Tektronix®

SG 5030

Programmable
Leveled Sine Wave Generator

SERVICE MANUAL

INSTRUCTION MANUAL

Tektronix®
COMMITTED TO EXCELLENCE

PLEASE CHECK FOR CHANGE INFORMATION AT THE REAR OF THIS MANUAL.

SG 5030

Programmable

Leveled Sine Wave Generator

SERVICE MANUAL

Tektronix, Inc.
P.O. Box 500
Beaverton, OR 97077
070-7703-01
Product Group 75

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INSTRUMENT SERIAL NUMBERS

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

B010000Tektronix, Inc., Beaverton, Oregon, USA
J300000Sony/Tektronix, Japan
H700000Tektronix Holland, NV, Heerenveen,
The Netherlands

Instruments manufactured for Tektronix by external vendors outside the United States are assigned a two digit alpha code to identify the country of manufacture (e.g. JP for Japan, HK for Hong Kong, IL for Israel, etc.)

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WARNING

The remaining portion of this Table of Contents lists information that may expose personnel to hazardous voltages. The information listed in the remaining sections of this manual is for qualified personnel only.

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Operator Safety Summary

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

Terms In This Manual

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

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

As Marked on Equipment

CAUTION — CAUTION indicates a hazard to property, including the equipment itself, and could cause minor personal injury.

WARNING — WARNING indicates solely a personal injury hazard not immediately accessible as you read the marking.

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

Symbols In This Manual

This symbol indicates where applicable cautionary or other information is to be found.

As Marked on Equipment

DANGER-High voltage.

Protective ground (earth) terminal.

ATTENTION-Refer to manual.

Power Source

This product is intended to operate in a power module connected to a power source that will not apply more than 250 volts RMS between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Grounding the Product

This product is grounded through the grounding conductor of the power module power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the product input or output terminals. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation. (I.E.C. Safety Class I)

Danger Arising From Loss of Ground

Upon loss of the protective-ground connection, all accessible conductive parts (including knobs and controls that may appear to be insulating) can render an electric shock.

Use The Proper Fuse

To avoid fire hazard, use only the fuse specified in the parts list for your product, and which is identical in type, voltage rating and current rating.

Refer fuse replacement to qualified service personnel.

Fuse replacement information can be found in the SG 5030 Service Manual (070-7703-01).

Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate this product in an explosive atmosphere unless it has been specifically certified for such operation.

Do Not Operate Plug-In Unit Without Covers

To avoid personal injury, do not operate this product without covers or panels installed. Do not apply power to the plug-in via a plug-in extender.

Remove from Operation

If you have reason to believe that the instrument has suffered a component failure, do not operate the instrument until the cause of the failure has been determined and corrected.

Service Safety Summary

FOR QUALIFIED SERVICE PERSONNEL ONLY

Refer also to the preceding Operators Safety Summary

Do Not Service Alone

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

Use Care When Servicing With Power On

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

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

Use Care When Servicing With Covers Off

With the side and top covers off, access is available to several heatsinks and power resistors which can cause sever skin burns.

When operating the SG 5030 outside the Power Module on flexible extender cables, a cooling fan fan should be used to blow air across the RF and Output Board heatsinkd. This is necessary to cool components for both service personnel safety and to prevent heat stressing electrical components.

Do Not Wear Jewerly

Remove jewelry prior to servicing. Rings, necklaces, and other metallic objects could come into contact with dangerous voltages and currents.

Section 1
Specifications

Introduction

This section of the manual contains a general description of the TEKTRONIX SG 5030 Programmable Leveled Sine Wave Generator and its electrical, environmental, and physical specifications.

Instrument Description

The SG 5030 Programmable Leveled Sine Wave Generator is a GPIB programmable TM 5000-series plug-in instrument designed to provide a low-distortion sinusoidal waveform with leveled output amplitude. Frequency, amplitude, and the front-panel store/recall parameters are fully programmable. Parameter values are displayed by 8 seven-segment LEDs in the display window. The SG 5030 output amplitude is programmable from 4.5mV to 5.5V peak-to-peak into 50Ω, and has a frequency range of 0.1Hz to 550MHz with a reference frequency of 50kHz. Additional connectors provide timebase input and output reference signals to external sources.

At power up, the instrument performs a self-test and assumes the settings in use when previously powered down, with the exception that the output is in the "OFF" condition. Up to twenty user-definable instrument configurations stored in memory.

Rear interface connections provide access to versions of all front-panel signals except the main output.

Output Leveling Head

Each SG 5030 is provided with a matching Output Leveling Head. This leveling head must be installed on the SG 5030 at all times for proper operation.

A label attached to the leveling head cable identifies the serial number of the SG 5030 to which the leveling head is calibrated. If it is necessary to change leveling heads, the complete Adjustment Procedure must be performed to match the new leveling head to the SG 5030. After adjustment, it is recommended a new identification label be attached to the leveling head.

IEEE 488 (GPIB) Functions

The SG 5030 can be remotely programmed via the digital interface specified in IEEE Standard 488.1-1987, IEEE Standard Digital Interface for Programmable Instrumentation. In this manual, the digital interface is called the General Purpose Interface Bus (GPIB).

The IEEE standard identifies the interface function repertoire of an instrument on the GPIB in terms of interface function subsets. The subsets that apply to the SG 5030 are listed in Table 1-1.

NOTE

Refer to IEEE Standard 488.1-1987 for more detailed information. The standard is published by the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, New York 10017.

Table 1-1: Interface Function Subsets

Function	Subset	Capability
Source Handshake	SH1	Complete Capability
Acceptor Handshake	AH1	Complete Capability
Basic Talker	T6	Responds to serial poll. Untalks if My Listen Address (MLA) is received.
Basic Listener	L4	Unlistens if My Talk Address (MTA) is received
Service Request	SR1	Complete Capability
Remote-Local	RL1	Complete Capability
Parallel Poll	PP0	Does not respond to Parallel Poll
Device Clear	DC1	Complete Capability
Device Trigger	DT0	Does not respond to GET
Controller Function	C0	No controller function
Electrical Interface	E2	Tri-state drivers

Electrical Characteristics

Performance Conditions

The limits stated in the Performance Requirements column of the following tables are valid with the following conditions:

1. All measurements are made at the output connector of the Output Leveling Head. The SG 5030 must have been adjusted with the same leveling head that is used during specification verification measurements.
2. The SG 5030 internal adjustments are performed at an ambient temperature of +20°C to +30°C.
3. The SG 5030 must be in a noncondensing environment whose limits are described under Table 1-3, Environmental.
4. Allow thirty minutes warm-up time for operation to specified accuracy; sixty minutes after exposure to or storage in high-humidity or condensing environment.

Items listed in the Performance Requirements column of the Electrical Characteristics are verified by completing the Performance Check in the Service Manual. Items listed in the Supplemental Information and Description columns is provided for user information only and should not be interpreted to be Performance Check Requirements.

Note

The SG 5030 has been designed in accordance with the intent of UL Standard 1244, "Safety Requirements for Electrical and Electronic Measuring and Test Equipment".

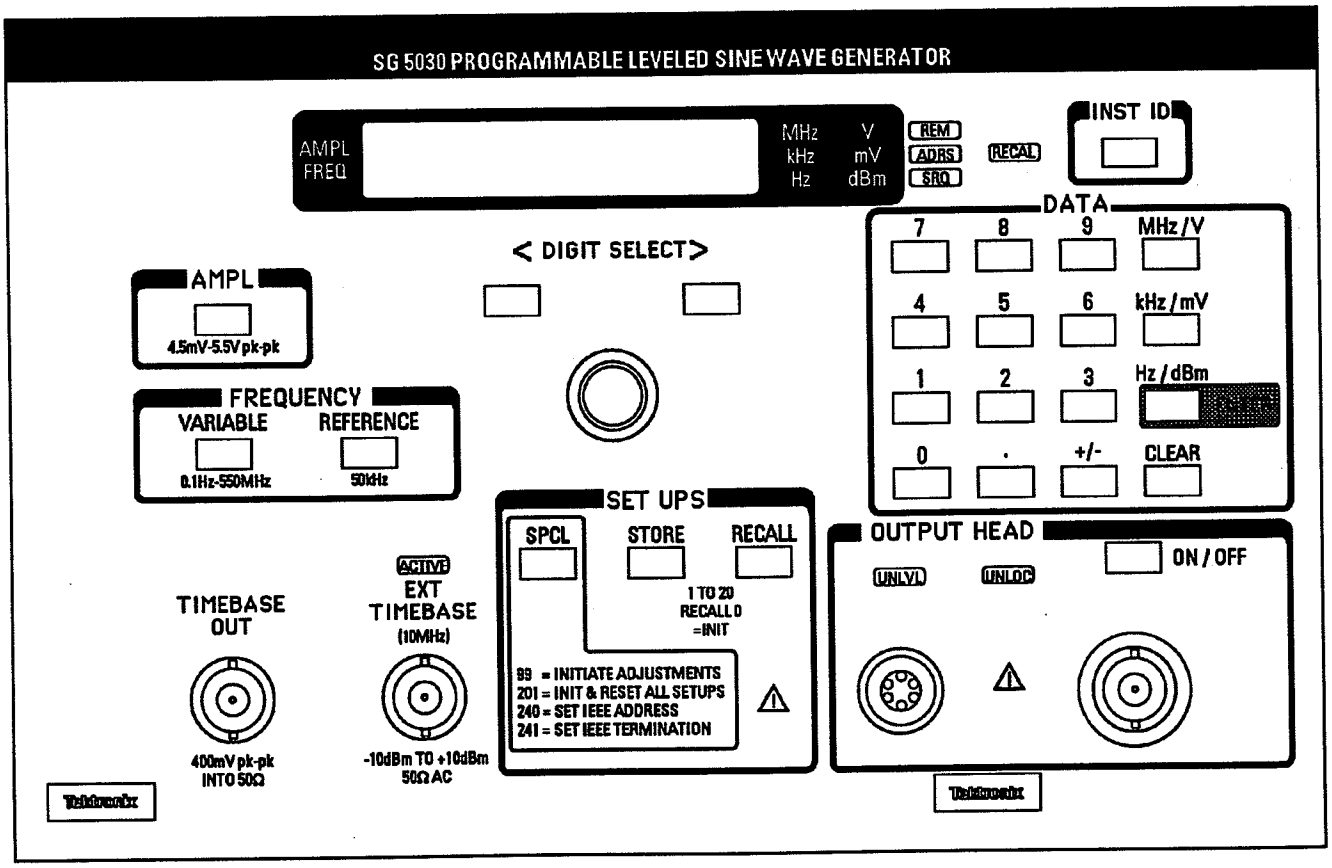


Figure 1-1: The SG 5030

Table 1-2: Electrical

Characteristics	Performance Requirement	Supplemental Information
Frequency Range/Resolution		
0.1Hz to 4.9999kHz		0.1Hz steps
5.000kHz to 49.999kHz		1Hz steps
50.00kHz to 550.00000MHz		10Hz steps
Frequency Accuracy		
Using Internal Timebase (within 1 year of last adjustment)		
0.1Hz to 4.9999kHz	±(0.0003% of setting +0.06Hz)	
5.000kHz to 49.999kHz	±(0.0003% of setting +0.3Hz)	
50.00kHz to 550.00000MHz	±(0.0003% of setting +3Hz)	
Frequency Aging		1ppm/year
Using External Timebase (10MHz ±1.5 ppm)		
0.1Hz to 4.9999kHz		±(external timebase error + 0.06Hz)
5.000kHz to 49.999kHz		±(external timebase error + 0.3Hz)
50.00kHz to 550.00000MHz		±(external timebase error + 3Hz)
Input Amplitude Requirement		–10dBM to +10dBM (70mV to 700mV RMS)
Input Resistance		50Ω AC, 500Ω DC
Lock Time		Less than 3 seconds
Timebase Out		
Output Frequency	10MHz	
Frequency Accuracy	±3ppm (using internal timebase)	±X ppm (using external timebase) Where X ppm is external timebase accuracy
Output Amplitude		400mV pk-to-pk into 50Ω
Output Resistance		50Ω
Amplitude Range/Resolution		
4.50mV to 55.00mV pk to pk		0.02mVolts peak to peak per step
55.2mV to 550.0mV pk to pk		0.2mVolts peak to peak per step
0.552V to 5.500V pk to pk		2mVolts peak to peak per step
–42.95dBm to +18.75dBm		0.05dBm per step
Amplitude Accuracy [1] (0.1Hz to 50kHz)	±1.5% of setting	

[1] Accuracy guaranteed only when the Leveling Head and SG 5030 have been calibrated together.

Electrical (continued)

Characteristics	Performance Requirement	Supplemental Information
Amplitude Flatness		
50.00kHz to 100MHz	±1.5% (of 50kHz ref)	Voltage peak-to-peak into 50 ohms
>100MHz to250 MHz	±3% (of 50kHz ref)	
>250MHz to 550MHz	±4% (of 50kHz ref)	
Output Source Resistance		50Ω, ±1%
Output DC Offset		< ± 1% of amplitude (V_{pp}) for 20°C to 30°C < ± 2% of amplitude (V_{pp}) for 0°C to 40°C
Output VSWR	Less than 1.2:1 up to 550MHz	
Spectral Purity		
0.1Hz to 49.999kHz		All harmonics and spurs less than –50dBc
50.00kHz to 550.00000MHz		
Harmonics	Less than –30dBc 2nd harmonic Less than –35dBc 3rd harmonic Less than –40dBc all others	
Nonharmonics		Less than –40 dBc
Phase Noise		Less than –85 dBc/Hz at 10kHz offset
GPIB Settling Time		From trailing edge of GPIB EOI until sine wave output is stable
Output OFF to ON		<150mS
All other function changes		<80mS

Table 1-3: Environmental[1]

Characteristics	Description
Temperature	Meets MIL-T-28800D, class 5, with exception to operating temperature.
Operating	0°C to +40°C
Nonoperating	–40°C to +71°C
Humidity (Noncondensing)	Exceeds MIL-T-28800D, class 5
Operating	95% ±5% RH, +10°C to +30°C, 75% ±5% RH, +30°C to +40°C, RH not controlled below +10°C
Altitude	Exceeds MIL-T-28800D, class 5
Operating	10,000 ft (4.5 Km)
Nonoperating	50,000 ft (15 Km)
Vibration[2]	Meets MIL-T-28800D, class 5
Operating	Displacement (peak-to-peak), 0.38mm (0.015"). 10Hz to 55Hz. Total time, 75 minutes.
Shock	
Nonoperating	30 g's, half sine, 11ms duration, 3 shocks in each direction along 3 major axis; 18 total shocks.
Bench Handling	Meets MIL-T-28800D, class 5
Operating	45 degrees or 4 inches or point of balance, whichever occurs first.
ESD	Meets IEC 802-2 ESD Test Meets 20kV maximum discharge applied to instrument case per Tektronix Product Design
EMC[3]	Within conducted emissions limit for FCC Regulations, Part 15, Subpart J, Class A and VDE 0871 Class B. Exceeds radiated emissions limit for FCC Regulations Part 15, Subpart J, Class A and VDE 0871 at the selected OUTPUT signal frequency. Within conducted emissions limits for MIL STD 461B/462 CE01, part 2 and CE03. Within conducted supceptability limits for MIL STD 461C CS01, CS02 and CS06.

[1]Note: The SG 5030 will meet MIL-T-28800D, Class 5 only as specified in the table below.
[2]Meets MIL-T-28800D, class 3, when tested outside a TM 5000-series power module.
[3]Tested with a TM 5006A, Option 15 Power Module.

Table 1-4: Mechanical

CHARACTERISTICS	DESCRIPTION
Maximum Overall Dimensions without leveling head	
Height	5.0"
Width	7.950"
Length	12.2"
Net Weight	
Standard Instrument Including leveling head	7.0 lbs

Section 2
Operating Instructions

This section of the manual contains plug-in installation and removal instructions and describes the functions of the SG 5030 front-panel controls, connectors, and indicators. Operators familiarization information is also provided as an aid in understanding how to operate the SG 5030 under local (manual) control only.

Complete information for programming the SG 5030 via the GPIB (General Purpose Interface Bus) is found in the Programming section of this manual.

Preparation For Use

The SG 5030 is calibrated and ready for use when received. The SG 5030 is designed to operate only in the TM 5000-Series power modules. Make certain the line selector block on the power module is positioned correctly.

The SG 5030 must also have the Output Leveling Head installed before use. The leveling head is calibrated to match the SG 5030. The two cables from the leveling head connect to the two OUTPUT HEAD connectors on the lower right portion of the SG 5030 front panel.

Installation and Removal

CAUTION

To prevent possible damage to the SG 5030, turn off the power module before installing or removing the instrument. Do not use excessive force to install or remove.

Check to see that the plastic barriers on the interconnecting jacks of the selected power module compartments match the cutouts in the SG 5030 rear interface connectors. If they do not match, do not install the SG 5030 until the reason is investigated. When the units are properly matched, align the SG 5030 chassis with the upper and lower guides of the selected compartments. Push the SG 5030 chassis in and press firmly to seat the rear-interface connectors in the interconnection jacks. Connect the two cables from the leveling head to the two connectors labled OUTPUT HEAD on the SG 5030 front panel. Apply power to the SG 5030 by turning on the power module.

To remove the SG 5030 from the power module, pull out both the release latches (located on the lower front panel) until the interconnecting jacks disengage and the SG 5030 slides out.

Repackaging For Shipment

If the instrument is to be shipped by commercial transportation, we recommend that it be packaged in the original manner. The carton and packaging material in which your instrument was shipped should be saved and used for this purpose.

Also, if the SG 5030 is to be shipped to a Tektronix Service Center for service or repair, attach a tag to the instrument showing the following:

- Owner of the instrument (with address);
- Name of person to contact at your firm;
- Complete instrument type and serial number;
- Describe the service required, or the symptoms of trouble the instrument exhibited.

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

1. Obtain a corrugated cardboard shipping carton with a 200-pound test strength and having inside dimensions at least six inches greater than the instrument dimensions.
2. Wrap the instrument with polyethylene sheeting or equivalent material to protect the finish.
3. Cushion the instrument on all sides by tightly packing dunnage or urethane foam between the carton and the instrument, allowing three inches on each side.
4. Seal the carton with shipping tape or with an industrial stapler.

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

Front Panel Controls, Connectors And Display

All controls necessary for local operation of the SG 5030 are located on the instrument front panel. Some push buttons illuminate to provide visual indication that associated functions are active. A brief description of these controls, connectors, and indicators follows. Refer to Figure 2-1.

1 Display Indicators

The SG 5030 uses seven-segment LED's to display a numerical value up to eight digits. In addition, LED indicators in the left and right areas of the display window illuminate when appropriate to indicate the selected function modes and parameter units of measure.

Function Mode

The function is defined by the illuminated mode indicator in the left side of the readout display window. The two function modes are:

AMPL Activated when the AMPL button is pressed.

FREQ Activated when the FREQUENCY VARIABLE or REFERENCE buttons are pressed.

Parameter Units of Measure

Display value units are defined by the illuminated units indicator in the right side of the readout display window. These units are:

MHz Activated when the FREQUENCY VARIABLE button is selected. Frequency selected is from 1MHz to 550MHz.

kHz Activated when the FREQUENCY VARIABLE or REFERENCE button is selected. Frequency selected is from 1kHz to 999.99kHz.

Hz Activated when the FREQUENCY VARIABLE button is selected. Frequency selected is from 0.1Hz to 999.9Hz.

V Activated when the AMPL button is selected. Amplitude selected is from 1V to 5.500V.

mV Activated when the AMPL button is selected. Amplitude selected is from 4.5mV to 998mV.

dBm Activated when the AMPL button is selected. Amplitude selected is from –42.95dBm to +18.75dBm.

2 GPIB STATUS Indicators

The current status of the GPIB is shown by the illuminated indicators just to the right of the readout display window. They are:

REM Illuminates when the SG 5030 is operating under remote control via the GPIB.

ADRS Illuminates when the SG 5030 is addressed via the GPIB.

SRQ Illuminates when the SG 5030 has detected an error or event. The controller must conduct a serial poll to query the error or event and to extinquish the SRQ indicator.

NOTE

At power-on the SRQ indicator is illuminated. This may not indicate an error condition but only that the power-on SRQ has not yet been serviced by a GPIB controller.

3 RECAL Indicator

Indicates the loss of the calibration constants. Most likely this is due to nonvolatile memory failure. This indicator will remain illuminated until the instrument has been readjusted by performing the Adjustment Procedure in the Service Manual.

4 INST ID push button

Causes the SG 5030 to display its primary GPIB address and message terminator. If USEREQ has been enabled, it will generate a Service Request (SRQ) over the GPIB.

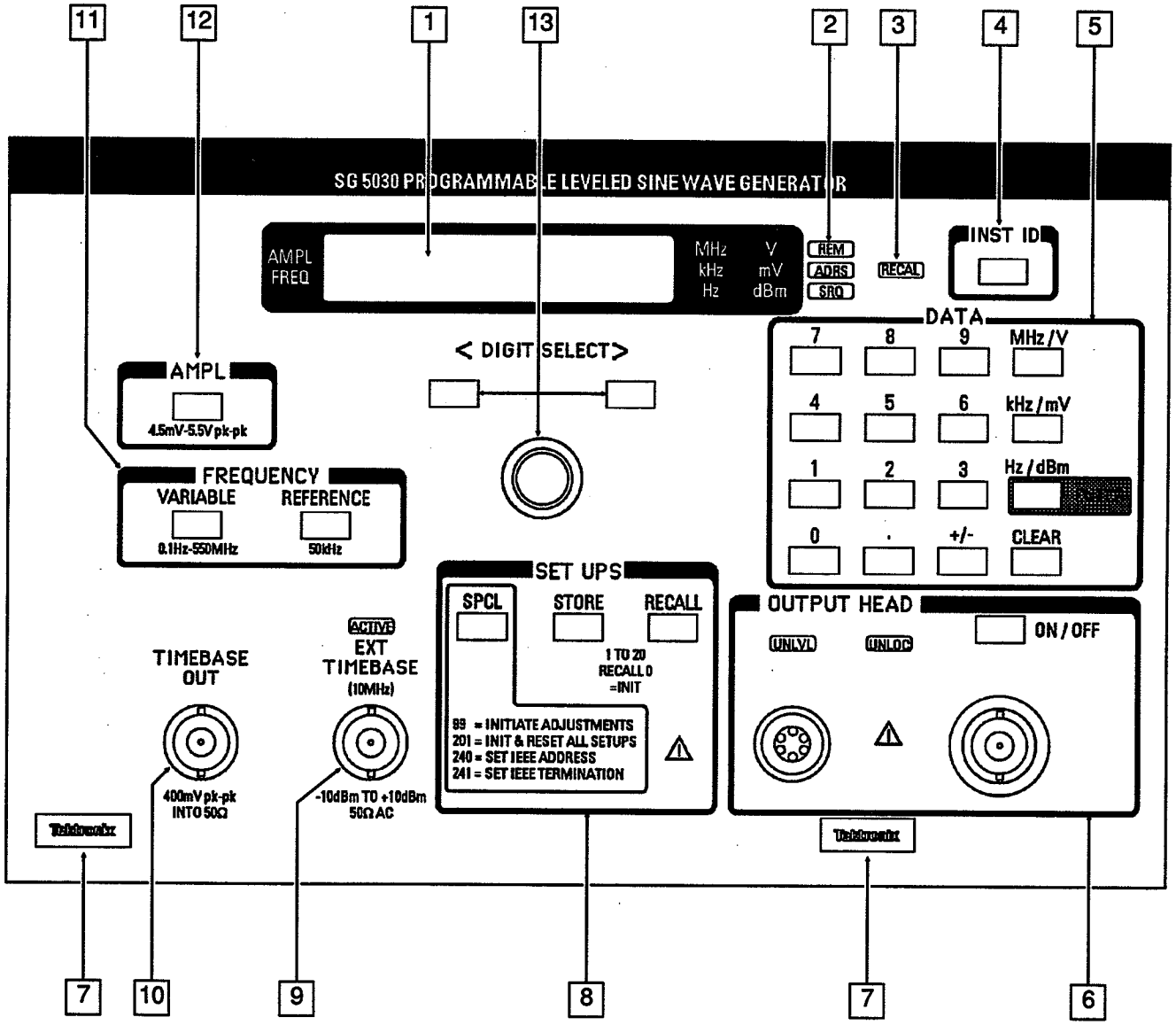
The message terminator currently selected in the SG 5030 (either EOI or LFEOI) will be displayed in the readout display window.

See Section 3-Programming, for instructions to change the GPIB address and to select the message terminator required by your controller.

5 DATA entry keypad

0 through 9, Decimal Point, +/–

Used to enter a numeric value for the amplitude, frequency, or the argument when using STORE, RECALL, or SPCL.



7703-1

Figure 2-1: Front Panel Controls and Connectors

MHz/V, kHz/mV, Hz/dBm

Used to terminate the entry of a parameter value and specify the unit of measure after you have selected the amplitude or frequency function. The appropriate unit will illuminate in the readout display window, indicating the selected unit.

ENTER

Used only with the front-panel SET UPS, entry of the STORE/RECALL storage locations, and the SPCL push button functions (e.g., setting the GPIB address).

CLEAR

Used to delete a partial entry. The SG 5030 will return to the previous valid instrument settings.

Also used after STORE or RECALL is pressed to cancel the STORE or RECALL operation and reset the display.

[6] Output Leveling Head

Connectors

The Output Leveling Head provides the connection between the SG 5030 and the Instrument-Under-Test. Within the leveling head are attenuators, signal level sense detectors, and precision impedance matching circuits. The leveling head must be used for all SG 5030 operations and should be connected directly to the load to maximize performance. The use of extension cables, matching networks, transformers, etc., between the leveling head and the Instrument-Under-Test can cause performance degradation due to transmission losses and reflections.

If extension cabling is absolutely necessary between the leveling head and the Instrument-Under-Test, coaxial air line is recommended to minimize frequency dependent losses that affect the apparent leveling performance.

Two cables connect the leveling head to the SG 5030; the BNC cable carries the output signal, and the multi-wire cable carries control and status signals back to the SG 5030. If the multi-wire cable is disconnected, the SG 5030 output will be automatically turned off. If only the BNC cable is disconnected, the SG 5030 signal may still be present at the front panel BNC but it is effectively removed from the Instrument-Under-Test.

The SG 5030 is adjusted and shipped from the factory with a matching leveling head. The serial number on the leveling head cable must match the SG 5030 serial number for calibrated operation. Do not interchange leveling heads between instruments, as performance may no longer be to specification. If the leveling head is interchanged, the complete calibration Adjustment Procedure must be performed before use.

ON/OFF push button

Disconnects the sine-wave signal output from the leveling head. The output impedance at the signal output connector remains at 50Ω.

UNLVL Indicator

When illuminated, indicates sine-wave output is unleveled (e.g., excessive loading, open signal or control line, leveling circuit failure, etc.).

UNLOC Indicator

When illuminated, indicates one of the frequency setting loops is not locked to the timebase reference frequency (e.g., out-of-range reference signal, circuit failure, etc.).

[7] Release Latches

Plug-in release latches. Pull both latches to remove the SG 5030 from the power module.

[8] SET UPS

STORE push button

Stores the current instrument setting in the specified user-definable storage location. Twenty locations (1 through 20) are available. Instrument settings are retained in memory when the instrument is powered down.

RECALL push button

Recalls an instrument setting from user-specified storage locations (1 through 20) and configures the instrument to those settings. Recall 0 configures the instrument to factory-default settings that are the same as the INIT settings.

SPCL push button

- Allows you to initialize the current front-panel settings and all twenty storage location setups at one time.
- Used in the Adjustment procedure to change calibration constants.
- Allows you to set the GPIB address or message terminator from the front panel. See Section 3-Programming.

[9] EXT TIMEBASE Connector

Allows the SG 5030 timebase to be frequency-locked to a precision external 10MHz reference frequency.

ACTIVE Indicator

Indicates the external 10MHz reference frequency signal has sufficient amplitude and approximately the correct frequency to lock the internal timebase.

[10] TIMEBASE OUT Connector

Provides the internal 10MHz timebase frequency output to frequency lock other signal sources to the SG 5030.

[11] FREQUENCY

VARIABLE push button

Selects the variable frequency function. Allows you to vary the sine-wave output frequency, using the Control knob or the DATA keypad. Frequency values can be selected in Hertz, Kilohertz, or Megahertz.

The VARIABLE push button and the FREQ indicator in the readout display window are both illuminated when the VARIABLE function is active.

REFERENCE push button

Selects the fixed 50kHz Reference frequency, and displays 50.00kHz in the readout display window. To return to the variable frequency setting that was last selected, press the VARIABLE push button.

The REFERENCE push button and the FREQ indicator in the readout display window are both illuminated when the REFERENCE function is active.

[12] AMPL push button

Selects the variable amplitude function. Allows you to vary the sine-wave output amplitude using either the Control knob or the DATA keypad. Amplitude values can be selected in volts, millivolts or dBm.

The AMPL indicator in the readout display window and the AMPL button is illuminated when the amplitude function is active.

The amplitude can be set in either the REFERENCE or VARIABLE FREQUENCY mode, and remains the same when switching between modes.

[13] Control Knob

Varies the value of the selected parameter. The smallest rate of change (increment) of a digit is determined by the mode and range that you select. For example, if you are in the amplitude mode and have selected a value within the range of 0.552V to 5.500V, the readout will increment or decrement in as small as 2mV steps.

DIGIT SELECT push buttons

Selects the Control Knob resolution (i.e., the digit that will change when the Control knob is rotated).

Each push of the left or right button will cause the selected digit to blink as it steps one place left or right.

Rear Panel Switches

On the rear panel of the SG 5030 is a four position DIP switch which is used to configure the instrument at power up. These switches are used to activate service functions and will not need to be used under normal operation. Their function however is described briefly below.

For normal operation, all toggles are set for open contacts (the contacts are closed when the toggle is depressed to the left, facing the rear of the instrument). The following functions are activated when the contacts are closed:

Toggle	Function
1	Reinitialize Firmware
2	Diagnostic Bypass
3	Enable Adjustment
4	Not Used

Operators Familiarization

General Operating Information

With the SG 5030 properly installed in the power module, allow 20 minutes warmup time for operation to specified accuracy; 60 minutes after storage in or exposure to a high humidity (condensing) environment.

Power-Up Sequence

When powered up, the SG 5030 performs a diagnostic self-test to check the functionality of its ROM, RAM, and some hardware circuits. It also illuminates all front panel LEDs and indicators. If a self-test error is detected, an E followed by a three-digit error code will appear in the readout window indicating an internal malfunction. Should this occur, refer the condition to qualified service personnel. Pressing any button clears the error code from the readout window and allows the instrument to complete initialization, but does not clear the condition causing the error code. If more than one error has been detected a button may have to be pushed several times to clear each of the errors in turn from the display.

Upon successful completion of the self-tests, the SG 5030 restores the instrument settings that were in use when the instrument was last turned off. The sine wave signal to the output head however will always be turned off at power up.

In addition the SG 5030 always powers up with the frequency displayed in the display window and with the control knob digit select resolution set to the default value.

Initializing the Instrument Settings

You can initialize the current front-panel settings, or all twenty of the instrument setting storage locations at one time.

To initialize the current front-panel settings:

1. Press the RECALL button.
2. Enter 0 (zero) on the DATA keypad.
3. Press the ENTER button.

The SG 5030 is now initialized to the following settings:

Output ON/OFF	OFF
AMPL	1.000V
FREQUENCY	10.00000MHz
REFERENCE (50kHz)	OFF
VARIABLE (0.1Hz - 550MHz)	ON
RQS	ON
USEREQ	OFF

To initialize the current instrument setting and all twenty of the storage locations:

1. Press the SPCL button.
2. Enter 201 on the DATA keypad.
3. Press the ENTER button.

The instrument settings and all storage locations are now initialized to the settings listed above.

Function and Parameter Selection

The SG 5030 generates an amplitude-leveled sine wave signal with two variable functions; amplitude and frequency. The parameters of these two functions are set from the front panel using either the Control knob or the DATA entry keypad (for GPIB operation, refer to Section 3-Programming). The ranges for each function and the parameter resolutions are specified in Section 1-Specification of this manual.

Setting Amplitude Parameters

To select a specific amplitude value, press the AMPL button. The amplitude parameter and unit of measure last selected will appear in the readout display window.

Voltage Resolution vs Range

Voltage Range	Resolution
–42.96dBm to +18.75dBm	0.05dBm
4.50mV to 55.00mV	0.02mV
55.2mV to 550mV	0.2mV
0.552V to 5.500V	2mV

Next, enter the desired amplitude value using either the Control knob or DATA entry keypad as follows:

Control knob entry

Press the DIGIT SELECT buttons to select the significant digit you wish to change (each digit will blink once when selected). Clockwise knob rotation will increment the selected digit, and counterclockwise rotation will decrement the selected digit.

DATA keypad entry

Select the numeric value first and then the units desired (e.g., V, mV, or dBm) on the keypad; this action enters the selected amplitude value. If the amplitude value entered on the keypad has a higher resolution than is allowed, the SG 5030 will round it off to the nearest allowable setting.

Setting Frequency Parameters

To select a specific frequency, press the VARIABLE FREQUENCY button. The frequency parameter and unit of measure last selected will appear in the readout display window.

Frequency Resolution vs Range

Frequency Range	Resolution
0.1Hz to 4.9999Hz	0.1Hz
5.000kHz to 49.999kHz	1Hz
50kHz to 550.00000MHz	10Hz

Next, enter the desired frequency value using either the Control knob or DATA keypad as follows:

Control knob entry

Press the DIGIT SELECT buttons to select the significant digit you wish to change (each digit will blink once when selected). Clockwise knob rotation will increment the selected digit, and counterclockwise knob rotation will decrement the selected digit.

DATA keypad entry

Select the numeric value first and then the units desired (e.g., Hz, kHz, or MHz) on the keypad; this action enters the selected frequency value. If the frequency value entered on the keypad has a higher resolution than is allowed, the SG 5030 will round it off to the nearest allowable setting.

Table 2-1: Front Panel Error Codes

Error	Description
E101	Command header error
E102	Header delimiter error
E103	Command argument error
E104	Argument delimiter error
E105	Non-numeric argument
E106	Missing argument
E107	Invalid message unit delimiter
E150	Bad symbol
E151	Syntax error
E153	Symbol number too long
E154	Invalid input character
E155	Invalid string input
E156	Numerical underflow
E205	Argument out of range
E250	Not in adjustment mode
E251	I/O buffers full, output flushed
E252	Settings buffer empty
E253	Illegal settings number specified
E254	Beyond calibration limit
E301	Interrupt fault
E302	System error
E350	HF unleveled
E351	Reference loop unlocked
E352	Wide loop unlocked
E353	Narrow loop unlocked
E354	Offset loop unlocked
E355	DDS loop unlocked
E356	Unplugged error
E360	EPROM checksum failure
E361	NVRAM test failure
E362	RAM test failure
E363	NVRAM lost
E364	CAL Constant Checksum failure
E370	Output Off test failure
E371	Ref Freq test failure
E372	DDS OFF test failure
E373	10.00000MHz test failure
E374	10.00001MHz test failure
E375	500.00000MHz test failure
E376	Wide Loop Divider test failure
E377	Output Amp powered test failure

Setting the 50kHz Reference Frequency

Press the REFERENCE FREQUENCY button. The readout window will display 50.00kHz (the reference frequency is not adjustable). You can set the Reference Frequency amplitude by selecting the AMPL button and entering the desired amplitude as described under Setting Amplitude Parameters above.

Select the VARIABLE FREQUENCY button to return to the previous variable frequency settings, and to turn off the reference frequency. The amplitude will be the same as the reference frequency amplitude.

Storing and Recalling Instrument Setups

You can store up to 20 instrument setups in a battery backed-up nonvolatile RAM. To store a setup, set the instrument parameters and units of measure as desired, and press the STORE button. Enter a storage location between 1 and 20 on the DATA keypad, and press the ENTER button. The current instrument setup is now stored in that location (in nonvolatile RAM), and will be retained when the instrument is powered down.

To recall a specific set of instrument settings, first press the RECALL button, enter any previously set storage location (1 through 20) on the DATA keypad, then press the ENTER button.

Displayed Errors

When powered up, the SG 5030 performs a diagnostic self-test to check its functionality. If an error is found, an error code will be displayed in the display window. The error can be cleared by pressing any key. Error code definitions are listed in Table 2-1.

If no error is found during self test, the SG 5030 restores the instrument settings that were in use when the instrument was last turned off, except the output is OFF.

⚠ Special Functions

The SG 5030 has several special functions that allow the user to check or change operational settings. These functions are listed in Table 2-2.

To invoke an SPCL function, press the SPCL button. Then enter the two or three-digit SPCL code and press ENTER.

⚠ Output Loading

The SG 5030 is designed to operate into a 50Ω impedance load at the leveling head output connector. If load impedance is substantially greater than 50Ω, connect a low-loss precision feed-through termination of the appropriate value to the leveling head, and then make connection the the load. Refer to Figure 2-2(B) for reference.

NOTE

When lit, the UNLVL light on the front panel indicates a mismatched load or that the output is shorted. When the leveling head is disconnected from the front panel, the UNLVL light is also illuminated, and the instrument will turn its output off.

Table 2-2: Special Functions

Code	Description
99	This function initiates the instrument adjustment process, and is intended for use by qualified service personnel only. If the user accidently selects this function, the instrument will show error code E250 (not in adjustment mode) in the display window, indicating the internal DIP switch toggles have not been set to allow adjustment.
201	Initializes the current front-panel settings and all twenty storage location setups at one time. See Initializing the Instrument Settings earlier in this section.
240	Shows the current GPIB address in the display window, and allows the user to enter a new address from the keypad, if desired. See resetting the GPIB Address and Message Terminator in Section 3-Programming.
241	Shows the currently selected message terminator in the display window, and allows the user to select either LFEOI or EOI. See Resetting the GPIB Address and Message Terminator in Section 3-Programming.

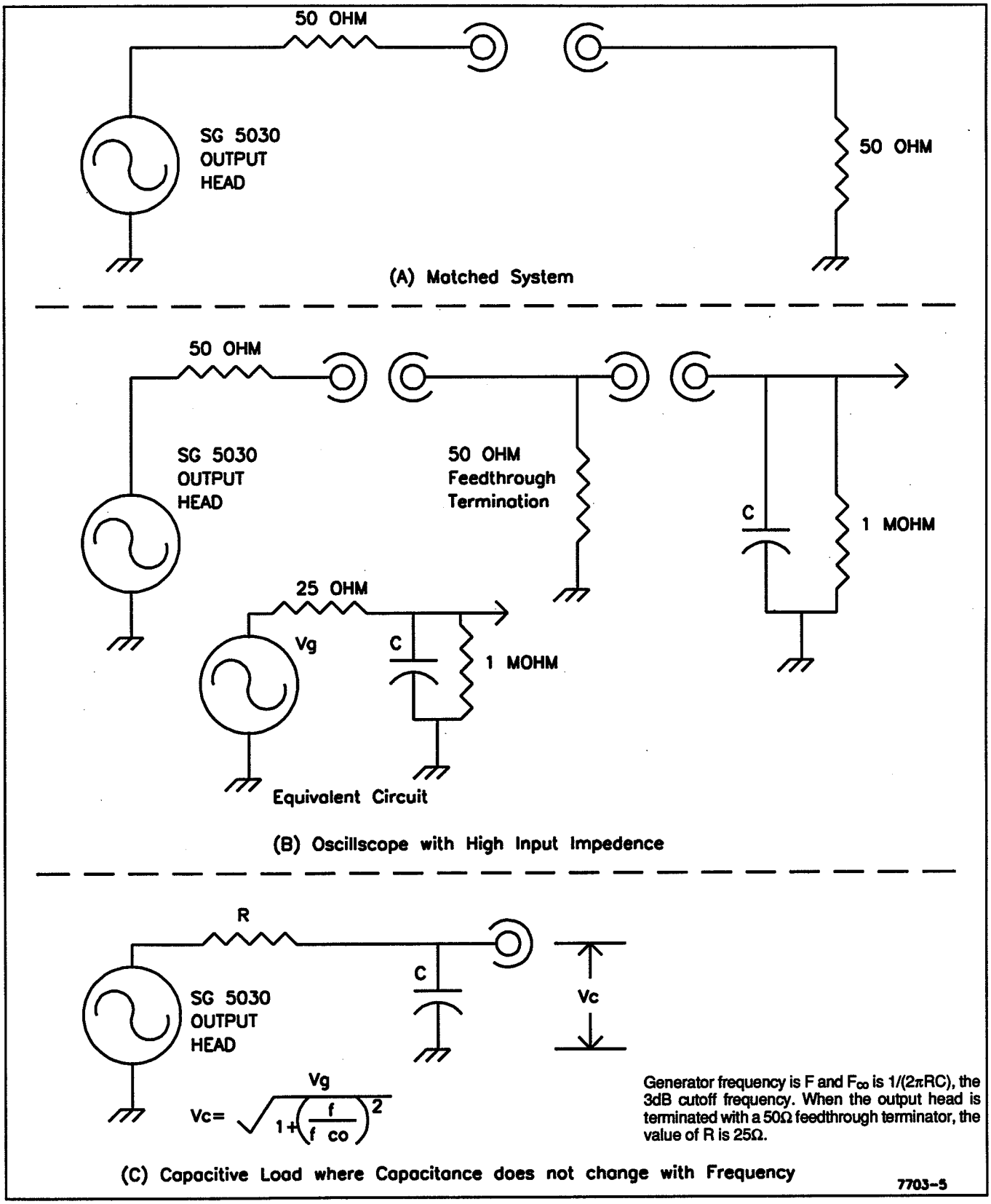


Figure 2-2: Signal Termination Configurations

The SG 5030 adjusts signal amplitude and distortion at the leveling head. To maintain signal integrity, it is important to minimize adapter and transmission line discontinuities and reflections between the leveling head and the Instrument-Under-Test. Adding coaxial cable or other devices between the output head and the load impairs the constant amplitude function, since transmission line insertion losses vary with frequency.

If there is a DC voltage across the load, use a DC blocking capacitor between the output head and the load. A DC blocking capacitor, listed in the Optional Accessories list in the Service Manual, can be used with minimal loss at frequencies greater than 1 MHz.

A DC block is also useful as a protective device when the SG 5030 signal is applied to RF equipment which is sensitive to DC voltage, such as some spectrum Analyzer inputs. Although the SG 5030 has only a small DC offset, it can output high amplitude low frequency AC signals which may be a problem to some sensitive RF circuits.

If signal amplitudes less than the minimum (4.5mV p-p) are desired, use appropriate attenuators connected between the leveling head and the device under test.

NOTE

Tektronix BNC attenuators with -02 suffix are recommended. Other attenuators may be used; however, measurement accuracy may be compromised.

When operating the SG 5030, always consider the total load impedance and its effect on the output amplitude. The input capacitance of the equipment under test will affect the bandwidth. The equivalent circuit shown in Figure 2-2(C) is useful in estimating the amplitude changes caused by capacitive loads. Note that as system input capacitance increases, output signal decreases.

Making Bandpass Measurements

Making bandpass measurements are easy with the SG 5030. Basically, a reference amplitude at the device-under-test output is set at a reference frequency, then the SG 5030 frequency is increased (or decreased) until the device-under-test output decreases by 3dB (29.3%) from the reference amplitude. This is shown graphically in Figure 2-3. It is important that the reference amplitude be set at a frequency where the device-under-test is known to be linear. For most devices, the 50kHz reference frequency of the SG 5030 is valid, though other frequencies may be used. An oscillscope whose bandwidth is substantially greater than the device-under-test makes an ideal measurement device for bandwidth checks.

1. Connect the oscilloscope to the output of the Device-Under-Test (DUT). To make the bandwidth measurement, set the reference frequency amplitude first. Adjust the SG 5030 output amplitude, the DUT gain, and the oscilloscope controls to display a sinewave of exactly six divisions, as shown in Figure 2-4.

2. Next, slowly increase (or decrease) the SG 5030 frequency until the oscilloscope display is reduced to 4.2 divisions, as shown in Figure 2-5. Allowing the oscilloscope trigger to free-run may make the display amplitude easier to judge. Do not adjust the gain or amplitude controls during this step.

3. Check the SG 5030 frequency readout display. This is the –3dB frequency of the DUT.

In some applications, a wide bandwidth DVM can be substituted for the oscilloscope. The following procedure may be used.

1. Connect the DVM to the output of the DUT. Set the reference frequency amplitude first. Adjust the SG 5030 output amplitude and the DUT gain to show some convenient value on the DVM, such as 1 volt.

2. Next, slowly increase (or decrease) the SG 5030 frequency until the DVM reading is 70.7% of the reference amplitude. Do not adjust the gain or amplitude controls during this step.

3. Check the SG 5030 frequency readout display. This is the –3dB frequency of the DUT.

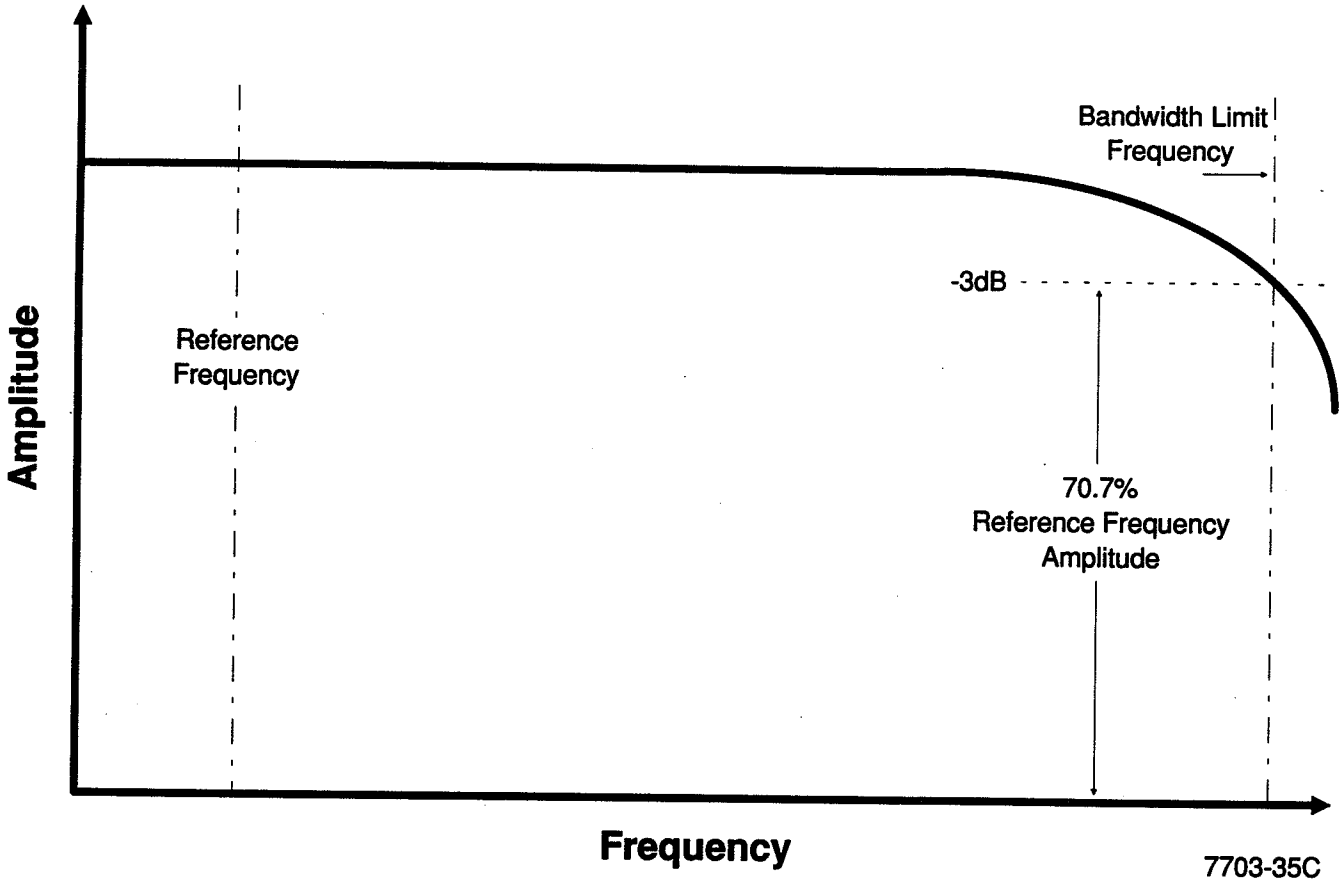
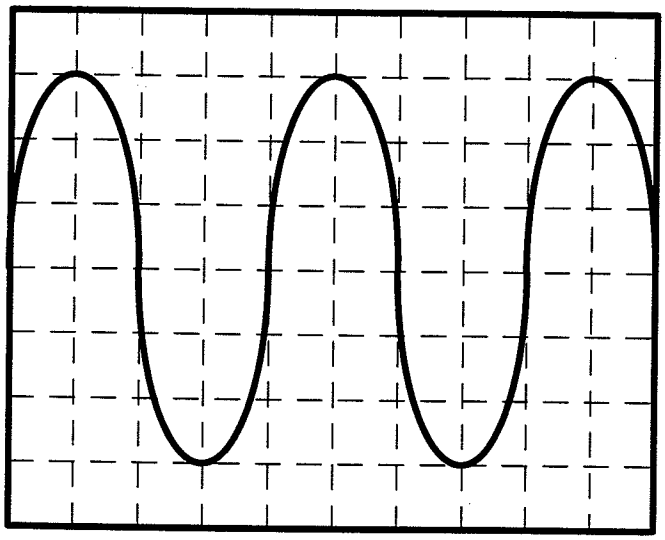


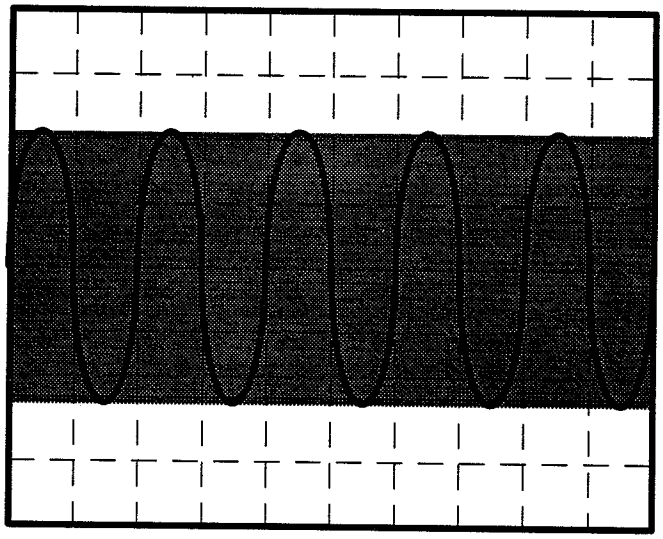
Figure 2-3: Bandpass Measurement



Part A
Set the Reference Amplitude

7703-35A

Figure 2-4: Reference Setup



Part B
Find the -3dB Point

7703-35B

Figure 2-5: The -3dB Point

Section 3
Programming

Introduction

This manual section provides the information required for programming the Tektronix SG 5030 Leveled Sine Wave Generator through the IEEE-488 bus, commonly called the General Purpose Interface Bus (GPIB). The IEEE-488 bus interface is specified and described in the IEEE-Standard 488.1-1987, Standard Digital Interface for Programmable Instrumentation.[1]

The information in this section assumes that the reader is knowledgeable in IEEE-488 bus communication and has some experience in programming a system that uses a GPIB-style interface.

All Tektronix programmable TM 5000 instruments are designed to communicate with any controller that can send and receive ASCII messages (commands) over the IEEE-488 bus. The instruments are connected to the IEEE-488 bus through a TM 5000 power module. Refer to the Operating Instructions section of this manual for information on installing the SG 5030 in the power module. Also, it is helpful to review that section and become familiar with front-panel functions.

Commands for TM 5000 programmable instruments either alter instrument settings or request information from the instrument. The command set for each instrument is designed for compatibility between TM 5000 instrument types. When possible, the same commands are used in different instruments to control similar functions. In addition, commands are specified in mnemonics that are related to the functions implemented. For example, the INIT command initializes instrument settings to predefined default settings.

[1] Published by the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, N.Y., 10017.

IEEE-488 Interface Function Subsets

The SG 5030 IEEE-488 interface is based on the IEEE-488.1-1987 interface (described above) and the Tektronix, Inc. C&F (062-1780-02) interface standard.

Table 3-1 shows the compatibility of SG 5030 operation with these combined standards.

GPIB Address and Message Terminator

The SG 5030 primary GPIB address can be set to any decimal number in the range 0 to 31. Address 31 effectively removes the SG 5030 from the bus, though it remains an electrical load. The SG 5030 is shipped with the GPIB address set to 10.

The SG 5030 responds to one of two possible message terminators (LF and EOI or EOI only). The message terminator must match that required by the controller. The SG 5030 is shipped with the message terminator

Table 3-1: IEEE-488 Interface Function Capability

Function	Subset	Capability
Source Handshake	SH1	Complete Capability
Acceptor Handshake	AH1	Complete Capability
Basic Talker	T6	Responds to serial poll. Untalks if My Listen Address (MLA) is received.
Basic Listener	L4	Unlistens if My Talk Address (MTA) is received
Service Request	SR1	Complete capability
Remote-Local	RL1	Complete capability
Parallel Poll	PP0	Does not respond to Parallel Poll
Device Clear	DC1	Complete Capability
Device Trigger	DT0	Does not respond to GET
Controller Function	C0	No controller function

set to EOI only. The message terminator and the primary GPIB address are stored in nonvolatile RAM memory.

