039
Q192	151-0347-00	B010100	B089999	TRANSISTOR:SILICON,NPN	80009	151-0347-00
Q192	151-0281-00	B090000		TRANSISTOR:SILICON,NPN	03508	X16P4039
Q220A,B	151-1049-00			TRANSISTOR:SILICON,JFE,N-CHANNEL,DUAL	80009	151-1049-00
Q230	151-0220-00	B010100	B029999	TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q230	151-0342-00	B030000		TRANSISTOR:SILICON,PNP	80009	151-0342-00
Q234	151-0220-00	B010100	B029999	TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q234	151-0342-00	B030000		TRANSISTOR:SILICON,PNP	80009	151-0342-00
Q236	151-0220-00	B010100	B029999	TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q236	151-0342-00	B030000		TRANSISTOR:SILICON,PNP	80009	151-0342-00
Q238	151-0220-00	B010100	B029999	TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q238	151-0342-00	B030000		TRANSISTOR:SILICON,PNP	80009	151-0342-00
Q242	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065

Replaceable Electrical Parts—5A18N

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
Q246	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q250	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q256	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q258	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q260	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q262	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q277	151-0220-00	B010100	B029999	TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q277	151-0342-00	B030000		TRANSISTOR:SILICON,PNP	80009	151-0342-00
Q278	151-0220-00	B010100	B029999	TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q278	151-0342-00	B030000		TRANSISTOR:SILICON,PNP	80009	151-0342-00
Q280	151-1005-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	80009	151-1005-00
Q282	151-1005-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	80009	151-1005-00
Q291	151-0347-00	B010100	B089999	TRANSISTOR:SILICON,NPN	80009	151-0347-00
Q291	151-0281-00	B090000		TRANSISTOR:SILICON,NPN	03508	X16P4039
Q292	151-0347-00	B010100	B089999	TRANSISTOR:SILICON,NPN	80009	151-0347-00
Q292	151-0281-00	B090000		TRANSISTOR:SILICON,NPN	03508	X16P4039
Q301	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q308	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
R107	322-0624-03			RES.,FXD,FILM:990K OHM,0.25%,0.25W	91637	MFF1421D99002C
R108	321-0289-03			RES.,FXD,FILM:10K OHM,0.25%,0.125W	91637	MFF1816D10001C
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
R116	311-0467-01			RES.,VAR,NONWIR:100K OHM,10%,0.50W	80009	311-0467-01
R117	321-0435-00			RES.,FXD,FILM:332K OHM,1%,0.125W	91637	MFF1816G33202F
R118	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R121	321-0328-00			RES.,FXD,FILM:25.5K OHM,1%,0.125W	91637	MFF1816G25501F
R123	321-0097-03			RES.,FXD,FILM:100 OHM,0.25%,0.125W	91637	MFF1816D100ROC
R124	321-0126-03			RES.,FXD,FILM:200 OHM,0.25%,0.125W	91637	MFF1816D200ROC
R125	321-0612-03			RES.,FXD,FILM:500 OHM,0.25%,0.125W	91637	MFF1816D500ROC
R126	321-0193-03			RES.,FXD,FILM:1K OHM,0.25%,0.125W	91637	MFF1816D10000C
R127	321-0222-03			RES.,FXD,FILM:2K OHM,0.25%,0.125W	91637	MFF1816D20000C
R128	321-0816-03			RES.,FXD,FILM:5K OHM,0.25%,0.125W	91637	MFF1816D50000C
R129	321-0328-00			RES.,FXD,FILM:25.5K OHM,1%,0.125W	91637	MFF1816G25501F
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	91637	MFF1816G25500F
R135	316-0220-00	B010100	B069999	RES.,FXD,CMPSN:22 OHM,10%,0.25W	01121	CB2201
R135	315-0101-00	B070000		RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
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	91637	MFF1816G25500F
R139	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
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	91637	MFF1816G44200F
R152	321-0320-00			RES.,FXD,FILM:21K OHM,1%,0.125W	91637	MFF1816G21001F
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	91637	MFF1816G21001F
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

