

## WARNING

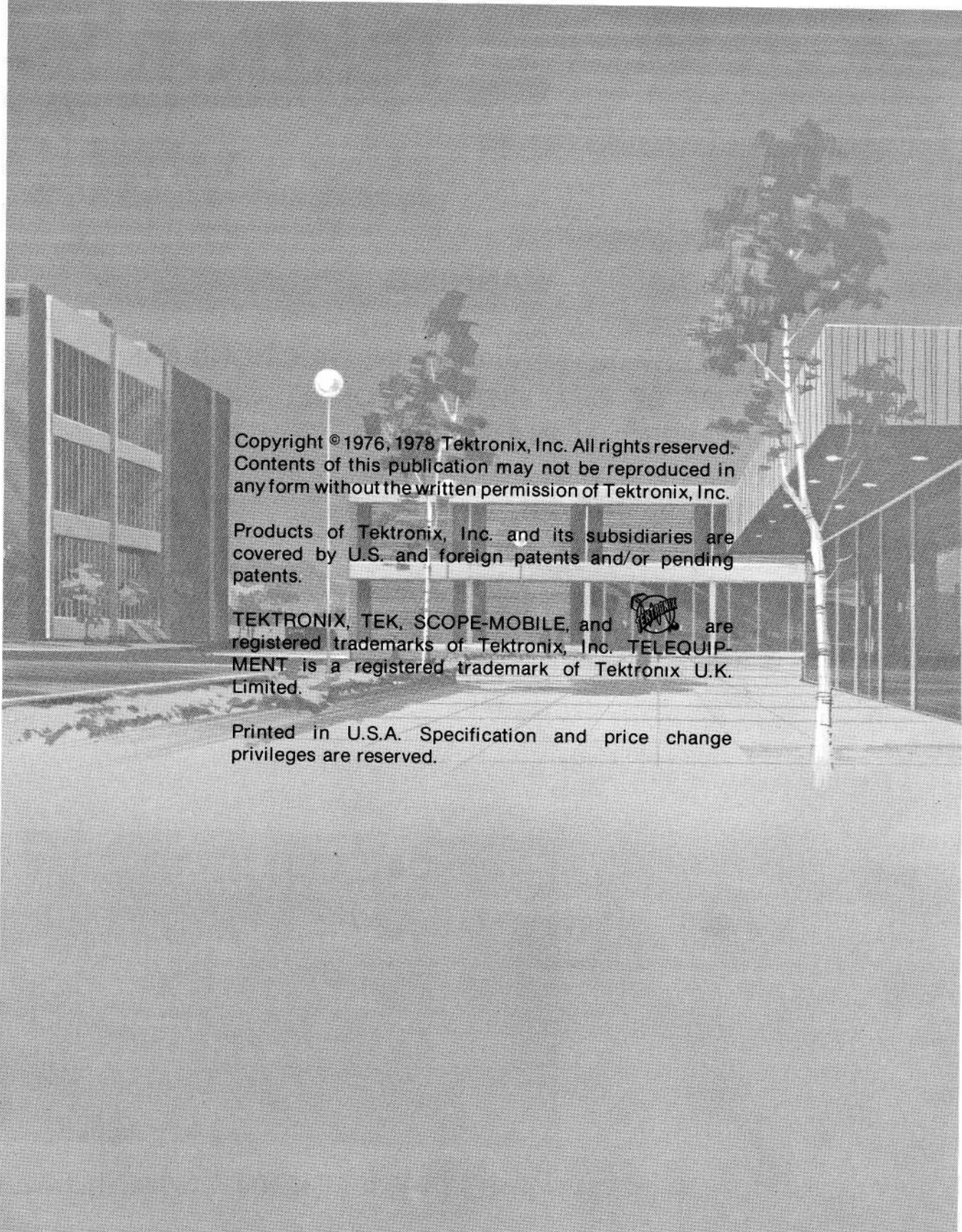
THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

# 7L5 SPECTRUM ANALYZER SERVICE

## INSTRUCTION MANUAL


Tektronix, Inc.  
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Serial Number \_\_\_\_\_



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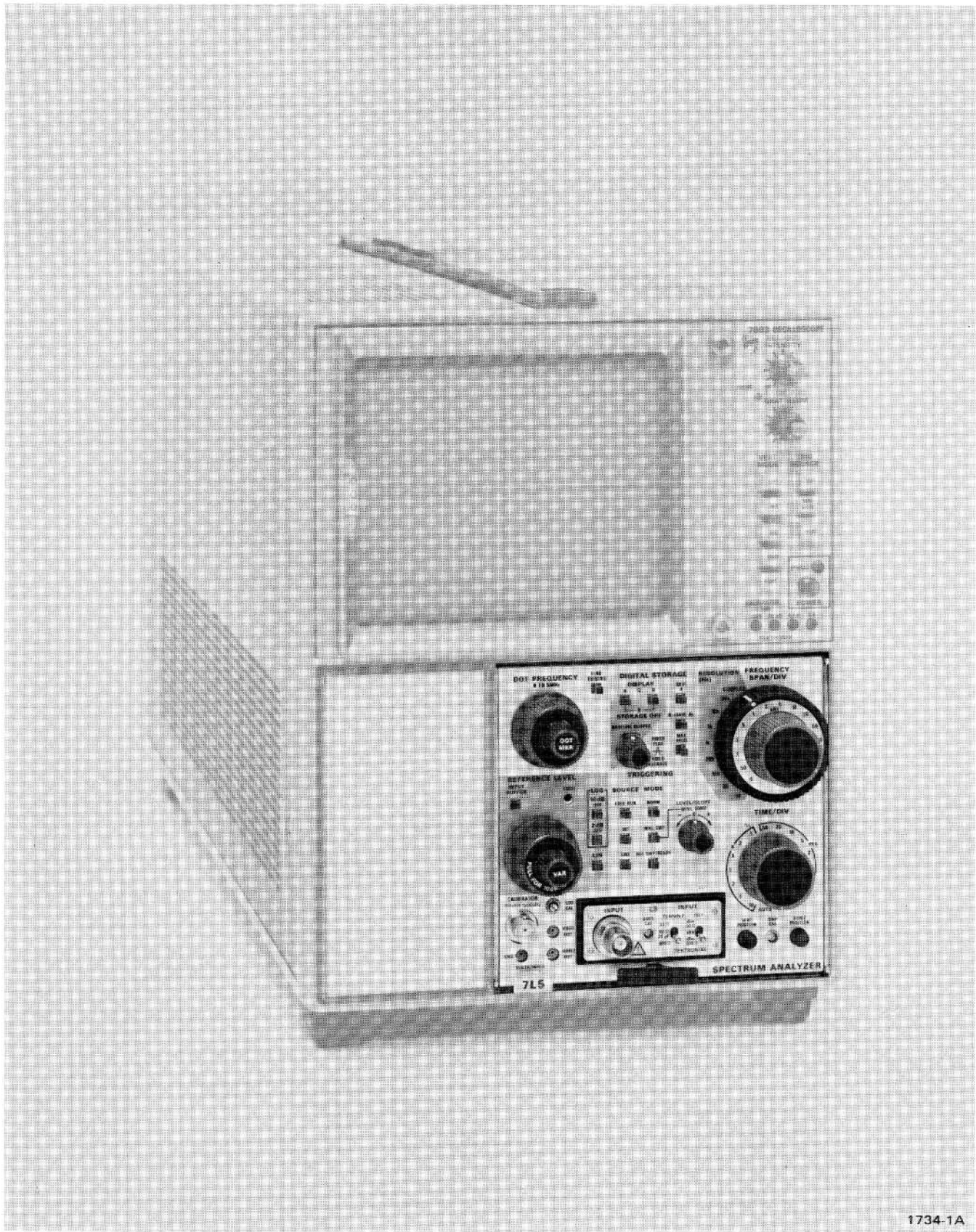


Fig. 1-1. 7L5 Spectrum Analyzer.

# GENERAL INFORMATION

## INTRODUCTION AND DESCRIPTION

To effectively use the 7L5 Spectrum Analyzer, the operation and capabilities of the instrument must be known. This instruction manual covers general service information for the instrument. It contains the specification, test and calibration procedure, circuit description, and maintenance procedure for the 7L5.

The 7L5 is a 5 MHz spectrum analyzer with digital storage. Frequency stability is within 5 Hz/hr and center frequency (dot) can be read with six digit accuracy immediately after turn-on; therefore there is no need to fine tune the display. Complex measurements and analysis can be made with relative ease. Built-in microprocessing circuits decode control settings, process frequency and reference level information, and optimize sweep time and resolution for the selected frequency span. At turn-on, the 7L5 is preset to a reference level of +17 dBm (50  $\Omega$  input) and center frequency of 00.0 kHz. This provides input attenuation to protect the front-end circuitry and a marker to verify correct operation.

The 7L5 with 80 dB or more of spurious free dynamic range provides the ability to measure wide relative amplitudes. Nanovolt sensitivity provides very low-level signal and noise requirements.

The 7L5 display is fully calibrated in dBm, dBV, or volts/div. The reference level can be accurately set in 1 dB increments.

A front panel input buffer control increases front-end immunity to intermodulation distortion while maintaining a constant reference level.

To accommodate a wide variety of impedance sources, the 7L5 uses quick disconnect plug-in input impedance modules of 50  $\Omega$ , 75  $\Omega$ , 600  $\Omega$ , 1 M $\Omega$ /28 pF and customized units to meet special requirements.

When the 7L5's digital storage capability is employed, one or two complete displays can be held in memory for subsequent viewing, comparison, or graphic reproduction. This capability converts a nonstorage, 7000-Series oscilloscope display into a stored display. The small dot size (of the conventional oscilloscope) used with the 7L5 enhances the resolution of low amplitude signals and other fine details that are often lost with a variable persistence oscilloscope. In storage mode, the vertical display may be bisected by an averaging threshold, above which video peak detection occurs (prior to storage) and below which video signal averaging occurs (prior to storage). Denoted by a cursor, the averaging threshold is continuously adjustable with a front panel control. The storage circuitry includes a maximum hold capability. This feature allows monitoring of signals that may change with time to provide a graphic record of amplitude/frequency excursion.

### **WARNING**

*The following service instructions are for personnel qualified to service electronic circuits. Personnel not familiar with electrical circuit operation should not perform any service other than that contained in the Operating Instruction manual.*

## MANUAL ORGANIZATION AND CONTENT

The abbreviations, graphic symbols, and logic symbology used in the text and diagrams of this manual are in accord with and based on ANSI Y1.1-1972, ANSI Y 32.3-1975, and ANSI Y32.14-1973 (American National Standard Institute, 345 East 47 Street; New York, N.Y. 10017).

Change information is contained on insert pages at the back of the manual. Original pages are identified by the symbol @ and revised pages are identified by a revision date in the lower inside corner of the page. If the serial number of your instrument is lower than the one on the title page, the manual contains revisions that may not apply to your instrument. History information, applicable to previous products, with the updated data, is integrated when the page or diagram is revised. The following describes the sections and information provided in this manual.

**Section 1—General Information:** Contains the instrument description and specification.

**Section 2—Circuit Description:** Provides basic and general circuit theory. This information may be useful when servicing or operating the instrument.

**Section 3—Performance Check:** Procedures to verify that the instrument is performing within its specified limits.

**Section 4—Calibration Procedure:** Test equipment setup and adjustment procedures required to calibrate the instrument.

**Section 5—Maintenance:** Describes routine and corrective maintenance procedures with detailed instructions for replacing assemblies, sub-assemblies, or individual components. An exploded drawing is part of Section 9. Troubleshooting procedures plus general information that may aid in servicing the instrument are also provided.

**Section 6—Options Information:** Describes options to the instrument or directs the reader to where the options are documented.

**Section 7—Replaceable Electrical Parts:** Provides information necessary to order replaceable parts and assemblies.

**Section 8—Diagrams:** Functional block diagrams and detailed circuit schematics are provided. Located adjacent to the diagram (usually on the back of the preceding diagram) are pictorial layout drawings that show sub-assembly and component locations. Integrated circuit diagrams, waveforms and voltage data for troubleshooting or circuit analysis are also provided adjacent to or on the diagram.

**Section 9—Replaceable Mechanical Parts, Exploded Drawings and Accessories:** Provides information necessary to order replaceable parts. The Replaceable Parts list is cross-referenced to the Replaceable Electrical Parts list. The exploded drawing identifies assemblies and mechanical components.

**Change Information:** Provides updating information in the form of inserts for the manual. These inserts are later incorporated into the manual text and diagrams when the manual is reprinted.

## ELECTRICAL CHARACTERISTICS

The following electrical characteristics apply when the 7L5 Spectrum Analyzer, in combination with a Plug-In Module, are normally installed in a 7000-Series oscilloscope and after a warm-up of ten minutes or more.

### Frequency Characteristics

#### Range

Input Frequency: 10 Hz through 5.0 MHz.

Dot Frequency: 0 Hz through 4999.75 kHz.

#### Accuracy

20°C to 30°C:  $\pm(5 \text{ Hz} + 2 \times 10^{-6} \text{ of dot readout})$ .

0°C to 50°C:  $\pm(20 \text{ Hz} + 10^{-5} \text{ of dot readout})$ .

#### Drift

5 Hz/hour or less.

#### Residual (Incidental) FM

50 Hz/div to 2 kHz/div: 1 Hz (p-p) or less.

5 kHz/div to 500 kHz/div: 40 Hz (p-p) or less.

**Resolution Bandwidth**

Accuracy

30 kHz—30 Hz: Within 20% of selected resolution (6 dB down).

10 Hz: Within 100 Hz  $\pm$ 20 Hz (70 dB down).

The COUPLED setting electronically selects the best resolution bandwidth for each setting of the FREQUENCY SPAN/DIV control.

Shape Factor

30 kHz—3 kHz: 5:1 or better (60:6 dB ratio).

1 kHz—10 Hz: 10:1 or better (60:6 dB ratio).

Amplitude Deviation

30 kHz—100 Hz: 0.5 dB or less.

30 kHz—10 Hz: 2.0 dB or less.

**Input Characteristics**



*The application of a dc voltage to the INPUT of the L1 or L2 Plug-In Modules may cause permanent damage to the mixer circuit.*

**Input Impedance (Nominal):**

- L1 50  $\Omega$
- L2 75  $\Omega$
- L3 Selectable (50  $\Omega$ , 600  $\Omega$ , and 1 M $\Omega$ /28 pF).

**Input Power** (maximum input level for reference levels of 0 dBm or greater):

- L1 21 dBm or 2.5 V rms
- L2 21 dBm or 3.07 V rms
- L3 21 dBm—input terminated 50  $\Omega$  or 600  $\Omega$ ; 100 V (peak ac + dc) input 1 M $\Omega$ /28 pF.

**Input Power** (maximum input level for reference levels below 0 dBm):

- L1 +10 dBm
- L2 +10 dBm
- L3 +10 dBm—input terminated 50  $\Omega$  or 600  $\Omega$ , and 100 V (peak ac + dc) with input of 1 M $\Omega$ /28 pF.

**Amplitude Characteristics**

NOTE

*If digital storage is used, an additional quantization error of 0.5% of full screen should be added to the amplitude characteristics.*

**Residual Response**

Internally generated spurious signals are  $-130$  dBm or less referred to the input (harmonics of the calibrator are  $-125$  dBm) with L1 or L2 plug-in module and  $-143$  dBV with the L3 plug-in module.

**Sensitivity**

The following tabulation of equivalent input noise for each resolution bandwidth is measured with; the INPUT BUFFER off, the VIDEO PEAK/AVG at max cw, and the TIME/DIV set to 10 seconds.

Resolution Bandwidth	Equivalent Input Noise (equal to or better than)		
	L1	L2	L3
10 Hz	$-135$ dBm	$-135$ dBm	$-148$ dBV
30 Hz	$-133$ dBm	$-133$ dBm	$-146$ dBV
100 Hz	$-130$ dBm	$-130$ dBm	$-143$ dBV
300 Hz	$-125$ dBm	$-125$ dBm	$-138$ dBV
1 kHz	$-120$ dBm	$-120$ dBm	$-133$ dBV
3 kHz	$-115$ dBm	$-115$ dBm	$-128$ dBV
10 kHz	$-110$ dBm	$-110$ dBm	$-123$ dBV
30 kHz	$-105$ dBm	$-105$ dBm	$-118$ dBV

NOTE

*Sensitivity is degraded an additional 8 dB when the INPUT BUFFER is on; e.g., at 3 kHz, the equivalent input noise would be  $-107$  dBm instead of  $-115$  dBm. Noise level will increase by approximately 10 dB when operation is in video peak mode.*

**Intermodulation Distortion**

Intermodulation products from two on-screen signals, within any frequency span are  $\geq 75$  dB down for third order products and at least 72 dB down for second order products.

Second and third order intermodulation products from two on-screen  $-53$  dBV or less signals within any frequency span are at least 80 dB down.

## General Information—7L5 Service

With the INPUT BUFFER switch on, the third order intermodulation products, for any two on-screen signals, within any frequency span, are at least 80 dB down.

### Display Flatness

Peak to peak deviation, over any selected frequency span: Quantization error must be added (see Note under Amplitude Characteristics) if digital storage is used.

L1	0.5 dB;
L2	0.5 dB;
L3	0.5 dB;

### Reference Level

Refers to top graticule line in Log mode. Calibrated in 1 dB and 10 dB steps for the L1 and L2 modules and 1 dB/2 dB and 10 dB for L3 plug-in module.

Range	L1	L2	L3
Log 2 dB/Div	-128 dBm to +21 dBm	-128 dBm/ 139 dBV to +21 dBm/ +10 dBV	-128 dBm to +21 dBm (50 $\Omega$ ), -139 dBm to +10 dBm (600 $\Omega$ ), -141 dBV to +8 dBV (Hi Z)
Log 10 dB/Div	-70 dBm to +21 dBm	-70 dBm/ -81 dBV to +21 dBm/ +10 dBV	-70 dBm to +21 dBm (50 $\Omega$ ), -81 dBm to +10 dBm (600 $\Omega$ ), -83 dBV to +8 dBV (Hi Z)

### Incremental Accuracy

When calibrated at -40 dBV in Log mode:

L1, L2 and L3: Within 0.2 dB/dB with cumulative error of 0.25 dB/10 dB.

Lin Mode Range: 20 mV/Div to 200 mV/Div within 5% in 1-2-5 sequence.

### NOTE

*A >sign is displayed adjacent to the reference level readout when the reference level is not calibrated due to an incompatible selection of controls.*

### Display Dynamic Range/Accuracy

Log 10 dB/Div Mode: Dynamic window is 80 dB. Accuracy is within 0.05 dB/dB to 2 dB maximum.

Log 2 dB/Div Mode: Dynamic window is 16 dB. Accuracy is within 0.1 dB/dB to 1 dB maximum.

## Sweep Characteristics

**Frequency Span.** Provides calibrated frequency spans from 50 Hz/div to maximum 500 kHz/div, within 4%, in 1-2-5 sequence.

Horizontal linearity is within 4% over the entire 10 div display.

A 0-Hz/Div position is provided for time domain operation.

**Sweep Rate.** Time per div is selectable from 10 s/div to 0.1 ms/div in a 1-2-5 sequence. An AUTO position permits automatic selection of optimum time/div for the selected resolution and span/div.

Sweep rate accuracy is within 5% of the rate selected.

**Triggering.** Provides two triggering sources, INT (internal) and LINE, in addition to a FREE-RUN position.

When INT is selected, ac coupled signal components from the mainframe Trigger Source (left or right vertical amplifiers) are used.

When LINE is selected, ac coupled sample of mainframe line voltage is used.

Three triggering modes are; NORM (normal), SGL SWP/READY (single sweep), and MNL SWEEP (manual sweep).

Trigger level is  $\geq 1.0$  div of internal signal for both NORM and SGL SWP modes over the approximate frequency range of 30 Hz to 500 kHz.

## Output Connectors

**Video Out.** Front-panel pin jack connector supplies the video (vertical) output signal at an amplitude of 50 mV/div  $\pm 5\%$  (about the crt vertical center) with source impedance of 1 k $\Omega$ .

**Horiz Out.** A front-panel pin jack connector supplies horizontal output signal (negative-going sawtooth that varies from 0.0 V dc to approximately -6 V dc) with a source impedance of 5 k $\Omega$ .



## INSTALLATION

Calibrator. Front panel BNC connector supplies a calibrated 500 kHz squarewave output signal (derived from the analyzer's time base). Output amplitude is within  $\pm 0.15$  dB of  $-40$  dBV into the impedance of the plug-in module.

### Environmental Characteristics

The 7L5 Spectrum Analyzer will meet the foregoing electrical characteristics within the environmental limits of a 7000-Series oscilloscope. Complete details on environmental test procedures, including failure criteria etc., can be obtained from a local Tektronix Field Office or representative.

### Physical Characteristics

Net weight (instrument only): 8 pounds, 12 ounces.

## ACCESSORIES AND OPTIONS

Refer to the Replaceable Mechanical Parts List for a complete listing of the standard and optional accessories.

### Options

- 7L5 Option 21—(Log Display)
- 7L5 Option 25—(Tracking Generator)
- 7L5 Option 28—(Readout)
- 7L5 Option 30—(Option 21/25)
- 7L5 Option 31—(Option 21/28)
- 7L5 Option 32—(Option 25/28)
- 7L5 Option 33—(Options 21/25/28)

### Initial Inspection

This instrument was inspected both mechanically and electrically before shipment. It should be free of marks or scratches and electrically meet or exceed the specification. Inspect the instrument for physical damage and check the electrical performance by the Operational Check procedure provided within the Operators Instruction Manual. This procedure will verify that the instrument is operating correctly and it will satisfy most receiving or incoming inspection requirements. If the instrument specification is to be verified, refer to the Performance Check procedure in this manual.

If there is physical damage or performance deficiency, contact your local Tektronix Field Office or representative.

### Installation

Install in a 7000-Series mainframe and after a 10 minute or more warm-up, check performance. To calibrate or service the 7L5, connect it to the 7000-Series mainframe interface through flexible plug-in extenders (see Equipment Required; Calibration section).

## REPACKAGING FOR SHIPMENT

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

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

1. Obtain a shipping container of heavy corrugated cardboard or wood with inside dimensions at least six inches greater than the instrument dimensions. This will allow room for cushioning. Refer to Table 1-1 for carton test strength requirements.

2. Wrap the instrument in heavy paper or polyethylene sheeting to protect the instrument finish. Protect the front panel with urethane foam or cardboard strips.

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

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

TABLE 1-1

Gross Weight (lb)	Carton Test Strength (lb)
0-10	200
10-30	275
30-120	375
120-140	500
140-160	600

If you have any questions, contact your local Tektronix Field Office or representative.

# CIRCUIT DESCRIPTION

## Introduction

The 7L5 is a swept front-end spectrum analyzer with selectable front-end plug-in modules that permit the user to obtain a calibrated display for a number of different impedances (i.e., 50 ohm, 600 ohm, etc.). The plug-in module contains: selectable attenuation, the first mixer, input low-pass filter, and an input buffer selector that trades noise figure for IM performance. Signal attenuation in the plug-in and gain of the IF processing chain are controlled by a reference level logic circuit in the 7L5 which provides calibrated settings in 1 dB or 10 dB steps over a range of 149 dB.

## Functional Block Diagram

The input signal to the 7L5 is mixed with the frequency of the main oscillator and fed to the IF at 10.7 MHz and amplified by the 10.7 MHz IF amplifier. Since the 7L5 input frequency range is 0 to 5 MHz, the main oscillator is tuned and swept from 10.7 to 15.7 MHz. The frequency of the main oscillator is controlled by two secondary (A and B) oscillators that use a synthesizer technique to tune and phase lock their frequencies. The sweep frequency control circuit drives the oscillators according to the settings of front panel DOT FREQUENCY and FREQUENCY SPAN/DIV controls.

The signal at 10.7 MHz is processed through a bandpass filter and amplifier, then mixed with the output from a 10.450 MHz oscillator to down-convert the 10.7 MHz to an IF of 250 kHz. Gain of the 250 kHz amplifier is controlled by the reference level logic circuit which establishes the amount of attenuation in the plug-in module and gain for the 250 kHz IF and Log amplifiers. The reference level is selectable in 1 dB and 10 dB steps.

The 250 kHz IF signal is processed through the variable resolution filter circuits for bandwidth selections of 10 Hz to 30 kHz. The signal is again amplified, detected, and the video is sent through amplifier circuits that provide the 10 dB/div, 2 dB/div, and linear gain characteristics.

The video signal is then fed to the display processing circuits where the signal is either stored and displayed, or if the storage mode is not selected, the signal is passed directly through the vertical output amplifier to the mainframe circuit. If either or both the DISPLAY A or DISPLAY B latches are enabled, the signal is converted to digital data, stored in A or B memory, then converted back to analog data and processed through the output amplifiers to the circuit. The vertical information is digitized and stored at 512 horizontal address locations across the screen. Therefore, the horizontal sweep information is converted to digital data for storage, then converted back to an analog signal for display. The horizontal sweep ramp is processed the same as the vertical signal. The vertical (video) information can be averaged or peak detected.

## IF Processing Chain b

This block diagram shows more detail of the circuitry involved with processing the IF signal from the 1st mixer. Signal loss through the 1st mixer is about 9 dB. The IF output of 10.7 MHz passes through an input and 30 kHz filter to improve flatness, then a 30 kHz crystal filter shapes the response to the bandpass characteristics of the instrument. A -40 dBm signal is required at this point for full screen deflection.

Signal level is increased 20 dB by the 10.7 MHz IF amplifier; it is then fed through the 300 kHz bandpass filter to the 2nd mixer. The 2nd LO frequency of 10.450 MHz mixing with 10.7 MHz produces an IF of 250 kHz which is fed through a 500 kHz lowpass filter to the 250 kHz amplifier. The loss through the 350 kHz and 500 kHz filters plus the 2nd mixer is about 10 dB; thus a -30 dBm signal level is required at the input of the 250 kHz amplifier to obtain full screen deflection.

## Circuit Description—7L5 Service

The 2nd LO frequency is controlled by a phase lock loop which uses 50 kHz and 100 kHz submultiples of a master 10 MHz crystal controlled oscillator to drive 500 kHz and 100 kHz reference frequencies. The gain of the 250 kHz IF amplifier is controlled by the decoded output from the reference level counter. The reference level counter in turn, is controlled by the front panel REFERENCE LEVEL control. Gain of the amplifier is adjustable in 1, 2, 4, 8, and two 16 dB steps. The attenuators, in the plug-in module are 4 dB, 8 dB, and 32 dB. Combinations of attenuators and IF gain are selected by the reference level counter and provide gain changes of 1 dB or 10 dB steps, depending on the position of the REFERENCE LEVEL control. The crossover point (no attenuation and unity gain through the amplifier) is -30 dBm.

The REFERENCE LEVEL control is a printed circuit switch that outputs a two bit binary code that repeats every four times. The code indicates the direction the control is rotated and an IC determines whether the count is up or down. The output code of the control, clocks a counter which provides the reference level required to drive the readout. Analog currents are provided by a ROM which is reading the output of the counter. When the REFERENCE LEVEL control is pulled out, for 10 dB steps, the counter counts in tens instead of digits. When LIN mode is selected or the dBm/dBV switch on the plug-in module is changed, the readout changes the Reference Level Counter so the crt reference level readout is in Volts/Div or dBV. The value of the constant to the counter depends on the input impedance of the plug-in module. This establishes a calibration reference level commensurate with the respective input impedance of the "L" plug-in module.

The inputs to the IF Gain and RF Attenuation Decoding block are the output from the Reference Level Counter and the Log 10 or Log 2 switch latches. The output supplies four gain change lines to the IF amplifier and the attenuator codes for the plug-in module. An invalid code is fed back to stop the counter when the reference level reaches a lower limit.

The output of the 250 kHz IF is fed to the Variable Resolution Filter. Bandwidths of 10 Hz to 3 kHz are selected by one filter block and 10 kHz and 30 kHz bandwidths by a second block. Signal routing through the filters, is controlled by the resolution code which in turn may be controlled by the RESOLUTION control. For automatic or coupled operation, a ROM selects the appropriate resolution bandwidth so the bandwidth and frequency span are compatible. If the operator selects a

resolution that is not appropriate for the FREQUENCY SPAN selected, the ROM activates a CAL light to invalidate the reference level reading and the readout presents a < symbol in front of the reference level readout.

The output signal from the Resolution Filters is fed through a Post VR Amplifier then a Log/Lin amplifier. The response amplitude level is now either Log 10, Log 2, or Linear depending on the setting of the log/lin latches. These latches are activated by front panel momentary contact pushbuttons. Log 10 control is also fed to the IF Gain and RF Attenuation Decoder.

The IF is then detected and the output video signal fed to another Log/Lin amplifier for gain adjustment between the Log/Lin displays. Part of the output is fed to U2005 to provide push-pull trigger signals (+ and -) to the mainframe and video signals to the VIDEO OUT jack on the front panel. The main video signal is fed to the display processing circuits where it is processed either through amplifiers to the mainframe for display, or, if the 7L5 is operating in the store mode, the signal is stored in memory, and then displayed as the memory is refreshed or updated.

### Sweep Control and Frequency Reference a

The Sweep Control circuit uses an IC that features; sweep gating, bright baseline, holdoff timing, automatic free run, lockout, single sweep and single sweep ready light control. The gate signal drives the sweep generator which in turn sends a sweep through the Manual Sweep switch to the Display Processing and circuitry related to the sweep for the A and B oscillators. Inputs to the sweep control IC include triggering source and mode signals. Trigger modes are set by latches that are actuated by front panel momentary contact pushbutton switches.

When SGL SWP is selected, the sweep is locked out until the SGL SWP button is pushed again. The circuit is now armed and the sweep will run if the trigger source is FREE RUN or when a trigger signal arrives. A built in delay of approximately 10 seconds allows the sweep to run if no trigger arrives (not in 0 Hz span). This keeps the memory capacitors for phase lock loop, of the A and B oscillators, refreshed.

When MNL SWP is selected the Sweep Generator is used as a 100 second timer to refresh the memory capacitors. The Sweep Control allows the Sweep Generator to free run; however, the Manual Sweep switch now selects the voltage output of the LEVEL/SLOPE control for the Sweep Horizontal signal.

When the sweep mode is NORM, sweep operation is conventional. The LEVEL/SLOPE control selects the triggering level and slope unless the mode is MNL SWP. It then becomes a manual sweep control.

The sweep generator contains an end of sweep comparator that outputs a pulse which is fed back to the sweep control IC to terminate the output gate and inhibit the sweep. The end of sweep pulse is OR'd with an output line from the phase lock logic circuit, which goes high at the end of the gate pulse period and holds this state until the sweep control circuit has stabilized about (50 ms) then it pulls the Ready line low. The state of the T and Sense lines, from the dot frequency control and phase lock loop circuit must also be correct before the phase lock logic circuit will permit the sweep control and sweep generator to start another sweep. Sweep lockout, by the dot frequency and phase lock loop circuits, is ignored when the Frequency Span/Div is ZERO.

The sweep rate is controlled by the TIME/DIV selector unless AUTO position is selected. When AUTO is selected, sweep rate is controlled by a ROM which looks at the FREQUENCY SPAN/DIV and RESOLUTION selections to determine the sweep rate. The RESOLUTION and FREQUENCY SPAN/DIV selectors are both printed circuit switches that feed their output into ROMs. The ROMs then control the frequency span and resolution bandwidth of the instrument and provide readout data to the circuit. The RESOLUTION selector has a COUPLED position where a ROM determines the optimum resolution for the selected FREQUENCY SPAN/DIV. In the manual positions of the RESOLUTION and TIME/DIV selectors, the uncal comparator monitors the sweep rate versus resolution bandwidth and Frequency Span/Div setting. It lights an UNCAL indicator when the display is not calibrated. At the same time a > symbol precedes the Reference Level readout to indicate that the readout is not calibrated.

### Frequency Reference

The center frequency of the span is programmed into  $\div N$  counters which are part of a frequency and phase lock synthesizer loop. Two of these  $\div N$  control loops set and lock the frequency of two secondary (A & B) oscillators which are part of a third loop that controls the 1st LO frequency. The 1st LO center frequency, therefore, is dependent on the programmed data in the  $\div N$  counters. The frequency span of the 1st LO depends on the ramp amplitude out of the sweep attenuator circuits. During retrace time, the secondary oscillators are locked to the center frequency. During lock the sweep reduces to a

voltage of zero. The time shared dot position is therefore, derived from an equivalent sweep voltage of zero. Frequency of the dot position is displayed by the crt readout. Accurate frequency measurements can be performed by tuning any desired segment of the display under the frequency dot and read out on the crt. In most cases readout accuracy is  $\leq 1\%$  of the display span or within  $\pm 50$  Hz.

In all frequency span positions except MAX span, the frequency dot is at the center or start of the display. In MAX span the center frequency of the span is 2.5 MHz. The frequency dot moves across the display as the center frequency is tuned. The frequency readout accuracy of the dot remains constant.

A simplified block diagram of the Frequency Reference circuitry is shown in Fig. 2-1. The frequency to be measured (fm), is fed to the 1st mixer in the plug-in module, where it is mixed with the output from the 1st LO. The output IF of 10.700 MHz is fed to the 2nd mixer where it is mixed with 10.45 MHz from the 2nd LO and converted down to a 250 kHz IF. The 2nd LO frequency is referenced to 500 kHz, a submultiple of a 10 MHz Master Oscillator.

### Frequency Control Circuits

As previously described, two divide by "N" ( $N_1$  and  $N_2$ ) control loops, with their oscillators, determine the frequency of the 1st LO. A 11.1 MHz to 16 MHz, "A" oscillator mixes with the frequency of the 1st LO (10.7 to 15.7 MHz). The difference is compared with the 40th sub-harmonic of a 12 to 16 MHz "B" oscillator in a  $\Delta f/\Delta \phi$  detector. Any difference produces an error voltage that is fed back through a summing amplifier to pull the 1st LO into a locked mode with both A and B oscillators.

The frequency of both secondary (A and B) oscillators is controlled by  $\div N$  loops. The value N is determined by the DOT frequency control. This control tunes the A oscillator in 100 kHz increments and the B oscillator in 10 kHz steps. (100 kHz and 10 kHz increments originate from the 10 MHz master oscillator.) The frequency of the B oscillator is divided down by 40 so the frequency into the comparator steps in 250 Hz increments. If the DOT frequency is 0 Hz, the frequencies of the A and B oscillator are 11.1 MHz and 16.0 MHz. The input to the phase lock comparator ( $\Delta f/\Delta \phi$  detector) from the  $\div 40$  source is 400 kHz (16 MHz  $\div$  40). The difference frequency out of the A oscillator and the 1st LO mixer must also be 400 kHz for the system to lock. Since the A and B oscillators are

## Circuit Description—7L5 Service

referenced to the same reference (10 MHz master oscillator) the 1st LO is locked to 10.7 MHz (11.1 MHz—400 kHz). Frequency changes to either A or B oscillators require a change in the value of "N" that is loaded into up/down counters for the respective control loops.

The DOT FREQUENCY will tune either the B oscillator in 10 kHz steps or the A oscillator in 100 kHz steps. The frequency of the 1st LO (and the dot) can therefore be tuned in 250 Hz or 100 kHz steps depending on which latch is enabled.

A more detailed block diagram of the Frequency Reference circuit is provided by the Sweep Control and Frequency Reference Block Diagram (1a) in the Diagrams section.

The 10 MHz of the crystal oscillator or Master Oscillator frequency is divided down to 100 kHz and 500 kHz by two counters. 100 kHz is fed to one input of a phase comparator for the A oscillator loop. It is also divided down to 10 kHz for application to one input of a phase comparator for the B oscillator loop. The output

voltages of the comparators are applied through logic circuitry to memory capacitors in each oscillator loop. The logic circuitry gates the comparator reference voltage to this memory circuit during retrace or the  $\overline{\text{Lock}}$  portion of the sweep cycle. This charge or reference voltage on the memory capacitor is summed with the sweep ramp from the frequency span (Sweep Control) circuit. The resultant voltage is applied through amplifiers to the A or B oscillator to control their frequencies.

The A oscillator output is mixed with the 1st LO frequency and the difference frequency applied to one input of a phase comparator and loop filter. The other input, to the phase comparator, is the 40 sub-frequency of the B oscillator. Any difference between the two frequencies produces an error voltage which is applied to the 1st LO to correct and control the 1st LO frequency. The oscillator frequencies can be expressed as:

$$f_{(1stLO)} = f_{(A\text{ osc})} - \frac{f_{(B\text{ osc})}}{40}$$

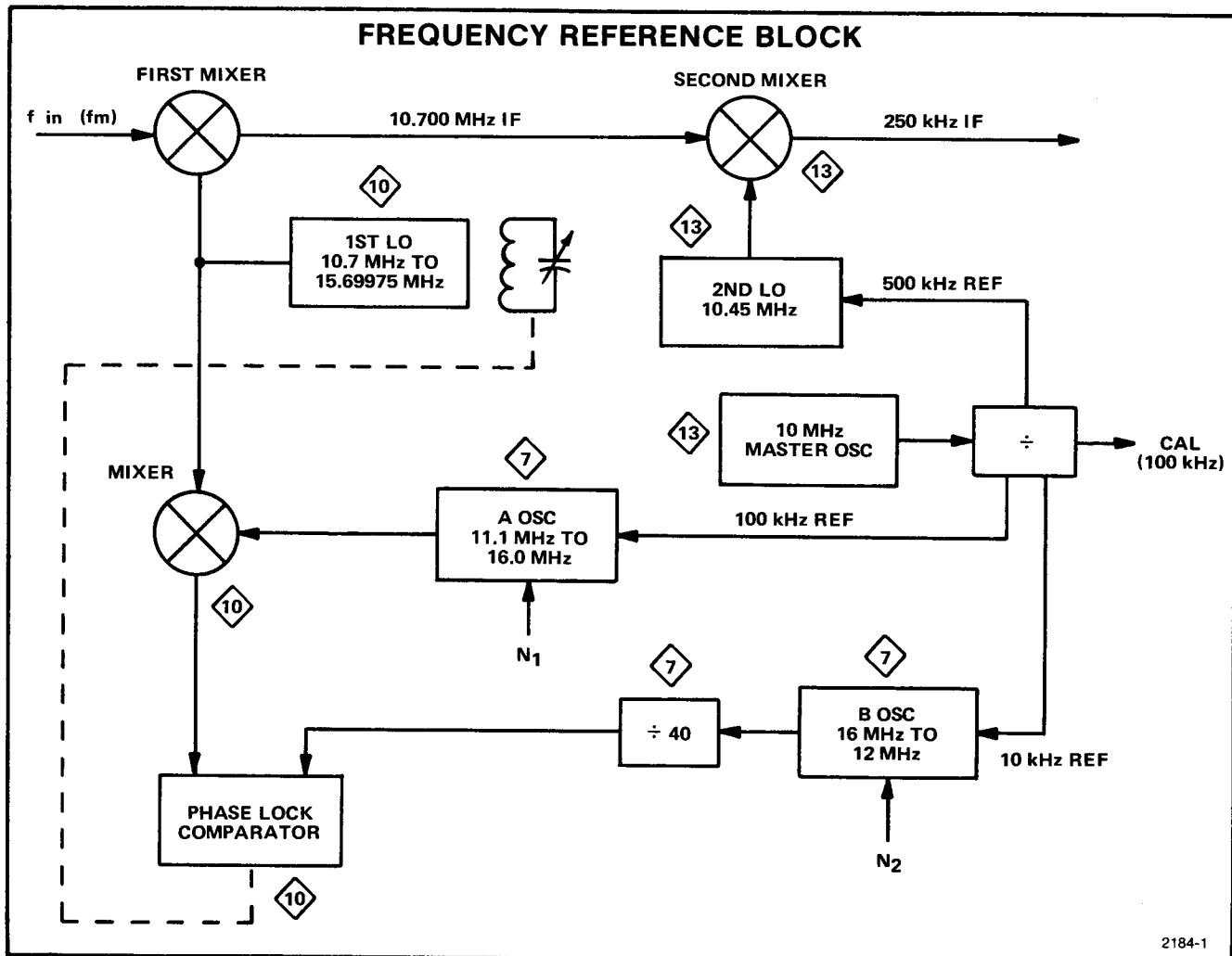


Fig. 2-1. Frequency reference block diagram.

Output frequencies of the A oscillator and B oscillator are fed back to  $A \div N$  and  $B \div N$  circuits. The value "N" assumes depends on the setting of the dot frequency control circuit. For example, a frequency of 16 MHz out of the A oscillator requires an "N" factor of 160 to divide 16 MHz down to 100 kHz, so the frequency into the phase comparator equals the 100 kHz at the other input to the comparator. As the dot frequency is changed, the "N" factor into either the  $A \div N$  or  $B \div N$  circuit changes to increase or decrease the A or B oscillator frequency. Since the 1st LO is slaved to these oscillators, its frequency must also change.

The Frequency Span/Div circuit determines the amount the A or B oscillator frequency is swept. The sweep horizontal voltage is applied through an attenuator and binary switch to a summing point, either in the A memory or B memory reference voltage line. The FREQUENCY SPAN/DIV selector sets the amount of sweep attenuation and thus the frequency span. The output of the SPAN/DIV selector is also fed to a ROM which looks at the selected span and chooses one of three sweep outputs from the binary controlled switch. These ramps are used for different span/div frequencies (50 Hz to 2 kHz, for the

B oscillator frequency loop, 5 kHz to 200 kHz and 500 kHz or MAX span for the A oscillator loop). Since the loop sensitivity of the two oscillator loops differ by a factor of 100, the attenuator settings are used twice to cover the full range (50 Hz to 500 kHz) of the FREQUENCY SPAN/DIV.

When the FREQUENCY SPAN/DIV is not in the MAX span position, the MAX switch closes to allow a dot marker voltage to be summed in with the A oscillator control loop so the dot can be positioned along the left portion of the 5 MHz display.

A turn-on circuit (on the left side of the diagram) forces a free run and normal selection of the trigger circuits, a dot frequency of 000, reference level of +17 dBm, and Display A, Display B store modes when power is applied.

**Readout**

A block diagram of the Readout circuits is shown in Fig. 2-2. Along the left side are the front panel selectors. The DOT FREQUENCY control drives a TEKTRONIX IC which provides the column data for the top horizontal readout location on the crt. Current for the Hz and kHz readout is supplied by a resistor matrix. Row data also comes from a fixed resistor matrix.

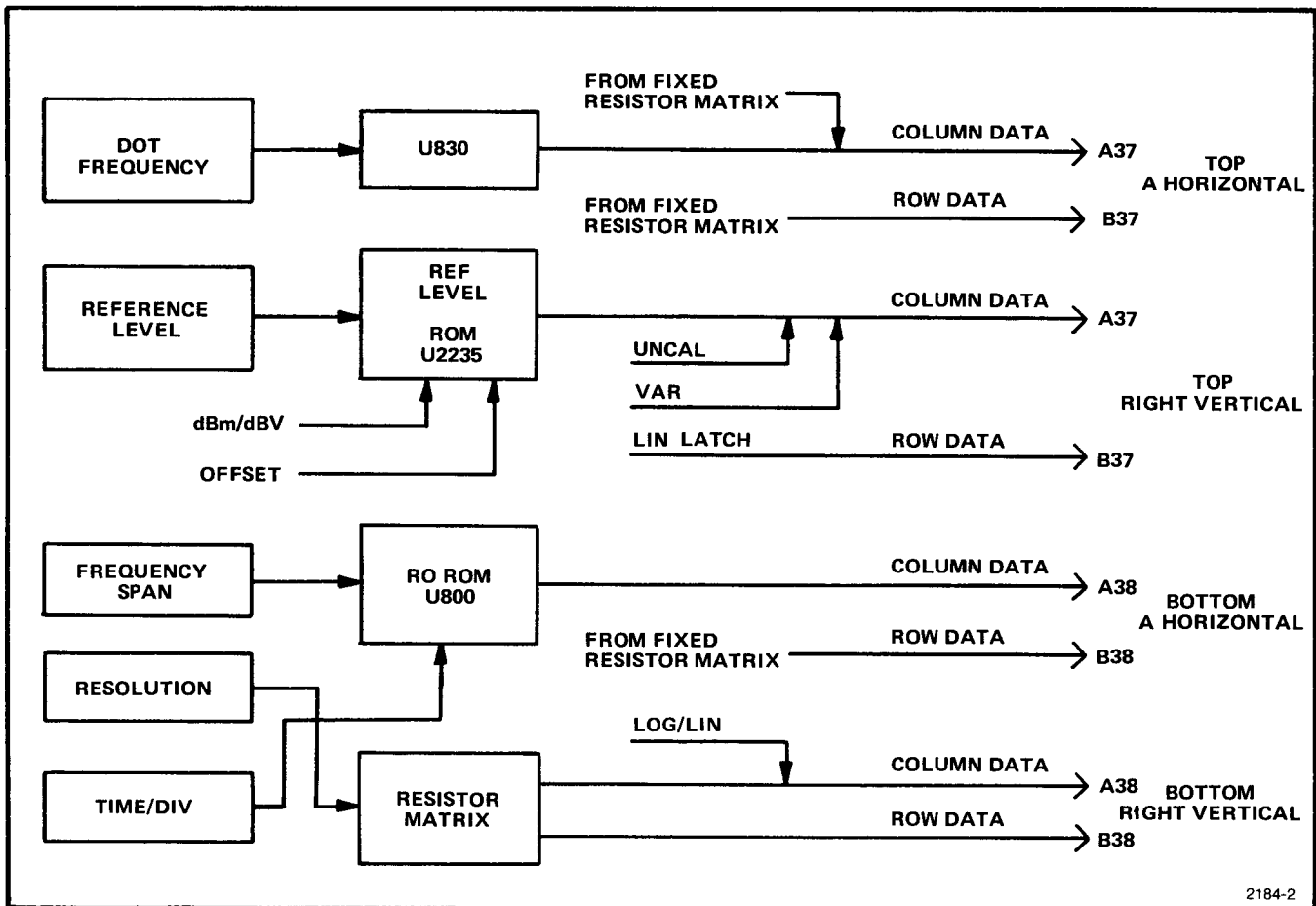


Fig. 2-2. Function block of readout circuits.

## Circuit Description—7L5 Service

The REFERENCE LEVEL drives U2235 which provides column data current for the top right vertical readout position. The output of the U2235 is influenced by the setting of the dBm/dBV selector and the offset set by the input impedance of the plug-in module and the reference level selected. The LIN switch latch changes the row data so the readout is in nV,  $\mu$ V, and mV instead of dBm or dBV. (The column data is also changed so the correct numbers are read out.)

The FREQUENCY SPAN/DIV drives ROM U800 which provides the column data for the bottom A horizontal position. Row data is from a fixed resistor matrix. If zero span is selected, it reads in time/division.

The RESOLUTION selector drives a resistor matrix that provides both column and row data to the bottom right vertical part of the display. The column data also gets the 10 dB, 2 dB, or, if LIN mode is selected, that portion of the display is a space.

### Display Processing Block Diagram

The video signal from the IF processing chain is fed through switch U735B to an A/D converter. The digital data from the converter is then placed in memory. It is read from memory and displayed at the command of Display A and Display B selectors. Before the vertical data is placed in memory, it may be either averaged or peak detected. Vertical data is placed at an address in memory derived from the sweep horizontal waveform. How the address is derived will be described later.

Referring to the lower left side of the diagram, the 1st LO tune voltage ramp is fed to an absolute value circuit, which looks at the ramp excursion. If the ramp exceeds certain limits, the output from the comparator is an overspan signal which opens the video path through switch U735B. A dc level is placed on the line to provide a baseline for the display. Unless overspan is detected, the video signal is fed to display switch U735C and the vertical analog-to-digital (A/D) converter. The video information is converted to an 8 bit data word that appears in serial form on the Data Out line. The clock for this converter is 1 MHz, derived from the 10 MHz master oscillator, so the vertical data bits are 1  $\mu$ s apart. Since there are 8 bits per word plus a sync pulse, each word takes 9  $\mu$ s or the word rate is 111 kHz. The vertical data out, in serial form, then goes to an average calculator where it is either averaged or peak detected. The output (on the Math line) is then stored at some address in memory.

The address is derived from the horizontal sweep ramp. This is a 10 volt negative-going ramp centered around the Dot frequency. The ramp is offset (up to plus or minus 10 volts) as the dot frequency is tuned so the sweep ramp range can run from  $-10$  V to  $+10$  V ( $-10$  V to 0 V at one end and 0 V to  $+10$  V at the other). The sweep is converted, by the horizontal A/D converter, to address data for memory. Memory consists of a 4096 (512 x 8) bit RAM and a 1024 (1024 x 1) bit overflow or offset RAM. The 4096 bit RAM has 512 horizontal access lines. Memory is divided into an A and B section with 256 lines assigned to each. Address locations are determined by the LSB (least significant bit) of the horizontal address word. Since the LSB of this word alternates with any count, the A and B locations in memory are adjacent with the odd bit assigned to A memory and the even bit to B memory sections.

The horizontal address is a 10 bit word. The first 9 bits ( $2^9$ ) are derived from the sweep ramp and stored in the first RAM. The tenth bit (MSB) is stored in the overflow or offset RAM. This tenth bit signifies the offset (to the right or left of center screen) of a given address and since the offset can be up to  $\pm 10$  V, a 20 volt ramp capability is provided.

At the slower sweep speeds, there are numerous words of vertical data for each horizontal address location. These numerous words of vertical data are averaged, by the average calculator, so with a 10 second sweep rate, up to 20,000 words are averaged at a horizontal address. At the 2 ms sweep rate, only four words would be averaged.

At the end of an 8 bit vertical word a sync pulse is sent out on the EOC (end of conversion) line to the display control timing block and through the synchronizer to the average calculator. When the sweep horizontal signal has traversed far enough to generate a new horizontal address, the EOC starts a three cycle sequence that writes a vertical word in memory at that address. This process requires 27  $\mu$ s (3 x 9  $\mu$ s). The rest of the time is utilized in the display mode to read from memory. At the beginning of the three cycle process the first cycle generates Start Divide to the average calculator. The average circuit divides the accumulated vertical data by the number of words during that period, and the resultant or quotient is gated into memory on the Math line, when the second cycle or Write Cycle arrives. Write Cycle signal is generated only when Valid is present. Valid is not present during retrace or when the dot frequency is changing.



The output of the horizontal display generator consists of readout addresses to memory and a synthesized horizontal sweep ramp for the Store horizontal line. Therefore, as the vertical data is read from memory, a corresponding change occurs in the horizontal sweep voltage so the vertical data written in memory is duplicated and displayed appropriately when it is read out. Data is stored in memory at the rate set by the Time/Div selector; however, it is read from memory at a constant rate.

If Display A is selected, the LSB for the address out of the horizontal display generator remains a 1. The counter counts in odd number sequence so only data in A section of memory is read. If Display B is selected, then the counter counts in even number sequence and data in B memory, is read out. If Display A and Display B are selected then the LSB for the address alternates and data is read first from A then from B memory. If Save A is selected, A memory is not updated during Write Cycle. If Display A is selected along with Save A, then the data stored in A, when Save A was pushed, is read out.

Vertical data out of memory goes to the vertical display generator on the Memory Data line. It is converted to analog data then processed to the display circuits. A timing signal, from the vertical analog to digital converter block, controls when data is read from memory. Data can only be read during the Read Cycle. When either Display A or Display B is selected, the display control block sends a Store signal to both the vertical and horizontal display switches (U735A, U375C). Both switches then select only data from the vertical display generator and the synthesized sweep, from the horizontal display generator for the vertical and horizontal output stages.

The inverted sweep containing dot marker position is summed with the "dot position" when Q735 is on, at the input to the horizontal output stage. The summation of minus sweep with dot position plus "dot position" is minus sweep. This is amplified by the output amplifier and applied to the crt deflection plates. When Q735 is off, only the "dot position" is applied to the output amplifier and the crt deflection plates. The dot is therefore displayed independent of sweep. Sweep horizontal is also applied through a separate amplifier to the front panel HORIZ OUT jack and pin A3 of the mainframe interface.

The Z axis and dot logic block determine when the dot is to be displayed. An output called  $\overline{\text{Dot}}$  is fed to multiplexer switches in the vertical and horizontal lines. This low disconnects the vertical and horizontal drive to the mainframe and positions the dot appropriately. The

logic also provides blanking and unblanking to the Z axis by blanking just before the dot transition and unblanking during dot presentation. It also blanks during the transition back to normal vertical and horizontal positioning. Data into Z axis and dot logic are Zero Span, Display Valid, and the mainframe data such as Channel and Mode information.

Peak/Average reference level originates with the PEAK/AVERAGE front panel control. This reference is compared with an analog signal out of the vertical analog-to-digital converter. If the vertical signal exceeds the reference level set by the control, the average calculator selects peak value. Signals below this reference are averaged. The control functions as a Peak/Average selector only in the Store mode. Division between average and peak display is indicated by a cursor on screen. In the non-store mode the control operates as a baseline clipper. Vertical information below the level set by the control is blanked.

This completes the block diagram description for the 7L5 circuitry.

## DETAILED CIRCUIT DESCRIPTION

### Sweep Control

This portion of the circuit description covers the Auto Sweep, Frequency Span and its Readout, and Trigger circuits. Diagrams 3 through 6 cover these circuits.

The Auto Sweep circuit sets the sweep rate according to the TIME/DIV selections; or, if the TIME/DIV selector is set to the AUTO position, the circuit automatically adjusts the sweep rate as a function of the FREQUENCY SPAN/DIV and RESOLUTION selector settings. If the RESOLUTION is at the COUPLED position, with the TIME/DIV at AUTO, the sweep rate and resolution are automatically computed as a function of the selected frequency span to keep the display calibrated. When the sweep rate is not compatible to the resolution and frequency span, the circuit activates a front panel UNCAL indicator.

The TIME/DIV selector assembly outputs a 5 bit address, as shown in the truth table. Four bits of this address are fed to one side of four section multiplexer U525. The B inputs to the multiplexer are selected when the Select (pin 1) line is high, so the TIME/DIV assembly output is switched through to the sweep generator circuit

## Circuit Description—7L5 Service

(Diagram 6). If the AUTO position is selected, U530D is enabled. This pulls pin 1 of U525 low and switches the multiplexer to its A inputs. The sweep rate is now a function of the address out of ROM U515.

The output address of ROM U515 is a function of the FREQUENCY SPAN/DIV and RESOLUTION control settings. This address is also fed to the B inputs of comparator U540 where it is compared with the TIME/DIV setting. If the code from the TIME/DIV selector is less than the code out of ROM U515, the output of comparator U540 goes high and, when inverted by U520E, pulls the Uncal line low to activate the UNCAL light and generate a (>) symbol as a prefix to the reference level readout.

When the RESOLUTION selector is in the COUPLED position, ROM U515 selects resolution that is compatible for the frequency span selected. The CMOS outputs for the FREQUENCY SPAN/DIV assembly are converted to TTL by the buffers (U510A, B, D, E, and F) to accommodate ROM (U650) in the Frequency Span circuit.

The outputs of the TIME/DIV and FREQUENCY SPAN/DIV selectors, are Darlington pairs which pull down to about 1.0 volt. The low state is offset two junctions below ground, by CR64 and CR66 through R512, to -15 V; so a logic low at the output is about ground potential. Logic high is pulled up through resistors in resistor pack R60.

The arm of the RESOLUTION switch is connected to the collector of Q70. With resistor pack R60A in the circuit, the transistor is saturated and ground return is furnished to the switch. With the resistor pack removed the base of the transistor is connected to the remote program line and the output is dependent on the external program. Diodes CR74 through CR76 provide isolation.

There are five lines that determine the sweep speed; four from multiplexer U525 and the fifth from the output of NAND gate U535C. The sweep generator (Diagram 6) consists of Miller integrator U700 with timing capacitors C712A and C712B. Capacitor C712B is switched into the timing circuit when the input line to pin 9 of multiplexer, (U80C) is low. C712 is in the circuit for sweep rates of 10 ms or slower. When the level at pin 9 is high, the switch opens, and C712B is out of the timing circuit.

Timing resistors are selected by multiplexer U695. Control lines A, B, and C (pins 11, 10, and 9) select the

timing resistors as indicated by the address table within the symbol for U695. Voltage reference for the selected timing resistor is the output of operational amplifier U690A. When Q680 is turned on, timing voltage is increased by a factor of two which increases the sweep speed proportionately. Table 2-1 lists the Time/Div selections with the output addresses and the corresponding addresses for U695, Q680 gate, and pin 9 of U680C. For example; 50 ms connects timing resistor R694, connects timing capacitor C712B, and turns off Q680 to add R686 as part of R<sub>i</sub> (input resistor) for operational amplifier U680A.

The Miller integrator is gated on by the +Gate signal into the base of Q705. This gate switches Q700 off and allows the Miller integrator output to ramp up. The output of the sweep generator is fed to one input of comparator U575A whose output switches high when the input ramp reaches the reference level, set by the divider network on the other input of the comparator or about 8.9 volts. This Sweep Inhibit signal is fed back to the sweep control IC to terminate the sweep gate. Unless Manual sweep has been selected, the sweep ramp is also fed through multiplexer U680B to operational amplifier U685A. Gain of U685A is about 1.2 producing an output ramp of approximately 10.4 volt. This ramp is fed to the frequency span attenuator circuit, containing R660-U665, and to the horizontal sweep processing circuit.

**TABLE 2-1**

**Truth Table for TIME/DIV Selections**

	TIME/DIV					SWEEP CONTROL				
	ST 5	ST 4	ST 3	ST 2	ST 1	U695 A B C			Q680 GATE	U680C-9
ms										
.1	0	0	0	0	0	0	0	1	1	1
.2	0	0	0	0	1	0	0	1	0	1
.5	0	0	0	1	1	0	0	0	0	1
1	0	0	1	0	0	0	1	1	1	1
2	0	0	1	0	1	0	1	1	0	1
5	0	0	1	1	1	0	1	0	0	1
10	0	1	0	0	0	0	0	1	1	0
20	0	1	0	0	1	0	0	1	0	0
50	0	1	0	1	1	0	0	0	0	0
sec										
.1	0	1	1	0	0	0	1	1	1	0
.2	0	1	1	0	1	0	1	1	0	0
.5	0	1	1	1	1	0	1	0	0	0
1	1	0	0	0	0	1	0	1	1	0
2	1	0	0	0	1	1	0	1	0	0
3	1	0	0	1	1	1	0	0	0	0
10	1	0	1	0	0	1	1	1	1	0
AUTO	1	1	1	1	0	1	1	0	1	0

Holdoff timing capacitors, for the sweep control IC (U580 on Diagram 5), are C728 and C726. When the logic input (pin 11) to multiplexer U680A is low, C726 parallels C728 to increase the time constant. The other output of U680A (pin 13) drives the base of the transistor in U585C to provide intensity limiting to the mainframe at the slower sweep speeds (below 10 ms/div). At faster speeds, the input line is high and pin 13 is grounded, so U585C is biased off to remove intensity limiting. In manual mode or, when operating with spans other than 0 Hz, the low state into U595D turns U585C on to provide intensity limiting. Intensity limiting is therefore provided for manual sweep operation, sweep rates below 10 ms/div, and 0 Hz span operation.

Multiplexer U665 selects the attenuation ratio for the 10.4 volt sweep ramp through resistor pack R660. The attenuation address (in at A, B, and C of U665) determines the attenuation. The sweep out of U665 is then fed through multiplexer U670 to one of four output lines. Three of these (1A, 1B, and #2) drive the A and B oscillators which establish the frequency span. The fourth line is for optional use if desired. The address within the IC symbols indicate the sweep ramp path through R660 and U670. For example; when the input address to U665 is 110, pin 2 of U665 is connected to the output. The sweep is attenuated through R660 by the combination of the 4.00 k and 1.33 k resistors. Table 2-2 and 2-3 show the input and output data for ROM U650 and multiplexers U665 and U670. Table 2-2 shows the Data Out of U650 with the corresponding sweep

output line. For example; with a FREQUENCY SPAN/DIV of 50 kHz, input lines A and B to U670 are low. Address 00 (into U670) switches the sweep output of U665 to pin 12 of U670 to drive the B oscillator. Table 2-4 lists the sweep for each SPAN/DIV setting. The table bypasses ROMs U510 and U650.

The Max Span Dot Position adjustment (R655) offsets the dc level of the memory voltage so a voltage of 0 corresponds to center screen (2.5 MHz). It also offsets the dc level of the 1st LO tune voltage so a center frequency of 2.5 MHz corresponds to 0 V at the output (pin 3) of U675B for centering the overspan clipping.

The 1st LO tune voltage is a positive-going ramp, centered around some dc level set by the DOT FREQUENCY control. The amplitude of this sweep voltage depends on the setting of the FREQUENCY SPAN/DIV selector. U675A, U575C, and U575A limit the excursion of the waveform. U675B, a non-inverting amplifier, drives the negative input of operational amplifier U675A. As the sweep ramp crosses its center point, diode CR660 disconnects and the polarity of the input signal to the comparator U575C reverses. The input waveform to pin 7 of U575C is therefore V shaped. This input is referenced (by a voltage divider) to about 4.5 volts. If either excursion of the V shaped waveform exceeds this reference, a positive output signal is produced which represents an overspan. This overspan voltage is fed to a multiplexer (U735B), in the video processing chain, and the output of

**TABLE 2-2**  
Input and Output Data for U650 (8223 ROM)

FREQ SPAN/DIV	INPUT ADDRESS(BINARY)					OCTAL EQUIV	DATA OUTPUT(BINARY)								OCTAL EQUIV	SWP
	A <sub>4</sub>	A <sub>3</sub>	A <sub>2</sub>	A <sub>1</sub>	A <sub>0</sub>		B <sub>7</sub>	B <sub>6</sub>	B <sub>5</sub>	B <sub>4</sub>	B <sub>3</sub>	B <sub>2</sub>	B <sub>1</sub>	B <sub>0</sub>		
MAX SPAN	1	1	0	1	1	33	1	1	0	1	0	1	0	1	325	1A
200 kHz	1	1	1	1	1	37	0	0	1	1	0	1	0	1	065	1B
100 kHz	1	1	1	1	0	36	1	0	0	1	0	1	0	1	225	1B
50 kHz	1	1	0	0	1	31	1	0	1	1	0	1	0	1	265	1B
20 kHz	1	1	1	0	1	35	0	0	1	1	0	1	0	1	065	1B
10 kHz	1	1	1	0	0	34	1	0	0	1	0	1	0	1	225	1B
5 kHz	1	0	0	1	1	23	1	0	1	1	0	1	0	1	265	1B
2 kHz	1	0	1	1	1	27	0	1	1	1	0	1	1	0	166	#2
1 kHz	1	0	1	1	0	26	1	1	0	1	0	1	1	0	326	#2
.5 kHz	1	0	0	0	1	21	1	1	1	1	0	1	1	0	366	#2
.2 kHz	1	0	1	0	1	25	0	1	1	1	0	1	1	0	166	#2
.1 kHz	1	0	1	0	0	24	1	1	0	1	0	1	1	0	326	#2
50 Hz	0	1	0	1	1	13	1	1	1	1	0	1	1	0	366	#2
0 Hz	0	0	1	0	0	04	1	0	1	0	1	1	1	1	257	0

B  
Control Line U670

A  
Control Line U670

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the detector is disconnected from the vertical output amplifier. The vertical display now becomes a dc voltage which produces a trace at the bottom of the screen. In non-store mode the overspan portion is blanked.

The lower half of multiplexer U670 provides a dc offset to the sweep ramp. In the MAX span position, the DOT FREQUENCY control moves the dot (readout) frequency across the screen. In other SPAN/DIV positions, the dot is at center screen unless it is moved by the DOT MKR

control. The dot always represents readout frequency. The dc level, set by the DOT MKR control (R50) feeds three of the inputs for the bottom half of U670. If the control address to U670 (from ROM U650) is anything except 10, the dc level of the DOT MKR control is switched through U670 to the input of operational amplifier U685B. Address code 10 occurs only when the FREQUENCY SPAN/DIV selector is in MAX span position. The offset voltage now comes from the synthesizer memory circuits. The dc output of U685B sets the input dc level of the sweep amplifier U685A to provide offset to the Sweep Horizontal ramp.

**TABLE 2-3**

**Input Data to the Frequency Span "ROMS"**

FREQ SPAN/DIV	FREQ SPAN/DIV SWITCH					U515 INPUTS					U650 INPUTS				
	TC	TJ	TB	TK	TD	A8	A7	A6	A5	A4	A4	A3	A2	A1	A0
MAX	0	0	0	0	0	1	1	1	1	0	1	1	0	1	1
.2 MHz	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1
.1 MHz	0	0	0	1	1	1	1	1	0	1	1	1	1	1	0
50 kHz	0	0	1	0	0	0	1	1	1	0	1	1	0	0	1
20 kHz	0	0	1	1	0	0	1	1	1	1	1	1	1	0	1
10 kHz	0	0	1	1	1	0	1	1	0	1	1	1	1	0	0
5 kHz	0	1	0	0	0	1	0	1	1	0	1	0	0	1	1
2 kHz	0	1	0	1	0	1	0	1	1	1	1	0	1	1	1
1 kHz	0	1	0	1	1	1	0	1	0	1	1	0	1	1	0
.5 kHz	0	1	1	0	0	0	0	1	1	0	1	0	0	0	1
.2 kHz	0	1	1	1	0	0	0	1	1	1	1	0	1	0	1
.1 kHz	0	1	1	1	1	0	0	1	0	1	1	0	1	0	0
50 Hz	1	0	0	0	0	1	1	0	1	0	0	1	0	1	1
0 Hz	1	1	1	1	1	0	0	0	0	1	0	0	1	0	0

**TABLE 2-4**

**Input and Output Data for  
FREQ SPAN Multiplexers, Bypassing U510 and U650**

FREQ SPAN/DIV	FREQ SPAN/DIV SWITCH					U670			U665		
	TC (FS5)	TJ (FS4)	TB (FS3)	TK (FS2)	TD (FS1)	B	A	SWP	C	B	A
MAX	0	0	0	0	0	1	0	1A	0	1	1
.2 MHz	0	0	0	1	0	0	0	1B	0	0	0
.1 MHz	0	0	0	1	1	0	0	1B	0	0	1
50 kHz	0	0	1	0	0	0	0	1B	1	1	0
20 kHz	0	0	1	1	0	0	0	1B	1	0	0
10 kHz	0	0	1	1	1	0	0	1B	1	0	1
5 kHz	0	1	0	0	0	0	0	1B	0	1	0
2 kHz	0	1	0	1	0	1	1	#2	0	0	0
1 kHz	0	1	0	1	1	1	1	#2	0	0	1
.5 kHz	0	1	1	0	0	1	1	#2	1	1	0
.2 kHz	0	1	1	1	0	1	1	#2	1	0	0
.1 kHz	0	1	1	1	1	1	1	#2	1	0	1
50 Hz	1	0	0	0	0	1	1	#2	0	1	0
0 Hz	1	1	1	1	1	0	1	0	1	0	0

## Trigger Logic and Sweep Control

5

Sweep and holdoff timing are controlled by IC U580. This IC provides triggered, single sweep, and free run operation. Trigger signals (+ Trigger In, -Trigger In, and Line) from the mainframe, are processed through U600 (which contains a comparator and gate) to the trigger input (pin 4) of U580. The triggering mode (Int, Line, and Free Run) is selected when the respective line to the trigger logic circuit is pulled low by the output of front panel latches. These latches are activated by front panel momentary contact switches. Sweep mode (Normal, Manual, or Single Sweep) is also set when their respective lines are pulled low. Other inputs to this circuit include; Zero Span logic line, which goes low only when FREQUENCY SPAN/DIV is at the 0 Hz position, Sense Bus, which clocks either at the 100 kHz or the 10 kHz rate until the synthesizer completes its lock up, and  $\bar{T}$  line, which goes low when the dot frequency is changed so that the frequency loops must relock to the new center frequency.

Fig. 2-3 is a timing diagram illustrating the sequence of events that start with the sweep inhibit pulse into pin 1 of U580. The sweep inhibit pulse terminates the gate output. A holdoff pulse is asserted out of inverter U565A to the input of U575B. The output of U575B is inverted by U565E, and gated through U570A to maintain sweep inhibit. Holdoff timing (pin 11, U580) is set by circuitry on Diagram 6. At the time sweep inhibit is generated, the output of U560A goes low to generate Lock Pulse. Since the Zero Span line at pin 5 of U560B is held low for frequency domain displays, Lock Pulse is gated through U560B to trigger one-shot multivibrator U590B. The Q output of U590B now provides Trigger Inhibit for sweep control IC U580. This output is also fed back through U560A to maintain Lock Pulse.

When Lock Pulse is asserted, the Sense Bus begins to clock pulses in (at 100 kHz or 10 kHz rate, depending on the Span/Div setting) until the synthesizer locks. This clock pulse keeps U590B in an unstable state until the synthesizer locks up. The time constant (R593 and C593) for U560B maintains this state for an additional 50 ms. Trigger Inhibit is then terminated and U580 is ready for a trigger. The sweep, however, is still held off by Sweep Inhibit at pin 1.

U565D and U565C use a common pull-up resistor (R840F) so the output of either affects the other. They operate as a NOR gate. Therefore, a low is maintained at pin 4 of U560B when U590B is in its triggered state.

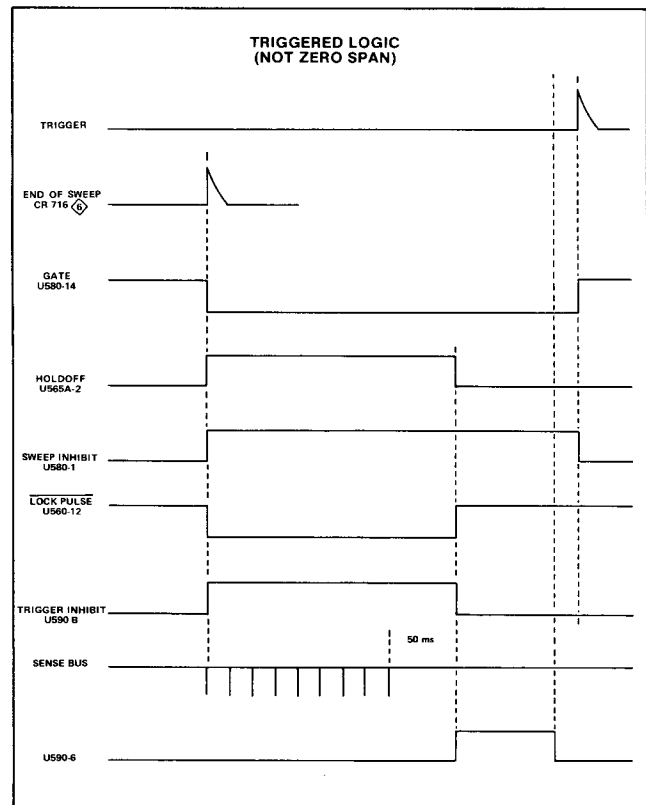


Fig. 2-3. Timing diagram of trigger logic events.

Trigger Inhibit and Lock Cycle are initiated either when the center frequency changes or at the end of sweep. When Lock Pulse and Trigger Inhibit terminate, the positive-going edge of Lock Pulse triggers one-shot multivibrator U590A. The output from U590A is inverted (U565B) and applied to "NAND" gate U570A. Since there is no negative Gate at this time, the resultant high out of U570A maintains Sweep Inhibit (at pin 1 of U580) to keep the sweep locked out. The duration of this period is either 500 ms or 40 ms depending on the state of Q591. Q591 is switched off to increase the time constant when a high out of ROM U535B (Diagram 3) is applied to the base. This occurs for the 10 Hz or 30 Hz resolution selections. The Sweep Inhibit period is therefore extended 500 ms or 50 ms (depending on the resolution) before the sweep control IC U580 will accept another trigger. This provides time for pulses that may be generated in the variable resolution filters to decay.

Bright Baseline Automatic is initiated about 10 s after end of sweep if no trigger arrives to trigger U580. The IC switches to automatic or free run operation when the Bright Baseline Timing input (pin 12, U580) charges high after Lock Pulse terminates. Charge time is set by R610 and C616.

## Circuit Description—7L5 Service

Zero Span line goes high in 0 Hz span and inhibits gate U560B and sets Lock Pulse low. One-shot U590B is now triggered by T line into pin 11 and the Q output is gated through U560A to assert Lock Pulse and inhibit Bright Baseline Automatic operation. Therefore, in time domain mode (0 span), a trigger signal or free run triggering mode is required to trigger the IC. In this mode there is no need to recharge the capacitors in the synthesizer. The Ready line goes low at the end of Holdoff. This is fed back through U575B, U570B, U565E, and U570A to terminate Sweep Inhibit. U580 is now ready for a trigger. Again, when dot frequency is changed, T is asserted to trigger both U590A and U590B. The output pulse from U590B is the trigger inhibit signal that delays sweep start for about 50 ms. The circuit does not terminate sweep but inhibits the start of the next sweep.

Trigger logic consists of latches, a comparator, and switching gates, that select; trigger source, and trigger slope circuits. The trigger signals (+Trigger and -Trigger) are ac coupled to one side of a comparator (one section of U600) then gated through one of the two "NAND" gates to the Trigger input of U580. Pushing the front panel INT trigger source switch, pulls the Int line low. This low, applied to gates U555A and U555D, produces a high out that is fed to both inputs of gate U555B and latches the output low. This low inhibits "NAND" gate U600(D) so the output of comparator U600(B) is not gated through. This allows a + or -Trigger signal from the mainframe to be gated through U600(C) to sweep control IC, U580.

When Line trigger is selected, the Line state goes low and the high out of U555B and U555D latches the output of U555A low. This inhibits the gate U600(C) so only Line trigger is fed through the comparator U600(B) and NAND gate U600(D) to U580.

In Free Run mode, the low on Free Run line inhibits both NAND gates of U600. The output of U595A goes high to enable free run operation.

The LEVEL/SLOPE control selects both triggering level and slope, for the sweep modes, and functions as a manual sweep control for the MNL mode. It functions as a level/slope control as follows: The range of the control is 0 to +15 volts. As the control is rotated through its range a ramp of approximately 10 volts is generated out of U605B. This ramp is offset (about -4 volts) by a voltage divider (R632, R636) so the voltage at the input to U605A, with the LEVEL control fully ccw, is about -4 volts. The output of U605A is about +15 V since CR638 is back biased. The comparator becomes an inverter when the input ramp (at pin 2) reaches 0 volts. When operating as a comparator the output is about +14 volts. When it becomes an inverter, the output drops to about +5 volts and ramps down to 0 volt as

the input voltage is increased. When U605A switches, the diode CR638 is forward biased and closes the feedback loop through R634 to the input. The circuit is now a gain of one amplifier and CR630 is back-biased so the dc (reference) level to the +Trigger In line (pin 2 of U600) ramps down with the output level of U605A. The voltage ramps up at the junction of CR630, R624, CR623 from 0.6 to about 5.6 volts, then back to 0.6 volt as the LEVEL control is rotated, with 5.6 volts representing the center position of the control. A voltage divider (R638, R640) offsets the output ramp of U605A so the Slope input (pin 5) of U580 switches the IC trigger slope from + to - when the output of U605A switches from +14 volts to +5 volts. When U580 is triggering on the negative slope, the reference voltage to the comparator U600A (pin 2) ramps positive as the LEVEL control is rotated from a full ccw position to its mid point. The triggering then switches to +slope and the reference voltage ramps toward 0 volt as the LEVEL control is rotated clockwise.

When selected, the Mnl line is pulled low to latch the output of NOR gate U595A high. The sweep control IC now free runs and the charge on the memory capacitors for the synthesizer is maintained. The sweep for the horizontal deflection circuit, as previously described, is now the output from U605B. This output varies as the LEVEL/SLOPE-MNL SWP control is rotated.

Pressing the front panel SGL SWP button activates Sgl Swp line and the outputs of U550A and U550B switch high. This high, fed back to the inputs (pins 9 and 11) of U550C, latch the output of this gate and pin 6 of U580 low. If the sweep is running, when SGL SWP mode is set, the sweep will finish its run up and stop. If the SGL SWP button is again pushed, a positive pulse is produced at the Single Sweep input of U580, and resets or arms the internal trigger circuit. The sweep will now run when U580 is triggered. This positive reset pulse is generated when the junction of R845G and R622 are pulled low by the momentary contact of the front panel SGL SWP pushbutton. The low is coupled through C622 to one input of the gate U550C. The outputs of the latch and the Single Sweep input of U580 pulses high and arms the trigger circuit within the IC.

If the sweep is running because of single sweep operation and the SGL SWP button is pushed, the sweep is terminated at that point. The trigger circuit is reset. This is produced when the positive pulse out of U550C is coupled through R629 and C629 to pin 5 of U575B. The output of U575B then asserts Sweep Inhibit and Lock Pulse cycle.

Returning to the single sweep latch U550C and its low output state when SGL SWP has been selected; the low on Ready line (from U580) enables NAND gate U570C and the output of inverter U570D lights the front panel READY indicator. The high output of U570C also turns U585E on to supply current to the mainframe interface connector A10. Remote SGL SWP Reset is provided through the interface connection B15.

Normal trigger mode is asserted by pulling the  $\overline{\text{Norm}}$  line low. This latches the output of U550A low and the output of U550C and U550B switch high to cancel free run or single sweep operation. The low output of U550A is fed back on the  $\overline{\text{Norm}}$  line to light the front panel indicator. Sweep lockout (from the mainframe) is fed in on pin B8. When this line is high, the sweep control IC is locked out. This occurs during dual time-base operation or when the Reset button (for a variable persistence storage oscilloscope) is pushed. When the Reset button is pushed, it retraces the sweep.

The upper right corner of Diagram 5 contains blanking and sweep gating functions. Sweep Gate output from emitter follower Q585B provides alternate time-base trigger and unblanks A sweep for the mainframe. Q570 is turned off when digital storage is used. Unblanking from the storage circuitry is applied through U585D to U585B. During non-store operation, transistor Q575 couples the blanking and unblanking gates (out of U560C) to the Z axis logic circuit. In store mode, the active state of  $\overline{\text{Store}}$  line pulls the base of both Q575 and Q520 low and turns both transistors off. The Valid line provides vertical line validity information to the digital storage circuitry.

In the lower left corner of the diagram is power on circuit that sets the trigger latches, digital storage latches, and input buffer, when power is turned on. During the period C621 is charging to -15 volts, Q621 is on to pull Free Run and  $\overline{\text{Norm}}$ , lines low. This gates the output of U555C high and the resultant RPRP (power up) line sets the digital storage latches (for Display A, Display B, not Max hold or Save A) the tuning to coarse, and switches the Input Buffer off.

### Frequency Span and Readout

4

This circuit provides row and column current for the frequency span and time/division readout that appears in the lower right section of the crt screen. Data from the FREQUENCY SPAN and TIME/DIV photo-optic selectors, plus logic data from Zero Span and MNL swp, is fed to ROM U800. The output of the ROM is column current for the Freq Span (kHz) or Time/Div (s, ms,  $\mu$ s) readout. U790 selects its input data from the FREQUENCY SPAN/DIV switch for all span positions. When it is set to 0 Hz, the data comes from the TIME/DIV selector. The control line for this device is the B input (pin 4). When this line is low, the X inputs are gated through and when the line is high (Zero Span line high) the device gates the Y inputs through. The output at Z<sub>3</sub> is Y<sub>3</sub> or X<sub>3</sub>.

The BCD data out of U790 is decoded by U795. Its output drives the W (word) inputs to U800. The ROM (U800) provides column current for the lower right of the mainframe readout character matrix. Row current for the respective time slot (TS) comes from a resistor matrix (R814, R818, R820, R822). A ROM in U830 (Diagram 8) supplies the column current for the dot frequency readout.

### Tune Reference $\div$ N Loops

8, 9, 10

The A and B oscillators are frequency swept during trace time and locked to a center frequency during retrace time. The lock frequency depends on the setting of the front panel DOT FREQUENCY control. This number, times the reference frequency, sets the oscillator frequency for the loop.

Referring to the A oscillator (11.1 to 16 MHz) tune reference loop, (Diagram 8) the following events occur during a lock operation: A digital number "N" is loaded into the counter (U160, U165). The oscillator frequency is counted down from this digital number in increments of 100 kHz (LSB). The output of the counter is then compared by the phase-detector (U175A, U175B) against a 100 kHz reference. Any differential in phase or frequency, generates an error voltage. This error is gated through U180 if  $\overline{\text{Clock Pulse}}$  and  $\overline{\text{CW}}$  are low. The error voltage charges an integrator and memory capacitor (C180) and is applied through a summing amplifier (U185) to the oscillator to pull it into a lock state. For example: If the value of "N" is 12.4 MHz, the BCD counter counts down from 400 kHz then borrows from the binary counter and cycles back through its full count of 1000 kHz until the binary counter has counted down from 12.0 MHz to 0. An output pulse from the binary counter occurs after the 12.4 MHz count-down is fed back to reset the counters. This process repeats until lock pulse goes away.

The operation of the Tune Reference (B  $\div$  N) loop for the B (16 to 12 MHz) oscillator, is similar to the A  $\div$  N loop except its input frequency is N X 10 kHz. The 10 kHz frequency increments are counted down by a  $\div$ 40 counter (U205, U210, U215) so the 1st LO loop shifts in 250 Hz steps. The output memory voltage of this integrator also feeds through a summing amplifier, to ramp or smooth the abrupt 100 kHz steps from the N X 100 kHz loop, before it is applied to the sweep shaper for the B oscillator.

The logic gate for the phase lock loop functions as a switch that gates the error signal, from the phase detector, to the integrator or memory. Controlling signal levels for the logic gate are  $\overline{\text{Lock Pulse}}$  and  $\overline{\text{CW}}$  line. A cw decoder (U650 on Diagram 6) selects which line ( $\overline{\text{CW1}}$ ,  $\overline{\text{CW2}}$ ) of the two gates is activated (pulled low). The  $\overline{\text{Lock Pulse}}$  line is a common bus to both gates, from the sweep circuit (Diagram 5) which is pulled low during retrace time.

When  $\overline{\text{Lock Pulse}}$  is asserted, the error signal from the phase detector is gated through the  $\overline{\text{CW}}$  selected gate to charge the integrator and feed a voltage back, through summing amplifiers, to the oscillator. As the oscillator pulls toward the programmed center frequency and phase lock condition, a lock sense (Sense Bus) signal is sent to the sweep circuit to signify that the oscillator is in a lock mode. The circuit is now ready to sweep the oscillator through this center frequency.

## Circuit Description—7L5 Service

During sweep time,  $\overline{\text{Lock Pulse}}$  goes high to disconnect the intergrator from the phase detector. The oscillator sweeps through the center frequency voltage, stored in memory, and the display chops between the sweep and the center frequency dot reference. This dot represents the programmed center frequency that was set into the  $\div N$  loops and the frequency readout on the crt. Since the dot is in center screen or sweep start and the oscillators are swept through the center frequency, any signal under the displayed dot is at center frequency and the dot frequency is read out on the crt display.

In MAX span, the sweep center (about 2.5 MHz) is established by an analog voltage. The position of the frequency dot depends on the center frequency memory voltage; therefore, as the DOT FREQUENCY is tuned, the memory voltage changes and the dot moves across the display. Accuracy of the dot remains constant.

Referring back to Diagram 8 (Tune Reference A  $\div N$ ); if A oscillator is phase locked, the output of the  $\div N$  counters clocks the JK flip-flop U175A at precisely the same time that the JK flip-flop U175B is clocked by the 100 kHz reference. The output of the comparator is gated through U180 when  $\overline{\text{Lock Pulse}}$  or  $\overline{\text{CW}}$  is asserted. Output pins 11 and 13 are connected across two diodes in CR178 which connect to memory capacitor C180. U180 disconnects input pins 4 and 6 from output pins 3 and 5 unless either  $\overline{\text{CW}}$  or  $\overline{\text{Lock Pulse}}$  is asserted. Output pins 11 and 13 are disconnected from input pins 12 and 9 unless pin 15 is low. When lock condition exists, the simultaneous output from the comparator is gated through to turn both diodes on together and no change occurs to the charge on C180. If the DOT FREQUENCY is changed, the counter output is not synchronized with the 100 kHz reference and the output of one flip-flop precedes the other so the charge on the memory capacitor is changed as a function of the time (phase) shift of the two outputs. This change is applied through U185 to the A oscillator circuit as a correction voltage to pull the frequency into a lock mode.

When  $\overline{\text{CW 1}}$  line is high, both sampling gates in U180 are open, ignoring the state of  $\overline{\text{Lock Pulse}}$ . At this time, however,  $\overline{\text{CW 2}}$  for the B  $\div N$  Tune Reference (Diagram 10) is low, so the 10 kHz Sense Bus line is turned on.

When the sampling gates are open, both diodes of CR178 are back-biased. The memory capacitor C180 must maintain its charge for at least 100 seconds so it is important that the capacitor and components around it have a very low leakage. C180 has a resistance of about  $5 \times 10^{12}$  ohms. The sampling diodes are selected for a leakage less than 1 pA and the differential amplifier U185 has a leakage of about 0.1 pA. The common point of the diodes is an isolation point.

### CAUTION

*It is IMPORTANT that this point be kept clean (fingerprints or any dirt may contribute to leakage). Leakage from all sources must be kept low ( $\approx \leq 2$  pA). If U185 should become reverse biased, the junction may break down and introduce leakage. The instrument will appear to work correctly except in the storage mode.*

NAND gates U170A and U170B ensure that the JK flip-flops, U175A and U175B, and the counters are not preset until the input oscillator frequency has completed 1/2 cycle.

A 17 bit counter U830 is clocked by the X,Y output from the DOT FREQUENCY switch. As the front panel knob is rotated, the output sequences through the digital table shown within the control symbol. The count, up or down, is determined by an exclusive OR gate in U830. The counter in U830, can be loaded some "N" number (N serial in) however, when instrument power comes up, a warmup circuit (Diagram 5) pulls this line and  $\overline{\text{Load}}$  low. This presets the counter to 0 and the "N" output to 0. TS1 (pin 21) resets the shift register and is also the Serial Clock input. The sum of the time slots (1 through 7) select the appropriate column current.  $\overline{\text{T}}$  (pin 5) is asserted when DOT FREQUENCY is changed and is applied to the trigger circuit.

The B  $\div N$  Tune Reference circuit (Diagram 9) is basically the same as the A  $\div N$  circuit. These counters count up. A BCD-to-binary decoder, (U195), is used for the counter U210. The 100 kHz reference is divided down to 10 kHz to provide the 10 kHz clock for U194A.

## A and B Oscillator and Control

This circuit contains the secondary (A and B) oscillators, the  $\div 40$  counter for the B  $\div N$  loop, and the shapers for the oscillator sweep voltage. An exponential sweep from the shapers is applied to Varactor diodes CR172 and CR262 to linearize the oscillator frequency output. Shorting straps P122, P124, or P262, P260, are added or removed to compensate for characteristic differences in the Varactor diodes and the inductors. The output sinewave from the oscillators is amplified and squared by two IC line receivers (U145, U260).



The A output of U260 is divided down by 40 through counters U270, U265A, and U265B. Their output is fed to the 1st LO lock circuit. The B output clocks the  $B \div N$  circuit. The output of U145 drives the  $A \div N$  and the 1st LO lock circuit.

The negative-going sweep voltage, from the Freq Span Attenuator, is on line 1A for Max Span, line 1B for 5 kHz/Div to 200 kHz/Div, and #2 swp for 2 kHz/Div to 50 Hz/Div spans. Sweep for the A oscillator (Max Span to 5 kHz/Div) is summed with A memory voltage at the input to operational amplifier U335. The output waveform is a positive-going ramp that drives the shaper circuit (U345 and U340). Its output waveform is shaped to produce a linear frequency shift out of the oscillator. Sweep for the B oscillator (2 kHz/Div to 50 Hz/Div) is inverted by U305A then summed with the B memory voltage at the input of summing amplifier U310. U310 and U325 shape the sweep voltage to drive the B oscillator.

The -11 volt Adjust (R365) sets the output of the operational amplifier to about 4.22 volts. This is  $V_{cc}$  for the two shaper IC's U325, U340. R365 also sets the current output of emitter follower Q365 which supplies the charge current for the shapers. The A Gain and B Gain adjustments (R345, R325) set the sweep amplitude and the frequency span of the oscillators.

### 1st LO/1st LO Lock

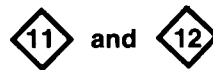
The 1st LO frequency is mixed with the A oscillator frequency in a double-balanced mixer (U225). The output is then fed through a 1 MHz low-pass filter (to remove the fundamental frequencies and upper sidebands) to a phase/frequency detector. The phase/frequency detector U230A, charge pump U230B, and operational amplifier Q230, U230C, comprise the phase comparator that is described in the block diagram description. Any difference in frequency between the A oscillator and the 1st LO is compared with the 40th sub-harmonic of the B oscillator in U230A and U230B and any phase lock error voltage is applied through amplifiers U230A, U230C to the 1st LO to correct its phase/frequency shift.

The oscillator (U2050) frequency is a function of voltage to Varicap diode CR2032. This voltage is the summation of; the phase lock error voltage, the pre-tune or main oscillator tune voltage (A oscillator plus 1/40th B oscillator frequency), and an offset voltage plus temperature compensation. The main oscillator tune voltage ramp (at pin WA) is added to an offset voltage out of U2030B at the +input of U2030A. The amount of offset is

set by R2015 and the voltage across temperature compensating diodes CR2027 and CR2033. This voltage sets the center of the tune ramp voltage to the 1st LO. Sweep Gain adjustment R2025 adjusts the slope of the tune ramp voltage.

The oscillator output frequency is transformer-coupled through T2048 to push-pull amplifier Q2060 and Q2065. The amplifier drives T2060 to provide single-ended output for the plug-in module and the feedback through P2060 to the mixer U225. Voltage regulator U2035 provides 5.1 V to the oscillator and the reference voltage for operational amplifier U2030B.

### Reference Level, Readout, and Timeslot



Reference level, dynamic range, display mode, and crt readout of the amplitude characteristics are controlled by TEKTRONIX IC U2235. The REFERENCE LEVEL control outputs a two bit word to the control IC. The IC outputs a decoded word to a ROM which programs the signal attenuation through the plug-in module and establishes the gain for the IF video and amplifier stages in the 7L5. Front panel pushbuttons activate the vertical control IC U2235 and changes the output address data to the gain ROM U2265 to establish display mode and dynamic range. Column current, for the reference level readout, is supplied by the IC U2235.

The row and column current circuitry for the top left and bottom left crt readout is shown in Diagram 12.

The two bit word output of the REFERENCE LEVEL control drives the X,Y inputs to U2235. The IC decodes the direction and quantization information from the word input and the decoded word drives the up/down counter that outputs an 8-bit BCD word to the ROM, U2265. The counter output is summed in an adder which drives a readout ROM to provide column current data for the readout circuit.

Offset current from the plug-in module, offsets the dBm/dBV readout to correlate with the plug-in module input impedance. The offset bit comes into offset pins as indicated at the top of the IC block symbol. The dBm/dBV switch, in the plug-in module, asserts a low for dBV and enables the gate U2225D. The output of the NOR gate drives pin 5 of U2235, plus two lines (one through inverter U2225A) for the plug-in module which establishes the offset data for the vertical control IC U2235.

## Circuit Description—7L5 Service

The state of the 10 dB/2 dB line is set by the REFERENCE LEVEL control. When pulled out, the line goes high and selects 10 dB steps; pushed in, the line goes low and selects either 2 dB or 1 dB steps depending on the state of the line into pin 16 of U2235. The line to pin 16 is hard-wired in the plug-in module for one state or the other.

An oscillator (U2230A, U2230B) provides a 500 Hz clock to synchronize the switching information into the X,Y inputs.

When Lin mode is selected, a low is asserted at pin 9 of gate U2230C. The gate is synchronized to the 500 Hz oscillator by the flip-flop U2230C and D. When the output is high, the reference level is offset so the readout provides a scale factor in V/Div.

When power is applied, the initial reference level is +17 dBm for 50  $\Omega$  plug-in modules. Q2310 ensures that the  $-15$  V supply for the IC is delayed by the charge time for C2310, until the +5 V supply comes on.

The BCD output of U2235 is an 8-bit word. The 1 bit drives the 1 dB line and asserts 1 dB of gain change in the IF when low. Bits 2 through 80 drive the ROM U2265, which controls the gain and attenuation in the IF and plug-in module. The cross-over point of the reference level (point with no attenuation or gain data out of the ROM) is  $-30$  dBm. Below this point, gain cells are added and above  $-30$  dBm, attenuation is inserted in the signal path. Near the cross-over point, combinations of gain and attenuation are programmed (i.e.,  $-31$  dBm would require 4 dB attenuation and 3 dB of gain).

The  $-30$  dBm reference level has a BCD value of 108 (80, 20, and 8) out of U2235. The LSD (least significant digit) of the word ( $A_1$  of U2265) generates a value of 1, the next 2, 4, etc; to the MSD (most significant digit) of the word ( $A_8$ ) which is 128. Therefore;  $-30$  dBm generates 84 (64 for  $A_7$ , 16 for  $A_5$ , 4 for  $A_3$ ). This input address of 84 produces a binary output word, from the ROM, of 11111011 (see Table 2-5).  $B_8$  output is inverted by U2245C to assert a low into the upper three NOR gates in U2250, inverted again through U2245D to assert a high into the lower three NOR gates in U2250. The upper gates of U2270 drive the gain cell lines, the lower gates the attenuators in the plug-in module. The 4, 16 and 32 dB lines are never used for gain and attenuation at the same time.

$B_1$  and  $B_2$  drive the X10 and X100 gain lines for the Log/Lin amplifier. Therefore, with the  $-30$  dBm binary word, no gain cells or attenuators are enabled. The highest sensitivity for Log 2 dB mode, using the 50  $\Omega$  plug-in module, is  $-128$  dBm. This is 98 dB below the crossover point so the BCD output from U2235 is 10 dBm (108 to 198) thus only  $A_4$ , into the ROM, is high or a 1. The output address from the ROM is therefore 00101000 (see Table 2-5) so the attenuator gates (U2250) are inhibited and the gain gates are enabled. This provides 16 dB plus 16 dB plus 4 dB (36 dB total) of gain. The low state of  $B_1$  and  $B_2$  (U2265) provide an additional 60 dB of gain. This, with the  $-30$  dBm, provides a reference level of  $-126$  dBm. When the 2 and 10 bits are different, the bonding option output goes high. This produces an additional 2 dB of gain and  $-128$  dBm reference level.

When the counter tries to step beyond the reference level range the input to Inhibit goes high. This forces a count up to the reference level limit. For example: The BCD for  $-129$  dBm is one less than  $-128$  dBm, so  $A_8$  (8 bit) and  $A_1$  (1 bit) are high. This address of 4 into the ROM generates an address of 11110100 at the output. The  $B_4$  low state inverted by U2245C, inverted again by U2245D, asserts a low into NOR gate U2320C. The other input to the gate (from Log 10 dB switch) is high for the 2 dB/Div mode. U2320C is an open collector IC with its pull-up resistor connected to the output of U2225C. The output of U2225C will be high when either input is low, depending on the  $B_1$  and  $B_2$  state of U2265. The output high from the gates therefore invalidates the reference level and the counter returns to a count that provides  $-128$  dBm reference level. The most sensitive position for the Log 10 dB/Div mode does not use the X10 or X100 lines; however,  $-71$  dBm causes the  $B_1$  output to go high which asserts inhibit. When switching from 2 dB/Div to 10 dB/Div, with a reference level below  $-71$  dBm, inhibit is asserted until the counter counts up to a reference level of  $-70$  dBm then both  $B_1$  and  $B_2$  go high to terminate inhibit. At the positive dBm end (+21 dBm) the counter for U2235 stops at 21 dBm.

When the Input Buffer is asserted, the input address to the ROM ( $A_8$  of U2265) is increased by a factor of 128. The output address increases so that  $B_8$  goes low and 8 dB attenuation is asserted. The Input Buffer line also asserts a high (through the IF Mother board pin 21 of P1010) to one of the filter amplifiers and increases gain 8 dB.

TABLE 2-5

## Vertical Control ROM U2265 Program

0—4	11110100	87	11110010	172	10001110
5—7	11110010	88—89	11100011	173—175	11110010
8—9	00101000	90—91	11010011	176	10001110
10—11	00111000	92	11000011	177—178	10011110
12	10101100	93—95	11110010	179	10001010
13—15	11110010	96	11000011	180	00011111
16	10101100	97—98	10110011	181—183	11110010
17—18	10111100	99—100	10100011	184—185	00001011
19	10101000	101—103	11110010	186—187	00011011
20	00111101	104—105	10010011	188	10001111
21—23	11110010	106—107	10000011	189—191	11110010
24—27	00101001	108	01110011	192	10001111
28	10101101	109—111	11110010	193—194	10011111
29—31	11110010	112—114	01100011	195—196	10001011
32	10101101	115—116	01010011	197—199	11110010
33—34	10111101	117—119	11110010	200—201	10011011
35	10101001	120—121	01000011	202—203	11001111
36	00111110	122—123	00110011	204	11011111
37—39	11110010	124	00100011	205—206	11110010
40—41	00101010	125—127	00000011	207	11110010
42—43	00111010	128—131	11010100	208	11011111
44	10101110	132	11110100	209—210	11001011
45—47	11110010	133—135	11110010	211—212	11011011
48	10101110	126—137	00001000	213—215	11110010
49—50	10111110	138—139	00011000	216—217	11000011
51	10101010	140	10001100	218—219	10110011
52	00111111	141—143	11110010	220	10100011
53—55	11110010	144	10001100	221—223	11110010
56—57	00101011	145—146	10011100	224	10100011
58—59	00111011	147	10001000	225—226	10010011
60	10101111	148	00011101	227—228	10000011
61—63	11110010	149—151	11110010	229—231	11110010
64	10101111	152—153	00001001	232—233	01110011
65—66	10111111	154—155	00011001	234—235	01100011
67—68	10101011	156	10001101	236	01010011
69—71	11110010	157—159	11110010	237—239	11110010
72—73	10111011	160	10001101	240	01010011
74—75	11101111	161—162	10011101	241—242	01000011
76	11111111	163	10001001	243—244	00110011
77—79	11110010	164	00011110	245—247	11110010
80	11111111	165—167	11110010	248—249	00100011
81—82	11101011	168—169	00001010	250—251	00010011
83—84	11111011	170—171	00011010	252—255	00000011
85—86	11110010				

Readout and Timeslot Decode:



This circuit pertains to the row and column current for the top and bottom left section of crt readouts. The top left reads reference level in dBm, dBV, or V/Div for Lin mode. If appropriate, reference level readout is preceded by a - sign for dBm or dBV readout. This may be preceded by a < or > symbol when the reference level is variable or not calibrated. The bottom left section reads resolution bandwidth in Hz or kHz, preceded by either 10 dB/ or 2 dB/ depending on the display mode. Row (2) and Column Data (2) currents drive the bottom left readout and Row (1) and Column Data (1) currents drive the top left readout.

Row (1) current for TS 10, 9, 8, 7, 3, 2, 1; row current (2) for TS 10, 9, 5, 4, 3; and Column Data (2) current for TS 10, 6, are set by the resistor matrix in R3000. Row (1) is asserted at pins 5 and 11, Row (2) at pin 13, and Column Data (2) current at pin 10. Column Data (1) current source, for all but TS 1 and 2, is the vertical control IC U2235 (Reference Level diagram). TS 3 column current source is pin 2 of U2235, with a dc offset set by 6.2 V Zener VR2292. TS 4—10 column current source is pin 3 of U2235 offset by VR2294. Table 2-6 shows row current and the characters generated with different column currents for all the time slots.

The Column Data (1) current for TS 2 writes either a < or > symbol. The current for this readout symbol is controlled by two FET's (Q2345, Q2350). When the Variable control is out of its CAL detent the Var line is high. Q2350 is biased off so column current (through R2352) generates a < symbol (voltage to R2352 is offset by CR2356 so resistor value is less than 75 k for 200 μA current). When Uncal is asserted, Q2345 is biased on and supplies current through R2342 to TS 2 to generate the > symbol. If the VAR control is out of the CAL detent and Uncal is asserted, the current is greater than 1 mA. Current greater than 1 mA generates > symbol.

The bottom left section of the crt is a function of Row (2) Column Data (2) currents. Resistor matrix in R3000, in combination with the currents generated by the state of BW 1, BW 2, and BW 3 lines, set the currents for TS 10, 9, 8, 7, 6 (resolution). Time slots 1—5 Column Data (2) current is a function of the display mode lines to Q2320, Q2330.

If the resolution bandwidth selection is 3 kHz, BW 1 and BW 3 lines are high (1) and BW 2 line is low (0). This biases Q2370, Q2365, and Q2355 off so row current set by R2366, and column current set by R2364, generate K for TS 8. Two units of column current are added (by R2360) to two units from R3000 to TS 6 to generate 3. Since Q2360 is on, TS 7 is a skip; therefore, 3 kHz would appear in the readout.

**TABLE 2-6**  
**Row Current and Characters**  
**(for Reference Level, Display Mode, and Resolution Bandwidth)**

TS	TOP LEFT			BOTTOM LEFT		
	Column (1)	Row (1)	Character	Column (2)	Row (2)	Character
1		*400 μA	No Symbol	200 μA/NC	NC	1/SKP
2	200 μA/1 mA	100 μA	</>/SKP	NC	NC	2/0
3	600 μA/NC	100 μA	-/SKP	NC	400 μA	d/SKP
4		----	0—9	NC	400 μA	B/SKP
5		----	0—9	NC	100 μA	/or SKP
6		----	0—9	200 μA/	NC/	1/3
7	600 μA/NC	400 μA	d/SKP	400 μA NC 100 μA/	NC	0/SKP
8	700 μA/NC	400 μA	B/SKP	600 μA	NC/300 μA	0/K
9	100 μA/200 μA 300 μA/NC	300 μA	M/w/n/SKP	500 μA	400 μA	H
10	200 μA/NC	400 μA	V/SKP	400 μA	500 μA	Z

\*In TS1 Row (1) current is switched depending on LIN or LOG readout.

Column current for TS 1—5 is a function of the resistor matrix consisting of R2320, R2322, R2324, R2330, and FET Q2320; or, R2332, R2334, R2336, R2338, R2348, and FET Q2330. Q2330 or Q2320 are switched on when  $\overline{\text{Log } 10}$  or  $\overline{\text{Log } 2}$  state is asserted.

When Log 2 display mode is selected, U2320D latches U2320A output low. This low turns Q2320 on. The outputs of U2320D and U2320B latch high so Q2320 is switched off. This generates 2 dB/ for TS 2—5. When Log 10 display mode is selected, TS 1 and 2 change to generate 10 for 10 dB/ readout.

When Lin mode is selected, Q2325 is switched on to provide additional Row (1) current to change the reference level readout to V/Div scale factor.

### IF Processing Chain through

As previously described in the block description, the "L" plug-in modules provide various input impedance selections such as; 50  $\Omega$ , 75  $\Omega$ , 600  $\Omega$ , and 1 M $\Omega$ . They contain relay actuated attenuators (4, 8, 16, 32 dB), a low-pass filter, some contain an amplifier (e.g., L3) and the 1st mixer. The output from the mixer is 10.7 MHz IF.

Referring to Ref Cal/ 10.7 MHz IF/ 2nd Mixer 2nd LO, Diagram 13, the 10.7 MHz IF from the plug-in module is applied through an input filter (A1000A2), and a 30 kHz bandpass filter (FL 1300) to an IF amplifier Q1305 and Q1325. The input filter is a matching network between the plug-in module mixer and the 30 kHz crystal filter. The crystal filter (FL 1300) has an insertion loss of about 3 dB and the amplifier a gain of 21 dB. The 2nd mixer input level, for full screen deflection, with no IF gain steps on, is about  $-20$  dBm.

The mixer, a double-balanced type, combines the 10.7 MHz IF and 10.450 MHz from the 2nd LO for a 250 kHz IF. C1600 and C1604 are in parallel with the secondary and primary of T1600, T1602. Both capacitors affect filter tuning and are adjusted for flat (30 kHz) bandpass characteristics. The mixer diodes are matched. The low-pass filter, between the mixer output and the 250 kHz IF amplifier, terminates the output of the mixer so only the difference frequency of 250 kHz is transmitted to the 2nd IF amplifier.

The 2nd LO (U1500A) is a 10.450 MHz crystal-controlled oscillator, phase-locked to the 10 MHz master oscillator. The output of the 10.450 MHz oscillator drives a push-pull amplifier (Q1500, Q1505) and the D input (through U1500B) of a flip-flop U1510B. The flip-flop is triggered by a 500 kHz clock signal which is derived from the 10 MHz master oscillator. The 10 MHz is counted down to 500 kHz and 100 kHz by U395. 10.500 MHz is the 21st harmonic of 500 kHz so when the 2nd LO is phase-locked, the output of U1510B will be 50 kHz. The 100 kHz is divided down to 50 kHz by U1510A and then the two 50 kHz signals out of U1510A and U1510B are applied to a phase detector U1535. Any error in phase or frequency produces a voltage out of U1535 which changes the capacitance of Varactor diode CR1504 and pulls the 2nd LO frequency into a locked mode with the master oscillator.

Because pin 14 of the phase detector U1535 is the input to an internal amplifier in the IC, an external amplifier Q1530 is used to raise the 50 kHz reference signal out of U1510A to a comparable level for the phase detector within U1535.

The 500 kHz calibrator output level is automatically adjusted so it is a 10 mV or  $-40$  dBV signal source for the different input impedance selections of the plug-in module. This 10 mV is not the peak-to-peak value of the square wave output signal from the counter U395, but 10 mV as indicated by the spectrum analyzer. The peak-to-peak value would be  $2.2 \times 10$  mV or 22.2 mV. The output voltage of the calibrator is a function of Q395 collector current through R394. This current, in turn, is a function of the voltage across R395. When the 500 kHz square-wave signal out of counter U395 is high, CR390 opens and the emitter current for Q395 is the current through R390. When the 500 kHz square-wave is low, CR390 turns on and diverts some of the current through R396. The amount diverted is proportional to the voltage across R396.

The output voltage of U750 sets the current through R396. For high impedance (1 M $\Omega$ ) plug-in modules, pin P of J530 is open and the output of the amplifier is set by the Hi Z adjustment (R892) to about  $-4.65$  volts. When a low impedance unit is used, pin P of J530 is either grounded (50  $\Omega$ ) or very close to ground (75  $\Omega$  has 2.05  $\Omega$ ). The amplifier gain raises the output voltage to about  $-9$  volts and the current through R396 increases to maintain a constant 10 mV output across R394 and the low impedance (50  $\Omega$ ) load.

## Circuit Description—7L5 Service

The 50  $\Omega$  Input Cal Level adjustment R895, calibrates the output level for a 50  $\Omega$  load. It is used to compensate for differences between the emitter-base junction of Q395 and the diode junction for CR390.

The IF for the 2nd mixer is applied through a Balun transformer T1400, to the 250 kHz IF amplifier (Diagram 14). Signal ground for the amplifier (denoted by the special ground symbol) is isolated from chassis ground to reduce ground loops. The 250 kHz IF amplifier consists of four stages that provide 46 dB of gain steps plus at least 8 dB of variable gain. If the reference level is set to  $-29$  dBm the output from this amplifier, for full screen deflection, is approximately 200 mV peak-to-peak, unless the INPUT BUFFER is on.

The 1st stage is a non-inverting operational amplifier (U1400C) with the feedback resistance a function of a photo-resistor IC, U1435. The resistance of U1435 is controlled by current drive from Q1420, which is controlled by the output level of a differential amplifier U1415. The negative input to U1415 is connected through a switch (U1410C) to either pin 12 or 13, depending on the state of the 1 dB line into pin 11. When pin 11 is high, the switch connects pin 13 to 14 and the drive to the negative input of U1415 is a function of the VARIable (Reference Level) control. When pin 11 is pulled low by the 1 dB line the switch connects pin 12 to 14 and the gain of the stage increases a calibrated 1 dB. It is still a function of the VARIable control.

Reference level for the differential amplifier is set by the plug-in module front panel AMPL CAL adjustment. The center arm of the VAR potentiometer (R45) connects to Q45. When the front panel disable is asserted, this line goes to ground which is the same as turning the VAR control fully ccw to the ground end. It also removes the > symbol that prefixes the Reference Level readout. Pin DN connects through interface boards to the plug-in module for additional gain compensation, if required in future plug-in modules.

The dc output voltage U1400C is connected to the +input of the differential amplifier U1415 to control the gain set by U1435 for the stage.

Gain Offset from the plug-in module is a dc level shift that changes the reference level scale factor from dBm to dBV or vice versa.

The 2nd stage consists of U1400B and the feedback loop through U1410A. A low state on pin 10 of U1410A connects pin 2 to 15 so the gain of the stage is unity. Switching pin 10 to a high increases the gain of the stage to 16 dB.

The 3rd stage consists of U1400D and the feedback loop-through multiplexer U1450. The input data to A,B,C of the multiplexer selects resistance combinations in R1455 to provide gain steps of 2 dB to 14 dB. For example; if input to pin A goes high, then pin 14 connects to pin 3.  $R_f$  for the operational amplifier is 1.007 k,  $R_i$  is 3.859 k for a gain of 2 dB. If A and B go high, pin 2 is connected to pin 3 and the gain is 12 dB.

The 4th stage consists of U1400A and the feedback loop through U1410B. Gain of this stage is either unity (pin 9 of U1410B low) or 16 dB (pin 9 high). If the Reference Level is set for  $-29$  dBm, the output from this amplifier for full screen deflection is approximately 200 mV peak-to-peak when the INPUT BUFFER is not on.

### Variable Resolution



The variable resolution circuit consists of four amplifier stages, each containing a crystal filter with variable bandwidth from 10 Hz to 3 kHz. Automatic bandwidth variation, as a function of span, is a feature of each stage. Gain compensation maintains a constant output level as the bandwidth changes. The signal level at TP1800 is about 2 V peak-to-peak for full screen display in 10 dB/div mode.

The 1st stage consists of an operational amplifier driving the input of a crystal filter. Gain is about 14 dB. T1660 provides about a 4:1 current gain to drive the crystal in narrow bandwidth mode. Resonant frequency of the circuit is 250 kHz. Adjustment C1666, in series with the crystal, sets the resonant frequency of the crystal. Adjustment C1660 neutralizes the effects of crystal parallel capacitance and is adjusted for response symmetry at 20 dB down.

A parallel resonant circuit, at the output of the crystal, consisting of L1680, C1660, plus stray circuit capacitance to ground, is tuned to a center frequency of 250 kHz. The Q of the circuit determines the 3 kHz bandwidth response. R1680 sets circuit Q. It is adjusted so the bandwidth of this stage (at 1.2 dB down) is about 3 kHz when the resolution bandwidth is set for maximum. The output load for the

crystal and consequently the bandwidth of the filter is determined by the shunt load of the photo-resistor-LED IC U1690 in series with gain adjustment R1685. The resistance of this photo-resistor determines the actual operating bandwidth of the stage. Resistance varies from about 200 k at maximum bandwidth to about 250  $\Omega$  for minimum bandwidth. The resistance of the photo-resistor is a function of the current through its LED, which in turn is set by the front panel RESOLUTION control or the automatic resolution circuit.

As the resolution bandwidth decreases, the load on the crystal filter decreases the output voltage by an amount that is proportional to the current through Q1690 and R1685. This generates a compensating current out of Q1680 that is summed with the output current of Q1670 to maintain a constant input drive current for the second operational amplifier stage Q1710, Q1720. Gain from the 1st to the 2nd stage is determined by the ratio of R1728 to R1674, so the drive level to the next crystal is a 2 V peak-to-peak signal for full screen deflection in the 10 dB/Div mode.

As previously stated, the bandwidth is controlled by changing the current through the LED's for the photo-resistor IC's. The resistor part of the IC forms one leg of a bridge circuit. The LED is driven by the output from an operational amplifier across the leg of the bridge (see Fig. 2-4). Q1690 is the voltage source for the bridge. The multiplexer, U1700, selects the resistance for the one leg in accordance to the input binary code from the front panel RESOLUTION switch. Any unbalance across the bridge produces an output from U1680 to increase or decrease the current through the LED. This, in turn, changes the resistance in the IC and balances the bridge.

The multiplexer U1700 selects resistance values for bandwidths from 10 Hz through 1 kHz. When 3 kHz is selected the current through the LED is shut off, the bandwidth is determined by the resistance of R1680 (3 kHz BW Adj).

Transistor Q1830 provides the isolation between the VR circuit and the post VR amplifier. It provides gain compensation. The output is normalized, by R1835, at approximately 1 V peak-to-peak for a full screen display at 10 dB/div.

As previously explained in the function block description, 10 kHz and 30 kHz resolution circuits bypass this circuit. They are shown in Diagram 16. When either is selected, the output of U1000 or U1002 goes high, which, activates the respective 10 kHz or 30 kHz bandpass filters. With 10 kHz or 30 kHz resolution, the input to an OR gate (composed of CR1812, CR1813) goes high. This turns Q1813 on and Q1810 off. Current source for the output amplifier Q1830 and the  $-15 V_4$ ,  $-15 V_5$  power supplies is Q1810 so, this effectively turns off all stages except the input amplifier to the VR circuit.

Q1765 is switched off when the Input Buffer switch (on the plug-in module) is turned on. The gain of this stage is then increased 8 dB to offset the added 8 dB of attenuation through the plug-in module.

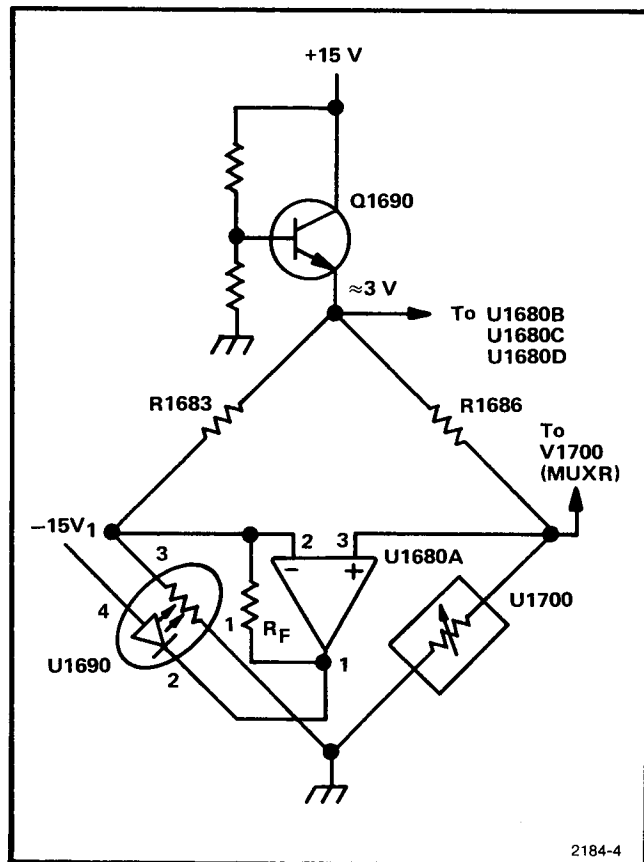


Fig. 2-4. Simplified diagram of the resolution circuit for the 1st stage.

### 10 kHz and 30 kHz Filters and Post VR Amplifier 16

When 10 kHz or 30 kHz resolution is selected, the 10 kHz or 30 kHz line (pins EP, EN) goes high (−15 V to 0 V). This high, switches either Q1890 and Q1900 (30 kHz) or Q1855 and Q1880 (10 kHz) on, and connects the 250 kHz IF signal from T1666-6 through either the 10 kHz filter (C1856/L1856 through C1878/L1878) or, through Q1900 to the amplifier Q1910 and the 30 kHz filter. A low on the 30 kHz line switches Q1890 and Q1900 off and Q1895 on, to bypass the stray rf signal to ground through C1896. A low on the 10 kHz line switches Q1855 and Q1880 off and Q1850 on, to bypass rf signals to ground through C1859.

Gain of either the 10 kHz amplifier (Q1800) or the 30 kHz amplifier (Q1900) is a function of their collector load, which consists of R1888, R1914, and (when Q1885 is on), R1887. When the INPUT BUFFER is switched on, the output of U1002A goes low. This turns Q1885 off and removes R1887 as part of the collector load, thus, increasing the gain of the 10 kHz or 30 kHz amplifiers to offset the 8 dB loss through the front end attenuators.

### Log/Lin Amplifier 17

This circuit provides an 80 dB dynamic window for the 10 dB/Div display, 16 dB window for the 2 dB/Div display, or a linear display for Lin mode. It consists of an input amplifier and four similar amplifier stages that provide linear or logarithmic gain characteristics. The non-linear or log gain characteristic (for the 10 dB/Div or 2 dB/Div mode) is produced by a gain-shaping transistor-diode array consisting of transistor-diode pairs connected across the input resistance to the current summing point of an operational amplifier. As the signal level increases, the gain-shaping array decreases the amplifier gain at an exponential rate. In addition to the gain-shaping network, the gain of the first three stages (in the LIN or 2 dB/Div mode) can be increased in 20 dB increments by switching a FET transistor on, to shunt the input resistance of the operational amplifier with a 20 dB gain setting resistance.

The first non-linear amplifier stage is an operational amplifier consisting of U1090E and Q1115 with a gain-shaping network across the input resistance (R1076, R1090B) to the current summing point of the amplifier. The log-shaping circuit is an array of three transistor-diode pairs (Q1080-Q1085, Q1090A-Q1090B, Q1090C-Q1090D) connected so the input signal level, to one pair (set by R1080, R1090E, R1090G), is 10 dB below the other. The transistor-diode pairs (current limiters) are conducting at low input signals levels to shunt the input resistance (R1076, R1090B) with about 200 Ω/pair. Gain of the stage

is 20 dB. As the signal level increases, the gain decreases at an exponential rate until Q1080 clamps and the first break point of the log gain slope is reached. The gain now equals 10 dB. A further increase in signal decreases the gain until Q1090A clamps and the second break point of the gain slope is reached. The gain is now unity. This continues to decrease until the third break point is reached when Q1090C clamps and the gain is reduced to −10 dB.

The stages limit sequentially starting with the last stage. In the 10 dB/Div mode, the log-shaping arrays for the four stages are activated by pulling Log 10 line (pin 24 of J1010) low. The Lin line (pin 23 of J1010) is high. In the 2 dB/Div mode only the last log-shaping array is activated because both the Log 10 and the Lin lines are high. The high on Lin line is inverted by U1002D and pulls pin FF low.