The front panel SPCL button allows the current GPIB primary address and message terminator to be displayed on the SG 5030 readout. To display the GPIB address, press the SPCL button, enter 240 from the keypad, and press ENTER. The address is then displayed, for example `GPIB 10`. Pressing the ID button will also display the GPIB address.

To display the message terminator, press the SPCL button, enter 241 from the keypad, and press ENTER. The letters `LF EOI` are then displayed if the selected message terminator is LF EOI, and the letters `EOI` are displayed if the terminator is EOI only.

Resetting the GPIB Address and Message Terminator

The SPCL button can also be used to change the GPIB primary address and the message terminator. To reset the GPIB address, preform the following operation:

1. Press SPCL
2. Enter 240 from keypad
3. Press ENTER
4. After current GPIB address setting is displayed, enter the new address from the keypad
5. Press ENTER

To reset the message terminator, perform the following operation:

1. Press SPCL
2. Enter 241 from keypad
3. Press ENTER
4. After current message terminator is displayed, use the knob to select the new terminator
5. Press ENTER

Commands

The SG 5030 is controlled either by front panel controls or by remote commands that it receives from the controller through the GPIB interface. The remote commands are divided into three types:

- **Setting commands** — control instrument settings.
- **Query/Output commands** — request data.
- **Operational commands** — changes instrument operational commands (i.e. store, test, etc.).

When the instrument is in the remote state, it executes all three types of commands in the appropriate manner (for example, sets an instrument control or returns the requested data). In the local state (that is, when the instrument is under front-panel control), the instrument only executes query/output commands.

In the following sections, the SG 5030 commands are presented in three ways:

- **Command Summary** — A command list divided into functional groups, with brief descriptions of each command.
- **Control/Command Descriptions** — A front panel illustration showing command relationships to front panel operation and internal parameters.
- **Detailed Command Descriptions** — An alphabetically arranged presentation of all the commands with complete detailed descriptions.

Command Format

A command consists of a header and, if necessary, one or more arguments. The command headers are English-language words that denote the operation to be carried out, such as INIT (initialize the instrument), or FREQUENCY (set the output signal frequency). Only the first three characters of a command header must be given, although it is acceptable to enter the entire command header.

When a command requires arguments, they are entered after the command header. For example, the FREQUENCY command requires an argument to give the desired frequency setting (`FRE 15000`). The header and arguments are generally separated by a space character, although the command will be accepted without the space.

The headers for query commands include a terminating question mark (?) symbol (USEREQ?). Since only the first three characters of a command header must be given, the ? may be given after these characters (for example, (USE?).

Additional information about the command format is given in the section titled Message Format.

Tektronix Codes and Formats

In addition to compliance with the IEEE-488.1 interface standard, the command headers, arguments, and syntax also meet the Tektronix Codes and Formats standard. This standard makes programming simple because the language and syntax between Tek instruments is consistant and easy to use. Standard instruments-data formats open up the lines of bus communication and makes the test system easy to set up and operate.

Command Summary

This section provides a summary of the SG 5030 commands. The list is arranged in functional groups: instrument commands, status commands, and system commands.

NOTE

Capitalized letters in the command header word are required characters, the lower case characters may be optionally entered. Angle brackets < > indicate a required user supplied element. Square brackets [ ] indicate an optional element.

Instrument Commands

The following commands control instrument operations that are associated with front-panel controls.

AMPlitude <num>[:<dBM>] — Sets the amplitude of the output signal. The default units are volts, if desired, dBm can be selected.

AMPlitude? — Returns the current amplitude setting.

FREquency <num> — Sets the frequency of the output signal.

FREquency? — Returns the current frequency setting.

REFreq ON — Turns on the 50kHz reference frequency and sends it to the output.

REFreq OFF — Turns off the 50kHz reference frequency and enables the variable frequency controls.

REFreq? — Returns the current status of the reference frequency (REFREQ ON or OFF).

OUTput ON — Turns the output on.

OUTput OFF — Turns the output off.

OUTput? — Returns the current status of the output (OUTPUT ON or OFF).

STOre <num> — Stores the current front-panel setup at location 1 to 20.

RECall <num> — Recalls the front-panel setup from location 0 to 20. (Location 0 contains the initialization settings.)

Status Commands

The following commands enable and disable service requests and return status information about instrument operation.

`RQS ON` — Enables generation of service requests.

`RQS OFF` — Disables generation of service requests.

`RQS?` — Returns status of service requests (RQS ON or OFF).

`USEreq ON` — Enables SRQ operation when the ID button is pushed.

`USEreq OFF` — Disables SRQ operation when the ID button is pushed.

`USEreq?` — Returns status of user request (USEREQ ON or OFF).

`LEVeled?` — Returns current status of output signal (LEVELED YES or NO).

`EXTtb?` — Returns current status of the external timebase input (EXTTB ACTIVE or INACTIVE).

System Commands

The following commands perform system wide operations.

`ID?` — Returns instrument identification and firmware version.

`INIt` — Initializes instrument settings.

`SET?` — Returns the current instrument settings to the GPIB interface. This command can be used for storage of set-ups on the host controller for later retrieval. It can also be used during development of an automated test procedure by allowing the host controller to "learn" a series of manual front panel settings.

`TESt` — Initiates a self test on the instrument. When the test is complete, the instrument returns to the settings last entered. If the self test failed, the SG 5030 returns an SRQ to the controller.

`EVEnt?` or `ERRor?` — Returns information about the event reported in the last serial poll.

`HELp?` — Returns a list of all the command headers the SG 5030 accepts.

`ABStouch <nr1>` — Provides a means of remotely activating (touching) front-panel buttons and controls through the GPIB interface. Refer to Table 3-2.

`CAL?` — Returns a list of all the Calibration settings (SPCL 99) stored in NVRAM.

Control/Command Descriptions

Fig. 3-1 shows the instrument commands and their relationship to the front-panel controls.

Detailed Command List

The following section provides a detailed description of the SG 5030 commands and their command syntax.

NOTE

Capitalized letters in the command header word are required characters, the lower case characters may be optionally entered. Angle brackets < > indicate a required user supplied element. Square brackets [ ] indicate an optional element.

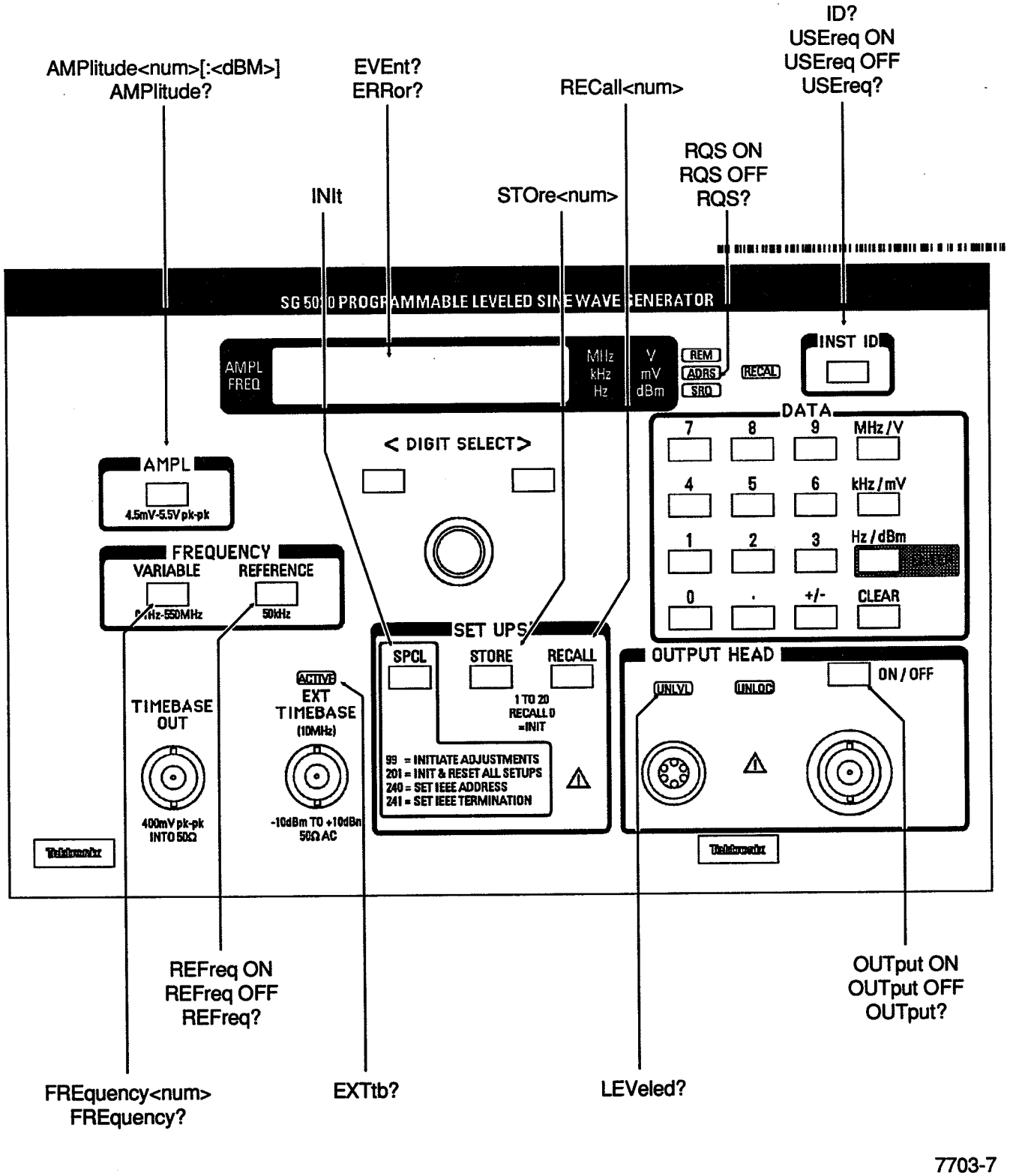


Figure 3-1: Instrument Commands & Front Panel Controls

ABSTOUCH

Type:

Setting

Setting syntax:

```
ABStouch <nr1>
```

Examples:

```
ABSTOUCH 5
ABS 5
```

Discussion:

This command causes one or more front-panel buttons or controls to be remotely activated (touched) through the GPIB interface. This feature is useful for evaluation and applications procedures that simulate operator actions.

Table 3-2: ABSTOUCH Command Arguments

Front Panel Switch Function	Argument (decimal number)
Knob Increment	0
Knob Decrement	1
Output ON	2
CLEAR	3
0	4
.	5
+/-	6
Hz/dBm/ENTER	7
1	8
2	9
3	10
KhZ/mV	11
4	12
5	13
6	14
MHz/V	15
7	16
8	17
9	18
INST ID	19
AMPLITUDE	20
VARIABLE	21
STORE	22
SPCL	23
<	24
>	25

AMPLITUDE

Type:

Setting or query

Setting syntax:

```
AMPlitude <num>[:dBm]
```

Examples:	Amplitude selected:
`AMPLITUDE 4.5`	4.5V p-p
`AMPL .5`	500mV p-p
`AMP 3.5E-2`	35mV p-p
`AMP 0:dBm`	0dBm
`AMP -30:dBm`	–30dBm

Query syntax:

```
AMPlitude?
```

Query response syntax:

```
AMPLITUDE <num>
AMPLITUDE <num>:dBm
```

Query response examples:

```
AMPLITUDE 3.250
AMPLITUDE 400.0E-3
AMPLITUDE -15.00:DBM
```

Discussion:

This command sets the amplitude of the output signal in volts peak-to-peak or dBm. If dBm units are not specified, volts are assumed. The dBm range is -42.95dBm to +18.75dBm, with a resolution of 0.05dBm. The voltage peak-to-peak range of the instrument is 4.50mV to 5.500V. This range is divided into three subranges, and the amplitude resolution is different in each of these subranges as follows:

Range	Resolution
-42.95dBm to +18.75dBm	0.05dBm
4.50mV to 55.00mV	0.02mV
55.2mV to 550.0mV	0.2mV
0.552V to 5.500V	2mV

If the amplitude specified in the command has a greater resolution than the subrange it falls in, the amplitude is rounded off to the closest allowable resolution.

The `AMPlitude?` command causes the current amplitude setting to be returned.

CAL?

Type:

Query

Query Syntax:

```
CAL <num>,<num>,<num>,<num>,<num>,
<num>,<num>,<num>,<num>,<num>,<num>,
<num>
```

Query Response Examples:

```
CAL 139,136,140,2746,2755,2747,2838,
340,2843,341,2841,342
```

Discussion:

This query returns the current DAC settings stored in NVRAM that were set either by default or by selection of the SPCL 99 calibration routine. Table 3-3 below shows a list of the DACs and the name of each DAC setting, listed in the order returned by the CAL? query.

Table 3-3: DAC Setting Names

DAC Name	DAC Setting Name
Offset DAC (high byte)	lf_power_amp_offset
Offset DAC (low byte)	lf_preamp_offset
Offset DAC (high byte)	rf_power_amp_offset
LF Level DAC	lf_gain_cal_x1
LF Level DAC	lf_gain_cal_x10
LF Level DAC	lf_gain_cal_x100
RF Level DAC	rf_gain_max_x1
RF Level DAC	rf_gain_min_x1
RF Level DAC	rf_gain_max_x10
RF Level DAC	rf_gain_min_x10
RF Level DAC	rf_gain_max_x100
RF Level DAC	rf_gain_min_x100

ERROR?
EVENT?

Type:

Query

Query syntax:

```
ERRor?
EVEnt?
```

Query response syntax:

```
ERROR <num>
EVENT <num>
```

Query response examples:

```
ERROR 205
EVENT 351
```

Discussion:

These commands return information about the event reported in the last serial poll. If RQS is ON, the <num> response for both commands is the event code for the last reported status byte. If RQS is OFF, <num> is the event code for the highest priority event that has occurred. The event code will be cleared upon completion of these commands. Refer to the section titled Status and Error Reporting for a discussion of event codes and status bytes. Table 3-3 lists all the SG 5030 error/event codes.

These two commands are equivalent and either may be used to preserve compatibility with other Tektronix GPIB products.

EXTTB?

Type:

Query

Query syntax:

```
EXTtb?
```

Query response: (one of the following)

```
EXTTB ACTIVE
EXTTB INACTIVE
```

Discussion:

This command returns the current status (ACTIVE or INACTIVE) of the external timebase input (EXT TIMEBASE connector).

FREQUENCY

Type:

Setting or query

Setting syntax:

```
FREquency <num>
```

Examples:

```
FREQUENCY 120E3
FREQ 1.5E4
FRE 5E+4
FRE .9
```

Query syntax:

```
FREquency?
```

Query response syntax:

```
FREQ <num>
```

Query response examples:

```
FREQ 125.00E+3
FREQ 1.0000E+3
```

Discussion:

This command sets the frequency of the output signal. The frequency range of the instrument is 0.1Hz to 550.00000 MHz. This range is divided into three subranges, and the frequency resolution is different in each of these subranges as follows:

Range	Resolution
0.1Hz to 4.9999kHz	0.1Hz
5.000kHz to 49.999kHz	1Hz
50.00kHz to 550.00000MHz	10Hz

If the frequency specified in the command has a greater resolution than the subrange it falls in, the frequency is rounded off to the nearest allowable resolution.

The `FREquency?` query causes the current frequency setting to be returned.

HELP?

Type:

Query

Query syntax:

```
HELp?
```

Query response:

```
HELP ABSTOUCH,AMPLITUDE,CAL,ERROR,
EVENT,EXTREF,FREQUENCY,HELP,ID,INIT,
LEVELED,OUTPUT,RECALL,REFREQ,RQS,SET,
STORE,TEST,USEREQ
```

Discussion:

This command returns the word `HELP` followed by a list of all the command headers the SG 5030 accepts.

ID?

Type:

Query

Query syntax:

```
ID?
```

Query response:

```
ID TEK/SG5030,V81.1,Fx.x
```

Discussion:

This command returns the instrument identification and the firmware version, as follows:

TEK/SG5030 — identifies the instrument type.

V81.1 — identifies the version of the Tektronix Codes and Formats used in the SG 5030 firmware design.

Fx.x — identifies the instrument's firmware version. For example, F1.0 indicates the firmware version 1.0.

INIT

Type:

System

Setting syntax:

```
INIt
```

Example:

```
INIT
```

Discussion:

The INIT command clears the current settings and initializes the SG 5030 to the following predefined settings:

```
OUTPUT OFF
AMPLITUDE 1.000
FREQUENCY 1.000000E+7
REFREQ OFF
RQS ON
USEREQ OFF
```

After the SG 5030 has executed the `INIT` command, the display shows FREQ 10.00000MHz, and the switch button VARIABLE is lighted. (No other switches are lighted.)

This command has the same effect as the `RECALL 0` command. Neither of these commands affects the UNLVL or EXT TIMEBASE Active LED. The stored settings buffer is not affected.

LEVELED?

Type:

Query

Query syntax:

```
LEVeled?
```

Query response: (one of the following)

```
LEVELED YES
LEVELED NO
```

Discussion:

This command returns the leveled-signal status of the output signal (YES or NO).

OUTPUT

Type:

Setting or query

Setting syntax:

```
OUTput ON
OUTput OFF
```

Examples:

```
OUTPUT ON
OUT OFF
```

Query syntax:

```
OUTput?
```

Query response: (one of the following)

```
OUTPUT ON
OUTPUT OFF
```

Discussion:

This command turns the signal output on or off at the OUTPUT HEAD connectors, depending on the argument specified. The source impedance is maintained when the output is off. At power-up, the output is set to OFF.

The `OUTput?` command returns the current status of the output signal (ON or OFF).

RECALL

Type:

Operational

Syntax:

```
RECall <num>
```

Examples:

```
RECALL 2
REC 7
REC 0
```

Discussion:

This command recalls the instrument settings from the non-volatile RAM location specified in the `<num>` argument, and sets the instrument to those settings. The `<num>` argument can be from 0 to 20 (decimal). Numbers 1 through 20 are used for user-selectable setups; number 0 references the initialization setup (that is, the `RECALL 0` command is equivalent to the `INIT` command). If no settings are stored in the specified location, the instrument assumes the `INIT` command settings.

REFREQ

Type:

Setting or query

Setting syntax:

```
REFreq ON
REFreq OFF
```

Query syntax:

```
REFreq?
```

Query response: (one of the following)

```
REFREQ ON
REFREQ OFF
```

Discussion:

This command turns the 50kHz reference frequency ON and OFF. When the reference frequency is ON, the variable frequency controls are disabled and the reference frequency is connected to the output. When the reference frequency is OFF, the variable frequency controls are enabled and control the frequency of the output signal. The output frequency is returned to the previous variable frequency. The output amplitude remains at its last setting.

The `REFreq?` command returns the current status of the reference frequency (ON or OFF).

RQS

Type:

Setting or query

Setting syntax:

```
RQS ON
RQS OFF
```

Query syntax:

```
RQS?
```

Query response: (one of the following)

```
RQS ON
RQS OFF
```

Discussion:

This command enables and disables the instruments ability to generate service requests (SRQs). When RQS (request for service) is ON, the instrument asserts an SRQ on the GPIB whenever an event occurs that requires a service request. The events that normally cause service requests to be asserted include the power-up sequence, self-test errors, front-panel operation errors, programming errors, and internal errors.

When RQS is OFF, SRQs are saved, and the SRQ annunciator light on the instrument front panel is lit. An `ERROR?` or `EVENT?` command query can then be used to determine which SRQs have been generated.

The RQS? command returns the current status of the SRQ function (ON or OFF).

SET?

Type:

Query

Query syntax:

```
SET?
```

Query response example:

```
OUTPUT ON;AMPLITUDE
17.40E-3;FREQUENCY
123.34543E+6;REFREQ OFF;RQS ON;USEREQ
OFF
```

Discussion:

This command returns the current instrument setting for OUTPUT (ON or OFF), AMPLITUDE, FREQUENCY, REFREQ (ON or OFF), RQS (ON or OFF), and USEREQ (ON or OFF). The maximum length of the settings query data string is 84 bytes.

STORE

Type:

Operational

Syntax:

STOre <num>

Examples:

STORE 8
STO 13

Discussion:

This command causes the current instrument front-panel control settings to be stored in non-volatile RAM at a location specified with the <num> argument. The <num> argument can be from 1 to 20 (decimal). Twenty front-panel control settings are saved for each instrument setup. Nonvolatile RAM is provided so that the settings are saved when power is turned off to the instrument.

TEST

Type:

Operational

Syntax:

TESt

Example:

TEST

Discussion:

This command causes the instrument to perform a self test. When the test is complete, the instrument returns to the settings last entered. If the self test failed, the SG 5030 returns an SRQ to the controller.

USEREQ

Type:

Setting or query

Setting syntax:

```
USEreq ON
USEreq OFF
```

Examples:

```
USEREQ ON
USE OFF
```

Query syntax:

```
USEreq?
```

Query response: (one of the following)

```
USEREQ ON
USEREQ OFF
```

Discussion:

This command enables or disables the SRQ interrupt that is generated when the front-panel INST ID button is pressed. When the `USEREQ` (user request) function is OFF, the instrument in inhibited from returning the instrument ID SRQ when the INST ID button is pressed.

The `USEreq?` command returns the current status of the instrument ID SRQ (ON or OFF).

B7 B6 B5 / BITS / B4 B3 B2 B1	0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
	CONTROL		NUMBERS SYMBOLS		UPPER CASE		LOWER CASE	
0 0 0 0	0 NUL 0	20 DLE 16	40 SP 32	60 0 48	100 @ 64	120 P 80	140 ` 96	160 p 112
0 0 0 1	1 GTL SOH 1	21 LLO DC1 17	41 ! 33	61 1 49	101 A 65	121 Q 81	141 a 97	161 q 113
0 0 1 0	2 STX 2	22 DC2 18	42 " 34	62 2 50	102 B 66	122 R 82	142 b 98	162 r 114
0 0 1 1	3 ETX 3	23 DC3 19	43 # 35	63 3 51	103 C 67	123 S 83	143 c 99	163 s 115
0 1 0 0	4 SDC EOT 4	24 DCL DC4 20	44 $ 36	64 4 52	104 D 68	124 T 84	144 d 100	164 t 116
0 1 0 1	5 PPC ENQ 5	25 PPU NAK 21	45 % 37	65 5 53	105 E 69	125 U 85	145 e 101	165 u 117
0 1 1 0	6 ACK 6	26 SYN 22	46 & 38	66 6 54	106 F 70	126 V 86	146 f 102	166 v 118
0 1 1 1	7 BEL 7	27 ETB 23	47 ' 39	67 7 55	107 G 71	127 W 87	147 g 103	167 w 119
1 0 0 0	10 GET BS 8	30 SPE CAN 24	50 (40	70 8 56	110 H 72	130 X 88	150 h 104	170 x 120
1 0 0 1	11 TCT HT 9	31 SPD EM 25	51) 41	71 9 57	111 I 73	131 Y 89	151 i 105	171 y 121
1 0 1 0	12 LF A 10	32 SUB 1A 26	52 * 2A 42	72 : 3A 58	112 J 74	132 Z 90	152 j 106	172 z 122
1 0 1 1	13 VT B 11	33 ESC 1B 27	53 + 2B 43	73 ; 3B 59	113 K 75	133 [91	153 k 107	173 { 123
1 1 0 0	14 FF C 12	34 FS 1C 28	54 , 2C 44	74 < 3C 60	114 L 76	134 \ 92	154 l 108	174 | 124
1 1 0 1	15 CR D 13	35 GS 1D 29	55 - 2D 45	75 = 3D 61	115 M 77	135] 93	155 m 109	175 } 125
1 1 1 0	16 SO E 14	36 RS 1E 30	56 . 2E 46	76 > 3E 62	116 N 78	136 ^ 94	156 n 110	176 ~ 126
1 1 1 1	17 SI F 15	37 US 1F 31	57 / 2F 47	77 UNL ? 3F 63	117 O 79	137 UNT _ 5F 95	157 o 111	177 DEL (RUBOUT) 7F 127
	ADDRESSED COMMANDS	UNIVERSAL COMMANDS	LISTEN ADDRESSES		TALK ADDRESSES		SECONDARY ADDRESSES OR COMMANDS (PPE)	(PPD)

KEY

octal 25 PPU
NAK
hex 15 21

GPIB code
ASCII character
decimal

Tektronix
COMMITTED TO EXCELLENCE

REF: ANSI STD X3. 4-1977
IEEE STD 488-1978
ISO STD 646-1973

Figure 3-2: ASCII Character Chart

Messages And Communication Protocol

Command Separator

A message consists of a command or a series of commands, followed by a message terminator. Messages consisting of multiple commands must have the commands separated by semicolons. A semicolon at the end of a message is optional. For example, each line below is a message:

```
INIT

INIT;RQS ON;USER OFF;ID?;SET?

init;
```

Message Terminator

Messages may be terminated with EOI (the GPIB End-Or-Identify signal) or the ASCII line feed (LF) character. Some controllers assert EOI concurrently with the last data byte; others use only the LF character as a terminator. The SG 5030 can be set via the front panel to accept either terminator. With EOI only selected as the terminator, the instrument interprets any data byte received with EOI asserted as the end of an input message; it also asserts EOI concurrently with the last byte of an output message. With LFEOI selected as the terminator, the SG 5030 interprets either a LF character or EOI as a message terminator. Here, the instrument interprets the LF character without EOI asserted (or any data byte received with EOI asserted) as the end of an input message. To terminate output messages, the instrument transmits a carriage return (CR) followed by a LF character with EOI asserted. The SG5030 is shipped with EOI only selected.

Formatting a Message

Commands sent to the SG5030 must have the proper format (syntax) to be understood; however, this format is flexible in that variations are acceptable. The following describes this format and the acceptable variations.

The instrument expects all commands to be encoded in ASCII; however, it accepts both upper and lower case ASCII characters. All data output is in upper case (see Fig. 3-2).

As previously discussed, a command consists of a header followed, if necessary, by arguments. A command with arguments may have a header delimiter, which consists of the space character (SP) between the header and the argument.

The SG 5030 ignores any extra formatting characters SP, CR (carriage return), and LF that are added between the header delimiter and the argument, as shown in the following examples. (In these examples, the formatting characters are shown inside parenthesis.)

Example 1: RQS(SP)ON;

Example 2: RQS(SPSP)ON;

Example 3: RQS(SPCRLFSPSP)ON

(In the LFEOI message terminator mode, the LF character can also be used to terminate messages.)

In general, these formatting characters are ignored after any delimiter and at the beginning and end of a message.

- (SP)RQS(SP)ON;(CRLF)
- (SP)USER(SP)OFF

Number Formats

The SG5030 recognizes the following three number formats:

- **NR1** (integer) — Signed or unsigned decimal integers (for example, +0, –0, +1, 2, –1, –10).
- **NR2** (real) — Signed or unsigned decimal real numbers (for example, –3.2, +5.0, .2).
- **NR3** (floating point) — Floating-point numbers expressed in scientific notation (for example, +1.0E–2, 1.47E1, 1.E–2, 0.01E+0).

In each of these formats, an unsigned value is interpreted as a positive value (that is, 2 is equivalent to +2).

Rounding of Numeric Arguments

The SG 5030 rounds numeric arguments to the nearest unit of resolution and then checks for out-of-range conditions. If the argument is outside the allowable range, the instrument sets the value to the highest (or lowest) allowable value within the range. For example, if a frequency of 700MHz is given, the instrument

frequency is set to 550MHz, the maximum allowable frequency and an Error 205 (argument out of range) is generated.

Message Protocol

As the SG 5030 receives a message it is stored in the input Buffer, processed, and executed. Processing a message consists of decoding commands, detecting delimiters, and checking syntax. If an error is detected during processing, the instrument will assert SRQ.

Executing a message consists of performing the actions specified by its command(s). For setting commands, this involves updating the instrument settings. The setting commands are executed in order received. Execution of the settings occurs when the instrument has received enough characters of the command to determine a valid setting. The instrument does not require a message terminator to execute a valid command.

The SG 5030 behaves the same regardless of whether each command is sent as a separate message or several commands are included in one message. The only difference is that multiple-command messages require less bus overhead. When the SG 5030 receives a query/output command in a message, it executes the command by retrieving the appropriate data and putting it in the output buffer. The instrument then continues to process and execute the remainder of the commands in the message. The query data is sent to the controller when the SG 5030 is made a talker.

Note:

It is not recommended that multiple queries be placed in one message. If more than one query is in a message, one or more response(s) may be lost. No error message will be generated.

Multiple Messages

The SG 5030 input buffer has finite capacity and a single message may be long enough to fill it. In this case, the instrument will process the first portion of the message before the instrument accepts additional input. While the commands in the full input buffer are being processed, the instrument holds off additional data (by asserting NRFD) until space is available in the input buffer.

When space is available, the instrument can accept the next message before the first has been completely processed.

As described above, after the SG 5030 executes a query-output command in a message, it holds the response in its output buffer until the controller makes the instrument a talker. If the instrument receives a new message before all of the output from the previous message is read, it clears the output buffer before execution the new message. This prevents the controller from getting unwanted data from old messages.

One other situation can cause the SG 5030 to delete output. The execution of a long message might cause both the input and output buffers to become full. When this occurs, the instrument cannot finish execution of the message because it is waiting for the controller to read the data it has generated; but the controller cannot read the data because it is waiting to finish sending its message. Because the instrument's input buffer is full and it is holding off the rest of the controller's message with NRFD, the system hangs up with the controller and instrument waiting for each other. When the SG 5030 detects this condition, it generates an error, asserts SRQ, and deletes the data in the output buffer.

Instrument Responses to IEEE-488 Interface Messages

The IEEE-488.1-1987 bus standard defines a set of interface commands and the effects of those commands on the instrument's interface functions. This section describes the effects of the IEEE-488 interface messages on SG 5030 operation. The standard abbreviations for these commands are used here.

UNL (Unlisten) and UNT (Untalk)

The UNL command cause the SG 5030 listener function goes to its idle state (unaddressed). In the idle state, the instrument does not accept instrument commands from the IEEE-488 bus.

The UNT command causes the instrument talker function to its idle state. In this state, the instrument cannot supply output data via the bus.

The ADRS indicator is off when both the talker and listener functions are idle. If the SG 5030 is either talk-addressed or listen-addressed, the indicator is on.

IFC (Interface Clear)

The IFC command has the same effect as issuing both the UNT and UNL commands. The front-panel ADRS indicator is off.

DCL (Device Clear)

The DCL command reinitializes communication between the SG 5030 and its controller. In response to DCL, the instrument clears any input and output messages. Also cleared are any errors or events waiting to be reported, except the power-on event. If the SRQ line is asserted for any reason other than power-on when DCL is received, SRQ is unasserted.

SDC (Selected Device Clear)

The SDC command has the same function as DCL; however, only instruments specifically addressed respond to SDC.

SPE (Serial Poll Enable)

The SPE command enables the SG 5030 to supply output serial poll status bytes when it is talk-addressed.

SPD (Serial Poll Disable)

The SPD command switches the SG 5030 to its normal operation of sending the data from the output buffer.

MLA (My Listen Address) and MTA (My Talk Address)

The SG 5030 IEEE-488 bus address establishes the primary listen and talk addresses. The current setting of the bus address is displayed on the instrument front-panel readout window when the INST ID button is pressed. When the instrument is addressed to either talk or listen, the front-panel ADRS indicator is lighted.

LLO (Local Lockout)

The LLO command causes the SG 5030 to change to a lockout state: from LOCS to LWLS or from REMS to RWLS. The LLO command sent by itself does not set the instrument into Local Lockout. You must send a following command to cause the GPIB circuitry to recognize and assert LLO.

REN (Remote Enable)

If REN is true, the SG 5030 will change to a remote state (from LOCS to REMS if the internal message return-to-local (rtl) is false, or from LWLS to RWLS when its listen address is received). REN false causes a transition from any state to LOCS; the instrument stays in LOCS as long as REN is false.

A REN transition may occur after message processing has begun. In this case, execution of the message being processed is not affected by a transition.

GTL (Go To Local)

If the instrument is listen addressed, the GTL command causes the SG 5030 to change to local state. Remote-to-local transitions caused by GTL do not affect the execution of the message being processed when GTL is received.

Remote-Local Operation

The preceding discussion of interface messages describes the state transitions that the GTL and REN commands cause. Most front-panel controls cause a transition from REMS to LOCS by asserting a message called return-to-local (rtl). This transition may occur during message execution; but, in contrast to GTL and REN transitions, a transition initiated by rtl affects message execution. In this case, the instrument generates an error if there are any unexecuted setting or operational commands. Front-panel controls that change only the display (such as INST ID) do not affect the remote-local states; only front-panel controls that

change settings assert rtl. The rtl message remains asserted while multiple keystroke settings are entered, and it is unasserted after the execution of the settings.

The SG 5030 maintains a record of its settings in the current settings buffer and new settings from the front panel or the controller update these recorded settings. In addition, the front panel is updated to reflect setting changes caused by commands. Instrument settings are unaffected by transitions between the four remote-local states. The REM indicator is lighted when the instrument is in REMS or RWLS.

Local State (LOCS)

In LOCS, the operator controls the SG 5030 settings via the front-panel push buttons and knob. The only bus commands that are executed are those that do not change instrument settings (query-output commands). All other bus commands (setting and operational commands) generate an error since those functions are under front-panel control.

Local Without Lockout State (LWLS)

When the SG 5030 is in LWLS, it operates the same as it does in LOCS, except that rtl does not inhibit a transition to remote.

Remote State (REMS)

In REMS, the SG 5030 executes all instrument commands from the GPIB bus. For commands having associated front-panel indicators, the front panel is updated when the commands are executed.

Remote with Lockout State (RWLS)

In RWLS, the SG 5030 operates similar to REMS operation except that the rtl message is ignored. (The front panel is locked out.)

Status And Error Reporting

The SG 5030 can alert the controller that it requires service through the service request function (defined in the IEEE-488 Standard). The service request function also provides a means of indicating that an event (a change in status or an error) has occurred. To service a request, the controller performs a serial poll. In response to this poll, the SG 5030 returns a status byte (STB), which indicates whether or not it was requesting service. The STB can also provide a limited amount of information about the request. The format of the information encoded in the STB is given in Fig. 3-3. Note that, when data bit 8 is set, the STB conveys Device Status information, which is contained in bits 1 through 4. (The SG 5030 does not utilize this feature.)

In case of an intermittent error condition multiple SRQs may be stored in the SG 5030 internal stack. These SRQs can all be simultaneously cleared with a DCL (Device Clear) command.

NOTE

The SG 5030 status is available over the bus by Serial Poll and/or Error Query, with or without RQS on.

Because the STB conveys limited information about an event, the events are divided into classes, which the STB reports. The classes of events are defined as follows:

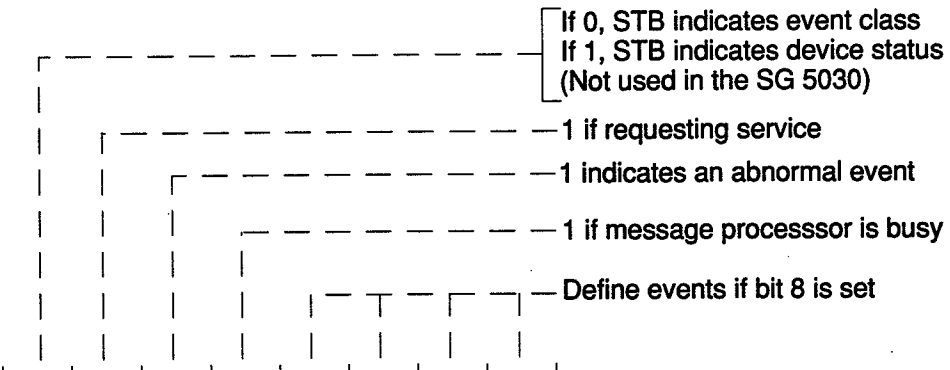
Command Error	Indicates that the SG 5030 has received a command that it cannot understand. The command does not affect the current state of the instrument.
Execution Error	Indicates that the instrument has received a command that it understands, but cannot execute because of the present state of the instrument, or because the command is out of the instrument's range.
Internal Error	Indicates that the instrument has detected a hardware condition or firmware problem that prevents operation.

Error Messages Sent to the Front Panel

Error messages sent to the front panel remain displayed until any front-panel button is pushed or a GPIB command is executed.

An NVRAM Battery Test (E363) error means the battery backed up memory failed, resulting in the front panel setups and the GPIB address & message terminator information being lost. Front-panel setups will default to the factory default settings with the GPIB address 25 and message terminator of EOI only.

A CAL Constant Checksum Failure (E364) means the calibration constants are in some way not correct. The instrument then defaults to a nominal set of calibration constants and the Front Panel RECAL LED will be illuminated.



8	7	6	5	4	3	2	1	BIT POSITION
128	64	32	16	8	4	2	1	DECIMAL WEIGHT
								Normal Events:
0	1	0	X	0	0	0	1	Power-up (65)
0	1	0	X	0	0	1	1	ID user request (67)
0	1	1	X	0	0	0	1	Abnormal Events:
0	1	1	X	0	0	1	0	Invalid command header (97)
0	1	1	X	0	0	1	1	Settings error (98)
								System error (99)

7703-9

Figure 3-3: STB Bit Configuration

Bus Error/Event Codes And Serial Poll Response

The SG 5030 provides additional information about many of the events, particularly the errors reported in the STB. The controller can request the additional information by issuing an `ERROR?` or `EVENT?` command. In response, the SG 5030 returns a code that defines the event. These codes are described in Table 3-4.

Power-on Sequences And Settings

Each time power is applied to the SG 5030, the internal microprocessor performs a self test diagnostic routine to check the instrument RAM and ROM functionality. If no RAM or ROM error is found, the microprocessor performs further routines that check the functionality of other instrument hardware.

If a hard ROM, RAM or NVRAM failure is found at power up, the instrument will lock up and indicate the error type with the four LEDs on the CPU board. The LED code is shown below:

	LED 1	LED 2	LED 3	LED 4
ROM	off	on	on	on
RAM	off	off	on	on
NVRAM	on	off	on	on

If a functional failure is detected, an error code will appear in the display window. The error will remain displayed until cleared by pressing any front-panel button or executing any GPIB command. The SG 5030 will respond to input and attempt to function in spite of the error. Refer to Table 3-4 for bus error codes and front-panel error codes.

Upon successful completion of the self tests, the SG 5030 restores the instrument settings that were in use when the instrument was last turned off, except that the sine-wave signal to the output head will be turned off.

Table 3-4: Error Query and Status Responses

Description	Error/Event Query Response	SerialPoll (Decimal)[1]
Command Errors/Events		
System normal	0	NSB[2]
Command header error	101	97 or 113
Header delimiter error	102	97 or 113
Command argument error	103	97 or 113
Argument delimiter error	104	97 or 113
Non-numeric argument	105	97 or 113
Missing argument	106	97 or 113
Invalid message unit delimiter	107	97 or 113
Bad symbol	150	97 or 113
Syntax error	151	97 or 113
Symbol number too long	153	97 or 113
Invalid input character	154	97 or 113
Invalid string input	155	97 or 113
Numerical underflow	156	97 or 113
Execution Errors/Events		
Argument out of range	205	98 or 114
Not in adjustment mode	250	98 or 114
I/O buffers full, output flushed	251	98 or 114
Settings buffer empty	252	98 or 114
Illegal settings number specified	253	98 or 114
Beyond adjustment limit	254	98 or 114
Internal Errors/Events		
Interrupt fault	301	99 or 115
System error	302	99 or 115
HF unleveled	350	99 or 115
Reference loop unlocked	351	99 or 115
Wide loop unlocked	352	99 or 115
Narrow loop unlocked	353	99 or 115
Offset loop unlocked	354	99 or 115
DDS loop unlocked	355	99 or 115
Unplugged error	356	99 or 115
CPU Self Test Errors		
EPROM checksum failure	360	99 or 115
NVRAM test failure	361	99 or 115
RAM test failure	362	99 or 115
NVRAM battery test failure	363	99 or 115
CAL constant checksum failure	364	99 or 115

Table 3-4: Error Query and Status Responses (Continued)

Description	Error/Event Query Response	SerialPoll (Decimal)[1]
Hardware Self Test Errors		
Output OFF test failure	370	99 or 115
REF Freq test failure	371	99 or 115
DDS OFF test failure	372	99 or 115
10.00000 MHz test failure	373	99 or 115
10.00001 MHz test failure	374	99 or 115
500.00000 MHz test failure	375	99 or 115
Wide Loop Divider test failure	376	99 or 115
Output Amp powered test failure	377	99 or 115
System Errors/Event		
No errors or events	0	NSB[2]
Power on	401	65 or 81
ID User request	403	67 or 83
SRQ pending	455	NSB[2]

[1] If the message processor is busy, the instrument returns a number 16 (decimal) higher than the serial poll response.
[2] No Status Byte.

Programming Examples

Talker/Listener Utility Programs

The following sample programs allow a user to send any of the commands listed in the Functional Command List and receive the data generated.

Talker/Listener Utility Program for IBM PC Compatibles

```
' ********************************************************************************
' ************************SG 5030 TALKER/LISTENER
PROGRAM**************************
' ********************************************************************************
' THIS PROGRAM REQUIRES THAT THE SG 5030 ADDRESS BE SET TO THE
' FACTORY DEFAULT OF 10.
COMMON SHARED IBSTA%, IBERR%, IBCNT%
ID$ = "TEKDEV1"
CALL IBFIND (ID$, BD%)                  ' SELECT TEKDEVI FOR GPIB ACCESS
SG% = 10                                ' SG% = FACTORY DEFAULT ADDRESS OF 10
CALL IBPAD (BD%, SG%)                   ' CHANGE TEKDEV1PRIMARY ADDRESS TO
ID$ = "GPIB0"                           ' SET UP GPIB FOR BOARD LEVEL
CALL IBFIND(ID$, GP%)                   ' COMMUNICATION
REMOTE% = 1
CALL IBSRE(GP%, REMOTE%)                ' SET REMOTE ENABLE
CLS                                     ' CLEAR SCREEN
REPLY$ = SPACES$(125)                   ' DIMENSION RD$ TO 125
PRINT
"********************************************************************************"
PRINT "********************SG 5030 TALKER/LISTENER
PROGRAM**************************"
PRINT
"********************************************************************************"
MAINPROG:
PRINT "RETURN TO EXIT; "
INPUT "ENTER MESSAGE(S)"L WRT$
IF WRT$ = " " THEN GOSUB TERMINATE
CALL IBWRT(BD%, WRT$)                   ' SEND MESSAGE TO SG 5030
GOSUB CHECKGPIB                         ' CHECK FOR GPIB ERROR
' ******************************INPUT FROM
DEVICE**********************************
FOR T = 1 TO 1000
NEXT T
CALL IBRD (BD%, REPLY$)                 ' INPUT DATA FROM SG 5030
GOSUB CHECKGPIB                         ' CHECK FOR GPIB ERROR GOSUB
CHECKSG                                 ' GET SG 5030 ERROR MESSAGE
PRINT : PRINT "INSTRUMENT REPLY ", REPLY$
PRINT : PRINT "Returned status byte:'; SPR%,
PRINT : PRINT ERRM$
GOTO MAINPROG
' ********************************ERROR
ROUTINE**************************************
```

```
CHECKSG:
ERRM$ = SPACE$(50)
CALL IBRSP (BD%, SPR%)
CALL IBWRT (BD%, "ERR?")
CALL IBRD (BD%, ERRM$)
RETURN
CHECKGPIB:
IF IBSTA% >=0 AND BD% >=0 AND IBSTA% < &H4000 AND IBERR% <> 6 THEN RETURN'no error
          to report
IF BD% < 0 THEN PRINT "device not installed - use IBCONF then reboot"
IF IBSTA% > 0 AND IBSTA% >= &H4000 THEN PRINT "timeout"
IF IBERR% = 6 THEN PRINT "timeout"
PRINT "gpib error "; IBERR%
IF IBERR% = 0 THEN PRINT "DOS error device not installed"
IF IBERR% = 1 THEN PRINT "function requires GPIB-PC to be CIC"
IF IBERR% = 2 THEN PRINT "no listener on write function"
IF IBERR% = 3 THEN PRINT "GPIB-PC not addressed correctly"
IF IBERR% = 4 THEN PRINT "invalid argument to function call"
IF IBERR% = 5 THEN PRINT "GPIB-PC not system controller as required"
IF IBERR% = 6 THEN PRINT "I/O operation aborted"
IF IBERR% = 7 THEN PRINT "non-existant GPIB-PC board"
IF IBERR% =10 THEN PRINT "I/O started before previous operation completed"
IF IBERR% =11 THEN PRINT "no capability for operation"
IF IBERR% =12 THEN PRINT "file system error"
IF IBERR% =14 THEN PRINT "command error during device call"
IF IBERR% =15 THEN PRINT "serial poll status byte lost"
IF IBERR% =16 THEN PRINT "SRQ stuck in ON position"
INPUT "[ENTER] TO CONTINUE"; A$     ' if help$ then
RETURN
' ********************************TERMINATE PROGRAM*********************************
TERMINATE:
REMOTE% = 0
CALL IBSRE (GP%, REMOTE%)           'CLEAR REMOTE ENABLE
PRINT "PROGRAM TERMINATED."
END
```

WARNING

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

Section 4
Theory of Operation

Introduction

NOTE

See page 10-1, Diagrams and Circuit Board Illustrations, tor an explanation of schematic symbols.

This section of the manual describes the circuitry used in the SG 5030 Programmable Leveled Sine Wave Generator. The description begins with a discussion of the instrument, using the basic block diagram, Figure 10-4, located in Section 10-Diagrams and Circuit Board Illustration. Next, the major circuitry for each circuit board is described using detailed block diagrams, as necessary, to show the relationship between stages. Detailed schematic diagrams for each circuit are located in Section 10-Diagrams section at the back of this manual; refer to these schematics throughout the following circuit description for specific electrical values and relationships.

The logic convention (L) is used throughout the text in this section to denote an active Low signal.

SG 5030 Overview

The SG 5030 generates a high spectral purity sine wave whose amplitude is constant over a broad frequency range. In addition, both frequency and amplitude are programmable over the GPIB. The frequency range is 0.1Hz to 550.00000MHz. The frequency setting resolution is 0.1Hz between 0.1Hz and 4.9999kHz, 1Hz between 5.000kHz and 49.999kHz, and 10Hz between 50.00kHz and 550.00000MHz. The output amplitude range is 4.5mV to 5.5V pk-to-pk (-42.95dBm to 18.75dBm, resolution 0.05dB). The amplitude setting resolution is 0.02mV between 4.50mV and 55.00mV, 0.2mV between 55.2mV and 550.0mV, and 2mV between 552mV and 5.500Volts.

Frequency Control Operation

Two separate signal paths are used to generate the output sine wave, depending on the frequency selected. The Low Frequency (LF) signal covers the range of 0.1Hz to 49.999kHz. This signal is generated by the DDS (direct-digital synthesizer) and directly drives the LF Preamp and Output Amplifier. The High Frequency (HF) signal covers the range of 50.00kHz through 550.00000MHz. The HF signal is generated by mixing two voltage-controlled oscillators (Wide Loop and Narrow Loop) and coupling the difference frequency to the Output Amplifier. The Wide Loop VCO is stepped in 10MHz steps (920MHz to 1470MHz) and is used for coarse frequency control. The Narrow Loop VCO is stepped in 10Hz steps (910.00000MHz to 919.99999MHz) by the DDS Loop signal and is used for fine frequency control. The frequency accuracy of the SG 5030 is determined by the 10MHz Timebase Oscillator which directly or indirectly feeds all the frequency generation circuitry. This 10MHz Timebase Oscillator is voltage controllable and can be phase-locked to a precision external 10MHz reference for even greater frequency accuracy.

Amplitude Control Operation

Coarse control of the output amplitude is provided by two 10X attenuator networks in the Leveling Head. Two separate signal paths provide fine control of the sine-wave output amplitude; one for 0.1Hz to 49.999kHz (LF), and one for 50.00kHz to 550MHz (HF).

The LF amplitude is controlled through a multiplying DAC (located in the LF preamp control block on the A7-Output board). The LF Sense Signal from a resistive divider at the Output Amplifier output completes a feedback loop that determines the system gain between the multiplying DAC and the output signal to the Leveling Head.

The HF amplitude is controlled by a PIN diode attenuator whose gain is controlled by a feedback signal from the Leveling Head. The Leveling Head peak-detecting diodes return a signal (essentially DC that is proportional to peak output) which is compared to a level set by the HF level DAC (U6161 schematic 17) located on the A5 RF circuit board. The error amplifier changes the PIN attenuation until the levels match.

Front Panel and GPIB Operation

The SG 5030 receives commands to change its operation from either the front-panel controls or from the GPIB. Once the instrument firmware accepts the command, the instrument is configured to the new setup. All front panel displays and controls communicate with the instrument through the CPU.

Internal Serial Bus

The CPU communicates with the rest of the instrument through the A2-Interconnect board. The CPU sends serial data on one data line along with a serial clock on one clock line to each of the circuit boards in the instrument. All serial data loops receive the same data.

The serial data loop that is to be set is then strobed through one of the 6 strobe lines being used. All control of the instrument operation is through these 8 lines.

Hardware Diagnostics

The SG 5030 performs several diagnostic checks upon power up. If errors are detected, error messages will be shown in the readout display. See Table 3-3 in the Programming section for a complete list of the error codes that are shown in the readout display.

During normal operation the various frequency and amplitude control loops will report an error to the CPU through the A2-Interconnect board if a problem is detected. These errors will indicate a frequency loop not in lock or the HF amplitude leveling circuit cannot maintain amplitude leveling. These errors are also displayed on the readout display until cleared by pushing a key on the front panel.

Rear Interface Signal Connections

Signal connections can be made to the rear-edge-connector of the SG 5030 for a 10MHz External Timebase input and a 10MHz Timebase output signal. The A6-Timebase signals (TBOUT and EXTTB) are connected through coaxial cables, either to the front panel or to a connector on the A6-Timebase board near the rear-edge connector.

Block Diagram Description

Seven circuit boards plus the amplitude leveling head comprise the SG 5030. The primary task of each circuit board is as follows:

A1-Front Panel Board

The A1-Front Panel board contains the readout display used to indicate the current amplitude or frequency settings. This board also contains the Control Knob and push-button switches used to set the frequency, set the amplitude, initiate the adjustment procedure, store or recall front-panel setups, initialize all 20 front panel setups, or set the GPIB address and message terminator.

A2-Interconnect Board

The A2-Interconnect Board is used to distribute power from the various power supplies located on the A4-DDS board, A6-Timebase Board, and the A7-Output Board. This board also distributes the control lines used by the CPU to configure the circuits as required for the various settings and functions.

A3-CPU Board

The CPU issues data and commands to the other circuit boards over the serial bus by way of the Interconnect Board and to the front panel display over the front panel interface ribbon cable.

A4-DDS Board

The A4-DDS Board contains the circuity to control the fine resolution frequency generation in the HF mode, and to generate the LF mode frequencies directly. The fine resolution frequency of the HF mode is coupled to the A5-RF Board through the DDSSIG cable. The frequency range of this signal is 11.000000MHz to 11.999999MHz. The LF frequency is differentially coupled to the LF Preamp Control circuit on the A7-Output Board via the LF+ and LF- cables. The frequency range of this signal is 0.1Hz to 49.999kHz.

A5-RF Board

The A5-RF Board contains the circuitry to generate the HF signal (50.00kHz to 550MHz) and control its amplitude. The Wide Loop block contains the circuitry to step the output frequency in 10MHz steps while the Narrow Loop block uses the DDSSIG (11.000000MHz to 11.999999MHz) to step the output frequency in 10Hz steps. The Amplitude Control circuitry uses the detected output from the leveling head to maintain the output amplitude constant regardless of HF frequency setting, and sets the output amplitude using information received from the CPU. The nominal amplitude output from the A5-RF Board is 1dBm when the programmed output amplitude is 18.75dBm (5.5V pk-to-pk).

A6-Timebase Board

The A6-Timebase Board contains the 10MHz reference oscillator. This oscillator is a VCXO (voltage controlled crystal oscillator) which can be phase locked to an external 10MHz reference frequency. The 10MHz Timebase frequency is connected to the A4-DDS Board and the A5-RF Board and is used as the internal frequency reference. This 10MHz Timebase frequency is also connected to a front panel BNC connector (TIMEBASE OUT) and can be used as a frequency reference for other instruments.

A7-Output Board

The A7-Output board provides power amplification for both the LF and HF frequencies. The LF Preamp Control Circuitry is used to set the LF output amplitude in combination with the programmable attenuators in the Leveling Head. The gain of the Output Amplifier on the output board is a nominal 24dB. The A7-Output Board also contains the circuity to maintain 0VDC at the output of the Leveling Head.

Leveling Head

The Leveling Head provides circuitry to detect the amplitude of the HF amplitude and to attenuate the output signal in two 20dB steps. The leveling head is not field serviceable.