Replaceable Electrical Parts—5A18N

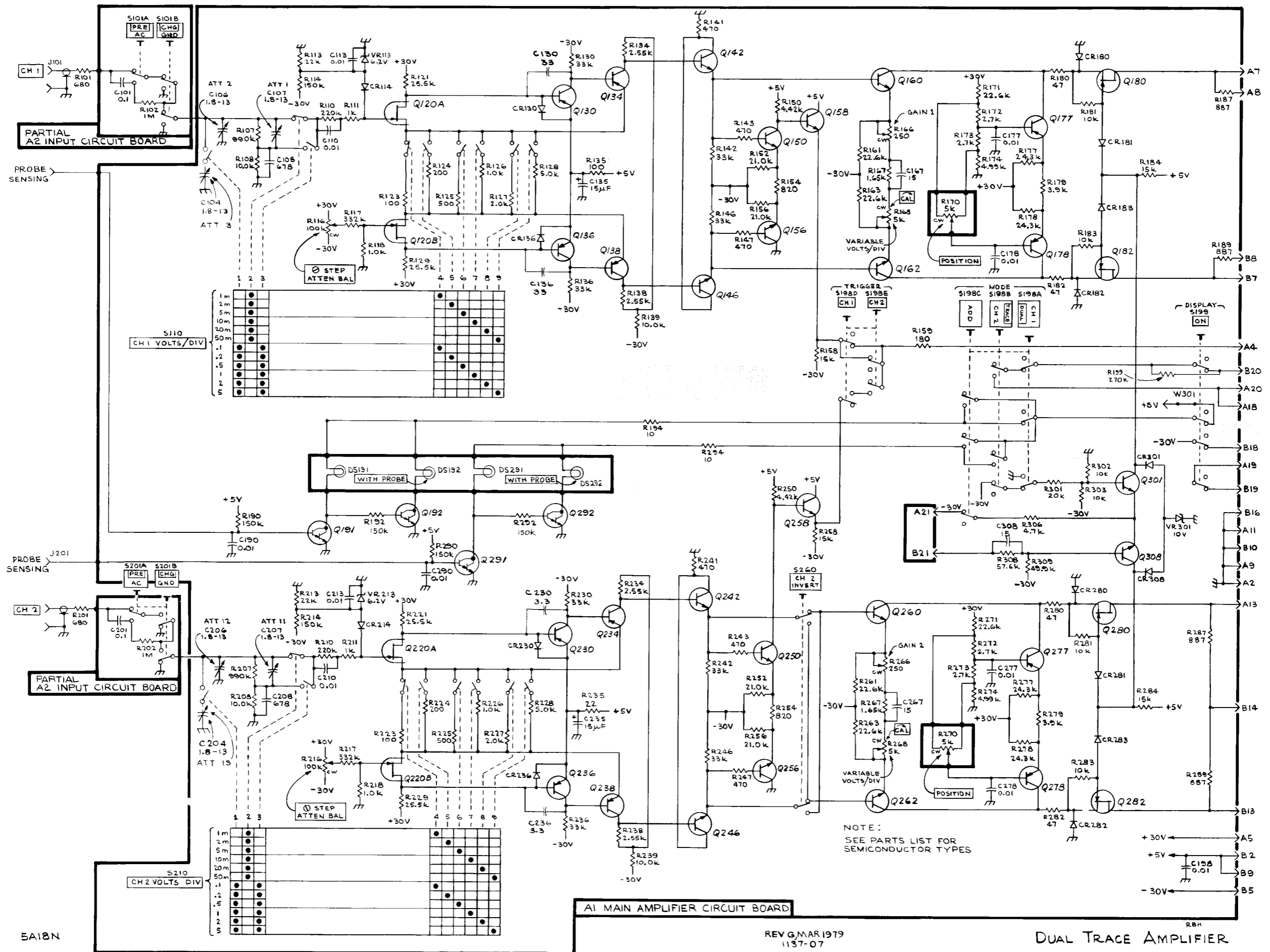
Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R161	321-0323-00			RES.,FXD,FILM:22.6K OHM,1%,0.125W	91637	MFF1816G22601F
R163	321-0323-00			RES.,FXD,FILM:22.6K OHM,1%,0.125W	91637	MFF1816G22601F
R166	311-1124-00			RES.,VAR,NONWIR:250 OHM,30%,0.25W	71450	201-YA5533
R167	321-0214-00			RES.,FXD,FILM:1.65K OHM,1%,0.125W	91637	MFF1816G16500F
R168	311-1127-00	B010100	B063559	RES.,FXD,NONWIR:5K OHM,0.5W,W/SW	80009	311-1127-00
R168	311-1403-00	B063560		RES.,VAR,NONWIR:5K OHM,20%,0.50W	01121	10M922
R170	311-0310-01			RES.,VAR,NONWIR:5K OHM,20%,0.50W	01121	W-7350B
R171	321-0323-00			RES.,FXD,FILM:22.6K OHM,1%,0.125W	91637	MFF1816G22601F
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	91637	MFF1816G49900F
R177	321-0326-00			RES.,FXD,FILM:24.3K OHM,1%,0.125W	91637	MFF1816G24301F
R178	321-0326-00			RES.,FXD,FILM:24.3K OHM,1%,0.125W	91637	MFF1816G24301F
R179	316-0392-00			RES.,FXD,CMPSN:3.9K OHM,10%,0.25W	01121	CB3921
R180	316-0470-00			RES.,FXD,CMPSN:47 OHM,10%,0.25W	01121	CB4701
R181	316-0103-00			RES.,FXD,CMPSN:10K OHM,10%,0.25W	01121	CB1031
R182	316-0470-00			RES.,FXD,CMPSN:47 OHM,10%,0.25W	01121	CB4701
R183	316-0103-00			RES.,FXD,CMPSN:10K OHM,10%,0.25W	01121	CB1031
R184	316-0153-00			RES.,FXD,CMPSN:15K OHM,10%,0.25W	01121	CB1531
R187	321-0188-00			RES.,FXD,FILM:887 OHM,1%,0.125W	91637	MFF1816G887ROF
R189	321-0188-00			RES.,FXD,FILM:887 OHM,1%,0.125W	91637	MFF1816G887ROF
R190	316-0154-00			RES.,FXD,CMPSN:150K OHM,10%,0.25W	01121	CB1541
R191	316-0105-00	B010100	B089999X	RES.,FXD,CMPSN:1M OHM,10%,0.25W	01121	CB1051
R192	316-0105-00	B010100	B089999	RES.,FXD,CMPSN:1M OHM,10%,0.25W	01121	CB1051
R192	315-0154-00	B090000		RES.,FXD,CMPSN:150K OHM,5%,0.25W	01121	CB1545
R194	316-0124-00	B010100	B089999	RES.,FXD,CMPSN:120K OHM,10%,0.25W	01121	CB1241
R194	315-0100-00	B090000		RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R207	322-0624-03			RES.,FXD,FILM:990K OHM,0.25%,0.25W	91637	MFF1421D99002C
R208	321-0289-03			RES.,FXD,FILM:10K OHM,0.25%,0.125W	91637	MFF1816D10001C
R210	316-0224-00			RES.,FXD,CMPSN:220K OHM,10%,0.25W	01121	CB2241
R211	316-0102-00			RES.,FXD,CMPSN:1K OHM,10%,0.25W	01121	CB1021
R213	316-0223-00			RES.,FXD,CMPSN:22K OHM,10%,0.25W	01121	CB2231
R214	316-0154-00			RES.,FXD,CMPSN:150K OHM,10%,0.25W	01121	CB1541
R216	311-0467-01			RES.,VAR,NONWIR:100K OHM,10%,0.50W	80009	311-0467-01
R217	321-0435-00			RES.,FXD,FILM:332K OHM,1%,0.125W	91637	MFF1816G33202F
R218	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R221	321-0328-00			RES.,FXD,FILM:25.5K OHM,1%,0.125W	91637	MFF1816G25501F
R223	321-0097-03			RES.,FXD,FILM:100 OHM,0.25%,0.125W	91637	MFF1816D100ROC
R224	321-0126-03			RES.,FXD,FILM:200 OHM,0.25%,0.125W	91637	MFF1816D200ROC
R225	321-0612-03			RES.,FXD,FILM:500 OHM,0.25%,0.125W	91637	MFF1816D500ROC
R226	321-0193-03			RES.,FXD,FILM:1K OHM,0.25%,0.125W	91637	MFF1816D10000C
R227	321-0222-03			RES.,FXD,FILM:2K OHM,0.25%,0.125W	91637	MFF1816D20000C
R228	321-0816-03			RES.,FXD,FILM:5K OHM,0.25%,0.125W	91637	MFF1816D50000C
R229	321-0328-00			RES.,FXD,FILM:25.5K OHM,1%,0.125W	91637	MFF1816G25501F
R230	316-0333-00			RES.,FXD,CMPSN:33K OHM,10%,0.25W	01121	CB3331
R234	321-0232-00			RES.,FXD,FILM:2.55K OHM,1%,0.125W	91637	MFF1816G25500F
R235	316-0220-00			RES.,FXD,CMPSN:22 OHM,10%,0.25W	01121	CB2201
R236	316-0333-00			RES.,FXD,CMPSN:33K OHM,10%,0.25W	01121	CB3331
R238	321-0232-00			RES.,FXD,FILM:2.55K OHM,1%,0.125W	91637	MFF1816G25500F
R239	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R241	316-0471-00			RES.,FXD,CMPSN:470 OHM,10%,0.25W	01121	CB4711
R242	316-0333-00			RES.,FXD,CMPSN:33K OHM,10%,0.25W	01121	CB3331
R243	316-0471-00			RES.,FXD,CMPSN:470 OHM,10%,0.25W	01121	CB4711

