Instruction Manual

Tektronix

TSG-170A
NTSC Television Generator

070-5680-02

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

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

WARRANTY

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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.

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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.

Connect and Disconnect Properly. Do not connect or disconnect probes or test leads while they are connected to a voltage source.

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.

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.

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

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.*

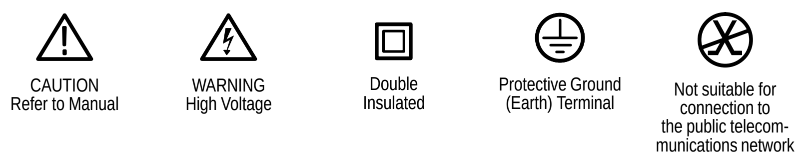
Terms on the Product. These terms may appear on the product:

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.

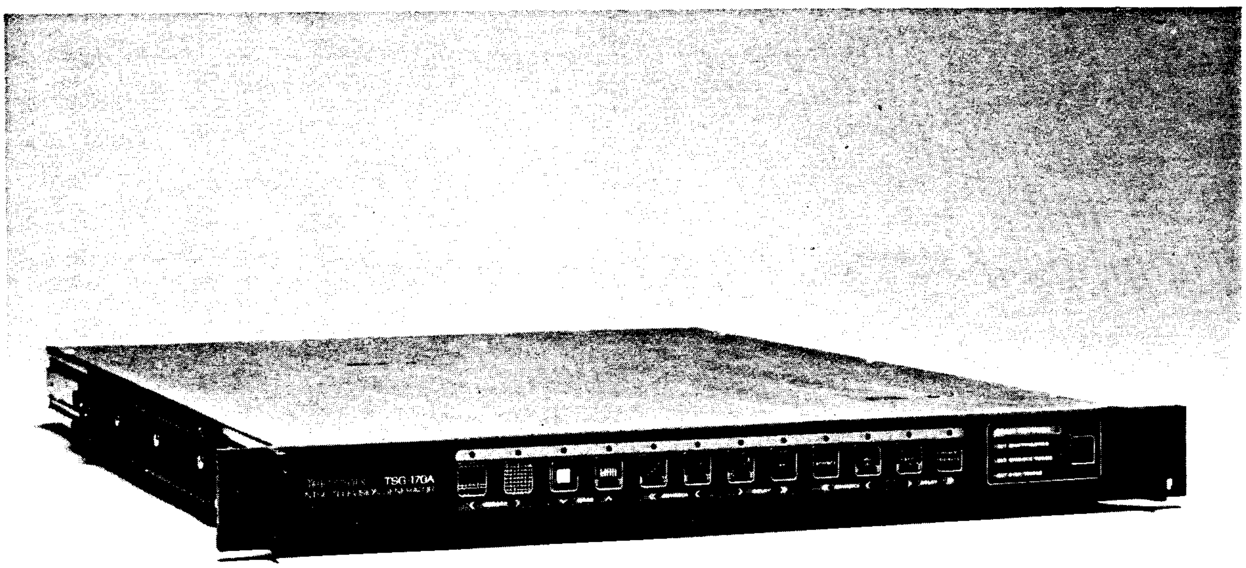
Do Not Service Alone. Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

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.

Introduction



5680-18

TSG-170A NTSC Television Generator.

SECTION 1
INTRODUCTION

PRODUCT DESCRIPTION

The TSG-170A is an NTSC test signal and sync pulse generator. Designed for easy operation, this generator provides a cost-effective complement of RS-170A signals tailored to production and post-production facilities. Moreover, it can be expanded to include an additional SMPTE bar generator, with a programmable I.D. generator and audio tone.

Test Signal Generator

The TSG-170A provides a wide range of 10-bit test signals for both production and maintenance requirements. Added to these is a pair of DAC test signals that permit easy calibration of the DAC reconstruction filters and output amplifier. The combination of 10-bit signal generation and precision D-to-A conversion assure correct SCH phase, amplitude accuracy, and long-term stability.

Test signals generated by the TSG-170A are:

- Color Bars
- Convergence
- Pulse Bar w/Window
- Multiburst
- 5-Step Staircase
- Y Ramp
- Modulated Ramp
- APL
- Bounce
- 100/10 IRE Flat Fields
- Red Field
- Multibars
- NTC7 Composite
- Line Sweep
- Multipulse
- System Test Matrix
- Monitor Setup Matrix
- DAC Test

RS–170A Sync Generator with Digital Genlock

The TSG-170A sync generator's stable color standard and unique digital genlock make it ideal for either master generator or slave operation. All outputs are correctly SCH phased, even if the TSG-170A is locked to an improperly SCH-phased reference input.

The digital genlock calculates sync timing and subcarrier phase to properly identify color framing of the input reference signal. The TSG-170A automatically senses reference inputs. It switches to an internal oscillator in the absence of a reference input signal. This high-stability crystal oscillator, with its constant temperature oven, ensures long-term frequency stability.

Flexible Timing Controls

Front-panel controls are provided to digitally advance or delay all box outputs relative to the genlock reference input. In addition, a separate set of timing controls is provided for sync outputs to simplify system timing. To protect system timing in case of a power failure, timing control settings are stored in non-volatile RAM. A front-panel lockout feature prevents inadvertent changes to the front-panel system timing controls.

Flexible Pulse Output

The TSG-170A has eight sync generator outputs; four fixed and four selectable. The primary outputs for SUBCARRIER, SYNC, BLANKING, and BLACK BURST are fixed. The secondary outputs are BURST FLAG, H DRIVE, V DRIVE, and COLOR FRAME PULSE. The secondary outputs can be changed by jumper selection to provide a second set of primary outputs. The BLANKING output may be set to have 10.5 μs, 10.7 μs, or 10.9 μs horizontal blanking widths and 19 or 20 line vertical blanking width.

SMPTE Bars with Programmable ID and Audio Tone (Option 1)

Option 1 adds a separate SMPTE bar output for routine studio needs, such as tape leaders, freeing the front-panel-selected test signals for engineering and maintenance.

An ID of up to 12 alphanumeric characters may be inserted in the SMPTE bar output. This front-panel programmable ID is ideal for identifying satellite feeds and videotapes. The SMPTE bars and ID may be switched to a 10-second countdown, followed by black, for tape leader generation.

Option 1 also provides an audio tone output, useful for checking program line continuity and adjusting audio levels. The tone can be adjusted over a 0 to +8 dBu range into 150Ω, 600Ω, or high impedance loads.

Special features of the tone include phase lock to the vertical rate for checking audio edits and variable click rate for audio source identification.

With the audio tone phase-locked to the vertical rate, an edit between sources carrying the SMPTE Bars and tone signals should provide a smooth vertical interval video edit and a disturbance-free audio transition. If, however, the audio transition is not properly cross faded, then an audible click will be heard at the edit point. The click is caused by the phase discontinuity in the tone at the edit point.
For audio source identification purposes, a variable rate click may be imposed on the audio tone. The click rate is continuously variable between 0.2 and 4 Hz. This provides a relatively reliable means for identifying up to four separate audio sources.

Option 1J

Option 1J consists of a standard instrument, with a modification to the test signals. Instead of the 7.5% setup level found on the standard test signals, Option 1J has a 0% setup level for use in Japan. In addition, the vertical blanking duration changes from 20 lines to 21.5 lines. There are no other changes in operation or capabilities of the instrument

Option 2J

Option 2J is a modified Option 1 instrument. Option 2J replaces the 7.5% setup level of the SMPTE color bar signal with a 0% setup level, just as the Option 1J does with the standard signal set. Option 2J also changes the Option 1 Audio Tone output from 449.55 Hz to 983.39 Hz. This option includes Option 1J.

Remote Control

Remote operation of test signal selection, timing presets, auto genlock on/off, character ID presets, and tape leader generator functions are available by simple ground closure through a rear-panel 9-pin connector.

Packaging

The TSG-170A's rugged, 1-3/4 inch package makes it ideal for remote vans or anywhere space is at a premium.

Operating Instructions

SECTION 2
OPERATING INSTRUCTIONS

This section explains how to operate the TSG–170A. It also describes each of the tests signals and the rear-panel connector outputs.

FRONT-PANEL CONTROLS

Thirteen click-dome switches control the TSG–170A (see Fig. 2-1). The Mode Select switch on the right selects four modes of operation: SELECT TEST SIGNAL, SET IDENTIFICATION, SET GENLOCK TIMING, and SET SYNC TIMING. The primary function of the twelve remaining switches is to select test signals; however, they also double as controls for timing and identification (ID).

The four leftmost test signal switches double as ID selection controls in SET IDENTIFICATION mode. The four middle test signal switches double as sync and test signal phase advance/delay controls in SET GENLOCK TIMING mode. The right four switches double as sync phase advance/delay controls in SET SYNC TIMING mode. In this manual, all twelve of these two-function switches have two names, one for their primary function and one for the secondary. Fig. 2-2 shows these names for each operating mode. Operation of the front panel in each of the four modes is described in more detail below.

SELECT TEST SIGNAL Mode

In this mode, all twelve switches select test signals (See Table 2-1). The instrument is powered up in the SELECT TEST SIGNAL mode. If the instrument is not in this mode, press the MODE SELECT switch on the right of the front panel until the SELECT TEST SIGNAL LED is lighted and then press the desired test signal switch.

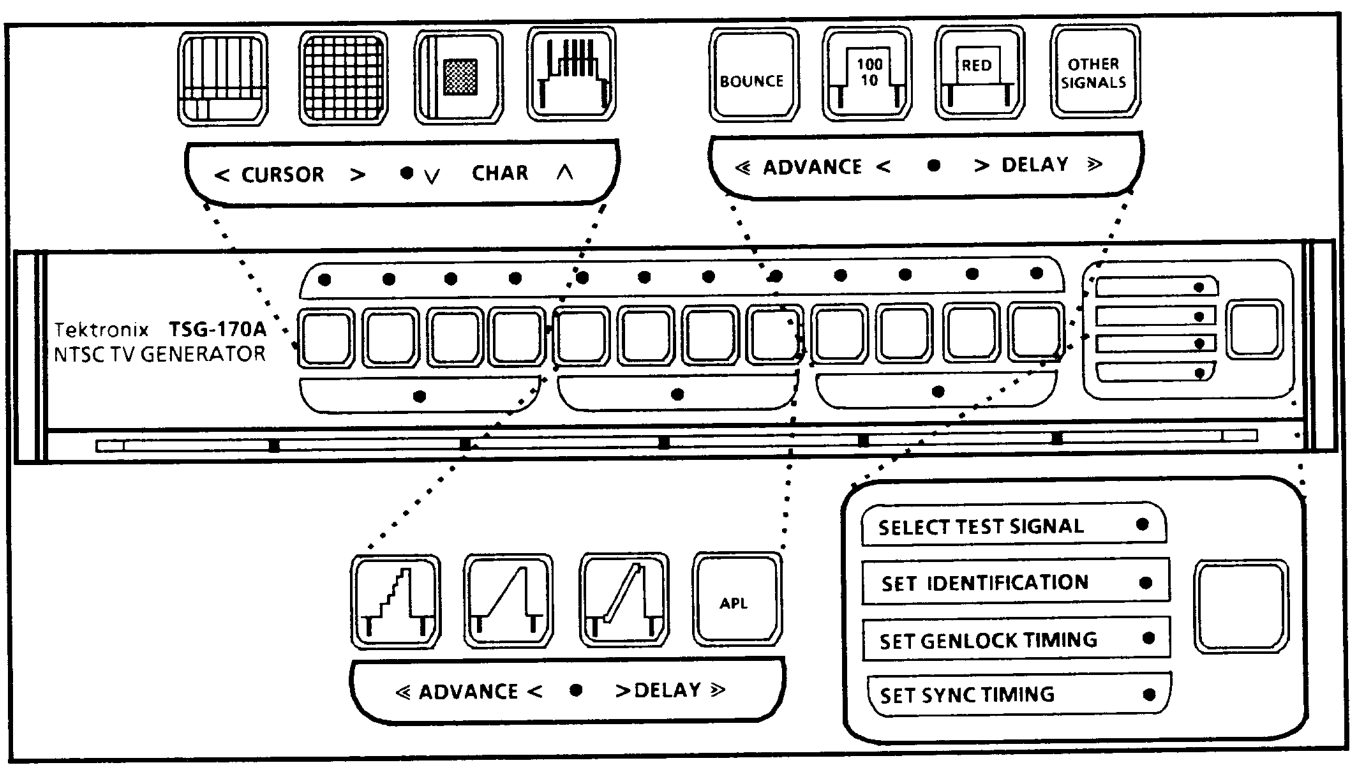
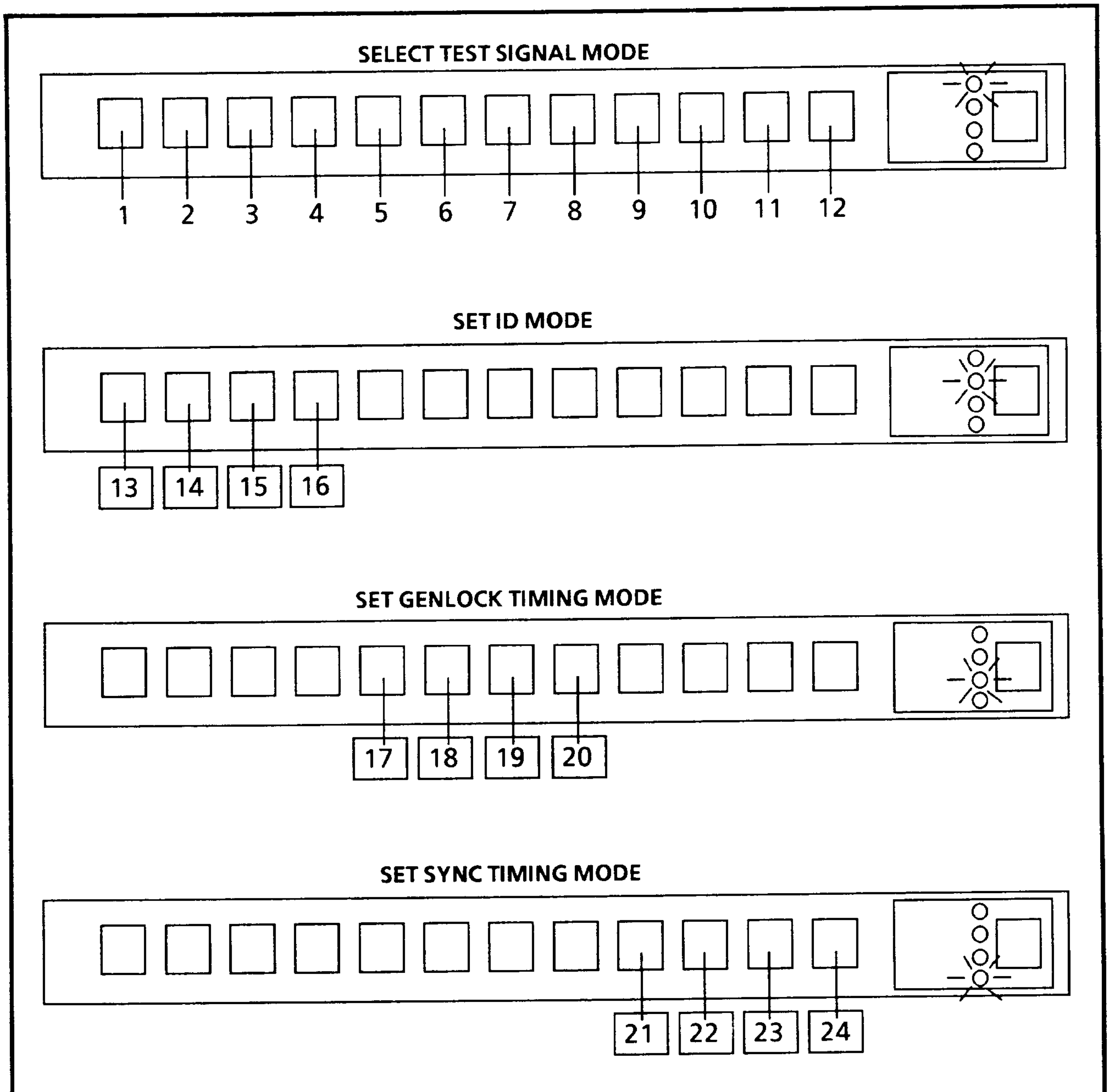


Fig. 2-1. TSG–170A front panel.



1. SMPTE BARS
2. CONVERGENCE
3. PULSE & BAR
4. MULTIBURST
5. 5-STEP
6. LUM RAMP
7. MOD RAMP
8. APL
9. AC BOUNCE
10. 100/10 IRE
11. RED
12. OTHER SIGNALS
13. CURSOR LEFT
14. CURSOR RIGHT
15. CHARACTER DOWN
16. CHARACTER UP
17. COARSE GENLOCK ADVANCE
18. FINE GENLOCK ADVANCE
19. FINE GENLOCK DELAY
20. COARSE GENLOCK DELAY
21. COARSE SYNC ADVANCE
22. FINE SYNC ADVANCE
23. FINE SYNC DELAY
24. COARSE SYNC DELAY

Fig. 2-2. TSG–170A front-panel switch names in the four front-panel modes.

Two of the switches (FLAT FIELDS and OTHER SIGNALS) may need to be pressed more than once to get the desired signal. Press the FLAT FIELDS switch once to select the 100 IRE Flat Field signal, and press it again to select 10 IRE Flat Field. Press the OTHER SIGNALS switch repeatedly to sequence through the following signals: Multibars, NTC7 Composite, Line Sweep, Multipulse, System Test Matrix, and Monitor Setup Matrix. The signal used last in OTHER SIGNALS is the one returned to after a different signal has been selected.

SET GENLOCK TIMING Mode

In SET GENLOCK TIMING mode, the four middle switches shift the timing of the test and sync pulse signals together with respect to the Genlock Input. While the front panel is in this mode, the four middle switches take on the following names (from left to right): COARSE GENLOCK ADVANCE, FINE GENLOCK ADVANCE, FINE GENLOCK DELAY, and COARSE GENLOCK DELAY.

FINE GENLOCK ADVANCE and FINE GENLOCK DELAY provide fine adjustment of genlocked test signal timing over a total range of about 55° in 0.2° steps. COARSE GENLOCK ADVANCE and COARSE GENLOCK DELAY provide coarse adjustment over a total range of $\pm 8\,\mu s$ in 35 ns (45°) steps. Arrows below the switches indicate the direction (advance or delay) and amount of timing offset.

Setting Genlock Timing

To adjust genlock timing, first press the mode select switch until the SET GENLOCK TIMING LED is lighted. Note that the red LED under the middle four switches is lighted to indicate that these switches now control genlock timing instead of selecting test signals.

To advance genlock timing, press the FINE GENLOCK ADVANCE switch for fine increments of advance (steps of 0.2°) or press the COARSE GENLOCK ADVANCE switch for coarse increments (35 ns steps or 45°). To delay genlock timing, press and hold down the FINE GENLOCK DELAY switch for fine increments of delay or press the COARSE GENLOCK DELAY switch for coarse increments of delay.

If none of the switches are pressed within 30 seconds after the SET GENLOCK TIMING mode is selected, the front panel automatically reverts to the SELECT TEST SIGNAL mode.

If the end of the fine advance range is reached and more adjustment is desired, push the COARSE GENLOCK ADVANCE switch to advance the phase by a whole coarse step. If this introduces more advance than desired, press the FINE GENLOCK DELAY switch to reduce the amount of advance.

Note that when the genlock timing switches are held down, they shift genlock timing at a rate of 5 steps per second for the first three seconds and then speed up to 20 steps per second.

Storing Genlock Setting

The genlock timing setting can be permanently stored in non-volatile memory. To store the settings in non-volatile memory, cycle the MODE SELECT switch through to SELECT TEST SIGNAL mode after selecting the settings. A setting is saved automatically upon a 30-second timeout to SELECT TEST SIGNALS mode.

SET SYNC TIMING Mode

In SET SYNC TIMING mode, the four rightmost switches advance or delay the generator's sync pulse outputs relative to the test signal outputs. (Fig. 2-3 shows this timing relationship.) While the front panel is in SET SYNC TIMING mode, these switches take on the following names (from left to right): COARSE SYNC ADVANCE, FINE SYNC ADVANCE, FINE SYNC DELAY, and COARSE SYNC DELAY.

FINE SYNC ADVANCE and FINE SYNC DELAY provide fine adjustment of sync timing over a range of about 55° in 0.2° steps. COARSE SYNC ADVANCE and COARSE SYNC DELAY provide coarse adjustment over a range of $\pm 4\,\mu s$ in 35 ns (45°) steps. Arrows below the switches indicate the direction and amount of timing shift.

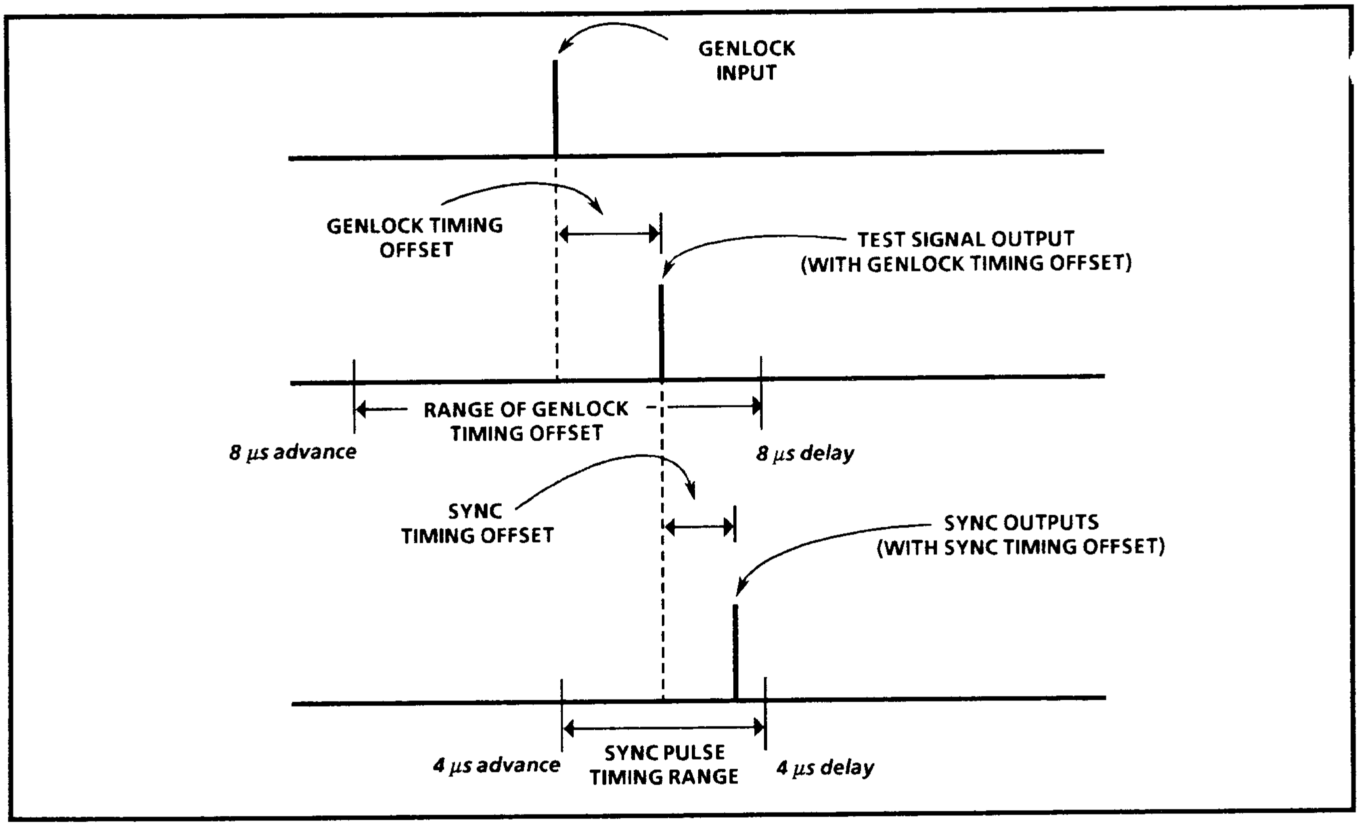


Fig. 2-3. Relative timing of Genlock Input signal, Test signals, and Sync Pulse signals.

Setting Sync Timing

To adjust the timing offset of the sync pulse signals with respect to the test signals, press the MODE SELECT switch until the SET SYNC TIMING LED is lighted. Note that the red LED under the four rightmost switches is lighted to indicate that these switches control sync pulse timing. Press and hold down the FINE SYNC ADVANCE switch to select small increments of advance (0.15 ns or 0.2°), or press the COARSE SYNC ADVANCE switch to select coarse increments (35 ns or 45°). Press the FINE SYNC DELAY and COARSE SYNC DELAY switches to add fine and coarse amounts of delay, respectively.

If none of the switches are pressed within 30 seconds after the SET GENLOCK TIMING mode is selected, the front panel automatically reverts to the SELECT TEST SIGNAL mode.

If the end of the fine advance range is reached and more adjustment is desired, push the COARSE SYNC ADVANCE switch to advance the phase by a whole coarse step. If this introduces more advance than desired, press the FINE SYNC DELAY switch to reduce the amount of advance.

When these advance/delay switches are held down, they shift sync timing at a rate of 5 steps per second for the first three seconds and then speed up to 20 steps per second.

Storing Sync Setting

Follow the instructions for storing genlock timing settings.

SET IDENTIFICATION Mode (Option 1)

In the SET IDENTIFICATION mode, the four left-most switches write up to 12 characters of text for display on the upper two-thirds of the color bars generated by the Option 1 board (A5). While the front panel is in this mode, these switches take on the following names (from left to right): CURSOR LEFT, CURSOR RIGHT, CHARACTER DOWN, and CHARACTER UP.

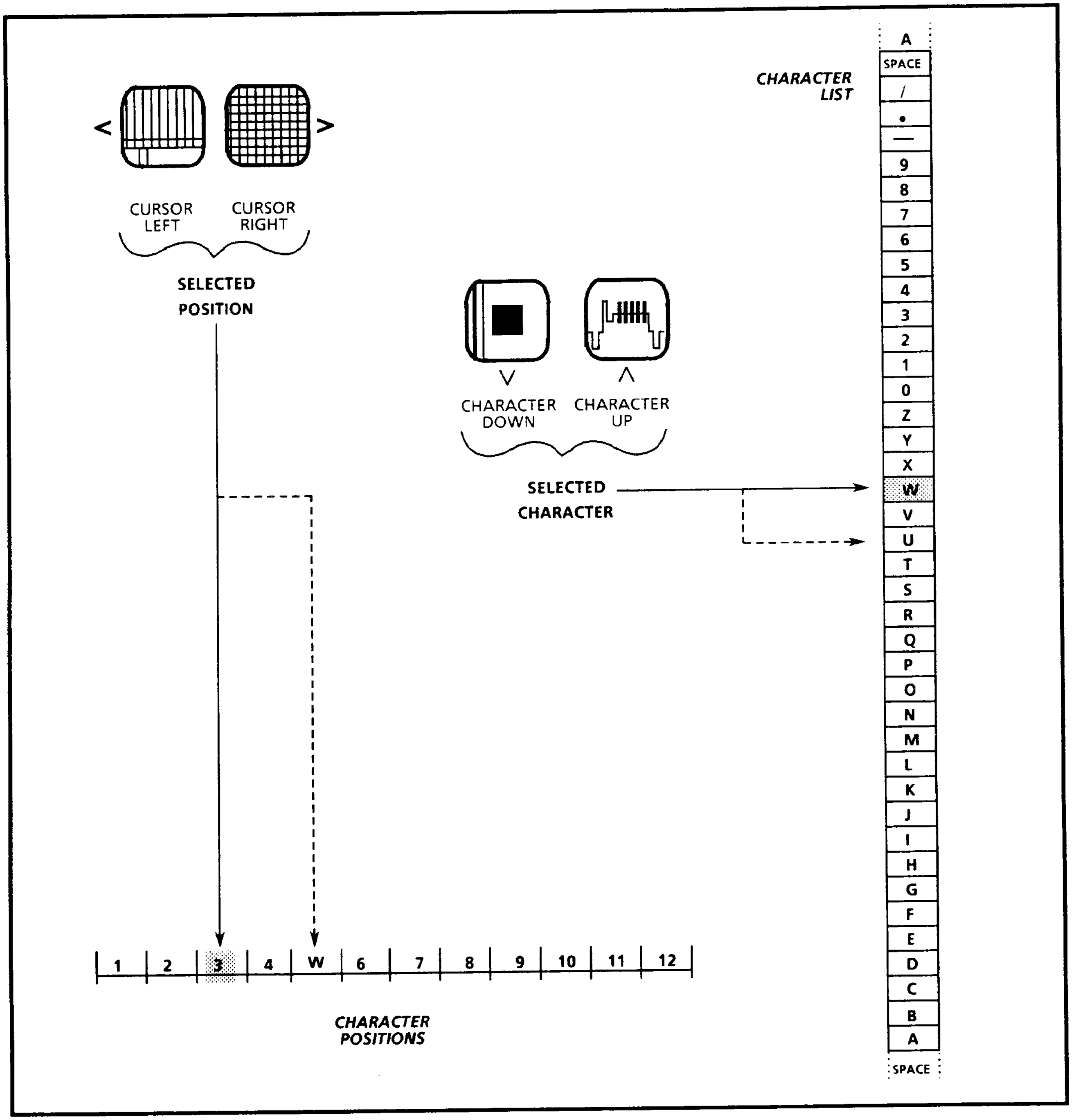


Fig. 2-4. Selecting Option 1 characters from the front panel.

As Fig. 2-4 shows, the cursor can be moved horizontally (with the a CURSOR LEFT and CURSOR RIGHT switches) into twelve positions or vertically (with the CHARACTER UP and CHARACTER DOWN switches) to select one of the characters in the character list. The CHARACTER UP and CHARACTER DOWN switches select the characters. Characters available are A through Z, 0 through 9, a space, and three punctuation marks: slash, hyphen, and period.

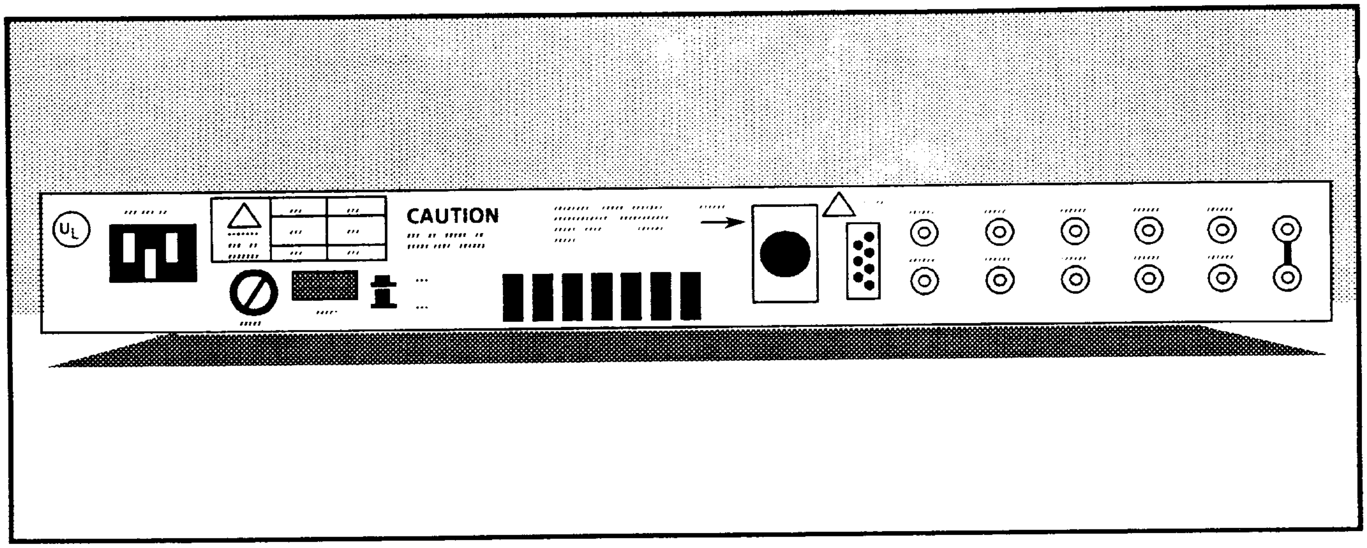


Fig. 2-5. TSG–170A rear panel.

Selecting the ID

To select an ID character, press the MODE SELECT switch until the SET IDENTIFICATION LED is lighted. Note that the LED below the four leftmost switches is lighted to indicate these switches control ID selection. Looking at the 12 character positions on a video monitor, note that a gray square is superimposed over one of the characters to indicate the cursor position.

Assume a W is in the fifth character position and the cursor is in the third position (as in Fig. 2-4). To change the W to a U, press the CURSOR RIGHT switch until the gray square is on the W. Then press the CHARACTER DOWN switch repeatedly until the U is displayed. To reselect the W, press the CHARACTER UP switch until the W is displayed. When these switches are held down, they automatically scroll left/right or up/down.

To move the cursor from position 5 to 12, press the CURSOR RIGHT switch until the cursor is in the desired position. Alternatively press the CURSOR LEFT switch until the cursor loops around to position 12.

Storing the Selection

Follow the instructions for storing the genlock timing settings.

Switching Off the Characters

To switch off the Character Generator and the black background window, delete all the characters by selecting a blank in all 12 character positions.

REAR-PANEL CONNECTORS

The rear panel has twelve BNC video connectors, one 9-pin remote control connector, one audio XLR connector, and one power socket. Fig. 2-5 shows the rear panel.

REAR-PANEL CONTROLS

POWER ON/OFF push-push switch.

REMOTE OPERATION

The TSG–170A can be remotely controlled through the 9-pin Remote Control connector located on the rear panel. By TTL-compatible ground closure, these pins control six different functions (described below). Typically, the pins would be grounded through user-supplied switches, using pin 9 as ground. The instrument can be locked into a fixed operating mode by wiring directly at the remote connector. To do this, attach a male 9-pin DIN plug to the remote connector and solder the appropriate pins to ground. Fig. 2-6 shows the connector pinout.

Explanation of Pins

Pin 1 (Used with Option 1 only)

Selects Tape Leader countdown out of the Option 1 rear-panel connector. (To generate a tape leader, record Bars, ID, and Audio Tone. Then ground pin 1* to select Tape Leader Countdown.) Tape Leader goes through the following sequence:

1. Switches off Audio Tone.
2. Selects a character ID countdown from 10 to 2 against a black background.
3. Selects black background until pin 1 is ungrounded.

*While pin 1 is grounded, the front panel cannot exit the Select Test Signal mode.

Pin 2

Selects Internal Sync Generator Reference mode when grounded. Otherwise, automatically switches to Genlock mode when a Genlock Input signal is present.

Pin 3

Increments through the front-panel selectable test signals when grounded. Starts at the signal currently selected and sequences from left to right across the front panel. Note: Pin 3 should be used only with a momentary contact switch.

Pins 4, 5, & 6

Three binary-coded control lines that select one of eight sets of genlock and sync timing presets. A timing preset can be programmed to select a different genlock and sync timing setting. To do this, ground the appropriate pins, set both the genlock and sync timing at the front panel, then cycle the front-panel MODE SELECT switch back to SELECT TEST SIGNAL mode.

Pins 7 & 8 (Option 1)

Two binary-coded control lines that select four different character ID presets. An ID preset can be programmed to select a different ID. To do this, ground the appropriate pins, select the ID at the front panel, then cycle the front-panel MODE SELECT switch back to SELECT TEST SIGNAL mode.

Pin 9

Ground.

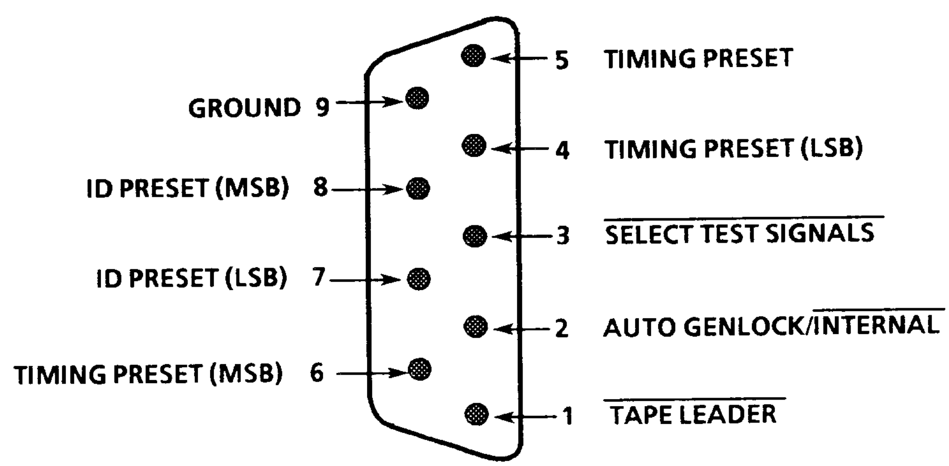


Fig. 2-6. Remote Connector (female) pinout.

Table 2-1
Signals Selectable in Select Test Signal Mode

SIGNAL	DESCRIPTION
SMPTE BARS	Selects a split field signal, comprising EIA Color Bars for the first 2/3rds of the field, Reverse Blue Bars for the next 1/12th of the field, and a -IWQB signal with Pluge for the remaining 1/4th. The signal is used for checking gain, setup, hue, and saturation.
CONVER-GENCE	Selects a signal that produces a cross-hatch display of horizontal and vertical lines on a picture monitor. Midway between each vertical line, the horizontal lines are broken and restarted to provide dots. This signal is used for checking and adjusting color convergence on picture monitors.
PULSE & BAR	Selects a signal consisting of a modulated 100 IRE 12.5T pulse, a 100 IRE 2T pulse, and a luminance bar with an inverted 100 IRE 2T pulse. The bar is gated to provide a window signal. The bar is used for measuring short-time, line-time, and field-time luminance distortion. The modulated pulse is used to measure chrominance-luminance gain and delay.
MULTI-BURST	Selects a signal consisting of a 70 IRE white flag and a 10 IRE black flag followed by six 60 IRE peak-to-peak packets of sine-wave bursts on a 40 IRE pedestal. The frequencies of the packets are: 500 kHz, 1 MHz, 2 MHz, 3 MHz, 3.58 MHz, and 4.2 MHz. The Multiburst signal is used to check the approximate frequency response of the television system.
5-STEP STAIRCASE	Selects a Staircase signal, consisting of five equal steps of luminance information from 0 to 100 IRE. This signal allows measurement of luminance nonlinearities.
LUM RAMP	Selects a Linear Ramp from 0 to 100 IRE, centered within the active line time. This signal is used for measuring luminance nonlinearity, especially in systems with ADCs and DACs.
MOD RAMP	Selects a Linear Ramp from 0 to 100 IRE, modulated with a 40 IRE subcarrier at 180° (same phase as burst). The Modulated Ramp is used for measurement of differential gain and phase.
APL	Selects one of three signals each time it is pressed: First is a 90% APL signal, comprised of a repeated sequence of a 100 IRE flat field inserted on four lines followed by the previously selected signal on the fifth line. Second is a 10% APL signal, comprised of a repeated sequence of a 0 IRE flat field on four lines followed by the previously selected signal on the fifth line. Third is a 50% APL signal, comprised of the previously selected signal on five out of five lines. The APL signals are used to measure APL-dependent distortion.
AC BOUNCE	Selects a signal comprised of a repeated sequence of four lines of flat field followed by one line of the previously selected signal. The amplitude of the flat field alternates between 100 and 0 IRE every second. The AC Bounce signal is used to check ac-coupled circuitry and APL-dependent distortion.
100/10 IRE	Selects one of two flat field signals (100 IRE or 10 IRE). The flat fields are used for color monitor alignment.
RED FIELD	Selects a 21.5 IRE flat field luminance signal modulated with a subcarrier of 103.4° phase and 100 IRE p-p amplitude. It is used to observe moire, color purity, and noise.

Table 2-1
Test Signals (cont)

SIGNAL	DESCRIPTION
OTHER SIGNALS	Selects one of six signals each time it is pressed, in the following order: 1. **Multibars** — This signal is comprised of Color Bars in the first half of the line, followed by Multiburst during the second. Color Bars are used for checking luminance, hue, and saturation. Multiburst is used for an approximate measurement of frequency response. The combined signal is part of the System Test Matrix. 2. **NTC7 Composite** — This signal consists of a 100 IRE bar; a 2T sine-squared pulse; a 12.5T modulated sine-squared pulse; and an 90 IRE, 5-step staircase modulated with ±20 IRE subcarrier. The bar is used to measure line-time tilt. The 2T sine-squared pulse is used to measure high frequency response and group delay. The modulated 12.5T pulse is used to measure chrominance-to-luminance gain and delay. The staircase is used for measuring nonlinear distortion such as differential gain and phase. 3. **Line Sweep** — A 100 IRE p-p sine wave that begins each line at 500 kHz and increases in frequency to 5 MHz at the end of the line. Four markers show position of 1, 2, 3, and 4 MHz frequencies. Line Sweep provides more detailed measurement of frequency than multiburst. 4. **Multipulse** — This signal is comprised of a 100 IRE White Flag, a 100 IRE 2T sine-squared pulse, followed by five 100 IRE modulated pulses at frequencies of 1.0, 2.0, 3.0, 3.58, and 4.2 MHz. Multipulse is used for measurement of gain/frequency and group delay distortions. 5. **System Test Matrix** — A combination of Multibars in the upper half of the field, followed by the NTC7 Composite in the lower. Simple enough even for waveform monitors without line select, this matrix signal is used for multiple testing of the studio with one signal. 6. **Monitor Setup Matrix** — A combination of four signals, displayed from the top to the bottom of the field in the following order: Convergence, -IWQB, Convergence, EIA Color Bars, Reverse Blue, and Convergence. Monitor Setup Matrix has a complete set of signals for setting up a color monitor.
DAC TEST	A split field (500 kHz and 3.58 MHz) 100 IRE p-p, noncomposite signal. Used for calibrating the analog output stage in the TSG–170A. (See Performance Checks.)

Table 2-2
Table of rear-panel connector outputs

CONNECTOR	STANDARD SIGNAL	OPTIONAL SIGNAL*
GENLOCK LOOP-THROUGH	Genlock Input.	—
TEST SIGNAL	Test Signal Output.	—
BARS (OPT. 1)	SMPTE Color Bars.	—
BLACK	Black Burst.	—
FRAME/BLACK	Field 1, Line 11 Reference Pulse or Color Frame Square Wave. Selectable with jumper. The output level of the frame output is selectable to either –4 V level or optional TTL level.	Black Burst
BLANKING	Composite Blanking. Jumper selections allow V-Blanking width (19 lines or 20 lines) and H-Blanking width (10.9 μs, 10.7 μs, or 10.5 μs).	—
V DRIVE/BLANK	V Drive	Blanking
SYNC	Composite Sync.	—
H DRIVE/SYNC	H Drive	Composite Sync
SUBCARRIER	3.58 MHz Color Subcarrier.	—
BURST FLAG/SUBC	Burst Flag	Color Subcarrier
REMOTE	Remote Control Input.	—
AUDIO TONE (OPT. 1)	449.55 Hz.	Jumper-selectable ID click. Click rate variable between 0.2 and 4 Hz.

***See operating mode jumper table for access to optional signals.**

Specifications

SECTION 3
TABLE OF SPECIFICATIONS

The performance requirements listed here apply over an ambient temperature range of 0°C to +50°C after a warmup time of 20 minutes. The rated accuracies are valid when this instrument is calibrated at +20°C to +30°C.

Test equipment used in verifying performance requirements must be calibrated and working within the limits specified under Table 5-1 of this manual.

Table 3-1
Test Signal Generator — General Test Signal Characteristics

Characteristics	Performance Requirement	Supplemental Information
Luminance Amplitude Accuracy	±1%.	Measured at 100 IRE.
Chrominance-to-Luminance Gain	±1%.	Measured at 500 kHz and 3.58 MHz.
Chrominance-to-Luminance Delay	≤10 ns.	
Blanking Level	0 Vdc ±50 mV.	
Luminance Rise Time	250 ns ±25 ns.	Except where specified otherwise.
Chrominance Rise Time	400 ns ±40 ns.	
Burst Amplitude	285.7 mV (40 IRE) ±2%.	
Burst Rise Time	400 ns ±40 ns.	
Sync Amplitude	285.7 mV ±1%.	
Sync Rise Time	140 ns ±20 ns.	
Line Timing	See Figs. 3-1 through 3-16.	
Front Porch Duration	1.5 μs ±0.1 μs.	
Line Blanking Interval	10.9 μs ±0.2 μs.	Beginning at 20 IRE point of active video.
Breezeway Duration	600 ns ±50 ns.	
Line Sync Duration	4.7 μs ±50 ns.	50% amplitude point.
Vertical Serration Duration	4.7 μs ±50 ns.	50% amplitude point.
Equalizing Pulse Duration	2.35 μs ±50 ns.	50% amplitude point.
Burst		
Delay from Sync	5.308 μs ±35 ns.	19 cycles of subcarrier.
Burst Duration	2.51 μs ±0.1 μs.	9 cycles of subcarrier.
Output Impedance	75Ω.	
Return Loss	≥36 dB to 4.2 MHz.	
Crosstalk	≥60 dB down.	
Residual Subcarrier	≥60 dB down.	
Glitches	≤2 mV.	Includes crosstalk from pulse outputs to test signals.

Table 3-2
Test Signal Generator —Test Signals

Characteristics	Performance Requirement	Supplemental Information
COLOR BARS	SMPTE Bars	10.6 μs blanking.
CONVERGENCE		
Amplitude	549.1 mV (76.9 IRE).	
Pattern		Crosshatch — 14 horizontal lines and 17 vertical lines per field.
Pulse HAD	225 ns ±25 ns.	
PULSE & BAR WITH WINDOW		
2T Pulse HAD	250 ns ±25 ns.	
White Bar Amplitude	100 IRE.	
Field Tilt	≤0.5%.	
Line Tilt	≤0.5%.	
Field Timing	Lines 72 to 202.	
Pulse-to-Bar Ratio	1:1 ±1%.	
Ringing	≤1% peak.	
MULTIBURST		
White Reference Bar Amplitude	500 mV (70 IRE).	
Packet Amplitudes	428.6 mV (60 IRE) p-p.	
Pedestal	285.7 mV (40 IRE).	
Burst Frequencies	500 kHz, 1.0 MHz, 2.0 MHz, 3.0 MHz 3.58 MHz, 4.2 MHz.	
Packet Rise Time		
500 kHz		140 ns typical (sine-squared shaped packets).
Other Packets		400 ns typical (sine-squared shaped packets).
5-STEP STAIRCASE		
Amplitude	714.3 mV (100 IRE).	
Linearity Error	≤1%.	Relative step matching.
LUMINANCE RAMP		
Luminance Amplitude	0 to 714.3 mV (100 IRE).	
Linearity Error	≤1%.	

Table 3-2 (cont.)
Test Signal Generator —Test Signals (cont.)

Characteristics	Performance Requirement	Supplemental Information
MODULATED RAMP Luminance Amplitude and Linearity Chrominance Amplitude Diff Gain Diff Phase	 Same as LUMINANCE RAMP. 285.7 mV (40 IRE). 0.6% maximum. 0.3° maximum.	
APL	1 line full-field signal and 4 lines 0 or 100 IRE flat field.	
AC BOUNCE Bounce Rate	 1 second high, 1 second low.	
FLAT FIELDS Amplitudes	 71.4 mV (10 IRE). 714.3 mV (100 IRE ±1%).	
RED FIELD Luminance Pedestal Chrominance Amplitude	 153.6 mV (21.5 IRE). 714.3 mV (100 IRE).	
MULTIBARS	Color bars and multiburst.	10.6 μs blanking width.
NTC 7 COMPOSITE	100 IRE bar; 2T and 12.5T mod pulse; 90 IRE 5-step staircase, modulated with 40 IRE subcarrier.	
LINE SWEEP	714.3 mV p-p. Linear sweep from 500 kHz to 5 MHz.	Markers at 1, 2, 3, and 4 MHz.
MULTIPULSE Amplitude Frequencies	 714.3 mV. 1.0 MHz, 2.0 MHz, 3.0 MHz, 3.58 MHz, 4.2 MHz.	
SYSTEM TEST MATRIX	Multibars and Composite.	
MONITOR SETUP MATRIX	Convergence, Color Bars, Reverse Bars, Convergence, IWQB, and Convergence.	
DAC TEST 1	Split field: 500 kHz (100 IRE p-p) followed by 3.58 MHz (140 IRE) p-p.	Non-composite signal.

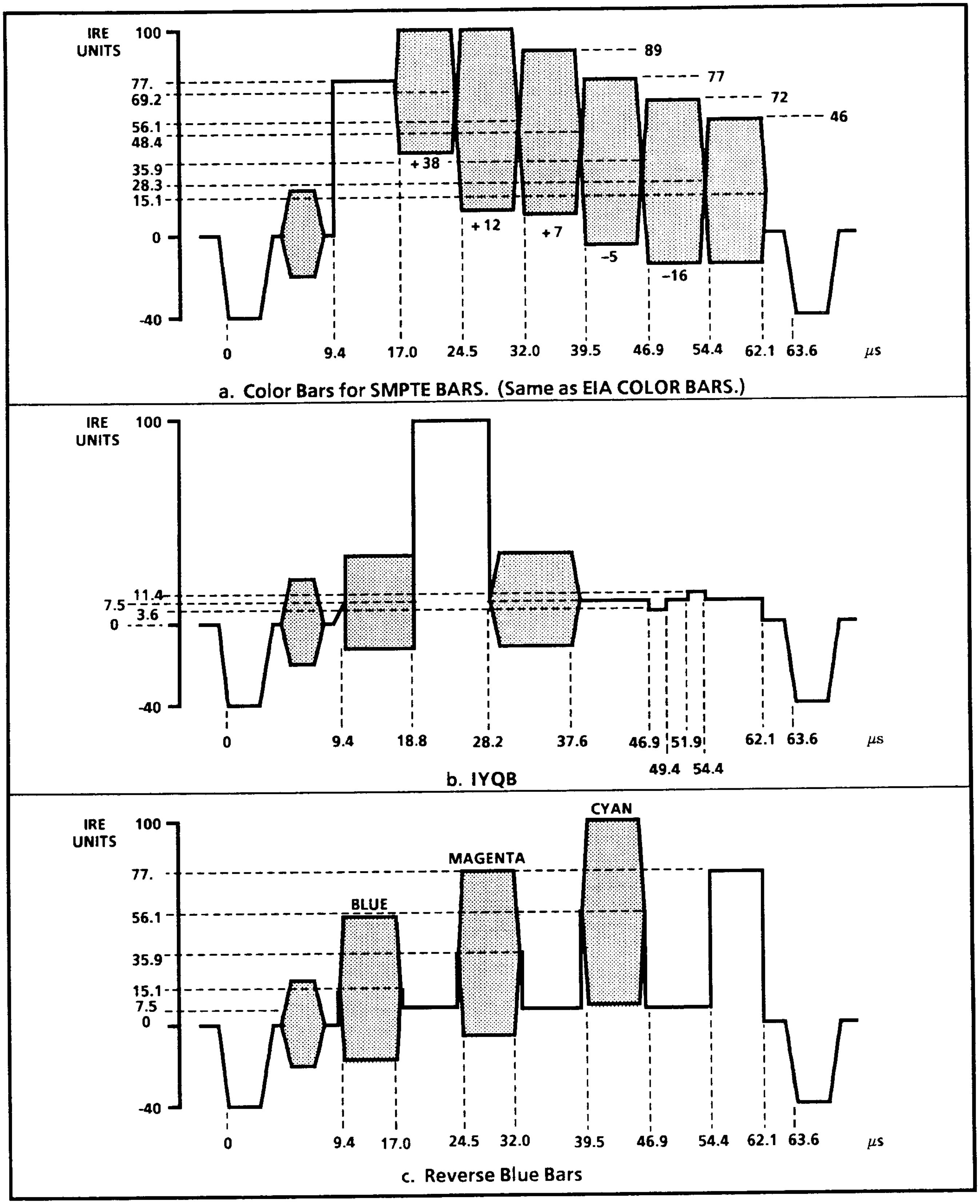


Fig. 3-1. Color Bar signal components.

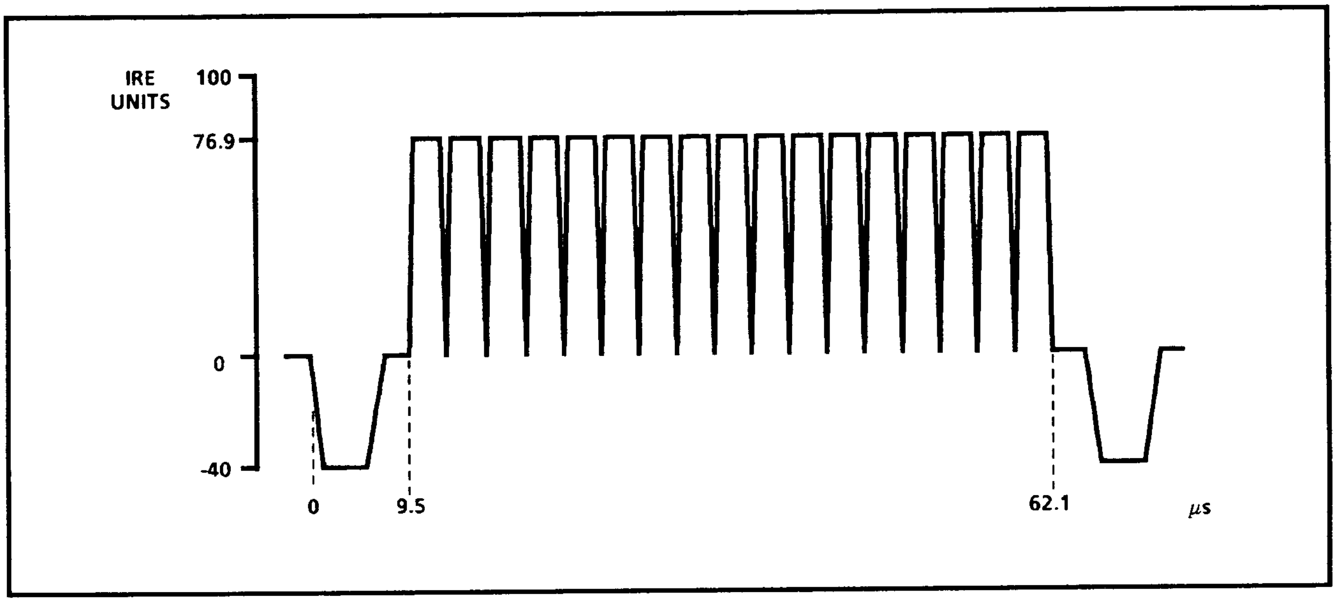


Fig. 3-2a. Horizontal component of Convergence test signal.

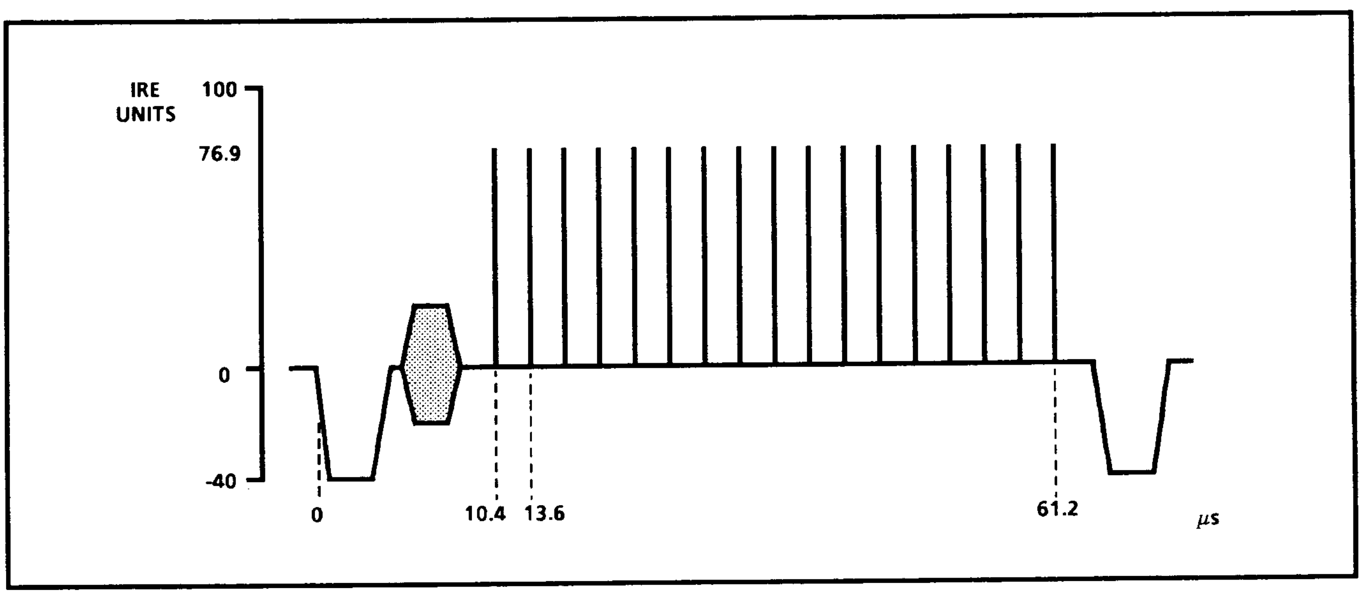


Fig. 3-2b. Vertical component of Convergence test signal.

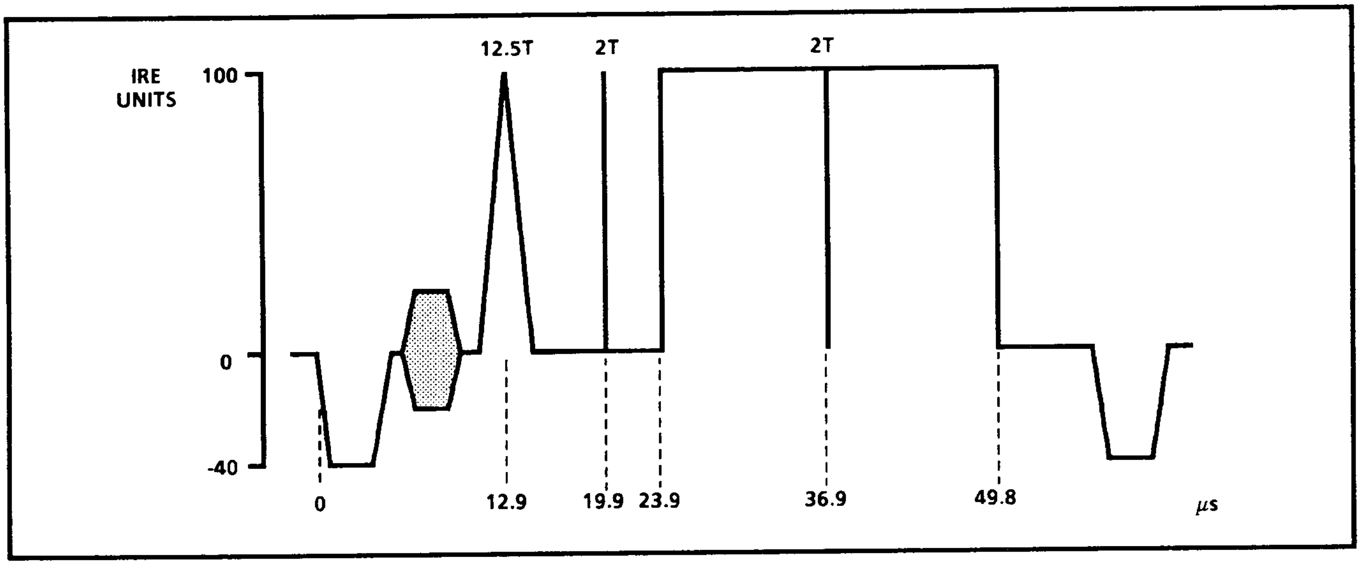


Fig. 3-3. Mod Pulse and Bar.

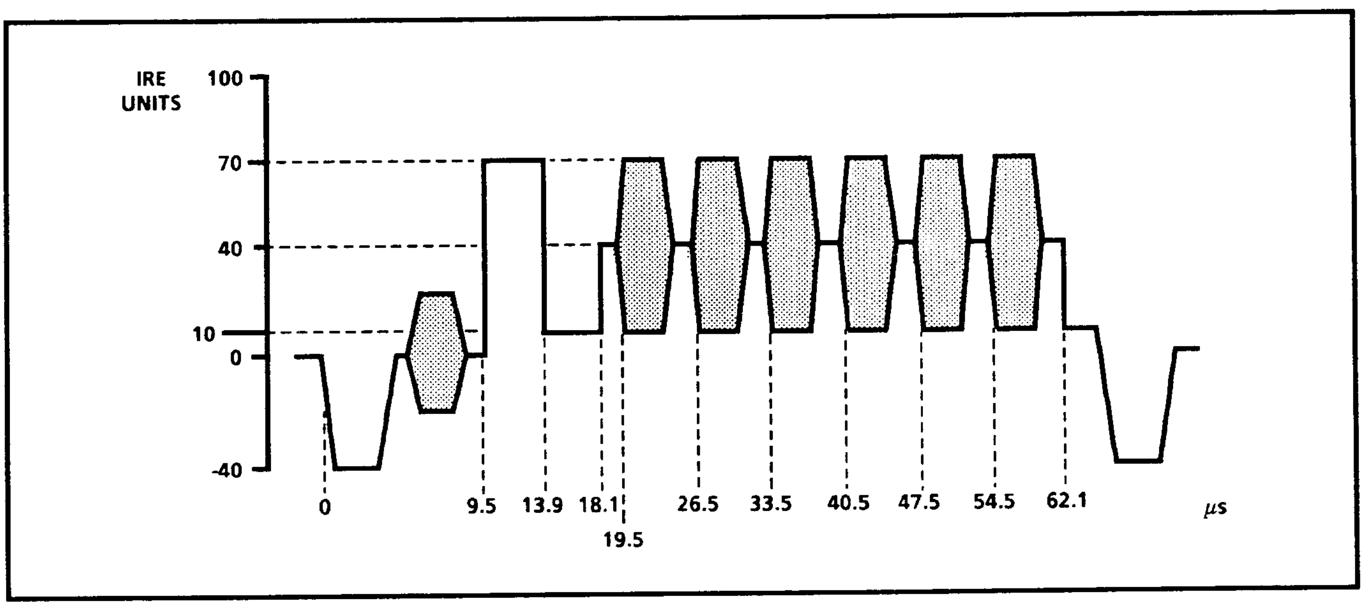


Fig. 3-4. Multiburst.

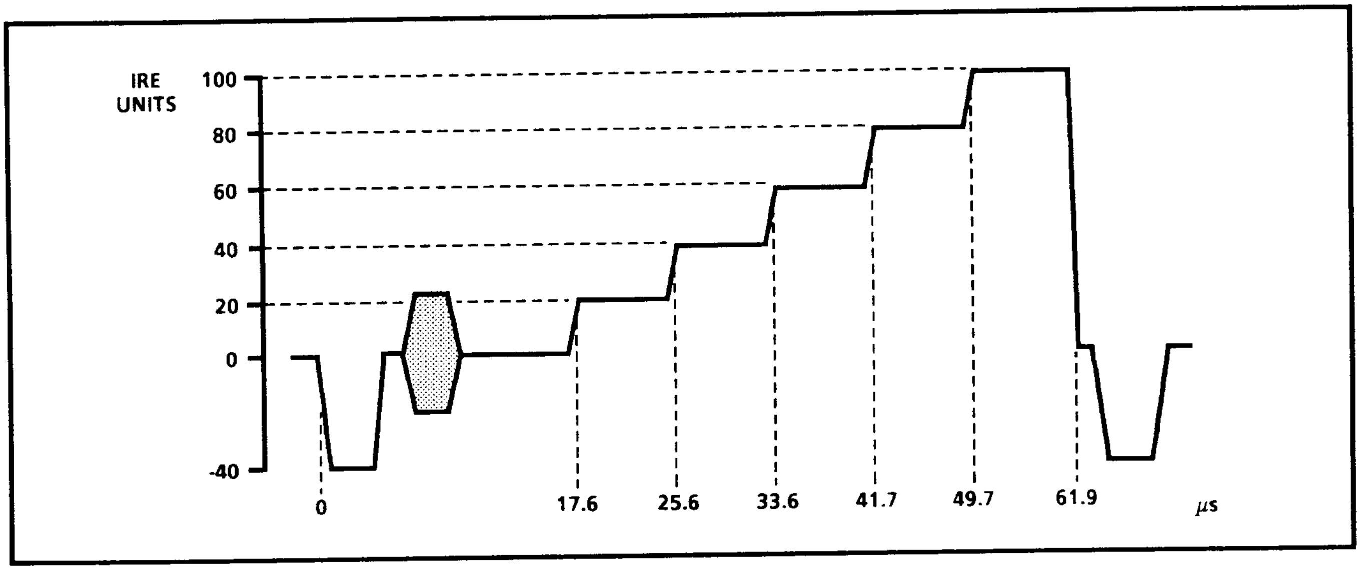


Fig. 3-5. 5-Step Staircase.

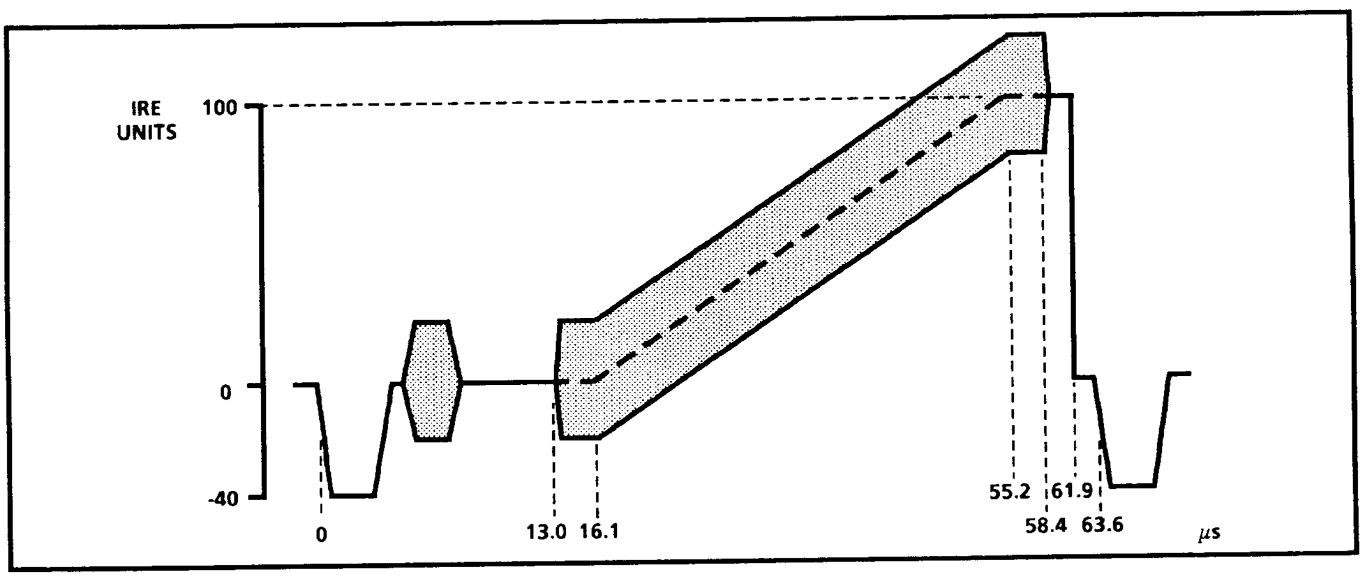


Fig. 3-6. Mod/Luminance Ramp.

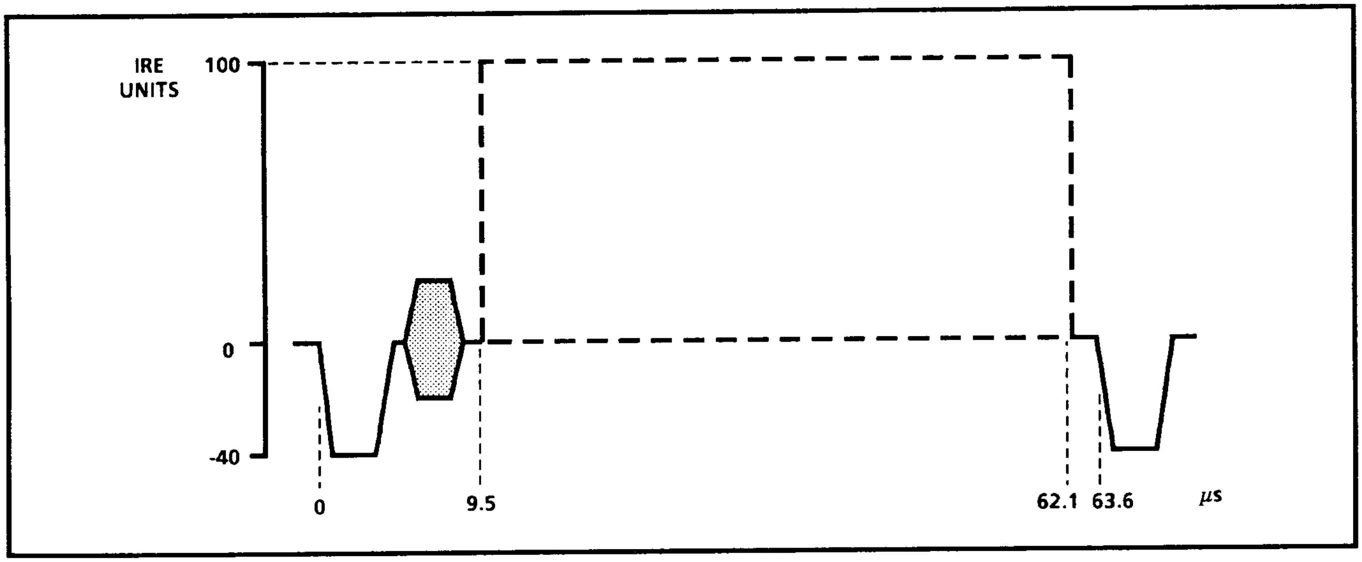


Fig. 3-7. APL and Bounce.

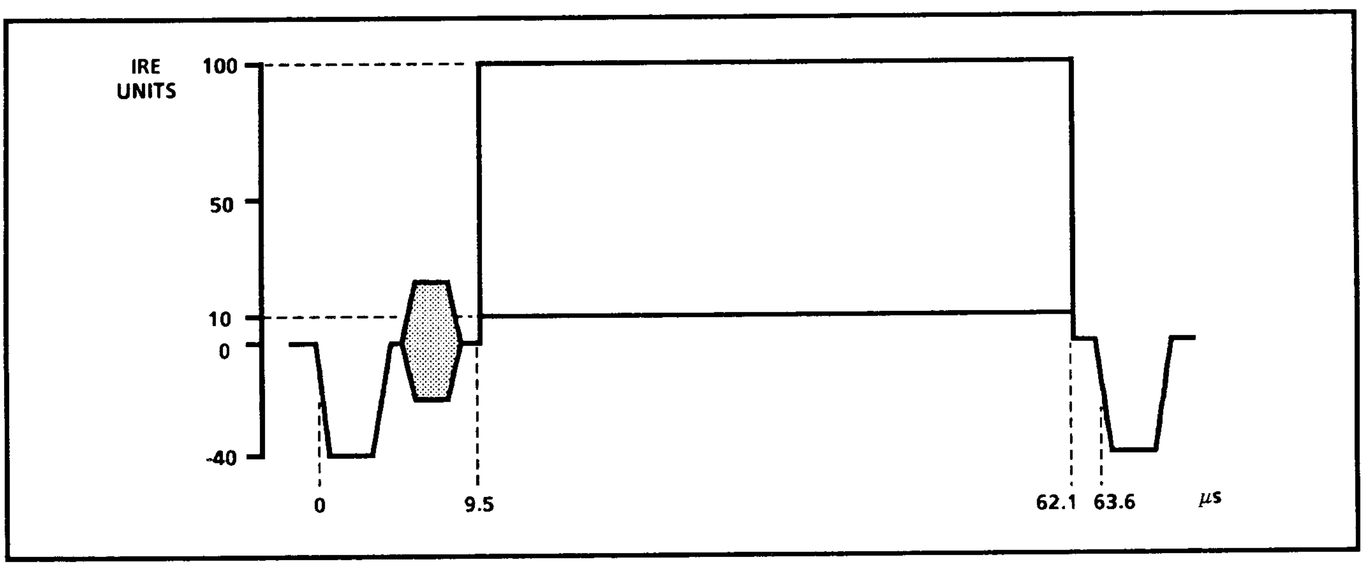


Fig. 3-8. 100/10 IRE Flat Fields.

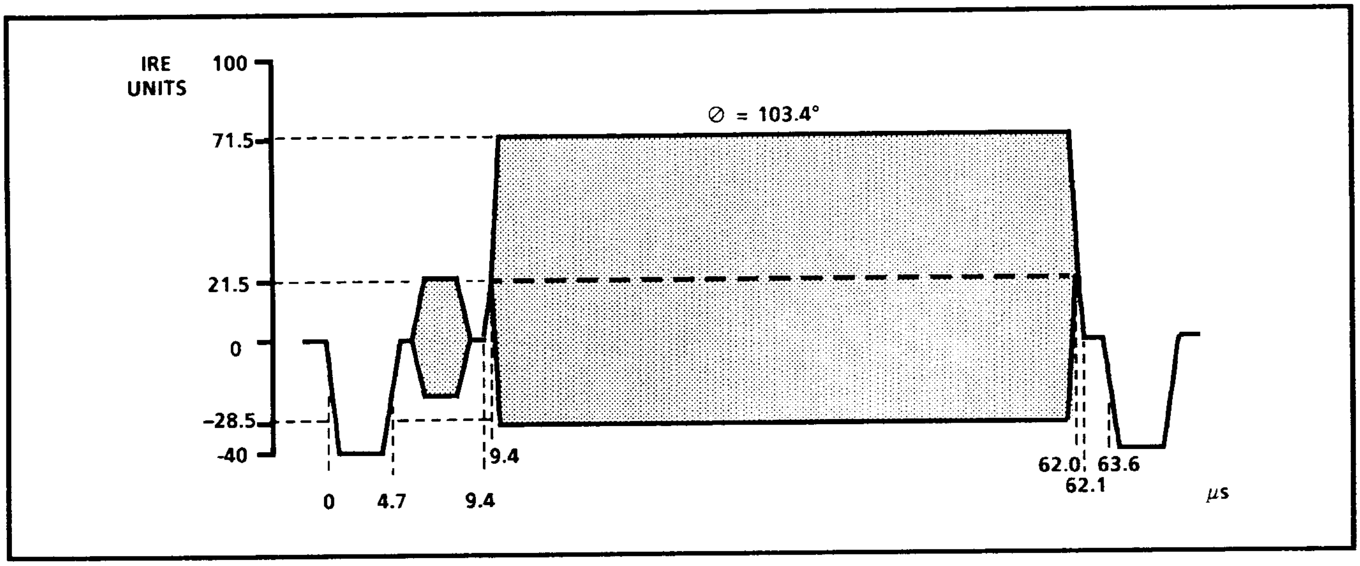


Fig. 3-9. Red Field.

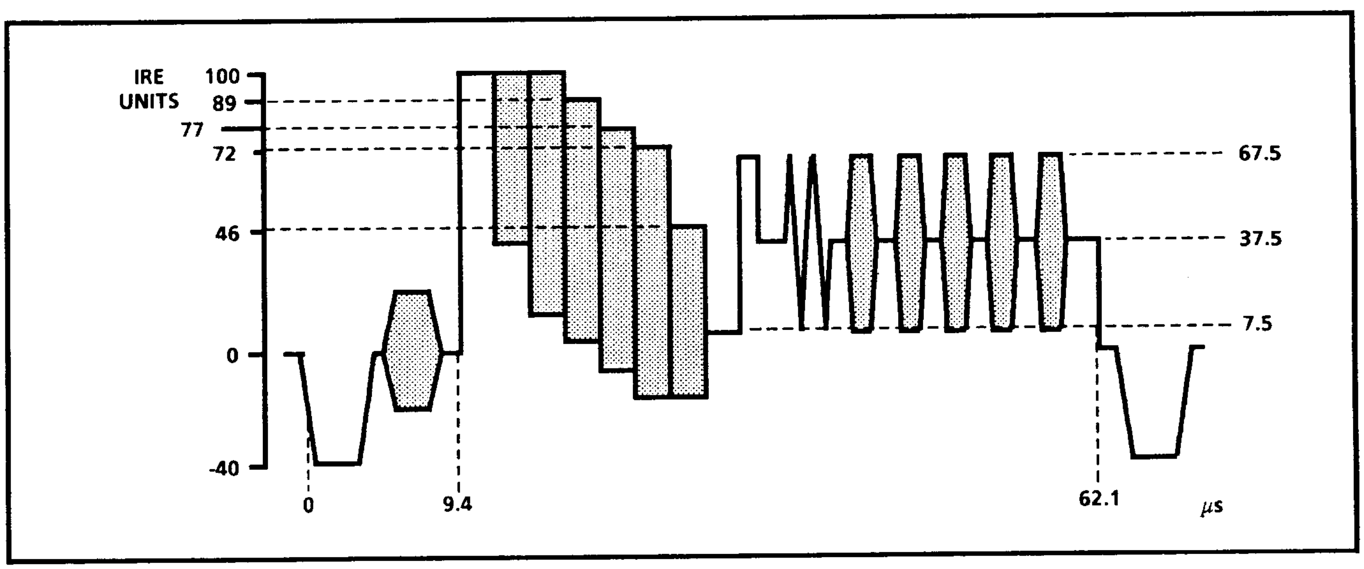


Fig. 3-10. Multibars.

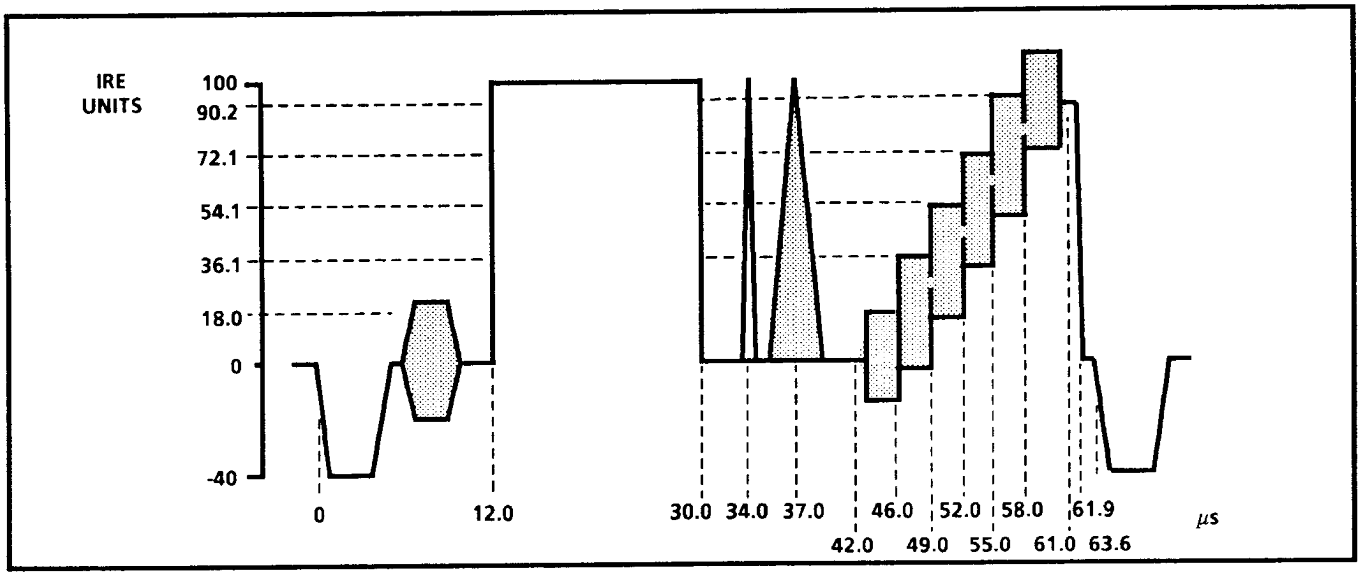


Fig. 3-11. NTC7 Composite.

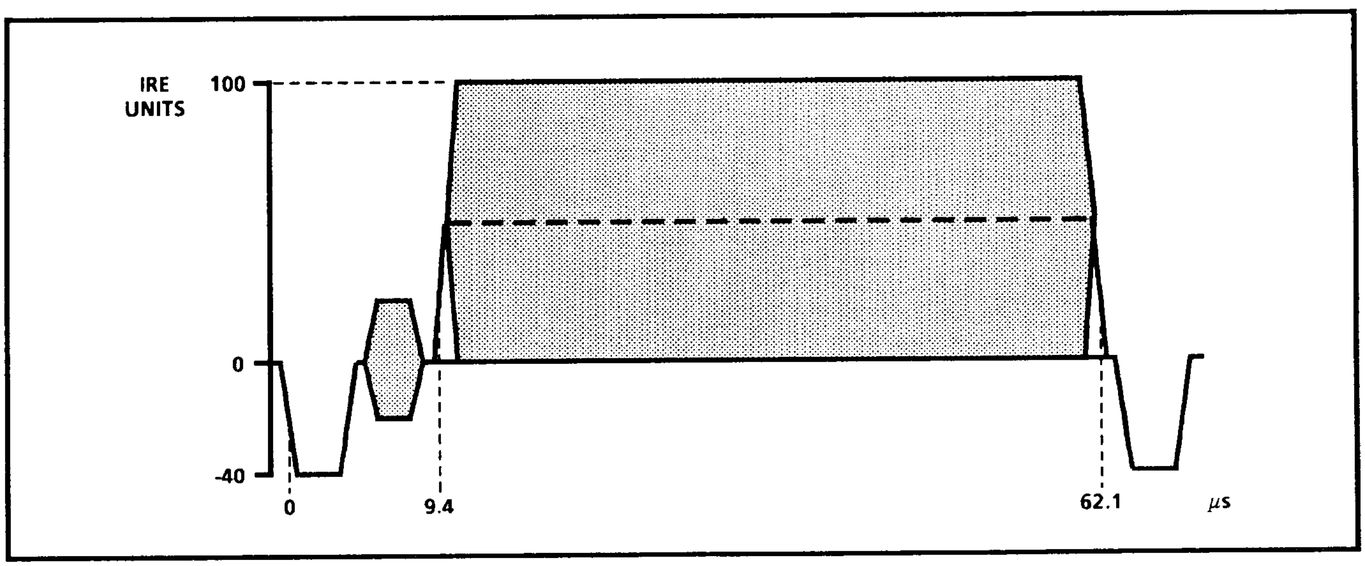


Fig. 3-12. Line Sweep with Markers.

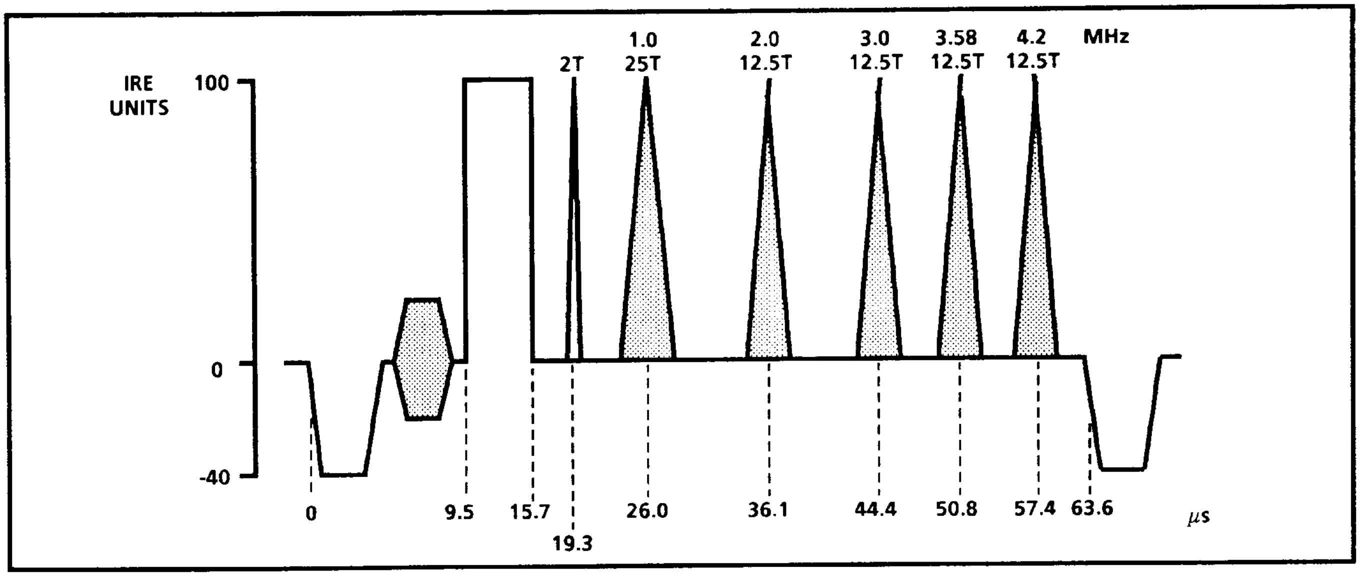


Fig. 3-13. Multipulse.

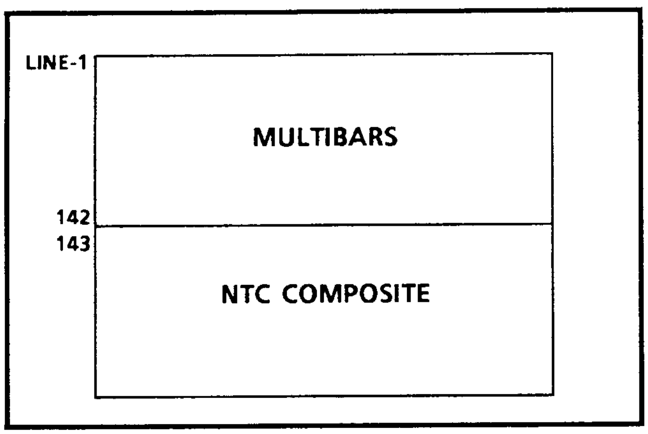


Fig. 3-14. System test matrix.

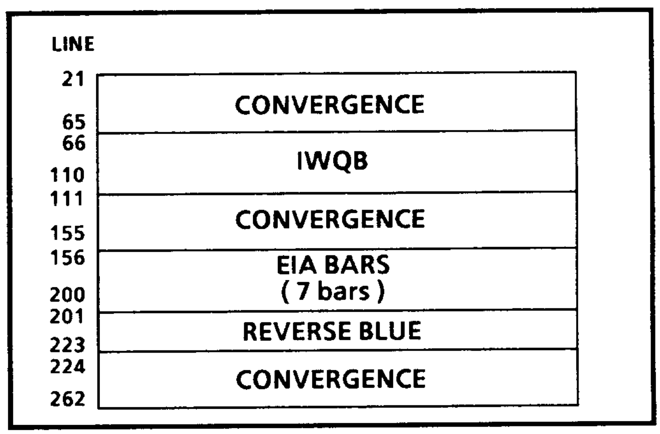


Fig. 3-15. Monitor setup matrix.

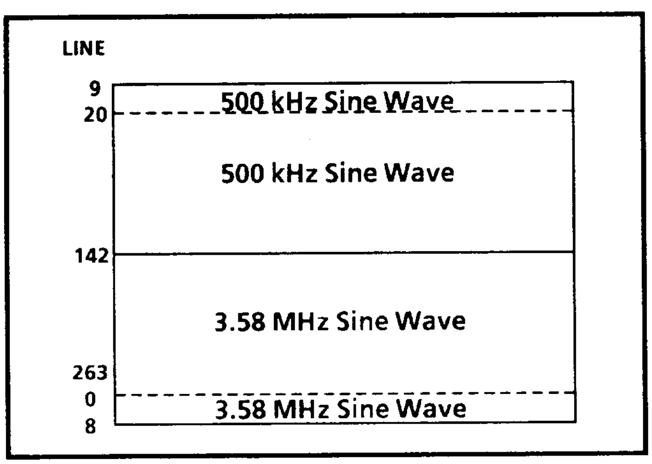


Fig. 3-16. DAC test signal.

Table 3-3
Test Signal Generator — Black Burst Output

Characteristics	Performance Requirement	Supplemental Information
Black Amplitude	7.5 IRE ±1 IRE.	
Blanking Width	10.2 μs ±0.2 μs.	
Sync Timing	See Fig. 3-17.	

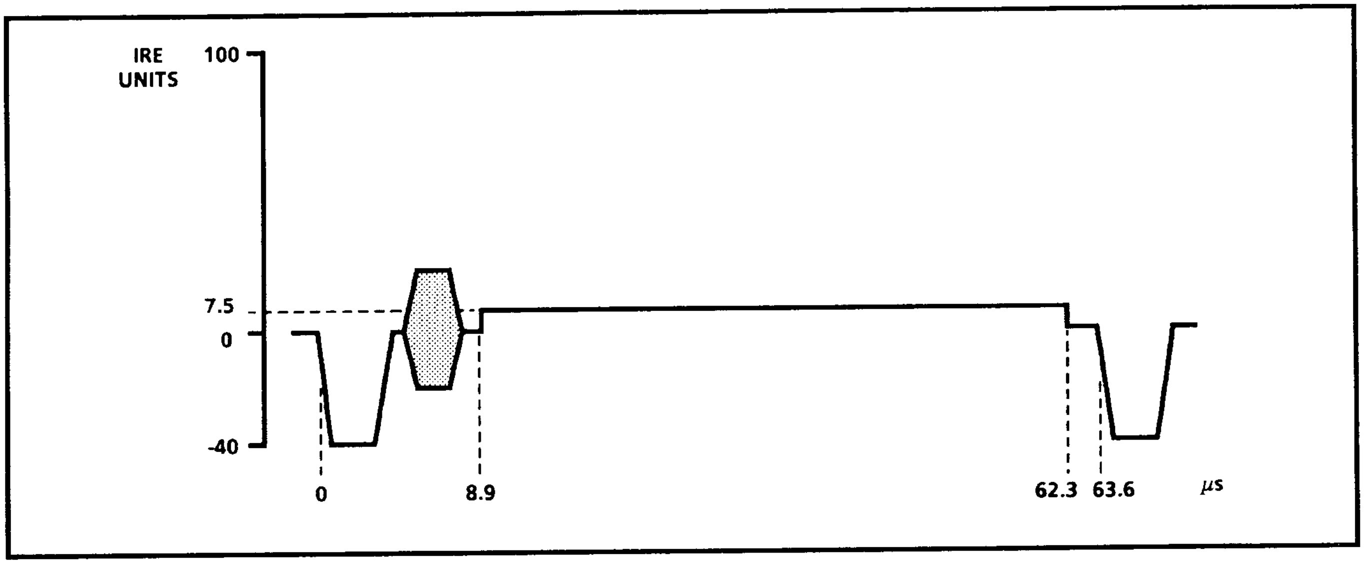


Fig. 3-17. Black Burst.

Table 3-4
Sync Generator — General Pulse Output Characteristics

Characteristics	Performance Requirement	Supplemental Information
Amplitude	-4.0 ±0.2 V.	
Impedance	75Ω.	
Return Loss	≥30 dB to 4.2 MHz.	
Rise Time	140 ns ±20 ns.	

Table 3-5
Sync Generator — Pulse Output Signals

Characteristics	Performance Requirement	Supplemental Information
COMPOSITE SYNC		
Horiz. Sync Duration	4.7 μs $\pm$0.1 μs.	
Vertical Serrations	4.7 μs $\pm$0.1 μs.	
Equalizing Pulse Duration	2.35 μs $\pm$0.1 μs.	
BLANKING		
Horizontal Blanking Duration	10.7 μs $\pm$0.1 μs.	Factory set to 10.7; Jumper selectable for 10.5 and 10.9 μs.
Front Porch Duration	1.4 μs $\pm$0.1 μs.	Changes with H-blanking duration to 1.33 μs or 1.54 μs, respectively.
Vertical Blanking Duration		
Standard	20 lines.	Jumper selectable for 19 or 20 lines.
Option 1J	21.5 lines.	
BURST FLAG		
Delay from Horizontal Sync	5.3 μs $\pm$0.1 μs.	Measured from sync pulse output to burst flag output.
Duration	2.51 μs $\pm$0.1 μs.	9 cycles of subcarrier.
HORIZONTAL DRIVE		
Duration	Start of line blanking to end of H-sync $\pm$0.1 μs.	
VERTICAL DRIVE		
Duration	9 lines.	
FRAME		
Field Reference Pulse		Low for line 11, field 1.
Color Frame Square Wave		Low for fields 1 & 2, high for fields 3 & 4. Selectable for -4 V or TTL compatible output.

Table 3-6
Sync Generator — Subcarrier Output

Characteristics	Performance Requirement	Supplemental Information
Amplitude	2 V p-p ±0.2 V.	
Free-Running Frequency	3.579545 MHz ±1 Hz.	After 20-minute warm up.
Long-Term Stability		Typical: 1 Hz per year after initial aging.
Return Loss	≥30 dB to 4.2 MHz.	

Table 3-7
Genlock Function

Characteristics	Performance Requirement	Supplemental Information
Input Configuration	75Ω loop-through.	
Return Loss (GENLOCK INPUT	At least 40 dB to 4.2 MHz.	
Genlock Phase Change with Input Burst Amplitude	286 mV +1 to -6 dB.	≤1° phase shift (burst lock).
Genlock Phase Change with Input Sync Amplitude	286 mV +3 to -6 dB.	≤10° phase shift (sync lock).
Genlock Phase Change with Input Signal APL	≤1° Burst phase change over 10% to 90% APL.	
Burst Lock Frequency Dependence	≤1° burst phase change for ±20 Hz change in incoming subcarrier.	
Horizontal Timing Range		
Genlock Timing	At least 8 μs advance and delay relative to Genlock Input.	Front-panel control (resolution: 0.2° steps).
Sync Timing	At least 4 μs advance and delay relative to Test Signal Output.	Front-panel control (resolution: 0.2° steps).
Vertical Timing Range	0, 1, or 2 lines advance. 1 line delay.	
Burst Lock Range	3.579545 MHz ±20 Hz.	

Table 3-7
Genlock Function (cont.)

Characteristics	Performance Requirement	Supplemental Information
SCH Phase Accuracy	0° ±5°	
Color Framing Decisions Hysteresis Angle of decision		120°. See Fig. 3-18. Initially, genlock circuit chooses field 1 if SCH Phase angle is <90° or >270°. Chooses field 3 if angle is >90° or <270°. Maintains field 1 decision from 0° ±120°. Maintains field 3 decision from 180° ±120°.
Phase Resolution (Burst)	0.5°.	
Jitter Burst lock Sync Lock	 ≤0.5°. <2 ns.	
Continuous Wave Input Specs		To be determined.

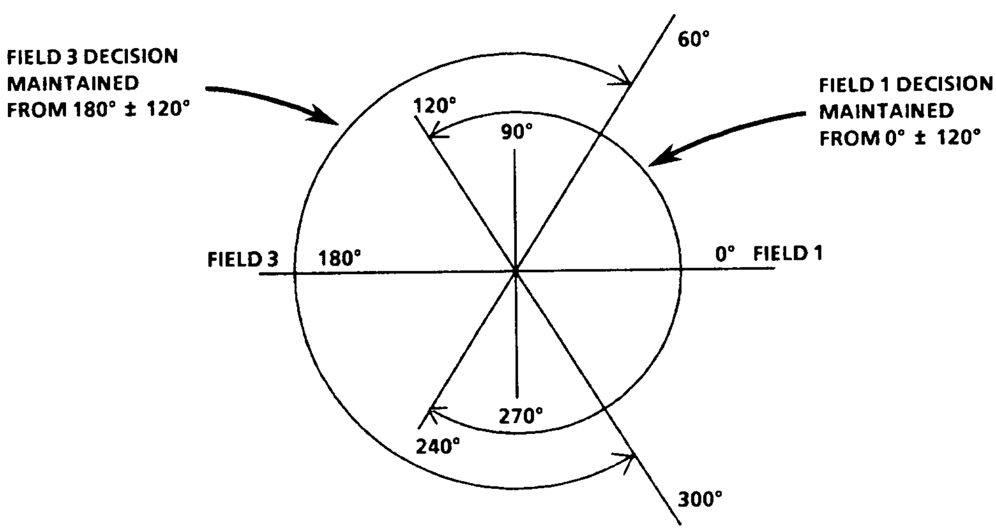


Fig. 3-18. Color framing decision angles.

Table 3-8
Option 1 (Color Bars, Audio Tone, and ID)

Characteristics	Performance Requirement	Supplemental Information
COLOR BARS Option 1 Option 2J	 SMPTE Bars. See Fig. 3-1. Same as Option 1, with no setup.	
IDENTIFICATION	12 characters, 7 x 9 matrix.	
AUDIO TONE Amplitude	 0 to +8 dBu adjustable.	 50Ω output balanced XLR impedance to drive 150Ω, 600Ω, or high impedance load.
Frequency Option 1 Option 2J	 449.55 Hz. 983.39 Hz.	 $f_{horizontal} \div 35$, vertically locked. $f_{horizontal} \div 16$, vertically locked.
Distortion (THD)	≤0.01%.	
Audio ID "click" Frequency Range	4 Hz to 0.2 Hz.	

Table 3-9
Power Supply

Characteristics	Performance Requirement	Supplemental Information
Supply Accuracy		
+12 V		+12 V ±300 mV.
+5 V		+5 V ±100 mV.
-5.2 V		-5.2 V ±300 mV.
-12 V		-12 V ±300 mV.
Current Limit		Total power limited to 75 W.
+12 V		
+5 V		
-5.2 V		
-12 V		
Hum		**Typical**
+12 V		10 mV.
+5 V		10 mV.
-5.2 V		20 mV.
-12 V		10 mV.
Noise		
+12 V		≤50 mV (5 MHz bandwidth).
-12 V		≤50 mV (5 MHz bandwidth).
+5 V		≤50 mV (5 MHz bandwidth).
-5.1 V		≤50 mV (5 MHz bandwidth).
Line Voltage Range		
110 Vac	90 - 132 Vac.	
220 Vac	180 - 250 Vac.	
Crest Factor		≥1.35.
Fuse Data		
115 V Setting		2 A Med-Blow.
230 V Setting		1A Med-Blow.
Power Consumption		
Typical		40 W.
Maximum		60 W.
Line Frequency		48 Hz to 62 Hz.

Table 3-10
Physical Characteristics

Characteristics	Information
Dimensions Rackmount Height	1.734 inches (4.4 cm).
Width	19.0 inches (48.3 cm).
Length	22.1 inches (56.1 cm).
Net Weight	13.5 lbs (6.14 kg).
Shipping Weight	22 lbs, 14 oz (10.4 kg).

Table 3-11
Environmental Characteristics

Characteristics	Information
Temperature Non-Operating	-40°C to +65°C.
Operating	0°C to +50°C.
Altitude Non-Operating	To 50,000 feet.
Operating	To 15,000 feet.
Vibration (Operating)	15 minutes each axis at 0.025 inch, frequency varied from 10-55-10 c/s in 4-minute cycles with instrument secured to vibration platform. Ten minutes each axis at any resonant point or at 55 c/s.
Shock	50 g's, 1/2 sine, 11 ms duration, 3 guillotine-type shocks per side.
Transportion	Qualified under NTSC Test Procedure 1A, Category II (24-inch drop).
Emissions	FCC 47 CFR Part 15, Subpart B, Class A

Table 3–11: Certifications and compliances

Category	Standards or description	
EC Declaration of Conformity – EMC	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
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.

Table 3–11: Certifications and compliances (cont.)

Category	Standards or description
Safety Certification Compliance	
Temperature, operating	+5 to +40° C
Altitude (maximum operating)	2000 meters
Equipment Type	Test and measuring
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.

Installation

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 4
INSTALLATION

PACKAGING

At installation time, save the shipping carton and packaging materials for repackaging in case reshipment becomes necessary. See Fig. 4-1.

ELECTRICAL INSTALLATION

Power Supply Frequency and Voltage Ranges

The power supply in this instrument operates over a line frequency range of 48 to 62 Hz and is set (by jumper P810) to receive a nominal line voltage of 115 V. Its installed line fuse is rated for 250 V and 2 Amps. To set the power supply to receive a nominal line voltage of 230 V, move P810 as shown in Table 4-4 and replace the line fuse with one rated for 250 V and 1 Amp.

Plug in Power Cable, then mount to extreme left of the line filter using one of the screws (on the instrument), loop clamp, and washer. See Fig. 4-2.

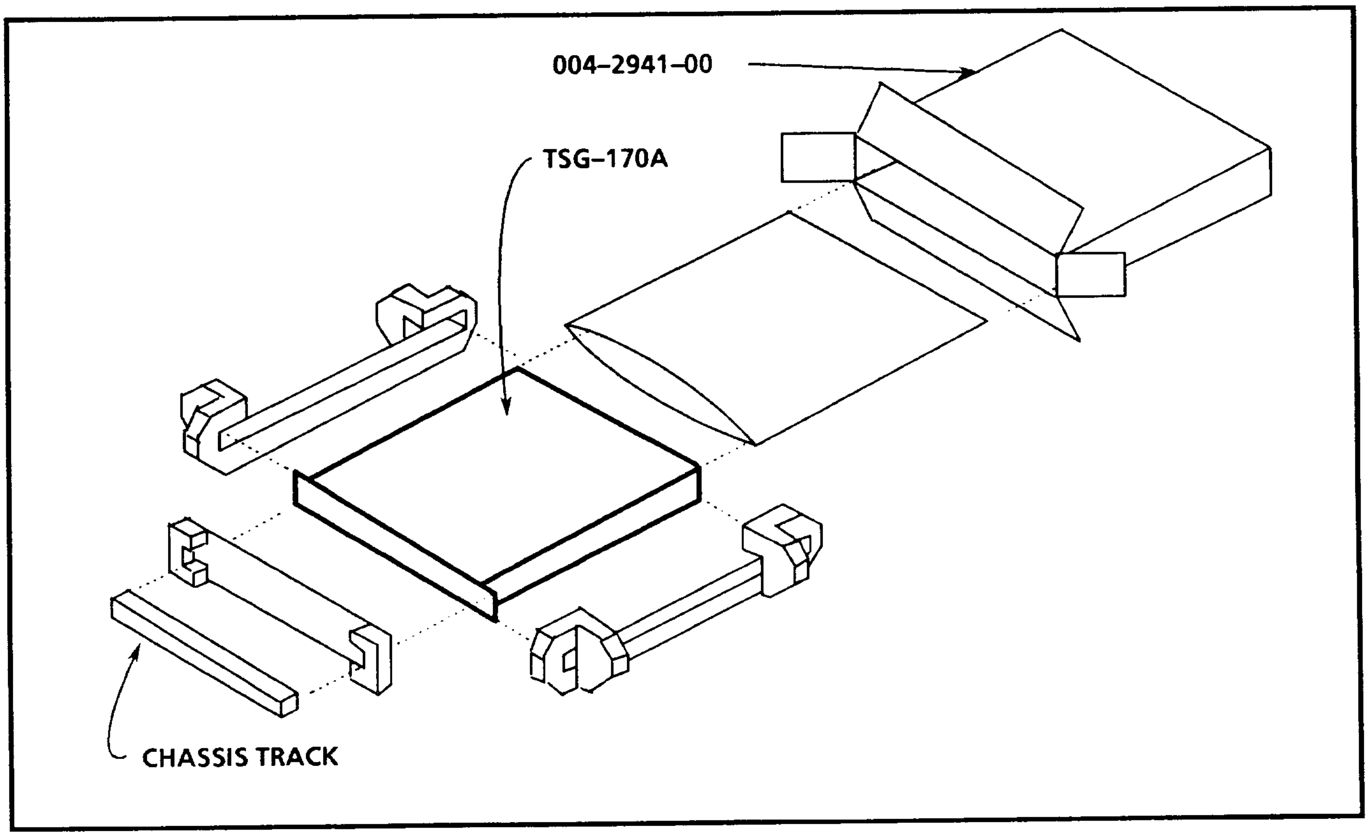


Fig. 4-1. Repacking instructions.

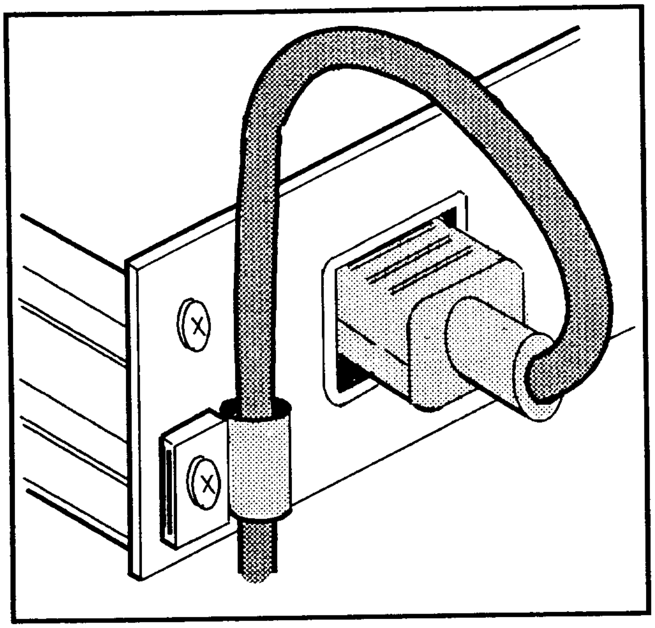


Fig. 4-2. Mount the power cord.

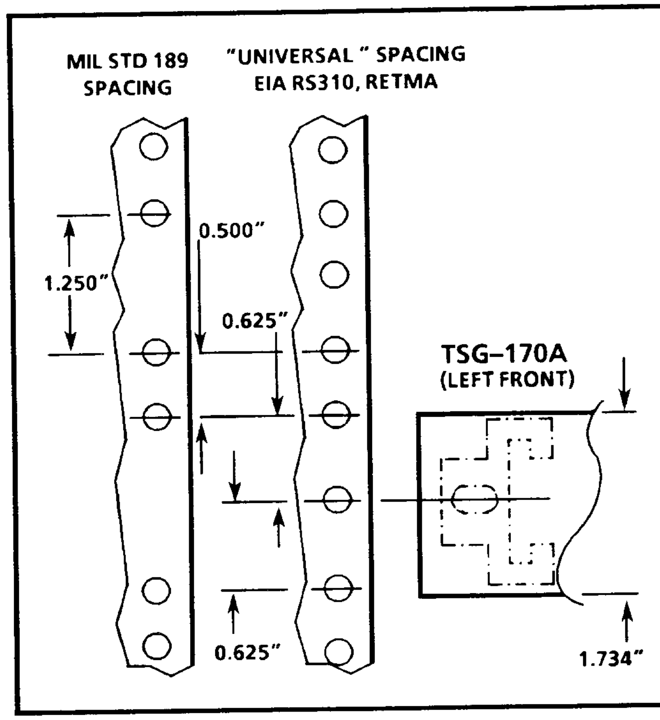


Fig. 4-3. Rail detail for mounting slide tracks.

MECHANICAL INSTALLATION

Rack Mounting

The TSG-170A is shipped 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 17-3/4 inches to allow clearance for the slide-out tracks.

Rack slides conveniently mount in any rack that has a front-to-rear rail spacing between 15-1/2 and 28 inches. Six inches of clearance between the instrument's rear panel and any rear cabinet panel is required for connector space and to provide adequate air circulation.

Mounting the Slide Tracks

Locate the proper rack holes as shown in Fig. 4-3. Notice that the hole spacing varies with the type of rack. When installing the slides in EIA-type racks, make certain that the slides are attached to the 1/2-inch-spaced holes.

Mount the rails using enclosed hardware as shown in Fig. 4-4. Fig. 4-5 shows the rail mounting details for both deep and shallow racks. Make sure the stationary sections are horizontally aligned and are level and parallel.

Installing the Instrument

Install the instrument in the rack, as shown in Fig. 4-6. Table 4-1 lists the signals available at the rear-panel connectors.

Rack Adjustments

After installation, the slide tracks may bind if they are not properly adjusted. To adjust the tracks, slide the instrument out about 10 inches, slightly loosen the screws holding the tracks to the front rails, and allow the tracks to seek an unbound position. Retighten the screws and check the tracks for smooth operation by sliding the instrument in and out of the rack several times.

Once the instrument is in place within the rack, tighten the knurled retaining screw to fasten it securely into the rack.

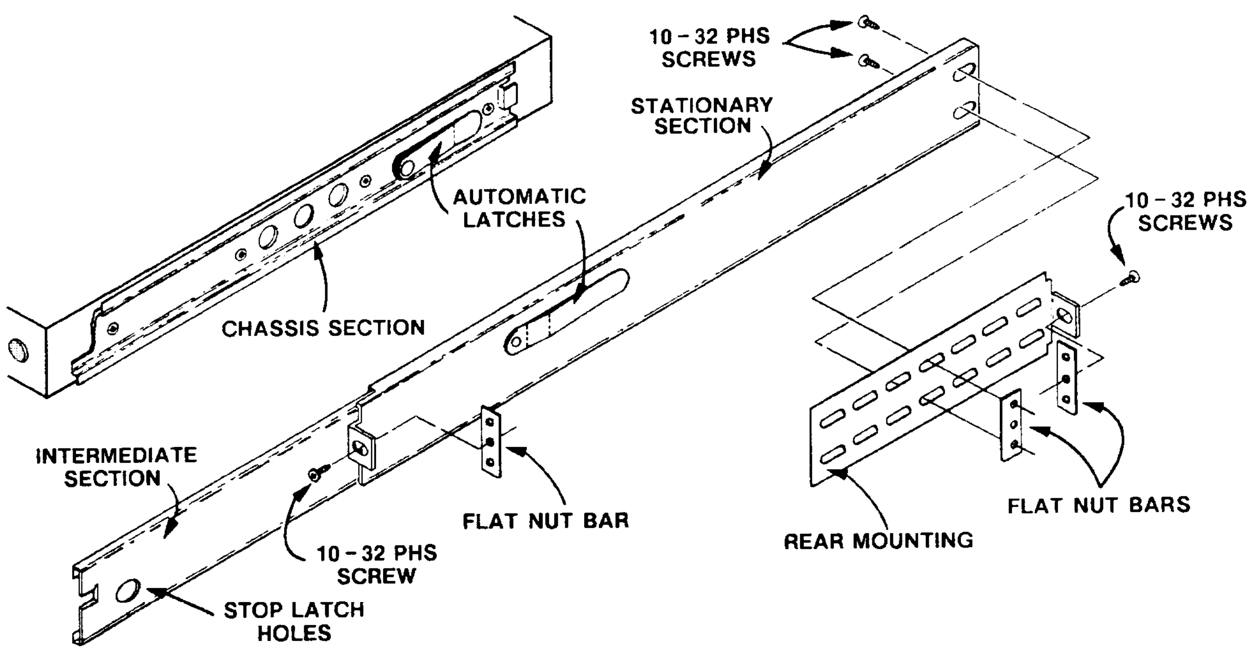
Rack Slide Maintenance

The slide-out tracks do not require lubrication. The dark gray finish on the tracks is a permanent, lubricated coating.

