TEK INSTRUCTION MANUAL

070-5056-00
Product Group 46

1107
DC INVERTER

Tektronix®
COMMITTED TO EXCELLENCE

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Product Group 46

1107
DC INVERTER

CAUTION

The 1107 should only be operated with the warning label and venting holes facing upward. This allows for proper ventilation of the internal components.

Please Check for CHANGE INFORMATION at the Rear of This Manual

First Printing MAR 1985
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Tektronix®
COMMITTED TO EXCELLENCE

INSTRUMENT SERIAL NUMBERS

Each instrument has a serial number on a panel insert, tag, or stamped on the chassis. The first number or letter designates the country of manufacture. The last five digits of the serial number are assigned sequentially and are unique to each instrument. Those manufactured in the United States have six unique digits. The country of manufacture is identified as follows:

B000000	Tektronix, Inc., Beaverton, Oregon, USA
100000	Tektronix Guernsey, Ltd., Channel Islands
200000	Tektronix United Kingdom, Ltd., London
300000	Sony/Tektronix, Japan
700000	Tektronix Holland, NV, Heerenveen, The Netherlands

Certificate of the Manufacturer/Importer

We hereby certify that the 1107 DC INVERTER AND ALL INSTALLED OPTIONS complies with the RF Interference Suppression requirements of Amtsbl.-Vfg 1046/1984.

The German Postal Service was notified that the equipment is being marketed.

The German Postal Service has the right to re-test the series and to verify that it complies.

TEKTRONIX

Bescheinigung des Herstellers/Importeurs

Hiermit wird bescheinigt, daß der/die/das 1107 DC INVERTER AND ALL INSTALLED OPTIONS in Übereinstimmung mit den Bestimmungen der Amtsblatt-Verfugüng 1046/1984 funkentstört ist.

Der Deutschen Bundespost wurde das Inverkehrbringen dieses Gerätes angezeigt und die Berechtigung zur Überprufüng der Serie auf Einhalten der Bestimmungen eingeräumt.

TEKTRONIX

NOTICE to the user/operator:

The German Postal Service requires that Systems assembled by the operator/user of this instrument must also comply with Postal Regulation, Vfg. 1046/1984, Par. 2, Sect. 1.

HINWEIS für den Benutzer/Betreiber:

Die vom Betreiber zusammengestellte Anlage, innerhalb derer dies Gerät eingesetzt wird, muß ebenfalls den Voraussetzungen nach Par. 2, Ziff. 1 der Vfg. 1046/1984 genugen.

NOTICE to the user/operator:

The German Postal Service requires that this equipment, when used in a test setup, may only be operated if the requirements of Postal Regulation, Vfg. 1046/1984, Par. 2, Sect. 1.7.1 are complied with.

HINWEIS für den Benutzer/Betreiber:

Dies Gerät darf in Meßaufbauten nur betrieben werden, wenn die Voraussetzungen des Par. 2, Ziff. 1.7.1 der Vfg. 1046/1984 eingehalten werden.

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WARNING

THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO. REFER TO OPERATORS SAFETY SUMMARY AND SERVICE SAFETY SUMMARY PRIOR TO PERFORMING ANY SERVICE.

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OPERATORS SAFETY SUMMARY

The general safety information in this part of the summary is for both operating and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply and do not appear in this summary.

Terms in This Manual

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.

WARNING statements identify conditions or practices that could result in personal injury or loss of life.

Terms as Marked on Equipment

CAUTION indicates a personal injury hazard not immediately accessible as one reads the markings, or a hazard to property, including the equipment itself.

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

Symbols as Marked on Equipment


Chassis ground.


Earth ground.

Power Source

This product is intended to operate from a power source of either +12 V or +24 V. A protective ground connection by way of the grounding conductor in the dc power cord is essential for safe operation.

Grounding the Product

This product is grounded through the dc power cord green-and-yellow conductor to earth ground. A protective ground connection by way of the grounding conductor in the dc power cord is essential for safe operation.

Use the Proper DC Power Cord

Use only the power cord and connector specified for this product.

Use only a dc power cord that is in good condition.

Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate this product in an explosive atmosphere.

Do Not Remove Covers or Panels

To avoid personal injury, do not remove the product covers or panels. Do not operate the product without the covers and panels properly installed.

SERVICE SAFETY SUMMARY

FOR QUALIFIED SERVICE PERSONNEL ONLY

Refer also to the preceding Operators Safety Summary.

Do Not Service Alone

Do not perform internal service or adjustment of this product unless another person capable of rendering first aid and resuscitation is present.

Use Care When Servicing With Power On

Dangerous voltages may exist at several points in this product. To avoid personal injury, do not touch exposed connections or components while power is on.

Disconnect power before removing protective panels, soldering, or replacing components.

5056-01A

The 1107 DC Inverter.

GENERAL INFORMATION

INTRODUCTION

The TEKTRONIX 1107 DC Inverter is a rugged, portable instrument that provides an output ac voltage from either a +12 V or +24 V dc input source. The instrument will sense the input dc voltage source and automatically select either the +12 V or +24 V dc mode of operation. This instrument was specifically designed to operate Tektronix 2000 Family oscilloscopes.

CAUTION

Do not use the 1107 to power any instrument other than the recommended Tektronix oscilloscopes. Damage could occur to either the 1107 or the instrument under power or both.

To operate Tektronix 2300 and 2400 Series oscilloscopes, verify that the oscilloscope Line Voltage Selector switch is set to 115-volt operation and that the proper line fuse is installed. The TEKTRONIX 1106 Battery Pack may be used to provide dc power to the 1107 DC Inverter. The 1107 is not compatible with 2200 Series oscilloscopes with the following serial numbers unless Option 48 has been installed:

United States built 2213's below B020100.
United States built 2215's below B022000.
United Kingdom built 2213's below 200239.
United Kingdom built 2215's below 200307.

The 1107 is shipped with the following standard accessories:

1 Instruction manual

1 Dc power cord

Optional accessory kits are available that allow the 1107 DC Inverter to be mechanically attached to the back of the portable oscilloscopes. Other optional accessories include a kit for attaching the 1106 Battery Pack to 2400 Series instruments.

For part numbers and further information about both standard and optional accessories, refer to the "Accessories" page at the back of this manual. For information about the usage of the 1107 with Tektronix portable oscilloscopes, contact your Tektronix representative or local Tektronix Field Office.

SPECIFICATION

The following electrical characteristics (Table 1-1) are valid for the 1107 when it is operating at an ambient temperature between −15°C and +55°C (unless otherwise noted). Items listed in the "Performance Requirements" column are verifiable qualitative or quantitative limits.

Environmental characteristics are given in Table 1-2. The 1107 meets the environmental requirements of MIL-T-28800C for Type III, Class 3, Style C equipment (except electromagnetic compatibility); humidity and temperature requirements defined in paragraphs 3.9.2.2, 3.9.2.3, and 3.9.2.4.

Physical characteristics of the instrument are listed in Table 1-3.

Table 1-1

Electrical Characteristics

Characteristics	Performance Requirements
Operating Inputs (At input of power cord supplied with instrument)	
12 Volt Mode	
Turn-On Range	+11.7 V to +15.9 V ±5%.[a]
Battery Protection Shut-Down Limit	+10 V ±5%.[a] Tested with a variable dc supply without a load on the output.
Voltage Difference Between Minimum Turn-On Range and Battery Protection Shut-Down Limit	⩾ 1.2 V measured without a load on the output.[a]
24 Volt Mode	
Turn-On Range	+22.2 V to +30.0 V ±5%.[a]
Battery Protection Shut-Down Limit	+21.0 V ±5%.[a] Tested with a variable dc supply and without a load on the output.
Voltage Difference Between Minimum Turn-On Range and Battery Protection Shut-Down Limit	⩾ 0.85 V measured without a load on the output.[a]

[a]Performance Requirement not checked in manual.

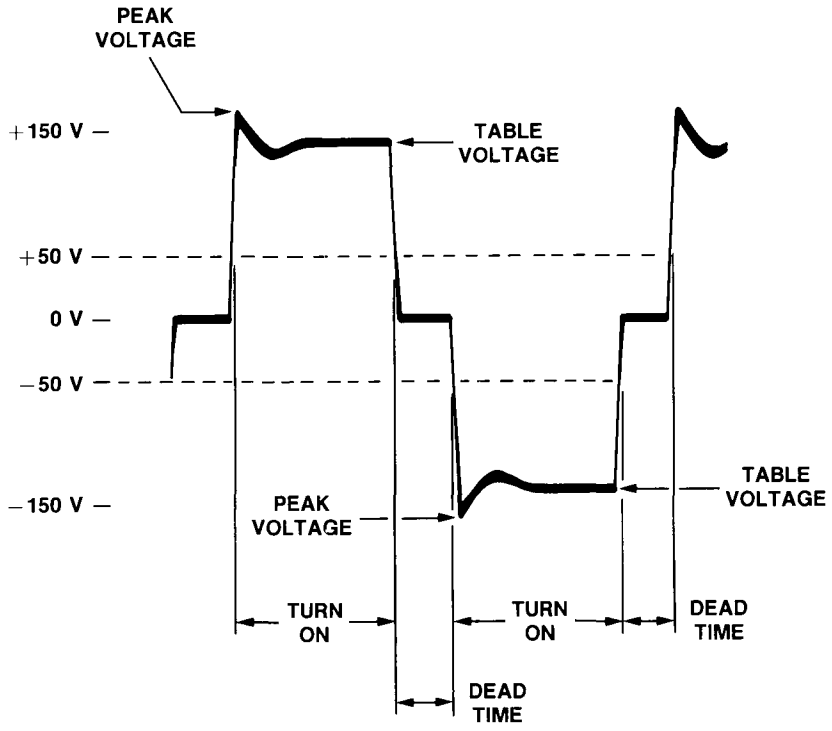
Table 1-1 (cont)

Characteristics	Performance Requirements	
Rated Output Power		
12 V Mode		
−15°C to +35°C	70 W.[a]	
−15°C to +55°C	50 W.[a] Dc voltage on the power source end of the supply cable must be at least +11.7 V with 10 amps of current.	
24 V Mode	100 W.[a]	
Output Voltage Measurements	See Figure 1-1 for typical output voltage waveforms into a resistive load.	
200 Ω Resistive Load (Approximately 60 W)		
Reference Input Voltage	**+12.3 V[a]**	**+14.2 V[a]**
Peak	160 V ±10%[b]	160 V ±10%[c]
Table	130 V ±10%[b]	140 V ±10%[c]
Turn-On	6.2 ms ±15%	6.2 ms ±15%
Dead Time	2.2 ms ±15%	2.2 ms ±15%
166 Ω Resistive Load (Approximately 100 W)		
Reference Input Voltage	**+22.5 V[a]**	**+28.5 V[a]**
Peak	150 V ±10%[b]	160 V ±10%[c]
Table	135 V ±10%[b]	150 V ±10%[c]
Turn-On	6.2 ms ±15%	6.2 ms ±15%
Dead Time	2.2 ms ±15%	2.2 ms ±15%

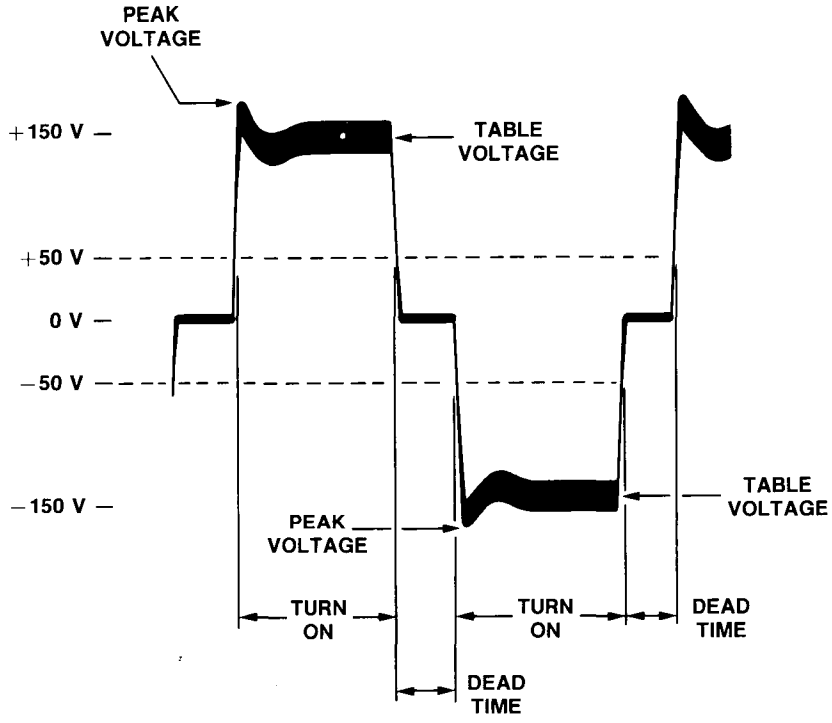
[a]Performance Requirement not checked in manual.

[b]Output waveform should not be showing the 50 kHz modulation signal (bucking off). See Figure 1-1A. If 50 kHz modulation signal is present, decrease the input dc voltage until it disappears; then return to the reference input voltage value.

[c]Output waveform should be showing the approximately 50 kHz modulation signal (bucking on). See Figure 1-1B. If 50 kHz modulation signal is not present, increase the input voltage until 50 kHz modulation starts; then return to the reference input voltage value.



(A) BUCK REGULATOR OFF



(B) BUCK REGULATOR ON; SHOWING 50 kHz MODULATION

5056-02

Figure 1-1. Typical output voltage waveforms into a resistive load.

Table 1-2

Environmental Characteristics

Characteristics	Description
	The instrument meets the environmental requirements of MIL-T-28800C for Type III, Class 3, Style C equipment (except electromagnetic compatibility); humidity and temperature requirements defined in paragraphs 3.9.2.2, 3.9.2.3, and 3.9.2.4.
Temperature	
Operating	−15°C to +55°C (+5°F to +131°F).
Nonoperating	−62°C to +85°C (−80°F to +185°F).
Altitude	
Operating	To 4,600 m (15,000 ft). Maximum operating temperature decreased 1°C per 300 m (1,000 ft) above 1500 m (5,000 ft).
Nonoperating (Storage)	To 15,250 m (50,000 ft).
Humidity (Operating and Nonoperating)	Stored at 95% relative humidity for five cycles (120 hours) from +30°C to +60°C, with operational performance checks at +30°C and +55°C.
Vibration (Operating)	15 minutes along each of three axes at a total displacement of 0.025 inch p-p (4 g at 55 Hz), with frequency varied from 10 Hz to 55 Hz in one-minute sweeps. Held 10 minutes at 55 Hz in each of the three major axes.
Shock (Operating and Nonoperating)	50 g, half-sine, 11-ms duration, three shocks on each face, for a total of 18 shocks.
Electromagnetic Compatibility	Meets radiated emission requirements per VDE 0871 Class B. Meets MIL Standard 461B for the following tests: CE01 part 4, CE03 part 4, CS01 part 7, CS02 part 4, CS06 part 5, RE02 part 7, RS02 part 5, and RS03 part 7. Conducted emissions specified on input dc power cord only.
Transportation	
Package Vibration Test	Meets the limits of the National Safe Transit Association test procedure 1A-B-1.
Package Drop Test	Meets the limits of the National Safe Transit Association test procedure 1A-B-2; ten drops of 36 inches.

Table 1-3

Physical Characteristics

Characteristics	Description
	See Figure 1-2 for dimensional drawing.
Domestic Shipping Weight	1.8 kg (4.0 lb).
Height	119 mm (4.7 in).
Width	276 mm (10.9 in).
Depth	84 mm (3.3 in).

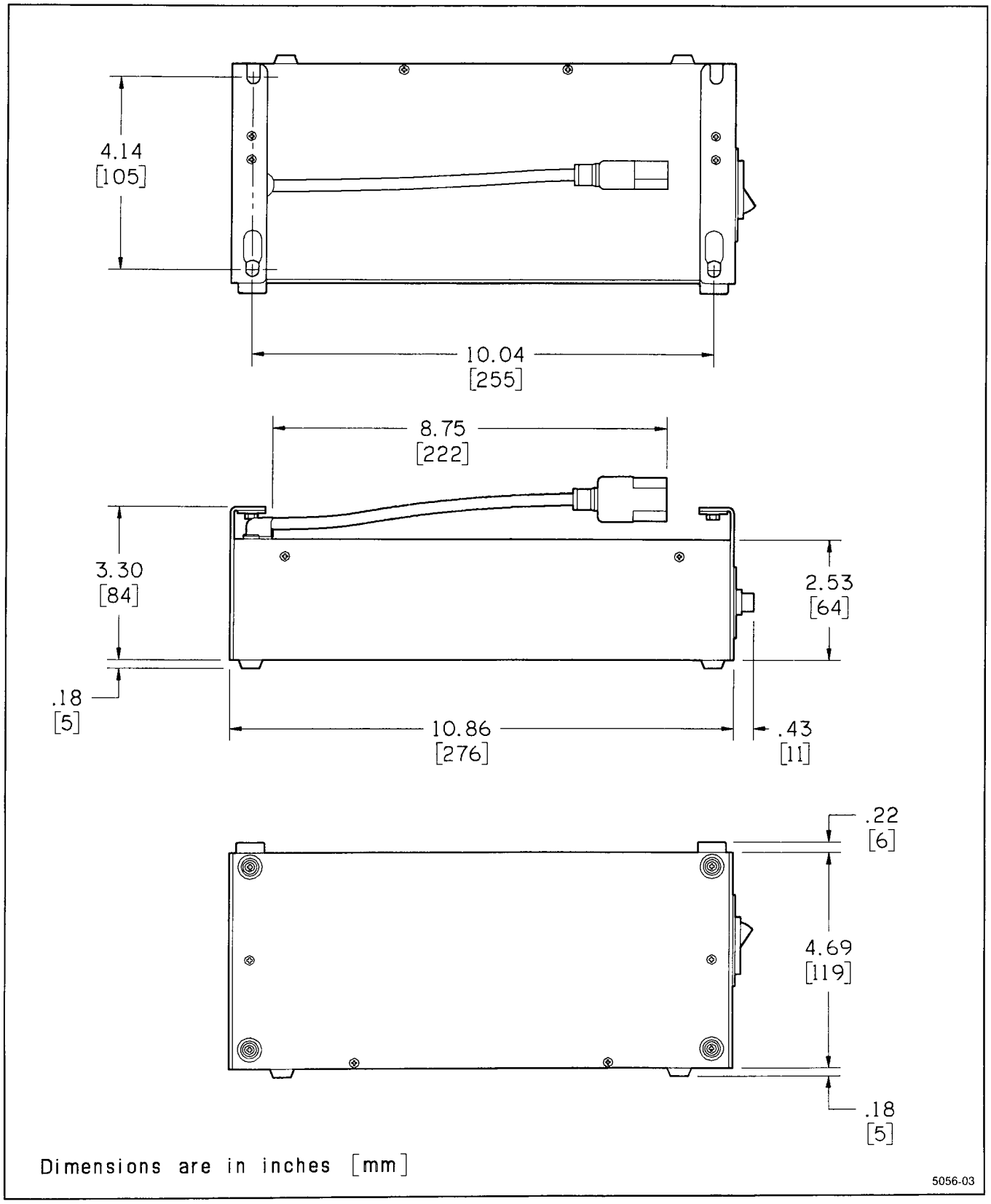


Figure 1-2. Physical dimensions of the 1107 DC Inverter.

PREPARATION FOR USE

Refer to the "Operators Safety Summary" at the front of this manual for power source, grounding, and other safety considerations pertaining to the use of the 1107. Before connecting the instrument to a dc power source, carefully read the following information about dc voltage and the dc power cord.

DC VOLTAGE SOURCE

This instrument is intended to operate from either a power source of 11.7 Vdc to 15.9 Vdc or 21.2 Vdc to 30.0 Vdc. The output resistance of the external dc source should be $\leq 0.05\ \Omega$.

NOTE

The 1107 may motorboat when driving an oscilloscope from an inadequate dc power source. When this condition exists, the 1107 will periodically switch between power-off and power-on (turning the oscilloscope briefly off and then on). Motorboating may cause the circuit breaker to open.

Motorboating can be caused by one of the following conditions:

Dc input voltage with poor regulation.

Dc input cable (other than the one supplied with the instrument) with a high resistance causing a higher than normal voltage drop.

Weak or discharged batteries.

Dc power supply with inadequate current rating.

Should motorboating persist, refer the 1107 to a qualified service person.

WARNING

To avoid electrical shock, the power cord protective grounding conductor must be connected to earth ground. When using the TEKTRONIX 1106 Battery Pack, connect earth ground lead to chassis ground screw (located near dc power receptacle of the 1107).

DC POWER INPUT CORD

The 1107 is provided with a detachable three-wire dc power cord for connection to an appropriate dc power source. The dc power cord consists of a three-contact plug (plugs into the 1107) and three wire conductors extending from the power cord jacket. The three conductors should be attached to the desired plug or connector by a qualified service person. See Table 2-1 for dc power cord color code. The earth ground conductor of the dc power cord is directly connected to the 1107 frame when the ac power cord is plugged into the oscilloscope.

If a different dc power cord is used other than the one shipped with the instrument, ensure that the internal resistance does not exceeds 0.07 Ω.

Table 2-1

DC Power Cord Color Code

Conductor	Color Code
Positive (+)	Red
Negative (−)	Violet
Earth Ground	Green-yellow

OUTPUT OVERLOAD PROTECTION

To protect 1107 components from damage, the instrument output will shut down when ac power output becomes excessive. During the shut-down period, an audible tone will be generated. To turn off the audible tone and return the 1107 to normal operation, disconnect the instrument's output load and reset the circuit breaker. If the audible tone returns, refer the instrument to a qualified service person.

If the 1107 returns to normal operation, reconnect the instrument's output load. If the output shuts down again, check that the oscilloscope being powered is one of the specified load instruments and is functioning properly.

INSTRUMENT COOLING

To prevent internal components from overheating, adequate ventilation around the instrument must be maintained at all times.

INSPECTION

Instruments that have been abused should be checked thoroughly to verify correct operation and performance. Instruments that are damaged or do not perform correctly should be referred to a qualified service person.

STORAGE

Instruments that are to be stored in extremely adverse humidity conditions should be removed from both the shipping carton and polyethylene bag to allow free circulation of air.

INSTRUMENT REPACKAGING

To ship an instrument, it is recommended that it be packaged in the original manner. The carton and packaging material in which your instrument was shipped to you should be saved and used for this purpose.

If the original packaging is unfit for use or is not available, repackage the instrument as follows:

1. Obtain a corrugated cardboard shipping carton having inside dimensions at least six inches greater than the instrument dimensions and having a carton test strength of at least 200 pounds.