Replaceable Electrical Parts—5A18N

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R246	316-0333-00			RES.,FXD,CMPSN:33K OHM,10%,0.25W	01121	CB3331
R247	316-0471-00			RES.,FXD,CMPSN:470 OHM,10%,0.25W	01121	CB4711
R250	321-0255-00			RES.,FXD,FILM:4.42K OHM,1%,0.125W	91637	MFF1816G44200F
R252	321-0320-00			RES.,FXD,FILM:21K OHM,1%,0.125W	91637	MFF1816G21001F
R254	316-0821-00			RES.,FXD,CMPSN:820 OHM,10%,0.25W	01121	CB8211
R256	321-0320-00			RES.,FXD,FILM:21K OHM,1%,0.125W	91637	MFF1816G21001F
R258	316-0153-00			RES.,FXD,CMPSN:15K OHM,10%,0.25W	01121	CB1531
R261	321-0323-00			RES.,FXD,FILM:22.6K OHM,1%,0.125W	91637	MFF1816G22601F
R263	321-0323-00			RES.,FXD,FILM:22.6K OHM,1%,0.125W	91637	MFF1816G22601F
R266	311-1124-00			RES.,VAR, NONWIR:250 OHM,30%,0.25W	71450	201-YA5533
R267	321-0214-00			RES.,FXD,FILM:1.65K OHM,1%,0.125W	91637	MFF1816G16500F
R268	311-1127-00	B010100	B063559	RES.,VAR, NONWIR:5K OHM,0.5W,W/SW	80009	311-1127-00
R268	311-1403-00	B063560		RES.,VAR, NONWIR:5K OHM,20%,0.50W	01121	10M922
R270	311-0310-01			RES.,VAR, NONWIR:5K OHM,20%,0.50W	01121	W-7350B
R271	321-0323-00			RES.,FXD,FILM:22.6K OHM,1%,0.125W	91637	MFF1816G22601F
R272	316-0272-00			RES.,FXD,CMPSN:2.7K OHM,10%,0.25W	01121	CB2721
R273	316-0272-00			RES.,FXD,CMPSN:2.7K OHM,10%,0.25W	01121	CB2721
R274	321-0260-00			RES.,FXD,FILM:4.99K OHM,1%,0.125W	91637	MFF1816G49900F
R277	321-0326-00			RES.,FXD,FILM:24.3K OHM,1%,0.125W	91637	MFF1816G24301F
R278	321-0326-00			RES.,FXD,FILM:24.3K OHM,1%,0.125W	91637	MFF1816G24301F
R279	316-0392-00			RES.,FXD,CMPSN:3.9K OHM,10%,0.25W	01121	CB3921
R280	316-0470-00			RES.,FXD,CMPSN:47 OHM,10%,0.25W	01121	CB4701
R281	316-0103-00			RES.,FXD,CMPSN:10K OHM,10%,0.25W	01121	CB1031
R282	316-0470-00			RES.,FXD,CMPSN:47 OHM,10%,0.25W	01121	CB4701
R283	316-0103-00			RES.,FXD,CMPSN:10K OHM,10%,0.25W	01121	CB1031
R284	316-0153-00			RES.,FXD,CMPSN:15K OHM,10%,0.25W	01121	CB1531
R287	321-0188-00			RES.,FXD,FILM:887 OHM,1%,0.125W	91637	MFF1816G887ROF
R289	321-0188-00			RES.,FXD,FILM:887 OHM,1%,0.125W	91637	MFF1816G887ROF
R290	316-0154-00			RES.,FXD,CMPSN:150K OHM,10%,0.25W	01121	CB1541
R291	316-0105-00	B010100	B089999X	RES.,FXD,CMPSN:1M OHM,10%,0.25W	01121	CB1051
R292	316-0105-00	B010100	B089999	RES.,FXD,CMPSN:1M OHM,10%,0.25W	01121	CB1051
R292	315-0154-00	B090000		RES.,FXD,CMPSN:150K OHM,5%,0.25W	01121	CB1545
R294	316-0124-00	B010100	B089999	RES.,FXD,CMPSN:120K OHM,10%,0.25W	01121	CB1241
R294	315-0100-00	B090000		RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R301	316-0154-00	B010100	B049999	RES.,FXD,CMPSN:150K OHM,10%,0.25W	01121	CB1541
R301	315-0303-00	B050000	B0999999	RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
R301	315-0203-00	B010000		RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
R302	321-0356-00	B010100	B049999	RES.,FXD,FILM:49.9K OHM,1%,0.125W	91637	MFF1816G49901F
R302	321-0289-00	B050000		RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R303	321-0356-00	B010100	B049999	RES.,FXD,FILM:49.9K OHM,1%,0.125W	91637	MFF1816G49901F
R303	321-0289-00	B050000		RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R306	316-0472-00			RES.,FXD,CMPSN:4.7K OHM,10%,0.25W	01121	CB4721
R308	321-0362-00			RES.,FXD,FILM:57.6K OHM,1%,0.125W	91637	MFF1816G57601F
R309	321-0356-00			RES.,FXD,FILM:49.9K OHM,1%,0.125W	91637	MFF1816G49901F
S110	105-0245-00			ACTUATOR,CAM SW:CAM SWITCH	80009	105-0245-00
S198A	260-1216-00			SWITCH,PUSH:	80009	260-1216-00
S198B						
S198C						
S198D						
S198E						
S199	260-1209-00			SWITCH,PUSH:4PDT	80009	260-1209-00
S210	105-0245-00			ACTUATOR,CAM SW:CAM SWITCH	80009	105-0245-00
S260	260-1211-00			SWITCH,PUSH:DPDT,PUSH-PUSH	80009	260-1211-00

Replaceable Electrical Parts—5A18N

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
VR113	152-0166-00			SEMICON D DEVICE:ZENER,0.4W,6.2V,5%	81483	69-9035
VR213	152-0166-00			SEMICON D DEVICE:ZENER,0.4W,6.2V,5%	81483	69-9035
VR301	152-0149-00			SEMICON D DEVICE:ZENER,0.4W,10V,5%	04713	1N961B
W301	131-0566-00	XB090000		LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	55210	L-2007-1
A2	670-1341-00			CKT BOARD ASSY:INPUT	80009	670-1341-00
C101	285-0727-00			CAP.,FXD,PLSTC:0.1UF,10%,600V	80009	285-0727-00
C201	285-0727-00			CAP.,FXD,PLSTC:0.1UF,10%,600V	80009	285-0727-00
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
R201	316-0681-00			RES.,FXD,CMPSN:680 OHM,10%,0.25W	01121	CB6811
R202	316-0105-00			RES.,FXD,CMPSN:1M OHM,10%,0.25W	01121	CB1051
S101A	260-1207-00			SWITCH,PUSH:2 MODULE	80009	260-1207-00
S101B						
S201A	260-1207-00			SWITCH,PUSH:2 MODULE	80009	260-1207-00
S201B						



NOTE:
SEE PARTS LIST FOR
SEMICONDUCTOR TYPES

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               | ELCTR   | ELECTRON              | IN       | INCH                 | SE      | SINGLE END      |
| ACTR  | NUMBER SIZE        | ELEC    | ELECTRICAL            | INCAND   | INCANDESCENT         | SECT    | SECTION         |
| ADPTR | ACTUATOR           | ELCTLT  | ELECTROLYTIC          | INSUL    | INSULATOR            | SEMICON | SEMICONDUCTOR   |
| ALIGN | ADAPTER            | ELEM    | ELEMENT               | INTL     | INTERNAL             | SHLD    | SHIELD          |
| AL    | ALIGNMENT          | EPL     | ELECTRICAL PARTS LIST | LPHLDR   | LAMPHOLDER           | SHLDR   | SHOULDERED      |
| ASSEM | ALUMINUM           | EQPT    | EQUIPMENT             | MACH     | MACHINE              | SKT     | SOCKET          |
| ASSY  | ASSEMBLED          | EXT     | EXTERNAL              | MECH     | MECHANICAL           | SL      | SLIDE           |
| ATTEN | ASSEMBLY           | FIL     | FILLISTER HEAD        | MTG      | MOUNTING             | SLFLKGG | SELF-LOCKING    |
| AWG   | ATTENUATOR         | FLEX    | FLEXIBLE              | NIP      | NIPPLE               | SLVG    | SLEEVING        |
| BD    | AMERICAN WIRE GAGE | FLH     | FLAT HEAD             | NON WIRE | NOT WIRE WOUND       | SPR     | SPRING          |
| BRKT  | BOARD              | FLTR    | FILTER HEAD           | OBD      | ORDER BY DESCRIPTION | SQ      | SQUARE          |
| BRZ   | BRACKET            | FR      | FRAME or FRONT        | OD       | OUTSIDE DIAMETER     | SST     | STAINLESS STEEL |
| BRS   | 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            |
| CRT   | CATHODE RAY TUBE   | ID      | INSIDE DIAMETER       | SCH      | SOCKET HEAD          | WSHR    | WASHER          |
| DEG   | DEGREE             | IDNT    | 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            |
|-----------|--------------------------------------------------|----------------------|-----------------------------|
| 000CY     | NORTHWEST FASTENER SALES, INC.                   | 7923 SW CIRRUS DRIVE | BEAVERTON, OREGON 97005     |
| 24931     | SPECIALTY CONNECTOR CO., INC.                    | 3560 MADISON AVE.    | INDIANAPOLIS, IN 46227      |
| 28520     | HEYMAN MFG. CO.                                  | 147 N. MICHIGAN AVE. | KENILWORTH, NJ 07033        |
| 45722     | USM CORP., PARKER-KALON FASTENER DIV.            |                      | CAMPBELLSVILLE, KY 42718    |
| 71785     | TRW, CINCH CONNECTORS                            | 1501 MORSE AVENUE    | 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.<br>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         |
| 93907     | CAMCAR SCREW AND MFG. CO.                        | 600 18TH AVE.        | ROCKFORD, IL 61101          |