Removing the Instrument

First, loosen the front-panel knurled retaining screw. See Fig. 4-6. Grasp the front handles and pull the instrument out until all three slide sections latch. The instrument is firmly held in this position.

To completely remove the instrument, press both release-latch buttons (visible in the stop-latch holes) and carefully slide the instrument free from the tracks. Be sure that all cabling is disconnected before removing the instrument.



NOTE:

Right hand and left hand stationary section is designated by the RH and the LH marked on the rails. Stop latch holes should be towards the bottom when slides are in place. (The right hand rail is shown above.)

Fig. 4-4. Assembly of rack mounting hardware.

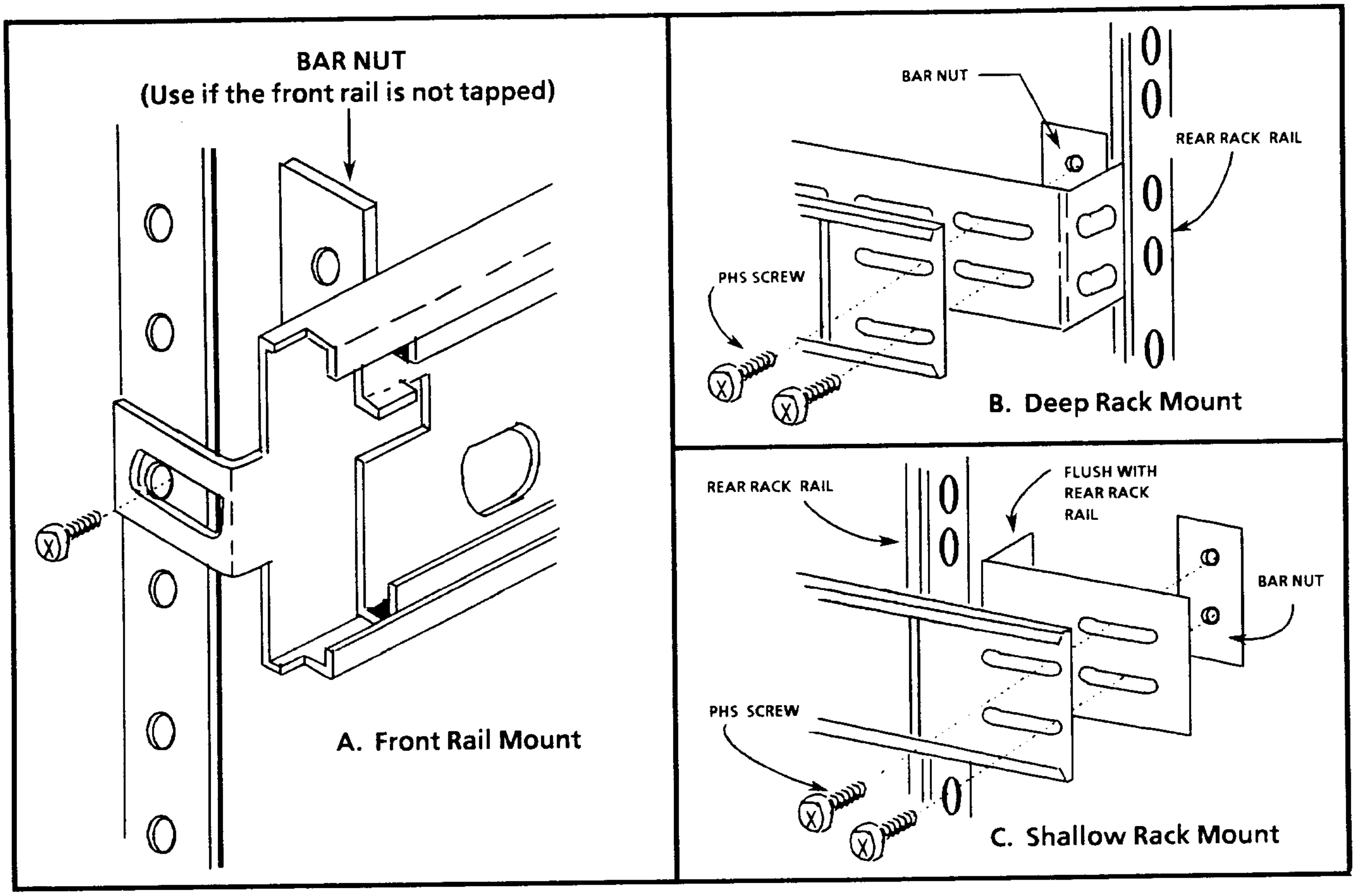
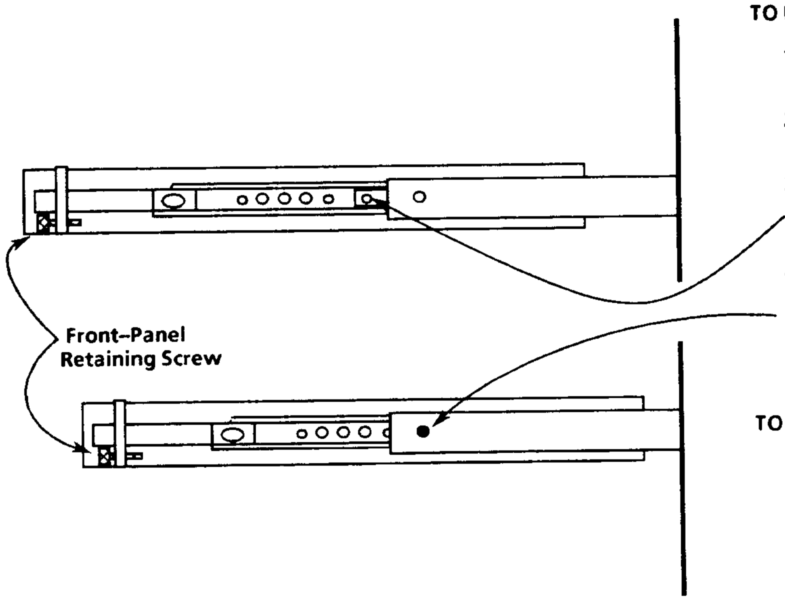


Fig. 4-5. Mounting stationary track sections.



TO INSTALL:

1. Pull the slide-out track section to the fully extended position.
2. Insert the instrument chassis sections into the slide-out sections
3. Press the stop latches and push the instrument toward the rack until the latches snap into their holes.
4. Again press the stop latches and push the instrument fully into the rack.
5. Tighten the front-panel retaining screw.

TO REMOVE:

1. Loosen retaining screw and pull instrument outward until the stop latches snap into the holes.
2. Press stop latches and remove instrument.

Fig. 4-6. Racking and unracking the TSG-170A.

Jumper Tables

This section gives jumper tables for the entire instrument. In all cases, the ▼ symbol on the circuit boards identifies pin 1. Green jumpers are for selecting operating modes. Red jumpers are for testing the instrument. The red jumpers should be used only by qualified service personnel.

Table 4-1
Analog Board (A3) Operating Mode Selection Jumpers

FUNCTION	JUMPER #	DESCRIPTION	FACTORY SET
H-Drive/Comp Sync Output Select	P385	Pins 1–2: Enables H-Drive signal at H-DRIVE/SYNC output connector. Pins 2–3: Enables Comp Sync signal at H-DRIVE/SYNC connector.	Pins 1–2
V-Drive/Comp Blanking Output Select	P765	Pins 1–2: Enables Comp Blanking signal at V-DRIVE/BLANK connector. Pins 2–3: Enables V-Drive signal at V-DRIVE/BLANK connector.	Pins 2–3
Frame/Black Select	P965	Pins 1–2: Enables Black Burst signal at FRAME/BLACK connector. Pins 2–3: Enables field reference or color frame square wave signal (see P565) at FRAME/BLACK connector	Pins 2–3
Field Reference/Color Frame Square Wave Select	P565	Pins 1–2: Enables Color Frame Square Wave signal at FRAME/BLACK connector.* Pins 2–3: Enables Field Reference signal at FRAME/BLACK connector.* *P965 must be on pins 2–3.	Pins 2–3
Color Frame Output Level Select	P680 P784	Pins 1–2: Enables –4 V output level (terminated in 75Ω).** Pins 2–3: Enables TTL output level (+5 V unterminated or +3 V terminated in 75Ω).** **Move P680 and P784 together.	Pins 1–2
Burst Flag/Subcarrier Select	P967	Pins 1–2: Enables Subcarrier signal at BURST FLAG/SUBC connector. Pins 2–3: Enables Burst flag signal at BURST FLAG/SUBC connector.	Pins 2–3

Table 4-1 (cont.)
Analog Board (A3) Operating Mode Selection Jumpers (cont.)

FUNCTION	JUMPER #	DESCRIPTION	FACTORY SET
Genlock Input	P520	Pins 1–2: Enables input clamp for Genlock Input. Pins 2–3: Disables clamp for locking to 3.58 MHz or 5 MHz CW input.	Pins 1–2
Genlock Input	P118	Pins 1–2: Dc coupling for Genlock Input. Pins 2–3: Ac coupling for locking to Subcarrier Input signal (3.58 MHz or 5 MHz CW input).	Pins 1–2

Table 4-2
Analog Board (A3) Test Jumpers

FUNCTION	JUMPER #	DESCRIPTION	FACTORY SET
Subcarrier Disable	P189	Pins 1–2: Enables Subcarrier signal at SUBCARRIER connector. Pins 2–3: Disables Subcarrier signal at SUBCARRIER connector to allow testing of return loss.	Pins 1–2
Test Signal Disable	P355	Pins 1–2: Disables test signal at TEST SIGNAL connector to allow testing of return loss. Pins 2–3: Enables test signal at TEST SIGNAL connector.	Pins 2–3

Table 4-3
Digital Board (A2) Operating Mode Selection Jumpers

FUNCTION	JUMPER #	DESCRIPTION	FACTORY SET
Spare	P211	Pins 1–2: Spare. Pins 2–3: Spare	Pins 1–2
Disable Genlock/Sync Timing Modes	P210	Pins 1–2: Enables full front-panel operation. Pins 2–3: Enables only Select Test Signal and Set ID modes.	Pins 1–2
Genlock Input Select	P407, P408	Pins 1–2, 1–2: Allows μP to lock to composite video. Pins 1–2, 2–3: Allows μP to lock to 3.58 MHz continuous wave. Pins 2–3, 1–2: For future use. Pins 2–3, 2–3: For future use.	Pins 1–2, 1–2
H-Blanking Width Select (for Sync Pulse outputs) *See visual aid below.	P680	Pins 3–4: Selects narrow (10.5 μs) H-Blanking width. Pins 1–3: Selects normal (10.7 μs) H-Blanking width. Pins 2–3: Selects wide (10.9 μs) H-Blanking width.	Pins 1–3
V-Blanking Width Select (for Sync Pulse outputs)	P696	Pins 1–2: Selects 19-line V-Blanking width. Pins 2–3: Selects 20-line V-Blanking width.	Pins 2–3
Vertical Timing	P881, P882	Pins 1–2, 1–2: No delay. Pins 1–2, 2–3: 1 line delay. Pins 2–3, 1–2: 2 lines advance. Pins 2–3, 2–3: 1 line advance.	Pins 1–2, 1–2

*Visual aid for P680.

2	3	4
	1	

Table 4-4
Digital Board (A2) Test Jumpers

FUNCTION	JUMPER #	DESCRIPTION	FACTORY SET
VCO Test *See visual aid below.	P180	Pins 1-3: Sets VCO control voltage to mid-range (ground) so VCO can be tuned to $4F_{SC}$ with C387. Pins 2-3: μP controls genlock loop response. Pins 4-3: Fixed test voltage (-5 V) decreases VCO frequency. Pins 5-3: Fixed test voltage (+5 V) increases VCO frequency.	 Pins 2-3
Crystal Frequency *See visual aid below.	P382	For coarse adjustment of free-running crystal frequency. Setting should only be changed when calibrating the subcarrier oscillator frequency.	See Performance Checks and Calibration Procedures.
Hard Reset Disable	P425	Pins 1-2: Enables $\overline{\text{HARD RESET}}$ signal. Pins 2-3: Disables $\overline{\text{HARD RESET}}$ signal (see Diagnostics).	Pins 1-2
Field Reference Disable	P767	Pins 1-2: Enables FLD REF signal to provide a genlocked field reference (field 3, line 10) pulse to the timing circuits. Pins 2-3: Disables FLD REF signal from providing a genlocked field reference (field 3, line 10) pulse to the timing circuits.	Pins 1-2

*Visual aid for P180 and P382.

	5	
2	3	4
	1	

Table 4-5
Power Supply Board (A4) Operating Mode Selection Jumpers

FUNCTION	JUMPER #	DESCRIPTION	FACTORY SET
115 V/230 V Line Voltage Select	P810	Pin 1 aligned with 115 V: Power Supply accepts 115 V line voltage. Fuse rating must be 2 A, medium blow. Pin 1 aligned with 230 V: Power Supply accepts 230 V line voltage. Fuse rating must be 1 A, medium blow.	115 V

Table 4-6
Power Supply Board (A4) Test Jumpers

FUNCTION	JUMPER #	DESCRIPTION	FACTORY SET
Overvolts Sensor Test (-5 V)	J120	Jacks 1 and 2 unshorted: Normal operation (voltage at pin 9 of U220B should be about +0.3 V). Jacks 1 and 2 shorted: Shuts down Power Supply.	Unshorted
Overvolts Sensor Test (+5 V)	J242	Jacks 1 and 2 unshorted: Normal operation (voltage at pin 10 of U335B should be about +2.1 V). Jacks 1 and 2 shorted: Shuts down Power Supply.	Unshorted

Table 4-7
Option 1 Board (A5) Test Jumpers

FUNCTION	JUMPER #	DESCRIPTION	FACTORY SET
Color Bar Signal Enable/Disable	P655	Pins 1–2: Disables Color Bar signal at BARS (OPT 1) connector to allow testing of return loss. Pins 2–3: Enables Color Bar signal at BARS (OPT 1) connector. Pin 2 also allows testing of Option 1 output filter with test signals from J355 of the Analog board. To do this, remove W348 in Schematic 9 and W663 in Schematic 13. Connect a shielded cable between pin 3 of J355 (Schematic 9) and pin 2 of J655 (Schematic 13). See Option 1 Performance Checks for details.	Pins 2–3

Table 4-8
Option 1 Board (A5) Operating Mode Selection Jumpers

FUNCTION	JUMPER #	DESCRIPTION	FACTORY SET
Audio Click	P318	Pins 1–2: Enables audio ID "click" at AUDIO TONE (Opt 1) connector. Pins 2–3: Disables audio ID "click" at AUDIO TONE (Opt. 1) connector.	Pins 2–3
For Future Use	P681	Pins 1–2: Normal operation. Pins 2–3: For future use.	Pins 1–2
For Future Use	P710	Pins 1–2: For future use. Pins 2–3: Normal operation.	Pins 2–3

Performance Check and Calibration Procedures

SECTION 5

PERFORMANCE CHECK AND CALIBRATION PROCEDURES

This section gives procedures for checking and calibrating your TSG-170A. They are split into short and long form. Short form procedures provide a quick reference for experienced technicians. The long form procedures give more detailed steps.

Table 5-1 lists the equipment you will need. If you use alternate equipment, make sure it meets the specifications given in this table.

These procedures are designed to be done in sequence. If you do not need to do a full procedure, start at the nearest convenient step that has a setup drawing.

NOTE

After completing each step, immediately return jumpers to their original position.

Table 5-1
Recommended Test Equipment (Including Accessories)

Test Equipment	Minimum Specifications	Equipment Examples
Test Oscilloscope Mainframe	At least 50 MHz bandwidth with dual-trace plug-in and 10X probe.	TEKTRONIX 7603.
Test Oscilloscope Differential Comparator Plug In	Minimum deflection factor 10 mV/div with 10X probe.	TEKTRONIX 7A13; plugs into 7603 mainframe.
Test Oscilloscope Dual-Trace Amplifier Plug-In	Minimum deflection factor 50 mV/div with 10X probe.	TEKTRONIX 7A26; plugs into 7603 mainframe.
Test Oscilloscope Dual Time Base Plug-In	Sweep rate 5 ns/div to 5 μs/div.	TEKTRONIX 7B53A; plugs into 7603 mainframe.
Spectrum Analyzer with 012-0113-00 cable	Capable of measuring to at least 5 MHz.	TEKTRONIX 7L12; plugs into TEKTRONIX 7603 mainframe.
Low Pass Filter	5 MHz.	Tektronix Part No. 015-0213-00.
NTSC Waveform Monitor	For displaying and measuring field-rate and line-rate waveforms	TEKTRONIX 1480 Mod W5F.
NTSC Vectorscope	For measuring differential phase and gain.	TEKTRONIX 520A.
NTSC Test Signal Generator	Provides the following test signals: black burst, flat field, staircase, pulse & bar, manual and continuous sweep, V drive, and subcarrier output. Provides variable subcarrier and sync amplitudes.	TEKTRONIX 1410/SPG2A (Opt AA)/TSP1/TSG3/TSG5/TSG6.

Table 5-1 (cont.)
Recommended Test Equipment (Including Accessories)

Test Equipment	Minimum Specifications	Equipment Examples
Video Amplitude Calibration Fixture (VAC)	Provides a chopped voltage reference accurate to ±0.05% from 0 to 1 V in 0.1 mV increments. (Used with the TEKTRONIX 1480 MOD W5F Waveform Monitor.)	Tektronix Part No. 067-0916-00. Plugs into a TEKTRONIX TM 503 Power Mainframe.
Leveled Sine Wave Generator	250 kHz to 5 MHz.	TEKTRONIX SG 503A; plugs into TM 503 Power Mainframe.
Frequency Counter	For measuring subcarrier frequency. Accurate to within 2-1/2 Hz out of 5 MHz.	TEKTRONIX DC 501, Opt. 01; plugs into TM 503 Power Mainframe
Peak-to-Peak Detector Amplifier with Detector Head	Facilitates differential frequency-response measurements. Provides a high-impedance load and bias for the 015-0413-00 Detector Head.	Tektronix Part No. 015-0408-00. (Includes one Detector Head, Tektronix Part No. 015-0413-00.) Detector Amplifier plugs into the TM 503 mainframe.
Return Loss Bridge	At least 54 dB, dc to 10 MHz; 75Ω inputs.	Tektronix Part No. 015-0149-00.
Low Loss Coaxial Cable (Qty 4)	Belden 8281 video cable. Impedance, 75Ω; length, 6 feet[a]. Equipped with bnc connectors.	Tektronix Part No. 012-0159-01.
RG59/U Coaxial Cables (Qty 2)	Impedance, 75Ω; length, 42 inches. Equipped with bnc connectors.	Tektronix Part No. 012-0074-00.
End-Line Termination (Qty 3)	Impedance, 75Ω. Equipped with bnc connectors.	Tektronix Part No. 011-0102-00.
Feed-Through Termination (Qty 2)	Impedance, 75Ω. Equipped with bnc connectors.	Tektronix Part No. 011-0103-02.
Jumper-Type Termination	Impedance 75Ω. (Two-pin connector with a 75Ω, 1%, 1/8 W resistor installed.)	Tektronix Part No. 119-1158-00.
50Ω to 75Ω Minimum Loss Attenuator	Equipped with bnc connectors.	Tektronix Part No. 011-0057-00.
DC Block	None.	Tektronix Part No. 015-0221-00.
BNC Female-to-BNC Female Adapter	None.	Tektronix Part No. 103-0028-00.
50Ω Coaxial Cable	Length, 36 inches. Equipped with bnc connectors. For use with the SG 503.	Tektronix Part No. 012-0482-00.

Table 5-1 (cont.)
Recommended Test Equipment (Including Accessories)

Test Equipment	Minimum Specifications	Equipment Examples
Distortion Analyzer.	Must test to at least 0.01% THD and test power output over range of 0 to 8 dBm.	TEKTRONIX AA501.
Audio Connector-to-Triple Banana Cable	None.	ITT Pamona Electronics, Model 4953-J-36. Must be reconfigured to match the TSG–170A audio output. Pin 1: Shield, pin 2: +, pin 3: —.
Variable Autotransformer		General Radio model W10MT3W.

[a]Six-foot length was used to interconnect the test equipment. If 42-inch length is preferred, the Tektronix Part No. is 012-0159-00.

SHORT FORM PERFORMANCE CHECK PROCEDURE

GENLOCK

1. Check Jitter

   ≤0.5° of burst.

2. Check Genlock Range and Burst Phase Change with Change in Incoming Burst Frequency

   ≤1° ±20 Hz change in incoming subcarrier.

3. Check Phase Change with Change in Incoming Burst Amplitude

   ≤1° phase shift with burst amplitude of 286 mV +1 to -6 dB.

4. Check Phase Shift with Change in Incoming APL

   ≤1° burst phase change over 10% to 90% APL.

SYNC LOCK

5. Check Jitter

   <2 ns.

GENLOCK TIMING AND SYNC TIMING

6. Check Genlock and Sync Horizontal Timing Range

   Genlock timing: at least 8 μs advance and delay. Sync timing: at least 4 μs advance and delay.

TEST SIGNAL OUTPUT

7. Check Blanking Level

   0 V ±50 mV.

8. Check Luminance Amplitude

   100 IRE ±7.14 mV (±1%).

9. Check 5-Step Staircase Linearity

   ±0.3.6 mV (or ±0.5% of total amplitude).

10. Check Pulse-to-Bar Ratio

    100% ±1%.

11. Check Group Delay

    100 IRE 25T pulse should be ±3.5 mV p-to-p or less. 100 IRE 12.5T pulse should be ±7.0 mV p-to-p or less.

12. Check Line Tilt

    3.6 mV (0.5%) or less.

13. Check Field Tilt

    3.6 mV (0.5%) or less.

14. Check Ringing

    7.14 mV (1 IRE) or less.

15. Check Differential Phase and Gain

    0.3° or less; 0.5% or less.

16. Check Chrominance-to-Luminance Gain

    7.14 mV (1%) or less.

BLACK BURST OUTPUT

17. Check Sync Amplitude

    285.7 mV ±1%.

18. Check Setup Amplitude

    53.6 mV ±7.1 mV (0.0 mV ±7.1 mV for Opt. 1J, Opt 2J).

19. Check Burst Amplitude

    285.7 mV ±2%.

20. Check Alternate BLACK BURST Output

    Check sync, burst, and setup amplitudes as above.

SUBCARRIER OUTPUT

21. Check Free-Running Frequency

    3.579545 MHz ±1 Hz.

22. Amplitude and Distortion

    2 V p-to-p ±0.2 V.

23. Check Alternate SUBCARRIER Output

    2 V p-to-p ±0.2 V.

PULSE OUTPUTS (Amplitude and Rise Times)

24. Check Sync Amplitude

    -4 V±200 mV.

25. Check Sync Rise and Fall Times

    140 ns ±20 ns.

26. Check All Other Pulse Outputs

    Amplitude: 0 to -4 V ±200 mV. Rise Time: 140 ns ±20 ns.

PULSE OUTPUTS (Timing)

27. Check Sync

    Horizontal sync and Vertical Serrations: 4.7 μs ±0.1 μs. Equalizing: 2.35 μs ±0.1 μs.

28. Check Blanking

    Horizontal: Jumper selectable for 10.5 μs ±0.1 μs, 10.7 μs ±0.1 μs, or 10.9 μs ±0.1 μs (J680, Schematic 5).

    Vertical: Jumper selectable for 19 or 20 lines (J696, Schematic 5).

29. Check Burst Flag

    Duration: 2.51 μs ±0.1 μs.

    Delay from leading edge of H Sync by 5.3 μs ±0.1 μs.

30. Check H Drive

    Duration: 10.7 μs ±0.1 μs.

31. Check V-Drive

    Low for 9 lines.

32. Check Frame

    Color Frame Square Wave low for fields 1 and 2; transition occurs on line 11.

    Field Reference low (-4 V) during line 11 of field 1.

RETURN LOSS

33. Check GENLOCK LOOP THROUGH

    At least 40 dB to 4.2 MHz.

34. Check TEST SIGNAL Output

    At least 36 dB down to 4.2 MHz.

35. Check BLACK BURST Output

    At least 36 dB down to 4.2 MHz.

36. Check SYNC Output

    At least 30 dB down to 4.2 MHz.

37. Check SUBCARRIER Output

    At leat 30 dB down to 4.2 MHz.

38. Check BARS (OPT 1) Output

    At least 36 dB down to 4.2 MHz.

AUDIO TONE (OPT 1) OUTPUT

39. Check Total Harmonic Distortion

    0.01% or less.

LONG FORM CHECKOUT PROCEDURE

GENLOCK

1. Check Jitter

a. Connect test equipment as in Fig. 5-1.

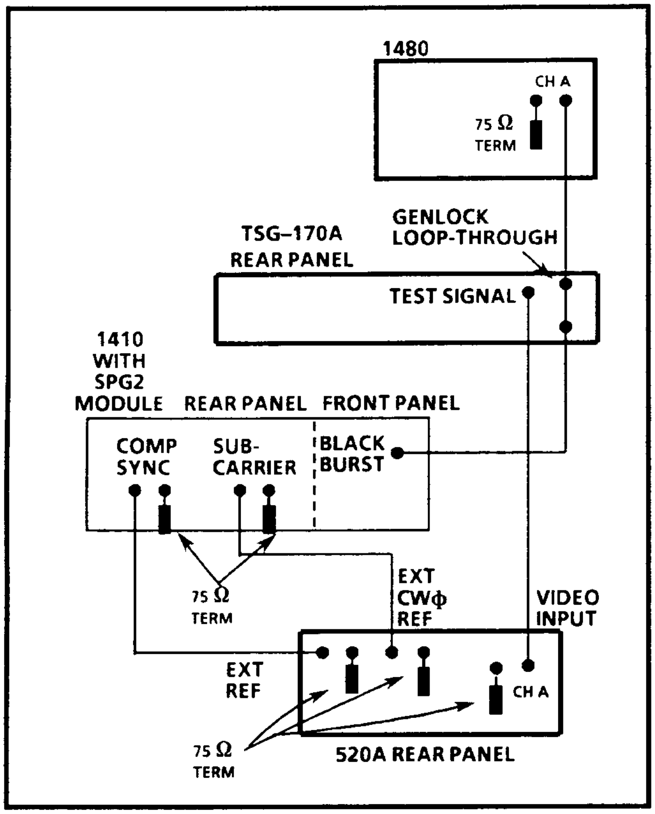


Fig. 5-1. Setup to check Genlock and Sync Lock.

b. Select the Mod Ramp signal from the TSG-170A front panel.

c. Set the vectorscope for differential phase measurements.

d. CHECK — for jitter of ≤0.5°.

2. Check Genlock Range and Burst Phase Change with Change in Incoming Burst Frequency

a. Select +20 Hz offset from the SPG2 Opt AA.

b. CHECK — that the TSG-170A re-acquires lock, and that burst phase has shifted ≤1°.

c. Select a -20 Hz offset at the 1410 SPG2 Opt AA.

d. CHECK — that the TSG-170A re-acquires lock, and that burst phase has shifted ≤1°.

e. Remove the 20 Hz offset and switch the 520A to Vector mode.

3. Phase Change with Change in Incoming Burst Amplitude

a. With the SPG2 Opt AA, increase burst amplitude from 40 IRE p-p to 56.5 IRE (+1 dB).

b. CHECK — for ≤1° phase shift.

c. Decrease the burst amplitude from 40 IRE p-to-p to 20 IRE p-to-p (-6 dB).

d. CHECK — for ≤1° phase shift.

4. Phase Shift with Change in Incoming APL

a. Replace the Black Burst Genlock Input with a variable amplitude Flat Field signal (TSG3).

b. Vary the Flat Field signal between 10 and 90 IRE.

c. CHECK — with the vectorscope in Diff Phase mode for a burst phase change of no more than 1°.

SYNC LOCK

5. Jitter

a. Replace the Flat Field Genlock Input with a Comp Sync signal (SPG2).

b. Set the vectorscope for a differential phase measurement.

c. CHECK — for jitter of ≤2.6° (2 ns).

GENLOCK TIMING AND SYNC TIMING

6. Genlock Timing and Sync Timing Range

a. Connect the test equipment as in Fig. 5-2.

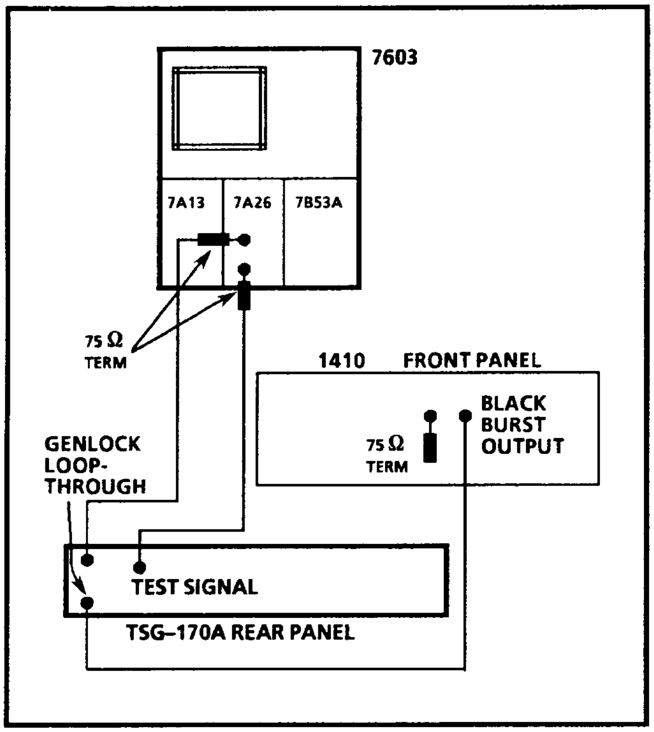


Fig. 5-2. Setup to test Genlock and Sync timing range.

b. Set the oscilloscope to display both the TSG-170A MOD RAMP output and the Black Burst Genlock Source at a horizontal rate. (Use Channel 1 as trigger source.)

c. At the TSG-170A front panel, advance and delay the TEST SIGNAL output as far as it will go (with the coarse genlock timing buttons) in either direction.

d. CHECK — that the test signal advances and delays at least 8 μs with respect to the reference (Black Burst) signal.

e. Disconnect the cable connected to the TSG-170A TEST SIGNAL output and connect it to the TSG-170A SYNC output.

f. Disconnect the cable connected to the top TSG-170A Genlock loop-through and connect it to the TSG-170A TEST SIGNAL output.

g. Terminate the upper TSG-170A Genlock loop-through in 75Ω.

h. At the TSG-170A front panel, advance and delay the SYNC output as far as it will go in either direction.

i. CHECK — that the SYNC output advances and delays at least 4 μs relative to the TEST SIGNAL output.

TEST SIGNAL OUTPUT

7. Blanking Level

a. Connect test equipment as in Fig. 5-3.

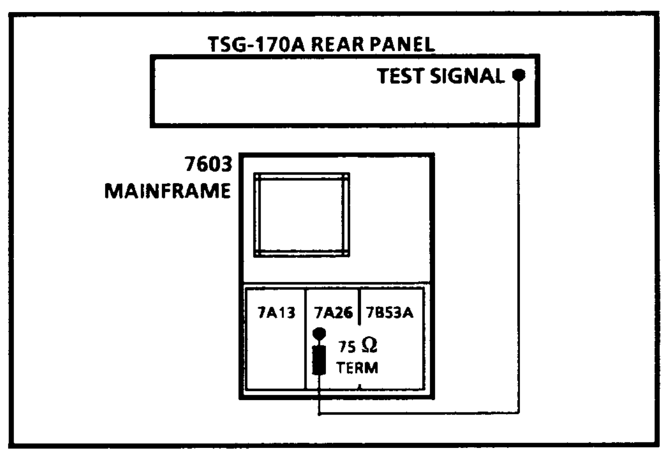


Fig. 5-3. Setup to test TEST SIGNAL output blanking level.

b. Select Luminance Ramp from the TSG-170A.

c. Set the oscilloscope to a ground reference.

d. CHECK — that the blanking level is 0 V ±50 mV.

8. Luminance Amplitude

a. Connect test equipment as in Fig. 5-4.

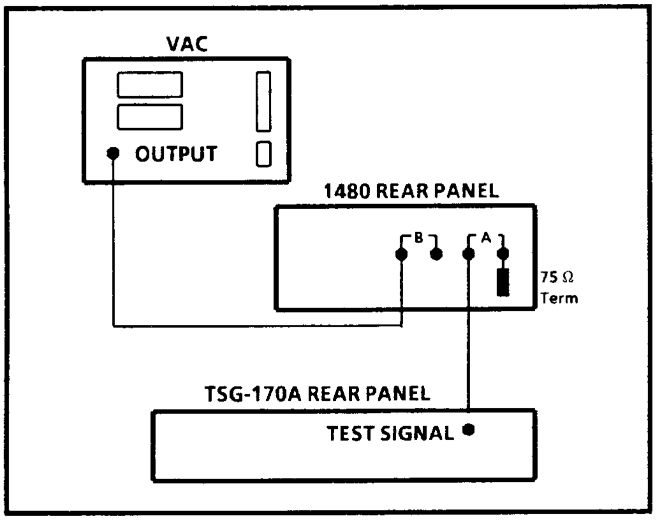


Fig. 5-4. Setup to check TEST SIGNAL output luminance amplitude.

b. Select Luminance Ramp from the TSG-170A.

c. Set the 1480 to view the Luminance Ramp at a horizontal rate in A-B mode, using a VAC (Voltage Amplitude Calibration Fixture) as the B input.

d. With the VAC, match the top of the ramp luminance level of the lower waveform with the blanking level of the upper waveform.

e. CHECK — that the ramp amplitude is 714.3 mV ±7.14 mV (1%).

9. 5-Step Staircase Linearity

a. Select the 5-Step Staircase signal from the TSG-170A.

b. Set the 1480 to view the 5-Step in differentiated form through the Channel A input at full scale.

c. CHECK — that the difference in relative amplitude of each differentiated step riser (spike) is ≤3.6 mV (0.5 IRE).

10. Pulse-to-Bar Ratio

a. Select Mod Pulse & Bar from the TSG-170A.

b. Set the 1480 to view the Mod Pulse & Bar at a horizontal rate in A-B mode, with a VAC as the B input.

c. CHECK — Use the VAC to check that the inverted pulse is within ±7.14 mV (1%) of the bar amplitude.

11. Group Delay

a. Select Multipulse from the TSG-170A.

b. Set the 1480 to view the bottom of the pulses.

c. CHECK — that the sine-wave-like envelope at the base of the pulses is no more than 3.6 mV p-to-p (0.5 IRE) for the 25T pulse and no more than 7.1 mV p-to-p (1 IRE) for the 12.5T pulse.

12. Check Line Tilt

a. Attach an external NTSC graticule to the 1480, and select Mod Pulse & Bar from the TSG-170A.

b. On the 1480 display, align one end of the bar with the Line Distortion (L.D.) section of the external NTSC graticule.

c. CHECK — Moving the waveform across the L.D. section of the graticule, check that the bar does not tilt by more than ±3.6 mV (0.5 %).

13. Check Field Tilt

a. Select a 100 IRE Flat Field from the TSG-170A, and set the 1480 for a two-field display

b. On the 1480 align one end of the Flat Field with the Line Distortion section of the external NTSC graticule.

c. CHECK — Moving the waveform across the L.D. section of the graticule check that the field tilt is no more than ±3.6 mV (0.5 %).

14. Check Ringing

a. Select the Mod Pulse & Bar signal from the TSG-170A.

b. Set the 1480 to display the 2T pulse at a horizontal rate.

c. CHECK — for a maximum of 7.14 mV (1 IRE) of ringing after the 2T pulse.

15. Diff Phase and Gain

a. Connect test equipment as in Fig. 5-5.

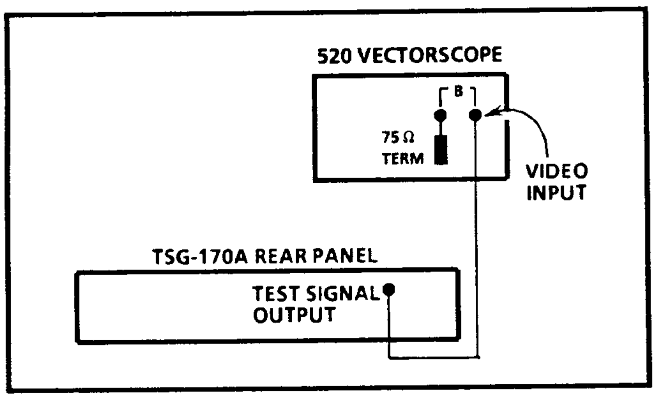


Fig. 5-5. Setup to check TEST SIGNAL output differential gain and phase.

b. Select Mod Ramp from the TSG-170A.

c. Set the 520A to measure differential phase of the channel B input.

d. CHECK — for ≤0.3° differential phase on the Calibrated Phase Dial.

e. Set the 520A to measure differential gain.

f. CHECK — that the Diff Gain of the Mod Ramp is ≤0.6% from 0 IRE to 100 IRE.

16. Chrominance-to-Luminance Gain

a. Connect test equipment as in Fig. 5-6.

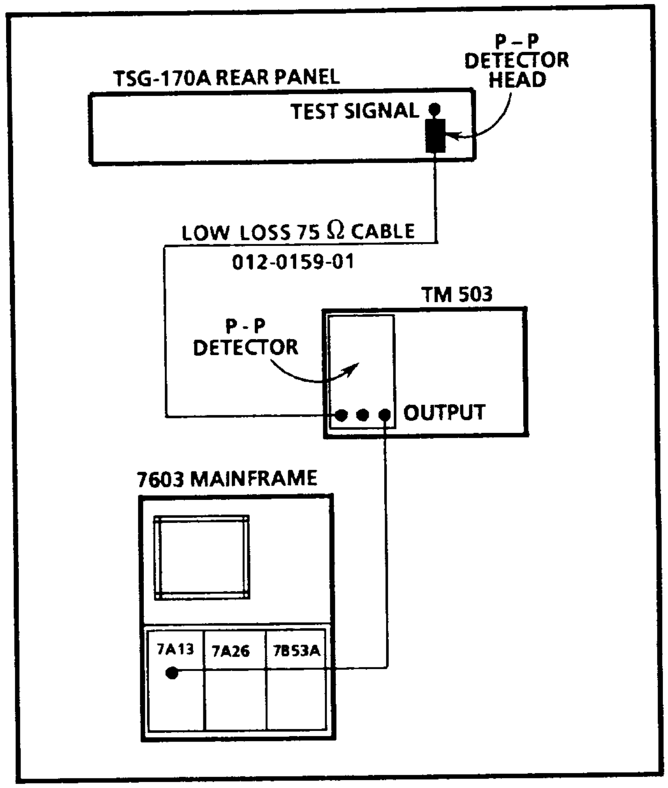


Fig. 5-6. Setup to check TEST SIGNAL output chrominance-to-luminance gain.

b. Select the DAC Test signal from the TSG-170A. (To select DAC Test signal, set switch S407 to 011011 (1=OPEN), power down and up, then cycle through the OTHER SIGNALS button until DAC Test is displayed.)

c. Set the the 7A13 to view a vertical rate signal at 10 mV/Div, then balance the peak-to-peak detector

d. CHECK — on the oscilloscope that the chrominance-to-luminance gain (displayed as a square wave on the scope) is no more than ±1% (±7.14 mV). Typical chrominance-to-luminance gain is ±0.3% (±3.3 mV).

e. Exit Diagnostics mode (close switch 6 of S407, then power down and up).

BLACK BURST OUTPUT

17. Sync Amplitude

a. Connect test equipment as in Fig. 5-7, and set the VAC output to 285.7 mV.

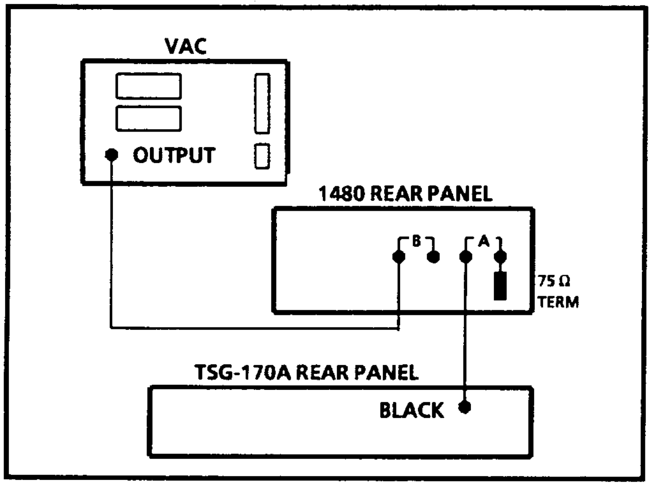


Fig. 5-7. Setup to check BLACK (Black Burst) output.

b. CHECK — With the 1480 in subtraction mode, check for sync amplitudes of 285.7 mV (0 IRE) ±1%.

18. Setup

a. Set the VAC output to 53.6 mV (0.0 mV for Opt 1J, Opt 2J).

b. CHECK — that the setup amplitude is 53.6 mV ±7.1 mV (0.0 mV ±7.1 mV for Opt 1J, Opt 2J).

19. Burst Amplitude

a. Set the VAC output to 285.7 mV.

b. CHECK -- for a burst amplitude of 285.7 mV ±2%.

20. Alternate Black Burst Output

a. Connect the TSG-170A FRAME/BLACK output to the 1480 Ch A loop-through and terminate the loop-through with 75Ω.

b. Move P965 to cover pins 1 & 2.

c. CHECK — the sync, burst, and setup amplitudes using the method in Steps 19, 20, and 21.

SUBCARRIER OUTPUT

21. Free-Running Frequency

NOTE

After initial shipment or long storage, allow a two-hour warm up to re-age the crystal. Thereafter, 10 to 20 minutes warm up is sufficient.

a. Connect the TSG-170A SUBCARRIER Output to channel A of a DC503 counter. Connect a clock reference, such as WWV, to the DC503 channel B input.

b. Set the DC503 to count a subcarrier rate frequency.

c. CHECK — that the TSG-170A subcarrier frequency is within ±1 Hz of 3.579545 MHz.

22. Amplitude and Distortion

a. Connect the TSG-170A SUBCARRIER output to the test oscilloscope 7A13 module through a 75Ω terminator.

b. Set the oscilloscope to display the subcarrier at full bandwidth.

c. CHECK — for 2 volts (±0.2 V) peak-to-peak amplitude and check, by visual inspection, that the sine wave is undistorted.

23. Alternate Subcarrier Output

a. Move jumper P967 to 1-2 position to select subcarrier from the BURST FLAG/SUBC output.

b. Connect BLACK FLAG/SUBC output to the 7A13 through a 75Ω terminator.

c. CHECK — Amplitude and distortion of the Subcarrier waveform as in Step 22.

PULSE OUTPUTS (AMPLITUDE AND RISE TIMES)

24. Sync Amplitude

a. Connect the TSG-170A as in Fig. 5-8.

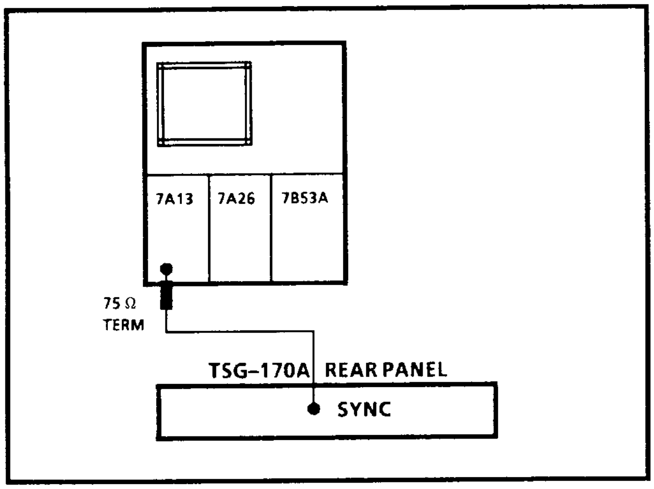


Fig. 5-8. Setup to check SYNC output.

b. Set the oscilloscope to display the TSG-170A SYNC output at a line rate.

c. CHECK — that the amplitude of the SYNC output is -4 V ±200 mV.

25. Rise and Fall Times

a. Set the oscilloscope to display sync transients.

b. CHECK — that the rise and fall times between 10% and 90% is 140 ns ±20 ns.

26. All Other Pulse Outputs

a. CHECK — the amplitudes of all other pulse outputs using the procedures in Step 24. Use the Jumper Table in the **Installation** section as a guide for output jumper selection.

b. CHECK — rise and fall times of all other pulse outputs using the procedures of Step 25.

PULSE OUTPUTS (TIMING)

27. Sync

a. Connect the SYNC output from the TSG-170A to the 7A13 test oscilloscope module through a 75Ω terminator.

b. Set the oscilloscope to display the horizontal sync pulses.

c. CHECK — that the horizontal pulses are 4.7 μs ±0.1 μs.

d. Set the oscilloscope to display the vertical serrations and equalizing pulses.

e. CHECK — that the vertical serrations are 4.7 μs ±0.1 μs and that the equalizing pulses are 2.35 μs ±0.1 μs.

28. Blanking

a. Connect the BLANKING output from the TSG-170A to the 7A13 through a 75Ω terminator.

b. Ensure jumper P680 (Digital board) is on pins 1 & 3.

c. Set the oscilloscope to display the Blanking signal at a horizontal rate.

d. CHECK — that H Blanking is 10.7 μs ±0.1 μs wide from the 50% points.

e. Move P680 (Digital board) to pins 3 & 4.

f. CHECK — H Blanking is 10.5 μs ±0.1 μs wide from the 50% points.

g. Move P680 (Digital board) to pins 2 & 3.

h. CHECK — H Blanking is 10.9 μs ±0.1 μs wide from the 50% points.

i. Set the oscilloscope to display the vertical blanking pulses.

j. Ensure P696 (Digital board) is on jumper pins 2 & 3.

k. CHECK — that Vertical Blanking duration is 20 lines.

l. Move P696 (Digital board) to pins 1 & 2.

m. CHECK — that Vertical Blanking duration is 19 lines.

29. Burst Flag

a. Connect the TSG-170A SYNC output to Channel 1 of the 7A13 through a 75Ω terminator, and connect BURST FLAG output to Channel 2 through a 75Ω terminator.

b. Ensure P967 (Analog board) covers pins 2 & 3.

c. Set the oscilloscope to display the Burst Flag and Sync signals at a horizontal rate.

d. CHECK — that the Burst Flag duration is 2.51 μs ±0.1 μs and that it is delayed from the leading edge of H Sync by 5.3 μs ±0.1 μs.

30. H Drive

a. Connect H DRIVE/SYNC output to Ch 1 of the 7A26 through a 75Ω terminator. Connect the BLANKING output to Channel 2, and connect the TSG-170A SYNC output to the + input of the 7A13.

b. Ensure P385 (Analog board) is on pins 1 & 2.

c. Set the oscilloscope to display the H Blanking, H Drive, and H Sync at a horizontal rate.

d. CHECK — that H Drive goes low at the start of H Blanking and goes high at the end of H Sync within ±0.1 μs.

31. V Drive

a. Disconnect from the oscilloscope all TSG-170A outputs.

b. Connect the TSG-170A V DRIVE/ BLANK output to the 7A13 through a 75Ω terminator.

c. Ensure P765 (Analog board) is on pins 2 & 3.

d. Set the oscilloscope to display the V Drive pulse.

e. CHECK — that V Drive pulse duration is for 9 lines (572 μs).

32. Frame

a. Disconnect the V DRIVE/BLANK output and connect FRAME/BLACK to the 7A13 through a 75Ω terminator.

b. Ensure P680 and P784 (Analog board) are on pins 1 & 2. Ensure P965 (Analog board) is on pins 2 & 3. Ensure P565 (Analog board) is on pins 1 & 2.

c. CHECK — that the Color Frame Square Wave is low for fields 1 and 2 and high for fields 3 and 4. The transition should occur on line 11.

d. Move P565 to pins 2 & 3.

e. CHECK — for a pulse at line 11, field 1 of one-line duration.

RETURN LOSS

33. Genlock Loop-Through

a. Connect test equipment as in Fig. 5-9.

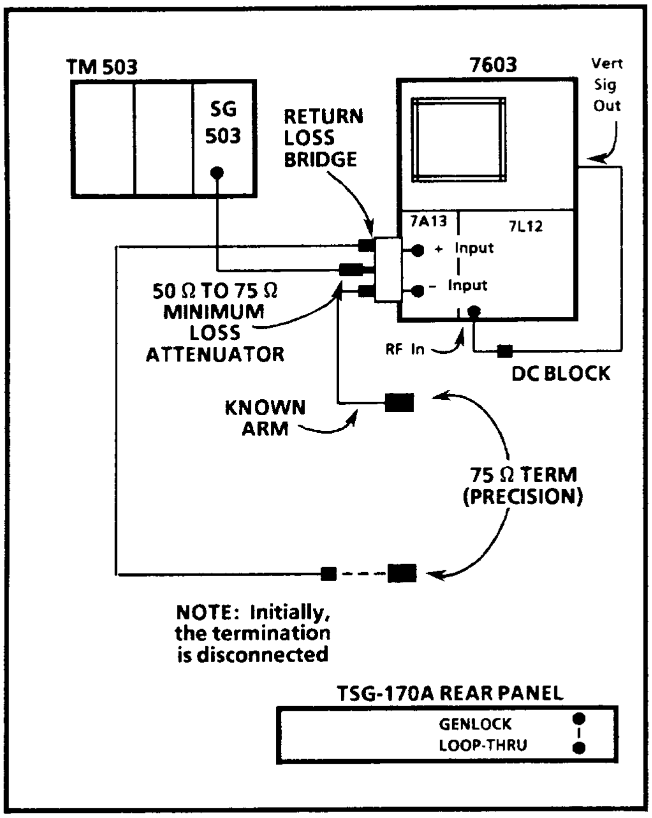


Fig. 5-9. Setup to check Return Loss.

b. Set the following controls:

7A13:

+Input	DC
-Input DC	
BW	Full
Volts/Div	50 mV

7603:

Vert Mode	Right
Trig Source	Left

SG503:

Amplitude	500 mV

7L12:

Freq	0 MHz
Time/Div	5 ms
Ref Level	-20 dB
Display Mode	10 dB/Div.
Gain Selector	CCW
Freq Span/Div	1 MHz
Resolution	300 kHz

c. Set the SG503 to 5 MHz.

d. With both precision terminators connected, adjust the Return Loss Bridge to null the 5 MHz response displayed on the spectrum analyzer.

e. Remove the precision 75Ω terminator from the UNKNOWN cable and connect the terminator to one of the TSG-170A GENLOCK LOOP-THROUGH connectors.

f. Place the peak of the displayed 5 MHz to be at the top line of the graticule by adjusting the spectrum analyzer Vertical Position controls.

g. Connect the UNKNOWN cable to the other TSG-170A GENLOCK LOOP-THROUGH connector.

h. CHECK — that the return loss is >40 dB (4 major divisions) as you vary the SG503 frequency between 5 MHz and 500 kHz.

i. Switch off the TSG-170A power and repeat Step h.

34. Check TEST SIGNAL Output

a. Switch off the TSG-170A and disable its output by moving jumper P355 (Analog board) to the 1-2 position.

b. Connect the UNKNOWN cable to the TEST SIGNAL output and switch on the TSG-170A.

c. CHECK — At the spectrum analyzer, check that the return loss is >36 dB as you vary the SG503 frequency between 5 MHz and 500 kHz.

35. Check BLACK BURST Output

a. Connect the UNKNOWN cable to the BLACK BURST output.

b. CHECK — that the return loss is >36 dB as you vary the SG503 frequency between 5 MHz and 500 kHz.

36. Check PULSE Outputs

Connect the UNKNOWN cable to each of the pulse outputs. For each output, check that the return loss is >30 dB as you vary the SG503 between 5 MHz and 500 kHz.

37. Check SUBCARRIER Output

a. Connect the UNKNOWN cable to the SUBCARRIER output.

b. CHECK — that the return loss is >30 dB as you vary the SG503 frequency between 500 kHz and 5 MHz.

38. Check Bars (Option 1)

a. Move jumper P655 (Option 1 board) to pins 1 & 2 and connect the UNKNOWN cable to the OPT 1 output.

b. CHECK — that the return loss is >36 dB as you vary the SG503 frequency between 5 MHz and 500 kHz.

AUDIO TONE (OPT 1) OUTPUT

39. Total Harmonic Distortion

a. Connect the equipment as in Fig. 5-10, and place a 150Ω or 600Ω resistor (to represent the impedance of your system) across the analyzer + and – terminals.

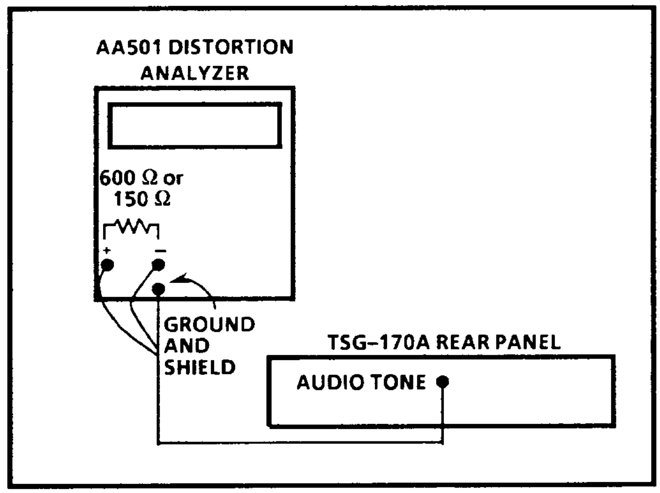


Fig. 5-10. Setup to check THD of AUDIO TONE output (Option 1 board).

b. Set the distortion analyzer to measure THD (Total Harmonic Distortion).

c. CHECK — that the THD is no more than 0.01%.

SHORT FORM CALIBRATION PROCEDURES

OSCILLATOR FREQUENCY

1. Routine Oscillator Frequency Adjustment

   Set to 3.579545 MHz ±0.1 Hz with C387.

2. Oscillator Frequency Adjustment after Crystal Replacement

   Coarse adjust with P382, fine adjust to 3.579545 MHz ±1 Hz with C387.

TEST SIGNAL OUTPUT

3. Blanking Level Adjustment

   Adjust R622 for 0 Vdc ±50 mV.

4. Luminance Gain Adjustment

   Adjust R730 for 714.3 mV ±7.14 mV (1%).

Steps 5 through 9 are interactive and should be repeated until the best overall response is obtained.

5. Frequency Response Adjustment

   Adjust L655, L556, L555, L456, and L455 for flat response.

6. Chrominance-to-Luminance Delay Adjustment

   Adjust L456 and L455 for flat pulse response. 25T: flat ±7.0 mV, 12.5T: flat ±3.5 mV.

7. Chrominance-to-Luminance Gain Adjustment

   With C725, adjust DAC Test signal for flatness of 714.3 mV ±7.14 mV (1%).

8. Burst Amplitude Adjustment

   Adjust C725 for burst amplitude of 285.7 mV ±5.7 mV (2%).

9. Burst Phase Adjustment

   Adjust C635 to match the burst phase of the Test Signal output to the burst phase of the Black Burst output.

BLACK BURST OUTPUT

10. Sync Amplitude Adjustment

    Adjust R853 for sync amplitude of 285.7 mV ±2.86 mV (1%).

11. Burst Amplitude Adjustment

    Adjust C845 for a burst amplitude of 285.7 mV ±5.7 mV (2%).

12. Setup Amplitude Adjustment (S/N B043142 and above)

    Adjust R739 for a setup level of 53.6 mV ±7.1 mV (0.0 mV ±7.1 mV for Opt 1J, Opt 2J).

SUBCARRIER OUTPUT

13. Subcarrier Output Adjustment

    Adjust R784 for subcarrier amplitude of 2 volts p-p ±0.2 V (1%).

OPTION 01 SMPTE BARS OUTPUT

14. Luminance Gain Adjustment

    Adjust R826 for white bar amplitude of 714.3 mV ±7.14 (1%).

15. Frequency Response Adjustment

    Adjust L647, L747, L847, L947, and L930 for flat response from 500 kHz to 5 MHz.

16. Chrominance-to-Luminance Delay Adjustment

    Adjust L647 and L747 for flat pulse response response. 25T: flat ±7.0 mV. 12.5T flat to ±3.5 mV.

17. Chrominance-to-Luminance Gain Adjustment

    Adjust C711 for flatness of 714.3 mV ±7.14 mV (1%). Use DAC Test signal.

18. Burst Amplitude Adjustment

    Adjust C711 for burst amplitude of 285.7 mV ±2%.

19. Genlock Timing and Sync Timing Range (B042879 and above)

OPTION 1 AUDIO OUTPUT

20. BARS (Option 1) Output Phasing

    Adjust C238 to match phasing of OPTION 1 BARS with TEST SIGNAL output.

21. AUDIO TONE Adjustment

    With 150Ω or 600Ω load (to represent your system), adjust R505 to obtain +8 dBm output.

22. Power Supply Adjustment

LONG FORM CALIBRATION PROCEDURES

OSCILLATOR FREQUENCY

NOTE

Before adjusting the oscillator frequency, allow 20 minutes for instrument warm up. Then do the following oven checkout: (1) Check that the Cold Oven LED (next to oven) is off. (2) With P180 in the 2–3 (operating) position, check that the voltage between P180 and ground is no more than 10 mV.

1. Routine Oscillator Frequency Adjustment

a. Connect the equipment as in Fig. 5-11.

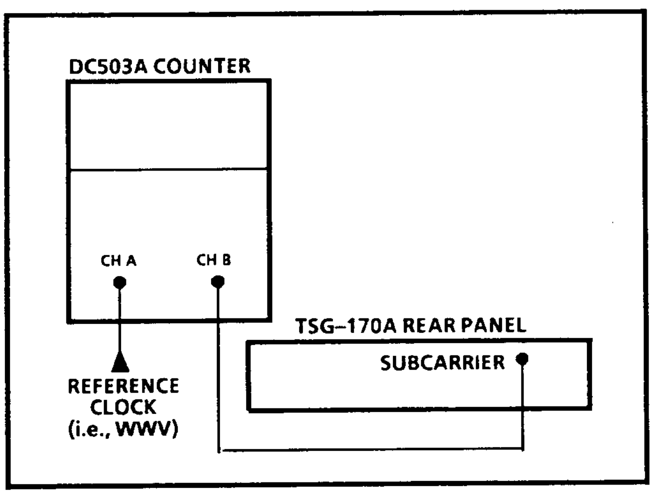


Fig. 5-11. Setup to adjust free-running oscillator frequency.

b. Set the DC503A to count a subcarrier rate frequency.

c. Fine-adjust the crystal frequency with C387 to bring the SUBCARRIER output to within 0.1 Hz of 3.579545 MHz. If C387 does not provide enough adjustment range, use step 2 below.

2. Oscillator Frequency Adjustment after Crystal Replacement

NOTE

Only do this procedure if the crystal has been replaced or if C387 has insufficient adjustment range to bring the crystal frequency within spec.

a. If necessary, do steps a and b of procedure 1 above.

b. Using the visual aid in the jumper table (or in schematic 4), move P382 to each of the four possible jumper positions to obtain the SUBCARRIER output nearest to 3.579545 MHz.

c. Fine-adjust the crystal frequency with C387 to bring the SUBCARRIER output to within 0.1 Hz of 3.579545 MHz.

TEST SIGNAL OUTPUT

3. Blanking Level Adjustment

a. Connect the equipment as in Fig. 5-12.

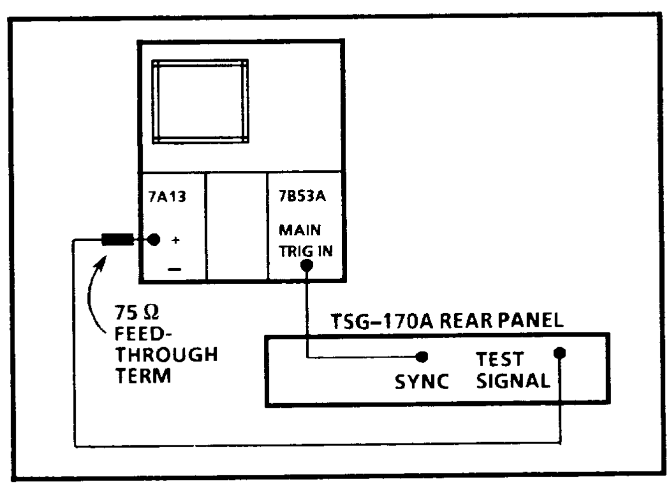


Fig. 5-12. Setup to check blanking level of TEST SIGNAL output.

b. Select Luminance Ramp from the TSG-170A.

c. Set the oscilloscope to display the blanking part of the Ramp at a horizontal rate

d. Set the oscilloscope trace to a ground reference, then adjust R622 on the Analog board for 0 volts ±50 mV blanking level.

4. **Luminance Gain Adjustment**

a. With Luminance Ramp selected at the TSG-170A, connect the equipment as in Fig. 5-13.

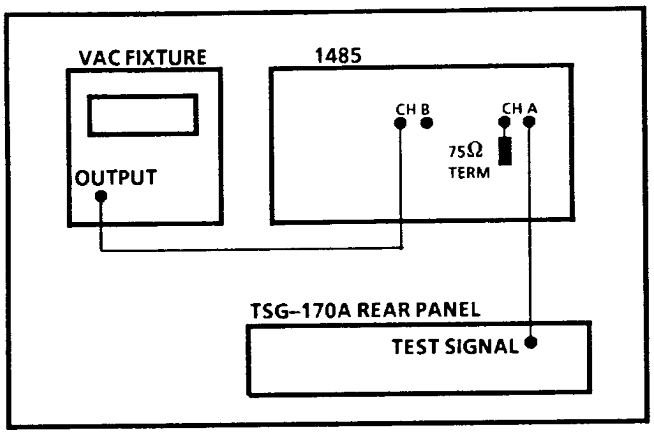


Fig. 5-13. Setup to adjust luminance gain.

b. Set the VAC to 714.3 mV and set the 1480 to view Luminance Ramp at a horizontal rate in A-B mode.

c. Adjust R730 (Analog board) for 714.3 mV ±7.14 mV (1%) amplitude.

NOTE

The following four adjustments (5, 6, 7, and 8) should be done as a set. Repeat the adjustments in sequence until the best overall response is obtained.

5. **Frequency Response Adjustment**

a. Select the Line Sweep signal from the TSG-170A TEST SIGNAL output. (To select Line Sweep, set switch S407 to 011011 (1=open), power down and up, then cycle through the OTHER SIGNALS front-panel switch until Line Sweep is displayed.)

b. Set the 1480 to display Line Sweep at a horizontal rate in A-B mode.

c. Adjust L655, L556, L555, L456, and L455 so that the displayed line sweep is as flat as possible. (Line Sweep goes from 500 kHz to 5 MHz.)

6. **Chrominance - to - Luminance Delay Adjustment**

a. Select Multipulse from the TSG-170A OTHER SIGNALS switch.

b. Looking at the bottom of the Multipulse waveform, adjust L456 and L455 for as flat as possible response.

c. Check that the bottom of the 25T pulse is flat to ±7.0 mV and that the bottoms of the 12.5T pulses are flat to ±3.5 mV.

7. **Chrominance - to - Luminance Gain Adjustment**

a. Connect the equipment as in Fig. 5-14.

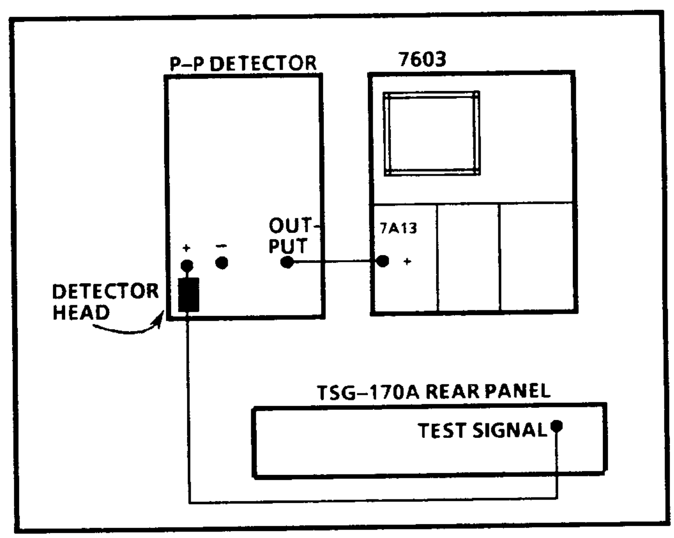


Fig. 5-14. Setup to adjust chrominance-to-luminance gain of TEST SIGNAL output.

b. Select DAC Test signal from the front-panel OTHER SIGNALS button.

c. Set the test oscilloscope to display the DAC Test signal at a vertical rate.

d. If there is significant chrominance-to-luminance gain, the displayed waveform on the oscilloscope looks like a square wave. Adjust C725 (Analog board) to reduce this square wave to a straight line.

e. Check that the square wave amplitude is no more than 7.14 mV.

8. Burst Amplitude Adjustment

a. Connect the equipment as in Fig. 5-13 and select Luminance Ramp from the TSG-170A. (Set bit 6 of S407 to OPEN then power down and up.)

b. Set the VAC to 285.7 mV, and set the 1480 to view the burst portion of Luminance Ramp at a horizontal rate in A-B mode.

c. Adjust C725 to bring the burst amplitude to 285.7 mV ±5.7 mV (2%).

9. Burst Phase Adjustment

a. Connect the equipment as shown in Fig. 5-15 and select the Line Sweep signal as the TEST SIGNAL output of the TSG-170A.

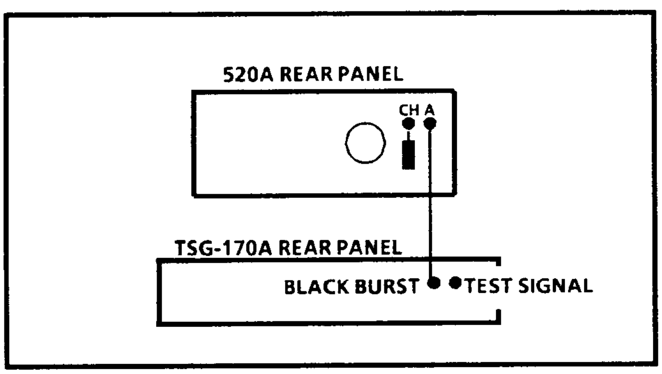


Fig. 5-15. Setup to adjust burst phase of TEST SIGNAL output.

b. Adjust the Vectorscope Ch A gain and phase controls to set the burst vector of the Black Burst signal to the compass rose at exactly 180°. DO NOT MOVE the vectorscope Ch A phase control for the remainder of this step.

c. Move the cable from the TSG-170A BLACK BURST output to the TEST SIGNAL output.

d. Adjust C635 to match the burst phase of the Test Signal output to the burst phase of the Black Burst output.

Steps 5 through 9 are interactive and should be repeated until the best overall response is obtained.

BLACK BURST OUTPUT

10. Sync Amplitude Adjustment

a. Connect the equipment as in Fig. 5-16.

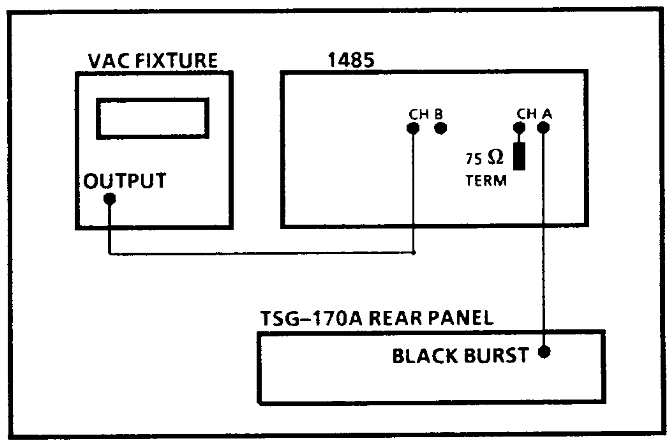


Fig. 5-16. Setup to adjust sync amplitude of BLACK BURST output.

b. Set the 1480 to display blanking at a line rate in A-B mode, and set the VAC to 285.7 mV.

c. Adjust R853 on the Analog board for a sync amplitude of 285.7 mV ±2.86 mV (1%).

11. Burst Amplitude Adjustment

Adjust C845 for a burst amplitude of 285.7 mV ± 5.7 V (2%).

12. Setup Amplitude Adjustment (S/N B043142 and above)

a. Set the VAC to 53.6 mV (0.0 mV for Opt 1J, Opt 2J).

b. Adjust R739 for a setup level of 53.6 mV ±7.1 mV (0.0 mV ±7.1 mV for Opt 1J, Opt 2J).

SUBCARRIER OUTPUT

13. Subcarrier Amplitude Adjustment

a. Connect the equipment as in Fig. 5-17.

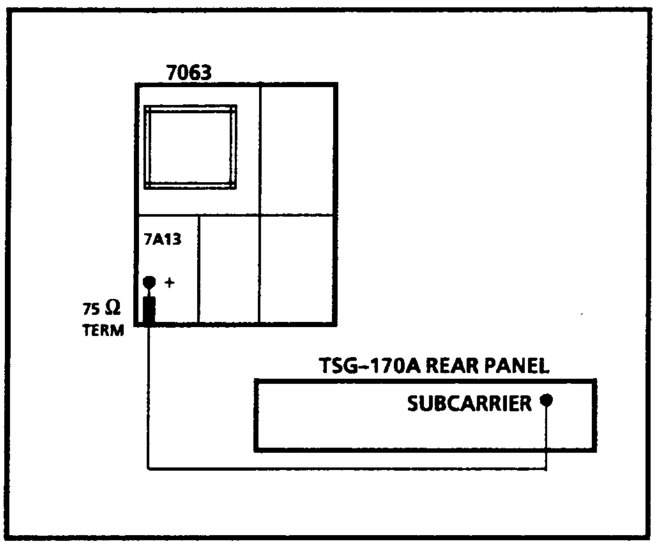


Fig. 5-17. Setup to adjust SUBCARRIER output.

b. Set the oscilloscope to display the subcarrier at full bandwidth.

c. Adjust R784 for 2 volts p-p ±0.2 V (1%) and check that the sine wave is undistorted.

OPTION 1 SMPTE BARS OUTPUT

14. Luminance Gain Adjustment

a. Connect the equipment as in Fig. 5-18.

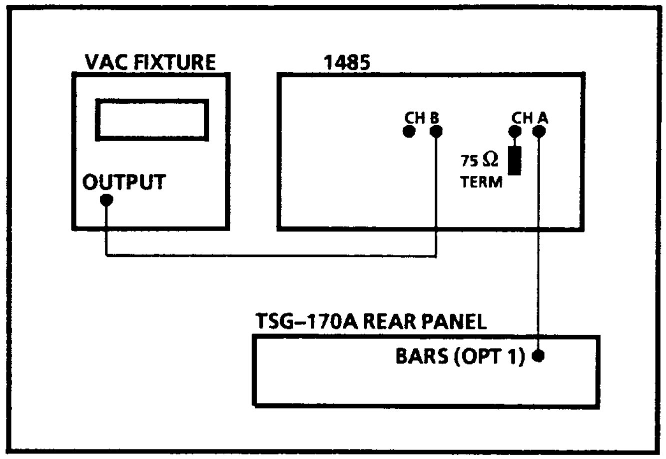


Fig. 5-18. Setup to adjust luminance gain of OPTION 1 output.

b. Set the following controls:

1480	
Input	A-B
Volts Full Scale	0.2
Magnifier	Off
Display	10 µs
VAC	
Output	714.3 mV

c. Using the 100 IRE white bar, adjust R826 (Option 1 board) for 714.3 mV ±7.14 (1%).

NOTE

The following four adjustments (15, 16, 17, and 18) should be done as a set. Repeat the adjustments in sequence until the best overall response is obtained.

15. Frequency Response Adjustment

a. Remove J355 on the Analog board and J655 on the Option 1 board.

b. Connect a shielded test cable from pins 1 & 3 of J355 to pins 1 & 2 of J655. (Pin 1 is ground for both jumpers.)

1485	
Volts Full Scale	1.0
Display	X5
Input	A-B

c. Set the following controls:

d. Select the Line Sweep signal from the TSG-170A TEST SIGNAL output. (To select Line Sweep, set switch S407 to 011011 (1=open), power down and up, then cycle through the OTHER SIGNALS front-panel switch until Line Sweep is displayed.)

e. Adjust L647, L747, L847, L947, and L930 so that the displayed line sweep is as flat as possible. (Line Sweep goes from 500 kHz to 5 MHz.)

16. Chrominance - to - Luminance Delay Adjustment

a. Select Multipulse from the TSG-170A OTHER SIGNALS switch.

b. Looking at the bottom of the Multipulse waveform, adjust L647 and L747 for as flat as possible response.

c. Check that the bottom of the 25T pulse is flat to ±7.0 mV and that the bottoms of the 12.5T pulses are flat to ±3.5 mV.

17. Chrominance - to - Luminance Gain Adjustment

a. Connect the equipment as in Fig. 5-19.

b. Set the following controls:

7A13	
+Input	DC
-Input	VC
Comparison Voltage	–
Volts/Div	5 mV

c. Select DAC Test signal from the front-panel OTHER SIGNALS button.

d. If there is significant chrominance-to-luminance gain, the displayed waveform on the oscilloscope looks like a square wave. Adjust C711 to reduce this square wave to a straight line.

e. Check that the square wave amplitude is no more than 7.14 mV (about 3 mV is typical).

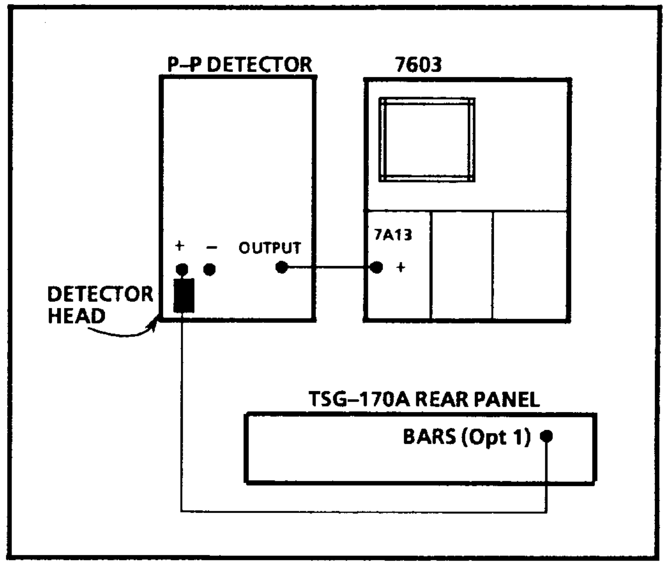


Fig. 5-19. Setup to adjust chrominance-to-luminance gain.

18. Burst Amplitude Adjustment

a. Connect the equipment as shown in Fig. 5-18.

b. Set the 1480 waveform monitor to display burst at a line rate in A-B mode, and set the VAC to 285.7 mV.

c. If necessary, adjust C711 to bring the burst amplitude to 285.7 mV ±5.7 mV (2%).

d. Repeat steps 15, 16, 17, and 18 until you obtain the best overall response.

19. Genlock Timing and Sync Timing Range (B042879 and above)

a. Connect the test equipment as in Fig. 5-20. Set R469 on the A2-1 board to midrange.

b. Set the oscilloscope to display both the TSG-170A MOD RAMP output and the Black Burst Genlock Source at a horizontal rate. Use Channel 1 as the trigger source.

c. At the TSG-170A front panel, advance and delay the TEST SIGNAL output as far as it will go (with the COARSE GENLOCK TIMING buttons) in either direction.

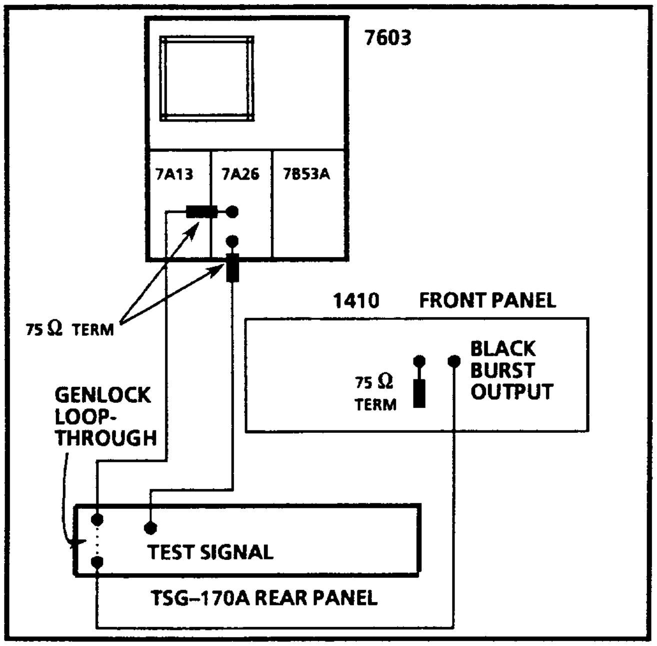


Fig. 5-20 (B042879 and above). Setup to test Genlock and Sync timing range.

d. CHECK – that the test signal advances and delays at least 8 μs with respect to the reference (Black Burst) signal.

e. Move the cable from the TSG-170A TEST SIGNAL output to the TSG-170A SYNC output.

f. Move the cable from the top TSG-170A GENLOCK loop-through to the TSG-170A TEST SIGNAL output.

g. Terminate the upper TSG-170A GENLOCK loop-through in 75Ω.

h. At the TSG-170A front panel, advance the SYNC output as far as it will go, using the FINE SYNC ADVANCE button. Set the sync pulse leading edge to a convenient reference point on the oscilloscope.

i. At the TSG-170A front panel, delay the SYNC output as far as it will go, using the FINE SYNC DELAY button.

i. CHECK – that the sync pulse leading edge has moved more than 40 ns from the reference position set in part h of this step.

NOTE

Selectable resistors (R475 and/or R481) may be removed to obtain >40 ns range of the FINE SYNC ADVANCE and DELAY.

i. CHECK – that the SYNC output advances and delays at least 4 μs relative to the TEST SIGNAL output, using the COARSE SYNC ADVANCE and DELAY buttons.

OPTION 1 AUDIO OUTPUT

20. BARS (OPTION 1) Output Phasing

a. Connect the equipment as in Fig. 5-21 and select color bars at the front panel.

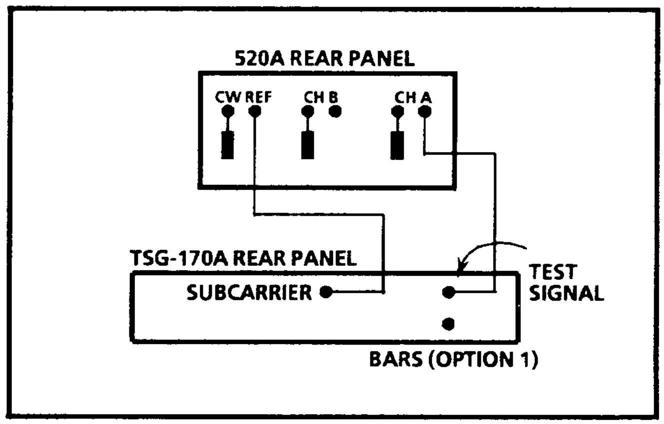


Fig. 5-21. Setup to test BARS (OPTION 1) output phasing.

b. With the vectorscope in Vector mode, adjust channel A gain and phase to set burst of the TEST SIGNAL output to extend to the graticule circle with an angle of exactly 180°.

c. Disconnect the cable attached to the TEST SIGNAL output and connect it to the BARS (OPTION 1) output.

d. Adjust C238 to bring the burst of BARS (OPTION 1) output to 180°.

21. Audio Tone Adjustment

a. Connect the equipment as in Fig. 5-22.

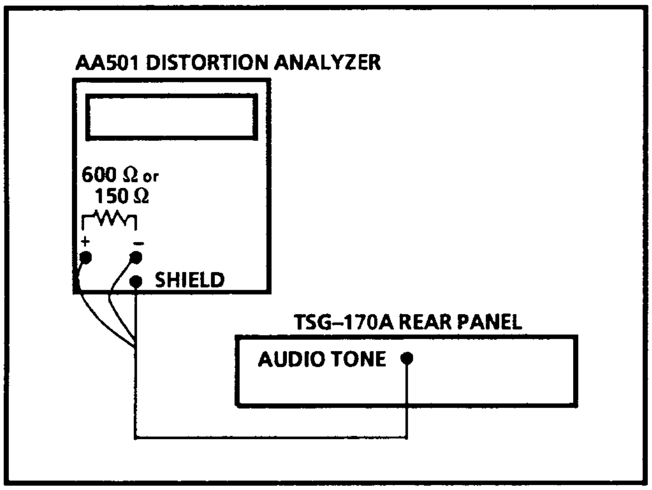


Fig. 5-22. Setup to adjust level of AUDIO output of Option 1 board.

b. Set the following controls:

AA501	
Input Level Range	Auto range
dBm Switch	In
Level Switch	In
All Filter Switches	Out

c. Attach a load resistor (either 150Ω or 600Ω, to represent the load of your system) across the AA501 Audio Input pins.

d. Adjust R505 to obtain the desired dB output. (Factory setting is +8 dBm.)

22. Power Supply Adjustment

a. Apply power to the TSG-170A through the Variable Autotransformer, and set it to apply 90 V as the input voltage. Set R415 (current limit) 1/4 turn from its counterclockwise limit.

b. CHECK/ADJUST – for +5 V ±100 mV at the +5 V test point on the power board. Use R510 to adjust it, if necessary. Set R415 (current limit) to its clockwise limit.

c. CHECK – to see if the LED (DS670) is flashing or not. If the LED is flashing, then the supply is current limiting. If the LED is not flashing, go to part e.

d. ADJUST – R415 slowly counterclockwise until the supply stops current limiting (the LED stops flashing).

e. ADJUST – R415 counterclockwise 1/4 turn from the point where the LED stops flashing.

f. CHECK – that the +5 V test point is still at +5 V ±100 mV.

Theory of Operation

SECTION 6
THEORY OF OPERATION

INTRODUCTION

Two parts make up the Theory of Operation. First is the Block Diagram Overview that describes the architecture of the TSG-170A in function blocks. Second are the Circuit Descriptions. These describe the 13 schematic diagrams that make up the function blocks.

CAUTION

Be sure the circuit descriptions and schematics you use in this section match your instrument's serial number. Where necessary, schematics and circuit descriptions have serial number labels.

BLOCK DIAGRAM OVERVIEW

This overview divides the TSG-170A into five sections: Input Processing, Genlock Loop, Signal Generation, Output Processing, and Power Supply. Following these is the Option 1 board. Refer to the Block Diagram in Section 9 when reading the description of these sections.

INPUT PROCESSING

To prepare the input reference (Genlock Input) signal for ADC sampling, the Input Processing circuit inverts it, clamps its sync tips to -50 mV, and filters it. The Sync Separator extracts composite sync from the Genlock Input signal, then supplies it to the Input Clamp and the Memory Controller (in the Genlock Loop). Both these circuits use it as a timing reference. The processed Genlock Input signal is passed to the Genlock Loop, where it is continuously sampled by the ADC.

GENLOCK LOOP

The Genlock Loop locks the TSG-170A outputs to the Genlock Input signal. It does this by generating two signals (CLK1 and FLD REF) that control the timing of the Signal Generation circuits. CLK1 is the 4Xsubcarrier system clock, and FLD REF (field reference) is a field-timing reference signal from which the Signal Generation circuits derive vertical and horizontal timing when the instrument is genlocked to composite video. (For block diagrams of the Genlock Loop, see Fig. 6-1 and the Genlock Loop block in the Block Diagram in Section 9.)

The TSG-170A accepts two types of Genlock Input signals: composite video (color or monochrome) and continuous-wave reference. After appropriate jumpers have been set in the Input Processing circuits, the Genlock Loop detects the type of Genlock Input signal being inserted. It responds by switching to a different mode of operation to handle the detected signal.

When a composite video signal (color or monochrome) is inserted, the Genlock Loop puts out both the system clock (CLK1) and the field timing signal (FLD REF) to the Signal Generation circuits. When a sine-wave reference is inserted, or when no signal is inserted, the Genlock Loop puts out only the system clock (CLK1).

Locking to Composite Video

To lock to composite video, the Genlock circuit finds the sync and burst portion of the incoming composite video signal (called the sync and burst window) and stores it in the Sample RAM every line. With this data, the μP calculates sync timing and burst phase. From this, it can lock to sync and burst, as described below.

Locking to Sync — Initially, the Genlock Loop acquires horizontal sync by locking its Line Counter in the Address Control circuits directly to incoming sync. This allows the μP to sample the sync and burst window to find vertical sync. Once it has found vertical sync, the Genlock Loop obtains a more accurate horizontal sync lock as follows: First, the μP switches the Line Counter to internal timing, and synchronizes the Line Counter timing with incoming sync timing as calculated from the window data. Since internal timing has less jitter than incoming sync, it provides a more accurate reference.

Once the Address Control is set to internal timing, the μP begins locking the VCO to either incoming burst or sync samples, depending on whether the incoming composite video signal has burst or is monochrome.

Locking to Burst — When the Genlock Input is composite video with burst, the μP uses burst samples contained in the sync-and-burst window to lock the VCO to incoming burst.

Because the ADC is clocked by the VCO, samples of incoming burst indicate VCO phase in relation to incoming burst phase. The μP extracts the burst-to-VCO phase information and uses it to generate a VCO correction word that the Genlock DAC converts to a voltage. An integrated version of this voltage keeps the VCO and its CLK1 output phase-locked to incoming burst by shifting the VCO frequency.

Once the VCO is burst locked, the μP calculates the timing for line 10 of field 3 and indicates this timing with a pulse to the Address Decoder. The Address Decoder gates this pulse with the 50% point of horizontal sync to generate the FLD REF signal.

When the Genlock Input is monochrome composite video, the μP uses incoming sync samples to calculate VCO phase relative to incoming sync. It then generates a correction word to shift VCO frequency (which shifts phase) accordingly. Thus, the VCO output (CLK1) is locked to incoming sync.

Fine Genlock Timing — Adjustment of fine genlock timing is done inside the Genlock Loop. When fine genlock timing is adjusted at the front panel, the μP adds an offset to its VCO correction word to shift VCO phase in the desired direction. This results in new ADC sample timing, and consequently, new sample values. When analyzing the new values, the μP takes into account the timing offset. Hence, it does not attempt to "correct" its own offset.

Locking to a Continuous Wave Reference

To lock to a continuous wave reference, the Genlock Input block samples the sync and burst window at a line rate in the same manner as for composite video reference. Except, of course, the window is no longer synchronized with sync, and it contains a continuous sine wave without sync.

The continuous wave reference is sampled by the ADC, stored in the Sample RAM, and then used by the μP to calculate correct VCO phase. When locked to a continuous wave, the Genlock circuit still generates the system clock (CLK1), but not the FLD REF signal. FLD REF is not needed since the sine-wave reference signal has no fields to which the TSG-170A must lock.

SIGNAL GENERATION

The Signal Generation section puts out two separately timed sets of signals: one set contains sync pulse signals and subcarrier, the other contains the selected test signal and black burst. All the signals are locked to the Genlock Input signal, but an additional timing offset (advance or delay) can be added to the sync pulse and subcarrier signals with respect to the test and black burst signals. The circuits that generate these signals are described below.

Test Signal Generation

The main job of the Test Signal Generation circuitry is to produce one of 18 selectable test signals. It does this by using two genlocked timing signals (CLK1 and FLD REF) plus delay information from the μP to drive its signal-selection and timing circuits. These circuits control the Test Signal PROMs, which generate the signals. The circuit blocks that generate the timing and signal selection are the Genlock Timing Offset, the H Timing Counter, the Vertical Counter, the H and V Timing PROMs, and the Signal Selector.

The Genlock Timing Offset is controlled by the μP. When coarse genlock timing is adjusted at the front panel, the Genlock Timing Offset shifts the timing of the H and V Counters, thus shifting the timing of the whole Test Signal Generation circuitry by up to $\pm 8\,\mu$s.

The H Timing Counters provide timing to the Test Signal PROMs by addressing the horizontal components of the selected signal. The V Counter provides vertical timing to the V Timing PROM, which in turn provides vertical timing to the Signal Selector.

Signal selection is updated during the vertical interval. The μP sends out a selection code that, combined with V Timing PROM outputs, tells the Signal Selector which signal to select and when to select it. The V Timing PROM also tells the selector which elements of the signal to select. The V Pulse PROM tells the selector when to select vertical sync.

The signals selected at the Test Signal PROMs are converted to analog by the Test Signal DAC, then low-pass filtered and buffered.

Black Burst Generation

Black burst is generated by switching the currently-selected test signal to setup level during active video and then switching back to the sync and burst portion of the test signal during sync and burst time.

Sync Pulse Generation

The main job of the Sync Pulse Generation section is to produce correctly timed sync pulse signals. It does this by using the two genlock signals (CLK1 and FLD REF) plus delay information from the μP to generate timing for its H and V Pulse PROMs. The output of these PROMs make up the sync pulse signals sent to the Analog board. The circuit blocks that generate timing for the H and V Sync Pulse PROMs are the Sync Phase Shifter and DAC, H Pulse Counter, and V Pulse Latch.

Controlled by the μP, the Sync Phase Shifter adds fine sync-timing offsets to the Sync Pulse Generation circuits. When fine sync timing is adjusted at the front panel, the μP shifts the phase of the CLK1 signal to produce three phase-shifted clocks (CLK2ϕ, CLK3ϕ, and CLK4). These shifted clocks drive the Sync Pulse Generation circuit blocks.

The H Pulse Counter, which derives its timing from the H Timing PROM, divides CLK4 by 910 to address the horizontal sync pulse components in the H Pulse PROM. The coarse sync timing offset selected at the front panel is added to the H Pulse PROM through this counter. The μP adds this offset by changing the counter's reset count.

The Vertical Counter generates vertical timing for the V Pulse PROM. However, the Vertical Counter does not have the sync timing offset, so the H Pulse PROM aligns the timing of the V Pulse PROM outputs with its own timing by controlling the timing of the V Pulse Latch. To permit both advance and delay of the vertical sync pulses, the V Pulse PROM outputs are programmed to be advanced relative to the H Pulse PROM outputs.

Subcarrier Generation

With its timing generated by CLK4, the Subcarrier Counter has the same timing as the sync pulse outputs. When sync pulse timing is adjusted at the front panel, this counter is reset in the same manner as the H Pulse Counter described above.

OUTPUT PROCESSING

Pulse and Subcarrier Output

The combined functions of the Pulse Output circuits are to convert the TTL level outputs from the Pulse Output Logic to standard TV levels and to supply the necessary power to drive the 75Ω load.

The Subcarrier Output circuit converts the square-wave subcarrier signal to a sinusiodal wave.

Test Signal and Black Burst Output

The Test Signal Output converts the digital signal outputs to analog, filters the analog signal to remove out-of-band components, provides the signal with the correct power and amplitude levels, and boosts the high end of the signal frequency to compensate for sinx/x roll-off.

POWER SUPPLY

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

OPTION 1

Color Bars and ID Character Generation

Option 1 generates SMPTE Bars, with which 12-character identification can be combined. The SMPTE Bars are continuously available at the BARS (OPT 1) output of the rear panel. But the character ID can be switched off to allow only SMPTE Bars to be displayed. Timing information from the Signal Generation circuits controls the Option 1 circuits.

Audio Tone Generation

The Audio Generation block produces a 449.5 kHz sine wave, horizontally and vertically locked to the test signal output. To make the sine wave identifiable, the Click Generator inserts on the sine wave a "click." This click repeats at an adjustable rate, from 0.2 Hz to 4 Hz.

FRONT PANEL INTERFACE CIRCUIT DESCRIPTION (Schematic 1)

The five main functions of the Front-Panel I/O circuitry are (1) to transfer user selections to the μP, (2) to transfer signal timing offset data from the μP to the Digital board, (3) to transfer diagnostic switch data to the μP, (4) to transfer remote control data to the μP, and (5) to transfer operating status and diagnostic data from the μP to the front-panel LEDs. Each of these is described below.

Front-Panel Selection

Decoder U307 converts the front-panel data selected by the 13 click dome switches (S129-S176) into a 4-bit word and applies it to buffer U311. During the vertical interval, the μP checks the front panel by enabling $\overline{\text{KEYBOARD}}$. This loads the 4-bit word onto the data bus. To determine if a new selection has been made at the front panel, the μP checks for a high level on the ED5 line. The Data Available output (pin 13, U307) pulls this line high for about 20 ms whenever a new front-panel selection is made.

In the 2-3 position, jumper P210 disables any attempts to change signal timing through the front panel. In the 1-2 position, the jumper allows normal front-panel operation.

When the Option 1 board is inserted, pin 8 of U311 is pulled low, indicating the presence of Option 1 to the μP.

Timing Offset Latches

The μP sends the coarse user-selectable timing offsets to the Signal Generation circuits through two latches (U459 and U767). Through U459 the μP sends the coarse genlock timing offset to the Genlock Timing Offset circuit (Schematic 5). Through U767 the μP sends the coarse sync timing offset to the H Pulse Counter (Schematic 5) and the Subcarrier Counter (Schematic 5), and sends the LSB (ϕFLIP) of this offset to the Phase Shifter (Schematic 4).

Diagnostic Switches

Through the Diagnostic switches (S407) the user selects the diagnostic routines. Immediately after the μP is reset, it checks the diagnostic switch buffer (U412), by asserting $\overline{\text{DIAG PORT}}$, and performs the selected diagnostic routine(s). When all switches are open, the instrument is in normal operation; that is, no diagnostics are selected. Refer to **Diagnostics** in the **Maintenance** section for a full description of the diagnostic routines.

Remote Control Port

The remote control and front panel can both operate simultaneously, but the remote control has priority. That is, during the vertical interval, the μP first checks the remote control buffers (U848 and U851) and then the front-panel buffer (U311). But if a new selection has been made at the remote control since the previous vertical interval, the μP executes the new selection and does not check for front-panel input.

Front Panel LEDs and LED Latches

The 19 front-panel LEDs are all controlled by the μP through three latches (U303, U218, and U314). The μP enables these latches with the $\overline{\text{LED0}}$, $\overline{\text{LED1}}$, and $\overline{\text{LED2}}$ signals. Note that U314 also puts out four additional signals: $\overline{\text{CHAR EN}}$, CONTROL1, $\overline{\text{INT}}$/GENLOCK, and $\overline{\text{HOLD}}$/ACQUIRE. $\overline{\text{CHAR EN}}$ switches on the ID characters in the Option 1 board. CONTROL1 switches off Option 1 bars and tone to provide a black background for the Tape Leader countdown. $\overline{\text{INT}}$/GENLOCK forces the Genlock Loop to either free run or lock to the Genlock Input signal. $\overline{\text{HOLD}}$/ACQUIRE controls the loop response of the Genlock Loop.

MICROPROCESSOR (μP) KERNEL CIRCUIT DESCRIPTION (Schematic 2) [Serial # B010000 to B010317]

This section breifly describes the functions of the μP Kernel and describes the components that make up the Kernel. For a description of the diagnostics executed by the μP, refer to the Maintenance section.

THE KERNEL

The μP Kernel has four main functions: to acquire and maintain genlock with the incoming reference signal, to service the front panel, to set the genlock and sync pulse timing offsets in the Signal Generation circuitry, and to execute diagnostics. The components of the Kernel are described as follows.

Microprocessor

The μP (U239) is the heart of the Kernel. Receiving its program instructions from the EPROM, the μP controls the Kernel through its address lines (A0-A15), its data lines (D0-D7), and its various control lines.

The clock that drives the μP is derived from CLK1. PAL U429 divides this clock by 5 and multiplies it by 2 to obtain a 5.727 MHz clock, called μPCLK, for the μP and the CTCs. U332B, U332C, and Q235 waveshape μPCLK and apply it to the μP.

Another function of PAL U429 is to prevent burst dither timing from occurring during the vertical interval. It does this by gating $\overline{\text{B DITHER}}$ with $\overline{\text{LV DRIVE}}$.

When the instrument is being powered up, the $\overline{\text{POWER RESET}}$ pulse from the Power Supply resets the μP through gates U222C and D. This sets all the address lines to zero. Note that pin 9 of U222C can be grounded (by placing jumper plug P122 in the 1-2 position) to manually reset the μP.

If the μP is not sending correct addressing and data to the two CTCs (U132 and U127), the CTCs put out a SOFT RESET pulse that reinitializes the μP through U871D.

Kernel Memory

EPROM (U245) and RAM (U152) — EPROM U245 contains the micro-instructions that control the μP. The addresses allocated to the EPROM are 0-7FFF. RAM U152 stores temporary data such as results of calculations. Its address allocations are 8000-9FFF.

NVRAM (U157) — This is a combined permanent (EEPROM) and temporary (static RAM) memory that stores the front-panel-selected sync and genlock timing offset settings, and also the character ID data for Option 1. The address allocations for this memory device are C000-FFFF.

If a new timing offset is selected at the front panel, the μP loads the new timing data into the RAM portion of the NVRAM during the vertical interval. When the MODE SELECT button is cycled back to the TEST SIGNAL SELECTION mode, the new offset data is permanently stored in the EEPROM part of the NVRAM.

When a new ID character is selected at the front panel, the μP loads the new ID character into NVRAM in the same manner as described for new timing offsets but also loads the character into the Character RAM (Schematic 12).

Immediately following a μP reset (which occurs whenever the instrument is powered up), the μP loads the front-panel data from the EEPROM portion of the NVRAM into the RAM portion. From the RAM portion, it loads the timing offsets (PRESET1) into the H & V Timing circuits (Schematic 5), and loads the character ID data (PRESET1) into the Character RAM (Schematic 12).

NVRAM Save Control

Made up of Q355, U332D, and associated components, the NVRAM Save Control prevents the NVRAM from saving data during power-up and power-down.

During power-up, $\overline{\text{POWER RESET}}$ forces the output of U332D high to pull $\overline{\text{NVRAMSAVE}}$ high.

During power-down, Q355 and associated components ensure that $\overline{\text{NVRAMSAVE}}$ remains high until the power (NVRAMPWR) has dropped to 3 V. Below 3 V, the NVRAM will not save data, regardless of $\overline{\text{NVRAMSAVE}}$.

When power is switched off, C259 and C359 supply current to the $\overline{\text{NVRAMSAVE}}$ line. As these capacitors discharge, they allow Q355 to switch on. This allows C355 to supply current to the NVRAMSAVE line while NVRAMPWR drops below 3 V.

Decoders

I/O Decoder1 (U329B) — Enabled by $\overline{\text{IORQ}}$, this device decodes address lines 4 and 5 to enable the CTCs and the two I/O control lines, $\overline{\text{IO0}}$ and $\overline{\text{IO2}}$. $\overline{\text{IO0}}$ enables I/O Decoder2, $\overline{\text{IO2}}$ enables the Character RAM on the Option 1 board, and the combination of $\overline{\text{IO0}}$ and $\overline{\text{IO2}}$ enables the External Data Transceiver, U420.

I/O Decoder2 (U162) — This chip decodes four address lines (A0-A3) to enable DACs, LEDs, and I/O ports throughout the instrument.

Memory Address Decoder (U351) — Enabled by $\overline{\text{MREQ}}$ from the μP, this chip decodes address lines 13 through 15 into four enable lines, three for the memory devices in the Kernel (EPROM U245, RAM U152, and NVRAM U157) and one for the Sample RAM in Schematic 3.

Sample RAM & Character RAM Address Buffers

Sample RAM Address Buffer (U620) — Enabled by the $\overline{\text{SAMPL RAM EN}}$ signal, this buffer is the port through which the μP addresses the Sample RAM when reading or writing to it. The address range of the Sample RAM is from A000 to BFFF.

Character RAM Address Buffer (U755) — When the μP updates the Character RAM in the Option 1 board, it addresses the RAM through this buffer.

CTCs

CTC0 and CTC1 (U132 and U127) — The two CTCs are configured as programmable event counters. Their job is to count pulse signals generated by the Genlock circuit (S HSYNC, COMP SYNC, S SAMPLE FINISHED, and S START SAMPLE) and indicate to the μP the sequence in which these signals occur. The μP instructs each channel clock to count a specified number of input pulses and to interrupt the μP when it has reached the specified count. In this manner, the μP can determine the sequence in which the genlock signals are occurring.

The CTCs are daisy chained so that CTC0 (U132) has interrupt priority. This means that CLK0 through CLK3 of CTC0 have higher interrupt priority than the CLK0 through CLK3 of CTC1. The signal level at the IEI inputs of the two CTCs determines the priority. When CTC0 is not servicing an interrupt, it pulls the IEI input of CTC1 (U127) high to allow CTC1 to service interrupts.

Data I/O

External Data Transceiver (U420) — Enabled by the IO0 and IO2 signals from I/O Decoder1 (U329B), this transceiver transfers data between the Kernel data bus and circuits outside the Kernel.

Sample RAM Data Transceiver (U416) — Enabled by the $\overline{\text{SAMPL RAM EN}}$ signal from decoder U351, this port sends data to and receives data from the Sample RAM (U611 and U615, Schematic 3). Normally, U416 will be receiving data samples every line.

MICROPROCESSOR (μP) KERNEL CIRCUIT DESCRIPTION (Schematic 2) [Serial # B020318 and up]

This section briefly describes the functions of the μP Kernel and describes the components that make up the Kernel. For a description of the diagnostics executed by the μP, refer to the **Maintenance** section.

THE KERNEL

The μP Kernel has four main functions: to acquire and maintain genlock with the incoming reference signal, to service the front panel, to set the genlock and sync pulse timing offsets in the Signal Generation circuitry, and to execute diagnostics. The components of the Kernel are described as follows.

Microprocessor

The μP (U239) is the heart of the Kernel. Receiving its program instructions from the EPROM, the μP controls the Kernel through its address lines (A0-A15), its data lines (D0-D7), and its various control lines.

The clock that drives the μP is derived from CLK 28 (28 MHz). PAL U429 divides this clock by 5 to obtain a 5.727 MHz clock, called μPCLK, for the μP and the CTCs. U332B, U332C, and Q235 wave-shape μPCLK and apply it to the μP.

PAL U429 has two other functions: It prevents burst dither timing from occurring during the vertical interval by gating $\overline{\text{B DITHER}}$ with $\overline{\text{LV DRIVE}}$. It also resets the μP if either $\overline{\text{POWER RESET}}$, $\overline{\text{MANUAL RESET}}$, or $\overline{\text{HARD RESET}}$ are asserted.

One-shots U222A and U222B control the $\overline{\text{HARD RESET}}$ signal. Retriggerable one-shot U222A receives an $\overline{\text{AWAKE}}$ pulse at least once a field from the μP via decoder U162. This pulse indicates that the μP is going through its routines normally. If the μP gets lost, the $\overline{\text{AWAKE}}$ pulse no longer occurs. If this pulse is absent for four consecutive fields, U222B asserts $\overline{\text{HARD RESET}}$ to reset the μP

In the 2–3 position, test jumper P245 disables $\overline{\text{HARD RESET}}$ by pulling it high.

If the μP is not sending correct addressing and data to the two CTCs (U132 and U127), CTC1 puts out the SOFT RESET pulse that reinitializes the μP through U871D.

Kernel Memory

EPROM (U245) and RAM (U152) — EPROM U245 contains the micro-instructions that control the μP. The addresses allocated to the EPROM are 0-7FFF. RAM U152 stores temporary data such as results of calculations. Its address allocations are 8000-9FFF.

NVRAM (U157) — This is a combined permanent (EEPROM) and temporary (static RAM) memory that stores the front-panel-selected sync and genlock timing offset settings, and also the character ID data for Option 1. The address allocations for this memory device are C000-FFFF.

If a new timing offset is selected at the front panel, the μP loads the new timing data into the RAM portion of the NVRAM during the vertical interval. When the MODE SELECT button is cycled back to the TEST SIGNAL SELECTION mode, the new offset data is permanently stored in the EEPROM part of the NVRAM.

When a new ID character is selected at the front panel, the μP loads the new ID character into NVRAM in the same manner as described for new timing offsets but also loads the character into the Character RAM (Schematic 12).

Immediately following a μP reset (which occurs whenever the instrument is powered up), the μP loads the front-panel data from the EEPROM portion of the NVRAM into the RAM portion. From the RAM portion, it loads the timing offsets (PRESET1) into the H & V Timing circuits (Schematic 5), and loads the character ID data (PRESET1) into the Character RAM (Schematic 12).

NVRAM Save Control

Made up of Q355, U332D, and associated components, the NVRAM Save Control prevents the NVRAM from saving data during power-up and power-down.

During power-up, $\overline{\text{POWER RESET}}$ forces the output of U332D high to pull NVSAVE high.

During power-down, Q355 and associated components ensure that $\overline{\text{NVSAVE}}$ remains high until the power (NVPWR) has dropped to 3 V. Below 3 V, the NVRAM will not save data, regardless of $\overline{\text{NVSAVE}}$.

When power is switched off, C259 and C359 supply current to the $\overline{\text{NVSAVE}}$ line. As these capacitors discharge, they allow Q355 to switch on. This allows C355 to supply current to the $\overline{\text{NVSAVE}}$ line while NVPWR drops below 3 V.

Decoders

I/O Decoder1 (U329B) — Enabled by $\overline{\text{IORQ}}$, this device decodes address lines 4 and 5 to enable the CTCs and the two I/O control lines, $\overline{\text{IO0}}$ and $\overline{\text{IO2}}$. $\overline{\text{IO0}}$ enables I/O Decoder2, $\overline{\text{IO2}}$ enables the Character RAM on the Option 1 board, and the combination of $\overline{\text{IO0}}$ and $\overline{\text{IO2}}$ enables the External Data Transceiver, U420.

I/O Decoder2 (U162) — This chip decodes four address lines (A0-A3) to enable DACs, LEDs, and I/O ports throughout the instrument.

Memory Address Decoder (U351) — Enabled by $\overline{\text{MREQ}}$ from the μP, this chip decodes address lines 13 through 15 into four enable lines, three for the memory devices in the Kernel (EPROM U245, RAM U152, and NVRAM U157) and one for the Sample RAM in Schematic 3.

Sample RAM and Character RAM Address Buffers

Sample RAM Address Buffer (U620) —Enabled by the $\overline{\text{SAMPL RAM EN}}$ signal, this buffer is the port through which the μP addresses the Sample RAM when reading or writing to it. The address range of the Sample RAM is from A000 to BFFF.

Character RAM Address Buffer U755 — When the μP updates the Character RAM in the Option 1 board, it addresses the RAM through this buffer.

CTCs

CTC0 and CTC1 (U132 and U127) — The two CTCs are configured as programmable event counters. Their job is to count pulse signals generated by the Genlock circuit (S HSYNC, COMP SYNC, S SAMPLE FINISHED, and S START SAMPLE) and indicate to the μP the sequence in which these signals occur. The μP instructs each channel clock to count a specified number of input pulses and to interrupt the μP when it has reached the specified count. In this manner, the μP can determine the sequence in which the genlock signals are occurring.

The CTCs are daisy chained so that CTC0 (U132) has interrupt priority. This means that CLK0 through CLK3 of CTC0 have higher interrupt priority than the CLK0 through CLK3 of CTC1. The signal level at the IEI inputs of the two CTCs determines the priority. When CTC0 is not servicing an interrupt, it pulls the IEI input of CTC1 (U127) high to allow CTC1 to service interrupts.

Data I/O

External Data Transceiver (U420) — Enabled by the IO0 and IO2 signals from I/O Decoder1 (U329B), this transceiver transfers data between the Kernel data bus and circuits outside the Kernel.

Sample RAM Data Transceiver (U416) — Enabled by the $\overline{\text{SAMPL RAM EN}}$ signal from decoder U351, this port sends data to and receives data from the Sample RAM (U611 and U615, Schematic 3). Normally, U416 will be receiving data samples every line.

GENLOCK DATA ACQUISITION CONTROLLER CIRCUIT DESCRIPTION (Schematic 3)

Introduction

The Genlock Data Acquisition circuit is the part of the Genlock Loop that acquires samples of the incoming reference signal for the μP to analyze. See Fig. 6-1 for a block diagram of the circuit. For a general description of the Genlock Loop, refer to **Genlock Loop** in the Block Diagram description.

