

TEKTRONIX®

**PG 508
50 MHz
PULSE GENERATOR**

INSTRUCTION MANUAL

Tektronix, Inc.
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Serial Number _____



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OPERATING INSTRUCTIONS

Instrument Description

The PG 508 is a 50 MHz general purpose full function pulse generator usable in all TM 500-series power modules except the TM 501. It is compatible with MOS and other general purpose circuitry. Important features of the instrument include independent period and duration controls with a control error light, independent pulse top and bottom level controls, variable leading and trailing transition time adjustments, and fully adjustable pulse delay capabilities. Front panel controls and connectors provide a trigger or synchronous gate input with level and slope controls, square wave output and complementary pulse output for high duty factors. Delayed and paired pulse and manual trigger or gate capabilities are also provided. All inputs and outputs are internally terminated in 50 Ω except the TRIG/GATE input which is internally selectable for either 50 Ω or 1 M Ω , 20 pF input impedance. Special positions on PERIOD, DURATION, DELAY, and TRANSITION controls permit customized control ranges.

The front panel is color coded for easy reference to controls and their associated functions. Green indicates triggering functions and blue indicates mode functions.

Installation and Removal

The PG 508 is calibrated and ready for use when received. It operates in any two compartments of the TM 500-series power modules. See the power module instruction manual for line voltage requirements and power module operation. Fig. 1-1 shows the installation and removal procedure. Make certain the power module is **off** when inserting or removing the PG 508. Check that the PG 508 is fully inserted in the power module. Pull the power switch on the power module. The POWER light on the PG 508 should now be on. Refer to the Controls and Connectors foldout page in Section 4 of this manual for a complete description of the front panel controls and connectors.

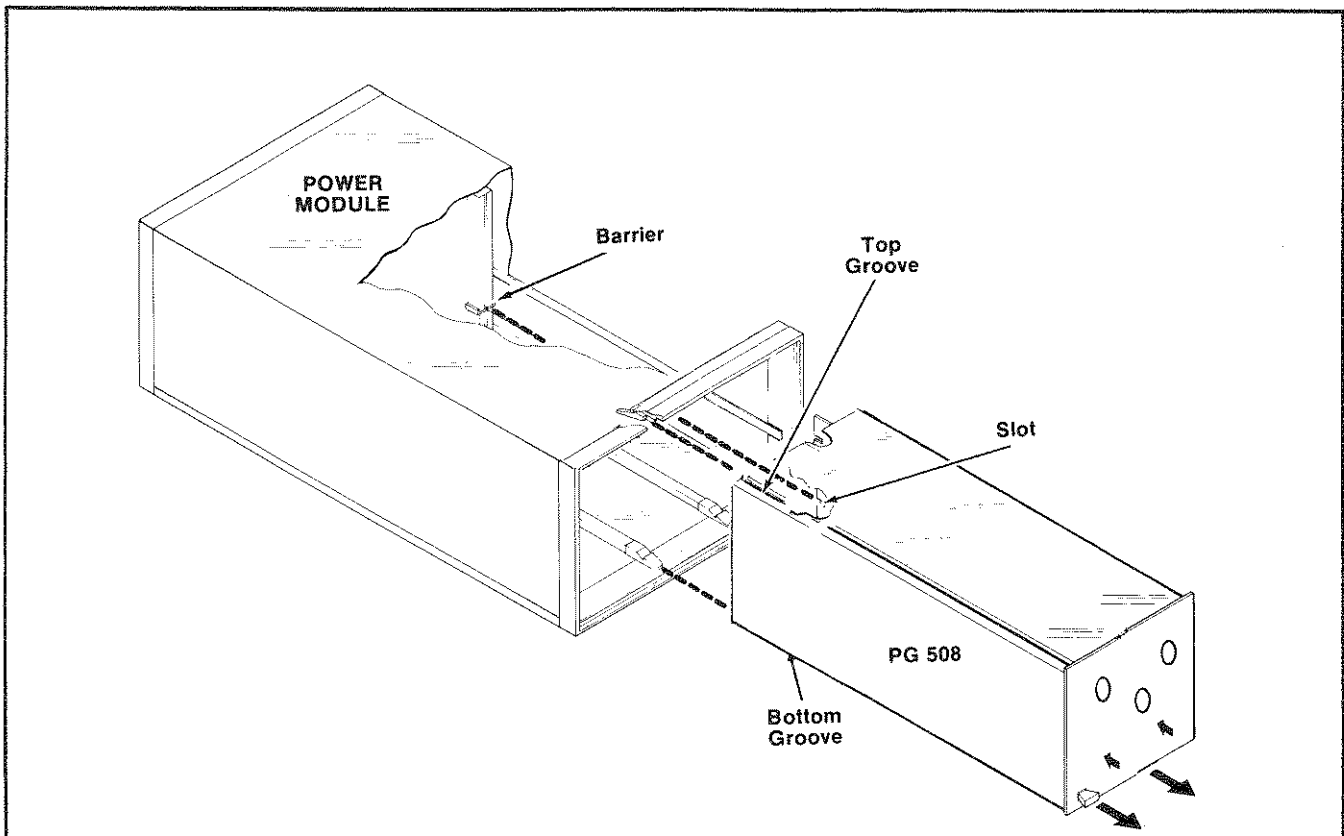


Fig. 1-1. PG 508 installation and Removal.

BASIC OPERATION

Period and Duration Selection

The period generator operates, in all modes except EXT TRIG or MAN, at a rate set by the PERIOD range switch and variable control. The duration of the output pulse is set by the DURATION range switch and variable control. When the DURATION control is set for a time greater than the PERIOD, the CONTROL ERROR lamp will light. When the DURATION control is set to the SQ WAVE position, the duration time is determined internally at approximately 50% of the period time.

The custom range positions on the PERIOD and DURATION controls permit user-selected period and duration times. To determine the approximate capacitor value for the desired period, multiply the period time in seconds by 5×10^{-3} . The result is the value of the capacitor in Farads. For example, a 50 ms period times 5×10^{-3} equals 250×10^{-6} or 250 μF . This capacitor must be non-polarized and have at least a 3 V rating. Solder this capacitor in the position shown in Fig. 1-2.

To determine the capacitor value for the duration time desired, multiply the duration time by 1×10^{-2} . For example a 50 ms duration time requires 50 ms times 1×10^{-2} or a

500 μF capacitor. If a polarized capacitor is used, observe the correct polarity. Use at least a 3 V rated capacitor. Connect this capacitor as shown in Fig. 1-2.

Duty Factors

Duty factors greater than those specified are obtainable on several ranges. When the duty factor is increased to the point that internal circuitry prevents completion of the pulse waveform, the CONTROL ERROR light will flash. To further increase the duty factor, switch to the complement mode. Set the DURATION control for a pulse width equal to the desired pulse off time and push the front panel COMPLEMENT (–) pushbutton.

Delayed and Paired Pulse Selection

In the pulse delay mode, the output pulse is delayed from the +TRIG OUT signal by the DELAY time selected plus a specified fixed delay. In the PAIRED mode of operation, the delay controls the time between the leading edges of the paired pulses. To use this feature push the DELAY button and trigger the external device from the +TRIG OUT jack. Set the DELAY control for the desired delay time from trigger to pulse leading edge. Use the variable control labeled CAL for time adjustments between steps or to increase the delay times beyond the steps.

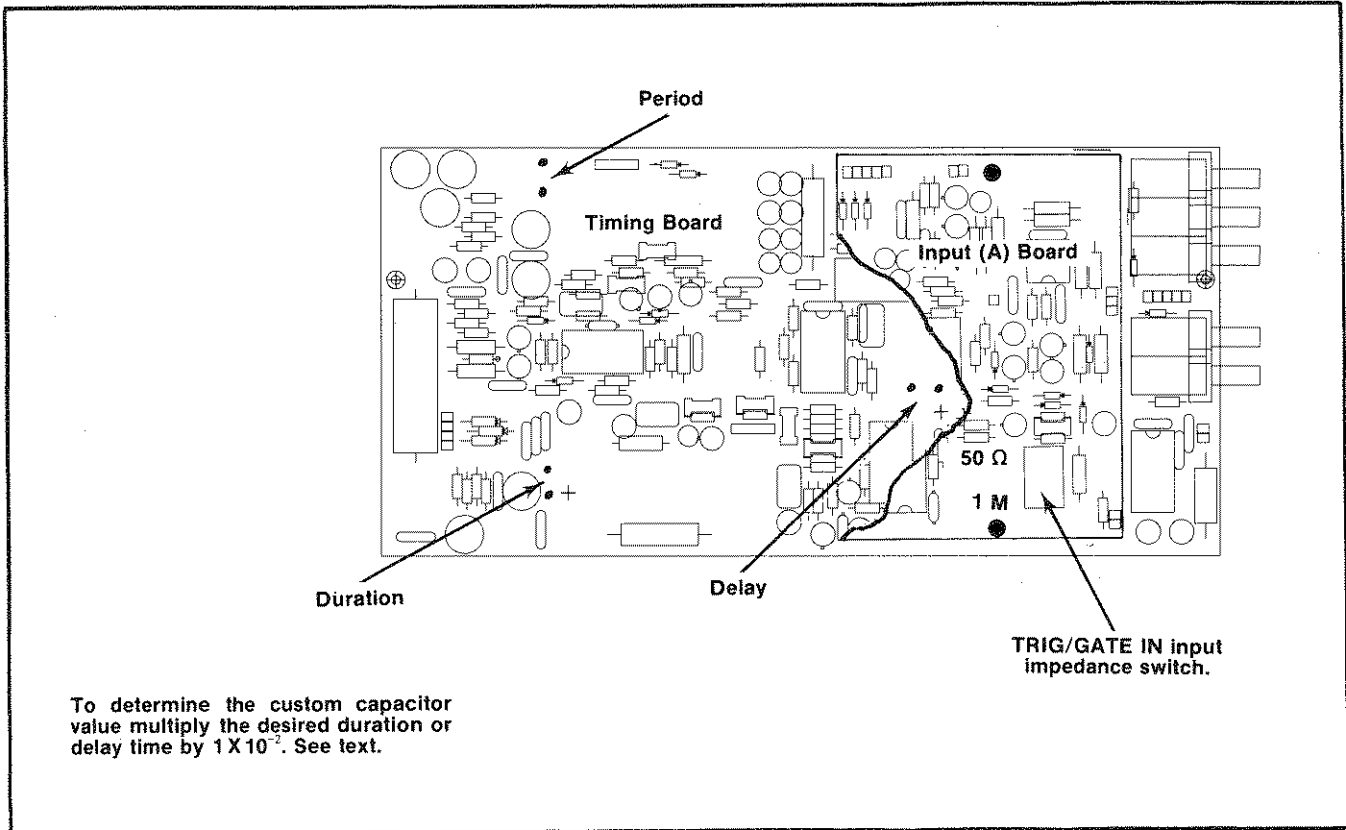


Fig. 1-2. Locations of period, delay and duration custom timing capacitors and TRIG/GATE IN input impedance switch. Remove the input board to gain access to the delay pads.

Paired pulses are obtained by pushing both the DELAY and UNDLY buttons. An initial pulse now occurs at external trigger time with the second or paired pulse delayed by the selected delay time. The CONTROL ERROR light illuminates if the delay is too short or long for a valid pulse train. A custom delay position is provided on the DELAY switch. To determine the value of the capacitor required, multiply the desired delay time in seconds by 1×10^{-2} . For example, a 50 ms delay time requires a $500 \mu\text{F}$ capacitor ($50 \text{ ms times } 1 \times 10^{-2}$). Use either a polarized or non-polarized capacitor with a rating of at least 50 V. If a polarized capacitor is used, observe the polarity markings. Remove the input board and connect the capacitor as shown in Fig. 1-2.

Transition Time Selection

The leading and trailing times of the pulses may be varied by using the TRANSITION TIME control and the LEADING and TRAILING variable controls. Select the desired transition time range with the TRANSITION TIME control and vary the leading and trailing times independently with the LEADING and TRAILING controls.

A custom range position is also provided on the TRANSITION TIME control. To select the correct capacitor (in Farads) for this range, multiply the desired transition time (in seconds) measured from 10% to 90% points, by 4.4×10^{-3} . For example, a desired transition time of 50 ms requires a capacitor of $220 \mu\text{F}$. Connect the capacitor as shown in Fig. 1-3. Use a capacitor with at least a 10 V rating and observe polarity requirements.

When the transition times become large compared with the duration or period times and the pulse does not reach full amplitude, the CONTROL ERROR light will flash indicating improper control settings.

Output Levels

The output amplitude and offset are selected by independent pulse LOW LEVEL and HIGH LEVEL controls. Use the front panel voltage calibration marks for an open circuit load and divide the values by two when the PG 508 is operating into a 50Ω load. The OUTPUT (VOLTS) controls are interlocked to prevent setting the HIGH LEVEL more negative than the LOW LEVEL. It is also impossible to set the controls for more than about 20 V peak to peak output amplitude into an open circuit or 10 V into 50Ω .

Pulse amplitude always equals the pulse high level minus the pulse low level. Offset may be the high level or the low level, whichever is used as the base line reference level. The flexibility of this method is useful in certain applications such as logic testing. Either the high or low level can be varied without disturbing the other.

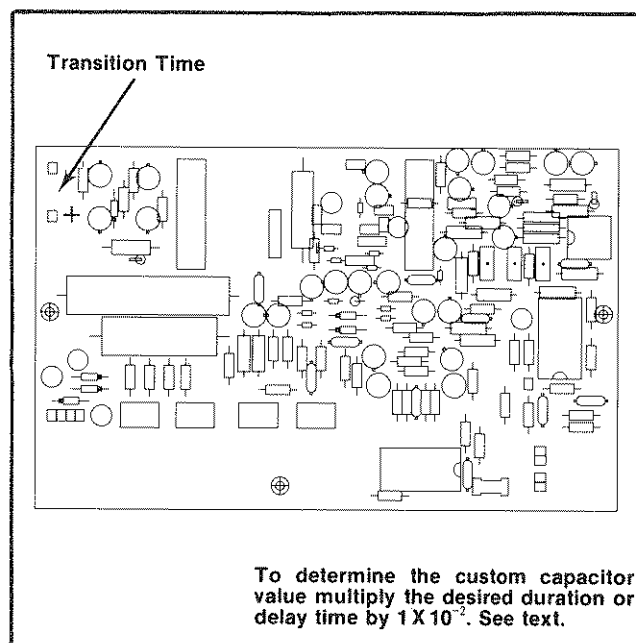


Fig. 1-3. Location for transition custom timing capacitor.

The pulse high and low levels can be preset. Push the PRESET button and adjust the HIGH LEVEL and the LOW LEVEL potentiometers with a screwdriver for the desired output levels.

External Triggering and Gating

To change the TRIG/GATE IN input impedance remove the plug-in from the mainframe. Remove the left side cover. Set the slide switch, located on the Input board and labeled Input Impedance, to either the 50Ω or the $1 \text{ M}\Omega$ position. In the $1 \text{ M}\Omega$ position the shunt capacitance is approximately 20 pF . A standard oscilloscope probe can be used to acquire the triggering signal from the external circuitry. If a compensated probe is used, calibrate the probe on the input of a $1 \text{ M}\Omega$ 20 pF oscilloscope first. A 10X probe allows triggering directly from high impedance sources such as MOS digital circuitry with an effective TRIG/GATE LEVEL range of $\pm 30 \text{ V}$.

For external gating select the desired period and duration. Press the SYNC GATE pushbutton. Select the desired trigger slope with the + or - SLOPE button. The OUTPUT now consists of pulses, described by the front panel controls, whenever the TRIG/GATE IN input exceeds the TRIG/GATE LEVEL control setting.

To externally trigger the PG 508, connect the triggering signal to the TRIG/GATE IN connector. Select the slope on which triggering is desired with the + or - SLOPE button. Place the PERIOD switch in the EXT TRIG OR MAN position. Now adjust the TRIG/GATE LEVEL control for the desired triggering level. The output waveform commences about 48 ns after the triggering signal.

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For external DURATION place the DURATION control in the EXT DUR position, and the PERIOD control in the EXT TRIG OR MAN position. The period and duration of the output waveform are now controlled by the triggering waveform. This is an extremely useful mode of operation for translating logic levels, etc. If the PERIOD is set for internal operation and the DURATION for external, the CONTROL ERROR light illuminates indicating an illegal mode of operation.

The TRIG'D/GATED indicator light functions as a TRIG/GATE level indicator. When the +SLOPE is selected and the external input level exceeds the threshold set by the TRIG/GATE LEVEL control, the light is on continuously. For input voltages below the threshold the light is continuously off. When the input transits through the threshold the light flashes. When the -SLOPE is selected the light behaves as for +SLOPE selection. However, the polarities are reversed.

The TRIG'D/GATED indicator light may be used as a logic level indicator for troubleshooting logic circuitry. Set the TRIG/GATE LEVEL control to a voltage equal to the midrange value of the logic voltage swing. If an attenuator probe is used for signal pickup, remember to consider the attenuation factor when setting the TRIG/GATE LEVEL voltage.

Trigger Output

The signal appearing at the connector is an approximate square wave. The leading edge (positive-going)

precedes the output pulse by a specified fixed delay plus the delay as set by the DELAY control. In paired pulse operation, the leading edge precedes the first pulse by the fixed delay. The second pulse then appears after the set delay. A complement square wave (negative-going leading edge) is also available at the front panel by moving a connector on the timing circuit board. See the illustration on the Rear Interface Connector Assignments at the rear of this manual for the location of this connector.

Manual Trigger

To use this feature place the PERIOD switch in the EXT TRIG OR MAN position. Set the TRIG/GATE LEVEL control fully clockwise. If the +SLOPE is selected, the manual trigger will occur when the MAN button is depressed. If the -SLOPE is selected, the trigger occurs when the button is released. The manual trigger causes one output pulse, or a set of paired pulses if the DELAY and UNDLY buttons are depressed.

Control Error Light

The CONTROL ERROR light helps to solve setup problems by indicating most control errors. A steady glow indicates static control setting errors while a flashing light indicates dynamic errors. In either case, the control settings do not correctly indicate the output. Check the control settings for compatibility. See Table 1-1. Dynamic functions monitored are period, delay, duration and transition time.

OPERATING CONSIDERATIONS

Output Terminations and Connections

The PG 508 operates as a voltage source in series with an internal 50 Ω impedance. Maximum pulse fidelity is obtained when the output operates into an external 50 Ω impedance. The output circuitry of the PG 508 is fully protected against any voltage transients when operating into passive loads.