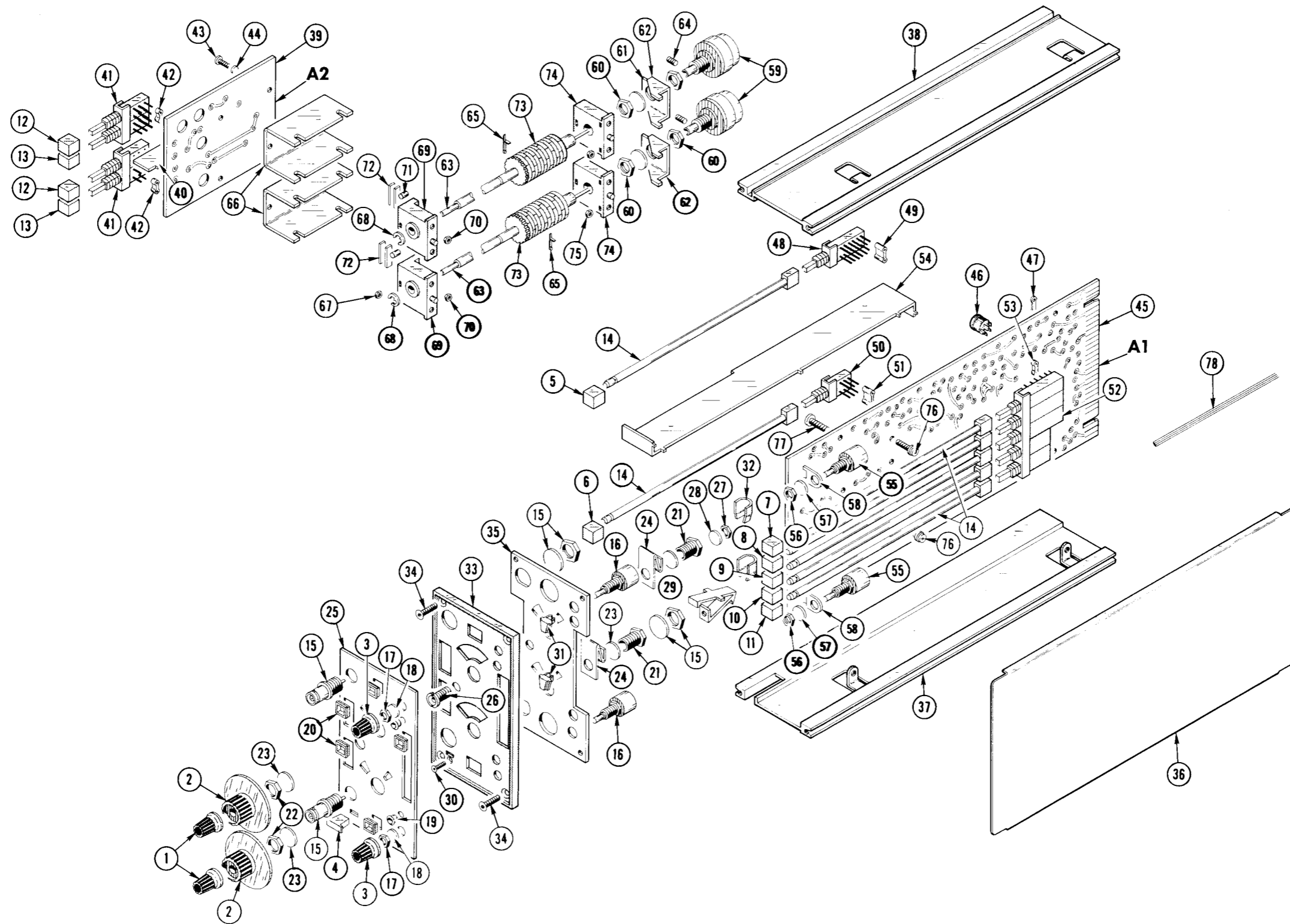
| Fig. & Index No. | Tektronix Part No. | Serial/Model No. Eff Dscont | Qty | 1 | 2 | 3 | 4 | 5 | Name & Description                          | Mfr Code | Mfr Part Number  |
|------------------|--------------------|-----------------------------|-----|---|---|---|---|---|---------------------------------------------|----------|------------------|
| 1-1              | 366-1317-00        |                             | 2   |   |   |   |   |   | KNOB:RED                                    | 80009    | 366-1317-00      |
|                  | -----              |                             |     |   |   |   |   |   | . EACH KNOB INCLUDES:                       |          |                  |
|                  | 213-0153-00        |                             | 1   |   |   |   |   |   | . SETSCREW:5-40 X 0.125,STL BK OXD,HEX      | 000CY    | OBD              |
| -2               | 366-1316-00        |                             | 2   |   |   |   |   |   | KNOB:GRAY,W/SKIRT                           | 80009    | 366-1316-00      |
|                  | -----              |                             |     |   |   |   |   |   | . EACH KNOB INCLUDES:                       |          |                  |
|                  | 213-0153-00        |                             | 2   |   |   |   |   |   | . SETSCREW:5-40 X 0.125,STL BK OXD,HEX      | 000CY    | OBD              |
| -3               | 366-0494-00        |                             | 2   |   |   |   |   |   | KNOB:GRAY WITH SETSCREW                     | 80009    | 366-0494-00      |
|                  | -----              |                             |     |   |   |   |   |   | . EACH KNOB INLCUDES:                       |          |                  |
|                  | 213-0153-00        |                             | 1   |   |   |   |   |   | . SETSCREW:5-40 X 0.125,STL BK OXD,HEX      | 000CY    | OBD              |
| -4               | 366-1286-00        | B010100 B049999             | 1   |   |   |   |   |   | KNOB:STL GY,0.5 X 0.2 X 0.375               | 80009    | 366-1286-00      |
|                  | 366-1286-03        | B050000 B106175             | 1   |   |   |   |   |   | KNOB:STL GY,0.5 X 0.2 X 0.375               | 80009    | 366-1286-03      |
|                  | 366-1690-00        | B106176                     | 1   |   |   |   |   |   | KNOB,LATCH:                                 | 80009    | 366-1690-00      |
| -5               | 366-1257-14        |                             | 1   |   |   |   |   |   | PUSH BUTTON:GRAY--ON                        | 80009    | 366-1257-14      |
| -6               | 366-1257-32        |                             | 1   |   |   |   |   |   | PUSH BUTTON:GRAY--INVERT                    | 80009    | 366-1257-32      |
| -7               | 366-1257-17        |                             | 1   |   |   |   |   |   | PUSH BUTTON:GRAY--CH1 DUAL                  | 80009    | 366-1257-17      |
| -8               | 366-1257-18        |                             | 1   |   |   |   |   |   | PUSH BUTTON:GRAY--TRACE CH                  | 80009    | 366-1257-18      |
| -9               | 366-1257-16        |                             | 1   |   |   |   |   |   | PUSH BUTTON:GRAY--ADD                       | 80009    | 366-1257-16      |
| -10              | 366-1257-19        |                             | 1   |   |   |   |   |   | PUSH BUTTON:GRAY--CH1                       | 80009    | 366-1257-19      |
| -11              | 366-1257-20        |                             | 1   |   |   |   |   |   | PUSH BUTTON:GRAY--CH2                       | 80009    | 366-1257-20      |
| -12              | 366-1257-11        |                             | 2   |   |   |   |   |   | PUSH BUTTON:GRAY--AC PRE                    | 80009    | 366-1257-11      |
| -13              | 366-1257-12        |                             | 2   |   |   |   |   |   | PUSH BUTTON:GRAY--CHG GND                   | 80009    | 366-1257-12      |
| -14              | 384-1059-00        |                             | 7   |   |   |   |   |   | EXTENSION SHAFT:6.58 INCH LONG              | 80009    | 384-1059-00      |
| -15              | 131-0679-00        | B010100 B076974             | 2   |   |   |   |   |   | CONNECTOR,RCPT,:BNC W/HARDWARE              | 24931    | 28JR168-1        |
|                  | 131-0679-02        | B076975                     | 2   |   |   |   |   |   | CONNECTOR,RCPT,:BNC W/HARDWARE              | 24931    | 28JR270-1        |
|                  |                    |                             |     |   |   |   |   |   | (ATTACHING PARTS FOR EACH)                  |          |                  |
|                  | 220-0497-00        | XB076975                    | 1   |   |   |   |   |   | NUT,PLAIN,HEX.:0.5-28 X 0.562 INCH HEX,BRS  | 73743    | OBD              |
|                  | 210-1039-00        | XB076975                    | 1   |   |   |   |   |   | WASHER,LOCK:INT,0.521 ID X 0.625 INCH OD    | 24931    | OBD              |
|                  |                    |                             |     |   |   |   |   |   | - - - * - - -                               |          |                  |
| -16              | -----              |                             | 2   |   |   |   |   |   | RESISTOR,VAR:(SEE R170,R270 EPL)            |          |                  |
|                  |                    |                             |     |   |   |   |   |   | (ATTACHING PARTS FOR EACH)                  |          |                  |