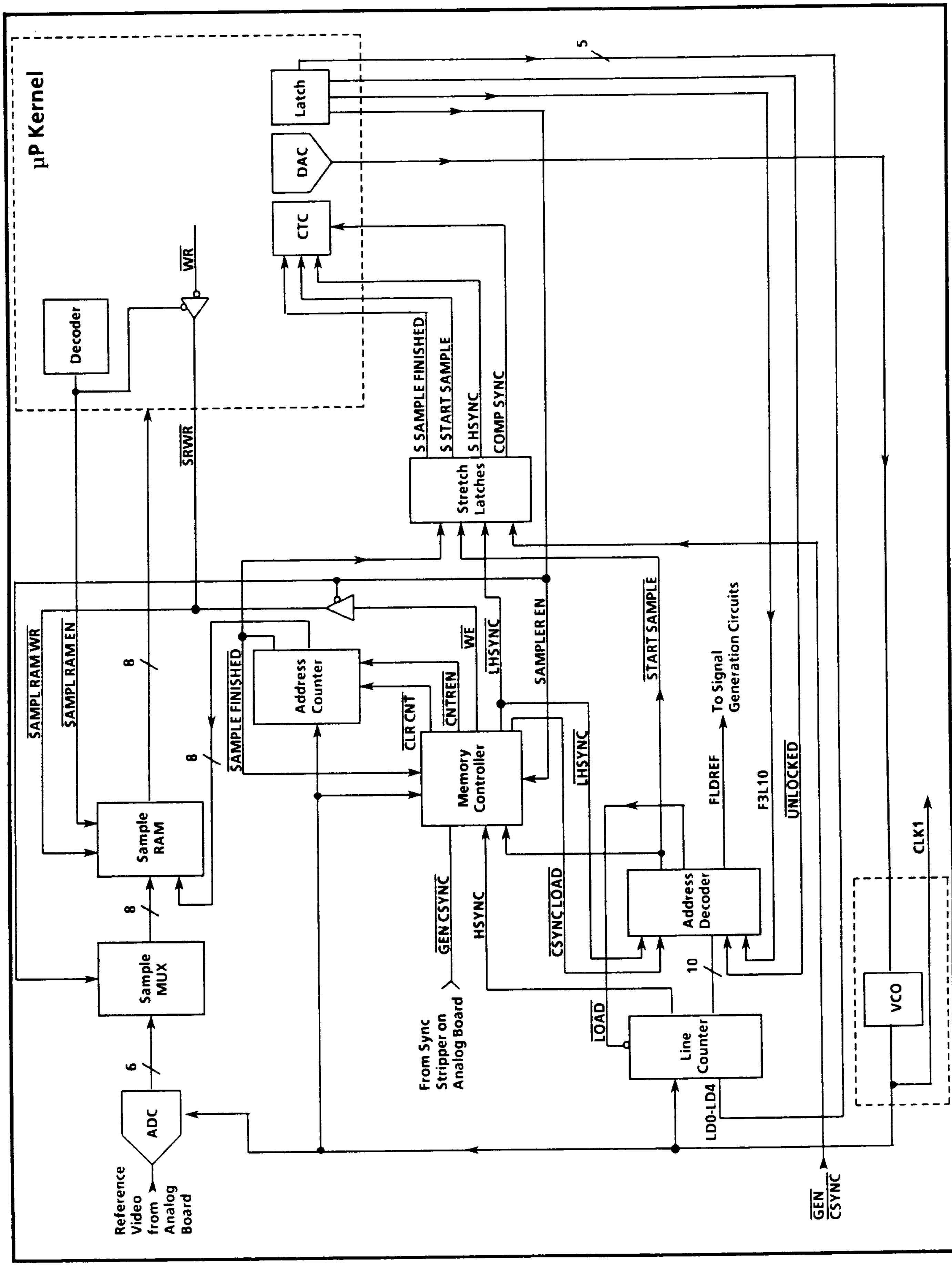


Fig. 6-1. Block diagram of Genlock Data Acquisition Controller circuit.

Input Filter

Made up of C910, C911, C913, and L907, this filter attenuates spectral components above the video band to prevent aliasing of the Genlock Input signal when it is quantized by the ADC.

ADC (Analog-to-Digital Converter)

The ADC (U814) converts the clamped and inverted video signal from the Analog board into 6-bit data. Dither inserted into the signal on the Analog board increases the resolution of the 6-bit data to that obtained from a 10-bit converter. U811 provides a regulated +2.5 V reference that U807 inverts and steps down to provide a precise 1 V reference to the ADC.

Because the ADC is clocked by the VCO (CLK1A), the ADC output indicates the VCO-to-burst phase relationship. During each field, the μP repeatedly checks this phase relationship and, if necessary, shifts the VCO frequency to keep it in phase with incoming burst.

Sample Multiplexer and Sample RAM

The main function of the Sample RAM (U611 and U615) is to store samples of the Genlock Input sync and burst (each sync and burst sample contains 256 sample points). The μP uses these samples to obtain and maintain lock with the Genlock Input.

Both the μP and Memory Controller (U711) control the Sample RAM, but the μP has priority. When the μP needs to analyze the sync and burst samples stored in the Sample RAM, it asserts SAMPLER EN to tristate the WE signal (at U338A) generated by the Memory Controller. The μP then asserts SAMPL RAM EN to enable the RAM output and pulls SAMPL RAM WR high to disable the RAM input.

When the μP is not looking at sync and burst samples, it pulls the SAMPLER EN signal low during the sync window to give control of the Sample RAM to the Memory Controller. With SAMPLER EN low, the Sample Multiplexer (U714 and U717) passes sync and burst data to the Sample RAM. Storage of sync and burst data in the Sample RAM is described under **Memory Controller** in this section.

Each time the μP is reset, it checks the diagnostic port (U412, Schematic 1). If the switches are set for Sample RAM diagnostics, the μP asserts SAMPLER EN and SAMPL RAM WR and loads diagnostic data into the RAM through the Sample Multiplexer, then checks the RAM output by asserting SAMPL RAM EN.

Address Control

Five circuits make up the Address Control: the Line Counter (U603, U703, and U803), the Line Counter Offset Latch (U403), the Address Decoder (U707), the Memory Controller (U711), and the Address Counter (U607). The combined function of these circuits is to provide timing to the Sample RAM such that the RAM's 28th sample (out of 256 sample points) is coincident with the 50% point of horizontal sync.

Line Counter and Address Decoder — By counting 910 positive CLK1B edges every line, the Line Counter generates timing for the Address Control circuits. When the Line Counter reaches the 910th count (1023 or 1111111111), it sends an HSYNC pulse to the Memory Controller. Twenty-eight counts before the HSYNC pulse occurs, the Address Decoder decodes the Line Counter output into the START SAMPLE pulse. During counts 208 (0011010000) through 276 (0100010100), the Address Decoder decodes the Line Counter output into the B DITHER pulse.

To provide correct timing, the Line Counter should be accurately locked to incoming sync. When the instrument is first fired up, or when the μP has lost the position of sync, the μP asserts UNLOCKED. In this condition, a derivative of the incoming sync (CSYNC LOAD) provides the most accurate reference available. The Address Decoder decodes CSYNC LOAD into the LOAD pulse, which loads the Line Counter with its nominal starting count of 114 (0001110010).

Once the μP has found the vertical interval, it can provide a more accurate sync reference by locking the Line Counter to the 50% point of the leading edge of incoming sync. The μP calculates this point by analyzing the samples of the sync window stored in the Sample RAM.

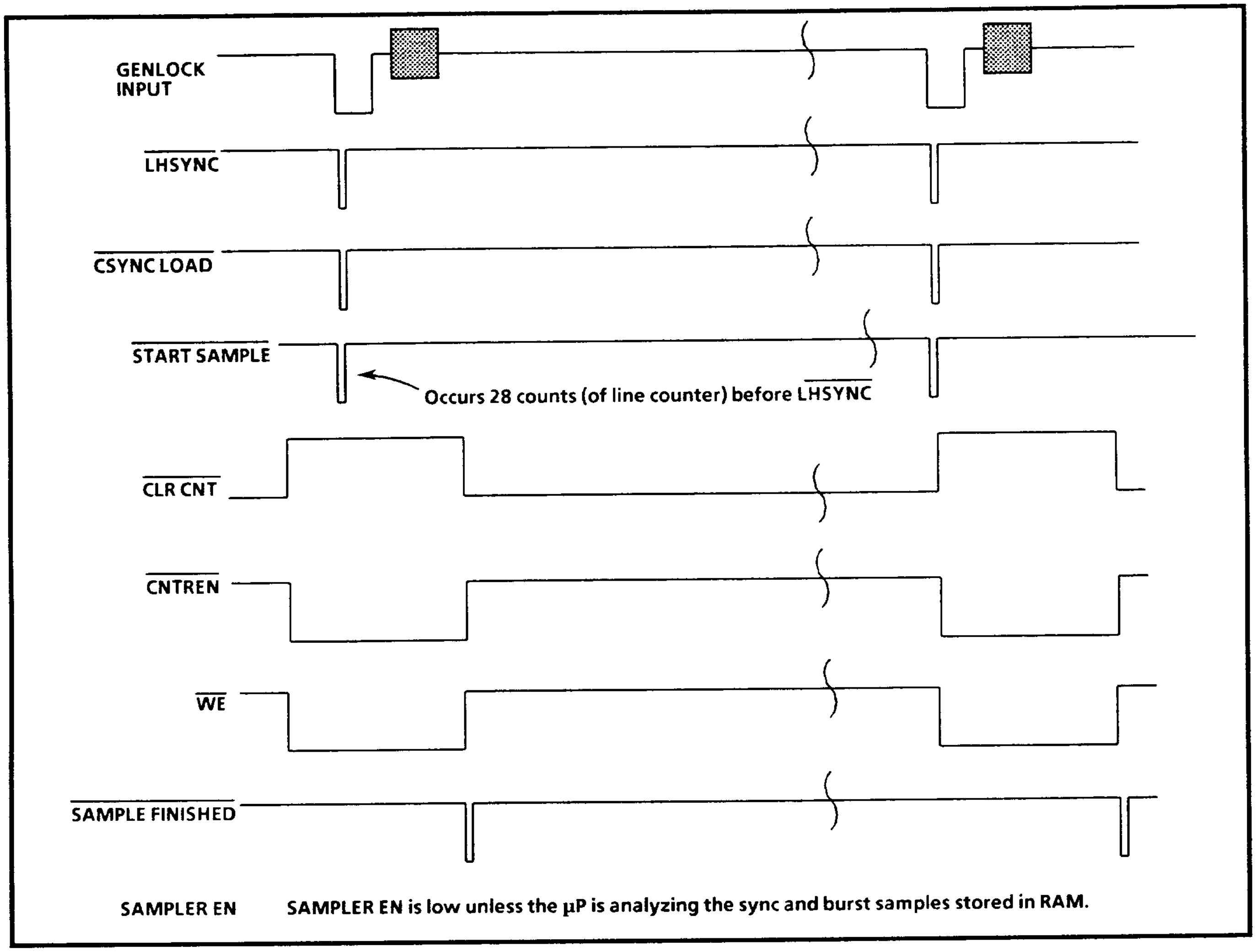


Fig. 6-2. Timing for Memory Controller and Address Counter outputs.

To lock the Line Counter to the 50% point of sync, the μP waits until the end of the vertical interval and pulls $\overline{\text{UNLOCKED}}$ false. This allows HSYNC to control the LOAD signal instead of $\overline{\text{CSYNC LOAD}}$. The μP then analyzes the sampled data and shifts (in 280-ns increments) the Line Counter offset (via U403) until HSYNC coincides with the 50% point of incoming sync. At this point, it returns the offset to 114.

At the start of line 10 on field 3, the μP asserts $\overline{\text{F3L10}}$. The Address Decoder ANDs this with the 70 ns $\overline{\text{LHSYNC}}$ pulse that occurs at the 50% point of sync and generates the FLD REF signal for the Signal Generation circuits.

Memory Controller and Address Counter — The Memory Controller (U711) controls the storage of ADC data in the Sample RAM. The Address Counter (U607) generates 256 addresses (0 to 255) in which the Sample RAM stores the ADC samples. Fig. 6-2 shows the timing for the Memory Controller and Address Counter outputs.

When $\overline{\text{START SAMPLE}}$ is true and SAMPLER EN is false, the Memory Controller enables the Address Counter on the next positive edge of CLK1B with the $\overline{\text{CNTR EN}}$ pulse. On the following negative edge of CLK1A, the Memory Controller asserts $\overline{\text{WE}}$, and one sample point is written into the Sample RAM.

The Memory Controller repeats this sequence of CNTR EN followed by WE until the Address Counter generates SAMPLE FINISHED on its 256th count. SAMPLE FINISHED tells the Memory Controller to enable CLR CNT, disable CNTR EN, and wait for the next START SAMPLE.

During the vertical interval, START SAMPLE never occurs if UNLOCKED is true. Remember that when UNLOCKED is true, the Address Decoder uses CSYNC LOAD (instead of HSYNC) to derive the LOAD pulse for the Line Counter. In the vertical interval, this CSYNC LOAD (and thus LOAD) occurs at a half line rate. Because this prevents the counter from reaching a full line count, the Address Decoder cannot generate START SAMPLE.

Stretch Latches

The Stretch Latches (D latch U435 and S.R. latch U432) have two functions: (1) to extend the length of three signals (START SAMPLE, SAMPLE FINISHED, and LHSYNC) so that they are long enough to clock the CTCs in the μP Kernel, and (2) to synchronize the three stretched signals and the GEN CSYNC signal with the μP Kernal. At the output of U435, these signals become the S HSYNC, S SAMPLE FINISH, S START SAMPLE and COMP SYNC signal sent to the μP.

The μP continuously analyzes the sequence of these four signals to determine the type of Genlock Input being inserted, and to find and keep track of the vertical interval. The signals occur in a sequence as shown in Figs. 6-3 and 6-4.

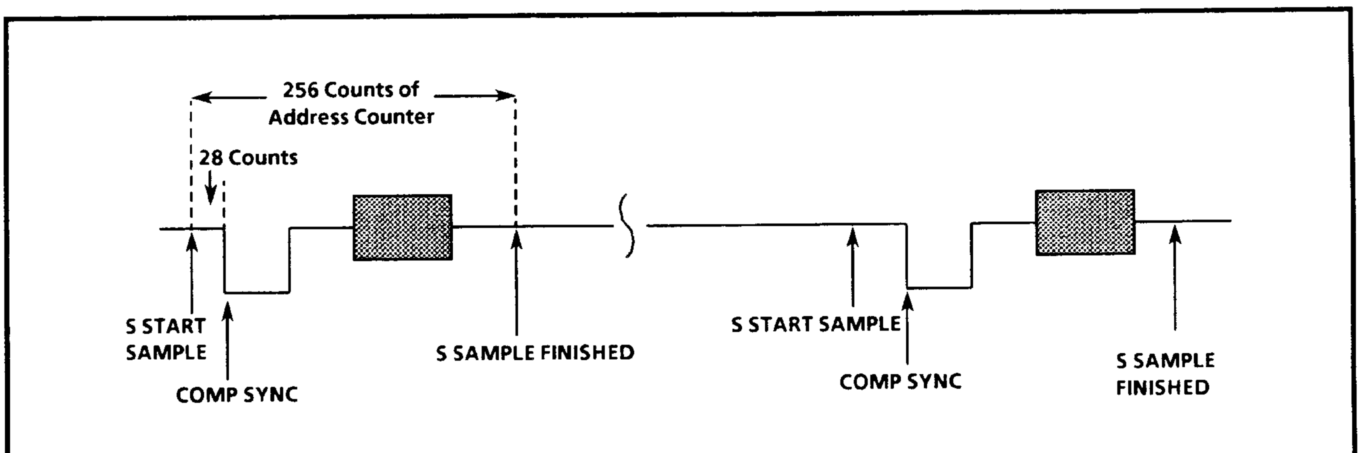


Fig. 6-3. Sequence of S START SAMPLE, COMP SYNC, and S SAMPLE FINISHED during the horizontal interval.

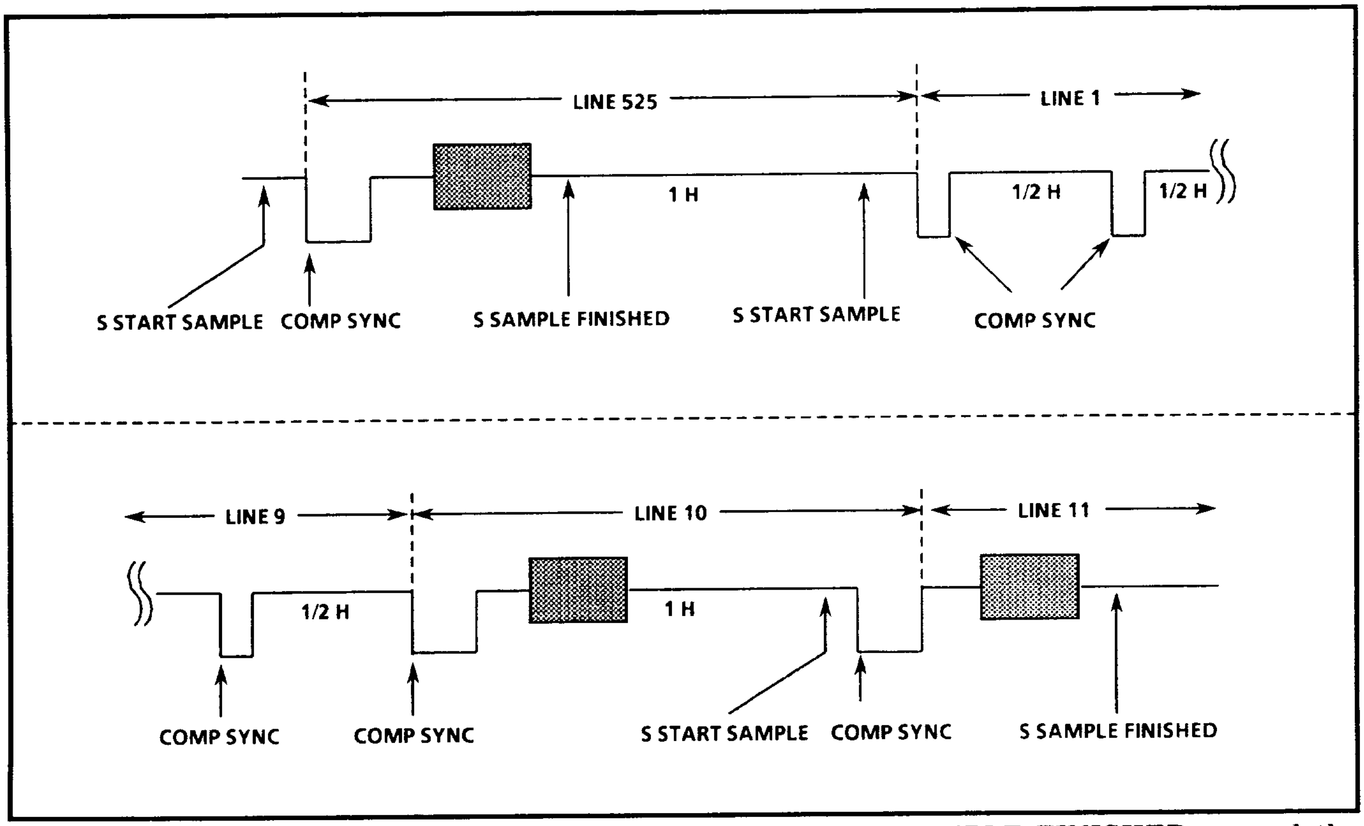


Fig. 6-4. Sequence of S START SAMPLE, COMP SYNC, and S SAMPLE FINISHED around the vertical interval (Fields 1 and 3).

CLOCK CIRCUIT (Schematic 4) [Serial #B010000 to B010317]

Introduction

The Clock circuit generates several 4Xsubcarrier clock signals that it distributes throughout the instrument. It has four main sections: (1) VCO & Oven Heater, (2) DAC, Integrator & Switcher, (3) Clock Shaper & Drivers, and (4) ϕFlip & Fine Sync Phase Shifter.

At the heart of the Clock circuit is the VCO. Controlled by the μP, the VCO generates a 4Xsubcarrier signal that is either free-running or locked to the Genlock Input.

The Clock Shaper circuit converts the VCO output to an ECL square wave and ensures its duty cycle is exactly 50%. The Drivers distribute this squarewave throughout the instrument as the CLK1 signal.

The ϕFlip circuit inverts the Clock Shaper output to produce a clock that has the smallest increment of coarse sync delay, CLK2ϕ. The Fine Sync Phase Shifter delays the inverted Clock Shaper output twice to generate a pair of delayed clock signals (CLK3ϕ and CLK4). These two clocks provide timing for the sync pulse outputs.

VCO

CAUTION

If it becomes necessary to remove Q293 from its heat sink, move J396 to the 2-3 position to prevent Q293 from overheating.

Configured as a colpitts oscillator, the VCO circuit generates the 4Xsubcarrier signal from which all clocks in the instrument are derived. C2 and C487 form a parallel resonant circuit with crystal Y11. They also step up the positive feedback voltage to the gate of FET Q1 to assure oscillation.

Varactor diode CR7, in parallel with C3, establishes the frequency correction range of the oscillator. As the μP changes the VCO correction voltage over a range of +2.5 to +7.5 V (at pin 4 of P12), the reverse-biased varactor diode shifts the oscillator frequency over a correction range centered around the oscillator's free-running frequency.

Coarse adjustment of the free-running frequency is accomplished by jumper-selecting a two-capacitor combination from the capacitors at P382 to obtain the frequency nearest to 4Xsubcarrier. Fine adjustment is accomplished with C387. See **Calibration** (Section 5) for full instructions on adjusting the VCO free-running frequency.

P180 allows the VCO correction voltage to be grounded when the free-running frequency is being adjusted. Also, P180 allows the VCO frequency to be checked over the full VCO correction voltage range. See **Performance Check** in Section 5.

Oven Heater Circuit — Comprised of thermistor RT6, op-amp U390B, darlington transistor Q293, and associated circuitry, the oven heater circuit is a feedback loop that keeps the crystal oven at a constant 60°C.

When the oven is cold, the resistance of RT6 is high, placing a more positive voltage at pin 6 of U390B. This pulls the output of U390B more negative and biases Q293 to increase its current flow and thus heat. As the oven heats up, the resistance of RT6 decreases, pulling the bias at the base of Q293 more positive to decrease its current flow.

Diode CR394 prevents U390B from excessively reverse biasing Q293 by limiting the maximum positive output of U390B to 5.6 V. Diode CR395 and DS397 current limit Q293 when U390B is at its maximum negative output. They do this by limiting the voltage at the base of Q1 to about 3.1 V. This limits the current through the emitter leg of the darlington to about 0.7 amps (one diode voltage drop across R298).

The current limiting occurs only when the oven is cold. This allows DS397 to act as an "Oven Cold" indicator.

DAC Integrator and Switcher — The μP controls the VCO through the VCO DAC (U267). Enabled by the $\overline{\text{VCO DAC}}$ signal from Decoder U162 (Schematic 2), the VCO DAC converts the μP correction words to current pulses and applies them to integrator U270A. The correction word ranges from 00 to FF (hex).

Integrator U270A has two main functions. First, it works as a current-to-voltage converter for the correction pulses generated by the VCO DAC. These pulses shift the VCO frequency to correct VCO phase. Second, the integrator produces an average of the correction pulses. This average is essentially a DC level that changes only to track the input burst frequency.

The switches in U176 put the Genlock Loop in one of four operating modes: Internal, Genlock, Hold, and Acquire. Each is described below. The μP controls the switches through the $\overline{\text{INT}}$/GENLOCK and $\overline{\text{HOLD}}$/ACQUIRE lines.

Internal Mode: When the μP cannot detect a valid Genlock Input signal, it switches the Genlock Loop into Internal mode by pulling the $\overline{\text{INT}}$/GENLOCK line low. This pulls the correction voltage at the integrator output to midrange or zero volts by closing three switches. The first switch (pin 16, U176) shorts out the integrator capacitor; the second and third switches (pins 8 and 9, U176) short out any residual voltage to ensure the correction voltage applied to the VCO is truly zero or midrange.

NOTE

Although the range of correction voltage from the integrator is +5 to –5 V, the correction range at pin 4 of the VCO board is +2.5 to +7.5, due to the voltage divider (R384 and R385) and its 10 V supply.

Genlock Mode: When the μP detects a valid Genlock Input signal, it pulls the $\overline{\text{INT}}$/GENLOCK line high to apply the VCO correction voltage to the VCO.

Acquire Mode: To acquire lock with the Genlock Input, the Genlock Loop needs to be faster than when it is just holding lock. To speed up the Genlock Loop, the μP increases integrator gain by pulling the $\overline{\text{HOLD}}$/ACQUIRE line high. This adds a large resistance (R171) to the integrator feedback loop.

Hold Mode: To hold lock, the μP slows down the Genlock Loop by pulling the $\overline{\text{HOLD}}$/ACQUIRE line low to remove R171 from the integrator feedback loop.

Clock Shaper and Drivers

Q491 buffers the VCO output. ECL driver U596A converts the buffered output into a complementary pair of square-wave clocks. Two RC circuits (R494 with C493 and R495 with C495) average the square waves. Op-amp U390A amplifies these averages and shifts the bias of the VCO output (at Q491) to correct its duty cycle.

Through U591A, the Clock Shaper distributes a pair of corrected clock outputs to the Digital board through ECL-to-TTL Translators U841 and U425 and to the Analog board through drivers U591C and U591B.

ϕFlip and Fine Sync Phase Shifter

ϕFlip — Controlled by the μP, the ϕFlip circuit generates the smallest increment of coarse sync phase shift, which is 35 ns or 45° of subcarrier. When the μP asserts ϕFLIP, EXOR gate U581B inverts an output from the Clock Shaper to delay it 35 ns. Picked off by driver U585A and converted to TTL by U574, this phase-flipped signal becomes the CLK2ϕ signal applied to sync timing circuits (Schematic 5). The phase-flipped signal is also applied to the Fine Phase Shifter.

Fine Phase Shifter — Controlled by the μP, the Fine Phase Shifter provides up to 54° of fine sync advance/delay relative to the test signal output. It does this by adding two advance/delays (each up to 27°) to the phase-flipped clock to generate CLK3ϕ and CLK4.

The μP advance/delays these clocks with timing data that it applies to DAC U370. Converted to an analog current by DAC U370 and to voltage by op-amp U270B, this data reverse biases the varactor diodes in two tank circuits (connected to the inputs of U577A and U577C). The resulting change in tank capacitance advance/delays the phase-flipped clock input by up to 27° in each tank circuit.

The output of the first tank becomes CLK3ϕ after passing through driver U577A and ECL-to-TTL converter U574. It is also the input to the second tank. The second tank output becomes CLK4 after passing through U577C and converter U574.

Variable resistor R173 (ϕSHIFT CENTER) centers the tank circuits so that a half scale on DAC U370 causes 0° advance/delay on CLK3ϕ and CLK4.

CLOCK CIRCUIT (Schematic 4) [Serial #B020318 and up]

Introduction

The Clock circuit generates several 4Xsubcarrier clock signals that it distributes throughout the instrument. It has four main sections: (1) VCO & Oven Heater, (2) DAC, Integrator & Switcher, (3) Clock Shaper & Drivers, and (4) ϕFlip & Fine Sync Phase Shifter.

At the heart of the Clock circuit is the VCO. Controlled by the μP, the VCO generates a 4Xsubcarrier signal that is either free-running or locked to the Genlock Input.

The Clock Shaper circuit converts the VCO output to an ECL square wave and ensures its duty cycle is exactly 50%. The Drivers distribute this square-wave throughout the instrument as the CLK1 signal.

The ϕFlip circuit inverts the Clock Shaper output to produce a clock that has the smallest increment of coarse sync advance/delay, CLK2ϕ. The Fine Sync Phase Shifter delays the inverted Clock Shaper out put twice to generate a pair of delayed clock signals (CLK3ϕ and CLK4). These two clocks provide timing for the sync pulse outputs.

VCO

CAUTION

If it becomes necessary to remove Q293 from its heat sink, move J396 to the 2-3 position to prevent Q293 from overheating.

Configured as a colpitts oscillator, the VCO circuit generates the 4Xsubcarrier signal from which all clocks in the instrument are derived. C2 and C487 form a parallel resonant circuit with crystal Y11. They also step up the positive feedback voltage to the gate of FET Q1 to assure oscillation.

Varactor diode CR7, in parallel with C3, establishes the frequency correction range of the oscillator. As the μP changes the VCO correction voltage over a range of +2.5 to +7.5 V (at pin 4 of P12), the reverse-biased varactor diode shifts the oscillator frequency over a correction range centered around the oscillator's free-running frequency.

Coarse adjustment of the free-running frequency is accomplished by jumper-selecting a two-capacitor combination from the capacitors at P391 to obtain the frequency nearest to 4Xsubcarrier. Fine adjustment is accomplished with C387. See **Calibration** (Section 5) for full instructions on adjusting the VCO free-running frequency.

P180 allows the VCO correction voltage to be grounded when the free-running frequency is being adjusted. Also, P180 allows the VCO frequency to be checked over the full VCO correction voltage range. See **Performance Check** in Section 5.

Oven Heater Circuit — Comprised of thermistor RT6, op-amp U390B, darlington transistor Q293, and associated circuitry, the oven heater circuit is a feedback loop that keeps the crystal oven at a constant 60°C.

When the oven is cold, the resistance of RT6 is high, placing a more positive voltage at pin 6 of U390B. This pulls the output of U390B more negative and biases Q293 to increase its current flow and thus heat As the oven heats up, the resistance of RT6 decreases, pulling the bias at the base of Q293 more positive to decrease its current flow.

Diode CR394 prevents U390B from excessively reverse biasing Q293 by limiting the maximum positive output of U390B to 5.6 V. Diode CR395 and DS397 current limit Q293 when U390B is at its maximum negative output. They do this by limiting the voltage at the base of Q1 to about 3.1 V. This limits the current through the emitter leg of the darlington to about 0.7 amps (one diode voltage drop across R298).

The current limiting occurs only when the oven is cold. This allows DS397 to act as an "Oven Cold" indicator.

DAC Integrator and Switcher — The μP controls the VCO through the VCO DAC (U267). Enabled by the $\overline{\text{VCO DAC}}$ signal from Decoder U162 (Schematic 2), the VCO DAC converts the μP correction words to current pulses and applies them to integrator U270A. The correction word ranges from 00 to FF (hex).

Integrator U270A has two main functions. First, it works as a current-to-voltage converter for the correction pulses generated by the VCO DAC. These pulses shift the VCO frequency to correct VCO phase. Second, the integrator produces an average of the correction pulses. This average is essentially a DC level that changes only to track the input burst frequency.

The switches in U176 put the Genlock Loop in one of four operating modes: Internal, Genlock, Hold, and Acquire. Each is described below. The μP controls the switches through the $\overline{\text{INT}}$/GENLOCK and $\overline{\text{HOLD}}$/ACQUIRE lines.

Internal Mode: When the μP cannot detect a valid Genlock Input signal, it switches the Genlock Loop into Internal mode by pulling the $\overline{\text{INT}}$/GENLOCK line low. This pulls the correction voltage at the integrator output to midrange or zero volts by closing three switches. The first switch (pin 16, U176) shorts out the integrator capacitor; the second and third switches (pins 8 and 9, U176) short out any residual voltage to ensure the correction voltage applied to the VCO is truly zero or midrange.

NOTE

Although the range of correction voltage from the integrator is +5 to –5 V, the correction range at pin 4 of the VCO board is +2.5 to +7.5, due to the voltage divider (R384 and R385) and its 10 V supply.

Genlock Mode: When the μP detects a valid Genlock Input signal, it pulls the $\overline{\text{INT}}$/GENLOCK line high to apply the VCO correction voltage to the VCO.

Acquire Mode: To acquire lock with the Genlock Input, the Genlock Loop needs to be faster than when it is just holding lock. To speed up the Genlock Loop, the μP increases integrator gain by pulling the $\overline{\text{HOLD}}$/ACQUIRE line high. This adds a large resistance (R171) to the integrator feedback loop.

Hold Mode: To hold lock, the μP slows down the Genlock Loop by pulling the $\overline{\text{HOLD}}$/ACQUIRE line low to remove R171 from the integrator feedback loop.

Clock Shaper, Drivers, and 28 MHz Clock

Q491 buffers the VCO output. ECL driver U596A converts the buffered output into a complementary pair of square-wave clocks. Two RC circuits (R494 with C493 and R495 with C495) average the square waves. Op-amp U390A amplifies these averages and shifts the bias of the VCO output (at Q491) to correct its duty cycle.

Through U591A, the Clock Shaper distributes a pair of corrected clock outputs to the Digital board via ECL-to-TTL Translators U841 and U425 and to the Analog board through drivers U591B and U591C.

U596C, U596B, and U585A together produce a 28 MHz clock by doubling the frequency of an output from the VCO.

The 4Xsubcarrier clock output from driver U596C goes directly to EXOR gate U585A and also to a delay network. Made up of R595, R596, and C594, this network delays the clock by 17.5 ns and applies it to gate U585A via driver U596B.

With a delayed and undelayed clock on its inputs, U585A generates a 28 MHz clock. Divided by 5 (by U429 in Schematic 2), this becomes the μP clock (μPCLK).

ϕFlip and Fine Sync Phase Shifter

ϕFlip — Controlled by the μP, the ϕFlip circuit generates the smallest increment of coarse sync phase shift, which is 35 ns or 45° of subcarrier. When the μP asserts ϕFLIP, EXOR gate U585B inverts an output from the Clock Shaper to delay it 35 ns. Picked off by driver U577A and converted to TTL by U574, this phase-flipped signal becomes the CLK2ϕ signal applied to sync timing circuits (Schematic 5). The phase-flipped signal is also applied to the Fine Phase Shifter.

Fine Phase Shifter — Controlled by the μP, the Fine Phase Shifter provides up to 54° of fine sync advance/delay relative to the test signal output. It does this by adding two advance/delays (each up to 27°) to the phase-flipped clock to generate CLK3ϕ and CLK4.

The μP advance/delays these clocks with timing data that it applies to DAC U370. Converted to an analog current by DAC U370 and to voltage by op-amp U270B, this data reverse biases the varactor diodes in two tank circuits (connected to the inputs of U577B and U577C). The resulting change in tank capacitance advance/delays the phase-flipped clock input by up to 27° in each tank circuit.

The output of the first tank becomes CLK3ϕ after passing through driver U577B and ECL-to-TTL converter U574. It is also the input to the second tank. The second tank output becomes CLK4 after passing through U577C and converter U574.

Variable resistor R469 (ϕSHIFT CENTER) centers the tank circuits so that a half scale on DAC U370 causes 0° advance /delay on CLK3ϕ and CLK4.

SIGNAL GENERATION CIRCUITS (Schematics 5, 6, and 7)

Introduction

The Signal Generation section consists of three schematics: Pulse and Test Signal Timing (Schematic 5), Test Signal Selection (Schematic 6), and Signal Memory & Multiplexing (Schematic 7). See Fig. 6-5 for a block diagram of the Signal Generation circuits.

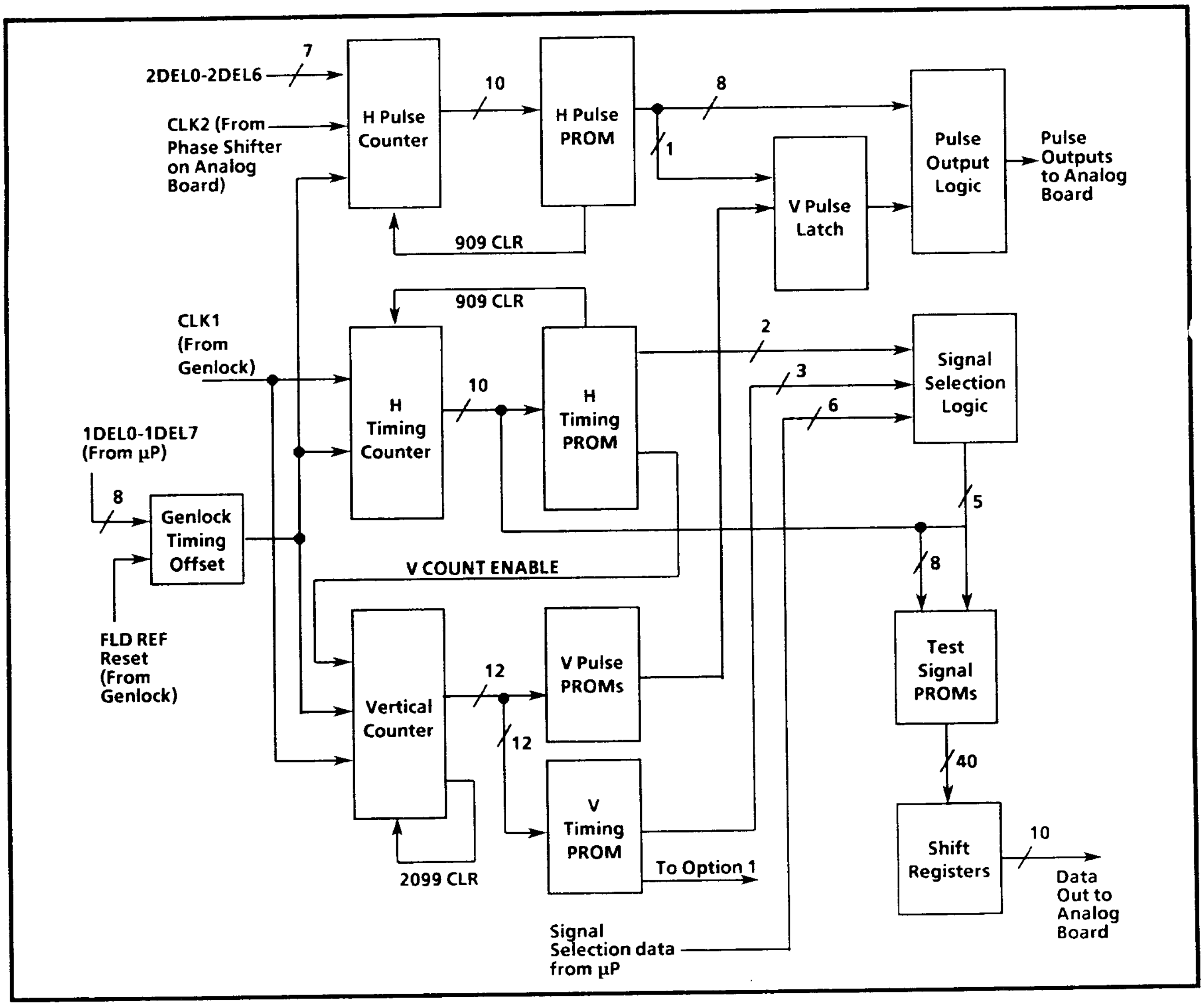


Fig. 6-5. Block diagram of Signal Generation circuits.

Overview

The H Pulse Counter and Vertical Counter provide timing to the H Pulse and V Pulse PROMs. The Pulse Output Logic combines the output of these two PROMs to generate the Pulse Outputs.

The H Timing Counter and Vertical Counter provide timing to the H Timing PROM and V Timing PROM, respectively. These PROMs provide timing to the Signal Selection Logic, which uses this timing, along with a code generated by the μP, to select the test signal in the Test Signal PROMs. The output rate from these PROMs is multiplexed by shift registers to provide the required test signal output rate.

PULSE & TEST SIGNAL TIMING (Schematic 5) [Serial # B010000 to B010317]

Genlock Timing Offset

The Genlock Timing Offset circuit is comprised of two 4-bit counters (U463 and U563) and two D flip-flops (U867A and U867B). The job of this circuit is to add the front-panel-selected coarse genlock timing offset to the Signal Generation circuits. It does this by delaying the time at which the FLD REF signal loads the Horizontal and Vertical Timing Counters.

Normally, counters U463 and U563 are in the load mode (disabled). But on line 10 of field 3, the FLD REF pulse enables the counters through flip-flop U867B, and the counters count to 255, beginning from the offset value at their load inputs (GENDEL0-GENDEL7). At the end of the count, the Carry output from U563 loads the Horizontal and Vertical Counters (through U867A) with their fixed offset values. In addition, the Carry output disables counters U463 and U563 through U867A and U867B.

When coarse genlock timing is adjusted at the front panel, the μP sends a new 8-bit offset word (GENDEL0-GENDEL7) to U463 and U563. On line 10 of field 1 the word is loaded into U463 and U563. As a result, U463 and U563 start their count at a different value, thus changing the time that the Horizontal and Vertical Timing Counters are loaded.

Horizontal Timing

H Timing Counter — Loaded by the delayed FLD REF signal and clocked at a 4Xsubcarrier frequency by CLK1G, the H Timing Counter (U663, U763, and U863) provides horizontal timing to the H Timing PROM and Test Signal PROMs (Schematic 7). It does this by addressing the H Timing PROM and Test Signal PROM at a rate of 910 words per line.

When the H Timing Counter has reached count 909, the H Timing PROM automatically clears it with the $\overline{\text{H COUNTER CLEAR}}$ signal. This signal is gated at U688C & D to prevent the H Timing Counter from being cleared while a genlock timing offset is being loaded.

The load inputs to the H Timing Counter present a fixed offset of 98 (hex). This offset allows the Genlock Timing Offset circuit to both advance and delay the genlock timing.

H Pulse Counter and H Pulse PROM

H Pulse Counter — The H Pulse Counter (U571, U671, and U771) provides horizontal timing for the H Pulse PROM. It does this by addressing the H Pulse PROM at a rate of 910 words per line. Outputs from the H Timing PROM ($\overline{\text{HP LOAD}}$) and the Vertical Counter (1V1) combine at U322C to load the H Pulse Counter every other line through four flip-flops (U367A-B and U467A-B). This locks the H Timing and H Pulse Counters together.

Even though the two counters are locked together, the H Pulse Counter is offset by user-selected coarse and fine sync timing. The μP applies all but the smallest increment of coarse sync offset to the load inputs of the H Pulse Counter through the SYNCDEL1-SYNCDEL7 lines.

CLK2ϕ — an inverted copy of CLK1 — adds the smallest increment of coarse sync offset (35 ns) by delaying the load pulse (out of U322C) as it passes through U367B. CLK3ϕ and CLK4A add the fine sync offset by delaying the load pulse as it passes through U467A and U467B.

H Pulse PROM — The H Pulse PROM (U675) has three functions: (1) to clear the H Pulse Counter after it has counted a line of addresses, (2) to provide horizontal timing pulses to the Pulse Output Logic, and (3) to provide latch timing for V Pulse PROM outputs.

Output D0 of the H Pulse PROM clears the H Pulse Counter. Combinational logic (gates U688A and U688B) prevents this counter from being cleared and loaded simultaneously. Outputs D1-D6 provide the timing pulses to the Pulse Outputs Logic. Output D7 controls the timing of the V Pulse Latch (U796). Table 6-1 summarizes the outputs of this PROM.

Subcarrier Counter — Counter U567 generates the 3.58 MHz square-wave signal (SUBC) sent to the Analog board. This signal has the same timing as the sync pulse outputs. The pulse that loads the H Pulse Counter also loads the sync timing offset (SYNCDEL1-SYNCDEL7) into the Subcarrier Counter.

Vertical Timing

Vertical Counter — Three 4-bit counters (U684, U784, and U884) make up the Vertical Counter. Clocked by CLK1H, the Vertical Counter provides vertical timing for the V Pulse PROM (U895) and the V Timing PROM (U889, Schematic 6). It does this by addressing the PROMs at a rate of 2100 counts per color frame (525 counts per field x 4 fields), one count occurring every half line. The counting cycle for the Vertical Counter is as follows:

Every half line, the V-COUNT ENABLE signal from the H Timing PROM (U859, Schematic 6) enables the three counters for 70 ns, allowing CK1H to clock the counters once. This is repeated until the counters have reached a count of 2099, at which point gate U792B clears the counters to start a new four-field frame.

The V-COUNT ENABLE signal is combined with 1H0 and 1V0 (at gates U788C, U788D, and U559D) to prevent the counters from clearing in the middle of a line when the instrument is operating as a master generator, i.e., when the Genlock Input is without sync.

When the Vertical Counter attempts to clear in the middle of a line, its timing is a half line off and the 1V0 bit is a logic 1 instead of 0. Consequently, the 1V0 input to gate U788C locks out V-COUNT ENABLE, making the Vertical Counter skip a count and thus shifting its timing by half a line.

When the instrument is operating in genlocked mode, the delayed FLD REF signal inserts the genlock timing offset into the Vertical Counter just as it does for the H Timing Counter. That is, it delays the loading of the vertical counter's fixed offset. When the instrument is operating in internal mode or subcarrier locked mode, the delayed FLD REF signal never occurs and the Vertical Counter is never loaded.

The $\overline{\text{F1 RST}}$ signal from U792B provides a vertical reset to the Audio Generator circuit in the Option 1 board.

V Pulse PROM — The V Pulse PROM (U895) has three functions: (1) to produce vertical sync pulse components for the Pulse Output Logic, (2) to produce vertical timing for the Test Signal Selection Logic, and (3) to provide a vertical timing interrupt for μP Kernel (Schematic 2). Table 6-2 summarizes the outputs of this PROM.

The outputs of the V Pulse PROM are programmed to have advanced timing. This allows the V-LATCH2 signal from the H Pulse PROM to add the sync timing offset to the genlocked V Pulse PROM outputs applied to the Pulse Output Logic. It does this by either advancing or delaying the time at which these outputs are latched into U796.

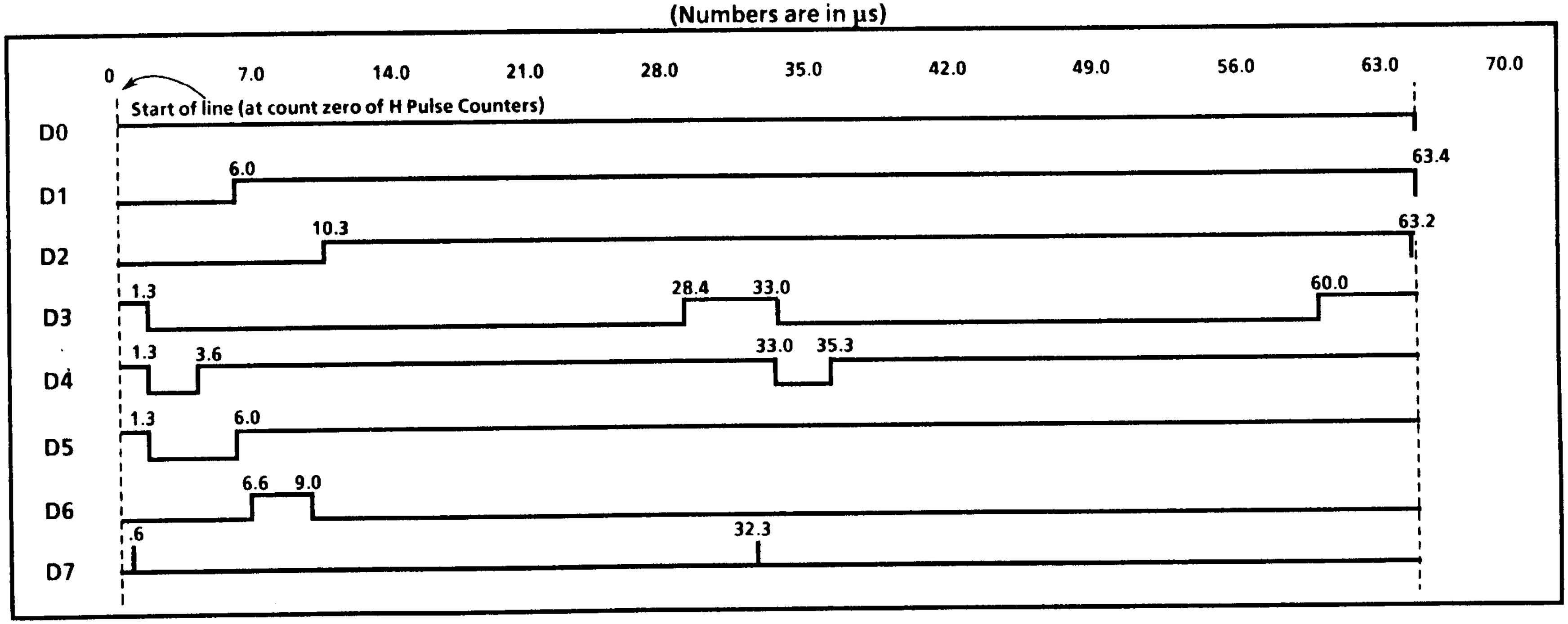
Four of these V Pulse PROM outputs (D0-D3) are picked off before the Pulse Outputs Latch and sent to the Test Signal Selection circuits (Schematic 6), where they provide timing for the Signal Selection Logic.

The latched D3 output of the V Pulse PROM ($\overline{\text{LV DRIVE}}$ from pin 5, U796) is also sent to CTC1 (Schematic 2) where it interrupts the μP to tell it to start servicing the front panel during the vertical interval when there is no Genlock Input signal. (Note that when a composite Genlock Input signal is present, the μP uses the vertical sync of the Genlock Input as a front-panel interrupt, not $\overline{\text{LV DRIVE}}$ from U796.)

Table 6-1
Horizontal Pulse PROM

Output	Function
D0	Negative pulse to clear the V Pulse Counter at count 909.
D1	Timing for H DRIVE output. Low from start of horizontal blanking until end of horizontal sync.
D2	Timing for H Blanking portion of Blanking output. Low from start of blanking until end of blanking.
D3	Timing for vertical sync serrations in SYNC output.
D4	Timing for equalizing pulses in SYNC output.
D5	Timing for horizontal sync portion of SYNC output.
D6	Timing for BURST FLAG output.
D7	Positive (twice-a-line) 70 ns signal to latch the V Pulse PROM outputs, aligning them with the H Pulse PROM timing.

Horizontal Pulse Output PROM
(Numbers are in µs)



Pulse Output Logic

The Pulse Output Logic combines the outputs of the H and V Pulse PROMs to produce the sync pulse signals that are applied to the Pulse Output Drivers on the Analog board. It generates the pulse outputs as follows:

Two field reference signals derived from the V Pulse PROM (COLOR-FRAME SQ WAVE and FLD REF) feed directly to the Analog board through buffer U832.

Jumper P696 selects the vertical blanking pulses $\overline{\text{V BL19}}$ and $\overline{\text{V BL20}}$. $\overline{\text{V BL19}}$ has 19 lines of blanking and $\overline{\text{V BL20}}$ has 20 lines. Gate U780C combines the selected vertical blanking signal with the H Blanking pulse. Buffer U832 passes this combined H and V blanking signal to the Analog board as the COMP BLANK signal.

The H-Pulse PROM (U675) puts out the H BLKNG (Horizontal Blanking signal) slightly ahead of its other outputs. This allows shift register U692 and its associated gates to produce horizontal blanking pulses of three different widths: wide (10.9 μs), medium (10.7 μs) and narrow (10.5 μs). Jumper P680 selects these. See Table 3-3.

Multiplexer U680 uses $\overline{\text{LV DRIVE}}$ and $\overline{\text{LV SYNC}}$ as select lines to determine which of three signals ($\overline{\text{EQUALIZER}}$, HV-SYNC, and $\overline{\text{H SYNC}}$) from PROM U675 make up the COMP SYNC signal applied to the Analog board through buffer U832.

Gate U871C shuts out $\overline{\text{BRST FLG}}$ (Burst Flag) during the vertical interval to produce the BURST FLAG signal applied to the Analog board through buffer U832.

Buffer U832 also feeds the VDRIVE (from U895) and HDRIVE (from U675) pulses to the Analog board. On the Analog board, these signals become the Vertical and Horizontal Drive signals (VDRIVE and HDRIVE) applied to the rear panel.

PULSE & TEST SIGNAL TIMING (Schematic 5) [Serial # B020318 and Up]

Genlock Timing Offset

The Genlock Timing Offset circuit is comprised of two 4-bit counters (U463 and U563) and two D flip-flops (U867A and U867B). The job of this circuit is to add the front-panel-selected coarse genlock timing offset to the Signal Generation circuits. It does this by delaying the time at which the FLD REF signal loads the Horizontal and Vertical Timing Counters

Normally, counters U463 and U563 are in the load mode (disabled). But on line 10 of field 3, the FLD REF pulse enables the counters through flip-flop U867B, and the counters count to 255, beginning from the offset value at their load inputs (GENDEL0-GENDEL7). At the end of the count, the Carry output from U563 loads the Horizontal and Vertical Counters (through U867A) with their fixed offset values. In addition, the Carry output disables counters U463 and U563 through U867A and U867B.

When coarse genlock timing is adjusted at the front panel, the μP sends a new 8-bit offset word (GENDEL0-GENDEL7) to U463 and U563. On line 10 of field 1 the word is loaded into U463 and U563. As a result, U463 and U563 start their count at a different value, thus changing the time that the Horizontal and Vertical Timing Counters are loaded.

Horizontal Timing

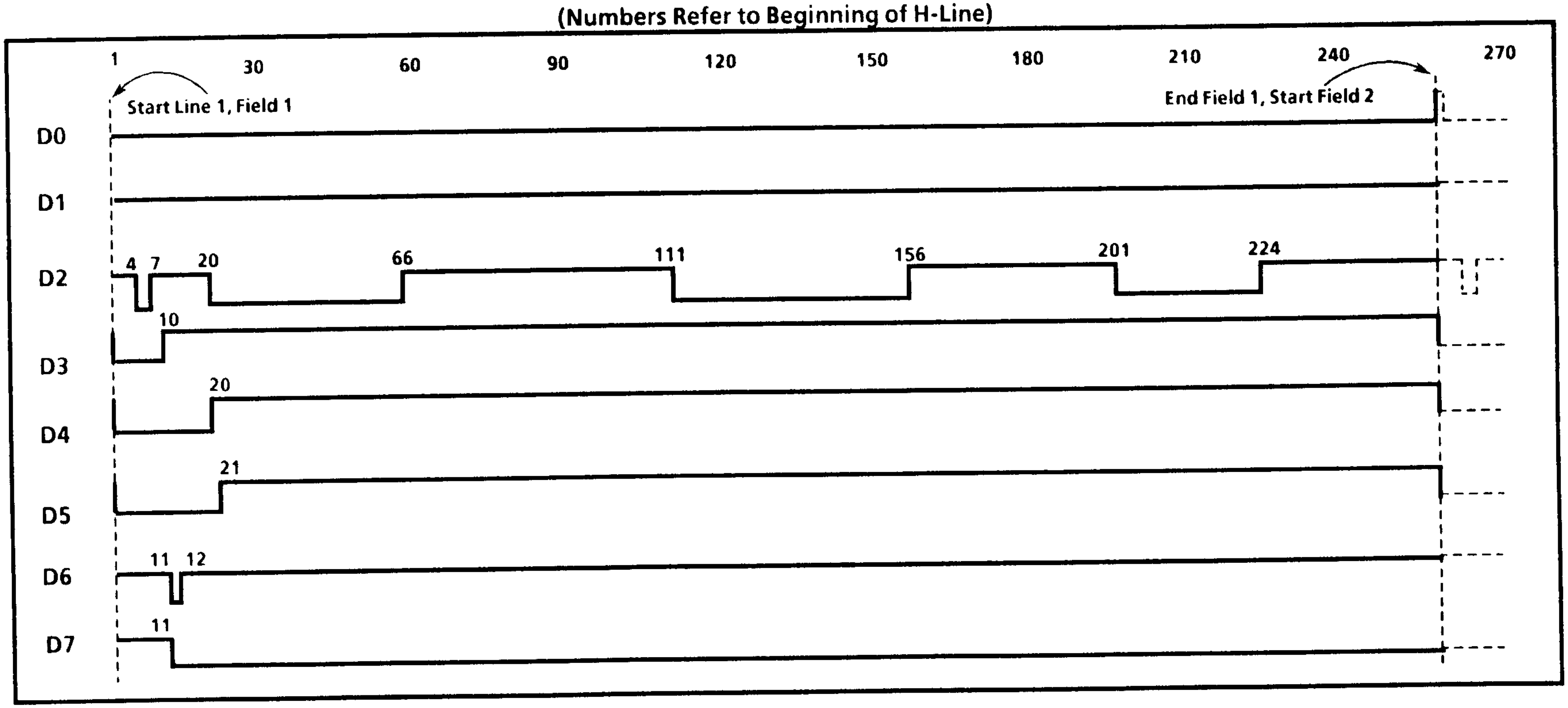
H Timing Counter — Loaded by the delayed FLD REF signal and clocked at a 4Xsubcarrier frequency by CLK1G, the H Timing Counter (U663, U763, and U863) provides horizontal timing to the H Timing PROM and Test Signal PROMs (Schematic 7). It does this by addressing the H Timing PROM and Test Signal PROM at a rate of 910 words per line.

When the H Timing Counter has reached count 909, the H Timing PROM automatically clears it with the $\overline{\text{H COUNTER CLEAR}}$ signal. This signal is gated at U688C & D to prevent the H Timing Counter from being cleared while a genlock timing offset is being loaded.

Table 6-2
Vertical Pulse PROM Outputs

Output	Function
D0	Half-line signal selection timing. High during line 263 of fields 1 and 3.
D1	Half-line signal selection timing. High during line 20 of fields 2 and 4.
D2	Timing for SYNC output when D3 is low. Also provides timing for matrix-signal selection.
D3	Low during vertical sync time.
D4	Timing for 19-line V-Blanking portion of BLANKING output.
D5	Timing for 20-line V-Blanking portion of BLANKING output.
D6	Timing for FIELD REFERENCE output (low during line 11 of field 1).
D7	Timing for COLOR-FRAME SQUARE WAVE output (low during fields 1 and 2; high during fields 3 and 4).

Vertical Pulse PROM Outputs (Field 1 of 4)
(Numbers Refer to Beginning of H-Line)



The load inputs to the H Timing Counter present a fixed offset of 98 (hex). This offset allows the Genlock Timing Offset circuit to both advance and delay the genlock timing.

H Pulse Counter and H Pulse PROM

H Pulse Counter — The H Pulse Counter (U571, U671, and U771) provides horizontal timing for the H Pulse PROM. It does this by addressing the H Pulse PROM at a rate of 910 words per line. Outputs from the H Timing PROM ($\overline{\text{HP LOAD}}$) and the Vertical Counter (1V1) combine at U322D to load the H Pulse Counter every other line through four flip-flops (U367A-B and U467A-B). This locks the H Timing and H Pulse Counters together.

Even though the two counters are locked together, the H Pulse Counter is offset by user-selected coarse and fine sync timing. The μP applies all but the smallest increment of coarse sync offset to the load inputs of the H Pulse Counter through the SYNCDEL1-SYNCDEL7 lines.

CLK2ϕ — an inverted copy of CLK1 — adds the smallest increment of coarse sync offset (35 ns) by delaying the load pulse (out of U322C) as it passes through U367B. CLK3ϕ and CLK4A add the fine sync offset by delaying the load pulse as it passes through U467A and U467B.

H Pulse PROM — The H Pulse PROM (U675) has three functions: (1) to clear the H Pulse Counter after it has counted a line of addresses, (2) to provide horizontal timing pulses to the Pulse Output Logic, and (3) to provide latch timing for V Pulse PROM outputs.

Output D0 of the H Pulse PROM clears the H Pulse Counter. Combinational logic (gates U688A and U688B) prevents this counter from being cleared and loaded simultaneously. Outputs D1-D6 provide the timing pulses to the Pulse Outputs Logic. Output D7 controls the timing of the V Pulse Latch (U796). Table 6-1 summarizes the outputs of this PROM.

Subcarrier Counter — Counter U567 generates the 3.58 MHz square-wave signal (SUBC) sent to the Analog board. This signal has the same timing as the sync pulse outputs. The pulse that loads the H Pulse Counter also loads the sync timing offset (SYNCDEL1-SYNCDEL2) into the Subcarrier Counter.

Vertical Timing

Vertical Counter — Three 4-bit counters (U684, U784, and U884) make up the Vertical Counter. Clocked by CLK1H, the Vertical Counter provides vertical timing for the V Pulse PROM (U895) and the V Timing PROM (U889, Schematic 6). It does this by addressing the PROMs at a rate of 2100 counts per color frame (525 counts per field x 4 fields), one count occurring every half line. The counting cycle for the Vertical Counter is as follows:

Every half line, the V-COUNT ENABLE signal from the H Timing PROM (U859, Schematic 6) enables the three counters for 70 ns, allowing CLK1H to clock the counters once. This is repeated until the counters have reached a count of 2099, at which point gate U792B clears the counters to start a new four-field frame.

The V-COUNT ENABLE signal is combined with 1H0 and 1V0 (at gates U788C, U788D, and U559D) to prevent the counters from clearing in the middle of a line when the instrument is operating as a master generator, i.e., when the Genlock Input is without sync.

When the Vertical Counter attempts to clear in the middle of a line, its timing is a half line off and the 1V0 bit is a logic 1 instead of 0. Consequently, the 1V0 input to gate U788C locks out V-COUNT ENABLE, making the Vertical Counter skip a count and thus shifting its timing by half a line.

When the instrument is operating in genlocked mode, the delayed FLD REF signal inserts the genlock timing offset into the Vertical Counter just as it does for the H Timing Counter. That is, it delays the loading of the vertical counter's fixed offset. When the instrument is operating in internal mode or subcarrier locked mode, the delayed FLD REF signal never occurs and the Vertical Counter is never loaded.

The $\overline{\text{F1 RST}}$ signal from U792B provides a vertical reset to the Audio Generator circuit in the Option 1 board.

Jumpers P881 and P882 together advance vertical timing by as much as two lines or delay it by one line. The asterisked Vertical Timing table in Schematic 5 shows the appropriate pin positions for advance/delay.

V Pulse PROM — The V Pulse PROM (U895) has three functions: (1) to produce vertical sync pulse components for the Pulse Output Logic, (2) to produce vertical timing for the Test Signal Selection Logic, and (3) to provide a vertical timing interrupt for μP Kernel (Schematic 2). Table 6-2 summarizes the outputs of this PROM.

The outputs of the V Pulse PROM are programmed to have advanced timing. This allows the V-LATCH2 signal from the H Pulse PROM to add the sync timing offset to the genlocked V Pulse PROM outputs applied to the Pulse Output Logic. It does this by either advancing or delaying the time at which these outputs are latched into U796.

Four of these V Pulse PROM outputs (D0-D3) are picked off before the Pulse Outputs Latch and sent to the Test Signal Selection circuits (Schematic 6), where they provide timing for the Signal Selection Logic.

The latched D3 output of the V Pulse PROM ($\overline{\text{LV DRIVE}}$ from pin 5, U796) is also sent to CTC1 (Schematic 2) where it interrupts the μP to tell it to start servicing the front panel during the vertical interval when there is no Genlock Input signal. (Note that when a composite Genlock Input signal is present, the μP uses the vertical sync of the Genlock Input as a front-panel interrupt, not $\overline{\text{LV DRIVE}}$ from U796.)

Pulse Output Logic

The Pulse Output Logic combines the outputs of the H and V Pulse PROMs to produce the sync pulse signals that are applied to the Pulse Output Drivers on the Analog board. It generates the pulse outputs as follows:

Two field reference signals derived from the V Pulse PROM (COLOR-FRAME SQ WAVE and FLD REF) feed directly to the Analog board through buffer U832.

Jumper P696 selects the vertical blanking pulses $\overline{\text{V BL19}}$ and $\overline{\text{V BL20}}$. $\overline{\text{V BL19}}$ has 19 lines of blanking and $\overline{\text{V BL20}}$ has 20 lines. Gate U780C combines the selected vertical blanking signal with the H Blanking pulse. Buffer U832 passes this combined H and V blanking signal to the Analog board as the COMP BLANK signal.

The H-Pulse PROM (U675) puts out the H BLKNG (Horizontal Blanking signal) slightly ahead of its other outputs. This allows shift register U692 and its associated gates to produce horizontal blanking pulses of three different widths. wide (10.9 μs), medium (10.7 μs) and narrow (10 5 μs). Jumper P680 selects these. See Table 3-3.

Multiplexer U680 uses $\overline{\text{LV DRIVE}}$ and $\overline{\text{LV SYNC}}$ as select lines to determine which of three signals ($\overline{\text{EQUALIZER}}$, HV-SYNC, and $\overline{\text{H SYNC}}$) from PROM U675 make up the COMP SYNC signal applied to the Analog board through buffer U832.

Gate U871C shuts out $\overline{\text{BRST FLG}}$ (Burst Flag) during the vertical interval to produce the BURST FLAG signal applied to the Analog board through buffer U832.

Buffer U832 also feeds the VDRIVE (from U895) and HDRIVE (from U675) pulses to the Analog board. On the Analog board, these signals become the Vertical and Horizontal Drive signals (VDRIVE and HDRIVE) applied to the rear panel.

TEST SIGNAL SELECTION (Schematic 6)

H Timing PROM

Addressed by the genlocked H Timing Counter (Schematic 5), the H Timing PROM (U859) has four functions: (1) to generate a pulse (BURST TIMING) coincident with burst, (2) to generate timing control signals for the H & V Timing circuits in Schematic 5, (3) to generate timing signals for the Signal Selection Logic, and (4) to align the vertical timing inputs of latch U880 with the H Timing Counter. See Table 6-3 for a summary of the H Timing PROM outputs.

V Timing PROM

Addressed by the genlocked Vertical Counter (Schematic 5), the V Timing PROM (U889) has two main functions: (1) To provide vertical timing for the Signal Selection PROM (U447) in the Signal Selection Logic, and (2) to provide vertical timing for the Color Bar Generator and the ID Generator on the Option 1 board. See Table 6-4 for a summary of the outputs.

Signal Selection Logic

The heart of the Signal Selection Logic is the Signal Selection PROM (U447). Addressed by the μP (Schematic 2) and two vertical timing PROMs (V Timing and V Pulse), the Signal Selection PROM generates the selection code that determines which test signal the Test Signal PROMs generate. The V Timing PROM (U889) provides the selection PROM with timing for selecting the split-field signals, and the V Pulse PROM (U895, Schematic 5) provides the Selection PROM with timing for selecting the vertical sync pulses.

When a test signal is selected at the front panel, the μP encodes the selection into an 8-bit data word (ED0-ED7) and sends it to the Signal Selection PROM via latch U443. Combined with the vertical timing signals, this data addresses the appropriate test signal selection code in U447.

The output of U447 is summarized as follows: Signals S0-S3 form the code that select the test signals at the Test Signal PROMs. Signals ϕA and ϕB make up part of that code when the selected test signal does not have chrominance. (See Table 6-5 for selection codes from U447.) When the selected signal does have chrominance, ϕA and ϕB determine which phase of test signal is selected from line to line. (Chrominance phase alternates 180° from line to line.)

ϕA and ϕB are gated with four signals (H BLANK, V DRIVE, VB, and BURSTϕ) at U363A-B and U788A-B to become the B1 and B2 signals at U788A and U559B. Gated by U559A (Schematic 7) and latched through U555 (Schematic 7), B1 and B2 are the signals that actually select chrominance phase or form part of the signal selection code described above.

When monochrome signals are selected, burst is still generated. This is done by the S0-S3 codes selecting the monochrome signal for the active portion of the line and then alternately selecting opposite-phased burst segments for the horizontal intervals.

At the end of fields 1 and 3 and the beginning of fields 2 and 4, the Signal Selection PROM selects half line segments of the selected test signal. Gates U455B, U455D, and U363C combine the F1L263V and F2L20V signals with half-line pulses (F2L20H and F1L263H) from the H Timing PROM to tell the Test Signal PROMs when to generate the half-line segments.

Note that the F2L20V and F1L263V signals are generated by the V Pulse PROM (U895, Schematic 5). To align them with the H Timing PROM, the H Timing PROM latches the signals into U880 with its V LATCH output.

Gates U696D, U871A, and U780B combine the VB (Vertical Blanking), V DRIVE, and BURST TIMING signals to generate the BURST GATE signal at U780B. This signal supplies timing for the output clamp circuit (U440 and U532) in Schematic 7. VB prevents the BURST GATE from activating the output clamp when the DAC TEST signal is selected.

At U780D, the LV–BL (Latched Vertical Blanking) signal combines with the H BLANK signal to generate the BB ENABLE signal for the Black Burst circuit in Schematic 7.

Table 6-3
Horizontal Timing PROM

Output	Function
D0	Positive pulse twice a line used to latch vertical information from the V Timing PROM, V Pulse PROM, and the Signal Selection PROM.
D1	Half-line timing at a horizontal rate for selecting half-line signal segments.
D2	Half-line timing at a horizontal rate for selecting half-line signal segments.
D3	Timing for B B ENABLE signal and for alternating burst phase from line to line (B1, B2).
D4	Negative, 70 ns pulse to clear the H Timing Counter to zero at count 909.
D5	Positive, 70 ns pulse twice a line enables the Vertical Counter to count twice a line.
D6	Negative pulse that is NORed with V DR to provide the BURST GATE signal. This signal is used on the Analog board to clamp the test signal output.
D7	Negative, 70 ns pulse used to load the H Pulse Counter once a line with a count specified by the μP.

Horizontal Timing PROM
(Numbers are in µs)

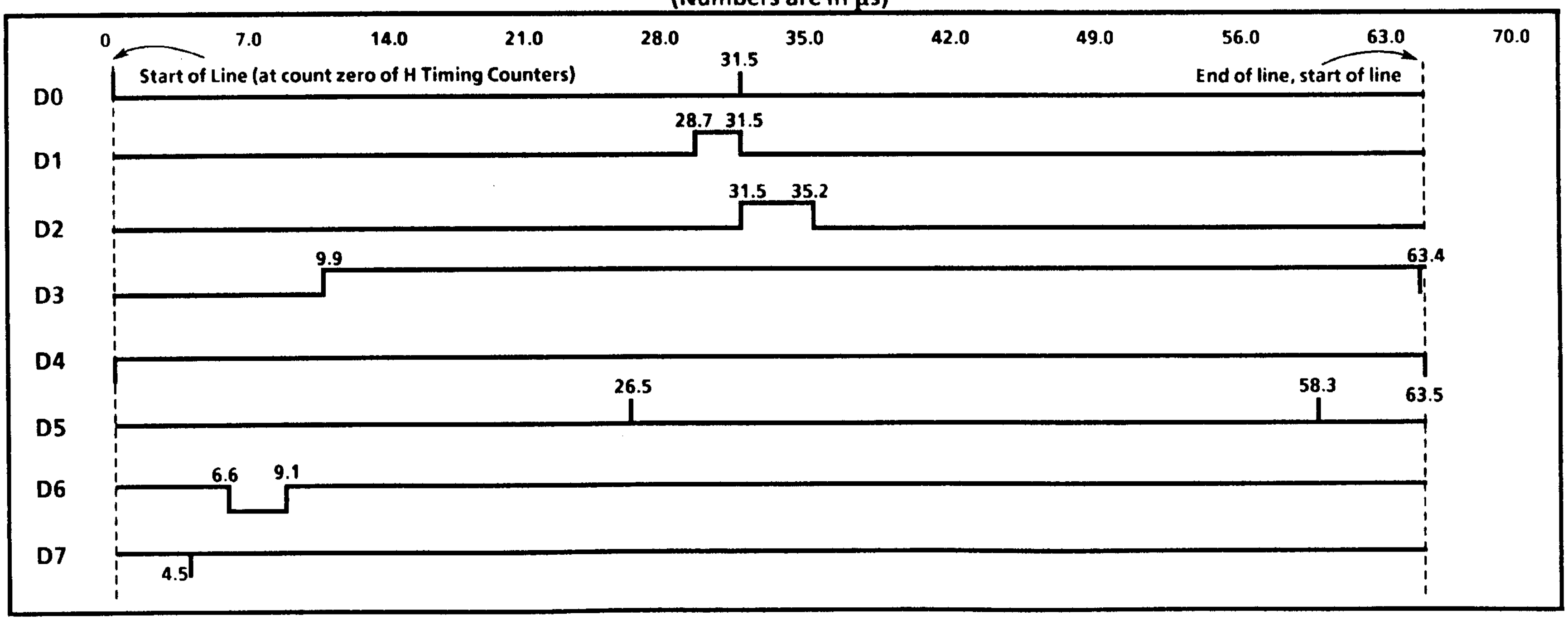


Table 6-4
Vertical Timing PROM

Output	Function
D0	APL timing (low for one horizontal line, high for four horizontal lines).
D1	Timing for horizontal lines in CNV (Convergence) signal.
D2, D3, D4	Three-bit code used by Signal Selection PROM for matrix and vertical sync timing. Also used for timing by Color Bar Data PROM in Option 1.
D5	Timing for station ID (Option 1). High for 1 line, low for 2.
D6	Used to clear the character generator on Option 1.
D7	Timing for black portion of station ID (Option 1).

Vertical Timing PROM (Field 1 of 4)
(Numbers Refer to Beginning of H-Line)

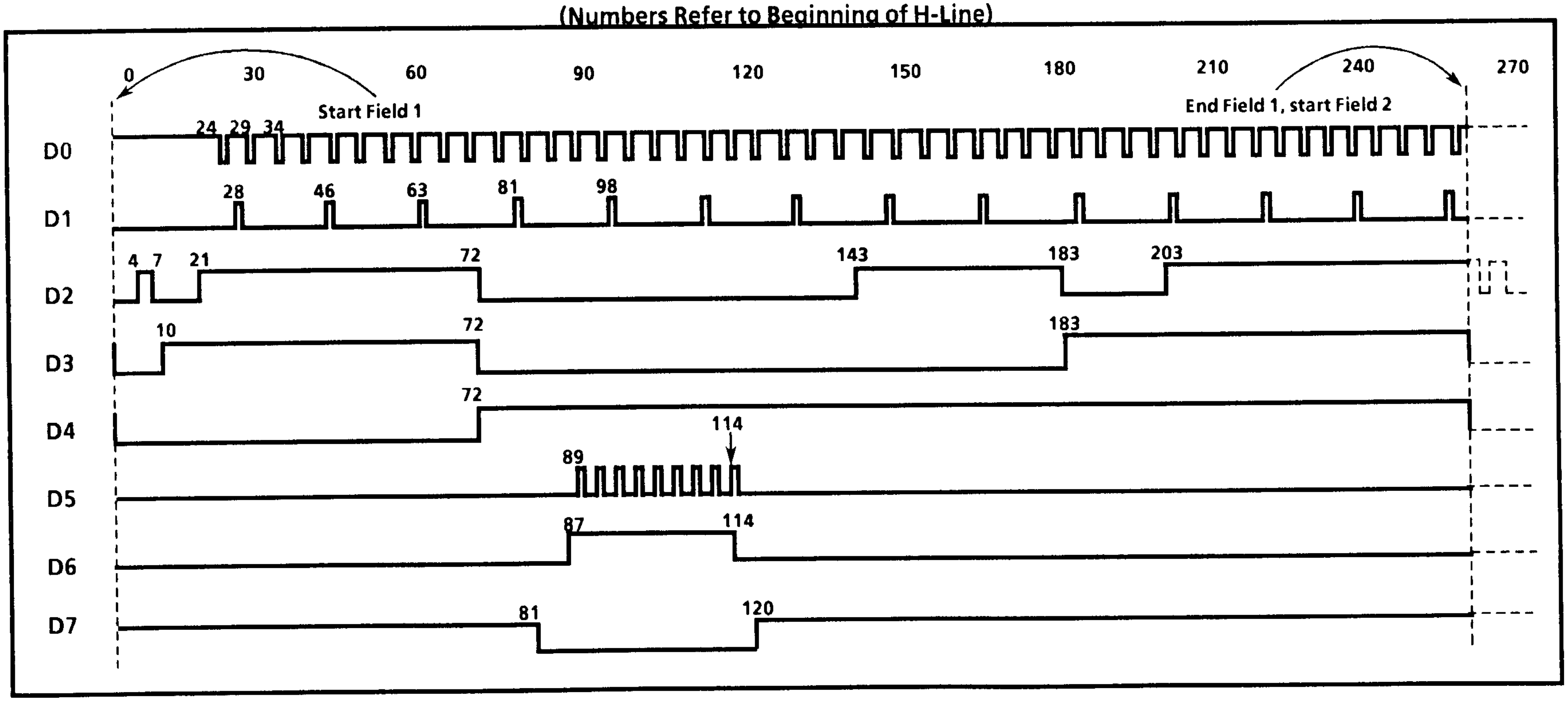


Table 6-5
Signal Selection PROM Output Codes

S3	S2	S1	S0	ϕA	ϕB	SELECTED SIGNAL
0	0	0	0	X	X	7 BAR COLOR BARS
0	0	0	1	X	X	REVERSE BLUE BARS
0	0	1	0	X	X	IWQB BARS
0	0	1	1	0	1	CONVERGENCE (HORIZ.)
0	0	1	1	1	0	CONVERGENCE (VERT.)
0	1	0	0	0	1	LINEAR RAMP
0	1	0	0	1	0	5 STEP
0	1	0	1	X	X	MOD RAMP
0	1	1	0	X	X	PULSE AND WINDOW
0	1	1	1	X	X	SWEEP MARKERS
1	0	0	0	0	1	MULTIBURST
1	0	0	0	1	0	BLANKING
1	0	0	1	0	1	10 IRE
1	0	0	1	1	0	100 IRE
1	0	1	0	X	X	MULTIBARS
1	0	1	1	X	X	RED FIELD
1	1	0	0	X	X	NTC7 COMPOSITE
1	1	0	1	0	1	3.58 MHz CW
1	1	0	1	1	0	500 kHz CW
1	1	1	0	0	1	LINE SWEEP
1	1	1	0	1	0	MULTIPULSE
1	1	1	1	0	1	EQUALIZERS
1	1	1	1	1	0	VERTICAL SYNC

TEST SIGNAL MEMORY AND MULTIPLEXERS (Schematic 7)

Test Signal PROMs

Five PROMs (U624, U631, U637, U644, and U650) store the signals and signal components that make up the 18 selectable test signals. The PROMs store these signals as a series of 10-bit words, each PROM storing two bits of each word. The output rate from these PROMs is 40 bits every 280 ns. This output is 4:1 multiplexed by ten serial shift registers to provide the required test signal output rate of 10 bits every 70 ns.

At the input to the Test Signal PROMs, the S0-S3 signals select the desired test signal and the HD0-HD6 signals (derived from the H Timing Counter, Schematic 6) address the components of the selected signal.

At the end of color fields 1 and 3, the PROMs generate only half of the last line in the field. Then they are switched to generate the vertical interval. But before they do, they are switched to generate a transition ramp that smooths out the otherwise sudden change from active video to equalizing pulses. The switching from active video to transition ramp to vertical is controlled by the HD7 signal, which is activated by the ½LINE signal. When the ½LINE signal is inactive, gate U363D allows the HD7 signal line to be used as part of the address code generated by the H Timing Counter (Schematic 6).

HD8 selects the chrominance phase of the test signal output. It does this by selecting one of two versions of the same signal. The chrominance phase of one is the opposite of the other. The selected version is alternated from line to line as chrominance changes phase from line to line.

Shift Registers

Ten shift registers (U723-U752) increase the data rate of the test signal output by converting the 4-bit parallel inputs to a serial bit stream. The timing for this process is shown in Fig. 6-6. Since the shift registers all operate in the same way, only one is described here.

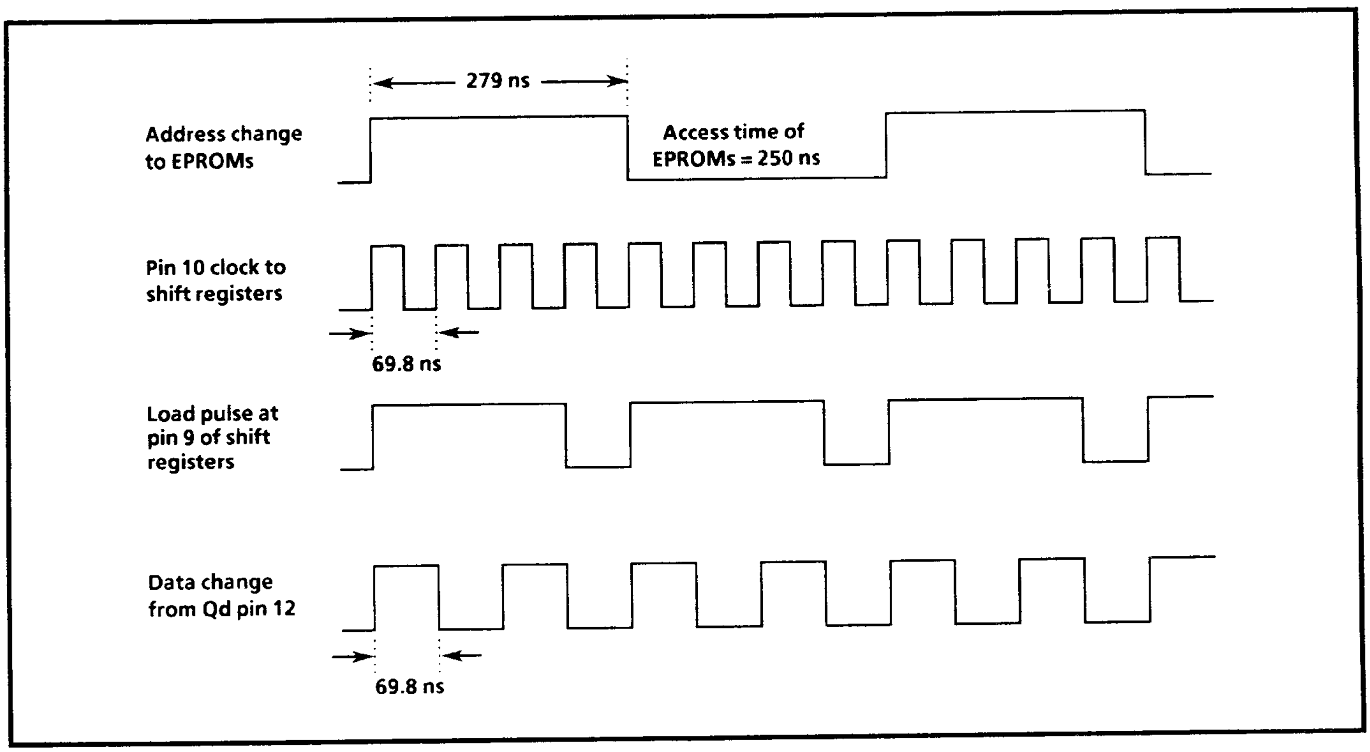


Fig. 6-6. Timing of data-multiplexing shift registers.

A data word's 8-bit output is considered stable 250 ns after it has been addressed in PROM U624. The S/L signal pulls pin 9 of both U723 and U726 low to load four bits of parallel data into each register. The fourth bit (loaded into the D3 input) appears immediately at the Q3 output. While the PROM is accessing its new data word, the shift registers shift the remaining three bits to the Q3 output, thereby increasing the data rate by 4:1. After three shifts, the load pulse goes low again and the process is repeated.

Each line is represented by 910 samples. But the shift registers load test signal data in four sample segments. Since 910 is not divisible by four, the shift registers get only 908 samples (samples 3-910) from the PROM. They get the remaining two samples (samples 1 and 2) from their serial inputs. These samples are generated as follows.

At the start of each line, the shift load cycle is interrupted because the SHIFT/$\overline{\text{LOAD}}$ line is kept high for two additional shifts. This allows two data samples from the serial inputs (pins 2 and 3) to be shifted out. These samples represent blanking level.

TTL-to-ECL Conversion

The 10-bit outputs from the shift registers are routed to TTL-to-ECL converters (U821, U824, and U827) where they are converted from TTL levels to ECL. The ECL representation of the digital signal is then routed to the Analog board for D-to-A conversion.

INPUT PROCESSING AND PULSE OUTPUTS CIRCUIT DESCRIPTIONS (Schematic 8)

This description divides Schematic 8 into two parts: Input Processing and Pulse Outputs. Input Processing prepares the Genlock Input signal for ADC sampling in the Genlock Loop, and Pulse Outputs prepares the sync pulse outputs for interfacing with other television equipment.

INPUT PROCESSING

Genlock Input Buffer

The AC-coupled Genlock Input Buffer inverts and amplifies the Genlock Input signal so that sync and burst fill the range of the Genlock ADC on the Digital board.

At the input stage, differential pair Q915 and Q917 isolate and current-amplify the Genlock Input signal. The second stage (Q817) inverts and voltage-amplifies the signal. The third stage, an emitter follower (Q815), applies the signal to the input filter on the Digital board. It also feeds the inverted signal back to the input, at the base of Q915.

As well as amplifier feedback, three other signals feed to the input of the Genlock Input Buffer: Line dither comes through R309, the Clamp circuit adds a DC offset through R914, and burst dither comes through R913.

Line Dither

The function of the Dither circuit is to increase the ADC's resolution (Schematic 3) to that of a 10-bit ADC by inserting 16-level pseudorandom noise into the Genlock Input signal.

Counter U218, DAC U210, and op-amp U310A make up the Dither circuit. The counter outputs are connected to the four high-order bits of the DAC, with the LSB tied to the highest order bit (bit 7) and the MSB tied to the low-order bit (bit 4). Op-amp U310A converts the DAC output current to voltage and applies it to the Genlock Input Buffer. An internal resistor connected to pins 1 and 16 is the feedback path for U310A.

Schottky diode CR210 protects the DAC against negative transients by switching on at -.3 V. Op-amp U310B provides a stable -0.625 V reference for DAC U210 and the Output Clamp (U532, Schematic 9).

Input Clamp

By comparing the sync tip voltage of the Genlock Input signal with a -50 mV reference, the Input Clamp circuit generates a DC offset voltage to clamp the incoming signal to -50 mV. It does this as follows:

Monostable multivibrator U520A shortens the incoming 4.7 μs sync pulse detected by the Sync Stripper to about 2 μs. This shortened pulse switches on U311, allowing U311 to generate a voltage equal to the difference between the sync of the input video applied to pin 3 and the reference with dither applied to pin 2 (-50 mV plus up to 1 mV dither). This difference voltage is stored in C425 for the remainder of the line. Through Darlington Q415, the voltage is applied to the base of Q915, where it clamps the sync tip of the Genlock Input to -50 mV.

When the Genlock Input is a continuous wave, no sync pulses are available to time the clamp so the Sync Stripper output must be switched off by moving P520 to the 2-3 position.

One of the purposes of the Input Clamp is to remove 60 Hz hum. When the Genlock Input is a continuous wave and there are no sync pulses to drive the Input Clamp, the hum can be removed by feeding the signal through a high-pass filter comprised of C411, R110, and R109. This is done by moving P118 to the 2-3 position.

In the high-pass filter, R109 and R110 also act as a voltage divider to bring the CW signal within the ADC range.

Burst Dither

NOTE

Burst dither is active only if a Genlock Input signal is connected and detected.

During burst, a sawtooth wave adds an increasing offset to the Genlock Input signal. This offset dithers the burst samples to improve sampling accuracy in the Genlock Data Acquisition circuits.

Q810 and C810 generate the sawtooth. A low $\overline{\text{BURST DITHER}}$ pulse turns off Q810 just before burst and leaves it off until just after burst. During this time, the collector of Q810 charges C810 to produce the sawtooth. This signal feeds to the Genlock Input buffer through R913.

Sync Stripper

The Sync Stripper extracts sync pulses from the buffered Genlock Input signal and applies them to the Input Clamp and the Genlock Data Acquisition circuits (Schematic 3). C712 filters off the chrominance portion of the Genlock Input. The remainder of the signal goes to peak detector U610A and inverting op-amp U610B. U510 compares the output of these devices and produces the composite sync.

PULSE OUTPUTS

Pulse Output Drivers

These drivers convert the TTL-level sync pulse signals to standard -4 V levels. Since all these pulse output drivers have the same circuitry (except the FRAME/BLACK output, which has an additional driver for more power), only the Burst Flag driver is described here.

Controlled by BURST FLAG from the Digital board, Q190 is essentially a switch that diverts current from R188 to two possible paths. When BURST FLAG is low, diode CR185 is switched on, and current flows from the +12 V supply through R188 and CR185 to ground on the Digital board. When BURST FLAG is pulled high, CR185 is switched off, and the current goes through Q190 to charge C294. The resultant pulse at the collector of Q190, which is wave shaped by the following RLC circuit, switches on the output driver (Q287) to generate the -4 V output pulse.

Q298 provides a TTL reference that sets the trip point at which CR185 is switched off and Q190 is switched on. Jumpers P385, P765, P565, P784, P680, P965, and P967 allow the user to select alternative outputs from the drivers. See the jumper table in the **Installation** section.

Subcarrier Output

This circuit is a tank amplifier followed by a discrete op-amp. The amplifier converts the TTL digital subcarrier input (SUBC) to a sine wave, while the discrete op-amp provides a high-impedance load to the tank amplifier and drives the Subcarrier output.

At the input, R184 and R185 act as a voltage divider and biasing network. On the emitter leg of the differential amplifier, R784 sets the amplitude of the sine wave. When P189 covers pins 2 and 3, it grounds the SUBC signal to allow testing of the Subcarrier output return loss.

Q895, Q890, and Q985 comprise the op-amp buffer that feeds the sine-wave output to the 75Ω output connector on the rear panel. U320B provides an isolated voltage of -10 V for the tank amplifier and the op-amp buffer.

TEST SIGNAL AND BLACK BURST OUTPUTS CIRCUIT DESCRIPTIONS (Schematic 9)

This material describes the Output DACs, the Output Filter, the Output Amplifier, and the Black Burst Output.

Output DACs

Two 6-bit DACs (U245 and U345) convert the test signal data from the Test Signal PROMs (Schematic 7) into an analog test signal. U345 converts the six MSBs and U245 converts the four LSBs. The two DAC outputs are combined at pin 8 of U345.

Both DACs draw a constant current. Current drawn through pin 8 of each DAC is proportional to the input data, and the current through pin 7 of each DAC is the remaining portion. The source of current is a reference of approximately 1.1 V, generated by U440 and U532.

Current drawn by pin 8 of U345 generates the MSB portion of the signal voltage across a 75Ω parallel resistor network comprised of R336, R337, R338, and R235. Pin 8 of U245 draws the same amount of current as pin 8 of U345, but R337, R235, and R338 divide its voltage contribution to the total DAC output by 64.

U319 puts out a 2.5 V reference that is used in the DACs to set the internal operating current and used by inverting op-amp U937 to generate a stable -10 V supply for the output amplifiers.

Output Filter

To remove out-of-band signal components, the analog test signal from the Output DACs is filtered by a low-pass reconstruction filter that is terminated in 75Ω. The front end of this filter provides group delay correction, and the following stages provide the reconstruction filtering.

Jumper P355 is for checking the return loss of the Test Signal and Black Burst Output Amplifiers, and for testing the low-pass filter on the Option 1 board. When P355 is in the 1-2 position, the DAC output is grounded and the test signal and Black Burst are at 0 V. This allows the return loss of the Test Signal Output Amplifier and Black Burst Output Amplifier to be tested. In the 2-3 position, the DAC output is passed directly to the filter.

The low-pass filter on the Option 1 board may be tested with signals from the DAC output of the Analog board by connecting the jumper from pin 3 of P355 to pin 2 of P655 on the Option 1 board (Schematic 12).

If the test signal output filter needs to be disconnected from the output amplifiers for testing, W645 provides a means of reconnecting the filter.

Output Amplifier

After filtering, the signal is applied to the Output Amplifier, which is a discrete, non-inverting op-amp having two differential amplifiers and an output stage. The first stage (Q628 and Q634) is an input buffer, the second (Q730 and Q735) is a gain stage, and the third (Q827) is an output driver.

From the emitter of Q827, negative feedback is applied to Q628 through a voltage divider network. At R730, the gain of the output is adjusted. In this feedback path, an RC network (connected to C725) provides sinx/x compensation by C725 decreasing negative feedback in the high end of the video spectrum. This compensation is adjustable through C725. R622 provides DC offset adjustment.

From Q827 the amplified and compensated signal is applied to the rear-panel connector through a 75Ω resistor.

Black Burst Output Amplifier

The Black Burst Amplifier generates black burst by using the currently-generated test signal and inserting setup-level during the active video portion of the signal.

Taken from the output filter, the test signal is buffered by a pair of emitter followers (Q635 and Q629). It is then applied to a switchable op-amp made up of three differential amplifier stages and an output driver.

The B B ENABLE signal controls the first two differential stages (U575A and U575B). During the horizontal sync interval, B B ENABLE switches on the first stage, allowing the first stage to send sync and burst to the third stage (Q752 and Q843). During active video, B B ENABLE switches the first stage off and the second stage on. This second stage sends setup-level video to the third stage. The resulting output at the driver (Q855) is Black Burst.

The voltage at pin 3 of U532 determines Black Burst setup level. R853 adjusts Black Burst gain.

Timed by the burst gate, U532 and U440 clamp the test signal output. U532 generates an offset voltage, and C540 stores this voltage throughout the line. U440 buffers C540 and adjusts the 1.1 V DAC reference in proportion to the offset voltage.

POWER SUPPLY CIRCUIT DESCRIPTION (Schematic 10)

Overview

The TSG-170A Power Supply consists of a Buck-type switching power supply that generates two regulated voltages (±5 V) and a linear supply that uses outputs from the switching supply (±15 V) to generate ±12 V. The Power Supply circuitry is contained on one board (A4). Fig. 6-7 shows a functional block diagram of the Power Supply.

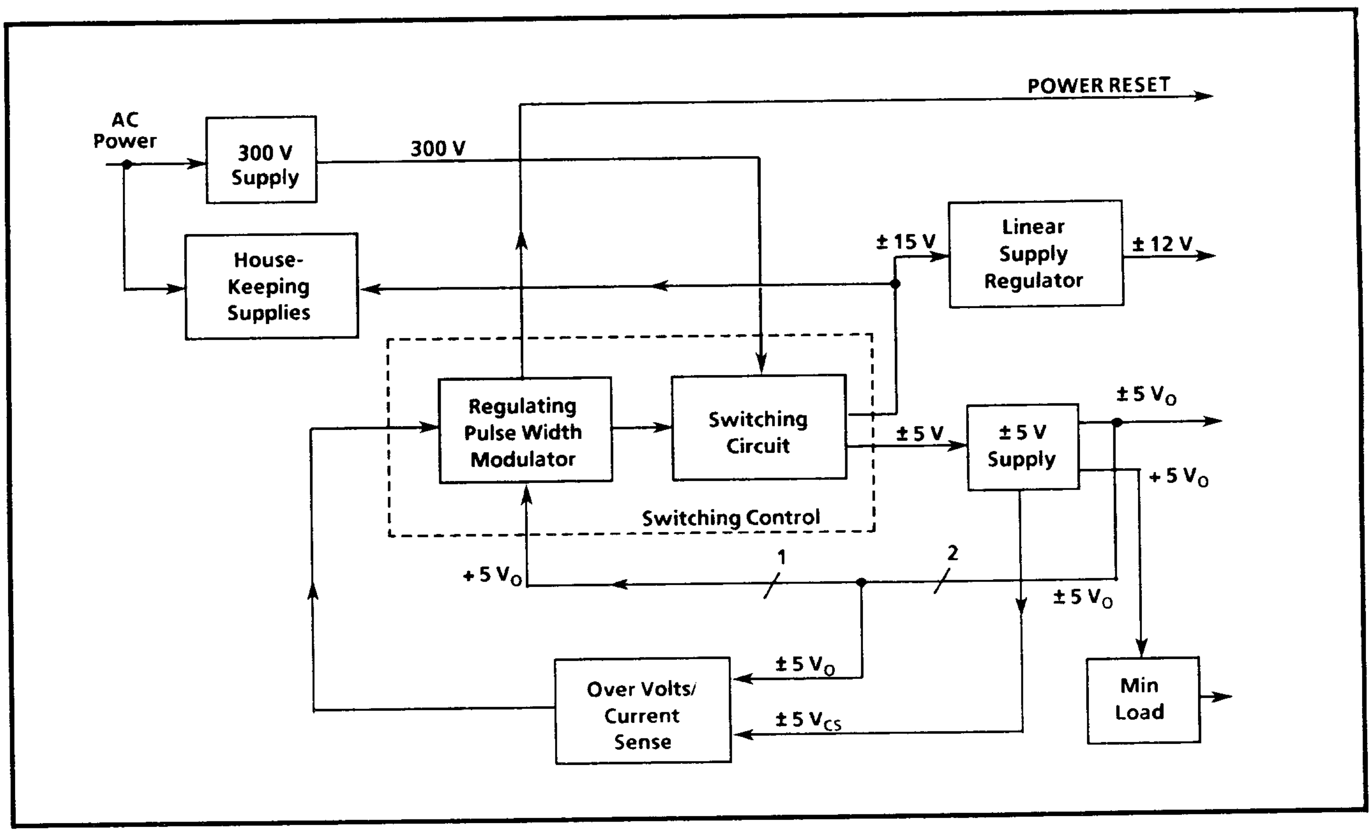


Fig. 6-7. Block diagram of Power Supply.

The AC line voltage enters the Power Supply through the Line Filter, where an EMI filter removes noise. The 300 V supply rectifies and filters the line voltage to provide +300 V to the Switching circuit.

Using the 300 V supply, the Switching circuits provide the current from which the regulated ±5 V and ±12 V supplies are generated. The Pulse Width Modulator regulates the ±5 V output, and the Linear Supply regulates the ±12 V supply.

Line Filter

The Line Filter (LF950) isolates the instrument from the power line. This prevents noise on the power lines from affecting the instrument's performance and, conversely, prevents any noise generated by the instrument from reaching the power lines.

300 V Supply

CAUTION

When modulator operation is in doubt, protect the FETs from high voltage by removing the wire strap (W950) that connects them to the 300 V supply.

The purpose of the 300 V supply is to convert the AC line voltage to 300 V for use in the Switching circuit.

Jumper J810 allows the Power Supply to accept either 115 or 230 Vac line voltage. When the arrow of the jumper plug is lined up with the **115** arrow on the circuit board, the two primary windings of T610 are in parallel and bridge rectifier CR810 acts as a full wave voltage doubler. When the jumper housing is rotated 180° so that its arrow is lined up with the **230** arrow, the windings of T610 are in series and CR810 acts as a full wave bridge rectifier.

Housekeeping Supplies

The Housekeeping Supply provides the Power Supply with a precision +2.5 V reference, a regulated ±8 V, and also a +14.4 V supply. The +2.5 V reference is used as a yardstick against which all other voltages that the Power Supply generates can be measured. The ±8 V supplies the regulation and protection circuits throughout the Power Supply. From the +8 V supply, the +5 V Housekeeping Supply (+5 V_{ref}) is derived. This +5 V_{ref} supply is generated across a 5 V Zener diode connected to pin 18 inside U435. Current to the Zener diode is from the +8 V supply. The +14.4 V supply provides power to the Pulse Width Modulator output buffer, U525.

When the instrument is first powered up, the secondary of T610 provides power for the Housekeeping Supply. Bridge rectifier CR510 converts the filtered line voltage to ±14.4 Vdc. C412 averages the positive output of CR510. U310 regulates this averaged output to generate the +8 V housekeeping voltage. U210 then accurately regulates the +8 V to produce the +2.5 V reference. C410 averages the negative output of CR510, and U212 regulates it to provide the -8 V reference.

Once the instrument is powered up, T610 no longer provides power for the housekeeping and reference voltages. Instead, the ±15 V at the input of the Linear Supply provides the power. This ±15 V supply is stepped down to ±14.4 by diodes CR420 and 410. The presence of ±14.4 V at the outputs of CR510 shuts CR510 off by reverse biasing its diodes.

Having two power sources for the Housekeeping Supply — one during power-up and one after power-up — makes the Housekeeping Supply independent of the regulated supplies that power the rest of the instrument. The Housekeeping Supply will always be powered up even if the rest of the regulated power supplies are shut down.

Switching Control (Pulse Width Modulator and Switching Circuit)

WARNING

When replacing the FETs (Q660 and Q661), be sure to replace the FET shield before powering up the supply. This shield is a protection from flying fragments should an FET explode.

The heart of the Switching Control circuit is the Pulse Width Modulator and the Switching circuit. Their combined purpose is to convert the 300 Vdc supply to a high frequency supply and then to a lower voltage supply that can be efficiently stepped down to generate the regulated supplies (±12 V and ±5 V).

The main purpose of the Pulse Width Modulator (U435) is to provide and control the switching pulses for the FET gates (Q660 and Q661) in the Switching circuit. An oscillator inside the Modulator generates the switching pulses. This oscillator is set at 47 kHz by the RC network connected to pins 9-11. The duty cycle of the switching pulses will vary in proportion to the load at the output and line voltage into the Power Supply. The output pulses from U435 are buffered by U525 and combined in the primary of T735 to form a signal that drives the FET gates on and off, one at a time.

The primary current for the main power transformer (T650) is gated by the FETs (Q660 and Q661) switching the 300 V supply on and off at a 47 kHz rate across the primary windings. C766 and C768 isolate DC voltage from the primary of the transformer.

When the Power Supply is first starting, U435 is not operational until the Housekeeping Supply reaches +8 V. Once U435 is operational, C433 charges, and the output duty cycle of U435 increases from minimum until the power requirements of the instrument are met. This process of increasing the duty cycle from minimum to meet the power demand is called "Soft Start." It prevents the FETs from being damaged as the supply charges the filter capacitors and attempts to regulate.

As the Power Supply is starting up, comparator U325B holds the $\overline{\text{POWER RESET}}$ line low. This disables the µP on the Digital board until the Power Supply is powered up and operating at proper voltage levels. Even after the voltage is up to the proper level, U325B will continue to hold the $\overline{\text{POWER RESET}}$ line low for a few more moments to wait until the voltage has stabilized.

Troubleshooting Notes — When the FETs (Q660 and 661) fail, the gate resistors (R750 and R751) also fail, so both the FETs and resistors should be replaced.

To ensure sufficient heat transfer, be sure that heat-sink-mounted components are screwed down with 4 inch-lbs torque.

± 12 V Linear Supply

The ±12 V supply is derived from the line-regulated ±15 V generated by one of the secondaries of T650. The secondary voltage is rectified by CR533-CR536 and applied to L435 This inductor acts as a current storage device. During the first part of each switching cycle, the inductor current increases from zero, storing energy taken from the input. During the second part, the stored energy discharges into the load, pumping energy from input to output. C156 and C176 filter the inductor output and then pass it to U360 and U260 (monolithic voltage regulators), which regulate it down to ±12 V. The nominal tolerance on the ±12 V supplies is 1%. If the current drawn from the ±12 V supply exceeds approximately 2 A, the monolithic regulators shut down to protect the regulators and the circuits they supply.

The ±15 V also powers the Housekeeping Supply once the Power Supply is powered up, providing a more regulated voltage than CR510 provides.

± 5 V Supply

The ±5 V supply is regulated by the Pulse Width Modulator (U435). The output from the secondary of T650 (pins 15 and 18) is rectified by CR460 and CR360, then applied to L451, which "pumps" the current to the load as described above. C235-C351 filter the inductor output to provide the ±5 V supply.

The Pulse Width Modulator samples the +5 V (+5V_0) and compares it at the Voltage Sense circuit (U331A) to a precise 2.5 V reference generated by the Housekeeping Supply. The difference is applied to the positive error input of U435. In response, U435 varies the duty cycle of the Switching Regulator, which, in turn, corrects the voltage of the ±5 V supply. This also causes a corresponding change to the other secondaries.

Overvolt Sensing

Comparators U335B and U220B monitor the regulated ±5 V power supply. If one of the supplies increases in magnitude by more than approximately 1 V, the output of one of the comparators will pull the input to timer U133 low and shut down U435. The normal operating voltages at pin 10 of U335B is +2.1 V, and at pin 9 of U220B is +0.3 V. Jumpers J242 and J120 provide easy testing of the sensors. When pins 1 and 2 of either jumper are shorted together, the Power Supply should shut down.

Overcurrent Sensing

Comparators U335A and U220A monitor the current output from the ±5 V supplies. If current flow from the +5 V supply exceeds approximately 8 A, or if the current flow from the -5 V supply exceeds approximately -4 A, the comparators shut down U435 in the same manner as do the Overvolt Sensors.

Minimum Load

This circuit ensures the Power Supply always has the minimum load required to keep it operational. When the Digital board is connected to the supply, the base of Q160 is grounded and the transistor draws no current. But if the Digital board is disconnected, the 5 V supply at the base of Q160 switches on the transistor, which draws current.

Indicator Lights

The Power Supply has two indicator lights. The first is the neon safety light (DS810) located in the 300 V supply. This light flashes when it has at least 70 V across it. When the mains power is switched off, the light will still remain flashing for about 30 seconds to indicate that the neighboring capacitors still have a residual charge.

The second light is a two-color LED (DS112) that indicates with a red LED when the instrument is in power-reset mode, and with a green LED when the instrument has powered up.

When the instrument is powering up, the $\overline{\text{POWER RESET}}$ line is low and the +5 V_{ref} supply lights the red LED. Shortly after, power reaches the +12 V supply and it lights the green LED. For a brief moment, both LEDs are on. Finally, as full power is reached, the $\overline{\text{POWER RESET}}$ line is pulled high and the red LED switches off.

Fan Supply

The fan has a main supply (-15 V) and an additional supply (+5 V) to help get it up to speed during power-up.

When the instrument is powering up, the $\overline{\text{POWER RESET}}$ line is low, switching on Darlington Q340 and placing 20 V (-15 V – +5 V) across the fan. But as the supply reaches full power, the $\overline{\text{POWER RESET}}$ line is pulled high and switches off Q340. This switches off the +5 V supply, leaving just the -15 V supply to power the fan (-14.3 V across the fan and -.3 V across diode CR409).

POWER SUPPLY CIRCUIT DESCRIPTION (Schematic 10) B040000 & Above

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:

+12V	0.5 Amps max
+5V	7 Amps max
-5V	2 Amps max
-12V	0.5 Amps max

The maximum power is limited by the maximum current in the primary of T440. 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, U176 and U276.

The power inductor, T440, is driven by switching the current to it's primary on and off. T440 is not used as a transformer, but as an energy storage device, storing the energy in the primary while the current is being applied. On the second half of the switching cycle the current to the primary is switched off, and the energy stored in the primary is transferred to the secondaries (flyback). Regulation is accomplished by applying feedback from the +5 V supply to the pulse width modulator controlling the current to the primary. This varies the length of time that the current 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, under-voltage shutdown if the ac input is too low, overvoltage protection (crowbar) on the +5 V supply, and shutdown circuitry which forces a restart of the supply if it remains in current limit for more than a short period of time (<1 second).

WARNING

All primary voltages are referenced to a floating ground, not chassis ground. An isolation transformer or a differential amplifier is therefore needed in order to troubleshoot the circuitry in the primary and the Pulse Width Modulator, and in their supporting circuitry.

As current never flows simultaneously in both the primary and the secondary, there is never any actual transformer action. As the magnetic flux in the inductor goes to zero at the end of each switching cycle, it is discontinuous.

Input, AC to DC Converter, and Voltage Doubler

This circuitry filters and rectifies the input ac voltage, placing a charge of approximately 320 Vdc across capacitors C845 and C865.

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, J810 is used to select between 110 V and 220 V operation. If set to 220 V, 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, J810 is set 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.

RV920 and RV820 limit voltage surges on the input which might pass the line filter, while R831 and R830 discharge C865 and C845 when the power is off. C830 and C730 bypass switching noise to ground, keeping it out of the input power line. DS720 and associated parts form a relaxation oscillator, so DS720 blinks when the instrument is powered up.

Kick Starter, Housekeeping Supply, and Undervoltage Lockout Circuits

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. The primary purpose of the undervoltage lockout circuit is to prevent the supply from starting up when set for 220 V operation and 110 Vac is applied instead, but it will stop the oscillation in the Pulse Width Modulator whenever the voltage across C845 and C865 (normally at 320 V) falls below approximately 200 V.

VR765 holds the emitter of Q755 at about 20 V, while the base is controlled by a divider comprised of R766, R767, and R768. So long as the charge across C845 and C865 remains around 320 V, Q755's base is held at approximately +30 V, and the transistor is off. As the voltage across C845 and C865 decreases, the base voltage does as well; when the voltage across the caps is down to approximately 200 V, Q755's base is at about +19 V, and Q755 is turned on. This, in turn, turns on Q727, applying the +5 V reference from U722-8 to U722-2. This disables the Pulse Width Modulator.

When the input voltage is sufficient to maintain the charge across C845 and C865 above 200 V, Q755 is off. This allows the Kick Start circuit to operate, providing the initial power to start up the Pulse Width Modulator. It does this by charging up C656 through Q667 and R560. During start-up, the +5 V reference output of U722 is at 0 V, and Q660 is off. The base current for Q667 during this time is supplied by R667.

When the charge across C656 reaches approximately 16 V, U722 starts to operate. It switches Q638 on and off through the base drive circuitry (Q741, Q750, Q648, and associated circuitry). The +5 V reference voltage at U722-8 is developed, which turns Q660 on. This diverts the base current from Q667, so it turns off and DS670 turns on to indicate normal operation.

The power to maintain the +16 V charge on C656 is now provided by the housekeeping winding of T440, pins 5 and 6, through CR556. If there is insufficient power to maintain the charge on C656 for any reason, such as the removal of J660, then the charge on C656 is quickly depleted. This stops the operation of U772, and the kick start sequence is repeated.

Power Inductor Operation

The heart of this power supply is T440, the multi-winding power inductor. The operation of T440 is as follows (see Fig. 6-8). Inductor T440 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 C845 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 bias their respective diodes (note the polarity dots). In this way, there is no current flowing in the secondaries while it is flowing in the primary.

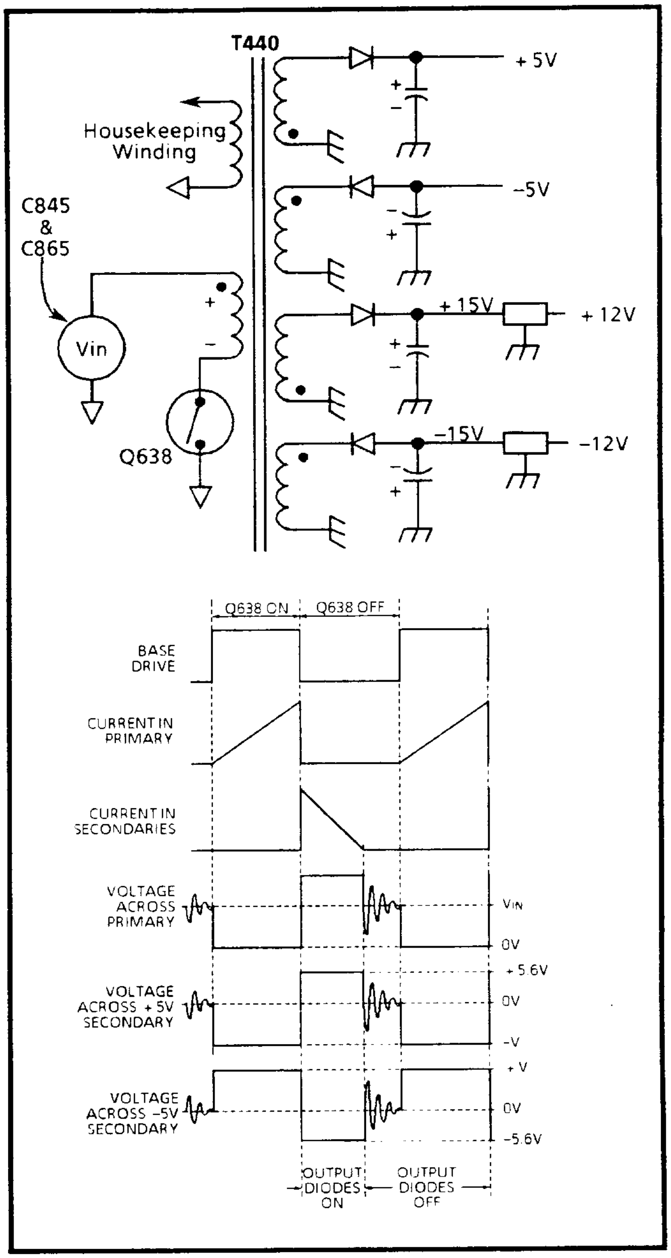


Fig. 6-8. Basic operation of T440

The primary current builds a linear ramp, storing the energy in T440 according to the relation $E = \frac{1}{2}Li^2$, 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 T440 then causes the voltages in the secondaries to reverse polarities, and all their diodes to turn on. The current in the secondaries linearly ramps down to zero as the energy which was stored in T440's primary is delivered to the load, charging the output capacitors.