Table 1-1 lists static control settings that illuminate the CONTROL ERROR light and their corresponding operating modes. Some of these modes may be useful.

If the load has a dc voltage across it, connect a blocking capacitor in series with the OUTPUT connector and the load. Make certain the time constant of the capacitor and load is large enough to maintain pulse top flatness.

TABLE 1-1

Control Settings	Operation
EXT TRIG OR MAN and SYNC GATE	External Trigger Mode
EXT DUR and Internal Period	Square Wave Mode
EXT TRIG OR MAN and SQ WAVE (INT PERIOD)	External Duration Mode
SQ WAVE (INT PERIOD) and SYNC GATE	Truncated square wave when gate ends
SQ WAVE (INT PERIOD) and DELAY	No delay
EXT DUR and DELAY	No delay

Risetime Measurements in Linear Systems

Consider the rise and falltime of associated equipment when measuring the rise or falltime of a linear device. If the risetime of the device under test is at least ten times slower than the combined risetimes of the PG 508, the monitoring oscilloscope, and associated cables, the error introduced will not exceed 1%, and usually may be ignored. If the rise or falltime of the test device is less than ten times slower than the combined risetimes of the testing systems, determine the actual risetime of the device under test by using the following formula:

$$R_t = \sqrt{R_1^2 + R_2^2 + R_3^2 + \dots}$$

R_t equals the overall rise or falltime of the entire measurement system and $R_1, R_2, R_3,$ etc., are the risetimes or falltimes of the individual components comprising the system.

External Voltage Control

The high and low level output voltages can be controlled externally through pins 22B and A at the rear interface connector. Fig. 1-4 shows the equivalent circuit.

Connections must be made from pad K to pad L and pad M to pad N located as shown on the adjustment location illustration in the fold out pages at the rear of this manual. Use ordinary hookup wire of the proper length. Solder the wire to the pads. Also note the location of the Ext Hi and Ext Lo potentiometers on the output board.

To use this feature, set the front panel controls as follows: depress the PRESET button (PRESET), place the PERIOD switch in the EXT TRIG OR MAN position, the DURATION in EXT DUR and the NORM COMPLEMENT switch in the NORM position (out). Use a screwdriver to center the Ext Hi and the preset HIGH LEVEL controls. Supply a voltage to the external high input (pin 22B on the rear interface connector) equal to the lowest external input voltage desired (maximum 20 V).

Now adjust the front panel preset HIGH LEVEL control for an OUTPUT voltage equal to the minimum desired output voltage. It may be necessary to adjust the preset LOW LEVEL control as the OUTPUT voltage is limited to 20 V peak to peak open circuit. The high level OUTPUT voltage is clamped by the low level OUTPUT voltage if this range is exceeded. Now apply a voltage equal to the highest external control voltage desired to the same rear interface connector (pin 22B). Adjust the Ext Hi potentiometer until the highest desired output voltage is obtained. It may be necessary to adjust the preset LOW LEVEL control to obtain the desired output. The high level OUTPUT voltage cannot go below the low level OUTPUT voltage due to the level control voltage clamps. The Ext Hi and the preset HIGH LEVEL controls interact. It may be necessary to repeat the above procedure several times until the desired results are obtained.

Now push the NORM COMPLEMENT switch (COMPLEMENT). Center the Ext Lo and preset LOW LEVEL potentiometers. Supply a voltage to pin 22A of the rear interface connector equal to the lowest external control voltage desired. Adjust the preset LOW LEVEL control for an OUTPUT voltage equal to the lowest OUTPUT voltage desired. Change this voltage to the highest desired external control voltage. Adjust the Ext Lo potentiometer for the highest OUTPUT voltage desired. As these adjustments interact, readjust the preset LOW LEVEL and the Ext Lo potentiometers for the desired results. Do not readjust the preset HIGH LEVEL or the Ext Hi potentiometers. The OUTPUT voltages now vary linearly and independently with the external control voltage.

Counted Burst Using the DD 501 Digital Delay Unit

This application permits preselecting the number of output pulses from the PG 508. The event is initiated by an externally applied signal or pulse, 5 ns or longer. The time duration of this signal or pulse has no effect on the output from the PG 508.

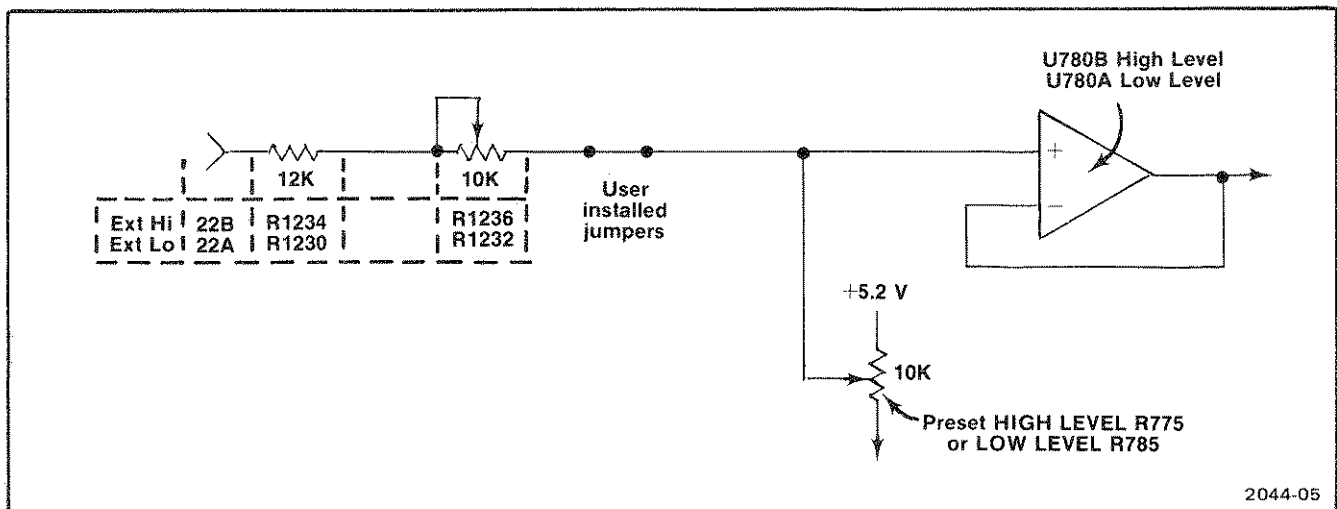


Fig. 1-4. Equivalent circuit of external input for output voltage control.

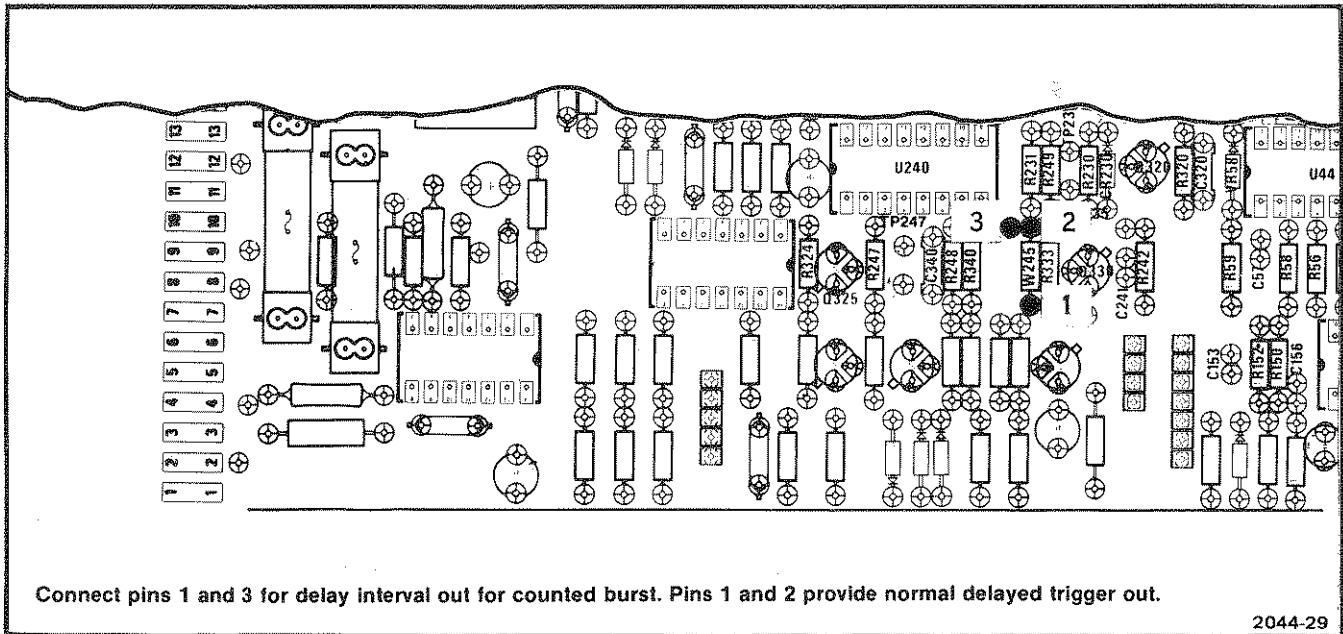


Fig. 1-5. Location of trigger jumpers in DD 501 for selecting trigger or delay interval output.

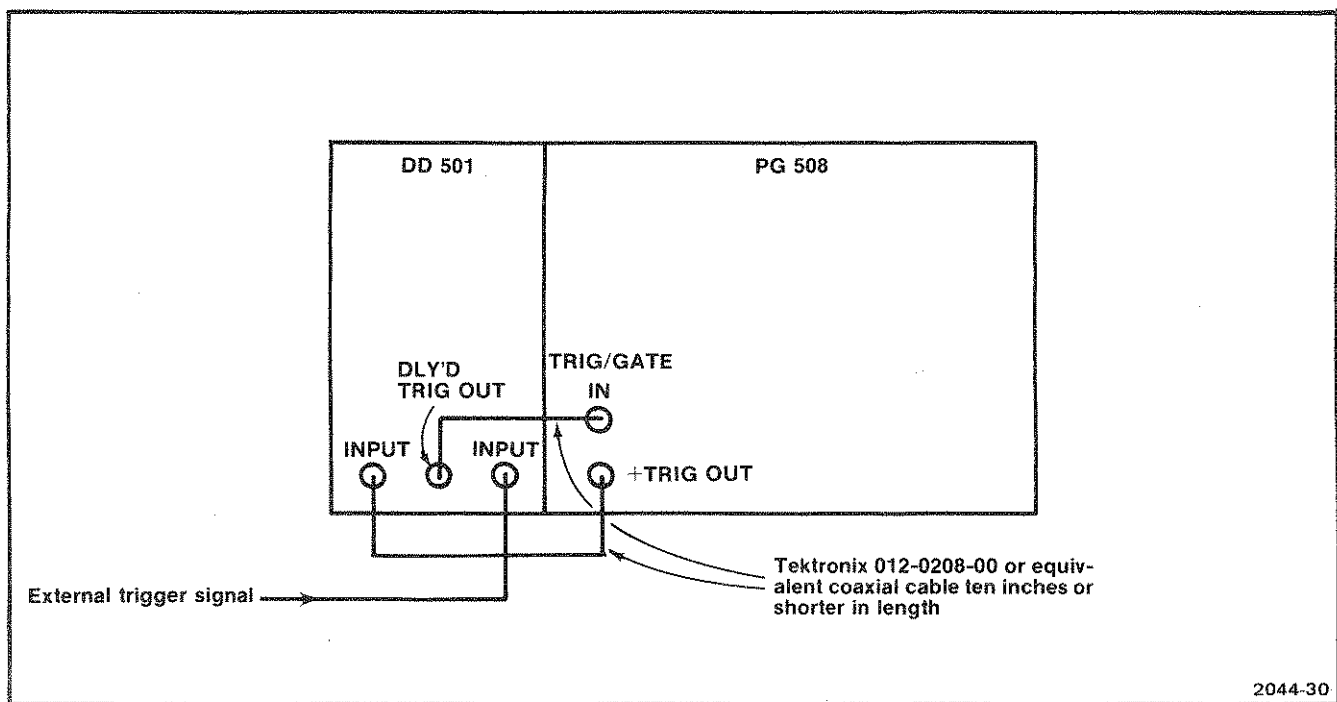


Fig. 1-6. PG 508-DD 501 interconnections for counted burst operation.

To use this feature, place the DD 501 in the delay interval mode of operation by moving the wire strap as shown in Fig. 1-5 or changing connections, depending on the DD 501 available. Connect the PG 508 and the DD 501 as shown in Fig. 1-6. Use ten inch (Tektronix Part Number 012-0208-00) or shorter cables for interconnecting the two units to reduce delays.

Make certain the PG 508 TRIG/GATE IN input impedance is set for 50 Ω . (See External Triggering and Gating discussion and Fig. 1-2.) Set the controls of the PG 508 for the desired output waveform with the PG 508 in FREE RUN. Do not use the SQ WAVE mode. Place the PG 508 in the + SLOPE, SYNC GATE mode and set the TRIG/GATE LEVEL control at the 2 o'clock position. Select EVENTS + SLOPE, START + SLOPE and place the EVENTS and START LEVEL controls at the 2 o'clock position on the DD 501. The three TRIG'D lights on the DD 501 and the TRIG'D/GATED light on the PG 508 will be off until the DD 501 is triggered. Upon receipt of a trigger, all lights will illuminate. If not, check the setup and slightly adjust the LEVEL controls as necessary.

Set the EVENTS DELAY COUNT on the DD 501 for one less than the desired number of counts up to PG 508 repetition rates of about 20 MHz. See below for further information. If necessary, a single trigger may be obtained by rotating the DD 501 START LEVEL control through the 0 position, with no external trigger applied. A single trigger may also be obtained by using the TEKTRONIX manual (One Shot) Trigger Generator, Tektronix Part Number 016-0597-00. All other DD 501 and PG 508 operating controls function normally.

Due to propagation delays in the PG 508, DD 501 and the interconnecting cables, one or more pulses in addition to the desired number are generated when the PG 508 repetition rates are set between 20 MHz and 50 MHz. These extra pulses are constant for any given frequency irrespective of the desired EVENTS DELAY COUNT setting. To determine the number of extra pulses for a given PG 508 period, set the PG 508 and the DD 501 controls as previously described. Now adjust the PG 508 TRIG/GATE LEVEL or the DD 501 EVENTS LEVEL for the same number of extra pulses at DD 501 EVENTS DELAY COUNT setting of zero and nine.

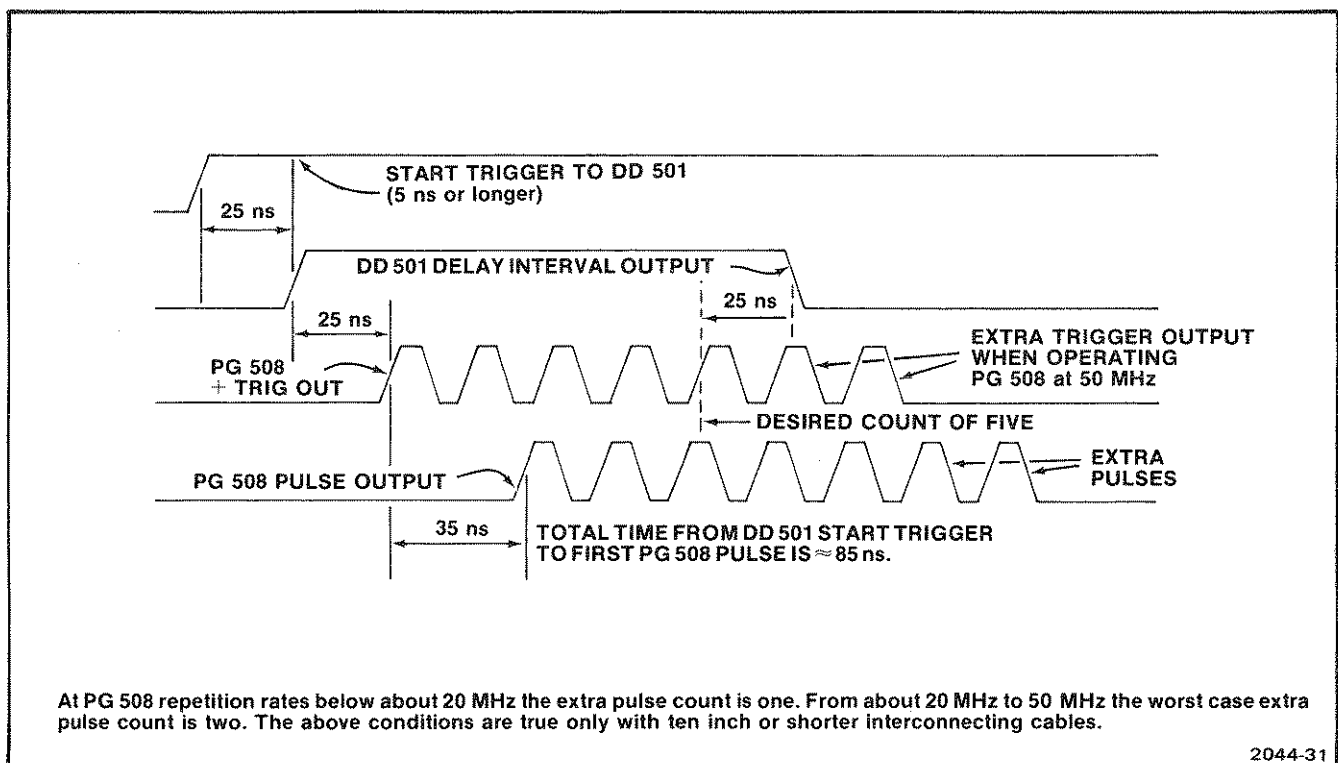


Fig. 1-7. Typical propagation delays using PG 508 with DD 501 in counted burst mode at 50 MHz repetition rate.

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Definitions of Pulse Characteristics

The following is a glossary of common pulse characteristics used in this manual. They are illustrated in Fig. 1-8.

Amplitude. The maximum absolute peak value of a pulse measured from the baseline regardless of sign, and excluding unwanted aberrations or overshoot. Measurement points are at 50% of the pulse duration time (pulse high level) and on the baseline (pulse low level) at 50% of the off time (the pulse period minus the pulse duration).