Circuit Theory Notes

Frequency Synthesis

The SG 5030 develops its output frequency from a single 10 MHz reference source using phase-locked loop techniques. A typical frequency synthesis loop is shown in Figure 4-0. The highly stable frequency reference, f_{REF}, is one input to the phase/frequecy detector. The phase/frequency detector outputs an error correction voltage which drives the loop into frequency lock with a mixer in the loop and phase lock without the mixer. Assume as a first example that there is no mixer or divider in the feedback path of the loop. Then under lock conditions the phase/frequency detector outputs narrow correction voltage pulses which are integrated by the Low Pass Filter generating a control voltage , V_c, which forces the voltage voltage-controlled oscillator (VCO) output frequency and phase to match that of the input reference. If there is a divider in the loop feedback path of divide ratio N, then the output frequency of the VCO is multiplied up in frequency by a factor of N. If a mixer is also inserted in the loop feedback path following the VCO, then the output frequency is shifted in frequency by the applied mixer frequency, f_{OFFSET}. Since the mixer generates a broad spectrum of sum and difference harmonics, a filter is required after the mixer to select the correct frequency to apply to the divider or phase detector.

Signal Power Notation

Since at high frequencies it is easier to measure power than voltage, the A5 RF Board schematics often show the signal level in terms of dBm. This notation refers to a power ratio compared to 1 milliwatt:

$$10 \log \left(\frac{P}{1\ mW} \right) .$$

As an example, 0 dBm represents 1 mW, 10 dBm represents 10 mW, and 20 dBm represents 100 mW. It is possible to convert the dBm values into voltage into a specified load. In the typical case, the SG 5030 load resistance can be assumed to be 50 ohms. The equations that can be used to convert power in dBm to volts are shown below:

$$XdBm = 10 \log \left(\frac{P}{1\ mW} \right)$$

$$P = \frac{V_{rms}^2}{R_o} = \frac{V_{rms}^2}{50} \quad \text{for } R_o = 50 \text{ ohms}$$

$$Vpp = 2\sqrt{2}\ \ Vrms$$

$$Vpp = 20\ X\ 10^{\left(\frac{\frac{XdBm}{10} - 3}{2} \right)}$$

ECL Signal Levels

Several of the frequency control circuits in the SG 5030 ECL integrated circuits are operated from a +5 V supply rather than a more conventional -5.2 V supply. This shifts the normal ECL logic levels. Using a +5 V supply results in a ECL logic HI of about +4.1 V and an ECL logic LO of about +3.3 V. The threshold voltage, VB, under these conditions is about +3.7 V. A threshold voltage supply is generated locally at several of the ECL ICs where the input signals are AC-coupled in order to minimize noise and reduce the effect of DC voltage offsets between circuit boards.

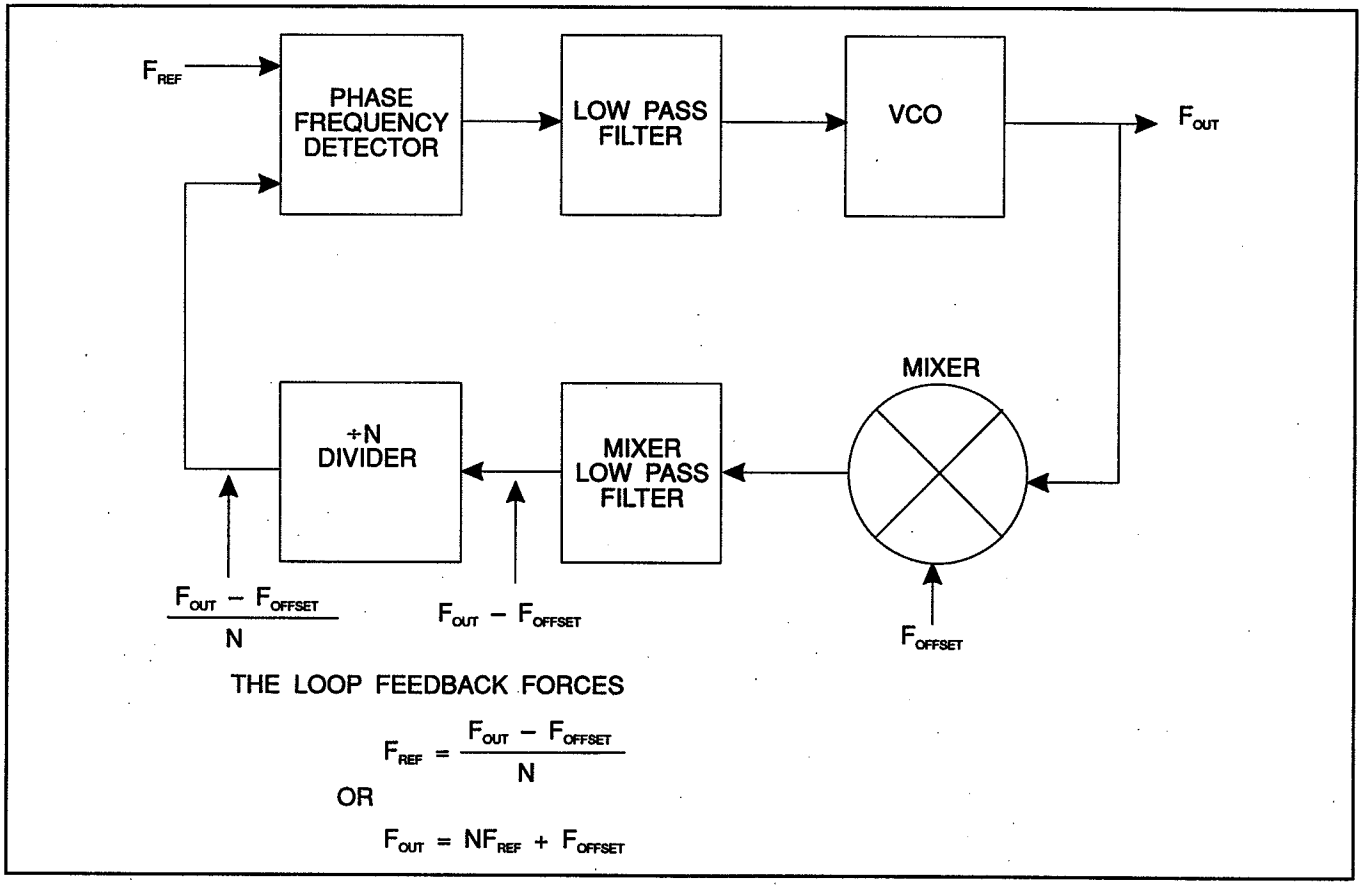


Figure 4-0: Frequency Synthesis Loop

Detailed Circuit Description

Refer to the schematic diagrams while reading this Detailed Circuit Description. Complete schematic diagrams are provided in the rear of this manual. Each diagram is divided into functional blocks that are bordered with dotted lines. The detailed Circuit Description subheadings provide schematic boxed numbers that refer to the appropriate schematic.

Assembly numbers (A numbers) identify components and the board these components are mounted on. The designation A7R2000 identifies the board as assembly A7 (the output board), and the component number as resistor R2000.

A1-Front Panel Board Schematic 1

The A1-Front Panel Board circuitry is composed of four functional sections; 1) the seven-segment LEDs in the readout display, 2) the discrete LED indicators, 3) the switches, and 4) the control knob rotary encoder..

The seven-segment LEDs in the readout display are multiplexed by U2071 on the A3-CPU Board.

The discrete LED indicators are multiplexed by U3071 on the A3-CPU Board.

The switches are scanned by U3080 on the A3-CPU Board. U3080 is operated in expanded mode through the use of U2010 on the A1-Front Panel Board, which allows more than the standard 20 switches to be handled.

The rotary contacting switch, SW2030, on the front panel was included in the switch matrix on earlier models of the SG 5030, but was replaced with a quadrature encoder with two phased outputs.

A2-Interconnect Board Schematic 5

The A2-Interconnect board provides for communication to and from the A3-CPU Board, for routing of power supplies, and for passing of a few special signals between circuit boards. There are also power supply regulators and filter components located on the board.

SG 5030 signal generation is controlled by signals from the A3-CPU Board which are sent over a serial data bus common to the A4-DDS, A5-RF, A6-Timebase, and A7-Output Boards. The serial data is sent over the SDATA line and is clocked into all the serial shift register groups by the SCLK line. The data is sent from the CPU 8 bits at a time, and is latched into the appropriate shift register group by one of the strobe signals, for example DDSSTB(L). For shift register groups that are longer than 8 bits in length, multiple bytes are sent from the CPU over the serial data bus before the appropriate strobe signal latches the data into the selected register.

The A3-CPU board also receives status signals back from the signal generation circuits over the A2-Interconnect Board. These signals are active low indicators of error conditions in the phase-locked-loop circuits and leveling head, or indicate status of the External Timebase Clock with the EXTREF(L) signal. These status signals are sampled by the A3-CPU Board processor as part of its periodic polling sequence. Detection of activity on these status signals will cause the processor to activate appropriate indicator lights on the Front Panel and may cause SRQs to be generated on the GPIB bus.

Power supply regulators are located on the A4-DDS, A6-Timebase, A7-Output, and A2-Interconnect Boards. The A2-Interconnect Board also provides power supply connections between the boards. The A4-DDS Board generates the +5VD supply which supplies power to the CPU and A1-Front Panel Boards and the -5.2V supply which is used only on the A4-DDS Board. The A6-Timebase Board generates the +5VA and +16V supplies which are bussed to all the signal generating boards. The A7-Output Board generates power supplies which are used locally by the Output Hybrid and supplies -26V from the power module for use by one of the A2-Interconnect board regulators. The A2-Interconnect board contains two three-terminal IC regulators which provide +12V (U2060) and -15V (U4050) to the analog signal boards.

The Leveling Head relays are controlled by signals which are routed through several boards by the A2-Interconnect board. A change in the state of the leveling head relays is initiated by the RELAY TRIG signal on the A4-DDS board. The RELAY TRIG signal is a bit in the DDSCNTL register which the A3-CPU board processor sets HI to start the activation cycle. The RELAY TRIG signal is sent as a trigger signal to a one-shot on the A6-Timebase board which generates the RELAY (L) signal. This approximately 7ms wide RELAY(L) signal is then sent to a driver on the A7-Output board which actually pulses the Leveling Head maglatch relays.

A3-CPU BOARD Schematics 2, 3, 4

The A3-CPU board provides the intelligence for instrument control. It processes the various inputs from the front panel and the GPIB, and outputs information back to the front panel. The A3-CPU board also sends data to control the other circuit boards in the SG 5030.

LED Indicators Schematic 2

The four LEDs on the A3-CPU board are used for diagnostics during power-up self test:

Diagnostic Test Results	LED Number (DS)			
	1030	1040	1041	1042
EPROM kernal failure	off	on	on	on
NVRAM kernal failure	on	off	on	on
RAM kernal failure	off	off	on	on
Normal kernal operation	off	off	off	off

Rear Panel Switch Schematic 2

The Rear Panel switch, SW3020, on the A3-CPU board is used to configure the instrument at power up. For normal operation, all toggles are set for open contacts (the contacts are closed when the toggle is depressed to the left, facing the rear of the instrument). The following functions are activated when the contacts are closed:

Toggle	Function
1	Reinitialize Firmware
2	Diagnostic Bypass
3	Enable Adjustment
4	Not used

68000 Microprocessor Schematic 2, 3

The digital CMOS 68HC000 microprocessor (U4040) is the heart of the A3-CPU board. Oscillator Y3040 provides a 10MHz clock for system operation. The power-on reset integrated circuit U4070 generates the RESET signal. U4070 also generates the HALT signal through transistor Q5070. The microprocessor fetches its program information from EPROMs U2051 and U3050, which are a pair of 27C512s. These two integrated circuits are bottom justified in their sockets because these sockets can also accommodate 27C010s. Variables are stored in RAMs U2060 and U2070. Calibration constants and stored settings are held in the two battery backup NVRAMs U3060 and U3070. Configuration information and CPU diagnostic display codes are accessed via the 16L8 PAL, U1050. The address decoding for the chip select generation for these parts comes from a 22V10 PAL, U4050, which also generates DTACK for everything except the LCA, U4020. Additional chip select generation comes from a 20L10 PAL, U2050. CMOS timer U2041 generates narrow pulses at approximately 100Hz to act as a clock for the microprocessor to do task switching and to generate long delays.

Jumpers J4020 and J4021 allow the microprocessor to execute read only instruction opcodes from resistor packs R1046 and R4080. When the jumpers are both between pins 1 and 2 the microprocessor will continuously walk the address space. No chip selects will be generated from either PAL. Normal operation occurs when both jumpers are between 2 and 3 which is simply a neutral storage position. The A3-CPU board can be manually reset by shorting the two pins of J4070 together.

GPIB Interface Schematic 3

The GPIB interface is composed of integrated circuit U2010, and GPIB drivers U1020 and U2020. The driver chips feed the GPIB via the circuit board edge connector P2010 at the rear of the instrument.

LCA Schematic 3

LCA (Logic Cell Array) U4020 performs a number of functions including Interrupt acknowledge, VPA generation, Interrupt masking and priority encoding, DTACK generation for its address space, and general I/O for instrument control.

When the microprocessor receives an interrupt, it asserts all ones on FC0-FC3, indicating an interrupt acknowledge cycle. The LCA is configured to recognize this and assert a zero on the VPA line telling the microprocessor to autovector to the interrupt service routine.

The LCA is configured to provide the ability to mask off any of the interrupts in order to disable them independently. If an interrupt is not masked off and it arrives at the LCA, it is sent on to the priority encoder which generates the appropriate interrupt level.

DTACK is generated by the LCA for all of its valid internal addresses. The LCA also generates an active low Valid Peripheral Address (VPA) signal when the keyboard encoder is accessed. This enables the microprocessor to execute a slower 6800 timing cycle and allows the keyboard encoder chip to fully assert its data to the proper levels. Communication with the rest of the instrument is provided through the LCA. This takes place in three forms; 1) serial output, 2) strobes, and 3) Istatus signal inputs. The microprocessor writes bytes out to the instrument in a serial format, accompanied by a clock through the LCA. Once the serial data is sent, one of the strobes is asserted to latch the data into its appropriate location. Status signals are sent back from the instrument for circuit status to be monitored through the LCA.

Front Panel Interface Schematic 4

The front panel display is driven by two 7218 display drivers: the seven segment LED displays are driven by U2071, and the discrete LEDs are driven by U3071. The front panel switches are scanned by keyboard encoder U3080. The keyboard encoder is used in a partially expanded format where the microprocessor can read an additional line from the key matrix via the two PALs. This line is labeled D5 (J3081, 43). The A3-CPU board communicates with the Front Panel board through connector J3081.

The front panel control knob encoder outputs, ENC2A and ENC2B , are decoded and stored in the quadrature decoder IC, U1080. The up/down count information is read by the microprocessor as part of its normal scanning routine.

A4-DDS BOARD **Schematics 8, 9, 10, 11**

The A4-DDS board contains a programmable 24-bit Direct Digitally Synthesized sine-wave generator. The DDS provides the LF signal (0.1Hz to 49.9999kHz) directly to the A7-Output board. It also provides the fine tune (10Hz resolution) control of the HF signal to the RF boards for frequency control within the 10MHz coarse steps. The fine tune HF control signal does not come directly from the DDS generator, but is mixed up 10 MHz from a 1 to 2 MHz base frequency to 11 to 12 MHz in the DDS Loop. Refer to Figure 4-1.

DDS Clock & DDS Schematics 8, 9

The timing reference signal for the DDS comes from the A6-Timebase board as the DDSREF signal. This 10MHz timebase clock is first buffered from ECL to TTL levels by U1050. The clock is then passed to the DDS Clock Multiplexer that selects, under processor control, either 10MHz, 10MHz divided-by-six, or DC (see Table 4-1). The 10MHz clock is selected for all frequencies 5kHz and greater. The divide-by six clock (1.67MHz) is selected for frequencies below 5kHz for better LF frequency resolution. The DC state is selected when the output is off, which stops the DDS generator. An additional state is for processor control of the DDS clocking to set the DDS output to a specific DC voltage for LF signal calibration. The DDS Clock circuit also provides a filtered 10MHz signal, DDS OFFSET, to the DDS Loop mixer.

As shown in Figure 4-1, the DDS output signals are generated by a Waveform DAC. This DAC is controlled in turn by a Sine-Wave Map stored in nonvolatile memory. The Sine-Wave Map contains a digitally encoded representation of a half period of a sine wave. The other half period of each sine wave cycle is reconstructed by the symmetry of a sine wave and the address counting scheme for the Map memory. The address control for the Sine-Wave Map comes from the 24 bit Phase Accumulator (U2070). The phase Accumulator output is a 24 bit encoded phase vector representing the phase of the DDS signal. Only the upper 12 bits of this phase output are available at the Phase Accumulator IC pins, and only 11 bits are actually used as addresses by the Sine-Wave Map in a count-up/count-down pattern. The phase accumulator may be thought of as a sine-wave phase generator which rotates the phase vector on each edge of the DDS clock an amount determined by the tuning word. The frequency of the DDS is controlled by a 24 bit TUNE word and the DDS clock frequency:

$$\text{DDS FREQ} = (\text{TUNE} * \text{DDSCLK FREQ})/16777216$$

For example, if the DDS clock frequency is 10.000000MHz and the 24 bit TUNE word is HEX 19999A (1677722), the DDS frequency is 1.000000MHz.

The A4-DDS board interfaces to the CPU with two registers; an 8 bit control register, and a 24 bit TUNE register. The 24 bit TUNE register controls the output frequency of the DDS. The lower four bits of the control register control the DDS clock as described earlier. The RELAY_TRIG bit is sent off to the A6-Timebase board to initiate the timing pulse for the leveling Head attenuator latching relays.

The DDS DAC is a current output device which drives 40mA p-p into the doubly terminated transmission lines that are connected to the A7-Output Board (LF+ and LF-). The LF- signal is also buffered by U4030 and supplies the reference frequency input to the DDS loop for SG 5030 output frequencies of 50kHz and greater. This buffered signal is low-pass filtered before driving the DDS Loop phase detector (U2021) input. The signal is also AC-coupled and requires an ECL termination voltage of about 3.7V which is supplied to both phase detector inputs by U2020. The 3.7 volts is available as an output on U2020 pin 11, and the ECL gates of U2020 are used as unity gain amplifiers to supply a buffered termination voltage.

DDS Loop Schematic 10

The DDS Loop phase detector output correction pulses are filtered by the Loop Filter (U4020), which supplies the frequency control voltage to the DDS VCO (Q6000). The Loop Filter output is attenuated by R5014, R5010, and R5013 to limit the range of frequency control of the DDS VCO. The DDS VCO is a Colpitts oscillator configuration using a JFET as the active device. The oscillator resonant tank is made up of L6010, C6002, C6000, and the voltage variable capacitance of CR5010 and CR6010. The DDS VCO is buffered by an ECL receiver (U4000) which provides the DDSSIG of 11 to 12 MHz in 1Hz steps to the A5-RF board. The same VCO signal from another ECL buffer is low-pass filtered and amplified by U3000 to provide the LO port signal to the Loop mixer (U1000).

Table 4-1: DDS_CLK, SEL_A & SEL_B Bits Truth Table

SEL_B	SEL_A	DDS_CLK	Function
0	0	1.67MHz	Frequencies from 0.1Hz to 4.999kHz.
0	1	Off	No clock output.
1	0	DDSCAL_CLK	Used to set DC volts out of the DDS for LF CAL.
1	1	10MHz	Frequencies from 5.000kHz to 550.00000MHz.

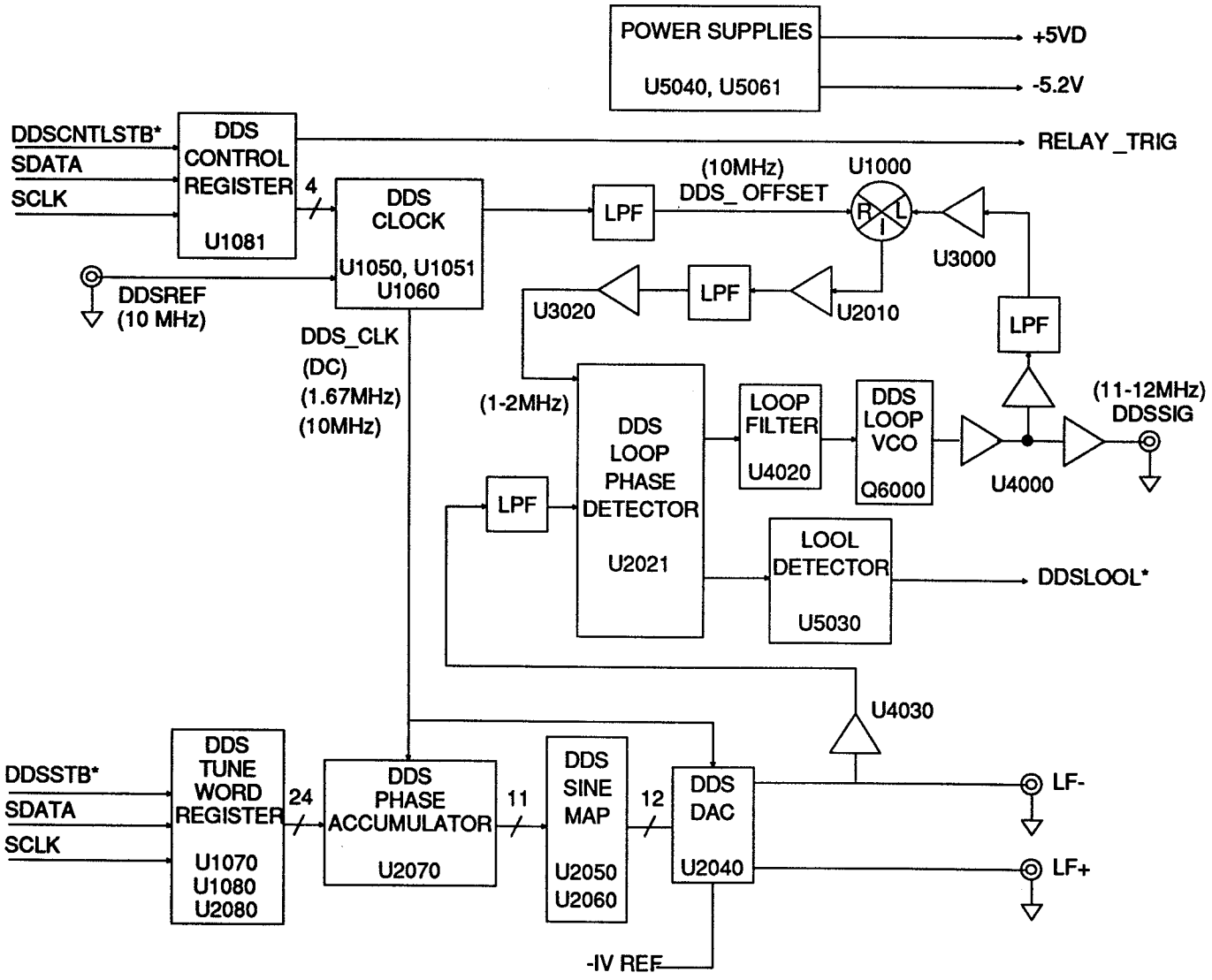


Figure 4-1: DDS Board Block Diagram

The RF port signal to the Loop mixer is an attenuated DDS OFFSET signal of 10MHz. The IF port output signal from the Loop mixer is terminated, amplified (U2010), low-pass filtered, attenuated, and amplified again (U3020), before being applied to the feedback port of the DDS Loop phase detector.

When the DDS Loop is locked, the phase detector (U2021) $\overline{U}$ and $\overline{D}$ outputs are at an ECL HI (4.2V) except for narrow spikes going LO at twice the input frequency. The U and D outputs are at an ECL LO (3.2V) most of the time, which puts the Loop Out of Lock comparator (U5030) pin 3 at 3.2V also. Since pin 3 of U5030 is set to about 3.45V, the comparator output is at a TTL HI. If the DDS Loop comes out of lock, the phase detector U and D outputs go HI for a sufficient duty cycle to cause the comparator output to switch to a TTL LO.

Power Supplies [Schematic 11]

The power supplies generated on the A4-DDS board are +5VD, which is used only by the A3-CPU board, and -5.2V, which is used only by the DDS DAC There are also three small regulators which are used to supply individually regulated power to amplifiers in the DDS Loop. The +5VD supply is regulated by U5061 from the +8V power module (mainframe) supply, and uses the mainframe NPN as its series pass transistor. The -5.2V supply is regulated by U5040 from the -26 V mainframe supply and uses the mainframe PNP as its series pass transistor.

The +5VD and -5.2V supplies use 723 style regulators (see Figure 4-3) as their error amplifiers. The reference voltage for the +5VD regulator is supplied from U5060. The voltage reference IC, U5060, also provides the stable source for the $-1V_{REF}$ Amplifier (U5050). This $-1V_{REF}$ is used by the DDS DAC to establish a stable full scale output current. The $-1V_{REF}$ is also used as the reference voltage for the -5.2V regulator.

The +5VD regulator supplies its load from a darlington emitter-follower configuration using the mainframe NPN as the main series pass transistor. The -5.2V regulator utilizes the mainframe PNP in a composite emitter-follower configuration where the U5040 internal zener diode is used between the error amp output emitter-follower and the mainframe PNP base. This zener is needed to keep the 723 error amp within its dynamic range. R4053 is used in this composite output stage to provide bias current for both emitter followers.

The +5VD supply current limit circuit uses R5080 as the current sense resistor and the 723 internal limit transistor. The -5.2V supply use U4060 as the current sense and Q4050 as the limit transistor which reduces the base drive to the mainframe PNP in overcurrent conditions.

A5-RF BOARD [Schematics 12, 13, 14, 15, 16, 17]

The RF board synthesizes frequencies from 50kHz to 550MHz by multiplying and mixing the 11 to 11.999999 MHz signal received from the A4-DDS board, and the 10MHz signals received from the A6-Timebase board. The A5-RF board controls the output frequency in 10MHz steps. The A4-DDS board controls the output frequency of the A5-RF board in 10Hz steps by moving its 11MHz to 11.999999MHz signal in 1Hz steps (refer to Figure 4-2). The A3-CPU board coordinates these two frequency controls to provide contiguous 10Hz frequency steps over the full 50kHz to 550MHz range of the A5-RF board. The A3-CPU board also sets the output amplitude on the A5-RF board. The amplitude level control loop adjusts the amplitude of the sine wave output from the A5-RF board to maintain the set amplitude at the leveling head output, using feedback from the leveling head.

Offset Loop [Schematic 12]

The offset loop (VCO U7060 and surrounding circuitry) is a phase-locked loop that produces an 800MHz reference using the 10MHz reference from the A6-Timebase board at J9010. The output of this loop drives the LO port of mixer U4060 in the Narrow Loop. 50Ω resistor attenuation pads provide isolation between the VCO U7060 and mixer U4060. Cascaded RF prescalers U6050 (divide-by-4), U6031 (divide-by-4) and U6020 (divide-by-5) divide the VCO frequency by a total of 80. Phase/frequency comparator U8020 converts a frequency or phase difference to pulses (minimum pulse width when phase difference is zero). Operational-amplifier U8040 filters and integrates these pulses to produce a voltage that tunes the VCO U7060 to phase lock the divide-by-80 output at U8020 with the 10MHz reference from J9010.

Narrow Loop [Schematic 13]

The narrow loop (VCO U2060 and surrounding circuitry) is a phase locked loop that produces frequencies from 910MHz to 919.99999MHz using the 800MHz reference from the offset loop (VCO U7060) and the 11MHz to 11.999999MHz from the A4-DDS board at J1011. The output of the narrow loop drives the RF port (pin 1) of mixer U3110 through the PIN attenuator. Amplifiers and attenuation pads provide isolation between VCO U2060 and mixer U3110. The output of VCO U2060 is mixed with the 800MHz from VCO U7060 at U4060, producing

the difference frequency, amplified (U4050) and filtered for the ECL divide-by-10 (U4020). This difference frequency, divided by 10, is compared to the frequency from the A4-DDS board at J1011 at U3020. Phase/frequency comparator U3020 converts a frequency or phase difference to pulses (minimum pulse width when phase difference is zero). Operational-amplifier U2040 filters and integrates these pulses to produce a voltage that tunes the VCO U2060 to phase lock the divide-by-10 output from U4020 with the 11MHz to 11.999999MHz reference from J1011.

Atten, Final Mixer, and Amplifier [Schematic 14]

The final mixer (U3110) produces 50kHz to 550MHz from the narrow loop output (910MHz to 919.99999MHz) and the wide loop output (920MHz to 1460MHz). The amplitude level control loop adjusts the output amplitude by controlling the PIN attenuator U2100. The output of mixer U3110 is filtered and amplified to drive the output board. Relays K3180 and K2180 attenuation the signal when smaller output voltage is required. The two attenuators associated with relays K2180 and K3180 are used to reduce the dynamic range requirements of the RF part of the signal for the final mixer (U3110) resulting in improved signal to noise ratio. Transistor Q7190, on schematic 17, switches off the power to the VCOs when no output is required from the RF board. K3180, K2180, and Q7190 are controlled by the same shift register (16 bits) that controls the drive-by-N for the wide loop.

Wide Loop [Schematic 15, 16]

The wide loop (VCO U6090 and surrounding circuitry) is a phase-locked loop that produces frequencies from 920MHz to 1460MHz steps using the 10MHz reference from the A6-Timebase board at J5140. The output of this loop drives the LO port of mixer U3110. Amplifiers and attenuation pads provide isolation between mixer U3110, VCO U6090 and frequency divide-by-4 U9080. Amplifier U8100 brings the divided frequency up to an ECL logic level. ECL 8 bit counter U8110 functions as a frequency divide-by-N. U8110 outputs Q4, Q5, Q7 and Carry-not are wire-OR connected to reload the counter whenever it counts down to zero. The counter reload byte values for D0-D7 are 91 to 145 for 920MHz to 1460MHz. The counter will stop in the reload state unless at least one of the three wire-OR bits (Q4, Q5, Q7) is loaded with a 1. Serial-to-parallel shift register U8120 provides the 8 reload bits at +3.6 volt CMOS logic levels compatible with the ECL counter's logic inputs. Serial clock, data and strobe inputs to U8120 come from +5V CMOS logic through level shifting resistors. ECL counter U8110 output Q6 is the VCO U6090 frequency divided by Nx4 (2.5MHz during normal operation). U6140 produces a 2.5MHz reference from J5140. Phase/frequency comparator U6130 converts a frequency or phase difference to pulses (zero pulse width when the phase difference is zero). Operational-amplifier U7110 filters and integrates these pulses to produce a voltage that tunes the VCO U6090 to phase lock the ECL divide-by-N U8110 output with the 2.5MHz reference from U6140. Comparator U6120 keeps the voltage input to VCO U6090 from straying too low (VCO stops) or too high (divide-by-N miscounts).

Amplitude Control [Schematic 17]

The amplitude level control loop compares the voltage from the DAC U6161 set by the A3-CPU board to the voltage from the detector diodes in the leveling head. There are two pairs of diodes in the leveling head, one pair to detect the peak-to-peak voltage at the leveling head, the other pair to allow compensation for the forward voltage of the detector diodes. Dual op-amps U6182 and U5181 buffer and scale the difference voltage from the leveling head to compare with the DAC voltage, and send this error voltage to quad op-amp U5180. Operational-amplifier U5180B integrates the error voltage and controls the A5-RF board output amplitude via the PIN attenuator U2100. Diode CR5170 speeds up the transient response of U5180B. U5180C sets the bias current for the detector diodes in the leveling head. U5180A increases the bias current when the error voltage is large to speed up the transient response of the detector diodes.

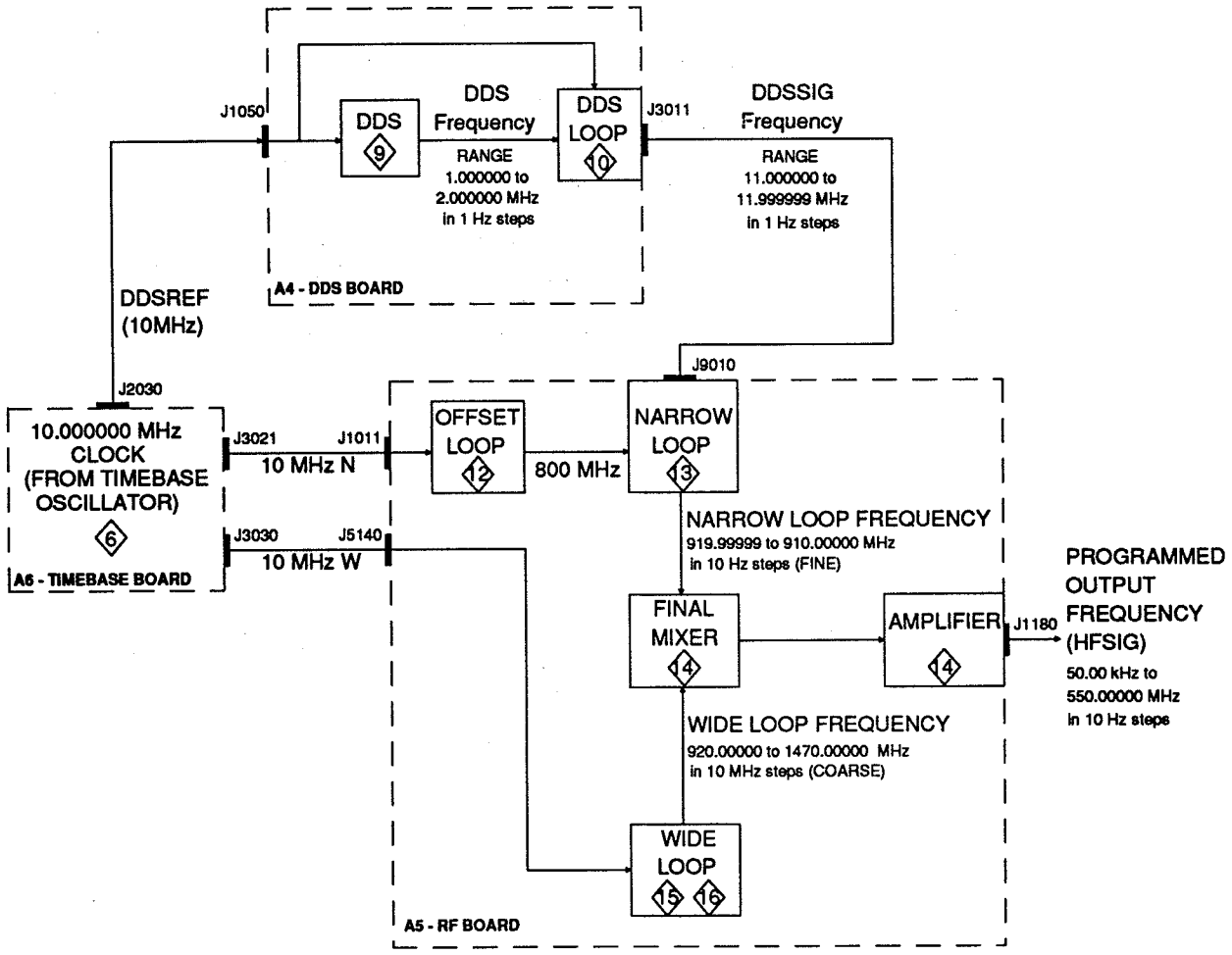
A6-TIMEBASE BOARD [Schematics 6, 7]

The A6-Timebase board provides a very accurate and stable timing reference signal to the frequency generation circuitry in the SG 5030. The source of the timing signals is a voltage-controlled crystal oscillator (VCXO).This VCXO (U2040) can be frequency locked to an external timebase standard such as WWV for improved frequency accuracy of the SG 5030 output. Refer to Figure 4-3.

Ext. Timebase Lock Loop, Oscillator and Buffer

[Schematic 6]

The external timebase input (EXTTB) is DC and AC terminated by R3016, C3020, and R3015. The EXTTB signal is then limited by R3014, CR3010, and CR3020 and coupled to an ECL buffer stage (U2010A). One output of the ECL buffer drives a discrete ECL-to-TTL



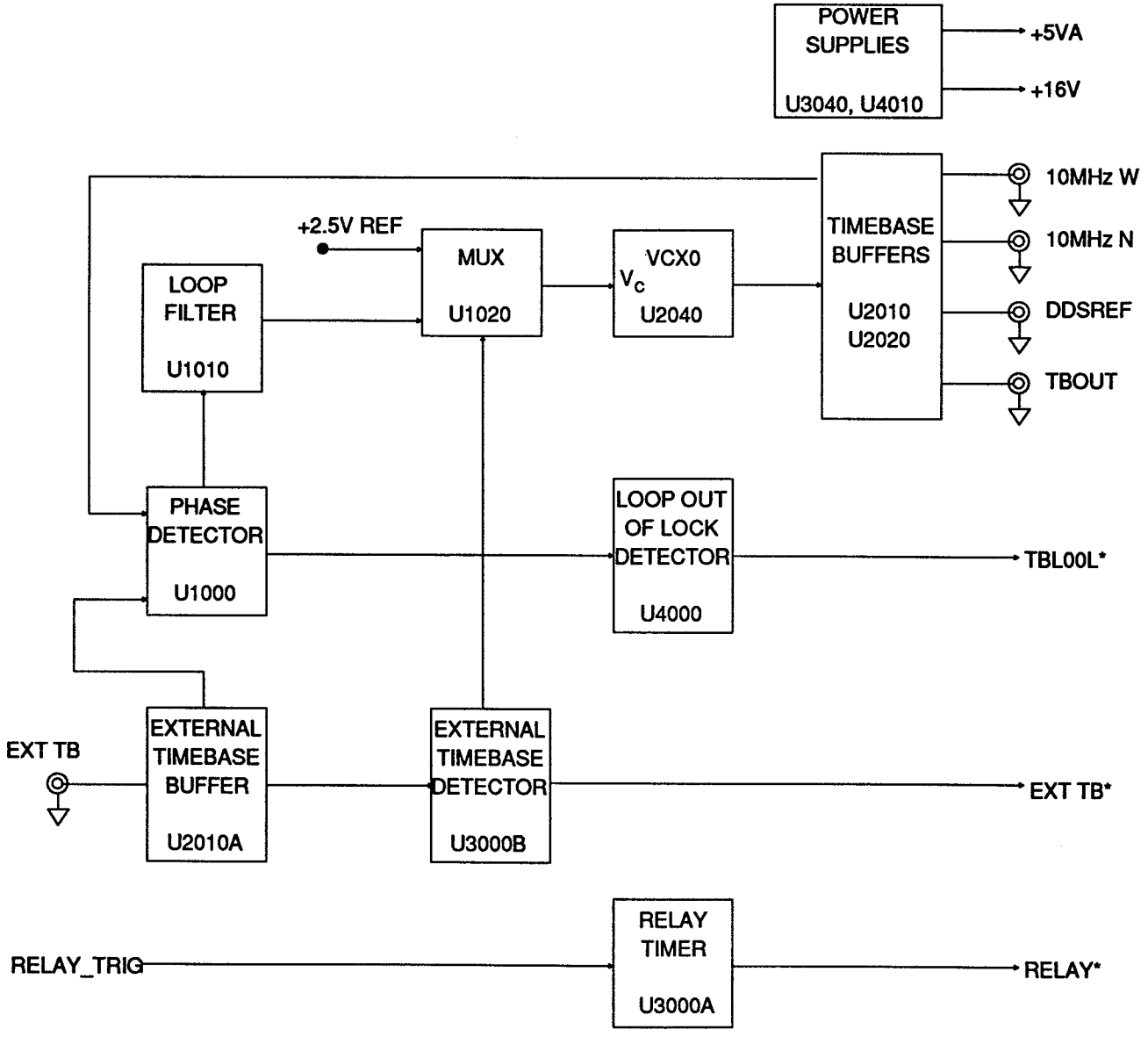
Programmed Output Frequency (HFSIG)	DDS Frequency	DDSSIG Frequency	Narrow Loop Frequency	Wide Loop Frequency
50.00 kHz	1.995000 MHz	11.995000 MHz	919.95000 MHz	920.00000 MHz
10.00000 MHz	1.000000 MHz	11.000000 MHz	910.00000 MHz	920.00000 MHz
10.00001 MHz	1.999999 MHz	11.999999 MHz	919.99999 MHz	930.00000 MHz
10.00002 MHz	1.999998 MHz	11.999998 MHz	919.99998 MHz	930.00000 MHz
100.00000 MHz	1.000000 MHz	11.000000 MHz	910.00000 MHz	1010.00000 MHz
102.50000 MHz	1.750000 MHz	11.750000 MHz	917.50000 MHz	1020.00000 MHz
105.00000 MHz	1.500000 MHz	11.500000 MHz	915.00000 MHz	1020.00000 MHz
107.50000 MHz	1.250000 MHz	11.250000 MHz	912.50000 MHz	1020.00000 MHz
550.00000 MHz	1.000000 MHz	11.000000 MHz	910.00000 MHz	1460.00000 MHz

These frequencies are assuming a time base frequency of 10.000000 MHz.

Figure 4-2: Frequency Loop Relationships

convertor which provides the trigger signal to the external timebase detector. The external timebase detector (U3000B) is a retriggerable one-shot that provides an indication to the microprocessor that an external timebase signal has been applied to the SG 5030. The time constant of U3000B has been chosen so that the EXTTB (L) signal to the microprocessor is an active TTL LO only for input frequencies greater than 5MHz. The U3000B active HI output also controls the multiplexer signal to the frequency control input of the VCXO. In order for the external timebase phase-locked loop to lock, the external timebase signal must be within a few parts per million of the 10MHz VCXO center frequency. This VCXO center frequency is also mechanically adjustable over a narrow range through a trimmer adjustment internal to the VCXO.

The second signal from the external timebase buffer (U2010A) provides the reference frequency to the external timebase loop phase detector (U1000). The other input of the phase detector is a buffered version of the VCXO output. When the external timebase loop



*Active low signal.

7703-15

Figure 4-3: Timebase Board Block Diagram

is locked, the $\overline{U}$ and $\overline{D}$ signal from U1000 are at an ECL HI (4.2V) most of the time except for narrow correction spikes at twice the timebase frequency. The phase detector $\overline{U}$ and $\overline{D}$ signals go to the loop filter (U1010) which provides a frequency control signal of 0 to 5 V to the VCXO. This control signal is limited by R1020, CR1020, AND CR1030. If an external timebase signal has been detected by U3000, its Q output turns on U1020A and turns off U1020D. The loop filter signal then passes through 1020A and is filtered by R1031 and C1031 before driving the voltage control input of the VCXO. When no external reference signal is detected, the Q output of U3000 turns off U1020A and turns on U1020D which provides a stable +2.5V reference signal to the voltage control input of the VCXO.

When a signal of sufficient amplitude and approximately the correct frequency is applied to the external timebase input the EXTTB (L) signal goes to a TTL LO. This is detected by the microprocessor in its polling routine and the microprocessor then activates the External Timebase Active LED on the front panel. If the external timebase input signal activates the detector (U300B) but is not within the required narrow frequency range to lock the VCXO, the loop will be out of lock. When this occurs the phase detector (U1000) U and D outputs will not be at an ECL L0 (3.2V) most of the time, as when the loop is locked, but will go HI for a long enough duty cycle to trigger the U4000 comparator and force the TBLOOL (L) signal to a TTL LO. This indicates an external timebase loop out of lock state to the microprocessor which will turn on the UNLOC LED if the external timebase ACTIVE LED is on. The timebase signal from the VCXO is distributed to several places in the SG 5030, with ECL buffers U2010 and U2020. These several outputs are series terminated with resistors, and AC-coupled at the circuits they drive. The exception is the TBOUT signal, which is also protected from external signals with diode limiters CR2020 and CR2021.

Power Supplies [Schematic 7]

The +16V and +5VA power supply regulators are located on the A6-Timebase board and supply power to the A4-DDS, A4-RF, and A7-Output boards The +16V supply is regulated off the +26V supply in the TM 5000-series power module (mainframe) and uses the mainframe PNP as its pass transistor. The +5VA regulator is regulated off the +8V supply in the mainframe and uses the mainframe NPN as its pass transistor. Both the +26V and +8V mainframe supplies are fused and filtered on entry to the A6-Timebase board. Both the +16V and +5VA supplies use a 723 type regulator (U3040 and U4010) as the error amplifier and current limiter. The internal block diagram for the 723 regulator is shown in Figure 4-4. The reference voltage for both supplies is provided by +2.5V from U3020.

The +5VA supply regulator action occurs as follows. If the +5VA output voltage drops slightly due to a sudden increase in load, a drop also is sensed at pin 4 of U3040 which is the inverting input to the 723 error amplifier. This causes the 723 error amplifier to increase the drive to the darlington pair made of the 723 internal pass transistor and the mainframe NPN transistor. This increase in current from the darlington pair continues until +5VA supply rises to its normal level. The +5VA has foldback current limiting with the R3041, R4040 pair providing the current limit sense. If, due to a fault condition, the voltage across this resistor pair exceeds the base-emitter turn-on voltage of the 723 current limiter transistor, the current limiter transistor removes base drive from the series pass transistors and limits the current available to the load. The R3043, R3051 resistor pair provides a foldback current limiting by attenuating the current limit sense voltage and delaying the start of current limit action.

The +16V supply regulator operates in a very similar manner to the +15VA regulator just described. The only significant difference is in the series pass transistor. The +5VA regulator uses the mainframe NPN in an emitter follower configuration driven by the 723 error amplifier. The +16V regulator uses the mainframe PNP as a current source whose base drive is provided by the 723 error amplifier. As part of this configuration R3054 is added to insure that the PNP transistor will shut off when base drive is removed.

A7-OUTPUT BOARD **Schematics 18A, 18B, 19, 20, 21A, 21B, 22**

The A7-Output board processes low level signals in the frequency range of 0.1Hz to 49.999kHz from the A4-DDS board and receives signals in the 50.0kHz to 550MHz range from the A5-RF board and amplifies them up to as much as a 10 V peak-to-peak (+24.8dBm) level for driving the Leveling Head.

The A7-Output board has five major functional blocks: the Output Amp Power Supply, Control Logic, LF Preamp, Output Amp Power Control, and the Relay Drive. Description of these major functional blocks and their sub-blocks follow (also refer to Figure 4-5).

Output Amp Power Supply [Schematic 22]

The A7-Output board has two major power supply regulators which will be described now, and several bias regulators which will be described with the Output Amplifier block. The major regulated voltages on the A7-Output board are +21V and -20.5V.

The +21V regulator IC (U3010) is a μA723 (see Figure 4-4) driving an external PNP series pass transistor in the TM 5000-series mainframe. Foldback current limiting is used to reduce the series pass transistor power dissipation if the power supply output is shorted to ground.

Integrated circuit μA723 also powers a MC1403 (U3020) precision reference supply which is the reference for both the +21V and –20.5V regulators, as well as for other circuits on the A7-Output board.

The –20.5V regulator is a discrete circuit comprised of a NE5534 operational-amplifier (U4010), which drives a discrete power amplifier made up from a small signal PNP device (Q5010) and the power NPN in the TM 5000-series mainframe. It also uses foldback current limiting with Q5020 as the control element.

Control Logic [Schematics 19, 20]

The Control Logic circuit accepts serial data from the A3-CPU board and places it in three parallel output latches. The parallel outputs are used to program low frequency amplitude and DC offset voltage adjustments for the LF Preamp and the Output Amplifier, as well as frequency band changing, which is transparent to the user.

A 24-bit latch (U2030, U2032, and U3030) controls low-frequency output amplitude, the power to the output amplifier hybrid, the leveling head relay programming,

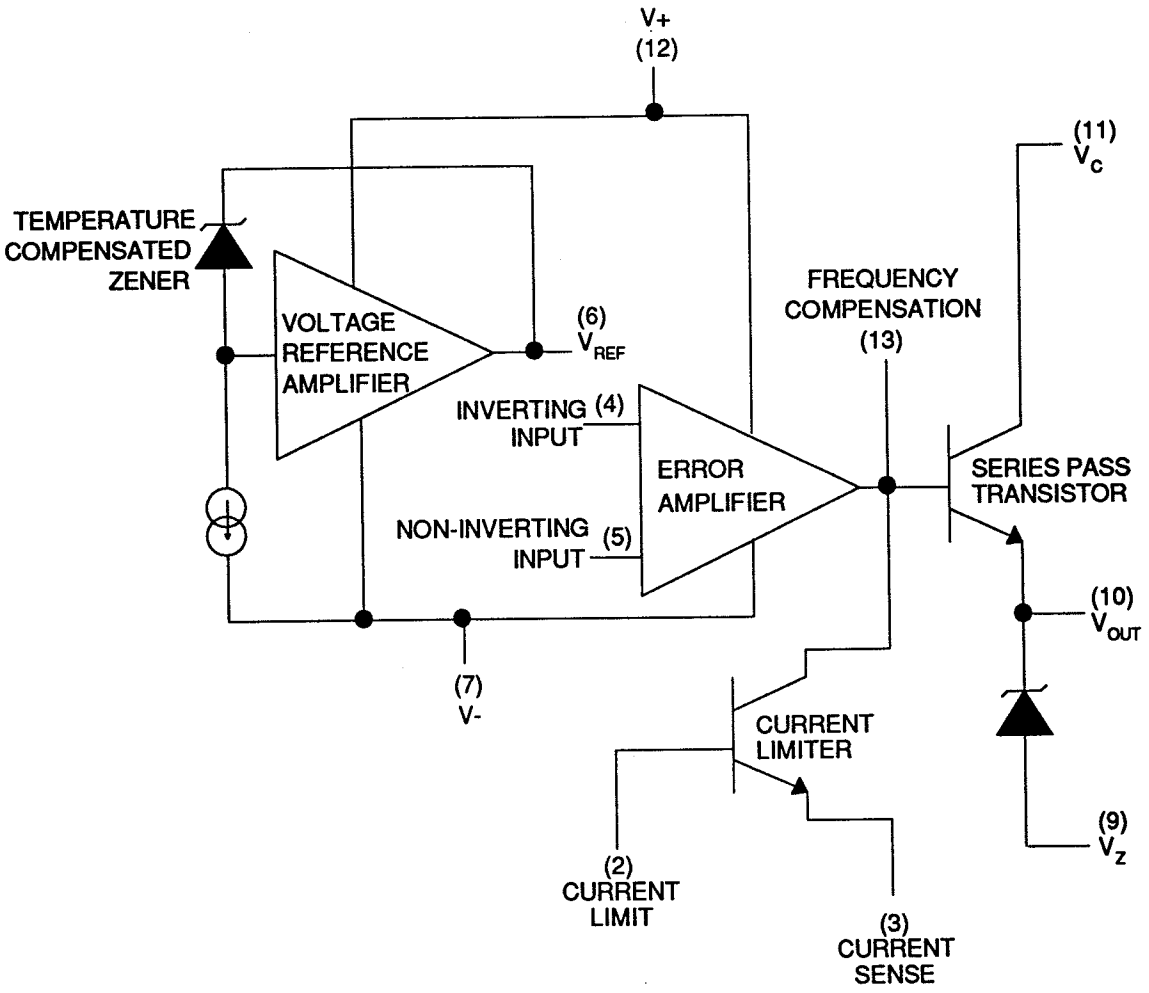


Figure 4-4: Block Diagram of the 723 Regulator

whether the SG 5030 is in the low-frequency mode (below 49.999kHz) or high frequency mode and output filter relay control.

An 8-bit latch (U2011) drives a DAC system which adjusts the DC offset voltage of the LF Preamp. Data for this latch is stored in calibration constants in nonvolatile RAM, and is only updated when the SG 5030 Adjustment Procedure is performed.

Another 8-bit latch (U2021 on schematic 21A) drives a DAC system which adjusts the DC offset voltage of the Output Amplifier.

The latches are independently addressable through separate strobe lines from the CPU.

LF Preamp | Schematic 19 |

The function of the Low-Frequency Preamplifier is to amplify and process the DDS output in the 0.1Hz to 49.999kHz range to drive the Output Amplifier circuitry. The LF Preamp has four sub blocks: the input amplifier, the attenuator DAC, signal switching, and the programming logic.

The input amplifier is comprised of U2000 and its feedback components. It has a differential input and single ended output configuration. Its input signal is the differential signal LFSIG+ and LFSIG– from the A4-DDS board, and its output drives the attenuator DAC (U1030), which will be discussed later. The differential signal offers better immunity to noise voltages which may exist between the A4-DDS and A7-Output boards.

Operational amplifier U2000 has a few millivolts of inherent DC offset voltage appearing between its inputs, which must be nulled out so it will not appear on the low frequency output signals. The nulling voltage comes from a programmable bipolar voltage source made from an 8-bit DAC (2010) and an operational-amplifier (U1020A). The data for the DAC comes from the Control Logic circuit. The ±10 volt output range of the DAC is attenuated and applied to the feedback resistors of U2000.

