Instruction Manual

Tektronix

SPG 1000
HDTV Sync Generator
B020279 and Above

070-8074-02

Warning
The servicing instructions are for use by qualified personnel only. To avoid personal injury, do not perform any servicing unless you are qualified to do so. Refer to all safety summaries prior to performing service.

CE

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Tektronix, Inc., P.O. Box 1000, Wilsonville, OR 97070–1000

WARRANTY

Tektronix warrants that this product will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If any such product proves defective during this warranty period, Tektronix, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product.

In order to obtain service under this warranty, Customer must notify Tektronix of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to the service center designated by Tektronix, with shipping charges prepaid. Tektronix shall pay for the return of the product to Customer if the shipment is to a location within the country in which the Tektronix service center is located. Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. Tektronix shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than Tektronix representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; or c) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

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Contacting Tektronix

Product Support	For application-oriented questions about a Tektronix measurement product, call toll free in North America: 1-800-TEK-WIDE (1-800-835-9433 ext. 2400) 6:00 a.m. – 5:00 p.m. Pacific time Or contact us by e-mail: tm_app_supp@tek.com For product support outside of North America, contact your local Tektronix distributor or sales office.
Service Support	Contact your local Tektronix distributor or sales office. Or visit our web site for a listing of worldwide service locations. http://www.tektronix.com
For other information	In North America: 1-800-TEK-WIDE (1-800-835-9433) An operator will direct your call.
To write us	Tektronix, Inc. P.O. Box 1000 Wilsonville, OR 97070-1000

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General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified.

Only qualified personnel should perform service procedures.

To Avoid Fire or Personal Injury

Use Proper Power Cord. Use only the power cord specified for this product and certified for the country of use.

Ground the Product. This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

Observe All Terminal Ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

Connect the ground lead of the probe to earth ground only.

Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

Do Not Operate Without Covers. Do not operate this product with covers or panels removed.

Use Proper Fuse. Use only the fuse type and rating specified for this product.

Avoid Exposed Circuitry. Do not touch exposed connections and components when power is present.

Wear Eye Protection. Wear eye protection if exposure to high-intensity rays or laser radiation exists.

Do Not Operate With Suspected Failures. If you suspect there is damage to this product, have it inspected by qualified service personnel.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive Atmosphere.

Keep Product Surfaces Clean and Dry.

Provide Proper Ventilation. Refer to the manual's installation instructions for details on installing the product so it has proper ventilation.

Symbols and Terms

Terms in this Manual. These terms may appear in this manual:

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

CAUTION. *Caution statements identify conditions or practices that could result in damage to this product or other property.*

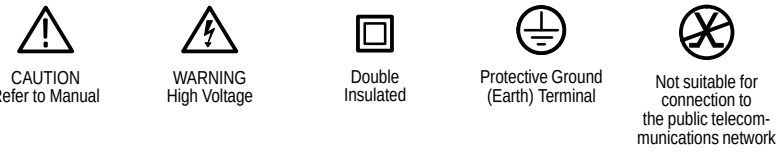
Terms on the Product. These terms may appear on the product:

DANGER indicates an injury hazard immediately accessible as you read the marking.

WARNING indicates an injury hazard not immediately accessible as you read the marking.

CAUTION indicates a hazard to property including the product.

Symbols on the Product. The following symbols may appear on the product:



Service Safety Summary

Only qualified personnel should perform service procedures. Read this *Service Safety Summary* and the *General Safety Summary* before performing any service procedures.

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

Disconnect Power. To avoid electric shock, switch off the instrument power, then disconnect the power cord from the mains power.

Use Care When Servicing With Power On. Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

To avoid electric shock, do not touch exposed connections.

Section 1
INTRODUCTION

General

The SPG 1000 is a multi-standard HDTV sync-pulse and test signal generator. Its applications include:

- Genlocking Tektronix TSG 1000 series HDTV test signal generators to compatible reference sources (see Table 1–1). Genlock offset of up to one-half frame advance or delay is available in increments as small as a fraction of a nanosecond.
- Serving as a stand-alone master sync source and/or test signal generator.
- Acting as a Genlocked slave sync source and test signal generator.
- Providing an external clock to TSG 1000 series programmable generators.

Test Signals

The SPG 1000 can output the following test signals in all supported standards (see Table 1-1):

- 100% Color Bars
- Pluge with white clip indicator
- Convergence Crosshatch with 5% overscan markers
- 5-Step Grey Staircase
- Red field
- Black, 50% Grey, and White fields
- Timing signal with 1 ns markers

All test signals are available in both GBR and Y, P_B, P_R formats. The signal format is selected with front panel controls.

Table 1–1 SPG 1000 Input/Output possibilities.

	Output Signal Standards					
Genlock Input Standard	525/1:1 1050/2:1 1050/1:1	625/1:1 1250/2:1 1250/1:1	787/788	1125/2:1 60 Hz	1125/2:1 59.94 Hz	N125/2:1 59.94 Hz
525/2:1	✓		✓			★
525/1:1	✓					★
1050/2:1	✓		✓			
1050/1:1	✓					
625/2:1		✓				
625/1:1 or 1250/2:1		✓				
1250/1:1		✓				
787/788			✓			
1125/2:1/60 Hz				✓		
1125/2:1/59.94 Hz					✓	★

* Possible only when the SPG 1000 has been purchased with Option 17.

Table 1–2 Standards, oscillators, and encoded clocks.

	Output Signals					
	525/1:1* 1050/2:1 1050/1:1	625/1:1** 1250/2:1 1250/1:1	787/788	1125/2:1 60 Hz	1125/2:1 59.94 Hz	N125/2:1 59.94 Hz
Genlock Input Standard	Encoded Clock A	Encoded Clock B	Encoded Clock C	Encoded Clock D	Encoded Clock E	Encoded Clock F
525/2:1	Osc. (1)		Osc. (2)			Osc. (5)
525/1:1	Osc. (1)					Osc. (5)
1050/2:1	Osc. (1)		Osc. (2)			
1050/1:1	Osc. (1)					
625/2:1		Osc. (1)				
625/1:1 or 1250/2:1		Osc. (1)				
1250/1:1		Osc. (1)				
787/788			Osc. (2)			
1125/2:1/60 Hz				Osc. (3)		
1125/2:1/59.94 Hz					Osc. (4)	Osc. (5)

* Encoded Clock A may also be used to drive a TSG 1XXX generating 525/2:1 signals.
** Encoded Clock B may also be used to drive a TSG 1XXX generating 625/2:1 signals.

Input/Output Standards and Combinations

Table 1–2 may be used as a guide to genlock input/output signal combinations possible with the installed SPG 1000 oscillator options. Occupied cells indicate potential operating modes; the numbers refer to the necessary oscillator and correspond to the following frequencies:

(1) 72.00 MHz
(2) 75.335664 MHz
(3) 74.25 MHz
(4) 74.175824 MHz
(5) 75.524475 MHz

Each column of the table represents a unique Encoded Clock output at the SPG 1000. The column headings list standards which are compatible

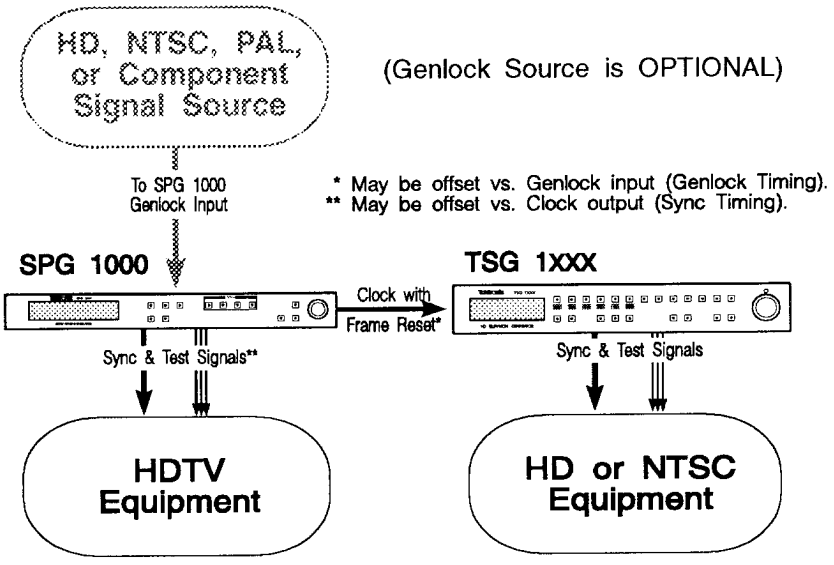


Fig. 1–1 The SPG 1000 as a genlocked or master sync source.

with that Encoded Clock and directly supported by the SPG 1000. Note that the Encoded Clock output may also be used to sync a Tektronix TSG 1000 series instrument that is generating signals of any standard compatible with that clock—whether it is directly supported by the SPG 1000 or not. For instance, an SPG 1000 genlocked to a 525 line progressive (1:1) input could synchronize NTSC color bars being generated by a TSG 1001 (while simultaneously providing an offset 1050 line progressive test signal of its own).

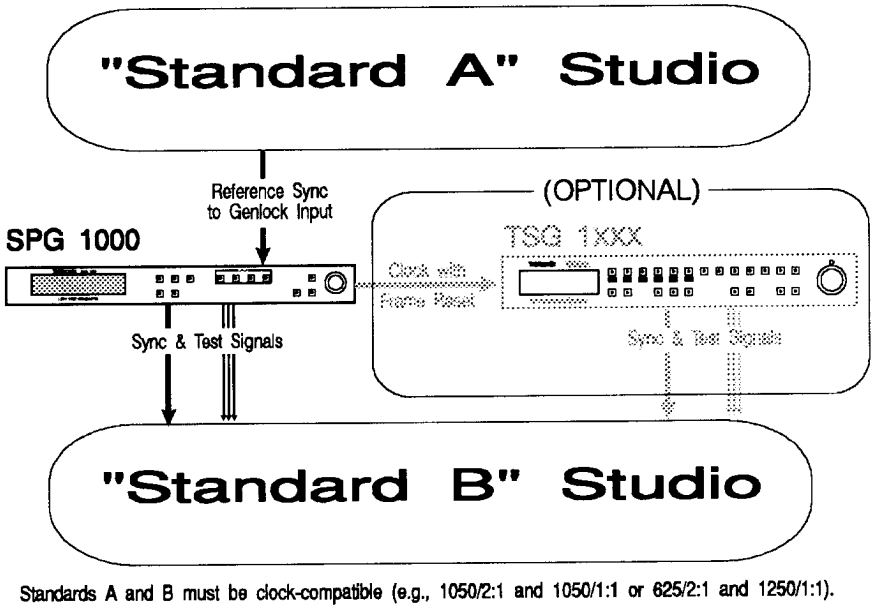


Fig. 1–2 Genlocking between standards with the SPG 1000.

Typical Configurations

The SPG 1000 may be used as a genlocked or reference sync (and test signal) source in either HDTV or mixed-standard environments. The many possibilities are outlined in Fig. 1–1. Note that the genlock input signal and the output signals may be of different standards as long as they are encoded clock-compatible.

The mixed-standard capabilities of the SPG 1000 make it possible to genlock—with precise offset, if needed—high-definition signals to standard video, and vice-versa. A general scenario is shown in Fig. 1–2. The specific case of genlocking NTSC video to HD signals would require a TSG 1XXX because the SPG 1000 lacks NTSC sync and test signals.

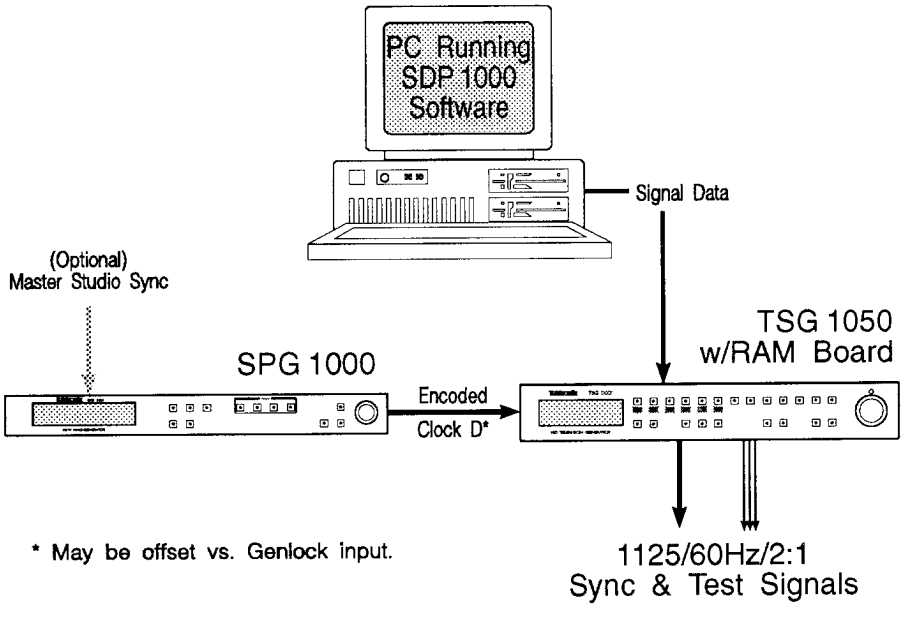


Fig. 1–3 Using the SPG 1000 as an external clock.

The SPG 1000, with three installed reference oscillators, may also be used as an external clock for Tektronix TSG 1000 series signal generators. When coupled with Tektronix SDP 1000 personal computer software this will enable support of several standards with a single TSG 1XXX—see Fig. 1–3 for an example. It will also

generation of signals to new HDTV standards which may emerge in the future.

Section 2
INSTALLATION

The SPG 1000 may be configured for operation world-wide and fits any standard 19-inch rack. It mounts in rack slides—which are provided with the instrument—for easy installation, removal, and transport. This section includes instructions for both electrical and mechanical installation.

Unpacking

When unpacking the SPG 1000, confirm that the following items have been received (in addition to the SPG 1000 and this manual):

- Correct power cord (see Fig. 2–1)
- Twin-Ax clock cable (Tek p/n 174-2355-01)
- Rack-mount hardware (Tek p/n 351-0751-01)

Please save the shipping carton and all packaging materials in case reshipment becomes necessary (see Fig. 2–2).

Electrical Installation

This instrument is designed to operate over a line frequency range of 48 to 66 Hz, and a nominal line voltage of either 115 or 230 Volts. The position of the voltage jumper (on the power supply board, near the cooling fan) and the value of the installed fuse have been determined by the power cord option which was ordered with the instrument (see Fig. 2–1 and Table 2–1). The fuse and voltage are indicated by the position of the black

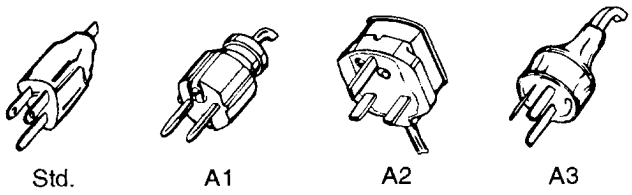


Fig. 2–1 The four power cord options.

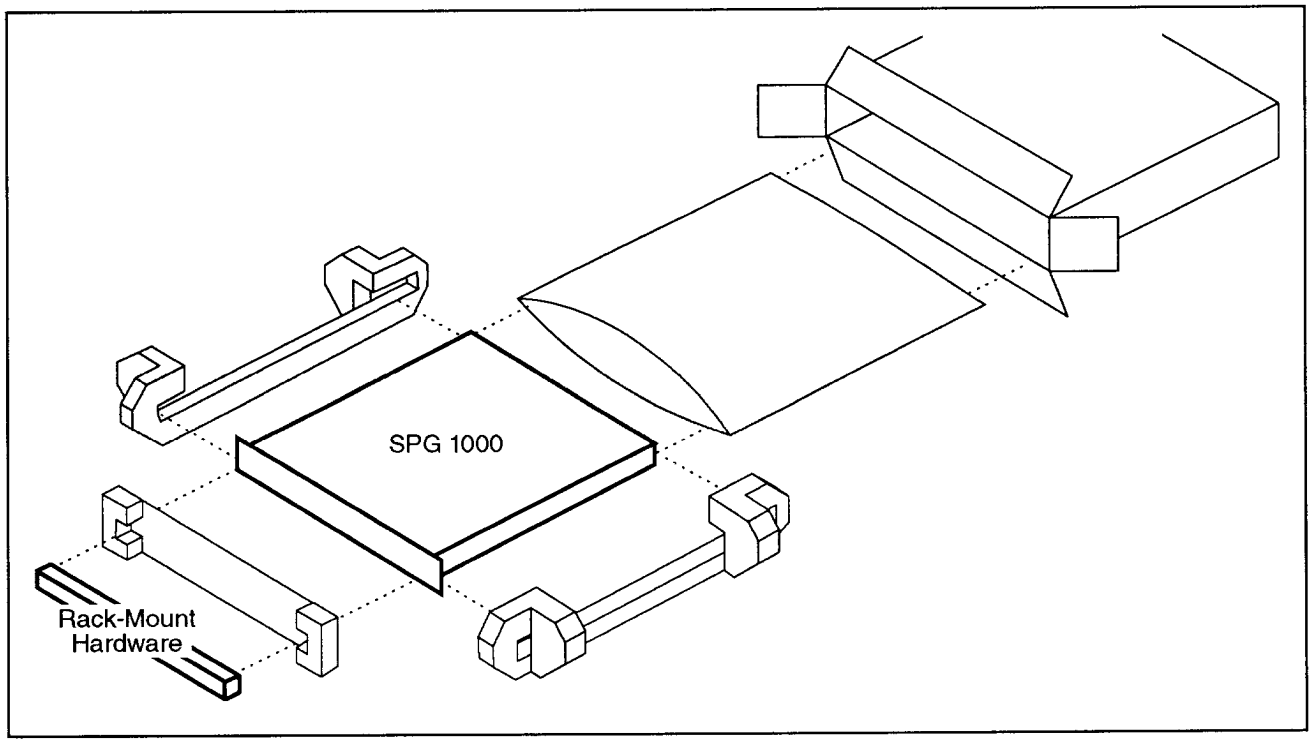


Fig. 2–2 Unpacking and re–packing the SPG 1000.

Table 2–1 The two possible power supply configurations.

Power Cord Option	Jumper Position	Installed Fuse
Standard (North America and Japan) 100–120V	J810	2 amp, medium blow
Opt. A1 (Univ. Euro) Opt. A2 (UK) Opt. A3 (Australia) 220–240V	J820	1 amp, medium blow

pan head screw to the right of the power receptacle on the rear panel of the instrument. Before installing the SPG 1000, confirm that the indicated configuration is correct for the local power supply.

Securing the Power Cord

Place the supplied loop-clamp around the power cord and plug the cord into the receptacle. Remove the screw at the lower-left of the rear panel and use the screw and washer supplied with the loop-clamp to mount the clamp to the instrument (see Fig. 2–3). This will minimize the chance of the SPG 1000 being accidentally unplugged when it is slid in and out of the rack.

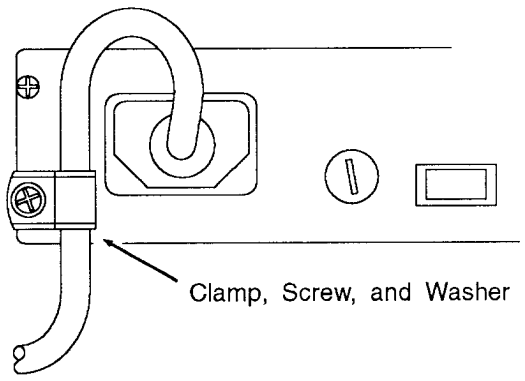


Fig. 2–3 Using the loop-clamp to secure the power cord.

Mechanical Installation

Rack Mounting

The SPG 1000 is supplied with hardware for rack mounting. The instrument fits in a standard 19-inch rack. Spacing between the front rails of the rack must be at least 17.75 inches (45.1 cm) to allow clearance for the slide-mounts.

The provided rack slide-mount hardware is compatible with any rack that has front-to-rear rail spacing of between 15.5 and 28.0 inches (39.4 and 71.1 cm). Six inches (15.2 cm) of clearance are required between the rear panel of the instrument and any rear cabinet panel or wall. This is to provide adequate room for connectors and air circulation.

The slide-mount tracks are coated with a self-lubricating finish. They do not require any other lubrication or maintenance.

Installing the Slide-Mount Hardware

Install the slide-mounts using the enclosed hardware as shown in Figs. 2–4 and 2–5. Be sure that the stationary sections are mounted at equal heights, and that they are level from front to back. For best results, do not fully tighten the screws until after the instrument has been installed.

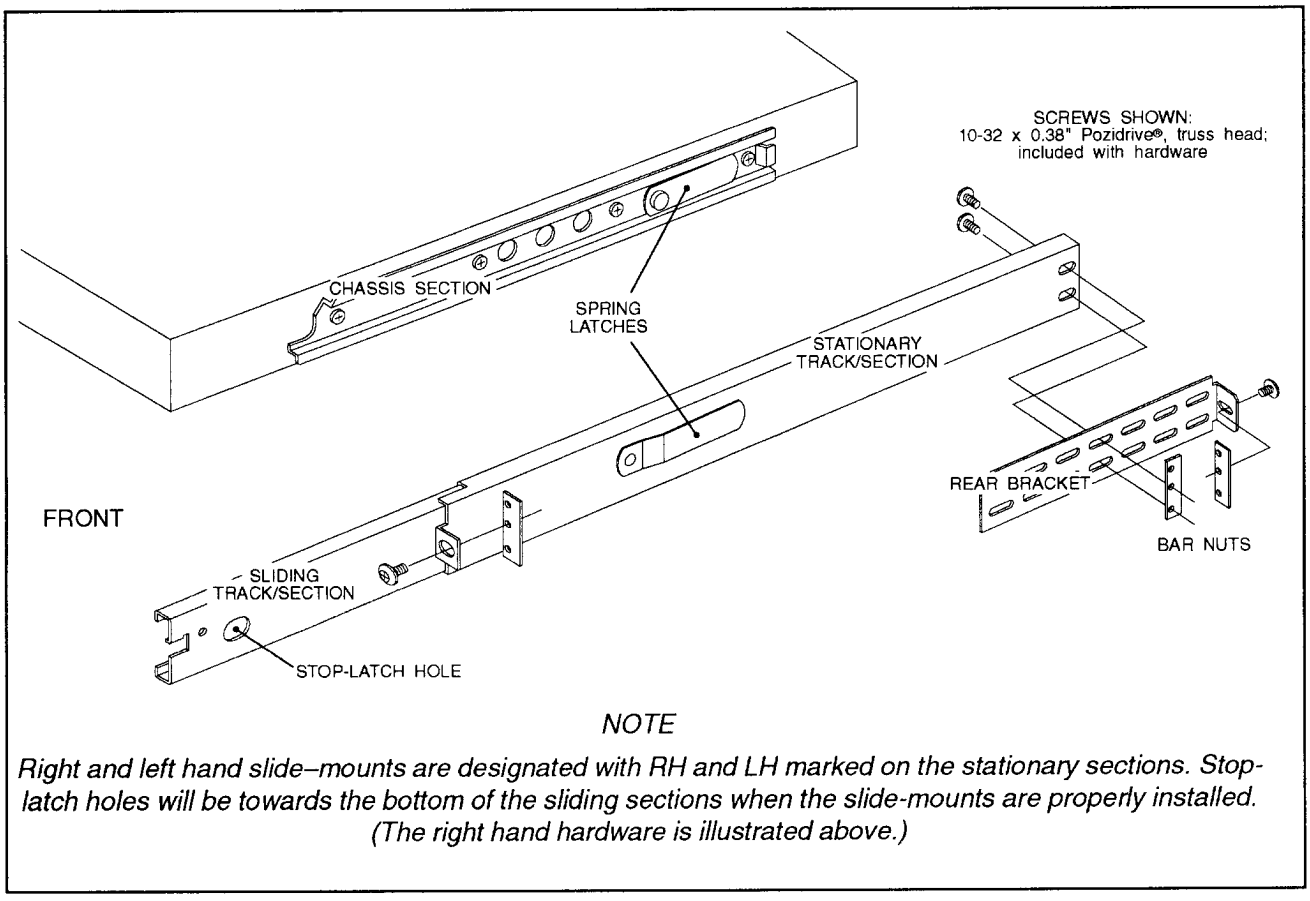
Installing the SPG 1000

Complete the rack installation of the SPG 1000 as follows:

a. Pull the sliding sections of the tracks to their fully-extended positions.

b. Insert the instrument into the extended sliding sections until the spring latches on the chassis sections begin pushing the sliding sections back into the stationary tracks.

c. Depress and hold the spring latches and push the instrument into the slide-mounts until the spring latches snap in the stop-latch holes.



NOTE

Right and left hand slide–mounts are designated with RH and LH marked on the stationary sections. Stop-latch holes will be towards the bottom of the sliding sections when the slide-mounts are properly installed. (The right hand hardware is illustrated above.)

Fig. 2–4 Assembly of the rack–mounting hardware.

d. Press the latches again and push the instrument the rest of the way into the rack. Tighten the screws that hold the stationary tracks to the rear of the rack. Slide the instrument out and back in at least once to make sure the tracks do not bind.

e. Pull the SPG 1000 out far enough to tighten the screws at the front of the stationary tracks. Once the tracks are secure, push the instrument all of the way into the rack and use the instrument retaining screw to secure it in the rack.

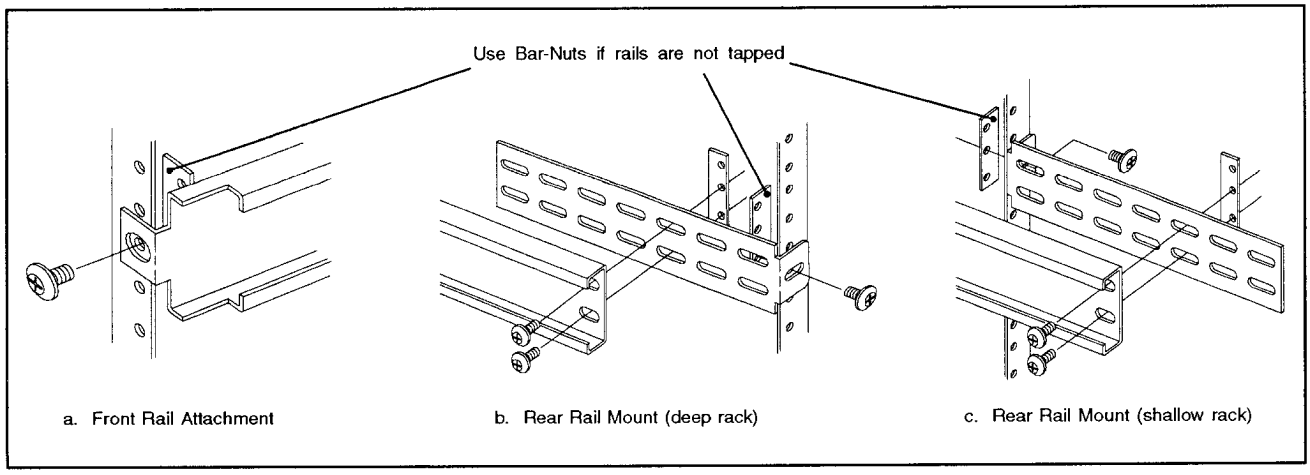


Fig. 2–5 Installing the stationary slide–mount sections.

Removing the SPG 1000

After all cables have been disconnected from the back of the instrument, the SPG 1000 may be removed from the rack as follows:

a. Loosen the retaining screw until it is completely disengaged from the rack.

b. Pull the instrument out until the chassis section spring latches snap into the stop-latch holes on both sides.

c. Press both spring latches to disengage them from the stop-latch holes and pull the SPG 1000 free of the slide tracks. For safety, push the sliding sections back into the stationary tracks (this may require pressing the spring latches on the stationary tracks out of the stop-latch holes at the rear of the sliding sections).

Section 3
OPERATING INSTRUCTIONS

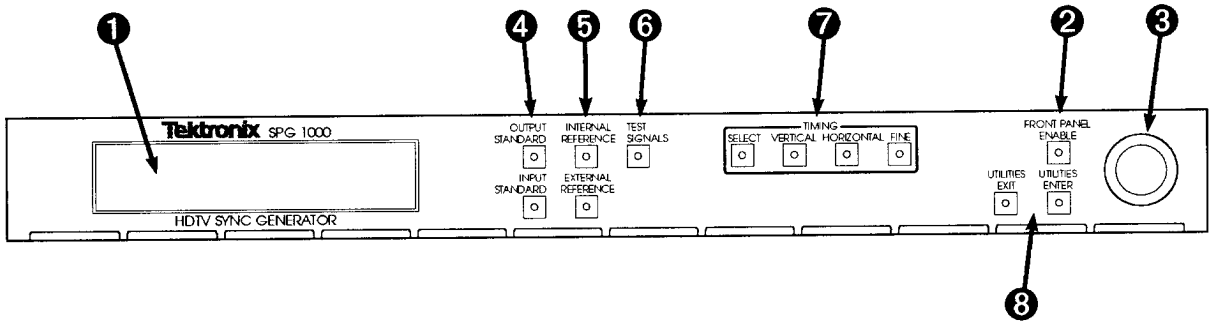


Fig. 3–1 The SPG 1000 front panel.

This section explains controls, indicators, connectors, and operation of the SPG 1000. The five major topics are Controls and Connections, Operating the SPG 1000, The Timing Signal, The Clock Output Signal, and Remote Control.

Controls and Connections

Front Panel Controls

Features of the SPG 1000 front panel are shown in Fig. 3–1. All operating parameters are accessed with the twelve push-button switches. In general, a button is pressed once to display a current setting or select the button's function. Selection of parameters is made with repeated pressing of the button or turning the Selector Knob. Each button has an integral LED; the meaning of a lighted LED depends on which button it is on. Please see the numbered paragraphs below for details.

① **Front Panel Readout** — A 2 line by 20 character display normally used to show current SPG 1000 settings selected with the front panel controls. Error messages, warnings, and software information may also be displayed.

② **Front Panel Enable button** — Is pressed to enable/disable changes of SPG 1000 settings through the remaining front panel controls and is intended to prevent inadvertent changes in operating conditions. The button's indicator LED will be lit when the front panel is enabled. The front panel will be disabled if none of the controls are actuated for 5 minutes. When the controls are disabled, pressing a function-select button will cause the applicable SPG 1000 settings to be displayed.

③ **Selector Knob** — Permits rapid selection of operating options when the front panel is enabled and a function-select button has been pressed. Turning this knob clockwise will scroll down the list of choices; turning it counterclockwise will scroll up. The front panel readout will display each new setting, and the SPG 1000 will "beep" to announce each change. Continuing to turn the knob when either top or bottom is reached will make the menu "wrap around" to the opposite end.

Note that turning the Selector Knob has effect only when the front panel has been enabled, and that *all selections made with the*

knob become effective immediately—as soon as displayed.

④ Standard-Select buttons:

OUTPUT STANDARD — Used to display and select the SPG 1000 output standard.

Pressing this button once will illuminate the LED and display the current output and input standards (in that order). Standards will be displayed on the readout as: Lines per frame/field frequency/field:frame ratio.

If the front panel is enabled, the initial press will also put the SPG 1000 in the output standard-select mode. Repeated pressing of the button while in the standard-select mode will scroll among the available output standards and activate them as displayed on the readout. As an alternative, the output standard may also be changed with the Selector Knob—which can scroll both up and down the list.

NOTE

Available output standards depend on the installed oscillators. The selection of an output standard determines which oscillator is used and limits the choice of input standards (see Table 3–1). The SPG 1000 has been programmed to "remember" the input standard last used with a given output standard and invoke it when the output standard is again selected. As a result, the SPG 1000 input standard is likely to change—without user intervention—as a new output standard is selected.

INPUT STANDARD — Used to display and select the SPG 1000 Genlock input standard.

Pressing the button once will light the LED and display the current output and input standards. If the front panel is enabled, the instrument will also enter the input standard-select mode.

Pressing the button repeatedly while in the standard-select mode will scroll between and activate, in turn, the input standards that are compatible with the active output standard. See Table 3–1 for possible SPG 1000 output/input combinations. Pressing the Input Standard button more than once will have no effect if only one input standard is compatible with the current output standard. As with other multiple-choice

Table 3–1: SPG 1000 Input/Output standard compatibility

Output Standard (osc. frequency)	Compatible Input Standards
525/59.94/1:1 (72.00 MHz)	525/59.94/2:1 525/59.94/1:1 1050/59.94/2:1 1050/59.94/1:1
1050/59.94/2:1 (72.00 MHz)	525/59.94/2:1 525/59.94/1:1 1050/59.94/2:1 1050/59.94/1
1050/59.94/1:1 (72.00 MHz)	525/59.94/2:1 525/59.94/1:1 1050/59.94/2:1 1050/59.94/1
625/50/1:1 (72.00 MHz)	625/50/2:1 625/50/1:1 1250/50/2:1 1250/50/1:1
1250/50/2:1 (72.00 MHz)	625/50/2:1 625/50/1:1 1250/50/2:1 1250/50/1:1
1250/50/1:1 (72.00 MHz)	625/50/2:1 625/50/1:1 1250/50/2:1 1250/50/1:1
787/59.94/1:1 (74.335664 MHz)	787/59.94/1:1 525/59.94/2:1 1050/59.94/2:1
1125/60/2:1 (74.25 MHz)	1125/60/2:1
1125/59.94/2:1 (74.175824 MHz)	1125/59.94/2:1
N125/59.94/2:1 (75.524475 MHz)*	525/59.94/2:1 525/59.94/1:1 1125/59.94/2:1

* Available with Option 17 only.

functions, the Selector Knob can also be used to choose among input standards.

⑤ **Reference-Select buttons** — When the front panel is enabled, the appropriate button may be pressed to select the desired reference, internal or external. INTERNAL REFERENCE is selected when the SPG 1000 is to be used as a master sync source. EXTERNAL REFERENCE is selected when another signal, present at the SPG 1000 Genlock input, is to be the master. The LEDs will light to indicate the current reference mode: A steady lamp on either button indicates that the associated reference is active.

The External Reference LED will flash when the SPG 1000 detects a missing, incorrect, or marginal reference signal. Pressing the button when its LED is flashing will cause a descriptive error message to be displayed briefly. See Reference Select, on page 3–7, for further discussion.

Pressing either reference-select button when the front panel is disabled will have no effect on SPG 1000 operation.

⑥ **Test Signals button** — Used to select the test signal to be output by the SPG 1000. May also be used to identify the current test signal.

Operation is consistent with the other option-select buttons: On first press the LED will light, the name of the current test signal will be displayed, and—if the front panel is enabled—the instrument will enter the test signal-select mode. When the SPG 1000 is in the signal-select mode the button may be pressed repeatedly to scroll down the following menu of test signals, with wrap-around to the top when the end is reached:

- 100% color bars
- Pluge with white clip indicator
- Convergence Crosshatch with 5% overscan markers
- 5-Step grey staircase
- Red field
- Black field
- 50% Grey field
- White field
- Bowtie-compatible timing signal with 1 ns markers

The Selector Knob may also be used for rapid scrolling up and down the list, with wrap-around at either end.

⑦ **Timing Offset buttons** — Are used to display and adjust Genlock and Sync timing. See Fig. 3–2 for a graphic representation of timing offsets. Genlock timing refers to an advance or delay (offset) in all SPG 1000 outputs relative to the reference signal present at the genlock input. Sync timing affects sync and test signal outputs, but not the encoded clock.

The sync timing offset is also displayed relative to the genlock reference signal. Note, however, that it is tied to the genlock offset. The differential between genlock and sync offsets will remain constant during genlock timing adjustments—the sync offset will change the same amount and direction as the genlock offset. To maintain a desired sync-to-reference offset, *always* adjust sync timing after any genlock timing adjustments.

Pressing any of the four timing buttons while the front panel is enabled will switch the instrument into the last-used (Genlock or Sync) timing mode. Pressing the VERTICAL, HORIZONTAL, or FINE button will enable adjustment of an offset by a corresponding timing increment with the Selector Knob. The button's indicator LED will be lit and the readout will show the current setting. A second—and any subsequent—ac-

tuation of the SELECT button will toggle the SPG 1000 between Genlock and Sync timing.

NOTE

When input and output signals are of different standards, timing adjustment ranges and increments depend on the frame and line duration of the input *signal.*

VERTICAL adjustments will advance or delay the SPG 1000 outputs in increments of one line. The Selector Knob is turned clockwise to advance and counterclockwise to delay. The SPG 1000 will "beep" to announce each one-line increment; the readout will display the number of lines offset.

HORIZONTAL adjustments will advance or delay SPG 1000 outputs in one-clock-pulse increments. The duration of a clock pulse and the number of pulses per line will depend on the active output standard. Again, the Selector Knob is used to make adjustments, and the SPG 1000 will emit a tone to signal each incremental change. The offset will be displayed in μs on the SPG 1000 readout.

FINE adjustments will shift the outputs in increments of approximately 50 ps. As with the other adjustments, a tone will accompany each incremental change; the readout, however, will display the offset rounded to the nearest nanosecond and will not change with each "beep."

⑧ **Utilities buttons** — Are used to set SPG 1000 operating parameters and access information about the instrument's software. UTILITIES ENTER is pressed once (when the front panel is enabled) to open and enable the utilities menu. Menu selections will be displayed on the SPG 1000 readout; the Selector Knob is used to scroll up and down the list. Once the desired function is displayed, UTILITIES ENTER is pressed again to invoke it. The UTILITIES EXIT button is used to "back up" one Utilities level at a time. It is *not* an "undo" button. The available utilities are:

- SOFTWARE VERSION — Will display the version and date of the installed software.
- TEST SIGNAL REVISION & DATE — Displays the revision number and date of the installed test signals.
- SELECT FORMAT — Permits selection of the test signal output format (GBR or Y, P_B, P_R).
- SET BAUD RATE — For serial remote control.
- ENABLE/DISABLE BEEPER.
- SELECT DISPLAY BRIGHTNESS — For ambient lighting conditions.

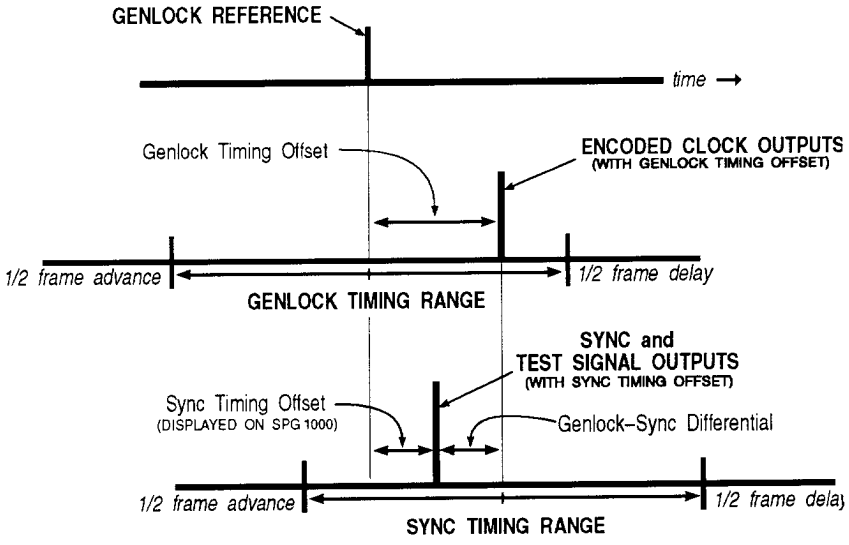


Fig. 3–2 The relationship between the reference input and the genlock and sync timing offsets.

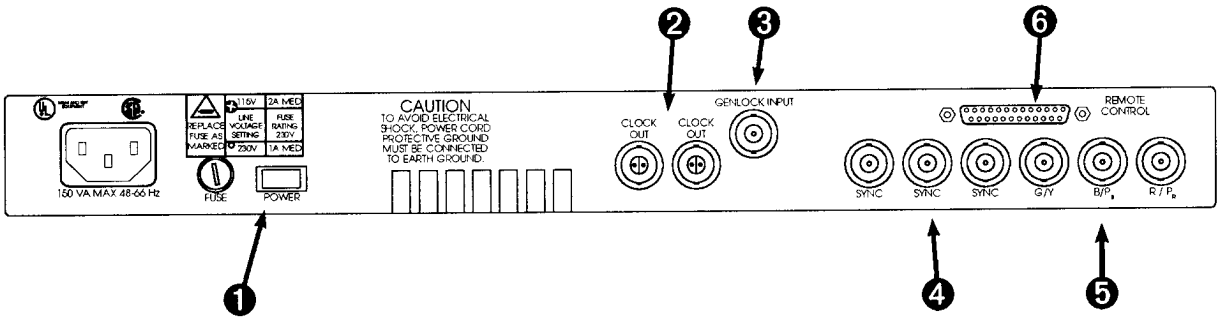


Fig. 3–3 The SPG 1000 rear panel.

- ENABLE/DISABLE FRAME IN CLOCK — Controls insertion of the "missing pulse" frame reset signal.

For more details see specific operating instructions beginning on the next page.

Rear Panel

Features of the SPG 1000 rear panel are shown in Fig. 3–3 and explained below.

① **Power Switch** — Push-push ON/OFF.

② **CLOCK outputs (2)** — 78 Ω balanced ECL clock through BNO connectors. Intended to drive Tektronix TSG 1000 series generators via twin-ax cable. Frame reset is encoded onto the clock signal in the form of a missing pulse.

③ **GENLOCK Input** — 75 Ω internally terminated BNC for the reference video input.

④ **SYNC outputs (3)** — 75 Ω BNCs for output of the Sync signal.

⑤ **G/Y, B/P_B, R/P_R outputs** — 75 Ω BNCs for the test signal outputs. The signal format (e.g., G or Y) will depend on the selection made with the front-panel Utilities buttons.

⑥ **REMOTE** — 25 pin female D-SUB connector to allow remote control of most generator functions through either RS-232 serial or ground-closure interface. See Remote Control, page 3–10, for details.

Operating the SPG 1000

General

- Read current settings with front panel enabled or disabled by pressing the appropriate button.
- Changes in settings can only be made with the front panel enabled (the FRONT PANEL ENABLE button will be lit). The front panel may be enabled before or after a function has been selected.
- Make changes with Selector Knob or repeated pressing of the function button. Changes are effective immediately—a tone will accompany each change and the display will show the new setting.
- Press another function-select button or FRONT PANEL ENABLE to quit an adjustment mode.

Specific (in alphabetical order)

The operations explained in detail are:

Baud rate, set
Beeper, enable/disable
Display brightness, adjust
Format, select
Frame in Clock, enable/disable
Input standard, select
Output standard, select
Reference, select
Software version, display
Test signal, select

Test signal revision and date, display Timing adjustments

Baud Rate, set

Baud rates available for serial remote control of the SPG 1000 are 1200, 2400, 4800, 9600, 19200, and 38400 bps.

a. Enable the front panel, if necessary, and press UTILITIES ENTER.

b. Use the Selector Knob to scroll the utilities menu to "Set Baud Rate." Press UTILITIES ENTER again.

c. With the Selector Knob, scroll to the desired baud rate. The SPG 1000 will emit a tone to announce each change. The new setting will be in effect as soon as it is displayed on the SPG 1000 readout.

d. Press UTILITIES EXIT to quit the Set Baud Rate utility. Press it again to exit the utilities menu.

Beeper, enable/disable

a. Enable the front panel, if necessary, and press UTILITIES ENTER.

b. Use the Selector Knob to scroll the utilities menu to "Enable/Disable Beeper." Press UTILITIES ENTER again.

c. With the Selector Knob or Enter button, toggle the beeper On or Off.

d. Press UTILITIES EXIT to quit the Enable/Disable Beeper utility. Press it again to exit the utilities menu.

Display Brightness, adjust

a. Enable the front panel, if necessary, and press UTILITIES ENTER.

b. Use the Selector Knob to scroll the utilities menu to "Select Display Brightness." Press UTILITIES ENTER again.

c. Turn the Selector Knob or press the Enter button repeatedly to select among Display Brightness "Low," "Medium," "Normal," and "High" (in order of increasing brightness). The display brightness will change noticeably with the setting.

d. Press UTILITIES EXIT to quit the Display Brightness utility. Press it again to exit the utilities menu.

Format (GBR or Y, P_B, P_R), select

a. Enable the front panel, if necessary, and press UTILITIES ENTER.

b. Use the Selector Knob to scroll the utilities menu to SET OUTPUT FORMAT. Press UTILITIES ENTER again.

c. With the Selector Knob, toggle to the desired format (pressing the Utilities Enter button will also toggle between formats). The SPG 1000 will emit a tone with each change. The new setting will be in effect as soon as it is displayed on the SPG 1000 readout.

d. Press UTILITIES EXIT to quit the Select Output Format utility. Press it again to exit the utilities menu.

Frame (Reset) in Clock, enable/disable

The frame reset must *be disabled if the clock is used to drive a TSG 1000 series instrument that is set to "2 Wire" external reference mode.*

a. Enable the front panel, if necessary, and press UTILITIES ENTER.

b. Use the Selector Knob to scroll the utilities menu to "Enable/Disable Frame in Clock." Press UTILITIES ENTER again.

c. With the Selector Knob or Enter button, toggle the "missing pulse" between Enabled and Disabled.

d. Press UTILITIES EXIT to quit the Enable/Disable Beeper utility. Press it again to exit the utilities menu.

Input Standard, select

Input standard options depend on the active output standard. See Table 3–1 (page 3–2) for input/output compatibility.

a. With the front panel enabled, press the INPUT STANDARD button. The current output and input standards will be displayed.

b. Scroll to the desired input standard with the Selector Knob. The SPG 1000 will emit a tone to announce each change. The new standard will be in effect as soon as its description is displayed.

c. When the desired input standard has been selected, press another function-select button or FRONT PANEL ENABLE to quit the Select Input Standard mode.

Output Standard, select

Output Standard options depend on the installed reference oscillators. See Table 1–2 for details.

a. With the front panel enabled, press the OUTPUT STANDARD button. The current output and input standards will be displayed. The output standard LED will light.

b. Scroll to the desired output standard with the Selector Knob. The SPG 1000 will emit a tone to announce each change. The new standard will be in effect as soon as it is displayed. Note that the input standard is also likely to change. If the input standard is inappropriate, select another at this time (see Input Standard, select).

c. When the desired output standard has been selected, press another function-select button or FRONT PANEL ENABLE to quit the Select Output Standard mode.

Reference, select

A lighted LED on either the Internal or External Reference button will indicate the active reference. To toggle from one reference to the other, (with the front panel enabled) press the unlit button. The External Reference LED will flash if that reference has been selected but the SPG 1000 detects a missing, incorrect, or marginal genlock reference signal. The LED will continue to flash until the problem has been corrected. Possible error scenarios are:

- Missing reference — If no signal is present at the input, the SPG 1000 will revert to the internal reference. In this case the Internal Reference LED will light and the External Reference LED will continue to flash until Internal reference is selected or an appropriate signal is presented to the genlock input. The error message will read "Genlock Error, No Video at Input."
- Incorrect Reference — If a signal is present at the genlock input but does not match the active input standard (as selected with the INPUT STANDARD button), the SPG 1000 will persist in attempts to lock to it. (Genlock will occur in some cases, but without proper frame resets.) The error message will read "Genlock Error, H/V Reset."
- Marginal reference — When the SPG 1000 is able lock to the reference signal but detects an error that may cause unacceptable jitter, the LED will flash as a warning. Possible error messages are: "Genlock Warning, AGC Error" (incorrect reference amplitude); "Genlock Warning, VCO Error" (incorrect reference time base); and "Genlock Warning, Clamp Error" (inconsistent reference dc level).

Software Version, display

a. Enable the front panel, if necessary, and press UTILITIES ENTER.

b. Use the Selector Knob to scroll the utilities menu to "Software Version." Press UTILITIES ENTER again; the version and date of its implementation will be displayed.

c. Press UTILITIES EXIT to quit the utility. Press it again to exit the utilities menu.

Test Signal, select

a. With the front panel enabled, press the TEST SIGNAL button. The test signal LED will light and the currently active test signal will be indicated on the SPG 1000 readout.

b. Scroll to the desired test signal with the Selector Knob. The SPG 1000 will emit a tone to announce each change and the new signal will be in effect as soon as it is displayed.

c. When the desired test signal has been invoked, press another function-select button or FRONT PANEL ENABLE to quit the select test signal mode.

Test Signal Revision and Date, display

a. Enable the front panel, if necessary, and press UTILITIES ENTER.

b. Use the Selector Knob to scroll the utilities menu to "Test Signal Revision & Date." Press UTILITIES ENTER again; the revision and date of its implementation will be displayed.

c. Press UTILITIES EXIT to quit the utility. Press it again to exit the utilities menu.

Timing Adjustments

See Fig 3–2 (page 3–4) for a graphic representation of the relationship between genlock and sync timing.

a. With the front panel enabled, press the appropriate timing increment button (VERTICAL, HORIZONTAL, or FINE); the SPG 1000 will enter the last-adjusted (genlock or sync) timing mode. The LED of the pressed button will be lit and the current offset type and value will be displayed (e.g., GENLOCK VERT TIMING/+ 47 LINES).

b. Press the SELECT button to toggle the timing mode, if necessary. Use the Selector Knob to adjust the offset. A tone will accompany each incremental change and the readout will change with each vertical and clock increment. Several fine steps (1/256 of a clock cycle), each announced with a tone, will occur before the readout indicates a 1 ns change in offset.

c. To perform another timing adjustment, press the timing SELECT button or another timing increment button. To exit the timing mode, press another function-select button or FRONT PANEL ENABLE.

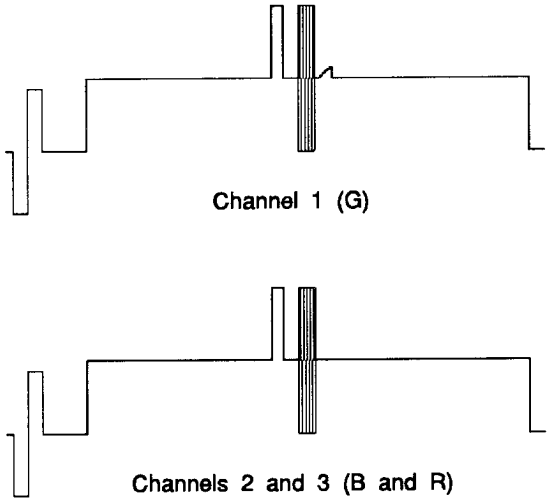


Fig. 3–4 The SPG 1000 timing signal.

The Timing Signal

Description

The SPG 1000 timing signal (Fig. 3–4) is unique yet compatible with standard Bowtie timing signals. It may be used to aid precise timing adjustments between channels, instruments, and signal paths and is used during calibration of the SPG 1000.

The basic signal consists of a 5.00 MHz burst packet with its 90 degree phase reference centered on the active video portion. All three channels

also have a pulse before the packet to aid in coarse inter-channel timing. A 5-step staircase after the burst on channel 1 (G/Y) is used to indicate inter-channel timing errors in ≈1 ns increments.

Using the Timing Signal

Typical use of the timing signal is illustrated in Fig. 3–5. The three channels are input to the component or system, and the output is viewed in A-B mode on an HD waveform monitor or oscilloscope. Timing errors can be identified and corrected using the shape of the resultant waveform.

If the A and B channels are perfectly synchronized and equal in amplitude, only the stair steps will remain (Fig. 3–6a). If the amplitudes are matched, but timing is off, it will show up as imperfect cancelling of the pulse or burst—or both.

Larger timing errors will be indicated by noticeable remnants at the leading and trailing edges of the pulse (Fig. 3–6b); errors of 5 ns or less may be gauged by comparing the height of the remnant sinusoid to the staircase, with each step representing a 1 ns advance or delay. The waveform represented in Fig. 3–6c, for example, indicates an error of approximately 1.5 ns.

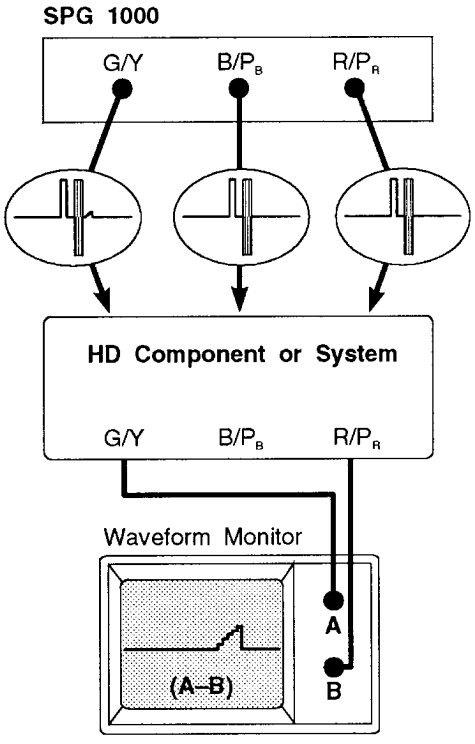


Fig. 3–5 Using the timing signal.

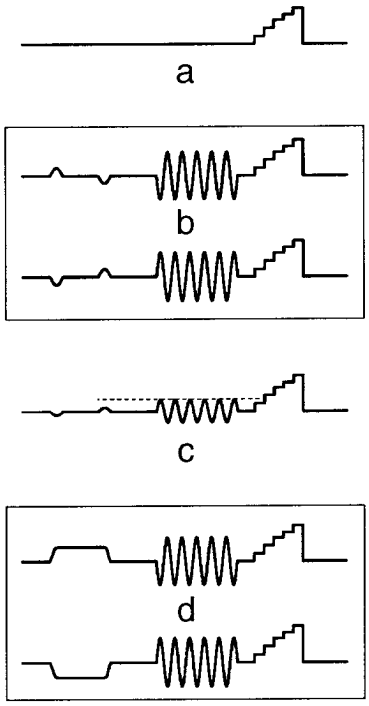


Fig. 3–6 Possible A–B timing waveforms.

Note that proper use of the staircase indicator requires that the two packets be of equal amplitude. On the A–B waveform, a pulse remnant in the shape of a plateau or valley—as shown in Fig. 3–6d—is likely to indicate amplitude inequality. Any packet-amplitude mismatch must be corrected (or compensated for with the test equipment's variable gain, if possible) before the staircase indicator can be used.

The Clock Output Signal

The SPG 1000 generates a differential clock signal that may replace the normal clock in a TSG 1000-series generator (which has been configured to accept an external clock). Frame reset information can be encoded into this clock signal

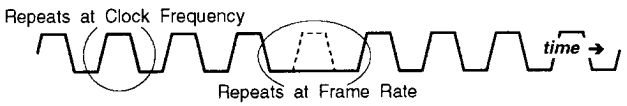


Fig. 3–7 An encoded clock signal.

through the deletion of a single "high" pulse (see Fig. 3–7 and table 3–2). The frame rate (i.e., the frequency of the missing pulse) is chosen to allow the controlled TSG to generate signals to several similar standards, thus it may not be the nominal rate for any standard. Please refer to Table 1–2 for standard compatibilities. The missing-pulse frame indicator may be toggled on and off through the SPG 1000 Utilities menu.

Table 3–2: Clock and frame-reset rates.

Clock	Frequency (MHz)	Reset Rate (Hz)
A	72.000000	14.985
B	72.000000	6.250
C	75.335664	14.985
D	74.250000	30.000
E	74.175824	29.970
F	75.524475	29.970

Remote Control

Remote control of the SPG 1000 may be through either RS-232 serial communications or ground closure. An internal cable leading from the rear panel Remote Control port is plugged into one of two connectors on the Controller board (see Fig. 3–8) to select the method of control. During manufacturing, the cable is plugged into the ground closure connector.

Most functions available through the SPG 1000 front panel are available through both methods of remote control. Ground closure adds the ability to store and recall up to 16 SPG 1000 operational states. (An "operational state" comprises all instrument settings—including timing offsets—in effect at a given time. An operational state which has been stored in non-volatile RAM will be referred to as a "preset" in this manual.)

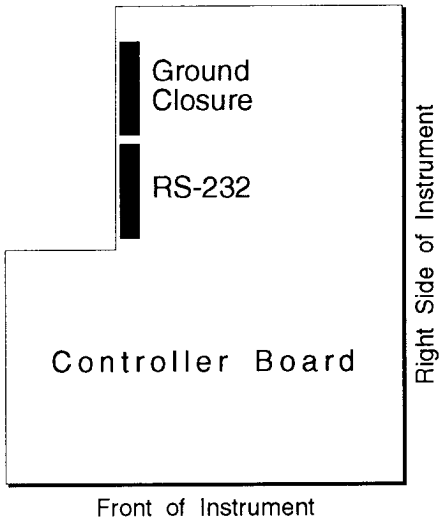


Fig. 3–8 Location of the internal remote connectors.

Ground-Closure Remote Control

Ground-closure remote control is so named because functions are selected or initiated when a connection to ground is closed, usually momentarily. In the SPG 1000, the closure is between two conductors (pins) on the rear panel REMOTE

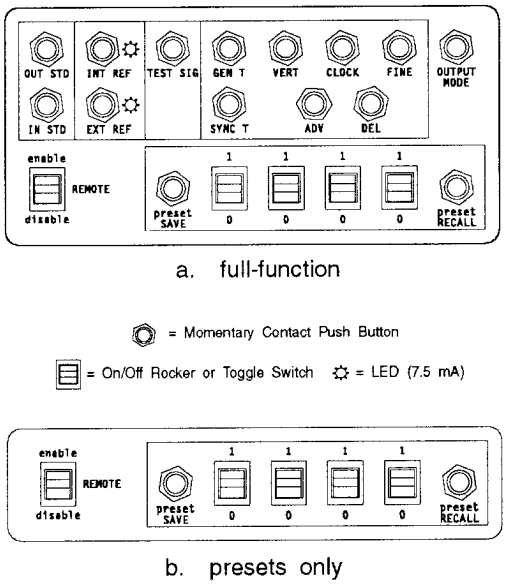


Fig. 3–9 Possible user-assembled ground-closure remote controls.

CONTROL connector, with one of the pins at ground potential. Typically, ground closure control will be implemented with a user-assembled remote control box or panel. The functions available at the remote are at the discretion of the designer/builder of the control unit. A possible layout of a "full-function" remote is illustrated in Fig. 3–9a. With the SPG 1000, the "remote" might even take the form of a small panel adjacent to the instrument used only to store operational states and recall presets, perhaps as shown in Fig. 3–9b.

The functions of the 25 pins of the SPG 1000 rear-panel Remote connector are outlined in Table 3–3. In most cases, momentary contact with ground will invoke a mode (e.g., genlock timing) or switch the SPG 1000 to the next selection on a related menu (e.g., test signals). In many instances, ground closure will have the same effect as pressing the function's button on the SPG 1000 front panel when the panel is enabled. Note, however, that while the initial push of a SPG 1000 button will only cause the current setting to be displayed, the initial ground closure *will change the setting*. (This is to remove any doubt as to the effect of ground closure—because the remote will often be used out of sight of the display.)

A brief explanation of the remote functions follows. For more detail, see the discussion of Front Panel Controls which begins on page 3–1. Unless stated, momentary grounding of the pin will perform the function; continuous grounding will prevent the selection of other functions.

Ground (pin 13) — Provides the "ground" for ground-closure.

Table 3–3 Pin assignments for ground closure remote control.

Remote Pinout	Remote Function	Suggested Switch
1	Internal reference LED	—
2	Spare LED	—
3	Input standard select	momentary
4	Test signal select	momentary
5	External reference select	momentary
6	Horizontal timing select	momentary
7	Timing advance	momentary*
8	Genlock timing select	momentary
9	Save presets	momentary
10	Preset designation, LSB	SPST**
11	Preset designation, bit 2	SPST**
12	Spare	—
13	Ground	—

Remote Pinout	Remote Function	Suggested Switch
14	External reference LED	—
15	Output format (toggle)	momentary
16	Output standard select	momentary
17	Internal reference select	momentary
18	Vertical timing select	momentary
19	Fine H timing select	momentary
20	Timing delay	momentary*
21	Sync timing select	momentary
22	Recall presets	momentary
23	Preset designation, bit 1	SPST**
24	Preset designation, MSB	SPST**
25	Remote enable	SPST

* Hold switch down for continuous timing change.

** These four switches may be replaced with one 16-position rotary switch, or a combination of SPST and rotary switches (see text).

Remote enable (pin 25) — Must be shorted to ground to enable remote control of the SPG 1000. Does not disable front panel control. Typically wired to ground through an On/Off switch, may also be hard-wired to ground (remote always enabled) or connected through a momentary-contact switch (as a safety feature—must press two buttons simultaneously to perform a function from the remote).

Input/Output standard select (pins 3 and 16) — On ground closure, will change the SPG 1000 to the next input or output standard available.

Reference select (pins 17 and 5) — Grounding of pin 17 will select internal reference; grounding of pin 5 will lock the SPG 1000 to the external timing reference, if possible.

Reference LEDs (pins 1 and 14) — LEDs (7.5 to 10.0 mA) may be wired between these pins and ground. They will mimic the operation of the corresponding LEDs on the SPG 1000 Reference-Select buttons.

Test signal select (pin 4) — Closure selects the next test signal on the menu of the SPG 1000.

Genlock/Sync timing select (pins 8 and 21) — Perform the functions of the front panel Timing Select button. Genlock timing is selected when pin 8 is connected to ground; grounding pin 21 will select sync timing. Once genlock or sync timing has been selected, the timing advance and delay functions (see below) will be available.

Vertical (line) timing select (pin 18) — Selects vertical timing.

Horizontal (coarse H) timing select (pin 6) — Selects coarse horizontal timing.

Fine (horizontal) timing select (pin 19) — Selects fine horizontal timing.

Timing advance/delay (pins 7 and 20) — Grounding will delay (pin 20) or advance (pin 7) the currently-selected timing offset (genlock or sync) in the most-recently selected increment (line, horizontal, or fine). A momentary ground will change the offset by one increment; continuous ground ("holding the button down") will cause continuous change.

Output format (pin 15) — Toggles the output between GBR and Y, P_B, P_R.

Preset designation (pins 10, 23, 11, and 24) and **Save/Recall presets** (pins 9 and 22) — Are used to designate, save, and recall presets. A full discussion of this capability follows.

Saving and Recalling Presets Through Ground-Closure

Pins 10, 23, 11, and 24 are used to select the four bits of the binary number which "names" a particular preset. When a pin is grounded, the associated bit is set to 1; when it is not grounded, the bit is 0. The order of the pins from least significant bit (LSB) to most significant (MSB) is 10–23–11–24.

To save an operational state of the SPG 1000, set the designation pins to the desired combination/number (e.g., 1001 binary = 9 decimal) and then momentarily connect pin 9 to ground. To return the instrument to that operational state later (any number of settings having been changed in the interim), set the designation pins to the same number and touch pin 22 to ground.

Preset designation can be accomplished with four SPST toggle switches, a rotary switch, or a combination of the two types. The method of selection is arbitrary as long as the 16 possible combinations of ground closure (0000 through 1111 = 0 through 15) can be set. (Indeed, if no more than eight presets are expected, pins 19–21 could be wired through an eight-position rotary switch, and pin 24 set permanently to 1 or 0.)

Note that a preset will be over-written with the current operational state if its number is selected when pin 9 (save preset) is grounded. Some users may find it desireable to add an on/off toggle switch in series with the Save Preset switch. Such

a toggle would act as a "save preset enable" and could serve to prevent inadvertent loss of presets.

Serial (RS-232) Remote Control

(In SPG 1000 software V1.10 and later)

The SPG 1000 may be controlled over a standard RS-232 interface by any device that can generate or transmit commands in ASCII characters. This makes it possible to control the SPG 1000 directly from an ASCII terminal or personal computer (PC).

Typically, serial remote control will be implemented with a PC that is running terminal-emulation or communication software, such as ProComm® or Smartcom®. Depending on the software used, commands that specify SPG 1000 settings may be entered directly through the keyboard or by transmitting text files that contain any number of commands. Many communications applications also permit the assignment of command "scripts" to function keys or key combinations.

Serial remote control will permit the operator to learn the settings of the SPG 1000 and change them from a distance. New settings may be specified by name (e.g., "BLACK" test signal) or value (e.g., "0.020us DLY"), which eliminates the need to scroll through a list of choices as with the front panel controls or ground-closure remote. In some cases, such as timing offsets, the settings may also be changed "a step at a time." RS-232 commands and command syntax will be explained in "Serial RC Commands," below. Some of the ways to use serial remote control are:

- Enter commands directly through the keyboard. The value of this approach is limited, however, because typing commands such as :STAN:OUTP *"1050/59.94/1:1 ypbpr"* (to change the output standard) will be tedious.
- Assign key combinations or function keys to certain settings or commands so the SPG-1000 can be controlled with a few key strokes. For example, if the script ":HORIZONTAL *Up*;:HORIZONTAL?" (followed by a carriage return) was associated with the F1 key, pressing F1 would delay horizontal timing by one increment and would return the new timing offset to the terminal screen. (Note that key assignment is not a standard feature of communication software; check the manual of your particular application.)
- While running communication software, execute simple programs to "automate" timing adjustments or substitute short mnemonic strings for long commands. (Such programs can be compiled and executed with ProComm Plus®; other applications may also have this capability. See Appendix A for an example.)
- Save an unlimited number of presets in the form of individual text files. Such preset files can specify all—or just a few—of the settings that make up an operational state. A preset file could be written, for example, to set all timing parameters to zero. Then, whenever it was desirable to "zero" the timing offsets, that file could be sent to the SPG 1000 (eliminating the need for much button-pushing and knob-turning).

Hardware and Software Requirements for Serial Remote Control

Cable

If the serial port is through a DB25 connector, use a straight-through cable as described in Table 3–4. Do not use a "null modem" cable. If the serial output is through a male DB9 connector (as on many IBM-compatible PCs), use a cable or adapter as described in Table 3–5. If the device has a non-standard connector, determine which pins perform the functions listed in the center column of Table 3–5 and connect them through to the appropriate pins of a DB25 connector as listed in the left column.

Table 3–4 RS-232 pin/conductor functions on the SPG 1000 and "standard" 25-pin serial ports.

SPG 1000 (25 pin female)	Pin/Conductor	PC (25 pin male)
GND (Shield)	1	GND (Shield)
RxD	2	TxD
TxD	3	RxD
CTS	4	RTS
RTS	5	CTS
DTR	6	DSR
DSR	20	DTR
Signal GND	7	Signal GND
DCD	8	DCD

Communications Parameters

- TTY or VT100 Terminal Emulation.
- Hardware Flow Control (RTS / CTS).
- 8 Data bits, no Parity, 1 Stop bit.
- Local Echo (or "Half Duplex").

See Appendix A for a list of settings that work with Procomm®; the list may be helpful in configuring other communications software as well. Some PC communications packages may not be able to detect the SPG 1000 RTS (request to send) signal. In such cases, hardware flow control will not be possible. Communication may still be possible at a lower baud rate (≤2400).

In addition, some versions of the SPG 1000 may not work with long cable lengths. If you experience problems, limit cable lengths to less than 60 feet, and contact your local Tektronix representative.

Text Commands and Command Files

For best results, follow these guidelines when sending text to the SPG 1000:

Table 3–5 Connections in a 9-pin to 25-pin RS-232 adapter.

DB25 Pin number	RS-232 Function	DB9 Female Pin number
2	TxD	3
3	RxD	2
4	RTS	7
5	CTS	8
6	DSR	6
7	Signal GND	5
8	DCD	1
20	DTR	4

- Send one line at a time; wait for a carriage return between lines. (The SPG will send a carriage return to signal that it has executed a command.)
- Lines may be up to 256 characters if hardware flow control is in effect.
- If hardware flow control is not possible, text should be limited to one command per line.
- End each line, including the last, with a carriage return.
- (Optional) Add a line feed to each carriage return sent.
- (Optional) Strip the line feed from each line received.

Serial RC Commands

Serial remote control commands may be used to set a particular SPG 1000 variable, or to prompt ("query") the SPG 1000 for the current status of that variable. The basic syntax is:

:VARIABLE?
or
:VARIABLE *Parameter*

Where the first form is a query and the second will set the variable. Important points to remember are:

- commands always begin with a colon (:) or an asterisk (*).
- There is never a space between the variable name (also called a command "header") and the question mark in a query.
- There is always a space between the header and the command parameter.
- Commands are not case-sensitive; headers and parameters may be entered in either capitals or lower case. In this manual, the short form of the header is capitalized; the remainder of the complete form is in lower case. Either form may be used, so entering :EXT? will have the same effect as entering :EXTERNAL?. Parameters are italized.
- Parameters can be either numeric, character strings or booleans . Numeric parameters can be a number (e.g., 0.000) or a number-

Table 3–6 Commands defined for serial remote control.

Command Header	Purpose	Parameter Example
:STANdard:OUTPut (:FORMat:OUTPut)	Output Standard and format, set or query.	*"1250/50/2:1 YPBPR"*
:STANdard:INPut (:FORMat:INPut)	Input Standard, set or query.	*"1050/59.94/2:1"*
:EXTernal	External reference, set (on or off) or query.	*ON*
:SGRP?	List [test] Signal Set, query only.	No Parameters
:SIGNal	[Test] Signal, set or query.	*"100% COLOR BARS"*
:TSELect	Timing [mode] Select, set or query.	*"GENLOCK"*
:VERTical	Vertical offset (current mode), set or query.	*"146 lines DLY"*
:HORizontal	Horizontal offset (current mode), set or query.	*"0.035us ADV"*
:FINe	Fine horizontal offset (current mode) in integer clock and fine units, set or query.	*637,232*
:VERSion:SOFTware?	Software Version, query only.	No parameters
:VERSion:SIGNal?	Test signals Version, query only.	No parameters
:BSET?	List possible baud rates, query only.	No parameters
:BAUD	RS-232 Baud rate, set or query.	*4800*
:BEEP	Beeper, set or query.	*OFF*
:FRAMe	Frame in clock, set or query.	*ON*
*RST	Reset all variables (except baud rate) to default.	No parameters
*IDN?	Identify device, query only.	No parameters
:SYSTem:ERRor?	Device, execution, command, or query errors	No parameters
:SYSTem:VERSion	RS-232 version compatability	No parameters

equivalent keyword (Min, Max, Up, Down). String parameters—for example, "white field"—are always enclosed in double quotation marks. Boolean parameters are ON and OFF.

- If a variable has a range of adjustment, the limits (minimum and maximum values) may be queried with the forms :VARIABLE? *Min* and :VARIABLE? *Max*. There must be a space between the question mark and the parameter.
- A line can contain several commands separated only by semi-colons (:VARIABLE1 *Parameter1*;:VARIABLE2 *Parameter2*;...). However, no line may exceed 256 characters.

The permissible command headers, their functions, and example parameters are listed in Table 3–6 and explained below.

:STANdard:OUTPut<*string*>
(also:FORMat:OUTPut)

Parameters: *"#/#/#:# gbr"* or *"#/#/#:# ypbpr"*

The correct parameter syntax is the standard as listed on the SPG 1000 display followed by a space and the desired output format. The entire string is enclosed in quotation marks. A query will return the current standard and format using the same syntax.

:STANdard:INPut <*string*>
(also:FORMat:INPut)

Parameters: *"#/#/#:#"*

Parameters are as with output standard, but do not include format (GBR, YP_BP_R). An "illegal parameter" statement will be returned if the requested input standard is incompatible with the current output standard.

Table 3–7 (:EXT?) Genlock error codes.

Code	Meaning
0	No error.
1	Error, No Video at Input
2	Error, H/V Reset
3	Warning, VCO error
4	Warning, AGC error
5	Warning, Offset (or "clamp") error

:EXTernal <*boolean*>

Parameters: *On* or *Off*

Sending *On* is equivalent to pressing the External Reference button on the front panel; *Off*, Internal Reference. A query will return three values—separated with commas—that indicate the current status, the last request, and an error condition. For status and request, 1 indicates On and 0 indicates Off. Meanings of the error codes are listed in Table 3–7. A query reply of 0,0,0 indicates that the SPG 1000 is on internal reference, that the last :EXT parameter sent was *Off*, and that there is no error condition; 1,1,0 would indicate that external reference has been requested and is active with no errors. For more information about possible genlock error conditions, see "Reference, select," on page 3–7.

:SGRP?

Parameters: None, query only

The query will return a list of the test signals installed in the SPG 1000.

:SIGNal <*string*>

Parameters: *"Signal Name"* or *Up* and *Down*

The query will return the name of the current test signal. Entering a signal name will invoke the named test signal. The desired test signal must appear as named on the SPG 1000 display and be enclosed in quotation marks. Correct test signal names are:

"100% Color Bars"
"Pluge"
"Convergence 5% Over Scan"
"5 Step Staircase"
"Red Field"
"Black"
"50% Grey Field"
"White Field"
"Timing 1 ns Markers"

Up and *Down* may be used to scroll through the above list to select the desired signal.

:TSELect <*string*>

Parameters: *"GENLOCK"* or *"SYNC"*

It is a good idea to include a timing select command immediately before any timing offset commands to be sure that the offset is applied to the desired timing mode.

:VERTical <*string*>

Parameters: *"# lines ADV"* or *"# lines DLY"*; *Down* or *Up*; *Max* or *Min*

The # can be any integer from 0 to Max (delay) and 0 to Min (advance). The values corresponding to Min and Max will vary with the input standard. The query :VERT? *Min* (or *Max*) will return the limit of vertical timing advance (or delay). The *Up* parameter will delay the timing by one line; *Down* will advance it one line.

:HORizontal <*string*>

Parameters: *"##.###us ADV"* or *"##.###us DLY"*; *Down* or *Up*; *Max* or *Min*

Used to set or query the horizontal offset to the nearest nanosecond. Again, the correct syntax is as the offset appears on the display. The numeric value can range from .000 to Max (or Min). The values corresponding to Min and Max will vary with the input standard. The query :HOR? *Min* (or *Max*) will return the limit of horizontal timing advance (or delay). The *Up* parameter will delay the timing by one clock cycle; *Down* will advance it one cycle.

:FINe <*numeric*>,<*numeric*>

Parameters: *#1,#2*; *Down* or *Up*; *Max* or *Min*

The FINe header is used to query or enter the "exact" horizontal offset; it is used to store offset values and recall them as accurately as is possible with the SPG 1000. The first integer, #1, represents clock cycles; the second integer,#2, indicates fine timing increments of approximately 50 ps. The two integers are separated by a comma. The value of Min will always be 0,0 and will correspond to the limit of horizontal advance. The value of Max will depend on the input standard; use the query :FIN? *Max* to display it. *Up* will delay the timing by one fine increment; *Down* will advance it one increment.

:VERSion:SOFTware?

Parameters: None, query only

This query will return the date of the software installed in the SPG 1000.

:VERSion:SIGNal?

Parameters: None, query only

This query will return the version and date of the test signals present in the SPG 1000.

:BSET?

Parameters: None, query only

This query will return a list of the baud rates available for serial remote control.

:BAUD <*numeric*>

Parameters: *1200, 2400, 4800, 9600, 19200,* or *38400*

The baud rate of the controlling device must also be changed immediately after using this command (if communication is to continue).

If you experience communication problems (overflow errors, such as missing characters), try using a lower baud rate (≤2400 baud).

:BEEP <*boolean*>

Parameters: *On* or *Off*

The query (:BEEP?) will return 1 when the beeper is active and 0 (zero) when it is inactive.

:FRAMe <*boolean*>

Parameters: *On* or *Off*

The query (:FRAM?) will return 1 when the frame reset signal (a missing pulse in the clock output) is active and 0 (zero) when it is inactive.

***RST**

Parameters: None

No parameters, no query. All settings except baud rate will be reset to their defaults. Use carefully.

***IDN?**

Parameters: None, query only

Used to verify which device is connected to the active serial port.

GPIB Control

Because most of the commands follow GPIB (General Purpose Interface Bus) standard syntax, it is also possible—with the addition of a GPIB-to-RS-232 converter—to control the SPG 1000 over an IEEE-488 bus.

With a GPIB interface, the SPG 1000 can become part of an integrated video system that may be pre-programmed and controlled from one location. There is much highly developed GPIB control hardware and software. One approach involves the construction, on a PC display, of a "virtual instrument"—a graphical representation of the SPG 1000 front panel—that can be manipulated with mouse and keyboard commands. (An application that includes the ability to create virtual front panels on MS-DOS machines is LabWindows®, by National Instruments® and available from Tektronix. A similar application for the Apple Macintosh®, is LabVIEW®, also by National Instruments.) GPIB standards and methods are well documented; check your technical library for more information—or contact your Tektronix representative.

Hardware Requirements

GPIB control of the SPG 1000 will require the addition of a GPIB-to-Serial converter. Consult the converter manual for the serial cable specifications. A null modem or null modem cable may be required. If so, and if a null modem is used, be sure it connects the RTS pin of the converter to the CTS pin of the SPG 1000—and vice-versa. Baud rates above 9600 bps may not work in all installations.

GPIB Commands

The following GPIB-only commands have been defined for the SPG 1000:

- *CLS (Clear status)
- *ESR? (Event status register—query only)
- *STB? (Status byte—query only)

Discussion of these commands is outside the scope of this manual. For more information, see *IEEE 488.2-1987, Codes, Formats, Protocols and Common Commands for Use with IEEE 488.1-1987*, published by the IEEE (Institute of Electrical and Electronic Engineers).

Section 4
SPECIFICATIONS

The performance requirements listed here apply when the ambient temperature is between 0°C and +50°C after a warmup of 30 minutes. The rated accuracies are valid only when the instrument has been calibrated at +20°C to +30°C.

Electrical Specifications

Table 4–1 Genlock Characteristics

Characteristic	Performance Requirement	Supplemental Information
Input Impedance	75 Ω	Internally terminated.
Return Loss (Genlock Input)	> 40 dB to 5 MHz > 30 dB to 30 MHz	
Input Signal Amplitude	± 6 dB	Relative to nominal.
Hum	≤ 0 dB (700 mV $_{p-p}$)	On 0 dB signal.
White Noise	S/N > 35 dB	30 MHz bandwidth.
Input SCH Range	± 45°	For correct color framing when locked to NTSC (or PAL*) signal and driving an NTSC generator only. (*SNBO10192 and above.)
Genlock Timing Ranges		
Vertical	± 1/2 Frame in one-line steps	Relative to input signal.
Horizontal	± 1/2 Line in clock-cycle steps	Relative to input signal.
Fine	± 1/2 Clock cycle	Relative to input signal. In steps of approx. 50 ps; 1 ns display resolution.
Genlock Stability with respect to:		
Input Amplitude	Tri-level Reference: ≤ 0.5 ns Bi-level Reference: ≤ 1.0 ns	Nominal input signal ± 3 dB. Nominal input signal ± 3 dB.
Input APL	≤ 0.5 ns	10% to 90% APL.
Hum	≤ 0.5 ns	–6 dB hum.
Reference Time Base		≤ 0.5 ns for a 10 ppm clock shift.
Ambient Temperature		≤ 1.0 ns, 0° to 50°C
Jitter		Measured with Bowtie
In the presence of White Noise, 30 MHz bandwidth.	≤ 0.5 ns $_{p-p}$	60 dB S/N, ± 3 dB input. Typically < 0.1 ns $_{p-p}$.
		≤ 1.0 ns $_{p-p}$ for > 35 dB S/N, ± 3 dB tri-level Reference Input.

Table 4–2 Oscillator/Clock Characteristics

Characteristic	Performance Requirement	Supplemental Information
Internal Reference Frequencies:		Oscillator frequencies determine available output standards.
Oscillator 1	72.000000 MHz ± 72 Hz	525, 625, 1050, and 1250 lines.
Oscillator 2	75.335664 MHz ± 75 Hz	787/788 lines.
Oscillator 3	74.250000 MHz ± 74 Hz	1125 lines, 60 Hz field rate.
Oscillator 4	74.175824 MHz ± 74 Hz	1125 lines, 59.94 Hz field rate.
Oscillator 5 (Option 17 only)	75.524475 MHz ± 76 Hz	1125 lines, 59.94 Hz field rate.
External Lock Range	± 10 ppm	
Clock Outputs:		Frame reset is encoded as a missing pulse.
Signal	Differential ECL	Twin-ax BNO connector.
Impedance	78 Ω	Differential.
Return Loss		> 30 dB at Clock frequency.

Table 4–3 Test Signal Output Characteristics

Characteristic	Performance Requirement	Supplemental Information
DC Offset	< 50 mV	
White Levels	± 1%	Max. error at full output.
Inter-Channel Amplitude Matching	± 0.5 %	Max. error between 2 outputs.
Sync Amplitude	–300 mV ± 3 mV and +300 mV ± 3 mV	From reference level (600 mV_{p-p} ± 6 mV).
S/N Ratio	> 50 dB to 300 MHz	RMS noise relative to a 700 mV signal. Typically ≤ 6 mV_{p-p} on White.
Impedance	75 Ω	
Return Loss	> 35 dB to 30 MHz	Typically 38–40 dB.
Skew:		
Sync Outputs	≤ 1.0 ns	Worst case between 2 outputs.
Test Signal Outputs	≤ 1.0 ns	Worst case between 2 outputs.
Sync to Test Signals		Typically 7 ns.
Test Signal/Sync Offset Ranges:		Sync offset is relative to Reference Input; follows genlock offset (see operating instructions).
Line	± 1/2 Frame in one-line steps	
Horizontal	± 1/2 Line in clock-cycle steps	
Fine	± 1/2 Clock cycle	In steps of approx. 100 ps; 1 ns display resolution.

Mechanical Specifications

Table 4–4 Physical Characteristics

Characteristics	Information
Dimensions Height Width Depth	 1.75 in (4.45 cm) 19.0 in (48.3 cm) 21.75 in (55.25 cm)
Net Weight	13.25 lbs (6.01 kg)
Shipping Weight	22.63 lbs (10.26 kg)

Table 4–5 Environmental Characteristics

Characteristics	Information
Temperature Non-Operating Operating	 –40°C to +65°C 0°C to +50°C
Altitude Non-Operating Operating	 To 50,000 ft (15,240 m) To 15,000 ft (4572 m)
Vibration (Operating)	15 minutes each axis at 0.015 in, frequency varied from 10–55–10 c/s in 4-minute cycles; instrument secured to vibration platform. 10 minutes each axis at any resonant point or at 55 c/s.
Shock	30 g, $^1/_2$ sine, 11 ms duration, 3 guillotine-type shocks per side.
Transportation	Qualified under NTSC Test Procedure 1A, Category II (24-inch drop).

Table 4–6: Certifications and compliances

Category	Standards or description
EC Declaration of Conformity – EMC [1]	Meets intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Union: EN 50081-1 Emissions: EN 55022 Class B Radiated and Conducted Emissions EN 50082-1 Immunity: IEC 801-2 Electrostatic Discharge Immunity IEC 801-3 RF Electromagnetic Field Immunity IEC 801-4 Electrical Fast Transient/Burst Immunity [1] High–quality shielded cables must be used to ensure compliance to the above listed standards.
FCC Compliance	Emissions comply with FCC Code of Federal Regulations 47, Part 15, Subpart B, Class A Limits.
Installation (Overvoltage) Category	Terminals on this product may have different installation (overvoltage) category designations. The installation categories are: CAT III Distribution-level mains (usually permanently connected). Equipment at this level is typically in a fixed industrial location. CAT II Local-level mains (wall sockets). Equipment at this level includes appliances, portable tools, and similar products. Equipment is usually cord-connected. CAT I Secondary (signal level) or battery operated circuits of electronic equipment.
Pollution Degree	A measure of the contaminates that could occur in the environment around and within a product. Typically the internal environment inside a product is considered to be the same as the external. Products should be used only in the environment for which they are rated. Pollution Degree 2 Normally only dry, nonconductive pollution occurs. Occasionally a temporary conductivity that is caused by condensation must be expected. This location is a typical office/home environment. Temporary condensation occurs only when the product is out of service.
Safety Standards	
U.S. Nationally Recognized Testing Laboratory Listing	UL1244 Standard for electrical and electronic measuring and test equipment.
Canadian Certification	CAN/CSA C22.2 No. 231 CSA safety requirements for electrical and electronic measuring and test equipment.
European Union Compliance	Low Voltage Directive 73/23/EEC, amended by 93/69/EEC EN 61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use.
Additional Compliance	IEC61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use.
Safety Certification Compliance	
Temperature, operating	+5 to +40° C
Altitude (maximum operating)	2000 meters
Equipment Type	Test and measuring

Table 4–6: Certifications and compliances (cont.)

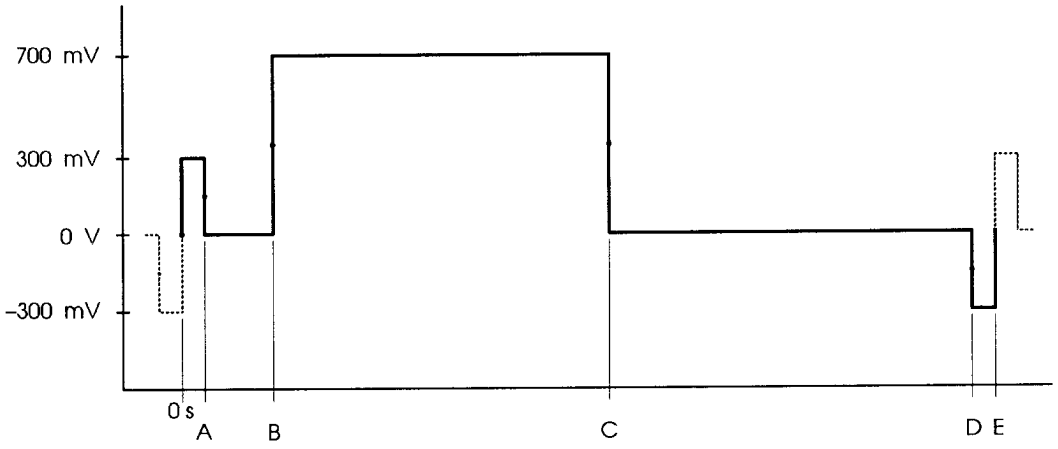
Category	Standards or description
Safety Class	Class 1 (as defined in IEC 1010-1, Annex H) – grounded product
Overvoltage Category	Overvoltage Category II (as defined in IEC 1010-1, Annex J)
Pollution Degree	Pollution Degree 2 (as defined in IEC 1010-1). Note: Rated for indoor use only.

Section 5
TEST SIGNAL DESCRIPTIONS

NOTE

The following diagrams and tables include nominal amplitudes and timing information. A properly calibrated SPG 1000 will typically output signals as described; however, the figures in this section are not specifications or performance requirements.

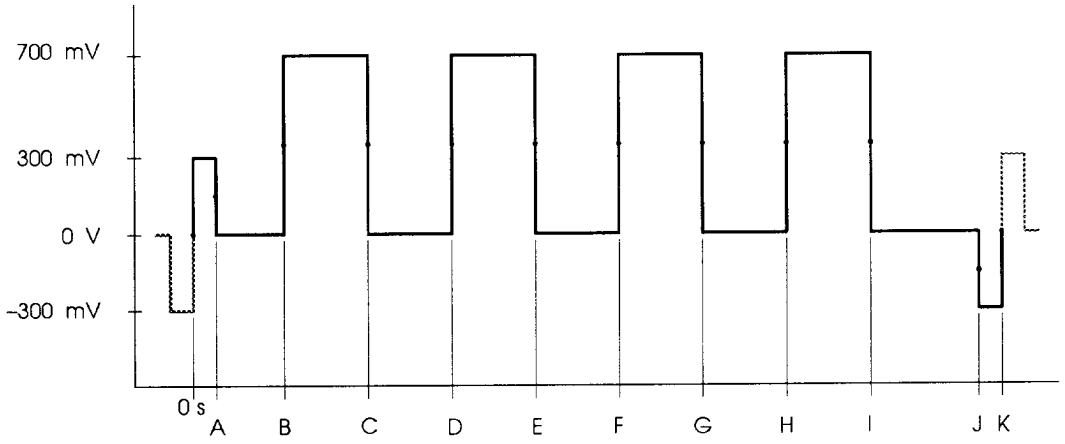
Not all channels of every signal are shown: Those that are omitted consist only of sync, and will resemble the Black Field as shown on page 5–10.