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

Baseline. The quiescent dc voltage reference level of the pulse waveform.

Complementary Pulse. Normal pulse with high and low levels interchanged. Pulse on-time becomes pulse off-time.

Duty Factor. Sometimes referred to as duty cycle. The ratio of pulse duration to period, or the product of pulse duration and pulse repetition rate. Duty factor in % = $\text{Duration/Period} \times 100$.

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

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

High Level. The most positive value of a pulse, regardless of unwanted aberrations or overshoot, measured at a point that is located at 50% of the pulse duration.

Low Level. The most negative value of a pulse, regardless of unwanted aberrations or overshoot, measured at a point that is 50% of the off time.

Offset. A dc potential of either polarity applied to the waveform to bias the baseline to an amplitude other than zero.

Overshoot. The short term pulse excursion (or transient) above the pulse top or below the baseline, which is simultaneous to the leading or trailing edge of the pulse.

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

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

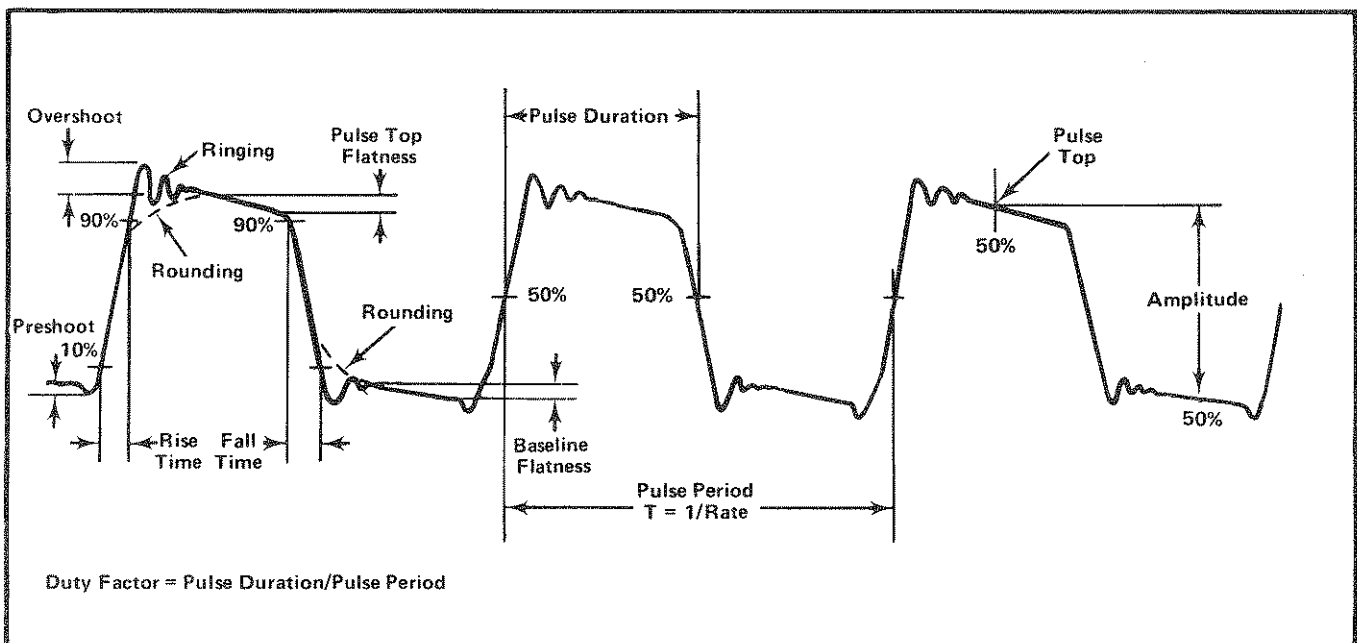


Fig. 1-8. Pulse characteristics.

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

Polarity. The direction from the baseline of the pulse excursion, either positive-going (+) or negative-going (-).

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

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

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

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

SPECIFICATIONS

PERIOD:

Range: ≤ 20 ns to ≥ 200 ms in seven decade steps plus variable, with overlap on all ranges. Periods longer than 200 ms can be obtained in custom range position.

Jitter: $< 0.1\% + 50$ ps.

DELAY: (Time between leading transitions in the paired pulse mode)

Range: ≤ 10 ns to ≥ 100 ms in seven decade steps plus variable, with overlap on all ranges. Delays longer than 100 ms can be obtained in custom range position.

Duty Factor: Delays to at least 70% of pulse periods for periods of $0.2 \mu\text{s}$ or greater, decreasing to at least 50% for a 20 ns period.

Jitter: $\leq 0.1\%$ to $+50$ ps.

DURATION

Range: ≤ 10 ns to ≥ 100 ms in seven decade steps plus variable, with overlap on all ranges. Durations longer than 100 ms can be obtained in custom range position. An additional position provides durations of approximately 50% of the period setting for square wave output.

Duty Factor: Pulse durations to at least 70% of pulse periods for periods of $\geq 0.2 \mu\text{s}$, decreasing to at least 50% for a 20 ns period.

Jitter: $\leq 0.1\% + 50$ ps.

PULSE OUTPUT:

Transition Times: Independently adjustable leading and trailing transition times from ≤ 5 ns typical (≤ 7 ns at some offset and amplitude levels) to ≥ 50 ms, measured from the 10% point to the 90% point, in six decade steps plus variable. Variable controls with 100:1 range (50:1 on 5 ns) provide overlap on all ranges. Transition times longer than 50 ms are obtainable in the custom range position.

Transition Linearity: Deviation from straight line $\leq 5\%$ between the 10% and 90% point for transition times greater than 10 ns.

Amplitude: Pulse high and low levels independently adjustable over a ± 20 V range from a 50Ω low reactance source. Maximum pulse amplitude into a 50Ω load is ≥ 10 V peak to peak; minimum is ≤ 0.5 V peak to peak. Maximum pulse amplitude into an open circuit is ≥ 20 V peak to peak; minimum is ≤ 1.0 V peak to peak. The preset level controls are adjustable over the same ranges.

Aberrations: $\leq 5\%$, $+50$ mV into a 50Ω load for pulse levels between ± 5 V. May increase to $\leq 10\%$, $+50$ mV for pulse levels outside this range.

TRIGGER OUTPUT:

Amplitude: $\geq +2$ V from 50Ω .

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Source Impedance: 50 Ω .

Duty Cycle:

Internal Triggering $\approx 50\%$.

External Triggering Determined by duty cycle of triggering signal.

TRIGGER/GATE INPUT:

Sensitivity: 80 mV peak to peak to ≥ 10 MHz; 250 mV peak to peak to 50 MHz at 50 Ω input impedance.

Input Impedance: Internally selected, 50 Ω or 1 M Ω paralleled by ≈ 20 pF.

Maximum Input: ± 5 V peak into 50 Ω , ± 20 V peak into 1 M Ω .

Minimum Input Pulse Width: 10 ns.

Trigger Level:

Polarity: Front panel selectable, + or - slope.

Range: ± 3 V.

TRIG'D GATED LIGHT:

Flashing: Input triggered at greater than approximately a 10 Hz repetition rate or following the input signal at slower repetition rates.

On: (Logic True) TRIG/GATE IN input potential above TRIG/GATE LEVEL setting with + SLOPE selected or below TRIG/GATE LEVEL setting with - SLOPE selected.

Off: (Logic False) TRIG/GATE IN input potential below TRIG/GATE LEVEL with + SLOPE selected or above TRIG/GATE LEVEL with - SLOPE selected.

Synchronous Gate: Rate generator starts synchronously with external gating signal and completes the last output pulse.

PULSE DELAY MODES:

Undelayed, delayed and paired. Paired pulse mode limited to 25 MHz. Minimum pulse separation governed by duration duty factor specification.

FIXED DELAYS:

Trigger Out to Pulse Out: ≈ 23 ns.

Gate Input to Trigger Out: ≈ 25 ns.

CONTROL ERROR LIGHT:

Steady On: Indicates invalid operating mode. Output is undefined.

Flashing: Timing control settings selected do not properly define the output pulse because valid limits have been exceeded.

Steady Off: Indicates valid operation for most control settings.

POWER REQUIREMENT:

Nominal: 40 Watts

Maximum: 45 Watts

POWER DISSIPATION:

Nominal: 25 Watts

Maximum: 28 Watts

WEIGHT: 3.5 lbs.

THEORY OF OPERATION

Introduction

Refer to the block diagram and the schematics in the foldout pages at the rear of this manual as well as the following discussion to understand the operation of the PG 508.

Input Circuitry

This circuitry processes the external trigger or gating signal providing triggering waveforms for the period circuit. The 50 Ω input impedance for this circuitry is provided by R12, switched in or out by internal switch S12. When R12 is out of the circuit, the input impedance is 1 M Ω , obtained by R14 and R16. Diodes CR16 and CR17 are protective diodes. The proper voltage at the drain of Q20 is set by VR20. The source voltage of Q20 is set by VR22. Impedance transformation, with no voltage shift, is obtained by source follower Q20. Constant current for Q20 is supplied by Q22. A differential comparator is formed by Q25 and Q26. This comparator compares the trigger or gate input level with the level set by the front panel TRIG/GATE control. Constant current for this comparator is provided by Q30. Level control voltage for the differential comparator is provided by operational amplifier U40. The output, pin 6, swings over a range of ± 3 V. The voltage at TP36 is the triggering level voltage, as set by the TRIG/GATE LEVEL control. If the triggering or gating voltage at the base of Q25 is more positive than TP36, then Q26 is conducting and Q25 is off. This places the collector of Q26 more positive than the collector of Q25. When the gating or triggering waveform level drops below TP36, Q25 conducts and Q26 turns off.

This switching waveform is applied to the bases of U60A and U60B, operating as a differential pair. The collector of U60A drives U60C in a cascode mode of operation. The collector of U60C drives the base of U60D which, as an emitter follower, drives the input of U70B. This gate operates as a dual input Schmitt trigger shaper. When the emitter of U60D goes to about 4.2 V above ground, pin 7 of U70B goes high. When the emitter of U60D drops to about 3.8 V, pin 7 of U70B drops to its low level. The inverting output terminal, pin 6, is always in the opposite state from pin 7. Positive feedback for this portion of the Schmitt is provided by R72. If the unit is manually triggered, pin 10 of U70B is momentarily connected to +5 V. Pin 10 of U70B, along with R75 and R76 now acts as a Schmitt shaper for the manual trigger. This action holds the output, pin 7, high and the inverting output, pin 6, low as long as the MAN button is depressed.

When the plus slope is selected for triggering or gating, +5 V is applied to pin 4 of U70A. This gate is now inhibited and the signal passes through U70C. As the outputs of U70A and C are connected together, a high on either output overrides the low. Pin 13 of U70C is low as long as the anodes of CR82 and CR84 are low, which occurs when the logic circuitry has enabled the input circuitry. When the control logic is set to disable the input circuitry, the anodes of these diodes are raised to +5 V which disables gates U70A and U70C.

Pin 12 of U70C now shifts between the high and low state corresponding with the input gate or trigger. The output from U70C, pin 14, is passed to the period circuitry. A high at the output of U70C turns the period circuitry off and a low starts the period generator.

TRIG'D/GATED Light Circuitry

Transistors Q100, Q102, Q110 and their associated components compose the circuitry that operates the front panel TRIG'D/GATE light emitting diode. The pair Q100 and Q102 form a modified astable multivibrator, while Q110 operates as a voltage source. When the output of U70A or U70C is high (period generator off) or the logic circuitry has inhibited the input circuitry, the base of Q100 is high. This causes the base of Q102 to be low through R106. The collector of Q102 is now high and the light emitting diode is off. When the base of Q100 goes low, the base of Q102 goes high, the collector goes low and the light emitting diode illuminates. The light emitting diode circuitry follows the triggering gate up to about a 5 Hz rate, i.e., about 100 ms on and 100 ms off. At faster gating frequencies, C106 inhibits the changing states of this circuitry at about the 5 Hz rate.

Triggered Mode

In the triggered mode of operation S200-2 is closed. This places a high on pin 10 of U140B locking pin 7 high and pin 6 low irrespective of the level on pin 11. This disables the period generator. Pin 15 of U140C now follows pin 4 of U140A in coincidence with the input triggering signal. Pin 14 of U140C drives Q244 and pin 15 drives Q240. The output from the collector of Q240 is in phase with the trigger or gate input signal providing the trigger output, and the phase of the waveform at the collector of Q244 is inverted.

Period Generator

This circuitry generates the internal period timing waveform. In this mode, U140B operates as an astable multivibrator. When either input of U140B is high, pin 7 is high and pin 6 is low. The switched timing capacitances are connected from pin 7 to pin 11. These capacitors are switched by the period range switch. The period variable control, R190, varies the resistance in the negative feedback loop.

To start the period cycle, assume pin 7 of U140B goes high and pin 6 low. This positive step, at pin 7, is coupled through the period timing capacitor to pin 11. As the timing capacitor discharges through the resistances connected from pin 11 to pin 6, the voltage at pin 11 decays at a rate determined by the timing capacitor and these resistances. When the switching level (approximately 4 V) is reached, pin 7 goes low and pin 6 goes high. The negative step, at pin 7, is coupled through the timing capacitor, and appears at pin 11. The capacitor now charges through the resistances until the switching level is reached, and the period cycle repeats. The symmetry adjustment compensates for the bias current through pin 11.

When the PERIOD switch is in any position other than EXT TRIG (MAN), switch S200-2 is opened. This lowers pin 10 of U140B and permits the period generator to operate during the external gate on time. During the time of the external gating signal pins 4 and 2 of U140A are low. Pin 3 is high. As transistors Q150 and Q160 form a comparator, with their bases connected to pins 3 and 1 of U140A respectively, the collector of Q150 is low causing the emitter of Q175 to be low, as well as pin 11 of U140B. This allows the period generator to operate. During the gated off time this action reverses. Pin 11 of U140B rises and inhibits the period generator.

Resistor R170 and R165 adjust the lock up voltage at pin 11 of U140B so that, at turn on, the first period generated is identical in time with subsequent periods. Resistor R165 is switched into the circuit only on the 20 ns range. Components R177 and C177 form a time constant to help compensate for first period error.

Delay Generator

This circuitry provides the delay for delayed or paired pulse operation. As the signal from the period generator of the external trigger input goes from high to low at pin 7 of U270B, pin 3 goes high. This causes pin 5 of U270A to go high and pin 2 low. Pin 13 of U270D and pin 9 of U300B go low. Pin 15 of U270D goes high but pin 10 of U300B does not follow until about 10 ns later, due to the delaying action of R275 and C275. When pin 9 of U300B goes low pin 6 goes high, assuming pin 11 is already low. Pin 6 stays

high until pin 10 goes high as described above. This action provides the delay generator with about a 10 ns trigger pulse under all input conditions.

The positive-going trigger pulse, at pin 5 of U300A, causes pin 3 to go low and pin 2 high. Positive feedback through R300 and C300 causes pin 4 to go high. The low at the base of Q320 turns Q320 off. The emitter of Q320 goes negative at a rate determined by the timing capacitor and current source Q342, with its variable emitter resistances. As the emitter of Q320 goes negative, it pulls the base of Q294 negative which lowers pin 4 of U300A. When pin 4 reaches the switching threshold (≈ 4.0 V) pin 2 goes low and pin 3 high. The timing capacitor is now discharged through Q320. The monostable delay generator is now reset for the next trigger pulse. Transistor Q290 provides a constant load for the power supplies irrespective of the current flowing through Q294.

Components R304, R306 and C304 provide a delay line for the CONTROL ERROR light. The output from the delay generator is connected to pin 13 of U300C. Pin 15 of U300C is high during the delay time and pin 14 low. Gates U360B and D provide a positive-going trigger at pin 15 of U360D when the delay time ends. Gates U360A and C provide a positive-going trigger at pin 14 when the delay time starts. As the delay time starts, pin 4 of U360A goes low as does pin 11 of U360C. Pin 10 of U360C is low as the anode of CR378 is grounded through the UNDLY switch. The low at pin 11 of U360C allows pin 14 to go high. Pin 14 stays high until the propagation time through gate U360A and the delaying action of R364 and C366 allow the high generated in U360A, from pin 2, to reset U360C through pin 10. This causes pin 14 to return to its low state. The width of the output trigger pulse is about 6 ns.

To obtain the delayed trigger, the anode of CR378 is connected to +5 V disabling gate U360C. The anode of CR382 is grounded through the DLY switch. Gates U360B and U360D now operate in exactly the same manner as U360A and C. A positive trigger pulse appears on pin 15 of U360D when the delay time ends (pin 6 of U360B goes from high to low). In the paired pulse mode both gates operate. Gate U360C provides a positive-going trigger at the start of the delay time and U360D a positive trigger at the end of the delay time.

Duration Generator

This circuitry generates the duration times. Gate U400B accepts the delayed or undelayed positive triggers from the delay generator. The result is a positive-going pulse at pin 5 or U400A. This triggers the duration generator which operates in the same manner as the delay generator. Refer to the discussion under the heading Delay Generator for a description of the duration generator operation. Gate U400C is an output buffer. Pin

12 goes high during the pulse duration time and if pin 13 is low, pin 15 goes high and pin 14 low. Pin 13 controls U400C in the square wave and external duration modes.

Duration and Delay Control Error Light Circuitry

This circuitry illuminates the CONTROL ERROR light when the duration or delay times are greater than the periods of their respective triggers. The positive pulse from the duration generator is fed into the D input, pin 10, of U480A. The clock enable line is low. If the duration time is set so that a trigger pulse (connected to the clock in) for the next duration pulse occurs before the output of the duration generator goes low, the high on the D input, pin 10 of U480A, is transferred to the output, pin 1. This high is connected to the set input, pin 5, of U480B which causes the output, pin 2, of U480B to go high illuminating the error light. When the output, pin 2, of U480B goes high, the inputs to U480A and B are disabled through the clock enable line preventing further trigger inputs until both flip flops are reset. When the output, pin 2, of U480B goes and stays high, C487 starts to charge to the voltage on pin 2, through R490. This takes approximately 100 ms. When the reset inputs to U480A and B, pins 13 and 4, reach the high level (about 4.0 V) U480A and B are reset and C487 discharges through R490. When these reset inputs return to the low level both flip flops are ready to accept triggers and the error cycle is ready to repeat. If the delay time is set for a time greater than the period of the delay triggers, the high on pin 7 of U480B transfers to pin 2 directly, and the light is illuminated. Reset takes place in the same manner as described above. Also connected to this circuitry is a line from the transition time board which also lights the CONTROL ERROR light.