2. If the instrument is to be shipped to a Tektronix Service Center for service or repair, attach a tag to the instrument showing the following: owner of the instrument (with address), the name of a person who can be contacted, complete instrument type and serial number, and a description of the service required.

3. Wrap the instrument with polyethylene sheeting or equivalent to protect the outside finish and prevent entry of packing materials into the instrument.

4. Cushion the instrument on all sides by tightly packing dunnage or urethane foam between the carton and the instrument, allowing three inches on each side.

5. Seal the carton with shipping tape or with an industrial stapler.

6. Mark the address of the Tektronix Service Center and the return address on the carton in one or more prominent locations.

CONTROL AND CONNECTORS

Refer to Figure 2-1 for location of items 1 through 4.

(1) **AC Power Cord**—A permanently attached three-wire ac power cord is used to connect the output ac voltage of the 1107 to the oscilloscope to be driven. At the end of the ac power cord is a three-contact polarized ac plug for connection to the oscilloscope.

CAUTION

If the Circuit Breaker switch is repeatedly turned on in a fault mode, damage may be done to the 1107 (instrument) components.

(2) **Circuit Breaker**—Turns the instrument power on and off. A failure in the operating conditions (excessive load, reversed input leads, or instrument malfunction) will usually cause the 10 A Circuit Breaker to open and turn the instrument off.

(3) **DC Power Cord Receptacle**—Provides the connection point for the dc power source to the instrument.

(4) **Chassis Ground Screw**—Provides direct connection to the instrument chassis ground.

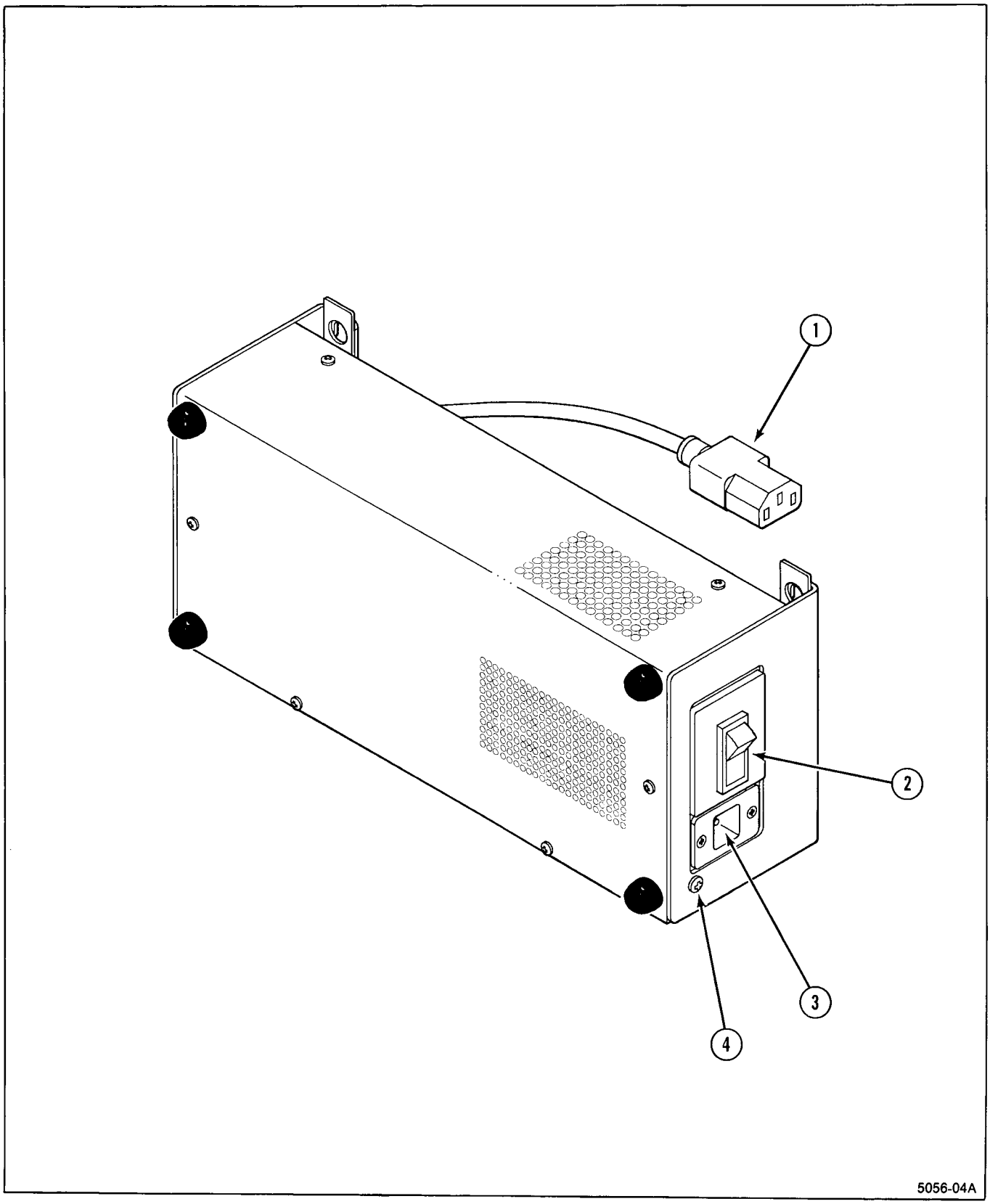


Figure 2-1. Circuit breaker, ac power cord, dc power cord receptacle, and chassis ground screw.

WARNING

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THEORY OF OPERATION

INTRODUCTION

SECTION ORGANIZATION

This section of the manual contains a general summary of instrument functions followed by a detailed description of each major circuit. A block diagram and the schematic diagram are located in the tabbed "Diagrams" section at the back of this manual. They are used to show the interconnections between parts of the circuitry components.

INTEGRATED CIRCUIT DESCRIPTIONS

Digital logic circuits perform many functions within the instrument. Functions and operation of the logic circuits are represented by logic symbology and terminology. Most logic functions are described using the positive-logic convention. Positive logic is a system of notation whereby the more positive of two levels is the TRUE (or 1) state; the more negative level is the FALSE (or 0) state. In this logic description the TRUE state is referred to as HI, and the FALSE state is referred to as LO. The specific voltages which constitute a HI or a LO state vary between specific devices. For specific device characteristics, refer to the manufacturer's data book.

BLOCK DIAGRAM

The following discussion is provided as an aid in understanding overall operation of the 1107 DC Inverter circuitry before the individual circuits are discussed in detail. A simplified block diagram of the instrument, showing basic interconnections, is shown in Figure 9-3.

BLOCK DESCRIPTION

The 1107 DC Inverter provides ac output voltage to power the 2000-family oscilloscopes from a dc voltage source of either +12 V or +24 V. The DC Inverter circuitry is composed of a Dc Input, Input Sensing, Range Selection, Dc-to-Dc Inverter, Dc-to-Ac Inverter, Regulation, Output Switching, and Shutdown Protection circuits. The input dc voltage is applied through the Dc Input circuit to the Input Sensing and Range Selection circuits. The Input Sensing circuit determines if the input dc voltage is within the correct operating range of either the 12 V or 24 V mode before the Dc-to-Dc Inverter is enabled. The Range Selection circuit senses the input dc voltage and selects the correct voltage mode of operation for the Dc-to-Dc Inverter.

The Dc-to-Dc Inverter circuitry is under control of the Dc Inverter Logic circuit which supplies switching signals to the Dc Inverter Switching circuit. The Dc Inverter Switching circuit chops the input dc voltage into an ac voltage that is converted to a higher unregulated dc voltage level by the Dc Inverter Output Rectifier circuit. The unregulated dc voltage then powers the Dc-to-Ac Inverter circuitry to supply the ac output power.

Operation of Dc-to-Ac Inverter circuitry is under control of the Output Bridge Logic circuit which supplies switching signals to the Full-Bridge Converter circuit and helps to control the Regulation and Output Switching circuits. The Regulation and Output Switching circuits maintain a stable ac rms output level from the Full-Bridge Converter circuit to power the oscilloscope load. The Shutdown Protection circuit protects the instrument from both excessive output loading and too high an unregulated dc voltage level from the Dc-to-Dc Inverter circuitry.

DETAILED CIRCUIT DESCRIPTION

DC INPUT

The input dc voltage is applied through the EMI filter and circuit breaker to the Input Sensing and Range Selection circuits of the instrument.

EMI Environmental

The EMI (electromagnetic interference) filter consists of common-mode choke T12, capacitors C120, C121, C122, C123, C124, and C125 which form a line-filter circuit. The EMI filter prevents high-frequency noise from being conducted out of the instrument.

+10 V_P Primary

The +10 V_P Primary supply is provided from the input dc source by Q103, Q104, and VR102. Voltage regulator VR102 along with Q104 sets the voltage levels and controls current flow through Q103. Diode CR105 protects Q103 from reverse voltage breakdown if the voltage polarity on the dc input power cord is accidently reversed. The +10 V_P Primary supply is referenced to the primary ground.

+5 V_P Primary

The +5 V_P Primary supply is developed from the +10 V_P Primary supply by voltage regulator U7. The +5 V_P Primary supply is referenced to the primary ground.

Reverse Input Voltage Protection

Parasitic diodes within Q101 and Q102 along with CR101 and CR104 protect the instrument from being damaged if a reversed polarity voltage is inadvertently applied to the instrument's input. Excessive current through CR101 and CR104 and through Q101 and Q102 causes the protective circuit breaker (S1) to trip.

INPUT SENSING AND RANGE SELECTION

The Input Sensing and Range Selection circuits determine the correct voltage mode of operation for the instrument.

Input Sensing

The Input Sensing circuit monitors the input dc voltage and determines if the applied dc voltage is within the operating range of either the 12 V or 24 V mode. When the voltage is within either correct operating range, the Input Sensing circuit will enable the Dc-to-Dc Inverter.

The input dc voltage is applied to comparator U1B pin 4 through a voltage divider of R18 and R19. The voltage drop across the voltage divider is the sensing voltage that is compared to the reference voltage on pin 5 of U1B. If the input dc voltage is +18 V or less (+5 V or less on pin 4 of U1B), the output of U1B goes HI, turning CR3 off and CR2 on. With CR2 on, the input dc voltage attenuator for U1C and U1D consists of the parallel combination of R12 and R24 in series with R14. If the input dc voltage is +18 V or greater (+5 V or greater on pin 4 of U1B), the output of Q1B goes LO, turning CR3 on and CR2 off. With CR2 off, the input dc voltage attenuator consists of R14 is series with R24; R12 is shunted to ground instead of being connected to R14.

The attenuated input dc voltage is then compared to the reference voltages of comparators U1C and U1D. If the attenuated dc voltage is less than +3.5 V, the output of U1C goes LO; if the voltage is greater than +5 V, the output of U1D goes LO. The outputs of U1C and U1D are connected as a wired-AND gate that has a HI on the output only when the attenuated dc voltage is greater than +3.5 V and less than +5 V. FET Q1 buffers and inverts the output signals of U1C and U1D before they are applied to the Dc Inverter as the $\overline{\text{RUN}}$ signal. In 24 V mode feedback resistor R21 sets the hysteresis level of the inverting input of U1C when Q1 is on. When in 12 V mode, the hysteresis level is increased by the action of R15.

Range Selection

The Range Selection circuit senses the input dc voltage and automatically select either 12 V or 24 V mode of operation for the Dc Inverter Output Rectifier.

The sensing voltage that is developed by voltage divider R18 and R19 is also applied to comparator U1A pin 6. Here it is compared to the fixed voltage on pin 7 of U1A. If the input dc voltage is +18 V or less (+5 V or less on pin 6 of U1A), the output of U1A goes HI, turning Q2 on and closing the contacts of relay K101. If the input dc voltage is +18 V or greater (+5 V or greater on pin 6 of U1A), the output of U1A goes LO, turning Q2 off and opening the contacts of relay K101. The circuit changes that occur when the relay is switched are discussed in "Dc Inverter Output Rectifier" part of the Dc-to-Dc Inverter circuitry.

DC-TO-DC INVERTER

The Dc-to-Dc Inverter chops the input dc voltage to an ac voltage and then rectifies the stepped-up ac voltage to provide a higher dc voltage level for the output. The Dc-to-Dc Inverter circuitry consists of Dc Inverter Logic, Dc Inverter Switching, and Dc Inverter Output Rectifier circuits.

Dc Inverter Logic

The Dc Inverter Logic circuit consists of astable oscillator U2, flip-flop U3A, comparator U4, and driver U105. A clock signal having a frequency rate of approximately 140 kHz is generated by U2. The clock frequency is set by R1, R2, and C1. Integrated circuit U3A divides the clock frequency by two, producing matched complementary 70 kHz outputs. The 70 kHz signals are symmetrically enhanced by U4A and U4B before being applied to U4C pin 10 and U4D pin 8. The $\overline{\text{RUN}}$ signal from the Input Sensing circuit is applied to U4C pin 11 and U4D pin 9 and enables or disables the Dc Inverter as required, depending on the dc input voltage. When Q1 is on, the voltage divider composed of R9 and R10 sets a voltage reference level on the $\overline{\text{RUN}}$ signal at +1.3 V that causes the outputs of U4C and U4D to be nearly complementary with some overlap. Comparators U4C and U4D drive switching FETs Q101 and Q102 via buffers U105A and U105B.

Transistor Q29, voltage regulator VR29, and diodes CR28 and CR29 ensure that a false start does not occur when the input dc voltage is below +7 V. In normal operating conditions Q29 will be turned off by the zener action of VR29. When the input dc voltage drops below +7 V, the +10 V_P supply will fall low enough to turn off VR29 and allow Q29 to conduct. With Q29 conducting, the outputs of U4A and B are held at ground level to prevent false start of the Dc-to-Dc Inverter.

Dc Inverter Switching

The Dc Inverter Switching circuit consists of Switching FETs Q101 and Q102, step-up transformer T129 and snubber network. The snubber network consisting of CR102, R102, C102, C104, and L104 shunts magnetizing current during light load conditions to protect Q101 and Q102 from exceeding their drain-to-source voltage ratings. The switching FETs chop the input dc voltage to an ac voltage at the primary of T129. The ac voltage is stepped up through T129 and then converted to provide a higher level of unregulated dc voltage by the Dc Inverter Output Rectifier circuit.

Switching FETs Q101 and Q102 are alternately turned on by the complementary 70 kHz signals from the DC Inverter Logic circuit. The drain voltage of the "on" FET will be near ground level, while the drain voltage of the "off" FET will be about twice the voltage at the center tap of T129. During the switching cycle, an overlap (approximately 50 ns) will occur of the switching signals when both Q101 and Q102 are momentarily on. The slight overlapping of the switching signals improves the EMI performance. With both switching FETs on, the center tap of the T129 will be briefly pulled down near ground level. The dc voltage at the center tap of T129 will return approximately to the input dc voltage level when one of the switching FETs turns off.

Dc Inverter Output Rectifier

The Inverter Output Rectifier circuit converts the stepped-up ac voltage from the secondary of T129 to the unregulated dc voltage. The unregulated dc voltage is a higher dc voltage than the input dc voltage and is used as the source for the Full-Bridge Converter in the Dc-to-Ac Inverter circuit. The other secondary winding on T129 applies an ac signal to a bridge rectifier for the +10 V_S Secondary supply. The +10 V_S Secondary supply is used to power the Output Bridge Logic, the Regulation, and the Shutdown Protection circuits.

The diode bridge for both the unregulated dc voltage and the +10 V_S Secondary supplies can operate either as conventional bridge or as a full-wave voltage doubler. Circuit configuration of the Dc Inverter Output Rectifier depends on the operating voltage mode and is controlled by relay K101 of the Range Selection circuit.

UNREGULATED DC VOLTAGE. In the 24 V mode, the relay contacts of K101 are open and CR132 and CR133 are connected in a conventional bridge rectifier circuit. In the 12 V mode, the relay contacts of K101 are closed to configure the rectifiers as a full-wave voltage doubler.

In the voltage doubler configuration, pin 2 of CR132 is connected to C132 through the contacts of K101. The diode located between pins 2 and 3 of CR133 conducts to charge C131 during one half cycle of the ac input voltage. The diode located between pins 1 and 2 of CR133 conducts during the other half of the cycle and charges C132. Capacitors C131 and C132 are both charged to the same voltage level that is applied to the series combination of C131 and C132 in the bridge rectifier configuration.

In the conventional bridge rectifier configuration, both C131 and C132 are charged in series on both half cycles of the input voltage.

+10 V_S SECONDARY. The +10 V_S Secondary supply is produced in the same manner as to the unregulated dc voltage except that it is regulated by Q133 and VR139. The +10 V_S Secondary supply is referenced to SGND (secondary ground).

DC-TO-AC INVERTER

The Dc-to-Ac Inverter circuitry converts the unregulated dc voltage to an ac output voltage to power an oscilloscope load. The Dc-to-Ac Inverter circuitry consists of the Output Bridge Logic and the Full-Bridge Converter circuits.

Output Bridge Logic

The Output Bridge Logic circuit consists of an astable oscillator U31, flip-flop U32A, buffer U33, and driver U34. A clock signal of approximately 240 Hz in frequency (set by R31 and C31) is generated by U31. The clock signal is divided by two at U32A and applied to U32B via a delay network of Q31, R34, and C32. The delay of the clock signal by R34 and C32 sets the correct timing relationship between switching and dead-time signals so that the Full-Bridge Converter circuit switches only during the dead-time period. When U32 pin 1 goes LO, pull-down transistor Q31 is forward biased to ensure a fast discharge of C32. Flip-Flop U32B divides the clock signal again by two, producing matched complementary 60 Hz switching signals. The switching signals are symmetrically enhanced by buffers U33A and B before being applied to drivers U34 and B. The necessary current to drive transformer T130 is provided by U34A and U34B. The 60 Hz switching signal is used to drive the Darlington output transistors of the Full-Bridge Converter circuit.

Full-Bridge Converter

The Full-Bridge Converter circuit converts the unregulated dc voltage from Dc-to-Dc Converter to an ac output voltage of approximately 170 V peak. The 60 Hz switching signals from the Output Bridge Logic circuit are coupled through T130 to the input of the Darlington output transistors (Q303 paired with Q304 and Q307 paired with Q308) The output transistors are connected in a full-bridge circuit configuration and are alternately turned on by the 60 Hz switching signals. Diodes reversed across each Darlington pair (CR303, CR304, CR307, and CR308) ensure proper base-to-emitter junction drive and turn off.

REGULATION

The Regulation circuitry regulates the ac output of the 1107. By sensing the level of the unregulated dc voltage being applied to the Full-Bridge Converter circuit, the Regulation circuitry is able to make the appropriate changes to the BUCK DRIVE signal to hold the output ac voltage level within regulation. The Regulation circuitry consists of Dead-Time Control, Buck Regulator, and Output Switching circuits.

Dead-Time Control

Immediately before the 60 Hz switching signal from the Output Bridge Logic circuit changes polarity, the Dead-Time signal (approximately 2.2 ms) turns off the Output Switching circuit. With the Output Switching circuit off, the Full Bridge Converter circuit is disconnected from secondary ground, allowing no voltage to be applied on the ac output.

The dead-time signal is developed by algebraically adding the switching signals from U31 and U32A at a summing node to input comparator U35D (pin 9). The sum of the switching signals is then compared to the reference voltage on pin 8 of U35D. When the sum of the switching signals exceeds the reference voltage, the output of U35D goes HI, producing the dead-time signal that is applied to the Buck Regulator circuit.

Buck Regulator

The Buck Regulator consists of Comparator U35, PWM (Pulse Width Modulator) U36 with its internal error amplifiers, oscillator, slow-start comparator, and $+5\ V_{REF}$ supply.

The Buck Regulator circuit when in bucking mode generates 50 kHz pulse width modulated signal that is gated with the DEAD-TIME signal to regulate the ac voltage output of the Full-Bridge Converter circuit. Unregulated dc voltage from the Dc-to-Dc Inverter is sensed to determine whether the DEAD-TIME signal needs to be modulated by the 50 kHz signal. If the unregulated dc voltage level is low, there is no bucking mode; if the unregulated dc voltage level is high the bucking mode is used to regulate the ac output voltage.

The DEAD-TIME signal from the Dead-Time circuit is applied to both comparator U35C and PWM U36. The passage of the DEAD-TIME signal (with or without 50 kHz modulation) to the output of the Buck Regulator is controlled by the $\overline{\text{BUCK}}$ signal at pin 11 of U35C. The $\overline{\text{BUCK}}$ signal is developed by comparing the unregulated dc voltage level at pin 6 of comparator U35A and comparing it with the $+5\ V_{REF}$ on pin 7. Comparator U35B sets the hysteresis level for pin 6 of U35A. When the instrument is first turned on, the output of U35A remains LO until capacitor C41 is charged to the $+5\ V_{REF}$ level.

When the unregulated dc voltage is less than +150 V or increasing from below the +150 V level to the +170 V level, the $\overline{\text{BUCK}}$ signal at U35C pin 11 will be HI. With a HI on pin 11 of U35, the DEAD-TIME signal is allowed to pass through U35C and to turn on Q33. With Q33 turned on, CR34 is forward biased and CR35 becomes reverse

biased. The DEAD-TIME signal is then applied to the Output Switching circuit through CR34 from Q33 and U35C while CR34 blocks the 50 kHz modulated signal from U36. When the unregulated dc voltage exceeds +170 V or is decreasing from above the +170 V level to the +150 V level, the $\overline{\text{BUCK}}$ signal at U35C pin 11 goes LO. With a LO on pin 11 of U35C, the DEAD-TIME signal is not allowed to pass through U35C and Q33 remains off. With Q33 off, CR34 is reverse biased and CR35 is forward biased. The 50 kHz modulated DEAD-TIME signal is then applied from U36 to the Output Switching circuit through CR35 while U35C blocks the unmodulated DEAD-TIME signal. Figure 3-1 illustrates the timing relationships between the DEAD-TIME signal the 50 kHz modulation for different unregulated dc voltage levels.

The dead-time signal is also applied to pin 1 of error amplifier U1 (part of U36) and is compared to the reference voltage on pin 2. If the voltage level at pin 1 of U1 is higher than the reference level at pin 2, the output of the error amplifier will be HI. The HI from the error amplifier U1 is applied to the inverting input of the PWM Comparator U3 (of U36), resulting in a zero volt signal without the 50 kHz modulation at pin 9 of U36 during the dead time period.