Color Bars — GBR, G output

	Output Standard(s)						
	525/1:1 1050/2:1	1050/1:1	625/1:1 1250/2:1	1250/1:1	787/788	1125/2:1 60 Hz	1125/2:1* 59.94 Hz
A	0.889 µs	0.444 µs	0.889 µs	0.444 µs	0.597 µs	0.593 µs	0.593 µs
B	3.556	1.778	3.556	1.778	2.668	2.586	2.588
C	16.778	8.393	16.889	8.448	11.287	15.515	15.531
D	30.889	15.445	31.111	15.556	20.558	29.037	29.066
E	31.778	15.889	32.000	16.000	21.185	29.630	29.659

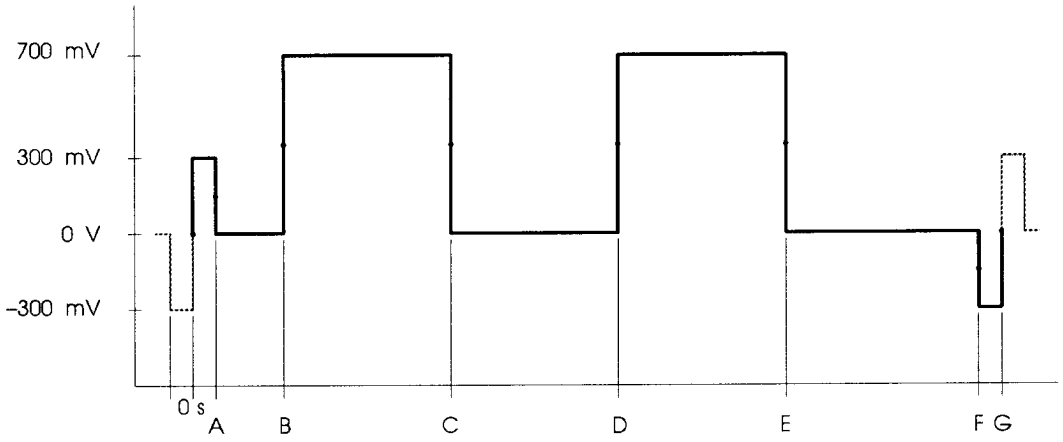
* Including N125/2:1/59.94



Color Bars — GBR, B output

	Output Standard(s)						
	525/1:1 1050/2:1	1050/1:1	625/1:1 1250/2:1	1250/1:1	787/788	1125/2:1 60 Hz	1125/2:1* 59.94 Hz
A	0.889 µs	0.444 µs	0.889 µs	0.444 µs	0.597 µs	0.593 µs	0.593 µs
B	3.556	1.778	3.556	1.778	2.668	2.586	2.588
C	6.862	3.432	6.889	3.445	4.823	5.818	5.824
D	10.168	5.086	10.222	5.113	6.978	9.051	9.060
E	13.474	6.740	13.556	6.781	9.133	12.283	12.295
F	16.780	8.393	16.889	8.448	11.287	15.515	15.531
G	20.086	10.047	20.222	10.116	13.442	18.748	18.766
H	23.392	11.701	23.556	11.784	15.597	21.980	22.002
I	26.698	13.355	26.889	13.452	17.752	25.212	25.237
J	30.889	15.445	31.111	15.556	20.558	29.037	29.066
K	31.778	15.889	32.000	16.000	21.185	29.630	29.659

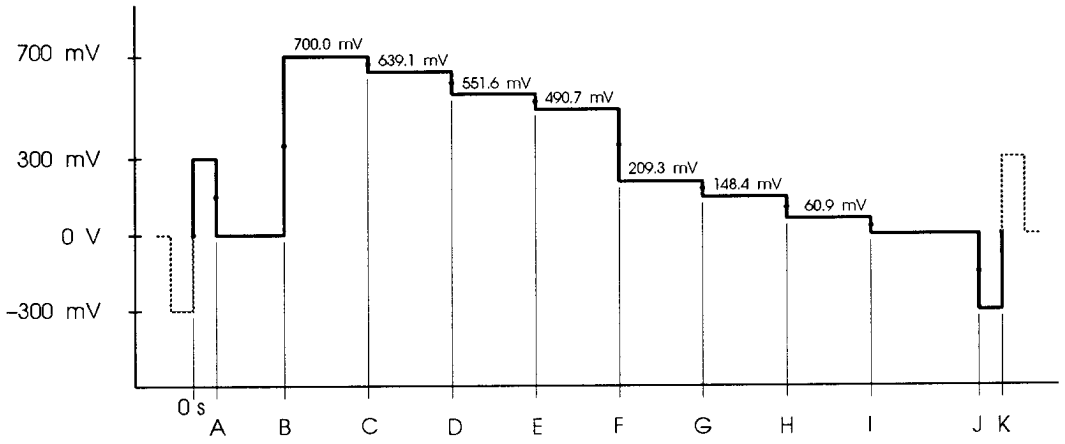
* Including N125/2:1/59.94



Color Bars — GBR, R output

	Output Standard(s)						
	525/1:1 1050/2:1	1050/1:1	625/1:1 1250/2:1	1250/1:1	787/788	1125/2:1 60 Hz	1125/2:1* 59.94 Hz
A	0.889 µs	0.444 µs	0.889 µs	0.444 µs	0.597 µs	0.593 µs	0.593 µs
B	3.556	1.778	3.556	1.778	2.668	2.586	2.588
C	10.168	5.086	10.222	5.113	6.978	9.051	9.060
D	16.780	8.393	16.889	8.448	11.287	15.515	15.531
E	23.392	11.701	23.556	11.784	15.597	21.980	22.002
F	30.889	15.445	31.111	15.556	20.558	29.037	29.066
G	31.778	15.889	32.000	16.000	21.185	29.630	29.659

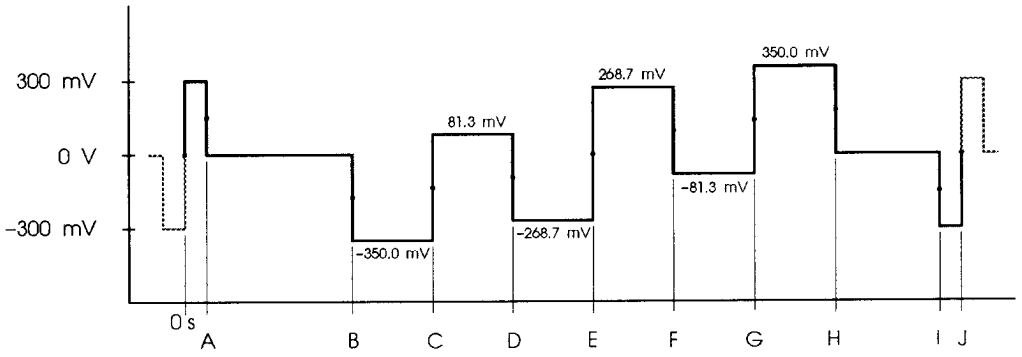
* Including N125/2:1/59.94



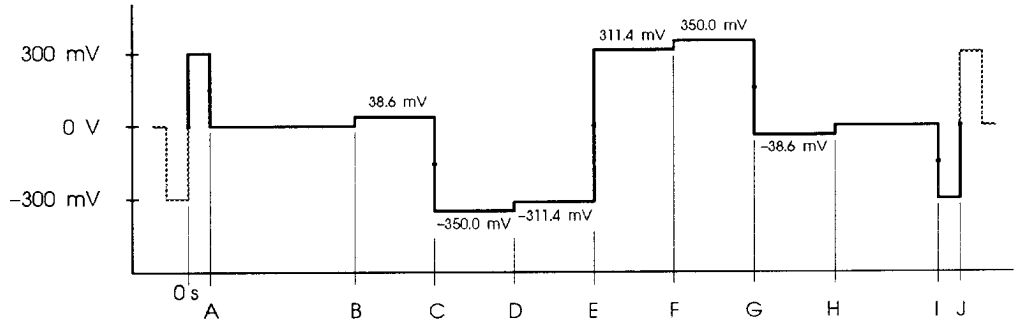
Color Bars — Y,P_B,P_R; Y output

	Output Standard(s)						
	525/1:1 1050/2:1	1050/1:1	625/1:1 1250/2:1	1250/1:1	787/788	1125/2:1 60 Hz	1125/2:1* 59.94 Hz
A	0.889 µs	0.444 µs	0.889 µs	0.444 µs	0.597 µs	0.593 µs	0.593 µs
B	3.556	1.778	3.556	1.778	2.668	2.586	2.588
C	6.862	3.432	6.889	3.445	4.823	5.818	5.824
D	10.168	5.086	10.222	5.113	6.978	9.051	9.060
E	13.474	6.740	13.556	6.781	9.133	12.283	12.295
F	16.780	8.393	16.889	8.448	11.287	15.515	15.531
G	20.086	10.047	20.222	10.116	13.442	18.748	18.766
H	23.392	11.701	23.556	11.784	15.597	21.980	22.002
I	26.698	13.355	26.889	13.452	17.752	25.212	25.237
J	30.889	15.445	31.111	15.556	20.558	29.037	29.066
K	31.778	15.889	32.000	16.000	21.185	29.630	29.659

* Including N125/2:1/59.94



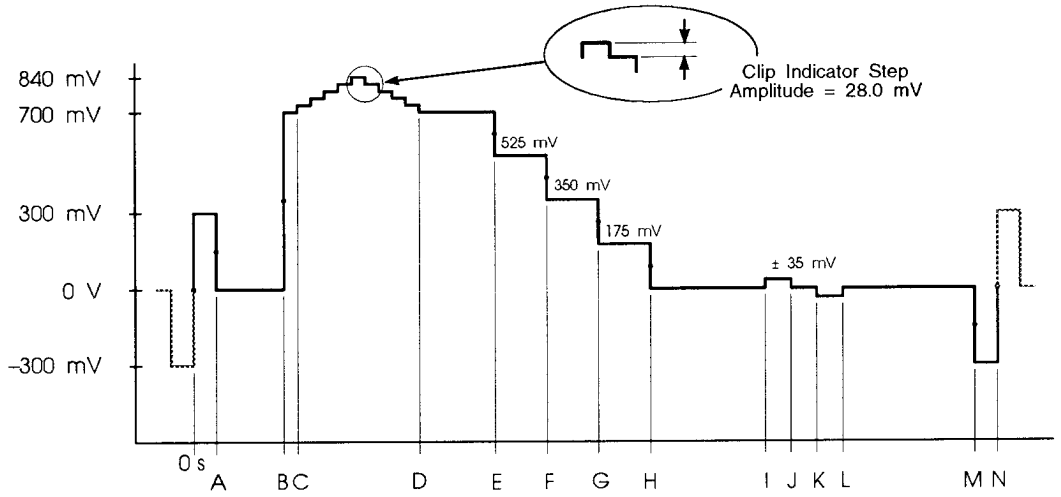
Color Bars — Y,P_B,P_R; P_B output



Color Bars — Y,P_B,P_R; P_R output

	Output Standard(s)						
	525/1:1 1050/2:1	1050/1:1	625/1:1 1250/2:1	1250/1:1	787/788	1125/2:1 60 Hz	1125/2:1* 59.94 Hz
A	0.889 µs	0.444 µs	0.889 µs	0.444 µs	0.597 µs	0.593 µs	0.593 µs
B	6.862	3.432	6.889	3.445	4.823	5.818	5.824
C	10.168	5.086	10.222	5.113	6.978	9.051	9.060
D	13.474	6.740	13.556	6.781	9.133	12.283	12.295
E	16.780	8.393	16.889	8.448	11.287	15.515	15.531
F	20.086	10.047	20.222	10.116	13.442	18.748	18.766
G	23.392	11.701	23.556	11.784	15.597	21.980	22.002
H	26.698	13.355	26.889	13.452	17.752	25.212	25.237
I	30.889	15.445	31.111	15.556	20.558	29.037	29.066
J	31.778	15.889	32.000	16.000	21.185	29.630	29.659

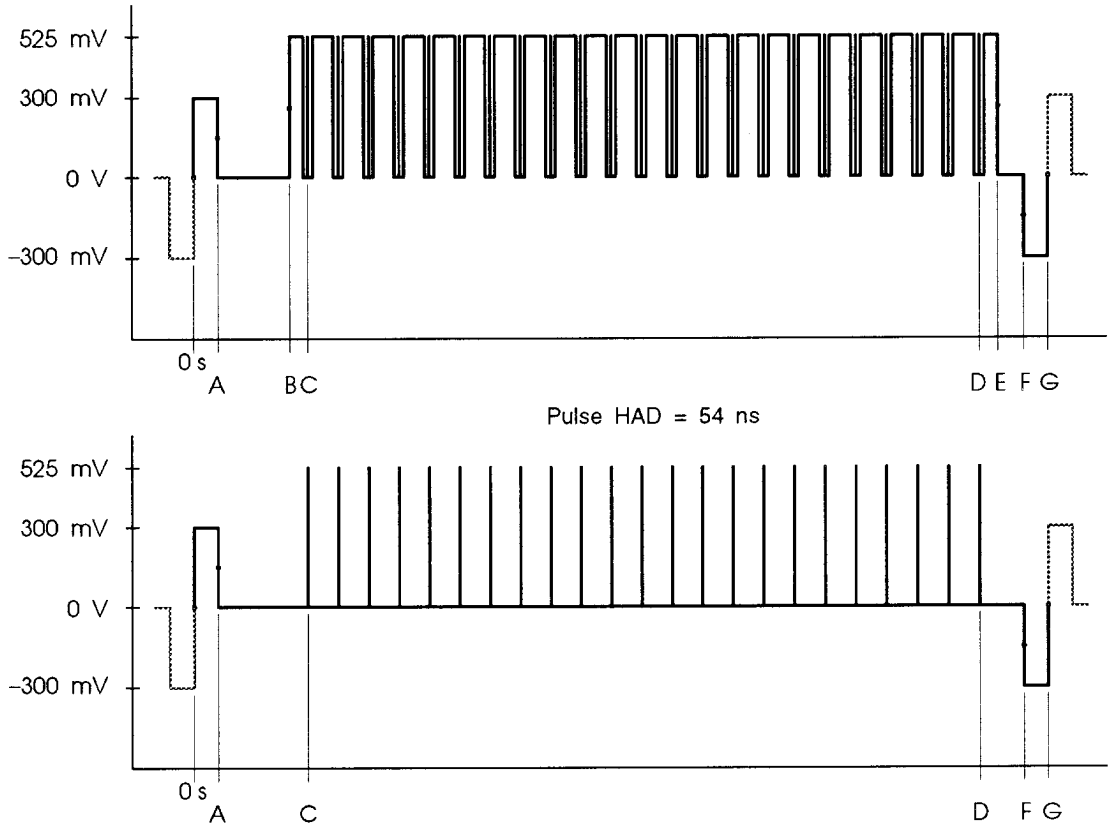
* Including N125/2:1/59.94



Pluge with White Clip Indicators — GBR, all outputs, and Y, P_B, P_R; Y output

	Output Standard(s)						
	525/1:1 1050/2:1	1050/1:1	625/1:1 1250/2:1	1250/1:1	787/788	1125/2:1 60 Hz	1125/2:1** 59.94 Hz
A	0.889 µs	0.444 µs	0.889 µs	0.444 µs	0.597 µs	0.593 µs	0.593 µs
B	3.556	1.778	3.556	1.778	2.668	2.586	2.588
C	4.093	2.047	4.083	2.049	*	3.111	3.114
D	8.930	4.466	8.806	4.489	*	7.841	7.849
E	11.930	5.967	11.736	6.002	8.127	10.774	10.785
F	13.996	7.000	13.764	7.044	9.474	12.795	12.807
G	16.062	8.034	15.778	8.087	10.821	14.815	14.830
H	18.128	9.068	17.806	9.129	12.167	16.835	16.852
I	22.678	11.344	22.250	11.424	15.134	21.284	21.306
J	23.695	11.852	23.250	11.937	15.796	22.279	22.301
K	24.711	12.361	24.236	12.450	16.459	23.273	23.296
L	25.728	12.870	25.236	12.963	17.122	24.267	24.291
M	30.889	15.445	31.111	15.556	20.558	29.037	29.066
N	31.778	15.889	32.000	16.000	21.185	29.630	29.659

* Due to memory limitations, 787/788 signal does not have white clip indicators.
** Including N125/2:1/59.94



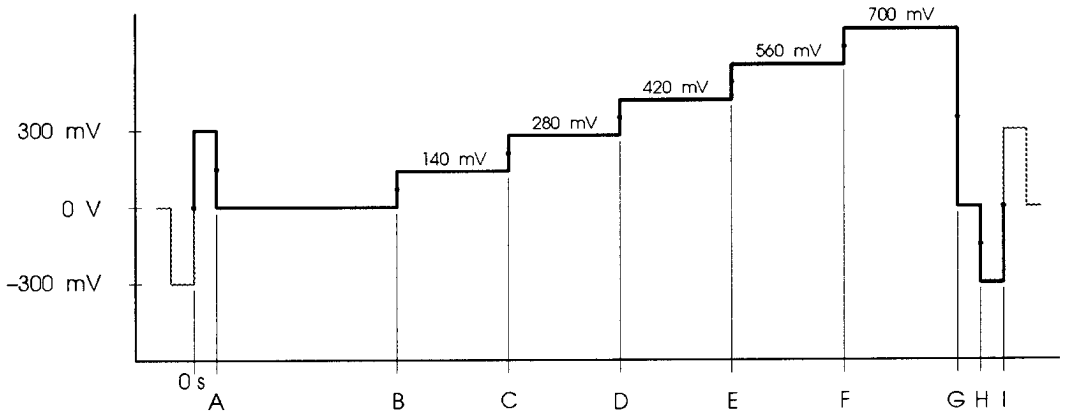
Convergence Crosshatch (essential components) — GBR, all outputs, and Y, P_B, P_R; Y output

NOTE

The SPG 1000 Convergence Crosshatch signal is composed of six different line configurations, two of which are shown above. The upper waveform makes up the basic horizontal line in the crosshatch pattern; the lower form is repeated to create vertical lines. The four remaining line configurations are variations of these two.

	Output Standard(s)						
	525/1:1 1050/2:1	1050/1:1	625/1:1 1250/2:1	1250/1:1	787/788	1125/2:1 60 Hz	1125/2:1* 59.94 Hz
A	0.889 µs	0.444 µs	0.889 µs	0.444 µs	0.597 µs	0.593 µs	0.593 µs
B	3.556	1.778	3.556	1.778	2.668	2.586	2.588
C	4.222	2.667	4.222	2.111	3.080	4.364	3.236
D	29.333	14.667	29.556	14.778	19.486	27.798	27.826
E	30.000	15.000	30.222	15.111	19.911	28.444	28.473
F	30.889	15.445	31.111	15.556	20.558	29.037	29.066
G	31.778	15.889	32.000	16.000	21.185	29.630	29.659

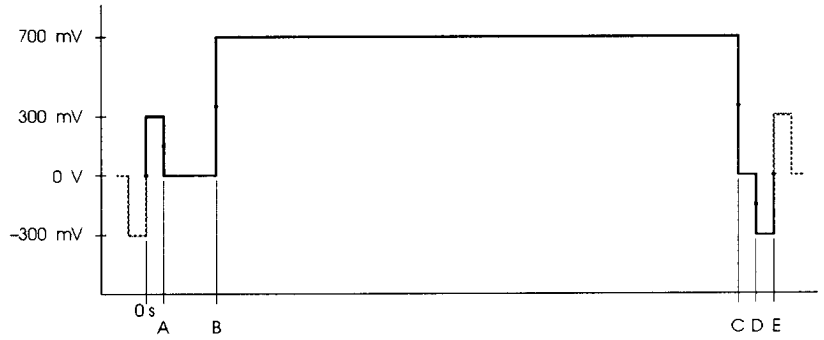
* Including N125/2:1/59.94



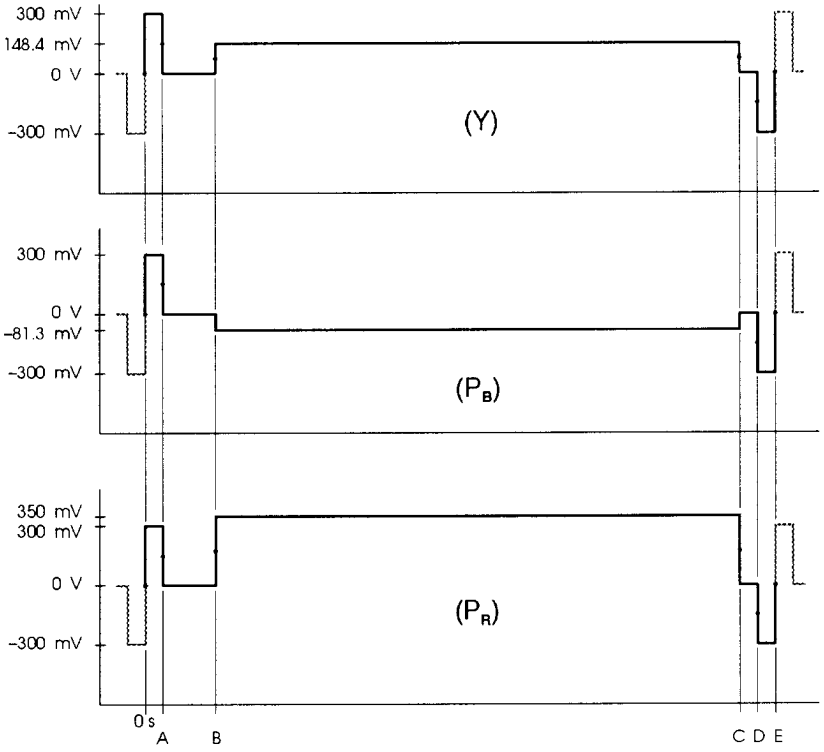
Five-Step Grey Staircase — GBR, all outputs, and Y, P_B, P_R; Y output

	Output Standard(s)						
	525/1:1 1050/2:1	1050/1:1	625/1:1 1250/2:1	1250/1:1	787/788	1125/2:1 60 Hz	1125/2:1* 59.94 Hz
A	0.889 µs	0.444 µs	0.889 µs	0.444 µs	0.597 µs	0.593 µs	0.593 µs
B	7.964	3.983	8.000	4.000	5.541	6.896	6.903
C	12.372	6.188	12.444	6.222	8.414	11.205	11.217
D	16.780	8.393	16.889	8.444	11.287	15.515	15.531
E	21.188	10.599	21.333	10.667	14.161	19.825	19.845
F	25.596	12.804	25.778	12.889	17.034	24.135	24.159
G	30.004	15.009	30.222	15.111	19.904	28.444	28.473
H	30.889	15.445	31.111	15.556	20.558	29.037	29.066
I	31.778	15.889	32.000	16.000	21.185	29.630	29.659

* Including N125/2:1/59.94



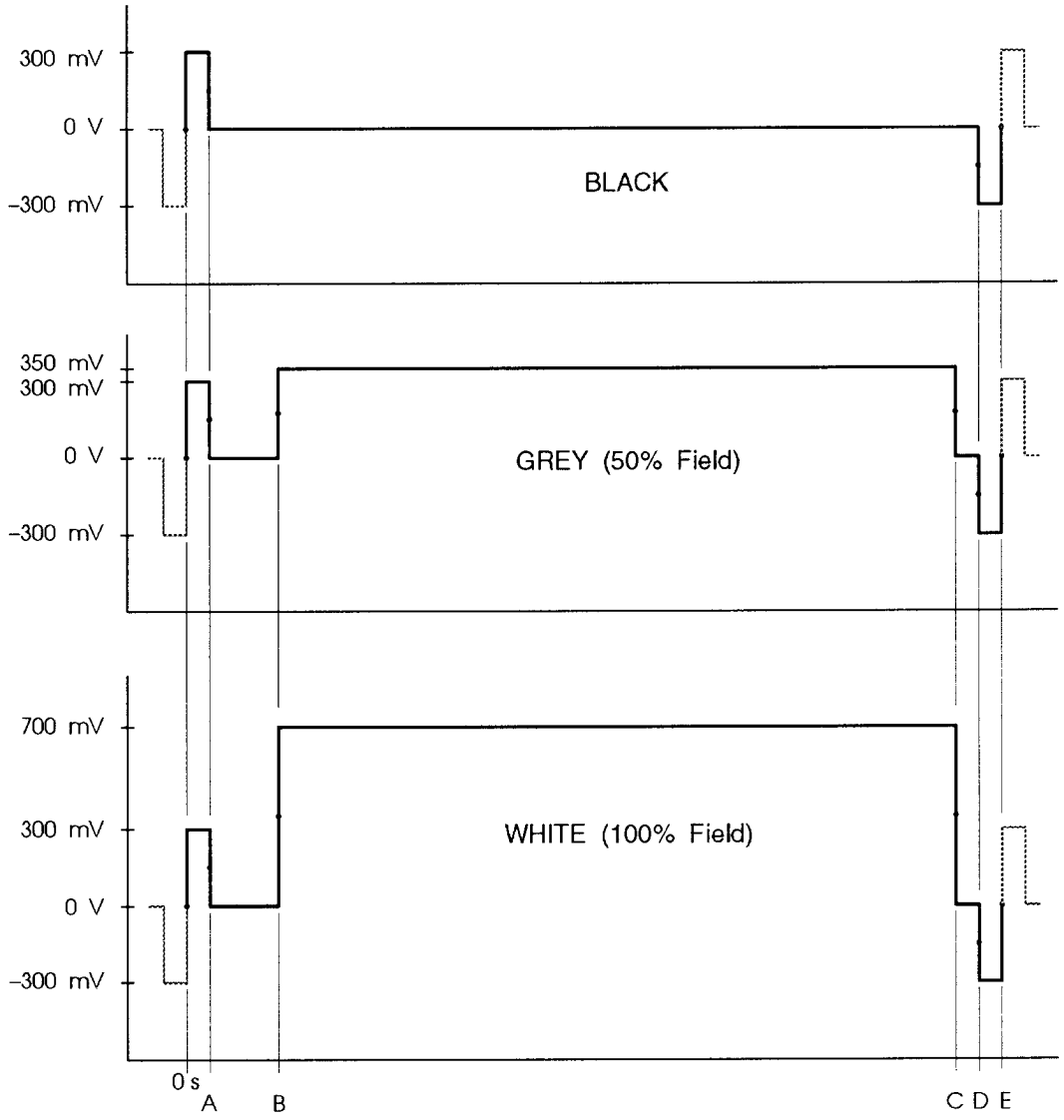
Red Field — GBR, R output



Red Field — Y,P_B,P_R; the three outputs

	Output Standard(s)						
	525/1:1 1050/2:1	1050/1:1	625/1:1 1250/2:1	1250/1:1	787/788	1125/2:1 60 Hz	1125/2:1* 59.94 Hz
A	0.889 µs	0.444 µs	0.889 µs	0.444 µs	0.597 µs	0.593 µs	0.593 µs
B	3.556	1.778	3.556	1.778	2.668	2.586	2.588
C	30.005	15.009	30.222	15.111	19.907	28.444	28.473
D	30.889	15.445	31.111	15.556	20.558	29.037	29.066
E	31.778	15.889	32.000	16.000	21.185	29.630	29.659

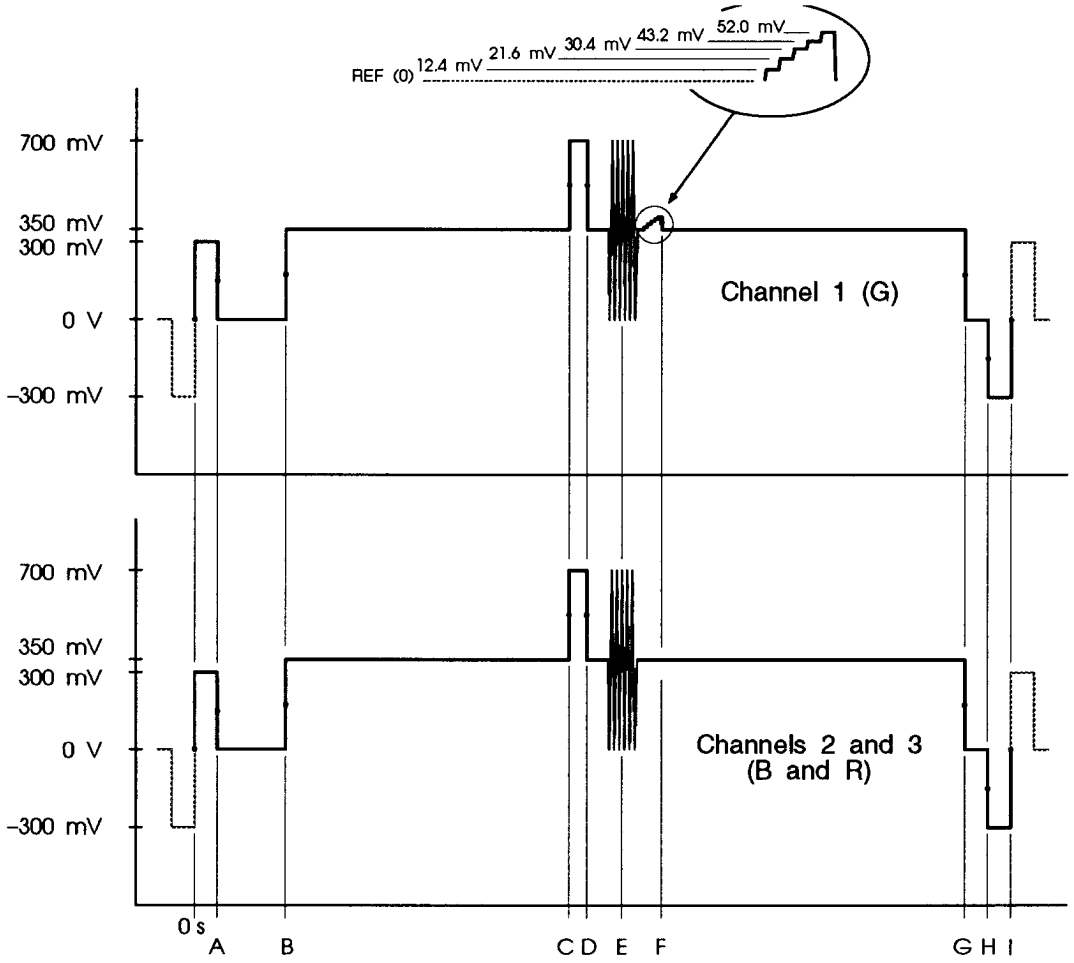
* Including N125/2:1/59.94



Black, Grey, and White Fields — GBR, all outputs, and Y,P_B,P_R; Y output

	Output Standard(s)						
	525/1:1 1050/2:1	1050/1:1	625/1:1 1250/2:1	1250/1:1	787/788	1125/2:1 60 Hz	1125/2:1* 59.94 Hz
A	0.889 µs	0.444 µs	0.889 µs	0.444 µs	0.597 µs	0.593 µs	0.593 µs
B	3.556	1.778	3.556	1.778	2.668	2.586	2.588
C	30.005	15.009	30.222	15.111	19.907	28.444	28.473
D	30.889	15.445	31.111	15.556	20.558	29.037	29.066
E	31.778	15.889	32.000	16.000	21.185	29.630	29.659

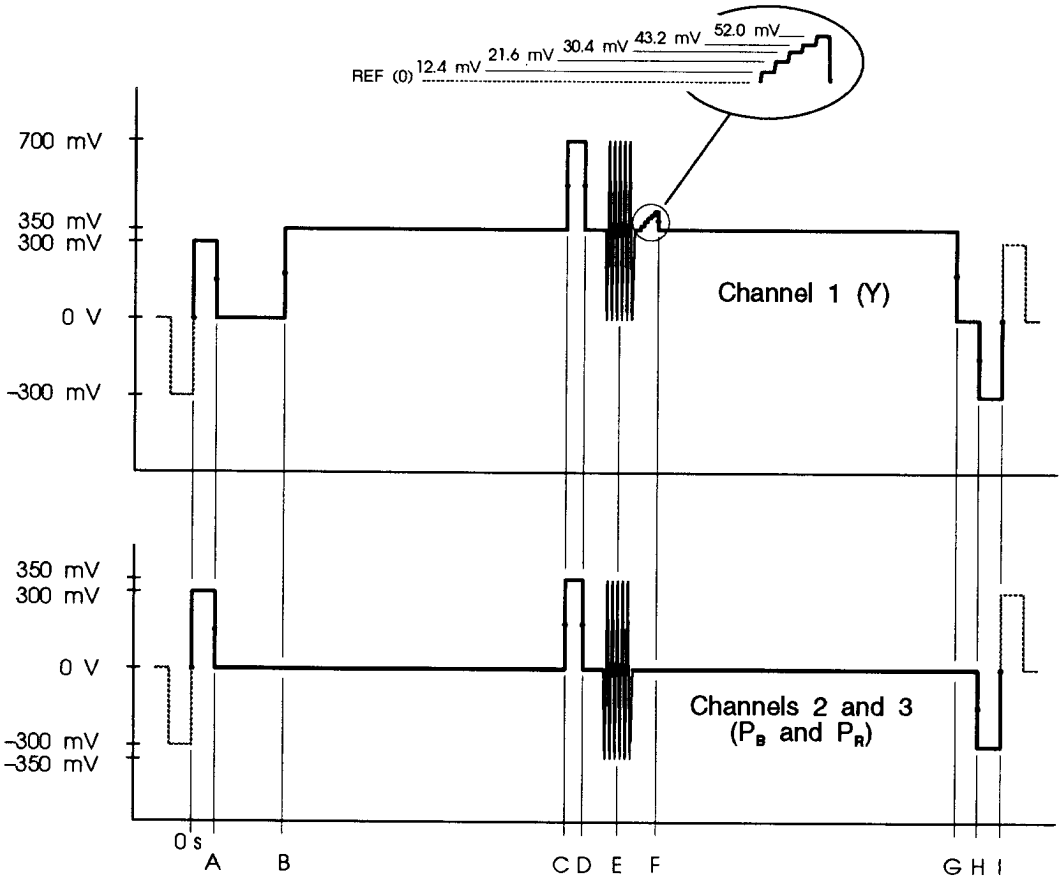
* Including N125/2:1/59.94



Timing Signal — GBR, all outputs

	Output Standard(s)						
	525/1:1 1050/2:1	1050/1:1	625/1:1 1250/2:1	1250/1:1	787/788	1125/2:1 60 Hz	1125/2:1* 59.94 Hz
A	0.889 µs	0.444 µs	0.889 µs	0.444 µs	0.597 µs	0.593 µs	0.593 µs
B	3.556	1.778	3.556	1.778	2.668	2.586	2.588
C	14.684	7.354	14.833	6.944	9.923	13.486	13.481
D	15.373	7.689	15.500	7.306	10.372	14.141	14.156
E	16.778	8.389	16.889	8.444	12.287	15.515	15.531
F	18.293	9.150	18.500	9.528	12.477	16.997	17.014
G	30.000	15.007	30.222	15.118	19.907	28.444	28.473
H	30.889	15.445	31.111	15.556	20.558	29.037	29.066
I	31.778	15.889	32.000	16.000	21.185	29.630	29.659

* Including N125/2:1/59.94



Timing Signal — Y,P_B,P_R; all outputs

	Output Standard(s)						
	525/1:1 1050/2:1	1050/1:1	625/1:1 1250/2:1	1250/1:1	787/788	1125/2:1 60 Hz	1125/2:1* 59.94 Hz
A	0.889 µs	0.444 µs	0.889 µs	0.444 µs	0.597 µs	0.593 µs	0.593 µs
B	3.556	1.778	3.556	1.778	2.668	2.586	2.588
C	14.684	7.354	14.833	6.944	9.923	13.486	13.481
D	15.373	7.689	15.500	7.306	10.372	14.141	14.156
E	16.778	8.389	16.889	8.444	12.287	15.515	15.531
F	18.293	9.150	18.500	9.528	12.477	16.997	17.014
G	30.000	15.007	30.222	15.118	19.907	28.444	28.473
H	30.889	15.445	31.111	15.556	20.558	29.037	29.066
I	31.778	15.889	32.000	16.000	21.185	29.630	29.659

* Including N125/2:1/59.94

WARNING

The following servicing instructions are for use only by qualified personnel. To avoid injury, do not perform any servicing other than that stated in the operating instructions unless you are qualified to do so. Refer to all Safety Summaries before performing any service.

Section 6
PERFORMANCE CHECKS and CALIBRATION

This section consists of lists and detailed procedures to use when verifying and calibrating SPG 1000 performance parameters.

The order of these procedures has been chosen, in part, to minimize changes in equipment setup. Performance parameters may be checked in any order; begin at a step accompanied by a setup illustration. Because many calibration steps are interactive, however, care must be taken when adjusting individual parameters to ensure that all others remain within specification.

In most cases, the choice of the output standard to be used in check and calibration procedures is arbitrary. Use a standard that has relevance to the normal operating environment of the instrument (i.e., if the SPG 1000 under test is most often used to provide 1125/59.94 sync and test signals, use that standard when checking and calibrating output parameters). Likewise, it is sufficient to check genlock to bi-level sync using either an NTSC *or* a PAL reference.

Recommended Test Equipment

Table 6–1 lists the equipment required for performance checks and calibration. Alternate equipment may be used if it meets or exceeds the performance of the recommended items. Use of inadequate equipment may result in inaccurate measurements or calibration.

Table 6–1 Recommended equipment for Performance Check and Calibration procedures.

Item	Minimum Specifications/Additional Information	Examples
Analog Test Oscilloscope	Three or more channels; 300 MHz bandwidth; horizontal resolution at least 500 ps. Suitable for most checks and adjustments.	Tektronix 2467B
Digitizing Oscilloscope with Video Amplifier	Three or more channels; 300 MHz bandwidth; 75Ω input impedance (or use 75Ω through-terms); offset range of ±1 V at 2 mV/Div; able to calculate mean and RMS amplitudes of selected portions of the waveform. Required for output S/N checks.	Tektronix 11403A with 11A34V Video Amplifier
Frequency Counter	Accurate within ±2.5 Hz in 75 MHz (in Ratio A/B mode).	Tektronix DC503A
HDTV Waveform Monitor	Accepts tri-level sync; able to display two waveforms (overlaid) simultaneously. Required to check/cal. V timing range and output gain.	Tektronix 1730HD
HDTV Sync Pulse/Test Signal Generator	Capable of generating to all standards present in the SPG 1000 under test; variable time base (±10 ppm); test signals must include Black, Grey, and White Fields.	Tektronix SPG 1000
NTSC Test Signal Generator	Must output Black and White Fields and Sync without burst. Variable time base and SCH.	Tektronix 1410 with SPG2A, TSG7, and TSG3

Table 6–1, Equipment recommendations, continued.

Item	Minimum Specifications/Additional Information	Examples
PAL Test Signal Generator	Must output Black and White Fields and Sync without burst. Variable time base.	Tektronix 1411 with SPG12A, TSG11, and TSG13
Video Amplifier/ Attenuator/Noise Generator (One or more instruments)	Able to amplify and attenuate video signals by ±6 dB and ±3 dB; provide unweighted white noise with 5 to 100 MHz bandwidth; and provide –6 dB hum. See Performance Check procedures 8 through 12 beginning on page 6–6.	Tektronix 1434 Video Noise Generator (preferred); Noise-Com NC6107 Noise Generator with opts. 9 (75Ω) and 4; Tektronix SG502 Oscillator
Network Analyzer/ Reflectometer	75Ω. Capable of return loss (S_{11}) measurements from 300 kHz to 30 MHz. Required for return loss measurements.	Hewlett-Packard 8753C Network Analyzer with 85046B S-Parameter test set.
Video Amplitude Calibration Fixture (VAC)	Provides a squarewave amplitude reference to at least 707 mV; 0.1% accuracy. 37.5Ω output; no termination required.	Tektronix p/n 067-0916-00
Spectrum Analyzer with Tracking Generator	Frequency range must encompass 63–83 MHz. Center frequency accuracy of at least ±6 kHz at 73 MHz. Required for clock filter alignment.	Tektronix 2710 with Opt. 04.
50Ω Type N to BNC adapters (2)	Used in clock filter alignment.	Tektronix p/n 103-0045-00
50Ω Coax cables (2)	BNC ends, used in clock filter alignment.	Tek p/n 012-0057-01
50–75Ω Min. loss attenuators (2)	Male to female BNC. Used in clock filter alignment.	Tektronix p/n 011-0057-01
BNC-to-Square pin coax cables (2)	Used in clock filter alignment.	Tektronix p/n 174-1770-00
Non-magnetic "tweak" tool	Used in clock filter alignment.	Tektronix p/n 003-0837-00
Coax Cable, BNC to Female SMB	Used in oscillator and sync fine timing adjustments.	Tektronix p/n 012-0532-00
BNC "T"	Used in alternate jitter vs. hum procedure.	Tek p/n 103-0030-00
75Ω Coax Cables (up to 5)	BNC ends, used in most checks and adjustments.	Tektronix p/n 012-0074-00 (42 in.)
75Ω Feed-through Terminations (3)	Male to female BNC.	Tektronix p/n 011-0103-00
75Ω Terminations (2)	Male BNC.	Tektronix p/n 011-0102-00

Performance Check List

Voltage-Controlled Oscillators

1. Free-running frequencies (nominal ±1 ppm).

Genlock and Sync Offset Ranges

2. Genlock vertical range (±1/2 frame).
3. Sync vertical range (±1/2 frame).
4. Genlock horizontal range (±1/2 line).
5. Sync horizontal range (±1/2 line).
6. Genlock fine range (±1/2 clock cycle).
7. Sync fine range (±1/2 clock cycle).

HD Genlock (Tri-level Sync)

8. Ability to lock to a ±6 dB reference.
9. Jitter with a ±3 dB reference (≤0.5 ns).
10. Stability with respect to reference APL (≤0.5 ns shift from 10% to 90% APL).
11. Jitter with respect to hum (≤0.5 ns with –6 dB hum).
12. Jitter with respect to noise (≤0.5 ns with white noise, 30 MHz bandwidth, 60 dB S/N, ±3 dB input).
13. Ability to lock to a reference with a time-base error of ±10 ppm.

NTSC/PAL Genlock (Bi-level Sync)

14. Ability to lock to a ±6 dB reference.
15. Jitter with a ±3 dB reference (≤ 1.0 ns).
16. Stability with respect to reference APL (≤ 0.5 ns shift from 10% to 90% APL).
17. Jitter with respect to hum (≤0.5 ns with –6 dB hum).
18. Jitter with respect to noise (≤0.5 ns with white noise, 30 MHz bandwidth, 60 dB S/N, ±3 dB input).
19. Ability to lock to a reference with a time-base error of ±10 ppm.
20. Ability to lock to an NTSC signal with 45° SCH error.

Output Signal Characteristics

21. Blanking levels (±50 mV).
22. White levels and Sync amplitudes ±1% of nominal, ±0.5% of each other).
23. S/N ratios (> 50 dB to 300 MHz).
24. Skew (≤1.0 ns between any two sync or any two test signal outputs).

Return Loss Measurements

25. Genlock input (> 40 dB to 5 MHz; > 30 dB to 30 MHz).
26. Test signal and sync outputs (> 35 dB to 30 MHz).

Performance Check Procedures

Voltage-Controlled Oscillators

1. Free-running frequencies:

NOTE

After initial setup or long storage, allow a two-hour warm up to re-age the crystals. Thereafter, 30 minutes warm up is sufficient.

a. Connect the test equipment as shown in Fig. 6–1. For best results, use a BNC-to-SMB (female) coax cable such as Tektronix p/n 012-0532-00 between J23 and the Counter/Timer.

b. Enter the output standard-select mode at the front panel of the SPG 1000. Using Table 6–2 as a guide, check that the oscillator frequency falls within the acceptable range for the current output standard.

c. Select, in turn, two other output standards which use the remaining installed oscillators. Check that the frequency for each falls within the acceptable range.

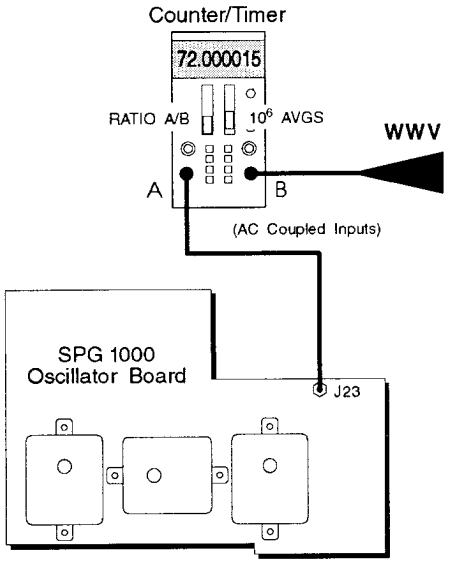


Fig. 6–1 A setup for verifying or adjusting oscillator frequencies.

Table 6–2 Acceptable VCO frequencies.

Output Standard	Minimum Freq. (MHz)	Maximum Freq. (MHz)
525, 625, 1050, and 1250 lines	71.999928	72.000072
787/788 lines	75.335589	75.335739
1125 lines, 60 Hz	74.249926	74.250074
1125 lines, 59.94 Hz	74.1758750	74.175898
N125 (Option 17)	75.524400	75.524550

Genlock and Sync Offset Ranges

2. Genlock vertical range:

a. Connect the equipment as shown in Fig. 6–2. Begin with the settings listed in Table 6–3.

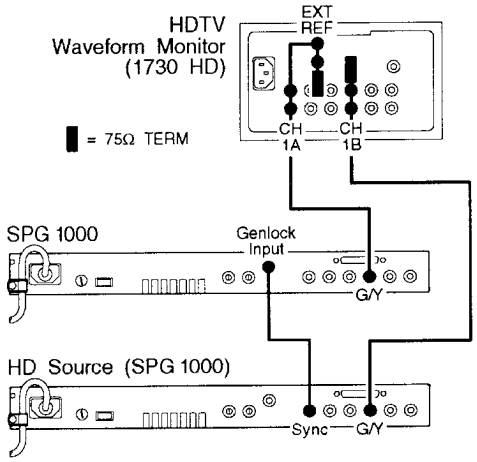


Fig. 6–2 A setup for checking vertical timing ranges.

b. Adjust the channel B offset (on the monitor) to separate the traces.

c. Select genlock vertical timing at the front panel of the SPG 1000 under test. Advance and delay the offset while watch-

Table 6–3 Settings for checking Genlock and Sync vertical ranges.

Variable	Setting
WAVEFORM MONITOR:	
Inputs	Channel 1, A & B
Reference	External
Display	2 Fields
Offsets (in Menu)	Enabled
HD SOURCE:	
Output Standard	Any
Reference	Internal
Output Format	GBR
Test Signal	50% Grey
SPG 1000:	
Output Standard	Compatible w/Source
Input Standard	Same as Source
Reference	External
Output Format	GBR
Test Signal	50% Grey

ing the waveform monitor. Confirm that the vertical interval of the channel B signal can be moved at least 1/2 frame (of the source standard) in either direction.

3. Sync vertical range:

Select Sync vertical timing at the front panel of the SPG 1000 under test. Again, advance and delay the offset while watching the waveform monitor. Confirm that the channel B signal can be advanced and delayed at least 1/2 of the channel A (source) frame.

4. Genlock horizontal range:

a. Connect the equipment as shown in Fig. 6–3. Begin with the settings listed in Table 6–4. The clock input to the 'scope (CH3) is required for checking the fine timing ranges. The clock signal may be taken directly from J23 on the oscillator board of the source SPG 1000 as in performance check number 1.

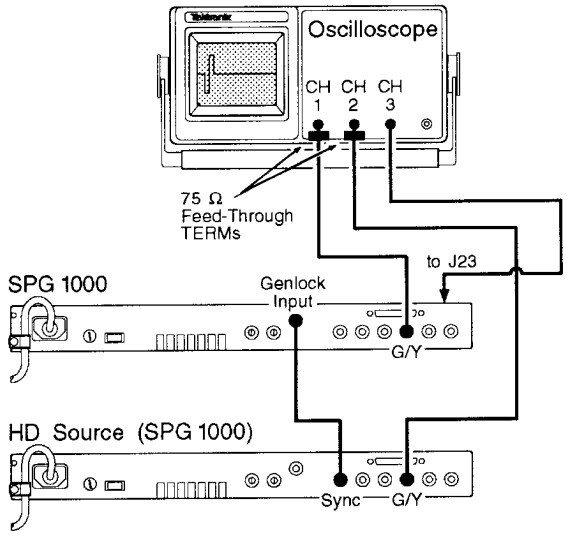


Fig. 6–3 A setup for checking horizontal and fine timing ranges.

b. Adjust the oscilloscope (and SPG 1000 under test, if necessary) to view a sync pulse on both channels.

Table 6–4 Initial settings for checking horizontal and fine timing ranges.

Variable	Setting
OSCILLOSCOPE:	
Vertical Mode	CH1 and CH2
Volts/Div	100 mV
Vertical Coupling	1MΩ, DC
Horizontal	10x Mag, 5 µs
Trigger Mode	Auto
Trigger Source	CH2
HD SOURCE:	
Output Standard	Any
Reference	Internal
Output Format	GBR
Test Signal	Black
SPG 1000:	
Output Standard	Compatible w/Source
Input Standard	Same as Source
Reference	External
Output Format	GBR
Test Signal	Black

c. Select genlock horizontal timing at the front panel of the SPG 1000 under test. Advance and delay the timing offset while watching the oscilloscope display. Confirm that the sync pulse of the CH1 signal can be offset at least 1/2 of the CH2 line in either direction. In actual use, there will be no apparent limits to the horizontal offset. Continuing to turn the knob will further advance or delay the output of the SPG 1000.

5. Sync horizontal range:

Select Sync horizontal timing at the SPG 1000 under test. Again, advance and delay the offset while watching the oscilloscope. Confirm that the CH1 sync can be advanced and delayed at least 1/2 of the CH2 line. As above, continuing to turn the knob will advance or delay the SPG 1000 output well beyond 1/2 line.

6. Genlock fine range:

a. Begin with the horizontal range setup and change the oscilloscope settings to those listed in Table 6–5.

b. Select genlock fine timing at the front panel of the SPG 1000 under test. Advance and delay the offset while watching the oscilloscope display. Confirm that the sync pulse of the CH1 signal and the CH3 clock signal can be offset by at least 1/2 clock-pulse in either direction. In fact, the CH1 sync will be seen to "jump" when it has moved slightly more than 1/2 pulse; continuing to turn the knob will further advance or delay the SPG 1000 output in "fine" increments.

7. Sync fine range:

a. Select sync fine timing at the front panel of the SPG 1000 under test. Advance and delay the offset while watching the oscilloscope display. Confirm that the sync pulse of the CH1 signal can be offset by at least 1/2 clock-pulse in either direction. Again, the CH1 sync will "jump" when it has moved slightly more than 1/2 pulse, and continuing to turn the knob will further advance or delay the test signal output in "fine" increments. Note that the clock output will not be affected by Sync timing adjustments.

Table 6–5 Oscilloscope settings for checking fine timing ranges.

Variable	Setting
Vertical Mode	CH1, CH2, & CH3
Volts/Div.	CH1 & CH2, 20 mV (CH3, as appropriate)
Horizontal	10x Mag, 10 ns/Div.

HD Genlock (tri-level sync)

8. Ability to lock to a ± 6 dB reference;

9. Jitter with a ± 3 dB reference; and

10. Stability with respect to reference APL:

a. Connect the equipment as shown in Fig. 6–4; begin with the settings listed in Table 6–6. Confirm the presence of equal-amplitude syncs on channels 1 and 2 of the oscilloscope. Confirm genlock (no horizontal movement in the channel 1 trace).

b. Adjust the amplifier/attenuator for 6 dB gain. CHECK and confirm that genlock is maintained.

c. Adjust the amplifier/attenuator for 6 dB attenuation. CHECK and confirm that genlock is maintained.

d. Adjust the Genlock (horizontal and fine) timing of the SPG 1000 under test to synchronize its output with that of the source (this will make it easier to locate the SPG 1000 output on the oscilloscope

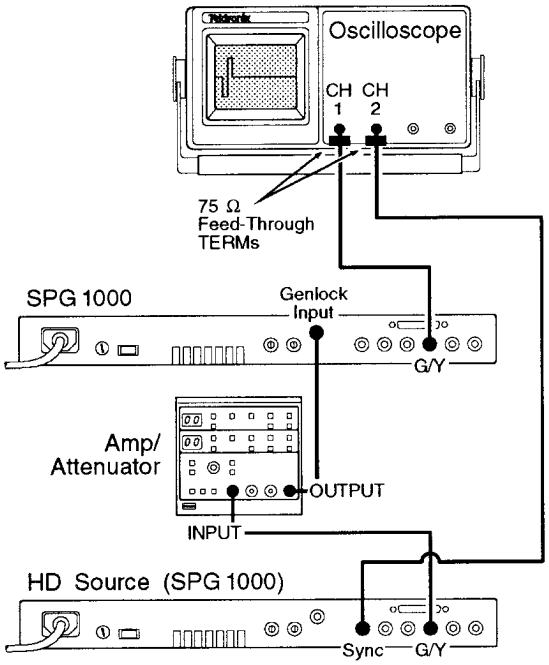


Fig. 6–4 A setup for verifying stability of genlock to an HDTV signal.

which will be triggered on source output). Switch the oscilloscope to view CH1 minus CH2; a null waveform will indicate proper synchronization.

e. (Jitter with nominal signal) Set the 'scope to show channel 1 only; adjust it to view a rising or falling portion of the sync at 500 ps/DIV and high vertical amplification (2 or 5 mV/DIV). CHECK that the jitter (total horizontal excursion of the trace) is less than 500 ps (0.5 ns).

f. (Timing shift with change in APL) Change the test signal being output by the source generator to Grey Field, then White Field. CHECK that the channel 1 trace on the 'scope has moved no more than 1 division (0.5 ns) to the left or right. Change the source output back to Black Field and confirm a shift of no more than 1 division.

g. (Jitter with + 3 dB reference) Adjust the amplifier/attenuator for 3 dB of gain. Use the horizontal position control of the 'scope, if necessary, to again display the channel 1 trace. CHECK that there is no more than 0.5 ns jitter.

h. (Jitter with –3 dB reference) Adjust the amplifier/attenuator for 3 dB of attenuation. Use the horizontal position control of the oscilloscope, if necessary, to locate the channel 1 trace. CHECK that there is no more than 0.5 ns jitter.

Table 6–6 Initial equipment settings for verifying HD genlock stability.

Variable	Setting
OSCILLOSCOPE:	
Vertical Mode	CH1 and CH2
Volts/Div	200 mV (both CH)
Vertical Coupling	1MΩ, DC (both CH)
Horizontal	x10 MAG, 2 µs/Div.
Trigger Mode	Auto
Trigger Source	CH2
Trigger Coupling	DC
AMP/ATTENUATOR:	
Gain/Attenuation	0 dB
HD SOURCE:	
Output Standard	1125 or any 2:1
Reference	Internal
Output Format	GBR
Test Signal	Black
SPG 1000:	
Output Standard	Source-compatible
Input Standard	Same as Source Out
Reference	External
Output Format	GBR
Test Signal	Black

11. Jitter with respect to hum:

If equipment for generating "video hum" is not available, use procedure 11A.

a. Continue with the equipment setup used in the previous step, replacing the amp/attenuator with a video noise generator, if

necessary. Change the output of the genlock source to White Field.

b. Adjust the noise generator to add –50 dB hum (approximately 2.2 mV_{p-p}) to the genlock reference signal. As before, set the 'scope to show a rising or falling portion of the channel 1 sync at 500 ps/DIV and high vertical amplification.

c. Gradually—or in steps—increase the added hum from –50 dB to –6 dB (350 mV_{p-p}). CHECK that the jitter increases to no more that 500 ps (0.5 ns).

11A. Jitter with respect to hum, alternate procedure:

This procedure uses a variable oscillator to simulate video hum. In preparation, the oscillator frequency and amplitude must be adjusted with a setup similar to that shown in Fig. 6–5. Select 50 or 60 Hz to correspond to local line frequency; for most accuracy, check the oscillator output with a frequency counter before beginning step a.

a. Connect the equipment as shown in Fig. 6–5. Set the HD source to output a Black Field. Trigger on the "hum." Adjust the oscillator for a center-trace amplitude of 350 mV_{p-p}. Confirm that the HD sync extends approximately 300 mV above and below the center sine wave. (Because of mismatched impedance, some attenuation—about 1 dB—is likely. Genlock performance of the SPG 1000 should not be affected.)

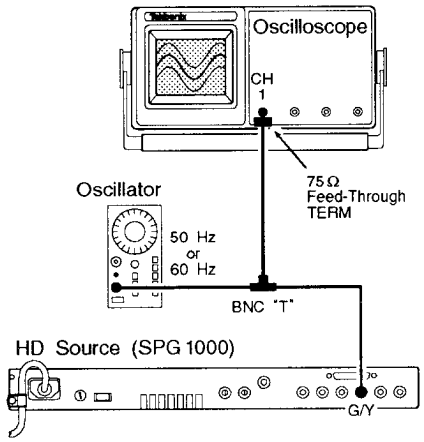


Fig. 6–5 Adjusting oscillator frequency and gain to simulate –6 dB hum.

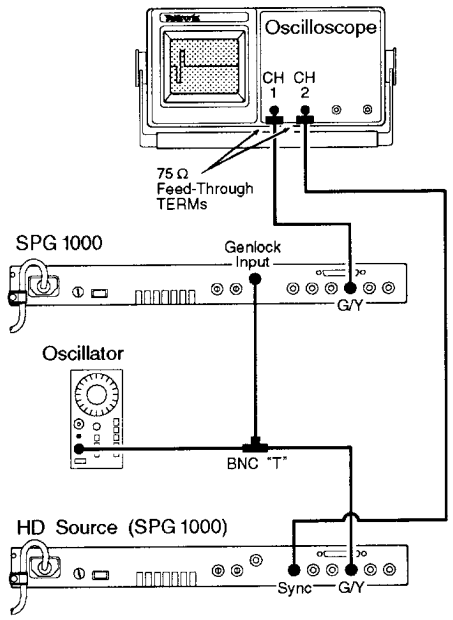


Fig. 6–6 A setup for checking jitter due to hum.

b. Change the equipment setup to that shown in Fig. 6–6. Change the source output to White Field.

c. As in the previous checks, trigger on the source sync and synchronize the two signals.

d. View a rising or falling portion of the channel 1 sync at 500 ps/DIV and high vertical amplification. CHECK for a jitter of no more than one division (0.5 ns).

12. Jitter with respect to noise:

NOTE

The ideal noise source for the following procedure would output unweighted white noise over a 30 MHz bandwidth, with a 0 dB level based on a 700 mV signal. If no such source is available, one which generates noise over a 5 MHz or other bandwidth may be substituted. If a (5 MHz) video noise generator is used, select a 68 dB S/N ratio for the proper "noise-voltage density" of 127.8 nV per root Hz (if no more than 60 dB attenuation is available—as with the TEK 1434—check for 1.25 ns jitter at 60 dB S/N).

Use the following formula to calculate the appropriate noise attenuation for generators of different bandwidth or 0 dB levels (formula is valid only for generators with 75Ω impedance):

$$A = 20 \log \left[\frac{V_0}{(1.278 \times 10^{-7}) \sqrt{B}} \right]$$

Where A is the attenuation in dB; B is the bandwidth of the generator in Hz; and V_0 is the 0 dB noise level in Volts (RMS).

a. Connect the equipment as shown in Fig. 6–7; begin with the settings listed in Table 6–7. Confirm the presence of equal-amplitude syncs on channels 1 and 2 of the oscilloscope. Confirm genlock (no horizontal movement in the channel 1 trace).

b. Adjust the genlock (horizontal and fine) timing of the SPG 1000 under test to synchronize its output with that of the source (this will make it easier to locate the SPG 1000 output on the oscilloscope which will be triggered on source output). Switch the 'scope to view CH1 minus CH2; a null waveform will indicate proper synchronization. Use fine timing to minimize any spikes at the beginning, middle, and end of the sync remnant.

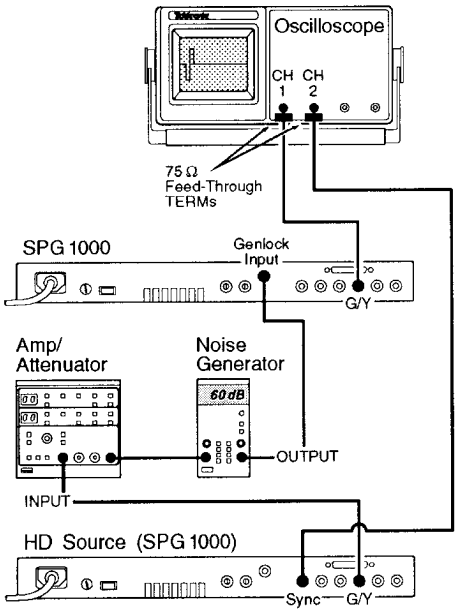


Fig. 6–7 A setup for checking jitter due to a noisy input signal.

Table 6–7 Initial equipment settings for checking jitter with noisy input.

Variable	Setting
OSCILLOSCOPE:	
Vertical Mode	CH1 and CH2
Volts/Div	200 mV (both CH)
Vertical Coupling	1MΩ, DC (both CH)
Horizontal	x10 MAG, 2 µs/Div.
Trigger Mode	Auto
Trigger Source	CH2
Trigger Coupling	DC
AMP/ATTENUATOR:	
Gain/Attenuation	0 dB
NOISE GENERATOR:	
Signal/Noise Ratio	60 dB; see *NOTE*
HD SOURCE:	
Output Standard	Any of interest
Reference	Internal
Output Format	GBR
Test Signal	White Field
SPG 1000:	
Output Standard	Source-compatible
Input Standard	Same as Source Out
Reference	External
Output Format	GBR
Test Signal	Black

c. (Jitter with 60 dB S/N and +3 dB reference) Adjust the amplifier/attenuator for 3 dB of gain. Set the 'scope to show channel 1 only and adjust it to view a rising or falling portion of the sync at 500 ps/DIV and high vertical amplification (2 or 5 mV/DIV). CHECK that the jitter (total horizontal excursion of the trace) is less than 0.5 ns.

d. (Jitter with 60 dB S/N and –3 dB reference) Adjust the amplifier/attenuator for

3 dB of attenuation. Use the horizontal position control of the oscilloscope, if necessary, to locate the channel 1 trace. Once again, CHECK that there is no more than 0.5 ns jitter.

13. Ability to lock to a reference with a time-base error of ±10 ppm:

a. Connect the equipment as shown in Fig. 6–8; begin with the settings listed in Table 6–8. The counter/timer input may be taken directly from J23 on the oscillator board of the source SPG 1000. See the setup for check number one (Fig. 6–3, on page 6–5.)

b. Consult Table 6–2 and choose a standard that corresponds to one of the oscillators installed in the SPG under test (the same frequency must also be available in the reference SPG). Select that standard as the output standard for both generators as well as the input standard for the SPG under test.

c. Find the CH1 and CH2 syncs on the 'scope display. Confirm that the SPG under test is genlocked to the reference source.

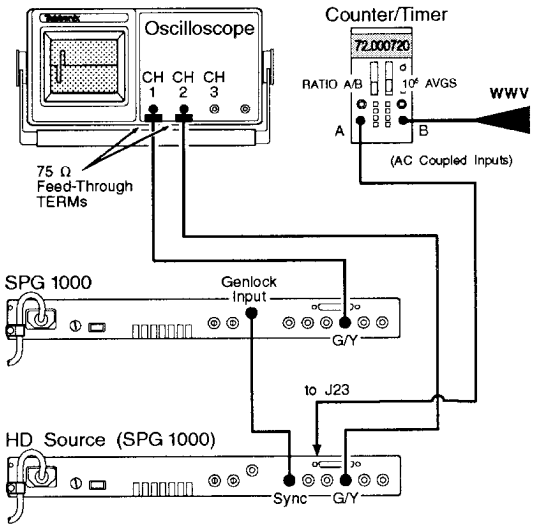


Fig. 6–8 A setup for checking genlock to a source with time-base error.

Table 6–8 Initial equipment settings for checking jitter with reference time-base error.

Variable	Setting
OSCILLOSCOPE:	
Vertical Mode	CH1 and CH2
Volts/Div	200 mV (both CH)
Vertical Coupling	1MΩ, DC (both CH)
Horizontal	x10 MAG, 2 µs/Div.
Trigger Mode	Auto
Trigger Source	CH2
Trigger Coupling	DC
HD SOURCE:	
Reference	Internal
Output Format	GBR
Test Signal	White Field
SPG 1000:	
Reference	External
Output Format	GBR
Test Signal	Black

NOTE

The time base of the source SPG 1000 may be controlled with a DC voltage applied to TP1/VCO on the oscillator board of the instrument. Applying between – 5 and –10 V will increase the frequency; between + 5 and +10 V will decrease it. Voltage may be applied with an external power supply or derived from TP5 (+10 V) and TP7 (–10 V) on the oscillator board. See Fig. 6–9.

d. Apply a sufficient negative voltage to TP1 of the source SPG to increase the reference time base by 10 ppm (e.g., 720 Hz for a 72 MHz oscillator). CHECK and confirm that genlock is maintained.

e. Apply a sufficient positive voltage to TP1 to decrease the reference time base by 10 ppm. CHECK and confirm that genlock is maintained.

f. Repeat steps b through e for the remaining installed oscillators (the voltage applied at TP1 will control the currently "active" oscillator).

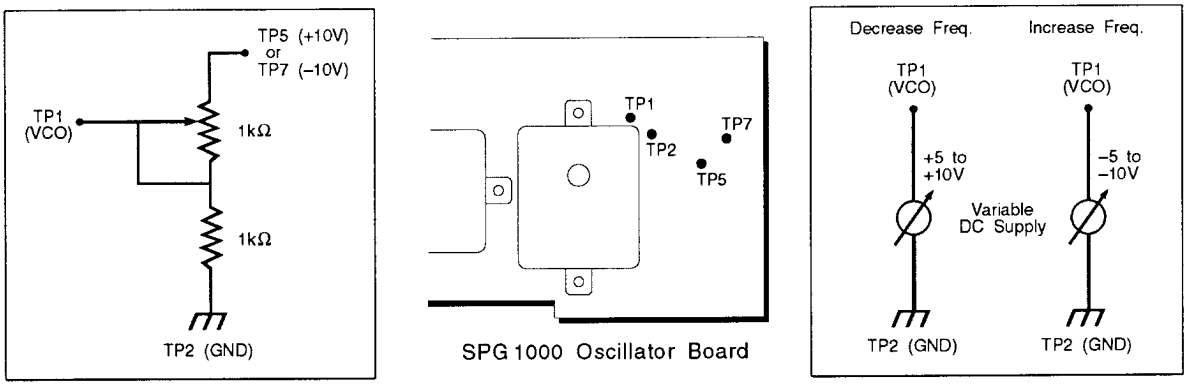


Fig. 6–9 Temporarily changing the frequency of an SPG 1000 Voltage-Controlled Oscillator with an internal (L) or external (R) voltage source.

NTSC/PAL Genlock (bi-level sync)

14. Ability to lock to a ± 6 dB reference;

15. Jitter with a ± 3 dB reference; and

16. Stability with respect to reference APL:

a. Connect the equipment as shown in Fig. 6–10; begin with the settings listed in Table 6–9. Confirm Genlock (no horizontal movement in the channel 1 trace).

b. Adjust the amplifier/attenuator for 6 dB gain. CHECK and confirm that genlock is maintained.

c. Adjust the amplifier/attenuator for 6 dB attenuation. CHECK and confirm that genlock is maintained.

d. Adjust the genlock timing of the SPG under test to synchronize its output with the source generator. It will then be easier to locate the SPG 1000 output on the oscilloscope which will be triggered on the source output. To synchronize the two signals, center the falling edge of the source sync and the blanking level of the SPG 1000 signal vertically on the oscilloscope graticule (gain of the two channels need not be the same). Use the horizontal and fine timing controls of the SPG 1000 to match the two syncs (see Fig. 6–11).

e. (Jitter with nominal signal) Set the oscilloscope to show channel 1 only; adjust it to view a rising or falling portion of the sync at 1 ns/Div. and high vertical amplification (2 or 5 mV/Div.). CHECK that jitter (total horizontal excursion of the trace) is less than 1 ns.

f. (Jitter with + 3 dB reference) Adjust the amplifier/attenuator for 3 dB of gain. Use the horizontal position control of the

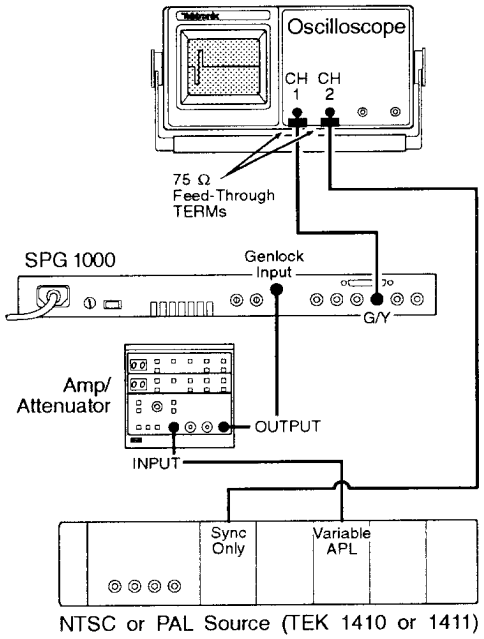


Fig. 6–10 A setup for Checks 14–18.

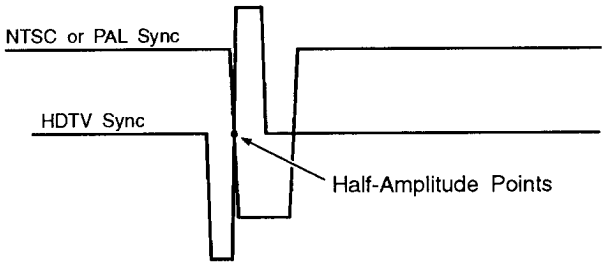


Fig. 6–11 Synchronizing an HDTV sync with a bi-level sync.

'scope, if necessary, to again display the channel 1 trace. CHECK that there is no more than 1 ns jitter.

g. (Jitter with –3 dB reference) Adjust the amplifier/attenuator for 3 dB of attenuation. Use the horizontal position control of the oscilloscope, if necessary, to locate the channel 1 trace. CHECK that there is no more than 1 ns jitter.

h. (Timing shift with change in reference APL) Return the amplifier/attenuator to 0 dB. Change the horizontal resolution of the 'scope to 500 ps/DIV and re-center the trace, if necessary. Alternate the source generator's output between 10% peak white (or Black Field) and 90% peak white (or White Field). CHECK that the channel 1 trace shifts no more than 1 division (0.5 ns) horizontally.

Table 6–9 Initial settings for checking genlock with an NTSC or PAL reference.

Variable	Setting
OSCILLOSCOPE:	
Vertical Mode	CH1 and CH2
Volts/Div	100 or 200 mV
Vertical Coupling	1MΩ, DC (both CH)
Horizontal	x10 MAG, 2 µs/Div.
Trigger Mode	Auto
Trigger Source	CH2
Trigger Coupling	DC
AMP/ATTENUATOR:	
Gain/Attenuation	0 dB
NTSC or PAL SOURCE:	(source depends on operating environment)
Test Signal	Black Field (0% white)
SPG 1000:	
Output Standard	1050/2:1 (NTSC ref.) or 1250/2:1 (PAL ref.)
Input Standard	525/2:1 (NTSC ref.) or 625/2:1 (PAL ref.)
Reference	External
Output Format	GBR
Test Signal	Black

17. Jitter with respect to hum:

If equipment for generating "video hum" (e.g., a Tektronix 1434) is not available, use procedure 17A.

a. Continue with the equipment setup used in the previous step, replacing the amp/attenuator with a video noise generator, if necessary. Change the output of the genlock source to White Field.

b. Adjust the noise generator to add –50 dB hum (approximately 2.2 mV_{p-p}) to the genlock reference signal. As before, set the 'scope to show a rising or falling portion of the channel 1 sync at 500 ps/DIV and high vertical amplification.

c. Gradually—or in steps—increase the added hum from –50 dB to –6 dB (350 mV_{p-p}). CHECK that the jitter increases to no more that 500 ps (0.5 ns).

17A. Jitter with respect to hum, alternate procedure:

This procedure uses a variable oscillator to simulate video hum. In preparation, the oscillator frequency and amplitude must be adjusted with a setup similar to that shown in Fig. 6–12. Select 50 or 60 Hz to correspond to local line frequency; for most accuracy, check the oscillator output with a frequency counter before beginning step a.

a. Connect the equipment as shown in Fig. 6–12. Set the HD source to output a Black Field. Trigger on the "hum." Ad-

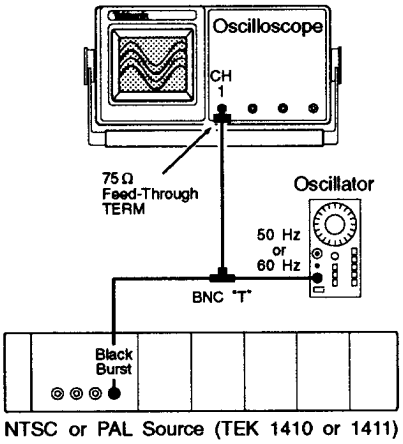


Fig. 6–12 Adjusting the oscillator to simulate –6 dB hum.

just the oscillator for a hum (the brightest trace) amplitude of 350 mV_{p-p}. Confirm that the sync-tip trace is approximately 300 mV below the hum. (Because of mismatched impedance, some attenuation—about 1 dB—is likely. Genlock performance of the SPG 1000 should not be affected.)

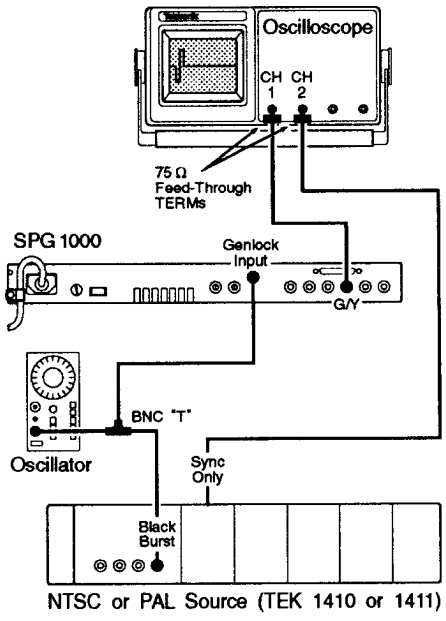


Fig. 6–13 A setup for checking jitter due to hum.

b. Change the equipment setup to that shown in Fig. 6–13.

c. As in the previous checks, trigger on the source sync and synchronize the two signals.

d. View a rising or falling portion of the channel 1 sync at 500 ps/DIV and high vertical amplification. CHECK for a jitter of no more than one division (0.5 ns).

18. Jitter with respect to noise:

This performance requirement has been verified with procedure 12. If verification is necessary—or if no HD source is available—check 12 may be performed as described with the substitution of an NTSC or PAL genlock source.

19. Ability to lock to a reference with a time-base error of ±10 ppm:

This ability (not a performance requirement) may be verified with procedure 13. Any check of the 72.00 MHz oscillator is valid for an NTSC or PAL source. If verification is necessary—or if no HD source is available—check 13 may be performed as described with any NTSC or PAL source which has a variable (±10 ppm) time base.

20. Ability to lock to an NTSC or PAL signal with 45° SCH error:

This check is only necessary if the SPG 1000 will be genlocked to an NTSC or PAL source and used to drive (time) other NTSC or PAL equipment.

a. Connect the equipment as shown in Fig. 6–14. Before connecting the source to the SPG 1000 genlock input, adjust the NTSC or PAL generator for an SCH error on the Black Burst of 45°.

b. Trigger the oscilloscope on channel 2 and adjust it to view both signals. CHECK that the SPG 1000 is genlocked to the source.

c. Re-adjust the source for an SCH error on the Black Burst of –45° and repeat step b.

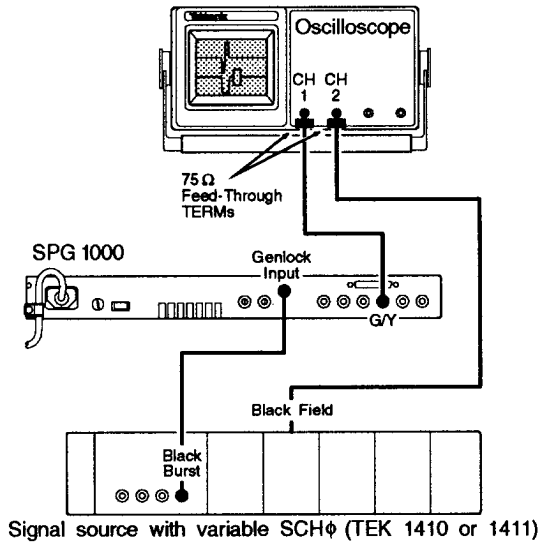


Fig. 6–14 A setup for checking immunity to input SCH error.

Output Signal Characteristics

21. Blanking levels:

a. Connect the test equipment as shown in Fig. 6–15.

b. At the front panel of the SPG 1000, select Black (with the Test Signal select button) and GBR output format (through the Utilities menu).

c. Adjust the oscilloscope to view the CH1 waveform with moderate vertical magnification. Settings that are appropriate for a Tek 2467B are listed in Table 6–10.

d. Set CH1 of the oscilloscope to GND coupled. Use the vertical position control to center the trace on the graticule.

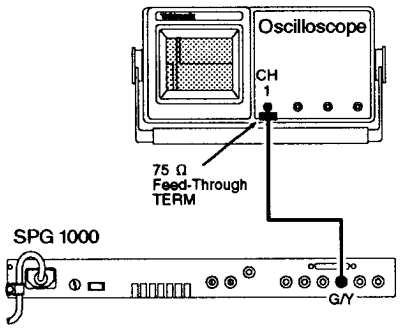


Fig. 6–15 A setup for verifying output blanking levels.

e. Switch the 'scope back to DC coupled. CHECK that the blanking level of the G/Y output is 0 ±50 mV (one division).

f. Move the coax from the G/Y output to the rest of the signal and sync outputs, in turn. CHECK that the blanking level of each is 0 ±50 mV.

Table 6–10 Oscilloscope settings for verifying output blanking levels.

Variable	Setting
Vertical Mode	CH1
Volts/Div	50 mV
Vertical Coupling	1MΩ, DC
Horizontal	x10 MAG, 1 µs/Div.
Trigger Mode	Auto
Trigger Source	CH1
Trigger Coupling	DC

22. White levels and Sync amplitudes (output amplifier gain adjustments):

a. Connect the test equipment as shown in Fig. 6–16. Be sure to terminate the CH1A loop-through and leave CH1B unterminated.

b. At the front panel of the SPG 1000, select White Field (with the Test Signal select button) and GBR output format (through the Utilities menu).

c. With the VAC set to 0 mV, adjust the waveform monitor to view one line of the CH1A waveform at 5X vertical magnification. Use the vertical position control to place the blanking level on the monitor graticule. Set the monitor to subtract CH1B from CH1A (this is a menu function on the 1730HD).

d. Adjust the VAC until the white level of the lower waveform matches the blanking level of the upper. CHECK that the

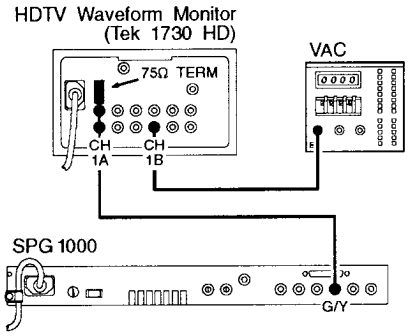


Fig. 6–16 A setup for verifying output signal amplitudes.

VAC output is between 693 and 707 mV. Make a note of the actual amplitude.

e. Move the coax from the G/Y output to the B/P_B and R/P_R outputs in turn. CHECK that the peak video level of each is 700 ± 7 mV. Record the actual amplitudes.

f. Compare the measurements made in steps d and e. CHECK that they are all within 3.5 mV of each other.

g. Move the coax from the R/P_R output to any one of the Sync outputs. Set the VAC back to 0 mV and adjust the waveform monitor to place the lower sync tip on the graticule.

h. Adjust the VAC to align the upper sync tip of the second, lower waveform with the lower tip of the first. CHECK that the VAC is set between 594 and 606 mV. Note the actual amplitude.

i. CHECK the other two Sync outputs for 600 mV_{p-p} ±6 mV; note the amplitudes and confirm that the three Sync outputs are within 3 mV_{p-p} of each other.

23. S/N Ratios:

The S/N ratios of the SPG1000 output may vary with output channel and oscillator. Therefore, to fully check the noise performance of the instrument, consult Table 6–2 and choose a standard which uses one of the three installed oscillators. Check all three channels (G, B, and R) for RMS noise with the procedure below. Then use the channel with the most noise to check performance in output standards that use the remaining two oscillators.

Note that the following procedure uses a digitizing oscilloscope with statistical functions to calculate the RMS noise. The procedure uses a Tektronix 11403A oscilloscope; however, the same basic approach may also work with alternate equipment. The steps in this approach are: 1) "zoom in" on the White video portion of the waveform; 2) normalize the white in order to center the noise on 0 V; and 3) sample the normalized waveform and find the root mean square of the samples. If possible, make several calculations of the RMS noise.

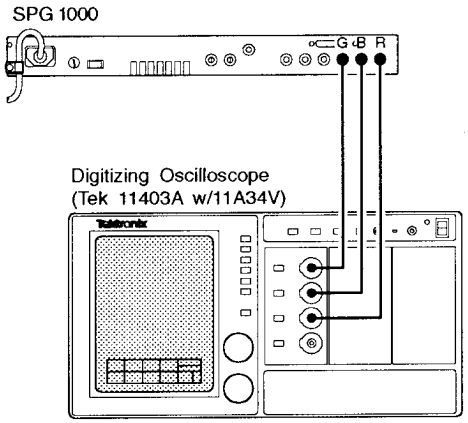


Fig. 6–17 A setup for checking noise on the output signals.

a. Connect the equipment as shown in Fig. 6–17; begin with the settings listed in Table 6–11.

b. Adjust the oscilloscope to view the white video portion of the waveform at high vertical amplification (2 or 5 mV/DIV) and a horizontal sweep rate of about 500 ns/DIV. (It may be necessary to adjust the trigger holdoff to get a "clean" trace.)

c. On a Tektronix 11403A, create a window to isolate and magnify part of the white video with its own time base. Change the acquire description to average the window waveform over at least

Table 6–11 Initial equipment settings for checking output signal noise.

Variable	Setting
OSCILLOSCOPE:	(Tek 11403A with 11A34V Video amp)
Vertical Desc	L1 (or appropriate)
Impedance	75Ω
Coupling	DC
Bandwidth Limit	300 MHz
Vertical Offset	700 mV
Trigger Select	Main
Trigger Mode	Auto
Trigger Level	685 mV
SPG 1000:	
Output Standard	Any (see text)
Reference	Internal
Output Format	GBR
Test Signal	White Field

32 samples. Change the window record length to 2048 points.

d. Through the 11403A Measurements menu, select Mean and RMS measurements. Use the Statistical Functions menu to calculate an average mean amplitude over 100 or more samples. Note the average; if the average fluctuates between two values, note the smaller of the two.

e. Turn the statistics functions off and return to the 11403A Waveform menu. Redefine the window waveform as the Main waveform less the average white amplitude; e.g., L1–697.3E-3 (the main waveform less 697.3 mV). The new waveform will represent only the noise on white. Change the acquire description to average the waveform as before. Wait for the oscilloscope to calculate the mean and RMS amplitudes of the noise. The mean value should be between 0.0 and 500 μV. If not, change the waveform definition to make it so.

f. Use the Statistical Functions of the 11403A to calculate an average RMS value of the noise. CHECK that the RMS noise is less than 2.21 mV. Typically, the maximum RMS value will also be below 2.21 mV.

g. Repeat steps b through f to check the noise on the B and R output channels.

h. Select, in turn, output standards that use the remaining two SPG 1000 oscillators. Repeat the check for each standard using the channel (G, B, or R) that proved noisiest in the first series of checks (steps a through g).

24. Skew:

a. Connect the equipment as shown in Fig. 6–18; use the initial settings as listed in Table 6–12. Adjust the oscilloscope to view the rising mid-transition of the G-channel sync, centering the trace on the horizontal graticule.

b. Remove the cable from the G/Y output of the SPG 1000 and connect it to the B/P_B output. CHECK that the trace crosses the horizontal graticule no more than one division to the left or right of center. Note the actual location of the crossing.

c. Remove the cable from the B/P_B output of the SPG 1000 and connect it to the R/P_R output. CHECK that the trace cros-

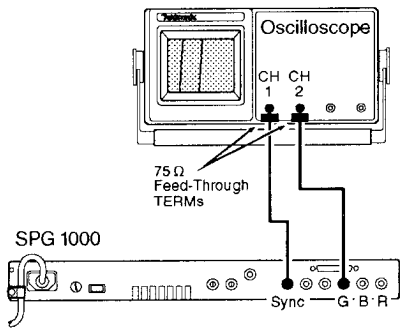


Fig. 6–18 An initial setup for checking skew between output channels.

Table 6–12 Initial equipment settings for checking output skew.

Variable	Setting
OSCILLOSCOPE:	
Vertical Mode	CH 1 and CH 2
Volts/Div	2 mV
Vertical Coupling	1 MΩ, DC
Horizontal	x10 MAG, 1 ns/Div
Trigger Select	CH 1
Trigger Level, Slope	approx. 10 mV, positive
SPG 1000:	
Output Standard	1125, or any of interest
Reference	Internal
Output Format	GBR
Test Signal	Black Field

ses the horizontal graticule no more than one division to the left or right of center, and no more than one division left or right of the crossing of the B-channel trace.

d. Move the (CH 1) cable from the SPG 1000 Sync output to the G/Y output. Re-establish a stable display if necessary. Move the (CH 2) cable from the R/PR output to the left Sync output. Adjust the oscilloscope to view the rising mid-transition of the sync, centering the trace on the horizontal graticule.

e. Remove the cable from the left Sync output of the SPG 1000 and connect it to the middle Sync output. CHECK that the trace crosses the horizontal graticule no more than one division to the left or right of center. Note the actual location of the crossing.

f. Remove the cable from the middle Sync output of the SPG 1000 and connect it to the right Sync output. CHECK that the trace crosses the horizontal graticule no more than one division to the left or right of center, and no more than one division left or right of the crossing of the middle Sync-out trace.

Return Loss Measurements

25. Genlock input; and

26. Test signal and sync outputs:

NOTE

Because of the 30 MHz bandwidth and lack of loop-throughs on the SPG 1000, it is recommended that traditional equipment and methods for checking video return loss ***not*** *be used. A general-purpose network analyzer is recommended for accurate measurements (see* Recommended Test Equipment *at the beginning of this section).*

The impedance of the SPG 1000 input and outputs has been calibrated during manufacturing for best return loss performance. These checks are unnecessary without strong evidence of improper impedance matching at the SPG 1000.

a. Follow the manufacturer's directions to prepare the network analyzer for 75Ω return loss (or S_{11}, the "complex reflection coefficient at port 1") measurements. Specify a frequency range to 30 MHz and place reference markers, if possible, at 5 MHz and 30, 35, and 40 dB down.

b. Follow the manufacturer's directions to calibrate the spectrum analyzer. Use a 75Ω type N-to-BNC adapter, the cable which will be connected to the SPG 1000 outputs, and a 75Ω BNC calibration kit appropriate to the spectrum analyzer and test set.

c. Remove all cables from the SPG 1000 genlock input and test signal and sync outputs. Turn the SPG off and disconnect the short cable from between J10 (on the Sync board) and J5 (on the Genlock board). This will remove test and sync signals from the SPG 1000 outputs. Turn the instrument back on.

d. Connect the cable leading from the spectrum analyzer/test set to the SPG 1000 genlock output. CHECK for return loss (reflection) of >40 dB down to 5 MHz and >30 dB down to 30 MHz.

e. Remove the cable from the genlock input and connect it to each sync and test signal output in turn. CHECK for return loss (reflection) of >35 dB down to 30 MHz at each output.

f. When finished, turn the SPG 1000 off and re-connect the short cable between J10 and J5.

Calibration List

Voltage-Controlled Oscillators

1. Free-running frequencies (oscillator adjustment screws for frequencies listed in Table 6–13).

Return Loss (Impedance Matching)

2. Test signal outputs (C172, C174, and C173 for reflection > 35 dB down from 300 kHz to 30 MHz).

Clock Filter

3. Clock filter adjustments (L6, L5, L4, and L3 for best filter alignment).

Timing Adjustments

4. Group delay (L5 for 2 to 3 mV pre-ringing).
5. Test signal inter-channel timing (L10 and L15 for < 0.5 ns skew between any two channels).
6. Fine Sync Timing (R164 and R165 for correct timing overlap, C147 to stop oscillations)

Output Amplifier Adjustments

7. DC levels (R8, R154, and R155 for test signal blanking at 0 V; R194 for matched sync and line blanking).
8. Gain adjustments (R146, R42, and R58 for 700 mV peak white; R17 for 600 ±6 mV peak-to-peak sync).

Calibration Procedures

Voltage-Controlled Oscillators

1. Free-running frequencies:

NOTE

After initial setup or long storage, allow a two-hour warm up to re-age the crystals. Thereafter, 30 minutes warm up is sufficient.

a. Connect the test equipment as shown in Fig. 6–19. For best results, use a BNC-to-SMB (female) coax cable such as Tektronix p/n 012-0532-00 between J23 and the Counter/Timer.

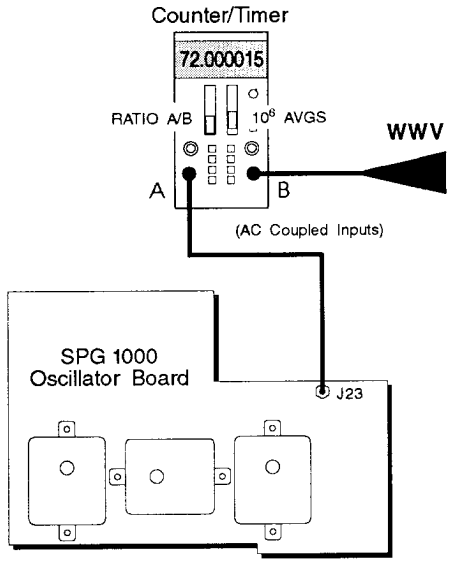


Fig. 6–19 A setup for adjusting oscillator frequencies.

b. Enter the output standard-select mode at the front panel of the SPG 1000. The nominal frequencies for all available standards are listed in Table 6–13.

c. Remove the plug on top of the oscillator oven cover. Use a screwdriver as shown in Fig. 6–20 to turn the frequency adjustment screw until the readout of the counter/timer matches the oscillator's nominal frequency. (The oscillator frequency should correlate with the setting of the associated hex switch(es) on the SPG 1000 Genlock board; see Hex Switch Settings, page 7–10, for details.)

Table 6–13 Nominal oscillator frequencies.

Output Standards	Nominal Frequency (MHz)
525, 625, 1050, and 1250 lines	72.000000
787/788 lines	75.335664
1125 lines, 60 Hz	74.250000
1125 lines, 59.94 Hz	74.175824
N125 (Option 17)	75.524475

d. Replace the plug in the oscillator oven cover.

e. Select, in turn, two other output standards which use the two remaining installed oscillators. Repeat steps c and d for each oscillator.

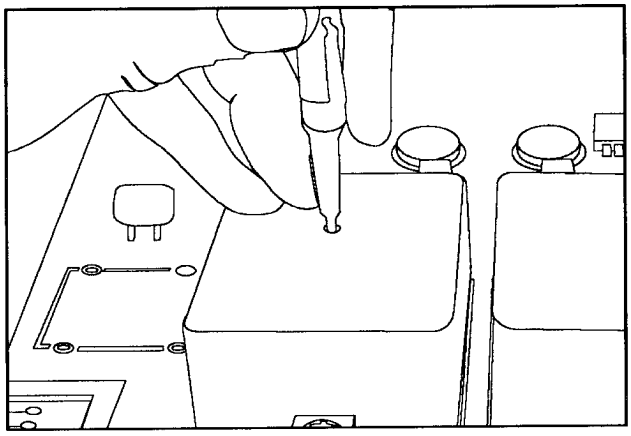


Fig. 6–20 Adjusting an oscillator.

Return Loss (Impedance Matching)

2. Test signal outputs:

NOTE

Because of the 30 MHz bandwidth and lack of loop-throughs on the SPG 1000, it is recommended that traditional equipment and methods for checking video return loss ***not*** *be used. A general-purpose network analyzer is recommended for accurate measurements (see* Recommended Test Equipment *at the beginning of this section).*

The impedance of the SPG 1000 test signal outputs has been calibrated during manufacturing for best return loss performance. These adjustments are unnecessary without strong evidence of improper impedance matching at these outputs.

a. Follow the manufacturer's directions to prepare the network analyzer for 75Ω return loss (or S_{11}, the "complex reflection coefficient at port 1") measurements. Specify a frequency range to 30 MHz and place a reference marker, if possible, at 35 dB down.

b. Follow the manufacturer's directions to calibrate the spectrum analyzer. Use a 75Ω type N-to-BNC adapter, the cable which will be connected to the SPG 1000 outputs, and a 75Ω BNC calibration kit appropriate to the spectrum analyzer and test set.

c. Remove all cables from the SPG 1000 test signal outputs. Turn the SPG off and disconnect the short cable from between J10 (on the Sync board) and J5 (on the Genlock board). This will remove test signals from the SPG 1000 outputs. Turn the instrument back on.

d. Connect the cable leading from the network analyzer/test set to the G/Y output. Adjust C172 for reflection >35 dB down from 300 kHz to 30 MHz.

e. Remove the cable from the G/Y output and connect it to the B/P_B and R/P_R outputs in turn. Adjust C174 (B/P_B) and C173 (R/P_R) for reflection >35 dB down from 300 kHz to 30 MHz.

f. When finished, turn the SPG 1000 off and re-connect the short cable between J10 and J5.