When all of the energy which was stored in T440 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 T440, this is called discontinuous flyback operation.

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 which drives Q638.

When the +5 V goes too high, U722 narrows the pulse width. This reduces the amount of energy stored in T440, 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 T440 and then transferred to the load, so the voltage goes up.

Pulse Width Modulator and Error Amp

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 which controls Q638, as mentioned above. This regulates the secondary voltages throughout variations of input voltage, output load, temperature, etc.

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, which is controlled by the +5 V output (see Fig. 6-9). 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, ramp 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, then, is a function of line voltage. As the line voltage varies, so will the primary current. An increase in line voltage causes an increase in primary current, so 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 primary current, the slope of the ramp decreases, 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 without having to wait for output voltage variations.

Load regulation is accomplished by sensing the output voltage of the +5 V supply, and applying an error signal through opto-isolator U520 to U722-2. If the load increases, the supply voltage decreases, and so does the error signal at U722-2. This has the following results:

1. The comparator input increases, due to inversion of the IC.
2. The output pulse width increases, keeping Q638 on for a longer time.
3. I_p increases.
4. Power flow increases.

On the other hand, if the load decreases, the +5 V increases, so the output pulse width decreases along with I_p, and less power is transferred to the secondaries. In this way, the +5 V is kept constant through changes in the load, and, as it varies the amount of energy transferred to the other secondaries too, it regulates them as well.

The error amplifier is U410, a band-gap reference. It keeps the voltage at its cathode at a constant 2.5 V, set by the voltage applied to its reference, pin 2. This reference is set by R314, R315, and R415. R415 is also used to adjust the +5 V supply.

As U410's cathode is held at 2.5 V, the current through R416 will vary with changes in the output voltage, as will the current through the LED within opto-isolator U520. This changes the conductance of the transistor element of the opto-isolator, which then varies the voltage applied to the feedback input, U722-2.

Current Limit

Current limit is provided for the primary circuit by the internal circuitry of U722. As the ramp voltage at U722-2 reaches 1 V, the output drive pulse ends. This shuts Q638 off, so no further current is supplied. The maximum primary current is approximately 1.5 Amps, which corresponds to a maximum power level of approximately 75 Watts.

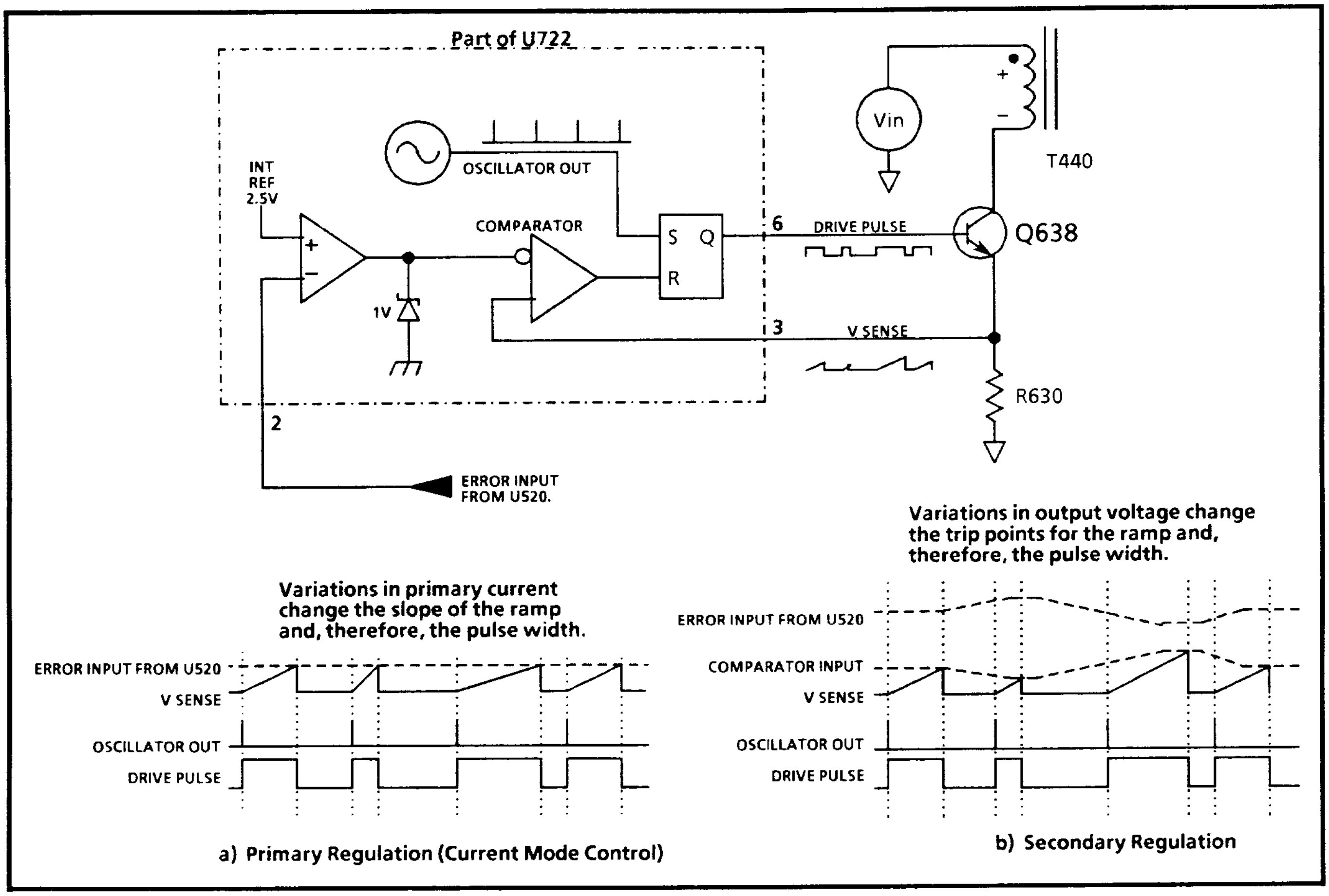


Fig. 6-9. Pulse Width Modulator operation.

As the supply goes into current limit, U615A and Q717 come into play. U615A starts to turn on as the ramp voltage passes ≈900 mV, and starts to charge C717. If the current limit condition persists long enough for the charge on C717 to reach 700 or 800 mV, 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.

Base Drive and Snubber

The pulse width modulated drive pulse from U722-6 is amplified by emitter followers Q741 and Q750. When the drive pulse is positive, Q750 is on and Q741 is off. Current flows through R746 and R747, through Q648 and CR649, and turns Q638 on. CR640, CR648, and CR649 form a Baker clamp to keep Q638 out of hard saturation.

As Q638 approaches saturation its collector-emitter voltage differential falls, and it needs less base current to maintain the same collector current. As saturation is approached, then, CR640 starts to conduct, providing a path for the excess base current.

When U722-6 goes to 0 V, Q750 is shut off and Q741 is turned on, so current is shunted to ground through CR651. C648 and VR650 speed up the switching off of Q638. The driven side of C648 is charged to approximately 5 V during the positive input half-cycle; then, when Q741 is turned on, C648's driven side is pulled down to +0.7 V by CR651, which pulls the base of Q638 down to approximately -3.3 V, through CR684. This abrupt transition draws a large current spike from the base momentarily (approximately 1 A for <0.3 μs), turning off Q638 very rapidly, along with CR640 and CR649.

When Q638 is turned off, there is a voltage spike applied to 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 ratings of Q638, a snubber circuit, consisting of C540, CR545, and R647, limits the spike to approximately 800 V.

Secondary Circuits

The secondary circuits all work in the same manner. As mentioned earlier, under basic operation, during the first half of the cycle, all their diodes 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 T440 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.

The +12 V and 12 V supplies actually start as +15 V and -15 V, at the transformer. These voltages are used for the fan, B100 (-15 V), and for the opto-isolator U520 (+15 V) only. Then they are filtered and applied to linear regulators, U176 and U276. These provide clean +12 V and -12 V outputs, respectively. CR169 prevents the +12 V from going negative, while CR170 keeps it from exceeding +15.7 V. CR269 and CR369 perform identical functions for the -12 V output.

Overvoltage Protection

Overvoltage protection is provided on the +5 V output by a crowbar circuit comprised by 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's gate voltage above its cathode, Q127 will turn on. This shorts the +5 V output to ground, forcing the primary circuit into current limit.

OPTION 1 CIRCUIT DESCRIPTION

The Option 1 circuitry is divided into three schematics: Color Bar and ID Generation (Schematic 12), Color Bar Output (Schematic 13), and Audio Generation (Schematic 14). Each is described below. See Fig. 6-10 for a block diagram.

COLOR BAR AND ID GENERATION (Schematic 12)

Color Bar Generation Circuit

The Color Bar Generation circuit produces continuous digital SMPTE color bars that the Color Bar DAC converts to an analog signal. Two PROMs make up the heart of this circuit: the Signal Segment PROM (U392) and the Segment Select PROM (U278). The Signal Segment PROM stores the color bar signal in eight-sample segments. The Segment Select PROM uses timing information from the Digital board to tell the Signal Segment PROM (through latch U292) which segment to generate.

The H Timing Counter (Schematic 5) and the Vertical Counter (Schematic 5) both apply timing signals to these two PROMs. Signals 1H3-1H9 and VC0-VC2 provide the Segment Select PROM with horizontal and vertical timing, respectively. The BURSTϕ signal dictates which chrominance phase the Segment Select PROM selects from line to line.

Signals 1H0-1H2 provide the Signal Segment PROM with timing for the eight samples in each signal segment. NAND gate U380B inverts 1H2 to align the timing of the Option 1 output with the Test Signal output.

The Color Bar Generation circuit also produces Black Burst as background for the countdown in the remotely controlled Tape Leader sequence.

When Tape Leader is selected, the μP asserts CONTROL 1 to switch off the Option 1 Bars and switch on Black Burst. At the same time, CONTROL 1 disables Audio Tone.

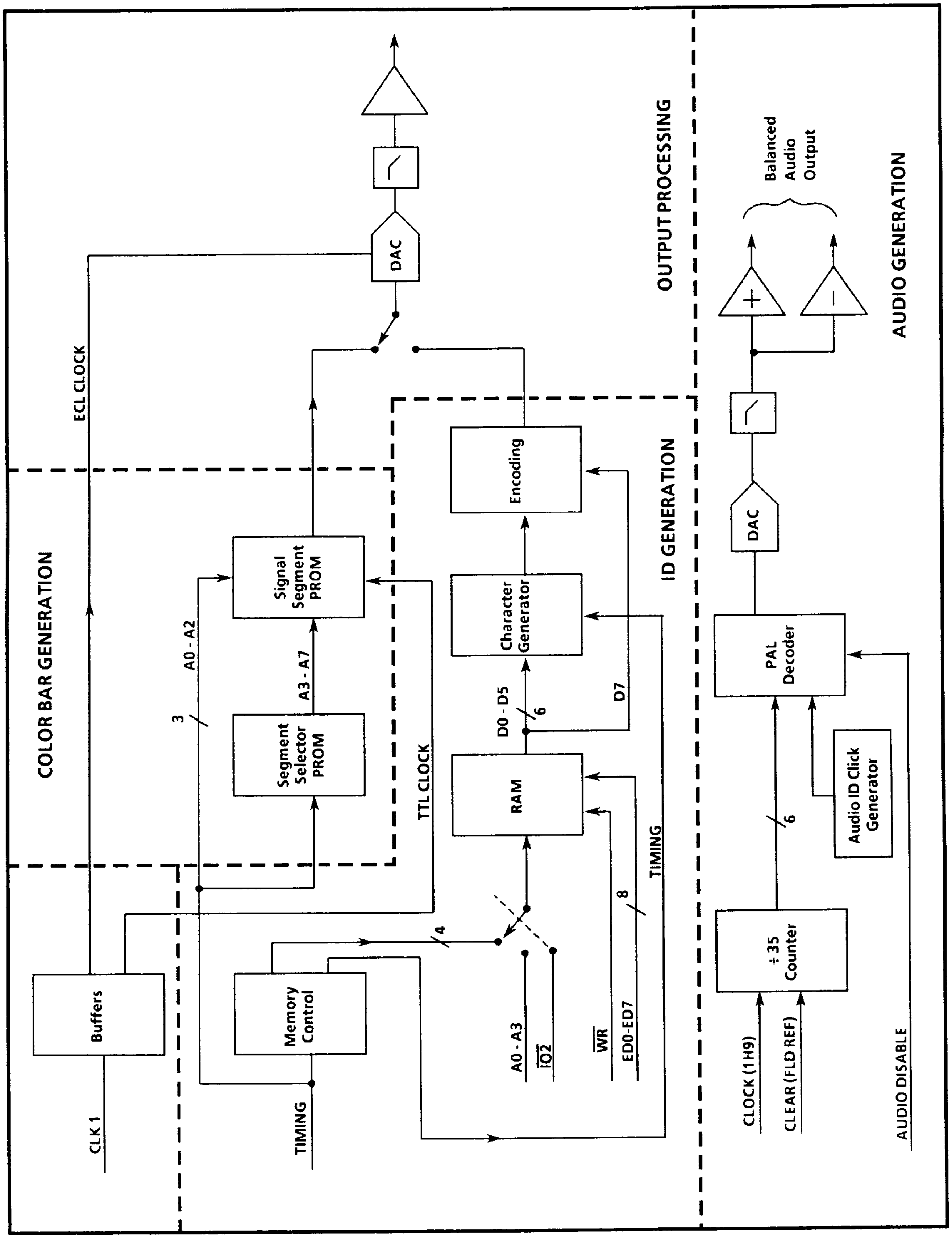


Fig. 6-10. Block diagram of Option 1 circuit.

Character ID Generation Circuit

The Character ID Generation circuit puts out a set of twelve characters on lines 87-114 of every field. Each character is made up of a 7 X 9 dot matrix, and each dot is three horizontal lines high.

Monolithic character generator U360 is essentially a serial output memory loaded with ID characters. Addressed through its A0-A5 inputs, the generator writes logic ones and zeros to encoder U592. These values represent white or black dots on a picture monitor.

The H Timing Counters (Schematic 5) and Vertical Timing PROM (U889, Schematic 6) provide the generator with timing. Fig. 6-11 shows these timing signals.

Encoder U592 has three main functions. First, it latches the data from the Character Generator. Second, it converts the Character Generator output to a parallel code representing voltage levels for black and white, and then applies it to the Color Bar DAC via the TTL-to-ECL converter in Schematic 13.

Its third function is to mark the position of the cursor on the video monitor with a gray square. When a character is being selected at the front panel — that is, when the front panel is in SET IDENTIFICATION mode — the μP pulls D7 high to tell encoder U592 to superimpose the gray square on the selected character.

Character RAM and RAM Control

The Character RAM (U350) stores selection codes for the twelve characters to be generated. It presents these codes (through U550), one at a time, to the address inputs of the Character Generator on every line of the field. The Character Generator puts out the characters only on lines 87-114.

When writing character selection codes to the Character Generator, the Character RAM is addressed by counter U535. The $\overline{\text{START CHAR}}$ and $\overline{\text{START LINE}}$ signals control this counter. Fig. 6-11 shows the timing for these signals.

There are two conditions in which the Character RAM reads from the NVRAM in the μP kernel: (1) when the instrument is in power-up mode or (2) when the front panel is in SET IDENTIFICATION mode. The read operation for these modes is as follows.

In power-up mode, the μP (Schematic 2) loads the 12-character selection codes stored in the EEPROM part of the NVRAM (Schematic 2) into the Character RAM (U350). For each of the twelve codes, the μP sends a 4-bit address code (A0-A3) to the Character RAM through multiplexer U335. It then asserts $\overline{\text{IO2}}$, sends the character selection codes (ED0-ED7) through buffer U255, and then asserts $\overline{\text{WR}}$.

When the front panel is in SET IDENTIFICATION mode, the μP loads character selection codes from the RAM portion of the NVRAM into the Character RAM in the same manner as that described above, except that it only loads the codes during the vertical interval and it asserts D7 to mark the position of the cursor. When exiting this mode, the μP pulls D7 low.

Color Bar/ID Switching Logic

For most of the field, Color Bars are on and ID is off. To turn the Bars off and ID on, the μP asserts $\overline{\text{CHR EN}}$. Gated with $\overline{\text{WINDOW WIDTH}}$ and $\overline{\text{OE}}$, this disables U392 at pin 21 and enables the output of U360. Fig. 6-11 shows the timing of $\overline{\text{OE}}$ and $\overline{\text{WINDOW WIDTH}}$.

COLOR BAR OUTPUT (Schematic 13)

Clock Processing

ECL line receiver U239C buffers the genlocked CLK1A signal coming into the DAC. The following tank circuit (L335, C330, and C238) phase shifts this clock input to match the phase of the Option 1 color bar output with the test signal output. C238 permits manual phase adjustment. U239A-B buffer the tank and feed the shifted clock to the Color Bar DACs (U775 and U875). U130A converts the ECL clock to TTL for the TTL devices in Schematic 12.

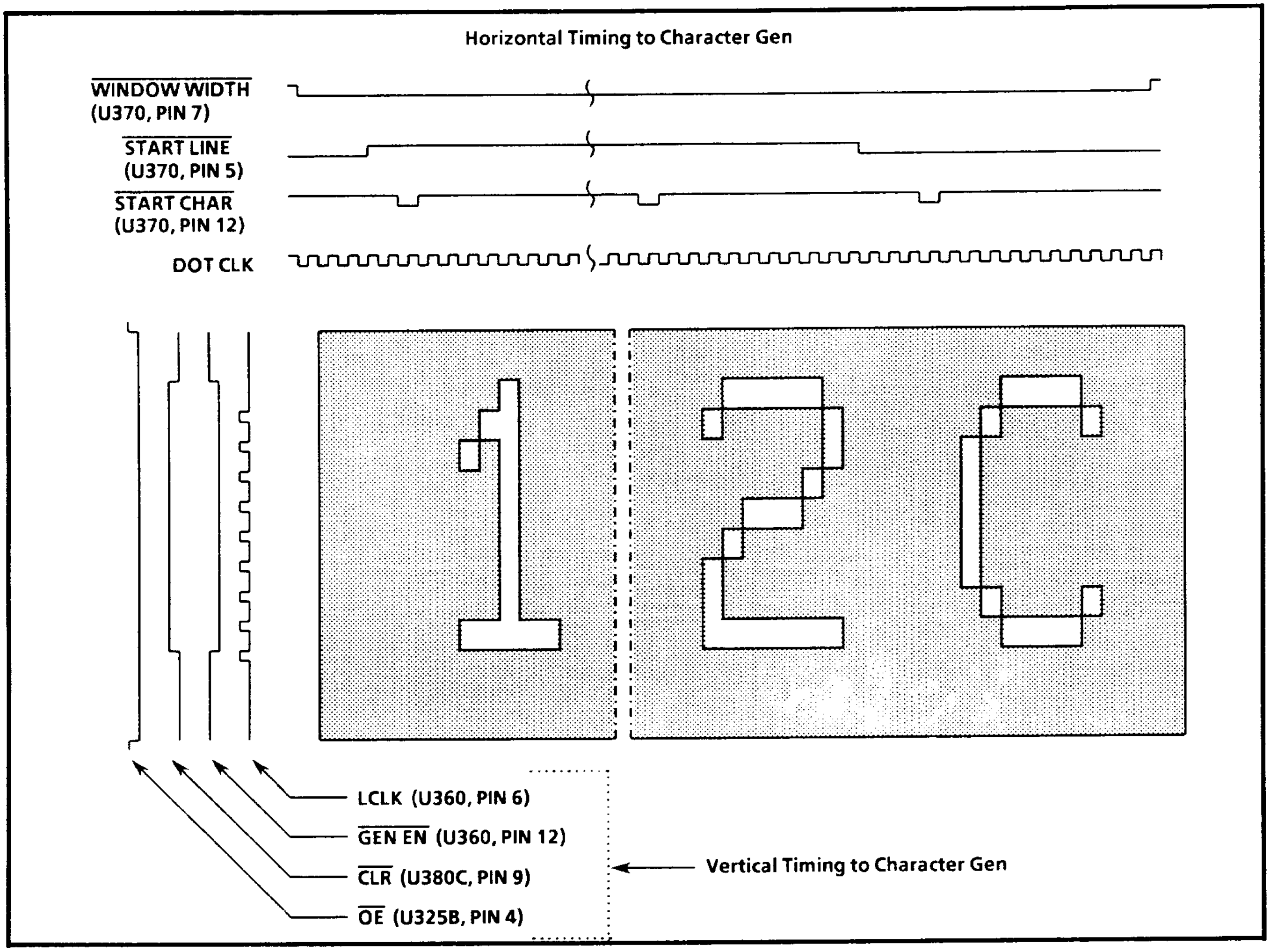


Fig. 6-11. Timing for ID generation.

TTL-to-ECL Converters and Color Bar DACs

U792 and U892 convert the TTL data from the Color Bar and Character ID Generators to ECL for the two ECL-input DACs, U775 and U875. The two DACs convert the digital color bar or character ID data to an analog signal. U775 converts the six MSBs, and U875 converts the two LSBs. The two DAC outputs are combined at pin 8 of U775.

Each DAC draws a constant current. Current drawn through pin 8 is proportional to the input data. Current drawn through pin 7 is the difference between the constant current and that drawn through pin 8. The current source is a reference of approximately 1.1 V generated by U963.

Current drawn by pin 8 of U775 generates the MSB portion of the signal voltage across a 75Ω parallel resistor network comprised of R661, R664, R665, and R666. Pin 8 of U875 draws the same amount of current, but R664, R665, and R666 divide its voltage contribution to the total DAC output by 64.

The DAC range is chosen to optimize the DAC signal-to-quantizer noise ratio to SMPTE color bars. These levels are shown in Fig. 6-12. R969 adjusts the DC level of the DAC output.

Output Filter and Output Amplifier

From the output of the MSB DAC (U775), the analog signal goes to a low-pass (5 MHz) reconstruction filter that is terminated by 75Ω. The front end of the filter provides group delay correction, and the following stages provide reconstruction filtering.

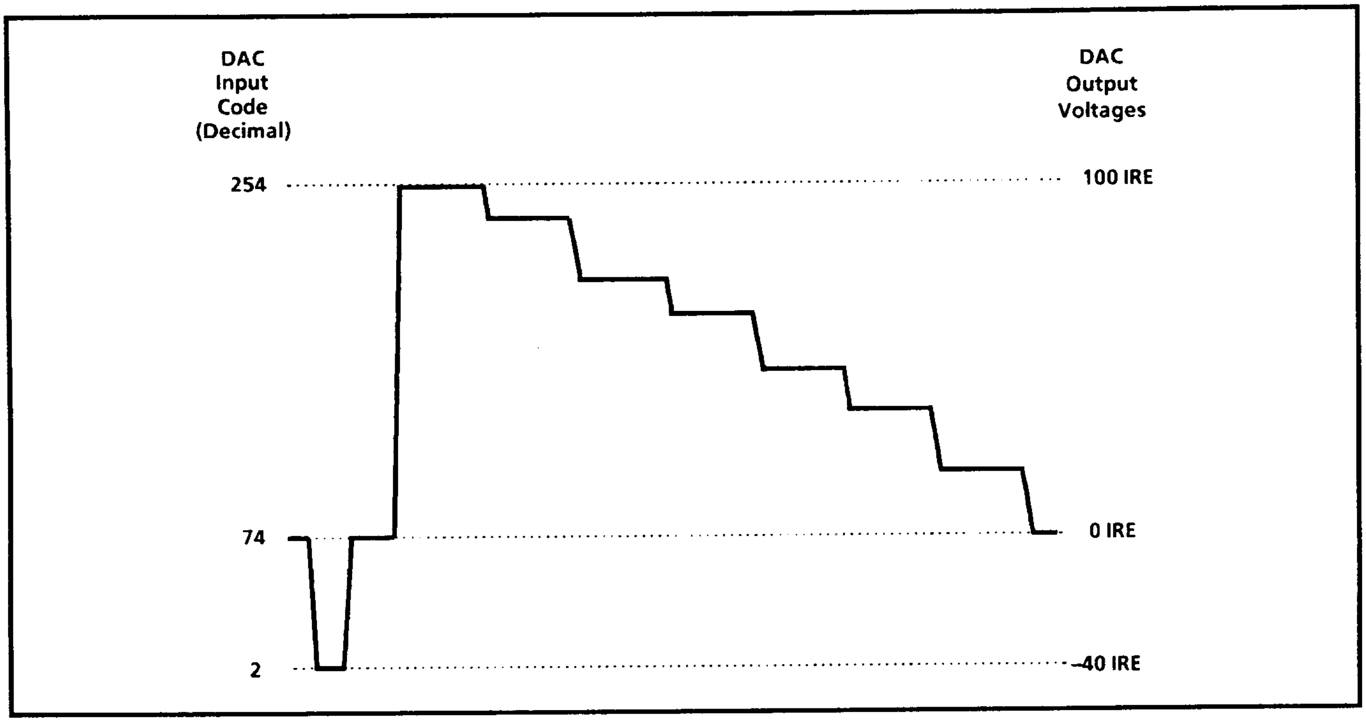


Fig. 6-12. Dynamic Range of Option 1 Color Bar DAC.

Jumper P655 is for checking the return loss of the Output Amplifier and for testing the low-pass filter.

When P655 is in the 1-2 position, the DAC output is grounded, allowing return loss to be tested. Also, when P655 is in the 1-2 position, the output filter can be checked with test signals from the DAC output of the Analog board. The Jumper Table in the Installation section explains how to do this. In the 2-3 position, the DAC output is passed directly to the output filter.

W824 provides a means of reconnecting the filter if it is disconnected from the output amplifier for testing.

Output Amplifier

After filtering, the signal feeds to the Output Amplifier, which is a discrete non-inverting op-amp comprised of two differential amplifier stages and an output stage. The first stage (Q720 and Q724) is an input buffer, the second (Q710 and Q708) is a gain stage, and the third (Q815) is an output driver.

From the emitter of Q815, negative feedback goes to the base of Q724 through a voltage divider network. In this feedback path, the RC network (R810, C805, and C711) decreases the negative feedback in the high end of the video band to compensate for the high frequency rolloff created by sampling of the signal This compensation is adjustable through C711. The amplifier output gain is adjustable through R826.

The amplified and compensated signal is applied from the emitter of Q815 to the rear-panel connector through a 75Ω resistor.

AUDIO GENERATION (Schematic 14)

The job of the Audio Generator is to produce a vertically locked 449.55 kHz sine wave ($F_{horiz} \div 35$). Five main blocks make up this Generator: Audio Counter, State Decoder, Audio DAC, Click ID Generator, and Low Pass Filter.

Audio Counter

Made up of two 4-bit counters, the Audio Counter generates 35 digital codes per cycle of audio tone by counting 35 horizontal-rate clock pulses. The clock (1H9), from the H-Timing Counter (Schematic 5), is horizontally locked to the genlocked test signal output.

Every 35 counts, NAND gate U380A loads the Audio Counter with zeros. The $\overline{\text{F1 RST}}$ signal clears the counter once every four fields, making sure the tone always turns on with the same phase.

Audio Decoder

Comprised of PAL U206 and gate U230A, the decoder converts the 35 counter codes into code that digitally represents one period of the audio sine wave. The CONTROL 1 signal is the audio output control line. Pulled high, this signal disables PAL U206 to turn off the audio output.

Audio DAC

The Audio DAC (U405) converts the 35 digital sine wave codes into current, and op-amp U627A converts the current into voltage. R505 adjusts the gain of the DAC to adjust the audio output level.

Click ID Generator

Astable multivibrator U106 generates a "click" through the pin 2 input of the decoder, U206. Selected at jumper P318, this input periodically tells the decoder to generate a digital equivalent to the RMS value of the generated sine wave. This RMS value interrupts the sine wave to produce a click sound. The length of click is about 16 ms. R110 adjusts the frequency of the click over a range of 4 Hz to 0.2 Hz.

Low Pass Filter and Balanced Audio Output

To remove distortion from the sine wave, it is passed through a five-pole low-pass filter. U627B and U420A make up four of the five poles in the filter. C625 and a 5 kΩ internal DAC resistance make up the fifth pole. U420B picks off an output of the filter and inverts it to provide the other half of the balanced audio output.

Maintenance

SECTION 7
MAINTENANCE

INTRODUCTION

This section has four main parts: preventive maintenance, troubleshooting aids, diagnostics, and corrective maintenance.

PREVENTIVE MAINTENANCE

Under average environmental conditions, preventive maintenance should be done about every 2000 hours. This includes cleaning, visual inspection, a performance check, and, if needed, calibration. See Section 5 for performance check and calibration procedures.

Cleaning

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

CAUTION

The front panel is molded plastic. Do not allow water to get inside any enclosed assembly or component. Do not clean any plastic materials with organic cleaning solvents, such as benzene, toluene, xylene, acetone, or similar compounds, because they may damage the plastic.

Static-Sensitive Components

CAUTION

Static discharge can damage any semiconductor component in this instrument.

This instrument contains electrical components that are susceptible to damage from static discharge. Static voltages of 1 kV to 30 kV are common in unprotected environments.

Observe the following precautions to avoid damage:

1. Minimize handling of static-sensitive components.
2. Transport and store static-sensitive components or assemblies in their original containers, on a metal rail, or on conductive foam. Label any package that contains static-sensitive assemblies or components.
3. Discharge the static voltage from your body by wearing a wrist strap while handling these components. Servicing static-sensitive assemblies or components should be performed only at a static-free work station by qualified personnel.
4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.
5. Keep the component leads shorted together whenever possible.
6. Pick up components by the body, never by the leads.
7. Do not slide the components over any surface.
8. Avoid handling components in areas that have a floor or work surface covering capable of generating a static charge.
9. Use a soldering iron that is connected to earth ground.
10. Use only special antistatic, suction-type or wick-type desoldering tools.

TROUBLESHOOTING AIDS

The following is miscellaneous information about schematics, circuit board illustrations, component numbering, and assembly numbering.

NOTE

No repair should be attempted during the warranty period.

Foldout Pages

The foldout pages at the back of the manual give block and schematic diagrams and circuit board illustrations. See Fig. 7-1.

Diagrams

The circuit number and electrical value of each component is shown on the diagrams. The first page in the Diagrams section explains the schematic symbols. The Replaceable Electrical Parts List gives a complete description of each component. Those portions of the circuit that are mounted on circuit boards or assemblies are enclosed in a gray border, with the name and assembly number shown on the border.

NOTE

Check the Change Information section at the rear of the manual for inserts describing corrections and modifications to the instrument and manual.

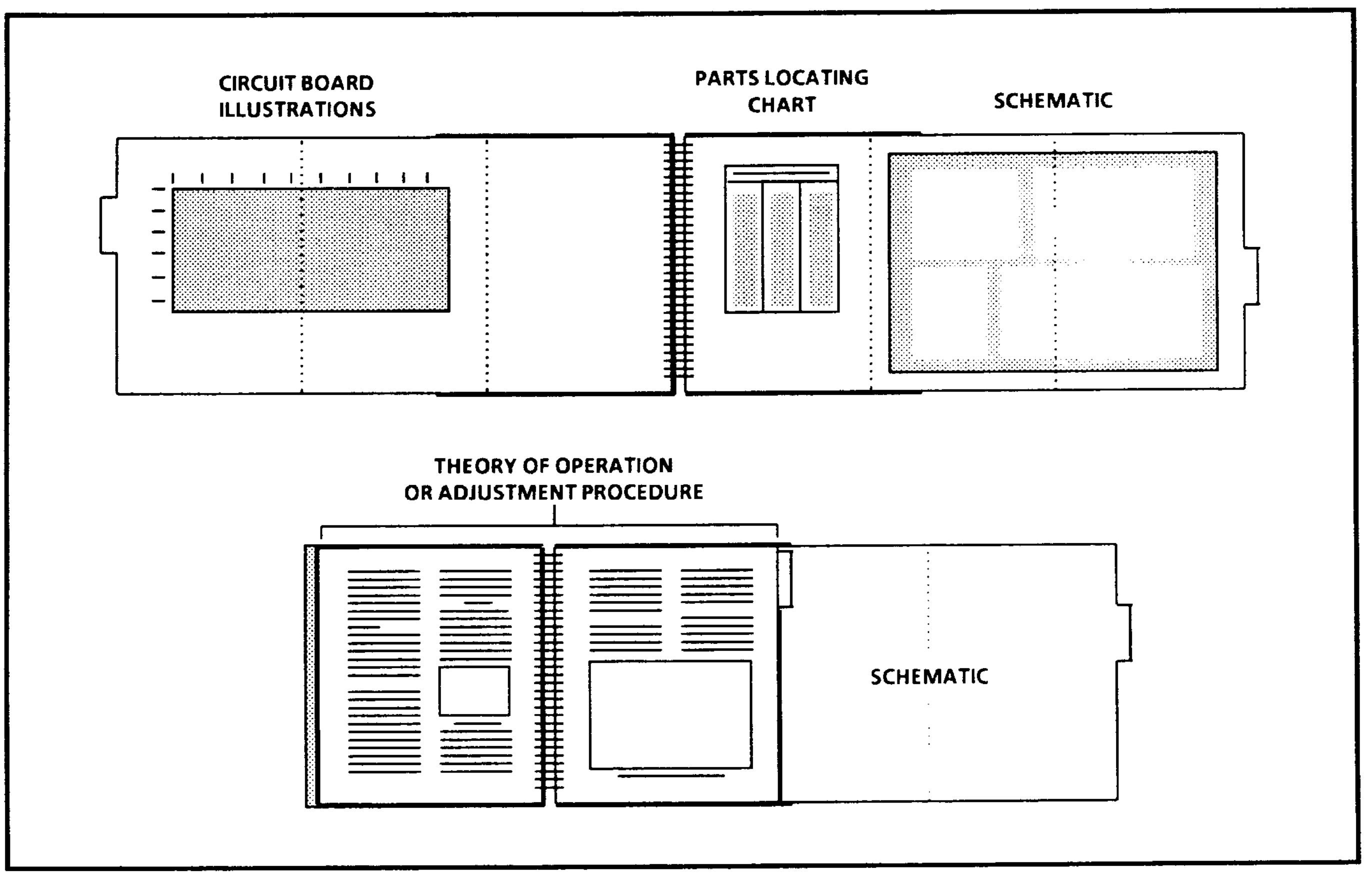


Fig. 7-1. Using the foldout pages.

Circuit Board Illustrations

Electrical components, connectors, and test points are identified on circuit board illustrations located on the inside fold of the corresponding circuit diagram or the back of the preceding diagram.

Assembly and Circuit Numbering

The circuit board assemblies are assigned assembly numbers starting with A1. Fig. 7-2 shows the location of the circuit board assemblies in the instrument. This illustration also shows the location of chassis-mounted components.

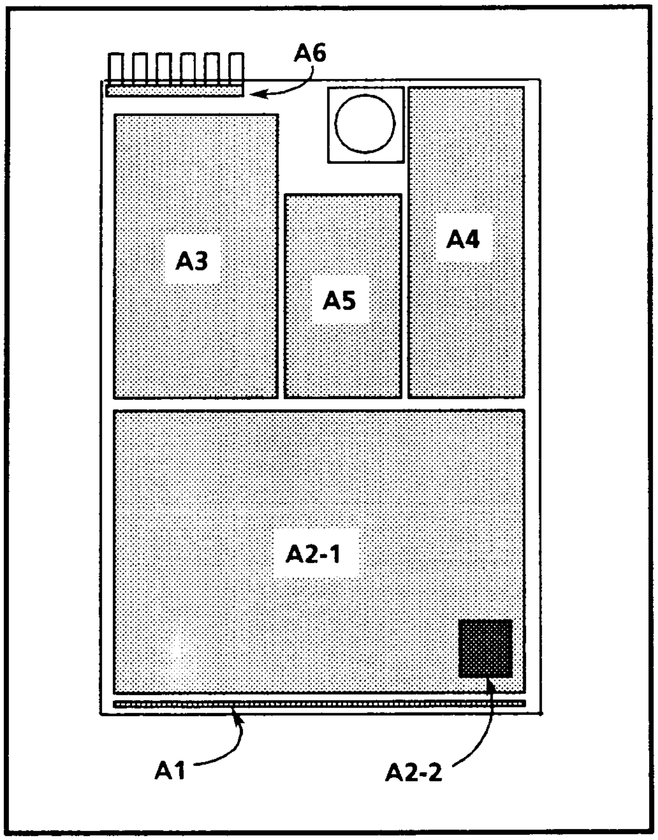


Fig. 7-2. Circuit board assembly locations.

Circuit boards have been assigned an assembly number so that they may be ordered from Tektronix, Inc. They are as follows:

A1	Front Panel Board Assembly
A2-1	Digital Board Assembly
A2-2	VCO Assembly
A3	Analog Board Assembly
A4	Power Supply Board
A5	Option 1 Board Assembly
A6	BNC Board Asembly

The part numbers for ordering these boards are given on the first page of the Replaceable Electrical Parts List in Section 9.

Each component is assigned a circuit number according to its location within an assembly. Component circuit numbers increase in units from left to right, and in hundreds from top to bottom on the circuit board.

The Replaceable Electrical Parts List is arranged in assembly-by-assembly order, as designated by ANSI Standard Y32.16-1975. The circuit number in the parts list is made up by combining the assembly number and the circuit number.

EXAMPLE: R123 on A2 would be listed in the Replaceable Parts list as A2R123.

In the Replaceable Electrical Parts List, assemblies are listed first, followed by circuit board-mounted parts in alpha numeric order.

NOTE

The parts list number should be used when ordering replacement parts.

DIAGNOSTICS

Two Types of Diagnostics

EPROM U245 (Schematic 2) stores diagnostic programs that check the μP kernel and external data paths that interface with the kernel. These diagnostics are divided into two types.

First are the Stimulus/Response (S/R) tests. In these tests the μP executes a selected diagnostic routine, analyzes the results, then gives a pass/fail indication through the front-panel LEDs. Table 7-1 describes the tests and how to interpret the LED readout.

The μP automatically executes the Stimulus/Response tests one time when the instrument is powered up or reset. These one-time Stimulus/Response tests are called Power-up Diagnostics. The μP indicates detected failures in these tests by lighting all the front-panel LEDs and bringing the instrument to a stop.

Second are the Stimulus Loop (SL) tests. These are free-running, continuous loop routines that do not provide a pass/fail indication. Instead, they allow a data path to be tested. The μP sends a periodic signal through the path under test. The signal can then be viewed on a scope at points along the path to isolate problems. Figs. 7-3 through 7-17 show waveforms at critical points along the tested paths for each Stimulus Loop test.

Selecting Diagnostics

Both Stimulus/Response and Stimulus Loop tests are selected through the Diagnostic switch (S407, Schematic 1). Table 7-1 is a switch guide for Stimulus/Response tests, and Table 7-2 is a guide for Stimulus Loop tests.

To Select a diagnostic test, set the Diagnostic switch for the desired test, then reset the μP by switching power off and on or by grounding jumper P122 (Schematic 2). Immediately after the reset, the μP polls the Diagnostic switch port (U229, Schematic 1) and performs the routine selected at switch S407.

Once the μP has been reset, all Stimulus Loop tests (except Sampler Test 2) can be selected without having to reset again.

Table 7-1
S/R (Stimulus/Response) Diagnostic Tests*

Switch Setting 654321	Test	Test Function	Pass/Fail Indication
**011111	EPROM Read Test (U245, Schematic 2)	Sums all data stored in EPROM and compares this to checksum stored in EPROM.	Lights LED above Staircase signal button if checksums do not match.
011110	RAM Read/ Write Test (U152, Schematic 2)	Writes to and reads from all μP RAM locations. Checks for a match between data written to and read from RAM.	Lights LED above Ramp signal button if data read from RAM does not match data written to it.
011101	NVRAM Read/ Write Test (U157, Schematic 2)	Writes to and reads from all locations in the RAM portion of the NVRAM. Checks for a match between data written to and read from NVRAM.	Lights LED above Mod Ramp signal button if data read from NVRAM does not match data written to it.
011100	Sample RAM Test (U611, U615 Schematic 3)	Writes to and reads from all Sample Ram locations and checks for a match between data written to and read from the Sample RAM.	Lights LED above APL signal button if data read from the Sample RAM does not match data written to it.

Table 7-1 (cont.)
S/R (Stimulus/Response) Diagnostic Tests*

Switch Setting 654321	Test	Test Function	Pass/Fail Indication
010000	NVRAM (ROM portion) Test (U157, Schematic 2).	Writes to and reads from all locations of the ROM portion of the NVRAM. Checks for a match between data written to and data read from the ROM portion. To protect from inadvertent use, this test must be accessed through the following front-panel sequence: 1. With the diagnostics switch set for this test, power the instrument off and then on. 2. Press the BOUNCE switch until the BOUNCE LED lights. 3. Press the RED FIELD switch until the RED FIELD LED lights. 4. Press the BOUNCE switch until the BOUNCE LED lights.	Lights MOD RAMP LED if data read from the ROM portion of NVRAM does not match data written to it. Lights CONVERGENCE LED if the data does match.
001111	Initialize	Sets the four remotely controlled Option 1 ID presets to be "TEKTRONIX1", TEKTRONIX2", "TEKTRONIX3", and "TEKTRONIX4". Also midranges the genlock and sync lock timing presets. Since this routine writes to the ROM portion of the NVRAM, it is protected from inadvertent use. To access this routine, follow the four-step sequence described in the NVRAM test routine above.	The four ID presets are set to "TEKTRONIX1–4".

* When these tests are selected through the diagnostics switch (S407), they run continuously; when run as part of the reset routine, they run only once.

** 1 = Switch open, 0 = switch closed.

Table 7-2
SL (Stimulus Loop) Diagnostic Tests

Switch Setting 654321	Test	Operation	Applications
011011	Calibration Signals	Configures front-panel software to allow consecutive selection of three signals (Line Sweep, Multipulse, and DAC Test) through the OTHER SIGNALS button on the front panel.	For checking and calibrating Test Signal output and Black Burst output paths. Allows consecutive selection of Line Sweep, Multipulse, and DAC Test Signal with the OTHER SIGNALS button.
011010	Port Test 1	μP places a shifting 1 on the ED0-ED7 bus and enables each of the 12 I/O ports connected to this bus, one at a time.	For checking the data and load paths, connected to the 12 I/O ports (U314, U267, U412, U370, U459, U403, U767, U443, U218, U303, U848, and U311). See Fig. 7-3.
011001	Port Test 2	μP places a shifting 0 on the ED0-ED7 bus and enables each of the 12 I/O ports connected to this bus, one at a time.	Same as Port Test 1. See Fig. 7-4.
011000	Port Test 3	μP sends a count from 0 to 255 to the ED0-ED7 bus and enables each of the 12 I/O ports connected to this bus, one at a time.	Same as Port Test 1. See Fig. 7-5.
010111	Port Test 4	μP alternately sends all 1's then all 0's to the ED0-ED7 bus and enables each of the 16 decoded I/O locations (0–15) of U162 (Schematic 2).	Same as Port Test 1. See Figs. 7-6 and 7-7.
010110	Sync DAC Test	μP sends data to the Sync DAC (U370, Schematic 4). This data generates a ramp at the Sync DAC Output. See Fig. 7-8.	For checking range and linearity of DAC.
010101	Genlock DAC Test	μP sends data to the Genlock DAC (U267, Schematic 4). This data generates a field-rate ramp at the Genlock DAC Output. See Fig. 7-9.	For checking range and linearity of genlock DAC. Also for checking genlock DAC integrator.

Table 7-2 (cont.)
SL (Stimulus Loop) Diagnostic Tests

Switch Setting 654321	Test	Operation	Applications
010100	Sampler Test 1	μP acquires a sample of sync and burst via the Genlock Input and then reconstructs the sampled sync and burst through the Sync DAC (U370, Schematic 4). Requires that genlock input is terminated. Also requires that the Analog Input, Data Acquisition, Sample RAM, CTCs, and μP are all working. See Fig. 7-10.	For checking that the μP is acquiring sync and burst. Also for checking the Genlock Data Acquisition Circuits.
010011	Sampler Test 2	μP sets up the Genlock Data Acquisition circuits to sample the incoming video continuously, by forcing the circuits into UNLOCKED mode. See Figs. 7-11, 7-12, and 7-13.	For checking Acquisition timing.
010010	Front-Panel LED Test	Turns on all front-panel LEDs. See Fig. 7-14.	For checking that all LEDs work. For checking the front-panel LEDs and LED latches (U303, U218, U314) in Schematic 1.
010001	Option 1 Board Test	Alternately writes two-character selection codes to the Character RAM in the Option 1 board (Schematic 12). These codes (AA hex and 55 hex) select a U and * at the Character Generator. See Figs. 7-15 and 7-16.	For checking the Option 1 Character Generation circuits. ***NOTE:*** *This test puts some noise on displayed characters.*
001110	Software Reset Test	Sets up the CTCs to pull the NMI input of the μP low. This causes the μP to start locking to the Genlock Input. This test requires that a Genlock Input signal is present.	For checking the software reset (NMI) in the μP kernel.
001101	Hardware Reset Test*	Disables the $\overline{\text{AWAKE}}$ line to assert the HARD RESET signal for 30 μs at a 67 ms rate. ***NOTE:*** *J245 must be in the 2-3 position for this test.*	Checks the hardware reset circuitry. See Fig. 7-17.

* Only for instruments with serial numbers B020318 and up.

PORT TEST 1
(Switch position: 011010)

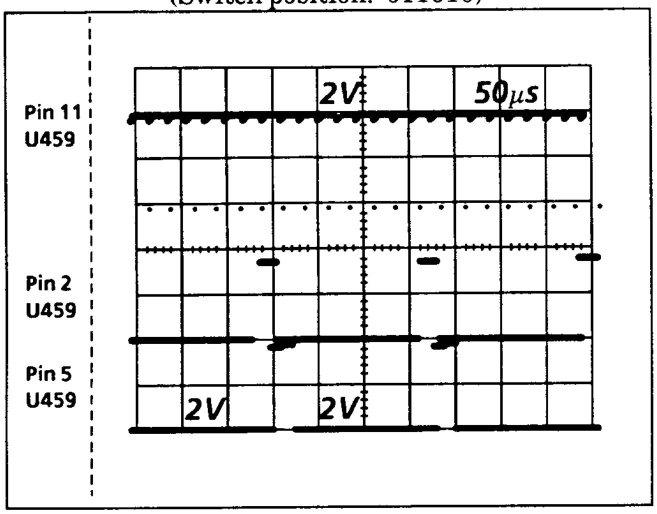


Fig. 7-3. Shows a shifting 1 through the two LSB outputs of the Genlock Offset Port (U459, Schematic 1), as well as the Enable Pulse ($\overline{\text{GEN DEL SEL}}$).

PORT TEST 2
(switch position: 011001)

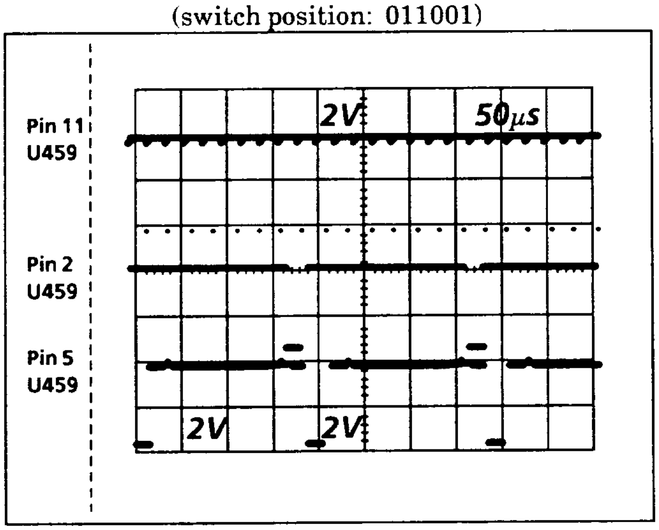


Fig. 7-4. Shows a shifting 0 through the two LSB outputs of the Genlock Offset Port (U459, Schematic 1), as well as the Enable Pulse ($\overline{\text{GEN DEL SEL}}$).

PORT TEST 3
(switch position: 011000)

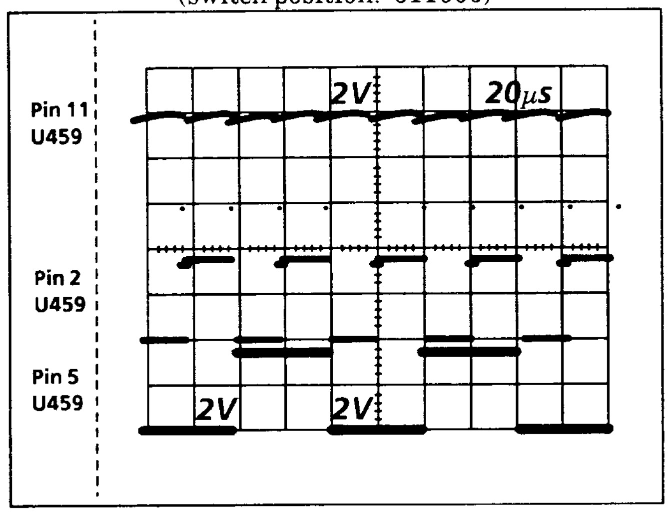


Fig. 7-5. Pin 2, U459 (output LSB), toggling twice as fast as pin 5 (next LSB) as μP counts from 0-255. Pin 11 ($\overline{\text{GEN DEL SEL}}$) enables U459.

PORT TEST 4
(switch position: 010111)

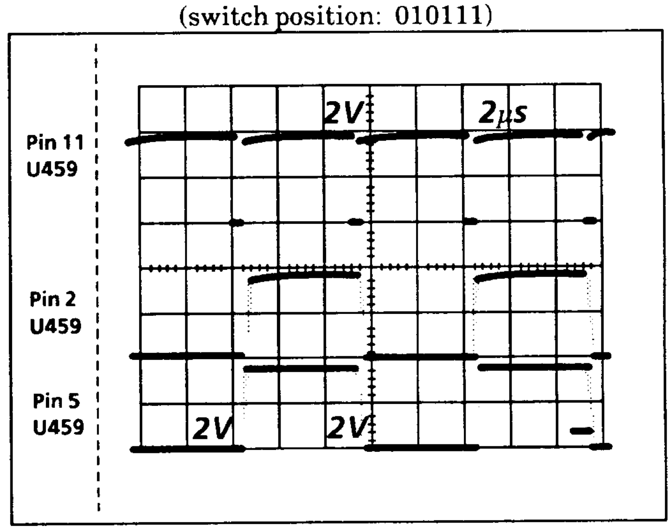


Fig. 7-6. Two LSB outputs (pins 2 and 5) of the Genlock Offset Port (U459, Schematic 1) as μP switches its I/O data from all 0's to all 1's. The $\overline{\text{GEN DEL SEL}}$ pulse enables U459.

PORT TEST 4
(switch position: 010111)

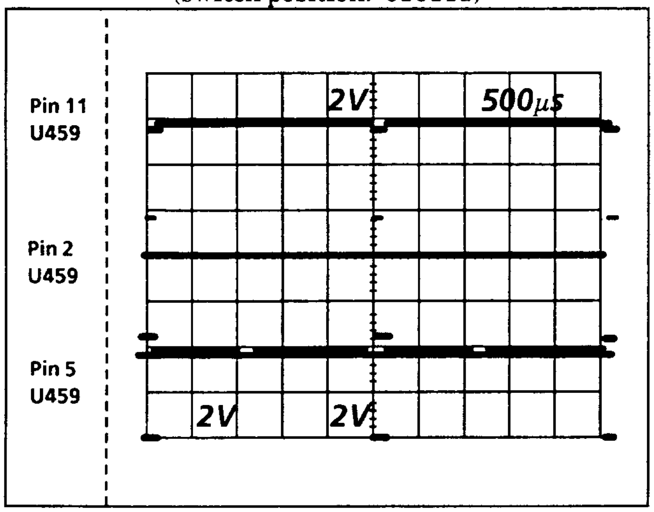


Fig. 7-7. Shows the same test setup as in Fig. 7-6, except with the scope at a slower sweep rate to show the test frequency.

GENLOCK DAC TEST
(switch position 010101)

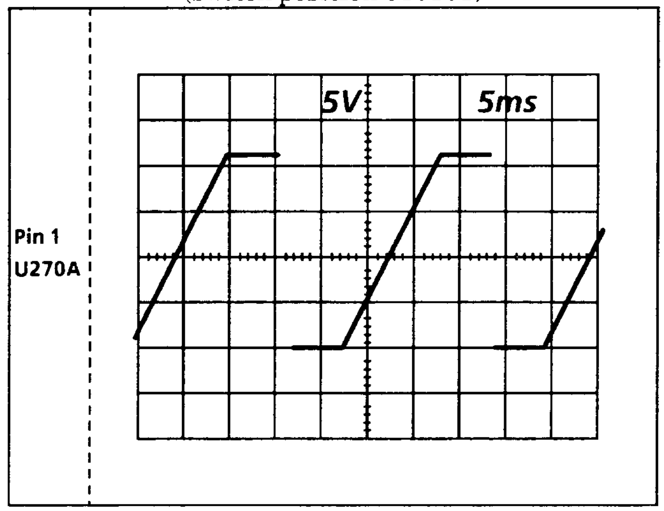


Fig. 7-9. Repeated ramp from pin 1 of integrator U270A. μP generates ramp by counting from 0-255 at a field rate.

SYNC DAC TEST
(switch position: 010110)

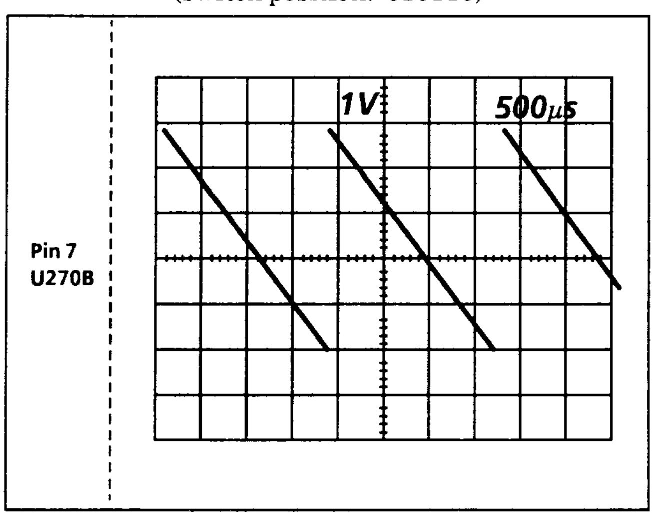


Fig. 7-8. Shows the ramp output at U270B (Schematic 4). μP generates ramp by sending a repeated count of 0-255 to Sync DAC (U370). R173 must be fully clockwise to get an unclipped ramp.

SAMPLER TEST 1
(switch position 010100)

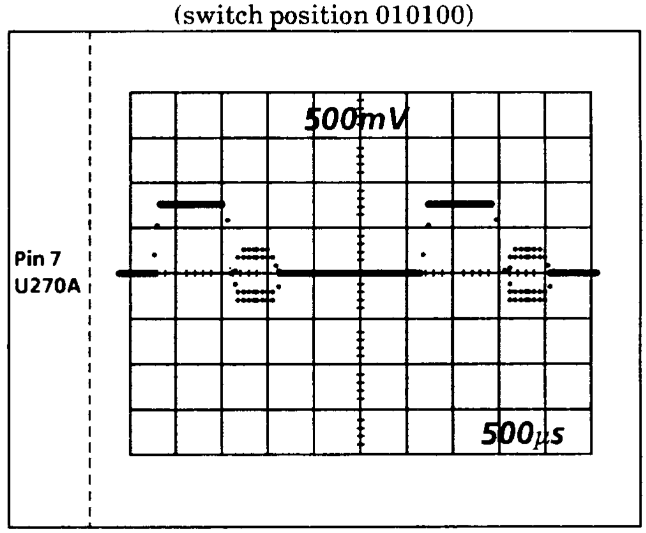


Fig. 7-10. Shows a μP-generated reconstruction of sync and burst at pin 7 of U270. Reconstruction shows the relative timing and amplitude of sync and burst.

SAMPLER TEST 2
(switch position: 010011)

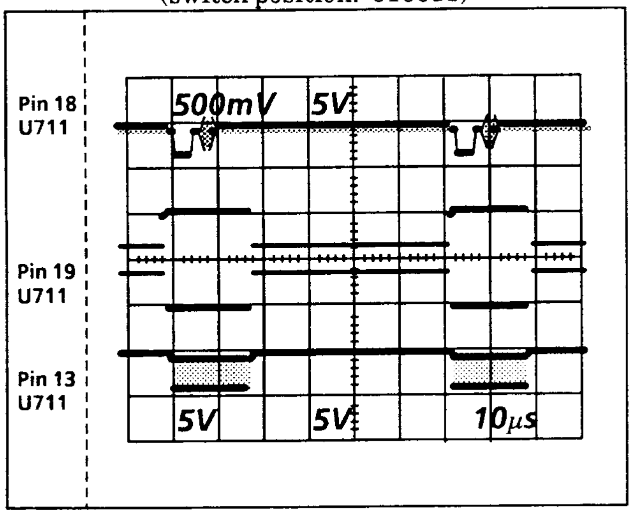


Fig. 7-11. Shows signals through the Genlock Data Acquisition circuit when it is in the UNLOCKED mode.

SAMPLER TEST 2
(switch position: 010011)

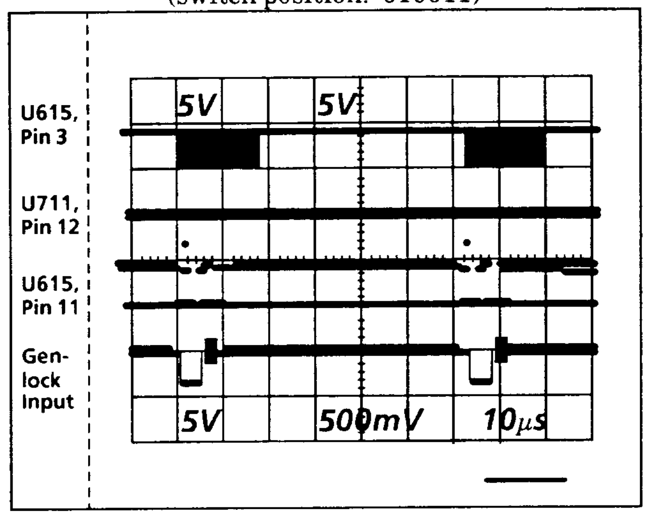


Fig. 7-13. Shows signals through the Genlock Data Acquisition circuit when it is in the UNLOCKED mode.

SAMPLER TEST 2
(switch position: 010011)

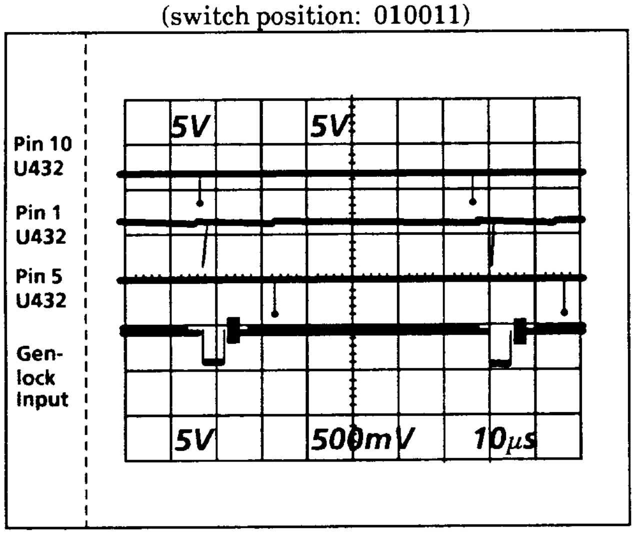


Fig. 7-12. Shows signals through the Genlock Data Acquisition circuit when it is in the UNLOCKED mode.

FRONT PANEL LED TEST
(switch position: 010010)

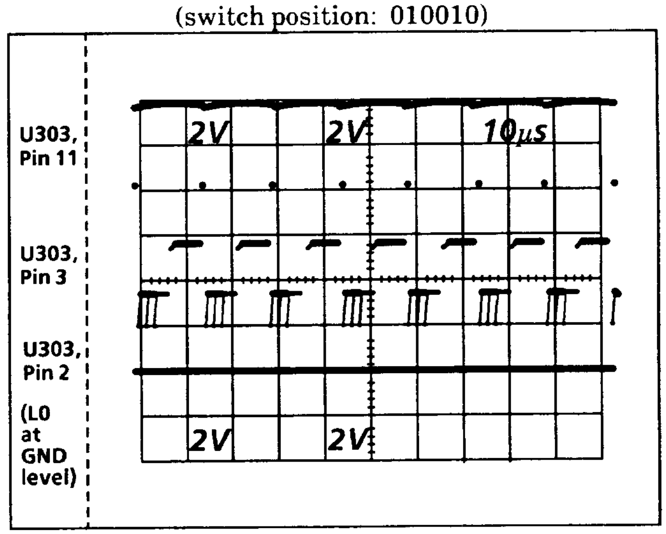


Fig. 7-14. Shows LED0 repeatedly loading a zero into the ED0 input (pin 3) of LED latch U303 (Schematic 1). This holds the L0 output (pin 2) on U303 low to light the DS229 LED. All other LEDs are tested in the same manner.

OPTION 1 BOARD TEST
(switch position: 010001)

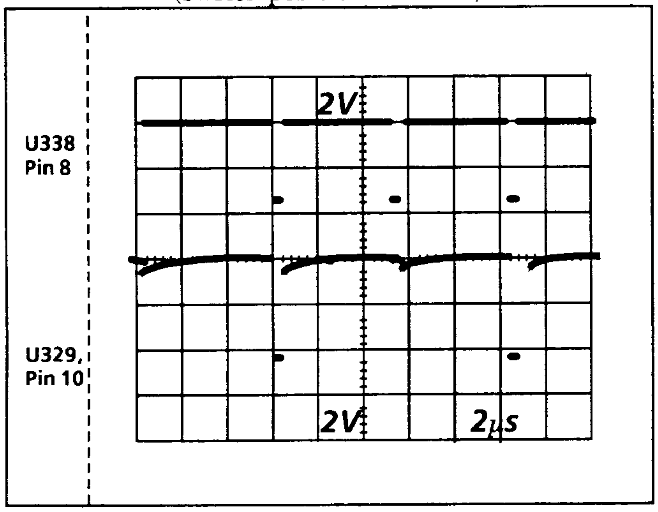


Fig. 7-15. Shows the $\overline{\text{WR}}$ and $\overline{\text{I02}}$ (Schematic 2) signals asserted to load the character selection codes into the Character RAM.

OPTION 1 BOARD TEST
(switch position: 010001)

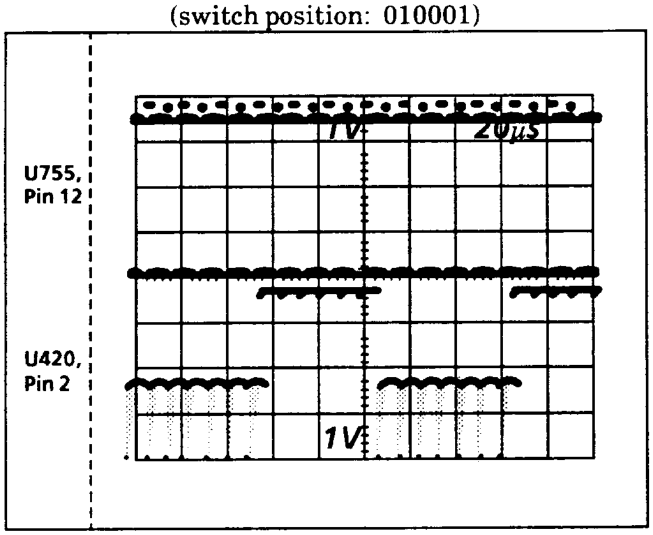


Fig. 7-16. Shows the A3 and ED0 (Schematic 2) lines as the μP repeatedly sends addresses and character selection codes to the Character RAM.

HARD RESET TEST
(switch position: 001101)

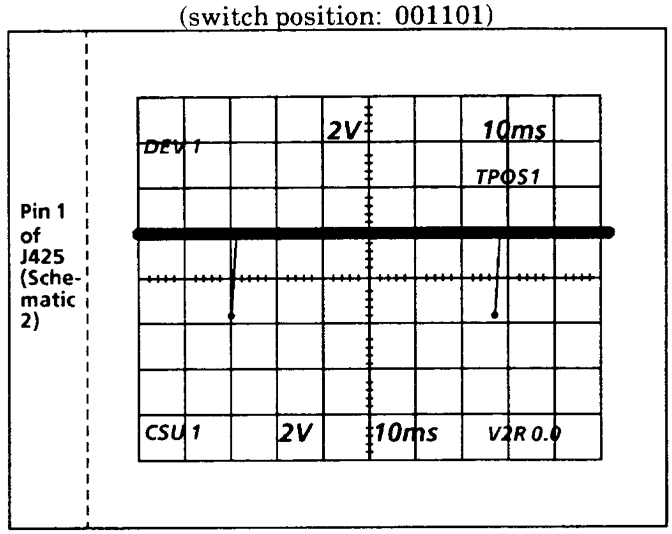


Fig. 7-17. Shows the Hard Reset pulse occurring at a 67 ms rate at the pin 9 output of U222B in the μP kernel.

CORRECTIVE MAINTENANCE

Corrective maintenance deals with obtaining replacement parts, torque specifications, and component replacement.

Obtaining Replacement Parts

Replacement parts are available from or through the local Tektronix, Inc., field office or representative.

When ordering parts be sure to **include the following information** in your order:

1. Instrument type (and option numbers, if any)
2. Instrument serial number
3. Description of the part, as it appears in the Replaceable Electrical or Mechanical Parts list
4. The Tektronix part number

If a part that has been ordered is replaced with a new or improved part, the local Tektronix field office or representative will contact you concerning any change in the part number. After repair, the circuits may need readjustment.

Torque Specifications

Only #4, #6, and #8 screws are used in the TSG-170A. Table 7-3 shows the torque ranges for these.

Table 7-3

Screw #	Torque Range (in inch pounds)
4	$3\frac{1}{2}$–5
6	7–9
8	14–18

Correct torque is critical on the screws holding the devices to the Power Supply heat sink.

Replacing Circuit Assemblies

WARNING

Disconnect the instrument power cord before replacing components.

Use the following procedures to remove circuit board assemblies. Reverse the order of the removal procedures to reinstall or replace an assembly.

Power Supply Board Removal

1. Remove the main power connector and fan connector.

2. Remove the nuts and screws attaching the line filter to the rear panel.

3. Remove the four screws attaching the shield and circuit board to the bottom pad.

4. Remove the three screws attaching the heat sink to the bottom pan.

5. Remove the remaining two mounting screws.

Analog Board Removal

1. Remove the ribbon-cable connector.

2. Remove the six mounting screws.

3. Disconnect the analog board from the 48-pin DIN connector, making sure to keep the Analog board square with the Digital board (to prevent bending the pins).

Digital Board Removal

1. Disconnect the two ribbon connectors and remote ribbon cable.

2. Remove the eight mounting screws and the two mounting posts.

3. Disconnect the Digital board from the Analog board (and the Option 1 board, if installed), making sure to keep the Analog board square with the Digital board to prevent bending the pins.

Front Panel Removal

1. Disconnect the four ground lugs attached to the Digital board.

2. Disconnect the front-panel ribbon connector from the Digital board.

3. Making sure to avoid pushing on the front-panel LEDs, push the front panel away from the front-panel frame to break the glue which holds them together. Avoid bending the front panel any more than necessary.

BNC Board Removal

1. Remove the Analog board ribbon cable connector.

2. Unsolder the BNC board from the twelve center connector lugs and the three terminal lugs.

3. Pull BNC board away from the lugs.

BNC Removal

1. To remove any of the top six BNC connectors, unsolder the center connector lug and the terminal lug (if attached).

2. Unbolt the BNC connector from the rear panel and pull out the connector.

Oven Assembly Removal

1. Unscrew the plastic insulating case and remove the top part of the case.

2. Remove the screw and nut that attach the power transistor to the outside of the metal oven.

3. Remove the oven from the Digital board by carefully pulling the oven off the seven square pins that attach it to the Digital board.

4. Remove the screw attaching the metal cover to the oven.

5. Remove the screw attaching the circuit board to the oven and pull the oscillator out of the oven.

EPROM Replacement Procedure

1. Making sure the power is switched off, remove the old EPROM (U245) from the Digital board and replace it with the new EPROM.

2. Switch on power.

NVRAM Replacement Schedule

The NVRAM (U157, Schematic 2) will save at least 10,000 front panel timing selections before it must be replaced. This amounts to about three years of use if you make ten selections a day.

Replaceable Electrical Parts List

Section 8
Replaceable Electrical Parts

This section contains a list of the components that are replaceable for the TSG-170A. 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.

Example a.

Component Number

A23R1234 **A23** **R1234**

Assembly Number Circuit Number

Read: Resistor 1234 of Assembly 23

Example b.

Component Number

A23A2R1234 **A23** **A2** **R1234**

Assembly Number Subassembly Number Circuit Number

Read: Resistor 1234 of Subassembly 2 of Assembly 23

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
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 655012	DALLAS TX 75265
02735	RCA CORP SOLID STATE DIVISION		
03508	GENERAL ELECTRIC CO SEMI–CONDUCTOR PRODUCTS DEPT	W GENESEE ST	AUBURN NY 13021
04222	AVX CERAMICS DIV OF AVX CORP	19TH AVE SOUTH P O BOX 867	MYRTLE BEACH SC 29577
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS SECTOR	5005 E MCDOWELL RD	PHOENIX AZ 85008–4229
05292	ITT COMPONENTS DIV		CLIFTON NJ
05397	UNION CARBIDE CORP MATERIALS SYSTEMS DIV	11901 MADISON AVE	CLEVELAND OH 44101
07088	KELVIN ELECTRIC CO	5907 NOBLE AVE	VAN NUYS CA 91411
07716	TRW INC TRW IRC FIXED RESISTORS/BURLINGTON	2850 MT PLEASANT AVE	BURLINGTON IA 52601
11236	CTS CORP BERNE DIV THICK FILM PRODUCTS GROUP	406 PARR ROAD	BERNE IN 46711–9506
11237	CTS ELECTRONICS CORP PASO ROBLES DIV ELECTROMECHANICAL GROUP	500 LINNE RD	PASO ROBLES CA 93446–9413
05828	GENERAL INSTRUMENT CORP GOVERNMENT SYSTEMS DIV	600 W JOHN ST	HICKSVILLE NY 11802
12969	MICROSEMI CORPORATION WATERTOWN DIVISION	530 PLEASANT STREET	WATERTOWN MA 02172
14433	ITT SEMICONDUCTORS DIV		WEST PALM BEACH FL
14552	MICROSEMI CORP	2830 S FAIRVIEW ST	SANTA ANA CA 92704–5948
14936	GENERAL INSTRUMENT CORP DISCRETE SEMI CONDUCTOR DIV	600 W JOHN ST	HICKSVILLE NY 11802
17856	SILICONIX INC	2201 LAURELWOOD RD	SANTA CLARA CA 95054–1516
19701	PHILIPS COMPONENTS DISCRETE PRODUCTS DIV RESISTIVE PRODUCTS FACILITY AIRPORT ROAD	PO BOX 760	MINERAL WELLS TX 76067–0760
22526	BERG ELECTRONICS INC (DUPONT)	857 OLD TRAIL RD	ETTERS PA 17319
24165	SPRAGUE ELECTRIC CO	267 LOWELL ROAD	HUDSON NH 03051
24226	GOWANDA ELECTRONICS CORP	NO 1 INDUSTRIAL PL	GOWANDA NY 14070–1409
24355	ANALOG DEVICES INC	RT 1 INDUSTRIAL PK PO BOX 9106	NORWOOD MA 02062
24546	CORNING GLASS WORKS	550 HIGH ST	BRADFORD PA 16701–3737
26364	COMPONENTS CORP	6 KINSEY PLACE	DENVILLE NJ 07834–2611
27014	NATIONAL SEMICONDUCTOR CORP	2900 SEMICONDUCTOR DR	SANTA CLARA CA 95051–0606
2M627	ROHM CORPORATION	PO BOX 19515	IRVINE CA 92713
32997	BOURNS INC TRIMPOT DIV	1200 COLUMBIA AVE	RIVERSIDE CA 92507–2114
34333	SILICON GENERAL INC	11651 MONARCH ST	GARDEN GROVE CA 92641–1816
37942	MALLORY CAPACITOR CO	7545 ROCKVILLE ROAD PO BOX 1284	INDIANAPOLIS IN 46206–1284
54473	MATSUSHITA ELECTRIC CORP OF AMERICA	ONE PANASONIC WAY PO BOX 1501	SECAUCUS NJ 07094–2917
54583	TDK ELECTRONICS CORP	12 HARBOR PARK DR	PORT WASHINGTON NY 11550
54937	DEYOUNG MANUFACTURING INC	12920 NE 125TH WAY	KIRKLAND WA 98034–7716
55680	NICHICON /AMERICA/ CORP	927 E STATE PKY	SCHAUMBURG IL 60195–4526
56708	ZILOG INC	1315 DELL AVE	CAMPBELL CA 95008–6609
57027	INTERNATIONAL RESISTIVE PRODUCTS INC	4222 S STAPLES	CORPUS CHRISTI TX 78411–2702
57668	ROHM CORP	8 WHATNEY PO BOX 19515	IRVINE CA 92713
57924	BOURNS INC NETWORKS DIV	1400 NORTH 1000 WEST	LOGAN UT 84321
58361	QUALITY TECHNOLOGIES CORP		
59124	KOA SPEER ELECTRONICS INC	BOLIVAR DRIVE PO BOX 547	BRADFORD PA 16701
60395	XICOR INC	851 BUCKEYE CT	MILPITAS CA 95035–7408
71400	BUSSMANN DIV OF COOPER INDUSTRIES INC	114 OLD STATE RD PO BOX 14460	ST LOUIS MO 63178
71744	CHICAGO MINIATURE LAMP INC	CHEVY CHASE BUSINESS PARK 1080 JOHNSON DRIVE	BUFFALO GROVE IL 60089

75042	IRC ELECTRONIC COMPONENTS PHILADELPHIA DIV TRW FIXED RESISTORS	401 N BROAD ST	PHILADELPHIA PA 19108–1001
76493	BELL INDUSTRIES INC JW MILLER DIV	19070 REYES AVE PO BOX 5825	COMPTON CA 90224–5825
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
81312	WINCHESTER ELECTRONICS DIVISION OF LITTON SYSTEMS INC	400 PARK RD	WATERTOWN CT 06795–1612
81483	INTERNATIONAL RECTIFIER	9220 SUNSET BLVD	LOS ANGELES CA 90069–3501
84411	AMERICAN SHIZUKI CORP OGALLALA OPERATIONS	301 WEST O ST	OGALLALA NE 69153–1844
91637	DALE ELECTRONICS INC	2064 12TH AVE PO BOX 609	COLUMBUS NE 68601–3632
S4307	SCHAFFNER ELECTRONIK AG		LUTERBACH SWITZERLAND
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
TK0858	STAUFFER SUPPLY CO (DIST)		
TK1134	TUSONIX INC	2155 N FORBES BLVD	TUCSON AZ 85705
TK1339	PREM MAGNETICS INC	3521 N CHAPEL HILL RD	MCHENRY IL 60050
TK1345	ZMAN & ASSOCIATES		
TK1424	MARCON AMERICA CORP		
TK1450	TOKYO COSMOS ELECTRIC CO LTD	2–268 SOBUDAI ZAWA	KANAGAWA 228 JAPAN
TK1483	TEKA PRODUCTS		
TK1573	WILHELM WESTERMAN	PO BOX 2345 AUGUSTA–ANLAGE 56	6800 MANNHEIM 1 WEST GERMANY
TK1960	U S TOYO FAN CORP	4915 WALNUT GROVE AVE DRAWER G	SAN GABRIEL CA 91776

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A1	––––– –––––			(PART OF 333–3248–00)		
A2–1	670–9111–00	B010100	B019999	CIRCUIT BD ASSY:DGTL	80009	670–9111–00
A2–1	670–9111–01	B020000	B020338	CIRCUIT BD ASSY:DGTL	80009	670–9111–01
A2–1	670–9111–02	B020339	B031192	CIRCUIT BD ASSY:DGTL	80009	670–9111–02
A2–1	670–9111–03	B031193	B031315	CIRCUIT BD ASSY:DGTL	80009	670–9111–03
A2–1	670–9111–04	B031316	B041718	CIRCUIT BD ASSY:DGTL	80009	670–9111–04
A2–1	670–9111–05	B041719	B042142	CIRCUIT BD ASSY:DGTL	80009	670–9111–05
A2–1	670–9111–06	B042143	B043884	CIRCUIT BD ASSY:DGTL	80009	670–9111–06
A2–1	670–9111–11	B043885		CIRCUIT BD ASSY:DGTL (STANDARD ONLY)	80009	670–9111–11
A2–1	670–9111–08	B043142	B043884	CIRCUIT BD ASSY:DGTL	80009	670–9111–08
A2–1	670–9111–12	B043885		CIRCUIT BD ASSY:DGTL (OPTION 1J & 2J ONLY)	80009	670–9111–12
A2–1	670–9111–07	B043091	B043187	CIRCUIT BD ASSY:DGTL	80009	670–9111–07
A2–1	670–9111–09	B043188	B043377	CIRCUIT BD ASSY:DGTL	80009	670–9111–09
A2–1	670–9111–10	B043378	B043884	CIRCUIT BD ASSY:DGTL	80009	670–9111–10
A2–1	670–9111–13	B043885		CIRCUIT BD ASSY:DGTL (OPTION 1V ONLY)	80009	670–9111–13
A2–2	119–2321–00	B010100	B031192	OVEN ASSEMBLY:	80009	119–2321–00
A2–2	119–2321–01	B031193	B041718	OVEN ASSEMBLY:	80009	119–2321–01
A2–2	119–2321–02	B041719	B042643	OVEN ASSEMBLY:	80009	119–2321–02
A2–2	119–2321–03	B042644		OVEN ASSEMBLY:TSG170A	80009	119–2321–03
A3	670–9112–00	B010100	B030737	CIRCUIT BD ASSY:ANALOG	80009	670–9112–00
A3	670–9112–01	B030738	B030894	CIRCUIT BD ASSY:ANALOG	80009	670–9112–01
A3	670–9112–02	B030895	B031040	CIRCUIT BD ASSY:ANALOG	80009	670–9112–02
A3	670–9112–03	B031041	B042108	CIRCUIT BD ASSY:ANALOG	80009	670–9112–03
A3	670–9112–04	B042109	B042780	CIRCUIT BD ASSY:ANALOG	80009	670–9112–04
A3	670–9112–06	B042781	B042948	CIRCUIT BD ASSY:ANALOG	80009	670–9112–06
A3	670–9112–07	B042949	B043172	CIRCUIT BD ASSY:ANALOG	80009	670–9112–07
A3	670–9112–09	B043173	B043446	CIRCUIT BD ASSY:ANALOG	80009	670–9112–09
A3	670–9112–11	B043447		CIRCUIT BD ASSY:ANALOG (STANDARD ONLY)	80009	670–9112–11
A3	670–9112–10	B043142	B043446	CIRCUIT BD ASSY:ANALOG	80009	670–9112–10
A3	670–9112–12	B043447		CIRCUIT BD ASSY:ANALOG (OPTION 1J &2J ONLY)	80009	670–9112–12
A4	670–9113–00	B010100	B030544	CIRCUIT BD ASSY:PWR SPLY	80009	670–9113–00
A4	670–9113–01	B030545	B030888	CIRCUIT BD ASSY:PWR SPLY	80009	670–9113–01
A4	670–9113–02	B030889	B031018	CIRCUIT BD ASSY:PWR SPLY	80009	670–9113–02
A4	670–9113–03	B031019	B031076	CIRCUIT BD ASSY:PWR SPLY	80009	670–9113–03
A4	670–9113–04	B031077	B031190	CIRCUIT BD ASSY:PWR SPLY	80009	670–9113–04
A4	670–9113–05	B031191	B031361	CIRCUIT BD ASSY:PWR SPLY	80009	670–9113–05
A4	670–9113–06	B031362	B039999	CIRCUIT BD ASSY:PWR SPLY	80009	670–9113–06
A4	671–0572–00	B040000	B042070	CIRCUIT BD ASSY:PWR SPLY	80009	671–0572–00
A4	671–0572–01	B042071	B042872	CIRCUIT BD ASSY:PWR SPLY	80009	671–0572–01
A4	671–0572–02	B042873	B043105	CIRCUIT BD ASSY:PWR SPLY	80009	671–0572–02
A4	671–0572–03	B043106	B043444	CIRCUIT BD ASSY:PWR SPLY	80009	671–0572–03
A4	671–0572–04	B043445	B043528	CIRCUIT BD ASSY:PWR SPLY	80009	671–0572–04
A4	671–0572–05	B043529	B043560	CIRCUIT BD ASSY:PWR SPLY	80009	671–0572–05
A4	671–0572–06	B043561		CIRCUIT BD ASSY:PWR SPLY	80009	671–0572–06
A5	670–9121–00	B010100	B020780	CIRCUIT BD ASSY:COLOR BAR	80009	670–9121–00
A5	670–9121–01	B030781	B041611	CIRCUIT BD ASSY:COLOR BAR	80009	670–9121–01
A5	670–9121–03	B041612	B042142	CIRCUIT BD ASSY:COLOR BAR	80009	670–9121–03
A5	670–9121–04	B042143	B042780	CIRCUIT BD ASSY:COLOR BAR	80009	670–9121–04
A5	670–9121–05	B042781		CIRCUIT BD ASSY:COLOR BAR (OPTION 01 ONLY)	80009	670–9121–05
A5	670–9121–06	B043142		CIRCUIT BD ASSY:COLOR BAR,OPTION 2J (OPTION 2J ONLY)	80009	670–9121–06
A6	670–9368–00			CIRCUIT BD ASSY:BNC	80009	670–9368–00

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A1	––––– –––––			(PART OF 333–3248–00)		
A1DS135	150–1068–00			LT EMITTING DIO:RED,635NM,10MA MAX	80009	150–1068–00
A1DS152	150–1068–00			LT EMITTING DIO:RED,635NM,10MA MAX	80009	150–1068–00
A1DS170	150–1068–00			LT EMITTING DIO:RED,635NM,10MA MAX	80009	150–1068–00
A1DS187	150–1068–00			LT EMITTING DIO:RED,635NM,10MA MAX	80009	150–1068–00
A1DS188	150–1068–00			LT EMITTING DIO:RED,635NM,10MA MAX	80009	150–1068–00
A1DS229	150–1097–00			LT EMITTING DIO:GREEN,565NM,10MA MAX,2.2V	80009	150–1097–00
A1DS234	150–1097–00			LT EMITTING DIO:GREEN,565NM,10MA MAX,2.2V	80009	150–1097–00
A1DS237	150–1097–00			LT EMITTING DIO:GREEN,565NM,10MA MAX,2.2V	80009	150–1097–00
A1DS242	150–1097–00			LT EMITTING DIO:GREEN,565NM,10MA MAX,2.2V	80009	150–1097–00
A1DS246	150–1097–00			LT EMITTING DIO:GREEN,565NM,10MA MAX,2.2V	80009	150–1097–00
A1DS250	150–1097–00			LT EMITTING DIO:GREEN,565NM,10MA MAX,2.2V	80009	150–1097–00
A1DS255	150–1097–00			LT EMITTING DIO:GREEN,565NM,10MA MAX,2.2V	80009	150–1097–00
A1DS259	150–1097–00			LT EMITTING DIO:GREEN,565NM,10MA MAX,2.2V	80009	150–1097–00
A1DS263	150–1097–00			LT EMITTING DIO:GREEN,565NM,10MA MAX,2.2V	80009	150–1097–00
A1DS267	150–1097–00			LT EMITTING DIO:GREEN,565NM,10MA MAX,2.2V	80009	150–1097–00
A1DS272	150–1097–00			LT EMITTING DIO:GREEN,565NM,10MA MAX,2.2V	80009	150–1097–00
A1DS276	150–1097–00			LT EMITTING DIO:GREEN,565NM,10MA MAX,2.2V	80009	150–1097–00
A1DS287	150–1097–00			LT EMITTING DIO:GREEN,565NM,10MA MAX,2.2V	80009	150–1097–00
A1DS288	150–1068–00			LT EMITTING DIO:RED,635NM,10MA MAX	80009	150–1068–00
A1S129	––––– –––––			(PART OF A1)		
A1S134	––––– –––––			(PART OF A1)		
A1S137	––––– –––––			(PART OF A1)		
A1S142	––––– –––––			(PART OF A1)		
A1S146	––––– –––––			(PART OF A1)		
A1S150	––––– –––––			(PART OF A1)		
A1S155	––––– –––––			(PART OF A1)		
A1S159	––––– –––––			(PART OF A1)		
A1S163	––––– –––––			(PART OF A1)		
A1S167	––––– –––––			(PART OF A1)		
A1S172	––––– –––––			(PART OF A1)		
A1S176	––––– –––––			(PART OF A1)		
A1S190	––––– –––––			(PART OF A1)		
A2–1	670–9111–00	B010100	B019999	CIRCUIT BD ASSY:DGTL	80009	670–9111–00
A2–1	670–9111–01	B020000	B020338	CIRCUIT BD ASSY:DGTL	80009	670–9111–01
A2–1	670–9111–02	B020339	B031192	CIRCUIT BD ASSY:DGTL	80009	670–9111–02
A2–1	670–9111–03	B031193	B031315	CIRCUIT BD ASSY:DGTL	80009	670–9111–03
A2–1	670–9111–04	B031316	B041718	CIRCUIT BD ASSY:DGTL	80009	670–9111–04
A2–1	670–9111–05	B041719	B042142	CIRCUIT BD ASSY:DGTL	80009	670–9111–05
A2–1	670–9111–06	B042143	B043884	CIRCUIT BD ASSY:DGTL	80009	670–9111–06
A2–1	670–9111–11	B043885		CIRCUIT BD ASSY:DGTL (STANDARD ONLY)	80009	670–9111–11
A2–1	670–9111–08	B043142	B043884	CIRCUIT BD ASSY:DGTL	80009	670–9111–08
A2–1	670–9111–12	B043885		CIRCUIT BD ASSY:DGTL (OPTION 1J & 2J ONLY)	80009	670–9111–12
A2–1	670–9111–07	B043091	B043187	CIRCUIT BD ASSY:DGTL	80009	670–9111–07
A2–1	670–9111–09	B043188	B043377	CIRCUIT BD ASSY:DGTL	80009	670–9111–09
A2–1	670–9111–10	B043378	B043884	CIRCUIT BD ASSY:DGTL	80009	670–9111–10
A2–1	670–9111–13	B043885		CIRCUIT BD ASSY:DGTL (OPTION 1V ONLY)	80009	670–9111–13
A2–1C170	290–0848–00	670–9111–00	670–9111–00	CAP,FXD,ELCTLT:47UF,+100–20%,16V	54473	ECE–A16N47U
A2–1C170	290–0990–00	670–9111–00		CAP,FXD,ELCTLT:10UF,20%,50V	24165	502D437
A2–1C180	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A2–1C205	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C205	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C206	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A2–1C206	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C207	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C207	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C214	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C214	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C222	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C259	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A2–1C270	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C270	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C273	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A2–1C275	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C275	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C276	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C276	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C280	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C280	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C281	283–0635–00	670–9111–00	670–9111–04	CAP,FXD,MICA DI:51PF,1%,500V	80009	283–0635–00
A2–1C282	283–0633–00	670–9111–00	670–9111–04	CAP,FXD,MICA DI:77PF,1%,100V	80009	283–0633–00
A2–1C290	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C290	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C318	283–0486–00	670–9111–01	670–9111–04	CAP,FXD,CER DI:1.0UF,10%,50V	04222	SR305C105KAA
A2–1C319	283–0238–00	670–9111–01	670–9111–04	CAP,FXD,CER DI:0.01UF,10%,50V	80009	283–0238–00
A2–1C325	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C325	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C329	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C329	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C335	283–0629–00			CAP,FXD,MICA DI:62PF,1%,500V	80009	283–0629–00
A2–1C351	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C351	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C355	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A2–1C359	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A2–1C363	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C363	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C367	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C367	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C370	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C370	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C372	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C372	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C374	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C374	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C376	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C376	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C378	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C378	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C380	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C380	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C381	283–0779–00	670–9111–00	670–9111–04	CAP,FXD,MICA DI:27 PF,2%,500V	80009	283–0779–00
A2–1C384	283–0632–00	670–9111–00	670–9111–00	CAP,FXD,MICA DI:87PF,1%,500V	80009	283–0632–00
A2–1C384	283–0631–00	670–9111–01	670–9111–04	CAP,FXD,MICA DI:95PF,1%,500V	80009	283–0631–00
A2–1C387	281–0284–00	670–9111–00	670–9111–04	CAP,VAR,CER DI:2.2–34PF,250V	80009	281–0284–00
A2–1C390	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C390	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C397	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C397	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C429	283–0644–00	670–9111–00	670–9111–00	CAP,FXD,MICA DI:150PF,1%,500V	80009	283–0644–00
A2–1C435	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C435	281–0775–01	670–9111–05		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
A2–1C443	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C443	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C455	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C455	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C467	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C467	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C473	283–0594–00			CAP,FXD,MICA DI:0.001UF,1%,100V	80009	283–0594–00
A2–1C474	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C474	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C476	283–0594–00			CAP,FXD,MICA DI:0.001UF,1%,100V	80009	283–0594–00
A2–1C477	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C477	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C478	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C478	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C479	283–0421–00	670–9111–00	670–9111–00	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C479	283–0594–00	670–9111–01		CAP,FXD,MICA DI:0.001UF,1%,100V	80009	283–0594–00
A2–1C481	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C481	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C483	283–0594–00			CAP,FXD,MICA DI:0.001UF,1%,100V	80009	283–0594–00
A2–1C485	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C485	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C487	283–0632–00	670–9111–00	670–9111–00	CAP,FXD,MICA DI:87PF,1%,500V	80009	283–0632–00
A2–1C487	283–0649–00	670–9111–01	670–9111–02	CAP,FXD,MICA DI:105PF,1%,500V	80009	283–0649–00
A2–1C487	283–0706–00	670–9111–03	670–9111–04	CAP,FXD,MICA DI:91PF,1%,500V	80009	283–0706–00
A2–1C488	283–0421–00	670–9111–00	670–9111–00	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C489	283–0785–00	670–9111–01		CAP,FXD,MICA DI:250PF,1%,500V	80009	283–0785–00
A2–1C491	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C491	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C492	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C493	283–0421–00	670–9111–00	670–9111–00	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C493	283–0666–00	670–9111–01	670–9111–04	CAP,FXD,MICA DI:890PF,2%,100V	80009	283–0666–00
A2–1C493	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C495	283–0421–00	670–9111–00	670–9111–00	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C495	283–0666–00	670–9111–01		CAP,FXD,MICA DI:890PF,2%,100V	80009	283–0666–00
A2–1C496	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C496	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C507	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C507	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C520	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C520	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C580	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C580	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C583	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A2–1C586	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A2–1C592	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C592	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C594	283–0175–00	670–9111–01		CAP,FXD,CER DI:10PF,5%,200V	05397	C312C100D2G5CA 8
A2–1C663	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C663	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C707	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C707	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C714	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C714	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C717	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C717	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C723	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C723	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C729	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A2–1C729	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C736	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C736	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C742	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C742	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C748	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C748	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C759	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C759	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C788	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C788	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C807	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C807	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C809	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C809	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C811	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C811	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C812	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C812	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C817	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A2–1C821	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C821	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C824	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C824	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C827	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C827	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C841	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C841	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C842	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C842	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C843	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C843	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C844	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C844	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C845	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C845	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C846	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C846	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C847	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C847	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C848	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C848	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C867	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C867	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C875	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C875	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C880	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C880	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C907	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C907	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C910	283–0647–00			CAP,FXD,MICA DI:70PF,1%,100V	80009	283–0647–00
A2–1C911	283–0772–00			CAP,FXD,MICA DI:497 PF,1%,500V	80009	283–0772–00
A2–1C913	283–0625–00			CAP,FXD,MICA DI:220PF,1%,500V	80009	283–0625–00
A2–1C918	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A2–1C933	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A2–1C939	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A2–1C944	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C944	281–0775–01	670–9111–05		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
A2–1C945	283–0421–00	670–9111–00	670–9111–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A2–1C945	281–0775–01	670–9111–05		CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A2–1C970	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A2–1C972	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A2–1C975	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A2–1C978	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A2–1CR122	152–0141–02	670–9111–00	670–9111–04	DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A2–1CR123	152–0141–02	670–9111–00	670–9111–04	DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A2–1CR179	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A2–1CR257	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A2–1CR357	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A2–1CR358	152–0322–00			DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811	80009	152–0322–00
A2–1CR359	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A2–1CR394	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A2–1CR395	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A2–1CR475	152–0269–00			SEMICOND DVC,DI:VVC,SI,35V,33PF AT 4V,DO–7	04713	SMV1263
A2–1CR476	152–0270–00			SEMICOND DVC,DI:VVC,SI,40V,62.6PF,DO–7	04713	SMV1563
A2–1CR481	152–0269–00			SEMICOND DVC,DI:VVC,SI,35V,33PF AT 4V,DO–7	04713	SMV1263
A2–1CR482	152–0270–00			SEMICOND DVC,DI:VVC,SI,40V,62.6PF,DO–7	04713	SMV1563
A2–1CR912	152–0322–00			DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811	80009	152–0322–00
A2–1DS397	150–1014–00			DIO,OPTO:LED;RED,66ONM,1 MCD AT 10 MA;T1 3/4	58361	Q6444/MV5054–1
A2–1J109	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A2–1J122	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A2–1J180	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A2–1J210	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A2–1J211	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A2–1J382	131–0608–00	670–9111–00	670–9111–04	TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A2–1J396	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A2–1J407	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A2–1J408	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A2–1J425	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 4)	80009	131–0608–00
A2–1J680	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A2–1J696	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A2–1J720	131–0608–00	670–9111–00	670–9111–04	TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A2–1J767	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A2–1J881	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A2–1J882	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A2–1J942	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A2–1J988	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A2–1L375	108–0559–00			COIL,RF:FIXED,1.59UH	80009	108–0559–00
A2–1L381	108–0559–00			COIL,RF:FIXED,1.59UH	80009	108–0559–00
A2–1L907	108–0103–01			COIL,RF:FIXED,2.5UH,2%	80009	108–0103–01
A2–1P122	131–0993–02			BUS,CNDCT:SHUNT ASSEMBLY,RED	00779	1–850100–O
A2–1P180	131–0993–02			BUS,CNDCT:SHUNT ASSEMBLY,RED	00779	1–850100–O
A2–1P210	131–0993–05			BUS,CNDCT:SHUNT ASSEMBLY,GREEN	00779	850100–5
A2–1P211	131–0993–05			BUS,CNDCT:SHUNT ASSEMBLY,GREEN	00779	850100–5
A2–1P214	131–0608–00	670–9111–00	670–9111–00	TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A2–1P286	131–0787–00			TERMINAL,PIN:	22526	47359–001
A2–1P382	131–0993–02	670–9111–00	670–9111–04	BUS,CNDCT:SHUNT ASSEMBLY,RED	00779	1–850100–O
A2–1P396	131–0993–02			BUS,CNDCT:SHUNT ASSEMBLY,RED	00779	1–850100–O
A2–1P407	131–0993–05			BUS,CNDCT:SHUNT ASSEMBLY,GREEN	00779	850100–5
A2–1P408	131–0993–05			BUS,CNDCT:SHUNT ASSEMBLY,GREEN	00779	850100–5
A2–1P425	131–0608–00	670–9111–01		TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A2–1P680	131–0993–05			BUS,CNDCT:SHUNT ASSEMBLY,GREEN	00779	850100–5
A2–1P696	131–0993–05			BUS,CNDCT:SHUNT ASSEMBLY,GREEN	00779	850100–5
A2–1P767	131–0993–02			BUS,CNDCT:SHUNT ASSEMBLY,RED	00779	1–850100–O
A2–1P881	131–0993–05			BUS,CNDCT:SHUNT ASSEMBLY,GREEN	00779	850100–5

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A2–1P882	131–0993–05			BUS,CNDCT:SHUNT ASSEMBLY,GREEN	00779	850100–5
A2–1P923	131–3440–00			CONN,DIN:PCB;MALE,RTANG,3 X 16,0.1 CTR,0.498 X 0.114 TAIL,30 GOLD,BD RETENTION;	80009	131–3440–00
A2–1P955	131–3440–00			CONN,DIN:PCB;MALE,RTANG,3 X 16,0.1 CTR,0.498 X 0.114 TAIL,30 GOLD,BD RETENTION;	80009	131–3440–00
A2–1Q235	151–0199–00			XSTR,SIG:BIPOLAR,PNP;12V,80MA,SWITCH-ING;MPS3640,TO–92 EBC	80009	151–0199–00
A2–1Q293	151–0657–00			XSTR,PWR:BIPOLAR,PNP;80V,8.0A,4.0MHZ,DARLING-TON,AMPL;2N6041,TO–220	80009	151–0657–00
A2–1Q355	151–0220–00			XSTR,SIG:BIPOLAR,PNP;40V,200MA,400MHZ, AMPL;2N3906(SEL),TO–92 EBC	80009	151–0220–00
A2–1Q491	151–0190–00			XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC	80009	151–0190–00
A2–1R112	315–0621–00			RES,FXD,FILM:620 OHM,5%,0.25W	80009	315–0621–00
A2–1R113	315–0621–00			RES,FXD,FILM:620 OHM,5%,0.25W	80009	315–0621–00
A2–1R114	315–0621–00			RES,FXD,FILM:620 OHM,5%,0.25W	80009	315–0621–00
A2–1R115	315–0621–00			RES,FXD,FILM:620 OHM,5%,0.25W	80009	315–0621–00
A2–1R116	315–0621–00			RES,FXD,FILM:620 OHM,5%,0.25W	80009	315–0621–00
A2–1R117	315–0621–00			RES,FXD,FILM:620 OHM,5%,0.25W	80009	315–0621–00
A2–1R118	307–0636–00			RES NTWK,FXD,FI:8,330 OHM,2%,0.125 W	80009	307–0636–00
A2–1R121	315–0103–00	670–9111–00	670–9111–04	RES,FXD,FILM:10K OHM,5%,0.25W	80009	315–0103–00
A2–1R121	315–0272–00	670–9111–05		RES,FXD,FILM:2.7K OHM,5%,0.25W	80009	315–0272–00
A2–1R122	315–0272–00	670–9111–05		RES,FXD,FILM:2.7K OHM,5%,0.25W	80009	315–0272–00
A2–1R168	315–0472–00			RES,FXD,FILM:4.7K OHM,5%,0.25W	80009	315–0472–00
A2–1R169	315–0271–00	670–9111–00	670–9111–00	RES,FXD,FILM:270 OHM,5%,0.25W	80009	315–0271–00
A2–1R169	315–0222–00	670–9111–01		RES,FXD,FILM:2.2K OHM,5%,0.25W	80009	315–0222–00
A2–1R171	315–0104–00	670–9111–00	670–9111–00	RES,FXD,FILM:100K OHM,5%,0.25W	80009	315–0104–00
A2–1R171	315–0393–00	670–9111–01	670–9111–03	RES,FXD,FILM:39K OHM,5%,0.25W	80009	315–0393–00
A2–1R171	315–0203–00	670–9111–04		RES,FXD,FILM:20K OHM,5%,0.25W	59124	CF1/4 20K 5% TR
A2–1R172	321–0312–00	670–9111–00	670–9111–00	RES,FXD,FILM:17.4K OHM,1%,0.125W,TC=T0	80009	321–0312–00
A2–1R178	315–0202–00			RES,FXD,FILM:2K OHM,5%,0.25W	80009	315–0202–00
A2–1R179	315–0202–00			RES,FXD,FILM:2K OHM,5%,0.25W	80009	315–0202–00
A2–1R203	307–0636–00			RES NTWK,FXD,FI:8,330 OHM,2%,0.125 W	80009	307–0636–00
A2–1R254	315–0102–00			RES,FXD,FILM:1K OHM,5%,0.25W	80009	315–0102–00
A2–1R255	315–0472–00			RES,FXD,FILM:4.7K OHM,5%,0.25W	80009	315–0472–00
A2–1R256	315–0682–00	670–9111–00	670–9111–00	RES,FXD,FILM:6.8K OHM,5%,0.25W	80009	315–0682–00
A2–1R256	315–0112–00	670–9111–01		RES,FXD,FILM:1.1K OHM,5%,0.25W	80009	315–0112–00
A2–1R257	315–0102–00	670–9111–00	670–9111–00	RES,FXD,FILM:1K OHM,5%,0.25W	80009	315–0102–00
A2–1R257	315–0271–00	670–9111–01		RES,FXD,FILM:270 OHM,5%,0.25W	80009	315–0271–00
A2–1R258	308–0433–00			RES,FXD,WW:1 OHM,10%,0.25W	80009	308–0433–00
A2–1R272	322–3289–00			RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A2–1R273	321–1643–07			RES,FXD,FILM:11.03K OHM,0.1%,0.125W,TC=T9	80009	321–1643–07
A2–1R274	321–1264–07			RES,FXD,FILM:5.56K OHM,0.1%,0.125W,TC=T9	07716	
A2–1R275	315–0362–00			RES,FXD,FILM:3.6K OHM,5%,0.25W	80009	315–0362–00
A2–1R277	315–0242–00			RES,FXD,FILM:2.4K OHM,5%,0.25W	80009	315–0242–00
A2–1R278	321–0264–07			RES,FXD,FILM:5.49K OHM,0.1%,0.125W,TC=T9	07716	CEAE54900B
A2–1R279	321–0264–07			RES,FXD,FILM:5.49K OHM,0.1%,0.125W,TC=T9	07716	CEAE54900B
A2–1R296	321–0353–00			RES,FXD,FILM:46.4K OHM,1%,0.125W,TC=T0	07716	CEAD46401F
A2–1R297	321–0413–00			RES,FXD,FILM:196K OHM,1%,0.125W,TC=T0	07716	CEAD19602F
A2–1R298	308–0677–00			RES,FXD,WW:1 OHM,5%,2W	75042	ORDER BY DESC
A2–1R318	322–3394–00	670–9111–01	670–9111–04	RES,FXD,FILM:124K OHM,1%,0.2W,TC=T0	91637	CCF50–2–G1243FT
A2–1R319	322–3264–00	670–9111–01	670–9111–04	RES,FXD,FILM:5.49K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 5K49
A2–1R334	315–0100–00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A2–1R335	315–0152–00			RES,FXD,FILM:1.5K OHM,5%,0.25W	80009	315–0152–00
A2–1R336	315–0621–00			RES,FXD,FILM:620 OHM,5%,0.25W	80009	315–0621–00
A2–1R356	315–0106–00			RES,FXD,FILM:10M OHM,5%,0.25W	01121	CB1065
A2–1R358	315–0100–00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A2–1R360	315–0103–00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315–0103–00
A2–1R373	315–0301–00	670–9111–00	670–9111–01	RES,FXD,FILM:300 OHM,5%,0.25W	80009	315–0301–00

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A2–1R373	315–0271–00	670–9111–02		RES,FXD,FILM:270 OHM,5%,0.25W	80009	315–0271–00
A2–1R374	315–0270–00			RES,FXD,FILM:27 OHM,5%,0.25W	80009	315–0270–00
A2–1R378	315–0270–00			RES,FXD,FILM:27 OHM,5%,0.25W	80009	315–0270–00
A2–1R379	315–0222–00	670–9111–00	670–9111–01	RES,FXD,FILM:2.2K OHM,5%,0.25W	80009	315–0222–00
A2–1R379	315–0271–00	670–9111–02		RES,FXD,FILM:270 OHM,5%,0.25W	80009	315–0271–00
A2–1R381	321–0441–00	670–9111–05		RES,FXD,FILM:383K OHM,1%,0.125W,TC=T0	80009	321–0441–00
A2–1R384	315–0514–00	670–9111–00	670–9111–00	RES,FXD,FILM:510K OHM,5%,0.25W	2M627	NTR25J–E510K
A2–1R384	321–0454–00	670–9111–01	670–9111–04	RES,FXD,FILM:523K OHM,1%,0.125W,TC=TO	80009	321–0454–00
A2–1R385	315–0514–00	670–9111–00	670–9111–00	RES,FXD,FILM:510K OHM,5%,0.25W	2M627	NTR25J–E510K
A2–1R385	321–0454–00	670–9111–01	670–9111–04	RES,FXD,FILM:523K OHM,1%,0.125W,TC=TO	80009	321–0454–00
A2–1R385	322–3318–00	670–9111–05		RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 20K0
A2–1R392	322–3318–00			RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 20K0
A2–1R393	321–0413–00			RES,FXD,FILM:196K OHM,1%,0.125W,TC=T0	07716	CEAD19602F
A2–1R394	321–0353–00			RES,FXD,FILM:46.4K OHM,1%,0.125W,TC=T0	07716	CEAD46401F
A2–1R398	315–0102–00			RES,FXD,FILM:1K OHM,5%,0.25W	80009	315–0102–00
A2–1R410	307–0650–00			RES NTWK,FXD,FI:9,2.7K OHM,5%,0.150W	11236	750–101–R2.7K
A2–1R423	315–0511–00	670–9111–00	670–9111–00	RES,FXD,FILM:510 OHM,5%,0.25W	80009	315–0511–00
A2–1R423	307–0526–00	670–9111–01		RES,NTWK:THICK FILM;(5)510 OHM,10%,0.125W EACH,TC=100 PPM;SIP6,PIN 1 COM	57924	4306X–101–511
A2–1R424	315–0511–00	670–9111–00	670–9111–00	RES,FXD,FILM:510 OHM,5%,0.25W	80009	315–0511–00
A2–1R428	315–0272–03	670–9111–00	670–9111–00	RES,FXD,CMPSN:2.7K 5%,0.25W	80009	315–0272–03
A2–1R429	315–0270–00	670–9111–00	670–9111–00	RES,FXD,FILM:27 OHM,5%,0.25W	80009	315–0270–00
A2–1R440	307–0650–00			RES NTWK,FXD,FI:9,2.7K OHM,5%,0.150W	11236	750–101–R2.7K
A2–1R469	311–2234–00			RES,VAR,TRMR:CERMET;5K OHM,20%,0.5W,0.197 SQ,TOP ADJUST;T&R	TK1450	GF06UT 5K
A2–1R470	321–0312–00	670–9111–01		RES,FXD,FILM:17.4K OHM,1%,0.125W,TC=T0	80009	321–0312–00
A2–1R471	322–3335–00			RES,FXD,FILM:30.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 30K1
A2–1R472	322–3210–00			RES,FXD:METAL FILM;1.5K OHM,1%,0.2W,TC=100 PPM;AX-IAL,SMALL BODY	57668	CRB20 FXE 1K50
A2–1R474	315–0103–00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315–0103–00
A2–1R475	322–3324–00	670–9111–00	670–9111–01	RES,FXD,FILM:23.2K OHM,1%,0.2W,TC=T0	91637	CCF50–2F23201F
A2–1R475	321–0347–00	670–9111–02		RES,FXD,FILM:40.2K OHM,1%,0.125W,TC=T0 (NOMINAL VALUE, SELECTED)	80009	321–0347–00
A2–1R476	322–3289–00			RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A2–1R478	322–3210–00			RES,FXD:MET FILM;1.5K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K50
A2–1R479	322–3210–00			RES,FXD:MET FILM;1.5K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K50
A2–1R480	315–0103–00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315–0103–00
A2–1R481	322–3324–00	670–9111–00	670–9111–01	RES,FXD,FILM:23.2K OHM,1%,0.2W,TC=T0	91637	CCF50–2F23201F
A2–1R481	321–0347–00	670–9111–02		RES,FXD,FILM:40.2K OHM,1%,0.125W,TC=T0 (NOMINAL VALUE, SELECTED)	80009	321–0347–00
A2–1R482	322–3289–00			RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A2–1R483	322–3210–00			RES,FXD:MET FILM;1.5K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K50
A2–1R484	315–0102–00			RES,FXD,FILM:1K OHM,5%,0.25W	80009	315–0102–00
A2–1R485	315–0751–00			RES,FXD,FILM:750 OHM,5%,0.25W	80009	315–0751–00
A2–1R486	315–0511–00			RES,FXD,FILM:510 OHM,5%,0.25W	80009	315–0511–00
A2–1R487	322–3305–00	670–9111–00	670–9111–00	RES,FXD,FILM:14.7K OHM,1%,0.2W,TC=T0	80009	322–3305–00
A2–1R487	322–3233–00	670–9111–01	670–9111–02	RES,FXD,FILM:2.61K OHM,1%,0.2W,TC=T0	80009	322–3233–00
A2–1R487	322–3098–00	670–9111–03	670–9111–04	RES,FXD,FILM:102 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 102E
A2–1R487	322–3152–00	670–9111–05		RES,FXD,FILM:374 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 374E
A2–1R488	321–0387–00			RES,FXD,FILM:105K OHM,1%,0.125W,TC=T0	07716	CEAD10502F
A2–1R489	322–3318–00			RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 20K0
A2–1R490	322–3385–00			RES,FXD:MET FILM;100K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 100K
A2–1R493	315–0242–00	670–9111–00	670–9111–00	RES,FXD,FILM:2.4K OHM,5%,0.25W	80009	315–0242–00
A2–1R493	315–0392–00	670–9111–01		RES,FXD,FILM:3.9K OHM,5%,0.25W	80009	315–0392–00
A2–1R494	315–0302–00			RES,FXD,FILM:3K OHM,5%,0.25W	80009	315–0302–00
A2–1R495	315–0302–00	670–9111–00	670–9111–00	RES,FXD,FILM:3K OHM,5%,0.25W	80009	315–0302–00
A2–1R495	315–0682–00	670–9111–01		RES,FXD,FILM:6.8K OHM,5%,0.25W	80009	315–0682–00
A2–1R496	315–0394–00	670–9111–03		RES,FXD,FILM:390K OHM,5%,0.25W	80009	315–0394–00