The CONTROL ERROR light is also illuminated for certain improper control settings. Fig. 2-1 shows a simplified schematic for the CONTROL ERROR indicator logic and control settings causing illumination.

Variable Transition Time Circuitry

This circuitry controls the output transition times. Resistors R534 and R536 provide equivalent $50\ \Omega$ termination impedance for the normal (positive-going) input from the duration generator. Also, R520 and R522 provide an identical termination impedance for the complement input (negative-going) from the duration generator. These inputs drive the bases of Q525 and Q530. When the input from the duration generator is high and the complement is low, the collector of Q530 drops from ground to about $-1/2$ V. This turns Q565 on and Q560 off. The adjustable constant current through Q545, to $+15$ V, is now passed through R578, from the -15 V supply. Transistor Q560 is turned off as its base is connected to ground. Zener diodes VR620 and VR630 lower the voltage from the bases of Q565 and Q560 to the bases of Q625 and Q630 by about 7.5 V. Transistor Q625 is therefore off and Q630 is conducting. Current flows from -15 V through an

adjustable current source Q635 and then through Q630 to charge the particular capacitor determined by the transition time selected. As the capacitor charges through a constant current source, the junction of CR584 and CR600 goes negative at a linear rate until the diode CR600 turns on. This diode serves as the negative clamp. The voltage at the anode of CR600 is set by R615 through Q608 and Q600. The voltage at the junction of CR584 and CR600 remains low for the pulse duration.

At the end of the pulse duration time, the collector of Q530 goes positive. This action turns Q565 off and Q560 on. Current from the $+15$ V supply flows through constant current source Q545, then through Q560 raising the junction of CR584 and CR600 at a linear rate determined by the capacitor value and the current available. The junction of CR584 and CR600 goes positive until CR584 turns on. The voltage at the cathode of CR584 is set by R570 through Q575 and Q580. Transistor Q625 is turned on, and Q630 off, passing current from constant current source Q635 through Q625, CR604, and R604 to ground. The leading and trailing transition times are varied independently by varying the amount of current passing through constant current source transistors Q635 and Q545.

The output waveform at the junction of CR584 and CR600 passes to the gate of fet Q680. This fet serves as a source follower for driving Q685 and Q690. These transistors compose a linear differential amplifier. The clamp levels for diodes CR584 and CR600 are set so that Q685 and Q690 are slightly overdriven. This serves to remove any ringing or other signal irregularities at the top and bottom of the waveform. Operational amplifier U665 provides, along with Q660, constant current for Q685 and Q690.

Transition Time Control Error Light Circuitry

This circuitry illuminates the control error light when the leading transition time is greater than the pulse duration time, or when the trailing transition time is greater than the pulse off time. The inverted signal from the leading and trailing generator appears at the base of Q704 through fet follower Q700. A differential amplifier is formed by Q704 and Q706. The output is taken from the collector of Q706. Transistors Q704 and Q706 are overdriven to reduce the window of comparison. During the pulse on time, the base of Q704 is negative with respect to ground. This action causes the collector of Q706 to also go negative, driving the base of Q715, an emitter follower negative. The emitter of Q715 is connected to pins 7 and 10, the D input of flip flops U720A and B.

The waveforms driving the transition time circuitry are also applied to gates U740A and B. Pin 6 of U740B is high during pulse time while pin 4 of U740A is low. The purpose of the four gates in U740 is to delay the signal ap-

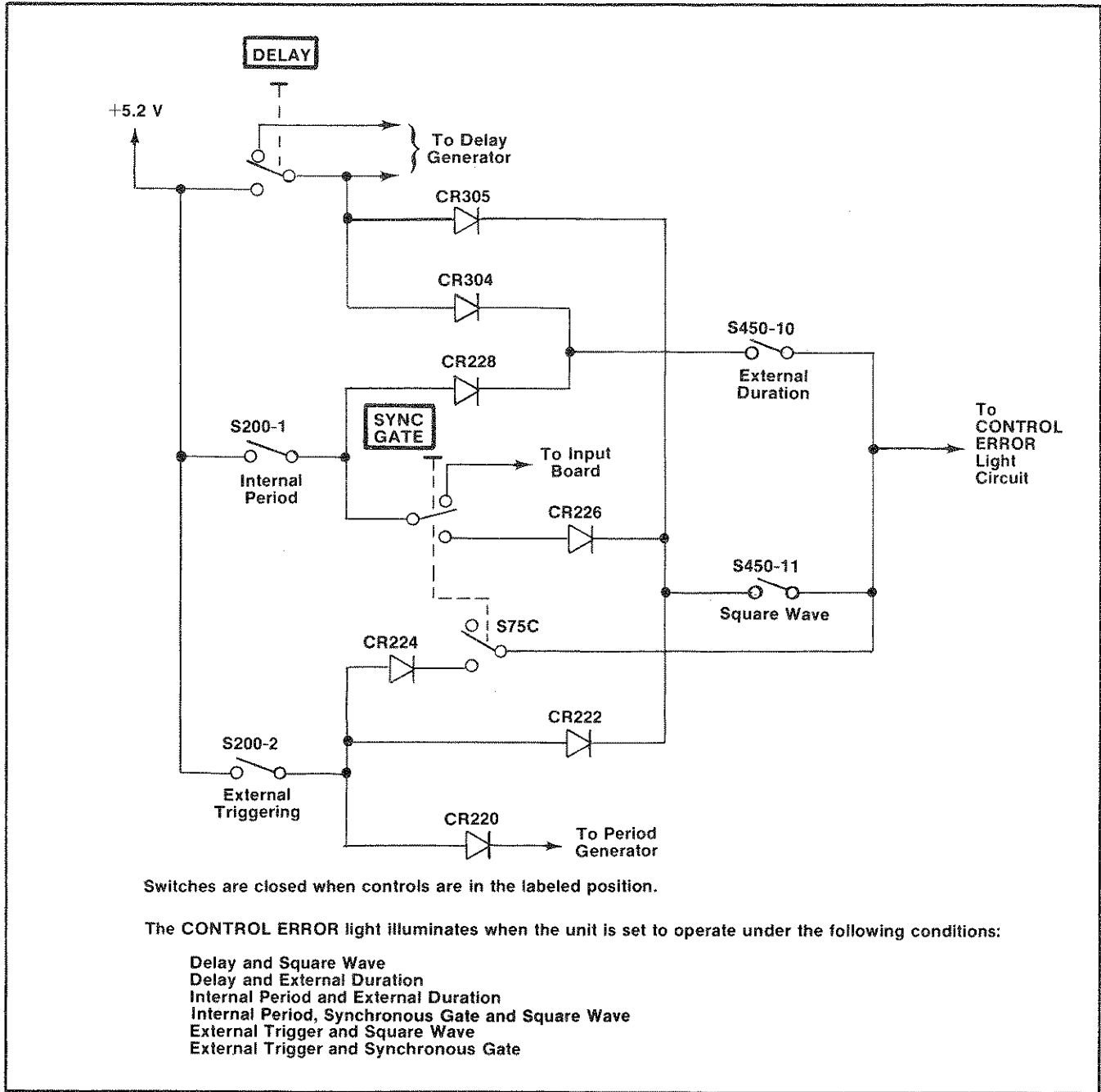


Fig. 2-1. Simplified schematic for CONTROL ERROR indicator logic with control settings causing illumination.

proximately the same amount as the circuitry in the variable transition time generator. The positive-going waveform from pin 14 of U740C is fed through pin 6 to the clock input, pin 6, of flip flop U720A. The negative-going output from pin 15 is fed to the clock input pin 11, of flip flop U720B. Flip flop U720A senses the pulse trailing timing error and U720B, the pulse leading timing error. If the leading time from the output of the variable transition time generator is slow enough so that the D input of U720B has not dropped below approximately the 50% point, when the waveform at the clock input of flip flop

U720B (waveform driving the transition time board) goes positive (end of pulse), the high on D input, pin 10, transfers to the output, pin 15, and the CONTROL ERROR lamp is lit.

When pin 15, of flip flop U720B goes high, C734 starts to charge through R728. When the voltage at pin 13 of U720B and pin 5 of U720A reaches the high level (≈ 4.0 V), both flip flops are reset to their initial conditions and the CONTROL ERROR light goes out. If the trailing time of the

pulse is slow enough so that the D input of flip flop U720A has not reached the high level when the pulse at the clock terminal (pin 6) of flip flop U720A goes high (leading portion of the next pulse driving the transition circuitry) the 0 terminal, pin 3, of flip flop U720A goes high. This high is connected to the set terminal, pin 12, of U720B causing the 1 terminal of U720B to go high illuminating the CONTROL ERROR light. The on time and reset for this error indicating mode now proceeds as previously described.

Level Control Multiplier

This circuitry provides independent top and bottom level control of the output pulse by controlling the amplitude and offset of the drive signal to the linear output amplifier. Also included is circuitry to accomplish the normal complement function and the preset function. Control voltage clamps to ensure the output amplifier is not over driven are also provided.

Amplitude control of the signal occurs in the analog multiplier, U850. The pulse signal provides the X input, and the level control voltages provide the Y input. The X·Y product of these inputs is converted to a drive current for the output amplifier.

Input and complement pulses from the variable transition time generator are applied to the bases of Q825 and Q840. These transistors form a differential amplifier, supplied by constant current source U800B and Q820. A positive-going signal at the base of Q825, with the complementary (negative-going) signal at the base of Q840 causes the signal current at pin 11 of the multiplier to go negative and the signal current at pin 12 to go positive. When the pulse polarity reverses, at the bases of Q825 and Q840, the signal current also reverses polarity at pins 11 and 12. The difference between the currents at pins 11 and 12 corresponds to the X signal input for the multiplier.

The total current flowing from pins 2 and 3 of U850 is essentially equal to the current required by the constant current source, U895A and Q900. However, the difference in currents between these pins corresponds to the Y input signal for the multiplier.

The amplitude difference of these currents is controlled by U895B. This is a dc differential amplifier which amplifies the difference between the high & low level control voltages to produce the Y input signal. Gain adjustment for the Y input signal is provided by R885.

The high and low level control voltages are determined by their respective front panel controls, R770B and R770A. If the preset function is selected, the preset high and preset low potentiometers, R775 and R785, provide the

control voltages. These voltages are buffered by unity gain amplifiers U780A and U780B. Both control voltages range between 0 and +5.2 V. When the control voltages are equal, the Y input is zero and the multiplier signal output (X·Y) equals zero. A difference of +2.6 V between the high and low level control voltages corresponds to maximum output amplitude from the pulse generator.

The normal complement switch inverts the level control voltage inputs to differential amplifier U895B. However, since the difference between the voltages is unchanged, the control voltage input signal has constant amplitude, but reverses polarity. This complements the pulse generator output. The normal complement balance adjustment, R910, ensures that the Y multiplier input responds equally to changes in either the high or low level control voltages.

The signal current at pins 5 and 6 of U850 is the pulse signal. Since Q845, in conjunction with U800B, provides a constant current sink, the current through R954, from the emitter of common base stage Q954, also contains signal current variations. The current driver for the output amplifier is Q954. The signal currents into pins 8 and 9 of U850 also contain the pulse signal. However constant current sink R847, and common base stage Q950 are included only as a balancing thermal load for the multiplier.

To obtain independent control of the output pulse high and low levels, the control voltages are averaged by resistor network R914, R915, R918 and R920. High and Low tracking potentiometers, R915 and R920, are adjustable to provide minimum interaction between pulse levels. The dc voltage from this network, along with the voltage from the offset adjustment R925, is summed and inverted by U930A. U930B provides further gain and level shifting and, in conjunction with Q945, serves as a level controlled offset generator. A dc current source to the collector of Q954 is provided by Q945. The collector of Q954 is the virtual ground input to the output amplifier.

When the high and low level control potentiometers are both at midrange (+2.6 V zero output) Q945 sources all the quiescent bias current required by Q954, which is approximately 15 mA. Therefore, there is no current drive to the output amplifier through R975 or R1055. If the high level control is turned fully cw (maximum output), the low level control voltage remains at +2.6 V. The high level control voltage increases to +5.2 V. This causes the voltage output of U930A to decrease, causing the offset generator U930B and Q945 to source approximately 20 mA. This is an increase of 5 mA. This difference in control voltage settings also causes maximum difference in the control voltage input signal to the multiplier. This action also causes 10 mA peak to peak signal current variations in the collector current of Q954. Since the signal current

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variations and dc offset currents are summed at the collectors of Q945 and Q954, the output pulse high level changes to maximum voltage and the low level remains at 0 V.

It follows that any positive increase in either the high or low level control voltages causes an increase in the dc offset current. A decrease in either control voltage causes a decrease in offset current. However, signal current variations respond only to differences between these control voltages. The larger the voltage difference, the larger the signal current amplitude into the output amplifier.

Since the dynamic range of the pulse generator output is + or - 20 V, and the maximum amplitude is only 20 V peak to peak, clamping circuits are provided to prevent the difference between the high and low level control voltages from exceeding +2.6 V, which corresponds to maximum output. A clamping circuit also prevents the high level from becoming less than the low level control voltage.

The level control unity gain amplifiers U780A and U780B contain a precision diode clamp composed of CR782, CR790, R780, and R782. Since the feedback for U780A is taken from the cathode of CR790, the voltage at the junction of CR782 and CR790 is equal to the low level control voltage plus one diode drop (CR790). If the high level attempts to decrease below the low level or attempts to increase above the high level control voltage, CR782 conducts clamping the high level at the low level voltage. Current limiting for U780B, during clamping, is provided by R780.

U800A is also configured as a precision clamping circuit. The output at pin 1 is equal to the low level control voltage plus 2.6 V plus one diode drop. Therefore, if the high level voltage attempts to exceed the low level plus 2.6 volts, or the low level is decreased more than 2.6 V below the high level, CR805 conducts and the high level is clamped at the low level control voltage plus 2.6 volts. The low level control always overrides the high level control. Current limiting for U780B, during clamping, is provided by R780.

Output Amplifier

The positive and negative dc voltages for this amplifier are provided by dual power supplies which track the high and low level control voltages. These tracking supplies ensure that the positive potential is at least 6 V above the output pulse high level and the negative potential is at least 6 volts below the output pulse low level. This arrangement enables the pulse generator to provide a 40 V dynamic range, with a 20 V peak to peak maximum output pulse, while maintaining minimum power dissipation and

voltage requirements for the amplifier transistors. The range of the positive tracking supply is +6 to +26 V, with a -6 to -26 V range for the negative supply.

The output circuit functions as a linear current driven operational amplifier with a closed loop transresistance gain of 2 V/mA. Negative feedback through R1042 to the input node (collectors of Q945 and Q954) causes a virtual ground at the input. A 10 mA peak to peak input signal creates a 20 V peak to peak output pulse (open circuit).

Since the output amplifier is a complementary circuit, only the operation of one side will be explained.

For a positive-going output pulse, current is driven into the input node. This action causes an increase in base current to Q975 which decreases the base drive to Q980. A cascode circuit is formed by Q980 and Q990, with R985 and L980 serving as a constant current source to the common collector-emitter connection. Therefore, when the base drive to Q980 is decreased, the current in Q990 increases. (The constant current source supplies approximately 60 mA which, with no signal, is equally divided between Q980 and Q990.) Another constant current source, Q1000, causes a 2.0 V drop across R1002. The emitter follower, Q995, buffers this potential and provides a voltage source for the base of the cascode transistor, Q990. An increasing current through Q990 increases the base current from the output parallel emitter followers, Q1010 and Q1015. The emitters of these transistors drive the output positive through a network of resistors and capacitors. Components R1020, R1024, and C1024, in this network, are adjustable to provide an internal resistive 50 Ω termination for the output. Network C1048 and R1048, with potentiometer R1050, provides transient response peaking for the amplifier.

Equivalent biasing for the complementary output emitter followers is provided by CR990, R990, and CR992. With zero output, the quiescent current in each output follower is approximately 20 mA. The output potential is available at the rear interface connector, pin 25A, for monitoring the output amplitude.

Power Supply

The +11.5 Vdc from the mainframe provides the raw supply voltage for the series regulated +5.2 Vdc supply. The precision voltage regulator, U1210, includes a temperature compensated voltage reference supply at pin 6. The +5.2 V potentiometer, R1210, with the voltage divider R1209 and R1211 provides the reference input to the non-inverting input, pin 5. The output voltage is applied to the inverting input, pin 4, through R1217. Sensing differences in the two input potentials, the regulator amplifier provides base current drive from pin 10

to the mainframe transistor used as the series pass element, until the inverting and non-inverting inputs are approximately equal. At this condition, the series pass transistor drops the voltage from the raw supply until the output is +5.2 V. Current limiting is provided by R1215. When the current from the supply exceeds approximately 1.1 A, the regulator provides no further base drive current to the series pass element and current limiting occurs.

The +33.5 Vdc from the mainframe is the raw supply for the regulated +15 Vdc. The 3-terminal voltage regulator, U1205, performs the entire regulating function. Current limiting occurs within U1205.

The -33.5 Vdc from the mainframe is the raw supply for the regulated -15 Vdc. As in the +15 Vdc supply a 3-terminal voltage regulator, U1335, provides the regulating function. However, due to additional load considerations, the raw supply is pre-regulated to decrease power dissipated by the integrated circuit. A shunt current path to the load is furnished by VR1330 and R1330. The zener voltage is also used to maintain base drive to the series pass mainframe transistor. This transistor is used as a pre-regulator to drop the voltage across U1335 to approximately 3.6 V. Current limiting is also provided by the regulator, U1335.

The dual tracking supplies provide the positive and negative voltages required by the output amplifier. The voltage at the base of Q1255 varies from 0 V to +5.2 V depending on the setting of the HIGH LEVEL control. When the voltage at the base of Q1255 varies from 0 V to +2.6 V, the voltage at the collector of the series pass transistor is +6 V. As the voltage at the base of Q1255 varies from +2.6 V to +5.2 V, the voltage at the collector of the series pass transistor varies from +6 V to +26 V.