In the LIN mode, all of the log-shaping arrays are disabled because the Log 10 line is high and the Lin line is pulled low. This low on the Lin line produces a high at pin FF which switches Q1170 on, to increase the gain of the last stage about 24 dB. This gain offsets the loss through the 1st stage and sets the nearest dBm/dBV deflection factor value to the equivalent mV/Div factor for the LIN mode.

Gain of the first three stages is switched in 20 dB increments (in the LIN and 2 dB/Div modes). Gain switching logic comes in on the X10 and X100 (pins 3 and 20 of P1010) lines. A truth table is shown on the diagram for the three gain cells.

### Detector and Video Amplifier 18

The signal from the function (log-Lin) amplifier is coupled to the detector circuit through a low Q single-pole filter network with a resonant frequency of 250 kHz (L1220-C1222). This filter narrows the noise bandwidth from the Log/Lin amplifier. A precision detector, consisting of an operational amplifier and a diode feedback circuit, converts the IF signal to video. Input series resistors R1220, R1224, convert the input signal voltage to a current at the input summing point of the operational amplifier. The ac feedback for the amplifier is through the diode-resistor network CR1252-R1250, or CR1240-R1242. The dc feedback path is through R1241 and R1240.

The output of the detector is a signal with negative-going peaks which is applied through a low-pass filter (C1254, L1254, C1256) with a pass-band of 15 kHz. The filter averages the video signal and further reduces the IF component. The signal is then amplified by U1050A, U1050B, and applied to operational amplifier U2210.



The amplifier U2210 allows only a negative swing at the output, therefore, this stage establishes the display baseline. The level of the signal above the baseline is set by Volts/Div Cal R2205 which is set so a 10 dB change at the input of the Log amplifier produces 1 volt of change at the output of U2210. Q2225 is switched off to provide the X5 gain required for the 2 dB/Div mode so the output of U2210 is 1 volt change for 2 dB change at the input. The baseline for the LIN mode is set with R2235. The baseline for the two log modes is then set with R2215 and R2225.

The Vertical Out signal of U2210 is applied through the front panel to the vertical display processing circuits and to amplifiers U2205A, U2205B. These amplifiers provide the Video signal to the front panel VIDEO OUT jack and the internal triggering circuits of the mainframe.

## DISPLAY PROCESSING

This portion of the description deals with Horizontal and Vertical Display Processing, the Average Calculator, Digital Storage, and Z Axis Logic and Dot Switching (Diagrams 19, 20, 21, and 22). Before reading this portion, review the display processing block diagram description.

The Average Calculator and Digital Storage circuit boards for instruments with SN B070000 and up have one Digital Storage board in place of the Average Calculator and Digital Storage boards. An additional function B—(SAVE A) pushbutton and indicator board is mounted on the front panel. Circuit description for this new board follows Digital Storage 21 description.

### Horizontal and Vertical Display Processing



This circuit processes, the vertical and horizontal data from either the digital storage circuit or the vertical out signal from the video output amplifier, and the sweep ramp from the sweep generator (Diagram 17). The Dot positioning is also summed with both the vertical and horizontal information. Horizontal sweep is provided to the front panel HORIZ OUT jack J98.

The video portion, on the Vertical Out line, is a 0 to -8 volt signal that is applied through R735 to the digital storage circuit on the Swp Vert line, and through U735B to one input of switch U735C. If an overspan occurs, pin 10 of U735B is pulled low and switches the common output (pin 15) of U735B to a dc level set by CR737-R840. This dc level provides a baseline reference for the display.

When  $\overline{\text{Store}}$  line is low (true) the video data on the Store Vert line (from digital storage) is applied through U735C to the operational amplifier U750B. When the  $\overline{\text{Store}}$  line is high (false) U735C switches and connects the Vertical Out signal from U735B to the input of U750B. Log Cal (R95) is part of the input resistance to the operational amplifier U750B and is adjusted to compensate for gain differences between 7000-Series mainframes.

The gain of U750B is about 0.5. Its output is clamped at 0 V so the signal amplitude out, varies between 0 and about +4 volts. If  $\overline{\text{Dot}}$  line is high (false) Q765 is on and the output of U750B is connected to the input of operational amplifier U730D. The dc level of the VERT POSITION (R755) control, summed with the vertical signal at the input to U730D, provides display positioning. The output of U730D then drives an inverting amplifier U630C and provides the negative-going portion for a push-pull vertical output signal to the mainframe.

The sweep ramp from the sweep generator (Diagram 6) is applied through R731 to one input of U735A and out, on the Swp Horiz line (pin HF), to the digital storage circuit. U735A selects either Store Horiz (synthesized sweep from digital storage circuit) when  $\overline{\text{Store}}$  line is true or the analog sweep ramp at pin 3 when  $\overline{\text{Store}}$  is false. The selected sweep is then applied through FET Q735 (when  $\overline{\text{Dot}}$  is false) to input of U730A and a current summing point at the input to U690B. The output of U690B drives the A sweep for the mainframe and provides a 0 to -6 volt ramp for the front panel HORIZ OUT jack. The selected sweep (Store Horiz or Swp Horiz) is amplified by U730A and its output provides the + Horizontal sweep. The ramp is inverted by U730B to provide the negative-going sweep ramp for the mainframe. Gain of U730A is adjusted by Swp Cal (R750) to compensate for mainframe differences in sensitivity.

When  $\overline{\text{Dot}}$  line goes low (about -7 volt) Q765 and Q735 are switched off. Dot position information (from U685B, Diagram 6) is now applied to the input of operational amplifier U730A. The vertical dc level is supplied from the VERT POSITION control. The sweep ramp also contains Dot information. The polarity of the dot position information (from U685B) nulls the dot position information riding on the sweep horizontal and the sweep to the HORIZ OUT jack. When the Dot is displayed the sweep horizontal plus dot information is switched off and only dot position information from U685B is applied through R734 to the null point of amplifier U730A.

### Average Calculator (SN B069999 and below)



An average or quotient is the summation of words of vertical data (numerator) divided by the number of words taken (denominator). The Average Calculator circuit accumulates data from the vertical A/D converter and divides this by the number of words taken within an averaging period. At the slow sweep rates as many as  $2^{16}$  words can be accumulated and averaged.

The accumulator for vertical data (numerator) is located in the upper portion of the diagram. The number of words (denominator) are counted by two IC's (U4125, U4120) in the lower left portion. The dividing process (accumulated data divided by the number of words) is performed by circuitry comprising three shift registers (U4100, U4000, U4105), two adders (U4005, U4010) and the NAND gate U4110B. The Average Calculator circuit also includes; a peak detector (U4065, U4060, U4075A, U4075C, U4070A, U4155A), a Max Hold (U4170, U4175, U4055C, U4055D, U4075D, U4155C), and a 3 to 4 MHz oscillator (U4080B).

Three lines (Start Divide, Memory Data, and Write Cycle) from the digital storage circuit go through level shifters (U4085B, U4080A, U4085A) to raise the logic level to a high of +15 volts.

The shift registers for the vertical data are clocked by Sync Clock. The counter for the denominator (number of words) is clocked by Sync Pulse. Sync Clock is generated by AND'ing EOC (positive pulse every  $9 \mu\text{s}$ ) with  $\bar{1}$  MHz clock. It is a  $1 \mu\text{s}$  clock with every 9th pulse missing. Sync Pulse is generated by AND'ing EOC with  $\bar{1}$  MHz in NAND gate U4180C. It is the missing pulse from Sync Clock which occurs every  $9 \mu\text{s}$  and is essentially the same as EOC.

The denominator accumulator is a synchronous 16 bit counter (U4125, U4120) that accumulates the number of sync pulses within an averaging period. It is reset by the leading edge of Start Divide.

Numerator data, in serial form on the Data Out line, is clocked by Sync Clock (1 MHz) into the shift register U4035. This 8 bit word appears at the input of two 4 bit adders (U4040, U4045) where it is summed with the previous summation in latches U4145, U4150. The LSB's of the two words are summed in U4040 while the MSB's are summed in U4045. The carry (or 9th bit) is entered into

overflow counters U4135, U4130. (Initially the 8 bit word out of U4035 is added to 0.) The sum ( $A_1B_1, A_2B_2$ , etc.) is latched, on the positive excursion or end of Sync Pulse, to the output of the latches U4145, U4150, where it is summed in U4010 and U4045 with the next 8 bit word out of U4035. This accumulation process continues for one horizontal window (512 increments per sweep).

Start Divide, out of level shift amplifier U4085B, triggers a one shot multivibrator U4160A. The Q output (at pin 6) then parallel loads the accumulated numerator data into 8 bit shift registers (U4140, U4030, U4025). These three registers provide 24 bit capacity. The Q output of U4160A also loads the accumulated word count into the denominator shift registers U4020, U4015.

At the termination of the pulse out of U4160A the positive excursion from  $\bar{Q}$  triggers a second one-shot multivibrator U4160B. The output of this one-shot resets the latches (U4145, U4150) and counters (U4135, U4130, U4125, U4120) in the numerator and denominator accumulator circuits. The  $\bar{Q}$  output clears the denominator register (U4100) in the divide circuit. At the beginning of Start Divide the data in the counters is loaded into shift registers. As soon as one-shot U4160A times out, the latches and counters are reset. They are now ready to start accumulating new data while the old data in the numerator accumulator is divided by the accumulated word count in the denominator.

When U4100 is cleared, pin 13 goes low. This switches the multiplexer (U4115) to the A inputs ( $1_A, 2_A, 4_A$ ). A free running 3 to 3.5 MHz oscillator (U4080B) provides a justify left clock signal. The clock shifts the accumulated word count in the numerator and denominator registers to the left (right on the diagram) until the MSB of the denominator (or 1) arrives at pin 13 of U4100. A high at the select input to multiplexer U4115 switches the fast clock off and  $2_Q$  (pin 7) of U4115 connects to Sync Clock input at  $2_{B-1}$  (pin 6).

Shift register U4100 now holds the justified denominator word until cleared again by the output of one-shot U4160B. Write Cycle enables NAND gate U4110C and Sync Clock pulses are gated to input  $2_B$  or U4115. These clock signals out of  $2_Q$  (pin 7) shift the data in the numerator registers and clocks the vertical information into the dividing circuit to perform the division.

The divider consists of 4 bit adders (U4005 and U4010) shift registers (U4000 and U4105) and NAND gate U4110B. Division is performed by adding the complement of the binary numbers for the numerator to the divisor (denominator) in a parallel serial fashion, with the quotient being the carry out of the adder (division by the complementary method).

Table 2-7 illustrates the process using 25 (11001) and 5 (101) as the numerator and denominator. Before the number is justified, pin 5 of U4020 has the MSB of the number 101, and pin 13 of U4140 has the MSB of the numerator 11001. Since the denominator is moved 21 counts to position in U4100, the MSB of the numerator would move to  $Q_2$  of the shift register U4000. The 0 line in Table 2-7 denotes the initial state for the division process. When the quotient (output of U4110B) is 0 (low) a shift function is performed by the registers (U4000, U4105) for the numerator. When the quotient is a 1 (high) the registers parallel offset load the present summation.

The output from this circuit is an 8 bit serial word representing the average vertical value for that particular address. The output is applied to gating circuits and gated to the Math line for the storage circuits.

The peak detector consists of a multiplexer circuit (U4060A, U4075A-B-C) and gates (U4065A through C). The circuit detects and selects the peak value from two data lines, either data on the Data Out line or data that is contained in an 8 bit register U4070A depending which is the higher. The selected data is then gated back into the register for the next comparison and to another multiplexer (U4050B, U4055A, U4110A) that selects the peak or average data value from the averaging circuit. The peak or average is selected by the setting of the Peak/Average cursor. The output signal goes to Digital Storage circuit on the Math Out line.

Write Cycle sets flip-flop U4060A to enable U4075C. Data will now pass through into U4070A for one cycle. This establishes an initial data value in register U4070A for comparison with new data so the peak can be selected. At the end of Write Cycle, the positive 1  $\mu$ s EOC pulse clears both flip-flops and  $\bar{Q}$  goes high. This high enables U4075A and U4075C so data in shift register U4070A and data on the Data Out line can be compared. The high bit sets either U4060A or U4060B and inhibits the least word from passing into register U4070A. At the end of the word, the flip-flops (U4060A, U4060B) are preset by EOC and the stored word in U4070A is again compared with the word on Data Out line.

The output of the peak detector is applied to another multiplexer consisting of U4050B, U4055A, U4110A, and U4055B. The D flip-flop U4050B is set by a high on pin 8 or reset by the clock input when Write Cycle ends. When the Peak/Average line is high, the Q output of U4050B is high and data from the peak detector is gated through U4055A, and U4055B to another multiplexer. When the Peak/Average line goes low, the multiplexer selects the output from the averaging circuit.

The comparator (U4576B, Diagram 21) that drives the Peak/Average line uses pull-up resistor R4129 (pin 10 U4155D). During Write Cycle the output of U4155D is low; therefore, the state of U4150B cannot change while data is written in memory.

The output of the NOR gate U4055B is applied to another peak detector where it is compared, if Max Hold is enabled, with the data in memory (on the Memory Data line). The peak of the two is then gated through U4075D to the Math Out line. Data in memory is read during Start Divide which occurs one cycle or 9  $\mu$ s before Write Cycle. The data on Memory Data line is delayed this 9  $\mu$ s by processing it through a D flip-flop (U4050A) and shift register (U4070B). Memory data is shifted out of U4070B by the next Sync Clock pulse and it is then compared by the peak detector (consisting of U4170A and B, U4175A and B, and U4055D and C) to the data from U4055B. The peak (from memory if Max Hold is enabled or data from U4055B) is then gated through U4075D onto the Math line. Operation of this detector is the same as the peak or average detector described previously.

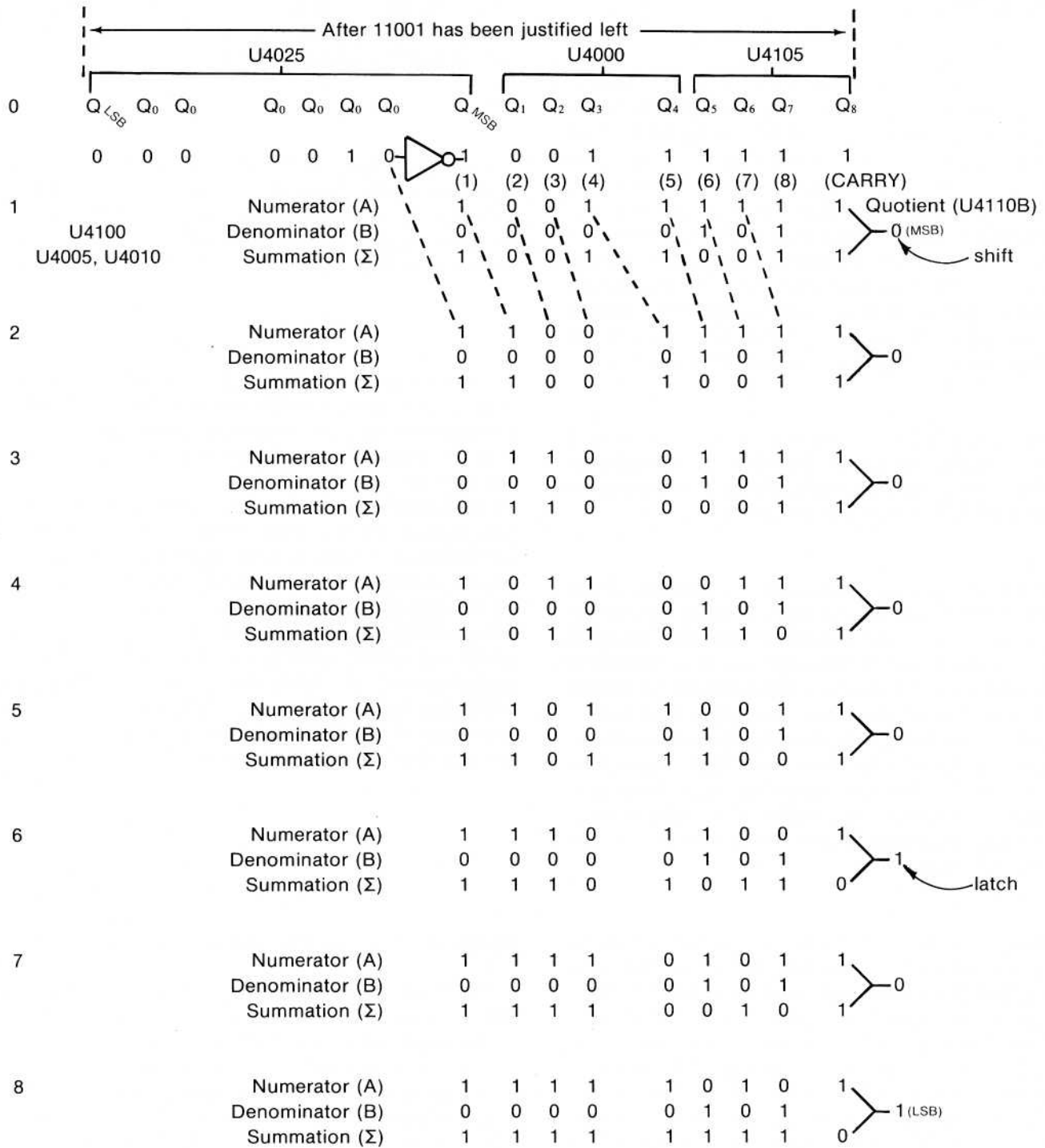
### Digital Storage (SN B069999 and below)



The description for this circuit is grouped into the following main sub-sections; derivation of the conversion clock pulses, vertical acquisition, horizontal acquisition, memory, vertical display, and horizontal display. The digital storage circuit digitizes vertical and horizontal analog signals, writes the information at a horizontal address in memory, then at a different rate, reads data from memory and converts this back to analog information for the display processing circuit. A display control circuit selects the sequence of display. The first two sweeps consist of data from memory, the third the cursor.

TABLE 2-7

DIVISION PROCESS FOR 25 ÷ 5  
IN AVERAGE CALCULATOR



The master clock for acquisition, storage, and display process, is 1 MHz ( $1\ \mu\text{s}$ ), derived from a 2 MHz sub-frequency of the master 10 MHz oscillator. The 2 MHz frequency comes in at pin YA and is divided down to 1 MHz by U4510A. The vertical A/D converter, U4504, U4506, is clocked by 1 MHz signal. Every 9th pulse ( $9\ \mu\text{s}$ ), EOC is sent out to trigger the flip-flop U4510B which generates a true EOC and Clock Enable. EOC is gated, in the Average Calculator with a 1 MHz clock signal to generate Sync Pulse and Sync Clock. Sync Pulse is coincident with EOC and Sync Clock occurs at  $1\ \mu\text{s}$  intervals with the 9th pulse missing (see Fig. 2-5).

Vertical information on the Sweep Vert line (pin GH) is fed through buffer amplifier U4522B to an A/D converter consisting of; a successive approximator U4506, digitally controlled current generator U4504, and comparator U4508A. The converted data goes out on the Data Out line to the Average Calculator diagram where it is averaged or peak detected and comes back through U4578A into memory on the Math line.

Video signal into buffer amplifier U4522B produces a current through R4528 and R4529 that is proportional to the signal amplitude at pin HG. This current produces a positive voltage at the input to comparator U4508A and its output switches high. The successive approximator

U4506 counts up until the converted 8 bit word produces an output current out of D/A converter U4504 equal to the current through R4528. On the 9th clock the word is loaded into the register, U4506, and EOC triggers the D flip-flop U4510B as described previously. The converted digital word then goes out on Data Out line during the next conversion cycle.

Horizontal information comes in on the Sweep Horiz line (pin HF) as a 10 volt ramp, offset between a maximum and minimum value of  $+10\ \text{V}$  and  $-10\ \text{V}$ , depending on the dot frequency position. The 10 volt sweep ramp is digitized by a continuous or ramping A/D converter (resistor ladder U4560) and two comparators (U4564A, U4564B). The sweep horizontal signal comes in pin HF to a node point of two comparators, offset from each other about 20 mV. This sweep ramp is summed with the output from the D/A converter whose output is opposite in polarity and slope. If the sweep voltage exceeds the converter output by 20 mV, U4564A switches high; or, if the converter output is the most positive, U4564B output switches high. When the two ramps are within 20 mV of each other the output of the comparators is low and the counter holds a constant value. The direction (up/down) of the count is determined by which comparator output is high. The 20 mV window between the two comparators keeps them from toggling.

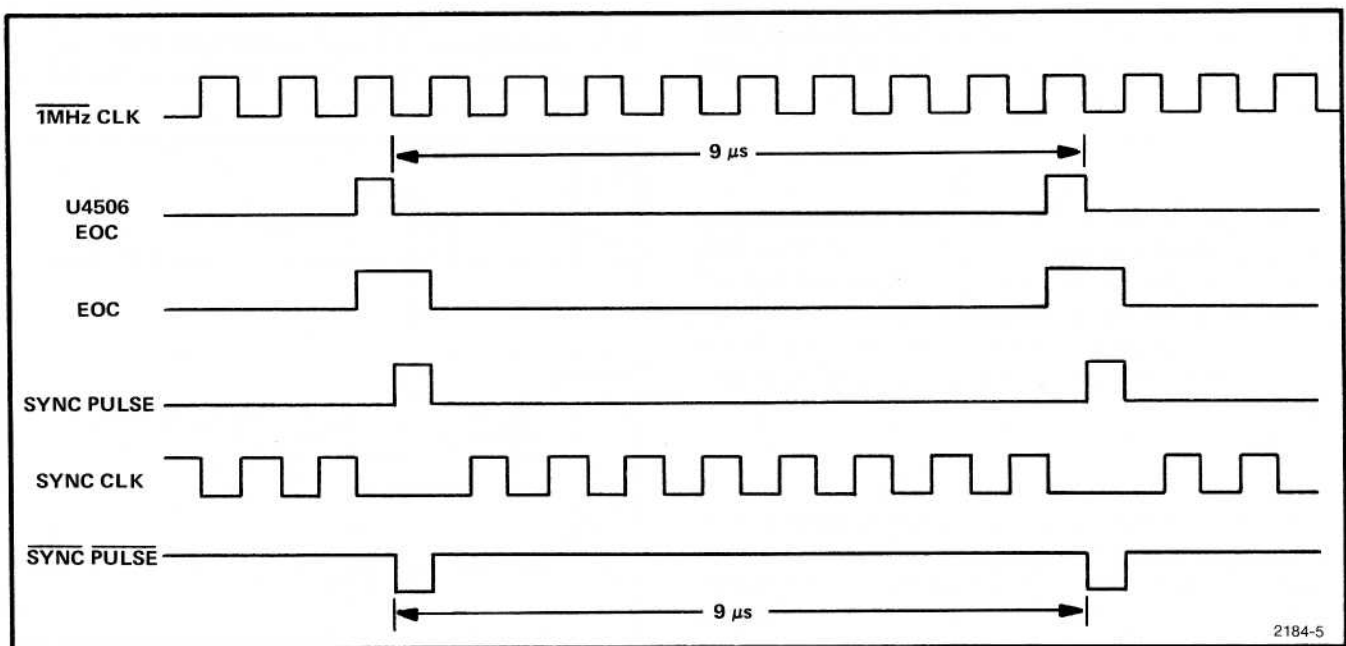


Fig. 2-5. Timing sequence of conversion pulses.

## Circuit Description—7L5 Service

The D/A converter (resistor ladder U4560) output is a 0 to +5 volt staircase ramp applied to a gain-of-two amplifier and offset an amount equal to the offset of the incoming Sweep Horizontal ramp at pin HF. If all the bits into the D/A converter U4560 are 1 (high), the output is +5 volts. This +5 volts at the + input to U4540A generates an output current through R4585, R4582, and R4572 proportional to the offset and amplitude between the input Sweep Horizontal and the +5 volt out of the converter. The common input to the comparators U4564A and U4564B is the node or 0 volt, therefore, since the resistance of R4572 is twice that of R4582 and R4586, a +5 volt output is offset by -10 volts at pin HF. When only the MSB of the word is 1, the converter output is +2.5 volts. The output of U4540A is 0 volt (current through R4588 equals current of R4586). The sweep horizontal input voltage at pin HF is, therefore, 0 volt. When the output of the converter is 0 volt, the output of U4540A is -5 volts so the input voltage at pin HF is +10 volts.

The counter output is a 10 bit word with the LSB for the horizontal address at pin 3 of U4562 and the MSB at pin 2 of U4580. 512 of the 1024 bits (discrete locations) are used to cover the screen width, the remaining 512 bits are divided so 256 locations are on either side of the screen. Since the frequency dot can be moved across the display (screen) and it always represents 0 volt and location 512, the distribution of the 512 locations within the screen width is in accordance to the dot position. If the dot is at the left edge of the screen, location 511 is at the right edge and 512 and 0 are at the left edge. Moving the dot to center screen distributes the locations so 255 locations are either side of location 512. Moving the dot to the right edge shifts location 1 to the left edge and location 511 to the right edge.

The MSB for the horizontal address is the offset data that determines the dot location on the display. The remaining 9 bits provide the address in memory and 512 discrete locations across the screen. Each location or step is 1/512th of the 10 volt sweep ramp or about 20 mV. This is the hysteresis window for comparators U4564A and U4564B.

When the horizontal acquisition counter needs to count up (during the sweep ramp period for Sweep Horizontal) the output of comparator U4564A goes high. This enables flip-flop U4530B so Sync Pulse clocks U4530B to assert Start Divide (see Fig. 2-6). The next Sync Pulse clocks U4530A and Write Cycle is asserted during which data is written into memory. At the end of Start Divide and Write

Cycle the horizontal acquisition counter counts up. The screen then refreshes until the next horizontal count occurs. Since each horizontal increment requires three 9  $\mu$ s periods, a total of 15 ms (512 X 27  $\mu$ s) minimum is required for each horizontal sweep or 2 ms/div or slower is required to acquire with digital storage.

During retrace time the output of U4564B switches high and enables the NAND gate U4566D so Sync Clock pulses can ripple the counter down in a short period.

When Start Divide is asserted, the horizontal address is latched into U4584, U4586, and U4564B; then during Write Cycle the vertical data on Math line is written in memory at that horizontal address. Memory consists of two RAM's U4598 and U4596. The vertical memory (U4598) is a serial memory operated by a 3 bit counter U4558A. The counter is run by Sync Clock and its output 3 bit word shifts data in and out of memory. The horizontal RAM is U4596. The offset data bit (MSB of the horizontal address that signifies the dot position) is fed into the RAM on the Left/Right line. The LSB of the horizontal address, into pin 5 of U4598, selects the section (A or B) for writing or reading the vertical data in memory. One mode of store operation updates each section of memory every cycle, the other mode, when Save A is asserted, saves data stored in A section and updates only the B section. When Save A line is high, U4514C is inhibited so the input to pin 5 of U4598 (memory) is held low during Write Cycle and prevents data from being written in A memory. The Save A line is switched high when the front panel SAVE A button is pushed. This switches the latch U10A, setting Q output high. When the button is again pushed, the latch switches back and the output goes low to inhibit Save A mode.

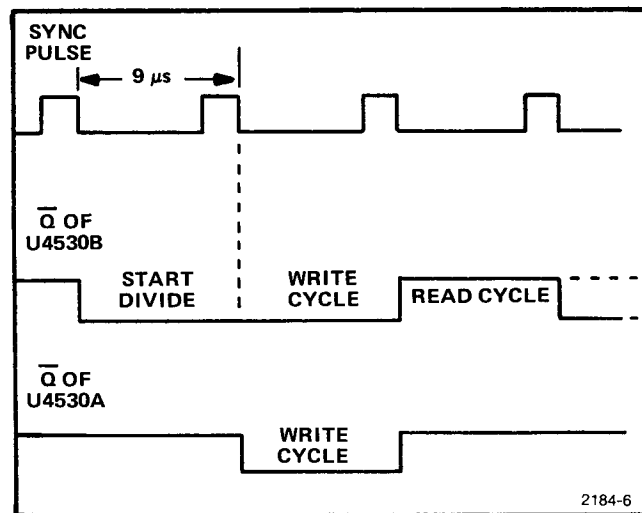


Fig. 2-6. Sequence of events for horizontal increment.

Memory is ready to be read after Write Cycle when U4530A is reset and  $\overline{Q}$  goes high or EOC ( $\overline{\text{Hold B}}$ ) is asserted. Data is clocked into register U4550 (part of the vertical output D/A converter) for one sync pulse period ( $9 \mu\text{s}$ ), allowed to stabilize for  $8 \mu\text{s}$ , then a sample and hold circuit is gated on and the analog output of U4548 is sampled and stored on C4553. The sample of new data is, inverted and summed with a sample of present or old data from the output of an integrator. The difference or summation is then integrated to become the new signal position.

If the signal from the D/A converter was applied to the vertical output without the integration process, the display would be a series of dots. The integrator is used to integrate from dot A to dot B position.

EOC out of U4506 clocks a divide-by-two flip-flop (U4554A) to produce an output pulse with a time period of  $9 \mu\text{s}$ . During the time  $\overline{\text{WCQ}}\overline{1}$  line and the Q output of U4554A are high (data is not being written into memory) the gate U4534A is enabled and Sync Clock ( $1 \mu\text{s}$  pulses) clocks data into U4550. During the next Sync Pulse period, data in the register U4550 is converted to analog information and EOC is gated through U4566C to the select input of multiplexers U4544A and U4544B. The capacitor C4553 now charges to the new data (voltage output from buffer amplifier U4546B) through U4544A. Coincident with the sample taken by C4553, C4561 is charged through U4544B to the present or old data out of integrator amplifier U4525B. The new data on C4553 is applied through buffer amplifier U4524A and inverter U4524B to the input of integrator U4525B where it is summed with the non-inverted sample on C4561. The voltage differential between the updated and current voltage seen by the integrator is proportional to the analog voltage change out of U4548. The output of the integrator is then applied through multiplexer U4544C to the vertical output amplifier. Each integration takes  $18 \mu\text{s}$  then a new sample is taken and the process repeats.

Multiplexer U4554C is driven by a ring counter, consisting of U4558B and U4556C (above the horizontal output amplifier). The counter counts 0, 1, 2; 0, 1, 2; etc. On the count of 2 (10) the multiplexer U4554C selects the cursor input (pin 13). Sequence of the display is B, A, cursor; so the cursor is displayed every third sweep.

The horizontal output circuit consists of an 8 bit counter (U4590), two latches (U4572, U4568), a D/A converter (U4570), and display control circuitry above the horizontal display circuit. The counter is clocked by the output from the display logic circuit which is programmed by front panel Display Mode push buttons (DISPLAY A, DISPLAY B, and SAVE A). During read cycle (Q output of U4530B low) the output of the display counter (U4590) is connected through U4588A and U4592A to drive the memory RAM. With the counter at some horizontal address, the vertical output sequence is executed then U4590 is clocked through U4588B or U4592B (depending on the display mode) and another vertical output sequence is executed.

When  $\overline{\text{Hold B}}$  line goes high the horizontal address for one word of data is clocked through the latches U4568, U4572, to the D/A converter U4570. Over the period of one sweep (512 increments) the output of U4570 is a +5 volt stairstep ramp which is smoothed and amplified by U4546A, U4540B. The output signal of U4540B is a negative going 10 volt sweep for the display processing circuits on Diagram 19.

There are four basic modes of store operation; Display A, Display B, Display both A and B, and Save A with either/or both Display A Display B. The LSB determines which section data is read out of or into memory. A LSB of 1 reads or writes in the A section and 0 of the B section. When Save A is selected, data in A memory is not updated during the Write Cycle because the LSB into the RAM is 0. Only B memory is updated. The display when either Display A or Display B is selected is 512 increments of data from the memory selected for two sweeps followed by the cursor (line between the average and peak detected video). Both sections of memory are updated during the respective Write Cycle. When both Display A and Display B are selected, each of the two display sweeps is an interlaced 512 increment combination of A and B data. The LSB into the RAM switches between 1 and 0 as the sweep runs. Again, the third sweep displays the cursor. When Save A is selected along with Display A Display B, one sweep displays A memory the next B memory followed by the cursor. The cycle then repeats. The A section of memory is not updated during Write Cycle.

## Circuit Description—7L5 Service

The display process of data out of memory is a function of front panel latches (U10A, U10B, U20A, U20B). The output state of these latches establishes the operational mode of the Display Control circuitry and determines which memory (A or B) will be displayed. Pushing a front panel display button activates a latch so its output switches. If the output goes high, it turns on an LED which illuminates the respective push button to indicate the mode asserted. The output of the latch is applied through gating circuits to set the mode of the display control flip-flop U4554B. The Q output of U4554B is fed through gates (U4566B, U4532B) and forces the LSB for memory (when Save A is selected) to inhibit writing in A memory.

When Display A and Display B are selected the high on both lines enables the gates U4516A, U4516B, so their output is gated through U4516C, U4516D, as a high to the J and K inputs of flip-flop U4554B. This state also enables U4534B which enables the tri-state device U4592B and inhibits U4588B. The display counter (U4590) is now clocked by the output of U4554B. The Q output also becomes the LSB for memory during Read Cycle and since it is toggling, the information out of memory will consist of 256 bits of A data interlaced with 256 bits of B data. The  $\overline{Q}$  output of U4554B is the LSB for the D/A converter (resistor ladder) U4570.

When Display A is selected, only the J input of U4554B goes high and the output remains constant. Only data in A memory is displayed. When Display B is selected, only the K input of U4554B goes high and Q output remains low which selects data in B memory. In both cases the display counter (U4590) is clocked by  $\overline{\text{Hold B}}$  signal which is gated through U4588B. When Save A is selected, with either Display A or Display B, the output of U4554B is the same as described previously for these two modes; however, when Save A is selected, with Display A and Display B, both inputs to the flip-flop go low. The LSB (A) of the ring counter (U4558B, U4555C) is fed back to a three input NAND gate U4515B.

The ring counter counts in sequence as shown in Table 2-8. When the LSB (A) goes low (state 0), U4514B is enabled so U4554B is reset and data in B memory is displayed. After 256 display points, the LSB goes high (state 1) and the output of U4514B goes low. This triggers one-shot multivibrator U4538A which sets the flip-flop U4554B and, data in A memory is displayed. In state 2, U4544C allows cursor data to be displayed as previously described.

**TABLE 2-8**  
**Sequence of counter U4558B, U4556C**

B/A	STATE
00	0
01	1
10	2

### Digital Storage and Averaging (SN B070000 and up) A

The Digital Storage and Digital Averaging circuit board assemblies have been replaced with one Digital Storage board. Most of the circuitry of the two older boards has been incorporated into two Tektronix ICs. One of these ICs contain the vertical acquisition, vertical display, peak detection, signal averaging, Z axis blanking, and special processing circuits. The other IC contains the horizontal acquisition, address counter, horizontal display counter, 10-bit RAM address multiplexer, and a logic array control matrix system. External to these two ICs are two eight-bit digital-to-analog (D/A) converters, two 10-bit D/A converters, one 10-bit latch, 8 k of RAM, all required analog functions, 1 MHz clock generator for timing, and control or programming circuitry.

An additional storage feature B—(SAVE A) with its front panel pushbutton and indicator, has also been added.

Graphic presentation of mathematical functions or data is common practice. One class of graphs are those which have a single "Y" value for each "X" coordinate. An alternate representation for a graph is a two-column table, where the X coordinate and Y value, for each X coordinate, were simply listed. If the first X coordinate and the spacing between X coordinates were known, then the two-column format could be reduced to a single-column table and the X coordinate would be implied by the Y value in the table. This is the essence of digital storage. The vertical analog voltage (Y value) is converted to a binary number and stored in a table (memory). The location in memory is determined by the analog sweep voltage (X coordinate). Once the table is created in memory, the function can be recreated by converting the values and table position (addresses) to analog voltages.

The digital storage system has two tables (called A and B) in memory. Table B is updated on every sweep; Table A is not updated if SAVE A control line is true. There are 512 "A" slots and 512 "B" slots in memory. Spacing between the X coordinates is the same in each table but the origin of the B is shifted such that the X coordinate for A and B are interlaced.



When the stored digital data is recreated and displayed, the user has the option of displaying either A data, B data, or both from memory. If SAVE A is true, when both data is displayed, data saved in A is displayed alternately with updated data in B memory. When SAVE A is not selected, then sequential interlaced values of the data in both A and B sections of memory are displayed as one trace of 1024 "X" coordinates. A third option, called B-(SAVE A), displays the difference value between B data and data saved in A.

Since a function is continuous and a table has values for discrete X coordinates, an algorithm is used to determine the Y value to be stored at a particular X coordinate (address). This allows the user to select one of two values for "Y", peak or average. The "Y" analog signal is continually sampled, the number of samples depends on the speed of the sweep voltage. For one X coordinate, there are always at least two samples (there may be as many as  $2^{17}$ ). From these samples the user can select the largest value, called peak, or the mean of all samples, called average. The selection is controlled by the Peak/Average logic signal. This signal is generated by comparing a dc level, set by the Peak Average control, to the analog vertical input signal. When the input is below the dc level, average value is computed; when the input is above this dc level, peak value is computed. This dc level appears on the display as a positionable line or cursor. The logic line, named cursor, is generated by switching the dc level to the analog output during the marker cycle.

Superimposed on the cursor is an intensified spot which shows the X coordinate at which undated "Y" values are being computed. The Undate Marker is formed by comparing the analog sweep input to the display analog X output and forcing the sweep to pause, increasing the marker brightness.

**Vertical Section.** The vertical analog (video) signal is applied through a level-shifting operational amplifier (U4704), to an analog-to-digital (A/D) converter. Video is converted to an eight-bit word by a successive approximation register (SAR) consisting of comparator U4702B, part of U4730, and D/A converter U4710. Eight clock pulses produce one digital approximation of the vertical analog value. A ninth pulse generates an end-of-conversion (EOC) pulse which is called SYNC. All other functions are synchronized by this pulse. Digital approximation is within one bit (LSB) of the vertical analog value.

Input at pin HD is set between 0 and +15 V by the Peak/Average control. This is divided down and applied through U4744B to comparator U4702A where it is compared to the analog vertical data. When vertical data is

more positive than the reference set by the Peak/Average control, U4730 calculates peak data to store in memory (RAM U4742 and U4753) and when the data is less than the reference, average data is stored.

When MAX HOLD line is high, the larger of the current memory value or the previously selected peak/average value for the X coordinate is stored in memory.

A three-bit synchronous counter in U4730, identifies which bit of the eight-bit vertical data is to be read or written into memory. This is the only memory addressing done by the device. All other addressing is under the control of U4751. This three-bit counter is cleared (000) by  $\overline{\text{SYNC}}$ .

The counter also drives the control lines of multiplexer U4748, which generates a "K" (constant) value for the B-(SAVE A) display according to the data selected by binary switch S4740. When B-(SAVE A) is selected, the actual expression is  $B-(A+K)$ , where K is a serial input external constant set by the user. This constant positions the B-(SAVE A) = 0 reference at any level selected by S4740. To avoid confusion, the display is blanked when  $B-(SAVE A + K)$  is off screen.

**Horizontal Section.** The analog sweep ramp is converted to an address for the current table value by a ten-bit tracking A/D converter (U4750). As the sweep ramp increases, the counter (in U4751) increments. As the sweep retraces, the counter decrements. Output of the D/A converter is summed with the output of operational amplifier U4744A at the input to comparators U4735A and U4735B. In this manner the D/A converter tracks the input sweep voltage.

When SAVE A line is high, the counter skips every other binary number so only "B" coordinates are updated in memory.

**Control Logic.** Display functions are activated by pushbuttons that clock "D" type latches. Output of the latch drives an LED to indicate that the function is active. This output is also buffered through tri-state device U4746 to U4751. B-(SAVE A) is an addition; therefore, the latch and indicator for this function are part of the Digital Storage circuit board.

B-(SAVE A) is applied through a Schmitt trigger to U4739A and ORed with SAVE A so the SAVE A function remains active. Display A, Display B, and B-(SAVE A) are applied to three-input NOR gate U4749A. When any display line is active the  $\overline{\text{STORE}}$  line (output of U4749A) is true.

# PERFORMANCE CHECK

## Introduction

Because specifications for amplitude and frequency measurement characteristics of this instrument are tighter than the specifications of typical test equipment, these procedures describe only an operational check. If the user desires to verify these characteristics, the accuracy of the measurement standard is the responsibility of the user and must exceed the specifications of the instrument. Assistance on how to verify these characteristics can be obtained from your local Tektronix Field Office.

The performance check is intended to verify that the 7L5 Spectrum Analyzer will meet the specifications listed in Section 1 of this manual. It is recommended that the performance check be included as part of the user routine maintenance program. An operational check out procedure is provided in the Operators Instruction manual. This procedure should be included as part of the overall instrument maintenance check.

The following procedures check the 7L5 sweep triggering frequency range, display flatness, resolution bandwidth, sweep rate, intermodulation distortion, and frequency drift. It does not include internal adjustments or checks. If the instrument fails to meet a specified performance requirement, the adjustment procedure for the related circuit will be found in the Calibration Procedure, Section 4.

## Equipment Required or Recommended

Test equipment as listed in Table 3-1 is recommended for this portion of the performance check. Test equipment characteristics are the minimum required for accurate checks. Characteristics of substitute equipment must meet or exceed those listed in Table 3-1.

**TABLE 3-1**  
**Equipment List**

Equipment/ Fixture	Specified Characteristics	Recommended Type/Model
Dual Trace Vertical Amplifier Plug-In Unit for 7000- Series Oscilloscope	Vertical Sensitivity, 5 mV to 5 V; bandwidth, $\geq 500$ kHz.	Tektronix 7A18 Plug-in Amplifier
Low Frequency Signal Generator (2 required)	Range, 1 Hz- 5 MHz; output accuracy, within 0.05 dB; expanded scale on output monitor; output impedance; 50, 75, and 600 ohms.	Hewlett-Packard 654A
Frequency Counter	Short term stability, 1 part in $10^7$ .	Tektronix 7D14 (7000-Series) or Digital Counter DC501, DC502 (TM500-Series)
Time Mark Generator	Outputs, 1 s, to 1 $\mu$ s; accuracy, 0.001%.	TG501 (TM500-Series)
Stable Signal Generator	Range, 400 kHz- 5 MHz; short term stability, 1 part in $10^7$ .	Hewlett-Packard 8640B
50 $\Omega$ Step Attenuator	1 and 10 dB steps; range, 1-79 dB; accuracy, +0.1 dB, -0.5 dB.	Tektronix 2701
Two 10X (20 dB) Attenuators	BNC connectors, 50 $\Omega$ for L1 Plug-In Module.	Tektronix Part No. 011-0059-02

## Performance Check—7L5 Service

### 1. Sweep Triggering

- a. Connect the test setup per Fig. 3-1.
- b. On the mainframe oscilloscope, select the Left Vertical Mode and the Left Vertical Trigger Source.
- c. On the 7L5, set the Digital Storage to off, FREQUENCY SPAN/DIV to 0, and select the NORM and FREE RUN triggering switches.
- d. Set the low frequency signal generator to 30 Hz at an output level of 1.5 vertical divisions on the crt graticule.
- e. Select the INT trigger source and rotate the LEVEL/SLOPE control until a stable, triggered display of the 30 Hz signal is obtained.
- f. Set the low frequency signal generator to 500 kHz and repeat step e.
- g. Select the LINE trigger source. Apply an ac voltage through a 10X probe to the input of the vertical plug-in amplifier (e.g., 7A18). Verify a stable triggered display.
- h. Select the FREE RUN and SGL SWP triggering switches. Verify that a sweep is initiated.

- i. Select the trigger mode MNL SWP. Verify that the MNL SWP control can move the trace over approximately the same range as the normal sweep.

### 2. Dot Frequency Range and Accuracy

- a. Connect test setup per Fig. 3-2. Set triggering to NORM and FREE RUN and set the other front panel controls as follows:

DOT FREQUENCY	500.00 kHz
RESOLUTION	COUPLED
FREQUENCY SPAN/DIV	50 (Hz)
TIME/DIV	AUTO
LOG 2 dB/DIV	On
REFERENCE LEVEL	-20 dBm
Mainframe Vertical Mode	Right
Mainframe Trigger Source	Right Vert

- b. Set signal generator to 500 kHz and adjust the output amplitude for a 6 division display (approximately -24 dBm) on the analyzer crt. Carefully adjust the signal generator frequency to place the displayed signal under the frequency dot. Use the digital counter to verify that signal output frequency is 500.00 kHz  $\pm$  6 Hz.

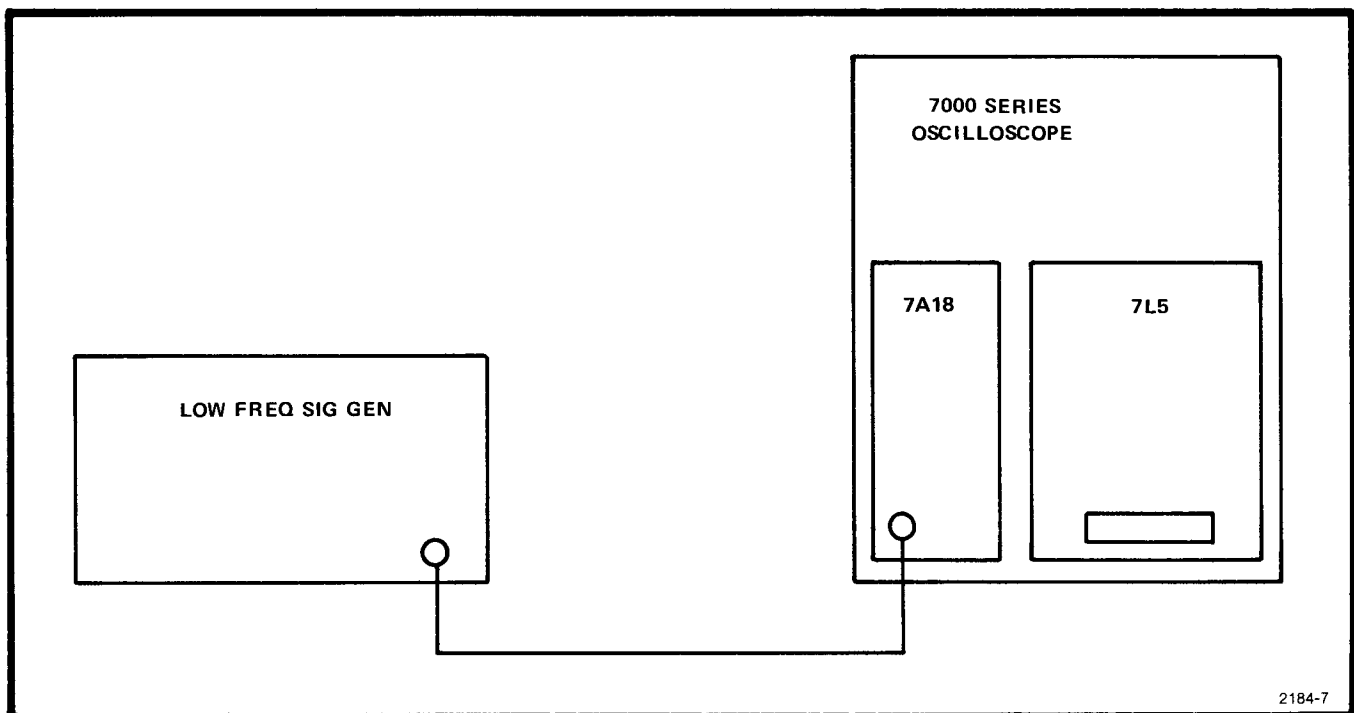


Fig. 3-1. Sweep triggering test equipment setup.

c. Set the signal generator to the following test frequencies and repeat step b for each frequency setting. Verify the dot frequency accuracy for each of the listed test frequencies.

Test Frequency, kHz	Tolerance
1,000.00	±7 Hz
1,500.00	±8 Hz
2,000.00	±9 Hz
2,500.00	±10 Hz
3,000.00	±11 Hz
3,500.00	±12 Hz
4,000.00	±13 Hz
4,500.00	±14 Hz
4,999.75	±15 Hz

**3. Display Flatness**

a. Connect test setup per Fig. 3-2. Set the front panel controls as follows:

DOT FREQUENCY	500.00 kHz
RESOLUTION	COUPLED
FREQUENCY SPAN/DIV	100 kHz
TIME/DIV	AUTO
LOG 2 dB/DIV	On
REFERENCE LEVEL	-20 dBm
DIGITAL STORAGE	Off

b. Set the signal generator frequency to 500 kHz and adjust its output level for a displayed 6 division signal amplitude reference on the analyzer crt graticule. Note the output level of the signal generator as indicated on the output level monitor meter.

c. Slowly adjust the signal generator frequency so the displayed signal moves across the full width of the graticule. Monitor the signal output level and adjust as required, to maintain a constant output. Verify that the displayed signal amplitude remains within 0.5 dB of the 6 division reference as the frequency is moved through the 1 MHz frequency range.

d. Set DOT FREQUENCY to 1500.00 kHz and repeat step c.

e. Set DOT FREQUENCY to 2500.00 kHz and repeat step c.

f. Set DOT FREQUENCY to 3500.00 kHz and repeat step c.

g. Set DOT FREQUENCY to 4500.00 kHz and repeat step c.

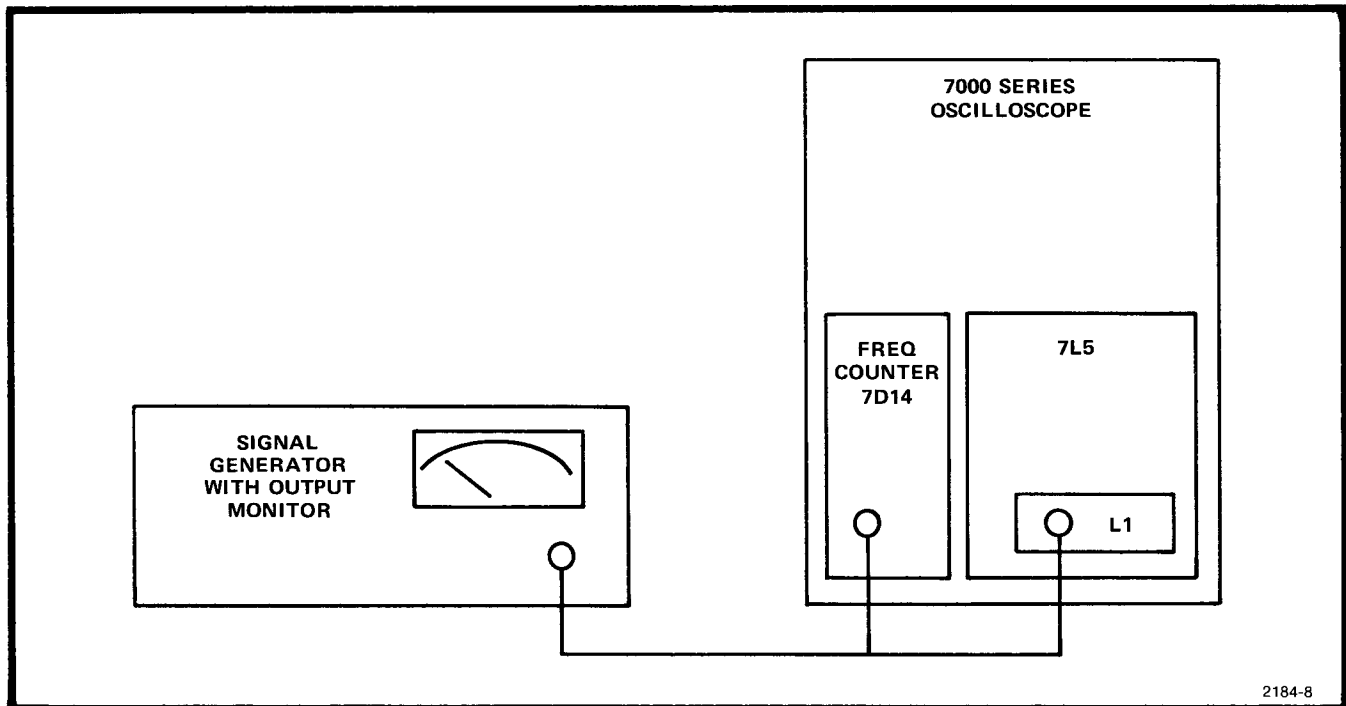


Fig. 3-2. Dot frequency range and display flatness test setup.

## Performance Check—7L5 Service

### 4. Frequency Span Accuracy and Linearity

a. Connect the CALIBRATOR signal to the INPUT connector and set the front panel controls as follows:

DOT FREQUENCY	0.00 kHz
RESOLUTION	30 kHz
FREQUENCY SPAN/DIV	MAX
TIME/DIV	AUTO
REFERENCE LEVEL	-30 dBm
Display Mode	LOG 10 dB/DIV

b. Verify that the crt display includes ten CALIBRATOR signals, excluding the signal at the left edge of the graticule. Verify linearity by ensuring that each signal is coincident with a vertical graticule line, within 4 percent ( $\pm 0.4$  division), over the 10 division display.

c. Connect the test setup in accordance with Fig. 3-3 and set front panel controls as follows:

DOT FREQUENCY	4000.00 kHz
FREQUENCY SPAN/DIV	200 kHz
RESOLUTION	10 kHz
REFERENCE LEVEL	+10 dBm or as required
DOT MKR	Max cw (dot to left edge of graticule)

d. Apply  $5 \mu\text{s}$  markers to the INPUT and verify one, (200 kHz) marker per division,  $\pm 4$  percent, over the center eight divisions. (For example, if the controls are adjusted so that the marker behind the 2nd graticule line is

coincident, then the marker behind the 8th graticule line must be within 0.32 division.)

e. Set the FREQUENCY SPAN/DIV to 100 kHz and apply  $10 \mu\text{s}$  markers to the INPUT connector. Verify one (100 kHz) marker per division,  $\pm 2$  percent, over the full graticule width.

f. Apply markers and set the FREQUENCY SPAN/DIV control in accordance with Table 3-2. Verify frequency span accuracy by noting the markers per division for each setting. Adjust the RESOLUTION control as required to optimize display amplitude.

TABLE 3-2

FREQUENCY SPAN/ DIV Setting	Marker Gen. Setting	Tolerance: within 4%
		Displayed Markers/Div
200 kHz	$5 \mu\text{s}$	1 div
100 kHz	$10 \mu\text{s}$	1 div
50 kHz	$10 \mu\text{s}$	2 div
20 kHz	$50 \mu\text{s}$	1 div
10 kHz	.1 ms	1 div
5 kHz	.1 ms	2 div
2 kHz	.5 ms	1 div
1 kHz	1 ms	1 div
.5 kHz	1 ms	2 div
.2 kHz	5 ms	1 div
.1 kHz	10 ms	1 div
50 Hz	10 ms	2 div

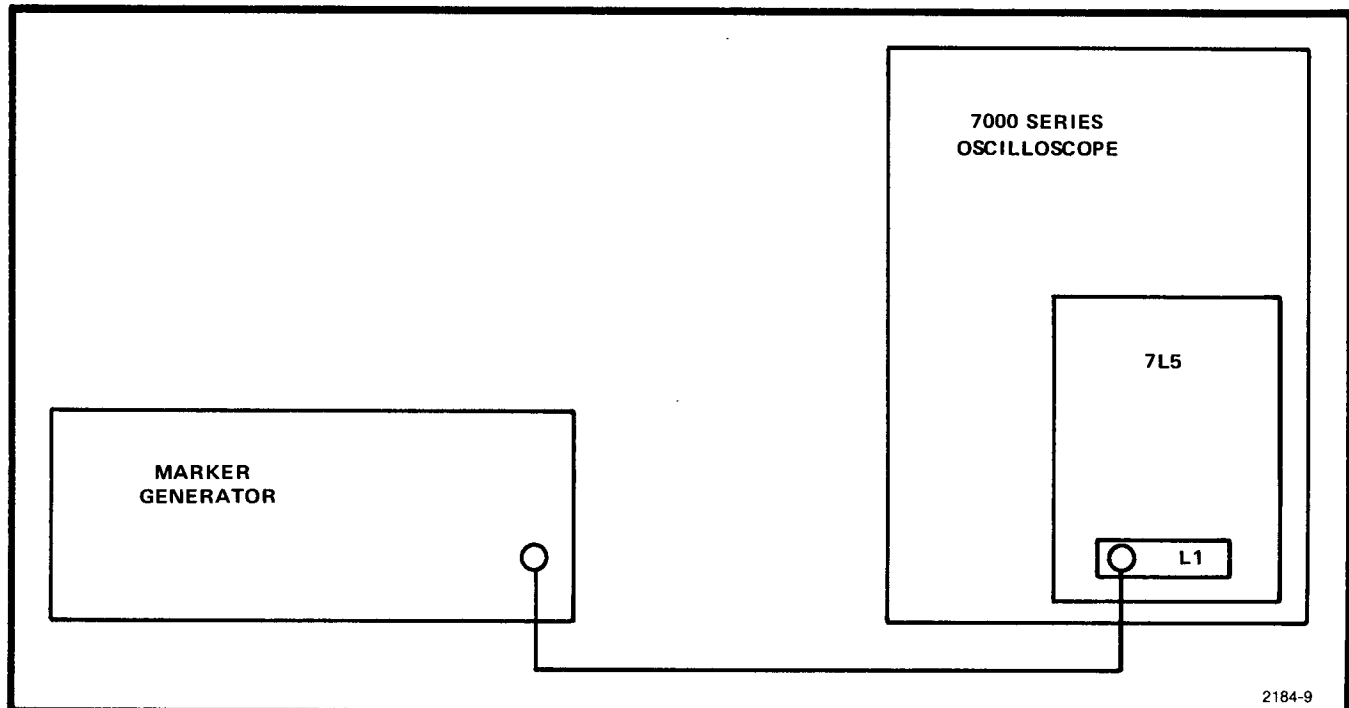


Fig. 3-3. Frequency span accuracy and linearity test equipment setup.

**5. Sweep Rate Accuracy**

a. Connect test setup per Fig. 3-4. Set the 7L5 front panel controls as follows:

- FREQUENCY SPAN/DIV 0
- TIME/DIV .1 ms
- TRIGGERING INT and NORM

b. On the oscilloscope mainframe, select Left Vertical Mode and Left Vertical Trigger Source.

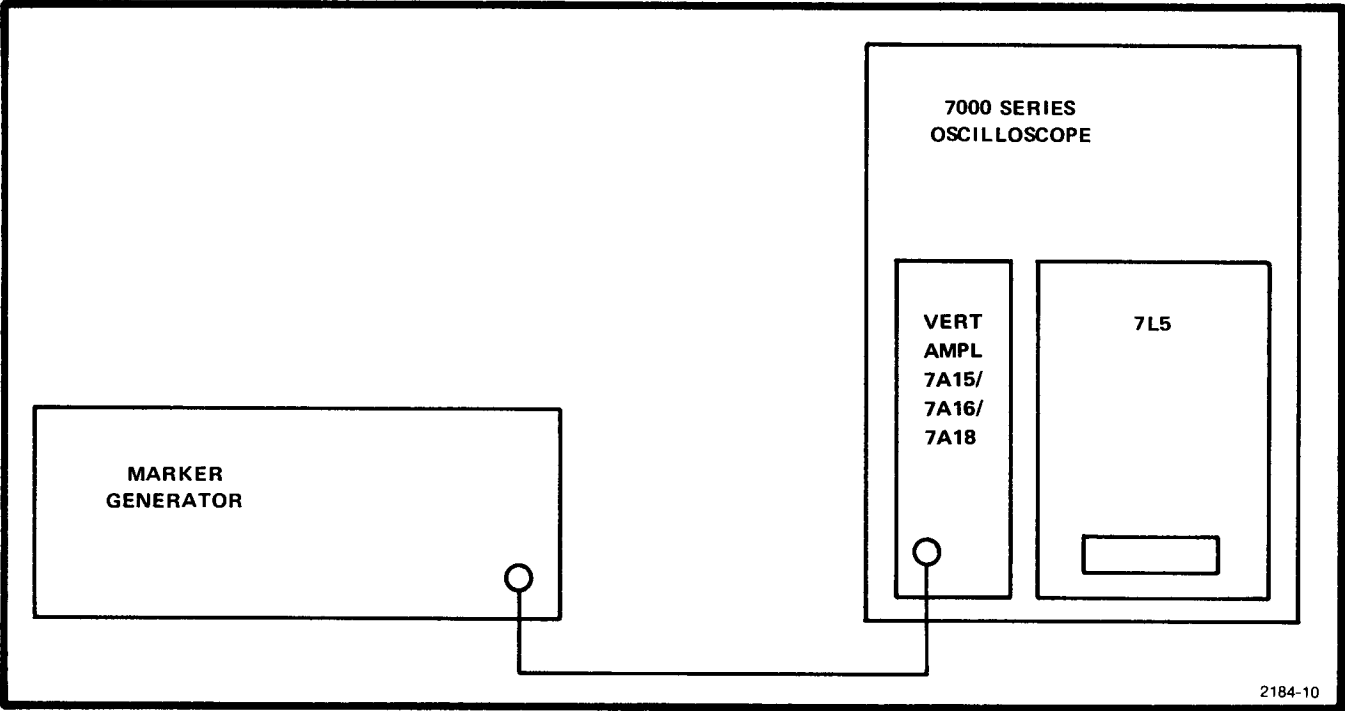
c. On the marker generator, select 0.1 ms markers. Adjust Volts/Div switch on vertical plug-in amplifier as required for a stable display on the crt.

d. Adjust 7L5 HORIZ POSITION as required, to align markers with the vertical graticule lines. Verify that the displayed markers per division are in accordance with Table 3-3 and within 5 percent of their respective graticule line, i.e., with the first marker on the left graticule line, the last marker should be within 0.5 division of the right graticule line.

e. Set TIME DIV switch to each position listed in Table 3-3 and repeat step d.

**TABLE 3-3**

7L5 TIME/DIV	Marker Generator	Displayed Markers/Div
.1 ms	.1 ms	1/1
.2 ms	1 ms	1/5
.5 ms	1 ms	1/2
1.0 ms	10 ms	1/5
5.0 ms	10 ms	1/2
10.0 ms	10 ms	1/1
20.0 ms	.1 s	1/5
50.0 ms	.1 s	1/2
.1 s	.1 s	1/1
.2 s	1 s	1/5
.5 s	1 s	1/2
1.0 s	1 s	1/1
2.0 s	1 s	2/1
5.0 s	5 s	1/1
10.0 s	5 s	2/1



**Fig. 3-4. Sweep rate test equipment setup.**

## Performance Check—7L5 Service

### 6. Intermodulation Distortion

a. Connect test setup in accordance with Fig. 3-5. Set the 7L5 front panel controls as follows:

DOT FREQUENCY	2500.00 kHz
RESOLUTION	3 kHz
FREQUENCY SPAN/DIV	5 kHz
TIME/DIV	.2 s
LOG 10 dB/DIV	On
REFERENCE LEVEL	-30 dBm
INPUT BUFFER	Off
DIGITAL STORAGE	DISPLAY A/B
BASELINE CLIPPER	Max cw

b. Adjust the output level of the signal generator No. 1 to approximately -20 dBm. Adjust its output frequency to 2495.0 kHz so that the displayed signal appears one division to the left of center screen.

c. Adjust the output level of signal generator No. 2 to approximately -20 dBm. Adjust its output frequency to 2505.0 kHz so that its displayed signal appears one division to the right of center screen.

d. Change the RESOLUTION to 300 Hz and adjust the signal generators output level so both signals are full screen (-30 dBm reference).

e. Reset the TIME/DIV to 2.0 s. Wait 20 seconds and verify that the third order intermodulation product, (3

divisions from center screen) is at least 7.5 divisions (75 dB) below the reference level.

f. Increase the external attenuation to reduce the input signal level by 10 dB. Set REFERENCE LEVEL to -40 dBm. Repeat step e to verify that third order IM products are at least 8 divisions below the reference level.

g. Reset signal generator No. 1 output frequency to 10.0 kHz and adjust its output signal level to -40 dBm (full screen). Wait 20 seconds and verify that the second order IM products (2 divisions from the signal generator No. 2 display) are 8 divisions (80 dB) below the reference level.

h. Remove 10 dB of external attenuation to increase both input signal levels. Set the REFERENCE LEVEL control to -30 dBm. Wait 20 seconds and verify that the second order IM products (2 divisions from signal generator No. 2 display) are at least 7.2 divisions (72 dB) below the reference level.

i. Set the INPUT BUFFER pushbutton to on. Wait 20 seconds and verify that the second order IM products are at least 8 divisions (80 dB) below the reference level.

j. Reset signal generator No. 1 frequency to 2495.0 kHz. Wait 20 seconds and verify that the third order IM products are at least 8 divisions below the reference.

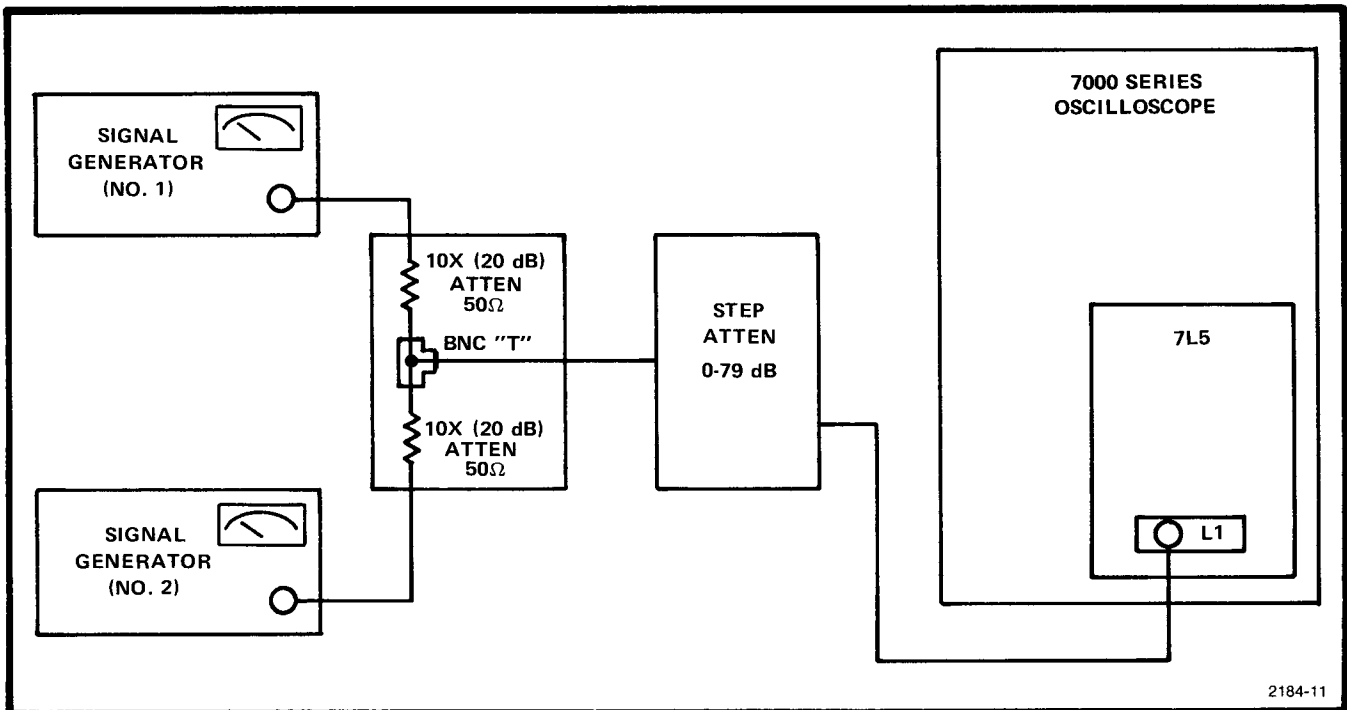


Fig. 3-5. Intermodulation distortion test equipment setup.

**7. Displayed Frequency Stability**

a. Connect the test setup in accordance with Fig. 3-2 using a stable signal generator; ( $\Delta$  frequency should be equal to or less than 0.5 Hz/hour).

b. Adjust a stable signal source for an output frequency of 500 kHz at an output level of approximately -20 dBm.

c. Set the 7L5 front panel controls as follows:

DOT FREQUENCY	500.00 kHz
RESOLUTION	100 Hz
FREQUENCY SPAN/DIV	50 (Hz)
TIME/DIV	.1 s
REFERENCE LEVEL	-27 dBm
DIGITAL STORAGE	DISPLAY A/B
Display Mode	LOG 2 dB/DIV

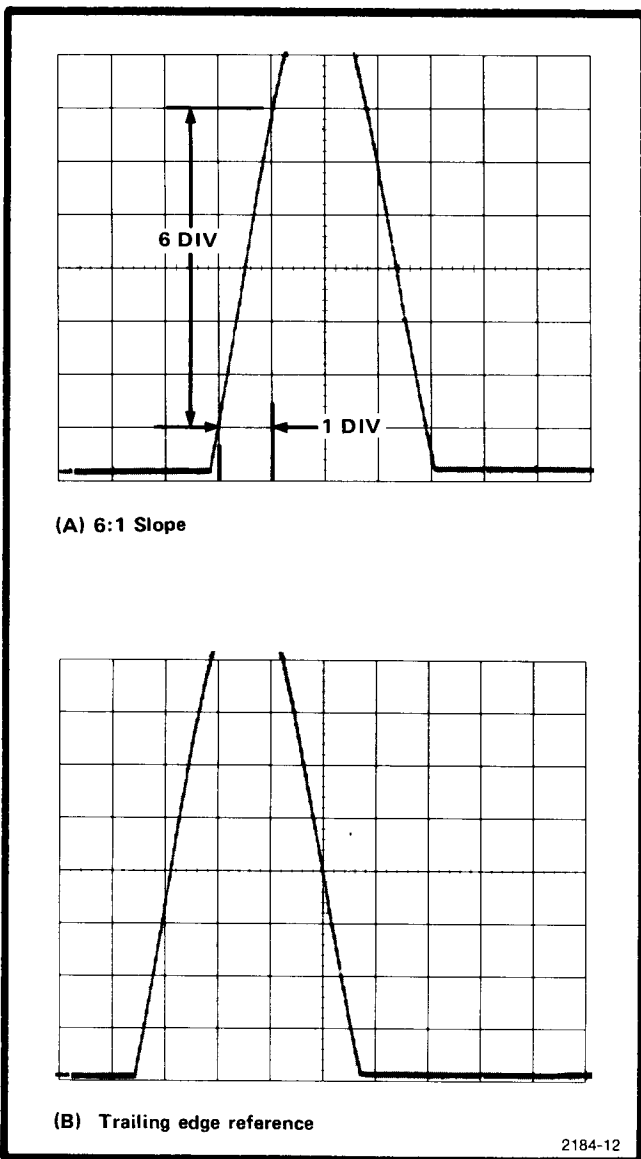


Fig. 3-6. Frequency stability test response setup.

d. With a displayed waveform similar to Fig. 3-6A, adjust the reference level slightly, as required, to establish a 6:1 slope on the linear portion of the waveform.

e. Carefully adjust the DOT MKR control to establish a center screen reference (vertical and horizontal) for the trailing edge of the waveform (Fig. 3-6B).

f. Activate the SAVE A and MAX HOLD pushbuttons.

g. After one hour, verify that any change in the displayed waveform is not more than 5 Hz. That is, any change in the displayed signal frequency, as indicated by horizontal and vertical separation between the display A "reference" waveform and the display B waveform, should be less than 0.6 vertical division (0.1 horizontal division). Refer to Fig. 3-7.

This completes the Performance Check and verifies that the 7L5 will perform within the specifications described in Section 1.

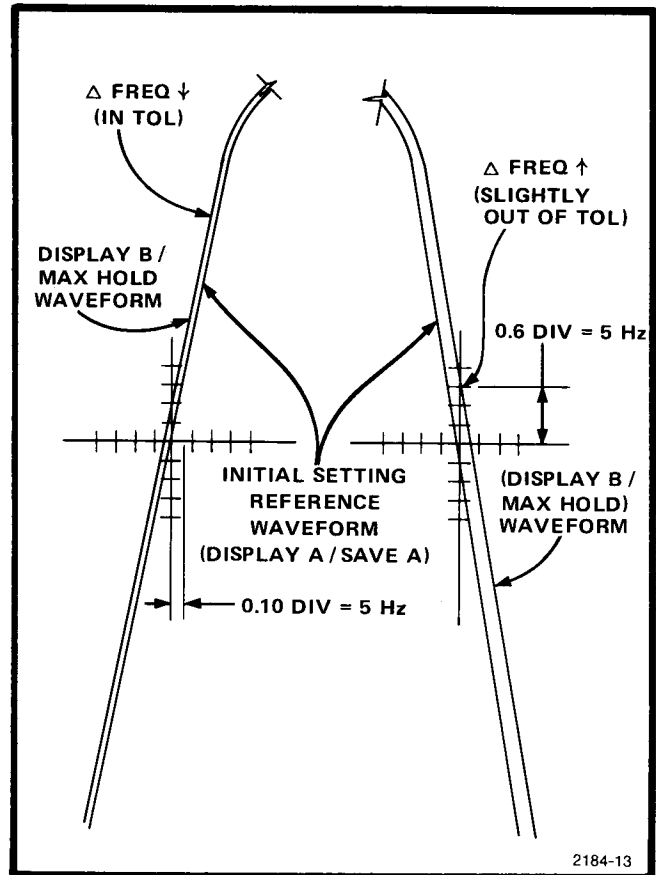


Fig. 3-7. Frequency stability test waveform interpolation.



# CALIBRATION PROCEDURE

## CAUTION

### STATIC DISCHARGE CAN DAMAGE MANY SEMICONDUCTOR COMPONENTS USED IN THIS INSTRUMENT.

*Many semiconductor components, especially MOS types can be damaged by static discharge. Damage may not be catastrophic, therefore, not immediately apparent. It usually appears as a "weakening" of the semiconductor characteristics. Devices that are particularly susceptible are: MOS, CMOS, J FET's, and high impedance OP amps. Damage can be significantly reduced by observing the following precautions.*

1. *Handle static sensitive components or circuit assemblies at or on a static free surface. Work station areas should contain a static free bench cover or work plane such as, conductive polyethylene sheeting and a grounding wrist strap. The work plane should be connected to earth ground.*
2. *All test equipment, accessories, and soldering tools should be connected to earth ground.*
3. *Minimize handling by keeping the components in their original containers until ready for use. Minimize the removal and installation of semiconductors from their circuit boards.*
4. *Hold the IC devices by their body rather than the terminals.*
5. *Use containers made of conductive material or filled with conductive material for storage and transportation. Avoid using ordinary plastic containers. Any static sensitive part or assembly (circuit board) that is to be returned to Tektronix, Inc.; should be packaged in its original container or one with anti-static packaging material.*

This section provides calibration adjustment procedures and internal checks. Performing the complete procedure will recalibrate the instrument to its specifications. After calibration, the instrument performance should be verified by performing the Performance Check.

The limits, tolerances, and waveform illustrations in this procedure are aids to calibrate the instrument and not intended as performance specifications.

### Complete or Partial Calibration

Because the circuits are very stable, re-calibration is usually necessary only after a component has been replaced or the instrument has been operating for a number of hours. We advise checking the performance and recalibrate only those circuits that do not meet specifications. Turn to the desired step within this procedure and prepare the instrument for calibration by referring to the preceding setup and control instructions, then adjust or calibrate as directed.

The instrument should be cleaned and inspected, as outlined in the Maintenance section, before performing a complete calibration. Perform the checks and ad-

justments in sequence for a complete calibration. Verify performance after a recalibration.

### History Information

The instrument and manual are periodically evaluated and updated. If modifications require changes in the calibration procedure, history information applicable to earlier instruments is included, as a deviation within a step or as a subpart to a step.

### Interaction

Adjustments that interact with other circuits are noted and reference made to the affected circuit.

### Equipment Required

Equipment for calibration includes the equipment listed for the Performance Check plus the following additional equipment.

1. Digital Voltmeter: 0.1% accuracy, 100 V range. Tektronix DC501 of the TM500-Series.
2. Two (2) Plug-In Extenders: Tektronix Part No. 067-0616-00.

## Calibration Procedure—7L5 Service

3. Shorting strap or jumper; Jumper lead approximately 4 inches long with square pin connector and miniature alligator clip (see Fig. 4-19).

4. Four (4) 10 k $\Omega$  swamping resistor straps: See Fig. 4-16 for construction details.

5. Adjusting (tuning) tool for rf coils on the Variable Resolution assemblies: Ferroxcube Corp. Saugerties, New York. Part No. 991-0368-00.

6. Non-metallic tuning screwdriver: 1/8 inch blade, JFD Production Tool 7104-5.

7. 50  $\Omega$  feedthrough termination: Tektronix Part No. 011-0099-00.

### Short Form Procedure and Record

The following abridged procedure provides a calibration record and an index to help locate adjustment steps.

7L5 Serial No. \_\_\_\_\_

Calibration Date \_\_\_\_\_

Calibrator \_\_\_\_\_

1. Check/Adjust the Reference Oscillator Frequency Page 4-6

Calibrate the CALIBRATOR frequency to 500 kHz  $\pm$ 1 Hz or the crystal oscillator frequency to 10 MHz  $\pm$ 20 Hz.

2. Calibrate the Calibrator Output Level Page 4-6

a. Use a calibrated reference signal of 10 mV, into a Hi Z plug-in module, to establish a reference amplitude then adjust the CALIBRATOR output with R892 to this reference.

b. Use a calibrated reference signal of 10 mV, into a Lo Z plug-in module, to establish a reference amplitude then adjust the CALIBRATOR output with R895 to this reference.

3. Calibrate Span/Div Page 4-7

a. Adjust the base voltage of Q365 to +11.0 volts with R365.

b. Adjust the MAX span dot position with R655.

c. Adjust the A Memory Gain with R345 for a voltage difference, at pin MH, of 16.6 to 16.7 volts, between DOT frequencies of 00.00 and 4999.75 kHz.

d. Adjust the B Gain with R325 for a voltage difference, at pin ND, of 18.0 volts between DOT frequencies of 00.75 and 100.00 kHz.

4. Sweep Timing Page 4-9

In the 0 span mode adjust the sweep timing with R685 for a calibrated sweep. (Use 10 ms/Div and 10 ms markers.)

5. 1st LO and 1st LO Phase Lock Calibration Page 4-10

a. With P246 connected from pins 2 to 3, adjust R255 for a voltage of 1.4 V at P246. Return P246 to pins 1 and 2.

b. With SPAN/DIV at MAX, adjust the Sweep Offset with R2015 for a voltage of 3.2 V at pin PB.

c. Adjust the Sweep Gain with R2025 for minimum signal amplitude at pin PB. Peak to peak signal amplitude should not exceed 1 volt.

d. Repeat these steps because of interaction.

6. Function IF Calibration Page 4-11

a. Calibrate the Volts/Div with R2205 for 1 V/10 dB signal level change at pin 6 of U2210.

b. With no signal applied and in LIN mode, adjust the Baseline Offset, with R2235, for 0 volt at pin 6 of U2210.

c. With the CALIBRATOR signal applied, adjust the REFERENCE LEVEL for -8 V at pin 6 of U2210, then adjust the 2 dB Offset with R2215 so the voltage at pin 6, for the 2 dB mode, is the same as it was in the LIN mode. Output level for the three display modes should match.

d. Calibrate the 2 dB Log and Lin 20 dB, 40 dB, and 60 dB gain with R1065, R1115, and R1145 respectively. For the L1 and L2 Plug-In Modules, these 20 dB gain stages are switched in at REFERENCE LEVELS of -70 to -71 dBm (20 dB gain), -90 to -91 dBm (40 dB gain) and -110 to -111 dBm (60 dB gain).

7. Calibrate the 250 kHz IF, 2nd Mixer, and 10.7 MHz Input Filter

Page 4-13

With the CALIBRATOR signal applied, peak L1200, L1400, C1606, C1600, and C1042.

8. Variable Resolution Amplifier Calibration

Page 4-13

a. With three of the four stages swamped, adjust the response of each for symmetry, bandwidth, and amplitude. Each stage is adjusted by repeating this procedure for the 1st stage:

1. Adjust C1660 for symmetry 20 dB down, C1664 for symmetry 2 dB down and finalize with L1680.

2. Adjust the bandwidth 1.5 dB down with R1680.

b. After the response of all stages has been calibrated, set the bandwidth for the 1 kHz to 30 Hz RESOLUTION positions with R1700 (1 kHz) R1702 (300 Hz) R1704 (100 Hz) and R1706 (30 Hz).

c. Set the 10 Hz bandwidth with R1708 so the bandwidth 70 dB down is 100 Hz.

d. Calibrate and equalize the gain as follows:

1. Short the input to all but one of the gain setting circuits (operational amplifier and photo-resistor-LED (ICs).

2. Adjust the 10 Hz gain for the stage that is shorted, (R1685-1st stage, R1735-2nd stage, R1795-3rd stage, and R1825-4th stage) so there is minimum shift in signal amplitude as the RESOLUTION is switched from 10 Hz to 3 kHz.

e. Remove all shorting straps, center the front panel AMPL CAL adjustment, then, with -40 dBV CALIBRATOR signal applied and the REFERENCE LEVEL at -40 dBV, calibrate the 30 kHz and 10 kHz gain with R1905 and R1885. Now calibrate the gain for the 10 Hz to 3 kHz resolution bandwidth setting with R1835.

9. Digital Storage Calibration (SN B069999 and below)

Page 4-16

a. With a DOT frequency of 500 kHz, SPAN/DIV at MAX, and RESOLUTION COUPLED, TIME/DIV 0.2 s, Display Mode 10 dB/DIV and DIGITAL STORAGE on, apply the CALIBRATOR signal to the INPUT and adjust the Horizontal Equalization with R4585 in a ccw direction until the display remains stored.

b. Increase the sweep rate and adjust the Horizontal Offset with R4570 to place the 500 kHz marker under the DOT.

c. Adjust the Horizontal Gain with R4625 so the store and non-store position of the 4500 kHz marker is the same.

d. With a SPAN/DIV of 10 kHz, adjust the Vertical Gain with R4565 so the amplitude of the stored display and the non-store display are the same.

e. Check the operation of DISPLAY A and SAVE A, then DISPLAY B and MAX HOLD.

9A. Digital Storage Calibration (SN B070000 and up)

Page 4-18

a. Set the DOT FREQUENCY to 1000 kHz. SPAN/DIV at 200 kHz, RESOLUTION at 30 kHz, TIME/DIV on AUTO, Display Mode at 10 dB/DIV and DIGITAL STORAGE (A and B) on. Set the reference voltage level to  $-2\text{ V} \pm 10\text{ mV}$  with adjustment R4781.

b. Adjust Horizontal Offset (R4746) so the stored display is under the frequency dot.

c. Adjust Horizontal Gain (R4744) so the stored 500 kHz and 1500 kHz markers correspond to those in the non-store position.

d. Adjust Vertical Gain (R4720) so the marker amplitude of the stored display equals that of the non-stored display.

e. Change the Display Mode to LIN. In the Store mode adjust vertical offset (R4713) until the baseline just stops moving down.

f. Set the SPAN/DIV to 0; A and B storage on. Then with A saved, change the DOT FREQUENCY to 540 kHz. Change the TRIGGERING to SGL SWP. The stored line should be near top of the screen.

g. Adjust C4708 while switching SAVE A on and off until the top of the display corresponds to SAVE A line.

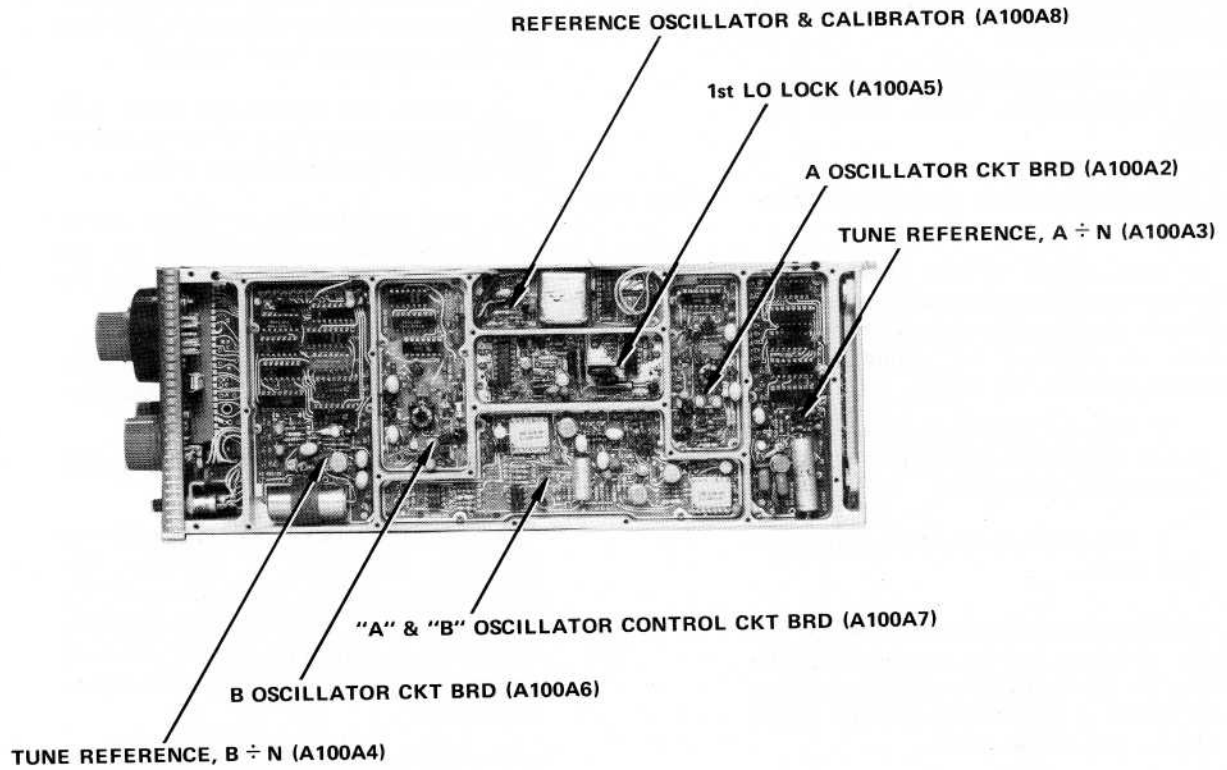
Preliminary Procedure

NOTE

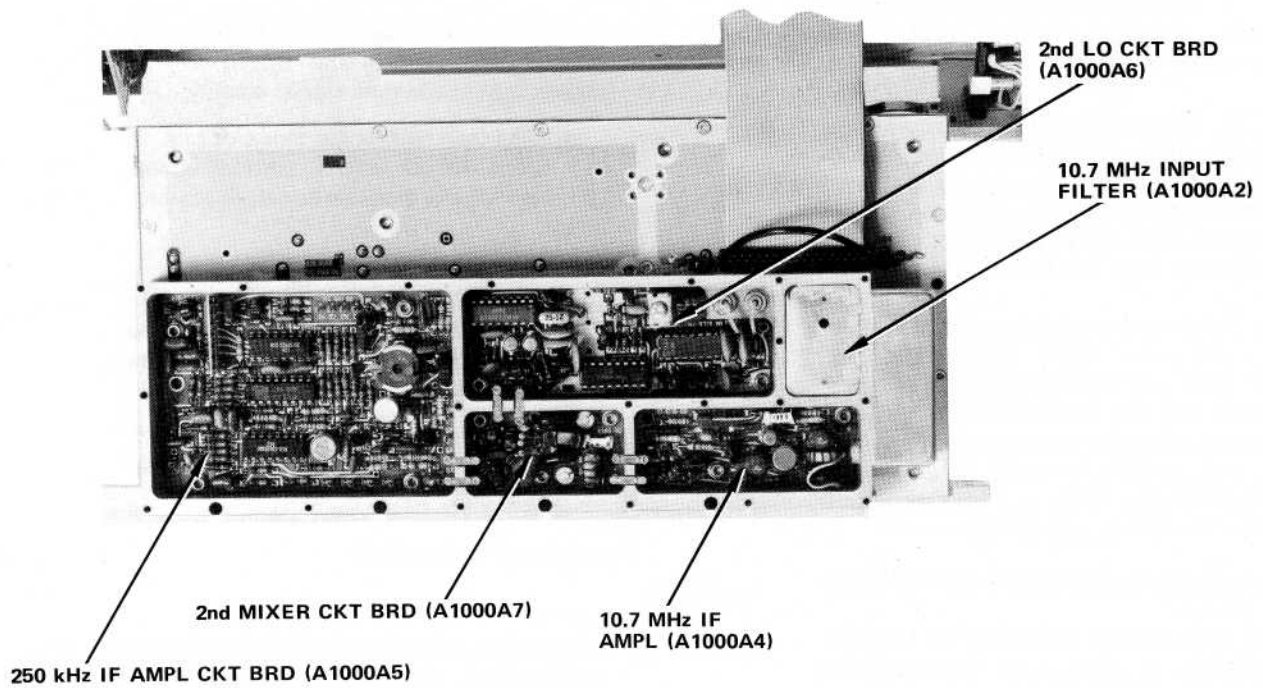
*Instrument calibration should be performed at a temperature equal to the ambient operating temperature that is normally within  $+20^{\circ}\text{C}$  to  $+30^{\circ}\text{C}$  after a warmup period (with power on) of at least 10 minutes to allow the instrument to stabilize.*

1. Check the front panel controls and selectors for smooth operation and proper indexing.

Calibration Procedure—7L5 Service

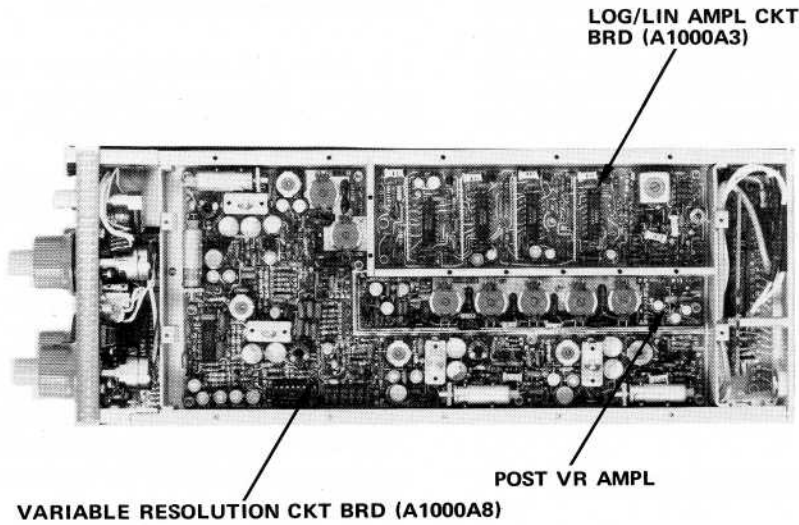


(A) HONEYCOMB SIDE OF THE REFERENCE MODULE.

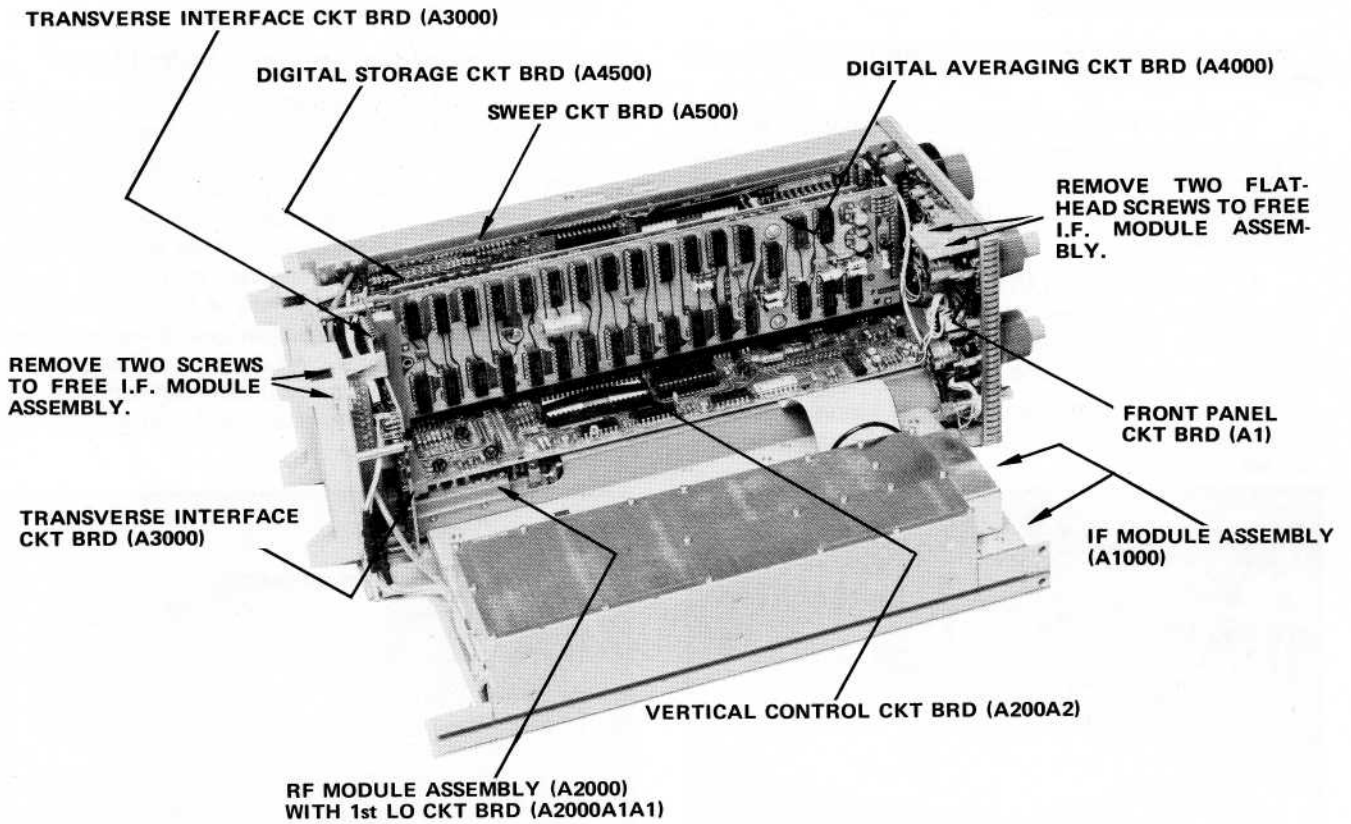


(B) HONEYCOMB SIDE OF THE IF MODULE.

Fig. 4-1A & B. Location of the major circuit boards and assemblies for the 7L5.



(C) VARIABLE RESOLUTION AND LOG/LIN AMPLIFIER OF THE IF MODULE.



(D) IF MODULE SWUNG DOWN TO EXPOSE THE DIGITAL AVERAGING AND VERTICAL CONTROL BOARDS.

Fig. 4-1C & D. Location of the major circuit boards and assemblies for the 7L5.

## Calibration Procedure—7L5 Service

2. Remove the 7L5 from the mainframe and reconnect it to the mainframe interface through the flexible plug-in extender cables. Connect the 7L5 to the center two compartments if a four hole mainframe is used. Remove the four screws that hold the IF module assembly in place (see Fig. 4-1D). This will allow the assembly to swing out and down for access to internal adjustments.

3. Turn the power ON and allow the instrument circuits to stabilize before making any adjustments.

### NOTE

Fig. 4-1 is a series of four photographs that show the location of the major circuit boards and assemblies, that are referred to in this procedure.

### 1. Check/Adjust the Reference Oscillator Frequency

Two procedures are given to check and adjust the reference oscillator frequency. The 1st procedure requires a four plug-in compartment mainframe and a vertical amplifier unit to amplify the 500 kHz Calibrator signal so it will drive a counter. The 2nd procedure is an alternate procedure that can be used with three plug-in compartment mainframes.

a. Using a four plug-in compartment mainframe and vertical amplifier unit:

1. Plug the 7L5, through extender cables, into the center two compartments of the mainframe, a vertical amplifier unit (e.g., 7A16) in the left vertical compartment, and a counter (e.g., 7D14) in the right horizontal compartment.

2. Connect the CALIBRATOR output to the Input of the vertical amplifier. Set the vertical sensitivity to 10 mV/Div, Input coupling to ac, and bandwidth to 20 MHz or less to reduce noise above 500 kHz.

3. Switch the mainframe Vertical Mode to Alt or Chop, Horizontal Mode to Chop, and B Trigger Source to Left Vertical.

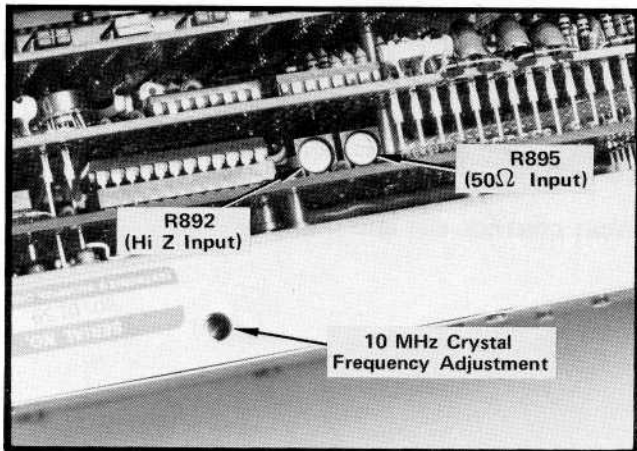


Fig. 4-2. Calibration adjustment locations for the Reference Oscillator and Calibrator.

4. Set the counter Input selector to Trig Source and the Measurement Interval to 10 s.

5. After a 5 minute warmup period, check the calibrator frequency. Frequency should measure 500 kHz  $\pm$  1 Hz (499.999 to 500.001).

6. Set the crystal frequency, with the adjustment illustrated in Fig. 4-2, so the calibrator frequency is within specifications.

b. Using a three plug-in compartment mainframe:

1. Remove the rf screen cover over the honeycomb reference module containing the reference oscillator circuit board. Plug the 7L5, through extender cables, into the right vertical and horizontal compartments, and a counter (e.g., 7D14) into the left vertical compartment.

2. Connect a 1X probe from the Input of the counter to the output of the crystal reference oscillator at P390 (Fig. 4-3). Note the frequency.

3. Calibrate the reference oscillator frequency to 10.0000 MHz  $\pm$  20 Hz with the crystal adjustment illustrated in Fig. 4-2.

### 2. Check/Adjust the Calibrator Output Level

The output of the Calibrator is -40 dBV at 500 kHz. Low and High Level adjustments calibrate the output current for low impedance (50  $\Omega$ ) and high impedance (1 M $\Omega$ ) plug-in modules. This calibration can be performed by using a low impedance and high impedance plug-in module or any plug-in module with pin B13 of J2210 or pin P of J530 shorted to ground for low impedance calibration and pin B13 of J2210 open for high impedance calibration. The output level of the calibrator is calibrated to a reference level set by a calibrated signal source. A high impedance rms differential voltmeter, with an accuracy of 1% or better, is used to set the reference level of the signal source.

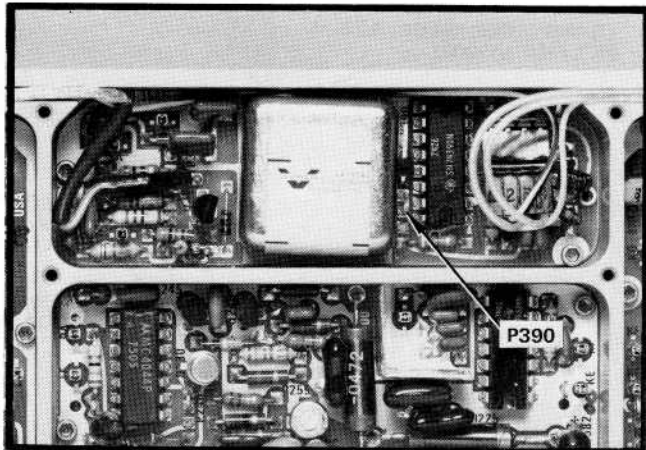


Fig. 4-3. Test point location for the 10 MHz Crystal Oscillator.

- a. Remove the plug-in module and place insulating tape (e.g., Scotch tape) over pins A13-B13, A14-B14, A15-B15 of the interface connector (Fig. 4-4), then re-insert the plug-in module in its compartment.
- b. Apply a 500 kHz signal from a signal source with a variable output adjustment to an accurate (within 1%) differential voltmeter and set the output of the signal generator for 10 mV rms.
- c. Now apply the calibrated 10 mV signal through an unterminated cable to the INPUT of the L-series plug-in module.
- d. Set the 7L5 FREQUENCY SPAN/DIV to 2 kHz, RESOLUTION to 30 k, Display Mode for 2 dB/Div, and adjust the REFERENCE LEVEL so the signal amplitude is at center screen or some reference level.
- e. Disconnect the reference signal and apply the 7L5 CALIBRATOR signal to the INPUT.
- f. Calibrate the output level of the Calibrator to the reference level, by adjusting R892 (Fig. 4-2).
- g. Now calibrate the signal source to 10 mV, into 50 ohm load, by applying the signal through a 50 ohm (within 1%) feedthrough termination to the differential voltmeter and adjust the generator output to 10 mV.

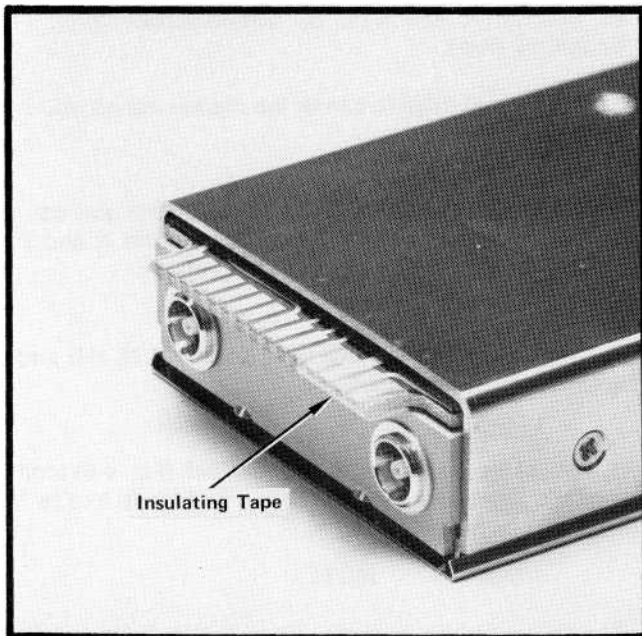


Fig. 4-4. Plug-in module connector partially insulated so the Hi Z calibrator level can be adjusted.

- h. Apply the unterminated signal to the INPUT of the plug-in module for the 7L5 and adjust the REFERENCE LEVEL so the signal amplitude is again at some graticule reference point.
- i. Remove the reference signal from the INPUT and apply the CALIBRATOR signal to the INPUT.
- j. Use a shorting strap to short pin B13 of J2210 (Fig. 4-5) to ground. (Pin B13 and pin 13 of the decoupling circuit board are connected together.)
- k. With pin B13 shorted, adjust the calibrator output with R895 (Fig. 4-2) until it equals the reference level of the signal source.
- l. Remove the shorting strap and recheck the calibrator signal level for high impedance input. If R892 must be readjusted, recalibrate the signal source for high impedance and repeat the above procedure for high impedance and low impedance calibration. These two adjustments interact.
- m. Remove the insulation from the plug-in connector and re-insert the plug-in module into the 7L5 compartment.

### 3. Frequency Span/Div (Reference Module & Sweep) Calibration

- a. Remove the rf screen cover over the honeycomb assembly. Set the FREQUENCY SPAN/DIV to 0, the DOT FREQUENCY to 2500.00 kHz, and turn the DOT MKR control fully ccw to its detent position.

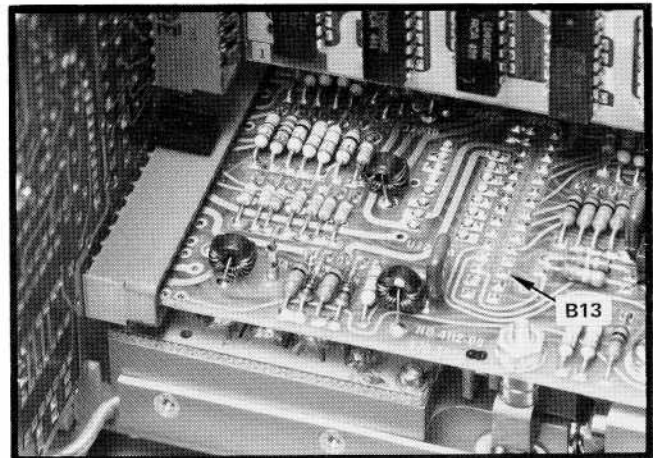


Fig. 4-5. Location of B13 on J2210.

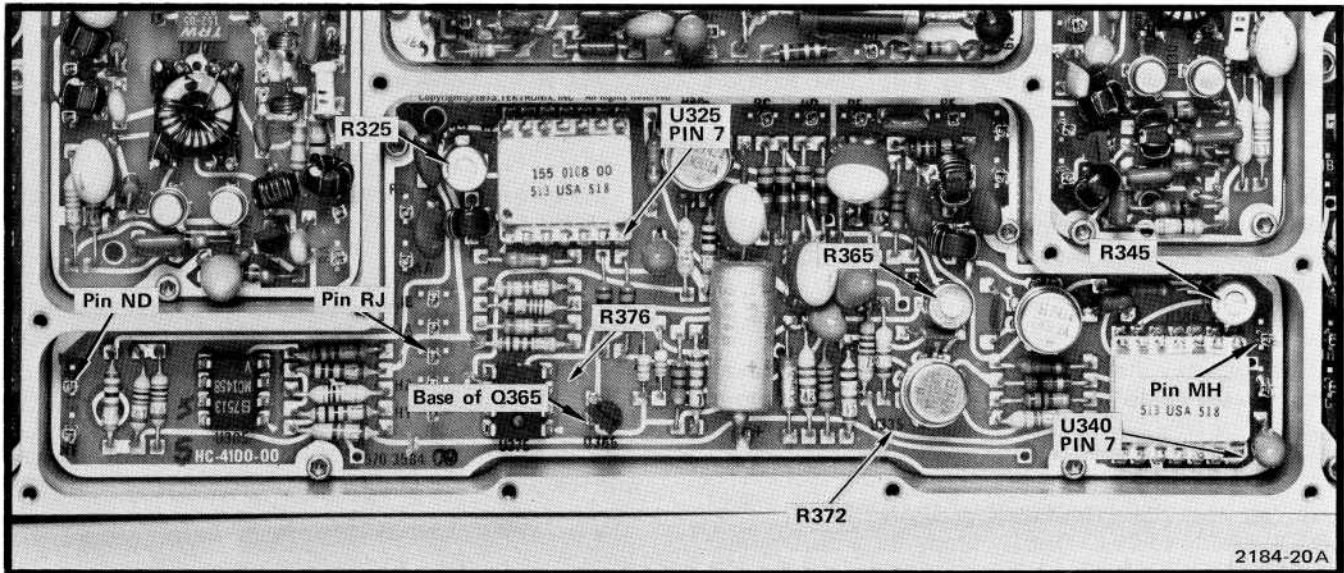


Fig. 4-6. Test point and adjustment locations for the A & B Oscillator Control.

b. Connect a DVM (digital voltmeter) to the base of Q365 (A and B Oscillator Control 7) and adjust R365 (Fig. 4-6) for a reading of 11.00 volts.

Connect the voltmeter to pin 7 of U340 and preset R372 for 4.00 volts. Connect the voltmeter to pin 7 of U325 and preset R376 for 4.00 volts.

c. Change the FREQUENCY SPAN/DIV to 5 kHz. Position the marker dot to the center line of the graticule with the HORIZ POSITION control.

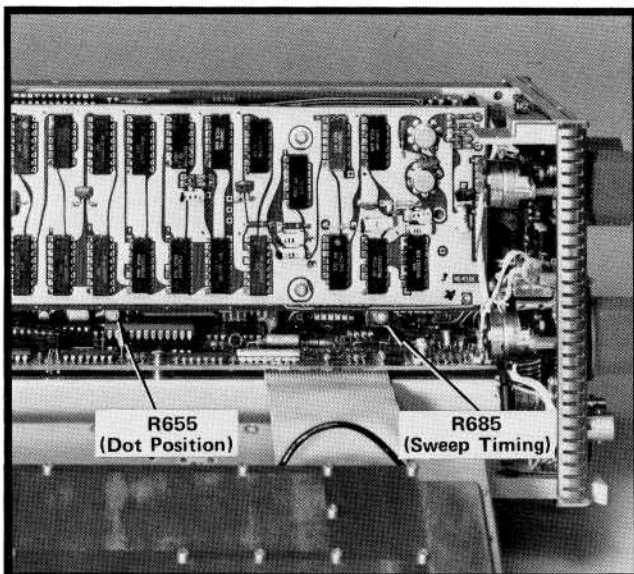


Fig. 4-7. Location of Dot Position and Sweep Timing adjustments and test points.

d. Set the FREQUENCY SPAN/DIV to MAX. Adjust the Max Span Dot Position with R655 (Fig. 4-7) to center the marker dot on the graticule.

**NOTE**

*If any frequency determining component (such as Varactor diode CR122) has been replaced, or the marker dot cannot be centered with adjustment R655, the following procedure should be used.*

1. Adjust R655 (Fig. 4-8) for 0 V at pin RJ (Fig. 4-6) then add or remove jumpers P122 and/or P124 (Tektronix Part No. 131-1493-00) so the DOT is close to, but not to the right of, center screen (high frequency side).

2. Now adjust R655 to center the marker dot on the crt graticule.

e. Set the DOT FREQUENCY to 00.00 kHz and connect the DVM to pin MH (A Memory) of the A and B Oscillator Control (Fig. 4-6). Note the voltage.

f. Change the DOT FREQUENCY to 4999.75 kHz and note the new voltage reading.

g. Adjust the A Memory Gain with R345 (Fig. 4-6) until the voltage difference between step e and f is 16.6 to 16.7 volts.

**NOTE**

*The following step is usually necessary only if some frequency-determining component such as diode CR260, has been replaced.*



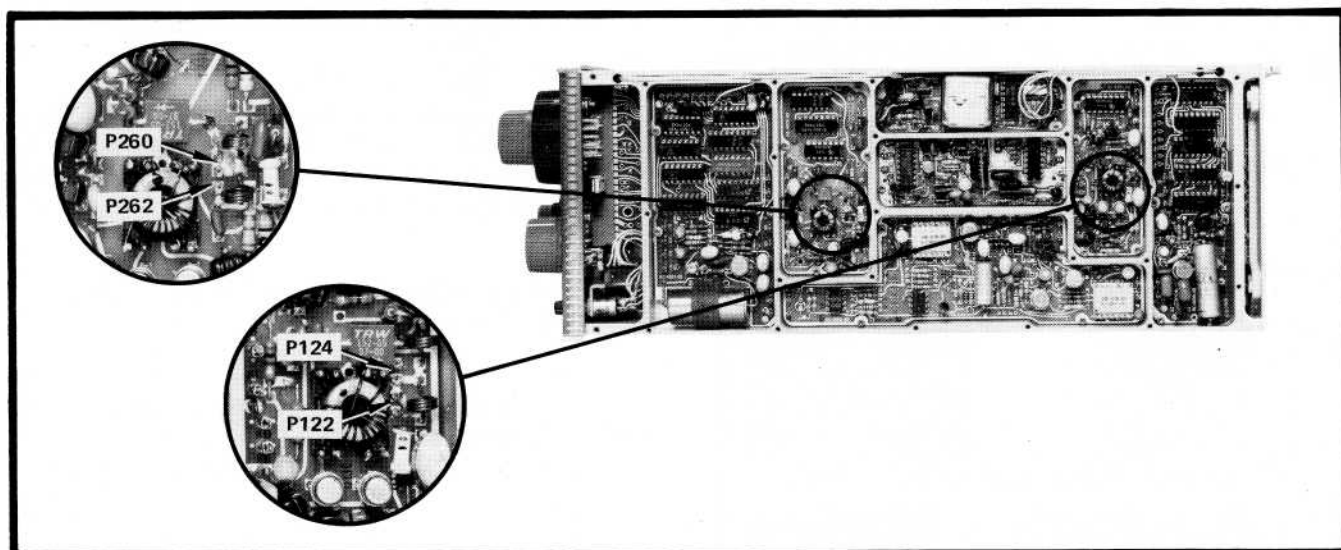


Fig. 4-8. Location of A & B Oscillator frequency determining jumpers.

h. Set the DOT FREQUENCY to 50.00 kHz then check the voltage at pin ND of the A and B Oscillator Control (Fig. 4-6). If the voltage is more than  $\pm 1.5$  V, remove or add jumpers P260 and P262 (Fig. 4-8) to decrease the voltage below  $\pm 1.5$  V.

i. Set the DOT FREQUENCY to 99.75 kHz. Measure the voltage at pin ND of the A and B Oscillator Control assembly (Fig. 4-6). Note this voltage.

j. Change the DOT FREQUENCY to 100.00 kHz. Measure and note the new voltage at pin ND.

k. Adjust the B Gain with R325 (Fig. 4-6) until the voltage difference at pin ND, between the two DOT FREQUENCY settings (steps i and j), is 18.0 volts.

l. Set the FREQUENCY SPAN/DIV to 500 kHz. Apply the CALIBRATOR signal to the INPUT and adjust the Reference Level (approximately  $-30$  dBm) to display 1 marker/division.

m. Check the span accuracy at 99.75 kHz and 100.00 kHz. If the span accuracy error at either setting exceeds 4%, adjust R345 for accuracy at 99.75 kHz and R376 for accuracy at 100.00 kHz (R345 affects accuracy at both 99.75 kHz and 100.00 kHz while R376 only affects 100.00 kHz).

n. Set the FREQUENCY SPAN/DIV to any position other than MAX and adjust the HORIZ POSITION to center the marker dot on screen.

o. Set the FREQUENCY SPAN/DIV to MAX and the DOT FREQUENCY to 2500.00 kHz. Apply the CALIBRATOR signal to the INPUT.

p. Adjust the front panel HORIZ POSITION if necessary to center the 2500.00 kHz marker.

q. Adjust the front panel SWP CAL for best span accuracy between 2500.00 kHz and 500.00 kHz. Adjust R372 for best span accuracy between 2500.00 kHz and 4500.00 kHz.

r. Tune the DOT FREQUENCY through its full range. Start at the left edge and check for tuning smoothness and accuracy as the DOT aligns behind successive graticule lines for every 500 kHz of dot frequency. Alignment accuracy should be within  $\pm 10$  kHz.

#### 4. Sweep Timing

##### NOTE

*The front panel SWP CAL and the SPAN/DIV calibration must be made before the sweep timing is calibrated.*

a. Apply 10 ms markers from the time mark generator to the left amplifier plug-in unit. Set the mainframe Vertical Mode and Trigger Source selectors to Left so the amplifier output is displayed.

b. Set the 7L5 TIME/DIV to 10 ms, FREQUENCY SPAN/DIV to 0, DIGITAL STORAGE off, TRIGGERING SOURCE to INT, and MODE to NORM. Adjust the Triggering LEVEL control for a triggered display.

c. Position the display with the HORIZ POSITION control and adjust R685 (Fig. 4-7) for 1 marker/division.

## Calibration Procedure—7L5 Service

d. Check other TIME/DIV settings for accuracy, using appropriate time marker input. Accuracy should equal or exceed 5% of the TIME/DIV selection.

e. Return the TIME/DIV to 100 ms.

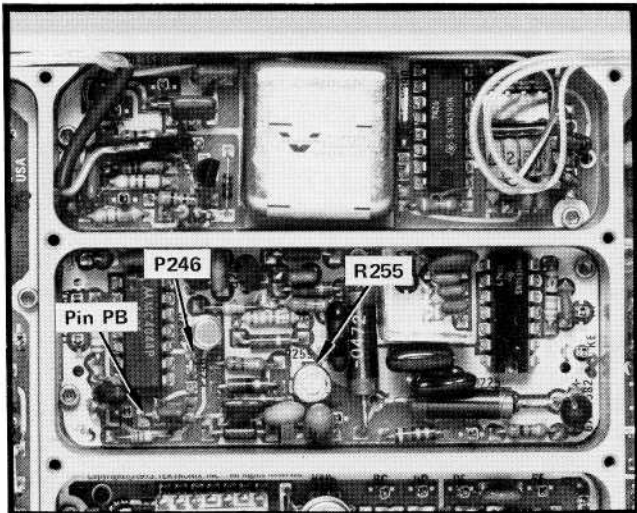


Fig. 4-9. Location of 1st LO Phase Lock test points and adjustments.

## 5. 1st LO and 1st LO Phase Lock Calibration

(Diagram  )

a. With the vertical amplifier unit (e.g., 7A18) in the left vertical compartment of the 7L5 mainframe, switch the Vertical Mode to Chop so both the 7L5 and amplifier displays can be observed.

b. Set the amplifier Volts/Div to 1 V, the 7L5 DIGITAL STORAGE off, and the TIME/DIV to 10 ms.

c. Ground the Input of the amplifier and position the trace to the center graticule line then switch the amplifier input coupling to DC so dc voltage can be measured.

d. Connect P246 (Fig. 4-9) from pin 2 to 3 then use the dc coupled amplifier to measure the dc voltage on P246. Adjust R255 (Fig. 4-9) for a voltage of 1.4 V. Reconnect jumper P246 from pin 1 to 2.

e. Connect the Input of the vertical amplifier through a test probe to pin PB (Fig. 4-9) on the 1st LO Lock board. With the FREQUENCY SPAN/DIV at MAX position, adjust the Sweep Offset, with R2015 (Fig. 4-10), for a voltage of 3.2 V at pin PB.