The unregulated dc voltage is sensed on pin 16 of the error amplifier U2 (part of U36). The output of error amplifier U2 is applied to PWM Comparator U3 when the output of U1 is LO. Width of the 50 kHz pulse will decrease in rising unregulated dc volts and increase in falling unregulated dc volts. The combined 50 kHz PWM signal gated with the DEAD-TIME pulse at U36 pin 9 is applied to Q131 via CR35 when CR34 is reverse biased. When the DEAD-TIME signal is LO, the 50 kHz modulated pulses are only present at U36 pin 9 when the output of U1 is LO.

The internal oscillator of PWM U36 generates a repetitive triangular wave at a frequency of 50 kHz (determined by R56 and C56). When the 1107 is turned on, capacitor C52 charges from the +5 V_{REF} level toward ground potential through R52 and R53. As it does, the voltage at pin 4 of Slow-Start Comparator U4 (part of U36) will pass through the positive-peak value of the triangular waveform on the other input of the Slow-Start Comparator. The Slow Start comparator will then begin outputting narrow pulses that become progressively wider as the voltage on pin 4 of U4 settles to zero volts. The slow progression from narrow to wide pulse will prevent excessive ac voltage at the output and false start of the Dc-to-Dc Inverter when the instrument is turned on.

Internal voltage of +5 V_{REF} from U36 is used to provide a reference voltage to the Dead-Time Control and Buck Regulator Logic circuits. The +5 V_{REF} voltage is referenced to the secondary ground.

OUTPUT SWITCHING

The Output Switching circuit consists of switching FET Q131, Q132, Buck coil L131, Buck diode CR141, and associated components. Switching of Q131 is controlled by the DEAD-TIME and 50 kHz pulse-width modulated signals from the Buck Regulator circuit. These signals set the current-on time for regulating the ac output voltage over a wide range of the unregulated dc voltage source to the Output Full-Bridge circuit.

When Q131 turns on, energy is stored in Buck coil L131; how often that happens sets the average emitter voltage level of Q304 and Q308 in the Output Switching circuit. The circuit action of L131 then is to cause that emitter voltage to track the unregulated dc source voltage. With a low unregulated dc voltage, the DEAD-TIME signal only is used to switch Q131 on and off at approximately 120 Hz. The time constant of the Buck coil and output load is such that peak current flow is reached, and the coil saturates during the on time of Q131. With the coil saturated, the impedance is reduced to the copper resistance only, and the emitter voltage of Q304 and Q308 is set near secondary ground potential. If the unregulated dc voltage becomes sufficiently large, 50 kHz bucking modulation is added to the Buck signal driving Q131. The 50 kHz signal is much faster than the time constant of the circuit consisting of L131 and the load, such that L131 cannot saturate during turn on. It therefore remains reactive to act as an emitter impedance; and, during bucking, the emitter voltage level rises by the amount of drop across the coil while Q131 is turned on. The pulse width of the 50 kHz modulation is set by PWM U36 to track the unregulated dc voltage, therefore the switching duty cycle of Q131 regulates the ac output voltage by making the emitter voltage of the Q304 and Q308 also track (see Figure 3-2).

Switching FET Q131 is turned on by a BUCK DR signal of about +10 V. The stray capacitance at the gate of Q131 therefore becomes charged to that +10 V level. To ensure a fast turn off of the switching FET, Q132 acts as an active pulldown on the gate of Q131. At turn off, CR139 becomes reverse biased, and the stored charge forward biases the emitter-to-base junction of Q132. The gate charge is then rapidly removed (in a matter of a few nanoseconds) to produce the quick turn off of Q131.

Energy stored in L131 in its magnetic field is returned to the output circuit when Q131 switches off. At the moment Q131 turns off, the polarity of voltage across L131 reverses and the Buck coil becomes a decaying current source. Buck diode CR141 is then forward biased to complete the return current path through the load and back to the opposite end of L131. Diode CR150 and R151 prevent the emitters of Q304 and Q308 from being pulled excessively negative when the output load includes an inductive line filter, and the attached oscilloscope is not powered up.

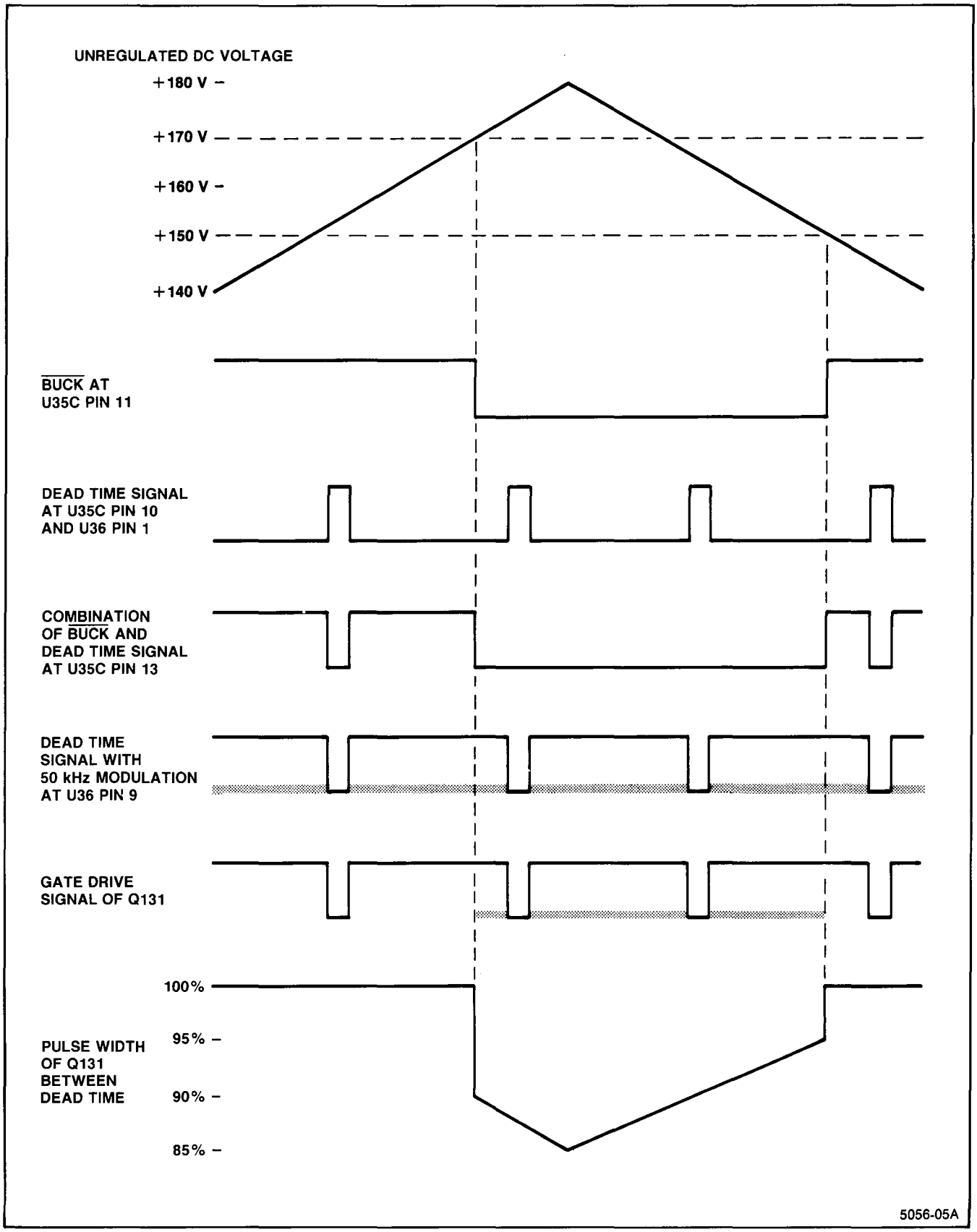


Figure 3-1. Timing relationship between dead time and 50 kHz modulation signals to different unregulated dc voltage levels.

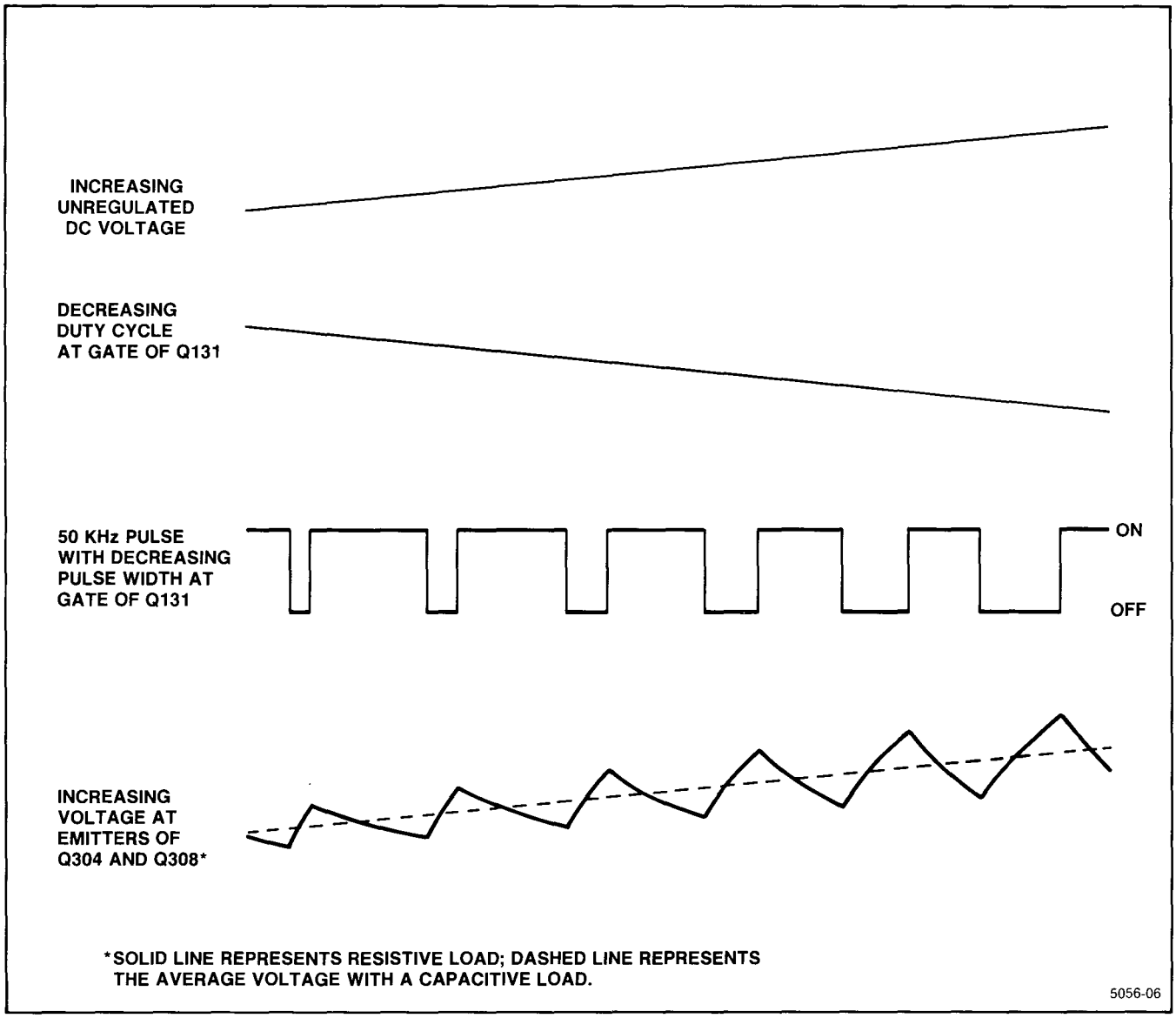


Figure 3-2. Emitter voltages of Q304 and Q308 with respect to the unregulated dc voltage.

SHUTDOWN PROTECTION

The Shutdown circuit protects the instrument from excessive output loading and from too high an unregulated dc voltage in the 24 V mode. When either limit is exceeded, the Dc-to-Dc Inverter Logic circuit is shut down to turn off the unregulated dc power to the Dc-to-Ac Inverter.

Unregulated dc voltage level is sensed via R150, with the VOLTAGE SENSE signal being developed across the series combination of R63, R51, and R67. That sense signal is compared against the $+5\ V_{REF}$ by comparator U37A. If the VOLTAGE SENSE level exceeds $+5\ V_{REF}$, U37A output switches LO to activate the shutdown switch, U30. The output of U37A is wire-ANDed with the output of U37B, the current overload comparator.

The CURRENT SENSE signal is developed across R160 in the source circuit of switching FET Q131. At the input of U37B, it is summed with a small voltage derived from the VOLTAGE SENSE signal via R66. That addition makes U37B a power-limit comparator rather than simply current only. Power-limiting is needed because of the wide range of unregulated dc voltage; excessive power dissipation can occur at high dc voltage without exceeding the maximum switching current capability of Q131. The long-time constant of R65-C65 permits the comparator input to follow the average power level and ignore instantaneous power peaks. If the voltage on C65 exceeds the comparison voltage level on the other input of U37B (about 270 mV), the comparator switches output states from HI to LO to activate the shutdown circuit.

When an overload or overvoltage occurs, the $\overline{\text{SHUTDOWN}}$ line drops to zero, but the full $+10\ V_S$ supply is still felt at the junction of R64 and R69 as C64 starts to charge. The voltage falls below $+5$ V to bias Q68 on via zener diode VR68, and that in turn switches on the LED in optoisolator U30. The light-activated SCR (silicon-controlled rectifier) in U30 then turns on to apply $+10\ V_P$ to the warning beeper (LS108) and to the base biasing circuit of Q8. With Q8 biased on, the drive signal to FET Q1 is shunted to ground, and the $\overline{\text{RUN}}$ signal goes HI to turn off the Dc-to-Dc Inverter switching FETs. The secondary voltages then start their decay; with the $+10\ V_S$ falling off rapidly and the unregulated dc voltage taking longer. The warning beeper will continue sounding until the circuit breaker is switched off. When the 1107 is switched on again, the SCR output of U30 is biased off, and the Shutdown circuit is reset.

During a normal shutoff of the 1107, the $+5\ V_{REF}$ level to comparator U37A falls off faster then the VOLTAGE SENSE level from the unregulated dc supply. To prevent erroneous activation of the shutdown circuit as the voltage levels are falling, VR68 ensures that when the $+10\ V_S$ supply falls below $+5$ V (the point at which the $+5\ V_{REF}$ in U36 also shuts down) a state change of the output of U37A will not be able to bias on Q68 through the 5 V zener.

PERFORMANCE CHECK PROCEDURE

There is no performance check procedure for this instrument other than powering up one of the Tektronix 2000 Family oscilloscopes referred to in Section 1 of this manual.

ADJUSTMENT PROCEDURE

There is no adjustment procedure for this instrument.

MAINTENANCE

This section of the manual contains information for conducting preventive maintenance, troubleshooting, and corrective maintenance on the 1107 DC Inverter.

STATIC-SENSITIVE COMPONENTS

The following precautions apply when performing any maintenance involving internal access to the instrument.

CAUTION

Static discharge can damage any semiconductor component in this instrument.

This instrument contains electrical components that are susceptible to damage from static discharge. Table 6-1 lists the relative susceptibility of various classes of semiconductors. Static voltages of 1 kV to 30 kV are common in unprotected environments.

When performing maintenance, observe the following precautions to avoid component damage:

1. Minimize handling of static-sensitive components.

2. Transport and store static-sensitive components or assemblies in their original containers or on a metal rail. Label any package that contains static-sensitive components or assemblies.

3. Discharge the static voltage from your body by wearing a grounded antistatic wrist strap while handling these components. Servicing static-sensitive components or assemblies should be performed only at a static-free work station by qualified service personnel.

4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.

5. Keep the component leads shorted together whenever possible.

6. Pick up components by their bodies, never by their leads.

7. Do not slide the components over any surface.

8. Avoid handling components in areas that have a floor or work-surface covering capable of generating a static charge.

9. Use a soldering iron that is connected to earth ground.

10. Use only approved antistatic, vacuum-type desoldering tools for component removal.

Table 6-1

Relative Susceptibility to Static-Discharge Damage

Semiconductor Classes	Relative Susceptibility Levels[a]
MOS or CMOS microcircuits or discretes, or linear microcircuits with MOS inputs (Most Sensitive)	1
Linear microcircuits	2
TTL (Least Sensitive)	3

[a]Voltage equivalent for levels (voltage discharged from a 100-pF capacitor through a resistance of 100 Ω):

1 = 100 to 500 V
2 = 400 to 1000 V (est)
3 = 1200 V

PREVENTIVE MAINTENANCE

INTRODUCTION

Preventive maintenance consists of cleaning, visual inspection, and checking instrument performance. When accomplished regularly, it may prevent instrument malfunction and enhance instrument reliability. The severity of the environment in which the instrument is used determines the required frequency of maintenance. Preventive maintenance should be performed every 2000 hours of operation or once each year if used infrequently.

GENERAL CARE

The cabinet minimizes accumulation of dust inside the instrument and should normally be in place when operating the DC Inverter.

INSPECTION AND CLEANING

The instrument should be visually inspected and cleaned as often as operating conditions require. Accumulation of dirt in the instrument can cause overheating and component breakdown. Dirt on components acts as an insulating blanket, preventing efficient heat dissipation. It also provides an electrical conduction path that could result in instrument failure, especially under high-humidity conditions.

CAUTION

Avoid the use of chemical cleaning agents which might damage the plastics used in this instrument. Use a nonresidue-type cleaner, preferably isopropyl alcohol, denatured ethyl alcohol, or a solution of 5% mild detergent and 95% water. Before using any other type of cleaner, consult your Tektronix Service Center or representative.

Exterior

INSPECTION. Instruments that appear to have been dropped or otherwise abused should be checked thoroughly to verify correct operation and performance. Deficiencies found that could cause personal injury or could lead to further damage to the instrument should be repaired immediately.

CLEANING. Loose dust on the outside of the instrument can be removed with a soft cloth or small soft-bristle brush. Dirt that remains can be removed with a soft cloth dampened in a mild detergent-and-water solution. Do not use abrasive cleaners.

Interior

To gain access to internal portions of the instrument for inspection and cleaning, refer to the "Removal and Replacement Instructions" in the "Corrective Maintenance" part of this section.

INSPECTION. Inspect the internal portions of the instrument for damage and wear. Deficiencies found should be repaired immediately. The corrective procedure for most visible defects is obvious; however, particular care must be taken if heat-damaged components are found. Overheating usually indicates other trouble in the instrument; therefore, it is important that the cause of overheating be corrected to prevent recurrence of the damage.

CAUTION

To prevent damage from electrical arcing, ensure that circuit boards and components are dry before applying power to the instrument.

CLEANING. To clean the interior, blow off dust with dry, low-pressure air (approximately 9 psi). Remove any remaining dust with a soft brush or a cloth dampened with a solution of mild detergent and water. A cotton-tipped applicator is useful for cleaning in narrow spaces and on circuit boards.

If these methods do not remove all the dust or dirt, the instrument may be spray washed using a solution of 5% mild detergent and 95% water as follows:

CAUTION

An exception to the following procedure is the A1—Power circuit board with its mounted transformers. Clean this circuit board only with isopropyl alcohol as described in step 4 of this procedure.

1. Gain access to the parts to be cleaned (see "Removal and Replacement Instructions").

2. Spray wash dirty parts with the detergent-and-water solution; then use clean water to thoroughly rinse them.

3. Dry all parts with low-pressure air.

4. Clean the A1—Power circuit board with isopropyl alcohol and wait 1 minute for the majority of the alcohol to evaporate. Then complete drying with low-pressure air.

5. Dry all components and assemblies in an oven or drying compartment using low-temperature (125°F to 150°F) circulating air.

SEMICONDUCTOR CHECKS

Periodic checks of the transistors and other semiconductors in the DC Inverter are not recommended. The best check of semiconductor performance is actual operation in the instrument.

TROUBLESHOOTING

INTRODUCTION

Preventive maintenance performed on a regular basis should reveal most potential problems before an instrument malfunctions. However, should troubleshooting be required, the following information is provided to help locate a fault. In addition, the material presented in the "Theory of Operation" and the "Diagrams" sections of this manual may be helpful while troubleshooting.

TROUBLESHOOTING AIDS

Schematic Diagrams

Complete schematic diagrams are located on tabbed foldout pages in the "Diagrams" section. The portions of circuitry that are mounted on each circuit board are enclosed within heavy black lines. Also within the black lines, near either the top or the bottom edge, are the assembly number and name of the circuit board.

Component numbers and electrical values of components in this instrument are shown on the schematic diagrams. Refer to the first page of the "Diagrams" section for definitions of the reference designators and symbols used to identify components.

Circuit Board Illustrations

Circuit board illustrations (showing the physical location of each component) are provided for use in conjunction with the schematic diagram. The board illustration can be found on the back side of a foldout page, preceding the schematic diagram to which it relates.

Waveform test-point locations are also identified on the circuit board illustration by hexagonal-outlined numbers that correspond to the waveform numbers appearing on both the schematic diagram and the waveform illustration.

Circuit Board Locations

An illustration showing the location of a circuit board within the instrument is shown on the foldout page near the circuit board illustration.

Grid Coordinate System

The schematic diagram and circuit board illustration have a grid border along the left and top edges. A table located adjacent to the schematic diagram lists the grid coordinates of each component shown on that schematic. To aid in physically locating a component on the respective circuit board, this table also lists the circuit-board grid coordinate of each component.

Adjacent to the circuit board illustration is an alphanumeric listing of every component mounted on the board.

Troubleshooting Chart

The troubleshooting chart contained in the "Diagrams" section is to be used as an aid in locating malfunctioning circuitry. This chart will help identify a particular problem area for further troubleshooting.

Both General and Specific notes may be called out in the troubleshooting-chart boxes. These notes are located on the inner panels of the foldout pages. Specific Notes contain procedures or additional information to be used in performing the particular troubleshooting step called for in that box. General Notes contain information that pertains to the overall troubleshooting procedure.

Some malfunctions, especially those involving multiple simultaneous failures, may require more elaborate troubleshooting approaches with references to circuit descriptions in the "Theory of Operation" section of this manual.

Component Color Coding

Information regarding color codes and markings of resistors and capacitors is located in the color-coding illustration (Figure 9-1) at the beginning of the "Diagrams" section.

TROUBLESHOOTING EQUIPMENT

The equipment listed in Table 6-2, or equivalent equipment, may be useful when troubleshooting this instrument.

TROUBLESHOOTING TECHNIQUES

The following procedure is arranged in an order that enables checking simple trouble possibilities before requiring more extensive troubleshooting. If a defective component is located, replace it, using the appropriate replacement procedure given under "Corrective Maintenance" in this section.