As part of the SG 5030 Adjustment Procedure, U2000's offset is adjusted to zero with the front-panel knob and the binary value of the offset is stored with other

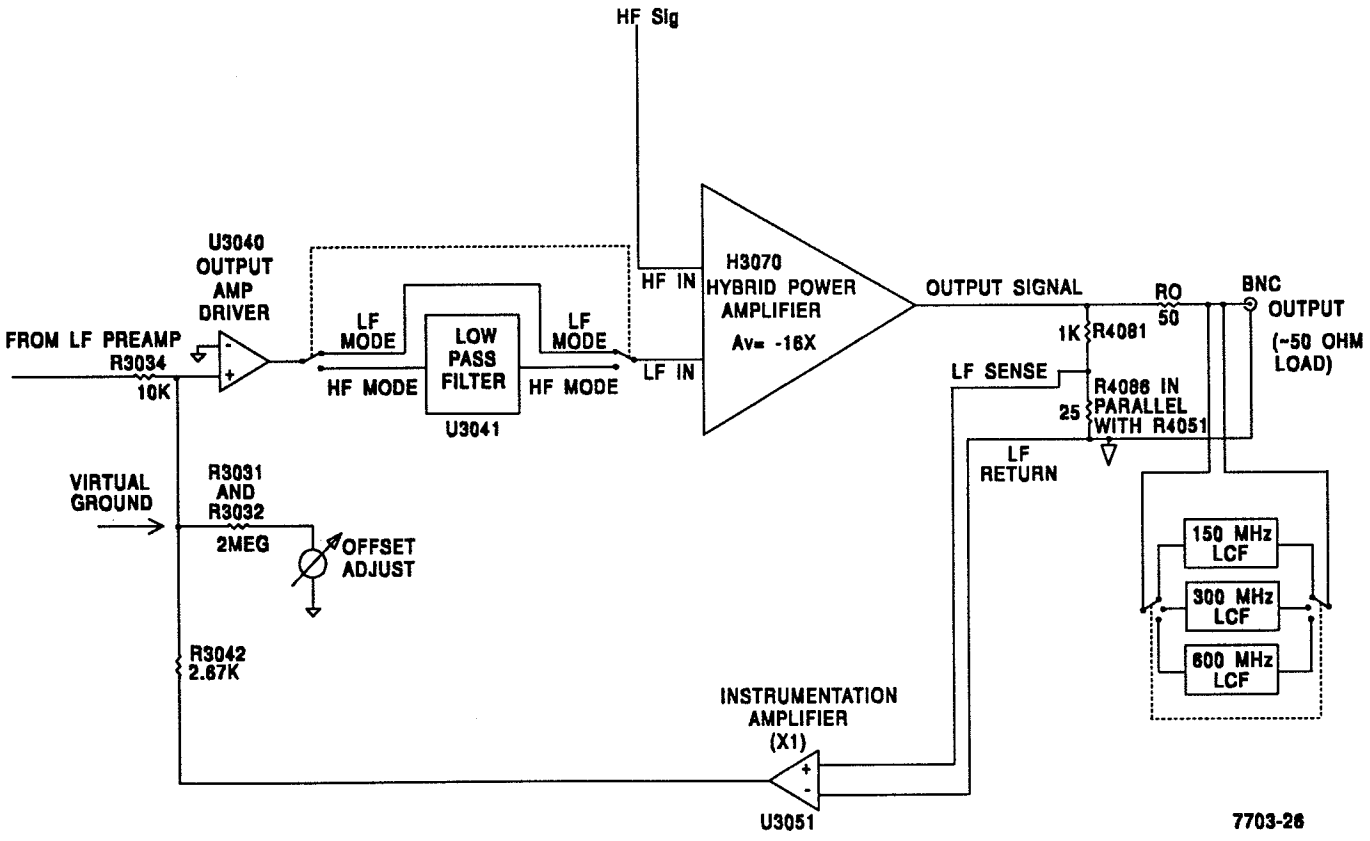


Figure 4-5: Output Amplifier Board Block Diagram

calibration constants in nonvolatile RAM, to be applied to the offset voltage DAC each time the instrument is turned on.

The attenuator DAC (U1030) is a 12-bit multiplying DAC which controls the amplitude of the signals from the input amplifier. An operational-amplifier (U1031A) configured as a transresistance amplifier converts the current output of the DAC back to voltage. The programming data for the attenuator DAC comes from the control logic. The attenuator DAC serves two functions: it controls the output amplitude in the 0.1Hz to 49.999kHz range in response to user input, and it is used to adjust full scale low-frequency amplitude when performing the Adjustment Procedure. The digital input for full scale output is adjusted during calibration to give 5.5 volts peak-to-peak at the output. This is done three times, once in each of the leveling head attenuator settings. The exact digital input for full output is stored in nonvolatile RAM. The output of the attenuator DAC goes to a pair of analog switches (U2031), which switch off the low-frequency signals if the SG 5030 is programmed for frequencies 50kHz or higher. The switches are arranged in a series-shunt configuration to increase their off state isolation. The output of the analog switches is routed to the input of the Output Amplifier.

Output Amplifier | Schematic 18A, 18B |

The Output Amplifier circuit amplifies the signals from the LF Preamp or from the A5-RF board, depending on the SG 5030's mode of operation, up to a level of twice the maximum programmed output voltage. The reason for amplifying to twice the normal output voltage is that half of the output amplifier's output is dropped in a 50Ω precision resistor in the leveling head, which defines the SG 5030's output impedance.

The simplified block diagram illustrated in Figure 4-5 shows that the Output Amplifier is a shunt feedback system. The feedback serves the following functions: it drives the DC component of the output voltage to zero, it controls the gain of the Output Amplifiers precisely and assures amplitude flatness in the 0.1Hz to 49.999kHz spectrum, it reduces low-frequency thermal distortion in the hybrid power amplifier, and it compensates for differences in ground potential between the input and output of the Hybrid Amp, H3070.

The LF feedback signal is derived from a fraction of the output signal. This signal is applied to an instrumentation amplifier (U3051) which removes the effects of ground potential differences across the output board. The output from the instrumentation amplifier is combined with the output of the LF Preamp at a virtual ground on the noninverting input of the Output Amplifier driver (U3040). Most of the open-loop gain of the system is in the Output Amplifier Driver, with the hybrid power amplifier contributing additional gain.

The hybrid power amplifier (H3070) is a three-stage, direct-coupled, class A amplifier. The amplifier is biased by several power supply voltages and active current sources. The first stage current is supplied to the Output Hybrid by a nominal 100mA current source with the current coming from Q4050 through RF choke L4060. All of the current sources are similar in construction. The first stage current source for example develops a reference voltage from a resistive divider which is applied to the non-inverting input of U5050A. The op amp feedback through R5052 forces a stable 10 volts across R4050. C5050 and R5051 provides some frequency compensation for the op amp, while C4051 and R4050 stabilize the base of Q4050. The current source is adjustable with R5050 in order to optimize the bias to the Output Hybrid for minimum harmonic distortion.

The second stage current of a nominal 100mA is supplied to the Output Hybrid from Q4060 through RF choke L3070. The first two stages sink their bias currents into the –15V power supply. Bias networks internal to the Output Hybrid set the voltage at pins 21 and 23 to approximately 0 volts when the Output Amp Driver applies about –7.0 volts to the LF Input, pin 29.

The third stage of the Output Hybrid has two emitter followers at its input which are biased by 80mA current sinks through Q1070 and Q4070. The third stage input voltage is set by a nominal –10 volt voltage source containing Q5080 and U5070B. The third stage output circuit is biased by a nominal 400mA current sink through Q2070. The third stage load resistors include R2080, R4080, and R5080 as well as the resistance contained in the attached leveling head. Resistor R2080 is driven by a voltage source of approximately 10 volts in order to supply about 200mA to the output stage.

The two hybrid power amp inputs, LF IN and HF IN are algebraically added in a resistive combiner before being applied to the amplifier itself. When the SG 5030 is generating signals in the 0.1Hz to 49.999kHz range, the signal is coming through the Output Amplifier Driver and into the LF IN, with no signals being applied to HF IN. If the SG 5030 is programmed to generate frequencies at 50.0kHz and above, the AC portion of the output signal comes from the A5-RF board into the HF IN. The DC bias

voltage, which keeps the output signal DC offset voltage at zero, comes to the LF IN from the output amp driver in response to the shunt feedback.

The LF sense feedback signal is picked off at the H3070 output with RF choke L3082. The LF sense signal is attenuated by R4081 and the combination of R4082 and R4051. It is also filtered by L4080 , C4081 and C4083 to limit the bandwidth of the signal applied to the differential buffer U3051. The differential buffer also includes a switchable feedforward network containing R3043, C3043, and C3033 which increases the frequency response of U3051 in LF mode. There is also an RC filter at the input of the Output Amp Driver (U3041) to keep from overdriving the U3041 input with high frequency signals.

The Output Amplifier offset voltage adjustment is done by sinking or sourcing a small current into the virtual ground at the input of the Output Amplifier driver (U3040). The adjustment current is derived from a 8-bit DAC (U2020), as in the LF Preamp.

As has been stated before, the input signal takes two different paths through the Output Amplifier, depending whether the SG 5030 is operating in Low-Frequency mode or High-Frequency mode. The transition occurs between 49.999kHz and 50.000kHz. Since the HF mode signals are applied directly to the hybrid power amplifier, rather than to the input of the shunt feedback system, the feedback system needs to be reconfigured so that the HF signals are not seen as an error voltage and suppressed. This is done by rolling off the open-loop gain of the system at a low frequency with a low-pass filter in the HF mode. This is accomplished with analog switches (U3050 and U4050) which are driven by the control logic. The low pass filtering of the LF sense signal in HF mode is done with both the U3041 unity gain filter and by rolling off the response of the Output Amp Driver, U3040.

Output Amplifier Filters

Although the Output Amplifier, H3070 is a highly linear class A amplifier, additional harmonic suppresion is achieved with a set of three switched output filters.

These filters reduce the harmonics generated at higher frequencies. The bandwidth of these three low pass filters are approximately 160MHz, 320MHz, and 600MHz. the two higher bandwidth filters are also AC coupled to reduce the noise bandwidth. For frequencies below about 150 MHz the output signal is DC-coupled through the filter between C2081 and C2084. For frequencies between about 150 MHz and 300 MHz the output signal is AC-coupled through the filter following C2089, while for frequencies above about 300 MHz, the output signal is AC-coupled through the filter following the C3084/C3085 combination. The switching frequencies stated are not exact due to hystersis in the firmware control of the switching frequencies to minimize transients. The LC filters are switched by RF relays K2080 and K3080. the relays are double pole-double throw action switches that are controlled by transistor switches Q2090 and Q3090. The selected frequency determines the filter path as controlled by the microprocessor using logic signals Filter 1 and Filter 2. The DC stabilizing properties of the feedback system remain intact however, keeping the DC component of the output signal at zero.

Output Amplifier Power Control | Schematics 20, 21 |

The Output Amplifier is powered by two voltage supplies: $V_{EE}1$ and $V_{EE}2$ and seven current supplies: CUR1 through CUR7 all of which are derived from two main switched voltage sources.. The +21V (switched) and –20.5V (switched) power supplies can be enabled or disabled by the power on logic, and are held off as part of the power up sequence to prevent voltage transients from appearing on the output. The actual switching of the +21V and -20.5V supplies is done with power MOSFETs, which are configured as Miller integrators to control their switching speed to avoid turn on transients.

Leveling HeadRelay Drive | Schematic 20 |

The Leveling Head Relay Drive circuitry decodes two bits of control logic and drives four latching relays in the leveling head, which switch the output attenuators. The output voltage of a 2-bit input to 4 output decoder is amplified to the 12V 150mA power level to drive the latching relays.

The relays require pulses of power which last approximately 7 milliseconds, and this is accomplished by gating the output of the decoder with a 7ms enable signal.

Leveling Head | Schematic 21 |

The leveling head has two major functions: it is the source of feedback near the instrument under test in the high-frequency mode and it houses the programmable amplitude range change attenuator.

Feedback near the load allows compensation for output cable standing waves and losses in the high-frequency mode. The feedback is taken just before the output

signal enters a precise 50Ω back termination resistor which defines the output impedance of the SG 5030. The action of the feedback makes the impedance of the input node of the back termination approach zero ohms, so this node contributes negligibly to the SG 5030 output impedance.

The high-frequency feedback is derived from a temperature compensated peak-to-peak detector. High frequency level detector temperature signals are also sent to the SG 5030 via the feedback cable.

The output attenuator is located between the back terminator and the leveling head output and is programmable to 1X, 10X or 100X attenuation. It is programmed in concert with the level control circuitry in the SG 5030 so that the output voltage can be programmed from 4.5mV to 5.5V peak-to-peak while allowing the SG 5030 amplitude control circuits to operate over only a 10:1 amplitude range. The attenuation selection is done with high frequency magnetic latching relays.

Unplug Detection

The output amplifier power supplies are disabled and the OUTPUT HEAD is turned off if either the output cable or the feedback cable is unplugged with power on. This is done for two reasons: to avoid transients being applied to the instrument-under-test when the cables are reconnected, and to prevent a potential overdrive to the input of the instrument-under-test. Overdriving could occur if a leveling head which had its output attenuator programmed for 100X attenuation were replaced with one programmed for 1X attenuation. The OUTPUT HEAD ON/OFF button on the front panel must be pushed to restore normal operation after the leveling head has been removed when powered up.

Section 5
Performance Check

Introduction

This procedure checks the electrical performance requirements as listed in the Specifications section of this manual and may be used in an incoming inspection facility to determine acceptability of performance. If the instrument fails to meet the requirements given in this Performance Check section, the Adjustment Procedure section should be performed. The Performance Check procedure can be performed at any ambient temperature between 0° and +40° C.

Performance Check Interval

The performance check should be performed at the following intervals:

-At incoming inspection.

-After 2000 hours of operation or every 12 months, if used infrequently.

-After repair of accidental abuse.

Services available

Tektronix, Inc. provides complete instrument repair facilities at local field service centers and at the factory service center. Contact your local Tektronix field office or representative for more information.

Conventions Used In this Procedure

All reference to the SG 5030 front panel controls, connectors, and indicators will be indicated by all capital letters. All associated equipment front panel controls, connectors and indicators will be indicated by initial capital letters.

Test Equipment Required

The test equipment, or equivalent (except as noted) listed in Table 5-1 is recommended to perform the Performance Check and the Adjustment Procedure in this manual.

Table 5-1: Required Test Equipment

Description	Minimum Requirement	Performance Check	Adjustment Procedure	Recommended Equipment
TM 5000 Series Power Module	Compatible with SG 5030.	X	X	Tektronix TM 5006A
Digital Counter	Time Base accurate to 0.75 PPM into 50Ω load.	X	X	Tektronix DP 501 Digital Prescaler and DC 5010 Opt. 10 Programmable 350MHz Universal Counter/Timer
Digital Voltmeter	0.25% AC accuracy, 1Hz to 100kHz, 55mV to 5.5V.	X	X	Hewlett Packard HP 3458A Multimeter
Spectrum Analyzer	Frequency Range 10kHz to 3GHz, Resolution Bandwidth 1kHz to 3MHz, Reference Level Range –50 dBm to +20dBm, Frequency Response Flatness to 3GHZ < ±3.0 dB.	X	X	Tektronix 2755AP Programmable Spectrum Analyzer
Power Meter	Frequency Range 100kHz to 3GHz, power range –30dBm to +20dBm.	X		Hewlett Packard HP 437B Power Meter
Power Sensor	Frequency Range 100kHz to 3GHz, power range –30dBm to +20dBm. Calibrated at test frequencies[1].	X		Hewlett Packard HP 8482A Power Sensor
Precision 50Ω SMA male Termination	50Ω ±0.5Ω DC, 1/2W, VSWR <1.06 to 1GHz.	X		Tektronix Part 015-1022-00
Precision 50Ω BNC Feed Through Termination	50Ω ±0.1% DC to 100kHz.	X	X	Tektronix Part 011-0129-00
Adapter	BNC female to dual banana plug	X		Tektronix Part 103-0090-00
Adapter	SMA male to N female	X		ITT Pomona Model No. 4298
Adapter	BNC female to N female	X		Hewlett Packard Part 1250-1474
Adapter	BNC female to N male	X		Tektronix Part 103-0045-00
Adapter	SMA male to 2 SMA females T connector	X		Tektronix Part 015-1016-000
Adapter	SMA male to BNC female	X		Tektronix Part 015-1018-00
Adapter	SMA female to SMA female	X		Tektronix Part 015-1012-00
DC Blocking Capacitor	BNC connections, 0.047μF.	X		Tektronix Part 015-0221-00
Precision cable, 50Ω SMA male to SMA male (two required)	50Ω ±1Ω 5ns +0.5ns.	X		Tektronix Part 015-1006-00
Coaxial 50Ω cable (two required)	BNC male to BNC male, 36".	X	X	Tektronix Part 012-0057-01

Table 5-1: Required Test Equipment (cont)

Description	Minimum Requirement	Performance Check	Adjustment Procedure	Recommended Equipment
Coaxial 50Ω cable	BNC male to BNC male, 10".	X	X	Tektronix Part 012-0208-00

[1] Power sensor calibration uncertainty between the frequencies of 100kHz to 100MHz is less than 1% (voltage), and is less than 2% (voltage) from 100MHz to 550MHz.

Preparation

a. Insert the SG 5030 into the power module. Connect the test equipment and the power module to a suitable line voltage source.

b. Turn on the power module and test equipment and allow at least 30 minutes warmup.

1. Check Frequency Accuracy

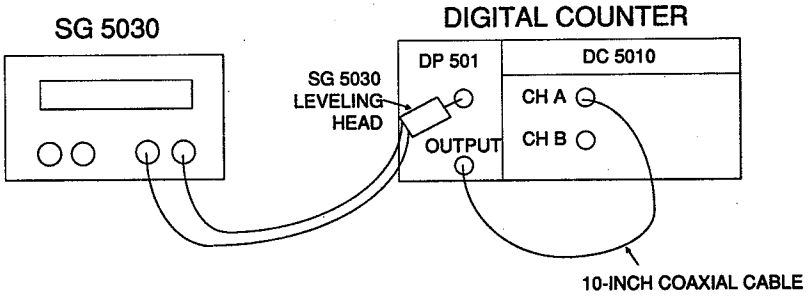
Description

This test verifies the output frequency accuracy (10Hz through 550MHz).

Procedure

a. Set up the equipment as illustrated in Figure 5-1.

REFER TO TABLE 5-1, TEST EQUIPMENT REQUIRED



Setup:

DP 501

Input (Prescale/Direct)..... Direct

DC 5010

Channel A

Term..... 50 Ohms
Atten..... X5
Slope..... +
Coupl..... DC
Auto Trig button.....Push once
Freq A.....Selected

SG5030

AMPL button.....Selected
DATA keypad.....5.5 V
FREQUENCY VARIABLE button.....Selected
DATA keypad..... 10 Hz
OUTPUT HEAD ON/OFF..... ON

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Figure 5-1: Frequency Accuracy Check

b. CHECK-Digital Counter readout is 10Hz, within the limits of 9.939970Hz to 10.06003Hz.

c. Enter 4.9999kHz on the SG 5030 DATA keypad.

d. CHECK-Digital Counter readout is 4.9999kHz, within the limits of 4.999825kHz to 4.999975kHz.

e. Enter 5.0000kHz on DATA keypad.

f. CHECK-Digital Counter readout is 5kHz, within the limits of 4.999685kHz to 5.000315kHz.

g. Enter 49.999kHz on DATA keypad.

h. CHECK-Digital Counter readout is 49.999kHz, within the limits of 49.99855kHz to 49.99945kHz.

i. Select FREQUENCY REFERENCE button (50kHz).

j. CHECK-Digital Counter readout is 50kHz, within the limits of 49.99685kHz to 50.00315kHz.

k. Select FREQUENCY VARIABLE button.

l. Enter 10MHz on DATA keypad.

m. CHECK-Digital Counter readout is 10MHz, within the limits of 9.999967MHz to 10.000033MHz.

n. Enter 10.00001MHz on DATA keypad.

o. CHECK-Digital Counter readout is 10.00001MHz, within the limits of 9.999977MHz to 10.000043MHz.

p. Enter 550MHz on the DATA keypad.

q. Change DP 501 Input (Prescale/Direct) to Prescale.

r. CHECK-Digital Counter readout is 550MHz, within the limits or 549.998347MHz to 550.001653MHz.

2. Check Spectral Purity

Description

This test verifies that the amplitude of the 2nd harmonic is less than –30dBc, the amplitude of the 3rd is less than –35dBc, and higher harmonics (only tested through 5th harmonic) are less than –40dBc of the fundamental frequency. The test is made at the SG 5030's maximum amplitude which is the condition for worst case harmonics.

The test starts with a spot check below 50kHz and then sweeps the SG 5030 frequency using the front panel control knob up to the maximum frequency. The SG 5030 output amplifier has several filters which are switched near 155MHz and 305MHz as the frequency is increased and near 145MHZ and 295MHz as the frequency is decreased. As a result, the following procedure requires that the frequency be adjusted both up and down near the filter switching frequencies to look for the worst case harmonics.

Procedure

a. Set up the equipment as illustrated in Figure 5-2.

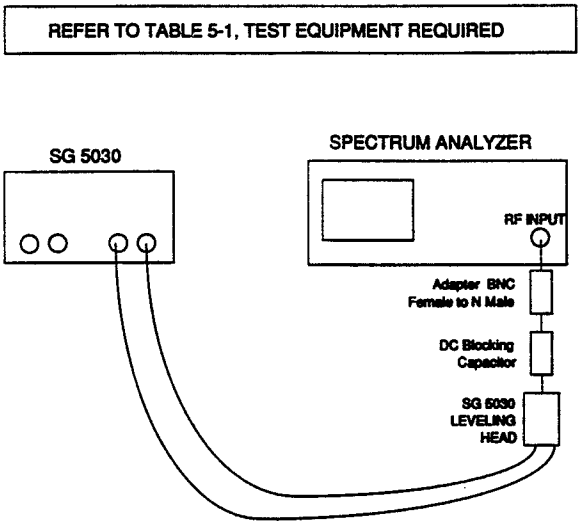
b. Press Find Peak (MAX) button. This should set the marker on the peak of the 10MHz signal.

c. Press Shift button (blue) followed by pushing the MKR ➔ Ref Level button. This should set the Ref Level on the Spectrum Analyzer to +19dBm ±1dBm. The Ref Level should not be changed during the rest of the procedure.

d. Set SG 5030 frequency to 50kHz. Set the Spectrum Analyzer Start/Stop Frequencies to 20kHz and 300kHz, respectively.

NOTE

The DC Blocking Capacitor will cause some attenuation of the signal below about 300kHz. This Blocking Capacitor is used to protect the Spectrum analyzer input from the application of excessive DC or very low frequency AC that the



SETUP:

Spectrum Analyzer (begin setup from power up default settings)

- Shift ..... Push
- Grat Illum/RESET ..... On
- Data Entry
  - Press ..... Ref Level
  - Keypad 20
  - Press ..... +dBx
  - Start/Stop button ..... Push
  - Keypad ..... 5 MHz
  - Keypad ..... 50 MHz
- Center/Marker Frequency
  - Tune Mkr ..... On
- Video Filter button ..... Wide
- Min Noise ..... On

SG 5030

- AMPL button ..... Selected
- DATA keypad ..... 5.5 V
- FREQUENCY VARIABLE button ..... Selected
- DATA keypad ..... 10 MHz
- OUTPUT HEAD (ON/OFF) ..... ON

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Figure 5-2: Spectral Purity Check

SG 5030 can produce. This attenuation will reduce the apparent harmonic performance by several dB.

e. CHECK-the 2nd harmonic amplitude peak is at least 3 divisions (–30dBc) and that the 3rd harmonic amplitude peak is at least 3.5 divisions (–35dBc) below the top horizontal graticule line (fundamental reference amplitude).

f. CHECK-that 4th and 5th harmonic amplitude peaks are at least 4 divisions (–40dBc) below the top horizontal graticule line.

g. Shift the MKR to Off so the center frequency can be scrolled.

h. Use the DIGIT SELECT buttons on the SG 5030 to set the control knob resolution to 10kHz. Then using the control knob, slowly increase the SG 5030 frequency to 1MHz. While increasing the SG 5030 frequency to 1MHz, monitor the harmonics using the spectrum analyzer as in steps e and f.

NOTE

In this and all the following steps as the SG 5030 frequency is increased the Spectrum Analyzer Center Frequency and Span will need to be increased to allow the first five harmonics of the SG 5030 output frequency to be observed. Be careful that the Spectrum Analyzer Span is not made too large compared to the frequency being measured or the accuracy of the amplitude measurement may be compromised.

i. Use the DIGIT SELECT buttons to set the control knob resolution to 100kHz. Then using the control knob, increase the SG 5030 frequency to 10MHz. While increasing the SG 5030 frequency to 10MHz, monitor the harmonics using the spectrum analyzer as in steps e and f.

j. Use the DIGIT SELECT buttons to set the control knob resolution to 1MHz. Then using the control knob, increase the SG 5030 frequency to 160MHz. While increasing the SG 5030 frequency to 160MHz, monitor the harmonics using the spectrum analyzer as in steps e and f.

k. The hysteresis in the 150MHz Output Filter switching control requires that the harmonics be checked going both up and down in frequency. Use the control knob to decrease the SG 5030 frequency to 140MHz.

NOTE

The resolution of the control knob should still be at 1MHz and left there during the remainder of this test unless there is a question about the worst case harmonics near the filter switching frequencies.

While decreasing the SG 5030 frequency to 140MHz, monitor the harmonics using the spectrum analyzer as in steps e and f.

l. Use the SG 5030 control knob to increase the frequency to 310MHz. While increasing the SG 5030 frequency to 310MHz, monitor the harmonics using the spectrum analyzer as in steps e and f.

m. The hysteresis in the 300MHz Output Filter switching control requires that the harmonics be checked going both up and down in frequency. Use the control knob to decrease the SG 5030 frequency to 290MHz. While decreasing the SG 5030 frequency to 290MHz, monitor the harmonics using the spectrum analyzer as in steps e and f.

n. Use the SG 5030 control knob to increase the frequency to 550MHz. While increasing the SG 5030 frequency to 550MHz, monitor the 2nd and 3rd harmonics using the spectrum analyzer as in step e.

o. Since the spectrum analyzer frequency band stops at 1.8GHz, step n must be repeated in the next higher spectrum analyzer frequency band to check for harmonic performance of the 4th and 5th harmonics as in step f.

p. Set the SG 5030 OUTPUT HEAD ON/OFF button to OFF.

q. Remove the SG 5030 Leveling Head from the Spectrum Analyzer.

3. Check Amplitude Accuracy

A worksheet (Table 5-2) is provided at the end of this check to record the various measurement readings required. These measurement readings will be used to calculate the accuracy of your instrument.

Description

This test verifies amplitude accuracy from 0.1Hz to 50Khz.

Procedure

a. Set up the equipment as illustrated in Figure 5-3. The DVM is configured to measure AC RMS Volts using Synchronous Sampling conversion.

b. CHECK-DVM readout for 19.445mV AC, within the limits of 19.154 to 19.737 mV.

c. Record the DVM readout on line 1 column 1 in Table 5-2 Part 1 (located in step 4) for 50 kHz data.

d. Enter 550 mV on the SG 5030 DATA keypad.

e. CHECK-DVM readout for 0.19445V AC, within the limits of 0.19154V to 0.19737V.

f. Record the DVM readout on line 2 column 1 in Table 5-2 Part 1 (located in step 4).

g. Enter 552mV on the SG 5030 DATA keypad.

h. CHECK-DVM readout for 0.19516V AC, within the limits of 0.19223V to 0.19809V.

i. Record the DVM readout on line 3 column 1 in Table 5-2 Part 1 (located in step 4).

j. Enter 1V on the SG 5030 DATA keypad.

k. CHECK-DVM readout for 0.35355V AC, within the limits of 0.34825V to 0.35886V.

l. Enter 2.5V on the SG 5030 DATA keypad.

m. CHECK-DVM readout for 0.88388V AC, within the limits of 0.87062V to 0.89714V.

n. Enter 5.5V on the SG 5030 DATA keypad.

o. CHECK-DVM readout for 1.9445V AC, within the limits of 1.9154V to 1.9737V.

p. Record the DVM readout on line 4 column 1 in Table 5-2 Part 1 (located in step 4).

q. Select the SG 5030 FREQUENCY VARIABLE button and enter 10Hz on the DATA keypad.

r. Select SG 5030 AMPL button and enter 552mV on the DATA keypad.

s. CHECK-DVM readout is 0.19516V AC, within the limits of 0.19223V to 0.19809V.

t. Enter 5.5V on the SG 5030 DATA keypad.

u. CHECK-DVM readout is 1.9455V AC, within the limits of 1.9154V to 1.9737V.

v. Select the SG 5030 FREQUENCY VARIABLE button and enter 1kHz on the DATA keypad.

w. CHECK-DVM readout is 1.9445V AC, within the limits of 1.9154V to 1.9737V.

x. Select the SG 5030 AMPL button and enter 552mV on the DATA keypad.

y. CHECK-DVM readout is 0.19516V AC, within the limits of 0.19223V to 0.19809V.

z. Select the SG 5030 FREQUENCY VARIABLE button and enter 30kHz on the DATA keypad.

aa. CHECK-DVM readout is 0.19516V AC, within the limits of 0.19223V to 0.19809V.

bb. Select the SG 5030 AMPL button and enter 5.5V on the DATA keypad.

cc. CHECK-DVM readout is 1.9445V AC, within the limits of 1.9154V to 1.9737V.

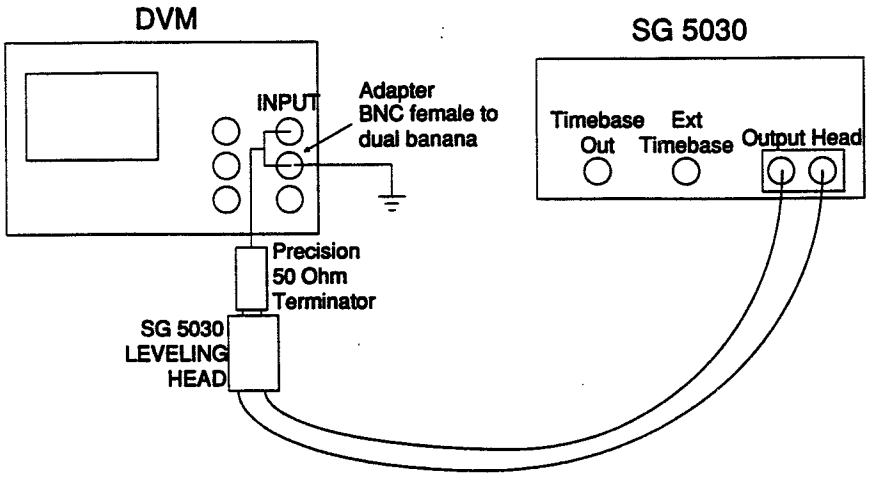
dd. Select the FREQUENCY VARIABLE button and enter 49.999kHz on the DATA keypad.

ff. CHECK-DVM readout is 1.9445V AC, within the limits of 1.9154V to 1.9737V.

gg. Select the AMPL button and enter 552mV on the DATA keypad.

hh. CHECK-DVM readout is 0.19516V AC, within the limits of 0.19223V to 0.19809V.

REFER TO TABLE 5-1, TEST EQUIPMENT REQUIRED



SETUP:

Digital Voltmeter

Blue button..... Press
Reset button..... Press
ACV button..... Select
Blue button.....Press
S..... Press
Down Arrow.....Press until SETACV
Right Arrow.....Press once
Down Arrow.....Press until SETACV SYNC
Enter button..... Press

SG 5030:

FREQUENCY REFERENCE button..... Selected
AMPL button..... Selected
DATA keypad..... 55 mV
OUTPUT HEAD ON/OFF..... ON

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Figure 5-3: Amplitude Accuracy Check

4. Check Amplitude Flatness

A worksheet (Tables 5-2 and 5-3) are provided at the end of this check to record the various measurement readings required. These measurement readings will be used to calculate the amplitude flatness of your instrument.

Description

This test verifies amplitude flatness from 50kHz to 550MHz. SG 5030 flatness is checked with a combination of procedures in order to improve measurement accuracy. Frequencies below 100kHz are checked using a DVM. Next, correction factors for 100kHz relative to the 50kHz reference frequency are derived. For frequencies above 100kHz, a power meter is used, and readings are compared against the 100kHz reference derived earlier. Finally, equations are provided that permit calculation of flatness across the frequency range of the SG 5030.

Part 1

a. Set up the equipment as illustrated in Figure 5-3. The DVM is configured to measure AC RMS Volts with the Frequency Variable set for 75 kHz.

b. Record the DVM readout on line 5 column 1 in the Table 5-2 Part 1 worksheet.

c. Select the SG 5030 AMPL button and enter 550mV on the DATA keypad.

d. Record the DVM readout on line 6 column 1in the Table 5-2 Part 1 worksheet.

e. Enter 552mV on the SG 5030 DATA keypad

f. Record the DVM readout on line 7 column 1 in the Table 5-2 Part 1 worksheet.

g. Enter 5.5V on the SG 5030 Data keypad.

h. Record the DVM readout on line 8 column 1 in the Table 5-2 Part 1 worksheet.

i. Select the SG 5030 FREQUENCY VARIABLE button and enter 100 kHz on the DATA keypad.

j. Select the SG 5030 AMPL button and enter 55mV on the DATA keypad.

k. Record the DVM readout on line 9 column 1 in the Table 5-2 Part 1 worksheet.

l. Select the SG 5030 AMPL button and enter 550mV on the Data keypad.

m. Record the DVM readout on line 10 column 1 in the Table 5-2 Part 1 worksheet.

n. Enter 552mV on the SG 5030 DATA keypad.

o. Record the DVM readout on line 11 column 1 in the Table 5-2 Part 1 worksheet.

p. Enter 5.5V on the SG 5030 DATA keypad.

q. Record the DVM readout on line 12 column 1 in the Table 5-2 Part 1 worksheet.

r. Remove the SG 5030 Leveling Head from the Digital Voltmeter.

Calculate 50khz to 100khz amplitude ratios (From Part 1, Table 5-2)

s. Divide the 75kHz, 55mV DVM reading by the 50kHz, 55mV DVM reading and enter the resultant ratio on line 5, column 2.

t. Repeat part (s) for each of the remaining amplitude values (55mV through 5.5V) for both 75kHz and 100kHz, (e.g., divide line 6 by line 2, line 7 by line 3, line 9 by line 1, etc., and enter the resultant ratios on the appropriate lines in column 2.)

u. CHECK-that all the figures entered in column 2 are within the range of 0.985 and 1.015.

Part 2

v. Set up the equipment as illustrated in Figure 5-4.

w. Press the Zero button to reset the display. Verify the display reads zero.

x. Connect the BNC-to-N adapter to the SG 5030 Leveling Head (shown in Fig. 5-4). Turn the SG 5030 OUTPUT to ON.

y. Let the HP 437B display settle (for the first measurement only, allow three minutes settling time to allow the Power Sensor to stablize).

z. Record the Power Meter readout on line 1, column 1 in the Table 5-3, Part 2 worksheet (The remaining Power Meter readings will all be entered in the Table 5-3 Part 2 worksheet.)

aa. Select the SG 5030 FREQUENCY VARIABLE button and enter 100 MHz on the DATA keypad.

bb. Record the Power Meter readout on line 2, column 3.

cc. Repeat steps (aa) and (bb), using frequencies of 250MHz and 550MHz, and entering the readings on lines 3 and 4 of column 3.

dd. Select the SG 5030 AMPL button and enter 550mV on the DATA keypad.

ee. Select the SG 5030 FREQUENCY VARIABLE button and enter 100 kHz on the Data keypad.

ff. Let the HP437B display settle. Record the Power Meter readout on line 5, column 1.

gg. Enter 100MHz on the SG 5030 DATA keypad.

hh. Record the Power Meter readout on line 6, column 3.

ii. Repeat steps (gg) and (hh), using frequencies of 250MHz and 550MHz, and entering the readings on lines 7 and 8 of column 3.

jj. Select the SG 5030 AMPL button and enter 552mV on the DATA keypad.

kk. Select the FREQUENCY VARIABLE button and enter 100kHz on the DATA keypad.

ll. Let the HP437B display settle. Record the Power Meter readout on line 9, column 1.

mm. Enter 100MHz on the SG 5030 DATA keypad.

nn. Record the Power Meter readout on line 10, column 3.

oo. Repeat steps (mm) and (nn), using frequencies of 250MHz and 550MHz, and entering the readings on lines 11 and 12 of column 3.

pp. Select the SG 5030 AMPL button and enter 5.5V on the DATA keypad.

qq. Select the SG 5030 FREQUENCY VARIABLE button and enter 100 kHz on the DATA keypad.

rr. Let the HP437B display settle. Record the Power Meter readout on line 13, column 1.

ss. Enter 100MHz on the SG 5030 DATA keypad.

tt. Record the Power Meter readout on line 14, column 3.

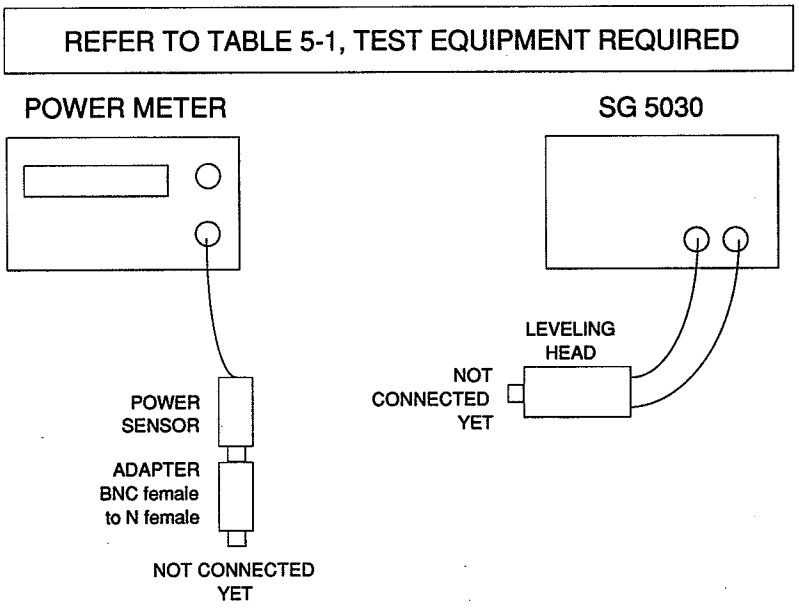
uu. Repeat steps (ss) and (tt), using frequencies of 250MHz and 550MHz, and entering the readings on lines 15 and 16 of column 3.

vv. Remove the SG 5030 Leveling Head from the Power Sensor unit.

Calculate 100kHz to 550MHz amplitude ratios (from Table 5-3, Part 2)

ww. Calculate the reciprocal of the value entered in line 1, column 1, and enter the result on lines 2, 3, and 4 of column 2.

xx. Calculate the reciprocal of the value entered in line 5, column 1, and enter the result on lines 6, 7, and 8 of column 2.



SETUP:

Power Meter

Green Preset Button.....Press

Enter Button.....Press

dBm/W Button.....Select (uW)

Blue Shift Button.....Press

dBm/W Resoln Button.....Select

Down Arrow Button.....Press until display reads RES3 0.01%

Enter Button.....Press

SG 5030

FREQUENCY VARIABLE button..... Selected
DATA keypad.....100 kHz
AMPL button.....Selected
DATA keypad.....55 mV
OUTPUT HEAD ON/OFF.....ON

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Figure 5-4: Part 2 Amplitude Flatness Check

yy. Calculate the reciprocal of the value entered in line 9, column 1, and enter the result on lines 10, 11, and 12 of column 2.

zz. Calculate the reciprocal of the value entered in line 13, column 1, and enter the result on lines 14, 15, and 16 of column 2.

aaa. Enter the 100kHz Cal Factor of the Power Sensor being used on all unshaded lines in column 4 of the Table 5-3 Part 2 worksheet. The necessary Cal Factors are provided with your Power Sensor. Refer to Table 5-1, Test Equipment Required.

bbb. Enter the reciprocal of the Power Sensor's Cal Factor for 100MHz in column 5, lines 2, 6, 10, and 14.

ccc. Enter the reciprocal of the Power Sensor's Cal Factor for 250MHz in column 5, lines 3, 7, 11, and 15.

ddd. Enter the reciprocal of the Power Sensor's Cal Factor for 550MHz in column 5, lines 4, 8, 12, and 16.

eee. For each of the lines 2, 3, 4, 6, 7, 8, 10, 11, 12, 14, 15, and 16, perform the following calculation:

$$\sqrt{\text{Col 2} \times \text{Col 3} \times \text{Col 4} \times \text{Col 5}} = \text{Col 6}$$

where Col (X) is the indicated column from Table 5-3, Part 2.

fff. Copy the number entered in Table 5-2, Part 1, line 9, column 2, to Table 5-3 Part 2, column 7, lines 2, 3, and 4.

ggg. Copy the number entered in Table 5-2 Part 1, line 10, column 2, to Table 5-3 Part 2, column 7, lines 6, 7, and 8.

hhh. Copy the number entered in Table 5-2 Part 1, line 11, column 2, to Table 5-3 Part 2, column 7, lines 10, 11, and 12.

iii. Copy the number entered in Table 5-2 Part 1, line 12, column 2, to Table 5-3 Part 2, column 7 lines 14, 15, and 16.

jjj. For each of the lines 2, 3, 4, 6, 7, 8, 10, 11, 12, 14, 15, and 16, perform the following calculation:

$$\text{Col 6} \times \text{Col 7} = \text{Col 8}$$

where Col (X) is the indicated column from Table 5-3, Part 2.

kkk. CHECK-that the results entered in column 8 is within the limits shown in columns 9 and 10.

Table 5-2: Amplitude Flatness Worksheet (Part 1)

(50 kHz to 100 kHz)

Line No.	SG 5030		Column 1	Column 2	Ratio Limits	
	Frequency	Amplitude	DVM Reading	DVM Amplitude Ratio	Lower Limit	Upper Limit
1	50kHz	55mV				
2		550mV				
3		552mV				
4		5.5V				
5	75kHz	55mV			0.985	1.015
6		550mV			0.985	1.015
7		552mV			0.985	1.015
8		5.5V			0.985	1.015
9	100kHz	55mV			0.985	1.015
10		550mV			0.985	1.015
11		552mV			0.985	1.015
12		5.5V			0.985	1.015

Table 5-3: Amplitude Flatness Worksheet (Part 2)

100kHz - 550MHz

Line No.	Freq	Ampl	Col 1 PWR @ 100kHz	Col 2 1÷PWR @ 100kHz	Col 3 Pwr Mtr Rdg @ Tst Freq	Col 4 Cal Factor @ 100kHz	Col 5 1÷Cal Factor @ Tst Freq	Col 6 Pwr Mtr Ampl Ratio	Col 7 DVM Ampl Ratio	Col 8 SG 5030 Flatness Ratio	Ratio Lmts Lwr Limit	Ratio Lmts Uppr Limit
1	100kHz	55mV										
2	100MHz										0.985	1.015
3	250MHz										0.970	1.03
4	550MHz										0.960	1.04
5	100kHz	550mV										
6	100MHz										0.985	1.015
7	250MHz										0.970	1.03
8	550MHz										0.960	1.04
9	100kHz	552mV										
10	100MHz										0.985	1.015
11	250MHz										0.970	1.03
12	550MHz										0.960	1.04
13	100kHz	5.5V										
14	100MHz										0.985	1.015
15	250MHz										0.970	1.03
16	550MHz										0.960	1.04

Col 6 = $\sqrt{\text{Col 2} \times \text{Col 3} \times \text{Col 4} \times \text{Col 5}}$

Col 8 = Col 6 x Col 7

5. Check Output VSWR

A worksheet (Table 5-4) is provided at the end of this step to record the various measurement readings required. These measurement readings will be used to calculate the VSWR of your instrument.

Description

This test verifies that the VSWR is 1.2:1 or less up to 550MHz at the Leveling Head output connector.

Procedure

a. Set up the equipment as illustrated in Figure 5-6.

b. Press the dBm/W button then the Zero button to reset the display. Verify the display reads zero.

c. Again press the dBm/W button. Now connect the Power Meter Power Sensor Head to the T-connector as shown in Figure 5-6. Turn the SG 5030 OUTPUT to ON.

e. Use the SG 5030 <DIGIT SELECT> buttons to choose the first zero to the left of the decimal point of the SG 5030 display.

f. Slowly rotate the SG 5030 Control Knob counterclockwise (lowering the frequency) while watching the Power Meter readout display. The displayed readout will eventurally reach a first maximum or minimum value (null). NOTE: As you decrease the frequency, the readout value will continuously alternate between maximum and minimum values as the power output level varies. Refer to Figure 5-5 for an illustration describing the points at which measurements are to be taken. The actual frequencies at which VSWR measurements should be taken will vary from instrument to instrument.

g. Record the first Power Meter readout value in Table 5-4, line 1 column 1.

h. Continue to lower the SG 5030 frequency while watching the Power Meter readout value. The readout will reach a second maximum or minimum.

i. Record the second Power Meter readout value in Table 5-4 line 2 column 1.

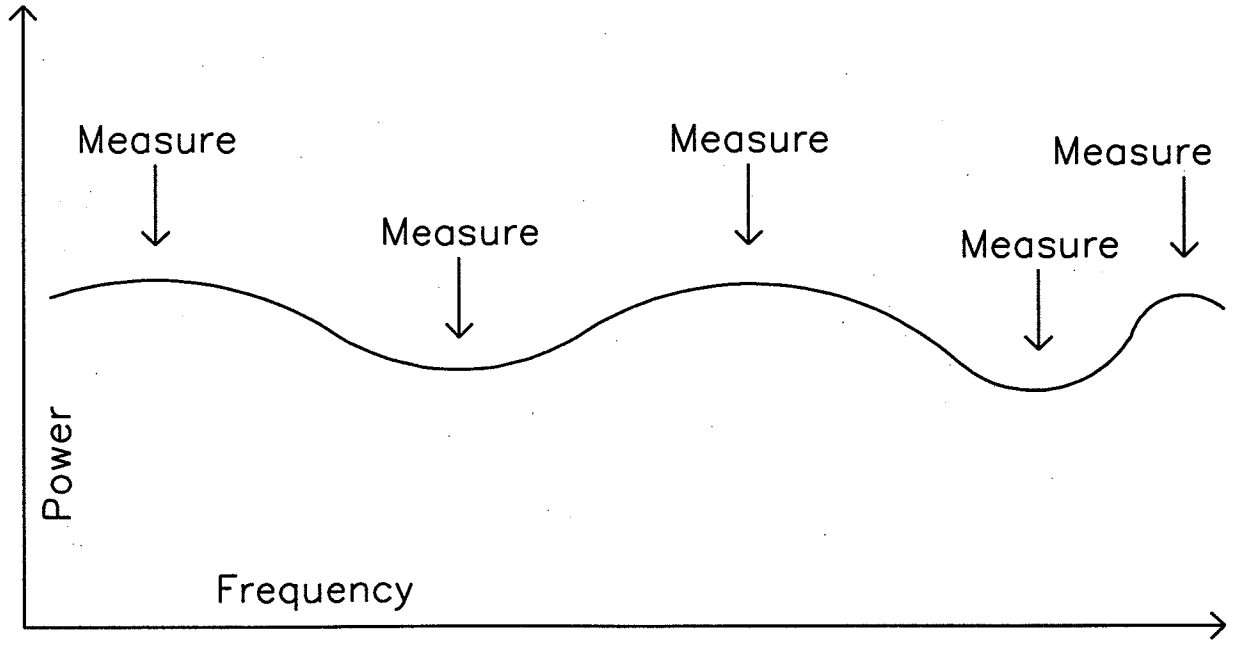
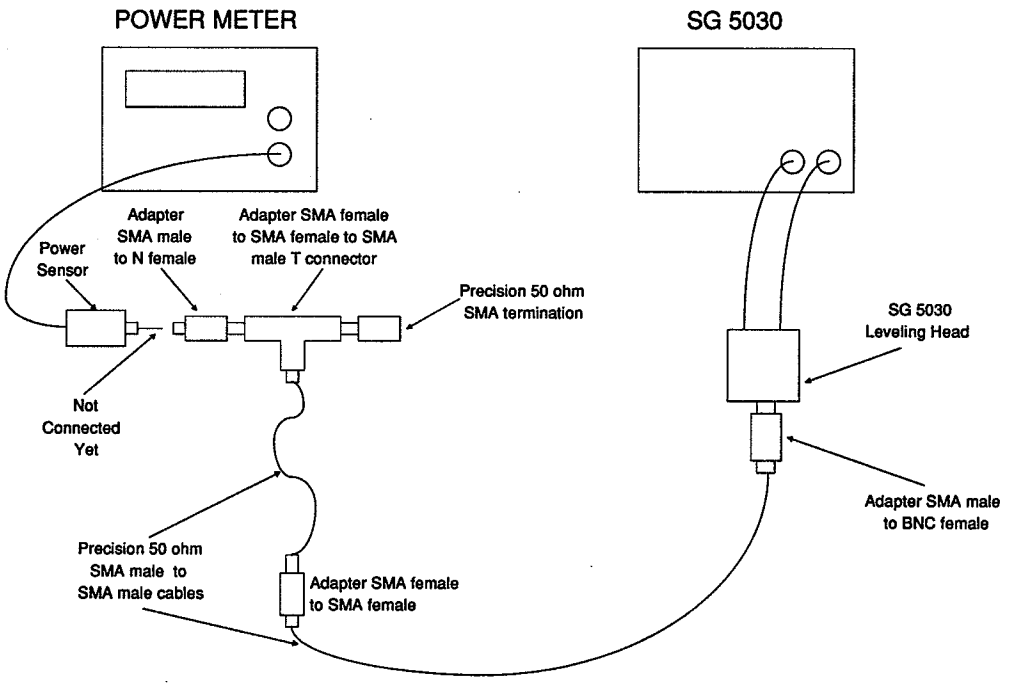


Figure 5-5: Determining VSWR Measurement Points

REFER TO TABLE 5-1, TEST EQUIPMENT REQUIRED



SETUP:

Power Meter

Green Preset Button.....Press

Enter Button.....Press

Blue Shift Button.....Press

dBm/W Resoln Button.....Select

Down Arrow Button.....Press until display reads RES3 0.001dB

Enter Button.....Press

SG 5030

AMPL button..... selected
keypad..... 55 mV
FREQUENCY VARIABLE..... selected
keypad..... 550 MHz
OUTPUT HEAD ON/OFF..... OFF

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Figure 5-6: VSWR Check

Table 5-4: VSWR Worksheet

Reading Number	Min/Max Value at specified Volts		
	55 mV	550 mV	5.5 V
1			
2			
Delta			
3			
4			
Delta			
5			
6			
Delta			
7			
8			
Delta			
9			
10			
Delta			
11			
12			
Delta			
13			
14			
Delta			

Reading Number	Min/Max Value at specified Volts		
	55 mV	550 mV	5.5 V
15			
16			
Delta			
17			
18			
Delta			
19			
20			
Delta			
21			
22			
Delta			
23			
24			
Delta			
25			
26			
Delta			
27			
28			
Delta			

NOTE: For each measurement pair in the above table, VSWR can be approximated by the following equation:

VSWR ≈ 1 + (0.4 x Delta)

j. Keep repeating parts (h) and (i), recording the values in Table 5-4 column 1 until the SG 5030 frequency readout reaches 300MHz or less. The number of readings taken may vary from instrument to instrument.

k. Press the SG 5030 FREQUENCY VARIABLE button. Enter 550MHZ on the DATA keypad.

l. Press the SG 5030 AMPL button. Enter 550mV on the DATA keypad.

m. Repeat parts (f) through (k) for 550mV, entering the readings in Table 5-4 column 2.

n. Press the SG 5030 FREQUENCY VARIABLE button. Enter 550MHz on the DATA keypad.

o. Press the SG 5030 AMPL button. Enter 5.5V on the DATA keypad.

p. Repeat parts (f) through (k) for 5.5 V, entering the readings in Table 5-4 column 3.

q. For each max/min measurement pair (i.e. Table 5-4 lines 1 and 2, column 1), calculate the difference (Delta), using the equation:

Delta = (first reading) – (second reading)

Enter the calculated value on the line immediately below the measurement pair, ignoring polarity.

r. CHECK-that the magnitude of the difference between each min/max value entered in Table 5-4 is less than 0.7dBm.

Disconnect all test equipment.

This completes the SG 5030 Performance Check.

Section 6
Adjustment Procedure

Introduction

To ensure instrument accuracy, the Performance Check should be done after every 2000 hours of operation or every twelve months if used infrequently. This Adjustment Procedure need not be performed unless the instrument fails the Performance Check procedure. The Internal Timebase Frequency adjustment, however, should be performed annually to correct for crystal aging effects. Adjustment is likely to be required after a repair has been made.

If adjustment of internal controls does not bring instrument performance within the limits listed in the Specification section, troubleshooting and repair is indicated. Adjustments should be made with the instrument operating at an ambient temperature of +20_ C to +30_ C.

Test Equipment Required

Test equipment used for adjustment of the SG 5030 is listed in Table 5-1 at the beginning of the Performance Check section of this manual.

Test Limits

Many of the adjustments in this procedure have adjustment limits. These limits are not specification limits, but represent values that will ensure peak instrument performance. It is possible (but not recommended) to exceed these limits and still meet performance specifications.