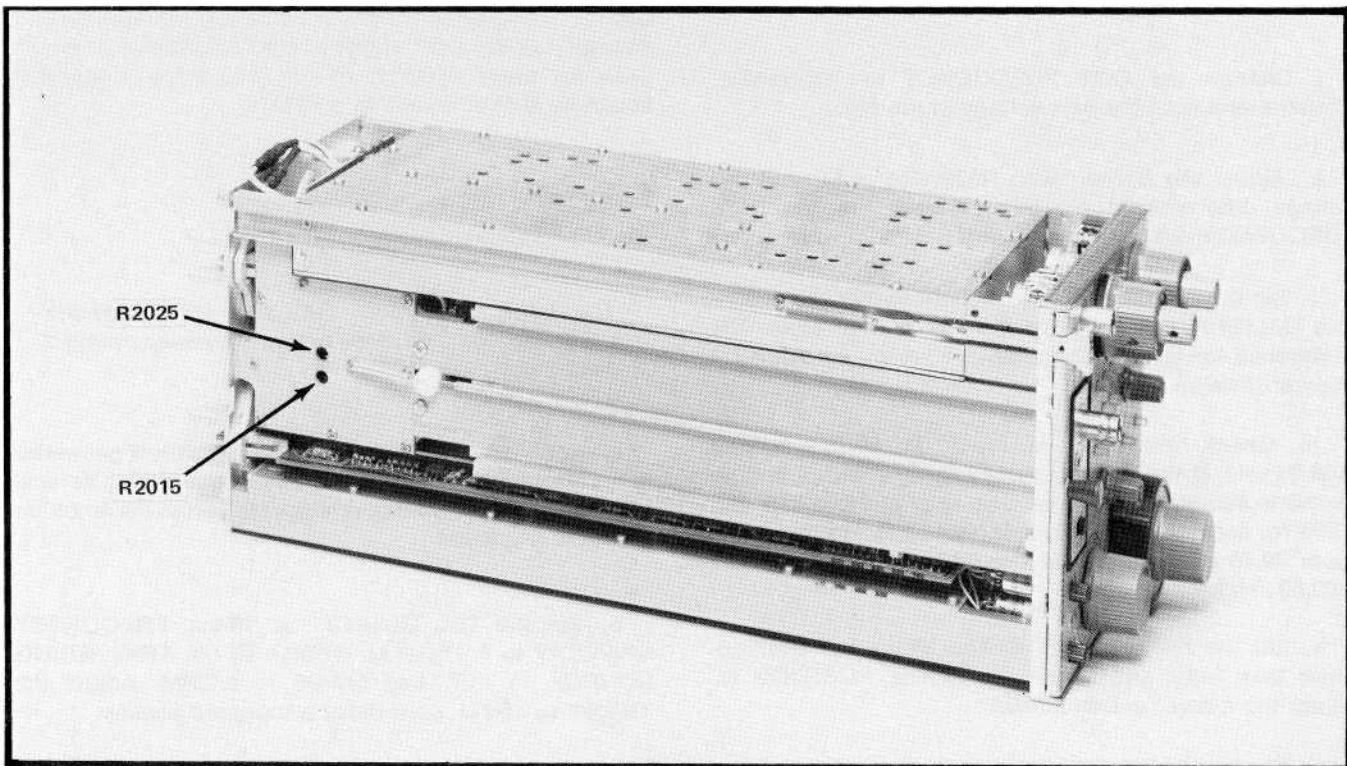


Fig. 4-10. Location of 1st LO adjustments.

f. Now adjust the Sweep Gain, with R2025 (Fig. 4-10), for minimum signal amplitude as illustrated in Fig. 4-11. Repeat the Sweep Offset and Sweep Gain adjustments until minimum peak-to-peak signal amplitude is obtained with a dc level, at pin PB, of 3.2 V.

**NOTE**

*The 1st LO frequency must be nearly correct to obtain the proper waveform from the 1st LO lock. If this waveform cannot be obtained, set the FREQUENCY SPAN/DIV to MAX, Display Mode to 10 dB/DIV, and RESOLUTION to 30 kHz. Note the position of the 0 Hz start spur. Now, adjust R2015 and R2025 (Fig. 4-10) to position the 0 Hz start spur under the first graticule line. If the lock is working, there should be a slight hesitation as the 0 Hz start spur is tuned past the 1st graticule line. Once the 0 Hz start spur is in the correct position, a usable waveform should be obtained from the 1st LO lock.*

g. Return the TIME/DIV to 100 ms or slower and switch DIGITAL STORAGE (DISPLAY A) on.

**6. Function IF Calibration**

a. Apply the CALIBRATOR signal through a 10 dB step attenuator to the INPUT of the plug-in module.

**NOTE**

*The step attenuator impedance must match the input impedance of the L-series plug-in module.*

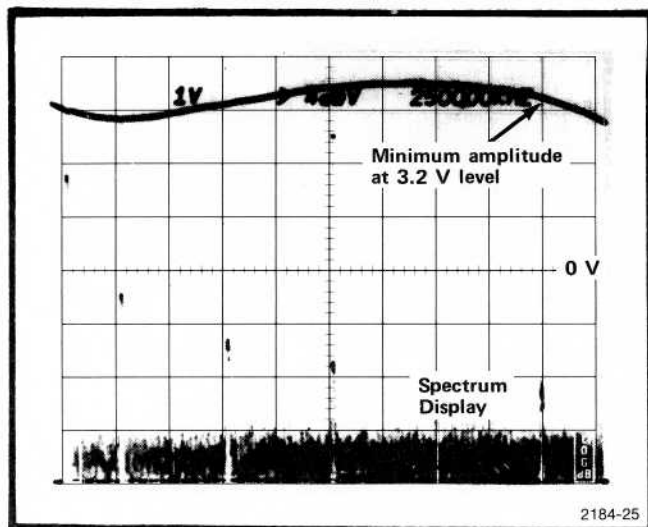


Fig. 4-11. Typical response at pin PB when adjusting Sweep Offset and Gain.

b. Connect the Input of a vertical amplifier plug-in unit (e.g., 7A18) through a 10X probe to pin 6 of U2210 on the Vertical Control board (Fig. 4-12 and Diagram 18).

c. Set the Volts/Div (vertical sensitivity) of the amplifier unit to 1 V, the Input Coupling to dc, and the 7000-Series mainframe Vertical Mode and Trigger Source switches to display the output of the vertical amplifier unit.

d. Set the DOT FREQUENCY to 500.00 kHz, the RESOLUTION to 30 k, the FREQUENCY SPAN/DIV to 0, and the Display Mode to 10 dB/DIV. Adjust the REFERENCE LEVEL and VAR controls to set the voltage, at pin 6 of U2210, at a graticule reference line.

**NOTE**

*Reference level should be -30 dBm or more to minimize noise.*

e. While switching the step attenuator in 10 dB steps, to change the input signal level 10 dB, adjust Volts/Div Cal R2205 (Fig. 4-12) for a corresponding 1.0 V change (at pin 6) per 10 dB change of signal level. Return the step attenuator to 0 dB.

f. Select the LIN mode with a reference level of 1 mV/Div or higher, disconnect the CALIBRATOR signal from the INPUT and adjust Baseline Offset R2235 (Fig. 4-12) for 0 volt at pin 6 of U2210. Position this 0 V reference level at the top graticule line with the Vertical Position control.

g. Reconnect the CALIBRATOR signal to the INPUT and adjust the REFERENCE LEVEL controls for an output level of -8 volts at pin 6 of U2210.

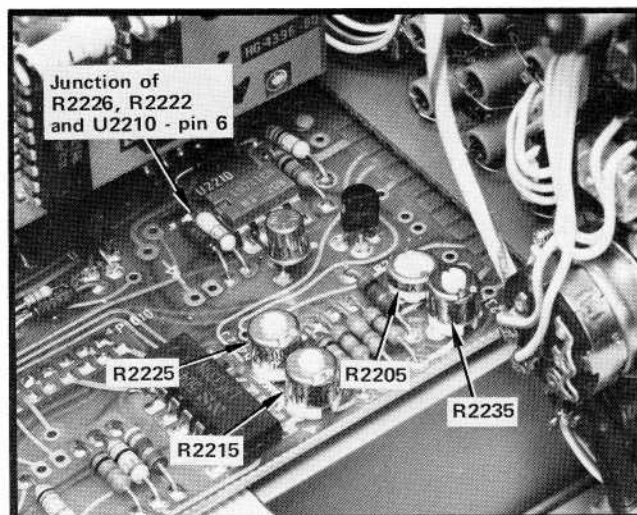


Fig. 4-12. Location of Vertical Control board test points and adjustments.

## Calibration Procedure—7L5 Service

h. With the REFERENCE LEVEL set as directed in step f, switch the Display Mode to 2 dB/DIV and adjust 2 dB Offset R2215 (Fig. 4-12) so the output level at pin 6 is -8 volts. The output level of U2210, for all three modes, should match.

### NOTE

*The display level may vary between display modes due to the mainframe sensitivity. This can be corrected with the front panel LOG CAL and AMPL adjustments.*

i. Disconnect the 10X probe from pin 6 of U2210. Switch the mainframe Vertical Mode and Trigger Source selectors to display the 7L5 output. Switch the Display Mode to 2 dB/DIV and adjust the REFERENCE LEVEL controls (at or near -50 dBm) to position the display at the top graticule line.

j. Calibrate the 2 dB Log and Lin 20 dB, 40 dB, and 60 dB gain stages as follows:

### NOTE

*For L1 and L2 plug-in modules, these 20 dB gain stages are switched in at REFERENCE LEVELS of -70 to -71 dBm (20 dB Gain), -90 to -91 dBm (40 dB Gain), and -110 to -111 dBm (60 dB Gain).*

1. With the REFERENCE LEVEL at -51 dBm, add external attenuation (approximately 40 dB) with the step attenuator until the display level is at the top graticule line.

2. Add 20 dB of external attenuation and increase the 7L5 REFERENCE LEVEL or amplifier gain 20 dB (-71 dBm).

3. Adjust the 20 dB Gain, with R1065 (Fig. 4-13), so the signal level equals the reference level (established in step 1).

4. Add an additional 20 dB of external attenuation and increase the 7L5 REFERENCE LEVEL to -91 dBm.

5. Adjust the 40 dB Gain with R1115 (Fig. 4-13) so the display level equals the reference level.

6. Repeat the procedure to calibrate the 60 dB Gain with R1145 (Fig. 4-13).

## 7. Calibrate the 250 kHz IF, 2nd Mixer, and 10.7 MHz Input Filter

a. Remove both rf screen covers over the IF processing honeycomb and the Variable Resolution honeycomb assembly.

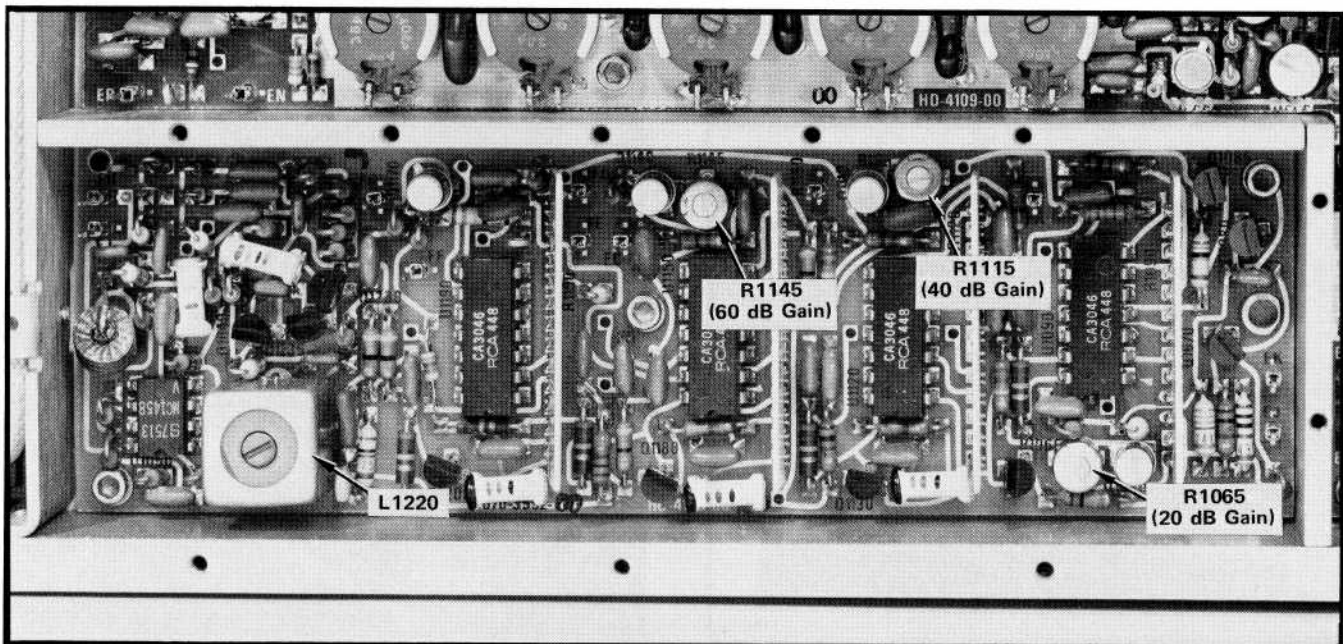


Fig. 4-13. Test points and adjustments on the Log/Lin Amplifier board.

b. Apply the CALIBRATOR signal to the INPUT of the plug-in module. Set the DOT FREQUENCY to 500.00 kHz, Display Mode for 2 dB/DIV, DIGITAL STORAGE off, FREQUENCY SPAN/DIV at 0, RESOLUTION 30 kHz, and TIME/DIV to 2 ms.

c. Adjust L1200 (Fig. 4-13), L1400, C1604, C1600, and C1042 (Fig. 4-14) for maximum response to the 500 kHz Calibrator signal.

d. Set the RESOLUTION to 30 kHz, FREQUENCY SPAN/DIV to 10 kHz, and adjust L1916, L1918 (Fig. 4-15) for symmetry and maximum amplitude around the DOT frequency.

e. Return the FREQUENCY SPAN/DIV to 0, tune the crystal filter center frequency to 250 kHz with adjustments C1666, C1726, C1766, and C1806 (Fig. 4-15). Tune for maximum response amplitude as the RESOLUTION is decreased towards 10 Hz.

### 8. Variable Resolution Calibration

a. With the front panel controls set as directed in step 7, adjust L1916, and L1918 (Fig. 4-15) for maximum response.

b. Change the RESOLUTION to 10 kHz and adjust L1856, L1860, L1864, L1870, and L1872 (Fig. 4-15) for maximum response.

c. Change the FREQUENCY SPAN/DIV to 5 kHz and adjust the 10 kHz filter response with L1856, L1860, L1864, L1870, and L1872 for maximum amplitude and symmetry around the DOT frequency. Bandwidth (6 dB down) should be 10 kHz  $\pm$ 20%.

f. Adjust the response of each VR stage for response symmetry, amplitude, and bandwidth as follows:

1. Set the FREQUENCY SPAN/DIV to 5 kHz, RESOLUTION to 3 kHz, and Display Mode to 10 dB/DIV.

2. Adjust the REFERENCE LEVEL for an on-screen display so the shape and bandwidth (20 dB down) can be observed.

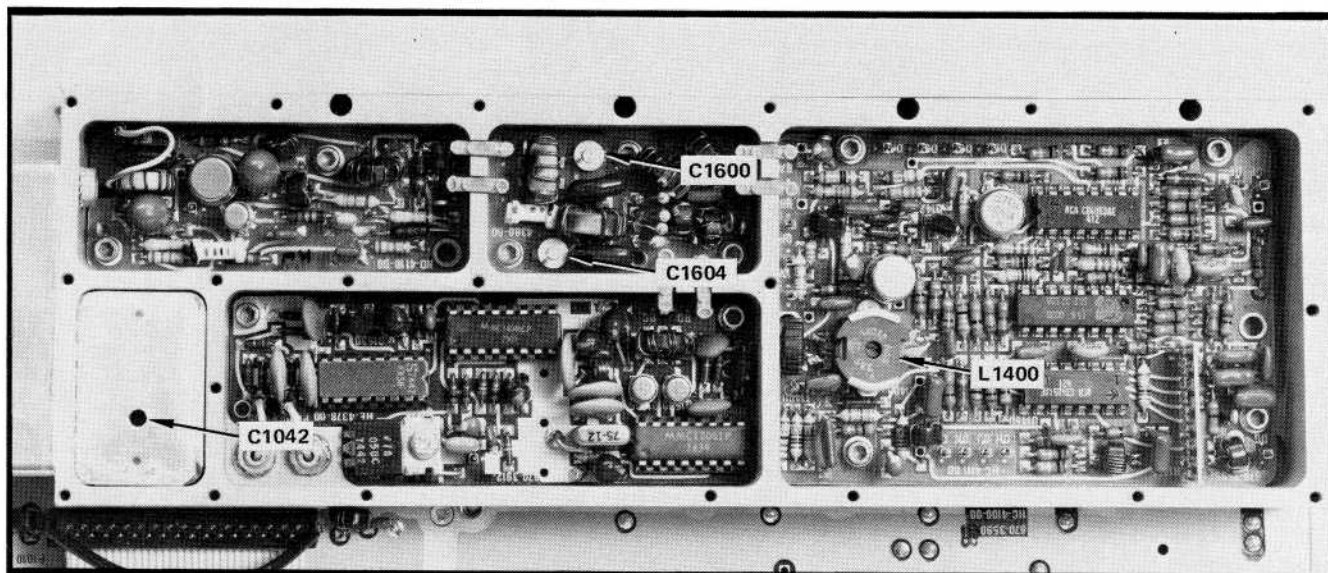


Fig. 4-14. Test points and adjustments on the 250 kHz IF Amplifier, 10.8 MHz Input Filter and 2nd Mixer.

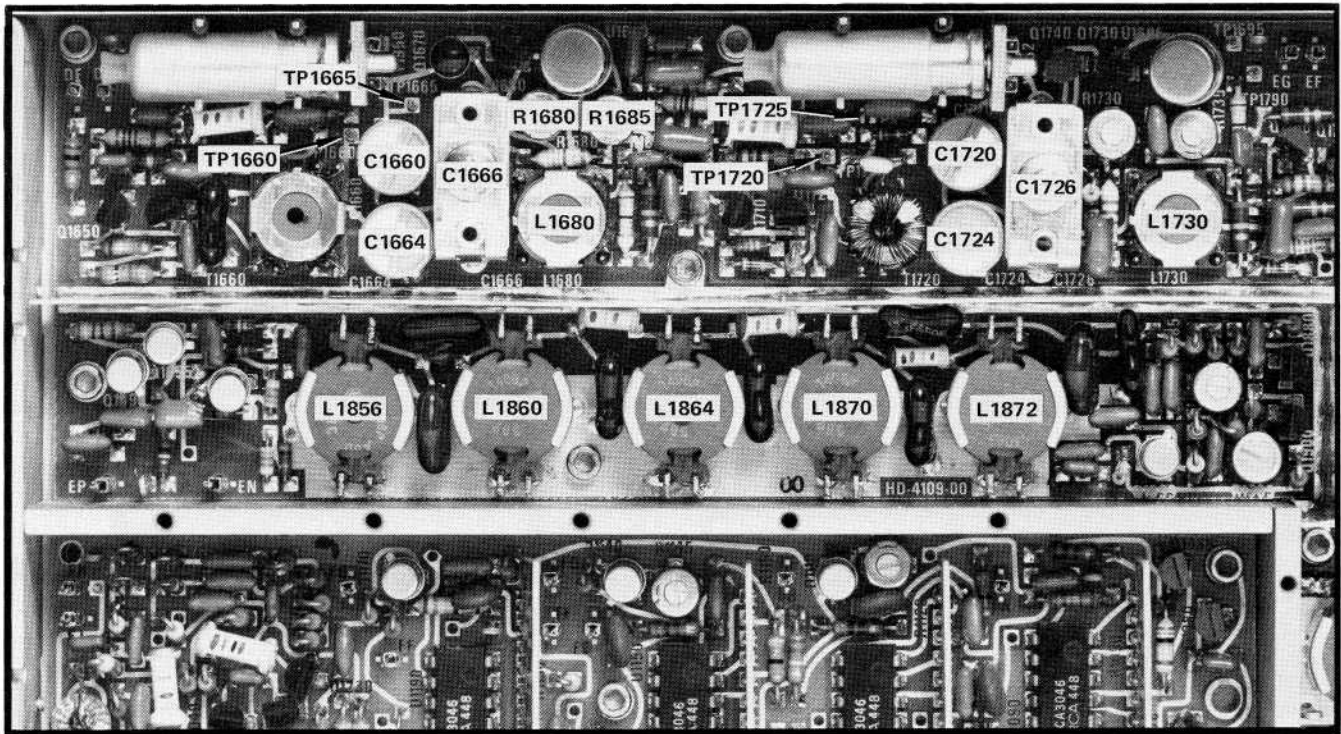


Fig. 4-15A. Test points and adjustments on the Variable Resolution board.

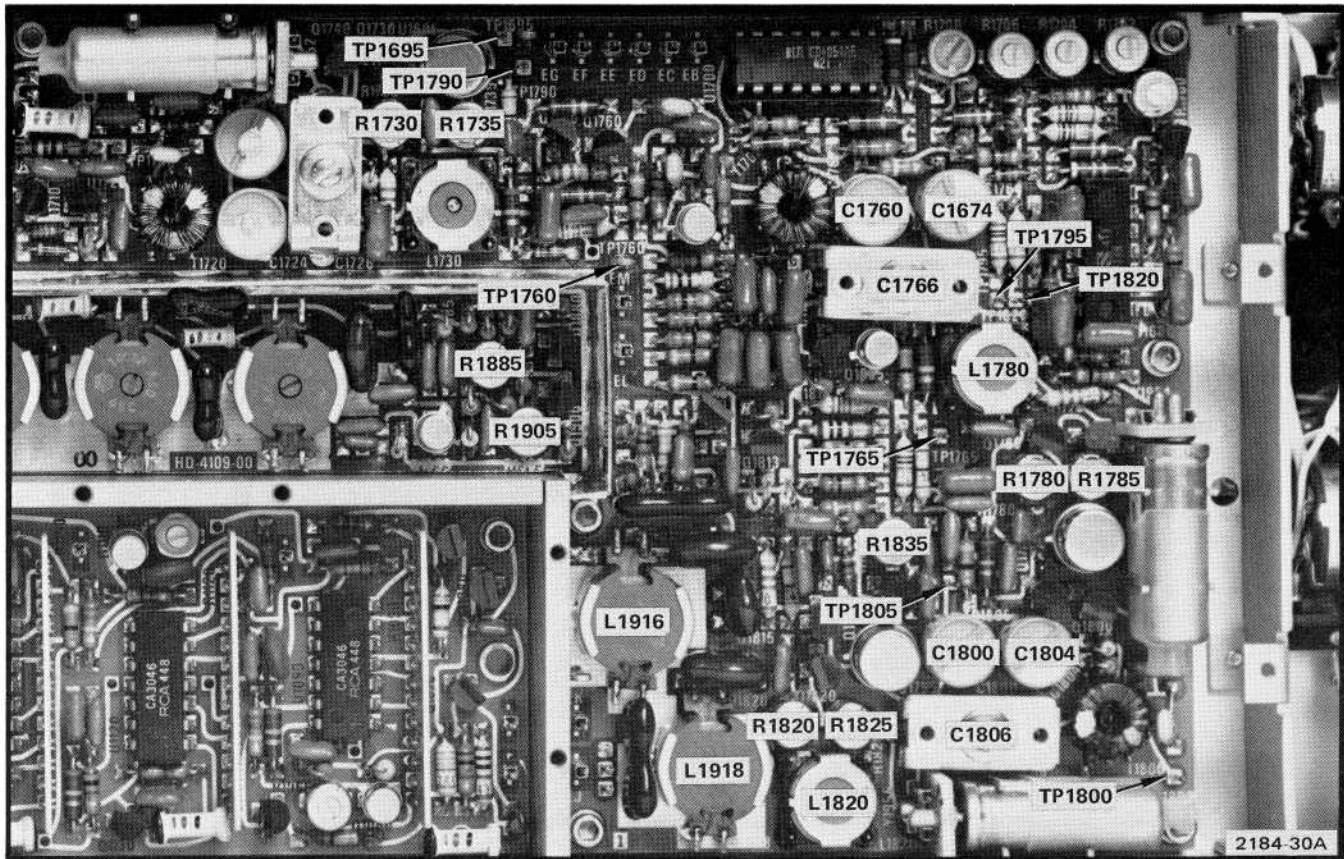


Fig. 4-15B. Test points and adjustments on the Variable Resolution board.

3. Install 10 kΩ swamping resistors (Fig. 4-16) across TP1720-TP1725, TP1760-TP1765, and TP1800-TP1805 (Fig. 4-15).

4. Adjust the response symmetry and center frequency of the 1st stage with C1660, C1664, and L1680 (Fig. 4-15) as follows:

a. Adjust for symmetry, 20 dB down, with C1660 (Fig. 4-17A).

b. Adjust for symmetry 2 dB down and response flatness with C1664 then finalize with L1680. Change the Display Mode to 2 dB/DIV and reduce the FREQUENCY SPAN/DIV to observe the 2 dB response symmetry. The sweep rate must be slow enough to maintain optimum response amplitude as the resolution bandwidth is adjusted. The response must be symmetrical about the DOT (see Fig. 4-17B).

5. Adjust R1680 (Fig. 4-15) for bandwidth (1.5 dB down) of 3 kHz ±20%.

6. Install a swamping resistor across TP1660-TP1665 and remove the swamping resistor across the 2nd stage (TP1720-TP1725).

7. Repeat the procedure to align and calibrate the response for the 2nd stage (adjustments C1720, C1724, L1730, and R1730).

8. Repeat the procedure to align and calibrate the 3rd and 4th stages, then remove the swamping resistors and check the overall response symmetry and bandwidth. Because of stray capacitance effect, lift the connector on the TP for the gate of the FET or remove the swamping resistors completely before checking the overall response.

9. Trim the response bandwidth and symmetry, if necessary, by spreading the adjustment over all four stages, or repeat the above procedure until the response is satisfactory.

g. Calibrate the resolution bandwidth (6 dB down) for the 1 kHz to 30 Hz RESOLUTION positions by decreasing the resolution bandwidth and FREQUENCY SPAN/DIV settings sequentially and adjusting the respective bandwidth with R1700 (1 kHz), R1702 (300 Hz), R1704 (100 Hz), and R1706 (30 Hz). See Fig. 4-18 for adjustment locations.

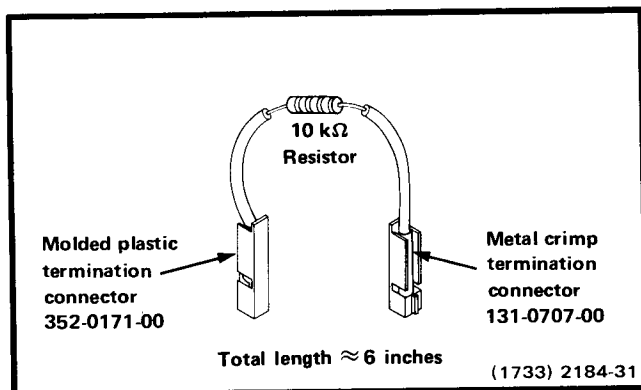


Fig. 4-16. Suggested construction of a 10 kΩ swamping resistor calibration fixture.

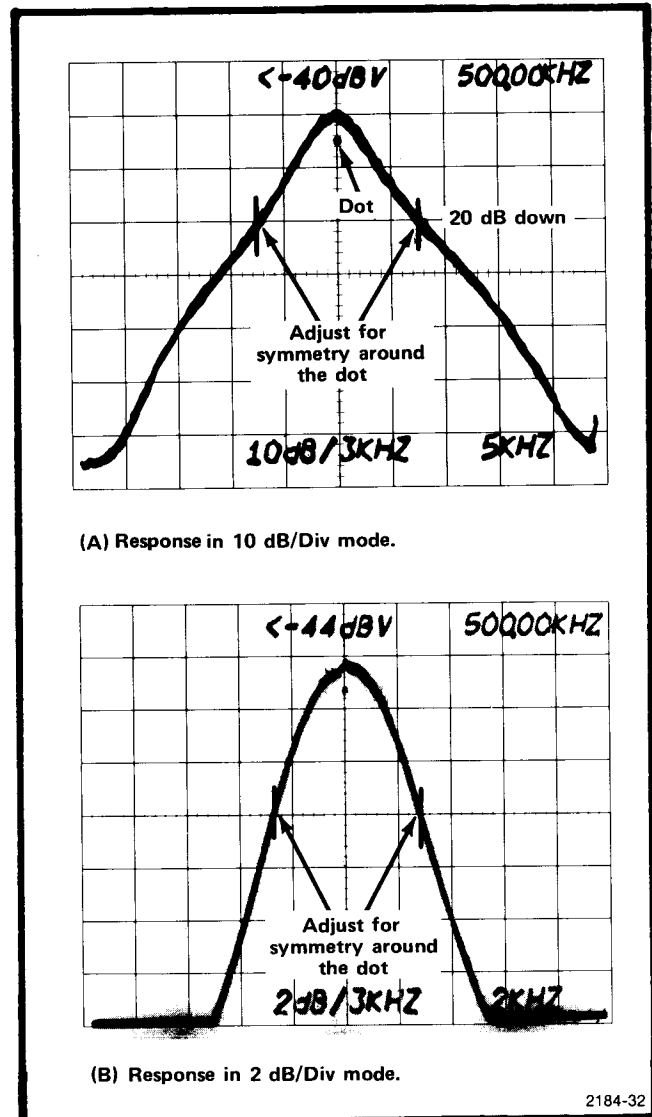


Fig. 4-17. Typical responses of a VR stage with all stages swamped.

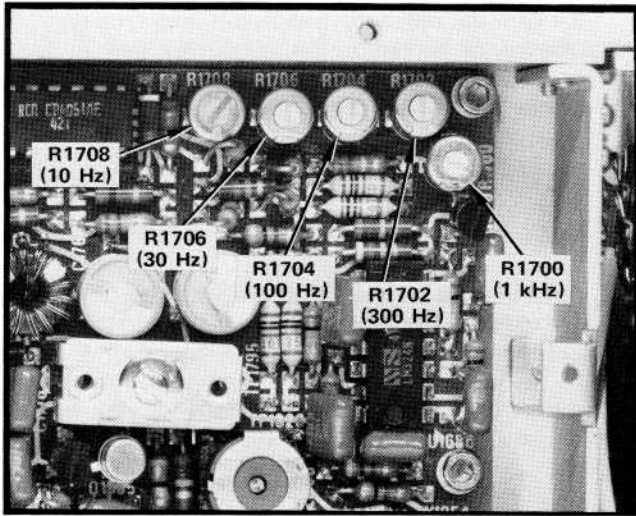


Fig. 4-18. Bandwidth adjustments for Variable Resolution Amplifier.

**NOTE**

Switch the DIGITAL STORAGE on and reduce the sweep rate to calibrate the narrow resolution settings.

h. Switch the RESOLUTION to 10 Hz. Adjust the 10 Hz bandwidth with R1708 (Fig. 4-18) so the bandwidth, 70 dB down, is 100 Hz  $\pm$  20 Hz.

i. Calibrate and equalize the VR gain as follows:

1. Install a shorting strap (Fig. 4-19) from TP1790, TP1795, and TP1820 (Fig. 4-15), to chassis ground.

2. Set the RESOLUTION to 3 kHz, FREQUENCY SPAN/DIV to 0, and the REFERENCE LEVEL to -40 dBV. Adjust the signal amplitude with the front panel AMPL CAL, on the plug-in module, for an on-screen signal reference level (approximately 7 divisions).

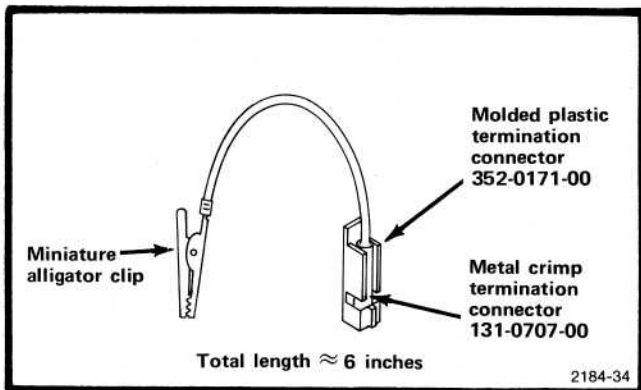


Fig. 4-19. Suggested construction for a shorting strap calibration fixture.

3. Adjust the 1st stage 10 Hz Gain with R1685 (Fig. 4-15) for minimum signal level shift as the RESOLUTION is switched between 3 kHz and 10 Hz positions.

4. Remove the shorting strap from TP1790 and adjust R1735 (Fig. 4-15) for minimum signal level shift between the 3 kHz and 10 Hz positions of RESOLUTION.

5. Remove the shorting strap from TP1795 and adjust the 3rd stage 10 Hz gain with R1785 for minimum signal level shift between the 3 kHz and 10 Hz RESOLUTION settings.

6. Remove the shorting strap from TP1820 and adjust R1825 for minimum signal level shift between the 3 kHz and 10 Hz RESOLUTION settings.

7. Center the AMPL CAL adjustment, on the front panel of the L-Series plug-in module, then with -40 dBV Calibrator signal applied and the REFERENCE LEVEL at -40 dBV, set the RESOLUTION to 30 kHz and adjust the 30 kHz gain with R1905 (Fig. 4-15) for a full screen (8 div) display. Switch the RESOLUTION to 10 kHz and adjust the 10 kHz gain with R1885 (Fig. 4-15) for full screen display. Switch the RESOLUTION to 3 kHz or less and adjust the 10 Hz to 3 kHz gain with R1835 for full screen display.

8. Replace the rf screen cover over the VR assembly. Check the response shape for a RESOLUTION of 3 kHz. Correct any shift of the response shape and center frequency with adjustments C1664, C1724, C1764, and C1804. C1664 will have the most significant effect on the response. Try to spread the adjustment evenly over the four stages.

**9. Digital Storage Calibration (instruments with Digital Averaging and Storage boards)**

a. Preparation: Turn the power off. Remove the Digital Averaging board to gain access to the adjustments on the Digital Storage board. Place the Digital Averaging board alongside or on top of the instrument with a piece of insulation material, such as a sheet of paper, between the back of the board and the instrument (Fig. 4-20). This will prevent accidentally grounding the exposed solder points on the circuit board.



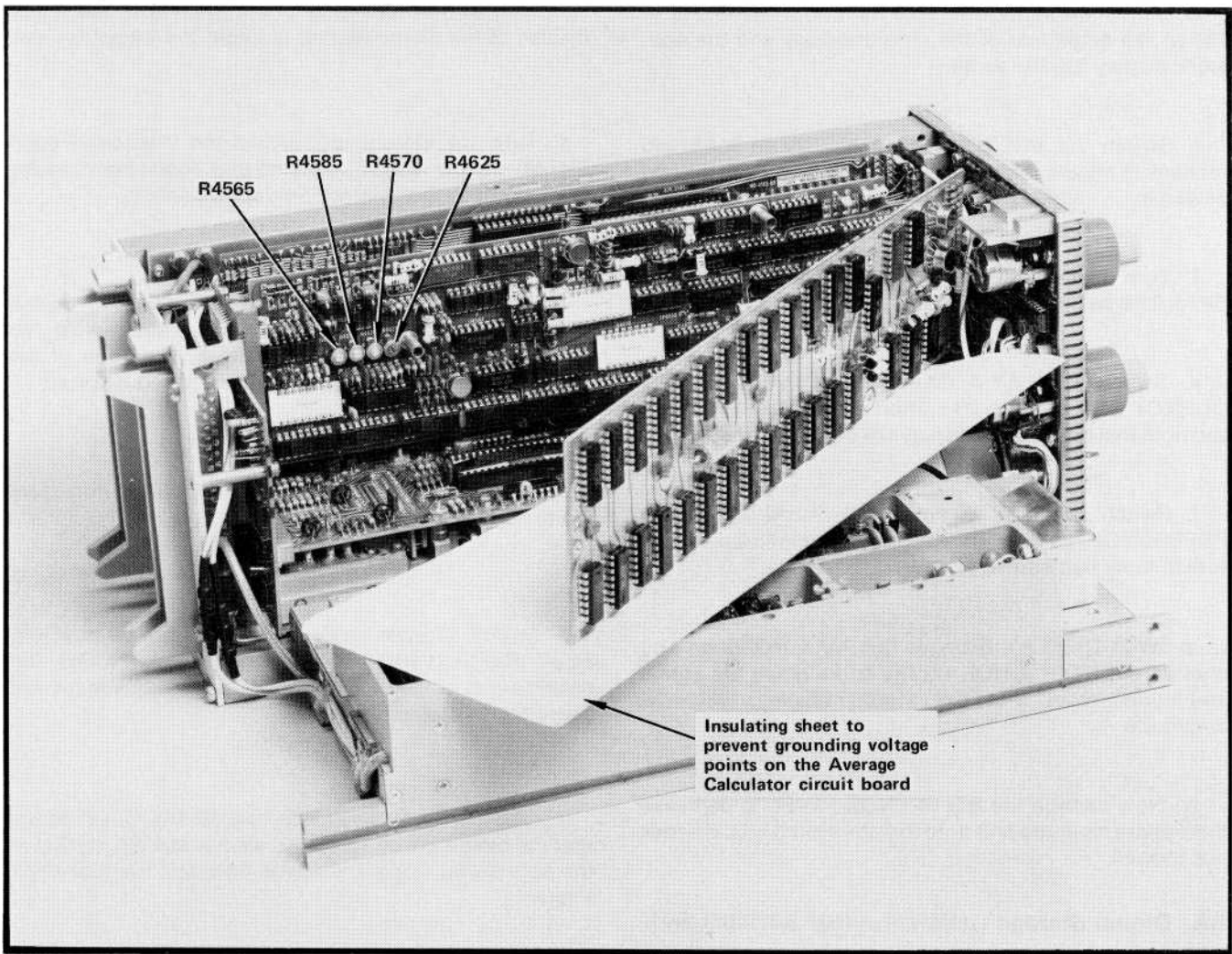


Fig. 4-20. Digital Storage test points and adjustments

b. Set the DOT FREQUENCY to 500.0 kHz, FREQUENCY SPAN/DIV to MAX, RESOLUTION COUPLED, TIME/DIV .2 s, Display Mode 10 dB/DIV, and switch the DIGITAL STORAGE on.

c. Apply the CALIBRATOR signal to the INPUT and adjust the REFERENCE LEVEL to display the 500 kHz markers.

d. Adjust R4585 (Fig. 4-20) slowly ccw, from a fully cw position, until all of the display (include the display edges) remain stored at the end of sweep. Turn R4585 slightly past this point to assure stability.

e. Increase the sweep rate to 10 ms or 5 ms, then adjust the Horizontal Offset with R4570 (Fig. 4-20) to place the stored 500 kHz marker under the frequency DOT. Check accuracy by switching the DIGITAL STORAGE off and on. The marker location for the non-store and stored displays should be the same.

f. Adjust the Horizontal Gain, with R4625 (Fig. 4-20), so the stored 4500 kHz marker is aligned with the non-store marker. Check the accuracy by switching the DIGITAL STORAGE off and on.

g. Change the FREQUENCY SPAN/DIV to 10 k and adjust the REFERENCE LEVEL so the signal amplitude is 7 divisions.

## Calibration Procedure—7L5 Service

h. Adjust the storage Vertical Gain, with R4565 (Fig. 4-20) so the amplitude of the stored display and the non-store display are the same.

i. Switch the FREQUENCY SPAN/DIV to MAX and recheck to ensure that the display is not erasing at the end of sweep.

j. Turn the DIGITAL STORAGE off, the FREQUENCY SPAN/DIV to 50 k and RESOLUTION to 30 k.

k. Switch DISPLAY A, SAVE A on. Change the FREQUENCY SPAN/DIV to 20 k, then switch DISPLAY B on and note that both stored displays (A and B) are displayed.

l. Switch DISPLAY A and SAVE A off, adjust the REFERENCE LEVEL so the signal amplitude is approximately half screen (0 dBV).

m. With DISPLAY B on, switch MAX HOLD on and change the REFERENCE LEVEL to increase the signal amplitude. Note that the stored display increases amplitude.

n. Now change the REFERENCE LEVEL to decrease the signal amplitude and note that the stored display does not change.

### 9A. Digital Storage Calibration (SN B070000 and up)

a. Preparation: Swing the IF module assembly down to expose the Digital Storage board (see Fig. 4-1D). Turn on the power.

b. Set the front panel controls as follows:

DOT FREQUENCY	1000 kHz
FREQUENCY SPAN/DIV	200 kHz
RESOLUTION	30 kHz
REFERENCE LEVEL	-40 dBV or -27 dBm
TIME/DIV	AUTO
LOG display mode	10 dB/DIV
DIGITAL STORAGE DISPLAY	A and B

c. Connect a digital voltmeter (DVM) between TP 4760 (Fig. 4-21) and chassis ground. Using the DVM, set the reference voltage level to  $-2\text{ V} \pm 10\text{ mV}$  with adjustment R4781 (Fig. 4-21).

d. Turn the storage off. Change the REFERENCE LEVEL to position the signal amplitude under the frequency dot.

e. Adjust the Horizontal Offset (R4746) so the stored display of the center marker is under the frequency dot.

f. Turn the storage on. Adjust the Horizontal Gain (R4744) so the stored 500 kHz and 1500 kHz markers correspond to those in the non-store position.

g. Change the DOT FREQUENCY to 500 kHz. Switch between store and non-store display and adjust the Vertical Gain (R4720) so the marker amplitude of the stored display equals that of the non-stored display.

h. Change the LOG display mode to LIN. In non-store mode note the baseline level.

i. Switch to store mode. From the fully cw position, adjust R4713 (Vertical Offset) to the point where the baseline just stops moving down. (Over-adjustment will cause signal clamping.)

j. Change the display mode to 2 dB/Div. Check to see that the amplitude of the stored display still equals that of the non-stored display. (Vertical Gain and Vertical offset interact.)

k. Change FREQUENCY SPAN/DIV to 0. Activate A and B digital storage displays. Activate SAVE A to save Display A, then change the DOT FREQUENCY to 540 kHz. Change TRIGGERING to SGL SWP. Note the amplitude of the stored line. (Line should be near the top of the screen.)

l. Adjust C4708 while switching SAVE A on and off (activating and deactivating) so the top of the display, with SAVE A deactivated, corresponds to the SAVE A line.

The reference level of B-(SAVE A) can be adjusted by binary switch S4740. The highest number on the switch (#8) is the MSB and changes the reference level approximately 5 divisions. The lowest number (#1) is the LSB and changes the reference level approximately 1/10 of a division. To set the reference level at the top of the graticule, close 1, 2, 3, 4, and 5.

This completes the calibration procedure for the 7L5 Spectrum Analyzer.

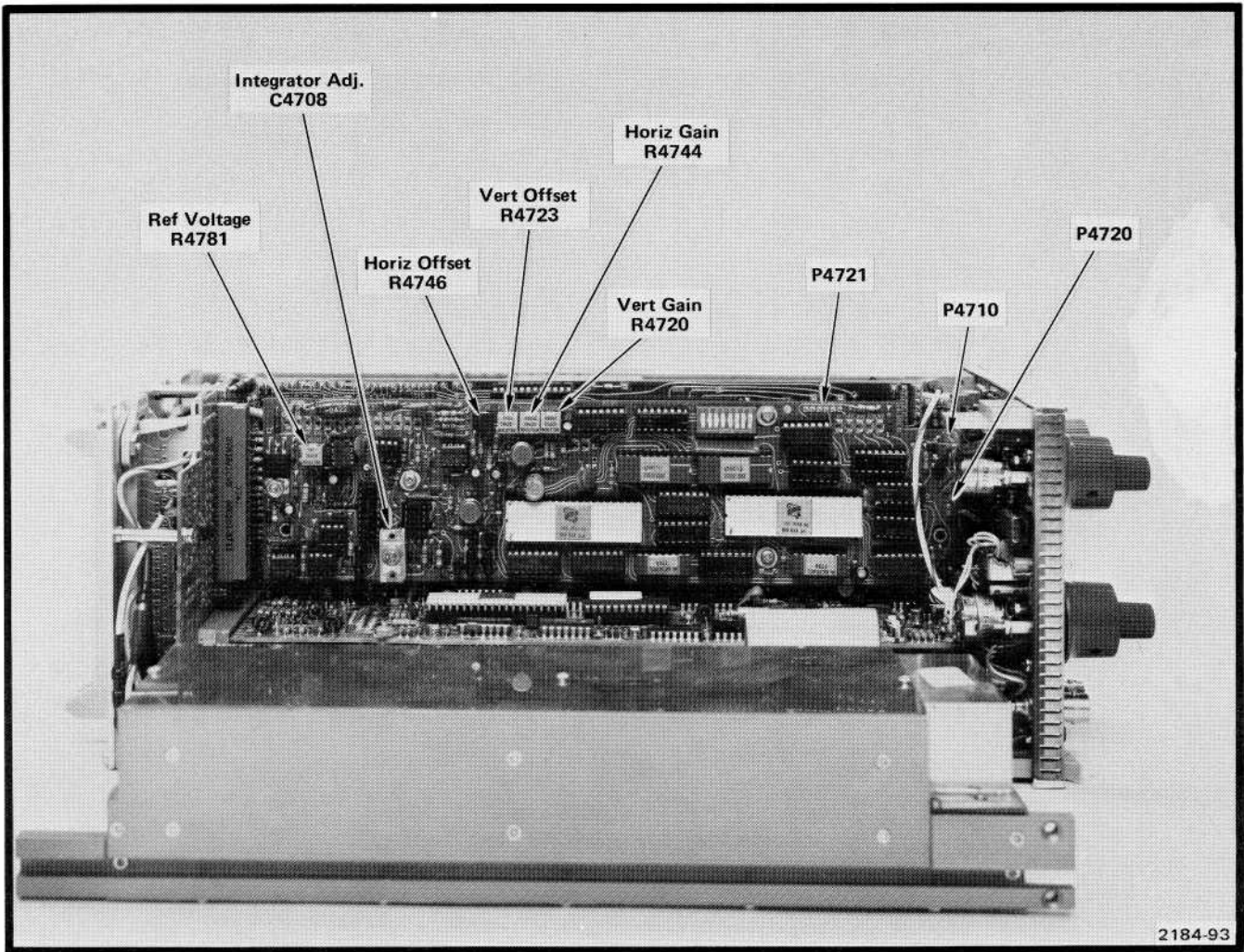


Fig. 4-21. Digital Storage 670-5671-00 test points and adjustments.

# MAINTENANCE

## Introduction

This section describes procedures for reducing or preventing instrument malfunction plus troubleshooting and corrective maintenance. Preventive maintenance improves instrument reliability. Should the instrument fail to function properly, corrective measures should be taken immediately; otherwise, additional problems may develop within the instrument.



**STATIC DISCHARGE CAN DAMAGE MANY SEMICONDUCTOR COMPONENTS USED IN THIS INSTRUMENT.**

*Many semiconductor components, especially MOS types can be damaged by static discharge. Damage may not be catastrophic, therefore, not immediately apparent. It usually appears as a "weakening" of the semiconductor characteristics. Devices that are particularly susceptible are: MOS, CMOS, J FET's, and high impedance OP amps. Damage can be significantly reduced by observing the following precautions.*

1. *Handle static sensitive components or circuit assemblies at or on a static free surface. Work station areas should contain a static free bench cover or work plane such as, conductive polyethylene sheeting and a grounding wrist strap. The work plane should be connected to earth ground.*
2. *All test equipment, accessories, and soldering tools should be connected to earth ground.*
3. *Minimize handling by keeping the components in their original containers until ready for use. Minimize the removal and installation of semiconductors from their circuit boards.*
4. *Hold the IC devices by their body rather than the terminals.*

5. *Use containers made of conductive material or filled with conductive material for storage and transportation. Avoid using ordinary plastic containers. Any static sensitive part or assembly (circuit board) that is to be returned to Tektronix, Inc.; should be packaged in its original container or one with anti-static packaging material.*

## PREVENTIVE MAINTENANCE

Preventive maintenance consists of cleaning, visual inspection, performance check, and if needed, a recalibration. The preventive maintenance schedule that is established for the instrument should be based on the environment in which the instrument is operated and the amount of use. Under average conditions (laboratory situation) a preventive maintenance check should be performed every 1000 hours of instrument operation.

### Cleaning

Clean the instrument often enough to prevent dust or dirt from accumulating in or on it. Dirt acts as a thermal insulating blanket and prevents efficient heat dissipation. It also provides high resistance electrical leakage paths between conductors or components in a humid environment.

**Exterior.** Clean the dust from the outside of the instrument by wiping or brushing the surface with a soft cloth or brush. The brush will remove dust from around the front panel selector buttons. Hardened dirt may be removed with a cloth dampened in water that contains a mild detergent. Abrasive cleaners should not be used.

**Interior.** Normally the interior of the instrument will not require cleaning unless it has been left out of the oscilloscope plug-in compartment and uncovered for an extended period of time. Clean the interior by loosening accumulated dust with a dry soft brush, then blow the loosened dirt away with low pressure air (high velocity air can damage some components). If the circuit board assemblies need cleaning, remove the circuit board by referring to the instructions under Corrective Maintenance in this section. Hardened dirt or grease may be removed with a cotton tipped applicator dampened with a solution of mild detergent in water. Do not leave detergent on critical memory components. Abrasive cleaners should not be used.

## Maintenance—7L5 Service

After cleaning, allow the interior to thoroughly dry before applying power to the instrument.

### CAUTION

Do not allow water to get inside any enclosed assembly or components, such as the photo-optic switch assemblies, memory capacitors, potentiometers, etc. Instructions for removing assemblies for maintenance are provided in the Corrective Maintenance section. Do not clean any plastic materials with organic cleaning solvents such as benzene, toluene, xylene, acetone or similar compounds because they may damage the plastic.

## Lubrication

No assemblies or components in this instrument require lubrication.

## Visual Inspection

After cleaning, carefully check the instrument for such defects as defective connections, damaged parts, and improperly seated transistors and integrated circuits. The remedy for most visible defects is obvious, however, if heat-damaged parts are discovered, try to determine the cause of overheating before the damaged part is replaced, otherwise the damage may be repeated.

## Transistor and Integrated Circuit Checks

Periodic checks of the transistors and integrated circuits are not recommended. The best measure of performance is the actual operation of the component in the circuit. Performance of these components is thoroughly checked during the performance check or recalibration, and any substandard transistors or integrated circuits will usually be detected at that time.

# TROUBLESHOOTING

The following are a few aids and suggestions that may assist in locating a problem. After the defective assembly or component has been located, refer to the Corrective Maintenance part of this section for removal and replacement instructions.

## Troubleshooting Aids

**Diagrams.** Circuit diagrams are on foldout pages in the Diagrams section of the manual. The circuit number and electrical value of each component is shown on the diagrams (see the first tab page for definition of the reference symbology used to identify components in each circuit). Each main circuit is assigned a series of compo-

nent numbers. Refer to the Replaceable Electrical Parts list section for a complete description of each component and assembly. Those portions of the circuit that are on circuit boards are enclosed with a black border line with the name and assembly number shown on the border.

## NOTE

Corrections and modifications to the manual and instrument are described on inserts bound into the rear of the manual. Check this section for manual instrument changes and corrections.

**Circuit Board Illustrations.** Electrical components, connectors, and test points are identified on circuit board illustrations located on the inside fold of the corresponding circuit diagram or the back of the preceding diagram. This allows cross-reference between the diagram and the circuit board, and shows the physical location of components.

**Wire Color Code.** Color-coded wires are used to aid circuit tracing. Power supply dc voltage leads have either a red background for positive voltage or a violet background for negative voltage. Signal wires and coaxial cables use an identifying one-band or two-band color code.

## Connectors: (Movable and Fixed).

**Multiple Terminal (Harmonica) Connector Holders:** The multi-connector holder is keyed with a triangle; one on the holder and one on the circuit board. When a connection is made perpendicular to a circuit board surface, the orientation of the triangle and the slot numbers on the connector holder are determined by the direction of the nomenclature marking (see Fig. 5-1). All harmonica connectors are identified on the schematic and board with the prefix "P".

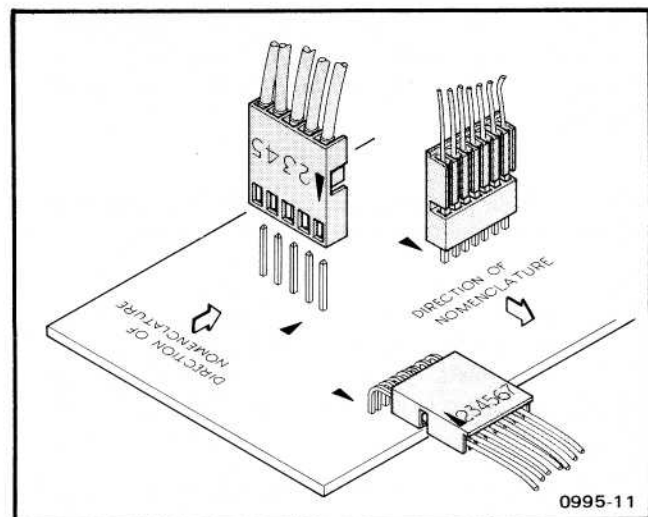


Fig. 5-1. Multipin (harmonica) circuit board connectors.

Square-pin and Edge Connectors: Interface connectors between circuit boards are identified with alphabetic letters. Interface connectors to the mainframe use an alpha prefix for the left (A) or right (B) side followed by a numeral (e.g., B17, A6).

**Capacitor Marking.** The capacitance value of common disc capacitors and some electrolytics are marked in microfarads on the side of the component body. The white ceramic capacitors are color-coded in picofarads. Tantalum capacitors are color-coded as shown in Fig. 5-2.

**Diode Code.** The cathode of each glass-encased diode is indicated by a stripe, a series of stripes, or a dot. Some diodes have a diode symbol printed on one side. Fig. 5-3 illustrates diode types and polarity markings that are used in this instrument.

**Transistor and Integrated Circuit Electrode Configuration.** Lead identification for the transistors is shown in Fig. 5-4. IC pin-out diagrams are shown, when necessary, on the back of the adjoining pullout schematic diagram.

**Finding Faulty Semiconductors**

Semiconductor failures account for the majority of electronic equipment failures. Most semiconductor devices (transistors and IC's) are socket-mounted. Substitution is often the most practical means for checking their performance. The following guidelines should be followed when substituting these components:

- a. First determine that circuit voltages are safe for the substituted component so the replacement will not be damaged.
- b. Use only good components for substitution.
- c. Turn the power off before a component is substituted and maintain a static-free environment (see CAUTION under IC Checks).

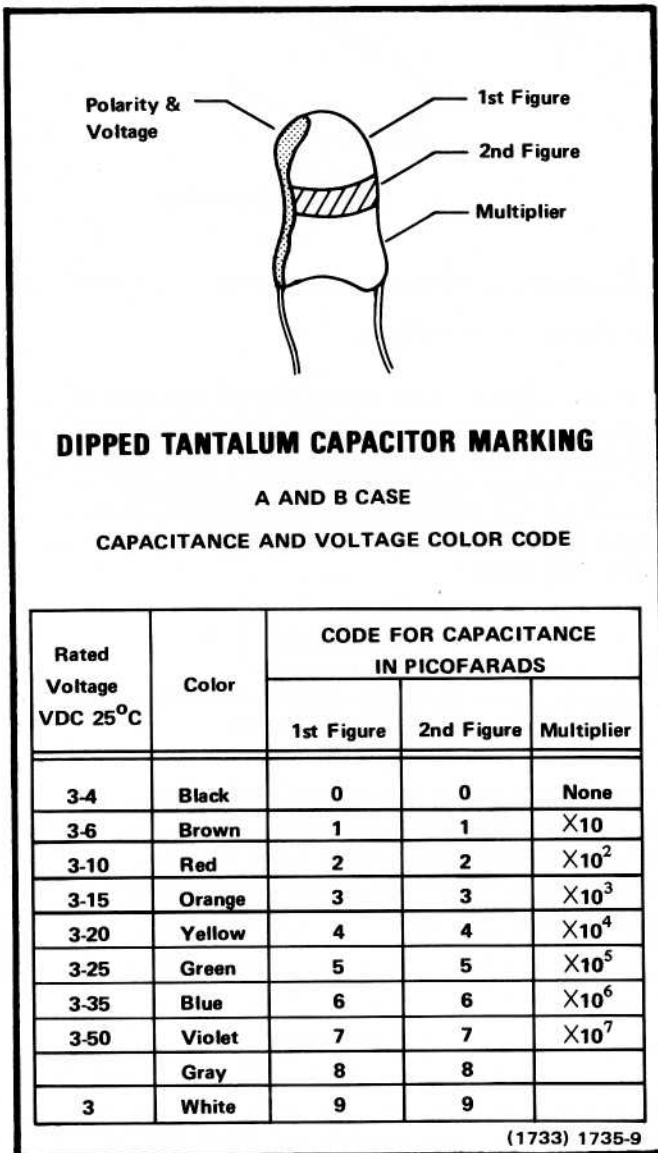


Fig. 5-2. Color code for some tantalum capacitors.

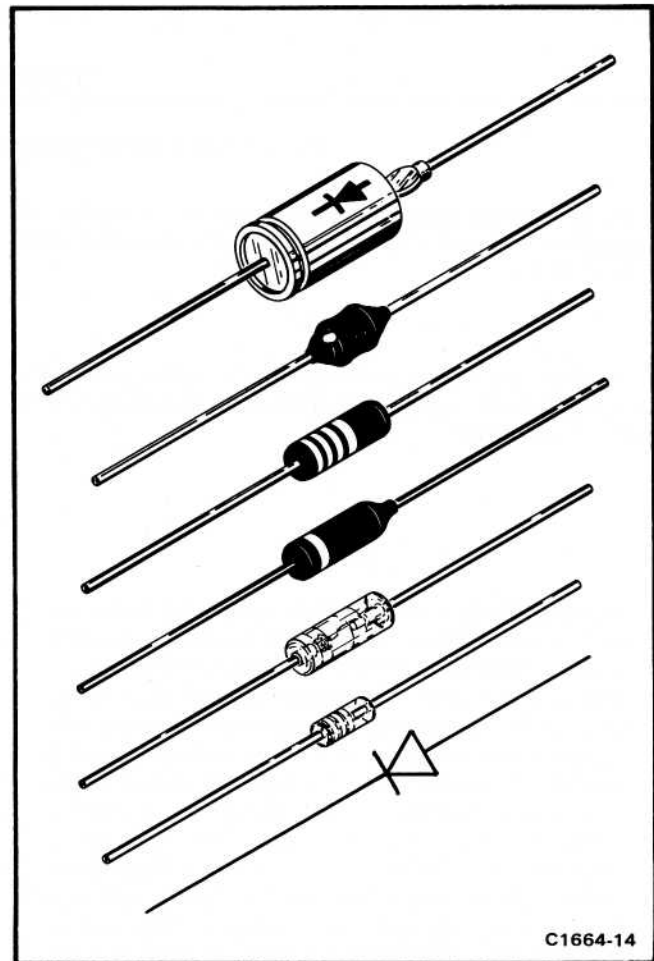


Fig. 5-3. Diode polarity markings.

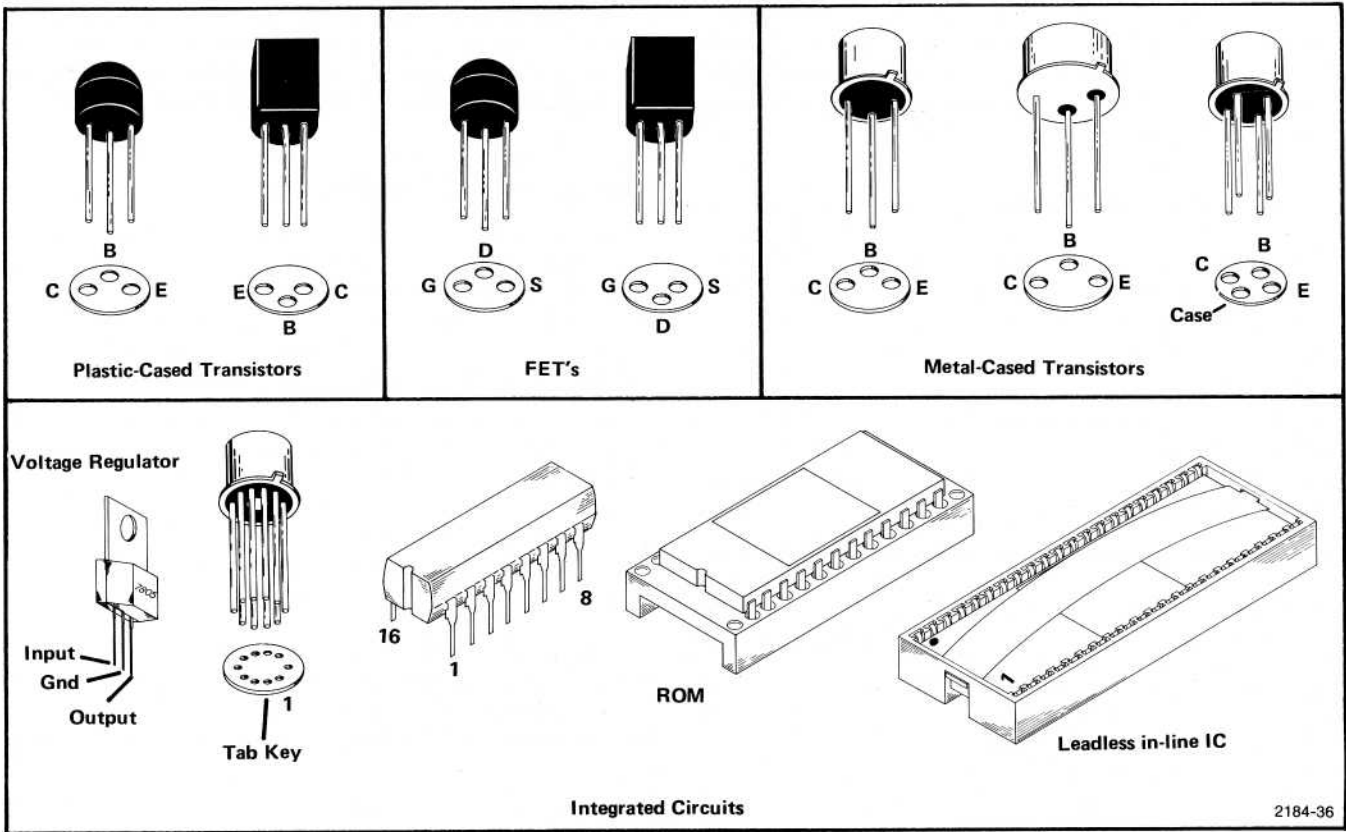


Fig. 5-4. Electrode configuration for semiconductor components.

d. Be sure the component (transistor or IC) is inserted properly in the socket (see Fig. 5-4 or the manufacturers data sheet).

e. After the operational check, return the good components to their original sockets to reduce calibration time and run-in period.

**NOTE**

If a substitute is not available, check the transistor with a dynamic tester such as the Tektronix Type 576 Curve Tracer or 5CT1N Curve Tracer for the 5000-Series mainframe. Static-type testers, such as an ohmmeter, can be used to check the resistance ratio across some semiconductor junctions if no other method is available. Use the high resistance ranges ( $R \times 1 k$  or higher) so the external test current is limited to less than 6 mA. If uncertain, measure the external test current with an ammeter. Resistance ratios across base-to-emitter or base-to-collector junctions usually run 100:1 or higher. The ratio is measured by connecting the meter leads across the terminals, noting the reading, then reversing the leads and noting the second reading.

**Diode Checks.** Most diodes can be checked in the circuit by taking measurements across the diode and comparing these with voltages listed on the diagram. Forward-to-back resistance ratios can usually be taken by referring to the schematic and pulling appropriate transistors and pin connectors to remove low resistance loops around the diode.

**CAUTION**

*Do not use an ohmmeter scale with a high external current to check the diode junction.*

**Integrated Circuit (IC) Checks.** Integrated circuits are most easily checked by direct replacement. When substitution is impossible, check input and output signal states as described in the Circuit Description and on the diagram. Lead configuration and data for the IC's, used in this instrument, are provided on the inside fold of the schematic or the back of the previous schematic.

**CAUTION**

*To avoid possible damage from static changes, handle all IC's in accordance with the instructions as previously described at the beginning of this section.*

Check calibration and performance after a faulty component has been replaced.

If the above procedure fails to locate the trouble, a more detailed analysis must be performed. The Circuit Description section describes the operational theory of each circuit and may aid to further evaluate the problem.

### General Troubleshooting Techniques

The following procedure is recommended to isolate a problem and expedite repairs.

1. Ensure that the malfunction exists in the instrument. Check the operation of associated equipment and the operating procedure for the 7L5 (see Operating Instructions).

2. Determine and evaluate all trouble symptoms. Try to isolate the problem to a circuit or assembly. The block diagram in the Diagrams section can aid in signal tracing and circuit isolation. It and the diagrams show the signal levels required (at various points) to produce full screen deflection.

**CAUTION**

*Exercise extreme care when placing meter leads or probes for voltage or waveform measurements. An inadvertent movement of the leads or probe in a high density area or section with limited access could cause a short circuit and produce transient voltages which can destroy many components.*

3. Make an educated guess as to the nature of the problem, such as component failure or calibration, and the functional area most likely at fault.

4. Visually inspect the area or the assembly for such defects as broken or loose connections, improperly seated components, overheated or burned components, chafed insulation, etc. Repair or replace all obvious defects. In the case of overheated components, try to determine the cause of the overheated condition and correct before applying power.

5. By successive electrical checks, locate the problem. At this time an oscilloscope is a valuable test item for evaluating circuit performance. If applicable, check the calibration adjustments. Before changing an adjustment, note its position so it can be returned to the original setting. This will facilitate recalibration after the trouble has been located and repaired.

6. Determine the extent of the repair needed; if complex, we recommend contacting your local Tektronix Field Office or representative. If the damage is minor, such as a component replacement, see the Parts List for replacement information. Removal and replacement procedures of the assemblies and sub-assemblies are described under Corrective Maintenance.

## CORRECTIVE MAINTENANCE

Corrective maintenance consists of component replacement and instrument repair. Special techniques and procedures required to replace components in this instrument are described here.

### Obtaining Replacement Parts

Most electrical and mechanical parts are available through your local Tektronix Field Office or representative. The Parts List section contains information on how to order these replacement parts. Many standard electronic components can be obtained locally in less time than that required to order from Tektronix, Inc. It is best to duplicate the original component as closely as possible. Parts orientation and lead dress should be duplicated because orientation may affect circuit interaction.

If a component you have ordered has been replaced with a new or improved part, your local Field Office or representative will contact you concerning the change in the part number. After repair, the circuits may need recalibration.

### Parts Repair and Exchange Program

Tektronix repair centers provide replacement or repair service on major assemblies as well as the unit. Return the instrument or assembly to your local Field Office for this service.

Refer to Repackaging For Shipment instructions (in Section 1) before shipping the instrument.



## Maintenance—7L5 Service

### Soldering Technique

**CAUTION**

*Disconnect the instrument from its power source before replacing or soldering components.*

Because it is easy to damage the plating in the board holes that the component is soldered to, we recommend cutting the old component free and leaving some lead length to solder the new component leads to. If the leads are pulled through, use caution when pulling them through the plated hole. Excessive heat or bent leads can damage the plating. Use a 15 watt pencil-type iron, straighten the leads on the back side of the board, then when the solder melts, gently pull the soldered lead through the hole. A desoldering tool should be used to remove the old solder.

### Transistor and Integrated Circuit Replacement

Transistors and IC's should not be replaced unless they are actually defective. When removed from their sockets during routine maintenance, return them to their original sockets. Unnecessary replacement or switching of semiconductor devices may affect the instrument adjustment. When an active device is replaced, check the operation of the circuit affected.

**CAUTION**

*The POWER switch must be turned off before removing or replacing semiconductors and observe static discharge caution at the beginning of this section.*

Replacement semiconductors should be of the original type or a direct replacement. Fig. 5-4 shows the lead configuration of the semiconductors used in this instrument.

An extracting tool should be used to remove the 14-pin integrated circuits to prevent damage to the pins. This tool is available from Tektronix, Inc. Order Tektronix Part No. 003-0619-00. If an extracting tool is not available, use care to avoid damaging the pins. Pull slowly and evenly on both ends of the IC. Try to avoid having one end of the IC disengaged from the socket before the other end.

### Replacing Square-pin for the Multi-pin Connectors and Circuit Boards

**NOTE**

*A pin replacement kit (including necessary tools, instructions, and replacement pins) is available from Tektronix, Inc. Order Tektronix Part No. 040-0542-00.*

It is important not to damage or disturb the ferrule when removing the old stub of a broken pin. The ferrule is pressed into the circuit board and provides a base for soldering the pin connector.

If the broken stub is long enough, grasp it with needle-nose pliers, apply heat with a small soldering iron to the pin base of the ferrule, and pull the old pin out. If the broken stub is too short to grasp with pliers, use a small dowel (0.028 inch diameter) to push the pin out. Use a pair of diagonal cutters to remove the ferrule from the new pin, and then insert the pin into the old ferrule and solder to both sides of the ferrule.

The pin sockets on the circuit boards are soldered to the rear of the board. Unsolder the pin, then straighten the tabs on the socket and remove it from the hole in the circuit board. Place the new socket in the circuit board hole and press the tabs down against the board. Solder the tabs of the socket to the circuit board; be careful not to get solder into the socket.

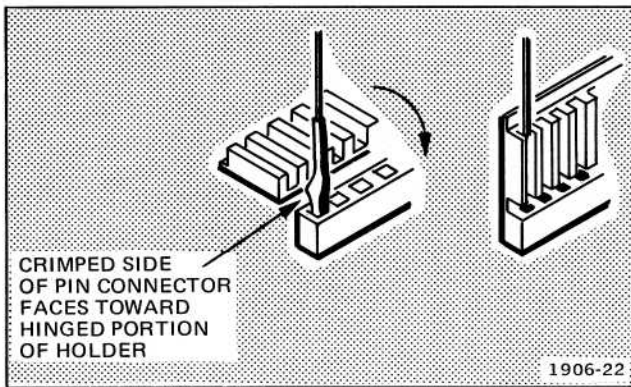
**NOTE**

*The spring tension of the pin sockets ensures a good connection between the circuit board and the pin. This spring tension can be destroyed by using the pin sockets as a connecting point for spring-loaded probe tips, alligator clips, etc.*

### Interconnecting Cable and Pin Connector Replacement

The interconnecting cable assemblies are factory assembled. They consist of machine installed pin connectors mounted in plastic holders. The plastic holders are easily replaced as individual items, but if the connectors are faulty the entire cable should be replaced.

It is possible for the pin connectors to become dislodged from the plastic holders. If this happens, the connector can be reinstalled as follows (see Fig. 5-5).



**Fig. 5-5. Pin connector replacement.**

1. Bend grooved portion of holder away from cable as shown.
2. Re-insert the connector into its hole in the plug-in portion of the holder. Wires are positioned in the holder according to color-code system.

#### NOTE

*Holder positions are numbered (number one is identified with a triangle). The wires are EIA color coded to match the numbers on the holder. For example, brown stripe for position 1 (triangle), red stripe for position 2, yellow stripe for position 4, etc.*

3. Bend grooved part of holder so that connector is inserted into groove.

When plugging connector holders onto board pins, be sure to match the triangle mark on the holder with the triangle mark on the circuit board.

## DISASSEMBLY OF THE 7L5 and REPLACING ASSEMBLIES

The following describes how to remove the major assemblies and circuit boards within the instrument. Refer to Fig. 4-1 for board and assembly identification. The exploded drawing in the Replaceable Mechanical Parts section may also help illustrate how the instrument is assembled.

### 1. Removing the Front Panel

- a. Unscrew and remove the plug-in module "release" knob located below the plug-in compartment.

- b. Use a 0.05 inch Allen wrench to loosen the two set-screws that hold the front panel to the upper and lower wall of the Reference Module (honeycomb) assembly. See Fig. 5-6A.

- c. Remove the two flat-head screws that hold the top rail of the IF Module assembly to the front panel (Fig. 5-6A), then remove the two screws that secure the top rail to the back (rear) panel (on the right side as viewed from the rear). This will allow the IF Module assembly to swing out and down (Fig. 5-6C).

- d. Turn the instrument on its side. Disconnect the return spring for the 7L5 "pull to release" knob located on the underside of the instrument (Fig. 5-6B).

- e. Use the Allen wrench to loosen the set-screw that holds the bottom hinge of the IF Module assembly to the front panel extrusion (Fig. 5-6B).

- f. Remove the front panel by pulling it away from the other assemblies with a slight wobbling motion to loosen the connectors. When the board connectors are free, unplug the coaxial connector from the rear of the CALIBRATOR connector.

### 2. Removing the IF Module Assembly (Variable Resolution, 250 kHz IF, Log/Lin Amplifier, etc.)

- a. Repeat the procedure in steps 1a through 1e.

- b. Unplug the ribbon connector at the IF Module mother board and the three coaxial connectors near the rear hinge (Fig. 5-6C). Remove the rear hinge screw.

- c. Carefully slip the assembly out and back, to free the front hinge pin from the front panel extrusion, then remove the assembly.

### 3. Removing the Digital Averaging and Digital Storage Circuit Boards

- a. Repeat the procedure for steps 1a through 1c.

- b. Remove the three screws through the Digital Averaging and Digital Storage boards (Fig. 5-6C).

- c. Carefully lift the Digital Averaging board out as far as its ribbon cable will permit, then remove the Digital Storage board by lifting it straight off its interconnecting pins.

- d. Unplug the multi-pin ribbon connector from the Digital Averaging board.

4. Removing the Sweep Board

a. Remove the Digital Averaging and Digital Storage boards, then the front panel as previously described.

b. Unplug and remove the Sweep board.

NOTE

To apply power to the Sweep board for servicing, re-install the front panel assembly and reconnect the coaxial cable to the CALIBRATOR connector. Plug the 7L5 through a flexible extender cable into the mainframe vertical and horizontal connectors. Turn the power on.

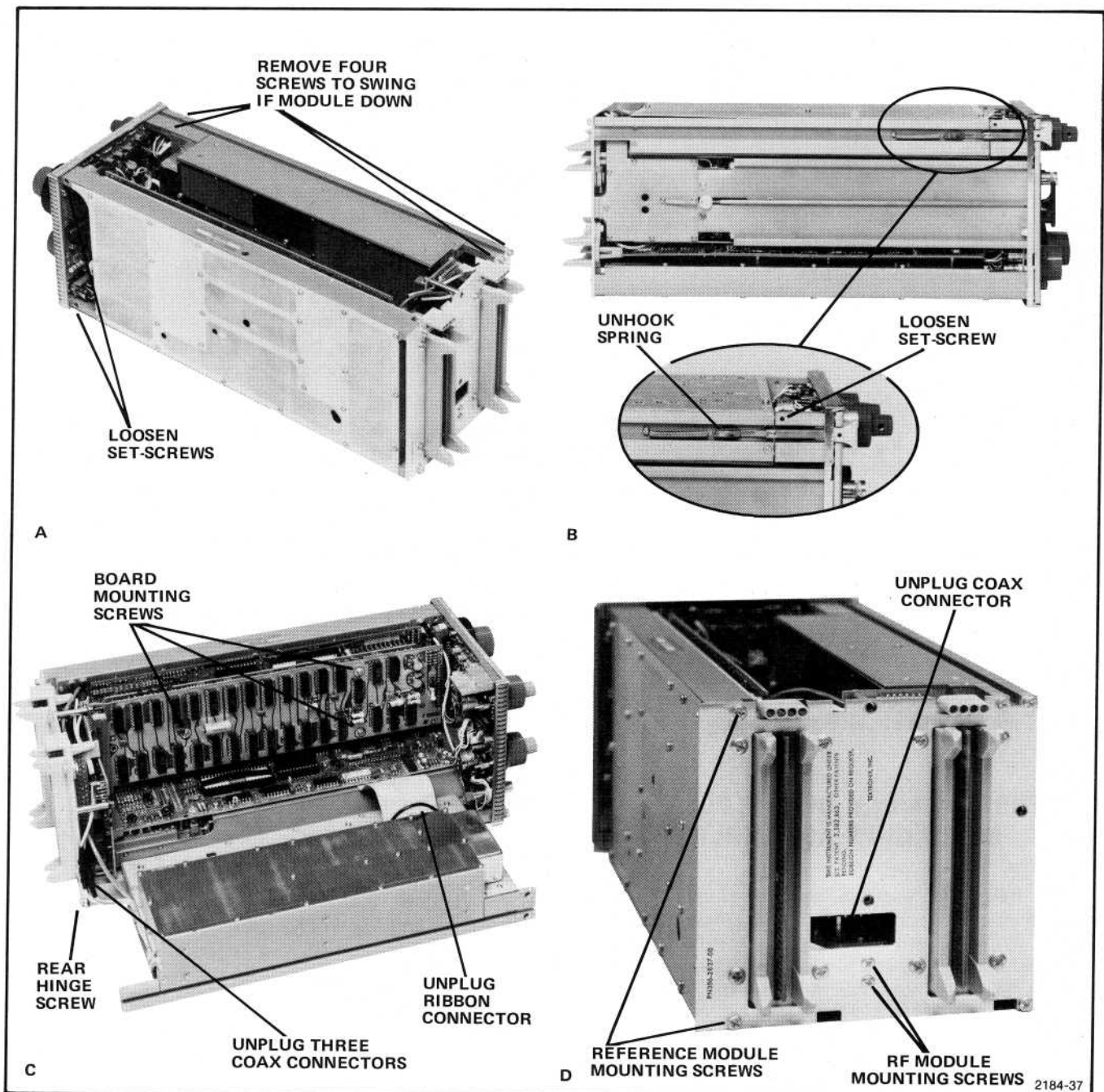


Fig. 5-6. 7L5 circuit board and assembly identification and location of holding setscrews.

### 5. Removing the RF Module (Vertical Control Board and 1st LO Assembly)

- a. Remove the Digital Averaging and Digital Storage circuit boards then remove the Front Panel assembly.
- b. Use a pair of needle-nose pliers to reach through the opening in the rear panel and disconnect the coaxial connector to the 1st LO Module (Fig. 5-6D). Now disconnect the coaxial connector for the cable from the IF Module Assembly to the semi-rigid coaxial cable for the 1st LO Module.
- c. Remove the two screws that hold the module to the back panel (Fig. 5-6D).
- d. Remove the assembly by pulling it straight out, to free (nearly) the Vertical Control board edge connector; then raise the assembly slightly while pressing down on the rear (through the cut-out in the rear panel) to clear the two coaxial connectors at the rear of the 1st LO Module. Once the assembly is disengaged, unplug the wire cable to free it entirely. Note the location and orientation of the cable connectors to aid in reassembly.

### 6. Removing the Transverse Interface Circuit Board

- a. Remove the RF Module assembly and the IF Module assembly.
- b. Remove the three screws that hold the board to the posts on the rear panel (Fig. 5-6D).
- c. Remove the board by pulling straight out from its connector.

**CAUTION**

*Avoid damaging the flexible interface circuit board that is attached from the Transverse Interface board to the rear interface plug-in connector. Before re-installing the board, check cable dress behind the board. This will facilitate connection later.*

### 7. Removing the Reference Module

- a. Remove the front panel, IF Module, Digital Averaging and Storage board, Sweep board, RF Module, and Transverse Interface board (steps 1 through 6).

- b. Remove the Reference Module mounting screws (Fig. 5-6C) and coaxial cables.

## REASSEMBLING THE 7L5

Reassembly is, in general, the reverse of disassembly. The following steps are intended only as a brief guide.

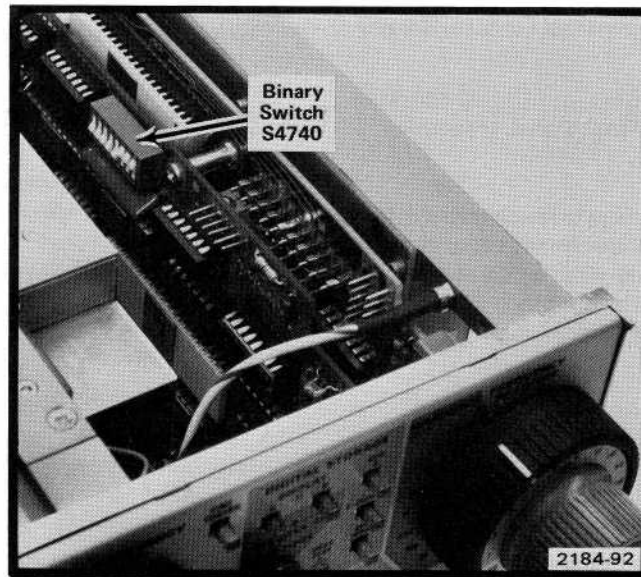
1. Reconnect the two cables (coaxial and wire) from the RF Module assembly. It may be necessary to temporarily remove the Transverse Interface circuit board assembly to gain access to the connectors.
2. Re-install the Transverse Interface circuit board assembly and replace the three screws that hold it to the back panel.
3. Re-install the RF Module assembly. Replace the two screws that hold it to the back panel.
4. Align the interconnect pins and receptacles between the Sweep board and the Digital Storage board, then gently press the board in place. Secure the Digital boards by installing the three mounting screws.
5. Re-install the front panel assembly and reconnect the CALIBRATOR coaxial connector.
6. Re-install the hinged IF Module assembly and reconnect the three coaxial connectors.
7. Replace the RF Module latch rod, the plug-in (7L5) knob spring, and tighten the three Allen screws that were loosened to remove the front panel.

## INTERNAL OPERATIONAL ADJUSTMENTS

### Setting the B-(SAVE A) = 0 Display Level

Normally the B-(SAVE A) = 0 level is set at the top of the graticule; however, this level can be set anywhere within the graticule area by changing the settings of S4740 (see Fig. 5-7).

S4740 is an eight-button binary switch package: each button sets the state of an 8-bit data word that determines the display level. The MSB (switch #8) shifts the display level 5 divisions; switch #7 shifts half this amount (2 1/2 divisions) and so on. Calculate the level change desired, then pull the 7L5 out of the mainframe and change the switch settings accordingly.



**Fig. 5-7. Binary switch for setting B—(SAVE A) display level. Normal switch setting is for a reference level at the top of screen (all closed except 6, 7, & 8).**

# OPTION INFORMATION

Options for the 7L5, such as Options 21, 25, 28, 30, 31, etc. are documented in a supplemental manual. This manual is included with the 7L5 Operating and Service manual if your instrument is so equipped.

# 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
00779	AMP, INC.	P O BOX 3608	HARRISBURG, PA 17105
00853	SANGAMO ELECTRIC CO., S. CAROLINA DIV.	P O BOX 128	PICKENS, SC 29671
01121	ALLEN-BRADLEY COMPANY	1201 2ND STREET SOUTH	MILWAUKEE, WI 53204
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P O BOX 5012, 13500 N CENTRAL EXPRESSWAY	DALLAS, TX 75222
02735	RCA CORPORATION, SOLID STATE DIVISION	ROUTE 202	SOMERVILLE, NY 08876
03508	GENERAL ELECTRIC COMPANY, SEMI-CONDUCTOR PRODUCTS DEPARTMENT	ELECTRONICS PARK	SYRACUSE, NY 13201
03888	KDI PYROFILM CORPORATION	60 S JEFFERSON ROAD	WHIPPANY, NJ 07981
04222	AVX CERAMICS, DIVISION OF AVX CORP.	P O BOX 867, 19TH AVE. SOUTH	MYRTLE BEACH, SC 29577
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD, PO BOX 20923	PHOENIX, AZ 85036
05574	VIKING INDUSTRIES, INC.	21001 NORDHOFF STREET	CHATSWORTH, CA 91311
05828	GENERAL INSTRUMENT CORP ELECTRONIC SYSTEMS DIV.	600 W JOHN ST.	HICKSVILLE LI, NY 11802
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS STREET	MOUNTAIN VIEW, CA 94042
08806	GENERAL ELECTRIC CO., MINIATURE LAMP PRODUCTS DEPARTMENT	NELA PARK	CLEVELAND, OH 44112
09023	CORNELL-DUBILIER ELECTRONIC DIVISION FEDERAL PACIFIC ELECTRIC CO.	2652 DALRYMPLE ST.	SANFORD, NC 27330
10389	CHICAGO SWITCH, INC.	2035 WABANSIA AVE.	CHICAGO, IL 60647
12697	CLAROSTAT MFG. CO., INC.	LOWER WASHINGTON STREET	DOVER, NH 03820
14329	WELLS ELECTRONICS, INC.	1701 SOUTH MAIN ST.	SOUTH BEND, IN 46613
14433	ITT SEMICONDUCTORS	3301 ELECTRONICS WAY P O BOX 3049	WEST PALM BEACH, FL 33402
17856	SILICONIX, INC.	2201 LAURELWOOD DRIVE	SANTA CLARA, CA 95054
18178	VACTEC, INC.	2423 NORTHLINE INDUSTRIAL BLVD.	MARYLAND HEIGHTS, MO 63043
18324	SIGNETICS CORP.	811 E. ARQUES	SUNNYVALE, CA 94086
18583	CURTIS INSTRUMENTS, INC.	200 KISCO AVE.	MOUNT KISCO, NY 10549
24355	ANALOG DEVICES INC.	RT 1 INDUSTRIAL PK, P O BOX 280	NORWOOD, MA 02062
24546	CORNING GLASS WORKS, ELECTRONIC COMPONENTS DIVISION	550 HIGH STREET	BRADFORD, PA 16701
27014	NATIONAL SEMICONDUCTOR CORP.	2900 SEMICONDUCTOR DR.	SANTA CLARA, CA 95051
27802	VECTRON LABORATORIES INC.	121 WATER STREET	NORWALK, CT 06854
32997	BOURNS, INC., TRIMPOT PRODUCTS DIV.	1200 COLUMBIA AVE.	RIVERSIDE, CA 92507
33096	COLORADO CRYSTAL CORPORATION	2303 W 8TH STREET	LOVELAND, CO 80537
34335	ADVANCED MICRO DEVICES	901 THOMPSON PL.	SUNNYVALE, CA 94086
50347	OPCOA, DIVISION OF IDS	330 TALMADGE ROAD	EDISON, NJ 08817
50434	HEWLETT-PACKARD COMPANY	640 PAGE MILL ROAD	PALO ALTO, CA 94304
50579	LITRONIX INC.	19000 HOMESTEAD RD.	CUPERTINO, CA 95014
51642	CENTRE ENGINEERING INC.	2820 E COLLEGE AVENUE	STATE COLLEGE, PA 16801
52769	SPRAGUE GOODMAN ELEC., INC.	134 FULTON AVENUE	GARDEN CITY PARK, NY 11040
55680	NICHICON/AMERICA/CORP.	6435 N PROESEL AVENUE	CHICAGO, IL 60645
56289	SPRAGUE ELECTRIC CO.	87 MARSHALL ST.	NORTH ADAMS, MA 01247
71279	CAMBRIDGE THERMIONIC CORP.	445 CONCORD AVE.	CAMBRIDGE, MA 02138
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
73138	BECKMAN INSTRUMENTS, INC., HELIPOT DIV.	2500 HARBOR BLVD.	FULLERTON, CA 92634
73899	JFD ELECTRONICS COMPONENTS CORP.	PINETREE ROAD	OXFORD, NC 27565
75042	TRW ELECTRONIC COMPONENTS, IRC FIXED RESISTORS, PHILADELPHIA DIVISION	401 N. BROAD ST.	PHILADELPHIA, PA 19108
75378	CTS KNIGHTS, INC.	400 REIMANN AVE.	SANDWICH, IL 60548
76493	BELL INDUSTRIES, INC., MILLER, J. W., DIV.	19070 REYES AVE., P O BOX 5825	COMPTON, CA 90224
78488	STACKPOLE CARBON CO.		ST. MARYS, PA 15857
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
90201	MALLORY CAPACITOR CO., DIV. OF P. R. MALLORY AND CO., INC.	3029 E. WASHINGTON STREET P. O. BOX 372	INDIANAPOLIS, IN 46206
91418	RADIO MATERIALS COMPANY, DIV. OF P.R. MALLORY AND COMPANY, INC.	4242 W BRYN MAWR	CHICAGO, IL 60646
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NE 68601



Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A1	614-0559-00			FRONT PNL ASSY:	80009	614-0559-00
A1A1	670-3587-00	B010100	B039999	CKT BOARD ASSY:FRONT PANEL	80009	670-3587-00
A1A1	670-3587-01	B040000		CKT BOARD ASSY:FRONT PANEL	80009	670-3587-01
A1A2	260-1693-00	B010100	B030523	SWITCH,ROTARY:RES AND SPAN WIDTH (FURNISHED AS A UNIT WITH S64)	80009	260-1693-00
A1A2	260-1693-01	B030524	B089999	SWITCH,ROTARY:RES AND SPAN WIDTH (FURNISHED AS A UNIT WITH S64)	80009	260-1693-01
A1A2	263-0064-00	B090000		SWITCH,ROTARY:OPTICAL,FREQUENCY SPAN (FURNISHED AS A UNIT WITH S64)	80009	263-0064-00
A1A3	260-1694-00	B010100	B030523	SWITCH,ROTARY:SWEEP TIME (FURNISHED AS A UNIT WITH S66)	80009	260-1694-00
A1A3	260-1694-01	B030524	B089999	SWITCH,ROTARY:SWEEP TIME (FURNISHED AS A UNIT WITH S66)	80009	260-1694-01
A1A3	263-0063-00	B090000		SWITCH,ROTARY:OPTICAL,TIME/DIVISION (FURNISHED AS A UNIT WITH S66)	80009	263-0063-00
A100	644-0448-00			REFERENCE MDL:	80009	644-0448-00
A100A1	670-3578-00			CKT BOARD ASSY:MOTHER	80009	670-3578-00
A100A2	670-3579-00			CKT BOARD ASSY:"A" OSCILLATOR	80009	670-3579-00
A100A3	670-3580-00			CKT BOARD ASSY:A DIVIDER N	80009	670-3580-00
A100A4	670-3581-00			CKT BOARD ASSY:B DIVIDER N	80009	670-3581-00
A100A5	670-3582-00			CKT BOARD ASSY:1ST LO LOCK	80009	670-3582-00
A100A6	670-3583-00	B010100	B020259	CKT BOARD ASSY:"B" OSCILLATOR	80009	670-3583-00
A100A6	670-3583-01	B020260		CKT BOARD ASSY:"B" OSCILLATOR	80009	670-3583-01
A100A7	670-3584-00	B010100	B079999	CKT BOARD ASSY:"A" AND "B" OSCILLATOR CONTROL	80009	670-3584-00
A100A7	670-3584-01	B080000		CKT BOARD ASSY:"A" AND "B" OSCILLATOR CONTROL	80009	670-3584-01
A100A8	670-3585-00	B010100	B020259	CKT BOARD ASSY:REF OSCILLATOR AND CALIBRATOR	80009	670-3585-00
A100A8	670-3585-01	B020260		CKT BOARD ASSY:REF OSCILLATOR AND CALIBRATOR	80009	670-3585-01
A500	670-3586-00	B010100	B039999	CKT BOARD ASSY:SWEEP	80009	670-3586-00
A500	670-3586-01	B040000	B049999	CKT BOARD ASSY:SWEEP	80009	670-3586-01
A500	670-3586-02	B050000	B059999	CKT BOARD ASSY:SWEEP	80009	670-3586-02
A500	670-3586-03	B060000		CKT BOARD ASSY:SWEEP	80009	670-3586-03
A1000	644-0449-00			IF MODULE:	80009	644-0449-00
A1000A1	670-3590-00			CKT BOARD ASSY:IF MOTHER	80009	670-3590-00
A1000A2	670-3591-00	B010100	B029999	CKT BOARD ASSY:10.7 MHZ IF INPUT FILTER	80009	670-3591-00
A1000A2	670-3591-01	B030000		CKT BOARD ASSY:10.7 MHZ IF INPUT FILTER	80009	670-3591-01
A1000A3	670-3592-00			CKT BOARD ASSY:LOG LIN AMPLIFIER	80009	670-3592-00
A1000A4	670-3594-00			CKT BOARD ASSY:10.7 MHZ IF AMPLIFIER	80009	670-3594-00
A1000A5	670-3595-00	B010100	B049999	CKT BOARD ASSY:250 KHZ AMPLIFIER	80009	670-3595-00
A1000A5	670-3595-01	B050000		CKT BOARD ASSY:250 KHZ AMPLIFIER	80009	670-3595-01
A1000A6	670-3912-00			CKT BOARD ASSY:2ND LO	80009	670-3912-00
A1000A7	670-3914-00			CKT BOARD ASSY:MIXER	80009	670-3914-00
A1000A8	672-0486-00			CKT BOARD ASSY:RESOLUTION & CRYSTAL	80009	672-0486-00
A1000	670-3593-00	B010100	B049999	CKT BOARD ASSY:VARIABLE RESOLUTION	80009	670-3593-00
A8A1						
A1000	670-3593-01	B050000	B071109	CKT BOARD ASSY:VARIABLE RESOLUTION	80009	670-3593-01
A8A1						
A1000	670-3593-02	B071110		CKT BOARD ASSY:VARIABLE RESOLUTION	80009	670-3593-02
A8A1						
A1000	670-3425-10			CKT BOARD ASSY:CRYSTAL HOLDER	80009	670-3425-10
A8A2						
A2000	644-0451-00			RF TUBE MODULE:	80009	644-0451-00
A2000A1	644-0450-00			OSC BUFFER MDL:	80009	644-0450-00
A2000	670-3597-00			CKT BOARD ASSY:1ST LO	80009	670-3597-00
A1A1						
A2000	670-3598-00			CKT BOARD ASSY:1ST LO MOTHER	80009	670-3598-00
A1A2						
A2000A2	670-3596-00	B010100	B049999	CKT BOARD ASSY:VERTICAL CONTROL (FURNISHED AS A UNIT WITH 672-0556-00)	80009	670-3596-00

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A2000A2	670-3596-01	B050000	B059999	CKT BOARD ASSY:VERTICAL CONTROL (FURNISHED AS A UNIT WITH 672-0556-00)	80009	670-3596-01
A2000A2	670-3596-02	B060000		CKT BOARD ASSY:VERTICAL CONTROL (FURNISHED AS A UNIT WITH 672-0556-00)	80009	670-3596-02
A2000	670-4194-00			CKT BOARD ASSY:DCPL "A"	80009	670-4194-00
A2A1 } A2000 } A2A2 }	670-4195-00			CKT BOARD ASSY:DCPL "B"	80009	670-4195-00
A3000A1	670-3588-01			CKT BOARD ASSY:TRANSVERSE INTERFACE	80009	670-3588-01
A4000	670-3929-00	B010100	B069999X	CKT BOARD ASSY:DIGITAL AVERAGING	80009	670-3929-00
A4500	670-3928-01	B010100	B020259	CKT BOARD ASSY:DIGITAL STORAGE	80009	670-3928-01
A4500	670-3928-02	B020260	B030322	CKT BOARD ASSY:DIGITAL STORAGE	80009	670-3928-02
A4500	670-3928-03	B030323	B040999	CKT BOARD ASSY:DIGITAL STORAGE	80009	670-3928-03
A4500	670-3928-04	B050000	B069999X	CKT BOARD ASSY:DIGITAL STORAGE	80009	670-3928-04
A4700	670-5671-00	XB070000	B081399	CKT BOARD ASSY:DIGITAL STORAGE	80009	670-5671-00
A4700	670-5671-01	B081400		CKT BOARD ASSY:DIGITAL STORAGE	80009	670-5671-01
A4700A1	670-5670-00	XB070000		CKT BOARD ASSY:B MINUS A LED	80009	670-5670-00
C3	283-0028-01			CAP., FXD, CER DI:0.0022UF, 20%, 5V	56289	19C606
C11	283-0028-00			CAP., FXD, CER DI:0.0022UF, 20%, 50V	56289	19C606
C15	283-0028-00	XB040000		CAP., FXD, CER DI:0.0022UF, 20%, 50V	56289	19C606
C102	281-0752-00			CAP., FXD, CER DI:0.00175UF, 10A	72982	1214-007
C104	281-0752-00			CAP., FXD, CER DI:0.00175UF, 10A	72982	1214-007
C106	281-0752-00			CAP., FXD, CER DI:0.00175UF, 10A	72982	1214-007
C108	281-0752-00			CAP., FXD, CER DI:0.00175UF, 10A	72982	1214-007
C110	281-0752-00			CAP., FXD, CER DI:0.00175UF, 10A	72982	1214-007
C112	281-0752-00			CAP., FXD, CER DI:0.00175UF, 10A	72982	1214-007
C114	281-0752-00			CAP., FXD, CER DI:0.00175UF, 10A	72982	1214-007
C120	290-0574-00			CAP., FXD, ELCTLT:47UF, 10%, 20V	90201	TDC476K020CL
C122	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C124	290-0535-00	B010100	B030528	CAP., FXD, ELCTLT:33UF, 20%, 10V	56289	196D336X0010KA1
C124	290-0527-00	B030529		CAP., FXD, ELCTLT:15UF, 20%, 20V	90201	TDC156M020FL
C126	283-0204-00			CAP., FXD, CER DI:0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C127	283-0180-00	B010100	B071279	CAP., FXD, CER DI:5600PF, 20%, 200V	72982	8121N204 E 562M
C127	283-0210-00	B071280		CAP., FXD, CER DI:5600PF, 10%, 100V	72982	8131N145W5R562M
C128	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C129	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C132	283-0249-00			CAP., FXD, CER DI:0.068UF, 10%, 50V	72982	8131N075 C 683K
C137	281-0617-00			CAP., FXD, CER DI:15PF, 10%, 200V	72982	374001COG0150K
C142	283-0204-00			CAP., FXD, CER DI:0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C154	283-0204-00			CAP., FXD, CER DI:0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C156	290-0574-00			CAP., FXD, ELCTLT:47UF, 10%, 20V	90201	TDC476K020CL
C158	283-0204-00			CAP., FXD, CER DI:0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C160	290-0532-00			CAP., FXD, ELCTLT:150UF, 20%, 6V	90201	TDC157M006WLC
C162	290-0776-00			CAP., FXD, ELCTLT:22UF, +50-10%, 10V	55680	10ULA22V-T
C166	290-0526-00			CAP., FXD, ELCTLT:6.8UF, 20%, 6V	90201	TDC685M00NLE
C172	290-0526-00			CAP., FXD, ELCTLT:6.8UF, 20%, 6V	90201	TDC685M00NLE
C178	283-0359-00			CAP., FXD, CER DI:1000PF, 10%, 200V	72982	8131N203COG0102K
C179	290-0574-00			CAP., FXD, ELCTLT:47UF, 10%, 20V	90201	TDC476K020CL
C180	285-1118-00			CAP., FXD, PLSTC:0.5UF, 10%, 200V	80009	285-1118-00
C182	283-0114-00			CAP., FXD, CER DI:0.0015UF, 5%, 200V	72982	805-509B152J
C184	290-0574-00			CAP., FXD, ELCTLT:47UF, 10%, 20V	90201	TDC476K020CL
C186	290-0574-00			CAP., FXD, ELCTLT:47UF, 10%, 20V	90201	TDC476K020CL
C190	290-0535-00			CAP., FXD, ELCTLT:33UF, 20%, 10V	56289	196D336X0010KA1
C198	290-0535-00			CAP., FXD, ELCTLT:33UF, 20%, 10V	56289	196D336X0010KA1
C201	290-0574-00			CAP., FXD, ELCTLT:47UF, 10%, 20V	90201	TDC476K020CL
C204	283-0360-00			CAP., FXD, CER DI:3300PF, 10%, 200V	72982	8141M200A332K

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C210	283-0070-00			CAP., FXD, CER DI: 30PF, 10%, 50V	72982	8121-060C0G0300K
C212	285-1125-00			CAP., FXD, PLSTC: 0.5UF, 20%, 50V	80009	285-1125-00
C214	290-0574-00			CAP., FXD, ELCTLT: 47UF, 10%, 20V	90201	TDC476K020CL
C216	290-0776-00			CAP., FXD, ELCTLT: 22UF, +50-10%, 10V	55680	10ULA22V-T
C218	290-0776-00			CAP., FXD, ELCTLT: 22UF, +50-10%, 10V	55680	10ULA22V-T
C219	290-0574-00			CAP., FXD, ELCTLT: 47UF, 10%, 20V	90201	TDC476K020CL
C220	290-0527-00			CAP., FXD, ELCTLT: 15UF, 20%, 20V	90201	TDC156M020FL
C222	290-0527-00			CAP., FXD, ELCTLT: 15UF, 20%, 20V	90201	TDC156M020FL
C224	290-0527-00			CAP., FXD, ELCTLT: 15UF, 20%, 20V	90201	TDC156M020FL
C226	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C227	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C228	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C230	283-0114-00			CAP., FXD, CER DI: 0.0015UF, 5%, 200V	72982	805-509B152J
C232	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C236	283-0640-00			CAP., FXD, MICA D: 160PF, 1%, 100V	00853	D151E161FO
C237	283-0687-00			CAP., FXD, MICA D: 560PF, 2%, 300V	00853	D153E561GO
C238	283-0640-00			CAP., FXD, MICA D: 160PF, 1%, 100V	00853	D151E161FO
C240	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C242	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C244	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C248	283-0087-00			CAP., FXD, CER DI: 300PF, 10%, 1000V	56289	403637
C252	283-0239-00			CAP., FXD, CER DI: 0.022UF, 10%, 50V	72982	8121N083X7R0223K
C253	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C256	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C258	290-0574-00			CAP., FXD, ELCTLT: 47UF, 10%, 20V	90201	TDC476K020CL
C259	290-0535-00	B010100	B030528	CAP., FXD, ELCTLT: 33UF, 20%, 10V	56289	196D336X0010KA1
C259	290-0527-00	B030529		CAP., FXD, ELCTLT: 15UF, 20%, 20V	90201	TDC156M020FL
C260	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C261	290-0726-00	XB020260		CAP., FXD, ELCTLT: 220UF, 20%, 10V	56289	196D227X0010TE3
C262	283-0198-00			CAP., FXD, CER DI: 0.22UF, 20%, 50V	72982	8121N083Z5U0224M
C264	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C270	283-0180-00	B010100	B071279	CAP., FXD, CER DI: 5600PF, 20%, 200V	72982	8121N204 E 562M
C270	283-0210-00	B071280		CAP., FXD, CER DI: 5600PF, 10%, 100V	72982	8131N145W5R562M
C272	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C273	283-0191-00			CAP., FXD, CER DI: 0.022UF, 20%, 50V	72982	8121N075Z5U0223M
C274	290-0574-00			CAP., FXD, ELCTLT: 47UF, 10%, 20V	90201	TDC476K020CL
C276	283-0249-00			CAP., FXD, CER DI: 0.068UF, 10%, 50V	72982	8131N075 C 683K
C278	281-0617-00			CAP., FXD, CER DI: 15PF, 10%, 200V	72982	374001C0G0150K
C290	290-0517-00			CAP., FXD, ELCTLT: 6.8UF, 20%, 35V	56289	196D685X0035KA1
C292	290-0517-00			CAP., FXD, ELCTLT: 6.8UF, 20%, 35V	56289	196D685X0035KA1
C293	290-0574-00			CAP., FXD, ELCTLT: 47UF, 10%, 20V	90201	TDC476K020CL
C294	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C296	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C297	290-0574-00			CAP., FXD, ELCTLT: 47UF, 10%, 20V	90201	TDC476K020CL
C310	283-0070-00			CAP., FXD, CER DI: 30PF, 10%, 50V	72982	8121-060C0G0300K
C326	290-0517-00			CAP., FXD, ELCTLT: 6.8UF, 20%, 35V	56289	196D685X0035KA1
C330	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C334	283-0070-00			CAP., FXD, CER DI: 30PF, 10%, 50V	72982	8121-060C0G0300K
C340	283-0070-00			CAP., FXD, CER DI: 30PF, 10%, 50V	72982	8121-060C0G0300K
C348	290-0517-00			CAP., FXD, ELCTLT: 6.8UF, 20%, 35V	56289	196D685X0035KA1
C350	283-0000-00			CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P
C352	283-0000-00			CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P
C354	283-0000-00			CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P
C356	283-0000-00			CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P
C364	290-0574-00			CAP., FXD, ELCTLT: 47UF, 10%, 20V	90201	TDC476K020CL
C372	290-0488-00			CAP., FXD, ELCTLT: 2.2UF, 10%, 20V	90201	TAC225K020P02
C375	290-0488-00	XB080000		CAP., FXD, ELCTLT: 2.2UF, 10%, 20V	90201	TAC225K020P02

Replaceable Electrical Parts—7L5

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C376	290-0248-01			CAP., FXD, ELCTLT: 150UF, 20%, 15V	56289	150D157X0015S2
C382	283-0167-00			CAP., FXD, CER DI: 0.1UF, 10%, 100V	72982	8131N145X5R0104K
C386	283-0167-00			CAP., FXD, CER DI: 0.1UF, 10%, 100V	72982	8131N145X5R0104K
C392	283-0167-00			CAP., FXD, CER DI: 0.1UF, 10%, 100V	72982	8131N145X5R0104K
C394	283-0339-00			CAP., FXD, CER DI: 0.22UF, 10%, 50V	72982	8131N075W5R224K
C404	283-0203-00			CAP., FXD, CER DI: 0.47UF, 20%, 50V	72982	8131N075E474M
C408	283-0203-00			CAP., FXD, CER DI: 0.47UF, 20%, 50V	72982	8131N075E474M
C514	283-0032-00			CAP., FXD, CER DI: 470PF, 5%, 500V	72982	0831085Z5E00471J
C516	283-0032-00			CAP., FXD, CER DI: 470PF, 5%, 500V	72982	0831085Z5E00471J
C518	283-0032-00			CAP., FXD, CER DI: 470PF, 5%, 500V	72982	0831085Z5E00471J
C569	283-0154-00			CAP., FXD, CER DI: 22PF, 5%, 50V	72982	8111B061C0G220J
C576	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C580	290-0536-00			CAP., FXD, ELCTLT: 10UF, 20%, 25V	90201	TDC106M025FL
C582	290-0536-00			CAP., FXD, ELCTLT: 10UF, 20%, 25V	90201	TDC106M025FL
C588	283-0177-00			CAP., FXD, CER DI: 1UF, +80-20%, 25V	56289	273C5
C589	290-0526-00			CAP., FXD, ELCTLT: 6.8UF, 20%, 6V	90201	TDC685M00NLE
C592	283-0191-00			CAP., FXD, CER DI: 0.022UF, 20%, 50V	72982	8121N075Z5U0223M
C593	290-0524-00			CAP., FXD, ELCTLT: 4.7UF, 20%, 10V	90201	TDC475M010EL
C610	283-0201-00			CAP., FXD, CER DI: 27PF, 10%, 200V	72982	8101B210X7R0270K
C616	290-0532-00			CAP., FXD, ELCTLT: 150UF, 20%, 6V	90201	TDC157M006WLC
C620	283-0238-00			CAP., FXD, CER DI: 0.01UF, 10%, 50V	72982	8121N075X7R0103K
C620	283-0238-00			CAP., FXD, CER DI: 0.01UF, 10%, 50V	72982	8121N075X7R0103K
C621	283-0198-00			CAP., FXD, CER DI: 0.22UF, 20%, 50V	72982	8121N083Z5U0224M
C622	283-0238-00			CAP., FXD, CER DI: 0.01UF, 10%, 50V	72982	8121N075X7R0103K
C626	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C629	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C670	283-0087-00			CAP., FXD, CER DI: 300PF, 10%, 1000V	56289	403637
C674	283-0203-00			CAP., FXD, CER DI: 0.47UF, 20%, 50V	72982	8131N075E474M
C676	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C710	283-0201-00			CAP., FXD, CER DI: 27PF, 10%, 200V	72982	8101B210X7R0270K
C712A)	295-0178-00			CAP., SET, MTCHD: 0.05UF, 4.95UF, MATCHED 1%	80009	295-0178-00
C712B)						
C724	283-0191-00	XB010158		CAP., FXD, CER DI: 0.022UF, 20%, 50V	72982	8121N075Z5U0223M
C726	283-0198-00			CAP., FXD, CER DI: 0.22UF, 20%, 50V	72982	8121N083Z5U0224M
C728	283-0176-00			CAP., FXD, CER DI: 0.0022UF, 20%, 50V	72982	8121B058X7R0222M
C758	283-0177-00			CAP., FXD, CER DI: 1UF, +80-20%, 25V	56289	273C5
C772	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C784	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C786	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C788	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C790	283-0003-00			CAP., FXD, CER DI: 0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C830	283-0103-00			CAP., FXD, CER DI: 180PF, 5%, 500V	56289	40C638
C832	283-0103-00			CAP., FXD, CER DI: 180PF, 5%, 500V	56289	40C638
C840	283-0065-00			CAP., FXD, CER DI: 0.001UF, 5%, 100V	72982	805-518-Z5D0102J
C841	283-0198-00			CAP., FXD, CER DI: 0.22UF, 20%, 50V	72982	8121N083Z5U0224M
C860	283-0640-00			CAP., FXD, MICA D: 160PF, 1%, 100V	00853	D151E161F0
C880	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1002	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1010	281-0752-00			CAP., FXD, CER DI: 0.00175UF, 10A	72982	1214-007
C1012	283-0154-00			CAP., FXD, CER DI: 22PF, 5%, 50V	72982	8111B061C0G220J
C1014	281-0752-00			CAP., FXD, CER DI: 0.00175UF, 10A	72982	1214-007
C1016	283-0154-00			CAP., FXD, CER DI: 22PF, 5%, 50V	72982	8111B061C0G220J
C1018	281-0752-00			CAP., FXD, CER DI: 0.00175UF, 10A	72982	1214-007
C1040	283-0706-00			CAP., FXD, MICA D: 91PF, +/-1PF, 500V	00853	D15-5E910F0
C1042	281-0167-00			CAP., VAR, CER DI: 9-45PF, 200V	72982	538-011-D 9-45
C1050	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1052	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M

Replaceable Electrical Parts—7L5

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
C1053	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1054	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1056	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1058	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1059	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1060	283-0000-00		CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P
C1074	283-0204-00		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1088	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1102	281-0509-00		CAP., FXD, CER DI: 15PF, +/-1.5PF, 500V	72982	301-000C0G0150K
C1104	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1110	283-0000-00		CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P
C1128	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1132	281-0509-00		CAP., FXD, CER DI: 15PF, +/-1.5PF, 500V	72982	301-000C0G0150K
C1134	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1140	283-0000-00		CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P
C1158	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1164	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1169	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1170	283-0000-00		CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P
C1182	281-0509-00		CAP., FXD, CER DI: 15PF, +/-1.5PF, 500V	72982	301-000C0G0150K
C1184	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1198	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1202	281-0509-00		CAP., FXD, CER DI: 15PF, +/-1.5PF, 500V	72982	301-000C0G0150K
C1214	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1216	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1220	283-0204-00		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1222	283-0051-00		CAP., FXD, CER DI: 0.0033UF, 5%, 100V	72982	813N145C0G0332J
C1224	281-0605-00		CAP., FXD, CER DI: 200PF, 10%, 500V	04222	7001-1375
C1226	283-0204-00		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1234	283-0204-00		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1240	283-0204-00		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1242	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1246	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1248	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1254	283-0268-00		CAP., FXD, CER DI: 0.015UF, 10%, 50V	72982	8121N083X7R0153K
C1256	283-0204-00		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1258	281-0551-00		CAP., FXD, CER DI: 390PF, 10%, 500V	04222	7001-1363
C1300	283-0604-00		CAP., FXD, MICA D: 304PF, 2%, 300V	00853	D153F3040G0
C1302	283-0204-00		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1304	290-0718-00		CAP., FXD, ELCTLT: 22UF, 20%, 35V	56289	196D226X0035PE4
C1306	290-0718-00		CAP., FXD, ELCTLT: 22UF, 20%, 35V	56289	196D226X0035PE4
C1312	283-0204-00		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1316	281-0579-00		CAP., FXD, CER DI: 21PF, 5%, 500V	72982	301-050C0G0210J
C1318	283-0204-00		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1320	283-0204-00		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1326	283-0204-00		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1350	283-0177-00		CAP., FXD, CER DI: 1UF, +80-20%, 25V	56289	273C5
C1354	283-0177-00		CAP., FXD, CER DI: 1UF, +80-20%, 25V	56289	273C5
C1364	283-0177-00		CAP., FXD, CER DI: 1UF, +80-20%, 25V	56289	273C5
C1374	283-0177-00		CAP., FXD, CER DI: 1UF, +80-20%, 25V	56289	273C5
C1380	283-0177-00		CAP., FXD, CER DI: 1UF, +80-20%, 25V	56289	273C5
C1384	283-0177-00		CAP., FXD, CER DI: 1UF, +80-20%, 25V	56289	273C5
C1390	290-0523-00		CAP., FXD, ELCTLT: 2.2UF, 20%, 20V	56289	196D225X0020HA1
C1392	283-0026-00		CAP., FXD, CER DI: 0.2UF, +80-20%, 25V	56289	274C3
C1400	283-0167-00		CAP., FXD, CER DI: 0.1UF, 10%, 100V	72982	8131N145X5R0104K
C1402	283-0204-00		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1406	283-0156-00		CAP., FXD, CER DI: 1000PF, +100-0%, 200V	72982	8111A208Z5U0102Z

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C1408	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1410	290-0523-00			CAP., FXD, ELCTLT: 2.2UF, 20%, 20V	56289	196D225X0020HA1
C1412	290-0523-00			CAP., FXD, ELCTLT: 2.2UF, 20%, 20V	56289	196D225X0020HA1
C1417	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1418	283-0070-00			CAP., FXD, CER DI: 30PF, 10%, 50V	72982	8121-060C0G0300K
C1420	283-0051-00			CAP., FXD, CER DI: 0.0033UF, 5%, 100V	72982	813N145C0G0332J
C1422	283-0180-00			CAP., FXD, CER DI: 5600PF, 20%, 200V	72982	8121N204 E 562M
C1430	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1436	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1440	283-0087-00			CAP., FXD, CER DI: 300PF, 10%, 1000V	56289	403637
C1442	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1448	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1452	283-0087-00			CAP., FXD, CER DI: 300PF, 10%, 1000V	56289	403637
C1454	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1458	283-0203-00			CAP., FXD, CER DI: 0.47UF, 20%, 50V	72982	8131N075E474M
C1460	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1462	283-0087-00			CAP., FXD, CER DI: 300PF, 10%, 1000V	56289	403637
C1464	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1468	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1500	283-0023-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 12V	91418	MX0104Z1205R5
C1501	290-0527-00			CAP., FXD, ELCTLT: 15UF, 20%, 20V	90201	TDC156M020FL
C1502	283-0023-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 12V	91418	MX0104Z1205R5
C1503	283-0023-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 12V	91418	MX0104Z1205R5
C1506	290-0527-00			CAP., FXD, ELCTLT: 15UF, 20%, 20V	90201	TDC156M020FL
C1507	283-0178-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 100V	72982	8131N145651 104Z
C1508	290-0523-00			CAP., FXD, ELCTLT: 2.2UF, 20%, 20V	56289	196D225X0020HA1
C1510	283-0023-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 12V	91418	MX0104Z1205R5
C1511	283-0080-00			CAP., FXD, CER DI: 0.022UF, +80-20%, 25V	56289	19C611
C1512	283-0032-00			CAP., FXD, CER DI: 470PF, 5%, 500V	72982	0831085Z5E00471J
C1520	283-0156-00			CAP., FXD, CER DI: 1000PF, +100-0%, 200V	72982	8111A208Z5U0102Z
C1522	283-0023-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 12V	91418	MX0104Z1205R5
C1528	283-0080-00			CAP., FXD, CER DI: 0.022UF, +80-20%, 25V	56289	19C611
C1532	283-0220-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N075X7R0103M
C1533	290-0527-00			CAP., FXD, ELCTLT: 15UF, 20%, 20V	90201	TDC156M020FL
C1534	290-0527-00			CAP., FXD, ELCTLT: 15UF, 20%, 20V	90201	TDC156M020FL
C1540	290-0534-00			CAP., FXD, ELCTLT: 1UF, 20%, 35V	56289	196D105X0035HA1
C1600	281-0158-00			CAP., VAR, CER DI: 7-45PF, 50V	73899	DVJ-5006
C1602	283-0672-00			CAP., FXD, MICA D: 200PF, 1%, 500V (NOMINAL VALUE, SELECTED)	00853	D155F2010F0
C1604	281-0158-00			CAP., VAR, CER DI: 7-45PF, 50V	73899	DVJ-5006
C1606	281-0544-00			CAP., FXD, CER DI: 5.6PF, 10%, 500V	72982	301-000C0H0569D
C1608	283-0672-00			CAP., FXD, MICA D: 200PF, 1%, 500V (NOMINAL VALUE, SELECTED)	00853	D155F2010F0
C1632	283-0051-00			CAP., FXD, CER DI: 0.0033UF, 5%, 100V	72982	813N145C0G0332J
C1634	283-0238-00			CAP., FXD, CER DI: 0.01UF, 10%, 50V	72982	8121N075X7R0103K
C1650	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1652	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1654	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1656	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1658	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1660	281-0093-00			CAP., VAR, CER DI: 5.5-18PF	72982	538-011A5.5-18
C1662	283-0604-00			CAP., FXD, MICA D: 304PF, 2%, 300V	00853	D153F3040G0
C1664	281-0093-00			CAP., VAR, CER DI: 5.5-18PF	72982	538-011A5.5-18
C1666	281-0125-00			CAP., VAR, MICA D: 90-400PF, 175V	52769	GMC30900
C1668	281-0604-00	B010100	B030408	CAP., FXD, CER DI: 2.2PF, +/-0.25PF, 500V	72982	301-000C0J0229C
C1668	281-0503-00	B030409		CAP., FXD, CER DI: 8PF, +/-0.5PF, 500V	72982	301-000C0H0809D
C1670	283-0177-00			CAP., FXD, CER DI: 1UF, +80-20%, 25V	56289	273C5