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A2–1R579	307–0539–00			RES NTWK,FXD,FI:(7)510 OHM,10%,1W	80009	307–0539–00
A2–1R583	307–0539–00			RES NTWK,FXD,FI:(7)510 OHM,10%,1W	80009	307–0539–00
A2–1R587	321–0249–00	670–9111–00	670–9111–04	RES,FXD,FILM:3.83K OHM,1%,0.125W,TC=T0	80009	321–0249–00
A2–1R593	315–0242–00			RES,FXD,FILM:2.4K OHM,5%,0.25W	80009	315–0242–00
A2–1R594	307–0503–00	670–9111–00	670–9111–00	RES NTWK,FXD,FI:(9) 510 OHM,20%,0.125W	91637	CSC10A01511GDO3
A2–1R594	307–0526–00	670–9111–01		RES,NTWK:THICK FILM;(5)510 OHM,10%,0.125W EACH,TC=100 PPM;SIP6,PIN 1 COM	57924	4306X–101–511
A2–1R595	322–3210–00	670–9111–01		RES,FXD:MET FILM;1.5K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K50
A2–1R596	322–3210–00	670–9111–01		RES,FXD:MET FILM;1.5K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K50
A2–1R669	315–0750–00			RES,FXD,FILM:75 OHM,5%,0.25W	80009	315–0750–00
A2–1R777	307–0650–00			RES NTWK,FXD,FI:9,2.7K OHM,5%,0.150W	11236	750–101–R2.7K
A2–1R809	315–0270–00			RES,FXD,FILM:27 OHM,5%,0.25W	80009	315–0270–00
A2–1R810	321–0929–07			RES,FXD,FILM:2.5K OHM,0.1%,0.125W,TC=T9	80009	321–0929–07
A2–1R811	322–3193–07			RES,FXD,FILM:1K OHM,0.1%,0.2W,TC=T9	80009	322–3193–07
A2–1R829	315–0102–00			RES,FXD,FILM:1K OHM,5%,0.25W	80009	315–0102–00
A2–1R837	307–0650–00			RES NTWK,FXD,FI:9,2.7K OHM,5%,0.150W	11236	750–101–R2.7K
A2–1R839	315–0511–00			RES,FXD,FILM:510 OHM,5%,0.25W	80009	315–0511–00
A2–1R846	307–0650–00			RES NTWK,FXD,FI:9,2.7K OHM,5%,0.150W	11236	750–101–R2.7K
A2–1R904	322–3179–00			RES,FXD,FILM:715 OHM,1%,0.2W,TC=T0	80009	322–3179–00
A2–1R916	321–0793–07			RES,FXD,FILM:37.5 OHM 0.1%,0.125W TC=T9	24546	NE55E37R5B
A2–1R921	307–0526–00			RES,NTWK:THICK FILM;(5)510 OHM,10%,0.125W EACH,TC=100 PPM;SIP6,PIN 1 COM	57924	4306X–101–511
A2–1R925	307–0526–00			RES,NTWK:THICK FILM;(5)510 OHM,10%,0.125W EACH,TC=100 PPM;SIP6,PIN 1 COM	57924	4306X–101–511
A2–1R929	315–0102–00			RES,FXD,FILM:1K OHM,5%,0.25W	80009	315–0102–00
A2–1R939	315–0511–00			RES,FXD,FILM:510 OHM,5%,0.25W	80009	315–0511–00
A2–1R953	315–0511–00			RES,FXD,FILM:510 OHM,5%,0.25W	80009	315–0511–00
A2–1R954	315–0511–00			RES,FXD,FILM:510 OHM,5%,0.25W	80009	315–0511–00
A2–1S407	260–1589–00			SWITCH,ROCKER:(6)SPST,125MA,30VDC	81073	76SB06S
A2–1TP101	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A2–1TP136	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A2–1TP167	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A2–1TP401	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A2–1TP499	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A2–1TP534	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A2–1TP578	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A2–1TP901	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A2–1TP913	214–0579–00	670–9111–01		TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A2–1TP936	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A2–1TP967	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A2–1TP999	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A2–1U127	156–2628–00			IC,PROCESSOR:NMOS,PRPHL;CNTR TMR;Z80–CTC,DIP28	56708	Z8430B PS OR CS
A2–1U132	156–2628–00			IC,PROCESSOR:NMOS,PRPHL;CNTR TMR;Z80–CTC,DIP28	56708	Z8430B PS OR CS
A2–1U152	156–1632–00			MICROCKT,DGTL:CMOS,2048 X 8 SRAM	80009	156–1632–00
A2–1U157	156–2491–00			IC,MEM:NMOS,EEPROM;128 X 8,200NS;2001,DIP24.6	60395	X2001 P OR D
A2–1U162	156–1026–02			IC,DGTL:LSTTL,DEMUX;74LS154,DIP24.6,TUBE	01295	SN74LS154N P3
A2–1U176	156–1850–00			IC,MISC:CMOS,ANALOG SWITCH;QUAD;DG211,DIP16.3	17856	SDG21107
A2–1U218	156–0865–02			IC,DGTL:LSTTL,FLIP FLOP;74LS273,DIP20.3,TUBE	80009	156–0865–02
A2–1U221	156–3050–00	670–9111–05		IC,MISC:	80009	156–3050–00
A2–1U222	156–0721–02	670–9111–00	670–9111–00	IC,DGTL:LSTTL,GATES;74LS132,DIP14.3,TUBE	80009	156–0721–02
A2–1U222	156–1645–00	670–9111–01	670–9111–04	IC,DGTL:STTL,MULTIVIBRATOR;DUAL RETRIG MONOST-ABLE;96S02,DIP16.3,TUBE	80009	156–1645–00
A2–1U239	156–0983–03			IC,PROCESSOR:NMOS,MIPRCS;8–BIT;Z80B,DIP40.6	56708	Z80BCPUDS
A2–1U245	160–3562–01	670–9111–00	670–9111–00	MICROCKT,DGTL:NMOS,32768 X 8 EPROM,3 STATE OUT	80009	160–3562–01
A2–1U245	160–3562–02	670–9111–01	670–9111–04	MICROCKT,DGTL:NMOS,32768 X 8 EPROM,3 STATE OUT	80009	160–3562–02
A2–1U245	160–3562–03	670–9111–05	670–9111–10	MICROCKT,DGTL:NMOS,32768 X 8 EPROM,PRGM	80009	160–3562–03
A2–1U245	160–3562–04	670–9111–11		MICROCKT,DGTL:NMOS,32768 X 8 EPROM,PRGM	80009	160–3562–04
A2–1U265	160–4190–00	670–9111–01		MICROCKT,DGTL:QUAD 16 INP RGTR AND/OR ARRAY	80009	160–4190–00

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A2–1U267	156–1367–00			IC,CONVERTER:CMOS,D/A;8 BIT,400NS,CURRENT OUT,MPU COMPATIBLE,MULTIPLYING;AD7524JN,DIP16.3	80009	156–1367–00
A2–1U270	156–0158–07			IC,LINEAR:BIPOLAR,OP–AMP;MC1458P1,DIP08.3	80009	156–0158–07
A2–1U276	156–1437–00			IC,LIN:BIPOLAR,V REF;POS,5V,1.0%,25PPM,SER; MC1404AU5,DIP08.3	80009	156–1437–00
A2–1U303	156–0865–02			IC,DGTL:LSTTL,FLIP FLOP;74LS273,DIP20.3,TUBE	80009	156–0865–02
A2–1U307	156–1215–01			IC,DGTL:CMOS,MUX/ENCODER;20–KEY ENCOD-ER;74C923,DIP18.3,TUBE,SCRN	27014	MM74C923JA+
A2–1U311	156–0956–02			IC,DGTL:LSTTL,BUFFER/DRIVER;74LS244,DIP20.3,TUBE	80009	156–0956–02
A2–1U314	156–0865–02			IC,DGTL:LSTTL,FLIP FLOP;74LS273,DIP20.3,TUBE	80009	156–0865–02
A2–1U322	156–0479–02	670–9111–00	670–9111–04	IC,DGTL:LSTTL,GATE;74LS32,DIP14.3,TUBE	80009	156–0479–02
A2–1U325	156–2338–00			IC,DGTL:ASTTL,FLIP FLOP;DUAL D–TYPE;74AS74,DIP14.3,TUBE	80009	156–2338–00
A2–1U329	156–0541–02	670–9111–00	670–9111–04	IC,DGTL:LSTTL,DEMUX/DCDR;74LS139,DIP16.3,TUBE	80009	156–0541–02
A2–1U332	156–2626–00			IC,DGTL:ALSTTL,GATE;QUAD 2–INPUT NAND, OC;74ALS03,DIP14.3,TUBE	01295	74ALS03
A2–1U338	156–1373–01	670–9111–00	670–9111–04	IC,DGTL:LSTTL,BUFFER/DRIVER;74LS125,DIP14.3,TUBE	80009	156–1373–01
A2–1U351	156–2100–00	670–9111–00	670–9111–04	IC,DGTL:ALSTTL,DEMUX/DCDR;3–TO–8 LINE DCDR ;74ALS138,DIP16.3,TUBE	01295	SN74ALS138N3
A2–1U352	160–5504–00	670–9111–05	670–9111–06	MICROCKT,DGTL:10 LOW OUT LOGIC ARRAY,PRGM	80009	160–5504–00
A2–1U352	160–5504–01	670–9111–06		IC,DGTL:CMOS,PLD;EEPLD,22V10,25NS,33.3MHZ,90MA,22V 10–25,DIP24.3,TUBE	80009	160–5504–01
A2–1U363	156–0479–02			IC,DGTL:LSTTL,GATE;74LS32,DIP14.3,TUBE	80009	156–0479–02
A2–1U367	156–2338–00	670–9111–00	670–9111–04	IC,DGTL:ASTTL,FLIP FLOP;DUAL D–TYPE;74AS74,DIP14.3,TUBE	80009	156–2338–00
A2–1U370	156–1367–00			IC,CONVERTER:CMOS,D/A;8 BIT,400NS,CURRENT OUT,MPU COMPATIBLE,MULTIPLYING;AD7524JN,DIP16.3	80009	156–1367–00
A2–1U376	156–0158–07			IC,LINEAR:BIPOLAR,OP–AMP;MC1458P1,DIP08.3	80009	156–0158–07
A2–1U390	156–0158–07			IC,LINEAR:BIPOLAR,OP–AMP;MC1458P1,DIP08.3	80009	156–0158–07
A2–1U403	156–0865–02			IC,DGTL:LSTTL,FLIP FLOP;74LS273,DIP20.3,TUBE	80009	156–0865–02
A2–1U412	156–0956–02			IC,DGTL:LSTTL,BUFFER/DRIVER;74LS244,DIP20.3,TUBE	80009	156–0956–02
A2–1U416	156–1111–02			IC,DGTL:LSTTL,TRANSCEIVER;74LS245,DIP20.3,TUBE	80009	156–1111–02
A2–1U420	156–1111–02			IC,DGTL:LSTTL,TRANSCEIVER;74LS245,DIP20.3,TUBE	80009	156–1111–02
A2–1U425	156–0316–04			IC,DGTL:ECL,XLTR;QUAD ECL TO TTL;10125,DIP16.3,TUBE	04713	MC10125P/L
A2–1U429	160–3619–00	670–9111–01	670–9111–01	MICROCKT,DGTL:QUAD,16 INP RGTR AND/OR,PRGM	80009	160–3619–00
A2–1U429	160–3619–01	670–9111–01	670–9111–04	MICROCKT,DGTL:QUAD 16 INP RGTR AND/OR,PRGM	80009	160–3619–01
A2–1U429	160–3619–02	670–9111–05		MICROCKT,DGTL:QUAD 16 INP RGTR AND/OR,PRGM	80009	160–3619–02
A2–1U432	156–0804–02	670–9111–00	670–9111–04	IC,DGTL:LSTTL,LATCH;QUADRUPLE S–R;74LS279,DIP16.3,TUBE	01295	SN74LS279NP3/JP4
A2–1U435	156–0392–03	670–9111–00	670–9111–04	IC,DGTL:LSTTL,FLIP FLOP;74LS175,DIP16.3,TUBE	80009	156–0392–03
A2–1U438	156–1707–00	670–9111–00	670–9111–04	IC,DGTL:FTTL,GATE;QUAD 2–INPUT NAND;74F00,DIP14.3,TUBE	80009	156–1707–00
A2–1U443	156–0865–02			IC,DGTL:LSTTL,FLIP FLOP;74LS273,DIP20.3,TUBE	80009	156–0865–02
A2–1U447	160–3559–00			MICROCKT,DGTL:NMOS,4096 X 8 EPROM W/3 STATE OUT,PRGM (STANDARD, 1J & 2J ONLY)	80009	160–3559–00
A2–1U447	160–8656–00	670–9111–07	670–9111–09	IC,MEM:NMOS,4096 X 8 EPROM W/3 STATE OUT,2732A,DIP24	80009	160–8656–00
A2–1U447	160–8656–01	670–9111–10		IC,MEM:NMOS,4096 X 8 EPROM W/3 STATE OUT,2732A,DIP24 (OPTION 1V ONLY)	80009	160–8656–01
A2–1U452	156–1664–00			IC,DGTL:ALSTTL,FLIP FLOP;OCTAL NONINV D–TYPE, 3–STATE;74ALS574,DIP20.3,TUBE	80009	156–1664–00
A2–1U455	156–0480–02			IC,DGTL:LSTTL,GATES;74LS08,DIP14.3,TUBE	80009	156–0480–02
A2–1U459	156–0865–02			IC,DGTL:LSTTL,FLIP FLOP;74LS273,DIP20.3,TUBE	80009	156–0865–02
A2–1U463	156–2520–00			IC,DGTL:ASTTL,CNTR;SYNCH 4–BIT BINARY;74AS163,DIP16.3,TUBE	01295	SN74AS163N3ORJ4
A2–1U467	156–2338–00			IC,DGTL:ASTTL,FLIP FLOP;DUAL D–TYPE;74AS74,DIP14.3,TUBE	80009	156–2338–00

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A2–1U555	156–2382–00			IC,DGTL:ASTTL,FLIP FLOP;OCTAL D–TYPE, 3–STATE;74AS374,DIP20.3,TUBE	01295	SN74AS374 N/J
A2–1U559	156–1707–00			IC,DGTL:FTTL,GATE;QUAD 2–INPUT NAND;74F00,DIP14.3,TUBE	80009	156–1707–00
A2–1U563	156–2520–00			IC,DGTL:ASTTL,CNTR;SYNCH 4–BIT BINARY;74AS163,DIP16.3,TUBE	01295	SN74AS163N3ORJ4
A2–1U567	156–2520–00			IC,DGTL:ASTTL,CNTR;SYNCH 4–BIT BINARY;74AS163,DIP16.3,TUBE	01295	SN74AS163N3ORJ4
A2–1U571	156–2520–00			IC,DGTL:ASTTL,CNTR;SYNCH 4–BIT BINARY;74AS163,DIP16.3,TUBE	01295	SN74AS163N3ORJ4
A2–1U574	156–0316–04			IC,DGTL:ECL,XLTR;QUAD ECL TO TTL;10125,DIP16.3,TUBE	04713	MC10125P/L
A2–1U577	156–0860–02			IC,DGTL:ECL,RCVR;TPL LINE;10116,DIP16.3,TUBE,SCRN	80009	156–0860–02
A2–1U581	156–0295–02	670–9111–00	670–9111–00	IC,DGTL:ECL,GATE;TPL 2–INPUT XOR/ XNOR;10107,DIP16.3,TUBE,SCRN	80009	156–0295–02
A2–1U581	156–0860–02	670–9111–01		IC,DGTL:ECL,RCVR;TPL LINE;10116,DIP16.3,TUBE,SCRN	80009	156–0860–02
A2–1U585	156–0860–02	670–9111–00	670–9111–00	IC,DGTL:ECL,RCVR;TPL LINE;10116,DIP16.3,TUBE,SCRN	80009	156–0860–02
A2–1U585	156–0295–02	670–9111–01		IC,DGTL:ECL,GATE;TPL 2–INPUT XOR/ XNOR;10107,DIP16.3,TUBE,SCRN	80009	156–0295–02
A2–1U588	156–0860–02	670–9111–00	670–9111–00	IC,DGTL:ECL,RCVR;TPL LINE;10116,DIP16.3,TUBE,SCRN	80009	156–0860–02
A2–1U591	156–0860–02			IC,DGTL:ECL,RCVR;TPL LINE;10116,DIP16.3,TUBE,SCRN	80009	156–0860–02
A2–1U596	156–0860–02			IC,DGTL:ECL,RCVR;TPL LINE;10116,DIP16.3,TUBE,SCRN	80009	156–0860–02
A2–1U603	156–2520–00			IC,DGTL:ASTTL,CNTR;SYNCH 4–BIT BINARY;74AS163,DIP16.3,TUBE	01295	SN74AS163N3ORJ4
A2–1U607	156–2331–00			IC,DGTL:LSTTL,CNTR;8–BIT, WITH STORAGE REGISTER, 3–STATE;74LS590,DIP16.3,TUBE	01295	SN74LS590N3
A2–1U611	156–2486–00	670–9111–00	670–9111–04	IC,MEM:CMOS,SRAM;256 X 4,35NS,SEP I/O,OE;DIP22.4	80009	156–2486–00
A2–1U612	156–2065–00	670–9111–05		IC,DGTL:ASTTL,LATCH;OCTAL D–TYPE TRANSPARENT, 3–STATE;74AS373,DIP20.3	01295	SN74AS373N
A2–1U615	156–2486–00	670–9111–00	670–9111–04	IC,MEM:CMOS,SRAM;256 X 4,35NS,SEP I/O,O;EDIP22.4	80009	156–2486–00
A2–1U616	156–2992–00	670–9111–05		IC,MEM:CMOS,SRAM;2K X 8,35NS,OE;DIP24.3	80009	156–2992–00
A2–1U620	156–0956–02			IC,DGTL:LSTTL,BUFFER/DRIVER;74LS244,DIP20.3,TUBE	80009	156–0956–02
A2–1U624	160–3563–00	670–9111–00	670–9111–02	MICROCKT,DGTL:NMOS,8192 X 8 EPROM W/3 STATE OUT	80009	160–3563–00
A2–1U624	160–3563–01	670–9111–02	670–9111–05	MICROCKT,DGTL:NMOS,8192 X 8 EPROM,PRGM	80009	160–3563–01
A2–1U624	160–3563–02	670–9111–06		MICROCKT,DGTL:NMOS,8192 X 8 EPROM,2764,DIP28 (STANDARD ONLY)	80009	160–3563–02
A2–1U624	160–8724–00	670–9111–08		IC,MEM:NMOS,EPROM;8192 X 8,W/THREE STATE OUT;2764A–25,DIP28 (OPTIION 1J &2J ONLY)	80009	160–8724–00
A2–1U624	160–8657–00	670–9111–07	670–9111–07	IC,MEM:NMOS,8192 X 8 EPROM W/3 STATE OUT,2764A–25,DIP28	80009	160–8657–00
A2–1U624	160–8883–00	670–9111–09		IC,MEM:NMOS,EPROM;8192 X 8,W/3 STATE OUT,2764A–25,DIP28 (OPTION 1V ONLY)	80009	160–8883–00
A2–1U631	160–3564–00	670–9111–00	670–9111–02	MICROCKT,DGTL:NMOS,8192 X 8 EPROM W/3 STATE OUT	80009	160–3564–00
A2–1U631	160–3564–01	670–9111–02	670–9111–05	MICROCKT,DGTL:NMOS,8192 X 8 EPROM,PRGM	80009	160–3564–01
A2–1U631	160–3564–02	670–9111–06		MICROCKT,DGTL:NMOS,8192 X 8 EPROM,2764,DIP28 (STANDARD ONLY)	80009	160–3564–02
A2–1U631	160–8725–00	670–9111–08		IC,MEM:NMOS,EPROM;8192 X 8,W/THREE STATE OUT;2764A–25,DIP28 (OPTIION 1J &2J ONLY)	80009	160–8725–00
A2–1U631	160–8658–00	670–9111–07	670–9111–07	IC,MEM:NMOS,8192 X 8 EPROM W/3 STATE OUT,2764A–25,DIP28	80009	160–8658–00
A2–1U631	160–8884–00	670–9111–09		IC,MEM:NMOS,EPROM;8192 X 8,W/3 STATE OUT,2764A–25,DIP28 (OPTION 1V ONLY)	80009	160–8884–00
A2–1U637	160–3565–00	670–9111–00	670–9111–02	MICROCKT,DGTL:NMOS,8192 X 8 EPROM W/3 STATE OUT	80009	160–3565–00
A2–1U637	160–3565–01	670–9111–02	670–9111–05	MICROCKT,DGTL:NMOS,8192 X 8 EPROM,PRGM	80009	160–3565–01
A2–1U637	160–3565–02	670–9111–06		MICROCKT,DGTL:NMOS,8192 X 8 EPROM,2764,DIP28 (STANDARD ONLY)	80009	160–3565–02

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A2–1U637	160–8726–00	670–9111–08		IC,MEM:NMOS,EPROM;8192 X 8,W/THREE STATE OUT;2764A–25,DIP28	80009	160–8726–00
				(OPTIION 1J &2J ONLY)		
A2–1U637	160–8659–00	670–9111–07	670–9111–07	IC,MEM:NMOS,8192 X 8 EPROM W/3 STATE OUT,2764A–25,DIP28	80009	160–8659–00
A2–1U637	160–8885–00	670–9111–09		IC,MEM:NMOS,EPROM;8192 X 8,W/3 STATE OUT,2764A–25,DIP28	80009	160–8885–00
				(OPTION 1V ONLY)		
A2–1U644	160–3566–00	670–9111–00	670–9111–02	MICROCKT,DGTL:NMOS,8192 X 8 EPROM W/3 STATE OUT	80009	160–3566–00
A2–1U644	160–3566–01	670–9111–02	670–9111–05	MICROCKT,DGTL:NMOS,8192 X 8 EPROM,PRGM	80009	160–3566–01
A2–1U644	160–3566–02	670–9111–06		MICROCKT,DGTL:NMOS,8192 X 8 EPROM,2764,DIP28	80009	160–3566–02
				(STANDARD ONLY)		
A2–1U644	160–8727–00	670–9111–08		IC,MEM:NMOS,EPROM;8192 X 8,W/THREE STATE OUT;2764A–25,DIP28	80009	160–8727–00
				(OPTIION 1J &2J ONLY)		
A2–1U644	160–8660–00	670–9111–07	670–9111–07	IC,MEM:NMOS,8192 X 8 EPROM W/3 STATE OUT,2764A–25,DIP28	80009	160–8660–00
A2–1U644	160–8886–00	670–9111–09		IC,MEM:NMOS,EPROM;8192 X 8,W/3 STATE OUT,2764A–25,DIP28	80009	160–8886–00
				(OPTION 1V ONLY)		
A2–1U650	160–3567–00	670–9111–00	670–9111–02	MICROCKT,DGTL:NMOS,8192 X 8 EPROM W/3 STATE OUT	80009	160–3567–00
A2–1U650	160–3567–01	670–9111–02	670–9111–05	MICROCKT,DGTL:NMOS,8192 X 8 EPROM,PRGM	80009	160–3567–01
A2–1U650	160–3567–02	670–9111–06		MICROCKT,DGTL:NMOS,8192 X 8 EPROM,PRGM,2764,DIP28	80009	160–3567–02
				(STANDARD ONLY)		
A2–1U650	160–8728–00	670–9111–08		IC,MEM:NMOS,EPROM;8192 X 8,W/THREE STATE OUT;2764A–25,DIP28	80009	160–8728–00
				(OPTIION 1J &2J ONLY)		
A2–1U650	160–8661–00	670–9111–07	670–9111–07	IC,MEM:NMOS,8192 X 8 EPROM W/3 STATE OUT,2764A–25,DIP28	80009	160–8661–00
A2–1U650	160–8887–00	670–9111–09		IC,MEM:NMOS,EPROM;8192 X 8,W/3 STATE OUT,2764A–25,DIP28	80009	160–8887–00
				(OPTION 1V ONLY)		
A2–1U659	156–2382–00			IC,DGTL:ASTTL,FLIP FLOP;OCTAL D–TYPE, 3–STATE;74AS374,DIP20.3,TUBE	01295	SN74AS374 N/J
A2–1U663	156–2520–00			IC,DGTL:ASTTL,CNTR;SYNCH 4–BIT BINARY;74AS163,DIP16.3,TUBE	01295	SN7AS163N3ORJ4
A2–1U670	156–0479–02	670–9111–05		IC,DGTL:LSTTL,GATE;74LS32,DIP14.3,TUBE	80009	156–0479–02
A2–1U671	156–2520–00			IC,DGTL:ASTTL,CNTR;SYNCH 4–BIT BINARY;74AS163,DIP16.3,TUBE	01295	SN74AS163N3ORJ4
A2–1U675	160–3571–00			MICROCKT,DGTL:CMOS,1K X 8 RGTR FROM W/3 STATE OUT,PRGM	80009	160–3571–00
A2–1U678	156–2338–00	670–9111–05		IC,DGTL:ASTTL,FLIP FLOP;DUAL D–TYPE;74AS74,DIP14.3,TUBE	80009	156–2338–00
A2–1U680	156–0798–02			IC,DGTL:LSTTL,MUX/ENCODER;74LS153,DIP16.3,TUBE	80009	156–0798–02
A2–1U684	156–2520–00			IC,DGTL:ASTTL,CNTR;SYNCH 4–BIT BINARY;74AS163,DIP16.3,TUBE	01295	SN74AS163N3ORJ4
A2–1U688	156–1707–00	670–9111–00	670–9111–04	IC,DGTL:FTTL,GATE;QUAD 2–INPUT NAND;74F00,DIP14.3,TUBE	80009	156–1707–00
A2–1U692	156–2120–00			IC,DGTL:FTTL,SHIFT REGISTER;8–BIT SIPO, WITH / MR;74F164A,DIP14.3,TUBE	80009	156–2120–00
A2–1U696	156–0383–02			IC,DGTL:LSTTL,GATES;74LS02,DIP14.3,TUBE	80009	156–0383–02
A2–1U703	156–2520–00			IC,DGTL:ASTTL,CNTR;SYNCH 4–BIT BINARY;74AS163,DIP16.3,TUBE	01295	SN74AS163N3ORJ4
A2–1U707	160–3569–00	670–9111–00	670–9111–04	MICROCKT,DGTL:STTL,OCTAL 16 IN AOI GATE ARRAY	80009	160–3569–00
A2–1U708	160–5505–00	670–9111–05		IC,DGTL:CMOS,PLD;OTP,20G10,25NS,55MA;20G10–25,DIP24.3	80009	160–5505–00
A2–1U711	160–3568–00	670–9111–00	670–9111–00	MICROCKT,DGTL:STTL,QUAD 16 INP RGTR AND/OR GATE ARRAY,PRGM	80009	160–3568–00
A2–1U711	160–3568–01	670–9111–00	670–9111–04	MICROCKT,DGTL:QUAD 16 INP RGTR AND/OR,PRGM	80009	160–3568–01

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A2–1U712	160–4422–00	670–9111–05		IC,DGTL:CMOS,PLD;EEPLD,16V8,25NS,90MA;16V8–25,DIP20.3	80009	160–4422–00
A2–1U714	156–2210–00	670–9111–00	670–9111–04	IC,DGTL:ALSTTL,MUX/ENCODER;QUAD 2–TO–1 DATA SELECTOR, 3–STATE;74ALS257,DIP16.3,TUBE	01295	SN74ALS257N3
A2–1U716	160–2065–00	670–9111–05		MICROCKT,DGTL:32 X 8 PROM,PRGM	80009	160–2065–00
A2–1U717	156–2210–00	670–9111–00	670–9111–00	IC,DGTL:ALSTTL,MUX/ENCODER;QUAD 2–TO–1 DATA SELECTOR, 3–STATE;74ALS257,DIP16.3,TUBE	01295	SN74ALS257N3
A2–1U720	156–1754–01	670–9111–05		IC,DGTL:ALSTTL,BUFFER/DRIVER;OCTAL NONINV, 3–STATE;74ALS244,DIP20.3,TUBE	01295	SN74ALS244AN3
A2–1U723	156–2518–00			IC,DGTL:FTTL,SHIFT REGISTER;4–BIT BIDIRECTIONAL UNIV;74F195,DIP16.3,TUBE	80009	156–2518–00
A2–1U726	156–2518–00			IC,DGTL:FTTL,SHIFT REGISTER;4–BIT BIDIRECTIONAL UNIV;74F195,DIP16.3,TUBE	80009	156–2518–00
A2–1U729	156–2518–00			IC,DGTL:FTTL,SHIFT REGISTER;4–BIT BIDIRECTIONAL UNIV;74F195,DIP16.3,TUBE	80009	156–2518–00
A2–1U732	156–2518–00			IC,DGTL:FTTL,SHIFT REGISTER;4–BIT BIDIRECTIONAL UNIV;74F195,DIP16.3,TUBE	80009	156–2518–00
A2–1U736	156–2518–00			IC,DGTL:FTTL,SHIFT REGISTER;4–BIT BIDIRECTIONAL UNIV;74F195,DIP16.3,TUBE	80009	156–2518–00
A2–1U739	156–2518–00			IC,DGTL:FTTL,SHIFT REGISTER;4–BIT BIDIRECTIONAL UNIV;74F195,DIP16.3,TUBE	80009	156–2518–00
A2–1U742	156–2518–00			IC,DGTL:FTTL,SHIFT REGISTER;4–BIT BIDIRECTIONAL UNIV;74F195,DIP16.3,TUBE	80009	156–2518–00
A2–1U745	156–2518–00			IC,DGTL:FTTL,SHIFT REGISTER;4–BIT BIDIRECTIONAL UNIV;74F195,DIP16.3,TUBE	80009	156–2518–00
A2–1U748	156–2518–00			IC,DGTL:FTTL,SHIFT REGISTER;4–BIT BIDIRECTIONAL UNIV;74F195,DIP16.3,TUBE	80009	156–2518–00
A2–1U752	156–2518–00			IC,DGTL:FTTL,SHIFT REGISTER;4–BIT BIDIRECTIONAL UNIV;74F195,DIP16.3,TUBE	80009	156–2518–00
A2–1U755	156–0956–02			IC,DGTL:LSTTL,BUFFER/DRIVER;74LS244,DIP20.3,TUBE	80009	156–0956–02
A2–1U763	156–2520–00			IC,DGTL:ASTTL,CNTR;SYNCH 4–BIT BINARY;74AS163,DIP16.3,TUBE	01295	SN74AS163N3ORJ4
A2–1U767	156–0865–02			IC,DGTL:LSTTL,FLIP FLOP;74LS273,DIP20.3,TUBE	80009	156–0865–02
A2–1U771	156–2520–00			IC,DGTL:ASTTL,CNTR;SYNCH 4–BIT BINARY;74AS163,DIP16.3,TUBE	01295	SN74AS163N3ORJ4
A2–1U780	156–0480–02			IC,DGTL:LSTTL,GATES;74LS08,DIP14.3,TUBE	80009	156–0480–02
A2–1U784	156–2520–00			IC,DGTL:ASTTL,CNTR;SYNCH 4–BIT BINARY;74AS163,DIP16.3,TUBE	01295	SN74AS163N3ORJ4
A2–1U788	156–1707–00			IC,DGTL:FTTL,GATE;QUAD 2–INPUT NAND;74F00,DIP14.3,TUBE	80009	156–1707–00
A2–1U792	156–0464–02			IC,DGTL:LSTTL,GATES;74LS20,DIP14.3,TUBE	80009	156–0464–02
A2–1U796	156–1911–00			IC,DGTL:FTTL,FLIP FLOP;HEX D–TYPE, WITH / MR;74F174,DIP16.3,TUBE	04713	MC74F174S
A2–1U803	156–2520–00			IC,DGTL:ASTTL,CNTR;SYNCH 4–BIT BINARY;74AS163,DIP16.3,TUBE	01295	SN74AS163N3ORJ4
A2–1U807	156–0067–00			IC,LINEAR:	80009	156–0067–00
A2–1U811	156–1173–00			IC,LINEAR:BIPOLAR,VOLTAGE REFERENCE;POSITIVE,2.5V,1.0%,40PPM,SERIES;MC1403U,DIP08.3	80009	156–1173–00
A2–1U814	156–2487–00			IC,CONVERTER:BIPOLAR,A/D;6–BIT,25MSPS FLASH;TDC1046,DIP18.3	80009	156–2487–00
A2–1U821	156–0368–03			IC,DGTL:ECL,TRANSLATOR;QUAD TTL–TO–ECL;10124,DIP16.3,TUBE	80009	156–0368–03
A2–1U824	156–0368–03			IC,DGTL:ECL,TRANSLATOR;QUAD TTL–TO–ECL;10124,DIP16.3,TUBE	80009	156–0368–03
A2–1U827	156–0368–03			IC,DGTL:ECL,TRANSLATOR;QUAD TTL–TO–ECL;10124,DIP16.3,TUBE	80009	156–0368–03
A2–1U832	156–0914–02			IC,DGTL:LSTTL,BUFFER/DRIVER;74LS240,DIP20.3,TUBE	80009	156–0914–02
A2–1U841	156–0316–04			IC,DGTL:ECL,TRANSLATOR;QUAD ECL TO TTL;10125,DIP16.3,TUBE	04713	MC10125P/L
A2–1U848	156–0956–02			IC,DGTL:LSTTL,BUFFER/DRIVER;74LS244,DIP20.3,TUBE	80009	156–0956–02

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A2–1U851	156–0956–02			IC,DGTL:LSTTL,BUFFER/DRIVER;74LS244,DIP20.3,TUBE	80009	156–0956–02
A2–1U859	160–3570–00	670–9111–00	670–9111–05	MICROCKT,DGTL:CMOS,1K X 8 RGTR FROM W/3 STATE OUT PRGM	80009	160–3570–00
A2–1U859	160–3570–01	670–9111–06		MICROCKT,DGTL:CMOS,1K X 8 RGTR PROM W/3 STATE OUT,PRGM,CY7C235,DIP24 (STANDARD ONLY)	80009	160–3570–01
A2–1U859	160–8655–00	670–9111–07	670–9111–07	IC,MEM:CMOS,1K X 8 RGTR PROM W/3 STATE OUT,CY7C235,DIP24	80009	160–8655–00
A2–1U859	160–3570–01	670–9111–09		MICROCKT,DGTL:CMOS,1K X 8 RGTR PROM W/3 STATE OUT,PRGM,CY7C235,DIP24 (OPTION 1V ONLY)	80009	160–3570–01
A2–1U863	156–2520–00			IC,DGTL:ASTTL,CNTR;SYNCH 4–BIT BINARY;74AS163,DIP16.3,TUBE	01295	SN74AS163N3ORJ4
A2–1U867	156–2338–00			IC,DGTL:ASTTL,FLIP FLOP;DUAL D–TYPE;74AS74,DIP14.3,TUBE	80009	156–2338–00
A2–1U871	156–1707–00	670–9111–00	670–9111–04	IC,DGTL:FTTL,GATE;QUAD 2–INPUT NAND;74F00,DIP14.3,TUBE	80009	156–1707–00
A2–1U875	156–1911–00			IC,DGTL:FTTL,FLIP FLOP;HEX D–TYPE, WITH / MR;74F174,DIP16.3,TUBE	04713	MC74F174S
A2–1U880	156–1911–00			IC,DGTL:FTTL,FLIP FLOP;HEX D–TYPE, WITH / MR;74F174,DIP16.3,TUBE	04713	MC74F174S
A2–1U884	156–2520–00			IC,DGTL:ASTTL,CNTR;SYNCH 4–BIT BINARY;74AS163,DIP16.3,TUBE	01295	SN74AS163N3ORJ4
A2–1U889	160–3560–00	670–9111–02	670–9111–02	MICROCKT,DGTL:NMOS,4096 X 8 EPROM W/3 STATE OUT	80009	160–3560–00
A2–1U889	160–3560–01	670–9111–02		MICROCKT,DGTL:NMOS,4096 X 8 EPROM,PRGM (STANDARD & OPTION 1V ONLY)	80009	160–3560–01
A2–1U889	160–8729–00	670–9111–08		IC,MEM:NMOS,EPROM;4096 X 8,W/THREE STATE OUT;2732A,DIP24 (OPTIION 1J &2J ONLY)	80009	160–8729–00
A2–1U895	160–3561–00	670–9111–00	670–9111–01	MICROCKT,DGTL:NMOS,4096 X 8 EPROM W/3 STATE OUT	80009	160–3561–00
A2–1U895	160–3561–01	670–9111–02		MICROCKT,DGTL:NMOS,4096 X 8 PROM W/3 STATE OUT (STANDARD & OPTION 1V ONLY)	80009	160–3561–01
A2–1U895	160–8730–00	670–9111–08		IC,MEM:NMOS,EPROM;4096 X 8,W/THREE STATE OUT;2732A,DIP24 (OPTIION 1J &2J ONLY)	80009	160–8730–00
A2–2	119–2321–00	B010100	B031192	OVEN ASSEMBLY:	80009	119–2321–00
A2–2	119–2321–01	B031193	B041718	OVEN ASSEMBLY:	80009	119–2321–01
A2–2	119–2321–02	B041719	B042643	OVEN ASSEMBLY:	80009	119–2321–02
A2–2	119–2321–03	B042644		OVEN ASSEMBLY:TSG170A	80009	119–2321–03
A2–2C2	283–0630–00	119–2321–00	119–2321–00	CAP,FXD,MICA DI:110PF,1%,100V	80009	283–0630–00
A2–2C2	283–0632–00	119–2321–01	119–2321–01	CAP,FXD,MICA DI:87PF,1%,500V	80009	283–0632–00
A2–2C3	283–0637–00	119–2321–00	119–2321–00	CAP,FXD,MICA DI:20PF,2.5%,500V	80009	283–0637–00
A2–2C3	283–0779–00	119–2321–01	119–2321–01	CAP,FXD,MICA DI:27 PF,2%,500V	80009	283–0779–00
A2–2C4	281–0773–00	119–2321–00	119–2321–01	CAP,FXD,CER:MLC;0.01UF,10%,100V,SAFETY,0.100 X 0.170;AXIAL,MI	80009	281–0773–00
A2–2C6	283–5025–00	119–2321–02		CAP,FXD,CER DI:220PF,5%,50V	80009	283–5025–00
A2–2C8	283–5025–00	119–2321–02		CAP,FXD,CER DI:220PF,5%,50V	80009	283–5025–00
A2–2C15	283–5008–00	119–2321–02		CAP,FXD,CER:MLC;12PF,5%,50V,NPO,1206;SMD,8MM T&R	54583	C3216C0G1H120J–T
A2–2C16	283–5206–00	119–2321–02		CAP,FXD,CER DI:56PF,5%,100V	80009	283–5206–00
A2–2C17	283–5004–00	119–2321–02		CAP,FXD,CER:MLC;0.1UF,10%,25V,X7R,1206;SMD,8MM T&R	80009	283–5004–00
A2–2C19	281–0165–00	119–2321–02		CAP,VAR,AIR DI:0.8–10PF,250V	80009	281–0165–00
A2–2CR7	152–0719–00	119–2321–00	119–2321–01	DIO,SIG:VVC;30V,100PF,5%;1N5456B,DO–7	04713	SMV1501
A2–2CR14	152–0612–00	119–2321–02		DIO,SIG:VVC;50V,15–20PF,C4/30=2.33,Q=15;1N4806 FMLY,DO–7	04713	SMV 1561
A2–2CR488	152–0141–02	119–2321–01	119–2321–01	DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A2–2CR489	152–0141–02	119–2321–01	119–2321–01	DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A2–2J286	131–2002–00			CONN,BOX:	TK1483	TKO–05254–103

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A2–2Q1	151–1124–00	119–2321–00	119–2321–01	XSTR,SIG:JFET,N–CH;4.5V,30MA,6MS,110 OHM,5.5MS @450MHZ;2N5397_FAMILY,TO–92	17856	J–2400
A2–2Q10	151–5001–00	119–2321–02	119–2321–02	XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;MMBT3904L,TO–236/SOT–23,8MM T&R	80009	151–5001–00
A2–2Q10	151–5035–00	119–2321–03		XSTR,SIG:BIPOLAR,NPN;25V,30MA,650MHZ, AMPL;MMBTH10L,TO–236/SOT–23,8MM T&R	04713	MMBTH10T1
A2–2R1	321–5043–00	119–2321–02		RES,FXD:THICK FILM;47.5 OHM,1%,0.125W,TC=100 PPM;1206	80009	321–5043–00
A2–2R3	307–1161–00	119–2321–02		RES,FXD,FILM:1M OHM,5%,0.062W,0805,8MM	TK0510	ERJ–6GCSJ105V
A2–2R4	321–5078–00	119–2321–02		RES,FXD,FILM:20K OHM,1%,125MW,0805 PKG	80009	321–5078–00
A2–2R5	317–0105–00	119–2321–00	119–2321–01	RES,FXD,CMPSN:1M OHM,5%,0.125W	80009	317–0105–00
A2–2R5	321–5078–00	119–2321–02		RES,FXD,FILM:20K OHM,1%,125MW,0805 PKG	80009	321–5078–00
A2–2R9	317–0105–00	119–2321–00	119–2321–01	RES,FXD,CMPSN:1M OHM,5%,0.125W	80009	317–0105–00
A2–2R9	321–5012–00	119–2321–02		RES,FXD:THICK FILM;332 OHM,1%,0.125W,TC=100 PPM;1206	80009	321–5012–00
A2–2R10	317–0470–00	119–2321–00	119–2321–01	RES,FXD,CMPSN:47 OHM,5%,0.125W	80009	317–0470–00
A2–2RT6	307–0181–01	119–2321–00	119–2321–01	RES,THERMAL:20K OHM,5%,AT 60 DEG C	80009	307–0181–01
A2–2RT11	307–0181–01	119–2321–02		RES,THERMAL:20K OHM,5%,AT 60 DEG C	80009	307–0181–01
A2–2Y11	——— ———			(PART 0F A2–2)		
A3	670–9112–00	B010100	B030737	CIRCUIT BD ASSY:ANALOG	80009	670–9112–00
A3	670–9112–01	B030738	B030894	CIRCUIT BD ASSY:ANALOG	80009	670–9112–01
A3	670–9112–02	B030895	B031040	CIRCUIT BD ASSY:ANALOG	80009	670–9112–02
A3	670–9112–03	B031041	B042108	CIRCUIT BD ASSY:ANALOG	80009	670–9112–03
A3	670–9112–04	B042109	B042780	CIRCUIT BD ASSY:ANALOG	80009	670–9112–04
A3	670–9112–06	B042781	B042948	CIRCUIT BD ASSY:ANALOG	80009	670–9112–06
A3	670–9112–07	B042949	B043172	CIRCUIT BD ASSY:ANALOG	80009	670–9112–07
A3	670–9112–09	B043173	B043446	CIRCUIT BD ASSY:ANALOG	80009	670–9112–09
A3	670–9112–11	B043447		CIRCUIT BD ASSY:ANALOG (STANDARD ONLY)	80009	670–9112–11
A3	670–9112–10	B043142	B043446	CIRCUIT BD ASSY:ANALOG	80009	670–9112–10
A3	670–9112–12	B043447		CIRCUIT BD ASSY:ANALOG (OPTION 1J &2J ONLY)	80009	670–9112–12
A3C140	290–0804–00			CAP,FXD,ELCTLT:10UF,+50–20%,25V	80009	290–0804–00
A3C160	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C184	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C190	281–0925–01	670–9112–07		CAP,FXD,CER:MLC;0.22UF,20%,50V,Z5U.0.170 X 0.120;AX-IAL	04222	SA115E224MAA
A3C198	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C205	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C210	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C215	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C217	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C230	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A3C231	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A3C237	290–0804–00			CAP,FXD,ELCTLT:10UF,+50–20%,25V	80009	290–0804–00
A3C241	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C250	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C261	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C277	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C294	283–0670–00			CAP,FXD,MICA DI:375PF,1%,500V	80009	283–0670–00
A3C295	283–0635–00			CAP,FXD,MICA DI:51PF,1%,500V	80009	283–0635–00
A3C305	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C306	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C310	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C311	283–0421–00	670–9112–00	670–9112–05	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C311	283–0059–00	670–9112–06		CAP,FXD,CER DI:1UF,+80–20%,50V	04222	SR305C105MAA
A3C312	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C320	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A3C321	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C322	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C334	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C340	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C361	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A3C365	281–0925–01	670–9112–07		CAP,FXD,CER:MLC;0.22UF,20%,50V,Z5U.0.170 X 0.120;AX-IAL	04222	SA115E224MAA
A3C374	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A3C375	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A3C376	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C377	283–0670–00			CAP,FXD,MICA DI:375PF,1%,500V	80009	283–0670–00
A3C386	281–0925–01	670–9112–07		CAP,FXD,CER:MLC;0.22UF,20%,50V,Z5U.0.170 X 0.120;AX-IAL	04222	SA115E224MAA
A3C396	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C397	283–0670–00			CAP,FXD,MICA DI:375PF,1%,500V	80009	283–0670–00
A3C410	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C411	290–0290–00	670–9112–00	670–9112–01	CAP,FXD,ELCTLT:10UF,20%,25V NPLZD	80009	290–0290–00
A3C425	283–0594–00			CAP,FXD,MICA DI:0.001UF,1%,100V	80009	283–0594–00
A3C430	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C431	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C435	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C440	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C445	283–0631–00			CAP,FXD,MICA DI:95PF,1%,500V	80009	283–0631–00
A3C446	283–0635–00			CAP,FXD,MICA DI:51PF,1%,500V	80009	283–0635–00
A3C447	283–0775–00			CAP,FXD,MICA DI:1764 PF,1%,500V	80009	283–0775–00
A3C448	283–0633–00			CAP,FXD,MICA DI:77PF,1%,100V	80009	283–0633–00
A3C450	283–0672–00			CAP,FXD,MICA DI:200PF,1%,500V	80009	283–0672–00
A3C464	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C465	283–0635–00			CAP,FXD,MICA DI:51PF,1%,500V	80009	283–0635–00
A3C485	283–0635–00			CAP,FXD,MICA DI:51PF,1%,500V	80009	283–0635–00
A3C498	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C510	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C511	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C512	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C528	283–0625–00			CAP,FXD,MICA DI:220PF,1%,500V	80009	283–0625–00
A3C535	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C540	283–0198–00			CAP,FXD,CER DI:0.22UF,20%,50V	05397	C330C224M5U1CA
A3C545	283–0687–00			CAP,FXD,MICA DI:560PF,2%,300V	80009	283–0687–00
A3C547	283–0615–00			CAP,FXD,MICA DI:33PF,5%,500V	80009	283–0615–00
A3C548	283–0689–00			CAP,FXD,MICA DI:550PF,1%,300V	80009	283–0689–00
A3C549	283–0674–00			CAP,FXD,MICA DI:85PF,1%,500V	80009	283–0674–00
A3C565	281–0925–01	670–9112–07		CAP,FXD,CER:MLC;0.22UF,20%,50V,Z5U.0.170 X 0.120;AX-IAL	04222	SA115E224MAA
A3C570	283–0670–00			CAP,FXD,MICA DI:375PF,1%,500V	80009	283–0670–00
A3C580	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C585	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C586	281–0925–01	670–9112–07		CAP,FXD,CER:MLC;0.22UF,20%,50V,Z5U.0.170 X 0.120;AX-IAL	04222	SA115E224MAA
A3C591	283–0670–00			CAP,FXD,MICA DI:375PF,1%,500V	80009	283–0670–00
A3C605	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A3C606	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C612	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C619	283–0672–00			CAP,FXD,MICA DI:200PF,1%,500V	80009	283–0672–00
A3C620	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A3C627	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C628	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C629	283–0648–00			CAP,FXD,MICA DI:10PF,+/–0.5PF,500V	80009	283–0648–00
A3C630	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB

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A3C631	283–0631–00			CAP,FXD,MICA DI:95PF,1%,500V	80009	283–0631–00
A3C635	281–0219–00	670–9112–03		CAP,VAR,CER DI:5–35PF,+2 –2.5%,100V	80009	281–0219–00
A3C636	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C645	283–0646–00			CAP,FXD,MICA DI:170PF,1%,500V,.380H X .460L;RADIAL	80009	283–0646–00
A3C649	283–0647–00			CAP,FXD,MICA DI:70PF,1%,100V	80009	283–0647–00
A3C664	283–0635–00			CAP,FXD,MICA DI:51PF,1%,500V	80009	283–0635–00
A3C665	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C685	283–0635–00			CAP,FXD,MICA DI:51PF,1%,500V	80009	283–0635–00
A3C686	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C707	283–0636–00	670–9112–02		CAP,FXD,MICA DI:36PF,2%,500V,0.370 X 0.460;RADIAL	80009	283–0636–00
A3C709	283–0636–00	670–9112–00	670–9112–01	CAP,FXD,MICA DI:36PF,2%,500V,0.370 X 0.460;RADIAL	80009	283–0636–00
A3C712	283–0051–00			CAP,FXD,CER DI:0.0033UF,5%,100V	80009	283–0051–00
A3C714	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A3C725	281–0153–00			CAP,VAR,AIR DI:1.7–10PF,250V	80009	281–0153–00
A3C730	––––– –––––	670–9112–00	670–9112–03	(SELECTED)		
A3C730	281–0592–00	670–9112–04		CAP,FXD,CER DI:4.7PF,+/–0.5PF,500V	80009	281–0592–00
A3C734	281–0604–00			CAP,FXD,CER DI:2.2PF,+/–0.25PF,500V	80009	281–0604–00
A3C735	283–0648–00			CAP,FXD,MICA DI:10PF,+/–0.5PF,500V	80009	283–0648–00
A3C736	283–0648–00			CAP,FXD,MICA DI:10PF,+/–0.5PF,500V	80009	283–0648–00
A3C742	283–0648–00			CAP,FXD,MICA DI:10PF,+/–0.5PF,500V	80009	283–0648–00
A3C753	283–0648–00			CAP,FXD,MICA DI:10PF,+/–0.5PF,500V	80009	283–0648–00
A3C760	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C765	281–0925–01	670–9112–07		CAP,FXD,CER:MLC;0.22UF,20%,50V,Z5U.0.170 X 0.120;AX-IAL	04222	SA115E224MAA
A3C770	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C771	283–0670–00			CAP,FXD,MICA DI:375PF,1%,500V	80009	283–0670–00
A3C810	283–0645–00			CAP,FXD,MICA DI:790PF,1%,300V	80009	283–0645–00
A3C813	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C814	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C815	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C816	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C817	283–0223–00			CAP,FXD,CER DI:3PF,+/–5PF,50V	TK1134	835XXXCOJO309D
A3C826	281–0592–00	670–9112–02	670–9112–03	CAP,FXD,CER DI:4.7PF,+/–0.5PF,500V	80009	281–0592–00
A3C827	281–0592–00	670–9112–00	670–9112–01	CAP,FXD,CER DI:4.7PF,+/–0.5PF,500V	80009	281–0592–00
A3C828	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C835	283–0051–00			CAP,FXD,CER DI:0.0033UF,5%,100V	80009	283–0051–00
A3C837	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C843	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C844	283–0648–00			CAP,FXD,MICA DI:10PF,+/–0.5PF,500V	80009	283–0648–00
A3C845	281–0153–00			CAP,VAR,AIR DI:1.7–10PF,250V	80009	281–0153–00
A3C856	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C857	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C858	281–0604–00			CAP,FXD,CER DI:2.2PF,+/–0.25PF,500V	80009	281–0604–00
A3C865	283–0635–00			CAP,FXD,MICA DI:51PF,1%,500V	80009	283–0635–00
A3C866	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C882	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C883	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C884	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C885	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C894	283–0651–00			CAP,FXD,MICA DI:430PF,1%,500V	80009	283–0651–00
A3C895	283–0622–00			CAP,FXD,MICA DI:450PF,1%,300V	80009	283–0622–00
A3C915	290–0990–00			CAP,FXD,ELCTLT:10UF,20%,50V	24165	502D437
A3C929	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C930	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C931	283–0648–00			CAP,FXD,MICA DI:10PF,+/–0.5PF,500V	80009	283–0648–00
A3C937	283–0648–00			CAP,FXD,MICA DI:10PF,+/–0.5PF,500V	80009	283–0648–00
A3C940	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C943	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D

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A3C959	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C960	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A3C961	283–0663–00			CAP,FXD,MICA DI:16.8PF,+/0.5PF,500V	80009	283–0663–00
A3C962	283–0663–00			CAP,FXD,MICA DI:16.8PF,+/0.5PF,500V	80009	283–0663–00
A3C970	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A3C985	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3C986	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A3CR136	152–0322–00			DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811	80009	152–0322–00
A3CR185	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A3CR210	152–0322–00			DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811	80009	152–0322–00
A3CR238	152–0322–00			DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811	80009	152–0322–00
A3CR373	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A3CR396	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A3CR512	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A3CR535	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A3CR565	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A3CR585	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A3CR708	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A3CR709	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A3CR765	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A3J118	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A3J189	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A3J355	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A3J385	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A3J520	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A3J565	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A3J680	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A3J765	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A3J784	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A3J908	131–0608–00	670–9112–02		TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A3J912	131–0608–00	670–9112–02		TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A3J940	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A3J965	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A3J967	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A3L295	108–1212–00			COIL,RF:FIXED,9UH,2%	TK1345	108–1212–00
A3L377	108–1212–00			COIL,RF:FIXED,9UH,2%	TK1345	108–1212–00
A3L397	108–1212–00			COIL,RF:FIXED,9UH,2%	TK1345	108–1212–00
A3L455	120–1180–00			XFMR,RF:VARIABLE	80009	120–1180–00
A3L456	114–0415–00			COIL,RF:VARIABLE,775–925NH	80009	114–0415–00
A3L536	108–1212–00			COIL,RF:FIXED,9UH,2%	TK1345	108–1212–00
A3L555	114–0366–00			COIL,RF:VAR,2.40–2.70UH,Q MIN 190 @ 2.6 UH, POT CORE	54937	114–0366–00
A3L556	114–0367–00			COIL,RF:VARIABLE,2.70–3.30UH	80009	114–0367–00
A3L572	108–1212–00			COIL,RF:FIXED,9UH,2%	TK1345	108–1212–00
A3L591	108–1212–00			COIL,RF:FIXED,9UH,2%	TK1345	108–1212–00
A3L629	108–1243–00	670–9112–04		COIL,RF:FXD,27UH,+/– 2%	24226	ML10–272G
A3L635	114–0369–00			COIL,RF:VARIABLE,2.19–2.53UH	80009	114–0369–00
A3L772	108–1212–00			COIL,RF:FIXED,9UH,2%	TK1345	108–1212–00
A3L894	108–1212–00			COIL,RF:FIXED,9UH,2%	TK1345	108–1212–00
A3P118	131–0993–05			BUS,CNDCT:SHUNT ASSEMBLY,GREEN	00779	850100–5
A3P165	131–3439–00			CONN,DIN:PCB;FEMALE,RTANG,3 X 16,0.1 CTR,0.209 MLG X 0.114 TAIL,30 GOLD	81312	48S–6043–0731–0
A3P189	131–0993–02			BUS,CNDCT:SHUNT ASSEMBLY,RED	00779	1–850100–O
A3P355	131–0993–02			BUS,CNDCT:SHUNT ASSEMBLY,RED	00779	1–850100–O
A3P385	131–0993–05			BUS,CNDCT:SHUNT ASSEMBLY,GREEN	00779	850100–5
A3P520	131–0993–05			BUS,CNDCT:SHUNT ASSEMBLY,GREEN	00779	850100–5
A3P565	131–0993–05			BUS,CNDCT:SHUNT ASSEMBLY,GREEN	00779	850100–5
A3P680	131–0993–05			BUS,CNDCT:SHUNT ASSEMBLY,GREEN	00779	850100–5
A3P765	131–0993–05			BUS,CNDCT:SHUNT ASSEMBLY,GREEN	00779	850100–5

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A3P784	131–0993–05			BUS,CNDCT:SHUNT ASSEMBLY,GREEN	00779	850100–5
A3P908	131–0993–05	670–9112–02		BUS,CNDCT:SHUNT ASSEMBLY,GREEN	00779	850100–5
A3P912	131–0993–05	670–9112–02		BUS,CNDCT:SHUNT ASSEMBLY,GREEN	00779	850100–5
A3P965	131–0993–05			BUS,CNDCT:SHUNT ASSEMBLY,GREEN	00779	850100–5
A3P967	131–0993–05			BUS,CNDCT:SHUNT ASSEMBLY,GREEN	00779	850100–5
A3Q190	151–0216–00			XSTR,SIG:BIPOLAR,PNP;25V,100MA,170MHZ, AMPL;MPS6523,TO–92 EBC	80009	151–0216–00
A3Q287	151–0192–00	670–9112–00	670–9112–00	XSTR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ, AMPL;MPS6521,TO–92 EBC	80009	151–0192–00
A3Q287	151–0192–06	670–9112–00	670–9112–03	XSTR:NPN,SI,X–55	80009	151–0192–06
A3Q287	151–0192–00	670–9112–03	670–9112–04	XSTR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ, AMPL;MPS6521,TO–92 EBC	80009	151–0192–00
A3Q287	151–0736–00	670–9112–05		XSTR,SIG:BIPOLAR,NPN;40V,600MA,250MHZ, AMPL;2N4401,TO–92 EBC	80009	151–0736–00
A3Q298	151–0190–00			XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC	80009	151–0190–00
A3Q365	151–0216–00			XSTR,SIG:BIPOLAR,PNP;25V,100MA,170MHZ, AMPL;MPS6523,TO–92 EBC	80009	151–0216–00
A3Q386	151–0216–00			XSTR,SIG:BIPOLAR,PNP;25V,100MA,170MHZ, AMPL;MPS6523,TO–92 EBC	80009	151–0216–00
A3Q412	151–0220–00			XSTR,SIG:BIPOLAR,PNP;40V,200MA,400MHZ, AMPL;2N3906(SEL),TO–92 EBC	80009	151–0220–00
A3Q415	151–0254–00			XSTR,SIG:BIPOLAR,NPN;30V,500MA,125MHZ, AMPL,DAR-LINGTON;MPSA14,TO–92 EBC	80009	151–0254–00
A3Q465	151–0192–00	670–9112–00	670–9112–00	XSTR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ, AMPL;MPS6521,TO–92 EBC	80009	151–0192–00
A3Q465	151–0192–06	670–9112–00	670–9112–03	XSTR:NPN,SI,X–55	80009	151–0192–06
A3Q465	151–0192–00	670–9112–03	670–9112–04	XSTR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ, AMPL;MPS6521,TO–92 EBC	80009	151–0192–00
A3Q465	151–0736–00	670–9112–05		XSTR,SIG:BIPOLAR,NPN;40V,600MA,250MHZ, AMPL;2N4401,TO–92 EBC	80009	151–0736–00
A3Q485	151–0192–00	670–9112–00	670–9112–00	XSTR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ, AMPL;MPS6521,TO–92 EBC	80009	151–0192–00
A3Q485	151–0192–06	670–9112–00	670–9112–03	XSTR:NPN,SI,X–55	80009	151–0192–06
A3Q485	151–0192–00	670–9112–03	670–9112–04	XSTR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ, AMPL;MPS6521,TO–92 EBC	80009	151–0192–00
A3Q485	151–0736–00	670–9112–05		XSTR,SIG:BIPOLAR,NPN;40V,600MA,250MHZ, AMPL;2N4401,TO–92 EBC	80009	151–0736–00
A3Q527	151–1103–00			XSTR,SIG:DMOSFET,N–CH;ENH,2V,50MA,45 OHM;SD210DE,TO–72	80009	151–1103–00
A3Q528	151–0220–00			XSTR,SIG:BIPOLAR,PNP;40V,200MA,400MHZ, AMPL;2N3906(SEL),TO–92 EBC	80009	151–0220–00
A3Q565	151–0216–00			XSTR,SIG:BIPOLAR,PNP;25V,100MA,170MHZ, AMPL;MPS6523,TO–92 EBC	80009	151–0216–00
A3Q586	151–0216–00			XSTR,SIG:BIPOLAR,PNP;25V,100MA,170MHZ, AMPL;MPS6523,TO–92 EBC	80009	151–0216–00
A3Q628	151–0190–00			XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC	80009	151–0190–00
A3Q629	151–0192–00	670–9112–00	670–9112–00	XSTR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ, AMPL;MPS6521,TO–92 EBC	80009	151–0192–00
A3Q629	151–0192–06	670–9112–00	670–9112–03	XSTR:NPN,SI,X–55	80009	151–0192–06
A3Q629	151–0192–00	670–9112–03		XSTR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ, AMPL;MPS6521,TO–92 EBC	80009	151–0192–00
A3Q634	151–0190–00			XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC	80009	151–0190–00
A3Q635	151–0216–00			XSTR,SIG:BIPOLAR,PNP;25V,100MA,170MHZ, AMPL;MPS6523,TO–92 EBC	80009	151–0216–00
A3Q665	151–0192–00	670–9112–00	670–9112–00	XSTR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ, AMPL;MPS6521,TO–92 EBC	80009	151–0192–00
A3Q665	151–0192–06	670–9112–00	670–9112–03	XSTR:NPN,SI,X–55	80009	151–0192–06

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A3Q665	151–0192–00	670–9112–03	670–9112–04	XSTR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ, AMPL;MPS6521,TO–92 EBC	80009	151–0192–00
A3Q665	151–0736–00	670–9112–05		XSTR,SIG:BIPOLAR,NPN;40V,600MA,250MHZ, AMPL;2N4401,TO–92 EBC	80009	151–0736–00
A3Q730	151–0220–00			XSTR,SIG:BIPOLAR,PNP;40V,200MA,400MHZ, AMPL;2N3906(SEL),TO–92 EBC	80009	151–0220–00
A3Q735	151–0220–00			XSTR,SIG:BIPOLAR,PNP;40V,200MA,400MHZ, AMPL;2N3906(SEL),TO–92 EBC	80009	151–0220–00
A3Q752	151–0220–00			XSTR,SIG:BIPOLAR,PNP;40V,200MA,400MHZ, AMPL;2N3906(SEL),TO–92 EBC	80009	151–0220–00
A3Q765	151–0216–00			XSTR,SIG:BIPOLAR,PNP;25V,100MA,170MHZ, AMPL;MPS6523,TO–92 EBC	80009	151–0216–00
A3Q769	151–0192–00	670–9112–00	670–9112–00	XSTR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ, AMPL;MPS6521,TO–92 EBC	80009	151–0192–00
A3Q769	151–0192–06	670–9112–00	670–9112–03	XSTR:NPN,SI,X–55	80009	151–0192–06
A3Q769	151–0192–00	670–9112–03	670–9112–04	XSTR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ, AMPL;MPS6521,TO–92 EBC	80009	151–0192–00
A3Q769	151–0736–00	670–9112–05		XSTR,SIG:BIPOLAR,NPN;40V,600MA,250MHZ, AMPL;2N4401,TO–92 EBC	80009	151–0736–00
A3Q786	151–0192–00	670–9112–00	670–9112–00	XSTR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ, AMPL;MPS6521,TO–92 EBC	80009	151–0192–00
A3Q786	151–0192–06	670–9112–00	670–9112–03	XSTR:NPN,SI,X–55	80009	151–0192–06
A3Q786	151–0192–00	670–9112–03	670–9112–04	XSTR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ, AMPL;MPS6521,TO–92 EBC	80009	151–0192–00
A3Q786	151–0736–00	670–9112–05		XSTR,SIG:BIPOLAR,NPN;40V,600MA,250MHZ, AMPL;2N4401,TO–92 EBC	80009	151–0736–00
A3Q790	151–0190–00			XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC	80009	151–0190–00
A3Q795	151–0190–00			XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC	80009	151–0190–00
A3Q810	151–0190–00			XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC	80009	151–0190–00
A3Q815	151–0367–00			XSTR,SIG:BIPOLAR,NPN;25V,30MA,1.0GHZ;MPS–H10 SPE-CIAL,TO–92 EBC	80009	151–0367–00
A3Q817	151–0220–00			XSTR,SIG:BIPOLAR,PNP;40V,200MA,400MHZ, AMPL;2N3906(SEL),TO–92 EBC	80009	151–0220–00
A3Q827	151–0103–02			XSTR,SIG:BIPOLAR,NPN;2N2219A,TO–39	80009	151–0103–02
A3Q845	151–0220–00			XSTR,SIG:BIPOLAR,PNP;40V,200MA,400MHZ, AMPL;2N3906(SEL),TO–92 EBC	80009	151–0220–00
A3Q855	151–0103–02			XSTR,SIG:BIPOLAR,NPN;2N2219A,TO–39	80009	151–0103–02
A3Q860	151–0190–00			XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC	80009	151–0190–00
A3Q868	151–0192–00	670–9112–00	670–9112–00	XSTR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ, AMPL;MPS6521,TO–92 EBC	80009	151–0192–00
A3Q868	151–0192–06	670–9112–00	670–9112–03	XSTR:NPN,SI,X–55	80009	151–0192–06
A3Q868	151–0192–00	670–9112–03	670–9112–04	XSTR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ, AMPL;MPS6521,TO–92 EBC	80009	151–0192–00
A3Q868	151–0736–00	670–9112–05		XSTR,SIG:BIPOLAR,NPN;40V,600MA,250MHZ, AMPL;2N4401,TO–92 EBC	80009	151–0736–00
A3Q890	151–0190–00			XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC	80009	151–0190–00
A3Q895	151–0190–00			XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC	80009	151–0190–00
A3Q915	151–0367–00			XSTR,SIG:BIPOLAR,NPN;25V,30MA,1.0GHZ;MPS–H10 SPE-CIAL,TO–92 EBC	80009	151–0367–00
A3Q917	151–0367–00			XSTR,SIG:BIPOLAR,NPN;25V,30MA,1.0GHZ;MPS–H10 SPE-CIAL,TO–92 EBC	80009	151–0367–00
A3Q985	151–0103–02			XSTR,SIG:BIPOLAR,NPN;2N2219A,TO–39	80009	151–0103–02
A3R109	322–3385–00			RES,FXD:MET FILM;100K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 100K
A3R110	321–0926–07			RES,FXD,FILM:4K OHM,0.1%,0.125W,TC=T9	19701	5033RE4K00B

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A3R136	322–3222–07			RES,FXD,FILM:2K OHM,0.1%,0.2W TC=T9	80009	322–3222–07
A3R137	315–0202–00			RES,FXD,FILM:2K OHM,5%,0.25W	80009	315–0202–00
A3R155	307–0540–00			RES NTWK,FXD,FI:(5)1K OHM,2%,0.7W	91637	CSC06A–01–102G
A3R170	315–0271–00			RES,FXD,FILM:270 OHM,5%,0.25W	80009	315–0271–00
A3R172	307–0540–00			RES NTWK,FXD,FI:(5)1K OHM,2%,0.7W	91637	CSC06A–01–102G
A3R184	315–0331–00			RES,FXD,FILM:330 OHM,5%,0.25W	80009	315–0331–00
A3R188	323–0178–00			RES,FXD,FILM:698 OHM,1%,0.5W,TC=T0	2M627	CRA12FX698OHM
A3R195	322–3219–00			RES,FXD,FILM:1.87K,OHM,1%,0.2W,TC=T0	80009	322–3219–00
A3R196	322–3289–00			RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A3R197	315–0270–00			RES,FXD,FILM:27 OHM,5%,0.25W	80009	315–0270–00
A3R198	315–0102–00			RES,FXD,FILM:1K OHM,5%,0.25W	80009	315–0102–00
A3R210	315–0270–00			RES,FXD,FILM:27 OHM,5%,0.25W	80009	315–0270–00
A3R217	315–0102–00			RES,FXD,FILM:1K OHM,5%,0.25W	80009	315–0102–00
A3R218	322–3193–07			RES,FXD,FILM:1K OHM,0.1%,0.2W,TC=T9	80009	322–3193–07
A3R219	321–0926–07			RES,FXD,FILM:4K OHM,0.1%,0.125W,TC=T9	19701	5033RE4K00B
A3R234	322–3001–00			RES,FXD:METAL FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3001–00
A3R235	321–0793–07			RES,FXD,FILM:37.5 OHM 0.1%,0.125W TC=T9	24546	NE55E37R5B
A3R236	321–0830–03			RES,FXD,FILM:2.41K OHM,0.25%,0.125W,TC=T2	07716	CEAC24100C
A3R237	321–0793–07			RES,FXD,FILM:37.5 OHM 0.1%,0.125W TC=T9	24546	NE55E37R5B
A3R238	322–3222–07			RES,FXD,FILM:2K OHM,0.1%,0.2W TC=T9	80009	322–3222–07
A3R239	315–0202–00			RES,FXD,FILM:2K OHM,5%,0.25W	80009	315–0202–00
A3R250	315–0511–00			RES,FXD,FILM:510 OHM,5%,0.25W	80009	315–0511–00
A3R251	315–0511–00			RES,FXD,FILM:510 OHM,5%,0.25W	80009	315–0511–00
A3R260	315–0621–00			RES,FXD,FILM:620 OHM,5%,0.25W	80009	315–0621–00
A3R261	315–0511–00			RES,FXD,FILM:510 OHM,5%,0.25W	80009	315–0511–00
A3R270	315–0511–00			RES,FXD,FILM:510 OHM,5%,0.25W	80009	315–0511–00
A3R271	315–0511–00			RES,FXD,FILM:510 OHM,5%,0.25W	80009	315–0511–00
A3R272	315–0271–00			RES,FXD,FILM:270 OHM,5%,0.25W	80009	315–0271–00
A3R295	322–3034–00	670–9112–00	670–9112–03	RES,FXD:MET FILM;22.1 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20FXE2K94
A3R295	322–3044–00	670–9112–03		RES,FXD:METAL FILM;28 OHM,1%,0.2W,TC=100 PPM;AXIAL (TEST SELECTABLE)	57668	CRB20FXE9K35
A3R296	321–0288–00			RES,FXD,FILM:9.76K OHM,1%,0.125W,TC=T0	80009	321–0288–00
A3R297	322–3135–00			RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0	80009	322–3135–00
A3R298	323–0085–00			RES,FXD,FILM:75.0 OHM,1%,0.5W,TC=T0	80009	323–0085–00
A3R309	321–0793–07			RES,FXD,FILM:37.5 OHM 0.1%,0.125W TC=T9	24546	NE55E37R5B
A3R310	322–3207–00	670–9112–02		RES,FXD,FILM:1.4K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K4
A3R311	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A3R320	322–3184–00			RES,FXD,FILM:806 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 806E
A3R321	322–3193–07			RES,FXD,FILM:1K OHM,0.1%,0.2W,TC=T9	80009	322–3193–07
A3R322	321–0926–07			RES,FXD,FILM:4K OHM,0.1%,0.125W,TC=T9	19701	5033RE4K00B
A3R323	322–3184–00			RES,FXD,FILM:806 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 806E
A3R324	315–0270–00			RES,FXD,FILM:27 OHM,5%,0.25W	80009	315–0270–00
A3R336	322–3086–00			RES,FXD,FILM:76.8 OHM,1%,0.2W,TC=T0	91637	CCF50–2G76R80F
A3R337	321–0830–03			RES,FXD,FILM:2.41K OHM,0.25%,0.125W,TC=T2	07716	CEAC24100C
A3R338	322–3392–00			RES,FXD,FILM:118K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 118K
A3R339	322–3086–00			RES,FXD,FILM:76.8 OHM,1%,0.2W,TC=T0	91637	CCF50–2G76R80F
A3R340	322–3085–00			RES,FXD:METAL FILM;75 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 75E0
A3R342	315–0820–00			RES,FXD,FILM:82 OHM,5%,0.25W	80009	315–0820–00
A3R376	323–0178–00			RES,FXD,FILM:698 OHM,1%,0.5W,TC=T0	2M627	CRA12FX698OHM
A3R377	322–3034–00	670–9112–00	670–9112–03	RES,FXD:MET FILM;22.1 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20FXE2K94
A3R377	322–3044–00	670–9112–03		RES,FXD:METAL FILM;28 OHM,1%,0.2W,TC=100 PPM;AXIAL (TEST SELECTABLE)	57668	CRB20FXE9K35
A3R378	321–0288–00			RES,FXD,FILM:9.76K OHM,1%,0.125W,TC=T0	80009	321–0288–00
A3R379	322–3135–00			RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0	80009	322–3135–00
A3R395	323–0042–00			RES,FXD,FILM:26.7 OHM,1%,0.5W,TC=T0	80009	323–0042–00
A3R396	323–0178–00			RES,FXD,FILM:698 OHM,1%,0.5W,TC=T0	2M627	CRA12FX698OHM
A3R397	322–3034–00	670–9112–00	670–9112–03	RES,FXD:MET FILM;22.1 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20FXE2K94
A3R397	322–3044–00	670–9112–03		RES,FXD:METAL FILM;28 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20FXE9K35

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
				(TEST SELECTABLE)		
A3R398	321–0288–00			RES,FXD,FILM:9.76K OHM,1%,0.125W,TC=T0	80009	321–0288–00
A3R410	315–0103–00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315–0103–00
A3R412	322–3207–00	670–9112–00	670–9112–01	RES,FXD,FILM:1.4K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K4
A3R413	315–0103–00	670–9112–00	670–9112–01	RES,FXD,FILM:10K OHM,5%,0.25W	80009	315–0103–00
A3R420	322–3289–00			RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A3R421	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A3R422	315–0103–00	670–9112–02		RES,FXD,FILM:10K OHM,5%,0.25W	80009	315–0103–00
A3R423	315–0302–00			RES,FXD,FILM:3K OHM,5%,0.25W	80009	315–0302–00
A3R424	315–0202–00			RES,FXD,FILM:2K OHM,5%,0.25W	80009	315–0202–00
A3R425	315–0203–00			RES,FXD,FILM:20K OHM,5%,0.25W	59124	CF1/4 20K 5% TR
A3R426	315–0106–00	670–9112–01		RES,FXD,FILM:10M OHM,5%,0.25W	01121	CB1065
A3R437	315–0513–00			RES,FXD,FILM:51K OHM,5%,0.25W	80009	315–0513–00
A3R438	315–0270–00			RES,FXD,FILM:27 OHM,5%,0.25W	80009	315–0270–00
A3R439	315–0124–00			RES,FXD,FILM:120K OHM,5%,0.25W	80009	315–0124–00
A3R440	315–0104–00			RES,FXD,FILM:100K OHM,5%,0.25W	80009	315–0104–00
A3R441	322–3216–00			RES,FXD,FILM:1.74K OHM,1%,0.2W,TC=T0 (STANDARD ONLY)	57668	CRB20 FXE 1K74
A3R442	322–3097–00			RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 100E
A3R470	323–0042–00			RES,FXD,FILM:26.7 OHM,1%,0.5W,TC=T0	80009	323–0042–00
A3R475	323–0085–00			RES,FXD,FILM:75.0 OHM,1%,0.5W,TC=T0	80009	323–0085–00
A3R487	323–0042–00			RES,FXD,FILM:26.7 OHM,1%,0.5W,TC=T0	80009	323–0042–00
A3R488	323–0085–00			RES,FXD,FILM:75.0 OHM,1%,0.5W,TC=T0	80009	323–0085–00
A3R498	322–3135–00			RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0	80009	322–3135–00
A3R525	315–0102–00			RES,FXD,FILM:1K OHM,5%,0.25W	80009	315–0102–00
A3R527	315–0104–00			RES,FXD,FILM:100K OHM,5%,0.25W	80009	315–0104–00
A3R530	315–0103–00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315–0103–00
A3R535	315–0103–00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315–0103–00
A3R537	322–3193–00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A3R538	322–3135–00	670–9112–00	670–9112–02	RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0	80009	322–3135–00
A3R538	322–3126–00	670–9112–03		RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A3R539	315–0122–00			RES,FXD,FILM:1.2K OHM,5%,0.25W	80009	315–0122–00
A3R570	323–0178–00			RES,FXD,FILM:698 OHM,1%,0.5W,TC=T0	2M627	CRA12FX698OHM
A3R571	322–3034–00	670–9112–00	670–9112–03	RES,FXD:MET FILM;22.1 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20FXE2K94
A3R571	322–3044–00	670–9112–03		RES,FXD:METAL FILM;28 OHM,1%,0.2W,TC=100 PPM;AXIAL (TEST SELECTABLE)	57668	CRB20FXE9K35
A3R589	322–3178–00			RES,FXD,FILM:698 OHM,1%,0.2W,TC=T0	91637	CCF50–2G698ROF
A3R591	322–3034–00	670–9112–00	670–9112–03	RES,FXD:MET FILM;22.1 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20FXE2K94
A3R591	322–3044–00	670–9112–03		RES,FXD:METAL FILM;28 OHM,1%,0.2W,TC=100 PPM;AXIAL (TEST SELECTABLE)	57668	CRB20FXE9K35
A3R592	321–0288–00			RES,FXD,FILM:9.76K OHM,1%,0.125W,TC=T0	80009	321–0288–00
A3R593	322–3135–00			RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0	80009	322–3135–00
A3R610	315–0270–00			RES,FXD,FILM:27 OHM,5%,0.25W	80009	315–0270–00
A3R612	315–0102–00			RES,FXD,FILM:1K OHM,5%,0.25W	80009	315–0102–00
A3R613	322–3193–00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A3R614	315–0471–00			RES,FXD,FILM:470 OHM,5%,0.25W	80009	315–0471–00
A3R615	322–3250–00			RES,FXD:MET FILM;3.92K OHM,1%,0.2W, TC=100 PPM;AX-IAL	91637	CCF50–2F39200F
A3R620	315–0102–00			RES,FXD,FILM:1K OHM,5%,0.25W	80009	315–0102–00
A3R621	315–0163–00			RES,FXD,FILM:16K OHM,5%,0.25W	80009	315–0163–00
A3R622	311–0644–00			RES,VAR,NONWW:TRMR,20K OHM,0.5W	80009	311–0644–00
A3R625	315–0103–00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315–0103–00
A3R627	315–0150–00			RES,FXD,FILM:15 OHM,5%,0.25W	80009	315–0150–00
A3R628	315–0102–00			RES,FXD,FILM:1K OHM,5%,0.25W	80009	315–0102–00
A3R629	––––– –––––	670–9112–00	670–9112–03	(SELECTED)		
A3R629	322–3126–00	670–9112–04		RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A3R634	315–0102–00			RES,FXD,FILM:1K OHM,5%,0.25W	80009	315–0102–00
A3R638	322–3085–00			RES,FXD:METAL FILM;75 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 75E0

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A3R644	322–3126–00	670–9112–03		RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	80009	322–3126–00
A3R645	––––– –––––			(SELECTED)		
A3R646	315–0362–00			RES,FXD,FILM:3.6K OHM,5%,0.25W	80009	315–0362–00
A3R647	321–0247–00			RES,FXD,FILM:3.65K OHM,1%,0.125W,TC=T0	80009	321–0247–00
A3R648	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K99
A3R649	322–3135–00	670–9112–00	670–9112–02	RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0	80009	322–3135–00
A3R649	322–3001–00	670–9112–03		RES,FXD:METAL FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3001–00
A3R670	321–0288–00			RES,FXD,FILM:9.76K OHM,1%,0.125W,TC=T0	80009	321–0288–00
A3R671	322–3135–00			RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0	80009	322–3135–00
A3R672	322–0073–00			RES,FXD,FILM:56.2 OHM,1%,0.25W,TC=T0	75042	CEBT0–56R20F
A3R673	323–0049–00			RES,FXD,FILM:31.6 OHM,1%,0.5W,TC=T0	24546	NA65D31R6F
A3R674	323–0099–00			RES,FXD,FILM:105 OHM,1%,0.5W,TC=T0	57668	CRB11FXE 105 OHM
A3R680	323–0085–00			RES,FXD,FILM:75.0 OHM,1%,0.5W,TC=T0	80009	323–0085–00
A3R690	323–0042–00			RES,FXD,FILM:26.7 OHM,1%,0.5W,TC=T0	80009	323–0042–00
A3R693	323–0085–00			RES,FXD,FILM:75.0 OHM,1%,0.5W,TC=T0	80009	323–0085–00
A3R708	315–0150–00			RES,FXD,FILM:15 OHM,5%,0.25W	80009	315–0150–00
A3R708	321–0348–00			RES,FXD,FILM:41.2K OHM,1%,0.125W,TC=T0	80009	321–0348–00
A3R709	315–0150–00			RES,FXD,FILM:15 OHM,5%,0.25W	80009	315–0150–00
A3R710	322–3289–00	670–9112–00	670–9112–01	RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A3R710	322–3289–07	670–9112–01		RES,FXD,FILM:10K OHM,0.1%,0.2W,TC=T9,SMALL BODY	80009	322–3289–07
A3R711	322–3289–00	670–9112–00	670–9112–01	RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A3R711	322–3289–07	670–9112–01		RES,FXD,FILM:10K OHM,0.1%,0.2W,TC=T9,SMALL BODY	80009	322–3289–07
A3R712	315–0472–00			RES,FXD,FILM:4.7K OHM,5%,0.25W	80009	315–0472–00
A3R713	322–3193–00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A3R714	315–0101–00			RES,FXD,FILM:100 OHM,5%,0.25W	80009	315–0101–00
A3R727	322–3327–00			RES,FXD,FILM:24.9K OHM,1%,0.2W,TC=T0	80009	322–3327–00
A3R728	322–3146–00			RES,FXD,FILM:324 OHM,1%,0.2W,TC=T0	91637	
A3R729	322–3193–00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A3R730	311–0634–00			RES,VAR,NONWW:TRMR,500 OHM,0.5W	80009	311–0634–00
A3R731	322–3226–00			RES,FXD:METAL FILM;2.21K OHM,1%,0.2W, TC=100 PPM;AXIAL,SMALL BODY	57668	CRB20 FXE 2K21
A3R732	315–0150–00			RES,FXD,FILM:15 OHM,5%,0.25W	80009	315–0150–00
A3R733	315–0150–00	670–9112–00	670–9112–01	RES,FXD,FILM:15 OHM,5%,0.25W	80009	315–0150–00
A3R735	322–3214–00			RES,FXD,FILM:1.65K OHM,1%,0.2W,TC=T0	80009	322–3214–00
A3R736	322–3193–00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A3R737	322–3193–00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A3R739	311–0613–00	670–9112–09		RES,VAR,NONWW:TRMR,100K OHM,0.5W	80009	311–0613–00
A3R739	311–0613–00	670–9112–10		RES,VAR,NONWW:TRMR,100K OHM,0.5W	80009	311–0613–00
A3R740	311–0473–00	670–9112–09		RES,VAR,WW:PNL,100 OHM,5W	11237	37192
A3R740	311–0473–00	670–9112–10		RES,VAR,WW:PNL,100 OHM,5W	11237	37192
A3R741	315–0563–00	670–9112–09		RES,FXD,FILM:56K OHM,5%,0.25W	80009	315–0563–00
A3R741	315–0563–00	670–9112–10		RES,FXD,FILM:56K OHM,5%,0.25W	80009	315–0563–00
A3R745	322–3164–00	670–9112–00	670–9112–02	RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A3R745	322–3114–00	670–9112–03		RES,FXD:MET FILM;150 OHM,1%,0.2W,TC=100 PPM;AXIAL	91637	CCF50–2–G1500F
A3R746	322–3222–00			RES,FXD:METAL FILM;2K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 2K00
A3R747	322–3175–00			RES,FXD,FILM:649 OHM,1%,0.2W,TC=T0	80009	322–3175–00
A3R748	322–3193–00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A3R749	322–3193–00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A3R750	322–3132–00			RES,FXD,FILM:232 OHM,1%,0.2W,TC=T0	80009	322–3132–00
A3R751	315–0150–00	670–9112–02		RES,FXD,FILM:15 OHM,5%,0.25W	80009	315–0150–00
A3R752	315–0150–00	670–9112–02		RES,FXD,FILM:15 OHM,5%,0.25W	80009	315–0150–00
A3R753	315–0150–00	670–9112–00	670–9112–01	RES,FXD,FILM:15 OHM,5%,0.25W	80009	315–0150–00
A3R756	322–3289–00	670–9112–03		RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A3R757	321–0068–00			RES,FXD,FILM:49.9 OHM,0.1%,0.125W,TC=T0	80009	321–0068–00
A3R758	321–0068–00			RES,FXD,FILM:49.9 OHM,0.1%,0.125W,TC=T0	80009	321–0068–00
A3R759	322–3156–00			RES,FXD,FILM:412 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 412E
A3R760	321–0187–00	670–9112–02		RES,FXD,FILM:866 OHM,1%,0.125W,TC=T0	07716	CEAD866R0F
A3R761	322–3222–00	670–9112–02		RES,FXD:METAL FILM;2K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 2K00

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A3R769	322–0073–00			RES,FXD,FILM:56.2 OHM,1%,0.25W,TC=T0	75042	CEBT0–56R20F
A3R770	323–0178–00			RES,FXD,FILM:698 OHM,1%,0.5W,TC=T0	2M627	CRA12FX698OHM
A3R772	322–3034–00	670–9112–00	670–9112–03	RES,FXD:MET FILM;22.1 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20FXE2K94
A3R772	322–3044–00	670–9112–03		RES,FXD:METAL FILM;28 OHM,1%,0.2W,TC=100 PPM;AXIAL (TEST SELECTABLE)	57668	CRB20FXE9K35
A3R780	321–0187–00	670–9112–00	670–9112–01	RES,FXD,FILM:866 OHM,1%,0.125W,TC=T0	07716	CEAD866R0F
A3R781	322–3222–00	670–9112–00	670–9112–01	RES,FXD:METAL FILM;2K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 2K00
A3R782	315–0820–00			RES,FXD,FILM:82 OHM,5%,0.25W	80009	315–0820–00
A3R784	311–0635–00			RES,VAR,NONWW:TRMR,1K OHM,0.5W	32997	3329H–L58–102
A3R792	315–0331–00			RES,FXD,FILM:330 OHM,5%,0.25W	80009	315–0331–00
A3R793	322–3213–00			RES,FXD,FILM:1.62K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K62
A3R794	315–0470–00			RES,FXD,FILM:47 OHM,5%,0.25W	80009	315–0470–00
A3R795	322–3030–00			RES,FXD:METAL FILM;20 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3030–00
A3R808	322–3334–00			RES,FXD,FILM:29.4K OHM,1%,0.2W,TC=TO	57668	CRB20 FXE 29K4
A3R809	315–0752–00			RES,FXD,FILM:7.5K OHM,5%,0.25W	80009	315–0752–00
A3R810	321–0372–00			RES,FXD,FILM:73.2K OHM,1%,0.125W,TC=T0	07716	CEAD73201F
A3R811	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W,TC=T0	80009	322–3254–00
A3R812	322–3207–00			RES,FXD,FILM:1.4K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K4
A3R814	315–0100–00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A3R815	322–3222–00			RES,FXD:METAL FILM;2K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 2K00
A3R816	315–0101–00			RES,FXD,FILM:100 OHM,5%,0.25W	80009	315–0101–00
A3R817	322–3210–00			RES,FXD:MET FILM;1.5K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K50
A3R826	315–0270–00	671–9112–00	671–9112–10	RES,FXD,FILM:27 OHM,5%,0.25W	80009	315–0270–00
A3R826	301–0391–00	671–9112–11		RES,FXD,FILM:390 OHM,5%,0.5W	80009	301–0391–00
A3R827	315–0150–00			RES,FXD,FILM:15 OHM,5%,0.25W	80009	315–0150–00
A3R834	315–0150–00	670–9112–02		RES,FXD,FILM:15 OHM,5%,0.25W	80009	315–0150–00
A3R835	322–3222–00			RES,FXD:METAL FILM;2K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 2K00
A3R836	322–3222–00			RES,FXD:METAL FILM;2K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 2K00
A3R837	322–3132–00			RES,FXD,FILM:232 OHM,1%,0.2W,TC=T0	80009	322–3132–00
A3R838	315–0360–00			RES,FXD,FILM:36 OHM,5%,0.25W	80009	315–0360–00
A3R839	321–0926–07			RES,FXD,FILM:4K OHM,0.1%,0.125W,TC=T9	19701	5033RE4K00B
A3R840	322–3193–07			RES,FXD,FILM:1K OHM,0.1%,0.2W,TC=T9	80009	322–3193–07
A3R841	322–3184–00			RES,FXD,FILM:806 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 806E
A3R842	315–0150–00	670–9112–00	670–9112–01	RES,FXD,FILM:15 OHM,5%,0.25W	80009	315–0150–00
A3R843	322–3222–00			RES,FXD:METAL FILM;2K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 2K00
A3R844	322–3222–00			RES,FXD:METAL FILM;2K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 2K00
A3R853	311–0634–00			RES,VAR,NONWW:TRMR,500 OHM,0.5W	80009	311–0634–00
A3R854	322–3414–00			RES,FXD:MET FILM;200K OHM,1%,0.2W,TC=100 PPM;AXIAL (STANDARD ONLY)	91637	CCF501G20002F
A3R855	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A3R856	322–3178–00			RES,FXD,FILM:698 OHM,1%,0.2W,TC=T0	91637	CCF50–2G698ROF
A3R857	322–3210–00			RES,FXD:MET FILM;1.5K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K50
A3R859	315–0150–00			RES,FXD,FILM:15 OHM,5%,0.25W	80009	315–0150–00
A3R870	323–0042–00			RES,FXD,FILM:26.7 OHM,1%,0.5W,TC=T0	80009	323–0042–00
A3R872	321–0288–00			RES,FXD,FILM:9.76K OHM,1%,0.125W,TC=T0	80009	321–0288–00
A3R873	322–3135–00			RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0	80009	322–3135–00
A3R877	308–0076–00			RES,FXD,WW:300 OHM,5%,3W	07088	
A3R878	323–0085–00			RES,FXD,FILM:75.0 OHM,1%,0.5W,TC=T0	80009	323–0085–00
A3R883	315–0470–00			RES,FXD,FILM:47 OHM,5%,0.25W	80009	315–0470–00
A3R884	315–0150–00			RES,FXD,FILM:15 OHM,5%,0.25W	80009	315–0150–00
A3R895	322–3251–00			RES,FXD,FILM:4.02K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K02
A3R896	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K99
A3R897	322–3251–00			RES,FXD,FILM:4.02K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K02
A3R898	322–3183–00			RES,FXD,FILM:787 OHM,1%,0.2W,TC–T0	80009	322–3183–00
A3R908	315–0201–00			RES,FXD,FILM:200 OHM,5%,0.25W	80009	315–0201–00
A3R909	321–0340–00	670–9112–02		RES,FXD,FILM:34.0K OHM,1%,0.125W,TC=T0	80009	321–0340–00
A3R910	322–3284–00	670–9112–02		RES,FXD,FILM:8.87K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 8K87
A3R911	321–0340–00	670–9112–00	670–9112–01	RES,FXD,FILM:34.0K OHM,1%,0.125W,TC=T0	80009	321–0340–00

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A3R911	321–0380–00	670–9112–02		RES,FXD,FILM:88.7K OHM,1%,0.125W,TC=T0	07716	CEAD88701F
A3R912	322–3222–00	670–9112–00	670–9112–01	RES,FXD:METAL FILM;2K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 2K00
A3R912	322–3481–00	670–9112–02		RES,FXD,FILM:1M OHM.1%,0.2W,TC=T0	80009	322–3481–00
A3R913	322–3481–00	670–9112–00	670–9112–01	RES,FXD,FILM:1M OHM.1%,0.2W,TC=T0	80009	322–3481–00
A3R913	322–3222–00	670–9112–02		RES,FXD:METAL FILM;2K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 2K00
A3R914	322–3385–00	670–9112–00	670–9112–01	RES,FXD:MET FILM;100K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 100K
A3R914	322–3205–00	670–9112–02		RES,FXD,FILM:1.33K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K33
A3R919	322–3286–00			RES,FXD,FILM:9.31K OHM,1%,0.2W,TC=T0	80009	322–3286–00
A3R920	322–3306–00			RES,FXD:MET FILM;15K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 15K0
A3R928	301–0221–00			RES,FXD,FILM:220 OHM,5%,0.5W	80009	301–0221–00
A3R930	322–3085–00	670–9112–00	670–9112–00	RES,FXD:METAL FILM;75 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 75E0
A3R930	321–0085–07	670–9112–00		RES,FXD,FILM:75 OHM,0.1%,0.125W,TC=T9	80009	321–0085–07
A3R943	322–3085–00	670–9112–00	670–9112–00	RES,FXD:METAL FILM;75 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 75E0
A3R943	321–0085–07	670–9112–00		RES,FXD,FILM:75 OHM,0.1%,0.125W,TC=T9	80009	321–0085–07
A3R958	322–3085–00	670–9112–00	670–9112–00	RES,FXD:METAL FILM;75 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 75E0
A3R958	321–0085–07	670–9112–00		RES,FXD,FILM:75 OHM,0.1%,0.125W,TC=T9	80009	321–0085–07
A3R959	301–0111–00			RES,FXD,FILM:110 OHM,5%,0.50W	19701	5053CX110R0J
A3R975	322–3085–00			RES,FXD:METAL FILM;75 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 75E0
A3R976	322–3085–00			RES,FXD:METAL FILM;75 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 75E0
A3R995	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K99
A3R996	322–3251–00			RES,FXD,FILM:4.02K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K02
A3R997	315–0472–00			RES,FXD,FILM:4.7K OHM,5%,0.25W	80009	315–0472–00
A3R998	315–0150–00			RES,FXD,FILM:15 OHM,5%,0.25W	80009	315–0150–00
A3TP105	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A3TP135	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A3TP190	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A3TP230	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A3TP499	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A3TP505	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A3TP697	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A3TP905	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A3TP990	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A3U210	156–1367–00			IC,CONVERTER:CMOS,D/A;8 BIT,400NS,CURRENT OUT,MPU COMPATIBLE,MULTIPLYING;AD7524JN,DIP16.3	80009	156–1367–00
A3U218	156–0844–02			IC,DGTL:LSTTL,CNTR;74LS161,DIP16.3,TUBE	80009	156–0844–02
A3U245	155–0282–00			MICROCKT,DGTL:DGTL TO ANALOG CONVERTER M219B	80009	155–0282–00
A3U260	156–0860–02			IC,DGTL:ECL,RCVR;TPL LINE;10116,DIP16.3,TUBE,SCRN	80009	156–0860–02
A3U310	156–0158–07			IC,LINEAR:BIPOLAR,OP–AMP;MC1458P1,DIP08.3	80009	156–0158–07
A3U311	156–0356–01			IC,LINEAR:OPNL AMPL,CHECKED	02735	CA3080TX
A3U319	156–1173–00			IC,LINEAR:BIPOLAR,VOLTAGE REFERENCE;POS-ITIVE,2.5V,1.0%,40PPM,SERIES;MC1403U,DIP08.3	80009	156–1173–00
A3U320	156–0158–07			IC,LINEAR:BIPOLAR,OP–AMP;MC1458P1,DIP08.3	80009	156–0158–07
A3U345	155–0282–00			MICROCKT,DGTL:DGTL TO ANALOG CONVERTER M219B	80009	155–0282–00
A3U440	156–0067–00			IC,LINEAR:	80009	156–0067–00
A3U510	156–1324–00			IC,LINEAR:BIPOLAR,COMPARATOR;TTL,20NS,COMPLE-MENTARY OUTPUT,W/STROBES;LM361N,DIP14.3	27014	LM361N/GLAA054
A3U520	156–1335–00			IC,DGTL:LSTTL,MULTIVIBRATOR;DUAL RETRIG MONOST-ABLE;96LS02,DIP16.3	80009	156–1335–00
A3U532	156–0356–01			IC,LINEAR:OPNL AMPL,CHECKED	02735	CA3080TX
A3U610	156–1272–00			IC,LINEAR:BIPOLAR,OP–AMP;DUAL,HIGH OUTPUT DRIVE,LOW NOISE;NE5532N,DIP08.3	80009	156–1272–00
A3U757	156–0534–01			IC,LINEAR:DUAL DIFF AMPL,BURN–INCA3102,MI	80009	156–0534–01
A3U937	156–0067–13	671–9112–00	671–9112–10	IC,LINEAR:	80009	156–0067–13
A3U937	156–1338–00	671–9112–11		IC,LINEAR:BIPOLAR,OP–AMP;HIGH OUTPUT DRIVE;NE5534N,DIP08.3	80009	156–1338–00
A3VR810	152–0688–00			DIO,ZENER:2.4V,5%,0.4W;1N4370A,DO–7 OR 35	04713	1N4370A
A3W348	131–0566–00			BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	80009	131–0566–00
A3W422	131–0566–00	670–9112–00	670–9112–01	BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	80009	131–0566–00
A3W645	131–0566–00	670–9112–00	670–9112–02	BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	80009	131–0566–00

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A3W751	131–0566–00	670–9112–00	670–9112–01	BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	80009	131–0566–00
A3W752	131–0566–00	670–9112–00	670–9112–01	BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	80009	131–0566–00
A3W832	131–0566–00	670–9112–00	670–9112–01	BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	80009	131–0566–00
A3W834	131–0566–00	670–9112–00	670–9112–01	BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	80009	131–0566–00
A4	670–9113–00	B010100	B030544	CIRCUIT BD ASSY:PWR SPLY	80009	670–9113–00
A4	670–9113–01	B030545	B030888	CIRCUIT BD ASSY:PWR SPLY	80009	670–9113–01
A4	670–9113–02	B030889	B031018	CIRCUIT BD ASSY:PWR SPLY	80009	670–9113–02
A4	670–9113–03	B031019	B031076	CIRCUIT BD ASSY:PWR SPLY	80009	670–9113–03
A4	670–9113–04	B031077	B031190	CIRCUIT BD ASSY:PWR SPLY	80009	670–9113–04
A4	670–9113–05	B031191	B031361	CIRCUIT BD ASSY:PWR SPLY	80009	670–9113–05
A4	670–9113–06	B031362	B039999	CIRCUIT BD ASSY:PWR SPLY	80009	670–9113–06
A4	671–0572–00	B040000	B042070	CIRCUIT BD ASSY:PWR SPLY	80009	671–0572–00
A4	671–0572–01	B042071	B042872	CIRCUIT BD ASSY:PWR SPLY	80009	671–0572–01
A4	671–0572–02	B042873	B043105	CIRCUIT BD ASSY:PWR SPLY	80009	671–0572–02
A4	671–0572–03	B043106	B043444	CIRCUIT BD ASSY:PWR SPLY	80009	671–0572–03
A4	671–0572–04	B043445	B043528	CIRCUIT BD ASSY:PWR SPLY	80009	671–0572–04
A4	671–0572–05	B043529	B043560	CIRCUIT BD ASSY:PWR SPLY	80009	671–0572–05
A4	671–0572–06	B043561		CIRCUIT BD ASSY:PWR SPLY	80009	671–0572–06
A4C130	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A4C133	283–0212–00			CAP,FXD,CER DI:2UF,20%,50V	05397	C340C205M5U1CA
A4C155	290–1069–00			CAP,FXD,ELCTLT:1000UF,20%,6.3V	80009	290–1069–00
A4C156	290–0798–00			CAP,FXD,ELCTLT:180UF,+100–10%,40V	24165	672D187H040DM5C
A4C160	283–0059–00			CAP,FXD,CER DI:1UF,+80–20%,50V	04222	SR305C105MAA
A4C175	283–0423–00			CAP,FXD,CER DI:0.22UF,+80–20%,50V	04222	MD015E224ZAA
A4C176	283–0423–00			CAP,FXD,CER DI:0.22UF,+80–20%,50V	04222	MD015E224ZAA
A4C210	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A4C212	290–0804–00			CAP,FXD,ELCTLT:10UF,+50–20%,25V	80009	290–0804–00
A4C213	290–0804–00			CAP,FXD,ELCTLT:10UF,+50–20%,25V	80009	290–0804–00
A4C220	290–0804–00			CAP,FXD,ELCTLT:10UF,+50–20%,25V	80009	290–0804–00
A4C221	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A4C224	283–0811–00			CAP,FXD,CER DI:0.01UF,20%,100V	80009	283–0811–00
A4C224	283–0811–00	670–9113–02		CAP,FXD,CER DI:0.01UF,20%,100V	80009	283–0811–00
A4C230	283–0114–00			CAP,FXD,CER DI:1500PF,5%,200V	80009	283–0114–00
A4C235	290–1069–00			CAP,FXD,ELCTLT:1000UF,20%,6.3V	80009	290–1069–00
A4C250	290–1069–00			CAP,FXD,ELCTLT:1000UF,20%,6.3V	80009	290–1069–00
A4C254	283–0211–00			CAP,FXD,CER DI:0.1UF,10%,200V	80009	283–0211–00
A4C256	290–0798–00			CAP,FXD,ELCTLT:180UF,+100–10%,40V	24165	672D187H040DM5C
A4C317	283–0328–00			CAP,FXD,CER DI:0.03UF,+80–20%,200V	80009	283–0328–00
A4C320	283–0605–00			CAP,FXD,MICA DI:678PF,1%,300V	80009	283–0605–00
A4C322	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A4C323	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A4C335	283–0059–00			CAP,FXD,CER DI:1UF,+80–20%,50V	04222	SR305C105MAA
A4C345	290–1069–00			CAP,FXD,ELCTLT:1000UF,20%,6.3V	80009	290–1069–00
A4C346	290–1069–00			CAP,FXD,ELCTLT:1000UF,20%,6.3V	80009	290–1069–00
A4C350	290–1069–00			CAP,FXD,ELCTLT:1000UF,20%,6.3V	80009	290–1069–00
A4C351	290–1069–00			CAP,FXD,ELCTLT:1000UF,20%,6.3V	80009	290–1069–00
A4C410	290–0919–00			CAP,FXD,ALUM:470UF,+50–20%,35V;10 X 20MM;RADIAL	55680	UVX1V471MPA
A4C412	290–0919–00			CAP,FXD,ALUM:470UF,+50–20%,35V;10 X 20MM;RADIAL	55680	UVX1V471MPA
A4C420	283–0594–00			CAP,FXD,MICA DI:0.001UF,1%,100V	80009	283–0594–00
A4C422	283–0330–00			CAP,FXD,CER DI:100PF,5%,50V	80009	283–0330–00
A4C429	283–0169–00			CAP,FXD,CER DI:0.022UF,10%,200V	80009	283–0169–00
A4C430	283–0220–00			CAP,FXD,CER:MLC;0.01UF,20%,50V,X7R,0.20 X 0.20;RADIAL	04222	SR205C103MAA
A4C433	290–0776–00			CAP,FXD,ELCTLT:22UF,+50–20 %,10V	55680	UVX1A220MAA
A4C434	283–0330–00			CAP,FXD,CER DI:100PF,5%,50V	80009	283–0330–00
A4C460	283–0079–00	670–9113–06		CAP,FXD,CER DI:0.01UF,20%,250V	80009	283–0079–00
A4C520	283–0220–00			CAP,FXD,CER:MLC;0.01UF,20%,50V,X7R,0.20 X 0.20;RADIAL	04222	SR205C103MAA
A4C532	283–0203–00			CAP,FXD,CER DI:0.47UF,20%,50V	80009	283–0203–00

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A4C550	283–0786–00			CAP,FXD,MICA DI:745PF,1%,500V	80009	283–0786–00
A4C750	283–0625–00			CAP,FXD,MICA DI:220PF,1%,500V	80009	283–0625–00
A4C766	285–1278–00			CAP,FXD,PLASTIC:2.2UF,10%,250V	84411	X661 2.2 10 250
A4C768	285–1278–00			CAP,FXD,PLASTIC:2.2UF,10%,250V	84411	X661 2.2 10 250
A4C810	283–0211–00			CAP,FXD,CER DI:0.1UF,10%,200V	80009	283–0211–00
A4C822	285–1222–00			CAP,FXD,PLASTIC:0.068UF,20%,250V	37942	158/.068/M/250/H
A4C845	290–1106–01			CAP,FXD,ELCTLT:470UF,20%,200VDC	TK1424	CEFHW2D471
A4C854	285–1246–00			CAP,FXD,PPR DI:0.022UF,20%,250VAC	80009	285–1246–00
A4C865	290–1106–01			CAP,FXD,ELCTLT:470UF,20%,200VDC	TK1424	CEFHW2D471
A4C910	285–1222–00			CAP,FXD,PLASTIC:0.068UF,20%,250V	37942	158/.068/M/250/H
A4C911	285–1222–00			CAP,FXD,PLASTIC:0.068UF,20%,250V	37942	158/.068/M/250/H
A4C919	285–1222–00			CAP,FXD,PLASTIC:0.068UF,20%,250V	37942	158/.068/M/250/H
A4C970	285–1246–00			CAP,FXD,PPR DI:0.022UF,20%,250VAC	80009	285–1246–00
A4CR119	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A4CR121	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A4CR140	152–0198–02			SEMICOND DVC,DI:RECT,SI,200V,3A,A249G	80009	152–0198–02
A4CR145	152–0198–02			SEMICOND DVC,DI:RECT,SI,200V,3A,A249G	80009	152–0198–02
A4CR160	152–0198–02			SEMICOND DVC,DI:RECT,SI,200V,3A,A249G	80009	152–0198–02
A4CR161	152–0066–03			DIO,RECT:400V,1A,1.1VF AT 1A,30A IFSM,2US;1N4004GP,DO–41	14433	LG4017
A4CR162	152–0066–03			DIO,RECT:400V,1A,1.1VF AT 1A,30A IFSM,2US;1N4004GP,DO–41	14433	LG4017
A4CR175	152–0066–03			DIO,RECT:400V,1A,1.1VF AT 1A,30A IFSM,2US;1N4004GP,DO–41	14433	LG4017
A4CR224	152–0141–02	670–9113–02		DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A4CR225	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A4CR225	152–0141–02	670–9113–02		DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A4CR226	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A4CR228	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A4CR360	152–0867–00	670–9113–00	670–9113–03	SEMICOND DVC,DI:DUAL RECT,SCHOTT-KY,SI,30V,8A,TO–220	80009	152–0867–00
A4CR360	152–0905–00	670–9113–04	670–9113–04	SEMICOND DVC,DI:DUAL RECT,SCHOTTKY,40V,8A	80009	152–0905–00
A4CR360	152–0914–00	670–9113–05	670–9113–05	SEMICOND DVC,DI:DUAL RECT,SCHOTT-KY,SI,60V,8A,TO–220	80009	152–0914–00
A4CR360	152–0905–00	670–9113–06		SEMICOND DVC,DI:DUAL RECT,SCHOTTKY,40V,8A	80009	152–0905–00
A4CR409	152–0066–03			DIO,RECT:400V,1A,1.1VF AT 1A,30A IFSM,2US;1N4004GP,DO–41	14433	LG4017
A4CR410	152–0066–03			DIO,RECT:400V,1A,1.1VF AT 1A,30A IFSM,2US;1N4004GP,DO–41	14433	LG4017
A4CR420	152–0066–03			DIO,RECT:400V,1A,1.1VF AT 1A,30A IFSM,2US;1N4004GP,DO–41	14433	LG4017
A4CR421	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A4CR422	152–0141–02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35	80009	152–0141–02
A4CR460	152–0793–00			SEMICOND DVC,DI:DUAL RECT,SI,40V,25A	81483	28CPQ040
A4CR510	152–0585–00			SEMICOND DVC,DI:RECT,SI,200V,1A	14936	W02M–30
A4CR533	152–0864–00			DIO,RECT:ULTRA FAST;150V,2A,25NS, IFSM=50A,SOFT REC;BYV–150	80009	152–0864–00
A4CR534	152–0864–00			DIO,RECT:ULTRA FAST;150V,2A,25NS, IFSM=50A,SOFT REC;BYV–150	80009	152–0864–00
A4CR535	152–0864–00			DIO,RECT:ULTRA FAST;150V,2A,25NS, IFSM=50A,SOFT REC;BYV–150	80009	152–0864–00
A4CR536	152–0864–00			DIO,RECT:ULTRA FAST;150V,2A,25NS, IFSM=50A,SOFT REC;BYV–150	80009	152–0864–00
A4CR810	152–0602–00	670–9113–01	670–9113–01	DIO,RECT:BRIDGE,600V,6A,IFSM=100A;RKBPC806	80009	152–0602–00
A4CR810	152–0750–00	670–9113–01		DIO,RECT:FAST RCVRY;BRIDGE,600V,3A, IFSM=125A,250NS,SAF CONT; RKBPC606	80009	152–0750–00
A4DS112	150–1049–00			DIO,OPTO:LED;RED/GREEN,BI–COLOR;T1 3/4,SPR 54MVW	80009	150–1049–00
A4DS810	150–0035–00			LAMP,GLOW:90V MAX,0.3MA,AID–T,WIRE LD	71744	A1B–120
A4F940	159–0023–00			FUSE,CARTRIDGE:3AG,2A,250V,SLOW BLOW	71400	MDX2