Transistor Q1255 and Q1270 form a differential comparator. The voltage at the base of Q1270 is referenced between the +5.2 V supply, ground and the output

voltage. As the HIGH LEVEL control is moved in the positive direction, the collector of Q1255 goes negative. This increases current flow through Q1280 and therefore the series pass transistor in the mainframe which raises the + tracking supply voltage to the output amplifier. Feedback to the differential comparator is provided by R1275. Transistor Q1265 prevents the +V tracking supply from going lower than about +6 V. The base of Q1265 is set at about 2.6 V. When the base of Q1255 goes more negative than about 2.6 V, Q1265 comes into conduction holding the common emitter circuit at one diode drop from the base of Q1265. If the base of Q1255 is lowered further, Q1255 loses control of the circuit and the supply voltage remains at the level determined by Q1265, +6 V.

Current limiters for this circuit are Q1285, Q1290 and Q1300. A differential comparator is formed by Q1285 and Q1290. If the load on the +V supply exceeds the maximum current allowed for the voltage supplied, the voltage drop across R1282 becomes great enough that Q1285 comes into conduction. This action increases conduction in Q1270 reducing the current flow in Q1255. Finally, the conduction through the series pass transistor is limited to a safe value. The current through Q1300 is determined by the actual supply output voltage. Therefore, the current limit varies proportionally with the supply voltage. In most overload conditions, the supply folds back to minimum current. Diode CR1310 conducts should the +V supply go more negative than ground.

The -V supply operates in the same manner as the +V supply. Only the polarities are reversed. Transistors Q1355 and Q1370 are the basic comparator transistors. The base of Q1355 varies between 0 V and +5.2 V. The -V output is prevented from going more positive than about -6 V by Q1365. The series pass transistor is driven by Q1380. The comparator transistors for the current limiting circuitry are Q1385 and Q1395. The current source for the current comparator is Q1400. Diode CR1410 prevents the -V output from going more positive than ground.



REPLACEABLE ELECTRICAL PARTS

PARTS ORDERING INFORMATION

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

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

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

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

SPECIAL NOTES AND SYMBOLS

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

ITEM NAME

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

ABBREVIATIONS

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

CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
00853	SANGAMO ELECTRIC CO., S. CAROLINA DIV.	P. O. BOX 128	PICKENS, SC 29671
01002	GENERAL ELECTRIC CO., INDUSTRIAL AND POWER CAPACITOR PRODUCTS DEPT.	JOHN ST.	HUDSON FALLS, NY 12839
01121	ALLEN-BRADLEY CO.	1201 2ND ST. SOUTH	MILWAUKEE, WI 53204
01282	PARKER STEARNS AND CO., INC.	300 SHEFFIELD AVE.	BROOKLYN, NY 11207
01295	TEXAS INSTRUMENTS, INC., COMPONENTS GROUP	P. O. BOX 5012	DALLAS, TX 75222
02735	RCA CORP., SOLID STATE DIVISION	ROUTE 202	SOMERVILLE, NY 08876
04713	MOTOROLA, INC., SEMICONDUCTOR PRODUCTS DIV.	5005 E. MCDOWELL RD.	PHOENIX, AZ 85008
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS ST.	MOUNTAIN VIEW, CA 94040
07910	TELEDYNE SEMICONDUCTOR	12515 CHADRON AVE.	HAWTHORNE, CA 90250
12040	NATIONAL SEMICONDUCTOR CORP.	COMMERCE DRIVE	DANBURY, CT 06810
12697	CLAROSTAT MFG. CO., INC.	LOWER WASHINGTON ST.	DOVER, NH 03820
14752	ELECTRO CUBE INC.	1710 S. DEL MAR AVE.	SAN GABRIEL, CA 91776
24931	SPECIALTY CONNECTOR CO., INC.	3560 MADISON AVE.	INDIANAPOLIS, IN 46227
27014	NATIONAL SEMI-CONDUCTOR CORP.	2900 SAN YSIDRO WAY	SANTA CLARA, CA 95051
32997	BOURNS, INC., TRIMPOT PRODUCTS DIV.	1200 COLUMBIA AVE.	RIVERSIDE, CA 92507
53184	XCITON	5 HEMLOCK STREET	LATHAM, NEW YORK 12116
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
71590	CENTRALAB ELECTRONICS, DIV. OF GLOBE-UNION, INC.	5757 N. GREEN BAY AVE.	MILWAUKEE, WI 53201
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
73138	BECKMAN INSTRUMENTS, INC., HELIPOT DIV.	2500 HARBOR BLVD.	FULLERTON, CA 92634
75042	TRW ELECTRONIC COMPONENTS, IRC FIXED RESISTORS, PHILADELPHIA DIVISION	401 N. BROAD ST.	PHILADELPHIA, PA 19108
79727	CONTINENTAL-WIRT ELECTRONICS CORP.		WARMINSTER, PA 18974
80009	TEKTRONIX, INC.	P. O. BOX 500	BEAVERTON, OR 97005
90201	MALLORY CAPACITOR CO., DIV. OF P. R. MALLORY CO., INC.	3029 E. WASHINGTON ST.	INDIANAPOLIS, IN 46206
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NB 68601

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A1	670-4273-00			CKT BOARD ASSY:INPUT	80009	670-4273-00
A2	670-4274-00			CKT BOARD ASSY:TIMING	80009	670-4274-00
A3	670-4275-00			CKT BOARD ASSY:TRANSITION TIMING	80009	670-4275-00
A4	670-4276-00			CKT BOARD ASSY:OUTPUT	80009	670-4276-00
A5	670-4272-00			CKT BOARD ASSY:AUXILIARY	80009	670-4272-00
C14	281-0518-00			CAP.,FXD,CER DI:47PF,+/-9.4PF,500V	72982	301-000U2J0470M
C36	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z
C40	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z
C55	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z
C70	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z
C76	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C104	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C106	290-0535-00			CAP.,FXD,ELCTLT:33UF,20%,10V	56289	196D336X0010KA1
C110	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z
C140	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C142	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C154	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C170	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C171	281-0540-00	B010100	B010124X	CAP.,FXD,CER DI:51PF,5%,500V	72982	301-000U2J0510J
C172	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C177	283-0663-00			CAP.,FXD,MICA D:16.8PF,+/-0.5PF,500V	00853	D155C16.8D0
C180	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C200	290-0722-00			CAP.,FXD,ELCTLT:100UF,20%,10V	56289	196D107X0010PE3
C201	290-0722-00			CAP.,FXD,ELCTLT:100UF,20%,10V	56289	196D107X0010PE3
C202	290-0722-00			CAP.,FXD,ELCTLT:100UF,20%,10V	56289	196D107X0010PE3
C203	290-0722-00			CAP.,FXD,ELCTLT:100UF,20%,10V	56289	196D107X0010PE3
C205	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
C206	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
C207	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
C208	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
C210	285-0576-00			CAP.,FXD,PLSTC:1UF,10%,100V	56289	410P10591
C212	285-0703-00			CAP.,FXD,PLSTC:0.1UF,5%,100V	56289	410P112
C214	285-0598-00			CAP.,FXD,PLSTC:0.01UF,5%,100V	01002	61F10AC103
C216	283-0645-00			CAP.,FXD,MICA D:790PF,1%,100V	00853	D151E791F0
C218	281-0540-00			CAP.,FXD,CER DI:51PF,5%,500V	72982	301-000U2J0510J
C244	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C260	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C270	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C275	283-0636-00	B010100	B010124	CAP.,FXD,MICA D:36PF,1.4%,100V	00853	D155E360G0
C275	283-0634-00	B010125		CAP.,FXD,MICA D:65PF,1%,100V	00853	D151E650F0
C277	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C279	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C296	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C300	281-0509-00			CAP.,FXD,CER DI:15PF,+/-1.5PF,500V	72982	301-000COG0150K
C304	283-0634-00			CAP.,FXD,MICA D:65PF,1%,100V	00853	D151E650F0
C317	281-0516-00			CAP.,FXD,CER DI:39PF,+/-3.9PF,500V	72982	301-000U2J0390K
C325	281-0504-00			CAP.,FXD,CER DI:10PF,+/-1PF,500V	72982	301-055COG0100F
C326	283-0677-00			CAP.,FXD,MICA D:82PF,1%,500V	00853	D155E820FG
C328	283-0594-00			CAP.,FXD,MICA D:0.001UF,1%,100V	00853	D151F102F0
C330	285-1049-00			CAP.,FXD,PLSTC:0.01UF,1%,200V	14752	230B1C103F
C332	285-0703-00			CAP.,FXD,PLSTC:0.1UF,5%,100V	56289	410P112
C334	285-0576-00			CAP.,FXD,PLSTC:1UF,10%,100V	56289	410P10591
C336	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C338	290-0531-00			CAP.,FXD,ELCTLT:100UF,20%,10V	90201	TDC107M010WLC
C432	281-0516-00			CAP.,FXD,CER DI:39PF,+/-3.9PF,500V	72982	301-000U2J0390K
C346	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C360	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C366	283-0635-00	B010100	B010124	CAP.,FXD,MICA D:51PF,1%,100V	00853	D151E510F0
C366	283-0634-00	B010125		CAP.,FXD,MICA D:65PF,1%,100V	00853	D151E650F0
C375	283-0635-00	B010100	B010124	CAP.,FXD,MICA D:51PF,1%,100V	00853	D151E510F0
C375	283-0634-00	B010125		CAP.,FXD,MICA D:65PF,1%,100V	00853	D151E650F0
C378	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C382	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C385	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C386	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C389	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C400	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C415	281-0509-00			CAP.,FXD,CER DI:15PF,+/-1.5PF,500V	72982	301-000C0G0150K
C418	283-0634-00			CAP.,FXD,MICA D:65PF,1%,100V	00853	D151E650F0
C432	281-0516-00	B010100	B010124	CAP.,FXD,CER DI:39PF,+/-3.9PF,500V	72982	301-000U2J0390K
C432	281-0509-00	B010125		CAP.,FXD,CER DI:15PF,+/-1.5PF,500V	72982	301-000C0G0150K
C433	283-0111-00	XB010125		CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C435	283-0634-00			CAP.,FXD,MICA D:65PF,1%,100V	00853	D151E650F0
C436	281-0504-00			CAP.,FXD,CER DI:10PF,+/-1PF,500V	72982	301-055C0G0100F
C438	283-0594-00			CAP.,FXD,MICA D:0.001UF,1%,100V	00853	D151F102F0
C439	281-0513-00			CAP.,FXD,CER DI:27PF,+/-5.4PF,500V	72982	301-000P2G0270M
C442	285-1049-00			CAP.,FXD,PLSTC:0.01UF,1%,200V	14752	230B1C103F
C444	285-0703-00			CAP.,FXD,PLSTC:0.1UF,5%,100V	56289	410P112
C446	285-0576-00			CAP.,FXD,PLSTC:1UF,10%,100V	56289	410P10591
C448	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
C450	290-0722-00			CAP.,FXD,ELCTLT:100UF,20%,10V	56289	196D107X0010PE3
C460	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C462	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C480	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C485	283-0111-00	B010100	B010169X	CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C493	283-0000-00	XB010170		CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C487	290-0530-00			CAP.,FXD,ELCTLT:68UF,20%,6V	90201	TDC686M006NLF
C500	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C502	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C503	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C505	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C532	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	8131N039Z5U-104Z
C544	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	8131N039Z5U-104Z
C555	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	8131N039Z5U-104Z
C563	281-0653-00			CAP.,FXD,CER DI:3.3PF,30%,200V	72982	374-001C0K0109C
C569	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C580	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C581	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020FL
C586	285-0934-00			CAP.,FXD,PLSTC:2.2UF,10%,200V	56289	430P238
C588	285-0633-00			CAP.,FXD,PLSTC:0.22UF,20%,200V	56289	410P22491
C590	285-0566-00			CAP.,FXD,PLSTC:0.022UF,10%,200V	56289	410P1000
C592	283-0694-00			CAP.,FXD,MICA D:2240PF,0.5%,300V	00853	D19-3F224IE0
C594	283-0625-00			CAP.,FXD,MICA D:220PF,1%,500V	00853	D105F221F0
C596	281-0544-00			CAP.,FXD,CER DI:5.6PF,10%,500V	72982	301-000C0H0569D
C600	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020FL
C601	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
C622	281-0653-00		CAP.,FXD,CER DI:3.3PF,30%,200V	72982	374-001C0K0109C
C630	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C643	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	8131N039Z5U-104Z
C647	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	8131N039Z5U-104Z
C662	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C665	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	8131N039Z5U-104Z
C675	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C680	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C682	283-0648-00		CAP.,FXD,MICA D:10PF,5%,100V	00853	D151C100DC
C697	283-0065-00		CAP.,FXD,CER DI:0.001UF,5%,100V	72982	805-505B102J
C701	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C708	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C720	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	8131N039Z5U-104Z
C724	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	8131N039Z5U-104Z
C734	290-0530-00		CAP.,FXD,ELCTLT:68UF,20%,6V	90201	TDC68M006NLF
C740	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	8131N039Z5U-104Z
C749	283-0648-00		CAP.,FXD,MICA D:10PF,5%,100V	00853	D151C100DC
C780	283-0178-00		CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z
C800	283-0178-00		CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z
C814	283-0000-00		CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C820	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C834	281-0604-00		CAP.,FXD,CER DI:2.2PF,+/-0.25PF,500V	72982	301-000C0J0229C
C836	283-0187-00		CAP.,FXD,CER DI:0.047UF,10%,400V	72982	8131N401X5R473K
C840	290-0527-00		CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020FL
C850	283-0752-00		CAP.,FXD,MICA D:345PF,1%,500V	00853	D15ED50F500
C852	283-0752-00		CAP.,FXD,MICA D:345PF,1%,500V	00853	D15ED50F500
C854	283-0752-00		CAP.,FXD,MICA D:345PF,1%,500V	00853	D15ED50F500
C856	283-0752-00		CAP.,FXD,MICA D:345PF,1%,500V	00853	D15ED50F500
C860	283-0002-00		CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
C863	283-0000-00		CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C879	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C880	283-0002-00		CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
C895	283-0178-00		CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z
C930	283-0178-00		CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z
C938	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C958	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C962	283-0178-00		CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z
C964	283-0178-00		CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z
C966	283-0178-00		CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z
C975	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C985	290-0573-00		CAP.,FXD,ELCTLT:2.7UF,20%,50V	56289	196D275X0050JA1
C989	283-0178-00		CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z
C992	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C997	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
Cl017	283-0669-00		CAP.,FXD,MICA D:360PF,1%,500V	00853	D155F361F0
Cl024	281-0092-00		CAP.,VAR,CER DI:9-35PF,200V	72982	538-011E2P094R
Cl048	285-0598-00		CAP.,FXD,PLSTC:0.01UF,5%,100V	01002	61F10AC103
Cl055	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
Cl065	290-0573-00		CAP.,FXD,ELCTLT:2.7UF,20%,50V	56289	196D275X0050JA1
Cl072	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
Cl075	283-0178-00		CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z
Cl077	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
Cl097	290-0573-00		CAP.,FXD,ELCTLT:2.7UF,20%,50V	56289	196D275X0050JA1

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Ckt No.	Tektronix Part No.	Serial/Model No.		Name & Description	Mfr Code	Mfr Part Number	
		Eff	Dscont				
C1202	290-0633-00			CAP.,FXD,ELCTLT:2400UF,+75-10%,30V	56289	39D360	
C1205	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z	
C1207	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600	
C1211	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M02OFL	
C1217	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P	
C1219	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600	
C1220	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M02OFL	
C1240	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600	
C1242	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600	
C1244	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600	
C1246	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M02OFL	
C1248	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M02OFL	
C1250	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M02OFL	
C1259	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z	
C1280	283-0103-00			CAP.,FXD,CER DI:180PF,5%,500V	56289	40C638	
C1307	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z	
C1308	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z	
C1310	290-0117-00			CAP.,FXD,ELCTLT:50UF,+75-10%,50V	56289	30D506G050DD9	
C1327	290-0633-00			CAP.,FXD,ELCTLT:2400UF,+75-10%,30V	56289	39D360	
C1335	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600	
C1337	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600	
C1340	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M02OFL	
C1342	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M02OFL	
C1344	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M02OFL	
C1359	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z	
C1380	283-0103-00			CAP.,FXD,CER DI:180PF,5%,500V	56289	40C638	
C1407	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z	
C1408	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z	
C1410	290-0117-00			CAP.,FXD,ELCTLT:50UF,+75-10%,50V	56289	30D506G050DD9	
CR16	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152	
CR17	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152	
CR25	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152	
CR26	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152	
CR80	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152	
CR82	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152	
CR84	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152	
CR86	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152	
CR145	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152	
CR147	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152	
CR220	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152	
CR222	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152	
CR224	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152	
CR226	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152	
CR228	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152	
CR296	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152	
CR304	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152	
CR305	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152	
CR378	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152	
CR382	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152	
CR493	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152	
CR495	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152	
CR584	152-0536-00			SEMICONV DEVICE:SILICON,HOT CARRIER,4V,280M	04713	MBD101	
CR600	152-0536-00			SEMICONV DEVICE:SILICON,HOT CARRIER,4V,280M	04713	MBD101	