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C1672	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1680	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1681	283-0177-00			CAP., FXD, CER DI:1UF, +80-20%, 25V	56289	273C5
C1682	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1690	283-0177-00			CAP., FXD, CER DI:1UF, +80-20%, 25V	56289	273C5
C1710	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1712	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1714	283-0204-00			CAP., FXD, CER DI:0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1716	283-0204-00			CAP., FXD, CER DI:0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1718	283-0197-00			CAP., FXD, CER DI:470PF, 5%, 100V	72982	8121N075C0G0471J
C1719	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1720	281-0093-00			CAP., VAR, CER DI:5.5-18PF	72982	538-011A5.5-18
C1724	281-0093-00			CAP., VAR, CER DI:5.5-18PF	72982	538-011A5.5-18
C1726	281-0125-00			CAP., VAR, MICA D:90-400PF, 175V	52769	GMC30900
C1727	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1728	281-0604-00			CAP., FXD, CER DI:2.2PF, +/-0.25PF, 500V	72982	301-000C0J0229C
C1730	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1731	283-0177-00			CAP., FXD, CER DI:1UF, +80-20%, 25V	56289	273C5
C1732	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1740	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1741	283-0177-00			CAP., FXD, CER DI:1UF, +80-20%, 25V	56289	273C5
C1742	283-0177-00			CAP., FXD, CER DI:1UF, +80-20%, 25V	56289	273C5
C1744	283-0177-00			CAP., FXD, CER DI:1UF, +80-20%, 25V	56289	273C5
C1746	283-0204-00			CAP., FXD, CER DI:0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1749	283-0177-00			CAP., FXD, CER DI:1UF, +80-20%, 25V	56289	273C5
C1750	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1752	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1756	283-0204-00			CAP., FXD, CER DI:0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1760	281-0093-00			CAP., VAR, CER DI:5.5-18PF	72982	538-011A5.5-18
C1762	283-0197-00			CAP., FXD, CER DI:470PF, 5%, 100V	72982	8121N075C0G0471J
C1764	281-0093-00			CAP., VAR, CER DI:5.5-18PF	72982	538-011A5.5-18
C1766	281-0125-00			CAP., VAR, MICA D:90-400PF, 175V	52769	GMC30900
C1768	283-0204-00			CAP., FXD, CER DI:0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1772	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1774	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1776	283-0204-00			CAP., FXD, CER DI:0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1778	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1780	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1781	283-0177-00			CAP., FXD, CER DI:1UF, +80-20%, 25V	56289	273C5
C1782	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1800	281-0093-00			CAP., VAR, CER DI:5.5-18PF	72982	538-011A5.5-18
C1802	283-0197-00			CAP., FXD, CER DI:470PF, 5%, 100V	72982	8121N075C0G0471J
C1804	281-0093-00			CAP., VAR, CER DI:5.5-18PF	72982	538-011A5.5-18
C1806	281-0125-00			CAP., VAR, MICA D:90-400PF, 175V	52769	GMC30900
C1816	283-0177-00			CAP., FXD, CER DI:1UF, +80-20%, 25V	56289	273C5
C1820	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1821	283-0177-00			CAP., FXD, CER DI:1UF, +80-20%, 25V	56289	273C5
C1822	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1830	283-0204-00			CAP., FXD, CER DI:0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1834	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1842	283-0177-00			CAP., FXD, CER DI:1UF, +80-20%, 25V	56289	273C5
C1844	283-0177-00			CAP., FXD, CER DI:1UF, +80-20%, 25V	56289	273C5
C1846	283-0177-00			CAP., FXD, CER DI:1UF, +80-20%, 25V	56289	273C5
C1847	283-0177-00			CAP., FXD, CER DI:1UF, +80-20%, 25V	56289	273C5
C1848	283-0177-00			CAP., FXD, CER DI:1UF, +80-20%, 25V	56289	273C5
C1850	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1852	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M

## Replaceable Electrical Parts—7L5

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
C1854	283-0641-00		CAP., FXD, MICA D: 180PF, 1%, 100V	00853	D151E181F0
C1856	283-0672-00		CAP., FXD, MICA D: 200PF, 1%, 500V	00853	D155F2010F0
C1859	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1860	283-0159-00		CAP., FXD, CER DI: 18PF, 5%, 50V	72982	8111B065C0G0180J
C1862	281-0645-00		CAP., FXD, CER DI: 8.2PF, +/-0.25PF, 500V	72982	374018C0H0829C
C1864	283-0670-00		CAP., FXD, MICA D: 375PF, 1%, 500V	00853	D155F3750F0
C1866	283-0698-00		CAP., FXD, MICA D: 390PF, 1%, 500V	09023	CD15ED391F03
C1868	281-0616-00		CAP., FXD, CER DI: 6.8PF, +/-0.5PF, 200V	72982	374001C0H0689D
C1870	283-0698-00		CAP., FXD, MICA D: 390PF, 1%, 500V	09023	CD15ED391F03
C1872	281-0715-00		CAP., FXD, CER DI: 10.7PF, 1%, 500V	72982	374005C0G01079F
C1874	283-0672-00		CAP., FXD, MICA D: 200PF, 1%, 500V	00853	D155F2010F0
C1876	283-0638-00		CAP., FXD, MICA D: 130PF, 1%, 100V	00853	D151F131F0
C1878	283-0634-00		CAP., FXD, MICA D: 65PF, 1%, 100V	00853	D151E650F0
C1879	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1884	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1886	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1888	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1894	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1895	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1896	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1902	283-0204-00		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C1904	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1906	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1910	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1912	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1913	283-0659-00		CAP., FXD, MICA D: 1160PF, 2%, 500V	00853	D195C1161G0
C1914	283-0697-00		CAP., FXD, MICA D: 545PF, 1%, 300V	09023	CD15EC(545)F03
C1916	283-0642-00		CAP., FXD, MICA D: 33PF, +/-0.5PF, 300V	00853	D10-5E330G
C1918	283-0697-00		CAP., FXD, MICA D: 545PF, 1%, 300V	09023	CD15EC(545)F03
C1919	283-0659-00		CAP., FXD, MICA D: 1160PF, 2%, 500V	00853	D195C1161G0
C2000	290-0135-00		CAP., FXD, ELCLTL: 15UF, 20%, 20V	56289	150D156X0020B2
C2012	290-0524-00		CAP., FXD, ELCLTL: 4.7UF, 20%, 10V	90201	TDC475M010EL
C2026	283-0156-00		CAP., FXD, CER DI: 1000PF, +100-0%, 200V	72982	8111A208Z5U0102Z
C2030	290-0523-00		CAP., FXD, ELCLTL: 2.2UF, 20%, 20V	56289	196D225X0020HA1
C2031	SELECTED				
C2032	283-0051-00		CAP., FXD, CER DI: 0.0033UF, 5%, 100V	72982	813N145C0G0332J
C2034	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C2040	290-0517-00		CAP., FXD, ELCLTL: 6.8UF, 20%, 35V	56289	196D685X0035KA1
C2044	283-0156-00		CAP., FXD, CER DI: 1000PF, +100-0%, 200V	72982	8111A208Z5U0102Z
C2046	290-0512-00		CAP., FXD, ELCLTL: 22UF, 20%, 15V	56289	196D226X0015KA1
C2048	283-0005-00		CAP., FXD, CER DI: 0.01UF, +100-0%, 250V	72982	8131N300Z5U0103P
C2052	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C2060	281-0617-00		CAP., FXD, CER DI: 15PF, 10%, 200V	72982	374001C0G0150K
C2064	283-0087-00		CAP., FXD, CER DI: 300PF, 10%, 1000V	56289	403637
C2102	281-0752-00		CAP., FXD, CER DI: 0.00175UF, 10A	72982	1214-007
C2104	281-0752-00		CAP., FXD, CER DI: 0.00175UF, 10A	72982	1214-007
C2106	281-0752-00		CAP., FXD, CER DI: 0.00175UF, 10A	72982	1214-007
C2258	283-0177-00		CAP., FXD, CER DI: 1UF, +80-20%, 25V	56289	273C5
C2268	283-0203-00		CAP., FXD, CER DI: 0.47UF, 20%, 50V	72982	8131N075E474M
C2269	283-0204-00		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C2270	283-0204-00		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C2287	283-0204-00		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C2289	283-0204-00		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C2290	283-0204-00		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C2291	283-0204-00		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C2310	290-0114-00		CAP., FXD, ELCLTL: 47UF, 20%, 6V	56289	150D476X0006B2
C2314	283-0204-00		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M



Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C2320	290-0530-00			CAP., FXD, ELCLTL: 68UF, 20%, 6V	90201	TDC686M006NLF
C2360	283-0203-00			CAP., FXD, CER DI: 0.47UF, 20%, 50V	72982	8131N075E474M
C2368	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C2371	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C2373	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C2377	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C2381	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C2384	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C2386	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C2387	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C2388	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C2391	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C2393	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C3002	283-0238-00			CAP., FXD, CER DI: 0.01UF, 10%, 50V	72982	8121N075X7R0103K
C3004	283-0177-00			CAP., FXD, CER DI: 1UF, +80-20%, 25V	56289	273C5
C3014	283-0641-00			CAP., FXD, MICA D: 180PF, 1%, 100V	00853	D151E181F0
C4094	283-0204-00	B010100	B069999X	CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C4158	281-0579-00	B010100	B069999X	CAP., FXD, CER DI: 21PF, 5%, 500V	72982	301-050C0G0210J
C4160	281-0523-00	B010100	B010104X	CAP., FXD, CER DI: 100PF, +/-20PF, 500V	72982	301-000U2M0101M
C4160	281-0523-00	XB020275	B069999X	CAP., FXD, CER DI: 100PF, +/-20PF, 500V (NOMINAL VALUE, SELECTED)	72982	301-000U2M0101M
C4172	283-0111-00	B010100	B069999X	CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C4174	283-0111-00	B010100	B069999X	CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C4176	283-0111-00	B010100	B069999X	CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C4178	283-0111-00	B010100	B069999X	CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C4180	283-0111-00	B010100	B069999X	CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C4182	281-0536-00	B010100	B069999X	CAP., FXD, CER DI: 1000PF, 10%, 500V	72982	301000 X5P0 102K
C4184	290-0425-00	B010100	B069999X	CAP., FXD, ELCLTL: 100UF, 20%, 20V	90201	THF107M020P1G
C4186	281-0536-00	B010100	B069999X	CAP., FXD, CER DI: 1000PF, 10%, 500V	72982	301000 X5P0 102K
C4189	281-0629-00	B010100	B020274	CAP., FXD, CER DI: 33PF, 5%, 600V	72982	308-000C0G0330J
C4189	281-0515-00	B020275	B069999X	CAP., FXD, CER DI: 27PF, +/-1.35PF, 500V	72982	302-005C0G0270J
C4193	281-0523-00	B010100	B069999X	CAP., FXD, CER DI: 100PF, +/-20PF, 500V	72982	301-000U2M0101M
C4195	281-0504-00	B010100	B069999X	CAP., FXD, CER DI: 10PF, +/-1PF, 500V	72982	301-055C0G0100F
C4196	281-0504-00	B010100	B069999X	CAP., FXD, CER DI: 10PF, +/-1PF, 500V	72982	301-055C0G0100F
C4531	281-0579-00	XB010105	B020274	CAP., FXD, CER DI: 21PF, 5%, 500V	72982	301-050C0G0210J
C4531	281-0656-00	B020275	B030339	CAP., FXD, CER DI: 22PF, 5%, 500V	72982	374005C0G0220J
C4531	281-0656-00	B030340	B069999X	CAP., FXD, CER DI: 22PF, 5%, 500V	72982	374005C0G0220J
C4532	281-0525-00	XB030325	B069999X	CAP., FXD, CER DI: 470PF, +/-94PF, 500V	04222	7001-1364
C4533	281-0525-00	B010100	B069999X	CAP., FXD, CER DI: 470PF, +/-94PF, 500V	04222	7001-1364
C4534	281-0579-00	B010100	B069999X	CAP., FXD, CER DI: 21PF, 5%, 500V	72982	301-050C0G0210J
C4538	281-0523-00	B010100	B069999X	CAP., FXD, CER DI: 100PF, +/-20PF, 500V	72982	301-000U2M0101M
C4542	283-0139-00	B010100	B010115	CAP., FXD, CER DI: 150PF, 20%, 50V	51642	W100-050-X5F151M
C4542	283-0139-00	B010116	B030322X	CAP., FXD, CER DI: 150PF, 20%, 50V (NOMINAL VALUE, SELECTED)	51642	W100-050-X5F151M
C4545	281-0523-00	B010100	B069999X	CAP., FXD, CER DI: 100PF, +/-20PF, 500V	72982	301-000U2M0101M
C4547	283-0330-00	B010100	B069999X	CAP., FXD, CER DI: 100PF, 5%, 50V	72982	8111N068C0G0101J
C4548	283-0203-00	B010100	B069999X	CAP., FXD, CER DI: 0.47UF, 20%, 50V	72982	8131N075E474M
C4553	281-0525-00	B010100	B030322	CAP., FXD, CER DI: 470PF, +/-94PF, 500V	04222	7001-1364
C4553	283-0631-00	B030323	B069999X	CAP., FXD, MICA D: 95PF, 1%, 100V	00853	D151E950F0
C4558	281-0637-00	B010100	B030322	CAP., FXD, CER DI: 91PF, 5%, 500V	72982	301000Z5D910J
C4558	283-0631-00	B030323	B069999X	CAP., FXD, MICA D: 95PF, 1%, 100V	00853	D151E950F0
C4561	281-0525-00	B010100	B030322	CAP., FXD, CER DI: 470PF, +/-94PF, 500V	04222	7001-1364
C4561	283-0631-00	B030323	B030417	CAP., FXD, MICA D: 95PF, 1%, 100V	00853	D151E950F0
C4561	281-0605-00	B030418	B069999X	CAP., FXD, CER DI: 200PF, 10%, 500V	04222	7001-1375
C4571	283-0111-00	XB010116	B069999X	CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C4576	283-0204-00	B010100	B069999X	CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C4580	283-0204-00	B010100	B010115X	CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M

**Replaceable Electrical Parts—7L5**

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C4585	281-0536-00	XB020260	B069999X	CAP., FXD, CER DI: 1000PF, 10%, 500V	72982	301000 X5P0 102K
C4587	290-0536-00	B010100	B069999X	CAP., FXD, ELCTLT: 10UF, 20%, 25V	90201	TDC106M025FL
C4589	281-0536-00	B010100	B069999X	CAP., FXD, CER DI: 1000PF, 10%, 500V	72982	301000 X5P0 102K
C4591	283-0111-00	XB010116	B069999X	CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C4594	283-0204-00	B010100	B069999X	CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C4600	283-0204-00	B010100	B069999X	CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C4610	281-0536-00	B010100	B069999X	CAP., FXD, CER DI: 1000PF, 10%, 500V	72982	301000 X5P0 102K
C4612	281-0523-00	B010100	B069999X	CAP., FXD, CER DI: 100PF, +/-20PF, 500V	72982	301-000U2M0101M
C4618	281-0551-00	B010100	B069999X	CAP., FXD, CER DI: 390PF, 10%, 500V	04222	7001-1363
C4620	281-0605-00	B010100	B069999X	CAP., FXD, CER DI: 200PF, 10%, 500V	04222	7001-1375
C4628	281-0536-00	B010100	B069999X	CAP., FXD, CER DI: 1000PF, 10%, 500V	72982	301000 X5P0 102K
C4630	290-0527-00	B010100	B069999X	CAP., FXD, ELCTLT: 15UF, 20%, 20V	90201	TDC156M020FL
C4632	281-0536-00	B010100	B069999X	CAP., FXD, CER DI: 1000PF, 10%, 500V	72982	301000 X5P0 102K
C4633	281-0536-00	B010100	B069999X	CAP., FXD, CER DI: 1000PF, 10%, 500V	72982	301000 X5P0 102K
C4634	290-0527-00	B010100	B069999X	CAP., FXD, ELCTLT: 15UF, 20%, 20V	90201	TDC156M020FL
C4636	281-0536-00	B010100	B069999X	CAP., FXD, CER DI: 1000PF, 10%, 500V	72982	301000 X5P0 102K
C4637	281-0536-00	B010100	B069999X	CAP., FXD, CER DI: 1000PF, 10%, 500V	72982	301000 X5P0 102K
C4638	290-0527-00	B010100	B069999X	CAP., FXD, ELCTLT: 15UF, 20%, 20V	90201	TDC156M020FL
C4640	281-0536-00	B010100	B069999X	CAP., FXD, CER DI: 1000PF, 10%, 500V	72982	301000 X5P0 102K
C4642	290-0535-00	B010100	B069999X	CAP., FXD, ELCTLT: 33UF, 20%, 10V	56289	196D336X0010KA1
C4643	283-0204-00	B010100	B069999X	CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C4644	283-0204-00	B010100	B069999X	CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C4646	290-0536-00	B010100	B069999X	CAP., FXD, ELCTLT: 10UF, 20%, 25V	90201	TDC106M025FL
C4648	290-0527-00	B010100	B069999X	CAP., FXD, ELCTLT: 15UF, 20%, 20V	90201	TDC156M020FL
C4660	283-0111-00	B010100	B069999X	CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C4662	283-0111-00	B010100	B069999X	CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C4664	283-0111-00	B010100	B069999X	CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C4666	283-0111-00	B010100	B069999X	CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C4668	283-0111-00	B010100	B069999X	CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C4701	283-0157-00	XB070000		CAP., FXD, CER DI: 7PF, 5%, 500V	72982	8111B064C0H0709J
C4702	283-0637-00	XB070000		CAP., FXD, MICA D: 20PF, 2.5%, 100V	00853	D151E200D0
C4704	283-0060-00	XB070000		CAP., FXD, CER DI: 100PF, 5%, 200V	72982	855-535U2J101J
C4705	283-0637-00	XB070000		CAP., FXD, MICA D: 20PF, 2.5%, 100V	00853	D151E200D0
C4706	283-0624-00	XB070000		CAP., FXD, MICA D: 1300PF, 2%, 500V	00853	D195E132G0
C4708	281-0125-00	XB070000		CAP., VAR, MICA D: 90-400PF, 175V	52769	GMC30900
C4709	283-0157-00	XB070000		CAP., FXD, CER DI: 7PF, 5%, 500V	72982	8111B064C0H0709J
C4720	290-0782-00	XB070000		CAP., FXD, ELCTLT: 4.7UF, +75-10%, 35V	56289	503D475G035AS
C4725	290-0782-00	XB070000		CAP., FXD, ELCTLT: 4.7UF, +75-10%, 35V	56289	503D475G035AS
C4728	290-0782-00	XB070000		CAP., FXD, ELCTLT: 4.7UF, +75-10%, 35V	56289	503D475G035AS
C4730	283-0047-00	XB070000		CAP., FXD, CER DI: 270PF, 5%, 500V	72982	0831522Z5D00271J
C4732	283-0065-00	XB070000		CAP., FXD, CER DI: 0.001UF, 5%, 100V	72982	805-518-Z5D0102J
C4740	290-0782-00	XB070000		CAP., FXD, ELCTLT: 4.7UF, +75-10%, 35V	56289	503D475G035AS
C4741	283-0204-00	XB070000		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C4742	283-0204-00	XB070000		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C4743	283-0204-00	XB070000		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C4744	283-0204-00	XB070000		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C4745	283-0065-00	XB070000		CAP., FXD, CER DI: 0.001UF, 5%, 100V	72982	805-518-Z5D0102J
C4747	283-0065-00	XB070000		CAP., FXD, CER DI: 0.001UF, 5%, 100V	72982	805-518-Z5D0102J
C4748	283-0065-00	XB070000		CAP., FXD, CER DI: 0.001UF, 5%, 100V	72982	805-518-Z5D0102J
C4750	283-0204-00	XB070000		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C4751	283-0204-00	XB070000		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C4752	283-0204-00	XB070000		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C4753	283-0204-00	XB070000		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C4754	283-0204-00	XB070000		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C4755	283-0204-00	XB070000		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C4756	283-0204-00	XB070000		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C4757	283-0204-00	XB070000		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C4758	283-0204-00	XB070000		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C4759	283-0204-00	XB070000		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C4760	290-0755-00	XB070000		CAP., FXD, ELCTLT: 100UF, +50-10%, 10V	56289	502D223
C4764	290-0782-00	XB070000		CAP., FXD, ELCTLT: 4.7UF, +75-10%, 35V	56289	503D475G035AS
C4766	290-0782-00	XB070000		CAP., FXD, ELCTLT: 4.7UF, +75-10%, 35V	56289	503D475G035AS
C4768	290-0782-00	XB070000		CAP., FXD, ELCTLT: 4.7UF, +75-10%, 35V	56289	503D475G035AS
C4770	283-0204-00	XB070000		CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C4772	283-0065-00	XB071182		CAP., FXD, CER DI: 0.001UF, 5%, 100V	72982	805-518-Z5D0102J
C4775	283-0032-00	XB081400		CAP., FXD, CER DI: 470PF, 5%, 500V	72982	0831085Z5E00471J
CR3	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR9	150-1004-00	B010100	B030489	LAMP, LED: RED, 2.5V, 15MA	08806	SSL-12
CR9	150-1040-00	B030490	B030749	LAMP, LED: RED, 5MA, 2.0V	50347	LLL-7A
CR9	150-1050-00	B030750		LT EMITTING DIO: RED	50579	RL-T1
CR11	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR16	150-1004-00	B010100	B030489	LAMP, LED: RED, 2.5V, 15MA	08806	SSL-12
CR16	150-1040-00	B030490	B030749	LAMP, LED: RED, 5MA, 2.0V	50347	LLL-7A
CR16	150-1050-00	B030750		LT EMITTING DIO: RED	50579	RL-T1
CR19	150-1004-00	B010100	B030489	LAMP, LED: RED, 2.5V, 15MA	08806	SSL-12
CR19	150-1040-00	B030490	B030749	LAMP, LED: RED, 5MA, 2.0V	50347	LLL-7A
CR19	150-1050-00	B030750		LT EMITTING DIO: RED	50579	RL-T1
CR24	150-1004-00	B010100	B030489	LAMP, LED: RED, 2.5V, 15MA	08806	SSL-12
CR24	150-1040-00	B030490	B030749	LAMP, LED: RED, 5MA, 2.0V	50347	LLL-7A
CR24	150-1050-00	B030750		LT EMITTING DIO: RED	50579	RL-T1
CR34	150-1004-00	B010100	B030489	LAMP, LED: RED, 2.5V, 15MA	08806	SSL-12
CR34	150-1040-00	B030490	B030749	LAMP, LED: RED, 5MA, 2.0V	50347	LLL-7A
CR34	150-1050-00	B030750		LT EMITTING DIO: RED	50579	RL-T1
CR38	150-1004-00	B010100	B030489	LAMP, LED: RED, 2.5V, 15MA	08806	SSL-12
CR38	150-1040-00	B030490	B030749	LAMP, LED: RED, 5MA, 2.0V	50347	LLL-7A
CR38	150-1050-00	B030750		LT EMITTING DIO: RED	50579	RL-T1
CR40	150-1004-00	B010100	B030489	LAMP, LED: RED, 2.5V, 15MA	08806	SSL-12
CR40	150-1040-00	B030490	B030749	LAMP, LED: RED, 5MA, 2.0V	50347	LLL-7A
CR40	150-1050-00	B030750		LT EMITTING DIO: RED	50579	RL-T1
CR42	150-1004-00	B010100	B030489	LAMP, LED: RED, 2.5V, 15MA	08806	SSL-12
CR42	150-1040-00	B030490	B030749	LAMP, LED: RED, 5MA, 2.0V	50347	LLL-7A
CR42	150-1050-00	B030750		LT EMITTING DIO: RED	50579	RL-T1
CR44	150-1004-00	B010100	B030489	LAMP, LED: RED, 2.5V, 15MA	08806	SSL-12
CR44	150-1040-00	B030490	B030749	LAMP, LED: RED, 5MA, 2.0V	50347	LLL-7A
CR44	150-1050-00	B030750		LT EMITTING DIO: RED	50579	RL-T1
CR64	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR66	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR70	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR72	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR74	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR76	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR80	150-1004-00	B010100	B030489	LAMP, LED: RED, 2.5V, 15MA	08806	SSL-12
CR80	150-1040-00	B030490	B030749	LAMP, LED: RED, 5MA, 2.0V	50347	LLL-7A
CR80	150-1050-00	B030750		LT EMITTING DIO: RED	50579	RL-T1
CR82	150-1004-00	B010100	B030489	LAMP, LED: RED, 2.5V, 15MA	08806	SSL-12
CR82	150-1040-00	B030490	B030749	LAMP, LED: RED, 5MA, 2.0V	50347	LLL-7A
CR82	150-1050-00	B030750		LT EMITTING DIO: RED	50579	RL-T1
CR84	150-1004-00	B010100	B030489	LAMP, LED: RED, 2.5V, 15MA	08806	SSL-12
CR84	150-1040-00	B030490	B030749	LAMP, LED: RED, 5MA, 2.0V	50347	LLL-7A
CR84	150-1050-00	B030750		LT EMITTING DIO: RED	50579	RL-T1
CR86	150-1004-00	B010100	B030489	LAMP, LED: RED, 2.5V, 15MA	08806	SSL-12
CR86	150-1040-00	B030490	B030749	LAMP, LED: RED, 5MA, 2.0V	50347	LLL-7A
CR86	150-1050-00	B030750		LT EMITTING DIO: RED	50579	RL-T1
CR87	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	01295	1N4152R

**Replaceable Electrical Parts—7L5**

Ckt No.	Tektronix		Serial/Model No.		Name & Description	Mfr Code	Mfr Part Number
	Part No.	Eff	Dscont				
CR88	150-1004-00	B010100	B030489		LAMP, LED: RED, 2.5V, 15MA	08806	SSL-12
CR88	150-1040-00	B030490	B030749		LAMP, LED: RED, 5MA, 2.0V	50347	LLL-7A
CR88	150-1050-00	B030750			LT EMITTING DIO: RED	50579	RL-T1
CR89	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR90	150-1004-00	B010100	B030489		LAMP, LED: RED, 2.5V, 15MA	08806	SSL-12
CR90	150-1040-00	B030490	B030749		LAMP, LED: RED, 5MA, 2.0V	50347	LLL-7A
CR90	150-1050-00	B030750			LT EMITTING DIO: RED	50579	RL-T1
CR94	150-1033-00				LT EMITTING DIO: YELLOW, 585NM, 40MA MAX	50434	5082-4584
CR122	152-0597-00				SEMICOND DEVICE: SILICON, 50V, 330PF	80009	152-0597-00
CR168	152-0322-00				SEMICOND DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR178A, B	153-0061-00				SEMICOND DVC, SE: SIGNAL, DUAL, 0.5PA AT 3V	80009	153-0061-00
CR192	152-0322-00				SEMICOND DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR200A, B	153-0061-00				SEMICOND DVC, SE: SIGNAL, DUAL, 0.5PA AT 3V	80009	153-0061-00
CR242	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR252	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR260	152-0597-00				SEMICOND DEVICE: SILICON, 50V, 330PF	80009	152-0597-00
CR360	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR362	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR390	152-0153-00				SEMICOND DEVICE: SILICON, 15V, 50MA	07263	FD7003
CR392	152-0322-00				SEMICOND DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR554	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR600	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR604	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR610	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR616	152-0322-00				SEMICOND DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR620	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR622	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR624	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR630	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR638	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR640	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR660	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR670	152-0322-00				SEMICOND DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR672	152-0322-00				SEMICOND DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR714	152-0246-00				SEMICOND DEVICE: SW, SI, 40V, 200MA	03508	DE140
CR716	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR720	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR730	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR731	152-0322-00				SEMICOND DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR732	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR733	152-0141-02	B010100	B049999X		SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR734	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR735	152-0322-00				SEMICOND DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR736	152-0075-00	XB050000			SEMICOND DEVICE: GE, 25V, 40MA	14433	G866
CR737	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR738	152-0075-00	XB050000			SEMICOND DEVICE: GE, 25V, 40MA	14433	G866
CR752	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR760	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR770	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR790	152-0322-00				SEMICOND DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR792	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR794	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR796	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR798	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR800	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR802	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR804	152-0141-02				SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R

Replaceable Electrical Parts—7L5

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
CR806	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR808	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR810	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR812	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR814	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR816	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR818	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR820	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR822	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR824	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR826	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR836	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR840	152-0075-00			SEMICON D DEVICE: GE, 25V, 40MA	14433	G866
CR843	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR845	152-0075-00			SEMICON D DEVICE: GE, 25V, 40MA	14433	G866
CR850	152-0075-00			SEMICON D DEVICE: GE, 25V, 40MA	14433	G866
CR860	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR862	152-0322-00			SEMICON D DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR864	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR878	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR1000	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR1001	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR1002	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR1176	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR1250	152-0322-00			SEMICON D DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR1252	152-0322-00			SEMICON D DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR1420	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR1504	152-0612-00			SEMICON D DEVICE: V VAR CAP., 4V, 17.5PF	80009	152-0612-00
CR1612	}					
CR1616						
CR1622	}	153-0044-00		SEMICON D VC SE: SIGNAL, MATCHED	80009	153-0044-00
CR1626						
CR1812	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR1813	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR1876	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR1888	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR1908	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR1910	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR2012	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR2027	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR2032	152-0622-00			SEMICON D DEVICE: VVC, SI, 15V, 155PF	80009	152-0622-00
CR2033	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR2050	152-0153-00			SEMICON D DEVICE: SILICON, 15V, 50MA	07263	FD7003
CR2226	152-0246-00	B010100	B049999X	SEMICON D DEVICE: SW, SI, 40V, 200MA	03508	DE140
CR2320	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR2322	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR2340	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR2342	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR2344	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR2346	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR2348	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR2356	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR2360	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR2362	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR2364	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR2366	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR2370	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R

## Replaceable Electrical Parts—7L5

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
CR2372	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR2374	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR2376	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR2378	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR3008	152-0075-00			SEMICON D DEVICE: GE, 25V, 40MA	14433	G866
CR3012	152-0322-00			SEMICON D DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR3014	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR3022	152-0322-00			SEMICON D DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR3024	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR3032	152-0322-00			SEMICON D DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR3034	152-0322-00			SEMICON D DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR3038	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR4189	152-0141-02	B010100	B069999X	SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR4553	152-0141-02	B010100	B069999X	SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR4602	152-0322-00	B010100	B069999X	SEMICON D DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR4611	152-0141-02	B010100	B069999X	SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR4612	152-0141-02	B010100	B069999X	SEMICON D DEVICE: SILICON, 30V, 150MA	01295	1N4152R
CR4705	152-0322-00	XB070000	B071181	SEMICON D DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR4705	152-0075-00	B071182		SEMICON D DEVICE: GE, 25V, 40MA	14433	G866
CR4706	152-0322-00	XB070000	B071181	SEMICON D DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR4706	152-0075-00	B071182		SEMICON D DEVICE: GE, 25V, 40MA	14433	G866
CR4715	152-0322-00	XB070000	B071181	SEMICON D DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR4715	152-0075-00	B071182		SEMICON D DEVICE: GE, 25V, 40MA	14433	G866
CR4750	152-0322-00	XB070000	B071181	SEMICON D DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR4750	152-0075-00	B071182		SEMICON D DEVICE: GE, 25V, 40MA	14433	G866
CR4754	150-1050-00	XB070000		LT EMITTING DIO: RED	50579	RL-T1
E132	276-0507-00	XB030490		SHIELDING BEAD, : FERRITE	78488	57-3443
E134	276-0507-00	XB030490		SHIELDING BEAD, : FERRITE	78488	57-3443
E266	276-0507-00	XB010150		SHIELDING BEAD, : FERRITE	78488	57-3443
E268	276-0507-00	XB010150		SHIELDING BEAD, : FERRITE	78488	57-3443
E276	276-0507-00	XB010150		SHIELDING BEAD, : FERRITE	78488	57-3443
E278	276-0507-00	XB010150		SHIELDING BEAD, : FERRITE	78488	57-3443
FL1300	119-0608-00			FILTER, BANDPASS: XTAL, CTR FREQ10.7MHZ	75378	961-0444
J10	131-1606-01			CONNECTOR, RCPT, : W/22-44 CONTACTS	80009	131-1606-01
J20	131-1617-01			CONNECTOR, RCPT, : W/18-36 CONTACTS	80009	131-1617-01
J94	136-0387-00			JACK, TIP: GRAY	71279	450-4352-01-0318
J96	103-0180-01			ADAPTER, CONN: FEMALE, BNC	80009	103-0180-01
J530	131-1617-01			CONNECTOR, RCPT, : W/18-36 CONTACTS	80009	131-1617-01
J2210	131-1616-00			CONNECTOR, RCPT, : W/15-30 CONTACTS	05574	3VH15/1JV15
J3020	131-1617-01			CONNECTOR, RCPT, : W/18-36 CONTACTS	80009	131-1617-01
J3030	131-1617-01			CONNECTOR, RCPT, : W/18-36 CONTACTS	80009	131-1617-01
L120	108-0551-00			COIL, RF: 14UH	80009	108-0551-00
L122	108-0552-00			COIL, RF: 80NH	80009	108-0552-00
L124	108-0420-00			COIL, RF: 60NH	80009	108-0420-00
L126	108-0551-00			COIL, RF: 14UH	80009	108-0551-00
L128	108-0598-00			COIL, RF: 200UH	80009	108-0598-00
L154	108-0551-00			COIL, RF: 14UH	80009	108-0551-00
L160	108-0409-00			COIL, RF: 17.5UH	80009	108-0409-00
L162	108-0409-00			COIL, RF: 17.5UH	80009	108-0409-00
L216	108-0551-00			COIL, RF: 14UH	80009	108-0551-00
L218	108-0551-00			COIL, RF: 14UH	80009	108-0551-00
L236	108-0472-00			COIL, RF: 160UH	80009	108-0472-00
L237	108-0472-00			COIL, RF: 160UH	80009	108-0472-00
L253	108-0800-00			COIL, RF: 820MH	71279	550-3399-48
L258	108-0551-00			COIL, RF: 14UH	80009	108-0551-00

Replaceable Electrical Parts—7L5

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
L260	108-0552-00			COIL, RF: 80NH	80009	108-0552-00
L262	108-0420-00			COIL, RF: 60NH	80009	108-0420-00
L264	108-0551-00			COIL, RF: 14UH	80009	108-0551-00
L270	108-0598-00			COIL, RF: 200UH	80009	108-0598-00
L272	108-0551-00			COIL, RF: 14UH	80009	108-0551-00
L330	108-0598-00			COIL, RF: 200UH	80009	108-0598-00
L352	108-0598-00			COIL, RF: 200UH	80009	108-0598-00
L356	108-0598-00			COIL, RF: 200UH	80009	108-0598-00
L384	108-0598-00			COIL, RF: 200UH	80009	108-0598-00
L562	108-0598-00			COIL, RF: 200UH	80009	108-0598-00
L860	108-0598-00			COIL, RF: 200UH	80009	108-0598-00
L1010	108-0598-00			COIL, RF: 200UH	80009	108-0598-00
L1012	108-0598-00			COIL, RF: 200UH	80009	108-0598-00
L1040	108-0826-00	XB030000		COIL, RF: 1.95 UH, TOROIDAL	80009	108-0826-00
L1220	114-0200-00			COIL, RF: 60-120UH	14329	387-120
L1254	108-0324-00			COIL, RF: 10MH	76493	70F102A1
L1302	108-0831-00			COIL, RF: FIXED, 740NH	80009	108-0831-00
L1304	108-0598-00			COIL, RF: 200UH	80009	108-0598-00
L1306	108-0598-00			COIL, RF: 200UH	80009	108-0598-00
L1380	108-0598-00			COIL, RF: 200UH	80009	108-0598-00
L1384	108-0598-00			COIL, RF: 200UH	80009	108-0598-00
L1390	108-0598-00			COIL, RF: 200UH	80009	108-0598-00
L1410	108-0598-00			COIL, RF: 200UH	80009	108-0598-00
L1512	108-0240-00			COIL, RF: FIXED, 820UH	76493	B5147
L1533	108-0598-00			COIL, RF: 200UH	80009	108-0598-00
L1632	108-0551-00	B010100	B010124	COIL, RF: 14UH	80009	108-0551-00
L1632	108-0836-00	B010125		COIL, RF: 14 UH TOROIDAL INDUCTOR	80009	108-0836-00
L1634	108-0551-00	B010100	B010124	COIL, RF: 14UH	80009	108-0551-00
L1634	108-0836-00	B010125		COIL, RF: 14 UH TOROIDAL INDUCTOR	80009	108-0836-00
L1680	114-0341-00			COIL, RF: 7.13-7.35MH	80009	114-0341-00
L1730	114-0341-00			COIL, RF: 7.13-7.35MH	80009	114-0341-00
L1780	114-0341-00			COIL, RF: 7.13-7.35MH	80009	114-0341-00
L1820	114-0341-00			COIL, RF: 7.13-7.35MH	80009	114-0341-00
L1856	114-0342-00			COIL, RF: 0.95-1.05MH	80009	114-0342-00
L1860	114-0342-00			COIL, RF: 0.95-1.05MH	80009	114-0342-00
L1864	114-0342-00			COIL, RF: 0.95-1.05MH	80009	114-0342-00
L1870	114-0342-00			COIL, RF: 0.95-1.05MH	80009	114-0342-00
L1872	114-0342-00			COIL, RF: 0.95-1.05MH	80009	114-0342-00
L1916	114-0342-00			COIL, RF: 0.95-1.05MH	80009	114-0342-00
L1918	114-0342-00			COIL, RF: 0.95-1.05MH	80009	114-0342-00
L2032	SELECTED			COIL, RF: 1.4UH		
	-----			(NOMINAL VALUE)		
L2240	108-0598-00			COIL, RF: 200UH	80009	108-0598-00
L2266	108-0598-00			COIL, RF: 200UH	80009	108-0598-00
L2268	108-0598-00			COIL, RF: 200UH	80009	108-0598-00
L2360	108-0598-00			COIL, RF: 200UH	80009	108-0598-00
L3004	108-0598-00			COIL, RF: 200UH	80009	108-0598-00
L4182	108-0598-00	B010100	B069999X	COIL, RF: 200UH	80009	108-0598-00
L4760	108-0422-00	XB070000		COIL, RF: FIXED, 82UH	80009	108-0422-00
M4770	149-0030-00	XB070000		METER, T TOTLZ: ELAPSED TIME, DC, CKT BD MT	18583	120-LC
P122	131-1493-00			CONTACT, ELEC: TEST POINT STRAP	80009	131-1493-00
P124	131-1493-00			CONTACT, ELEC: TEST POINT STRAP	80009	131-1493-00
P246	131-1493-00			CONTACT, ELEC: TEST POINT STRAP	80009	131-1493-00
P260	131-1493-00			CONTACT, ELEC: TEST POINT STRAP	80009	131-1493-00
P262	131-1493-00			CONTACT, ELEC: TEST POINT STRAP	80009	131-1493-00
P390	131-1493-00			CONTACT, ELEC: TEST POINT STRAP	80009	131-1493-00

## Replaceable Electrical Parts—7L5

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
P3008	131-0993-00			BUS, CONDUCTOR: 2 WIRE BLACK	00779	530153-2
Q45	151-1066-00			TRANSISTOR: SILICON, FE, P-CHANNEL	80009	151-1066-00
Q55	151-1066-00			TRANSISTOR: SILICON, FE, P-CHANNEL	80009	151-1066-00
Q70	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q125	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q130	151-0230-00			TRANSISTOR: SILICON, NPN	01295	SAC6176
Q135	151-0230-00			TRANSISTOR: SILICON, NPN	01295	SAC6176
Q230	151-1012-00			TRANSISTOR: SILICON, FE, N-CHANNEL	80009	151-1012-00
Q240	151-0195-00			TRANSISTOR: SILICON, NPN	80009	151-0195-00
Q245	151-0195-00			TRANSISTOR: SILICON, NPN	80009	151-0195-00
Q260	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q270	151-0230-00			TRANSISTOR: SILICON, NPN	01295	SAC6176
Q275	151-0230-00			TRANSISTOR: SILICON, NPN	01295	SAC6176
Q365	151-0188-00			TRANSISTOR: SILICON, PNP	04713	SPS6868K
Q395	151-0216-00			TRANSISTOR: SILICON, PNP	04713	SPS8803
Q525	151-0188-00			TRANSISTOR: SILICON, PNP	04713	SPS6868K
Q570	151-0456-00			TRANSISTOR: SILICON, NPN	80009	151-0456-00
Q575	151-0456-00			TRANSISTOR: SILICON, NPN	80009	151-0456-00
Q591	151-0188-00			TRANSISTOR: SILICON, PNP	04713	SPS6868K
Q621	151-1021-00			TRANSISTOR: SILICON, JFE	17856	FN815
Q680	151-1078-00			TRANSISTOR: SILICON, JFE, N-CHANNEL	17856	J2133
Q700	151-1022-00			TRANSISTOR: SILICON, JFE, SEL FROM 2N4392	80009	151-1022-00
Q705	151-0188-00			TRANSISTOR: SILICON, PNP	04713	SPS6868K
Q735	151-1079-00			TRANSISTOR: SILICON, FE, N-CHANNEL	05828	MEM660
Q765	151-1079-00			TRANSISTOR: SILICON, FE, N-CHANNEL	05828	MEM660
Q1040	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q1060	151-1021-00			TRANSISTOR: SILICON, JFE	17856	FN815
Q1070	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q1080	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q1085	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q1110	151-1021-00			TRANSISTOR: SILICON, JFE	17856	FN815
Q1115	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q1130	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q1140	151-1021-00			TRANSISTOR: SILICON, JFE	17856	FN815
Q1170	151-1021-00			TRANSISTOR: SILICON, JFE	17856	FN815
Q1180	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q1200	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q1230	151-0188-00			TRANSISTOR: SILICON, PNP	04713	SPS6868K
Q1235	151-0188-00			TRANSISTOR: SILICON, PNP	04713	SPS6868K
Q1305	151-0442-00			TRANSISTOR: SILICON, NPN	80009	151-0442-00
Q1325	151-0288-00			TRANSISTOR: SILICON, NPN	80009	151-0288-00
Q1420	151-0188-00			TRANSISTOR: SILICON, PNP	04713	SPS6868K
Q1500	151-0441-00			TRANSISTOR: SILICON, NPN	04713	SRF501
Q1505	151-0441-00			TRANSISTOR: SILICON, NPN	04713	SRF501
Q1530	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q1650	151-0188-00			TRANSISTOR: SILICON, PNP	04713	SPS6868K
Q1660	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q1670	151-1006-00			TRANSISTOR: SILICON, JFE, N-CHANNEL	80009	151-1006-00
Q1680	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q1690	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q1710	151-0188-00			TRANSISTOR: SILICON, PNP	04713	SPS6868K
Q1720	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q1730	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q1740	151-1005-00			TRANSISTOR: SILICON, JFE, N-CHANNEL	80009	151-1005-00
Q1750	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q1760	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677



Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
Q1765	151-1021-00			TRANSISTOR: SILICON, JFE	17856	FN815
Q1770	151-1005-00			TRANSISTOR: SILICON, JFE, N-CHANNEL	80009	151-1005-00
Q1775	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q1780	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q1800	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q1810	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q1813	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q1815	151-1005-00			TRANSISTOR: SILICON, JFE, N-CHANNEL	80009	151-1005-00
Q1820	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q1830	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q1850	151-1021-00			TRANSISTOR: SILICON, JFE	17856	FN815
Q1855	151-1021-00			TRANSISTOR: SILICON, JFE	17856	FN815
Q1880	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q1885	151-1021-00			TRANSISTOR: SILICON, JFE	17856	FN815
Q1890	151-1021-00			TRANSISTOR: SILICON, JFE	17856	FN815
Q1895	151-1021-00			TRANSISTOR: SILICON, JFE	17856	FN815
Q1900	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q1910	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q2060	151-0441-00			TRANSISTOR: SILICON, NPN	04713	SRF501
Q2065	151-0441-00			TRANSISTOR: SILICON, NPN	04713	SRF501
Q2225	151-1021-00			TRANSISTOR: SILICON, JFE	17856	FN815
Q2310	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q2320	151-1097-00			TRANSISTOR: SILICON, FE	80009	151-1097-00
Q2325	151-1097-00			TRANSISTOR: SILICON, FE	80009	151-1097-00
Q2330	151-1097-00			TRANSISTOR: SILICON, FE	80009	151-1097-00
Q2345	151-1097-00			TRANSISTOR: SILICON, FE	80009	151-1097-00
Q2350	151-1045-00			TRANSISTOR: SILICON, JFE, P-CHANNEL	80009	151-1045-00
Q2355	151-1097-00			TRANSISTOR: SILICON, FE	80009	151-1097-00
Q2360	151-1097-00			TRANSISTOR: SILICON, FE	80009	151-1097-00
Q2365	151-1097-00			TRANSISTOR: SILICON, FE	80009	151-1097-00
Q2370	151-1097-00			TRANSISTOR: SILICON, FE	80009	151-1097-00
Q3000	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q3020	151-0188-00			TRANSISTOR: SILICON, PNP	04713	SPS6868K
Q4750	151-0190-01	XB070000		TRANSISTOR: SILICON, NPN	80009	151-0190-01
R3	315-0226-00			RES., FXD, CMPSN: 22M OHM, 5%, 0.25W	01121	CB2265
R4	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R6	315-0274-00			RES., FXD, CMPSN: 270K OHM, 5%, 0.25W	01121	CB2745
R7	315-0112-00			RES., FXD, CMPSN: 1.1K OHM, 5%, 0.25W	01121	CB1125
R8	315-0275-00			RES., FXD, CMPSN: 2.7M OHM, 5%, 0.25W	01121	CB2755
R9	315-0331-00			RES., FXD, CMPSN: 330 OHM, 5%, 0.25W	01121	CB3315
R11	315-0226-00			RES., FXD, CMPSN: 22M OHM, 5%, 0.25W	01121	CB2265
R12	315-0112-00			RES., FXD, CMPSN: 1.1K OHM, 5%, 0.25W	01121	CB1125
R14	315-0275-00			RES., FXD, CMPSN: 2.7M OHM, 5%, 0.25W	01121	CB2755
R15	315-0226-00	XB040000		RES., FXD, CMPSN: 22M OHM, 5%, 0.25W	01121	CB2265
R16	315-0331-00			RES., FXD, CMPSN: 330 OHM, 5%, 0.25W	01121	CB3315
R17	315-0112-00			RES., FXD, CMPSN: 1.1K OHM, 5%, 0.25W	01121	CB1125
R18	315-0275-00			RES., FXD, CMPSN: 2.7M OHM, 5%, 0.25W	01121	CB2755
R19	315-0331-00			RES., FXD, CMPSN: 330 OHM, 5%, 0.25W	01121	CB3315
R20	315-0112-00			RES., FXD, CMPSN: 1.1K OHM, 5%, 0.25W	01121	CB1125
R22	315-0275-00			RES., FXD, CMPSN: 2.7M OHM, 5%, 0.25W	01121	CB2755
R24	315-0331-00			RES., FXD, CMPSN: 330 OHM, 5%, 0.25W	01121	CB3315
R30	315-0112-00			RES., FXD, CMPSN: 1.1K OHM, 5%, 0.25W	01121	CB1125
R32	315-0275-00			RES., FXD, CMPSN: 2.7M OHM, 5%, 0.25W	01121	CB2755
R34	315-0331-00			RES., FXD, CMPSN: 330 OHM, 5%, 0.25W	01121	CB3315
R36	315-0112-00			RES., FXD, CMPSN: 1.1K OHM, 5%, 0.25W	01121	CB1125
R37	315-0275-00			RES., FXD, CMPSN: 2.7M OHM, 5%, 0.25W	01121	CB2755
R38	315-0331-00			RES., FXD, CMPSN: 330 OHM, 5%, 0.25W	01121	CB3315

## Replaceable Electrical Parts—7L5

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Discont	Name & Description	Mfr Code	Mfr Part Number
R40	315-0331-00			RES., FXD, CMPSN: 330 OHM, 5%, 0.25W	01121	CB3315
R41	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R42	315-0331-00			RES., FXD, CMPSN: 330 OHM, 5%, 0.25W	01121	CB3315
R44	315-0331-00			RES., FXD, CMPSN: 330 OHM, 5%, 0.25W	01121	CB3315
R45	311-1714-01			RES., VAR, NONWIR: 15K OHM, 20%, 1W	80009	311-1714-01
	-----			(FURNISHED AS A UNIT WITH S45)		
R46	321-0338-00			RES., FXD, FILM: 32.4K OHM, 1%, 0.125W	91637	MFF1816G32401F
R50	311-1714-01			RES., VAR, NONWIR: 15K OHM, 20%, 1W	80009	311-1714-01
R52	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R54	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R55	311-1005-00			RES., VAR, NONWIR: 15K OHM, 10%, 0.50W	12697	382-CM40952
R56	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R60	307-0410-00	B010100	B020169	RES, NTWK, FXD, FI: 15 RES, DIP	73138	1898-38-0
R60	307-0504-00	B020170		RES NTWK, FXD, FI: (15) 300K OHM, 2%	01121	316A304
R62	323-0151-00	B010100	B020169	RES., FXD, FILM: 365 OHM, 1%, 0.50W	75042	CECT0-3650F
R62	323-0175-00	B020170		RES., FXD, FILM: 649 OHM, 1%, 0.50W	75042	CECT0-6490F
R63	323-0151-00	B010100	B020169	RES., FXD, FILM: 365 OHM, 1%, 0.50W	75042	CECT0-3650F
R63	323-0175-00	B020170		RES., FXD, FILM: 649 OHM, 1%, 0.50W	75042	CECT0-6490F
R64	315-0331-00			RES., FXD, CMPSN: 330 OHM, 5%, 0.25W	01121	CB3315
R65	311-1005-00			RES., VAR, NONWIR: 15K OHM, 10%, 0.50W	12697	382-CM40952
R86	315-0331-00			RES., FXD, CMPSN: 330 OHM, 5%, 0.25W	01121	CB3315
R88	315-0331-00			RES., FXD, CMPSN: 330 OHM, 5%, 0.25W	01121	CB3315
R92	315-0181-00			RES., FXD, CMPSN: 180 OHM, 5%, 0.25W	01121	CB1815
R95	311-1005-00			RES., VAR, NONWIR: 15K OHM, 10%, 0.50W	12697	382-CM40952
	-----			(FURNISHED AS A UNIT WITH S96)		
R120	315-0201-00			RES., FXD, CMPSN: 200 OHM, 5%, 0.25W	01121	CB2015
R121	315-0201-00			RES., FXD, CMPSN: 200 OHM, 5%, 0.25W	01121	CB2015
R122	307-0103-00			RES., FXD, CMPSN: 2.7 OHM, 5%, 0.25W	01121	CB27G5
R128	315-0621-00			RES., FXD, CMPSN: 620 OHM, 5%, 0.25W	01121	CB6215
R129	315-0185-00			RES., FXD, CMPSN: 1.8M OHM, 5%, 0.25W	01121	CB1855
R130	315-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.25W	01121	CB5105
R132	321-0241-00			RES., FXD, FILM: 3.16K OHM, 1%, 0.125W	91637	MFF1816G31600F
R133	315-0201-00			RES., FXD, CMPSN: 200 OHM, 5%, 0.25W	01121	CB2015
R134	315-0201-00			RES., FXD, CMPSN: 200 OHM, 5%, 0.25W	01121	CB2015
R136	315-0220-00			RES., FXD, CMPSN: 22 OHM, 5%, 0.25W	01121	CB2205
R137	315-0270-00			RES., FXD, CMPSN: 27 OHM, 5%, 0.25W	01121	CB2705
R138	321-0241-00			RES., FXD, FILM: 3.16K OHM, 1%, 0.125W	91637	MFF1816G31600F
R152	321-0399-00			RES., FXD, FILM: 140K OHM, 1%, 0.125W	91637	MFF1816G14002F
R154	315-0201-00			RES., FXD, CMPSN: 200 OHM, 5%, 0.25W	01121	CB2015
R156	315-0681-00			RES., FXD, CMPSN: 680 OHM, 5%, 0.25W	01121	CB6815
R160	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R161	307-0106-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.25W	01121	CB47G5
R164	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R166	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R168	321-0133-00			RES., FXD, FILM: 237 OHM, 1%, 0.125W	91637	MFF1816G237R0F
R170	321-0241-00			RES., FXD, FILM: 3.16K OHM, 1%, 0.125W	91637	MFF1816G31600F
R172	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R174	315-0431-00			RES., FXD, CMPSN: 430 OHM, 5%, 0.25W	01121	CB4315
R176	321-0142-00			RES., FXD, FILM: 294 OHM, 1%, 0.125W	91637	MFF1816G294R0F
R178	321-0241-00			RES., FXD, FILM: 3.16K OHM, 1%, 0.125W	91637	MFF1816G31600F
R179	315-0330-00			RES., FXD, CMPSN: 33 OHM, 5%, 0.25W	01121	CB3305
R180	321-0261-00			RES., FXD, FILM: 5.11K OHM, 1%, 0.125W	91637	MFF1816G51100F
R182	321-0261-00			RES., FXD, FILM: 5.11K OHM, 1%, 0.125W	91637	MFF1816G51100F
R184	315-0330-00			RES., FXD, CMPSN: 33 OHM, 5%, 0.25W	01121	CB3305
R186	315-0330-00			RES., FXD, CMPSN: 33 OHM, 5%, 0.25W	01121	CB3305
R190	307-0387-00			RES., FXD, FILM: 13 RES. NETWORK	73138	898-1-R8 2K
R191	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R192	321-0133-00			RES., FXD, FILM: 237 OHM, 1%, 0.125W	91637	MFF1816G237R0F
R194	321-0142-00			RES., FXD, FILM: 294 OHM, 1%, 0.125W	91637	MFF1816G294R0F
R196	315-0431-00			RES., FXD, CMPSN: 430 OHM, 5%, 0.25W	01121	CB4315
R198	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R200	321-0241-00			RES., FXD, FILM: 3.16K OHM, 1%, 0.125W	91637	MFF1816G31600F
R201	315-0330-00			RES., FXD, CMPSN: 33 OHM, 5%, 0.25W	01121	CB3305
R202	321-0241-00			RES., FXD, FILM: 3.16K OHM, 1%, 0.125W	91637	MFF1816G31600F
R204	321-0261-00			RES., FXD, FILM: 5.11K OHM, 1%, 0.125W	91637	MFF1816G51100F
R210	321-0261-00			RES., FXD, FILM: 5.11K OHM, 1%, 0.125W	91637	MFF1816G51100F
R214	315-0330-00			RES., FXD, CMPSN: 33 OHM, 5%, 0.25W	01121	CB3305
R219	315-0330-00			RES., FXD, CMPSN: 33 OHM, 5%, 0.25W	01121	CB3305
R220	315-0201-00			RES., FXD, CMPSN: 200 OHM, 5%, 0.25W	01121	CB2015
R222	307-0106-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.25W	01121	CB47G5
R224	315-0270-00			RES., FXD, CMPSN: 27 OHM, 5%, 0.25W	01121	CB2705
R230	315-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.25W	01121	CB5105
R232	321-0187-00			RES., FXD, FILM: 866 OHM, 1%, 0.125W	91637	MFF1816G866R0F
R238	315-0621-00			RES., FXD, CMPSN: 620 OHM, 5%, 0.25W	01121	CB6215
R240	315-0512-00			RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R241	321-0354-00			RES., FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	MFF1816G47501F
R242	315-0512-00			RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R243	321-0310-00			RES., FXD, FILM: 16.5K OHM, 1%, 0.125W	91637	MFF1816G16501F
R244	315-0512-00			RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R246	315-0113-00			RES., FXD, CMPSN: 11K OHM, 5%, 0.25W	01121	CB1135
R248	315-0512-00			RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R252	321-0414-00			RES., FXD, FILM: 200K OHM, 1%, 0.125W	91637	MFF1816G20002F
R254	315-0750-00			RES., FXD, CMPSN: 75 OHM, 5%, 0.25W	01121	CB7505
R255	311-1260-00			RES., VAR, NONWIR: 250 OHM, 10%, 0.50W	32997	3329P-L58-251
R256	307-0103-00			RES., FXD, CMPSN: 2.7 OHM, 5%, 0.25W	01121	CB27G5
R258	315-0201-00			RES., FXD, CMPSN: 200 OHM, 5%, 0.25W	01121	CB2015
R259	315-0201-00			RES., FXD, CMPSN: 200 OHM, 5%, 0.25W	01121	CB2015
R261	315-0681-00			RES., FXD, CMPSN: 680 OHM, 5%, 0.25W	01121	CB6815
R266	315-0201-00			RES., FXD, CMPSN: 200 OHM, 5%, 0.25W	01121	CB2015
R268	315-0201-00			RES., FXD, CMPSN: 200 OHM, 5%, 0.25W	01121	CB2015
R269	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R270	315-0242-00			RES., FXD, CMPSN: 2.4K OHM, 5%, 0.25W	01121	CB2425
R272	321-0399-00			RES., FXD, FILM: 140K OHM, 1%, 0.125W	91637	MFF1816G14002F
R273	316-0565-00			RES., FXD, CMPSN: 5.6M OHM, 10%, 0.25W	01121	CB5651
R274	315-0201-00			RES., FXD, CMPSN: 200 OHM, 5%, 0.25W	01121	CB2015
R275	315-0270-00			RES., FXD, CMPSN: 27 OHM, 5%, 0.25W	01121	CB2705
R276	321-0241-00			RES., FXD, FILM: 3.16K OHM, 1%, 0.125W	91637	MFF1816G31600F
R277	321-0241-00			RES., FXD, FILM: 3.16K OHM, 1%, 0.125W	91637	MFF1816G31600F
R278	315-0220-00			RES., FXD, CMPSN: 22 OHM, 5%, 0.25W	01121	CB2205
R279	315-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.25W	01121	CB5105
R280	321-0327-03			RES., FXD, FILM: 24.9K OHM, 0.25%, 0.125W	24546	NC55C2492C
R282	321-0310-00			RES., FXD, FILM: 16.5K OHM, 1%, 0.125W	91637	MFF1816G16501F
R284	321-0748-06	B010100	B030528	RES., FXD, FILM: 4.95K OHM, 0.25%, 0.125W	91637	MFF1816C49500C
R284	321-0764-01	B030529		RES., FXD, FILM: 5.09K OHM, 0.5%, 0.125W (NOMINAL VALUE, SELECTED)	91637	MFF1816G50900D
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R286	321-0318-07			RES., FXD, FILM: 20K OHM, 0.1%, 0.125W	24546	NE55E2002B
R287	321-0620-00			RES., FXD, FILM: 8.45K OHM, 0.25%, 0.125W	91637	MFF1816D84500C
R288	321-0631-03			RES., FXD, FILM: 12.5K OHM, 0.25%, 0.125W	91637	MFF1816D12501C
R290	315-0330-00			RES., FXD, CMPSN: 33 OHM, 5%, 0.25W	01121	CB3305
R292	315-0330-00			RES., FXD, CMPSN: 33 OHM, 5%, 0.25W	01121	CB3305
R294	315-0330-00			RES., FXD, CMPSN: 33 OHM, 5%, 0.25W	01121	CB3305
R296	315-0330-00			RES., FXD, CMPSN: 33 OHM, 5%, 0.25W	01121	CB3305
R300	321-0289-00			RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R302	321-0289-07			RES., FXD, FILM: 10K OHM, 0.1%, 0.125W	91637	MFF1816C10001B

## Replaceable Electrical Parts—7L5

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R304	321-0289-00			RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R306	321-0281-07			RES., FXD, FILM: 8.25K OHM, 0.10%, 0.125W	91637	MFF1816C82500B
R308	321-1602-04			RES., FXD, FILM: 29.27K OHM, 0.1%, 0.125W	91637	MFF1816D29271B
R310	321-0289-00			RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R312	321-0603-07			RES., FXD, FILM: 15K OHM, 0.1%, 0.125W	91637	MFF1816C15001B
R313	321-0292-00			RES., FXD, FILM: 10.7K OHM, 1%, 0.125W	91637	MFF1816G10701F
R314	321-0318-00			RES., FXD, FILM: 20K OHM, 1%, 0.125W	91637	MFF1816G20001F
R316	321-0318-00			RES., FXD, FILM: 20K OHM, 1%, 0.125W	91637	MFF1816G20001F
R324	315-0332-00			RES., FXD, CMPSN: 3.3K OHM, 5%, 0.25W	01121	CB3325
R325	311-1268-00			RES., VAR, NONWIR: 10K OHM, 10%, 0.50W	32997	3329P-L58-103
R326	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R328	315-0332-00			RES., FXD, CMPSN: 3.3K OHM, 5%, 0.25W	01121	CB3325
R330	321-0097-00			RES., FXD, FILM: 100 OHM, 1%, 0.125W	91637	MFF1816G100R0F
R331	321-0447-00			RES., FXD, FILM: 442K OHM, 1%, 0.125W	24546	NA55D4423F
R332	321-0232-00			RES., FXD, FILM: 2.55K OHM, 1%, 0.125W	91637	MFF1816G25500F
R334	321-0288-00			RES., FXD, FILM: 9.76K OHM, 1%, 0.125W	91637	MFF1816G97600F
R338	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R342	315-0332-00			RES., FXD, CMPSN: 3.3K OHM, 5%, 0.25W	01121	CB3325
R344	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R345	311-1268-00			RES., VAR, NONWIR: 10K OHM, 10%, 0.50W	32997	3329P-L58-103
R346	315-0332-00			RES., FXD, CMPSN: 3.3K OHM, 5%, 0.25W	01121	CB3325
R348	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R350	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R354	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R365	311-1263-00			RES., VAR, NONWIR: 1K OHM, 10%, 0.50W	32997	3329P-L58-102
R366	321-0161-00			RES., FXD, FILM: 464 OHM, 1%, 0.125W	91637	MFF1816G464R0F
R370	321-0293-00			RES., FXD, FILM: 11K OHM, 1%, 0.125W	91637	MFF1816G11001F
R372	321-0253-00	B010100	B079999	RES., FXD, FILM: 4.22K OHM, 1%, 0.125W	91637	MFF1816G42200F
R372	311-1268-00	B080000		RES., VAR, NONWIR: 10K OHM, 10%, 0.50W	32997	3329P-L58-103
R374	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R376	311-1268-00	XB080000		RES., VAR, NONWIR: 10K OHM, 10%, 0.50W	32997	3329P-L58-103
R378	321-0293-00	XB080000		RES., FXD, FILM: 11K OHM, 1%, 0.125W	91637	MFF1816G11001F
R382	307-0103-00			RES., FXD, CMPSN: 2.7 OHM, 5%, 0.25W	01121	CB27G5
R384	315-0100-00			RES., FXD, CMPSN: 10 OHM, 5%, 0.25W	01121	CB1005
R386	321-0190-00			RES., FXD, FILM: 931 OHM, 1%, 0.125W	91637	MFF1816G931R0F
R388	321-0143-03			RES., FXD, FILM: 301 OHM, 0.25%, 0.125W	91637	MFF1816D301R0C
R390	321-0225-00			RES., FXD, FILM: 2.15K OHM, 1%, 0.125W	91637	MFF1816G21500F
R392	321-0339-00			RES., FXD, FILM: 33.2K OHM, 1%, 0.125W	91637	MFF1816G33201F
R394	321-0751-06			RES., FXD, FILM: 50 OHM, 0.25%, 0.125W	91637	MFF1816C50R00C
R396	321-0292-09			RES., FXD, FILM: 10.7K OHM, 1%, 0.125W	24546	NE55E1072F
R398	321-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.125W	91637	MFF1816G10000F
R400	315-0472-00			RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R402	321-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.125W	91637	MFF1816G10000F
R404	315-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R406	317-0472-00	XB020260		RES., FXD, CMPSN: 4.7K OHM, 5%, 0.125W	01121	BB4725
R408	315-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R512	315-0472-00			RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R514	315-0432-00			RES., FXD, CMPSN: 4.3K OHM, 5%, 0.25W	01121	CB4325
R516	315-0432-00			RES., FXD, CMPSN: 4.3K OHM, 5%, 0.25W	01121	CB4325
R518	315-0432-00			RES., FXD, CMPSN: 4.3K OHM, 5%, 0.25W	01121	CB4325
R520	315-0513-00			RES., FXD, CMPSN: 51K OHM, 5%, 0.25W	01121	CB5135
R522	315-0513-00			RES., FXD, CMPSN: 51K OHM, 5%, 0.25W	01121	CB5135
R556	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R558	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R560	315-0303-00			RES., FXD, CMPSN: 30K OHM, 5%, 0.25W	01121	CB3035
R562	315-0240-00			RES., FXD, CMPSN: 24 OHM, 5%, 0.25W	01121	CB2405
R563	315-0242-00			RES., FXD, CMPSN: 2.4K OHM, 5%, 0.25W	01121	CB2425

Replaceable Electrical Parts—7L5

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R564	315-0242-00			RES., FXD, CMPSN: 2.4K OHM, 5%, 0.25W	01121	CB2425
R566	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R568	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R570	315-0242-00			RES., FXD, CMPSN: 2.4K OHM, 5%, 0.25W	01121	CB2425
R571	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R572	315-0472-00			RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R573	315-0753-00			RES., FXD, CMPSN: 75K OHM, 5%, 0.25W	01121	CB7535
R574	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R575	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R576	307-0106-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.25W	01121	CB47G5
R577	315-0304-00			RES., FXD, CMPSN: 300K OHM, 5%, 0.25W	01121	CB3045
R578	315-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R580	321-0068-00			RES., FXD, FILM: 49.9 OHM, 1%, 0.125W	91637	MFF1816G49R90F
R581	321-0194-00			RES., FXD, FILM: 1.02K OHM, 1%, 0.125W	91637	MFF1816G10200F
R582	321-0068-00			RES., FXD, FILM: 49.9 OHM, 1%, 0.125W	91637	MFF1816G49R90F
R583	321-0194-00			RES., FXD, FILM: 1.02K OHM, 1%, 0.125W	91637	MFF1816G10200F
R584	321-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.125W	91637	MFF1816G10000F
R586	321-0199-00			RES., FXD, FILM: 1.15K OHM, 1%, 0.125W	91637	MFF1816G11500F
R588	315-0163-00			RES., FXD, CMPSN: 16K OHM, 5%, 0.25W	01121	CB1635
R589	315-0224-00			RES., FXD, CMPSN: 220K OHM, 5%, 0.25W	01121	CB2245
R590	315-0913-00			RES., FXD, CMPSN: 91K OHM, 5%, 0.25W	01121	CB9135
R591	315-0163-00			RES., FXD, CMPSN: 16K OHM, 5%, 0.25W	01121	CB1635
R592	315-0163-00			RES., FXD, CMPSN: 16K OHM, 5%, 0.25W	01121	CB1635
R593	315-0333-00			RES., FXD, CMPSN: 33K OHM, 5%, 0.25W	01121	CB3335
R594	321-0355-00			RES., FXD, FILM: 48.7K OHM, 1%, 0.125W	91637	MFF1816G48701F
R596	321-0289-00			RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R598	315-0183-00			RES., FXD, CMPSN: 18K OHM, 5%, 0.25W	01121	CB1835
R600	321-0399-00			RES., FXD, FILM: 140K OHM, 1%, 0.125W	91637	MFF1816G14002F
R602	315-0681-00			RES., FXD, CMPSN: 680 OHM, 5%, 0.25W	01121	CB6815
R604	315-0105-00			RES., FXD, CMPSN: 1M OHM, 5%, 0.25W	01121	CB1055
R606	321-0226-00			RES., FXD, FILM: 2.21K OHM, 1%, 0.125W	91637	MFF1816G22100F
R608	321-0222-00			RES., FXD, FILM: 2K OHM, 1%, 0.125W	91637	MFF1816G20000F
R610	315-0513-00			RES., FXD, CMPSN: 51K OHM, 5%, 0.25W	01121	CB5135
R612	315-0112-00			RES., FXD, CMPSN: 1.1K OHM, 5%, 0.25W	01121	CB1125
R614	315-0622-00			RES., FXD, CMPSN: 6.2K OHM, 5%, 0.25W	01121	CB6225
R616	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R618	321-0337-00			RES., FXD, FILM: 31.6K OHM, 1%, 0.125W	91637	MFF1816G31601F
R620	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R621	315-0106-00			RES., FXD, CMPSN: 10M OHM, 5%, 0.25W	01121	CB1065
R622	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R623	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R624	315-0511-00			RES., FXD, CMPSN: 510 OHM, 5%, 0.25W	01121	CB5115
R626	321-0356-00			RES., FXD, FILM: 49.9K OHM, 1%, 0.125W	91637	MFF1816G49901F
R628	321-0385-00			RES., FXD, FILM: 100K OHM, 1%, 0.125W	91637	MFF1816G10002F
R629	315-0821-00			RES., FXD, CMPSN: 820 OHM, 5%, 0.25W	01121	CB8215
R630	315-0752-00			RES., FXD, CMPSN: 7.5K OHM, 5%, 0.25W	01121	CB7525
R632	321-0289-00			RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R634	321-0289-00			RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R636	321-0304-00			RES., FXD, FILM: 14.3K OHM, 1%, 0.125W	91637	MFF1816G14301F
R638	315-0622-00			RES., FXD, CMPSN: 6.2K OHM, 5%, 0.25W	01121	CB6225
R640	315-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R642	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R644	315-0821-00			RES., FXD, CMPSN: 820 OHM, 5%, 0.25W	01121	CB8215
R646	315-0821-00			RES., FXD, CMPSN: 820 OHM, 5%, 0.25W	01121	CB8215
R648	315-0270-00			RES., FXD, CMPSN: 27 OHM, 5%, 0.25W	01121	CB2705
R650	321-0385-00			RES., FXD, FILM: 100K OHM, 1%, 0.125W	91637	MFF1816G10002F
R652	321-0385-00			RES., FXD, FILM: 100K OHM, 1%, 0.125W	91637	MFF1816G10002F

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R654	321-0254-00			RES., FXD, FILM: 4.32K OHM, 1%, 0.125W	91637	MFF1816G43200F
R655	311-1268-00			RES., VAR, NONWIR: 10K OHM, 10%, 0.50W	32997	3329P-L58-103
R656	321-0283-00			RES., FXD, FILM: 8.66K OHM, 1%, 0.125W	91637	MFF1816G86600F
R660	307-1039-00			RES., FXD, THK FI: ATTENUATOR, 1KOHM	80009	307-1039-00
R661	321-0285-00			RES., FXD, FILM: 9.09K OHM, 1%, 0.125W	91637	MFF1816G90900F
R662	321-0291-00			RES., FXD, FILM: 10.5K OHM, 1%, 0.125W	91637	MFF1816G10501F
R664	311-1283-00	XB040000		RES., VAR, NONWIR: 10K OHM, 10%, 0.50W	32997	3329W-L58-103
R665	311-1281-00	XB040000		RES., VAR, NONWIR: 2.5K OHM, 10%, 0.5W	32997	3329W-L58-252
R666	321-0337-00			RES., FXD, FILM: 31.6K OHM, 1%, 0.125W	91637	MFF1816G31601F
R667	321-0337-00			RES., FXD, FILM: 31.6K OHM, 1%, 0.125W	91637	MFF1816G31601F
R668	321-0632-00			RES., FXD, FILM: 9.41K OHM, 0.5%, 0.125W	91637	MFF1816D94100C
R670	321-1643-07			RES., FXD, FILM: 11.03K OHM, 0.1%, 0.125W	91637	MFF1816C11031B
R672	321-1643-07			RES., FXD, FILM: 11.03K OHM, 0.1%, 0.125W	91637	MFF1816C11031B
R674	315-0106-00			RES., FXD, CMPSN: 10M OHM, 5%, 0.25W	01121	CB1065
R676	315-0103-00	B010100	B049999X	RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R678	321-0260-00	B010100	B049999	RES., FXD, FILM: 4.99K OHM, 1%, 0.125W	91637	MFF1816G49900F
R678	315-0391-00	B050000		RES., FXD, CMPSN: 390 OHM, 5%, 0.25W	01121	CB3915
R680	321-0402-00			RES., FXD, FILM: 150K OHM, 1%, 0.125W	24546	NA55D1503F
R682	321-0356-00			RES., FXD, FILM: 49.9K OHM, 1%, 0.125W	91637	MFF1816G49901F
R684	321-0349-00			RES., FXD, FILM: 42.2K OHM, 1%, 0.125W	91637	MFF1816G42201F
R685	311-1266-00			RES., VAR, NONWIR: 2.5K OHM, 10%, 0.50W	32997	3329P-L58-252
R686	321-0349-00			RES., FXD, FILM: 42.2K OHM, 1%, 0.125W	91637	MFF1816G42201F
R688	321-0291-00			RES., FXD, FILM: 10.5K OHM, 1%, 0.125W	91637	MFF1816G10501F
R690	315-0475-00			RES., FXD, CMPSN: 4.7M OHM, 5%, 0.25W	01121	CB4755
R692	321-0289-00			RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R694	321-0327-00			RES., FXD, FILM: 24.9K OHM, 1%, 0.125W	91637	MFF1816G24901F
R696	321-0385-00			RES., FXD, FILM: 100K OHM, 1%, 0.125W	91637	MFF1816G10002F
R698	321-0423-00			RES., FXD, FILM: 249K OHM, 1%, 0.125W	91637	MFF1816G24902F
R700	321-0481-00			RES., FXD, FILM: 1M OHM, 1%, 0.125W	24546	NA4D1004F
R702	322-0519-01			RES., FXD, FILM: 2.49M OHM, 0.5%, 0.25W	91637	HFF143G24903D
R704	307-0465-00			RES., FXD, FILM: 10M OHM, 1%, 0.5W	03888	FL1/2-105F
R706	321-0355-00			RES., FXD, FILM: 48.7K OHM, 1%, 0.125W	91637	MFF1816G48701F
R708	315-0683-00			RES., FXD, CMPSN: 68K OHM, 5%, 0.25W	01121	CB6835
R709	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R716	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R720	315-0562-00			RES., FXD, CMPSN: 5.6K OHM, 5%, 0.25W	01121	CB5625
R722	321-0724-03			RES., FXD, FILM: 13.6K OHM, 0.25W, 0.125W	24546	NC55C1362C
R724	321-0896-03			RES., FXD, FILM: 9.8K OHM, 0.25%, 0.125W	91637	MFF1816D98000C
R726	321-1289-03			RES., FXD, FILM: 10.1K OHM, 0.25%, 0.125W	91637	MFF1816D10101C
R728	315-0513-00			RES., FXD, CMPSN: 51K OHM, 5%, 0.25W	01121	CB5135
R730	321-0260-00			RES., FXD, FILM: 4.99K OHM, 1%, 0.125W	91637	MFF1816G49900F
R731	321-0957-03			RES., FXD, FILM: 4.408K OHM, 0.25%, 0.125W	91637	MFF1816D44080C
R732	321-0776-03			RES., FXD, FILM: 3.501K OHM, 0.25%, 0.125W	91637	MFF1816D35010C
R734	321-0962-03			RES., FXD, FILM: 8K OHM, 0.25%, 0.125W	91637	MFF1816D80000C
R735	321-0289-00			RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R736	321-0357-00			RES., FXD, FILM: 51.1K OHM, 1%, 0.125W	91637	MFF1816G51101F
R737	315-0562-00			RES., FXD, CMPSN: 5.6K OHM, 5%, 0.25W	01121	CB5625
R738	321-0357-00			RES., FXD, FILM: 51.1K OHM, 1%, 0.125W	91637	MFF1816G51101F
R739	315-0303-00			RES., FXD, CMPSN: 30K OHM, 5%, 0.25W	01121	CB3035
R740	307-0442-00			RES., FXD, FILM: BIAS OF 8	80009	307-0442-00
R741	321-0350-00			RES., FXD, FILM: 43.2K OHM, 1%, 0.125W	91637	MFF1816G43201F
R742	321-0379-00			RES., FXD, FILM: 86.6K OHM, 1%, 0.125W	91637	MFF1816G86601F
R744	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R745	307-0442-00			RES., FXD, FILM: BIAS OF 8	80009	307-0442-00
R746	321-0154-00			RES., FXD, FILM: 392 OHM, 1%, 0.125W	91637	MFF1816G392R0F
R747	311-1712-00			RES., VAR, NONWIR: 20K OHM, 10%, 1W	01121	SPSG040S203UA
R750	311-1711-00			RES., VAR, NONWIR: 200 OHM, 10%, 1W	01121	SPSG040S201UA

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
R752	321-0350-00		RES., FXD, FILM: 43.2K OHM, 1%, 0.125W	91637	MFF1816G43201F
R754	321-0322-00		RES., FXD, FILM: 22.1K OHM, 1%, 0.125W	91637	MFF1816G22101F
R755	311-1712-00		RES., VAR, NONWIR: 20K OHM, 10%, 1W	01121	SPSG040S203UA
R756	315-0102-00		RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R760	321-0283-00		RES., FXD, FILM: 8.66K OHM, 1%, 0.125W	91637	MFF1816G86600F
R762	321-0350-00		RES., FXD, FILM: 43.2K OHM, 1%, 0.125W	91637	MFF1816G43201F
R764	321-0354-00		RES., FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	MFF1816G47501F
R766	321-0193-00		RES., FXD, FILM: 1K OHM, 1%, 0.125W	91637	MFF1816G10000F
R770	315-0103-00		RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R772	315-0912-00		RES., FXD, CMPSN: 9.1K OHM, 5%, 0.25W	01121	CB9125
R776	315-0623-00		RES., FXD, CMPSN: 62K OHM, 5%, 0.25W	01121	CB6235
R778	315-0623-00		RES., FXD, CMPSN: 62K OHM, 5%, 0.25W	01121	CB6235
R780	315-0822-00		RES., FXD, CMPSN: 8.2K OHM, 5%, 0.25W	01121	CB8225
R782	315-0682-00		RES., FXD, CMPSN: 6.8K OHM, 5%, 0.25W	01121	CB6825
R784	315-0101-00		RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R786	307-0106-00		RES., FXD, CMPSN: 4.7 OHM, 5%, 0.25W	01121	CB47G5
R788	307-0106-00		RES., FXD, CMPSN: 4.7 OHM, 5%, 0.25W	01121	CB47G5
R790	321-0767-03		RES., FXD, FILM: 38.02K OHM, 0.25%, 0.125W	91637	MFF1816D38021C
R792	315-0104-00		RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R794	315-0104-00		RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R796	315-0104-00		RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R798	321-0344-00		RES., FXD, FILM: 37.4K OHM, 1%, 0.125W	91637	MFF1816G37401F
R800	321-0335-00		RES., FXD, FILM: 30.1K OHM, 1%, 0.125W	91637	MFF1816G30101F
R801	315-0331-00		RES., FXD, CMPSN: 330 OHM, 5%, 0.25W	01121	CB3315
R802	321-0344-00		RES., FXD, FILM: 37.4K OHM, 1%, 0.125W	91637	MFF1816G37401F
R804	321-0327-00		RES., FXD, FILM: 24.9K OHM, 1%, 0.125W	91637	MFF1816G24901F
R806	321-0356-00		RES., FXD, FILM: 49.9K OHM, 1%, 0.125W	91637	MFF1816G49901F
R808	321-0344-00		RES., FXD, FILM: 37.4K OHM, 1%, 0.125W	91637	MFF1816G37401F
R810	321-0335-00		RES., FXD, FILM: 30.1K OHM, 1%, 0.125W	91637	MFF1816G30101F
R812	321-0327-00		RES., FXD, FILM: 24.9K OHM, 1%, 0.125W	91637	MFF1816G24901F
R814	321-0373-00		RES., FXD, FILM: 75K OHM, 1%, 0.125W	91637	MFF1816G75001F
R818	321-0356-00		RES., FXD, FILM: 49.9K OHM, 1%, 0.125W	91637	MFF1816G49901F
R820	321-0344-00		RES., FXD, FILM: 37.4K OHM, 1%, 0.125W	91637	MFF1816G37401F
R822	321-0335-00		RES., FXD, FILM: 30.1K OHM, 1%, 0.125W	91637	MFF1816G30101F
R834	315-0101-00		RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R836	315-0102-00		RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R837	315-0103-00		RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R838	303-0392-00		RES., FXD, CMPSN: 3.9K OHM, 5%, 1W	01121	GB3925
R839	315-0163-00		RES., FXD, CMPSN: 16K OHM, 5%, 0.25W	01121	CB1635
R840	307-0446-00		RES, NTWK, FXD FI: 10K OHM, 20%, (9) RES	91637	MSP10A01-103M
R841	315-0105-00		RES., FXD, CMPSN: 1M OHM, 5%, 0.25W	01121	CB1055
R842	315-0163-00		RES., FXD, CMPSN: 16K OHM, 5%, 0.25W	01121	CB1635
R843	315-0472-00		RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R844	321-0402-00		RES., FXD, FILM: 150K OHM, 1%, 0.125W	24546	NA55D1503F
R845	307-0446-00		RES, NTWK, FXD FI: 10K OHM, 20%, (9) RES	91637	MSP10A01-103M
R846	321-0356-00		RES., FXD, FILM: 49.9K OHM, 1%, 0.125W	91637	MFF1816G49901F
R848	321-0373-00		RES., FXD, FILM: 75K OHM, 1%, 0.125W	91637	MFF1816G75001F
R850	307-0446-00		RES, NTWK, FXD FI: 10K OHM, 20%, (9) RES	91637	MSP10A01-103M
R851	321-0344-00		RES., FXD, FILM: 37.4K OHM, 1%, 0.125W	91637	MFF1816G37401F
R852	315-0513-00		RES., FXD, CMPSN: 51K OHM, 5%, 0.25W	01121	CB5135
R862	315-0472-00		RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R864	315-0471-00		RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R868	321-0442-00		RES., FXD, FILM: 392K OHM, 1%, 0.125W	91637	MFF1816G39202F
R870	321-0425-00		RES., FXD, FILM: 261K OHM, 1%, 0.125W	91637	MFF1816G26102F
R874	321-0385-00		RES., FXD, FILM: 100K OHM, 1%, 0.125W	91637	MFF1816G10002F
R876	321-0426-00		RES., FXD, FILM: 267K OHM, 1%, 0.125W	91637	MFF1816G26702F
R878	321-0377-00		RES., FXD, FILM: 82.5K OHM, 1%, 0.125W	91637	MFF1816G82501F

## Replaceable Electrical Parts—7L5

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R880	307-0106-00			RES.,FXD,CMPSN:4.7 OHM,5%,0.25W	01121	CB47G5
R882	307-0106-00			RES.,FXD,CMPSN:4.7 OHM,5%,0.25W	01121	CB47G5
R891	301-0562-00			RES.,FXD,CMPSN:5.6K OHM,5%,0.50W	01121	EB5625
R892	311-1280-00			RES.,VAR,NONWIR:1K OHM,10%,0.50W	32997	3329W-L58-102
R893	321-0915-07			RES.,FXD,FILM:1.291K OHM,0.1%,0.125W	24546	NE55E112910B
R894	321-0816-07			RES.,FXD,FILM:5K OHM,0.1%,0.125W	91637	MFF1816C50000B
R895	311-1280-00			RES.,VAR,NONWIR:1K OHM,10%,0.50W	32997	3329W-L58-102
R896	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R897	321-0815-07			RES.,FXD,FILM:4.1K OHM,0.1%,0.125W	91637	MFF1816C41000B
R898	321-0249-09			RES.,FXD,FILM:3.83K OHM,1%,0.125W	91637	MFF1816C38300F
R1000	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R1002	315-0273-00			RES.,FXD,CMPSN:27K OHM,5%,0.25W	01121	CB2735
R1003	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R1004	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
R1006	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R1008	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R1010	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R1012	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R1014	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R1016	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R1018	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R1020	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R1022	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R1040	317-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.125W	01121	BB5105
R1050	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R1052	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R1053	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R1054	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R1056	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R1058	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R1059	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R1060	315-0224-00			RES.,FXD,CMPSN:220K OHM,5%,0.25W	01121	CB2245
R1064	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R1065	311-1263-00			RES.,VAR,NONWIR:1K OHM,10%,0.50W	32997	3329P-L58-102
R1066	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
R1070	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R1072	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R1074	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R1076	321-0283-00			RES.,FXD,FILM:8.66K OHM,1%,0.125W	91637	MFF1816G86600F
R1080	321-0283-00			RES.,FXD,FILM:8.66K OHM,1%,0.125W	91637	MFF1816G86600F
R1084	321-0371-00			RES.,FXD,FILM:71.5K OHM,1%,0.125W	91637	MFF1816G71501F
R1090	307-0444-00			RES.,FXD,FILM:BIAS OF 10	80009	307-0444-00
R1104	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R1110	315-0224-00			RES.,FXD,CMPSN:220K OHM,5%,0.25W	01121	CB2245
R1112	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R1115	311-1260-00			RES.,VAR,NONWIR:250 OHM,10%,0.50W	32997	3329P-L58-251
R1116	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R1120	307-0444-00			RES.,FXD,FILM:BIAS OF 10	80009	307-0444-00
R1130	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R1134	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R1140	315-0224-00			RES.,FXD,CMPSN:220K OHM,5%,0.25W	01121	CB2245
R1145	311-1260-00			RES.,VAR,NONWIR:250 OHM,10%,0.50W	32997	3329P-L58-251
R1146	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R1150	307-0444-00			RES.,FXD,FILM:BIAS OF 10	80009	307-0444-00
R1164	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R1169	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R1170	315-0224-00			RES.,FXD,CMPSN:220K OHM,5%,0.25W	01121	CB2245



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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R1172	321-0139-00			RES., FXD, FILM: 274 OHM, 1%, 0.125W	91637	MFF1816G274ROF
R1174	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R1180	315-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R1184	315-0562-00			RES., FXD, CMPSN: 5.6K OHM, 5%, 0.25W	01121	CB5625
R1190	307-0444-00			RES., FXD, FILM: BIAS OF 10	80009	307-0444-00
R1191	321-0270-00			RES., FXD, FILM: 6.34K OHM, 1%, 0.125W	91637	MFF1816G63400F
R1200	315-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R1204	315-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R1214	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R1216	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R1220	321-0267-00			RES., FXD, FILM: 5.9K OHM, 1%, 0.125W	91637	MFF1816G59000F
R1224	321-0161-00			RES., FXD, FILM: 464 OHM, 1%, 0.125W	91637	MFF1816G464ROF
R1226	315-0620-00			RES., FXD, CMPSN: 62 OHM, 5%, 0.25W	01121	CB6205
R1230	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R1232	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R1234	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R1236	315-0472-00			RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R1240	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R1241	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R1242	321-0155-00			RES., FXD, FILM: 402 OHM, 1%, 0.125W	91637	MFF1816G402ROF
R1246	315-0302-00			RES., FXD, CMPSN: 3K OHM, 5%, 0.25W	01121	CB3025
R1248	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R1249	321-0260-00			RES., FXD, FILM: 4.99K OHM, 1%, 0.125W	91637	MFF1816G49900F
R1250	321-0155-00			RES., FXD, FILM: 402 OHM, 1%, 0.125W	91637	MFF1816G402ROF
R1252	321-0251-00			RES., FXD, FILM: 4.02K OHM, 1%, 0.125W	91637	MFF1816G40200F
R1254	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R1256	321-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.125W	91637	MFF1816G10000F
R1258	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R1260	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R1262	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R1300	321-0068-00			RES., FXD, FILM: 49.9 OHM, 1%, 0.125W	91637	MFF1816G4990F
R1304	307-0113-00			RES., FXD, CMPSN: 5.1 OHM, 5%, 0.25W	01121	CB5165
R1306	315-0182-00			RES., FXD, CMPSN: 1.8K OHM, 5%, 0.25W	01121	CB1825
R1308	315-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.25W	01121	CB5105
R1310	321-0246-00			RES., FXD, FILM: 3.57K OHM, 1%, 0.125W	91637	MFF1816G35700F
R1312	315-0561-00			RES., FXD, CMPSN: 560 OHM, 5%, 0.25W	01121	CB5615
R1314	315-0511-00			RES., FXD, CMPSN: 510 OHM, 5%, 0.25W	01121	CB5115
R1316	315-0511-00			RES., FXD, CMPSN: 510 OHM, 5%, 0.25W	01121	CB5115
R1318	321-0114-00			RES., FXD, FILM: 150 OHM, 1%, 0.125W	91637	MFF1816G150ROF
R1320	315-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.25W	01121	CB5105
R1322	321-0068-00			RES., FXD, FILM: 49.9 OHM, 1%, 0.125W	91637	MFF1816G4990F
R1324	315-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.25W	01121	CB5105
R1326	315-0620-00			RES., FXD, CMPSN: 62 OHM, 5%, 0.25W	01121	CB6205
R1350	315-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R1352	315-0303-00			RES., FXD, CMPSN: 30K OHM, 5%, 0.25W	01121	CB3035
R1354	315-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R1356	315-0303-00			RES., FXD, CMPSN: 30K OHM, 5%, 0.25W	01121	CB3035
R1358	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R1359	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R1360	315-0203-00	B010100	B049999X	RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R1362	315-0103-00	B010100	B049999	RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R1362	315-0391-00	B050000		RES., FXD, CMPSN: 390 OHM, 5%, 0.25W	01121	CB3915
R1364	315-0302-00	B010100	B049999	RES., FXD, CMPSN: 3K OHM, 5%, 0.25W	01121	CB3025
R1364	315-0202-00	B050000		RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
R1366	315-0152-00	B010100	B049999X	RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W	01121	CB1525
R1370	315-0203-00	B010100	B049999X	RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R1372	315-0103-00	B010100	B049999	RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R1372	315-0391-00	B050000		RES., FXD, CMPSN: 390 OHM, 5%, 0.25W	01121	CB3915
R1374	315-0302-00	B010100	B049999	RES., FXD, CMPSN: 3K OHM, 5%, 0.25W	01121	CB3025
R1374	315-0202-00	B050000		RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
R1376	315-0152-00	B010100	B049999X	RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W	01121	CB1525
R1380	315-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R1384	315-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R1390	321-0263-00			RES., FXD, FILM: 5.36K OHM, 1%, 0.125W	91637	MFF1816G53600F
R1392	321-0255-00			RES., FXD, FILM: 4.42K OHM, 1%, 0.125W	91637	MFF1816G44200F
R1394	321-0222-00			RES., FXD, FILM: 2K OHM, 1%, 0.125W	91637	MFF1816G20000F
R1396	321-0130-00			RES., FXD, FILM: 221 OHM, 1%, 0.125W	91637	MFF1816G221ROF
R1398	321-0216-00			RES., FXD, FILM: 1.74K OHM, 1%, 0.125W	91637	MFF1816G17400F
R1400	321-0170-00			RES., FXD, FILM: 576 OHM, 1%, 0.125W	91637	MFF1816G576ROF
R1402	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R1404	315-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.25W	01121	CB5105
R1406	321-0239-00			RES., FXD, FILM: 3.01K OHM, 1%, 0.125W	91637	MFF1816G30100F
R1408	315-0301-00			RES., FXD, CMPSN: 300 OHM, 5%, 0.25W	01121	CB3015
R1410	321-0404-00			RES., FXD, FILM: 158K OHM, 1%, 0.125W	91637	MFF1816G15802F
R1411	321-0246-00			RES., FXD, FILM: 3.57K OHM, 1%, 0.125W	91637	MFF1816G35700F
R1412	321-0334-00			RES., FXD, FILM: 29.4K OHM, 1%, 0.125W	91637	MFF1816G29401F
R1413	321-0263-00			RES., FXD, FILM: 5.36K OHM, 1%, 0.125W	91637	MFF1816G53600F
R1414	321-0247-00			RES., FXD, FILM: 3.65K OHM, 1%, 0.125W	91637	MFF1816G36500F
R1416	321-0481-00			RES., FXD, FILM: 1M OHM, 1%, 0.125W	24546	NA4D1004F
R1417	315-0131-00			RES., FXD, CMPSN: 130 OHM, 5%, 0.25W	01121	CB1315
R1418	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R1419	321-0452-00			RES., FXD, FILM: 499K OHM, 1%, 0.125W	91637	MFF1816G49902F
R1420	321-0259-00			RES., FXD, FILM: 4.87K OHM, 1%, 0.125W	91637	MFF1816G48700F
R1422	321-0259-00			RES., FXD, FILM: 4.87K OHM, 1%, 0.125W	91637	MFF1816G48700F
R1424	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R1426	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R1428	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R1429	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R1430	315-0151-00			RES., FXD, CMPSN: 150 OHM, 5%, 0.25W	01121	CB1515
R1432	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R1434	321-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.125W	91637	MFF1816G10000F
R1436	315-0750-00			RES., FXD, CMPSN: 75 OHM, 5%, 0.25W	01121	CB7505
R1440	315-0151-00			RES., FXD, CMPSN: 150 OHM, 5%, 0.25W	01121	CB1515
R1442	321-0193-03			RES., FXD, FILM: 1K OHM, 0.25%, 0.125W	91637	MFF1816D10000C
R1446	321-1669-03			RES., FXD, FILM: 5.31K OHM, 0.25%, 0.125W	91637	MFF1816D53100C
R1448	315-0272-00			RES., FXD, CMPSN: 2.7K OHM, 5%, 0.25W	01121	CB2725
R1449	315-0301-00			RES., FXD, CMPSN: 300 OHM, 5%, 0.25W	01121	CB3015
R1450	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R1452	315-0151-00			RES., FXD, CMPSN: 150 OHM, 5%, 0.25W	01121	CB1515
R1454	315-0272-00			RES., FXD, CMPSN: 2.7K OHM, 5%, 0.25W	01121	CB2725
R1455	307-1048-00			ATTENUATOR, FXD: 14 RESISTOR	80009	307-1048-00
R1456	315-0301-00			RES., FXD, CMPSN: 300 OHM, 5%, 0.25W	01121	CB3015
R1458	321-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.125W	91637	MFF1816G10000F
R1459	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R1460	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R1462	315-0151-00			RES., FXD, CMPSN: 150 OHM, 5%, 0.25W	01121	CB1515
R1464	321-0193-03			RES., FXD, FILM: 1K OHM, 0.25%, 0.125W	91637	MFF1816D10000C
R1466	321-1669-03			RES., FXD, FILM: 5.31K OHM, 0.25%, 0.125W	91637	MFF1816D53100C
R1468	315-0272-00			RES., FXD, CMPSN: 2.7K OHM, 5%, 0.25W	01121	CB2725
R1469	315-0301-00			RES., FXD, CMPSN: 300 OHM, 5%, 0.25W	01121	CB3015
R1500	317-0300-00			RES., FXD, CMPSN: 30 OHM, 5%, 0.125W	01121	BB3005
R1507	301-0100-00			RES., FXD, CMPSN: 10 OHM, 5%, 0.50W	01121	EB1005
R1510	317-0162-00			RES., FXD, CMPSN: 1.6K OHM, 5%, 0.125W	01121	BB1625
R1511	317-0221-00			RES., FXD, CMPSN: 220 OHM, 5%, 0.125W	01121	BB2215

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R1512	317-0512-00			RES., FXD, CMPSN: 5.1K OHM, 5%, 0.125	01121	BB5125
R1513	317-0221-00			RES., FXD, CMPSN: 220 OHM, 5%, 0.125W	01121	BB2215
R1520	317-0274-00			RES., FXD, CMPSN: 270K OHM, 5%, 0.125W	01121	BB2745
R1522	317-0152-00			RES., FXD, CMPSN: 1.5K OHM, 5%, 0.125W	01121	BB1525
R1524	317-0512-00			RES., FXD, CMPSN: 5.1K OHM, 5%, 0.125	01121	BB5125
R1526	317-0301-00			RES., FXD, CMPSN: 300 OHM, 5%, 0.125W	01121	BB3015
R1528	317-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.125W	01121	BB1025
R1529	317-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.125W	01121	BB1025
R1530	317-0303-00	B010100	B071279	RES., FXD, CMPSN: 30K OHM, 5%, 0.125W	01121	BB3035
R1530	317-0103-00	B071280		RES., FXD, CMPSN: 10K OHM, 5%, 0.125W	01121	BB1035
R1531	317-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.125W	01121	BB1035
R1532	317-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.125W	01121	BB1035
R1533	317-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.125W	01121	BB1015
R1536	317-0564-00			RES., FXD, CMPSN: 560K OHM, 5%, 0.125W	01121	BB5645
R1540	317-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.125W	01121	BB1035
R1544	317-0202-00			RES., FXD, CMPSN: 2K OHM, 5%, 0.125W	01121	BB2025
R1612	321-0068-00			RES., FXD, FILM: 49.9 OHM, 1%, 0.125W	91637	MFF1816G49R90F
R1616	321-0068-00			RES., FXD, FILM: 49.9 OHM, 1%, 0.125W	91637	MFF1816G49R90F
R1622	321-0068-00			RES., FXD, FILM: 49.9 OHM, 1%, 0.125W	91637	MFF1816G49R90F
R1626	321-0068-00			RES., FXD, FILM: 49.9 OHM, 1%, 0.125W	91637	MFF1816G49R90F
R1632	315-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.25W	01121	CB5105
R1650	317-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.125W	01121	BB4705
R1652	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R1654	321-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.125W	91637	MFF1816G10000F
R1656	315-0240-00			RES., FXD, CMPSN: 24 OHM, 5%, 0.25W	01121	CB2405
R1657	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R1658	315-0183-00			RES., FXD, CMPSN: 18K OHM, 5%, 0.25W	01121	CB1835
R1660	315-0302-00			RES., FXD, CMPSN: 3K OHM, 5%, 0.25W	01121	CB3025
R1667	315-0105-00			RES., FXD, CMPSN: 1M OHM, 5%, 0.25W	01121	CB1055
R1668	321-0260-00			RES., FXD, FILM: 4.99K OHM, 1%, 0.125W	91637	MFF1816G49900F
R1669	315-0105-00			RES., FXD, CMPSN: 1M OHM, 5%, 0.25W	01121	CB1055
R1670	321-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.125W	91637	MFF1816G10000F
R1672	317-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.125W	01121	BB4705
R1673	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R1674	321-0256-00			RES., FXD, FILM: 4.53K OHM, 1%, 0.125W	91637	MFF1816G45300F
R1675	315-0273-00			RES., FXD, CMPSN: 27K OHM, 5%, 0.25W	01121	CB2735
R1676	315-0912-00			RES., FXD, CMPSN: 9.1K OHM, 5%, 0.25W	01121	CB9125
R1677	315-0272-00			RES., FXD, CMPSN: 2.7K OHM, 5%, 0.25W	01121	CB2725
R1678	315-0301-00			RES., FXD, CMPSN: 300 OHM, 5%, 0.25W	01121	CB3015
R1679	317-0301-00			RES., FXD, CMPSN: 300 OHM, 5%, 0.125W	01121	BB3015
R1680	311-1263-00			RES., VAR, NONWIR: 1K OHM, 10%, 0.50W	32997	3329P-L58-102
R1681	315-0203-00	B010100	B071109	RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R1681	315-0202-00	B071110		RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
R1682	321-0135-00			RES., FXD, FILM: 249 OHM, 1%, 0.125W	91637	MFF1816G249R0F
R1683	321-0318-00			RES., FXD, FILM: 20K OHM, 1%, 0.125W	91637	MFF1816G20001F
R1684	315-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R1685	311-1259-00			RES., VAR, NONWIR: 100 OHM, 10%, 0.50W	32997	3329P-L58-101
R1686	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R1687	315-0113-00	B010100	B049999X	RES., FXD, CMPSN: 11K OHM, 5%, 0.25W	01121	CB1135
R1688	315-0203-00	B010100	B049999	RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R1688	315-0202-00	B050000		RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
R1689	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R1690	315-0473-00			RES., FXD, CMPSN: 47K OHM, 5%, 0.25W	01121	CB4735
R1691	315-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R1692	315-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R1693	315-0393-00	B010100	B049999X	RES., FXD, CMPSN: 39K OHM, 5%, 0.25W	01121	CB3935
R1694	315-0203-00	B010100	B049999	RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R1694	315-0391-00	B050000		RES., FXD, CMPSN: 390 OHM, 5%, 0.25W	01121	CB3915
R1700	311-1273-00			RES., VAR, NONWIR: 200K OHM, 10%, 0.5W	32997	3329P-L58-204
R1702	311-1271-00			RES., VAR, NONWIR: 50K OHM, 10%, 0.50W	32997	3329P-L58-503
R1704	311-1268-00			RES., VAR, NONWIR: 10K OHM, 10%, 0.50W	32997	3329P-L58-103
R1706	311-1267-00			RES., VAR, NONWIR: 5K OHM, 10%, 0.50W	32997	3329P-L58-502
R1708	311-1265-00			RES., VAR, NONWIR: 2K OHM, 10%, 0.50W	32997	3329P-L58-202
R1710	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R1714	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R1716	317-0183-00			RES., FXD, CMPSN: 18K OHM, 5%, 0.125W	01121	BB1835
R1720	317-0302-00			RES., FXD, CMPSN: 3K OHM, 5%, 0.125W	01121	BB3025
R1728	321-0289-00			RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R1729	315-0301-00			RES., FXD, CMPSN: 300 OHM, 5%, 0.25W	01121	CB3015
R1730	311-1263-00			RES., VAR, NONWIR: 1K OHM, 10%, 0.50W	32997	3329P-L58-102
R1731	315-0203-00	B010100	B071109	RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R1731	315-0202-00	B071110		RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
R1732	321-0135-00			RES., FXD, FILM: 249 OHM, 1%, 0.125W	91637	MFF1816G249ROF
R1733	321-0318-00			RES., FXD, FILM: 20K OHM, 1%, 0.125W	91637	MFF1816G20001F
R1734	315-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R1735	311-1259-00			RES., VAR, NONWIR: 100 OHM, 10%, 0.50W	32997	3329P-L58-101
R1740	315-0200-00			RES., FXD, CMPSN: 20 OHM, 5%, 0.25W	01121	CB2005
R1741	315-0220-00			RES., FXD, CMPSN: 22 OHM, 5%, 0.25W	01121	CB2205
R1742	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R1744	321-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.125W	91637	MFF1816G10000F
R1746	321-0286-00			RES., FXD, FILM: 9.31K OHM, 1%, 0.125W	91637	MFF1816G93100F
R1748	315-0220-00			RES., FXD, CMPSN: 22 OHM, 5%, 0.25W	01121	CB2205
R1749	315-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R1750	315-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R1752	315-0123-00			RES., FXD, CMPSN: 12K OHM, 5%, 0.25W	01121	CB1235
R1754	315-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R1756	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R1760	315-0562-00			RES., FXD, CMPSN: 5.6K OHM, 5%, 0.25W	01121	CB5625
R1766	321-0308-00			RES., FXD, FILM: 15.8K OHM, 1%, 0.125W	91637	MFF1816G15801F
R1768	321-0328-00			RES., FXD, FILM: 25.5K OHM, 1%, 0.125W	91637	MFF1816G25501F
R1770	321-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.125W	91637	MFF1816G10000F
R1772	315-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R1774	315-0123-00			RES., FXD, CMPSN: 12K OHM, 5%, 0.25W	01121	CB1235
R1776	321-0286-00			RES., FXD, FILM: 9.31K OHM, 1%, 0.125W	91637	MFF1816G93100F
R1778	315-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R1780	311-1263-00			RES., VAR, NONWIR: 1K OHM, 10%, 0.50W	32997	3329P-L58-102
R1781	315-0203-00	B010100	B071109	RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R1781	315-0202-00	B071110		RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
R1782	321-0135-00			RES., FXD, FILM: 249 OHM, 1%, 0.125W	91637	MFF1816G249ROF
R1783	321-0318-00			RES., FXD, FILM: 20K OHM, 1%, 0.125W	91637	MFF1816G20001F
R1784	315-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R1785	311-1259-00			RES., VAR, NONWIR: 100 OHM, 10%, 0.50W	32997	3329P-L58-101
R1799	315-0301-00			RES., FXD, CMPSN: 300 OHM, 5%, 0.25W	01121	CB3015
R1800	315-0562-00			RES., FXD, CMPSN: 5.6K OHM, 5%, 0.25W	01121	CB5625
R1802	321-0289-00			RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R1810	315-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R1811	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R1812	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R1813	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R1814	315-0392-00			RES., FXD, CMPSN: 3.9K OHM, 5%, 0.25W	01121	CB3925
R1816	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R1818	321-0286-00			RES., FXD, FILM: 9.31K OHM, 1%, 0.125W	91637	MFF1816G93100F
R1819	315-0301-00			RES., FXD, CMPSN: 300 OHM, 5%, 0.25W	01121	CB3015
R1820	311-1263-00			RES., VAR, NONWIR: 1K OHM, 10%, 0.50W	32997	3329P-L58-102

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R1821	315-0203-00	B010100	B071109	RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
R1821	315-0202-00	B071110		RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
R1822	321-0135-00			RES.,FXD,FILM:249 OHM,1%,0.125W	91637	MFF1816G249ROF
R1823	321-0318-00			RES.,FXD,FILM:20K OHM,1%,0.125W	91637	MFF1816G20001F
R1824	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R1825	311-1259-00			RES.,VAR, NONWIR:100 OHM,10%,0.50W	32997	3329P-L58-101
R1830	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R1832	315-0163-00			RES.,FXD,CMPSN:16K OHM,5%,0.25W	01121	CB1635
R1834	317-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.125W	01121	BB3015
R1835	311-1263-00			RES.,VAR, NONWIR:1K OHM,10%,0.50W	32997	3329P-L58-102
R1836	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R1842	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R1844	317-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.125W	01121	BB4705
R1846	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R1847	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
R1848	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R1854	321-0171-00			RES.,FXD,FILM:590 OHM,1%,0.125W	91637	MFF1816G590ROF
R1856	317-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.125W	01121	BB1045
R1858	317-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.125W	01121	BB1045
R1874	317-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.125W	01121	BB3025
R1876	317-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.125W	01121	BB1035
R1878	321-0174-00			RES.,FXD,FILM:634 OHM,1%,0.125W	91637	MFF1816G634ROF
R1880	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
R1882	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R1883	315-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
R1885	311-1263-00			RES.,VAR, NONWIR:1K OHM,10%,0.50W	32997	3329P-L58-102
R1886	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R1887	321-0223-00			RES.,FXD,FILM:2.05K OHM,1%,0.125W	91637	MFF1816G20500F
R1888	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R1890	317-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.125W	01121	BB1045
R1894	317-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.125W	01121	BB1045
R1902	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
R1903	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
R1904	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R1905	311-1265-00			RES.,VAR, NONWIR:2K OHM,10%,0.50W	32997	3329P-L58-202
R1906	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
R1908	315-0224-00			RES.,FXD,CMPSN:220K OHM,5%,0.25W	01121	CB2245
R1910	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R1912	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
R1914	321-0260-00			RES.,FXD,FILM:4.99K OHM,1%,0.125W	91637	MFF1816G49900F
R1916	315-0301-00	B010100	B020211	RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
R1916	315-0241-00	B020212		RES.,FXD,CMPSN:240 OHM,5%,0.25W	01121	CB2415
R1918	315-0162-00			RES.,FXD,CMPSN:1.6K OHM,5%,0.25W	01121	CB1625
R1919	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
R2000	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R2002	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	91637	MFF1816G20000F
R2010	321-0272-00			RES.,FXD,FILM:6.65K OHM,1%,0.125W	91637	MFF1816G66500F
R2012	321-0318-00			RES.,FXD,FILM:20K OHM,1%,0.125W	91637	MFF1816G20001F
R2013	321-0291-00			RES.,FXD,FILM:10.5K OHM,1%,0.125W	91637	MFF1816G10501F
R2014	321-0251-00	B010100	B091999	RES.,FXD,FILM:4.02K OHM,1%,0.125W	91637	MFF1816G40200F
R2014	321-0666-00	B092000		RES.,FXD,FILM:3.04K OHM,0.5%,0.125W	91637	MFF1816D30400D
R2015	311-1267-00			RES.,VAR, NONWIR:5K OHM,10%,0.50W	32997	3329P-L58-502
R2020	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R2022	321-0318-00			RES.,FXD,FILM:20K OHM,1%,0.125W	91637	MFF1816G20001F
R2024	321-0251-00			RES.,FXD,FILM:4.02K OHM,1%,0.125W	91637	MFF1816G40200F
R2025	311-1265-00			RES.,VAR, NONWIR:2K OHM,10%,0.50W	32997	3329P-L58-202
R2026	321-0237-00			RES.,FXD,FILM:2.87K OHM,1%,0.125W	91637	MFF1816G28700F

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R2027	321-0246-00			RES.,FXD,FILM:3.57K OHM,1%,0.125W	91637	MFF1816G35700F
R2028	321-0306-00			RES.,FXD,FILM:15K OHM,1%,0.125W	91637	MFF1816G15001F
R2030	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R2032	321-0204-00			RES.,FXD,FILM:1.3K OHM,1%,0.125W	91637	MFF1816G13000F
R2033	321-0334-00			RES.,FXD,FILM:29.4K OHM,1%,0.125W	91637	MFF1816G29401F
R2040	315-0121-00			RES.,FXD,CMPSN:120 OHM,5%,0.25W	01121	CB1215
R2042	307-0103-00			RES.,FXD,CMPSN:2.7 OHM,5%,0.25W	01121	CB27G5
R2052	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R2060	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
R2062	315-0100-00	B010100	B010114	RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R2062	307-0114-00	B010115		RES.,FXD,CMPSN:6.2 OHM,5%,0.25W	01121	CB62G5
R2064	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
R2066	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
R2067	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
R2068	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
R2202	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R2204	321-0318-00			RES.,FXD,FILM:20K OHM,1%,0.125W	91637	MFF1816G20001F
R2205	311-1265-00			RES.,VAR, NONWIR:2K OHM,10%,0.50W	32997	3329P-L58-202
R2206	321-0373-00			RES.,FXD,FILM:75K OHM,1%,0.125W	91637	MFF1816G75001F
R2208	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R2210	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R2212	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R2214	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R2215	311-1272-00			RES.,VAR, NONWIR:100K OHM,10%,0.50W	32997	3329P-L58-104
R2216	321-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.125W	91637	MFF1816G49R90F
R2218	321-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.125W	91637	MFF1816G49R90F
R2220	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
R2222	321-0298-00			RES.,FXD,FILM:12.4K OHM,1%,0.125W	91637	MFF1816G12401F
R2224	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R2225	311-1272-00			RES.,VAR, NONWIR:100K OHM,10%,0.50W	32997	3329P-L58-104
R2226	321-0356-00			RES.,FXD,FILM:49.9K OHM,1%,0.125W	91637	MFF1816G49901F
R2227	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R2230	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
R2232	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
R2235	311-1273-00			RES.,VAR, NONWIR:200K OHM,10%,0.5W	32997	3329P-L58-204
R2237	315-0274-00			RES.,FXD,CMPSN:270K OHM,5%,0.25W	01121	CB2745
R2238	315-0273-00			RES.,FXD,CMPSN:27K OHM,5%,0.25W	01121	CB2735
R2240	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R2248	315-0432-00			RES.,FXD,CMPSN:4.3K OHM,5%,0.25W	01121	CB4325
R2250	307-0475-00			RES,NTWK,FXD,FI:10K OHM,(15)RES,DIP 16 LD	32997	4116R-002-103
R2255	307-0447-00	B010100	B071109	RES NTWK,FXD,FI:47K OHM,(15)RES	73138	898-1-R47K
R2255	307-0602-00	B071110		RES NTWK,FXD FI:3,1K OHM,12,47K OHM,2%	73138	1898-916-0
R2258	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R2262	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R2264	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R2266	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R2268	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R2269	317-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.125W	01121	BB4705
R2270	317-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.125W	01121	BB4705
R2272	317-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.125W	01121	BB1045
R2273	317-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.125W	01121	BB1045
R2275	317-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.125W	01121	BB1045
R2277	317-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.125W	01121	BB1045
R2278	317-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.125W	01121	BB1045
R2280	317-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.125W	01121	BB1045
R2282	317-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.125W	01121	BB1045
R2284	317-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.125W	01121	BB4705

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R2286	317-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.125W	01121	BB4705
R2287	317-0513-00			RES., FXD, CMPSN: 51K OHM, 5%, 0.125W	01121	BB5135
R2289	317-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.125W	01121	BB4705
R2290	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R2291	317-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.125W	01121	BB4705
R2292	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2294	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2300	321-0315-00			RES., FXD, FILM: 18.7K OHM, 1%, 0.125W	91637	MFF1816G18701F
R2302	321-0344-00			RES., FXD, FILM: 37.4K OHM, 1%, 0.125W	91637	MFF1816G37401F
R2304	321-0373-00			RES., FXD, FILM: 75K OHM, 1%, 0.125W	91637	MFF1816G75001F
R2306	321-0402-00			RES., FXD, FILM: 150K OHM, 1%, 0.125W	24546	NA55D1503F
R2308	321-0402-00			RES., FXD, FILM: 150K OHM, 1%, 0.125W	24546	NA55D1503F
R2315	315-0223-00			RES., FXD, CMPSN: 22K OHM, 5%, 0.25W	01121	CB2235
R2316	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R2318	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R2320	321-0356-00			RES., FXD, FILM: 49.9K OHM, 1%, 0.125W	91637	MFF1816G49901F
R2322	321-0327-00			RES., FXD, FILM: 24.9K OHM, 1%, 0.125W	91637	MFF1816G24901F
R2324	321-0321-00			RES., FXD, FILM: 21.5K OHM, 1%, 0.125W	91637	MFF1816G21501F
R2330	321-0344-00			RES., FXD, FILM: 37.4K OHM, 1%, 0.125W	91637	MFF1816G37401F
R2332	321-0373-00			RES., FXD, FILM: 75K OHM, 1%, 0.125W	91637	MFF1816G75001F
R2334	321-0402-00			RES., FXD, FILM: 150K OHM, 1%, 0.125W	24546	NA55D1503F
R2336	321-0327-00			RES., FXD, FILM: 24.9K OHM, 1%, 0.125W	91637	MFF1816G24901F
R2338	321-0321-00			RES., FXD, FILM: 21.5K OHM, 1%, 0.125W	91637	MFF1816G21501F
R2340	321-0402-00			RES., FXD, FILM: 150K OHM, 1%, 0.125W	24546	NA55D1503F
R2342	321-0306-00			RES., FXD, FILM: 15K OHM, 1%, 0.125W	91637	MFF1816G15001F
R2344	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R2346	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2348	321-0344-00			RES., FXD, FILM: 37.4K OHM, 1%, 0.125W	91637	MFF1816G37401F
R2350	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R2352	321-0371-00			RES., FXD, FILM: 71.5K OHM, 1%, 0.125W	91637	MFF1816G71501F
R2354	315-0105-00			RES., FXD, CMPSN: 1M OHM, 5%, 0.25W	01121	CB1055
R2356	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R2358	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R2360	321-0371-00			RES., FXD, FILM: 71.5K OHM, 1%, 0.125W	91637	MFF1816G71501F
R2362	321-0400-00			RES., FXD, FILM: 143K OHM, 1%, 0.125W	91637	MFF1816G14302F
R2364	321-0333-00			RES., FXD, FILM: 28.7K OHM, 1%, 0.125W	91637	MFF1816G28701F
R2366	321-0354-00			RES., FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	MFF1816G47501F
R2368	317-0047-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.125W	01121	BB47G5
R2371	317-0047-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.125W	01121	BB47G5
R2373	317-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.125W	01121	BB4705
R2377	317-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.125W	01121	BB4705
R2381	317-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.125W	01121	BB4705
R2382	321-0431-00			RES., FXD, FILM: 301K OHM, 1%, 0.125W	91637	MFF1816G30102F
R2383	321-0306-00			RES., FXD, FILM: 15K OHM, 1%, 0.125W	91637	MFF1816G15001F
R2384	317-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.125W	01121	BB4705
R2386	317-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.125W	01121	BB4705
R2387	317-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.125W	01121	BB4705
R2388	317-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.125W	01121	BB4705
R2389	317-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.125W	01121	BB4705
R2391	317-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.125W	01121	BB4705
R2393	317-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.125W	01121	BB4705
R2396	317-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.125W	01121	BB2225
R2397	317-0105-00	B010100	B020274	RES., FXD, CMPSN: 1M OHM, 5%, 0.125W	01121	BB1055
R2397	317-0102-00	B020275		RES., FXD, CMPSN: 1K OHM, 5%, 0.125W	01121	BB1025
R3000	307-0474-00			RES., FXD, FILM: 17 RES. NETWORK	80009	307-0474-00
R3010	307-0445-00			RES, NTWK, FXD, FI: 4.7K OHM, 20%, (9) RES	91637	MSP10A01-472M
R3012	315-0392-00			RES., FXD, CMPSN: 3.9K OHM, 5%, 0.25W	01121	CB3925

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R3014	321-0185-00			RES., FXD, FILM: 825 OHM, 1%, 0.125W	91637	MFF1816G825ROF
R3022	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R3024	321-0250-00	B010100	B030366	RES., FXD, FILM: 3.92K OHM, 1%, 0.125W	91637	MFF1816G39200F
R3024	321-0239-00	B030367		RES., FXD, FILM: 3.01K OHM, 1%, 0.125W	91637	MFF1816G30100F
R3026	321-0189-00	B010100	B030366	RES., FXD, FILM: 909 OHM, 1%, 0.125W	91637	MFF1816G909ROF
R3026	321-0164-00	B030367		RES., FXD, FILM: 499 OHM, 1%, 0.125W	91637	MFF1816G499ROF
R3032	315-0431-00			RES., FXD, CMPSN: 430 OHM, 5%, 0.25W	01121	CB4315
R4095	315-0202-00	B010100	B069999X	RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
R4129	315-0103-00	B010100	B069999X	RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R4158	315-0103-00	B010100	B069999X	RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R4189	315-0102-00	B010100	B069999X	RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R4190	315-0182-00	B010100	B069999X	RES., FXD, CMPSN: 1.8K OHM, 5%, 0.25W	01121	CB1825
R4191	315-0133-00	B010100	B069999X	RES., FXD, CMPSN: 13K OHM, 5%, 0.25W	01121	CB1335
R4192	315-0512-00	B010100	B069999X	RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R4193	315-0182-00	B010100	B069999X	RES., FXD, CMPSN: 1.8K OHM, 5%, 0.25W	01121	CB1825
R4194	315-0512-00	B010100	B069999X	RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R4195	315-0182-00	B010100	B069999X	RES., FXD, CMPSN: 1.8K OHM, 5%, 0.25W	01121	CB1825
R4196	315-0471-00	B010100	B069999X	RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R4197	315-0682-00	B010100	B069999X	RES., FXD, CMPSN: 6.8K OHM, 5%, 0.25W	01121	CB6825
R4198	315-0104-00	B010100	B069999X	RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R4199	315-0303-00	B010100	B069999X	RES., FXD, CMPSN: 30K OHM, 5%, 0.25W	01121	CB3035
R4506	315-0102-00	B010100	B069999X	RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R4520	321-0289-00	B010100	B069999X	RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R4524	321-0289-00	B010100	B069999X	RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R4526	321-0289-00	B010100	B069999X	RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R4527	321-0399-00	B010100	B069999X	RES., FXD, FILM: 140K OHM, 1%, 0.125W	91637	MFF1816G14002F
R4528	321-0231-00	B010100	B069999X	RES., FXD, FILM: 2.49K OHM, 1%, 0.125W	91637	MFF1816G24900F
R4529	315-0101-00	B010100	B069999X	RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R4531	315-0472-00	XB010125	B030339	RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R4531	315-0472-00	B030340	B069999X	RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W (NOMINAL VALUE, SELECTED)	01121	CB4725
R4532	321-0231-00	B010100	B069999X	RES., FXD, FILM: 2.49K OHM, 1%, 0.125W	91637	MFF1816G24900F
R4533	315-0203-00	B010100	B069999X	RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R4534	321-0231-00	B010100	B069999X	RES., FXD, FILM: 2.49K OHM, 1%, 0.125W	91637	MFF1816G24900F
R4535	315-0303-00	XB030323	B069999X	RES., FXD, CMPSN: 30K OHM, 5%, 0.25W	01121	CB3035
R4536	315-0104-00	B010100	B069999X	RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R4538	315-0682-00	B010100	B069999X	RES., FXD, CMPSN: 6.8K OHM, 5%, 0.25W	01121	CB6825
R4540	315-0753-00	B010100	B069999X	RES., FXD, CMPSN: 75K OHM, 5%, 0.25W	01121	CB7535
R4541	315-0471-00	B010100	B069999X	RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R4542	315-0103-00	B010100	B030322X	RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R4543	315-0512-00	XB030323	B069999X	RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R4544	315-0103-00	B010100	B030322X	RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R4545	315-0102-00	B010100	B069999X	RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R4546	321-0436-00	B010100	B069999X	RES., FXD, FILM: 340K OHM, 1%, 0.125W	91637	MFF1816G34002F
R4547	315-0103-00	B010100	B069999X	RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R4548	321-0405-00	B010100	B069999X	RES., FXD, FILM: 162K OHM, 1%, 0.125W	91637	MFF1816G16202F
R4549	321-0254-00	B010100	B030417	RES., FXD, FILM: 4.32K OHM, 1%, 0.125W	91637	MFF1816G43200F
R4549	321-0289-00	B030418	B069999X	RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R4551	321-0177-00	B010100	B069999X	RES., FXD, FILM: 681 OHM, 1%, 0.125W	91637	MFF1816G681ROF
R4553	321-0289-00	B010100	B069999X	RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R4554	315-0512-00	XB030323	B069999X	RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R4555	321-0289-00	B010100	B030322	RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R4555	321-0231-00	B030323	B030417	RES., FXD, FILM: 2.49K OHM, 1%, 0.125W	91637	MFF1816G24900F
R4555	321-0235-00	B030418	B069999X	RES., FXD, FILM: 2.74K OHM, 1%, 0.125W	91637	MFF1816G27400F
R4556	315-0155-00	XB030323	B049999X	RES., FXD, CMPSN: 1.5M OHM, 5%, 0.25W	01121	CB1555
R4557	315-0104-00	B010100	B069999X	RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R4558	321-0409-00	B010100	B069999X	RES., FXD, FILM: 178K OHM, 1%, 0.125W	91637	MFF1816G17802F