CAUTION

Before using any test equipment to make measurements on static-sensitive, current-sensitive, or voltage-sensitive components or assemblies, ensure that any voltage or current supplied by the test equipment does not exceed the limits of the component to be tested.

1. Check that associated equipment is operating correctly.

WARNING

To avoid electrical shock, disconnect the instrument from the dc power-input source before performing visual inspection.

2. Perform a visual check for obvious damage or defective components.

WARNING

Dangerous potentials exist at several points throughout this instrument. If it is operated with the cabinet removed, do not touch exposed connections or components.

3. Use the troubleshooting tree as an aid in isolating trouble to a circuit (located in foldout section at the rear of this manual).

4. Check circuit board interconnections for loose, broken, or heat-damaged connections.

NOTE

Voltages and waveforms given on the schematic diagram are not absolute and may vary slightly between instruments.

Table 6-2

Test Equipment Required

Item No. and Description	Minimum Specification	Purpose	Examples of Suitable Test Equipment
1. Dc Power Supply	0 to 40 Vdc, 15 A.	Provide dc power.	Hewlett-Packard Model 6274B.
2. Digital Multimeter	Range: 0 to 40 V. Dc voltage accuracy: ±0.15%. 4-1/2-digit display.	Measure input dc voltage.	TEKTRONIX DM 501A[a]
3. Oscilloscope with two 10X probes.	Bandwidth: dc to 10 MHz. Minimum deflection factor: 5 mV/div. Accuracy: ±3%. Differential measurement capability.	Ac output check and general troubleshooting.	TEKTRONIX 2213A.

[a]Requires a TM 500-series power-module mainframe.

5. Check voltages and waveforms (see Section 9 of this manual).

WARNING

To avoid electric shock, always disconnect the instrument from the dc power input source before removing or replacing components.

6. Check individual components associated with faulty voltages or waveforms. See Figure 9-1 for value identification and Figure 9-2 for typical semiconductor lead configuration.

7. Replace defective components in a circuit. Follow the procedures given under "Corrective Maintenance" in this section. Check for proper operation after repair (see Section 4 of this manual).

TROUBLESHOOTING REGULATOR AND OUTPUT CIRCUIT BOARDS

Regulator Circuit Board

The Regulator circuit board can be removed from the instrument for troubleshooting purposes (see "Removal and Replacement Instructions" in this section). Once removed, +10 volts from an external dc power supply can be applied to pin 1 of J5 and J6 (nearest pin to the index arrow marking on the circuit board). Connect the ground return for the +10 volt dc supply to pin 2 of J5 and J6.

For the location of J5 and J6, see the "Test Point Locations" foldout page in the "Diagrams" section of this manual.

Output Circuit Board

WARNING

220 V_{pk} is present on the Output circuit board. To avoid an electric-shock hazard, turn the instrument off before connecting a resistive load to the ac output of the instrument.

The test waveforms on the Output circuit board should be measured with a resistive load connected to the ac output of the instrument. The recommended resistive load is 100 kΩ, 2 W or greater dissipation. For safety purposes, it is recommended that the resistive load be connected between TP300 (OUT1) and TP301 (OUT2).

For the location of TP300 and TP301, see the Test Point Locations foldout page in the "Diagrams" section of this manual.

CORRECTIVE MAINTENANCE

INTRODUCTION

Corrective maintenance consists of component replacement and instrument repair. This part of the manual describes special techniques and procedures required to replace components in this instrument. If it is necessary to ship your instrument to a Tektronix Service Center for repair or service, refer to the "Repackaging for Shipment" instructions in Section 2 of this manual.

MAINTENANCE PRECAUTIONS

To reduce the possibility of personal injury or instrument damage, observe the following precautions:

1. Disconnect the instrument from the dc power input source before removing or installing components.

2. Use care not to interconnect instrument grounds which may be at different potentials (cross grounding). When troubleshooting the Regulator circuit board separately (removed from the instrument), a common ground may be used with the applied +10 Vdc source.

OBTAINING REPLACEMENT PARTS

NOTE

Physical size and shape of a component may affect instrument performance, particularly at high frequencies. Always use direct-replacement components, unless it is known that a substitute will not degrade instrument performance.

Most electrical and mechanical parts can be obtained through your local Tektronix Field Office or representative. However, many of the standard electronic components can usually be obtained from a local commercial source. Before purchasing or ordering a part from a source other

than Tektronix, Inc., please check the "Replaceable Electrical Parts" list (Section 8) for the proper value, rating, tolerance, and description.

Special Parts

In addition to the standard electronic components, some special parts are used in this instrument. These parts are manufactured or selected by Tektronix, Inc. to meet specific performance requirements, or are manufactured for Tektronix, Inc. in accordance with our specifications. The various manufacturers can be identified by referring to the "Cross Index-Mfr Code Number to Manufacturer" at the beginning of the "Replaceable Electrical Parts" list. Most of the mechanical parts used in this instrument were manufactured by Tektronix, Inc. Order all special parts directly from your local Tektronix Field Office or representative.

Ordering Parts

When ordering replacement parts from Tektronix, Inc., be sure to include all of the following information:

1. Instrument type (include modification or option numbers).

2. Instrument serial number.

3. A description of the part (if electrical, include its component number).

4. Tektronix part number.

MAINTENANCE AIDS

The maintenance aids listed in Table 6-3 include items required for performing most of the maintenance procedures on this instrument. Equivalent products may be substituted for the examples given, provided their characteristics are similar.

Table 6-3

Maintenance Aids

Description	Specification	Usage	Example
1. Soldering Iron	15 to 25 W.	General soldering and unsoldering.	Antex Precision Model C.
2. Phillips Screwdriver	Phillips tips: #4, #6, and #8 (for optional mounting kits).	Assembly and disassembly.	Tektronix Part Numbers: #4 003-0415-00 #6 003-0602-00 #8 003-0603-00.
3. Nutdriver Special	1/4 inch.	Assembly and disassembly.	Tektronix Part Number 003-0124-01.
4. Long-nose Pliers		Component removal and replacement.	
5. Diagonal Cutters		Component removal and replacement.	
6. Vacuum Solder Extractor	No static charge retention.	Unsoldering components.	Pace Model PC-10.
7. Pin-Replacement Kit		Replace circuit board connector pins.	Tektronix Part Number 040-0542-00.
8. 10X Probe		Troubleshooting.	TEKTRONIX P6122 Probe (10X). Part Number 010-6122-01.
9. IC Test Clip	16-lead tester.	Testing DIP IC packages.	AP Products Model TC-16.
10. Strain Relief Bushing Tool		Assembly and disassembly.	Heyco Model No. 29.

INTERCONNECTIONS

Pin connectors are used to connect wires to the interconnecting pins. They are grouped together and mounted in a plastic holder and should be removed, reinstalled, or replaced as a unit. If an individual wire or connector in the assembly is faulty, the entire cable assembly should be replaced. To provide correct orientation of this multipin connector when it is reconnected to its mating pins, an arrow is stamped on the circuit board and a matching arrow is molded into the plastic housing of the multipin connector. Be sure these arrows are aligned with each other when the multipin connector is reinstalled.

TRANSISTORS AND INTEGRATED CIRCUITS

NOTE

After replacing a power transistor, check that the collector is not shorted to the heat sink before applying power to the instrument.

Transistors and integrated circuits should not be replaced unless they are actually defective. If unsoldered from the circuit board during routine maintenance, return them to their original board locations. Unnecessary replacement or transposing of semiconductor devices may affect the operation of the instrument. When a semiconductor is replaced, check the performance of the instrument to verify correct operation.

Replacement components should be of the original type or a direct replacement. Bend transistor leads to fit their circuit board holes and cut the leads to the same length as the original component. See Figure 9-2 for typical lead-configuration illustrations.

Reinstall the insulators and replace the heat-sink compound when replacing heat-sink chassis-mounted transistors. The compound should be applied to both sides of the insulators and should be applied to the bottom side of the transistor where it comes in contact with the insulator.

SOLDERING TECHNIQUES

The reliability and accuracy of this instrument can be maintained only if proper soldering techniques are used to remove or replace parts. Only persons qualified in circuit board maintenance should attempt to replace components.

WARNING

To avoid an electric-shock hazard, observe the following precautions before attempting any soldering: turn the instrument off, disconnect it from the dc power source, and allow approximately 1 minute for the power-supply capacitors to discharge.

Use rosin-core wire solder containing 63% tin and 37% lead. Contact your local Tektronix Field Office or representative to obtain the names of approved solder types.

CAUTION

Attempts to unsolder, remove, and resolder leads from the component side of a circuit board may cause damage to the reverse side of the circuit board.

When soldering on circuit boards or small insulated wires, use only a 15- to 25-watt, pencil-type soldering iron. A higher wattage soldering iron can cause etched-circuit conductors to separate from the board base material and melt the insulation on small wires. Always keep the soldering-iron tip properly tinned to ensure best heat transfer from the iron tip to the solder joint. To protect heat-sensitive components, either hold the component lead with long-nose pliers or place a heat block between the component body and the solder joint. Apply only enough solder to make a firm joint. After soldering, clean the area around the solder connection with an approved flux-removing solvent (such as isopropyl alcohol) and allow it to air dry.

REMOVAL AND REPLACEMENT INSTRUCTIONS

The exploded-view drawings in the "Replaceable Mechanical Parts" list (Section 10) may be helpful during the removal and reinstallation of individual subassemblies or components. Circuit board and component locations are shown in the "Diagrams" section.

Cabinet

WARNING

To avoid electric shock, disconnect the instrument from the dc power input source before removing or replacing any component or assembly.

To remove the instrument cabinet, perform the following steps:

1. Disconnect the dc power cord from the 1107 and the ac output cord from the oscilloscope.

2. Remove the six screws from the cover (two on one side of the cover and four on the other side of the cover).

3. Pull the cover (side with the four feet) straight out.

To reinstall the cover, perform the reverse of the preceding instructions. Ensure that the circuit board support mount on the inside of the cover is securely fitted to the Regulator circuit board.

A2—Regulator and A3—Output Circuit Boards

Removal of the Regulator and Output circuit boards is accomplished by the following steps:

1. Pull the Regulator circuit board straight out of the connectors.

2. Remove two screws holding the Output circuit board to the spacers.

3. Pull the Output circuit board straight out until it clears the straight pins of J1 and J4 on the Power circuit board.

4. Tilt the Output circuit board forward and remove the two ac output connectors from the mounted transistors (Q303 and Q307) on the circuit board. Note their locations for reinstallation.

To reinstall the Regulator and Output circuit boards, perform the reverse of the preceding instructions.

A1—Power Circuit Board

Removal of the Power circuit board is accomplished by the following steps:

1. Remove the Regulator and Output circuit boards.

2. Remove the screw securing the protective electric shield to the heat sink that covers the Dc Power Cord Receptacle.

3. Press down on the inside corner of the electric shield and pull it from underneath the mounting nut and ground screw. Pull the electric shield out of the slot in the Power circuit board.

4. Disconnect the two dc power connectors, P110 and P111, from the Power circuit board. Note their orientation for reinstallation.

5. Disconnect the four dc power wires (W110, W111, W112, and W113) from the circuit breaker. Note their orientation for reinstallation.

6. Remove the five screws from the two spring clips that secure Q101, Q102, Q103, Q131, Q133, CR102, CR132, CR133, and CR141 to the heat sink.

7. Remove the six screws holding the Power circuit board to the instrument chassis.

To reinstall the Power circuit board, perform the reverse of the preceding instructions.

OPTIONS

There are currently no options for the 1107.

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.

LIST OF ASSEMBLIES

A list of assemblies can be found at the beginning of the Electrical Parts List. The assemblies are listed in numerical order. When the complete component number of a part is known, this list will identify the assembly in which the part is located.

CROSS INDEX-MFR. CODE NUMBER TO MANUFACTURER

The Mfr. Code Number to Manufacturer index for the Electrical Parts List is located immediately after this page. The Cross Index provides codes, names and addresses of manufacturers of components listed in the Electrical Parts List.

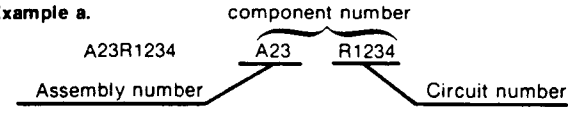
ABBREVIATIONS

Abbreviations conform to American National Standard Y1.1.

COMPONENT NUMBER (column one of the Electrical Parts List)

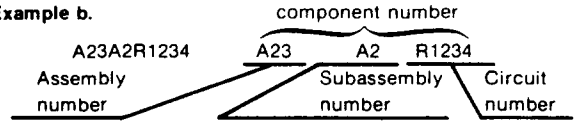
A numbering method has been used to identify assemblies, subassemblies and parts. Examples of this numbering method and typical expansions are illustrated by the following:

Example a.



Read: Resistor 1234 of Assembly 23

Example b.



Read: Resistor 1234 of Subassembly 2 of Assembly 23

Only the circuit number will appear on the diagrams and circuit board illustrations. Each diagram and circuit board illustration is clearly marked with the assembly number. Assembly numbers are also marked on the mechanical exploded views located in the Mechanical Parts List. The component number is obtained by adding the assembly number prefix to the circuit number.

The Electrical Parts List is divided and arranged by assemblies in numerical sequence (e.g., assembly A1 with its subassemblies and parts, precedes assembly A2 with its subassemblies and parts).

Chassis-mounted parts have no assembly number prefix and are located at the end of the Electrical Parts List.

TEKTRONIX PART NO. (column two of the Electrical Parts List)

Indicates part number to be used when ordering replacement part from Tektronix.

SERIAL/MODEL NO. (columns three and four of the Electrical Parts List)

Column three (3) indicates the serial number at which the part was first used. Column four (4) indicates the serial number at which the part was removed. No serial number entered indicates part is good for all serial numbers.

NAME & DESCRIPTION (column five of the Electrical Parts List)

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.

MFR. CODE (column six of the Electrical Parts List)

Indicates the code number of the actual manufacturer of the part. (Code to name and address cross reference can be found immediately after this page.)

MFR. PART NUMBER (column seven of the Electrical Parts List)

Indicates actual manufacturers part number.

CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
00779	AMP INC	P O BOX 3608	HARRISBURG PA 17105
01295	TEXAS INSTRUMENTS INC SEMICONDUCTOR GROUP	13500 N CENTRAL EXPRESSWAY P O BOX 225012 M/S 49	DALLAS TX 75265
02735	RCA CORP SOLID STATE DIVISION	ROUTE 202	SOMERVILLE NJ 08876
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT	W GENESEE ST	AUBURN NY 13021
04222	AVX CERAMICS DIV OF AVX CORP	19TH AVE SOUTH P O BOX 867	MYRTLE BEACH SC 29577
04713	MOTOROLA INC SEMICONDUCTOR GROUP	5005 E MCDOWELL RD	PHOENIX AZ 85008
07716	TRW INC TRW ELECTRONICS COMPONENTS TRW IRC FIXED RESISTORS/BURLINGTON	2850 MT PLEASANT AVE	BURLINGTON IA 52601
09019	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT OPERATIONAL PLANNING AND CUSTOMER ENGINEERING	ELECTRONICS PARK	SYRACUSE NY 13201
12969	UNITRODE CORP	580 PLEASANT ST	WATERTOWN MA 02172
14193	CAL-R INC	1601 OLYMPIC BLVD	SANTA MONICA CA 90404
14433	ITT SEMICONDUCTORS DIV		WEST PALM BEACH FL
14936	GENERAL INSTRUMENT CORP DISCRETE SEMI CONDUCTOR DIV	600 W JOHN ST	HICKSVILLE NY 11802
17856	SILICONIX INC	2201 LAURELWOOD RD	SANTA CLARA CA 95054
19701	MEPCO/ELECTRA INC A NORTH AMERICAN PHILIPS CO	P O BOX 760	MINERAL WELLS TX 76067
22526	DU PONT E I DE NEMOURS AND CO INC DU PONT CONNECTOR SYSTEMS	30 HUNTER LANE	CAMP HILL PA 17011
24546	CORNING GLASS WORKS	550 HIGH ST	BRADFORD PA 16701
27014	NATIONAL SEMICONDUCTOR CORP	2900 SEMICONDUCTOR DR	SANTA CLARA CA 95051
32293	INTERSIL INC	10900 N TANTAU AVE	CUPERTINO CA 95014
51406	MURATA ERIE NORTH AMERICA INC GEORGIA OPERATIONS	1148 FRANKLIN RD SE	MARIETTA GA 30067
51642	CENTRE ENGINEERING INC	2820 E COLLEGE AVE	STATE COLLEGE PA 16801
54473	MATSUSHITA ELECTRIC CORP OF AMERICA	ONE PANASONIC WAY	SECAUCUS NJ 07094
55680	NICHICON /AMERICA/ CORP	927 E STATE PKY	SCHAUMBURG IL 60195
56289	SPRAGUE ELECTRIC CO	87 MARSHALL ST	NORTH ADAMS MA 01247
57668	ROHM CORP	16931 MILLIKEN AVE	IRVINE CA 92713
71400	BUSSMANN MFG CO MCGRAW EDISION CO	114 OLD STATE RD PO BOX 14460	ST LOUIS MO 63178
78488	STACKPOLE CARBON CO		ST MARYS PA 15857
80009	TEKTRONIX INC	4900 S W GRIFFITH DR P O BOX 500	BEAVERTON OR 97077
81541	AIRPAX ELECTRONICS INC	WOODS RD	CAMBRIDGE MD 21613
91094	ESSEX GROUP INC SUFLEX/IWP DIV	BAY RD	NEWMARKET NH 03857
TK0515	RIFA WORLD PRODUCTS INC	19678 8TH STREET EAST P O BOX 517	SONOMA CA 95476
TK1689	AROMAT CORP	10400 N TANTAU AVE	CUPERTINO CA 95014
TK1913	WIMA THE INTER-TECHNICAL GROUP IND	ONE BRIDGE ST PO BOX 23	IRVINGTON NY 10533
TK2038	MULTI COMP INC	3005 SW 154TH TERRACE #3	BEAVERTON, OR 97006
TK2042	ZMAN & ASSOCIATES	7633 SO. 180TH	KENT, WA 98032

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1	670-8485-00			CIRCUIT BD ASSY:POWER	80009	670-8485-00
A2	670-8486-00			CIRCUIT BD ASSY:REGULAR	80009	670-8486-00
A3	670-8487-00			CIRCUIT BD ASSY:OUTPUT	80009	670-8487-00

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1	670-8485-00			CIRCUIT BD ASSY:POWER	80009	670-8485-00
A1C101	290-0939-00			CAP,FXD,ELCTLT:10UF,+100-10%,100V	56289	672D106H100CG2C
A1C102	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A1C103	283-0335-00			CAP,FXD,CER DI:0.1UF,20%,600V	51642	500 600W5R104M
A1C104	290-0939-00			CAP,FXD,ELCTLT:10UF,+100-10%,100V	56289	672D106H100CG2C
A1C105	290-0804-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	55680	ULB1E100TAAANA
A1C107	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A1C111	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A1C120	285-1192-00			CAP,FXD,PPR DI:0.0022 UF,20%,250VAC	TK0515	PME271Y510
A1C121	285-1192-00			CAP,FXD,PPR DI:0.0022 UF,20%,250VAC	TK0515	PME271Y510
A1C122	283-0177-00			CAP,FXD,CER DI:1UF,+80-20%,25V	04222	SR302E105ZAATR
A1C123	283-0057-00			CAP,FXD,CER DI:0.1UF,+80-20%,200V	04222	SR306E104ZAA
A1C124	285-1192-00			CAP,FXD,PPR DI:0.0022 UF,20%,250VAC	TK0515	PME271Y510
A1C125	285-1192-00			CAP,FXD,PPR DI:0.0022 UF,20%,250VAC	TK0515	PME271Y510
A1C131	290-0962-00			CAP,FXD,ELCTLT:27UF,+100-10%,150VDC	56289	672D276H150GE2C
A1C132	290-0962-00			CAP,FXD,ELCTLT:27UF,+100-10%,150VDC	56289	672D276H150GE2C
A1C133	290-0920-00			CAP,FXD,ELCTLT:33UF,+50-10%,35V	55680	ULB1V330TAAANA
A1C134	290-0920-00			CAP,FXD,ELCTLT:33UF,+50-10%,35V	55680	ULB1V330TAAANA
A1C135	290-0804-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	55680	ULB1E100TAAANA
A1C140	283-0164-00			CAP,FXD,CER DI:2.2UF,20%,25V	04222	SR402E225MAA
A1CR101	152-0400-00			SEMICOND DVC,DI:RECT,SI,400V,1A	04713	SR1977K
A1CR102	152-0839-00			SEMICOND DVC,DI:RECT,SI,400V,50A,TO-220	04713	SUR116A
A1CR104	152-0400-00			SEMICOND DVC,DI:RECT,SI,400V,1A	04713	SR1977K
A1CR105	152-0400-00			SEMICOND DVC,DI:RECT,SI,400V,1A	04713	SR1977K
A1CR132	152-0901-00			SEMICOND DVC,DI:RECT,SI,TO-220,300V	14936	FED16FT
A1CR133	152-0901-00			SEMICOND DVC,DI:RECT,SI,TO-220,300V	14936	FED16FT
A1CR135	152-0400-00			SEMICOND DVC,DI:RECT,SI,400V,1A	04713	SR1977K
A1CR136	152-0400-00			SEMICOND DVC,DI:RECT,SI,400V,1A	04713	SR1977K
A1CR137	152-0400-00			SEMICOND DVC,DI:RECT,SI,400V,1A	04713	SR1977K
A1CR138	152-0400-00			SEMICOND DVC,DI:RECT,SI,400V,1A	04713	SR1977K
A1CR139	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR140	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR141	152-0839-00			SEMICOND DVC,DI:RECT,SI,400V,50A,TO-220	04713	SUR116A
A1CR150	152-0400-00			SEMICOND DVC,DI:RECT,SI,400V,1A	04713	SR1977K
A1E107	276-0557-00			CORE,EM:TOROID,FERRITE (QUANTITY OF 2)	78488	57-0131
A1E107	176-0120-00			WIRE,ELECTRICAL:18 AWG,BARE,12.0 L	80009	176-0120-00
A1E107	196-3044-00			LEAD,ELECTRICAL:20 AWG,1.312 L,9-0	80009	196-3044-00
A1E107	162-0503-00			INSUL SLVG,ELEC:0.042 ID,ACRYLIC/FIBERGLASS BLACK,0.087 OD	91094	ORDER BY DESCR
A1F101	159-0082-00			FUSE,CARTRIDGE:1AG,15A,32V,2SEC,1.5INRADLD	71400	GKN-15
A1J1	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 3)	22526	48283-036
A1J2	131-3177-00			CONN,RCPT,ELEC:CKT BD,1 X 9,0.15 SPACING	00779	5-3809509
A1J3	131-3177-00			CONN,RCPT,ELEC:CKT BD,1 X 9,0.15 SPACING	00779	5-3809509
A1J4	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 3)	22526	48283-036
A1K101	148-0164-00			RELAY,ARMATURE:2 FORM A,8A,250VAC,COIL 12VDC,600 OHMS	TK1689	ST2E-DC12V
A1L101	108-0911-00			COIL,RF:FIXED,65UH	80009	108-0911-00
A1L103	108-0911-00			COIL,RF:FIXED,65UH	80009	108-0911-00
A1L104	108-0742-00			COIL,RF:FIXED,83UH	80009	108-0742-00
A1L131	108-1283-00			COIL,RF:FIXED,6MH,10%	80009	108-1283-00
A1LS108	119-1537-00			XDCR,AUDIO:PIEZOELECTRIC W/OSCILLATOR	51406	PKB8-4A0
A1Q101	151-1161-00			TRANSISTOR:FET,N-CHAN,SI,TO-92	17856	IRF540
A1Q102	151-1161-00			TRANSISTOR:FET,N-CHAN,SI,TO-92	17856	IRF540
A1Q103	151-0462-00			TRANSISTOR:PNP,SI,TO-220	04713	SJE491
A1Q104	151-0432-00			TRANSISTOR:NPN,SI,TO-106	04713	SPS8512
A1Q131	151-1141-00			TRANSISTOR:FE,N-CHANNEL,SI,TO-220	04713	STP3000