Clock Filter

3. Clock filter adjustments:

a. Remove the jumper from J13 on the SPG 1000 Oscillator board and connect the equipment as shown in Fig. 6–21; two cable assemblies as shown in Fig. 6–22 are required. Connect pin 2 (the signal lead) of the square pin cable-ends to pin 1 at both J13 and J1. Initial settings to the spectrum analyzer are listed in Table 6–14. Once the cables are attached, adjust the reference level to center the trace on the display.

b. Move the jumper from J6 to J3. Adjust L6 with a non-magnetic tool (e.g., Tek-

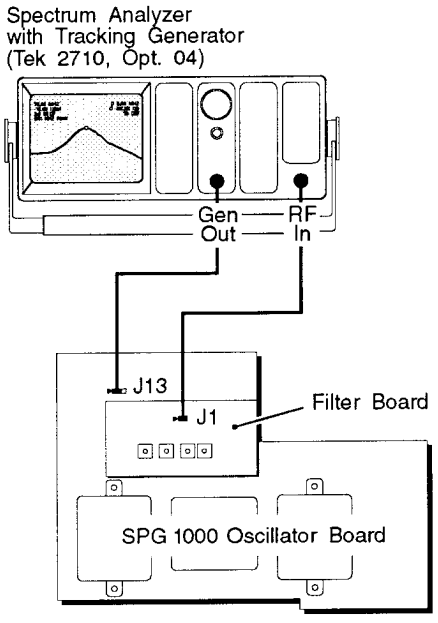


Fig. 6–21 A setup for clock filter adjustments.

Table 6–14 Initial spectrum analyzer (Tektronix 2710/12) settings for clock filter adjustments.

Variable	Setting
MKR/FREQ menu:	
Frequency	73.0 MHz
Span/Div.	2.0 MHz
DET/GEN menu:	
Detector	ON
TG Fixed Level	–10 dBm
Other Controls:	
Auto Sweep	ON
Auto Resolution	ON
Video Filter	ON
Ref Level	–20 dBm
Vert Scale	5 dB/Div

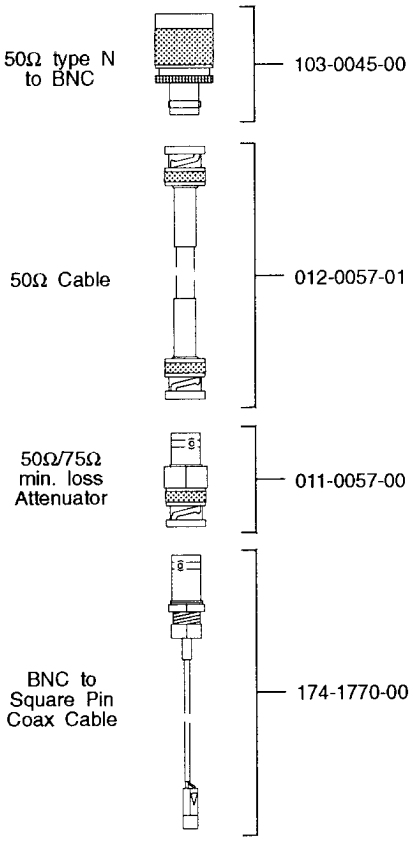


Fig. 6–22 Components (with Tektronix part numbers) of the spectrum analyzer-to-SPG 1000 cables.

tronix p/n 003-0837-00) to move the signal peak—visible on the spectrum analyzer display—to 73 MHz. (When L6 is adjusted correctly the 73 MHz marker will be on the highest point of the frequency trace.)

c. Move the jumper from J3 to J4. Adjust L5 to move the lowest point of the signal trough to 73 MHz.

d. Move the jumper from J4 to J5. Adjust L4 to move the **center** signal peak to 73 MHz.

e. Move the jumper from J5 to J6. Use L3 to move the lowest point of the signal trough to 73 MHz.

f. Remove the cables from J13 and J1. Reinstall the jumper on J13. Leave the jumper installed on J6.

Timing Adjustments

4. Group delay:

a. Connect the G/Y output of the SPG 1000 to CH1 of the test oscilloscope through a 75Ω through-term; use the initial settings listed in Table 6–15.

Table 6–15 Initial equipment settings for adjusting group delay.

Variable	Setting
OSCILLOSCOPE:	
Vertical Mode	CH 1
Volts/Div	5 mV
Vertical Coupling	1 MΩ, DC
Horizontal	x10 MAG, 500 ns/Div
Trigger Select	CH 1
Trigger Level, Slope	approx. 10 mV, positive
SPG 1000:	
Output Standard	1125, or any of interest
Reference	Internal
Output Format	GBR
Test Signal	Convergence

b. Adjust the oscilloscope to view the base of a 54 ns pulse.

c. Adjust L5 (Sync board) for pre-ringing of between 2 and 3 mV.

5. Test signal inter-channel timing:

a. Connect the equipment as shown in Fig. 6–23; use the initial settings as listed in Table 6–16. Adjust the oscilloscope to

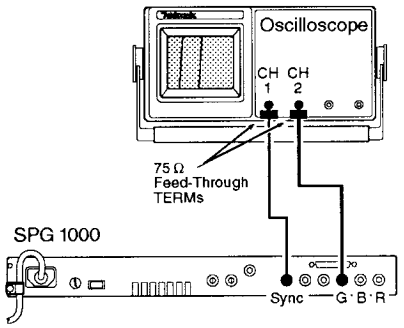


Fig. 6–23 An initial setup for adjusting inter-channel timing.

view the rising edge (or "mid-transition") of the G-channel sync; use the horizontal position control of the oscilloscope to move the trace to the center of the horizontal graticule.

Table 6–16 Initial equipment settings for adjusting inter-channel timing.

Variable	Setting
OSCILLOSCOPE:	
Vertical Mode	CH 1 and CH 2
Volts/Div	2 mV
Vertical Coupling	1 MΩ, DC
Horizontal	x10 MAG, 1 ns/Div
Trigger Select	CH 1
Trigger Level, Slope	approx. 10 mV, positive
SPG 1000:	
Output Standard	1125, or any of interest
Reference	Internal
Output Format	GBR
Test Signal	Black Field

b. Remove the cable from the G/Y output of the SPG 1000 and connect it to the B/P_B output. Adjust L10 (Sync board) to center the sync edge on the horizontal graticule.

c. Remove the cable from the B/P_B output of the SPG 1000 and connect it to the R/P_R output. Adjust L15 to center the sync edge on the horizontal graticule.

6. Fine Sync Timing:

This procedure ensures that the full range of fine sync timing adjustments is available. The voltage adjustments made with R164 and R165 control the range of the variable delay line that "creates" fine sync offset.

The procedure is performed first with an output standard that uses the highest–frequency oscillator installed in the SPG1000 (in the standard instrument, 787/59.94/1:1, at 75.336 MHz). It is then checked and repeated, if necessary, with the two remaining clocks. The order of the complete procedure will be: Highest frequency; lowest frequency; middle frequency. Repeat until overlap at all advance/delay transitions is between 0.5 and 1.5 ns, and the control voltage stays between 4.0 and –10.6 V.

a. Connect the equipment as shown in Fig. 6-24. Use an SMB–to–BNC cable (e.g., Tektronix P/N 012–0532–00) to connect J23 to CH1 of the oscilloscope; use a X1 probe to pick the delayed clock signal off the lead of R179 (or R180) that is closer to the left side of the instrument chassis. Connect the multimeter positive lead to pin 1 of U57 on the Sync board, and the negative lead to the –12V test point (TP8) on the Oscillator board. Use the initial settings listed in Table 6-17.

b. Initialize the SPG 1000 by turning it off and then turning it back on while pressing the Output Standard button. Then, with

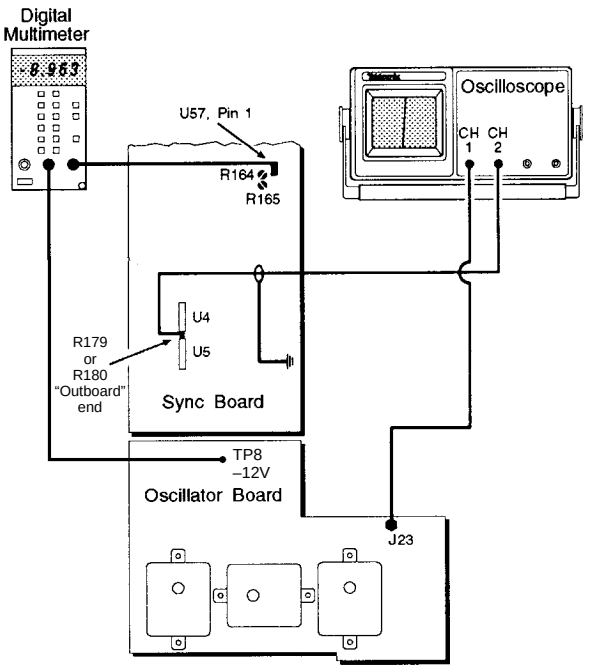


Fig. 6–24 A setup for fine Sync timing adjustments.

Table 6–17 Initial equipment settings for fine Sync timing adjustments.

Variable	Setting
OSCILLOSCOPE:	
Vertical Mode	CH 2
Volts/Div	2 mV
Vertical Coupling	1 MΩ, **AC**
Horizontal	x10 MAG, 500 ps/Div
Trigger Select	CH 1
SPG 1000:	
Output Standard	Uses fastest oscillator (see text).

the front panel enabled, use the Timing Select and Fine buttons to choose fine Sync timing; the display will read **0.000us DLY**. Turn the knob one increment (one "beep") counterclockwise (CCW) so the display reads **.000us DLY**

Note

*After some adjustment of fine timing, the leading zero at minimum delay (**0**.000us) will no longer be displayed. This is due to round–off error in the many calculations performed by the SPG 1000 microprocessor. The point of interest is the threshold between timing advance and delay, which is initially easier to identify with the aid of the extra zero.*

c. Set R164 and R165 completely CCW, and use the oscilloscope horizontal position control to center the clock trace on the graticule.

d. Check for a multimeter reading of >0.4 V.

e. Adjust R165 smoothly clockwise (CW), and check that the trace moves smoothly with the adjustment; no jumps, oscillations, or sliding.

f. Adjust C147, if needed, to stop any oscillation or voltage railing problems.

g. Return R165 to a CCW position.

h. Adjust R164 smoothly CW, and check that the trace moves smoothly with the adjustments; no jumps, oscillations, or sliding.

i. Adjust C147, if needed, to stop any oscillation or voltage railing problems.

j. Adjust R164 for a multimeter reading of 0.85 V.

k. Adjust R165 for a multimeter reading of 1.0 to 1.2 V.

l. Adjust the SPG 1000 fine timing until **.006us ADV** is displayed. Continue to advance the sync timing until the clock trace jumps on the oscilloscope display. Rotate the knob back and forth to toggle across this jump.

m. Adjust R165 for a displacement of ≈0.65 ns on the oscilloscope display between **.000 ADV** and **.006 ADV**. (Must be >0.5 ns.)

n. Check that the multimeter reading is ≤ +15 V. Typically this will be in the range of +7 to +11 V.

o. Adjust the SPG 1000 fine timing until you can toggle between **.000us ADV** and **0.000us DLY**. Use the knob to go back and forth across the jump threshold.

p. Check that the timing overlap is > 0.5 ns and < 1.5 ns. If the overlap is < 0.5 ns perform part q of this step. If the overlap is > 1.5 ns, perform part r of this step.

q. Adjust R165 (ONLY if overlap is < 0.5 ns) for an overlap of > 0.5 ns on the oscilloscope, as the SPG 1000 is toggled between **.000us ADV** and **0.000us DLY.**

r. Adjust R164 (ONLY if overlap is >1.5ns) for an overlap of <1.5 ns on the oscilloscope, as the SPG 1000 is toggled between **.000us ADV** and **0.000us DLY.**

s. Check that the multimeter reading is ≤ +16 V. Typically this will be in the range of +7 to +11 V.

t. Repeat parts o through s of this step for the **.000us ADV** to **.006us ADV** transition.

u. Repeat parts o through t of this step until the overlap and multimeter readings are correct for both the **.000us ADV** and **0.000us DLY** and the **.000us ADV** to **.006us ADV** transitions.

v. Select an output standard that uses the lowest frequency oscillator and repeat parts o through t until the overlap and multimeter readings are correct for both the **.000us ADV** and **0.000us DLY** and the **.000us ADV** to **.006us ADV** transitions.

w. Select an output standard that uses the middle frequency oscillator and repeat parts o through t until the overlap and multimeter readings are correct for both the **.000us ADV** and **0.000us DLY** and the **.000us ADV** to **.006us ADV** transitions.

Output Amplifier Adjustments

7. DC level adjustments

a. Connect the test equipment as shown in Fig. 6–25.

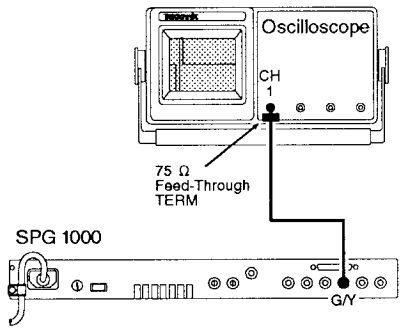


Fig. 6–25 A setup for calibrating output DC levels.

b. At the front panel of the SPG 1000, select Black (with the Test Signal select button. and GBR output format (through the Utilities menu), if necessary. Any output standard may be used.

c. Adjust the oscilloscope to view the CH1 waveform with moderate vertical magnification. Settings that are appropriate for a Tek 2467B are listed in Table 6–18.

d. Set the oscilloscope CH1 Input Coupling to GND. Use the vertical position control to center the trace on the graticule.

e. Set the oscilloscope CH1 Input Coupling to DC coupled. Adjust R8 for a G–channel blanking level of 0 V.

f. Move the coax from the G/Y output to the B/P_B output. Adjust R154 for a blanking level of 0 V.

Table 6–18 Oscilloscope settings for calibrating DC levels.

Variable	Setting
Vertical Mode	CH1
Volts/Div	20 or 50 mV
Vertical Coupling	1MΩ, DC
Horizontal	x10 MAG, 1 µs/Div.
Trigger Mode	Auto
Trigger Source	CH1
Trigger Coupling	DC

g. Move the coax from the B/P_B output to the R/P_R output. Adjust R155 for a blanking level of 0 V.

h. Move the coax from the R/P_R output to any of the Sync outputs. Adjust the oscilloscope to view the center of a sync pulse, if necessary. Adjust R194 to match the black line level with the DC level of the sync (no step should be evident before or after the sync pulse.

8. Gain Adjustments

a. Connect the test equipment as shown in Fig. 6–26. Be sure to terminate the CH1A

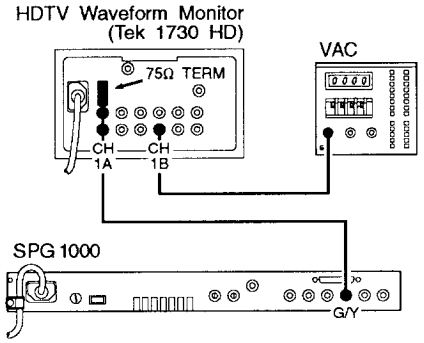


Fig. 6–26 A setup for calibrating output signal amplitudes.

loop–through and leave CH1B un–terminated.

b. At the front panel of the SPG 1000, select White Field and GBR output format, if necessary. Any output standard which is compatible with the waveform monitor may be used.

c. With the VAC set to 0 mV, adjust the waveform monitor to view one line of the CH1A waveform at 5X vertical magnification. Use the vertical position control to place the blanking level on the monitor graticule. Set the monitor to subtract CH1B from CH1A (this is a menu function on the 1730HD).

d. Set the VAC to 700 mV. Adjust R146 to make the white level of the lower waveform match the blanking level of the upper.

e. Move the coax from the G/Y output to the B/P_B output. Adjust R42 to make the white level of the lower waveform match the blanking level of the upper.

f. Move the coax from the B/P_B output to the R/P_R output. Adjust R58 to make the white level of the lower waveform match the blanking level of the upper.

g. Move the coax from the R/P_R output to any one of the Sync outputs. Set the VAC back to 0 mV and adjust the waveform monitor to place the lower sync tip on the graticule.

h. Set the VAC to 600 mV. Adjust R17 to align the upper sync tip of the second, lower waveform with the lower tip of the first.

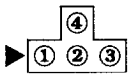
Section 7
MAINTENANCE

Jumper and DIP Tables

The tables below give information about circuit board jumpers and switches for the entire instrument. The ▼ symbol on a circuit board identifies jumper pin 1 and DIP switch position 1. Green jumpers are used to select operating modes; red jumpers are used in testing the instrument. The red jumpers should be used only by qualified service personnel.

Table 7–1 Sync board jumpers.

Function	Jumper #	Description	Factory Position
SYNC OUT Signal Select	J9*	Pins 1–2: Tri-level sync. Pins 3–2: G/Y Video. Pins 4–2: Blanking level DC.	1–2
Clock–to–Data Timing	J13/J14 J15/J16	J13/J14 and J15/J16 must be in the same position. Pins 1–1: Minimum delay. Pins 4–4: Maximum delay.	**

*Pin assignments for J9: 

**Each instrument has been calibrated during assembly for optimum clock–to–data timing.

Table 7–2 Oscillator board jumpers.

Function	Jumper #	Description	Factory Position
Oscillator 1 Oven Oscillator 2 Oven Oscillator 3 Oven	J1 J4 J7	Pins 1–2: Enables Oven. Pins 2–3: Disables Oven.	1–2
Oscillator 1 Test Oscillator 2 Test Oscillator 3 Test	J3* J6* J9*	Pins 1–3: Fixed test voltage (+5 V); decreases Oscillator frequency. Pins 2–3: Calibrated voltage for free-running VCO frequency. Pins 4–3: Fixed test voltage (–5 V); increases Oscillator frequency. Pins 5–3: Fixed test voltage (GND); increases Oscillator frequency.	2–3
Filter Alignment Signal In	J13	Pins 1–2: Normal operation. Pins 2–3: Driven with 73 MHz signal for filter alignment (pin 2, signal; pin 3, GND).	1–2

*Pin assignments for jumpers J3, J6, and J9:

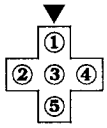


Table 7–3 Filter board jumpers.

Function	Jumper #	Description	Factory Position
Filter Alignment Signal Out	J1	Output to analyzer for filter alignment (pin 1, signal; pin 2, GND)—see calibration procedures.	Open
Resonator 1 Adjust	J3	Open: normal operation. Shorted: Permits adjustment of 1st resonator for return loss null—see calibration procedures.	Open
Resonator 2 Adjust	J4	Open: normal operation. Shorted: Permits adjustment of resonator 2 for return loss peak—see calibration procedures.	Open
Resonator 3 Adjust	J5	Open: normal operation. Shorted: Permits adjustment of resonator 3 for return loss null—see calibration procedures.	Open
Spare	J6	Holds spare jumper for use on J3, J4, and J5.	Occupied

Table 7–4 Power supply board jumpers.

Function	Jumper #	Description	Factory Position
Fan Voltage Control	J390	Pins 1–2: 14.5 Volts Pins 2–3: 12.0 Volts	2–3
Transformer Disable	J500	Jumper present: Normal operation. Open: For power supply trouble-shooting only.	Jumper present
Housekeeping Power Supply	J650	Jumper present: Normal operation. Open: For power supply trouble-shooting only.	Jumper present
Primary Current Limit Enable	J720	Jumper present: Normal operation. Open: For power supply trouble-shooting only.	Jumper present
115 V Line voltage select	J810	Jumper present: 115 V operation; J820 must be open. Open for 230 V operation.	*
230 V Line voltage select	J820	Jumper present: 230 V operation; J810 must be open. Open for 115 V operation.	*

* Depends on power cord option ordered with instrument (see Table 2–1).

Table 7–5 Controller board jumpers.

Function	Jumper #	Description	Factory Position
Watchdog Enable	J1	Pins 1–2: Watchdog enabled. Pins 2–3: Watchdog disabled.	1–2
Reset	J2	Pins 1–2: Normal operation. Pins 2–3: Hardware reset.	1–2
Beeper	J14	Pins 1–2: Beeper enabled. Pins 2–3: Beeper disabled.	1–2

Table 7–6 Controller board DIP S1 settings.

Switch	Description	Factory Position
1–8	Binary selection of diagnostic modes (switch 8, MSB; switch 1, LSB) **MODE.....SETTING** 1) Front panel lockout.....00000001 2) Front panel enable.....00000010 3) Port Test.....10000000 4) LED Test.....10000001 5) Keys Test.....10000010 6) Software Version.....10000011 7) Selection Knob Test.....10000100 8) CTC Test.....10000101 9) UART Test.....10000110 10) Data Line Test.....10000111 11) DAC Diag Test.....10001000 12) Display Test.....10001001	0 (Closed)

Diagnostic Modes

Several diagnostic modes are available through DIP S1 on the SPG 1000 controller board—see Table 7–6. In addition, a software reset and RAM test may be performed from the outside of the instrument. These diagnostic modes are described below.

Software Initialization/RAM Test

To perform a complete software reset of the SPG 1000, turn the instrument off with the on-off switch and then hold the Output Standard button down while turning the power back on. This will test and initialize the RAM, and return all settings to their default values. Note that timing offsets

will be reset to zero and any presets saved through remote control will be lost: *Reset With Care.*

In the course of initialization, numerals will appear (briefly) on the display to indicate the step or test being performed. The sub-initialization steps are:

1 — Read TOC PROM from the Sync Board.
2 — Oscillator initialization
3 — Read/write Genlock Board.
4 — Read/write RAMDAC.
5 — Front panel initialization.

In the event of failure of one of these steps, initialization will stop and the number of the failed step will be displayed for approximately two seconds. Normal operation will not be possible.

When the RAM test is passed, the instrument will begin normal operation set to internal reference and the default input and output standards. If the SPG 1000 fails the Initialization/RAM test for any reason it should be refered to qualified personnel for additional diagnosis and repair.

S1 Diagnostics

The diagnostic modes available through DIP S1 are used in checkout and calibration of the instrument when it is assembled; they may also be used for later troubleshooting and service if necessary. To initiate a mode, simply set S1 as listed in Table 7–6; the instrument will return to normal operation when all switches are again set to the closed (0) position.

NOTE

A software reset/initialization will occur whenever switch S1-8 is moved from the open (1) to closed (0) position. Therefore, returning to normal operation from diagnostic modes 3 through 10 will "erase" all presets and timing offsets. ***Initiate the diagnostic modes with care.***

It is suggested that jumper J1 (Watchdog Enable) be moved to position 2–3 during the running of diagnostic tests and returned to pins 1–2 when the tests are completed.

1) Front panel disable/lockout mode

S1 = 00000001.
When in this mode, the instrument will be disabled as with the Front Panel Enable button (LED unlit). Function of the Enable button will be blocked; therefore, no changes to the settings or function of the SPG 1000 will be possible until this mode is ended.

2) Front panel timeout disable mode

S1 = 00000010.
When in this mode, Front Panel Enable will not automatically "time out" after 5 minutes as during normal operation. Rather, the front panel will remain enabled (and the LED will remain lighted) until the Enable button is pressed again.

3) Port test

S1 = 10000000.
During this test, consecutive pulses will be written to pins 2 through 17 on U5 (on the controller board). The pulses will be approximately −5 V in amplitude and 125 µs apart. The test is passed when pulses are detected—in the correct sequence—on all 16 pins (2–17). To perform this test:

a. Connect the test equipment as shown in Fig. 7–1.

b. Set S1 to 10000000 (position 8 open, all others closed) and move J1 (Watchdog Enable) to pins 2 and 3.

c. Set the oscilloscope to trigger on channel 1 and adjust the instrument to show the pulse present at pin 2 of U5.

d. Connect the probe from channel 2 to pin 3 of U5. Find the pulse and verify that it occurs approximately 125 µs after the pulse on channel 2.

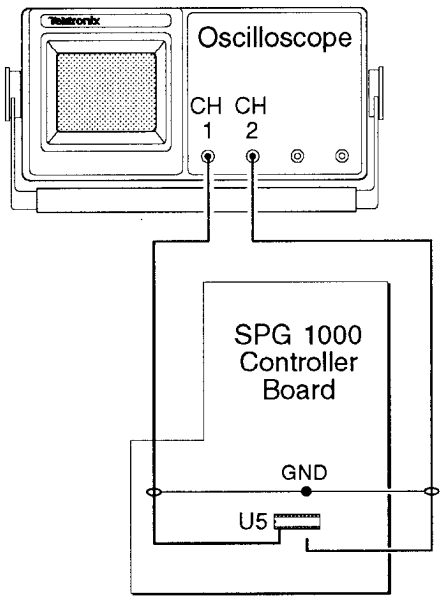


Fig. 7–1 Equipment setup for the port test.

e. Repeat step d for pins 4 through 17, in order. Each pulse should occur about 125 µs later than the one on the previous pin.

f. Return the SPG 1000 to normal operation by setting all positions on S1 to 0 (closed) and moving J1 back to pins 1 and 2.

4) LED test

S1 = 10000001, self-running.
All front panel LEDs should be lit while in this diagnostic mode.

5) Front panel keys test

S1 = 10000010, operator controlled.
In this mode, a press of any front panel key will cause a character, unique to that key, to be written to the SPG 1000 display panel.

6) Software version

S1 = 10000001, self-running.
The software version and date will be written to the display when this mode is selected. This mode duplicates the Software Version utility available at the front panel of the SPG 1000 (through the Utilities Enter button).

7) Selection knob test

S1 = 10000100, operator controlled.
While in this mode, each incremental turn of the selection knob will cause an ASCII character to be displayed on the SPG 1000 readout. No two consecutive characters will be the same.

8) CTC test

S1 = 10000101, self-running.
Checks for proper function of the CTC. Shortly after the test is initiated, a Pass or Fail message will be written to the display.

9) UART test

S1 = 10000110, self-running.
Checks for proper function of the UART. Shortly after the test is initiated, a Pass or Fail message will be written to the display.

10) Data line test

S1 = 10000111, self-running.
Checks the Controller Board's data bus. Set S1-8 to 1 (open) *last*. Shortly after the test is initiated, PASSED or FAILED will be written to the display.

11) DAC test

S1 = 10001000.
During this test a repeating ramp, or "saw-tooth," signal will be read from the DAC and written to the test signal outputs of the SPG 1000. Faulty bits will result in an irregular—rather than smooth—ramp. To perform this test:

a. Connect the test equipment as shown in Fig. 7–2.

b. Set S1-8 and S1-4 to open. All other switches should be closed. Wait until the display reads DAC DIAG TEST; the test signal will then be present at the outputs.

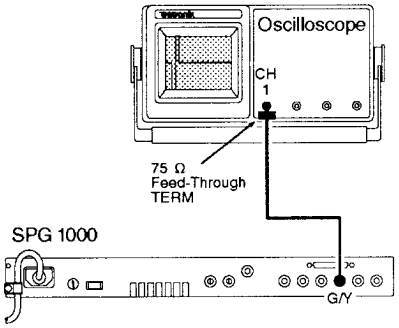


Fig. 7–2 Equipment setup for the DAC test.

c. Adjust the oscilloscope to view the ramp. Suggested settings: 200 mV/Div, vertical; 500 ns/Div, horizontal; trigger between –300 and +700 mV.

d. If the ramp appears to be smooth, increase the vertical and horizontal magnification. A faulty bit will cause regular "notches" in the ramp—the more significant the bit, the "deeper" the notch.

e. Return the SPG 1000 to normal operation by setting all positions on S1 to 0 (closed).

12) Display Test:

S1 = 10001001, self-running.
Writes solid rectangles to all display character locations. Used to check character pixels.

Replacing an Oscillator

To replace an oscillator, follow these steps:

WARNING

TO AVOID INJURY AND DAMAGE TO EQUIPMENT, DISCONNECT POWER TO THE INSTRUMENT BEFORE PERFORMING THIS PROCEDURE.

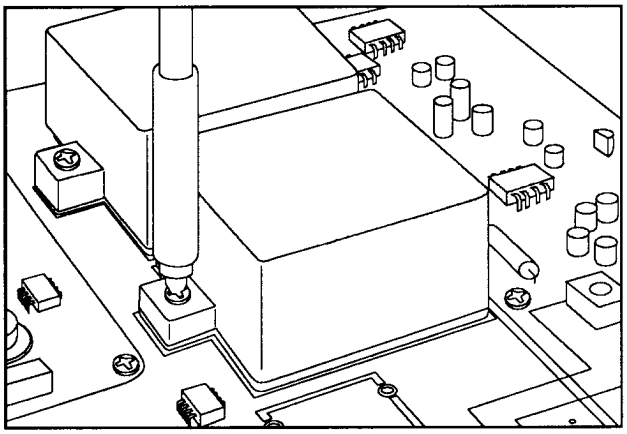


Fig. 7–3 Removing the oven cover.

a. Locate the oscillator to be changed (when viewed from the front of the instrument, the oscillators are numbered 1, 2, and 3 from left to right). Remove the two screws retaining the oscillator oven cover (see Fig. 7–3), and remove the cover.

b. Remove the screw that holds the oscillator case to the heating transistor (see Fig. 7–4; note that the screw may be installed from either direction).

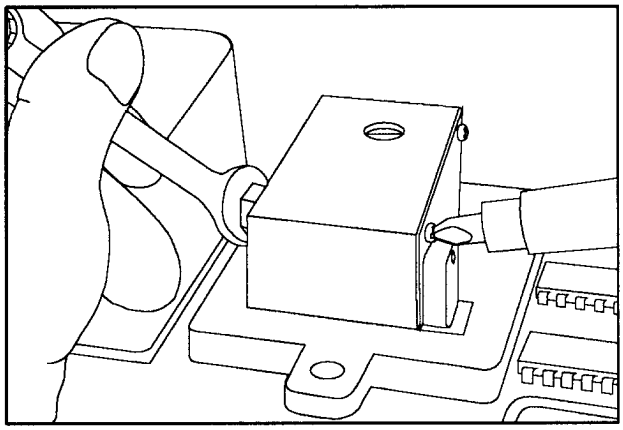


Fig. 7–4 Removing the heating transistor screw.

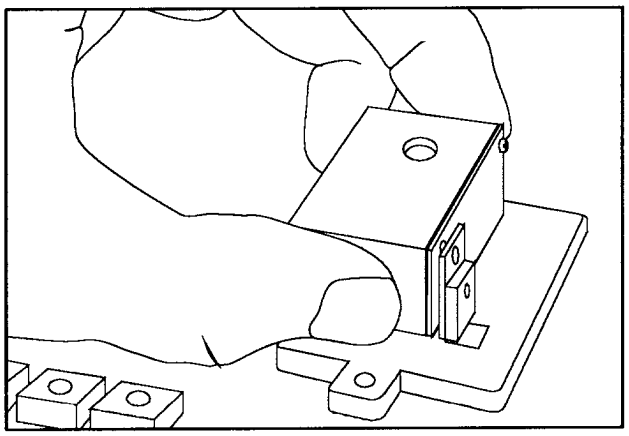


Fig. 7–5 Removing the oscillator case.

c. Unplug the oscillator assembly from the circuit board (Fig. 7–5). Lift the oscillator case straight upward to prevent damage to the circuit board pins.

d. Remove the screw and side–plate from the oscillator case, exposing the surface–mount crystal board.

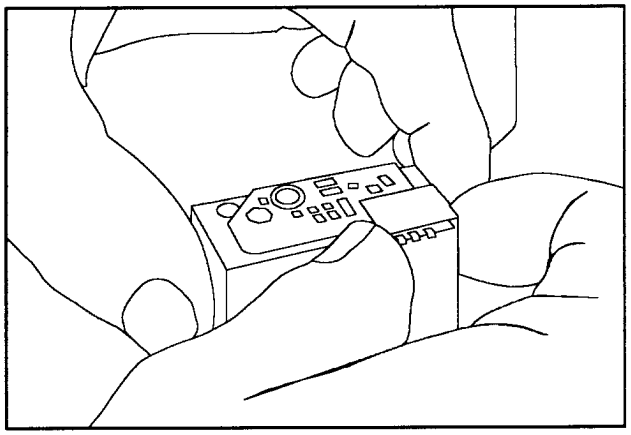


Fig. 7–6 Removing the oscillator assembly.

e. Remove the crystal board retaining screw, then the oscillator assembly from its case (Fig. 7–6).

f. Replace the entire oscillator assembly and reassemble by reversing the above steps. Be sure to re-install and tighten the heating

transistor retaining screw. Reset the associated hex switch to match the oscillator frequency if necessary (see Hex Switch Settings, below). Calibrate the oscillator using the procedures in this manual's Performance Check and Calibration section.

WARNING

THE HEATING TRANSISTOR WILL FAIL IF IT IS NOT PROPERLY ATTACHED TO THE OSCILLATOR CASE. THIS FAILURE COULD RESULT IN PERSONAL INJURY IF THE OVEN COVER IS NOT INSTALLED. DO NOT OPERATE THIS INSTRUMENT WITHOUT HAVING RE-SECURED THE HEATING TRANSISTOR AND REPLACED THE OVEN COVER.

Hex Switch Settings

The four hexadecimal switches (S1–S4, see Fig. 7–7) on the SPG 1000 Genlock board are set according to the frequency of the oscillators which occupy positions 1, 2, and 3. Switches 1 and 2 correspond to oscillators 1 and 2, respectively, permitting 16 possible codes for those positions. Switches 3 and 4 are both associated with position 3, permitting 256 possible codes for that oscillator (switch 3 selects the less significant digit; switch 4, the more significant). Codes 0 through 15 are the same for all three oscillators; codes 16 through FF are available for possible future use with oscillator 3.

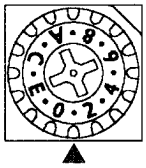


Fig. 7–7 A hexadecimal switch.

Table 7–7 SPG 1000 hex switch settings.

Switch Setting	Oscillator Frequency
0	Unassigned
1	72.000000 MHz
2	74.250000 MHz
3	75.335664 MHz
3 (Option 17)	75.524475 MHz
4	74.175824 MHz
5–FF	Currently Unassigned

The hex switch setting is indicated with a triangle printed on the side of the switch. In the SPG 1000, this side faces the front of the instrument. For example, the switch illustrated in Fig. 7–7 is set to position 1.

Switch settings and oscillator frequencies are listed in table 7–7.

Section 8
THEORY OF OPERATION

Introduction

This Theory of Operation section consists of descriptions of the circuits contained on each of six main circuit boards in the SPG 1000. The boards discussed are:

A2A1, Oscillator;
A3, HD Sync;
A4, Power Supply;
A5, Controller;
A6, HD Genlock; and
A7, HD Reference Input.

Each circuit board description is further broken into discussions of the major circuits contained on the board. These are presented in the order that they appear on the circuit board schematics in this manual. The numbers enclosed in angle brackets (<>) refer to the schematic of interest.

A block diagram of the instrument is also included with the circuit board diagrams and schematics. Consult the block diagram as necessary to gain understanding of the overall operation of the instrument.

Oscillator Board (A2A1)

Overview

The SPG 1000 uses oscillators that operate at one-fifth the frequency required for a given HDTV standard. For example, a standard that requires a 72.0 MHz clock will be served by a 14.4 MHz oscillator in the SPG 1000. A frequency multiplier is used to generate the fifth harmonic of a selected oscillator. The Oscillator board consists of three ovenized crystal timebases, the frequency multiplier, a bandpass filter, power supplies, and signal routing circuits to select and control the timebases. These functions are detailed below.

Crystal Timebases <1>

Three ovenized oscillators are used in the SPG 1000. These are populated with fundamental-mode crystals selected for a ±10 ppm tune range in response to a ±8 V control signal. The ovens are osc 1, osc 2, and osc 3, and are connected to the Oscillator board through J2, J5, and J8, respectively. The tune line is bused through J10 from the Reference Input board. The tune voltage test point is TP1. An oven temperature is controlled by a thermistor inside the oscillator. Referring to the control loop on osc 1, U1A compares the voltage set by R7, R8, and R9 with that set by R4, R10, and the thermistor to drive Q2, which acts as the oven heater. A timebase is selected by switching the power to the oscillator as with Q1 on osc 1.

Frequency Multiplier <2>

The output of the selected oscillator is amplified by U12. The output of U12 drives a diode multiplier CR4–CR7. A wide bandpass filter consisting of Q17, Q16, C70, and L18 buffers and pre-selects the fifth harmonic.

Bandpass Filter <2>

A 68 to 78 MHz bandpass filter, residing on a separate board that is "piggy-backed" onto the Oscillator board, selects the fifth harmonic of the timebase to provide the clock standard. This filter typically attenuates the unwanted oscillator harmonics by 40 dB. The output of the Filter board is a differential ECL signal which is amplified and passed to the Genlock board. The spectral purity of the clock can be verified at J23.

Power Supplies <3>

Power for the Oscillator board is provided by J20. The ±5 V and ±12 V supplies are filtered and routed to the Oscillator board circuits. A tracking ±10 V regulator consisting of U10, U11, Q11 and Q12 provides stable power for the timebases.

Interface <3>

J11 provides control and selection of the timebases via TOSC(1-3). In addition, the YES_CLOCK signal is asserted whenever a timebase is selected and stable in amplitude. The TINT signal allows the processor to disconnect the timebase from genlock control.

Sync Board (A3)

The HD Sync board generates component HD signals and three tri-level sync outputs. The sync outputs are derived from the G/Y test signal channel by blanking out the active video portion of the signal. The signals are "run-length encoded," and the data blocks are stored in a slow EPROM. When the standard changes, or a different test signal is requested, the microprocessor (μP) on the Controller board transfers the data from the EPROM to the RAM in a RAMDAC IC. This RAMDAC includes three 8-bit DACs that generate the analog test signals. Counters drive vertical, horizontal, and signal decoding PROMs that select the appropriate data blocks in the RAMDAC.

Also included on the board is sync fine-timing adjustment circuitry. The sync vertical (lines) and horizontal (clock cycle) offsets are done on the Digital Genlock board.

Horizontal Counters <1>

The horizontal counters consist of U3, U4, and U5. They count from a loaded value up to 4095. The load value is decoded from the standard-select lines, STAND(0..4), by U12 and U43 and shifted from TTL levels to ECL levels by U1, U2, and U44. U6 generates a load signal by ORing the carry outputs of the counter ICs. U7A ANDs the frame reset signal from the Genlock board with the load signal to create the horizontal offset.

The counter output is level-shifted from ECL to TTL by U8, U9, and U10. Bits 0 and 1 are used to drive the LSBs of the RAMDAC (the data blocks in the RAMDAC are 4 bytes long); bits 2 through 11 are used to drive the EPROMs that select the data blocks in the RAMDAC. These bits are also decoded by U62 to generate the BLANK signal that removes active video from the G/Y channel to produce the sync output. Also decoded is a signal, CLAMP, which defines a time period immediately after horizontal sync. This signal is used to turn on a sampler that holds the blanking level of G/Y for the sync outputs.

Bits 1 and 3 from the counters are used by U71 and U42 to generate TTL, clock/4 (TH1CLK and TBLOCK), and clock/16 (TH3CLK) signals. TH1CLK is a delayed version of TBLOCK. The amount of delay is selected with J13, J14, J15, and J16 from delay lines DL3 and DL4. The delay is necessary to time BLOCK(0..7) into the RAMDAC, U20. U6C and U45A are used to disable one cycle of clock/4 each time the horizontal counters reload. This is done to ensure that a short cycle does not occur if a certain line length is required for a future standard. U7B and EH3EN (decoded by U62 from the horizontal counters) are used to ensure that clock/16 does not have too short a cycle for the memories it is clocking. Again, this short cycle can happen depending on what the horizontal counter reset value is.

Vertical Counters <2>

The vertical counter is made of U49, U50, U51, and U63; they count from 0 up to the number of lines in the standard. The enable for this counter, VCOUNTEN, is decoded from the horizontal count by U62 (SCH <1>). The clock for the counter (a clock/4 derived from TTLH1) is the

same as for the horizontal decoder, U62, in order to preserve the timing between the enable and the clock. This clock, DH1CLK, is delayed by U64 (SCH <3>) to allow adequate setup time for U62. The vertical counters are cleared by LVCLEAR, a latched (U13) signal from the vertical decoding PROM, U46. The counters are aligned with the genlock input by a frame-reset pulse. The pulse is first delayed by the fine timing circuitry, then lengthened and timed by DH1CLK and U52A and U52B. The output of U52B is TFRAME, which loads the counters to zero.

Test Signal Memory <2>

Four memories are involved in addressing the data blocks in the RAMDAC. They are U46, U47, U11, and U17. The μP on the Controller board latches the standard-select bits, STAND(0..3), into U19. These bits select the correct vertical matrix information in the vertical decoding PROM, U46. The processor also latches an 8-bit word into U53. The lower four bits identify the test signal requested and the upper four bits identify the standard. These eight bits and the vertical matrix information from U46 go into U47 to select which line of video to generate. The output of U47 is latched once each line by VCOUNTEN. The latch output, STS(0..7), and the eight MSBs of the horizontal counter address, U11, which outputs a pointer to a block of sixteen data words. This output is latched in U13 and U15 by a clock/16, TH3CLK. This pointer, along with DH2 and DH3, addresses U17, which points to blocks of four data words in the RAMDAC. U17 is clocked by a clock/4, TBLOCK, discussed above. DH2 and DH3 are delayed by U64 to allow hold time since TBLOCK is also derived from the horizontal counters. The output of U17 is latched in U16 by clock/4 TH1CLK as discussed above.

Microprocessor Interface and RAMDAC <3>

The Controller board communicates with the Sync board over a cable to connector J1. The extended address bus is buffered by U24 and U25. The extended data bus goes through a bidirectional buffer, U22, to the RAMDAC, U20, and the table of contents (TOC) PROM, U23. U21 decodes the address bus to supply enables, latching pulses, direction control, and read and write pulses. When the test signal or standard is changed, the μP reads data from U23 and writes it into the RAMDAC. The RAMDAC includes a 256-by-24-bit RAM and three 8-bit DACs.

A signal defining blanking time, BLANK, is sent to the processor from U62. The processor monitors this signal so the RAMDAC is not written to during sync pulses. When the processor writes to the RAMDAC the DACs hold data from the previous clock cycle that could put a glitch in a signal with changing levels. For this reason the processor selects the Black test signal—which is always written into the RAMDAC—and then loads new test signal data while monitoring BLANK. When the download is finished, the processor reads the data back to make sure the download was successful, and then selects the downloaded signal.

G/Y Filter and Output Amplifier <4>

The output of the DAC is filtered by a 75 Ω, 5-pole filter and one group delay correction stage made up of L3, L4, L5 and associated capacitors. Because current only flows out of the DAC, a resistor divider network, R36, R188, R189 and R190, is needed to shift blanking level to ground. U72 gives the signal a gain of two and drives the 75 Ω output. A 3-pole filter made up of C23, L22, and C172 filters high order clock harmonics from the signal before it goes out the BNC. U72 also drives the input to U27, which switches between test signal and blanking level to provide a sync signal with no active video. The blanking level is determined by a sampler that samples the G/Y signal during clamp time and holds during the rest of the line. The sampler works by turning on FET Q20 and charging C144 to the blanking voltage. The FET is then turned off for the rest of the line.

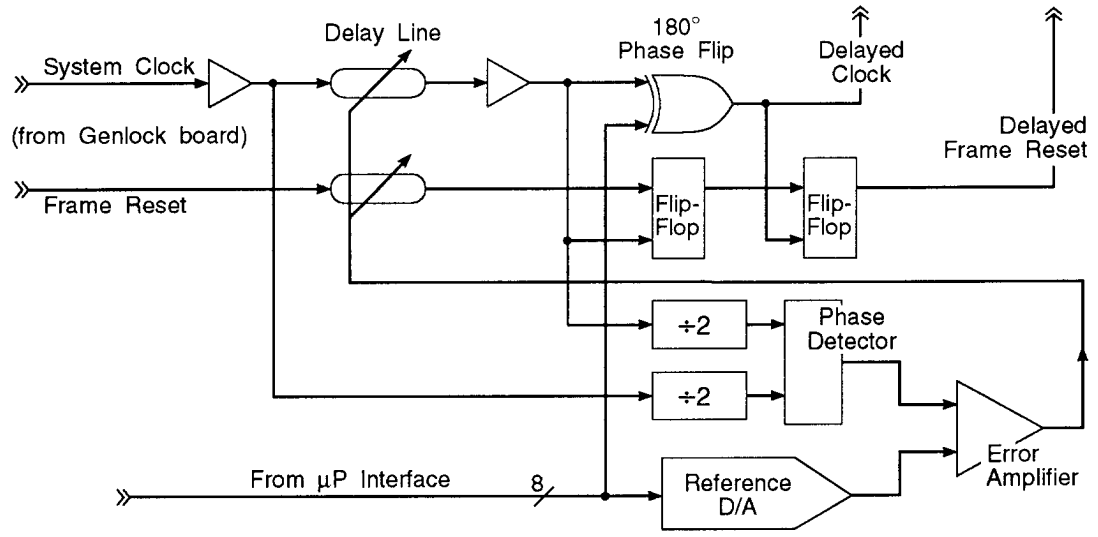


Fig. 8–1 Block diagram of the fine sync delay circuits.

U73 is a FET buffer that sends the blanking level over to U27.

Tri-Level Sync Output <4>

The tri-level sync signal generated by U27 (described above) is buffered by U29, U30, and U31 before being output.

B/PB Filter and Output Amplifier <5>

The filter for the B/PB channel is exactly the same as the G/Y channel. The dc offset, however, is controlled by a current source made of Q14 and associated parts. When the PB format is selected, Q15 is turned on to change the offset. Q15 is controlled by LEVEL, which is a bit latched in U19 by the processor. The signal is given a gain of two by U34 and filtered before the output.

R/PR Filter and Output Amplifier <5>

This circuit is exactly the same as the B/PB channel.

Clock and Frame Reference Fine Timing <6>

The clock and frame reference signals come from the Genlock board to the Sync board on J10. The vertical and horizontal offsets have been done on the Genlock board. The sub-clock cycle timing is done on the Sync board. When the system clock, CLK, comes onto the Sync board it is buffered by U55A and fed into a variable delay line. The delay line is composed of two multi-tap static delay lines, DL1 and DL2, and varactors, CR5 to CR9, connecting their taps.

The clock signal is ac-coupled in and out of the delay line to U55B. The anodes of the varactors are set at –12 V, and the voltage on the cathode is controlled by error amplifier U57A. The delay line is in a feedback loop that forces the requested phase relationship between the input clock and the delayed clock. The delay line is designed to provide variable delay—up to 180 degrees—to the clocks used in the instrument. The additional 180 degrees is derived by inverting the clock with U54A and U54B. This clock inversion occurs after the phase locked loop (PLL).

Two divide-by-two flip-flops, U59A and U59B, a multiplier, U66, and an error amplifier, U57A, make up the rest of the PLL. The input clock, CLKA, and the delayed clock, CLKE, are divided by two and fed into the multiplier, which serves as a phase detector. The clocks are divided by two

so that the phase between them can be changed by more than 180 degrees without the phase detector reversing direction and causing a positive—rather than negative—feedback loop. The divide-by-two flip-flops are set by frame reset pulses to ensure the correct polarity of their signals. Incorrect polarity would cause a positive feedback loop.

The output of the phase detector is filtered by C78 and compared with the reference voltage by the error amplifier, U57A. The reference voltage is set up by the DAC, U38, which is controlled by the processor via latch U37. The MSB from the latch controls the inversion of the clock (180 degree phase flip), and the 7 remaining bits control the DAC.

After arriving at the Sync board via J10, the frame reference pulse, FRAME, goes through a variable delay circuit to help time it with the delayed clock. This delay circuit includes CR17, CR18, and varactor CR16. The same voltage, DELAYV, that controls the clock delay line also controls the frame reset delay by changing the voltage across CR16.

The delayed signal, DFRAME, is then latched (U58A) by the delayed clock, and latched again (U58B) by the clock from U54. The clock from U54 is either the same as the delayed clock, or has been flipped 180 degrees by the MSB of the offset latch, U37. The frame reset is thus completely timed with the sync fine timing.

Power Supply Board (A4)

The switching power supply generates 5 V for TTL and ECL devices. A stable linear supply of 12 V is provided for powering the analog circuitry.

This type of power supply is called a current-mode-controlled, discontinuous, flyback, switching power supply. The current output is distributed between the four supplies as follows:

+ 12 V	0.8 Amps max
+5 V	7 Amps max
–5 V	6 Amps max
–12 V	0.8 Amps max

The maximum power is limited by the maximum current in the primary of T1. This is also the only current limit for the ± 5 V supplies, as they have no secondary current limit. The ± 12 V supplies are current limited on the secondaries by the ± 12 V linear regulators, U150 and U152, and the secondary ± 14.5 pulse width modulator, U200.

The power inductor, T1, is driven by switching the voltage to its primary winding on and off at a rate of approximately 60 kHz. T1 is not used as a transformer, but as an energy storage device; the energy is stored in the primary during the first half of the switching cycle, while voltage is being applied. On the second half of the switching cycle, voltage to the primary is switched off and the energy stored in T1 is transferred to the secondaries. Regulation is accomplished by feedback from the +5 V supply to the Pulse Width Modulator controlling voltage to the primary. This varies the length of time that voltage is applied to the primary, causing it to store either more or less energy.

There is also circuitry to provide for operation from both 110 and 220 VAC supplies, over voltage protection (crowbar) on the +5 V supply, and shutdown circuitry that forces a restart of the supply if it remains in current limit for more than a short period of time ≤ 200 ms).

WARNING

All primary voltages are referenced to a floating ground, not chassis ground. An isolation transformer or a differential amplifier is therefore required for troubleshooting the circuitry in the primary and the Pulse Width Modulator, and in the supporting circuits.

Input, AC to DC Converter, and Voltage Doubler

This circuitry filters and rectifies the input AC voltage, charging capacitors C845 and C865 to approximately 320 VDC.

The line current passes through line filter LF950, fuse F940, and power switch S930, and is applied to rectifier CR820. At the input of CR820, P810 is used to select between 110 V and 220 V operation. If J810 is placed on P820, for 220 V operation, CR820 works as a full-wave rectifier and C845 and C865 act in series, charging to the peak voltage (approximately 320 VDC) during the first part of each one-half cycle. They then maintain that voltage through the rest of the cycle, as the input voltage and current fall to zero.

If, on the other hand, P810 is placed on J810 (for 110 V operation), CR820, C845, and C865 act as a half-wave rectifier and voltage doubler. During the positive half-cycle of the AC input only one of the diodes within CR820 conducts, charging C865 to the peak positive voltage. A different diode within CR820 conducts during the negative half-cycle, and charges C845 to the negative peak. The total voltage across C845 and C865 is then approximately 320 VDC.

E920 and E820 limit voltage surges on the input that might pass the line filter, while R865 and R845 discharge C865 and C845 when the power is off. DS720 and associated parts form a relaxation oscillator, so DS720 blinks when the instrument is powered up. L700, C5, C6, and C700 form a filter to keep noise developed by the Power Supply from getting onto C865 and C845 and out the line cord.

Kick Starter, Housekeeping Supply

These circuits supply the power to start and maintain oscillation of the Pulse Width Modulator, so long as the input AC voltage is sufficient to maintain regulation. When the power supply is first turned on, C656 charges through R921. When the charge across C656 reaches approximately 16 V, U722 begins to switch Q638 on and off through the base drive circuitry (Q648, and associated circuits).

The power to maintain the +16 V charge on C656 is now provided by the housekeeping winding of T1, pins 5 and 6, through CR600. If there is insufficient power to maintain the charge on C656 for any reason, such as the removal of P660, then the charge on C656 is quickly depleted. U722 will turn off when the voltage on C656 drops to approximately 10 V. Then, C656 will slowly charge again through R921, and the kick start sequence will be repeated. P660 may be used as a troubleshooting jumper, to trigger and verify the kick start sequence before applying power to T1 through P500.

Power Inductor Operation

The heart of this power supply is T1, the multi-winding power inductor. The operation of T1 is as follows (see Figures 8–2 and 8–3).

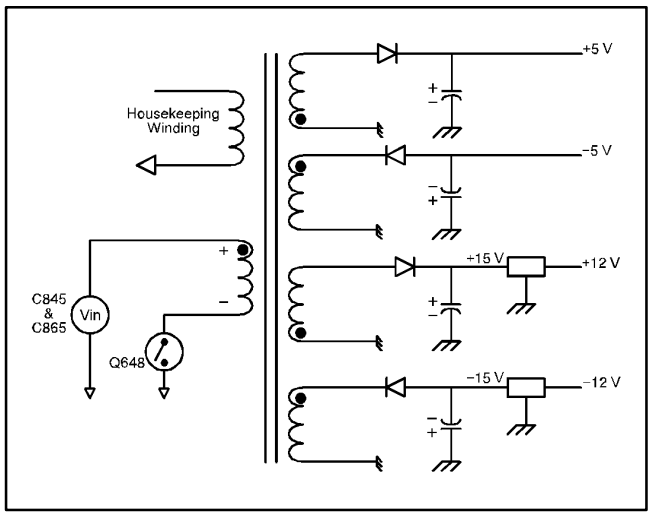


Figure 8–2: Power Inductor Circuit

Inductor T1 is initially uncharged (has zero magnetic flux). Q638, acting as a switch, is turned on by the base drive from U722. This places the charge developed on C545 and C865 (approximately 320 V) across the primary winding. The polarity of this charge is such that the voltages induced in the secondaries all reverse

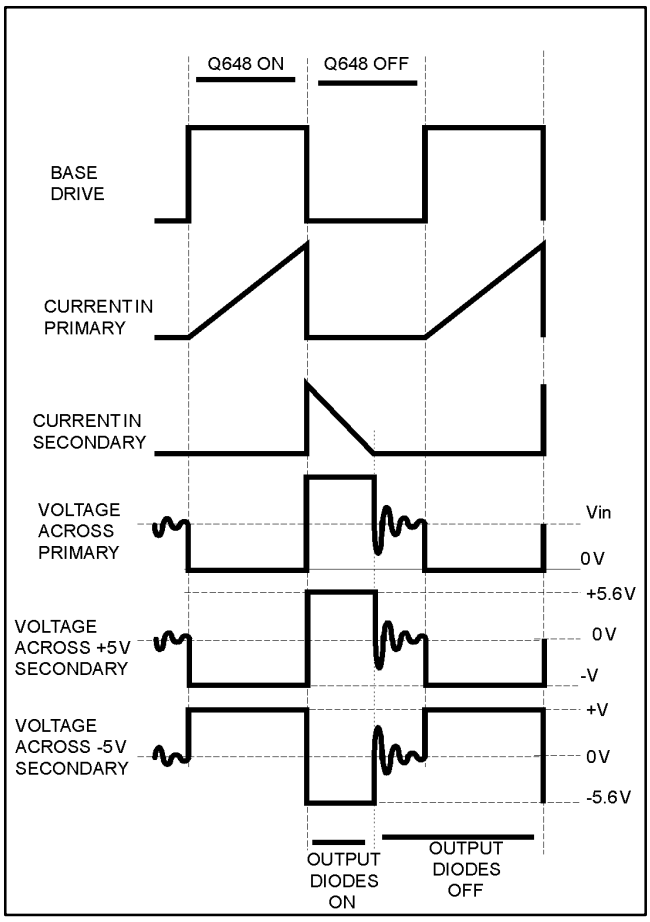


Figure 8–3: Power Inductor Operation

bias their respective diodes (note the polarity dots). In this way, there is no current flowing in the secondaries while current is flowing in the primary.

The primary current builds as a linear ramp, storing the energy in T1 according to the relationship $E = 1/2\ Li^2$, where L is the primary inductance and i is the current flowing through it.

The current path is broken when Q638 is switched off, so current stops flowing in the primary. The flyback action of T1 then causes the voltages in the secondaries to reverse polarities, and CR575 and CR320 to turn on.

The current in the secondaries linearly ramps down as the energy that was stored in T1 primary is delivered to the load, charging the output capacitors.

When all of the energy that was stored in T1 during the first half of this cycle is delivered to the load, the current in the secondaries is at zero, and the diodes turn off. There is no current flowing in either the primary or the secondaries until Q638 is turned back on to start the next cycle. As there is not a continuous flow of energy in T1, this is called discontinuous flyback operation. At low line voltages or high loads all the power in inductor T1 may not be transferred to the load during the second half of the cycle, in which case the diodes will not be off when Q638 turns back on. In that case there will also be some energy still stored in T1 at the end of the cycle (at low line or high load).

Load regulation is provided by sensing the +5 V supply with a divider comprised by R314, R315, and R415, and using U410 to convert this to an error signal. This error signal is optically coupled through U520 back to the Pulse Width Modulator, U722. U722 uses the error signal to vary the width of the pulse that drives Q638.

When the +5 V goes too high, U722 narrows the pulse width. This reduces the amount of energy stored in T1, and therefore the amount transferred to the load, so the +5 V goes down. Contrariwise, when the +5 V is too low, the pulse width is increased, increasing the amount of energy stored in T1 and then transferred to the load, so the voltage goes up.

Pulse Width Modulator and Error Amplifier

The Pulse Width Modulator, U722, is a current-mode controller. It uses inputs from the primary circuit and from the +5 V output to vary the width of the pulse that controls Q638, as mentioned above. This regulates the secondary voltages throughout variations such as input voltage, output load, and temperature.

Current mode control works by allowing the current flowing in the primary to reach a peak level that is set by the output of the error amp (internal to U722), which is controlled by the +5 V output. The current in the primary winding is sensed by R630, and applied to U722-3 as a voltage. At the start of the cycle the oscillator sets the flip-flop within U722, which turns Q638 on. The primary current, and therefore the voltage to U722-3, ramps up until the I - SENSE level is sufficient to trip the comparator. This resets the flip-flop, ending the drive pulse to Q638, and the energy stored in the transformer is transferred to the secondaries.

Line regulation is accomplished automatically without voltage feedback. As the input voltage increases, the slope of the ramp increases, and the trip point is reached sooner. This results in a shorter pulse width. A decrease in line voltage causes a decrease in the slope of the ramp, and it takes longer to reach the trip point. The same peak current is reached in both cases, however, so the same amount of energy is transferred to the load. Line regulation, then, is achieved before variations in output voltage can occur.

Load regulation is accomplished by sensing the output voltage of the + 5 V supply and comparing it to a 2.5 V reference (internal to U410). U410 is a band-gap reference set to function as an error amp. Pin 3 of U410 is the error signal; this signal is coupled to U722 through opto-isolator U520. If the load increases, the signal at U722-2 drops in

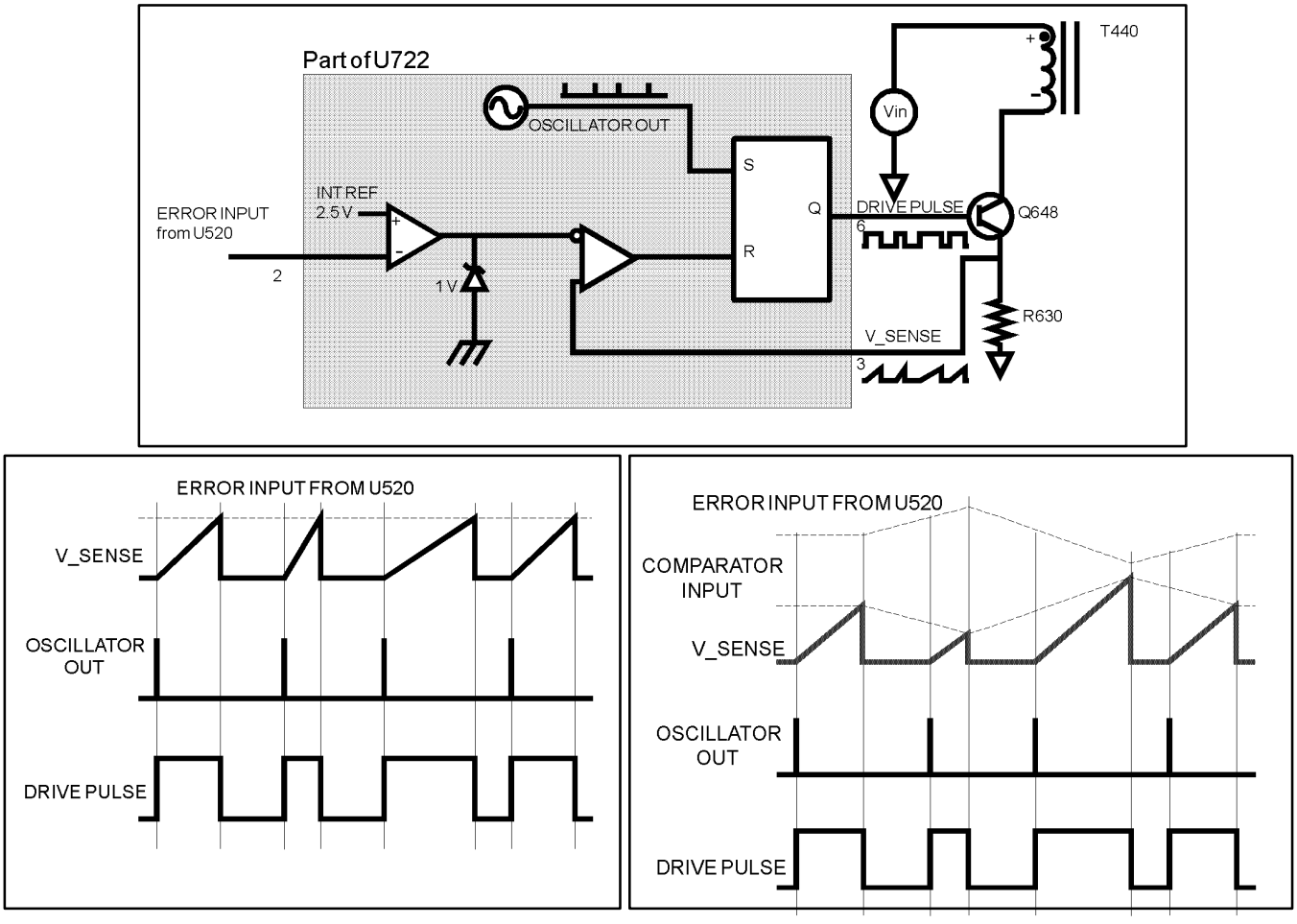


Figure 8–4: Pulse Width Modulator and Error Amplifier Circuit

voltage. This causes U722 to increase the pulse width, and thus the current and power through T1.

On the other hand, if the load decreases, the +5 V increases momentarily. The output pulse width then decreases along with the current in T1, and less power is transferred to the secondaries. In this way, the +5 V is kept constant through changes in the load.

Current Limit

Current limit is provided for the primary circuit by the internal circuitry of U722. If the ramp voltage at U722 ever reaches 1V, the output drive pulse ends. This shuts Q638 off, so no further voltage is supplied. Thus, the maximum primary current in T1 is limited to approximately 2.5 Amps, which corresponds to a maximum power level of approximately 140 Watts.

As the supply goes into current limit, U615A and Q717 come into play. U722-1 provides an indication of the peak current in T1. This voltage is fed to the inverting input of comparator U615A and compared to a fixed voltage set by divider R616, R615, and R510. R510 is an output power adjustment set so trip point will be approximately 115 Watts. If U722-1 goes high enough to trip U615A-1 low, then C717 will start to charge. If the current limit condition persists long enough for the charge on C717 to reach 700 or 800 mV, U615B trips and Q717 is turned on. This applies the reference voltage from U722-8 directly to U722-3, shutting down the supply and forcing a kick start. The supply will then cycle through kick start, current limit, and shutdown until the problem is corrected. Jumper P720 is included for troubleshooting; its removal will disable the current limit shutdown circuits.

Base Driver and Snubber

Q638 is a high (1000V) blocking voltage power transistor. To prevent transistor failure and ensure proper operation, Q638-base must have a large forward current during the on-time and a reverse base-emitter current during turn-off. The pulse from U722-6 turns FET Q648 on and current flows through R746, CR649, and into the base of Q638. The current level is set by R746. Thus Q638 turns on and 320 volts appear across T1, pins 1 and 2. When the pulse from U722-6

ends, Q648 turns off and the collector current of Q638 flows out the base of Q638 through CR648, and quickly turns Q638 off. CR640 forms a Baker Clamp to keep Q638 out of hard saturation and a slow-turn-off. When Q638 is turned off, a voltage spike appears at its collector. A combination of reflected secondary voltages, input voltage, and transformer leakage inductance can combine to produce a spike of over a thousand volts. As this can exceed the voltage rating of Q638, a snubber circuit limits the spike to approximately twice the rectified line voltage. CR500, C500, and the winding on T1, pins 3 and 4, make up the snubber circuit.

Secondary Circuits

The secondary circuits all work in the same manner. As mentioned earlier, during the first half of the cycle, CR575 and CR320 are reverse-biased, so there is no current flow.

On the second half of the cycle, when Q638 is shut off, the flyback action reverses the polarities of the secondaries, and the diodes are forward biased. This allows the energy stored within T1 to charge up the capacitors in the secondaries.

The +5 V and the –5 V supplies use LC filters from this point, to further smooth the voltage and eliminate most of the ripple.

Generation of 12 Volts

The ±12 V supplies are generated with a secondary PWM and regulator composed of U200, Q250, T2, and the associated circuits. This secondary PWM is free-running with respect to the primary PWM at a frequency of approximately 60 kHz. The frequency is set by R105 and C105. Q250 is controlled by U200 to switch +5 V and –5 V (10 Volts total) across T2 during the

first half of the switching cycle. During the second half of the cycle, the voltage across T2 reverses and CR150 and CR160 turn on, causing a charge to build up on C150 and C152. The voltage on C150 is regulated by U200 to be approximately +14.5V, and the voltage on C152 will follow at approximately –14.5V. The 14.5 Volts is then filtered by L150 and L162, respectively, and applied to the three terminal linear regulators (U150 and U152) to derive the + 12 V and –12 V outputs.

R260 senses the current in T2 and feeds it back as a voltage to U200-3. Q200 applies part of the ramp voltage on U200-4 through R125 to U200-3 for better noise immunity.

Q100 is in the voltage feedback path for the +14.5 volts and acts as a level shifter to get the voltage feedback signal to a level referenced at + 2.5 V with respect to U200-5. U200-5 is at –5 V with respect to ground. P800 disables the operation of U200 and turns Q250 off. With U200 disabled, the ±14.5 V outputs will go to ±5 volts. Jumper P800 is provided for troubleshooting. Its removal will disable the ±12 V PWM, which may be necessary for diagnosis or repair of the primary portion of the power supply.

Over Voltage Protection

Over voltage protection is provided on the +5 V output by a crowbar circuit composed of Q127, VR120, and R120. If the +5 V output exceeds approximately +5.5 V, VR120 will start to conduct. When VR120 is drawing enough current through R120 to raise SCR Q127 gate voltage above its cathode by approximately 0.7V, Q127 will turn on. This shorts the +5 V output to ground, forcing the primary circuit into current limit.

Controller Board (A5)

Overview

The SPG 1000 Controller board is divided into four major sections:

- Microprocessor Kernel;
- IO Ports;
- Remote Control and Miscellaneous; and
- Bus Drivers.

Microprocessor Kernel <1>

The SPG 1000 Kernel consists of a Z80 microprocessor (µP), RAM, PROM, CTC, IO Decoders, Memory Decoder, External Data Bus transceiver, Address Bus Driver, Diagnostic Switch, Clock Generator, and Watchdog Timer.

The Z80, U1, is the core of the Controller board. It is a general-purpose µP with 64K of memory space. In this application the upper memory range from C000H to FFFFH (physically on the Sync board) are bank switch pages of data containing all the Signal- and Standard-specific information for the rest of the instrument.

U3 is a static RAM—with battery back-up—that is used for storing all parameters and restoring them on power-up. The RAM is also used as scratch-pad RAM.

All code instructions are stored in the kernel PROM, U11. When the instrument is initially powered up the first address accessed is the first location of U11 (0000H).

The CTC, U6, is used as a general purpose timer, an interrupt controller for the front panel, and a "framer" that alerts the µP when a vertical interval has occurred to allow things such as signal changes to occur on video frame boundaries.

Memory, U93, and IO decoder, U5, decode all the memory and IO ports used on the Controller

board. All other boards do their own decoding of IO ports and memory locations.

Memory decoding is done in a 22V10 PAL. This PAL, U93, decodes RAM, PROM, and UART IO banks.

Memory Map

Sync Bd	BC00H–FFFFH
RAM	A000H–AFFFH
ROM	0000H–9FFFH

IO Map

Genlock Bd	20H–33H
Display	1CH–1DH
CTC	18H–1BH
RS232	10H–17H
IO Decoder	00H–0FH

The diagnostic switch, S1, is mapped into the µP as an input port at IO address 00H. The definition and usage of the diagnostics are covered in Section 7, Maintenance.

The clock generator, Y1, provides a 6 MHz clock to the Z80 and CTC with the proper amplitude, rise times, and a 50/50 duty cycle.

The watchdog timer, U10, is an analog, self-triggering one-shot that does nothing during normal operation. During normal operation the µP periodically strobes the ST input which tells the watchdog that the µP is operating. If the µP is disturbed by a power hit, a hardware problem, or the disruption of computer remote controls, then a reset pulse is issued to the µP and a reset sequence is initiated.

Resets can also occur when a reset is asserted by placing P2 on pins 2 and 3, and in cases of low power supply voltage or power-up conditions.

IO Ports (Front Panel Interface) <2>

The IO Port section consists of three sub-sections: 1) Keyboard Encoder; 2) LED ports; and 3) Knob Decoder.

The Keyboard Encoder, U20, encodes and debounces the front panel switch array to a form that is readable by the µP so that appropriate action can be taken. The switch matrix on the Front Panel board is scanned to determine which key is pressed. While a key is depressed the DA line (U20-13) is high. This signal goes to the CTC, U6, and initiates an interrupt request. When the µP is ready, keyboard data is read from port U28. U28 also has the DISP_BUSY signal on it, which the front panel display asserts while it is busy. The µP waits for this line to go inactive when trying to output a message to the display.

The LED Ports, U23, U24, and U25, latch the information from the Controller to turn the front panel LEDs on and off. All outputs are active low (i.e., Low = On).

The knob decoder circuitry—U22, U30, and U31—processes the quadrature-encoded signals from the knob to detect rotation and ascertain the amount of the rotation. (The direction is determined in software.)

Remote Control and Miscellaneous <3>

The Remote Control and Miscellaneous section is composed of ground-closure remote ports and a UART for RS-232 communication.

The ground closure remote ports—U77, U79, and U82—take outputs from passive switches to ground and allow the µP to read them. The diode arrays—CR2, CR3, CR4, and CR5—are for static and overvoltage protection. The ports approximate the front panel switches and allow for LEDs to show genlock status. See Remote Control in Section 3 of this manual for pinout information.

The UART, U86, along with Y2, U88, and U89, provides RS-232 communication. U88 and U89 are level-shifters that convert from ±12 V to TTL signal levels.

U75 is the port that is used to turn the beeper on and off. The beeper circuit is a 555 timer IC configured as an oscillator that is enabled to allow the beep. U75 also has a soft reset output that resets the CTC and the UART.

Bus Drivers <4>

U13, U14, U7, and U83 make up the interface circuitry of the UMI (Universal Microprocessor Interface) bus. These ICs provide buffering to increase fanout of the associated signals and provide fault isolation to the Controller board. All signals are distributed to each board via the UMI bus, which consists of buffered address, data, and control buses.

Decoder PLD U93 controls the external data bus (EDBUS) transceiver, U7, which isolates the kernel from any external faults when any μP core tasks (e.g., diagnostics and memory reads/writes) are executed.

HD Genlock Board (A6)

Overview

The Genlock board performs the digital portion of the SPG 1000 genlock function. It is closely tied to the Reference Input board which does the analog part. As a pair, the two boards use the external reference video to phase lock one of the oscillators in the instrument.

The Genlock board's output is two sets of clock and frame resets—an internal one for use by the Sync/Test Signal board and an encoded version for external use by a TSG 1000 series generator. The phase of the clock and the time of the reset pulses within the reference video frame are under user control.

The board contains horizontal and vertical counters, strobe decoders, a color frame decision circuit, power supply conditioning, decoders for the Universal Microprocessor Interface (UMI) signals, a fine clock phase adjustment circuit, two timing offset and clock output drivers, and miscellaneous circuits such as error signal buffers and interface latches.

The board is described by eight schematics:

<1> Vertical Counter and Offset/Horizontal Counter
<2> Strobe Decoders
<3> Color Frame Circuit
<4> UMI Decoder
<5> Fine Edge Sample Delay and Power Supply
<6> Horizontal Offset and Clock/Frame outputs—External
<7> Horizontal Offset and Sync outputs—Internal
<8> Interface Buffers

Vertical Counter and Offset <1>

The entire vertical counter, two independent 14-bit latched comparators, and a switched 10-bit comparator are all incorporated into U117, a large PLD. The internal operation of U117 is explained here to aid in overall understanding.

The counter—a 14-bit TTL programmable up-counter—runs at the horizontal rate of the input standard (15 to 50 kHz), and is used to track frame-related events. The 14-bit two's complement of the number of lines in a field sequence is loaded once by the processor into latches in U117. The counter counts up until it reaches all ones, then self-preloads. The TTL sequence reference input, TSEQREF, will also cause a preload to occur; this is how initial lock is acquired. The output TVLOADN goes low when the self-preload or an external preload occurs.

There are two independent offset circuits, one for the external genlock drive and one for the internal sync generator. Looking at the external genlock circuit, TTL genlock vertical offset low- and high-byte enable inputs, TGVOFFLE and TGVOFFHE, latch the offset information from the user input into U117. These data are compared to the vertical counter outputs inside U117. When they are equal, the TTL genlock vertical reference line, TGVREF, is asserted. This line goes to schematic <6> to be combined with horizontal information. The sync offset circuit works the same way, with TSVREF going to schematic <7>.

The switched 10-bit comparator generates the TTL color frame circuit signal, TCFCNT. This occurs for sixteen lines in field 2 for NTSC, and for eight lines in fields 2 and 4 for PAL. This line goes to U64 on schematic <3> to gate the color frame decision process.

Horizontal Counter <1>

This counter runs at full clock speed, 70 to 75 MHz, and is used to synchronize events within a line. The horizontal counter is a 13-bit ECL programmable up-counter. The count length is the number of clock cycles in a line and is set once by the processor into latches U27 and U28. U17, U18, U19, and U20 convert the TTL preset data to ECL to drive the counters. Four bit counters U21, U22, U23, and U24 are connected to form the 13-bit counter, and they count from the preset value up to all ones. Then, U25 and U26 decode the terminal count outputs to preload the counters, which starts the sequence over. U29 stretches the decoded preload pulse to four clock cycles to drive the vertical counters. U30 shortens the ECL horizontal sync time error signal from schematic 7 to one clock cycle. This ECL H sync time signal, EHSYNCTN, presets the counter through U25 during acquisition to get it coarse-locked.

Strobe Decoder <2>

The strobe decoder generates the unique timing signals to control the rest of the board. This includes sample strobes and counter resets, as well as miscellaneous signals such as burst filter enables. These circuits also detect the vertical interval.

The strobe decoder has four major parts: The high speed ECL PLD sync sample decoder; the lower speed TTL PROM horizontal decoder; the TTL PLD vertical decoder; and a TTL PLD miscellaneous glue decoder.

The ECL PLD, U47, decodes the sync edge sample strobes as a function of input standard EINSTAND(0..4) and the 6 LSBs of the H counter EHCOUNT(0..5). The counter inputs and all outputs are registered through U46 and U60 to prevent glitching. ECL PLD enable line, EPALE, comes from the TTL PROM and is decoded from the higher order bits to allow only one strobe per line on the ECL edge strobe signal, EEDGEST.

The ECL PLD also decodes the EPROME signal which eventually clocks the output register on the TTL PROM. This occurs every 16 clock cycles (approximately 222 ns) except immediately after the H counter reset when U56B and U118 "swallow" the enable pulse to prevent the latching of bad data at the PROM outputs.

When the reference is NTSC or PAL and the second ECL PLD enable signal (EPAL2E, from the TTL PROM) is asserted, the ECL PLD also decodes the ECL burst phase sample strobe, EBPSN.

TTL PROM U52 decodes strobes to detect events within a line. This is done as a function of the top nine horizontal counter bits and the input standard. Thus each of the 32 possible standards has 512 bytes of data. The signals encoded in the PROM are:

TEPALE — Asserted for 64 clocks to select one cycle of the ECL PLD for the edge sample.

THST — TTL H sync time. Asserted when H sync is expected. Used to mask TCOMPSYNC when the circuit is locked.

TCLAMPS — TTL clamp sample strobe. Turns on the back porch sampler unless qualified by TCOMPSYNC and TNOVIDN.

TVST1,2 — TTL vertical sync times. Strobes in the first or second half line vertical sync times.

THLINE — TTL half line. Strobe during half line sync.

TEPAL2E — TTL ECL PLD enable. Qualifies the NTSC/PAL burst phase sample.

U51 (a TTL PLD) works with dual flip-flop U57 to decode the vertical interval. The PLD also decodes some other special signals as a function of standard.

The mode that U51 uses in decoding the vertical interval is standard-dependent. Basically, the two flip-flops on the output are set and cleared when TCOMPSYNC and the signals from the PROM coincide. The outputs of the flip-flops are also fed back to the PLD for use in the decode process.

The other outputs of U51 are: The burst notch filter enables for NTSC and PAL, T358F and T442F; the TTL bi-level sync line, TBLS; and the unused TTL filter spare signal, TFLSPARE.

U118 is the "glue" PLD. It handles all the interface between the other PALs and the various flip-flops and counters. One such counter, U58, blanks comp sync for the first 48 lines after the vertical, passes the next 64 lines, then blanks the rest of the field. The TTL vertical blanking mask signal, TVBLKMX, prevents U58 from being retriggered until it has reached its terminal count. This is necessary to prevent a constant vertical mode false-lock.

Color Frame Circuit <3>

Since the SPG 1000 allows different input and output frame rates, the longest frame period within a compatible group is used for the entire group. Thus, for the group [NTSC; 525p; 1050i; 1050p] the frame period is 66.733 ms, the NTSC color frame period. Since this is more than one frame for the other standards, the field sequence counter U65 is programmed by U64 to divide the input frame rate down to the common frame rate. The color frame circuit works by resetting the phase of this counter.

For NTSC the color frame circuit uses burst phase to differentiate between fields 2 and 4. In doing so, it checks the phase during the field it has previously selected as field 2. If the phase proves to be correct for field four the circuit allows the next vertical sync to reset the field sequence counter to field 1.

The system is similar for PAL except that the phase of burst is sampled in fields 2 and 4. If either is determined to be field 6 or 8 the field sequence counter is allowed to reset on the next odd field.

The analog burst signal, A358B, is buffered by Q28 and Q29. The output of Q29 drives ac magnitude detector U62C whose output will be high if there is large burst. The emitter of Q29 also drives an ECL buffer to get a slightly asymmetric square wave. When the ECL burst phase sample asserted low signal, EBPSN, goes low, it effectively determines that burst is present and of the correct phase. If either is not true, the ECL burst phase error output, EBPEO, goes high.

EBPEO is stretched to 16 clock cycles by F-F U67, it then clears F-F U66A. This whole process happens either 8 or 16 times (every other or every fourth line) and is controlled by PLD U64. If EBPEO never goes high, then the burst phase is assumed to be incorrect, and the next time the TTL vertical field reference line, TVFLDREF,

goes high it feeds through U64 and U66B to reset the sequence counter, U65.

After the color frame is correct—or if no burst is present—EBPEO will always go high so that U66 will always be reset and U65 will thus count uninterrupted. For standards other than NTSC and PAL U66 is never set, and U65 therefore runs as a simple divider as preset by U64.

UMI Decoder <4>

The UMI Decoder serves as the interface between the Genlock board and the Universal Microprocessor Interface (UMI) bus. U101 and U105 buffer the address and data buses. U102, U103, and U104 decode the address and processor control lines to generate the various read and write strobes which are explained in Table 8–1. U103 also decodes the control lines for the data bus buffer, U105.

Fine Edge Sample Delay Circuit <5>

The fine delay circuit offsets the sync-edge sample pulse—which is four clock cycles long—in steps of 50–100 ps over one clock cycle. This has the effect of changing the internal clock phase relative to the external reference video.

The circuit works by charging capacitor C79 with differential current sources. The two current sources on the bottom have twice the current as the ones on top. For example, assume a value of 1 ma for the upper current sources. When the circuit is not switching, the current in each diode is 1 ma, and the offset voltage across the diode network (e.g., U74 pin 3 to 12) is zero. During transitions, one diode from each series pair will turn off and the capacitor will charge or discharge with 1 ma of current. When the capacitor has charged to one-half the logic swing, the output gate will switch. Thus, by varying the current sources with DAC U72, the delay can be adjusted. (Actually, one of the current sources—U71B—needs to be slightly larger to compensate for board parasitics.)

Power Supply Conditioning and Filtering <5>

U69 and Q30/Q31 form a tracking ±10 V supply. Q36 and Q37 provide current limiting by shunting base drive away from Q30/Q31 if the voltage across R259 or R260 exceeds approximately 0.5 V. The LC filters in the ±5 V supplies serve to minimize digital noise in the analog circuits.

Clock/Frame Outputs and H Offset—External <6>

This circuit generates the frame and clock information to be sent to a TSG. User offset data is latched into U78/U79, translated and applied to magnitude comparators U84, U85, and U86 to select one clock cycle per line.

The genlock vertical reference signal, TGVREF, is converted to ECL then re-timed by the EHLOAD signal in U75B. This output is wire-ORed with the output of the three magnitude comparators to get a frame pulse that is low for one clock cycle per field.

U75A re-clocks the signal to be centered on the rising edge of clock, then U119A encodes the frame information onto the clock by deleting one clock pulse. U77 then launches the clock/frame signal differentially on the BNC-Twin connector. The MSB of the offset data controls the enable of U75 via the ECL genlock frame enable low signal, EGLFREN, to prevent frame resets during lock acquisition or if requested by the user through the utilities menu.

Clock/Frame Outputs and H Offset—Internal <7>

This circuit is similar to number 6; however, it drives the internal sync generator. Instead of en-

Table 8–1 UMI Strobes.

Name	Description
TDB(0..7)	TTL data bus
ABUS(0..7)	TTL buffered address bus lower bits
TCPLLE	TTL counts per line low byte latch enable
TCPLHE	TTL counts per line high byte latch enable
TCPFLE	TTL counts per field low byte latch enable
TCPFHE	TTL counts per field high byte latch enable
TSVOFFLE	TTL sync vertical offset low byte enable
TSVOFFHE	TTL sync vertical offset high byte enable
TGVOFFLE	TTL genlock vertical offset low byte latch enable
TGVOFFHE	TTL genlock vertical offset high byte latch enable
TGHOFFLE	TTL genlock horizontal offset low byte enable
TGHOFFHE	TTL genlock horizontal offset high byte enable
TSHOFFLE	TTL sync horizontal offset low byte enable
TSHOFFHE	TTL sync horizontal offset high byte enable
TGFOFFLE	TTL genlock Fine offset low byte enable
TGFOFFHE	TTL genlock fine offset high byte enable
TERREN	TTL error read enable
TERRCLRN	TTL input to clear error flip-flops
TOSC12REN	TTL oscillator one and two freq. code read enable
TOSC3REN	TTL oscillator three freq. code read enable
TINSTANDE	TTL input standard latch enable
TOUTSTANDE	TTL output standard latch enable
EA(0..15)	UMI address bus
ED(0..7)	UMI data bus
(BRESET)	Buffered reset asserted low
(BRD)	Buffered read asserted low
(BWR)	Buffered write asserted low
(BIOREQ)	Buffered I/O request asserted low
(BMREQ)	Buffered memory request asserted low (not used)
(BUFF_M1)	Buffered M1 line asserted low
(TDB_EN)	TTL data bus enable asserted low
EDDIR	ED bus direction

coded clock/frame, separate signals are output. And instead of BNC-twin connectors, it uses a 10-conductor ribbon to send signals to the sync board.

Interface <8>

Includes miscellaneous buffers and latches, oscillator programming switches, and 10 pin connector to the Oscillator board.

The interface schematic has five major parts: The interface to the Oscillator board; the interface to the Reference Input board; the error latches and read port; the oscillator programming switches; and the input standard latch.

The interface to the Oscillator board is through J8. Differential clocks come in and are buffered by U113A. The TTL oscillator-select lines TOSC1, 2, and 3 are latched from the processor in U112 and drive the Oscillator board. One of these lines should be high to hold the corresponding oscillator on. The TTL internal line, TINT, is high when the SPG is in internal mode and low for the genlock mode. The TTL oscillator and clock error line, TOCLKERR, goes high when there is no clock detected on the Oscillator board. Note that the TTL output standard lines TOUTSTAND (0..4) of U112 are not currently used on the Genlock board.

The interface to the Reference Input board is through J12. Power, sample strobes, filter selects lines, and a bi-level mode-select line are output to the Reference Input board; comp sync, filtered burst, and several error flags are returned.

The error lines are latched by flip-flops U99, U115, and U116. The processor can then read them via port U114, and subsequently clear the flip-flops via the TTL error clear not line, TERRCLRN.

The oscillator select switches, S1-S4, drive the read ports, U110 and U111. These are set at calibration to show what oscillators are in the box and are read by the processor.

The final circuit on this page is U109, the input standard port. This latches the input standard code and the TINT line from the processor. TTL input select line, TINSEL0; TTL filter spare line, TFLSPARE; and TTL frame spare line, TFRSPARE, are currently unused.

HD Reference Input Board (A7)

Overview

The Reference Input board performs the analog portion of genlock in the SPG 1000. It is closely tied to the Genlock board which does the digital part.

The board uses analog circuits for input AGC, clamping, and sampling. These are triggered by strobes from the Digital board with the eventual outputs being a comp sync line, burst signal, VCO tune voltage, and some error signals.

The two boards in combination use external video as a reference to phase lock an internal clock. The outputs are the clock and a frame reset pulse. The phase of the clock and the time of the reset pulse within the reference video frame are under user control.

The Reference Input board is described by four schematics:

<1> Input and Power Supply
<2> Negative Peak Detector (and Sync Stripper)
<3> Clamp Sampler
<4> Edge Sampler

Input AGC and Clamp Amplifier <1>

The AGC functions to maintain a constant internal video level regardless of changes in external video amplitude, and the clamp keeps the black level of the internal video at ground.

U1 performs both functions. The video input is terminated and attenuated by R1, R2, and R186.

L1 improves input return loss by compensating for excess capacitance. The VG input to U1 controls its gain and is driven by the analog gain feedback signal, AGAINFB, from the sync tip peak detector. The analog clamp feedback signal, ACLAMPFB, from the back porch sampler, is used to correct for blanking errors in the video signal. This "dc restoration" is done in two places: Wideband through R210, and low frequency only through R187. The dual-path feedback serves to optimize loop performance and distortion.

The output of U1 is twice normal amplitude video that should have back porch at ground. This signal, AVIDX2, is set up to drive J2, a 50 Ω test output at normal video level.

Power Supply Conditioning and Filtering <1>

U18, Q28, and Q29 form a tracking ±10 V supply. This is done because some of the circuits (such as the samplers) are more sensitive to supply imbalance than to absolute supply voltage. Q32 and Q33 provide current limiting by shunting base drive away from Q28 and Q29 when the voltage on R208 or R209 reaches the base-emitter voltage of Q32/33, approximately 0.5 V.

The LC filters in the ±5 V supplies serve to minimize digital noise in the analog circuits.

Peak (sync tip) Detector and Sync Stripper <2>

This circuit detects and holds the most negative part of video, which should be the sync tip. It also generates composite sync, strips burst from composite video, and generates two error signals.

AVIDX2 is twice normal amplitude video; it drives sync tip sampler Q5, sync stripper U6, and sync over-range detector U21.

Upon initial application of video, the analog negative peak voltage, ANPEAK, stored on C29 and buffered by U5A, will be at ground. When the first sync signal falls to more than 0.1 volts below ANPEAK, U21 will make the analog sync over-range signal, ASYNCOR, charge C84 on the clamp sampler. The next time the clamp sampler opens it will set the video to this higher level instead of to ground. This offset will then slowly recover by the C84/R97 time constant. This process has the effect of ensuring that the video always approaches lock from a known state. Note that U12B will perform a similar function if video is lost (i.e., the signal drops to half-amplitude or less within one line period).

Also upon initial application of video—if the AVIDX2 signal goes more than 0.15 V below ANPEAK—U6 will be triggered. The output of U6 is the TTL composite sync signal, TCOMPSYNC. TCOMPSYNC feeds back and fires the 200 ns one-shot U7B which also turns on the MOSFET Q5 and fully charges the hold cap to the negative sync tip. Since the on time is fixed—and much longer than the hold cap/Rds time constant—the value is independent of sync pulse duration.

TCOMPSYNC also goes to the Genlock board and resets the horizontal counters. This has the effect of making the front and back porch samples occur at the appropriate time.

TCOMPSYNC is fed back to re-trigger one-shot U7A as well. If U7A has not been triggered by TCOMPSYNC for 80–100 µs, it then sets the TTL sync time out error signal, TSYNCTO, and starts the 555 timer, U10, running. The output of the timer triggers U7B to turn on the FET and periodically sample the video. The use of the FET and asychronous error sampling eliminates the need for a bleed resistor on the hold cap. Also, if no sync tip has been detected, the AGC goes to maximum gain to aid the acquisition.

The voltage on the hold cap is buffered by U5A and sent out as the analog negative peak signal, ANPEAK. U5B compares ANPEAK to a −0.6 V reference to generate the analog AGC feedback signal, AGAINFB. This signal also goes into the

window comparator U9A/U9B to check for gain error conditions.

The circuits at the bottom of the page are burst notch filters. Q6 and Q34 get turned on for PAL video and notch out the 4.42 MHz burst. Q7 and Q8 do the same with the 3.58 MHz NTSC burst. The collectors of Q7 and Q8 both drive Q31, which buffers the burst to route it to the genlock board for use in the color frame circuit.

Clamp Sampler <3>

The clamp sampler turns on during front and back porch to generate the error signal to remove dc offset and hum.