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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R4561	321-0409-00	B010100	B069999X	RES.,FXD,FILM:178K OHM,1%,0.125W	91637	MFF1816G17802F
R4562	321-0289-00	B010100	B069999X	RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R4563	321-0399-00	B010100	B010149	RES.,FXD,FILM:140K OHM,1%,0.125W	91637	MFF1816G14002F
R4563	321-0406-00	B010150	B069999X	RES.,FXD,FILM:165K OHM,1%,0.125W	91637	MFF1816G16502F
R4564	315-0472-00	B010100	B010114	RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R4564	321-0253-00	B010115	B069999X	RES.,FXD,FILM:4.22K OHM,1%,0.125W	91637	MFF1816G42200F
R4565	311-1263-00	B010100	B069999X	RES.,VAR, NONWIR:1K OHM,10%,0.50W	32997	3329P-L58-102
R4566	321-0289-00	B010100	B030322	RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R4566	321-0342-00	B030323	B069999X	RES.,FXD,FILM:35.7K OHM,1%,0.125W	91637	MFF1816G35701F
R4567	315-0153-00	XB030323	B030339	RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R4567	315-0133-00	B030340	B069999X	RES.,FXD,CMPSN:13K OHM,5%,0.25W	01121	CB1335
R4568	315-0474-00	B010100	B069999X	RES.,FXD,CMPSN:470K OHM,5%,0.25W	01121	CB4745
R4569	315-0103-00	XB030323	B069999X	RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R4570	311-1272-00	B010100	B069999X	RES.,VAR, NONWIR:100K OHM,10%,0.50W	32997	3329P-L58-104
R4571	315-0562-00	XB010116	B069999X	RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625
R4572	321-0318-00	B010100	B069999X	RES.,FXD,FILM:20K OHM,1%,0.125W	91637	MFF1816G20001F
R4573	315-0562-00	XB010116	B069999X	RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625
R4574	315-0302-00	B010100	B069999X	RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
R4575	321-0201-00	B010100	B069999X	RES.,FXD,FILM:1.21K OHM,1%,0.125W	91637	MFF1816G12100F
R4576	321-0261-00	B010100	B069999X	RES.,FXD,FILM:5.11K OHM,1%,0.125W	91637	MFF1816G51100F
R4577	315-0471-00	B010100	B069999X	RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R4578	315-0103-00	B010100	B010115X	RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R4579	315-0510-00	XB010116	B069999X	RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
R4580	315-0910-00	B010100	B010115X	RES.,FXD,CMPSN:91 OHM,5%,0.25W	01121	CB9105
R4581	315-0243-00	XB010116	B069999X	RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435
R4582	321-0277-00	B010100	B069999X	RES.,FXD,FILM:7.5K OHM,1%,0.125W	91637	MFF1816G75000F
R4583	315-0471-00	XB010116	B069999X	RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R4585	311-1267-00	B010100	B069999X	RES.,VAR, NONWIR:5K OHM,10%,0.50W	32997	3329P-L58-502
R4586	321-0289-00	B010100	B069999X	RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R4588	321-0289-00	B010100	B069999X	RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R4589	315-0562-00	XB010116	B069999X	RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625
R4591	315-0562-00	XB010116	B069999X	RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625
R4593	315-0510-00	XB010116	B069999X	RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
R4595	315-0471-00	XB010116	B069999X	RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R4602	315-0102-00	B010100	B069999X	RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R4609	315-0103-00	B010100	B069999X	RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R4610	315-0104-00	B010100	B069999X	RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R4611	315-0104-00	B010100	B069999X	RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R4612	315-0103-00	B010100	B069999X	RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R4613	315-0203-00	B010100	B069999X	RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
R4614	321-0289-00	B010100	B069999X	RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R4616	321-0289-00	B010100	B069999X	RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R4618	315-0393-00	B010100	B069999X	RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935
R4620	315-0102-00	B010100	B069999X	RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R4622	315-0102-00	B010100	B069999X	RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R4624	321-0282-00	B010100	B010104	RES.,FXD,FILM:8.45K OHM,1%,0.125W	91637	MFF1816G84500F
R4624	321-0289-00	B010105	B069999X	RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R4625	311-1265-00	B010100	B010104	RES.,VAR, NONWIR:2K OHM,10%,0.50W	32997	3329P-L58-202
R4625	311-1266-00	B010105	B069999X	RES.,VAR, NONWIR:2.5K OHM,10%,0.50W	32997	3329P-L58-252
R4626	315-0682-00	B010100	B069999X	RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R4627	321-0486-00	B010100	B069999X	RES.,FXD,FILM:1.13M OHM,1%,0.125W	91637	HMF188G11303F
R4628	321-0289-00	B010100	B069999X	RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R4629	315-0103-00	B010100	B069999X	RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R4630	315-0100-02	B010100	B069999X	RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R4633	315-0103-00	B010100	B069999X	RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R4634	315-0100-02	B010100	B069999X	RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R4637	315-0103-00	B010100	B069999X	RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035

Replaceable Electrical Parts—7L5

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R4642	307-0103-00	B010100	B069999X	RES., FXD, CMPSN: 2.7 OHM, 5%, 0.25W	01121	CB27G5
R4646	315-0102-00	B010100	B069999X	RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R4648	315-0100-02	B010100	B069999X	RES., FXD, CMPSN: 10 OHM, 5%, 0.25W	01121	CB1005
R4701	321-0431-00	XB070000		RES., FXD, FILM: 301K OHM, 1%, 0.125W	91637	MFF1816G30102F
R4702	321-0402-00	XB070000		RES., FXD, FILM: 150K OHM, 1%, 0.125W	24546	NA55D1503F
R4703	321-0289-00	XB070000		RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R4704	321-0289-00	XB070000		RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R4705	321-0431-00	XB070000		RES., FXD, FILM: 301K OHM, 1%, 0.125W	91637	MFF1816G30102F
R4706	321-0231-00	XB070000		RES., FXD, FILM: 2.49K OHM, 1%, 0.125W	91637	MFF1816G24900F
R4707	321-0193-00	XB070000		RES., FXD, FILM: 1K OHM, 1%, 0.125W	91637	MFF1816G10000F
R4708	315-0101-00	XB070000		RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R4709	315-0103-00	XB070000		RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R4711	315-0471-00	XB070000		RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R4712	315-0822-00	XB070000		RES., FXD, CMPSN: 8.2K OHM, 5%, 0.25W	01121	CB8225
R4714	315-0473-00	XB070000		RES., FXD, CMPSN: 47K OHM, 5%, 0.25W	01121	CB4735
R4715	315-0102-00	XB070000		RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R4716	321-0222-00	XB070000		RES., FXD, FILM: 2K OHM, 1%, 0.125W	91637	MFF1816G20000F
R4718	315-0102-00	XB070000		RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R4720	311-1281-00	XB070000		RES., VAR, NONWIR: 2.5K OHM, 10%, 0.5W	32997	3329W-L58-252
R4721	315-0272-00	XB070000		RES., FXD, CMPSN: 2.7K OHM, 5%, 0.25W	01121	CB2725
R4722	315-0104-00	XB070000	B081399	RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R4722	315-0753-00	B081400		RES., FXD, CMPSN: 75K OHM, 5%, 0.25W	01121	CB7535
R4723	311-1286-00	XB070000		RES., VAR, NONWIR: 50K OHM, 10%, 0.5W	32997	3329W-L58-503
R4724	321-0289-00	XB070000		RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R4726	315-0104-00	XB070000		RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R4727	315-0105-00	XB070000		RES., FXD, CMPSN: 1M OHM, 5%, 0.25W	01121	CB1055
R4728	321-0402-00	XB070000		RES., FXD, FILM: 150K OHM, 1%, 0.125W	24546	NA55D1503F
R4730	321-0164-00	XB070000		RES., FXD, FILM: 499 OHM, 1%, 0.125W	91637	MFF1816G499ROF
R4731	315-0152-00	XB070000		RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W	01121	CB1525
R4732	315-0471-00	XB070000		RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R4733	315-0471-00	XB070000		RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R4734	321-0164-00	XB070000		RES., FXD, FILM: 499 OHM, 1%, 0.125W	91637	MFF1816G499ROF
R4735	321-0260-00	XB070000		RES., FXD, FILM: 4.99K OHM, 1%, 0.125W	91637	MFF1816G49900F
R4736	307-0446-00	XB070000		RES, NTWK, FXD FI: 10K OHM, 20%, (9) RES	91637	MSP10A01-103M
R4737	315-0104-00	XB070000		RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R4738	321-0402-00	XB070000		RES., FXD, FILM: 150K OHM, 1%, 0.125W	24546	NA55D1503F
R4740	321-0289-00	XB070000		RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R4742	321-0289-00	XB070000		RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R4744	311-1281-00	XB070000		RES., VAR, NONWIR: 2.5K OHM, 10%, 0.5W	32997	3329W-L58-252
R4745	315-0392-00	XB070000		RES., FXD, CMPSN: 3.9K OHM, 5%, 0.25W	01121	CB3925
R4746	311-1282-00	XB070000		RES., VAR, NONWIR: 5K OHM, 10%, 0.50W	32997	3329W-L58-502
R4747	315-0562-00	XB070000		RES., FXD, CMPSN: 5.6K OHM, 5%, 0.25W	01121	CB5625
R4750	315-0471-00	XB070000		RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R4751	315-0103-00	XB070000		RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R4755	321-0193-00	XB070000		RES., FXD, FILM: 1K OHM, 1%, 0.125W	91637	MFF1816G10000F
R4756	321-0305-00	XB070000		RES., FXD, FILM: 14.7K OHM, 1%, 0.125W	91637	MFF1816G14701F
R4757	321-0123-00	XB070000		RES., FXD, FILM: 187 OHM, 1%, 0.125W	91637	MFF1816G187ROF
R4758	315-0104-00	XB070000		RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R4759	315-0104-00	XB070000		RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R4760	315-0103-00	XB070000		RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R4761	315-0331-00	XB070000		RES., FXD, CMPSN: 330 OHM, 5%, 0.25W	01121	CB3315
R4762	321-0193-00	XB070000		RES., FXD, FILM: 1K OHM, 1%, 0.125W	91637	MFF1816G10000F
R4764	321-0277-00	XB070000		RES., FXD, FILM: 7.5K OHM, 1%, 0.125W	91637	MFF1816G75000F
R4766	321-0260-00	XB070000	B071181	RES., FXD, FILM: 4.99K OHM, 1%, 0.125W	91637	MFF1816G49900F
R4766	321-0613-00	B071182		RES., FXD, FILM: 5.03K OHM, 1%, 0.125W	91637	MFF1816G50300F
R4768	315-0472-00	XB070000		RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R4769	315-0472-00	XB070000		RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R4770	321-0289-00	XB070000		RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R4771	321-0289-00	XB070000		RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R4772	321-0957-03	XB070000		RES.,FXD,FILM:4.408K OHM,0.25%,0.125W	91637	MFF1816D44080C
R4773	321-0385-00	XB070000	B071181	RES.,FXD,FILM:100K OHM,1%,0.125W	91637	MFF1816G10002F
R4773	321-0510-00	B071182		RES.,FXD,FILM:2M OHM,1%,0.125W	91637	HFF188G20003F
R4774	321-0385-00	XB070000	B071181	RES.,FXD,FILM:100K OHM,1%,0.125W	91637	MFF1816G10002F
R4774	321-0510-00	B071182		RES.,FXD,FILM:2M OHM,1%,0.125W	91637	HFF188G20003F
R4775	315-0395-00	XB070000		RES.,FXD,CMPSN:3.9M OHM,5%,0.25W	01121	CB3955
R4776	307-0103-00	XB070000		RES.,FXD,CMPSN:2.7 OHM,5%,0.25W	01121	CB27G5
R4778	307-0103-00	XB070000		RES.,FXD,CMPSN:2.7 OHM,5%,0.25W	01121	CB27G5
R4779	315-0133-00	XB070000		RES.,FXD,CMPSN:13K OHM,5%,0.25W	01121	CB1335
R4780	315-0152-00	XB070000		RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
R4781	311-1280-00	XB070000		RES.,VAR, NONWIR:1K OHM,10%,0.50W	32997	3329W-L58-102
R4784	315-0101-00	XB081400		RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
S2	263-0019-00			SWITCH PB ASSY:MOMENTARY	80009	263-0019-00
S12	263-0019-00			SWITCH PB ASSY:MOMENTARY	80009	263-0019-00
S18	263-0019-00			SWITCH PB ASSY:MOMENTARY	80009	263-0019-00
S22	263-0019-00			SWITCH PB ASSY:MOMENTARY	80009	263-0019-00
S32	263-0019-00			SWITCH PB ASSY:MOMENTARY	80009	263-0019-00
S34	263-0019-00	XB070000		SWITCH PB ASSY:MOMENTARY	80009	263-0019-00
S36	263-0019-00			SWITCH PB ASSY:MOMENTARY	80009	263-0019-00
S40	263-0019-00			SWITCH PB ASSY:MOMENTARY	80009	263-0019-00
S42	263-0019-00			SWITCH PB ASSY:MOMENTARY	80009	263-0019-00
S44	263-0019-00			SWITCH PB ASSY:MOMENTARY	80009	263-0019-00
S45	311-1714-01			RES.,VAR, NONWIR:15K OHM,20%,1W (FURNISHED AS A UNIT WITH R45)	80009	311-1714-01
S46	401-0127-02			ROTOR-CONT ASSY:DELRLN,W/O CONTACTS	80009	401-0127-02
S47	260-0960-01			SWITCH,SLIDE:0.5A,120VDC,CKT BD MT	10389	23-021-043
S54	401-0127-02			ROTOR-CONT ASSY:DELRLN,W/O CONTACTS	80009	401-0127-02
S54B	263-0019-00			SWITCH PB ASSY:MOMENTARY	80009	263-0019-00
S64	260-1693-00	B010100	B030523	SWITCH,ROTARY:RES AND SPAN WIDTH (FURNISHED AS A UNIT WITH A1A2)	80009	260-1693-00
S64	260-1693-01	B030524	B089999	SWITCH,ROTARY:RES AND SPAN WIDTH (FURNISHED AS A UNIT WITH A1A2)	80009	260-1693-01
S64	263-0064-00	B090000		SWITCH,ROTARY:OPTICAL,FREQUENCY SPAN (FURNISHED AS A UNIT WITH A1A2)	80009	263-0064-00
S66	260-1694-00	B010100	B030523	SWITCH,ROTARY:SWEEP TIME (FURNISHED AS A UNIT WITH A1A3)	80009	260-1694-00
S66	260-1694-01	B030524	B089999	SWITCH,ROTARY:SWEEP TIME (FURNISHED AS A UNIT WITH A1A3)	80009	260-1694-01
S66	263-0063-00	B090000		SWITCH,ROTARY:OPTICAL,TIME/DIVISION (FURNISHED AS A UNIT WITH A1A3)	80009	263-0063-00
S80	263-0019-00			SWITCH PB ASSY:MOMENTARY	80009	263-0019-00
S82	263-0019-00			SWITCH PB ASSY:MOMENTARY	80009	263-0019-00
S84	263-0019-00			SWITCH PB ASSY:MOMENTARY	80009	263-0019-00
S86	263-0019-00			SWITCH PB ASSY:MOMENTARY	80009	263-0019-00
S88	263-0019-00			SWITCH PB ASSY:MOMENTARY	80009	263-0019-00
S90	263-0019-00			SWITCH PB ASSY:MOMENTARY	80009	263-0019-00
S96	311-1005-00			RES.,VAR, NONWIR:15K OHM,10%,0.50W (FURNISHED AS A UNIT WITH R95)	12697	382-CM40952
S4740	260-1721-00	XB070000		SWITCH,ROCKER:8,SPST,125MA,30VDC	00779	435166-5
T130	120-1009-00			XFMR,RF:TOROID,4 WINDINGS	80009	120-1009-00
T140	120-1010-00			XFMR,RF:TOROID,4 WINDINGS,QUADFILAR	80009	120-1010-00
T260	120-1010-00			XFMR,RF:TOROID,4 WINDINGS,QUADFILAR	80009	120-1010-00
T270	120-1009-00			XFMR,RF:TOROID,4 WINDINGS	80009	120-1009-00
T406	120-1015-00			XFMR,RF:TOROID,2 WINDINGS	80009	120-1015-00

**Replaceable Electrical Parts—7L5**

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
T407	120-1015-00			XFMR, RF: TOROID, 2 WINDINGS	80009	120-1015-00
T1040	120-1023-00	B010100	B029999X	TRANSFORMER, RF: TOROID, 2 WINDINGS	80009	120-1023-00
T1320	120-1013-00			XFMR, RF: TOROID, 3 WINDINGS	80009	120-1013-00
T1400	120-1014-00			XFMR, RF: TOROID, 2 WINDINGS, BIFILAR	80009	120-1014-00
T1402	120-1008-00			TRANSFORMER, RF: VARIABLE, POT CORE	80009	120-1008-00
T1500	120-1012-00			XFMR, RF: TOROID, 2 WINDINGS, TRIFILAR	80009	120-1012-00
T1600	120-1024-00			TRANSFORMER, RF: TOROID, 2 WINDINGS	80009	120-1024-00
T1602	120-1025-00			TRANSFORMER, RF: TOROID, 3 WINDINGS	80009	120-1025-00
T1634	120-1011-00			XFMR, RF: TOROID, 3 WINDINGS, TRIFILAR	80009	120-1011-00
T1636	120-0445-00			XFMR, TOROID: 8 TURNS, BIFILAR	80009	120-0445-00
T1660	120-0957-00			TRANSFORMER, RF: POT CORE	80009	120-0957-00
T1720	120-0956-00			TRANSFORMER, RF: 3 WINDINGS	80009	120-0956-00
T1760	120-0956-00			TRANSFORMER, RF: 3 WINDINGS	80009	120-0956-00
T1800	120-0956-00			TRANSFORMER, RF: 3 WINDINGS	80009	120-0956-00
T2048	120-1011-00			XFMR, RF: TOROID, 3 WINDINGS, TRIFILAR	80009	120-1011-00
T2060	120-1012-00			XFMR, RF: TOROID, 2 WINDINGS, TRIFILAR	80009	120-1012-00
U10	156-0366-00	B010100	B060969	MICROCIRCUIT, DI: DUAL D-TYPE F-F	80009	156-0366-00
U10	156-0366-02	B060970		MICROCIRCUIT, DI: DUAL D FLIP-FLOP, CHK	80009	156-0366-02
U20	156-0366-00	B010100	B060969	MICROCIRCUIT, DI: DUAL D-TYPE F-F	80009	156-0366-00
U20	156-0366-02	B060970		MICROCIRCUIT, DI: DUAL D FLIP-FLOP, CHK	80009	156-0366-02
U30	156-0366-00	B010100	B060969	MICROCIRCUIT, DI: DUAL D-TYPE F-F	80009	156-0366-00
U30	156-0366-02	B060970		MICROCIRCUIT, DI: DUAL D FLIP-FLOP, CHK	80009	156-0366-02
U40	156-0683-00			MICROCIRCUIT, DI: HEX. BUS RCVR	18324	8T37B
U50	156-0140-00			MICROCIRCUIT, DI: HEX BFR, 15V, TTL	80009	156-0140-00
U145	156-0177-00			MICROCIRCUIT, LI: DUAL LINE RECEIVER	01295	SN75107AN
U160	156-0569-00			MICROCIRCUIT, DI: BCD COUNTER	27014	DM74LS190
U165	156-0422-00			MICROCIRCUIT, DI: UP/DOWN SYNC BINARY COUNTER	07263	74LS191PC OR DC
U170	156-0508-00			MICROCIRCUIT, DI: QUAD R-S LATCH, TTL	01295	SN74279N
U175	156-0567-00			MICROCIRCUIT, DI: DUAL J-K NEG EDGE TRIG F-F	01295	SN74LS113
U180	156-0506-00			MICROCIRCUIT, DI: QUAD SGL ENDED DUAL LINE D	27014	DM8831N
U185	156-0516-00			MICROCIRCUIT, LI: OPNL AMPL	24355	AD523J
U192	156-0047-00	B010100	B020274	MICROCIRCUIT, DI: TPL 3-INPUT POS NAND GATE	80009	156-0047-00
U192	156-0386-00	B020275	B030499	MICROCIRCUIT, DI: TRIPLE 3-INPUT NAND GATE	04713	SN74LS10N OR J
U192	156-0047-00	B030500		MICROCIRCUIT, DI: TPL 3-INPUT POS NAND GATE	80009	156-0047-00
U194	156-0567-00			MICROCIRCUIT, DI: DUAL J-K NEG EDGE TRIG F-F	01295	SN74LS113
U195	156-0315-00			MICROCIRCUIT, DI: BCD +0 BINARY CONV	01295	SN74184AN
U196	156-0506-00			MICROCIRCUIT, DI: QUAD SGL ENDED DUAL LINE D	27014	DM8831N
U198	156-0516-00			MICROCIRCUIT, LI: OPNL AMPL	24355	AD523J
U200	156-0079-00	B010100	B020274	MICROCIRCUIT, DI: DECADE COUNTER, TTL	80009	156-0079-00
U200	156-0656-00	B020275		MICROCIRCUIT, DI: DECADE COUNTER	01295	SN74LS90N OR J
U205	156-0117-00	B010100	B020274	MICROCIRCUIT, DI: SYNC 4-BIT BINARY COUNTER	80009	156-0117-00
U205	156-0784-00	B020275		MICROCIRCUIT, DI: SYNC 4 BIT BINARY COUNTER	01295	SN74LS163AN
U210	156-0084-00	B010100	B020274	MICROCIRCUIT, DI: SYNCHRONOUS DECADE COUNTER	07263	9310DC
U210	156-0788-00	B020275		MICROCIRCUIT, DI: SYN 4-BIT CNTR W/SYN CLEAR	34335	SN74LS162A
U215	156-0084-00	B010100	B030639	MICROCIRCUIT, DI: SYNCHRONOUS DECADE COUNTER	07263	9310DC
U215	156-0788-00	B030640		MICROCIRCUIT, DI: SYN 4-BIT CNTR W/SYN CLEAR	34335	SN74LS162A
U225	156-0517-00			MICROCIRCUIT, DI: DOUBLE BAL MIXER	80009	156-0517-00
U230	156-0124-00			MICROCIRCUIT, DI: SGL FREQ/PHASE DETECTOR	80009	156-0124-00
U260	156-0177-00			MICROCIRCUIT, LI: DUAL LINE RECEIVER	01295	SN75107AN
U265	156-0041-00			MICROCIRCUIT, DI: DUAL D-TYPE FLIP-FLOP	27014	DM7474N
U270	156-0079-00			MICROCIRCUIT, DI: DECADE COUNTER, TTL	80009	156-0079-00
U305	156-0158-00	B010100	B071109	MICROCIRCUIT, LI: DUAL OPERATIONAL AMPLIFIER	18324	MC1458V
U305	156-0158-04	B071110		MICROCIRCUIT, LI: DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG
U310	156-0077-00			MICROCIRCUIT, LI: OPERATIONAL AMPLIFIER	27014	LM301AH
U325	155-0108-00			MICROCIRCUIT, LI: SHAPER CIRCUIT	80009	155-0108-00
U335	156-0077-00			MICROCIRCUIT, LI: OPERATIONAL AMPLIFIER	27014	LM301AH
U340	155-0108-00			MICROCIRCUIT, LI: SHAPER CIRCUIT	80009	155-0108-00

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
U345	156-0077-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	27014	LM301AH
U375	156-0067-00	B010100	B071109	MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	02735	85145
U375	156-0067-12	B071110	B079999	MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	04713	MC1741CU
U375	156-0158-04	B080000		MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG
U395	156-0626-00			MICROCIRCUIT,DI:DUAL DECADE CNTR	01295	SN74390N
U510	156-0503-00	B010100	B060969	MICROCIRCUIT,DI:HEX INVERTER BUFFER	80009	156-0503-00
U510	156-0503-02	B060970	B071109	MICROCIRCUIT,DI:HEX INV/BUFF,SEL	80009	156-0503-02
U510	156-0494-02	B071110		MICROCIRCUIT,DI:HEX INV/BUFF,SELECTED	80009	156-0494-02
U515	156-0463-28	B010100	B010134	MICROCIRCUIT,DI:PROM,256 X 8,PRGM	80009	156-0463-28
U515	156-0726-00	B010135		MICROCIRCUIT,DI:ROM,PROGRAMMED	27014	MM5213N
U520	156-0683-00			MICROCIRCUIT,DI:HEX. BUS RCVR	18324	8T37B
U525	156-0547-00	B010100	B060969	MICROCIRCUIT,DI:QUAD TOW-INPUT MULTIPLEXER	80009	156-0547-00
U525	156-0547-02	B060970		MICROCIRCUIT,DI:QUAD 2-INP MUX,SEL	80009	156-0547-02
U530	156-0350-00	B010100	B060969	MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	80009	156-0350-00
U530	156-0350-02	B060970		MICROCIRCUIT,DI:QUAD 2 INPUT NAND GATE,SEL	80009	156-0350-02
U535	156-0349-00	B010100	B060969	MICROCIRCUIT,DI:QUAD 2-INPUT NOR GATE	27014	CD4001CJ
U535	156-0349-03	B060970		MICROCIRCUIT,DI:QUAD 2-INPUT NOR GATE,SEL	80009	156-0349-03
U540	156-0548-00	B010100	B060969	MICROCIRCUIT,DI:FOUR-BIT MAGNITUDE COMPTR	80009	156-0548-00
U540	156-0548-02	B060970		MICROCIRCUIT,DI:4-BIT MAGNITUDE COMPTR,SEL	80009	156-0548-02
U550	156-0144-00			MICROCIRCUIT,DI:3-INPUT POS NAND GATE	80009	156-0144-00
U555	156-0186-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	01295	SN7403N
U560	156-0178-00			MICROCIRCUIT,DI:TRIPLE 3-INPUT NOR GATE	01295	SN7427N
U565	156-0403-00			MICROCIRCUIT,DI:HEX. INV W/OPEN COLL OUTPS	80009	156-0403-00
U570	156-0043-00			MICROCIRCUIT,DI:QUAD 2-INPUT POS NOR GATE	80009	156-0043-00
U575	156-0411-00			MICROCIRCUIT,LI:QUAD-COMP,SGL SUPPLY	27014	LM339N
U580	155-0056-00			MICROCIRCUIT,DI:SWEEP CONTROL	80009	155-0056-00
U585	156-0259-00			MICROCIRCUIT,LI:5 TRANSISTOR ARRAY	80009	156-0259-00
U590	156-0487-00			MICROCIRCUIT,DI:DUAL RETRIG,ONE SHOT	80009	156-0487-00
U595	156-0112-00			MICROCIRCUIT,DI:QUAD 2-INPUT POS NAND GATE	80009	156-0112-00
U600	156-0177-00			MICROCIRCUIT,LI:DUAL LINE RECEIVER	01295	SN75107AN
U605	156-0158-00	B010100	B071109	MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	MC1458V
U605	156-0158-04	B071110		MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG
U650	156-0305-04			MICROCIRCUIT,DI:PROM,PROGRAM #1	80009	156-0305-04
U665	156-0513-00	B010100	B060969	MICROCIRCUIT,DI:8-CHAN MUX	80009	156-0513-00
U665	156-0513-02	B060970		MICROCIRCUIT,DI:8-CHANNEL MUX,SEL	80009	156-0513-02
U670	156-0514-00	B010100	B060969	MICROCIRCUIT,DI:DIFF 4-CHAN MUX	80009	156-0514-00
U670	156-0514-01	B060970		MICROCIRCUIT,DI:DIFF 4-CHANNEL MUX,SEL	80009	156-0514-01
U675	156-0158-00	B010100	B071109	MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	MC1458V
U675	156-0158-04	B071110		MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG
U680	156-0515-00	B010100	B060969	MICROCIRCUIT,DI:TRIPLE 3-CHAN MUX	80009	156-0515-00
U680	156-0515-02	B060970		MICROCIRCUIT,DI:TRIPLE 3-CHANMUX,SEL	80009	156-0515-02
U685	156-0158-00	B010100	B071109	MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	MC1458V
U685	156-0158-04	B071110	B092353	MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG
U685	156-1272-00	B092354		MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	NE5532 FE-11B
U690	156-0158-00	B010100	B071109	MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	MC1458V
U690	156-0158-04	B071110		MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG
U695	156-0513-00	B010100	B060969	MICROCIRCUIT,DI:8-CHAN MUX	80009	156-0513-00
U695	156-0513-02	B060970		MICROCIRCUIT,DI:8-CHANNEL MUX,SEL	80009	156-0513-02
U700	156-0223-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	27014	LM308H
U730	155-0035-00			MICROCIRCUIT,LI:QUAD OPERATIONAL AMPL	80009	155-0035-00
U735	156-0515-00	B010100	B060969	MICROCIRCUIT,DI:TRIPLE 3-CHAN MUX	80009	156-0515-00
U735	156-0515-02	B060970		MICROCIRCUIT,DI:TRIPLE 3-CHANMUX,SEL	80009	156-0515-02
U750	156-0158-00	B010100	B071109	MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	MC1458V
U750	156-0158-04	B071110		MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG
U790	156-0505-00	B010100	B060969	MICROCIRCUIT,DI:4 BIT AND/OR SEL	04713	MC14519BCL
U790	156-0505-02	B060970		MICROCIRCUIT,DI:4 BIT AND/OR SELECTOR,SEL	80009	156-0505-02
U795	156-0566-00	B010100	B060969	MICROCIRCUIT,DI:BCD TO DECIMAL DCDR	80009	156-0566-00

## Replaceable Electrical Parts—7L5

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
U795	156-0566-02	B060970		MICROCIRCUIT,DI:BCD TO DECIMAL DECODER,SEL	80009	156-0566-02
U800	155-0110-00			MICROCIRCUIT,DI:LEGEND GENERATOR	80009	155-0110-00
U830	155-0117-00	B010100	B059999	MICROCIRCUIT,DI:KNOB READOUT COUNTER/HORIZ	80009	155-0117-00
U830	155-0198-00	B060000		MICROCIRCUIT,DI:KNOB READOUT COUNTER/HORIZ	80009	155-0198-00
U1000	156-0411-00			MICROCIRCUIT,LI:QUAD-COMP, SGL SUPPLY	27014	LM339N
U1002	156-0411-00			MICROCIRCUIT,LI:QUAD-COMP, SGL SUPPLY	27014	LM339N
U1050	156-0158-00	B010100	B071109	MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	MC1458V
U1050	156-0158-04	B071110		MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG
U1090	156-0048-00			MICROCIRCUIT,LI:FIVE NPN TRANSISTOR ARRAY	02735	CA3046
U1120	156-0048-00			MICROCIRCUIT,LI:FIVE NPN TRANSISTOR ARRAY	02735	CA3046
U1150	156-0048-00			MICROCIRCUIT,LI:FIVE NPN TRANSISTOR ARRAY	02735	CA3046
U1190	156-0048-00			MICROCIRCUIT,LI:FIVE NPN TRANSISTOR ARRAY	02735	CA3046
U1400	155-0035-00			MICROCIRCUIT,LI:QUAD OPERATIONAL AMPL	80009	155-0035-00
U1410	156-0515-00	B010100	B060969	MICROCIRCUIT,DI:TRIPLE 3-CHAN MUX	80009	156-0515-00
U1410	156-0515-02	B060970		MICROCIRCUIT,DI:TRIPLE 3-CHANMUX,SEL	80009	156-0515-02
U1415	156-0077-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	27014	LM301AH
U1435	307-0476-00			CPLR,OPTOELECTR:100 OHM,40MA	18178	VTL2C4
U1450	156-0513-00	B010100	B060969	MICROCIRCUIT,DI:8-CHAN MUX	80009	156-0513-00
U1450	156-0513-02	B060970		MICROCIRCUIT,DI:8-CHANNEL MUX,SEL	80009	156-0513-02
U1500	156-0624-00			MICROCIRCUIT,LI:CRYSTAL OSC	04713	MC12061P
U1505	156-0277-00			MICROCIRCUIT,LI:VOLTAGE REGULATOR	07263	MICROA7805UC
U1510	156-0230-00			MICROCIRCUIT,DI:DUAL D MA-SLAVE FLIP-FLOP	80009	156-0230-00
U1535	156-0704-00			MICROCIRCUIT,LI:PHASE LOCK LOOP	04713	MC14046CP
U1680	156-0495-00			MICROCIRCUIT,LI:OPNL AMPL	27014	LM324N
U1690	307-0476-00			CPLR,OPTOELECTR:100 OHM,40MA	18178	VTL2C4
U1695	307-0476-00			CPLR,OPTOELECTR:100 OHM,40MA	18178	VTL2C4
U1700	156-0513-00	B010100	B060969	MICROCIRCUIT,DI:8-CHAN MUX	80009	156-0513-00
U1700	156-0513-02	B060970		MICROCIRCUIT,DI:8-CHANNEL MUX,SEL	80009	156-0513-02
U1790	307-0476-00			CPLR,OPTOELECTR:100 OHM,40MA	18178	VTL2C4
U1795	307-0476-00			CPLR,OPTOELECTR:100 OHM,40MA	18178	VTL2C4
U2030	156-0158-00	B010100	B071109	MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	MC1458V
U2030	156-0158-04	B071110	B092353	MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG
U2030	156-1272-00	B092354		MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	NE5532 FE-IIB
U2035	156-0277-00			MICROCIRCUIT,LI:VOLTAGE REGULATOR	07263	MICROA7805UC
U2050	156-0266-00			MICROCIRCUIT,LI:EMITTER COUPLED OSCILLATOR	80009	156-0266-00
U2205	156-0158-00	B010100	B071109	MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	MC1458V
U2205	156-0158-04	B071110		MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG
U2210	156-0067-00	B010100	B071109	MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	02735	85145
U2210	156-0067-02	B071110		MICROCIRCUIT,LI:OPNL AMPLIFIER,SELECTED	80009	156-0067-02
U2215	156-0411-00			MICROCIRCUIT,LI:QUAD-COMP, SGL SUPPLY	27014	LM339N
U2225	156-0350-00	B010100	B060969	MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	80009	156-0350-00
U2225	156-0350-02	B060970		MICROCIRCUIT,DI:QUAD 2 INPUT NAND GATE,SEL	80009	156-0350-02
U2230	156-0349-00	B010100	B060969	MICROCIRCUIT,DI:QUAD 2-INPUT NOR GATE	27014	CD4001CJ
U2230	156-0349-03	B060970		MICROCIRCUIT,DI:QUAD 2-INPUT NOR GATE,SEL	80009	156-0349-03
U2235	155-0118-00	B010100	B059999	MICROCIRCUIT,DI:VERT CONTROL	80009	155-0118-00
U2235	155-0199-00	B060000		MICROCIRCUIT,DI:VERT CONTROL	80009	155-0199-00
U2240	156-0140-00			MICROCIRCUIT,DI:HEX BFR,15V, TTL	80009	156-0140-00
U2245	156-0093-00			MICROCIRCUIT,DI:HEX. INVERTER	80009	156-0093-00
U2250	156-0683-00			MICROCIRCUIT,DI:HEX. BUS RCVR	18324	8T37B
U2265	156-0463-29	B010100	B010134	MICROCIRCUIT,DI:PROM,256 X 8,PRGM	80009	156-0463-29
U2265	156-0725-00	B010135		MICROCIRCUIT,DI:ROM,PROGRAMMED	27014	MM5213N
U2320	156-0186-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	01295	SN7403N
U3000	156-0267-00			MICROCIRCUIT,DI:8-INPUT NAND GATE	80009	156-0267-00
U3005	156-0131-00			MICROCIRCUIT,DI:8-BIT SER-IN PAR OUT SR	80009	156-0131-00
U3010	156-0075-00			MICROCIRCUIT,DI:SGL 8-BIT DATA SEL MUX	80009	156-0075-00
U3015	156-0197-00			MICROCIRCUIT,LI:5 TRANSISTOR ARRAY	80009	156-0197-00
U4000	156-0580-00	B010100	B060969	MICROCIRCUIT,DI:4 STAGE PRL IN-PRL OUT	80009	156-0580-00

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
U4000	156-0580-02	B060970	B069999X	MICROCIRCUIT,DI:4 STAGE PRL IN/PRL OUT,SEL	80009	156-0580-02
U4005	156-0502-00	B010100	B060969	MICROCIRCUIT,DI:4 BIT ADDER	80009	156-0502-00
U4005	156-0502-02	B060970	B069999X	MICROCIRCUIT,DI:4 BIT ADDER,SELECTED	80009	156-0502-02
U4010	156-0502-00	B010100	B060969	MICROCIRCUIT,DI:4 BIT ADDER	80009	156-0502-00
U4010	156-0502-02	B060970	B069999X	MICROCIRCUIT,DI:4 BIT ADDER,SELECTED	80009	156-0502-02
U4015	156-0576-00	B010100	B060969	MICROCIRCUIT,DI:8 BIT PRL INP-SERIAL OUTPT	04713	MC14021BCL
U4015	156-0576-02	B060970	B069999X	MICROCIRCUIT,DI:8-BIT PRL INP/SER OUT,SEL	80009	156-0576-02
U4020	156-0576-00	B010100	B060969	MICROCIRCUIT,DI:8 BIT PRL INP-SERIAL OUTPT	04713	MC14021BCL
U4020	156-0576-02	B060970	B069999X	MICROCIRCUIT,DI:8-BIT PRL INP/SER OUT,SEL	80009	156-0576-02
U4025	156-0576-00	B010100	B060969	MICROCIRCUIT,DI:8 BIT PRL INP-SERIAL OUTPT	04713	MC14021BCL
U4025	156-0576-02	B060970	B069999X	MICROCIRCUIT,DI:8-BIT PRL INP/SER OUT,SEL	80009	156-0576-02
U4030	156-0576-00	B010100	B060969	MICROCIRCUIT,DI:8 BIT PRL INP-SERIAL OUTPT	04713	MC14021BCL
U4030	156-0576-02	B060970	B069999X	MICROCIRCUIT,DI:8-BIT PRL INP/SER OUT,SEL	80009	156-0576-02
U4035	156-0572-00	B010100	B060969	MICROCIRCUIT,DI:8 BIT SERIAL IN-PRL OUT	80009	156-0572-00
U4035	156-0572-02	B060970	B069999X	MICROCIRCUIT,DI:8 BIT SERIAL IN/PRL OUT,SE	80009	156-0572-02
U4040	156-0502-00	B010100	B060969	MICROCIRCUIT,DI:4 BIT ADDER	80009	156-0502-00
U4040	156-0502-02	B060970	B069999X	MICROCIRCUIT,DI:4 BIT ADDER,SELECTED	80009	156-0502-02
U4045	156-0502-00	B010100	B060969	MICROCIRCUIT,DI:4 BIT ADDER	80009	156-0502-00
U4045	156-0502-02	B060970	B069999X	MICROCIRCUIT,DI:4 BIT ADDER,SELECTED	80009	156-0502-02
U4050	156-0366-00	B010100	B060969	MICROCIRCUIT,DI:DUAL D-TYPE F-F	80009	156-0366-00
U4050	156-0366-02	B060970	B069999X	MICROCIRCUIT,DI:DUAL D FLIP-FLOP,CHK	80009	156-0366-02
U4055	156-0350-01	B010100	B060969	MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	80009	156-0350-01
U4055	156-0350-03	B060970	B069999X	MICROCIRCUIT,DI:QUAD 2 INPUT NAND GATE,SEL	80009	156-0350-03
U4060	156-0525-00	B010100	B060969	MICROCIRCUIT,DI:DUAL J-K MASTER SLAVE F-F	80009	156-0525-00
U4060	156-0525-03	B060970	B069999X	MICROCIRCUIT,DI:DUAL J-K MASTER SLAVE FF	80009	156-0525-03
U4065	156-0575-02	B010100	B060969	MICROCIRCUIT,DI:3-INPUT NOR GATE	80009	156-0575-02
U4065	156-0575-04	B060970	B069999X	MICROCIRCUIT,DI:3 INPUT NOR GATE,SELECTED	80009	156-0575-04
U4070	156-0681-00	B010100	B060969	MICROCIRCUIT,DI:18 STAGE STATIC SHIFT RGTR	80009	156-0681-00
U4070	156-0681-02	B060970	B069999X	MICROCIRCUIT,DI:18-STAGE STATIC SR,SEL	04713	MC14006BCLDS
U4075	156-0350-01	B010100	B060969	MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	80009	156-0350-01
U4075	156-0350-03	B060970	B069999X	MICROCIRCUIT,DI:QUAD 2 INPUT NAND GATE,SEL	80009	156-0350-03
U4080	156-0570-00	B010100	B069999X	MICROCIRCUIT,LI:DUAL HIGH SPEED COMPARATOR	27014	LM319H
U4085	156-0570-00	B010100	B069999X	MICROCIRCUIT,LI:DUAL HIGH SPEED COMPARATOR	27014	LM319H
U4100	156-0572-00	B010100	B060969	MICROCIRCUIT,DI:8 BIT SERIAL IN-PRL OUT	80009	156-0572-00
U4100	156-0572-02	B060970	B069999X	MICROCIRCUIT,DI:8 BIT SERIAL IN/PRL OUT,SE	80009	156-0572-02
U4105	156-0580-00	B010100	B060969	MICROCIRCUIT,DI:4 STAGE PRL IN-PRL OUT	80009	156-0580-00
U4105	156-0580-02	B060970	B069999X	MICROCIRCUIT,DI:4 STAGE PRL IN/PRL OUT,SEL	80009	156-0580-02
U4110	156-0350-01	B010100	B060969	MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	80009	156-0350-01
U4110	156-0350-03	B060970	B069999X	MICROCIRCUIT,DI:QUAD 2 INPUT NAND GATE,SEL	80009	156-0350-03
U4115	156-0547-00	B010100	B060969	MICROCIRCUIT,DI:QUAD 2-INPUT MULTIPLEXER	80009	156-0547-00
U4115	156-0547-02	B060970	B069999X	MICROCIRCUIT,DI:QUAD 2-INP MUX,SEL	80009	156-0547-02
U4120	156-0579-00	B010100	B060969	MICROCIRCUIT,DI:DUAL 4-BIT BIN COUNTER	04713	MC14520BCL
U4120	156-0579-02	B060970	B069999X	MICROCIRCUIT,DI:DUAL 4 BIT BIN COUNTER,SEL	80009	156-0579-02
U4125	156-0579-00	B010100	B060969	MICROCIRCUIT,DI:DUAL 4-BIT BIN COUNTER	04713	MC14520BCL
U4125	156-0579-02	B060970	B069999X	MICROCIRCUIT,DI:DUAL 4 BIT BIN COUNTER,SEL	80009	156-0579-02
U4130	156-0579-00	B010100	B060969	MICROCIRCUIT,DI:DUAL 4-BIT BIN COUNTER	04713	MC14520BCL
U4130	156-0579-02	B060970	B069999X	MICROCIRCUIT,DI:DUAL 4 BIT BIN COUNTER,SEL	80009	156-0579-02
U4135	156-0579-00	B010100	B060969	MICROCIRCUIT,DI:DUAL 4-BIT BIN COUNTER	04713	MC14520BCL
U4135	156-0579-02	B060970	B069999X	MICROCIRCUIT,DI:DUAL 4 BIT BIN COUNTER,SEL	80009	156-0579-02
U4140	156-0576-00	B010100	B060969	MICROCIRCUIT,DI:8 BIT PRL INP-SERIAL OUTPT	04713	MC14021BCL
U4140	156-0576-02	B060970	B069999X	MICROCIRCUIT,DI:8-BIT PRL INP/SER OUT,SEL	80009	156-0576-02
U4145	156-0580-00	B010100	B060969	MICROCIRCUIT,DI:4 STAGE PRL IN-PRL OUT	80009	156-0580-00
U4145	156-0580-02	B060970	B069999X	MICROCIRCUIT,DI:4 STAGE PRL IN/PRL OUT,SEL	80009	156-0580-02
U4150	156-0580-00	B010100	B060969	MICROCIRCUIT,DI:4 STAGE PRL IN-PRL OUT	80009	156-0580-00
U4150	156-0580-02	B060970	B069999X	MICROCIRCUIT,DI:4 STAGE PRL IN/PRL OUT,SEL	80009	156-0580-02
U4155	156-0494-00	B010100	B060969	MICROCIRCUIT,DI:HEX INVERTER/BUFFER	80009	156-0494-00
U4155	156-0494-02	B060970	B069999X	MICROCIRCUIT,DI:HEX INV/BUFF,SELECTED	80009	156-0494-02

Replaceable Electrical Parts—7L5

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
U4160	156-0578-00	B010100	B060969	MICROCIRCUIT,DI:DUAL 1 SHOT MULTIVIBRATOR	80009	156-0578-00
U4160	156-0578-02	B060970	B069999X	MICROCIRCUIT,DI:DUAL ONE-SHOTMV,SEL	04713	MC14528BCLDS
U4170	156-0575-02	B010100	B060969	MICROCIRCUIT,DI:3-INPUT NOR GATE	80009	156-0575-02
U4170	156-0575-04	B060970	B069999X	MICROCIRCUIT,DI:3 INPUT NOR GATE,SELECTED	80009	156-0575-04
U4175	156-0525-00	B010100	B060969	MICROCIRCUIT,DI:DUAL J-K MASTER SLAVE F-F	80009	156-0525-00
U4175	156-0525-03	B060970	B069999X	MICROCIRCUIT,DI:DUAL J-K MASTER SLAVE FF	80009	156-0525-03
U4180	156-0349-00	B010100	B030322	MICROCIRCUIT,DI:QUAD 2-INPUT NOR GATE	27014	CD4001CJ
U4180	156-0349-01	B030323	B060969	MICROCIRCUIT,DI:QUAD 2-INPUT NOR GATE	80009	156-0349-01
U4180	156-0349-04	B060970	B069999X	MICROCIRCUIT,DI:QUAD 2-INPUT NOR GATE,SEL	80009	156-0349-04
U4504	156-0509-00	B010100	B069999X	MICROCIRCUIT,DI:8-BIT BINARY,MULT CUR	04713	MC1408L8
U4506	156-0583-00	B010100	B060969	MICROCIRCUIT,DI:SUCCESSIVE APPROX REGISTER	04713	MC14559BCL
U4506	156-0583-02	B060970	B069999X	MICROCIRCUIT,DI:SUCCESSIVE APPROX RGTR,SEL	80009	156-0583-02
U4508	156-0570-00	B010100	B069999X	MICROCIRCUIT,LI:DUAL HIGH SPEED COMPARATOR	27014	LM319H
U4510	156-0366-00	B010100	B060969	MICROCIRCUIT,DI:DUAL D-TYPE F-F	80009	156-0366-00
U4510	156-0366-02	B060970	B069999X	MICROCIRCUIT,DI:DUAL D FLIP-FLOP,CHK	80009	156-0366-02
U4514	156-0575-00	B010100	B060969	MICROCIRCUIT,DI:3 INPUT NOR GATE	80009	156-0575-00
U4514	156-0575-03	B060970	B069999X	MICROCIRCUIT,DI:3 INPUT NOR GATE,SELECTED	80009	156-0575-03
U4516	156-0350-00	B010100	B060969	MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	80009	156-0350-00
U4516	156-0350-02	B060970	B069999X	MICROCIRCUIT,DI:QUAD 2 INPUT NAND GATE,SEL	80009	156-0350-02
U4522	156-0158-00	B010100	B069999X	MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	MC1458V
U4524-1	156-0158-00	B010100	B069999X	MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	MC1458V
U4525-2	156-0158-00	B010100	B069999X	MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	MC1458V
U4530	156-0680-00	B010100	B060969	MICROCIRCUIT,DI:DUAL J-K F-F W/CLEAR	80009	156-0680-00
U4530	156-0680-02	B060970	B069999X	MICROCIRCUIT,DI:DUAL J-K F-F,W/CLEAR,SEL	80009	156-0680-02
U4532	156-0350-00	B010100	B060969	MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	80009	156-0350-00
U4532	156-0350-02	B060970	B069999X	MICROCIRCUIT,DI:QUAD 2 INPUT NAND GATE,SEL	80009	156-0350-02
U4534	156-0350-00	B010100	B060969	MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	80009	156-0350-00
U4534	156-0350-02	B060970	B069999X	MICROCIRCUIT,DI:QUAD 2 INPUT NAND GATE,SEL	80009	156-0350-02
U4536	156-0349-00	B010100	B060969	MICROCIRCUIT,DI:QUAD 2-INPUT NOR GATE	27014	CD4001CJ
U4536	156-0349-03	B060970	B069999X	MICROCIRCUIT,DI:QUAD 2-INPUT NOR GATE,SEL	80009	156-0349-03
U4538	156-0578-00	B010100	B060969	MICROCIRCUIT,DI:DUAL 1 SHOT MULTIVIBRATOR	80009	156-0578-00
U4538	156-0578-02	B060970	B069999X	MICROCIRCUIT,DI:DUAL ONE-SHOTMV,SEL	04713	MC14528BCLDS
U4540-1	156-0158-00	B010100	B069999X	MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	MC1458V
U4541-2	156-0158-00	B010100	B069999X	MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	MC1458V
U4544	156-0515-00	B010100	B060969	MICROCIRCUIT,DI:TRIPLE 3-CHAN MUX	80009	156-0515-00
U4544	156-0515-02	B060970	B069999X	MICROCIRCUIT,DI:TRIPLE 3-CHANMUX,SEL	80009	156-0515-02
U4546	156-0158-00	B010100	B069999X	MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	MC1458V
U4548	307-0479-00	B010100	B069999X	RES NTWK,FILM:LADDER 40K,80K & 78.5K OHM	80009	307-0479-00
U4550	156-0572-00	B010100	B060969	MICROCIRCUIT,DI:8 BIT SERIAL IN-PRL OUT	80009	156-0572-00
U4550	156-0572-02	B060970	B069999X	MICROCIRCUIT,DI:8 BIT SERIAL IN/PRL OUT,SE	80009	156-0572-02
U4552	156-0494-00	B010100	B060969	MICROCIRCUIT,DI:HEX INVERTER/BUFFER	80009	156-0494-00
U4552	156-0494-02	B060970	B069999X	MICROCIRCUIT,DI:HEX INV/BUFF,SELECTED	80009	156-0494-02
U4554	156-0525-00	B010100	B050929	MICROCIRCUIT,DI:DUAL J-K MASTER SLAVE F-F	80009	156-0525-00
U4554	156-0525-02	B050930	B069999X	MICROCIRCUIT,DI:DUAL J-K MASTER SLAVE FF	80009	156-0525-02
U4556	156-0577-00	B010100	B060969	MICROCIRCUIT,DI:QUAD 2 INPUT AND GATE	80009	156-0577-00
U4556	156-0577-02	B060970	B069999X	MICROCIRCUIT,DI:QUAD 2-IMP AND GATE,SEL	27014	DM74C08
U4558	156-0579-00	B010100	B060969	MICROCIRCUIT,DI:DUAL 4-BIT BIN COUNTER	04713	MC14520BCL
U4558	156-0579-02	B060970	B069999X	MICROCIRCUIT,DI:DUAL 4 BIT BIN COUNTER,SEL	80009	156-0579-02
U4560	307-0479-00	B010100	B069999X	RES NTWK,FILM:LADDER 40K,80K & 78.5K OHM	80009	307-0479-00
U4562	156-0627-00	B010100	B060969	MICROCIRCUIT,DI:SYN 4-B,UP-DOWN BINARY CTR	80009	156-0627-00
U4562	156-0627-02	B060970	B069999X	MICROCIRCUIT,DI:SYN 4-B UP/DNBIN,CNTR,SEL	80009	156-0627-02
U4564	156-0571-00	B010100	B010115	MICROCIRCUIT,LI:A TO D CONTROL	04713	MC1407L
U4564	156-0570-00	B010116	B069999X	MICROCIRCUIT,LI:DUAL HIGH SPEED COMPARATOR	27014	LM319H
U4566	156-0350-00	B010100	B060969	MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	80009	156-0350-00
U4566	156-0350-02	B060970	B069999X	MICROCIRCUIT,DI:QUAD 2 INPUT NAND GATE,SEL	80009	156-0350-02
U4568	156-0682-00	B010100	B060969	MICROCIRCUIT,DI:HEX D FLIP-FLOP	80009	156-0682-00
U4568	156-0682-02	B060970	B069999X	MICROCIRCUIT,DI:HEX D FLIP-FLOP,SEL	27014	MM74C174



Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
U4570	307-0479-00	B010100	B069999X	RES NTWK,FILM:LADDER 40K,80K & 78.5K OHM	80009	307-0479-00
U4572	156-0682-00	B010100	B060969	MICROCIRCUIT,DI:HEX D FLIP-FLOP	80009	156-0682-00
U4572	156-0682-02	B060970	B069999X	MICROCIRCUIT,DI:HEX D FLIP-FLOP,SEL	27014	MM74C174
U4574	156-0366-00	B010100	B060969	MICROCIRCUIT,DI:DUAL D-TYPE F-F	80009	156-0366-00
U4574	156-0366-02	B060970	B069999X	MICROCIRCUIT,DI:DUAL D FLIP-FLOP,CHK	80009	156-0366-02
U4576	156-0570-00	B010100	B069999X	MICROCIRCUIT,LI:DUAL HIGH SPEED COMPARATOR	27014	LM319H
U4578	156-0494-00	B010100	B060969	MICROCIRCUIT,DI:HEX INVERTER/BUFFER	80009	156-0494-00
U4578	156-0494-02	B060970	B069999X	MICROCIRCUIT,DI:HEX INV/BUFF,SELECTED	80009	156-0494-02
U4580	156-0627-00	B010100	B060969	MICROCIRCUIT,DI:SYN 4-B,UP-DOWN BINARY CTR	80009	156-0627-00
U4580	156-0627-02	B060970	B069999X	MICROCIRCUIT,DI:SYN 4-B UP/DNBIN,CNTR,SEL	80009	156-0627-02
U4582	156-0627-00	B010100	B060969	MICROCIRCUIT,DI:SYN 4-B,UP-DOWN BINARY CTR	80009	156-0627-00
U4582	156-0627-02	B060970	B069999X	MICROCIRCUIT,DI:SYN 4-B UP/DNBIN,CNTR,SEL	80009	156-0627-02
U4584	156-0574-00	B010100	B060969	MICROCIRCUIT,DI:TRI-STATE QUAD D F-F	80009	156-0574-00
U4584	156-0574-02	B060970	B069999X	MICROCIRCUIT,DI:3-STATE QUAD D FF,CHK	80009	156-0574-02
U4586	156-0574-00	B010100	B060969	MICROCIRCUIT,DI:TRI-STATE QUAD D F-F	80009	156-0574-00
U4586	156-0574-02	B060970	B069999X	MICROCIRCUIT,DI:3-STATE QUAD D FF,CHK	80009	156-0574-02
U4588	156-0649-00	B010100	B060969	MICROCIRCUIT,DI:3 STATE HEX. NON INVT BFR	80009	156-0649-00
U4588	156-0649-02	B060970	B069999X	MICROCIRCUIT,DI:3 STATE HEX-NON INVT BFR	80009	156-0649-02
U4590	156-0579-00	B010100	B060969	MICROCIRCUIT,DI:DUAL 4-BIT BIN COUNTER	04713	MC14520BCL
U4590	156-0579-02	B060970	B069999X	MICROCIRCUIT,DI:DUAL 4 BIT BIN COUNTER,SEL	80009	156-0579-02
U4592	156-0649-00	B010100	B060969	MICROCIRCUIT,DI:3 STATE HEX. NON INVT BFR	80009	156-0649-00
U4592	156-0649-02	B060970	B069999X	MICROCIRCUIT,DI:3 STATE HEX-NON INVT BFR	80009	156-0649-02
U4594	156-0513-00	B010100	B010115	MICROCIRCUIT,DI:8-CHAN MUX	80009	156-0513-00
U4594	156-0577-00	B010116	B060969	MICROCIRCUIT,DI:QUAD 2 INPUT AND GATE	80009	156-0577-00
U4594	156-0577-02	B060970	B069999X	MICROCIRCUIT,DI:QUAD 2-INP AND GATE,SEL	27014	DM74C08
U4596	156-0291-01	B010100	B069999X	MICROCIRCUIT,DI:1024 X 1 STATIC, RAM,CHK	80009	156-0291-01
U4598	156-0573-00	B010100	B069999X	MICROCIRCUIT,DI:4K DYNAMIC RAM	04713	MCM6605L-1
U4702	156-0570-00	XB070000		MICROCIRCUIT,LI:DUAL HIGH SPEED COMPARATOR	27014	LM319H
U4704	156-0742-00	XB070000		MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	27014	LM318N
U4707	156-0742-00	XB070000		MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	27014	LM318N
U4708	156-0742-00	XB070000		MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	27014	LM318N
U4709	156-0742-00	XB070000		MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	27014	LM318N
U4710	156-0509-00	XB070000		MICROCIRCUIT,DI:8-BIT BINARY,MULT CUR	04713	MC1408L8
U4712	156-0509-00	XB070000		MICROCIRCUIT,DI:8-BIT BINARY,MULT CUR	04713	MC1408L8
U4720	156-0515-02	XB070000		MICROCIRCUIT,DI:TRIPLE 3-CHANMUX,SEL	80009	156-0515-02
U4730	155-0157-00	XB070000		MICROCIRCUIT,DI:DIGITAL STORAGE VERTICAL	80009	155-0157-00
U4735	156-0570-00	XB070000		MICROCIRCUIT,LI:DUAL HIGH SPEED COMPARATOR	27014	LM319H
U4736	156-0388-00	XB070000		MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	80009	156-0388-00
U4737	156-0577-00	XB070000	B081399	MICROCIRCUIT,DI:QUAD 2 INPUT AND GATE	80009	156-0577-00
U4737	156-0480-00	B081400		MICROCIRCUIT,DI:QUAD 2-INPUT AND GATE	01295	SN74LS08(N OR J)
U4739	156-0382-00	XB070000		MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	01295	SN74LS00(N OR J)
U4740	156-0578-02	XB070000		MICROCIRCUIT,DI:DUAL ONE-SHOTMV,SEL	04713	MC14528BCLDS
U4742	156-0987-00	XB070000		MICROCIRCUIT,DI:4096 X 1 STATIC R/W RAM	80009	156-0987-00
U4744	156-0158-04	XB070000		MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG
U4746	156-0649-02	XB070000		MICROCIRCUIT,DI:3 STATE HEX-NON INVT BFR	80009	156-0649-02
U4747	156-0645-00	XB070000		MICROCIRCUIT,DI:HEX SCHMITT-TRIG INVERTER	80009	156-0645-00
U4748	156-0994-00	XB070000		MICROCIRCUIT,DI:8 INPUT DATA SEL/MUX	01295	SN74LS151N OR J
U4749	156-0718-00	XB070000		MICROCIRCUIT,DI:TRIPLE 3-INP POS-NOR GATES	80009	156-0718-00
U4750	156-0927-00	XB070000		MICROCIRCUIT,LI:DIGITAL TO ANALOG CONVERTER	80009	156-0927-00
U4751	155-0158-00	XB070000		MICROCIRCUIT,DI:DIGITAL STORAGE HORIZONTAL	80009	155-0158-00
U4752	156-0158-04	XB070000		MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG
U4753	156-0987-00	XB070000		MICROCIRCUIT,DI:4096 X 1 STATIC R/W RAM	80009	156-0987-00
U4754	156-0927-00	XB070000		MICROCIRCUIT,LI:DIGITAL TO ANALOG CONVERTER	80009	156-0927-00
U4755	156-0391-00	XB070000		MICROCIRCUIT,DI:HEX LATCH WITH CLEAR	04713	74LS174(N OR J)
U4756	156-0391-00	XB070000		MICROCIRCUIT,DI:HEX LATCH WITH CLEAR	04713	74LS174(N OR J)
U4760	156-0158-04	XB070000		MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG
U4764	156-0388-00	XB070000		MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	80009	156-0388-00

Replaceable Electrical Parts—7L5

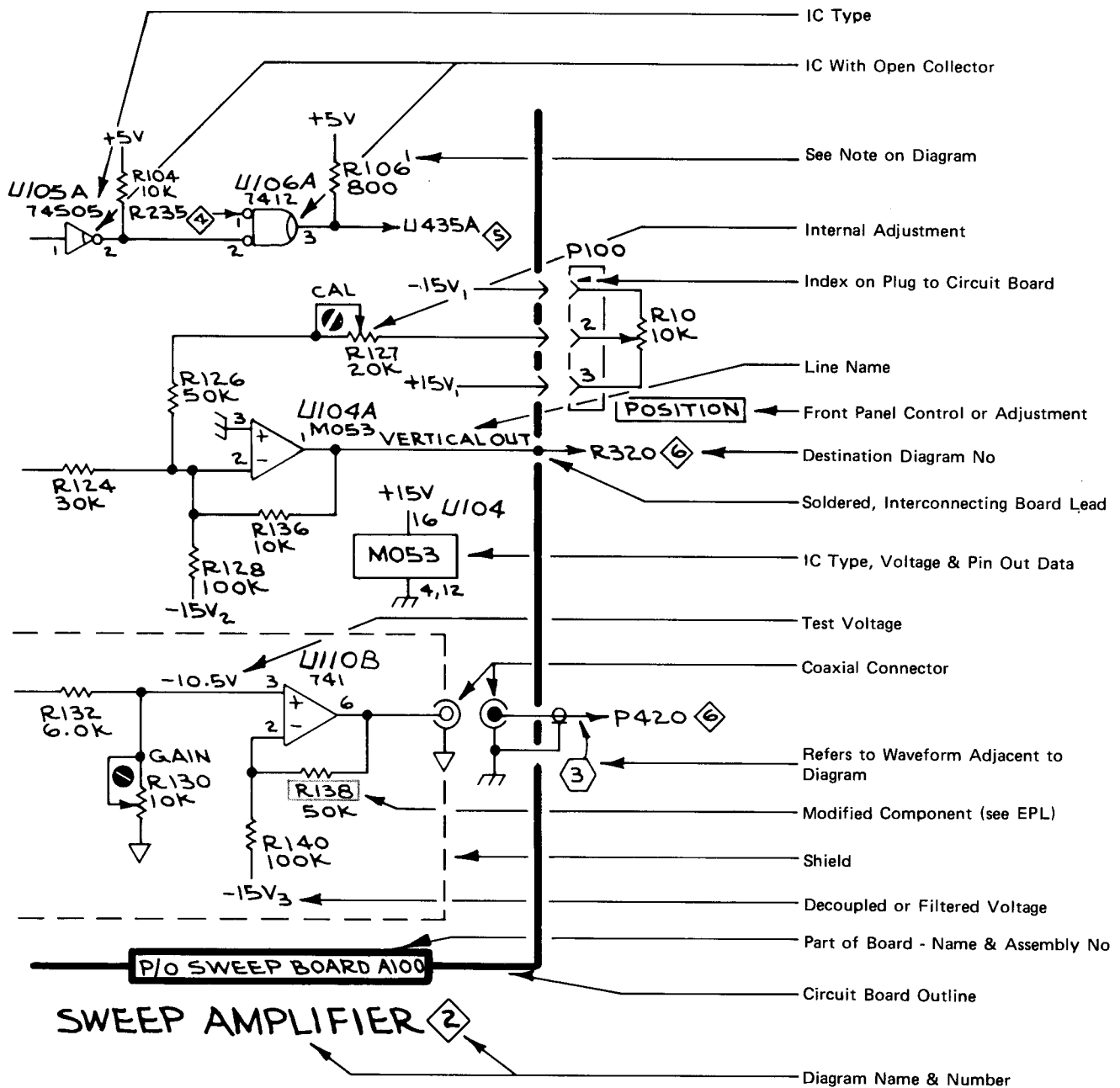
Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
U4766	156-0846-00	XB070000		MICROCIRCUIT,LI:VOLTAGE REGULATOR	04713	MC7905CT
VR142	152-0175-00			SEMICONV DEVICE:ZENER,0.4W,5.6V,5%	04713	SZG35008
VR260	152-0175-00			SEMICONV DEVICE:ZENER,0.4W,5.6V,5%	04713	SZG35008
VR364	152-0175-00			SEMICONV DEVICE:ZENER,0.4W,5.6V,5%	04713	SZG35008
VR368	152-0589-00			SEMICONV DEVICE:ZENER,0.4W,11.7V,5%	80009	152-0589-00
VR522	152-0127-00			SEMICONV DEVICE:ZENER,0.4W,7.5V,5%	04713	SZG35009K2
VR602	152-0195-00			SEMICONV DEVICE:ZENER,0.4W,5.1V,5%	04713	SZ11755
VR676	152-0149-00	XB050000		SEMICONV DEVICE:ZENER,0.4W,10V,5%	80009	152-0149-00
VR734	152-0217-00	B010100	B049999X	SEMICONV DEVICE:ZENER,0.4W,8.2V,5%	04713	SZG20
VR840	152-0175-00			SEMICONV DEVICE:ZENER,0.4W,5.6V,5%	04713	SZG35008
VR842	152-0175-00			SEMICONV DEVICE:ZENER,0.4W,5.6V,5%	04713	SZG35008
VR892	152-0317-00			SEMICONV DEVICE:ZENER,0.25W,6.2V,5%	80009	152-0317-00
VR1360	152-0149-00	XB050000		SEMICONV DEVICE:ZENER,0.4W,10V,5%	80009	152-0149-00
VR1366	152-0662-00	XB050000		SEMICONV DEVICE:ZENER,0.4W,5V,1%	04713	SZG195
VR1370	152-0149-00	XB050000		SEMICONV DEVICE:ZENER,0.4W,10V,5%	80009	152-0149-00
VR1376	152-0662-00	XB050000		SEMICONV DEVICE:ZENER,0.4W,5V,1%	04713	SZG195
VR1687	152-0662-00	XB050000		SEMICONV DEVICE:ZENER,0.4W,5V,1%	04713	SZG195
VR1693	152-0149-00	XB050000		SEMICONV DEVICE:ZENER,0.4W,10V,5%	80009	152-0149-00
VR2226	152-0306-00	XB050000		SEMICONV DEVICE:ZENER,0.4W,9.1V,5%	14433	1N960B
VR2292	152-0166-00			SEMICONV DEVICE:ZENER,0.4W,6.2V,5%	04713	SZ11738
VR2294	152-0166-00			SEMICONV DEVICE:ZENER,0.4W,6.2V,5%	04713	SZ11738
VR2316	152-0278-00			SEMICONV DEVICE:ZENER,0.4W,3V,5%	04713	SZG35009K20
VR3004	152-0508-00			SEMICONV DEVICE:ZENER,0.4W,12.6V,5%	80009	152-0508-00
VR4553	152-0306-00	XB050000	B069999X	SEMICONV DEVICE:ZENER,0.4W,9.1V,5%	14433	1N960B
VR4575	152-0166-00	B010100	B069999X	SEMICONV DEVICE:ZENER,0.4W,6.2V,5%	04713	SZ11738
VR4600	152-0280-00	B010100	B069999X	SEMICONV DEVICE:ZENER,0.4W,6.2V,5%	80009	152-0280-00
VR4636	152-0278-00	B010100	B069999X	SEMICONV DEVICE:ZENER,0.4W,3V,5%	04713	SZG35009K20
VR4646	152-0149-00	B010100	B069999X	SEMICONV DEVICE:ZENER,0.4W,10V,5%	80009	152-0149-00
VR4740	152-0279-00	XB070000		SEMICONV DEVICE:ZENER,0.4W,5.1V,5%	80009	152-0279-00
W200	175-1670-00			CABLE ASSY,RF:50 OHM COAX,5.166 LONG	80009	175-1670-00
W230	175-1675-00			CA ASSY,SP,ELEC:50 OHM COAX,7.75 INCH LONG	80009	175-1675-00
W380	175-1672-00			CABLE ASSY,RF:50 OHM COAX,12.5 L,GREEN	80009	175-1672-00
W385	175-1674-00			CABLE ASSY,RF:50 OHM COAX,15.25 L	80009	175-1674-00
W390	175-1673-00			CABLE ASSY,RF:50 OHM COAX,12.5 L,YELLOW	80009	175-1673-00
W1040	175-1669-00			CA ASSY,SP,ELEC:10.7 MHZ TO OSC BUFFER	80009	175-1669-00
W1500	175-1668-00			CA ASSY,SP,ELEC:2ND LO TO REFOSC	80009	175-1668-00
W1505	175-1667-00			CA ASSY,SP,ELEC:2ND LO TO REFOSC	80009	175-1667-00
Y390	119-0499-00			OSCILLATOR,RF:XTAL CONT,10MHZ,TEMP STAB	27802	C0-232T
Y1504	158-0102-00			XTAL UNIT,QTZ:10.45 MHZ,0.002%	33096	0BD
Y1950	158-0094-02			XTAL UNIT SET:(4)XTAL MTCHD FREQ DFT-TEMP	80009	158-0094-02
Y1952						
Y1954						
Y1956						

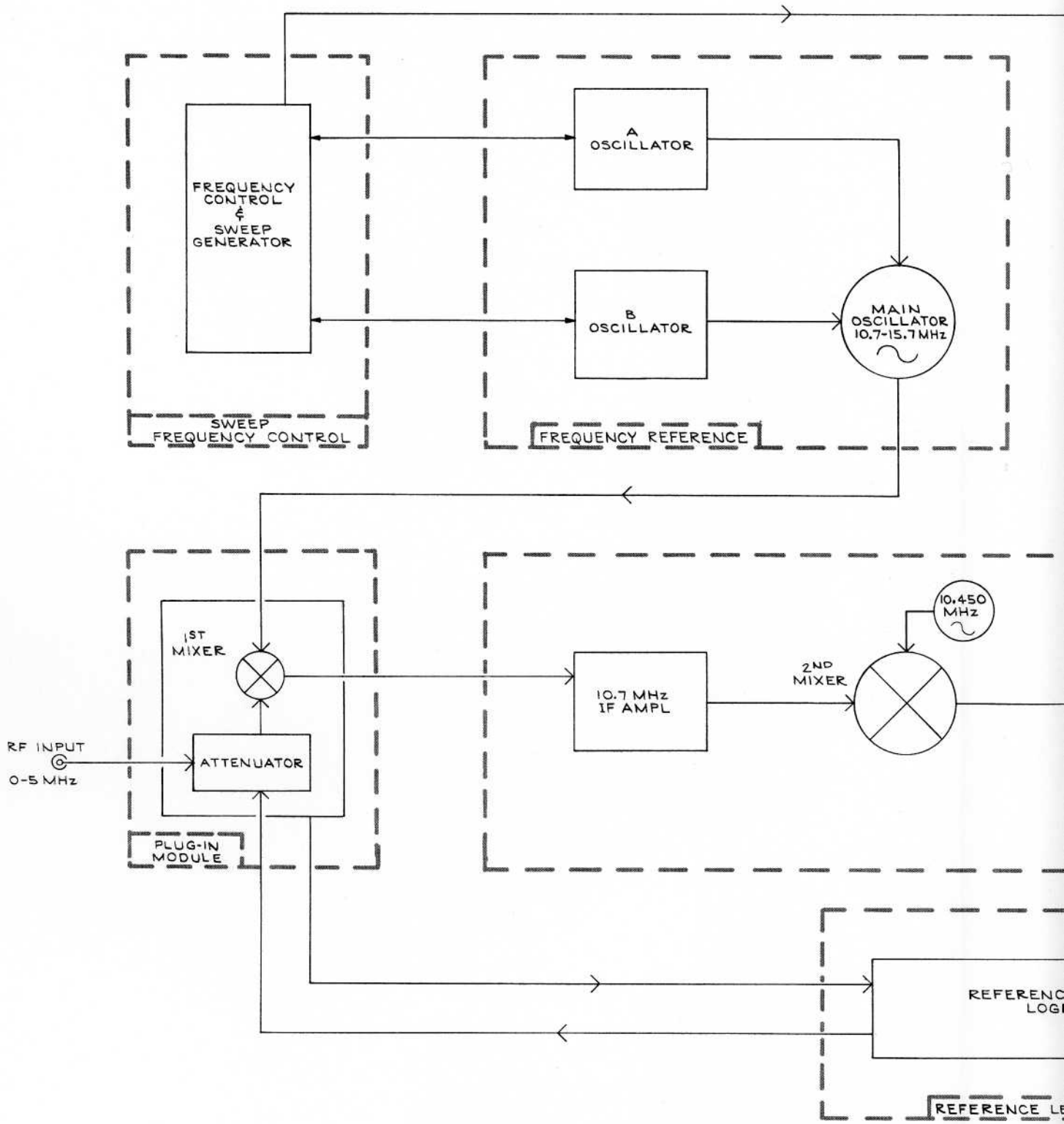
# DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

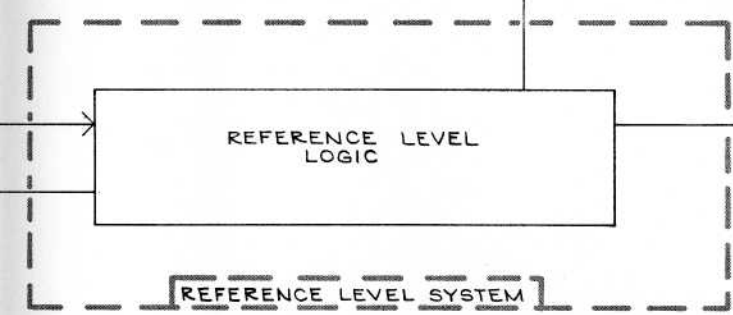
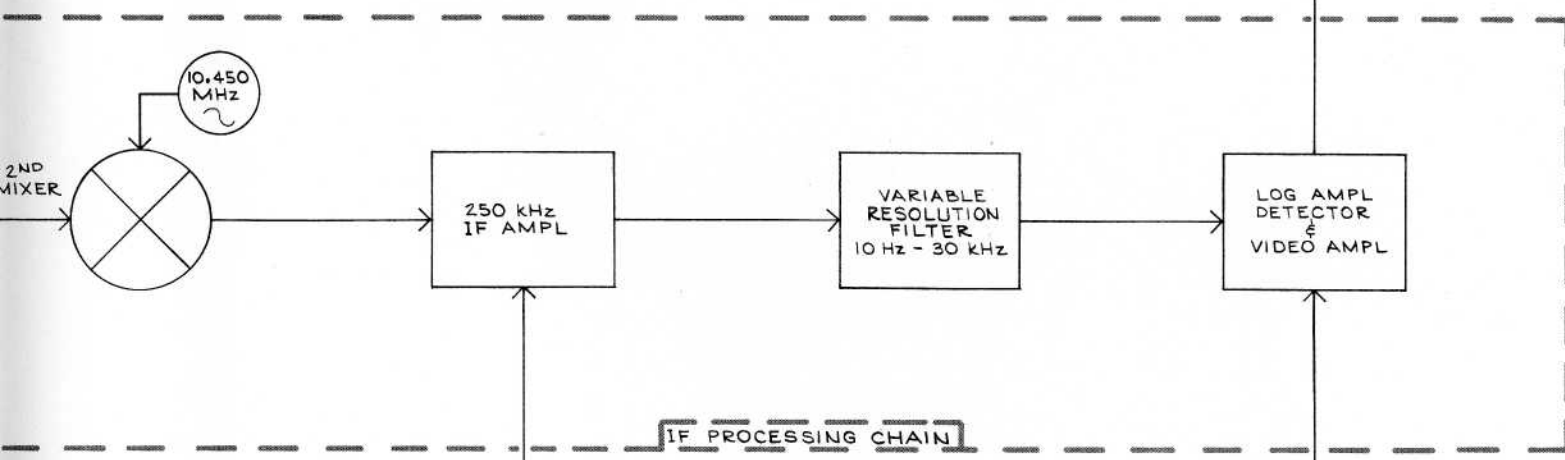
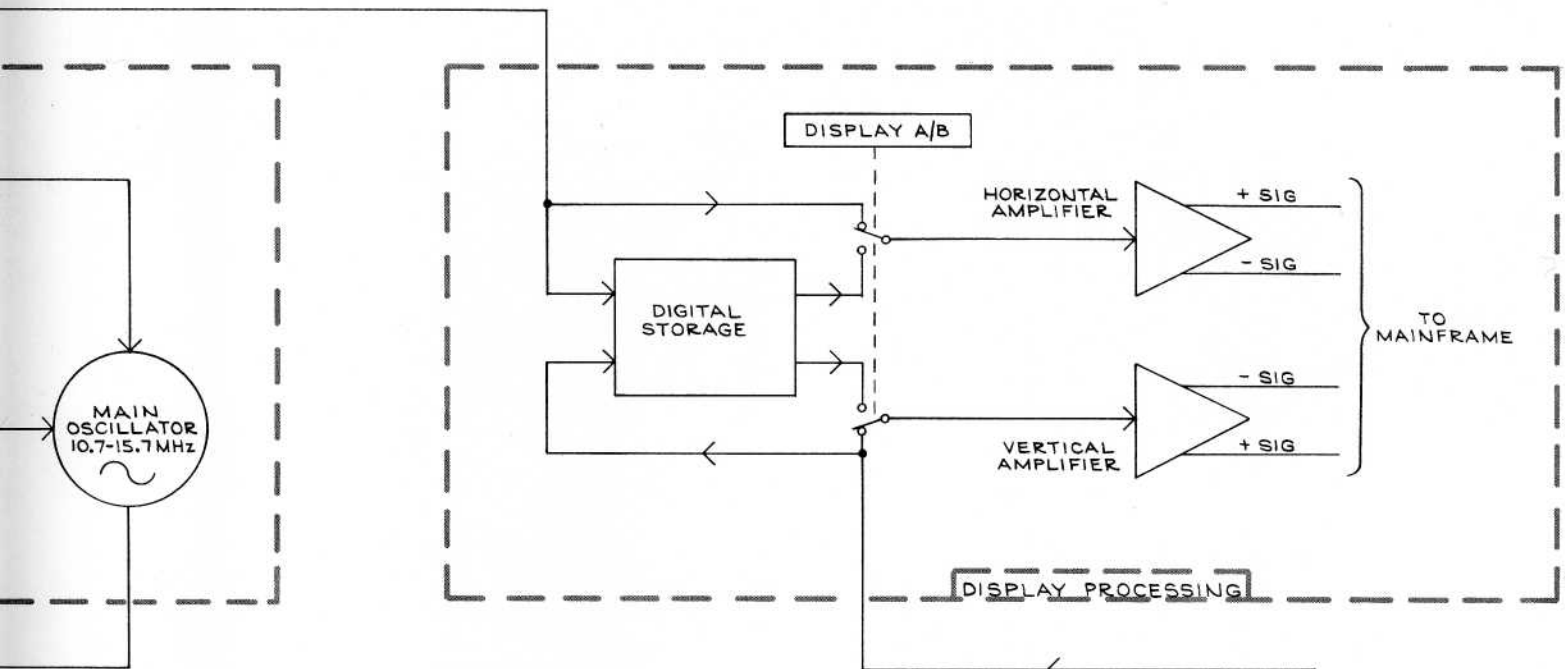
## Symbols and Reference Designators

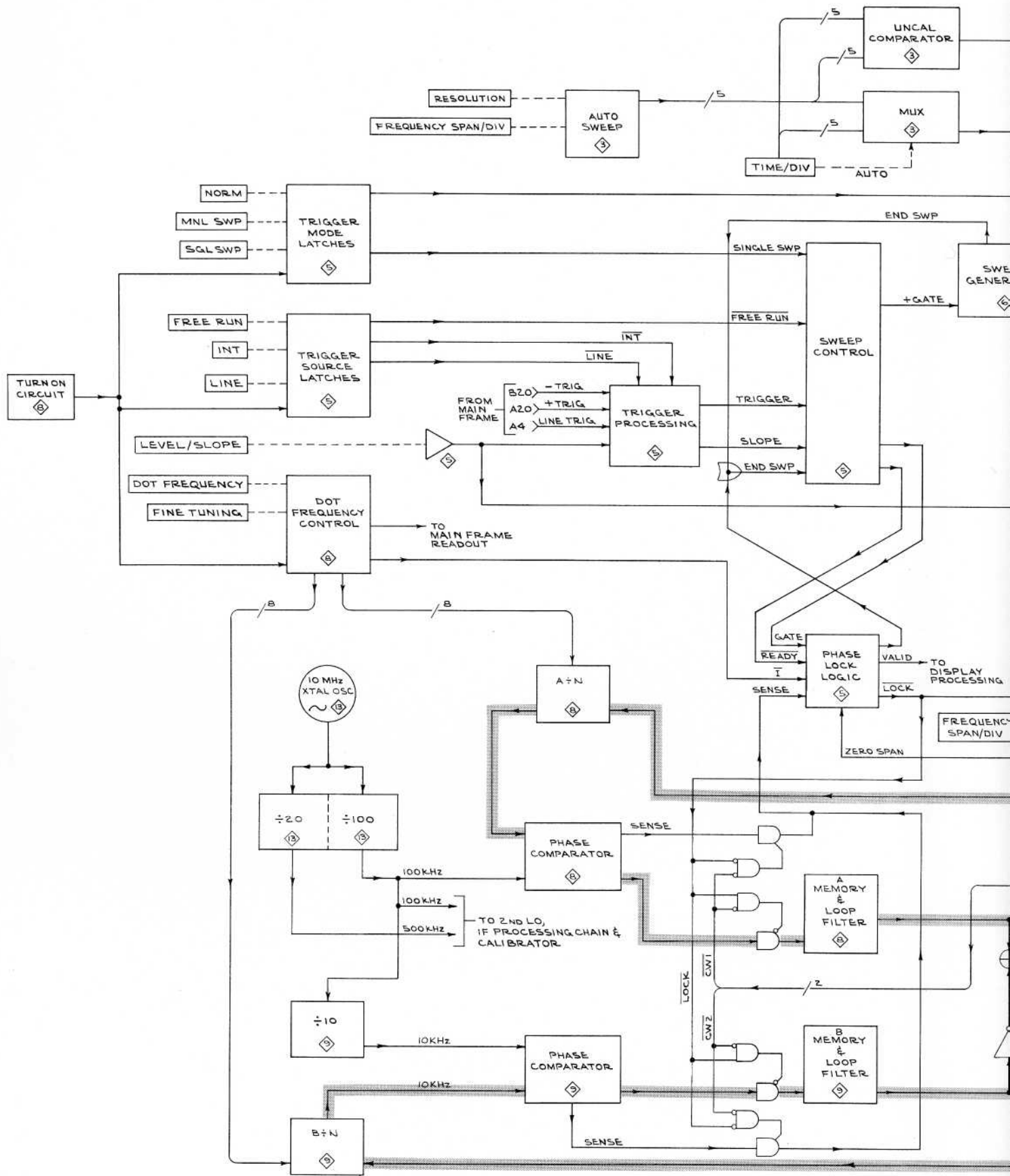
Graphic symbols for electrical and logic symbols, used on the diagrams, are based on ANSI Y32.2, 1970, and ANSI Y32.14, 1973, "American National Standards Institute." Logic symbols depict the logic function of the device in positive logic. Copies of these standards can be obtained from the Institute of Electrical and Electronics Engineers, 345 East 47th Street, New York, N.Y., 11017. Exceptions and additions are shown on this sample diagram. These conform or are based on the manufacturers data sheet and industry trends.

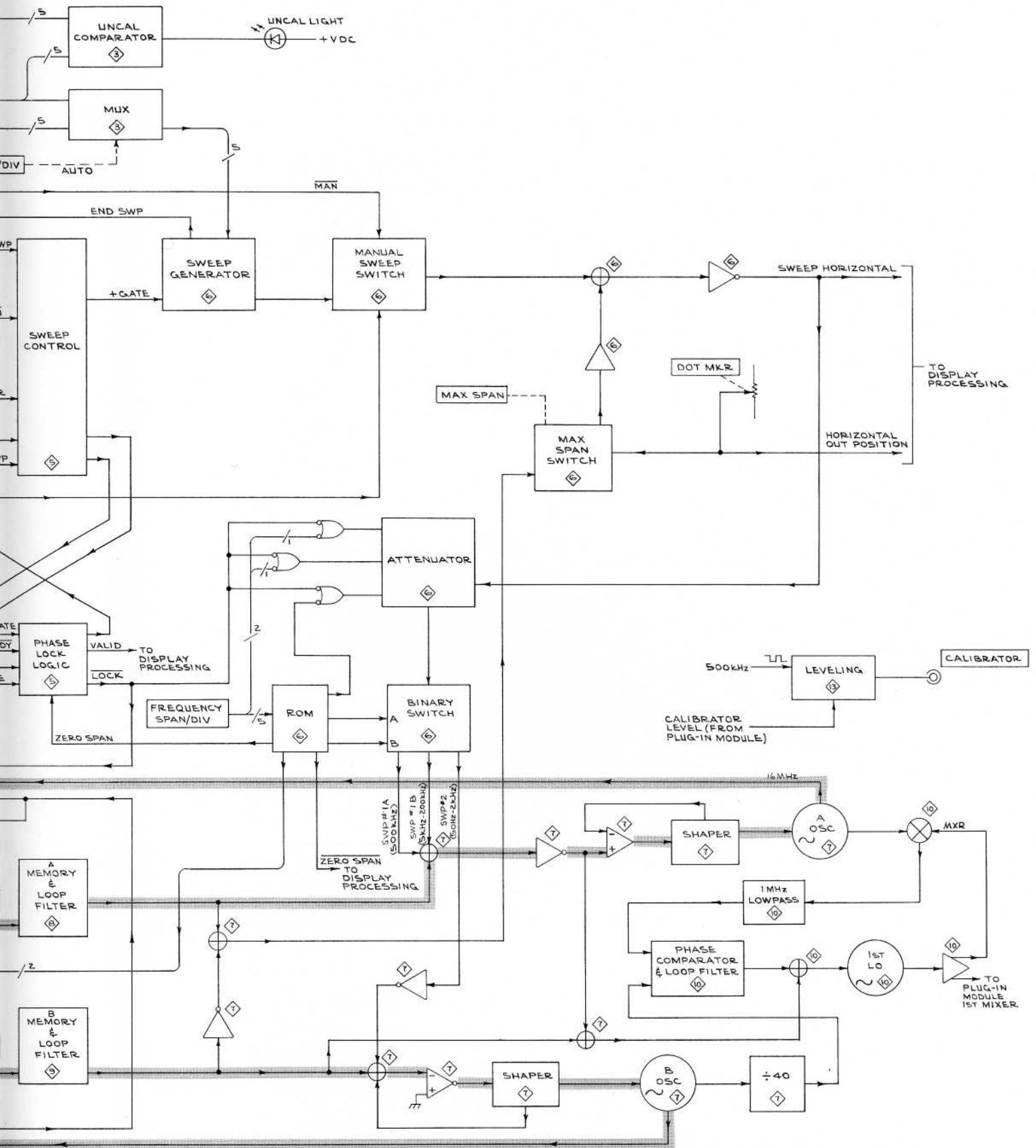
Resistor values are in ohms, unless noted otherwise, and the  $\Omega$  symbol is omitted. Capacitor values  $\geq 1$  (e.g. 10) are in picofarads (pF) and values  $< 1$  (e.g. 0.01) are in microfarads unless otherwise noted.



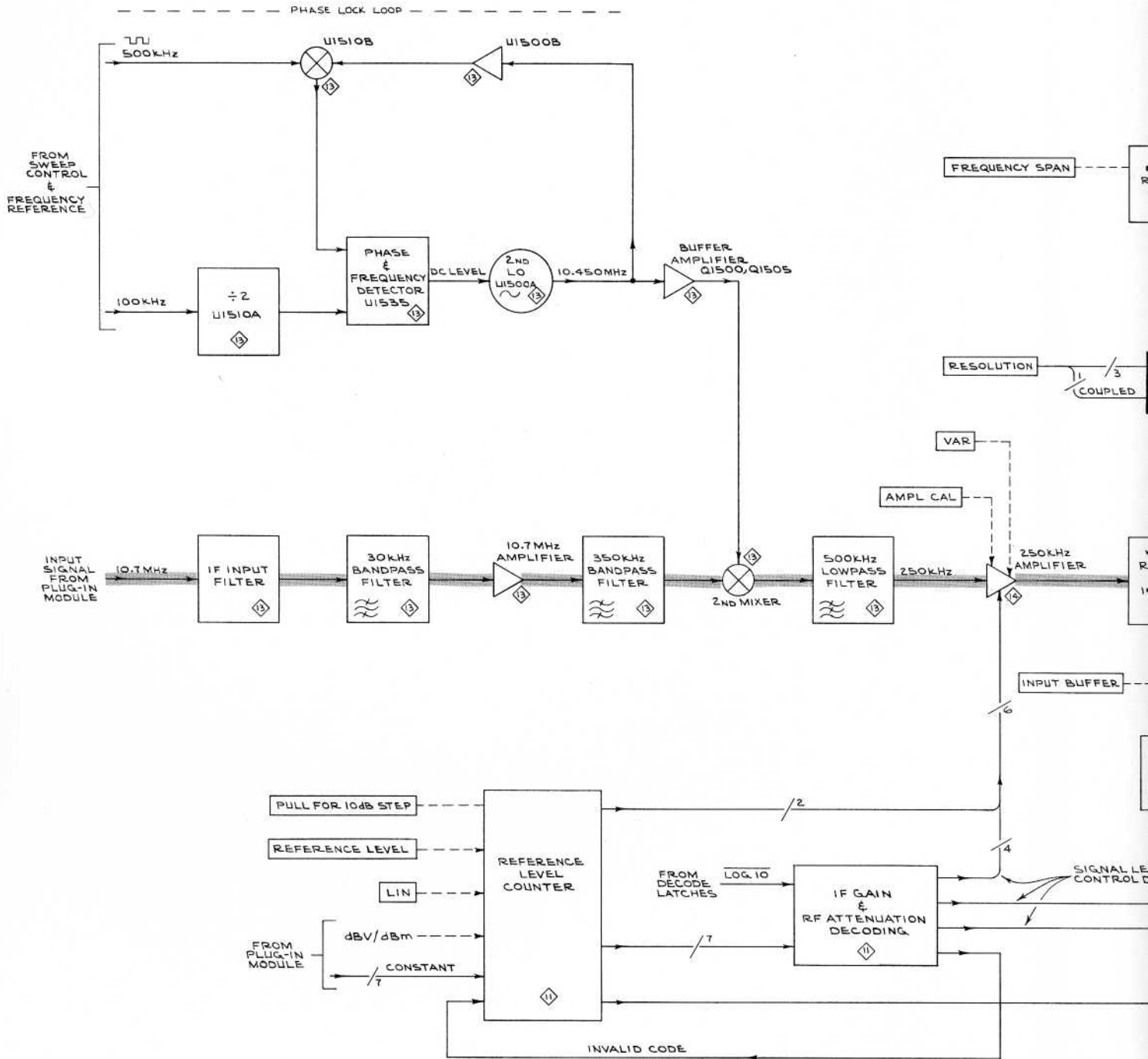








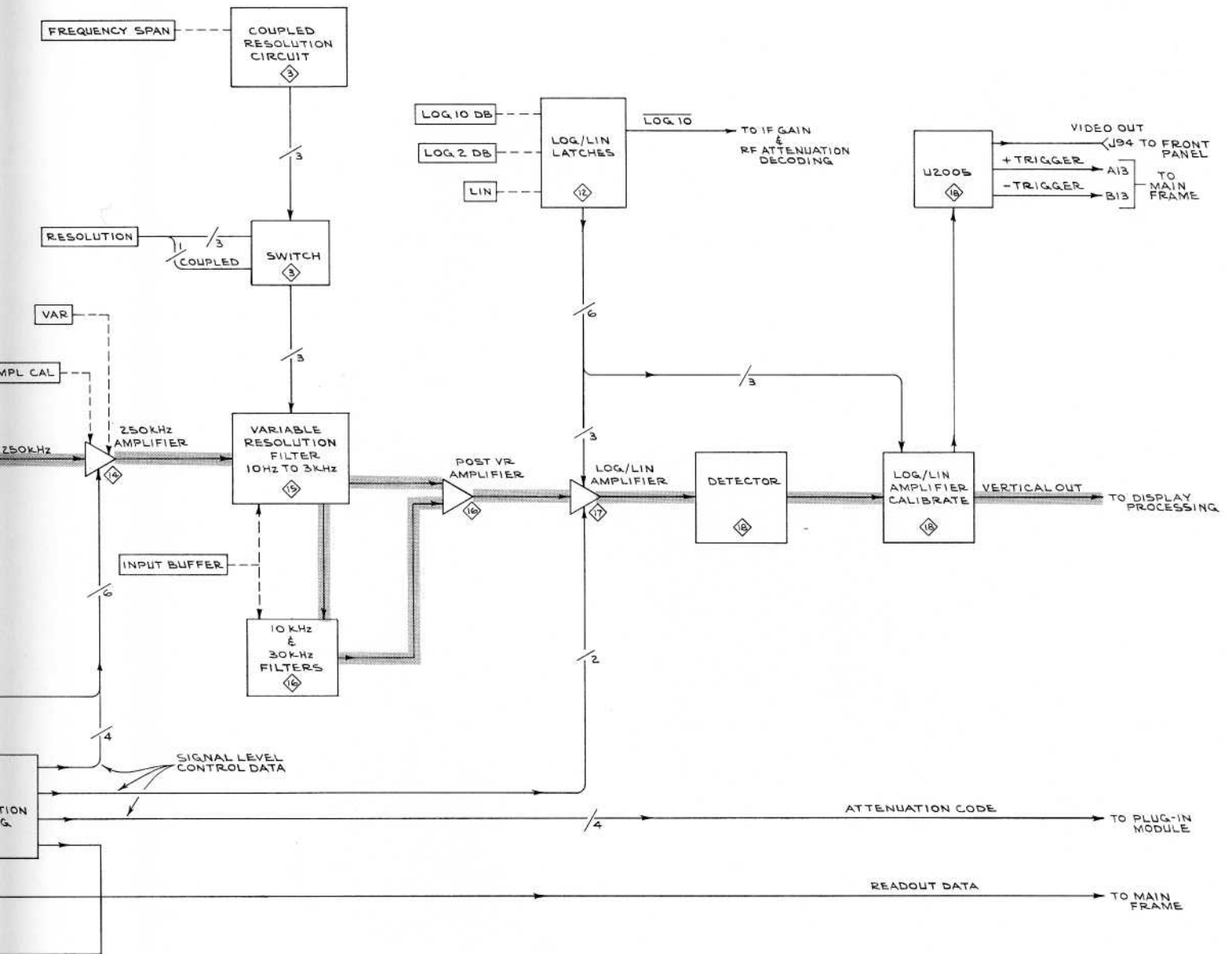
SWEEP CONTROL & FREQUENCY REFERENCE BLOCK DIAGRAM



2154-40  
@

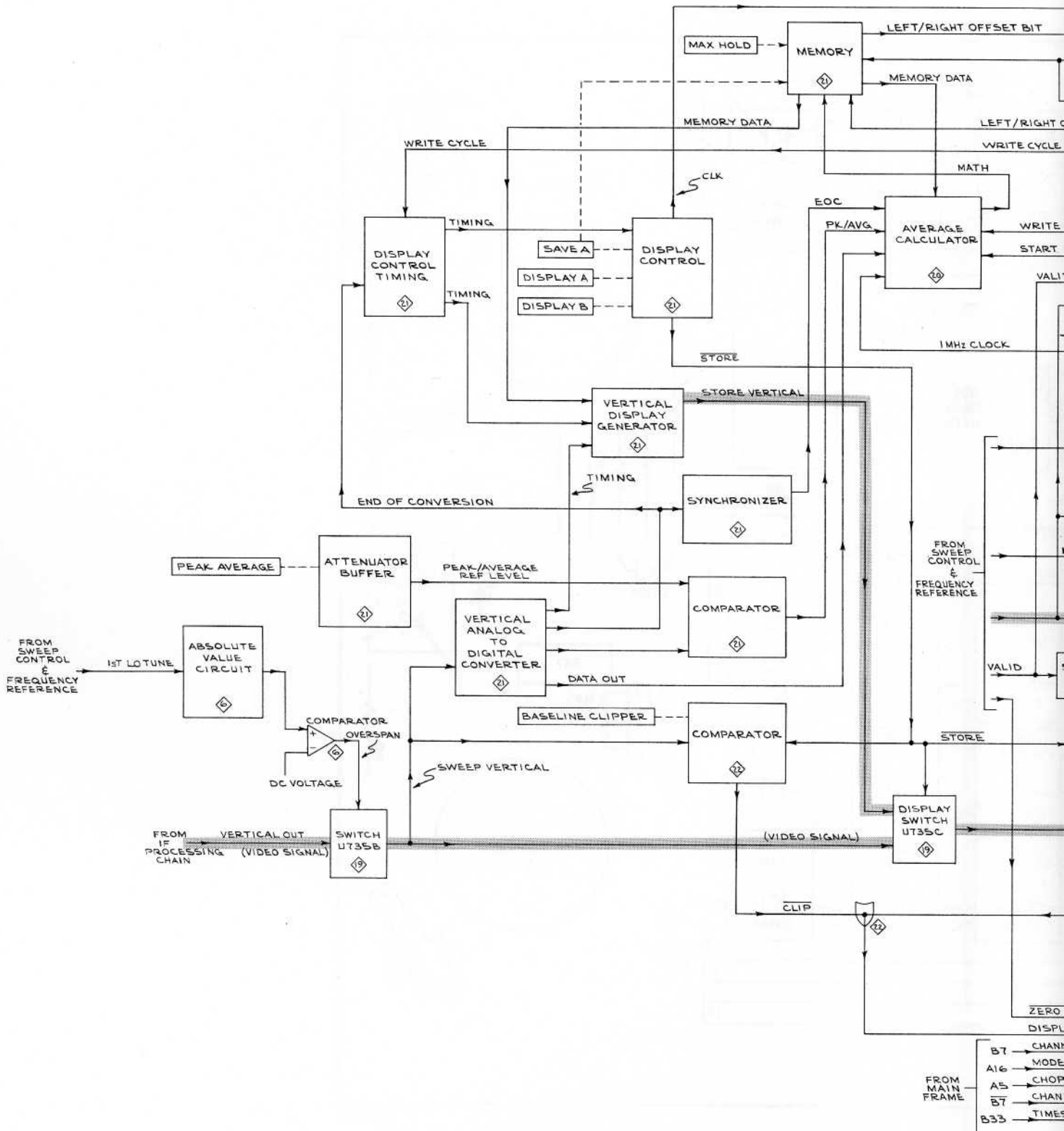
7L5



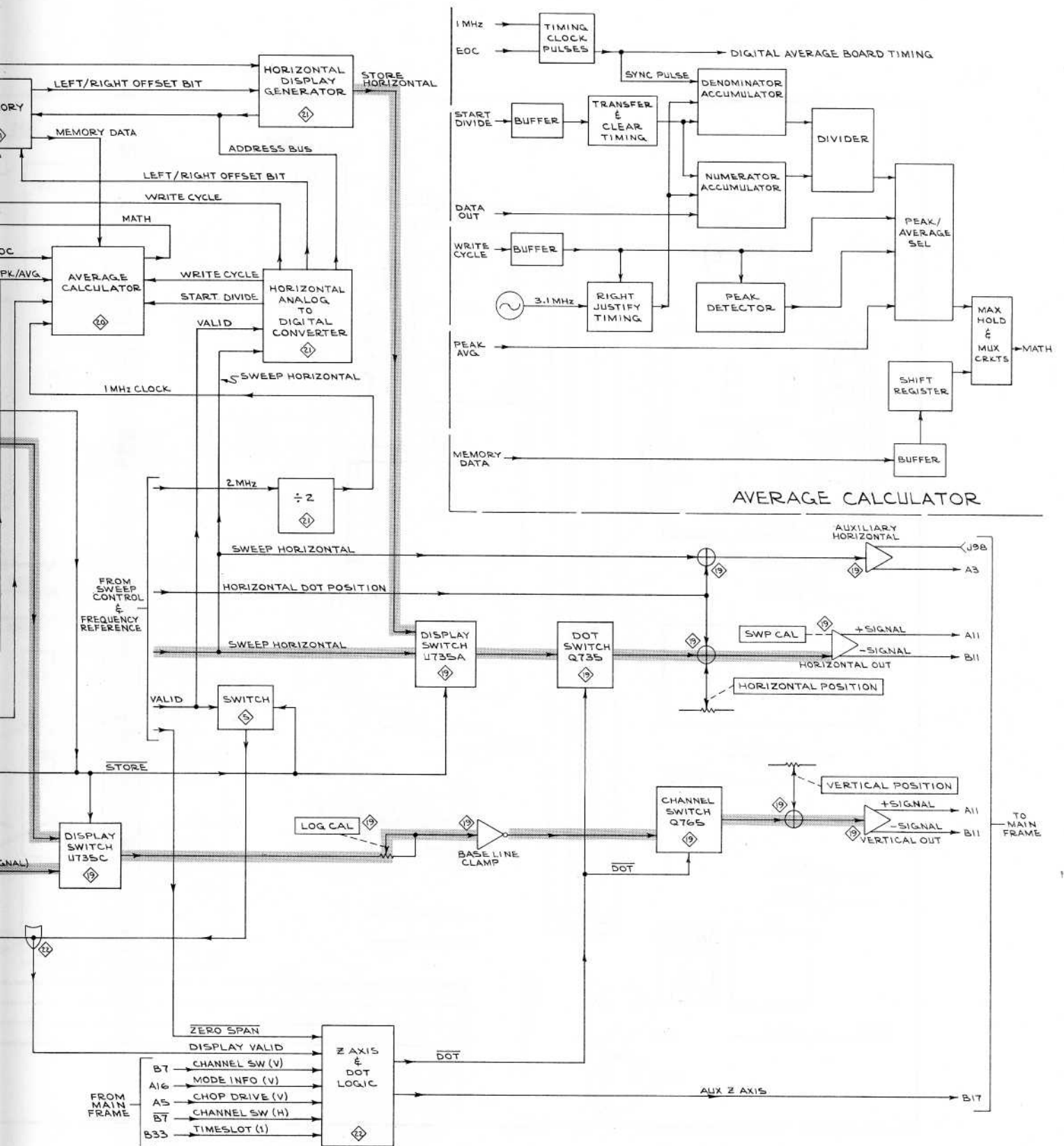


IF PROCESSING CHAIN 1<sub>b</sub>  
BLOCK DIAGRAM

1175 PLM



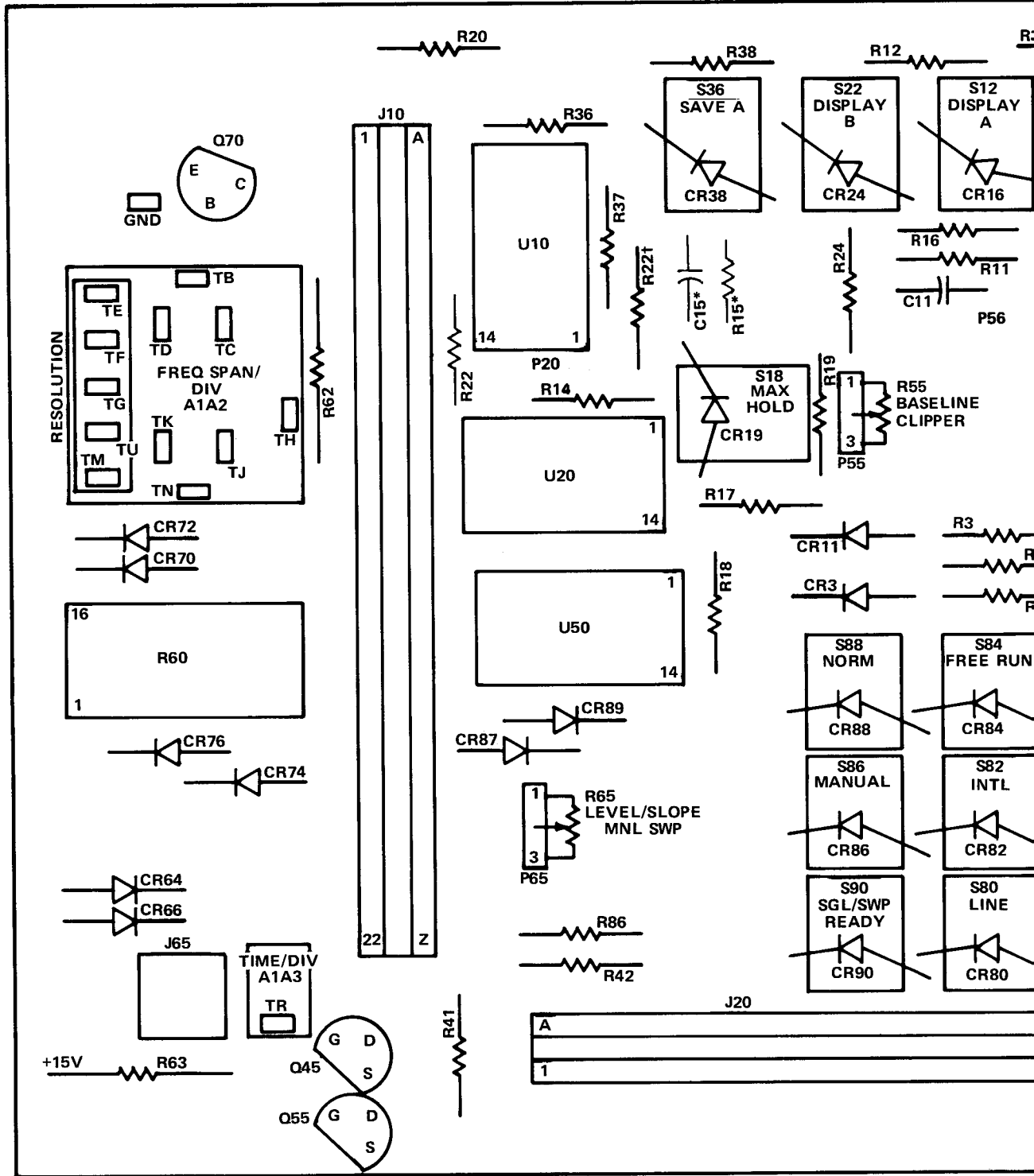
7L5



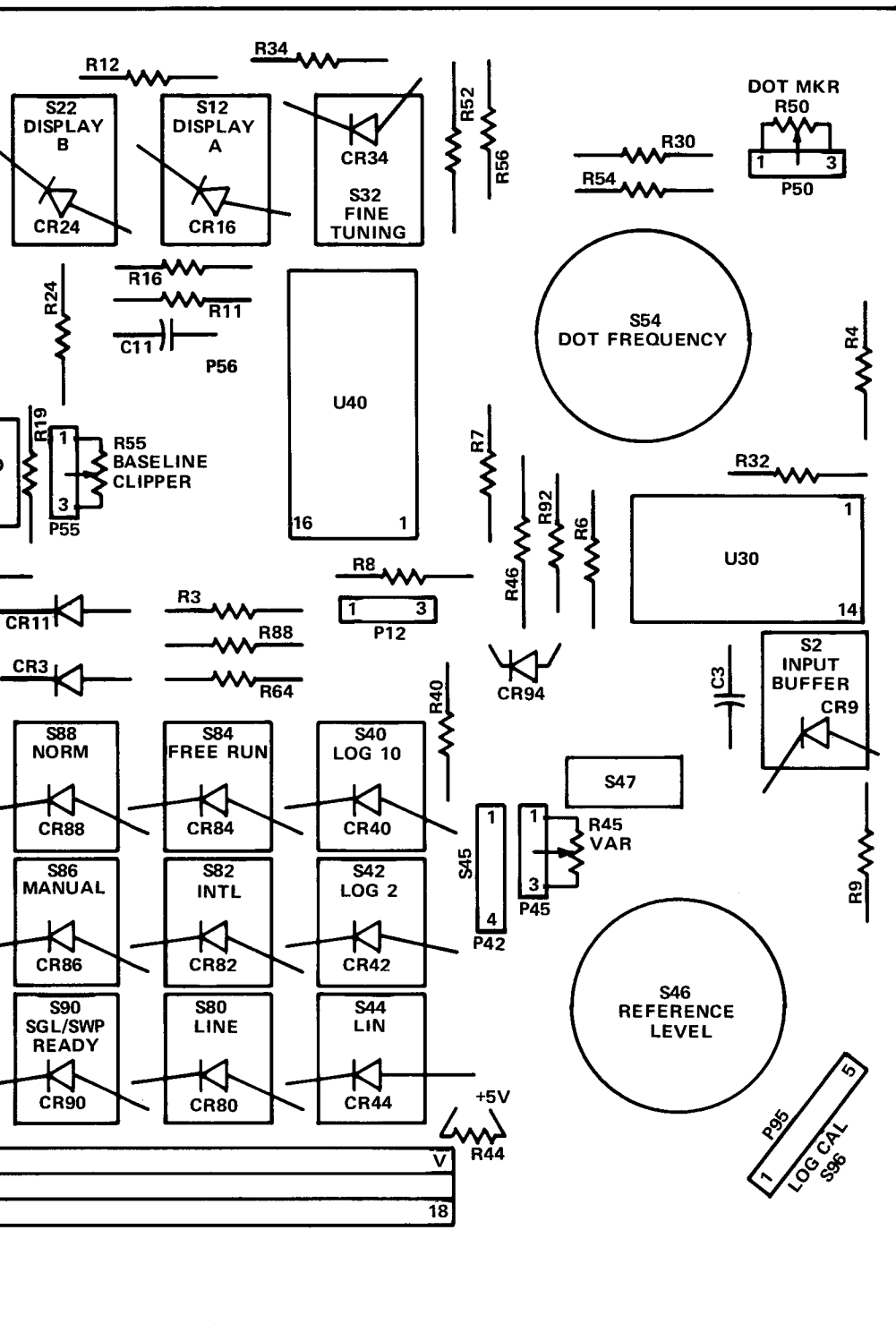
2184-41  
 ©

DISPLAY PROCESSING  $\text{I}_c$   
 BLOCK DIAGRAM

1175 PLM



A1A1 Front Panel

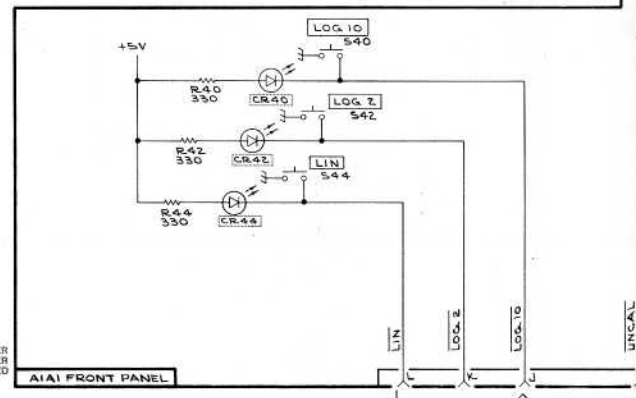
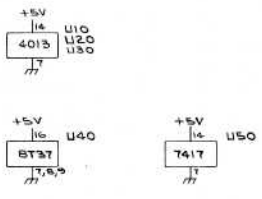
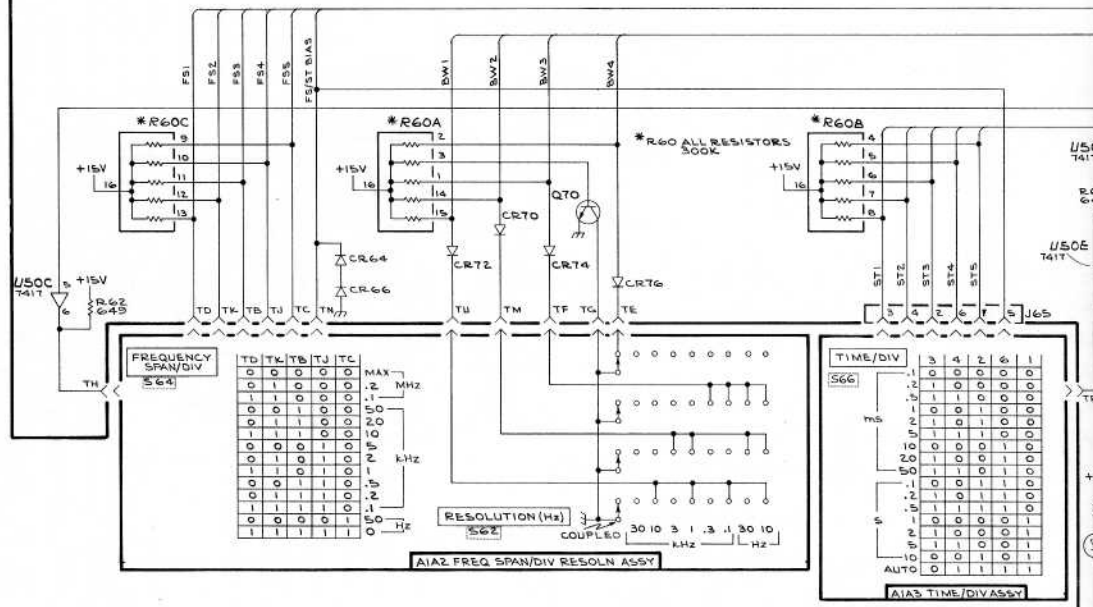
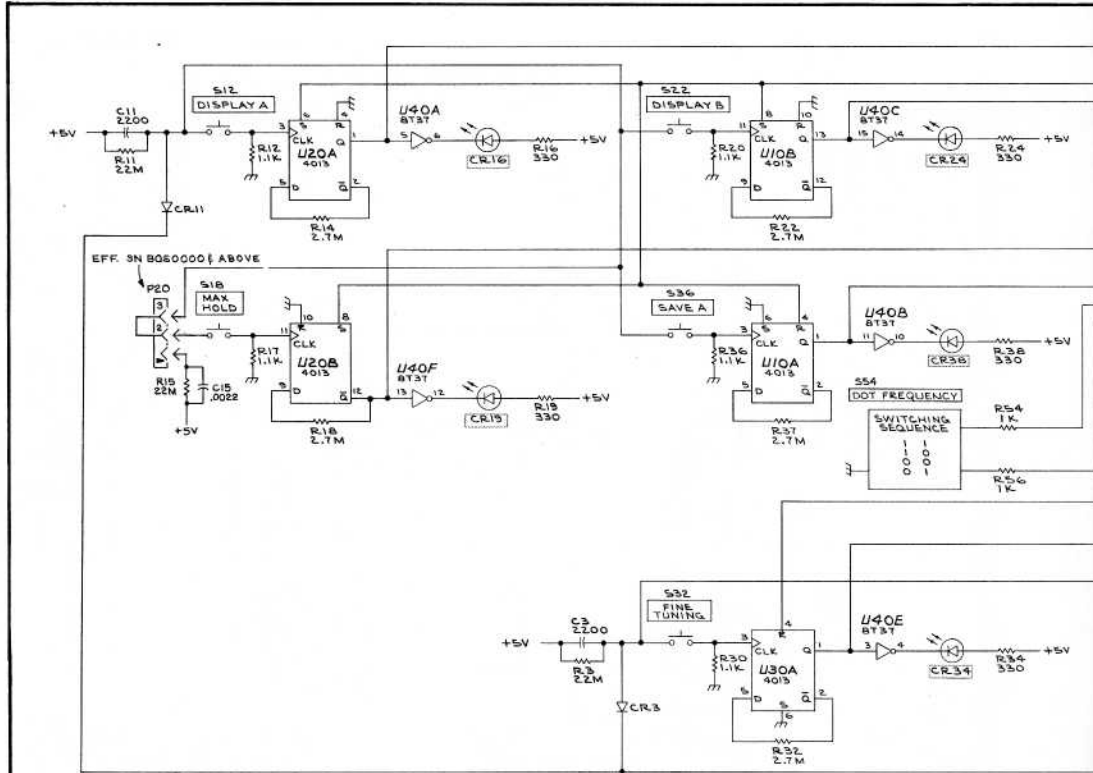


2184-89

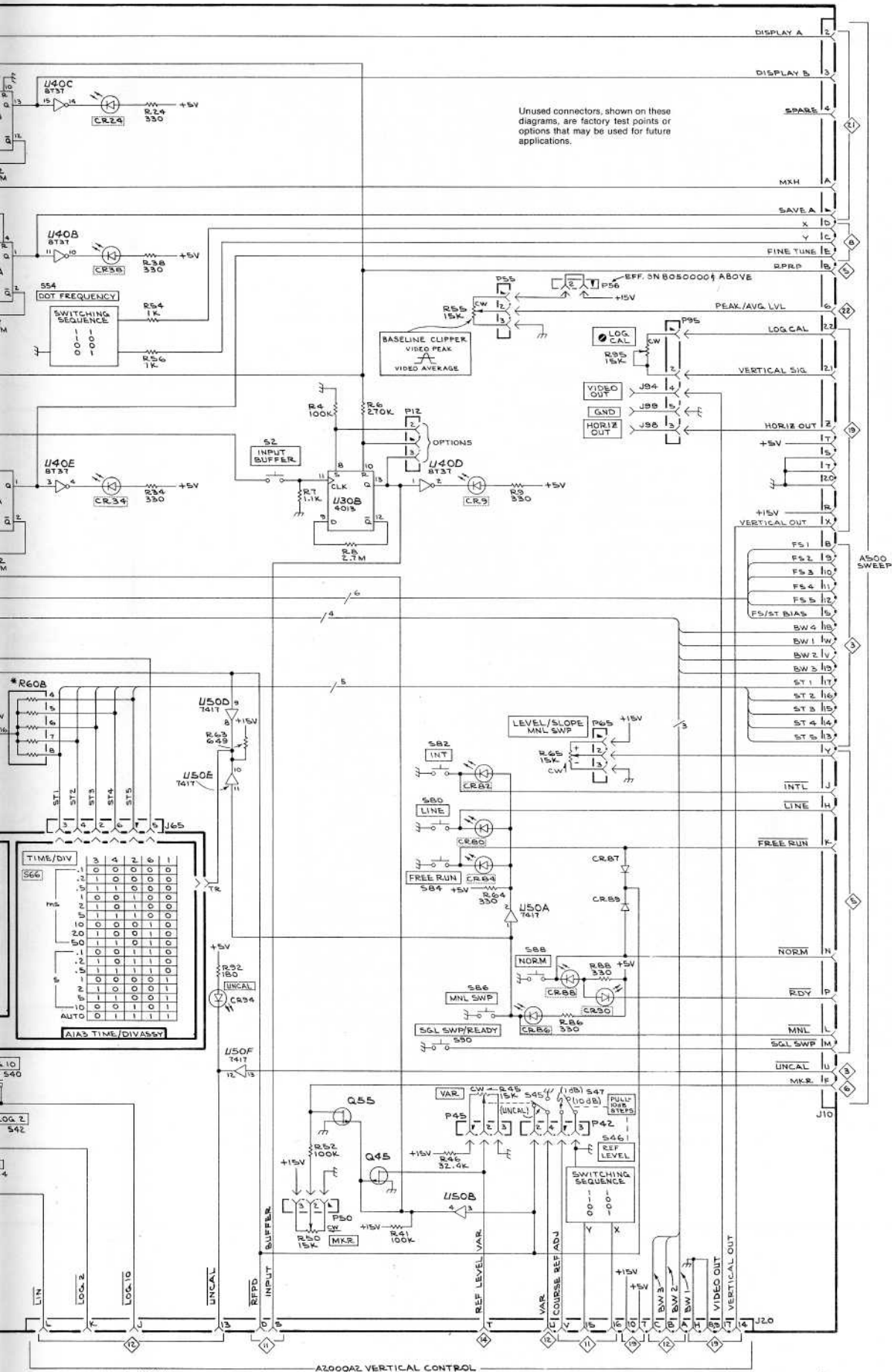
Front Panel

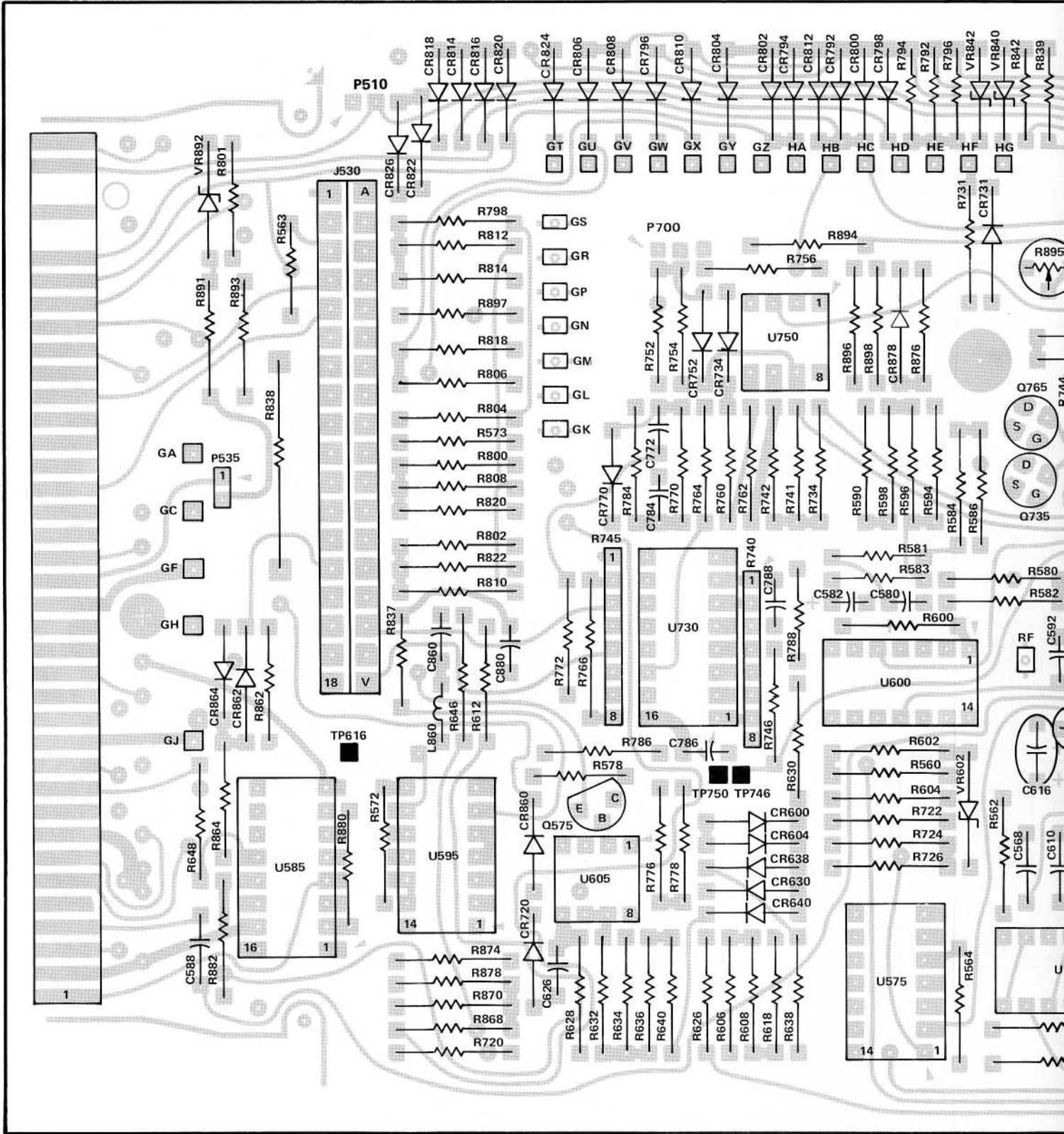
\*See Parts List for serial number ranges.