If, for some reason, it is not possible to adjust within the stated limits, several corrective actions may be taken:

1. Verify the equipment is set up exactly as described in the procedure.
2. Verify all cabling is in good condition and all connections are tight.
3. Make sure all test equipment and the SG 5030 are fully warmed up and stable.

If the limits are exceeded by only a small amount, the SG 5030 may still perform to specification. The Performance Check procedure can be used to verify performance to specification.

1. Preparation

a. Before you insert the SG 5030 into the power module, you must first set the internal DIP switch toggles to the adjustment mode. Turn the SG 5030 so that you are facing the rear-panel connectors. DIP switch SW3020 is accessed through the rear-panel, just below the rear GPIB interface connector. Set toggle number 3 to the closed position (third toggle from top, depressed to the left, when facing the rear of the instrument). Toggles 1, 2, and 4 remain in the open (depressed right) position.

Note

The oscillator adjustment cover screw, to be removed in the following step, is neither tethered nor magnetic.

b. Using a screwdriver, unscrew the oscillator adjustment cover screw. The cover screw is located on the crystal oscillator assembly, and is accessed through a hole in the top panel of the SG 5030. Carefully remove the oscillator adjustment cover screw using tweezers or a pair of long-nosed pliers.

c. Remove the fasteners that secure the power module's top cover, but do not remove the top cover yet. This will allow access to the SG 5030 adjustment while in the power module. (Refer to the power module manual for top cover for removal instructions.)

d. Before inserting the SG 5030 into the TM 5006A Power Module, the right side cover of the SG 5030 should be removed to gain access to the adjustments on the back of the Output board. The SG 5030 should now be inserted into the left most slot of the TM 5006A Power

Module so that access is available to the Output board adjustments from the three empty plug-in slots. Connect the test equipment and the power module to a suitable line voltage source.

e. Turn on the power module and test equipment, and allow at least 30 minutes warm-up (with the power module top cover on).

2. Adjust Output Hybrid Bias

The bias adjustments on the Output Hybrid are used to optimize the harmonic performance of the SG 5030. If the SG 5030 passes the Spectral Purity test (Section 5, step 2) in the Performance Check, it is not necessary to perform this adjustment.

Setup test equipment as in Figure 6-1.

Note

If parts of the Output Hybrid Bias circuitry have been replaced, it may be necessary to setup the bias adjustments to nominal values before begining this procedure. Refer to tSection 7 Maintenance for the appropriate power supply checks and bias setup.

Note

In the following steps the adjustments should be made using an insulated adjustment tool (Tektronix Part Number 003-0675-00). Access to the adjustments can be made through the three empty plug-in slots in the TM 5006A Power Module.

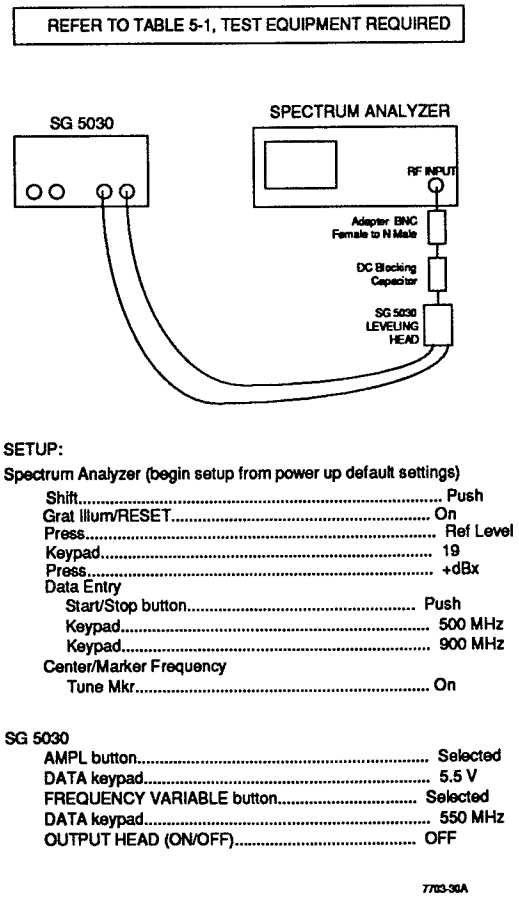


Figure 6-1: Output Hybrid Adjustment

WARNING

The heatsinks and power resistors on the back of the Output board are hot enough to cause skin burns.

a. Turn the SG 5030 OUTPUT ON.

Press Find Peak (MAX) button on the Spectrum Analyzer. Then press Shift button (blue) followed by MKR ➔ Ref Level. This should set the Ref Level on the Spectrum Analyzer to +19dBm ±1dBm. The Ref Level should not be changed during the rest of the procedure. press Shift button (blue) followed by MKR Off.

Change the SG 5030 frequency from 550MHz to 295MHz. It is important to decrease the frequency to 295MHz without going any lower to ensure that this adjustment step is made with the highest frequency filter switched into the circuit. The SG 5030 amplitude must be at maximum to test for worst case harmonics.

b. Adjust the cur6 adjustment for best 2nd harmonic performance as measured by the Spectrum Analyzer with its center frequency at 590MHz. If this step must be repeated for best ove5rall harmonic performance, cur1 should be adjusted so the 2nd harmonic is –40dBc or better. Check that the 3rd harmonic (885MHz) is also –40dBc or better.

c. Change the SG 5030 frequency from 295MHz to 200MHz. Then decrease the frequency to 145MHz without going any lower to ensure that this adjustment step is made with the middle frequency filter switched into the circuit.

Move DIGIT SELECT to the 1MHz position. Slowly increase the SG 5030 frequency until the second harmonic is at a maximum.

d. Adjust the cur1 and cur2 adjustments for best 2nd harmonic performance as measured by the Spectrum Analyzer with its center frequency at 290MHz. Adjust cur6 if necessary to optimize harmonic performance, recognizing it will affect the performance set in step d. Check that both the 2nd and 3rd (435MHz) harmonics are –40dBc or better.

e. Repeat steps c through f for best overall harmonic performance.

Note

The DC Blocking Capacitor will cause some attenuation of the signal below about 300kHz. This attenuation will reduce the apparent harmonic performance by several dB. The Blocking Capacitor is used to protect the Spectrum Analyzer input from the application of excessive DC or very low frequency AC that the SG 5030 can produce.

f. Change the SG5030 Variable Frequency to 50kHz. Adjust vee2 and cur4 adjustments for best 2nd and 3rd harmonic performance as measured with the Spectrum Analyzer. It will be necessary to compromise the 2nd and 3rd harmonic performance and all the higher order harmonics so the higher order harmonics are –55dBc or better and the 2nd and 3rd harmonics are –40dBc or better. To achieve best amplitude flatness, the 3rd harmonic should also be adjusted slightly lower than the 2nd harmonic.

g. Repeat adjustment steps d, f, and h as necessary for best harmonic performance since the adjustments are somewhat interactive.

h. The Check Spectral Purity procedure in the Performance Check (Section 5) should be performed to check for harmonic performance over the full frequency range of the SG 5030.

3. Adjust Internal Timebase Frequency

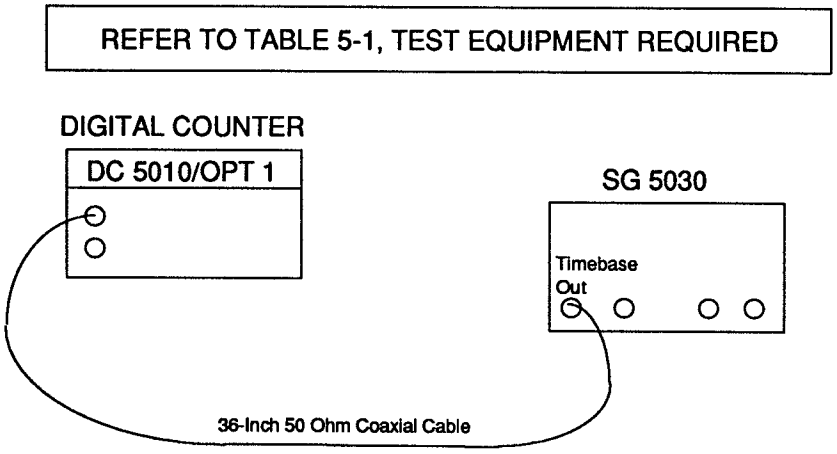
a. Perform the Preparation procedure.

b. Setup the equipment as illustrated in Figure 6-2.

c. Slide the power module's top cover (loosened earlier, under Preparation) back far enough to gain access to the crystal oscillator adjustment trimmer.

d. ADJUST — the trimmer capacitor using an insulated alignment tool for a Digital Counter readout of 10.000000MHz, within the limits of 9.999990MHz to 10.000010MHz.

e. Replace the SG 5030 oscillator adjustment cover screw. Re-install the TM 5000 power module's top cover.



Setup:

DIGITAL COUNTER
CHANNEL A
TERM..... 50 Ohm
ATTEN..... X1
SLOPE..... +
COUPL..... DC
FILTER..... OFF

All other controls remain same as when powered up.

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Figure 6-2: Timebase Frequency Adjustment

4. Set Offset and Gain Cal Constants

NOTE

Once started, the remainder of this Adjustment Procedure must be completed exactly as described on the following pages. Any deviation from this step-by-step sequence will result in instrument misadjustment.

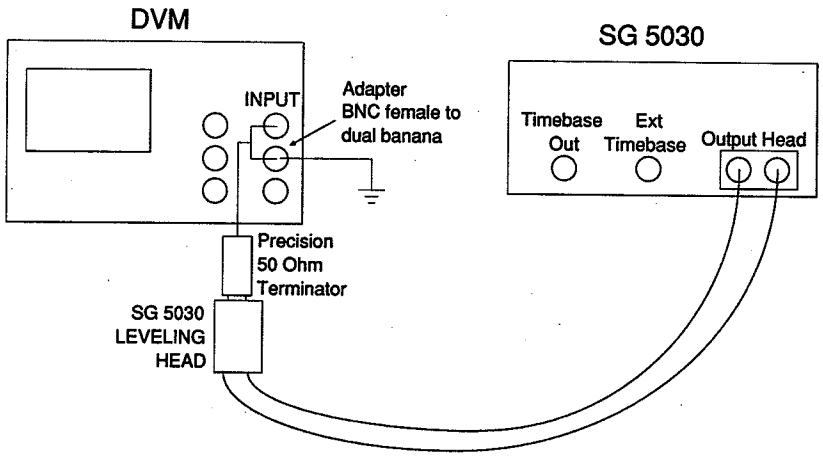
a. Set up the equipment as illustrated in Figure 6-3.

b. Press the SG 5030 SPCL button, and enter 99 on the keypad. Press the ENTER button. The readout will display a 1 on the left side of the display and the current calibration constant number on the right side of the display.

NOTE

When you press the ENTER button the front-panel red RECAL indicator will illuminate and remain illuminated until the adjustment process is completed.

REFER TO TABLE 5-1, TEST EQUIPMENT REQUIRED



Setup:

DVM

Blue.....Press
Reset.....Press
Blue.....Press
S.....Press
Down Arrow.....Press until SETACV
Right Arrow.....Press once
Down Arrow.....Press until SETACV SYNC
Enter.....Press

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Figure 6-3: Offset and Gain Adjustment

Set the LF Power Amplifier DC Offset (CAL 1)

c. Rotate the SG 5030 Control knob for a DVM readout of 0.0mVDC, within the limits of –3 to +3 mVDC.

d. Press the SG 5030 ENTER button.

Set the LF Preamplifier DC Offset (CAL 2)

e. Rotate the Control knob for a DVM readout of 0.0mVDC, within the limits of –1 to +1 mVDC. Press the SG 5030 ENTER button.

Set the RF Power Amplifier DC Offset (CAL 3)

f. Rotate the SG 5030 Control knob for a DVM readout of 0.0mVDC, within the limits of –3 to +3 mVDC. Press the SG 5030 ENTER button.

Set the LF Gain X1 (CAL 4)

g. Set the DVM Function/Range to ACV (Volts RMS).

h. Rotate the Control knob for a DVM readout of 01.9445VAC, within the limits of 1.9435 to 1.9455 VAC.

i. Press the ENTER button.

Set the LF Gain X10 (CAL 5)

j. Rotate the Control knob for a DVM readout of 0.19445VAC, within the limits of 0.19435 to 0.19455 VAC. Press the ENTER button.

Set the LF Gain X100 (CAL 6)

k. Rotate the Control knob for a DVM readout of 19.445mVAC, within the limits of 19.435 to 19.455 mVAC.k.

l. Press the ENTER button.

Set the RF Gain X1 (CAL 7)

m. Rotate the Control knob for a DVM readout of 1.9445VAC, within the limits of 1.9430 to 1.9460 VAC.

n. Press the ENTER button.

Set the RF Gain Min X1 (CAL 8)

o. Rotate the Control knob for a DVM readout of 0.19445VAC, within the limits of 0.19390 to 0.19500 VAC.

p. Press the ENTER button.

Set the RF Gain Max X10 (CAL 9)

q. Rotate the Control knob for a DVM readout of 0.19445VAC, within the limits of 0.19430 to 0.19460 VAC.

r. Press the ENTER button.

Set the RF Gain Min X10 (CAL 10)

s. Rotate the control knob for a DVM readout of 19.445mVAC, within the limits of 19.390 to 19.500 mVAC.

t. Press the ENTER button.

Set the RF Gain Max X100 (CAL 11)

u. Rotate the Control knob for a DVM readout of 19.445mVAC, within the limits of 19.430 to 19.460 mVAC.

v. Press the ENTER button.

Set the RF Gain Min X100 (CAL 12)

w. Rotate the Control knob for a DVM readout of 1.9445mVAC, within the limits of 1.9420 to 1.9470 mVAC.

x. Press the ENTER button to terminate the adjustment process.

Remove the Leveling Head from the DVM.

Set toggle number 3 on the DIP switch back to the open (depressed right) position.

This completes the Adjustment Procedure.

Section 7
Maintenance

Introduction

This section of the manual gives rear interface information and provides general maintenance and service information for the SG 5030 Sine Wave Generator.

CAUTION

To prevent damage to the SG 5030, turn off the power module before installing or removing the instrument. Do not use excessive force to install or remove the SG 5030 from the power module.

Rear Interface Information

The pin assignments shown in Figure 7-1 are identical for the A4-DDS (Direct Digital Synthesis) board and the A7-Output board.

Figure 7-2 shows the pin assignments for the GPIB connector on the A3-CPU board. Figure 7-3 shows the pin assignments for the A6-Timebase board.

General Maintenance

Loss of NVRAM

Stored setups and the current contents of the SG 5030 front-panel buffer will be lost upon failure of either one or both of the internal battery backed NVRAMs (front panel error codes E361, E363 and E354). The batteries are contained within RAM ICs U3060 and U3070, located on the A3-CPU circuit board.

Upon NVRAM failure, either one or both of these NVRAM ICs must be replaced to restore the nonvolatile memory capability. The SG 5030 must be re-calibrated and all stored setups must be re-entered upon completion of any NVRAM replacement. The NVRAM internal batteries have a life of approximately ten years.

Troubleshooting Aids

Diagrams.

Complete circuit diagrams are located in the pullout pages in the Diagrams and Circuit Board Illustrations section of this manual. The portions of the circuit mounted on the circuit boards are enclosed by a solid line. The circuit number of each component in this instrument is shown on a diagram. See the first page of the Diagrams and Circuit Board Illustrations section for definitions of the symbols and reference designators used on the diagrams.

Circuit Board Illustrations.

Circuit board illustrations are provided in conjunction with the circuit diagrams. Each board-mounted component shown on a diagram is also identified on the circuit board illustration by circuit number. A lookup table is provided with each diagram, listing components by assembly and circuit number. The table also lists the component grid locations on both the associated diagram and the circuit board illustration.

Transistor and Diode Pinouts

Most active devices in the SG 5030 are shown on the schematics with pin numbers usually referenced to an orientation mark. There is no pin number information on transistors and diodes since they have a standard naming convention for a given case style. See the transistor and diode pinout diagrams in the front of section 10.

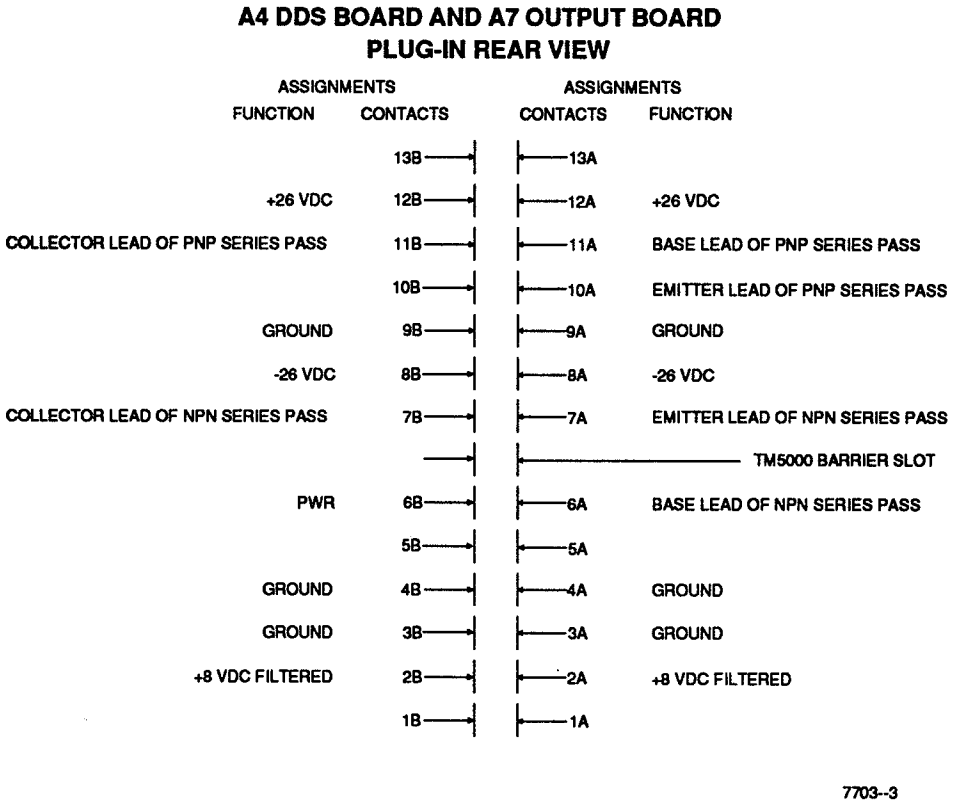


Figure 7-1: DDS and Output Board Rear Interface

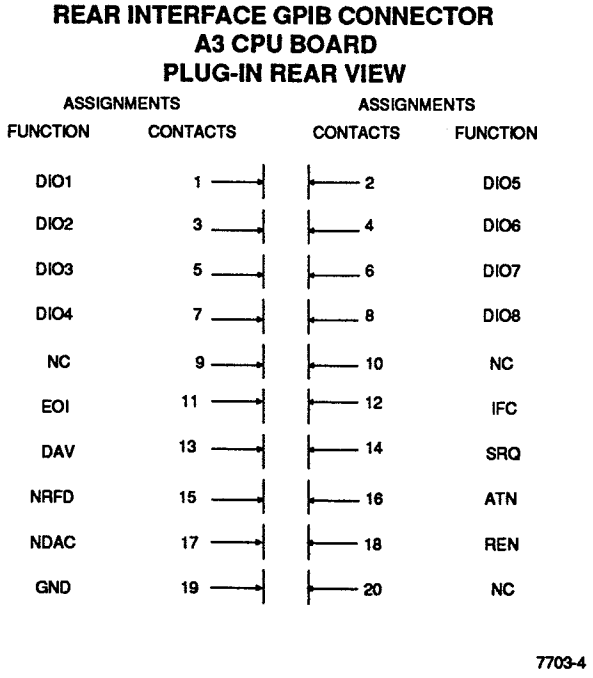
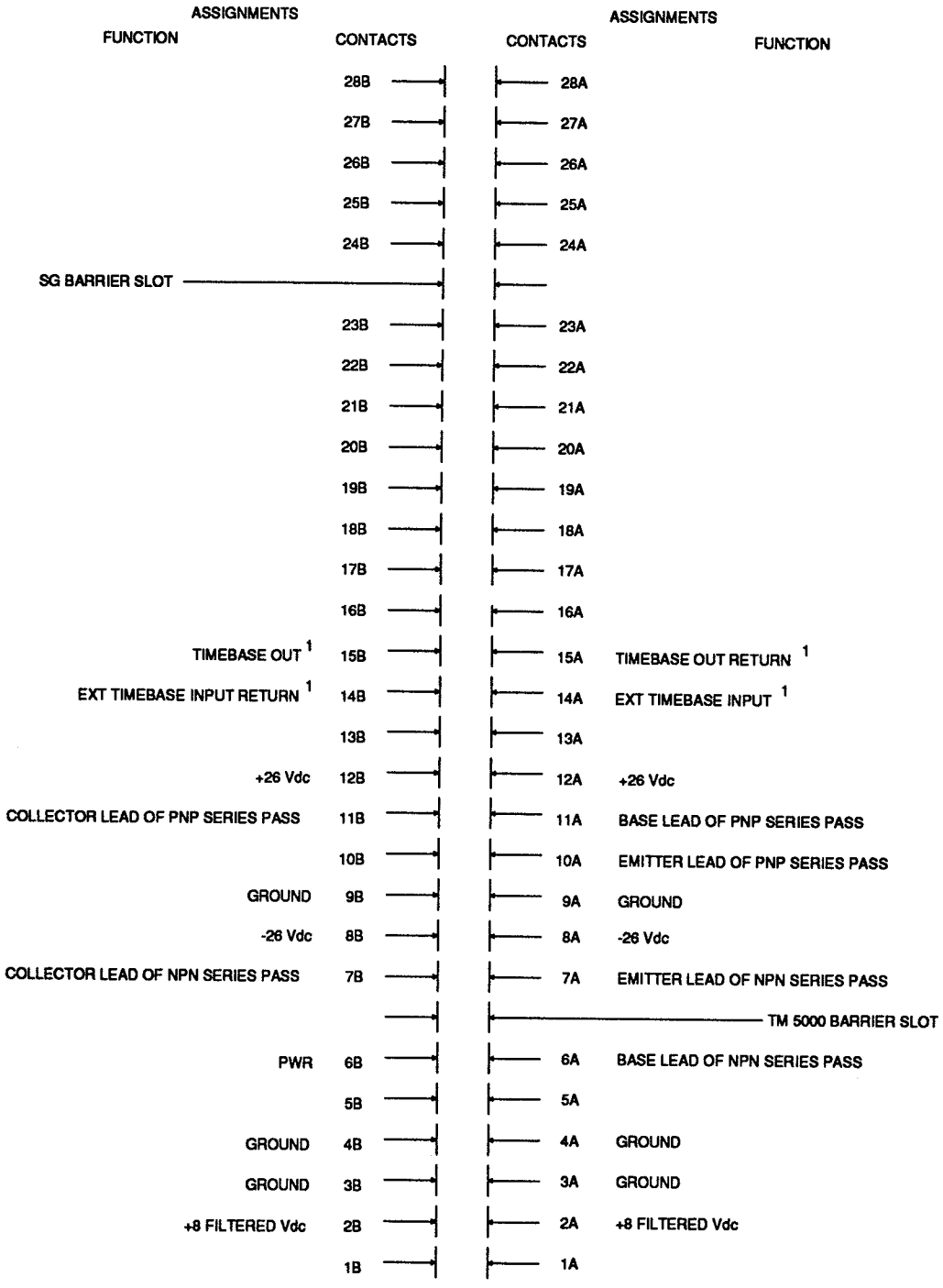


Figure 7-2: CPU Board GPIB Rear Interface

A6 TIMEBASE BOARD PLUG-IN REAR VIEW



[1] These rear connector functions are active only when the coaxial cables are removed from the front-panel connectors and reconnected to J3050 and J3051 on the A6-Timebase board.

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Figure 7-3: Timebase Board Rear Interface

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. See Table 7-1 for relative susceptibility of various classes of semiconductors. Static voltages of 1kV to 30kV are common in unprotected environments.

Observe the following precautions to avoid damage:

1. Minimize hamdling 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 service personnel.
4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.
5. Keep the component leads shorted together whenever possible.
6. Pick up components by 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.

Use only special antistatic suction-type or wick-type desoldering tools.

Table 7-1: Static Discharge Susceptibility Levels

Semiconductor Classes	Relative Susceptibility Levels[a]
MOS or CMOS microcircuits or discretes or linear microcircuits with MOS inputs (Most Sensitive)	1
ECL	2
Schottky signal diodes	3
Schottky TTL	4
High-frequency bipolar transistors	5
JFET	6
Linear microcircuits	7
Low-power Schottky TTL	8
TTL (Least Sensitive)	9

a Voltage equivalent for levels (voltage discharge from a 100 pF capacitor through resistance of 100Ω:

1 = 100 to 500 V	6 = 600 to 800 V
2 = 200 to 500 V	7 = 400 to 1000 V (est)
3 = 250 V	8 = 900 V
4 = 500 V	9 = 1200 V
5 = 400 to 600 V	

Internal Fuse Replacement

Remove the SG 5030 from the power module.

WARNING

To avoid shock hazard, do not attempt to replace internal fuses with power applied to the SG 5030. Disconnect plug-in extender cables, if used, from the power module.

Remove the cabinet side panels, top rails, and rear panel as described under Circuit Board Removal in this section.

WARNING

To avoid fire hazard use only the fuse of correct type, voltage, and current rating as specified in Section 9-Replaceable Electrical Parts.

The SG 5030 has seven internal fuses soldered on various circuit boards. Figure 7-4 shows the function of each fuse and its location. After fuse replacement, reinstall the cabinet panels in reverse order of removal.

Output Hybrid Bias Setup

The bias adjustments on the Output Hybrid are used to optimize the harmonic performance of the SG 5030.

Performing the steps below is necessary only if parts of the Output Hybrid Bias circuitry have been replaced.

For the following bias adjustments to be accurate, the DC control loop must be functional. This can be checked by measuring the output DC voltage for <10mV DC offset.

Care should be taken in probing the following bias points since access is not always convenient.

The checks in steps a and b need to be done with the TM 5006A Power Module top cover slid back to provide better access to the measurement points. An alternate method is to operate the SG 5030 outside the TM 5006A Power Module on flexible extender cables. (See note in Circuit Board Removal part of this section on use of a cooling fan if flexible extender cables are used.)

CAUTION

The SG 5030 should not be operated for an extended period of time with the covers slid back, since reduced air flow over the instrument will cause an unacceptable temperature rise.

a. Verify operation of all output hybrid bias voltages and currents

- +21VS — voltage should be +21V ±0.5V measurable at the middle pin of Q1040.
- –20.5VS — voltage should be –20.5V ±0.5V measurable at the middle pin of Q2040.
- Vee2 — voltage variable approximately –11.2V to –8.8V measurable at pin 18 of H3070.
- cur1 — current variable 80mA to 140mA (±5mA) measurable as voltage across R4050 (100Ω)
- cur2 — current variable 80mA to 140mA (±5mA) measurable as voltage across R4060 (100Ω)
- cur3 — current should be 200 ma (±5 ma) measurable as voltage across R5080 (50Ω)
- cur4 — current variable 120mA to 200mA (±5mA) measurable as voltage at top pin (emitter) of Q1080 (+5.8V to 9.8V) (100Ω)
- cur5 — current should be 80 ma (±3 ma) measurable as voltage across R4070 (100Ω)

Note

The test points for adjustments cur6 and cur7 are accessible through the slots in the rail on the front side of the Output board by using a set of small meter leads such as Tektronix Meter Lead Set ALM02

- cur6 — current variable approximately 320mA to 500mA measurable as voltage across R1070 (10Ω)
- cur7 –current should be 80 ma ±3 ma measurable as voltage across R1080 (100Ω)

b. Set nominal values for all variable bias adjustments:

- cur1 –set to 100 ma (10V across R4050)
- cur2 –set to 100 ma (10V across R4060)
- cur4 –set voltage at top pin (emitter) of Q1080 to 8 volts
- cur6 –set to 400 ma (4V across R1070)
- vee2 –set voltage to –10V at pin 18 of H3070

Cleaning

This instrument should be cleaned as often as operating conditions require. Loose dust accumulated on the outside of the instrument can be removed with a soft

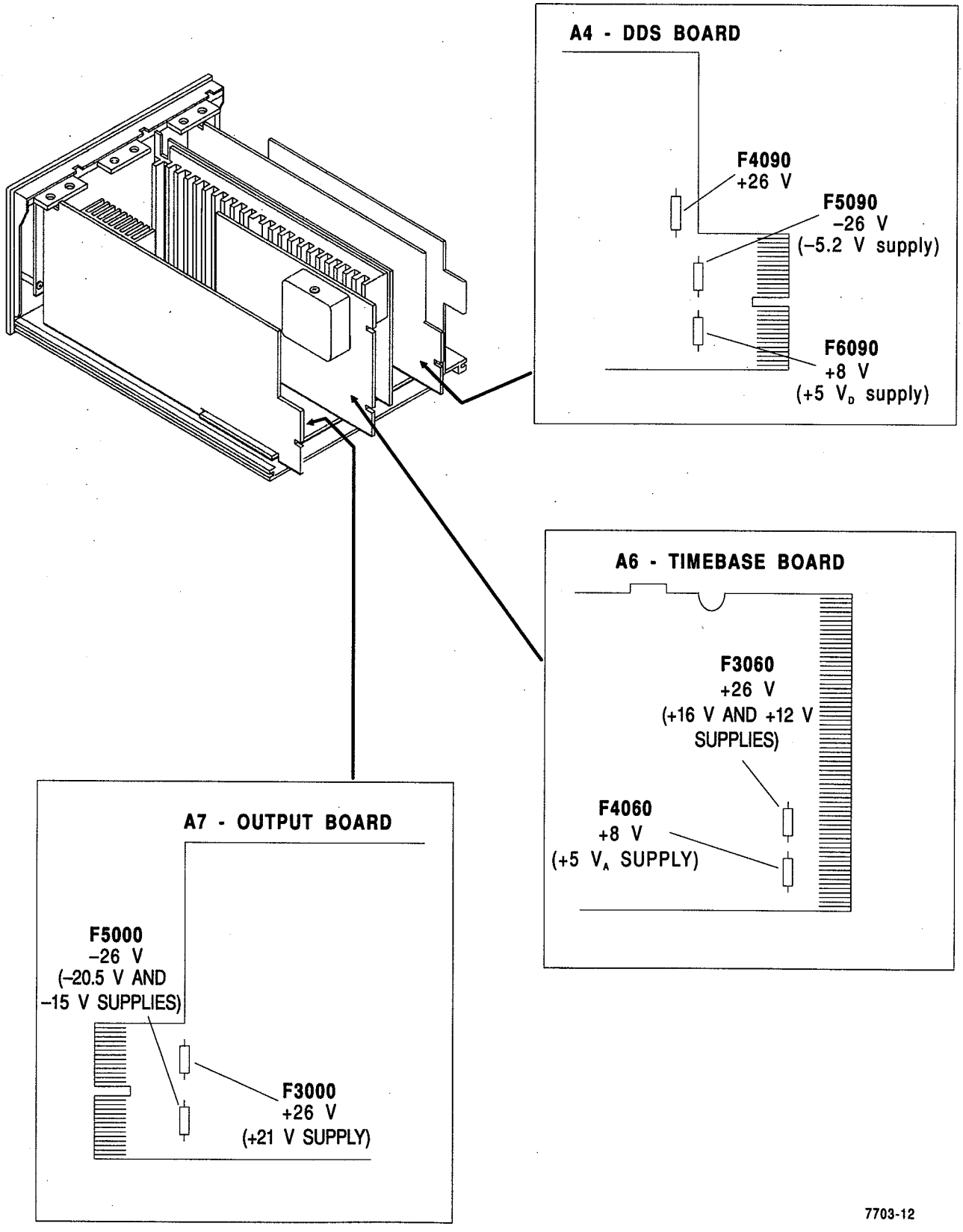

Figure 7-4: Internal Fuse Locations and Functions

cloth or a small brush. Remove dirt that remains with a soft cloth dampened in a mild detergent and water solution. Do not use abrasive cleaners.

Cleaning the interior of a unit should precede calibration since the cleaning processes could alter the settings of calibration adjustments. Use low-velocity compressed air (approximately 5 lb/in^2) to blow off accumulated dust. Hardened dirt can be removed with a soft brush or cloth dampened in a solution of water and mild detergent.

CAUTION

To prevent damaging circuit boards and components allow time for drying before applying power.

Avoid using chemical cleaning agents that might damage plastic parts. Avoid chemicals containing benzene, toluene, xylene, acetone, or similar solvents.

A3-CPU Board IC/Socket Orientation (U2051 and U3050)

EPROMs U2051 and U3050 each have 28-pins and are inserted into 32-pin sockets. The 28-pin EPROMs are properly inserted into their sockets when the top four socket pins (socket pins 1, 2, 31 and 32) are empty.

A4-DDS Board A4U4030 Replacement

The A4U4030 Integrated Circuit has a glued on Heat Sink that is not provided with the replacement IC. The old Heat Sink cannot be removed and reused. When ordering a replacement IC it is also necessary to order a replacement Heat Sink, whose part number can be obtained in the Replaceable Mechanical Parts list at the back of this manual.

The Heat Sink must be attached with a thermally conductive adhesive. Tektronix recommends the use of the LOCTITE® OUTPUT two part adhesive system, LOCTITE® item # 31520 for the adhesive and LOCTITE® item #17100 for the activator.

The Integrated Circuit should be soldered to the board before mounting the Heat Sink. Spread a small amount of the activator on the surface of the Integrated Circuit, making sure none runs onto the IC pins. Next, spread a small amount of adhesive on the surface of the Heat Sink, ensuring there are no voids. The Heat Sink may be attached to the Integrated Circuit immediately, and will be fairly secure in about five minutes.

A5-RF Board Heat Sink Installation

Some of the mounting screws for the Heat Sink have fibre washers under them to prevent the screw from shorting to circuit board runs. The location of these fibre washers should be noted on disassembly so that they may be replaced correctly upon reassembly.

Preventive Maintenance/Adjustment

The SG 5030 Sine Wave Generator does not require preventive maintenance.

To ensure proper operation, check the electrical adjustment of this power module after each 2,000 hours of operation, or every 12 months if used infrequently.

Multi-pin Connectors

The pin connectors used to connect the wires to the interconnecting pins are clamped to the ends of the wires. To replace damaged multi-pin connectors, remove the old pin connector from the holder. Do this by inserting a scribe between the connector and holder to release the catch, and pull the connector from the holder. Clamp the replacement connector to the wire. Reinstall the connector in the holder.

If the individual end lead pin connectors are removed from the plastic holder, note the order of the individual wires for correct replacement in the holder.

Obtaining Replacement Parts

Electrical and mechanical parts can be obtained through your local Tektronix Field Office or representative. However, it may be possible to obtain many of the standard electronic components from a local commercial source. Before purchasing or ordering a part from a source other than Tektronix, Inc., check the Replaceable Electricall Parts list for the proper value, rating, tolerance, and description.

NOTE

When selecting replacement parts, remember that the physical size and shape of a component may affect its performance in the instrument.

Some parts are manufactured or selected by Tektronix, Inc., to satisfy particular requirements or are manufactured for Tektronix, Inc., to our specifications.

Most of the mechanical parts used in this instrument have been manufactured by Tektronix, Inc. To determine the manufacturer, refer to the Replaceable Parts list and the Cross Reference indes, Mfr. Code Number to Manufacturer.

When ordering replacement parts from Tektronix, Inc., include the following information:

1. Instrument type and option number.
2. Instrument serial number.
3. A description of the part (if electrical, include complete circuit number).
4. Tektronix part number.

Diagnostics

The SG 5030 Hardware self-testing is initiated by a Power-On cycle or by the operator issuing the `TESt?` command. Frequency and Amplitude control circuitry is also monitored by the firmware during normal instrument operation to detect hardware problems.

If an error code is either displayed on the instrument fron panel or returned to the controller in response to an `EVEnt?` or `ERRor?` query, refer to the error code definitions in the Programming section of this manual. The only error codes that indicate instrument malfunction are those classified as Internal Errors in the error code list.

The hardware returns simple diagnostic information to the processor via polled lines. The Logic Cell Array on the CPU Board serves as the control interface. The following diagnostic lines have been defined (NOTE: the terminating * indicates an active low signal):

DDS BOARD

EXTREF* — External Reference Detected

REFLOOL* — Reference Loop Out of Lock

DDSLOOL* — DDS Loop Out of Lock

RF BOARD

OFSTLOOL* Offset Loop Out of Lock

PLLNLOOL* — Narrow Loop Out of Lock

PLLWLOOL* — Wide Loop Out of Lock

RFLVLOOL* — RF Leveling Loop Out of Lock

OUTPUT BOARD

UNPLUG* — Leveling Head Unplugged

1. Self Tests

The power-on self tests run each hardware test once. If an error occurs, it is stored in the error queue. After all tests are completed and if one or more tests have failed, the SG 5030 display is set to the code of the first error detected. To display additional error codes, if any, press any key on the front panel. If any errors are detected during power-on self test, they must be cleared from the front panel before the instrument will be ready for normal operation. Any errors found during the power-on self test are also reported via the GPIB after they are cleared from the front panel.

The `TESt?` command, issued over the GPIB, will initiate the self test sequence, as well. However, the errors found, if any, are reported in a different manner. Any errors found as a result of the `TESt?` command are reported via the GPIB with an active SRQ. The Front Panel readout displays only the last error found.

At the start of the self test, whether initiated by power-on or the `TESt?` command, the entire display will light for approximately 3 to 4 seconds. The display will then go blank for about a half second. This is to verify that the display is working properly.

CPU Self Tests

EPROM Checksum (E360):

This error is generated if the checksum calculated by the checksum algorithm does not match the checksum stored in the EPROMs. If this occurs at power-up, it is considered a catastrophic error and the system will not continue beyond this point.

NVRAM Test (E361):

The NVRAM test writes to a test section of the NVRAM, and then reads it back for comparison. If the values do not match, then the NVRAM test fails. If this occurs at power-up, it is considered a catastrophic error and the system will not continue beyond this point.

RAM Test (E362):

The RAM test writes to a test section of the RAM, and then reads it back for comparison. If the values do not match, then the RAM test fails. If this occurs at power-up, it is considered a catastrophic error and the system will not continue beyond this point.

Table 7-2: Loop Out of Lock Test States

Hardware Diagnostic Test	RFLVLOOL	REFLOOL	PLLWLLOL	DDSLOOL	OFSTLOOL	PLLNLOOL
Output Off Test	U	*	U	U	U	U
Ref Frequency Test	U	*	L	L	L	L
DDS Off Test	U	*	L	U	L	L
10.00000MHz Test	U	*	L	L	L	L
10.00001MHz Test	U	*	L	L	L	L
550.00000MHz Test	U	*	L	L	L	L
Wide Loop Divider Test	U	*	U	L	L	L
Output Amp Powered Test	U	*	U	U	U	U

The **U** symbol represents the UNLOCKED state and the **L** symbol represents the LOCKED state of the LOOL error signals. The * symbol represents the following dependence:

U if EXTREF * is inactive
L if EXTREF * is active

NVRAM Battery Test (E363):

At power-up, a test word that has been previously stored is checked to see if it is valid. If not, then it is assumed that the stored SG 5030 settings are corrupted. In this case a new test word is stored, an error is generated, and the instrument is returned to its factory default settings. This test failure usually also generates error E364.

CAL Constant Checksum Test (E364):

A CAL constant checksum is stored in the NVRAM whenever the instrument is run through the calibration sequence. At power-up, a checksum value is calculated by the CPU and compared against the stored value. If they do not match, then it is assumed that the calibration constant values are corrupted. If this occurs, the calibration constants are set to nominal values and the RE-CAL LED is lit.

Frequency and Amplitude Hardware Tests

After the CPU self tests, the power-on diagnostics then check that the individual frequency and amplitude loops will lock over the extremes of frequency range. The hardware diagnostics also indirectly test the operation of the serial data bus by monitoring for correct error signal response as the serial shift register values are changed. The operation of the loop-out-of-lock detector circuits is also tested as part of the hardware diagnostic tests, except the REFLOOL which requires an external signal to check for lock.

The following diagnostic steps are performed at power-on after the CPU diagnostics are performed:

1. OUTPUT OFF TEST - E370
   Test for all loops out of lock
2. REF FREQ TEST - E371
   Tests for main FREQ loops locked
3. DDS OFF TEST - E372
   Test for DDS loop unlock
4. 10.00000MHz TEST - E373
   Tests DDS lock to 1MHz, PLLN to 910MHz
5. 10.00001MHz TEST - E374
   Tests DDS lock to 2MHz, PLLN to 920MHz
6. 550.00000MHz TEST - E375
   Tests PLLW lock to 1460MHz
7. WIDE LOOP DIVIDER TEST - E376
   Tests PLLW unlock above max count
8. OUTPUT AMP POWERED TEST - E377
   Tests the state preceding the application of power to the Output Amp

Table 7-2 shows the state of the Loop Out of Lock lines during each of the tests listed above. For more information on the circuits which are tested, see the Theory of Operation section of this manual.

2. Operational Errors

The SG 5030 continuously monitors various error signals from the analog circuitry to determine if the instrument is operating normally, and to inform the operator if an error is detected.

The frequency control circuitry diagnostic signals monitor the lock condition of each of the five phase-locked loops in the SG 5030. The amplitude control circuitry diagnostic signals monitor the valid operating range of the leveling head feedback loop for the HF frequency range. In addition, the UNPLUG* signal and the EXTREF* signals are monitored.

The front panel UNLVL, UNLCK, and EXT TIMEBASE ACTIVE LEDs are turned on and off as appropriate, based on the above signals. In addition, the SG 5030 will turn its output off automatically if it detects the head UNPLUG* signal active.

Listed below are the error lines monitored during operation, and the errors generated if an active signal is detected on any of them:

DDS Board

REFLOOL* — E351

Reference Loop Out of Lock. This error can be generated only if an External Reference is being used.

DDSLOOL* — E355

DDS Loop Out of Lock. Frequency of 50MHz or Greater.

RF Board (All Errors HF mode only)

OFSTLOOL* — E354

Offset Loop Out of lock.

PLLNLOOL* — E353

Narrow Loop Out of Lock.

PLLWLOOL* — E352

Wide Loop Out of Lock.

RFLVLOOL* — E350

RF Leveling Loop Out of Lock.

OUTPUT BOARD

UNPLUG* — E356

Leveling Head Unplugged. When this condition is detected, the CPU turns the output OFF.

For more information on these signals, see the Theory of Operation section in this manual.

Removal Instructions

WARNING

To avoid shock or fire hazard remove any extending cables from the power module before continuing.

Cabinet Side, Top, and Rear Panel Removal

The side panels, top rails, and rear panel will need to be removed for most repairs.

Side Cover Removal

The two side panels are snapped into the top and bottom rails of the SG 5030. To aid removal, there are cut-outs at the rear corners of the covers. To remove, insert tweezers or a small straight-edged screwdriver into the cutout at the back edge of the cover, and carefully pry the cover away from the rail.

To replace covers, insert the front edge of the cover into the groove along the inside edge of the front frame assembly. Then press the cover down over the rails.

Release Latch Handle and Slider Removal

All plastic parts of the latch assemblies and the coil springs are individually replaceable. However, if a latch tension spring becomes damaged, the attached bottom frame rail assembly must be replaced.

1. Remove the side covers from the SG 5030.
2. Pull the release latch handle out about 1/8" and hold.
3. Using a small screwdriver, move the release latch slider forward slightly while pushing down on the release latch handle with your finger to free the handle shaft from the slider. Pull out on the handle to remove.
4. To repair the release latch assembly, remove the bottom rail to which it is fastened. The rails are held with screws into the front and rear panel assemblies.
5. To replace the release latch handle, push the handle shaft through the slot in the front panel as far as it will go and hold it. Using a small screwdriver, move the release latch slider forward and the handle upward until the T-shaped end of the handle engages the end of the slider.

Rear Panel Removal

1. Remove side covers.
2. Remove the 4 screws holding the rear panel to the top frame assembly.
3. Remove the 4 guide studs holding the rear panel to the bottom chassis assembly. (Use a 3/16" hex wrench.)
4. Remove the rear panel.
5. Reassemble in reverse order.

Circuit Board Removal

The exploded-view drawing associated with the Replaceable Mechanical Parts list (at the rear of this manual) may be helpful in the removal or disassembly of individual components or subassemblies.

Plug-in circuit Board Removal

The following boards are plugged into the A2-Interconnect Board (left to right, viewed from the rear):

Output Board (A7)
Timebase Board (A6)
RF Board (A5)
DDS Board (A4)
CPU Board (A3)

To remove the plug-in boards:

1. Remove side covers.
2. Remove top rails and rear panel (as one unit) as follows:
   a. Remove the 6 screws that secure the top rails to the front casting.
   b. Remove the 3 screws from the center rail.
   c. Remove the 4 guide studs holding the rear panel to the bottom chassis assembly.

3. Unplug all cable connectors on the board, keeping track of cable orientation and socket location. Also refer to the SG 5030 basic block/cabling diagram in Section 10. Before the A5-RF board can be removed, you must also remove the 2 screws that secure it to the bottom chassis assembly.

4. Carefully unplug and remove the desired board from the Interconnect Board.

NOTE

For troubleshooting purposes, boards can be reconnected with an Extender Board. Refer to Test Fixtures at the end of the Replaceable Mechanical Parts list for ordering information.

Troubleshooting of the circuit boards in the SG 5030 on an extender board (067-0175-00) is handled most easily with the use of flexible power module extender cables. (067-0645-02). Three power module extender cables are required, and in addition the SG 5030 could be operated using GPIB commands with a GPIB extender cable (067-0996-00) attached to the SG 5030 CPU circuit board.

CAUTION

The SG 5030 should not be operated for an extended period of time outside the power module unless an external fan can supply sufficient air flow over the RF and Output circuit boards to keep the circuit board components from overheating.

WARNING

Heatsinks and power resistors on several of the SG 5030 circuit boards can become hot enough to cause skin burns.

A1-Front Panel Board Removal

1. Remove side covers.

2. Remove release latch handles.

3. Remove 12 screws holding front panel assembly to top and bottom frame assemblies.

4. Unplug the ribbon cable from the front of the A3-CPU board. Unplug the two Output Head connector cables from the circuit boards. Pull the Front Panel assembly away from the top and bottom frame assemblies and unplug the two timebase cables from the Front Panel connectors. Note the locations of the coaxial cables at the Front Panel connectors for reconnection.

5. Remove 4 screws from Front Panel board and lift the circuit board away from the front panel casting.

6. Reassemble in reverse order of removal.

A2-Interconnect Board Removal

1. Remove all five circuit boards that plug into the Interconnect board.

2. Remove the hardware that secures the power transistor to the bottom frame assembly.

3. Remove the 6 screws that secure the A2-Interconnect board and lift away from the bottom frame assembly.

4. Reassemble in reverse order of removal.

Section 8
Options

There are no options available for the SG 5030 at the time this manual was printed.

Section 9
Replaceable Parts Lists

Parts Ordering Information

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative. When ordering parts, include the following information in your order: part number, instrument type or number, serial number, and modification number if applicable.

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

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

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

Cross Index-Mfr. Code Number to Manufacturer

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

Abbreviations

Abbreviations conform to American National Standard Y1.1.

Parts List Entry Description

Component Number

Items in the Electrical Parts Lists are referenced by circuit component numbers. The circuit component's number appears on the diagrams and circuit board illustrations. Each diagram and circuit board illustration is clearly marked with the assembly number. Assembly numbers are also marked on the mechanical exploded views located in the mechanical parts list. The component number is obtained by adding the assembly number prefix to the circuit number.

The electrical parts list is divided and arranged by assemblies in numerical sequence (e.g. assembly A1 with its subassemblies and parts precedes assembly A2 with its subassemblies and parts).

Chassis mounted parts have no assembly number prefix and are located at the end of the electrical parts list.

Figure and Index Number

Items in the Mechanical Parts Lists are referenced by figure and index numbers to the illustration(s) located after the schematic drawings.

Tektronix Part Number

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

Serial Number

The first entry indicates the serial number at which the part was first used. The second entry indicates the serial number at which the part was removed. No serial number entered indicates the part used is valid for all serial numbers.

Name and Description

Provides the name and a brief description of the part. Because of space limitations, an item name may sometimes appear as incomplete. For further item name identification, the U.S. Federal Catalog handbook H6-1 can be utilized where possible.

Mfr. Code

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.

Indicates the actual manufacturer's part number.