Between samples—i.e., most of the time—the sampler bridge (CR9, CR10, CR11, and CR12) is off. During this time, current flows through Q17 and Q18 to hold CR13 and CR14 on. This reverse biases the bridge diodes so they are off and it puts a low impedance on the bridge corners to reduce blow-by. When the TTL clamp sample strobe signal, TCLAMPSTN, goes low it turns on Q9, Q10, Q11, Q12, and Q19. This couples enough current into the bridge corners to turn off CR13 and CR14 and turn on all four bridge diodes. While the bridge diodes are on, current flows from the AVIDX2 signal into the integrator, U10A.

The output of the integrator, U10A, goes through inverter U10B to generate the analog clamp feedback signal, ACLAMPFB. The output of U10B also drives window comparator U11A/B to check for offset loop errors.

Edge Sampler <4>

The edge sampler turns on during the reference edge of sync and extracts timing information. The resulting signal is used to phase lock the clock.

The sample bridge for the edge sampler is similar to the clamp sampler; the impedance levels are lower to allow faster operation, and the incoming strobe is differential ECL. R146, R143, and C80 form an integrator after the sampler. The signal is then amplified by the loop filter, U14A, which drives FET switch U15.

FET switch U15 provides gain switching to permit operation on bi-level syncs. When the TTL bi-level sync signal, TBLSN, is unasserted (high) the input is applied to pin 3 so the gain of U17A is +1.25, and the loop filter U14A is referenced to ground. When TBLSN is true the input drives pin 2 to give U17A a gain of –1.25, and U14A integrates relative to one-half of the sync tip voltage on the ANPEAK line.

The output of U17A drives the analog VCO tune line, AVCOTUNE, and the window comparator U16A/U16B which checks for both ac and dc errors on the tune line.

Section 9
Replaceable Electrical Parts

This section contains a list of the components that are replaceable for the SPG 1000. Use this list to identify and order replacement parts. There is a separate Replaceable Electrical Parts list for each instrument.

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. Therefore, when ordering parts, it is important to include the following information in your order.

- Part number
- Instrument type or model number
- Instrument serial number
- Instrument 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.

Using the Replaceable Electrical Parts List

The tabular information in the Replaceable Electrical Parts list is arranged for quick retrieval. Understanding the structure and features of the list will help you find all of the information you need for ordering replaceable parts.

Cross Index–Mfr. Code Number to Manufacturer

The Mfg. Code Number to Manufacturer Cross Index for the electrical parts list is located immediately after this page. The cross index provides codes, names, and addresses of manufacturers of components listed in the electrical parts list.

Abbreviations

Abbreviations conform to American National Standards Institute (ANSI) standard Y1.1.

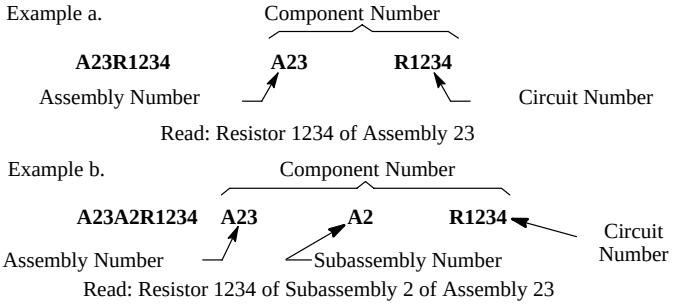
List of Assemblies

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

Column Descriptions

Component No. (Column 1)

The component circuit number appears on the diagrams and circuit board illustrations, located in the diagrams section. Assembly numbers are also marked on each diagram and circuit board illustration, in the Diagram section and on the mechanical exploded views, in the mechanical parts list. The component number is obtained by adding the assembly number prefix to the circuit number.



The electrical parts list is arranged by assemblies in numerical sequence (A1, with its subassemblies and parts, precedes A2, with its subassemblies and parts).

Mechanical subparts to the circuit boards are listed in the electrical parts list. These mechanical subparts are listed with their associated electrical part (for example, fuse holder follows fuse).

Chassis-mounted parts and cable assemblies have no assembly number prefix and are located at the end of the electrical parts list.

Tektronix Part No. (Column 2)

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

Serial/Assembly No. (Column 3 and 4)

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

Name and Description (Column 5)

An item name is separated from the description by a colon (:). Because of space limitations, an item name may sometimes appear as incomplete. Use the U.S. Federal Catalog handbook H6-1 for further item name identification.

The mechanical subparts are shown as *ATTACHED PARTS* / *END ATTACHED PARTS* or *MOUNTING PARTS* / *END MOUNTING PARTS* in column five (5).

Mfr. Code (Column 6)

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

Mfr. Part No. (Column 7)

Indicates actual manufacturer's part number.

Cross Index – Mfr. Code Number To Manufacturer

Mfr. Code.	Manufacturer	Address	City, State, Zip Code
D5243	ROEDERSTEIN ERNST GMBH	LUDMILLASTRASSE 23	8300 LANDSHUT GERMANY
TK0IU	OPTREX CORPORATION	3–14–9 YUSHIMA, BUNKYO–KU TOKYO	113 JAPAN
TK0435	LEWIS SCREW CO	4300 S RACINE AVE	CHICAGO IL 60609–3320
TK0510	PANASONIC COMPANY DIV OF MATSUSHITA ELECTRIC CORP	ONE PANASONIC WAY	SECAUCUS NJ 07094
TK0515	EVOX–RIFA INC	100 TRI–STATE INTERNATIONAL SUITE 290	LINCOLNSHIRE IL 60015
TK0858	STAUFFER SUPPLY CO (DIST)		
TK0891	MICONICS	1 FAIRCHILD AVE	PLAINVIEW NY 11803
TK1066	STAR MICRONICS		
TK1134	TUSONIX INC	2155 N FORBES BLVD	TUCSON AZ 85705
TK1345	ZMAN & ASSOCIATES		
TK1386	PYRAMID ELECTRONICS SUPPLY INC	9757 JUANITA DRIVE NE	KIRKLAND WA 98034
TK1442	TAIYO–YUDEN (USA) INC	ARLINGTON CENTER 714 W ALGONQUIN RD	ARLINGTON HEIGHTS IL 60005
TK1483	TEKA PRODUCTS		
TK1547	MOORE ELECTRONICS INC (DIST)	19500 SW 90TH COURT PO BOX 1030	TUALATIN OR 97062
TK1601	PULSE ENGINEERING INC	2801 M00RPARK AVE SUITE 7	SAN JOSE CA 95128
TK1727	PHILIPS NEDERLAND BV AFD ELONCO	POSTBUS 90050	5600 PB EINDHOVEN THE NETHERLANDS
TK1743	UNITRODE (UK) LTD	6 CRESSWELL PARK BLACKHEATH	LONDON SE 3 9RD ENGLAND
TK1857	HIROSE ELECTRIC USA INC	2688 WESTHILLS COURT	SIMI VALLEY, CA 93065–6235
TK1913	WIMATHE INTER–TECHNICAL GROUP IND	2269 SAW MILL RIVER ROAD PO BOX 127	ELMSFORD NY 10523
TK2042	ZMAN & ASSOCIATES	7633 S 180TH	KENT WA 98032
TK2058	TDK CORPORATION OF AMERICA	1600 FEEHANVILLE DRIVE	MOUNT PROSPECT, IL 60056
TK2073	TOKYO AMERICA INC	565 W GULF ROAD	ARLINGTON HEIGHTS IL 60005
TK2133	SCHAFFNER		
TK2319	COLLMER	14368 PROTON RD	DALLAS TX 75244
TK2469	UNITREK CORPORATION	3000 LEWIS & CLARK WAY SUITE #2	VANCOUVER WA 98601
TK2519	ALLIANCE SEMICONDUCTOR	3099 N FIRST ST.	SAN JOSE, CA 95134–2006
TK2598	MAXIM – ASIC	14150 SW KARL BRAUN DRIVE	BEAVERTON, OR 97077
TK2635	DAITRON INC	27520A SW 95TH AVE PO BOX 3500	WILSONVILLE, OR 97070
0B0A9	DALLAS SEMICONDUCTOR CORP	4350 BELTWOOD PKWY SOUTH	DALLAS TX 75244
0C8T6	CITEL AMERICA INC	1111 PARK CENTRE BLVD SUITE 474	MIAMI, FL 33169
0GV52	SCHAFFNER EMC INC	9–B FADEM ROAD	SPRINGFIELD, NJ 07081
0H1N5	TOSHIBA MARCON ELECTRONICS AMERICA CORPORATION	998 FIRST EDGE DRIVE	VERNON HILLS IL 60061
0JR03	ZMAN MAGNETICS INC	7633 S 180th	KENT WA 98032

Mfr. Code.	Manufacturer	Address	City, State, Zip Code
0JR04	TOSHIBA AMERICA INC ELECTRONICS COMPONENTS DIV	9775 TOLEDO WAY	IRVINE CA 92718
0J9R2	HARISON ELECTRIC CO LTD	ASAHIMACHI 5–CHOME IMABARI	EHIME JAPAN
0LUA3	PHILIPS COMPONENTS	100 PROVIDENCE PIKE	SLATERSVILLE, RI 02876
00779	AMP INC	2800 FULLING MILL PO BOX 3608	HARRISBURG PA 17105
01121	ALLEN–BRADLEY CO INDUSTRIAL CONTROL PRODUCTS	1201 S 2ND ST	MILWAUKEE WI 53204–2410
01295	TEXAS INSTRUMENTS INC SEMICONDUCTOR GROUP	13500 N CENTRAL EXPY PO BOX 655303	DALLAS TX 75262–5303
02113	COILCRAFT INC	1102 SILVER LAKE RD	CARY IL 60013–1658
02735	RCA CORP SOLID STATE DIVISION		
04072	BELL INDUSTRIES JW MILLER DIVISION		COMPTON CA 94539
04222	AVX/KYOCERA DIV OF AVX CORP	19TH AVE SOUTH P O BOX 867	MYRTLE BEACH SC 29577
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS SECTOR	5005 E MCDOWELL RD	PHOENIX AZ 85008–4229
05397	UNION CARBIDE CORP MATERIALS SYSTEMS DIV	11901 MADISON AVE	CLEVELAND OH 44101
07933	RAYTHEON CO SEMICONDUCTOR DIV HQ	350 ELLIS ST	MOUNTAIN VIEW CA 94042
09922	BURNDY CORP	1 RICHARDS AVE	NORWALK CT 06856
09969	DALE ELECTRONICS INC	EAST HIGHWAY 50 P O BOX 180	YANKTON SD 57078
1CH66	PHILIPS SEMICONDUCTORS	811 E ARQUES AVENUE PO BOX 3409	SUNNYVALE CA 94088–3409
1ES66	MAXIM INTEGRATED PRODUCTS INC	120 SAN GABRIEL DRIVE	SUNNYVALE CA 94086
11236	CTS CORPORATION RESISTOR NETWORKS DIVISION	406 PARR ROAD	BERNE IN 46711–9506
12327	FREEWAY CORP	9301 ALLEN DR	CLEVELAND OH 44125–4632
12969	MICROSEMI CORPORATION WATERTOWN DIVISION	530 PLEASANT STREET	WATERTOWN MA 02172
13103	THERMALLOY CO INC	2021 W VALLEY VIEW LN PO BOX 810839	DALLAS TX 75381
13919	BURR–BROWN RESEARCH CORP	6730 S TUCSON BLVD P O BOX 11400	TUCSON AZ 85734
14301	ANDERSON ELECTRONICS INC	PO BOX 89	HOLLIDAYSBURG PA 16648–0089
15454	KETEMA RODAN DIVISION	2900 BLUE STAR STREET	ANAHEIM CA 92806–2591
15542	MINI–CIRCUITS LABORATORY	2625 E 14TH ST	BROOKLYN NY 11235–3915
17856	SILICONIX INC	2201 LAURELWOOD RD	SANTA CLARA CA 95054–1516
18565	CHOMERICS INC	77 DRAGON COURT	WOBURN MA 01801–1039
19396	ILLINOIS TOOL WORKS INC PAKTRON DIV	1205 MCCONVILLE RD PO BOX 4539	LYNCHBURG VA 24502–4535
19615	ALLEN AVIONICS INC	255 EAST 2ND ST P O BOX 350	MINEOLA NY 11501–3503
19701	PHILIPS COMPONENTS DISCRETE PRODUCTS DIV RESISTIVE PRODUCTS FACILITY AIRPORT ROAD	PO BOX 760	MINERAL WELLS TX 76067–0760

Mfr. Code.	Manufacturer	Address	City, State, Zip Code
2W944	PAPST MECHATRONIC CORP	AQUIDNECK INDUSTRIAL PK	NEWPORT RI 02840
21847	FEI MICROWAVE INC	825 STEWART DR	SUNNYVALE CA 94086–4514
22526	BERG ELECTRONICS INC (DUPONT)	857 OLD TRAIL RD	ETTERS PA 17319
24165	SPRAGUE ELECTRIC CO	267 LOWELL ROAD	HUDSON NH 03051
24355	ANALOG DEVICES INC	1 TECHNOLOGY DRIVE	NORWOOD MA 02062
24546	DALE ELECTRONICS A VISHAY INTERTECHNOLOGY INC CO	550 HIGH ST	BRADFORD PA 16701–3737
24931	SPECIALTY CONNECTOR CO INC	2100 EARLYWOOD DR PO BOX 547	FRANKLIN IN 46131
25088	SIEMENS CORP	186 WOOD AVE S	ISELIN NJ 08830–2704
26364	COMPONENTS CORP	6 KINSEY PLACE	DENVILLE NJ 07834–2611
27014	NATIONAL SEMICONDUCTOR CORP	2900 SEMICONDUCTOR DR	SANTA CLARA CA 95051–0606
30161	AAVID ENGINEERING INC	ONE KOOL PATH PO BOX 400	LACONIA NH 03247
31223	MICRO PLASTICS INC	20821 DEARBORN ST	CHATSWORTH CA 91311–5916
31918	ITT SCHADOW INC	8081 WALLACE RD	EDEN PRAIRIE MN 55344–2224
32159	WEST–CAP ARIZONA SUB OF SFE TECHNOLOGIES		
32997	BOURNS INC TRIMPOT DIV	1200 COLUMBIA AVE	RIVERSIDE CA 92507–2114
33062	FERRONICS INC	45 O'CONNER ROAD	FAIRPORT, NY 14450
33096	COLORADO CRYSTAL CORP	2303 W 8TH ST	LOVELAND CO 80537–5268
34335	ADVANCED MICRO DEVICES	901 THOMPSON PL PO BOX 3453	SUNNYVALE CA 94086–3413
34371	HARRIS CORP HARRIS SEMICONDUCTOR PRODUCTS GROUP	200 PALM BAY BLVD PO BOX 883	MELBOURNE FL 32919
34630	K AND L/QUARTZTEK INC		
37964	GENNUM CORPORATION	970 FRASER DRIVE PO BOX 489, STA A	BURLINGTON, ONTARIO, CANADA L7R 3Y3
4T165	NEC ELECTRONICS USA INC ELECTRON DIV	475 ELLIS ST PO BOX 7241	MOUNTAIN VIEW CA 94039
50139	ALLEN–BRADLEY CO ELECTRONIC COMPONENTS	1414 ALLEN BRADLEY DR	EL PASO TX 79936
50434	HEWLETT–PACKARD CO OPTOELECTRONICS DIV	370 W TRIMBLE RD	SAN JOSE CA 95131–1008
53387	3M COMPANY	ELECTRONICS PRODUCTS DIV 3M AUSTIN CENTER	AUSTIN, TX 78769–2963
55285	BERGQUIST CO INC THE	5300 EDINIA INDUSTRIAL BLVD	MINNEAPOLIS MN 55435–3707
55322	SAMTEC INC	810 PROGRESS BLVD PO BOX 1147	NEW ALBANY IN 47150–2257
55680	NICHICON /AMERICA/ CORP	927 E STATE PKY	SCHAUMBURG IL 60195–4526
56708	ZILOG INC	1315 DELL AVE	CAMPBELL CA 95008–6609
56845	DALE ELECTRONICS INC	2300 RIVERSIDE BLVD PO BOX 74	NORFOLK NE 68701–2242
57668	ROHM CORPORATION	15375 BARRANCA PARKWAY SUITE B207	IRVINE CA 92718
57924	BOURNS INC NETWORKS DIV	1400 NORTH 1000 WEST	LOGAN UT 84321
59124	KOA SPEER ELECTRONICS INC	BOLIVAR DRIVE PO BOX 547	BRADFORD PA 16701

Mfr. Code.	Manufacturer	Address	City, State, Zip Code
59659	REMTEK CORP	46107 LANDING PKY	FREMONT CA 94538–6407
59660	TUSONIX INC	7741 N BUSINESS PARK DR PO BOX 37144	TUCSON AZ 85740–7144
61271	FUJITSU MICROELECTRONICS INC ELECTRONICS COMPONENTS DIVISION	3545 NORTH FIRST	SAN JOSE, CA 95134–1804
61429	FOX ELECTRONICS DIV OF ELECTRONICS INC	5842 CORPORATION CIRCLE	FOR MEYERS FL 33905
61529	AROMAT CORP	629 CENTRAL AVE	NEW PROVIDENCE NJ 07974
61772	INTEGRATED DEVICE TECHNOLOGY	3236 SCOTT BLVD	SANTA CLARA CA 95051
61935	SCHURTER INC	1016 CLEGG COURT	PETALUMA CA 94952–1152
62104	CALIFORNIA EASTERN LABORATORIES INC	4590 PATRICK HENRY DR	SANTA CLARA CA 95054–3309
62643	UNITED CHEMICON INC	9801 W HIGGINS ST SUITE 430	ROSEMONT, IL 60018–4771
66958	SGS THOMSON MICROELECTRONICS	1000 E BELL RD	PHOENIX AZ 85022–2649
67183	ALTERA CORP	3525 MONROE ST	SANTA CLARA CA 95051
68994	XILINX INC	2100 LOGIC DRIVE	SAN JOSE CA 95124
71400	BUSSMANN DIV OF COOPER INDUSTRIES INC	114 OLD STATE RD PO BOX 14460	ST LOUIS MO 63178
71468	ITT CANNON COMERCIAL COMPONENTS DIV (CCD)	1851 E DEERE AVE	SANTA ANA CA 92705
71744	CHICAGO MINIATURE LAMP INC	CHEVY CHASE BUSINESS PARK 1080 JOHNSON DRIVE	BUFFALO GROVE IL 60089
73138	BECKMAN INDUSTRIAL CORP BECKMAN ELECTRONIC TECHNOLOGIES SUB OF EMERSON ELECTRIC	4141 PALM ST	FULLERTON CA 92635
73743	FISCHER SPECIAL MFG CO	111 INDUSTRIAL RD	COLD SPRING KY 41076–9749
75042	IRC ELECTRONIC COMPONENTS PHILADELPHIA DIV TRW FIXED RESISTORS	401 N BROAD ST	PHILADELPHIA PA 19108–1001
75498	MULTICOMP INC	3005 SW 154TH TERRACE #3	BEAVERTON OR 97006
78189	ILLINOIS TOOL WORKS INC SHAKEPROOF DIV	ST CHARLES ROAD	ELGIN IL 60120
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON OR 97077–0001
81073	GRAYHILL INC	561 HILLGROVE AVE PO BOX 10373	LA GRANGE IL 60525–5914
82389	SWITCHCRAFT INC SUB OF RAYTHEON CO	5555 N ELSTRON AVE	CHICAGO IL 60630–1314
90484	SURPRENANT WIRE AND CABLE DIV OF FL INDUSTRIES INC	172 STERLING ST	CLINTON MA 01510
91293	JOHANSON MFG CO	400 ROCKWAY VALLEY RD	BOONTON NJ 07005
91506	AUGAT IPD	452 JOHN DIETSCH BLVD PO BOX 2510	ATTLEBORO FALLS MA 02763
91637	DALE ELECTRONICS INC	2064 12TH AVE PO BOX 609	COLUMBUS NE 68601–3632
93907	TEXTRON INC CAMCAR DIV	600 18TH AVE	ROCKFORD IL 61108–5181
98159	RUBBER TECK INC	19115 HAMILTON AVE PO BOX 389	GARDENA CA 90247

Mfr. Code.	Manufacturer	Address	City, State, Zip Code
D5243	ROEDERSTEIN E SPEZIALFABRIK FUER KONDENSATOREN GMBN	LUDMILLASTRASSE 23–25	8300 LANDSHUT GERMANY
S3629	SCHURTER AG H C/O PANEL COMPONENTS CORP	2015 SECOND STREET	BERKELEY CA 94170

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A1	671–1905–01			CIRCUIT BD ASSY:FRONT PANEL	80009	671–1905–01
A2	672–1904–02			CIRCUIT BD ASSY:OSCILLATOR; A2A1 W/ A2A1A1, A2A1A2, AND A2A1A3 INSTALLED	80009	672–1904–02
A2A1	671–1904–02	672–1904–02		CIRCUIT BD ASSY:OSCILLATOR	80009	671–1904–02
A2A1A1	119–3402–03			OVEN ASSY:TSG1125	80009	119–3402–03
A2A1A2	119–3893–03			OVEN ASSY:TSG1050 & TSG1250	80009	119–3893–03
A2A1A3	119–4088–01			OVEN ASSY:TSG1001	80009	119–4088–01
A2A1A4	119–4304–00			OVEN ASSY:SPG1000	80009	119–4304–00
A2A1A5	119–5546–00			OVEN ASSY:SPG1000 (OPTION 17 ONLY)	80009	119–5546–00
A3	671–1902–06		B020292	CIRCUIT BD ASSY:HD SYNC	80009	671–1902–06
A3	671–1902–07	B020293		CIRCUIT BD ASSY:HD SYNC	80009	671–1902–06
A3	671–3973–00			CIRCUIT BD ASSY:HD SYNC (OPTION 17 ONLY)	80009	671–3973–00
A4	671–3242–04			CKT BD ASSY:POWER SUPPLY BOARD	80009	671–3242–04
A5	671–1903–06			CIRCUIT BD ASSY:CONTROLLER	80009	671–1903–06
A5	671–3974–00			CIRCUIT BD ASSY:CONTROLLER (OPTION 17 ONLY)	80009	671–3974–00
A6	671–1901–02			CIRCUIT BD ASSY:HD GENLOCK	80009	671–1901–02
A6	671–3972–00			CIRCUIT BD ASSY:HD GENLOCK (OPTION 17 ONLY)	80009	671–3972–00
A7	671–2071–02			CIRCUIT BD ASSY:HD REF IN	80009	671–2071–02
A8	119–4078–00			DISPLAY,FLAT PL:	80009	119–4078–00
A9	671–1939–01			CIRCUIT BD ASSY:OSCILLATOR FLTR	80009	671–1939–01
A1	671–1905–00			CIRCUIT BD ASSY:FRONT PANEL	80009	671–1905–00
A1J4	174–2339–00			CA ASSY,SP,ELEC:3.5 L,FRT PNL	80009	174–2339–00
A1S1	260–2671–00			SWITCH,PUSH SPST;MOM,NO,100 GRM FRC,COND RUBBER CONTACTS,GRN LED,W/KEYCAP	TK2635	SKECFL
A1S2	260–2671–00			SWITCH,PUSH SPST;MOM,NO,100 GRM FRC,COND RUBBER CONTACTS,GRN LED,W/KEYCAP	TK2635	SKECFL
A1S3	260–2671–00			SWITCH,PUSH SPST;MOM,NO,100 GRM FRC,COND RUBBER CONTACTS,GRN LED,W/KEYCAP	TK2635	SKECFL
A1S5	260–2671–00			SWITCH,PUSH SPST;MOM,NO,100 GRM FRC,COND RUBBER CONTACTS,GRN LED,W/KEYCAP	TK2635	SKECFL
A1S6	260–2671–00			SWITCH,PUSH SPST;MOM,NO,100 GRM FRC,COND RUBBER CONTACTS,GRN LED,W/KEYCAP	TK2635	SKECFL
A1S7	260–2671–00			SWITCH,PUSH SPST;MOM,NO,100 GRM FRC,COND RUBBER CONTACTS,GRN LED,W/KEYCAP	TK2635	SKECFL
A1S8	260–2671–00			SWITCH,PUSH SPST;MOM,NO,100 GRM FRC,COND RUBBER CONTACTS,GRN LED,W/KEYCAP	TK2635	SKECFL
A1S11	260–2671–00			SWITCH,PUSH SPST;MOM,NO,100 GRM FRC,COND RUBBER CONTACTS,GRN LED,W/KEYCAP	TK2635	SKECFL
A1S12	260–2671–00			SWITCH,PUSH SPST;MOM,NO,100 GRM FRC,COND RUBBER CONTACTS,GRN LED,W/KEYCAP	TK2635	SKECFL
A1S13	260–2671–00			SWITCH,PUSH SPST;MOM,NO,100 GRM FRC,COND RUBBER CONTACTS,GRN LED,W/KEYCAP	TK2635	SKECFL
A1S18	260–2671–00			SWITCH,PUSH SPST;MOM,NO,100 GRM FRC,COND RUBBER CONTACTS,GRN LED,W/KEYCAP	TK2635	SKECFL
A1S19	260–2671–00			SWITCH,PUSH SPST;MOM,NO,100 GRM FRC,COND RUBBER CONTACTS,GRN LED,W/KEYCAP	TK2635	SKECFL
A1S33	311–2193–00			ENCDR,DGTL:INCREMENTAL,2 CHAN,50PPR/CH	TK0510	EWT–XAK01950B
				MOUNTING PARTS		
	210–0978–00			WSHR,FLAT:0.375 ID X 0.5 OD X 0.024,STL	12327	ORDER BY DESCR
	220–0495–00			NUT,PLAIN,HEX:0.375–32 X 0.438 HEX,BRS,CD PL	73743	ORDER BY DESCR
				END MOUNTING PARTS		
A2	672–1904–02			CIRCUIT BD ASSY:OSCILLATOR; A2A1 W/ A2A1A1, A2A1A2, AND A2A1A3 INSTALLED	80009	672–1904–02
				(OPTION 15 ONLY)		

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A2A1	671–1904–02	672–1904–02		CIRCUIT BD ASSY:OSCILLATOR	80009	671–1904–02
A2A1C1	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C2	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C3	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C4	290–0974–00			CAP,FXD,ELCTLT:10UF,20%,50VDC	55680	UVX1H100MAA
A2A1C5	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C6	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C7	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C8	290–0974–00			CAP,FXD,ELCTLT:10UF,20%,50VDC	55680	UVX1H100MAA
A2A1C9	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C10	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C11	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C12	290–0974–00			CAP,FXD,ELCTLT:10UF,20%,50VDC	55680	UVX1H100MAA
A2A1C13	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C14	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C15	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C16	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C17	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C18	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C19	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C39	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C40	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C41	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C42	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C43	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A2A1C44	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C45	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C46	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C47	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C48	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A2A1C49	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A2A1C50	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C51	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A2A1C52	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A2A1C53	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A2A1C54	283–0644–00			CAP,FXD,MICA DI:150PF,1%,500V	80009	283–0644–00
A2A1C55	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C56	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C58	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C59	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C60	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C61	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C63	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C64	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A2A1C67	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C68	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C69	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C70	283–0784–00			CAP,FXD,MICA DI:40PF,2%,500V	80009	283–0784–00
A2A1C71	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C72	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C73	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C74	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C75	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C76	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1C77	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2A1CR1	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A2A1CR2	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A2A1CR3	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02

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A2A1CR4	152–0725–00			SEMICOND DVC,DI:SI,SCHOTTKY,20V,1.2PF,DO–35	21847	A2X1582
A2A1CR5	152–0725–00			SEMICOND DVC,DI:SI,SCHOTTKY,20V,1.2PF,DO–35	21847	A2X1582
A2A1CR6	152–0725–00			SEMICOND DVC,DI:SI,SCHOTTKY,20V,1.2PF,DO–35	21847	A2X1582
A2A1CR7	152–0725–00			SEMICOND DVC,DI:SI,SCHOTTKY,20V,1.2PF,DO–35	21847	A2X1582
A2A1CR8	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A2A1CR9	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A2A1CR10	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A2A1CR11	152–0725–00			SEMICOND DVC,DI:SI,SCHOTTKY,20V,1.2PF,DO–35	21847	A2X1582
A2A1DS1	150–1017–00			LT EMITTING DIO:GRN,550NM,55MA MAX	80009	150–1017–00
A2A1DS2	150–1017–00			LT EMITTING DIO:GRN,550NM,55MA MAX	80009	150–1017–00
A2A1DS3	150–1017–00			LT EMITTING DIO:GRN,550NM,55MA MAX	80009	150–1017–00
A2A1E1	276–0818–00			COIL,EM:100MHZ,FERRITE,BEAD ON LEAD, IMP: 100 OHM @ 100MHZ	80009	276–0818–00
A2A1E2	276–0818–00			COIL,EM:100MHZ,FERRITE,BEAD ON LEAD, IMP: 100 OHM @ 100MHZ	80009	276–0818–00
A2A1E3	276–0818–00			COIL,EM:100MHZ,FERRITE,BEAD ON LEAD, IMP: 100 OHM @ 100MHZ	80009	276–0818–00
A2A1E4	276–0818–00			COIL,EM:100MHZ,FERRITE,BEAD ON LEAD, IMP: 100 OHM @ 100MHZ	80009	276–0818–00
A2A1E5	276–0818–00			COIL,EM:100MHZ,FERRITE,BEAD ON LEAD, IMP: 100 OHM @ 100MHZ	80009	276–0818–00
A2A1J1	131–0608–00			TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 3)	80009	131–0608–00
A2A1J2	131–0787–00			TERM,PIN: (QUANTITY 5)	22526	47359–001
A2A1J3	131–0608–00			TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 5)	80009	131–0608–00
A2A1J4	131–0608–00			TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 3)	80009	131–0608–00
A2A1J5	131–0787–00			TERM,PIN: (QUANTITY 5)	22526	47359–001
A2A1J6	131–0608–00			TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 5)	80009	131–0608–00
A2A1J7	131–0608–00			TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 3)	80009	131–0608–00
A2A1J8	131–0787–00			TERM,PIN: (QUANTITY 5)	22526	47359–001
A2A1J9	131–0608–00			TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 5)	80009	131–0608–00
A2A1J10	131–0608–00			TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 2)	80009	131–0608–00
A2A1J11	131–4529–00			CONN,HDR:PCB;MALE,STR,2 X 5,0.1 CTR,0.365 H X 0.112 TAIL,SHRD/4 SIDES,CTR PLZ	80009	131–4529–00
A2A1J13	131–0608–00			TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 3)	80009	131–0608–00
A2A1J20	131–3364–00			CONN,HDR:	53387	2534–6002UB
A2A1J21	131–0787–00			TERM,PIN: (QUANTITY 5)	22526	47359–001
A2A1J22	131–0787–00			TERM,PIN: (QUANTITY 5)	22526	47359–001
A2A1J23	131–0391–00			CONN,RF JACK:	80009	131–0391–00
A2A1L1	108–0249–00			CHOKE,RF:FXD,12UH	04072	B–4992
A2A1L2	108–0249–00			CHOKE,RF:FXD,12UH	04072	B–4992
A2A1L3	108–0249–00			CHOKE,RF:FXD,12UH	04072	B–4992
A2A1L11	108–0858–00			COIL,RF:	TK1345	108–0858–00
A2A1L12	108–0215–00			COIL,RF:IDCTR;FXD,1.1UH,10%,38AWG,31 TURNS,276–0020–00 FORM,NYL	TK1345	108–0215–00
A2A1L13	108–0215–00			COIL,RF:IDCTR;FXD,1.1UH,10%,38AWG,31 TURNS,276–0020–00 FORM,NYL	TK1345	108–0215–00

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A2A1L14	108–0215–00			COIL,RF:IDCTR;FXD,1.1UH,10%,38AWG,31 TURNS,276–0020–00 FORM,NYL	TK1345	108–0215–00
A2A1L15	108–1112–00			COIL,RF:FXD 170UH	80009	108–1112–00
A2A1L16	108–0735–00			COIL,RF:FXD,584NH	80009	108–0735–00
A2A1L17	120–0487–00			XFMR,TOROID:	80009	120–0487–00
A2A1L18	108–0260–00			COIL,RF:FXD,98NH	TK2042	ORDER BY DESCR
A2A1L19	120–0487–00			XFMR,TOROID:	80009	120–0487–00
A2A1P1	131–0993–02			BUS,CNDCTR:SHUNT ASSY,RED	00779	1–850100–O
A2A1P3	131–0993–02			BUS,CNDCTR:SHUNT ASSY,RED	00779	1–850100–O
A2A1P4	131–0993–02			BUS,CNDCTR:SHUNT ASSY,RED	00779	1–850100–O
A2A1P6	131–0993–02			BUS,CNDCTR:SHUNT ASSY,RED	00779	1–850100–O
A2A1P7	131–0993–02			BUS,CNDCTR:SHUNT ASSY,RED	00779	1–850100–O
A2A1P9	131–0993–02			BUS,CNDCTR:SHUNT ASSY,RED	00779	1–850100–O
A2A1P13	131–0993–02			BUS,CNDCTR:SHUNT ASSY,RED	00779	1–850100–O
A2A1Q1	151–0188–00			XSTR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ, AMPL;2N3906,TO–92 EBC	80009	151–0188–00
A2A1Q2	151–0657–00			XSTR,PWR:BIPOLAR,PNP;80V,8.0A,4.0MHZ,DARLING-TON,AMPL;2N6041,TO–220	80009	151–0657–00
A2A1Q3	151–0190–00			XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC	80009	151–0190–00
A2A1Q4	151–0188–00			XSTR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ, AMPL;2N3906,TO–92 EBC	80009	151–0188–00
A2A1Q5	151–0657–00			XSTR,PWR:BIPOLAR,PNP;80V,8.0A,4.0MHZ,DARLING-TON,AMPL;2N6041,TO–220	80009	151–0657–00
A2A1Q6	151–0190–00			XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC	80009	151–0190–00
A2A1Q7	151–0188–00			XSTR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ, AMPL;2N3906,TO–92 EBC	80009	151–0188–00
A2A1Q8	151–0657–00			XSTR,PWR:BIPOLAR,PNP;80V,8.0A,4.0MHZ,DARLING-TON,AMPL;2N6041,TO–220	80009	151–0657–00
A2A1Q9	151–0190–00			XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC	80009	151–0190–00
A2A1Q11	151–0710–00			XSTR,SIG:BIPOLAR,NPN;40V,1.0A,50MHZ, AMPL;2N6715/MPSW01A,TO–237/TO–226AE	80009	151–0710–00
A2A1Q12	151–0622–00			XSTR,SIG:BIPOLAR,PNP;40V,1.0A,50MHZ,AMPL; 2N6727/MPS6727/MPSW51A,TO–237/TO–226AE EBC	80009	151–0622–00
A2A1Q13	151–0190–00			XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC	80009	151–0190–00
A2A1Q14	151–0190–00			XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC	80009	151–0190–00
A2A1Q15	151–0188–00			XSTR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ, AMPL;2N3906,TO–92 EBC	80009	151–0188–00
A2A1Q16	151–0720–00			XSTR,SIG:BIPOLAR,NPN;25V,50MA,650MHZ, AMPL;MPSH10,TO–92 BEC	80009	151–0720–00
A2A1Q17	151–0720–00			XSTR,SIG:BIPOLAR,NPN;25V,50MA,650MHZ, AMPL;MPSH10,TO–92 BEC	80009	151–0720–00
A2A1R1	322–3193–00			RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A2A1R2	322–3426–00			RES,FXD,FILM:267K OHM,1%,0.2W,TC=T0	91637	CCF50–2F26702F
A2A1R3	322–3335–00			RES,FXD,FILM:30.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 30K1
A2A1R4	322–3354–00			RES,FXD:MET FILM;47.5K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3354–00
A2A1R5	322–3289–00			RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3289–00
A2A1R6	322–3246–00			RES,FXD,FILM:3.57K OHM,1%,0.2W,TC=T0	80009	322–3246–00
A2A1R7	322–3414–00			RES,FXD:MET FILM;200K OHM,1%,0.2W,TC=100 PPM;AX	91637	CCF501G20002F
A2A1R8	322–3354–00			RES,FXD:MET FILM;47.5K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3354–00
A2A1R9	322–3318–00			RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 20K0
A2A1R10	322–3414–00			RES,FXD:MET FILM;200K OHM,1%,0.2W,TC=100 PPM;AX	91637	CCF501G20002F
A2A1R11	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A2A1R12	322–3318–00			RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 20K0
A2A1R13	322–3258–00			RES,FXD:MET FILM;4.75K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3258–00
A2A1R14	322–3097–00			RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 100E

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A2A1R15	308–0677–00			RES,FXD,WW:1 OHM,5%,2W	75042	ORDER BY DESC
A2A1R16	322–3193–00			RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 1K00
A2A1R17	322–3426–00			RES,FXD,FILM:267K OHM,1%,0.2W,TC=T0	91637	CCF50–2F26702F
A2A1R18	322–3335–00			RES,FXD,FILM:30.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 30K1
A2A1R19	322–3354–00			RES,FXD:MET FILM;47.5K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3354–00
A2A1R20	322–3289–00			RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3289–00
A2A1R21	322–3246–00			RES,FXD,FILM:3.57K OHM,1%,0.2W,TC=T0	80009	322–3246–00
A2A1R22	322–3414–00			RES,FXD:MET FILM;200K OHM,1%,0.2W,TC=100 PPM;AX	91637	CCF501G20002F
A2A1R23	322–3354–00			RES,FXD:MET FILM;47.5K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3354–00
A2A1R24	322–3318–00			RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 20K0
A2A1R25	322–3414–00			RES,FXD:MET FILM;200K OHM,1%,0.2W,TC=100 PPM;AX	91637	CCF501G20002F
A2A1R26	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A2A1R27	322–3318–00			RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 20K0
A2A1R28	322–3258–00			RES,FXD:MET FILM;4.75K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3258–00
A2A1R29	322–3097–00			RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 100E
A2A1R30	308–0677–00			RES,FXD,WW:1 OHM,5%,2W	75042	ORDER BY DESC
A2A1R31	322–3193–00			RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 1K00
A2A1R32	322–3426–00			RES,FXD,FILM:267K OHM,1%,0.2W,TC=T0	91637	CCF50–2F26702F
A2A1R33	322–3335–00			RES,FXD,FILM:30.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 30K1
A2A1R34	322–3354–00			RES,FXD:MET FILM;47.5K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3354–00
A2A1R35	322–3289–00			RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3289–00
A2A1R36	322–3246–00			RES,FXD,FILM:3.57K OHM,1%,0.2W,TC=T0	80009	322–3246–00
A2A1R37	322–3414–00			RES,FXD:MET FILM;200K OHM,1%,0.2W,TC=100 PPM;AX	91637	CCF501G20002F
A2A1R38	322–3354–00			RES,FXD:MET FILM;47.5K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3354–00
A2A1R39	322–3318–00			RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 20K0
A2A1R40	322–3414–00			RES,FXD:MET FILM;200K OHM,1%,0.2W,TC=100 PPM;AX	91637	CCF501G20002F
A2A1R41	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A2A1R42	322–3318–00			RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 20K0
A2A1R43	322–3258–00			RES,FXD:MET FILM;4.75K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3258–00
A2A1R44	322–3097–00			RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 100E
A2A1R45	308–0677–00			RES,FXD,WW:1 OHM,5%,2W	75042	ORDER BY DESC
A2A1R46	322–3453–00			RES,FXD,FILM:511K OHM,1%,0.2W,TC=T0	91637	CCF50–2F51102F
A2A1R47	322–3289–00			RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3289–00
A2A1R48	322–3289–00			RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3289–00
A2A1R49	322–3453–00			RES,FXD,FILM:511K OHM,1%,0.2W,TC=T0	91637	CCF50–2F51102F
A2A1R50	322–3068–00			RES,FXD:MET FILM;49.9 OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3068–00
A2A1R51	322–3068–00			RES,FXD:MET FILM;49.9 OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3068–00
A2A1R52	322–3289–00			RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3289–00
A2A1R53	322–3239–00			RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 3K01
A2A1R54	322–3385–00			RES,FXD:MET FILM;100K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 100K
A2A1R55	322–3123–00			RES,FXD:MET FILM;187 OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3123–00
A2A1R56	322–3123–00			RES,FXD:MET FILM;187 OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3123–00
A2A1R57	322–3089–00			RES,FXD:MET FILM;82.5 OHM,1%.0.2W,TC=100 PPM;AX	80009	322–3089–00
A2A1R66	322–3289–00			RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3289–00
A2A1R67	322–3289–00			RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3289–00
A2A1R68	322–3289–00			RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3289–00
A2A1R69	322–3243–00			RES,FXD:MET FILM;3.32K OHM,1%,0.2W,TC=100 PPM;AX	91637	CCF50–1–G33200F
A2A1R70	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K99
A2A1R71	322–3193–00			RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 1K00
A2A1R72	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A2A1R73	322–3193–00			RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 1K00
A2A1R74	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A2A1R75	322–3231–00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322–3231–00
A2A1R76	301–0111–00			RES,FXD,FILM:110 OHM,5%,0.50W	19701	5053CX110R0J
A2A1R77	322–3193–00			RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 1K00
A2A1R78	322–3193–00			RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 1K00
A2A1R79	322–3105–00			RES,FXD:MET FILM;121 OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3105–00
A2A1R80	322–3105–00			RES,FXD:MET FILM;121 OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3105–00

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A2A1R81	322–3001–00			RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3001–00
A2A1R82	322–3001–00			RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3001–00
A2A1R83	322–3106–00			RES,FXD,FILM:124 OHM,1%,0.2W,TC=100PPM,SM BODY	80009	322–3106–00
A2A1R84	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K99
A2A1R85	322–3289–00			RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3289–00
A2A1R87	317–0047–00			RES,FXD,CMPSN:4.7 OHM,5%,0.125W	80009	317–0047–00
A2A1R88	317–0047–00			RES,FXD,CMPSN:4.7 OHM,5%,0.125W	80009	317–0047–00
A2A1R89	322–3193–00			RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 1K00
A2A1R90	322–3193–00			RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 1K00
A2A1R91	322–3193–00			RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 1K00
A2A1R92	322–3193–00			RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 1K00
A2A1R93	322–3001–00			RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3001–00
A2A1R94	322–3193–00			RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 1K00
A2A1R95	322–3105–00			RES,FXD:MET FILM;121 OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3105–00
A2A1R96	322–3082–00			RES,FXD,FILM:69.8 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 69E8
A2A1R97	322–3105–00			RES,FXD:MET FILM;121 OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3105–00
A2A1R98	322–3222–00			RES,FXD:MET FILM;2K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 2K00
A2A1R99	322–3318–00			RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 20K0
A2A1R100	322–3105–00			RES,FXD:MET FILM;121 OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3105–00
A2A1R101	322–3105–00			RES,FXD:MET FILM;121 OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3105–00
A2A1TP1	214–4085–00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A2A1TP2	214–4085–00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A2A1TP3	214–4085–00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A2A1TP4	214–4085–00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A2A1TP5	214–4085–00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A2A1TP6	214–4085–00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A2A1TP7	214–4085–00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A2A1TP8	214–4085–00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A2A1TP9	214–4085–00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A2A1U1	156–0158–07			IC,LIN:BIPOLAR,OP–AMP;MC1458P1,DIP08.3	80009	156–0158–07
A2A1U2	156–0158–07			IC,LIN:BIPOLAR,OP–AMP;MC1458P1,DIP08.3	80009	156–0158–07
A2A1U3	156–0158–07			IC,LIN:BIPOLAR,OP–AMP;MC1458P1,DIP08.3	80009	156–0158–07
A2A1U4	156–1850–00			IC,MISC:CMOS,ANALOG SW;QUAD;DG211,DIP16.3	17856	SDG21107
A2A1U5	156–1699–00			MICROCKT,LIN:DUAL BI–FET,OPNL AMPL	01295	TL288CP
A2A1U6	156–1640–00			IC,DGTL:ECL,RCVR;TPL LINE;10H116,DIP16.3,TUBE	80009	156–1640–00
A2A1U7	156–0385–02			IC,DGTL:LSTTL,GATES;74LS04,DIP14.3,TUBE	80009	156–0385–02
A2A1U10	156–0853–02			IC,LIN:BIPOLAR,OP–AMP;LM358N,DIP08.3	80009	156–0853–02
A2A1U11	156–1173–00			IC,LIN:BIPOLAR,V REF;POS,2.5V,1.0%,40PPM,SER; MC1403U,DIP08.3	80009	156–1173–00
A2A1U12	156–3047–00			IC,LIN:BIPOLAR,AMPL;RF AMP,20DB GAIN,600MHZ;NE5205AN,DIP08.3	80009	156–3047–00
A2A1VR1	152–0688–00			DIO,ZENER:2.4V,5%,0.4W;1N4370A,DO–7 OR 35	04713	1N4370A
A2A1VR2	152–0688–00			DIO,ZENER:2.4V,5%,0.4W;1N4370A,DO–7 OR 35	04713	1N4370A
A2A1VR3	152–0688–00			DIO,ZENER:2.4V,5%,0.4W;1N4370A,DO–7 OR 35	04713	1N4370A
A2A1A1	119–3402–03			OVEN ASSY:TSG1125	80009	119–3402–03
				(OPTION 15 & 01, MOUNT AT A2A1J2)		
				ATTACHED PARTS		
	134–0209–00			BTN,PLUG:0.187 DIA HOLE,PLSTC	31223	62PP018BM14
	200–3264–00			COVER,TOP:ALUM	80009	200–3264–00

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
	200–3266–01			CAP,HTSK:PLSTC	80009	200–3266–01
	210–0586–00			NUT,PL,ASSEM WA:4–40 X 0.25,STL CD PL	78189	211–041800–00
	211–0021–00			SCR,MACH:4–40 X 1.25,PNH,STL	TK0435	ORDER BY DESCR
	211–0244–00			SCR,ASSEM WSHR:4–40 X 0.312,PNH STL (QUANTITY 2)	TK0858	211–0244–00
	211–0513–00			SCR,MACH:6–32 X 0.625,PNH,STL (QUANTITY 2)	93907	B80–00032–003
	214–3863–01			HTSK,ELEC:ALUM	80009	214–3863–01
	348–0935–00			GASKET:2.0 X 1.7,NEOPRENE	80009	348–0935–00
	432–0154–00			BASE,HTSK:PLSTC *END ATTACHED PARTS*	80009	432–0154–00
A2A1A1C6	283–5238–00			CAP,FXD,CER DI:150PF,5%,100V	04222	12061A151JAT1A
A2A1A1C8	283–5025–00			CAP,FXD,CER DI:220PF,5%,50V	80009	283–5025–00
A2A1A1C15	283–5007–00			CAP,FXD,CER:MLC;8PF,+/–0.5PF,50V,NPO,1206;SMD,8MM	80009	283–5007–00
A2A1A1C16	283–5206–00			CAP,FXD,CER DI:56PF,5%,100V	80009	283–5206–00
A2A1A1C17	283–5004–00			CAP,FXD,CER:MLC;0.1UF,10%,25V,X7R,1206;SMD,8MM T&R	80009	283–5004–00
A2A1A1C19	281–0165–00			CAP,VAR,AIR DI:0.8–10PF,250V	80009	281–0165–00
A2A1A1CR14	152–0269–01			DIO,SIG:VVC;C4=33PF,5%,C4/C20=2;SMV1263–1,DO–7,T&R	04713	SMV1263–1
A2A1A1P33	131–2002–00			CONN,BOX:	TK1483	TKO–05254–103
A2A1A1Q10	151–5035–00			XSTR,SIG:BIPOLAR,NPN;25V,30MA,650MHZ, AMPL; MMBTH10L,TO–236/SOT–23,8MM T&R	04713	MMBTH10T1
A2A1A1R1	321–5043–00			RES,FXD:THICK FILM;47.5 OHM,1%,0.125W,TC=100 PPM	80009	321–5043–00
A2A1A1R3	307–1161–00			RES,FXD,FILM:1M OHM,5%,0.062W,0805,8MM	TK0510	ERJ–6GCSJ105V
A2A1A1R4	321–5078–00			RES,FXD,FILM:20K OHM,1%,125MW,0805 PKG	80009	321–5078–00
A2A1A1R5	321–5078–00			RES,FXD,FILM:20K OHM,1%,125MW,0805 PKG	80009	321–5078–00
A2A1A1R9	321–5012–00			RES,FXD:THICK FILM;332 OHM,1%,0.125W,TC=100 PPM;1206,T&R	80009	321–5012–00
A2A1A1RT11	307–0181–01			RES,THRM:20K OHM,5%,AT 60 DEG C *ATTACHED PARTS*	80009	307–0181–01
	162–0581–00			INSUL SLVG,ELEC:0.027 ID,PTFE,CLR (QUANTITY 0.042000 FT) *END ATTACHED PARTS*	59659	#22TFE
A2A1A1Y11	——— ———			XTAL UNIT,QTZ: (REPLACEABLE AT A2A1A1 ONLY)		
A2A1A2	119–3893–03			OVEN ASSY:TSG1050 & TSG1250 (OPTION 15 & 02, MOUNT AT A2A1J5) *ATTACHED PARTS*	80009	119–3893–03
	134–0209–00			BTN,PLUG:0.187 DIA HOLE,PLSTC	31223	62PP018BM14
	200–3264–00			COVER,TOP:ALUM	80009	200–3264–00
	200–3266–01			CAP,HTSK:PLSTC	80009	200–3266–01
	210–0586–00			NUT,PL,ASSEM WA:4–40 X 0.25,STL CD PL	78189	211–041800–00
	211–0021–00			SCR,MACH:4–40 X 1.25,PNH,STL	TK0435	ORDER BY DESCR
	211–0244–00			SCR,ASSEM WSHR:4–40 X 0.312,PNH STL (QUANTITY 2)	TK0858	211–0244–00
	211–0513–00			SCR,MACH:6–32 X 0.625,PNH,STL (QUANTITY 2)	93907	B80–00032–003
	214–3863–01			HTSK,ELEC:ALUM	80009	214–3863–01
	348–0935–00			GASKET:2.0 X 1.7,NEOPRENE	80009	348–0935–00
	432–0154–00			BASE,HTSK:PLSTC *END ATTACHED PARTS*	80009	432–0154–00
A2A1A2C6	283–5238–00			CAP,FXD,CER DI:150PF,5%,100V	04222	12061A151JAT1A
A2A1A2C8	283–5025–00			CAP,FXD,CER DI:220PF,5%,50V	80009	283–5025–00
A2A1A2C15	283–5007–00			CAP,FXD,CER:MLC;8PF,+/–0.5PF,50V,NPO,1206;SMD,8MM	80009	283–5007–00
A2A1A2C16	283–5206–00			CAP,FXD,CER DI:56PF,5%,100V	80009	283–5206–00
A2A1A2C17	283–5004–00			CAP,FXD,CER:MLC;0.1UF,10%,25V,X7R,1206;SMD,8MM T&R	80009	283–5004–00
A2A1A2C19	281–0165–00			CAP,VAR,AIR DI:0.8–10PF,250V	80009	281–0165–00
A2A1A2CR14	152–0269–01			DIO,SIG:VVC;C4=33PF,5%,C4/C20=2;SMV1263–1,DO–7,T&R	04713	SMV1263–1

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A2A1A2P33	131–2002–00			CONN,BOX:	TK1483	TKO–05254–103
A2A1A2Q10	151–5035–00			XSTR,SIG:BIPOLAR,NPN;25V,30MA,650MHZ, AMPL;MMBTH10L,TO–236/SOT–23,8MM T&R	04713	MMBTH10T1
A2A1A2R1	321–5043–00			RES,FXD:THICK FILM;47.5 OHM,1%,0.125W,TC=100 PPM	80009	321–5043–00
A2A1A2R3	307–1161–00			RES,FXD,FILM:1M OHM,5%,0.062W,0805,8MM	TK0510	ERJ–6GCSJ105V
A2A1A2R4	321–5078–00			RES,FXD,FILM:20K OHM,1%,125MW,0805 PKG	80009	321–5078–00
A2A1A2R5	321–5078–00			RES,FXD,FILM:20K OHM,1%,125MW,0805 PKG	80009	321–5078–00
A2A1A2R9	321–5012–00			RES,FXD:THICK FILM;332 OHM,1%,0.125W,TC=100 PPM	80009	321–5012–00
A2A1A2RT11	307–0181–01			RES,THRM:20K OHM,5%,AT 60 DEG C	80009	307–0181–01
				ATTACHED PARTS		
	162–0581–00			INSUL SLVG,ELEC:0.027 ID,PTFE,CLR	59659	#22TFE
				(QUANTITY 0.042000 FT)		
				END ATTACHED PARTS		
A2A1A2Y11	——— ———			XTAL UNIT,QTZ:14.4000MHZ,+/–0.0005%,PRL, CL=32PF, RESIST AT RESONANCE 10 OHM,PKG HC–43/U		
				(REPLACEABLE AT A2A1A2 ONLY)		
A2A1A3	119–4088–01			OVEN ASSY:TSG1001	80009	119–4088–01
				(OPTION 15 & 03, MOUNT AT A2A1J8)		
				ATTACHED PARTS		
	134–0209–00			BTN,PLUG:0.187 DIA HOLE,PLSTC	31223	62PP018BM14
	200–3264–00			COVER,TOP:ALUM	80009	200–3264–00
	200–3266–01			CAP,HTSK:PLSTC	80009	200–3266–01
	210–0586–00			NUT,PL,ASSEM WA:4–40 X 0.25,STL CD PL	78189	211–041800–00
	211–0021–00			SCR,MACH:4–40 X 1.25,PNH,STL	TK0435	ORDER BY DESCR
	211–0244–00			SCR,ASSEM WSHR:4–40 X 0.312,PNH STL	TK0858	211–0244–00
				(QUANTITY 2)		
	211–0513–00			SCR,MACH:6–32 X 0.625,PNH,STL	93907	B80–00032–003
				(QUANTITY 2)		
	214–3863–01			HTSK,ELEC:ALUM	80009	214–3863–01
	348–0935–00			GASKET:2.0 X 1.7,NEOPRENE	80009	348–0935–00
	432–0154–00			BASE,HTSK:PLSTC	80009	432–0154–00
				END ATTACHED PARTS		
A2A1A3C6	283–5238–00			CAP,FXD,CER DI:150PF,5%,100V	04222	12061A151JAT1A
A2A1A3C8	283–5025–00			CAP,FXD,CER DI:220PF,5%,50V	80009	283–5025–00
A2A1A3C15	283–5007–00			CAP,FXD,CER:MLC;8PF,+/–0.5PF,50V,NPO,1206;SMD,8MM	80009	283–5007–00
A2A1A3C16	283–5206–00			CAP,FXD,CER DI:56PF,5%,100V	80009	283–5206–00
A2A1A3C17	283–5004–00			CAP,FXD,CER:MLC;0.1UF,10%,25V,X7R,1206;SMD,8MM T&R	80009	283–5004–00
A2A1A3C19	281–0165–00			CAP,VAR,AIR DI:0.8–10PF,250V	80009	281–0165–00
A2A1A3CR14	152–0269–01			DIO,SIG:VVC;C4=33PF,5%,C4/C20=2;SMV1263–1,DO–7,T&R	04713	SMV1263–1
A2A1A3P33	131–2002–00			CONN,BOX:	TK1483	TKO–05254–103
A2A1A3Q10	151–5035–00			XSTR,SIG:BIPOLAR,NPN;25V,30MA,650MHZ, AMPL;MMBTH10L,TO–236/SOT–23,8MM T&R	04713	MMBTH10T1
A2A1A3R1	321–5043–00			RES,FXD:THICK FILM;47.5 OHM,1%,0.125W,TC=100 PPM	80009	321–5043–00
A2A1A3R3	307–1161–00			RES,FXD,FILM:1M OHM,5%,0.062W,0805,8MM	TK0510	ERJ–6GCSJ105V
A2A1A3R4	321–5078–00			RES,FXD,FILM:20K OHM,1%,125MW,0805 PKG	80009	321–5078–00
A2A1A3R5	321–5078–00			RES,FXD,FILM:20K OHM,1%,125MW,0805 PKG	80009	321–5078–00
A2A1A3R9	321–5012–00			RES,FXD:THICK FILM;332 OHM,1%,0.125W,TC=100 PPM	80009	321–5012–00
A2A1A3RT11	307–0181–01			RES,THRM:20K OHM,5%,AT 60 DEG C	80009	307–0181–01
				ATTACHED PARTS		
	162–0581–00			INSUL SLVG,ELEC:0.027 ID,PTFE,CLR	59659	#22TFE
				(QUANTITY 0.042000 FT)		
				END ATTACHED PARTS		
A2A1A3Y11	——— ———			XTAL UNIT,QTZ:15.067133MHZ,+/–5%,PRL, CL=32PF,RS 10 OHM,PKG HC–43/U		
				(REPLACEABLE AT A2A1A3 ONLY)		
A2A1A4	119–4304–00			OVEN ASSY:SPG1000	80009	119–4304–00

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
				(OPTION 04, MOUNT AT A2A1J2 OR A2A1J5 OR A2A1J8)		
				ATTACHED PARTS		
	134–0209–00			BTN,PLUG:0.187 DIA HOLE,PLSTC	31223	62PP018BM14
	200–3264–00			COVER,TOP:ALUM	80009	200–3264–00
	200–3266–01			CAP,HTSK:PLSTC	80009	200–3266–01
	210–0586–00			NUT,PL,ASSEM WA:4–40 X 0.25,STL CD PL	78189	211–041800–00
	211–0021–00			SCR,MACH:4–40 X 1.25,PNH,STL	TK0435	ORDER BY DESCR
	211–0244–00			SCR,ASSEM WSHR:4–40 X 0.312,PNH STL	TK0858	211–0244–00
				(QUANTITY 2)		
	211–0513–00			SCR,MACH:6–32 X 0.625,PNH,STL	93907	B80–00032–003
				(QUANTITY 2)		
	214–3863–01			HTSK,ELEC:ALUM	80009	214–3863–01
	348–0935–00			GASKET:2.0 X 1.7,NEOPRENE	80009	348–0935–00
	432–0154–00			BASE,HTSK:PLSTC	80009	432–0154–00
				END ATTACHED PARTS		
A2A1A4C6	283–5238–00			CAP,FXD,CER DI:150PF,5%,100V	04222	12061A151JAT1A
A2A1A4C8	283–5025–00			CAP,FXD,CER DI:220PF,5%,50V	80009	283–5025–00
A2A1A4C15	283–5007–00			CAP,FXD,CER:MLC;8PF,+/–0.5PF,50V,NPO,1206;SMD,8MM	80009	283–5007–00
A2A1A4C16	283–5206–00			CAP,FXD,CER DI:56PF,5%,100V	80009	283–5206–00
A2A1A4C17	283–5004–00			CAP,FXD,CER:MLC;0.1UF,10%,25V,X7R,1206;SMD,8MM T&R	80009	283–5004–00
A2A1A4C19	281–0165–00			CAP,VAR,AIR DI:0.8–10PF,250V	80009	281–0165–00
A2A1A4CR14	152–0269–01			DIO,SIG:VVC;C4=33PF,5%,C4/C20=2;SMV1263–1,DO–7,T&R	04713	SMV1263–1
A2A1A4P33	131–2002–00			CONN,BOX:	TK1483	TKO–05254–103
A2A1A4Q10	151–5035–00			XSTR,SIG:BIPOLAR,NPN;25V,30MA,650MHZ, AMPL;MMBTH10L,TO–236/SOT–23,8MM T&R	04713	MMBTH10T1
A2A1A4R1	321–5043–00			RES,FXD:THICK FILM;47.5 OHM,1%,0.125W,TC=100 PPM;1206,T&R	80009	321–5043–00
A2A1A4R3	307–1161–00			RES,FXD,FILM:1M OHM,5%,0.062W,0805,8MM	TK0510	ERJ–6GCSJ105V
A2A1A4R4	321–5078–00			RES,FXD,FILM:20K OHM,1%,125MW,0805 PKG	80009	321–5078–00
A2A1A4R5	321–5078–00			RES,FXD,FILM:20K OHM,1%,125MW,0805 PKG	80009	321–5078–00
A2A1A4R9	321–5012–00			RES,FXD:THICK FILM;332 OHM,1%,0.125W,TC=100 PPM	80009	321–5012–00
A2A1A4RT11	307–0181–01			RES,THRM:20K OHM,5%,AT 60 DEG C	80009	307–0181–01
				ATTACHED PARTS		
	162–0581–00			INSUL SLVG,ELEC:0.027 ID,PTFE,CLR	59659	#22TFE
				(QUANTITY 0.042000 FT)		
				END ATTACHED PARTS		
A2A1A4Y11	——— ———			XTAL UNIT,QTZ:14.835165MHZ,+/–5%,PRL, CL=32PF,PKG HC–43/U		
				(REPLACEABLE AT A2A1A4 ONLY)		
A2A1A5	119–5546–00			OVEN ASSY:SPG1000	80009	119–5546–00
				(OPTION 17, MOUNT AT A2A1J2 OR A2A1J5 OR A2A1J8)		
				ATTACHED PARTS		
	134–0209–00			BTN,PLUG:0.187 DIA HOLE,PLSTC	31223	62PP018BM14
	200–3264–00			COVER,TOP:ALUM	80009	200–3264–00
	200–3266–01			CAP,HTSK:PLSTC	80009	200–3266–01
	210–0586–00			NUT,PL,ASSEM WA:4–40 X 0.25,STL CD PL	78189	211–041800–00
	211–0021–00			SCR,MACH:4–40 X 1.25,PNH,STL	TK0435	ORDER BY DESCR
	211–0244–00			SCR,ASSEM WSHR:4–40 X 0.312,PNH STL	TK0858	211–0244–00
				(QUANTITY 2)		
	211–0513–00			SCR,MACH:6–32 X 0.625,PNH,STL	93907	B80–00032–003
				(QUANTITY 2)		
	214–3863–01			HTSK,ELEC:ALUM	80009	214–3863–01
	348–0935–00			GASKET:2.0 X 1.7,NEOPRENE	80009	348–0935–00
	432–0154–00			BASE,HTSK:PLSTC	80009	432–0154–00
				END ATTACHED PARTS		
A2A1A5C6	283–5238–00			CAP,FXD,CER DI:150PF,5%,100V	04222	12061A151JAT1A
A2A1A5C8	283–5025–00			CAP,FXD,CER DI:220PF,5%,50V	80009	283–5025–00

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A2A1A5C15	283–5007–00			CAP,FXD,CER:MLC;8PF,+/–0.5PF,50V,NPO,1206;SMD,8MM	80009	283–5007–00
A2A1A5C16	283–5206–00			CAP,FXD,CER DI:56PF,5%,100V	80009	283–5206–00
A2A1A5C17	283–5004–00			CAP,FXD,CER:MLC;0.1UF,10%,25V,X7R,1206;SMD,8MM T&R	80009	283–5004–00
A2A1A5C19	281–0165–00			CAP,VAR,AIR DI:0.8–10PF,250V	80009	281–0165–00
A2A1A5CR14	152–0269–01			DIO,SIG:VVC;C4=33PF,5%,C4/C20=2;SMV1263–1,DO–7,T&R	04713	SMV1263–1
A2A1A5P33	131–2002–00			CONN,BOX:	TK1483	TKO–05254–103
A2A1A5Q10	151–5035–00			XSTR,SIG:BIPOLAR,NPN;25V,30MA,650MHZ, AMPL;MMBTH10L,TO–236/SOT–23,8MM T&R	04713	MMBTH10T1
A2A1A5R1	321–5043–00			RES,FXD:THICK FILM;47.5 OHM,1%,0.125W,TC=100 PPM	80009	321–5043–00
A2A1A5R3	307–1161–00			RES,FXD,FILM:1M OHM,5%,0.062W,0805,8MM	TK0510	ERJ–6GCSJ105V
A2A1A5R4	321–5078–00			RES,FXD,FILM:20K OHM,1%,125MW,0805 PKG	80009	321–5078–00
A2A1A5R5	321–5078–00			RES,FXD,FILM:20K OHM,1%,125MW,0805 PKG	80009	321–5078–00
A2A1A5R9	321–5012–00			RES,FXD:THICK FILM;332 OHM,1%,0.125W,TC=100 PPM	80009	321–5012–00
A2A1A5RT11	307–0181–01			RES,THRM:20K OHM,5%,AT 60 DEG C *ATTACHED PARTS*	80009	307–0181–01
	162–0581–00			INSUL SLVG,ELEC:0.027 ID,PTFE,CLR (QUANTITY 0.042000 FT) *END ATTACHED PARTS*	59659	#22TFE
A2A1A5Y1	——— ———			XTAL UNIT,QTZ:15.104893,+/–5%,PRL, CL=32PF,RS 10 OHM,PKG HC–43/U (REPLACEABLE AT A2A1A5 ONLY)		
A3	671–1902–06		B020292	CIRCUIT BD ASSY:HD SYNC	80009	671–1902–06
A3	671–1902–07	B020293		CIRCUIT BD ASSY:HD SYNC	80009	671–1902–06
A3	671–3973–00			CIRCUIT BD ASSY:HD SYNC,SPG100017 (OPTION 17 ONLY)	80009	671–3973–00
A3C1	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C2	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C3	290–0990–00			CAP,FXD,ELCTLT:10UF,20%,50V	80009	290–0990–00
A3C4	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C6	283–0743–00			CAP,FXD,MICA DI:43PF,2%,500V	80009	283–0743–00
A3C7	283–0728–00			CAP,FXD,MICA DI:120PF,1%,500V	80009	283–0728–00
A3C9	281–0895–00			CAP,FXD,CER DI:6.8PF,100VDC	80009	281–0895–00
A3C10	283–0637–00			CAP,FXD,MICA DI:20PF,2.5%,500V	80009	283–0637–00
A3C11	283–0766–00			CAP,FXD,MICA DI:47 PF,1%,500V	80009	283–0766–00
A3C13	283–0672–00			CAP,FXD,MICA DI:200PF,1%,500V	80009	283–0672–00
A3C17	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C18	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C19	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C20	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C22	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C23	283–0643–00			CAP,FXD,MICA DI:22PF,0.5%,500V	80009	283–0643–00
A3C32	283–0743–00			CAP,FXD,MICA DI:43PF,2%,500V	80009	283–0743–00
A3C33	283–0728–00			CAP,FXD,MICA DI:120PF,1%,500V	80009	283–0728–00
A3C35	281–0895–00			CAP,FXD,CER DI:6.8PF,100VDC	80009	281–0895–00
A3C36	283–0637–00			CAP,FXD,MICA DI:20PF,2.5%,500V	80009	283–0637–00
A3C37	283–0766–00			CAP,FXD,MICA DI:47 PF,1%,500V	80009	283–0766–00
A3C39	283–0672–00			CAP,FXD,MICA DI:200PF,1%,500V	80009	283–0672–00
A3C40	283–0643–00			CAP,FXD,MICA DI:22PF,0.5%,500V	80009	283–0643–00
A3C41	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C49	283–0743–00			CAP,FXD,MICA DI:43PF,2%,500V	80009	283–0743–00
A3C50	283–0728–00			CAP,FXD,MICA DI:120PF,1%,500V	80009	283–0728–00
A3C52	281–0895–00			CAP,FXD,CER DI:6.8PF,100VDC	80009	281–0895–00
A3C53	283–0637–00			CAP,FXD,MICA DI:20PF,2.5%,500V	80009	283–0637–00
A3C54	283–0766–00			CAP,FXD,MICA DI:47 PF,1%,500V	80009	283–0766–00
A3C56	283–0672–00			CAP,FXD,MICA DI:200PF,1%,500V	80009	283–0672–00
A3C57	283–0643–00			CAP,FXD,MICA DI:22PF,0.5%,500V	80009	283–0643–00
A3C58	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A3C59	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C65	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C66	290–0990–00			CAP,FXD,ELCTLT:10UF,20%,50V	80009	290–0990–00
A3C67	290–0990–00			CAP,FXD,ELCTLT:10UF,20%,50V	80009	290–0990–00
A3C68	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C69	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C76	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C78	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C79	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A3C80	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C83	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C84	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C85	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C86	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C87	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C90	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C91	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C92	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C96	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C97	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C100	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C101	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C102	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C103	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C104	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C105	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C106	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C107	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C108	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C109	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C110	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C111	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C112	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C113	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C114	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C115	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A3C116	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A3C117	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A3C118	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A3C119	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C120	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C121	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C122	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C128	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C129	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C130	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C131	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C132	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C133	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C134	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C135	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C136	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C137	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C138	281–0757–00			CAP,FXD,CER DI:10PF,20%,100V TUBULAR,MI	80009	281–0757–00
A3C139	281–0757–00			CAP,FXD,CER DI:10PF,20%,100V TUBULAR,MI	80009	281–0757–00
A3C140	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C141	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C142	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA

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A3C143	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C144	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A3C145	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C146	283–0636–00			CAP,FXD,MICA DI:36PF,2%,500V,0.370 X 0.460;RDL	80009	283–0636–00
A3C147	281–0184–00			CAP,VAR,PLSTC:2–18PF,500VDC	80009	281–0184–00
A3C149	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C150	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C151	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C152	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C153	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C154	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C155	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C156	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A3C157	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C158	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A3C159	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C160	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C161	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C163	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C165	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C167	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A3C168	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C169	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C170	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C171	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3C172	281–0123–00			CAP,VAR,CER DI:5–25PF,100V	59660	518–000A5–25
A3C173	281–0123–00			CAP,VAR,CER DI:5–25PF,100V	59660	518–000A5–25
A3C174	281–0123–00			CAP,VAR,CER DI:5–25PF,100V	59660	518–000A5–25
A3C176	281–0757–00			CAP,FXD,CER DI:10PF,20%,100V TUBULAR,MI	80009	281–0757–00
A3C177	281–0757–00			CAP,FXD,CER DI:10PF,20%,100V TUBULAR,MI	80009	281–0757–00
A3C178	281–0797–00			CAP,FXD,CER:MLC;15PF,10%,100V,SAF ,0.100 X 0.170;AX	80009	281–0797–00
A3C179	281–0797–00			CAP,FXD,CER:MLC;15PF,10%,100V,SAF ,0.100 X 0.170;AX	80009	281–0797–00
A3C180	281–0797–00			CAP,FXD,CER:MLC;15PF,10%,100V,SAF ,0.100 X 0.170;AX	80009	281–0797–00
A3C181	283–0223–00			CAP,FXD,CER DI:3PF,+/–5PF,50V	TK1134	835XXXCOJO309D
A3C182	283–0223–00			CAP,FXD,CER DI:3PF,+/–5PF,50V	TK1134	835XXXCOJO309D
A3C183	283–0223–00			CAP,FXD,CER DI:3PF,+/–5PF,50V	TK1134	835XXXCOJO309D
A3C184	281–0763–00			CAP,FXD,CER:MLC;47PF,10%,100V,0.100 X 0.170;AX	04222	SA102A470KAA
A3C185	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A3CR4	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A3CR5	152–0665–00			DIO,SIG:VVC;28V,C3 = 32PF,C3/C25 = 6.5;KV3901,DO–35	25088	BB109G
A3CR6	152–0665–00			DIO,SIG:VVC;28V,C3 = 32PF,C3/C25 = 6.5;KV3901,DO–35	25088	BB109G
A3CR7	152–0665–00			DIO,SIG:VVC;28V,C3 = 32PF,C3/C25 = 6.5;KV3901,DO–35	25088	BB109G
A3CR8	152–0665–00			DIO,SIG:VVC;28V,C3 = 32PF,C3/C25 = 6.5;KV3901,DO–35	25088	BB109G
A3CR9	152–0665–00			DIO,SIG:VVC;28V,C3 = 32PF,C3/C25 = 6.5;KV3901,DO–35	25088	BB109G
A3CR10	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A3CR11	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A3CR12	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A3CR13	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A3CR14	152–0322–00			DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A3CR16	152–0665–00			DIO,SIG:VVC;28V,C3 = 32PF,C3/C25 = 6.5;KV3901,DO–35	25088	BB109G
A3CR17	152–0322–00			DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A3CR18	152–0322–00			DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A3CR20	152–0665–00	671–1902–07		DIO,SIG:VVC;28V,C3 = 32PF,C3/C25 = 6.5;KV3901,DO–35	25088	BB109G
A3DL1	119–1380–00			DELAY LINE,ELEC:10NS W/5 TAPS,100 OHM,DCR 1 OHM,SIP07	80009	119–1380–00
A3DL2	119–1380–00			DELAY LINE,ELEC:10NS W/5 TAPS,100 OHM,DCR 1 OHM,SIP07	80009	119–1380–00

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A3DL3	119–1380–00			DELAY LINE,ELEC:10NS W/5 TAPS,100 OHM,DCR 1 OHM,SIP07	80009	119–1380–00
A3DL4	119–1380–00			DELAY LINE,ELEC:10NS W/5 TAPS,100 OHM,DCR 1 OHM,SIP07	80009	119–1380–00
A3J1	131–3364–00			CONN,HDR:	53387	2534–6002UB
A3J2	131–3378–00			CONN,RF JACK:	00779	227677–1
A3J3	131–3378–00			CONN,RF JACK:	00779	227677–1
A3J4	131–3378–00			CONN,RF JACK:	00779	227677–1
A3J5	131–3378–00			CONN,RF JACK:	00779	227677–1
A3J6	131–3378–00			CONN,RF JACK:	00779	227677–1
A3J7	131–3378–00			CONN,RF JACK:	00779	227677–1
A3J8	131–3364–00			CONN,HDR:	53387	2534–6002UB
A3J9	131–0608–00			TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 4)	80009	131–0608–00
A3J10	131–4529–00			CONN,HDR:PCB;MALE,STR,2 X 5,0.1 CTR,0.365 H X 0.112 TAIL,SHRD/4 SIDES,CTR PLZ	80009	131–4529–00
A3J13	131–0608–00			TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 4)	80009	131–0608–00
A3J14	131–0608–00			TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 4)	80009	131–0608–00
A3J15	131–0608–00			TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 4)	80009	131–0608–00
A3J16	131–0608–00			TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 4)	80009	131–0608–00
A3L1	108–0212–00			COIL,RF:FXD,495NH	80009	108–0212–00
A3L3	108–1513–00			COIL,RF:VAR,580–640NH,PRESET TO NOMIN 610NH,SHIELDED,PKG 0.44SQ X 0.53 HI	80009	108–1513–00
A3L4	108–1514–00			COIL,RF:VAR,490–542NH,PRESET TO 516NH,+/–1%,SHIELDED,PKG 0.44 SQ X 0.53 HI	80009	108–1514–00
A3L5	120–1903–00			XFMR,RF:VAR,351–388NH,RATIO 1:1,PRESET TO 371NH +/– 1%	80009	120–1903–00
A3L8	108–1513–00			COIL,RF:VAR,580–640NH,PRESET TO NOMIN 610NH,SHIELDED,PKG 0.44SQ X 0.53 HI	80009	108–1513–00
A3L9	108–1514–00			COIL,RF:VAR,490–542NH,PRESET TO 516NH,+/–1%,SHIELDED,PKG 0.44 SQ X 0.53 HI	80009	108–1514–00
A3L10	120–1903–00			XFMR,RF:VAR,351–388NH,RATIO 1:1,PRESET TO 371NH +/– 1%	80009	120–1903–00
A3L13	108–1513–00			COIL,RF:VAR,580–640NH,PRESET TO NOMIN 610NH,SHIELDED,PKG 0.44SQ X 0.53 HI	80009	108–1513–00
A3L14	108–1514–00			COIL,RF:VAR,490–542NH,PRESET TO 516NH,+/–1%,SHIELDED,PKG 0.44 SQ X 0.53 HI	80009	108–1514–00
A3L15	120–1903–00			XFMR,RF:VAR,351–388NH,RATIO 1:1,PRESET TO 371NH +/– 1%	80009	120–1903–00
A3L17	108–0212–00			COIL,RF:FXD,495NH	80009	108–0212–00
A3L18	108–0212–00			COIL,RF:FXD,495NH	80009	108–0212–00
A3L20	108–0215–00			COIL,RF:IDCTR;FXD,1.1UH,10%,38AWG,31 TURNS,276–0020–00 FORM,NYL	TK1345	108–0215–00
A3L21	108–0215–00			COIL,RF:IDCTR;FXD,1.1UH,10%,38AWG,31 TURNS,276–0020–00 FORM,NYL	TK1345	108–0215–00
A3L22	108–0315–00			COIL,RF:FXD,220NH	32159	72203M
A3L23	108–0315–00			COIL,RF:FXD,220NH	32159	72203M
A3L24	108–0315–00			COIL,RF:FXD,220NH	32159	72203M
A3P2	131–0993–02			BUS,CNDCTR:SHUNT ASSY,RED	00779	1–850100–O
A3P3	131–0993–02			BUS,CNDCTR:SHUNT ASSY,RED	00779	1–850100–O
A3P9	131–0993–05			BUS,CNDCTR:SHUNT ASSY,GRN	00779	850100–5
A3Q14	151–0192–00			XSTR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ, AMPL;MPS6521,TO–92 EBC	80009	151–0192–00
A3Q15	151–1066–00			XSTR,SIG:JFET,P–CH;10V,10MA(MIN),75 OHM; P1086_FAMILY,TO–92	80009	151–1066–00

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A3Q16	151–0192–00			XSTR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ, AMPL;MPS6521,TO–92 EBC	80009	151–0192–00
A3Q18	151–0710–00			XSTR,SIG:BIPOLAR,NPN;40V,1.0A,50MHZ, AMPL;2N6715/MPSW01A,TO–237/TO–226AE	80009	151–0710–00
A3Q19	151–0341–00			XSTR,SIG:BIPOLAR,NPN;45V,50MA,40MHZ, AMPL;MPS6520/PN3565,TO–92 EBC	80009	151–0341–00
A3Q20	151–1103–00			XSTR,SIG:DMOSFET,N–CH;ENH,2V,50MA,45 OHM;SD210DE,TO–72	80009	151–1103–00
A3R1	307–0503–00			RES NTWK,FXD,FI:(9) 510 OHM,20%,0.125W	91637	CSC10A01511GDO3
A3R2	307–0503–00			RES NTWK,FXD,FI:(9) 510 OHM,20%,0.125W	91637	CSC10A01511GDO3
A3R3	307–0503–00			RES NTWK,FXD,FI:(9) 510 OHM,20%,0.125W	91637	CSC10A01511GDO3
A3R6	322–3193–00			RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 1K00
A3R7	322–3085–00			RES,FXD:MET FILM;75 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 75E0
A3R8	311–0643–00			RES,VAR,NONWW:TRMR,50 OHM,0.5W	80009	311–0643–00
A3R9	322–3085–00			RES,FXD:MET FILM;75 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 75E0
A3R10	322–3085–00			RES,FXD:MET FILM;75 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 75E0
A3R11	322–3085–00			RES,FXD:MET FILM;75 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 75E0
A3R12	322–3201–00			RES,FXD:MET FILM;1.21K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3201–00
A3R13	322–3201–00			RES,FXD:MET FILM;1.21K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3201–00
A3R14	322–3156–00			RES,FXD,FILM:412 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 412E
A3R15	322–3154–00			RES,FXD:MET FILM;392 OHM,1%,0.2W,TC=100 PPM;AX	57668	RB20FX392E
A3R16	322–3154–00			RES,FXD:MET FILM;392 OHM,1%,0.2W,TC=100 PPM;AX	57668	RB20FX392E
A3R17	311–0643–00			RES,VAR,NONWW:TRMR,50 OHM,0.5W	80009	311–0643–00
A3R20	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 301E
A3R22	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 301E
A3R23	322–3085–00			RES,FXD:MET FILM;75 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 75E0
A3R36	322–3082–00			RES,FXD,FILM:69.8 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 69E8
A3R37	322–3085–00			RES,FXD:MET FILM;75 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 75E0
A3R39	322–3085–00			RES,FXD:MET FILM;75 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 75E0
A3R40	322–3135–00			RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0	80009	322–3135–00
A3R41	322–3130–00			RES,FXD:MET FILM;221 OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3130–00
A3R42	311–0643–00			RES,VAR,NONWW:TRMR,50 OHM,0.5W	80009	311–0643–00
A3R52	322–3085–00			RES,FXD:MET FILM;75 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 75E0
A3R53	322–3085–00			RES,FXD:MET FILM;75 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 75E0
A3R55	322–3085–00			RES,FXD:MET FILM;75 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 75E0
A3R56	322–3135–00			RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0	80009	322–3135–00
A3R57	322–3130–00			RES,FXD:MET FILM;221 OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3130–00
A3R58	311–0643–00			RES,VAR,NONWW:TRMR,50 OHM,0.5W	80009	311–0643–00
A3R61	322–3235–00			RES,FXD:MET FILM;2.74K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 2K74
A3R68	322–3085–00			RES,FXD:MET FILM;75 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 75E0
A3R69	322–3085–00			RES,FXD:MET FILM;75 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 75E0
A3R70	322–3231–00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322–3231–00
A3R71	322–3231–00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322–3231–00
A3R72	322–3231–00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322–3231–00
A3R75	307–0503–00			RES NTWK,FXD,FI:(9) 510 OHM,20%,0.125W	91637	CSC10A01511GDO3
A3R79	307–0503–00			RES NTWK,FXD,FI:(9) 510 OHM,20%,0.125W	91637	CSC10A01511GDO3
A3R80	307–0503–00			RES NTWK,FXD,FI:(9) 510 OHM,20%,0.125W	91637	CSC10A01511GDO3
A3R81	322–3235–00			RES,FXD:MET FILM;2.74K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 2K74
A3R82	322–3235–00			RES,FXD:MET FILM;2.74K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 2K74
A3R106	322–3289–00			RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3289–00
A3R108	322–3289–00			RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3289–00
A3R110	322–3085–00			RES,FXD:MET FILM;75 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 75E0
A3R111	322–3085–00			RES,FXD:MET FILM;75 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 75E0
A3R118	322–3231–00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322–3231–00
A3R127	322–3117–00			RES,FXD,FILM:162 OHM,1%,0.2W,TC=T0	80009	322–3117–00
A3R128	322–3137–00			RES,FXD,FILM:261 OHM,1%,0.2W,TC=T0	80009	322–3137–00
A3R131	322–3001–00			RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3001–00
A3R133	322–3295–00			RES,FXD:MET FILM;11.5K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3295–00

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A3R134	322–3206–00			RES,FXD,FILM:1.37K OHM,1%,0.2W,TC=T0	80009	322–3206–00
A3R135	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A3R136	322–3211–00			RES,FXD,FILM:1.54K OHM,1%,0.2W,TC=T0	80009	322–3211–00
A3R137	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A3R138	322–3044–00			RES,FXD:MET FILM;28 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20FXE9K35
A3R140	322–3044–00			RES,FXD:MET FILM;28 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20FXE9K35
A3R141	322–3235–00			RES,FXD:MET FILM;2.74K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 2K74
A3R142	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 301E
A3R143	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 301E
A3R144	322–3135–00			RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0	80009	322–3135–00
A3R145	322–3130–00			RES,FXD:MET FILM;221 OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3130–00
A3R146	311–0643–00			RES,VAR,NONWW:TRMR,50 OHM,0.5W	80009	311–0643–00
A3R152	322–3130–00			RES,FXD:MET FILM;221 OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3130–00
A3R154	311–0622–00			RES,VAR,NONWW:TRMR,100 OHM,0.5W	80009	311–0622–00
A3R155	311–0622–00			RES,VAR,NONWW:TRMR,100 OHM,0.5W	80009	311–0622–00
A3R156	322–3114–00			RES,FXD:MET FILM;150 OHM,1%,0.2W,TC=100 PPM;AX	91637	CCF50–2–G1500F
A3R157	322–3193–00			RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 1K00
A3R158	322–3263–00			RES,FXD,FILM:5.36K OHM,1%,0.2W,TC=T0	80009	322–3263–00
A3R159	322–3248–00			RES,FXD,FILM:3.74K OHM,1%,0.2W,TC=T0	80009	322–3248–00
A3R160	307–0526–00			RES,NTWK:THICK FILM;(5)510 OHM,10%,0.125W EACH,TC=100 PPM;SIP6,PIN 1 COMMON	57924	4306X–101–511
A3R161	322–3097–00			RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 100E
A3R162	322–3097–00			RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 100E
A3R163	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A3R164	311–0633–00		671–1902–06	RES,VAR,NONWW:TRMR,5K OHM,0.5W	32997	3329H–L58–502
A3R164	311–0609–00	671–1902–07		RES,VAR,NONWW:TRMR,2K OHM,0.5W CERMET	32997	3329H–L58–202
A3R165	311–0609–00			RES,VAR,NONWW:TRMR,2K OHM,0.5W	80009	311–0609–00
A3R166	322–3231–00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322–3231–00
A3R168	322–3222–00			RES,FXD:MET FILM;2K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 2K00
A3R169	322–3193–00			RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 1K00
A3R170	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A3R175	322–3289–00			RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3289–00
A3R177	317–0047–00			RES,FXD,CMPSN:4.7 OHM,5%,0.125W	80009	317–0047–00
A3R179	322–3137–00			RES,FXD,FILM:261 OHM,1%,0.2W,TC=T0	80009	322–3137–00
A3R180	322–3117–00			RES,FXD,FILM:162 OHM,1%,0.2W,TC=T0	80009	322–3117–00
A3R181	322–3117–00			RES,FXD,FILM:162 OHM,1%,0.2W,TC=T0	80009	322–3117–00
A3R182	322–3117–00			RES,FXD,FILM:162 OHM,1%,0.2W,TC=T0	80009	322–3117–00
A3R185	322–3137–00			RES,FXD,FILM:261 OHM,1%,0.2W,TC=T0	80009	322–3137–00
A3R186	322–3137–00			RES,FXD,FILM:261 OHM,1%,0.2W,TC=T0	80009	322–3137–00
A3R188	322–3001–00			RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3001–00
A3R189	322–3001–00			RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3001–00
A3R190	322–3202–00			RES,FXD,FILM:1.24K OHM,1%,0.2W,TC=T0	80009	322–3202–00
A3R191	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 301E
A3R192	322–3485–00			RES,FXD,FILM:5.0K OHM,1%,0.2W,TC=TO	80009	322–3485–00
A3R193	311–0607–00			RES,VAR,NONWW:TRMR,10K OHM,0.5W	80009	311–0607–00
A3R193	322–3289–00			RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3289–00
A3R194	322–3289–00			RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3289–00
A3R205	311–0605–00			RES,VAR,NONWW:TRMR,200 OHM,0.5W	80009	311–0605–00
A3R207	322–3097–00			RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 100E
A3R208	322–3097–00			RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 100E
A3R209	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A3R210	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A3R211	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A3R215	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A3R216	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 301E
A3R217	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 301E
A3R218	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 301E
A3R219	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 301E

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A3R220	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 301E
A3R222	131–4566–00			BUS,CNDCTR:0 OHM,300 SPACING,SM BODY	80009	131–4566–00
A3R223	322–3242–00			RES,FXD,FILM:3.24K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 3K24
A3R225	322–3324–00			RES,FXD,FILM:23.2K OHM,1%,0.2W,TC=T0	91637	CCF50–2F23201F
A3R226	322–3215–00			RES,FXD,FILM:1.69K OHM,1%,0.2W,TC=T0	91637	CCF50–2F16900F
A3R227	322–3256–00			RES,FXD,FILM:4.53K OHM,1%,0.2W,TC=T0	80009	322–3256–00
A3R228	322–3289–00			RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3289–00
A3R229	322–3414–00			RES,FXD:MET FILM;200K OHM,1%,0.2W,TC=100 PPM;AX	91637	CCF501G20002F
A3R230	322–3147–00			RES,FXD:MET FILM;332 OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3147–00
A3R231	322–3117–00			RES,FXD,FILM:162 OHM,1%,0.2W,TC=T0	80009	322–3117–00
A3R232	322–3117–00			RES,FXD,FILM:162 OHM,1%,0.2W,TC=T0	80009	322–3117–00
A3R233	322–3117–00			RES,FXD,FILM:162 OHM,1%,0.2W,TC=T0	80009	322–3117–00
A3R234	322–3137–00			RES,FXD,FILM:261 OHM,1%,0.2W,TC=T0	80009	322–3137–00
A3R335	307–1318–00			RES NTWK,FXD,FI:(2) 162 OHM,(2) 260 OHM,2%,0.125W	80009	307–1318–00
A3R336	307–1318–00			RES NTWK,FXD,FI:(2) 162 OHM,(2) 260 OHM,2%,0.125W	80009	307–1318–00
A3R337	307–1318–00			RES NTWK,FXD,FI:(2) 162 OHM,(2) 260 OHM,2%,0.125W	80009	307–1318–00
A3R338	307–1318–00			RES NTWK,FXD,FI:(2) 162 OHM,(2) 260 OHM,2%,0.125W	80009	307–1318–00
A3R339	322–3165–00			RES,FXD,FILM:511 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 511E
A3R340	322–3165–00			RES,FXD,FILM:511 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 511E
A3R341	322–3165–00			RES,FXD,FILM:511 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 511E
A3R342	322–3165–00			RES,FXD,FILM:511 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 511E
A3R343	322–3097–00			RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 100E
A3R344	322–3097–00			RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 100E
A3TP1	214–4085–00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A3TP2	214–4085–00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A3TP3	214–4085–00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A3TP4	214–4085–00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A3TP5	214–4085–00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A3TP6	214–4085–00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A3U1	156–0368–03			IC,DGTL:ECL,XLTR;QUAD TTL–TO–ECL;10124,DIP16.3,TUBE	80009	156–0368–03
A3U2	156–0368–03			IC,DGTL:ECL,XLTR;QUAD TTL–TO–ECL;10124,DIP16.3,TUBE	80009	156–0368–03
A3U3	156–2142–00			IC,DGTL:ECL,CNTR;4–BIT BIN;10H016,DIP16.3,TUBE	80009	156–2142–00
A3U4	156–2142–00			IC,DGTL:ECL,CNTR;4–BIT BIN;10H016,DIP16.3,TUBE	80009	156–2142–00
A3U5	156–2142–00			IC,DGTL:ECL,CNTR;4–BIT BIN;10H016,DIP16.3,TUBE	80009	156–2142–00
A3U6	156–1642–01			IC,DGTL:ECL,GATE;TPL 2–3–2 IN OR/NOR;10H105,DIP16.3,TUBE	80009	156–1642–01
A3U7	156–1674–00			IC,DGTL:ECL,GATE:QUAD 2–IN AND;10H104,DIP16.3	04713	MC10H104 P
A3U8	156–2290–00			IC,DGTL:ECL,XLTR;QUAD ECL–TO–TTL;10H125,DIP16.3,TUBE	80009	156–2290–00
A3U9	156–2290–00			IC,DGTL:ECL,XLTR;QUAD ECL–TO–TTL;10H125,DIP16.3,TUBE	80009	156–2290–00
A3U10	156–2290–00			IC,DGTL:ECL,XLTR;QUAD ECL–TO–TTL;10H125,DIP16.3,TUBE	80009	156–2290–00
A3U11	160–8500–02			IC,DGTL:CMOS,EPROM;65536 X 16;150NS,27C1024,DIP40.6	80009	160–8500–02
A3U11	163–0830–00			IC,MEMORY:CMOS,EPROM,64K X 16,150NS, 27C1024, DIP 40.6 (OPTION 17 ONLY)	80009	163–0830–00
				MOUNTING PARTS		
	136–0757–00			SKT,DIP:	09922	DILB40P–108
				END MOUNTING PARTS		
A3U12	160–8677–00			IC,DGTL:CMOS,PLD;EEPLD,16V8,25NS,90MA;16V8–25,DIP20.3,TUBE	80009	160–8677–00