†Location of this part for 670-3586-00 only.

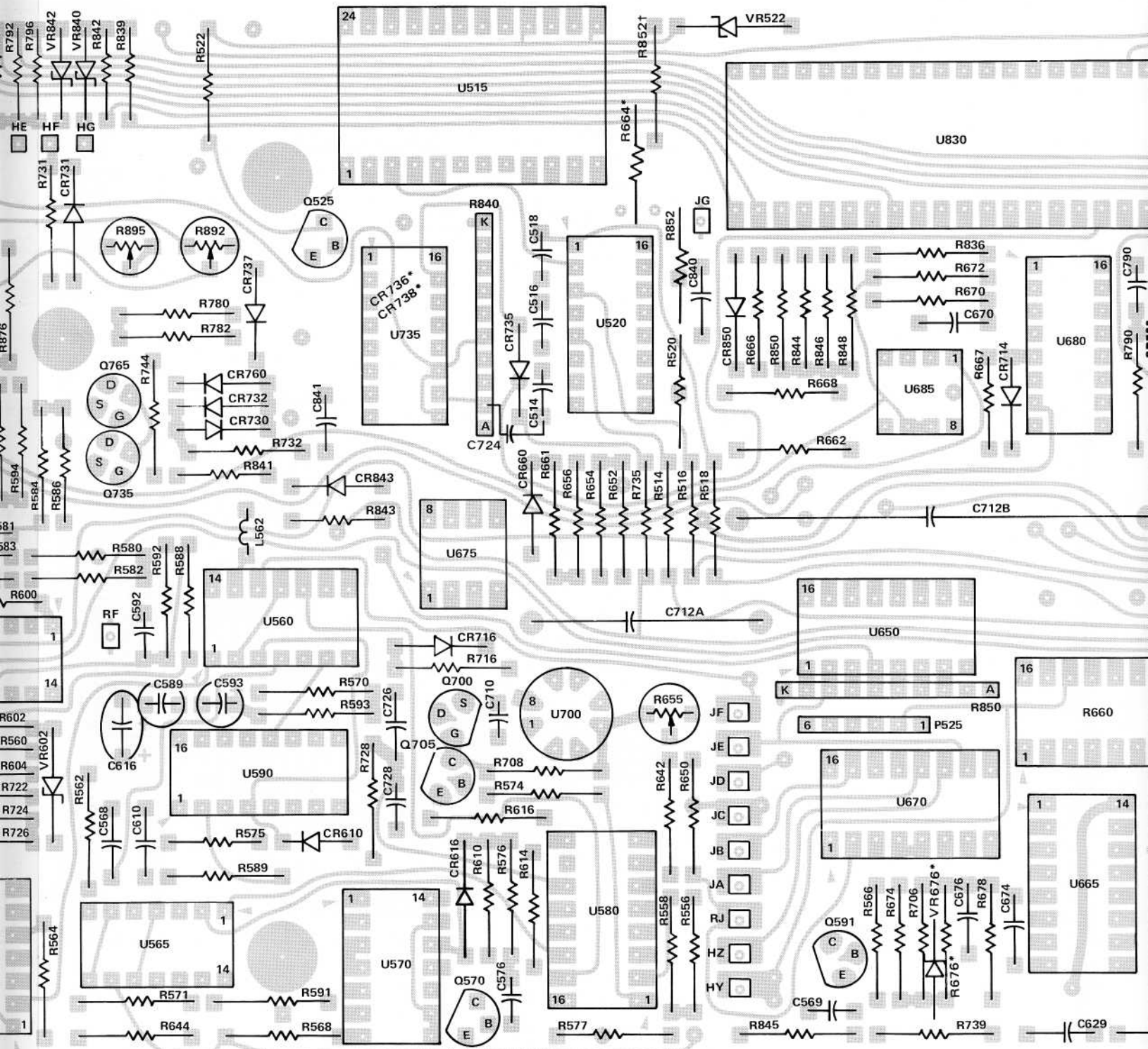


SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.



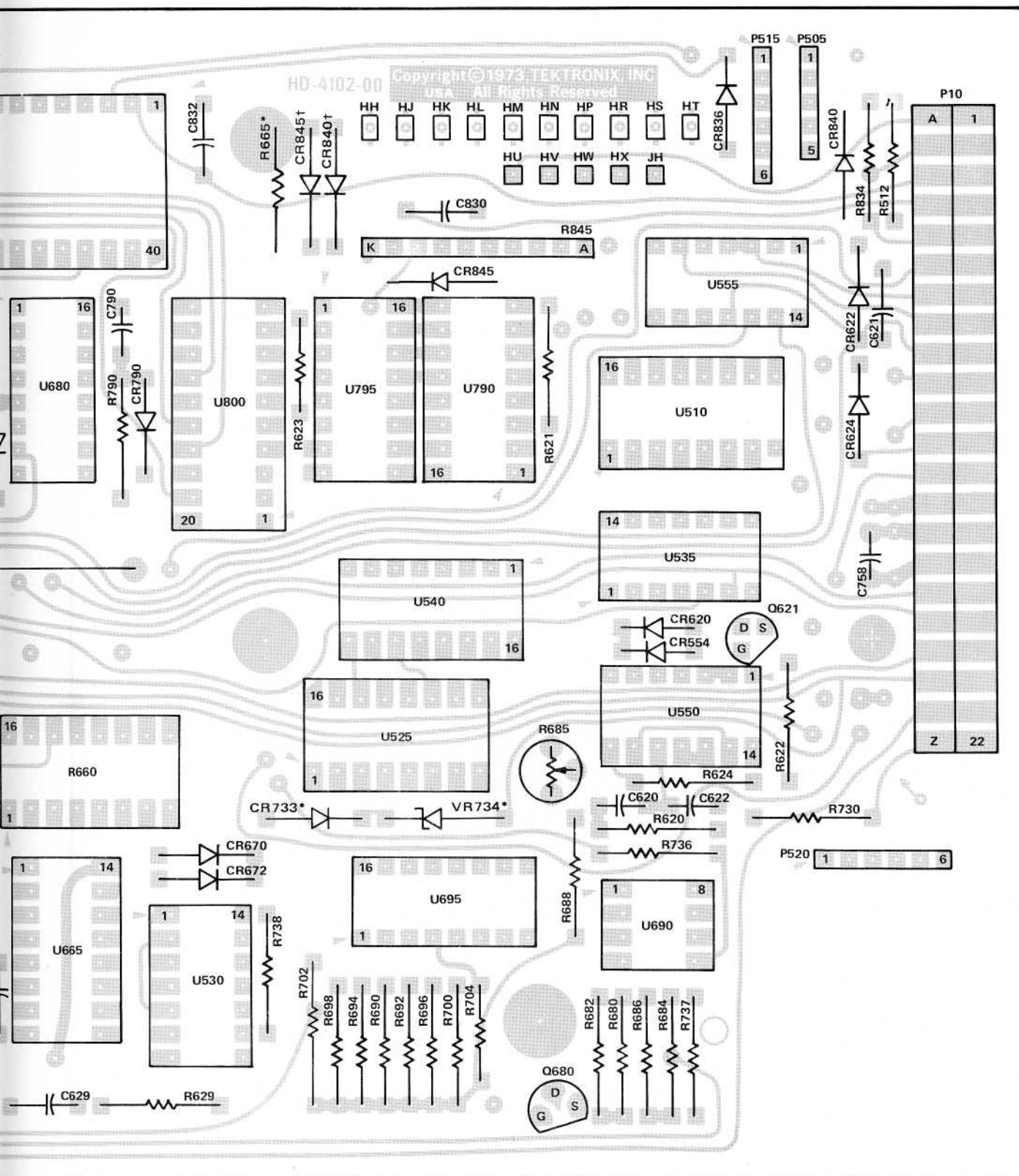






A500 Sweep

A1A1 Front Panel component location shown on back of Diagram 1 c

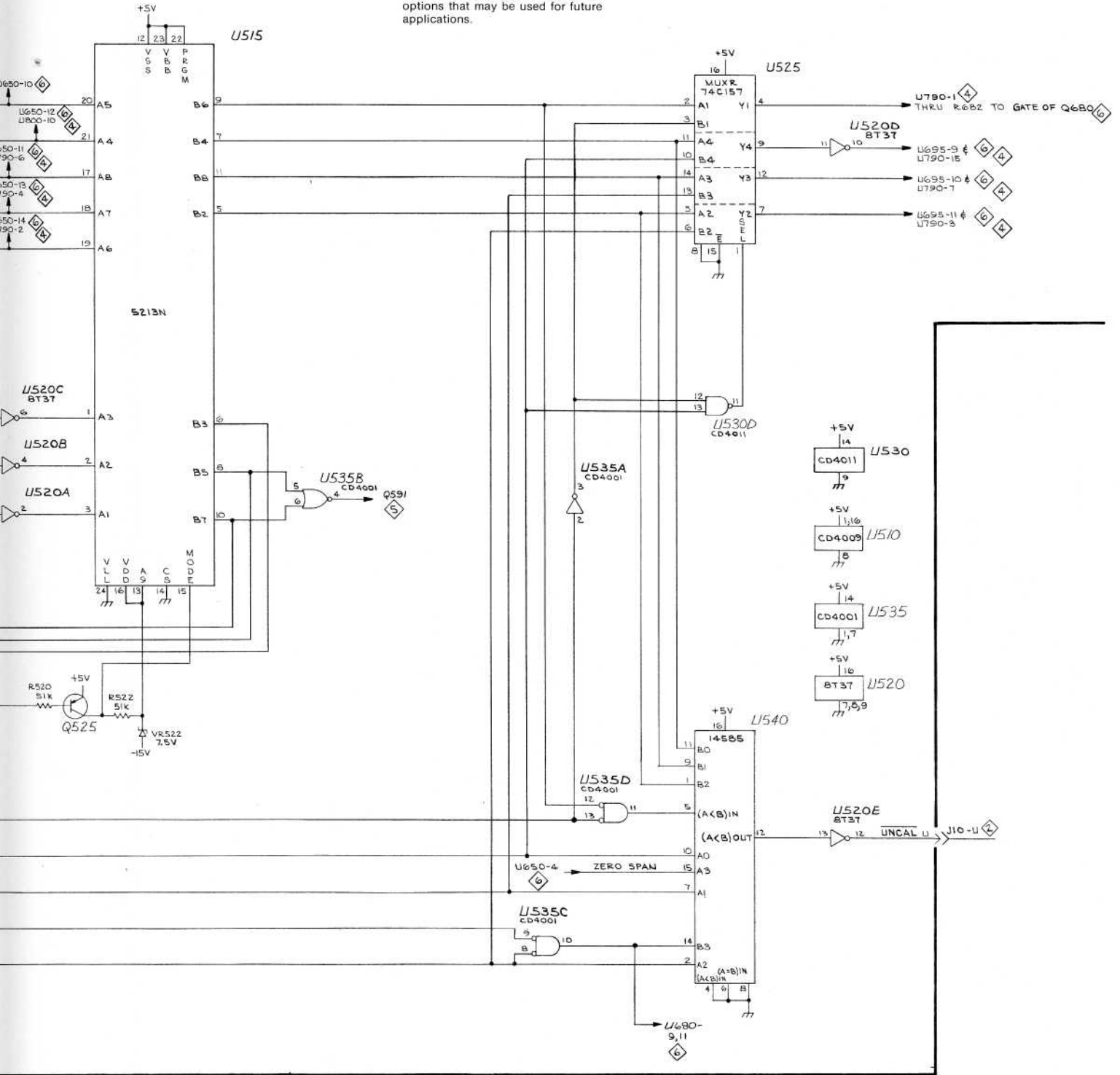


\*See Parts List for serial number ranges.

†Location of this part for 670-3586-00 only.

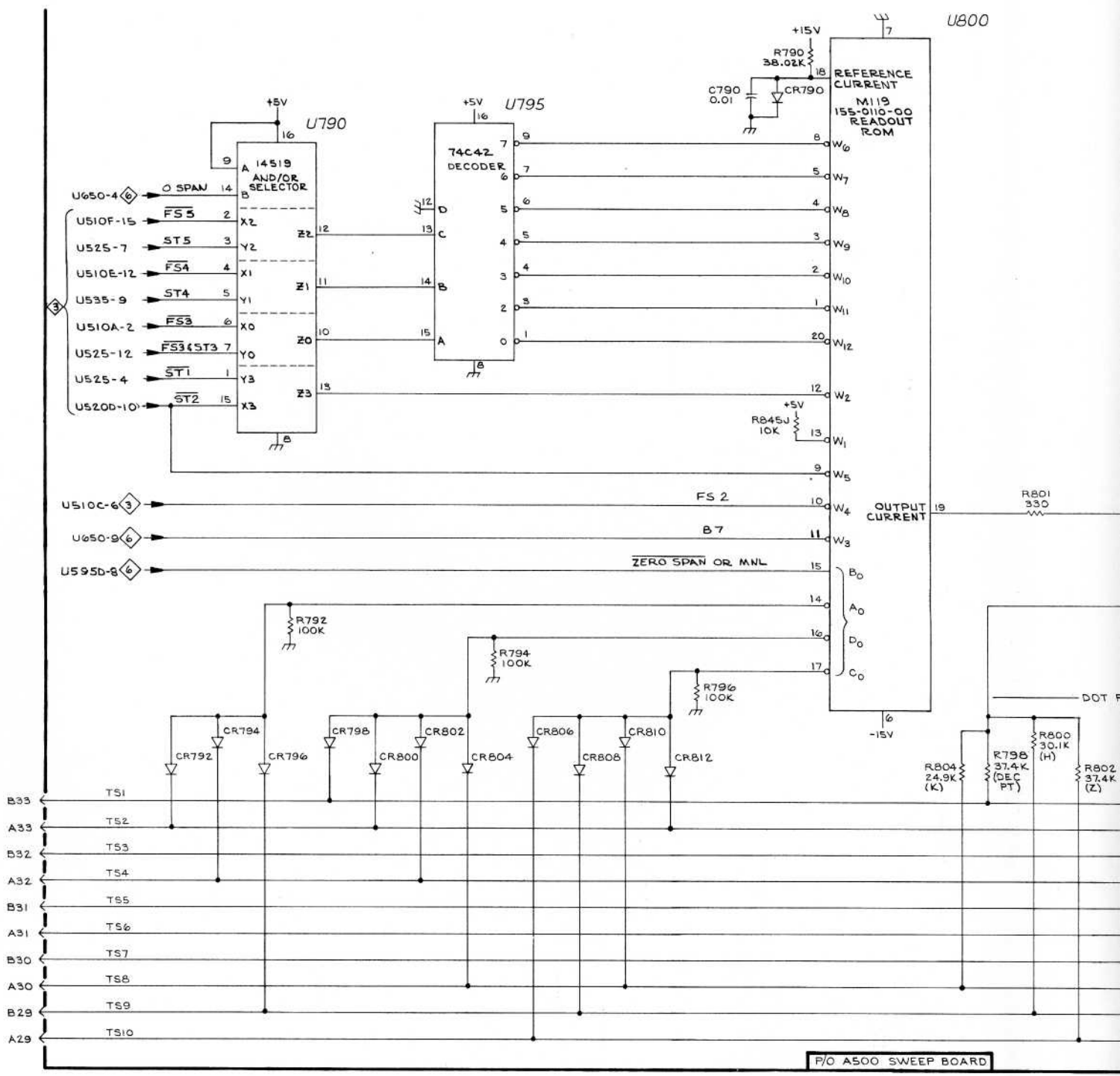


Unused connectors, shown on these diagrams, are factory test points or options that may be used for future applications.



A500 Sweep Component Location shown on back of Diagram  2

A3000 Transverse/Vertical Interface component location shown on back of Diagram  21 a



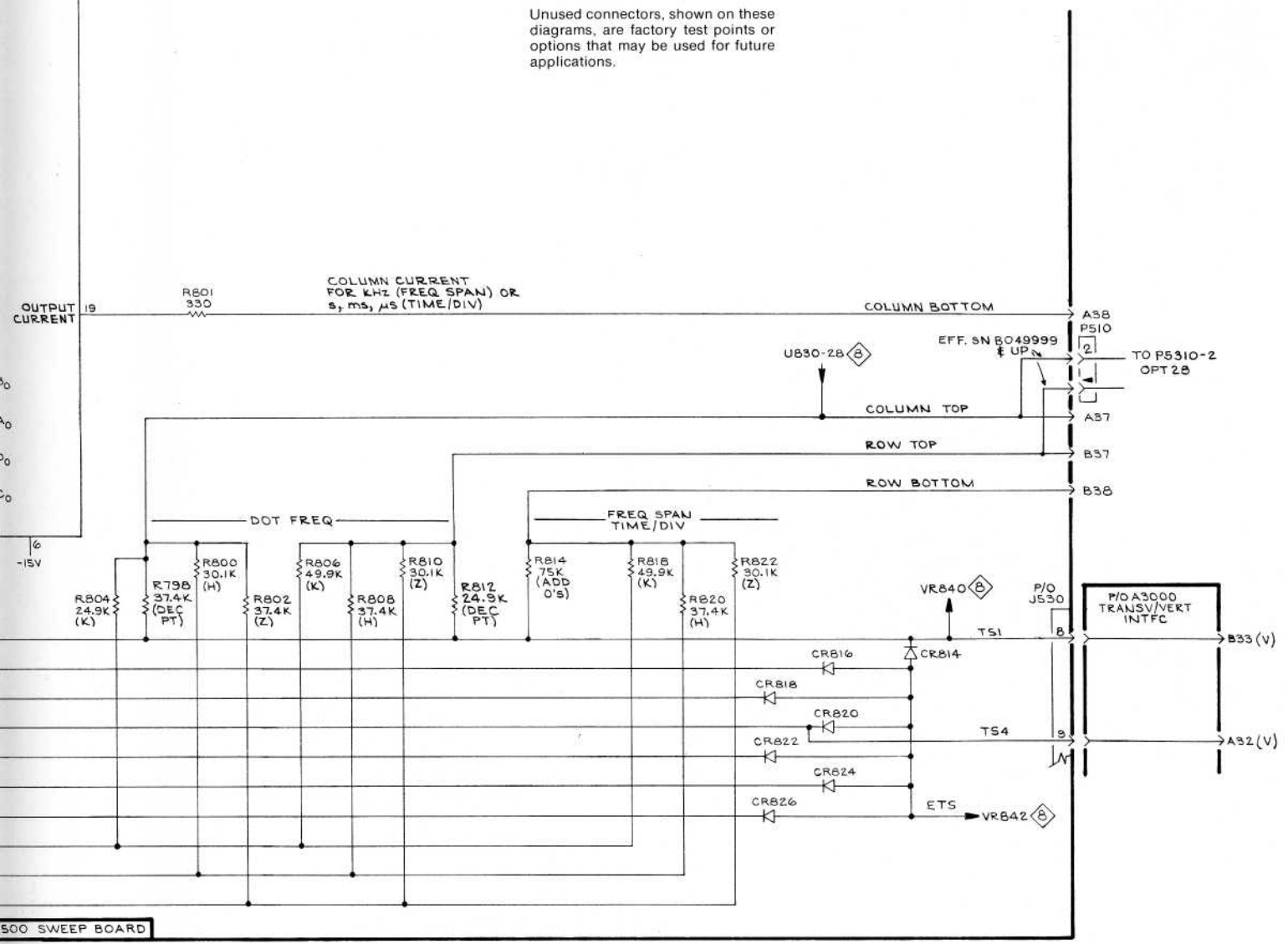
7L5

2184-44  
REV B, MAR 1979

47 UB00

REFERENCE CURRENT  
M119  
-0110-00  
READOUT ROM

Unused connectors, shown on these diagrams, are factory test points or options that may be used for future applications.



500 SWEEP BOARD

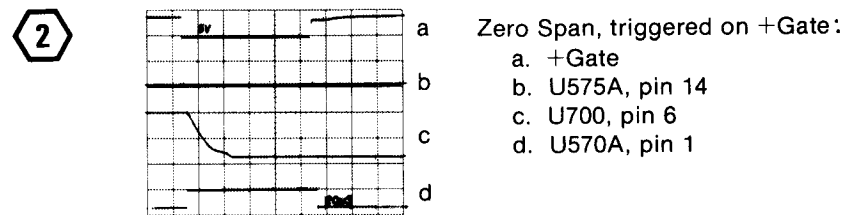
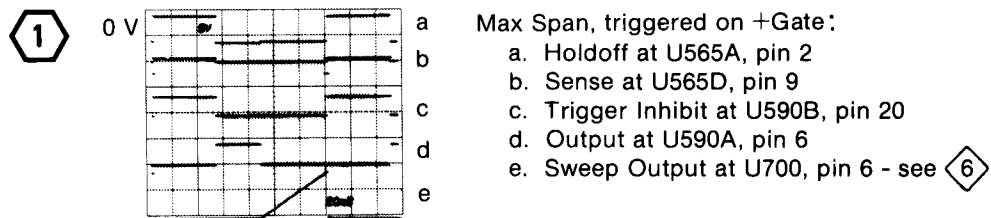
2184-44  
REV B, MAR 1979

FREQ SPAN & READOUT 4 1175 DJ

Waveforms shown on this diagram were obtained under the following conditions:

The oscilloscope mainframe contained two dual trace vertical amplifier units (e.g. 7A18) and one time base unit (e.g. 7B70). A C-50 oscilloscope camera was used. Time/Div and Volts/Div settings are indicated on the waveform. The triggering source is internal or indicated with the waveform.

The Digital Averaging circuit board for the 7L5 was positioned to the side as shown in the Calibration section (Fig. 4-20). Pertinent 7L5 control settings are also indicated with the waveform.



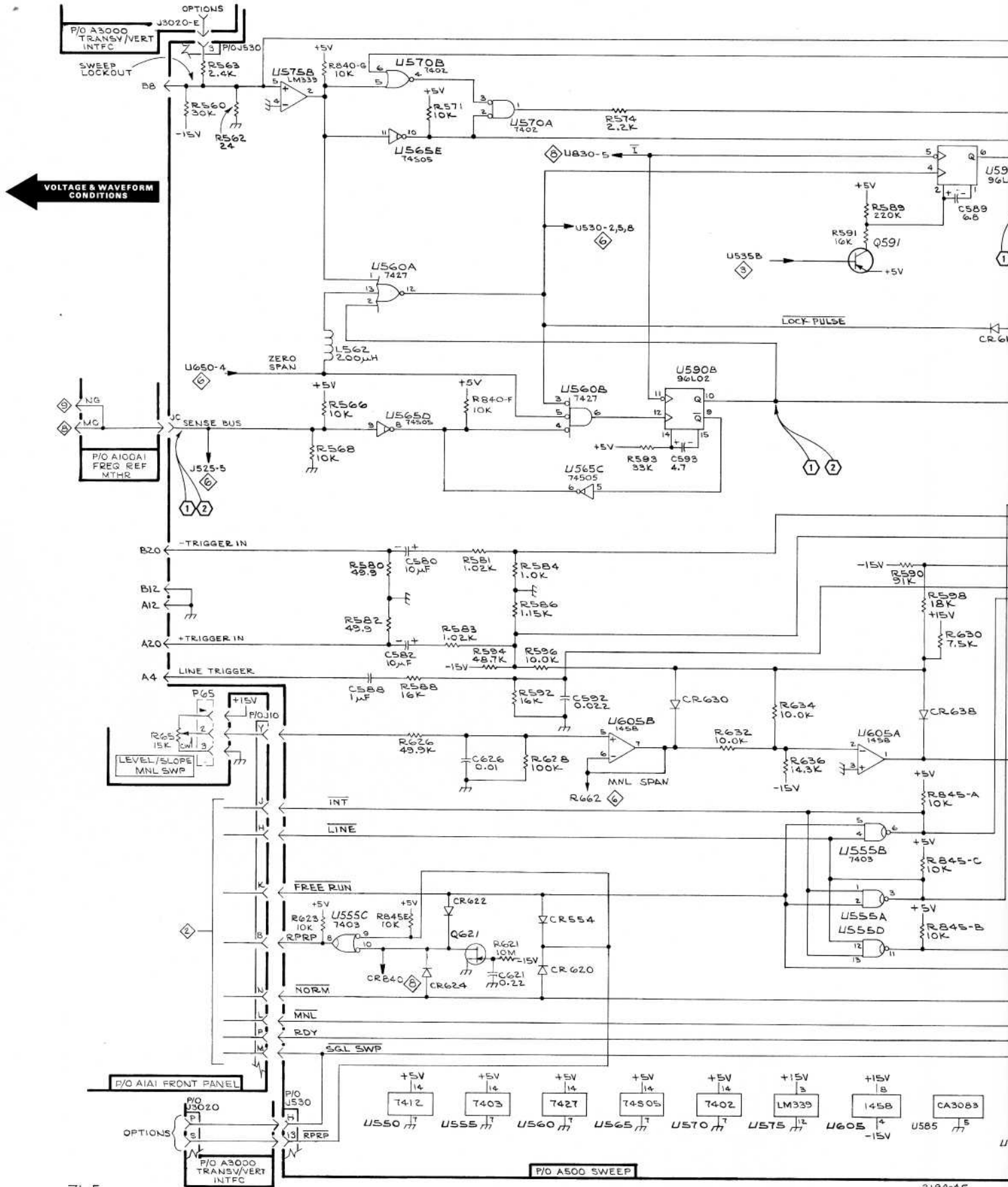
A1A1 Front Panel component location shown on back of Diagram 1 c

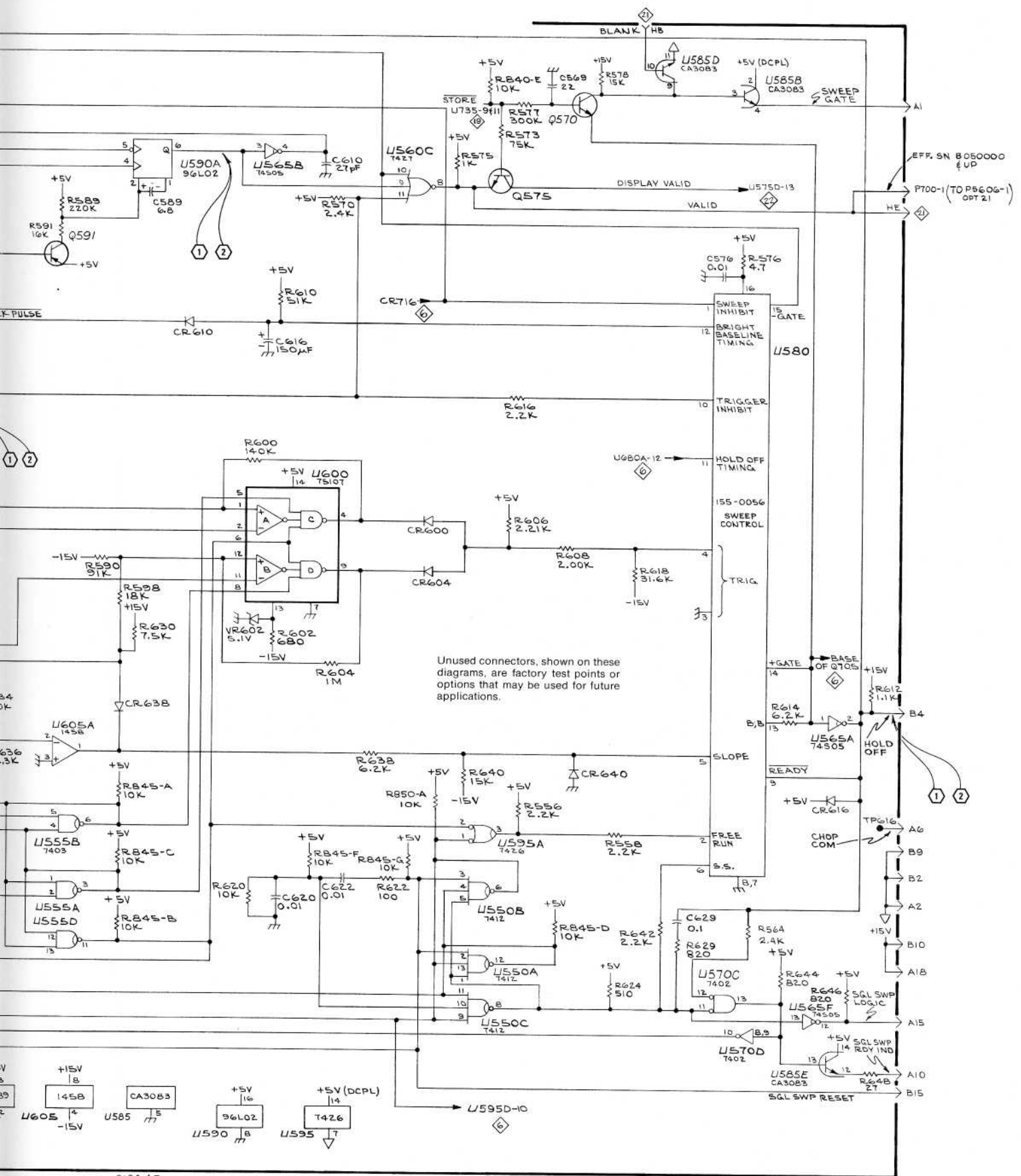
A100A1 Frequency Reference Mother component location shown on back of Diagram 7

A500 Sweep Component Location shown on back of Diagram 2

A3000 Transverse/Vertical Interface component location shown on back of Diagram 21 a





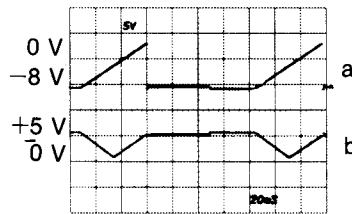


Waveforms shown on this diagram were obtained under the following conditions:

The oscilloscope mainframe contained two dual trace vertical amplifier units (e.g. 7A18) and one time base unit (e.g. 7B70). A C-50 oscilloscope camera was used. Time/Div and Volts/Div settings are indicated on the waveform. The triggering source is internal or indicated with the waveform.

The Digital Averaging circuit board for the 7L5 was positioned to the side as shown in the Calibration section (Fig. 4-20). Pertinent 7L5 control settings are also indicated with the waveform.

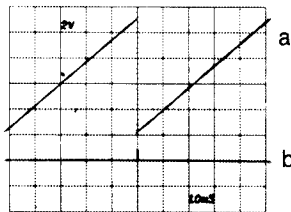
1



Max Span, triggered on +Gate:

- a. Input at U675B, pin 5
- b. Input at U575C, pin 7

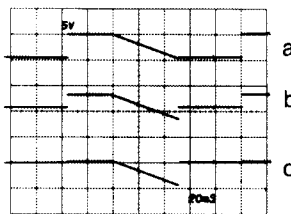
2



Zero Span, triggered on +Gate:

- a. Sweep Output at U700, pin 6
- b. Sweep Inhibit at CR716

3



Max Span, triggered on +Gate

Shows output of U665, pin 3

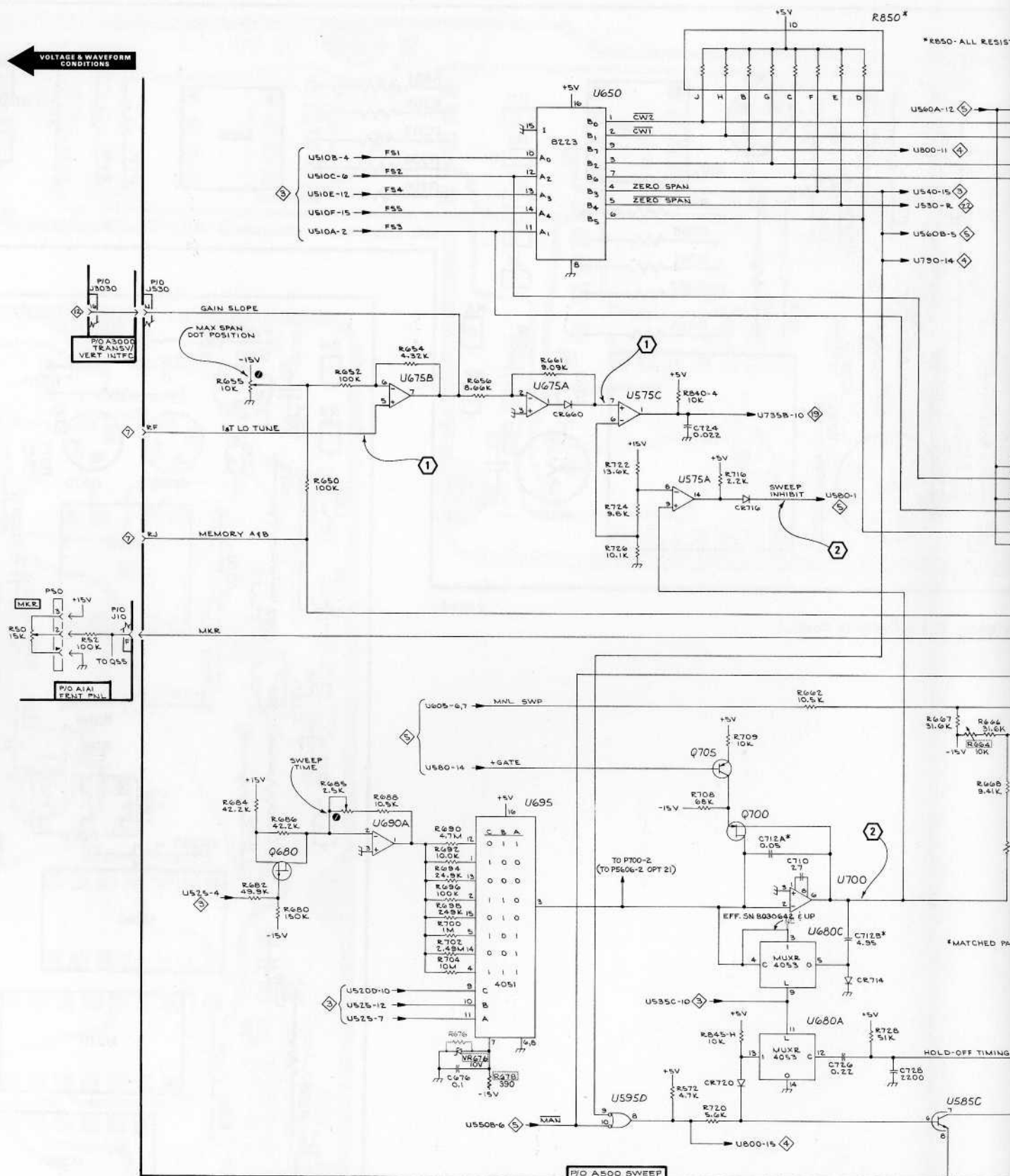
- with DOT FREQUENCY of:
- a. 00.0
  - b. 2500.0 kHz
  - c. 4999.75 kHz

A1A1 Front Panel component location shown on back of Diagram 1 c

A1000A7 2nd Mixer component location shown on back of Diagram 12

A500 Sweep Component Location shown on back of Diagram 2

A3000 Transverse/Vertical Interface component location shown on back of Diagram 21 a



VOLTAGE & WAVEFORM CONDITIONS

\*R850-ALL RESISTORS

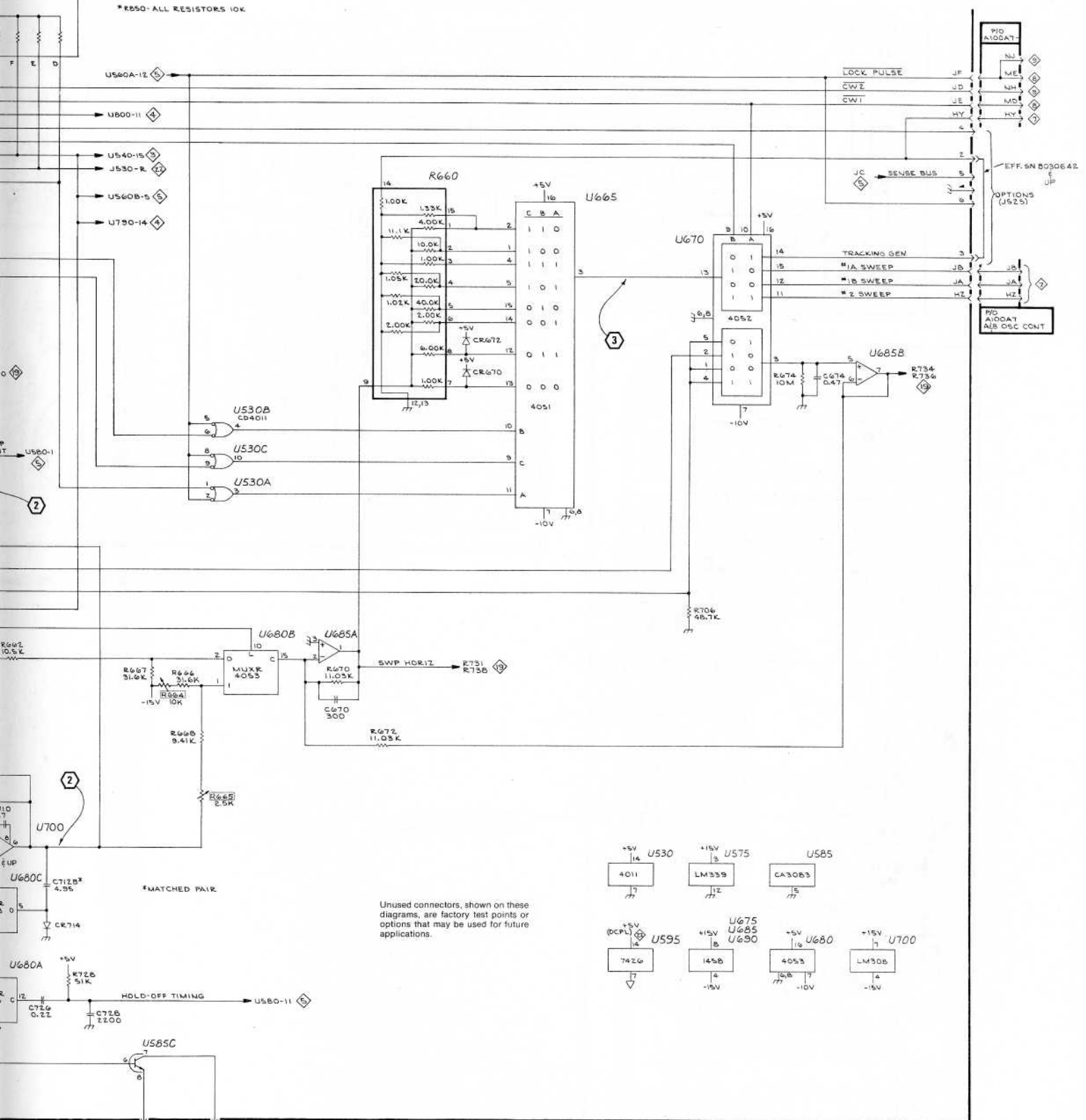
PID A500 SWEEP

AUX Z AXIS COM INT

2184-46  
REV B, MAR 1

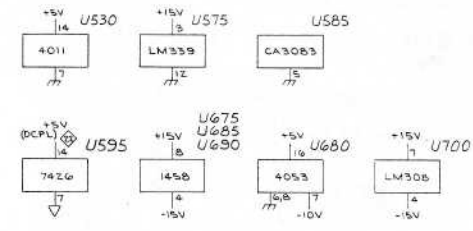
R850\*

\*R850- ALL RESISTORS 10K



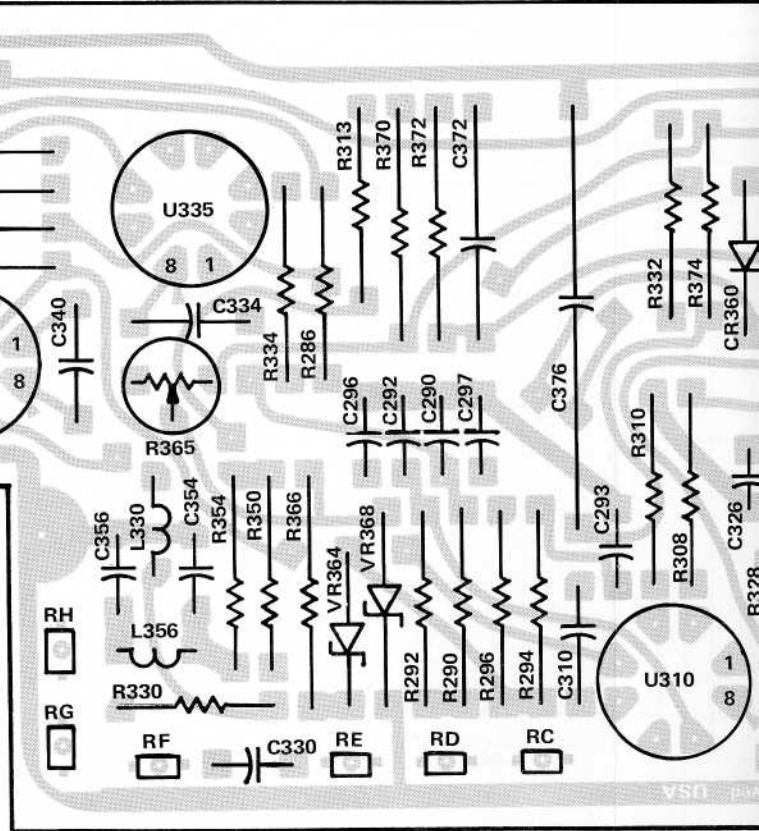
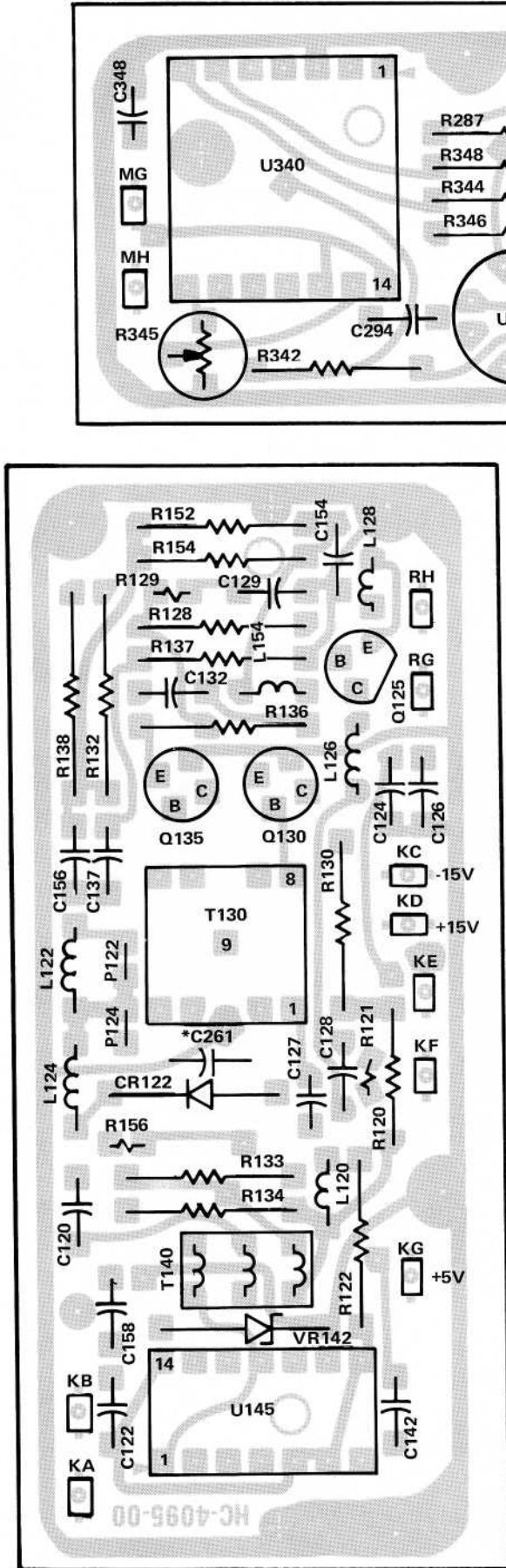
\*MATCHED PAIR

Unused connectors, shown on these diagrams, are factory test points or options that may be used for future applications.



2184-46  
REV B, MAR 1979

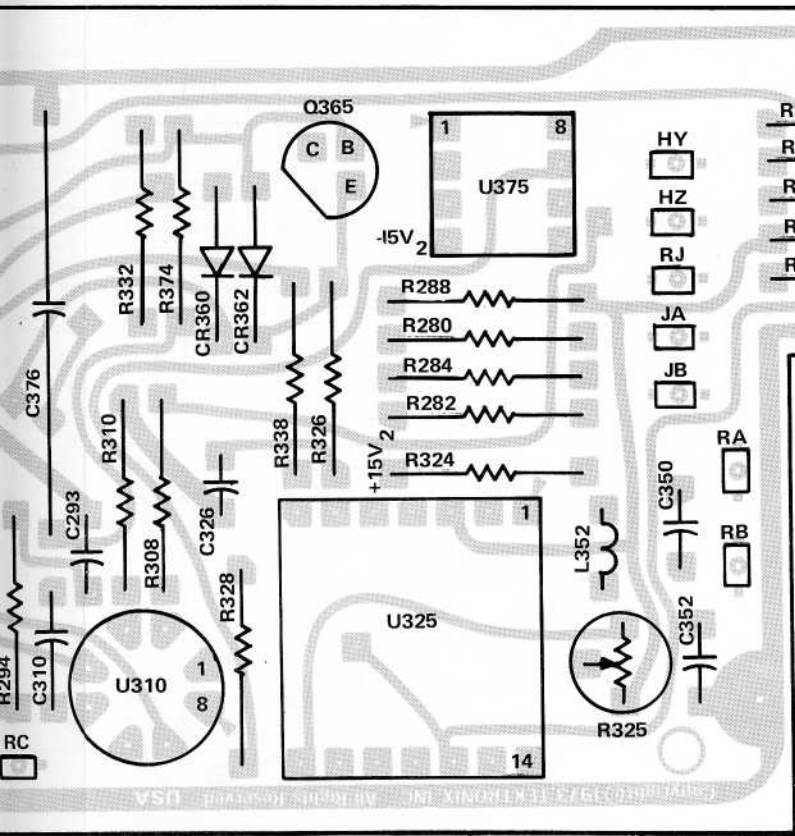
SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.



A100A7 A & B Oscillator

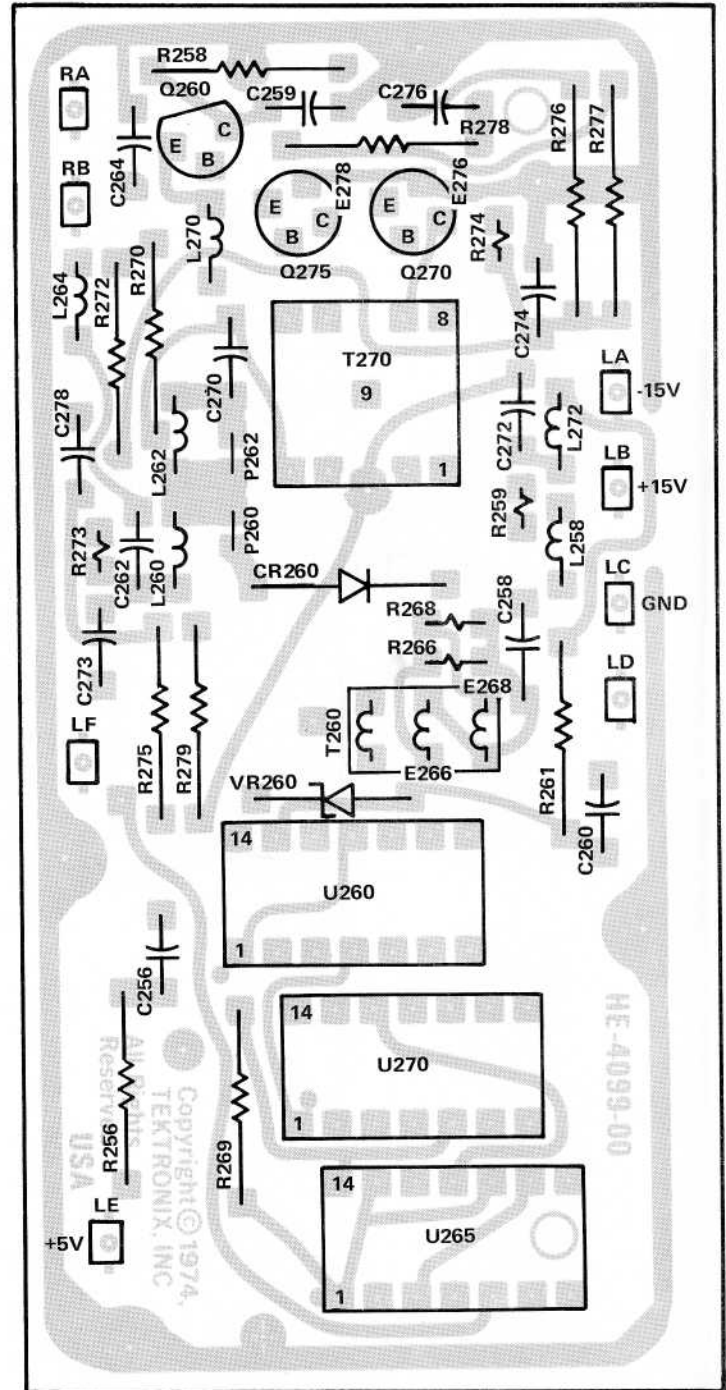
\*See Parts List for serial number ranges.

A100A2 A Oscillator



2184-93

A100A7 A & B Oscillator Control



2184-94

A100A6 B Oscillator



A100A1 Frequency Reference Mother component location shown on back of Diagram 7

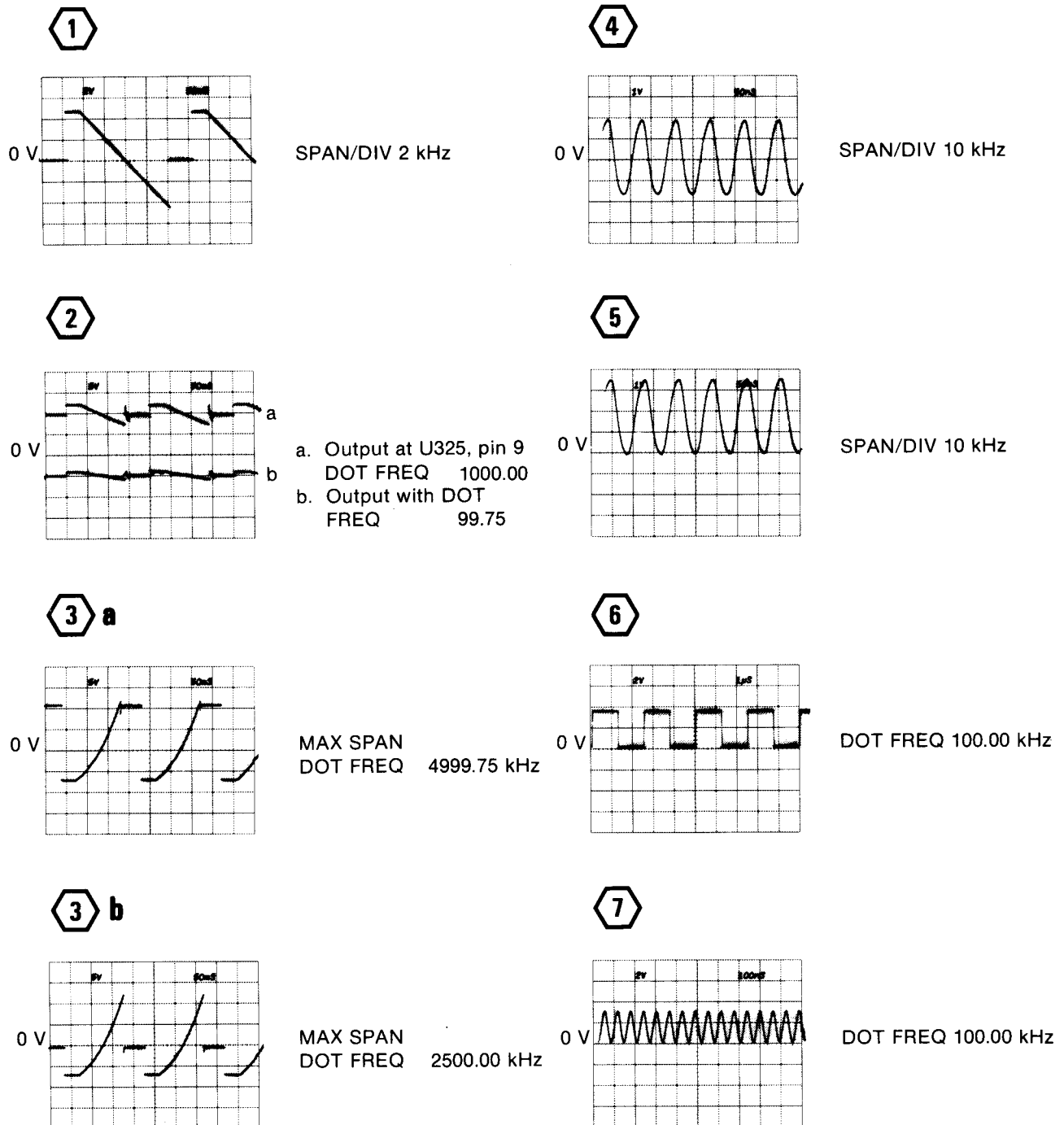
A500 Sweep component location shown on back of Diagram 2



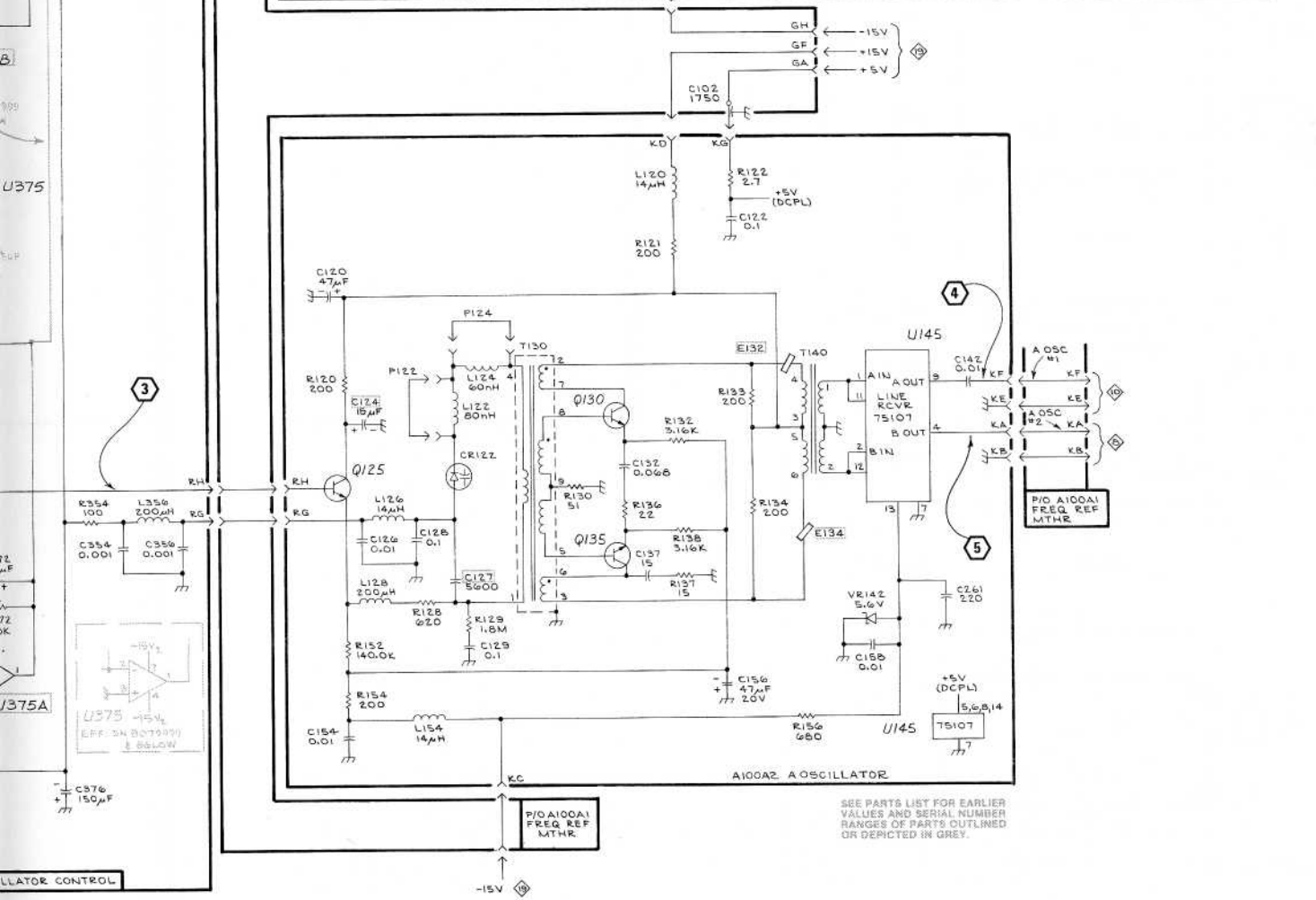
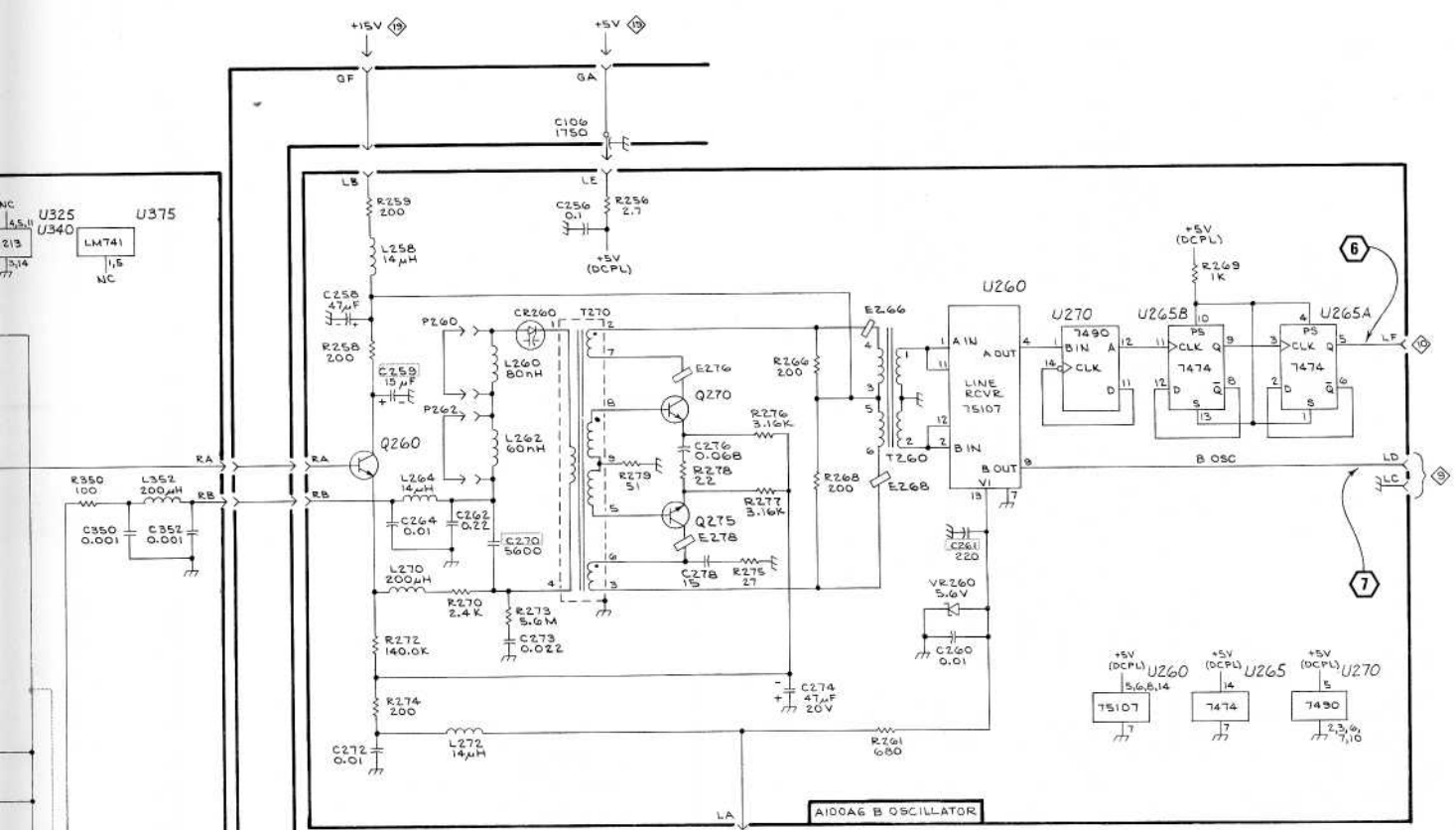
Waveforms shown on this diagram were obtained under the following conditions:

The oscilloscope mainframe contained two dual trace vertical amplifier units (e.g. 7A18) and one time base unit (e.g. 7B70). A C-50 oscilloscope camera was used. Time/Div and Volts/Div settings are indicated on the waveform. The triggering source is internal or indicated with the waveform.

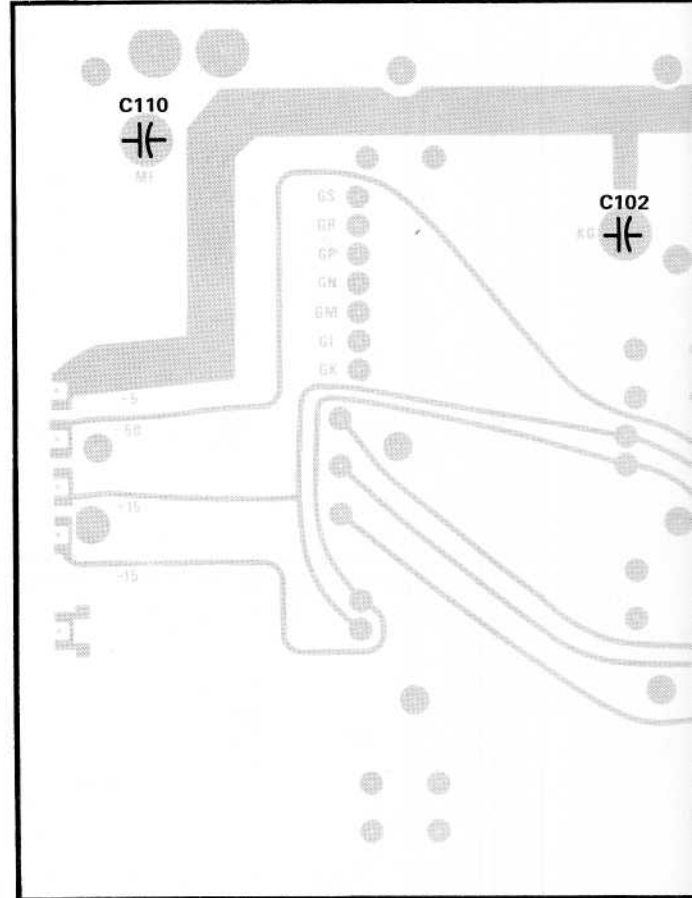
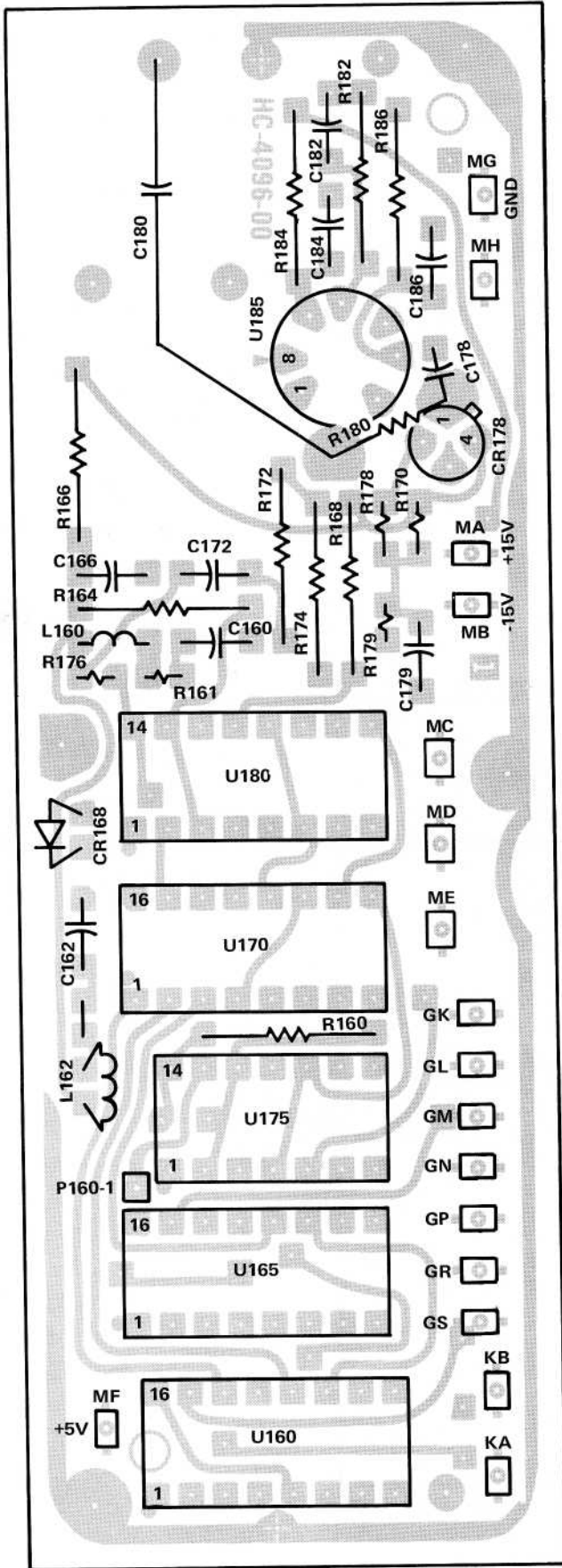
The Digital Averaging circuit board for the 7L5 was positioned to the side as shown in the Calibration section (Fig. 4-20). Pertinent 7L5 control settings are also indicated with the waveform.





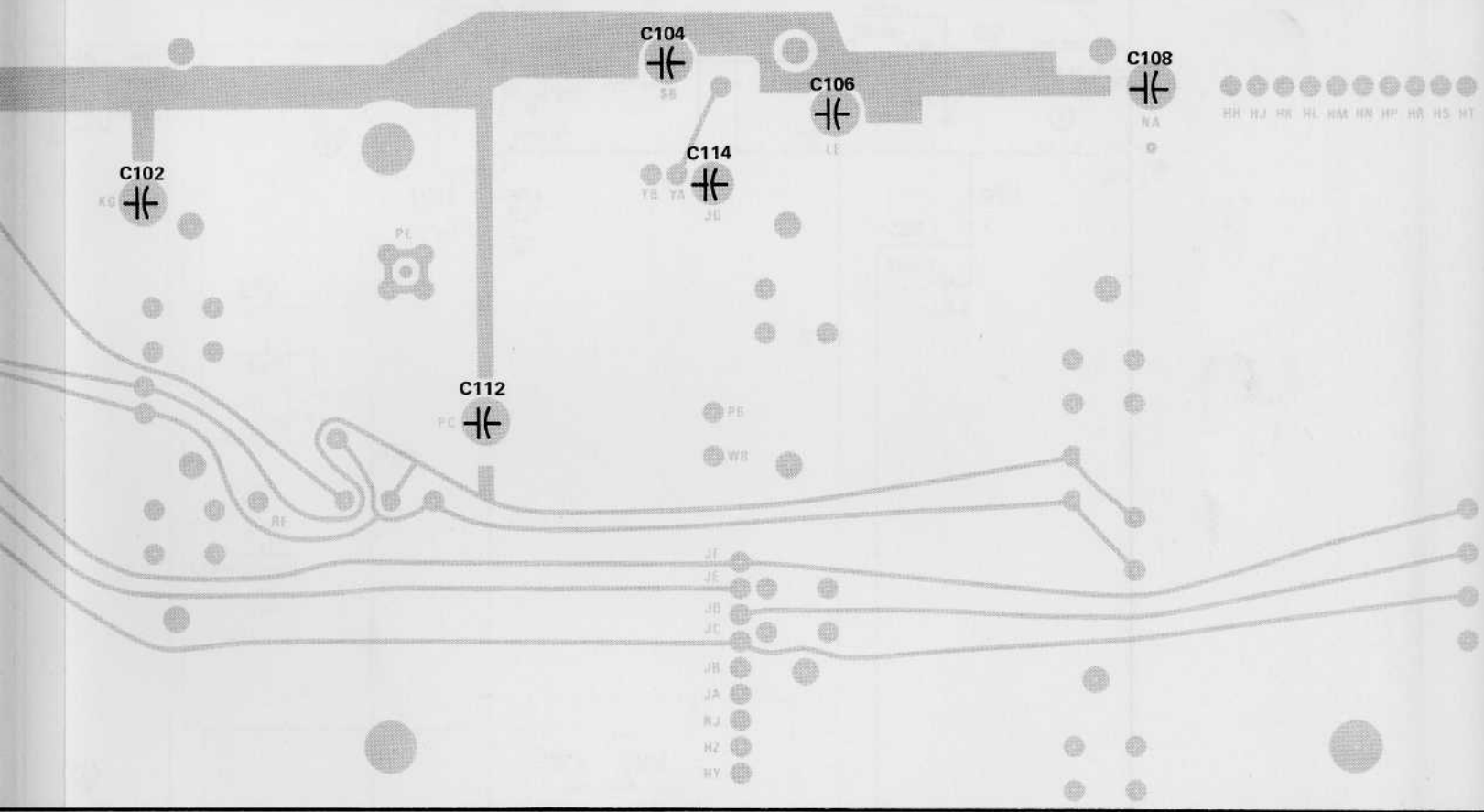


SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DERIVED IN GREY.



2184-80

A100A3 Tune Reference (A ÷ N)



A100A1 Frequency Reference Mother

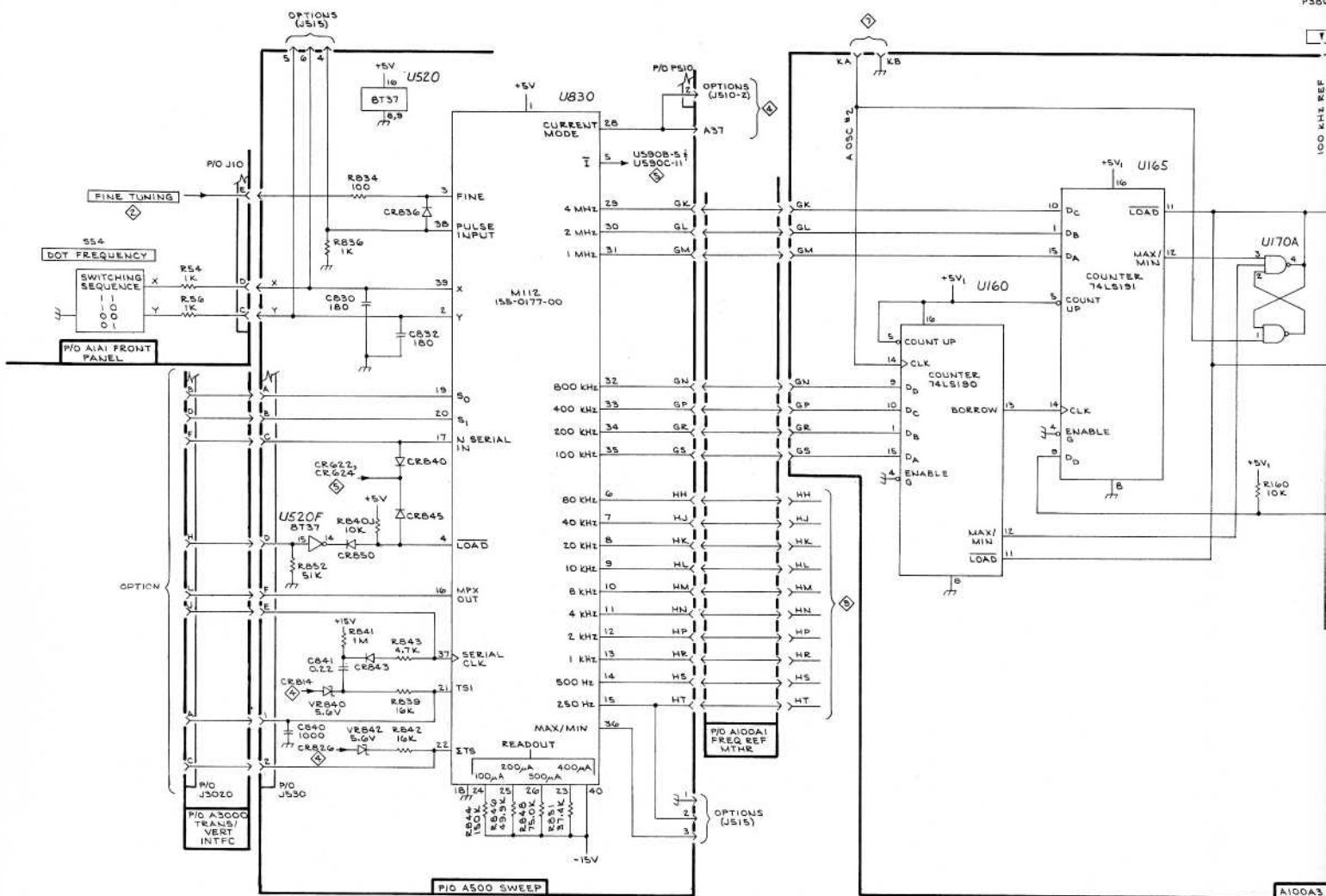


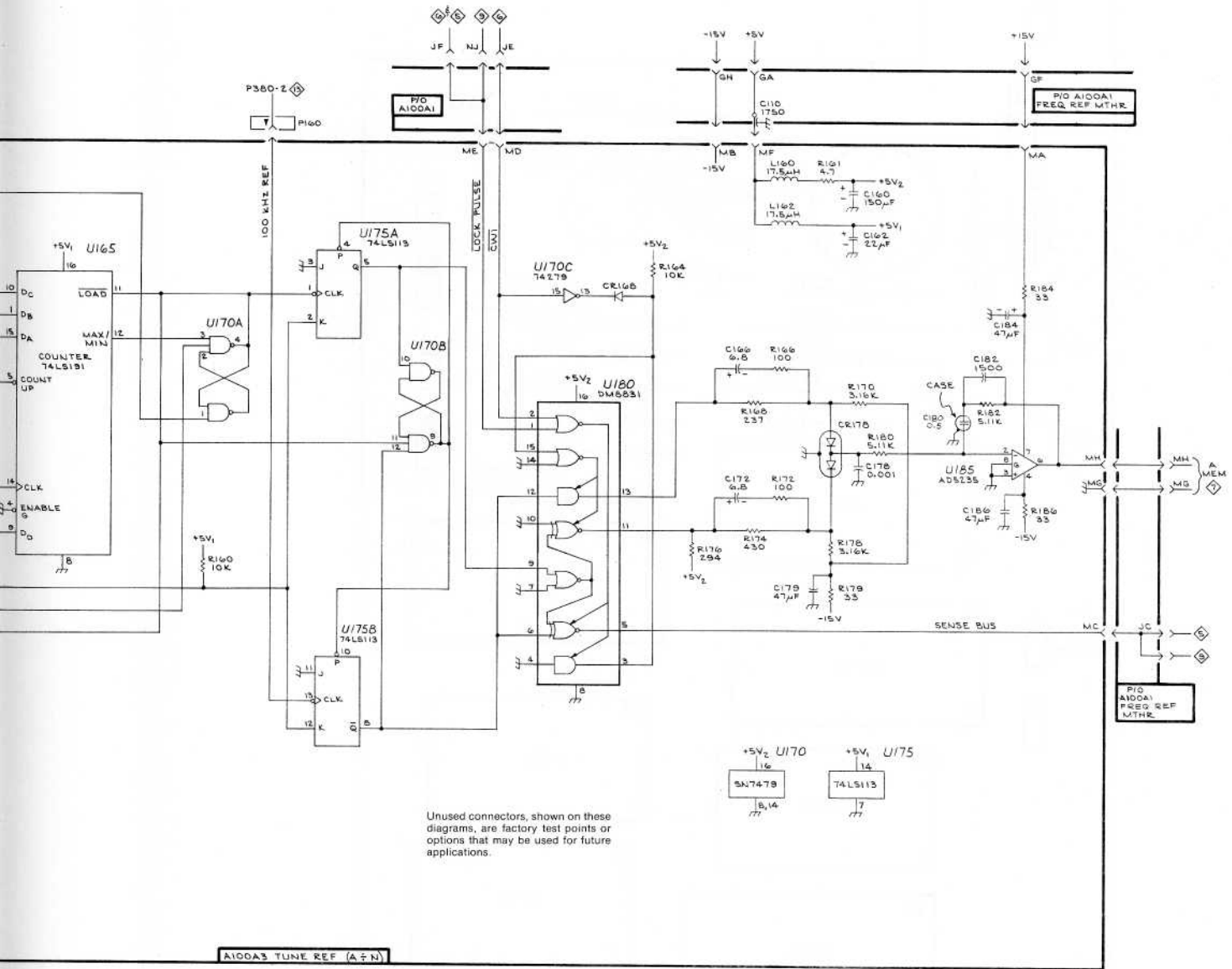
2184-63

A1A1 Front Panel component location shown on back of Diagram 1 c

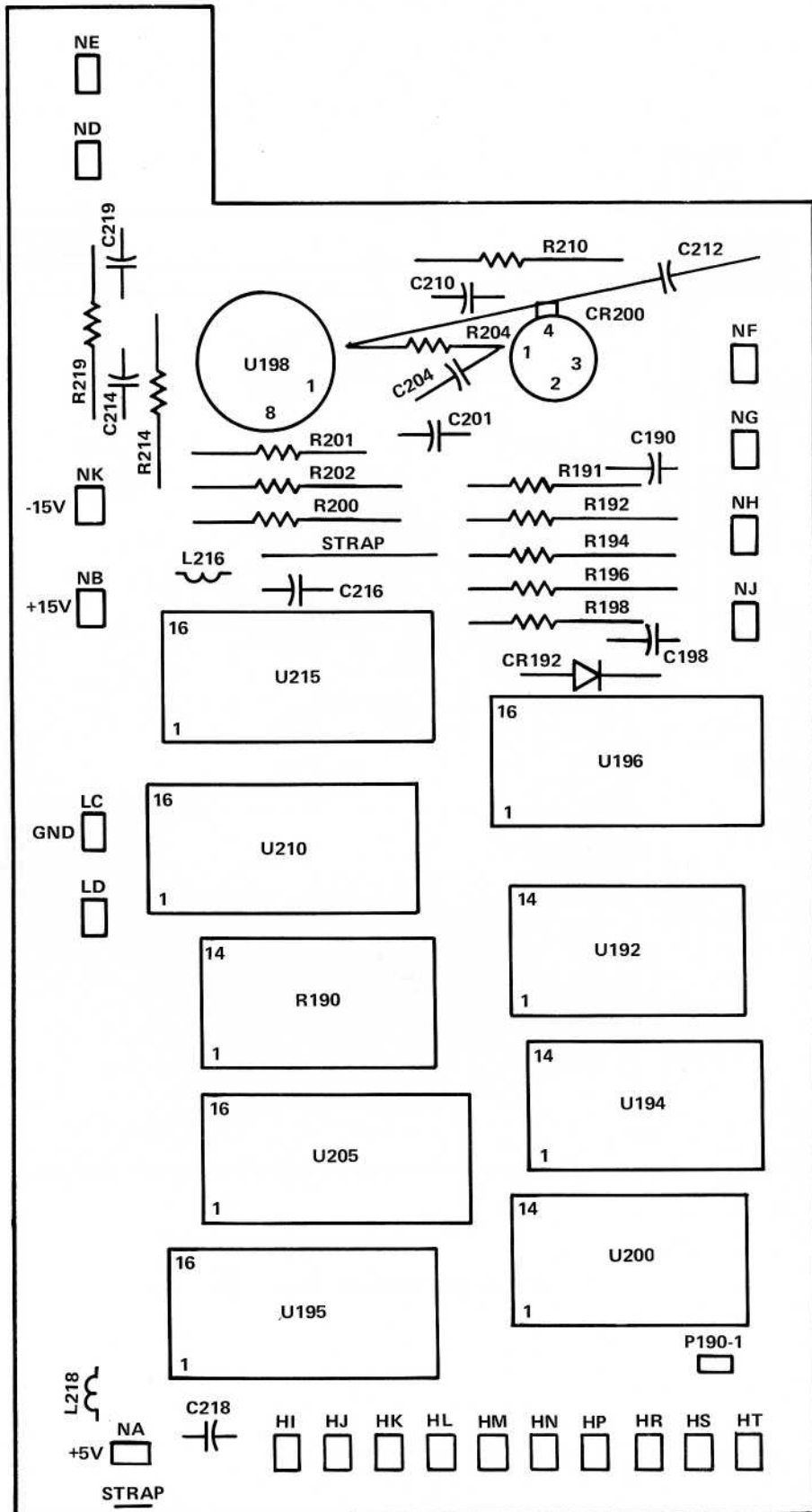
A500 Sweep Component Location shown on back of Diagram 2

A3000 Transverse/Vertical Interface component location shown on back of Diagram 21 a







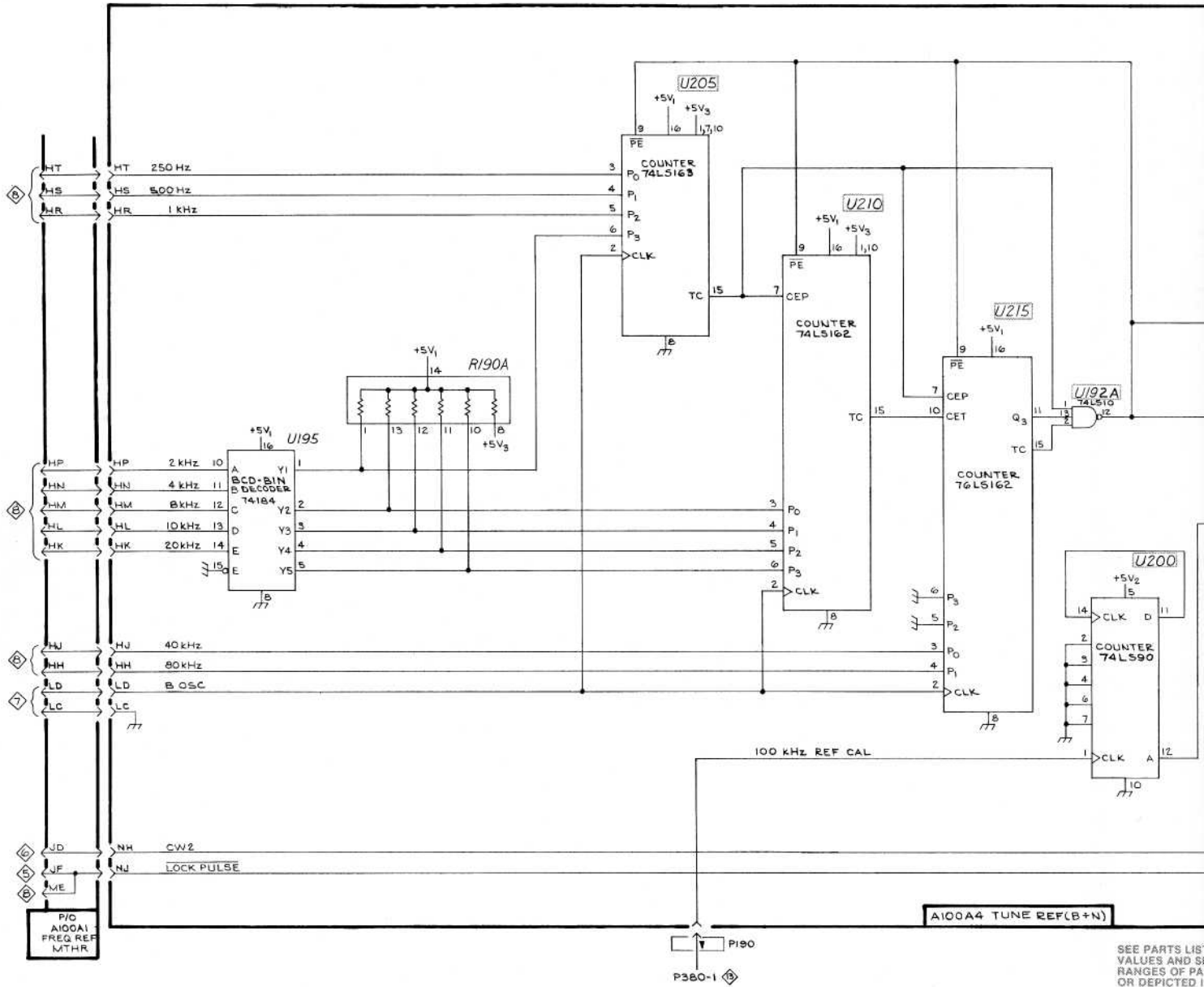


A100A4 Tune Reference (B ÷ N)

2184-79

A100A1 Frequency Reference Mother component location shown on back of Diagram



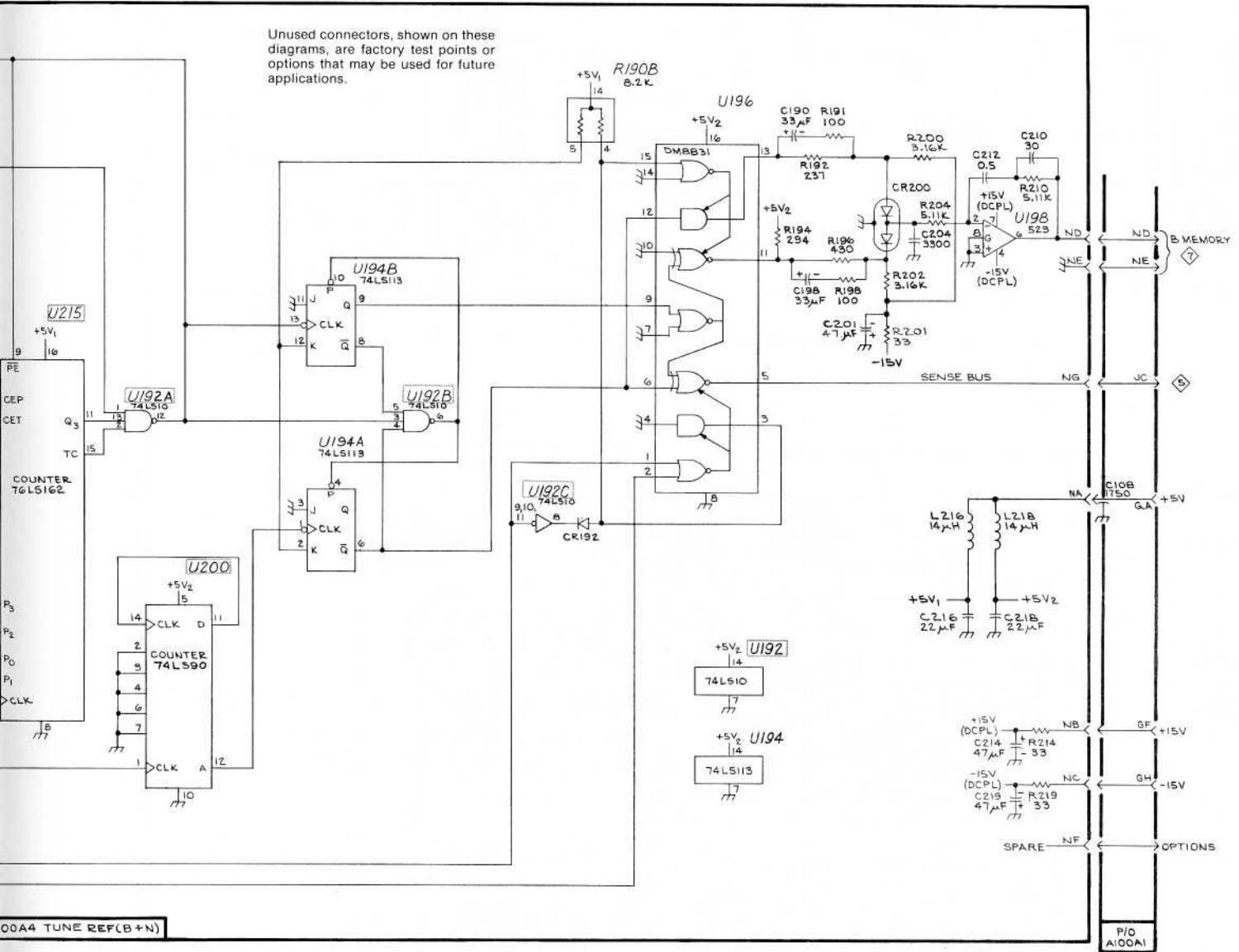


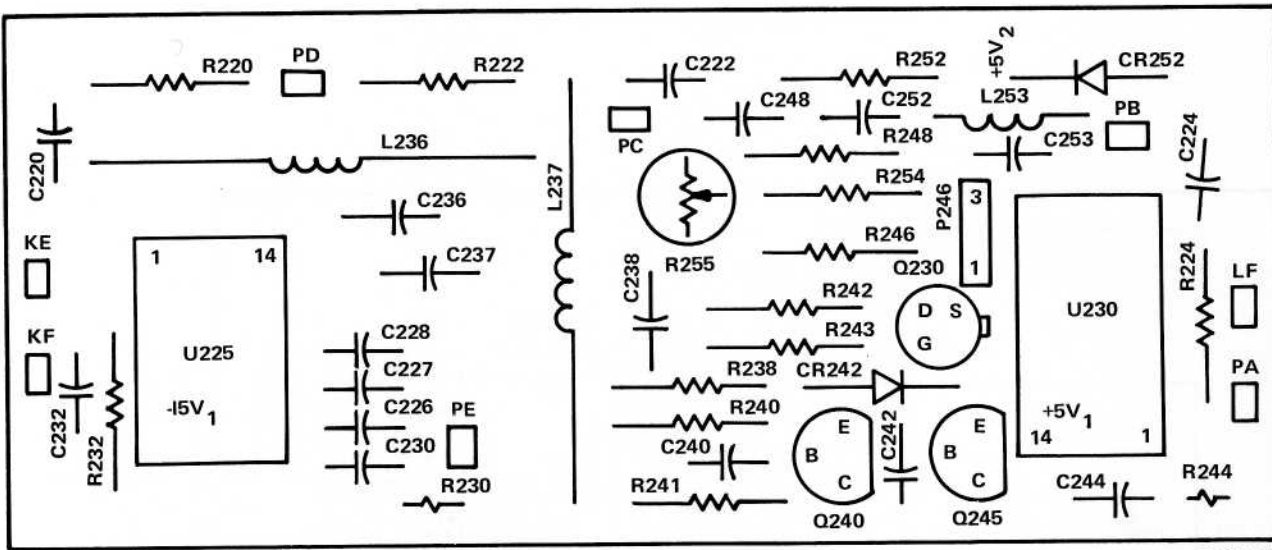
7L5

2.184-49  
REV. A, JUNE 1978

SEE PARTS LIST  
VALUES AND SE  
RANGES OF PAR  
OR DEPICTED I

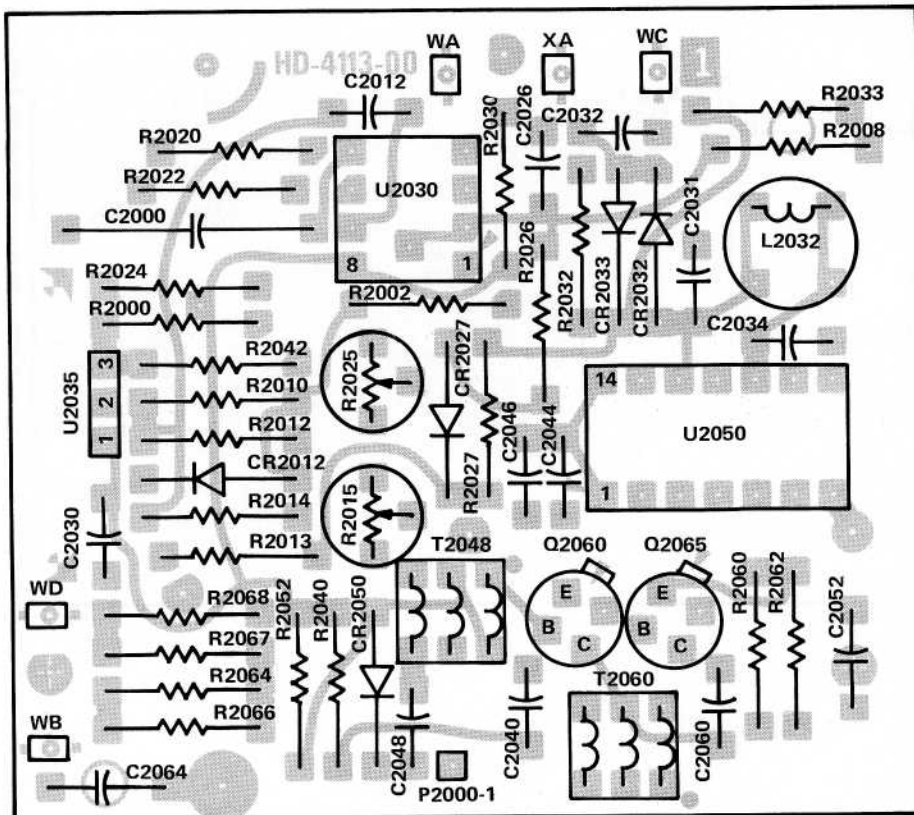
Unused connectors, shown on these diagrams, are factory test points or options that may be used for future applications.





2184-95

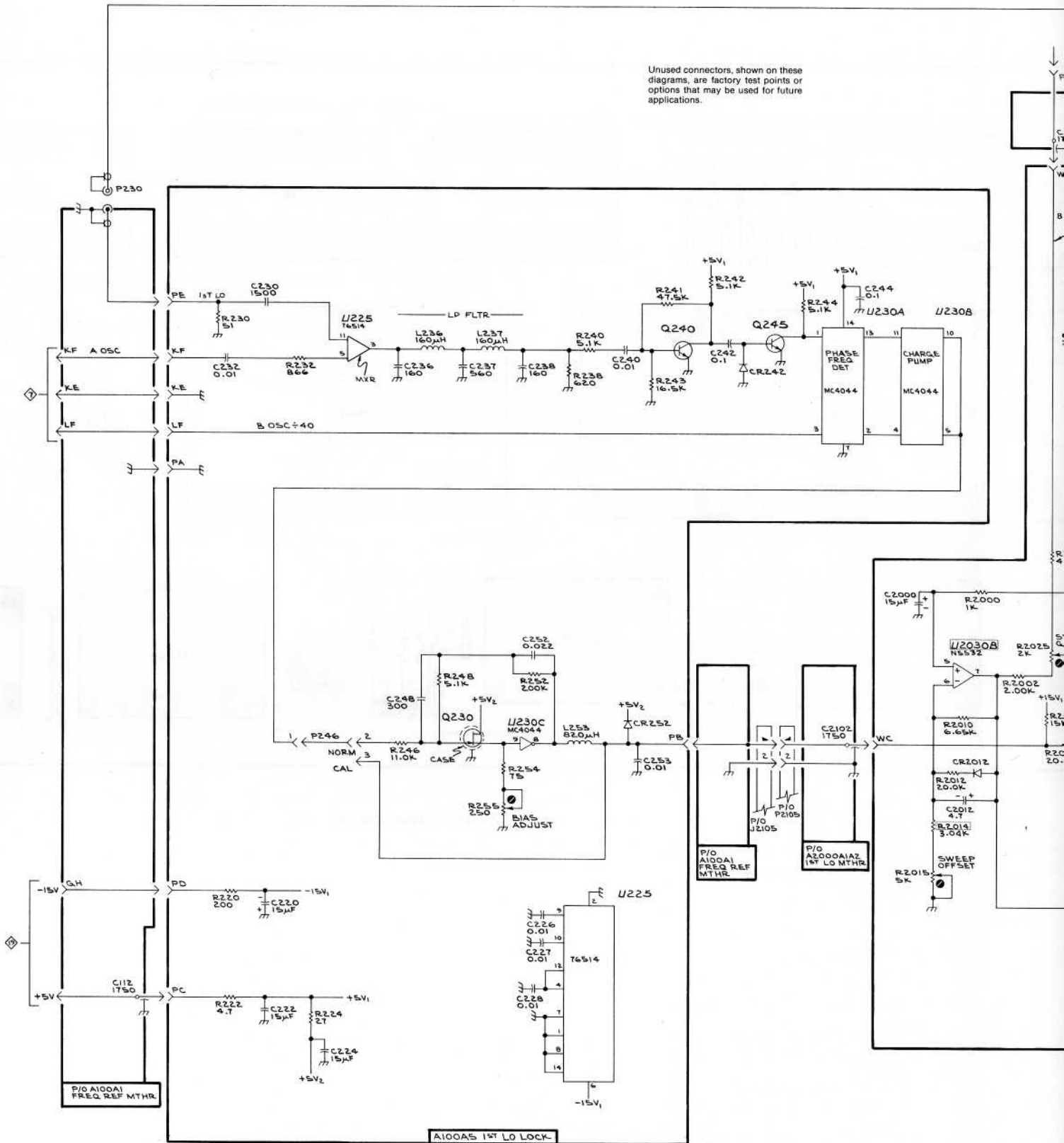
A100A5 1st LO Lock

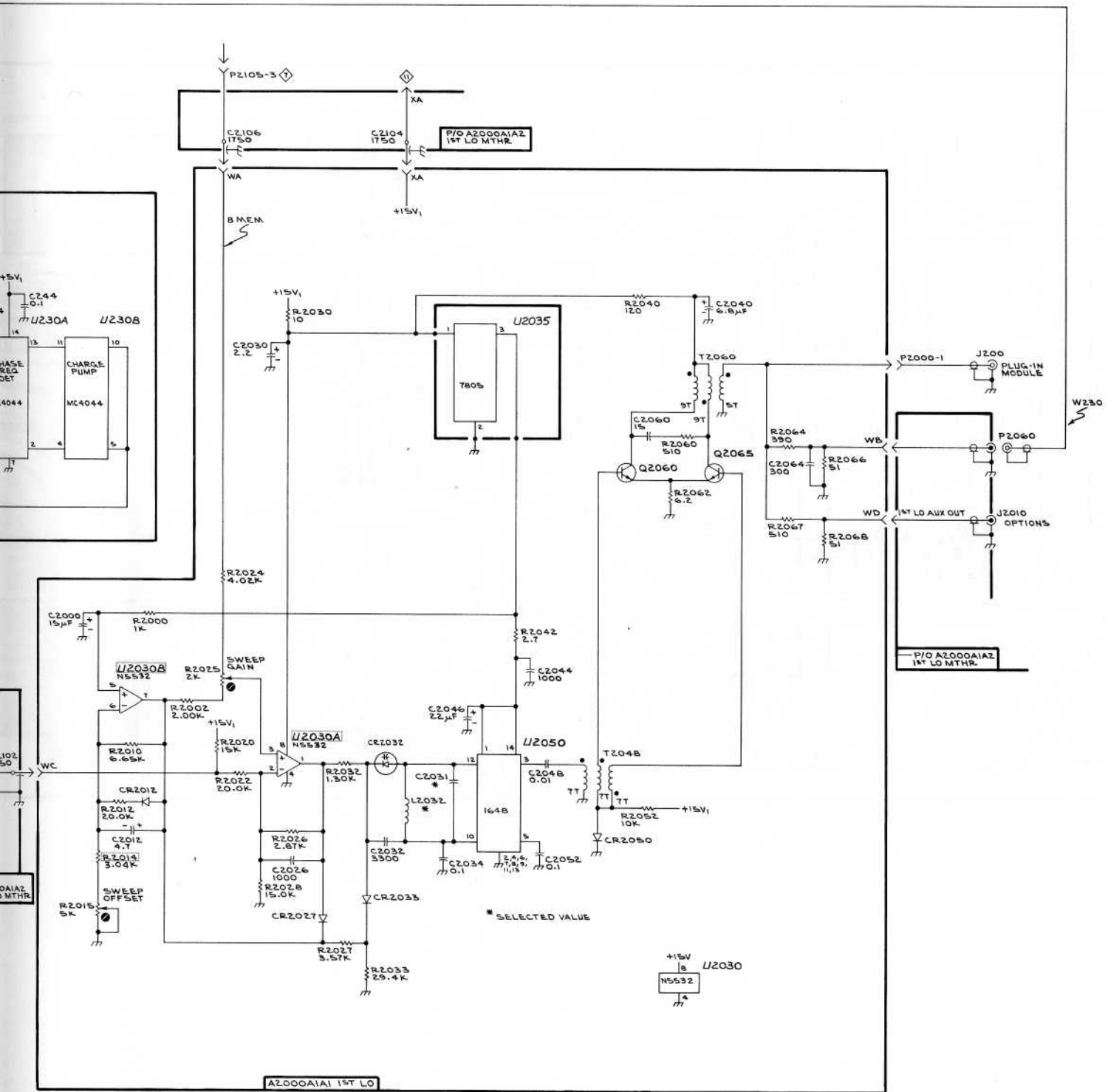


2184-78

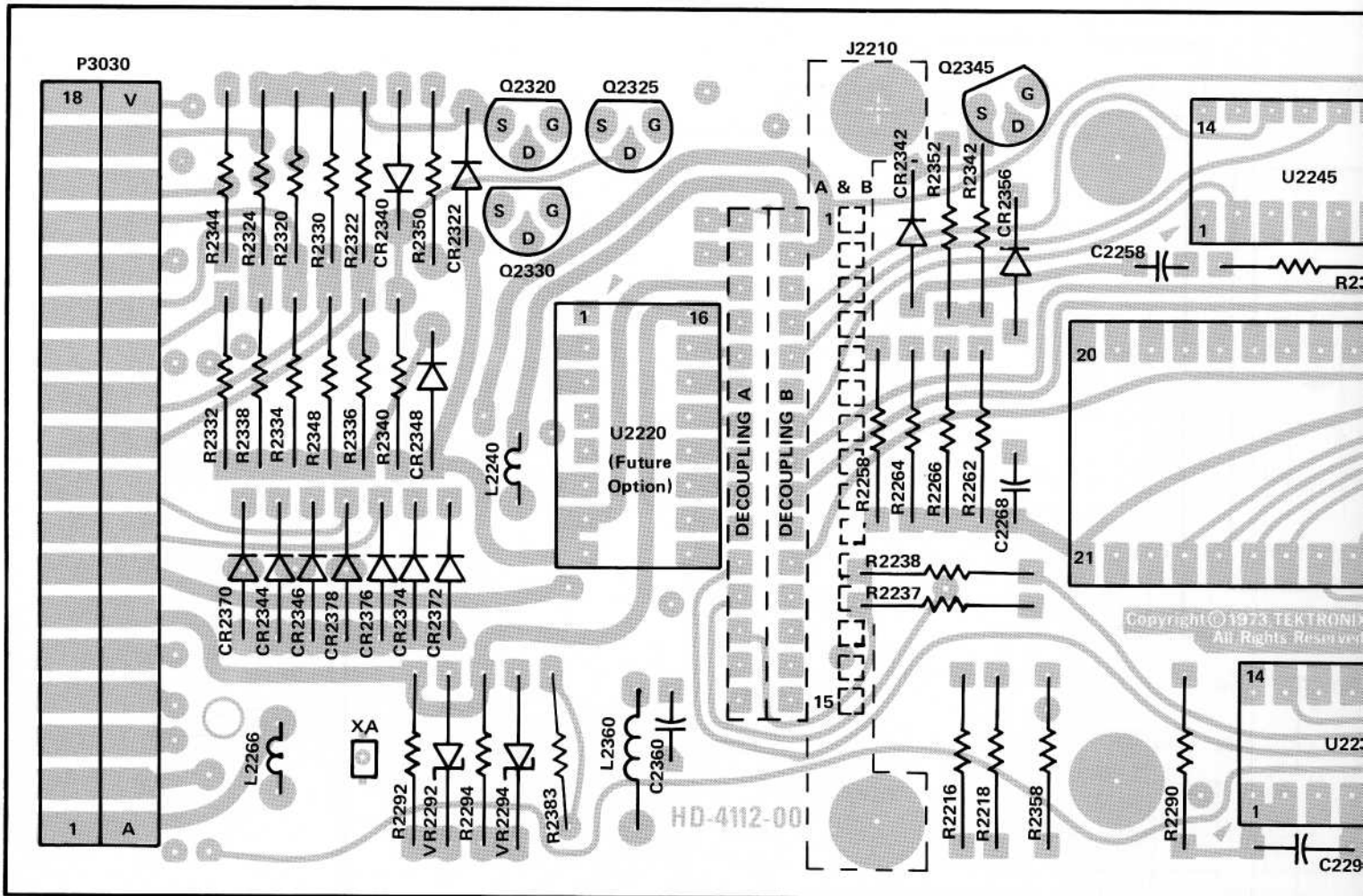
A2000A1A1 1st LO Board

Unused connectors, shown on these diagrams, are factory test points or options that may be used for future applications.

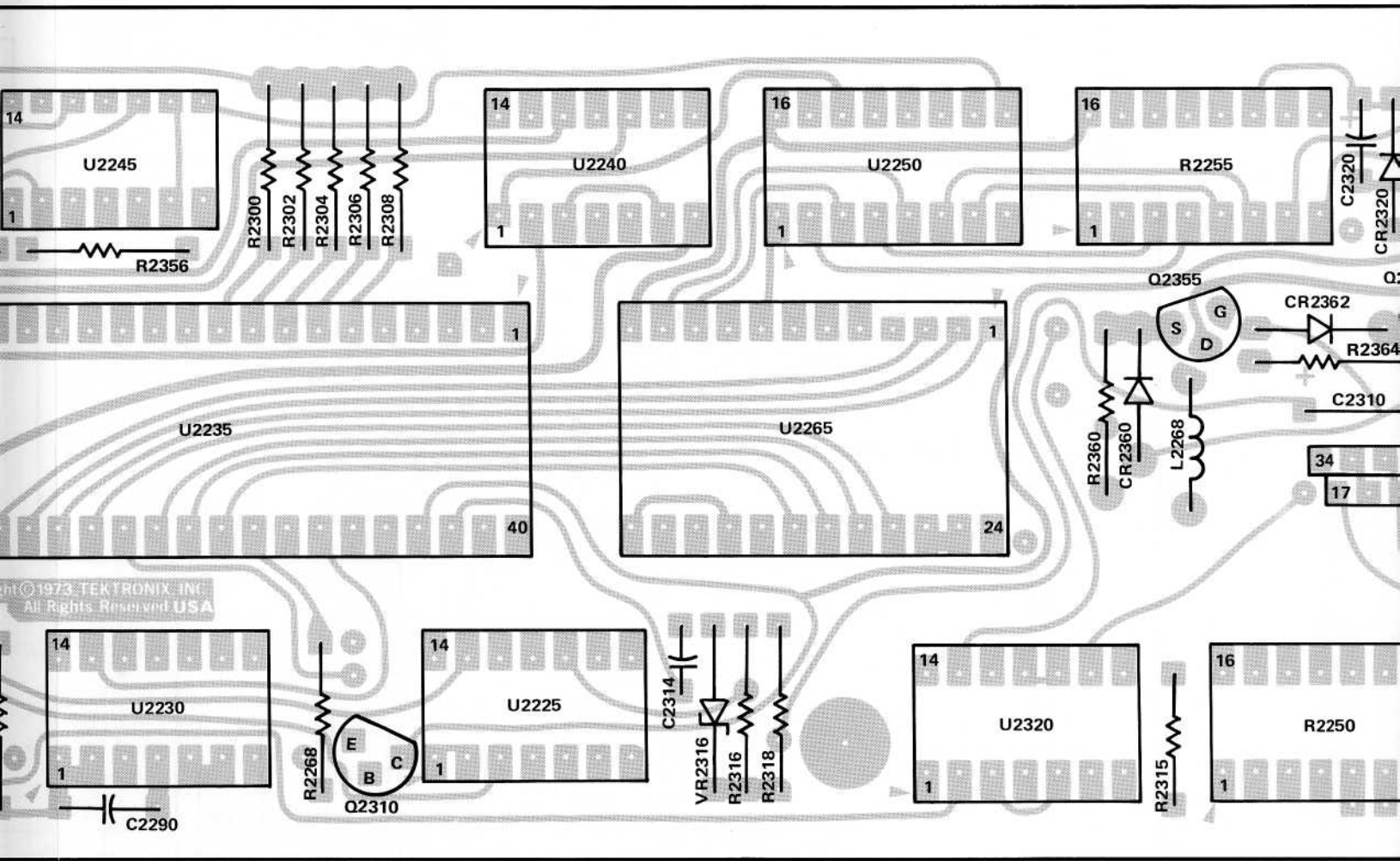




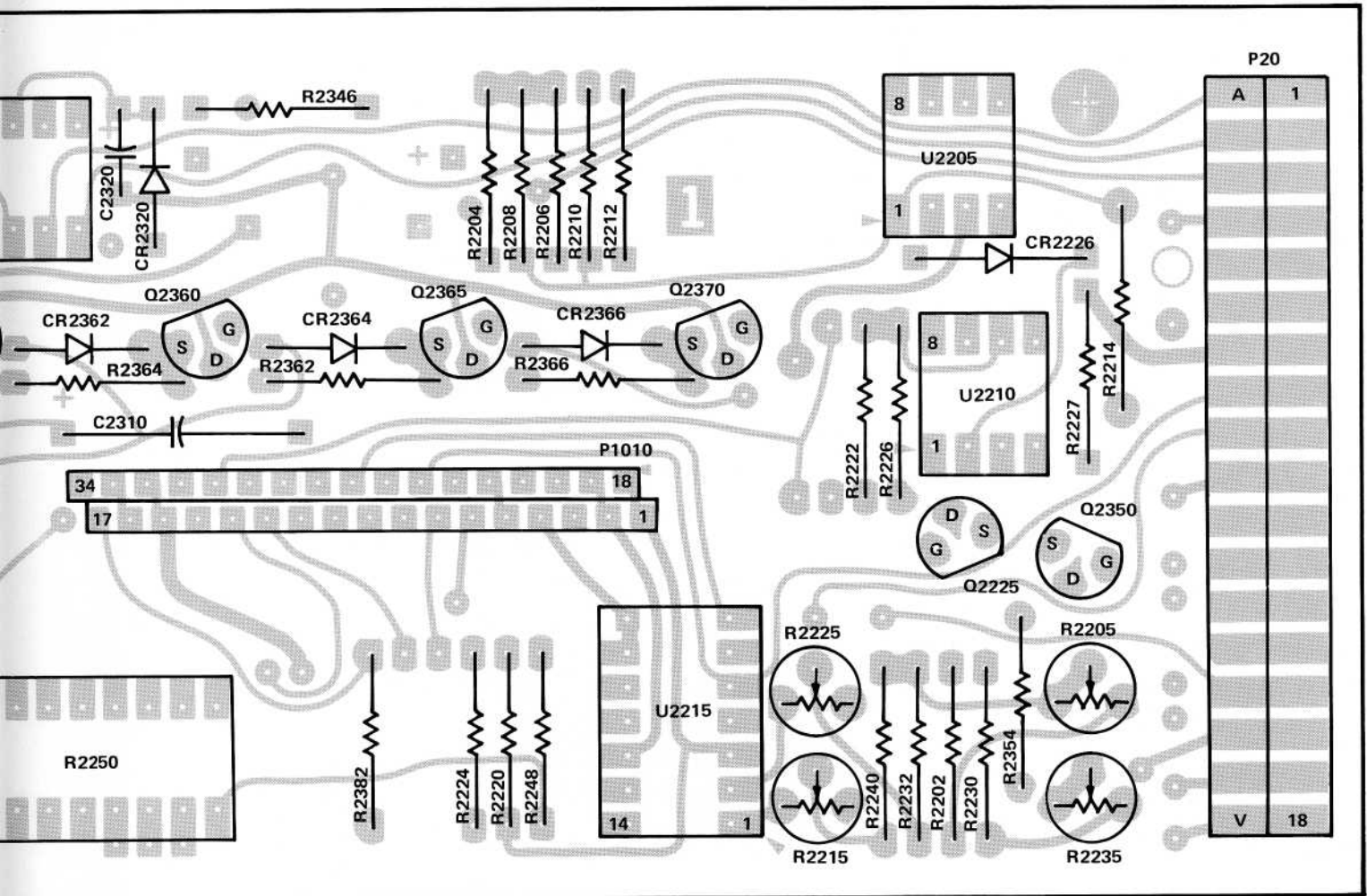
SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.