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1Q132	151-0453-00			TRANSISTOR:PNP,SI,TO-92	27014	ORDER BY DESCR
A1Q133	151-0743-00			TRANSISTOR:NPN,SI,TO-220	03508	D44C8
A1R101	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R102	315-0220-00			RES,FXD,FILM:22 OHM,5%,0.25W	19701	5043CX22R00J
A1R105	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A1R106	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A1R107	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R108	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R109	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A1R110	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A1R111	315-0220-00			RES,FXD,FILM:22 OHM,5%,0.25W	19701	5043CX22R00J
A1R112	308-0230-00			RES,FXD,WW:2.7K OHM,5%,3W	14193	SA31-2701J
A1R131	301-0104-00			RES,FXD,FILM:100K OHM,5%,0.5W	19701	5053CX100K0J
A1R132	301-0104-00			RES,FXD,FILM:100K OHM,5%,0.5W	19701	5053CX100K0J
A1R133	315-0393-00			RES,FXD,FILM:39K OHM,5%,0.25W	57668	NTR25J-E39K0
A1R134	315-0393-00			RES,FXD,FILM:39K OHM,5%,0.25W	57668	NTR25J-E39K0
A1R135	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R136	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R140	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R141	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A1R149	321-0437-00			RES,FXD,FILM:348K OHM,1%,0.125W,TC=T0	19701	5043ED348K0F
A1R150	321-0435-00			RES,FXD,FILM:332K OHM,1%,0.125W,TC=T0	07716	CEAD33202F
A1R151	315-0151-00			RES,FXD,FILM:150 OHM,5%,0.25W	57668	NTR25J-E150E
A1R160	308-0463-00			RES,FXD,WW:0.3 OHM,1%,3W	14193	SA31-R300F
A1T122	120-1648-00			TRANSFORMER,RF:COMMON MODE 1107	TK2042	ORDER BY DESCR
A1T129	120-1544-00			TRANSFORMER,RF:POWER HIGH FREQUENCY	TK2038	ORDER BY DESCR
A1T130	120-1604-00			XFMR,PWR,STPDN:LOW FREQUENCY	80009	120-1604-00
A1TP100	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1TP103	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1TP104	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1TP105	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1TP133	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1TP150	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1U105	156-0328-00			MICROCKT,DGTL:DUAL MOS CLOCK DRIVER	04713	MMH0026CP1D
A1VR102	152-0055-00			SEMICOND DVC,DI:ZEN,SI,11V,5%,0.4W,DO-7	14433	Z5407
A1VR139	152-0055-00			SEMICOND DVC,DI:ZEN,SI,11V,5%,0.4W,DO-7	14433	Z5407
A1W108	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 X 0.225	24546	OMA 07
A1W110	196-2840-00			LEAD,ELECTRICAL:18 AWG,2.75 L,7-N	80009	196-2840-00
A1W111	196-2841-00			LEAD,ELECTRICAL:18 AWG,2.25 L,2-N	80009	196-2841-00
A1W112	196-2840-00			LEAD,ELECTRICAL:18 AWG,2.75 L,7-N	80009	196-2840-00
A1W113	196-2841-00			LEAD,ELECTRICAL:18 AWG,2.25 L,2-N	80009	196-2841-00
A1W130	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 X 0.225	24546	OMA 07

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A2	670-8486-00			CIRCUIT BD ASSY:REGULAR	80009	670-8486-00
A2C1	281-0812-00			CAP,FXD,CER DI:1000PF,10%,100V	04222	MA101C102KAA
A2C2	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A2C3	290-0920-00			CAP,FXD,ELCTLT:33UF,+50-10%,35V	55680	ULB1V330TAAANA
A2C5	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2C6	290-0804-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	55680	ULB1E100TAAANA
A2C11	290-0745-00			CAP,FXD,ELCTLT:22UF,+50-10%,25V	54473	ECE-A25V22L
A2C14	283-0164-00			CAP,FXD,CER DI:2.2UF,20%,25V	04222	SR402E225MAA
A2C19	290-0804-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	55680	ULB1E100TAAANA
A2C31	283-0167-00	B010100	B010194	CAP,FXD,CER DI:0.1UF,10%,100V	04222	3430-100C-104K
A2C31	285-1349-00	B010195		CAP,FXD,MTLZD:0.1UF,5%,63VDC	TK1913	MKS 2
A2C32	283-0167-00	B010100	B010194	CAP,FXD,CER DI:0.1UF,10%,100V	04222	3430-100C-104K
A2C32	285-1349-00	B010195		CAP,FXD,MTLZD:0.1UF,5%,63VDC	TK1913	MKS 2
A2C35	283-0167-00	B010100	B010194	CAP,FXD,CER DI:0.1UF,10%,100V	04222	3430-100C-104K
A2C35	285-1349-00	B010195		CAP,FXD,MTLZD:0.1UF,5%,63VDC	TK1913	MKS 2
A2C41	290-0782-00			CAP,FXD,ELCTLT:4.7UF,+75-10%,35VDC	55680	ULB1V4R7TAAANA
A2C48	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A2C52	290-0782-00			CAP,FXD,ELCTLT:4.7UF,+75-10%,35VDC	55680	ULB1V4R7TAAANA
A2C55	283-0100-00			CAP,FXD,CER DI:0.0047UF,10%,200V	04222	SR306A472KAA
A2C56	281-0812-00			CAP,FXD,CER DI:1000PF,10%,100V	04222	MA101C102KAA
A2C58	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2C60	290-0804-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	55680	ULB1E100TAAANA
A2C64	290-0804-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	55680	ULB1E100TAAANA
A2C65	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A2C68	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A2C69	290-0782-00			CAP,FXD,ELCTLT:4.7UF,+75-10%,35VDC	55680	ULB1V4R7TAAANA
A2CR2	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2CR3	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2CR6	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2CR28	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2CR29	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2CR32	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2CR33	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2CR34	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2CR35	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2J5	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 2)	22526	48283-036
A2J6	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 2)	22526	48283-036
A2P2	131-0787-00			TERMINAL,PIN:0.64 L X 0.025 SQ PH BRZ (QUANTITY OF 9)	22526	47359-000
A2P3	131-0787-00			TERMINAL,PIN:0.64 L X 0.025 SQ PH BRZ (QUANTITY OF 9)	22526	47359-000
A2Q1	151-1121-00			TRANSISTOR:FE,N CHANNEL,SI,TO-92	17856	V10206
A2Q2	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A2Q8	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A2Q29	151-0453-00			TRANSISTOR:PNP,SI,TO-92	27014	ORDER BY DESCR
A2Q31	151-0453-00			TRANSISTOR:PNP,SI,TO-92	27014	ORDER BY DESCR
A2Q33	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A2Q68	151-0453-00			TRANSISTOR:PNP,SI,TO-92	27014	ORDER BY DESCR
A2R1	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A2R2	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
A2R3	315-0272-00			RES,FXD,FILM:2.7K OHM,5%,0.25W	57668	NTR25J-E02K7
A2R4	315-0272-00			RES,FXD,FILM:2.7K OHM,5%,0.25W	57668	NTR25J-E02K7
A2R5	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A2R6	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A2R7	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A2R8	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A2R9	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A2R10	315-0152-00			RES,FXD,FILM:1.5K OHM,5%,0.25W	57668	NTR25J-E01K5
A2R11	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A2R12	321-0338-00			RES,FXD,FILM:32.4K OHM,1%,0.125W,TC=T0	19701	5033ED32K40F
A2R13	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A2R14	321-0289-00			RES,FXD,FILM:10.0K OHM,1%,0.125W,TC=T0	19701	5033ED10K0F
A2R15	315-0154-00			RES,FXD,FILM:150K OHM,5%,0.25W	57668	NTR25J-E150K
A2R16	321-0253-00			RES,FXD,FILM:4.22K OHM,1%,0.125W,TC=T0	19701	5033ED 4K 220F
A2R17	321-0289-00			RES,FXD,FILM:10.0K OHM,1%,0.125W,TC=T0	19701	5033ED10K0F
A2R18	321-0332-00			RES,FXD,FILM:28.0K OHM,1%,0.125W,TC=T0	07716	CEAD28001F
A2R19	321-0289-00			RES,FXD,FILM:10.0K OHM,1%,0.125W,TC=T0	19701	5033ED10K0F
A2R20	315-0364-00			RES,FXD,FILM:360K OHM,5%,0.25W	57668	NTR25J-E360K
A2R21	315-0134-00			RES,FXD,FILM:130K OHM,5%,0.25W	57668	NTR25J-E130K
A2R22	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A2R24	321-0357-00			RES,FXD,FILM:51.1K OHM,1%,0.125W,TC=T0	07716	CEAD51101F
A2R26	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A2R27	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A2R29	315-0152-00			RES,FXD,FILM:1.5K OHM,5%,0.25W	57668	NTR25J-E01K5
A2R30	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E05K1
A2R31	321-0333-00			RES,FXD,FILM:28.7K OHM,1%,0.125W,TC=T0	19701	5043ED28K70F
A2R32	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A2R33	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A2R34	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A2R35	315-0682-00			RES,FXD,FILM:6.8K OHM,5%,0.25W	57668	NTR25J-E06K8
A2R36	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A2R37	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A2R38	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E05K1
A2R41	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A2R42	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A2R43	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E05K1
A2R44	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A2R45	315-0244-00			RES,FXD,FILM:240K OHM,5%,0.25W	19701	5043CX240K0J
A2R46	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A2R47	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A2R48	321-0293-00			RES,FXD,FILM:11.0K OHM,1%,0.125W,TC=T0	07716	CEAD11001F
A2R49	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A2R50	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A2R51	321-0214-00			RES,FXD,FILM:1.65K OHM,1%,0.125W,TC=T0	19701	5033ED1K65F
A2R52	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A2R53	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A2R54	315-0433-00			RES,FXD,FILM:43K OHM,5%,0.25W	19701	5043CX43K00J
A2R55	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A2R56	321-0335-00			RES,FXD,FILM:30.1K OHM,1%,0.125W,TC=T0	57668	RB14FXE30K1
A2R58	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A2R60	315-0123-00			RES,FXD,FILM:12K OHM,5%,0.25W	57668	NTR25J-E12K0
A2R61	321-0413-00			RES,FXD,FILM:196K OHM,1%,0.125W,TC=T0	07716	CEAD19602F
A2R62	321-0289-00			RES,FXD,FILM:10.0K OHM,1%,0.125W,TC=T0	19701	5033ED10K0F
A2R63	321-0258-00			RES,FXD,FILM:4.75K OHM,1%,0.125W,TC=T0	19701	5033ED4K750F
A2R64	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A2R65	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A2R66	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A2R67	321-0165-00			RES,FXD,FILM:511 OHM,1%,0.125W,TC=T0	07716	CEAD511R0F
A2R68	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
A2R69	315-0393-00			RES,FXD,FILM:39K OHM,5%,0.25W	57668	NTR25J-E39K0
A2TP10	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2TP20	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2TP30	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2TP31	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2TP35	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A2TP36	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2TP40	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2TP42	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2U1	156-0411-00			MICROCKT,LINEAR:SGL SPLY COMPARATOR	04713	LM339N
A2U2	156-1408-00			MICROCKT,LINEAR:TIMER,LOW POWER	32293	ITS9217
A2U3	156-0366-02			MICROCKT,DGTL:DUAL D FLIP-FLOP,SCREENED	02735	CD4013BFX
A2U4	156-0411-00			MICROCKT,LINEAR:SGL SPLY COMPARATOR	04713	LM339N
A2U7	156-1437-00			MICROCKT,LINEAR:VOLTAGE REF	04713	MC1404AU5DS
A2U30	156-1238-00			MICROCKT,LINEAR:OPTICAL ISOLATOR,SCR OUTPUT	09019	H11CX604
A2U31	156-1408-00	B010100	B010194	MICROCKT,LINEAR:TIMER,LOW POWER	32293	ITS9217
A2U31	156-1408-02	B010195		MICROCKT,LINEAR:TIMER	01295	TLC555CP
A2U32	156-0366-02			MICROCKT,DGTL:DUAL D FLIP-FLOP,SCREENED	02735	CD4013BFX
A2U33	156-1225-00			MICROCKT,LINEAR:DUAL COMPARATOR	01295	LM393P
A2U34	156-0328-00			MICROCKT,DGTL:DUAL MOS CLOCK DRIVER	04713	MMH0026CP1D
A2U35	156-0411-00			MICROCKT,LINEAR:SGL SPLY COMPARATOR	04713	LM339N
A2U36	156-1627-00			MICROCKT,LINEAR:PULSE WIDTH MOD CONT CKT	12969	UC494ACN
A2U37	156-1225-00			MICROCKT,LINEAR:DUAL COMPARATOR	01295	LM393P
A2VR29	152-0662-00			SEMICOND DVC,DI:ZEN,SI,5V,1%,400MW,DO-7	04713	SZG195RL
A2VR68	152-0662-00			SEMICOND DVC,DI:ZEN,SI,5V,1%,400MW,DO-7	04713	SZG195RL
A2W5	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 X 0.225	24546	OMA 07
A2W14	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 X 0.225	24546	OMA 07

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A3	670-8487-00			CIRCUIT BD ASSY:OUTPUT	80009	670-8487-00
A3C300	285-1196-00			CAP,FXD,PPR DI:0.01UF,20%,250V	TK0515	PME 265 MB 510
A3C301	285-1196-00			CAP,FXD,PPR DI:0.01UF,20%,250V	TK0515	PME 265 MB 510
A3CR303	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A3CR304	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A3CR307	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A3CR308	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A3J1	131-1882-00			CONN,RCPT,ELEC:CKT BD,1X3,0.1 SPACING,TIN	00779	1-380949-3
A3J4	131-1882-00			CONN,RCPT,ELEC:CKT BD,1X3,0.1 SPACING,TIN	00779	1-380949-3
A3Q303	151-0815-00			TRANSISTOR:PNP,TO-3	04713	MJ11021
A3Q304	151-0814-00			TRANSISTOR:NPN,TO-3	04713	MJ11022
A3Q307	151-0815-00			TRANSISTOR:PNP,TO-3	04713	MJ11021
A3Q308	151-0814-00			TRANSISTOR:NPN,TO-3	04713	MJ11022
A3TP1	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A3TP2	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
P110	----- -----			(SEE FIG. 1 INDEX -31)		
P111	----- -----			(SEE FIG. 1 INDEX -31)		
S1	260-2209-01			CIRCUIT BREAKER:2 POLE,10A,250VAC	81541	203-11151-103-S1

DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

Symbols

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 is in 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.

American National Standard Institute
1430 Broadway
New York, New York 10018

Component Values

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

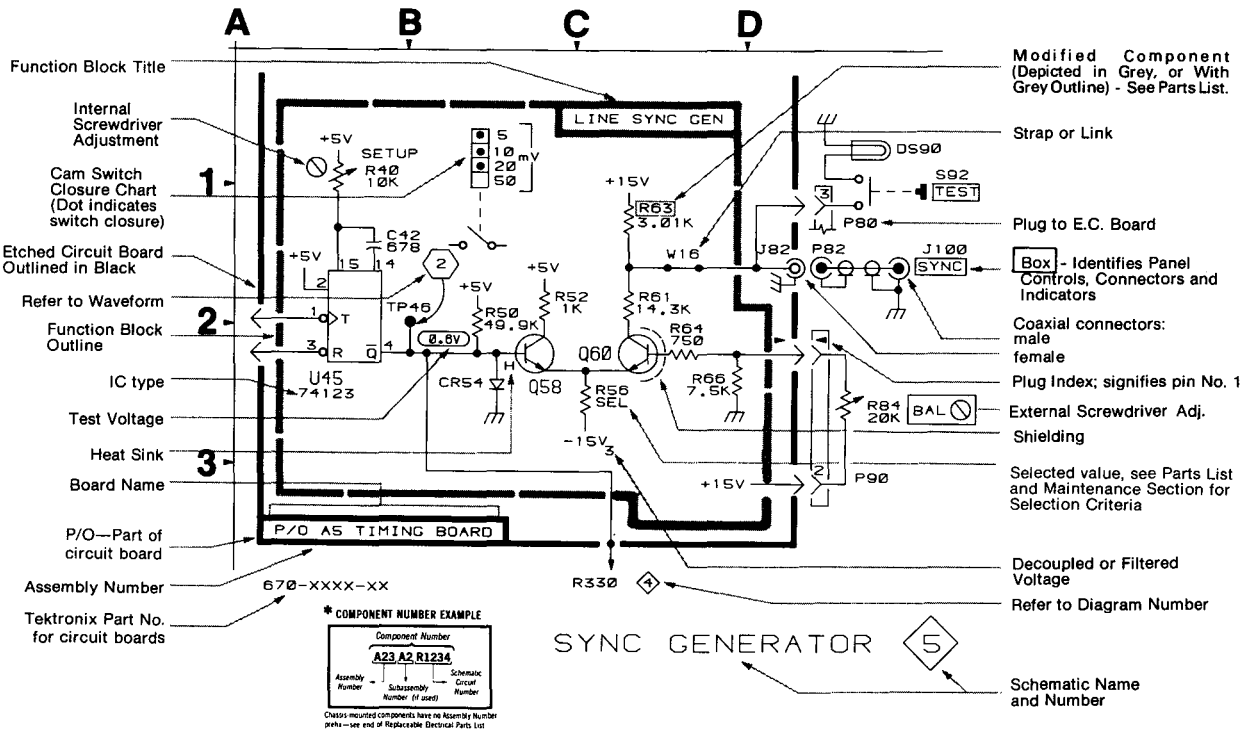
Capacitors = Values one or greater are in picofarads (pF). Values less than one are in microfarads (μF).
Resistors = Ohms (Ω).

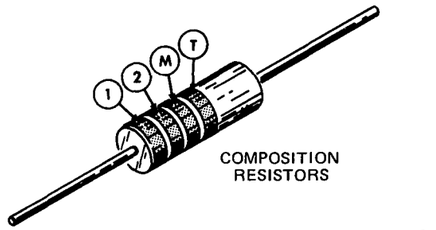
The information and special symbols below may appear in this manual.

Assembly Numbers and Grid Coordinates

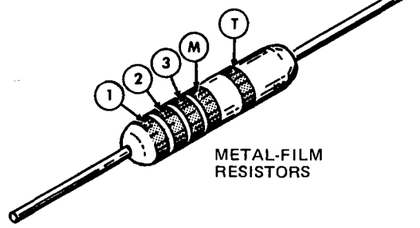
Each assembly in the instrument is assigned an assembly number (e.g., A20). The assembly number appears on the circuit board outline on the diagram, in the title for the circuit board component location illustration, and in the lookup table for the schematic diagram and corresponding component locator illustration. The Replaceable Electrical Parts list is arranged by assemblies in numerical sequence; the components are listed by component number *(see following illustration for constructing a component number).

The schematic diagram and circuit board component location illustration have grids. A lookup table with the grid coordinates is provided for ease of locating the component. Only the components illustrated on the facing diagram are listed in the lookup table. When more than one schematic diagram is used to illustrate the circuitry on a circuit board, the circuit board illustration may only appear opposite the first diagram on which it was illustrated; the lookup table will list the diagram number of other diagrams that the circuitry of the circuit board appears on.