| -17              | 210-0583-00        |                             | 1   |   |   |   |   |   | NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS     | 73743    | 2X20224-402      |
| -18              | 210-0940-00        |                             | 1   |   |   |   |   |   | WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL     | 79807    | OBD              |
|                  |                    |                             |     |   |   |   |   |   | - - - * - - -                               |          |                  |
| -19              | 358-0378-00        | B010100 B095618             | 2   |   |   |   |   |   | BUSHING,SLEEVE:PRESS MOUNT                  | 80009    | 358-0378-00      |
|                  | 358-0599-00        | B095619                     | 2   |   |   |   |   |   | BUSHING,SLEEVE:0.125 ID X 0.234 THK,PLSTC   | 28520    | B-187-125        |
| -20              | 426-0681-00        |                             | 11  |   |   |   |   |   | FR,PUSH BUTTON:GRAY PLASTIC                 | 80009    | 426-0681-00      |
| -21              | 358-0029-00        |                             | 2   |   |   |   |   |   | BSHG,MACH.THD:HEX,0.375-32 X 0.438"LONG     | 80009    | 358-0029-00      |
|                  |                    |                             |     |   |   |   |   |   | (ATTACHING PARTS FOR EACH)                  |          |                  |
| -22              | 210-0590-00        |                             | 1   |   |   |   |   |   | NUT,PLAIN,HEX.:0.375 X 0.438 INCH,STL       | 73743    | 2X28269-402      |
| -23              | 210-0978-00        |                             | 2   |   |   |   |   |   | WASHER,FLAT:0.375 ID X 0.50 INCH OD,STL     | 78471    | OBD              |
| -24              | 344-0195-01        |                             | 1   |   |   |   |   |   | CLIP,ELECTRICAL:CAM SHAFT                   | 80009    | 344-0195-01      |
|                  |                    |                             |     |   |   |   |   |   | - - - * - - -                               |          |                  |
| -25              | 333-1389-00        |                             | 1   |   |   |   |   |   | PANEL,FRONT:                                | 80009    | 333-1389-00      |
| -26              | 358-0409-00        | B010100 B039999             | 1   |   |   |   |   |   | BSHG,MACH.THD:0.25-32 X 0.159 ID X 0.24     | 80009    | 358-0409-00      |
|                  | 131-1204-00        | B040000                     | 1   |   |   |   |   |   | JACK,TIP:GROUNDING                          | 80009    | 131-1204-00      |
|                  |                    |                             |     |   |   |   |   |   | (ATTACHING PARTS)                           |          |                  |
| -27              | 210-0583-00        |                             | 1   |   |   |   |   |   | NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS     | 73743    | 2X20224-402      |
| -28              | 210-0046-00        |                             | 1   |   |   |   |   |   | WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL     | 78189    | 1214-05-00-0541C |
|                  |                    |                             |     |   |   |   |   |   | - - - * - - -                               |          |                  |
| -29              | 214-1513-00        | B010100 B049999             | 1   |   |   |   |   |   | LCH,PL-IN RTNG:PLASTIC                      | 80009    | 214-1513-00      |
|                  | 214-1513-01        | B050000 B106175             | 1   |   |   |   |   |   | LCH,PLUG-IN RET:                            | 80009    | 214-1513-01      |
|                  | 105-0719-00        | B106176                     | 1   |   |   |   |   |   | LATCH,RETAINING:PLUG-IN                     | 80009    | 105-0719-00      |
|                  |                    |                             |     |   |   |   |   |   | (ATTACHING PARTS)                           |          |                  |
| -30              | 213-0254-00        |                             | 1   |   |   |   |   |   | SCR,TPG,THD CTG:2-32 X 0.250,100 DEG,FLH    | 45722    | OBD              |
|                  |                    |                             |     |   |   |   |   |   | - - - * - - -                               |          |                  |
|                  | 105-0718-01        | XB106176                    | 1   |   |   |   |   |   | BAR,LATCH RLSE:                             | 80009    | 105-0718-01      |
| -31              | 136-0429-00        |                             | 4   |   |   |   |   |   | RETAINER,LAMP:CAM SWITCH                    | 80009    | 136-0429-00      |
| -32              | 337-1430-00        |                             | 4   |   |   |   |   |   | SHIELD,LIGHT:LAMP                           | 80009    | 337-1430-00      |
| -33              | 386-1916-00        |                             | 1   |   |   |   |   |   | SUBPANEL,FRONT:                             | 80009    | 386-1916-00      |
|                  |                    |                             |     |   |   |   |   |   | (ATTACHING PARTS)                           |          |                  |
| -34              | 213-0229-00        |                             | 4   |   |   |   |   |   | SCR,TPG,THD FOR:6-20 X0.375"100 DEG,FLH STL | 93907    | OBD              |
|                  |                    |                             |     |   |   |   |   |   | - - - * - - -                               |          |                  |