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A3U12	163–0831–00			IC,DIGITAL:CMOS, PLD, EEPLD,16V8,25NS,90 MA,16V8–25, DIP 20.3,TUBE (OPTION 17 ONLY)	80009	163–0831–00
				MOUNTING PARTS		
	136–0752–00			SKT,PL–IN ELEK:MICROCKT,20 DIP	09922	DILB20P–108
				END MOUNTING PARTS		
A3U13	156–2953–00			IC,DGTL:FTTL,FLIP FLOP;OCTAL NONINV D–TYPE, 3–STATE;74F574,DIP20.3,TUBE	80009	156–2953–00
A3U15	156–2953–00			IC,DGTL:FTTL,FLIP FLOP;OCTAL NONINV D–TYPE, 3–STATE;74F574,DIP20.3,TUBE	80009	156–2953–00
A3U16	156–2953–00			IC,DGTL:FTTL,FLIP FLOP;OCTAL NONINV D–TYPE, 3–STATE;74F574,DIP20.3,TUBE	80009	156–2953–00
A3U17	160–8670–02			IC,MEM:CMOS,PROM;8K X 8,RGTR,CY7C265–40,DIP28.3	80009	160–8670–02
A3U17	163–0834–00			IC, MEMORY:CMOS,PROM,8K X 8,40NS,REGISTERED, 7C265,DIP 28.3 (OPTION 17 ONLY)	80009	163–0834–00
				MOUNTING PARTS		
	136–1038–00			SKT,DIP:	00779	2–641873–1
				END MOUNTING PARTS		
A3U19	156–1664–00			IC,DGTL:ALSTTL,FLIP FLOP;OCTAL NONINV D–TYPE, 3–STATE;74ALS574,DIP20.3,TUBE	80009	156–1664–00
A3U20	156–6382–00			IC,CONV:CMOS,D/A;TPL 8 BIT,80MHZ,256 X 24 COLOR PALETTE	80009	156–6382–00
				MOUNTING PARTS		
	136–1047–00			SKT,PLCC:PCB;44 POS,0.05 CTR,0.360 H X 0.125 TAIL,TIN	80009	136–1047–00
				END MOUNTING PARTS		
A3U21	160–8671–01			IC,DGTL:CMOS,PLD;EEPLD,22V10,15NS,130MA;22V10–15,DIP24.3	80009	160–8671–01
				MOUNTING PARTS		
	136–0925–00			SKT,DIP:	91506	224–AG30D
				END MOUNTING PARTS		
A3U22	156–1111–02			IC,DGTL:LSTTL,XCVR;74LS245,DIP20.3,TUBE	80009	156–1111–02
A3U23	160–8669–02			IC,DGTL:CMOS,EPROM;131072 X 8,150NS,27C010,DIP32.6	80009	160–8669–02
A3U23	163–0835–00			IC, MEMORY:CMOS,EPROM, 28K X 8,150NS,27C010, DIP32.6 (OPTION 17 ONLY)	80009	163–0835–00
				MOUNTING PARTS		
	136–0963–00			SKT,PL–IN ELEK:MICROCKT,32 PIN	00779	2–644018–3
				END MOUNTING PARTS		
A3U24	156–1754–02			IC,DGTL:ALSTTL,BFR/DRVR;OCTAL NONINV, HI DRV, 3–STATE;74ALS244–1,DIP20.3,TUBE	80009	156–1754–02
A3U25	156–1754–02			IC,DGTL:ALSTTL,BFR/DRVR;OCTAL NONINV, HI DRV, 3–STATE;74ALS244–1,DIP20.3,TUBE	80009	156–1754–02
A3U26	156–3019–00			IC,LIN:BIPOLAR,V REF;1.235V,1.0%,150PPM,SHUNT,MICROPWR;LM385BZ–1.2,TO–92	27014	LM385BZ–1.2
A3U27	234–0428–20			QUICK CHIP:VIDEO CHANNEL SW,PKG	80009	234–0428–20
				MOUNTING PARTS		
	136–0752–00			SKT,PL–IN ELEK:MICROCKT,20 DIP	09922	DILB20P–108
				END MOUNTING PARTS		
A3U29	156–3432–00			IC,LIN:BIPOLAR,OP–AMP;CUR FDBK,200MHZ;CLC400AJP,DIP08.3	80009	156–3432–00
A3U30	156–3432–00			IC,LIN:BIPOLAR,OP–AMP;CUR FDBK,200MHZ;CLC400AJP,DIP08.3	80009	156–3432–00
A3U31	156–3432–00			IC,LIN:BIPOLAR,OP–AMP;CUR FDBK,200MHZ;CLC400AJP,DIP08.3	80009	156–3432–00
A3U34	156–3432–00			IC,LIN:BIPOLAR,OP–AMP;CUR FDBK,200MHZ;CLC400AJP,DIP08.3	80009	156–3432–00
A3U36	156–3432–00			IC,LIN:BIPOLAR,OP–AMP;CUR FDBK,200MHZ;CLC400AJP,DIP08.3	80009	156–3432–00
A3U37	156–1664–00			IC,DGTL:ALSTTL,FLIP FLOP;OCTAL NONINV D–TYPE, 3–STATE;74ALS574,DIP20.3,TUBE	80009	156–1664–00
A3U38	156–1255–00			IC,CONV:BIPOLAR,D/A;8 BIT,85NS,CUR OUT,MULTIPLYING;DAC08HP,DIP16.3	80009	156–1255–00

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A3U41	156–0368–03			IC,DGTL:ECL,XLTR;QUAD TTL–TO–ECL;10124,DIP16.3,TUBE	80009	156–0368–03
A3U42	156–2290–00			IC,DGTL:ECL,XLTR;QUAD ECL–TO–TTL;10H125,DIP16.3,TUBE	80009	156–2290–00
A3U43	160–8678–00			IC,DGTL:CMOS,PLD;EEPLD,16V8,25NS,90MA;16V8–25,DIP20.3,TUBE	80009	160–8678–00
A3U43	163–0836–00			IC, DIGITAL:CMOS,PLD,EEPLD,16V8,25NS,90MA, 16V8–25,DIP 20.3,TUBE (OPTION 17 ONLY)	80009	163–0836–00
				MOUNTING PARTS		
	136–0752–00			SKT,PL–IN ELEK:MICROCKT,20 DIP	09922	DILB20P–108
				END MOUNTING PARTS		
A3U44	156–0368–03			IC,DGTL:ECL,XLTR;QUAD TTL–TO–ECL;10124,DIP16.3,TUBE	80009	156–0368–03
A3U45	156–1639–00			IC,DGTL:ECL,FLIP FLOP;DUAL D–TYPE MASTER–SLAVE;10H131,DIP16.3,TUBE	80009	156–1639–00
A3U46	160–8497–00			IC,DGTL:CMOS,EPROM;131072 X 8,150NS,27C010,DIP32.6	80009	160–8497–00
A3U46	163–0837–00			IC, MEMORY:CMOS,EPROM,128K X 8,150NS,27C010, DIP 32.6 (OPTION 17 ONLY)	80009	163–0837–00
				MOUNTING PARTS		
	136–0963–00			SKT,PL–IN ELEK:MICROCKT,32 PIN	00779	2–644018–3
				END MOUNTING PARTS		
A3U47	160–8498–02			IC,DGTL:CMOS,EPROM;8K X 8,W/3 STATE OUT;27C64–200,DIP28.6	80009	160–8498–02
A3U47	163–0838–00			IC, MEMORY:CMOS,EPROM,8K X 8 W/3–STATE–OUT, 27C64–200,DIP 28.6 (OPTION 17 ONLY)	80009	163–0838–00
				MOUNTING PARTS		
	136–0755–00			SKT,DIP:	09922	DILB28P–108
				END MOUNTING PARTS		
A3U48	156–0865–02			IC,DGTL:LSTTL,FLIP FLOP;74LS273,DIP20.3,TUBE	80009	156–0865–02
A3U49	156–2520–00			IC,DGTL:ASTTL,CNTR;SYNCH 4–BIT BIN;74AS163,DIP16.3,TUBE	01295	SN74AS163N3ORJ4
A3U50	156–2520–00			IC,DGTL:ASTTL,CNTR;SYNCH 4–BIT BIN;74AS163,DIP16.3,TUBE	01295	SN74AS163N3ORJ4
A3U51	156–2520–00			IC,DGTL:ASTTL,CNTR;SYNCH 4–BIT BIN;74AS163,DIP16.3,TUBE	01295	SN74AS163N3ORJ4
A3U52	156–2338–00			IC,DGTL:ASTTL,FLIP FLOP;DUAL D–TYPE;74AS74,DIP14.3,TUBE	80009	156–2338–00
A3U53	156–1664–00			IC,DGTL:ALSTTL,FLIP FLOP;OCTAL NONINV D–TYPE, 3–STATE;74ALS574,DIP20.3,TUBE	80009	156–1664–00
A3U54	156–1676–00			IC,DGTL:ECL,GATE;TPL 2–IN EXOR/NOR;10H107,DIP16.3	04713	MC10H107 P
A3U55	156–1640–00			IC,DGTL:ECL,RCVR;TPL LINE;10H116,DIP16.3,TUBE	80009	156–1640–00
A3U57	156–0853–00			IC,LIN:BIPOLAR,OP–AMP;DUAL,SGL SPLY;LM358N,DIP08.3	80009	156–0853–00
A3U58	156–1639–00			IC,DGTL:ECL,FLIP FLOP;DUAL D–TYPE MASTER–SLAVE;10H131,DIP16.3,TUBE	80009	156–1639–00
A3U59	156–1639–00			IC,DGTL:ECL,FLIP FLOP;DUAL D–TYPE MASTER–SLAVE;10H131,DIP16.3,TUBE	80009	156–1639–00
A3U61	156–0093–02			IC,DGTL:TTL,BFR/DRVR;7416,DIP14.3,TUBE	80009	156–0093–02
				MOUNTING PARTS		
	136–0728–00			SKT,PL–IN ELEK:MICROCKT,14 CONTACT	09922	DILB14P–108
				END MOUNTING PARTS		
A3U62	160–8499–01			IC,DGTL:CMOS,PLD;OTP,22V10,25NS,33.3MHZ,90MA;22V10–25,DIP24.3	80009	160–8499–01
				MOUNTING PARTS		
	136–0925–00			SKT,DIP:	91506	224–AG30D
				END MOUNTING PARTS		
A3U63	156–2520–00			IC,DGTL:ASTTL,CNTR;SYNCH 4–BIT BIN;74AS163,DIP16.3,TUBE	01295	SN74AS163N3ORJ4
A3U64	156–2067–00			IC,DGTL:FTTL,FLIP FLOP;HEX D–TYPE, W/ENABLE;74F378,DIP16.3,TUBE	80009	156–2067–00
				MOUNTING PARTS		

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
	136–0729–00			SKT,DIP:PCB;FEM,STR,2 X 8,16 POS,0.1 X 0.3 CTR,0.175 H X 0.130 TAIL,BECU,TIN	09922	DILB16P–108T
				END MOUNTING PARTS		
A3U66	156–0407–00			IC,MISC:BIPOLAR,MULTR;FOUR QDRNT;MC1495L,DIP14.3	04713	MC1495L
A3U67	156–0277–00			IC,LIN:BIPOLAR,VR;POS,5.0V,1.0A,4%;MC7805CT,TO–220	80009	156–0277–00
A3U68	156–0846–00			IC,LIN:BIPO-LAR,VR;NEG,–5.0V,1.0A,4.0%;MC7905CT,TO–220	27014	LM7905CT
A3U69	156–1173–00			IC,LIN:BIPOLAR,V REF;POS,2.5V,1.0%,40PPM,SER;MC1403U,DIP08.3	80009	156–1173–00
A3U70	156–0158–07			IC,LIN:BIPOLAR,OP–AMP;MC1458P1,DIP08.3	80009	156–0158–07
A3U71	156–2290–00			IC,DGTL:ECL,XLTR;QUAD ECL–TO–TTL;10H125,DIP16.3,TUBE	80009	156–2290–00
A3U72	156–3432–00			IC,LIN:BIPOLAR,OP–AMP;CUR FDBK,200MHZ;CLC400AJP,DIP08.3	80009	156–3432–00
A3U73	156–1149–00			IC,LIN:BIFET,OP–AMP;LF351N,DIP08.3	27014	LF351N/GLEA134
A3W1	131–4566–00			BUS,CNDCTR:0 OHM,300 SPACING,SM BODY	80009	131–4566–00
A3W2	131–4566–00			BUS,CNDCTR:0 OHM,300 SPACING,SM BODY	80009	131–4566–00
A3W187	131–4566–00			BUS,CNDCTR:0 OHM,300 SPACING,SM BODY	80009	131–4566–00
A3W187	131–4566–00			BUS,CNDCTR:0 OHM,300 SPACING,SM BODY	80009	131–4566–00
A4	671–3242–04			CKT BD ASSY:POWER SUPPLY BOARD	80009	671324200
A4C5	285–1246–00			CAP,FXD,PPR DI:0.022UF,20%,250VAC	TK0515	PME 289 MB 5220
A4C6	285–1246–00			CAP,FXD,PPR DI:0.022UF,20%,250VAC	TK0515	PME 289 MB 5220
A4C105	281–0826–00			CAP,FXD,CER:MLC;2200PF,10%,100V,0.100 X	TK1743	CGB222KEX
A4C120	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA75E104MAA
A4C130	281–0812–00			CAP,FXD,CER:MLC;1000PF,10%,100V,0.100 X	04222	SA71C102KAA
A4C135	281–0788–00			CAP,FXD,CERAMIC:MLC,470PF,10%,100V,0.100 X 0.170,AXIAL,MI	04222	SA102C471KAA
A4C142	290–1301–00			CAP,FXD,ALUM:2700UF,20%,10V,12.5 X 30MM (0.492 X 1.180)	0H1N5	CEEFM1A272M7
A4C143	290–1301–00			CAP,FXD,ALUM:2700UF,20%,10V,12.5 X 30MM (0.492 X 1.180)	0H1N5	CEEFM1A272M7
A4C144	290–1301–00			CAP,FXD,ALUM:2700UF,20%,10V,12.5 X 30MM (0.492 X 1.180)	0H1N5	CEEFM1A272M7
A4C145	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA75E104MAA
A4C150	290–1302–00			CAP,FXD,ALUM:1000UF,20%,35V,12.5 X 30MM (0.492 X 1.180)	0H1N5	CEEFM1V102M7
A4C151	281–0812–00			CAP,FXD,CER:MLC;1000PF,10%,100V,0.100 X	04222	SA71C102KAA
A4C152	290–1302–00			CAP,FXD,ALUM:1000UF,20%,35V,12.5 X 30MM (0.492 X 1.180)	0H1N5	CEEFM1V102M7
A4C160	290–1315–00			CAP,FXD,ALUM:47UF,20%,35V,ESR=0.34 OHM(100KHZ,20C),6X11MM,LOW IMP	55680	UPL1V470MEH1TD
A4C162	290–1315–00			CAP,FXD,ALUM:47UF,20%,35V,ESR=0.34 OHM(100KHZ,20C),6X11MM,LOW IMP	55680	UPL1V470MEH1TD
A4C170	290–1315–00			CAP,FXD,ALUM:47UF,20%,35V,ESR=0.34 OHM(100KHZ,20C),6X11MM,LOW IMP	55680	UPL1V470MEH1TD
A4C172	290–1315–00			CAP,FXD,ALUM:47UF,20%,35V,ESR=0.34 OHM(100KHZ,20C),6X11MM,LOW IMP	55680	UPL1V470MEH1TD
A4C180	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA75E104MAA
A4C182	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA75E104MAA
A4C200	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA75E104MAA
A4C220	281–0563–00			CAP,FXD,CER:MLC;0.47UF,20%,50V,0.150 X0.290	04222	SA305E474MAA
A4C222	281–0812–00			CAP,FXD,CER:MLC;1000PF,10%,100V,0.100 X	04222	SA71C102KAA
A4C225	290–1301–00			CAP,FXD,ALUM:2700UF,20%,10V,12.5 X 30MM (0.492 X 1.180)	0H1N5	CEEFM1A272M7
A4C230	281–0563–00			CAP,FXD,CER:MLC;0.47UF,20%,50V,0.150 X0.290	04222	SA305E474MAA
A4C253	290–1301–00			CAP,FXD,ALUM:2700UF,20%,10V,12.5 X 30MM (0.492 X 1.180)	0H1N5	CEEFM1A272M7
A4C254	290–1301–00			CAP,FXD,ALUM:2700UF,20%,10V,12.5 X 30MM (0.492 X 1.180)	0H1N5	CEEFM1A272M7

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A4C320	290–1315–00	671–3242–02	671–3242–03	CAP,FXD,ALUM:47UF,20%,35V,ESR=0.34 OHM(100KHZ,20C),6X11MM,LOW IMP,RADIAL,T&A	55680	UPL1V470MEH1TD
A4C320	290–0766–00	671–3242–03		CAP,FXD,ALUM:2.2UF,20%,35V,ESR=0.34 OHM(100KHZ,20C),6X11MM,LOW IMP,RADIAL,T&A	55680	UPL1V470MEH1TD
A4C325	290–1301–00			CAP,FXD,ALUM:2700UF,20%,10V,12.5 X 30MM (0.492 X 1.180)	0H1N5	CEEFM1A272M7
A4C350	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA75E104MAA
A4C358	290–1301–00			CAP,FXD,ALUM:2700UF,20%,10V,12.5 X 30MM (0.492 X 1.180)	0H1N5	CEEFM1A272M7
A4C360	290–1301–00			CAP,FXD,ALUM:2700UF,20%,10V,12.5 X 30MM (0.492 X 1.180)	0H1N5	CEEFM1A272M7
A4C365	290–1315–00			CAP,FXD,ALUM:47UF,20%,35V,ESR=0.34 OHM(100MHZ,20C),6X11MM,LOW IMP	55680	UPL1V470MEH1TD
A4C370	290–1301–00			CAP,FXD,ALUM:2700UF,20%,10V,12.5 X 30MM (0.492 X 1.180)	0H1N5	CEEFM1A272M7
A4C415	281–0813–00	671–3242–02	671–3242–03	CAP,FXD,CERAMIC:MLC,0.047UF,20%,50V,0.100 X 0.170,AXIAL,MI	04222	SA75E104MAA
A4C415	281–0051–02	671–3242–03		CAP,FXD,CERAMIC:MLC,0.0033UF,20%,50V,0.100 X 0.170,AXIAL,MI	04222	SA75E104MAA
A4C464	290–1301–00			CAP,FXD,ALUM:2700UF,20%,10V,12.5 X 30MM (0.492 X 1.180)	0H1N5	CEEFM1A272M7
A4C475	290–1301–00			CAP,FXD,ALUM:2700UF,20%,10V,12.5 X 30MM (0.492 X 1.180)	0H1N5	CEEFM1A272M7
A4C480	290–1301–00			CAP,FXD,ALUM:2700UF,20%,10V,12.5 X 30MM (0.492 X 1.180)	0H1N5	CEEFM1A272M7
A4C481	290–1301–00			CAP,FXD,ALUM:2700UF,20%,10V,12.5 X 30MM (0.492 X 1.180)	0H1N5	CEEFM1A272M7
A4C500	285–1329–00			CAP,FXD,PLASTIC:METALIZED FILM;680PF,10%,1600V,POLYPROPYLENE,.70X.43	TK1913	FKP1 680/1600/1
A4C521	281–0791–00			CAP,FXD,CER:MLC;270PF,10%,100V,0.100 X 0.170	04222	SA72C271KAA
A4C575	281–0812–00			CAP,FXD,CER:MLC;1000PF,10%,100V,0.100 X	04222	SA71C102KAA
A4C621	281–0772–00			CAP,FXD,CER:MLC;4700PF,10%,100V,0.100 X	04222	SA71C472KAA
A4C650	281–0563–00			CAP,FXD,CER:MLC;0.47UF,20%,50V,0.150 X 0.290	04222	SA305E474MAA
A4C656	290–1309–00			CAP,FXD,AL:100UF,20%,63V,10 X 20MM,RADIAL,105 DEG,L0W Z,T&A	0H1N5	CEEFM1J101M6–T4
A4C657	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA75E104MAA
A4C700	285–1421–00			CAP,FXD,PLASTIC:1.0UF,10%,400V,	TK1913	MKS4 1.0/400/10
A4C717	281–0563–00			CAP,FXD,CER:MLC;0.47UF,20%,50V,0.150 X 0.290	04222	SA305E474MAA
A4C722	281–0788–00			CAP,FXD,CER:MLC;470PF,10%,100V,0.100 X 0.170	04222	SA72C471KAA
A4C727	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA75E104MAA
A4C820	285–1252–00			CAP,FXD,PLASTIC:0.15UF,10%,250VAC	D5243	F1772–415–2000
A4C845	290–1293–00			CAP,FXD,ALUM:390UF,20%,200V,ESR=0.425 OHM(120HZ,20C),25X30MM,105C	0H1N5	CEAUF2D391M20
A4C865	290–1293–00			CAP,FXD,ALUM:390UF,20%,200V,ESR=0.425 OHM(120HZ,20C),25X30MM,105C	0H1N5	CEAUF2D391M20
A4C942	281–0812–00			CAP,FXD,CER:MLC;1000PF,10%,100V,0.100 X	04222	SA71C102KAA
A4CR150	152–0581–00			DIODE,RECT:SCHTKY,20V,1A,.450VF,25A IFSM,1N5817	04713	1N5822
A4CR160	152–0581–00			DIODE,RECT:SCHTKY,20V,1A,.450VF,25A IFSM,1N5817	04713	1N5817
A4CR170	152–0601–01			DIODE,RECT:ULTRA FAST;150V,25NS,35A IFSM	04713	MUR115RL
A4CR180	152–0601–01			DIODE,RECT:ULTRA FAST;150V,25NS,35A IFSM	04713	MUR115RL
A4CR200	152–0141–00			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO–71N3605	80009	152–0141–00
A4CR320	152–0884–00			DIODE,RECT:SCHTKY;35V,16A,150A IFSM,630MVF	04713	MBR1635
A4CR500	152–1085–00			DIODE,RECT:ULTRA FAST;1000V,1A,30A IFSM,75 NS SOFT RECOVERY	0LUA3	BYV26E
A4CR575	152–0884–00			DIODE,RECT:SCHTKY;35V,16A,150A IFSM,630MVF	04713	MBR1635
				MOUNTING PARTS		
	210–1178–00			WASHER,SHLDR:TRANSISTOR,TO–220,0.2"ODX0.116	13103	7721–7PPS
	211–0012–00			SCREW,MACHINE:4–40 X 0.375,PNH,STL CD PL,POZ	93907	ORDER BY DESCRIPTION

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
	342–0563–00			INSULATOR,PLATE:TRANSISTOR,FIBERGLASS REINFORCED SILICON RUBBER	18565	69–11–8805–1674
				END MOUNTING PARTS		
A4CR600	152–0601–01			DIODE,RECT:ULTRA FAST;150V,25NS,35A IFSM	04713	MUR115RL
A4CR648	152–0581–00			DIODE,RECT:SCHTKY,20V,1A,.450VF,25A IFSM,1N5817	04713	1N5817
A4CR649	152–0581–00			DIODE,RECT:SCHTKY,20V,1A,.450VF,25A IFSM,1N5817	04713	1N5817
A4CR820	152–0750–00			DIODE,RECT:FAST RCVRY;BRIDGE,600V,3A, IFSM=125A,250NS	TK2319	RKBPC606
A4DS720	150–0050–00			LAMP,GLOW:135V MAX,1.9MA,C2A–T,WIRE LEAD	0J9R2	NE–2Q–11R–T
A4E820	119–0181–00			ARSR,ELEC SURGE:230V, +/–15%; GAS DISCHARGE	0C8T6	BBS–230V +/–15%
A4F940	159–0023–00			FUSE,CARTRIDGE:3AG,2A,250V,SLOW BLOW, (FOR 90–132VAC OPERATION)	71400	MDX2
A4F940	159–0019–00			FUSE,CARTRIDGE:3AG,1A,250V,SLOW BLOW, (FOR 180–250VAC OPERATION)	71400	MDL 1
				MOUNTING PARTS		
	204–0906–00			BODY,FUSEHOLDER:3AG & 5 X 20MM FUSES	61935	TYPE FAU 031.35
				END MOUNTING PARTS		
A4FL950	119–3835–00			FILTER,RFI:3A,250V,400HZ W/PC TERMINALS	0GV52	FN 326–3/02
A4H5	214–2953–00			HEAT SINK,SEMIC:TRANSISTOR,TO–220,VERTICAL MOUNT,SLOT HOLE,(3)SOLDERABLE TABS,COPPER,BLACK PAINT	13103	6030B–TT
A4H6	214–2953–00			HEAT SINK,SEMIC:TRANSISTOR,TO–220,VERTICAL MOUNT,SLOT HOLE,(3)SOLDERABLE TABS,COPPER,BLACK PAINT	13103	6030B–TT
A4J160	131–3364–00			CONN,HDR:PCB;MALE,STR,2 X 17,0.1 CTR,0.365D	53387	2534–6002UB
A4J370	131–3270–00			CONN,HDR::PCB,MALE,STR,1 X 2,0.1 CTR,0.295 MLG X 0.140 TAIL,TIN,PLZ WALL,W/FRICTION LOCK,	00779	640456–2
A4L150	108–1262–00			INDUCTOR,FXD:POWER;100UH,10%,I<0.75A,RDC<0.23 OHM,Q>15,SRF>5.4MHZ,BOBBIN CORE	TK2058	TSL0807–101KR75
A4L162	108–1262–00			INDUCTOR,FXD:POWER;100UH,10%,I<0.75A,RDC<0.23 OHM,Q>15,SRF>5.4MHZ,BOBBIN CORE	TK2058	TSL0807–101KR75
A4L230	108–0554–00			INDUCTOR,FXD:CUSTOM,POWER;5UH,20%,I<10 A,RDC<0.01 OHM,ROD CORE 276–0147–00	0JR03	108–0554–00
A4L258	108–0554–00			INDUCTOR,FXD:CUSTOM,POWER;5UH,20%,I<10 A,RDC<0.01 OHM,ROD CORE 276–0147–00	0JR03	108–0554–00
A4L656	108–1263–00			INDUCTOR,FXD:POWER;10UH,10%,I<2.1A,RDC<0.043 OHM,Q>20,SRF>19MHZ,BOBBIN	TK2058	TSL0707–100K1R9
A4L700	120–1449–00			TRANSFORMER,RF:COMMON MODE,2.7MH,2A	02113	P104
A4Q100	151–0188–00			XSTR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ,AMPLIFIER	0JR04	2N3906
A4Q127	151–0528–00			THYRISTOR,PWR:BIPOLAR,SCR;50V,16A RMS,PHASE	04713	2N6400
A4Q250	151–1171–00			XSTR,PWR:MOS,N–CH;50V,12A,0.12 OHM	04713	MTP15N05E
A4Q648	151–1300–00			XSTR,PWR:MOS,N–CH;800V,8.0A,1.2 OHM	66958	STH8N80FI
A4Q717	151–0188–00			XSTR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ,AMPLIFIER	0JR04	2N3906
A4R100	322–3171–00			RES,FXD,FILM:590 OHM,1%,0.2W,TC=T0 MI,SMALL BODY	57668	CRB20 FXE 590E
A4R105	322–3281–00			RES,FXD:METAL FILM,8.25K OHM,1%,0.2W,TC=100 PPM,AXIAL,T&R,SMALL BODY	57668	CRB20 FXE 8K25
A4R110	322–3106–00			RES,FXD,FILM:124 OHM,1%,0.2W,TC=100PPM,SM BODY	91637	CCF502G124ROFT
A4R120	322–3193–00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A4R121	322–3130–00			RES,FXD:METAL FILM,221 OHM,1%,0.2W,TC=100 PPM,AXIAL,T&R,SMALL BODY	57668	RB20FX221E
A4R125	322–3172–00			RES,FXD,FILM:604 OHM,1%,0.2W,TC=T0 MI,SMALL BODY	57668	CRB20 FXE 604E
A4R135	322–3001–00			RES,FXD:METAL FILM,10 OHM,1%,0.2W,TC=100 PPM,AXIAL,T&R,SMALL BODY	91637	CCF501G10R00F
A4R140	322–3181–00			RES,FXD,FILM:750 OHM,1%,0.2W,TC=T0MI,SM BODY	91637	CCF501G750ROF
A4R150	322–3339–00			RES,FXD:METAL FILM,33.2K OHM,1%,0.2W,TC=100 PPM,AXIAL,T&R,SMALL BODY	91637	CCF50–2–G3322FT
A4R152	322–3289–00			RES,FXD:METAL FILM;10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A4R153	322–3378–00			RES,FXD,FILM:84.5K OHM,1%,0.2W,TC=T0MI,SM BODY	91637	CCF50–2F84501F

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A4R215	322–3001–00			RES,FXD:METAL FILM;10 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10R00F
A4R222	315–0101–00			RES,FXD,FILM:100 OHM,5%,0.25W,,MI	TK1727	SFR25 2322–181–
A4R250	322–3030–00			RES,FXD:METAL FILM;20 OHM,1%,0.2W,TC=100 PPM	91637	CCF50G20R00F
A4R255	322–3289–00			RES,FXD:METAL FILM;10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A4R260	308–0710–00			RES,FXD:0.27 OHM,5%,1W MI	91637	CPF–1–0R27JT1–T/R
A4R314	322–3291–00			RES,FXD:METAL FILM,10.5K OHM,1%,0.2W,TC=100 PPM,AXIAL,T&R,SMALL BODY	57668	CRB20 FXE 10K5
A4R315	322–3235–00			RES,FXD:METAL FILM,2.74K OHM,1%,0.2W,TC=100 PPM,AXIAL,T&R,SMALL BODY	57668	CRB20 FXE 2K74
A4R316	322–3201–00	671–3242–01	671–3242–02	RES,FXD:METAL FILM,1.21K OHM,1%,0.2W,TC=100 PPM,AXIAL,T&R,SMALL BODY	91637	CCF501G12100F
A4R316	322–3193–00	671–3242–02		RES,FXD:METAL FILM,1.00K OHM,1%,0.2W,TC=100 PPM,AXIAL,T&R,SMALL BODY	91637	CCF501G12100F
A4R320	315–0101–00			RES,FXD,FILM:100 OHM,5%,0.25W,,MI	TK1727	SFR25 2322–181–
A4R415	311–2231–00			RES,VAR,TRMR:CERMET;1K OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 102 M L
A4R416	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W,TC=100 PPM,AXIAL,T&R,SMALL BODY	91637	CCF501G10000F
A4R615	322–3285–00			RES,FXD,FILM:9.09K OHM,1%,0.2W,TC=T0MI,SM BODY	91637	CCF501G90900F
A4R616	322–3258–00			RES,FXD:METAL FILM;4.75K OHM,1%,0.2W,TC=100	56845	CCF50–2–G4751FT
A4R617	322–3289–00			RES,FXD:METAL FILM;10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A4R619	322–3289–00			RES,FXD:METAL FILM;10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A4R620	322–3235–00			RES,FXD:METAL FILM;2.74K OHM,1%,0.2W,TC=100	91637	CCF501G27400F
A4R621	322–3289–00			RES,FXD:METAL FILM;10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A4R622	322–3243–00			RES,FXD:METAL FILM;3.32K OHM,1%,0.2W,TC=100	91637	CCF50–1–G33200F
A4R625	322–3201–00			RES,FXD:METAL FILM;1.21K OHM,1%,0.2W,TC=100	91637	CCF501G12100F
A4R630	308–0679–00			RES,FXD:0.51 OHM,5%,2W	91637	CPF–2–0R51JT1
A4R656	315–0101–00			RES,FXD,FILM:100 OHM,5%,0.25W,MI	TK1727	SFR25 2322–181–
A4R700	322–3258–00			RES,FXD:METAL FILM;4.75K OHM,1%,0.2W,TC=100	56845	CCF50–2–G4751FT
A4R701	322–3258–00			RES,FXD:METAL FILM;4.75K OHM,1%,0.2W,TC=100	56845	CCF50–2–G4751FT
A4R717	322–3314–00			RES,FXD:METAL FILM;18.2K OHM,1%,0.2W,TC=100	91637	CCF501G18201F
A4R718	322–3393–00	671–3242–03	671–3242–04	RES,FXD:METAL FILM;121K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G12102F
A4R718	322–3424–00	.671–3242–04		RES,FXD:METAL FILM;255K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G12102F
A4R720	322–3265–00			RES,FXD:METAL FILM;5.62K OHM,1%,0.2W,TC=100	91637	CCF501G56200F
A4R722	322–3289–00			RES,FXD:METAL FILM;10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A4R742	322–3335–00			RES,FXD,FILM:30.1K OHM,1%,0.2W,TC=T0MI,SM BODY	91637	CCF501G30101F
A4R743	322–3393–00			RES,FXD:METAL FILM;121K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G12102F
A4R818	322–3402–00			RES,FXD:METAL FILM;150K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G15002F
A4R819	322–3402–00			RES,FXD:METAL FILM;150K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G15002F
A4R822	301–0106–00			RES,FXD,FILM:10M OHM,5%,0.50W	50139	EB1065
A4R845	301–0474–00			RES,FXD,FILM:470K OHM,5%,0.5W	TK1727	SFR30 2322–182–
A4R865	301–0474–00			RES,FXD,FILM:470K OHM,5%,0.5W	TK1727	SFR30 2322–182–
A4R921	303–0154–00			RES,FXD,CMPSN:150K OHM,5%,1W	24546	FP1 150 K OHM 5 PERCENT
A4R922	315–0101–00			RES,FXD,FILM:100 OHM,5%,0.25W,,MI	TK1727	SFR25 2322–181–
A4R923	322–3235–00			RES,FXD:METAL FILM,2.74K OHM,1%,0.2W,TC=100 PPM,AXIAL,T&R,SMALL BODY	57668	CRB20 FXE 2K74
A4R925	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W,TC=100 PPM,AXIAL,T&R,SMALL BODY	91637	CCF501G20000F
A4RT820	307–0746–00			RES,THERMAL:5 OHM,10%,7A/DEG C	15454	SG200–S STRAI
A4S930	260–2443–00			SWITCH,PWR:DPDT;PUSH PUSH ALT ACT,PC PINS,6A 250VAC/1A 100VDC,36A AC SURGE,RIGHT ANG MNT,W/HARD END WIRE BAIL	31918	NE18–00–EE–N–47
A4T1	120–1897–00			XFMR,RF,PWR:SWITCHING,70KHZ,PRI 254V,SEC 100V 0.1A,18V 0.1A,+/–5V8.0A,PKG 1.8 X 1.755,1.275HIGH,UL REG	75498	129–0122–EE

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A4T2	120–1889–00			TRANSFORMER,RF:TOROID,1:1,150UH +/–10%,DCR 0.13OHM,2.2A MAX,VERTICALMOUNT,W/HOLDER,0.425 WIDE,1.1 HIGH EACH	0JR03	120–1889–00
A4U150	156–3633–00			IC,LINEAR:BIPOLAR,VR;POS,12V,1A,3%,LOW DROPOUT	27014	LM2940CT–12
A4U152	156–4530–00			IC,LINEAR:BIPOLAR,VR;NEG,–12V,1.0A,2%,LOW DROPOUT	27014	LM2990T–12
A4U200	156–4104–00			IC,LINEAR:BIPOLAR,SW–REGULATOR CONTROLLER,PWM,CURRENT MODE,SINGLE TOTEM POLE OUTPUT,UC3843	04713	UC3843N
A4U370	156–2558–00			IC,LINEAR:BIPOLAR,VR;POS,12V,1.5A,2%	01295	TL780–12CKC
A4U410	156–1631–01			IC,LINEAR:BIPOLAR,VR;ADJUST,SHUNT,100MA,2.2%	01295	TL431CLPM
A4U520	156–0885–00			IC, OPTOCOUPLER:7.5KV ISOL, VCEO 70V, I COLL 100MA, HFE 400; 6 PIN DIP,	04713	CNY17–1
A4U615	156–1225–00			IC,LIN:BIPOLAR,COMPARATOR;DUAL,OPEN COLL,300NS	01295	LM393P
A4U722	156–4236–00			IC,LINEAR:BIPOLAR,SW–REGULATOR CONTROLLER;PWM,CURRENT MODE,SINGLE TOTEM POLE OUTPUT	04713	UC3844BN
A4U723	156–0853–00			IC,LINEAR:BIPOLAR,OP–AMP,DUAL,SINGLE SUPPLY,LM358N,DIP08.3	01295	LM358P
A4VR120	152–0279–00			DIODE,ZENER:5.1V,5%,0.4W	04713	1N751ARL
A4W390	131–4566–00			BUS,CONDUCTOR:0 OHM,300 SPACING,SM BODY-MI,DUMMY RES	91637	FRJ–50
A4W500	131–4566–00			BUS,CONDUCTOR:0 OHM,300 SPACING,SM BODY-MI,DUMMY RES	91637	FRJ–50
A5	671–1903–06			CIRCUIT BD ASSY:CONTROLLER	80009	671–1903–06
A5	671–3974–00			CIRCUIT BD ASSY:CONTROLLER,SPG100017 (OPTION 17 ONLY)	80009	671–3974–00
A5C3	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C4	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C6	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C7	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C8	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C9	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C10	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C11	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C12	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C13	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C14	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C15	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C16	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C17	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C18	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C19	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C20	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C21	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C22	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C23	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C24	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C25	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C26	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C27	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C28	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C29	281–0775–01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C30	281–0773–00			CAP,FXD,CER:MLC;0.01UF,10%,100V,SAF,0.100 X 0.170;AX	80009	281–0773–00
A5C31	285–1100–00			CAP,FXD,PLSTC:FILM&FOIL;0.022UF,5%,200V,POLY-EST,0.21 X 0.485;AXIA,MI	19396	223J02PT485
A5C34	283–0615–00			CAP,FXD,MICA DI:33PF,5%,500V	80009	283–0615–00
A5C35	283–0615–00			CAP,FXD,MICA DI:33PF,5%,500V	80009	283–0615–00
A5C36	283–0788–00			CAP,FXD,MICA DI:267PF,1%,500V	80009	283–0788–00
A5C37	283–0788–00			CAP,FXD,MICA DI:267PF,1%,500V	80009	283–0788–00

A4U723	156–0853–00	IC,LINEAR:BIPOLAR,OP–AMP,DUAL,SINGLE SUPPLY,LM358N,DIP08.3	01295	LM358P
A5C38	283–0788–00	CAP,FXD,MICA DI:267PF,1%,500V	80009	283–0788–00
A5C39	283–0788–00	CAP,FXD,MICA DI:267PF,1%,500V	80009	283–0788–00
A5C40	285–1100–00	CAP,FXD,PLSTC:FILM&FOIL;0.022UF,5%,200V,POLY-EST,0.21 X 0.485;AXIA,MI	19396	223J02PT485
A5C41	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C42	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C43	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C44	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C45	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C46	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C47	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C49	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C50	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C51	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C53	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C54	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C55	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C56	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C57	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C58	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C59	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C60	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C62	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C63	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C64	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C65	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C69	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C70	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C71	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C72	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C82	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C83	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A5C84	290–0973–00	CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A5CR1	152–0141–02	DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A5CR2	152–0964–00	DIO,SIG:	80009	152–0964–00
A5CR3	152–0964–00	DIO,SIG:	80009	152–0964–00
A5CR4	152–0964–00	DIO,SIG:	80009	152–0964–00
A5CR5	152–0964–00	DIO,SIG:	80009	152–0964–00
A5J1	131–0608–00	TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 3)	80009	131–0608–00
A5J2	131–0608–00	TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 3)	80009	131–0608–00
A5J4	131–3364–00	CONN,HDR:	53387	2534–6002UB
A5J13	131–3362–00	CONN,HDR:	53387	2526–6002UB
A5J14	131–0608–00	TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 3)	80009	131–0608–00
A5J18	131–3364–00	CONN,HDR:	53387	2534–6002UB
A5J19	131–3362–00	CONN,HDR:	53387	2526–6002UB
A5J20	131–3364–00	CONN,HDR:	53387	2534–6002UB
A5J21	131–3364–00	CONN,HDR:	53387	2534–6002UB
A5J22	131–5356–00	CONN,HDR:PCB;MALE,STR,1 X 2,0.98 CTR,295 MLG X 0.137 TAIL,PLZ WALL,TIN	80009	131–5356–00
A5LS1	119–2101–00	XDCR,AUDIO:	TK1066	SMX–06
A5P1	131–0993–02	BUS,CNDCTR:SHUNT ASSY,RED	00779	1–850100–O
A5P2	131–0993–02	BUS,CNDCTR:SHUNT ASSY,RED	00779	1–850100–O
A5P14	131–0993–05	BUS,CNDCTR:SHUNT ASSY,GRN	00779	850100–5
A5Q1	151–0190–00	XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC	80009	151–0190–00

A4U723	156–0853–00	IC,LINEAR:BIPOLAR,OP–AMP,DUAL,SINGLE SUPPLY,LM358N,DIP08.3	01295	LM358P
A5Q2	151–0190–00	XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC	80009	151–0190–00
A5R1	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 1K00
A5R4	307–0650–00	RES NTWK,FXD,FI:9,2.7K OHM,5%,0.150W	11236	750–101–R2.7K
A5R5	307–0650–00	RES NTWK,FXD,FI:9,2.7K OHM,5%,0.150W	11236	750–101–R2.7K
A5R6	307–0636–00	RES NTWK,FXD,FI:8,330 OHM,2%,0.125 W	80009	307–0636–00
A5R8	322–3360–02	RES,FXD,FILM:54.9K OHM,0.5%,0.2W,TC=T2	57668	CRB20 DYE 54K9
A5R9	322–3360–02	RES,FXD,FILM:54.9K OHM,0.5%,0.2W,TC=T2	57668	CRB20 DYE 54K9
A5R12	307–0636–00	RES NTWK,FXD,FI:8,330 OHM,2%,0.125 W	80009	307–0636–00
A5R13	307–0636–00	RES NTWK,FXD,FI:8,330 OHM,2%,0.125 W	80009	307–0636–00
A5R18	322–3310–00	RES,FXD,FILM:16.5K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 16K5
A5R20	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 1K00
A5R21	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 1K00
A5R22	322–3481–00	RES,FXD,FILM:1M OHM.1%,0.2W,TC=T0	80009	322–3481–00
A5R23	322–3097–00	RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 100E
A5R29	322–3385–00	RES,FXD:MET FILM;100K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 100K
A5R30	322–3385–00	RES,FXD:MET FILM;100K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 100K
A5R31	322–3385–00	RES,FXD:MET FILM;100K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 100K
A5R32	322–3385–00	RES,FXD:MET FILM;100K OHM,1%,0.2W,TC=100 PPM;AX	57668	CRB20 FXE 100K
A5R33	307–0650–00	RES NTWK,FXD,FI:9,2.7K OHM,5%,0.150W	11236	750–101–R2.7K
A5R34	307–0650–00	RES NTWK,FXD,FI:9,2.7K OHM,5%,0.150W	11236	750–101–R2.7K
A5R35	307–0650–00	RES NTWK,FXD,FI:9,2.7K OHM,5%,0.150W	11236	750–101–R2.7K
A5R36	307–0648–00	RES NTWK,FXD,FI:8,100 OHM,2%,0.125 W	80009	307–0648–00
A5R37	307–0648–00	RES NTWK,FXD,FI:8,100 OHM,2%,0.125 W	80009	307–0648–00
A5R38	307–0648–00	RES NTWK,FXD,FI:8,100 OHM,2%,0.125 W	80009	307–0648–00
A5S1	260–1721–00	SW,ROCKER:8,SPST,125MA,30VDC	81073	76SB08S
A5TP1	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A5TP2	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A5TP3	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A5TP4	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A5TP5	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A5TP6	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A5TP7	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A5U1	156–0983–03	IC,PROCESSOR:NMOS,MICROPROCES-SOR;8–BIT;Z80B,DIP40.6	56708	Z80BCPUDS
		MOUNTING PARTS		
	136–0757–00	SKT,DIP:	09922	DILB40P–108
		END MOUNTING PARTS		
A5U3	156–2991–00	IC,MEM:CMOS,NVRAM;8K X 8,200NS,SRAM,INT BTRY;1225,DIP28.6,SAF CONT	80009	156–2991–00
		MOUNTING PARTS		
	136–0755–00	SKT,DIP:	09922	DILB28P–108
		END MOUNTING PARTS		
A5U5	156–3934–00	IC,DGTL:FTTL,DEMUX/DCD;1–OF–16;74F154,DIP24.3,TUBE	80009	156–3934–00
A5U6	156–2628–00	IC,PROCESSOR:NMOS,PRPHL;CNTR TMR;Z80–CTC,DIP28	56708	Z8430B PS OR CS
		MOUNTING PARTS		
	136–0755–00	SKT,DIP:	09922	DILB28P–108
		END MOUNTING PARTS		
A5U7	156–1748–02	IC,DGTL:ALSTTL,XCVR;OCTAL NONINV, 3–STATE;74ALS245,DIP20.3,TUBE	01295	SN74ALS245AN3
A5U10	156–3050–00	IC,MISC:	80009	156–3050–00
A5U11	160–8674–05	IC,MEM:CMOS,EPROM;64K 8,15NS,27C512	80009	160–8674–05

A4U723	156–0853–00	IC,LINEAR:BIPOLAR,OP–AMP,DUAL,SINGLE SUPPLY,LM358N,DIP08.3	01295	LM358P
A5U11	163–0839–00	IC, MEMORY:CMOS,EPROM,64K X 8,150NS,27C512, DIP 28.6 (OPTION 17 ONLY)	80009	163–0839–00
		MOUNTING PARTS		
	136–0755–00	SKT,DIP:	09922	DILB28P–108
		END MOUNTING PARTS		
A5U13	156–2391–00	IC,DGTL:ALSTTL,BFR/DRVR;OCTAL NONINV, 3–STATE;74ALS541,DIP20.3,TUBE	80009	156–2391–00
A5U14	156–2391–00	IC,DGTL:ALSTTL,BFR/DRVR;OCTAL NONINV, 3–STATE;74ALS541,DIP20.3,TUBE	80009	156–2391–00
A5U19	156–2391–00	IC,DGTL:ALSTTL,BFR/DRVR;OCTAL NONINV, 3–STATE;74ALS541,DIP20.3,TUBE	80009	156–2391–00
A5U20	156–1215–01	IC,DGTL:CMOS,MUX/ENCDR;74C923,DIP18.3,TUBE	27014	MM74C923JA+
A5U22	156–2392–00	IC,DGTL:HCMOS,GATE;HEX INV, SCHMITT TRIG;74HC14,DIP14.3,TUBE	80009	156–2392–00
A5U23	156–1664–00	IC,DGTL:ALSTTL,FLIP FLOP;OCTAL NONINV D–TYPE, 3–STATE;74ALS574,DIP20.3,TUBE	80009	156–1664–00
A5U24	156–1664–00	IC,DGTL:ALSTTL,FLIP FLOP;OCTAL NONINV D–TYPE, 3–STATE;74ALS574,DIP20.3,TUBE	80009	156–1664–00
A5U25	156–1664–00	IC,DGTL:ALSTTL,FLIP FLOP;OCTAL NONINV D–TYPE, 3–STATE;74ALS574,DIP20.3,TUBE	80009	156–1664–00
A5U28	156–2391–00	IC,DGTL:ALSTTL,BFR/DRVR;OCTAL NONINV, 3–STATE;74ALS541,DIP20.3,TUBE	80009	156–2391–00
A5U30	156–3509–00	IC,DGTL:FTTL,CNTR;SYNCH 8–BIT UP/DWN BIN, 3–STATE;74F1779,DIP16.3,TUBE	80009	156–3509–00
A5U31	156–1658–00	IC,DGTL:STTL,PLD;PAL, 16R8, 18MHZ, 90MA;16R8A–2,DIP20.3,TUBE	80009	156–1658–00
		MOUNTING PARTS		
	136–0752–00	SKT,PL–IN ELEK:MICROCKT,20 DIP	09922	DILB20P–108
		END MOUNTING PARTS		
A5U75	156–1664–00	IC,DGTL:ALSTTL,FLIP FLOP;OCTAL NONINV D–TYPE, 3–STATE;74ALS574,DIP20.3,TUBE	80009	156–1664–00
A5U76	156–0402–00	IC,MISC:BIPOLAR,TMR;LM555CN,DIP08.3	80009	156–0402–00
A5U77	156–2391–00	IC,DGTL:ALSTTL,BFR/DRVR;OCTAL NONINV, 3–STATE;74ALS541,DIP20.3,TUBE	80009	156–2391–00
A5U79	156–2391–00	IC,DGTL:ALSTTL,BFR/DRVR;OCTAL NONINV, 3–STATE;74ALS541,DIP20.3,TUBE	80009	156–2391–00
A5U82	156–2391–00	IC,DGTL:ALSTTL,BFR/DRVR;OCTAL NONINV, 3–STATE;74ALS541,DIP20.3,TUBE	80009	156–2391–00
A5U83	156–2864–00	IC,DGTL:FTTL,BFR;OCTAL, BFR/DRVR, 3–STATE;74F541,DIP20.3,TUBE	1CH66	N74F541N
A5U86	156–4278–00	IC,PROCESSOR:CMOS;ASYNCHRONOUS RCVR/XCVR W/FIFO;16550,DIP40	80009	156–4278–00
		MOUNTING PARTS		
	136–0757–00	SKT,DIP:	09922	DILB40P–108
		END MOUNTING PARTS		
A5U88	156–0879–01	IC,MISC:TTL,INTFC;1488,DIP14.3,TUBE	80009	156–0879–01
A5U89	156–0878–01	IC,MISC:TTL,INTFC;1489,DIP14.3,TUBE	80009	156–0878–01
A5U93	160–8672–00	IC,DGTL:STTL,PLD;PAL,22V10,25NS,28.5MHZ,180MA;22V10 A,DIP24.3,TUBE	80009	160–8672–00
		MOUNTING PARTS		
	136–0925–00	SKT,DIP:	91506	224–AG30D
		END MOUNTING PARTS		
A5U94	160–8673–00	IC,DGTL:STTL,PLD;PAL,22V10,25NS,28.5MHZ,180MA;22V10 A,DIP24.3,TUBE	80009	160–8673–00
		MOUNTING PARTS		
	136–0925–00	SKT,DIP:	91506	224–AG30D
		END MOUNTING PARTS		
A5Y1	119–3425–00	OSCILLATOR,RF:CRYSTAL CONT, 6.0 MHZ, +/–0.01%,CMOS,4 PIN,14 PINDIP COMPATIBLE	14301	012–401–01657

A4U723	156–0853–00	IC,LINEAR:BIPOLAR,OP–AMP,DUAL,SINGLE SUPPLY,LM358N,DIP08.3	01295	LM358P
A5Y2	158–0271–00	XTAL UNIT,QTZ:3.6864MHZ,700PPM,SER,ESR 120 OHMS,HC–18/U OR HC–49UPKG	61429	FOX–0368S
		ATTACHED PARTS		
	346–0032–00	STRAP,RETAINING:0.075 DIA X 4.0 L,MLD RBR	98159	2829–75–4
		END ATTACHED PARTS		
A6	671–1901–02	CIRCUIT BD ASSY:HD GENLOCK	80009	671–1901–02
A6	671–3972–00	CIRCUIT BD ASSY:HD GENLOCK,SPG100017 (OPTION 17 ONLY)	80009	671–3972–00
A6C58	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C59	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C60	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C61	281–0773–00	CAP,FXD,CER:MLC;0.01UF,10%,100V,SAF,0.100 X 0.170;AX	80009	281–0773–00
A6C62	281–0773–00	CAP,FXD,CER:MLC;0.01UF,10%,100V,SAF,0.100 X 0.170;AX	80009	281–0773–00
A6C63	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C64	281–0791–00	CAP,FXD,CER:MLC;270PF,10%,100V,0.100 X 0.170;AX	04222	SA102C271KAA
A6C65	281–0791–00	CAP,FXD,CER:MLC;270PF,10%,100V,0.100 X 0.170;AX	04222	SA102C271KAA
A6C66	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C67	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C68	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C69	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C70	290–0973–00	CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A6C71	290–0973–00	CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A6C72	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C73	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C74	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C77	290–0973–00	CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A6C78	290–0973–00	CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A6C79	281–0757–00	CAP,FXD,CER DI:10PF,20%,100V TUBULAR,MI	80009	281–0757–00
A6C80	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C81	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C82	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C85	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C87	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C88	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C89	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C90	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C91	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C92	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C93	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C94	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C95	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C96	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C97	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C98	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C99	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C100	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C101	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C102	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C103	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C104	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C105	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C106	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C107	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C108	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C109	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C110	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C111	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA

A4U723	156–0853–00	IC,LINEAR:BIPOLAR,OP–AMP,DUAL,SINGLE SUPPLY,LM358N,DIP08.3	01295	LM358P
A6C112	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C113	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C114	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C115	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C116	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C117	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C121	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C123	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C126	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C127	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C128	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C129	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C130	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C131	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C132	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C133	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C134	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C135	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C136	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C137	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C139	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C140	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C141	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C142	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C146	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C153	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C154	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C155	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C156	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C157	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C158	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C159	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C160	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C161	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C162	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C163	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C164	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C165	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C167	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C168	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C169	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C170	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C171	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C172	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C173	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C174	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C175	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C176	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C177	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C178	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C179	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C180	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C228	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C229	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C230	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C231	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C232	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C233	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA

A4U723	156–0853–00	IC,LINEAR:BIPOLAR,OP–AMP,DUAL,SINGLE SUPPLY,LM358N,DIP08.3	01295	LM358P
A6C234	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C235	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C236	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C237	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C238	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C239	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C240	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C241	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C242	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C243	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C245	281–0773–00	CAP,FXD,CER:MLC;0.01UF,10%,100V,SAF,0.100 X 0.170;AX	80009	281–0773–00
A6C246	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C247	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A6C248	281–0759–00	CAP,FXD,CER:MLC;22PF,10%,100V,0.100 X 0.170;AX	80009	281–0759–00
A6C249	281–0759–00	CAP,FXD,CER:MLC;22PF,10%,100V,0.100 X 0.170;AX	80009	281–0759–00
A6C250	281–0759–00	CAP,FXD,CER:MLC;22PF,10%,100V,0.100 X 0.170;AX	80009	281–0759–00
A6C251	281–0759–00	CAP,FXD,CER:MLC;22PF,10%,100V,0.100 X 0.170;AX	80009	281–0759–00
A6CR30	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A6CR31	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A6CR32	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A6CR33	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A6CR34	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A6CR35	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A6CR36	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A6J5	131–4529–00	CONN,HDR:PCB;MALE,STR,2 X 5,0.1 CTR,0.365 H X 0.112 TAIL,SHRD/4 SIDES,CTR PLZ	80009	131–4529–00
A6J7	131–3364–00	CONN,HDR:	53387	2534–6002UB
A6J8	131–4529–00	CONN,HDR:PCB;MALE,STR,2 X 5,0.1 CTR,0.365 H X 0.112 TAIL,SHRD/4 SIDES,CTR PLZ	80009	131–4529–00
A6J9	131–5453–00	CONN,RF JACK:BNC–TWIN;MALE/FEM,RTANG,PCB/REAR PNL,0.174 MLG X	80009	131–5453–00
A6J10	131–5453–00	CONN,RF JACK:BNC–TWIN;MALE/FEM,RTANG,PCB/REAR PNL,0.174 MLG X	80009	131–5453–00
A6J11	131–3364–00	CONN,HDR:	53387	2534–6002UB
A6J12	131–3364–00	CONN,HDR:	53387	2534–6002UB
A6J13	131–3364–00	CONN,HDR:	53387	2534–6002UB
A6L7	108–0215–00	COIL,RF:IDCTR;FXD,1.1UH,10%,38AWG,31 TURNS,276–0020–00 FORM,NYL	TK1345	108–0215–00
A6L8	108–0215–00	COIL,RF:IDCTR;FXD,1.1UH,10%,38AWG,31 TURNS,276–0020–00 FORM,NYL	TK1345	108–0215–00
A6Q29	151–0720–00	XSTR,SIG:BIPOLAR,NPN;25V,50MA,650MHZ, AMPL;MPSH10,TO–92 BEC	80009	151–0720–00
A6Q30	151–0622–00	XSTR,SIG:BIPOLAR,PNP;40V,1.0A,50MHZ, AMPL;2N6727/MPS6727/MPSW51A,TO–237/TO–226AE EBC	80009	151–0622–00
A6Q31	151–0710–00	XSTR,SIG:BIPOLAR,NPN;40V,1.0A,50MHZ, AMPL;2N6715/MPSW01A,TO–237/TO–226AE	80009	151–0710–00
A6Q32	151–0188–00	XSTR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ, AMPL;2N3906,TO–92 EBC	80009	151–0188–00
A6Q34	151–0192–00	XSTR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ, AMPL;MPS6521,TO–92 EBC	80009	151–0192–00
A6Q35	151–0719–00	XSTR,SIG:BIPOLAR,PNP;20V,50MA,600MHZ, AMPL;MPSH81,TO–92 BEC	80009	151–0719–00
A6Q36	151–0719–00	XSTR,SIG:BIPOLAR,PNP;20V,50MA,600MHZ, AMPL;MPSH81,TO–92 BEC	80009	151–0719–00
A6Q37	151–0720–00	XSTR,SIG:BIPOLAR,NPN;25V,50MA,650MHZ, AMPL;MPSH10,TO–92 BEC	80009	151–0720–00
A6R163	307–0503–00	RES NTWK,FXD,FI:(9) 510 OHM,20%,0.125W	91637	CSC10A01511GDO3
A6R164	307–0503–00	RES NTWK,FXD,FI:(9) 510 OHM,20%,0.125W	91637	CSC10A01511GDO3
A6R167	307–0503–00	RES NTWK,FXD,FI:(9) 510 OHM,20%,0.125W	91637	CSC10A01511GDO3

A4U723	156–0853–00	IC,LINEAR:BIPOLAR,OP–AMP,DUAL,SINGLE SUPPLY,LM358N,DIP08.3	01295	LM358P
A6R168	307–0503–00	RES NTWK,FXD,FI:(9) 510 OHM,20%,0.125W	91637	CSC10A01511GDO3
A6R169	307–0503–00	RES NTWK,FXD,FI:(9) 510 OHM,20%,0.125W	91637	CSC10A01511GDO3
A6R170	307–0503–00	RES NTWK,FXD,FI:(9) 510 OHM,20%,0.125W	91637	CSC10A01511GDO3
A6R171	322–3164–00	RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A6R172	322–3164–00	RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A6R173	322–3164–00	RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A6R174	322–3164–00	RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A6R175	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A6R176	322–3260–00	RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K99
A6R177	322–3260–00	RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K99
A6R178	322–3346–00	RES,FXD:MET FILM;39.2K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3346–00
A6R179	322–3306–00	RES,FXD:MET FILM;15K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 15K0
A6R180	322–3231–00	RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322–3231–00
A6R181	322–3231–00	RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322–3231–00
A6R182	322–3289–00	RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A6R183	307–0503–00	RES NTWK,FXD,FI:(9) 510 OHM,20%,0.125W	91637	CSC10A01511GDO3
A6R184	322–3289–00	RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A6R185	322–3289–00	RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A6R186	322–3289–00	RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A6R187	322–3243–00	RES,FXD:MET FILM;3.32K OHM,1%,0.2W,TC=100 PPM;AX	91637	CCF50–1–G33200F
A6R188	322–3260–00	RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K99
A6R189	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A6R190	322–3164–00	RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A6R191	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A6R192	322–3164–00	RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A6R193	322–3231–00	RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322–3231–00
A6R194	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A6R196	322–3164–00	RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A6R198	322–3158–00	RES,FXD,FILM:432 OHM,1%,0.2W,TC=T0	80009	322–3158–00
A6R199	322–3126–00	RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A6R200	322–3126–00	RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A6R201	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A6R202	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A6R203	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A6R204	322–3126–00	RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A6R205	322–3126–00	RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A6R206	322–3001–00	RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3001–00
A6R207	322–3001–00	RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3001–00
A6R208	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A6R209	307–0503–00	RES NTWK,FXD,FI:(9) 510 OHM,20%,0.125W	91637	CSC10A01511GDO3
A6R210	322–3021–00	RES,FXD,FILM:16.2 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 16E2
A6R211	322–3021–00	RES,FXD,FILM:16.2 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 16E2
A6R214	322–3021–00	RES,FXD,FILM:16.2 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 16E2
A6R215	322–3021–00	RES,FXD,FILM:16.2 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 16E2
A6R216	322–3108–00	RES,FXD,FILM:130 OHM,1%,0.2W,TC=T0	80009	322–3108–00
A6R217	322–3108–00	RES,FXD,FILM:130 OHM,1%,0.2W,TC=T0	80009	322–3108–00
A6R218	322–3108–00	RES,FXD,FILM:130 OHM,1%,0.2W,TC=T0	80009	322–3108–00
A6R219	322–3108–00	RES,FXD,FILM:130 OHM,1%,0.2W,TC=T0	80009	322–3108–00
A6R220	322–3089–00	RES,FXD:MET FILM;82.5 OHM,1%.0.2W,TC=100 PPM;AXIAL	80009	322–3089–00
A6R221	322–3089–00	RES,FXD:MET FILM;82.5 OHM,1%.0.2W,TC=100 PPM;AXIAL	80009	322–3089–00
A6R222	322–3089–00	RES,FXD:MET FILM;82.5 OHM,1%.0.2W,TC=100 PPM;AXIAL	80009	322–3089–00
A6R223	322–3089–00	RES,FXD:MET FILM;82.5 OHM,1%.0.2W,TC=100 PPM;AXIAL	80009	322–3089–00
A6R224	307–0503–00	RES NTWK,FXD,FI:(9) 510 OHM,20%,0.125W	91637	CSC10A01511GDO3
A6R225	307–0503–00	RES NTWK,FXD,FI:(9) 510 OHM,20%,0.125W	91637	CSC10A01511GDO3
A6R226	307–0503–00	RES NTWK,FXD,FI:(9) 510 OHM,20%,0.125W	91637	CSC10A01511GDO3
A6R227	307–0503–00	RES NTWK,FXD,FI:(9) 510 OHM,20%,0.125W	91637	CSC10A01511GDO3
A6R228	307–0503–00	RES NTWK,FXD,FI:(9) 510 OHM,20%,0.125W	91637	CSC10A01511GDO3
A6R229	307–0503–00	RES NTWK,FXD,FI:(9) 510 OHM,20%,0.125W	91637	CSC10A01511GDO3

A4U723	156–0853–00	IC,LINEAR:BIPOLAR,OP–AMP,DUAL,SINGLE SUPPLY,LM358N,DIP08.3	01295	LM358P
A6R243	307–0503–00	RES NTWK,FXD,FI:(9) 510 OHM,20%,0.125W	91637	CSC10A01511GDO3
A6R244	322–3097–00	RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 100E
A6R245	322–3163–00	RES,FXD,FILM:487 OHM,1%,0.2W,TC=T0	91637	CCF50–2G487R0F
A6R246	307–0695–00	RES NTWK,FXD,FI:9,150 OHM,2%,0.2W EA	11236	750–101–R150 OHM
A6R247	307–0695–00	RES NTWK,FXD,FI:9,150 OHM,2%,0.2W EA	11236	750–101–R150 OHM
A6R250	307–0445–00	RES,NTWK:THICK FILM;(9) 4.7K OHM,2%,0.2W EACH,TC=100 PPM;SIP10,PIN 1 COMMON	91637	MSP10A01472GD03
A6R251	307–0445–00	RES,NTWK:THICK FILM;(9) 4.7K OHM,2%,0.2W EACH,TC=100 PPM;SIP10,PIN 1 COMMON	91637	MSP10A01472GD03
A6R252	322–3134–00	RES,FXD,FILM:243 OHM,1%,0.2W,TC=T0	80009	322–3134–00
A6R253	322–3134–00	RES,FXD,FILM:243 OHM,1%,0.2W,TC=T0	80009	322–3134–00
A6R254	322–3226–00	RES,FXD:MET FILM;2.21K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 2K21
A6R255	322–3289–00	RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A6R256	322–3134–00	RES,FXD,FILM:243 OHM,1%,0.2W,TC=T0	80009	322–3134–00
A6R257	322–3114–00	RES,FXD:MET FILM;150 OHM,1%,0.2W,TC=100 PPM;AXIAL	91637	CCF50–2–G1500F
A6R258	322–3097–00	RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 100E
A6R259	317–0047–00	RES,FXD,CMPSN:4.7 OHM,5%,0.125W	80009	317–0047–00
A6R260	317–0047–00	RES,FXD,CMPSN:4.7 OHM,5%,0.125W	80009	317–0047–00
A6R261	322–3114–00	RES,FXD:MET FILM;150 OHM,1%,0.2W,TC=100 PPM;AXIAL	91637	CCF50–2–G1500F
A6R262	307–0738–00	RES NTWK,FXD,FI:10,270 OHM,2%,0.19 EACH	91637	CSC11B–1–271G
A6R263	307–0738–00	RES NTWK,FXD,FI:10,270 OHM,2%,0.19 EACH	91637	CSC11B–1–271G
A6R264	322–3134–00	RES,FXD,FILM:243 OHM,1%,0.2W,TC=T0	80009	322–3134–00
A6R265	322–3134–00	RES,FXD,FILM:243 OHM,1%,0.2W,TC=T0	80009	322–3134–00
A6R266	322–3114–00	RES,FXD:MET FILM;150 OHM,1%,0.2W,TC=100 PPM;AXIAL	91637	CCF50–2–G1500F
A6R267	322–3114–00	RES,FXD:MET FILM;150 OHM,1%,0.2W,TC=100 PPM;AXIAL	91637	CCF50–2–G1500F
A6R268	322–3134–00	RES,FXD,FILM:243 OHM,1%,0.2W,TC=T0	80009	322–3134–00
A6R269	322–3114–00	RES,FXD:MET FILM;150 OHM,1%,0.2W,TC=100 PPM;AXIAL	91637	CCF50–2–G1500F
A6R270	322–3134–00	RES,FXD,FILM:243 OHM,1%,0.2W,TC=T0	80009	322–3134–00
A6R271	322–3114–00	RES,FXD:MET FILM;150 OHM,1%,0.2W,TC=100 PPM;AXIAL	91637	CCF50–2–G1500F
A6R272	322–3134–00	RES,FXD,FILM:243 OHM,1%,0.2W,TC=T0	80009	322–3134–00
A6S1	260–2126–00	SW,RTRY:MEM SEL	80009	260–2126–00
A6S2	260–2126–00	SW,RTRY:MEM SEL	80009	260–2126–00
A6S3	260–2126–00	SW,RTRY:MEM SEL	80009	260–2126–00
A6S4	260–2126–00	SW,RTRY:MEM SEL	80009	260–2126–00
A6TP1	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A6TP2	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A6TP3	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A6TP4	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A6TP5	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A6TP6	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A6TP7	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A6TP8	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A6TP9	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A6TP10	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A6TP11	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A6TP12	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02

A4U723	156–0853–00	IC,LINEAR:BIPOLAR,OP–AMP,DUAL,SINGLE SUPPLY,LM358N,DIP08.3	01295	LM358P
A6TP13	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A6TP14	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A6U17	156–0368–03	IC,DGTL:ECL,XLTR;QUAD TTL–TO–ECL;10124,DIP16.3	80009	156–0368–03
A6U18	156–0368–03	IC,DGTL:ECL,XLTR;QUAD TTL–TO–ECL;10124,DIP16.3	80009	156–0368–03
A6U19	156–0368–03	IC,DGTL:ECL,XLTR;QUAD TTL–TO–ECL;10124,DIP16.3	80009	156–0368–03
A6U20	156–0368–03	IC,DGTL:ECL,XLTR;QUAD TTL–TO–ECL;10124,DIP16.3	80009	156–0368–03
A6U21	156–2142–00	IC,DGTL:ECL,CNTR;4–BIT BIN;10H016,DIP16.3,TUBE	80009	156–2142–00
A6U22	156–2142–00	IC,DGTL:ECL,CNTR;4–BIT BIN;10H016,DIP16.3,TUBE	80009	156–2142–00
A6U23	156–2142–00	IC,DGTL:ECL,CNTR;4–BIT BIN;10H016,DIP16.3,TUBE	80009	156–2142–00
A6U24	156–2142–00	IC,DGTL:ECL,CNTR;4–BIT BIN;10H016,DIP16.3,TUBE	80009	156–2142–00
A6U25	156–1642–01	IC,DGTL:ECL,GATE;TPL 2–3–2 IN OR/NOR;10H105,DIP16.3	80009	156–1642–01
A6U26	156–1642–01	IC,DGTL:ECL,GATE;TPL 2–3–2 IN OR/NOR;10H105,DIP16.3	80009	156–1642–01
A6U27	156–1664–00	IC,DGTL:ALSTTL,FLIP FLOP;OCTAL NONINV D–TYPE, 3–STATE;74ALS574,DIP20.3,TUBE	80009	156–1664–00
A6U28	156–1664–00	IC,DGTL:ALSTTL,FLIP FLOP;OCTAL NONINV D–TYPE, 3–STATE;74ALS574,DIP20.3,TUBE	80009	156–1664–00
A6U29	156–0230–02	IC,DGTL:ECL,FLIP FLOP;DUAL D–TYPE MASTER SLAVE;10131,DIP16.3,TUBE,CER PACK	80009	156–0230–02
A6U30	156–0230–02	IC,DGTL:ECL,FLIP FLOP;DUAL D–TYPE MASTER SLAVE;10131,DIP16.3,TUBE,CER PACK	80009	156–0230–02
A6U46	156–1712–00	IC,DGTL:ECL,FLIP FLOP;HEX D–TYPE MASTER SLAVE;10H176,DIP16.3	04713	MC10H176 P
A6U47	160–7880–01	IC,DGTL:ECL,PLD;PAL,10E301,6NS,170MA;10E301L–6, DIP24.3	80009	160–7880–01
A6U47	163–0840–00	IC. DIGITAL:ECL,PLD,PAL,10E301,6NS,170MA, 10E301L–6,DIP 24.3,TUBE (OPTION 17 ONLY)	80009	163–0840–00
		MOUNTING PARTS		
	136–0925–00	SKT,DIP:	91506	224–AG30D
		END MOUNTING PARTS		
A6U48	156–0316–04	IC,DGTL:ECL,XLTR;QUAD ECL TO TTL;10125,DIP16.3,TUBE	04713	MC10125P/L
A6U49	156–0316–04	IC,DGTL:ECL,XLTR;QUAD ECL TO TTL;10125,DIP16.3,TUBE	04713	MC10125P/L
A6U50	156–0368–03	IC,DGTL:ECL,XLTR;QUAD TTL–TO–ECL;10124,DIP16.3	80009	156–0368–03
A6U51	160–7509–00	IC,DGTL:CMOS,PLD;OTP,22V10,25NS,33.3MHZ,90MA; 22V10–25,DIP24.3	80009	160–7509–00
A6U51	163–0841–00	IC,DIGITAL:CMOS,PLD,OTP,22V10,25NS,33.3 MHZ, 90MA,22V10–25,DIP 24.3,TUBE (OPTION 17 ONLY)	80009	163–0841–00
		MOUNTING PARTS		
	136–0925–00	SKT,DIP:	91506	224–AG30D
		END MOUNTING PARTS		
A6U52	156–1664–00	IC,DGTL:ALSTTL,FLIP FLOP;OCTAL NONINV D–TYPE, 3–STATE;74ALS574,DIP20.3,TUBE	80009	156–1664–00
A6U53	160–8377–02	IC,DGTL:HCTCMOS,CNTR,74HCT4520	80009	160–8377–02
A6U53	163–0842–00	IC, MEMORY:CMOS,EPROM,16 K X 8 ,150NS,27C128, DIP 28.6 (OPTION 17 ONLY)	80009	163–0842–00
		MOUNTING PARTS		
	136–0751–00	SKT,DIP:	09922	DILB24P108
		END MOUNTING PARTS		
A6U54	156–0316–04	IC,DGTL:ECL,XLTR;QUAD ECL TO TTL;10125,DIP16.3,TUBE	04713	MC10125P/L
A6U55	156–0368–03	IC,DGTL:ECL,XLTR;QUAD TTL–TO–ECL;10124,DIP16.3	80009	156–0368–03
A6U56	156–1756–00	IC,DGTL:ALSTTL,FLIP FLOP;DUAL D–TYPE W/ CLR;74ALS74,DIP14.3	01295	SN74ALS74NP3/JP4
A6U57	156–1756–00	IC,DGTL:ALSTTL,FLIP FLOP;DUAL D–TYPE W/ CLR;74ALS74,DIP14.3	01295	SN74ALS74NP3/JP4
A6U58	156–2334–00	IC,DGTL:ALSTTL,CNTR;SYNCH 4–BIT UP/DWN BIN;74ALS191,DIP16.3,TUBE	01295	SN74ALS191N3
A6U60	156–1712–00	IC,DGTL:ECL,FLIP FLOP;HEX D–TYPE MASTER SLAVE;10H176,DIP16.3	04713	MC10H176 P
A6U62	156–1640–00	IC,DGTL:ECL,RCVR;TPL LINE;10H116,DIP16.3,TUBE	80009	156–1640–00

A4U723	156–0853–00		IC,LINEAR:BIPOLAR,OP–AMP,DUAL,SINGLE SUPPLY,LM358N,DIP08.3	01295	LM358P
A6U63	156–1641–00		IC,DGTL:ECL,GATE;QUAD 2–IN NOR;10H102,DIP16.3,TUBE	80009	156–1641–00
A6U64	160–8069–01	671–1901–01	IC,DGTL:CMOS,PLD;OTP,22V10,25NS,33.3MHZ,90MA;22V10 –25,DIP24.3	80009	160–8069–01
A6U64	163–0843–00		IC, DIGITAL:CMOS,PLD,OTP,22V10,25NS,33.3 MHZ, 90MA,22V10–25,DIP 24.3,TUBE (OPTION 17 ONLY)	80009	163–0843–00
			MOUNTING PARTS		
	136–0925–00		SKT,DIP:	91506	224–AG30D
			END MOUNTING PARTS		
A6U65	156–2586–00		IC,DGTL:ALSTTL,CNTR;SYNCH 4–BIT BIN;74ALS163,DIP16.3,TUBE	80009	156–2586–00
A6U66	156–1756–00		IC,DGTL:ALSTTL,FLIP FLOP;DUAL D–TYPE W/ CLR;74ALS74,DIP14.3	01295	SN74ALS74NP3/JP4
A6U67	156–0230–02		IC,DGTL:ECL,FLIP FLOP;DUAL D–TYPE MASTER SLAVE;10131,DIP16.3,TUBE,CER PACK	80009	156–0230–02
A6U69	156–0853–02		IC,LIN:BIPOLAR,OP–AMP;LM358N,DIP08.3	80009	156–0853–02
A6U70	156–1173–00		IC,LIN:BIPOLAR,V REF;POS,2.5V,1.0%,40PPM,SER; MC1403U,DIP08.3	80009	156–1173–00
A6U71	156–1381–00		IC,LIN:BIPOLAR,XSTR ARRAY;THREE NPN,TWO PNP,IN-DEP;CA3096AE,DIP16.3	02735	CA3096AE–17
A6U73	156–1381–00		IC,LIN:BIPOLAR,XSTR ARRAY;THREE NPN,TWO PNP,IN-DEP;CA3096AE,DIP16.3	02735	CA3096AE–17
A6U74	156–1640–00		IC,DGTL:ECL,RCVR;TPL LINE;10H116,DIP16.3,TUBE	80009	156–1640–00
A6U75	156–1639–00		IC,DGTL:ECL,FLIP FLOP;DUAL D–TYPE MASTER–SLAVE;10H131,DIP16.3,TUBE	80009	156–1639–00
A6U77	156–1640–00		IC,DGTL:ECL,RCVR;TPL LINE;10H116,DIP16.3,TUBE	80009	156–1640–00
A6U78	156–1664–00		IC,DGTL:ALSTTL,FLIP FLOP;OCTAL NONINV D–TYPE, 3–STATE;74ALS574,DIP20.3,TUBE	80009	156–1664–00
A6U80	156–0368–03		IC,DGTL:ECL,XLTR;QUAD TTL–TO–ECL;10124,DIP16.3	80009	156–0368–03
A6U81	156–0368–03		IC,DGTL:ECL,XLTR;QUAD TTL–TO–ECL;10124,DIP16.3	80009	156–0368–03
A6U82	156–0368–03		IC,DGTL:ECL,XLTR;QUAD TTL–TO–ECL;10124,DIP16.3	80009	156–0368–03
A6U83	156–0368–03		IC,DGTL:ECL,XLTR;QUAD TTL–TO–ECL;10124,DIP16.3	80009	156–0368–03
A6U84	156–2480–00		IC,DGTL:ECL,COMPTR;5–BIT MAGTD;10H166,DIP16.3,TUBE,CER PACK,SCRN	04713	MC10H166(LDORP)
A6U85	156–2480–00		IC,DGTL:ECL,COMPTR;5–BIT MAGTD;10H166,DIP16.3,TUBE,CER PACK,SCRN	04713	MC10H166(LDORP)
A6U86	156–2480–00		IC,DGTL:ECL,COMPTR;5–BIT MAGTD;10H166,DIP16.3,TUBE,CER PACK,SCRN	04713	MC10H166(LDORP)
A6U87	156–1639–00		IC,DGTL:ECL,FLIP FLOP;DUAL D–TYPE MASTER–SLAVE;10H131,DIP16.3,TUBE	80009	156–1639–00
A6U88	156–1640–00		IC,DGTL:ECL,RCVR;TPL LINE;10H116,DIP16.3,TUBE	80009	156–1640–00
A6U91	156–0368–03		IC,DGTL:ECL,XLTR;QUAD TTL–TO–ECL;10124,DIP16.3	80009	156–0368–03
A6U92	156–0368–03		IC,DGTL:ECL,XLTR;QUAD TTL–TO–ECL;10124,DIP16.3	80009	156–0368–03
A6U93	156–0368–03		IC,DGTL:ECL,XLTR;QUAD TTL–TO–ECL;10124,DIP16.3	80009	156–0368–03
A6U94	156–0368–03		IC,DGTL:ECL,XLTR;QUAD TTL–TO–ECL;10124,DIP16.3	80009	156–0368–03
A6U95	156–2480–00		IC,DGTL:ECL,COMPTR;5–BIT MAGTD;10H166,DIP16.3, TUBE,CER PACK,SCRN	04713	MC10H166(LDORP)
A6U96	156–2480–00		IC,DGTL:ECL,COMPTR;5–BIT MAGTD;10H166,DIP16.3, TUBE,CER PACK,SCRN	04713	MC10H166(LDORP)
A6U97	156–2480–00		IC,DGTL:ECL,COMPTR;5–BIT MAGTD;10H166,DIP16.3, TUBE,CER PACK,SCRN	04713	MC10H166(LDORP)
A6U99	156–1756–00		IC,DGTL:ALSTTL,FLIP FLOP;DUAL D–TYPE W/ CLR;74ALS74,DIP14.3	01295	SN74ALS74NP3/JP4
A6U101	156–2391–00		IC,DGTL:ALSTTL,BFR/DRVR;OCTAL NONINV, 3–STATE;74ALS541,DIP20.3,TUBE	80009	156–2391–00
A6U102	160–8066–01		IC,DGTL:CMOS,PLD;EEPLD,22V10,15NS,130MA;22V10–15,DIP24.3	80009	160–8066–01
			MOUNTING PARTS		
	136–0925–00		SKT,DIP:	91506	224–AG30D
			END MOUNTING PARTS		

A4U723	156–0853–00	IC,LINEAR:BIPOLAR,OP–AMP,DUAL,SINGLE SUPPLY,LM358N,DIP08.3	01295	LM358P
A6U103	160–8067–01	IC,DGTL:CMOS,PLD;EEPLD,22V10,15NS,130MA;22V10–15,DIP24.3	80009	160–8067–01
		MOUNTING PARTS		
	136–0925–00	SKT,DIP:	91506	224–AG30D
		END MOUNTING PARTS		
A6U104	160–8068–01	IC,DGTL:CMOS,PLD;EEPLD,22V10,15NS,130MA;22V10–15,DIP24.3	80009	160–8068–01
		MOUNTING PARTS		
	136–0925–00	SKT,DIP:	91506	224–AG30D
		END MOUNTING PARTS		
A6U105	156–1748–02	IC,DGTL:ALSTTL,XCVR;OCTAL NONINV, 3–STATE;74ALS245,DIP20.3,TUBE	01295	SN74ALS245AN3
A6U107	156–1191–00	IC,LIN:BIFET,OP–AMP;DUAL;TL072CN/LF353N,DIP08.3	80009	156–1191–00
A6U108	156–2870–00	IC,CONV:CMOS,D/A;12 BIT,CUR OUT,MPU COMPATIBLE,MULTIPLYING;AD7545AKN,DIP20.3	80009	156–2870–00
A6U110	156–2391–00	IC,DGTL:ALSTTL,BFR/DRVR;OCTAL NONINV, 3–STATE;74ALS541,DIP20.3,TUBE	80009	156–2391–00
A6U111	156–2391–00	IC,DGTL:ALSTTL,BFR/DRVR;OCTAL NONINV, 3–STATE;74ALS541,DIP20.3,TUBE	80009	156–2391–00
A6U113	156–1640–00	IC,DGTL:ECL,RCVR;TPL LINE;10H116,DIP16.3,TUBE	80009	156–1640–00
A6U114	156–2391–00	IC,DGTL:ALSTTL,BFR/DRVR;OCTAL NONINV, 3–STATE;74ALS541,DIP20.3,TUBE	80009	156–2391–00
A6U115	156–1756–00	IC,DGTL:ALSTTL,FLIP FLOP;DUAL D–TYPE W/ CLR;74ALS74,DIP14.3	01295	SN74ALS74NP3/JP4
A6U116	156–1756–00	IC,DGTL:ALSTTL,FLIP FLOP;DUAL D–TYPE W/ CLR;74ALS74,DIP14.3	01295	SN74ALS74NP3/JP4
A6U117	160–8070–01	IC,DGTL:CMOS,PLD;OTP,5064,64 MACROCELL,30NS;5064–30,PLCC44,TUBE	80009	160–8070–01
		MOUNTING PARTS		
	136–1047–00	SKT,PLCC:PCB;44 POS,0.05 CTR,0.360 H X 0.125 TAIL,TIN	80009	136–1047–00
		END MOUNTING PARTS		
A6U118	160–8638–00	IC,DGTL:STTL,PLD;PAL,20L8,25NS,210MA;20L8,DIP24.3	80009	160–8638–00
		MOUNTING PARTS		
	136–0925–00	SKT,DIP:	91506	224–AG30D
		END MOUNTING PARTS		
A6U119	156–1642–01	IC,DGTL:ECL,GATE;TPL 2–3–2 IN OR/NOR;10H105,DIP16.3,TUBE	80009	156–1642–01
A6U120	156–0316–04	IC,DGTL:ECL,XLTR;QUAD ECL TO TTL;10125,DIP16.3,TUBE	04713	MC10125P/L
A6W1	131–4566–00	BUS,CNDCTR:0 OHM,300 SPACING,SM BODY	80009	131–4566–00
A6W2	131–4566–00	BUS,CNDCTR:0 OHM,300 SPACING,SM BODY	80009	131–4566–00
A7	671–2071–02	CIRCUIT BD ASSY:HD REF IN	80009	671–2071–02
A7C7	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C8	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C13	290–0973–00	CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A7C16	281–0773–00	CAP,FXD,CER:MLC;0.01UF,10%,100V,SAF,0.100 X 0.170;AX	80009	281–0773–00
A7C17	281–0865–00	CAP,FXD,CER DI:1000PF,5%,100V	04222	SA201A102JAA
A7C18	281–0773–00	CAP,FXD,CER:MLC;0.01UF,10%,100V,SAF,0.100 X 0.170;AX	80009	281–0773–00
A7C19	281–0863–00	CAP,FXD,CER:MLC;240PF,5%,100V,0.100 X 0.170;AXIAL,MI	04222	SA101A241JAA
A7C20	281–0865–00	CAP,FXD,CER DI:1000PF,5%,100V	04222	SA201A102JAA
A7C21	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C24	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C25	283–0638–00	CAP,FXD,MICA DI:130PF,1%,500V	80009	283–0638–00
A7C26	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C27	283–0796–00	CAP,FXD,MICA DI:100PF,5%,500V	80009	283–0796–00
A7C29	281–0773–00	CAP,FXD,CER:MLC;0.01UF,10%,100V,SAF,0.100 X 0.170;AX	80009	281–0773–00
A7C30	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C31	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C32	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA

A4U723	156–0853–00	IC,LINEAR:BIPOLAR,OP–AMP,DUAL,SINGLE SUPPLY,LM358N,DIP08.3	01295	LM358P
A7C33	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C34	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C35	281–0772–00	CAP,FXD,CER:MLC;4700PF,10%,100V,0.100 X 0.170;AX	04222	SA101C472KAA
A7C36	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C37	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C40	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C42	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C43	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C44	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C45	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C46	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C47	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C48	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C49	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C50	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C51	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C52	281–0765–00	CAP,FXD,CER DI:100PF,5%,100V	04222	SA102A101JAA
A7C53	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C55	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C56	281–0865–00	CAP,FXD,CER DI:1000PF,5%,100V	04222	SA201A102JAA
A7C57	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C58	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C59	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C60	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C61	290–0973–00	CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A7C62	290–0973–00	CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A7C63	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C64	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C65	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C66	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C67	290–0973–00	CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A7C68	290–0973–00	CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A7C69	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C70	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C72	290–0973–00	CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A7C73	290–0973–00	CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A7C74	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C75	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C76	281–0773–00	CAP,FXD,CER:MLC;0.01UF,10%,100V,SAF,0.100 X 0.170;AX	80009	281–0773–00
A7C77	281–0759–00	CAP,FXD,CER:MLC;22PF,10%,100V,0.100 X 0.170;AXIAL,MI	80009	281–0759–00
A7C78	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C79	281–0865–00	CAP,FXD,CER DI:1000PF,5%,100V	04222	SA201A102JAA
A7C80	281–0773–00	CAP,FXD,CER:MLC;0.01UF,10%,100V,SAF,0.100 X 0.170;AX	80009	281–0773–00
A7C81	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C82	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7C83	281–0865–00	CAP,FXD,CER DI:1000PF,5%,100V	04222	SA201A102JAA
A7C84	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A7CR4	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR5	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR6	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR7	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR8	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR9	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR10	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR11	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR12	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR13	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR14	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00

A4U723	156–0853–00	IC,LINEAR:BIPOLAR,OP–AMP,DUAL,SINGLE SUPPLY,LM358N,DIP08.3	01295	LM358P
A7CR17	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR18	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR19	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR20	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR21	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR22	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR23	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR24	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR25	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR28	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR29	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR30	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR31	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR32	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR34	152–0141–02	DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A7CR35	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7CR36	152–0322–00	DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811,T&R	80009	152–0322–00
A7J1	131–3378–00	CONN,RF JACK:	00779	227677–1
A7J2	131–0391–00	CONN,RF JACK:	80009	131–0391–00
A7J4	131–0608–00	TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 2)	80009	131–0608–00
A7J5	131–3364–00	CONN,HDR:	53387	2534–6002UB
A7L1	108–0642–00	COIL,RF:FXD,30NH,+/–15%,FORM 276–0145–00	80009	108–0642–00
A7L3	108–0317–00	COIL,RF:FXD,15 UH	TK1345	108–0317–00
A7L4	108–0215–00	COIL,RF:IDCTR;FXD,1.1UH,10%,38AWG,31 TURNS,276–0020–00 FORM,NYL	TK1345	108–0215–00
A7L5	108–0215–00	COIL,RF:IDCTR;FXD,1.1UH,10%,38AWG,31 TURNS,276–0020–00 FORM,NYL	TK1345	108–0215–00
A7L6	108–0215–00	COIL,RF:IDCTR;FXD,1.1UH,10%,38AWG,31 TURNS,276–0020–00 FORM,NYL	TK1345	108–0215–00
A7L7	108–0215–00	COIL,RF:IDCTR;FXD,1.1UH,10%,38AWG,31 TURNS,276–0020–00 FORM,NYL	TK1345	108–0215–00
A7Q3	151–0720–00	XSTR,SIG:BIPOLAR,NPN;25V,50MA,650MHZ, AMPL;MPSH10,TO–92 BEC	80009	151–0720–00
A7Q4	151–0719–00	XSTR,SIG:BIPOLAR,PNP;20V,50MA,600MHZ, AMPL;MPSH81,TO–92 BEC	80009	151–0719–00
A7Q5	151–1103–00	XSTR,SIG:DMOSFET,N–CH;ENH,2V,50MA,45 OHM;SD210DE,TO–72	80009	151–1103–00
A7Q6	151–0720–00	XSTR,SIG:BIPOLAR,NPN;25V,50MA,650MHZ, AMPL;MPSH10,TO–92 BEC	80009	151–0720–00
A7Q7	151–0720–00	XSTR,SIG:BIPOLAR,NPN;25V,50MA,650MHZ, AMPL;MPSH10,TO–92 BEC	80009	151–0720–00
A7Q8	151–0720–00	XSTR,SIG:BIPOLAR,NPN;25V,50MA,650MHZ, AMPL;MPSH10,TO–92 BEC	80009	151–0720–00
A7Q9	151–0720–00	XSTR,SIG:BIPOLAR,NPN;25V,50MA,650MHZ, AMPL;MPSH10,TO–92 BEC	80009	151–0720–00
A7Q10	151–0720–00	XSTR,SIG:BIPOLAR,NPN;25V,50MA,650MHZ, AMPL;MPSH10,TO–92 BEC	80009	151–0720–00
A7Q11	151–0719–00	XSTR,SIG:BIPOLAR,PNP;20V,50MA,600MHZ, AMPL;MPSH81,TO–92 BEC	80009	151–0719–00
A7Q12	151–0719–00	XSTR,SIG:BIPOLAR,PNP;20V,50MA,600MHZ, AMPL;MPSH81,TO–92 BEC	80009	151–0719–00
A7Q19	151–0719–00	XSTR,SIG:BIPOLAR,PNP;20V,50MA,600MHZ, AMPL;MPSH81,TO–92 BEC	80009	151–0719–00
A7Q20	151–0720–00	XSTR,SIG:BIPOLAR,NPN;25V,50MA,650MHZ, AMPL;MPSH10,TO–92 BEC	80009	151–0720–00
A7Q21	151–0719–00	XSTR,SIG:BIPOLAR,PNP;20V,50MA,600MHZ, AMPL;MPSH81,TO–92 BEC	80009	151–0719–00
A7Q22	151–0719–00	XSTR,SIG:BIPOLAR,PNP;20V,50MA,600MHZ, AMPL;MPSH81,TO–92 BEC	80009	151–0719–00