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
CR604	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR782	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR790	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR792	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR794	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR805	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR876	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR885	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR958	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR990	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR991	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR1200	152-0488-00		SEMICON D DEVICE:SILICON,200V,1500MA	80009	152-0488-00
CR1202	152-0066-00		SEMICON D DEVICE:SILICON,400V,750MA	80009	152-0066-00
CR1207	152-0066-00		SEMICON D DEVICE:SILICON,400V,750MA	80009	152-0066-00
CR1219	152-0066-00		SEMICON D DEVICE:SILICON,400V,750MA	80009	152-0066-00
CR1225	152-0488-00		SEMICON D DEVICE:SILICON,200V,1500MA	80009	152-0488-00
CR1240	152-0066-00		SEMICON D DEVICE:SILICON,400V,750MA	80009	152-0066-00
CR1242	152-0066-00		SEMICON D DEVICE:SILICON,400V,750MA	80009	152-0066-00
CR1244	152-0066-00		SEMICON D DEVICE:SILICON,400V,750MA	80009	152-0066-00
CR1246	152-0066-00		SEMICON D DEVICE:SILICON,400V,750MA	80009	152-0066-00
CR1248	152-0066-00		SEMICON D DEVICE:SILICON,400V,750MA	80009	152-0066-00
CR1250	152-0066-00		SEMICON D DEVICE:SILICON,400V,750MA	80009	152-0066-00
CR1272	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR1282	152-0066-00		SEMICON D DEVICE:SILICON,400V,750MA	80009	152-0066-00
CR1283	152-0066-00		SEMICON D DEVICE:SILICON,400V,750MA	80009	152-0066-00
CR1306	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR1310	152-0066-00		SEMICON D DEVICE:SILICON,400V,750MA	80009	152-0066-00
CR1325	152-0488-00		SEMICON D DEVICE:SILICON,200V,1500MA	80009	152-0488-00
CR1327	152-0066-00		SEMICON D DEVICE:SILICON,400V,750MA	80009	152-0066-00
CR1337	152-0066-00		SEMICON D DEVICE:SILICON,400V,750MA	80009	152-0066-00
CR1340	152-0066-00		SEMICON D DEVICE:SILICON,400V,750MA	80009	152-0066-00
CR1342	152-0066-00		SEMICON D DEVICE:SILICON,400V,750MA	80009	152-0066-00
CR1344	152-0066-00		SEMICON D DEVICE:SILICON,400V,750MA	80009	152-0066-00
CR1372	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR1382	152-0066-00		SEMICON D DEVICE:SILICON,400V,750MA	80009	152-0066-00
CR1383	152-0066-00		SEMICON D DEVICE:SILICON,400V,750MA	80009	152-0066-00
CR1406	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR1410	152-0066-00		SEMICON D DEVICE:SILICON,400V,750MA	80009	152-0066-00
DL480	119-0755-00		DELAY LINE,ELEC:4.75NS,50 OHMS	80009	119-0755-00
DS110	150-1029-00		LAMP,LED:2.0V,GREEN	53184	XC209G
DS500	150-1031-00		LAMP,LED:RED,20V	53184	XC209R
DS1250	150-1029-00		LAMP,LED:2.0V,GREEN	53184	XC209G
J10	131-0955-00		CONNECTOR,RCPT,:BNC,FEMALE	24931	28JR200-1
J12	131-1003-00		CONNECTOR BODY,:CKT BD MT,3 PRONG	80009	131-1003-00
J90	131-1003-00		CONNECTOR BODY,:CKT BD MT,3 PRONG	80009	131-1003-00
J140	131-1003-00		CONNECTOR BODY,:CKT BD MT,3 PRONG	80009	131-1003-00
J254	131-1003-00		CONNECTOR BODY,:CKT BD MT,3 PRONG	80009	131-1003-00
J255	131-0955-00		CONNECTOR,RCPT,:BNC,FEMALE	24931	28JR200-1
J260	131-1003-00		CONNECTOR BODY,:CKT BD MT,3 PRONG	80009	131-1003-00
J305	131-1003-00		CONNECTOR BODY,:CKT BD MT,3 PRONG	80009	131-1003-00
J450	131-1003-00		CONNECTOR BODY,:CKT BD MT,3 PRONG	80009	131-1003-00
J452	131-1003-00		CONNECTOR BODY,:CKT BD MT,3 PRONG	80009	131-1003-00

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
J480	131-1003-00			CONNECTOR BODY, :CKT BD MT, 3 PRONG	80009	131-1003-00
J481	131-1003-00			CONNECTOR BODY, :CKT BD MT, 3 PRONG	80009	131-1003-00
J485	131-1003-00			CONNECTOR BODY, :CKT BD MT, 3 PRONG	80009	131-1003-00
J520	131-1003-00			CONNECTOR BODY, :CKT BD MT, 3 PRONG	80009	131-1003-00
J522	131-1003-00			CONNECTOR BODY, :CKT BD MT, 3 PRONG	80009	131-1003-00
J1024	131-1003-00			CONNECTOR BODY, :CKT BD MT, 3 PRONG	80009	131-1003-00
J1025	131-1315-00			CONNECTOR, RCPT, :BNC, FEMALE	80009	131-1315-00
J1200	131-1003-00			CONNECTOR BODY, :CKT BD MT, 3 PRONG	80009	131-1003-00
J1201	131-1003-00			CONNECTOR BODY, :CKT BD MT, 3 PRONG	80009	131-1003-00
L240	276-0569-00			CORE, TOROID:	80009	276-0569-00
L507	108-0114-00			COIL, RF: 6UH	80009	108-0114-00
L980	108-0543-00			COIL, RF: 1.1UH	80009	108-0543-00
L1060	108-0543-00			COIL, RF: 1.1UH	80009	108-0543-00
LR682	108-0328-00			COIL, RF: 0.3UH	80009	108-0328-00
Q20	151-1042-00			SEMICON DVC SE: MATCHED PAIR FET	80009	151-1042-00
Q22						
Q25	151-0221-00			TRANSISTOR: SILICON, PNP	80009	151-0221-00
Q26	151-0221-00			TRANSISTOR: SILICON, PNP	80009	151-0221-00
Q30	151-0188-00			TRANSISTOR: SILICON, PNP	01295	2N3906
Q100	151-0333-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS918	80009	151-0333-00
Q102	151-0333-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS918	80009	151-0333-00
Q110	151-0424-00			TRANSISTOR: SILICON, NPN	07263	2N5769
Q150	151-0424-00			TRANSISTOR: SILICON, NPN	07263	2N5769
Q160	151-0424-00			TRANSISTOR: SILICON, NPN	07263	2N5769
Q175	151-0333-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS918	80009	151-0333-00
Q178	151-0221-00	XB010125		TRANSISTOR: SILICON, PNP	80009	151-0221-00
Q240	151-0221-00			TRANSISTOR: SILICON, PNP	80009	151-0221-00
Q244	151-0221-00			TRANSISTOR: SILICON, PNP	80009	151-0221-00
Q290	151-0424-00			TRANSISTOR: SILICON, NPN	07263	2N5769
Q294	151-0221-00			TRANSISTOR: SILICON, PNP	80009	151-0221-00
Q320	151-0424-00			TRANSISTOR: SILICON, NPN	07263	2N5769
Q342	151-0225-00			TRANSISTOR: SILICON, NPN	07910	CS23365
Q406	151-0424-00			TRANSISTOR: SILICON, NPN	07263	2N5769
Q410	151-0221-00			TRANSISTOR: SILICON, PNP	80009	151-0221-00
Q435	151-0424-00			TRANSISTOR: SILICON, NPN	07263	2N5769
Q460	151-0225-00			TRANSISTOR: SILICON, NPN	07910	CS23365
Q525	151-0221-00			TRANSISTOR: SILICON, PNP	80009	151-0221-00
Q530	151-0221-00			TRANSISTOR: SILICON, PNP	80009	151-0221-00
Q545	151-0221-00			TRANSISTOR: SILICON, PNP	80009	151-0221-00
Q550	151-0190-00			TRANSISTOR: SILICON, NPN	80009	151-0190-00
Q560	151-0221-00			TRANSISTOR: SILICON, PNP	80009	151-0221-00
Q565	151-0221-00			TRANSISTOR: SILICON, PNP	80009	151-0221-00
Q575	151-0190-00			TRANSISTOR: SILICON, NPN	80009	151-0190-00
Q580	151-0301-00			TRANSISTOR: SILICON, PNP	04713	2N2907A
Q600	151-0302-00			TRANSISTOR: SILICON, NPN	04713	2N2222A
Q608	151-0188-00			TRANSISTOR: SILICON, PNP	01295	2N3906
Q625	151-0424-00			TRANSISTOR: SILICON, NPN	07263	2N5769
Q630	151-0424-00			TRANSISTOR: SILICON, NPN	07263	2N5769
Q635	151-0424-00			TRANSISTOR: SILICON, NPN	07263	2N5769
Q640	151-0188-00			TRANSISTOR: SILICON, PNP	01295	2N3906
Q660	151-0282-00			TRANSISTOR: SILICON, NPN	02735	2N5179

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
Q675}	151-1042-00		SEMICON DVC SE:MATCHED PAIR FET	80009	151-1042-00
Q680}					
Q685	151-0282-00		TRANSISTOR:SILICON,NPN	02735	2N5179
Q690	151-0282-00		TRANSISTOR:SILICON,NPN	02735	2N5179
Q700}	151-1042-00		SEMICON DVC SE:MATCHED PAIR FET	80009	151-1042-00
Q701}					
Q704	151-0333-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS918	80009	151-0333-00
Q706	151-0333-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS918	80009	151-0333-00
Q715	151-0424-00		TRANSISTOR:SILICON,NPN	07263	2N5769
Q820	151-0221-00		TRANSISTOR:SILICON,PNP	80009	151-0221-00
Q825	151-0221-00		TRANSISTOR:SILICON,PNP	80009	151-0221-00
Q840	151-0221-00		TRANSISTOR:SILICON,PNP	80009	151-0221-00
Q845	151-0221-00		TRANSISTOR:SILICON,PNP	80009	151-0221-00
Q900	151-0190-00		TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q945	151-0424-00		TRANSISTOR:SILICON,NPN	07263	2N5769
Q950	151-0221-00		TRANSISTOR:SILICON,PNP	80009	151-0221-00
Q954	151-0221-00		TRANSISTOR:SILICON,PNP	80009	151-0221-00
Q975	151-0438-00		TRANSISTOR:SILICON,PNP,SEL FROM SPS6927	80009	151-0438-00
Q980	151-0211-00		TRANSISTOR:SILICON,NPN	01282	2N3866
Q990	151-0285-00		TRANSISTOR:SILICON,PNP	80009	151-0285-00
Q995	151-0424-00		TRANSISTOR:SILICON,NPN	07263	2N5769
Q1000	151-0302-00		TRANSISTOR:SILICON,NPN	04713	2N2222A
Q1010	151-0411-00		TRANSISTOR:SILICON,NPN	80009	151-0411-00
Q1015	151-0411-00		TRANSISTOR:SILICON,NPN	80009	151-0411-00
Q1055	151-0424-00		TRANSISTOR:SILICON,NPN	07263	2N5769
Q1060	151-0285-00		TRANSISTOR:SILICON,PNP	80009	151-0285-00
Q1070	151-0211-00		TRANSISTOR:SILICON,NPN	01282	2N3866
Q1075	151-0188-00		TRANSISTOR:SILICON,PNP	01295	2N3906
Q1080	151-0301-00		TRANSISTOR:SILICON,PNP	04713	2N2907A
Q1090	151-0450-00		TRANSISTOR:SILICON,PNP,SEL FROM 2N5583	80009	151-0450-00
Q1095	151-0450-00		TRANSISTOR:SILICON,PNP,SEL FROM 2N5583	80009	151-0450-00
Q1255	151-0432-00		TRANSISTOR:SILICON,NPN	12040	SM07391
Q1265	151-0432-00		TRANSISTOR:SILICON,NPN	12040	SM07391
Q1270	151-0432-00		TRANSISTOR:SILICON,NPN	12040	SM07391
Q1280	151-0463-00		TRANSISTOR:SILICON,PNP	80009	151-0463-00
Q1285	151-0350-00		TRANSISTOR:SILICON,PNP	07263	S036521
Q1295	151-0350-00		TRANSISTOR:SILICON,PNP	07263	S036521
Q1300	151-0347-00		TRANSISTOR:SILICON,NPN	80009	151-0347-00
Q1355	151-0453-00		TRANSISTOR:SILICON,PNP	80009	151-0453-00
Q1365	151-0453-00		TRANSISTOR:SILICON,PNP	80009	151-0453-00
Q1370	151-0453-00		TRANSISTOR:SILICON,PNP	80009	151-0453-00
Q1380	151-0439-00		TRANSISTOR:SILICON,NPN	80009	151-0439-00
Q1385	151-0347-00		TRANSISTOR:SILICON,NPN	80009	151-0347-00
Q1395	151-0347-00		TRANSISTOR:SILICON,NPN	80009	151-0347-00
Q1400	151-0453-00		TRANSISTOR:SILICON,PNP	80009	151-0453-00
R12	301-0510-00		RES.,FXD,CMPSN:51 OHM,5%,0.50W	01121	EB5105
R14	315-0913-00		RES.,FXD,CMPSN:91K OHM,5%,0.25W	01121	CB9135
R16	315-0914-00		RES.,FXD,CMPSN:910K OHM,5%,0.25W	01121	CB9145
R20	301-0471-00		RES.,FXD,CMPSN:470 OHM,5%,0.50W	01121	EB4715
R22	301-0471-00		RES.,FXD,CMPSN:470 OHM,5%,0.50W	01121	EB4715
R25	315-0470-00		RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R28	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R30	315-0152-00		RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
R32	315-0302-00		RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R33	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
R36	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R38	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R40	321-0302-00			RES.,FXD,FILM:13.7K OHM,1%,0.125W	91637	MFF1816G13701F
R42	321-0327-00			RES.,FXD,FILM:24.9K OHM,1%,0.125W	91637	MFF1816G24901F
R43	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R45	321-0290-00			RES.,FXD,FILM:10.2K OHM,1%,0.125W	91637	MFF1816G10201F
R48	311-1484-00			RES.,VAR,NONWIR:2.5K OHM 1W	01121	11M110
R52	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R53	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R55	315-0182-00			RES.,FXD,CMPSN:1.8K OHM,5%,0.25W	01121	CB1825
R56	315-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
R57	315-0242-00			RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	CB2425
R60	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
R62	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
R64	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
R66	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R70	315-0151-00			RES.,FXD,CMPSN:150 OHM,5%,0.25W	01121	CB1515
R72	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
R73	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
R75	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R76	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R78	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R90	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
R92	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R95	315-0561-00			RES.,FXD,CMPSN:560 OHM,5%,0.25W	01121	CB5615
R100	301-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.50W	01121	EB1525
R102	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
R104	315-0161-00			RES.,FXD,CMPSN:160 OHM,5%,0.25W	01121	CB1615
R106	321-0297-00			RES.,FXD,FILM:12.1K OHM,1%,0.125W	91637	MFF1816G12101F
R110	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
R112	321-0217-00			RES.,FXD,FILM:1.78K OHM,1%,0.125W	91637	MFF1816G17800F
R113	321-0255-00			RES.,FXD,FILM:4.42K OHM,1%,0.125W	91637	MFF1816G44200F
R140	315-0131-00			RES.,FXD,CMPSN:130 OHM,5%,0.25W	01121	CB1315
R142	315-0820-00			RES.,FXD,CMPSN:82 OHM,5%,0.25W	01121	CB8205
R145	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R147	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R150	315-0121-00			RES.,FXD,CMPSN:120 OHM,5%,0.25W	01121	CB1215
R152	315-0430-00			RES.,FXD,CMPSN:43 OHM,5%,0.25W	01121	CB4305
R154	301-0132-00			RES.,FXD,CMPSN:1.3K OHM,5%,0.50W	01121	EB1325
R156	315-0430-00			RES.,FXD,CMPSN:43 OHM,5%,0.25W	01121	CB4305
R160	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R162	315-0242-00			RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	CB2425
R165	311-1561-00			RES.,VAR,NONWIR:2.5K OHM,20%,0.50W	73138	91A-25000M
R167	315-0112-00			RES.,FXD,CMPSN:1.1K OHM,5%,0.25W	01121	CB1125
R169	315-0362-00			RES.,FXD,CMPSN:3.6K OHM,5%,0.25W	01121	CB3625
R170	311-1560-00			RES.,VAR,NONWIR:5K OHM,5%,0.50W	73138	91A-50000M
R171	315-0430-00	B010100	B010124X	RES.,FXD,CMPSN:43 OHM,5%,0.25W	01121	CB4305
R172	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
R175	315-0431-00			RES.,FXD,CMPSN:430 OHM,5%,0.25W	01121	CB4315
R177	315-0680-00			RES.,FXD,CMPSN:68 OHM,5%,0.25W	01121	CB6805
R178	315-0271-00	XB010125		RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
R180	311-1560-00			RES.,VAR,NONWIR:5K OHM,5%,0.50W	73138	91A-50000M