Replaceable Mechanical Parts—5A18

| Fig. & Index No. | Tektronix Part No. | Serial/Model No. Eff | Dscont   | Qty | 1 2 3 4 5 | Name & Description                                                                   | Mfr Code | Mfr Part Number  |
|------------------|--------------------|----------------------|----------|-----|-----------|--------------------------------------------------------------------------------------|----------|------------------|
| 1-35             | 337-1398-00        |                      |          | 1   |           | SHIELD,ELEC:SUBPANEL                                                                 | 80009    | 337-1398-00      |
| -36              | 337-1399-00        |                      |          | 2   |           | SHLD,ELECTRICAL:SIDE                                                                 | 80009    | 337-1399-00      |
| -37              | 426-0724-00        |                      |          | 1   |           | FR SECT,PLUG-IN:BOTTOM                                                               | 80009    | 426-0724-00      |
| -38              | 426-0725-00        |                      |          | 1   |           | FR SECT,PLUG-IN:TOP                                                                  | 80009    | 426-0725-00      |
| -39              | -----              |                      |          | 1   |           | CKT BOARD ASSY:INPUT(SEE A2 EPL)                                                     |          |                  |
| -40              | 337-1400-00        |                      |          | 1   |           | . SHIELD,ELEC:                                                                       | 80009    | 337-1400-00      |
| -41              | -----              |                      |          | 2   |           | . SWITCH,PUSH:(SEE S101A,B AND S201A,B EPL)<br>(ATTACHING PARTS FOR EACH)            |          |                  |
| -42              | 361-0385-00        |                      |          | 2   |           | . SPACER,PB SW:0.164 INCH LONG<br>- - - * - - -<br>(ATTACHING PARTS FOR CKT BD ASSY) | 80009    | 361-0385-00      |
| -43              | 211-0001-00        | B010100              | B039999  | 4   |           | SCREW,MACHINE:2-56 X 0.25 INCH,PNH STL                                               | 83385    | OBD              |
|                  | 211-0001-00        | B040000              |          | 2   |           | SCREW,MACHINE:2-56 X 0.25 INCH,PNH STL                                               | 83385    | OBD              |
| -44              | 210-0001-00        |                      |          | 4   |           | WASHER,LOCK:INTL,0.092 ID X 0.18"OD,STL<br>- - - * - - -                             | 78189    | 1202-00-00-0541C |
| -45              | -----              |                      |          | 1   |           | CKT BOARD ASSY:MAIN AMPLIFIER(SEE A1 EPL)                                            |          |                  |
| -46              | 136-0235-00        |                      |          | 2   |           | . SOCKET,PLUG-IN:6 CONTACT,ROUND                                                     | 71785    | 133-96-12-062    |
| -47              | 214-0579-00        |                      |          | 6   |           | . TERM.,TEST PT:BRS CD PL                                                            | 80009    | 214-0579-00      |
| -48              | -----              |                      |          | 1   |           | . SWITCH,PUSH(SEE S199 EPL)<br>(ATTACHING PARTS)                                     |          |                  |
| -49              | 361-0383-00        |                      |          | 2   |           | . SPACER,PB SW:CHARCOAL,0.33 INCH LONG<br>- - - * - - -                              | 80009    | 361-0383-00      |
| -50              | -----              |                      |          | 1   |           | . SWITCH,PUSH:(SEE S260 EPL)<br>(ATTACHING PARTS)                                    |          |                  |
| -51              | 361-0383-00        |                      |          | 2   |           | . SPACER,PB SW:CHARCOAL,0.33 INCH LONG<br>- - - * - - -                              | 80009    | 361-0383-00      |
| -52              | -----              |                      |          | 1   |           | . SWITCH,PUSH:(SEE S198A,E EPL)<br>(ATTACHING PARTS)                                 |          |                  |
| -53              | 361-0384-00        |                      |          | 5   |           | . SPACER,PB SW:0.133 INCH LONG<br>- - - * - - -                                      | 80009    | 361-0384-00      |
| -54              | 337-1397-00        |                      |          | 1   |           | . SHIELD,ELEC:                                                                       | 80009    | 337-1397-00      |
| -55              | -----              |                      |          | 2   |           | . RESISTOR,VAR:(SEE R168 AND R268 EPL)<br>(ATTACHING PARTS FOR EACH)                 |          |                  |
| -56              | 210-0583-00        |                      |          | 1   |           | . NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS                                            | 73743    | 2X20224-402      |
| -57              | 210-0940-00        |                      |          | 1   |           | . WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL                                            | 79807    | OBD              |
| -58              | 387-0794-00        |                      |          | 1   |           | . PLATE,CMPNT MTG:VAR RESISTOR,BRASS                                                 | 80009    | 387-0794-00      |
|                  | 361-0386-00        | XB063560             |          | 2   |           | . SPACER,SLEEVE:0.078 L X 0.255 ID<br>- - - * - - -                                  | 80009    | 361-0386-00      |
| -59              | -----              |                      |          | 2   |           | . RESISTOR,VAR:(SEE R168 AND R268 EPL)<br>(ATTACHING PARTS FOR EACH)                 |          |                  |
| -60              | 210-0590-00        | B010100              | B063559X | 2   |           | . NUT,PLAIN,HEX.:0.375 X 0.438 INCH,STL                                              | 73743    | 2X28269-402      |
| -61              | 210-0012-00        | B010100              | B063559X | 1   |           | . WASHER,LOCK:INTL,0.375 ID X 0.50" OD STL                                           | 78189    | 1220-02-00-0541C |
| -62              | 407-0894-00        | B010100              | B063559X | 1   |           | . BRACKET,ELEC SW:BRASS<br>- - - * - - -                                             | 80009    | 407-0894-00      |
| -63              | 384-0255-00        | B010100              | B063559  | 2   |           | . EXTENSION SHAFT:0.08/0.125 DIA X 5.594" L                                          | 80009    | 384-0255-00      |
|                  | 384-1193-00        | B063560              |          | 2   |           | . EXTENSION SHAFT:0.081/0.125 OD X 5.422" L<br>(ATTACHING PARTS FOR EACH)            | 80009    | 384-1193-00      |
| -64              | 213-0048-00        | B010100              | B063559  | 1   |           | . SETSCREW:4-40 X 0.125 INCH,HEX SOC STL                                             | 74445    | OBD              |
|                  | 376-0050-00        | B063560              |          | 1   |           | . CPLG,SHAFT,FLEX:FOR 0.081/0.125 INCH SHAFTS<br>- - - * - - -                       | 80009    | 376-0050-00      |
| -65              | 131-0604-00        |                      |          | 18  |           | . CONTACT,ELEC:CKT BD SW,SPR,CU BE                                                   | 80009    | 131-0604-00      |
|                  | 105-0245-00        |                      |          | 2   |           | . ACTUATOR,CAM SW:CAM SWITCH                                                         | 80009    | 105-0245-00      |
|                  | -----              |                      |          | -   |           | . . . EACH CAM SWITCH ASSY INCLUDES:                                                 |          |                  |
| -66              | 200-1193-00        |                      |          | 1   |           | . . . COVER,CAM SW:<br>(ATTACHING PARTS)                                             | 80009    | 200-1193-00      |
| -67              | 210-0405-00        | B010100              | B039999  | 2   |           | . . . NUT,PLAIN,HEX.:2-56 X 0.188 INCH,BRS                                           | 73743    | 2X12157-402      |
|                  | 210-0405-00        | B040000              |          | 1   |           | . . . NUT,PLAIN,HEX.:2-56 X 0.188 INCH,BRS                                           | 73743    | 2X12157-402      |
|                  | 220-0636-00        | XB040000             |          | 1   |           | . . . NUT,PLAIN,HEX.:2-56 X 0.188 INCH HEX,BRS                                       | 73743    | OBD              |
|                  | 131-1219-00        | XB040000             |          | 1   |           | . . . CONTACT,ELEC:GROUNDING<br>- - - * - - -                                        | 80009    | 131-1219-00      |
| -68              | 354-0219-00        |                      |          | 1   |           | . . . RING,RETAINING:FOR 0.25 INCH SHAFT                                             | 79136    | 5103-25-MD-R     |
| -69              | 401-0057-00        |                      |          | 1   |           | . . . BEARING,CAM SW:FRONT<br>(ATTACHING PARTS)                                      | 80009    | 401-0057-00      |
| -70              | 210-0406-00        |                      |          | 2   |           | . . . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS<br>- - - * - - -                          | 73743    | 2X12161-402      |

| Fig. & Index No. | Tektronix Part No. | Serial/Model No. Eff | Dscont | Qty | 1 2 3 4 5 | Name & Description                          | Mfr Code | Mfr Part Number |
|------------------|--------------------|----------------------|--------|-----|-----------|---------------------------------------------|----------|-----------------|
| 1-71             | 214-1127-00        |                      |        | 1   | . . .     | ROLLER,DETENT:0.125 DIA X 0.125 INCH L      | 80009    | 214-1127-00     |
|                  | 214-1139-00        |                      |        | 2   | . . .     | SPRING,FLAT:0.885 X 0.156CU BE GLD CLR      | 80009    | 214-1139-00     |
|                  | -----              |                      |        | -   | . . .     | * REPLACE ONLY WITH PART BEARING THE SAME   |          |                 |
|                  | 214-1139-02        |                      |        | 2   | . . .     | * COLOR AS THE ORIGINAL PART IN YOUR INSTR. | 80009    | 214-1139-02     |
|                  | -----              |                      |        | -   | . . .     | SPRING,FLAT:GREEN COLORED                   |          |                 |
|                  | -----              |                      |        | -   | . . .     | * REPLACE ONLY WITH PART BEARING THE SAME   |          |                 |
|                  | -----              |                      |        | -   | . . .     | * COLOR AS THE ORIGINAL PART IN YOUR INSTR. |          |                 |
| -72              | 214-1139-03        |                      |        | 1   | . . .     | SPRING,FLAT:GREEN COLORED                   | 80009    | 214-1139-03     |
|                  | -----              |                      |        | -   | . . .     | * REPLACE ONLY WITH PART BEARING THE SAME   |          |                 |
|                  | -----              |                      |        | -   | . . .     | * COLOR AS THE ORIGINAL PART IN YOUR INSTR. |          |                 |
| -173             | 105-0220-00        |                      |        | 1   | . . .     | ACTUATOR,CAM SW:                            | 80009    | 105-0220-00     |
|                  | 334-3448-00        |                      |        | 1   | . . .     | MARKER IDENT:MARKED NOTICE                  | 80009    | 334-3448-00     |
| -74              | 401-0056-00        |                      |        | 1   | . . .     | BEARING,CAM SW:REAR                         | 80009    | 401-0056-00     |
|                  |                    |                      |        |     |           | (ATTACHING PARTS)                           |          |                 |
| -75              | 210-0406-00        |                      |        | 2   | . . .     | NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS        | 73743    | 2X12161-402     |
|                  |                    |                      |        |     |           | - - - * - - -                               |          |                 |
|                  |                    |                      |        |     |           | (ATTACHING PARTS FOR EACH CAM SW)           |          |                 |
| -76              | 211-0116-00        |                      |        | 4   | . . .     | SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS    | 83385    | OBD             |
|                  |                    |                      |        |     |           | - - - * - - -                               |          |                 |
|                  |                    |                      |        |     |           | (ATTACHING PARTS FOR CKT BD ASSY)           |          |                 |
| -77              | 213-0146-00        |                      |        | 4   | . . .     | SCR,TPG,THD FOR:6-20 X 0.313 INCH,PNH STL   | 83385    | OBD             |
|                  |                    |                      |        |     |           | - - - * - - -                               |          |                 |
| -78              | 175-0826-00        |                      |        | FT  | . . .     | WIRE,ELECTRICAL:3 WIRE RIBBON               | 80009    | 175-0826-00     |
|                  |                    |                      |        |     |           | STANDARD ACCESSORIES                        |          |                 |
|                  | 070-1137-00        |                      |        | 1   | . . .     | MANUAL:INSTRUCTION(NOT SHOWN)               | 80009    | 070-1137-00     |