A2000A2 Vertical Control



2184-77

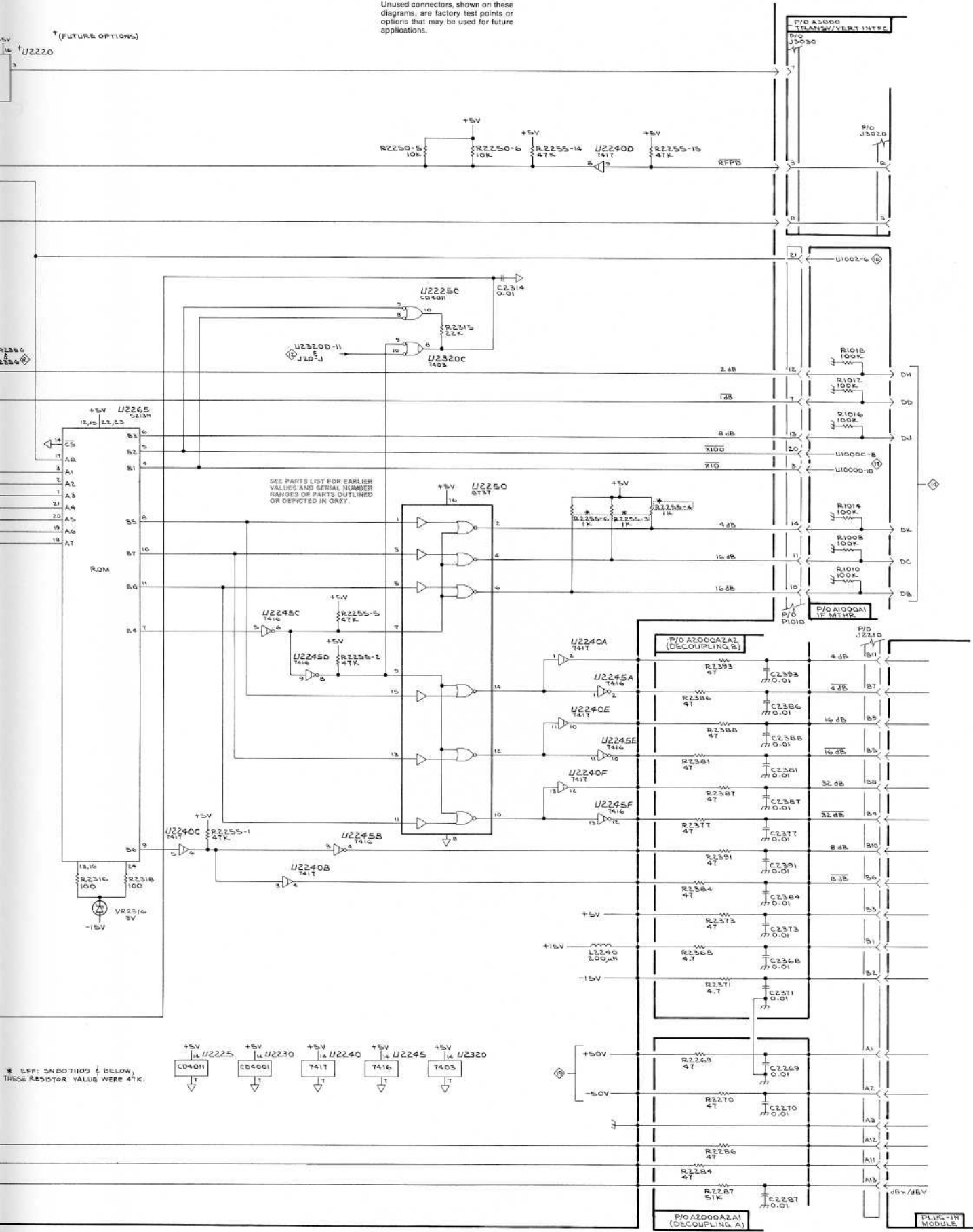
A1A1 Front Panel component location shown on back of Diagram 1 c

A1000A1 IF Mother component location shown on back of Diagram 7

A3000 Transverse/Vertical Interface component location shown on back of Diagram 21 a



Unused connectors, shown on these diagrams, are factory test points or options that may be used for future applications.



\* EFF: 5N07109 & BELOW, THESE RESISTOR VALUE WERE 47K.

A1A1 Front Panel component location shown on back of Diagram  c

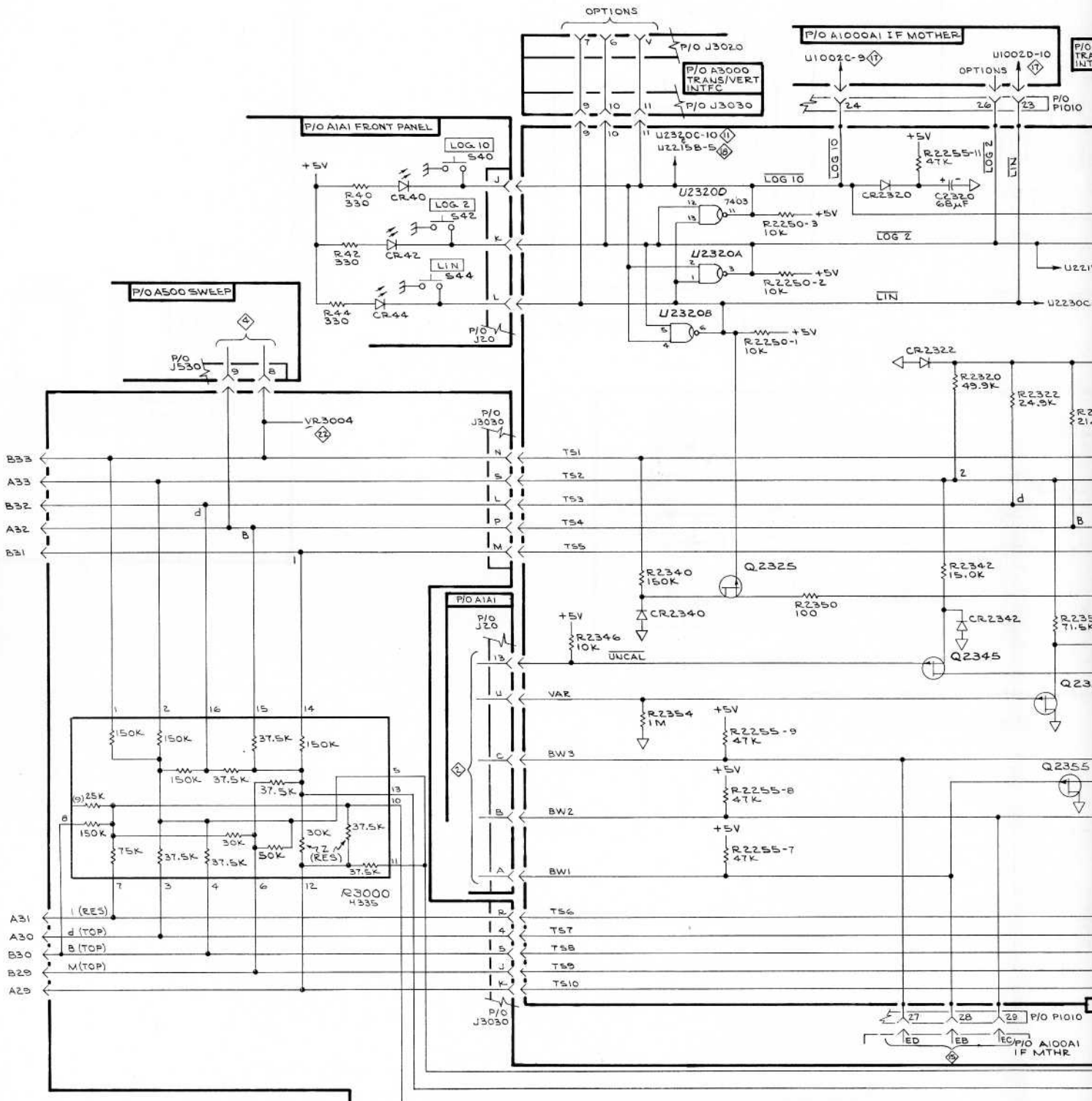
A500 Sweep component location shown on back of Diagram 

A1000A1 IF Mother component location shown on back of Diagram 

A1000A5 250 kHz Amplifier component location shown on back of Diagram 

A2000A2 Vertical Control component location shown on back of 

A3000 Transverse/Vertical Interface component location shown on back of Diagram  a

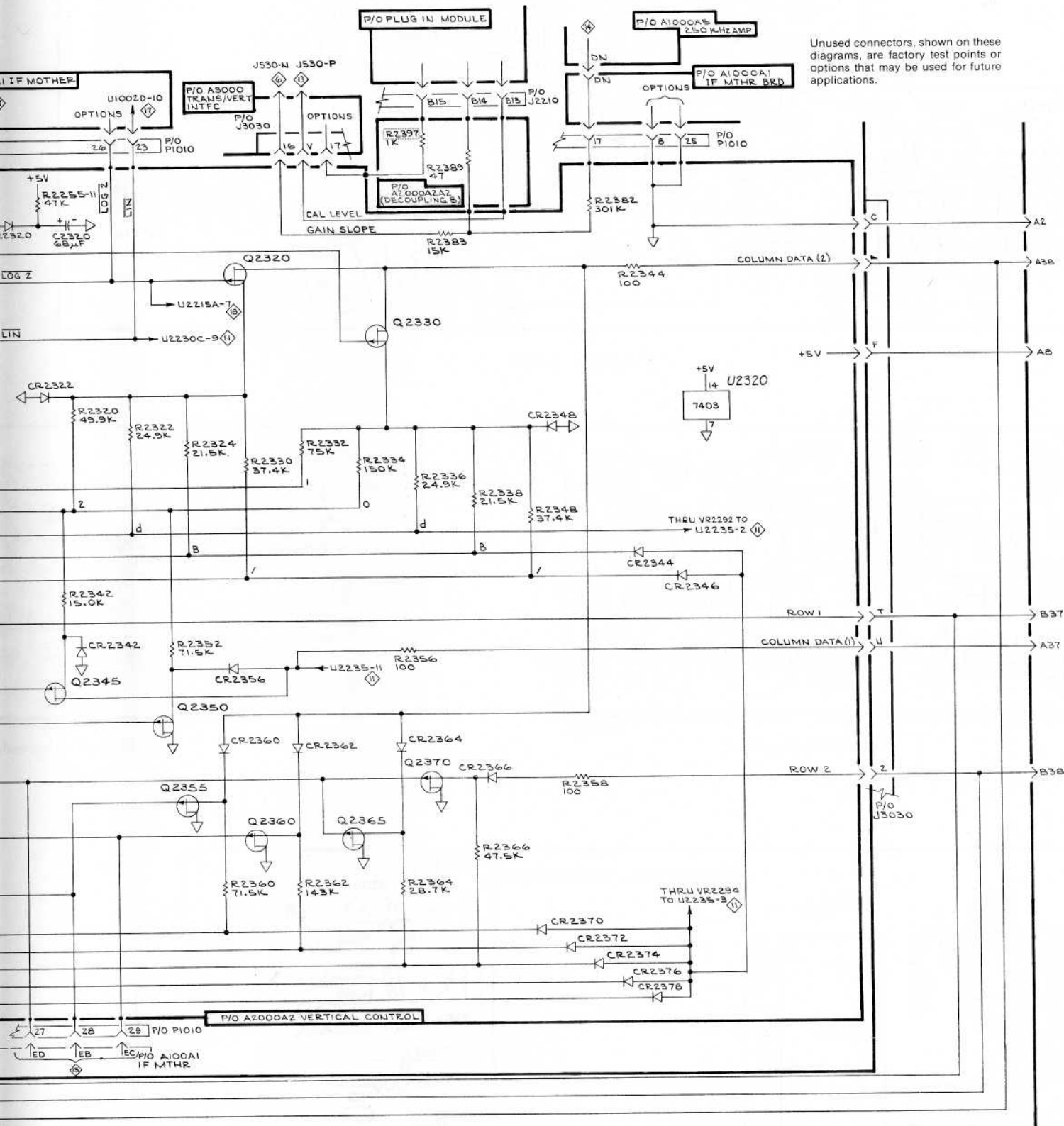


SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.

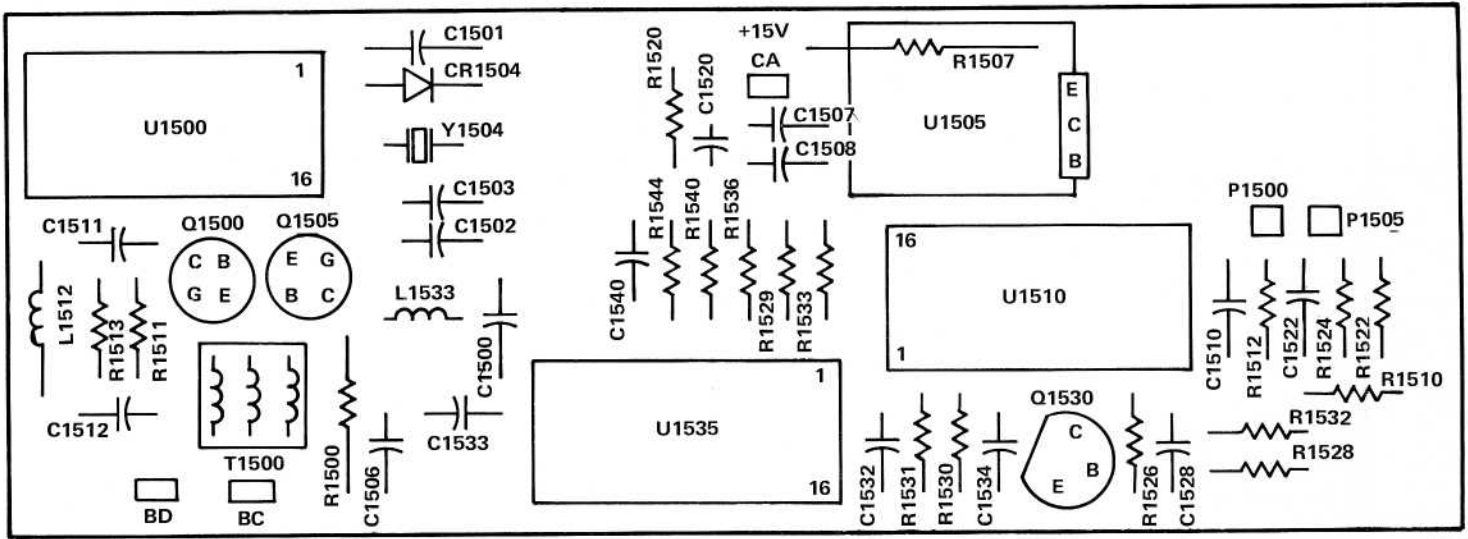
P/O A3000 TRANS/VERT INTFC

7L5

2184-52  
REV A, MAR

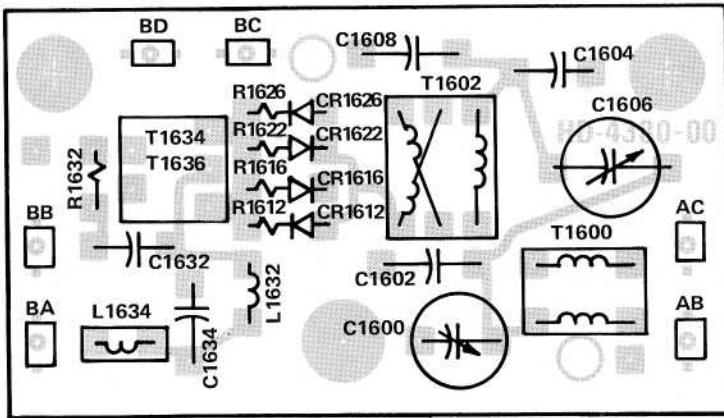


Unused connectors, shown on these diagrams, are factory test points or options that may be used for future applications.



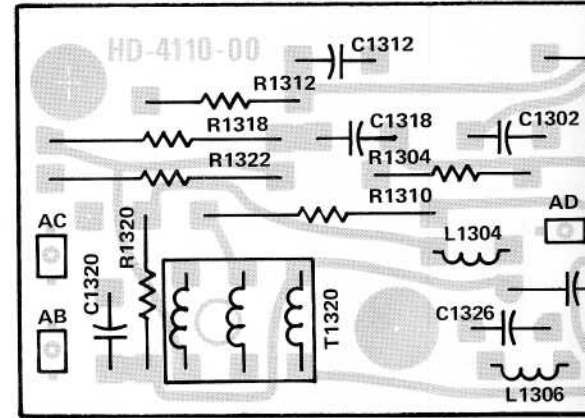
A1000A6 2nd LO

2184-96

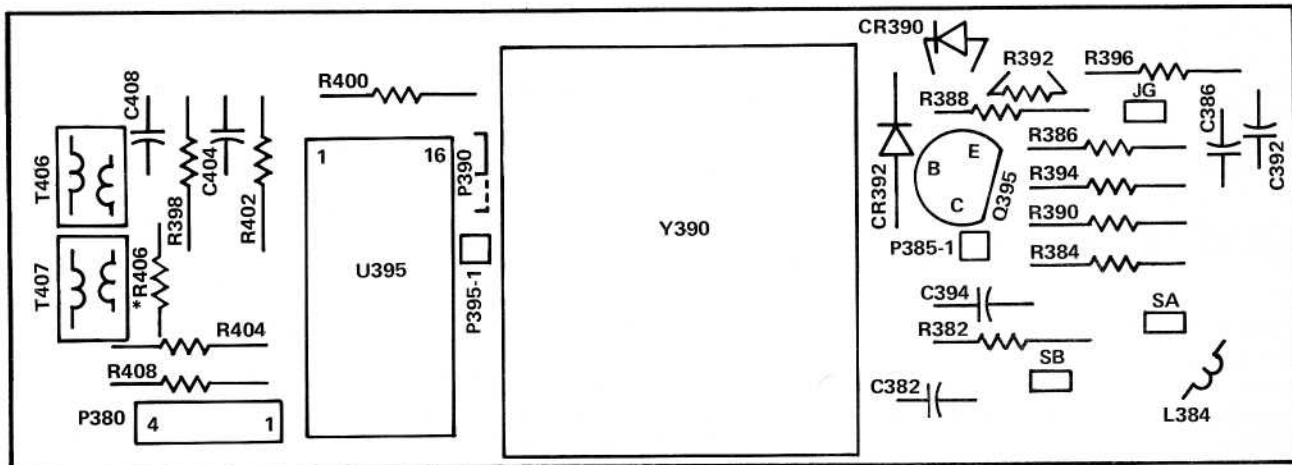


A1000A7 2nd Mixer

2184-98



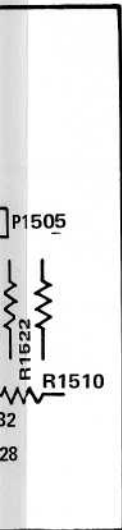
A1000A4 10.7 MHz A



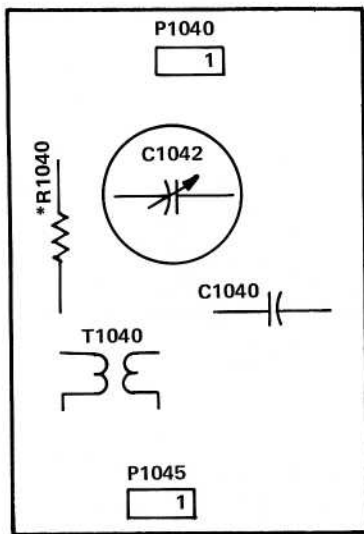
A100A8 Reference Oscillator & Calibrator

2184-75



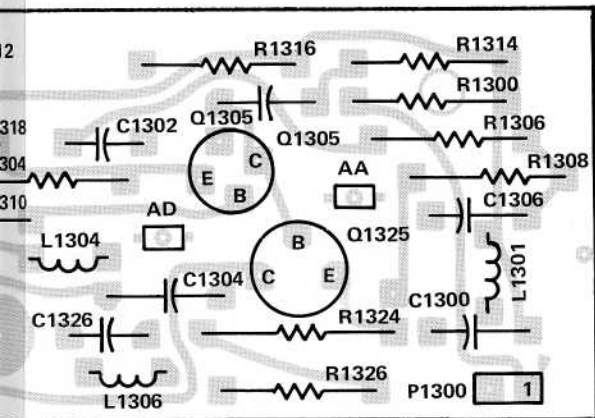


2184-96



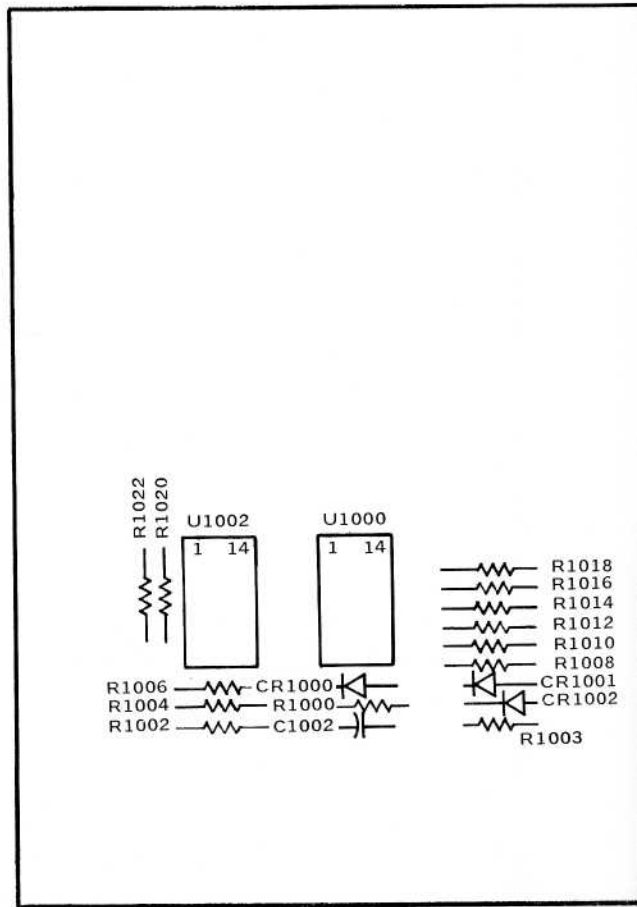
2184-97

A1000A2 10.7 MHz IF Input Filter

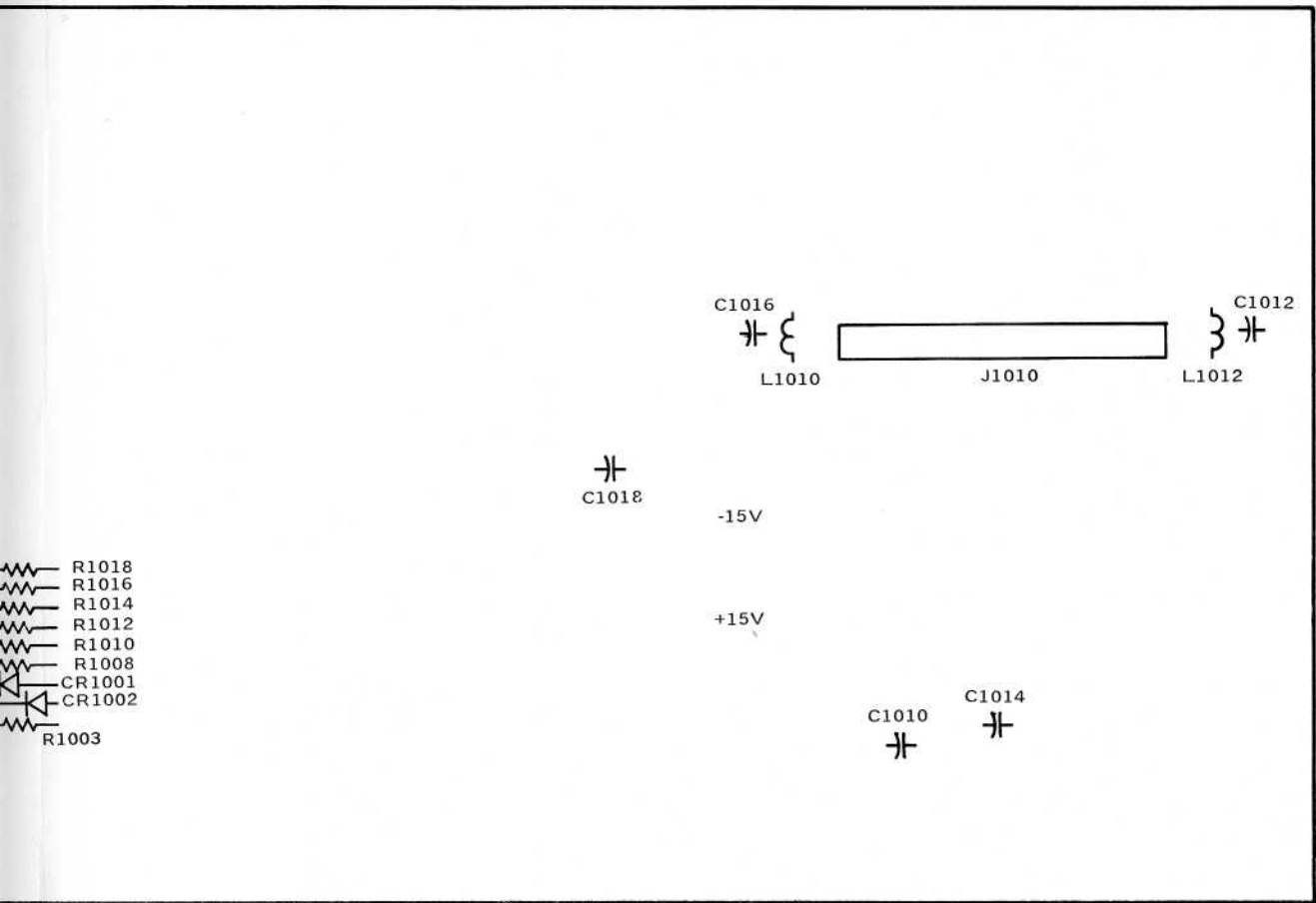


2184-99

000A4 10.7 MHz Amplifier



\*See Parts List for serial number ranges.



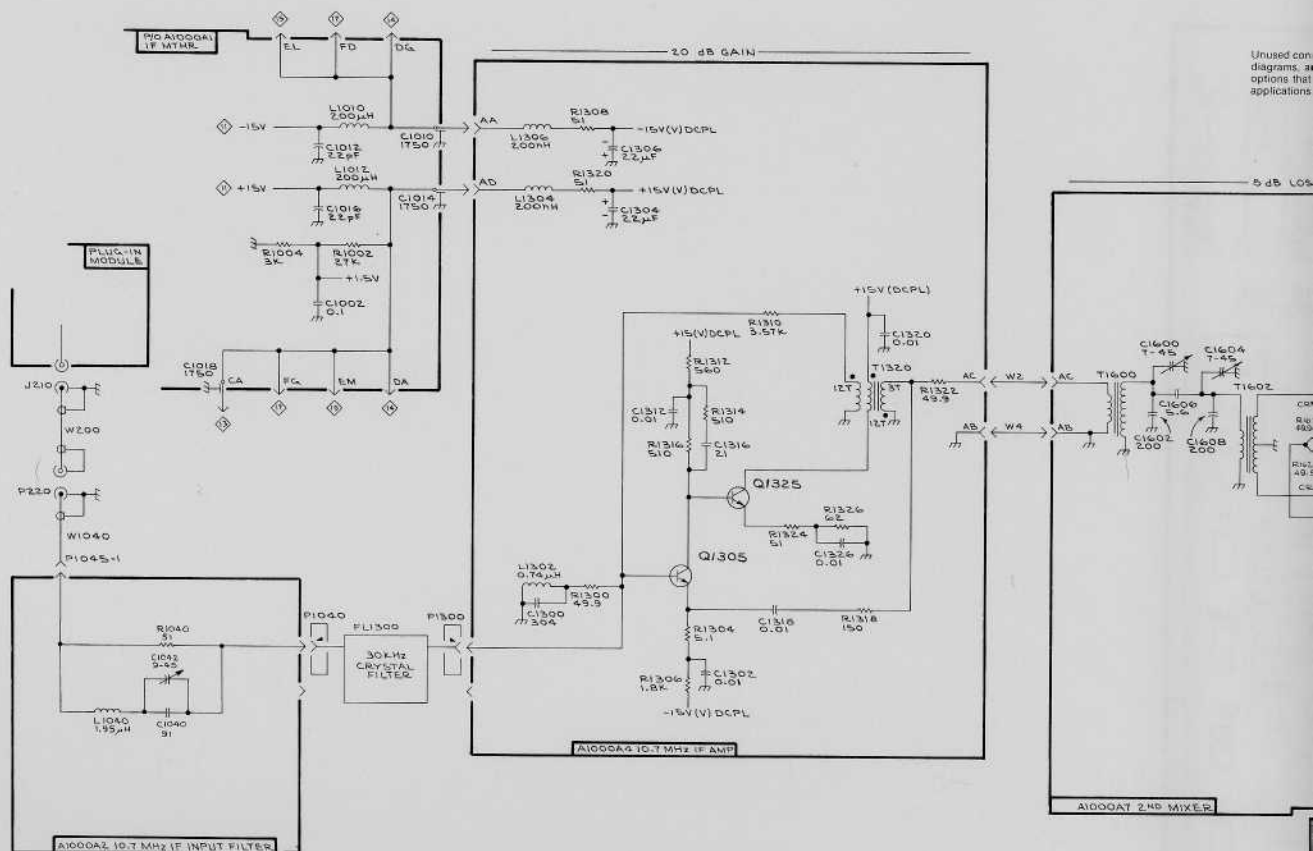
A1000A1 IF Mother

2184-100

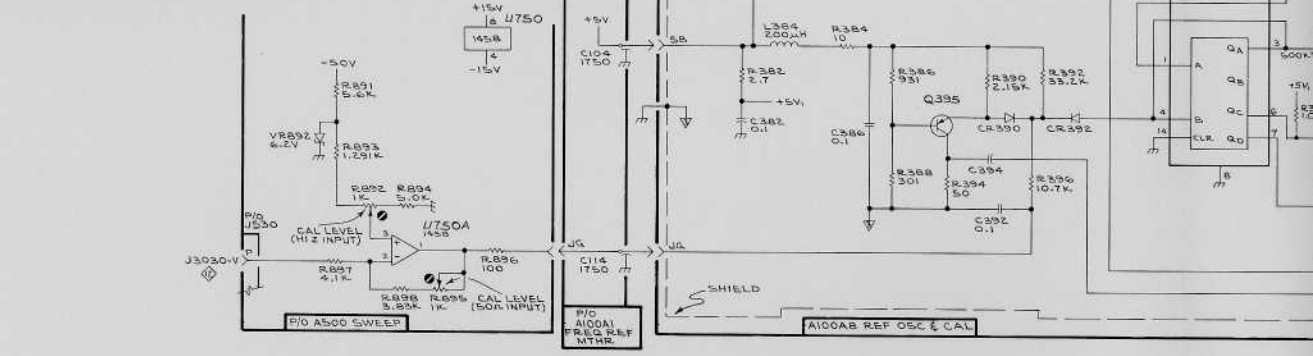
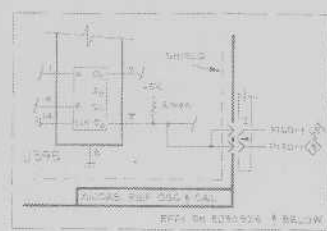
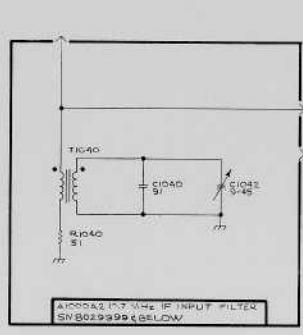
A1A1 Front Panel component location shown on back of Diagram 1 c

A100A1 Frequency Reference Mother component location shown on back of Diagram 7

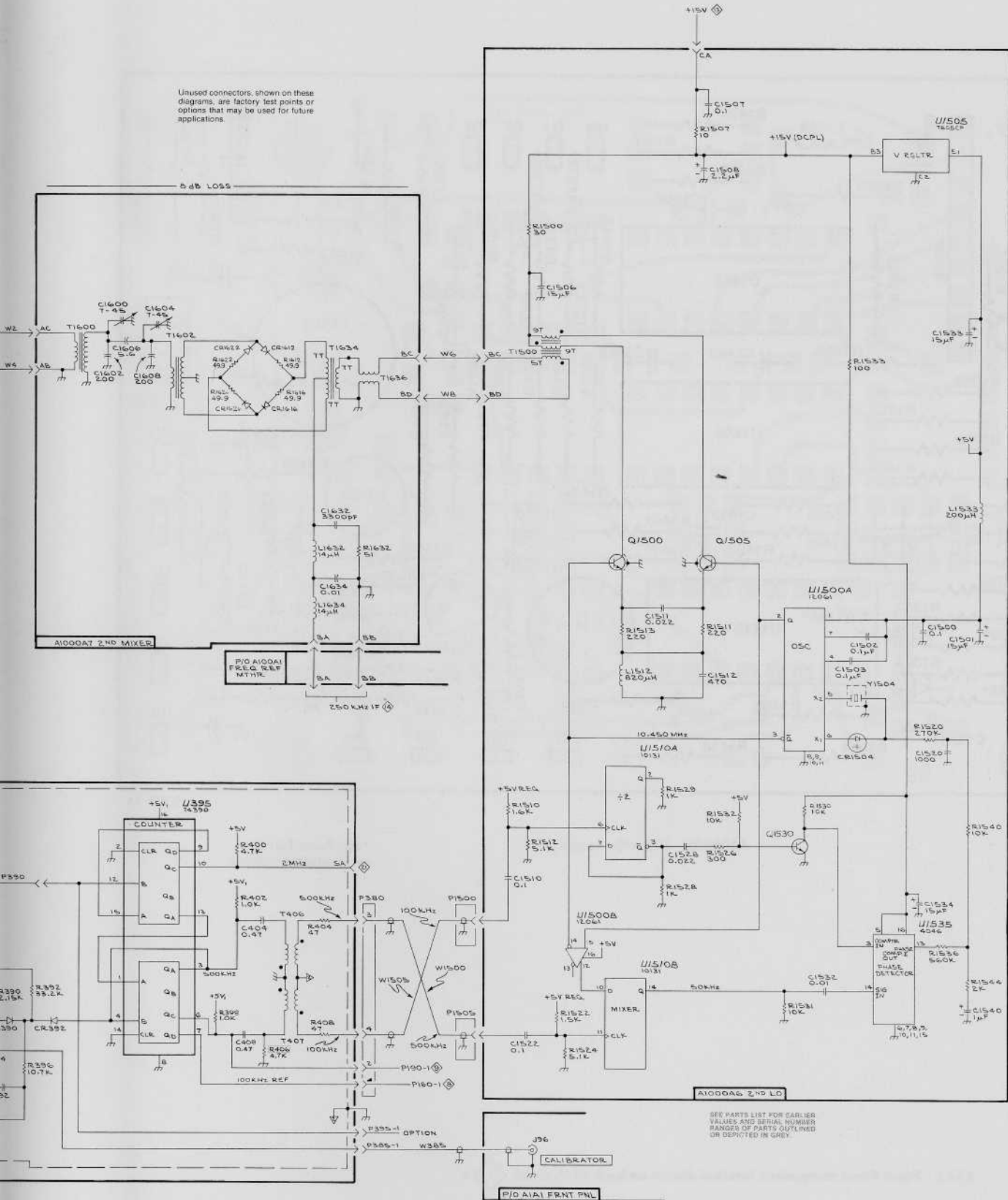
A500 Sweep component location shown on back of Diagram 2

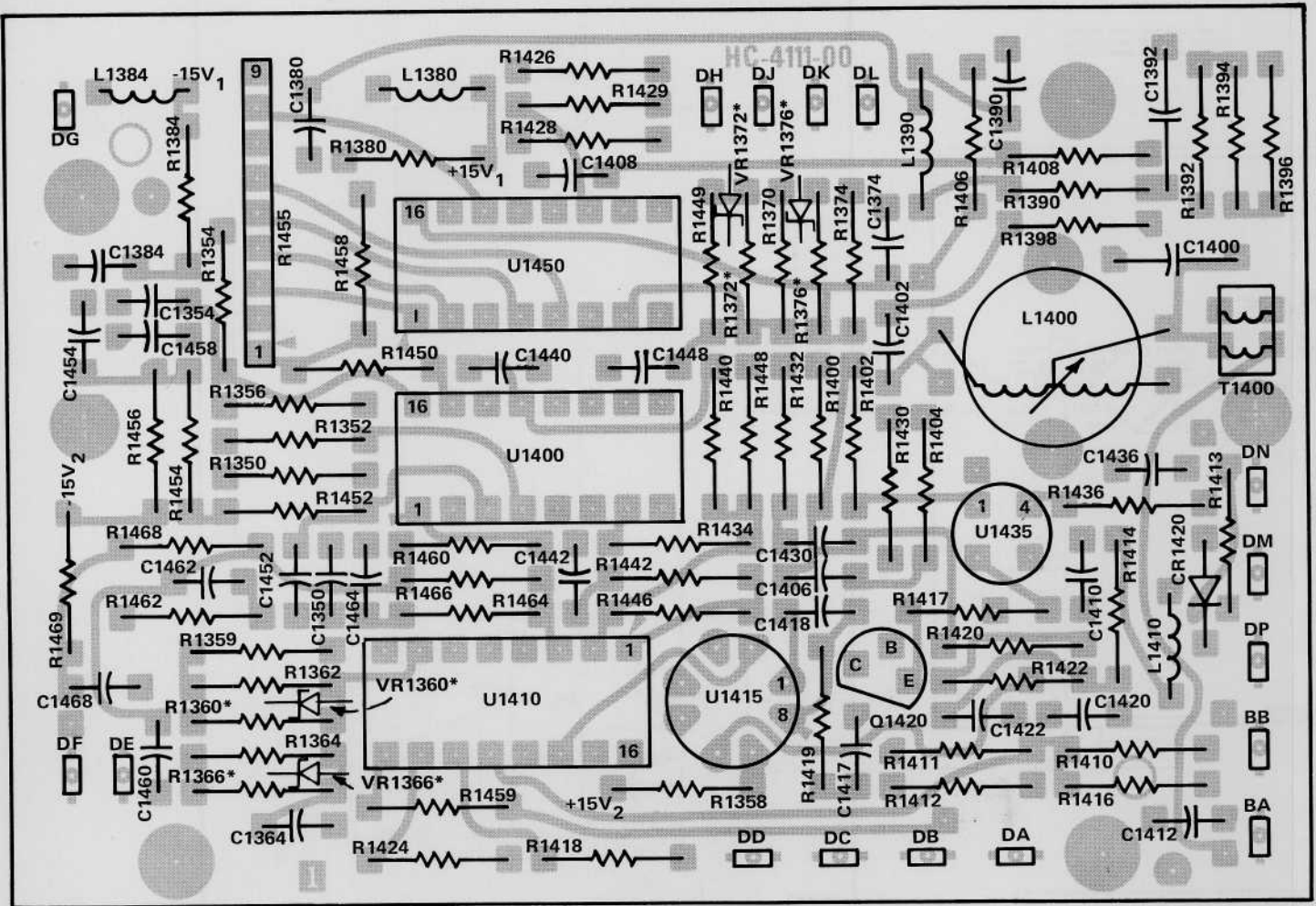


Unused con-  
diagrams, al-  
options that  
applications



Unused connectors, shown on these diagrams, are factory test points or options that may be used for future applications.





2184-74

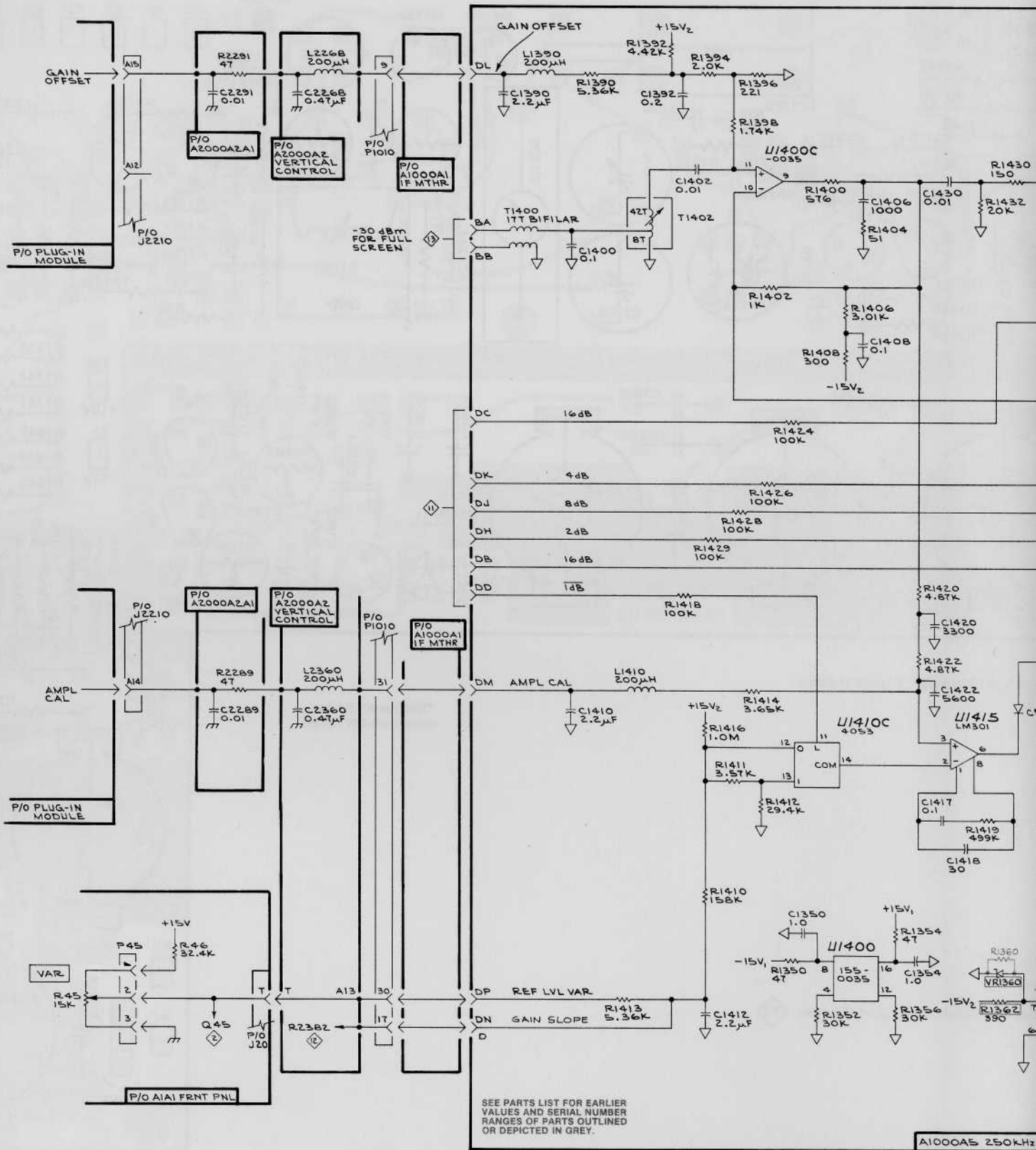
A1000A5 250 kHz Amplifier

\*See Parts List for serial number ranges.

A1A1 Front Panel component location shown on back of Diagram 1 c

A1000A1 IF Mother component location shown on back of Diagram 7

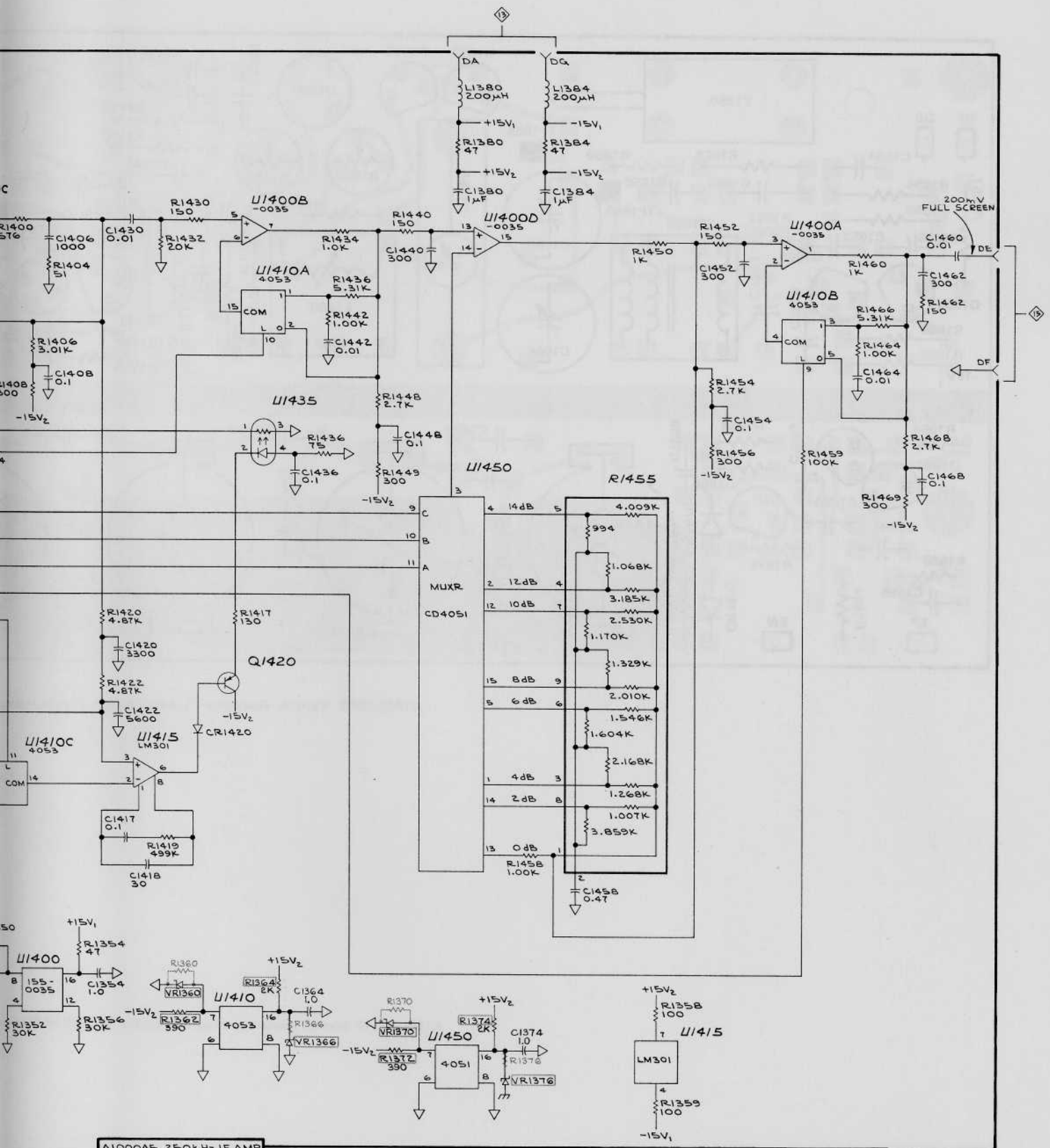
A2000A2 Vertical Control component location shown on back of Diagram 10



7L5

SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.

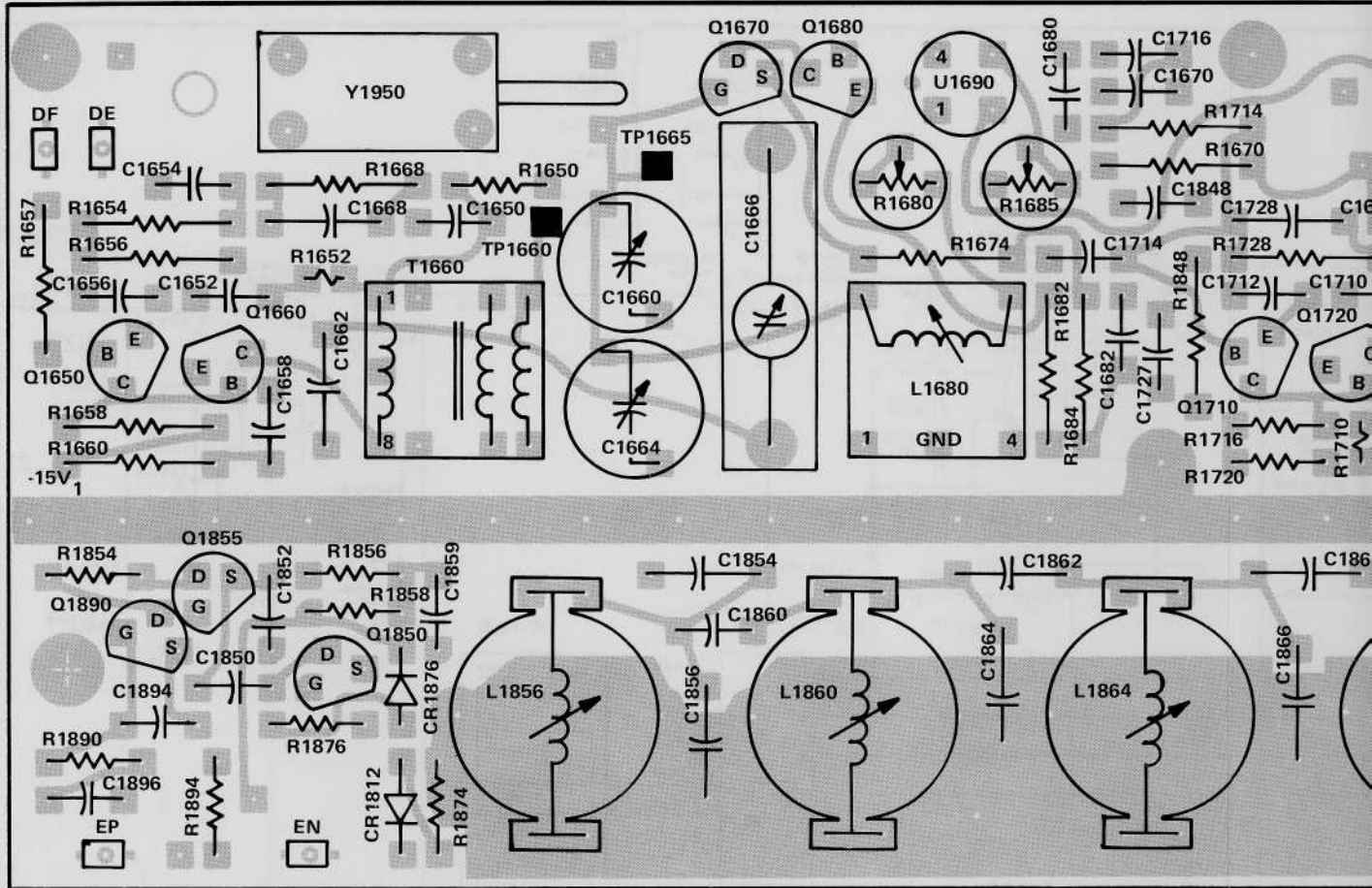
A1000A5 250K-Hz  
2184-54  
REV. A, JUNE 1978



A1000AS 250kHz IF AMP  
2184-54

REV. A, JUNE 1978

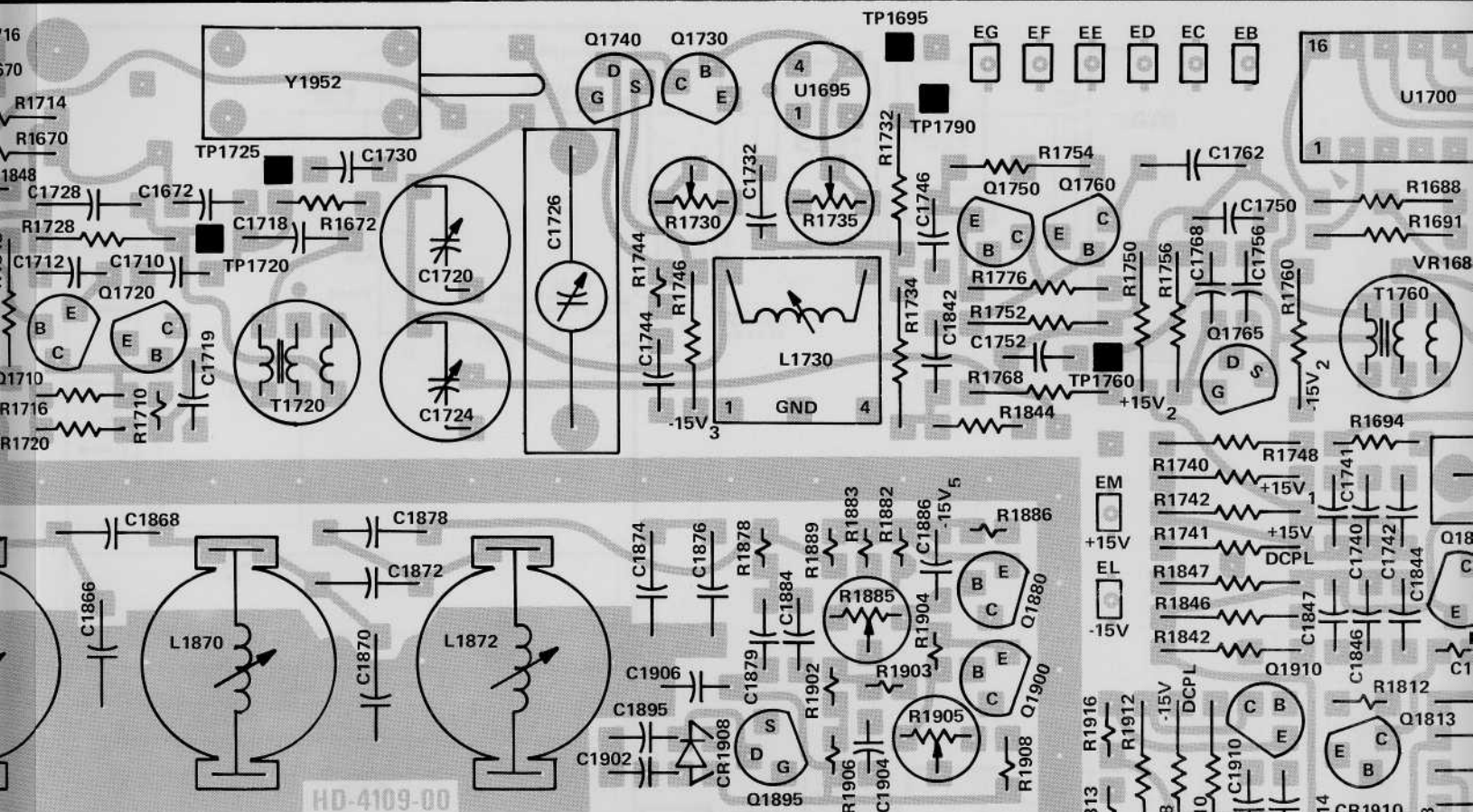
250kHz IF AMPLIFIER 14 1175 PLM



A1000A8A1 Variable Resolution & A1000A8A2 Crystal H

A1000A1 IF Mother component location shown on back of Dia

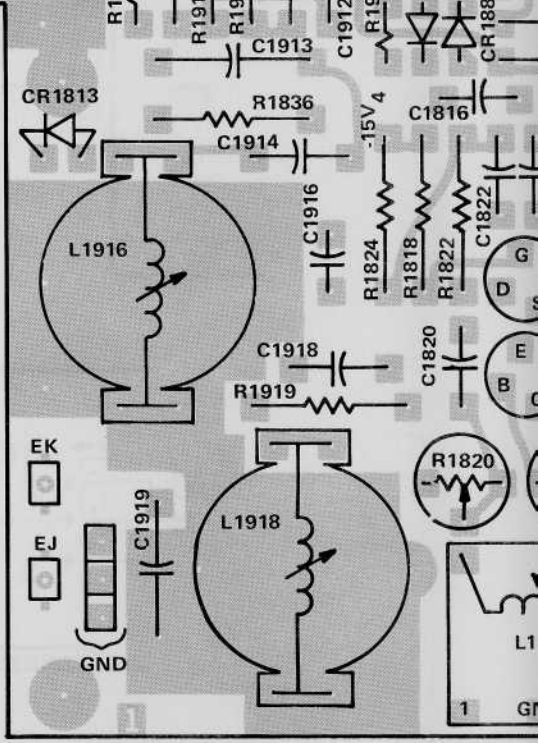


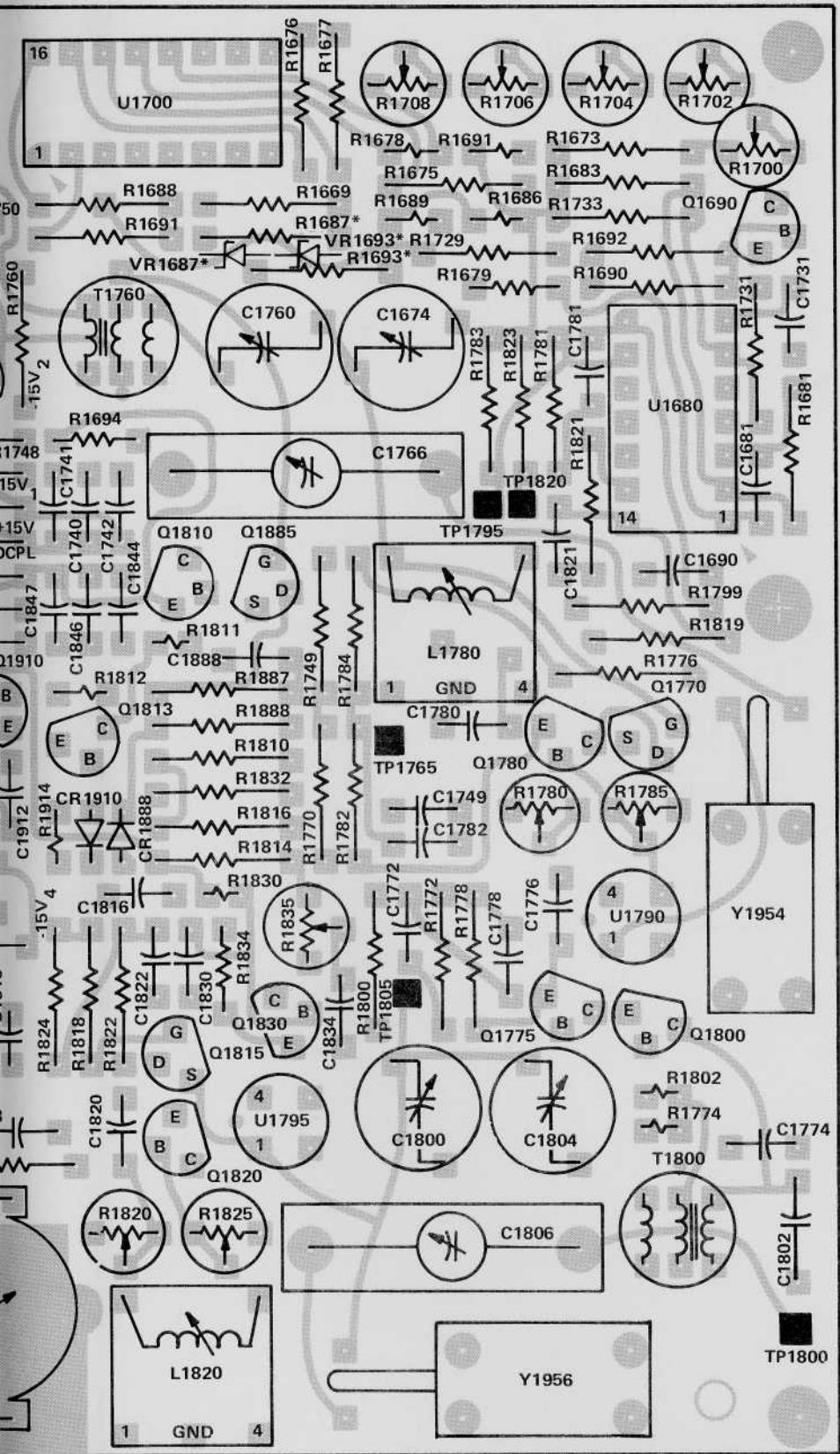


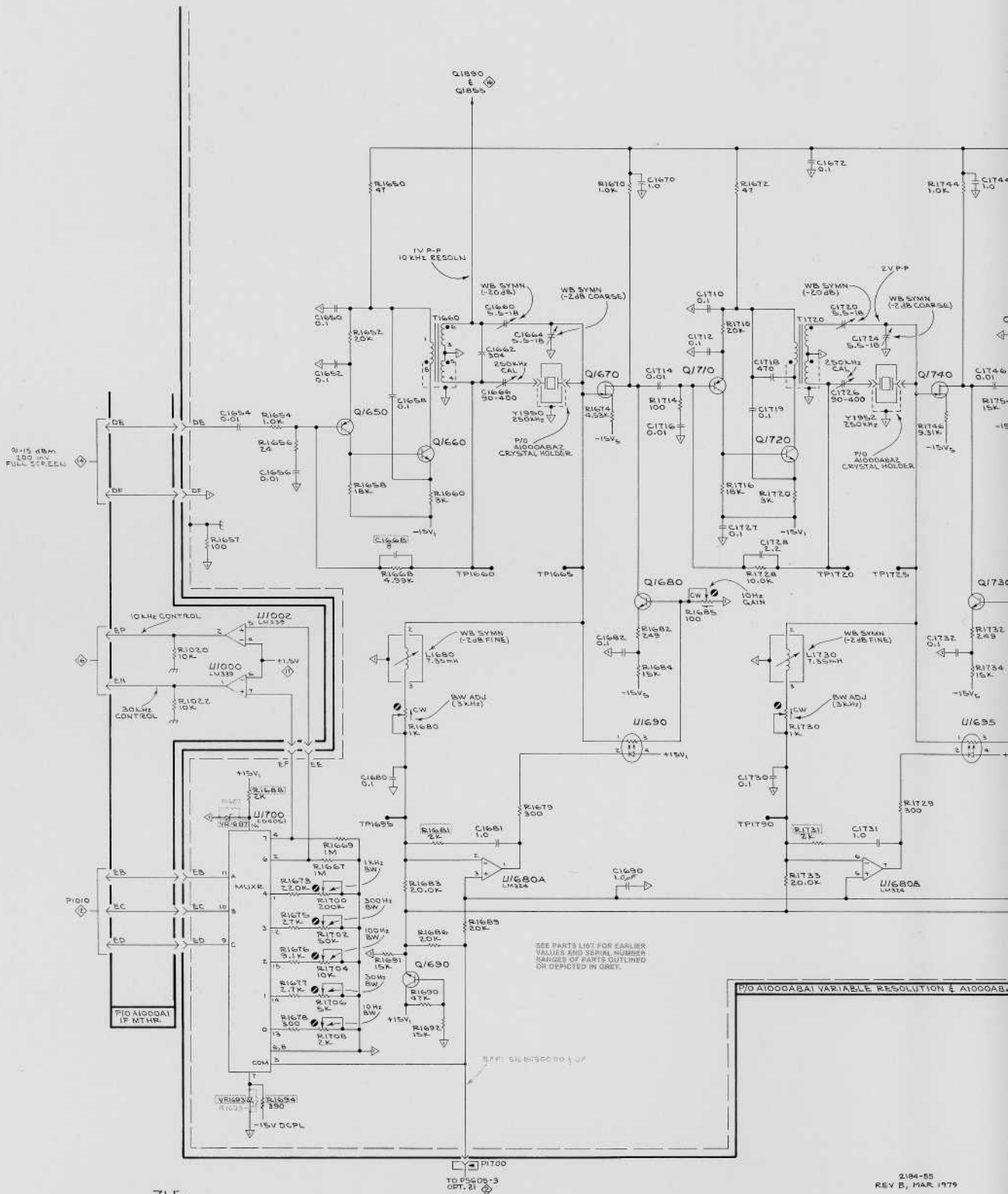
000A8A2 Crystal Holders

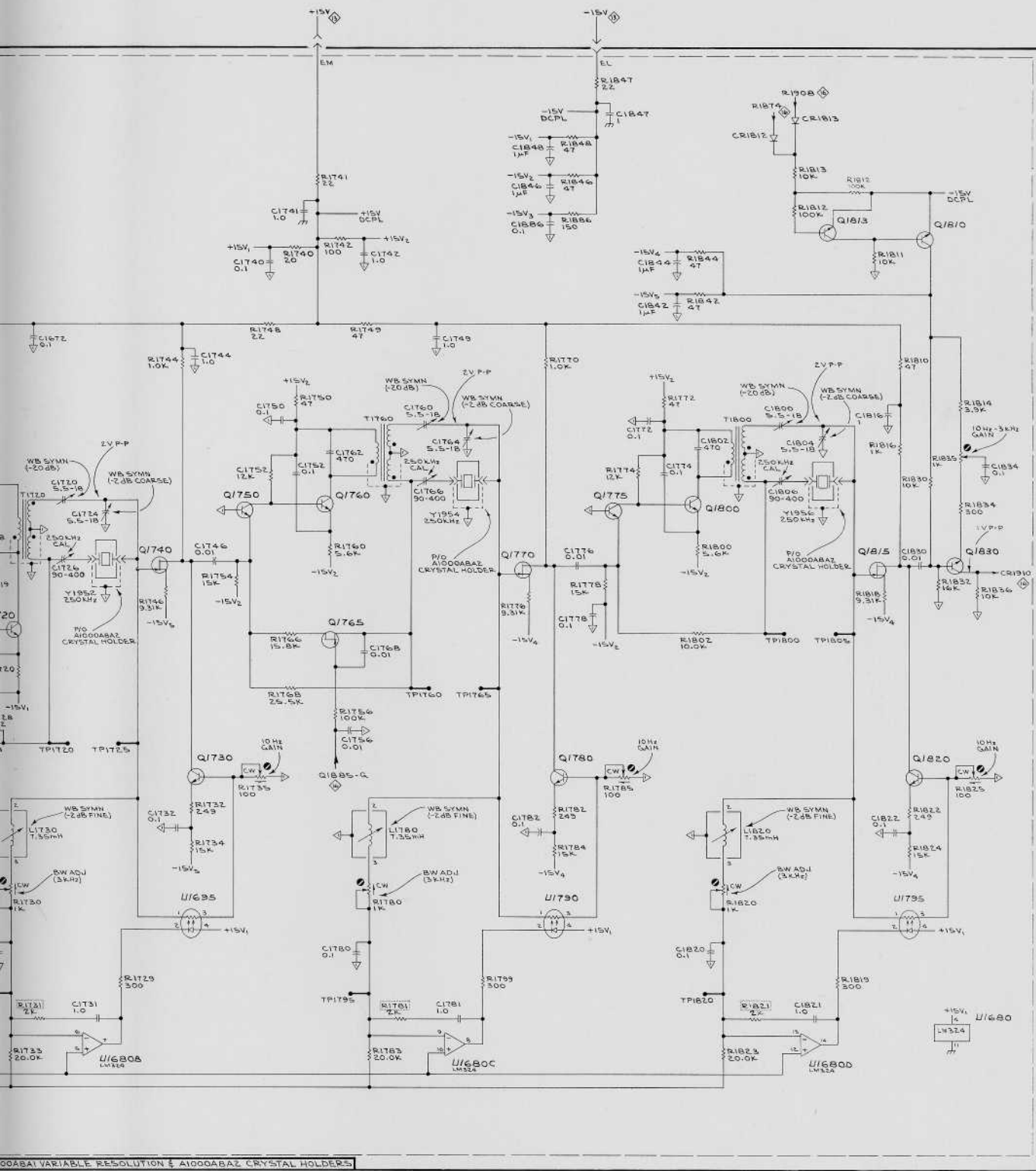
\*See Parts List for serial number ranges.

shown on back of Diagram 12








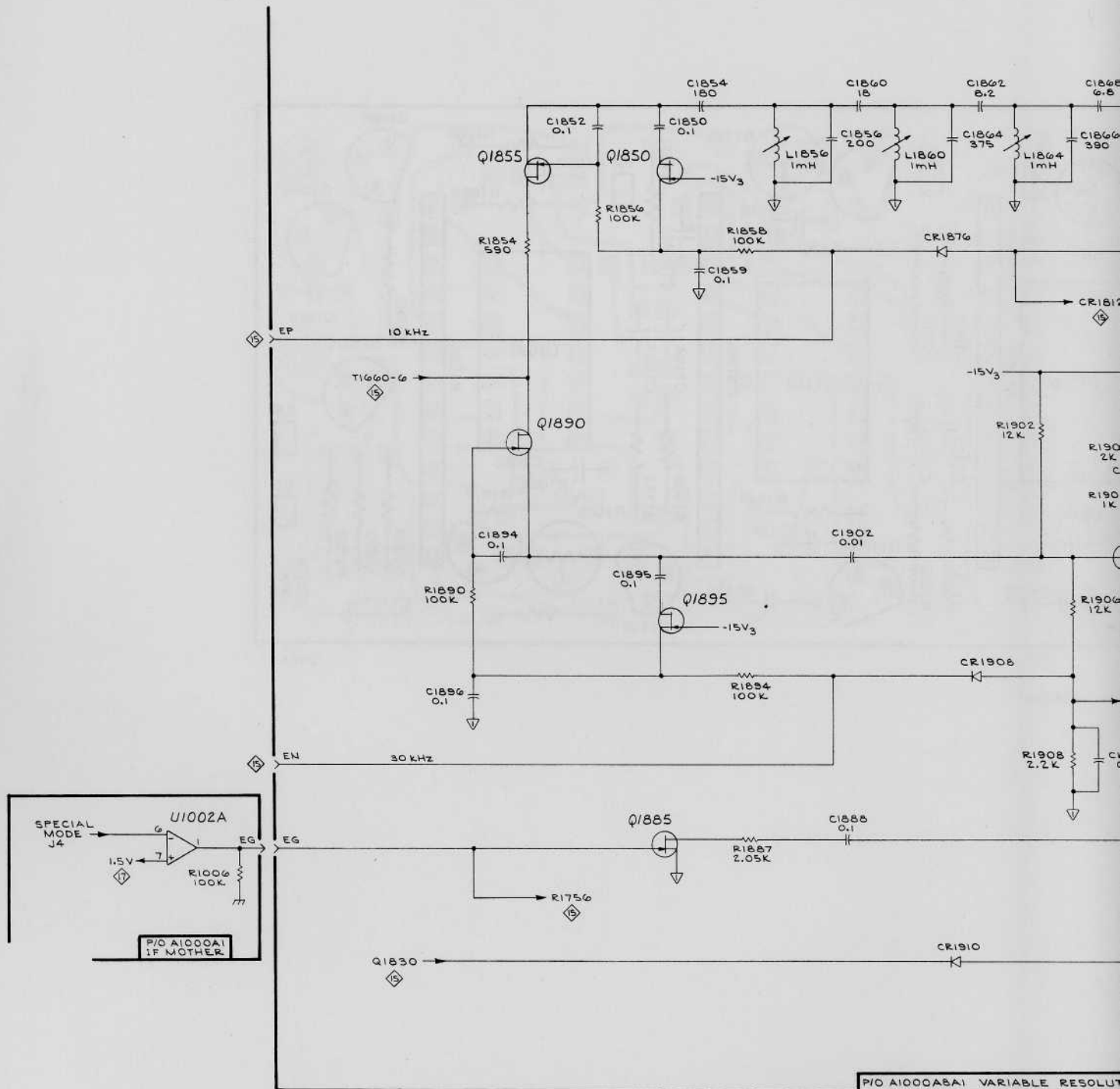


00ABA VARIABLE RESOLUTION & AIGOOABAZ CRYSTAL HOLDERS

A1000A1 IF Mother component location shown on back of Diagram 

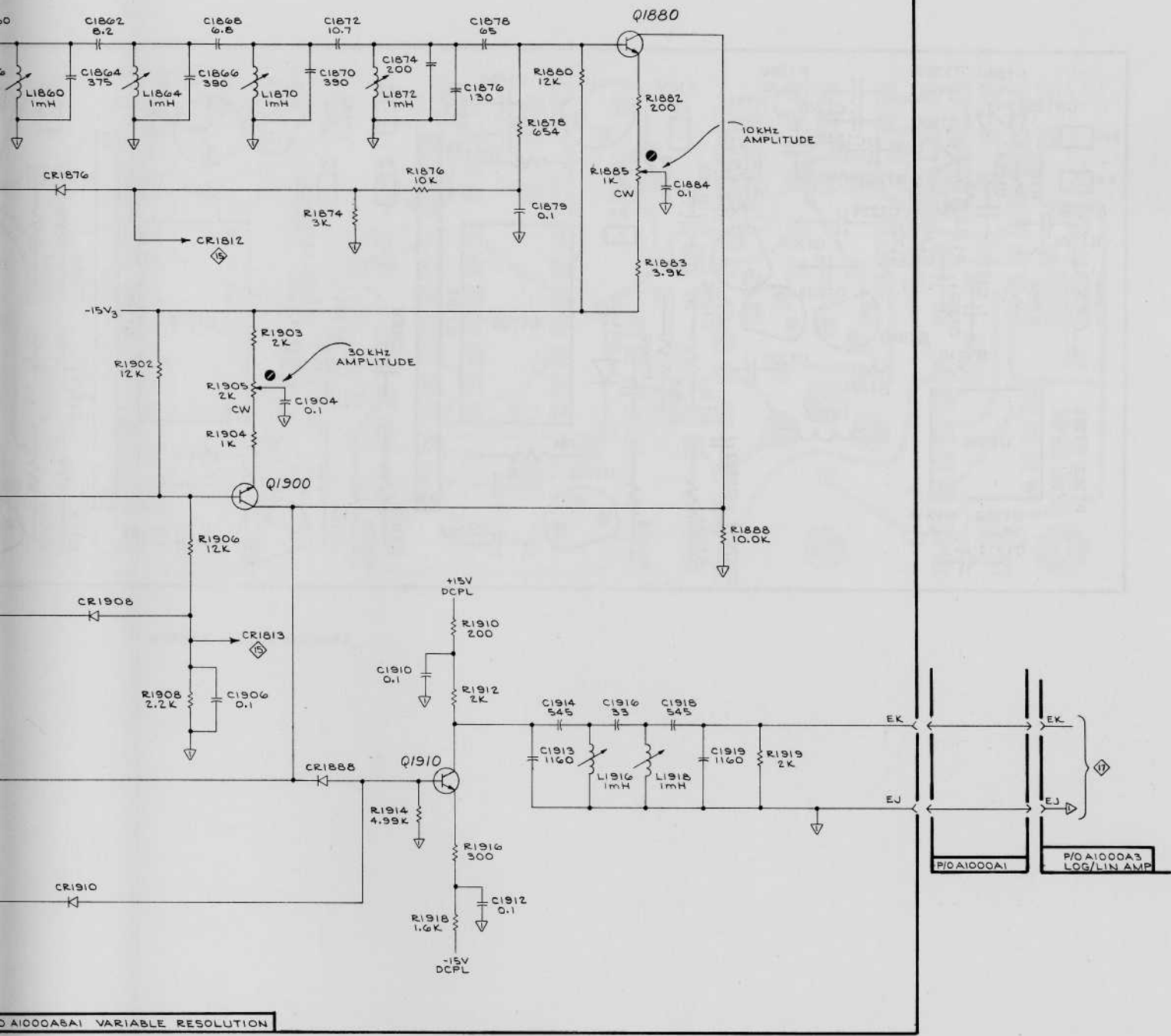
A1000A3 Log/Lin Amplifier component location shown on back of Diagram 

A1000A8A1 Variable Resolution component location shown on back of Diagram 



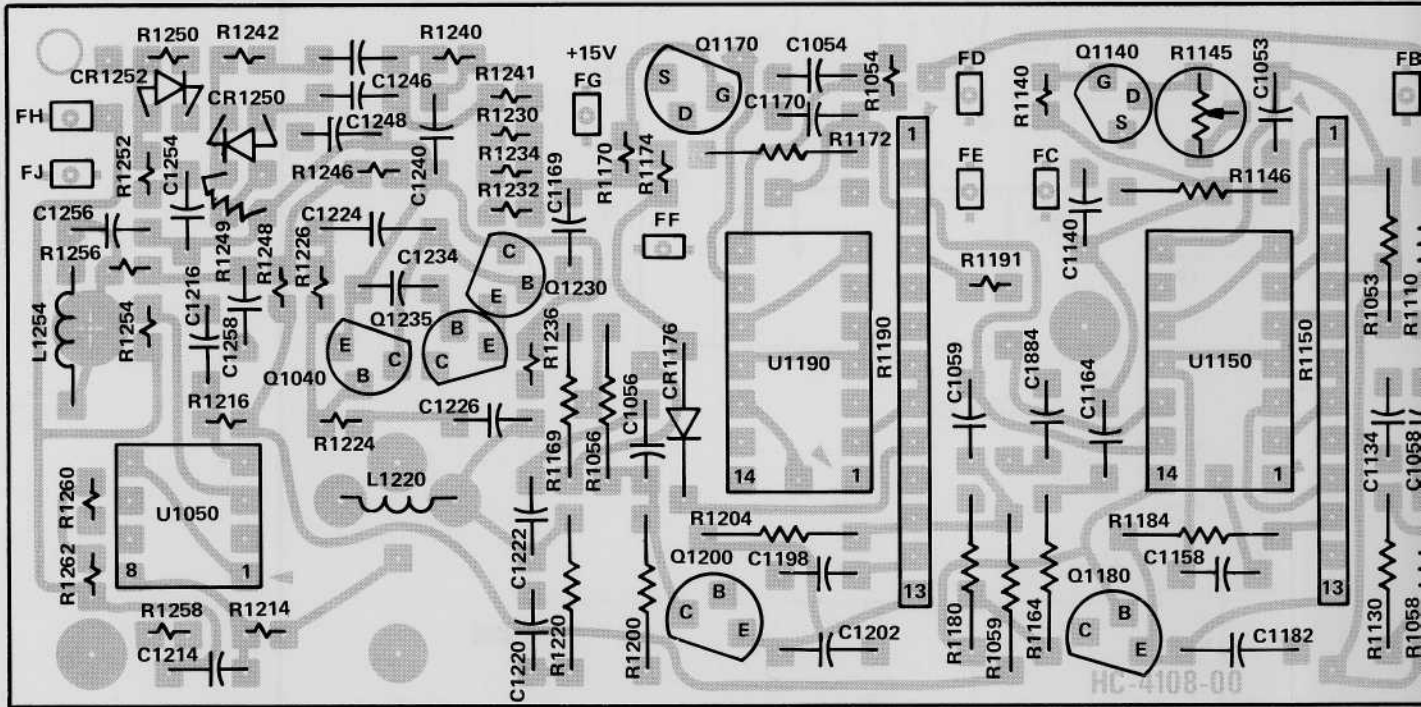
7L5

2184-56  
REV A, MAR 1979



2184-56  
REV A, MAR 1979

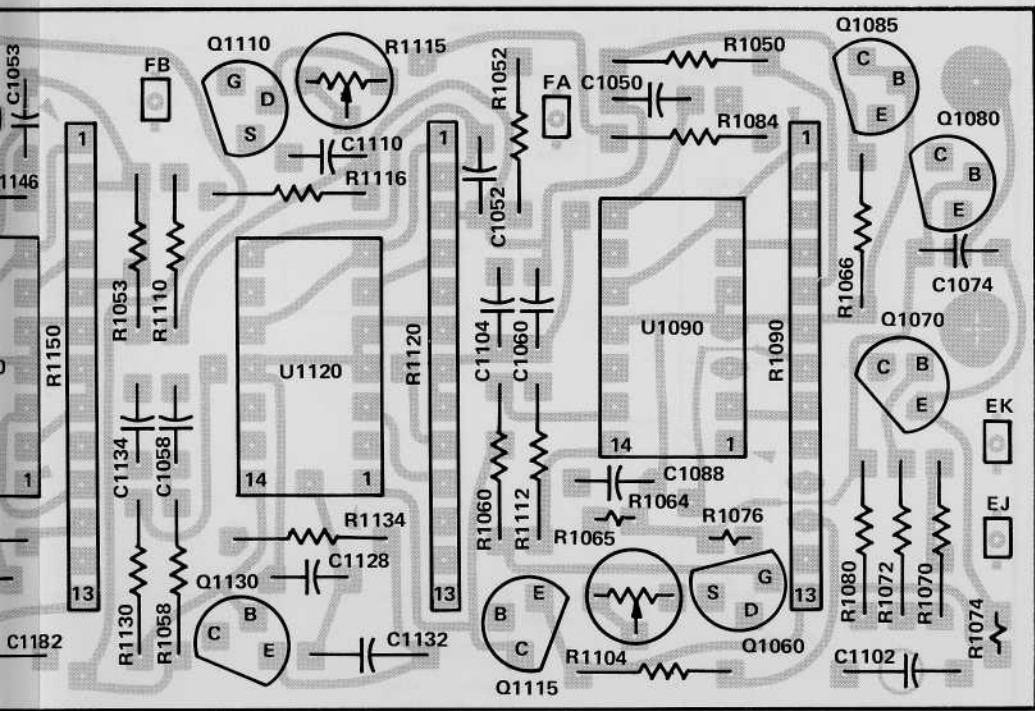
10kHz & 30kHz FILTERS/  
POST VR AMPL 16 1175 DJ



A1000A3 Log/Lin Amplifier

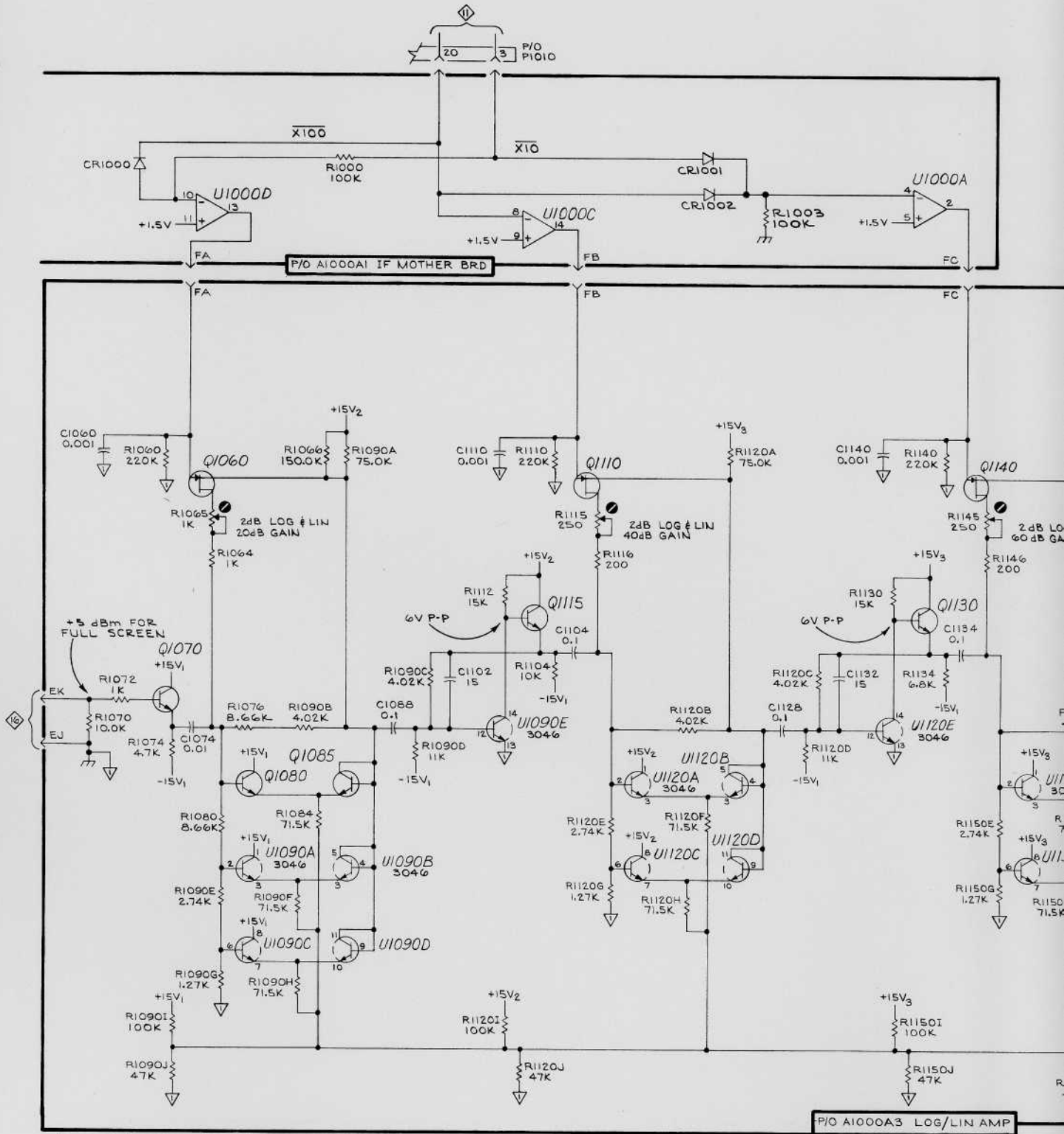
A1000A1 IF Mother component location shown on back of Diagram 12





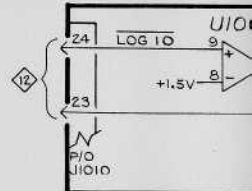
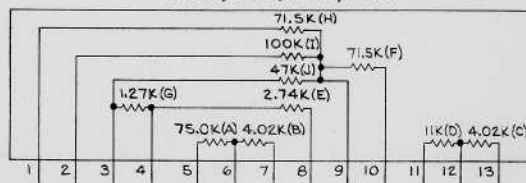
2184-71

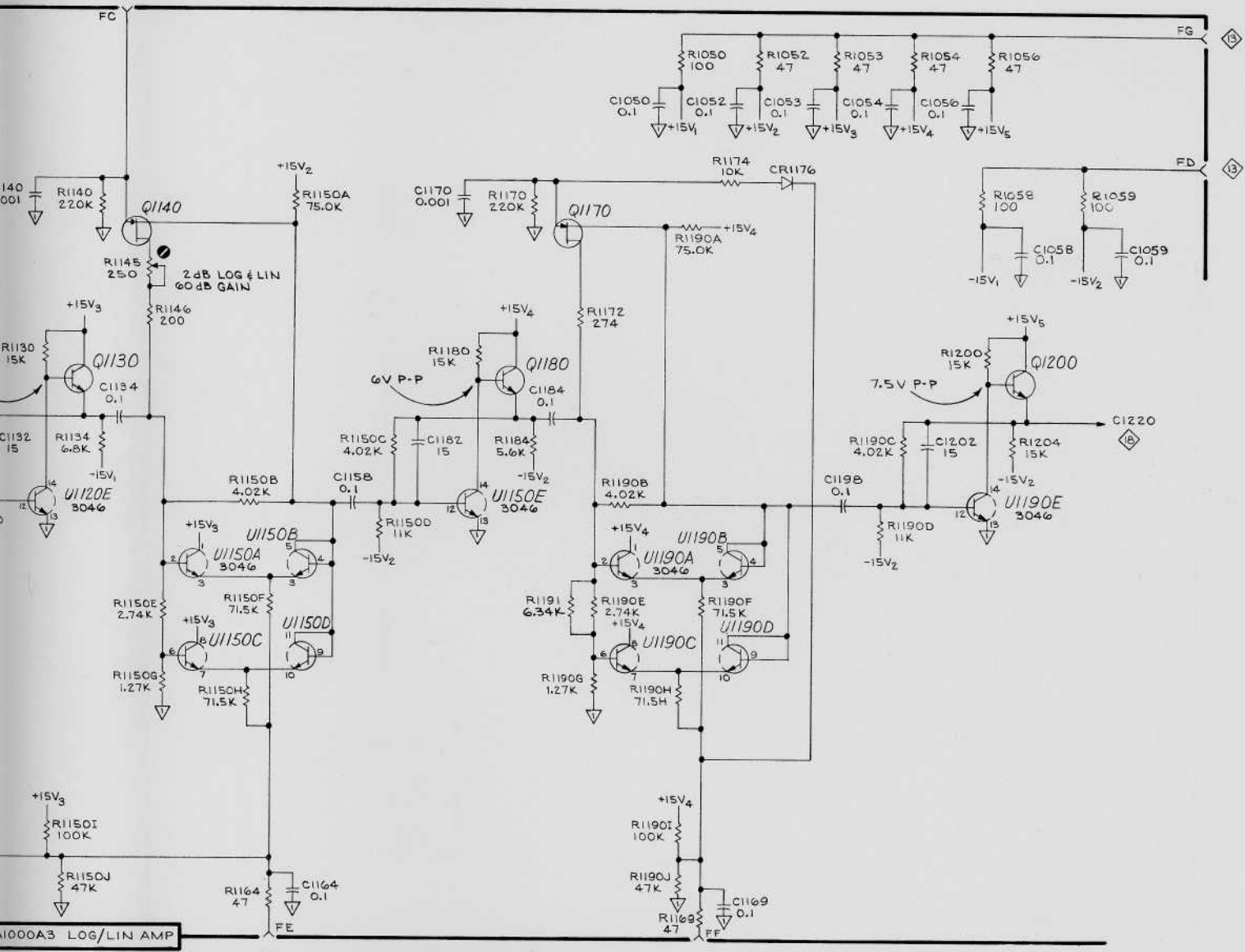
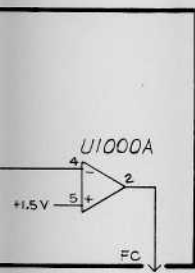
ifier



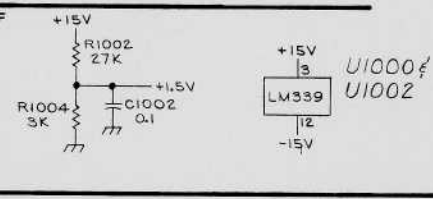
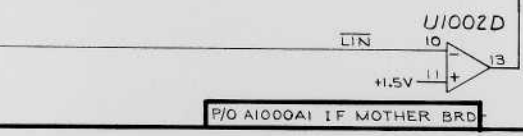
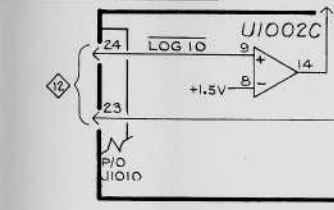
X10 INPUT 1	X100 INPUT 2	GAIN CELL 1	GAIN CELL 2	GAIN CELL 3
1	1	OFF	OFF	OFF
0	1	OFF	OFF	ON
1	0	OFF	ON	ON
0	0	ON	ON	ON

RESISTOR PIN OUT DATA  
R1090, R1120, R1150, R1190





U1000A3 LOG/LIN AMP



P/O A1000A1 IF MOTHER BRD

A1A1 Front Panel component location shown on back of Diagram  c

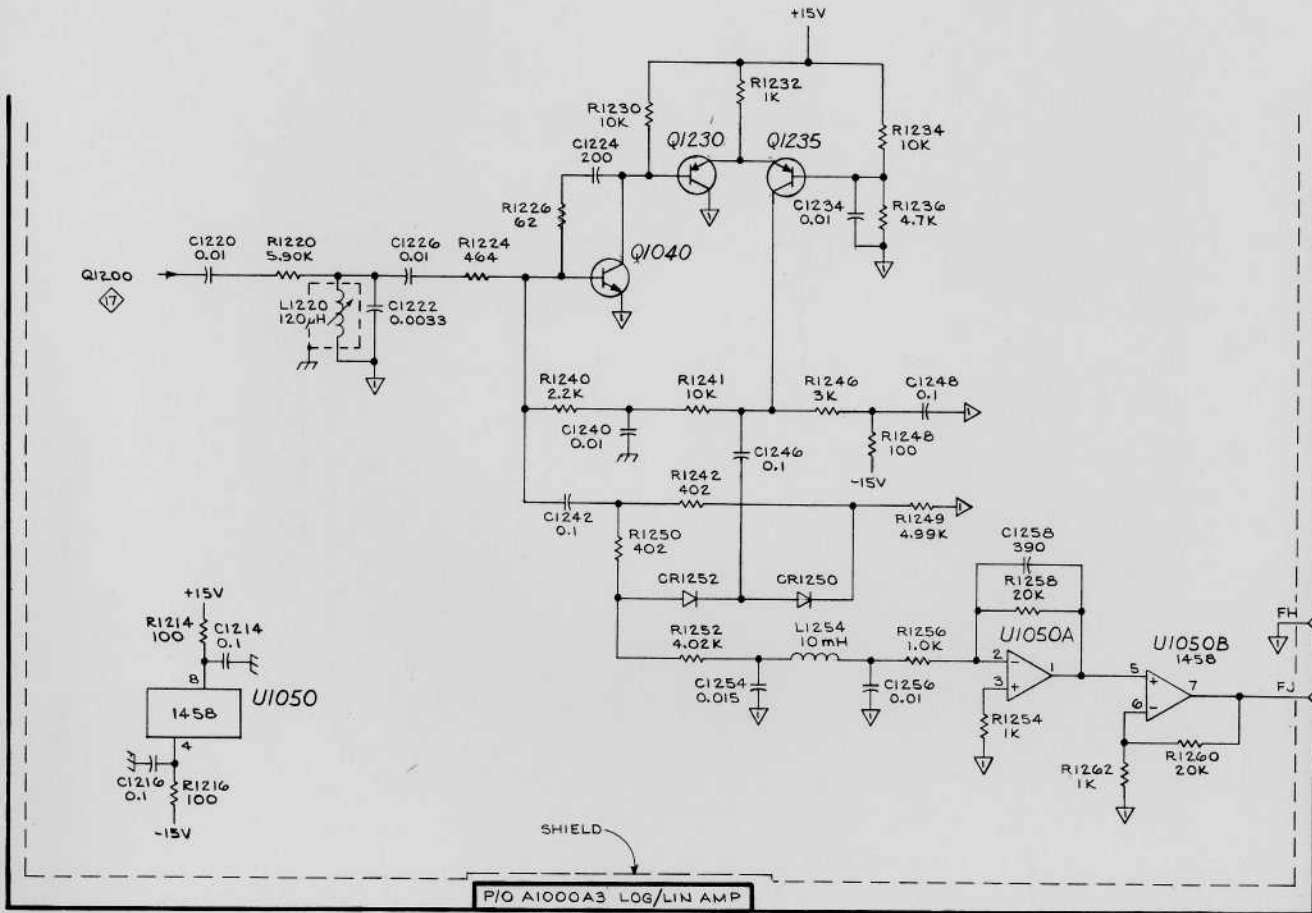
A1000A1 IF Mother component location shown on back of Diagram 

A1000A3 Log/Lin Amplifier component location shown on back of Diagram 

A2000A2 Vertical Control component location shown on back of Diagram 

A3000 Transverse/Vertical Interface component location shown on back of Diagram  a

DETECTOR

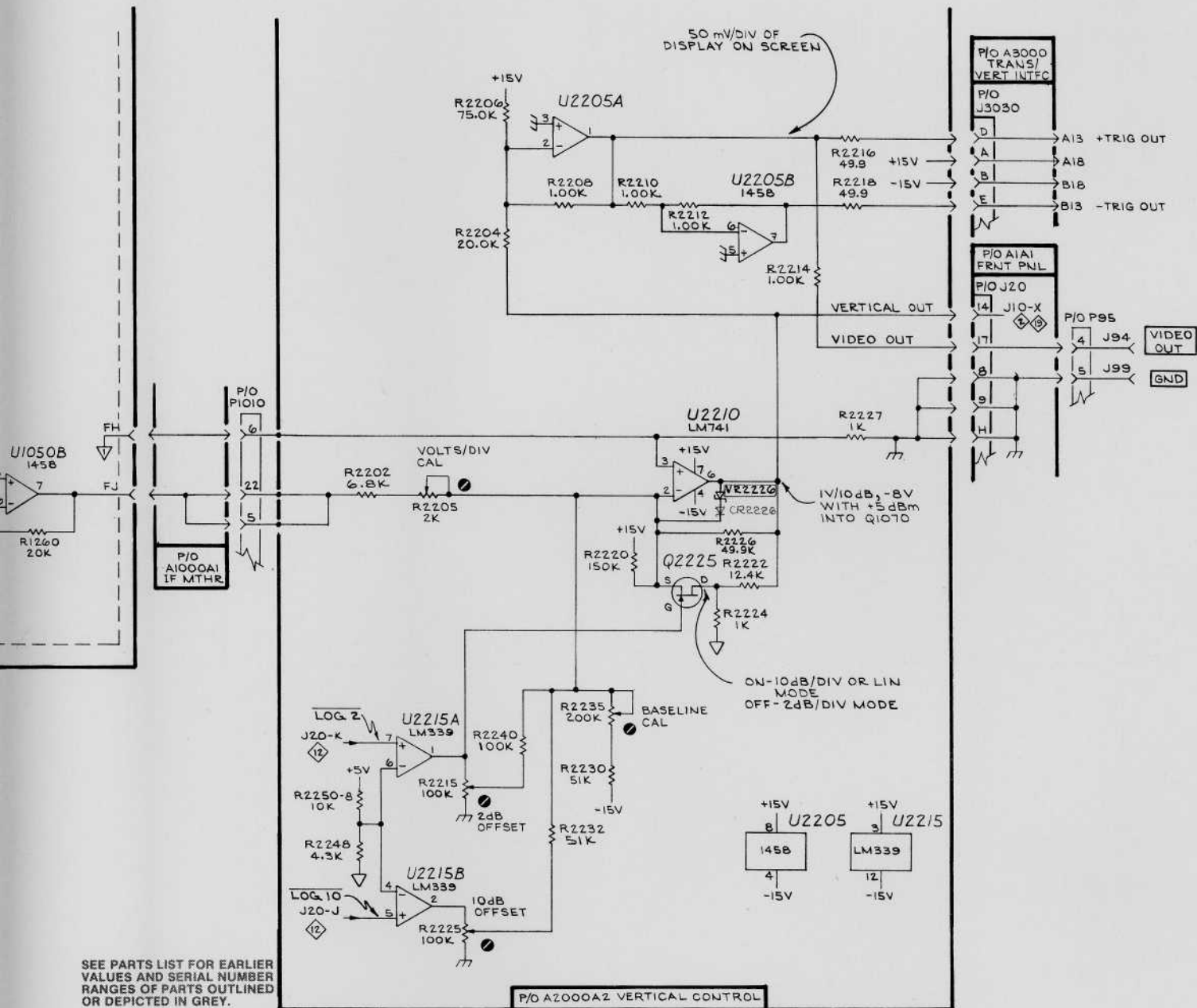


SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINE OR DEPICTED IN GREY.

7L5

2184-58  
REV B, MAR 1979

VERTICAL AMPLIFIER



DETECTOR & VERTICAL OUT 18 1175 DJ

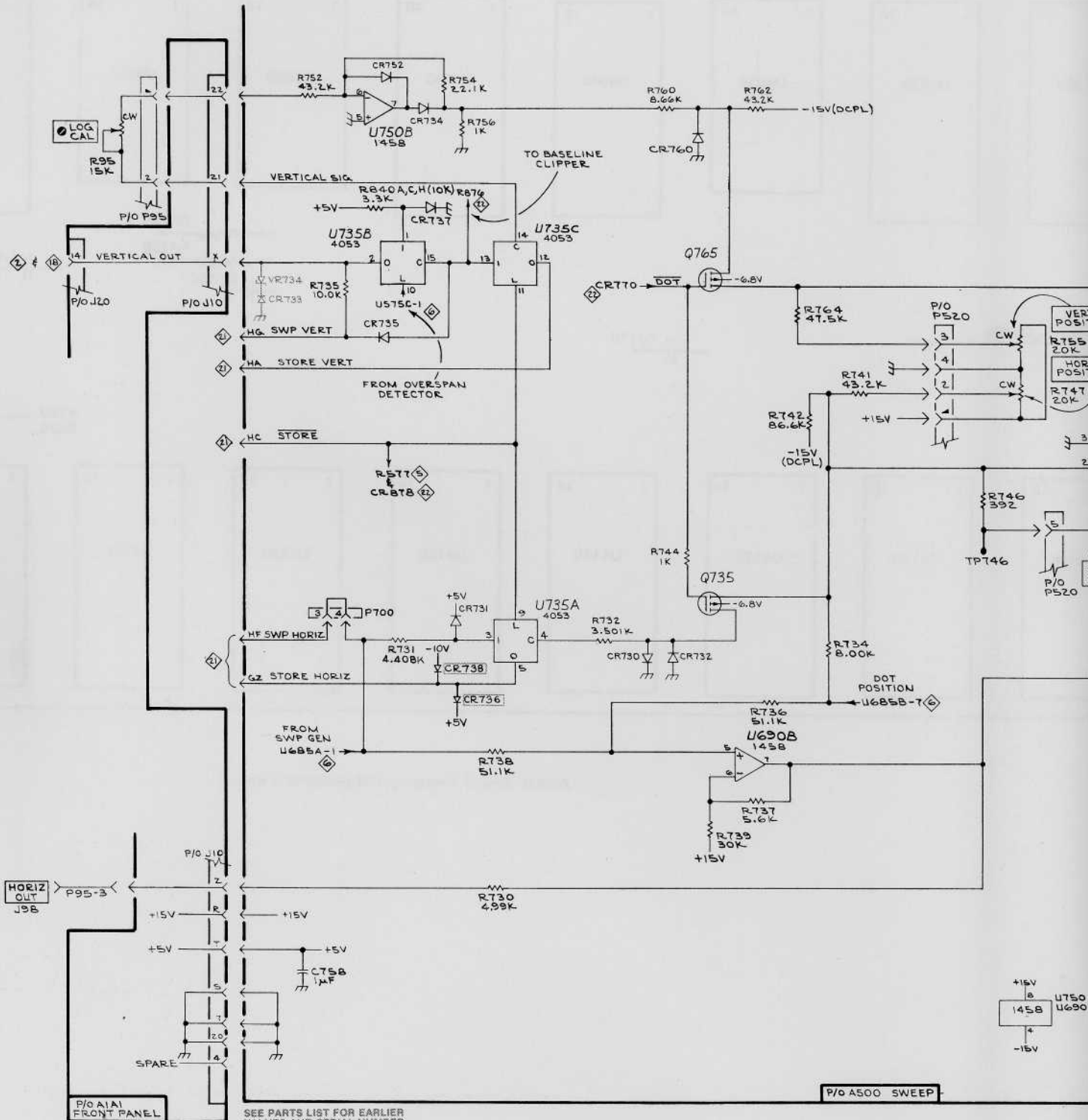
A1A1 Front Panel component location shown on back of Diagram  c

A100A1 Frequency Reference Mother component location shown on back of Diagram 

A500 Sweep component location shown on back of Diagram 

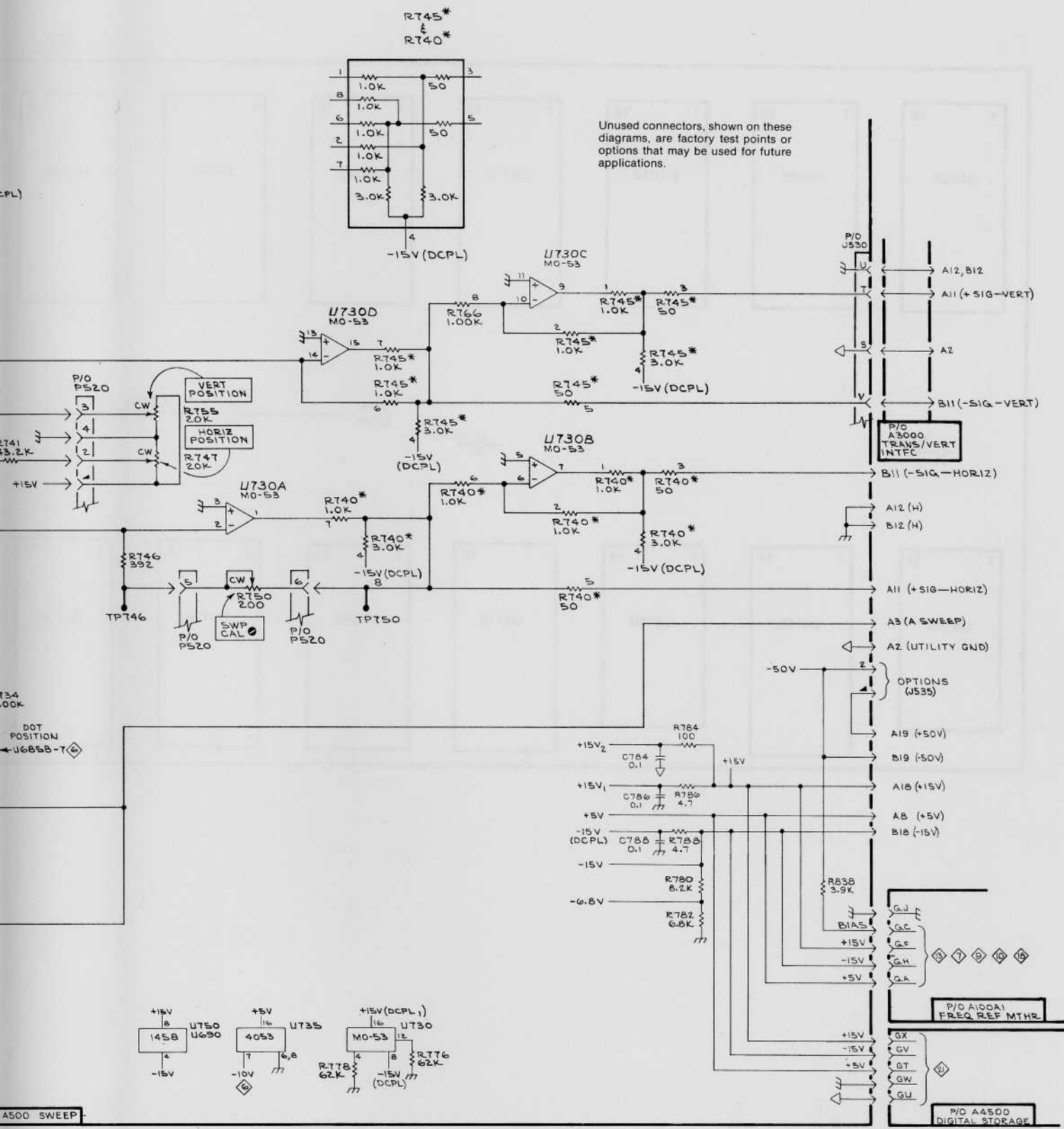
A4500 Digital Storage component location shown on back of Diagram 

A3000 Transverse/Vertical Interface component location shown on back of Diagram  a



SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.





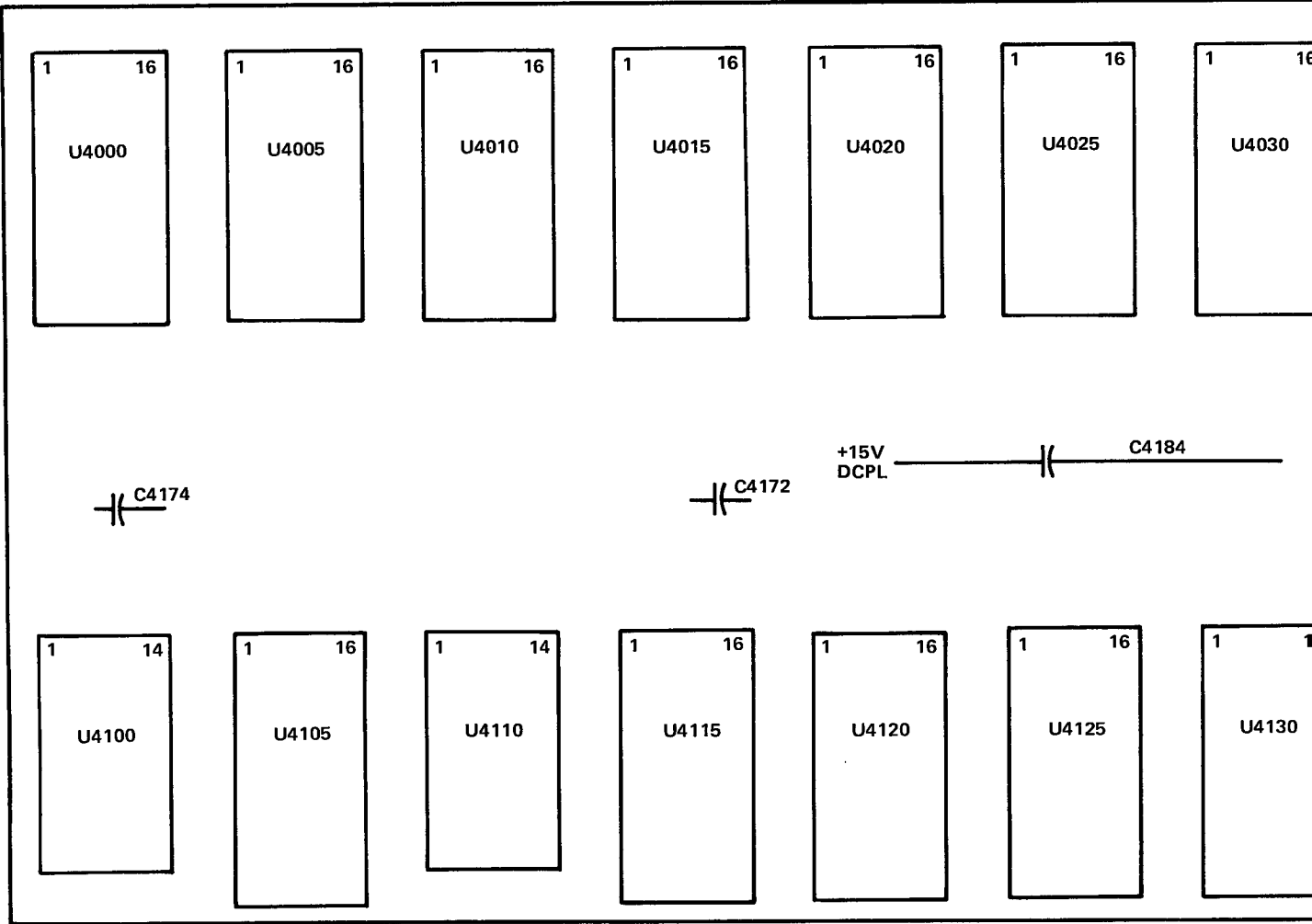
Unused connectors, shown on these diagrams, are factory test points or options that may be used for future applications.

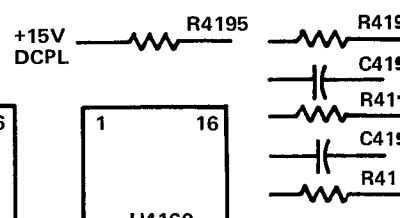
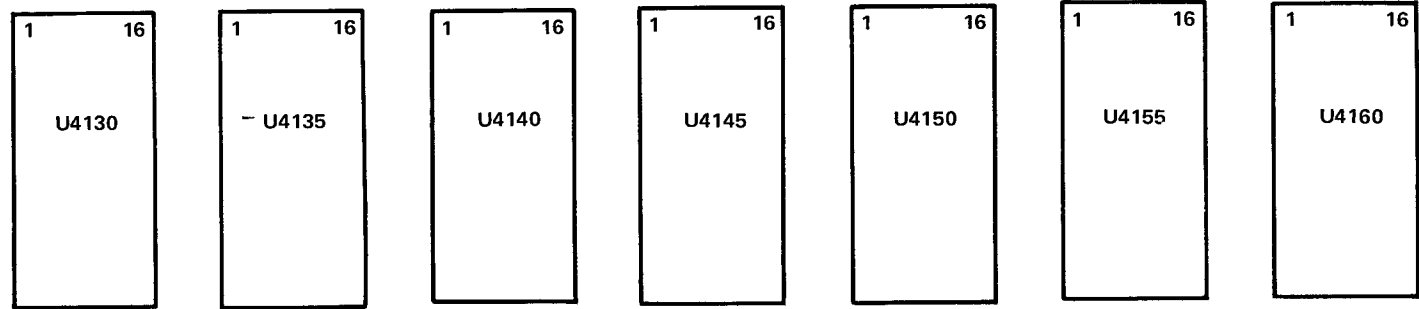
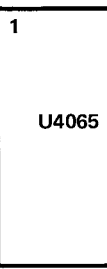
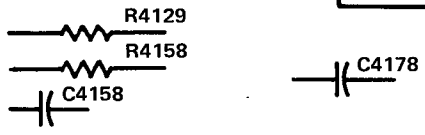
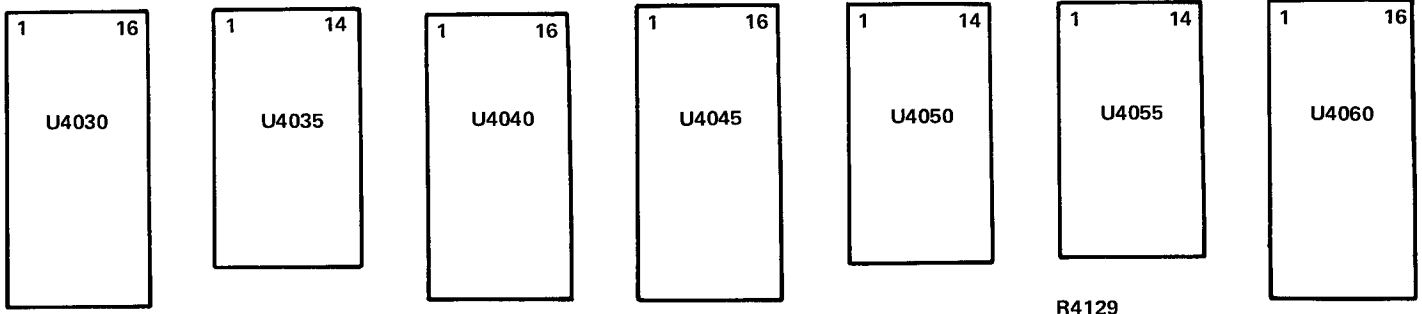
CPL)

134  
00K

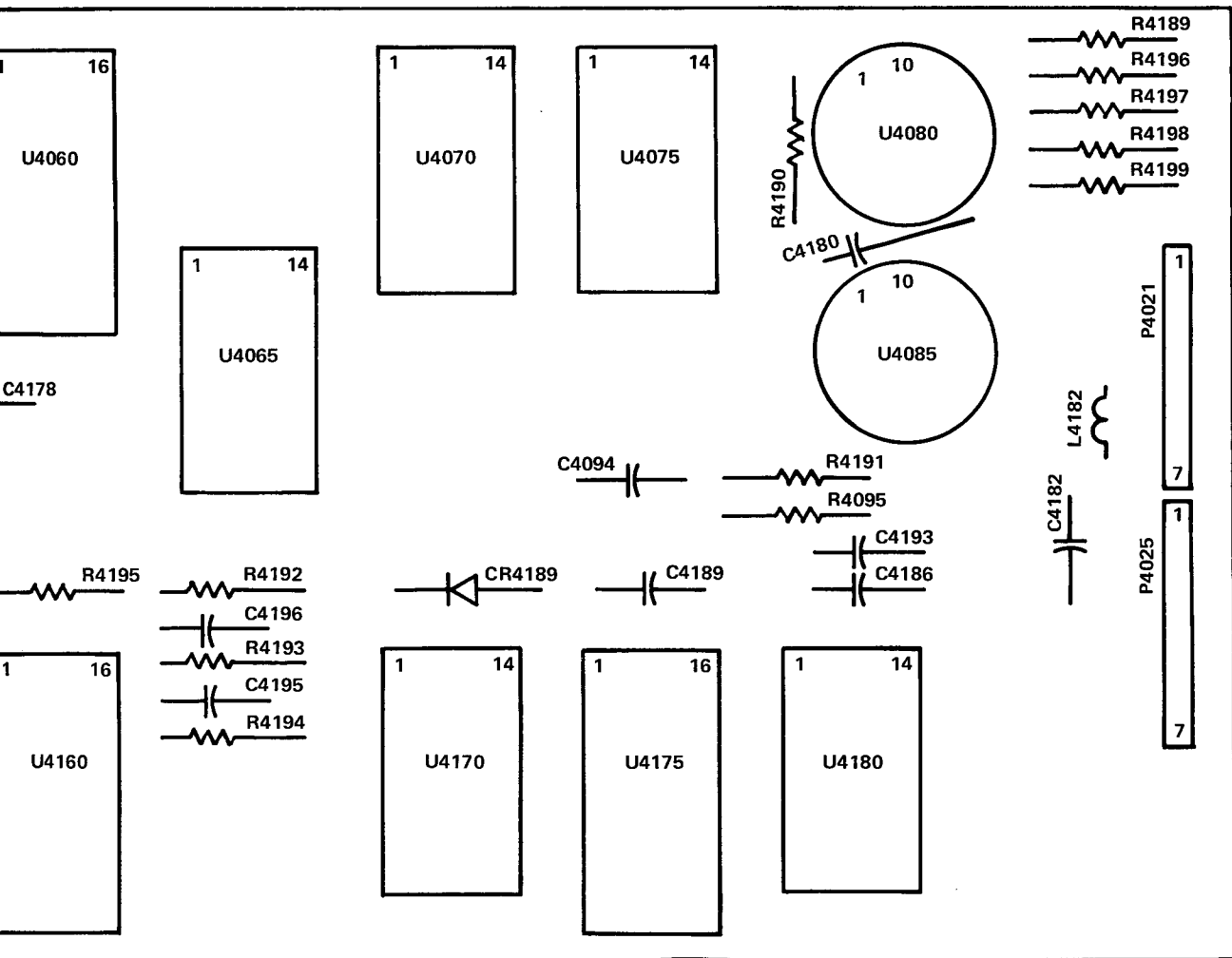
DOT POSITION  
← U685B-7

A500 SWEEP





A4000 Digital Averaging (SN B069999 & below)



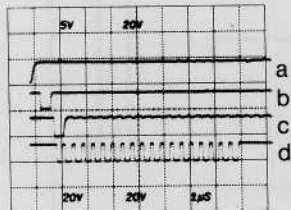
Waveforms shown on this diagram were obtained under the following conditions:

The oscilloscope mainframe contained two dual trace vertical amplifier units (e.g. 7A18) and one time base unit (e.g. 7B70). Oscilloscope settings (Time/Div and Volts/Div) are indicated on the waveform photograph. The triggering is indicated on the waveform.