A4U723	156–0853–00	IC,LINEAR:BIPOLAR,OP–AMP,DUAL,SINGLE SUPPLY,LM358N,DIP08.3	01295	LM358P
A7Q23	151–0720–00	XSTR,SIG:BIPOLAR,NPN;25V,50MA,650MHZ, AMPL;MPSH10,TO–92 BEC	80009	151–0720–00
A7Q24	151–0720–00	XSTR,SIG:BIPOLAR,NPN;25V,50MA,650MHZ, AMPL;MPSH10,TO–92 BEC	80009	151–0720–00
A7Q25	151–0720–00	XSTR,SIG:BIPOLAR,NPN;25V,50MA,650MHZ, AMPL;MPSH10,TO–92 BEC	80009	151–0720–00
A7Q26	151–0719–00	XSTR,SIG:BIPOLAR,PNP;20V,50MA,600MHZ, AMPL;MPSH81,TO–92 BEC	80009	151–0719–00
A7Q27	151–0720–00	XSTR,SIG:BIPOLAR,NPN;25V,50MA,650MHZ, AMPL;MPSH10,TO–92 BEC	80009	151–0720–00
A7Q28	151–0710–00	XSTR,SIG:BIPOLAR,NPN;40V,1.0A,50MHZ, AMPL;2N6715/MPSW01A,TO–237/TO–226AE	80009	151–0710–00
A7Q29	151–0622–00	XSTR,SIG:BIPOLAR,PNP;40V,1.0A,50MHZ, AMPL; 2N6727/MPS6727/MPSW51A,TO–237/TO–226AE EBC	80009	151–0622–00
A7Q31	151–0720–00	XSTR,SIG:BIPOLAR,NPN;25V,50MA,650MHZ, AMPL;MPSH10,TO–92 BEC	80009	151–0720–00
A7Q32	151–0719–00	XSTR,SIG:BIPOLAR,PNP;20V,50MA,600MHZ, AMPL;MPSH81,TO–92 BEC	80009	151–0719–00
A7Q33	151–0720–00	XSTR,SIG:BIPOLAR,NPN;25V,50MA,650MHZ, AMPL;MPSH10,TO–92 BEC	80009	151–0720–00
A7R1	322–3058–00	RES,FXD:MET FILM;39.2 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3058–00
A7R2	322–3056–00	RES,FXD,FILM:37.4 OHM,1%,0.2W,TC=T0	91637	CCF50–2F37R40F
A7R3	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R5	322–3207–00	RES,FXD,FILM:1.4K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K4
A7R6	322–3068–00	RES,FXD:MET FILM;49.9 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3068–00
A7R28	322–3001–00	RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3001–00
A7R29	322–3001–00	RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3001–00
A7R40	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R41	322–3164–00	RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A7R44	322–3135–00	RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0	80009	322–3135–00
A7R45	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R46	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R47	322–3289–00	RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A7R48	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R49	322–3402–00	RES,FXD:MET FILM;150K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3402–00
A7R50	322–3222–00	RES,FXD:MET FILM;2K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 2K00
A7R51	322–3135–00	RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0	80009	322–3135–00
A7R52	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R53	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R54	322–3135–00	RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0	80009	322–3135–00
A7R55	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R56	322–3414–00	RES,FXD:MET FILM;200K OHM,1%,0.2W,TC=100 PPM;AXIAL	91637	CCF501G20002F
A7R57	322–3001–00	RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3001–00
A7R58	322–3001–00	RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3001–00
A7R61	322–3001–00	RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3001–00
A7R62	322–3231–00	RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322–3231–00
A7R63	322–3039–00	RES,FXD,FILM:24.9 OHM,1%,0.2W,TC=T0	80009	322–3039–00
A7R64	322–3039–00	RES,FXD,FILM:24.9 OHM,1%,0.2W,TC=T0	80009	322–3039–00
A7R65	322–3318–00	RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 20K0
A7R66	322–3318–00	RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 20K0
A7R67	322–3231–00	RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322–3231–00
A7R68	322–3231–00	RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322–3231–00
A7R69	322–3231–00	RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322–3231–00
A7R70	322–3154–00	RES,FXD:MET FILM;392 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	RB20FX392E
A7R71	322–3164–00	RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A7R72	322–3246–00	RES,FXD,FILM:3.57K OHM,1%,0.2W,TC=T0	80009	322–3246–00
A7R73	322–3327–00	RES,FXD,FILM:24.9K OHM,1%,0.2W,TC=T0	80009	322–3327–00
A7R75	322–3231–00	RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322–3231–00
A7R76	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00

A4U723	156–0853–00	IC,LINEAR:BIPOLAR,OP–AMP,DUAL,SINGLE SUPPLY,LM358N,DIP08.3	01295	LM358P
A7R77	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R78	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R79	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R81	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R85	322–3210–00	RES,FXD:MET FILM;1.5K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K50
A7R86	322–3210–00	RES,FXD:MET FILM;1.5K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K50
A7R87	322–3222–00	RES,FXD:MET FILM;2K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 2K00
A7R88	322–3222–00	RES,FXD:MET FILM;2K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 2K00
A7R89	322–3097–00	RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 100E
A7R90	322–3164–00	RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A7R91	322–3164–00	RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A7R92	322–3126–00	RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A7R93	322–3097–00	RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 100E
A7R94	322–3126–00	RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A7R95	322–3164–00	RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A7R96	322–3135–00	RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0	80009	322–3135–00
A7R97	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R98	322–3001–00	RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3001–00
A7R99	322–3289–00	RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A7R100	322–3289–00	RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A7R101	322–3001–00	RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3001–00
A7R102	322–3289–00	RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A7R111	322–3097–00	RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 100E
A7R112	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R113	322–3097–00	RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 100E
A7R114	322–3164–00	RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A7R115	322–3164–00	RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A7R116	322–3126–00	RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A7R117	322–3277–00	RES,FXD,FILM:7.5K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 7K50
A7R118	322–3277–00	RES,FXD,FILM:7.5K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 7K50
A7R119	322–3260–00	RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K99
A7R120	322–3260–00	RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K99
A7R121	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R122	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R123	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R126	322–3414–00	RES,FXD:MET FILM;200K OHM,1%,0.2W,TC=100 PPM;AXIAL	91637	CCF501G20002F
A7R129	322–3001–00	RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3001–00
A7R130	322–3001–00	RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3001–00
A7R131	322–3126–00	RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A7R132	322–3135–00	RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0	80009	322–3135–00
A7R133	322–3135–00	RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0	80009	322–3135–00
A7R134	322–3097–00	RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 100E
A7R135	322–3135–00	RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0	80009	322–3135–00
A7R136	322–3097–00	RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 100E
A7R137	322–3001–00	RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3001–00
A7R138	322–3289–00	RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A7R139	322–3231–00	RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322–3231–00
A7R140	322–3231–00	RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322–3231–00
A7R141	322–3164–00	RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A7R142	322–3164–00	RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A7R143	322–3289–00	RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A7R144	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R145	322–3481–00	RES,FXD,FILM:1M OHM.1%,0.2W,TC=T0	80009	322–3481–00
A7R146	322–3126–00	RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A7R147	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R148	322–3001–00	RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3001–00
A7R149	322–3001–00	RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3001–00
A7R150	322–3289–00	RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00

A4U723	156–0853–00	IC,LINEAR:BIPOLAR,OP–AMP,DUAL,SINGLE SUPPLY,LM358N,DIP08.3	01295	LM358P
A7R151	322–3126–00	RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A7R152	322–3126–00	RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A7R153	322–3289–00	RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A7R154	322–3385–00	RES,FXD:MET FILM;100K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 100K
A7R155	322–3147–00	RES,FXD:MET FILM;332 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3147–00
A7R156	322–3147–00	RES,FXD:MET FILM;332 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3147–00
A7R157	322–3202–00	RES,FXD,FILM:1.24K OHM,1%,0.2W,TC=T0	80009	322–3202–00
A7R158	322–3001–00	RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3001–00
A7R159	322–3260–00	RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K99
A7R160	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R161	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R162	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R163	322–3001–00	RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3001–00
A7R167	322–3258–00	RES,FXD:MET FILM;4.75K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3258–00
A7R168	322–3231–00	RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322–3231–00
A7R169	322–3258–00	RES,FXD:MET FILM;4.75K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3258–00
A7R170	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R171	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R172	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R173	322–3114–00	RES,FXD:MET FILM;150 OHM,1%,0.2W,TC=100 PPM;AXIAL	91637	CCF50–2–G1500F
A7R174	322–3114–00	RES,FXD:MET FILM;150 OHM,1%,0.2W,TC=100 PPM;AXIAL	91637	CCF50–2–G1500F
A7R175	322–3289–00	RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A7R176	322–3289–00	RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A7R177	322–3289–00	RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A7R178	322–3243–00	RES,FXD:MET FILM;3.32K OHM,1%,0.2W,TC=100 PPM;AX	91637	CCF50–1–G33200F
A7R179	322–3260–00	RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K99
A7R180	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R181	322–3164–00	RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A7R182	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R183	322–3164–00	RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A7R184	322–3231–00	RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322–3231–00
A7R185	322–3135–00	RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0	80009	322–3135–00
A7R186	322–3056–00	RES,FXD,FILM:37.4 OHM,1%,0.2W,TC=T0	91637	CCF50–2F37R40F
A7R187	322–3289–00	RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A7R188	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R189	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R190	322–3097–00	RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 100E
A7R191	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R192	322–3001–00	RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3001–00
A7R193	322–3097–00	RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 100E
A7R194	322–3164–00	RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A7R195	322–3135–00	RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0	80009	322–3135–00
A7R196	322–3164–00	RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A7R197	322–3373–00	RES,FXD,FILM:75K OHM,1%,0.2W,TC=T0	80009	322–3373–00
A7R198	322–3354–00	RES,FXD:MET FILM;47.5K OHM,1%,0.2W,TC=100 PPM;AX	80009	322–3354–00
A7R199	322–3277–00	RES,FXD,FILM:7.5K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 7K50
A7R200	322–3271–00	RES,FXD,FILM:6.49K OHM,1%,0.2W,TC=T0	91637	CCF502G64900FT
A7R201	322–3289–00	RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A7R202	322–3134–00	RES,FXD,FILM:243 OHM,1%,0.2W,TC=T0	80009	322–3134–00
A7R203	322–3134–00	RES,FXD,FILM:243 OHM,1%,0.2W,TC=T0	80009	322–3134–00
A7R204	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R205	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R206	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R207	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R208	317–0027–00	RES,FXD,CMPSN:2.7 OHM,5%,0.125W	01121	BB27G5
A7R209	317–0027–00	RES,FXD,CMPSN:2.7 OHM,5%,0.125W	01121	BB27G5
A7R210	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A7R211	322–3135–00	RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0	80009	322–3135–00

A4U723	156–0853–00	IC,LINEAR:BIPOLAR,OP–AMP,DUAL,SINGLE SUPPLY,LM358N,DIP08.3	01295	LM358P
A7R212	322–3338–00	RES,FXD,FILM:32.4K OHM,1%,0.2W,TC=T0	91637	CCF50–2F32401F
A7R213	322–3385–00	RES,FXD:MET FILM;100K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 100K
A7R214	322–3097–00	RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 100E
A7R215	322–3126–00	RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A7R217	322–3068–00	RES,FXD:MET FILM;49.9 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3068–00
A7TP10t	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A7TP11	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A7TP12	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A7TP13	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A7TP14	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A7TP15	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A7TP16	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A7TP17	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A7TP18	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A7TP19	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A7TP20	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A7TP21	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A7TP22	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A7TP23	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A7TP24	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A7U1	156–4136–00	IC,LIN:	80009	156–4136–00
A7U5	156–1191–01	IC,LIN:BIFET,OP–AMP;6MV VOS;TL072ACP,DIP08.3	80009	156–1191–01
A7U6	156–1324–00	IC,LIN:BIPOLAR,COMPTR;TTL,20NS,COMPLEMENTARY OUT,W/STROBES;LM361N,DIP14.3	27014	LM361N/GLAA054
A7U7	156–1335–00	IC,DGTL:LSTTL,MULTIVIBRATOR;DUAL RETRIG MONOST-ABLE;96LS02,DIP16.3	80009	156–1335–00
A7U8	156–1225–00	IC,LIN:BIPOLAR,COMPTR;DUAL,OPEN COLL,300NS;LM393N,DIP08.3	01295	LM393P
A7U9	156–0402–00	IC,MISC:BIPOLAR,TMR;LM555CN,DIP08.3	80009	156–0402–00
A7U10	156–1191–01	IC,LIN:BIFET,OP–AMP;6MV VOS;TL072ACP,DIP08.3	80009	156–1191–01
A7U11	156–1225–00	IC,LIN:BIPOLAR,COMPTR;DUAL,OPEN COLL,300NS;LM393N,DIP08.3	01295	LM393P
A7U12	156–1335–00	IC,DGTL:LSTTL,MULTIVIBRATOR;DUAL RETRIG MONOST-ABLE;96LS02,DIP16.3	80009	156–1335–00
A7U14	156–1191–01	IC,LIN:BIFET,OP–AMP;6MV VOS;TL072ACP,DIP08.3	80009	156–1191–01
A7U15	156–1850–00	IC,MISC:CMOS,ANALOG SW;QUAD;DG211,DIP16.3	17856	SDG21107
A7U16	156–1225–00	IC,LIN:BIPOLAR,COMPTR;DUAL,OPEN COLL,300NS;LM393N,DIP08.3	01295	LM393P
A7U17	156–0853–00	IC,LIN:BIPOLAR,OP–AMP;DUAL,SGL SPLY;LM358N,DIP08.3	80009	156–0853–00
A7U18	156–0853–00	IC,LIN:BIPOLAR,OP–AMP;DUAL,SGL SPLY;LM358N,DIP08.3	80009	156–0853–00
A7U19	156–1173–00	IC,LIN:BIPOLAR,V REF;POS,2.5V,1.0%,40PPM,SER; MC1403U,DIP08.3	80009	156–1173–00
A7U20	156–2095–00	IC,DGTL:ALSTTL,GATE;QUAD 2–IN XOR;74ALS86,DIP14.3,NOT FOR	80009	156–2095–00

A4U723	156–0853–00	IC,LINEAR:BIPOLAR,OP–AMP,DUAL,SINGLE SUPPLY,LM358N,DIP08.3	01295	LM358P
A7U21	156–1324–00	IC,LIN:BIPOLAR,COMPTR;TTL,20NS,COMPLEMENTARY OUT,W/STROBES;LM361N,DIP14.3	27014	LM361N/GLAA054
A7VR1	152–0647–00	DIO,ZENER:6.8V,5%,0.4W;1N957B,DO–7 OR 35,TR	04713	1N957B
A7VR2	152–0647–00	DIO,ZENER:6.8V,5%,0.4W;1N957B,DO–7 OR 35,TR	04713	1N957B
A8	119–4078–00	DISPLAY,FLAT PL:	80009	119–4078–00
A9	671–1939–01	CIRCUIT BD ASSY:OSCILLATOR FLTR	80009	671–1939–01
		MOUNTING PARTS		
	211–0244–00	SCR,ASSEM WSHR:4–40 X 0.312,PNH STL (QUANTITY 4)	TK0858	211–0244–00
		END MOUNTING PARTS		
A9C1	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A9C2	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A9C3	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A9C4	283–0767–00	CAP,FXD,MICA DI:107 PF,1%,500V	80009	283–0767–00
A9C5	283–0680–00	CAP,FXD,MICA DI:330PF,1%,500V	80009	283–0680–00
A9C6	283–0600–00	CAP,FXD,MICA DI:43PF,5%,500V	80009	283–0600–00
A9C7	283–0140–00	CAP,FXD,CER DI:4.7PF,+/–0.25PF,50V	80009	283–0140–00
A9C8	283–0853–00	CAP,FXD,CER DI:2.2PF,200V	04222	SR592A2R2DAAAP1
A9C9	283–0223–00	CAP,FXD,CER DI:3PF,+/–5PF,50V	TK1134	835XXXCOJO309D
A9C10	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A9C11	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A9C12	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A9C13	283–0636–00	CAP,FXD,MICA DI:36PF,2%,500V,0.370 X 0.460;RDL	80009	283–0636–00
A9C14	283–0636–00	CAP,FXD,MICA DI:36PF,2%,500V,0.370 X 0.460;RDL	80009	283–0636–00
A9C15	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A9C16	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A9C17	283–0639–00	CAP,FXD,MICA DI:56PF,1%,500V	80009	283–0639–00
A9C18	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A9C19	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A9C20	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A9C21	281–0775–01	CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A9J1	131–0608–00	TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 2)	80009	131–0608–00
A9J3	131–0608–00	TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 2)	80009	131–0608–00
A9J4	131–0608–00	TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 2)	80009	131–0608–00
A9J5	131–0608–00	TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 2)	80009	131–0608–00
A9J6	131–0608–00	TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 2)	80009	131–0608–00
A9J7	131–5224–00	CONN,BOX: (QUANTITY 5)	80009	131–5224–00
A9J8	131–5224–00	CONN,BOX: (QUANTITY 5)	80009	131–5224–00
A9L1	108–0212–00	COIL,RF:FXD,495NH	80009	108–0212–00
A9L2	108–0212–00	COIL,RF:FXD,495NH	80009	108–0212–00
A9L3	114–0476–00	COIL,RF:VAR 89–98UH,NOM 94NH,SHIELDED,PWRD IRON CORE	80009	114–0476–00
A9L4	114–0476–00	COIL,RF:VAR 89–98UH,NOM 94NH,SHIELDED,PWRD IRON CORE	80009	114–0476–00
A9L5	114–0476–00	COIL,RF:VAR 89–98UH,NOM 94NH,SHIELDED,PWRD IRON CORE	80009	114–0476–00
A9L6	114–0476–00	COIL,RF:VAR 89–98UH,NOM 94NH,SHIELDED,PWRD IRON CORE	80009	114–0476–00
A9L7	108–0212–00	COIL,RF:FXD,495NH	80009	108–0212–00
A9P6	131–0993–02	BUS,CNDCTR:SHUNT ASSY,RED	00779	1–850100–O

A4U723	156–0853–00	IC,LINEAR:BIPOLAR,OP–AMP,DUAL,SINGLE SUPPLY,LM358N,DIP08.3	01295	LM358P
A9Q1	151–0427–00	XSTR,SIG:BIPOLAR,NPN;15V,50MA,900 MHZ, AMPL;2N5770,TO–92 EBC	80009	151–0427–00
A9R1	322–3001–00	RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3001–00
A9R2	322–3068–00	RES,FXD:MET FILM;49.9 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3068–00
A9R3	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A9R4	322–3193–00	RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A9R6	322–3097–00	RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 100E
A9R7	322–3143–00	RES,FXD,FILM:301 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 301E
A9R8	322–3085–00	RES,FXD:MET FILM;75 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 75E0
A9R9	322–3085–00	RES,FXD:MET FILM;75 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 75E0
A9R10	322–3164–00	RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A9R11	322–3164–00	RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A9R12	322–3066–00	RES,FXD:MET FILM;47.5 OHM,1%,0.2W,TC=100 PPM;AXIAL	09969	CCF502G47R50F
A9R13	322–3058–00	RES,FXD:MET FILM;39.2 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3058–00
A9R14	322–3070–00	RES,FXD,FILM:52.3 OHM,1%,0.2W,TC=T0	80009	322–3070–00
A9TP1	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A9TP2	214–4085–00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104–01–02
A9U1	156–3047–00	IC,LIN:BIPOLAR,AMPL;RF AMP,20DB GAIN,600MHZ;NE5205AN,DIP08.3	80009	156–3047–00
A9U2	156–1640–00	IC,DGTL:ECL,RCVR;TPL LINE;10H116,DIP16.3,TUBE	80009	156–1640–00
B100	119–4270–00	FAN,TUBEAXIAL:12 VDC,2.6W,0.22A,4200 RPM,32DB,16.6CFM,60X60MM,25MM	80009	119–4270–00
J100	131–5358–00	CONN,DSUB FLTR: (CONNECTED FROM W19 TO REAR PANEL) *MOUNTING PARTS*	80009	131–5358–00
	131–0890–00	CONN,HARDWARE: (QUANTITY 2) *END MOUNTING PARTS*	71468	D 20418–2
W1	174–2384–00	CA ASSY,SP,ELEC:34,28 AWG,10.1 L,RBN (CONNECTED FROM A5J21 TO A3J1 TO A6J7)	80009	174–2384–00
W2	174–2383–00	CA ASSY,SP,ELEC:2,26 AWG,8.0 L,RBN (CONNECTED FROM A8P2 TO A5J22)	80009	174–2383–00
W3	174–2376–00	CA ASSY,SP,ELEC:34,28 AWG,11.6 L,RBN (CONNECTED FROM A8P3 T0 A5J20)	80009	174–2376–00
W5	174–2594–00	CA ASSY,RF:75 OHM COAX,13.0 L,W/CONN &HLDR (CONNECTED FROM A2J10 TO A7J4)	80009	174–2594–00
W10	174–2375–00	CA ASSY,SP,ELEC:10,28 AWG,2.0 L,RBN (CONNECTED FROM A3J10 TO A6J5)	80009	174–2375–00
W11	174–2375–00	CA ASSY,SP,ELEC:10,28 AWG,2.0 L,RBN (CONNECTED FROM A2J11 TO A6J8)	80009	174–2375–00
W12	174–2379–00	CA ASSY,SP,ELEC:34,28 AWG,6.5 L,RBN (CONNECTED FROM A6J12 TO A7J5)	80009	174–2379–00
W19	174–2378–00	CA ASSY,SP,ELEC:26,28 AWG,23.0 L,RBN (CONNECTED FROM J100 TO A5J19) *MOUNTING PARTS*	80009	174–2378–00
	211–0102–00	SCR,MACH:4–40 X 0.5,FLH,100 DEG,STL (QUANTITY 2) *END MOUNTING PARTS*	93907	ORDER BY DESCR
W20	174–2385–00	CA ASSY,SP,ELEC:34,28 AWG,10.24 L,RBN (CONNECTED FROM A2J20 TO A3J8 TO A6J13)	80009	174–2385–00
W160	174–2385–00	CA ASSY,SP,ELEC:34,28 AWG,10.24 L,RBN (CONNECTED FROM A6J11 TO A4J160 TO A5J18)	80009	174–2385–00

DIAGRAMS/CIRCUIT BOARD ILLUSTRATIONS

Symbols

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

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

Both overline and parenthesis indicate a low asserting state.

Example: $\overline{\text{ID CONTROL}}$ or (ID CONTROL)

Abbreviations are based on ANSI Y1.1-1972.

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

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

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

Component Values

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

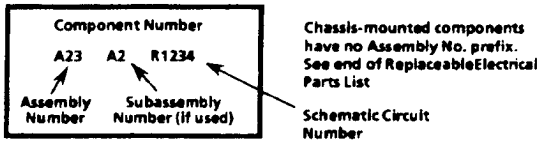
Capacitors:
Values one or greater are in picofarads (pF).
Values less than one are in microfarads (μF).
Resistors = Ohms (Ω).

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

Assembly Numbers

Each assembly in the instrument is assigned an assembly number (e.g., A20). The assembly number appears on the diagram (in circuit board outline), circuit board illustration title, and lookup table for the schematic diagram.

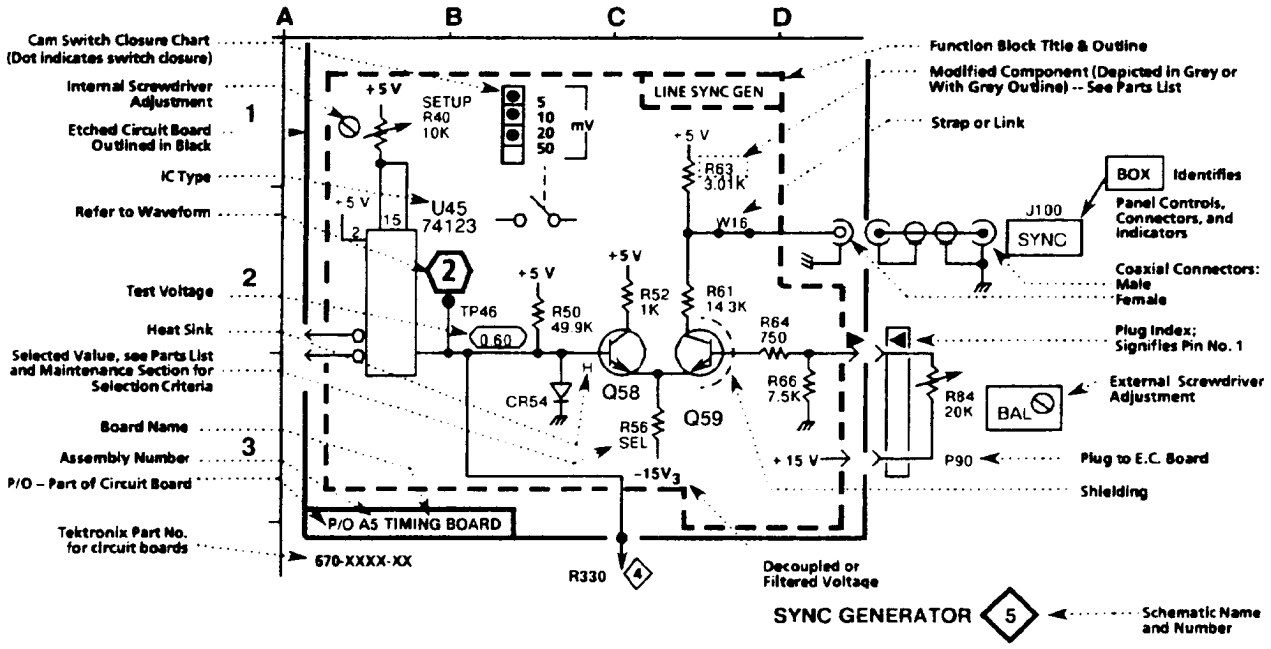
The Replaceable Electrical Parts List is arranged by assembly number in numerical sequence; the components are listed by component number. Example:



Grid Coordinates

The schematic diagram and circuit board component location illustration have grids. A lookup table with the grid coordinates is provided for ease of locating the component. Only the components illustrated on the facing diagram are listed in the lookup table.

When more than one schematic diagram is used to illustrate the circuitry on a circuit board, the circuit board illustration may only appear opposite the first diagram; the lookup table will list the diagram number of other diagrams that the other circuitry appears on.



Block Diagram

SPG 1000 BLOCK DIAGRAM

REFERENCE INPUT BOARD A7

GENLOCK INPUT
GAIN FEEDBACK
NEGATIVE PEAK HOLD
2X VIDEO
AGC AMP
SYNC STRIP COMPARATOR
–.3V
CLAMP FEEDBACK
SAMPLER
BURST NOTCH FILTER / AMPS
BURST
BACK PORCH SAMPLE STROBE
SAMPLER
SYNC EDGE SAMPLE STROBE
±1
BI-LEVEL TRI-LEVEL

HD GENLOCK BOARD A6

DATA CONTROL
UMI DECODER
UMI
U117
VERT COUNTER
14
BURST SAMPLE DECODE
SYNC OFFSET COMPARATOR
GENLOCK OFFSET COMPARATOR
CLOCK/ FRAME ENCODER
CLOCK
ENCODED CLOCK DIFFERENTIAL OUTPUTS
VCLOCK
COMPOSITE SYNC
CLOCK
HORIZ COUNTER
13
SYNC OFFSET COMPARATOR
GENLOCK OFFSET COMPARATOR
4–12
SLOW DECODER
6
VERTICAL INTERNAL DETECTOR
ODD FIELD
COLOR FRAME COUNTER
FIELD 1
BURST
BURST PHASE SAMPLER
0–5
FAST DECODER
FINE DELAY CIRCUIT
CLOCK DIST.
CLOCK
SYNC FRAME
BUFFERS
CHANNEL SWITCH
TRI-LEVEL SYNC OUTPUTS
BACK PORCH SAMPLE AND HOLD
CLAMP
BLANK

POWER SUPPLY

LINE INPUT
POWER SWITCH
SWITCHING SUPPLY
±5
SWITCHING SUPPLY
±12

OSCILLATOR BOARD A2A1

VCO$_{TUNE}$
OSC1 A2A2
OSC2 A2A3
OSC3 A2A4
X5
FREQUENCY MULTIPLIER
68–78 MHz A2A1
CLOCK

CONTROLLER BOARD A5

DISPLAY
BUFFERED DATA
6 MHZ CLOCK GEN
UMI BUS
BUFFER
BUFFER
BUFFER
FRONT PANEL BUTTONS
BUTTON ENCODER
FRONT PANEL KNOB
KNOB ENCODER
FRONT PANEL LEDS
LED DRIVERS
Z80 µP
ADDRESS
CONTROL
DATA
NVRAM
PROM
CTC
RS232 INTER.
GC REMOTE INTER.
SELECT ONE TO REAR PANEL DB-25
DECODER
TO PORTS

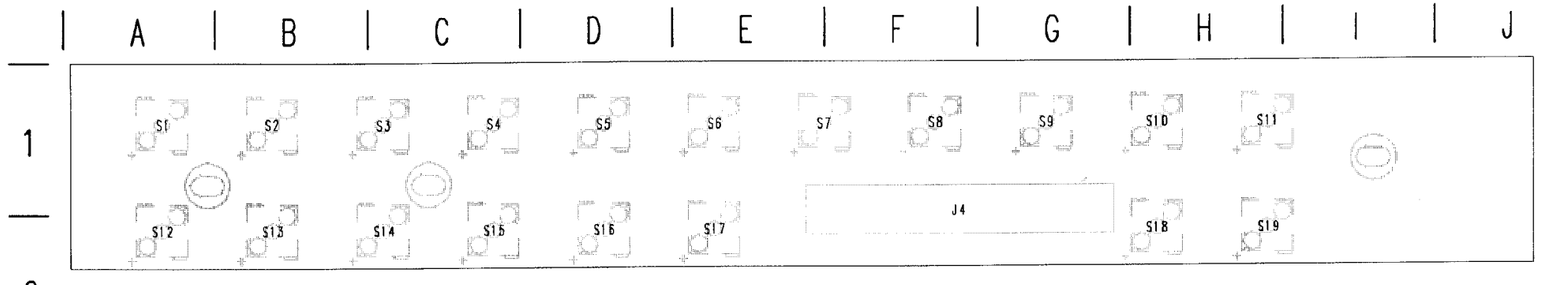
FINE SYNC TIMING

SEE FIG. 8-1

SYNC BOARD A3

CLOCK
HORI-ZONTAL DECODER
UMI
TABLE OF CONTENTS FROM TEST SIGNAL DATA
INTERFACE WITH CONTROLLER
SIGNAL SELECT
STANDARD SELECT
COUNTER ENABLE
VERTICAL COUNTERS
VERTICAL DECODING PROM
VERTICAL COUNT
SIGNAL SELECT PROM
POINTER TO BLOCKS OF 16 BYTES
POINTER TO BLOCKS OF 4 BYTES
2
COUNTER CLEAR
STANDARD SELECT
HORIZONTAL COUNT
DELAYED CLOCK
DELAYED FRAME RESET
HORI-ZONTAL COUNTERS
CLOCK/16
CLOCK/4
RAM
8
D/A
D/A
D/A
LOW PASS FILTER
LOW PASS FILTER
LOW PASS FILTER
X2
X2
X2
G/Y
B/P$_B$
R/P$_R$
TEST SIGNAL OUTPUTS

A1 Front Panel



A1 FRONT PANEL BOARD

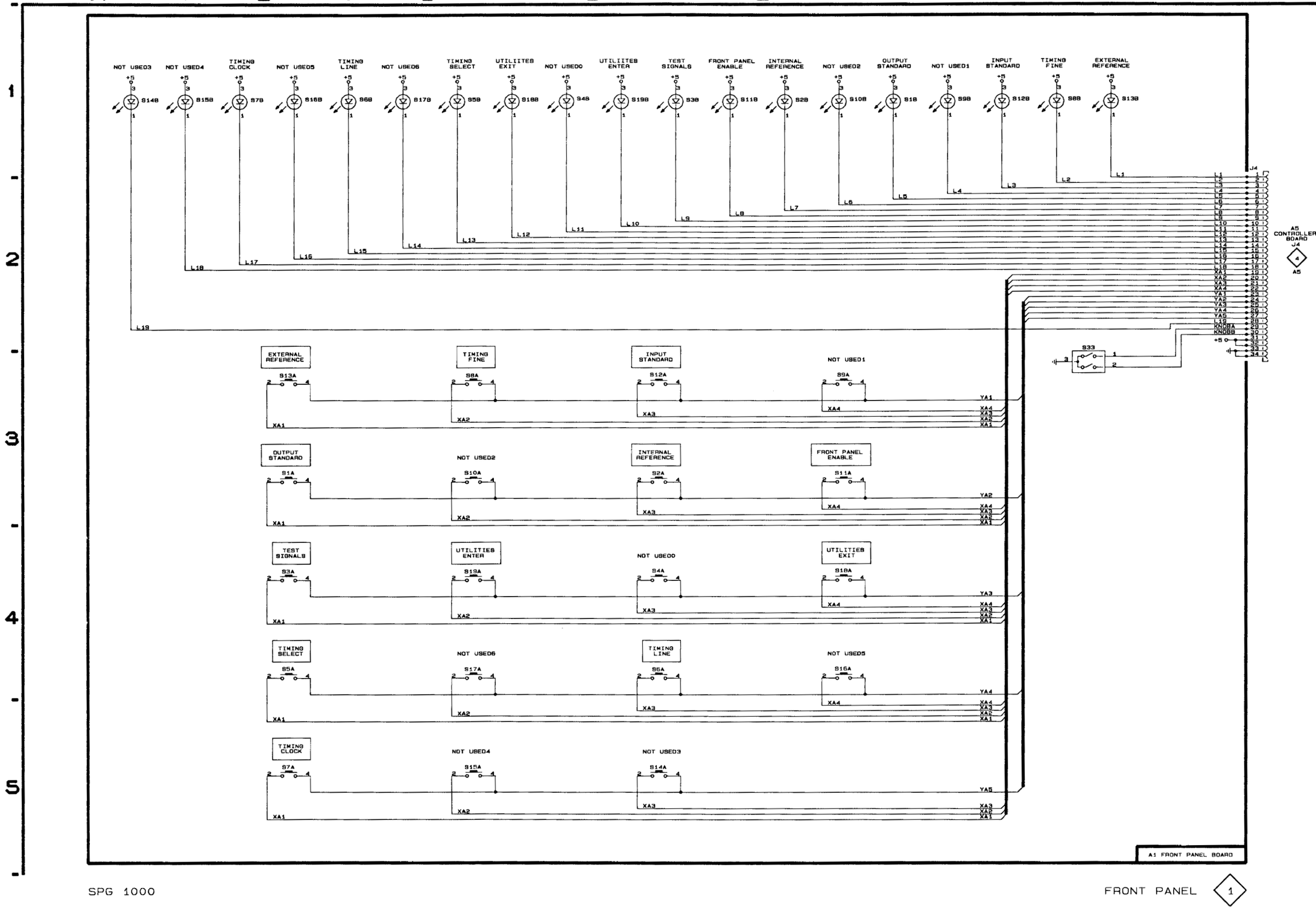
Static Sensitive Devices
See Maintenance Section

FRONT PANEL BOARD
Schematic <1> Look-Up Chart

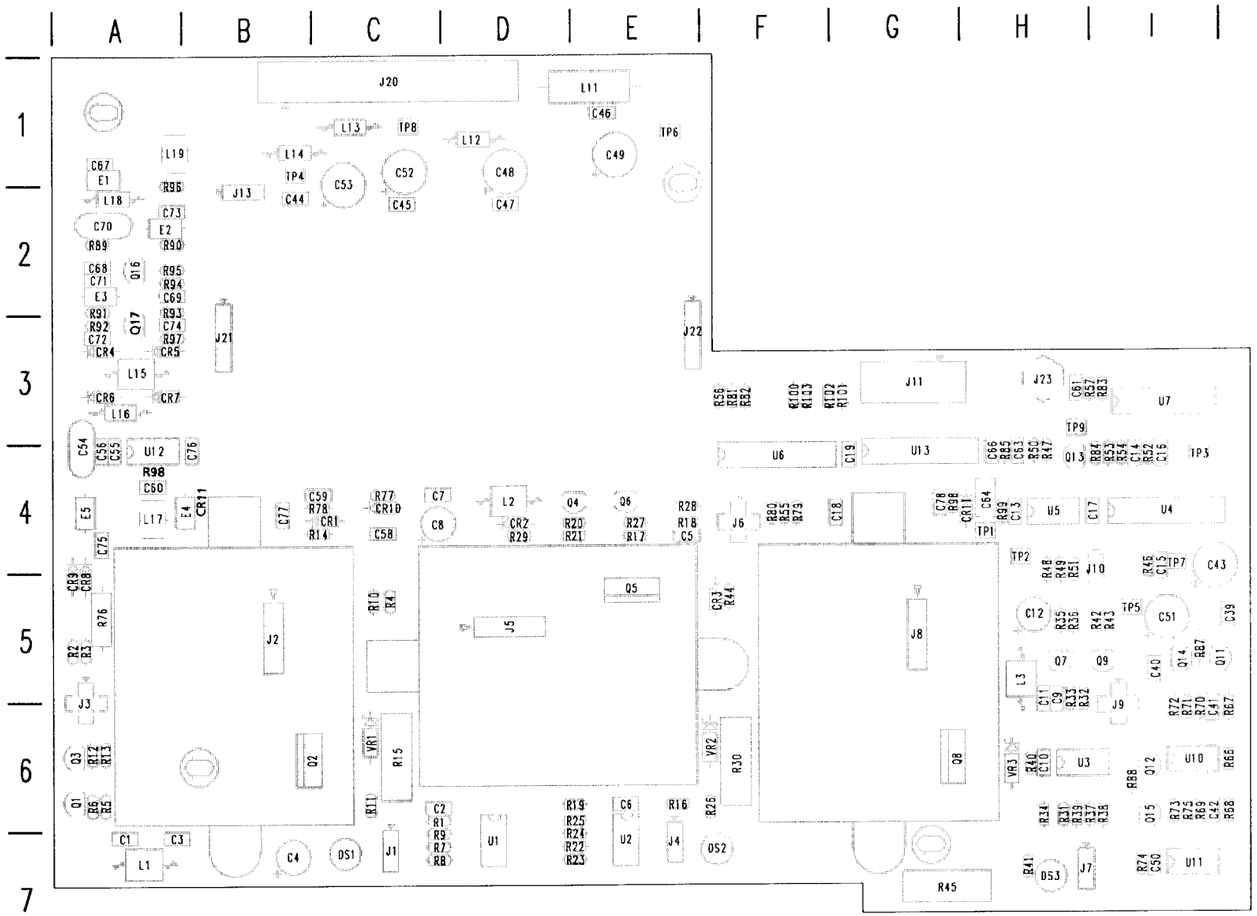
The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

Assembly A1.

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
J4	H1	F2	S11B	E1	H1
			S12A	D3	A2
S1A	B3	A1	S12B	F1	A2
S1B	F1	A1			
S2A	D3	B1	S13A	B3	B2
			S13B	G1	B2
S2B	E1	B1	S14A	D5	B2
S3A	B4	C1			
S3B	D1	C1	S14B	A1	B2
			S15A	C5	C2
S4A	D4	C1	S15B	A1	C2
S4B	D1	C1			
S5A	B4	D1	S16A	E4	D2
			S16B	B1	D2
S5B	C1	D1	S17A	C4	E2
S6A	D4	E1			
S6B	B1	E1	S17B	C1	E2
			S18A	E4	H2
S7A	B5	E1	S18B	C1	H2
S7B	B1	E1			
S8A	C3	F1	S19A	C4	H2
			S19B	D1	H2
S8B	G1	F1	S33	G3	I2
S9A	E3	G1			
S9B	F1	G1			
S10A	C3	H1			
S10B	E1	H1			
S11A	E3	H1			


NOT USED3
NOT USED4
TIMING CLOCK
NOT USED5
TIMING LINE
NOT USED6
TIMING SELECT
UTILITIES EXIT
NOT USED0
UTILITIES ENTER
TEST SIGNALS
FRONT PANEL ENABLE
INTERNAL REFERENCE
NOT USED2
OUTPUT STANDARD
NOT USED1
INPUT STANDARD
TIMING FINE
EXTERNAL REFERENCE
S14B
S15B
S7B
S16B
S6B
S17B
S5B
S18B
S4B
S19B
S3B
S11B
S2B
S10B
S1B
S9B
S12B
S8B
S13B
L1
L2
L3
L4
L5
L6
L7
L8
L9
L10
L11
L12
L13
L14
L15
L16
L17
L18
L19
J4
A5 CONTROLLER BOARD
J4
4
A5
KNOBA
KNOBB
+5
S33
EXTERNAL REFERENCE
S13A
TIMING FINE
S8A
INPUT STANDARD
S12A
NOT USED1
S9A
OUTPUT STANDARD
S1A
NOT USED2
S10A
INTERNAL REFERENCE
S2A
FRONT PANEL ENABLE
S11A
TEST SIGNALS
S3A
UTILITIES ENTER
S19A
NOT USED0
S4A
UTILITIES EXIT
S18A
TIMING SELECT
S5A
NOT USED6
S17A
TIMING LINE
S6A
NOT USED5
S16A
TIMING CLOCK
S7A
NOT USED4
S15A
NOT USED3
S14A
XA1
XA2
XA3
XA4
YA1
YA2
YA3
YA4
YA5
A1 FRONT PANEL BOARD

A2A1 Front Panel



A2A1 OSCILLATOR BOARD

671-1904-00 — 02

Static Sensitive Devices
See Maintenance Section

OSCILLATOR BOARD
Schematic <1> Look-Up Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

Assembly A2A1. *Partial A2A1 also shown on Schematics 2 and 3.*

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1	E1	A7
C2	E1	C6
C3	H2	A7
C4	H2	B7
C5	E3	E4
C6	E2	E6
C7	H3	C4
C8	H3	C4
C9	E4	H6
C10	E4	H6
C11	H5	B4
C12	H5	H5
CR1	D1	C4
CR2	D3	D4
CR3	D4	F5
DS1	F1	C7
DS2	F3	E7
DS3	F4	H7
J1	E1	C7
J2	C1	B4
J3	G2	A5
J4	E3	E7
J5	C3	C5
J6	G3	F4
J7	E4	I7
J8	C4	G4
J9	G5	I5
L1	H1	A7
L2	H3	D4
L3	H4	H5
Q1	H1	A6
Q2	F1	C6
Q3	H1	A6
Q4	H3	E4
Q5	F3	E5
Q6	H3	E4
Q7	H4	H5
Q8	F4	H6
Q9	H4	I5
R1	E1	C6
R2	E2	A5
R3	E2	A5
R4	F1	C5
R5	H1	A6
R6	H1	A6
R7	D1	C7
R8	D1	C7
R9	D1	C7
R10	F1	C5
R11	F1	C6
R12	H1	A6
R13	G1	A6
R14	C1	C4
R15	G1	C6
R16	E3	E6
R17	E3	E4
R18	E4	E4
R19	F2	D6
R20	H2	D4
R21	H3	D4
R22	D3	D7
R23	D3	D7
R24	D3	D7
R25	F2	D6
R26	F3	F6
R27	H3	E4
R28	G3	E4
R29	C3	D4
R30	G2	F6
R31	E4	H6
R32	E5	H6
R33	E5	H6
R34	F4	H6
R35	H4	H5
R36	H4	H5
R37	D4	I6
R38	D4	I6
R39	D4	H6
R40	F4	H6
R41	F4	H7
R42	H4	I5
R43	G4	I5
R44	C4	F5
R45	G4	G7
U1A	E1	D6
U1B	D1	D6
U2A	E3	E6
U2B	D3	E6
U3A	E4	H6
U3B	D4	H6
VR1	F1	C6
VR2	F3	F6
VR3	F4	H6

A2A1A1 OVEN BOARD

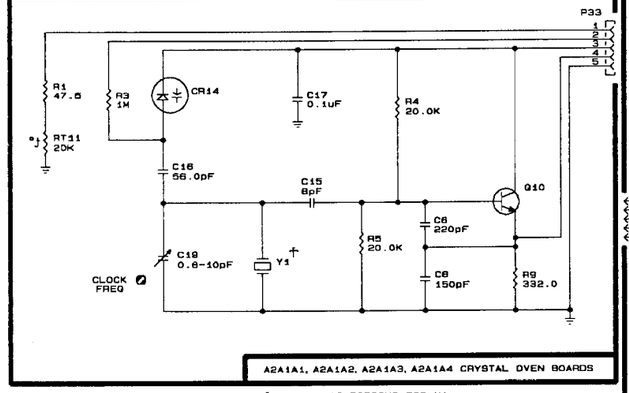
C6	B2	
C8	B2	
C15	B2	
C16	A2	
C17	B2	
C19	A2	
CR14	A2	
P33	C1	
Q10	B2	
R1	A2	
R3	A2	
R4	B2	
R5	B2	
R9	B2	
RT11	A2	
Y1	B2	

A2A1A2 OVEN BOARD

C6	B3	
C8	B4	
C15	B3	
C16	A3	
C17	B3	
C19	A4	
CR14	A3	
P33	C3	
Q10	B3	
R1	A3	
R3	A3	
R4	B3	
R5	B4	
R9	B4	
RT11	A3	
Y1	B4	

A2A1A3 OVEN BOARD

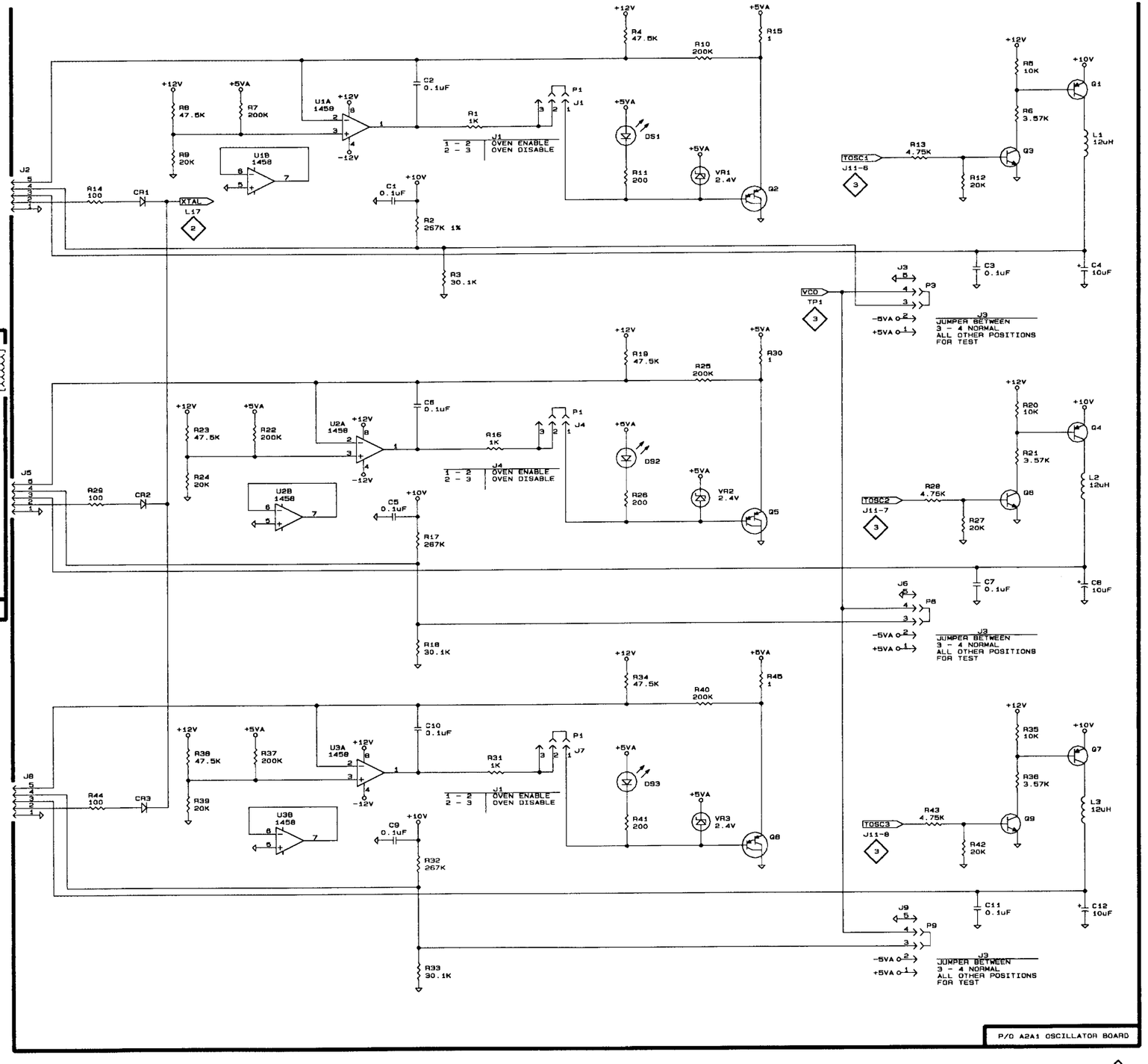
C6	B5	
C8	B5	
C15	B5	
C16	A5	
C17	B4	
C19	A5	
CR14	A4	
P33	C4	
Q10	B5	
R1	A4	
R3	A4	
R4	B4	
R5	B5	
R9	B5	
RT11	A5	
Y1	B5	



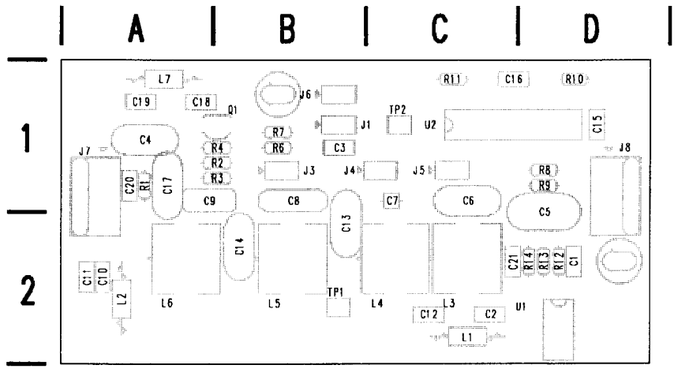
A2A1A1, A2A1A2, A2A1A3, A2A1A4 CRYSTAL OVEN BOARDS

†CRYSTAL SELECTIONS FOR Y1

A2A1A1	15.06MHz	119-3402-02
A2A1A2	14.40MHz	119-3893-02
A2A1A4	14.83MHz	119-4304-00
A2A1A3	14.85MHz	119-4068-00



P/O A2A1 OSCILLATOR BOARD



A9 OSCILLATOR FILTER BOARD

671-1939-01

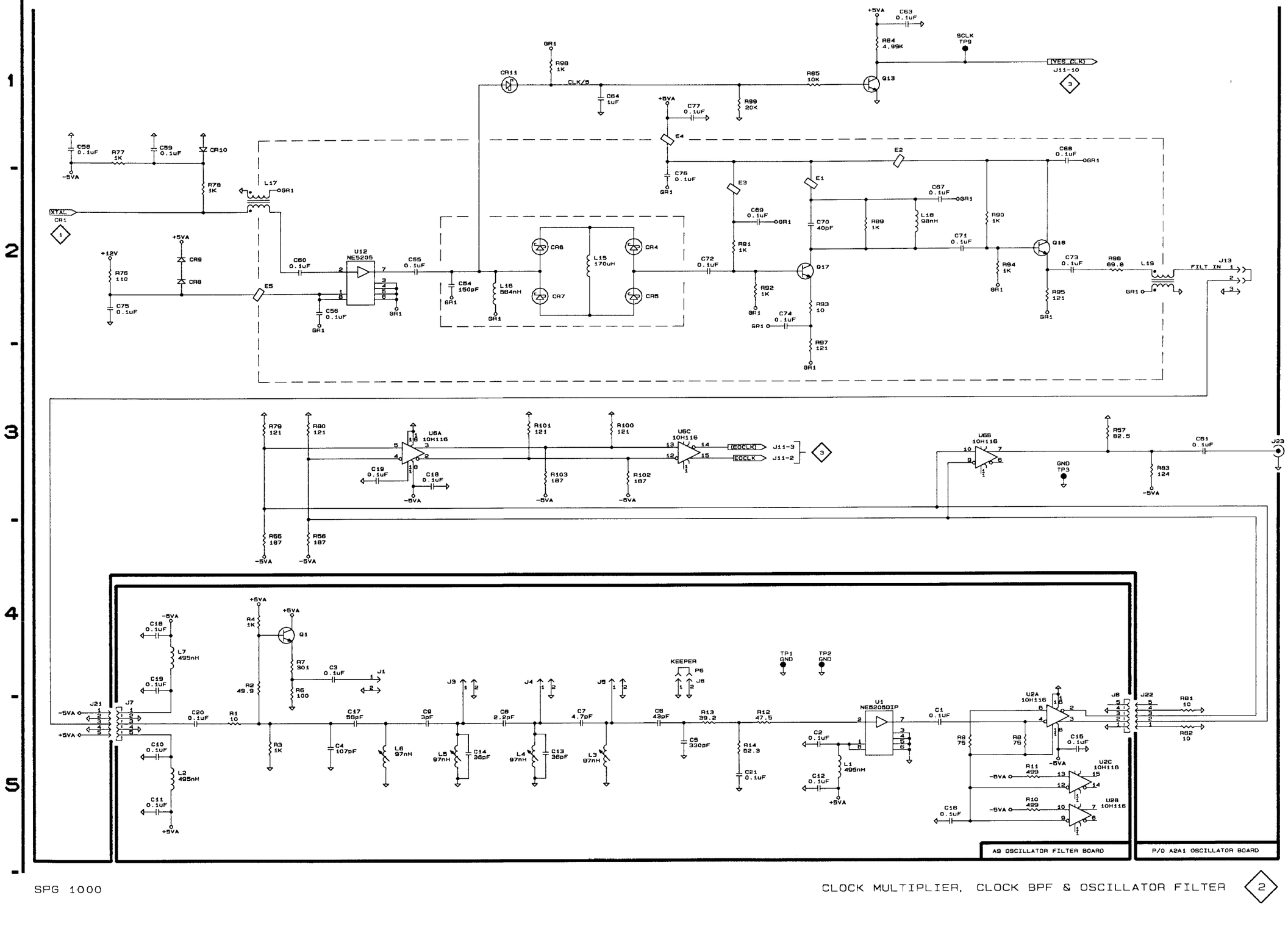
Static Sensitive Devices
See Maintenance Section

OSCILLATOR BOARD
Schematic <2> Look-Up Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

Assembly A2. *Partial A2 also shown on Schematics 1 and 3.*

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C18	C3	G4
C19	C3	G4
C54	C2	A4
C55	C2	A4
C56	B2	A4
C58	A1	C4
C59	A1	C4
C60	B2	A4
C61	H3	H3
C63	F1	H4
C64	D1	H4
C67	F2	A1
C68	G1	A2
C69	E2	A2
C70	E2	A2
C71	F2	A2
C72	E2	A3
C73	G2	A2
C74	E2	A3
C75	A2	A4
C76	D2	B4
C77	E1	B4
CR4	D2	A3
CR5	D2	A3
CR6	D2	A3
CR7	D2	A3
CR8	A2	A5
CR9	A2	A5
CR10	B1	C4
CR11	C1	H4
E1	E2	A1
E2	F1	A2
E3	E2	A2
E4	D1	B4
E5	B2	A4
J13	H2	B1
J21	A5	B2
J22	G5	E2
J23	H3	H3
L15	D2	A3
L16	C2	A3
L17	B2	A4
L18	F2	A2
L19	G2	A1
Q13	F1	H4
Q16	G2	A2
Q17	E2	A2
R55	B4	F4
R56	B4	F3
R57	G3	I3
R76	A2	A5
R77	A1	C4
R78	B2	C4
R79	B3	F4
R80	B3	F4
R81	H5	F3
R82	H5	F3
R83	G3	I3
R84	F1	I4
R85	E1	H4
R89	F2	A2
R90	F2	A2
R91	E2	A3
R92	E2	A3
R93	E2	A3
R94	F2	A2
R95	G2	A2
R96	G2	A2
R97	E2	A3
R98	D1	A4
R99	E1	H4
R100	D3	F3
R101	D3	G3
R102	D3	G3
R103	D3	F3
TP3	G3	I4
TP9	F1	H3
U6A	C3	F4
U6B	F3	F4
U6C	D3	F4
U12	B2	A4
A9 OSCILLATOR FILTER BOARD		
C1	F5	D2
C2	E5	C2
C3	B4	B1
C4	B5	A1
C5	D5	D2
C6	D5	C1
C7	D5	C1
C8	C5	B1
C9	C5	A1
C10	A5	A2
C11	A5	A2
C12	E5	C2
C13	D5	B2
C14	C5	B2
C15	G5	D1
C16	F5	C1
C17	C5	A1
C18	A4	A1
C19	A4	A1
C20	B5	A1
C21	E5	
J1	C4	B1
J3	C4	B1
J4	D4	B1
J5	D4	C1
J6	D4	B1
J7	A5	A1
J8	G5	D1
L1	E5	C2
L2	A5	A2
L3	D5	C2
L4	D5	C2
L5	C5	B2
L6	C5	A2
L7	A4	A1
Q1	B4	B1
P6	D4	
R1	B5	A1
R2	B4	B1
R3	B5	B1
R4	B4	B1
R6	B4	B1
R7	B4	B1
R8	G5	D1
R9	F5	D1
R10	G5	D1
R11	G5	C1
R12	E5	D2
R13	E5	D2
R14	E5	D2
TP1	E4	B2
TP2	E4	C1
U1	F5	D2
U2A	G5	C1
U2B	G5	C1
U2C	G5	C1

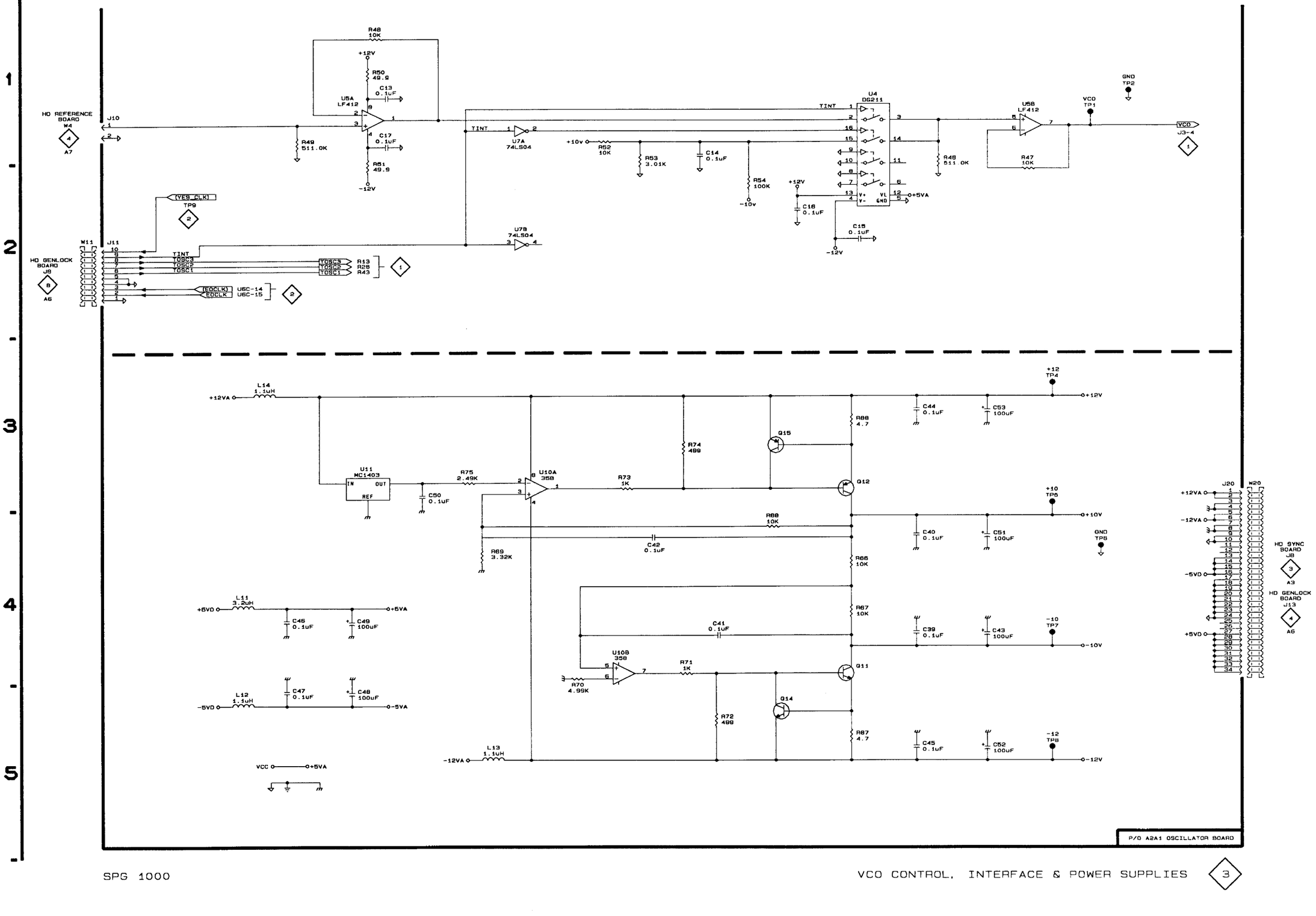

A9 OSCILLATOR FILTER BOARD
P/O A2A1 OSCILLATOR BOARD

OSCILLATOR BOARD
Schematic <3> Look-Up Chart

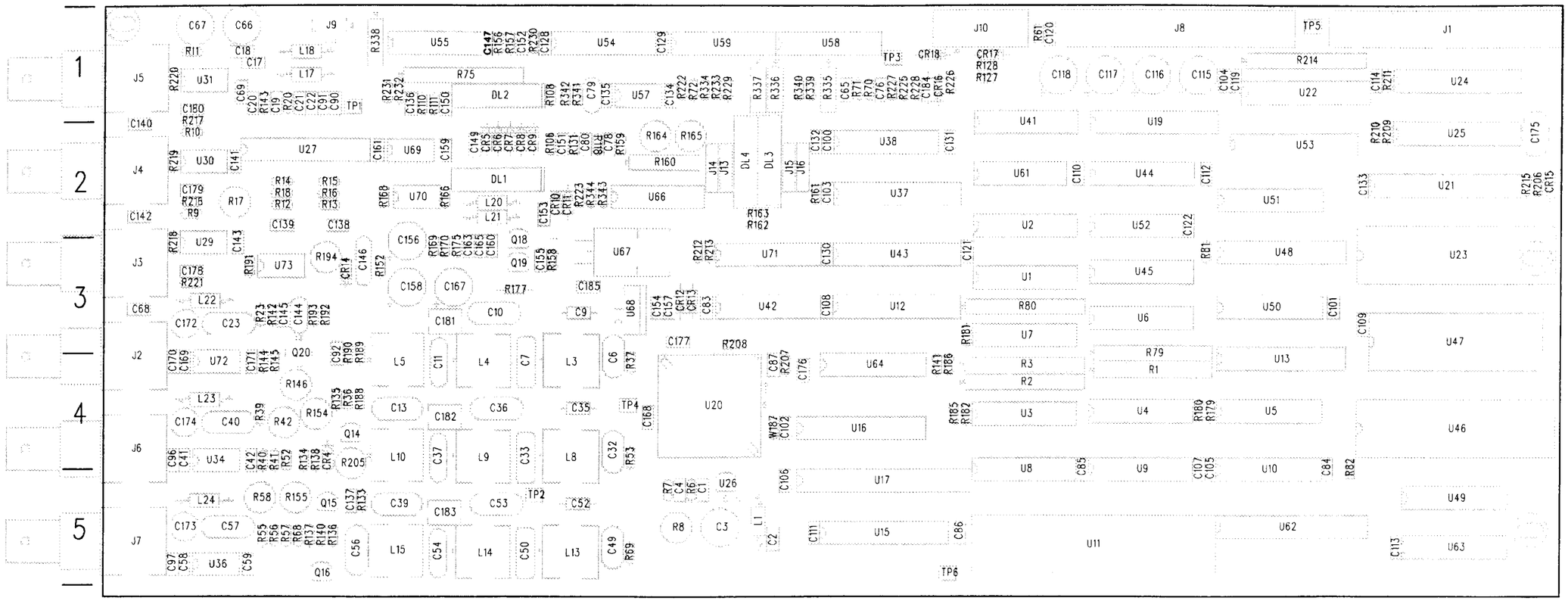
The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

Assembly A2. *Partial A2 also shown on Schematics 1 and 2.*

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C13	C1	H4
C14	E1	I4
C15	F2	I5
C16	E2	I4
C17	C1	I4
C39	F4	J5
C40	F4	I5
C41	E4	I6
C42	D4	I6
C43	F4	I5
C44	F3	B2
C45	F5	C2
C46	B4	E1
C47	B5	D2
C48	C5	D2
C49	C4	E1
C50	C3	I7
C51	F4	I5
C52	F5	C2
C53	F3	C2
J10	A1	I4
J11	A2	G3
J20	H3	B1
L11	B4	E1
L12	B5	D1
L13	C5	C1
L14	B3	B1
Q11	F4	I5
Q12	F3	I6
Q14	E5	I5
Q15	E3	I6
R46	F1	I5
R47	G2	H4
R48	C1	H5
R49	B1	H5
R50	C1	H4
R51	C1	H5
R52	D1	I4
R53	D1	I4
R54	E2	I4
R66	F4	J6
R67	F4	J6
R68	E4	J6
R69	C4	I6
R70	D4	I6
R71	E4	I6
R72	E5	I6
R73	D3	I6
R74	E3	I7
R75	C3	I6
R87	F5	I5
R88	F3	I6
TP1	G1	H4
TP2	G1	H4
TP4	G3	B1
TP5	G3	I5
TP6	G4	E1
TP7	G4	I5
TP8	G5	C1
U4	F1	I4
U5A	C1	H4
U5B	G1	H4
U7A	D1	I3
U7B	D2	I3
U10A	D3	I6
U10B	D4	I6
U11	C3	I7


HD REFERENCE BOARD
W4
A7
J10
R48 10K
+12V
R50 49.9
C13 0.1uF
U5A LF412
R49 511.0K
C17 0.1uF
R51 49.9
-12V
(VES_CLK)
TP9
W11
J11
HD GENLOCK BOARD
J8
A6
TINT
TOSC3
TOSC2
TOSC1
R13
R28
R43
(EOCLK)
EOCLK
U6C-14
U6C-15
U7A 74LS04
U7B 74LS04
U4 DG211
R52 10K
R53 3.01K
C14 0.1uF
R54 100K
-10v
C16 0.1uF
C15 0.1uF
R48 511.0K
U5B LF412
R47 10K
VCO TP1
GND TP2
VCO
J3-4
L14 1.1uH
+12VA
C44 0.1uF
C53 100uF
+12 TP4
+12V
R74 499
Q15
R88 4.7
U11 MC1403
IN OUT REF
R75 2.49K
C50 0.1uF
U10A 358
R73 1K
Q12
+10 TP5
+10V
R89 3.32K
R88 10K
C42 0.1uF
C40 0.1uF
C51 100uF
GND TP8
R86 10K
R67 10K
C41 0.1uF
C39 0.1uF
C43 100uF
-10 TP7
-10V
U10B 358
R70 4.99K
R71 1K
Q11
Q14
R72 499
R87 4.7
C45 0.1uF
C52 100uF
-12 TP8
-12V
L13 1.1uH
-12VA
L11 3.2uH
+5VD
C46 0.1uF
C49 100uF
+5VA
L12 1.1uH
-5VD
C47 0.1uF
C48 100uF
-5VA
VCC
J20
W20
HD SYNC BOARD
J8
A3
HD GENLOCK BOARD
J13
A6
P/O A2A1 OSCILLATOR BOARD

A3 Output



A3 HD SYNC BOARD

671-1902-06

Static Sensitive Devices
See Maintenance Section

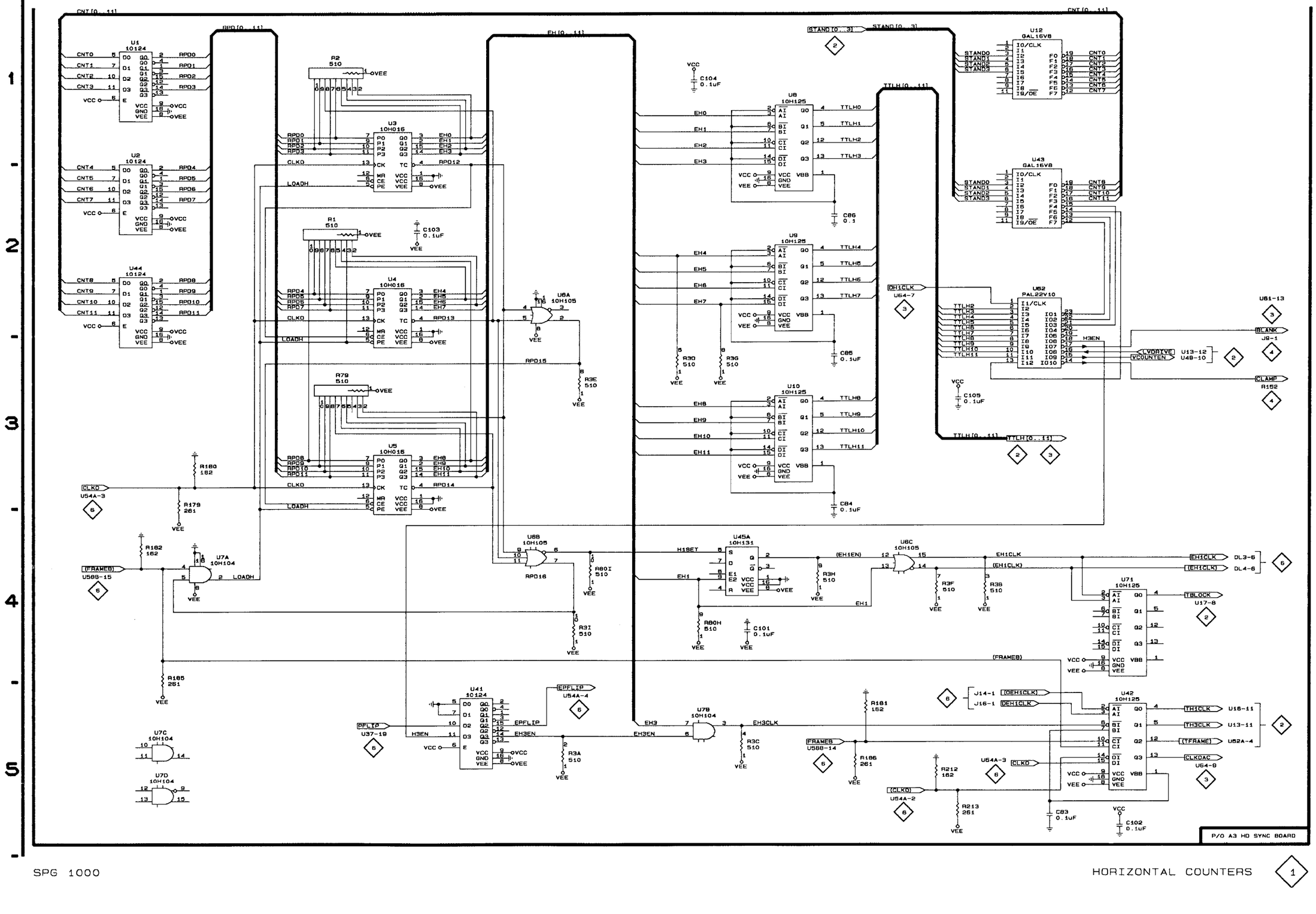
HD SYNC BOARD Schematic <1> Look-Up Chart

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram.

Assembly A3. *Partial A3 also shown on Schematics 2, 3, 4, 5, and 6.*

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C83	G5	F3	R3I	D4	H4	U6C	F4	I3
C84	E3	K5	R79	B3	I3	U7A	B4	H3
C85	E3	I5	R80H	E4	H3	U7B	E5	H3
C86	E2	H5	R80I	D4	H3	U7C	A5	H3
C101	E4	K3	R179	A3	J4	U7D	A5	H3
			R180	B3	J4	U8	E1	H5
C102	G5	F4						
C103	C2	G2	R181	F5	H3	U9	E2	I5
C104	E1	J1	R182	A4	H4	U10	E3	J5
C105	F3	J5	R185	A4	H4	U12	G1	G3
			R186	F5	H4	U41	C5	H2
R1	B2	I4	R212	F5	F3	U42	G5	F3
R2	B1	H4	R213	F5	F3	U43	G2	G3
R3A	D5	H4						
R3B	F4	H4	U1	A1	H3	U44	A2	I2
R3C	E5	H4	U2	A2	H3	U45A	E4	I3
			U3	C1	H4	U62 *	G2	J5
R3D	E3	H4				U71	G4	F3
R3E	D3	H4	U4	C2	I4			
R3F	F4	H4	U5	C3	J4	W1	C5	H1
R3G	E3	H4	U6A	D2	I3	W2	B5	H1
R3H	E4	H4	U6B	D4	I3			

** See Parts List for Serial Number Ranges.*



SPG 1000

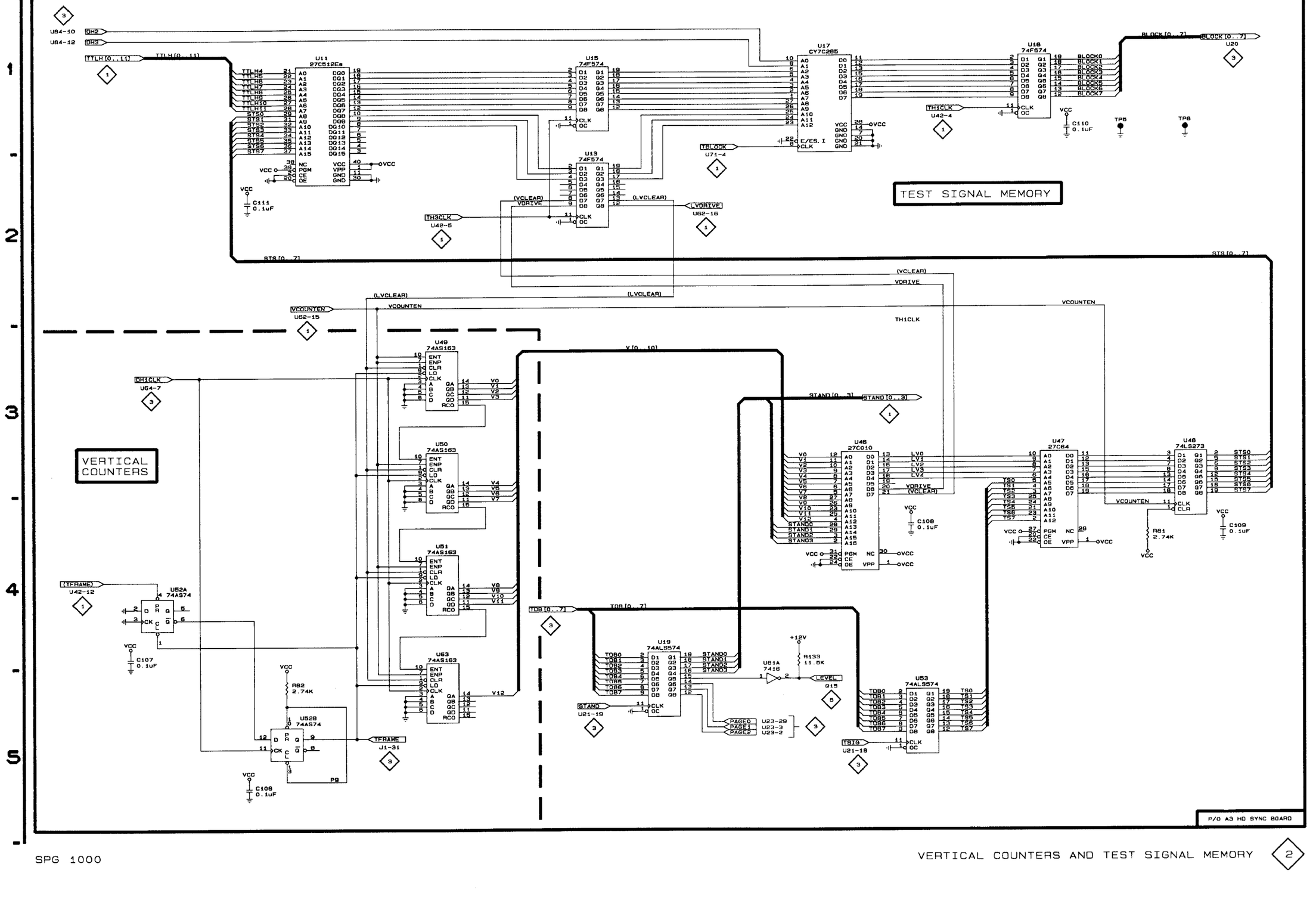
HORIZONTAL COUNTERS 1

HD SYNC BOARD
Schematic <2> Look-Up Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

Assembly A3. *Partial A3 also shown on Schematics 1, 3, 4, 5, and 6.*

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C106	B5	F5	U16	G1	F4
C107	A4	J5	U17	E1	G5
C108	F4	G3	U19	D4	I2
C109	H4	K3	U46	F3	K5
C110	G1	I2	U47	G3	K4
C111	B2	G5	U48	H3	J3
R81	G4	J3	U49	C3	L5
R82	B5	K5	U50	C3	J3
R133	E4	C5	U51	C4	J2
TP5	G1	K1	U52A	A4	I3
TP6	H1	H6	U52B	B5	I3
			U53	F5	J2
U11	B1	H6			
U13	D2	J4	U61A	E5	H2
U15	D1	G5	U63	C4	L5



SPG 1000

VERTICAL COUNTERS AND TEST SIGNAL MEMORY 2

HD SYNC BOARD
Schematic <3> Look-Up Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

Assembly A3. *Partial A3 also shown on Schematics 1, 2, 4, 5, and 6.*

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1	F2	F5	L1	F3	F5
C2	F3	F5	L20	D4	D2
C3	F3	F5	L21	E5	D2
C4	H2	E5			
C87	E3	F4	Q18	G5	D2
			Q19	G5	D3
C112	B1	J2			
C113	D2	L5	R6	F2	F5
C114	D3	K1	R7	F2	E5
C115	C4	J1	R8	F2	E5
C116	C4	I1	R61	A2	H2
			R141	F1	H4
C117	B4	I1			
C118	B4	I1	R166	E4	C2
C119	C4	J1	R168	F5	C2
C120	C4	I1	R169	F5	C3
C121	B4	H3	R170	G5	C3
			R175	F4	D3
C122	B4	J2			
C153	B5	D2	R177	G5	D3
C154	B5	E3	R206	C3	M2
C155	C5	D3	R207	E3	F4
C156	C5	C3	R208	E3	F3
			R209	B2	L2
C157	C5	E3			
C158	C5	C3	R210	B3	K2
C159	E4	C2	R211	B3	L1
C160	F5	D3	R214	D2	J1
C161	D5	C2	R215	B3	M2
C163	F4	D3	U20	G2	F4
C165	H5	D3	U21	C3	K2
C167	H5	C3	U22	D1	J2
C168	H3	E4	U23	C1	K3
C175	C3	M2	U24	B1	L1
C176	F3	G4	U25	B1	L2
C177	F3	E4	U26	F2	F5
			U64	F1	G4
CR10	C5	E2	U67	B5	D3
CR11	C5	E2	U68	B5	E3
CR12	C5	E3			
CR13	C5	F3	U69	D4	C2
CR15	C3	M2	U70A	F5	C2
J1	A1	M1	W187	F3	F4
J8	A4	K1			

uP INTERFACE, RAMDAC
REGULATED SUPPLIES
CONTROLLER BOARD W1
OSCILLATOR BOARD W20
U24 74ALS244
U25 74ALS244
U23 27C010
U22 74LS245
U21 PAL22V10
U16
U64 74F378
U20 BT477
U26 LM385BYZ-1.2
U61F 7416
U528-9
U82-1
U82-17
U42-13
U19-14
U19-13
U19-12
U19-11
U53-11
U37-11
U17-10
U17-9
U67 7805
U68 7905
U69 MC1403
U70A 1458
J1
J8
W187
L1 .495uH
L20 1.1uH
L21 1.1uH
P/O A3 HD SYNC BOARD

HD SYNC BOARD
Schematic <4> Look-Up Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

Assembly A3. *Partial A3 also shown on Schematics 1, 2, 3, 5, and 6.*

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C6A	A4	E4
C7	B4	D4
C9	B3	D3
C10	B3	D3
C11	C4	C4
C13	C4	C4
C17	E2	B1
C18	E2	B1
C19	C1	B1
C20	B1	B1
C21	B1	B1
C22	B1	B1
C23	F4	A3
C66	D2	B1
C67	D2	A1
C68	G1	A3
C69	G3	B1
C90	C2	C1
C91	C2	B1
C92	A5	C4
C138	D1	B2
C139	E1	B2
C140	G2	A1
C141	G2	B2
C142	G1	A2
C143	G1	B3
C144	E5	B3
C145	B5	B3
C146	D5	C3
C169	E3	A4
C170	E4	A4
C171	E4	B4
C172	G4	A3
C178	F1	B3
C179	F2	A2
C180	F2	A1
C181	C3	C3
CR14	D5	C3
J2	H4	A3
J3	H1	A2
J4	H2	A2
J5	H2	A1
J9	A1	C1
L3	B4	D3
L4	B4	D3
L5	C4	C3
L17	D2	B1
L18	D2	B1
L22	G4	A3
P1	A1	
Q20	E5	B3
R9	H1	A3
R10	H2	A2
R11	H2	A1
R12	F1	B2
R13	D1	B2
R14	E1	B2
R15	D1	B2
R16	D1	B2
R17	E1	B2
R18	E1	B2
R20	B1	B1
R23	F4	B3
R36	D3	C4
R37	A4	E4
R142	E4	B3
R143	E4	B1
R144	E4	B4
R145	D4	B4
R146	D4	B4
R152	D5	C3
R188	D4	C4
R189	D4	C4
R190	D4	C4
R191	C2	B3
R192	E5	B3
R193	E5	B3
R194	E5	B3
R216	F2	B2
R217	F2	A1
R218	G1	A3
R219	G2	A2
R220	G3	A1
R221	F1	A3
TP3	A5	G1
TP4	B5	E4
U27	C1	B2
U29	G1	B3
U30	G2	A2
U31	G2	A2
U72	E4	B4
U73	F5	B3

P9
VISUAL AIDE
P8
J9
VCC
BLANK
U62-17
U27
CHSW4
IN1
IN2
IN3
IN4
AOUT
AINV
BOUT
BINV
VCC
VCC3
VCC4
VCC5
GND
VEE
CB
CP
CN
CD
A0
A1
R20 301.0
R191 301.0
C22 0.1uF
C21 0.1uF
C20 0.1uF
C19 0.1uF
C136 10pF
R15 392
R16 392
R13 1.21K
-12V
C139 10pF
R14 412
R18 374
R17 50
SYNC AMPLITUDE
R12 1.21K
C91 0.1uF
C67 10uF
L16 0.495uH
C16 0.1uF
C90 0.1uF
C66 10uF
L17 0.495uH
C17 0.1uF
-5A
+5A
TRI-LEVEL SYNC OUTPUT
R221 301.0
C178 15pF
U29 CLC400
C68 0.1uF
C143 0.1uF
R218 301.0
R9 75.0
J3
R216 301.0
C179 15pF
U30 CLC400
C142 0.1uF
C141 0.1uF
R219 301.0
R10 75.0
J4
SYNC OUTPUTS
R217 301.0
C180 15pF
U31 CLC400
C140 0.1uF
C69 0.1uF
R220 301.0
R11 75.0
J5
G/Y FILTER & OUTPUT AMPLIFIER
DACG
U20-28
R37 75.0
C9 6.8pF
L3 610nH
C8 43pF
C10 20pF
L4 516nH
C7 120pF
C11 47pF
C181 3pF
L5 300nH
C13 200pF
R36 69.8
R188 10.0
R189 10.0
R190 1.24K
-10V
U72 CLC400
C169 0.1uF
C170 0.1uF
C171 0.1uF
R23 75.0
L22 217nH
C23 20pF
C172 5-25
G/Y
J2
R142 301.0
R143 301.0
IN1
R144 249.0
R145 221.0
G/Y AMPLITUDE
R146 50
C92 0.1uF
C145 0.1uF
TP3
TP4
CLAMP
U62-14
R152 221.0
C146 36pF
CR14
Q20
R193 10.0K
R192 6.0K
C144 1.0uF
R194 10.0K
SYNC BLANKING LEVEL
U73 LF351
P/O A3 HD SYNC BOARD

HD SYNC BOARD
Schematic <5> Look-Up Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

Assembly A3. *Partial A3 also shown on Schematics 1, 2, 3, 4, and 6.*

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C32	A4	E4
C33	B4	D4
C35	B3	D4
C36	C3	D4
C37	C4	C4
C39	D4	C5
C40	G4	B4
C41	F3	A4
C42	F4	B5
C49	A2	E5
C50	B2	D5
C52	B1	D5
C53	C1	D5
C54	C2	C5
C56	D2	C5
C57	G2	B5
C58	F1	A5
C59	F2	B5
C96	F3	A4
C97	F1	A5
C137	D4	C5
C173	G2	A5
C174	G4	A4
C182	D3	C3
C183	D1	C5
CR4	D4	B4
J6	H4	A4
J7	H1	A5
L8	B3	D4
L9	C3	D4
L10	C4	C4
L13	B1	D5
L14	C1	D5
L15	C2	C5
L23	G4	A4
L24	G1	A5
Q14	E4	C4
Q15	C4	C5
Q16	E2	B6
R39	F4	B4
R40	F4	B5
R41	F4	B5
R42	E4	B4
R52	E4	B4
R53	A4	E4
R55	F1	B5
R56	F2	B5
R57	F2	B5
R58	E2	B5
R68	E2	B5
R69	A2	E5
R134	D5	B5
R135	E5	C4
R136	D4	C5
R137	E2	B5
R138	E4	B5
R140	D2	B5
R154	E5	B4
R155	E2	B5
R205	C4	C4
U34	F4	A5
U36	F1	A6

R/PR FILTER & OUTPUT AMPLIFIER

DACR
U20-25
3
R69 75.0
C49 43pF
C52 6.8pF
L13 610nH
C50 120pF
C53 20pF
L14 516nH
C54 47pF
C183 3pF
L15 300nH
C58 200pF
R68 75.0
R140 28
Q16
R137 499
-10V
R155 100
R OFFSET
-10V
+5R
C58 0.1uF
C97 0.1uF
U36 CLC400
C59 0.1uF
-5R
R56 249.0
R57 221.0
R58 50
R/PR AMPLITUDE
R55 75.0
C57 20pF
L24 217nH
C173 5-25
R/PR
J7

B/PB FILTER & OUTPUT AMPLIFIER

DACB
U20-27
3
R53 75.0
C32 43pF
C35 6.8pF
L8 610nH
C33 120pF
C36 20pF
L9 516nH
C37 47pF
C182 3pF
L10 300nH
C39 200pF
R52 75.0
LEVEL
U61A-2
2
Q15
R205 200
PB, PR OFFSET ADJUST
R138 1.54K
C137 0.1uF
R138 28
Q14
CR4
R134 1.37K
-10V
R135 499
-10V
B OFFSET
R154 100
-10V
+5R
C41 0.1uF
C96 0.1uF
U34 CLC400
C42 0.1uF
-5R
R40 249.0
R41 221.0
R42 50
B/PB AMPLITUDE
R39 75.0
C40 20pF
L23 217nH
C174 5-25
B/PB
J6

P/O A3 HD SYNC BOARD

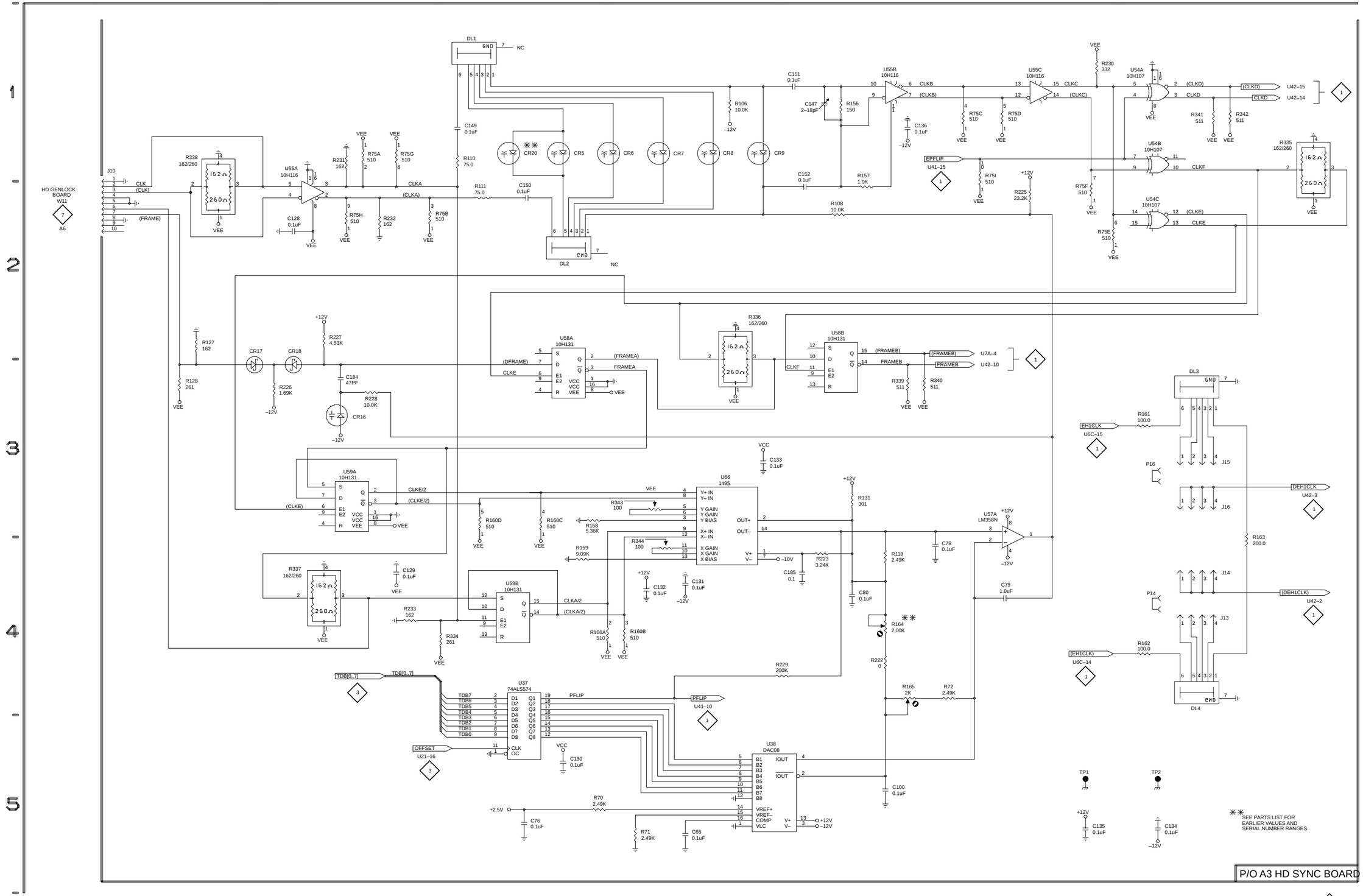
HD SYNC BOARD
Schematic <6> Look-Up Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

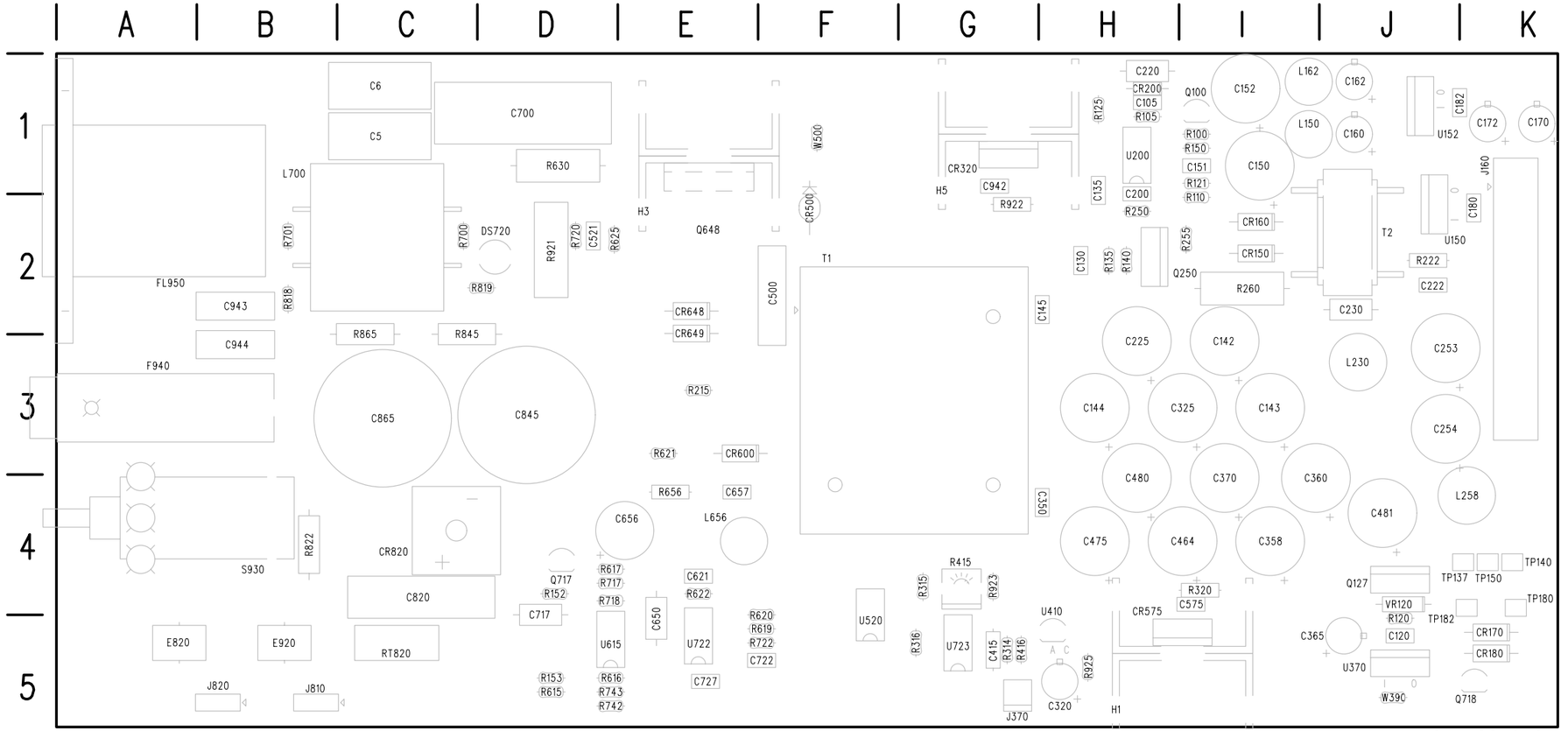
Assembly A3. *Partial A3 also shown on Schematics 1, 2, 3, 4, and 5.*

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C65	D5	G1
C76	C5	G1
C78	F4	E2
C79	F4	E1
C80	E4	E2
C100	F5	G2
C128	B2	D1
C129	C4	E1
C130	D5	G3
C131	E4	H2
C132	E4	G2
C133	E3	K2
C134	H5	E1
C135	G5	E1
C136	F1	C1
C147	E1	D1
C149	C1	D2
C150	D2	C1
C151	E1	D2
C152	E2	D1
C184	B3	H1
C185	E4	E2
CR5	D1	D2
CR6	D1	D2
CR7	D1	D2
CR8	E1	D2
CR9	E1	D2
CR16	B3	H1
CR17	B2	G1
CR18	B2	G1
CR20 *	C1	D2
DL1	C1	D2
DL2	D2	D1
DL3	G3	F2
DL4	G4	F2
J10	A1	H1
J13	G4	F2
J14	G4	F2
J15	G3	F2
J16	G3	G2
P14	G4	
P16	G3	
R70	D5	G1
R71	D5	G1
R75A	B2	C1
R75B	C2	C1
R75C	F1	C1
R75D	F1	C1
R75E	G2	C1
R75F	G2	C1
R75I	F1	C1
R106	E1	D2
R108	E2	E1
R110	C1	C1
R111	C2	C1
R118	F4	E2
R127	B2	H1
R128	A3	H1
R131	E3	E2
R156	E1	D1
R157	E2	D1
R158	D3	E2
R159	D4	E2
R160A	D4	E2
R160B	D4	E2
R160C	D3	E2
R160D	C3	E2
R161	G3	G2
R162	G4	F2
R163	H3	F2
R164*	F4	E2
R165	F4	E1
R222	F4	E1
R223	E4	E2
R225	G2	E1
R226	B3	H1
R227	B2	G2
R228	B3	G1
R229	E4	E2
R230	G1	D1
R231	C2	C1
R232	C2	D1
R233	C4	F1
R334	C4	F1
R335	H1	G1
R336	E2	F1
R337	B4	G1
R338	B2	C1
R339	F3	F1
R340	F3	G1
R341	H1	E1
R342	H1	E1
R343	E4	E3
R344	E4	E2
TP1	G5	C1
TP2	H5	C5
U37	C4	G2
U38	E5	G2
U54A	G1	D1
U54B	G1	D1
U54C	G2	D1
U55A	B2	C1
U55B	F1	C1
U55C	G1	C1
U57A	F3	E2
U58A	D2	F1
U58B	E2	F1
U59A	B3	E1
U59B	C4	E1
U66	E3	E2

* See parts list for earlier values and serial number ranges.