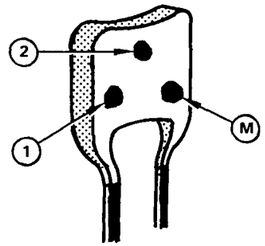
COMPOSITION RESISTORS



METAL-FILM RESISTORS

(1) (2) and (3) — 1st, 2nd, and 3rd significant figures
(M) —multiplier (T) —tolerance

COLOR CODE

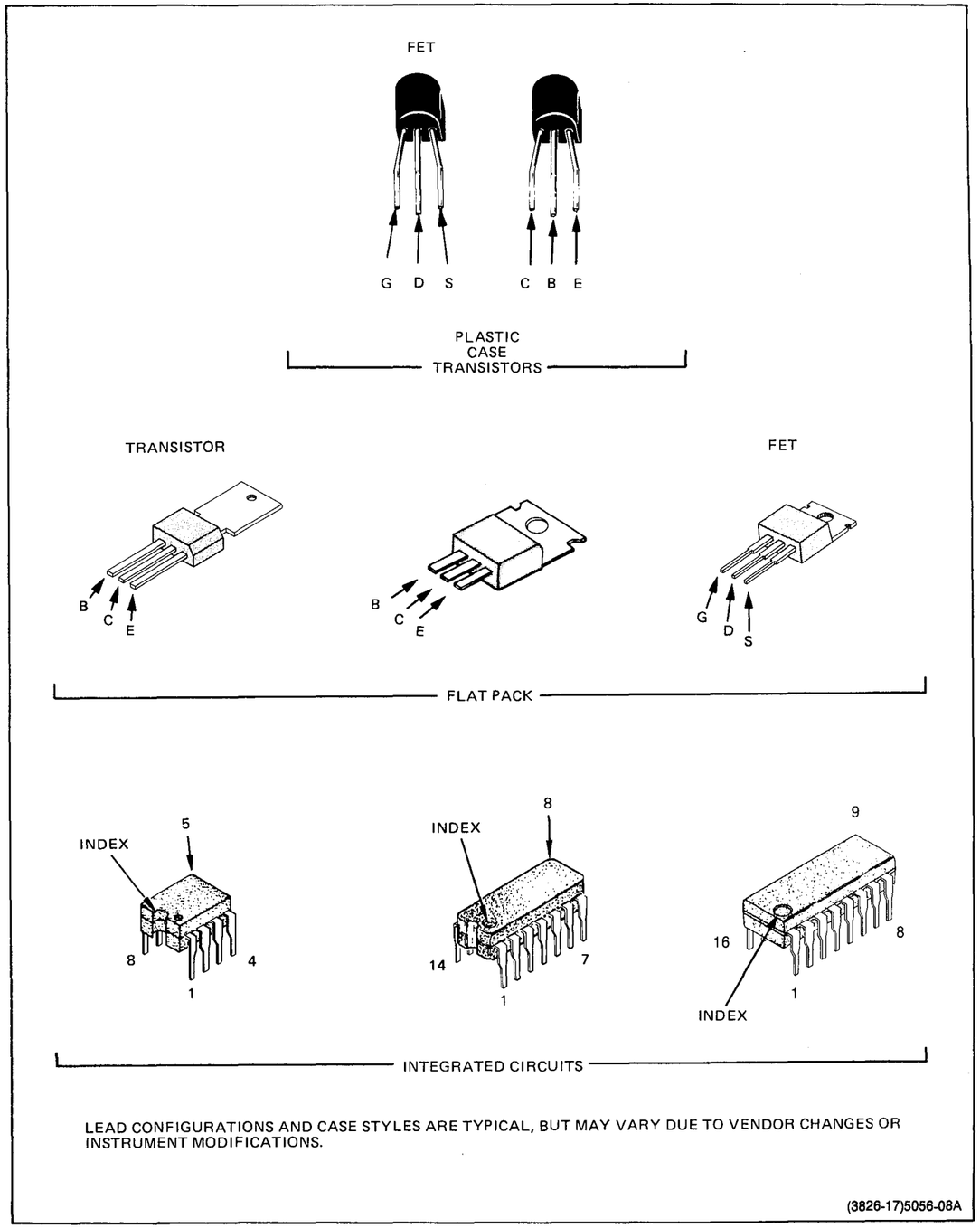


SMALL DISC CAPACITORS

COLOR	SIGNIFICANT FIGURES	RESISTORS		CAPACITORS			DIPPED TANTALUM VOLTAGE RATING
		MULTIPLIER	TOLERANCE	MULTIPLIER	TOLERANCE		
					over 10 pF	under 10 pF	
BLACK	0	1	———	1	±20%	±2 pF	4 VDC
BROWN	1	10	±1%	10	±1%	±0.1 pF	6 VDC
RED	2	10^2 or 100	±2%	10^2 or 100	±2%	———	10 VDC
ORANGE	3	10^3 or 1 K	±3%	10^3 or 1000	±3%	———	15 VDC
YELLOW	4	10^4 or 10 K	±4%	10^4 or 10,000	+100% –9%	———	20 VDC
GREEN	5	10^5 or 100 K	±½%	10^5 or 100,000	±5%	±0.5 pF	25 VDC
BLUE	6	10^6 or 1 M	±¼%	10^6 or 1,000,000	———	———	35 VDC
VIOLET	7	———	±1/10%	———	———	———	50 VDC
GRAY	8	———	———	10^{-2} or 0.01	+80% –20%	±0.25 pF	———
WHITE	9	———	———	10^{-1} or 0.1	±10%	±1 pF	———
GOLD	–	10^{-1} or 0.1	±5%	———	———	———	———
SILVER	–	10^{-2} or 0.01	±10%	———	———	———	———
NONE	–	———	±20%	———	±10%	±1 pF	———

(1861-20A)5056-07

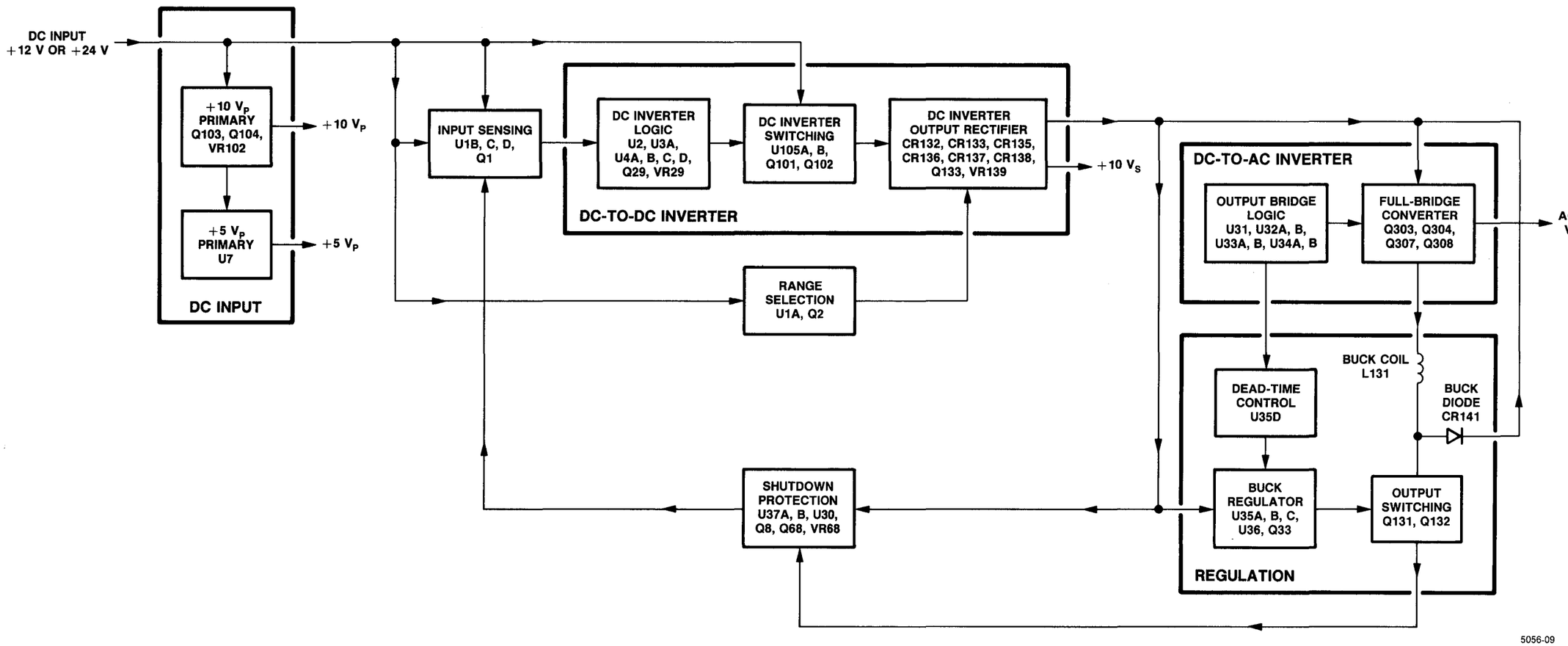
Figure 9-1. Color codes for resistors and capacitors.



LEAD CONFIGURATIONS AND CASE STYLES ARE TYPICAL, BUT MAY VARY DUE TO VENDOR CHANGES OR INSTRUMENT MODIFICATIONS.

(3826-17)5056-08A

Figure 9-2. Semiconductor lead configurations.



BLOCK DIAGRAM

FIG. 9-3

Figure 9-3. Block diagram.

FIG. 9-4, -5, -6, -7

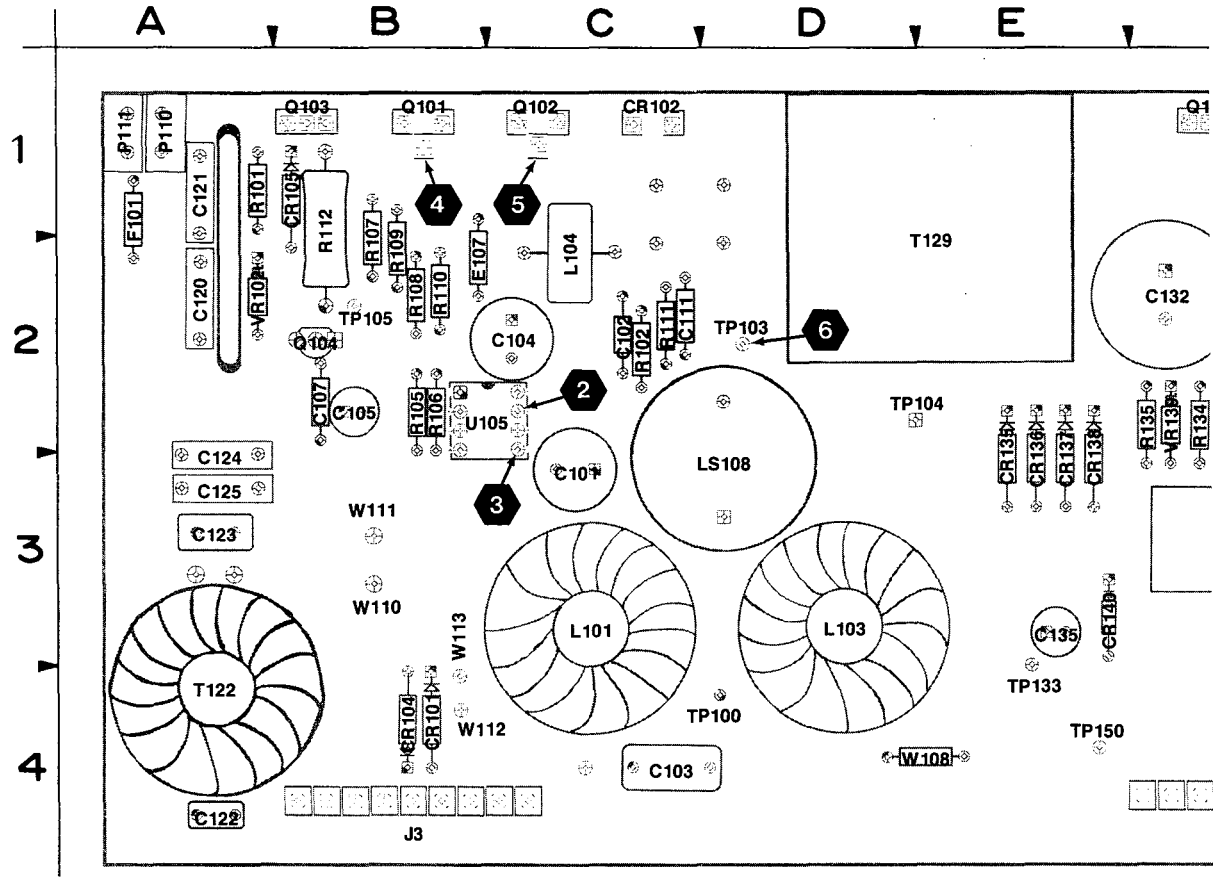
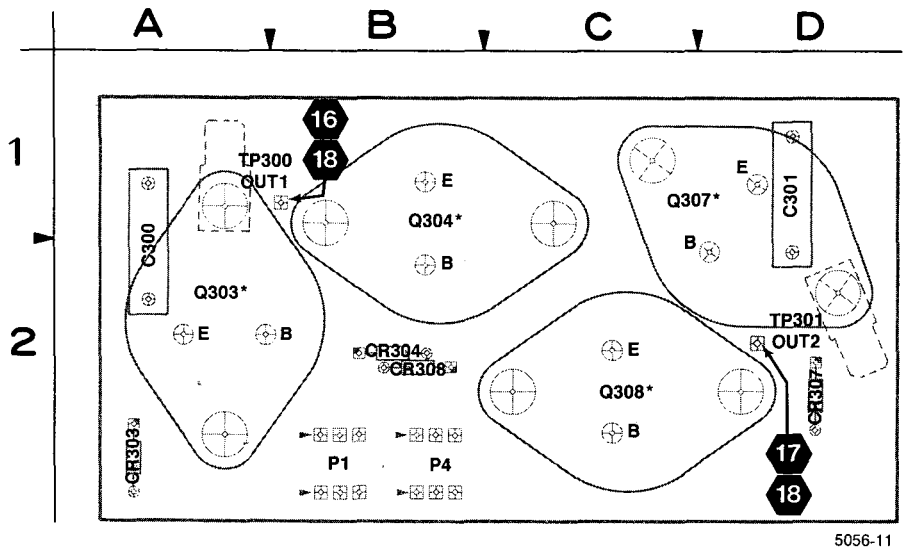


Figure 9-4. A1—Power board.



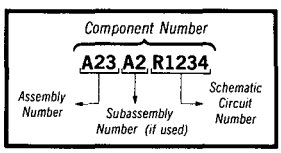
5056-11

Figure 9-5. A3—Output board.

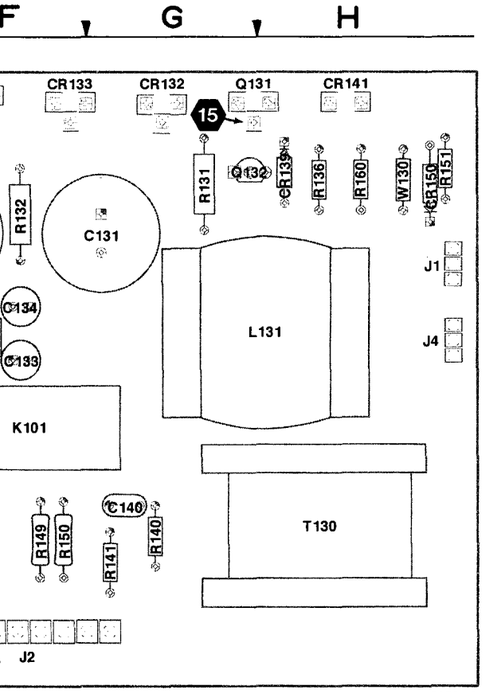
*NOTE:
Q303, Q304, Q307, Q308 ARE MOUNTED ON BACK OF BOARD

Static Sensitive Devices
See Maintenance Section

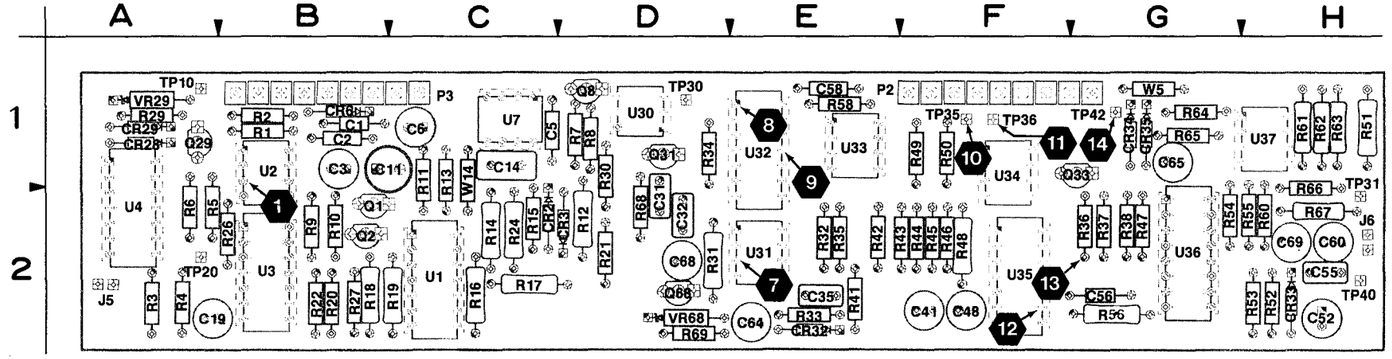
COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.



5056-10

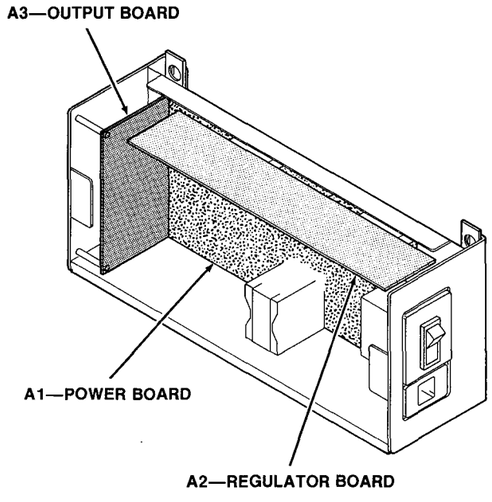


5056-12

Figure 9-6. A2—Regulator board.

5056-13

Figure 9-7. Circuit view of A2—Regulator board.



DC INVERTER

ASSEMBLY A1

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C101	2E	3C	CR141	7M	1H	R101	1F	1A	TP150	6M	4E
C102	2H	2C	CR150	8N	1H	R102	1H	2C			
C103	2D	4C				R105	3G	2B	U105A	3G	2B
C104	2H	2C	E107	3H	2B	R106	3G	2B	U105B	3G	2B
C105	2F	2B				R107	3H	1B	U105	2G	2B
C107	2F	2B	F101	1B	1A	R108	3H	2B			
C111	2J	2C				R109	2H	2B	VR102	2E	2A
C120	1B	2A	J1	7N	2H	R110	3H	2B	VR139	3L	2F
C121	2B	1A	J1	7N	2B	R111	2H	2C			
C122	2B	4A	J2	5M	4F	R112	1E	1B	W108	4G	4D
C123	2C	3A	J3	2B	4B	R131	2K	1G	W110	2C	3B
C124	1C	3A	J3	3G	4B	R132	2K	2F	W111	1C	3B
C125	2C	3A	J4	3N	2H	R133	3K	2F	W112	2D	4B
C131	2K	2F	J4	4N	2H	R134	3K	2F	W113	1D	4B
C132	2K	2F	J4	4N	2B	R135	3L	2F	W130	3M	1H
C133	3K	2F				R136	9M	1H			
C134	3K	2F	K101	4K	3F	R140	5M	4G			
C135	3L	3E				R141	6M	4G			
C140	5M	3G	L101	1E	3C	R149	7M	4F			
			L103	1G	3D	R150	7M	4F			
CR101	1D	4B	L104	2H	1C	R151	8N	1H			
CR102	2G	1C	L131	8N	2G	R160	10M	1H			
CR104	2D	4B									
CR105	2F	1B	LS108	4G	3D	T122	1C	4A			
CR132	2J	1G				T129	1J	1D			
CR133	1J	1F	Q101	2H	1B	T130	4N	3H			
CR135	3J	2E	Q102	3H	1C						
CR136	3K	2E	Q103	2F	1B	TP100	1F	4D			
CR137	3K	2E	Q104	2F	2B	TP103	1H	2D			
CR138	3J	2E	Q131	9M	1G	TP104	4B	2D			
CR139	9M	1H	Q132	9M	1G	TP105	2G	2B			
CR140	4K	3E	Q133	3L	1F	TP133	3M	3E			

ASSEMBLY A2

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1	3C	1B	Q2	7D	2B	R38	6K	2G	U1D	5D	2C
C2	3C	1B	Q8	7E	1D	R41	7G	2E	U1	8C	2C
C3	9D	1B	Q29	4F	1A	R42	7H	2E	U2	3D	1B
C5	3C	1C	Q31	6J	1D	R43	7J	2E	U2	9D	1B
C6	3C	1C	Q33	7L	1G	R44	7J	2F	U3A	3E	2B
C11	5E	1B	Q68	6F	2D	R45	8H	2F	U3B	4D	2B
C14	5D	1C				R46	7J	2F	U3	8D	2B
C19	7C	2A	R1	3D	1B	R47	7L	2G	U4A	3E	2A
C31	6H	2D	R2	3D	1B	R48	7K	2F	U4B	3E	2A
C32	5J	2D	R3	3E	2A	R49	5L	1F	U4C	3F	2A
C35	6H	2E	R4	3F	2A	R50	5L	1F	U4D	3F	2A
C41	7G	2F	R5	3F	2A	R51	8G	1H	U4	8C	2A
C48	7K	2F	R6	3F	2A	R52	9J	2H	U7	3C	1C
C52	9J	2H	R7	7F	1D	R53	9J	2H	U30	7F	1D
C55	9J	2H	R8	7E	1D	R54	8J	2G	U31	5H	2E
C56	9J	2G	R9	4E	2B	R55	8J	2H	U31	9C	2E
C58	6K	1E	R10	4E	2B	R56	9J	2G	U32A	5J	1E
C60	5L	2H	R11	5E	1C	R58	6K	1E	U32B	5K	1E
C64	6G	2E	R12	4D	2D	R60	8J	2H	U32	9D	1E
C65	10G	1G	R13	5E	1C	R61	9G	1H	U33A	5L	1E
C68	7F	2D	R14	5D	2C	R62	9G	1H	U33B	6L	1E
C69	9G	2H	R15	6E	2C	R63	8G	1H	U33	9D	1E
			R16	5D	2C	R64	6G	1G	U34A	5L	1F
CR2	5D	2C	R17	6D	2C	R65	10H	1G	U34B	6L	1F
CR3	6C	2D	R18	7C	2B	R66	9H	2H	U34	9E	1F
CR6	8D	1B	R19	7C	2C	R67	8G	2H	U35A	7H	2F
CR28	4E	1A	R20	6C	2B	R68	7F	2D	U35B	8J	2F
CR29	4F	1A	R21	6E	2D	R69	6G	2D	U35C	7K	2F
CR32	7H	2E	R22	6D	2B				U35D	6J	2F
CR33	9J	2H	R24	4D	2C	TP10	4C	1A	U35	9F	2F
CR34	8L	1G	R26	3D	2B	TP20	4F	2A	U36	8K	2G
CR35	9L	1G	R27	6C	2B	TP30	6L	1D	U37A	7G	1H
			R29	4E	1A	TP31	5L	1H	U37B	9G	1H
J5	2C	2A	R30	7F	1D	TP35	5L	1F	U37	9F	1H
J6	5L	2H	R31	6H	2D	TP36	5L	1F			
			R32	6H	2E	TP40	6L	2H	VR29	4E	1A
P2	5L	1E	R33	6J	2E	TP42	8L	1G	VR68	6F	2D
P3	2B	1C	R34	5J	1D						
P3	3F	1C	R35	6H	2E	U1A	7C	2C	W5	5L	1G
			R36	6J	2G	U1B	6C	2C	W14	5D	1C
Q1	5E	2B	R37	6K	2G	U1C	5D	2C			