## **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<br>PG 501 replaces 107<br>108    | PG 501 - Risetime less than 3.5 ns into 50 Ω.<br>PG 501 - 5 V output pulse; 3.5 ns Risetime                                                                                                                                                                                                                                                                          | 107 - Risetime less than 3.0 ns into 50 Ω.<br>108 - 10 V output pulse<br>1 ns Risetime                                                                                                                                                                                                                                                      |
| PG 502 replaces 107<br>108<br>111                     | PG 502 - 5 V output<br>PG 502 - Risetime less than 1 ns; 10 ns<br>Pretrigger pulse delay                                                                                                                                                                                                                                                                             | 108 - 10 V output<br>111 - Risetime 0.5 ns; 30 to 250 ns<br>Pretrigger pulse delay                                                                                                                                                                                                                                                          |
| PG 508 replaces 114<br>115<br>2101                    | Performance of replacement equipment is the same or better than equipment being replaced.                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                             |
| PG 506 replaces 106<br>067-0502-01                    | PG 506 - Positive-going trigger output signal at least 1 V; High Amplitude output, 60 V.<br>PG 506 - Does not have chopped feature.                                                                                                                                                                                                                                  | 106 - Positive and Negative-going trigger output signal, 50 ns and 1 V; High Amplitude output, 100 V.<br>0502-01 - Comparator output can be alternately chopped to a reference voltage.                                                                                                                                                     |
| SG 503 replaces 190, 190A, 190B<br>191<br>067-0532-01 | SG 503 - Amplitude range 5 mV to 5.5 V p-p.<br>SG 503 - Frequency range 250 kHz to 250 MHz.                                                                                                                                                                                                                                                                          | 190B - Amplitude range 40 mV to 10 V p-p.<br>0532-01 - Frequency range 65 MHz to 500 MHz.                                                                                                                                                                                                                                                   |
| SG 504 replaces 067-0532-01<br>067-0650-00            | SG 504 - Frequency range 245 MHz to 1050 MHz.                                                                                                                                                                                                                                                                                                                        | 0532-01 - Frequency range 65 MHz to 500 MHz.                                                                                                                                                                                                                                                                                                |
| TG 501 replaces 180, 180A<br>181<br>184<br>2901       | TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.<br>TG 501 - Trigger output-slaved to market output from 5 sec through 100 ns. One time-mark can be generated at a time.<br>TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time. | 180A - Trigger pulses 1, 10, 100 Hz; 1, 10, and 100 kHz. Multiple time-marks can be generated simultaneously.<br>181 - Multiple time-marks<br>184 - Separate trigger pulses of 1 and 0.1 sec; 10, 1, and 0.1 ms; 10 and 1 μs.<br>2901 - 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.**

Change Reference: M35901 Date: 3-12-79

Product: 5A18N 070-1137-00 EFF SN B116596

| CHANGE | DESCRIPTION |
|--------|-------------|
|--------|-------------|

ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

CHANGE TO:

- |      |             |                                       |
|------|-------------|---------------------------------------|
| C110 | 281-0614-00 | CAP., FXD, CER DI:6800PF,+80-20%,500V |
| C210 | 281-0614-00 | CAP., FXD, CER DI:6800PF,+80-20%,500V |

C110 and C210 are located on the MAIN AMPLIFIER circuit board assembly.



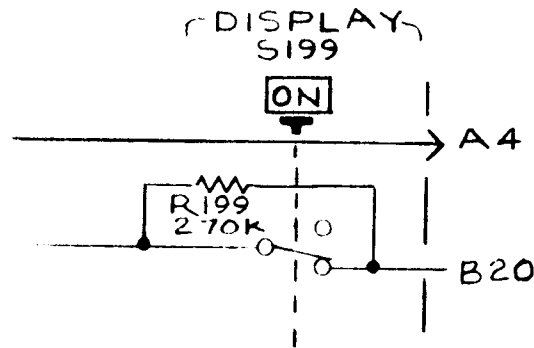
| CHANGE | DESCRIPTION |
|--------|-------------|
|--------|-------------|

### ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

ADD:

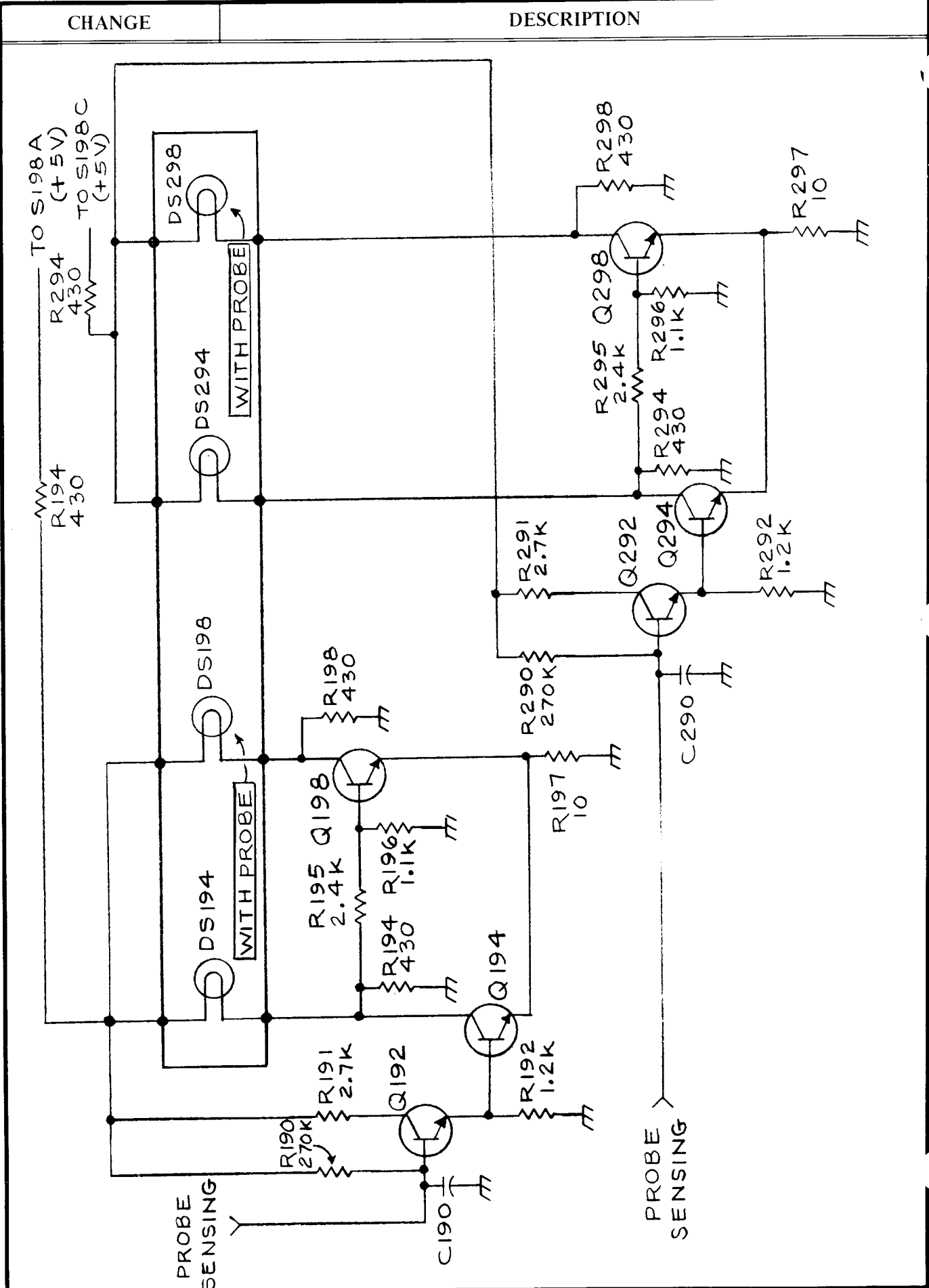
R199      315-0274-00      RES., FXD, CMPSN: 270K OHM, 5%, 0.25W