HD GENLOCK BOARD W11
A6
J10
CLK
(CLK)
(FRAME)
R338 162/260
R127 162
R128 261
CR17
CR18
R226 1.69K
R227 4.53K
C184 47PF
R228 10.0K
CR16
U55A 10H116
R231 162
R75A 510
R75G 510
C128 0.1uF
R75H 510
R232 162
R75B 510
CLKA
(CLKA)
R111 75.0
C150 0.1uF
DL1
DL2
GND
END
NC
C149 0.1uF
R110 75.0
CR20
CR5
CR6
CR7
CR8
CR9
R106 10.0K
C151 0.1uF
C147 2–18pF
R156 150
C152 0.1uF
R157 1.0K
R108 10.0K
U55B 10H116
C136 0.1uF
CLKB
(CLKB)
U55C 10H116
CLKC
(CLKC)
R75C 510
R75D 510
R230 332
U54A 10H107
(CLKD)
CLKD
U42–15
U42–14
R341 511
R342 511
U54B 10H107
EPFLIP
U41–15
R75I 510
R225 23.2K
CLKF
R335 162/260
R75F 510
U54C 10H107
(CLKE)
CLKE
R75E 510
R336 162/260
U58A 10H131
(DFRAME)
CLKE
(FRAMEA)
FRAMEA
U58B 10H131
(FRAMEB)
FRAMEB
U7A–4
U42–10
R339 511
R340 511
U59A 10H131
CLKE/2
(CLKE/2)
R160D 510
R160C 510
U59B 10H131
CLKA/2
(CLKA/2)
R160A 510
R160B 510
R337 162/260
C129 0.1uF
R233 162
R334 261
U66 1495
R343 100
R158 5.36K
R344 100
R159 9.09K
C133 0.1uF
C132 0.1uF
C131 0.1uF
C185 0.1
R131 301
R223 3.24K
C80 0.1uF
R118 2.49K
C78 0.1uF
U57A LM358N
C79 1.0uF
R164 2.00K
R222 0
R229 200K
R165 2K
R72 2.49K
C100 0.1uF
TDB[0..7]
U37 74ALS574
TDB7
TDB6
TDB5
TDB4
TDB3
TDB2
TDB1
TDB0
PFLIP
U41–10
OFFSET
U21–16
C130 0.1uF
U38 DAC08
IOUT
R70 2.49K
R71 2.49K
C76 0.1uF
C65 0.1uF
DL3
DL4
EHICLK
U6C–15
R161 100.0
P16
J15
J16
DEHICLK
U42–3
R163 200.0
P14
J14
J13
(DEHICLK)
U42–2
R162 100.0
(EHICLK)
U6C–14
TP1
TP2
C135 0.1uF
C134 0.1uF
SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES.
P/O A3 HD SYNC BOARD

A4 Power Supply



671–3242–01

Static Sensitive Devices
See Maintenance Section

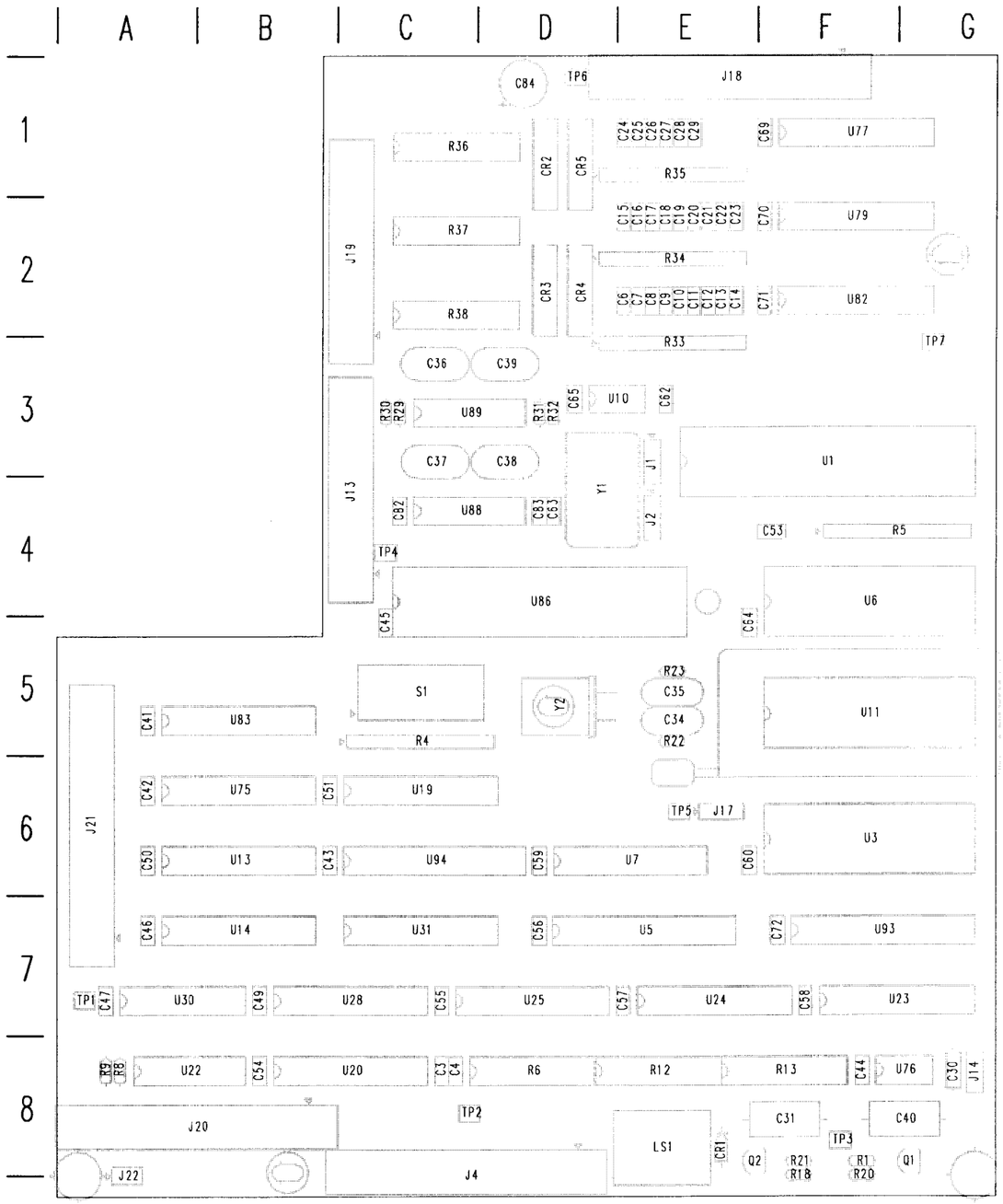
A4 POWER SUPPLY BOARD

A4 Power Supply Board and Diagram <1> Component Locator

Comp No	Diag No	Diag Loc	Bd Loc
C5	1	D1	C1
C6	1	D1	C1
C105	1	D4	H1
C120	1	G2	J5
C130	1	D4	H2
C135	1	D3	H2
C142	1	E3	I3
C143	1	E3	I3
C144	1	F3	H3
C145	1	E3	H2
C150	1	F3	I1
C151	1	D4	I1
C152	1	F3	I1
C160	1	F3	J1
C162	1	F3	J1
C170	1	G3	K1
C172	1	G3	K1
C180	1	G3	K2
C182	1	G3	K1
C200	1	E3	H2
C220	1	E4	H1
C222	1	E4	J2
C225	1	E3	H3
C230	1	E3	J2
C253	1	F3	J3
C254	1	G2	J3
C320	1	E5	H5
C325	1	F3	H3
C350	1	D2	H4
C358	1	F2	I4
C360	1	F2	I4
C365	1	H4	I5
C370	1	E2	I4
C415	1	E5	G5
C464	1	E2	H4
C475	1	E2	H4
C480	1	F2	H4
C481	1	F2	J4
C500	1	C2	F2
C521	1	C5	D2
C575	1	D2	I4
C621	1	A3	E4
C650	1	B3	E5
C656	1	B3	D4
C657	1	C2	E4
C700	1	D1	D1
C717	1	B5	D5
C722	1	A3	E5
C727	1	A3	E5
C820	1	B1	C4
C845	1	C1	D3
C865	1	C1	C3
C942	1	D3	G1
C943	1	D1	B2
C944	1	D1	B3
CR150	1	F3	I2
CR160	1	F4	I2
CR170	1	G3	K5
CR180	1	G3	K5
CR200	1	D3	H1
CR320	1	D3	G1
CR500	1	C2	F2
CR575	1	D2	H5
CR600	1	C2	E3
CR648	1	B3	E2
CR649	1	C3	E3
CR820	1	B1	C4
DS720	1	C1	D2
E820	1	B1	A5
E920	1	B1	B5
F940	1	A1	A3
FL950	1	A1	A2
H1	1	D2	H5
H2	1	D2	
H3	1	C3	E2
H4	1	C3	
H5	1	E2	G2
H6	1	E2	
J160	1	H2	K1
J370	1	H4	G5
J810	1	B1	B5
J820	1	B2	B5
L150	1	F3	I1
L162	1	F3	I1
L230	1	F3	J3
L258	1	G2	J4
L656	1	C2	E4
L700	1	D1	B1
P810	1	B1	
Q100	1	D3	I1
Q127	1	G2	J4
Q250	1	E4	H2
Q648	1	C3	E2
Q717	1	C5	D4
Q718	1	H3	K5
R100	1	D3	I1
R105	1	D3	H1
R110	1	D4	I2
R120	1	G2	J5
R121	1	D4	I1
R125	1	D3	H1
R135	1	D4	H2
R140	1	E4	H2
R150	1	D4	I1
R152	1	A2	D4
R153	1	A2	D5
R215	1	C3	E3
R222	1	E4	J2
R250	1	E4	H2
R255	1	E4	I2
R260	1	F4	I2
R314	1	E5	G5
R315	1	E5	G4
R316	1	D5	G5
R320	1	D2	I4
R415	1	E5	G4
R416	1	E5	G5
R615	1	A5	D5
R616	1	A5	D5
R617	1	C5	D4
R619	1	A5	E5
R620	1	C5	E5
R621	1	C3	E3
R622	1	A3	E4
R625	1	C4	E2
R630	1	C3	D1
R656	1	B2	E4
R700	1	D1	C2
R701	1	D1	B2
R717	1	B5	D4
R718	1	B5	D4
R720	1	C5	D2
R722	1	A3	E5
R742	1	B4	D5
R743	1	A5	D5
R818	1	C1	B2
R819	1	C1	C2
R822	1	A1	B4
R845	1	C1	C3
R865	1	C1	C3
R921	1	B2	D2
R922	1	D3	G2
R923	1	E5	G4
R925	1	E5	H5
RT820	1	B1	C5
S930	1	A1	B4
T1	1	D2	F2
T2	1	E3	J2
TP137	1	G3	J4
TP140	1	G2	K4
TP150	1	G2	K4
TP180	1	G3	K4
TP182	1	G4	J5
U150	1	G3	J2
U152	1	G3	J1
U200	1	D4	H1
U370	1	G4	J5
U410	1	E5	H5
U520	1	D5	F5
U615A	1	B5	E5
U615B	1	B5	E5
U722	1	B3	E5
U723A	1	E5	G5
VR120	1	G2	J4
W390	1	G4	J5
W500	1	D2	F1

POWER
FUSE F940
220V 1A MEDIUM BLOW
110V 2A SLOW BLOW
NOT INSTALLED
150VA MAX
50/60 Hz
FL950
F940
2 AMP
CGND
S930
RT820
5
R822
10M
C820
.15UF
E820
E920
CR820
C865
390UF
C845
390UF
R865
470K
R845
470K
R818
150K
R819
150K
DS720
C943
C944
CGND
R701
4.75K
L700
R700
4.75K
C5
.022UF
C6
.022UF
C700
1UF
COM
J810
P810
110V
J820
220V
AC INPUT
&
LINE RECTIFIERS
R152
10.0K
HOUSEKEEPING SUPPLY
TRANSFORMER SWITCHING
R153
84.5K
R921
150K
1W
R656
100
C657
.1UF
L656
10UH
CR600
C500
680PF
CR500
W500
T1
C575
.001UF
R320
100
CR575
C350
.1UF
HEATSINKS
FOR CR575
H5
H6
VISUAL AID
Q127
+/–5V OUTPUTS
TP150
TP140
L258
5UH
+5V
C475
2700UF
C464
2700UF
C370
2700UF
C360
2700UF
C358
2700UF
C480
2700UF
C481
2700UF
C120
.1UF
R120
1.00K
VR120
5.1V
C254
2700UF
HEATSINKS
FOR CR320
H1
H2
CR320
C145
.1UF
C225
2700UF
C142
2700UF
C143
2700UF
C144
2700UF
C325
2700UF
L230
5UH
C253
2700UF
–5V
TP137
NOT INSTALLED
C656
100UF
C650
.47UF
VISUAL AID
Q648
HEATSINKS
FOR Q648
H3
H4
C942
.001UF
R922
100
Q718
MC34064
IN
RESET
GND
J160
J160
CONNECTS
TO J3
5
A2
DIGITAL
BOARD
+/–12V OUTPUTS
VREF
C727
.1UF
R622
3.32K
C621
4700PF
U722
UC3844
RT/CT
VFB
ISEN
COMP
VREF
OUT
VCC
GND
R722
10.0K
C722
470PF
CR649
R215
10.0
Q648
CR648
R621
10.0K
R630
.51
R625
1.21K
R742
30.1K
R100
590
C135
470PF
R125
604
Q100
CR200
C200
.1UF
R105
8.25K
U200
UC3843
R121
221
R150
33.2K
C151
.001UF
C105
2200PF
R110
124
R135
10.0
C130
.001UF
R140
750
C220
.47UF
C230
47UF
T2
CR150
C222
.001UF
R222
100
R250
20.0
Q250
CR160
R255
10.0K
R260
.27
L150
100UH
U150
LM2940–12
IN
OUT
REF
C150
1000UF
C160
47UF
C180
.1UF
C170
47UF
CR170
TP180
C152
1000UF
L162
100UH
C162
47UF
C182
.1UF
C172
47UF
CR180
U152
LM2990T–12
TP182
NOT INSTALLED
FAN DRIVE
J370
FAN
W390
0 OHM
U370
7812
C365
47UF
PULSE WIDTH MODULATOR
R619
10.0K
R743
121K
U615A
LM393
R717
18.2K
R718
255K
C717
.47UF
U615B
LM393
R617
10.0K
Q717
R720
5.62K
C521
270PF
R616
4.75K
R615
9.09K
U520
MOC1005
R620
2.74K
+5V ERROR AMP
&
FEEDBACK
R316
1.00K
U723A
LM358
R923
2.74K
R415
1K
R315
2.74K
R925
2.00K
C415
.0033UF
R314
10.5K
R416
1.00K
C320
2.22UF
U410
431C
NOTE:
SEE PARTS LIST FOR
EARLIER VALUES AND
SERIAL NUMBER RANGES.
A4 POWER SUPPLY

A5 Controller



A5 CONTROLLER BOARD 671-1903-00 — 04

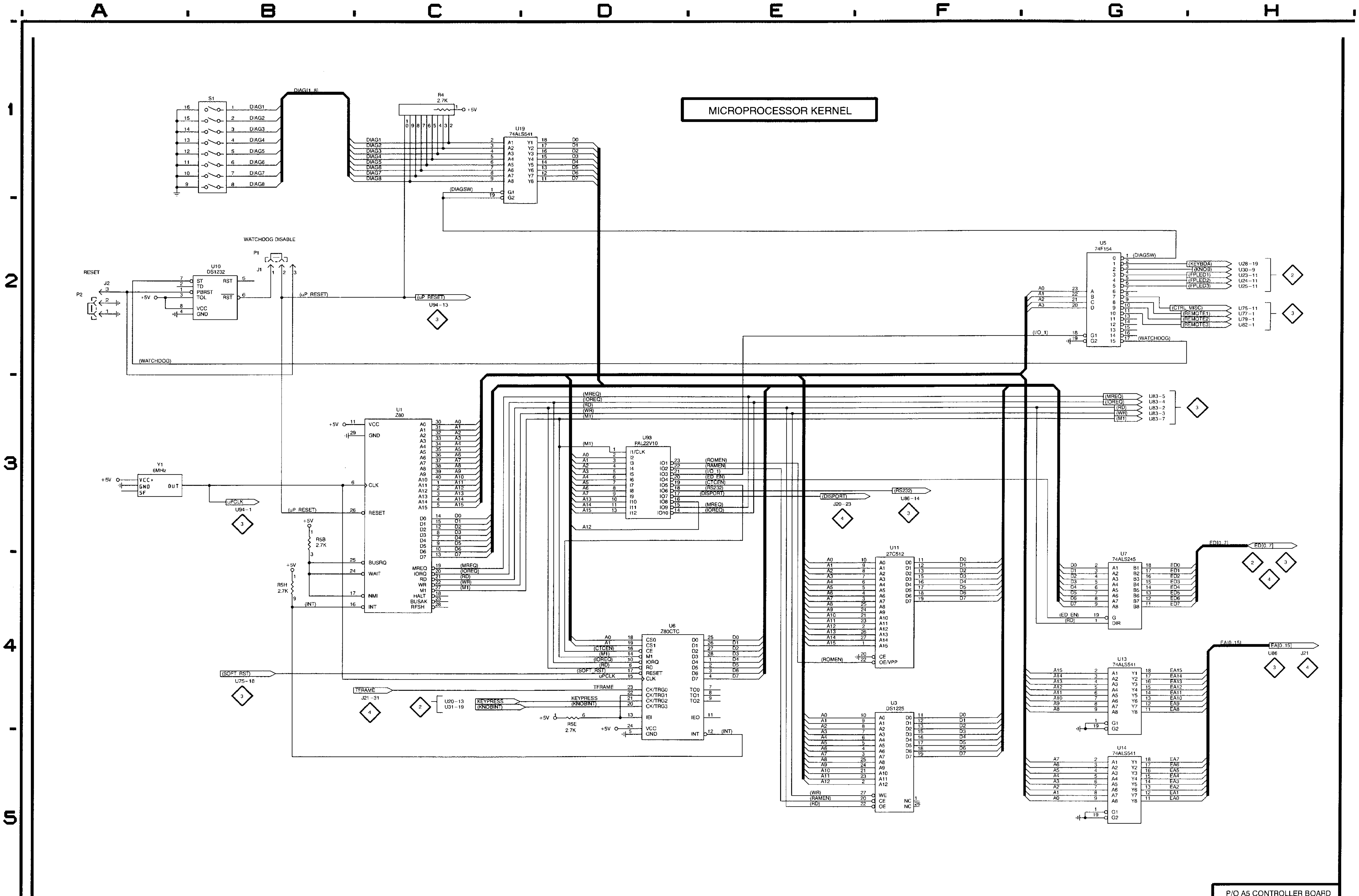
Static Sensitive Devices
See Maintenance Section

CONTROLLER BOARD
Schematic <1> Look-Up Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

Assembly A5. *Partial A5 also shown on Schematics 2, 3, and 4.*

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
J1	B2	E3
J2	A2	E4
J17	F4	E6
P1	B2	
P2	A2	
P17	F4	
R4	C1	C5
R5B	B3	F4
R5E	D4	F4
R5H	B4	F4
S1	B1	C5
U1	C3	F3
U3	F4	F6
U5	G2	E7
U6	D4	F4
U7	G4	E6
U10	B2	D3
U11	F4	F5
U13	G4	B6
U14	G5	B7
U19	C1	C6
U93	D3	F7
Y1	A3	D4

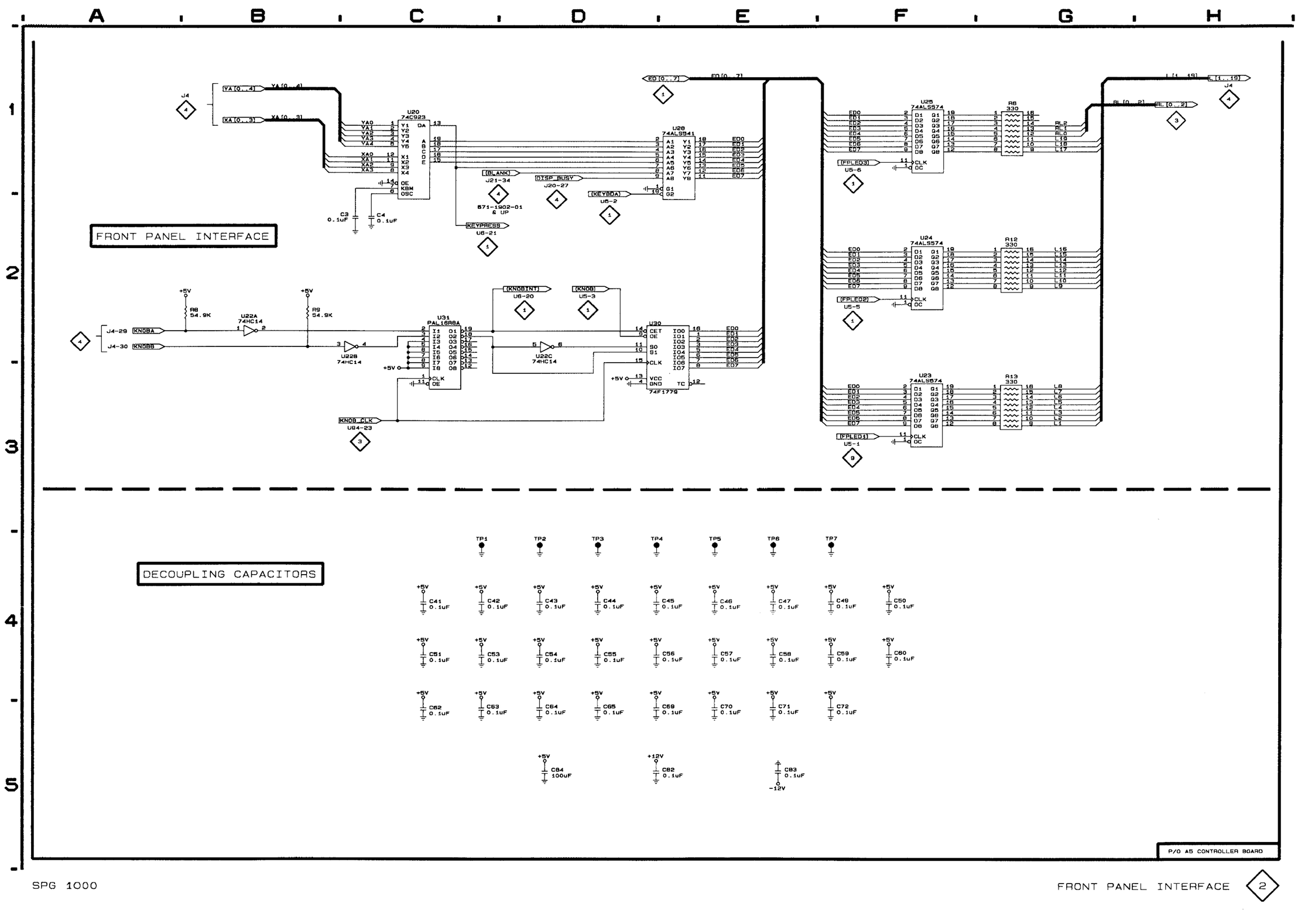

MICROPROCESSOR KERNEL
P/O A5 CONTROLLER BOARD

CONTROLLER BOARD
Schematic <2> Look-Up Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

Assembly A5. *Partial A5 also shown on Schematics 1, 3, and 4.*

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C3	C2	C8
C4	C2	C8
C41	C4	A5
C42	C4	A6
C43	D4	B6
C44	D4	F8
C45	D4	C5
C46	E4	A7
C47	E4	A7
C49	F4	B7
C50	F4	A6
C51	C4	B6
C53	C4	F4
C54	D4	B8
C55	D4	C7
C56	D4	D7
C57	E4	E7
C58	E4	F7
C59	F4	D6
C60	F4	E6
C62	C5	E3
C63	C5	D4
C64	D5	E5
C65	D5	D3
C69	D5	F1
C70	E5	F2
C71	E5	F2
C72	F5	F7
C82	D5	C4
C83	E5	D4
C84	D5	D1
R6	G1	D8
R8	B2	A8
R9	B2	A8
R12	G2	E8
R13	G3	F8
TP1	C4	A7
TP2	D4	C8
TP3	D4	F8
TP4	D4	C4
TP5	E4	E6
TP6	E4	D1
TP7	F4	G3
U20	C1	C8
U22A	B2	A8
U22B	C2	A8
U22C	D2	A8
U23	F3	F7
U24	F2	E7
U25	F1	D7
U28	E1	C7
U30	D2	A7
U31	C2	C7

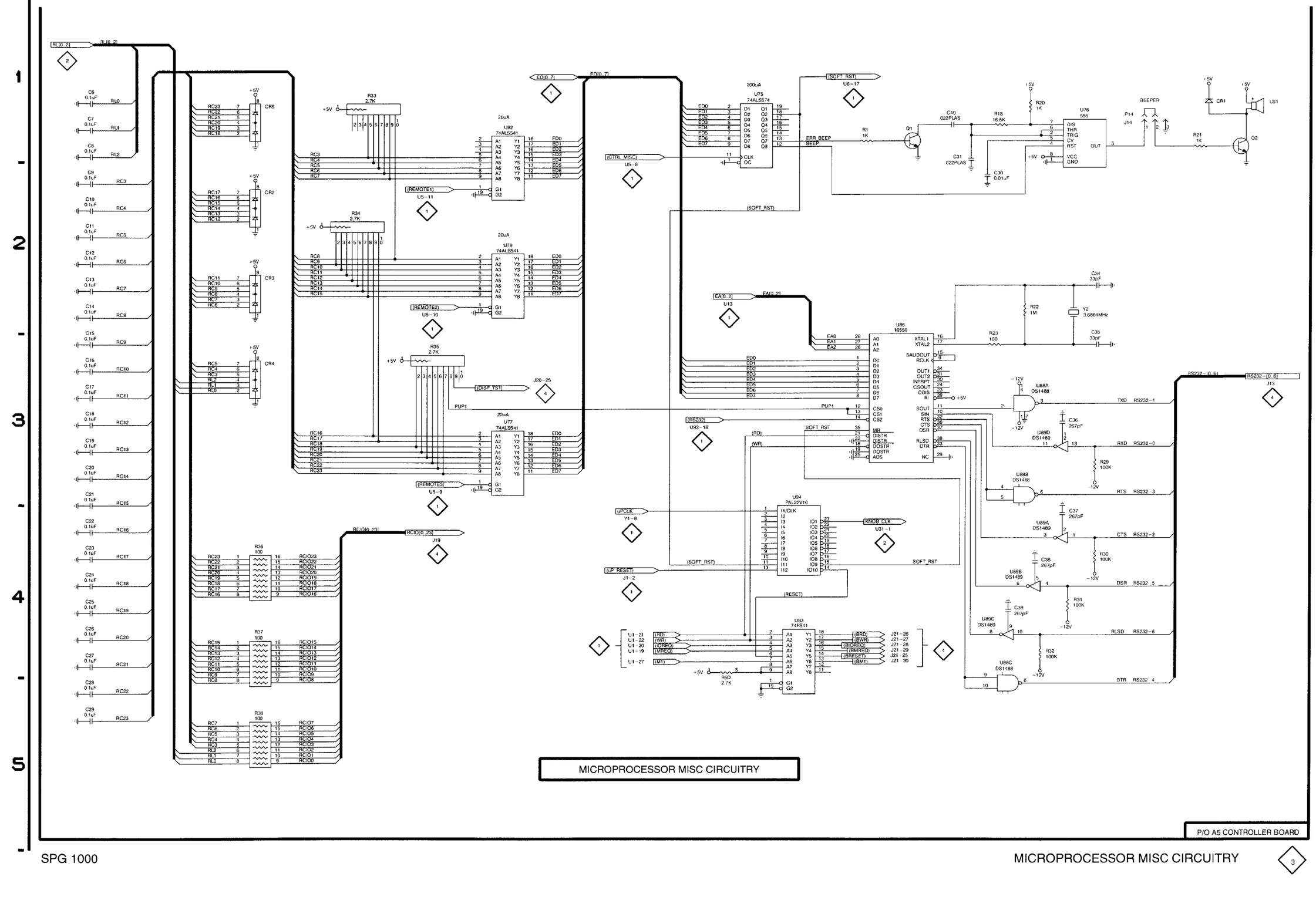

FRONT PANEL INTERFACE
DECOUPLING CAPACITORS
U20 74C923
U28 74ALS541
U31 PAL16R8A
U30 74F1779
U25 74ALS574
U24 74ALS574
U23 74ALS574
U22A 74HC14
U22B 74HC14
U22C 74HC14
R8 54.9K
R9 54.9K
R6 330
R12 330
R13 330
C3 0.1uF
C4 0.1uF
C41 0.1uF
C42 0.1uF
C43 0.1uF
C44 0.1uF
C45 0.1uF
C46 0.1uF
C47 0.1uF
C49 0.1uF
C50 0.1uF
C51 0.1uF
C53 0.1uF
C54 0.1uF
C55 0.1uF
C56 0.1uF
C57 0.1uF
C58 0.1uF
C59 0.1uF
C60 0.1uF
C62 0.1uF
C63 0.1uF
C64 0.1uF
C65 0.1uF
C69 0.1uF
C70 0.1uF
C71 0.1uF
C72 0.1uF
C84 100uF
C82 0.1uF
C83 0.1uF
TP1
TP2
TP3
TP4
TP5
TP6
TP7
P/O A5 CONTROLLER BOARD

CONTROLLER BOARD
Schematic <3> Look-Up Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

Assembly A5. *Partial A5 also shown on Schematics 1, 2, and 4.*

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C6	A1	E2
C7	A1	E2
C8	A1	E2
C9	A2	E2
C10	A2	E2
C11	A2	E2
C12	A2	E2
C13	A2	E2
C14	A2	E2
C15	A3	E2
C16	A3	E2
C17	A3	E2
C18	A3	E2
C19	A3	E2
C20	A3	E2
C21	A3	E2
C22	A4	E2
C23	A4	E2
C24	A4	E1
C25	A4	E1
C26	A4	E1
C27	A4	E1
C28	A5	E1
C29	A5	E1
C30	F2	G8
C31	F1	F8
C34	G2	E5
C35	G3	E5
C36	G3	C3
C37	G4	C3
C38	G4	D3
C39	G4	D3
C40	F1	G8
CR1	H1	E8
CR2	B2	D1
CR3	B2	D2
CR4	B3	D2
CR5	B1	D1
J14	G1	G8
LS1	H1	E8
P14	G1	
Q1	F1	G8
Q2	H1	E8
R1	F1	F8
R5D	E4	F4
R18	F1	F9
R20	G1	F9
R21	H1	F8
R22	G2	E5
R23	F3	E5
R29	G3	C3
R30	G4	C3
R31	G4	D3
R32	G4	D3
R33	B1	E3
R34	B2	E2
R35	C3	E1
R36	B4	C1
R37	B4	C2
R38	B5	C2
U75	E1	A6
U76	G1	G8
U77	C3	F1
U79	C2	F2
U82	C1	F2
U83	E4	A6
U86	F3	D4
U88A	G3	C4
U88B	G3	C4
U88C	G4	C4
U89A	G4	C3
U89B	G4	C3
U89C	G4	C3
U89D	G3	C3
U94	E4	C6
Y2	G2	D5


MICROPROCESSOR MISC CIRCUITRY
P/O A5 CONTROLLER BOARD
SPG 1000
MICROPROCESSOR MISC CIRCUITRY
3

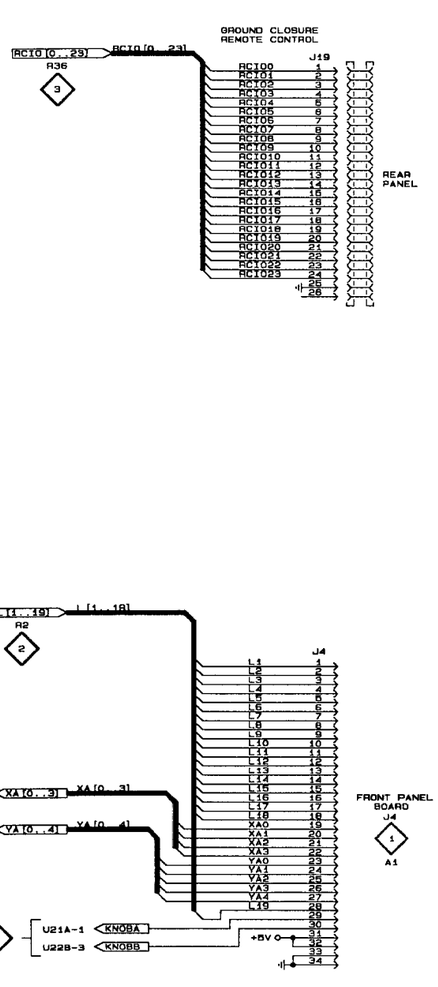
CONTROLLER BOARD
Schematic <4> Look-Up Chart

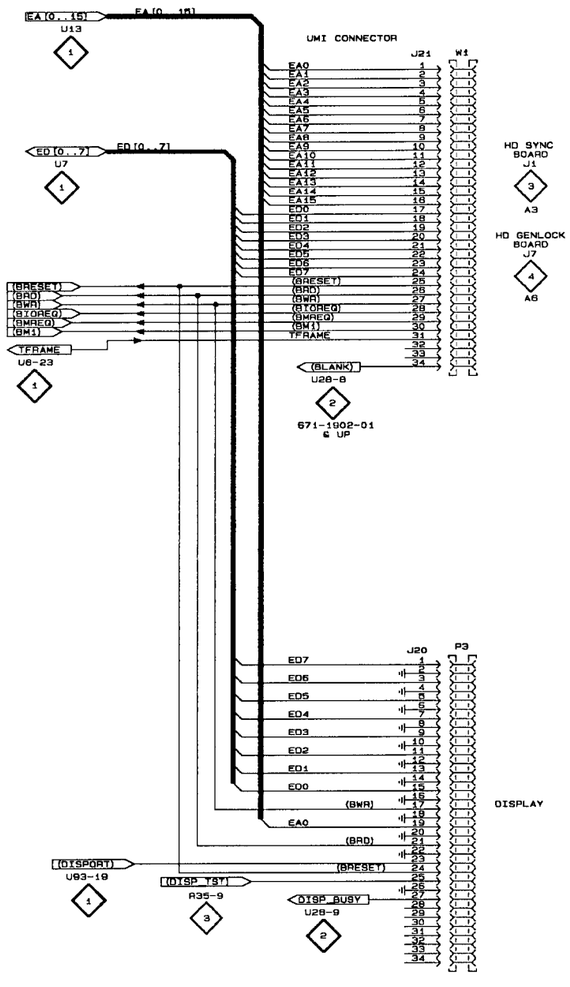
The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

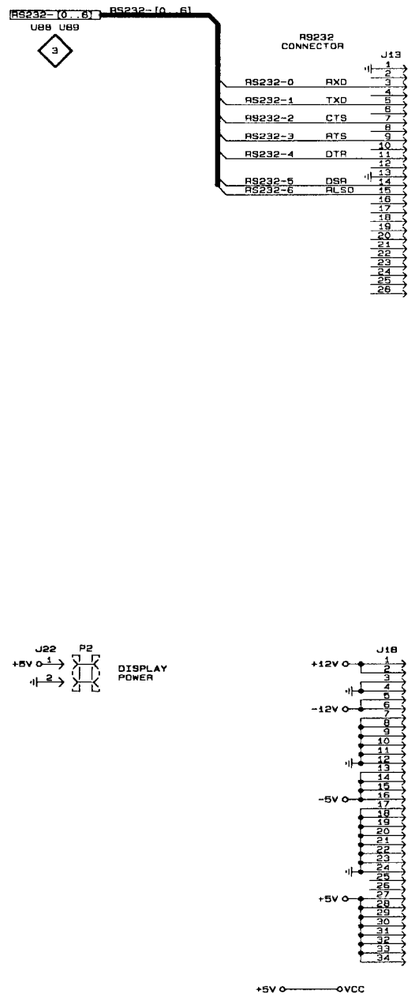
Assembly A5. *Partial A5 also shown on Schematics 1, 2, and 3.*

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
J4	C4	C9
J13	G2	C4
J18	G4	E1
J19	C2	C2
J20	E4	A8
J21	E2	A7
J22	G4	A9
J100	C2	
P3	E4	
W1	E2	

INTERCONNECT

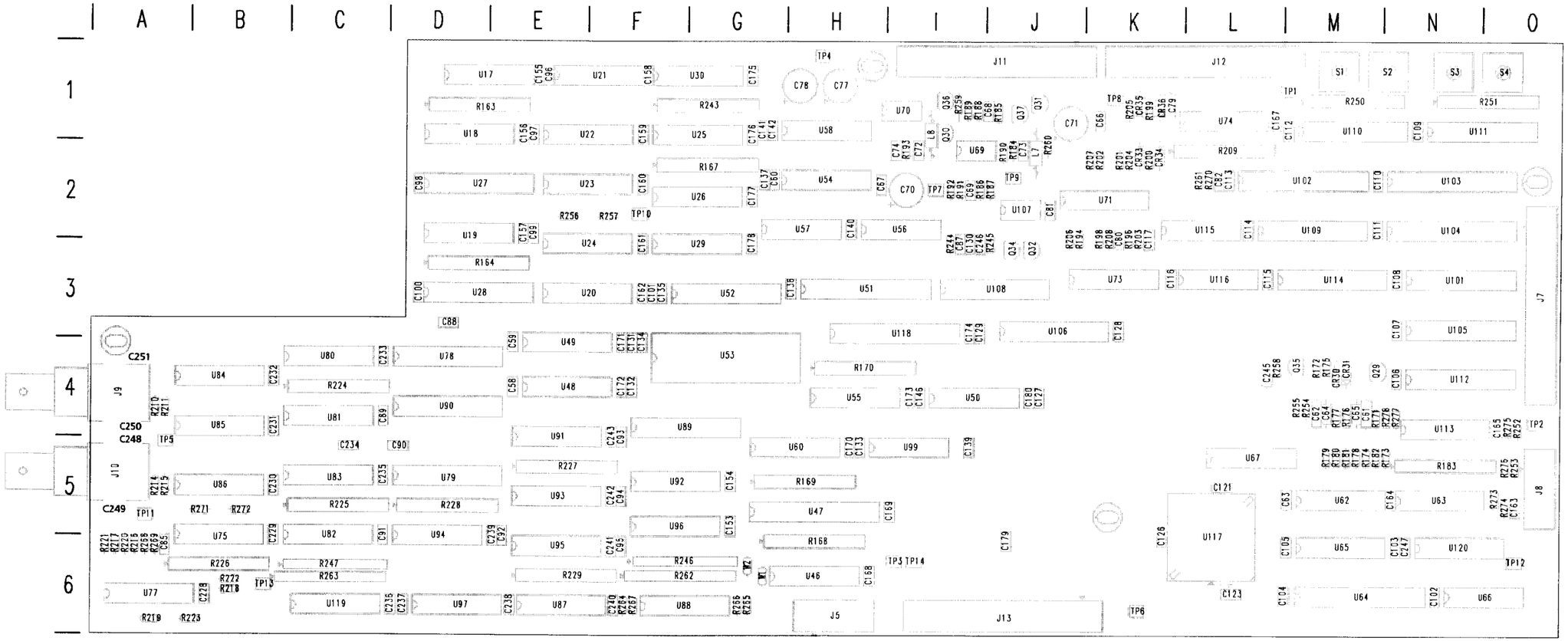






P/O A5 CONTROLLER BOARD

A6 HD Genlock



671-1901-00 — 02

Static Sensitive Devices
See Maintenance Section

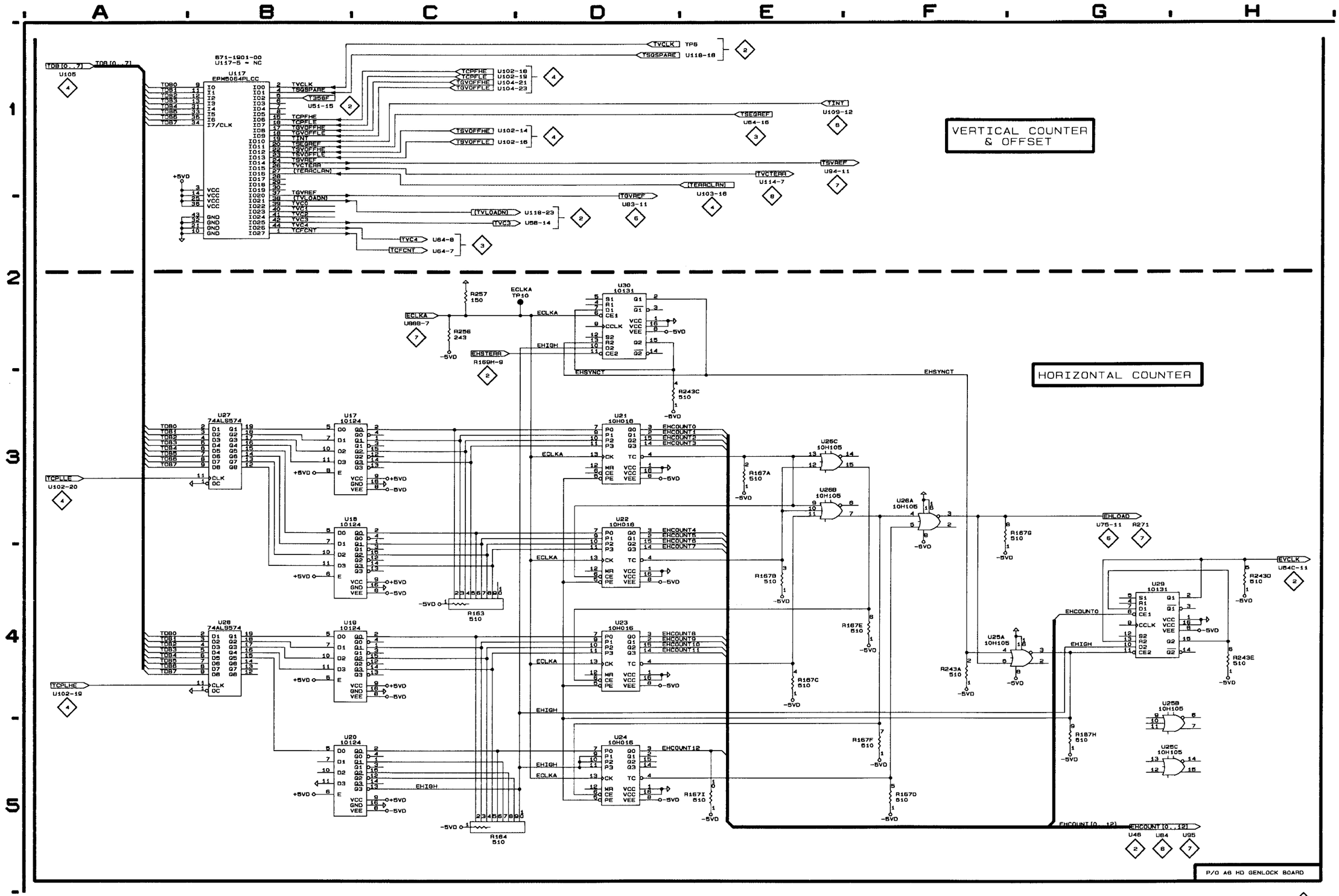
A6 HD GENLOCK BOARD

HD GENLOCK BOARD Schematic <1> Look-Up Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

Assembly A6. *Partial A6 also shown on Schematics 2, 3, 4, 5, 6, 7, and 8.*

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
R163	C4	D1	R243C	D3	F1	U23	D4	E2
R164	C5	D3	R243D	H4	F1	U24	D5	E3
R167A	E3	F2	R243E	H4	F1	U25A	G4	F2
			R256	C2	E2			
R167B	E4	F2	R257	C2	F2	U25B	G4	F2
R167C	E4	F2				U25C	G5	F2
R167D	F5	F2	TP10	D2	F2	U26A	F3	F2
R167E	F4	F2	U17	B3	D1	U26B	E3	F2
R167F	F5	F2	U18	B3	D2	U26C	E3	F2
R167G	F3	F2	U19	B4	D3	U27	B3	D2
R167H	G5	F2	U20	B5	E3	U28	B4	D3
R167I	E5	F2	U21	D3	E1	U29	G4	F3
R243A	F4	F1	U22	D3	E2	U30	D2	F1

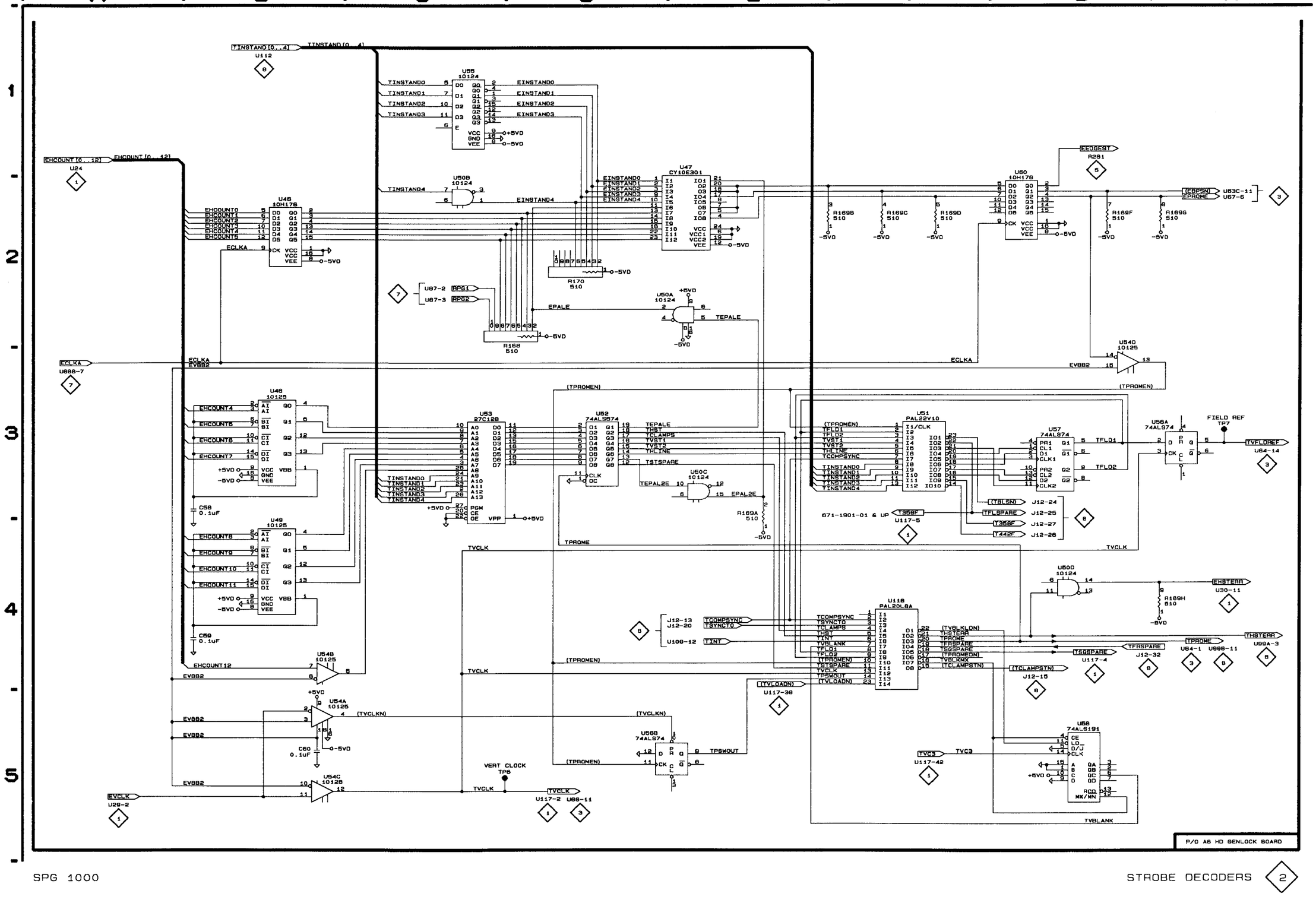

VERTICAL COUNTER & OFFSET
HORIZONTAL COUNTER
TDB[0..7]
U105
871-1901-00
U117-5 = NC
U117
EPM5064PLCC
TVCLK
TSQSPARE
T386F
U51-15
TCPFHE
TCPFLE
TGVOFFHE
TGVOFFLE
TSVOFFHE
TSVOFFLE
TINT
TSEQREF
TSVREF
TVCTERA
(TERACLAN)
TGVREF
(TVLOADN)
TVC3
TVC4
TCFCNT
TP6
U118-18
U102-18
U102-19
U104-21
U104-23
U102-14
U102-16
U109-12
U64-16
U94-11
U114-7
U103-16
U83-11
U118-23
U58-14
U64-8
U64-7
+5VD
VCC
GND
ECLKA
TP10
R257
150
R256
243
U88B-7
EHSTERA
R169H-8
U30
10131
EHIGH
EHSYNCT
R243C
510
U27
74ALS574
U17
10124
U21
10H016
EHCOUNT0
EHCOUNT1
EHCOUNT2
EHCOUNT3
TCPLLE
U102-20
U18
10124
U22
10H016
EHCOUNT4
EHCOUNT5
EHCOUNT6
EHCOUNT7
R163
510
R187A
510
U26C
10H105
U26B
10H105
U26A
10H105
R187G
510
EHLOAD
U75-11
R271
R167B
510
U28
74ALS574
U19
10124
U23
10H016
EHCOUNT8
EHCOUNT9
EHCOUNT10
EHCOUNT11
TCPLHE
U102-19
R167C
510
U25A
10H105
R243A
510
U29
10131
EHCOUNT0
EVCLK
U64C-11
R243D
510
R243E
510
U20
10124
U24
10H016
EHCOUNT12
R164
510
R167I
510
R167E
510
R167F
510
R167D
510
R187H
510
U25B
10H105
U25C
10H105
EHCOUNT[0..12]
U46
U84
U95
P/O A6 HD GENLOCK BOARD

HD GENLOCK BOARD
Schematic <2> Look-Up Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

Assembly A6. *Partial A6 also shown on Schematics 1, 3, 4, 5, 6, 7, and 8.*

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C58	B3	E4
C59	B4	E4
C60	B5	G2
R168	C2	G6
R169A	E3	G5
R169B	E2	G5
R169C	F2	G5
R169D	F2	G5
R169F	G2	G5
R169G	H2	G5
R169H	H4	G5
R170	D2	H4
TP6	C5	K6
TP7	H3	I2
U46	B2	G6
U47	D2	G5
U48	B3	E4
U49	B4	E4
U50A	E2	I4
U50B	C2	I4
U50C	E3	I4
U50D	G4	I4
U51	F3	H3
U52	D3	F3
U53	C3	F4
U54A	B5	H2
U54B	B4	H2
U54C	B5	H2
U54D	G3	H2
U55	C1	H4
U56A	H3	H3
U56B	D5	H3
U57	G3	G3
U58	G5	H2
U60	G2	G5
U118	F4	H4

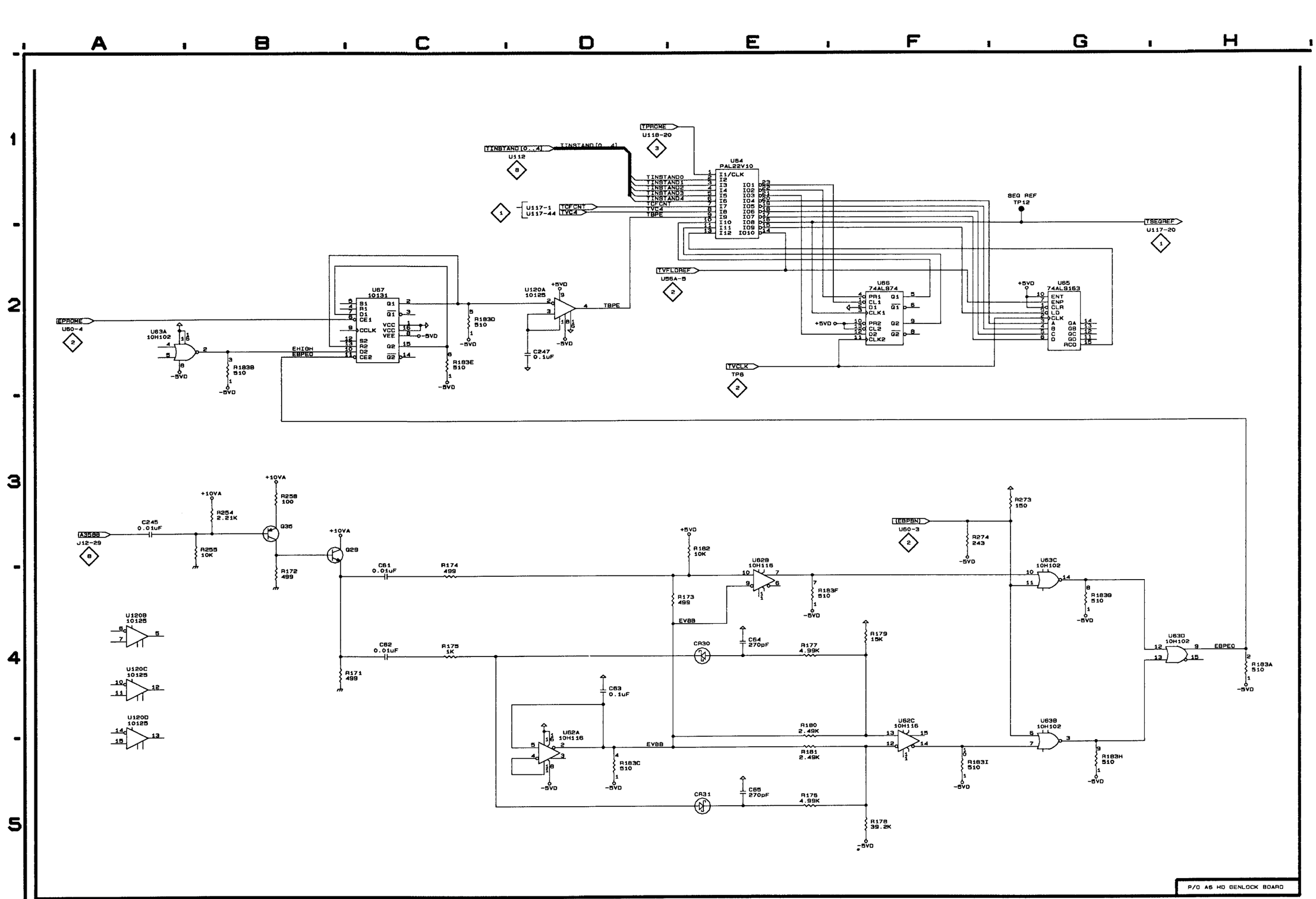

TINSTAND [0..4]
U112
8
U55
10124
TINSTAND0
TINSTAND1
TINSTAND2
TINSTAND3
EINSTAND0
EINSTAND1
EINSTAND2
EINSTAND3
+5VD
-5VD
EHCOUNT [0..12]
U24
1
U48
10H176
EHCOUNT0
EHCOUNT1
EHCOUNT2
EHCOUNT3
EHCOUNT4
EHCOUNT5
ECLKA
U50B
10124
TINSTAND4
EINSTAND4
U47
CY10E301
R170
510
7
U87-2 RPG1
U87-3 RPG2
EPALE
U50A
10124
TEPALE
R168
510
R169B
510
R169C
510
R169D
510
U60
10H176
EEDGEST
R251
5
EEDPSN
EPROME
U63C-11
U67-6
3
R169F
510
R169G
510
ECLKA
U68B-7
7
ECLKA
EVBB2
U54D
10125
EVBB2
(TPROMEN)
U48
10125
EHCOUNT4
EHCOUNT5
EHCOUNT6
EHCOUNT7
C58
0.1uF
U49
10125
EHCOUNT8
EHCOUNT9
EHCOUNT10
EHCOUNT11
C59
0.1uF
U53
27C128
TINSTAND0
TINSTAND1
TINSTAND2
TINSTAND3
TINSTAND4
+5VD
U52
74ALS574
TEPALE
THST
TCLAMPS
TVST1
TVST2
THLINE
TSTSPARE
CLK
OC
U50C
10124
TEPAL2S
EPAL2E
R169A
510
-5VD
TPROME
TVCLK
U51
PAL22V10
TFLD1
TFLD2
TVST1
TVST2
THLINE
TCOMPSYNC
TINSTAND0
TINSTAND1
TINSTAND2
TINSTAND3
TINSTAND4
671-1901-01 & UP
T358F
U117-5
1
U57
74ALS74
TFLD1
TFLD2
U58A
74ALS74
FIELD REF
TP7
TVFLDREF
U64-14
3
(TBLSN)
J12-24
TFLSPARE
J12-25
T358F
J12-27
T442F
J12-26
8
U50D
10124
EHSTERR
U30-11
1
R189H
510
U118
PAL20L8A
TCOMPSYNC
TSYNCTO
TCLAMPS
THST
TINT
TVBLANK
TFLD1
TFLD2
(TPROMEN)
TSTSPARE
TVCLK
TFSWOUT
(TVLOADN)
J12-13
J12-20
TCOMPSYNC
TSYNCTO
U109-12
TINT
6
(TVBLKLON)
THSTERR
TPROME
TFRSPARE
TSGSPARE
(TPROMEON)
TVBLKMX
(TCLAMPSTN)
U117-4
1
TSGSPARE
TPRSPARE
J12-32
TPROME
U64-1
U99E-11
THSTERR
U99A-3
(TCLAMPSTN)
J12-15
U117-38
(TVCLOADN)
U54B
10125
EVBB2
U54A
10125
(TVCLKN)
EVBB2
EVBB2
C60
0.1uF
U54C
10125
EVBB2
EVCLK
U29-2
1
VERT CLOCK
TP6
TVCLK
U117-2 U66-11
1
3
U56B
74ALS74
TPSWOUT
U56
74ALS191
TVC3
U117-42
1
MX/MN
TVBLANK
P/O A8 HD GENLOCK BOARD

HD GENLOCK BOARD
Schematic <3> Look-Up Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

Assembly A6. *Partial A6 also shown on Schematics 1, 2, 4, 5, 6, 7, and 8.*

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C61	C4	M4
C62	C4	M4
C63	D4	M5
C64	E4	M4
C65	E5	M4
C245	A3	L4
C247	D2	N6
CR30	E4	M4
CR31	E5	M4
Q29	B3	M4
Q35	B3	M4
R171	B4	M4
R172	B4	M4
R173	E4	N5
R174	C4	M5
R175	C4	M4
R176	E5	M4
R177	E4	M4
R178	F5	M5
R179	F4	M5
R180	E4	M5
R181	E5	M5
R182	E3	M5
R183A	H4	N5
R183B	B2	N5
R183C	D5	N5
R183D	C2	N5
R183E	C2	N5
R183F	E4	N5
R183G	G4	N5
R183H	G5	N5
R183I	F5	N5
R254	B3	M4
R255	B3	M4
R258	B3	L4
TP12	G1	O6
U62A	D5	M5
U62B	E4	M5
U62C	F4	M5
U63A	A2	N5
U63B	G4	N5
U63C	G4	N5
U63D	H4	N5
U64	E1	M6
U65	G2	M6
U66	F2	N6
U67	C2	L5
U120A	D2	N6
U120B	A4	N6
U120C	A4	N6
U120D	A4	N6

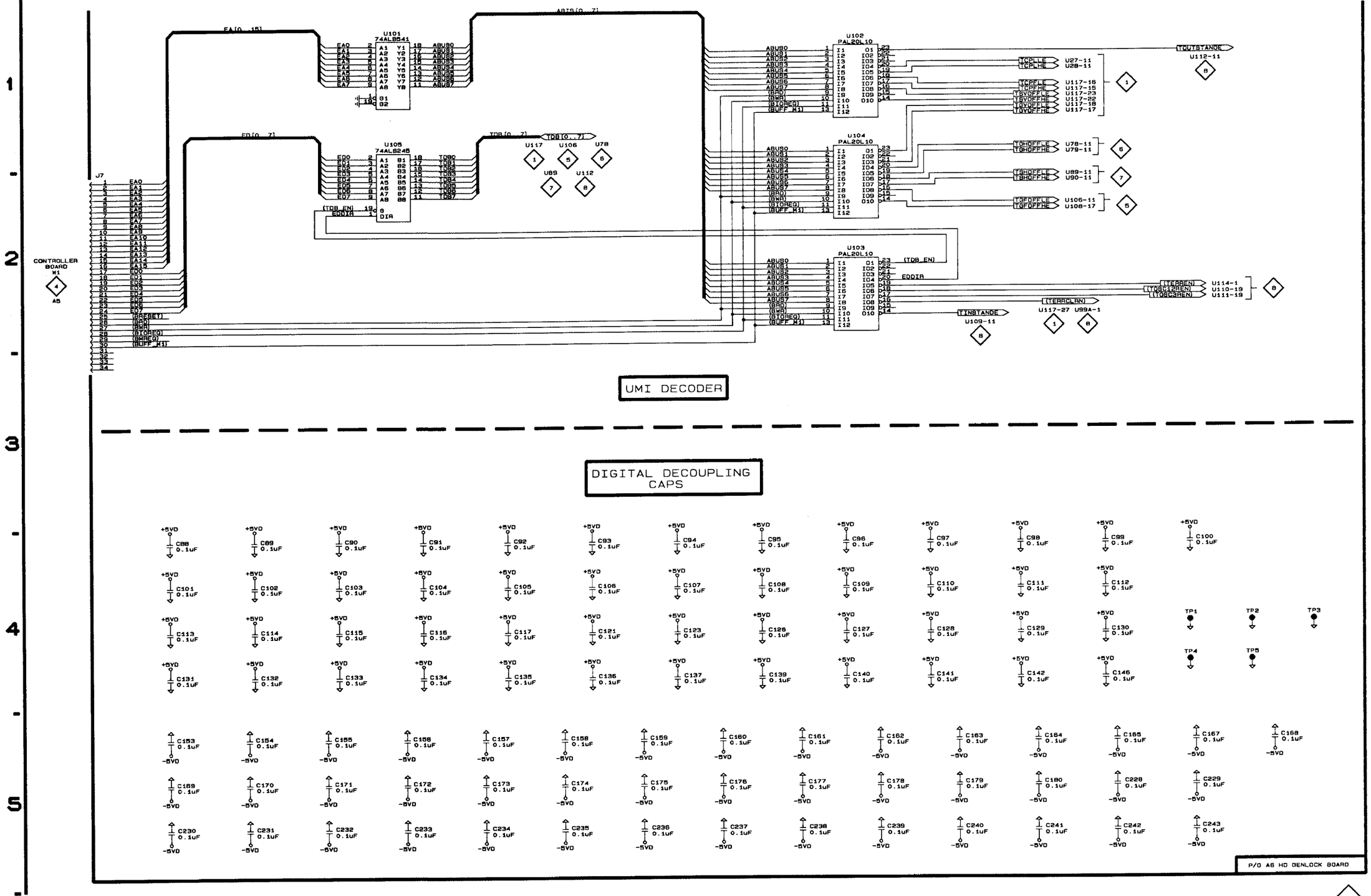

TPROME
U118-20
TINSTAND[0..4]
U112
U84
PAL22V10
TINSTAND0
TINSTAND1
TINSTAND2
TINSTAND3
TINSTAND4
TCFCNT
TVC4
TBPE
U117-1
U117-44
SEQ REF
TP12
TSEQREF
U117-20
TVFLDREF
U56A-5
U66
74ALS74
U65
74ALS163
TVCLK
TP6
EPROME
U60-4
U63A
10H102
EHIGH
EBPEO
U67
10131
R1838
510
R183E
510
U120A
10125
C247
0.1uF
R1830
510
A3588
U12-29
C245
0.01uF
R254
2.21K
R255
10K
R258
100
Q35
Q29
R172
499
C61
0.01uF
R174
499
R171
499
C62
0.01uF
R175
1K
U120B
10125
U120C
10125
U120D
10125
R182
10K
R173
499
EVBB
U62B
10H116
R183F
510
CR30
C64
270pF
R177
4.99K
R179
15K
C63
0.1uF
U62A
10H116
R183C
510
R180
2.49K
R181
2.49K
U62C
10H116
CR31
C65
270pF
R178
4.99K
R178
39.2K
[EBPBN]
U60-3
R273
150
R274
243
R183I
510
U63C
10H102
R1836
510
U63B
10H102
R183H
510
U63D
10H102
EBPEO
R183A
510
P/O A6 HD GENLOCK BOARD

HD GENLOCK BOARD
Schematic <4> Look-Up Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

Assembly A6. *Partial A6 also shown on Schematics 1, 2, 3, 5, 6, 7, and 8.*

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C66	F5	K1
C67	F4	H2
C68	E5	J1
C69	E4	I2
C70	G4	I2
C71	G5	J1
C72	B4	I2
C73	D5	J2
C74	C4	I2
C77	A4	H1
C78	A4	H1
J7	A2	O2
J11	A3	I1
J13	H3	I6
L7	D5	J2
L8	B4	I1
Q30	F4	I2
Q31	F5	J1
Q36	F4	I1
Q37	F5	J1
R184	F4	J2
R185	F4	J1
R186	E4	I2
R187	D4	J2
R188	D5	I1
R189	E5	I1
R190	E5	J2
R191	E4	I2
R192	E4	I2
R193	D4	I2
R259	F4	I1
R260	F5	J2
TP8	G5	K1
TP9	G4	J2
U69A	D4	I2
U69B	E5	I2
U70	C4	H1
U101	B1	N3
U102	E1	L2
U103	E2	N2
U104	E1	N3
U105	B2	N4


U101
74ALS541
U105
74ALS245
U102
PAL20L10
U104
PAL20L10
U103
PAL20L10
J7
CONTROLLER BOARD
M1
A5
EA[0..15]
ED[0..7]
ABUS[0..7]
TDB[0..7]
EDDIR
(TDB_EN)
UMI DECODER
DIGITAL DECOUPLING CAPS
+5VD
-5VD
0.1uF
TP1
TP2
TP3
TP4
TP5
P/O A6 HD GENLOCK BOARD

HD GENLOCK BOARD
Schematic <5> Look-Up Chart

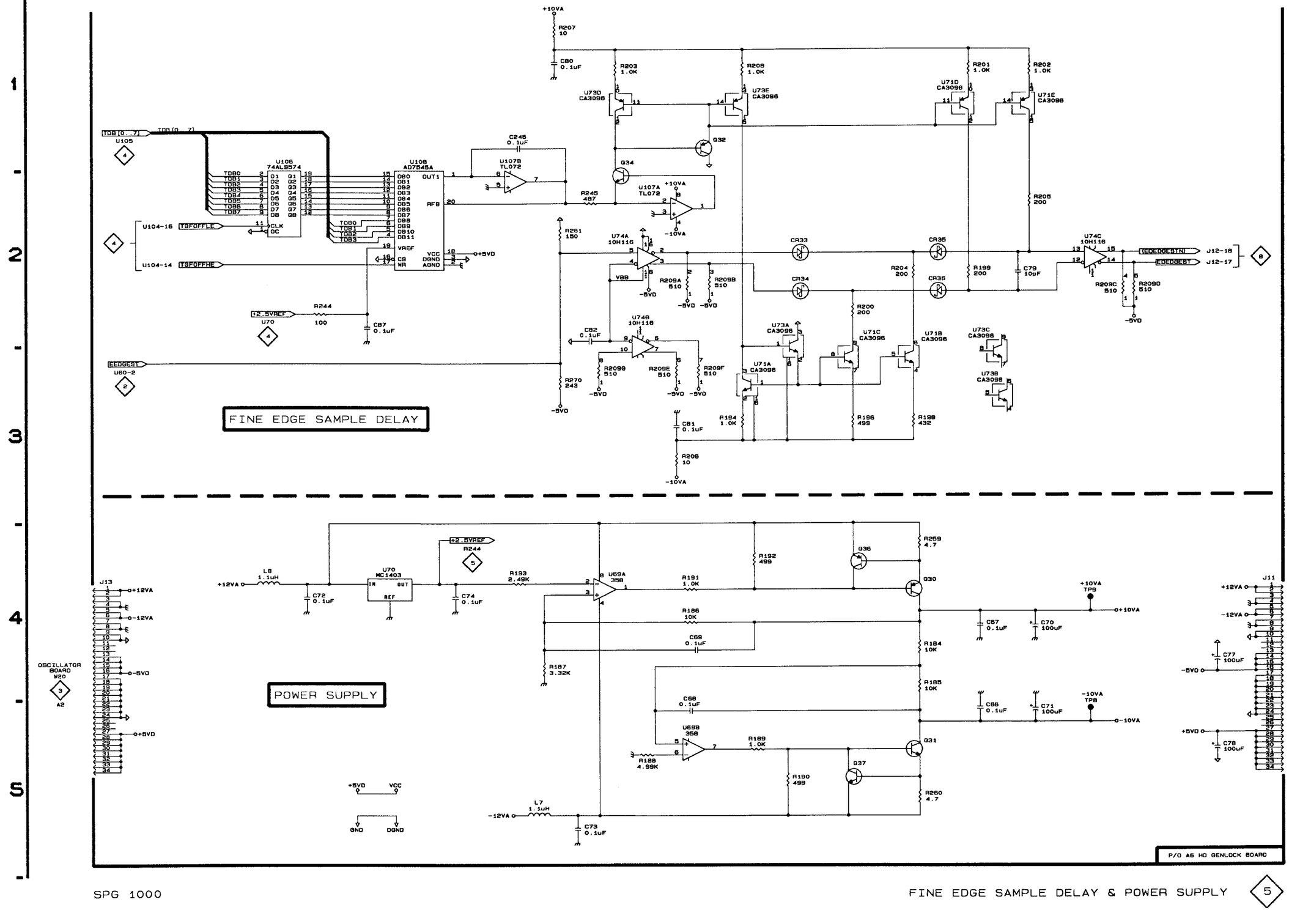
The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

Assembly A6. *Partial A6 also shown on Schematics 1, 2, 3, 4, 6, 7, and 8.*

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C79	G2	K1
C80	D1	K3
C81	D3	J2
C82	D2	L2
C87	B2	I3
C88	A4	D3
C89	A4	C4
C90	B4	D5
C91	B4	C6
C92	C4	E6
C93	C4	F5
C94	D4	F5
C95	D4	F6
C96	E4	E1
C97	E4	E2
C98	F4	D2
C99	F4	E3
C100	G4	D3
C101	A4	F3
C102	A4	N6
C103	B4	N6
C104	B4	M6
C105	C4	M6
C106	C4	N4
C107	D4	N3
C108	D4	N3
C109	E4	N1
C110	E4	M2
C111	F4	M2
C112	F4	M1
C113	A4	L2
C114	A4	L2
C115	B4	L3
C116	B4	K3
C117	C4	K3
C121	C4	L5
C123	D4	L6
C126	D4	K6
C127	E4	J4
C128	E4	K4
C129	F4	I4
C130	F4	I3
C131	A4	F4
C132	A4	F4
C133	B4	H5
C134	B4	F4
C135	C4	F3
C136	C4	H3
C137	D4	G2
C139	D4	I5
C140	E4	H2
C141	E4	G1

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C142	F4	G1
C146	F4	I4
C153	A5	G5
C154	A5	G5
C155	B5	E1
C156	B5	E2
C157	C5	E3
C158	C5	F1
C159	D5	F2
C160	D5	F2
C161	E5	F3
C162	E5	F3
C163	E5	O5
C164	F5	N5
C165	F5	O4
C167	G5	L1
C168	G5	H6
C169	A5	I5
C170	A5	H5
C171	B5	F4
C172	B5	F4
C173	C5	I4
C174	C5	I4
C175	D5	G1
C176	D5	G2
C177	E5	G2
C178	E5	G3
C179	E5	J6
C180	F5	J4
C228	F5	B6
C229	G5	B6
C230	A5	B5
C231	A5	B4
C232	B5	B4
C233	B5	C4
C234	C5	C5
C235	C5	C5
C236	D5	D6
C237	D5	D6
C238	E5	E6
C239	E5	E6
C240	E5	F6
C241	F5	F6
C242	F5	F5
C243	G5	F5
C246	C1	I3
CR33	E2	K2
CR34	E2	K2
CR35	F2	K1
CR36	F2	K1
Q32	D1	J3
Q34	D1	J3

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
R194	E3	J3
R196	F3	K3
R198	F3	K3
R199	G2	K1
R200	F2	K2
R201	G1	K2
R202	G1	K2
R203	D1	K3
R204	F2	K2
R205	G2	K1
R206	D3	J3
R207	D1	K2
R208	E1	K3
R209A	D2	K2
R209B	D2	K2
R209C	G2	K2
R209D	H2	K2
R209E	D3	K2
R209F	D3	K2
R209G	D3	K2
R244	B2	I3
R245	D2	J3
R261	D2	L2
R270	D2	L2
TP1	G4	M1
TP2	G4	O4
TP3	H4	I6
TP4	G4	H1
TP5	G4	A4
U71A	E3	J2
U71B	F3	J2
U71C	E3	J2
U71D	F1	J2
U71E	G1	J2
U73A	E2	J3
U73B	G3	J3
U73C	G2	J3
U73D	D1	J3
U73E	E1	J3
U74A	D2	K2
U74B	D2	K2
U74C	G2	K2
U106	B2	J4
U107A	D2	I2
U107B	C2	I2
U108	B2	I3

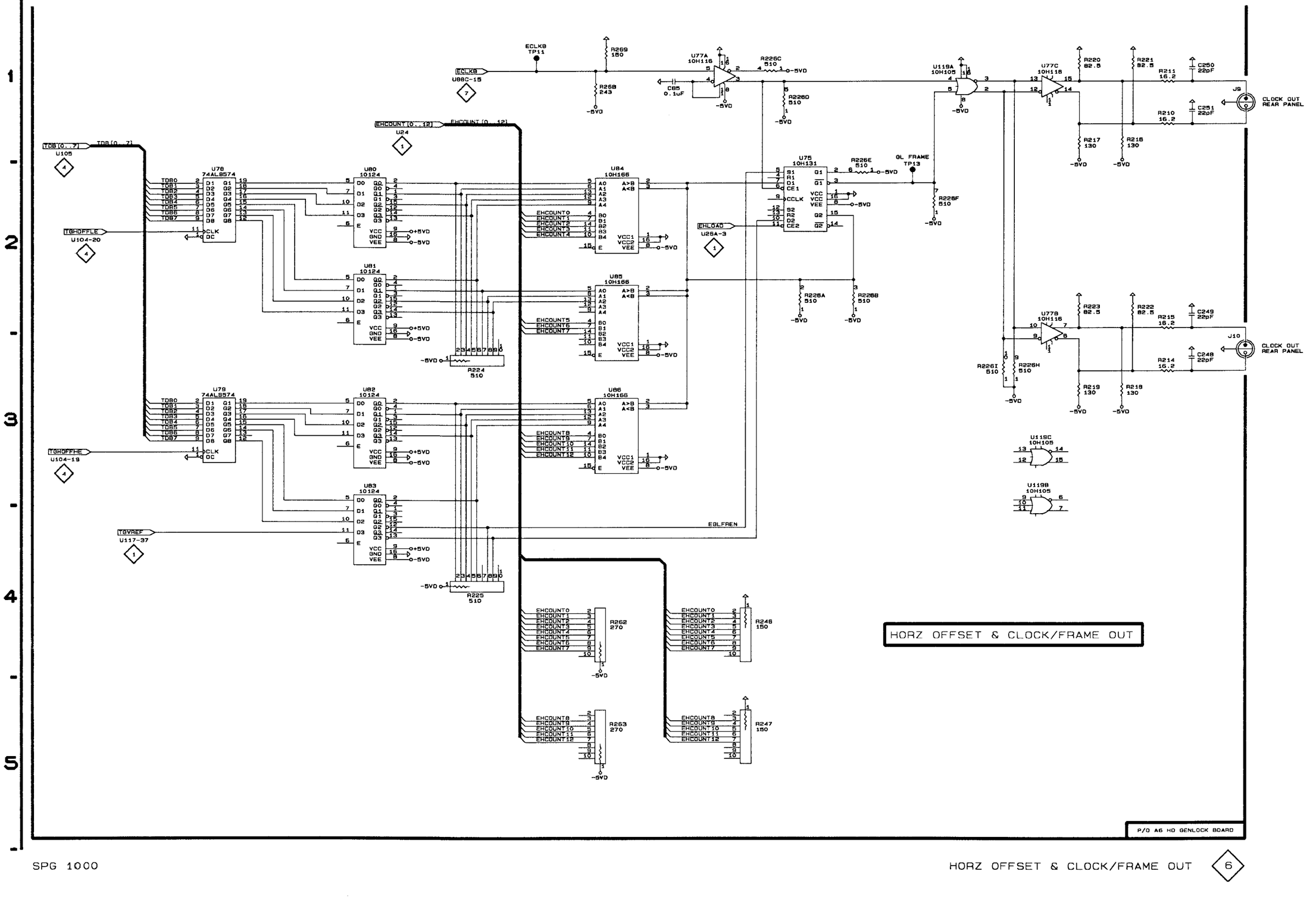

FINE EDGE SAMPLE DELAY
POWER SUPPLY
P/O A6 HD GENLOCK BOARD
+10VA
R207 10
C80 0.1uF
R203 1.0K
R208 1.0K
R201 1.0K
R202 1.0K
U73D CA3096
U73E CA3096
U71D CA3096
U71E CA3096
Q32
Q34
R205 200
TDB[0..7]
U105
U106 74ALS574
U108 AD7545A
C245 0.1uF
U107B TL072
U107A TL072
R245 487
U104-15 TGFOFFLE
U104-14 TGFOFFHE
R261 150
U74A 10H116
CR33
CR35
CR34
CR36
R204 200
R199 200
C79 10pF
U74C 10H116
(EDEDGESTN)
EDEDGEST
J12-16
J12-17
R209A 510
R209B 510
R209C 510
R209D 510
+2.5VREF
U70
R244 100
C87 0.1uF
C82 0.1uF
U74B 10H116
R209G 510
R209E 510
R209F 510
R200 200
U73A CA3096
U71C CA3096
U71B CA3096
U73C CA3096
U71A CA3096
U73B CA3096
EDGEST
U60-2
R270 243
R194 1.0K
R196 499
R198 432
C81 0.1uF
R206 10
-10VA
J13
+12VA
-12VA
-5VD
+5VD
OSCILLATOR BOARD M20
A2
L8 1.1uH
U70 MC1403
C72 0.1uF
C74 0.1uF
R193 2.49K
U69A 358
R192 499
R191 1.0K
R259 4.7
Q36
Q30
R186 10K
C69 0.1uF
R187 3.32K
R184 10K
R185 10K
C68 0.1uF
U69B 358
R188 4.99K
R189 1.0K
Q31
Q37
R190 499
R260 4.7
L7 1.1uH
C73 0.1uF
C67 0.1uF
C70 100uF
C66 0.1uF
C71 100uF
C77 100uF
C78 100uF
J11
POWER SUPPLY BOARD M160
A4
+5VD VCC
GND DGND

HD GENLOCK BOARD
Schematic <6> Look-Up Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

Assembly A6. *Partial A6 also shown on Schematics 1, 2, 3, 4, 5, 7, and 8.*

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C85	E1	A6
J9	H1	A4
J10	H3	A5
R210	H1	A4
R211	H1	A4
R214	H3	A5
R215	H2	A5
R216	G1	A6
R217	G1	A6
R218	G3	B6
R219	G3	A6
R220	G1	A6
R221	G1	A6
R222	G2	B6
R223	G2	A6
R224	C3	B4
R225	C4	B5
R226A	E2	A6
R226B	F2	A6
R226C	E1	A6
R226D	E1	A6
R226E	F2	A6
R226F	F2	A6
R226H	G3	A6
R226I	G3	A6
R246	E4	F6
R247	E5	C6
R262	D4	F6
R263	D5	B6
R268	D1	A6
R269	D1	A6
TP11	D1	A5
TP13	F2	B6
U75	E2	A6
U77A	E1	A6
U77B	G2	A6
U77C	G1	A6
U78	B2	D4
U79	B3	D5
U80	C2	C3
U81	C2	C5
U82	C3	B6
U83	C3	B5
U84	D2	A4
U85	D2	A5
U86	D3	A5
U119A	F1	B6
U119B	G3	B6
U119C	G3	B6



HORZ OFFSET & CLOCK/FRAME OUT

P/O A6 HD GENLOCK BOARD

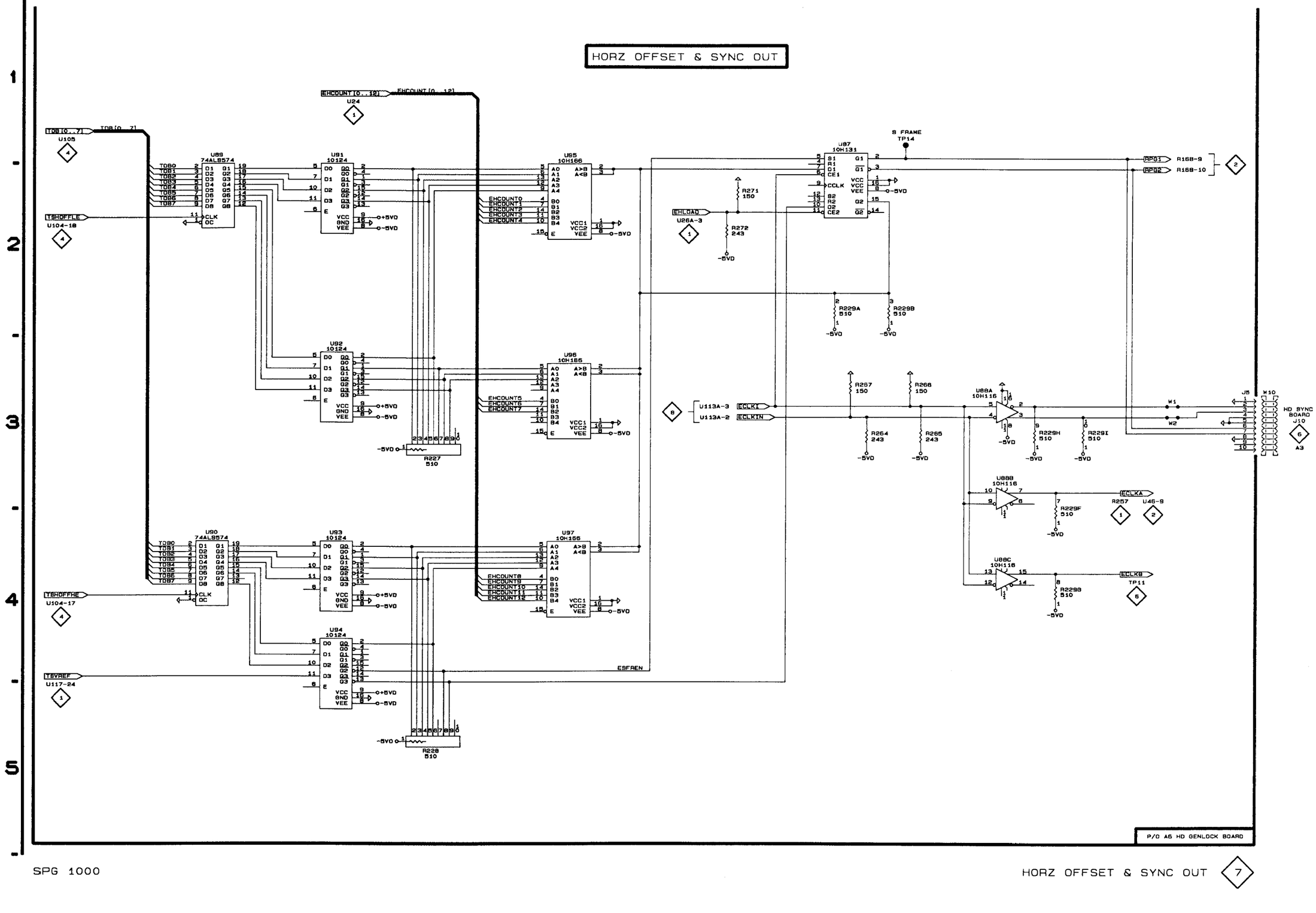
HD GENLOCK BOARD
Schematic <7> Look-Up Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