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A4J120	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A4J160	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A4J242	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A4J310	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A4J810	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A4J950	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A4J950	131–0608–00	670–9113–02		TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A4L435	120–1668–00			XFMR,RF:TOROIDAL,265UH,1.5 AMPS	80009	120–1668–00
A4L451	120–1669–00			XFMR,RF:TOROIDAL,65UH,10 AMPS	80009	120–1669–00
A4L950	108–0959–00			COIL,RF:FIXED,150UH	TK1345	108–0959–00
A4LF950	119–1946–00			FILTER,RFI:1A,250V,400HZ W/PC TERMINAL	S4307	FN326–1/02–K–D–T
A4P950	131–0993–02			BUS,CNDCT:SHUNT ASSEMBLY,RED	00779	1–850100–O
A4P950	131–0993–02	670–9113–02		BUS,CNDCT:SHUNT ASSEMBLY,RED	00779	1–850100–O
A4Q160	151–0736–00			XSTR,SIG:BIPOLAR,NPN;40V,600MA,250MHZ, AMPL;2N4401,TO–92 EBC	80009	151–0736–00
A4Q230	151–0190–00			XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC	80009	151–0190–00
A4Q331	151–0482–00			XSTR,PWR:BIPO- LAR,PNP;100V,3.0A,3.0MHZ,AMPL;TIP32C,TO–220	80009	151–0482–00
A4Q340	151–0435–00			XSTR:DARLINGTON,PNP,SI,TO–92	80009	151–0435–00
A4Q660	151–1141–01			XSTR,PWR:MOS,N–CH;IRF730/MTP5N40E,TO–220	80009	151–1141–01
A4Q661	151–1141–01			XSTR,PWR:MOS,N–CH;IRF730/MTP5N40E,TO–220	80009	151–1141–01
A4R112	322–3206–00	670–9113–00	670–9113–00	RES,FXD,FILM:1.37K OHM,1%,0.2W,TC=T0	80009	322–3206–00
A4R112	321–0206–02	670–9113–00		RES,FXD,FILM:1.37K OHM,0.5%,0.125W,TC=T2	80009	321–0206–02
A4R114	315–0821–00			RES,FXD,FILM:820 OHM,5%,0.25W	80009	315–0821–00
A4R118	315–0561–00			RES,FXD,FILM:560 OHM,5%,0.25W	80009	315–0561–00
A4R119	321–0932–00			RES,FXD,FILM:2.5K OHM,1%,0.125W,TC=T0	01121	
A4R120	321–1696–07			RES,FXD,FILM:6K OHM,0.1%,0.125W,TC=T9	19701	5033RE6K00B
A4R121	322–3194–00	670–9113–00	670–9113–01	RES,FXD,FILM:1.02K OHM,1%,0.2W,TC=T0	91637	CCF50–2G10200F
A4R121	321–0001–01	670–9113–02		RES,FXD,FILM:10.0 OHM,0.5%,0.125W,TC=T0	80009	321–0001–01
A4R122	321–0001–01	670–9113–00	670–9113–01	RES,FXD,FILM:10.0 OHM,0.5%,0.125W,TC=T0	80009	321–0001–01
A4R122	322–3194–00	670–9113–02		RES,FXD,FILM:1.02K OHM,1%,0.2W,TC=T0	91637	CCF50–2G10200F
A4R123	321–0001–01	670–9113–00	670–9113–01	RES,FXD,FILM:10.0 OHM,0.5%,0.125W,TC=T0	80009	321–0001–01
A4R160	308–0297–00			RES,FXD,WW:24.7 OHM,1%,3W	07088	
A4R161	315–0102–00			RES,FXD,FILM:1K OHM,5%,0.25W	80009	315–0102–00
A4R162	315–0361–00			RES,FXD,FILM:360 OHM,5%,0.25W	80009	315–0361–00
A4R215	321–1133–02			RES,FXD,FILM:240 OHM,0.5%,0.125W,TC=T2	07716	
A4R218	315–0224–00			RES,FXD,FILM:220K OHM,5%,0.25W	80009	315–0224–00
A4R219	315–0472–00			RES,FXD,FILM:4.7K OHM,5%,0.25W	80009	315–0472–00
A4R220	315–0272–00			RES,FXD,FILM:2.7K OHM,5%,0.25W	80009	315–0272–00
A4R222	322–3289–00			RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A4R223	321–0253–00			RES,FXD,FILM:4.22K OHM,1%,0.125W,TC=T0	19701	5033ED 4K 220F
A4R224	321–0452–00			RES,FXD,FILM:499K OHM,1%,0.125W,TC=T0	80009	321–0452–00
A4R224	321–0452–00	670–9113–02		RES,FXD,FILM:499K OHM,1%,0.125W,TC=T0	80009	321–0452–00
A4R225	315–0202–00			RES,FXD,FILM:2K OHM,5%,0.25W	80009	315–0202–00
A4R226	322–3289–00			RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A4R226	322–3289–00	670–9113–02		RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3289–00
A4R227	315–0561–00			RES,FXD,FILM:560 OHM,5%,0.25W	80009	315–0561–00
A4R228	321–0932–00			RES,FXD,FILM:2.5K OHM,1%,0.125W,TC=T0	01121	
A4R230	322–3193–00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A4R233	321–0245–00			RES,FXD,FILM:3.48K OHM,1%,0.125W,TC=T0	80009	321–0245–00
A4R234	321–0168–00			RES,FXD,FILM:549 OHM,1%,0.125W,TC=T0	07716	CEAD549R0F
A4R235	321–0001–01			RES,FXD,FILM:10.0 OHM,0.5%,0.125W,TC=T0	80009	321–0001–01
A4R236	321–0001–01	670–9113–00	670–9113–01	RES,FXD,FILM:10.0 OHM,0.5%,0.125W,TC=T0	80009	321–0001–01
A4R245	308–0802–00			RES,FXD,WW:0.01 OHM,5%,5W	07088	KM500–4T
A4R246	308–0802–00			RES,FXD,WW:0.01 OHM,5%,5W	07088	KM500–4T
A4R314	321–1133–02			RES,FXD,FILM:240 OHM,0.5%,0.125W,TC=T2	07716	
A4R315	322–3206–00	670–9113–00	670–9113–00	RES,FXD,FILM:1.37K OHM,1%,0.2W,TC=T0	80009	322–3206–00

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A4R315	321–0206–02	670–9113–00		RES,FXD,FILM:1.37K OHM,0.5%,0.125W,TC=T2	80009	321–0206–02
A4R316	321–0612–07			RES,FXD,FILM:500 OHM,0.1%,0.125W,TC=T9	80009	321–0612–07
A4R317	321–0612–07			RES,FXD,FILM:500 OHM,0.1%,0.125W,TC=T9	80009	321–0612–07
A4R318	315–0752–00			RES,FXD,FILM:7.5K OHM,5%,0.25W	80009	315–0752–00
A4R319	315–0752–00			RES,FXD,FILM:7.5K OHM,5%,0.25W	80009	315–0752–00
A4R320	321–0452–00			RES,FXD,FILM:499K OHM,1%,0.125W,TC=T0	80009	321–0452–00
A4R320	321–0452–00	670–9113–02		RES,FXD,FILM:499K OHM,1%,0.125W,TC=T0	80009	321–0452–00
A4R321	322–3383–00			RES,FXD,FILM:95.3K OHM,1%,0.2W,TC=T0	80009	322–3383–00
A4R322	315–0223–00	670–9113–01		RES,FXD,FILM:22K OHM,5%,0.25W	80009	315–0223–00
A4R340	315–0472–00			RES,FXD,FILM:4.7K OHM,5%,0.25W	80009	315–0472–00
A4R410	315–0102–00			RES,FXD,FILM:1K OHM,5%,0.25W	80009	315–0102–00
A4R411	321–0312–00			RES,FXD,FILM:17.4K OHM,1%,0.125W,TC=T0	80009	321–0312–00
A4R413	315–0100–02			RES,FXD,CMPSN:10 OHM,5%,0.25W	80009	315–0100–02
A4R420	315–0473–00			RES,FXD,FILM:47K OHM,5%,0.25W	80009	315–0473–00
A4R434	315–0270–00			RES,FXD,FILM:27 OHM,5%,0.25W	80009	315–0270–00
A4R460	315–0100–00	670–9113–06		RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A4R522	315–0101–00			RES,FXD,FILM:100 OHM,5%,0.25W	80009	315–0101–00
A4R523	315–0101–00			RES,FXD,FILM:100 OHM,5%,0.25W	80009	315–0101–00
A4R536	303–0360–00			RES,FXD,CMPSN:36 OHM,5%,1W	80009	303–0360–00
A4R735	315–0511–00			RES,FXD,FILM:510 OHM,5%,0.25W	80009	315–0511–00
A4R736	315–0511–00			RES,FXD,FILM:510 OHM,5%,0.25W	80009	315–0511–00
A4R750	308–0874–00			RES,FXD,WW:10 OHM,5%,1W	57027	BW–20F–10–5%
A4R751	308–0874–00			RES,FXD,WW:10 OHM,5%,1W	57027	BW–20F–10–5%
A4R810	315–0221–00			RES,FXD,FILM:220 OHM,5%,0.25W	80009	315–0221–00
A4R811	315–0106–00			RES,FXD,FILM:10M OHM,5%,0.25W	01121	CB1065
A4R820	301–0154–00			RES,FXD,FILM:150K OHM,5%,0.5W	80009	301–0154–00
A4R821	301–0154–00			RES,FXD,FILM:150K OHM,5%,0.5W	80009	301–0154–00
A4R850	301–0101–00			RES,FXD,FILM:100 OHM,5%,0.5W	01121	EB1015
A4R852	315–0220–00			RES,FXD,FILM:22 OHM,5%,0.25W	80009	315–0220–00
A4R910	301–0105–00			RES,FXD,FILM:1M OHM,5%,0.50W	19701	5053CX1M000J
A4R950	315–0226–00			RES,FXD,FILM:22M OHM,5%,0.25W	80009	315–0226–00
A4RV852	307–0638–00			RES,V SENSITIVE:18V,20%,0.5 W	80009	307–0638–00
A4RV915	307–0449–00			RES,V SENSITIVE:1900PF,100A,130V,MET OXD SAF CONT	03508	V130LA20A
A4RV917	307–0449–00			RES,V SENSITIVE:1900PF,100A,130V,MET OXD SAF CONT	03508	V130LA20A
A4S930	260–1849–07			SWITCH,PUSH:DPST,4A,250VAC	80009	260–1849–07
A4T610	120–1667–00			XFMR,PWR,STPDN:60HZ	TK1339	SPW053
A4T650	120–1666–00			XFMR,PWR,STPDN:50KHZ	80009	120–1666–00
A4T735	120–1472–00			XFMR,PWR,STPDN:GATE DRIVE HF	80009	120–1472–00
A4TP212	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A4TP234	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A4TP510	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A4TP534	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A4TP535	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A4U133	156–1408–01			IC,MISC:CMOS,TIMER;TLC555CP/ICM7555IPA,DIP08.3	80009	156–1408–01
A4U210	156–1173–00			IC,LINEAR:BIPOLAR,VOLTAGE REFERENCE;POS-ITIVE,2.5V,1.0%,40PPM,SERIES;MC1403U,DIP08.3	80009	156–1173–00
A4U212	156–1451–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR;NEGATIVE,AD-JUSTABLE,1.5A,4%;LM337T,TO–220	80009	156–1451–00
A4U220	156–1226–01			IC,LINEAR:BIPOLAR,COMPARATOR;LM319N,DIP14.3	80009	156–1226–01
A4U260	156–2559–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR;NEG-ATIVE,–12V,1.5A,2%;MC7912ACT,TO–220	80009	156–2559–00
A4U310	156–1161–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR;POSITIVE,AD-JUSTABLE,1.5A,4%;LM317T,TO–220	04713	LM317T
A4U325	156–1226–01			IC,LINEAR:BIPOLAR,COMPARATOR;LM319N,DIP14.3	80009	156–1226–01
A4U331	156–0853–02			IC,LINEAR:BIPOLAR,OP–AMP;LM358N,DIP08.3	80009	156–0853–02
A4U335	156–1226–01			IC,LINEAR:BIPOLAR,COMPARATOR;LM319N,DIP14.3	80009	156–1226–01
A4U360	156–2558–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR;POS-ITIVE,12V,1.5A,2%;MC7812ACT,TO–220	80009	156–2558–00

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A4U435	156–1585–02			IC,LINEAR:BIPOLAR,SW–REGULATOR;3526,DIP18.3	34333	SG2526BJ/11589
A4U525	156–0328–00			IC,DGTL:MOS,DRIVER;DUAL CLOCK DRIVER;0026,DIP8.3	04713	MMH0026CP1D
A4VR120	152–0175–00			DIO,ZENER:5.6V,5%,0.4W;1N752A,DO–7 OR 35,TR	14552	TD3810976
A4VR130	152–0662–00			DIO,ZENER:5V,1%,0.4W;1N751 FMLY,DO–7 OR 35,TR	04713	SZG195RL
A4VR233	152–0175–00			DIO,ZENER:5.6V,5%,0.4W;1N752A,DO–7 OR 35,TR	14552	TD3810976
A4	671–0572–00	B040000	B042070	CIRCUIT BD ASSY:PWR SPLY	80009	671–0572–00
A4	671–0572–01	B042071	B042872	CIRCUIT BD ASSY:PWR SPLY	80009	671–0572–01
A4	671–0572–02	B042873	B043105	CIRCUIT BD ASSY:PWR SPLY	80009	671–0572–02
A4	671–0572–03	B043106	B043444	CIRCUIT BD ASSY:PWR SPLY	80009	671–0572–03
A4	671–0572–04	B043445	B043528	CIRCUIT BD ASSY:PWR SPLY	80009	671–0572–04
A4	671–0572–05	B043529	B043560	CIRCUIT BD ASSY:PWR SPLY	80009	671–0572–05
A4	671–0572–06	B043561		CIRCUIT BD ASSY:PWR SPLY	80009	671–0572–06
A4C142	290–1069–00	671–0572–00	671–0572–03	CAP,FXD,ELCTLT:1000UF,20%,6.3V	80009	290–1069–00
A4C142	290–1301–00	671–0572–04		CAP,FXD,ALUM:2700UF,20%,10V,12.5 X 30MM(0.492 X 1.180);RADIAL,LOWIMP,1.95A RIPPLE,BULK	80009	290–1301–00
A4C161	290–0804–00	671–0572–00	671–0572–03	CAP,FXD,ELCTLT:10UF,+50–20%,25V	80009	290–0804–00
A4C161	290–0943–00	671–0572–04		CAP,FXD,ALUM:47UF,+50–20%,25V,6 X 11MM;RADIAL	55680	UVX1V470MPA
A4C169	283–0423–00			CAP,FXD,CER DI:0.22UF,+80–20%,50V	04222	MD015E224ZAA
A4C225	290–1069–00	671–0572–00	671–0572–03	CAP,FXD,ELCTLT:1000UF,20%,6.3V	80009	290–1069–00
A4C225	290–1301–00	671–0572–04		CAP,FXD,ALUM:2700UF,20%,10V,12.5 X 30MM(0.492 X 1.180);RADIAL,LOWIMP,1.95A RIPPLE,BULK	80009	290–1301–00
A4C241	290–1034–00	671–0572–00	671–0572–03	CAP,FXD,ALUM:330UF,20%,25V,13 X 25MM;RADIAL	TK1424	CEUFM1E331
A4C241	290–1302–00	671–0572–04		CAP,FXD,ALUM:1000UF,20%,35V,12.5 X 30MM(0.492 X 1.180);RADIAL,LOWIMP,1.95A RIPPLE,BULK	80009	290–1302–00
A4C250	290–1034–00	671–0572–00	671–0572–03	CAP,FXD,ALUM:330UF,20%,25V,13 X 25MM;RADIAL	TK1424	CEUFM1E331
A4C250	290–1302–00	671–0572–04		CAP,FXD,ALUM:1000UF,20%,35V,12.5 X 30MM(0.492 X 1.180);RADIAL,LOWIMP,1.95A RIPPLE,BULK	80009	290–1302–00
A4C258	290–1069–00	671–0572–00	671–0572–03	CAP,FXD,ELCTLT:1000UF,20%,6.3V	80009	290–1069–00
A4C258	290–1301–00	671–0572–04		CAP,FXD,ALUM:2700UF,20%,10V,12.5 X 30MM(0.492 X 1.180);RADIAL,LOWIMP,1.95A RIPPLE,BULK	80009	290–1301–00
A4C269	283–0423–00			CAP,FXD,CER DI:0.22UF,+80–20%,50V	04222	MD015E224ZAA
A4C270	283–0423–00			CAP,FXD,CER DI:0.22UF,+80–20%,50V	04222	MD015E224ZAA
A4C320	283–0423–00			CAP,FXD,CER DI:0.22UF,+80–20%,50V	04222	MD015E224ZAA
A4C321	283–0005–00	671–0572–01		CAP,FXD,CER DI:0.01UF,+100–0%,250V	04222	SR30VE103ZAA
A4C325	290–1069–00	671–0572–00	671–0572–03	CAP,FXD,ELCTLT:1000UF,20%,6.3V	80009	290–1069–00
A4C325	290–1301–00	671–0572–04		CAP,FXD,ALUM:2700UF,20%,10V,12.5 X 30MM(0.492 X 1.180);RADIAL,LOWIMP,1.95A RIPPLE,BULK	80009	290–1301–00
A4C358	290–1069–00	671–0572–00	671–0572–03	CAP,FXD,ELCTLT:1000UF,20%,6.3V	80009	290–1069–00
A4C358	290–1301–00	671–0572–04		CAP,FXD,ALUM:2700UF,20%,10V,12.5 X 30MM(0.492 X 1.180);RADIAL,LOWIMP,1.95A RIPPLE,BULK	80009	290–1301–00
A4C360	290–1069–00	671–0572–00	671–0572–03	CAP,FXD,ELCTLT:1000UF,20%,6.3V	80009	290–1069–00
A4C360	290–1301–00	671–0572–04		CAP,FXD,ALUM:2700UF,20%,10V,12.5 X 30MM(0.492 X 1.180);RADIAL,LOWIMP,1.95A RIPPLE,BULK	80009	290–1301–00
A4C361	290–0804–00	671–0572–00	671–0572–03	CAP,FXD,ELCTLT:10UF,+50–20%,25V	80009	290–0804–00
A4C361	290–0943–00	671–0572–04		CAP,FXD,ALUM:47UF,+50–20%,25V,6 X 11MM;RADIAL	55680	UVX1V470MPA
A4C370	290–1069–00	671–0572–00	671–0572–03	CAP,FXD,ELCTLT:1000UF,20%,6.3V	80009	290–1069–00
A4C370	290–1301–00	671–0572–04		CAP,FXD,ALUM:2700UF,20%,10V,12.5 X 30MM(0.492 X 1.180);RADIAL,LOWIMP,1.95A RIPPLE,BULK	80009	290–1301–00
A4C371	283–0423–00			CAP,FXD,CER DI:0.22UF,+80–20%,50V	04222	MD015E224ZAA
A4C415	283–0268–00			CAP,FXD,CER DI:0.015UF,20%,50V	80009	283–0268–00
A4C464	290–1069–00	671–0572–00	671–0572–03	CAP,FXD,ELCTLT:1000UF,20%,6.3V	80009	290–1069–00
A4C464	290–1301–00	671–0572–04		CAP,FXD,ALUM:2700UF,20%,10V,12.5 X 30MM(0.492 X 1.180);RADIAL,LOWIMP,1.95A RIPPLE,BULK	80009	290–1301–00
A4C475	290–1069–00	671–0572–00	671–0572–03	CAP,FXD,ELCTLT:1000UF,20%,6.3V	80009	290–1069–00
A4C475	290–1301–00	671–0572–04		CAP,FXD,ALUM:2700UF,20%,10V,12.5 X 30MM(0.492 X 1.180);RADIAL,LOWIMP,1.95A RIPPLE,BULK	80009	290–1301–00
A4C521	283–0672–00			CAP,FXD,MICA DI:200PF,1%,500V	80009	283–0672–00
A4C525	285–1196–00			CAP,FXD,PPR DI:0.01UF,20%,250V	80009	285–1196–00

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A4C540	285–1329–00			CAP,FXD,PLASTIC:MTLZD FILM;680PF,10%,1600V,POLY-PROPYLENE,.70X.43; RADIAL,T/A	80009	285–1329–00
A4C548	285–1331–00			CAP,FXD,MTLZD:0.47UF,5%,400V	TK1573	MKS4 .47/400/5
A4C575	283–0005–00	671–0572–01		CAP,FXD,CER DI:0.01UF,+100–0%,250V	04222	SR30VE103ZAA
A4C621	283–0051–00			CAP,FXD,CER DI:0.0033UF,5%,100V	80009	283–0051–00
A4C648	285–1187–00			CAP,FXD,MTLZD:0.47 UF,10%,100 V	05292	PMT 3R .47K 100
A4C656	290–0844–00			CAP,FXD,ELCTLT:100UF,+75–20%,35WVDC	24165	513D107M035CC4D
A4C717	290–0804–00			CAP,FXD,ELCTLT:10UF,+50–20%,25V	80009	290–0804–00
A4C718	283–0211–00			CAP,FXD,CER DI:0.1UF,10%,200V	80009	283–0211–00
A4C722	283–0032–00			CAP,FXD,CER DI:470PF,5%,500V	80009	283–0032–00
A4C727	283–0423–00			CAP,FXD,CER DI:0.22UF,+80–20%,50V	04222	MD015E224ZAA
A4C730	285–1196–00			CAP,FXD,PPR DI:0.01UF,20%,250V	80009	285–1196–00
A4C830	285–1196–00			CAP,FXD,PPR DI:0.01UF,20%,250V	80009	285–1196–00
A4C845	290–1070–00	671–0572–00	671–0572–04	CAP,FXD,ELCTLT:220UF,20%,200V	80009	290–1070–00
A4C845	290–1293–00	671–0572–05		CAP,FXD,ALUM:390UF,20%,200V,25 X 30MM;SNAP IN,105 DEG,BULK	80009	290–1293–00
A4C865	290–1070–00	671–0572–00	671–0572–04	CAP,FXD,ELCTLT:220UF,20%,200V	80009	290–1070–00
A4C865	290–1293–00	671–0572–05		CAP,FXD,ALUM:390UF,20%,200V,25 X 30MM;SNAP IN,105 DEG,BULK	80009	290–1293–00
A4C920	285–1323–00			CAP,FXD,MTLZD:0.22UF,250V,X	80009	285–1323–00
A4CR169	152–0198–00			DIO,RECT:200V,3A,125A IFSM,1VF AT 3A,SAF CONT;1N5624	80009	152–0198–00
A4CR170	152–0066–00			DIO,RECT:400V,1A,IFSM=30A,1.2VF,2US;GP10G/1N5060,SAFETY CONTROLLED	05828	GP10G–020
A4CR215	152–0066–00			DIO,RECT:400V,1A,IFSM=30A,1.2VF,2US;GP10G/1N5060,SAFETY CONTROLLED	05828	GP10G–020
A4CR269	152–0198–00			DIO,RECT:200V,3A,125A IFSM,1VF AT 3A,SAF CONT;1N5624	80009	152–0198–00
A4CR320	152–0884–00			SEMICOND DVC,DI:16 AMP,35V,TO–220,AC PKG	04713	MBR1635
A4CR340	152–0601–01			SEMICOND DVC,DI:RECTIFIER,SI,150V,1A,35NS	04713	MUR115RL
A4CR348	152–0601–01			SEMICOND DVC,DI:RECTIFIER,SI,150V,1A,35NS	04713	MUR115RL
A4CR369	152–0066–00			DIO,RECT:400V,1A,IFSM=30A,1.2VF,2US;GP10G/1N5060,SAFETY CONTROLLED	05828	GP10G–020
A4CR545	152–0897–00			DIO,RECT:FAST RCVRY;1000V,1.5A,300NS,SOFT RCVRY;BYV96E	80009	152–0897–00
A4CR556	152–0400–00			DIO,RECT:FAST RCVRY;400V,1A,200NS;1N4936,DO–41	80009	152–0400–00
A4CR575	152–0884–00			SEMICOND DVC,DI:16 AMP,35V,TO–220,AC PKG	04713	MBR1635
A4CR640	152–0841–00			DIO,RECT:ULTRA FAST;1KV,100NS;BYT–12P–1000,TO–220	80009	152–0841–00
A4CR648	152–0864–00			DIO,RECT:ULTRA FAST;150V,2A,25NS,IFSM=50A,SOFT REC;BYV–150	80009	152–0864–00
A4CR649	152–0864–00			DIO,RECT:ULTRA FAST;150V,2A,25NS,IFSM=50A,SOFT REC;BYV–150	80009	152–0864–00
A4CR651	152–0581–04			DIO,RECT:SCHTKY;20V,1A,.450VF,25A IFSM;1N5817	04713	1N5817RL
A4CR820	152–0750–00			DIO,RECT:FAST RCVRY;BRIDGE,600V,3A, IFSM=125A,250NS,SAFETY CONTROLLED; RKBPC606	80009	152–0750–00
A4DS670	150–1017–00			LT EMITTING DIO:GREEN,550NM,55MA MAX	80009	150–1017–00
A4DS720	150–0035–00			LAMP,GLOW:90V MAX,0.3MA,AID–T,WIRE LD	71744	A1B–120
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 SAF CONT (FOR 180–250VAC OPERATION)	71400	MDL 1
A4J160	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 34)	80009	131–0608–00
A4J310	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 2)	80009	131–0608–00
A4J556	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 2)	80009	131–0608–00
A4J660	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 2)	80009	131–0608–00
A4J720	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 2)	80009	131–0608–00

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A4J810	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 3)	80009	131–0608–00
A4L230	108–0554–00			COIL,RF:FIXED,5UH,+/–20%, 17 1/2 TURNS (2 LAYERS) OF 16AWG,ON FORM 276–0147–00	TK1345	108–0554–00
A4L261	108–1262–00			COIL,RF:FXD,100UH,10%,Q=30,SRF 8.2MHZ,DCR 0.23 OHM,I MAX 0.75ARADIAL LEAD	80009	108–1262–00
A4L358	108–0554–00			COIL,RF:FIXED,5UH,+/–20%, 17 1/2 TURNS (2 LAYERS) OF 16AWG,ON FORM 276–0147–00	TK1345	108–0554–00
A4L361	108–1262–00			COIL,RF:FXD,100UH,10%,Q=30,SRF 8.2MHZ,DCR 0.23 OHM,I MAX 0.75ARADIAL LEAD	80009	108–1262–00
A4L520	108–1448–00			COIL,RF:TOROID,1MH,+/–30%,AWG #20,PKG 0.65 DIA X 0.6	TK1345	108–1448–00
A4L770	108–0205–00			COIL,RF:INDUCTOR;FXD,1MH,+–5%, DCR 2.12 OHMS, FERRITE CORE	76493	8209
A4LF950	119–1946–00			FILTER,RFI:1A,250V,400HZ W/PC TERMINAL	S4307	FN326–1/02–K–D–T
A4P556	131–0993–02			BUS,CNDCT:SHUNT ASSEMBLY,RED	00779	1–850100–O
A4P660	131–0993–02			BUS,CNDCT:SHUNT ASSEMBLY,RED	00779	1–850100–O
A4P720	131–0993–02			BUS,CNDCT:SHUNT ASSEMBLY,RED	00779	1–850100–O
A4Q127	151–0528–00			THYRISTOR,PWR:BIPOLAR,SCR;50V,16A RMS,PHASE CONTROL;2N6400,TO–220	80009	151–0528–00
A4Q215	151–0435–00			XSTR:DARLINGTON,PNP,SI,TO–92	80009	151–0435–00
A4Q638	151–0908–00			XSTR,PWR:BIPOLAR,NPN;500V VCEO,1000V VCEV,5A,SWITCHING;MJH16002A,TO–218	80009	151–0908–00
A4Q648	151–0323–00			XSTR,PWR:BIPOLAR,NPN;80V,4.0A,2.0MHZ,AMPL; 2N5192,TO–126	80009	151–0323–00
A4Q660	151–0190–00			XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC	80009	151–0190–00
A4Q667	151–0750–00			XSTR,SIG:BIPOLAR,NPN;400V,300MA,20MHZ, AMPL;MPSA44,TO–92 EBC	80009	151–0750–00
A4Q717	151–0188–00			XSTR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ, AMPL;2N3906,TO–92 EBC	80009	151–0188–00
A4Q727	151–0190–00			XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC	80009	151–0190–00
A4Q741	151–0324–00			XSTR,PWR:BIPOLAR,PNP;80V,4.0A,2.0MHZ, AMPL;2N5195,TO–126	80009	151–0324–00
A4Q750	151–0323–00			XSTR,PWR:BIPOLAR,NPN;80V,4.0A,2.0MHZ, AMPL;2N5192,TO–126	80009	151–0323–00
A4Q755	151–0188–00			XSTR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ, AMPL;2N3906,TO–92 EBC	80009	151–0188–00
A4R120	315–0101–00			RES,FXD,FILM:100 OHM,5%,0.25W	80009	315–0101–00
A4R215	315–0272–00			RES,FXD,FILM:2.7K OHM,5%,0.25W	80009	315–0272–00
A4R216	315–0472–00			RES,FXD,FILM:4.7K OHM,5%,0.25W	80009	315–0472–00
A4R225	301–0680–00			RES,FXD,FILM:68 OHM,5%,0.5W	80009	301–0680–00
A4R314	315–0202–00			RES,FXD,FILM:2K OHM,5%,0.25W	80009	315–0202–00
A4R315	315–0152–00			RES,FXD,FILM:1.5K OHM,5%,0.25W	80009	315–0152–00
A4R316	315–0163–00	671–0572–00	671–0572–01	RES,FXD,FILM:16K OHM,5%,0.25W	80009	315–0163–00
A4R316	322–3254–00	671–0572–02		RES,FXD,FILM:4.32K OHM,1%,0.2W,TC=T0	80009	322–3254–00
A4R321	315–0100–00	671–0572–01		RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A4R415	311–1225–00			RES,VAR,NONWW:TRMR,1K OHM,0.5W	80009	311–1225–00
A4R416	315–0102–00			RES,FXD,FILM:1K OHM,5%,0.25W	80009	315–0102–00
A4R510	311–0978–00			RES,VAR,NONWW:TRMR,250 OHM,0.5W	80009	311–0978–00
A4R560	301–0204–00	671–0572–00	671–0572–05	RES,FXD,FILM:200K OHM,5%,0.5W	80009	301–0204–00
A4R560	303–0204–00	671–0572–06		RES,FXD,CMPSN:200K OHM,5%,1W	80009	303–0204–00
A4R575	315–0100–00	671–0572–01		RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A4R614	315–0152–00			RES,FXD,FILM:1.5K OHM,5%,0.25W	80009	315–0152–00
A4R615	322–3181–00	671–0572–00	671–0572–02	RES,FXD,FILM:750 OHM,1%,0.2W,TC=T0	80009	322–3181–00
A4R615	322–3175–00	671–0572–03		RES,FXD,FILM:649 OHM,1%,0.2W,TC=T0	80009	322–3175–00
A4R616	322–3258–00			RES,FXD:MET FILM;4.75K OHM,1%,0.2W, TC=100 PPM;AX-IAL	80009	322–3258–00
A4R617	315–0182–00			RES,FXD,FILM:1.8K OHM,5%,0.25W	80009	315–0182–00

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A4R619	315–0103–00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315–0103–00
A4R620	315–0432–00	671–0572–00	671–0572–01	RES,FXD,FILM:4.3K OHM,5%,0.25W	80009	315–0432–00
A4R620	322–3254–00	671–0572–02		RES,FXD,FILM:4.32K OHM,1%,0.2W,TC=T0	80009	322–3254–00
A4R621	315–0103–00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315–0103–00
A4R622	322–3275–00	671–0572–00	671–0572–03	RES,FXD,FILM:7.15K OHM,1%,0.2W,TC=T0	80009	322–3275–00
A4R622	322–3248–00	671–0572–04		RES,FXD,FILM:3.74K OHM,1%,0.2W,TC=T0	80009	322–3248–00
A4R625	322–3181–00	671–0572–00	671–0572–02	RES,FXD,FILM:750 OHM,1%,0.2W,TC=T0	80009	322–3181–00
A4R625	322–3199–00	671–0572–03		RES,FXD,FILM:1.15K OHM,1%,0.2W,TC=T0	80009	322–3199–00
A4R630	308–0755–00			RES,FXD,WW:0.75 OHM,5%,2W	91637	CPF–1–0R75JT1
A4R647	301–0274–00			RES,FXD,FILM:270K OHM,5%,0.5W	80009	301–0274–00
A4R665	315–0332–00			RES,FXD,FILM:3.3K OHM,5%,0.25W	80009	315–0332–00
A4R666	315–0473–00			RES,FXD,FILM:47K OHM,5%,0.25W	80009	315–0473–00
A4R667	301–0105–00	671–0572–00	671–0572–05	RES,FXD,FILM:1M OHM,5%,0.50W	19701	5053CX1M000J
A4R667	303–0105–00	671–0572–06		RES,FXD,CMPSN:1M OHM,5%,1W	01121	GB1055
A4R717	315–0183–00			RES,FXD,FILM:18K OHM,5%,0.25W	80009	315–0183–00
A4R718	315–0221–00			RES,FXD,FILM:220 OHM,5%,0.25W	80009	315–0221–00
A4R722	315–0103–00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315–0103–00
A4R723	307–0863–00			RES,THERMAL:10 OHM,10%,NTC	80009	307–0863–00
A4R731	315–0473–00			RES,FXD,FILM:47K OHM,5%,0.25W	80009	315–0473–00
A4R746	303–0750–00			RES,FXD,CMPSN:75 OHM,5%,1W	80009	303–0750–00
A4R747	303–0750–00			RES,FXD,CMPSN:75 OHM,5%,1W	80009	303–0750–00
A4R765	301–0105–00			RES,FXD,FILM:1M OHM,5%,0.50W	19701	5053CX1M000J
A4R766	322–3439–00			RES,FXD,FILM:365K OHM,1%,0.2W,TC=T0	80009	322–3439–00
A4R767	322–3439–00			RES,FXD,FILM:365K OHM,1%,0.2W,TC=T0	80009	322–3439–00
A4R768	322–3374–00	671–0572–00	671–0572–03	RES,FXD,FILM:76.8K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE76K8
A4R768	315–0104–00	671–0572–04		RES,FXD,FILM:100K OHM,5%,0.25W	80009	315–0104–00
A4R818	315–0106–00			RES,FXD,FILM:10M OHM,5%,0.25W	01121	CB1065
A4R822	301–0105–00			RES,FXD,FILM:1M OHM,5%,0.50W	19701	5053CX1M000J
A4RV820	307–0449–00			RES,V SENS:1900PF,100A,130V,METAL OXD SAF CONT	03508	V130LA20A
A4RV920	307–0449–00			RES,V SENS:1900PF,100A,130V,METAL OXD SAF CONT	03508	V130LA20A
A4S930	260–1849–07			SWITCH,PUSH:DPST,4A,250VAC (QUANTITY 2)	80009	260–1849–07
A4T440	120–1782–00			XFMR,RF:	80009	120–1782–00
A4TP133	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYLON COLLAR	26364	104–01–02
A4TP137	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYLON COLLAR	26364	104–01–02
A4TP140	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYLON COLLAR	26364	104–01–02
A4TP173	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYLON COLLAR	26364	104–01–02
A4TP341	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYLON COLLAR	26364	104–01–02
A4TP350	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYLON COLLAR	26364	104–01–02
A4TP667	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYLON COLLAR	26364	104–01–02
A4U176	156–3633–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR;POSITIVE,12V,1A,3%,LOW DROPOUT;LM2940CT–12,TO–220	80009	156–3633–00
A4U215	156–3217–00			IC,MISC:	80009	156–3217–00
A4U276	156–2559–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR;NEGATIVE,–12V,1.5A,2%;MC7912ACT,TO–220	80009	156–2559–00
A4U410	156–1631–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR; SHUNT,ADJUSTABLE,100MA;TL431CLP,TO–92	01295	TL431C–LP
A4U520	156–0885–00			CPLR,OPTOELECTR:LED,5KV ISOLATION	04713	SOC 123A
A4U615	156–1225–01			IC,LINEAR:BIPOLAR,COMPARATOR;LM393N,DIP08.3	80009	156–1225–01
A4U722	156–2524–00	671–0572–00	671–0572–03	IC,LINEAR:	12969	UC3842N
A4U722	156–4236–00	671–0572–04		IC,LINEAR:	80009	156–4236–00
A4VR120	152–0662–00			DIO,ZENER:5V,1%,0.4W;1N751 FMLY,DO–7 OR 35,TR	04713	SZG195RL

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A4VR650	152–0395–00			DIO,ZENER:4.3V,5%,0.4W;1N749A,DO–35 OR 7,TR	80009	152–0395–00
A4VR765	152–0304–00			DIO,ZENER:20V,5%,0.4W;1N968B,DO–35 OR 7,TR	80009	152–0304–00
A4W810	198–5653–00			WIRE SET,ELEC:	80009	198–5653–00
A5	670–9121–00	B010100	B020780	CIRCUIT BD ASSY:COLOR BAR	80009	670–9121–00
A5	670–9121–01	B030781	B041611	CIRCUIT BD ASSY:COLOR BAR	80009	670–9121–01
A5	670–9121–03	B041612	B042142	CIRCUIT BD ASSY:COLOR BAR	80009	670–9121–03
A5	670–9121–04	B042143	B042780	CIRCUIT BD ASSY:COLOR BAR	80009	670–9121–04
A5	670–9121–05	B042781		CIRCUIT BD ASSY:COLOR BAR (OPTION 01 ONLY)	80009	670–9121–05
A5	670–9121–06	B043142		CIRCUIT BD ASSY:COLOR BAR,OPTION 2J (OPTION 2J ONLY)	80009	670–9121–06
A5C185	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A5C218	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C219	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C238	281–0131–00			CAP,VAR,AIR DI:2.4–24.5PF,250V	80009	281–0131–00
A5C292	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C330	——— ———			(SELECTED)		
A5C358	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C365	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C380	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C418	290–0990–00			CAP,FXD,ELCTLT:10UF,20%,50V	24165	502D437
A5C420	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C428	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A5C460	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C470	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C480	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C492	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C505	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A5C515	285–1307–00			CAP,FXD,PLASTIC:0.02UF,1%,50V	80009	285–1307–00
A5C524	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C525	285–1221–00			CAP,FXD,MTLZD:0.1UF,2%,100V	80009	285–1221–00
A5C555	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C570	283–0421–00	670–9121–00	670–9121–04	CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C570	283–0059–00	670–9121–05		CAP,FXD,CER DI:1UF,+80–20%,50V	04222	SR305C105MAA
A5C610	283–0648–00			CAP,FXD,MICA DI:10PF,+/–0.5PF,500V	80009	283–0648–00
A5C618	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A5C625	285–1221–00			CAP,FXD,MTLZD:0.1UF,2%,100V (OPTION 01 ONLY)	80009	285–1221–00
A5C625	285–0901–00	670–9121–06		CAP,FXD,PLASTIC:0.047UF,5%,50V (OPTION 2J ONLY)	80009	285–0901–00
A5C629	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C630	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C634	285–1221–00			CAP,FXD,MTLZD:0.1UF,2%,100V	80009	285–1221–00
A5C635	283–0785–00			CAP,FXD,MICA DI:250PF,1%,500V	80009	283–0785–00
A5C647	283–0775–00			CAP,FXD,MICA DI:1764 PF,1%,500V	80009	283–0775–00
A5C652	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C660	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A5C665	283–0051–00			CAP,FXD,CER DI:0.0033UF,5%,100V	80009	283–0051–00
A5C669	290–0804–00			CAP,FXD,ELCTLT:10UF,+50–20%,25V	80009	290–0804–00
A5C670	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C692	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C710	283–0648–00			CAP,FXD,MICA DI:10PF,+/–0.5PF,500V	80009	283–0648–00
A5C711	281–0153–00			CAP,VAR,AIR DI:1.7–10PF,250V	80009	281–0153–00
A5C731	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A5C747	283–0633–00			CAP,FXD,MICA DI:77PF,1%,100V	80009	283–0633–00
A5C752	283–0631–00			CAP,FXD,MICA DI:95PF,1%,500V	80009	283–0631–00
A5C755	283–0635–00			CAP,FXD,MICA DI:51PF,1%,500V	80009	283–0635–00

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A5C770	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C805	283–0648–00			CAP,FXD,MICA DI:10PF,+/–0.5PF,500V	80009	283–0648–00
A5C811	281–0604–00			CAP,FXD,CER DI:2.2PF,+/–0.25PF,500V	80009	281–0604–00
A5C823	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C824	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C825	283–0646–00			CAP,FXD,MICA DI:170PF,1%,500V,.380H X .460L;RADIAL	80009	283–0646–00
A5C826	283–0647–00			CAP,FXD,MICA DI:70PF,1%,100V	80009	283–0647–00
A5C830	283–0660–00			CAP,FXD,MICA DI:510PF,2%,500V	80009	283–0660–00
A5C831	283–0689–00			CAP,FXD,MICA DI:550PF,1%,300V	80009	283–0689–00
A5C836	283–0674–00			CAP,FXD,MICA DI:85PF,1%,500V	80009	283–0674–00
A5C852	283–0672–00			CAP,FXD,MICA DI:200PF,1%,500V	80009	283–0672–00
A5C853	283–0615–00			CAP,FXD,MICA DI:33PF,5%,500V	80009	283–0615–00
A5C855	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C865	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A5C866	283–0051–00			CAP,FXD,CER DI:0.0033UF,5%,100V	80009	283–0051–00
A5C869	290–0804–00			CAP,FXD,ELCTLT:10UF,+50–20%,25V	80009	290–0804–00
A5C870	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C923	283–0648–00			CAP,FXD,MICA DI:10PF,+/–0.5PF,500V	80009	283–0648–00
A5C925	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C953	283–0687–00			CAP,FXD,MICA DI:560PF,2%,300V	80009	283–0687–00
A5C955	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C970	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C983	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C984	283–0421–00			CAP,FXD,CER DI:0.1UF,+80–20%,50V	04222	MD015C104MAB
A5C985	290–0973–00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A5CR575	152–0322–00			DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811	80009	152–0322–00
A5CR775	152–0322–00			DIO,SIG:SCHTKY;15V,410MVF AT 1MA,1.2PF;5082–2811	80009	152–0322–00
A5J318	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A5J655	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A5J681	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A5J710	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A5J910	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A5J915	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A5L335	108–0549–00			COIL,RF:FIXED,4.45UH	80009	108–0549–00
A5L647	114–0415–00			COIL,RF:VARIABLE,775–925NH	80009	114–0415–00
A5L747	120–1180–00			XFMR,RF:VARIABLE	80009	120–1180–00
A5L847	114–0366–00			COIL,RF:VAR,2.40–2.70UH,Q MIN 190 @ 2.6 UH, POT CORE	54937	114–0366–00
A5L930	114–0369–00			COIL,RF:VARIABLE,2.19–2.53UH	80009	114–0369–00
A5L947	114–0367–00			COIL,RF:VARIABLE,2.70–3.30UH	80009	114–0367–00
A5P155	131–3439–00			CONN,DIN:PCB;FEMALE,RTANG,3 X 16,0.1 CTR,0.209 MLG X 0.114 TAIL,30 GOLD	81312	48S–6043–0731–0
A5P318	131–0993–05			BUS,CNDCT:SHUNT ASSEMBLY,GREEN	00779	850100–5
A5P655	131–0993–02			BUS,CNDCT:SHUNT ASSEMBLY,RED	00779	1–850100–O
A5P681	131–0993–02			BUS,CNDCT:SHUNT ASSEMBLY,RED	00779	1–850100–O
A5P710	131–0993–02			BUS,CNDCT:SHUNT ASSEMBLY,RED	00779	1–850100–O
A5Q708	151–0220–00			XSTR,SIG:BIPOLAR,PNP;40V,200MA,400MHZ, AMPL;2N3906(SEL),TO–92 EBC	80009	151–0220–00
A5Q710	151–0220–00			XSTR,SIG:BIPOLAR,PNP;40V,200MA,400MHZ, AMPL;2N3906(SEL),TO–92 EBC	80009	151–0220–00
A5Q720	151–0190–00			XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC	80009	151–0190–00
A5Q724	151–0190–00			XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC	80009	151–0190–00
A5Q729	151–1103–00			XSTR,SIG:DMOSFET,N–CH;ENH,2V,50MA,45 OHM;SD210DE,TO–72	80009	151–1103–00
A5Q815	151–0190–00			XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC	80009	151–0190–00
A5R108	315–0243–00			RES,FXD,FILM:24K OHM,5%,0.25W	80009	315–0243–00
A5R109	315–0222–00			RES,FXD,FILM:2.2K OHM,5%,0.25W	80009	315–0222–00

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A5R110	311–0698–00			RES,VAR,NONWW:TRMR,1MEG OHM,0.5W	80009	311–0698–00
A5R155	315–0271–00			RES,FXD,FILM:270 OHM,5%,0.25W	80009	315–0271–00
A5R156	315–0271–00			RES,FXD,FILM:270 OHM,5%,0.25W	80009	315–0271–00
A5R245	307–0539–00			RES NTWK,FXD,FI:(7)510 OHM,10%,1W	80009	307–0539–00
A5R249	322–3165–00			RES,FXD,FILM:511 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 511E
A5R250	322–3165–00			RES,FXD,FILM:511 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 511E
A5R460	315–0202–00			RES,FXD,FILM:2K OHM,5%,0.25W	80009	315–0202–00
A5R471	315–0202–00			RES,FXD,FILM:2K OHM,5%,0.25W	80009	315–0202–00
A5R479	315–0202–00			RES,FXD,FILM:2K OHM,5%,0.25W	80009	315–0202–00
A5R492	315–0202–00			RES,FXD,FILM:2K OHM,5%,0.25W	80009	315–0202–00
A5R505	311–0614–00			RES,VAR,NONWW:TRMR,30K OHM,0.5W	80009	311–0614–00
A5R514	321–0614–00			RES,FXD,FILM:10.1K OHM,1%,0.125W,TC=T0	80009	321–0614–00
A5R515	321–0614–00			RES,FXD,FILM:10.1K OHM,1%,0.125W,TC=T0	80009	321–0614–00
A5R516	321–0309–00			RES,FXD,FILM:16.2K OHM,1%,0.125W,TC=T0 (OPTION 01 ONLY)	80009	321–0309–00
A5R516	322–3277–00	670–9121–06		RES,FXD,FILM:7.5K OHM,1%,0.2W,TC=T0 (OPTION 2J ONLY)	57668	CRB20 FXE 7K50
A5R552	315–0202–00			RES,FXD,FILM:2K OHM,5%,0.25W	80009	315–0202–00
A5R561	322–3184–00			RES,FXD,FILM:806 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 806E
A5R562	321–0926–07			RES,FXD,FILM:4K OHM,0.1%,0.125W,TC=T9	19701	5033RE4K00B
A5R563	322–3193–07			RES,FXD,FILM:1K OHM,0.1%,0.2W,TC=T9	80009	322–3193–07
A5R569	315–0820–00			RES,FXD,FILM:82 OHM,5%,0.25W	80009	315–0820–00
A5R575	322–3222–07			RES,FXD,FILM:2K OHM,0.1%,0.2W TC=T9	80009	322–3222–07
A5R580	315–0202–00			RES,FXD,FILM:2K OHM,5%,0.25W	80009	315–0202–00
A5R581	315–0202–00			RES,FXD,FILM:2K OHM,5%,0.25W	80009	315–0202–00
A5R605	322–3039–00			RES,FXD,FILM:24.9 OHM,1%,0.2W,TC=T0	80009	322–3039–00
A5R606	322–3039–00			RES,FXD,FILM:24.9 OHM,1%,0.2W,TC=T0	80009	322–3039–00
A5R610	322–3222–00			RES,FXD:METAL FILM;2K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 2K00
A5R616	321–0309–00			RES,FXD,FILM:16.2K OHM,1%,0.125W,TC=T0 (OPTION 01 ONLY)	80009	321–0309–00
A5R616	322–3277–00	670–9121–06		RES,FXD,FILM:7.5K OHM,1%,0.2W,TC=T0 (OPTION 2J ONLY)	57668	CRB20 FXE 7K50
A5R617	321–1313–08			RES,FXD,FILM:18K OHM,1%,0.125W,TC=T2 (OPTION 01 ONLY)	07716	CEAC18001F
A5R617	322–3281–00	670–9121–06		RES,FXD:MET FILM;8.25K OHM,1%,0.2W, TC=100 PPM;AX-IAL (OPTION 2J ONLY)	80009	322–3281–00
A5R618	322–3385–00			RES,FXD:MET FILM;100K OHM,1%,0.2W,TC=100 PPM;AXIAL (OPTION 01 ONLY)	57668	CRB20 FXE 100K
A5R618	322–3352–00	670–9121–06		RES,FXD,FILM:45.3K OHM,1%,0.2W,TC=T0 (OPTION 2J ONLY)	57668	CRB20 FXE 45K3
A5R619	321–0756–00			RES,FXD,FILM:50K OHM,1%,0.125W,TC=T0 (OPTION 01 ONLY)	01121	
A5R619	322–3352–00	670–9121–06		RES,FXD,FILM:45.3K OHM,1%,0.2W,TC=T0 (OPTION 2J ONLY)	57668	CRB20 FXE 45K3
A5R620	322–3132–00			RES,FXD,FILM:232 OHM,1%,0.2W,TC=T0	80009	322–3132–00
A5R635	322–3385–00			RES,FXD:MET FILM;100K OHM,1%,0.2W,TC=100 PPM;AXIAL (OPTION 01 ONLY)	57668	CRB20 FXE 100K
A5R635	322–3352–00	670–9121–06		RES,FXD,FILM:45.3K OHM,1%,0.2W,TC=T0 (OPTION 2J ONLY)	57668	CRB20 FXE 45K3
A5R660	315–0270–00			RES,FXD,FILM:27 OHM,5%,0.25W	80009	315–0270–00
A5R661	322–3086–00			RES,FXD,FILM:76.8 OHM,1%,0.2W,TC=T0	91637	CCF50–2G76R80F
A5R662	322–3085–00			RES,FXD:METAL FILM;75 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 75E0
A5R664	321–0830–03			RES,FXD,FILM:2.41K OHM,0.25%,0.125W,TC=T2	07716	CEAC24100C
A5R665	322–3392–00			RES,FXD,FILM:118K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 118K
A5R666	321–0793–07			RES,FXD,FILM:37.5 OHM 0.1%,0.125W TC=T9	24546	NE55E37R5B
A5R675	315–0202–00			RES,FXD,FILM:2K OHM,5%,0.25W	80009	315–0202–00
A5R708	315–0150–00			RES,FXD,FILM:15 OHM,5%,0.25W	80009	315–0150–00

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A5R709	315–0150–00			RES,FXD,FILM:15 OHM,5%,0.25W	80009	315–0150–00
A5R710	322–3222–00			RES,FXD:METAL FILM;2K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 2K00
A5R721	322–3193–00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A5R722	322–3193–00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A5R723	322–3214–00			RES,FXD,FILM:1.65K OHM,1%,0.2W,TC=T0	80009	322–3214–00
A5R730	315–0103–00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315–0103–00
A5R731	315–0104–00			RES,FXD,FILM:100K OHM,5%,0.25W	80009	315–0104–00
A5R760	322–3001–00			RES,FXD:METAL FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL	80009	322–3001–00
A5R761	322–3086–00			RES,FXD,FILM:76.8 OHM,1%,0.2W,TC=T0	91637	CCF50–2G76R80F
A5R762	321–0830–03			RES,FXD,FILM:2.41K OHM,0.25%,0.125W,TC=T2	07716	CEAC24100C
A5R763	321–0793–07			RES,FXD,FILM:37.5 OHM 0.1%,0.125W TC=T9	24546	NE55E37R5B
A5R764	315–0820–00			RES,FXD,FILM:82 OHM,5%,0.25W	80009	315–0820–00
A5R774	315–0202–00			RES,FXD,FILM:2K OHM,5%,0.25W	80009	315–0202–00
A5R775	322–3222–07			RES,FXD,FILM:2K OHM,0.1%,0.2W TC=T9	80009	322–3222–07
A5R776	315–0202–00			RES,FXD,FILM:2K OHM,5%,0.25W	80009	315–0202–00
A5R783	307–0539–00			RES NTWK,FXD,FI:(7)510 OHM,10%,1W	80009	307–0539–00
A5R810	322–3146–00			RES,FXD,FILM:324 OHM,1%,0.2W,TC=T0	91637	
A5R811	322–3193–00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 1K00
A5R823	322–3085–00			RES,FXD:METAL FILM;75 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 75E0
A5R825	315–0150–00			RES,FXD,FILM:15 OHM,5%,0.25W	80009	315–0150–00
A5R826	311–0634–00			RES,VAR,NONWW:TRMR,500 OHM,0.5W	80009	311–0634–00
A5R862	315–0270–00			RES,FXD,FILM:27 OHM,5%,0.25W	80009	315–0270–00
A5R863	322–3241–00			RES,FXD,FILM:3.16K OHM,1%,0.2W,TC=T0	80009	322–3241–00
A5R864	321–0649–00			RES,FXD,FILM:2.19K OHM,0.25%,0.125W,TC=T2	07716	CEAC21900C
A5R883	307–0539–00			RES NTWK,FXD,FI:(7)510 OHM,10%,1W	80009	307–0539–00
A5R920	321–0209–00			RES,FXD,FILM:1.47K OHM,1%,0.125W,TC=T0	80009	321–0209–00
A5R921	301–0221–00			RES,FXD,FILM:220 OHM,5%,0.5W	80009	301–0221–00
A5R922	322–3085–00	670–9121–00	670–9121–00	RES,FXD:METAL FILM;75 OHM,1%,0.2W,TC=100 PPM;AXIAL	57668	CRB20 FXE 75E0
A5R922	321–0085–07	670–9121–00		RES,FXD,FILM:75 OHM,0.1%,0.125W,TC=T9	80009	321–0085–07
A5R961	322–3221–00			RES,FXD,FILM:1.96K OHM,1%,0.2W,TC=T0	91637	CCF50–2F19600F
A5R962	321–0454–00			RES,FXD,FILM:523K OHM,1%,0.125W,TC=TO	80009	321–0454–00
A5R969	311–0644–00			RES,VAR,NONWW:TRMR,20K OHM,0.5W	80009	311–0644–00
A5R975	315–0621–00			RES,FXD,FILM:620 OHM,5%,0.25W	80009	315–0621–00
A5TP113	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A5TP190	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A5TP480	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A5TP510	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A5TP570	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A5TP735	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A5TP910	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A5TP983	214–0579–00			TERM,TEST POINT:BRS CD PL	TK0858	ORDER BY DESCR
A5U106	156–0402–02			IC,MISC:BIPOLAR,TIMER;LM555CN,DIP08.3	27014	LM555CN/A+
A5U118	156–0784–02			IC,DGTL:LSTTL,CNTR;74LS163,DIP16.3,TUBE	80009	156–0784–02
A5U130	156–0316–04			IC,DGTL:ECL,TRANSLATOR;QUAD ECL TO TTL;10125,DIP16.3,TUBE	04713	MC10125P/L
A5U206	160–3722–00			IC,DGTL:STTL,PLD;PAL,16R8LPC;16R8LPC,DIP20.3	80009	160–3722–00
				(OPTION 01 ONLY)		
A5U206	160–8765–00	670–9121–06		IC,DGTL:STTL,PLD;PAL,16R8,18MHZ,90MA;16R8A–2,DIP20.3,TUBE	80009	160–8765–00
				(OPTION 2J ONLY)		
A5U218	156–0784–02			IC,DGTL:LSTTL,CNTR;74LS163,DIP16.3,TUBE	80009	156–0784–02
A5U230	156–0381–02			IC,DGTL:LSTTL,GATES;74LS86,DIP14.3,TUBE	80009	156–0381–02
A5U239	156–0860–02			IC,DGTL:ECL,RCVR;TPL LINE;10116,DIP16.3,TUBE,SCRN	80009	156–0860–02
A5U255	156–1754–01			IC,DGTL:ALSTTL,BUFFER/DRIVER;OCTAL NONINV, 3–STATE;74ALS244,DIP20.3,TUBE	01295	SN74ALS244AN3
A5U265	160–3573–00			MICROCKT,DGTL:STTL,256 X 4 PROM W/3 STATE OUT	80009	160–3573–00
A5U278	160–3572–00	670–9121–00	670–9121–03	MICROCKT,DGTL:NMOS,4096 X 8 EPROM W/3 STATE OUT	80009	160–3572–00

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A5U278	160–3572–01	670–9121–04		MICROCKT,DGTL:NMOS,4096 X 8 EPROM W/3 STATE OUT,2732A,DIP24	80009	160–3572–01
				(OPTION 01 ONLY)		
A5U278	160–8766–00	670–9121–06		IC,MEM:NMOS,EPROM;4096 X 8,W/THREE STATE OUT;2732A,DIP24	80009	160–8766–00
				(OPTION 2J ONLY)		
A5U292	156–2382–00			IC,DGTL:ASTTL,FLIP FLOP;OCTAL D–TYPE, 3–STATE;74AS374,DIP20.3,TUBE	01295	SN74AS374 N/J
A5U325	156–0479–02			IC,DGTL:LSTTL,GATE;74LS32,DIP14.3,TUBE	80009	156–0479–02
A5U335	156–0530–02	670–9121–00	670–9121–01	IC,DGTL:LSTTL,MUX/ENCODER;74LS157,DIP16.3,TUBE	80009	156–0530–02
A5U335	156–2159–00	670–9121–03		IC,DGTL:ASTTL,MUX;QUAD 2–TO–1 DATA SELECTOR, NONINV;74AS157,DIP16.3,TUBE	80009	156–2159–00
A5U350	156–1632–00			MICROCKT,DGTL:CMOS,2048 X 8 SRAM	80009	156–1632–00
A5U360	156–2517–00			MICROCKT,DGTL:7 X 9 UPPERCASE CHARACTER GEN	27014	DM86S64 BWF/N
A5U370	156–1911–00			IC,DGTL:FTTL,FLIP FLOP;HEX D–TYPE, WITH / MR;74F174,DIP16.3,TUBE	04713	MC74F174S
A5U380	156–0180–04			IC,DGTL:STTL,GATES;74S00,DIP14.3,TUBE	80009	156–0180–04
A5U392	160–3574–00	670–9121–00	670–9121–00	MICROCKT,DGTL:CMOS,1K X 8 RGTR FROM W/3 STATE OUT,PRGM	80009	160–3574–00
A5U392	160–3574–01	670–9121–01	670–9121–03	MICROCKT,DGTL:CMOS,1K X 8 RGTR,PRGM	80009	160–3574–01
A5U392	160–3574–02	670–9121–04		MICROCKT,DGTL:CMOS,1K X 8 RGTR PRGM,7C235,DIP24	80009	160–3574–02
				(OPTION 01 ONLY)		
A5U392	160–8767–00	670–9121–06		IC,DGTL:CMOS,1K X 8,RGTR PROM,W/THREE STATE OUT,DIP24	80009	160–8767–00
				(OPTION 2J ONLY)		
A5U405	156–1329–00			IC,CONV:BIPOLAR,D/A;12 BIT,CUR OUT,REF;AD565AJD, DIP24.6	24355	AD565AJD
A5U420	156–1272–00			IC,LINEAR:BIPOLAR,OP–AMP;DUAL,HIGH OUTPUT DRIVE,LOW NOISE;NE5532N,DIP08.3	80009	156–1272–00
A5U535	156–0784–02			IC,DGTL:LSTTL,CNTR;74LS163,DIP16.3,TUBE	80009	156–0784–02
A5U550	156–1664–00			IC,DGTL:ALSTTL,FLIP FLOP;OCTAL NONINV D–TYPE, 3–STATE;74ALS574,DIP20.3,TUBE	80009	156–1664–00
A5U563	156–0067–13			IC,LINEAR:	80009	156–0067–13
A5U575	156–1173–00			IC,LINEAR:BIPOLAR,VOLTAGE REFERENCE;POS-ITIVE,2.5V,1.0%,40PPM,SERIES;MC1403U,DIP08.3	80009	156–1173–00
A5U592	160–3723–00			IC,DGTL:STTL,PLD;PAL,16R8LPC;16R8LPC,DIP20.3	80009	160–3723–00
A5U627	156–1272–00			IC,LINEAR:BIPOLAR,OP–AMP;DUAL,HIGH OUTPUT DRIVE,LOW NOISE;NE5532N,DIP08.3	80009	156–1272–00
A5U775	155–0282–00			MICROCKT,DGTL:DGTL TO ANALOG CONVERTER M219B	80009	155–0282–00
A5U792	156–0368–03			IC,DGTL:ECL,TRANSLATOR;QUAD TTL–TO–ECL;10124,DIP16.3,TUBE	80009	156–0368–03
A5U875	155–0282–00			MICROCKT,DGTL:DGTL TO ANALOG CONVERTER M219B	80009	155–0282–00
A5U892	156–0368–03			IC,DGTL:ECL,TRANSLATOR;QUAD TTL–TO–ECL;10124,DIP16.3,TUBE	80009	156–0368–03
A5U963	156–0067–13			IC,LINEAR:	80009	156–0067–13
A5W621	131–0566–00			BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	80009	131–0566–00
A5W663	––––– –––––			(SELECTED)		
A5W720	131–0566–00			BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	80009	131–0566–00
A6	670–9368–00			CIRCUIT BD ASSY:BNC	80009	670–9368–00
A6J307	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
				(OPTION 01 ONLY)		
A6J420	131–0608–00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	80009	131–0608–00
A6L118	108–0655–00			COIL,RF:FIXED,63NH	80009	108–0655–00
A6L124	108–0655–00			COIL,RF:FIXED,63NH	80009	108–0655–00
B100	119–2068–00	B010100	B042499	FAN,TUBEAXIAL:24VDC,20CFM,60 X 60 MM 4800RPM, SAFETY CONTROLLED	TK1960	TFDD6024RXA
B100	119–2068–01	B042500		FAN,TUBEAXIAL:	80009	119–2068–01

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
J107	131–0955–03			CONN,RF JACK:	80009	131–0955–03
J134	131–0955–03			CONN,RF JACK:	80009	131–0955–03
J207	131–0955–03			CONN,RF JACK:	80009	131–0955–03
J234	131–0955–03			CONN,RF JACK:	80009	131–0955–03
J407	131–0955–03			CONN,RF JACK:	80009	131–0955–03
J434	131–0955–03			CONN,RF JACK:	80009	131–0955–03
J607	131–0955–03			CONN,RF JACK:	80009	131–0955–03
J634	131–0955–03			CONN,RF JACK:	80009	131–0955–03
J707	131–0955–03			CONN,RF JACK:	80009	131–0955–03
J734	131–0955–03			CONN,RF JACK:	80009	131–0955–03
J907	131–0955–03			CONN,RF JACK:	80009	131–0955–03
J934	131–0955–03			CONN,RF JACK:	80009	131–0955–03

Schematics and Circuit Board Illustrations

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.

Overline, parenthesis, or leading slash indicate a low asserting state.

Example: $\overline{\text{ID CONTROL}}$, (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:

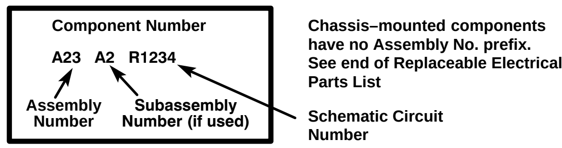
Capacitors: Values one or greater are in picofarads (pF).
Values less than one are in microfarads (μF).
Resistors = Ohms (Ω).

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.

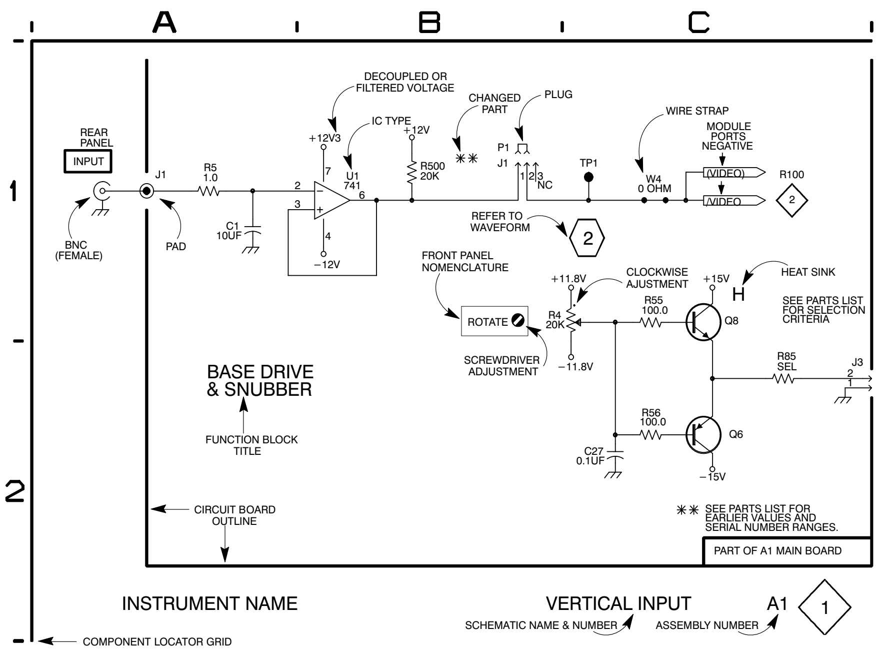
The Replaceable Electrical Parts List is arranged by assembly number in numerical sequence; the components are listed by component number. Example:

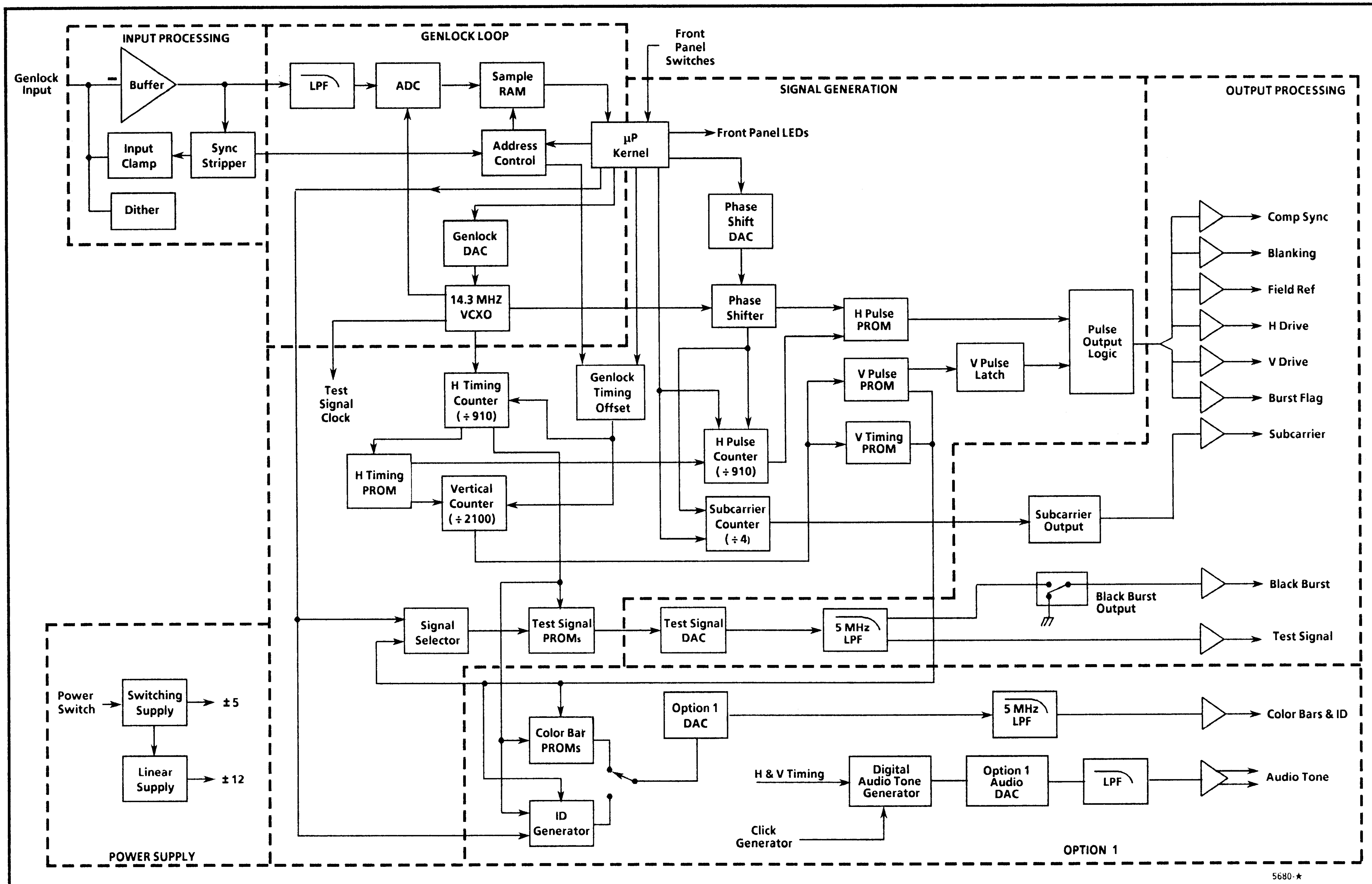


Grid Coordinates

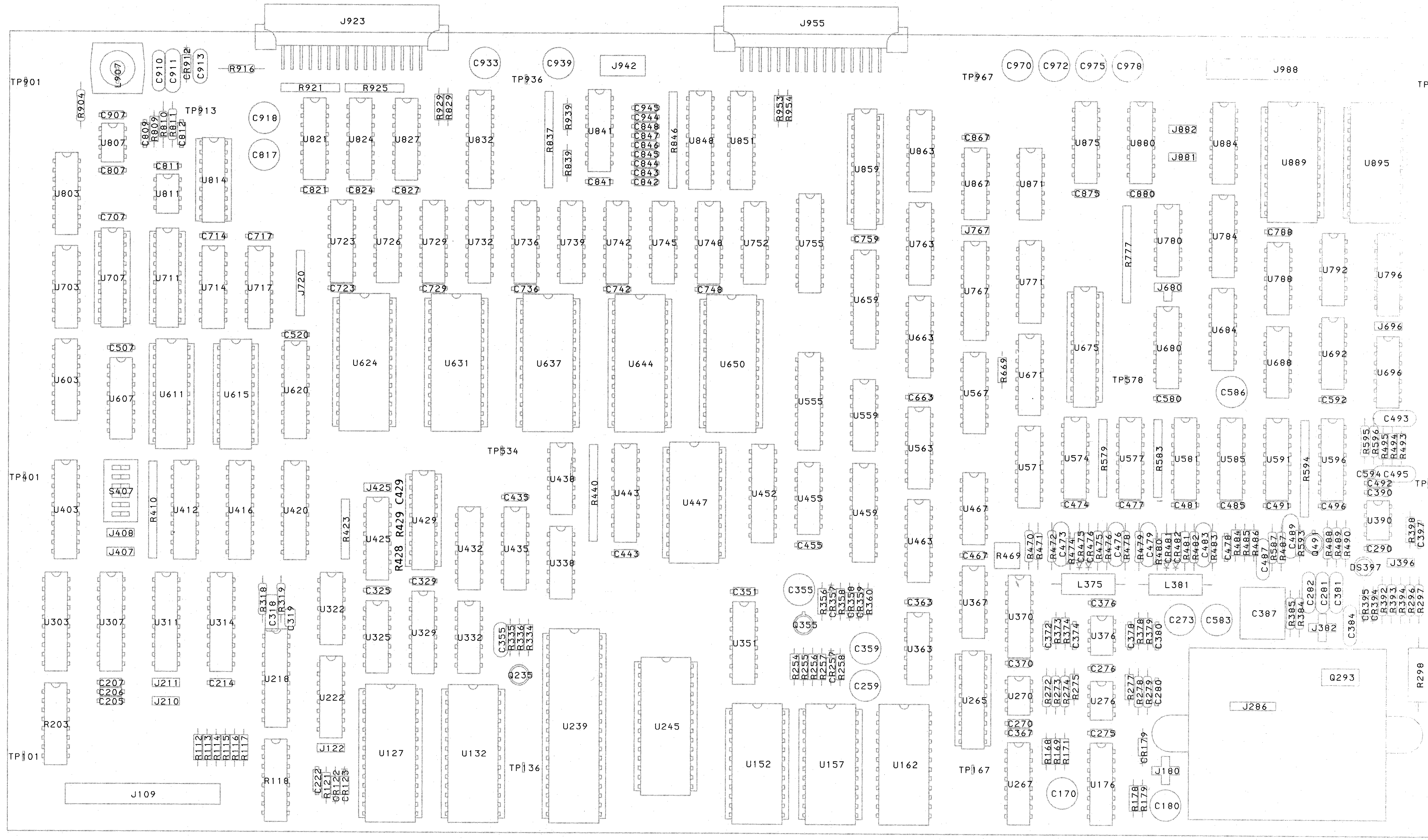
The schematic diagram and circuit board component location illustration have grids. A lookup table with the grid coordinates is provided for ease of locating the component. Only the components illustrated on the facing diagram are listed in the lookup table.

When more than one schematic diagram is used to illustrate the circuitry on a circuit board, the circuit board illustration will only appear opposite the first diagram; the lookup table will list the diagram number of other diagrams that the other circuitry appears on.



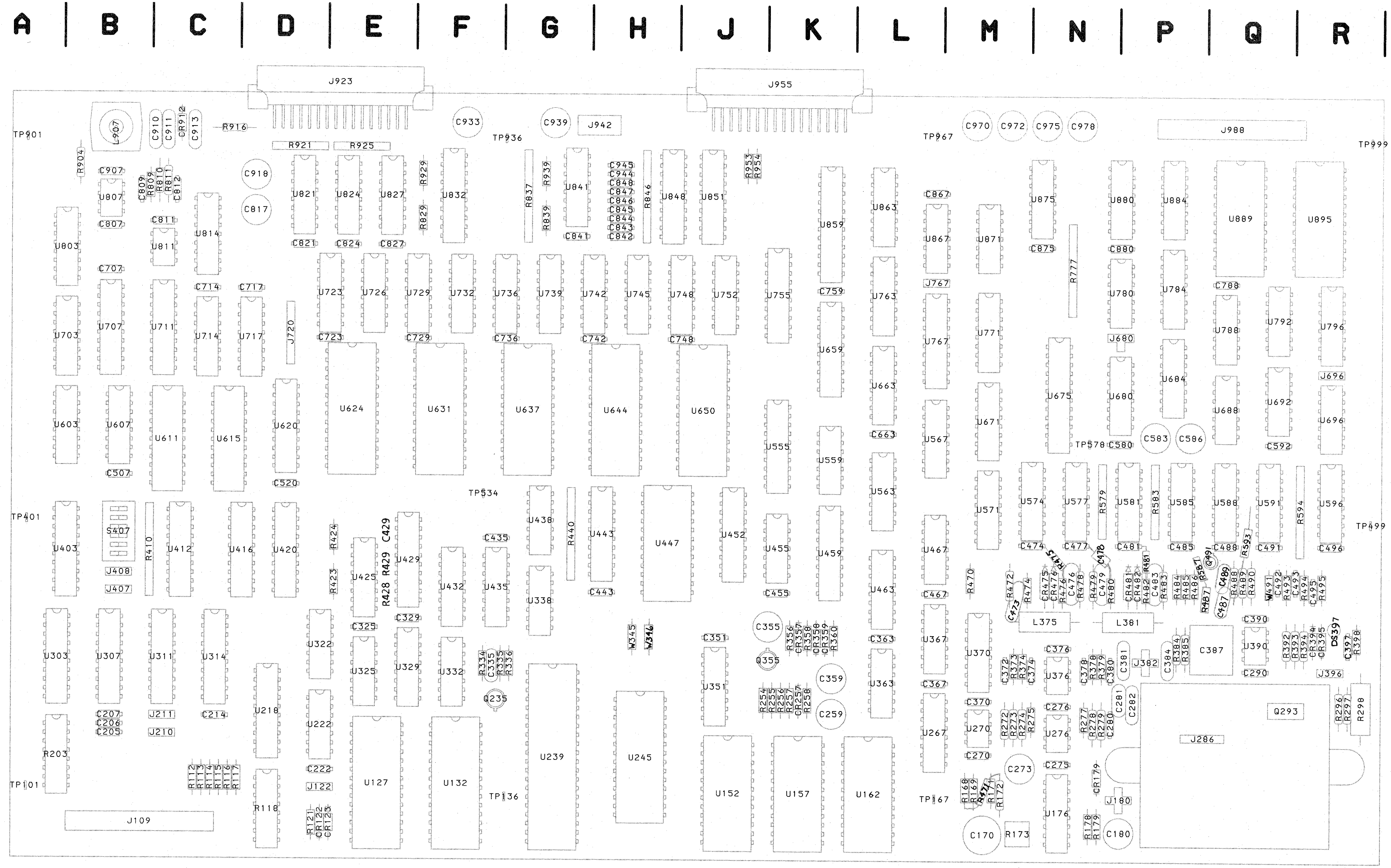


TSG-170A **BLOCK DIAGRAM**



STATIC SENSITIVE DEVICES

A2-1 DIGITAL BOARD (B020318 AND UP)



STATIC SENSITIVE DEVICES

A2-1 DIGITAL BOARD (B010000 TO B010317)

DIAGRAM 1

SCHEMATIC DIAGRAM LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location
Assembly -A2A1		R112	F3
C205	C3	R113	F3
C206	C3	R114	F3
C843	B5	R115	F3
C844	B5	R116	F3
C845	B5	R117	F3
C846	B4		
C847	B4		
C848	B4	R118	F2
C944	B5	R203	F1
C945	B5	R410	C3
		R440	E3
J109	C1	R777	E3
J109	F1	R846	C5
J210	D1		
J211	D2		
J407	C4	S407	C3
J408	D4		
J942	B4		
J955	C1	U218	F2
J955	F4	U303	F1
		U307	C1
P109	B1	U311	D1
P109	F1	U314	F3
P210	D1	U412	D3
P211	D2	U459	F5
P407	C4	U767	H5
P408	D4	U848	C4
P942	B4	U851	D4

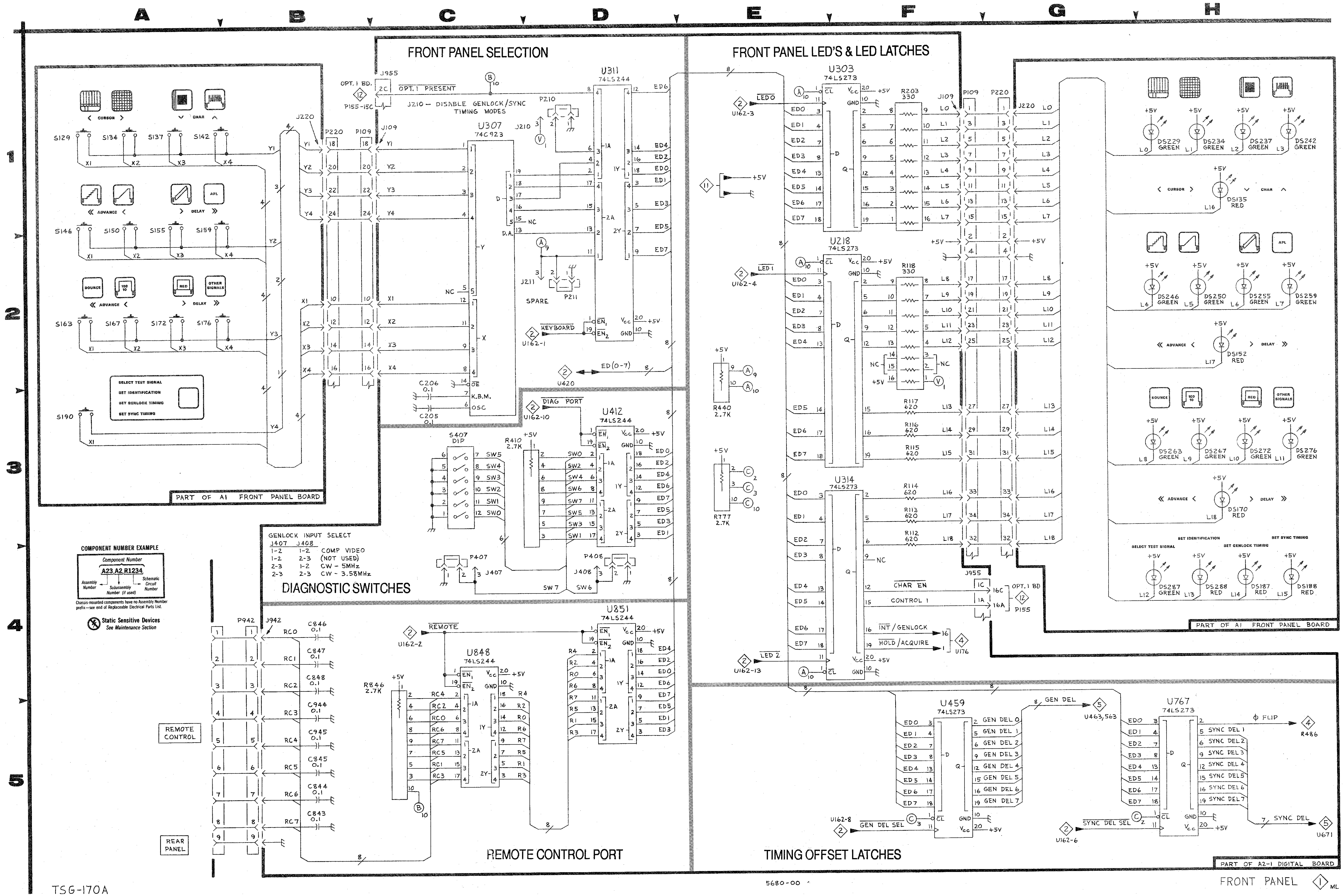

FRONT PANEL SELECTION
FRONT PANEL LED'S & LED LATCHES
DIAGNOSTIC SWITCHES
REMOTE CONTROL PORT
TIMING OFFSET LATCHES
PART OF A1 FRONT PANEL BOARD
PART OF A2-1 DIGITAL BOARD
COMPONENT NUMBER EXAMPLE
Static Sensitive Devices
See Maintenance Section
REMOTE CONTROL
REAR PANEL
TSG-170A
FRONT PANEL
5680-00

DIAGRAM 2
(B020318 AND UP)
SCHEMATIC DIAGRAM LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Schematic Circuit Number	Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location
Assembly – A2A1		R121	A4	U245	D3
C222	A4	R254	F1	U265	E1
C259	G1	R255	F1	U322D	D2
C318	B5	R256	F2	U325A	B1
C319	B4	R257	F2	U325B	B1
C335	B2	R258	G1	U329A	B1
C355	F1	R318	B5	U329B	D1
C359	G1	R319	B4	U332A	D2
C429	A4	R428	A4		
		R429	A4	U332B	B3
CR122	A2			U332D	F2
CR123	A2	R334	B4	U338B	C1
CR257	F2	R335	B2	U338C	H2
CR357	F1	R336	B2	U338D	E1
CR358	F1	R356	F1	U351	D1
CR359	F1	R358	F1	U416	G4
		R360	F1		
J122	A4	R440	A5	U420	G3
J425	B4	R837	A5	U429	B3
923	H5			U455C	G2
J955	H2	U127	E4	U620	F5
J988	A2	U132	D4	U755	F4
		U152	E3	U792A	D1
P122	A4	U157	F3	U871B	D1
P425	B4	U162	G1	U871D	E5
		U222A	B5		
Q235	B2	U222B	B4		
Q355	F1	U239	C3		

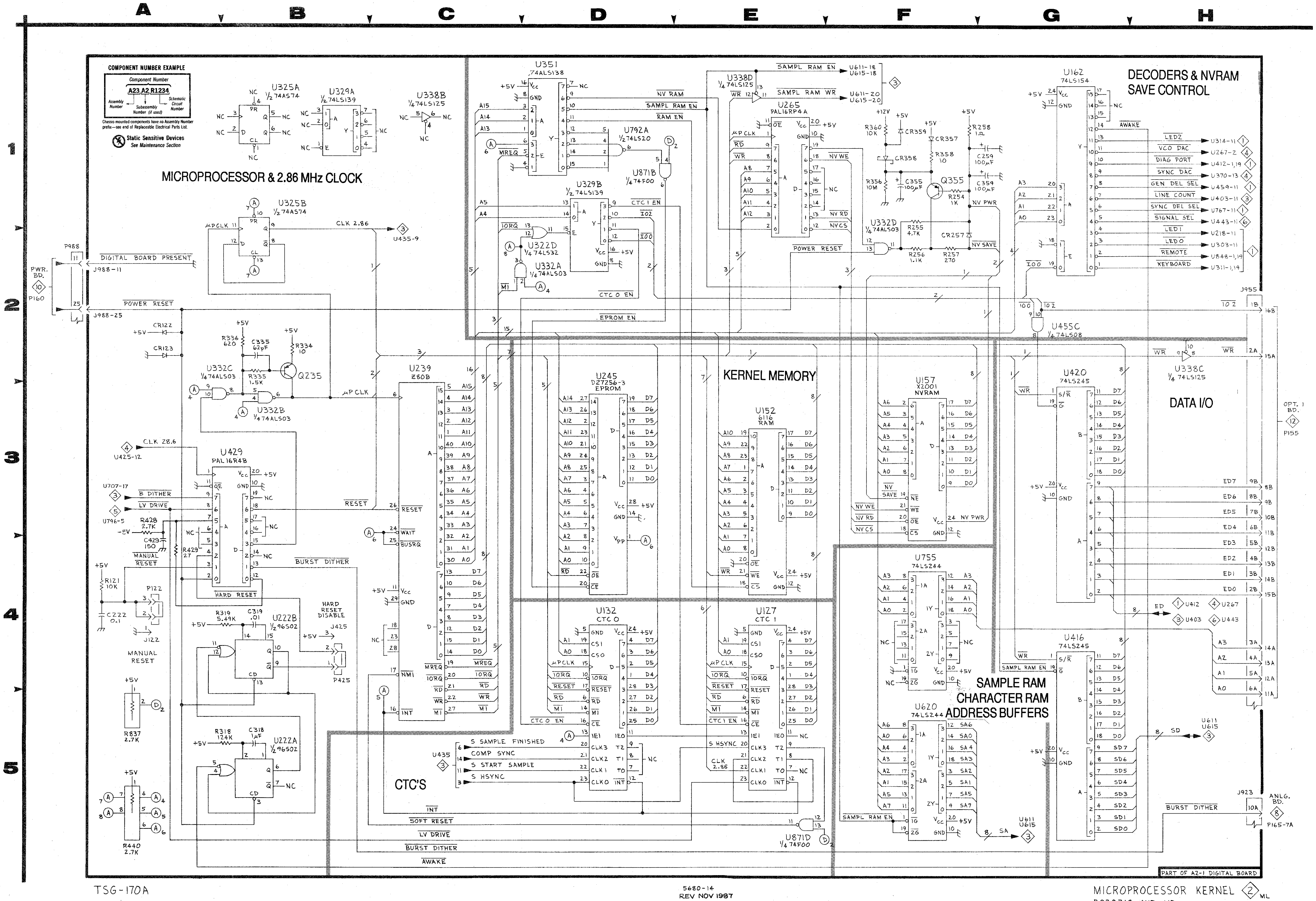
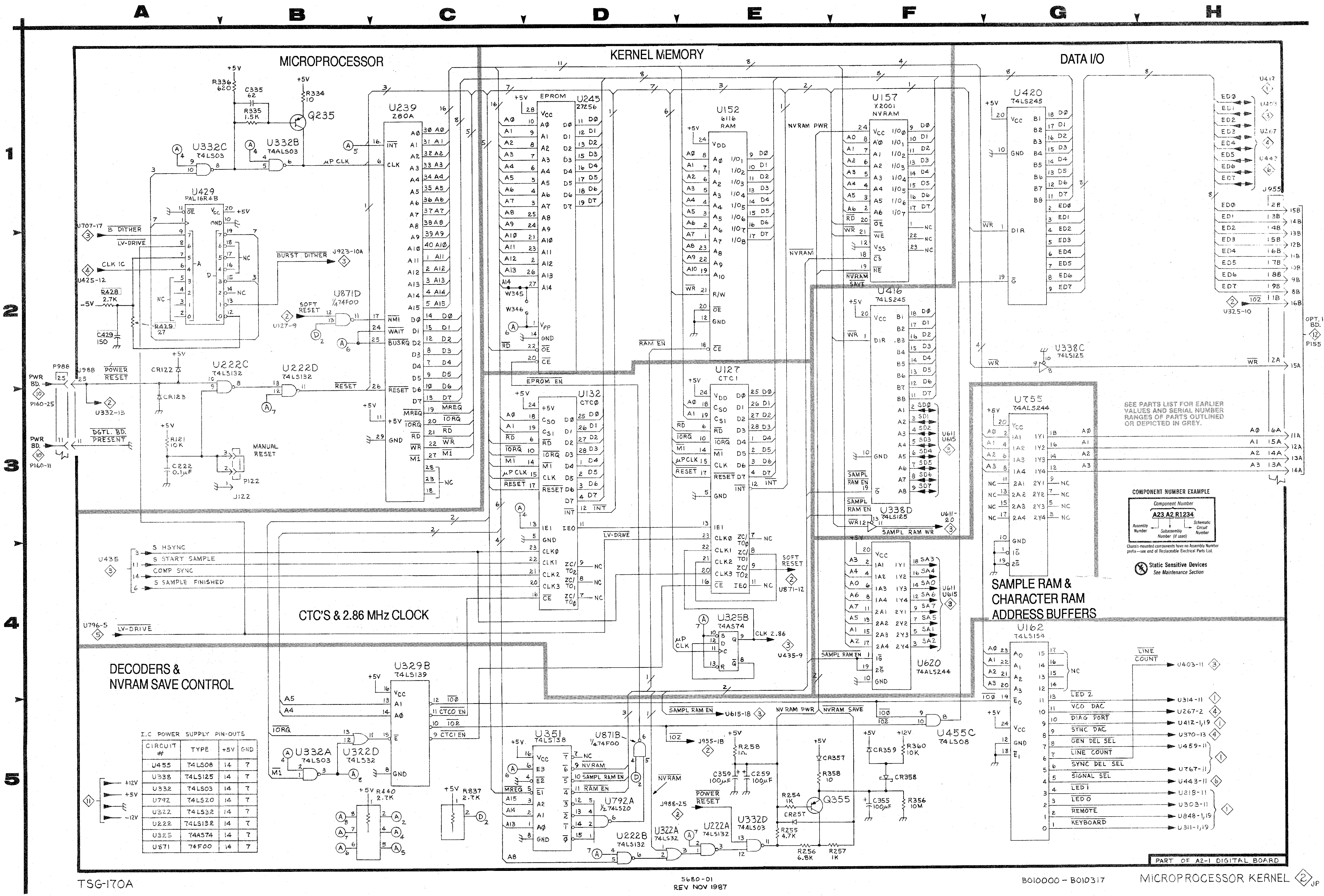

COMPONENT NUMBER EXAMPLE
Static Sensitive Devices
See Maintenance Section
MICROPROCESSOR & 2.86 MHz CLOCK
DECODERS & NVRAM
SAVE CONTROL
KERNEL MEMORY
DATA I/O
SAMPLE RAM
CHARACTER RAM
ADDRESS BUFFERS
CTC'S
PART OF A2-1 DIGITAL BOARD
TSG-170A
5680-14
REV NOV 1987
MICROPROCESSOR KERNEL
B020318 AND UP

DIAGRAM 2
(B010000 TO B010317)
SCHEMATIC DIAGRAM LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location
Assembly – A2-1		U127	E2
		U132	D3
C222	A3	U152	E1
C259	E5	U157	F1
C335	B1	U162	G4
C355	F5	U222A	E5
C359	E5	U222B	D5
C429*	A2		
		U222C	A2
CR122	A2	U222D	B2
CR123	A3	U239	C1
CR257	E5	U245	D1
CR357	E5	U322A	D5
CR358	F5	U322D	B5
CR359	F5	U325B	E4
J122	B3	U329B	C4
J955	H1	U332A	B5
J988	A2	U332B	B1
		U332C	A1
P122	B3	U332D	E5
P988	A2	U338C	G2
		U338D	F3
Q235	B1		
Q355	E5	U351	D5
		U416	F2
R121	A3	U420	G1
R254	E5	U429	A1
R255	E5	U455C	F5
R256	E5	U620	F4
R257	E5	U755	G3
R258	E5		
R334	B1	U792A	D5
		U871B	D5
R335	B1	U871D	B2
R336	B1		
R356	F5	W345	C2
R358	E5	W346	C2
R360	F5		
R428*	A2		
R429*	A2		
R440	B5		
R837	C5		

***See Parts List for serial number ranges.**



I.C POWER SUPPLY PIN-OUTS

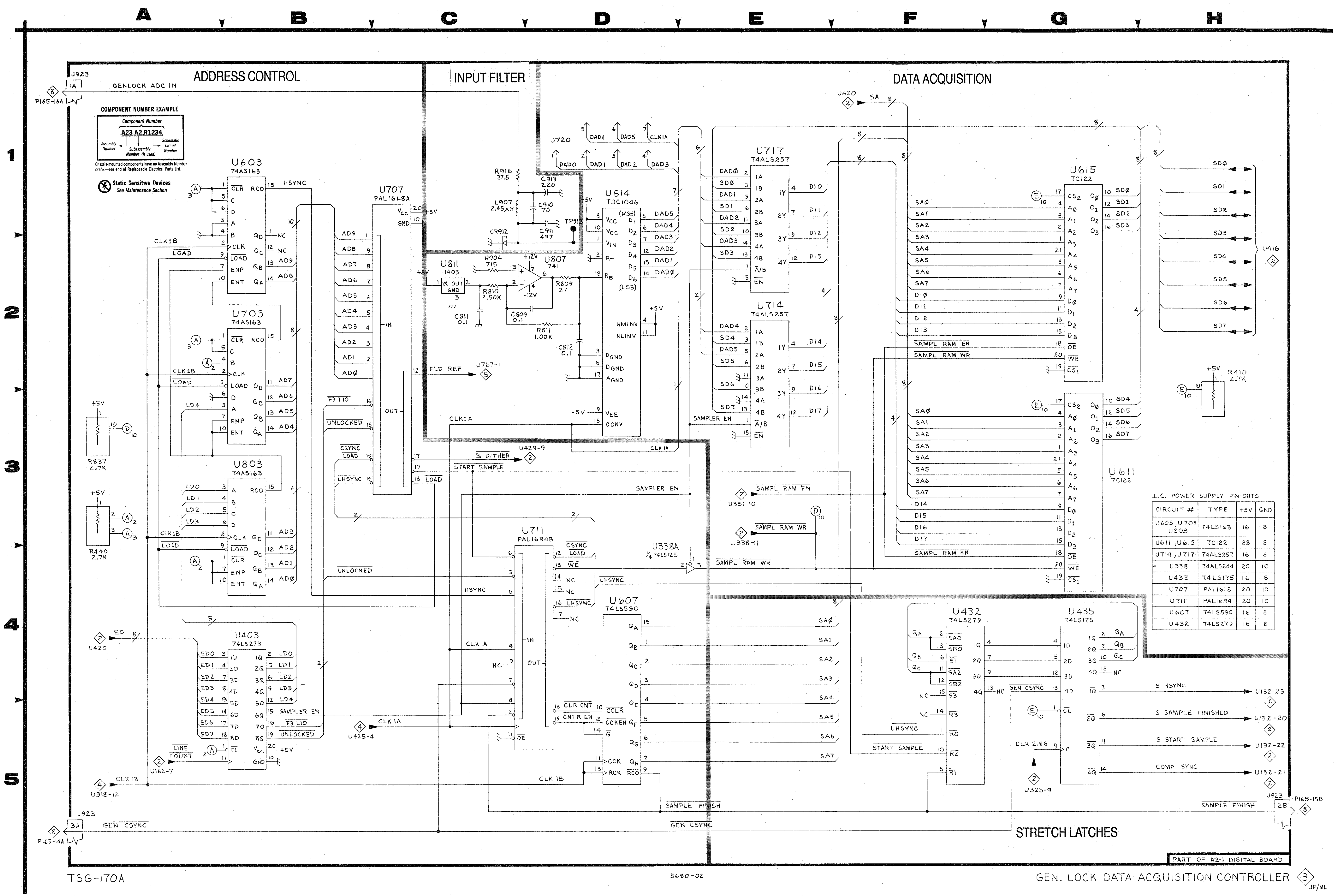
CIRCUIT #	TYPE	+5V	GND
U455	74LS08	14	7
U338	74LS125	14	7
U332	74LS03	14	7
U792	74LS20	14	7
U322	74LS132	14	7
U222	74LS132	14	7
U325	74AS74	14	7
U871	74F00	14	7

DIAGRAM 3

SCHEMATIC DIAGRAM LOOK-UP CHART

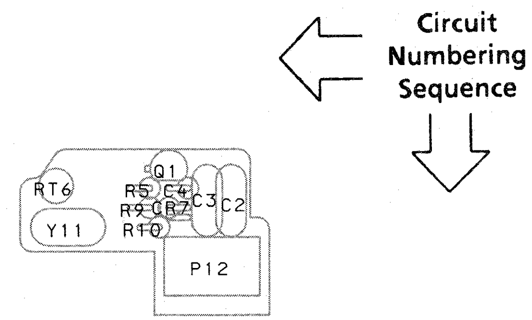
The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Schematic Circuit Number	Diagram Location	Circuit Number	Schematic Diagram Location
Assembly – A2A1		TP913	D1
C809	C2	U338A	D4
C811	C2	U403	B4
C812	D2	U432	F4
C910	D1	U435	G4
C911	D1	U603	B1
C913	D1	U607	D4
CR912	C2		
		U611	G3
J720	D1	U615	G1
J923	A1	U703	B2
J923	A5	U707	C1
		U711	D4
L907	C1	U714	E2
P720	D1		
		U717	E1
R410	H2	U803	B3
R440	A3	U807	D2
R809	D2	U811	C2
R810	C2	U814	D1
R811	D2		
R837	A3		
R904	C2		
R916	C1		



I.C. POWER SUPPLY PIN-OUTS

CIRCUIT #	TYPE	+5V	GND
U603, U703 U803	74LS163	16	8
U611, U615	7C122	22	8
U714, U717	74ALS257	16	8
U338	74ALS244	20	10
U435	74LS175	16	8
U707	PAL16L8	20	10
U711	PAL16R4	20	10
U607	74LS590	16	8
U432	74LS279	16	8

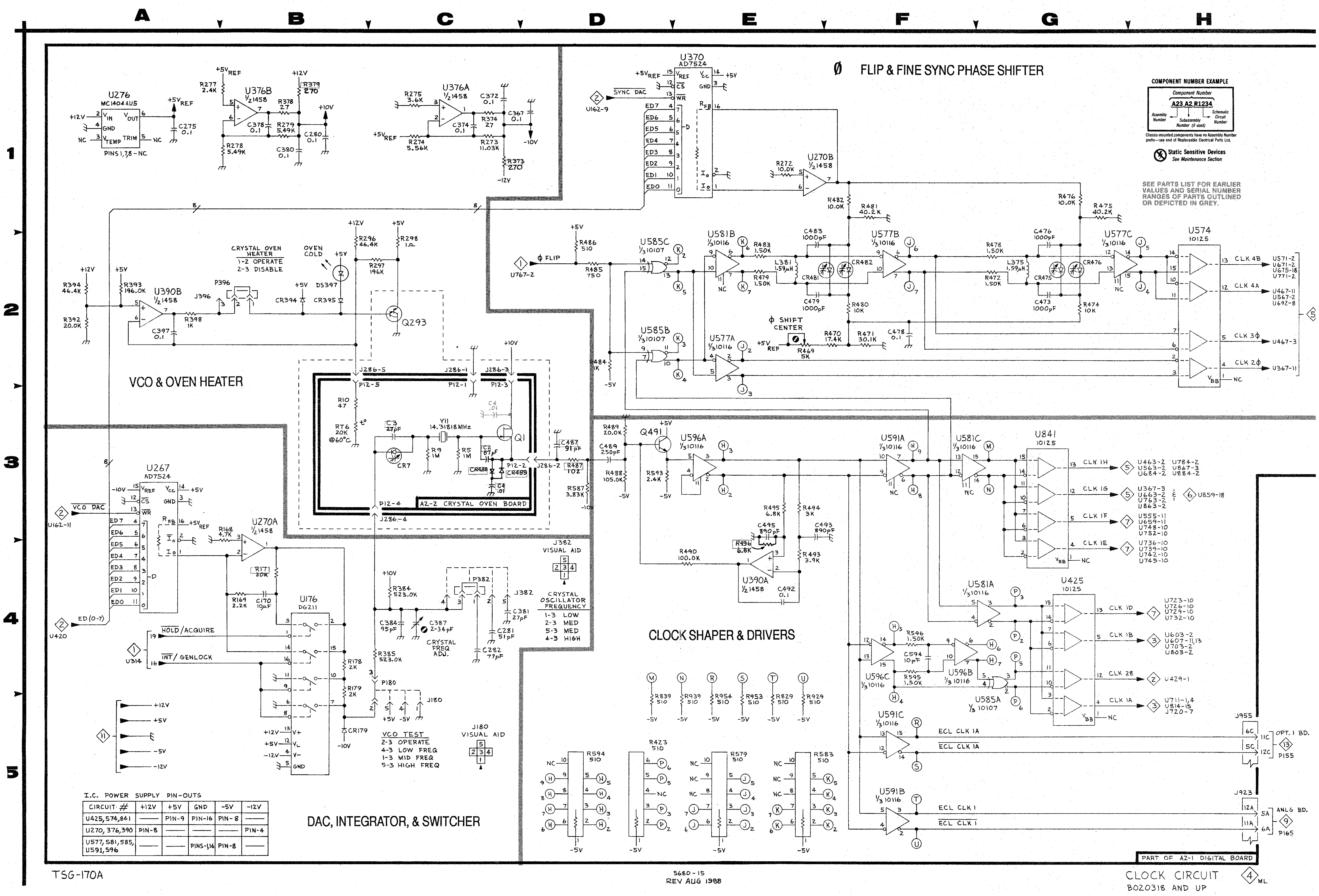


A2-2 OVEN BOARD

DIAGRAM 4
(B020318 AND UP)
SCHEMATIC DIAGRAM LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Circuit Number	Schematic Diagram Location
Assembly – A2A1	
C170	B4
C275	A1
C280	B1
C281	C4
C282	C4
C367	C1
C372	C1
C374	C1
C378	B1
C380	B1
C381	C4
C384	C4
C387	C4
C397	A2
C473	G2
C476	G2
C479	E2
C478	F2
C483	E2
C487	D3
C489	D3
C492	E4
C493	E4
C495	E4
C594	F4
C594	F4
CR179	B5
CR394	B2
CR395	B2
CR475	G2
CR476	G2
CR481	E2
CR482	F2
CR488*	C3
CR489*	C3
DS397	B2
J180	C5
J286	B2
J286	C2
J286	D3
J382	C4
J396	A2
J923	H5
J955	H5
L375	G2
L381	E2
P180	C5
P286	B2
P382	C4
P396	A2
Q293	C2
Q491	D3
R168	A4
R169	B4
R171	B4
R178	B4
R179	B5
R272	E1
R273	C1
R274	C1
R275	C1
R277	A1
R278	B1
R279	B1
R296	B2
R297	C2
R298	C2
R373	C1
R374	C1
R378	B1
R379	B1
R384	C4
R385	C4
R392	A2
R393	A2
R394	A2
R398	A2
R423	D5
R469	E2
R470	F2
R471	F2
R472	G2
R474	G2
R475	G1
R476	G1
R478	G2
R479	E2
R480	F2
R481	F1
R482	F1
R483	E2
R484	D2
R485	D2
R486	D2
R487	D3
R488	D3
R489	D3
R490	E4
R493	E4
R494	E3
R495	E3
R496*	E4
R579	E5
R583	E5
R587	D3
R593	D3
R594	D5
R595	F4
R595	F4
R596	F4
R829	E5
R839	D5
R929	E5
R939	D5
R953	E5
R954	E5
U176	B4
U267	A3
U270A	B4
U270B	E1
U276	A1
U370	E1
U376A	C1
U376B	B1
U390A	E4
U390B	A2
U425	G4
U574	H2
U577A	E2
U577B	F2
U577C	G2
U581A	G4
U581B	E2
U585A	G4
U585B	D2
U585C	D2
U591A	F3
U591B	F5
U591C	F3
U591C	F5
U596A	E3
U596B	F4
U596C	F4
U841	G3
Assembly – A2A2	
C2	C3
C3	C3
C4	C3
CR7	C3
P12	B3
P12	C3
Q1	C3
R5	C3
R9	C3
R10	B3
RT6	B3
Y11	C3



I.C. POWER SUPPLY PIN-OUTS

CIRCUIT #	+12V	+5V	GND	-5V	-12V
U425,574,841	——	PIN-9	PIN-16	PIN-8	——
U270,376,390	PIN-8	——	——	——	PIN-4
U577,581,585, U591,596	——	——	PINS-1,16	PIN-8	——

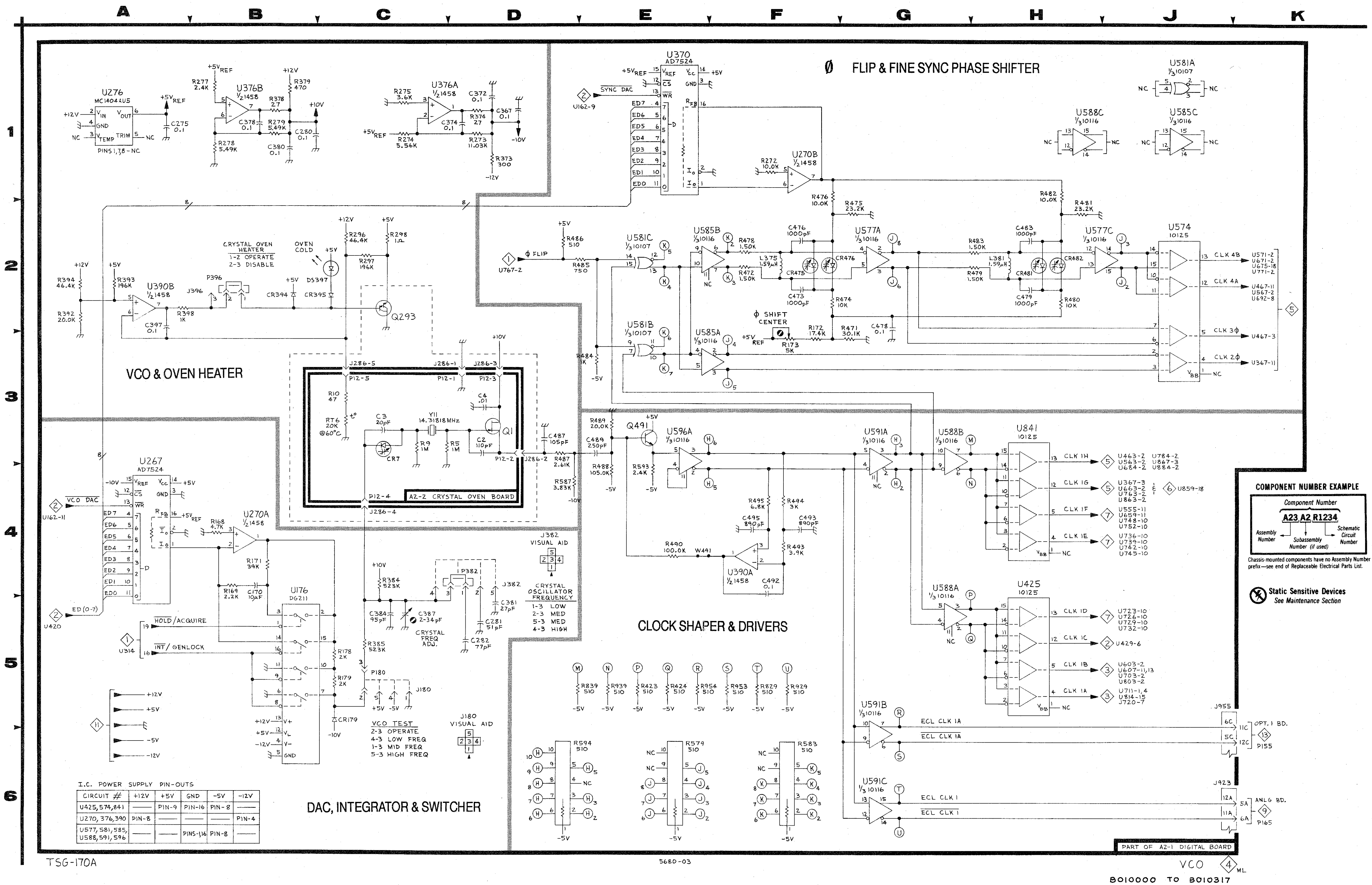
DIAGRAM 4

(B010000 TO B010317)

SCHEMATIC DIAGRAM LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Schematic Circuit Number	Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location
Assembly – A2-1		L375	F2	R423	E5	U176	B5
C170	B4	L381	H2	R424	E5	U267	A4
C275	A1	P180	C5	R471	G3	U270A	B4
C280	B1	P382	D4	R472	F2	U270B	F1
C281	D5	P396	B2	R474	F2	U276	A1
C282	D5	Q293	C2	R475	G2	U370	E1
C367	D1	Q491	E3	R476	F1	U376A	C1
C372	D1	R168	B4	R478	F2	U376B	B1
C374	D1	R169	B4	R479	H2	U390A	F4
C378	B1	R171	B4	R480	H2	U390B	A2
C380	B1	R172	F3	R481	H2	U425	H5
C381	D5	R173	F3	R482	H1	U574	J2
C384	C5	R178	C5	R483	H2	U577A	G2
C387	C5	R179	C5	R484	E3	U577C	H2
C397	A2	R272	F1	R485	E2	U581A	J1
C473	F2	R273	D1	R486	D2	U581B	E3
C476	F2	R274	C1	R487	D3	U581C	E2
C478	G2	R275	C1	R488	E4	U585A	E3
C479	H2	R277	B1	R489	E3	U585B	E2
C483	H2	R278	B1	R490	E4	U585C	J1
C487	D3	R279	B1	R493	F4	U588A	G5
C489	E3	R296	C2	R494	F4	U588B	G3
C492	F4	R297	C2	R495	F4	U588C	H1
C493	F4	R298	C2	R579	E6	U591A	G3
C495	F4	R373	D1	R583	F6	U591B	G5
CR179	C5	R374	D1	R587	D4	U591C	G6
CR394	B2	R378	B1	R593	E4	U596A	E3
CR395	C2	R379	B1	R594	D6	U841	H3
CR475	F2	R384	C4	R829	F5	W491	E4
CR476	F2	R385	C5	R839	E5		
CR481	H2	R392	A2	R929	F5		
CR482	H2	R393	A2	R939	E5		
DS397	C2	R394	A2	R953	F5		
J180	C5	R398	A2	R954	E5		
J286	C3						
J382	D4						
J396	B2						
J923	J6						
J955	J5						