Cross Index - Mfr. Code Number to Manufacturer

Mfr. Code	Manufacturer	Address	City, State, Zip Code
S0482	Sony Corp		Tokyo Japan
TK0303	Fab Tek Inc	17 Sugar Hollow Rd	Danbury Ct 06810
TK0435	Lewis Screw Co	4300 S Racine Ave	Chicago IL 60609-3320
TK0508	Northwest Spring and Mfg Co.	5858 Willow Lane	Lake Oswego OR 97034-5343
TK0858	Stauffer Supply Co (dist)		
TK0891	Miconics	1 Fairchild Ave	Plainview NY 11803
TK1111	Shigma Inc (importer)	80 Martin Ln	Elk Grove Village IL 60007-1308
TK1285	Gerome Mfg Co Inc	PO Box 737	Newburg OR 97132
TK1319	Morellis Q & D Plastics	1812 16th Ave	Forest Grove OR 97116
TK1442	Taiyo-Yuden (USA) Inc	Arlington Center 714 W Algonquin Rd	Arlington Heights IL 60005
TK1643	Peters-Delaet Inc	7911 NE 33rd Dr Suite 170	Portland OR 97211
TK1665	Portland Die and Stamping Inc	4805 SE 26th	Portland OR 97202
TK1727	Philips Nederland BV AFD Elonco	Postbus 90050	5600 PB Eindhoven The Netherlands
TK1743	Unitrode (UK) LTD	6 Cresswell Park Blackheath	London SE 39 RD England
TK2005	Maxim Integrated Products	510 N Pastoria Ave	Sunnyvale CA 94086-3520
TK2096	Kelvin Associates	14724 Ventura Blvd Suite 1003	Sherman Oaks CA 91403-3501
TK2314	Z-Communications Inc	5450 NW 33rd Ave Suite 100	Ft Lauderdale FL 33309
0A525	Digital RF Solutions	3080 Olcott St suite 200-D	Santa Clara CA 95054-3209
0B0A9	Dallas Semiconductor Corp	4350 Beltwood Pkwy South	Dallas TX 75244
0FDX0	Kyocera Northwest Inc	5701 E 4th Plain Blvd	Vancouver WA 98661
0JR03	Zman And Associates	7633 S 180th	Kent WA 98032
0JR04	Toshiba America Inc Electronics Components Div Business Sector	2692 Dow Ave	Tustin CA 92680
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
0J9P9	Gerome Mfg Co Inc	PO Box 737	Newburg OR 97132
0J9R5	Marcon America Corp	3 Pearl Court	Allendale NJ 07401
0KBZ5	Morellis Q & D Plastics	1812 16th Ave	Forest Grove OR 97116
00213	Nytronics Components Group Inc Subsidiary Of Nytronics Inc	Orange St	Darlington SC 29532
00779	AMP Inc	2800 Fulling Mill PO Box 3608	Harrisburg PA 17105
01121	Allen-bradley Co	1201 S 2nd St	Milwaukee WI 53204-2410
01295	Texas Instruments Semiconductor Group	13500 N Central Expy PO Box 655012	Dallas TX 75265
02113	Coilcraft Inc	1102 Silver Lake Rd	Cary IL 60013-1658
03888	KDI Electronics	60 S Jefferson Rd	Whippany NJ 07981-1001
04222	AVX Ceramics Div Of AVX Corp	19th Ave South PO Box 867	Myrtle Beach SC 29577
04713	Motorola Inc Semiconductor Products Sector	5005 E Mcdowell Rd	Phoenix AZ 85008-4229

Mfr. Code	Manufacturer	Address	City, State, Zip Code
05820	EG and G Wakefield Engineering	60 Audubon Rd	Wakefield MA 01880-1203
05828	General Instrument Corp Goverment Systems Div	600 W John St	Hicksville NY 11802
06665	Precision Monolithics Sub Of Bourns Inc	1500 Space Park Dr	Santa Clara CA 95050
07263	Fairchild Semiconductor Corp North American Sales Sub of Schlumberger Ltd MS 118	10400 Ridgeview Ct	Cupertino CA 95014
09023	Cornell-Dubilier Electronics Div Federal Pacific Electric Co	2652 Dalrymple St	Sanford NC 27330
09922	Burndy Corp	Richards Ave	Norwalk CT 06852
1W344	United Chemi-Con Inc	9801 W Higgins Suite 430	Rosemont IL 60018-4704
11236	CTS Corp Berne Div Thick Film Products Group	406 Parr Road	Berne IN 46711-9506
11502	International Resistive Co Inc	Greenway Rd PO Box 1860	Boone NC 28607-1860
11532	Teledyne Relays Teledyne Industries Inc Sub of Teledyne Inc	12525 Daphne Ave	Hawthorne CA 90250-3308
12969	Unitrode Corp	5 Forbes Rd	Lexington MA 02173-7305
13103	Thermalloy Co Inc	2021 W Vally View Ln PO Box 810839	Dallas TX 75381
15542	Mini-Circuits Laboratory	2625 E 14th St	Brooklyn NY 11235-3915
18324	Signetics Corp Military Product Div	4130 Market Court	Sacramento CA 95834-1222
18796	Murata Erie North American Inc State College Operations	1900 W College Ave	State College PA 16801-2723
19701	Philips Components Discrete Products Div Resistive Products Facility Airport Road	PO Box 760	Mineral Wells TX 76067-0760
22526	Du Point E I Nemours And Co Inc Du Pont Electronics Dept	825 Old Trail Road	Etters PA 17319
24355	Analog Devices Inc	Rt 1 Industrial Pk PO Box 9106	Norwood MA 02062
24539	Avantek Inc	3175 Bowers Ave	Santa Clara CA 95051
24546	Corning Glass Works	550 High St	Bradford PA 16701-3737
24931	Specialty Connecotr Co Inc	2100 Earlywood Dr PO Box 547	Franklin IN 46131
27014	National Semiconductor Corp	2900 Semiconductor Dr	Santa Clara CA 95051-0606
27802	Vectron Labs	166 Glover Ave	Norwalk CT 06850
29454	Johanson Dielectrics Inc	2210 Screenland Dr PO Box 6465	Burbank CA 91505-1137
30161	Aavid Engineering Inc	One Kool Path Box 400	Laconia NH 03246
34371	Harris Corp Harris Semiconductor Products Group	200 Palm Bay Blvd PO Box 883	Melbourne FL 32919
46384	Penn Engineering And Mfg Copr	Old Easton Rd PO Box 1000	Danboro PA 18916
5W664	NDK America Inc	828 Main Street Suite 1906, PO Box 884	Lynchburg VA 24505
5X920	Synergy Microwave Corp	483 McLean Blvd & 18th Ave	Patterson NJ 07504

Mfr. Code	Manufacturer	Address	City, State, Zip Code
50140	K and L Microwave Inc Sub of Dover Corp	408 Coles Cir	Salisbury MD 21801-3214
50434	Hewlett-packard Co Optoelectronics Div	370 W Trimble Rd	San Jose CA 95131
51167	Aries Electronics Inc	62 Trenton Ave PO Box 130	Frenchtown NJ 08825-1221
51640	Analog Devices Inc Microelectronics Div	829 Woburn St	Wilmington MA 01887-3414
53387	Minnesota Mining & Mfg Co	PO Box 2963	Austin TX 78769-2963
54583	TDK Electronics Corp	12 Harbor Park Dr	Port Washington NY 11550
55285	The Berquist Co Inc	5300 Edina Industrial Blvd	Minneapolis MN 55435-3707
55680	Nichicon America Corp	927 E State Pky	Schaumburg 60195-4526
56289	Sprague Electric Co World Headquarters	92 Hayden Ave	Lexington MA 02173-7929
56845	Dale Electronics Inc	2300 Riverside Blvd PO Box 74	Norfolk NE 68701-2242
57027	International Resistive Products Inc	4222 S Staples	Corpus Christi TX 78411-2702
57688	Rohm Corp	8 Whatney PO Box 19515	Irvine CA 92713
58050	Teka Products Inc	45 Salem St	Providence RI 02907
58361	Quality Technologies Corp	3400 Hillview Ave	Palo Alto CA 94304-1319
59621	TRW/LSI Products Div Of TRW Inc	4243 Campus Point Court	San Diego CA 92126
61429	Fox Electronics Fox Enterprises Inc	PO Box 1078	Cape Coral FL 33910-1078
62104	California Eastern Laboratories Inc	3260 Jay St	Santa Clara CA 95054-3309
62786	Hitachi America LTD	1800 Bering Drive	San Jose CA 95122
64155	Linera Technology Corp	1630 Mccarthy Blvd	Milpitas CA 95035-7417
68994	Xilinx	2069 Hamilton Ave	San Jose CA 95125
7X318	Kaso Plastics Inc	11015 A Ne 39th	Vancouver WA 98662
73743	Fishvher Special Mfg Co	111 Industrial Rd	Cold Spring KY 41076-9749
75042	IRC Electronics Components Philadelphia Div TRW Fixed Resistors	401 N Broad St	Philadelphia PA 19108-1001
75915	Littelfuse Inc Sub Tracor Inc	800 Northwest Hwy	Des Plaines IL 60016-3049
80009	Tektronix Inc	14150 SW Karl Braun PO Box 500	Beaverton OR 97077-0001
81073	Grayhill Inc	561 Hillgrove Ave PO Box 10373	La Grange IL 60525-5914
83486	Elco Industries Inc	1101 Samuelson Rd	Rockford IL 61101
91637	Dale Electronics Inc	2064 12th Ave PO Box 609	Columbus NE 68601-3632

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial No. Effective	Dscont	Name & Description	Mfr. Code	Mfr.Part No.
A1	671-1438-00			CIRCUIT BD ASSY: FRONT PANEL	80009	671-1438-00
A1CR3010	152-0141-02			SEMICOND DVC, DI: SW,SI,30V,150MA,30V,DO-35	12969	NDP/263/TR
A1CR3011	152-0141-02			SEMICOND DVC, DI: SW,SI,30V,150MA,30V,DO-35	12969	NDP/263/TR
A1DS1010	150-1138-00			LT EMITTING DIO: RED, RECTANGULAR SOLID STATE	50434	HLMP-0300
A1DS1011	150-1138-00			LT EMITTING DIO: RED, RECTANGULAR SOLID STATE	50434	HLMP-0300
A1DS1012	150-1162-00			LT EMITTING DIO: RED	50434	HDSP-7501
A1DS1020	150-1162-00			LT EMITTING DIO: RED	50434	HDSP-7501
A1DS1021	150-1162-00			LT EMITTING DIO: RED	50434	HDSP-7501
A1DS1022	150-1162-00			LT EMITTING DIO: RED	50434	HDSP-7501
A1DS1023	150-1162-00			LT EMITTING DIO: RED	50434	HDSP-7501
A1DS1030	150-1162-00			LT EMITTING DIO: RED	50434	HDSP-7501
A1DS1031	150-1162-00			LT EMITTING DIO: RED	50434	HDSP-7501
A1DS1032	150-1162-00			LT EMITTING DIO: RED	50434	HDSP-7501
A1DS1040	150-1138-00			LT EMITTING DIO: RED, RECTANGULAR SOLID STATE	50434	HLMP-0300
A1DS1041	150-1138-00			LT EMITTING DIO: RED, RECTANGULAR SOLID STATE	50434	HLMP-0300
A1DS1042	150-1138-00			LT EMITTING DIO: RED, RECTANGULAR SOLID STATE	50434	HLMP-0300
A1DS1043	150-1138-00			LT EMITTING DIO: RED, RECTANGULAR SOLID STATE	50434	HLMP-0300
A1DS1044	150-1138-00			LT EMITTING DIO: RED, RECTANGULAR SOLID STATE	50434	HLMP-0300
A1DS1045	150-1138-00			LT EMITTING DIO: RED, RECTANGULAR SOLID STATE	50434	HLMP-0300
A1DS1050	150-1109-00			LT EMITTING DIO: GREEN, 30MA	50434	QLMP-0549
A1DS1051	150-1109-00			LT EMITTING DIO: GREEN, 30MA	50434	QLMP-0549
A1DS1052	150-1109-00			LT EMITTING DIO: GREEN,30MA	50434	QLMP-0549
A1DS1053	150-1138-00			LT EMITTING DIO: RED, RECTANGULAR SOLID STATE	50434	HLMP-0300
A1DS3010	150-1109-00			LT EMITTING DIO: GREEN, 30MA	50434	QLMP-0549
A1DS3040	150-1138-00			LT EMITTING DIO: RED, RECTANGULAR SOLID STATE	50434	HLMP-0300
A1DS3050	150-1138-00			LT EMITTING DIO: RED, RECTANGULAR SOLID STATE	50434	HLMP-0300
A1MP1	136-1094-00			SKT,PL-IN ELEK: DIP, PCB, STR,10 POS, 2 X 5,0.2	51167	10-2511-10
A1MP2	136-1094-00			SKT,PL-IN ELEK: DIP, PCB, STR,10 POS, 2 X 5,0.2	51167	10-2511-10
A1MP3	136-1094-00			SKT,PL-IN ELEK: DIP, PCB, STR,10 POS, 2 X 5,0.2	51167	10-2511-10
A1MP4	136-1094-00			SKT,PL-IN ELEK: DIP, PCB, STR,10 POS, 2 X 5,0.2	51167	10-2511-10
A1MP5	136-1094-00			SKT,PL-IN ELEK: DIP, PCB, STR,10 POS, 2 X 5,0.2	51167	10-2511-10
A1MP6	136-1094-00			SKT,PL-IN ELEK: DIP, PCB, STR,10 POS, 2 X 5,0.2	51167	10-2511-10
A1MP7	136-1094-00			SKT,PL-IN ELEK: DIP, PCB, STR,10 POS, 2 X 5,0.2	51167	10-2511-10
A1MP8	136-1094-00			SKT,PL-IN ELEK: DIP, PCB, STR,10 POS, 2 X 5,0.2	51167	10-2511-10
A1MP9	352-0955-00			HOLDER, LAMP: 10 LED, PLASTIC	7X318	ORDER BY DESCRI
A1MP10	352-0955-00			HOLDER, LAMP: 10 LED, PLASTIC	7X318	ORDER BY DESCRI
A1MP11	352-0955-00			HOLDER, LAMP: 10 LED, PLASTIC	7X318	ORDER BY DESCRI
A1MP12	366-0732-00			KNOB, KEYCAP: LIGHTED	0KBZ5	ORDER BY DESCRI
A1MP13	366-0732-00			KNOB, KEYCAP: LIGHTED	0KBZ5	ORDER BY DESCRI
A1MP14	366-0732-00			KNOB, KEYCAP: LIGHTED	0KBZ5	ORDER BY DESCRI
A1MP15	366-0732-00			KNOB, KEYCAP: LIGHTED	0KBZ5	ORDER BY DESCRI
A1MP16	366-0733-00			KNOB, KEYCAP: UNLIT	OKBZ5	ORDER BY DESCRI
A1MP17	366-0733-00			KNOB, KEYCAP: UNLIT	OKBZ5	ORDER BY DESCRI
A1MP18	366-0733-00			KNOB, KEYCAP: UNLIT	OKBZ5	ORDER BY DESCRI
A1MP19	366-0733-00			KNOB, KEYCAP: UNLIT	OKBZ5	ORDER BY DESCRI
A1MP20	366-0733-00			KNOB, KEYCAP: UNLIT	OKBZ5	ORDER BY DESCRI
A1MP21	366-0733-00			KNOB, KEYCAP: UNLIT	OKBZ5	ORDER BY DESCRI
A1MP22	366-0733-00			KNOB, KEYCAP: UNLIT	OKBZ5	ORDER BY DESCRI
A1MP23	366-0733-00			KNOB, KEYCAP: UNLIT	OKBZ5	ORDER BY DESCRI
A1MP24	366-0733-00			KNOB, KEYCAP: UNLIT	OKBZ5	ORDER BY DESCRI
A1MP25	366-0733-00			KNOB, KEYCAP: UNLIT	OKBZ5	ORDER BY DESCRI

Component Number	Tektronix Part Number	Serial No. Effective	Dscont	Name & Description	Mfr. Code	Mfr.Part No.
A1MP26	366-0733-00			KNOB, KEYCAP: UNLIT	OKBZ5	ORDER BY DESCRI
A1MP27	366-0733-00			KNOB, KEYCAP: UNLIT	OKBZ5	ORDER BY DESCRI
A1MP28	366-0733-00			KNOB, KEYCAP: UNLIT	OKBZ5	ORDER BY DESCRI
A1MP29	366-0733-00			KNOB, KEYCAP: UNLIT	OKBZ5	ORDER BY DESCRI
A1MP30	366-0733-00			KNOB, KEYCAP: UNLIT	OKBZ5	ORDER BY DESCRI
A1MP31	366-0733-00			KNOB, KEYCAP: UNLIT	OKBZ5	ORDER BY DESCRI
A1MP32	366-0733-00			KNOB, KEYCAP: UNLIT	OKBZ5	ORDER BY DESCRI
A1MP33	366-0733-00			KNOB, KEYCAP: UNLIT	OKBZ5	ORDER BY DESCRI
A1MP34	366-0733-00			KNOB, KEYCAP: UNLIT	OKBZ5	ORDER BY DESCRI
A1MP35	366-0733-00			KNOB, KEYCAP: UNLIT	OKBZ5	ORDER BY DESCRI
A1MP36	366-0733-00			KNOB, KEYCAP: UNLIT	OKBZ5	ORDER BY DESCRI
A1MP37	366-0733-00			KNOB, KEYCAP: UNLIT	OKBZ5	ORDER BY DESCRI
A1R1000	313-1470-00			RES, FXD, FILM: 47 OHM, 5%, 0.2W	57668	TR20JE 47E
A1R1001	313-1470-00			RES, FXD, FILM: 47 OHM, 5%, 0.2W	57668	TR20JE 47E
A1R1002	313-1470-00			RES, FXD, FILM: 47 OHM, 5%, 0.2W	57668	TR20JE 47E
A1R1003	313-1470-00			RES, FXD, FILM: 47 OHM, 5%, 0.2W	57668	TR20JE 47E
A1R1004	313-1470-00			RES, FXD, FILM: 47 OHM, 5%, 0.2W	57668	TR20JE 47E
A1R1010	313-1470-00			RES, FXD, FILM: 47 OHM, 5%, 0.2W	57668	TR20JE 47E
A1R1011	313-1470-00			RES, FXD, FILM: 47 OHM, 5%, 0.2W	57668	TR20JE 47E
A1R2000	313-1470-00			RES, FXD, FILM: 47 OHM, 5%, 0.2W	57668	TR20JE 47E
A1R2010	313-1104-00			RES, FXD, FILM: 100K OHM, 5%, 0.2W	57668	TR20JE 100K
A1R2011	313-1104-00			RES, FXD, FILM: 100K OHM, 5%, 0.2W	57668	TR20JE 100K
A1SW1050	260-2504-00			SWITCH, PUSH: SPST, SUBMINATURE, W/O LED	TK1111	TR1-01
A1SW1051	260-2504-00			SWITCH, PUSH: SPST, SUBMINATURE, W/O LED	TK1111	TR1-01
A1SW1060	260-2504-00			SWITCH, PUSH: SPST, SUBMINATURE, W/O LED	TK1111	TR1-01
A1SW1061	260-2504-00			SWITCH, PUSH: SPST, SUBMINATURE, W/O LED	TK1111	TR1-01
A1SW1062	260-2504-00			SWITCH, PUSH: SPST, SUBMINATURE, W/O LED	TK1111	TR1-01
A1SW2000	260-2503-00			SWITCH, PUSH: SPST, SUBMINATURE, W LED, RED	TK1111	TR2-21-L2
A1SW2020	260-2504-00			SWITCH, PUSH: SPST, SUBMINATURE, W/O LED	TK1111	TR1-01
A1SW2030	260-2524-00			SWITCH, ROTARY: CONTACTING ENCODER	TK1111	MRP-1-20
A1SW2031	260-2504-00			SWITCH, PUSH: SPST, SUBMINATURE, W/O LED	TK1111	TR1-01
A1SW2050	260-2504-00			SWITCH, PUSH: SPST, SUBMINATURE, W/O LED	TK1111	TR1-01
A1SW2051	260-2504-00			SWITCH, PUSH: SPST, SUBMINATURE, W/O LED	TK1111	TR1-01
A1SW2052	260-2504-00			SWITCH, PUSH: SPST, SUBMINATURE, W/O LED	TK1111	TR1-01
A1SW2053	260-2504-00			SWITCH, PUSH: SPST, SUBMINATURE, W/O LED	TK1111	TR1-01
A1SW2060	260-2504-00			SWITCH, PUSH: SPST, SUBMINATURE, W/O LED	TK1111	TR1-01
A1SW2061	260-2504-00			SWITCH, PUSH: SPST, SUBMINATURE, W/O LED	TK1111	TR1-01
A1SW2062	260-2504-00			SWITCH, PUSH: SPST, SUBMINATURE, W/O LED	TK1111	TR1-01
A1SW2063	260-2504-00			SWITCH, PUSH: SPST, SUBMINATURE, W/O LED	TK1111	TR1-01
A1SW3000	260-2503-00			SWITCH, PUSH: SPST, SUBMINATURE, W LED, RED	TK1111	TR2-21-L2
A1SW3010	260-2503-00			SWITCH, PUSH: SPST, SUBMINATURE, W LED, RED	TK1111	TR2-21-L2
A1SW3020	260-2504-00			SWITCH, PUSH: SPST, SUBMINATURE, W/O LED	TK1111	TR1-01
A1SW3030	260-2504-00			SWITCH, PUSH: SPST, SUBMINATURE, W/O LED	TK1111	TR1-01
A1SW3040	260-2504-00			SWITCH, PUSH: SPST, SUBMINATURE, W/O LED	TK1111	TR1-01
A1SW3050	260-2504-00			SWITCH, PUSH: SPST, SUBMINATURE, W/O LED	TK1111	TR1-01
A1SW30511	260-2504-00			SWITCH, PUSH: SPST, SUBMINATURE, W/O LED	TK1111	TR1-01
A1SW3060	260-2504-00			SWITCH, PUSH: SPST, SUBMINATURE, W/O LED	TK1111	TR1-01
A1SW3061	260-2503-00			SWITCH, PUSH: SPST, SUBMINATURE, W LED, RED	TK1111	TR2-21-L2
A1SW3062	260-2504-00			SWITCH, PUSH: SPST, SUBMINATURE, W/O LED	TK1111	TR1-01
A1U2010	156-3058-00			IC, DIGITAL: HCMOS, GATE; DUAL 4-INPUT NAND	01295	SN74HC20N
A1W3081	175-9026-00			CA ASSY, SP, ELEC: 50, 28 AWG, 6.5 L	53387	ORDER BY DESCRI

Component Number	Tektronix Part Number	Serial No. Effective	Dscont	Name & Description	Mfr. Code	Mfr.Part No.
A2	671-1439-00			CIRCUIT BD ASSY: INTERCONNECT	80009	671-1439-00
A2C2010	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA 10Z5U104Z50V
A2C2020	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA 10Z5U104Z50V
A2C2021	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA 10Z5U104Z50V
A2C2040	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA 10Z5U104Z50V
A2C2041	290-0845-00			CAP, FXD, ELCTLT: 330UF, + 50-10%, 25V	1W344	KMC25VB331M10X2
A2C2042	290-0845-00			CAP, FXD, ELCTLT: 330UF, + 50-10%, 25V	1W344	KMC25VB331M10X2
A2C2050	290-0804-01			CAP, FXD, ELCTLT: 10UF, 20%, 25V	0J9R5	CEUSM1E100T12
A2C2060	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA 10Z5U104Z50V
A2C2061	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA 10Z5U104Z50V
A2C3010	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA 10Z5U104Z50V
A2C3020	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA 10Z5U104Z50V
A2C3040	290-0845-00			CAP, FXD, ELCTLT: 330UF, + 50-10%, 25V	1W344	KMC25VB331M10X2
A2C3060	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA 10Z5U104Z50V
A2C4050	290-0920-00			CAP, FXD, ELCTLT: 33UF, + 50-20%, 35WVDC	1W344	SM35VB33RM6X11L
A2CR4050	152-0066-00			SEMICOND DVC, DI: RECT, SI,400V, 1A, DO-41	05828	GP10G-020
A2J5030	131-4823-00			CONN, PLUG, ELEC: HDR, PCB, MALE, STR, 2X20	00779	1-102692-3
A2J5040	131-4823-00			CONN, PLUG, ELEC: HDR, PCB, MALE, STR, 2X20	00779	1-102692-3
A2J5090	131-4823-00			CONN, PLUG, ELEC: HDR, PCB, MALE, STR, 2X20	00779	1-102692-3
A2J5100	131-4823-00			CONN, PLUG, ELEC: HDR, PCB, MALE, STR, 2X20	00779	1-102692-3
A2J7020	131-4823-00			CONN, PLUG, ELEC: HDR, PCB, MALE, STR, 2X20	00779	1-102692-3
A2MP2	214-2518-01			HEAT SINK, XSTR: TO-202/TO-220, AL	TK0303	332-012
A2R3010	307-0446-00			RES NTWK, FXD,FI: 10K OHM, 20%, (9) RES	11236	750-101-R10K
A2U2060	156-0285-00			IC, LINEAR: BIPOLAR, VOLTAGE REGULATOR; POS 15V	04713	MC7812CT
A2U4050	156-0527-00			IC, LINEAR: BIPOLAR, VOLTAGE REGULATOR; NEG 15V	01295	UA7915CKC

Component Number	Tektronix Part Number	Serial No. Effective	Dscont	Name & Description	Mfr. Code	Mfr.Part No.
A3	671-1444-00			CIRCUIT BD ASSY: CPU	80009	671-1444-00
A3C1040	281-0893-00			CAP, FXD, CER DI: 4.7PF, + /-0.5PF, 100V	04222	SA101A4R7DAA
A3C1041	281-0811-00			CAP, FXD, CER DI: 10PF, 10%, 100V	04222	SA101A100KAA
A3C1081	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A3C2020	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A3C2040	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A3C2060	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A3C2061	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A3C2070	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A3C2071	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A3C2072	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A3C2080	290-0943-00			CAP, FXD, ELCTLT: 47UF, 20%, 25V	1W344	SME25VB47RM5X11
A3C3020	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A3C3021	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A3C3030	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A3C3031	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A3C3050	290-0944-00			CAP, FXD, ELCTLT: 220UF, 20%, 10V	1W344	UMC10VB221M8X11
A3C4020	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A3C4030	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A3C4050	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A3C4060	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A3C4061	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A3C4062	283-0167-00			CAP, FXD, CER DI: 0.1UF, 10%, 100V	04222	SR211C104KAA
A3C4080	281-0563-00			CAP, FXD, CER DI: 0.47UF, 20%, 50V	04222	MA405E474MAA
A3C5070	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A3C5080	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A3C5081	281-0813-00			CAP, FXD, CER DI: 0.47UF, 20%, 50V	04222	SA105E473MAA
A3DS1030	150-1043-00			LT EMITTING DIO: ORANGE, 635NM, 35MA MAX	58361	MV5774C
A3DS104	150-1043-00			LT EMITTING DIO: ORANGE, 635NM, 35MA MAX	58361	MV5774C
A3DS1041	150-1043-00			LT EMITTING DIO: ORANGE, 635NM, 35MA MAX	58361	MV5774C
A3DS1042	150-1043-00			LT EMITTING DIO: ORANGE, 635NM, 35MA MAX	58361	MV5774C
A3J3030	131-0608-00			TERMINAL, PIN: 0.365 L X 0.025 PH BRZ GOLD PL	22526	48283-036
A3J3081	131-0608-00			TERMINAL, PIN: 0.365 L X 0.025 PH BRZ GOLD PL	22526	48283-036
A3J4020	131-0608-00			TERMINAL, PIN: 0.365 L X 0.025 PH BRZ GOLD PL	22526	48283-036
A3J4021	131-0608-00			TERMINAL, PIN: 0.365 L X 0.025 PH BRZ GOLD PL	22526	48283-036
A3J4070	131-0608-00			TERMINAL, PIN: 0.365 L X 0.025 PH BRZ GOLD PL	22526	48283-036
A3J5030	131-4822-00			CONN, RCPT, ELEC: BOX, PCB, FEMALE, 2X20	00779	1-102585-2
A3L5020	108-1319-00			INDUCTOR, FIXED: 33UH, 10%, 1.8A	54583	TSL1110-330K 1R
A3P4020	131-0993-00			BUS, CONDUCTOR: SHUNT ASSEMBLY, BLACK	22526	65474-006
A3P4021	131-0993-00			BUS, CONDUCTOR: SHUNT ASSEMBLY, BLACK	22526	65474-006
A3Q5070	151-0190-00			TRANSISTOR: NPN, SI, TO-92	07263	2N3904
A3R1042	307-0446-00			RES NTWK, FXD,FI: 10K OHM, 20%, (9) RES	11236	750-101-R10K
A3R1043	307-0446-00			RES NTWK, FXD,FI: 10K OHM, 20%, (9) RES	11236	750-101-R10K
A3R1044	307-0446-00			RES NTWK, FXD,FI: 10K OHM, 20%, (9) RES	11236	750-101-R10K
A3R1045	307-0446-00			RES NTWK, FXD,FI: 10K OHM, 20%, (9) RES	11236	750-101-R10K
A3R1046	307-0446-00			RES NTWK, FXD,FI: 10K OHM, 20%, (9) RES	11236	750-101-R10K
A3R2030	313-1331-00			RES, FXD, FILM: 330 OHM, 5%, 0.2W	57668	TR20JE 330E
A3R2040	313-1331-00			RES, FXD, FILM: 330 OHM, 5%, 0.2W	57668	TR20JE 330E
A3R2041	313-1331-00			RES, FXD, FILM: 330 OHM, 5%, 0.2W	57668	TR20JE 330E
A3R2042	313-1331-00			RES, FXD, FILM: 330 OHM, 5%, 0.2W	57668	TR20JE 330E
A3R4060	313-1124-00			RES, FXD, FILM: 120K OHM, 5%, 0.2W	57668	TR20JE 120K
A3R4070	313-1102-00			RES, FXD, FILM: 1K OHM, 5%, 0.2W	57668	TR20JE 01K0
A3R4080	307-0446-00			RES NTWK, FXD, FI: 10K OHM, 20%, (9) RES	11236	750-101-R10K
A3R5070	313-1123-00			RES, FXD, FILM: 12K OHM, 5%, 0.2W	57668	TR20JE 12K0
A3SK2030	136-0757-00			SKT, PL-IN ELEK: MICROCIRCUIT, 40 DIP	09922	DILB40P-108
A3SK2051	136-0963-00			SKT, PL-IN ELEK: MICROCKT, 32 PIN	00779	2-644018-3
A3SK2060	136-0755-00			SKT, PL-IN ELEK: MICROCIRCUIT, 28 DIP	09922	DILB28P-108
A3SK2070	136-0755-00			SKT, PL-IN ELEK: MICROCIRCUIT, 28 DIP	09922	DILB28P-108
A3SK3050	136-0963-00			SKT, PL-IN ELEK: MICROCKT, 32 PIN	00779	2-644018-3
A3SK3060	136-0755-00			SKT, PL-IN ELEK: MICROCIRCUIT, 28 DIP	09922	DILB28P-108
A3SK3070	136-0755-00			SKT, PL-IN ELEK: MICROCIRCUIT, 28 DIP	09922	DILB28P-108
A3SK4020	136-0875-00			SKT, PL-IN ELEK: PLCC, 68 POS, 0.05 CTR, TIN	00779	3-821574-1
A3SK4040	136-0875-00			SKT, PL-IN ELEK: PLCC, 68 POS, 0.05 CTR, TIN	00779	3-821574-1
A3SW3020	260-2174-00			SWITCH, ROCKER: (4) SPST, 30MA, 30V	81073	76PSB04S
A3U1020	156-1414-00			IC, DIGITAL: LSTTL, TRANSCEIVER; OCTAL IEEE-488	01295	SN75160B (N OR

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A3U1050	160-6619-00			MICROCKT, DGTL: LOW POWER PRGM ARRAY LOGIC, PR	80009	160-6619-00
A3U1080	156-2980-00			MICROCKT, DGTL: HCMOS,QUADRATURE DECODER/COUNTER INTERFACE	50444	HCTL-2000
A3U2020	156-1415-00			IC, DIGITAL: LSTTL, TRANSCEIVER; OCTAL IEEE-488	01295	SN75161B (N OR
A3U2021	156-1444-01			IC, PROCESSOR; NMOS, CONTROLLER; GPIB ADAPTER	01295	TMS9914A (NL OR
A3U2041	156-1408-00			MICROCKT, LINEAR: TIMER, LOW POWER	34371	ITS9217
A3U2050	160-6755-00			MICROCKT, DGTL: STTL, PLD, 20 IN, 10 OUT, PRGM	80009	160-6755-00
A3U2051	160-6447-01			MICROCKT, DGTL: CMOS, EPROM, PRGM	80009	160-6447-01
A3U2060	156-3251-00			IC, MEMORY: CMOS, SRAM; 32K X 8, 120NS	62786	HM62256P-12
A3U2070	156-3251-00			IC, MEMORY: CMOS, SRAM; 32K X 8, 120NS	62786	HM62256P-12
A3U2071	156-1621-00			MICROCKT, DGTL: CMOS, 8 DIGIT LED DRIVER	TK2005	ICM7218AIPI
A3U3050	160-6448-01			MICROCKT, DGTL: CMOS, EPROM, PRGM	80009	160-6448-01
A3U3060	156-2991-00			IC, MEMORY: CMOS, NVRAM; 8K X 8, 200NS, SRAM, INTE	0B0A9	DSI225Y
A3U3070	156-2991-00			IC, MEMORY: CMOS, NVRAM; 8K X 8, 200NS, SRAM, INTE	0B0A9	DSI225Y
A3U3071	156-1621-00			MICROCKT, DGTL: CMOS, 8 DIGIT LED DRIVER	TK2005	ICM7218AIPI
A3U3080	156-1215-00			IC, DIGITAL: CMOS, MUX/ENCODER; 20-KEY ENCODER	27014	MM74C923N
A3U4020	156-5390-00			MICROCKT, DGTL: CMOS, 10 X 10 LOGIC CELL ARRAY	68994	XC2018-50PC68C
A3U4040	156-5960-00			MICROCKT, DGTL: CMOS, MICROPROCESSOR, 16-BIT, 10	04713	MC68HC000FN10
A3U4050	160-6756-00			MICROCKT, DGTL: STTL, PLD, 20IN, 10 OUT, PRGM	80009	160-6756-00
A3U4070	156-3050-00			IC, MISC: CMOS, PWR SUPPLY SUPERVISOR; MPU RESE	0B0A9	DS1232
A3W3020	131-0566-00			BUS, CONDUCTOR: DUMMY RES, 0.094 OD X 0.225L	24546	OMA 07
A3Y1030	158-0271-00			XTAL UNIT, QTZ: 3.6864MHZ, 700PPM, SERIES, ESR 1	5W664	NDK-037
A3Y3040	119-3715-00			OSC, XTAL, CLOCK: HCMOS, 10.0MHZ, 0.01%, 4 PIN	61429	F5C 10.000 MHZ

Component Number	Tektronix Part Number	Serial No. Effective	Dscont	Name & Description	Mfr. Code	Mfr.Part No.
A4	671-1440-00			CIRCUIT BD ASSY: DDS	80009	671-1440-00
A4C1000	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C1010	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C1011	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C1020	290-0943-00			CAP, FXC, ELECTLT: 47UF, + 50-20%, 25V	1W344	KMC25VB47RM6X11
A4C1021	281-0909-00			CAP, FXC, CER DI: 0.022UF, 20%, 50V, AXIAL	0422	SA105C223MAA
A4C1022	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C1030	281-0268-00			CAP, FXD, CER DI: 680PF, 100V	04222	MA101A681KAA OR
A4C1040	281-0268-00			CAP, FXD, CER DI: 680PF, 100V	04222	MA101A681KAA OR
A4C1041	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C1042	281-0770-00			CAP, FXD, CER DI: 1000PF, 20%, 100V	04222	SA101C102MAA
A4C1043	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C1050	290-0804-00			CAP, FXC, ELCTLT: 10UF, + 50-20%, 25V	1W344	SMC63VB10RM6X11
A4C1051	281-0909-00			CAP, FXC, CER DI: 0.022UF, 20%, 50V, AXIAL	0422	SA105C223MAA
A4C1070	281-0909-00			CAP, FXC, CER DI: 0.022UF, 20%, 50V, AXIAL	0422	SA105C223MAA
A4C1080	281-0909-00			CAP, FXC, CER DI: 0.022UF, 20%, 50V, AXIAL	0422	SA105C223MAA
A4C2000	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C2001	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C2010	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C2020	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C2021	283-0051-00			CAP, FXC, CER DI: 0.0033UF, 5%, 100V	04222	SA301A332JAA
A4C2022	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C2023	281-0826-00			CAP, FXD, CER DI: 2200PF, 10%, 100V	TK1743	CGB222KEX
A4C2024	281-0909-00			CAP, FXC, CER DI: 0.022UF, 20%, 50V, AXIAL	0422	SA105C223MAA
A4C2030	290-0943-00			CAP, FXC, ELECTLT: 47UF, + 50-20%, 25V	1W344	KMC25VB47RM6X11
A4C2031	283-0051-00			CAP, FXC, CER DI: 0.0033UF, 5%, 100V	04222	SA301A332JAA
A4C2034	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C2040	290-0943-00			CAP, FXC, ELECTLT: 47UF, + 50-20%, 25V	1W344	KMC25VB47RM6X11
A4C2060	281-0909-00			CAP, FXC, CER DI: 0.022UF, 20%, 50V, AXIAL	0422	SA105C223MAA
A4C2061	281-0909-00			CAP, FXC, CER DI: 0.022UF, 20%, 50V, AXIAL	0422	SA105C223MAA
A4C2080	281-0909-00			CAP, FXC, CER DI: 0.022UF, 20%, 50V, AXIAL	0422	SA105C223MAA
A4C3000	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C3001	281-0909-00			CAP, FXC, CER DI: 0.022UF, 20%, 50V, AXIAL	0422	SA105C223MAA
A4C3002	281-0823-00			CAP, FXD, CER DI: 470PF, 10%, 50V	04222	SA101A471KAA
A4C3003	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C3010	281-0909-00			CAP, FXC, CER DI: 0.022UF, 20%, 50V, AXIAL	0422	SA105C223MAA
A4C3011	281-0823-00			CAP, FXD, CER DI: 470PF, 10%, 50V	04222	SA101A471KAA
A4C3012	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C3013	281-0826-00			CAP, FXD, CER DI: 2200PF, 10%, 100V	TK1743	CGB222KEX
A4C3014	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C3020	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C3021	281-0909-00			CAP, FXC, CER DI: 0.022UF, 20%, 50V, AXIAL	0422	SA105C223MAA
A4C3030	281-0823-00			CAP, FXD, CER DI: 470PF, 10%, 50V	04222	SA101A471KAA
A4C3031	281-0909-00			CAP, FXC, CER DI: 0.022UF, 20%, 50V, AXIAL	0422	SA105C223MAA
A4C3032	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C3033	281-0826-00			CAP, FXD, CER DI: 2200PF, 10%, 100V	TK1743	CGB222KEX
A4C3034	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C3040	281-0826-00			CAP, FXD, CER DI: 2200PF, 10%, 100V	TK1743	CGB222KEX
A4C3041	281-0797-00			CAP, FXD, CER DI: 15PF, 10%, 100V	04222	SA106A150KAA
A4C3050	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C3051	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C3060	281-0909-00			CAP, FXC, CER DI: 0.022UF, 20%, 50V, AXIAL	0422	SA105C223MAA
A4C3080	281-0920-00			CAP, FXD, ELCTLT: 33UF, + 50-20%, 35WVDC	1W344	SM35VB33RM6X11L
A4C4000	290-0943-00			CAP, FXC, ELECTLT: 47UF, + 50-20%, 25V	1W344	KMC25VB47RM6X11
A4C4001	281-0909-00			CAP, FXC, CER DI: 0.022UF, 20%, 50V, AXIAL	0422	SA105C223MAA
A4C4002	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C4010	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C4020	290-0943-00			CAP, FXC, ELECTLT: 47UF, + 50-20%, 25V	1W344	KMC25VB47RM6X11
A4C4021	281-0823-00			CAP, FXD, CER DI: 470PF, 10%, 50V	04222	SA101A471KAA
A4C4022	281-0909-00			CAP, FXC, CER DI: 0.022UF, 20%, 50V, AXIAL	0422	SA105C223MAA
A4C4023	281-0909-00			CAP, FXC, CER DI: 0.022UF, 20%, 50V, AXIAL	0422	SA105C223MAA
A4C4030	281-0909-00			CAP, FXC, CER DI: 0.022UF, 20%, 50V, AXIAL	0422	SA105C223MAA
A4C4031	281-0759-00			CAP, FXD, CER DI: 22PF, 10%, 100V	04222	SA101A220KAA
A4C4032	290-0943-00			CAP, FXC, ELECTLT: 47UF, + 50-20%, 25V	1W344	KMC25VB47RM6X11
A4C4033	290-0943-00			CAP, FXC, ELECTLT: 47UF, + 50-20%, 25V	1W344	KMC25VB47RM6X11
A4C4040	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V

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A4C4041	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C4050	290-0804-00			CAP, FXC, ELCTLT: 10UF, + 50-20%, 25V	1W344	SMC63VB10RM6X11
A4C4051	281-0765-00			CAP, FXD, CER DI: 100PF, 5%, 100V	04222	SA102A101JAA
A4C4070	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C4071	290-0943-00			CAP, FXC, ELECTLT: 47UF, + 50-20%, 25V	1W344	KMC25VB47RM6X11
A4C4080	290-0920-00			CAP, FXD, ELCTLT: 33UF, + 50-20%, 35WVDC	1W344	SM35VB33RM6X11L
A4C5000	281-0909-00			CAP, FXC, CER DI: 0.022UF, 20%, 50V, AXIAL	0422	SA105C223MAA
A4C5010	290-0943-00			CAP, FXC, ELECTLT: 47UF, + 50-20%, 25V	1W344	KMC25VB47RM6X11
A4C5020	281-0909-00			CAP, FXC, CER DI: 0.022UF, 20%, 50V, AXIAL	0422	SA105C223MAA
A4C5030	290-0943-00			CAP, FXC, ELECTLT: 47UF, + 50-20%, 25V	1W344	KMC25VB47RM6X11
A4C5031	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C5040	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C5041	281-0770-00			CAP, FXD, CER DI: 1000PF, 20%, 100V	04222	SA101C102MAA
A4C5050	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C5051	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C5052	283-0177-00			CAP, FXD, CER DI: 1UF, + 80-20%, 25V	04222	SR305E105ZAA
A4C5070	281-0770-00			CAP, FXD, CER DI: 1000PF, 20%, 100V	04222	SA101C102MAA
A4C5071	290-0943-00			CAP, FXC, ELECTLT: 47UF, + 50-20%, 25V	1W344	KMC25VB47RM6X11
A4C5080	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C5081	290-0943-00			CAP, FXC, ELECTLT: 47UF, + 50-20%, 25V	1W344	KMC25VB47RM6X11
A4C6000	283-0772-01			CAP, FXD, MICA DI: 497PF, 1%, 500V	09023	CDA15FD(497)F03
A4C6001	281-0770-00			CAP, FXD, CER DI: 1000PF, 20%, 100V	04222	SA101C102MAA
A4C6002	283-0598-01			CAP, FXD, MICA DI: 253PF, 5%, 500V	09023	CDA15FD(253)J03
A4C6010	281-0909-00			CAP, FXC, CER DI: 0.022UF, 20%, 50V, AXIAL	0422	SA105C223MAA
A4C6011	281-0909-00			CAP, FXC, CER DI: 0.022UF, 20%, 50V, AXIAL	0422	SA105C223MAA
A4C602	290-0943-00			CAP, FXC, ELECTLT: 47UF, + 50-20%, 25V	1W344	KMC25VB47RM6X11
A4C6030	290-0943-00			CAP, FXC, ELECTLT: 47UF, + 50-20%, 25V	1W344	KMC25VB47RM6X11
A4C6040	290-0943-00			CAP, FXC, ELECTLT: 47UF, + 50-20%, 25V	1W344	KMC25VB47RM6X11
A4C6041	281-0913-00			CAP, FXC, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A4C6042	290-0804-00			CAP, FXC, ELCTLT: 10UF, + 50-20%, 25V	1W344	SMC63VB10RM6X11
A4C6050	290-0943-00			CAP, FXC, ELECTLT: 47UF, + 50-20%, 25V	1W344	KMC25VB47RM6X11
A4CR4040	152-0141-02			SEMICOND DVC, DI: SW, SI, 30V, 150MA, 30V, D0-35	12969	NDP/263/TR
A4CR4050	152-0951-00			SEMICOND DVC, DI: SCHOTTKY, SI, 15V, 1.2PF, DO-35	50434	5083-2672
A4CR5010	152-0673-00			SEMICOND DVC, DI: VVC, SI, 480PF, 18V, TO-92	04713	MVAM115
A4CR5080	152-0066-00			SEMICOND DVC, DI:, RECT, SI, 400V, 1A, DO-41	05828	GP10G-020
A4CR6010	152-0673-00			SEMICOND DVC, DI: VVC, SI, 480PF, 18V, TO-92	04713	MVAM115
A4CR6050	152-0066-00			SEMICOND DVC, DI:, RECT, SI, 400V, 1A, DO-41	05828	GP10G-020
A4CR6051	152-0166-00			SEMICOND DVC, DI: ZEN, SI, 6.2V, 5%, 400MW, DO-7	04713	SZ11738RL
A4F4090	159-0159-00			FUSE, WIRE LEAD: 1.5A, 125V, 5 SEC	75915	25501.5
A4F5090	159-0159-00			FUSE, WIRE LEAD: 1.5A, 125V, 5 SEC	75915	25501.5
A4F6090	159-0159-00			FUSE, WIRE LEAD: 1.5A, 125V, 5 SEC	75915	25501.5
A4J1050	136-0252-07			SOCKET, PIN CONN: SINGLE, PCB, T/G, 0.030H, 0.05	22526	75060-012
A4J2050	136-0252-07			SOCKET, PIN CONN: SINGLE, PCB, T/G, 0.030H, 0.05	22526	75060-012
A4J2055	136-0252-07			SOCKET, PIN CONN: SINGLE, PCB, T/G, 0.030H, 0.05	22526	75060-012
A4J3011	136-0252-07			SOCKET, PIN CONN: SINGLE, PCB, T/G, 0.030H, 0.05	22526	75060-012
A4JG1040	131-1003-00			CONN, RCPT, ELEC: CKT BD MT, 3 PRONG	80009	131-1003-00
A4JG204	131-1003-00			CONN, RCPT, ELEC: CKT BD MT, 3 PRONG	80009	131-1003-00
A4JG3040	131-1003-00			CONN, RCPT, ELEC: CKT BD MT, 3 PRONG	80009	131-1003-00
A4JG4000	131-1003-00			CONN, RCPT, ELEC: CKT BD MT, 3 PRONG	80009	131-1003-00
A4L1040	108-1355-00			COIL, RF: FXD, 0.82UH, 10%	91637	IR-2 0.82 MICRO
A4L2010	108-1344-00			COIL, RF: FXD, 3.9 UH, + /-10%, Q =45, SRF 65 MH	54583	SP0305-3R9K
A4L2030	276-0752-00			CORE, EM: FERRITE	TK1442	BP53-BH3.5X10X4
A4L2031	276-0752-00			CORE, EM: FERRITE	TK1442	BP53-BH3.5X10X4
A4L2032	108-1344-00			COIL, RF: FXD, 3.9 UH, + /-10%, Q =45, SRF 65 MH	54583	SP0305-3R9K
A4L3000	108-1355-00			COIL, RF: FXD, 0.82UH, 10%	91637	IR-2 0.82 MICRO
A4L3010	108-1344-00			COIL, RF: FXD, 3.9 UH, + /-10%, Q =45, SRF 65 MH	54583	SP0305-3R9K
A4L3040	108-1344-00			COIL, RF: FXD, 3.9 UH, + /-10%, Q =45, SRF 65 MH	54583	SP0305-3R9K
A4L3090	276-0752-00			CORE, EM: FERRITE	TK1442	BP53-BH3.5X10X4
A4L4030	276-0752-00			CORE, EM: FERRITE	TK1442	BP53-BH3.5X10X4

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A4L4040	276-0752-00			CORE, EM: FERRITE	TK1442	BP53-BH3.5X10X4
A4L4070	276-0752-00			CORE, EM: FERRITE	TK1442	BP53-BH3.5X10X4
A4L4080	108-0538-00			COIL, RF: FIXED, 2.7UH	0JR03	108-05538-00
A4L4081	108-0538-00			COIL, RF: FIXED, 2.7UH	0JR03	108-05538-00
A4L5000	276-0752-00			CORE, EM: FERRITE	TK1442	BP53-BH3.5X10X4
A4L5010	276-0752-00			CORE, EM: FERRITE	TK1442	BP53-BH3.5X10X4
A4L5070	108-0538-00			COIL, RF: FIXED, 2.7UH	0JR03	108-05538-00
A4L5080	108-0538-00			COIL, RF: FIXED, 2.7UH	0JR03	108-05538-00
A4L6010	108-1479-00			COIL, RF: FIXED, 707NH, TOROIDAL INDUCTOR	80009	108-1479-00
A4L6030	108-0538-00			COIL, RF: FIXED, 2.7UH	0JR03	108-05538-00
A4L6050	108-0538-00			COIL, RF: FIXED, 2.7UH	0JR03	108-05538-00
A4L6060	108-0538-00			COIL, RF: FIXED, 2.7UH	0JR03	108-05538-00
A4P5040	131-4822-00			CONN, RCPT, ELEC: BOX, PCB, FEMALE, RTANG, 2 X 20	00779	1-102585-2
A4Q4050	151-0188-00			TRANSISTOR: PNP, SI, TO-92	04713	2N3906
A4Q6000	151-1012-00			TRANSISTOR: FET, N-CHAN, SI, TO-72	04713	SFD1012
A4R1000	322-3114-00			RES, FXD, FILM: 150 OHM, 1%. 0.2W, TC=T0	57668	CRB20-FX-150E-A
A4R1001	322-3056-00			RES, FXD, FILM: 37.4 OHM, 1%. 0.2W, TC=T0	91637	CCF50-2F-37R40F
A4R1002	322-3114-00			RES, FXD, FILM: 150 OHM, 1%. 0.2W, TC=T0	57668	CRB20-FX-150E-A
A4R1020	313-1271-00			RES, FXD, FILM: 270 OHM, 5%. 0.2W	57668	TR20JE270E
A4R1040	313-1102-00			RES, FXD, FILM: 1K OHM, 5%. 0.2W	57668	TR20JE01K0
A4R1041	313-1510-00			RES, FXD, FILM: 51 OHM, 5%. 0.2W	57668	TR20JT6851E0
A4R1050	313-1103-00			RES, FXD, FILM :10K OHM,5 %, 0.2W	57668	TR20JE10K0
A4R2000	322-3114-00			RES, FXD, FILM: 150 OHM, 1%. 0.2W, TC=T0	57668	CRB20-FX-150E-A
A4R2001	322-3056-00			RES, FXD, FILM: 37.4 OHM, 1%. 0.2W, TC=T0	91637	CCF50-2F-37R40F
A4R2002	322-3114-00			RES, FXD, FILM: 150 OHM, 1%. 0.2W, TC=T0	57668	CRB20-FX-150E-A
A4R2003	322-3210-00			RES, FXD, FILM: 1.5K OHM, 1%. 0.2W, TC=T0	57668	CRB20-FXE-1K50
A4R2004	322-3143-00			RES, FXD, FILM: 301 OHM, 1% .0.2W, TC=T0	57668	CRB20-FXE-301E
A4R2010	322-3143-00			RES, FXD, FILM: 301 OHM, 1% .0.2W, TC=T0	57668	CRB20-FXE-301E
A4R2011	322-3199-00			RES, FXD, FILM: 1.15K OHM, 1%. 0.2W, TC=T0	57668	CRB20-FXE-1K15
A4R2020	313-1510-00			RES, FXD, FILM: 51 OHM, 5%. 0.2W	57668	TR20JT6851E0
A4R2021	313-1102-00			RES, FXD, FILM: 1K OHM, 5%. 0.2W	57668	TR20JE01K0
A4R2022	322-3267-00			RES, FXD, FILM: 5.9K OHM, 1%. 0.2W, TC=T0	56845	ORDER BY DESCRI
A4R2023	313-1510-00			RES, FXD, FILM: 51. OHM, 5%. 0.2W	57668	TR20JT6851E0
A4R2030	313-1271-00			RES, FXD, FILM: 270 OHM, 5%. 0.2W	57668	TR20JE270E
A4R2031	322-3267-00			RES, FXD, FILM: 5.9K OHM, 1%. 0.2W, TC=T0	56845	ORDER BY DESCRI
A4R2032	313-1510-00			RES, FXD, FILM: 51 OHM, 5%. 0.2W	57668	TR20JT6851E0
A4R2034	313-1103-00			RES, FXD, FILM :10K OHM,5 %, 0.2W	57668	TR20JE10K0
A4R2035	313-1202-00			RES, FXD, FILM: 2K OHM, 5%, 0.2W	57668	TR20JE02K0
A4R2040	321-0751-06			RES, FXD, FILM: 50 OHM, 0.25%. 0.125W, TC=T9	57668	CRB14-CZE-50.0
A4R2050	313-1511-00			RES, FXD, FILM: 510 OHM, 5%. 0.2W	57668	TR20JT68 510E
A4R3000	322-3114-00			RES, FXD, FILM: 150 OHM, 1%. 0.2W, TC=T0	57668	CRB20-FX-150E-A
A4R3001	322-3056-00			RES, FXD, FILM: 37.4 OHM, 1%. 0.2W, TC=T0	91637	CCF50-2F-37R40F
A4R3002	322-3114-00			RES, FXD, FILM: 150 OHM, 1%. 0.2W, TC=T0	57668	CRB20-FX-150E-A
A4R3003	313-1430-00			RES, FXD, FILM: 43 OHM, 5%. 0.2W	57668	TR20JT68 43E
A4R3010	322-3142-00			RES, FXD, FILM: 294 OHM, 1%. 0.2W, TC=T0	91637	CCF50-2F294R0F
A4R3011	322-3142-00			RES, FXD, FILM: 294 OHM, 1%. 0.2W, TC=T0	91637	CCF50-2F294R0F
A4R3012	322-3025-00			RES, FXD, FILM: 17.8 OHM, 1%. 0.2W, TC=T0	57668	CRB20FXE1K50
A4R3020	313-1510-00			RES, FXD, FILM: 51 OHM, 5%. 0.2W	57668	TR20JT6851E0
A4R3021	313-1510-00			RES, FXD, FILM: 51 OHM, 5%. 0.2W	57668	TR20JT6851E0
A4R3022	313-1103-00			RES, FXD, FILM :10K OHM,5 %, 0.2W	57668	TR20JE10K0
A4R3030	313-1510-00			RES, FXD, FILM: 51 OHM, 5%. 0.2W	57668	TR20JT6851E0
A4R3031	313-1103-00			RES, FXD, FILM :10K OHM,5 %, 0.2W	57668	TR20JE10K0
A4R3032	313-1510-00			RES, FXD, FILM: 51 OHM, 5%. 0.2W	57668	TR20JT6851E0
A4R3040	322-3143-00			RES, FXD, FILM: 301 OHM, 1% .0.2W, TC=T0	57668	CRB20-FXE-301E
A4R3041	313-1510-00			RES, FXD, FILM: 51 OHM, 5%. 0.2W	57668	TR20JT6851E0
A4R3050	321-0212-07			RES, FXD, FILM: 1.58K OHM, 0.1%. 0.125W, TC=T9	57027	1.58K CM55 T9.1
A4R3051	322-3183-00			RES, FXD, FILM: 787 OHM, 1%. 0.2W, TC=T0	57668	CRB20 FXE 787E
A4R3080	307-0446-00			RES NTWK, FXD, FI: 10K OHM, 20%, (9) RES	11236	750-101-R10K
A4R4000	313-1430-00			RES, FXD, FILM: 43 OHM, 5%. 0.2W	57668	TR20JT68 43E
A4R4001	307-0526-00			RES NTWK, FXD, FI: 5, 510 OHM, 10%, 0.125 W	11236	750-61-R510 OHM
A4R4010	313-1511-00			RES, FXD, FILM: 510 OHM, 5%. 0.2W	57668	TR20JT68 510E
A4R4011	322-3210-00			RES, FXD, FILM: 1.5K OHM, 1%. 0.2W, TC=T0	57668	CRB20-FXE-1K50
A4R4012	322-3143-00			RES, FXD, FILM: 301 OHM, 1% .0.2W, TC=T0	57668	CRB20-FXE-301E