Ckt No.	Tektronix		Serial/Model No.		Name & Description	Mfr	
	Part No.	Eff	Dscont			Code	Mfr Part Number
R182	315-0683-00				RES., FXD, CMPSN:68K OHM, 5%, 0.25W	01121	CB6835
R185	315-0101-00				RES., FXD, CMPSN:100 OHM, 5%, 0.25W	01121	CB1015
R186	311-1567-00				RES., VAR, NONWIR:100 OHM, 20%, 0.50W	73138	91A-100ROM
R190	311-1832-00				RES., VAR, NONWIR:5K OHM, 10%, 0.50W	01121	14M395
R192	315-0123-00				RES., FXD, CMPSN:12K OHM, 5%, 0.25W	01121	CB1235
R194	315-0432-00				RES., FXD, CMPSN:4.3K OHM, 5%, 0.25W	01121	CB4325
R195	311-1566-00				RES., VAR, NONWIR:200 OHM, 20%, 0.50W	73138	91A-200ROM
R214	307-0113-00				RES., FXD, CMPSN:5.1 OHM, 5%, 0.25W	01121	CB51G5
R218	315-0180-00				RES., FXD, CMPSN:18 OHM, 5%, 0.25W	01121	CB1805
R219	315-0100-00				RES., FXD, CMPSN:10 OHM, 5%, 0.25W	01121	CB1005
R224	315-0471-00				RES., FXD, CMPSN:470 OHM, 5%, 0.25W	01121	CB4715
R230	315-0471-00				RES., FXD, CMPSN:470 OHM, 5%, 0.25W	01121	CB4715
R232	315-0471-00				RES., FXD, CMPSN:470 OHM, 5%, 0.25W	01121	CB4715
R234	315-0471-00				RES., FXD, CMPSN:470 OHM, 5%, 0.25W	01121	CB4715
R240	315-0220-00				RES., FXD, CMPSN:22 OHM, 5%, 0.25W	01121	CB2205
R242	301-0431-00				RES., FXD, CMPSN:430 OHM, 5%, 0.50W	01121	EB4315
R244	301-0431-00				RES., FXD, CMPSN:430 OHM, 5%, 0.50W	01121	EB4315
R248	315-0100-00				RES., FXD, CMPSN:10 OHM, 5%, 0.25W	01121	CB1005
R249	315-0510-00				RES., FXD, CMPSN:51 OHM, 5%, 0.25W	01121	CB5105
R252	315-0100-00				RES., FXD, CMPSN:10 OHM, 5%, 0.25W	01121	CB1005
R253	315-0510-00				RES., FXD, CMPSN:51 OHM, 5%, 0.25W	01121	CB5105
R270	315-0271-00				RES., FXD, CMPSN:270 OHM, 5%, 0.25W	01121	CB2715
R272	315-0471-00				RES., FXD, CMPSN:470 OHM, 5%, 0.25W	01121	CB4715
R274	315-0471-00				RES., FXD, CMPSN:470 OHM, 5%, 0.25W	01121	CB4715
R275	315-0680-00				RES., FXD, CMPSN:68 OHM, 5%, 0.25W	01121	CB6805
R280	315-0471-00				RES., FXD, CMPSN:470 OHM, 5%, 0.25W	01121	CB4715
R284	315-0471-00				RES., FXD, CMPSN:470 OHM, 5%, 0.25W	01121	CB4715
R290	315-0271-00				RES., FXD, CMPSN:270 OHM, 5%, 0.25W	01121	CB2715
R292	315-0111-00				RES., FXD, CMPSN:110 OHM, 5%, 0.25W	01121	CB1115
R294	315-0302-00				RES., FXD, CMPSN:3K OHM, 5%, 0.25W	01121	CB3025
R296	315-0100-00				RES., FXD, CMPSN:10 OHM, 5%, 0.25W	01121	CB1005
R300	315-0121-00				RES., FXD, CMPSN:120 OHM, 5%, 0.25W	01121	CB1215
R304	315-0430-00				RES., FXD, CMPSN:43 OHM, 5%, 0.25W	01121	CB4305
R306	315-0151-00				RES., FXD, CMPSN:150 OHM, 5%, 0.25W	01121	CB1515
R310	315-0271-00				RES., FXD, CMPSN:270 OHM, 5%, 0.25W	01121	CB2715
R312	315-0271-00				RES., FXD, CMPSN:270 OHM, 5%, 0.25W	01121	CB2715
R315	315-0390-00				RES., FXD, CMPSN:39 OHM, 5%, 0.25W	01121	CB3905
R317	315-0510-00				RES., FXD, CMPSN:51 OHM, 5%, 0.25W	01121	CB5105
R320	315-0220-00				RES., FXD, CMPSN:22 OHM, 5%, 0.25W	01121	CB2205
R325	315-0270-00				RES., FXD, CMPSN:27 OHM, 5%, 0.25W	01121	CB2705
R328	315-0100-00				RES., FXD, CMPSN:10 OHM, 5%, 0.25W	01121	CB1005
R342	315-0101-00				RES., FXD, CMPSN:100 OHM, 5%, 0.25W	01121	CB1015
R346	315-0202-00				RES., FXD, CMPSN:2K OHM, 5%, 0.25W	01121	CB2025
R348	315-0201-00				RES., FXD, CMPSN:200 OHM, 5%, 0.25W	01121	CB2015
R350	315-0621-00				RES., FXD, CMPSN:620 OHM, 5%, 0.25W	01121	CB6215
R352	311-1562-00				RES., VAR, NONWIR:2K OHM, 20%, 0.50W	73138	91A-2000M
R354	315-0124-00				RES., FXD, CMPSN:120K OHM, 5%, 0.25W	01121	CB1245
R355	311-1834-00				RES., VAR, NONWIR:50K OHM, 10%, 0.50W	01121	14M397
R360	315-0471-00				RES., FXD, CMPSN:470 OHM, 5%, 0.25W	01121	CB4715
R362	315-0471-00				RES., FXD, CMPSN:470 OHM, 5%, 0.25W	01121	CB4715
R364	315-0680-00				RES., FXD, CMPSN:68 OHM, 5%, 0.25W	01121	CB6805
R366	315-0471-00				RES., FXD, CMPSN:470 OHM, 5%, 0.25W	01121	CB4715
R368	315-0471-00				RES., FXD, CMPSN:470 OHM, 5%, 0.25W	01121	CB4715

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R370	315-0471-00			RES., FXD, CMPSN:470 OHM, 5%, 0.25W	01121	CB4715
R372	315-0680-00			RES., FXD, CMPSN:68 OHM, 5%, 0.25W	01121	CB6805
R375	315-0471-00			RES., FXD, CMPSN:470 OHM, 5%, 0.25W	01121	CB4715
R380	315-0102-00			RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
R400	315-0471-00	B010100	B010124	RES., FXD, CMPSN:470 OHM, 5%, 0.25W	01121	CB4715
R400	315-0271-00	B010125		RES., FXD, CMPSN:270 OHM, 5%, 0.25W	01121	CB2715
R402	315-0471-00	B010100	B010124	RES., FXD, CMPSN:470 OHM, 5%, 0.25W	01121	CB4715
R402	315-0271-00	B010125		RES., FXD, CMPSN:270 OHM, 5%, 0.25W	01121	CB2715
R406	315-0271-00			RES., FXD, CMPSN:270 OHM, 5%, 0.25W	01121	CB2715
R408	315-0111-00			RES., FXD, CMPSN:110 OHM, 5%, 0.25W	01121	CB1115
R410	315-0302-00			RES., FXD, CMPSN:3K OHM, 5%, 0.25W	01121	CB3025
R412	315-0100-00			RES., FXD, CMPSN:10 OHM, 5%, 0.25W	01121	CB1005
R415	315-0121-00			RES., FXD, CMPSN:120 OHM, 5%, 0.25W	01121	CB1215
R420	315-0430-00			RES., FXD, CMPSN:43 OHM, 5%, 0.25W	01121	CB4305
R422	315-0151-00			RES., FXD, CMPSN:150 OHM, 5%, 0.25W	01121	CB1515
R425	315-0271-00			RES., FXD, CMPSN:270 OHM, 5%, 0.25W	01121	CB2715
R426	315-0271-00			RES., FXD, CMPSN:270 OHM, 5%, 0.25W	01121	CB2715
R430	315-0390-00			RES., FXD, CMPSN:39 OHM, 5%, 0.25W	01121	CB3905
R432	315-0510-00			RES., FXD, CMPSN:51 OHM, 5%, 0.25W	01121	CB5105
R436	315-0270-00			RES., FXD, CMPSN:27 OHM, 5%, 0.25W	01121	CB2705
R439	315-0100-00			RES., FXD, CMPSN:10 OHM, 5%, 0.25W	01121	CB1005
R455	315-0220-00			RES., FXD, CMPSN:22 OHM, 5%, 0.25W	01121	CB2205
R456	315-0101-00			RES., FXD, CMPSN:100 OHM, 5%, 0.25W	01121	CB1015
R460	315-0202-00			RES., FXD, CMPSN:2K OHM, 5%, 0.25W	01121	CB2025
R465	311-1561-00			RES., VAR, NONWIR:2.5K OHM, 20%, 0.50W	73138	91A-25000M
R462	315-0201-00			RES., FXD, CMPSN:200 OHM, 5%, 0.25W	01121	CB2015
R467	315-0621-00			RES., FXD, CMPSN:620 OHM, 5%, 0.25W	01121	CB6215
R470	311-1562-00			RES., VAR, NONWIR:2K OHM, 20%, 0.50W	73138	91A-20000M
R473	315-0124-00			RES., FXD, CMPSN:120K OHM, 5%, 0.25W	01121	CB1245
R475	311-1834-00			RES., VAR, NONWIR:50K OHM, 10%, 0.50W	01121	14M397
R482	315-0102-00	XB010125		RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
R485	315-0102-00			RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
R487	315-0102-00			RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
R490	315-0152-00			RES., FXD, CMPSN:1.5K OHM, 5%, 0.25W	01121	CB1525
R492	315-0102-00	XB010125		RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
R493	315-0102-00			RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
R495	315-0101-00			RES., FXD, CMPSN:100 OHM, 5%, 0.25W	01121	CB1015
R500	315-0151-00			RES., FXD, CMPSN:150 OHM, 5%, 0.25W	01121	CB1515
R520	315-0131-00			RES., FXD, CMPSN:130 OHM, 5%, 0.25W	01121	CB1315
R522	315-0820-00			RES., FXD, CMPSN:82 OHM, 5%, 0.25W	01121	CB8205
R525	315-0510-00			RES., FXD, CMPSN:51 OHM, 5%, 0.25W	01121	CB5105
R527	315-0102-00			RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
R528	315-0220-00			RES., FXD, CMPSN:22 OHM, 5%, 0.25W	01121	CB2205
R530	315-0102-00			RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
R534	315-0820-00			RES., FXD, CMPSN:82 OHM, 5%, 0.25W	01121	CB8205
R536	315-0131-00			RES., FXD, CMPSN:130 OHM, 5%, 0.25W	01121	CB1315
R538	315-0510-00			RES., FXD, CMPSN:51 OHM, 5%, 0.25W	01121	CB5105
R540	311-1833-00			RES., VAR, NONWIR:50K OHM, 10%, 0.50W	01121	14M396
R542	311-1248-00			RES., VAR, NONWIR:500 OHM, 10%, 0.50W	73138	72X-23-0-501K
R544	315-0111-00			RES., FXD, CMPSN:110 OHM, 5%, 0.25W	01121	CB1115
R545	315-0111-00			RES., FXD, CMPSN:110 OHM, 5%, 0.25W	01121	CB1115
R547	315-0391-00			RES., FXD, CMPSN:390 OHM, 5%, 0.25W	01121	CB3915
R550	315-0271-00			RES., FXD, CMPSN:270 OHM, 5%, 0.25W	01121	CB2715

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Ckt No.	Tektronix	Serial/Model No.		Name & Description	Mfr	
	Part No.	Eff	Dscont		Code	Mfr Part Number
R552	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
R554	321-0225-00			RES.,FXD,FILM:2.15K OHM,1%,0.125W	91637	MFF1816G21500F
R555	321-0297-00			RES.,FXD,FILM:12.1K OHM,1%,0.125W	91637	MFF1816G12101F
R560	317-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.125W	01121	BB4705
R563	317-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.125W	01121	BB4705
R565	317-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.125W	01121	BB2205
R569	315-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.25W	01121	CB7515
R570	311-1237-00			RES.,VAR,NONWIR:1K OHM,10%,0.50W	32997	3386H-T07-102
R571	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
R575	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R578	301-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.50W	01121	EB4715
R585	317-0150-00			RES.,FXD,CMPSN:15 OHM,5%,0.125W	01121	BB1505
R586	317-0150-00			RES.,FXD,CMPSN:15 OHM,5%,0.125W	01121	BB1505
R600	315-0221-00	XB010125		RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R604	315-0161-00			RES.,FXD,CMPSN:160 OHM,5%,0.25W	01121	CB1615
R608	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R614	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
R615	311-1237-00			RES.,VAR,NONWIR:1K OHM,10%,0.50W	32997	3386H-T07-102
R616	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R620	315-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.25W	01121	CB7515
R622	317-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.125W	01121	BB4705
R625	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
R630	315-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.25W	01121	CB7515
R631	317-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.125W	01121	BB4705
R635	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
R637	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
R640	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
R643	321-0297-00			RES.,FXD,FILM:12.1K OHM,1%,0.125W	91637	MFF1816G12101F
R644	321-0225-00			RES.,FXD,FILM:2.15K OHM,1%,0.125W	91637	MFF1816G21500F
R647	315-0111-00			RES.,FXD,CMPSN:110 OHM,5%,0.25W	01121	CB1115
R648	315-0111-00			RES.,FXD,CMPSN:110 OHM,5%,0.25W	01121	CB1115
R650	311-1248-00			RES.,VAR,NONWIR:500 OHM,10%,0.50W	73138	72X-23-0-501K
R655	311-1833-00			RES.,VAR,NONWIR:50K OHM,10%,0.50W	01121	14M396
R660	321-0173-00			RES.,FXD,FILM:619 OHM,1%,0.125W	91637	MFF1816G619ROF
R662	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R667	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R668	321-0282-00			RES.,FXD,FILM:8.45K OHM,1%,0.125W	91637	MFF1816G84500F
R670	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R671	321-0282-00			RES.,FXD,FILM:8.45K OHM,1%,0.125W	91637	MFF1816G84500F
R678	317-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.125W	01121	BB1015
R682	315-0151-00			RES.,FXD,CMPSN:150 OHM,5%,0.25W	01121	CB1515
R685	321-0069-00			RES.,FXD,FILM:51.1 OHM,1%,0.125W	91637	MFF1816G51R10F
R687	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
R690	321-0069-00			RES.,FXD,FILM:51.1 OHM,1%,0.125W	91637	MFF1816G51R10F
R692	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
R695	321-0199-00			RES.,FXD,FILM:1.15K OHM,1%,0.125W	91637	MFF1816G11500F
R697	317-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.125W	01121	BB1015
R698	321-0153-00			RES.,FXD,FILM:383 OHM,1%,0.125W	91637	MFF1816G383ROF
R700	315-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.25W	01121	CB7515
R702	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R704	315-0162-00			RES.,FXD,CMPSN:1.6K OHM,5%,0.25W	01121	CB1625
R706	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R708	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715

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Ckt No.	Tektronix Part No.	Serial/Model No.		Name & Description	Mfr Code	Mfr Part Number
		Eff	Dscont			
R710	321-0153-00			RES.,FXD,FILM:383 OHM,1%,0.125W	91637	MFF1816G383ROF
R712	321-0199-00			RES.,FXD,FILM:1.15K OHM,1%,0.125W	91637	MFF1816G11500F
R715	315-0431-00			RES.,FXD,CMPSN:430 OHM,5%,0.25W	01121	CB4315
R722	315-0561-00			RES.,FXD,CMPSN:560 OHM,5%,0.25W	01121	CB5615
R724	315-0561-00			RES.,FXD,CMPSN:560 OHM,5%,0.25W	01121	CB5615
R728	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
R730	315-0561-00			RES.,FXD,CMPSN:560 OHM,5%,0.25W	01121	CB5615
R732	315-0151-00			RES.,FXD,CMPSN:150 OHM,5%,0.25W	01121	CB1515
R734	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R742	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R744	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
R748	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R749	315-0680-00			RES.,FXD,CMPSN:68 OHM,5%,0.25W	01121	CB6805
R750	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
R770A,B	311-1162-00			RES.,VAR, NONWIR:2 X 10K OHM,10%,1W	12697	381-CM39691
R775	311-1245-00			RES.,VAR, NONWIR:10K OHM,10%,0.50W	73138	72X-28-0-103K
R777	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
R778	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R780	315-0182-00			RES.,FXD,CMPSN:1.8K OHM,5%,0.25W	01121	CB1825
R782	317-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.125W	01121	BB1005
R785	311-1245-00			RES.,VAR, NONWIR:10K OHM,10%,0.50W	73138	72X-28-0-103K
R787	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
R788	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R790	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
R794	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
R796	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R798	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R800	315-0183-00			RES.,FXD,CMPSN:18K OHM,5%,0.25W	01121	CB1835
R802	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R804	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R810	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R811	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R814	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R815	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R817	321-0182-00			RES.,FXD,FILM:768 OHM,1%,0.125W	91637	MFF1816G768ROF
R820	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R825	321-0107-00			RES.,FXD,FILM:127 OHM,1%,0.125W	91637	MFF1816G127ROF
R827	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R830	321-0142-00			RES.,FXD,FILM:294 OHM,1%,0.125W	91637	MFF1816G294ROF
R832	321-0142-00			RES.,FXD,FILM:294 OHM,1%,0.125W	91637	MFF1816G294ROF
R834	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R836	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
R840	321-0107-00			RES.,FXD,FILM:127 OHM,1%,0.125W	91637	MFF1816G127ROF
R842	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R845	322-0119-00			RES.,FXD,FILM:169 OHM,1%,0.25W	91637	MFF1421G169ROF
R847	323-0145-00			RES.,FXD,FILM:316 OHM,1%,0.50W	75042	CECT0-3160F
R850	321-0114-00			RES.,FXD,FILM:150 OHM,1%,0.125W	91637	MFF1816G150ROF
R852	321-0114-00			RES.,FXD,FILM:150 OHM,1%,0.125W	91637	MFF1816G150ROF
R854	321-0114-00			RES.,FXD,FILM:150 OHM,1%,0.125W	91637	MFF1816G150ROF
R856	321-0114-00			RES.,FXD,FILM:150 OHM,1%,0.125W	91637	MFF1816G150ROF
R860	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R861	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
R863	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015