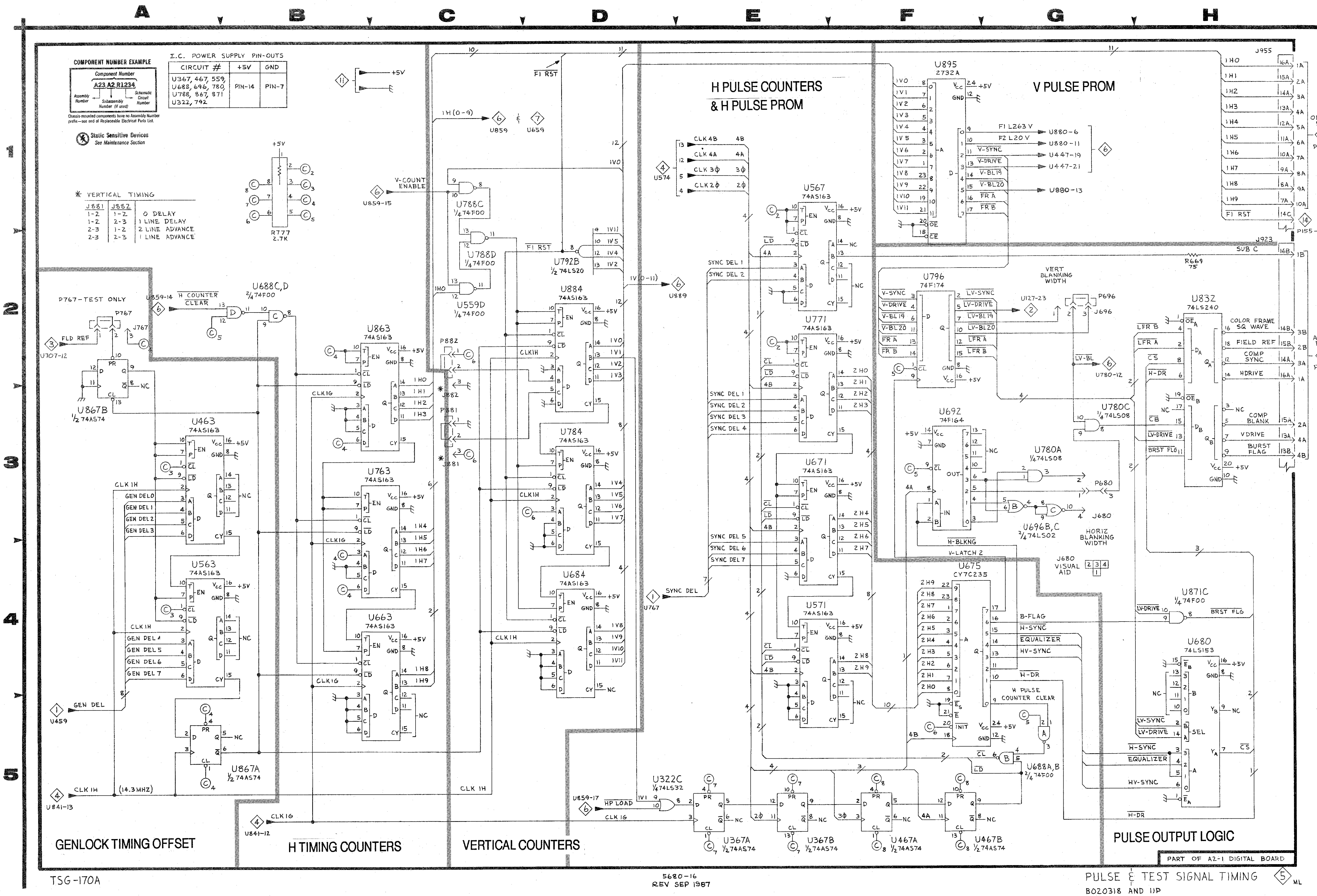


Ø FLIP & FINE SYNC PHASE SHIFTER
VCO & OVEN HEATER
CLOCK SHAPER & DRIVERS
DAC, INTEGRATOR & SWITCHER
A2-Z CRYSTAL OVEN BOARD
COMPONENT NUMBER EXAMPLE
Component Number
A23 A2 R1234
Assembly Number
Subassembly Number (if used)
Schematic Circuit Number
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.
Static Sensitive Devices
See Maintenance Section
PART OF A2-1 DIGITAL BOARD
TSG-170A
5680-03
VCO
B010000 TO B010317

DIAGRAM 5
(B020318 AND UP)
SCHEMATIC DIAGRAM LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location
Assembly – A2A1		U684	D4
J680	G3	U688A	G5
J696	F5	U688B	G5
J767	A2	U688C	B2
J881	C3	U688D	B2
J882	C2	U692	F3
J923	H2		
J955	H1	U696B	G3
		U696C	G3
P680	G3	U763	C3
P696	F5	U771	E2
P767	A2	U780A	G3
P881	C3	U780C	G3
P882	C2		
R669	H2	U784	D3
R777	B1	U788C	C1
		U788D	C2
U322C	D5	U792B	D2
U367A	E5	U796	F2
U367B	E5	U832	H2
U463	A3		
U467A	F5		
U467B	F5	U863	C2
U559D	C2	U867A	A5
		U867B	A3
U563	A4	U871C	H4
U567	E1	U884	D2
U571	E4	U895	F1
U663	C4		
U671	E3		
U675	F4		
U680	H4		



A
B
C
D
E
F
G
H
COMPONENT NUMBER EXAMPLE
I.C. POWER SUPPLY PIN-OUTS
H PULSE COUNTERS
& H PULSE PROM
V PULSE PROM
GENLOCK TIMING OFFSET
H TIMING COUNTERS
VERTICAL COUNTERS
PULSE OUTPUT LOGIC
PART OF A2-1 DIGITAL BOARD
TSG-170A
5680-16
REV SEP 1987
PULSE & TEST SIGNAL TIMING
B020318 AND UP

DIAGRAM 5
(B010000 TO B010317)
SCHEMATIC DIAGRAM LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Circuit Number	Schematic Diagram Location
Assembly – A2-1	
J680	H4
J696	H2
J767	A2
J923A & B	K2
J955	K1
P680	H4
P696	H2
P767	A2
R669	J2
R777	B2
U322C	E6
U367A	F6
U367B	F6
U463	B3
U467A	G6
U467B	G6
U559D	D3
U563	B4
U567	F2
U571	F5
U663	C5
U671	F4
U675	G4
U680	J5
U684	D4
U688A	H5
U688B	H6
U688C	B2
U688D	B2
U692	G3
U696B	H4
U696C	H4
U763	C4
U771	F3
U780A	H3
U780C	H3
U784	D3
U788C	D2
U788D	D2
U792B	D2
U796	G2
U832	J2
U863	C3
U867A	B6
U867B	A3
U871C	J5
U884	D2
U895	G1

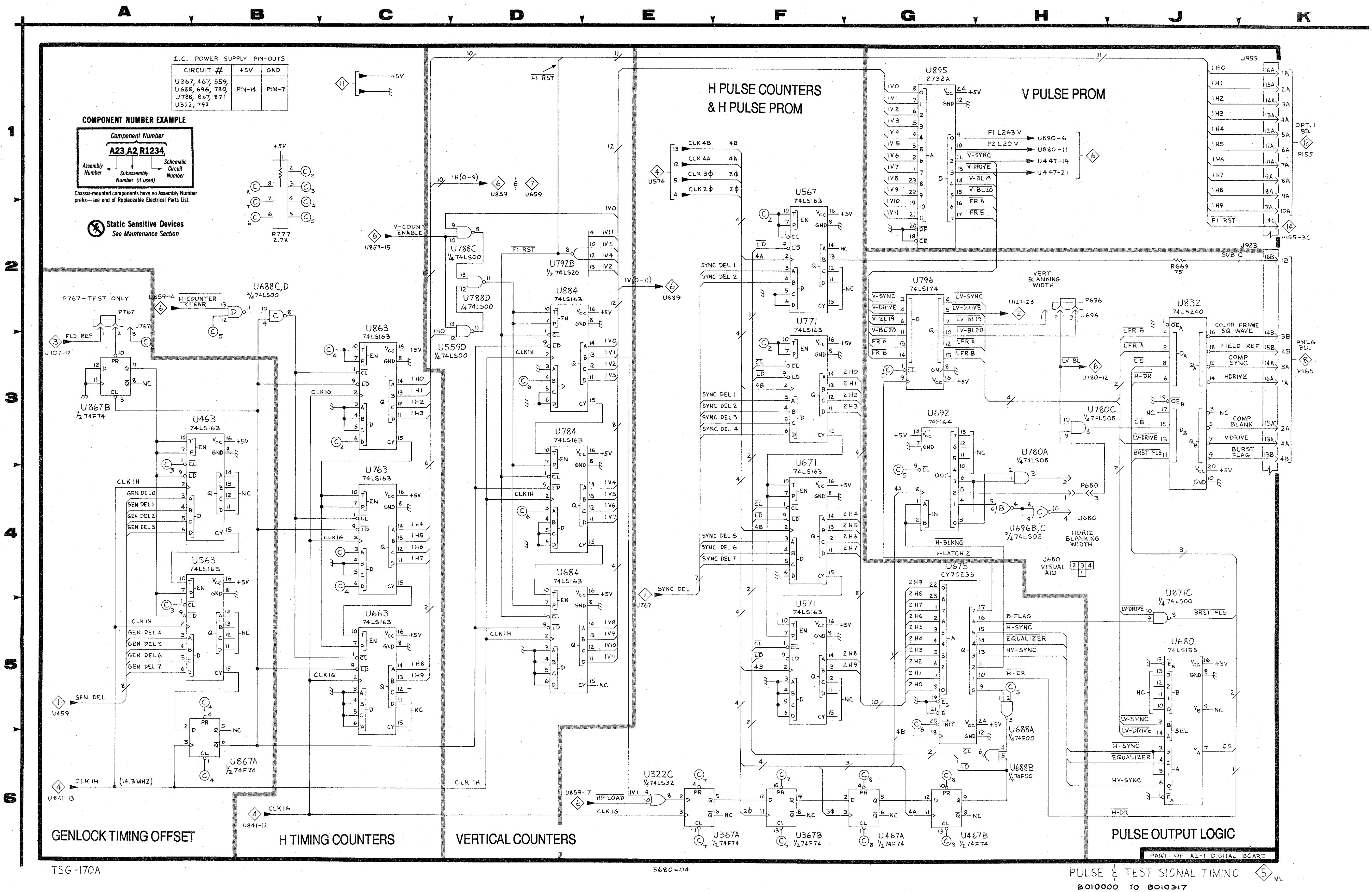
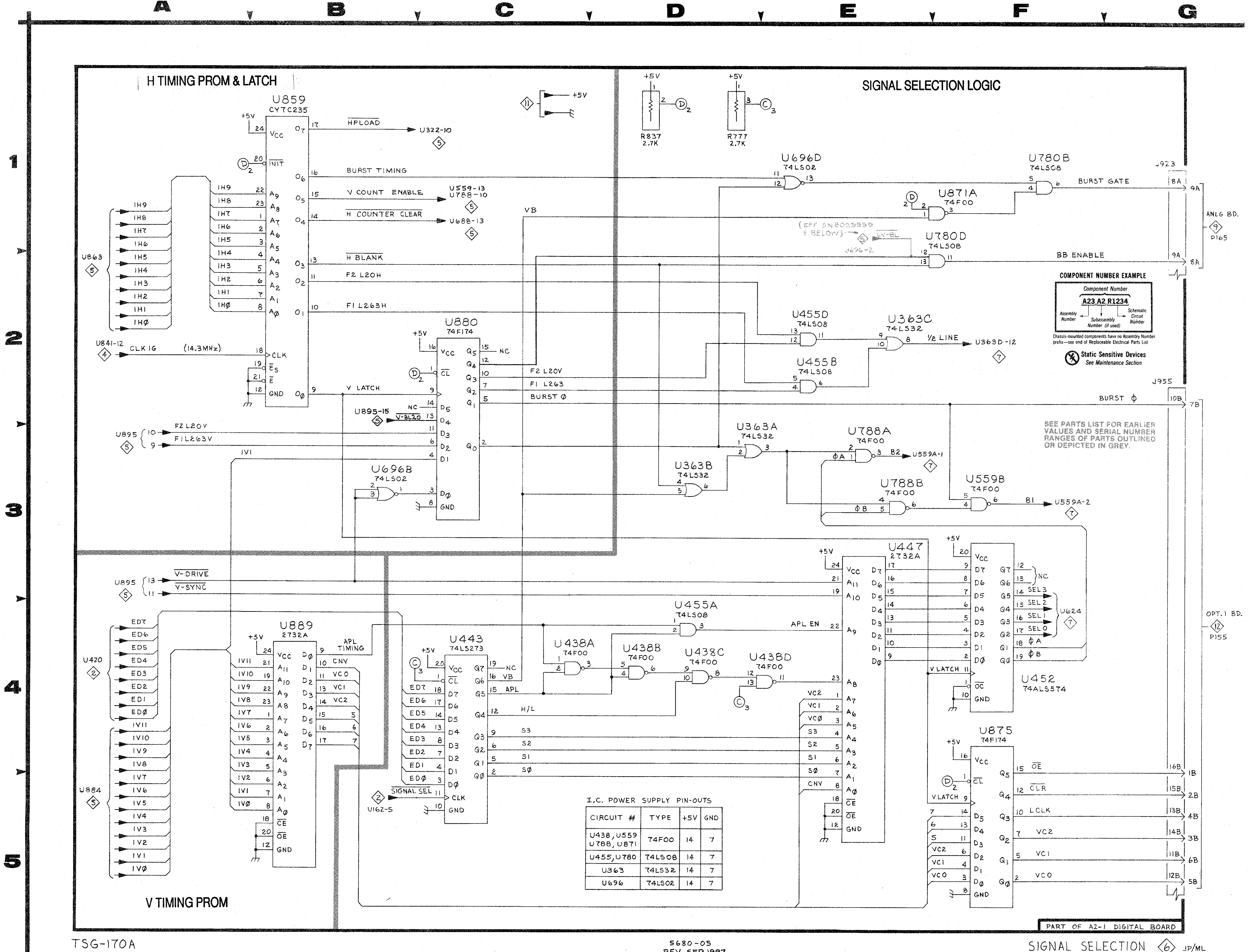

I.C. POWER SUPPLY PIN-OUTS
CIRCUIT # | +5V | GND
U367, 467, 559, U688, 696, 780, U788, 867, 871, U322, 792 | PIN-14 | PIN-7
COMPONENT NUMBER EXAMPLE
Component Number
A23 A2 R1234
Assembly Number
Subassembly Number (if used)
Schematic Circuit Number
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.
Static Sensitive Devices
See Maintenance Section
H PULSE COUNTERS
& H PULSE PROM
V PULSE PROM
GENLOCK TIMING OFFSET
H TIMING COUNTERS
VERTICAL COUNTERS
PULSE OUTPUT LOGIC
PART OF A2-1 DIGITAL BOARD
TSG-170A
5680-04
PULSE & TEST SIGNAL TIMING
B010000 TO B010317

DIAGRAM 6

SCHEMATIC DIAGRAM LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location
Assembly – A2A1		U455A	D4
		U455B	E2
J923	G1	U455D	E2
J955	G2	U559B	F3
		U696B	B3
R777	D1		
R837	D1		
		U696D	E1
U363A	D3	U780B	F1
U363B	D3	U780D	F1
U363C	E2	U788A	E3
U438A	C4	U788B	E3
U438B	D4		
U438C	D4	U859	B1
U438D	E4	U871A	F1
U443	C4	U875	F4
U447	E3	U880	C2
U452	F4	U889	B4



I.C. POWER SUPPLY PIN-OUTS

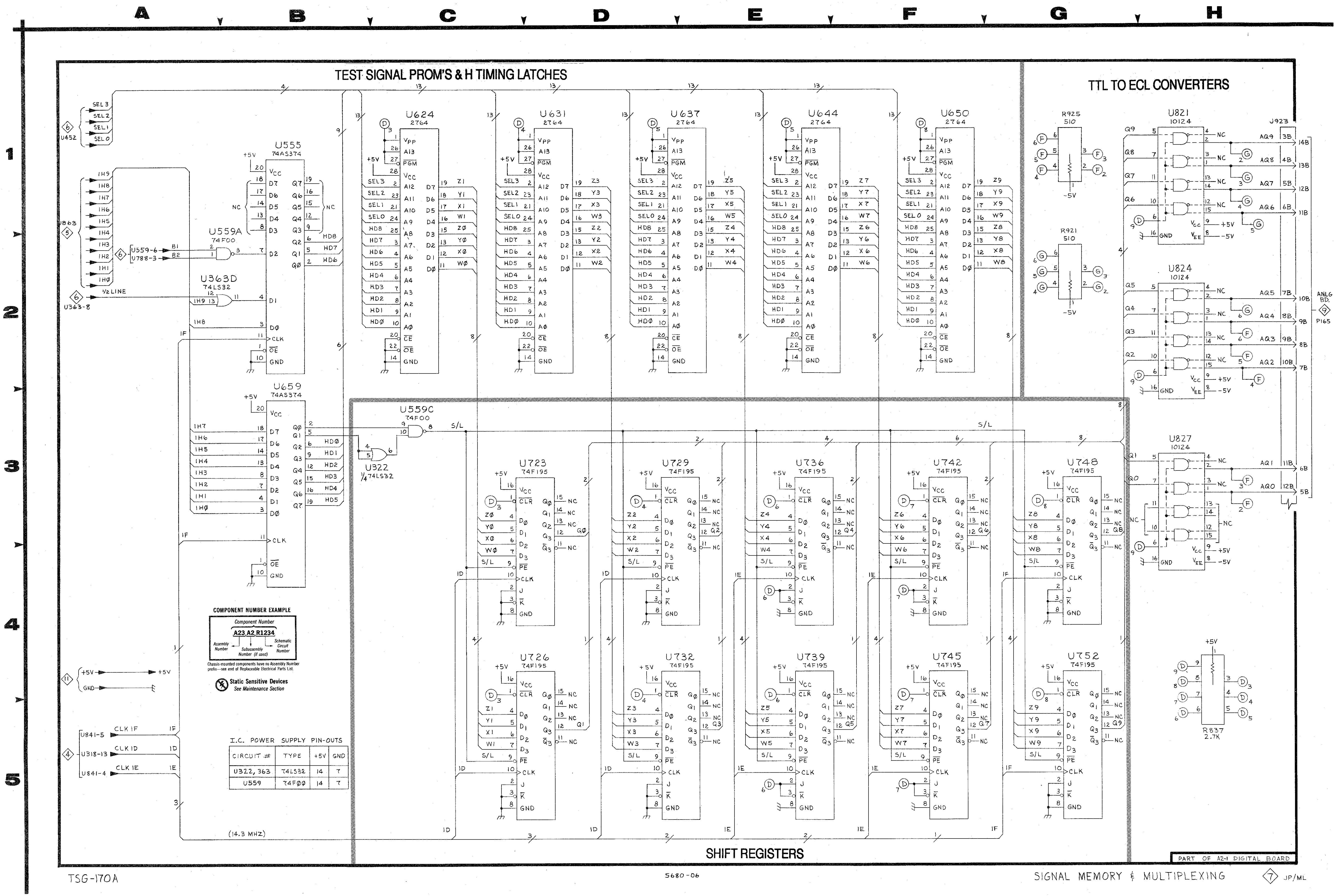
CIRCUIT #	TYPE	+5V	GND
U438, U559, U788, U871	74F00	14	7
U455, U780	74LS08	14	7
U363	74LS32	14	7
U696	74LS02	14	7

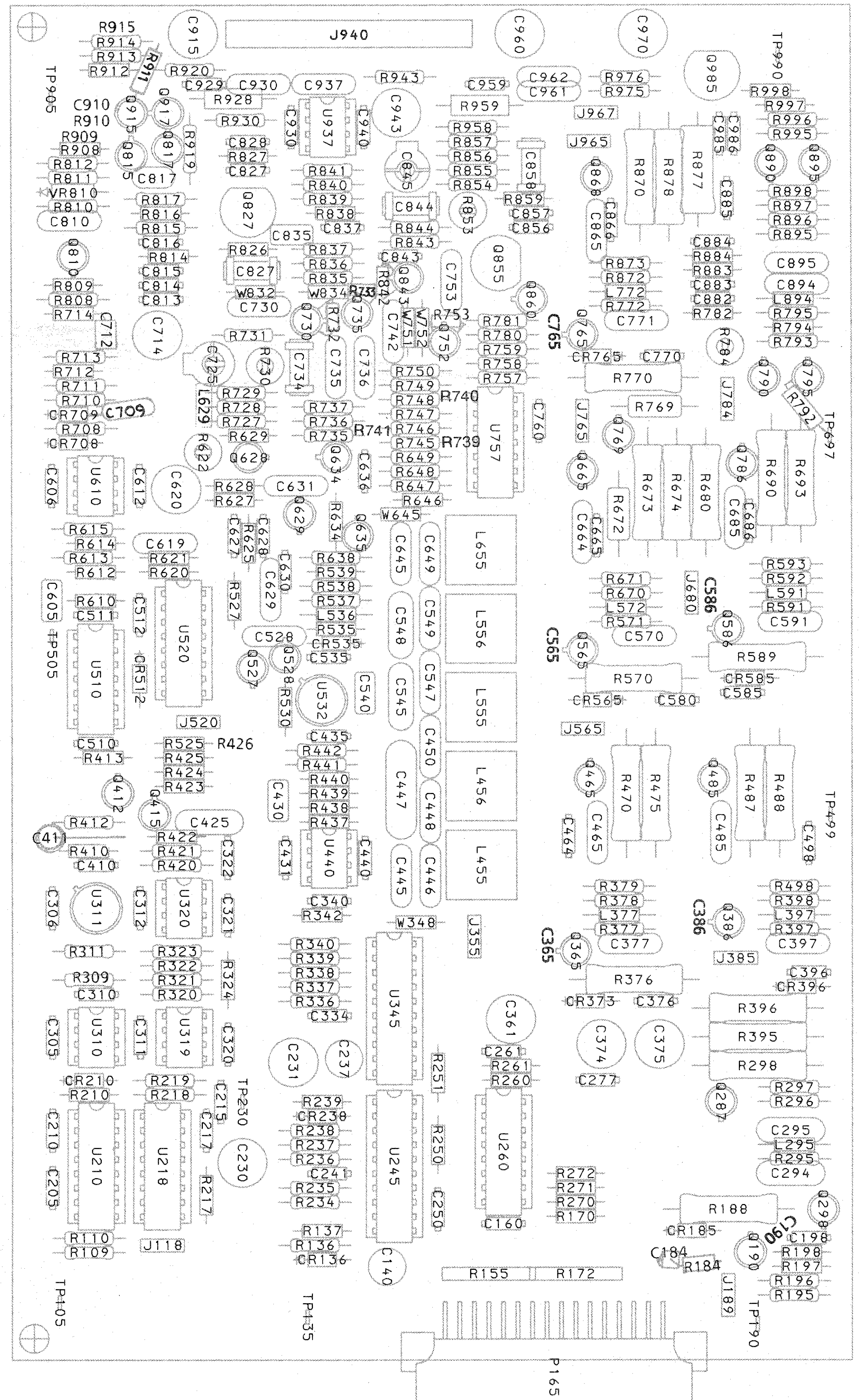
DIAGRAM 7

SCHEMATIC DIAGRAM LOOK-UP CHART

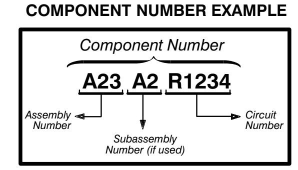
The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Schematic Circuit Number	Diagram Location	Circuit Number	Schematic Diagram Location
Assembly – A		U644	E1
		U650	F1
		U659	B3
J923	H1	U723	C3
		U726	C4
R837	H5		
R921	G2		
R925	G1	U729	D3
		U732	D4
U322B	B3	U736	E3
U363D	A2	U739	E4
U555	B1	U742	F3
U559A	A2		
U559C	C3	U748	G3
		U752	G4
U624	C1	U821	H1
U631	D1	U824	H2
U637	D1	U827	H3


TEST SIGNAL PROM'S & H TIMING LATCHES
TTL TO ECL CONVERTERS
SHIFT REGISTERS
U555 74AS374
U659 74AS374
U559A 74F00
U559C 74F00
U363D 74LS32
U322 1/4 74LS32
U624 2764
U631 2764
U637 2764
U644 2764
U650 2764
U723 74F195
U729 74F195
U736 74F195
U742 74F195
U748 74F195
U726 74F195
U732 74F195
U739 74F195
U745 74F195
U752 74F195
U821 10124
U824 10124
U827 10124
R925 510
R921 510
R837 2.7K
J923
ANLG BD. P165
COMPONENT NUMBER EXAMPLE
Static Sensitive Devices
See Maintenance Section
I.C. POWER SUPPLY PIN-OUTS
CIRCUIT # | TYPE | +5V | GND
U322, 363 | 74LS32 | 14 | 7
U559 | 74F00 | 14 | 7
(14.3 MHZ)
PART OF A2-1 DIGITAL BOARD
TSG-170A
5680-06
SIGNAL MEMORY & MULTIPLEXING
7
JP/ML



COMPONENT NUMBER EXAMPLE



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

STATIC SENSITIVE DEVICES

A3 ANALOG BOARD

DIAGRAM 8

SCHEMATIC DIAGRAM LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Assembly – A3

Circuit Number	Schematic Diagram Location
C184	B5
C190*	G5
C198	G5
C210	B4
C215	A4
C294	G5
C295	G5
C321	C5
C365*	G1
C377	G1
C386*	G3
C397	G3
C411	D2
C425	F2
C465	G1
C485	G2
C565*	G4
C586*	G2
C570	G4
C591	G2
C605	D1
C619	E1
C664	G4
C685	G2
C709	D1
C712	C2
C765*	G4
C771	G3
C810	B2
C813	B1
C814	C1
C815	C2
C816	C1
C817	C1
C865	G3
C882	D5
C883	C4
C884	E4
C885	E4
C894	D4
C895	D4
C915	B1
C961	H5
C962	H5
C985	E4
C986	E4
CR185	G5
CR210	B4
CR373	G1
CR396	G2
CR512	E1
CR565	G4

Circuit Number	Schematic Diagram Location
CR585	G2
CR708	D1
CR709	D1
CR765	G3
J118	D2
J189	C5
J385	F2
J520	D2
J565	F4
J680	H3
J765	F3
J784	H3
J908*	C3
J912*	C3
J940	J1
J940	A1
J965	H4
J967	H5
L295	G5
L377	G1
L397	G3
L572	G4
L591	G2
L772	G3
L894	C4
P118	D2
P165	A2
P165	J1
P189	C4
P385	F2
P520	D2
P565	F4
P680	H3
P765	F3
P784	H3
P940	A1
P965	H4
P967	H5
Q190	G5
Q287	H5
Q298	F5
Q365	G1
Q386	G2
Q412	F1
Q415	F2
Q465	H1
Q485	H2
Q565	G4
Q586	G2
Q665	H4
Q765	G3
Q769	H4

Circuit Number	Schematic Diagram Location
Q786	H2
Q790	D5
Q795	C5
Q810	A2
Q815	C2
Q817	C1
Q868	H3
Q890	D4
Q895	D4
Q915	B1
Q917	B1
Q985	E4
R109	D2
R110	D2
R184	C5
R185	C5
R188	G5
R195	F5
R196	F5
R197	G5
R198	F5
R210	B4
R217	A3
R218	A4
R219	A4
R295	G5
R296	G5
R297	G5
R298	H5
R309	D2
R311	E3
R320	A4
R321	C5
R322	C5
R323	C5
R324	C5
R376	G1
R377	G1
R378	G1
R379	G1
R395	H5
R396	G2
R397	G3
R398	G2
R410	E2
R412	C3
R413	F2
R420	E3
R421	E3
R423	F1
R424	F2
R425	F1
R426*	F3
R470	H1
R475	H1

Circuit Number	Schematic Diagram Location
R487	H3
R488	H2
R498	G3
R525	D1
R570	G4
R571	G4
R589	G2
R591	G2
R592	G2
R593	G2
R610	D1
R612	D1
R613	D1
R614	C1
R615	C1
R620	E2
R621	E1
R670	G4
R671	G4
R672	H4
R673	H4
R674	H4
R680	H4
R690	H2
R693	H2
R708	C1
R710	D2
R711	C2
R712	C1
R713	C1
R714	C2
R769	H4
R770	G3
R777	G3
R782	D5
R784	C5
R793	C5
R794	D5
R795	C4
R808	A2
R809	A3
R810	A2
R811	C2
R812	C2
R814	C2
R815	C1
R816	C1
R817	B1
R870	H3
R872	G3
R873	G3
R877	E4
R878	H3
R883	D4

Circuit Number	Schematic Diagram Location
R884	E4
R895	D4
R896	D5
R897	E5
R898	D5
R908	C2
R909*	C3
R910*	C3
R911	B2
R912	B1
R913	B2
R914	B3
R919	B1
R920	B1
R975	H5
R976	H5
R995	E5
R997	D4
R998	E4
TP135	E2
TP230	E1
U210	B3
U218	A3
U310A	B4
U310B	A4
U311	F2
U320A	E3
U320B	C5
U510	D1
U520A	E1
U610A	D1
U610B	D1
VR810	B2
W422	F2

***See Part List for earlier Serial number ranges.**

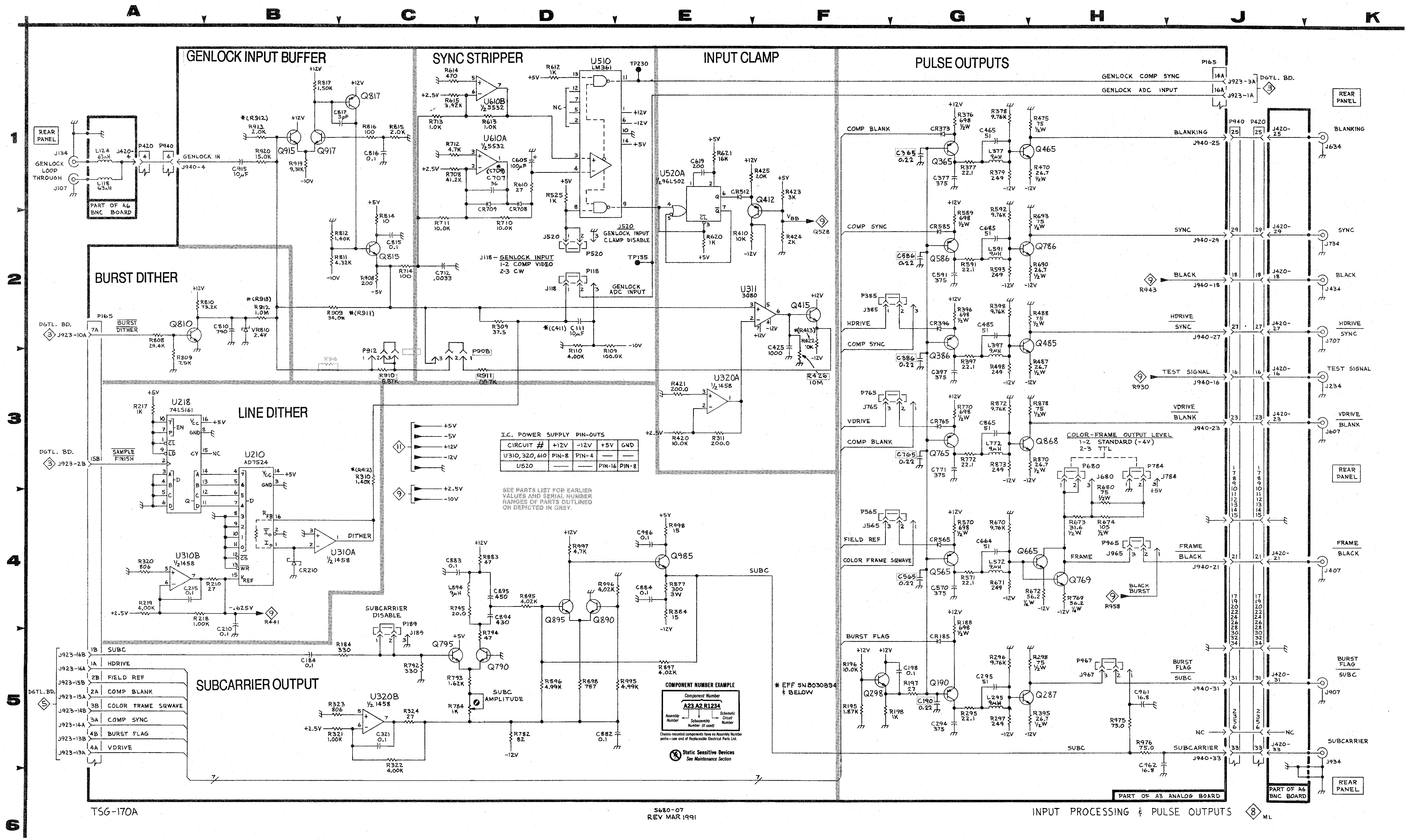

GENLOCK INPUT BUFFER
SYNC STRIPPER
INPUT CLAMP
PULSE OUTPUTS
BURST DITHER
LINE DITHER
SUBCARRIER OUTPUT
GENLOCK COMP SYNC
GENLOCK ADC INPUT
REAR PANEL
GENLOCK LOOP THROUGH
PART OF A6 BNC BOARD
PART OF A3 ANALOG BOARD
COMP BLANK
COMP SYNC
HDRIVE
VDRIVE
FIELD REF
COLOR FRAME SQWAVE
BURST FLAG
BLANKING
SYNC
BLACK
HDRIVE SYNC
TEST SIGNAL
VDRIVE BLANK
FRAME BLACK
BURST FLAG SUBC
SUBCARRIER
SUBCARRIER DISABLE
SUBC AMPLITUDE
COLOR-FRAME OUTPUT LEVEL
1-2 STANDARD (-4V)
2-3 TTL
I.C. POWER SUPPLY PIN-OUTS
SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.
COMPONENT NUMBER EXAMPLE
A23 A2 R1234
Static Sensitive Devices See Maintenance Section
* EFF SN B030894 & BELOW
TSG-170A
5680-07
REV MAR 1991
INPUT PROCESSING & PULSE OUTPUTS

DIAGRAM 9

SCHEMATIC DIAGRAM LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Assembly – A3

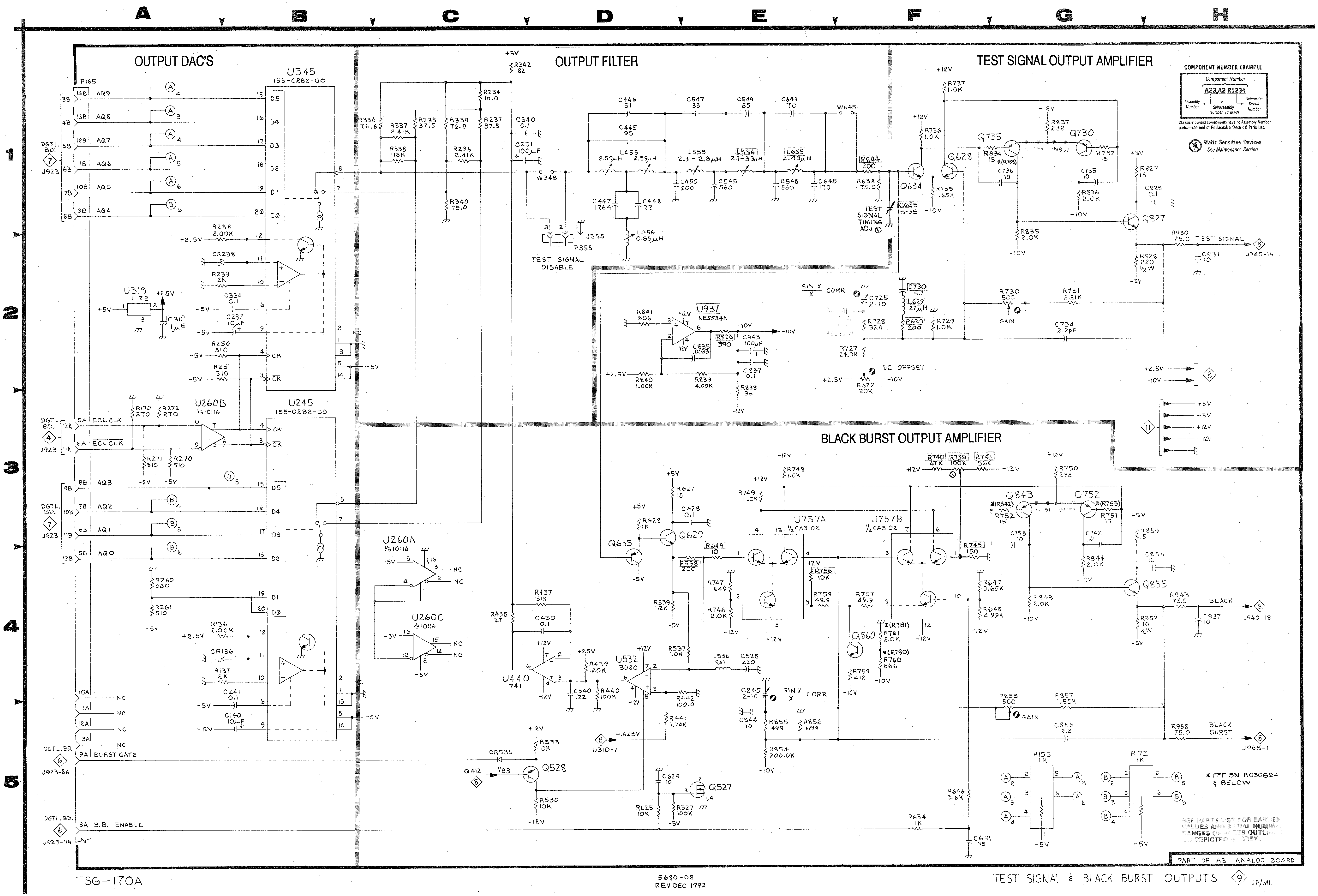
Schematic Circuit Number	Diagram Location
C140	B5
C231	C1
C237	B2
C241	B5
C311	A2
C334	B2
C340	C1
C430	D4
C445	D1
C446	D1
C447	D1
C448	D1
C450	D1
C528	E4
C540	D4
C545	E1
C547	E1
C548	E1
C549	E1
C627	E3
C628	E3
C629	D5
C630	D4
C631	F5
C635	F1
C645	E1
C649	E1
C725	F2
C730	F2
C734	G2
C735	G1
C736	G1
C742	G3
C753	G3
C826 *	F2
C827	H1
C828	H1
C835	E2
C837	E2
C844	E5
C845	E4
C856	H4
C858	G5
C929	G2
C931	H2
C937	H4
C943	E2
C959	G4

Circuit Number	Schematic Diagram Location
CR136	A4
CR238	A2
CR535	C
J355	D2
L455	D1
L456	D2
L536	E4
L555	E1
L556 *	E1
L655 *	E1
P165	A1
P355	D2
Q527	E5
Q528	D5
Q628	F1
Q629	D3
Q634	F1
Q635	D4
Q730	G1
Q735	G1
Q752	G3
Q827	H1
Q843	G3
Q855	H4
Q860	F4
R137	A4
R155	G5
R170	A3
R172	G5
R234	C1
R235	C1
R236	C1
R237	C1
R238	A2
R239	A2
R250	A2
R251	A2
R260	A4
R261	A4
R270	A3
R271	A3
R272	A3
R336	C1
R337	C1
R338	C1
R339	C1
R340	C1

Circuit Number	Schematic Diagram Location
R342	C1
R437	D4
R438	C4
R439	D4
R440	D4
R441	D5
R442	D4
R527	D5
R530	D5
R535	D5
R537	D4
R538 *	E4
R539	D4
R622	F2
R625	D5
R627	D3
R628	D3
R629	F2
R634	F5
R638	F1
R644 *	F1
R646	F5
R647	F4
R648	F4
R649 *	E4
R727	F2
R728	F2
R729	F2
R730	G2
R731	G2
R732	G1
R733	G1
R735	F1
R736	F1
R737	F1
R739 *	F3
R740 *	F3
R741 *	F3
R745 *	F4
R746	E4
R747	E4
R748	E3
R749	E3
R750	G3
R753	G3
R756 *	E4
R757	F4
R758	E4
R759	F4
R780	F4
R781	F4

Circuit Number	Schematic Diagram Location
R826	E2
R827	H1
R835	G1
R836	G1
R837	G1
R838	E2
R839	E2
R840	D2
R841	D2
R842	G3
R843	G4
R844	G4
R853	G5
R854	E5
R855	E5
R856	E5
R857	G5
R859	H3
R928	G2
R930	H2
R943	H4
R958	H5
R959	G4
U245	B3
U260A	C4
U260B	A3
U260C	C4
U319	A2
U345	B1
U440	C4
U532	D4
U757A	E3
U757B	F3
U937	E2
W348	D1
W645	F1
W751 *	G3
W752 *	G3
W832	G1
W834	G1

***See Parts List for serial number ranges.**



OUTPUT DAC'S
OUTPUT FILTER
TEST SIGNAL OUTPUT AMPLIFIER
BLACK BURST OUTPUT AMPLIFIER
COMPONENT NUMBER EXAMPLE
Static Sensitive Devices
See Maintenance Section
TEST SIGNAL DISABLE
TEST SIGNAL
BLACK
BLACK BURST
BURST GATE
B.B. ENABLE
*EFF SN B030894 & BELOW
SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.
PART OF A3 ANALOG BOARD
TSG–170A
5680-08
REV DEC 1992
TEST SIGNAL & BLACK BURST OUTPUTS 9

DIAGRAM 10

(B040000 & UP)

SCHEMATIC DIAGRAM LOOK-UP CHART

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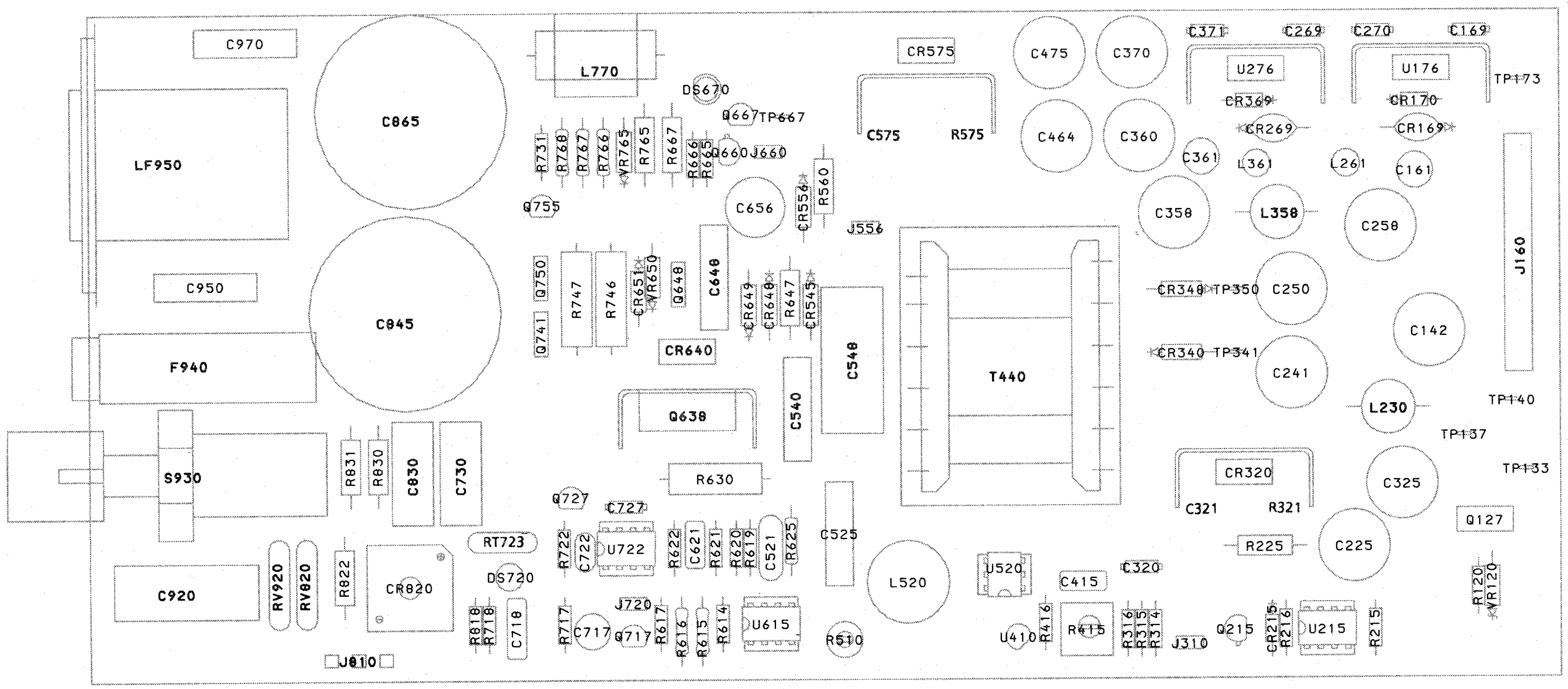


Static Sensitive Devices
See Maintenance Section

A4 POWER SUPPLY BOARD
(SN B040000 AND ABOVE)

Circuit Number	Schematic Diagram Location
Assembly – A4	
B100	H2
C142	F4
C161	F3
C169	G3
C225	F4
C241	F3
C250	F3
C253	G4
C269	G3
C270	F3
C320	C4
C321 *	E4
C325	F4
C358	G4
C360	F4
C361	F3
C370	F3
C415	D5
C469	F4
C475	F4
C521	D4
C525	E4
C540	E4
C548	D3
C575 *	E4
C621	B4
C830	D1
C845	D1
C648	D4
C656	D2
C865	D1
C717	A4
C718	D1
C722	B3
C727	B3
C730	D1
C920	B1
CR169	G3
CR170	G2
CR215	G4
CR269	G3
CR320	E4
CR340	F3
CR348	E3
CR369	G3
CR545	E4
CR556	D2
CR575	F4
CR640	D4
CR648	D4
CR649	D4
CR651	C4
CR820	C1

Circuit Number	Schematic Diagram Location
DS670	C2
DS720	D1
F940	B1
J160	H3
J310	H2
J556	E3
J660	D2
J720	B4
J810	C2
L230	F4
L258	G4
L261	F3
L361	F3
L520	E3
L770	D1
LF950	A1
P310	H2
P556	E3
P720	B4
P810	C1
Q127	G4
Q215	G4
Q638	E4
Q648	D3
Q660	C3
Q667	C2
Q717	B4
Q727	B3
Q741	C4
Q755	B2
R120	G4
R215	G4
R216	G4
R225	F4
R314	D5
R315	D5
R316	D5
R321 *	E4
R415	D5
R416	D5
R510	A4
R560	C2
R575 *	F4
R614	A4
R615	A4
R616	A4
R617	B4
R619	B4
R620	B5
R621	C4

Circuit Number	Schematic Diagram Location
R622	B4
R625	D4
R630	D4
R647	E4
R665	C2
R666	C3
R667	C2
R717	A4
R718	D1
R722	B3
R731	A3
R746	C4
R747	C4
R765	A2
R766	B2
R767	B2
R768	B2
R818	D1
R822	B1
R830	C1
R831	C1
RT723	C1
RV820	C1
RV920	C1
S930A	B1
S930B	B1
T440	E3
TP133	G1
TP137	F4
TP140	G4
TP173	G1
TP340	F3
TP350	F3
TP667	D2
U176	G3
U215	G4
U276	G3
U410	D5
U520	C4
U615A	A4
U615B	A3
U722	B4
VR120	G4
VR650	D3
VR765	A2

*See Parts List for serial number ranges.

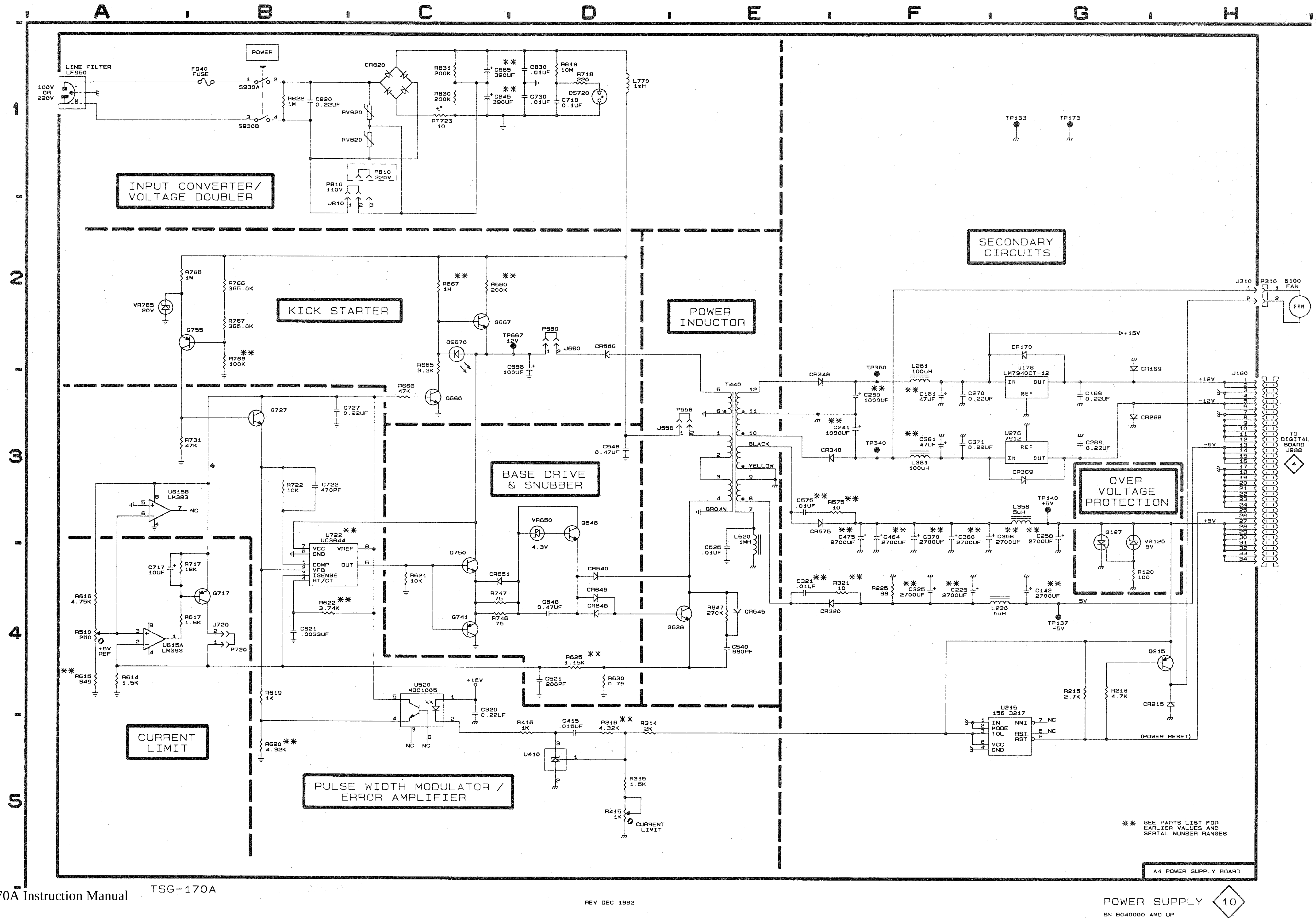
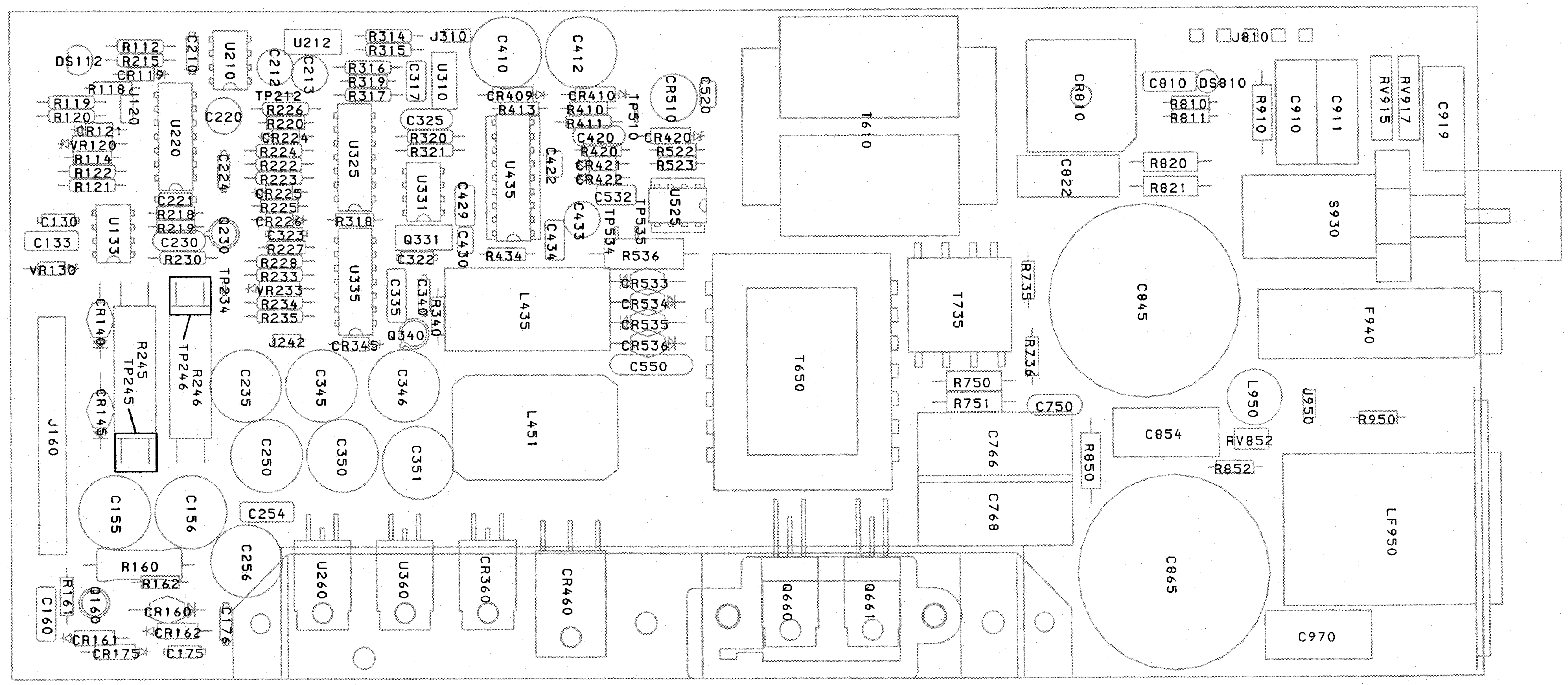

INPUT CONVERTER/ VOLTAGE DOUBLER
KICK STARTER
POWER INDUCTOR
SECONDARY CIRCUITS
BASE DRIVE & SNUBBER
OVER VOLTAGE PROTECTION
CURRENT LIMIT
PULSE WIDTH MODULATOR / ERROR AMPLIFIER
TO DIGITAL BOARD J988
** SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES
A4 POWER SUPPLY BOARD
TSG-170A
REV DEC 1992
POWER SUPPLY
10
SN B040000 AND UP

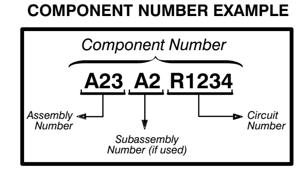
DIAGRAM 10
(SN B039999 & BELOW)
SCHEMATIC DIAGRAM LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.



A4 POWER SUPPLY BOARD (SNB010889 TO SNB039999)

COMPONENT NUMBER EXAMPLE



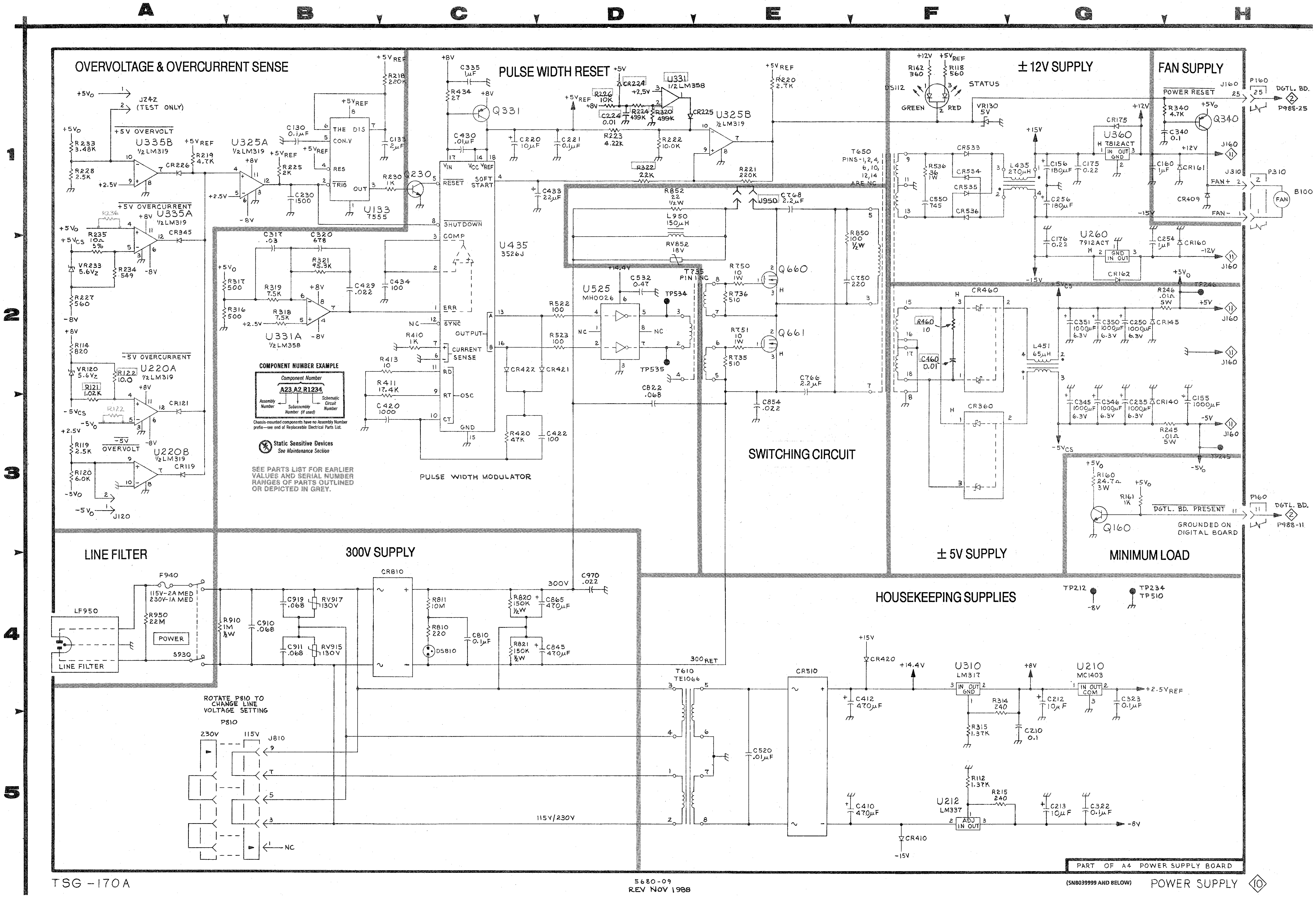
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

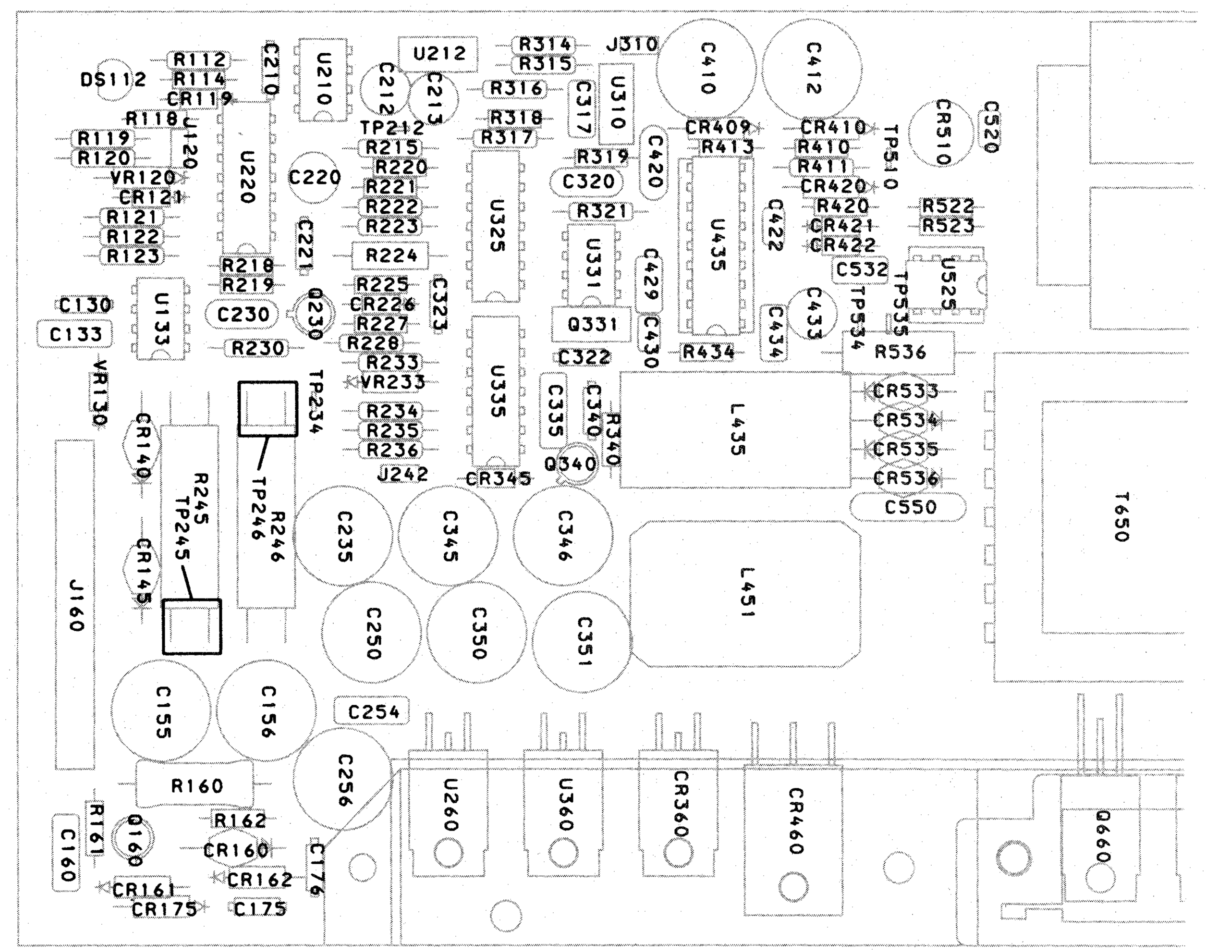
STATIC SENSITIVE DEVICES

Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location
Assembly – A4		CR162	G2	R219	A1	TP245	H3
		CR175	G1	R220	E1	TP246	H2
C130	B1	CR224 *	D1	R221	E1	TP510	G4
C133	C1	CR225 *	D1	R222	D1	TP534	D2
C155	H2	CR226	A1	R223	D1	TP535	D2
C156	G1	CR345	A1	R224 *	D1		
C160	G1	CR360	F3	R226 *	D1	U133	B1
C175	G1	CR409	H1	R225	B1	U210	G4
C176	G1	CR410	F5	R227	A2	U212	F5
C210	G5	CR420	F4	R228	A1	U220B	A3
C212	G4	CR421	D2	R230	C1	U260	G1
C213	G5	CR422	C2	R233	A1	U310	F4
C220	C1	CR460	F2	R234	A2	U325A	B1
C221	D1	CR510	E4	R235	A1	U325B	E1
C224 *	D1	CR533	F1	R236 *	A1	U331A	B2
C230	B1	CR534	F1	R245	G3	U335A	A1
C235	G2	CR535	F1	R246	G2	U335B	A1
C250	G2	CR536	F1	R314	F4	U360	G1
C254	G1	CR810	C4	R315	F5	U435	C2
C256	G1			R316	A2	U525	D2
C317	B1	DS112	F1	R317	A2		
C320	B1	DS810	C4	R318	B2	VR120	A2
C322	G5			R319	B2	VR130	F1
C323	G4	F940	A4	R320 *	D1	VR233	A2
C335	C1			R321	B2		
C340	H1	J120	A3	R322 *	D1	W950	E1
C345	G2	J160	H1	R340	H1		
C346	G2	J242	A1	R410	C2		
C350	G2	J310	H1	R411	B2		
C351	G2	J810	B5	R413	B2		
C410	E5	J950 *	D1	R420	C3		
C412	E4			R434	C1		
C420	B3	L435	G1	R460 *	F2		
C422	D3	L451	G2	R522	D2		
C429	B2	L950	D1	R523	D2		
C430	C1			R536	F1		
C433	C1	LF950	A4	R735	E2		
C434	C2			R736	E2		
C460 *	F2	P160	H3	R750	E2		
C520	E5	P810	A5	R751	E2		
C532	D2			R810	C4		
C550	F1	Q160	G3	R811	C4		
C750	E2	Q230	C1	R820	C4		
C766	E2	Q331	C1	R821	C4		
C768	E1	Q340	H1	R850	E1		
C810	C4	Q660	E2	R852	D1		
C822	D2	Q661	E2	R910	A4		
C845	D4			R950	A4		
C854	E2	R112	F5				
C865	D4	R114	A2	RV852	D2		
C910	B4	R118	F1	RV915	B4		
C911	B4	R119	A3	RV917	B4		
C919	B4	R120	A3				
C970	D4	R121 *	A2	S930	A4		
		R122 *	A2				
CR119	A3	R123 *	A3	T610	D4		
CR121	A3	R160	G3	T650	F1		
CR140	G2	R161	G3	T735	D2		
CR145	G2	R162	F1				
CR160	H1	R215	F5	TP212	G4		
CR161	H1	R218	C1	TP234	G4		

*See Parts List for serial number ranges.

REV FEB 1990


OVERVOLTAGE & OVERCURRENT SENSE
PULSE WIDTH RESET
± 12V SUPPLY
FAN SUPPLY
PULSE WIDTH MODULATOR
COMPONENT NUMBER EXAMPLE
Static Sensitive Devices
See Maintenance Section
SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.
SWITCHING CIRCUIT
LINE FILTER
300V SUPPLY
± 5V SUPPLY
MINIMUM LOAD
HOUSEKEEPING SUPPLIES
ROTATE P810 TO CHANGE LINE VOLTAGE SETTING
PART OF A4 POWER SUPPLY BOARD
TSG-170A
5680-09
REV NOV 1988
(SN B039999 AND BELOW)
POWER SUPPLY



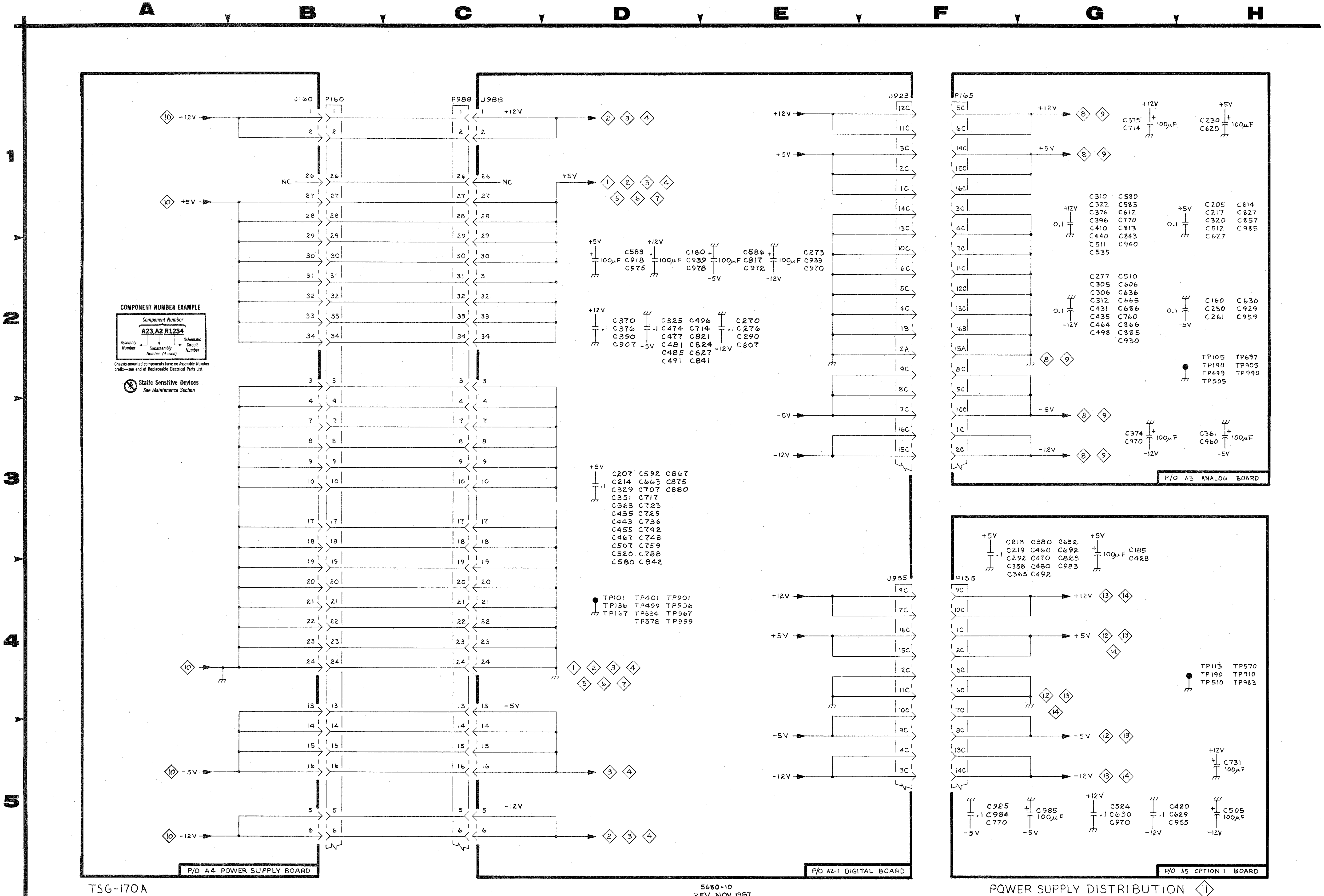
A4 POWER SUPPLY BOARD (SN B010888 & BELOW)

DIAGRAM 11

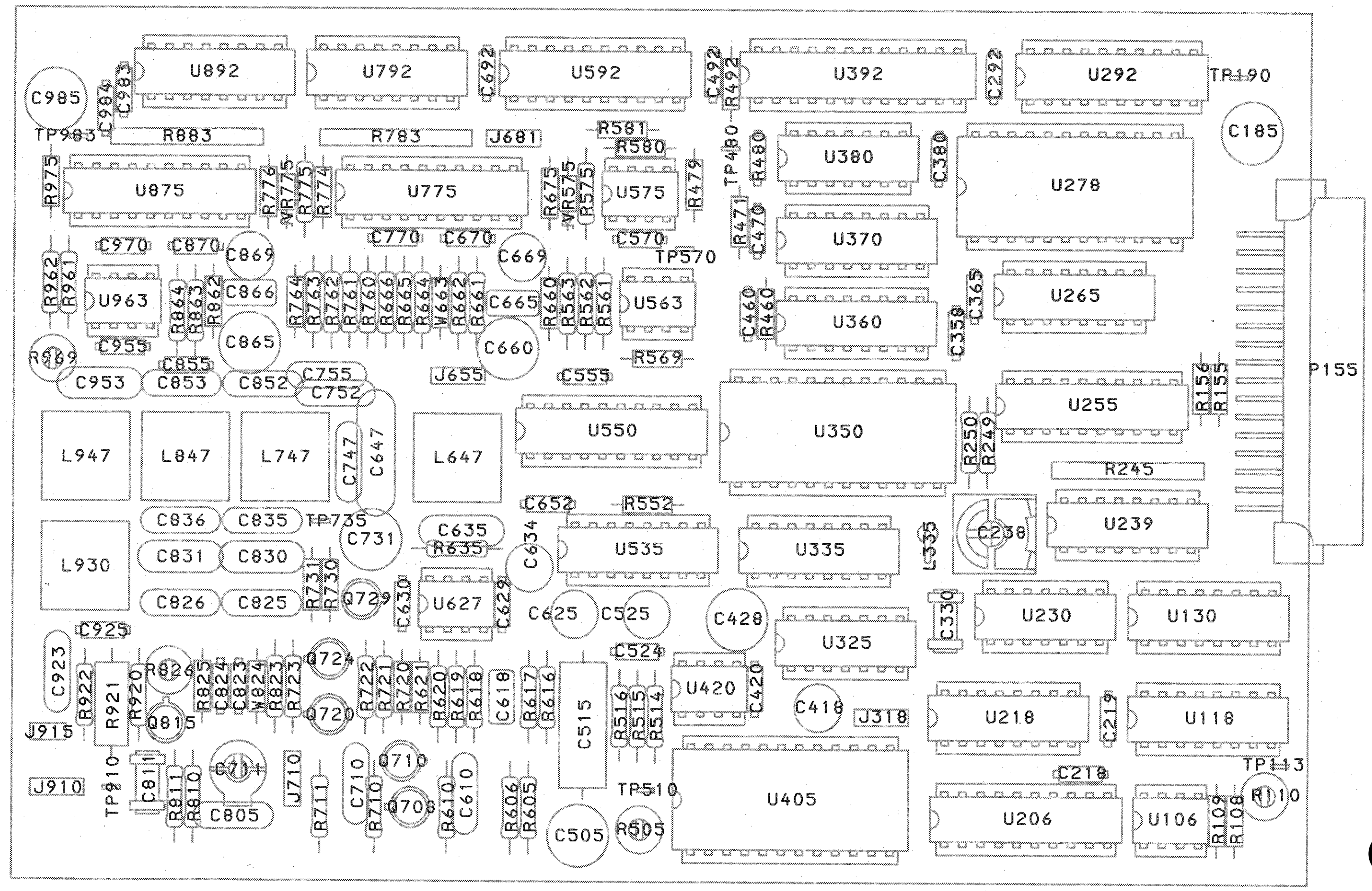
SCHEMATIC DIAGRAM LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Circuit Number	Schematic Diagram Location
Assembly – A2A1	
C180	D2
C207	D3
C214	D3
C270	E2
C273	E2
C273	E2
C276	E2
C290	E2
C325	D2
C329	D3
C351	D3
C363	D3
C370	D2
C376	D2
C390	D2
C435	D3
C443	D3
C455	D3
C467	D3
C474	D2
C477	D2
C481	D2
C485	D2
C491	D2
C496	D2
C507	D3
C520	D3
C580	D3
C583	D2
C586	E2
C592	D3
C663	D3
C707	D3
C714	D2
C717	D3
C723	D3
C729	D3
C736	D3
C742	D3
C748	D3
C759	D3
C788	D3
C807	E2
C817	E2
C821	D2
C824	D2
C827	D2
C841	D2
C842	D3
C867	D3
C875	D3
C880	D3
C907	D2
C918	D2
C933	E2
C939	D2
C970	E2
C972	E2
C975	D2
C978	D2
J923	F1
J955	F4
J988	C1
P988	C1
TP101	D4
TP136	D4
TP167	D4
TP401	D4
TP499	D4
TP534	D4
TP578	D4
TP901	D4
TP936	D4
TP967	D4
TP999	D4
Assembly – A3	
C160	H2
C205	H1
C217	H1
C230	H1
C250	H2
C261	H2
C277	G2
C305	G2
C306	G2
C310	G1
C312	G2
C320	H1
C322	G1
C361	H3
C374	G3
C375	G1
C376	G1
C396	G1
C410	G1
C431	G2
C435	G2
C435	G2
C435	G2
C435	G2
C435	G2
C440	G1
C464	G2
C498	G2
C510	G2
C511	G2
C512	H1
C535	G2
C580	G1
C585	G1
C606	G2
C612	G1
C620	H1
C627	H1
C630	H2
C636	G2
C665	G2
C686	G2
C714	G1
C760	G2
C770	G1
C813	G1
C814	H1
C827	H1
C843	G1
C857	H1
C866	G2
C885	G2
C929	H2
C930	G2
C940	G2
C959	H2
C960	H3
C970	G3
C985	H1
P165	F1
TP105	H2
TP190	H2
TP499	H2
TP505	H2
TP697	H2
TP905	H2
TP990	H2
Assembly – A5	
C185	G3
C218	F3
C219	F3
C292	F3
C358	F4
C365	F4
C380	G3
C420	G3
C428	G3
C460	G3
C470	G3
C480	G4
C492	G4
C505	H5
C524	G5
C629	G3
C630	G3
C652	G3
C692	G3
C731	H5
C770	F5
C823	G3
C925	F5
C955	G5
C970	G3
C983	G4
C984	F5
C985	G5
P155	F4
TP113	H4
TP190	H4
TP510	H4
TP570	H4
TP910	H4
TP983	H4

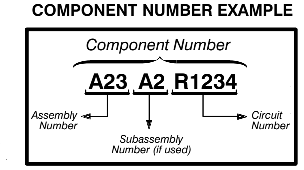


COMPONENT NUMBER EXAMPLE
Static Sensitive Devices
See Maintenance Section
P/O A4 POWER SUPPLY BOARD
P/O A2-1 DIGITAL BOARD
P/O A3 ANALOG BOARD
P/O A5 OPTION 1 BOARD
TSG-170A
5680-10
REV NOV 1987
POWER SUPPLY DISTRIBUTION



A5 OPTION 1 BOARD

COMPONENT NUMBER EXAMPLE



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

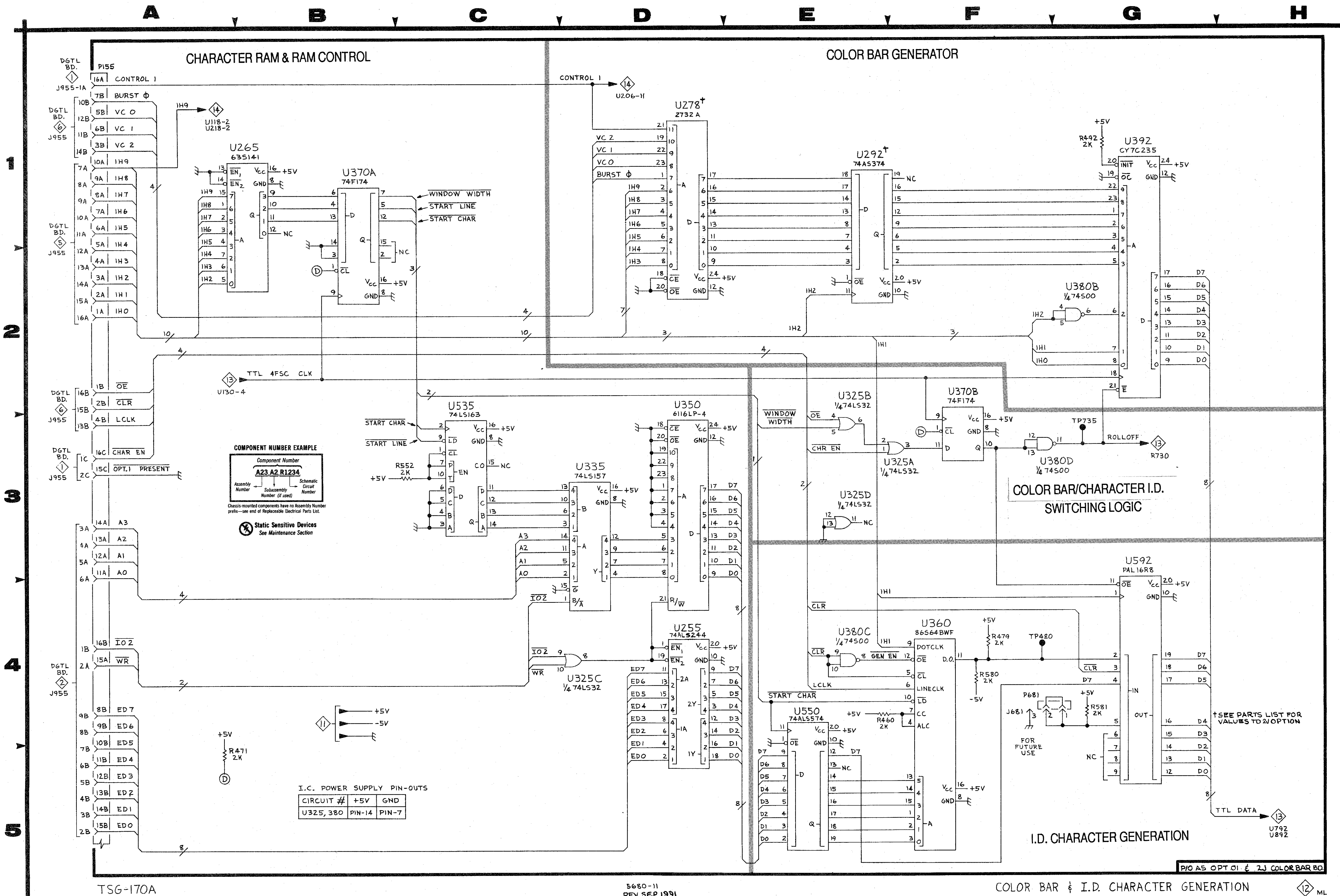
STATIC SENSITIVE DEVICES

DIAGRAM 12

SCHEMATIC DIAGRAM LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location
Assembly – A5		U278	D1
		U292	E1
J681	F4	U325A	F3
		U325B	E3
P155	A1	U325C	D4
P681	F4	U325D	E3
R460	E4	U335	D3
R471	A5	U350	D3
R479	F4	U360	F4
R492	G1	U370A	B1
R552	C3	U370D	F3
R580	F4	U380B	G2
R581	G4		
		U380C	E4
TP480	F4	U380D	F3
TP735	G3	U392	G1
		U535	C3
U255	D4	U550	E4
U265	B1	U592	G4



CIRCUIT #	+5V	GND
U325, 380	PIN-14	PIN-7

DIAGRAM 13

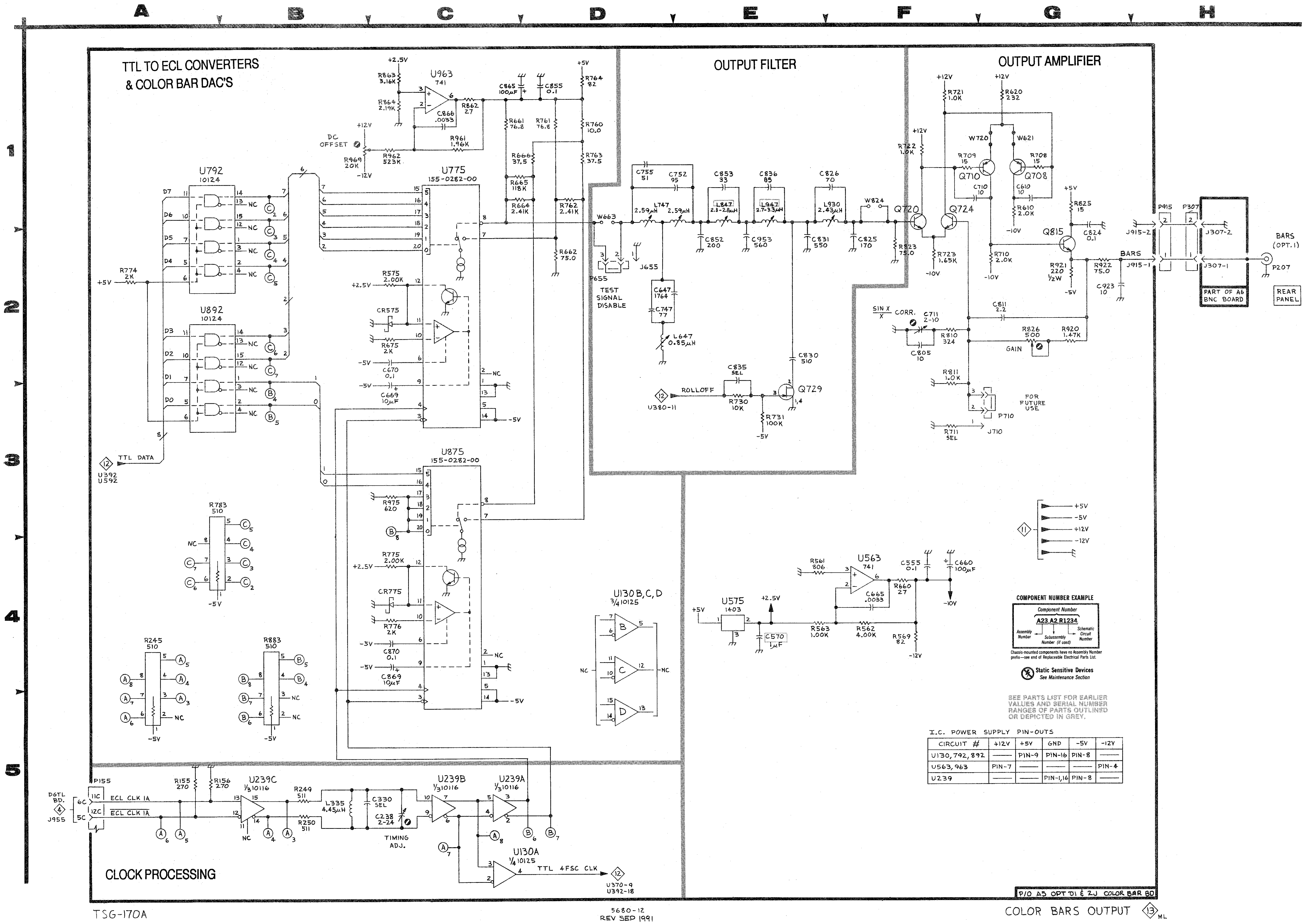
SCHEMATIC DIAGRAM LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location
Assembly – A5		R155	A5	U563	F4
		R156	A5	U575	E4
C238	C5	R245	A4	U775	C1
C330	B5	R249	B5	U792	A1
C555	F4	R250	B5	U875	C3
C570	E4	R561	E4	U892	A2
C610	G1	R562	F4	U963	C1
C647	D2	R563	E4		
C660	F4	R569	F4	W621	G1
C665	F4	R575	C2	W663	D1
C669	C3	R610	G1	W720	G1
C670	C2	R620	G1	W824	F1
C710	G1	R660	F4		
C711	F2	R661	C1		
C747	D2	R662	D2		
C752	E1	R664	D1		
C755	D1	R665	D1		
C805	F2	R666	D1		
C811	G2	R675	C2		
C824	G2	R708	G1		
C825	F2	R709	F1		
C826	F1	R710	G2		
C830	E2	R711	F3		
C831	E2	R721	F1		
C835	E2	R722	F1		
C836	E1	R723	F2		
C852	E2	R730	E3		
C853	E1	R731	E3		
C855	D1	R760	D1		
C865	C1	R761	D1		
C866	C1	R762	D1		
C869	C4	R763	D1		
C870	C4	R764	D1		
C923	G2	R774	A2		
C953	E2	R775	C4		
		R776	C4		
CR575	C2	R783	A3		
CR775	C4	R810	F2		
		R811	F2		
J655	D2	R823	F2		
J710	G3	R825	G1		
J915	H1	R826	G2		
		R862	C1		
L335	B5	R863	C1		
L647	D2	R864	C1		
L747	D1	R883	B4		
L847 *	E1	R920	G2		
L930	F1	R921	G2		
L947 *	E1	R922	G2		
		R961	C1		
P155	A5	R962	C1		
P655	D2	R969	B1		
P710	G3	R975	C3		
P915	H1				
		U130B	D4		
Q708	G1	U130C	D4		
Q710	G1	U130D	D4		
Q720	F1	U130A	C6		
Q724	F1	U239A	C5		
Q729	E3	U239B	C5		
Q815	G2	U239C	B5		

*See Parts List for serial number ranges.

REV FEB 1990



I.C. POWER SUPPLY PIN-OUTS

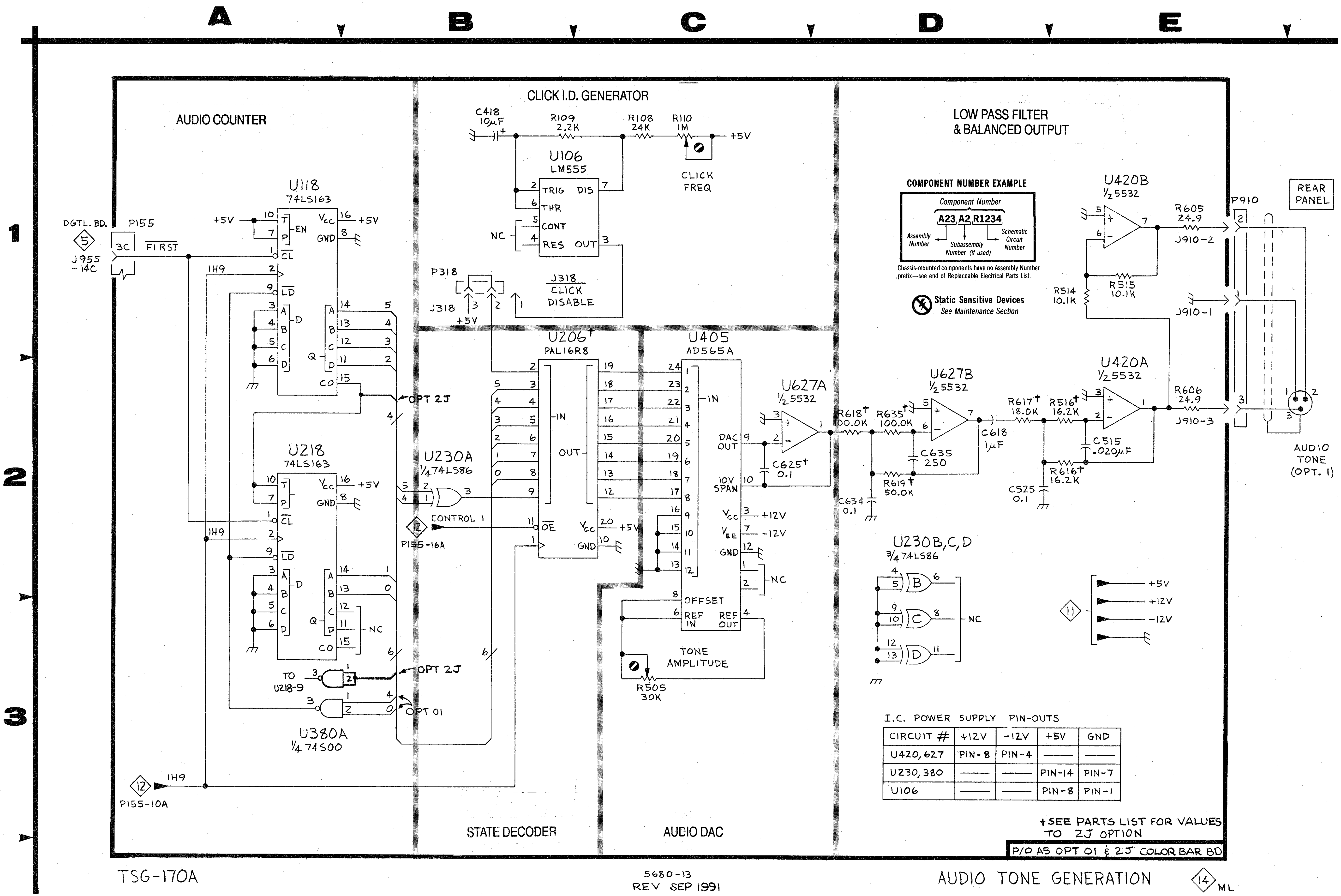
CIRCUIT #	+12V	+5V	GND	-5V	-12V
U130, 792, 892	——	PIN-9	PIN-16	PIN-8	——
U563, 963	PIN-7	——	——	——	PIN-4
U239	——	——	PIN-1,16	PIN-8	——

DIAGRAM 14

SCHEMATIC DIAGRAM LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Schematic Circuit Number	Diagram Location	Circuit Number	Schematic Diagram Location
Assembly – A5		R605	E1
		R606	E2
C418	B1	R616	E2
C515	E2	R617	D2
C525	D2	R618	D2
C618	D2	R619	D2
C625	C2	R635	D2
C634	D2		
C635	D2	U106	B1
		U118	A1
J318	B1	U206	B2
J910	E1	U218	A2
		U230A	B2
P155	A1	U230B	D2
P318	B1	U230C	D3
P910	E2		
		U230D	D3
R108	C1	U380A	A3
R109	B1	U405	C2
R110	C1	U420A	E2
R505	C3	U420B	E1
R514	E1	U627A	C2
R515	E1	U627B	D2
R516	E2		


A
B
C
D
E
1
2
3
AUDIO COUNTER
CLICK I.D. GENERATOR
LOW PASS FILTER
& BALANCED OUTPUT
STATE DECODER
AUDIO DAC
U118
74LS163
U218
74LS163
U106
LM555
U206
PAL16R8
U405
AD565A
U230A
1/4 74LS86
U380A
1/4 74S00
U627A
1/2 5532
U627B
1/2 5532
U420A
1/2 5532
U420B
1/2 5532
U230B,C,D
3/4 74LS86
DGTL. BD.
P155
J955
-14C
FIRST
1H9
C418
10µF
R109
2.2K
R108
24K
R110
1M
+5V
CLICK
FREQ
P318
J318
CLICK
DISABLE
NC
OPT 2J
OPT 01
CONTROL 1
P155-16A
P155-10A
TO
U218-9
DAC
OUT
10V
SPAN
OFFSET
REF
IN
REF
OUT
TONE
AMPLITUDE
R505
30K
R618
100.0K
R635
100.0K
C625
0.1
C634
0.1
C635
250
R619
50.0K
C618
1µF
R617
18.0K
R516
16.2K
R616
16.2K
C515
.020µF
C525
0.1
R514
10.1K
R515
10.1K
R605
24.9
R606
24.9
J910-1
J910-2
J910-3
P910
REAR
PANEL
AUDIO
TONE
(OPT. 1)
+12V
-12V
COMPONENT NUMBER EXAMPLE
Component Number
A23 A2 R1234
Assembly Number
Subassembly Number (if used)
Schematic Circuit Number
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.
Static Sensitive Devices
See Maintenance Section
I.C. POWER SUPPLY PIN-OUTS
CIRCUIT # | +12V | -12V | +5V | GND
U420,627 | PIN-8 | PIN-4 | — | —
U230,380 | — | — | PIN-14 | PIN-7
U106 | — | — | PIN-8 | PIN-1
+SEE PARTS LIST FOR VALUES
TO 2J OPTION
P/O A5 OPT 01 & 2J COLOR BAR BD
TSG-170A
5680-13
REV SEP 1991
AUDIO TONE GENERATION
14
ML

Replaceable Mechanical Parts List

Section 10
Replaceable Mechanical Parts

This section contains a list of the components that are replaceable for the TSG-170A. 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
K1072	GREENPAR CONNECTORS LTD	PO BOX 15	HARLOW ESSEX, CM20 2ER UK
TK0435	LEWIS SCREW CO	4300 S RACINE AVE	CHICAGO IL 60609–3320
TK0588	UNIVERSAL PRECISION PRODUCTS	1775 NW 216TH	HILLSBORO OR 97123
TK0941	BEARINGS INC (DIST)	2720 NW 29TH PO BOX 3005	PORTLAND OR 97210–1702
TK1064	CONNECT–AIR INTERNATIONAL INC	50 37TH STREET NE	AUBURN WA 98002–1502
TK1151	QUALITY PLASTIC INC	2101 CRESTVIEW DR PO BOX 740	NEWBERG OR 97132–9518
TK1386	PYRAMID ELECTRONICS SUPPLY INC	9757 JUANITA DRIVE NE	KIRKLAND WA 98034
TK1547	MOORE ELECTRONICS INC (DIST)	19500 SW 90TH COURT PO BOX 1030	TUALATIN OR 97062
TK1572	RAN–ROB INC	631 85TH AVE	OAKLAND CA 94621–1254
TK1828	LITE SPECIALTY METAL WORKS	20460 SW AVERY CT	TUALATIN OR 97062
TK1989	GASKET SPECIALTIES	4968 NE 122ND AVE	PORTLAND OR 97220
TK2027	PROCO MANUFACTURING CO	10950 SW 5TH ST SUITE 280	BEAVERTON OR 97005
TK2548	XEROX BUSINESS SERVICES DIV OF XEROX CORPORATION	14181 SW MILLIKAN WAY	BEAVERTON OR 97077
TK2601	MAXTEK COMPONENTS CORPORATION	13335 SW TERMAN RD PO BOX 1480	BEAVERTON, OR 97075–1480
0B445	ELECTRI–CORD MFG CO INC	312 EAST MAIN ST	WESTFIELD PA 16950
0JR05	TRIQUEST CORP	3000 LEWIS AND CLARK HWY	VANCOUVER WA 98661–2999
0J260	COMTEK MANUFACTURING OF OREGON (METALS)	PO BOX 4200	BEAVERTON OR 97076–4200
0J7N4	ARCHER PRECISION SHEET METAL INC	10950 SW 5TH ST	BEAVERTON OR 97005
0KB01	STAUFFER SUPPLY	810 SE SHERMAN	PORTLAND OR 97214
00779	AMP INC	2800 FULLING MILL PO BOX 3608	HARRISBURG PA 17105
02875	HUDSON TOOL AND DIE CO INC	18 MALVERN ST	NEWARK NJ 07105–1511
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS SECTOR	5005 E MCDOWELL RD	PHOENIX AZ 85008–4229
05276	ITT POMONA ELECTRONICS DIV	1500 E 9TH ST PO BOX 2767	POMONA CA 91766–3835
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
08530	RELIANCE MICA CORP	341–39TH ST	BROOKLYN NY 11212–2903
09422	PLASTIC STAMPING CORP	2216 W ARMITAGE AVE	CHICAGO IL 60647–4461
09922	BURNDY CORP	1 RICHARDS AVE	NORWALK CT 06856
12327	FREEWAY CORP	9301 ALLEN DR	CLEVELAND OH 44125–4632
13103	THERMALLOY CO INC	2021 W VALLEY VIEW LN PO BOX 810839	DALLAS TX 75381
18565	CHOMERICS INC	77 DRAGON COURT	WOBURN MA 01801–1039
2K262	BOYD CORP	6136 NE 87th AVE PO BOX 20038	PORTLAND OR 97220
22526	BERG ELECTRONICS INC (DUPONT)	857 OLD TRAIL RD	ETTERS PA 17319
27264	MOLEX INC	2222 WELLINGTON COURT	LISLE IL 60532–1613
31223	MICRO PLASTICS INC	20821 DEARBORN ST	CHATSWORTH CA 91311–5916
5Y400	TRIAX METAL PRODUCTS INC DIV OF BEAVERTON PARTS MFG CO	1800 NW 216TH AVE	HILLSBORO OR 97124–6629
57997	EMI PRECISION (FORMERLY ENGELCKE MFG INC)	20350 71ST AVENUE NE SUITE C	ARLINGTON, WA 98223
58050	TEKA PRODUCTS INC	45 SALEM ST	PROVIDENCE RI 02907
61935	SCHURTER INC	1016 CLEGG COURT	PETALUMA CA 94952–1152
72228	AMCA INTERNATIONAL CORP CONTINENTAL SCREW CO DIV	459 MT PLEASANT	NEW BEDFORD MA 02742

Mfr. Code	Manufacturer	Address	City, State, Zip Code
73743	FISCHER SPECIAL MFG CO	111 INDUSTRIAL RD	COLD SPRING KY 41076–9749
78189	ILLINOIS TOOL WORKS INC SHAKEPROOF DIV	ST CHARLES ROAD	ELGIN IL 60120
79963	ZIERICK MFG CO	RADIO CIRCLE	MT KISCO NY 10549
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON OR 97077–0001
82389	SWITCHCRAFT INC SUB OF RAYTHEON CO	5555 N ELSTRON AVE	CHICAGO IL 60630–1314
85471	BOYD CORP	13885 RAMOMA AVE	CHINO CA 91710
85480	BRADY W H CO CORP H Q INDUSTRIAL PRODUCTS DIV	2221 W CAMDEN RD PO BOX 2131	MILWAUKEE WI 53209
9F051	QUINTEC INDUSTRIES INSULECTRO DIV	15510 NE 90TH	REDMOND WA 98052
96392			

Fig. & Index No.	Tektronix Part No.	Serial Number Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
1–1	200–3159–00			1	COVER,TOP:TSG170A *MOUNTING PARTS*	0J7N4	ORDER BY DESC
–2	211–0559–00			7	SCREW,MACHINE:6–32 X 0.375,FLH,100 DEG,STL *END MOUNTING PARTS*	TK0435	1593–300
–3	351–0104–03			2	SL SECT,DWR EXT:12.625 L,W/O HARDWARE *MOUNTING PARTS*	06666	C–720–3 (WITHOU
–4	212–0158–00			8	SCREW,MACH:8–32 X 0.375,PNH,STL,CDPL,T–20 TORX DR *END MOUNTING PARTS*	0KB01	ORDER BY DESC
–5	333–3248–00			1	PANEL,FRONT:TSG170A	27264	333–3248–00
–6	131–1343–00			1	CONN,HDR:PCB;MALE,STR,1 X 36,0.1 CTR,0.23 0 MLG X 0.195 TAIL,30 GOLD	58050	082–3643–SS02
–7	174–0034–00			3	CA ASSY,SP,ELEC:28 AWG,3.0 L,RIBBON,2X17 X 2X17 0.1 CTR BOX	TK1547	ORDER BY DESC
–8	378–0269–00			1	FILTER,AIR:TSG170A	85471	ORDER BY DESC
–9	213–0216–00			1	THUMBSCREW:10–32 X 0.85,0.375 OD HD,SST *MOUNTING PARTS*	0KB01	213–0216–00
–10	354–0025–00			1	RING,RETAINING:EXTERNAL,U/O 0.187 DIA SFT *END MOUNTING PARTS*	TK0941	555–18MI
–11	210–0894–00			1	WASHER,FLAT:0.19 ID X 0.438 OD X 0.031 POLTHN	09422	ORDER BY DESC
–12	196–3116–00			4	LEAD,ELECTRICAL:34 AWG,1.65 L,BRAIDED *MOUNTING PARTS*	9F051	ORDER BY DESC
–13	211–0661–00			4	SCR,ASSEM WSHR:4–40 X 0.25,PNH,STL,CD PL,POZ,MACH *END MOUNTING PARTS*	TK0435	ORDER BY DESC
–14	426–2116–00	B010100	B030548	1	FRAME,FRONT:TSG170A	80009	426211600
	426–2116–01	B030549		1	FRAME,FRONT:TSG170A *MOUNTING PARTS*	80009	426211601
–15	213–0760–00			4	SCREW,TPG,TF:8–32 X 0.875,SPCL TAPTITE,FILH,STL *END MOUNTING PARTS*	72228	ORDER BY DESC
–16	————			1	CIRCUIT BD ASSY:DIGITAL (SEE A2–1 REPL) *MOUNTING PARTS*		
–17	211–0661–00			10	SCR,ASSEM WSHR:4–40 X 0.25,PNH,STL,CD PL,POZ,MACH	TK0435	ORDER BY DESC
–18	129–1115–00			2	SPACER,POST:1.218 L,4–40 EXT,6–32 INT,AL	TK0588	TO BE ASSIGNED
–19	210–0004–00			2	WASHER,LOCK:#4 INTL,0.015 THK,STL *END MOUNTING PARTS* CKT BOARD ASSY INCLUDES:	78189	1204–00–00–0541
–20	131–0993–02	670–9111–00	670–9111–01	6	.BUS,CONDUCTOR:SHUNT ASSEMBLY,RED	00779	1–850100–O
	131–0993–02	670–9111–02		7	.BUS,CONDUCTOR:SHUNT ASSEMBLY,RED	00779	1–850100–O
	131–0993–05	670–9111–00	670–9111–01	8	.BUS,CONDUCTOR:SHUNT ASSEMBLY,GREEN	00779	850100–5
	131–0993–05	670–9111–02		7	.BUS,CONDUCTOR:SHUNT ASSEMBLY,GREEN	00779	850100–5
–21	131–0608–00			117	.CONN,TERMINAL:PRESSFIT/PCB;MALE,STR,0.025SQ, 0.248 MLG X 0.137 TAIL,50 GOLD,PHZ BRZ,W/FERRULE	22526	48283–018
–22	337–1417–00			1	.SHIELD,ELEC:0.55 SQ X 0.685 INCH HIGH	02875	SO–9649–CN
–23	131–3440–00			1	.CONN,DIN:PCB;MALE,RTANG,3 X 16,0.1CTR,0.209 MLG X 0,114 TAIL,30 GOLD,BD RETENTION *MOUNTING PARTS*	00779	148020–5
–24	210–0405–00			4	.NUT,PLAIN,HEX:2–56 X 0.188,BRS CD PL	73743	12157–50
–25	210–0001–00			4	.WASHER,LOCK:#2 INTL,0.013 THK,STL	78189	1202–00–00–0541
–26	211–0185–00			4	.SCREW,MACHINE:2–56 X 0.438,PNH,STL *END MOUNTING PARTS*	0KB01	ORDER BY DESC
	————			1	.OVEN ASSEMBLY: (SEE A2–2 REPL) *MOUNTING PARTS*		
–27	211–0513–00			2	.SCREW,MACHINE:6–32 X 0.625,PNH,STL *END MOUNTING PARTS* OVEN ASSY INCLUDES:	TK0435	ORDER BY DESC
–28	200–3266–00			1	..CAP,HEAT SINK:PLASTIC	80009	200326600
	134–0209–00			1	..BUTTON,PLUG:0.187 DIA HOLE,PLASTIC	31223	62PP018BM14

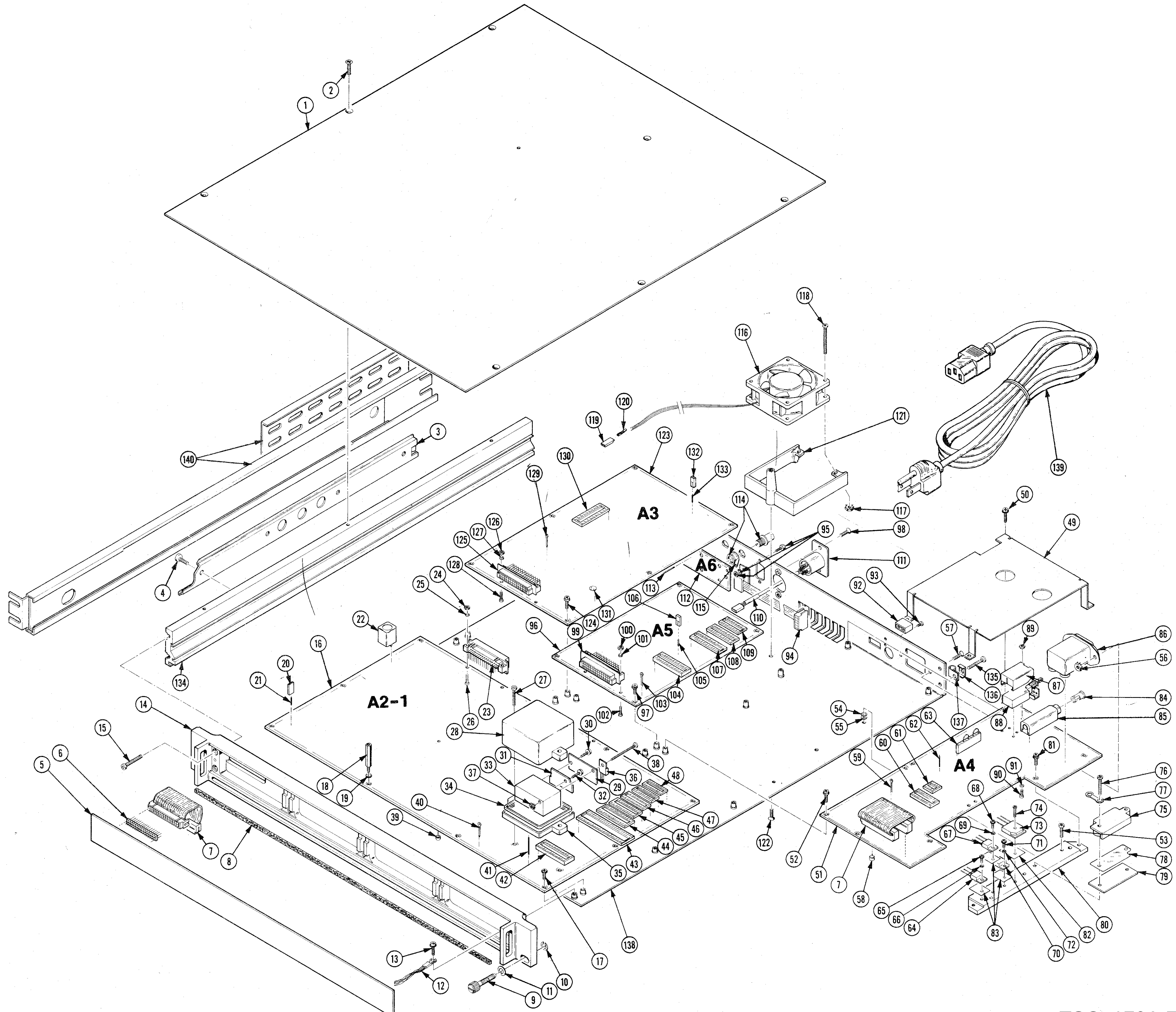
Fig. & Index No.	Tektronix Part No.	Serial Number Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
–29	200–3264–00			1	..COVER,TOP:ALUMINUM *MOUNTING PARTS*	5Y400	ORDER BY DESC
–30	211–0661–00			2	..SCR,ASSEM WSHR:4–40 X 0.25,PNH,STL,CD PL,POZ,MACH *END MOUNTING PARTS*	TK0435	ORDER BY DESC
–31	————			1	..CKT BOARD ASSY:OVEN (PART OF A2–2) *MOUNTING PARTS*		
–32	211–0661–00			2	..SCR,ASSEM WSHR:4–40 X 0.25,PNH,STL,CD PL,POZ,MACH *END MOUNTING PARTS*	TK0435	ORDER BY DESC
–33	214–3863–00			1	..HEAT SINK,ELEC:ALUMINUM	TK1828	ORDER BY DESC
–34	348–0935–00			1	.GASKET:2.0 X 1.7,NEOPRENE	TK1989	ORDER BY DESC
–35	432–0154–00			1	.BASE,HEAT SINK:PLASTIC	80009	432015400
–36	————			1	.TRANSISTOR: (SEE A2–1Q293 REPL) *MOUNTING PARTS*		
–37	210–0586–00			1	.NUT,PL,ASSEM WA:4–40 X 0.25,STL CD PL	TK0435	ORDER BY DESC
–38	211–0021–00			1	.SCREW,MACHINE:4–40 X 1.25,PNH,STL *END MOUNTING PARTS*	TK0435	ORDER BY DESC
–39	131–0157–00			2	.TERMINAL,PIN:0.25 L X 0.04 OD,BRS,SLDR PL	05276	013–100–1000–47
–40	214–0579–00			12	.TERM,TEST POINT:PCB,TEST POINT;EYELET 0.055ID,0.4 L X 0.052 WIDE X 0.032 THK,TIN PL,W/0.045 TIPCHAMFER	0J260	ORDER BY DESC
–41	131–0787–00			5	.TERM,PIN:PCB/PRESSFIT;MALE,STR,0.025 SQ,0.448 MLG X 0.137 TAIL,0.600 L,PHOS BRZ,50 GLD,0.049 +/– 0.002 PCB	22526	47359–001
–42	136–0790–00	670–9111–00	670–9111–01	2	.SKT,PL–IN ELEK:MICROCKT,24 CONTACT	80009	136079000
	136–0925–00	670–9111–02		2	.SKT,DIP:PCB;24 POS,2 X 12,0.1 X 0.3 CTR,0.196 H X 0.130 TAIL,BECU,TIN,ACCOM 0.008–0.015THRU 0.014 X 0.022 LEADS	00779	2–641932–3
–43	136–0757–00			1	.SOCKET,DIP:PCB;FEMALE,STR,2 X 20,40 POS,0.1 X 0.6 CTR,0.175 H X0.130 TAIL,BECU,TIN,ACCOM 0.008–0.015 X 0.014–0.022 IC	09922	DILB40P–108
–44	136–0755–00			8	.SOCKET,DIP:PCB;FEMALE,STR,2 X 14,28 POS,0.1 X 0.6 CTR,0.175 H X0.130 TAIL,BECU,TIN,ACCOM 0.008–0.0015 X 0.014–0.022	09922	DILB28P–108
–45	136–0751–00			5	.SOCKET,DIP:PCB;STR,2 X 12,24 POS,0.1 X 0.6CTR,0.175 H X 0.13 TAIL,BECU,TIN,ACCOM 0.008–0.015 X 0.014–0.022 LEADS	09922	DILB24P108
–46	136–0754–00			2	.SOCKET,DIP:PCB;FEMALE,STR,2 X 11,22 POS,0.1 X 0.4 CTR,0.175 H X0.130 TAIL,BECU,TIN,ACCOM 0.008–0.015 X 0.014–0.022 IC	09922	DILB22P–108
–47	136–0752–00	670–9111–00	670–9111–00	3	.SKT,PL–IN ELEK:MICROCIRCUIT,20 DIP	09922	DILB20P–108
	136–0752–00	670–9111–01		4	.SKT,PL–IN ELEK:MICROCIRCUIT,20 DIP	09922	DILB20P–108
	136–0728–00	670–9111–02		1	.SKT,PL–IN ELEK:MICROCKT,14 CONTACT	09922	DILB14P–108
	136–0729–00	670–9111–02		1	.SOCKET,DIP:PCB;FEMALE,STR,2 X 8,16 POS,0.1X 0.3 CTR,0.175 H X 0.130 TAIL,BECU,TIN	09922	DILB16P–108T
–48	136–0756–00			1	.SOCKET,DIP:PCB;FEMALE,STR,2 X 9,18 POS,0.1X 0.3 CTR,0.175 H X 0.130 TAIL,BECU,TIN	09922	DILB18P–108
–49	337–3286–00	670–9113–00	670–9113–06	1	SHIELD:LV PWR SUPPLY	0J260	337–3286–00
	337–3286–01	671–0572–00		1	SHIELD,PWR SPLY:LOW VOLTAGE *MOUNTING PARTS*	0J260	337–3286–01
–50	211–0244–00			4	SCR,ASSEM WSHR:4–40 X 0.312,PNH,STL,CD PL,POZ, MACHINE *END MOUNTING PARTS*	TK0435	7772–312
–51	————			1	CKT BOARD ASSY:POWER SUPPLY (SEE A4 REPL) *MOUNTING PARTS*		
–52	211–0661–00			6	SCR,ASSEM WSHR:4–40 X 0.25,PNH,STL,CD PL,POZ, MACHINE	TK0435	ORDER BY DESC
–53	211–0578–00			3	SCREW,MACHINE:6–32 X 0.438,PNH,STL	TK0435	ORDER BY DESC
–54	210–0006–00			3	WASHER,LOCK:#6 INTL,0.018 THK,STL	78189	1206–00–00–0541