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A4R4020	313-1100-00			RES, FXD, FILM: 10 OHM, 5%. 0.2W	57668	TR20JE10E0
A4R4021	322-3276-00			RES, FXD, FILM: 7.32K OHM, 1%. 0.2W, T C=T0	57668	CRB20-FXE-7K32
A4R4022	322-3276-00			RES, FXD, FILM: 7.32K OHM, 1%. 0.2W, T C=T0	57668	CRB20-FXE-7K32
A4R4023	322-3276-00			RES, FXD, FILM: 7.32K OHM, 1%. 0.2W, T C=T0	57668	CRB20-FXE-7K32
A4R4024	322-3276-00			RES, FXD, FILM: 7.32K OHM, 1%. 0.2W, T C=T0	57668	CRB20-FXE-7K32
A4R4040	313-1102-00			RES, FXD, FILM: 1K OHM, 5%. 0.2W	57668	TR20JE01K0
A4R4041	321-0751-06			RES, FXD, FILM: 50 OHM, 0.25%. 0.125W, T C=T9	57668	CRB14-CZE-50.0
A4R4042	313-1101-00			RES, FXD, FILM: 100 OHM, 5%. 0.2W	57668	TR20JE100E
A4R4050	313-1430-00			RES, FXD, FILM: 43 OHM, 5%. 0.2W	57668	TR20JT68 43E
A4R4051	313-1101-00			RES, FXD, FILM: 100 OHM, 5%. 0.2W	57668	TR20JE100E
A4R4052	322-3183-00			RES, FXD, FILM: 787 OHM, 1%. 0.2W, T C=T0	57668	CRB20-FXE-787E
A4R4053	301-0152-00			RES, FXD, FILM: 1.5K OHM, 5%. 0.5W	TK1727	SFR30 2322-182
A4R4060	308-0058-00			RES, FXD, WW: 1.5 OHM, 10%, 1W	75042	SP-20-1R500K
A4R4061	313-1101-00			RES, FXD, FILM: 100 OHM, 5%. 0.2W	57668	TR20JE100E
A4R4070	313-1430-00			RES, FXD, FILM: 43 OHM, 5%. 0.2W	57668	TR20JT68 43E
A4R4071	307-0446-00			RES NTWK, FXD, FI: 10K OHM, 20%, (9) RES	11236	750-101-R10K
A4R4080	307-0446-00			RES NTWK, FXD, FI: 10K OHM, 20%, (9) RES	11236	750-101-R10K
A4R5000	313-1102-00			RES, FXD, FILM: 1K OHM, 5%. 0.2W	57668	TR20JE01K0
A4R5001	313-1511-00			RES, FXD, FILM: 510 OHM, 5%. 0.2W	57668	TR20JT68 510E
A4R5010	322-3202-00			RES, FXD, FILM: 1.24K OHM, 1%. 0.2W, T C=T0	57668	CRB20 FXE 1K24
A4R5011	313-1105-00			RES, FXD, FILM: 1M OHM, 5%. 0.2W	57668	TR20JE1M
A4R5012	313-1103-00			RES, FXD, FILM :10K OHM,5 %, 0.2W	57668	TR20JE10K0
A4R5013	322-3242-00			RES, FXD, FILM: 3.24K OHM, 1%. 0.2W, T C=T0	57668	CRB20 FXE 3K24
A4R5014	322-3222-00			RES, FXD, FILM: 2K OHM, 1%. 0.2W, T C=T0	57668	CRB20 FXE 2K00
A4R5030	313-1100-00			RES, FXD, FILM: 10 OHM, 5%. 0.2W	57668	TR20JE10E0
A4R5031	313-1103-00			RES, FXD, FILM :10K OHM,5 %, 0.2W	57668	TR20JE10K0
A4R5040	313-1103-00			RES, FXD, FILM :10K OHM,5 %, 0.2W	57668	TR20JE10K0
A4R5041	322-3195-00			RES, FXD, FILM: 1.05K OHM, 1%. 0.2W, T C=T0	76685	CRB20 FXE 1K05
A4R5050	313-1391-00			RES, FXD, FILM: 390 OHM, 5%. 0.2W	57668	TR20JE 390E
A4R5051	313-1391-00			RES, FXD, FILM: 390 OHM, 5%. 0.2W	57668	TR20JE 390E
A4R5052	322-3193-00			RES, FXD, FILM: 1K OHM, 1%. 0.2W, T C=T0	57668	CRB20 FXE 1K00
A4R5053	322-3289-07			RES, FXD, FILM: 10K OHM, 0.1%.0 .2W, T C=T9	91637	CCF501C10001B
A4R5054	301-0202-00			RES, FXD, FILM: 2K OHM, 5%. 0.5W	19701	5053CX2K000J
A4R5070	307-0887-00			RES NTWK, FXD, FI: 5.2K OHM, 2%, 1.5W	01121	110B202
A4R5080	308-0847-01			RES, FXD, WW: 0.62 OHM, 5%, 1W	75042	SP20-R6200J
A4R6000	313-1102-00			RES, FXD, FILM: 1K OHM, 5%. 0.2W	57668	TR20JE01K0
A4R6010	313-1100-00			RES, FXD, FILM: 10 OHM, 5%. 0.2W	57668	TR20JE10E0
A4R6030	313-1105-00			RES, FXD, FILM: 1M OHM, 5%. 0.2W	57668	TR20JE1M
A4R6031	313-1103-00			RES, FXD, FILM :10K OHM,5 %, 0.2W	57668	TR20JE10K0
A4R6040	313-1103-00			RES, FXD, FILM :10K OHM,5 %, 0.2W	57668	TR20JE10K0
A4R6041	322-3255-00			RES, FXD, FILM: 4.42K OHM, 1%. 0.2W, T C=T0	57668	CRB20 FXE 4K42
A4SH4020	337-3337-00			SHIELD, ELEC: 2.1 X 1.1 X 0.4, PERIOD CNTR	0J9P9	337-3337-00
A4SH5000	337-3337-00			SHIELD, ELEC: 2.1 X 1.1 X 0.4, PERIOD CNTR	0J9P9	337-3337-00
A4SK2070	136-0965-00			SKT, PL-IN ELEK: PLCC, PCB, 84, 0.360 H X 0.125	00779	821573-1
A4U1000	119-2592-00			MIXER, FREQUENCY: 1-500MHZ	15542	SBL-1
A4U1010	156-1529-00			MICROCKT, LINEAR; 3-TERM ADJ OUT POS V RGLTR	04713	LM317LZ
A4U1050	156-2256-00			IC, DIGITAL: HCMOS, GATE; QUAD 2-INPUT NAND	01295	SN74HC00N3/J4
A4U1051	156-2358-00			IC, DIGITAL: HCMOS, COUNTER; JOHNSON DECADE CO	04713	MC74HC4017 (NDS
A4U1060	156-2581-00			IC, DIGITAL: HCMOS, MUX; DUAL 4-TO-1 DATA SELE	27014	MM74HC153N
A4U1070	156-2349-00			IC, DIGITAL: HCMOS, SHIFT REGISTER; 8-BIT SIPO	0JR04	TC74HC595AP
A4U1080	156-2349-00			IC, DIGITAL: HCMOS, SHIFT REGISTER; 8-BIT SIPO	0JR04	TC74HC595AP
A4U1081	156-2349-00			IC, DIGITAL: HCMOS, SHIFT REGISTER; 8-BIT SIPO	0JR04	TC74HC595AP
A4U2000	156-1529-00			MICROCKT, LINEAR; 3-TERM ADJ OUT POS V RGLTR	04713	LM317LZ
A4U2010	156-3047-00			MICROCKT, LINEAR: MONOLITHIC, RF AMPLIFIER	80009	156-3047-00
A4U2020	156-0860-00			IC, DIGITAL: ECL, RECEIVER; TRIPLE LINE	04713	MC10116P
A4U2021	156-0518-00			IC, DIGITAL: ECL, MISC; PHASE-FREQUENCY DETECTOR	04713	MC12040(P OR L)
A4U2034	156-1631-00			IC, LINEAR: BIPOLAR, VOLTAGE REGULATOR; SHUNT, A	01295	TL431C-LP
A4U2040	156-3219-00			IC, CONVERTER: BIPOLAR, D/A; 12 BIT, 20MHZ, 2 LSB	59621	TDC1012N7C1

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A4U2050	156-4033-00			IC, MEMORY: CMOS, MROM; 2048 X 8, DRFS-2252PC, 8	80009	156-4033-00
A4U2060	156-4034-00			IC, MEMORY: CMOS, MROM; 2048 X 8, DRFS-2254PC, 4	80009	156-4034-00
A4U2070	156-6100-00			IC, MISC: CMOS, FREQ SYNTH; DIRECT DIGITAL SYNT	0A525	DRFS-3250-35JC
A4U2080	156-2349-00			IC, DIGITAL: HCMOS, SHIFT REGISTER; 8-BIT SIPO	0JR04	TC74HC595AP
A4U3000	156-3047-00			MICROCKT, LINEAR: MONOLITHIC, RF AMPLIFIER	80009	156-3047-00
A4U3010	156-1529-00			MICROCKT, LINEAR; 3-TERM ADJ OUT POS V RGLTR	04713	LM317LZ
A4U3020	156-3047-00			MICROCKT, LINEAR: MONOLITHIC, RF AMPLIFIER	80009	156-3047-00
A4U4000	156-0860-00			IC, DIGITAL: ECL, RECEIVER; TRIPLE LINE	04713	MC10116P
A4U4020	156-1338-00			MICROCKT, LINEAR: OPERATIONAL AMPLIFIER	01295	NE5534P
A4U4030	156-3218-00			MICROCKT, LINEAR: OP-AMP WB H SLEW RATE	34371	HA1-2542-5
A4U5030	156-1225-00			MICROCKT, LINEAR: DUAL COMPARATOR	01295	LM393P
A4U5040	156-0071-00			IC, LINEAR: BIPOLST, VOLTAGE REGULATOR; VARIABLE	04713	MC1723CP
A4U5050	156-0854-00			IC, LINEAR: BIPOLAR, OP-AMP; LOW INPUT BIAS CURRENT	27014	LM308AN
A4U5060	156-2186-00			MICROCKT, LINEAR: VOLTAGE REFERENCE, 10 VOLT	27014	LM368H-10
A4U5061	156-0071-00			IC, LINEAR: BIPOLST, VOLTAGE REGULATOR; VARIABLE	04713	MC1723CP
A4W100	174-2591-00			CABLE ASSY, RF:5 0 OHM COAX, 8.5 L, 6-0	80009	175-6344-00
A4W400	174-2591-00			CABLE ASSY, RF:5 0 OHM COAX, 8.5 L, 6-0	80009	175-6344-00
A4W500	175-8803-00			CABLE ASSY, RF: 50 OHM COAX, 16.75 L, 6-2	80009	175-8803-00
A4W600	175-8803-00			CABLE ASSY, RF: 50 OHM COAX, 16.75 L, 6-2	80009	175-8803-00

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A5	671-1441-01			CIRCUIT BD ASSY: RF	80009	671-1441-00
A5C1040	290-5039-00			CAP, FXD, ELECTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A5C1060	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C1080	290-5039-00			CAP, FXD, ELECTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A5C1081	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C1100	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C1110	290-5039-00			CAP, FXD, ELECTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A5C1130	290-5039-00			CAP, FXD, ELECTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A5C1160	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C1161	290-5039-00			CAP, FXD, ELECTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A5C1170	290-5039-00			CAP, FXD, ELECTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A5C2020	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C2030	283-5025-00			CAP, FXD, CER DI: 220PF, 5%, 50V	54583	C3216COG1H221J
A5C2040	283-5113-00			CAP, FXD, CER DI: 0.047UF, 10%, 50V, X7R, 1206 PKT	0FDX0	W1206X473K2B04
A5C2041	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C2042	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C2043	283-5042-00			CAP, FXD, CER DI: 27PF, 5%, 50V	29454	101R18N270JW4-T
A5C2044	283-5027-00			CAP, FXD, CER DI: 470PF, 5%, 50V	54583	C3216COG1H471J
A5C2080	283-5002-00			CAP, FXD, CER DI: 1000PF, 10%, 50V	04222	1206A102KAT050
A5C2081	283-5002-00			CAP, FXD, CER DI: 1000PF, 10%, 50V	04222	1206A102KAT050
A5C2090	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C2100	283-5003-00			CAP, FXD, CER DI: 0.01UF, 10%, 50V	0FDX0	W1206X103K2B04
A5C2120	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C2130	283-5005-00			CAP, FXD, CER DI: 4PF, + /-0.25PF, 50V	54583	C3216COG1H040C
A5C2131	283-5107-00			CAP, FXD, CER DI: 22PF, 5%, 100V	04222	W1206C220J3B04
A5C2140	283-5105-00			CAP, FXD, CER DI: 1UF, + 80/-20%, 50V	0FDX0	W1825Z105Z2B04
A5C2150	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C2151	283-5004-00			CAP, FXD, CER DI: 0.1UF, 10%, 25V	0FDX0	W1206X104K1B01
A5C2152	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C2160	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C2161	283-5004-00			CAP, FXD, CER DI: 0.1UF, 10%, 25V	0FDX0	W1206X104K1B01
A5C3020	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C3021	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C3030	283-5025-00			CAP, FXD, CER DI: 220PF, 5%, 50V	54583	C3216COG1H221J
A5C3031	283-5113-00			CAP, FXD, CER DI: 0.047UF, 10%, 50V, X7R, 1206 PKT	0FDX0	W1206X473K2B04
A5C3040	290-5039-00			CAP, FXD, ELECTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A5C3041	290-5039-00			CAP, FXD, ELECTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A5C3080	283-5002-00			CAP, FXD, CER DI: 1000PF, 10%, 50V	04222	1206A102KAT050
A5C3090	283-5002-00			CAP, FXD, CER DI: 1000PF, 10%, 50V	04222	1206A102KAT050
A5C3120	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C3130	283-5004-00			CAP, FXD, CER DI: 0.1UF, 10%, 25V	0FDX0	W1206X104K1B01
A5C3131	283-5005-00			CAP, FXD, CER DI: 4PF, + /-0.25PF, 50V	54583	C3216COG1H040C
A5C3140	283-5105-00			CAP, FXD, CER DI: 1UF, + 80/-20%, 50V	0FDX0	W1825Z105Z2B04
A5C3141	283-5005-00			CAP, FXD, CER DI: 4PF, + /-0.25PF, 50V	54583	C3216COG1H040C
A5C3150	283-5005-00			CAP, FXD, CER DI: 4PF, + /-0.25PF, 50V	54583	C3216COG1H040C
A5C3151	283-5105-00			CAP, FXD, CER DI: 1UF, + 80/-20%, 50V	0FDX0	W1825Z105Z2B04
A5C3170	283-5105-00			CAP, FXD, CER DI: 1UF, + 80/-20%, 50V	0FDX0	W1825Z105Z2B04
A5C3240	283-5000-00			CAP, FXD, CER DI: 10PF, 5%, 50V	04222	W1206C100J2B04
A5C4010	290-5039-00			CAP, FXD, ELECTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A5C4030	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C4031	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C4032	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C4040	283-5011-00			CAP, FXD, CER DI: 33PF, 5%, 50V	54583	C3216COG1H330J
A5C4041	283-5022-00			CAP, FXD, CER DI: 47PF, 5%, 50V	54583	C3216COG1H470J
A5C4042	283-5011-00			CAP, FXD, CER DI: 33PF, 5%, 50V	54583	C3216COG1H330J
A5C4043	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C4050	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C4051	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C4080	283-5000-00			CAP, FXD, CER DI: 10PF, 5%, 50V	04222	CC1206COG100J10
A5C4090	283-5002-00			CAP, FXD, CER DI: 1000PF, 10%, 50V	04222	1206A102KAT050
A5C4091	283-5000-00			CAP, FXD, CER DI: 10PF, 5%, 50V	04222	CC1206COG100J10
A5C4092	283-5000-00			CAP, FXD, CER DI: 10PF, 5%, 50V	04222	CC1206COG100J10
A5C4100	283-5002-00			CAP, FXD, CER DI: 1000PF, 10%, 50V	04222	1206A102KAT050
A5C4101	283-5000-00			CAP, FXD, CER DI: 10PF, 5%, 50V	04222	CC1206COG100J10
A5C4120	283-5000-00			CAP, FXD, CER DI: 10PF, 5%, 50V	04222	CC1206COG100J10
A5C4121	283-5002-00			CAP, FXD, CER DI: 1000PF, 10%, 50V	04222	1206A102KAT050
A5C4160	283-5039-00			CAP, FXD, ELECTLT: 10UF, 35V	1W344	MVK35VC10RM5TP

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A5C4161	283-5027-00			CAP, FXD, CER DI: 470PF, 5%, 50V	54583	C3216COG1H471J
A5C4080	283-5000-00			CAP, FXD, CER DI: 10PF, 5%, 50V	54583	C3216X7R1H333K
A5C4180	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C4181	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C4190	290-5039-00			CAP, FXD, ELECTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A5C5040	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C5090	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C5150	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C5160	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C5161	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C5162	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C5170	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C5171	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C5172	283-5049-00			CAP, VXD, CER DI: 180PF, 5%, 50V	54583	C3216COG1H181J
A5C5173	290-5039-00			CAP, FXD, ELECTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A5C5180	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C5181	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C5190	283-5002-00			CAP, FXD, CER DI: 1000PF, 10%, 50V	04222	1206A102KAT050
A5C5191	283-5002-00			CAP, FXD, CER DI: 1000PF, 10%, 50V	04222	1206A102KAT050
A5C6020	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C6021	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C6030	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C6031	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C6032	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C6040	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C6041	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C6042	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C6043	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C6050	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C6051	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C6100	290-5039-00			CAP, FXD, ELECTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A5C6101	283-5015-00			CAP, FXD, CER DI: 3300PF, 10%, 50V	54583	C3216X7R1H332K
A5C6102	283-5004-00			CAP, FXD, CER DI: 0.1UF, 10%, 25V	0FDX0	W1206X104K1B01
A5C6110	283-5015-00			CAP, FXD, CER DI: 3300PF, 10%, 50V	54583	C3216X7R1H332K
A5C6111	290-5039-00			CAP, FXD, ELECTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A5C6130	283-5010-00			CAP, FXD, CER DI: 0.22UF, 10%, 25V	54583	C3225X7R1E224K
A5C6131	283-5105-00			CAP, FXD, CER DI: 1UF, + 80/-20%, 50V	0FDX0	W1825Z105Z2B04
A5C6140	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C6141	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C6150	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C6170	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C6171	283-5000-00			CAP, FXD, CER DI: 10PF, 5%, 50V	04222	CC1206COG100J10
A5C6172	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C6180	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C7020	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C7021	290-5039-00			CAP, FXD, ELECTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A5C7022	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C7030	283-5050-00			CAP, FXD, CER DI: 560PF, 5%, 50V	54583	C3216COG1H561J
A5C7040	283-5003-00			CAP, FXD, CER DI: 0.01UF, 10%, 50V	0FDX0	W1206X103K2B04
A5C7041	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C7042	290-5039-00			CAP, FXD, ELECTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A5C7070	283-5000-00			CAP, FXD, CER DI: 10PF, 5%, 50V	04222	CC1206COG100J10
A5C7071	283-5002-00			CAP, FXD, CER DI: 1000PF, 10%, 50V	04222	1206A102KAT050
A5C7080	283-5000-00			CAP, FXD, CER DI: 10PF, 5%, 50V	04222	CC1206COG100J10
A5C7081	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C7090	283-5002-00			CAP, FXD, CER DI: 1000PF, 10%, 50V	04222	1206A102KAT050
A5C7091	290-5039-00			CAP, FXD, ELECTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A5C7092	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C7100	283-5004-00			CAP, FXD, CER DI: 0.1UF, 10%, 25V	0FDX0	W1206X104K1B01
A5C7101	283-5004-00			CAP, FXD, CER DI: 0.1UF, 10%, 25V	0FDX0	W1206X104K1B01
A5C7102	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C7110	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C7111	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C7112	290-5039-00			CAP, FXD, ELECTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A5C7130	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C7131	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C7150	290-5039-00			CAP, FXD, ELECTLT: 10UF, 35V	1W344	MVK35VC10RM5TP

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A5C7151	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C7170	290-5039-00			CAP, FXD, ELECTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A5C7171	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C7190	283-5004-00			CAP, FXD, CER DI: 0.1UF, 10%, 25V	0FDX0	W1206X104K1B01
A5C8020	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C8030	283-5050-00			CAP, FXD, CER DI: 560PF, 5%, 50V	54583	C3216COG1H561J
A5C8031	283-5003-00			CAP, FXD, CER DI: 0.01UF, 10%, 50V	0FDX0	W1206X103K2B04
A5C8032	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C8033	290-5039-00			CAP, FXD, ELECTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A5C8040	283-5042-00			CAP, FXD, CER DI: 27PF, 5%, 50V	29454	101R18N270JW4-T
A5C8041	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C8042	290-5039-00			CAP, FXD, ELECTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A5C8043	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C8050	283-5025-00			CAP, FXD, CER DI: 220PF, 5%, 50V	54583	C3216COG1H221J
A5C8080	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C8090	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C8100	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C8110	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C8120	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C8160	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C8180	290-5039-00			CAP, FXD, ELECTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A5C8190	290-5039-00			CAP, FXD, ELECTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A5C9070	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C9080	283-5002-00			CAP, FXD, CER DI: 1000PF, 10%, 50V	04222	1206A102KAT050
A5C9090	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C9100	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C9110	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5C9120	283-5018-00			CAP, FXD, CER DI: 0.033UF, 10%, 50V	54583	C3216X7R1H333K
A5CR4170	152-5018-00			DIODE, SIG:, ULTRA FAST; 100V, 0.74VF, 4NS, 2.0PF	27014	FDSO1203.SA
A5CR5020	152-5018-00			DIODE, SIG:, ULTRA FAST; 100V, 0.74VF, 4NS, 2.0PF	27014	FDSO1203.SA
A5CR5170	152-5018-00			DIODE, SIG:, ULTRA FAST; 100V, 0.74VF, 4NS, 2.0PF	27014	FDSO1203.SA
A5CR7020	152-5018-00			DIODE, SIG:, ULTRA FAST; 100V, 0.74VF, 4NS, 2.0PF	27014	FDSO1203.SA
A5CR8040	152-5018-00			DIODE, SIG:, ULTRA FAST; 100V, 0.74VF, 4NS, 2.0PF	27014	FDSO1203.SA
A5CR8120	152-5018-00			DIODE, SIG:, ULTRA FAST; 100V, 0.74VF, 4NS, 2.0PF	27014	FDSO1203.SA
A5J1011	136-0252-07			SOCKET, PIN CONN: SINGLE, PCB, 0.030 H, 0.054	22526	75060-012
A5J1180	136-0252-07			SOCKET, PIN CONN: SINGLE, PCB, 0.030 H, 0.054	22526	75060-012
A5J5140	136-0252-07			SOCKET, PIN CONN: SINGLE, PCB, 0.030 H, 0.054	22526	75060-012
A5J5190	131-1857-00			TERM SET, PIN: HDR, PCB, MALE, STR, 1 X 36, 0.1 CTR	58050	082-3644-SS10
A5J9010	136-0252-07			SOCKET, PIN CONN: SINGLE, PCB, T/G, 0.030 H, 0.054	22526	75060-012
A5JG1011	131-1003-00			CONN, RCPT, ELEC: CKT BD MT, 3 PRONG	80009	131-1003-00
A5JG1180	131-1003-00			CONN, RCPT, ELEC: CKT BD MT, 3 PRONG	80009	131-1003-00
A5JG5140	131-1003-00			CONN, RCPT, ELEC: CKT BD MT, 3 PRONG	80009	131-1003-00
A5JG9010	131-1003-00			CONN, RCPT, ELEC: CKT BD MT, 3 PRONG	80009	131-1003-00
A5K2180	148-0198-00			RELAY, REED: DPDT, 98 OHMS, 6V	11532	712-6
A5K3180	148-0198-00			RELAY, REED: DPDT, 98 OHMS, 6V	11532	712-6
A5L2080	108-5013-00			COIL, RF: FXD, 40NH, + /-10%, Q= 35, SRF 900 MHZ	02113	1008CT-400XK2A
A5L2130	108-5030-00			COIL, RF: FXD, 100NH, + /-10%, Q= 25, SRF 950 MHZ	02113	1008CS-101XK2A
A5L2131	108-5073-00			COIL, RF: FXD, 8NH, + /-10%, Q =50, SRF 900 MHZ	02113	1008CT-080XK2A
A5L2140	108-5030-00			COIL, RF: FXD, 100NH, + /-10%, Q= 25, SRF 950 MHZ	02113	1008CS-101XK2A
A5L2150	108-5083-00			COIL, RF: FXD, 0.018UH, 20%, Q =21, SRF 190 MHZ	80009	108-5083-00
A5L2151	108-5097-00			COIL, RF: FXD, 56NH, 10%, SMD	02113	1008CS-560-XK2
A5L2160	108-5030-00			COIL, RF: FXD, 100NH, + /-10%, Q= 25, SRF 950 MHZ	02113	1008CS-101XK2A
A5L2161	108-5013-00			COIL, RF: FXD, 40NH, + /-10%, Q= 35, SRF 900 MHZ	02113	1008CT-400XK2A
A5L2170	108-5058-00			COIL, RF: FXD, 680UH, + /-10%, Q =30, SRF 3.0	54583	NL453232T-681K
A5L3090	108-5013-00			COIL, RF: FXD, 40NH, + /-10%, Q= 35, SRF 900 MHZ	02113	1008CT-400XK2A
A5L3130	108-5028-00			COIL, RF: FXD, 30NH, + /-5%, Q =35, SRF 900 MHZ	02113	1008CT-300XJ2A
A5L3131	108-5073-00			COIL, RF: FXD, 8NH, + /-10%, Q =50, SRF 900 MHZ	02113	1008CT-080XK2A
A5L3140	108-5083-00			COIL, RF: FXD, 0.018UH, 20%, Q =21, SRF 190 MHZ	02113	1008CT-080XK2A
A5L3141	108-5073-00			COIL, RF: FXD, 8NH, + /-10%, Q =50, SRF 900 MHZ	02113	1008CT-080XK2A
A5L3150	108-5073-00			COIL, RF: FXD, 8NH, + /-10%, Q =50, SRF 900 MHZ	02113	1008CT-080XK2A
A5L3151	108-5073-00			COIL, RF: FXD, 8NH, + /-10%, Q =50, SRF 900 MHZ	02113	1008CT-080XK2A
A5L3170	108-5020-00			COIL, RF: FXD, 270NH, + /-5%, Q= 28, SRF 550 MHZ	02113	1008CS-271XJ2A
A5L3171	108-5073-00			COIL, RF: FXD, 8NH, + /-10%, Q =50, SRF 900 MHZ	02113	1008CT-080XK2A
A5L4040	108-5013-00			COIL, RF: FXD, 40NH, + /-10%, Q= 35, SRF 900 MHZ	02113	1008CT-400XK2A
A5L4041	108-5013-00			COIL, RF: FXD, 40NH, + /-10%, Q= 35, SRF 900 MHZ	02113	1008CT-400XK2A
A5L4042	108-5084-00			COIL, RF: FERRITE CHIP BEAD, 0.087 RDC 400 MA	45835	HF70ACB322513T
A5L4050	108-5084-00			COIL, RF: FERRITE CHIP BEAD, 0.087 RDC 400 MA	45835	HF70ACB322513T

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A5L4051	108-5020-00			COIL, RF: FXD, 270NH, + /-5%, Q= 28, SRF 550 MHZ	02113	1008CS-271XJ2A
A5L4100	108-5083-00			COIL, RF: FXD, 0.018UH, 20%, Q =21, SRF 190 MHZ	80009	108-5083-00
A5L4120	108-5083-00			COIL, RF: FXD, 0.018UH, 20%, Q =21, SRF 190 MHZ	80009	108-5083-00
A5L5010	108-5084-00			COIL, RF: FERRITE CHIP BEAD, 0.087 RDC 400 MA	45835	HF70ACB322513T
A5L6150	108-5084-00			COIL, RF: FERRITE CHIP BEAD, 0.087 RDC 400 MA	45835	HF70ACB322513T
A5L7030	108-5084-00			COIL, RF: FERRITE CHIP BEAD, 0.087 RDC 400 MA	45835	HF70ACB322513T
A5L7170	108-5084-00			COIL, RF: FERRITE CHIP BEAD, 0.087 RDC 400 MA	45835	HF70ACB322513T
A5L8020	108-5084-00			COIL, RF: FERRITE CHIP BEAD, 0.087 RDC 400 MA	45835	HF70ACB322513T
A5L8170	108-5084-00			COIL, RF: FERRITE CHIP BEAD, 0.087 RDC 400 MA	45835	HF70ACB322513T
A5L8190	108-5084-00			COIL, RF: FERRITE CHIP BEAD, 0.087 RDC 400 MA	45835	HF70ACB322513T
A5P5100	131-4822-00			CONN, RCPT, ELEC: BOX, PCB, FEMALE, RTANG, 2 X 20	00779	1-102585-2
A5Q1150	151-5000-00			TRANSISTOR, SIG: BIPOLAR, PNP; 40V, 200MA, 250MHZ	04713	MMBT3906LT1
A5Q2130	151-5000-00			TRANSISTOR, SIG: BIPOLAR, PNP; 40V, 200MA, 250MHZ	04713	MMBT3906LT1
A5Q2160	151-5000-00			TRANSISTOR, SIG: BIPOLAR, PNP; 40V, 200MA, 250MHZ	04713	MMBT3906LT1
A5Q3130	151-5010-00			TRANSISTOR, SIG: BIPOLAR, NPN; 12V, 200MA, 6.5 GHZ	62104	NE85634T2
A5Q3140	151-5010-00			TRANSISTOR, SIG: BIPOLAR, NPN; 12V, 200MA, 6.5 GHZ	62104	NE85634T2
A5Q3160	151-5010-00			TRANSISTOR, SIG: BIPOLAR, NPN; 12V, 200MA, 6.5 GHZ	62104	NE85634T2
A5Q3161	151-5010-00			TRANSISTOR, SIG: BIPOLAR, NPN; 12V, 200MA, 6.5 GHZ	62104	NE85634T2
A5Q4170	151-5001-00			TRANSISTOR, SIG: BIPOLAR, NPN; 40V, 200MA, 300MHZ	04713	MMBT3904T1/T2
A5Q4171	151-5000-00			TRANSISTOR, SIG: BIPOLAR, PNP; 40V, 200MA, 250MHZ	04713	MMBT3906LT1
A5Q5180	151-5002-00			TRANSISTOR, SIG: JFET, N-CHANNEL	04713	MMBF4392LT1
A5Q6180	151-5001-00			TRANSISTOR, SIG: BIPOLAR, NPN; 40V, 200MA, 300MHZ	04713	MMBT3904T1/T2
A5Q7180	151-5001-00			TRANSISTOR, SIG: BIPOLAR, NPN; 40V, 200MA, 300MHZ	04713	MMBT3904T1/T2
A5Q7190	151-5045-00			TRANSISTOR, PWR: MOS, P-CH; 50V, 4A, 0.6 OHM	04713	MTD4P05RL
A5R1070	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R1080	321-5016-00			RES, FXD, FILM: 681 OHM, 1%, 0.125W	91637	CRCW12066810FT
A5R1081	321-5016-00			RES, FXD, FILM: 681 OHM, 1%, 0.125W	91637	CRCW12066810FT
A5R1082	321-5016-00			RES, FXD, FILM: 681 OHM, 1%, 0.125W	91637	CRCW12066810FT
A5R1100	321-5008-00			RES, FXD, FILM: 150 OHM, 1%, 0.125W	91637	CRCW12061500FT
A5R1120	321-5032-00			RES, FXD, FILM: 15.0K, 1%, 0.125W	91637	CRCW12061502FT
A5R1130	321-5006-00			RES, FXD, FILM: 100 OHM, 1%, 0.125W	91637	CRCW12061000FT
A5R1131	321-5044-00			RES, FXD, FILM: 56.2 OHM, 1%, 0.125W	91637	CRCW120656R2FT
A5R1132	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R1140	321-5006-00			RES, FXD, FILM: 100 OHM, 1%, 0.125W	91637	CRCW12061000FT
A5R1150	321-5002-00			RES, FXD, FILM: 15 OHM, 1%, 0.125W	91637	CRCW120615R0FT
A5R1151	321-5027-00			RES, FXD, FILM: 5.62K, 1%, 0.125W	91637	CRCW12065621FT
A5R1152	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R1160	321-5002-00			RES, FXD, FILM: 15 OHM, 1%, 0.125W	91637	CRCW120615R0FT
A5R1161	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R1162	321-5005-00			RES, FXD, FILM: 27.4 OHM, 1%, 0.125W	91637	CRCW120627R4FT
A5R1163	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R1170	321-5007-00			RES, FXD, FILM: 121 OHM, 1%, 0.125W	91637	CRCW12061210FT
A5R1171	321-5014-00			RES, FXD, FILM: 475 OHM, 1%, 0.125W	91637	CRCW12064750FT
A5R2020	321-5015-00			RES, FXD, FILM: 562 OHM, 1%, 0.125W	91637	CRCW12065620FT
A5R2030	321-5015-00			RES, FXD, FILM: 562 OHM, 1%, 0.125W	91637	CRCW12065620FT
A5R2031	321-5046-00			RES, FXD, FILM: 82.5 OHM, 1%, 0.125W	91637	CRCW120682R5FT
A5R2032	321-5017-00			RES, FXD, FILM: 825 OHM, 1%, 0.125W	91637	CRCW12068250FT
A5R2033	321-5017-00			RES, FXD, FILM: 825 OHM, 1%, 0.125W	91637	CRCW12068250FT
A5R2034	321-5046-00			RES, FXD, FILM: 82.5 OHM, 1%, 0.125W	91637	CRCW120682R5FT
A5R2040	321-5017-00			RES, FXD, FILM: 825 OHM, 1%, 0.125W	91637	CRCW12068250FT
A5R2041	321-5046-00			RES, FXD, FILM: 82.5 OHM, 1%, 0.125W	91637	CRCW120682R5FT
A5R2042	321-5019-00			RES, FXD, FILM: 1.21K OHM, 1%, 0.125W	91637	CRCW12061211FT
A5R2050	321-5014-00			RES, FXD, FILM: 475 OHM, 1%, 0.125W	91637	CRCW12064750FT
A5R2051	321-5012-00			RES, FXD, FILM: 332 OHM, 1%, 0.125W	91637	CRCW12063320FT
A5R2052	321-5004-00			RES, FXD, FILM: 22.1 OHM, 1%, 0.125W	91637	CRCW120622R1FT
A5R2080	321-5011-00			RES, FXD, FILM: 274 OHM, 1%, 0.125W	91637	CRCW12062740FT
A5R2081	321-5045-00			RES, FXD, FILM: 68.1 OHM, 1%, 0.125W	91637	CRCW120668R1FT
A5R2082	321-5045-00			RES, FXD, FILM: 68.1 OHM, 1%, 0.125W	91637	CRCW120668R1FT
A5R2090	321-5016-00			RES, FXD, FILM: 681 OHM, 1%, 0.125W	91637	CRCW12066810FT
A5R2091	321-5016-00			RES, FXD, FILM: 681 OHM, 1%, 0.125W	91637	CRCW12066810FT
A5R2092	321-5016-00			RES, FXD, FILM: 681 OHM, 1%, 0.125W	91637	CRCW12066810FT
A5R2100	321-5006-00			RES, FXD, FILM: 100 OHM, 1%, 0.125W	91637	CRCW12061000FT
A5R2101	321-5011-00			RES, FXD, FILM: 274 OHM, 1%, 0.125W	91637	CRCW12062740FT
A5R2102	321-5011-00			RES, FXD, FILM: 274 OHM, 1%, 0.125W	91637	CRCW12062740FT
A5R2103	321-5003-00			RES, FXD, FILM: 18.2 OHM, 1%, 0.125W	91637	CRCW120618R2FT
A5R2110	321-5011-00			RES, FXD, FILM: 274 OHM, 1%, 0.125W	91637	CRCW12062740FT
A5R2111	321-5003-00			RES, FXD, FILM: 18.2 OHM, 1%, 0.125W	91637	CRCW120618R2FT

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A5R2113	321-5011-00			RES, FXD, FILM: 274 OHM, 1%, 0.125W	91637	CRCW12062740FT
A5R2120	321-5036-00			RES, FXD, FILM: 33.2K OHM, 1%, 0.125W	91637	CRCW12063322FT
A5R2121	321-5027-00			RES, FXD, FILM: 5.62K, 1%, 0.125W	91637	CRCW12065621FT
A5R2130	321-5002-00			RES, FXD, FILM: 15 OHM, 1%, 0.125W	91637	CRCW120615R0FT
A5R2131	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R2132	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A5R2140	321-5044-00			RES, FXD, FILM: 56.2 OHM, 1%, 0.125W	91637	CRCW120656R2FT
A5R2141	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A5R2142	321-5011-00			RES, FXD, FILM: 274 OHM, 1%, 0.125W	91637	CRCW12062740FT
A5R2150	321-5036-00			RES, FXD, FILM: 33.2K OHM, 1%, 0.125W	91637	CRCW12063322FT
A5R2152	321-5007-00			RES, FXD, FILM: 121 OHM, 1%, 0.125W	91637	CRCW12061210FT
A5R2153	321-5032-00			RES, FXD, FILM: 15.0K, 1%, 0.125W	91637	CRCW12061502FT
A5R2160	321-5006-00			RES, FXD, FILM: 100 OHM, 1%, 0.125W	91637	CRCW12061000FT
A5R2161	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A5R2162	321-5009-00			RES, FXD, FILM: 182 OHM, 1%, 0.125W	91637	CRCW12061820FT
A5R2163	321-5028-00			RES, FXD, FILM: 6.81K OHM, 1%, 0.125W	91637	CRCW12066811FT
A5R2164	321-5033-00			RES, FXD, FILM: 18.2K OHM, 1%, 0.125W	91637	CRCW12061822FT
A5R2170	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A5R2171	321-5009-00			RES, FXD, FILM: 182 OHM, 1%, 0.125W	91637	CRCW12061820FT
A5R2172	321-5029-00			RES, FXD, FILM: 8.25K OHM, 1%, 0.125W	91637	CRCW12068251FT
A5R2173	321-5009-00			RES, FXD, FILM: 182 OHM, 1%, 0.125W	91637	CRCW12061820FT
A5R2174	321-5007-00			RES, FXD, FILM: 121 OHM, 1%, 0.125W	91637	CRCW12061210FT
A5R2175	321-5014-00			RES, FXD, FILM: 475 OHM, 1%, 0.125W	91637	CRCW12064750FT
A5R2176	321-5046-00			RES, FXD, FILM: 82.5 OHM, 1%, 0.125W	91637	CRCW120682R5FT
A5R2177	321-5014-00			RES, FXD, FILM: 475 OHM, 1%, 0.125W	91637	CRCW12064750FT
A5R3020	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A5R3021	321-5015-00			RES, FXD, FILM: 562 OHM, 1%, 0.125W	91637	CRCW12065620FT
A5R3030	321-5036-00			RES, FXD, FILM: 33.2K OHM, 1%, 0.125W	91637	CRCW12063322FT
A5R3031	321-5015-00			RES, FXD, FILM: 562 OHM, 1%, 0.125W	91637	CRCW12065620FT
A5R3032	321-5038-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW12064752FT
A5R3033	321-5017-00			RES, FXD, FILM: 825 OHM, 1%, 0.125W	91637	CRCW12068250FT
A5R3034	321-5046-00			RES, FXD, FILM: 82.5 OHM, 1%, 0.125W	91637	CRCW120682R5FT
A5R3040	321-5004-00			RES, FXD, FILM: 22.1 OHM, 1%, 0.125W	91637	CRCW120622R1FT
A5R3041	321-5004-00			RES, FXD, FILM: 22.1 OHM, 1%, 0.125W	91637	CRCW120622R1FT
A5R3050	321-5011-00			RES, FXD, FILM: 274 OHM, 1%, 0.125W	91637	CRCW12062740FT
A5R3070	321-5043-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW120647R5FT
A5R3071	321-5008-00			RES, FXD, FILM: 150 OHM, 1%, 0.125W	91637	CRCW12061500FT
A5R3072	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R3073	321-5043-00			RES, FXD, FILM: 47.5 OHM, 1%, 0.125W	91637	CRCW120647R5FT
A5R3074	321-5001-00			RES, FXD, FILM: 12.1 OHM, 1%, 0.125W	91637	CRCW120612R1FT
A5R3081	321-5043-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW120647R5FT
A5R3090	321-5008-00			RES, FXD, FILM: 150 OHM, 1%, 0.125W	91637	CRCW12061500FT
A5R3091	321-5042-00			RES, FXD, FILM: 39.2 OHM, 1%, 0.125W	91637	CRCW120639R2FT
A5R3092	321-5008-00			RES, FXD, FILM: 150 OHM, 1%, 0.125W	91637	CRCW12061500FT
A5R3130	321-5007-00			RES, FXD, FILM: 121 OHM, 1%, 0.125W	91637	CRCW12061210FT
A5R3131	321-5011-00			RES, FXD, FILM: 274 OHM, 1%, 0.125W	91637	CRCW12062740FT
A5R3140	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R3160	321-5004-00			RES, FXD, FILM: 22.1 OHM, 1%, 0.125W	91637	CRCW120622R1FT
A5R3161	321-5004-00			RES, FXD, FILM: 22.1 OHM, 1%, 0.125W	91637	CRCW120622R1FT
A5R3170	321-5029-00			RES, FXD, FILM: 8.25K OHM, 1%, 0.125W	91637	CRCW12068251FT
A5R3171	321-5009-00			RES, FXD, FILM: 182 OHM, 1%, 0.125W	91637	CRCW12061820FT
A5R3172	321-5012-00			RES, FXD, FILM: 332 OHM, 1%, 0.125W	91637	CRCW12063320FT
A5R3173	321-5050-00			RES, FXD, FILM: 33.2K OHM, 1%, 0.125W	91637	CRCW120633R2FT
A5R4020	321-5015-00			RES, FXD, FILM: 562 OHM, 1%, 0.125W	91637	CRCW12065620FT
A5R4030	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A5R4031	321-5043-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW120647R5FT
A5R4080	321-5043-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW120647R5FT
A5R4081	321-5046-00			RES, FXD, FILM: 82.5 OHM, 1%, 0.125W	91637	CRCW120682R5FT
A5R4082	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R4083	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R4090	321-5011-00			RES, FXD, FILM: 274 OHM, 1%, 0.125W	91637	CRCW12062740FT
A5R4091	321-5003-00			RES, FXD, FILM: 18.2 OHM, 1%, 0.125W	91637	CRCW120618R2FT
A5R4092	321-5011-00			RES, FXD, FILM: 274 OHM, 1%, 0.125W	91637	CRCW12062740FT
A5R4100	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R4101	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R4120	321-5004-00			RES, FXD, FILM: 22.1 OHM, 1%, 0.125W	91637	CRCW120622R1FT
A5R4121	321-5004-00			RES, FXD, FILM: 22.1 OHM, 1%, 0.125W	91637	CRCW120622R1FT

Component Number	Tektronix Part Number	Serial No. Effective	Dscont	Name & Description	Mfr. Code	Mfr.Part No.
A5R4122	321-5004-00			RES, FXD, FILM: 22.1 OHM, 1%, 0.125W	91637	CRCW120622R1FT
A5R4123	321-5004-00			RES, FXD, FILM: 22.1 OHM, 1%, 0.125W	91637	CRCW120622R1FT
A5R4124	321-5004-00			RES, FXD, FILM: 22.1 OHM, 1%, 0.125W	91637	CRCW120622R1FT
A5R4125	321-5004-00			RES, FXD, FILM: 22.1 OHM, 1%, 0.125W	91637	CRCW120622R1FT
A5R4160	321-5006-00			RES, FXD, FILM: 100 OHM, 1%, 0.125W	91637	CRCW12061000FT
A5R4170	321-5038-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW12064752FT
A5R4171	321-5038-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW12064752FT
A5R4172	321-5030-00			RES, FXD, FILM: 10.0K OHM, 1%, 0.125W	91637	CRCW12061002FT
A5R4173	321-5040-00			RES, FXD, FILM: 68.1K OHM, 1%, 0.125W	91637	CRCW12066812FT
A5R4174	321-5013-00			RES, FXD, FILM: 392 OHM, 1%, 0.125W	91637	CRCW12063920FT
A5R4175	321-5049-00			RES, FXD, FILM: 1 MEG, 1%, 0.125W	91637	CRCW1206-1004FT
A5R4176	321-5027-00			RES, FXD, FILM: 5.62K, 1%, 0.125W	91637	CRCW12065621FT
A5R4177	321-5031-00			RES, FXD, FILM: 12.1K OHM, 1%, 0.125W	91637	CRCW12061212FT
A5R4178	321-5026-00			RES, FXD, FILM: 4.75K OHM, 1%, 0.125W	91637	CRCW12064751FT
A5R4180	321-5038-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW12064752FT
A5R4181	321-5047-00			RES, FXD, FILM: 100K OHM, 1%, 0.125W	91637	CRCW12061003FT
A5R4182	321-5047-00			RES, FXD, FILM: 100K OHM, 1%, 0.125W	91637	CRCW12061003FT
A5R4183	321-5039-00			RES, FXD, FILM: 56.2K OHM, 1%, 0.125W	91637	CRCW12065622FT
A5R4184	321-5027-00			RES, FXD, FILM: 5.62K, 1%, 0.125W	91637	CRCW12065621FT
A5R4190	321-5048-00			RES, FXD, FILM: 33.2K OHM, 1%, 0.125W	91637	CRCW12063323FT
A5R5030	321-5015-00			RES, FXD, FILM: 562 OHM, 1%, 0.125W	91637	CRCW12065620FT
A5R5070	321-5011-00			RES, FXD, FILM: 274 OHM, 1%, 0.125W	91637	CRCW12062740FT
A5R5090	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R5091	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R5120	321-5013-00			RES, FXD, FILM: 392 OHM, 1%, 0.125W	91637	CRCW12063920FT
A5R5130	321-5015-00			RES, FXD, FILM: 562 OHM, 1%, 0.125W	91637	CRCW12065620FT
A5R5131	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R5132	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R5133	321-5038-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW12064752FT
A5R5134	321-5015-00			RES, FXD, FILM: 562 OHM, 1%, 0.125W	91637	CRCW12065620FT
A5R5150	321-5022-00			RES, FXD, FILM: 2.21K OHM, 1%, 0.125W	91637	CRCW12062211FT
A5R5151	321-5025-00			RES, FXD, FILM: 3.92K OHM, 1%, 0.125W	91637	CRCW12063921FT
A5R5152	321-5034-00			RES, FXD, FILM: 22.1K, OHM 1%, 0.125W	91637	CRCW12062212FT
A5R5160	321-5043-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW120647R5FT
A5R5170	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R5171	321-5025-00			RES, FXD, FILM: 3.92K OHM, 1%, 0.125W	91637	CRCW12063921FT
A5R5172	321-5047-00			RES, FXD, FILM: 100K OHM, 1%, 0.125W	91637	CRCW12061003FT
A5R5173	321-5024-00			RES, FXD, FILM: 3.32K OHM, 1%, 0.125W	91637	CRCW12063321FT
A5R5174	321-5038-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW12064752FT
A5R5175	321-5049-00			RES, FXD, FILM: 1 MEG, 1%, 0.125W	91637	CRCW1206-1004FT
A5R5176	321-5049-00			RES, FXD, FILM: 1 MEG, 1%, 0.125W	91637	CRCW1206-1004FT
A5R5177	321-5041-00			RES, FXD, FILM: 82.5 OHM, 1%, 0.125W	91637	CRCW12068252FT
A5R5178	321-5036-00			RES, FXD, FILM: 33.2K OHM, 1%, 0.125W	91637	CRCW12063322FT
A5R5179	321-5039-00			RES, FXD, FILM: 56.2K OHM, 1%, 0.125W	91637	CRCW12065622FT
A5R5180	321-5031-00			RES, FXD, FILM: 12.1K OHM, 1%, 0.125W	91637	CRCW12061212FT
A5R5181	321-5038-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW12064752FT
A5R5182	321-5030-00			RES, FXD, FILM: 10.0K OHM, 1%, 0.125W	91637	CRCW12061002FT
A5R5183	321-5048-00			RES, FXD, FILM: 33.2K OHM, 1%, 0.125W	91637	CRCW12063323FT
A5R5184	321-5030-00			RES, FXD, FILM: 10.0K OHM, 1%, 0.125W	91637	CRCW12061002FT
A5R5185	321-5027-00			RES, FXD, FILM: 5.62K, 1%, 0.125W	91637	CRCW12065621FT
A5R5190	321-5048-00			RES, FXD, FILM: 33.2K OHM, 1%, 0.125W	91637	CRCW12063323FT
A5R5191	321-5045-00			RES, FXD, FILM: 68.1K, 1%, 0.125W	91637	CRCW120668R1FT
A5R5192	321-5045-00			RES, FXD, FILM: 68.1K, 1%, 0.125W	91637	CRCW120668R1FT
A5R6010	321-5015-00			RES, FXD, FILM: 562 OHM, 1%, 0.125W	91637	CRCW12065620FT
A5R6011	321-5015-00			RES, FXD, FILM: 562 OHM, 1%, 0.125W	91637	CRCW12065620FT
A5R6020	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A5R6021	321-5036-00			RES, FXD, FILM: 33.2K OHM, 1%, 0.125W	91637	CRCW12063322FT
A5R6030	321-5008-00			RES, FXD, FILM: 150 OHM, 1%, 0.125W	91637	CRCW12061500FT
A5R6031	321-5042-00			RES, FXD, FILM: 39.2 OHM, 1%, 0.125W	91637	CRCW120639R2FT
A5R6032	321-5008-00			RES, FXD, FILM: 150 OHM, 1%, 0.125W	91637	CRCW12061500FT
A5R6033	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R6040	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R6050	321-5011-00			RES, FXD, FILM: 274 OHM, 1%, 0.125W	91637	CRCW12062740FT
A5R6051	321-5003-00			RES, FXD, FILM: 18.2 OHM, 1%, 0.125W	91637	CRCW120618R2FT
A5R6052	321-5011-00			RES, FXD, FILM: 274 OHM, 1%, 0.125W	91637	CRCW12062740FT
A5R6060	321-5043-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW120647R5FT
A5R6061	321-5043-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW120647R5FT

Component Number	Tektronix Part Number	Serial No. Effective	Dscont	Name & Description	Mfr. Code	Mfr.Part No.
A5R6062	321-5043-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW120647R5FT
A5R6070	321-5043-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW120647R5FT
A5R6071	321-5010-00			RES, FXD, FILM: 221 OHM, 1%, 0.125W	91637	CRCW12062210FT
A5R6072	321-5043-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW120647R5FT
A5R6073	321-5011-00			RES, FXD, FILM: 274 OHM, 1%, 0.125W	91637	CRCW12062740FT
A5R6074	321-5011-00			RES, FXD, FILM: 274 OHM, 1%, 0.125W	91637	CRCW12062740FT
A5R6100	321-5043-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW120647R5FT
A5R6101	321-5013-00			RES, FXD, FILM: 392 OHM, 1%, 0.125W	91637	CRCW12063920FT
A5R6102	321-5023-00			RES, FXD, FILM: 2.74K OHM, 1%, 0.125W	91637	CRCW12062741FT
A5R6110	321-5013-00			RES, FXD, FILM: 392 OHM, 1%, 0.125W	91637	CRCW12063920FT
A5R6111	321-5023-00			RES, FXD, FILM: 2.74K OHM, 1%, 0.125W	91637	CRCW12062741FT
A5R6112	321-5030-00			RES, FXD, FILM: 10.0K OHM, 1%, 0.125W	91637	CRCW12061002FT
A5R6113	321-5030-00			RES, FXD, FILM: 10.0K OHM, 1%, 0.125W	91637	CRCW12061002FT
A5R6114	321-5014-00			RES, FXD, FILM: 475 OHM, 1%, 0.125W	91637	CRCW12064750FT
A5R6115	321-5022-00			RES, FXD, FILM: 2.21K OHM, 1%, 0.125W	91637	CRCW12062211FT
A5R6116	321-5047-00			RES, FXD, FILM: 100K OHM, 1%, 0.125W	91637	CRCW12061003FT
A5R6117	321-5043-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW120647R5FT
A5R6120	321-5013-00			RES, FXD, FILM: 392 OHM, 1%, 0.125W	91637	CRCW12063920FT
A5R6121	321-5036-00			RES, FXD, FILM: 33.2K OHM, 1%, 0.125W	91637	CRCW12063322FT
A5R6130	321-5015-00			RES, FXD, FILM: 562 OHM, 1%, 0.125W	91637	CRCW12065620FT
A5R6131	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R6132	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R6133	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R6134	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R6140	321-5015-00			RES, FXD, FILM: 562 OHM, 1%, 0.125W	91637	CRCW12065620FT
A5R6141	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R6142	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R6143	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R6150	321-5032-00			RES, FXD, FILM: 15.0K, 1%, 0.125W	91637	CRCW12061502FT
A5R6151	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R6160	321-5023-00			RES, FXD, FILM: 2.74K OHM, 1%, 0.125W	91637	CRCW12062741FT
A5R6161	321-5023-00			RES, FXD, FILM: 2.74K OHM, 1%, 0.125W	91637	CRCW12062741FT
A5R6162	321-5027-00			RES, FXD, FILM: 5.62K OHM, 1%, 0.125W	91637	CRCW12065621FT
A5R6163	321-5027-00			RES, FXD, FILM: 5.62K OHM, 1%, 0.125W	91637	CRCW12065621FT
A5R6170	321-5047-00			RES, FXD, FILM: 100K OHM, 1%, 0.125W	91637	CRCW12061003FT
A5R6171	321-5034-00			RES, FXD, FILM: 22.1K, OHM 1%, 0.125W	91637	CRCW12062212FT
A5R6172	321-5026-00			RES, FXD, FILM: 4.75K OHM, 1%, 0.125W	91637	CRCW12064751FT
A5R6173	321-5030-00			RES, FXD, FILM: 10.0K OHM, 1%, 0.125W	91637	CRCW12061002FT
A5R6174	321-5043-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW120647R5FT
A5R6180	321-5026-00			RES, FXD, FILM: 4.75K OHM, 1%, 0.125W	91637	CRCW12064751FT
A5R6181	321-5039-00			RES, FXD, FILM: 56.2K OHM, 1%, 0.125W	91637	CRCW12065622FT
A5R6182	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A5R6183	321-5026-00			RES, FXD, FILM: 4.75K OHM, 1%, 0.125W	91637	CRCW12064751FT
A5R6184	321-5032-00			RES, FXD, FILM: 15.0K OHM, 1%, 0.125W	91637	CRCW12061502FT
A5R7020	321-5015-00			RES, FXD, FILM: 562 OHM, 1%, 0.125W	91637	CRCW12065620FT
A5R7021	321-5015-00			RES, FXD, FILM: 562 OHM, 1%, 0.125W	91637	CRCW12065620FT
A5R7030	321-5021-00			RES, FXD, FILM: 1.82K OHM, 1%, 0.125W	91637	CRCW12061821FT
A5R7031	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R7040	321-5004-00			RES, FXD, FILM: 22.1 OHM, 1%, 0.125W	91637	CRCW120622R1FT
A5R7070	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R7071	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R7080	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R7081	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R7082	321-5011-00			RES, FXD, FILM: 274 OHM, 1%, 0.125W	91637	CRCW12062740FT
A5R7083	321-5003-00			RES, FXD, FILM: 18.2 OHM, 1%, 0.125W	91637	CRCW120618R2FT
A5R7084	321-5011-00			RES, FXD, FILM: 274 OHM, 1%, 0.125W	91637	CRCW12062740FT
A5R7090	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R7091	321-5022-00			RES, FXD, FILM: 2.21K OHM, 1%, 0.125W	91637	CRCW12062211FT
A5R7092	321-5004-00			RES, FXD, FILM: 22.1 OHM, 1%, 0.125W	91637	CRCW120622R1FT
A5R7100	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A5R7101	321-5035-00			RES, FXD, FILM: 27.4K OHM, 1%, 0.125W	91637	CRCW12062742FT
A5R7102	321-5030-00			RES, FXD, FILM: 10.0K OHM, 1%, 0.125W	91637	CRCW12061002FT
A5R7110	321-5043-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW120647R5FT
A5R7120	321-5027-00			RES, FXD, FILM: 5.62K OHM, 1%, 0.125W	91637	CRCW12065621FT
A5R7121	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R7122	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R7130	321-5015-00			RES, FXD, FILM: 562 OHM, 1%, 0.125W	91637	CRCW12065620FT