ASSEMBLY A3

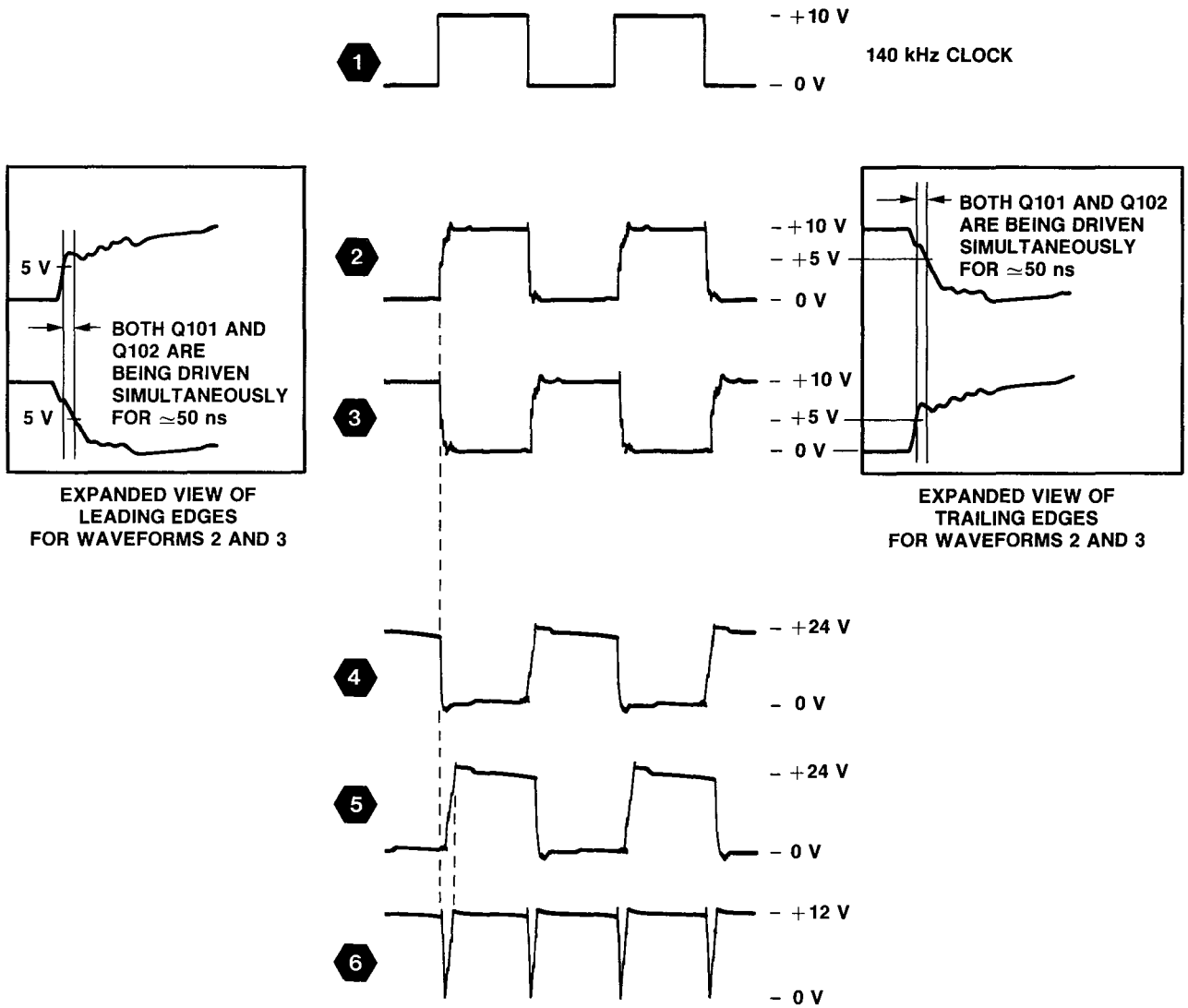
CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C300	6P	1A	CR308	7P	2B	Q304	7P	1B
C301	6S	1D				Q307	5P	1D
			P1	7N	2H	Q308	7P	2C
CR303	4P	2A	P4	4N	2H			
CR304	8P	2B				TP300	5P	1B
CR307	4P	2D	Q303	4P	2A	TP301	5S	2D

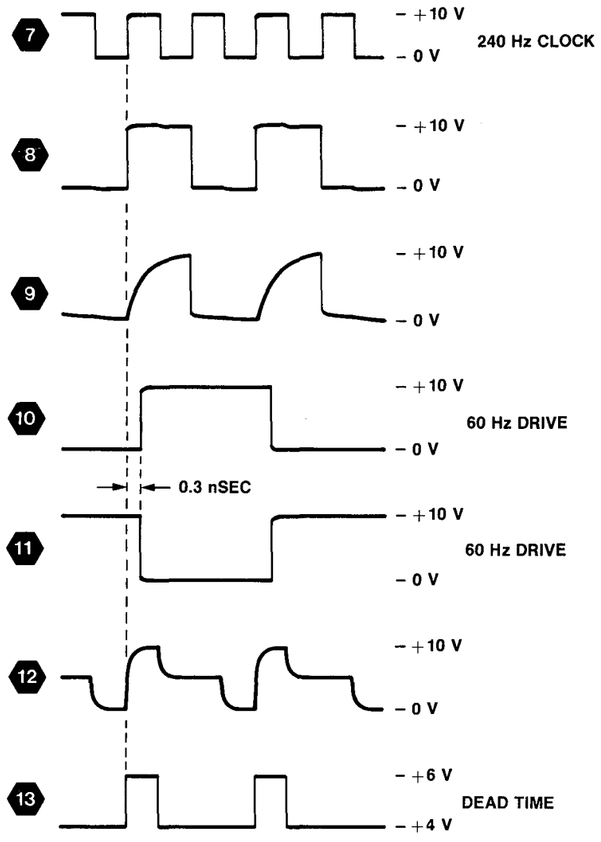
CHASSIS MOUNTED PARTS

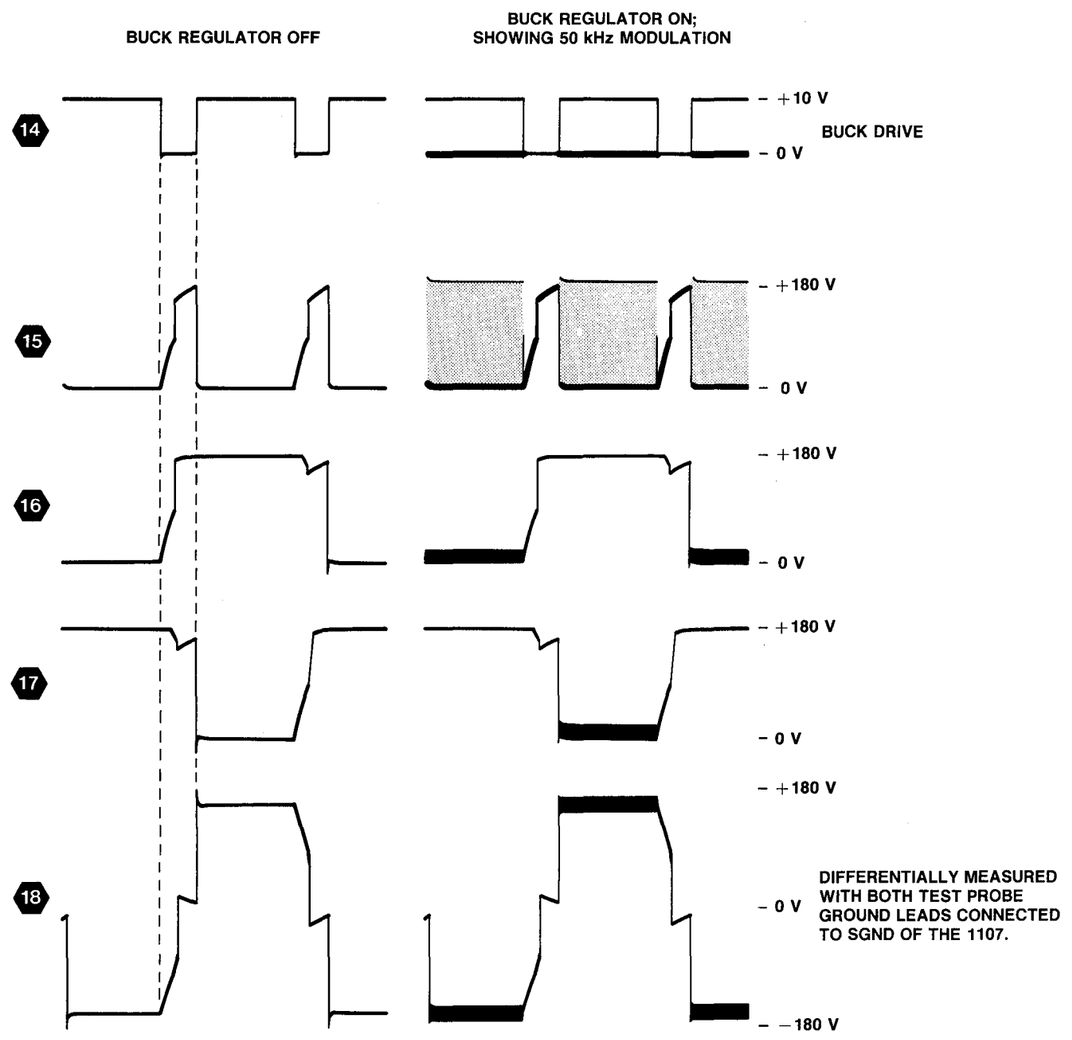
CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
P110	2B	CHASSIS	P111	1B	CHASSIS	S1	1D	CHASSIS

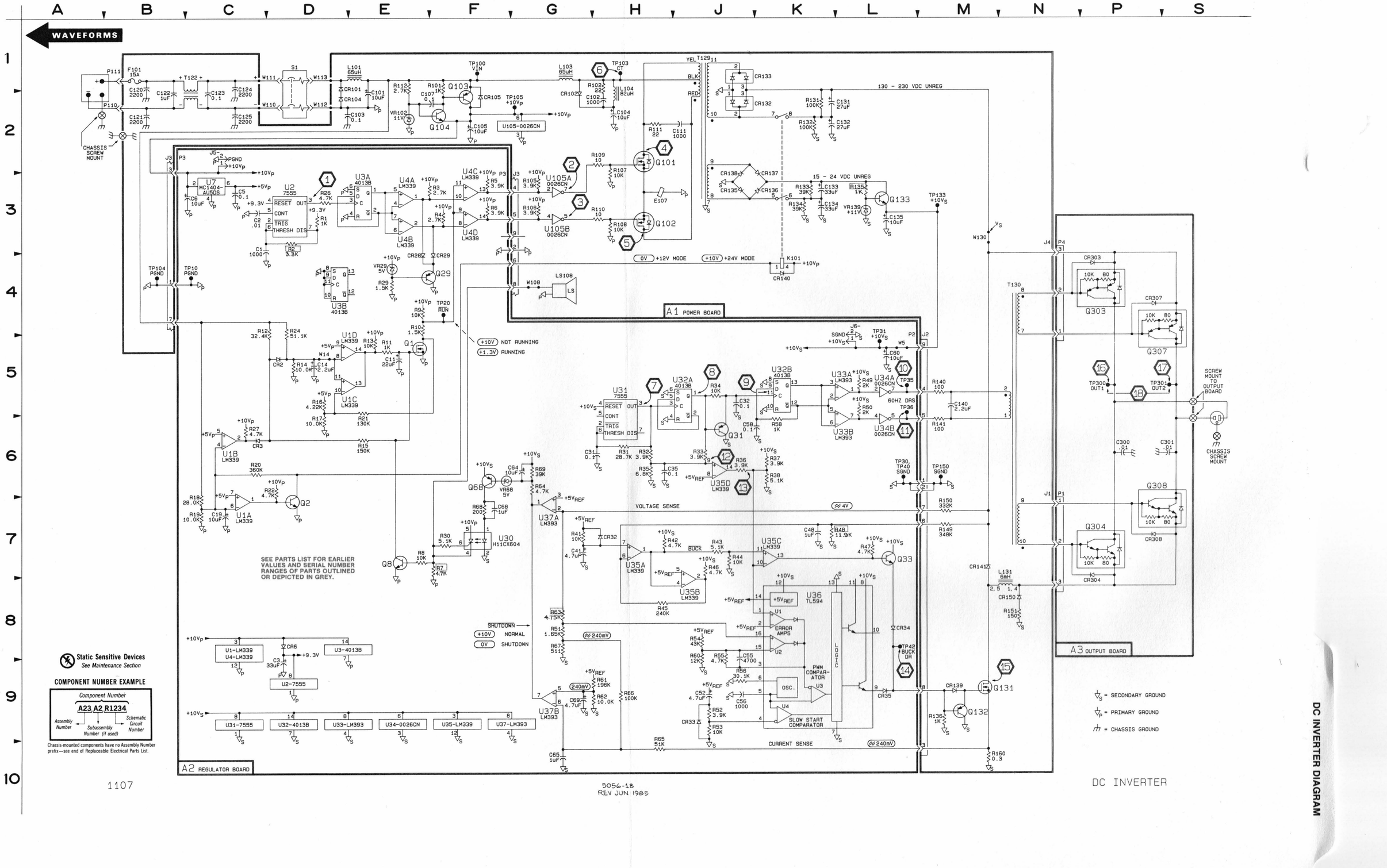
TEST WAVEFORM MEASUREMENTS

On the left-hand pages preceding the schematic diagram are test waveform illustrations that are intended to aid in troubleshooting the instrument. These test waveforms were obtained at the test points shown on the schematic diagram and circuit board illustrations. The test waveforms are representative of signals that may be expected at the associated points on the instrument.









Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE

Component Number
A23 A2 R1234
Assembly Number — *Subassembly Number (if used)* — *Schematic Circuit Number*

Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

1107

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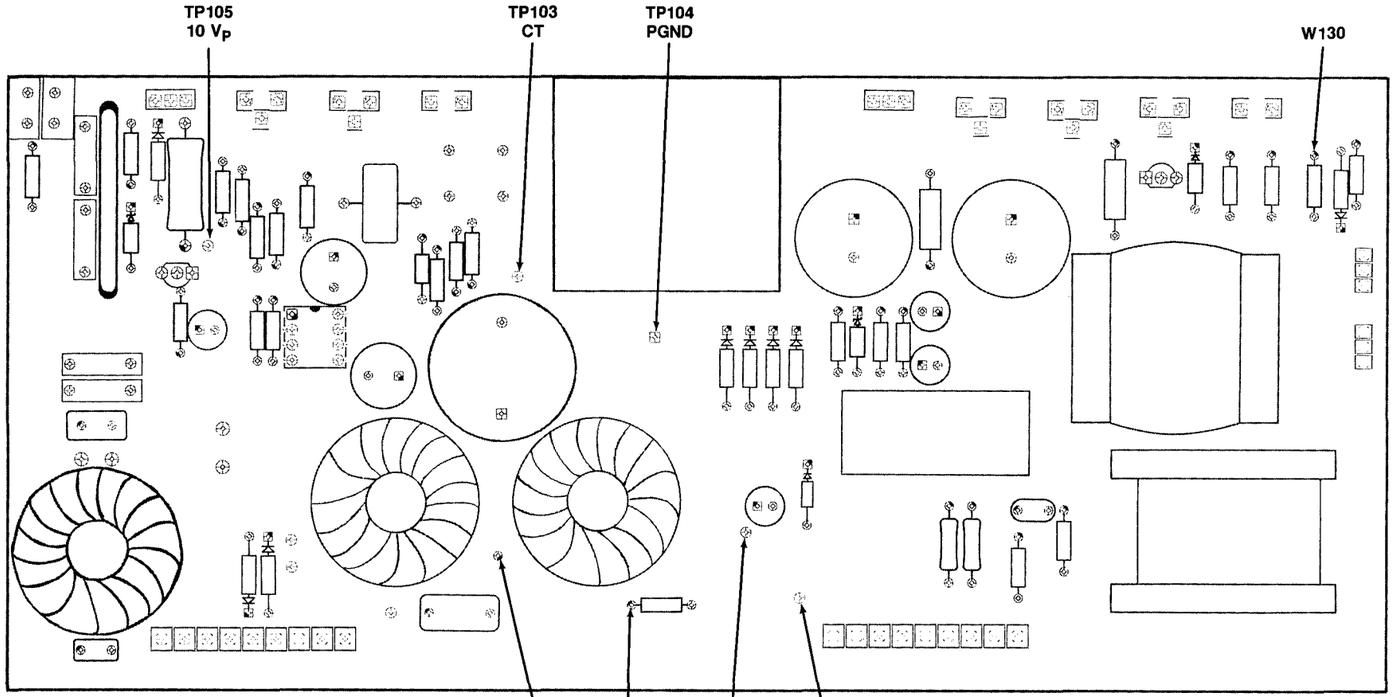
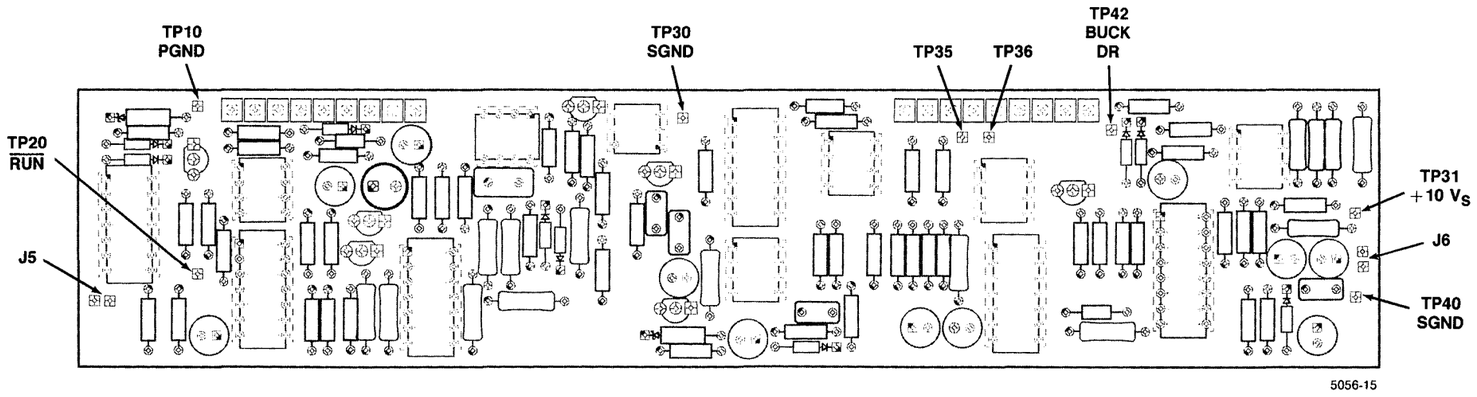
DC INVERTER

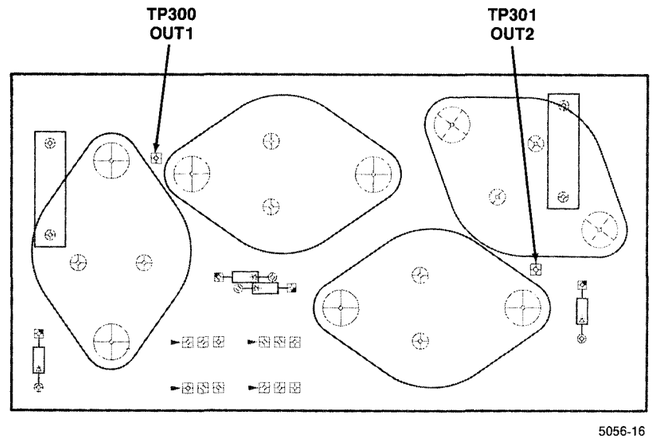
DC INVERTER DIAGRAM



A1—POWER BOARD TEST POINT LOCATIONS



A2—REGULATOR BOARD TEST POINT LOCATIONS



A3—OUTPUT BOARD TEST POINT LOCATIONS

TROUBLESHOOTING GUIDE INFORMATION

WARNING

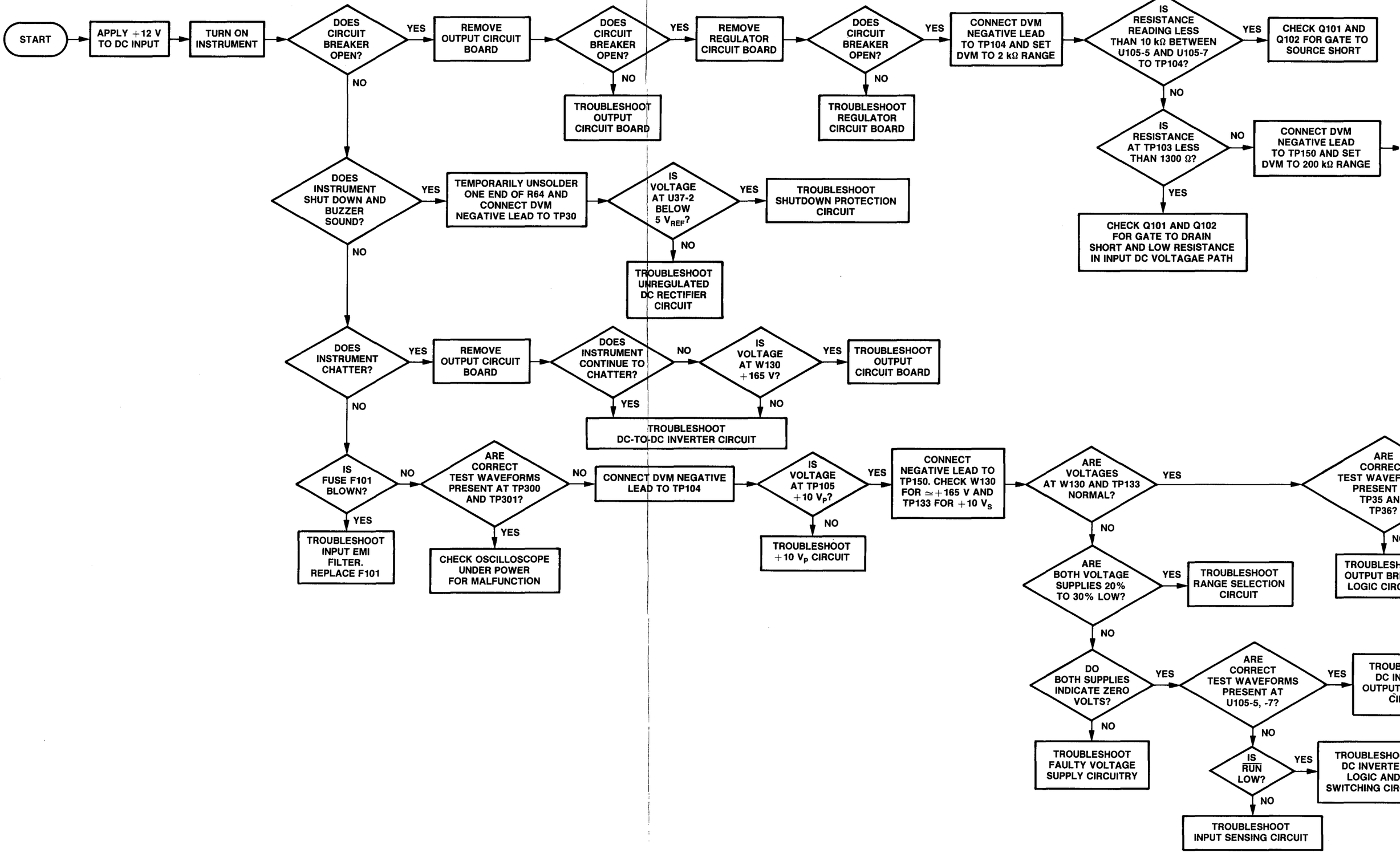
220 V_{pk} is present on the Output circuit board.