Fig. & Index No.	Tektronix Part No.	Serial Number Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
–55	210–0870–00			3	WASHER,FLAT:0.141 ID X 0.312 OD X 0.05,STL	12327	ORDER BY DESC
–56	210–0586–00			2	NUT,PL,ASSEM WA:4–40 X 0.25,STL CD PL	TK0435	ORDER BY DESC
–57	211–0025–00			2	SCREW,MACHINE:4–40 X 0.375,FLH,100 DEG,STL	TK0435	ORDER BY DESC
					END MOUNTING PARTS		
					CKT BOARD ASSY INCLUDES:		
–58	131–0157–00	670–9113–00	670–9113–06	1	.TERMINAL,PIN:0.25 L X 0.04 OD,BRS,SLDR PL	05276	013–100–1000–47
–59	214–0579–00	670–9113–00	670–9113–06	5	.TERM,TEST POINT:PCB,TEST POINT;EYELET 0.055ID,0.4 L X 0.052 WIDE X 0.032 THK,TIN PL,W/0.045 TIPCHAMFER	0J260	ORDER BY DESC
–60	136–0756–00	670–9113–00	670–9113–06	1	.SOCKET,DIP:PCB;FEMALE,STR,2 X 9,18 POS,0.1X 0.3 CTR,0.175 H X 0.130 TAIL,BECU,TIN	09922	DILB18P–108
–61	136–0727–00	670–9113–00	670–9113–06	1	.SKT,PL–IN ELEK:MICROCKT,8 CONTACT	09922	DILB8P–108
–62	131–0608–00	670–9113–00	670–9113–06	51	.CONN,TERMINAL:PRESSFIT/PCB;MALE,STR,0.025SQ, 0.248 MLG X 0.137 TAIL,50 GOLD,PHZ BRZ,W/FERRULE	22526	48283–018
–63	198–5529–00	670–9113–00	670–9113–06	1	.WIRE SET,ELEC:TSG170A	TK1064	ORDER BY DESC
–64	————			1	MICROCIRCUIT,DI: (SEE A4U260 REPL)		
	————			1	MICROCIRCUIT,DI: (SEE A4U276 REPL)		
					MOUNTING PARTS		
–65	211–0661–00	670–9113–00	670–9113–06	1	.SCR,ASSEM WSHR:4–40 X 0.25,PNH,STL,CD PL,POZ, MACHINE	TK0435	ORDER BY DESC
	211–0097–00	671–0572–00		1	.SCREW,MACHINE:4–40 X 0.312,PNH,STL	TK0435	ORDER BY DESC
–66	210–1178–00			1	.WASHER,SHLDR:U/W TO–220 TRANSISTOR	13103	7721–7PPS
	214–2953–00	671–0572–00		1	.HEAT SINK,SEMIC:XSTR,TO–220;VERTICALMOUNT,SLOT HOLE,(3)SOLDERABLE TABS,COPPER,BLACK PAINT	13103	6030B–TT
	210–0586–00	671–0572–00		1	.NUT,PL,ASSEM WA:4–40 X 0.25,STL CD PL		
	342–0563–00	671–0572–00		1	.INSULATOR,PLATE:TRANSISTOR,FIBERGLASS	TK0435	ORDER BY DESC
					REINFORCED SILICON RUBBER	18565	69–11–8805–1674
					END MOUNTING PARTS		
–67	————			1	.MICROCIRCUIT,DI: (SEE A4U360 REPL)		
	————			1	.MICROCIRCUIT,DI: (SEE A4U176 REPL)		
					MOUNTING PARTS		
–68	211–0661–00	670–9113–00	670–9113–06	1	.SCR,ASSEM WSHR:4–40 X 0.25,PNH,STL,CD PL,POZ, MACHINE	TK0435	ORDER BY DESC
	211–0097–00	671–0572–00		1	.SCREW,MACHINE:4–40 X 0.312,PNH,STL	TK0435	ORDER BY DESC
–69	210–1178–00			1	.WASHER,SHLDR:U/W TO–220 TRANSISTOR	13103	7721–7PPS
	214–2953–00	671–0572–00		1	.HEAT SINK,SEMIC:TRANSISTOR,TO–220;VERTICAL-MOUNT,SLOT HOLE,(3)SOLDERABLE TABS,COP-PER,BLACK PAINT	13103	6030B–TT
	342–0572–00	671–0572–00		1	.INSULATOR,FILM:ROM PACK,POLYMADE	96392	ORDER BY DESC
	210–0586–00	671–0572–00		1	.NUT,PL,ASSEM WA:4–40 X 0.25,STL CD PL	TK0435	ORDER BY DESC
					END MOUNTING PARTS		
–70	————			1	.SEMICOND DVC,DI: (SEE A4CR360 REPL)		
	————			1	.SEMICOND DVC,DI: (SEE A4CR320,CR575 REPL)		
					MOUNTING PARTS		
–71	211–0661–00	670–9113–00	670–9113–06	1	.SCR,ASSEM WSHR:4–40 X 0.25,PNH,STL,CD PL,POZ, MACHINE	TK0435	ORDER BY DESC
	211–0097–00	671–0572–00		2	.SCREW,MACHINE:4–40 X 0.312,PNH,STL	TK0435	ORDER BY DESC

Fig. & Index No.	Tektronix Part No.	Serial Number Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
–72	210–1178–00			1	.WASHER,SHLDR:U/W TO–220 TRANSISTOR	13103	7721–7PPS
	210–1178–00	671–0572–00		1	.WASHER,SHLDR:U/W TO–220 TRANSISTOR	13103	7721–7PPS
	214–2953–00	671–0572–00		2	.HEAT SINK,SEMIC:TRANSISTOR,TO–220;VERTICAL-MOUNT,SLOT HOLE,(3)SOLDERABLE TABS,COPPER ,BLACK PAINT	13103	6030B–TT
	342–0563–00	671–0572–00		2	.INSULATOR,PLATE:TRANSISTOR,FIBERGLASS REINFORCED SILICON RUBBER	18565	69–11–8805–1674
	210–0586–00	671–0572–00		1	.NUT,PL,ASSEM WA:4–40 X 0.25,STL CD PL (CR320 ONLY)	TK0435	ORDER BY DESC
	214–4115–00	671–0572–00		1	.HEAT SINK:COPPER (CR575 ONLY)	5Y400	ORDER BY DESC
					END MOUNTING PARTS		
–73	———————			1	.SEMICOND DVC,DI: (SEE A4CR460 REPL)		
	———————			1	.TRANSISTOR: (SEE A4Q638 REPL)		
					MOUNTING PARTS		
–74	211–0012–00	670–9113–00	670–9113–06	1	.SCREW,MACHINE:4–40 X 0.375,PNH,STL	TK0435	ORDER BY DESC
	211–0097–00	671–0572–00		1	.SCREW,MACHINE:4–40 X 0.312,PNH,STL	TK0435	ORDER BY DESC
	210–1178–00	671–0572–00		1	.WASHER,SHLDR:U/W TO–220 TRANSISTOR	13103	7721–7PPS
	214–2953–00	671–0572–00		1	.HEAT SINK,SEMIC:TRANSISTOR,TO–220;VERTICAL-MOUNT,SLOT HOLE,(3)SOLDERABLE TABS,COPPER ,BLACK PAINT	13103	6030B–TT
	342–0354–00	671–0572–00		1	.INSULATOR,PLATE:TRANSISTOR,SILICONE RUBBER	2K262	342–0354–00
	210–0586–00	671–0572–00		1	.NUT,PL,ASSEM WA:4–40 X 0.25,STL CD PL		
					END MOUNTING PARTS	TK0435	ORDER BY DESC
–75	200–2269–01	670–9113–00	670–9113–06	1	.COVER,XSTR:7612D	0JR05	ORDER BY DESC
					MOUNTING PARTS		
–76	211–0513–00	670–9113–00	670–9113–06	2	.SCREW,MACHINE:6–32 X 0.625,PNH,STL	TK0435	ORDER BY DESC
–77	210–0273–00	670–9113–00	670–9113–02	1	.TERMINAL,LUG:0.196 ID,PLAIN,BRS TINNED	79963	ORDER BY DESC
					END MOUNTING PARTS		
–78	342–0458–00	670–9113–00	670–9113–06	1	.INSULATOR,PLATE:TRANSISTOR,MICA	08530	1339X1–2MC
–79	342–0449–01	670–9113–00	670–9113–06	1	.INSULATOR,PLATE:TRANSISTOR,ALUMINA	TK2601	342044901
–80	214–3797–00	670–9113–00	670–9113–06	1	.HEAT SINK:ALUMINUM	TK2027	ORDER BY DESC
					MOUNTING PARTS		
–81	211–0661–00	670–9113–00	670–9113–06	2	.SCR,ASSEM WSHR:4–40 X 0.25,PNH,STL,CD PL,POZ, MACHINE	TK0435	ORDER BY DESC
					END MOUNTING PARTS		
–82	342–0354–00	670–9113–00	670–9113–06	1	.INSULATOR,PLATE:TRANSISTOR,SILICONE RUBBER	2K262	342–0354–00
–83	342–0563–00	670–9113–00	670–9113–06	3	.INSULATOR,PLATE:TRANSISTOR,FIBERGLASS REINFORCED SILICON RUBBER	18565	69–11–8805–1674
–84	200–2264–00			1	.CAP,FUSEHOLDER:3AG FUSES	61935	FEK 031 1666
–85	204–0906–00			1	.BODY,FUSEHOLDER:3AG & 5 X 20MM FUSES	61935	TYPE FAU 031.35
–86	———————			1	.LINE FILTER: (SEE A4LF950 REPL)		
–87	200–2735–00			1	.COVER,POWER SW:BLACK,POLYCARBONATE	0JR05	ORDER BY DESC
–88	———————			1	.SWITCH,PUSH: (SEE A4S930 REPL)		
					MOUNTING PARTS		
–89	210–0405–00			2	.NUT,PLAIN,HEX:2–56 X 0.188,BRS CD PL	73743	12157–50
–90	211–0022–00			2	.SCREW,MACHINE:2–56 X 0.188,PNH,STL	TK0435	ORDER BY DESC
–91	210–0001–00			2	.WASHER,LOCK:#2 INTL,0.013 THK,STL	78189	1202–00–00–0541
					END MOUNTING PARTS		
–92	366–1160–00			1	.PUSH BUTTON:CHARCOAL,0.523 X 0.253 X 0.43	80009	366116000
–93	211–0177–00			1	SCREW,MACHINE:4–40 X 0.312,PNH,STL	TK0435	ORDER BY DESC
–94	175–9877–00			1	CA ASSY,SP,ELEC:10,28 AWG,12.5 L,RIBBON	TK1547	ORDER BY DESC
					MOUNTING PARTS		
–95	214–3903–01			1	SCREW,JACK:4–40 X 0.312 EXT THD,4–40 INT THD,0.188 HEX,STEEL,CADPLATE	0KB01	214–3903–01
					END MOUNTING PARTS		

Fig. & Index No.	Tektronix Part No.	Serial Number Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
–96	——————			1	CKT BOARD ASSY:COLOR BAR (SEE A5 REPL) *MOUNTING PARTS*		
–97	211–0661–00			4	SCR,ASSEM WSHR:4–40 X 0.25,PNH,STL,CD PL,POZ, MACHINE	TK0435	ORDER BY DESC
–98	211–0025–00			2	SCREW,MACHINE:4–40 X 0.375,FLH,100 DEG,STL *END MOUNTING PARTS* CKT BOARD ASSY INCLUDES:	TK0435	ORDER BY DESC
–99	131–3439–00			1	.CONN,DIN:PCB;FEMALE,RTANG,3 X 16,0.1 CTR,0.209 MLG X 0.114 TAIL,30 GOLD *MOUNTING PARTS*	00779	650893–4
–100	210–0405–00			2	.NUT,PLAIN,HEX:2–56 X 0.188,BRS CD PL	73743	12157–50
–101	210–0001–00			2	.WASHER,LOCK:#2 INTL,0.013 THK,STL	78189	1202–00–00–0541
–102	211–0185–00			2	.SCREW,MACHINE:2–56 X 0.438,PNH,STL *END MOUNTING PARTS*	0KB01	ORDER BY DESC
–103	214–0579–00			8	.TERM,TEST POINT:PCB,TEST POINT;EYELET 0.055ID,0.4 L X 0.052 WIDE X 0.032 THK,TIN PL,W/0.045 TIPCHAMFER	0J260	ORDER BY DESC
–104	136–0790–00	670–9121–00	670–9121–01	1	.SKT,PL–IN ELEK:MICROCKT,24 CONTACT	80009	136079000
	136–0925–00	670–9121–01		1	.SOCKET,DIP:PCB;24 POS,2 X 12,0.1 X 0.3 CTR,0.196 H X 0.130 TAIL,BECU,TIN,ACCOM 0.008–0.015THRU 0.014 X 0.022 LEADS	00779	2–641932–3
–105	131–0608–00			17	.CONN,TERMINAL:PRESSFIT/PCB;MALE,STR,0.025SQ, 0.248 MLG X 0.137 TAIL,50 GOLD,PHZ BRZ,W/FERRULE	22526	48283–018
–106	131–0993–02			3	.BUS,CONDUCTOR:SHUNT ASSEMBLY,RED	00779	1–850100–O
	131–0993–05			1	.BUS,CONDUCTOR:SHUNT ASSEMBLY,GREEN	00779	850100–5
–107	136–0751–00			3	.SKT,DIP:PCB;STR,2 X 12,24 POS,0.1 X 0.6CTR,0.175 H X 0.13 TAIL,BECU,TIN,ACCOM 0.008–0.015 X 0.014–0.022 LEADS	09922	DILB24P108
–108	136–0752–00			4	.SKT,PL–IN ELEK:MICROCIRCUIT,20 DIP	09922	DILB20P–108
–109	136–0729–00			1	.SOCKET,DIP:PCB;FEMALE,STR,2 X 8,16 POS,0.1X 0.3 CTR,0.175 H X 0.130 TAIL,BECU,TIN	09922	DILB16P–108T
–110	175–9542–00			1	.CA ASSY,SP,ELEC:3,26 AWG,4.75 L,MULTI COND	TK1386	ORDER BY DESC
–111	131–3207–00			1	.CONN,RCPT,ELEC:MALE,3 CONTACT	82389	D3M
–112	——————			1	CKT BOARD ASSY:BNC (SEE A6 REPL)		
–113	131–0608–00			38	.CONN,TERMINAL:PRESSFIT/PCB;MALE,STR,0.025SQ, 0.248 MLG X 0.137 TAIL,50 GOLD,PHZ BRZ,W/FERRULE	22526	48283–018
–114	131–0955–00			12	CONN,RF JACK:BNC;50 OHM,FEMALE,STR,SLDR CUP/FRONT PNL,GOLD,0.520 MLG X 0.490 TAIL,0.092 L SLDR CUP,0.375–32/D/1 FLAT	K1072	G35152BN
–115	210–0255–00			2	TERMINAL,LUG:0.391 ID,LOCKING,BRS CD PL	TK1572	ORDER BY DESC
–116	——————			1	FAN,TUBAXIAL: (SEE B100 REPL) *MOUNTING PARTS*		
–117	210–0458–00			2	NUT,PL,ASSEM WA:8–32 X 0.344,STL CD PL	0KB01	210–0458–00
–118	212–0012–00			2	SCREW,MACHINE:8–32 X 1.25,FLH,100 DEG,STL *END MOUNTING PARTS*	0KB01	O.B.D.
–119	352–0169–00	B010100	B042499	1	HLDR,TERM CONN:2 WIRE,BLACK	0JR05	ORDER BY DESC
–120	131–0707–00	B010100	B042499	2	CONTACT,ELEC:22–26 AWG,BRS & CU BE GOLDPL SAFETY CONTROLLED	22526	47439–000
–121	407–3379–00	B010100	B020555	1	BRKT,FAN MTG:TSG170A	TK1151	ORDER BY DESC
	407–3379–01	B020556		1	BRKT,FAN MTG:ALUMINUM *MOUNTING PARTS*	TK1151	ORDER BY DESC
–122	211–0559–00			1	SCREW,MACHINE:6–32 X 0.375,FLH,100 DEG,STL *END MOUNTING PARTS*	TK0435	1593–300
–123	——————			1	CIRCUIT BD ASSY:ANALOG (SEE A3 REPL) *MOUNTING PARTS*		

Fig. & Index No.	Tektronix Part No.	Serial Number Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
–124	211–0661–00			6	SCR,ASSEM WSHR:4–40 X 0.25,PNH,STL,CD PL,POZ, MACHINE	TK0435	ORDER BY DESC
					END MOUNTING PARTS		
					CKT BOARD ASSY INCLUDES:		
–125	131–3440–00			1	.CONN,DIN:PCB;MALE,RTANG,3 X 16,0.1CTR,0.209 MLG X 0,114 TAIL,30 GOLD,BD RETENTION	00779	148020–5
					MOUNTING PARTS		
–126	210–0405–00			2	.NUT,PLAIN,HEX:2–56 X 0.188,BRS CD PL	73743	12157–50
–127	210–0001–00			2	.WASHER,LOCK:#2 INTL,0.013 THK,STL	78189	1202–00–00–0541
–128	211–0185–00			2	.SCREW,MACHINE:2–56 X 0.438,PNH,STL	0KB01	ORDER BY DESC
					END MOUNTING PARTS		
–129	214–0579–00			9	.TERM,TEST POINT:PCB,TEST POINT;EYELET 0.055ID,0.4 L X 0.052 WIDE X 0.032 THK,TIN PL,W/0.045 TIPCHAMFER	0J260	ORDER BY DESC
–130	136–0752–00			2	.SKT,PL–IN ELEK:MICROCIRCUIT,20 DIP	09922	DILB20P–108
–131	342–0324–00	670–9113–00	670–9113–03	5	.INSULATOR,DISK:TRANSISTOR,NYLON	13103	7717–5N
–132	131–0993–02			2	.BUS,CONDUCTOR:SHUNT ASSEMBLY,RED	00779	1–850100–O
	131–0993–05			9	.BUS,CONDUCTOR:SHUNT ASSEMBLY,GREEN	00779	850100–5
–133	131–0608–00			67	.CONN,TERMINAL:PRESSFIT/PCB;MALE,STR,0.025SQ, 0.248 MLG X 0.137 TAIL,50 GOLD,PHZ BRZ,W/FERRULE	22526	48283–018
–134	426–2115–00			1	FRAME SECTION:SIDE	57997	426–2115–00
					MOUNTING PARTS		
–135	213–0760–00			4	SCREW,TPG,TF:8–32 X 0.875,SPCL TAPTITE,FILH,STL	72228	ORDER BY DESC
–136	210–0863–00			1	WSHR,LOOP CLAMP:0.091 ID U/W 0.5 W CLP,STLCD PL	85480	C191
–137	343–0003–00			1	CLAMP,LOOP:0.25 ID,PLASTIC	06915	E4 CLEAR ROUND
					END MOUNTING PARTS		
–138	200–3160–00			1	COVER,BOTTOM:TSG170A	0J7N4	ORDER BY DESC
					STANDARD ACCESSORIES		
–139	161–0066–00			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
–140	351–0751–00	B010100	B042142	1	TRK,SL OUT SECT:STATIONARY & INTERMEDIATE SAFETY CONTROLLED	06666	3442–99–0004
	351–0751–01	B042143		1	TRK,SL OUT SECT:STATIONARY &INTERMEDIATE SAFETY CONTROLLED	06666	CC3442–99–0006
	070–5680–00			1	MANUAL,TECH:INSTR,TSG170A TV GENERATOR	TK2548	070568000



TSG–170A Exploded View

Option 1V

Appendix A
Option 1V

Option 1V for the TSG–170A provides a custom signal set for use with the Tektronix VM700A. This custom signal set replaces several of the test signals with new ones, and changes the button assignment for the NTC7 Composite signal (see Table A-1 for details). Table A-2 shows the characteristics of the added signals, and Figures A-1 through A-8 provide timing information for them.

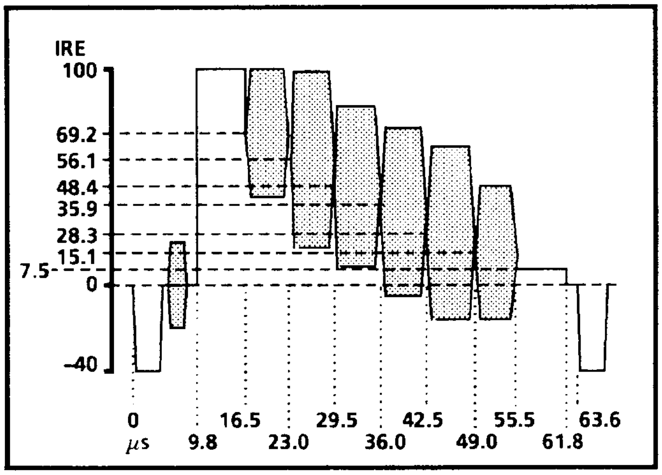


Fig. A-1. Option 1V FCC Color Bars.

Table A-1
Option 1V Test Signal Changes

Standard Signal	Option 1V Signal
Pulse & Bars	NTC7 Composite
Other Signals	
Multibars	FCC Color Bars
NTC7 Composite	SINX / X
Line Sweep w/Markers	Chroma Freq Response
Multipulse	Field Square Wave [1]
System Test Matrix	NTC7 Combination
Monitor Setup Matrix	New matrix. See Fig. A-7
10% Flat Field	50% Flat Field
Red Field (12.5% pedestal)	Red Field (50% pedestal)

[1] Ver. 1.2 and above (Multipulse below Ver. 1.2).

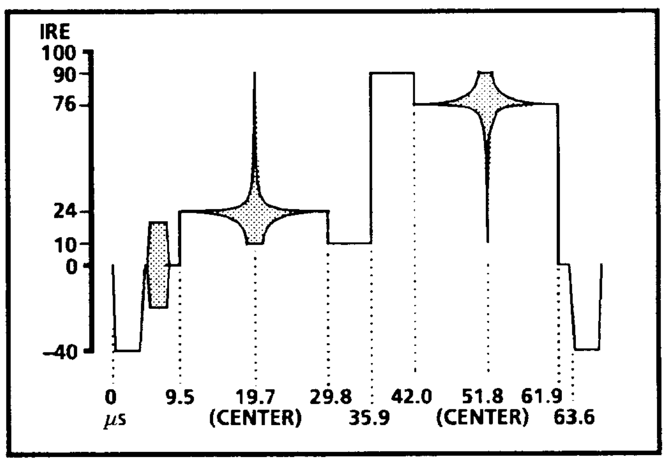


Fig. A-2. Option 1V SIN X/X.

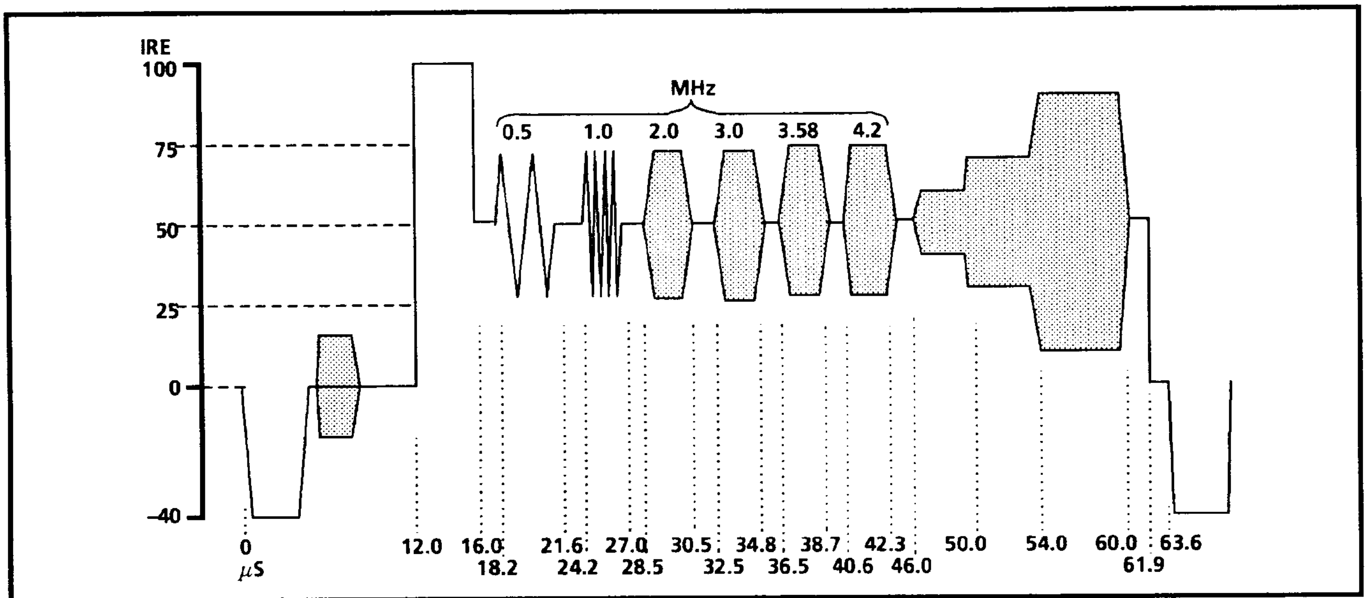


Fig. A-3. Option 1V NTC7 Combination.

Table A-2. Option 1V Test Signal Characteristics

Characteristics	Performance Requirement	Supplemental Information
FCC COLOR BARS	Full Field color bars.	75% Amplitude, 7.5% setup with a 100 IRE White Flag. See Fig. A-1.
SIN X/X Spectrum		See Fig. A-2. -3 dB at 4.75 MHz.
Chroma Frequency Response	100 IRE BAR; 50 IRE Pedestal with 30 IRE sine wave at five frequencies: 3.08, 3.33, 3.58, 3.83, and 4.08 MHz.	See Fig. A-4.
NTC7 Combination	100 IRE BAR; 50 IRE Pedestal with six 50 IRE Multiburst packets at 0.5, 1.0, 2.0, 3.0, 3.58, and 4.2 MHz; 20 IRE, 40 IRE, 80 IRE 90° modulation.	See Fig. A-3.
50% Flat Field Amplitude	357.2 mV (50 IRE).	See Fig. A-5.
Red Field Luminance Pedestal Chrominance Amplitude	 357.2 mV (50 IRE). 714.3 mV (100 IRE).	See Fig. A-6.
Monitor Setup Matrix	FCC Color Bars, 50% Flat Field, NTC7 Combination, SINX/X, NTC7 Composite, Red Field, and Chroma Frequency Response.	See Fig. A-7.
Field Square Wave [1] Amplitude Field Timing	 714 mV (100 IRE). Lines 72 – 202.	See Fig. A-8.

[1] Ver. 1.2 and above.

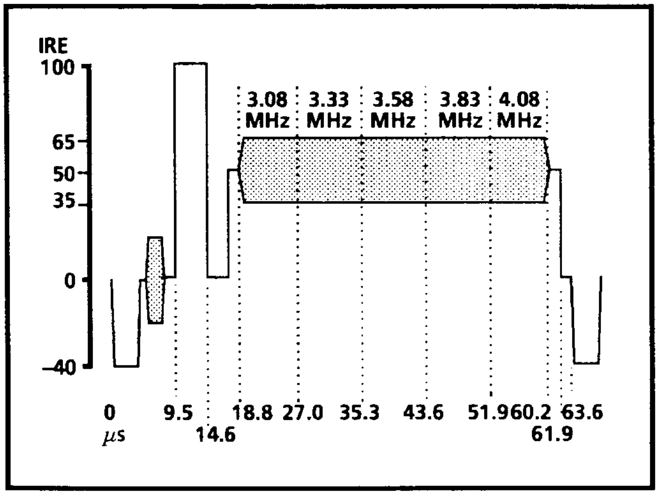


Fig. A-4. Option 1V Chroma Frequency Response.

Line	
20–65	FCC Color Bars
66–110	50% Flat Field
111–142	NTC7 Combination
143–182	$\frac{\text{SIN X}}{\text{X}}$
183–202	NTC7 Composite
203–223	Red Field
224–263	Chroma Frequency Response

Fig. A-7. Option 1V Monitor Setup Matrix.

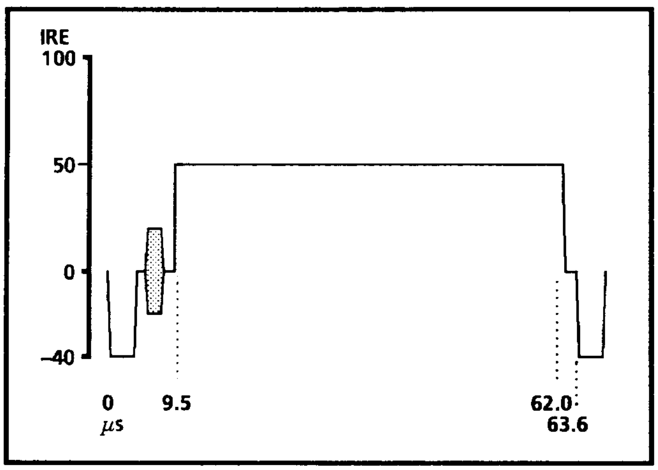


Fig. A-5. Option 1V 50% Flat Field.

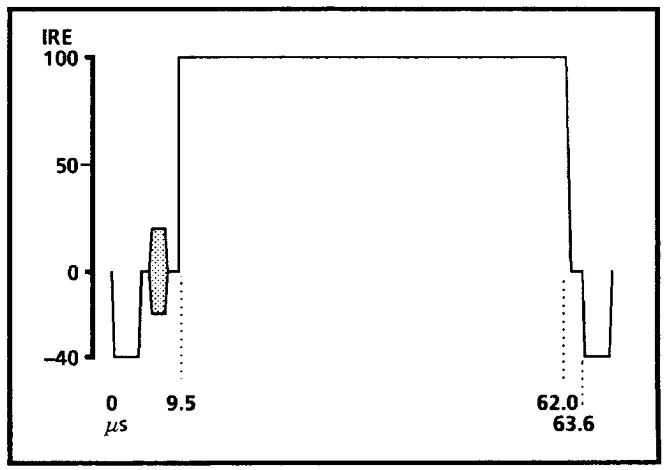


Fig. A-8. Option 1V Field Square Wave (Ver 1.2 and above).

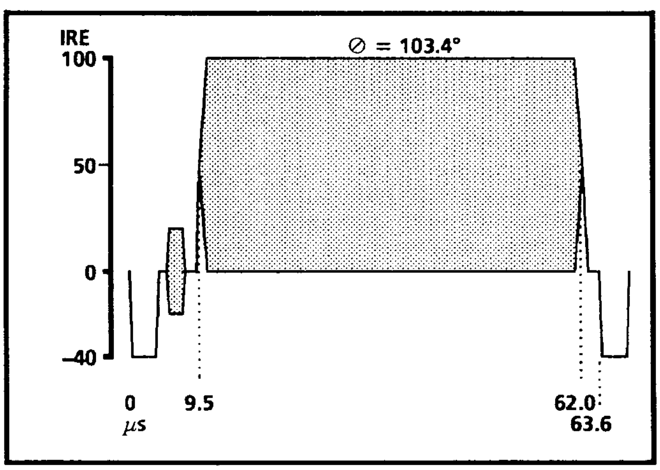


Fig. A-6. Option 1V Red Field.

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 COMMITTED TO EXCELLENCE

MANUAL CHANGE INFORMATION Group Code 20

Date: 10/28/88 Change Reference: M62651

Product: TSG-170A Manual Part No: 070-5680-00

DESCRIPTION

EFF S/N: B041719

TEXT, ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

SECTION 3 SPECIFICATIONS,

Page 3-17, Table 3-7 Genlock Function

CHANGE Continuous Wave Input Specs **TO READ:**

Table 3-7 Genlock Function

Continuous Wave Input Specs		
Genlock Phase Change with Input CW Amplitude Change	≤ 1° burst phase change for input CW amplitude range of 2V +1, -6 dB	
CW Lock Range	3.578545 MHz ±20 Hz	
Jitter	≤0.5°	

SECTION 4 INSTALLATION,

Page 4-6, Table 4-1

CHANGE P118 and P520 entries **TO READ, AND ADD** P908 and P917 entries **AS FOLLOWS:**

Table 4-1 (cont.)
Analog Board (A3) Operating Mode Selection Jumpers

Genlock Input Clamp Disable	P520	Pins 1-2:	Enables Genlock Clamp for Genlock Input.	Pins 1-2
		Pins 2-3:	Disables Genlock Clamp, for locking to 3.58 MHz CW input.	
Genlock Input Select	P118	Pins 1-2	Dc coupling for Genlock Input.	Pins 1-2
		Pins 2-3	Ac coupling for locking to 3.58 MHz CW input.	
Genlock Input Select	P908	Pins 1-2:	Enables Input Clamp for Genlock Input.	Pins 1-2
		Pins 2-3:	Disables Input Clamp for locking to 3.58 MHz CW input, and decreases Input Buffer gain.	
Genlock Input Select	P917	Pins 1-2:	Selects correct input buffer gain for 3.58 MHz CW input.	
		Pins 2-3	Selects correct Input Buffer gain for Composite Video input.	Pins 2-3

Date: 10/28/88	Group Code 20	Change Reference: M62651
Product: TSG-170A		Manual Part No: 070-5680-00

Page 4-8, **CHANGE** Table 4-4 Digital Board (A2) Test Jumpers **TO READ:**

Table 4-4
Digital Board (A2) Test Jumpers

FUNCTION	JUMPER #	DESCRIPTION	FACTORY SET
VCO Test *See visual aid below.	J180	Pins 1-3: Sets VCO control voltage to mid-range (ground) so VCO can be tuned to 4Fsc with C19. Pins 2-3: μP controls genlock loop response. Pins 4-3: Fixed test voltage (-10 V) increases VCO frequency. Pins 5-3: Fixed test voltage (+10 V) decreases VCO frequency.	Pins 2-3
Hard Reset	J425	Pins 1-2: Enables HARD,RESET signal. Pins 2-3: Forces HARD,RESET. Pins 3-4: Disables HARD,RESETsignal.	Pins 1-2
Manual Reset	J122	Pins 1-2: Normal operation. Pins 2-3: Reset μP.† †J425 must be in its 1-2 position.	Pins 1-2
Field Reference Disable	J767	Pins 1-2: Enables FLD REF signal to provide a genlocked field reference (field 3, line 10) pulse to the timing circuits. Pins 2-3: Disables FLD REF signal from providing a genlocked field reference (field 3, line 10) pulse to the timing circuits.	Pins 1-2
Crystal Oven heater	J396	Pins 1-2: Oven heater operating. Pins 2-3: Oven heater disabled.	Pins 1-2

SECTION 5 PERFORMANCE CHECK AND CALIBRATION PROCEDURES,

SHORT FORM CALIBRATION PROCEDURES, Page 5-15,

CHANGE Step 1, Routine Oscillator Frequency Adjustment **TO READ:**

1. Oscillator Frequency Adjustment

   Set to 3.579545 MHz ±0.1 Hz with C19, which is accessable through the hole in the top of the oven cap.

DELETE Step 2. Oscillator Frequency Adjustment after Crystal Replacement,

DECREMENT remaining steps by 1 (3 becomes 2, 4 becomes 3, etc.).

LONG FORM CALIBRATION PROCEDURES, Page 5-17,

CHANGE Step 1, Routine Oscillator Frequency Adjustment TO READ:

1. **Oscillator Frequency Adjustment**

   a. Connect the equipment as shown in Fig. 5-11.

   b. Set the DC503A to count a subcarrier rate frequency.

   c. Fine-adjust the crystal frequency with C19 to bring the SUBCARRIER output to within 0.1 Hz of 3.579545 MHz. C19 is located beneath the hole in the top of the oven cap. Remove the plug that is in the hole with fingernails or the edge of a screwdriver.

NOTE

To ensure that the proper operating temperature for the crystal is maintained, make sure to replace the plug in the oven cap after adjusting C19.

DELETE Step 2. Oscillator Frequency Adjustment after Crystal Replacement,
DECREMENT remaining steps by 1 (3 becomes 2, 4 becomes 3, etc.).

SECTION 6 THEORY OF OPERATION

Page 6-7, MICROPROCESSOR (μP) KERNEL CIRCUIT DESCRIPTION (Schematic 2)

REPLACE Schematic 2 circuit description WITH THE FOLLOWING:

MICROPROCESSOR (μP) KERNEL CIRCUIT DESCRIPTION (Schematic 2)

This section briefly describes the functions of the μP Kernel and describes the components that make up the Kernel. For a description of the diagnostics executed by the μP, refer to the Maintenance section.

THE KERNEL

The μP Kernel has four main functions: to acquire and maintain genlock with the incoming reference signal, to service the front panel, to set the genlock and sync pulse timing offsets in the Signal Generation circuitry, and to execute diagnostics. The components of the Kernel are described as follows.

Microprocessor

The μP (U239) is the heart of the Kernel. Receiving its program instructions from the EPROM, the μP controls the Kernel through its address lines (A0 – A15), its data lines (D0 – D7) and its various control lines.

The clock that drives the μP is derived from CLK28 (28 MHz). PAL U429 divides this clock by 5 to obtain a 5.727 MHz clock, called μPCLK, for the μP and the CTCs. U332C, U332D, and Q235 waveshape the μPCLK and apply it to the μP.

U221 monitors three vital conditions of the μP (U239):

a) low power supply.
b) software hangups (lost).
c) manual reset.

U221 monitors the status of the +5V power supply line for a 10% low condition. When this condition is detected, the reset output is activated and held in this condition for approximately 250 ms after the supply voltage returns to a within-tolerance condition.

The second function of U221 is to monitor the AWAKE line for negative pulses; the pulses should occur at a field rate. These pulses are from the μP *via* the decoder (U162) and indicate that the μP is going through its routines normally. If the μP gets lost, the AWAKE pulse no longer occurs. If this pulse is absent for approximately 600 ms, U221 times out and activates the μP reset line.

The third function of U221 is manual reset, which is activated by moving J122 to pins 2–3 while J425 is in its pins 1–2 position. U221 keeps the reset activated for approximately 250 ms after J122 is returned to pins 1–2.

In the 3–4 position, test jumper P245 disables RESET by pulling it high.

If the μP is not sending correct addressing and data to the two CTCs (U132 and U127), CTC1 puts out the SOFT RESET pulse that reinitializes the μP through U871D.

Kernel Memory

EPROM (U245) and RAM (U152) — EPROM U245 contains the micro-instructions that control the μP. The addresses allocated to the EPROM are 0-7FFF. RAM U152 stores temporary data such as results of calculations. Its address allocations are 8000-9FFF.

NVRAM (U157) — This is a combined permanent (EEPROM) and temporary (static RAM) memory that stores the front-panel-selected sync and genlock timing offset settings, and also the character ID data for Option 1. The address allocations for this memory device are C000-FFFF.

If a new timing offset is selected at the front panel, the μP loads the new timing data into the RAM portion of the NVRAM during the vertical interval. When the MODE SELECT button is cycled back to the TEST SIGNAL SELECTION mode, the new offset data is permanently stored in the EEPROM part of the NVRAM.

When a new ID character is selected at the front panel, the μP loads the new ID character into NVRAM in the same manner as described for new timing offsets but also loads the character into the Character RAM (Schematic 12).

Immediately following a μP reset (which occurs whenever the instrument is powered up), the μP loads the front-panel data from the EEPROM portion of the NVRAM into the RAM portion. From the RAM portion, it loads the timing offsets (PRESET1) into the H & V Timing circuits (Schematic 5), and loads the character ID data (PRESET1) into the Character RAM (Schematic 12).

NVRAM Save Control

Made up of Q355, U332D, and associated components, the NVRAM Save Control prevents the NVRAM from saving data during power-up and power-down.

During power-up, POWER,RESET forces the output of U332A high to pull NVSAVE high.

During power-down, Q355 and associated components ensure that NVSAVE remains high until the power (NVPWR) has dropped to 3 V. Below 3 V, the NVRAM will not save data, regardless of NVSAVE.

When power is switched off, C259 and C359 supply current to the NVSAVE line. As these capacitors discharge, they allow Q355 to switch on. This allows C355 to supply current to the NVSAVE line while NVPWR drops below 3 V.

Decoders

CTC and Memory Decoder (U352) - U352 is a PAL programmed to function as two separate decoder networks; one for the CTC's and I/O, and the other one for the Kernel memory. The decoder for the CTC's and I/O is enabled by IORQ, which decodes address lines 4 and 5 to enable the CTC's and the three I/O control lines (IO0, IO2, and IO3). IO0 enables the I/O Decoder, U162; IO2 enables the Character RAM on the Option 1 board; and IO3 enables the External Data Transceiver, U420.

The memory decoder portion of U352 is enabled by MREQ from the μP, address lines 13 through 15 are decoded into four enable lines, three for the memory devices in the Kernel (EPROM U245, RAM U152, and NVRAM U157) and one for the Sample RAM in schematic 3.

I/O Decoder (U162) — This chip decodes four address lines (A0-A3) to enable DACs, LEDs, and I/O ports throughout the instrument.

Sample RAM and Character RAM Address Buffers

Sample RAM Address Buffer (U620) —Enabled by the SAMPL,RAM,EN signal, this buffer is the port through which the μP addresses the Sample RAM when reading or writing to it. The address range of the Sample RAM is from A000 to BFFF.

Character RAM Address Buffer U755 — When the μP updates the Character RAM in the Option 1 board, it addresses the RAM through this buffer.

CTCs

CTC0 and CTC1 (U132 and U127) — The two CTCs are configured as programmable event counters. Their job is to count pulse signals generated by the Genlock circuit (S HSYNC, COMP SYNC, S SAMPLE FINISHED, and S START SAMPLE) and indicate to the μP the sequence in which these signals occur. The μP instructs each channel clock to count a specified number of input pulses and to interrupt the μP when it has reached the specified count. In this manner, the μP can determine the sequence in which the genlock signals are occurring.

The CTCs are daisy chained so that CTC0 (U132) has interrupt priority. This means that CLK0 through CLK3 of CTC0 have higher interrupt priority than the CLK0 through CLK3 of CTC1. The signal level at the IEI inputs of the two CTCs determines the priority. When CTC0 is not servicing an interrupt, it pulls the IEI input of CTC1 (U127) high to allow CTC1 to service interrupts.

Data I/O

External Data Transceiver (U420) — Enabled by the IO3 signal from the CTC and I/O Decoder (part of U352), this transceiver transfers data between the Kernel data bus and circuits outside the Kernel.

Sample RAM Data Transceiver (U416) — Enabled by the SAMPL,RAM,EN signal from decoder U352, this port sends data to and receives data from the Sample RAM (U616, Schematic 3). Normally, U416 will be receiving data samples every line.

GENLOCK DATA ACQUISITION CONTROLLER CIRCUIT DESCRIPTION (Schematic 3)

Page 6–10, **CHANGE** Sample Multiplexer and Sample RAM discussion **THROUGH** end of Schematic 3 circuit description **TO READ:**

Sample Multiplexer and Sample RAM

The main function of the Sample RAM (U616) is to store samples of the Genlock Input sync and burst (each sync and burst sample contains 256 sample points). The μP uses these samples to obtain and maintain lock with the Genlock Input.

Both the μP and the Memory Controller (U712) control the Sample RAM, but the μP has priority. When the μP needs to analyze the sync and burst samples stored in the Sample RAM, it asserts SAMPLER EN. The SAMPLER EN, via the Memory Controller (U712) output CNTEN, disables the RAM Address Counter and tristates three other functions: the RAM Address Counter Latch, U612; the ADC Output Latch, U716; and the WE signal at U720, generated by the Memory Controller. The μP can then address and read data from the RAM (U616).

When the μP is not looking at sync and burst samples, it pulls the SAMPLER EN signal low during the sync window to give control of the Sample RAM to the Memory Controller. With SAMPLER EN low, the CNTEN output of the Memory Controller is activated and enables the RAM Address Counter. It also un-tristates the output latch of the RAM Address Counter and ADC Output, and the WE signal is allowed to reach the Sample RAM to enable it to write data into itself. Storage of sync and burst data in the Sample RAM is described under **Memory Controller** in this section.

Each time the μP is reset, it checks the diagnostic port (U412, Schematic 1). If the switches are set for Sample RAM diagnostics, the μP asserts SAMPLER EN and SAMPL,RAM,EN, loads diagnostic data into the RAM through the Sample Multiplexer, then checks the RAM output by dis-asserting SAMPL RAM,EN while SAMPLER EN is still asserted.

Address Control

Five circuits make up the Address Control: the Line Counter (U603, U703, and U803), the Line Counter

Offset Latch (U403), the Address Decoder (U708), the Memory Controller (U712), and the Address Counter (U607). The combined function of these circuits is to provide timing to the Sample RAM such that the RAM's 28th sample (out of 256 sample points) is coincident with the 50% point of horizontal sync.

Line Counter and Address Decoder — By counting 910 positive CLK1B edges every line, the Line Counter generates timing for the Address Control circuits. When the Line Counter reaches the 910th count (1023 or 1111111111), it sends an HSYNC pulse to the Memory Controller. Twenty-eight counts before the HSYNC pulse occurs, the Address Decoder decodes the Line Counter output into the START SAMPLE pulse. 250 counts after the START SAMPLE pulse first occurred the SAMPLE FINISHED pulse occurs. During counts 208 (0011010000) through 276 (0100010100), the Address Decoder decodes the Line Counter output into the B,DITHER pulse.

The START SAMPLE, SAMPLE FINISHED, and S HSYNC outputs of the Address Decoder are seven clock cycles wide so that they are long enough to clock the CTC's in the μP Kernel. The SHsync starts with count 114, which coincides with the LHSYNC pulse.

At the start of line 10 on field 3, the μP asserts F3L10. The Address Decoder ANDs this with the 70 ns LHSYNC pulse that occurs at the 50% point of sync and generates the FLD REF signal for the Signal Generation circuits.

Memory Controller and Address Counter — To provide correct timing, the Line Counter should be accurately locked to incoming sync. When the instrument is first fired up, or when the μP has lost the position of sync, the μP asserts UNLOCKED. In this condition, a derivative of the incoming sync (GEN CSYNC) provides the most accurate reference available. The Memory Controller (U712) decodes GEN CSYNC into the LOAD pulse, which loads the Line Counter with its nominal starting count of 114 (0001110010).

Once the μP has found the vertical interval, it can provide a more accurate sync reference by locking the Line Counter to the 50% point of the leading edge of incoming sync. The μP calculates this point by analyzing the samples of the sync window stored in the Sample RAM.

To lock the Line Counter to the 50% point of sync, the μP waits until the end of the vertical interval and pulls UNLOCKED false. This allows HSYNC to control the LOAD signal instead of GEN,CSYNC. The μP then analyzes the sampled data and shifts (in 280-ns increments) the Line Counter offset (via U403) until HSYNC coincides with the 50% point of incoming sync. At this point, it returns the offset to 114.

The Memory Controller (U712) controls the storage of ADC data in the Sample RAM. The Address Counter (U607) generates 256 addresses (0 to 255) in which the Sample RAM stores the ADC samples. Fig. 6-2 shows the timing for the Memory Controller and Address Counter outputs.

When START SAMPLE is true and SAMPLER EN is false, the Memory Controller enables the Address Counter with the CNTR,EN pulse. The Memory Controller also allows WE to start clocking the inverse of clock CLK1B. The sample data from the ADC, U814, is written into the Sample RAM.

The Memory Controller allows this operation to continue until SAMPLE FINISHED is asserted (approximately 256 counts later). SAMPLE FINISHED tells the Memory Controller to enable CLR,CNT, disable CNTR,EN, and wait for the next START SAMPLE.

During the vertical interval, START SAMPLE never occurs if UNLOCKED is true. Remember that when UNLOCKED is true, the Address Decoder uses GEN,CSYNC (instead of HSYNC) to derive the LOAD pulse for the Line Counter. In the vertical interval, this GEN,CSYNC (and thus LOAD) occurs at a half line rate. Because this prevents the counter from reaching a full line count, the Address Decoder cannot generate START SAMPLE.

CLOCK CIRCUIT (Schematic 4)

Page 6-16,

CHANGE VCO discussion **TO READ:**

VCO

CAUTION

If it becomes necessary to remove Q293 from its heat sink, move J396 to the 2–3 position to prevent Q293 from overheating.

Configured as a Colpitts oscillator, the VCO circuit generates the 4Xsubcarrier signal from which all clocks in the instrument are derived. C15, in series with C8, and C6; C16, in series with varactor CR14; and C19 form the parallel resonant circuit with the crystal, Y11. C6 and C8 also provide some additional positive feedback to the base of Q1, to ensure oscillation.

Varactor diode CR14, in series with C16, establishes the frequency correction range of the oscillator. As the μP changes the VCO correction voltage over a range of +9 to –10 V (at pin 4 of P11), the reverse-biased varactor diode shifts the oscillator frequency over a correction range centered around the oscillator's free-running frequency.

Adjustment of the free-running frequency is accomplished with C19. See **Calibration** (Section 5)

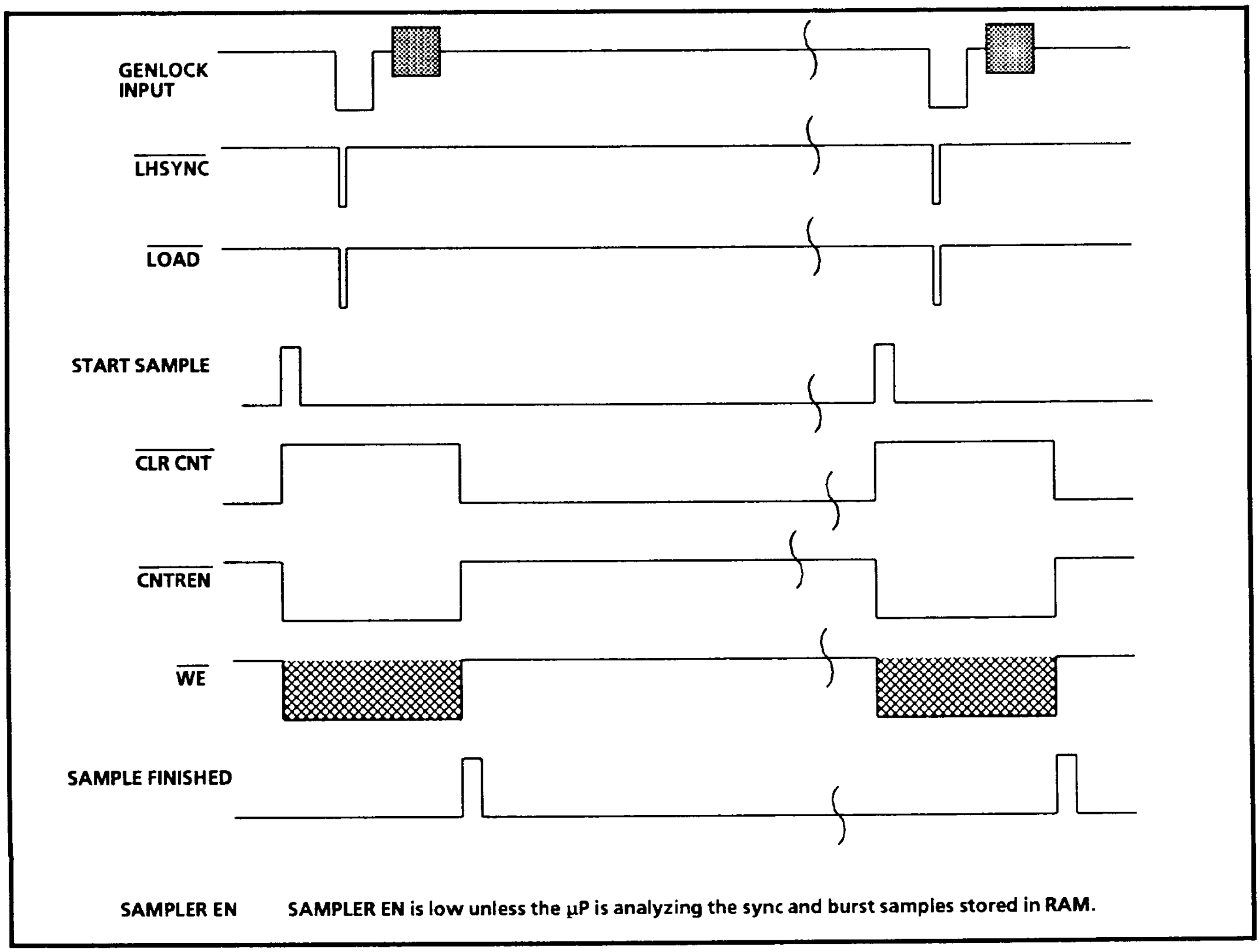


Fig. 6-2. Timing for Memory Controller and Address Counter outputs.

for full instructions on adjusting the VCO free-running frequency.

P180 allows the VCO correction voltage to be grounded when the free-running frequency is being adjusted. Also, P180 allows the VCO frequency to be checked over the full VCO correction voltage range. See **Performance Check** in Section 5.

Oven Heater Circuit — Comprised of thermistor RT11, op-amp U390B, darlington transistor Q293, and associated circuitry, the oven heater circuit is a feedback loop that keeps the crystal oven at a constant 60°C.

When the oven is cold, the resistance of RT11 is high, placing a more positive voltage at pin 6 of U390B. This pulls the output of U390B more negative and biases Q293 to increase its current flow and thus heat. As the oven heats up, the resistance of RT11 decreases, pulling the bias at the base of Q293 more positive to decrease its current flow.

Diode CR394 prevents U390B from excessively reverse biasing Q293 by limiting the maximum positive output of U390B to 5.6 V. Diode CR395 and DS397 current limit Q293 when U390B is at its maximum negative output. They do this by limiting the voltage at the base of Q293 to about 3.1 V. This limits the current through the emitter leg of the darlington to about 0.7 amps (one diode voltage drop across R296).

The current limiting occurs only when the oven is cold. This allows DS397 to act as an "Oven Cold" indicator.

PULSE & TEST SIGNAL TIMING (Schematic 5)

Page 6-24,

1st column, **H Pulse Counter and H Pulse PROM**, 1st paragraph
CHANGE: reference to U322 **TO READ:** U670
CHANGE: reference to U367A-B **TO READ:** U678A-B

CLK2Φ
CHANGE reference to U322 **TO READ:**U670

H Pulse PROM, 2nd paragraph, 2nd sentence
CHANGE 2nd sentence **TO READ:**

... Combinational logic (gate U670C) prevents this counter from being cleared and loaded simultaneously.

2nd column, **Vertical Timing, Vertical Counter,** 3rd paragraph
CHANGE; reference to U559D **TO READ:** U729A

Page 6-25,

Pulse Output Logic, 2nd column, 2nd paragraph
CHANGE reference to U780C **TO READ:** U780D

5th paragraph
CHANGE reference to U871C **TO READ:** U559B

TEST SIGNAL SELECTION (Schematic 6)

Page 6-26

Signal Selection Logic, 2nd column, 4th paragraph, 2nd sentence
CHANGE begining of 2nd sentence **TO READ:**

Gates U455C, U455D, and U363B combine the F1L263V...

6th paragraph
CHANGE reference to U871A **TO READ:** U696B

7th paragraph
CHANGE begining of 7th paragraph **TO READ:**

At U780A, the **LV**$_L$**BL** (Latched Vertical Blanking)...

SECTION 7 MAINTENANCE

Page 7–4, **Table 7–1 S/R (Stimulus/Response) Diagnostic Tests,** Switch Setting 011100,
CHANGE: Test column reference to (U611, U615) **TO READ:** (U616).

ADD switch settings 001100 (CTC Test) and 000000 (Cycle Diagnostics) **AS FOLLOWS:**

001100	CTC Test	Sets up the Counter Timer Chips as timers and checks to see that they can generate interrupts. Each of the CTC's four sections are set up to interrupt after 4096 processor clock cycles. If any of the CTC's sections have not interrupted within the allocated time, an error is logged and the test continues.	Lignts CHARACTER ID CONTROLS LED if an error is detected in U132. Lights DELAY CONTROLS LED if an error is detected in U127.
000000	Cycle Diagnostic	Continuously cycles through the EPROM, μP RAM, NVRAM, and SAMPLE RAM tests, then turns on all LEDs. On detecting an error, the appropriate LED is lit, and the test stops.	Lights STAIRCASE LED to indicate an error during the EPROM test. Lights RAMP LED to indicate an error during the μP RAM test. Lights MOD RAMP LED to indicate an error during the NVRAM test. Lights APL LED to indicate an error during the SAMPLE RAM test.

Page 7–7, **Table 7–2 SL (Stimulus Loop) Diagnostic Tests,** Switch Setting 011001, Hardware Reset Test.
CHANGE TO READ:

001101	Hardware Reset Test	First set J425 to its 1–2 position, then select the Hardware Reset Test. Check J425–1 with an oscilloscope to verify that there is a 1200 mS square wave (low = true)	Checks the hardware reset circuitry.

Page 7–11
DELETE: Fig. 7–17.

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SECTION 8 REPLACEABLE ELECTRICAL PARTS LIST

REMOVE:

A2-1C222	283-0421-00	CAP, FXD, CER DI:0.1UF, +80-20%, 50V
A2-1C281	283-0635-00	CAP, FXD, MICA DI:51PF, 1%, 100V
A2-1C282	283-0633-00	CAP, FXD, MICA DI:77PF, 1%, 100V
A2-1C318	283-0486-00	CAP, FXD, CER DI:1.0UF, 10%, 50V
A2-1C319	283-0238-00	CAP, FXD, CER DI:1.01UF, 10%, 50V
A2-1C381	283-0779-00	CAP, FXD, MICA DI:27PF, 2%, 500V
A2-1C384	283-0631-00	CAP, FXD, MICA DI:95PF, 1%, 500V
A2-1C387	281-0284-00	CAP, VAR, CER DI:2.2-34PF, 250V
A2-1C487	283-0706-00	CAP, VAR,MICA DI:91PF,1%, 500V
A2-1CR122	152-0141-02	SEMICOND DVC, DI:SW, SI, 30V, 150MA, 30V, D0-35
A2-1CR123	152-0141-02	SEMICOND DVC, DI:SW, SI, 30V, 150MA, 30V, D0-35
A2-1J382	131-0608-00	TERMINAL, PIN:0.365 L X 0.025 BRZ GLD PL, QTY 5
A2-1J720	131-0608-00	TERMINAL, PIN:0.365 L X 0.025 BRZ GLD PL, QTY 7
A2-1P382	131-0993-05	BUS, CONDUCTOR:SHUNT ASSEMBLY, GREEN
A2-1R121	315-0103-00	RES, FXD, FILM:10K OHM, 5%, 0.25W
A2-1R171	315-0393-00	RES, FXD, FILM:39K OHM, 5%, 0.25W
A2-1R318	321-0394-00	RES, FXD, FILM:124K OHM, 1%, 0.125W, TC=TO
A2-1R319	321-0264-00	RES, FXD, FILM:5.49K OHM, 1%, 0.125W, TC=TO
A2-1R384	321-0454-00	RES, FXD, FILM:523K OHM, 1%, 0.125W, TC=TO
A2-1R587	321-0249-00	RES, FXD, FILM:3.83K OHM, 1%, 0.125W, TC=TO
A2-1U222	156-1645-00	MICROCKT, DGTL:STTL, DUAL RETRIGGERABLE RESETABLE MONOSTABLE MULTIVIBRATOR, SCRN
A2-1U322	156-0479-02	MICROCKT, DGTL:QUAD 2-INP OR GATE, SCRN
A2-1U329	156-0541-02	MICROCKT, DGTL:DUAL 2-TO 4-LINE DCDR/DEMUX
A2-1U338	156-1373-01	MICROCKT, DGTL:QUAD BUS BFR
A2-1U351	156-2100-00	MICROCKT, DGTL:3 TO 8 LINE DECODES/DEMUX
A2-1U367	156-2338-00	MICROCKT, DGTL:DUAL D-TYPE POS EDGE-TRIG FF
A2-1U429	160-3619-01	MICROCKT, DGTL:QUAD 16 INPUT REGISTERED AND/OR, PRGM
A2-1U432	156-0804-02	MICROCKT, DGTL:QUADRUPLE S-R LATCH
A2-1U435	156-0392-03	MICROKT, DGTL:QUAD LATCH W/CLEAR, SCRN
A2-1U438	156-1707-00	MICROCKT, DGTL:QUAD 2-INPUT NAND GATE, SCRN
A2-1U611	156-2486-00	MICROCKT, DGTL:256 X 4 RAM
A2-1U615	156-2486-00	MICROCKT, DGTL:256 X 4 RAM
A2-1U688	156-1707-00	MICROCKT, DGTL:QUAD 2-INPUT NAND GATE, SCRN
A2-1U707	160-3569-00	MICROCKT, DGTL:STTL, OCTAL 16 IN AOI GATE ARRAY
A2-1U711	160-3568-01	MICROCKT, DGTL:QUAD 16 INPUT REGISTERED AND/OR, PRGM
A2-1U714	156-2210-00	MICROCKT, DGTL:QUAD SEL/MUX W/3-STATE OUT
A2-1U717	156-2210-00	MICROCKT, DGTL:QUAD SEL/MUX W/3-STATE OUT
,A2-1U871	156-1707-00	MICROCKT,DGTL:QUAD 2-INPUT NAND GATE,SCRN
A2-2C2	283-0632-00	CAP, FXD, MICA DI: 87 PF, 10%, 100V
A2-2C3	283-0779-00	CAP, FXD, MICA DI: 27 PF, 2%, 500V

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A2-2C4	281-0773-00	CAP, FXD, CER DI: 0.01 PF, 2%, 500V
A2-2CR7	152-0719-00	SEMICOND DVC,DI: VVC, SI, 100 PF, 5%, 30V, DO-7
A2-2CR488	152-0141-02	SEMICOND DVC, DI: SW, SI,30V, 150MA, 30V, D0-35
A2-2CR489	152-0141-02	SEMICOND DVC, DI: SW, SI,30V, 150MA, 30V, D0-35
A2-2R5	317-0105-00	RES, FXD, CMPSN: 1M OHM, 5%, 0.125W
A2-2R9	317-0105-00	RES,FXD, CMPSN: 1M OHM, 5%, 0.125W
A2-2R10	317-0470-00	RES, FXD, CMPSN: 47 OHM, 5%, 0.125W
A2-2RT6	307-0181-00	RES,THERMAL: 20K OHM,5%,AT 60 DEG C
A2-2Q1	151-1124-00	TRANSISTOR: JFE, N-CHAN, SI, SEL,TO-92

ADD:

A2-1J425	131-0608-00	TERMINAL, PIN: 0.365 L X 0.025 PH BRZ GLD PL, QTY 4
A2-1R122	315-0272-00	RES, FXD, FILM: 2.7K OHM, 5%.0.25W
A2-1R171	315-0203-00	RES, FXD, FILM: 20K OHM, 5%, 0.25W
A2-1R381	321-0441-00	RES, FXD, FILM: 383K OHM, 1%,0.125W
A2-1R385	321-0318-00	RES, FXD, FILM: 20.0K OHM, 1%,0.125W
A2-1U221	156-3050-00	MICROCKT, LINEAR: POWER SUPPLY MONITOR 1232, DIP8
A2-1U352	160-5504-00	MICROCKT, DGTL: 10 LOW OUT LOGIC ARRAY, PRGM PAL20L, DIP24
A2-1U612	156-2065-00	MICROCKT, DGTL: OCTAL D TYPE TRANS LATCHES W/3 STATE OUT
A2-1U616	156-2992-00	MICROCKT, DGTL: 2048 X 8 STATIC R/W RAM 7C128-35, DIP24
A2-1U670	156-0479-02	MICROCKT, DGTL: QUAD 2-INP OR GATE, SCRN 74LS32
A2-1U678	156-2338-00	MICROCKT, DGTL: DUAL D-TYPE POS EDGE-TRIG FF
A2-1U708	160-5505-00	MICROCKT, DGTL: PRGM LOGIC DEVICE, PRGM 20G10-25PC
A2-1U712	160-4422-00	MICROCKT, DGTL: CMOS, OCATAL 16 INP PLD, PRGM 16V8-25,DIP20
A2-1U716	160-2065-00	MICROCKT, DGTL: OCTAL D TYPE TRANS LATCHES W/3 STATE OUT
A2-1U720	156-1754-01	MICROCKT, DGTL: OCTAL BUFFER W/3-STATE OUT 74ALS244
A2-2C6	283-5025-00	CAP, FXD, CER DI: 220PF, 5%, 50V NPO, 1206 PKG, SMD, 8MM
A2-2C8	283-5025-00	CAP, FXD, CER DI: 220PF, 5%, 50V NPO, 1206 PKG, SMD, 8MM
A2-2C15	283-5008-00	CAP, FXD, CER DI: 12PF, 5%, 50V, NPO, 1206 PKG, SMD, 8MM
A2-2C16	283-5206-00	CAP, FXD, CER DI: 56PF,
A2-2C17	283-5004-00	CAP, FXD, CER DI:0.1UF, 10%, 25V X7R, 1206 PKG, SMD, 8MM
A2-2C19	281-0165-00	CAP, VAR, AIR DI: 0.8-10PF, 250V
A2-2CR14	152-0612-00	SEMICOND DVC,DI: VVC,SI,50V,17.5PF,DO-71N4806 FAMILY
A2-2Q10	151-5001-00	TRANSISTOR: NPN, SI, SOT-23 MMBT3904
A2-2R1	321-5043-00	RES, FXD, FILM: 47.5 OHM, 1%, 0.125W
A2-2R3	307-1161-00	RES, FXD, FILM: 1M OHM, 5%, 0.062W
A2-2R4	321-5078-00	RES, FXD, FILM: 20K OHM, 1%, 125MW,TC=100PPM
A2-2R5	321-5078-00	RES, FXD, FILM: 20K OHM, 1%, 125MW,TC=100PPM
A2-2R9	321-5012-00	RES, FXD, FILM: 332 OHM, 1%, 0.125W
A2-2RT11	307-0181-01	RES,THERMAL: 20K OHM,5%,AT 60 DEG C

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CHANGE TO READ:

A2-1	670-9111-05	CIRCUIT BD ASSY:DIGITAL
A2-1C205	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C206	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C207	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C214	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C270	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C275	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C276	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C280	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C290	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C325	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C329	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C351	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C363	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C367	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C370	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C372	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C374	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C376	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C378	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C380	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C390	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C397	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C435	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C443	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C455	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C467	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C474	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C477	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C478	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C481	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C485	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C491	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C493	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C496	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C507	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C520	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C580	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C592	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C663	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C707	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C714	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C717	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C723	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V

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A2-1C729	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C736	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C742	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C748	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C759	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C788	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C807	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C809	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C811	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C812	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C821	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C824	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C827	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C841	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C842	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C843	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C844	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C845	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C846	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C847	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C848	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C867	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C875	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C880	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C907	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C944	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1C945	281-0775-01	CAP, FXD, CER DI: 0.1UF, 20%, 50V
A2-1R121	315-0272-00	RES, FXD, FILM: 2.7K OHM, 5%, 0.25W
A2-1R385	321-0318-00	RES, FXD, FILM: 20.0K OHM,1%, 0.125W, TC=TO
A2-1R487	321-0152-00	RES, FXD, FILM: 1.5K OHM,5%, 0.125W
A2-1R171	321-0203-00	RES, FXD, FILM: 20.0K OHM, 5%, 0.25W
A2-1U245	160-3562-03	MICROCKT, DGTL:NMOS, 32768 X 8 EPROM, PRGM
A2-1U429	160-3619-02	MICROCKT, DGTL:QUAD 16 INPUT REGISTERED AND/OR,PGRM
A2-2	119-2321-02	OVEN ASSY:

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SECTION 9 SCHEMATICS AND CIRCUIT BOARD ILLUSTRATIONS

Due to the re-layout of the Digital (A2–1) board, many of the pull-up resistors for the ECL parts are connected to different parts. The following tables detail these changes.

Schematic 1 Pullup Resistor Changes

From		To	
IC	Pullup	Pullup	IC
J210-3	R118-1	R440-4	
J211-3	R440-9	R440-5	
U218-1	R440-10	R440-6	
U303-1	R440-10	R440-6	
U314-1	R440-10	R440-6	
U459-1	R777-3	R777-10	
U767-1	R777-2	R777-10	

Schematic 4 Pullup Resistor Changes

From		To	
IC	Pullup	Pullup	IC
U591A-6	R594-8	R594-8	U591B-6
U591A-7	R594-9	R594-9	U591B-7
U591B-2	R929	R929	U591A-2
U591B-3	R829	R829	U591A-3
U591C-14	R954	R953	
U591C-15	R593	R954	

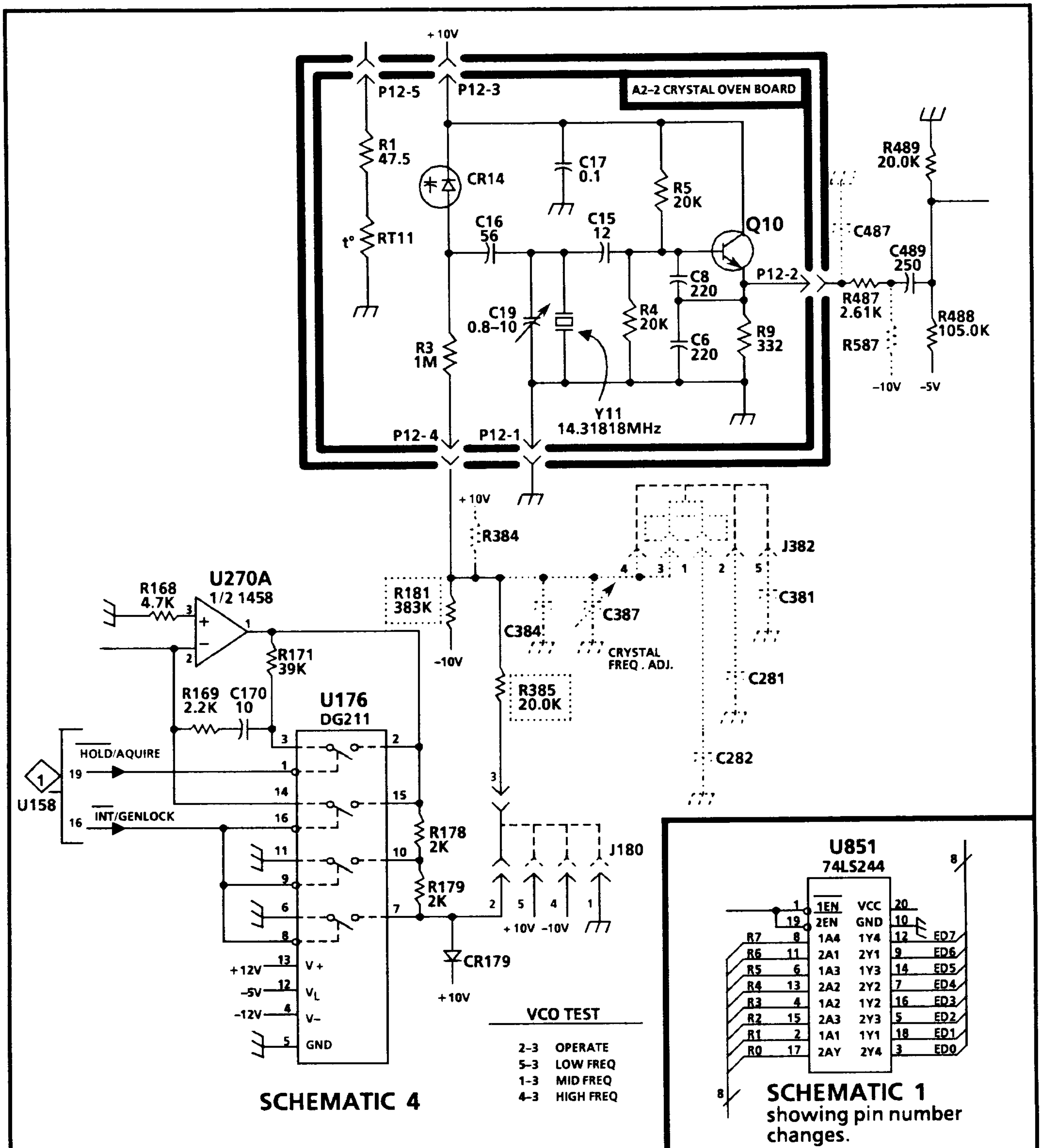
Date: 10/28/88	Group Code 20	Change Reference: M62651
Product: TSG–170A		Manual Part No: 070–5680–00

Schematic 5 Pullup Resistor Changes

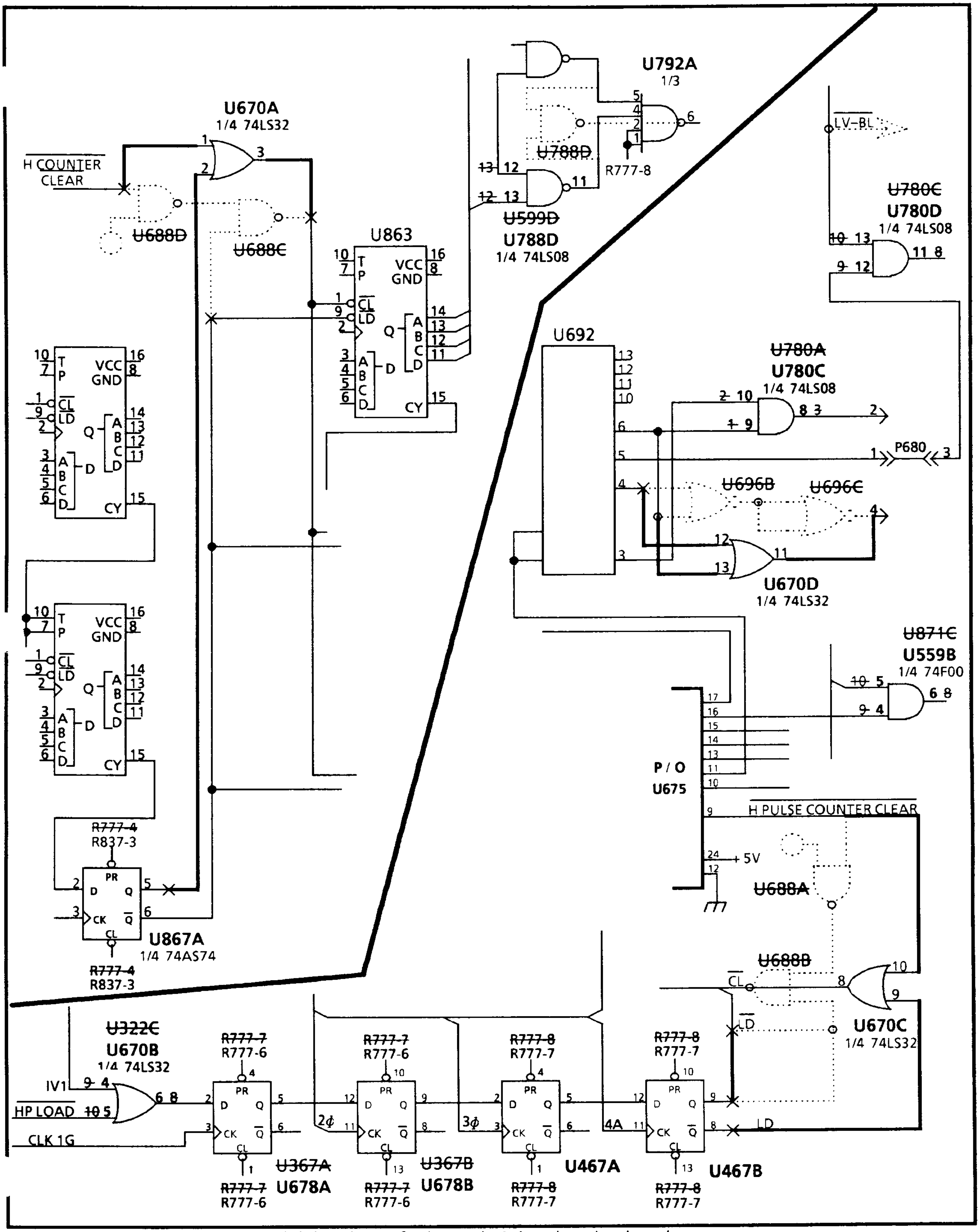
From		To	
IC	Pullup	Pullup	IC
J881-3	R777-6	R777-9	
J882-1	R777-6	R777-9	
P767-3	R777-4	R837-5	
U367A-1	R777-7	R777-6	U678A-1
U367A-4	R777-7	R777-6	U678A-4
U367B-10	R777-7	R777-6	U678A-10
U367B-13	R777-7	R777-6	U678A-13
U463-1	R777-3	R777-10	
U467A-1	R777-8	R777-7	
U467A-4	R777-8	R777-7	
U467B-10	R777-8	R777-7	
U467B-13	R777-8	R777-7	
U563-1	R777-3	R777-10	
U567-1	R777-2	R837-4	
U567-7	R777-2	R837-4	
U567-10	R777-2	R837-4	
U675-20	R777-6	R777-6	
U688A-2	R777-5	———	
U688D-12	R777-5	———	
U692-9	R777-5	R777-8	
U763-3	R777-4	R837-2	
U763-6	R777-4	R837-2	
U771-7	R777-2	R837-4	
U771-10	R777-2	R837-4	U784-3
U784-3	R777-6	R777-9	
U792A	———	R777-8	
U796-1	R777-5	R777-8	
U863-6	R777-4	R837-2	
U863-7	R777-4	R837-2	
U863-10	R777-4	R837-2	
U867A-1	R777-4	R837-3	
U867A-4	R777-4	R837-3	

Schematic 7 Pullup Resistor Changes

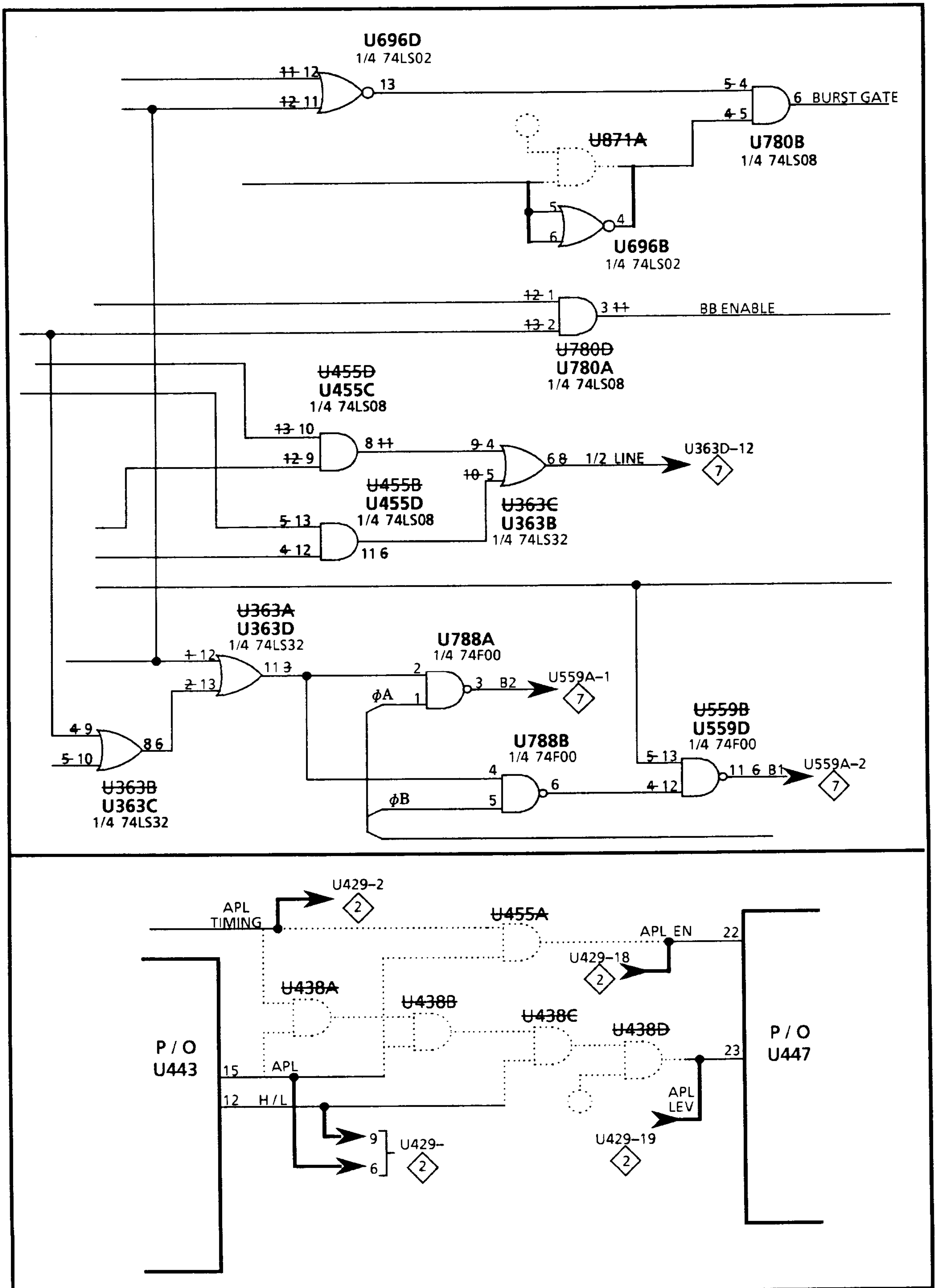
From		To	
IC	Pullup	Pullup	IC
U322B	———	R777-10	U455A-2
U624-1	R837-3	+5 Direct	
U631-1	R837-4	+5 Direct	
U637-1	R837-5	+5 Direct	
U644-1	R837-5	+5 Direct	
U650-1	R837-8	+5 Direct	
U723-1	R837-3	R837-10	
U726-1	R837-3	R837-10	
U729-1	R837-4	R837-9	
U732-1	R837-4	R837-9	
U736-1	R837-6	R837-8	
U736-2	R837-6	R837-8	
U736-3	R837-6	R837-8	
U739-1	R837-6	R837-8	
U739-2	R837-6	R837-8	
U739-3	R837-6	R837-8	
U748-1	R837-8	R837-6	
U752-1	R837-8	R837-6	
U821-6	R837-9	R837-6	
U824-6	R837-9	R837-6	
U827-6	R837-9	R837-6	



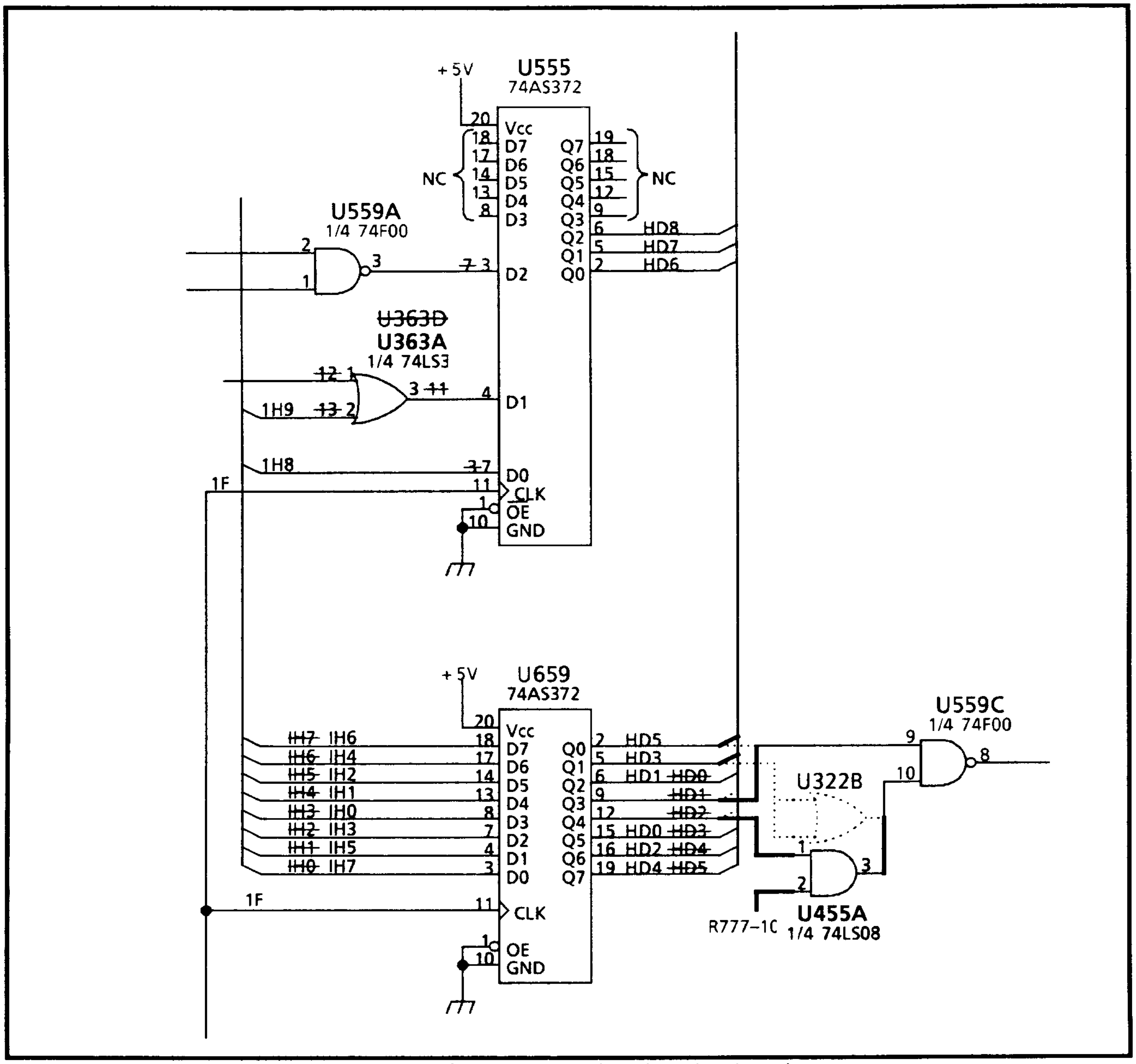
Partial schematics showing circuitry changes.



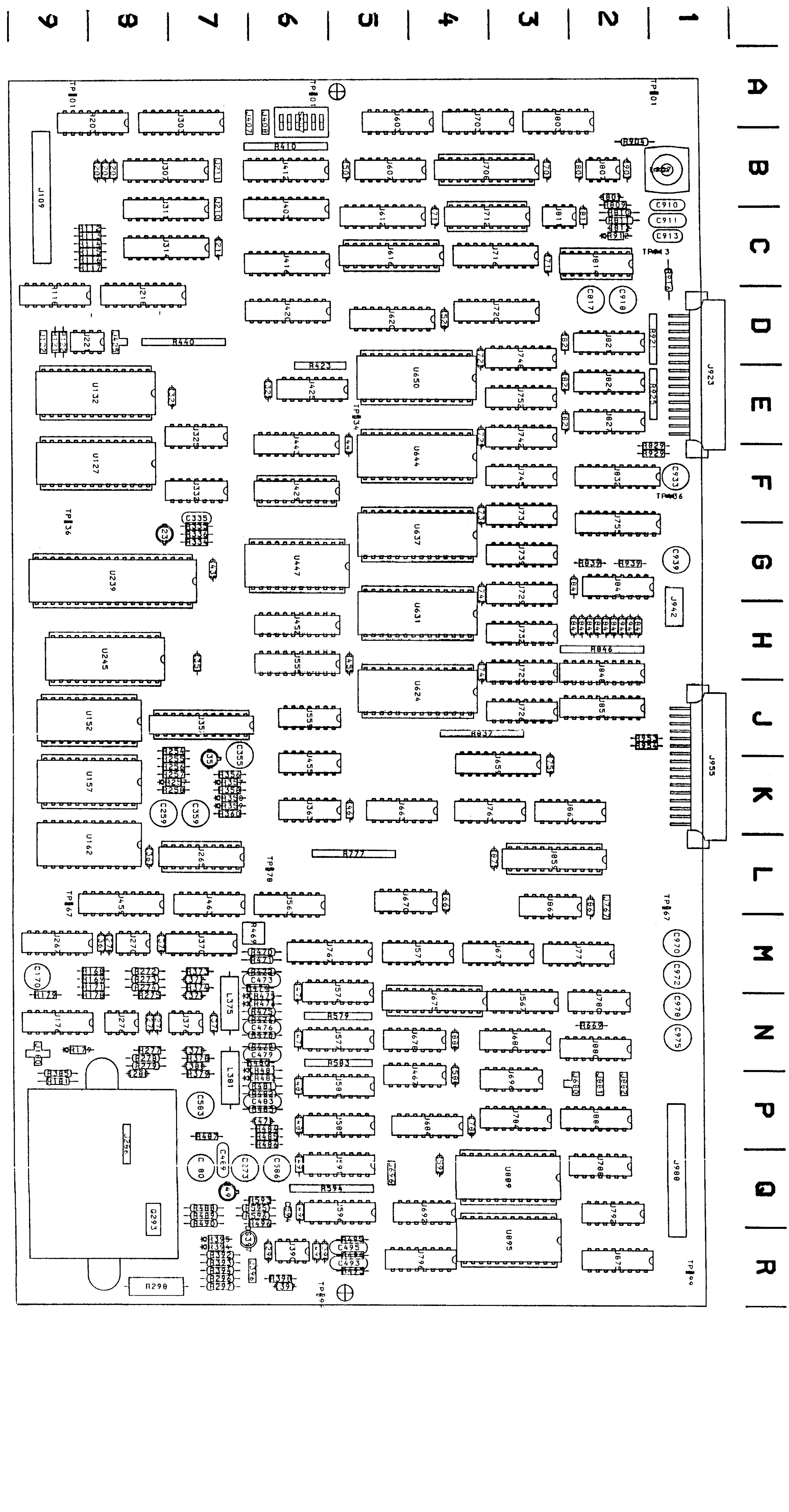
Partial drawings of Schematic 5 showing circuitry changes.



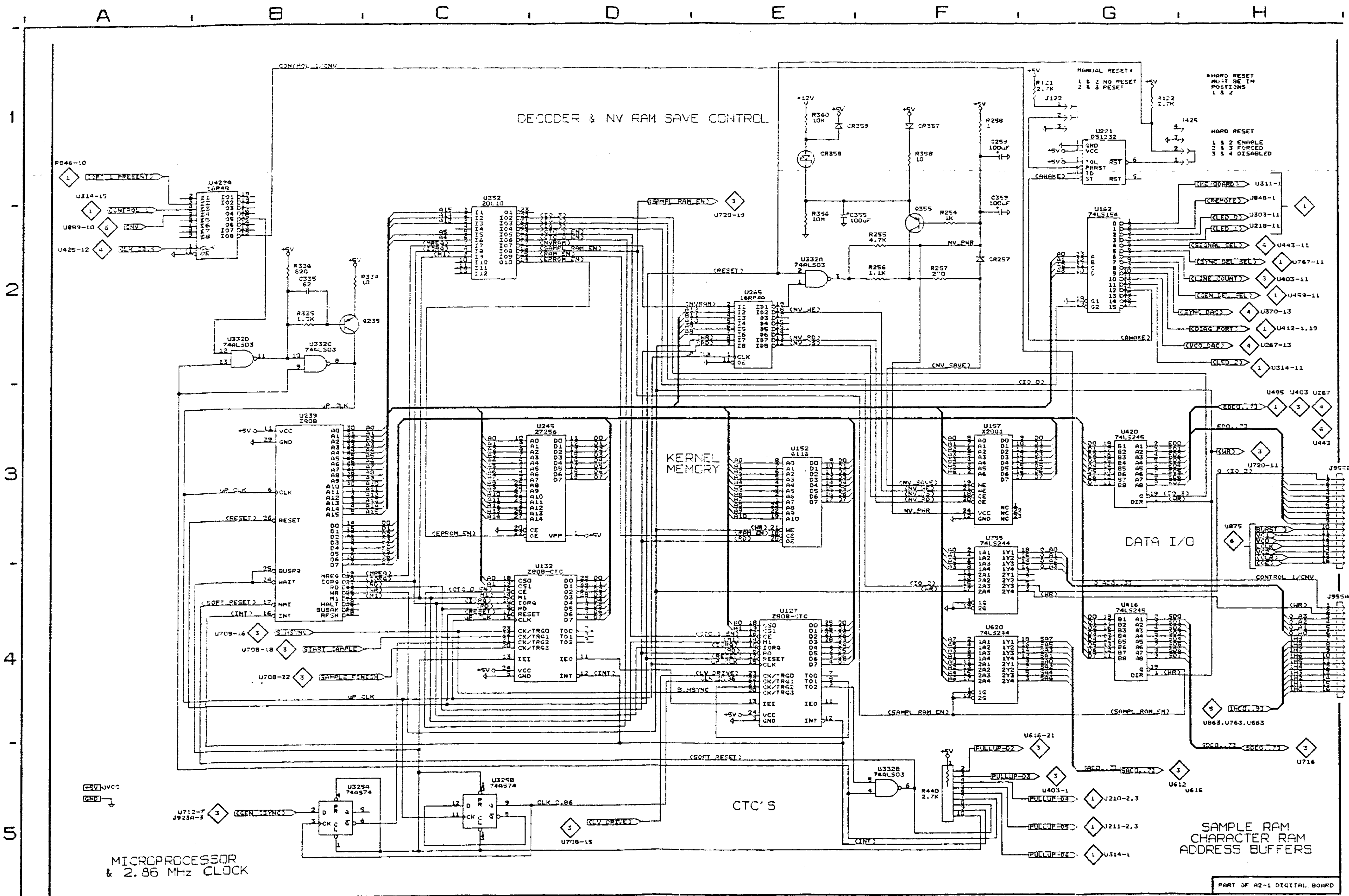
Partial drawings of Schematic 6 showing circuitry changes.



Partial drawing of Schematic 7 showing circuitry changes.

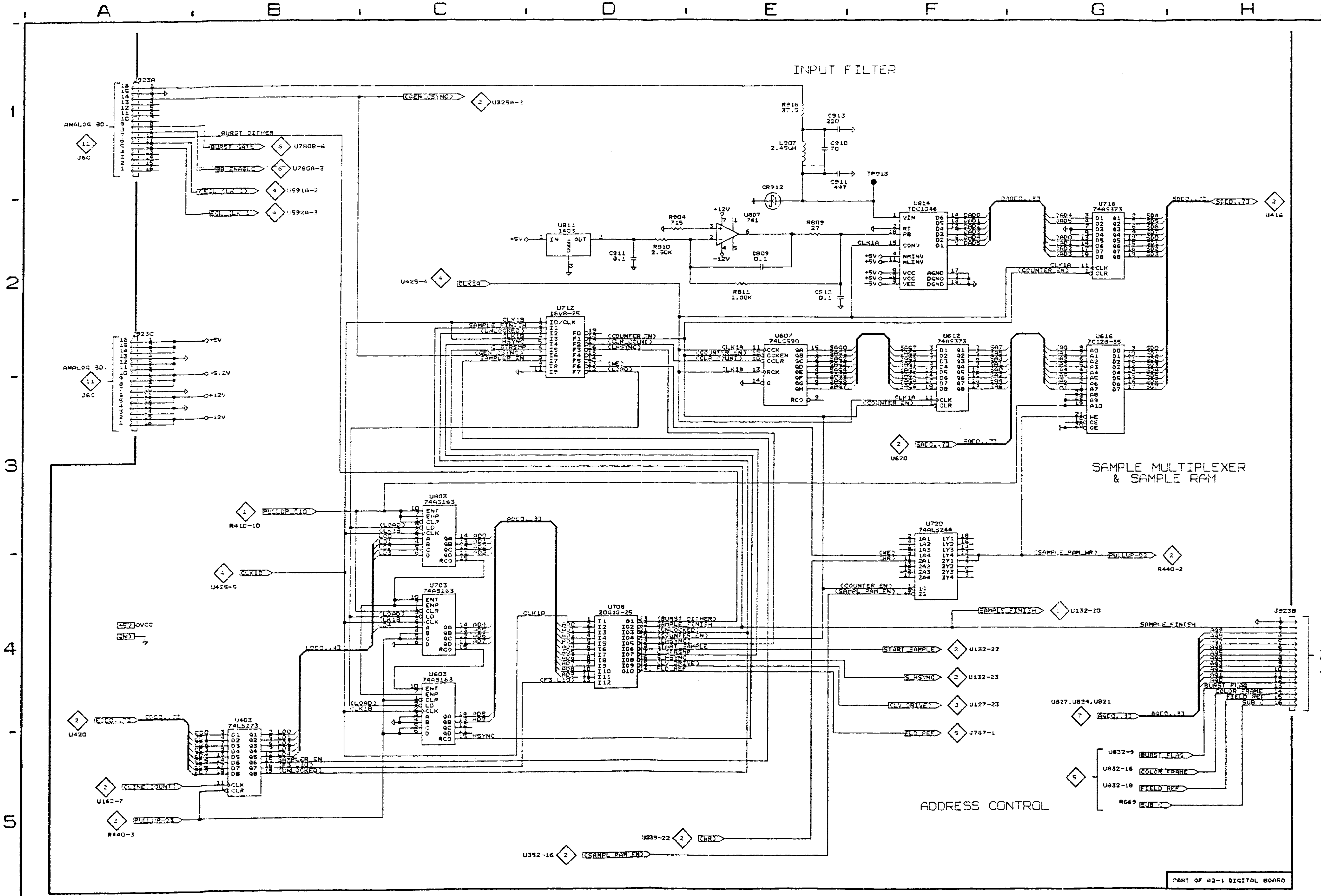


1 2 3 4 5 6 7 8 9
A B C D E F G H J K L M N P Q R



TSG-170A

MICROPROCESSOR KERNEL 2



TSG-170A

GEN. LOCK DATA ACQUISITION CONTROLLER 3

Tektronix
COMMITTED TO EXCELLENCE

MANUAL CHANGE INFORMATION

Group Code 20

Date: 8/17/90 Change Reference: M73086

Product: See List Manual Part No: See List

DESCRIPTION

Inst.	Manual P/N	Eff S/N	Inst.	Manual P/N	Eff S/N
SPG170A	070-5965-00	B021206	TSG370	061-3656-00	B010286
TSG170A	070-5680-00	B042779	TSG371	061-3717-00	B010414
TSG170D	070-6943-00	B010275	TSG422	061-3596-00	B010253
VITS201	070-7385-00	B030337	TPG625	061-3677-00	B010194
SPG271	061-3546-00	B021016	TSG1050	061-3718-00	B010100
TSG271	070-6304-00	B031611	TSG1125	061-3629-00	B010115
TSG300	070-5722-00	B031522	TSG1250	061-3719-00	B010100

ELECTRICAL PARTS LIST and SCHEMATIC CHANGES

In the TSG170A, TSG170D, TSG370, and SPG170A

CHANGE TO READ:

A2-2	119-2321-04	OVEN ASSEMBLY:
A2-2C6	283-5238-00	CAP,FXD,CER DI:150 PF,5%,100V
A2-2C15	283-5000-00	CAP,FXD,CER DI:8 PF, ± 5 PF,50V

In the SPG271, TSG271, TSG371, and TPG625

CHANGE TO READ:

A2-2	119-2501-05	OVEN ASSEMBLY:
A2-2C6	283-5238-00	CAP,FXD,CER DI:150 PF,5%,100V
A2-2C15	283-5000-00	CAP,FXD,CER DI:8 PF, ± 5 PF,50V

In the VITS201

CHANGE TO READ:

A1A2	119-2501-05	OVEN ASSEMBLY:
A1A2C6	283-5238-00	CAP,FXD,CER DI:150 PF,5%,100V
A1A2C15	283-5000-00	CAP,FXD,CER DI:8 PF, ± 5 PF,50V

In the TSG300, and TSG422

CHANGE TO READ:

A2-2	119-2323-04	OVEN ASSEMBLY:
A2-2C6	283-5238-00	CAP,FXD,CER DI:150 PF,5%,100V
A2-2C15	283-5000-00	CAP,FXD,CER DI:8 PF, ± 5 PF,50V

In the TSG1125

CHANGE TO READ:

A3A4	119-3402-02	OVEN ASSEMBLY:
A2-2C6	283-5238-00	CAP,FXD,CER DI:150 PF,5%,100V
A2-2C15	283-5000-00	CAP,FXD,CER DI:8 PF, ± 5 PF,50V

Date: 8/17/90	Group Code 20	Change Reference: M73086
Product: See List		Manual Part No: See List

In the TSG1050 and TSG1250

CHANGE TO READ:

A3A4	119-3893-02	OVEN ASSEMBLY:
A3A4C6	283-5238-00	CAP,FXD,CER DI:150 PF,5%,100V
A2-2C15	283-5000-00	CAP,FXD,CER DI:8 PF,±5 PF,50V

Tektronix

MANUAL CHANGE INFORMATION

Date: 12/7/94 **Change Reference:** M81833

Product:	Manual P/N:
TSG 170A	070–5680–01
TSG 300	070–5722–01
TSG 131A	070–8663–01
TSG 130A	070–8664–01

Replaceable Electrical Parts Changes

In the TSG 170A

Change to Read:

A3Q629 151–0195–02 TRANSISTOR,SIG:BIPOLAR,NPN;150MHZ2N5223/MPS6521

In the TSG 300

Change to Read:

A3Q410 151–0195–02 TRANSISTOR,SIG:BIPOLAR,NPN;150MHZ2N5223/MPS6521

In the TSG 131A

Change to Read:

A2Q105 151–0195–02 TRANSISTOR,SIG:BIPOLAR,NPN;150MHZ2N5223/MPS6521

In the TSG 130A

Change to Read:

A2Q11 151–0195–02 TRANSISTOR,SIG:BIPOLAR,NPN;150MHZ2N5223/MPS6521

Tektronix

MANUAL CHANGE INFORMATION

Date: 1/10/94 **Change Reference:** M79236

Product: All Television Products **Manual Part Number:** NA

Tektronix Television Division will no longer use electrolytic capacitors with 85˚ ratings. They are being replaced with 105˚ rated capacitors, for better long term reliability. All other ratings on the new capacitors are the same or better. If you need to order any of these caps, be sure to use the new part number.

ELECTRICAL PARTS LIST CHANGES

REPLACE		WITH	
100 UF	290–1100–00	290–1309–00	CAP,FXD,AL:100UF,20%,63V,RADIAL,105 DEG
10 UF	290–0974–03	290–1311–00	CAP,FXD,AL:10UF,20%,50V,5 X 11MM,105 DEG
10 UF	290–0990–01	290–1313–00	CAP,FXD,AL:10UF,20%,50V,8 X 11MM,105 DEG
2.2 UF	290–0758–00	290–1312–00	CAP,FXD,AL:2.2UF,20%,315V;10 X 125MM,105 DEG

Tektronix

MANUAL CHANGE INFORMATION

Date: 7/25/94 **Change Reference:** M81904

Product:	Manual P/N:	Effective S/N:
728M	070–8045–00	B020189
728E	070–7630–02	B020282
ECO 170A	070–6113–00	B021464
SPG 170A	070–5965–00	B022083
SPG 271	070–6814–00	B022464
TPG 625	070–7248–00	B010372
TSG–170A	070–5680–00	B044102
TSG 170D	070–6943–00	B010857
TSG 271	070–6304–00	B033388
TSG 300	070–5722–00	B032112
TSG 370	070–7446–00	N/A
TSG 371	070–7707–00	B011124

Replaceable Electrical Parts Changes

In the 728M and 728E

Change to Read:

A4	671–1836–06	CKT BD ASSY:POWER SUPPLY
A4R510	311–0634–00	RES,VAR,NONWW:TRMR,500 OHM,0.5W CERMET

In the ECO 170A,SPG 170A, SPG 271, TPG 625, TSG 170A, TSG 170D, TSG 271, TSG 300, TSG 370, TSG 371

Change to Read:

A4	671–0572–07	CKT BD ASSY:POWER SUPPLY
A4R510	311–0634–00	RES,VAR,NONWW:TRMR,500 OHM,0.5W CERMET

Tektronix

MANUAL CHANGE INFORMATION

Date: 5/30/95 **Change Reference:** M82523 REV 1

Product:	**Manual P/N:**	**Effective S/N:**
SPG170A	070–5965–00	B022188
SPG271	070–6814–00	B022574
TSG170A	070–5680–00	B044296
TSG170D	070–6943–00	B010895
TSG271	070–6304–00	B033558
TSG273	070–7956–00	B010301
TSG371	070–7707–00	B011162
TSG422	070–7022–00	B031482
TPG625	070–7248–00	B010378
TSG300	070–5722–00	B032150
TSG300E	070–8374–00	B032150

Replaceable Electrical Parts Changes

Replaceable Electrical Parts

In the TSG170A. TSG170D, and TSG370, **CHANGE TO READ:**

A2–1	670–9111–14	CKT BD ASSY:DIGITAL;WIRED (TSG170A ONLY)
A2–1	670–9111–15	CKT BD ASSY:DIGITAL;WIRED (TSG170A OPT 2J ONLY)
A2–1	670–9111–16	CKT BD ASSY:DIGITAL;WIRED (TSG170A OPT 1V ONLY)
A2–1	670–9111–59	CKT BD ASSY:DIGITAL;WIRED (TSG170D ONLY)
A2–1	670–9111–60	CKT BD ASSY:DIGITAL;WIRED (TSG170D OPT 1J ONLY)
A2–1	670–9111–61	CKT BD ASSY:DIGITAL;WIRED (TSG170D OPT 1V ONLY)
A2–1	670–9111–71	CKT BD ASSY:DIGITAL;WIRED (TSG370 ONLY)
A2–1R258	308–0677–00	RES,FXD,WW:1 OHM,5%,2W AXIAL LEAD

In the TSG300, TSG300E, and TSG370, **CHANGE TO READ:**

A2–1	670–9130–16	CKT BD ASSY:DIGITAL;WIRED (TSG300 OPT 01 ONLY)
A2–1	670–9130–17	CKT BD ASSY:DIGITAL;WIRED (TSG300 ONLY)
A2–1	670–9130–18	CKT BD ASSY:DIGITAL;WIRED (TSG300E ONLY)
A2–1R997	308–0677–00	RES,FXD,WW:1 OHM,5%,2W AXIAL LEAD

In the SPG170A **CHANGE TO READ:**

A2–1	670–9523–08	CKT BD ASSY:DIGITAL;WIRED (SPG170 ONLY)
A2–1	670–9523–09	CKT BD ASSY:DIGITAL;WIRED (SPG170 OPT 2J ONLY)
A2–1R338	308–0677–00	RES,FXD,WW:1 OHM,5%,2W AXIAL LEAD

Date: 5/30/95	Change Reference: M82523 Rev 1

In the SPG271, TSG271, TSG273, and TSG371 **CHANGE TO READ:**

A2–1	670–9905–18	CKT BD ASSY:DIGITAL;WIRED (TSG271 ONLY)
A2–1	670–9905–19	CKT BD ASSY:DIGITAL;WIRED (TSG271 OPT 03 ONLY)
A2–1	670–9905–33	CKT BD ASSY:DIGITAL;WIRED (TSG371 ONLY)
A2–1	670–9905–56	CKT BD ASSY:DIGITAL;WIRED (SPG271 ONLY)
A2–1	670–9905–57	CKT BD ASSY:DIGITAL;WIRED (SPG271 OPT 02 ONLY)
A2–1	670–9905–94	CKT BD ASSY:DIGITAL;WIRED (TSG273 ONLY)
A2–1R446	308–0677–00	RES,FXD,WW:1 OHM,5%,2W AXIAL LEAD

In the TSG422 **CHANGE TO READ:**

A2–1	671–0764–12	CKT BD ASSY:DIGITAL;WIRED (TSG422 ONLY)
A2–1R996	308–0677–00	RES,FXD,WW:1 OHM,5%,2W AXIAL LEAD

In the TPG625 **CHANGE TO READ:**

A2–1	671–0958–01	CKT BD ASSY:DIGITAL;WIRED (TPG625 ONLY)
A2–1R359	308–0677–00	RES,FXD,WW:1 OHM,5%,2W AXIAL LEAD