DIAGRAM - DUAL TRACE AMPLIFIER - Partial





| CHANGE                                      | DESCRIPTION |                                  |
|---------------------------------------------|-------------|----------------------------------|
| ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES |             |                                  |
| CHANGE TO:                                  |             |                                  |
| A1                                          | 670-1343-04 | CKT BOARD ASSY:MAIN AMPLIFIER    |
| Q192                                        | 151-0192-00 | TRANSISTOR:SILICON,NPN,MPS6521   |
| Q292                                        | 151-0192-00 | TRANSISTOR:SILICON,NPN,MPS6521   |
| R110                                        | 315-0224-00 | RES.,FXD,CMPSN:220K OHM,5%,0.25W |
| R111                                        | 315-0102-00 | RES.,FXD,CMPSN:1K OHM,5%,0.25W   |
| R113                                        | 315-0223-00 | RES.,FXD,CMPSN:22K OHM,5%,0.25W  |
| R114                                        | 315-0154-00 | RES.,FXD,CMPSN:150K OHM,5%,0.25W |
| R130                                        | 315-0333-00 | RES.,FXD,CMPSN:33K OHM,5%,0.25W  |
| R136                                        | 315-0333-00 | RES.,FXD,CMPSN:33K OHM,5%,0.25W  |
| R141                                        | 315-0471-00 | RES.,FXD,CMPSN:470 OHM,5%,0.25W  |
| R142                                        | 315-0333-00 | RES.,FXD,CMPSN:33K OHM,5%,0.25W  |
| R143                                        | 315-0471-00 | RES.,FXD,CMPSN:470 OHM,5%,0.25W  |
| R146                                        | 315-0333-00 | RES.,FXD,CMPSN:33K OHM,5%,0.25W  |
| R147                                        | 315-0471-00 | RES.,FXD,CMPSN:470 OHM,5%,0.25W  |
| R154                                        | 315-0821-00 | RES.,FXD,CMPSN:820 OHM,5%,0.25W  |
| R158                                        | 315-0153-00 | RES.,FXD,CMPSN:15K OHM,5%,0.25W  |
| R159                                        | 315-0181-00 | RES.,FXD,CMPSN:180 OHM,5%,0.25W  |
| R172                                        | 315-0272-00 | RES.,FXD,CMPSN:2.7K OHM,5%,0.25W |
| R173                                        | 315-0272-00 | RES.,FXD,CMPSN:2.7K OHM,5%,0.25W |
| R179                                        | 315-0392-00 | RES.,FXD,CMPSN:3.9K OHM,5%,0.25W |
| R180                                        | 315-0470-00 | RES.,FXD,CMPSN:47 OHM,5%,0.25W   |
| R181                                        | 315-0103-00 | RES.,FXD,CMPSN:10K OHM,5%,0.25W  |
| R182                                        | 315-0470-00 | RES.,FXD,CMPSN:47 OHM,5%,0.25W   |
| R183                                        | 315-0103-00 | RES.,FXD,CMPSN:10K OHM,5%,0.25W  |
| R184                                        | 315-0153-00 | RES.,FXD,CMPSN:15K OHM,5%,0.25W  |
| R190                                        | 315-0274-00 | RES.,FXD,CMPSN:270K OHM,5%,0.25W |
| R192                                        | 315-0122-00 | RES.,FXD,CMPSN:1.2K OHM,5%,0.25W |
| R194                                        | 315-0431-00 | RES.,FXD,CMPSN:430 OHM,5%,0.25W  |
| R210                                        | 315-0224-00 | RES.,FXD,CMPSN:220K OHM,5%,0.25W |
| R211                                        | 315-0102-00 | RES.,FXD,CMPSN:1K OHM,5%,0.25W   |





**DESCRIPTION**

## REPLACEABLE ELECTRICAL PARTS AND SCHEMATIC CHANGES

## CHANGE TO:

|      |             |                                         |
|------|-------------|-----------------------------------------|
| A1   | 670-1343-05 | CKT BOARD ASSY:MAIN AMPLIFIER           |
| C167 | 281-0542-00 | CAP.,FXD,CER DI:18PF,10%,500V           |
| C267 | 281-0542-00 | CAP.,FXD,CER DI:18PF,10%,500V           |
| C308 | 281-0759-00 | CAP.,FXD,CER DI:22PF,10%,100V           |
| Q180 | 151-1059-00 | TRANSISTOR:SILICON,FET,N-CHANNEL,U1897E |
| Q182 | 151-1059-00 | TRANSISTOR:SILICON,FET,N-CHANNEL,U1897E |
| Q280 | 151-1059-00 | TRANSISTOR:SILICON,FET,N-CHANNEL,U1897E |
| Q282 | 151-1059-00 | TRANSISTOR:SILICON,FET,N-CHANNEL,U1897E |
| R161 | 321-0265-00 | RES.,FXD,FILM:5.62K OHM,1%,0.125W       |
| R163 | 321-0265-00 | RES.,FXD,FILM:5.62K OHM,1%,0.125W       |
| R167 | 321-0145-00 | RES.,FXD,FILM:316 OHM,1%,0.125W         |
| R177 | 321-0268-00 | RES.,FXD,FILM:6.04K OHM,1%,0.125W       |
| R178 | 321-0268-00 | RES.,FXD,FILM:6.04K OHM,1%,0.125W       |
| R179 | 321-0192-00 | RES.,FXD,FILM:976 OHM,1%,0.125W         |
| R181 | 315-0302-00 | RES.,FXD,CMPSN:3K OHM,5%,0.25W          |
| R183 | 315-0302-00 | RES.,FXD,CMPSN:3K OHM,5%,0.25W          |
| R187 | 321-0130-00 | RES.,FXD,FILM:221 OHM,1%,0.125W         |
| R189 | 321-0130-00 | RES.,FXD,FILM:221 OHM,1%,0.125W         |
| R261 | 321-0265-00 | RES.,FXD,FILM:5.62K OHM,1%,0.125W       |
| R263 | 321-0265-00 | RES.,FXD,FILM:5.62K OHM,1%,0.125W       |
| R267 | 321-0145-00 | RES.,FXD,FILM:316 OHM,1%,0.125W         |
| R277 | 321-0268-00 | RES.,FXD,FILM:6.04K OHM,1%,0.125W       |
| R278 | 321-0268-00 | RES.,FXD,FILM:6.04K OHM,1%,0.125W       |

DESCRIPTION

|      |             |                                   |
|------|-------------|-----------------------------------|
| R279 | 321-0192-00 | RES.,FXD,FILM:976 OHM,1%,0.125W   |
| R281 | 315-0302-00 | RES.,FXD,CMPSN:3K OHM,5%,0.25W    |
| R283 | 315-0302-00 | RES.,FXD,CMPSN:3K OHM,5%,0.25W    |
| R287 | 321-0130-00 | RES.,FXD,FILM:221 OHM,1%,0.125W   |
| R289 | 321-0130-00 | RES.,FXD,FILM:221 OHM,1%,0.125W   |
| R306 | 315-0182-00 | RES.,FXD,CMPSN:1.8K OHM,5%,0.25W  |
| R308 | 321-0338-00 | RES.,FXD,FILM:32.4K OHM,1%,0.125W |
| R309 | 321-0332-00 | RES.,FXD,FILM:28K OHM,1%,0.125W   |

ADD:

|      |             |                                |
|------|-------------|--------------------------------|
| R169 | 315-0102-00 | RES.,FXD,CMPSN:1K OHM,5%,0.25W |
| R269 | 315-0102-00 | RES.,FXD,CMPSN:1K OHM,5%,0.25W |

DIAGRAM DUAL TRACE AMPLIFIER

R169 is added in parallel with R168. R269 is added in parallel with R268.