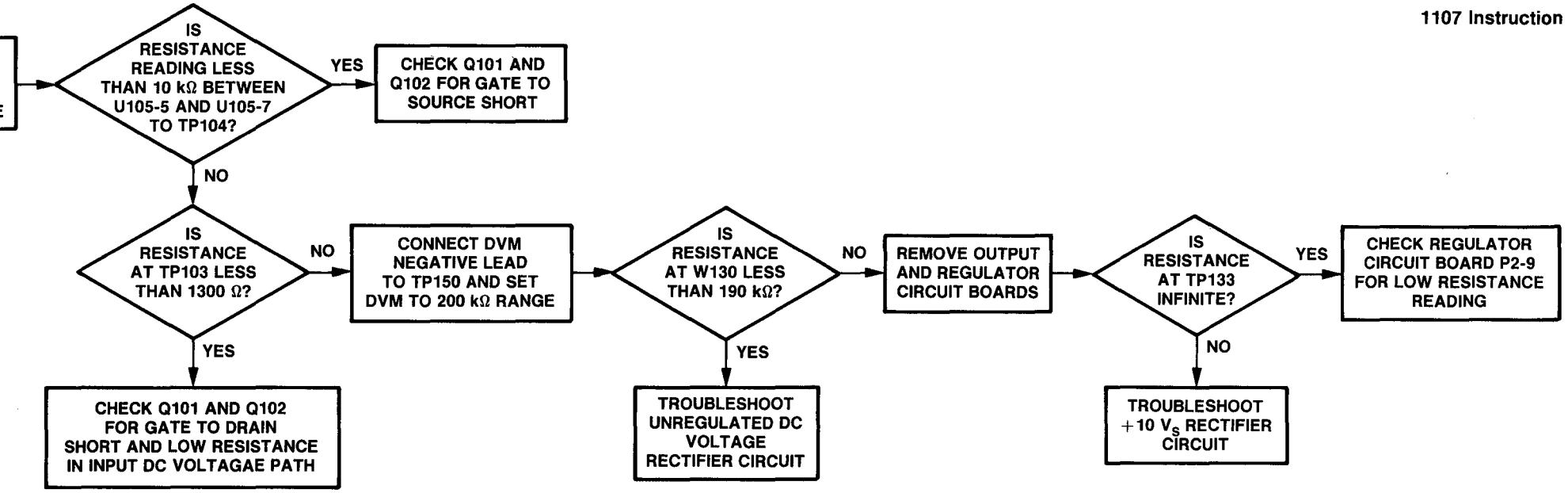
Use the schematic diagram, the block diagram, circuit board illustrations, and circuit descriptions when analyzing instrument malfunctions and locating test points. The schematic diagram includes typical waveforms and voltages that are intended as an aid in troubleshooting.

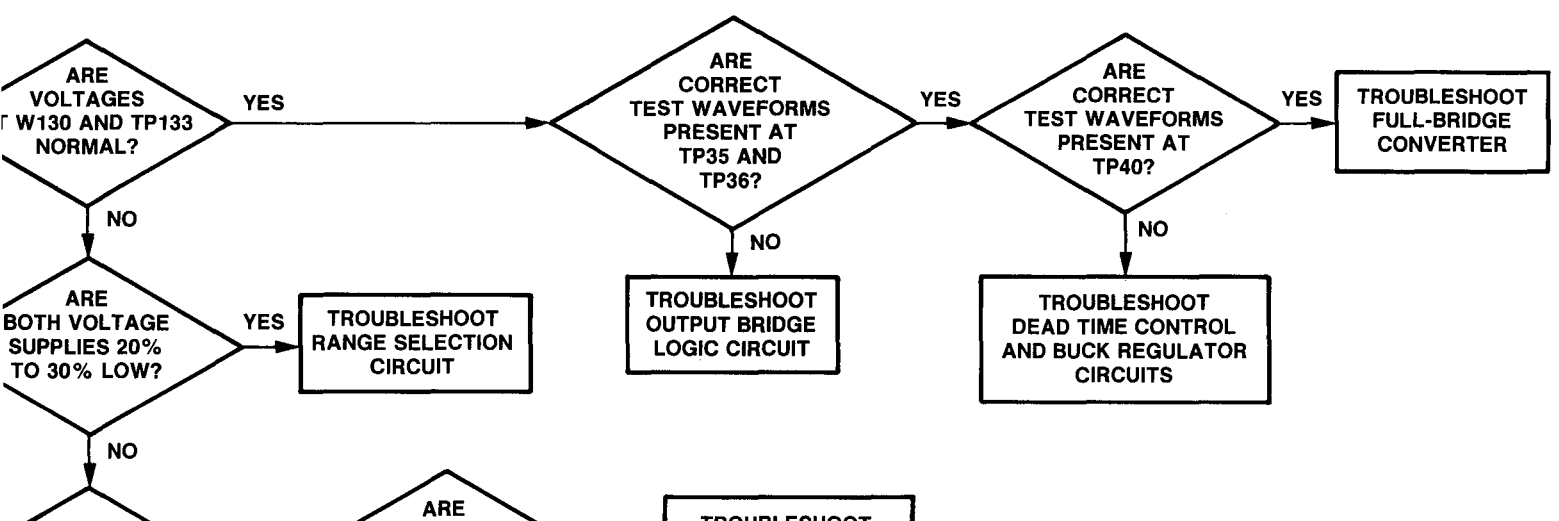
When troubleshooting the 1107, use a dc power source that provides 12 volts. The 12 volt power source will verify the correct operation of relay K101 (closing the contacts) in the Range Selection circuit.

Observe the correct grounding points (PGND and SGND) and power supplies (V_P and V_S) when measuring voltages within the instrument.

If a fault is suspected in the Regulator or the Output circuit boards, use the "Troubleshooting Regulator and Output Circuit Boards" procedure found in Section 6 of this manual.







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.

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.

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.

ABBREVIATIONS

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

CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
00779	AMP INC	P O BOX 3608	HARRISBURG PA 17105
06383	PANDUIT CORP	17301 RIDGELAND	TINLEY PARK IL 60477
06915	RICHCO PLASTIC CO	5825 N TRIPP AVE	CHICAGO IL 60646
09422	PLASTIC STAMPING CORP	2216 W ARMITAGE AVE	CHICAGO IL 60647
13103	THERMALLOY CO INC	2021 W VALLEY VIEW LANE P O BOX 34829	DALLAS TX 75234
16428	BELDEN CORP ELECTRONIC DIV	2200 US HWY 27 SOUTH P O BOX 1980	RICHMOND IN 47374
28520	HEYCO MOLDED PRODUCTS	147 MICHIGAN AVE P O BOX 160	KENILWORTH NJ 07033
70485	ATLANTIC INDIA RUBBER WORKS INC	571 W POLK ST	CHICAGO IL 60607
78189	ILLINOIS TOOL WORKS INC SHAKEPROOF DIVISION	ST CHARLES ROAD	ELGIN IL 60120
80009	TEKTRONIX INC	4900 S W GRIFFITH DR P O BOX 500	BEAVERTON OR 97077
93907	TEXTRON INC CAMCAR DIV	600 18TH AVE	ROCKFORD IL 61101
TK0409	KEN R HUMKE CO	2211 NW NICOLAI	PORTLAND OR 97210
TK0435	LEWIS SCREW CO	4114 S PEORIA	CHICAGO IL 60609
TK1034	R C DUDEK CO	10546 W PICO BLVD	LOS ANGELES CA 90064
TK1319	MORELLIS Q & D PLASTICS	1812 16-TH AVE	FOREST GROVE OR 97116
TK1372	ELECTRI-CORD MFG CO INC	312 EAST MAIN ST	WESTFIELD PA 16950
TK1717	PSM FASTENERS LTD	LONGACRES, WILLENHALL	WEST MIDLANDS WV13 2JS ENGLAND

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
1-1	200-2964-00	B010100	B010274	1	COVER,INVERTER:ALUMINUM	80009	200-2964-00
	200-2964-01	B010275		1	COVER,INVERTER:ALUMINUM	80009	200-2964-01
					ATTACHING PARTS		
-2	211-0008-00			6	SCREW,MACHINE:4-40 X 0.25,PNH,STL	93907	ORDER BY DESCR
					COVER ASSEMBLY INCLUDES:		
					END ATTACHING PARTS		
-3	343-0401-00			1	.RETAINER,CABLE:PLASTIC	06915	KKU-4
-4	348-0048-00	B010100	B010274	4	.FOOT,CAMERA:BLACK VINYL W/6-32 STUD	80009	348-0048-00
	348-0187-00	B010275		4	.FOOT,CABINET:BLACK POLYURETHANE	80009	348-0187-00
					ATTACHING PARTS		
-5	211-0008-00			4	.SCREW,MACHINE:4-40 X 0.25,PNH,STL	93907	ORDER BY DESCR
					END ATTACHING PARTS		
-6	407-3205-00			1	BRACKET,CMPNT:POWER SUPPLY,ALUMINUM	80009	407-3205-00
					ATTACHING PARTS		
-7	210-0457-00			3	NUT,PL,ASSEM WA:6-32 X 0.312,STL CD PL	78189	511-061800-00
					END ATTACHING PARTS		
-8	214-2270-00			2	CONTACT,ELEC:CRT TO SHLD,CU-BE CU-SN-ZN PL	80009	214-2270-00
-9	105-0952-00			2	LATCH,PWR SPLY:0.62 THK,EPOXY GLASS BLACK	80009	105-0952-00
					ATTACHING PARTS		
-10	211-0101-00			4	SCREW,MACHINE:4-40 X 0.25,FLH,100 DEG,STL	TK0435	ORDER BY DESCR
-11	210-0586-00			4	NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	78189	211-041800-00
					END ATTACHING PARTS		
-12	161-0197-00			1	CA ASSY,SP,ELEC:3,18 AWG,125V,9.75 L	TK1372	ECM-161-0197-00
-13	358-0323-00			1	BSHG,STRAIN RLF:U/W 0.29 DIA CABLE,R ANGLE	28520	SR-15-1
-14	----- -----			1	CKT BOARD ASSY:OUTPUT (SEE A3 REPL)		
					ATTACHING PARTS		
-15	211-0504-00			2	SCREW,MACHINE:6-32 X 0.250,PNH,STL	TK0435	ORDER BY DESCR
					END ATTACHING PARTS		
					OUTPUT BOARD ASSY INCLUDES:		
-16	361-1333-00			4	.SPACER,XSTR MTG:GLASS FILLED NYLON,TO-3	13103	8180E1
-17	----- -----			4	.TRANSISTORS:(SEE Q303,Q304,Q307,Q308 REPL)		
					ATTACHING PARTS		
-18	210-0457-00			8	.NUT,PL,ASSEM WA:6-32 X 0.312,STL CD PL	78189	511-061800-00
					END ATTACHING PARTS		
-19	131-1688-00			2	.TERM,QIK DISC.:MALE,0.032 X 0.25 BL	00779	42577-4
-20	441-1564-01			1	CHASSIS,INV:MAIN	80009	441-1564-01
-21	361-0045-00			2	.SPACER,POST:1.062 L W/6-32 THD ONE END,AL	TK1034	ORDER BY DESCR
-22	129-0584-00			6	.SPACER,POST:0.25 L,4-40,SST,0.165 OD	80009	129-0584-00
-23	220-0646-00			4	.NUT,PRESSMOUNT:4-40 X 0.188 HEX,SST	80009	220-0646-00
-24	355-0054-00			2	.STUD,PRESSMOUNT:6-32 X 0.312,STL CD PL	TK1717	PFH6-32X 5/16
-25	334-6227-00			1	MARKER,IDENT:BLANK	80009	334-6227-00
-26	210-0457-00			2	NUT,PL,ASSEM WA:6-32 X 0.312,STL CD PL	78189	511-061800-00
					(ATTACHES GND LUG TO CHASSIS)		
-27	334-3379-04			2	MARKER,IDENT:MKD GRND SYMBOL,12/334-3379-00	80009	334-3379-04
-28	407-3205-01			1	BRACKET,CMPNT:PWR SPLY,ALUMINUM	80009	407-3205-01
					ATTACHING PARTS		
-29	210-0457-00			3	NUT,PL,ASSEM WA:6-32 X 0.312,STL CD PL	78189	511-061800-00
					END ATTACHING PARTS		
-30	211-0578-00			1	SCREW,MACHINE:6-32 X 0.438,PNH,STL	TK0435	ORDER BY DESCR
					(GROUND SCREW)		
-31	650-1771-00			1	CONNECTOR ASSY:PWR,MALE,125VDC,7A	80009	650-1771-00
					ATTACHING PARTS		
-32	211-0038-00			2	SCREW,MACHINE:4-40 X 0.312,FLH,100 DEG	TK0435	ORDER BY DESCR
-33	210-0589-00			2	NUT,SLFLKG,HEX:4-40 X 0.246,STL CD PL	TK0409	CF22NM40
					END ATTACHING PARTS		
-34	----- -----			1	CIRCUIT BREAKER:(SEE S1 REPL)		
-35	337-3251-00			1	SHIELD,ELEC:DC CONNECTOR	80009	337-3251-00
					ATTACHING PARTS		
-36	211-0565-00			1	SCREW,MACHINE:6-32 X 0.250,TRH,STL	TK0435	ORDER BY DESCR
					END ATTACHING PARTS		
-37	214-3585-00			1	HEAT SINK,XSTR:2,TO-220,ALUMINUM	80009	214-3585-00
					ATTACHING PARTS		
-38	211-0038-00			2	SCREW,MACHINE:4-40 X 0.312,FLH,100 DEG	TK0435	ORDER BY DESCR
-39	211-0008-00			2	SCREW,MACHINE:4-40 X 0.25,PNH,STL	93907	ORDER BY DESCR
					END ATTACHING PARTS		
-40	348-0873-00			1	GASKET,HT SK:3.25 L,INSUL BURQUIST ADHSV	80009	348-0873-00

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
1-41	348-0037-00			2	FOOT:BLACK RUBBER	70485	1059
					ATTACHING PARTS		
-42	211-0008-00			2	SCREW,MACHINE:4-40 X 0.25,PNH,STL	93907	ORDER BY DESCR
					END ATTACHING PARTS		
-43	342-0389-00			9	INSULATOR,PLATE:TRANSISTOR,NYLON	TK1319	N/A
-44	----- -----			1	CKT BOARD ASSY:MAIN PWR (SEE A1 REPL)		
					ATTACHING PARTS		
-45	211-0008-00			6	SCREW,MACHINE:4-40 X 0.25,PNH,STL	93907	ORDER BY DESCR
					END ATTACHING PARTS		
					MAIN BOARD ASSY INCLUDES:		
-46	----- -----			4	.SEMICOND:(SEE CR102,CR132,CR133,CR141 REPL)		
					.XISTORS:(SEE Q101,Q102,Q103,Q131,Q133 REPL)		
-47	----- -----			1	.RELAY:(SEE K101 REPL)		
-48	361-1270-00			1	.SPACER,RELAY:PLASTIC	80009	361-1270-00
					.(UNDER K101)		
	346-0128-00			1	.STRAP,TIEDOWN,E:8.0 L X 0.1 W,NYLON	06383	PLT2M
-49	----- -----			2	.COILS:(SEE L101,L103 REPL)		
					ATTACHING PARTS		
-50	211-0019-00			2	.SCREW,MACHINE:4-40 X 1.0,PNH,STL	TK0435	ORDER BY DESCR
-51	210-0586-00			2	.NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	78189	211-041800-00
					END ATTACHING PARTS		
-52	348-0037-00			2	.FOOT:BLACK RUBBER	70485	1059
-53	210-0894-00			1	.WASHER,FLAT:0.19 ID X 0.438 OD X 0.031	09422	ORDER BY DESCR
					.(UNDER L104)		
-54	214-3788-00			1	.INSUL,SPACER:CLEAR,POLYESTER	80009	214-3788-00
					.(UNDER T122)		
-55	344-0380-00			1	CLIP,SPR TNSN:HEAT SINK,PH BRONZE	80009	344-0380-00
					ATTACHING PARTS		
-56	211-0565-00			3	SCREW,MACHINE:6-32 X 0.250,TRH,STL	TK0435	ORDER BY DESCR
					END ATTACHING PARTS		
-57	344-0381-00			1	CLIP,SPR TNSN:HEAT SINK,PA BRONZE	80009	344-0381-00
					ATTACHING PARTS		
-58	211-0565-00			2	SCREW,MACHINE:6-32 X 0.250,TRH,STL	TK0435	ORDER BY DESCR
-59	----- -----			1	CKT BOARD ASSY:REGULATOR (SEE A2 REPL)		
					STANDARD ACCESSORIES		
	070-5056-00			1	MANUAL,TECH:INSTR,1107	80009	070-5056-00
	161-0095-00			1	CABLE ASSY,PWR,:3,18AWG,125V,20.0 L	16428	KH7668
					OPTIONAL ACCESSORIES		
	016-0783-01			1	ACCESSORY KIT:MOUNTING,1107 TO 2400	80009	016-0783-01
	016-0785-00			1	ACCESSORY KIT:MOUNTING,1107 TO 2200	80009	016-0785-00
	016-0786-00			1	ACCESSORY KIT:MOUNTING,1107 TO 2300	80009	016-0786-00
	016-0797-02			1	ACCESSORY KIT:MOUNTING,1106 TO 2400	80009	016-0797-02

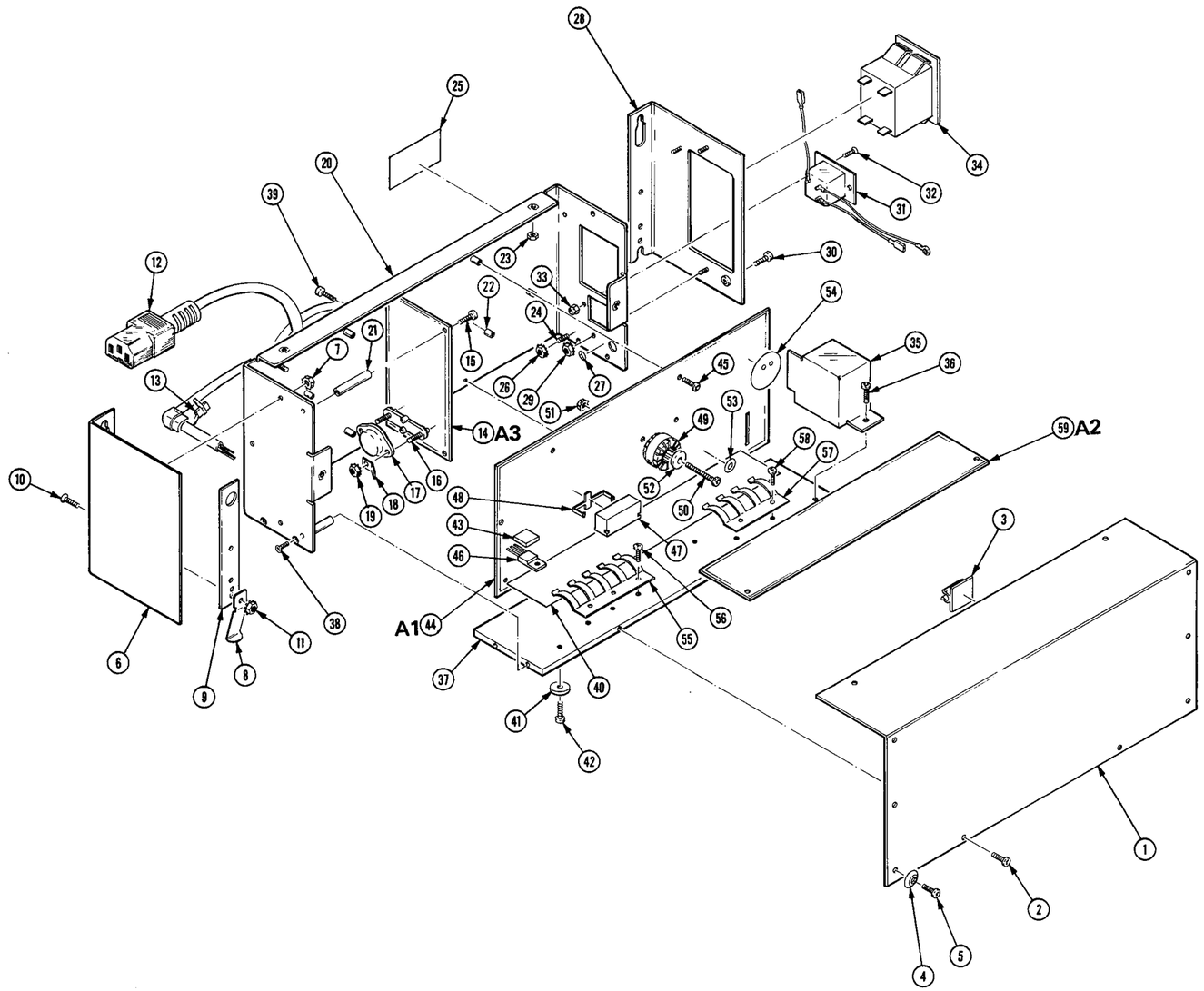


FIG. 1 EXPLODED VIEW

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.

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MANUAL CHANGE INFORMATION

Date: 4-28-87 Change Reference: M62738

Product: 1107 INSTRUCTION Manual Part No.: 070-5056-00

DESCRIPTION Product Group 46

EFFECTIVE SERIAL NUMBER: B010433

REPLACEABLE ELECTRICAL PARTS LIST CHANGES

CHANGE TO:

A2U3	156-0366-00	MICROCKT,DGTL: DUAL D FLIP-FLOP
A2U32	156-0366-00	MICROCKT,DGTL: DUAL D FLIP-FLOP