Assembly A6. *Partial A6 also shown on Schematics 1, 2, 3, 4, 5, 6, and 8.*

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
J5	H3	H6
R227	C3	E5
R228	C5	C5
R229A	E2	E6
R229B	F2	E6
R229H	G3	E6
R229I	G3	E6
R264	F3	F6
R265	F3	G6
R266	F3	G6
R267	F3	F6
R271	E2	B5
R272	E2	B5
TP14	F1	I6
U87	E1	E6
U88A	G3	F6
U88B	G3	F6
U88C	G4	F6
U89	B2	F5
U90	B4	D4
U91	B2	E5
U92	B3	F5
U93	B4	E5
U94	B4	D6
U95	D2	E6
U96	D3	F6
U97	D4	D6
W1	H3	G6
W2	H3	G6

HORZ OFFSET & SYNC OUT

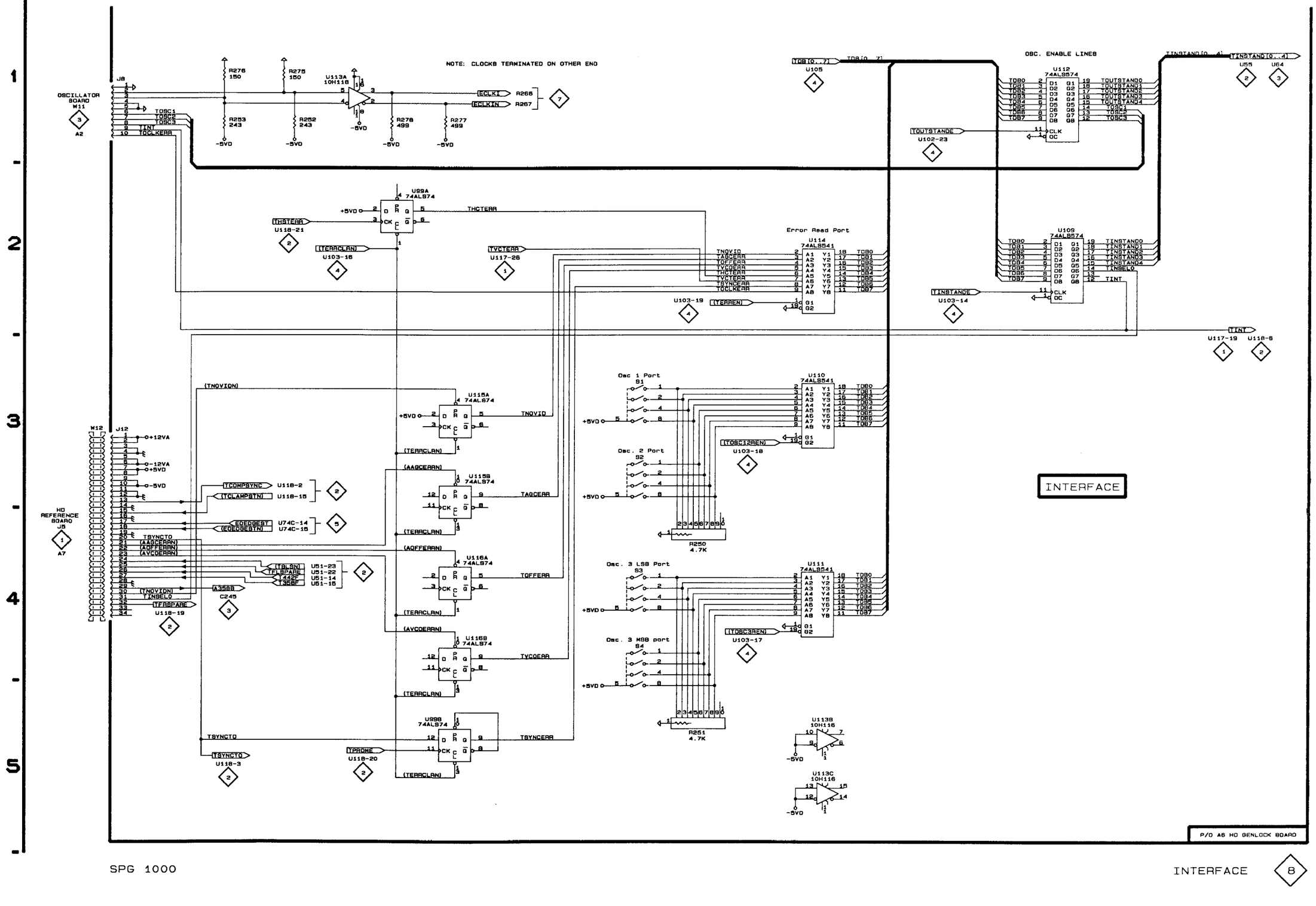


HD GENLOCK BOARD
Schematic <8> Look-Up Chart

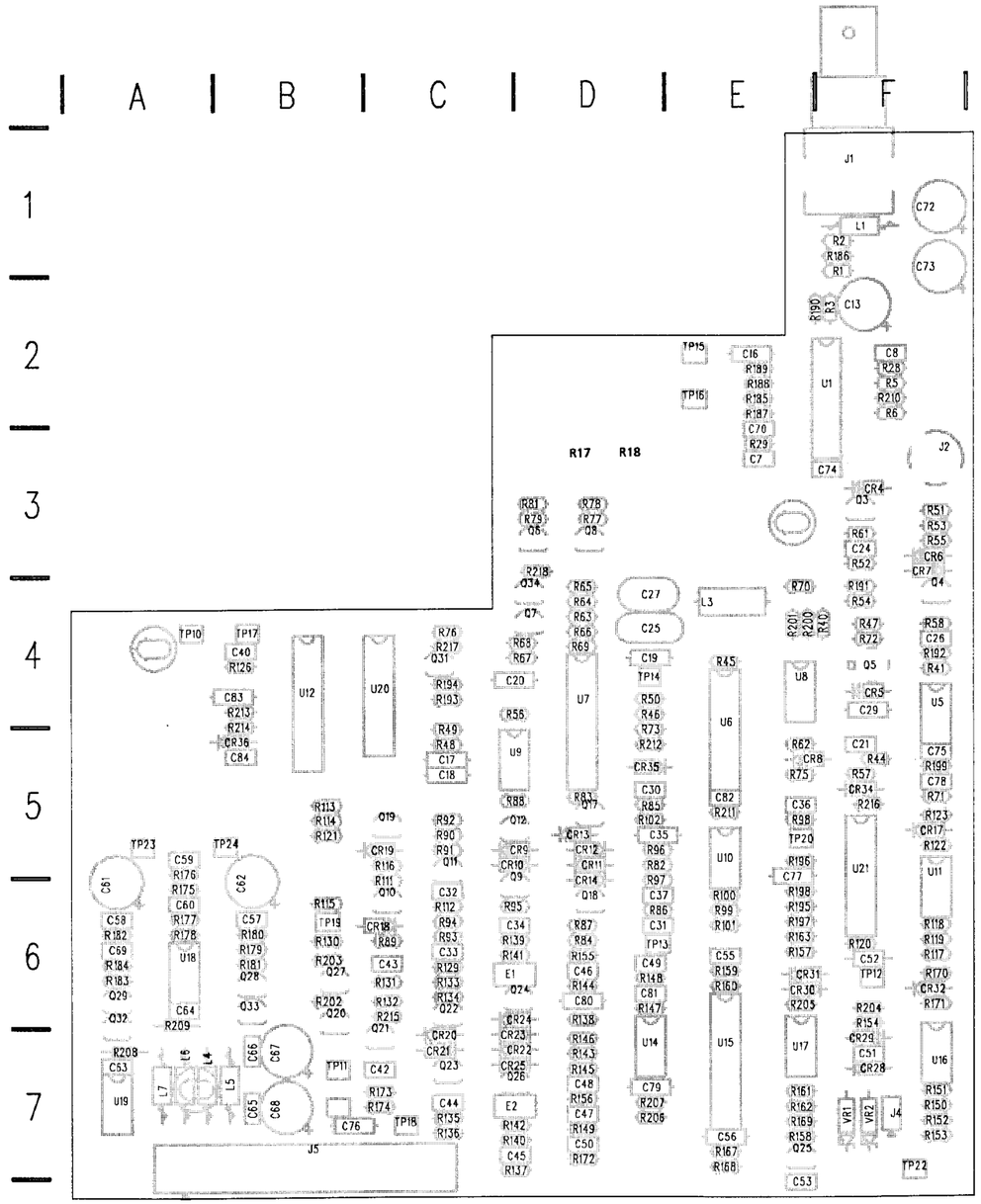
The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

Assembly A6. *Partial A6 also shown on Schematics 1, 2, 3, 4, 5, 6, and 7.*

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
J8	A1	O5
J12	A3	L1
R250	E4	M1
R251	E5	N1
R252	B1	O4
R253	B1	O5
S1	D3	M1
S2	D3	N1
S3	D4	N1
S4	D4	O1
U99A	C2	H5
U99B	C5	H5
U109	G2	L3
U110	E3	M2
U111	E4	N2
U112	G1	N4
U113A	B1	N5
U113B	E5	N5
U113C	E5	N5
U114	E2	M3
U115A	C3	K3
U115B	C3	K3
U116A	C4	L3
U116B	C4	L3


NOTE: CLOCKS TERMINATED ON OTHER END
OSCILLATOR BOARD W11
HD REFERENCE BOARD U5
J8
J12
W12
R276 150
R275 150
R253 243
R252 243
R278 499
R277 499
U113A 10H116
-5VD
+5VD
+12VA
-12VA
TOSC1
TOSC2
TOSC3
TINT
TOCLKERR
ECLKI
ECLKIN
A266
A267
U89A 74ALS74
THSTERR
U116-21
THCTERR
ITERACLAN
U103-16
TVCTERR
U117-26
U114 74ALS541
Error Read Port
TNOVID
TAGCERR
TOFFERR
TVCOERR
TVCTERR
TSYNCERR
TOCLKERR
TOB0
TOB1
TOB2
TOB3
TOB4
TOB5
TOB6
TOB7
ITERAEN
U103-19
TDB[0..7]
U105
OSC. ENABLE LINES
U112 74ALS574
TOUTSTAND0
TOUTSTAND1
TOUTSTAND2
TOUTSTAND3
TOUTSTAND4
TOSK1
TOSC2
TOSC3
TOUTSTANDE
U102-23
TINSTAND[0..4]
U55
U64
U109 74ALS574
TINSTAND0
TINSTAND1
TINSTAND2
TINSTAND3
TINSTAND4
TINSELO
TINSTANDE
U103-14
U117-19
U118-6
(TNOVION)
U115A 74ALS74
TNOVID
(TERACLAN)
(AAGCEARN)
U115B 74ALS74
TAGCERR
(AQFFEARN)
U116A 74ALS74
TOFFERR
(AVCOEARN)
U116B 74ALS74
TVCOERR
U99B 74ALS74
TSYNCERR
TPROME
U118-20
TSYNCTO
U118-3
TCOMPSYNC
U118-2
(TCLAMPBTN)
U118-15
EQEQGBST
U74C-14
(EQEQGBTN)
U74C-15
(TBLSN)
U51-23
TFLSPARE
U51-22
T424F
U51-14
T356F
U51-15
A356B
C245
TFRBPARE
U118-19
TINSELO
Osc. 1 Port
S1
Osc. 2 Port
S2
Osc. 3 LSB Port
S3
Osc. 3 MSB port
S4
R250 4.7K
R251 4.7K
U110 74ALS541
U111 74ALS541
(TOSC12REN)
U103-18
(TOSC3REN)
U103-17
U113B 10H116
U113C 10H116
INTERFACE
P/O A6 HD GENLOCK BOARD

A7 HD Ref Input



A7 HD REF INPUT BOARD 671-2071-02

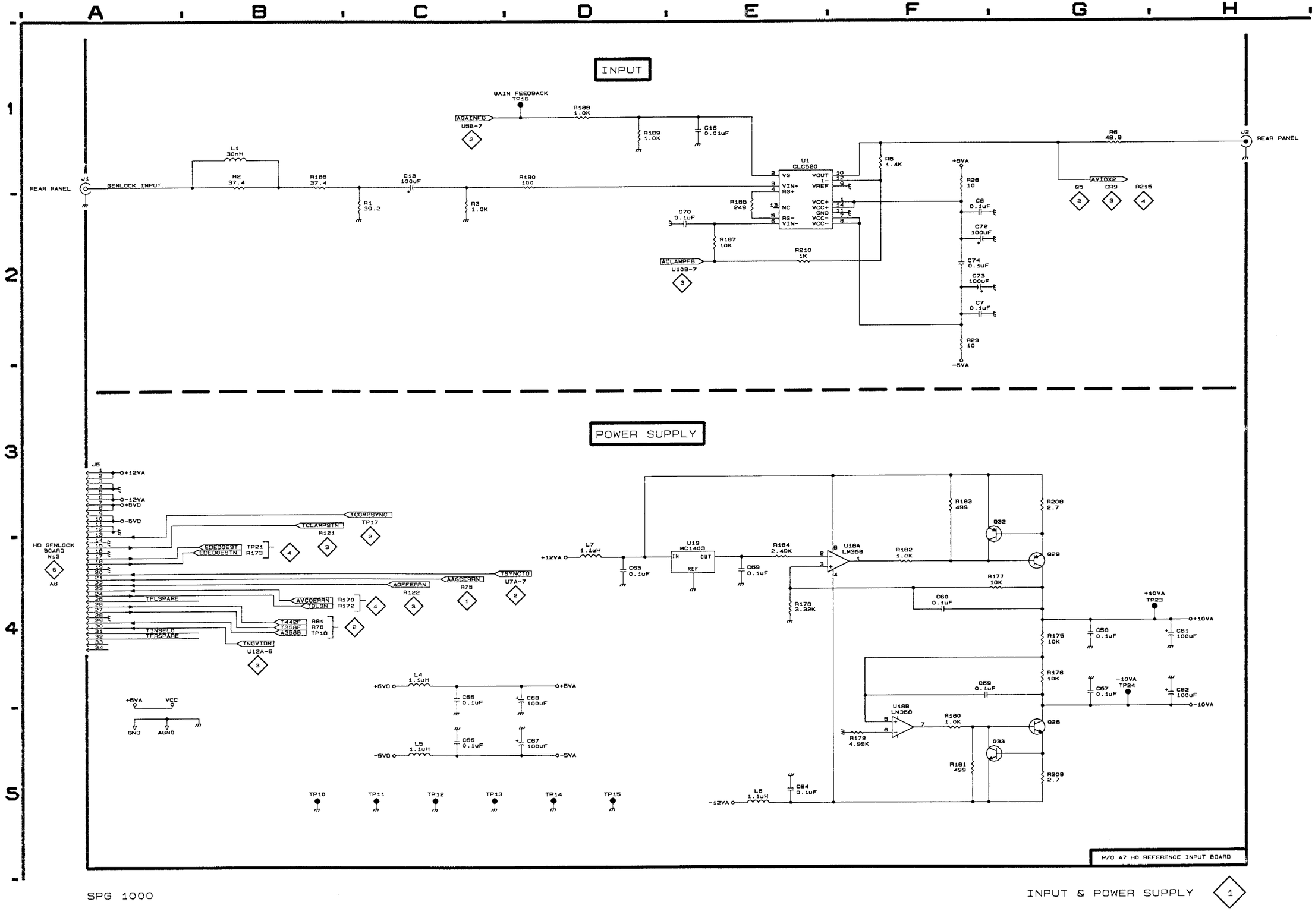
A7 HD REFERENCE BOARD

(671-2071-02 & UP)

Use the circuit board lookup table, below, for Schematic <1>

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

CKT NO.	SCHEM LOC	SCHEM NO.	BD LOC
C7	F2	1	E3
C8	F2	1	F2
C13	C1	1	F2
C16	E1	1	E2
C17	F1	2	C5
C18	F1	2	C5
C19	A1	2	D4
C20	F1	2	C4
C21	D3	2	F5
C24	C1	2	F3
C25	D4	2	D4
C26	D3	2	F4
C27	D4	2	D4
C29	D3	2	F4
C30	E3	3	D5
C31	E4	3	D6
C32	C2	3	C6
C33	D3	3	C6
C34	C4	3	C6
C35	F4	3	D5
C36	F3	3	E5
C37	F3	3	D6
C40	G2	3	B4
C42	B1	4	B7
C43	C2	4	C6
C44	D2	4	C7
C45	D3	4	C7
C46	E2	4	D6
C47	E2	4	D7
C48	H2	4	D7
C49	H2	4	D6
C50	H2	4	D7
C51	E4	4	F7
C52	E4	4	F6
C53	E4	4	E8
C55	E4	4	E6
C56	B5	4	E7
C57	G4	1	B6
C58	G4	1	A6
C59	F4	1	A5
C60	F4	1	A6
C61	H4	1	A6
C62	H4	1	B6
C63	D4	1	A7
C64	E5	1	A6
C65	C4	1	B7
C66	C5	1	B7
C67	D5	1	B7
C68	D4	1	B7
C69	E4	1	A6
C70	E2	1	E3
C72	F2	1	F1
C73	F2	1	F1
C74	F2	1	E3
C75	E3	2	F5
C76	G4	2	B7
C77	A2	2	E5
C78	D3	2	F5
C79	G3	4	D7
C80	F2	4	D6
C81	G2	4	D6
C82	C2	2	E5
C83	E1	3	B4
C84	F2	3	B5
CR4	B1	2	F3
CR5	D3	2	F4
CR6	C1	2	F3
CR7	C2	2	F3
CR8	G3	2	E5
CR9	D3	3	C5
CR10	D3	3	C5
CR11	E3	3	D5
CR12	E3	3	D5
CR13	D3	3	D5
CR14	D4	3	D6
CR17	G4	3	F5
CR18	C3	3	B6
CR19	B3	3	C5
CR20	E2	4	C7
CR21	E2	4	C7
CR22	F2	4	C7
CR23	F2	4	C7
CR24	E2	4	C6
CR25	E2	4	C7
CR28	F4	4	F7
CR29	F5	4	F7
CR30	D4	4	E6
CR31	D4	4	E6
CR32	G4	4	F6
CR34	C2	2	F5
CR35	F3	3	D5
CR36	F2	3	B5
J1	A1	1	F1
J2	H1	1	F3
J4	H3	4	F7
J5	A3	1	A7
L1	B1	1	F1
L3	D4	2	E4
L4	C4	1	A7
L5	C5	1	B7
L6	E5	1	A7
L7	D4	1	A7
Q3	B1	2	F3
Q4	D1	2	F4
Q5	C3	2	F4
Q6	C5	2	D3
Q7	F4	2	D4
Q8	C5	2	D3
Q9	D4	3	C6
Q10	C3	3	C6
Q11	C3	3	C5
Q12	D2	3	C5
Q17	E2	3	D5
Q18	E4	3	D6
Q19	B2	3	C5
Q20	B2	4	B6
Q21	D1	4	C7
Q22	E1	4	C6
Q23	E2	4	C7
Q24	F1	4	C6
Q25	B4	4	E7
Q26	F2	4	C7
Q27	B2	4	B6
Q28	G5	1	B6
Q29	G4	1	A6
Q31	G4	2	C4
Q32	F3	1	A6
Q33	F5	1	B6
Q34	F4	2	D4
R1	C2	1	F1
R2	B1	1	F1
R3	C2	1	F2
R5	F1	1	F2
R6	G1	1	F2
R17	E3	3	D3
R18	E4	3	D3
R28	F1	1	F2
R40	B1	2	F4
R29	F2	1	E3
R41	E3	2	F4
R44	D3	2	F5
R45	D4	2	E4
R46	D4	2	D4
R47	F3	2	F4
R48	G1	2	C5
R49	G1	2	C5
R50	B1	2	D4
R51	C2	2	F3
R52	C1	2	F3
R53	C1	2	F3
R54	D1	2	F4
R55	D2	2	F3
R56	F1	2	C4
R57	D3	2	F5
R58	D2	2	F4
R61	D1	2	F3
R62	G3	2	E5
R63	D4	2	D4
R64	C4	2	D4
R65	C4	2	D4
R66	D5	2	D4
R67	E4	2	C4
R68	E4	2	C4
R69	D5	2	D4
R70	D4	2	E4
R71	E3	2	F5
R72	F3	2	F4
R73	E4	2	D5
R75	G3	2	E5
R76	F4	2	C4
R77	C5	2	C4
R78	C5	2	D3
R79	B5	2	D3
R81	B5	2	D3
R82	E3	3	D5
R83	E2	3	D5
R84	E4	3	D6
R85	D3	3	D5
R86	D4	3	D6
R87	E4	3	D6
R88	E2	3	C5
R89	C2	3	C6
R90	C2	3	C5
R91	C2	3	C5
R92	D2	3	C5
R93	D4	3	C6
R94	D4	3	C6
R95	C4	3	C6
R96	E3	3	D5
R97	E3	3	D6
R98	F3	3	E5
R99	G3	3	E6
R100	G4	3	E6
R101	F4	3	E6
R102	F3	3	D5
R111	C4	3	C6
R112	C3	3	C6
R113	B2	3	B5
R114	B2	3	B5
R115	B3	3	B6
R116	B3	3	C5
R117	F4	3	F6
R118	F4	3	F6
R119	F4	3	F6
R120	F5	3	F6
R121	B3	3	B5
R122	G4	3	F5
R123	H4	3	F5
R126	G2	3	B4
R129	B1	4	C6
R130	C2	4	B6
R131	B2	4	C6
R132	B1	4	C6
R133	D1	4	C6
R134	E1	4	C6
R135	E2	4	C7
R136	E1	4	C7
R137	F2	4	C7
R138	F1	4	D6
R139	G2	4	D6
R140	F1	4	C6
R141	F1	4	C6
R142	F2	4	C7
R143	G2	4	D6
R144	G1	4	D6
R145	G2	4	D7
R146	F2	4	D7
R147	G1	4	D6
R148	G2	4	D7
R149	G2	4	D7
R150	F4	4	F7
R151	F4	4	F7
R152	F5	4	F7
R153	F5	4	F7
R154	F4	4	F6
R155	E2	4	D6
R156	E3	4	D7
R157	E5	4	E6
R158	E4	4	E7
R159	D5	4	E6
R160	D4	4	E6
R161	D4	4	E7
R162	D4	4	E7
R163	E4	4	E6
R167	B4	4	E7
R168	B5	4	E7
R169	B4	4	E7
R170	G4	4	F6
R171	G4	4	F6
R172	A4	4	D7
R173	C2	4	B7
R174	B2	4	B7
R175	G4	1	A6
R176	G4	1	A5
R177	G4	1	A6
R178	E4	1	A6
R179	F5	1	B6
R180	F5	1	B6
R181	F5	1	B6
R182	F4	1	A6
R183	F3	1	A6
R184	E4	1	A6
R185	E2	1	E2
R186	B1	1	F1
R187	E2	1	E2
R188	D1	1	E2
R189	D1	1	E2
R190	D1	1	E2
R191	C3	2	F4
R192	E3	2	F4
R193	G4	2	C4
R194	G4	2	C4
R195	C2	2	E6
R196	A3	2	E5
R197	B2	2	E6
R198	B2	2	E6
R199	E3	2	F5
R200	F3	2	E4
R201	F3	2	E4
R202	B2	4	B6
R203	C2	4	B6
R204	C5	4	E6
R205	C5	4	E6
R206	A5	4	D7
R207	B5	4	D7
R208	G3	1	A7
R209	G5	1	A6
R210	E2	1	F2
R211	C2	2	E5
R212	E4	2	D5
R213	D5	4	E6
R214	E1	3	B4
R215	D2	4	C6
R216	B2	2	F5
R217	E2	3	C4
R218	E4	3	D3
TP10	B5	1	A4
TP11	C5	1	B7
TP12	C5	1	F6
TP13	C5	1	D6
TP14	D5	1	D4
TP15	D5	1	E2
TP16	D1	1	E2
TP17	G4	2	B4
TP18	H4	2	C7
TP19	A2	3	B6
TP20	G3	3	E5
TP21	A2	4	B7
TP22	E3	4	F7
TP23	H4	1	A5
TP24	G4	1	B5
U1	E1	1	F2
U6	E4	2	E4
U9	G1	2	C5
U15	C4	4	E7
U19	E4	1	A7
U21	B2	2	F5
U5A	D3	2	F4
U7A	F2	2	D4
U8A	F3	2	E4
U10A	F3	3	E5
U11A	G4	3	F6
U12A	G2	3	B4
U14A	G2	4	D7
U16A	F4	4	F7
U17A	E4	4	E7
U18A	F4	1	A6
U20A	H1	2	C4
U5B	E3	2	F4
U7B	A1	2	D4
U8B	F3	2	E4
U10B	G3	3	E5
U11B	G5	3	F6
U12B	E1	3	B4
U14B	B5	4	D7
U16B	F4	4	F7
U17B	C5	4	E7
U18B	F5	1	A6
U20B	H2	2	C4
U20C	H2	2	C4
U20D	H2	2	C4
VR1	E4	4	F7
VR2	E5	4	F7

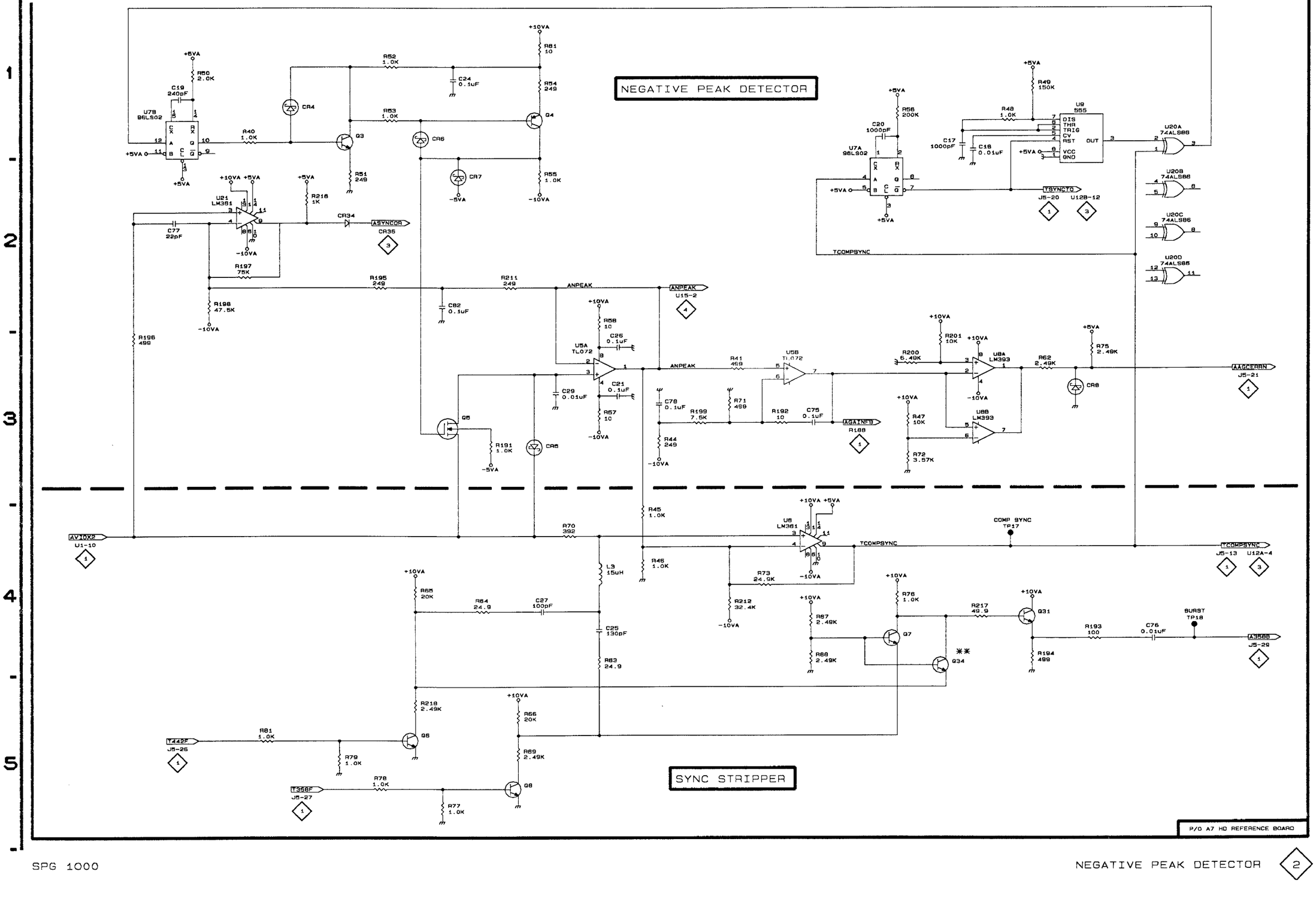

INPUT
GAIN FEEDBACK
TP16
AGAINFB
U5B-7
2
R188
1.0K
R189
1.0K
C18
0.01uF
L1
30nH
R2
37.4
R186
37.4
C13
100uF
R190
100
R1
39.2
R3
1.0K
J1
REAR PANEL
GENLOCK INPUT
U1
CLC520
VG
VIN+
RG+
RG-
VIN-
NC
VOUT
I-
VREF
VCC+
VCC+
GND
VCC-
VCC-
R185
249
C70
0.1uF
R187
10K
R210
1K
ACLAMPFB
U10B-7
3
R5
1.4K
+5VA
R28
10
C8
0.1uF
C72
100uF
C74
0.1uF
C73
100uF
C7
0.1uF
R29
10
-5VA
R6
49.9
J2
REAR PANEL
AVIDX2
Q5
2
CR9
3
R215
4
POWER SUPPLY
J5
0+12VA
-12VA
+5VD
-5VD
HD GENLOCK
BOARD
W12
8
A8
TCOMPSYNC
TCLAMPSTN
TP17
R121
EDEDGEST
EDEDGESTN
TP21
R173
AVCOEBAR
VBLSN
R170
R172
T442F
T368F
A358F
R81
R78
TP18
TPLSPARE
TINSELD
TPRSPARE
TNOVIDN
U12A-6
3
AOFFERAN
R122
AAGCERAN
R75
TSYNCTO
U7A-7
2
L7
1.1uH
+12VA
C63
0.1uF
U19
MC1403
IN
OUT
REF
C69
0.1uF
R184
2.49K
U18A
LM358
R182
1.0K
R183
499
R208
2.7
Q32
Q29
R177
10K
C60
0.1uF
R178
3.32K
+10VA
TP23
+10VA
R175
10K
C58
0.1uF
C61
100uF
R176
10K
C59
0.1uF
-10VA
TP24
C57
0.1uF
C62
100uF
-10VA
U18B
LM358
R179
4.99K
R180
1.0K
Q28
Q33
R181
499
R209
2.7
L8
1.1uH
-12VA
C64
0.1uF
L4
1.1uH
+5VD
+5VA
C65
0.1uF
C68
100uF
L5
1.1uH
-5VD
-5VA
C66
0.1uF
C67
100uF
+5VA
VCC
GND
AGND
TP10
TP11
TP12
TP13
TP14
TP15
P/O A7 HD REFERENCE INPUT BOARD

HD REFERENCE BOARD
Schematic <2> Look–Up Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

Assembly A7. *Partial A7 also shown on Schematics 1, 3, and 4.*

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C17	F1	C5
C18	F1	C5
C19	A1	D4
C20	F1	C4
C21	D3	F5
C24	C1	F3
C25	D4	D4
C26	D3	F4
C27	D4	D4
C29	D3	F4
C75	E3	F5
C76	G4	B7
C77	A2	E5
C78	D3	F5
CR4	B1	F3
CR5	D3	F4
CR6	C1	F3
CR7	C2	F3
CR8	G3	E5
CR34	C2	F5
L3	D4	E4
Q3	B1	F3
Q4	D1	F4
Q5	C3	F4
Q6	C5	D3
Q7	F4	D4
Q8	C5	D3
R40	B1	F4
R41	E3	F4
R44	D3	F5
R45	D4	E4
R46	D4	D4
R47	F3	F4
R48	G1	C5
R49	G1	C5
R50	B1	D4
R51	C2	F3
R52	C1	F3
R53	C1	F3
R54	D1	F4
R55	D2	F3
R56	F1	C4
R57	D3	F5
R58	D2	F4
R61	D1	F3
R62	G3	E5
R63	D4	D4
R65	C4	D4
R66	D5	D4
R67	E4	C4
R68	E4	C4
R69	D5	D4
R70	D4	E4
R71	E3	F5
R72	F3	F4
R73	E4	D5
R75	G3	E5
R76	F4	C4
R77	C5	C4
R78	C5	D3
R79	B5	D3
R81	B5	D3
R191	C3	F4
R192	E3	F4
R193	G4	C4
R194	G4	C4
R195	C2	E6
R196	A3	E5
R197	B2	E6
R198	B2	E6
R199	E3	F5
R200	F3	E4
R201	F3	E4
R211	C2	E5
R212	E4	D5
R216	B2	F5
TP17	G4	B4
TP18	H4	C7
U6	E4	E4
U9	G1	C5
U5A	D3	F4
U5B	E3	F4
U7A	F2	D4
U7B	A1	D4
U8A	F3	E4
U8B	F3	E4
U20A	H1	C4
U20B	H2	C4
U20C	H2	C4
U20D	H2	C4
U21	B2	F5
VR2	E5	F7


NEGATIVE PEAK DETECTOR
SYNC STRIPPER
+10VA
+5VA
-10VA
-5VA
R50 2.0K
C19 240pF
U7B 96LS02
R40 1.0K
CR4
R52 1.0K
C24 0.1uF
R61 10
R54 249
Q3
R53 1.0K
Q4
CR6
CR7
R51 249
R55 1.0K
U21 LM361
C77 22pF
R216 1K
CR34
ASYNCOR
CR35
R197 75K
R198 47.5K
R196 499
R195 249
R211 249
ANPEAK
U15-2
C82 0.1uF
R58 10
C26 0.1uF
U5A TL072
C29 0.01uF
C21 0.1uF
R57 10
Q5
R191 1.0K
CR5
R41 499
U5B TL072
C78 0.1uF
R199 7.5K
R71 499
R192 10
C75 0.1uF
AGAYNFG
R188
R44 249
R49 150K
R48 1.0K
U9 555
DIS
THR
TRIG
CV
RST
OUT
VCC
GND
C17 1000pF
C18 0.01uF
U20A 74ALS86
U20B 74ALS86
U20C 74ALS86
U20D 74ALS86
R56 200K
C20 1000pF
U7A 96LS02
TSYNCTO
J5-20
U12B-12
TCOMPSYNC
R200 6.49K
R201 10K
U8A LM393
R62 2.49K
R75 2.49K
CR8
AAGCERAN
J5-21
R47 10K
U8B LM393
R72 3.57K
AV10X2
U1-10
R70 392
L3 15uH
R45 1.0K
U8 LM361
R46 1.0K
R73 24.9K
R212 32.4K
TCOMPSYNC
COMP SYNC
TP17
TCOMPSYNC
J5-13
U12A-4
R65 20K
R64 24.9
C27 100pF
C25 130pF
R63 24.9
R67 2.49K
R68 2.49K
R76 1.0K
Q7
Q34
**
R217 49.9
Q31
R194 499
R193 100
C76 0.01uF
BURST
TP18
A3588
J5-29
R218 2.49K
R66 20K
R89 2.49K
R81 1.0K
T442F
J5-26
R79 1.0K
R78 1.0K
T950F
J5-27
R77 1.0K
Q6
Q8
P/O A7 HD REFERENCE BOARD

HD REFERENCE BOARD
Schematic <3> Look-Up Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

Assembly A7. *Partial A7 also shown on Schematics 1, 2, and 4.*

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C30	E3	D5
C31	E4	D6
C32	C2	C6
C33	D3	C6
C34	C4	C6
C35	F4	D5
C36	F3	E5
C37	F3	D6
C40	G2	B4
C83	E1	B4
C84	F2	B5
CR9	D3	C5
CR10	D3	C5
CR11	E3	D5
CR12	E3	D5
CR13	D3	D5
CR14	D4	D6
CR17	G4	F5
CR18	C3	B6
CR19	B2	C5
CR35	F3	D5
CR36	F2	B5
Q9	D4	C6
Q10	C3	C6
Q11	C3	C5
Q12	D2	C5
Q19	B2	C5
R17	E3	D3
R18	E4	D3
R85	D3	D5
R86	D4	D6
R87	E4	D6
R88	E2	C5
R89	C2	C6
R90	C2	C5
R91	C2	C5
R92	D2	C5
R93	D4	C6
R94	D4	C6
R95	C4	C6
R96	E3	D5
R97	E3	D6
R98	F3	E5
R99	G3	E6
R100	G3	E6
R101	F3	E6
R102	F3	D5
R111	C3	C6
R112	C3	C6
R113	B2	B5
R114	B2	B5
R115	B3	B6
R116	B3	C5
R117	F4	F6
R118	F4	F6
R119	F4	F6
R120	F5	F6
R121	B2	B5
R122	G4	F5
R123	H4	F5
R126	G2	B4
R213	E1	B4
R214	E2	B4
TP19	A2	B3
TP20	G3	B3
U10A	F3	E5
U10B	G3	E5
U11A	G4	F6
U11B	G4	F6
U12A	G2	B4
U12B	E2	B4

** SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES.

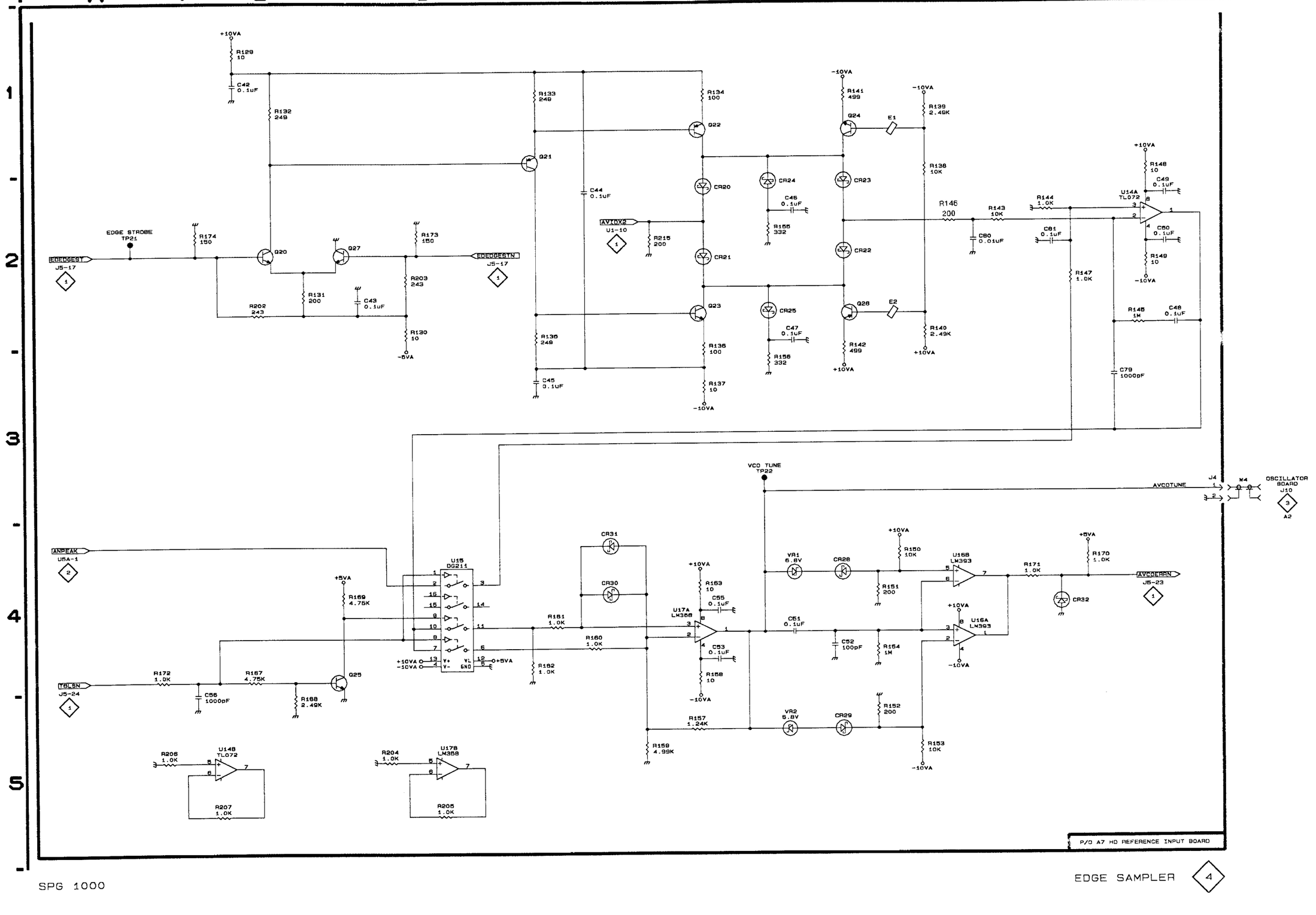
P/O A7 HD REFERENCE INPUT BOARD

HD REFERENCE BOARD
Schematic <4> Look-Up Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

Assembly A7. *Partial A7 also shown on Schematics 1, 2, and 3.*

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C42	B1	B7
C43	C2	C6
C44	D2	C7
C45	D3	C7
C46	E2	D6
C47	E2	D7
C48	H2	D7
C49	H2	D6
C50	H2	D7
C51	E4	F7
C52	F4	F6
C53	E4	E8
C55	E4	E6
C56	B5	E7
C79	G3	D7
C80	F2	D6
C81	G2	D6
CR20	E2	C7
CR21	E2	C7
CR22	F2	C7
CR23	F2	C7
CR24	E2	C6
CR25	E2	C7
CR28	F4	F7
CR29	F5	F7
CR30	D4	E6
CR31	D4	E6
CR32	G4	F6
E1	F1	C6
E2	F2	C7
J4	H3	F7
Q20	B2	B6
Q21	D1	C7
Q22	E1	C6
Q23	E2	C7
Q24	F1	C6
Q25	C4	E7
Q26	F2	C7
Q27	C2	B6
R129	B1	C6
R130	C2	B6
R131	B2	C6
R132	B1	C6
R133	D1	C6
R134	E1	C6
R135	D2	C7
R136	E2	C7
R137	E3	C7
R138	F1	D6
R139	F1	C6
R140	F2	C7
R141	F1	C6
R142	F2	C7
R143	G2	D7
R144	G2	D6
R145	G2	D7
R146	F2	D7
R147	G2	D6
R148	G1	D6
R149	G2	D7
R150	F4	F7
R151	F4	F7
R152	F5	F7
R153	F5	F7
R154	F4	F6
R155	E2	D6
R156	E3	D7
R157	E5	E6
R158	E4	E7
R159	E5	E6
R160	D4	E6
R161	D4	E7
R162	D4	E7
R163	E4	E6
R167	B4	E7
R168	B5	E7
R169	C4	E7
R170	G4	F6
R171	G4	F6
R172	B4	D7
R173	C2	B7
R174	B2	B7
R202	B2	B6
R203	C2	B6
R204	C5	F6
R205	C5	E6
R206	B5	D7
R207	B5	D7
R215	E2	C6
TP21	A2	A3
TP22	E3	B3
U14A	G2	D7
U14B	B5	D7
U15	C4	E7
U16A	F4	F7
U16B	F4	F7
U17A	E4	E7
U17B	C5	E7
VR1	E4	F7
VR2	E5	F7


EDGE STROBE
TP21
EDEDGEST
J5-17
EDEDGESTN
J5-17
AVIOX2
U1-10
R146
200
U14A
TL072
VCO TUNE
TP22
AVCOTUNE
OSCILLATOR
BOARD
J10
ANPEAK
U5A-1
U15
DG211
U17A
LM358
U16A
LM393
U16B
LM393
AVCOERRN
J5-23
TBLSN
J5-24
U14B
TL072
U17B
LM358
P/O A7 HD REFERENCE INPUT BOARD

Section 11
Replaceable Mechanical Parts

This section contains a list of the components that are replaceable for the SPG 1000. Use this list to identify and order replacement parts. There is a separate Replaceable Mechanical Parts list for each instrument.

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. Therefore, when ordering parts, it is important to include the following information in your order.

- Part number
- Instrument type or model number
- Instrument serial number
- Instrument 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.

Using the Replaceable Mechanical Parts List

The tabular information in the Replaceable Mechanical Parts list is arranged for quick retrieval. Understanding the structure and features of the list will help you find all of the information you need for ordering replaceable parts.

Cross Index–Mfr. Code Number to Manufacturer

The Mfg. Code Number to Manufacturer Cross Index for the mechanical parts list is located immediately after this page. The cross index provides codes, names, and addresses of manufacturers of components listed in the mechanical parts list.

Abbreviations

Abbreviations conform to American National Standards Institute (ANSI) standard Y1.1.

Chassis Parts

Chassis-mounted parts and cable assemblies are located at the end of the Replaceable Electrical Parts list.

Column Descriptions

Figure & Index No. (Column 1)

Items in this section are referenced by figure and index numbers to the illustrations.

Tektronix Part No. (Column 2)

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

Serial No. (Column 3 and 4)

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

Qty (Column 5)

This indicates the quantity of mechanical parts used.

Name and Description (Column 6)

An item name is separated from the description by a colon (:). Because of space limitations, an item name may sometimes appear as incomplete. Use the U.S. Federal Catalog handbook H6-1 for further item name identification.

Following is an example of the indentation system used to indicate relationship.

1 2 3 4 5 Name & Description
Assembly and/or Component
Mounting parts for Assembly and/or Component
MOUNTING PARTS/*END MOUNTING PARTS*
Detail Part of Assembly and/or Component
Mounting parts for Detail Part
MOUNTING PARTS/*END MOUNTING PARTS*
Parts of Detail Part
Mounting parts for Parts of Detail Part
MOUNTING PARTS/*END MOUNTING PARTS*

Mounting 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. **Mounting parts must be purchased separately, unless otherwise specified.**

Mfr. Code (Column 7)

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

Mfr. Part Number (Column 8)

Indicates actual manufacturer's part number.

Cross Index – Mfr. Code Number To Manufacturer

Mfr. Code	Manufacturer	Address	City, State, Zip Code
S3109	FELLER	72 VERONICA AVE UNIT 4	SUMMERSET NJ 08873
TK0433	PORTLAND SCREW CO		
TK0435	LEWIS SCREW CO	4300 S RACINE AVE	CHICAGO IL 60609–3320
TK0858	STAUFFER SUPPLY CO (DIST)		
TK1373	PATELEC–CEM (ITALY)	10156 TORINO	VAICENTALLO 62/45S ITALY
TK1947	NORTHWEST ETCH TECHNOLOGY	3223 C ST NE UNIT 2	AUBURN WA 98002
TK2548	XEROX BUSINESS SERVICES DIV OF XEROX CORPORATION	14181 SW MILLIKAN WAY	BEAVERTON OR 97077
0B445	ELECTRI–CORD MFG CO INC	312 EAST MAIN ST	WESTFIELD PA 16950
06666	GENERAL DEVICES CO INC	1410 S POST RD PO BOX 39100	INDIANAPOLIS IN 46239–9632
06915	RICHCO PLASTIC CO	5825 N TRIPP AVE	CHICAGO IL 60646–6013
24931	SPECIALTY CONNECTOR CO INC	2100 EARLYWOOD DR PO BOX 547	FRANKLIN IN 46131
70399	AMERICAN SCREW MACHINE PRODUCTS INC	5240 BELMONT	DOWNERS GROVE IL 60515–4316
77250	ALLIED PRODUCTS CORP PHEOLL MFG CO DIV	5700 W ROOSEVELT RD	CHICAGO IL 60650–1156
78189	ILLINOIS TOOL WORKS INC SHAKEPROOF DIV	ST CHARLES ROAD	ELGIN IL 60120
79136	WALDES KOHINOOR INC	47–16 AUSTEL PLACE	LONG ISLAND CITY NY 11101–4402
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON OR 97077–0001
80126	PACIFIC ELECTRICORD CO	747 WEST REDONDO BEACH PO BOX 10	GARDENA, CA 90247–4203
93907	TEXTRON INC CAMCAR DIV	600 18TH AVE	ROCKFORD IL 61108–5181
95987	BRADY/WECKESSER MFG CO	4444 WEST IRVING PARK RD	CHICAGO IL 60641

Replaceable Mechanical Parts

Fig. & Index No.	Tektronix Part No.	Serial Number Effective	Dscont	Qty	Name & Description	Mfr. Code	Mfr. Part No.
1–1	200–3922–01	B020000		1	COVER,TOP:ALUMINUM	80009	200–3922–01
					MOUNTING PARTS		
–2	211–0538–00			13	SCREW,MACHINE:6–32 X 0.312,FLH,100 DEG,STL	93907	ORDER BY DESCR
					END MOUNTING PARTS		
–3	367–0437–03			1	HANDLE:ALUMINUM	80009	367–0437–03
					MOUNTING PARTS		
–4	211–0538–00			2	SCREW,MACHINE:6–32 X 0.312,FLH,100 DEG,STL	93907	ORDER BY DESCR
					END MOUNTING PARTS		
–5	367–0437–01			1	HANDLE:ALUMINUM	80009	367–0437–01
					MOUNTING PARTS		
–6	211–0538–00			2	SCREW,MACHINE:6–32 X 0.312,FLH,100 DEG,STL	93907	ORDER BY DESCR
					END MOUNTING PARTS		
–7	213–0216–00			1	THUMBSCREW:10–32 X 0.85,0.375 OD HD,SST	80009	213–0216–00
–8	354–0025–00			1	RING,RETAINING:EXTERNAL,U/O 0.187 DIA SFT	79136	5555–18
–9	426–2433–01	B020000		1	FRAME,SECTION:ALUMINUM	80009	426–2433–01
					MOUNTING PARTS		
–10	211–0538–00			3	SCREW,MACHINE:6–32 X 0.312,FLH,100 DEG,STL	93907	ORDER BY DESCR
					END MOUNTING PARTS		
–11	366–1545–00			1	KNOB:TV GRAY	80009	366–1545–00
–12	——— ———			1	CIRCUIT BD ASSY:FRONT PANEL		
					(SEE A1 REPL)		
					MOUNTING PARTS		
–13	211–0198–00			5	SCREW,MACHINE:4–40 X 0.438,PNH,STL	TK0435	ORDER BY DESCR
					END MOUNTING PARTS		
–15	361–1608–00			1	SPACER,FR PNL:ABS,BLACK	80009	361–1608–00
–16	366–0671–00			10	PUSH BUTTON:W/LENS,HL20–1101	80009	366–0671–00
–17	——— ———			1	DISPLAY,FLAT PL:		
					(SEE A8 REPL)		
					MOUNTING PARTS		
–18	211–0198–00			4	SCREW,MACHINE:4–40 X 0.438,PNH,STL	TK0435	ORDER BY DESCR
					END MOUNTING PARTS		
–19	378–0384–00			1	FILTER,DISPLAY:ACRYLIC,BLUE	80009	378–0384–00
–20	333–3571–00			1	PANEL,FRONT:SPG1000	80009	333–3571–00
–21	——— ———			1	CIRCUIT BD ASSY:OSCILLATOR		
					(SEE A2 REPL)		
					MOUNTING PARTS		
–22	211–0244–00			5	SCR,ASSEM WSHR:4–40 X 0.312,PNH STL	TK0858	211–0244–00
					END MOUNTING PARTS		
–23	——— ———			1	CIRCUIT BD ASSY:FILTER		
					(SEE A2A1 REPL)		
					MOUNTING PARTS		
–24	211–0244–00			4	SCR,ASSEM WSHR:4–40 X 0.312,PNH STL	TK0858	211–0244–00
					END MOUNTING PARTS		
–25	——— ———			1	CIRCUIT BD ASSY:CONTROLLER		
					(SEE A5 REPL)		
					MOUNTING PARTS		
–26	211–0244–00			6	SCR,ASSEM WSHR:4–40 X 0.312,PNH STL	TK0858	211–0244–00
					END MOUNTING PARTS		
–27	337–4012–00	B020000		1	SHEILD,ELECT:0.020 POLY,SPG422,SAFETYCONTROLLED	80009	337–4012–00
					MOUNTING PARTS		
–28	211–0244–00			3	SCR,ASSEM WSHR:4–40 X 0.312,PNH STL	TK0858	211–0244–00
					END MOUNTING PARTS		
–29	337–3796–00			1	SHIELD,ELEC:LINE FILTER,ALUMINUM	TK1947	337–3796–00
					MOUNTING PARTS		

Fig. & Index No.	Tektronix Part No.	Serial Number Effective	Dscont	Qty	Name & Description	Mfr. Code	Mfr. Part No.
–30	211–0025–00	B020000		2	SCREW,MACHINE:4–40 X 0.375,FLH,100 DEG,STL	TK0435	ORDER BY DESC
					END MOUNTING PARTS		
–31	——— ———			1	CIRCUIT BD ASSY:POWER SUPPLY		
					(SEE A4 REPL)		
					MOUNTING PARTS		
–32	211–0244–00			4	SCR,ASSEM WSHR:4–40 X 0.312,PNH STL	TK0858	211–0244–00
					END MOUNTING PARTS		
–33	——— ———			1	CIRCUIT BD ASSY:HD REF INPUT		
					(SEE A7 REPL)		
					MOUNTING PARTS		
–34	211–0244–00			5	SCR,ASSEM WSHR:4–40 X 0.312,PNH STL	TK0858	211–0244–00
	210–1063–00			2	WASHER,FLAT:0.147 ID X 0.29 OD X 0.1,ABS	80009	210–1063–00
–35	220–0497–00			1	NUT,PLAIN,HEX:0.5–28 X 0.562 HEX,BRS CD PL	80009	220–0497–00
–36	210–1039–00			1	WASHER,LOCK:0.521 ID,INT,0.025 THK,SST	24931	ORDER BY DESCR
					END MOUNTING PARTS		
					END MOUNTING PARTS		
–39	——— ———			1	CIRCUIT BD ASSY:HD GENLOCK		
					(SEE A6 REPL)		
					MOUNTING PARTS		
–40	211–0244–00			3	SCR,ASSEM WSHR:4–40 X 0.312,PNH STL	TK0858	211–0244–00
–41	129–1403–00			5	SPACER,POST:4–40 X 0.160,SST,0.250 HEX,1.1L,4–40 X 0.438 DEEP	80009	129–1403–00
–42	220–0497–00			2	NUT,PLAIN,HEX:0.5–28 X 0.562 HEX,BRS CD PL	80009	220–0497–00
–43	210–1039–00			2	WASHER,LOCK:0.521 ID,INT,0.025 THK,SST	24931	ORDER BY DESCR
					END MOUNTING PARTS		
–44	——— ———			1	CIRCUIT BD ASSY:HD SYNC		
					(SEE A3 REPL)		
					MOUNTING PARTS		
–45	211–0244–00			7	SCR,ASSEM WSHR:4–40 X 0.312,PNH STL	TK0858	211–0244–00
–46	220–0497–00			6	NUT,PLAIN,HEX:0.5–28 X 0.562 HEX,BRS CD PL	80009	220–0497–00
–47	210–1039–00			6	WASHER,LOCK:0.521 ID,INT,0.025 THK,SST	24931	ORDER BY DESCR
					END MOUNTING PARTS		
–48	407–4134–00			1	BRKT,FAN,MTG:SPG1000	80009	407–4134–00
					MOUNTING PARTS		
–49	211–0538–00			2	SCREW,MACHINE:6–32 X 0.312,FLH,100 DEG,STL	93907	ORDER BY DESCR
					END MOUNTING PARTS		
–50	——— ———			1	FAN,TUBEAXIAL:		
					(SEE B100 REPL)		
					MOUNTING PARTS		
–51	211–0619–00			2	SCREW,MACHINE:6–32 X 1.5,FLH,100 DEG,STL	TK0433	ORDER BY DESCR
–52	210–0457–00			2	NUT,PL,ASSEM WA:6–32 X 0.312,STL CD PL	78189	511–061800–00
					END MOUNTING PARTS		
					MOUNTING PARTS		
–54	212–0065–00	B010100	B019999	1	SCREW,MACHINE:8–32 X 0.5 L,PNH,STL	70399	ORDER BY DESCR
					END MOUNTING PARTS		
–55	131–3573–00	B020000		1	CONN,PLUG,ELEC:MALE,W/LOCKING ADAPTER	80126	B–0779
					END MOUNTING PARTS		
–58	351–0104–03			1	SL SECT,DWR EXT:12.625 L,W/O HARDWARE	06666	C–720–3
					MOUNTING PARTS		
–59	212–0001–00			8	SCREW,MACHINE:8–32 X 0.25,PNH,STL	77250	ORDER BY DESCR
					END MOUNTING PARTS		
–60	211–0177–00			1	SCREW,MACHINE:4–40 X 0.312,PNH,STL	TK0435	ORDER BY DESCR
–61	200–3923–01	B020000		1	COVER,BOTTOM:ALUMINUM	80009	200–3923–01
					STANDARD ACCESSORIES		
–62	351–0751–01			1	TRK,SL OUT SECT:STATIONARY & INTERMEDIATE	80009	351–0751–01
–63	174–2355–01			1	CABLE ASSY,RF:78 OHM COAX,1 METER L	80009	174–2355–01

Fig. & Index No.	Tektronix Part No.	Serial Number Effective	Dscont	Qty	Name & Description	Mfr. Code	Mfr. Part No.
	070–8074–01			1	MANUAL,TECH:SPG1000	TK2548	070–8074–01
–64	161–0066–00	B010100	B039999	1	CA ASSY,PWR:3,18 AWG,250V/10A,98 INCH,STR,IEC320, RCPT X NEMA 5–15P,US,SAFTEY CONTROLLED	0B445	ECM–161–0066–00
	161–0216–00	B040000		1	CABLE ASSY,PWR:3,18 AWG,2.5M L,BLACK (STANDARD ONLY)	80126	C7120–25M–BL
					OPTIONAL ACCESSORIES		
–65	161–0066–09	B010100	B039999	1	CA ASSY,PWR:3,0.75MM SQ,250V/10A,99 INCH,STR, IEC320,RCPT,EUROPEAN,SAFTEY CONTROLLED	S3109	86511000
	161–0215–00	B040000		1	CABLE ASSY,PWR:3,0.75MU,2.5MM L,GREY (EUROPEAN OPTION A1 ONLY)	80126	0–5335–008–GY
–66	161–0066–10			1	CA ASSY,PWR: (UNITED KINGDOM OPTION A2 ONLY)	TK1373	24230
–67	161–0066–11			1	CA ASSY,PWR:3,1.0MM SQ,250V/10A,2.5 METER,STR,IEC320,RCPT,AUSTRALIA,SAF CONT (AUSTRALIAN OPTION A3 ONLY)	80009	161–0066–11

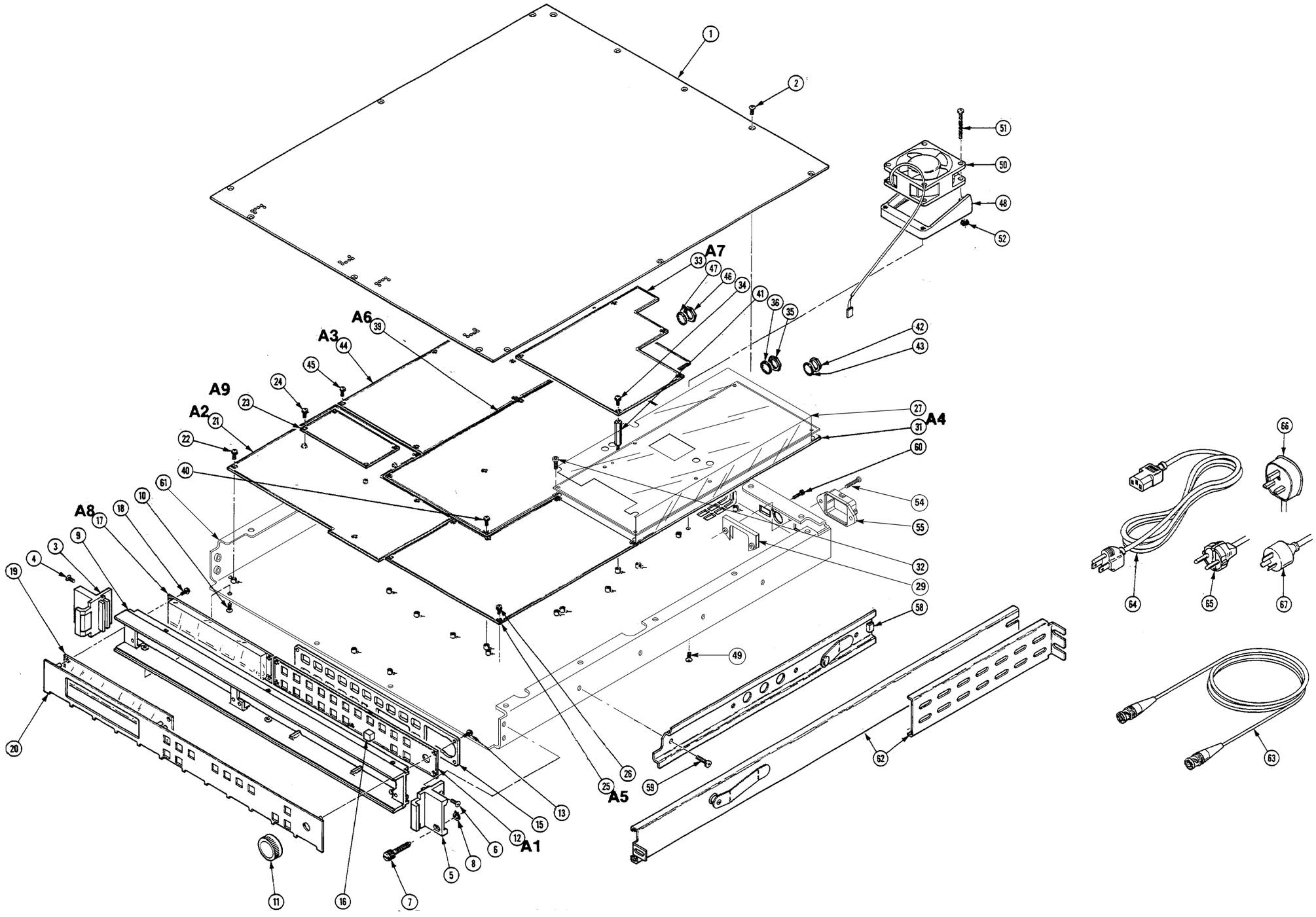


Figure 1: Exploded View

Appendix A
Serial Remote Control Examples

Please note that the information below has been included for the convenience of the user. It is intended to assist in implementing RS-232 remote control of the SPG 1000 and to demonstrate a possible control strategy. This appendix is not intended as an endorsement of any software product, or as an exhaustive discussion on the topic.

Terminal Options Example

Many existing Personal Computer (PC) communications applications may be used for serial remote control of the SPG 1000. As each application has slightly different capabilities and features, it is impossible to suggest "universal" settings and parameter choices.

The following Procomm Plus® (MS-DOS, version 2.0) Terminal Options may be used as an example; they are known to work for RS-232 control of the SPG 1000:

Terminal emulation:	VT100 *or* ASCII
Duplex:	HALF
Soft flow ctrl (XON/XOFF):	OFF
Hard flow ctrl (RTS/CTS):	ON
Line wrap:	ON
Screen scroll:	ON
CR translation:	CR *or* CR/LF

(Not easily done with Procomm, but more desirable for many purposes, is to translate CR into CR/LF when sending and to "strip" LF from CR/LF when receiving.)

BS [back space] translation:	n/a
Break length (millisecs):	350
Enquiry (ENQ):	n/a
EGA/VGA true underline:	OFF (n/a)
Terminal width:	80
ANSI 7 or 8 bit commands:	7 BIT

Script File Example

Some communications programs also include the ability to automate procedures with program or "Script" files. The command lanquage or syntax will vary with the application; please consult the documentation of your program for its capabilities and procedures.

The example script file that is listed on the following pages may be used with Procomm Plus® version 2.0. The program is intended to ease the burden of typing long commands (e.g., :STANDARD:OUTPUT *"1050/59.94/2:1 gbr"*<CR>); it takes the longest, most-often used commands and shortens them to just a few keystrokes. For example, to enter the same command as above when the program is running, the operator need only type o3<CR>.

For timing adjustments, there is a u/d mnemonic for up and down incremental changes. After first entering a timing command such as :VERT *up*<CR>, the operator may then type u<CR> (or d<CR>)—and each subsequent key press will cause a vertical up (or down) command to execute. To stop this action (to exit the progam loop), type q<CR>.

The script file also has a "help" list of all the command mnemonics; the list is accessed by typing h<CR>. Any command not defined in the script—and on the help list—may be entered normally while the program is running. To quit the program, type q<CR> when not in a timing-adjust loop.

For more information and further insight into the operation of this script, please consult the Procomm Plus User Manual and "Aspect Script Language" Reference Manual.

Sample Procomm Plus® script file:

```
string cmd
string buffer
string time_type
integer output

define FALSE   0
define TRUE    1

proc main

   while forever
      call get_cmd
      call process_cmd
      if output
         call output_cmd
         endif
      endwhile
   endproc

proc get_cmd

   get cmd
   endproc

proc process_cmd

   output = TRUE
   switch cmd
      case  "q"
         exit
         output = FALSE
         endcase
      case  "o1"
         strcpy buffer ":standard:out 1125/60/2:1 gbr"
         endcase
      case  "o2"
         strcpy buffer ":standard:out 1125/59.94/2:1 gbr"
         endcase
      case  "o3"
         strcpy buffer ":standard:out 1050/59.94/2:1 gbr"
         endcase
      case  "o4"
         strcpy buffer ":standard:out 525/59.94/1:1 gbr"
         endcase
      case  "o5"
         strcpy buffer ":standard:out 1050/59.94/1:1 gbr"
         endcase
      case  "o6"
         strcpy buffer ":standard:out 1250/50/2:1 gbr"
         endcase
      case  "o7"
```

Sample Procomm Plus® script file, continued.

```
   strcpy buffer ":standard:out 625/50/1:1 gbr"
   endcase
case  "o8"
   strcpy buffer ":standard:out 1250/50/1:1 gbr"
   endcase
case  "o9"
   strcpy buffer ":standard:out 787/59.94/1:1 gbr"
   endcase
case  "i1"
   strcpy buffer ":standard:in 1125/60/2:1"
   endcase
case  "i2"
   strcpy buffer ":standard:in 1125/59.94/2:1"
   endcase
case  "i3"
   strcpy buffer ":standard:in 525/59.94/1:1"
   endcase
case  "i4"
   strcpy buffer ":standard:in 525/59.94/2:1"
   endcase
case  "i5"
   strcpy buffer ":standard:in 1050/59.94/2:1"
   endcase
case  "i6"
   strcpy buffer ":standard:in 1050/59.94/1:1"
   endcase
case  "i7"
   strcpy buffer ":standard:in 625/50/2:1"
   endcase
case  "i8"
   strcpy buffer ":standard:in 625/50/1:1"
   endcase
case  "i9"
   strcpy buffer ":standard:in 1250/50/2:1"
   endcase
case  "i10"
   strcpy buffer ":standard:in 1250/50/1:1"
   endcase
case  "i11"
   strcpy buffer ":standard:in 787/59.94/1:1"
   endcase
case  "s1"
   strcpy buffer ":signal 100% color bars"
   endcase
case  "s2"
   strcpy buffer ":signal pluge"
   endcase
case  "s3"
   strcpy buffer ":signal convergence 5% over scan"
   endcase
case  "s4"
```

Sample Procomm Plus® script file, continued.

```
      strcpy buffer ":signal 5 step staircase"
      endcase
   case  "s5"
      strcpy buffer ":signal red field"
      endcase
   case  "s6"
      strcpy buffer ":signal black"
      endcase
   case  "s7"
      strcpy buffer ":signal 50% grey field"
      endcase
   case  "s8"
      strcpy buffer ":signal white field"
      endcase
   case  "s9"
      strcpy buffer ":signal timing with 1 ns markers"
      endcase
   case  "b1"
      strcpy buffer ":baud 1200"
      endcase
   case  "b2"
      strcpy buffer ":baud 2400"
      endcase
   case  "b3"
      strcpy buffer ":baud 4800"
      endcase
   case  "b4"
      strcpy buffer ":baud 9600"
      endcase
   case  "b5"
      strcpy buffer ":baud 19200"
      endcase
   case  "b6"
      strcpy buffer ":baud 38400"
      endcase
   case  "u"
      call handle_up
      output = FALSE;
      endcase
   case  "d"
      call handle_down
      output = FALSE
      endcase
   case  "h"
      call help_screen
      output = FALSE
      endcase
   default
      call check_for_time
      strcpy buffer cmd
      endcase
```

Sample Procomm Plus® script file, continued.

```
      endswitch
   endproc

proc handle_up
   integer key = 0

   while forever
      strcmp time_type "ver"
      if success
         transmit ":vertical up^M"
         waitfor "^M"
         endif
      strcmp time_type "hor"
      if success
         transmit ":horizontal up^M"
         waitfor "^M"
         endif
      strcmp time_type "fin"
      if success
         transmit ":fine up^M"
         waitfor "^M"
         endif
      keyget key
      if key == 113
         return
         endif
      endwhile
   endproc

proc handle_down
   integer key = 0

   while forever
      strcmp time_type "ver"
      if success
         transmit ":vertical down^M"
         waitfor "^M"
         endif
      strcmp time_type "hor"
      if success
         transmit ":horizontal down^M"
         waitfor "^M"
         endif
      strcmp time_type "fin"
      if success
         transmit ":fine down^M"
         waitfor "^M"
         endif
      keyget key
      if key == 113
         return
```

Sample Procomm Plus® script file, continued.

```
            endif
         endwhile
      endproc

   proc check_for_time

      strcmp cmd ":ver" 4
      if success
         substr time_type cmd 1 3
         endif
      strcmp cmd ":hor" 4
      if success
         substr time_type cmd 1 3
         endif
      strcmp cmd ":fin" 4
      if success
         substr time_type cmd 1 3
         endif
      endproc

   proc output_cmd

       strcat buffer "^M"
       transmit buffer
       endproc

   proc help_screen

      message "q     = quit"
      message "o1    = output standard 1125/60/2:1 gbr"
      message "o2    = output standard 1125/59.94/2:1 gbr"
      message "o3    = output standard 1050/59.94/2:1 gbr"
      message "o4    = output standard 525/59.94/1:1 gbr"
      message "o5    = output standard 1050/59.94/1:1 gbr"
      message "o6    = output standard 1250/50/2:1 gbr"
      message "o7    = output standard 625/50/1:1 gbr"
      message "o8    = output standard 1250/50/1:1 gbr"
      message "o9    = output standard 787/59.94/1:1 gbr"
      message "i1    = input standard 1125/60/2:1"
      message "i2    = input standard 1125/59.94/2:1"
      message "i3    = input standard 525/59.94/1:1"
      message "i4    = input standard 525/59.94/2:1"
      message "i5    = input standard 1050/59.94/2:1"
      message "i6    = input standard 1050/59.94/1:1"
      message "i7    = input standard 625/50/1:1"
      message "i8    = input standard 625/50/2:1"
      message "i9    = input standard 1250/50/2:1"
      message "i10   = input standard 1250/50/1:1"
      message "i11   = input standard 787/59.94/1:1"
      message "^M"
      message "Press any key to continue^M"
```

Sample Procomm Plus® script file, continued.

```
keyget
message "s1    = signal Color Bars"
message "s2    = signal Pluge"
message "s3    = signal Convergence 5% Over Scan"
message "s4    = signal 5 Step Staircase"
message "s5    = signal Red Field"
message "s6    = signal Black"
message "s7    = 50% Grey Field"
message "s8    = White"
message "s9    = Timing With 1 ns Markers"
message "b1    = Baud 1200"
message "b2    = Baud 2400"
message "b3    = Baud 4800"
message "b4    = Baud 9600"
message "b5    = Baud 19200"
message "b6    = Baud 38400"
message "u     = Up   (on last selected timing type)"
message "d     = Down (on last selected timing type)"
message "h     = This Screen"
message "^M"
message "^M"
message "^M"
message "^M"
endproc
```

Manual Change Information

Tektronix products are constantly under development for increased performance or lower cost to the customer. Often, changes are incorporated into a product as soon as they are shown to meet the highest quality standards.

This aggressive policy of product improvement can result in changes that are not reflected in the appropriate sections of the manual. Information regarding such changes will appear on the following pages. If no change notices are inserted after this page, the manual is correct as printed.

Please review any included change information and note the changes that will affect your use of the product. A single change may apply to several sections of the manual. Because change information sheets are inserted until all the changes are incorporated into every applicable section of the manual, some duplication may result.

Tektronix

MANUAL CHANGE INFORMATION

Group Code 20

Date: 6/4/93 Change Reference: M78022 Rev 1

Product: SPG 1000 Manual Part No: 070–8074–00

DESCRIPTION

EFF. S/N: B010214

TEXT and ELECTRICAL PARTS LIST CHANGES

SECTION 6 PERFORMANCE CHECKS AND CALIBRATION

Page 6–19, Calibration list

CHANGE step 6 **TO READ:**

6. Fine Sync Timing (R164 and R165 for correct tming overlap) (and C147 to stop oscillations, B010214 and above)

Calibration Procedures, *Page 6–23*,

CHANGE Step 6 Fine Sync Timing **TO READ:**

6. Fine Sync Timing:

This procedure ensures that the full range of fine sync timing adjustments is available. The voltage adjustments made with R164 and R165 control the range of the variable delay line that "creates" fine sync offset.

The procedure is performed first with an output standard that uses the highest-frequency oscillator installed in the SPG 1000 (in the standard instrument, 787/59.94/1:1, at 75.336 MHz). It is then checked and repeated, if necessary, with the two remaining clocks. The order of the complete procedure will be: Highest frequency; lowest frequency; middle frequency. Repeat until overlap at all advance/delay transitions is between 0.5 and 1.5 ns, and the control voltage stays between +4.0 and –10.6 V.

a. Connect the equipment as shown in Fig. 6–24. Use an SMB-to-BNC cable (e.g., Tektronix P/N 012–0532–00) to connect J23 to CH1 of the oscilloscope; use a 1X probe to pick the delayed clock signal off the lead of R179 (or R180) that is closer to the left side of the instrument chassis. Connect the multimeter positive lead to pin 1 of U57 on the Sync board, and the negative lead to the –12 V test point (TP8) on the Oscillator board. Use the initial settings listed in Table 6–17.

b. Initialize the SPG 1000 by turning it off and then turning it back on while pressing the output standard button. Then, with the front panel enabled, use the Timing Select and Fine buttons to choose fine Sync timing; the display will read **0.000us DLY**. Turn the knob one increment (one "beep") counterclockwise (CCW) so the display reads **.000us ADV**.

NOTE

*After some adjustment of fine timing, the leading zero at minimum delay (**0**.000us) will no longer be displayed. This is due to round-off error in the many calculations performed by the SPG 1000 microprocessor. The point of interest is the threshold between timing advance and delay, which is initially easier to identify with the aid of the extra zero.*

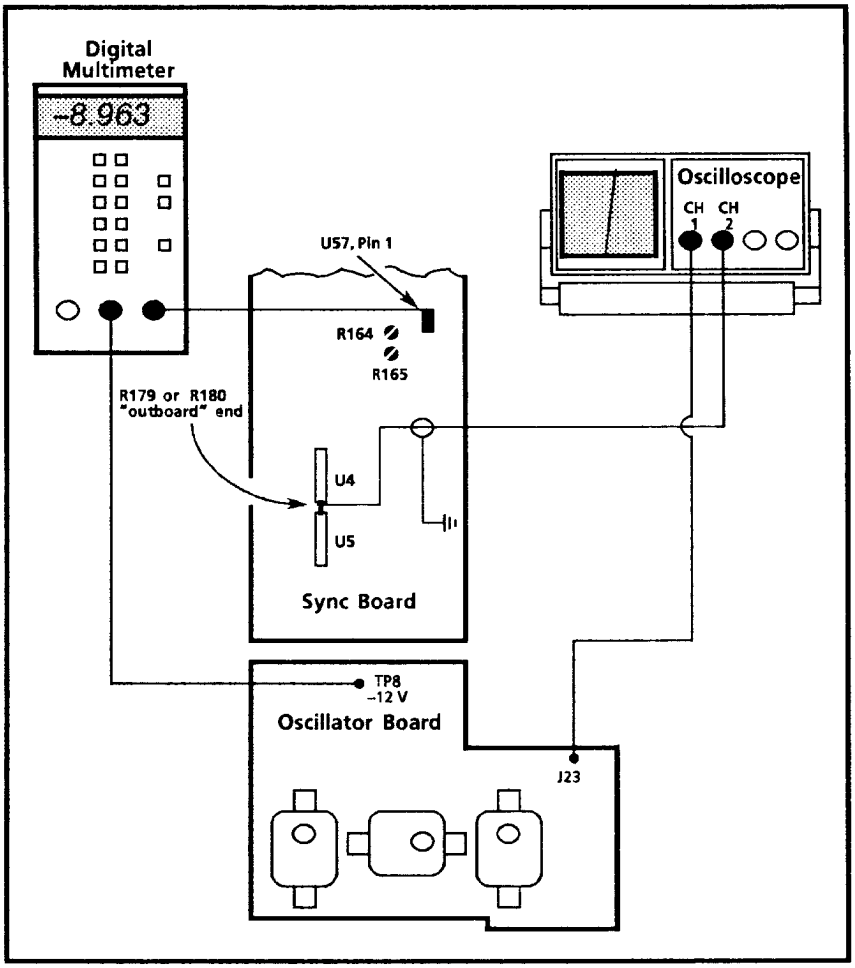


Fig. 6–24. Equipment setup for fine Sync timing adjustments.

c. Set R164 and R165 completely CCW, and use the oscilloscope horizontal position control to center the clock trace on the graticule.

d. CHECK – for a multimeter reading of >0.4 V.

e. ADJUST – R165 smoothly clockwise (CW), and check that the trace moves smoothly with the adjustment; no jumps, oscillation, or sliding.

f. ADJUST – C147 (S/N B010214 and above) if needed, to stop any oscillations or voltage railing problems.

g. Return R165 to a CCW position.

h. ADJUST – R164 smoothly CW, and check that the trace moves smoothly with the adjustment; no jumps, oscillation, or sliding.

i. ADJUST – C147 (S/N B010214 and above) if needed, to stop any oscillations or voltage railing problems.

j. ADJUST – R164 for a multimeter reading of 0.85 V.

k. ADJUST – R165 for a multimeter reading of 1.0 to 1.2 V.

l. Adjust the SPG 1000 fine timing until **.006us ADV** is displayed. Continue to advance the sync timing until the clock trace jumps on the oscilloscope display. Rotate the knob back and forth to toggle across this jump.

m. ADJUST – R165 for a displacement of ≈0.65 ns on the oscilloscope display between **.000 ADV** and **.006 ADV**. (Must be >0.5 ns.)

n. CHECK – that the multimeter reading is ≤ +15 V. Typically this will be in the range of +7 to +11 V.

o. Adjust the SPG 1000 fine timing until you can toggle between **.000us ADV** and **0.000us DLY**. Use the knob to go back and forth across the jump threshold.

p. CHECK – that the timing overlap is >0.5 ns and <1.5 ns. If the overlap is <0.5 ns perform part q of this step. If the overlap is >1.5 ns perform part r of this step.

q. ADJUST – R165 (ONLY if overlap is <0.5 ns) for an overlap of >0.5 ns on the oscilloscope, as the SPG 1000 is toggled between **.000us ADV** and **0.000us DLY**.

r. ADJUST – R164 (ONLY if overlap is >1.5 ns) for an overlap of <1.5 ns on the oscilloscope, as the SPG 1000 is toggled between **.000us ADV** and **0.000us DLY**.

s. CHECK – that the multimeter reading is ≤ +16 V. Typically this will be in the range of +7 to +11 V.

t. Repeat parts o through s of this step for the **.000us ADV** to **.006us ADV** transition.

u. Repeat parts o through t until the overlap and multimeter reading are correct for both the **.000us ADV** to **0.000us DLY** and the **000us ADV** to **.006us ADV** transitions.

v. Select an output standard that uses the lowest frequency oscillator and repeat parts o through t until the overlap and multimeter reading are correct for both the **.000us ADV** to **0.000us DLY** and the **000us ADV** to **.006us ADV** transitions.

w. Select an output standard that uses the lowest frequency oscillator and repeat parts o through t until the overlap and multimeter reading are correct for both the **.000us ADV** to **0.000us DLY** and the **000us ADV** to **.006us ADV** transitions.

SECTION 9 REPLACEABLE ELECTRICAL PARTS LIST

CHANGE TO READ:

			Shown on
A3	671–1902–06	CKT BD ASSY:HD SYNC BOARD	A3 Schematic
A3R158	322–3285–00	RES,FXD,FILM:5.36K OHM,1%,0.2W	6
A5	671–1903–06	CKT BD ASSY:CONTROLLER BOARD	A5 Schematic
A5U11	160–8674–05	IC,MEMORY:CMOS,EPROM,64K X 8,27C512 PRGM	1

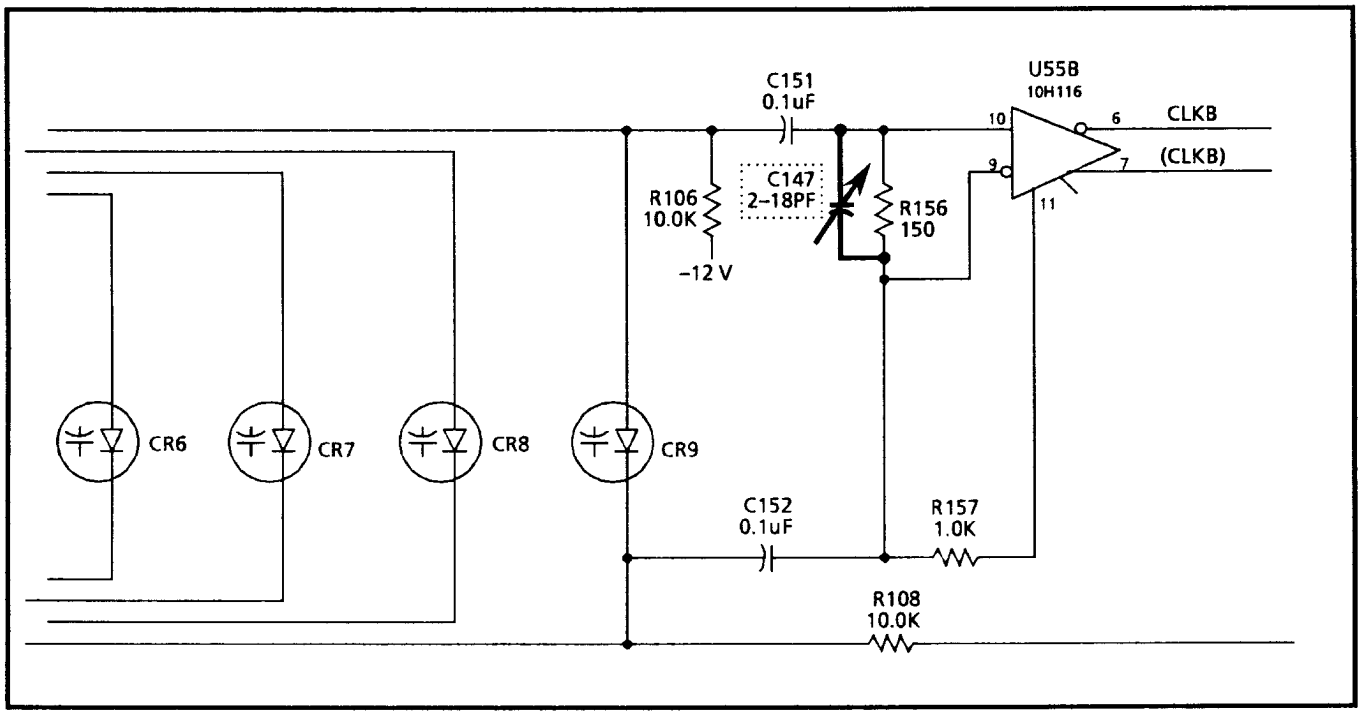
ADD:

A3C147	281–0184–00	CAP,VAR,PLASTIC:2–18PF,500VDC,TOP/BOTTOM ADJ

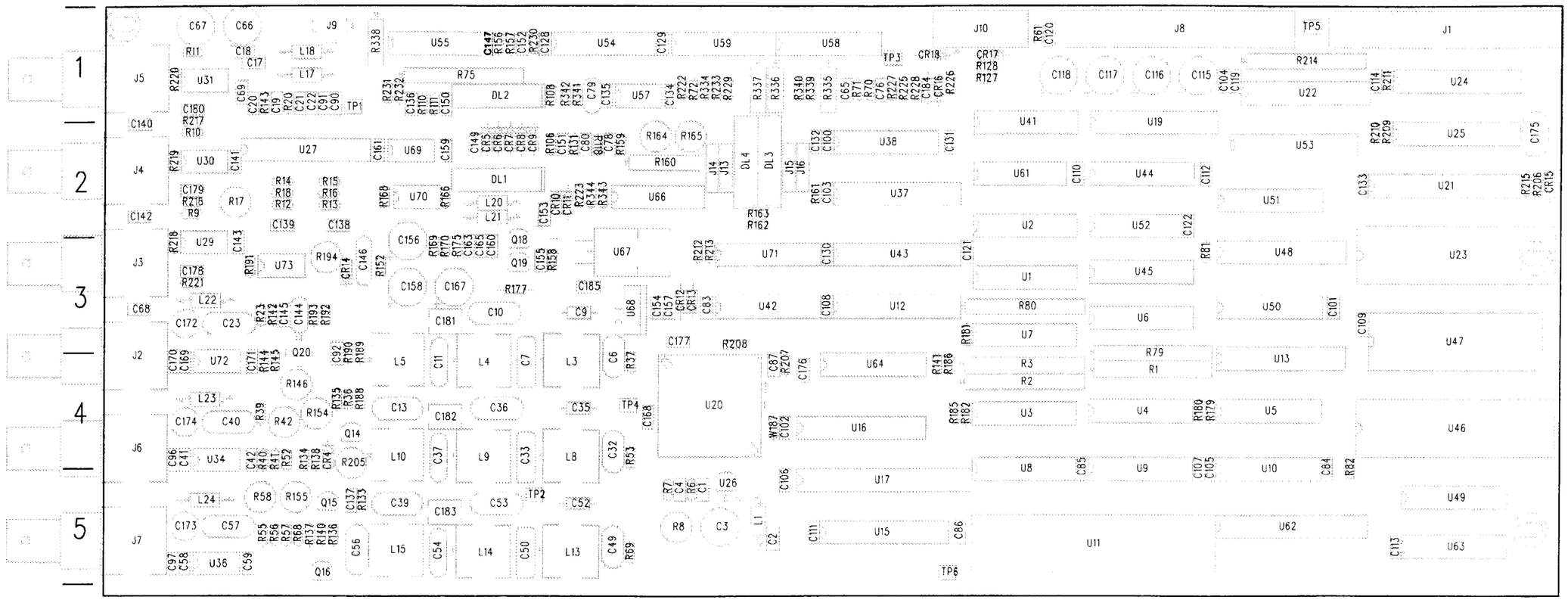
The added part is shown in the following partial schematic:

Date: 6/4/93 Group Code 20 Change Reference: M78022 Rev 1

Product: SPG 1000 Manual Part No: 070-8074-00



Part of A3 schematic 6, showing location of added part.



A3 HD SYNC BOARD **671-1902-06**

Tektronix

MANUAL CHANGE INFORMATION

Date: 6/6/94

Change Reference: M81265

Product:	Manual P/N:	Product	Manual P/N:
067–1011–00	070–3679–00	TSG 1125	061–3629–00
118AS/118RC	070–5114–00	TSG 1250	061–3719–00
1450–1	070–5568–00	TSG–170A	070–5680–00
1450–2	070–2998–00	TSG–170D	070–6943–00
1450–3A	070–3660–01	TSG200	070–8351–00
1910	070–4523–00	TSG–271	070–6304–00
728D	070–7629–00	TSG–273	070–7956–00
728E	070–7630–02	TSG–300	070–5722–00
728M	070–8045–00	TSG–370	070–7446–00
751	070–7631–00	TSG–371	070–7707–00
ASG100	070–8546–00	TSG–422	070–7022–00
ASG140	070–8867–01	VITS100	061–3939–00
DAC422	070–8595–00	VITS200	061–3923–00
ECO–170A	070–6113–00	VITS200 AA	061–3984–00
PE1000	070–8474–00	VITS201	070–7385–00
SPG1000	070–8074–00	VM700 Vol 1	070–8197–00
SPG–170A	070–5965–00	VM700 Vol 2	070–8275–00
SPG–271	070–6814–00	VM700A	070–8165–00
TPG–625	070–7248–00	VS210	070–8754–00
TSG 1001	070–8625–00	VS211	070–8164–00
TSG 1050	061–3718–00	VS211A	070–8827–00

Mechanical Parts List Changes

In the 1910

CHANGE all occurances of 131–0890–00 **TO READ:**

214–3903–01	1	SCREW,JACK:4–40 X 0.312 EXT THD,4–40 INT THD,0.188 HEX, STEEL,CAD PLATE
		ATTACHED PARTS
210–0004–00	2	WASHER,LOCK:#4 INTL,0.015 THK,STL CD PL
210–0406–00	2	NUT,PLAIN,HEX: 4–40 X 0.188,BRS CD PL
		END ATTACHED PARTS

In all other instruments

CHANGE all occurances of 131–0890–00 **TO READ:**

214–3903–01	1	SCREW,JACK:4–40 X 0.312 EXT THD,4–40 INT THD,0.188 HEX, STEEL,CAD PLATE