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Ckt No.	Tektronix Part No.	Serial/Model No.		Name & Description	Mfr Code	Mfr Part Number
		Eff	Dscont			
R865	315-0222-00			RES., FXD, CMPSN:2.2K OHM, 5%, 0.25W	01121	CB2225
R866	315-0222-00			RES., FXD, CMPSN:2.2K OHM, 5%, 0.25W	01121	CB2225
R868	315-0222-00			RES., FXD, CMPSN:2.2K OHM, 5%, 0.25W	01121	CB2225
R869	315-0222-00			RES., FXD, CMPSN:2.2K OHM, 5%, 0.25W	01121	CB2225
R875	315-0301-00			RES., FXD, CMPSN:300 OHM, 5%, 0.25W	01121	CB3015
R876	315-0272-00			RES., FXD, CMPSN:2.7K OHM, 5%, 0.25W	01121	CB2725
R878	315-0510-00			RES., FXD, CMPSN:51 OHM, 5%, 0.25W	01121	CB5105
R883	315-0470-00			RES., FXD, CMPSN:47 OHM, 5%, 0.25W	01121	CB4705
R885	311-1566-00			RES., VAR, NONWIR:200 OHM, 20%, 0.50W	73138	91A-200ROM
R887	321-0097-00			RES., FXD, FILM:100 OHM, 1%, 0.125W	91637	MFF1816G100ROF
R888	321-0097-00			RES., FXD, FILM:100 OHM, 1%, 0.125W	91637	MFF1816G100ROF
R892	321-0271-00			RES., FXD, FILM:6.49K OHM, 1%, 0.125W	91637	MFF1816G64900F
R893	321-0289-00			RES., FXD, FILM:10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R895	321-0271-00			RES., FXD, FILM:6.49K OHM, 1%, 0.125W	91637	MFF1816G64900F
R897	321-0289-00			RES., FXD, FILM:10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R898	323-0133-00			RES., FXD, FILM:237 OHM, 1%, 0.50W	75042	CECT0-237OF
R900	315-0101-00			RES., FXD, CMPSN:100 OHM, 5%, 0.25W	01121	CB1015
R904	321-0223-00			RES., FXD, FILM:2.05K OHM, 1%, 0.125W	91637	MFF1816G20500F
R905	321-0324-00			RES., FXD, FILM:23.2K OHM, 1%, 0.125W	91637	MFF1816G23201F
R908	321-0223-00			RES., FXD, FILM:2.05K OHM, 1%, 0.125W	91637	MFF1816G20500F
R910	311-1562-00			RES., VAR, NONWIR:2K OHM, 20%, 0.50W	73138	91A-20000M
R911	321-0322-00			RES., FXD, FILM:22.1K OHM, 1%, 0.125W	91637	MFF1816G22101F
R914	315-0203-00			RES., FXD, CMPSN:20K OHM, 5%, 0.25W	01121	CB2035
R915	311-1559-00			RES., VAR, NONWIR:10K OHM, 20%, 0.50W	73138	91A-10001M
R918	315-0203-00			RES., FXD, CMPSN:20K OHM, 5%, 0.25W	01121	CB2035
R920	311-1559-00			RES., VAR, NONWIR:10K OHM, 20%, 0.50W	73138	91A-10001M
R924	315-0273-00			RES., FXD, CMPSN:27K OHM, 5%, 0.25W	01121	CB2735
R925	311-1559-00			RES., VAR, NONWIR:10K OHM, 20%, 0.50W	73138	91A-10001M
R930	315-0432-00			RES., FXD, CMPSN:4.3K OHM, 5%, 0.25W	01121	CB4325
R932	321-0287-00			RES., FXD, FILM:9.53K OHM, 1%, 0.125W	91637	MFF1816G95300F
R934	321-0260-00			RES., FXD, FILM:4.99K OHM, 1%, 0.125W	91637	MFF1816G49900F
R936	321-0260-00			RES., FXD, FILM:4.99K OHM, 1%, 0.125W	91637	MFF1816G49900F
R938	321-0289-00			RES., FXD, FILM:10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R942	321-0289-00			RES., FXD, FILM:10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R944	315-0101-00			RES., FXD, CMPSN:100 OHM, 5%, 0.25W	01121	CB1015
R945	315-0821-00			RES., FXD, CMPSN:820 OHM, 5%, 0.25W	01121	CB8215
R947	323-0157-00			RES., FXD, FILM:422 OHM, 1%, 0.50W	91637	MFF1226G422ROF
R950	317-0100-00			RES., FXD, CMPSN:10 OHM, 5%, 0.125W	01121	BB1005
R954	317-0100-00			RES., FXD, CMPSN:10 OHM, 5%, 0.125W	01121	BB1005
R956	317-0101-00			RES., FXD, CMPSN:100 OHM, 5%, 0.125W	01121	BB1015
R958	315-0102-00			RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
R975	315-0100-00			RES., FXD, CMPSN:10 OHM, 5%, 0.25W	01121	CB1005
R977	315-0160-00			RES., FXD, CMPSN:16 OHM, 5%, 0.25W	01121	CB1605
R978	301-0751-00			RES., FXD, CMPSN:750 OHM, 5%, 0.50W	01121	EB7515
R982	321-0001-00			RES., FXD, FILM:10 OHM, 1%, 0.125W	75042	CEATO-10ROOF
R985	322-0051-00			RES., FXD, FILM:33.2 OHM, 1%, 0.25W	75042	CEBT0-33R2OF
R990	307-0110-00			RES., FXD, CMPSN:3 OHM, 5%, 0.25W	01121	CB30G5
R992	315-0100-00			RES., FXD, CMPSN:10 OHM, 5%, 0.25W	01121	CB1005
R995	301-0472-00			RES., FXD, CMPSN:4.7K OHM, 5%, 0.50W	01121	EB4725
R1000	321-0218-00			RES., FXD, FILM:1.82K OHM, 1%, 0.125W	91637	MFF1816G18200F
R1002	321-0136-00			RES., FXD, FILM:255 OHM, 1%, 0.125W	91637	MFF1816G255ROF
R1005	315-0430-00			RES., FXD, CMPSN:43 OHM, 5%, 0.25W	01121	CB4305
R1014	307-0114-00			RES., FXD, CMPSN:6.2 OHM, 5%, 0.25W	01121	CB62G5

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R1017	315-0821-00			RES., FXD, CMPSN:820 OHM, 5%, 0.25W	01121	CB8215
R1018	307-0114-00			RES., FXD, CMPSN:6.2 OHM, 5%, 0.25W	01121	CB62G5
R1019	301-0132-00			RES., FXD, CMPSN:1.3K OHM, (NOM VALUE), SEL	01121	EB1325
R1020	311-1563-00			RES., VAR, NONWIR:1K OHM, 20%, 0.50W	73138	91A-10000M
R1021	303-0391-00			RES., FXD, CMPSN:390 OHM, 5%, 1W	01121	GB3915
R1024	311-1567-00			RES., VAR, NONWIR:100 OHM, 20%, 0.50W	73138	91A-100ROM
R1026	305-0470-00			RES., FXD, CMPSN:47 OHM, 5%, 2W	01121	HB4705
R1027	305-0470-00			RES., FXD, CMPSN:47 OHM, 5%, 2W	01121	HB4705
R1028	303-0100-00			RES., FXD, CMPSN:10 OHM, 5%, 1W	01121	GB1005
R1029	303-0100-00			RES., FXD, CMPSN:10 OHM, 5%, 1W	01121	GB1005
R1030	305-0470-00			RES., FXD, CMPSN:47 OHM, 5%, 2W	01121	HB4705
R1031	305-0470-00			RES., FXD, CMPSN:47 OHM, 5%, 2W	01121	HB4705
R1032	303-0100-00			RES., FXD, CMPSN:10 OHM, 5%, 1W	01121	GB1005
R1033	303-0100-00			RES., FXD, CMPSN:10 OHM, 5%, 1W	01121	GB1005
R1035	315-0273-00			RES., FXD, CMPSN:27K OHM, 5%, 0.25W	01121	CB2735
R1040	315-0105-00			RES., FXD, CMPSN:1M OHM, 5%, 0.25W	01121	CB1055
R1042	322-0222-00			RES., FXD, FILM:2K OHM, 1%, 0.25W	75042	CEBT0-2001F
R1044	315-0105-00			RES., FXD, CMPSN:1M OHM, 5%, 0.25W	01121	CB1055
R1048	315-0390-00			RES., FXD, CMPSN:39 OHM, 5%, 0.25W	01121	CB3905
R1050	311-1568-00			RES., VAR, NONWIR:50 OHM, 20%, 0.50W	73138	91A-50ROOM
R1055	315-0100-00			RES., FXD, CMPSN:10 OHM, 5%, 0.25W	01121	CB1005
R1057	315-0160-00			RES., FXD, CMPSN:16 OHM, 5%, 0.25W	01121	CB1605
R1058	301-0751-00			RES., FXD, CMPSN:750 OHM, 5%, 0.50W	01121	EB7515
R1062	321-0001-00			RES., FXD, FILM:10 OHM, 1%, 0.125W	75042	CEAT0-10R00F
R1065	322-0051-00			RES., FXD, FILM:33.2 OHM, 1%, 0.25W	75042	CEBT0-33R20F
R1072	315-0100-00			RES., FXD, CMPSN:10 OHM, 5%, 0.25W	01121	CB1005
R1075	301-0472-00			RES., FXD, CMPSN:4.7K OHM, 5%, 0.50W	01121	EB4725
R1080	321-0218-00			RES., FXD, FILM:1.82K OHM, 1%, 0.125W	91637	MFF1816G18200F
R1082	321-0136-00			RES., FXD, FILM:255 OHM, 1%, 0.125W	91637	MFF1816G255R0F
R1085	315-0470-00			RES., FXD, CMPSN:47 OHM, 5%, 0.25W	01121	CB4705
R1094	307-0114-00			RES., FXD, CMPSN:6.2 OHM, 5%, 0.25W	01121	CB62G5
R1098	307-0114-00			RES., FXD, CMPSN:6.2 OHM, 5%, 0.25W	01121	CB62G5
R1202	315-0272-00			RES., FXD, CMPSN:2.7K OHM, 5%, 0.25W	01121	CB2725
R1205	308-0179-00			RES., FXD, WW:5 OHM, 5%, 5W	91637	RS5-05R000J
R1209	321-0209-00			RES., FXD, FILM:1.47K OHM, 1%, 0.125W	91637	MFF1816G14700F
R1210	311-1562-00			RES., VAR, NONWIR:2K OHM, 20%, 0.50W	73138	91A-20000M
R1211	321-0265-00			RES., FXD, FILM:5.62K OHM, 1%, 0.125W	91637	MFF1816G56200F
R1215	308-0245-00			RES., FXD, WW:0.6 OHM, 5%, 2W	91637	RS2B162ER6000J
R1217	315-0182-00			RES., FXD, CMPSN:1.8K OHM, 5%, 0.25W	01121	CB1825
R1230	315-0123-00			RES., FXD, CMPSN:12K OHM, 5%, 0.25W	01121	CB1235
R1232	311-1559-00			RES., VAR, NONWIR:10K OHM, 20%, 0.50W	73138	91A-10001M
R1234	315-0123-00			RES., FXD, CMPSN:12K OHM, 5%, 0.25W	01121	CB1235
R1236	311-1559-00			RES., VAR, NONWIR:10K OHM, 20%, 0.50W	73138	91A-10001M
R1250	315-0221-00			RES., FXD, CMPSN:220 OHM, 5%, 0.25W	01121	CB2215
R1255	315-0182-00			RES., FXD, CMPSN:1.8K OHM, 5%, 0.25W	01121	CB1825
R1257	315-0752-00	B010100	B010149	RES., FXD, CMPSN:7.5K OHM, 5%, 0.25W	01121	CB7525
R1257	315-0512-00	B010150		RES., FXD, CMPSN:5.1K OHM, 5%, 0.25W	01121	CB5125
R1259	315-0103-00			RES., FXD, CMPSN:10K OHM, 5%, 0.25W	01121	CB1035
R1260	315-0103-00			RES., FXD, CMPSN:10K OHM, 5%, 0.25W	01121	CB1035
R1265	321-0246-00			RES., FXD, FILM:3.57K OHM, 1%, 0.125W	91637	MFF1816G35700F
R1266	321-0246-00			RES., FXD, FILM:3.57K OHM, 1%, 0.125W	91637	MFF1816G35700F
R1270	315-0103-00			RES., FXD, CMPSN:10K OHM, 5%, 0.25W	01121	CB1035
R1272	321-0238-00			RES., FXD, FILM:2.94K OHM, 1%, 0.125W	91637	MFF1816G29400F

Ckt No.	Tektronix		Serial/Model No.		Name & Description	Mfr	
	Part No.	Eff	Dscont	Code		Mfr Part Number	
R1273	321-0254-00				RES.,FXD,FILM:4.32K OHM,1%,0.125W	91637	MFF1816G43200F
R1275	321-0296-00				RES.,FXD,FILM:11.8K OHM,1%,0.125W	91637	MFF1816G11801F
R1276	315-0470-00				RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R1280	315-0102-00				RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R1282	308-0767-00				RES.,FXD,WW:1.1 OHM,5%,1W	75042	BW20-1R100J
R1285	315-0272-00				RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725
R1287	315-0103-00				RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R1290	315-0101-00				RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R1295	301-0152-00				RES.,FXD,CMPSN:1.5K OHM,5%,0.50W	01121	EB1525
R1297	321-0124-00				RES.,FXD,FILM:191 OHM,1%,0.125W	91637	MFF1816G191ROF
R1298	315-0392-00				RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
R1300	321-0164-00				RES.,FXD,FILM:499 OHM,1%,0.125W	91637	MFF1816G499ROF
R1302	321-0326-00				RES.,FXD,FILM:24.3K OHM,1%,0.125W	91637	MFF1816G24301F
R1305	321-0290-00				RES.,FXD,FILM:10.2K OHM,1%,0.125W	91637	MFF1816G10201F
R1306	321-0211-00				RES.,FXD,FILM:1.54K OHM,1%,0.125W	91637	MFF1816G15400F
R1310	315-0472-00				RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R1327	315-0272-00				RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725
R1330	305-0471-00				RES.,FXD,CMPSN:470 OHM,5%,2W	01121	HB4715
R1355	315-0182-00				RES.,FXD,CMPSN:1.8K OHM,5%,0.25W	01121	CB1825
R1357	321-0277-00				RES.,FXD,FILM:7.5K OHM,1%,0.125W	91637	MFF1816G75000F
R1359	315-0103-00				RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R1360	315-0103-00				RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R1365	321-0246-00				RES.,FXD,FILM:3.57K OHM,1%,0.125W	91637	MFF1816G35700F
R1366	321-0246-00				RES.,FXD,FILM:3.57K OHM,1%,0.125W	91637	MFF1816G35700F
R1370	315-0103-00				RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R1372	321-0236-00				RES.,FXD,FILM:2.8K OHM,1%,0.125W	91637	MFF1816G28000F
R1373	321-0278-00				RES.,FXD,FILM:7.68K OHM,1%,0.125W	91637	MFF1816G76800F
R1375	321-0303-00				RES.,FXD,FILM:14K OHM,1%,0.125W	91637	MFF1816G14001F
R1376	315-0470-00				RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R1380	315-0102-00				RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R1382	308-0767-00				RES.,FXD,WW:1.1 OHM,5%,1W	75042	BW20-1R100J
R1385	315-0272-00				RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725
R1387	315-0103-00				RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R1390	315-0101-00				RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R1395	301-0152-00				RES.,FXD,CMPSN:1.5K OHM,5%,0.50W	01121	EB1525
R1397	321-0124-00				RES.,FXD,FILM:191 OHM,1%,0.125W	91637	MFF1816G191ROF
R1398	315-0392-00				RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
R1400	321-0164-00				RES.,FXD,FILM:499 OHM,1%,0.125W	91637	MFF1816G499ROF
R1402	321-0321-00				RES.,FXD,FILM:21.5K OHM,1%,0.125W	91637	MFF1816G21501F
R1405	321-0306-00				RES.,FXD,FILM:15K OHM,1%,0.125W	91637	MFF1816G15001F
R1406	321-0204-00				RES.,FXD,FILM:1.3K OHM,1%,0.125W	91637	MFF1816G13000F
R1410	315-0472-00				RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
S12	260-0723-00				SWITCH,SLIDE:DPDT,0.5A,125VAC	79727	GF126-0028
S75A-C	260-1723-00				SWITCH,PUSH:3 BUTTON,2 POLE	80009	260-1723-00
S200	263-1142-00				DRUM ASSY,CAM S:	80009	263-1142-00
S330A,B	263-1141-00				DRUM ASSY,CAM S:	80009	263-1141-00
S380A,B	260-1801-00				SWITCH,PUSH:DPDT,2 BUTTON	71590	2KBC020000-972
S450	263-1144-00				DRUM ASSY,CAM S:	80009	263-1144-00
S590	263-1143-00				DRUM ASSY,CAM S:	80009	263-1143-00
S785	260-1453-00				SWITCH,PUSH:1 BUTTON	80009	260-1453-00
S865	260-1453-00				SWITCH,PUSH:1 BUTTON	80009	260-1453-00
U40	156-0067-00				MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	80009	156-0067-00

Replaceable Electrical Parts—PG 508

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
U60	156-0197-00			MICROCIRCUIT,LI:5 TRANSISTOR ARRAY	02735	OBD
U70	156-0182-00			MICROCIRCUIT,DI:TRIPLE 2-3-2 INPUT GATE	04713	MC10105L
U140	156-0182-00			MICROCIRCUIT,DI:TRIPLE 2-3-2 INPUT GATE	04713	MC10105L
U270	156-0205-00			MICROCIRCUIT,DI:QUAD 2-INPUT NOR GATE	04713	MC10102 P OR L
U300	156-0182-00			MICROCIRCUIT,DI:TRIPLE 2-3-2 INPUT GATE	04713	MC10105L
U360	156-0205-00			MICROCIRCUIT,DI:QUAD 2-INPUT NOR GATE	04713	MC10102 P OR L
U400	156-0182-00			MICROCIRCUIT,DI:TRIPLE 2-3-2 INPUT GATE	04713	MC10105L
U480	156-0230-00			MICROCIRCUIT,DI:DUAL D MA-SLAVE FLIP-FLOP	04713	MC10131 P OR L
U665	156-0067-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	80009	156-0067-00
U720	156-0230-00			MICROCIRCUIT,DI:DUAL D MA-SLAVE FLIP-FLOP	04713	MC10131 P OR L
U740	156-0205-00			MICROCIRCUIT,DI:QUAD 2-INPUT NOR GATE	04713	MC10102 P OR L
U780	156-0158-00			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	80009	156-0158-00
U800	156-0158-00			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	80009	156-0158-00
U850	155-0078-10			MICROCIRCUIT,LI:MONOLITHIC	80009	155-0078-10
U895	156-0158-00			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	80009	156-0158-00
U930	156-0158-00			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	80009	156-0158-00
U1205	156-0312-00			MICROCIRCUIT,LI:VOLTAGE REGULATOR,15V,1A	27014	LM340T-15
U1210	156-0071-00			MICROCIRCUIT,LI:VOLTAGE REGULATOR	07263	723DC
U1335	156-0527-00			MICROCIRCUIT,LI:NEG VOLTAGE REGULATOR,15V	04713	MC7915CP
VR20	152-0127-00			SEMICOND DEVICE:ZENER,0.4W,7.5V,5%	04713	1N755A
VR22	152-0127-00			SEMICOND DEVICE:ZENER,0.4W,7.5V,5%	04713	1N755A
VR65	152-0217-00			SEMICOND DEVICE:ZENER,0.4W,8.2V,5%	07910	1N756A
VR172	152-0279-00			SEMICOND DEVICE:ZENER,0.4W,5.1V,5%	07910	CD332305
VR620/ VR630)	153-0063-00			SEMICOND DVC SE:MATCHED,50MV AT 10 MA	80009	153-0063-00
VR795	152-0149-00			SEMICOND DEVICE:ZENER,0.4W,10V,5%	04713	1N961B
VR944	152-0279-00			SEMICOND DEVICE:ZENER,0.4W,5.1V,5%	07910	CD332305
VR1000	152-0278-00			SEMICOND DEVICE:ZENER,0.4W,3V,5%	07910	1N4372A
VR1080	152-0278-00			SEMICOND DEVICE:ZENER,0.4W,3V,5%	07910	1N4372A
VR1257	152-0280-00	XB010150		SEMICOND DEVICE:ZENER,0.4W,6.2V,5%	04713	1N753A
VR1330	152-0395-00			SEMICOND DEVICE:ZENER,0.4W,4.3V,5%	04713	1N749A