The 7L5 Digital Averaging circuit board was positioned to the side as shown in the Calibration section (Fig. 4-20). The CALIBRATOR signal is applied to the INPUT. 7L5 control settings are as follows:

SPAN/DIV	0	DISPLAY A and B	ON
RESOLUTION	10 kHz	SAVE A	OFF
Display Mode	10 dB/DIV	Sweep Mode	SGL SWP
REFERENCE LEVEL	-40 dBm	Time/Div	5 ms
DOT FREQUENCY	1 MHz		

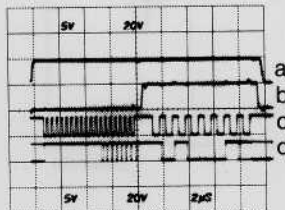
1



- a. U4085, pin 8 (Trigger)
- b. U4160, pin 7
- c. U4160, pin 9
- d. U4100, pin 8

Front panel controls same as Diagram 21, waveform 7.

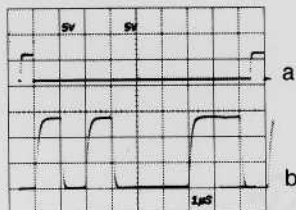
2



- a. U4085, pin 8 (Trigger)
- b. U4085, pin 3
- c. R4000, pin 6
- d. U4110, pin 4

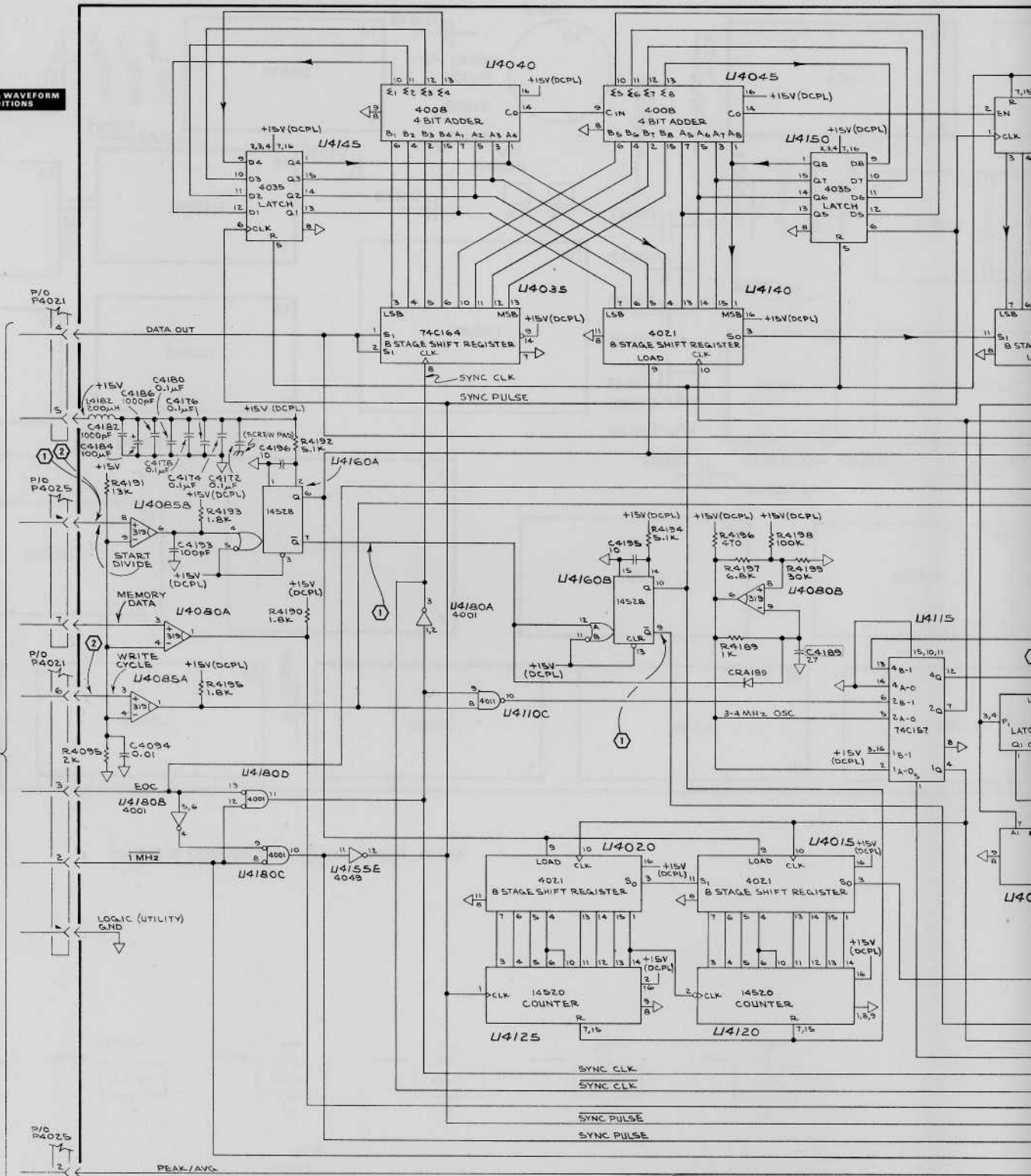
Front panel controls same as Diagram 21, waveform 7

3



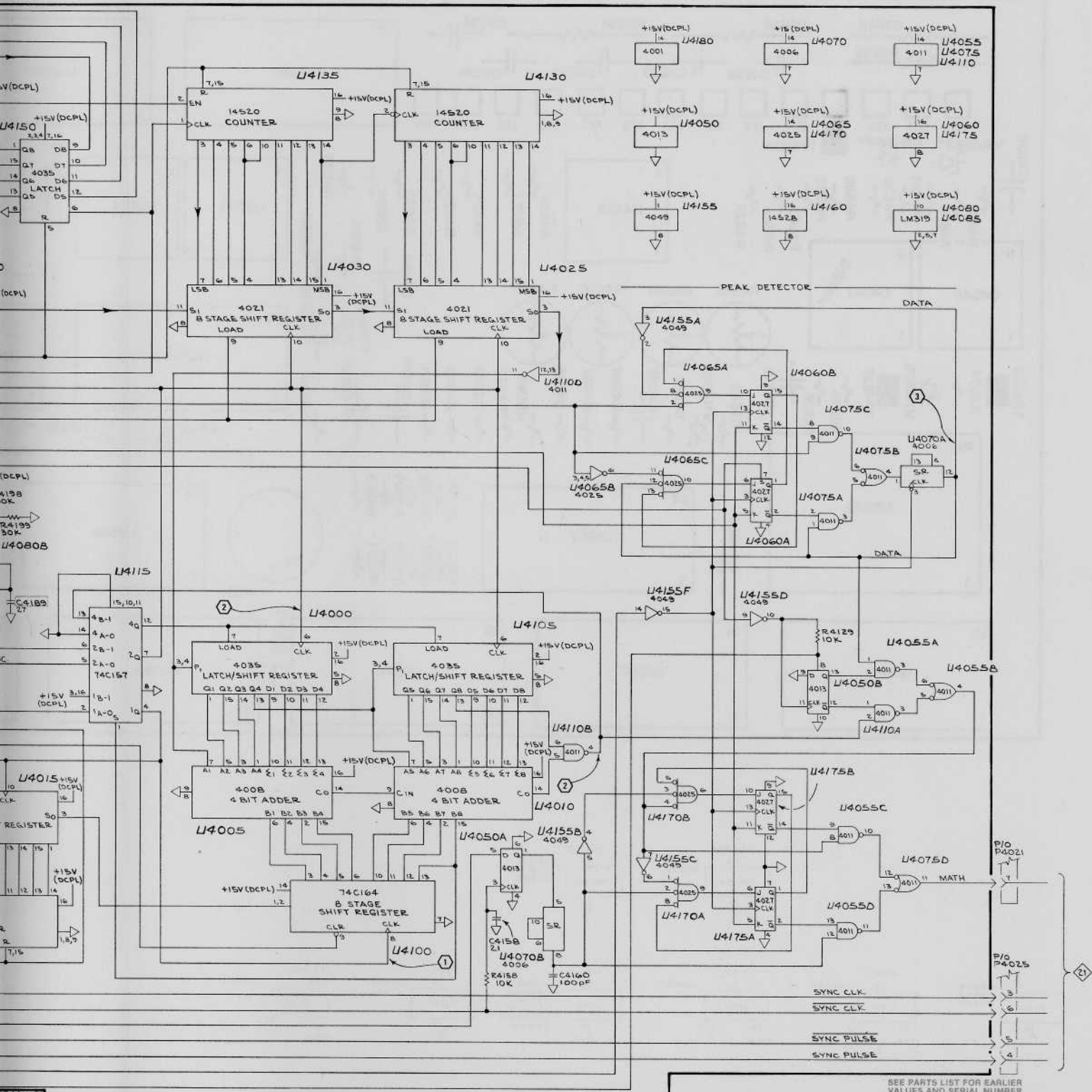
- a. Trigger SOURCE from TP4512 (Sync Pulse)
- b. U4506, pin 5 (Data Out)

VOLTAGE & WAVEFORM CONDITIONS



7L5

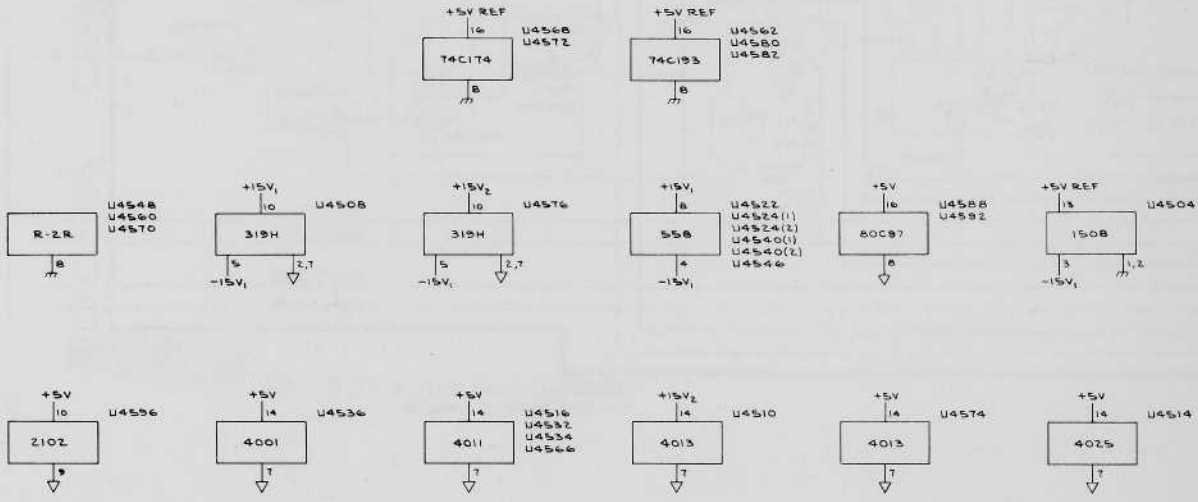
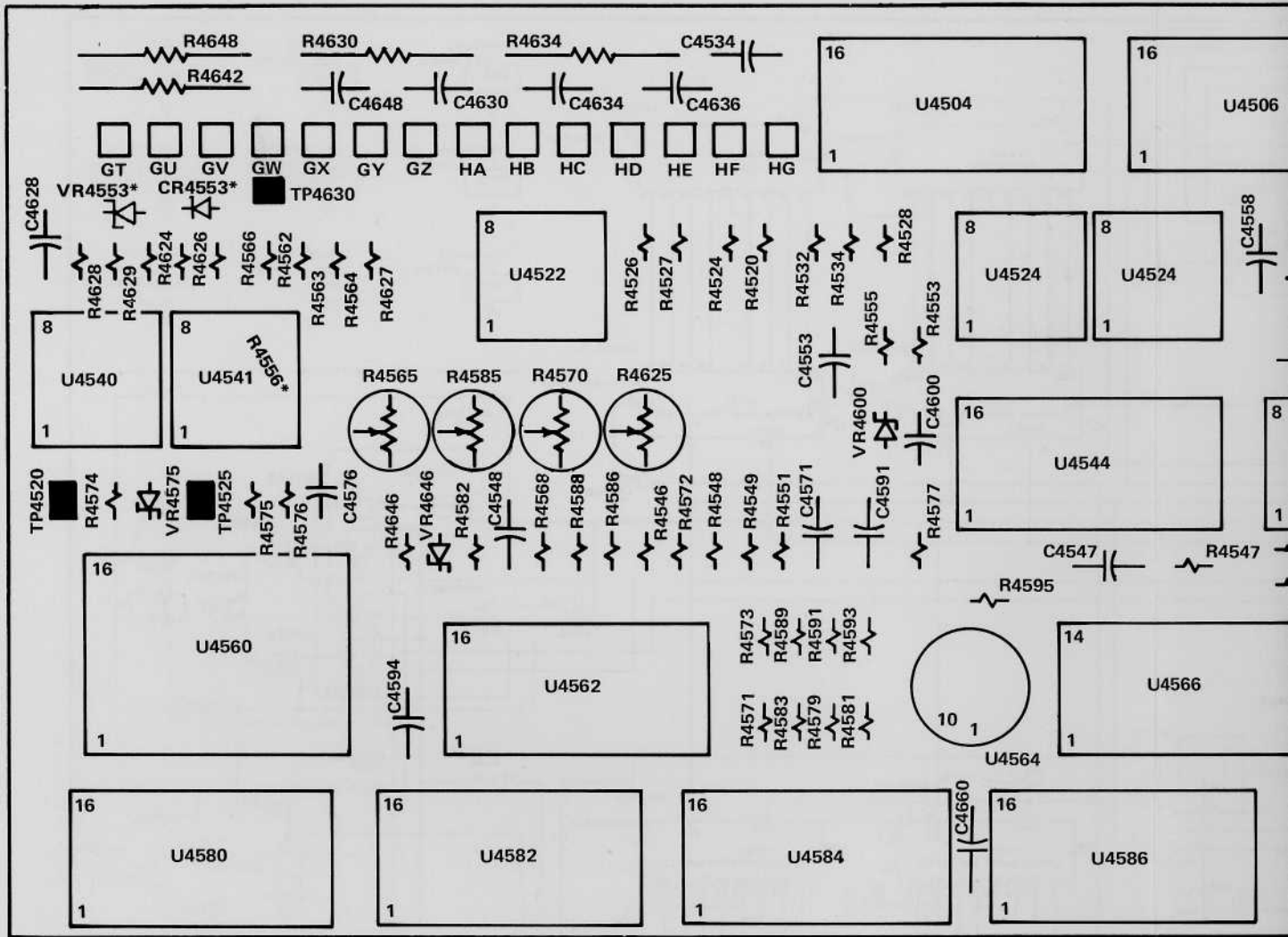
2184-60  
REV A, MAR 1979



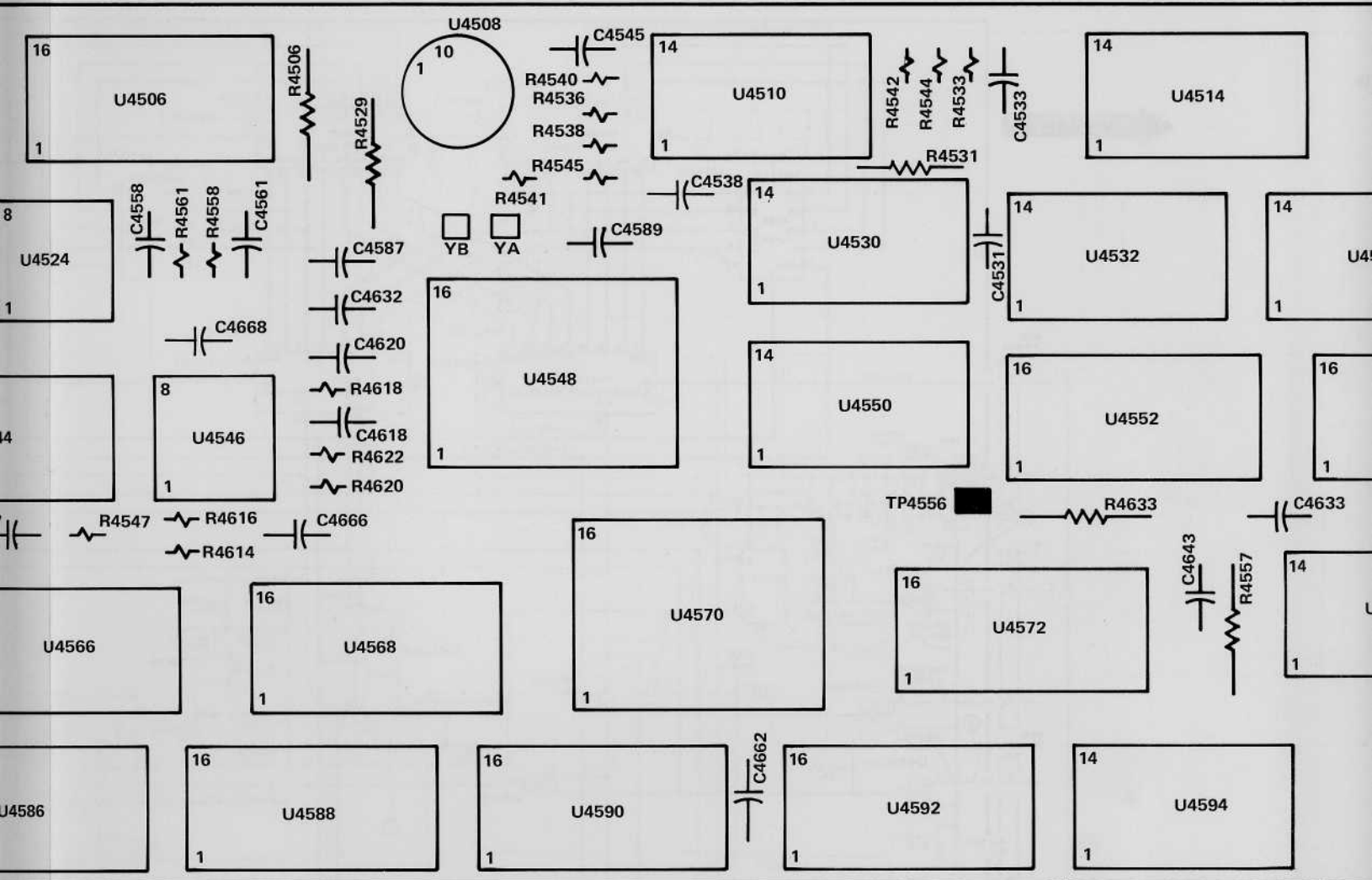
2184-40  
REV A, MAR 1979

AVERAGE CALCULATOR 20  
SN B06999 & BELOW

SEE PARTS LIST FOR EARLIER  
VALUES AND SERIAL NUMBER  
RANGES OF PARTS OUTLINED  
OR DEPICTED IN GREY.  
1175 PLM

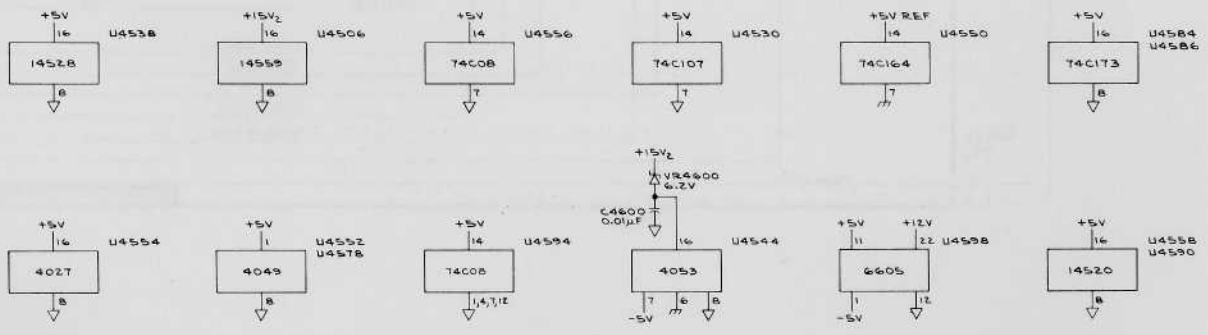


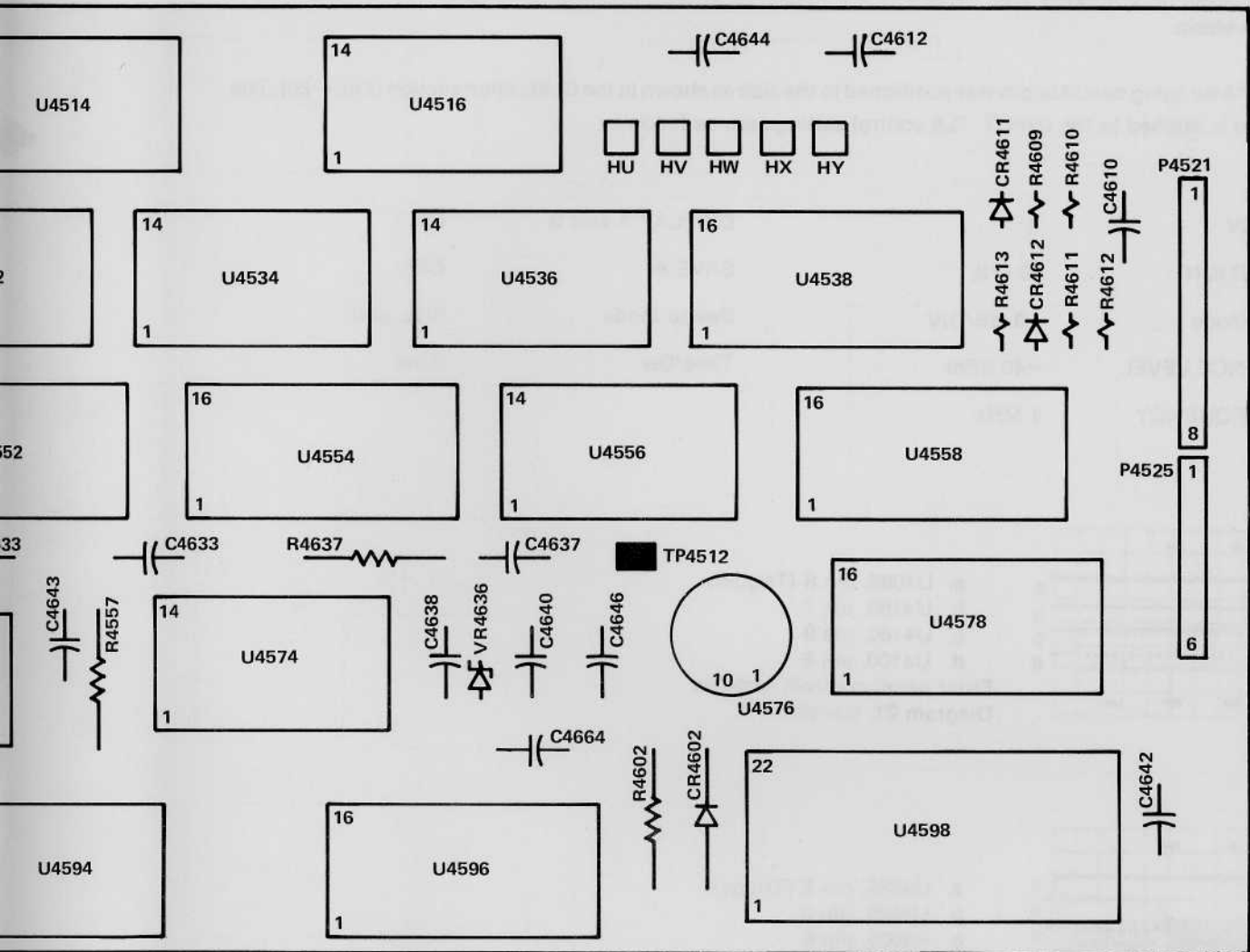




A4500 Digital Storage (SN B069999 & below).

\*See Parts List for serial number ranges





2184-66

\*See Parts List for serial number ranges.

A1A1 Front Panel component location shown on back of Diagram 1 c

A100A1 Frequency Reference Mother component location shown on back of Diagram 7

A500 Sweep component location shown on back of Diagram 2

U4584  
U4586

U4558  
U4590

Waveforms shown on this diagram were obtained under the following conditions:

The oscilloscope mainframe contained two dual trace vertical amplifiers (e.g. 7A18) and one time base unit (e.g. 7B70). Oscilloscope settings (Time/Div and Volts/Div) are indicated on the waveform. Triggering source and mode are indicated on the waveform.

The 7L5 Digital Averaging circuit board was positioned to the side as shown in the Calibration section (Fig. 4-20). The CALIBRATOR signal was applied to the INPUT.

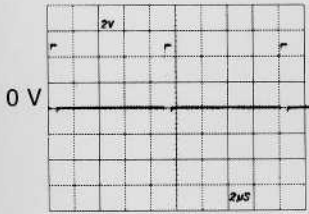
Waveforms 1, 2, 3, 4, 5 and 6; control settings are as follows:

SPAN/DIV	10 kHz
RESOLUTION	10 kHz
Display Mode	10 dB/DIV
DISPLAY A and B	ON
SAVE A	OFF
Time/Div	5 ms
DOT FREQUENCY	00.0

Waveform 7 and 8; the control settings are the same except as follows:

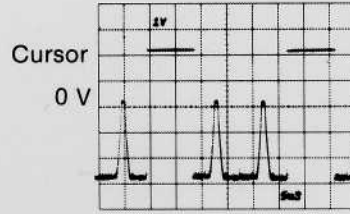
SPAN/DIV	0
REFERENCE LEVEL	-40 dBm
DOT FREQUENCY	1 MHz

1



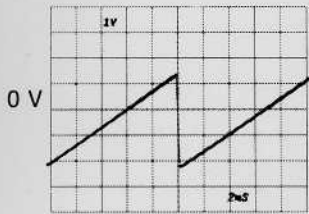
TP4512

5



Same as 4 with slow sweep

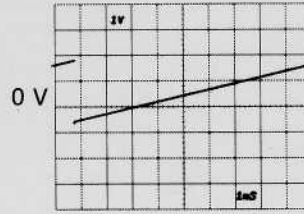
2



TP4520

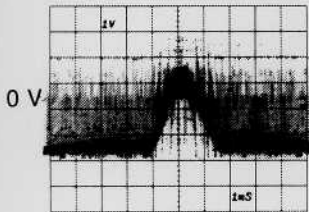
0 SPAN, 1 ms/DIV  
(Digitized Horiz Sweep)

6



U4570, pin 16  
SGL SWP ON

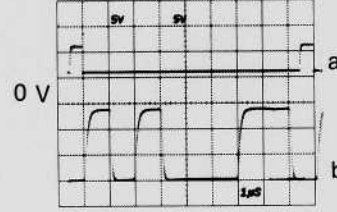
3



U4556, pin 7  
Triggered on signal at TP4556

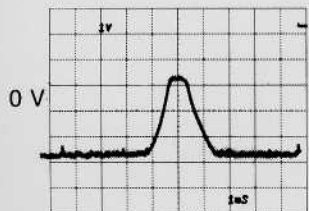
SGL SWEEP MODE

7



a. TRIGGER SOURCE from TP4512 (Sync Pulse)  
b. U4506, pin 5 (Data Out)

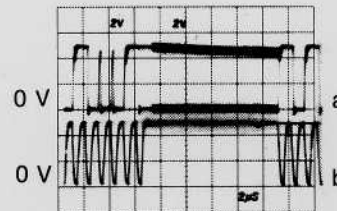
4



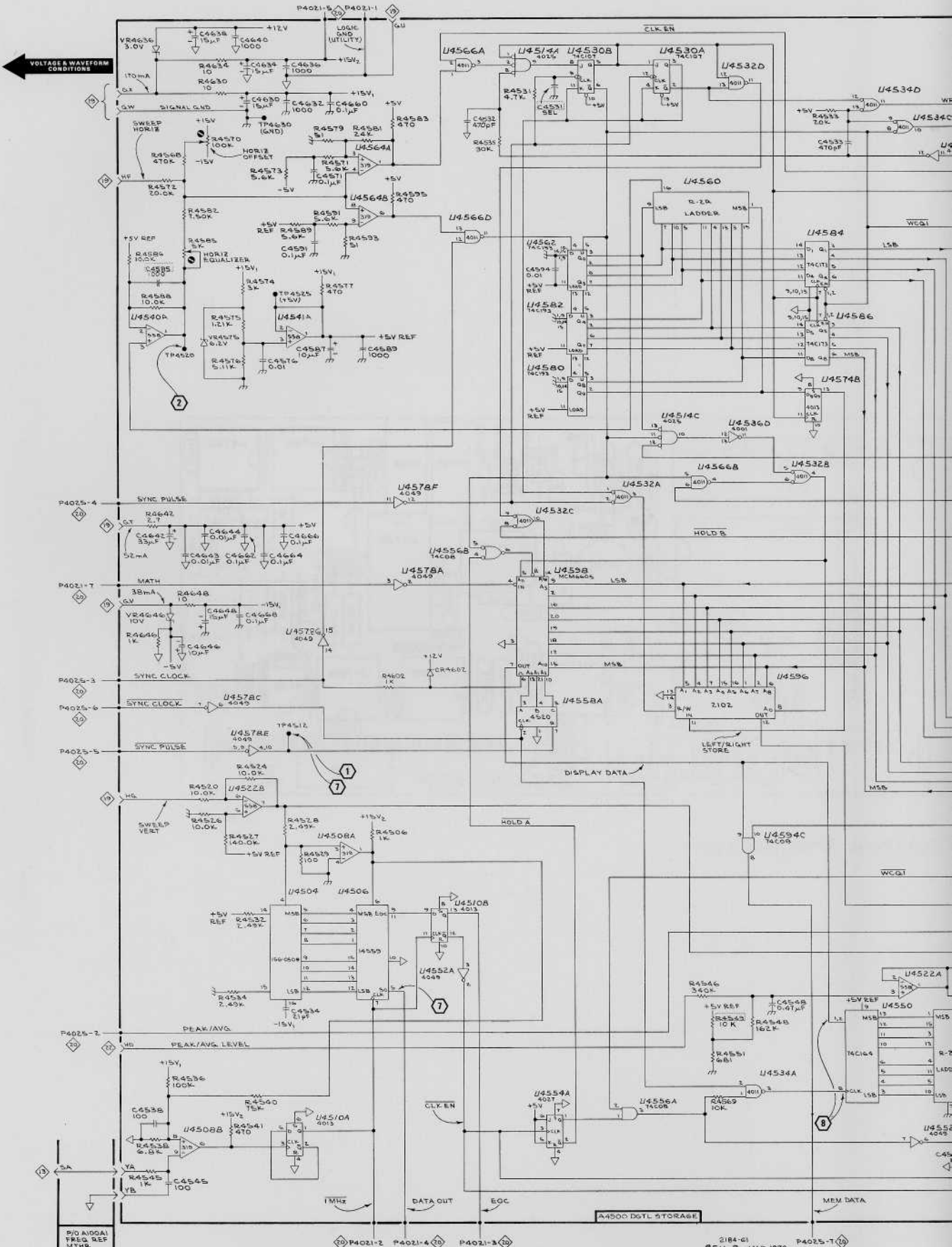
U4544, pin 14  
Triggered on TP4556

SGL SWP ON  
Cursor at top

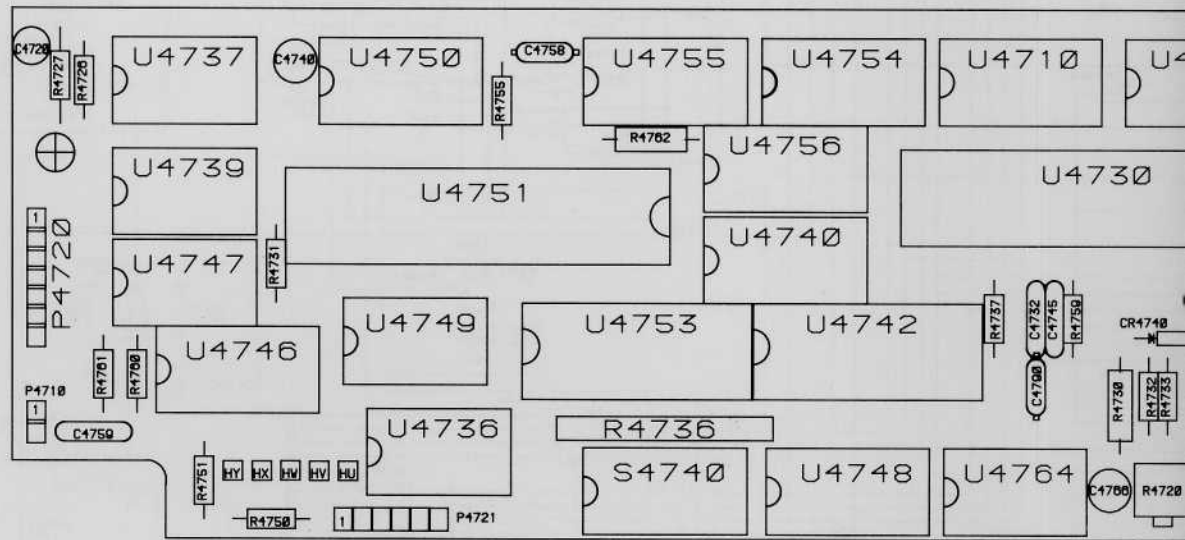
8



a. U4550, pin 1  
b. U4500, pin 8 (Trigger Source)





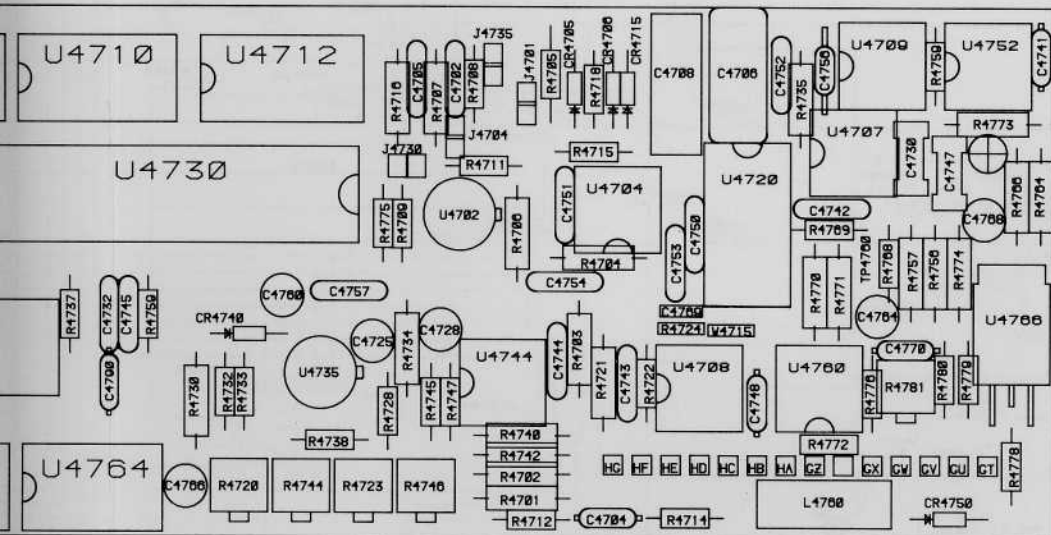


A4700 Digital Storage (SN B070000)

A1A1 Front Panel component location shown on back of Diagram 1 c

A100A1 Frequency Reference Mother component location shown on back of Diagram 7

A500 Sweep component location shown on back of Diagram 2

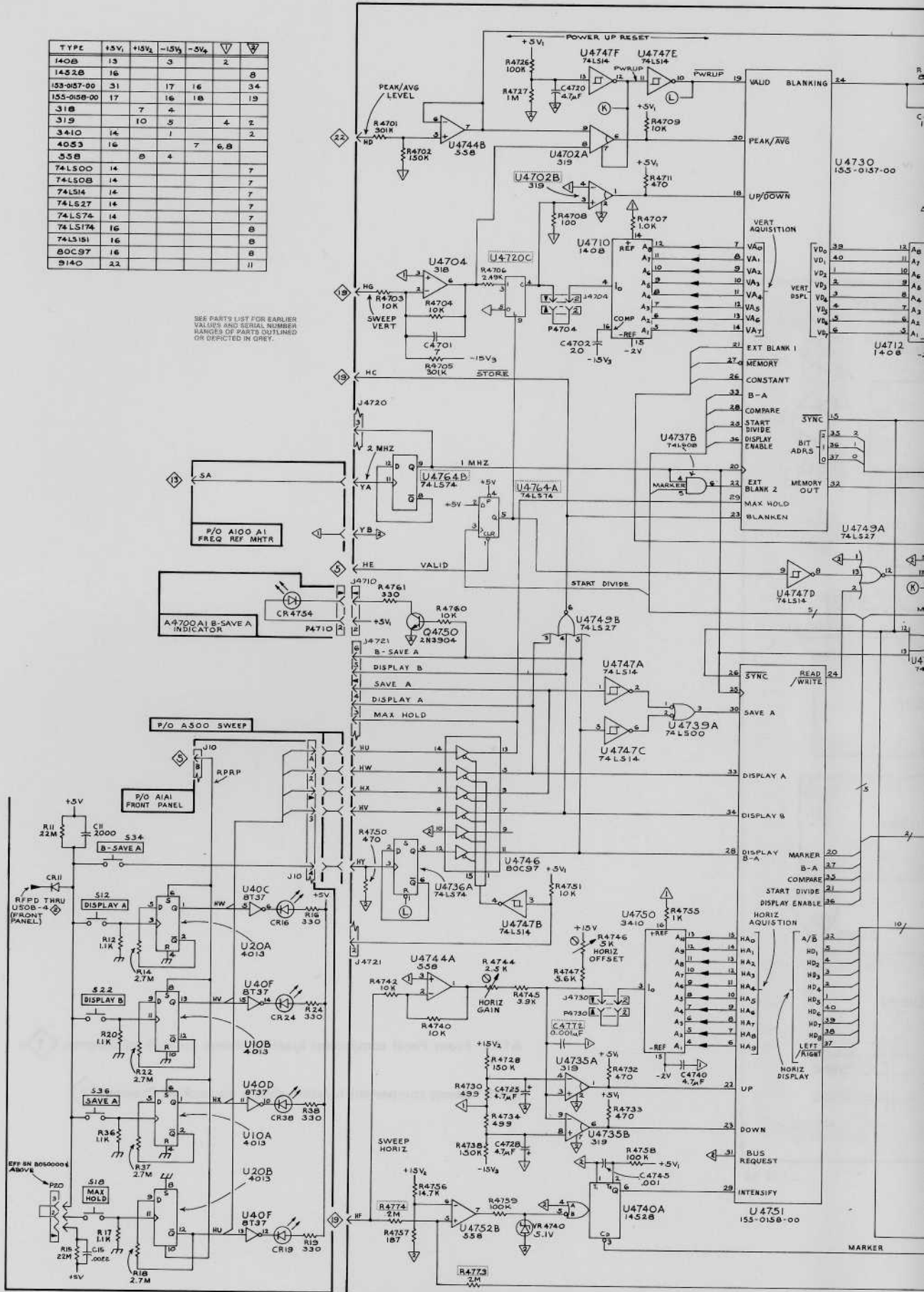


2184.91

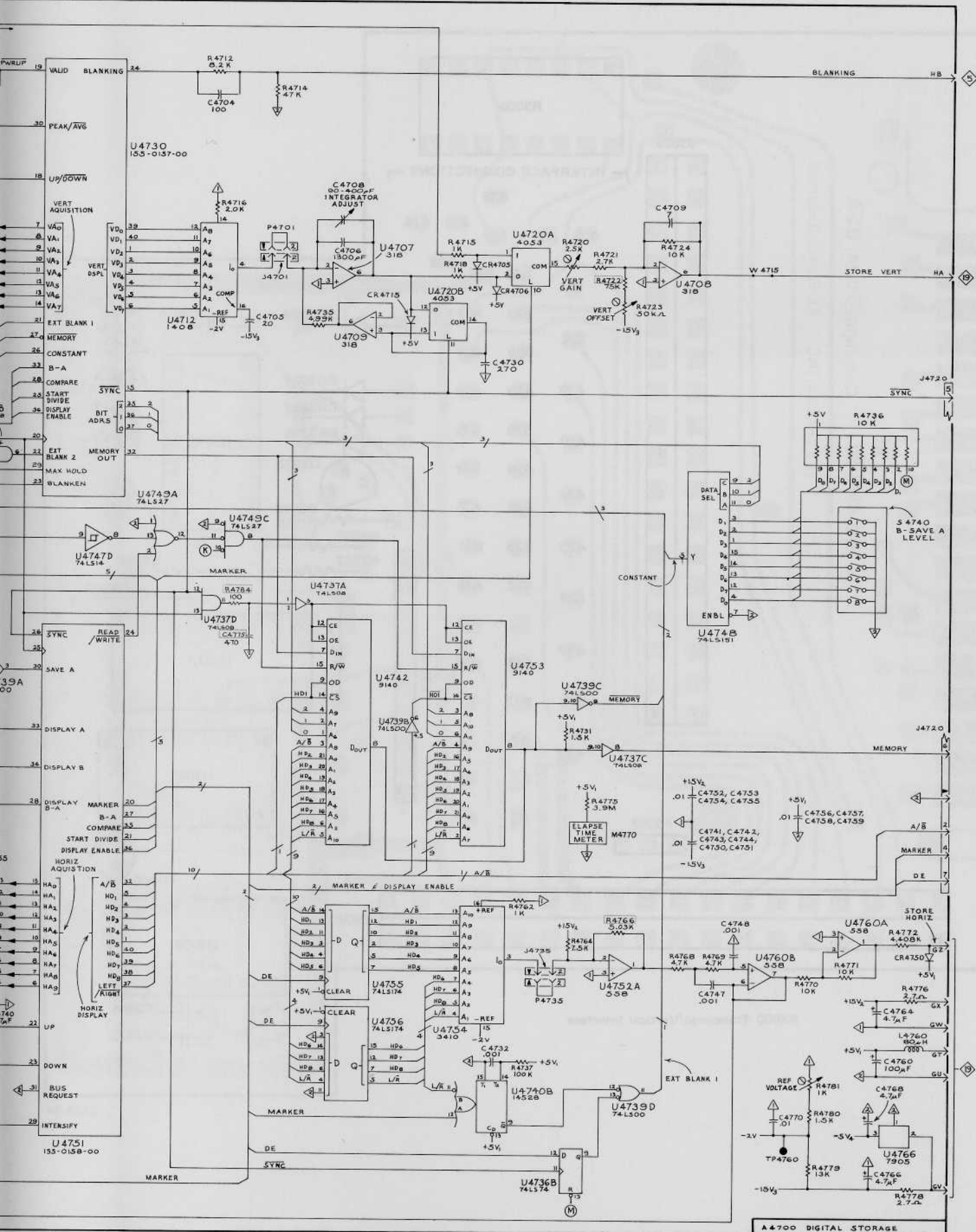
Digital Storage (SN B070000 & up)

TYPE	+5V <sub>1</sub>	+5V <sub>2</sub>	-15V <sub>2</sub>	-5V <sub>2</sub>	▽	▽
140B	13		3		2	
1452B	16					8
153-0157-00	31		17	16		34
153-0158-00	17		16	18		19
31B		7	4			
319		10	5		4	2
3410	14		1			2
4053	16			7	6,8	
55B		8	4			
74LS00	14					7
74LS0B	14					7
74LS14	14					7
74LS27	14					7
74LS74	14					7
74LS174	16					8
74LS151	16					8
80C97	16					8
9140	22					11

SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.

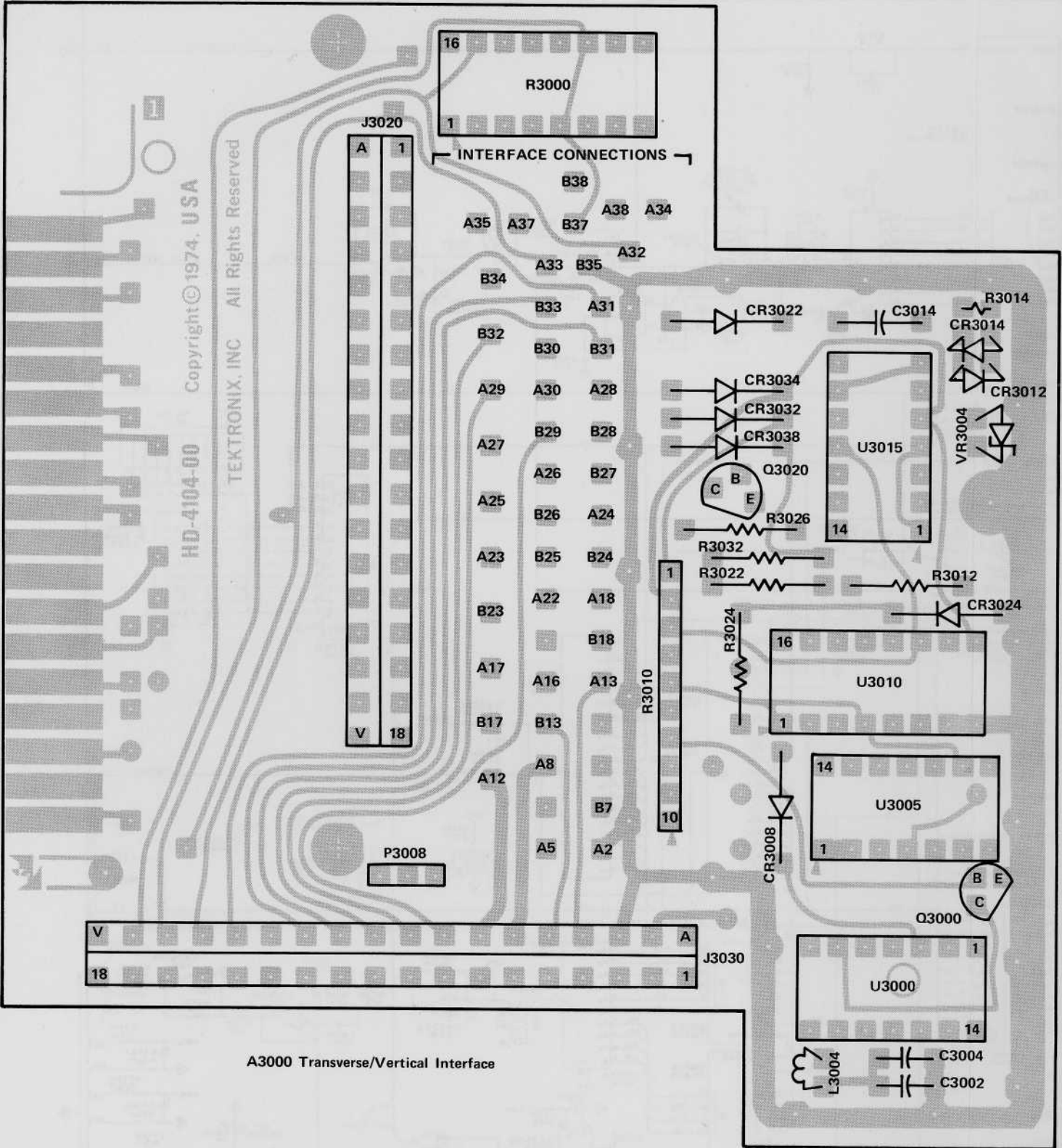




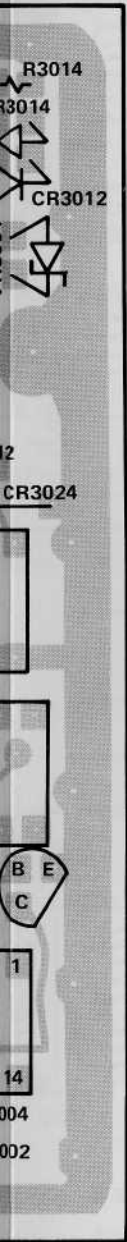


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A3000 Transverse/Vertical Interface

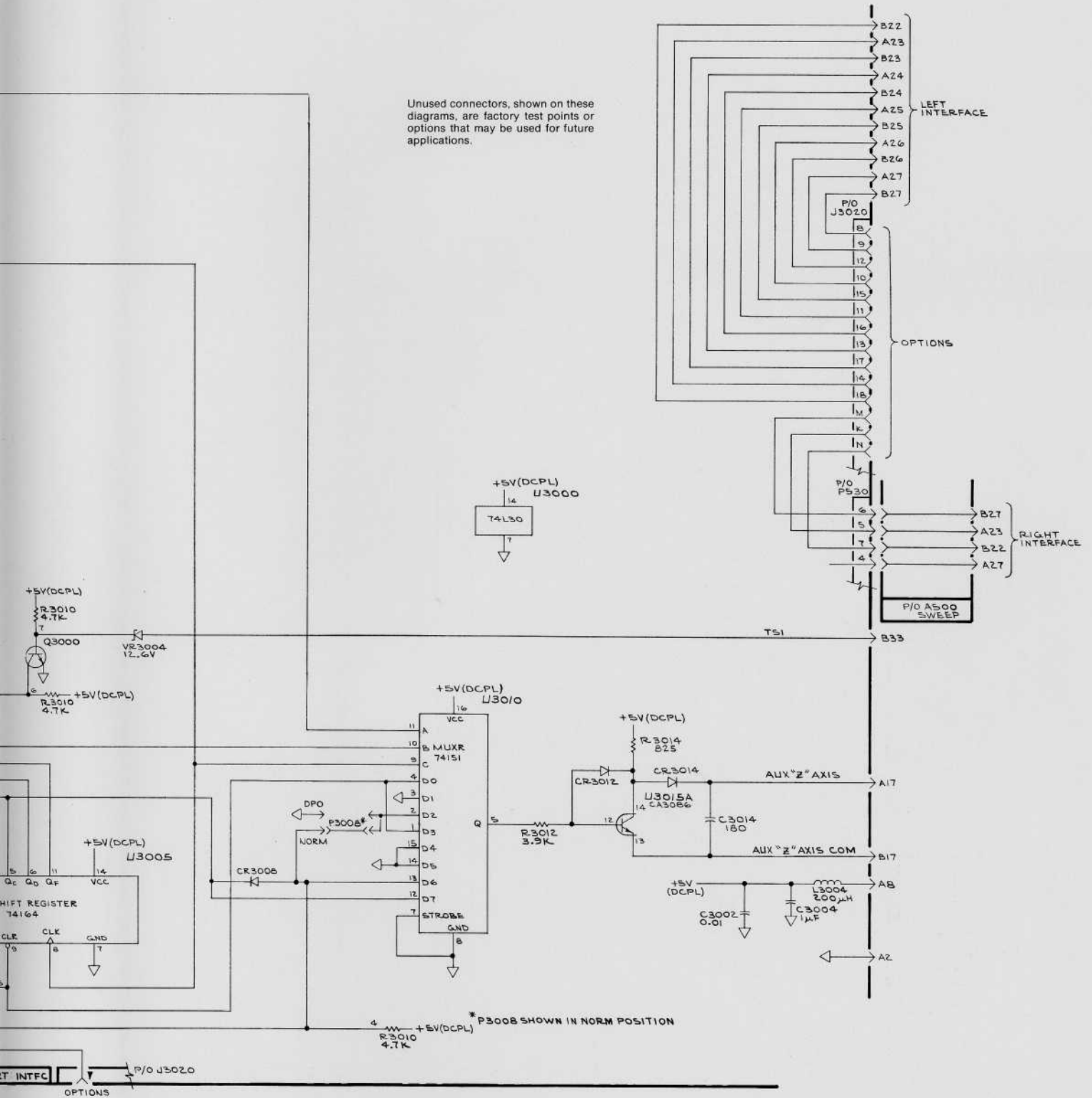


A1A1 Front Panel component location shown on back of Diagram 1 c

A500 Sweep component location shown on back of Diagram 2



Unused connectors, shown on these diagrams, are factory test points or options that may be used for future applications.



2184-62  
@

# REPLACEABLE MECHANICAL PARTS

## PARTS ORDERING INFORMATION

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

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

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

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

## SPECIAL NOTES AND SYMBOLS

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

## FIGURE AND INDEX NUMBERS

Items in this section are referenced by figure and index numbers to the illustrations.

## INDENTATION SYSTEM

This mechanical parts list is indented to indicate item relationships. Following is an example of the indentation system used in the description column.

```

1 2 3 4 5           Name & Description
Assembly and/or Component
Attaching parts for Assembly and/or Component
    --- * ---
Detail Part of Assembly and/or Component
Attaching parts for Detail Part
    --- * ---
Parts of Detail Part
Attaching parts for Parts of Detail Part
    --- * ---

```

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. The separation symbol --- \* --- indicates the end of attaching parts.

**Attaching parts must be purchased separately, unless otherwise specified.**

## ITEM NAME

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

## ABBREVIATIONS

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

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
000AH	STANDARD PRESSED STEEL CO., UNBRAKO DIV.	8535 DICE ROAD	SANTA FE SPRINGS, CA 90670
000BK	STAUFFER SUPPLY	105 SE TAYLOR	PORTLAND, OR 97214
000CY	NORTHWEST FASTENER SALES, INC.	7923 SW CIRRHUS DRIVE	BEAVERTON, OREGON 97005
0000A	LEMO USA	2015 SECOND ST.	BERKELEY, CA 94710
00779	AMP, INC.	P O BOX 3608	HARRISBURG, PA 17105
05574	VIKING INDUSTRIES, INC.	21001 NORDHOFF STREET	CHATSWORTH, CA 91311
08261	SPECTRA-STRIP CORP.	7100 LAMPSON AVE.	GARDEN GROVE, CA 92642
10389	CHICAGO SWITCH, INC.	2035 WABANSIA AVE.	CHICAGO, IL 60647
12327	FREEWAY CORPORATION	9301 ALLEN DRIVE	CLEVELAND, OH 44125
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
22599	ESNA, DIV. OF AMERACE CORPORATION	16150 STAGG STREET	VAN NUYS, CA 91409
34641	INSTRUMENT SPECIALTIES CO., INC.	1111 STANLEY DR., P O BOX 365	EULESS, TX 76039
57771	STIMPSON, EDWIN B., CO., INC.	900 SYLVAN AVENUE	BAYPORT, NY 11705
70318	ALLMETAL SCREW PRODUCTS CO., INC.	821 STEWART AVE.	GARDEN CITY, NY 11530
71279	CAMBRIDGE THERMIONIC CORP.	445 CONCORD AVE.	CAMBRIDGE, MA 02138
71785	TRW, CINCH CONNECTORS	1501 MORSE AVENUE	ELK GROVE VILLAGE, IL 60007
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
73803	TEXAS INSTRUMENTS, INC., METALLURGICAL MATERIALS DIV.	34 FOREST STREET	ATTLEBORO, MA 02703
74445	HOLO-KROME CO.	31 BROOK ST. WEST	HARTFORD, CT 06110
77250	PHEOLL MANUFACTURING CO., DIVISION OF ALLIED PRODUCTS CORP.	5700 W. ROOSEVELT RD.	CHICAGO, IL 60650
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
80756	TRW INC., RAMSEY CORPORATION	P O BOX 513	ST. LOUIS, MO 63166
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153
87308	N. L. INDUSTRIES, INC., SOUTHERN SCREW DIV.	P. O. BOX 1360	STATESVILLE, NC 28677
88245	LITTON SYSTEMS, INC., USECO DIV.	13536 SATICOY ST.	VAN NUYS, CA 91409
91260	CONNOR SPRING AND MFG. CO.	1729 JUNCTION AVE.	SAN JOSE, CA 95112
95987	WECKESSER CO., INC.	4444 WEST IRVING PARK RD.	CHICAGO, IL 60641
98159	RUBBER TECK, INC.	19115 HAMILTON AVE., P O BOX 389	GARDENA, CA 90247
98291	SEAELECTRO CORP.	225 HOYT	MAMARONECK, NY 10544
99742	PERMACEL DIV. OF JOHNSON AND JOHNSON	U. S. HIGHWAY 1	NEW BRUNSWICK, NJ 08901

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-1	384-0996-01 384-0996-02 644-0448-00	B010100 B020369 B020370	1 1 1		SHAFT,EJECTOR:PLUG-IN,W/KNOB SHAFT,EJECTOR:PLUG-IN MOD,W/KNOB REFERENCE MDL: (ATTACHING PARTS)	80009 80009 80009	384-0996-01 384-0996-02 644-0448-00
-2	213-0022-00		2		SETSCREW:4-40 X 0.188 INCH,HEX SOC STL - - - * - - -	74445	OBD
-3	386-2837-00		1		. PANEL,REAR: (ATTACHING PARTS)	80009	386-2837-00
-4	213-0192-00		5		. SCR,TPG,THD FOR:6-32 X 0.50 INCH,PNH STL	87308	OBD
-5	361-0326-00		1		. SPACER,SLEEVE:0.18 ID X 0.25 OD X 0.10"L	80009	361-0326-00
-6	211-0007-00		2		. SCREW,MACHINE:4-40 X 0.188 INCH,PNH STL - - - * - - -	83385	OBD
-7	-----		1		. CKT BOARD ASSY:TRANSV INTFC(SEE A3000A1 REPL) (ATTACHING PARTS)		
-8	211-0116-00		3		. SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS - - - * - - -	83385	OBD
-9	131-0608-00 131-0608-00	B010100 B050899 B050900	3 14		. . . CKT BOARD ASSEMBLY INCLUDES: . . . TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD . . . TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526 22526	47357 47357
-10	131-1617-01		2		. . . CONNECTOR,RCPT,:W/18-36 CONTACTS	80009	131-1617-01
-11	131-0993-00		1		. . . BUS,CONDUCTOR:2 WIRE BLACK	00779	530153-2
-12	351-0217-00		1		. GUIDE,CKT CARD:PLASTIC (ATTACHING PARTS)	80009	351-0217-00
-13	220-0556-00		4		. NUT,SLEEVE:6-32 X 0.252 OD X 0.015"L BRS	80009	220-0556-00
-14	211-0507-00		4		. SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL - - - * - - -	83385	OBD
-15	351-0217-00		1		. GUIDE,CKT CARD:PLASTIC (ATTACHING PARTS)	80009	351-0217-00
-16	220-0557-00		4		. NUT,SLEEVE:6-32 X 0.204 OD X 0.118 L BRS	80009	220-0557-00
-17	211-0507-00		4		. SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL - - - * - - -	83385	OBD
-18	129-0161-00		3		. SPACER,POST:0.86 INCH LONG,BRS	80009	129-0161-00
-19	337-2103-00		1		. REFERENCE MDL ASSY INCLUDES: . SHIELD,ELEC:REF MODULE COVER (ATTACHING PARTS)	80009	337-2103-00
-20	211-0234-00		24		. SCREW,MACHINE:2-56 X 0.188 INCH,PNH SST - - - * - - -	83385	OBD
-21	-----		1		. CKT BOARD ASSY:B DIVIDER N(SEE A100A4 REPL) (ATTACHING PARTS)		
-22	211-0162-00		4		. SCREW,MACHINE:2-56 X 0.188 INCH,SCH,SST - - - * - - -	000AH	OBD
-23	131-1425-00		1		. . . CKT BOARD ASSEMBLY INCLUDES: . . . CONTACT SET,ELE:R ANGLE,0.150" L,STR OF 36	22526	65521-136
-24	214-0579-00		2		. . . TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-25	136-0263-04		21		. . . SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-26	136-0252-07		132		. . . SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-27	131-0344-00		2		. . . TERMINAL,STUD:BIFURCATED	88245	421837-9
-28	358-0241-00		2		. . . INSULATOR,BSHG:0.05 ID X 0.125" OD,W/FLGE	88245	421565
-29	255-0569-00		FT		. . . TAPE,PRESS SENS:108 FT X 0.5 X 0.125	99742	PU25F
-30	-----		1		. CKT BOARD ASSY:"B" OSC(SEE A100A6 REPL) (ATTACHING PARTS)		
-31	211-0162-00		4		. SCREW,MACHINE:2-56 X 0.188 INCH,SCH,SST - - - * - - -	000AH	OBD
-32	214-0579-00		2		. . . CKT BOARD ASSEMBLY INCLUDES: . . . TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-33	131-1493-00		2		. . . CONTACT,ELEC:TEST POINT STRAP	80009	131-1493-00
-34	136-0252-07		57		. . . SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-35	136-0263-04		8		. . . SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-36	-----		1		. CKT BOARD ASSY:REF OSC AND CAL(SEE A100A8 REPL) (ATTACHING PARTS)		
-37	211-0162-00		2		. SCREW,MACHINE:2-56 X 0.188 INCH,SCH,SST - - - * - - -	000AH	OBD



Replaceable Mechanical Parts—7L5

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
1-	-----	-----	-	.	.	.	.	.	CKT BOARD ASSEMBLY INCLUDES:		
-38	131-1425-00		1	.	.	.	.	.	CONTACT SET,ELE:R ANGLE,0.150" L,STR OF 36	22526	65521-136
-39	136-0263-04		3	.	.	.	.	.	SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-40	214-0579-00		2	.	.	.	.	.	TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-41	131-1493-00		1	.	.	.	.	.	CONTACT,ELEC:TEST POINT STRAP	80009	131-1493-00
-42	136-0252-07		22	.	.	.	.	.	SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-43	-----	-----	1	.	.	.	.	.	CKT BOARD ASSY:1ST LO LOCK(SEE A100A5 REPL) (ATTACHING PARTS)		
-44	211-0162-00		2	.	.	.	.	.	SCREW,MACHINE:2-56 X 0.188 INCH,SCH,SST	000AH	OBD
	-----	-----	-	.	.	.	.	.	CKT BOARD ASSEMBLY INCLUDES:		
-45	337-2237-00		1	.	.	.	.	.	SHIELD,ELEC:1ST LCL OSC LOCK,BOT	80009	337-2237-00
-46	136-0263-04		8	.	.	.	.	.	SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-47	214-0579-00		2	.	.	.	.	.	TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-48	131-1493-00		1	.	.	.	.	.	CONTACT,ELEC:TEST POINT STRAP	80009	131-1493-00
-49	337-2236-00		1	.	.	.	.	.	SHIELD,ELEC:1ST LCL OSC LOCK,TOP	80009	337-2236-00
-50	136-0252-07		41	.	.	.	.	.	SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-51	-----	-----	1	.	.	.	.	.	CKT BOARD ASSY:A & B OSC CONT(SEE A100A7 REPL) (ATTACHING PARTS)		
-52	211-0162-00		4	.	.	.	.	.	SCREW,MACHINE:2-56 X 0.188 INCH,SCH,SST	000AH	OBD
	-----	-----	-	.	.	.	.	.	CKT BOARD ASSEMBLY INCLUDES:		
-53	136-0263-04		17	.	.	.	.	.	SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-54	214-0579-00		2	.	.	.	.	.	TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-55	136-0252-07		71	.	.	.	.	.	SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-56	-----	-----	1	.	.	.	.	.	CKT BOARD ASSY:"A" OSC(SEE A100A2 REPL) (ATTACHING PARTS)		
-57	211-0162-00		4	.	.	.	.	.	SCREW,MACHINE:2-56 X 0.188 INCH,SCH,SST	000AH	OBD
	-----	-----	-	.	.	.	.	.	CKT BOARD ASSEMBLY INCLUDES:		
-58	136-0252-07		29	.	.	.	.	.	SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-59	136-0263-04		9	.	.	.	.	.	SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-60	131-1493-00		2	.	.	.	.	.	CONTACT,ELEC:TEST POINT STRAP	80009	131-1493-00
-61	214-0579-00		2	.	.	.	.	.	TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-62	-----	-----	1	.	.	.	.	.	CKT BOARD ASSY:A DIVIDER N(SEE A100A3 REPL) (ATTACHING PARTS)		
-63	211-0162-00		4	.	.	.	.	.	SCREW,MACHINE:2-56 X 0.188 INCH,SCH,SST	000AH	OBD
	-----	-----	-	.	.	.	.	.	CKT BOARD ASSEMBLY INCLUDES:		
-64	136-0263-04		17	.	.	.	.	.	SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-65	136-0252-07		88	.	.	.	.	.	SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-66	131-1425-00		1	.	.	.	.	.	CONTACT SET,ELE:R ANGLE,0.150" L,STR OF 36	22526	65521-136
-67	214-0579-00		2	.	.	.	.	.	TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-68	131-0344-00		2	.	.	.	.	.	TERMINAL,STUD:BIFURCATED	88245	421837-9
-69	358-0241-00		2	.	.	.	.	.	INSULATOR,BSHG:0.05 ID X 0.125" OD,W/FLGE	88245	421565
-70	346-0032-00		1	.	.	.	.	.	STRAP,RETAINING:0.075 DIA X 4.0 L,MLD RBR	98159	2859-75-4
-71	175-1673-00		1	.	.	.	.	.	CABLE ASSY,RF:50 OHM COAX,12.5 L,YELLOW	80009	175-1673-00
-72	175-1672-00		1	.	.	.	.	.	CABLE ASSY,RF:50 OHM COAX,12.5 L,GREEN	80009	175-1672-00
-73	175-1674-00		1	.	.	.	.	.	CABLE ASSY,RF:50 OHM COAX,15.25 L	80009	175-1674-00
-74	-----	-----	1	.	.	.	.	.	CKT BOARD ASSY:MOTHER(SEE A100A1 REPL) (ATTACHING PARTS)		
-75	211-0162-00		22	.	.	.	.	.	SCREW,MACHINE:2-56 X 0.188 INCH,SCH,SST	000AH	OBD
	-----	-----	-	.	.	.	.	.	CKT BOARD ASSY INCLUDES:		
-76	131-0590-00		27	.	.	.	.	.	CONTACT,ELEC:0.71 INCH LONG	22526	47351
-77	386-1556-00		1	.	.	.	.	.	SUPPORT,CKT BD:0.215 H,ACETAL	80009	386-1556-00
-78	351-0213-00		3	.	.	.	.	.	GUIDE-POST,LOCK:0.285 INCH LONG	80009	351-0213-00
-79	131-1729-00		1	.	.	.	.	.	CONNECTOR,RCPT,:SMB SNAP-ON	98291	051-051-0219-1
-80	131-0593-00		31	.	.	.	.	.	CONTACT,ELEC:1.15 INCH LONG	22526	47354
-81	281-0752-00		7	.	.	.	.	.	CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
-82	136-0263-06		5	.	.	.	.	.	SOCKET,PIN TERM:FOR 0.025 I		
-83	337-2279-00		1	.	.	.	.	.	SHIELD,ELEC:MOTHER CARD	80009	337-2279-00
-84	131-1612-01		15	.	.	.	.	.	TERMINAL,FEEDTH:W/INSULATOR	80009	131-1612-01

Replaceable Mechanical Parts—7L5

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-85	337-2065-00			1		. SHIELD,ELEC:REF MODULE	80009	337-2065-00
-86	-----	B010100	B069999X	1		CKT BOARD ASSY:DIGITAL AVG(SEE A4000 REPL) (ATTACHING PARTS)		
-87	211-0018-00	B010100	B069999X	3		SCREW,MACHINE:4-40 X 0.875 PNH,STL - - - * - - -	83385	OBD
	-----			-		. CKT BOARD ASSY INCLUDES:		
	136-0269-02	XB020275	B069999X	10		. SKT,PL-IN ELEK:MICROCIRCUIT,14 DIP,LOW CLE	73803	CS9002-14
	136-0260-02	XB020275	B069999X	22		. SKT,PL-IN ELEK:MICROCIRCUIT,16 DIP,LOW CLE	71785	133-51-92-008
	-----			-		. CKT BOARD ASSY INCLUDES:		
-88	131-1425-00	B010100	B069999X	1		. CONTACT SET,ELE:R ANGLE,0.150" L,STR OF 36	22526	65521-136
-89	-----	B010100	B069999X	1		CKT BOARD ASSY:DIGITAL STORAGE(SEE A4500 REPL)		
-90	214-0579-00	B010100	B069999X	5		. TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-91	136-0621-00	B010100	B069999X	1		. SOCKET,PLUG-IN:22 CONTACT	73803	CS9002-22
-92	136-0260-02	B010100	B069999X	1		. SKT,PL-IN ELEK:MICROCIRCUIT,16 DIP,LOW CLE	71785	133-51-92-008
	136-0260-02	XB020275	B069999X	19		. SKT,PL-IN ELEK:MICROCIRCUIT,16 DIP,LOW CLE	71785	133-51-92-008
-93	136-0263-04	B010100	B069999X	19		. SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-94	361-0766-00	B010100	B069999X	3		. SPACER,SLEEVE:0.136 ID X 0.593 LONG,BRS	80009	361-0766-00
	136-0269-02	XB020275	B069999X	12		. SKT,PL-IN ELEK:MICROCIRCUIT,14 DIP,LOW CLE	73803	CS9002-14
	136-0514-00	XB020275	B069999X	6		. SKT,PL-IN ELEK:MICROCIRCUIT,8 DIP	73803	CS9002-8
	-----	XB070000		1		CKT BOARD ASSY:DIGITAL STORAGE(SEE A4700 REPL)		
	-----	XB070000		1		. LINK,TERM,CONNE:(SEE W4715 REPL)		
	131-0608-00	XB070000		21		. TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
	131-0787-00	XB070000		2		. CONTACT,ELEC:0.64 INCH LONG	22526	47359
	131-0993-00	XB070000		4		. BUS,CONDUCTOR:2 WIRE BLACK	00779	530153-2
	136-0252-04	XB070000	B071199	20		. SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
	136-0252-07	B071200		100		. SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
	136-0260-02	XB070000		10		. SKT,PL-IN ELEK:MICROCIRCUIT,16 DIP,LOW CLE	71785	133-51-92-008
	136-0263-04	XB070000		21		. SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
	136-0269-02	XB070000		6		. SKT,PL-IN ELEK:MICROCIRCUIT,14 DIP,LOW CLE	73803	CS9002-14
	136-0514-00	XB070000		7		. SKT,PL-IN ELEK:MICROCIRCUIT,8 DIP	73803	CS9002-8
	136-0621-00	XB070000		2		. SOCKET,PLUG-IN:22 CONTACT	73803	CS9002-22
	136-0623-00	XB070000	B071199X	2		. SOCKET,PLUG-IN:40 DIP,LOW PROFILE	73803	CS9002-40
	214-0579-00	XB070000		1		. TERM,TEST POINT:BRS CD PL	80009	214-0579-00
	-----			1		. TRANSISTOR:(SEE U4766 REPL) (ATTACHING PARTS)		
	210-0586-00	XB070000		1		. NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	OBD
	211-0008-00	XB070000		1		. SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL - - - * - - -	83385	OBD
	-----	XB070000		1		CKT BOARD ASSY:B-A LED(SEE A4700A1 REPL)		
	136-0252-04	XB070000		2		. SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
	136-0328-03	XB070000		2		. SOCKET,PIN TERM:HORIZ,SQ PIN RCPT	22526	47710
-95	-----			1		CKT BOARD ASSY:SWEEP(SEE A500 REPL) (ATTACHING PARTS)		
-96	211-0116-00			3		SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS - - - * - - -	83385	OBD
	-----			-		. CKT BOARD ASSY INCLUDES:		
-97	366-1389-00			2		. KNOB:GRAY	80009	366-1389-00
	-----			-		. . EACH KNOB INCLUDES:		
	213-0306-00			1		. . SETSCREW:2-56 X 0.062 INCH,OX STL	74445	OBD
-98	-----			1		. RESISTOR,VAR:(SEE R755 REPL) (ATTACHING PARTS)		
-99	210-0583-00			1		. NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS - - - * - - -	73743	2X20317-402
-100	-----			1		. RESISTOR,VAR:(SEE R750 REPL) (ATTACHING PARTS)		
-101	210-0583-00			1		. NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20317-402
-102	361-0387-00			1		. SPACER,RING:0.255 ID X 0.375 INCH OD - - - * - - -	80009	361-0387-00
-103	-----			1		. RESISTOR,VAR:(SEE R747 REPL) (ATTACHING PARTS)		
-104	210-0583-00			1		. NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS - - - * - - -	73743	2X20317-402
-105	407-1574-00			1		. BRACKET,VAR RES:ALUMINUM (ATTACHING PARTS)	80009	407-1574-00
-106	211-0180-00			2		. SCR,ASSEM WSHR:2-56 X 0.25 INCH,PNH BRS - - - * - - -	83385	OBD

Replaceable Mechanical Parts—7L5

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-107	136-0252-04	B010100 B071199	214	.	SOCKET, PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
	136-0252-07	B071200	254	.	SOCKET, PIN CONN:W/O DIMPLE	22526	75060-012
-108	131-0608-00	B010100 B049999	25	.	TERMINAL, PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
	131-0608-00	B050000	31	.	TERMINAL, PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-109	131-0590-00		24	.	CONTACT, ELEC:0.71 INCH LONG	22526	47351
-110	136-0260-02		1	.	SKT, PL-IN ELEK:MICROCIRCUIT, 16 DIP, LOW CLE	71785	133-51-92-008
-111	136-0263-04		28	.	SOCKET, PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-112	129-0266-00		3	.	POST, ELEC-MECH:0.515 L X 0.219 OD, 0.219 BRS	80009	129-0266-00
-113	346-0130-00	B010100 B059999X	1	.	STRAP, RETAINING:FOR 40 CONTACT SBSTR SKT	00779	350894-1
-114	136-0641-00	B010100 B059999	1	.	SOCKET, PLUG-IN:40 CONTACT	00779	1-485169-2
	136-0623-00	B060000 B071199X	1	.	SOCKET, PLUG-IN:40 DIP, LOW PROFILE	73803	CS9002-40
-115	136-0578-00		1	.	SKT, PL-IN ELEK:MICROCKT, 24 PIN, LOW PROFILE	73803	C S9002-24
-116	131-1617-01		1	.	CONNECTOR, RCPT, :W/18-36 CONTACTS	80009	131-1617-01
	131-0993-00	XB030642 B049999	1	.	BUS, CONDUCTOR:2 WIRE BLACK	00779	530153-2
	131-0993-00	B050000	2	.	BUS, CONDUCTOR:2 WIRE BLACK	00779	530153-2
	644-0451-00		1	.	RF TUBE MODULE:	80009	644-0451-00
	672-0556-00		1	.	CKT BOARD ASSY:VERTICAL CONTROL (ATTACHING PARTS)	80009	672-0556-00
-117	211-0116-00		3	.	SCR, ASSEM WSHR:4-40 X 0.312 INCH, PNH BRS	83385	OBD
	-----		-	.	----- * -----		
	-----		-	.	CKT BOARD ASSY INCLUDES:		
-118	-----		1	.	CKT BOARD ASSY:VERT CONTR(SEE A2000A2 REPL)		
-119	136-0252-04	B010100 B020274	30	.	SOCKET, PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
	136-0252-04	B020275 B071199	60	.	SOCKET, PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
	136-0252-07	B071200	100	.	SOCKET, PIN CONN:W/O DIMPLE	22526	75060-012
-120	136-0578-00		1	.	SKT, PL-IN ELEK:MICROCKT, 24 PIN, LOW PROF	73803	C S9002-24
-121	346-0130-00		1	.	STRAP, RETAINING:FOR 40 CONTACT SBSTR SKT	00779	350894-1
-122	136-0641-00	B010100 B059999	1	.	SOCKET, PLUG-IN:40 CONTACT	00779	1-485169-2
	136-0623-00	B060000 B071199X	1	.	SOCKET, PLUG-IN:40 DIP, LOW PROFILE	73803	CS9002-40
-123	136-0269-02	B010100 B071079	1	.	SKT, PL-IN ELEK:MICROCIRCUIT, 14 DIP,	73803	CS9002-14
	136-0252-04	B071080	14	.	SOCKET, PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
-124	136-0263-04		1	.	SOCKET, PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-125	-----		1	.	CKT BD ASSY:DCPL "A"(SEE A2000A2A1 REPL)		
-126	-----		1	.	CKT BD ASSY:DCPT "B"(SEE A2000A2A2 REPL)		
-127	131-1616-00		1	.	CONNECTOR, RCPT, :W/15-30 CONTACTS (ATTACHING PARTS)	05574	3VH15/1JV15
-128	210-0586-00		2	.	NUT, PL, ASSEM WA:4-40 X 0.25, STL CD PL	83385	OBD
-129	211-0018-00		2	.	SCREW, MACHINE:4-40 X 0.875 PNH, STL	83385	OBD
-130	210-1002-00		2	.	WASHER, FLAT:0.125 ID X 0.25 INCH OD, BRS	12327	OBD
-131	361-0122-00		4	.	SPACER, SLEEVE:0.125 L X 0.12 ID BRS	80009	361-0122-00
			-	.	----- * -----		
-132	342-0240-00		1	.	INSULATOR, FILM:RF TUBE, W/SELF ADH BACK	80009	342-0240-00
-133	348-0469-00	B010100 B020209	4	.	SHLD, GSKT, ELEC:0.37 WIDE W/ADH TAPE	34641	97520-A
	351-0490-00	B020210	2	.	GUIDE, SLIDE:GROUNDING (ATTACHING PARTS)	80009	351-0490-00
	210-0671-00	XB020210	4	.	EYELET, METALLIC:0.121 OD X 0.125 L, BRS	57771	GS 4-4
			-	.	----- * -----		
-134	351-0457-01	B010100 B020209	4	.	GUIDE, SLIDE:PLUG-IN, W/FOAM	80009	351-0457-01
	351-0489-00	B020210	2	.	GUIDE, SLIDE:GROUNDING (ATTACHING PARTS)	80009	351-0489-00
	210-0671-00	B020210	4	.	EYELET, METALLIC:0.121 OD X 0.125 L, BRS	57771	GS 4-4
			-	.	----- * -----		
-135	337-2099-00		1	.	SHIELD, ELEC:RF TUBE (ATTACHING PARTS)	80009	337-2099-00
-136	211-0008-00		2	.	SCREW, MACHINE:4-40 X 0.25 INCH, PNH STL	83385	OBD
			-	.	----- * -----		
-137	105-0628-00		1	.	EJECTOR, PLUG-IN:RF	80009	105-0628-00
-138	337-2095-00		1	.	SHIELD, ELEC:RF TUBE, WRAPAROUND (ATTACHING PARTS)	80009	337-2095-00
-139	211-0087-01		4	.	SCREW, MACHINE:2-56 X 0.188" 82 DEG, FLH, STL	83385	OBD
			-	.	----- * -----		
	644-0450-00		1	.	.OSC BUFFER MDL:	80009	644-0450-00
-140	214-1280-00		1	.	SPRING, HLCPS:0.14 OD X 1.126"L, 0.16"DIA W (ATTACHING PARTS)	80009	214-1280-00
-141	211-0069-00		1	.	SCREW, MACHINE:2-56 X 0.125 INCH, PNH STL	77250	OBD
			-	.	----- * -----		

Replaceable Mechanical Parts—7L5

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
1-142	337-2266-00		2	.	.	.	.	.	SHIELD,ELEC:FIRST OSCILLATOR PLATE (ATTACHING PARTS)	80009	337-2266-00
-143	211-0105-00		1	.	.	.	.	.	SCREW,MACHINE:4-40 X 0.188"100 DEG,FLH STL - - - * - - -	83385	OBD
-144	337-2094-00		1	.	.	.	.	.	SHIELD,ELEC:OSC AND BUFFER BOX COVER (ATTACHING PARTS)	80009	337-2094-00
-145	211-0069-00		8	.	.	.	.	.	SCREW,MACHINE:2-56 X 0.125 INCH,PNH STL - - - * - - -	77250	OBD
-146	-----		1	.	.	.	.	.	CKT BOARD ASSY:FIRST LO(SEE A2000A1A1 REPL) (ATTACHING PARTS)		
-147	211-0162-00		4	.	.	.	.	.	SCREW,MACHINE:2-56 X 0.188 INCH,SCH,SST - - - * - - -	000AH	OBD
-148	-----		-	.	.	.	.	.	CKT BOARD ASSY INCLUDES: MICROCIRCUIT,LI:(SEE U2035 REPL) (ATTACHING PARTS)		
-149	211-0105-00		1	.	.	.	.	.	SCREW,MACHINE:4-40 X 0.188"100 DEG,FLH - - - * - - -	83385	OBD
-150	131-1425-00		1	.	.	.	.	.	CONTACT SET,ELE:R ANGLE,0.150" L	22526	65521-136
-151	214-0579-00		2	.	.	.	.	.	TERM,TEST POINT:BR3 CD PL	80009	214-0579-00
-152	136-0252-07		30	.	.	.	.	.	SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-153	136-0263-04		5	.	.	.	.	.	SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-154	-----		1	.	.	.	.	.	CKT BD ASSY:1ST LO MOTHER(SEE A2000A1A2 REPL) (ATTACHING PARTS)		
-155	211-0162-00		8	.	.	.	.	.	SCREW,MACHINE:2-56 X 0.188 INCH,SCH,SST	000AH	OBD
-156	210-0259-00		2	.	.	.	.	.	TERMINAL,LUG:0.099"ID INT TOOTH,SE - - - * - - -	80009	210-0259-00
-157	131-0593-00		-	.	.	.	.	.	CKT BOARD ASSEMBLY INCLUDES: CONTACT,ELEC:1.15 INCH LONG	22526	47354
-158	281-0752-00		3	.	.	.	.	.	CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
-159	346-0032-00		1	.	.	.	.	.	STRAP,RETAINING:0.075 DIA X 4.0 L,MLD RBR	98159	2859-75-4
-160	131-0938-00		1	.	.	.	.	.	CONNECTOR,RCPT,:50 OHM MALE SNAP-ON	98291	051-043-0349
-161	131-1605-00		2	.	.	.	.	.	CONNECTOR,RCPT,:MALE,50 OHM,SLIDE-ON	0000A	FA 00.250
-162	175-1670-00		1	.	.	.	.	.	CABLE ASSY,RF:50 OHM COAX,5.166 LONG (ATTACHING PARTS)	80009	175-1670-00
-163	211-0069-00		1	.	.	.	.	.	SCREW,MACHINE:2-56 X 0.125 INCH,PNH STL - - - * - - -	77250	OBD
-164	337-2072-00		1	.	.	.	.	.	SHIELD,ELEC:OSC-BUFFER	80009	337-2072-00
	644-0449-00		1	.	.	.	.	.	IF MODULE: (ATTACHING PARTS)	80009	644-0449-00
-165	213-0075-00		2	.	.	.	.	.	SETSCREW:4-40 X 0.094,STL BK OXD,HEX SKT	000BK	OBD
-166	211-0101-00		2	.	.	.	.	.	SCREW,MACHINE:4-40 X 0.25" 100 DEG,FLH STL - - - * - - -	83385	OBD
-167	337-2088-00		-	.	.	.	.	.	IF MODULE ASSY INCLUDES: SHIELD,ELEC:PRE VOLTAGE REG COVER (ATTACHING PARTS)	80009	337-2088-00
-168	211-0234-00		20	.	.	.	.	.	SCREW,MACHINE:2-56 X 0.188 INCH,PNH SST - - - * - - -	83385	OBD
-169	342-0321-00		1	.	.	.	.	.	INSULATOR,FILM:POLYESTER 4/SELF ADH BACK	80009	342-0321-00
-170	337-2278-00		1	.	.	.	.	.	SHIELD,ELEC:2ND MIXER	80009	337-2278-00
-171	-----		1	.	.	.	.	.	FILTER,BANDPASS:10.7 MHZ(SEE FL1300 REPL)		
	348-0480-00		1	.	.	.	.	.	SHLD,GSKT,ELEC:30 KHZ FILTER	80009	348-0480-00
-172	131-1612-01		6	.	.	.	.	.	TERMINAL,FEEDTH:W/INSULATOR	80009	131-1612-01
-173	-----		1	.	.	.	.	.	CKT BOARD ASSY:10.7 MHZ IF AMP(SEE A1000A4 REPL) (ATTACHING PARTS)		
-174	211-0196-00		2	.	.	.	.	.	SCREW,MACHINE:4-40 X 0.188,SCH,HEX,STL - - - * - - -	000AH	OBD
-175	131-0608-00		-	.	.	.	.	.	CKT BOARD ASSEMBLY INCLUDES: TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-176	214-0579-00		2	.	.	.	.	.	TERM,TEST POINT:BR3 CD PL	80009	214-0579-00
-177	136-0252-07		7	.	.	.	.	.	SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-178	136-0263-04		4	.	.	.	.	.	SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-179	-----		1	.	.	.	.	.	CKT BD ASSY:10.7 MHZ IF FLTR INP(SEE A1000A2) (ATTACHING PARTS)		
-180	211-0196-00		2	.	.	.	.	.	SCREW,MACHINE:4-40 X 0.188,SCH,HEX,STL - - - * - - -	000AH	OBD

Replaceable Mechanical Parts—7L5

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-	-----		-	.	. . CKT BOARD ASSY INCLUDES:		
-181	131-0608-00		4	.	. . TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-182	-----		1	.	. CKT BOARD ASSY:MIXER(SEE A1000A7) (ATTACHING PARTS)		
-183	211-0196-00		3	.	. SCREW,MACHINE:4-40 X 0.188,SCH,HEX,STL	000AH	OBD
	-----		-	.	. . CKT BOARD ASSEMBLY INCLUDES:		
-184	214-0579-00		2	.	. . TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-185	136-0263-04		6	.	. . SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-186	-----		1	.	. CKT BOARD ASSY:2ND LO (SEE A1000A6) (ATTACHING PARTS)		
-187	211-0196-00		2	.	. SCREW,MACHINE:4-40 X 0.188,SCH,HEX,STL	000AH	OBD
	-----		-	.	. . CKT BOARD ASSEMBLY INCLUDES:		
-188	214-0579-00		2	.	. . TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-189	131-0608-00		2	.	. . TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-190	-----		1	.	. . MICROCIRCUIT,LI:VOLTAGE REG(SEE U1501 REPL) (ATTACHING PARTS)		
-191	211-0016-00		1	.	. . SCREW,MACHINE:4-40 X 0.625 INCH,PNH STL	83385	OBD
-192	351-0213-00	B010100 B050909	1	.	. . GUIDE-POST,LOCK:0.285 INCH LONG	80009	351-0213-00
	361-0906-00	B050910	1	.	. . SPACER,SLEEVE:0.285 L X 0.115 ID,BRASS	80009	361-0906-00
-193	136-0263-04		3	.	. . SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-194	136-0252-07		13	.	. . SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-195	136-0260-02		3	.	. . SKT,PL-IN ELEK:MICROCIRCUIT,16 DIP,LOW CLE	71785	133-51-92-008
-196	-----		1	.	. CKT BOARD ASSY:250KHZ AMP(SEE A100A5) (ATTACHING PARTS)		
-197	211-0196-00		4	.	. SCREW,MACHINE:4-40 X 0.188,SCH,HEX,STL	000AH	OBD
	-----		-	.	. . CKT BOARD ASSEMBLY INCLUDES:		
-198	136-0263-04		16	.	. . SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-199	136-0252-07		63	.	. . SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-200	214-0579-00		2	.	. . TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-201	386-3390-00		1	.	. PLATE,HEAT SINK:ALUMINUM (ATTACHING PARTS)	80009	386-3390-00
-202	211-0087-00		7	.	. SCREW,MACHINE:2-56 X 0.188 INCH,FLH SST	70318	OBD
-203	211-0112-00		1	.	. SCREW,MACHINE:2-56 X 0.375,FLH,100 DEG	83385	OBD
-204	343-0001-00		2	.	. CLAMP,LOOP:0.15 INCH DIA,PLASTIC (ATTACHING PARTS)	95987	1-8-6B
-205	211-0022-00		2	.	. SCREW,MACHINE:2-56 X 0.188 INCH,PNH STL	83385	OBD
-206	210-0850-00		2	.	. WASHER,FLAT:0.093 ID X 0.281 INCH OD	12327	OBD
-207	337-2098-00		1	.	. SHIELD,ELEC:VOLTAGE REGULATOR COVER (ATTACHING PARTS)	80009	337-2098-00
-208	211-0234-00		21	.	. SCREW,MACHINE:2-56 X 0.188 INCH,PNH SST	83385	OBD
-209	-----		1	.	. CKT BOARD ASSY:LOG LIN AMP(A1000A3 REPL) (ATTACHING PARTS)		
-210	211-0196-00		3	.	. SCREW,MACHINE:4-40 X 0.188,SCH,HEX,STL	000AH	OBD
	-----		-	.	. . CKT BOARD ASSEMBLY INCLUDES:		
-211	136-0263-04		11	.	. . SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-212	136-0252-07		106	.	. . SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-213	214-0579-00		3	.	. . TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-214	-----		1	.	. CKT BOARD ASSY:RESOLN & XTAL(SEE A1000A8 REPL)		
	-----		4	.	. . CKT BOARD ASSY:XTAL HOLDER(SEE A1000A8A2 . . REPL)		
	-----		-	.	. . EACH CIRCUIT BOARD ASSEMBLY INCLUDES:		
-215	136-0234-00		2	.	. . . SOCKET,PIN TERM:0.088 OD X 0.247 INCH L	00779	380598-1
-216	136-0328-03		2	.	. . . SOCKET,PIN TERM:HORIZ,SQ PIN RCPT	22526	47710
	342-0542-00	XB092170	1	.	. INSULATOR,PLATE:FILTER,POLYESTER	80009	342-0542-00
-217	-----		1	.	. . CKT BOARD ASSY:VAR RESOLN(SEE A1000A8A1 . . REPL) (ATTACHING PARTS)		
-218	211-0196-00		10	.	. . SCREW,MACHINE:4-40 X 0.188,SCH,HEX,STL	000AH	OBD

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-	-----						
-219	131-0608-00	B010100 B049999	15	. . .	CKT BOARD ASSEMBLY INCLUDES:		
	131-0608-00	B050000	1	. . .	TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-220	214-0579-00		5	. . .	TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-221	352-0387-00		8	. . .	HLDR,XTAL UNIT:CU BE	80009	352-0387-00
-222	131-0590-00		8	. . .	CONTACT,ELEC:0.71 INCH LONG	22526	47351
-223	337-2100-00		1	. . .	SHIELD,ELEC:FILTER TO VOLTAGE REG, TOP	80009	337-2100-00
-224	136-0252-07		117	. . .	SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-225	136-0263-04		14	. . .	SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-226	337-2142-00		1	. . .	SHIELD,ELEC:FILTER TO VOLTAGE REG,BOTTOM	80009	337-2142-00
-227	337-2096-00		1	. . .	SHIELD,ELEC:1F MODULE, RIGHT (ATTACHING PARTS)	80009	337-2096-00
-228	211-0206-00		4	. . .	SCR,CAP,SOC HD:2-56 X 0.312 INCH,STL	000AH	OBD
-229	211-0087-00		3	. . .	SCREW,MACHINE:2-56 X 0.188 INCH,FLH SST -----*	70318	OBD
-230	346-0126-00		4	. . .	STRAP,RETAINING:CU BE (ATTACHING PARTS)	80009	346-0126-00
-231	211-0069-00		4	. . .	SCREW,MACHINE:2-56 X 0.125 INCH,PNH STL -----*	77250	OBD
-232	337-2092-00		1	. . .	SHIELD,ELEC:LEFT SIDE, UPPER (ATTACHING PARTS)	80009	337-2092-00
-233	211-0087-00		2	. . .	SCREW,MACHINE:2-56 X 0.188 INCH,FLH SST	70318	OBD
-234	211-0112-00		1	. . .	SCREW,MACHINE:2-56 X 0.375,FLH,100 DEG	83385	OBD
-235	211-0162-00		1	. . .	SCREW,MACHINE:2-56 X 0.188 INCH,SCH,SST -----*	000AH	OBD
-236	337-2090-01	B010100 B091927	1	. . .	SHIELD,ELEC:LOWER LEFT,W/HINGE PIN	80009	337-2090-01
	337-2090-03	B091928	1	. . .	SHIELD,ELEC:LOWER LEFT,W/HINGE PIN (ATTACHING PARTS)	80009	337-2090-03
-237	211-0087-00		7	. . .	SCREW,MACHINE:2-56 X 0.188 INCH,FLH SST	70318	OBD
-238	211-0112-00		2	. . .	SCREW,MACHINE:2-56 X 0.375,FLH,100 DEG -----*	83385	OBD
-239	337-2093-00	B010100 B092285	2	. . .	SHIELD,ELEC:FRONT AND REAR LEFT	80009	337-2093-00
	337-2822-00	B092286	2	. . .	SHIELD,ELEC:FRONT AND REAR LEFT (ATTACHING PARTS)	80009	337-2822-00
-240	211-0087-00		4	. . .	SCREW,MACHINE:2-56 X 0.188 INCH,FLH SST -----*	70318	OBD
-241	342-0315-00		4	. . .	INSULATOR,FILM:CKT BD,BOTTOM,W/SELF ADH B	80009	342-0315-00
-242	342-0316-00		1	. . .	INSULATOR,FILM:CKT BOARD, TOP,W/SELF ADH B	80009	342-0316-00
-243	337-2091-00		1	. . .	SHIELD,ELEC:LOG LIN TO FILTER (ATTACHING PARTS)	80009	337-2091-00
-244	211-0087-00		5	. . .	SCREW,MACHINE:2-56 X 0.188 INCH,FLH SST -----*	70318	OBD
-245	337-2089-00		1	. . .	SHIELD,ELEC:LOG LIN TO VOLTAGE REG (ATTACHING PARTS)	80009	337-2089-00
-246	211-0087-00		2	. . .	SCREW,MACHINE:2-56 X 0.188 INCH,FLH SST -----*	70318	OBD
-247	131-1612-01		2	. . .	TERMINAL,FEEDTH:W/INSULATOR	80009	131-1612-01
-248	-----		1	. . .	CKT BOARD ASSY:I.F. MOTHER(SEE A1000A1 REPL)		
-249	129-0106-00		13	. . .	POST,ELEC-MECH:0.218 OD X 0.125 INCH L,RRS	80009	129-0106-00
-250	131-0591-00		30	. . .	CONTACT,ELEC:0.835 INCH LONG	22526	47352
-251	131-0608-00		34	. . .	TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-252	131-0593-00		3	. . .	CONTACT,ELEC:1.15 INCH LONG	22526	47354
-253	281-0752-00		3	. . .	CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
-254	131-0595-00		2	. . .	CONTACT,ELEC:1.37 INCH LONG	22526	47355
-255	175-1667-00		1	. . .	CA ASSY,SP,ELEC:2ND LO TO REFO SC	80009	175-1667-00
-256	175-1668-00		1	. . .	CA ASSY,SP,ELEC:2ND LO TO REFO SC	80009	175-1668-00
-257	175-1669-00		1	. . .	CA ASSY,SP,ELEC:10.7 MHZ TO OSC BUFFER	80009	175-1669-00
	614-0559-00		1	. . .	FRONT PNL ASSY:	80009	614-0559-00
-258	366-1610-02		1	. . .	KNOB:GRAY--DOT MKR	80009	366-1610-02
	213-0153-00		1	. . .	SETSCREW:5-40 X 0.125,STL BK OXD,HEX	000CY	OBD
-259	366-1007-02		1	. . .	KNOB:GRAY	80009	366-1007-02
	213-0153-00		2	. . .	SETSCREW:5-40 X 0.125,STL BK OXD,HEX	000CY	OBD
-260	366-1610-01		1	. . .	KNOB:GRAY--VAR	80009	366-1610-01
	213-0153-00		1	. . .	SETSCREW:5-40 X 0.125,STL BK OXD,HEX	000CY	OBD

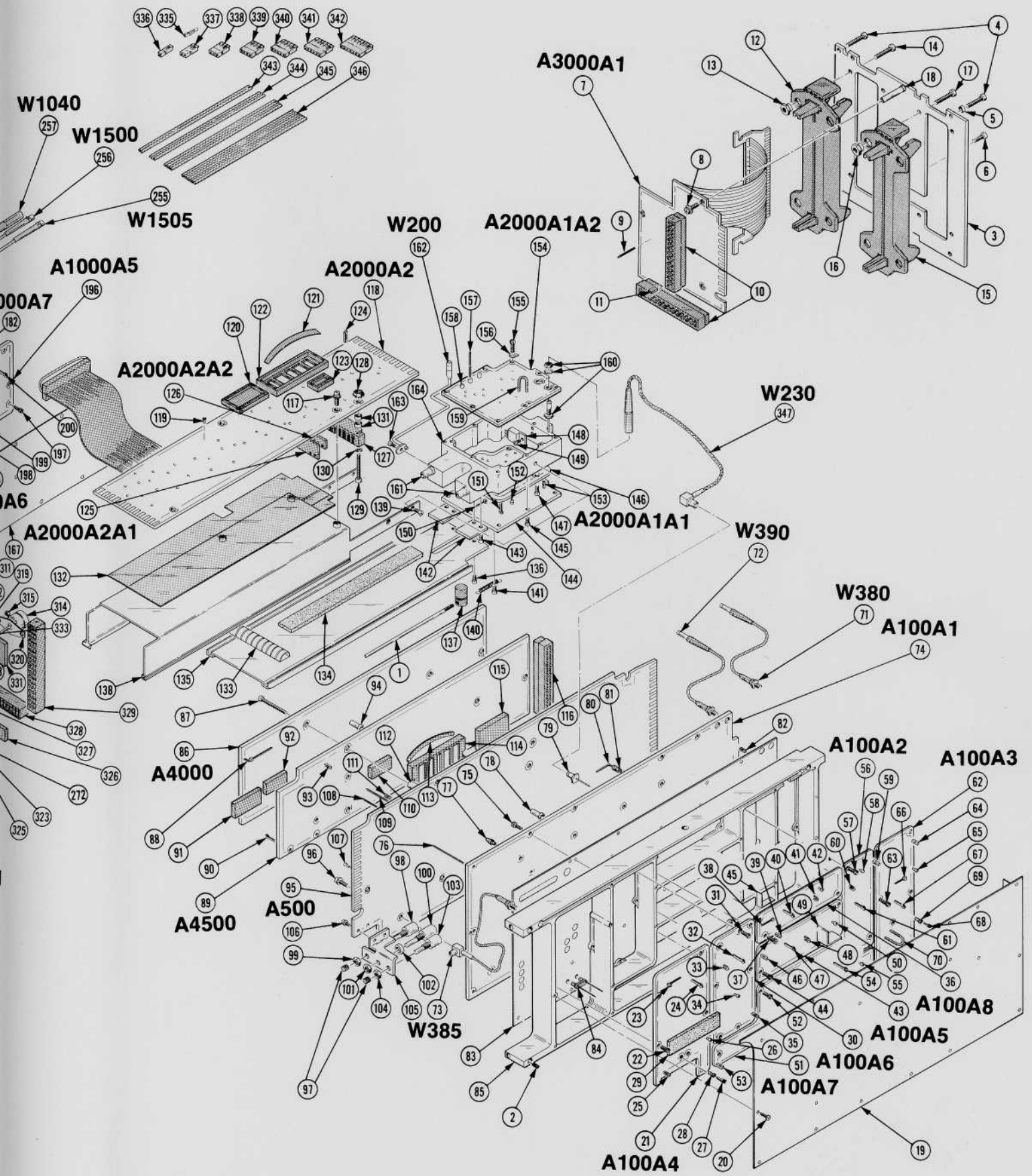
**Replaceable Mechanical Parts—7L5**

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
1-261	366-1007-04		1	.					KNOB:GRAY	80009	366-1007-04
	213-0153-00		2	.	.	.	.	.	SETSCREW:5-40 X 0.125,STL BK OXD,HEX	000CY	OBD
-262	366-0494-00		2	.					KNOB:GRAY WITH SETSCREW	80009	366-0494-00
	-----		-	.	.	.	.	.	EACH KNOB INCLUDES:UDES:		
	213-0153-00		1	.	.	.	.	.	SETSCREW:5-40 X 0.125,STL BK OXD,HEX	000CY	OBD
-263	358-0301-00		3	.					BUSHING,SLEEVE:FOR 0.185 DIA HOLE,GRAY	80009	358-0301-00
	358-0534-00		1	.					BUSHING,SLEEVE:0.156 ID X 0.25 L,0.375 OD	80009	358-0534-00
-264	366-1058-63		1	.					KNOB:LATCH--7L5	80009	366-1058-63
									(ATTACHING PARTS)		
-265	214-1095-00		1	.					PIN,SPG,SPLIT:0.094 OD X 0.187 INCH LONG	22599	52-022-094-0187
									-----*		
	105-0076-02	B010100 B030639	1	.					REL BAR,LATCH:PLUG-IN UNIT	80009	105-0076-02
-266	105-0076-00	B030640	1	.					REL BAR,LATCH:PLUG-IN UNIT	80009	105-0076-00
-267	214-1280-00		1	.					SPRING,HLCPS:0.14 OD X 1.126"L,0.16"DIA W	80009	214-1280-00
									(ATTACHING PARTS)		
-268	211-0069-00		1	.					SCREW,MACHINE:2-56 X 0.125 INCH,PNH STL	77250	OBD
									-----*		
-269	-----		1	.					SWITCH,ROTARY:RES AND SPAN(SEE A1A2 REPL)		
									(ATTACHING PARTS)		
-270	211-0007-00		2	.					SCREW,MACHINE:4-40 X 0.188 INCH,PNH STL	83385	OBD
									-----*		
-271	-----		1	.					SWITCH,ROTARY:SWEEP TIME(SEE A1A3)		
									(ATTACHING PARTS)		
-272	211-0007-00		2	.					SCREW,MACHINE:4-40 X 0.188 INCH,PNH STL	83385	OBD
									-----*		
-273	333-1936-00	B010100 B069999	1	.					PANEL,FRONT:	80009	333-1936-00
	333-1936-01	B070000	1	.					PANEL,FRONT:	80009	333-1936-01
-274	426-1181-00		1	.					FR,PLUG-IN MOD:	80009	426-1181-00
-275	348-0235-00		2	.					SHLD GSKT,ELEC:4.734 INCH LONG	80009	348-0235-00
-276	351-0432-00		1	.					GUIDE POST:LOWER	80009	351-0432-00
									(ATTACHING PARTS)		
-277	211-0105-00		1	.					SCREW,MACHINE:4-40 X 0.188"100 DEG,FLH STL	83385	OBD
									-----*		
-278	351-0430-00		1	.					GUIDE POST:UPPER	80009	351-0430-00
									(ATTACHING PARTS)		
-279	211-0105-00		1	.					SCREW,MACHINE:4-40 X 0.188"100 DEG,FLH STL	83385	OBD
									-----*		
-280	136-0387-00		3	.					JACK,TIP:GRAY	71279	450-4352-01-0318
-281	103-0180-01		1	.					ADAPTER,CONN:FEMALE,BNC	80009	103-0180-01
-282	352-0157-00		1	.					LAMPHOLDER:WHITE PLASTIC	80009	352-0157-00
-283	426-1180-00		1	.					FR SECT,PLUG-IN:UPPER LEFT	80009	426-1180-00
									(ATTACHING PARTS)		
-284	213-0192-00		2	.					SCR,TPG,THD FOR:6-32 X 0.50 INCH,PNH STL	87308	OBD
									-----*		
-285	-----		1	.					RESISTOR,VAR:(SEE R55 REPL)		
									(ATTACHING PARTS)		
-286	210-0583-00		1	.					NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20317-402
									-----*		
-287	-----		1	.					RESISTOR,VAR:(SEE R65 REPL)		
-288	210-0046-00		1	.					WASHER,LOCK:0.261 ID,INTL,0.018 THK,BRS	78189	1214-05-00-0541C
-289	-----		1	.					RESISTOR,VAR:(SEE R95,S96 REPL)		
									(ATTACHING PARTS)		
-290	210-0583-00		1	.					NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20317-402
									-----*		
-291	426-1179-00		1	.					FR SECT,PLUG-IN:LOWER LEFT	80009	426-1179-00
									(ATTACHING PARTS)		
-292	213-0192-00		2	.					SCR,TPG,THD FOR:6-32 X 0.50 INCH,PNH STL	87308	OBD
									-----*		
-293	214-1054-00		1	.					SPRING,FLAT:0.825 X 0.322,SST	80009	214-1054-00
-294	105-0075-00		1	.					BOLT,LATCH:7A & 7B SER PL-IN	80009	105-0075-00
-295	263-0019-00	B010100 B069999	15	.					SWITCH PB ASSY:MOMENTARY	80009	263-0019-00
	263-0019-00	B070000	16	.					SWITCH PB ASSY:MOMENTARY	80009	263-0019-00
-296	376-0161-00		1	.					COUPLER,SWITCH:0.157 ID X 0.562 OD,FEMALE	80009	376-0161-00
									(ATTACHING PARTS)		
-297	354-0272-00		1	.					RING,RETAINING:0.467 ID X 0.018 THICK	80756	US50CI
									-----*		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-298	354-0518-00		1	.	RING, ROT SW: SLIP (ATTACHING PARTS)	80009	354-0518-00
-299	211-0087-01		1	.	SCREW, MACHINE: 2-56 X 0.188" 82 DEG, FLH, STL - - - * - - -	83385	OBD
-300	214-0660-00		1	.	PIN, STR, HDLS: 0.062 OD X 0.312" LONG, STL	22599	59-012-062-0312
-301	376-0162-00		1	.	COUPLER, SWITCH: 0.157 ID X 0.50 OD, MALE (ATTACHING PARTS)	80009	376-0162-00
-302	213-0022-00		1	.	SETSCREW: 4-40 X 0.188 INCH, HEX SOC STL - - - * - - -	74445	OBD
-303	214-2254-00		1	.	SPRING, DETENT: 0.59 ID X 0.09 HIGH	91260	OBD
-304	214-1127-00		1	.	ROLLER, DETENT: 0.125 DIA X 0.125 INCH L	80009	214-1127-00
-305	214-1579-00		1	.	SPRING, DETENT: 0.59 ID X 0.08 W X 0.01 THK	80009	214-1579-00
-306	214-1127-00		1	.	ROLLER, DETENT: 0.125 DIA X 0.125 INCH L	80009	214-1127-00
-307	380-0244-00		2	.	HOUSING, SWITCH: POLYCARBONATE (ATTACHING PARTS)	80009	380-0244-00
-308	210-0405-00		2	.	NUT, PLAIN, HEX.: 2-56 X 0.188 INCH, BRS - - - * - - -	73743	2X12157-402
-309	384-0994-04		1	.	SHAFT, ROTARY SW: W/16 POSN DETENT AND CONT	80009	384-0994-04
-310	384-0994-03		1	.	SHAFT, ROTARY SW: W/32 POSN DETENT AND CONT	80009	384-0994-03
-311	-----		1	.	RESISTOR, VAR: (SEE R50 REPL) (ATTACHING PARTS)		
-312	210-0405-00		2	.	NUT, PLAIN, HEX.: 2-56 X 0.188 INCH, BRS	73743	2X12157-402
-313	213-0202-00		2	.	SCREW, MACHINE: 2-56 X 0.625 INCH, FLH STL - - - * - - -	83385	OBD
-314	-----		1	.	RESISTOR, VAR: (SEE R45, S45 REPL) (ATTACHING PARTS)		
-315	210-0405-00		2	.	NUT, PLAIN, HEX.: 2-56 X 0.188 INCH, BRS	73743	2X12157-402
-316	213-0202-00		2	.	SCREW, MACHINE: 2-56 X 0.625 INCH, FLH STL - - - * - - -	83385	OBD
-317	200-1232-00		2	.	COVER, RTRY SW: CIRCUIT BOARD	80009	200-1232-00
-318	401-0127-02		2	.	ROTOR-CONT ASSY: DELRIN, W/O CONTACTS	80009	401-0127-02
-319	129-0301-00		4	.	POST, ELEC-MECH: 0.156 HEX X 0.312 L, BRS	80009	129-0301-00
-320	386-2029-00		2	.	PL, VAR RES MTG: ALUMINUM	80009	386-2029-00
-321	384-0995-01		1	.	SHAFT, SLIDE SW: 0.125 OD X 0.866" L, W/PINS	80009	384-0995-01
-322	-----		1	.	CKT BOARD ASSY: FRONT PANEL (SEE A1A1 REPL) (ATTACHING PARTS)		
-323	211-0116-00		7	.	SCR, ASSEM WSHR: 4-40 X 0.312 INCH, PNH BRS - - - * - - -	83385	OBD
-324	-----		-	.	CKT BOARD ASSY INCLUDES:		
-324	351-0442-00		1	.	SLIDE, DR, MECH: TIME/DIV SWITCH	80009	351-0442-00
-325	136-0252-07		15	.	SOCKET, PIN CONN: W/O DIMPLE	22526	75060-012
-326	136-0269-02		4	.	SKT, PL-IN ELEK: MICROCIRCUIT, 14 DIP, LOW CLE	73803	CS9002-14
-327	136-0263-04		13	.	SOCKET, PIN TERM: FOR 0.025 INCH SQUARE PIN	22526	75377-001
-328	131-1617-01		1	.	CONNECTOR, RCPT: W/18-36 CONTACTS	80009	131-1617-01
-329	131-1606-01		1	.	CONNECTOR, RCPT: W/22-44 CONTACTS	80009	131-1606-01
-330	131-0608-00	B010100 B049999	24	.	TERMINAL, PIN: 0.365 L X 0.025 PH BRZ GOLD	22526	47357
	131-0608-00	B050000	29	.	TERMINAL, PIN: 0.365 L X 0.025 PH BRZ GOLD	22526	47357
	131-0993-00	XB050000	2	.	BUS, CONDUCTOR: 2 WIRE BLACK	00779	530153-2
	131-2193-00	XB050900	30	.	TERMINAL, PIN: BRASS	80009	131-2193-00
-331	136-0260-02		2	.	SKT, PL-IN ELEK: MICROCIRCUIT, 16 DIP, LOW CLE	71785	133-51-92-008
-332	407-1572-00		1	.	BRACKET, ELEC SW: BRASS, CU-SN PL	80009	407-1572-00
-333	260-0960-01		1	.	SWITCH, SLIDE: 0.5A, 120VDC, CKT BD MT	10389	23-021-043
-334	386-1858-08		1	.	SUBPANEL, FRONT:	80009	386-1858-08
-335	131-0707-00		54	.	CONNECTOR, TERM.: 22-26 AWG, BRS& CU BE GOLD	22526	47439
-336	352-0171-00		8	.	HLDR, TERM CONN: 1 WIRE BLACK	80009	352-0171-00
-337	352-0169-00		1	.	HLDR, TERM CONN: 2 WIRE BLACK	80009	352-0169-00
-338	352-0161-00		3	.	HLDR, TERM CONN: 3 WIRE BLACK	80009	352-0161-00
-339	352-0162-00		2	.	HLDR, TERM CONN: 4 WIRE BLACK	80009	352-0162-00
-340	352-0163-00		1	.	CONN BODY, PL, EL: 5 WIRE BLACK	80009	352-0163-00
-341	352-0164-00		1	.	CONN BODY, PL, EL: 6 WIRE BLACK	80009	352-0164-00
-342	352-0165-01		1	.	CONN BODY, PL, EL: 7 WIRE BROWN	80009	352-0165-01
	352-0165-05		1	.	CONN BODY, PL, EL: 7 WIRE GREEN	80009	352-0165-05
-343	175-0825-00		FT	.	WIRE, ELECTRICAL: 2 WIRE RIBBON	80009	175-0825-00
-344	175-0826-00		FT	.	WIRE, ELECTRICAL: 3 WIRE RIBBON	80009	175-0826-00
-345	175-0827-00		FT	.	CABLE, SP, ELEC: 4, 26 AWG, STRD, PVC JKT, RBN	08261	SS04267(1061)OC
-346	175-0830-00		1	.	WIRE, ELECTRICAL: 7 WIRE RIBBON	08261	SS-0726-710610C
-347	175-1675-00		1	.	CA ASSY, SP, ELEC: 50 OHM COAX, 7.75 INCH LONG	80009	175-1675-00







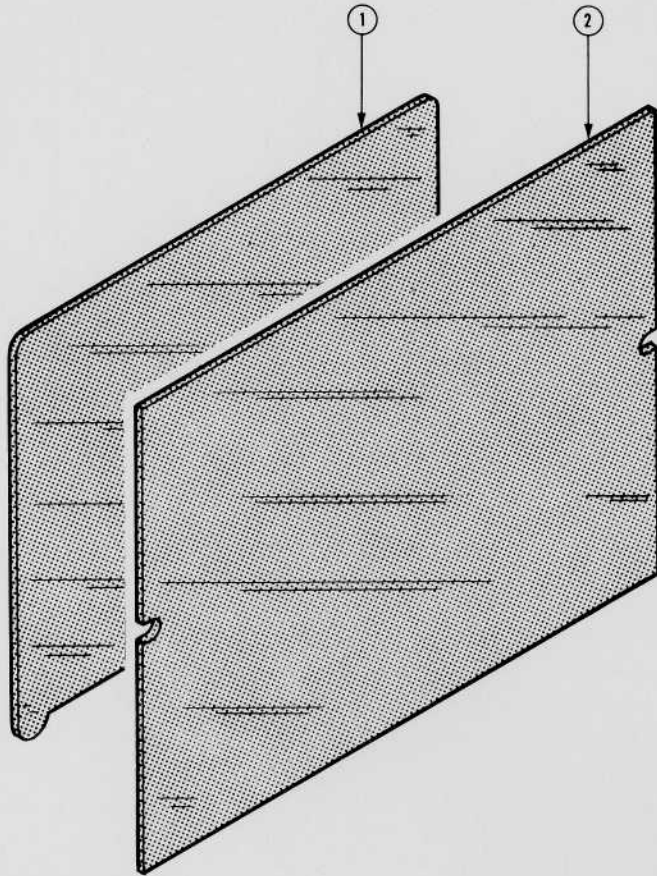


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
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STANDARD ACCESSORIES

-1	337-1159-02			1						SHLD,IMPLOSION:MARKED	80009	337-1159-02
-2	378-0684-00			1						FILTER,LT,CRT:BLUE	80009	378-0684-00
	070-1734-01			1						MANUAL,TECH:OPERATORS	80009	070-1734-01
	070-2184-01			1						MANUAL,TECH:INSTRUCTION	80009	070-2184-01

OPTIONAL ACCESSORIES

-----				1						L1 PL-IN MODULE:50 OHM		
-----				1						L2 PL-IN MODULE:75 OHM		
-----				1						L3 PL-IN MODULE:50 OHM,600 OHM,1MEG OHM/28PF		
-----				1						2701:ATTENUATOR,STEP, 50 OHM		
-----				1						2703:ATTENUATOR,STEP, 75 OHM		

## **MANUAL CHANGE INFORMATION**

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

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

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

## **SERVICE NOTE**

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

# CALIBRATION TEST EQUIPMENT REPLACEMENT

## Calibration Test Equipment Chart

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

Comparison of Main Characteristics

DM 501 replaces 7D13		
PG 501 replaces 107 108	PG 501 - Risetime less than 3.5 ns into 50 $\Omega$ . PG 501 - 5 V output pulse; 3.5 ns Risetime	107 - Risetime less than 3.0 ns into 50 $\Omega$ . 108 - 10 V output pulse 1 ns Risetime
PG 502 replaces 107 108 111	PG 502 - 5 V output PG 502 - Risetime less than 1 ns; 10 ns Pretrigger pulse delay	108 - 10 V output 111 - Risetime 0.5 ns; 30 to 250 ns Pretrigger pulse delay
PG 508 replaces 114 115 2101	Performance of replacement equipment is the same or better than equipment being replaced.	
PG 506 replaces 106 067-0502-01	PG 506 - Positive-going trigger output signal at least 1 V; High Amplitude output, 60 V. PG 506 - Does not have chopped feature.	106 - Positive and Negative-going trigger output signal, 50 ns and 1 V; High Amplitude output, 100 V. 0502-01 - Comparator output can be alternately chopped to a reference voltage.
SG 503 replaces 190, 190A, 190B 191 067-0532-01	SG 503 - Amplitude range 5 mV to 5.5 V p-p. SG 503 - Frequency range 250 kHz to 250 MHz.	190B - Amplitude range 40 mV to 10 V p-p. 0532-01 - Frequency range 65 MHz to 500 MHz.
SG 504 replaces 067-0532-01 067-0650-00	SG 504 - Frequency range 245 MHz to 1050 MHz.	0532-01 - Frequency range 65 MHz to 500 MHz.
TG 501 replaces 180, 180A 181 184 2901	TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time. TG 501 - Trigger output-slaved to market output from 5 sec through 100 ns. One time-mark can be generated at a time. TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	180A - Trigger pulses 1, 10, 100 Hz; 1, 10, and 100 kHz. Multiple time-marks can be generated simultaneously. 181 - Multiple time-marks 184 - Separate trigger pulses of 1 and 0.1 sec; 10, 1, and 0.1 ms; 10 and 1 $\mu$ s. 2901 - Separate trigger pulses, from 5 sec to 0.1 $\mu$ s. Multiple time-marks can be generated simultaneously.

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

Date: 2-28-80

Change Reference: M38038

Product: 7L5 SPECTRUM ANALYZER SERVICE

Manual Part No.: 070-2184-01

DESCRIPTION

EFF SN B091945

REPLACEABLE ELECTRICAL PARTS CHANGES

CHANGE TO:

L1254      108-1036-00      COIL,RF:10MH

L1254 is located on the LOG LIN AMPLIFIER circuit board assembly and shown on diagram 18 DETECTOR & VERTICAL OUT.

Date: 7-13-81 Change Reference: M40663 Rev.

Product: 7L5 Service Manual Part No.: 070-2184-01

DESCRIPTION

EFF SN B092470

ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

CHANGE:

A1000A6            670-3912-01        CKT BOARD ASSY:2ND LO

CHANGE:

A1000A6Q1530    151-0427-00        TRANSISTOR:SILICON,NPN

A1000A6R1532    317-0478-00        RES.,FXD,CMPSN:47K OHM,5%,0.125W

A1000A6R1526    317-0101-00        RES.,FXD,CMPSN:100 OHM,5%,0.125W

The above parts are located on the 2nd LO circuit board assembly and shown on  
Diagram 13 REF CAL/10.7 MHZ IF/2nd MIXER/2nd LO LOCK