Component Number	Tektronix Part Number	Serial No. Effective	Dscont	Name & Description	Mfr. Code	Mfr.Part No.
A5R7140	321-5015-00			RES, FXD, FILM: 562 OHM, 1%, 0.125W	91637	CRCW12065620FT
A5R7141	321-5015-00			RES, FXD, FILM: 562 OHM, 1%, 0.125W	91637	CRCW12065620FT
A5R7142	321-5015-00			RES, FXD, FILM: 562 OHM, 1%, 0.125W	91637	CRCW12065620FT
A5R7143	321-5015-00			RES, FXD, FILM: 562 OHM, 1%, 0.125W	91637	CRCW12065620FT
A5R7144	321-5015-00			RES, FXD, FILM: 562 OHM, 1%, 0.125W	91637	CRCW12065620FT
A5R7150	321-5026-00			RES, FXD, FILM: 4.75K OHM, 1%, 0.125W	91637	CRCW12064751FT
A5R7151	321-5049-00			RES, FXD, FILM: 1 MEG, 1%, 0.125W	91637	CRCW1206-1004FT
A5R7160	321-5025-00			RES, FXD, FILM: 3.92K OHM, 1%, 0.125W	91637	CRCW12063921FT
A5R7161	321-5011-00			RES, FXD, FILM: 274 OHM, 1%, 0.125W	91637	CRCW12062740FT
A5R7162	321-5023-00			RES, FXD, FILM: 2.74K OHM, 1%, 0.125W	91637	CRCW12062741FT
A5R7163	321-5030-00			RES, FXD, FILM: 10.0K OHM, 1%, 0.125W	91637	CRCW12061002FT
A5R7164	321-5011-00			RES, FXD, FILM: 274 OHM, 1%, 0.125W	91637	CRCW12062740FT
A5R7165	321-5049-00			RES, FXD, FILM: 1 MEG, 1%, 0.125W	91637	CRCW1206-1004FT
A5R7166	321-5025-00			RES, FXD, FILM: 3.92K OHM, 1%, 0.125W	91637	CRCW12063921FT
A5R7167	321-5027-00			RES, FXD, FILM: 5.62K, 1%, 0.125W	91637	CRCW12065621FT
A5R7170	321-5043-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW120647R5FT
A5R7171	321-5043-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW120647R5FT
A5R7172	321-5026-00			RES, FXD, FILM: 4.75K OHM, 1%, 0.125W	91637	CRCW12064751FT
A5R7173	321-5030-00			RES, FXD, FILM: 10.0K OHM, 1%, 0.125W	91637	CRCW12061002FT
A5R7180	321-5049-00			RES, FXD, FILM: 1 MEG, 1%, 0.125W	91637	CRCW1206-1004FT
A5R7181	321-5025-00			RES, FXD, FILM: 3.92K OHM, 1%, 0.125W	91637	CRCW12063921FT
A5R7182	321-5011-00			RES, FXD, FILM: 274 OHM, 1%, 0.125W	91637	CRCW12062740FT
A5R7183	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A5R7184	321-5034-00			RES, FXD, FILM: 22.1K, OHM 1%, 0.125W	91637	CRCW12062212FT
A5R7185	321-5038-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW12064752FT
A5R8010	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A5R8011	321-5015-00			RES, FXD, FILM: 562 OHM, 1%, 0.125W	91637	CRCW12065620FT
A5R8021	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R8022	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R8023	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R8030	321-5038-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW12064752FT
A5R8031	321-5015-00			RES, FXD, FILM: 562 OHM, 1%, 0.125W	91637	CRCW12065620FT
A5R8032	321-5014-00			RES, FXD, FILM: 475 OHM, 1%, 0.125W	91637	CRCW12064750FT
A5R8033	321-5017-00			RES, FXD, FILM: 825 OHM, 1%, 0.125W	91637	CRCW12068250FT
A5R8034	321-5014-00			RES, FXD, FILM: 475 OHM, 1%, 0.125W	91637	CRCW12064750FT
A5R8035	321-5021-00			RES, FXD, FILM: 1.82K OHM, 1%, 0.125W	91637	CRCW12061821FT
A5R8036	321-5017-00			RES, FXD, FILM: 825 OHM, 1%, 0.125W	91637	CRCW12068250FT
A5R8040	321-5020-00			RES, FXD, FILM: 1.50K OHM, 1%, 0.125W	91637	CRCW12061501FT
A5R8041	321-5007-00			RES, FXD, FILM: 121 OHM, 1%, 0.125W	91637	CRCW12061210FT
A5R8080	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R8081	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R8082	321-5030-00			RES, FXD, FILM: 10.0K, 1%, 0.125W	91637	CRCW12061002FT
A5R8090	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R8091	321-5008-00			RES, FXD, FILM: 150 OHM, 1%, 0.125W	91637	CRCW12061500FT
A5R8092	321-5042-00			RES, FXD, FILM: 39.2 OHM, 1%, 0.125W	91637	CRCW120639R2FT
A5R8093	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R8100	321-5008-00			RES, FXD, FILM: 150 OHM, 1%, 0.125W	91637	CRCW12061500FT
A5R8101	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R8110	321-5015-00			RES, FXD, FILM: 562 OHM, 1%, 0.125W	91637	CRCW12065620FT
A5R8111	321-5043-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW120647R5FT
A5R8112	321-5010-00			RES, FXD, FILM: 221 OHM, 1%, 0.125W	91637	CRCW12062210FT
A5R8120	321-5030-00			RES, FXD, FILM: 10.0K OHM, 1%, 0.125W	91637	CRCW12061002FT
A5R8150	321-5026-00			RES, FXD, FILM: 4.75K OHM, 1%, 0.125W	91637	CRCW12064751FT
A5R8160	321-5030-00			RES, FXD, FILM: 10.0K OHM, 1%, 0.125W	91637	CRCW12061002FT
A5R9030	321-5004-00			RES, FXD, FILM: 22.1 OHM, 1%, 0.125W	91637	CRCW120622R1FT
A5R9040	321-5004-00			RES, FXD, FILM: 22.1 OHM, 1%, 0.125W	91637	CRCW120622R1FT
A5R9051	321-5020-00			RES, FXD, FILM: 1.50K, 1%, 0.125W	91637	CRCW12061501FT
A5R9052	321-5020-00			RES, FXD, FILM: 1.50K, 1%, 0.125W	91637	CRCW12061501FT
A5R9053	321-5020-00			RES, FXD, FILM: 1.50K, 1%, 0.125W	91637	CRCW12061501FT
A5R9090	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R9091	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R9100	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A5R9110	321-5004-00			RES, FXD, FILM: 22.1 OHM, 1%, 0.125W	91637	CRCW120622R1FT
A5R9111	321-5005-00			RES, FXD, FILM: 27.4 OHM, 1%, 0.125W	91637	CRCW120627R4FT
A5U2040	156-5095-01			MICROCKT, LINEAR: OP AMP, LOW NOISE	80009	156-5095-01
A5U2060	119-3982-00			OSCILLATOR: VCO 600 - 1200 MHZ, TUNE VOLT	TK2314	C706
A5U2090	119-3980-00			FILTER, ELEC: BAND PASS, 5 SECTION, 915 MHZ	50140	5IB32-915/R57.8

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A5U2080	156-6119-00			IC, LINEAR: BIPOLAR AMPLIFIER, 1.0 GHZ, 23 DB	24539	MSA-0886
A5U2100	119-3921-00			ATTENUATOR:PCB, WIDE BAND, 40DB, 100 - 2000 MHZ	24539	PPF-030
A5U2120	119-3981-00			FILTER, ELEC: LOW PASS, 6 SECTION, 629 MHZ 3DB	50140	61L21-629/R6292
A5U3020	156-5976-00			IC, DIGITAL:ECL, MISC; PHASE FREQUENCY DETECTOR	04713	MC12040FN
A5U3080	156-6119-00			IC, LINEAR: BIPOLAR AMPLIFIER, 1.0 GHZ, 23 DB	24539	MSA-0886
A5U3110	119-4070-00			MIXER, ELEC: BROAD BAND DOUBLE BALANCED	80009	119-4070-00
A5U4020	156-5978-00			IC, DIGITAL: ECL, MISC; DIVIDE BY 10/11 PRESCALER	04713	MC12013FN
A5U4050	156-5918-00			IC, LINEAR: BIPOLAR, RF AMPLIFIER, 1.9 GHZ	62104	UPC1678G
A5U4060	119-4027-00			MIXER, ELEC: RF/LO (20 - 1500) MHZ, LO DRIVE= 7DBM	5X920	SMD-C2
A5U4090	156-5922-00			MICROCKT, LINEAR: BIPOLAR, RF AMPLIFIER	62104	UPC1675G
A5U4100	156-5918-00			IC, LINEAR: BIPOLAR, RF AMPLIFIER, 1.9 GHZ	62104	UPC1678G
A5U4110	156-4013-00			IC, LINEAR: BIPOLAR, AMPLIFIER; MICROWAVE, 7.5DB, 2.5 GHZ	24539	MSA-0520
A5U4150	156-5868-00			IC, LINEAR: BIPOLAR, VOLTAGE REFERENCE; POSITIVE	64155	LT102DCS8-10
A5U5160	156-5854-00			MICROCKT, LINEAR: DUAL PRECISION HIGH SPEED, BIFET	51640	AD42356
A5U5180	156-2051-00			MICROCKT, LINEAR: QUAD J FET	01295	TL074CD
A5U5181	156-5854-00			MICROCKT, LINEAR: DUAL PRECISION HIGH SPEED, BIFET	51640	AD42356
A5U6020	156-5977-00			IC, DIGITAL: ECL, MISC; DIVIDE BY 5/6 PRESCALER	04713	MC12009FN
A5U6030	156-5922-00			MICROCKT, LINEAR: BIPOLAR, RF AMPLIFIER	62104	UPC1675G
A5U6031	156-5838-00			MICROCKT, DGTL: BIPOLAR, 2.5 GHZ PRESCALER	62104	UPC585G
A5U6050	156-5838-00			MICROCKT, DGTL: BIPOLAR, 2.5 GHZ PRESCALER	62104	UPC585G
A5U6090	119-3983-00			OSCILLATOR: VCO, 850-1735 MHZ, TUNE VOLT	TK2314	C500BX
A5U6120	156-5019-00			IC, LINEAR: BIPOLAR, COMPARATOR; DUAL, SINGLE SUPPLY	01295	LM393D
A5U6130	156-5976-00			IC, DIGITAL:ECL, MISC; PHASE FREQUENCY DETECTOR	04713	MC12040FN
A5U6140	156-5221-00			IC, DIGITAL: ECL, FLIP FLOP; DUAL D-TYPE	04713	MC10H131FN
A5U6160	156-5480-00			IC, DIGITAL; HCCMOS, SHIFT REGISTER; 8-BIT	04713	MC74HC595AD
A5U6161	156-5440-00			MICROCKT, LINEAR: CMOS, D/A CONVERTER, 12-BIT	24355	AD7543JP
A5U6180	156-5019-00			IC, LINEAR: BIPOLAR, COMPARATOR; DUAL, SINGLE SUPPLY	01295	LM393D
A5U6181	156-5019-00			IC, LINEAR: BIPOLAR, COMPARATOR; DUAL, SINGLE SUPPLY	01295	LM393D
A5U6182	156-5854-00			MICROCKT, LINEAR: DUAL PRECISION HIGH SPEED, BIFET	51640	AD42356
A5U7060	119-3982-00			OSCILLATOR: VCO 600 - 1200 MHZ, TUNE VOLT	TK2314	C706
A5U7070	156-5922-00			MICROCKT, LINEAR: BIPOLAR, RF AMPLIFIER	62104	UPC1675G
A5U7110	156-5095-01			MICROCKT, LINEAR: OP AMP, LOW NOISE	80009	156-5095-01
A5U7160	156-5019-00			IC, LINEAR: BIPOLAR, COMPARATOR; DUAL, SINGLE SUPPLY	01295	LM393D
A5U7180	156-5019-00			IC, LINEAR: BIPOLAR, COMPARATOR; DUAL, SINGLE SUPPLY	01295	LM393D
A5U8020	156-5976-00			IC, DIGITAL:ECL, MISC; PHASE FREQUENCY DETECTOR	04713	MC12040FN
A5U8040	156-5095-01			MICROCKT, LINEAR: OP AMP, LOW NOISE	80009	156-5095-01
A5U8100	156-5922-00			MICROCKT, LINEAR: BIPOLAR, RF AMPLIFIER	62104	UPC1675G
A5U8110	156-5928-00			IC, DIGITAL: ECL, COUNTER; 8-BIT BINARY UP/DOWN, 1 GHZ	S0482	CXB1136Q
A5U8120	156-5480-00			IC, DIGITAL; HCCMOS, SHIFT REGISTER; 8-BIT	04713	MC74HC595AD
A5U9080	156-5838-00			MICROCKT, DGTL: BIPOLAR, 2.5 GHZ PRESCALER	62104	UPC585G

Component Number	Tektronix Part Number	Serial No. Effective	Dscont	Name & Description	Mfr. Code	Mfr.Part No.
A6	671-1443-00			CIRCUIT BD ASSY: TIMEBASE	80009	671-1443-00
A6C1000	281-0909-00			CAP, FXD, CER DI: 0.022UF, 20%, 50V	04222	SA105C223MAA
A6C1001	281-0962-00			CAP, FXD, CERAMIC: MLC, 0.22UF, 10%, 50V	04222	SA405C224KAA
A6C1002	281-0962-00			CAP, FXD, CERAMIC: MLC, 0.22UF, 10%, 50V	04222	SA405C224KAA
A6C1010	290-0943-00			CAP, FXD, ELCTLT: 47UF, + 50-20%, 25V	1W344	KMC25VB47RM6X11
A6C1011	283-0190-00			CAP, FXD, CER DI: 0.47UF, 5%, 50V	04222	SR305C474JAA
A6C1012	283-0190-00			CAP, FXD, CER DI: 0.47UF, 5%, 50V	04222	SR305C474JAA
A6C1013	281-0909-00			CAP, FXD, CER DI: 0.022UF, 20%, 50V	04222	SA105C223MAA
A6C1014	281-0909-00			CAP, FXD, CER DI: 0.022UF, 20%, 50V	04222	SA105C223MAA
A6C1015	281-0909-00			CAP, FXD, CER DI: 0.022UF, 20%, 50V	04222	SA105C223MAA
A6C1020	290-0943-00			CAP, FXD, ELCTLT: 47UF, + 50-20%, 25V	1W344	KMC25VB47RM6X11
A6C1021	290-0943-00			CAP, FXD, ELCTLT: 47UF, + 50-20%, 25V	1W344	KMC25VB47RM6X11
A6C1022	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A6C1023	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A6C1030	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A6C1031	281-0909-00			CAP, FXD, CER DI: 0.022UF, 20%, 50V	04222	SA105C223MAA
A6C1032	281-0909-00			CAP, FXD, CER DI: 0.022UF, 20%, 50V	04222	SA105C223MAA
A6C2010	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A6C2011	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A6C2020	281-0909-00			CAP, FXD, CER DI: 0.022UF, 20%, 50V	04222	SA105C223MAA
A6C2021	281-0909-00			CAP, FXD, CER DI: 0.022UF, 20%, 50V	04222	SA105C223MAA
A6C2022	281-0909-00			CAP, FXD, CER DI: 0.022UF, 20%, 50V	04222	SA105C223MAA
A6C3000	283-0167-02			CAP, FXD, CER DI: 0.1UF, 10%, 100V	04222	SR301C104KAATR
A6C3001	281-0909-00			CAP, FXD, CER DI: 0.022UF, 20%, 50V	04222	SA105C223MAA
A6C3002	281-0759-00			CAP, FXD, CER DI: 22PF, 10%, 100V	04222	SA101A220KAA
A6C3020	281-0909-00			CAP, FXD, CER DI: 0.022UF, 20%, 50V	04222	SA105C223MAA
A6C3021	290-0974-00			CAP, FXD, ELCTLT: 10UF, 20%, 50VDC	55680	UVX1H100MAA
A6C3022	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A6C3030	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A6C3031	290-0943-00			CAP, FXD, ELCTLT: 47UF, + 50-20%, 25V	1W344	KMC25VB47RM6X11
A6C3040	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A6C3041	281-0770-00			CAP, FXD, CER DI: 1000PF, 20%, 100V	04222	SA101C102MAA
A6C3050	290-0920-00			CAP, FXD, ELCTLT: 33UF, + 50-20%, 35WVDC	1W344	SM35VB33RM6X11L
A6C3051	281-0909-00			CAP, FXD, CER DI: 0.022UF, 20%, 50V	04222	SA105C223MAA
A6C4000	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A6C4001	290-0974-00			CAP, FXD, ELCTLT: 10UF, 20%, 50VDC	55680	UVX1H100MAA
A6C4002	281-0913-00			CAP, FXD, CER DI: 0.1UF, 50V, AXIAL	18796	RPA10Z5U104Z50V
A6C4010	281-0770-00			CAP, FXD, CER DI: 1000PF, 20%, 100V	04222	SA101C102MAA
A6C4011	281-0909-00			CAP, FXD, CER DI: 0.022UF, 20%, 50V	04222	SA105C223MAA
A6C4012	290-0943-00			CAP, FXD, ELCTLT: 47UF, + 50-20%, 25V	1W344	KMC25VB47RM6X11
A6C4030	290-0950-00			CAP, FXD, ELCTLT: 100UF, + 50-20% 50WVDC	1W344	SM50VB101M10X20
A6C4031	290-0944-00			CAP, FXD, ELCTLT: 220UF, + 50-20%, 10V	0J9R5	CEUSM1A221
A6C4050	290-0943-00			CAP, FXD, ELCTLT: 47UF, + 50-20%, 25V	1W344	KMC25VB47RM6X11
A6CR1020	152-0141-02			SEMICOND DVD, DI: SW, SI, 30V, 150MA, DO-35	12969	NDP/263/TR
A6CR1030	152-0141-02			SEMICOND DVD, DI: SW, SI, 30V, 150MA, DO-35	12969	NDP/263/TR
A6CR2020	152-0141-02			SEMICOND DVD, DI: SW, SI, 30V, 150MA, DO-35	12969	NDP/263/TR
A6CR2021	152-0141-02			SEMICOND DVD, DI: SW, SI, 30V, 150MA, DO-35	12969	NDP/263/TR
A6CR3010	152-0951-00			SEMICOND DVC, DI: SCHOTTKY, SI, 15V, 1.2PF, DO-35	50434	5082-2672
A6CR3020	152-0951-00			SEMICOND DVC, DI: SCHOTTKY, SI, 15V, 1.2PF, DO-35	50434	5082-2672
A6CR3030	152-0066-00			SEMICOND DVC, DI: RECT, SI, 400V, 1A, DO-41	05828	GP10G-020
A6CR3040	152-0066-00			SEMICOND DVC, DI: RECT, SI, 400V, 1A, DO-41	05828	GP10G-020
A6F3060	159-0159-00			FUSE, WIRE LEAD: 1.5A, 125V, 5 SEC	75915	25501.5
A6F4060	159-0246-00			FUSE, WIRE LEAD: 3.5A, 125V, FAST	75915	R25103.5T1
A6J2030	136-0252-07			SOCKET, PIN CONN: SINGLE, PCB, T/G, 0.030 H	22526	75060-012
A6J3010	136-0252-07			SOCKET, PIN CONN: SINGLE, PCB, T/G, 0.030 H	22526	75060-012
A6J3020	136-0252-07			SOCKET, PIN CONN: SINGLE, PCB, T/G, 0.030 H	22526	75060-012
A6J3021	136-0252-07			SOCKET, PIN CONN: SINGLE, PCB, T/G, 0.030 H	22526	75060-012
A6J3030	136-0252-07			SOCKET, PIN CONN: SINGLE, PCB, T/G, 0.030 H	22526	75060-012
A6J3050	136-0252-07			SOCKET, PIN CONN: SINGLE, PCB, T/G, 0.030 H	22526	75060-012
A6J3051	136-0252-07			SOCKET, PIN CONN: SINGLE, PCB, T/G, 0.030 H	22526	75060-012
A6JG2030	131-1003-00			CONN, RCPT, ELEC: CKT BD MT, 3 PRONG	80009	131-1003-00
A6JG3010	131-1003-00			CONN, RCPT, ELEC: CKT BD MT, 3 PRONG	80009	131-1003-00
A6JG3020	131-1003-00			CONN, RCPT, ELEC: CKT BD MT, 3 PRONG	80009	131-1003-00
A6JG3021	131-1003-00			CONN, RCPT, ELEC: CKT BD MT, 3 PRONG	80009	131-1003-00
A6JG3030	131-1003-00			CONN, RCPT, ELEC: CKT BD MT, 3 PRONG	80009	131-1003-00

Component Number	Tektronix Part Number	Serial No. Effective	Dscont	Name & Description	Mfr. Code	Mfr.Part No.
A6JG3050	131-1003-00			CONN, RCPT, ELEC: CKT BD MT, 3 PRONG	80009	131-1003-00
A6JG3051	131-1003-00			CONN, RCPT, ELEC: CKT BD MT, 3 PRONG	80009	131-1003-00
A6L3040	108-0538-00			COIL, RF: FIXED, 2.7UH	0JR03	108-0538-00
A6L4010	276-0752-00			CORE, EM: FERRITE	TK1442	BP53-BH3.5X10X4
A6L4020	108-0538-00			COIL, RF: FIXED, 2.7UH	0JR03	108-0538-00
A6L4050	108-0538-00			COIL, RF: FIXED, 2.7UH	0JR03	108-0538-00
A6L4051	108-1263-00			COIL, RF: FXD, 10UH, 10%, Q =70, SRF 27 MHZ	54583	TSL 0707-100K1R
A6P5090	131-4822-00			CONN, RCPT, ELEC: BOX, PCB, FEMALE, RTANG, 2 X 20	00779	1-102585-2
A6Q3010	151-0188-00			TRANSISTOR: PNP, SI, TO-92	04713	2N3906
A6Q3011	151-0188-00			TRANSISTOR: PNP, SI, TO-92	04713	2N3906
A6R1000	322-3310-00			RES, FXD, FILM: 16.5K OHM, 1%, 0.2W, TC=T0	57668	CRB20 FXE 16K5
A6R1010	322-3437-00			RES, FXD, FILM: 348K OHM, 1%, 0.2W, TC=T0	57668	CRB20 FXE 348K
A6R1011	322-3310-00			RES, FXD, FILM: 16.5K OHM, 1%, 0.2W, TC=T0	57668	CRB20 FXE 16K5
A6R1012	322-3310-00			RES, FXD, FILM: 16.5K OHM, 1%, 0.2W, TC=T0	57668	CRB20 FXE 16K5
A6R1013	322-3310-00			RES, FXD, FILM: 16.5K OHM, 1%, 0.2W, TC=T0	57668	CRB20 FXE 16K5
A6R1014	322-3437-00			RES, FXD, FILM: 348K OHM, 1%, 0.2W, TC=T0	57668	CRB20 FXE 348K
A6R1015	313-1100-00			RES, FXD, FILM: 10 OHM, 5%, 0.2W	57668	TR20JE10E0
A6R1020	313-1332-00			RES, FXD, FILM: 3.3K OHM, 5%, 0.2W	57668	TR20JE03K3
A6R1021	313-1100-00			RES, FXD, FILM: 10 OHM, 5%, 0.2W	57668	TR20JE10E0
A6R1030	313-1102-00			RES, FXD, FILM: 1K OHM, 5%, 0.2W	57668	TR20JE01K0
A6R1031	313-1102-00			RES, FXD, FILM: 1K OHM, 5%, 0.2W	57668	TR20JE01K0
A6R1032	313-1102-00			RES, FXD, FILM: 1K OHM, 5%, 0.2W	57668	TR20JE01K0
A6R2000	313-1511-00			RES, FXD, FILM: 510 OHM, 5%, 0.2W	57668	TR20JE68510E
A6R2001	313-1511-00			RES, FXD, FILM: 510 OHM, 5%, 0.2W	57668	TR20JE68510E
A6R2002	313-1103-00			RES, FXD, FILM: 10K OHM, 5%, 0.2W	57668	TR20JE10K0
A6R2003	322-3385-00			RES, FXD, FILM: 100K OHM 1%, 0.2W, TC=T0	57668	CRB20 FXE 100K
A6R2010	313-1103-00			RES, FXD, FILM: 10K OHM, 5%, 0.2W	57668	TR20JE10K0
A6R2011	313-1511-00			RES, FXD, FILM: 510 OHM, 5%, 0.2W	57668	TR20JE68510E
A6R2012	313-1511-00			RES, FXD, FILM: 510 OHM, 5%, 0.2W	57668	TR20JE68510E
A6R2013	313-1510-00			RES, FXD, FILM: 51 OHM, 5%, 0.2W	57668	TR20JT6851E0
A6R2014	307-0526-00			RES, NTWK, FXD, FI: 5, 510 OHM, 10%, 0.125W	11236	750-61-R510 OHM
A6R2020	313-1332-00			RES, FXD, FILM: 3.3K OHM, 5%, 0.2W	57668	TR20JE03K3
A6R2021	313-1102-00			RES, FXD, FILM: 1K OHM, 5%, 0.2W	57668	TR20JE01K0
A6R2022	313-1430-00			RES, FXD, FILM: 43 OHM, 5%, 0.2W	57668	TR20JT6843E
A6R2023	307-0526-00			RES, NTWK, FXD, FI: 5, 510 OHM, 10%, 0.125W	11236	750-61-R510 OHM
A6R2024	313-1430-00			RES, FXD, FILM: 43 OHM, 5%, 0.2W	57668	TR20JT6843E
A6R2030	313-1430-00			RES, FXD, FILM: 43 OHM, 5%, 0.2W	57668	TR20JT6843E
A6R2031	313-1430-00			RES, FXD, FILM: 43 OHM, 5%, 0.2W	57668	TR20JT6843E
A6R3000	313-1510-00			RES, FXD, FILM: 51 OHM, 5%, 0.2W	57668	TR20JT6851E0
A6R3001	313-1102-00			RES, FXD, FILM: 1K OHM, 5%, 0.2W	57668	TR20JE01K0
A6R3002	313-1103-00			RES, FXD, FILM: 10K OHM, 5%, 0.2W	57668	TR20JE10K0
A6R3010	313-1102-00			RES, FXD, FILM: 1K OHM, 5%, 0.2W	57668	TR20JE01K0
A6R3011	313-1331-00			RES, FXD, FILM: 330 OHM, 5%, 0.2W	57668	TR20JE330E
A6R3012	313-1510-00			RES, FXD, FILM: 51 OHM, 5%, 0.2W	57668	TR20JT6851E0
A6R3013	313-1105-00			RES, FXD, FILM: 1M OHM, 5%, 0.2W	57668	TR20JE1M
A6R3014	313-1101-00			RES, FXD, FILM: 100 OHM, 5%, 0.2W	57668	TR20JE100E
A6R3015	313-1510-00			RES, FXD, FILM: 51 OHM, 5%, 0.2W	57668	TR20JT6851E0
A6R3016	313-1511-00			RES, FXD, FILM: 510 OHM, 5%, 0.2W	57668	TR20JE68510E
A6R3020	313-1101-00			RES, FXD, FILM: 100 OHM, 5%, 0.2W	57668	TR20JE100E
A6R3030	308-0365-00			RES, FXD, WW: 1.5 OHM, 5%, 3W	TK2096	KM 300 1.5 OHM
A6R3031	313-1430-00			RES, FXD, FILM: 43 OHM, 5%, 0.2W	57668	TR20JT6843E
A6R3040	322-3231-00			RES, FXD, FILM: 2.49K OHM, 1%, 0.2W, TC=T0	57668	CRB20 FXE 2K49
A6R3041	308-0365-00			RES, FXD, WW: 1.5 OHM, 5%, 3W	TK2096	KM 300 1.5 OHM
A6R3042	322-3231-00			RES, FXD, FILM: 2.49K OHM, 1%, 0.2W, TC=T0	57668	CRB20 FXE 2K49
A6R3043	313-1103-00			RES, FXD, FILM: 10K OHM, 5%, 0.2W	57668	TR20JE10K0
A6R3044	313-1202-00			RES, FXD, FILM: 2K OHM, 5%, 0.2W	57668	TR20JE02K0
A6R3050	313-1101-00			RES, FXD, FILM: 100 OHM, 5%, 0.2W	57668	TR20JE100E
A6R3051	322-3231-00			RES, FXD, FILM: 2.49K OHM, 1%, 0.2W, TC=T0	57668	CRB20 FXE 2K49
A6R3052	313-1430-00			RES, FXD, FILM: 43 OHM, 5%, 0.2W	57668	TR20JT6843E
A6R3053	313-1510-00			RES, FXD, FILM: 51 OHM, 5%, 0.2W	57668	TR20JT6851E0
A6R3054	313-1101-00			RES, FXD, FILM: 100 OHM, 5%, 0.2W	57668	TR20JE100E
A6R4000	313-1103-00			RES, FXD, FILM: 10K OHM, 5%, 0.2W	57668	TR20JE10K0
A6R4001	313-1103-00			RES, FXD, FILM: 10K OHM, 5%, 0.2W	57668	TR20JE10K0
A6R4010	322-3231-00			RES, FXD, FILM: 2.49K OHM, 1%, 0.2W, TC=T0	57668	CRB20 FXE 2K49
A6R4011	313-1103-00			RES, FXD, FILM: 10K OHM, 5%, 0.2W	57668	TR20JE10K0
A6R4012	313-1151-00			RES, FXD, FILM: 150 OHM, 5%, 0.2W	57668	TR20JE150E

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A6R4013	313-1103-00			RES, FXD, FILM: 10K OHM, 5%, 0.2W	57668	TR20JE10K0
A6R4020	313-1202-00			RES, FXD, FILM: 2K OHM, 5%, 0.2W	57668	TR20JE02K0
A6R4021	322-3184-00			RES, FXC, FILM: 806 OHM, 1%, 0.2W, T C =T0	57668	CRB20 FXE 806E
A6R4022	322-3301-00			RES, FXD, FILM: 13.3K OHM, 1%, 0.2W, T C =T0	57668	CRB20 FXE 13K3
A6R4030	313-1101-00			RES, FXD, FILM: 100 OHM, 5%, 0.2W	57668	TR20JE100E
A6R4040	308-0365-00			RES, FXD, WW: 1.5 OHM, 5%, 3W	TK2096	KM 300 1.5 OHM
A6U1000	156-0518-00			IC, DIGITAL: ECL, MISC, PHASE-FREQUENCY DETECTOR	04713	MC12040 (P OR L)
A6U1010	156-1156-00			MICROCKT, LINEAR: BIFET, OPNL AMPL	27014	LF356N (D/C 880)
A6U1020	156-1211-00			IC, MISC: BIFET, ANALOG SWITCH, QUAD	06665	SW-06
A6U2010	156-0860-00			IC, DIGITAL: ECL, RECEIVER, TRIPLE LINE	04713	MC10116P
A6U2020	156-0308-00			IC, DIGITAL: ECL, RECEIVER, QUAD DIFFERENTIAL	04713	MC10115L OR P
A6U2040	119-4064-00			OSCILLATOR, RF: 10.000MHZ, VCXO	27802	TCX035-28
A6U3000	156-3776-00			IC, DIGITAL: HCCMOS, MULTIVABRATOR, DUAL RETRIGGERABLE	0JR04	TC74HC4538P
A6U3020	156-1173-00			MICROCKT, LINEAR: VOLTAGE REFERENCE	04713	MC1403U
A6U3040	156-0071-00			IC, LINEAR: BIPLST, VOLTAGE REGULATOR, VARIABLE	04713	MC1723CP
A6U4000	156-1225-00			MICROCKT, LINEAR: DUAL COMPARATOR	01295	LM393P
A6U4010	156-0071-00			IC, LINEAR: BIPOLST, VOLTAGE REGULATOR, VARIABLE	04713	MC1723CP
A6W100	175-8803-00			CABLE ASSY, RF: 50 OHM COAX, 16.75 L, 6-2	80009	175-8803-00
A6W300	175-8488-00			CABLE ASSY, RF: 50 OHM COAX, 11.5 L, 6-1	80009	175-8488-00
A6W400	174-0665-00			CABLE ASSY, RF: 50 OHM COAX, 13.3 L	80009	174-0665-00
A6W410	175-8488-00			CABLE ASSY, RF: 50 OHM COAX, 11.5 L, 6-1	80009	175-8488-00
A6W420	174-0665-00			CABLE ASSY, RF: 50 OHM COAX, 13.3 L	80009	174-0665-00
A6W700	174-0665-00			CABLE ASSY, RF: 50 OHM COAX, 13.3 L	80009	174-0665-00

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A7	671-1442-02			CIRCUIT BOARD ASSEMBLY: OUTPUT	80009	671-1442-00
A7C1000	283-5195-00			CAP, FXD, CER DI: 10PF, 5%, 100V	04222	W1206C100J3B04
A7C1010	283-5003-00			CAP, FXD, CER DI: 0.01UF, 10%, 50V	04222	W1206X103K2B04
A7C1020	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C1021	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C1022	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C1023	283-5003-00			CAP, FXD, CER DI: 0.01UF, 10%, 50V	04222	W1206X103K2B04
A7C1030	283-5187-00			CAP, FXD, CER DI: 15PF, 5%, 100V	04222	W1206C150J3B04
A7C1031	283-5004-00			CAP, FXD, CER DI: 0.1UF, 10%, 25V	04222	W1206X104K1B01
A7C1032	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C1033	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C1040	283-5279-00			CAP, FXD: CERAMIC, 0.47UF, 10%, 50V	04222	W1825X474K2B04
A7C1041	290-5037-01			CAP, FXD, ELCTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A7C1050	290-0950-00			CAP, FXD, ELCTLT: 100UF, + 50-20%, 50WVDC	1W344	SM50VB101M10X20
A7C1051	290-5037-01			CAP, FXD, ELCTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A7C1052	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C1053	290-5037-01			CAP, FXD, ELCTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A7C1060	283-5196-00			CAP, FXD, CER DI: 47PF, 5%, 100V	04222	W1206C470J3B04
A7C1070	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C1071	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C1072	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C1073	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C1080	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C1081	290-5037-01			CAP, FXD, ELCTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A7C1082	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C1090	290-5037-01			CAP, FXD, ELCTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A7C2000	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C2001	283-5195-00			CAP, FXD, CER DI: 10PF, 5%, 100V	04222	W1206C100J3B04
A7C2010	283-5107-00			CAP, FXD, CER DI: 22PF, 5%, 100V	04222	W1206C220J3B04
A7C2011	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C2022	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C2030	290-0950-00			CAP, FXD, ELCTLT: 100UF, + 50-20%, 50WVDC	1W344	SM50VB101M10X20
A7C2031	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C2040	290-5037-01			CAP, FXD, ELCTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A7C2041	283-5279-00			CAP, FXD: CERAMIC, 0.47UF, 10%, 50V	04222	W1825X474K2B04
A7C2050	290-0950-00			CAP, FXD, ELCTLT: 100UF, + 50-20%, 50WVDC	1W344	SM50VB101M10X20
A7C2060	283-5105-00			CAP, FXD, CER DI: 1UF, + 80/-20%, 50V	04222	W1825Z105Z2B04
A7C2070	290-5037-01			CAP, FXD, ELCTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A7C2080	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C2081	283-5107-00			CAP, FXD, CER DI: 22PF, 5%, 100V	04222	W1206C220J3B04
A7C2082	283-5107-00			CAP, FXD, CER DI: 22PF, 5%, 100V	04222	W1206C220J3B04
A7C2083	283-5107-00			CAP, FXD, CER DI: 22PF, 5%, 100V	04222	W1206C220J3B04
A7C2084	283-5107-00			CAP, FXD, CER DI: 22PF, 5%, 100V	04222	W1206C220J3B04
A7C2085	283-5005-00			CAP, FXD, CER DI: 4PF, + /-0.25%, 50V	54583	C3216COG1H040C
A7C2086	283-5006-00			CAP, FXD, CER DI: 5PF, + /-0.25%, 50V	54583	C3216COG1H050C
A7C2087	283-5008-00			CAP, FXD, CER DI: 12PF, 5%, 50V	54583	C3216COG1H120J
A7C2088	283-5006-00			CAP, FXD, CER DI: 5PF, + /-0.25%, 50V	54583	C3216COG1H050C
A7C2089	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C2182	283-5236-00			CAP, FXD, CER DI: 3.0PF, 0.25%, 100V	04222	W1206C3R0C3B04
A7C2183	283-5195-00			CAP, FXD, CER DI: 10PF, 5%, 100V	04222	W1206C100J3B04
A7C3010	283-5203-00			CAP, FXD, CER DI: 1000PF, 10%, 100V	04222	W1206X102K2B04
A7C3020	283-5004-00			CAP, FXD, CER DI: 0.1UF, 10%, 25V	04222	W1206X104K1B01
A7C3021	283-5004-00			CAP, FXD, CER DI: 0.1UF, 10%, 25V	04222	W1206X104K1B01
A7C3022	290-0950-00			CAP, FXD, ELCTLT: 100UF, + 50-20%, 50WVDC	1W344	SM50VB101M10X20
A7C3030	290-0950-00			CAP, FXD, ELCTLT: 100UF, + 50-20%, 50WVDC	1W344	SM50VB101M10X20
A7C3031	283-5195-00			CAP, FXD, CER DI: 10PF, 5%, 100V	04222	W1206C100J3B04
A7C3032	283-5195-00			CAP, FXD, CER DI: 10PF, 5%, 100V	04222	W1206C100J3B04
A7C3033	283-5195-00			CAP, FXD, CER DI: 10PF, 5%, 100V	04222	W1206C100J3B04
A7C3034	283-5189-00			CAP, FXD, CER DI: 220PF, 5%, 100V	04222	W1206C221J3B04
A7C3040	285-0808-00			CAP, FXD, PLASTIC: 0.1UF, 10%, 50V	04099	EK13-16
A7C3041	283-5004-00			CAP, FXD, CER DI: 0.1UF, 10%, 25V	04222	W1206X104K1B01
A7C3042	283-5201-00			CAP, FXD, CER DI: 33PF, 5%, 100V	04222	W1206C330J3B04
A7C3043	283-5004-00			CAP, FXD, CER DI: 0.1UF, 10%, 25V	04222	W1206X104K1B01
A7C3044	283-5004-00			CAP, FXD, CER DI: 0.1UF, 10%, 25V	04222	W1206X104K1B01
A7C3045	285-1466-00			CAP, FXD, PLASTIC: 2.2UF, 10%, 63V	84411	X665 2.2 10 63
A7C3046	283-5105-00			CAP, FXD, CER DI: 1UF, + 80/-20%, 50V	04222	W1825Z105Z2B04
A7C3050	283-5004-00			CAP, FXD, CER DI: 0.1UF, 10%, 25V	04222	W1206X104K1B01

Component Number	Tektronix Part Number	Serial No. Effective	Dscont	Name & Description	Mfr. Code	Mfr.Part No.
A7C3060	283-5105-00			CAP, FXD, CER DI: 1UF, + 80/-20%, 50V	04222	W1825Z105Z2B04
A7C3080	283-5005-00			CAP, FXD, CER DI: 4PF, + /-0.25PF, 50V	54583	C3216COG1H040C
A7C3081	283-5005-00			CAP, FXD, CER DI: 4PF, + /-0.25PF, 50V	54583	C3216COG1H040C
A7C3082	283-5005-00			CAP, FXD, CER DI: 4PF, + /-0.25PF, 50V	54583	C3216COG1H040C
A7C3083	283-5005-00			CAP, FXD, CER DI: 4PF, + /-0.25PF, 50V	54583	C3216COG1H040C
A7C3084	283-5195-00			CAP, FXD, CER DI: 10PF, 5%, 100V	04222	W1206C100J3B04
A7C3085	283-5195-00			CAP, FXD, CER DI: 10PF, 5%, 100V	04222	W1206C100J3B04
A7C3090	290-5037-01			CAP, FXD, ELCTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A7C4000	290-0920-00			CAP, FXD, ELCTLT: 33UF, + 50/-20%, 35WVDC	1W344	SM35VB33RM6X11LL
A7C4010	283-5105-00			CAP, FXD, CER DI: 1UF, + 80/-20%, 50V	04222	W1825Z105Z2B04
A7C4011	283-5201-00			CAP, FXD, CER DI: 33PF, 5%, 100V	04222	W1206C330J3B04
A7C4012	283-5004-00			CAP, FXD, CER DI: 0.1UF, 10%, 25V	04222	W1206X104K1B01
A7C4013	283-5004-00			CAP, FXD, CER DI: 0.1UF, 10%, 25V	04222	W1206X104K1B01
A7C4020	283-5196-00			CAP, FXD, CER DI: 47PF, 5%, 100V	04222	W1206C470J3B04
A7C4021	290-0950-00			CAP, FXD, ELCTLT: 100UF, + 50-20%, 50WVDC	1W344	SM50VB101M10X20
A7C4022	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C4023	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C4030	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C4031	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C4032	283-5004-00			CAP, FXD, CER DI: 0.1UF, 10%, 25V	04222	W1206X104K1B01
A7C4041	283-5003-00			CAP, FXD, CER DI: 0.01UF, 10%, 50V	04222	W1206X103K2B04
A7C4042	283-5279-00			CAP, FXD: CERAMIC, 0.47UF, 10%, 50V	04222	W1825X474K2B04
A7C4043	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C4044	290-1250-00			CAP, FXD, ELCTLT: 220MF, 20%, 50WVDC	55680	UVX1H221MPA
A7C4050	285-1466-00			CAP, FXD, PLASTIC: 2.2UF, 10%, 63V	84411	X665 2.2 10 63
A7C4051	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C4060	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C4070	290-5037-01			CAP, FXD, ELCTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A7C4080	283-5189-00			CAP, FXD, CER DI: 220PF, 5%, 100V	04222	W1206C221J3B04
A7C4081	283-5189-00			CAP, FXD, CER DI: 220PF, 5%, 100V	04222	W1206C221J3B04
A7C4083	283-5189-00			CAP, FXD, CER DI: 220PF, 5%, 100V	04222	W1206C221J3B04
A7C5010	290-0920-00			CAP, FXD, ELCTLT: 33UF, + 50/-20%, 35WVDC	1W344	SM35VB33RM6X11LL
A7C5020	283-5004-00			CAP, FXD, CER DI: 0.1UF, 10%, 25V	04222	W1206X104K1B01
A7C5030	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C5031	283-5004-00			CAP, FXD, CER DI: 0.1UF, 10%, 25V	04222	W1206X104K1B01
A7C5040	290-1250-00			CAP, FXD, ELCTLT: 220MF, 20%, 50WVDC	55680	UVX1H221MPA
A7C5050	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C5051	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C5052	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C5060	290-5037-01			CAP, FXD, ELCTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A7C5061	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C5070	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C5071	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C5072	283-5202-00			CAP, FXD, CER DI: 0.022UF, 10%, 50V	04222	W1206223K2B04
A7C5073	290-5037-01			CAP, FXD, ELCTLT: 10UF, 35V	1W344	MVK35VC10RM5TP
A7CR1030	152-5018-00			DIODE, SIG: 100V, 4NS, 2.0PF	27014	FDSO1203.SA
A7CR1031	152-5018-00			DIODE, SIG: 100V, 4NS, 2.0PF	27014	FDSO1203.SA
A7CR1040	152-5018-00			DIODE, SIG: 100V, 4NS, 2.0PF	27014	FDSO1203.SA
A7CR1041	152-5018-00			DIODE, SIG: 100V, 4NS, 2.0PF	27014	FDSO1203.SA
A7CR2040	152-5027-00			DIODE, RECT: SCHTKY, 40V, 1A	04713	MBRS140T3
A7CR2041	152-5018-00			DIODE, SIG: 100V, 4NS, 2.0PF	27014	FDSO1203.SA
A7CR2042	152-5018-00			DIODE, SIG: 100V, 4NS, 2.0PF	27014	FDSO1203.SA
A7CR2043	152-5018-00			DIODE, SIG: 100V, 4NS, 2.0PF	27014	FDSO1203.SA
A7CR2050	152-5027-00			DIODE, RECT: SCHTKY, 40V, 1A	04713	MBRS140T3
A7CR2051	152-5027-00			DIODE, RECT: SCHTKY, 40V, 1A	04713	MBRS140T3
A7CR2060	152-5018-00			DIODE, SIG: 100V, 4NS, 2.0PF	27014	FDSO1203.SA
A7CR2090	152-5018-00			DIODE, SIG: 100V, 4NS, 2.0PF	27014	FDSO1203.SA
A7CR3020	152-5027-00			DIODE, RECT: SCHTKY, 40V, 1A	04713	MBRS140T3
A7CR3040	152-5018-00			DIODE, SIG: 100V, 4NS, 2.0PF	27014	FDSO1203.SA
A7CR3060	152-5018-00			DIODE, SIG: 100V, 4NS, 2.0PF	27014	FDSO1203.SA
A7CR3090	152-5018-00			DIODE, SIG: 100V, 4NS, 2.0PF	27014	FDSO1203.SA
A7CR4020	152-5027-00			DIODE, RECT: SCHTKY, 40V, 1A	04713	MBRS140T3
A7CR4030	152-5018-00			DIODE, SIG: 100V, 4NS, 2.0PF	27014	FDSO1203.SA
A7CR4031	152-5018-00			DIODE, SIG: 100V, 4NS, 2.0PF	27014	FDSO1203.SA
A7CR4050	152-5018-00			DIODE, SIG: 100V, 4NS, 2.0PF	27014	FDSO1203.SA
A7CR4051	152-5018-00			DIODE, SIG: 100V, 4NS, 2.0PF	27014	FDSO1203.SA
A7CR5010	152-5018-00			DIODE, SIG: 100V, 4NS, 2.0PF	27014	FDSO1203.SA

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A7CR5040	152-5018-00			DIODE, SIG: 100V, 4NS, 2.0PF	27014	FDSO1203.SA
A7CR5041	152-5018-00			DIODE, SIG: 100V, 4NS, 2.0PF	27014	FDSO1203.SA
A7CR5080	152-5018-00			DIODE, SIG: 100V, 4NS, 2.0PF	27014	FDSO1203.SA
A7F3000	159-0159-00			FUSE, WIRE LEAD: 1.5A, 125V, 5 SEC	75915	25501.5
A7F5000	159-0159-00			FUSE, WIRE LEAD: 1.5A, 125V, 5 SEC	75915	25501.5
A7H3070	165-2351-00			MICROCKT, HYBRID: LINEAR POWER AMP	80009	165-2351-00
A7HS3070	136-0764-00			SKT, PL-IN ELEK: 48 PIN CONTROLLED IMPEDANCE	00779	54973-1
A7J1000	136-0252-07			SOCKET, PIN CONN: SINGLE, 0.030H X 0.054DIA	22526	75060-12
A7J3000	136-0252-07			SOCKET, PIN CONN: SINGLE, 0.030H X 0.054DIA	22526	75060-12
A7J3060	136-0252-07			SOCKET, PIN CONN: SINGLE, 0.030H X 0.054DIA	22526	75060-12
A7J3090	136-0252-07			SOCKET, PIN CONN: SINGLE, 0.030H X 0.054DIA	22526	75060-12
A7J5080	131-0608-00			TERMINAL, PIN: PCB, 0.25 X 0.248L, PHOS BRZ	22526	48283-036
A7J5082	131-0608-00			TERMINAL, PIN: PCB, 0.25 X 0.248L, PHOS BRZ	22526	48283-036
A7JG1000	131-1003-00			CONN, RCPT, ELEC: CKT BD MT, 3 PRONG	80009	131-1003-00
A7JG3000	131-1003-00			CONN, RCPT, ELEC: CKT BD MT, 3 PRONG	80009	131-1003-00
A7JG3060	131-1003-00			CONN, RCPT, ELEC: CKT BD MT, 3 PRONG	80009	131-1003-00
A7JG3090	131-1003-00			CONN, RCPT, ELEC: CKT BD MT, 3 PRONG	80009	131-1003-00
A7K2080	148-0198-00			RELAY, REED: DPDT, 98Ω, 6V	11532	712-6
A7K3080	148-0198-00			RELAY, REED: DPDT, 98Ω, 6V	11532	712-6
A7L2070	108-0472-00			COIL, RF: FXD, 150UH, + /-10%, AXIAL LEAD	0JR30	108-0472-00
A7L2080	108-5108-00			COIL, RF: FXD, 68NH, + /-10%	02113	1008CS-680
A7L2081	108-5108-00			COIL, RF: FXD, 68NH, + /-10%	02113	1008CS-680
A7L2082	108-5112-00			COIL, RF: FXD, 22NH, + /-10%	02113	1206CS-220XK2B
A7L2083	108-5111-00			COIL, RF: FXD, 12NH, + /-10%	02113	1206CS-120XK2B
A7L2090	108-5084-00			COIL, RF: FERRITE CHIP BEAD	54583	HF70ACB322513T
A7L3030	108-1449-00			INDUCTOR: BOBBIN CORE, 33UH, 10%	54583	TSL0807-330K1R2
A7L3070	108-0472-00			COIL, RF: FIXED, 150UH, + /-10%, AXIAL LEAD	0JR30	108-0472-00
A7L3075	108-0472-00			COIL, RF: FIXED, 150UH, + /-10%, AXIAL LEAD	0JR30	108-0472-00
A7L3080	108-5105-00			COIL, RF: FXD, 0.018UH, + /-10%	02113	1008CS-180-XK2A
A7L3081	108-5105-00			COIL, RF: FXD, 0.018UH, + /-10%	02113	1008CS-180-XK2A
A7L3082	108-5020-00			COIL, RF: FXD, 270NH, + /-5%	02113	1008CS-271XJ2A
A7L4000	108-0538-02			COIL, RF: FXD, 2.7UH	0JR03	108-0538-02
A7L4030	108-1449-00			INDUCTOR: BOBBIN CORE, 33UH, 10%	54583	TSL0807-330K1R2
A7L4060	108-0472-00			COIL, RF: FIXED, 150UH, + /-10%, AXIAL LEAD	0JR30	108-0472-00
A7L4080	108-5106-00			COIL, RF: FXD, 680NH, + /-10%	02113	1008CS-681-XK2A
A7L5000	108-0538-02			COIL, RF: FXD, 2.7UH	0JR03	108-0538-02
A7L5020	108-5084-00			COIL, RF: FERRITE CHIP BEAD	54583	HF70ACB322513T
A7L5021	108-5084-00			COIL, RF: FERRITE CHIP BEAD	54583	HF70ACB322513T
A7P7020	131-4822-00			CONN, BOX: PCB, FEMALE, 2 X 20, SIDE ENTRY	0070	1-102585-2
A7Q1040	151-1257-00			TRANSISTOR, PWR: MOS, P-CH, 80V, 20A	04713	MTH20P08
A7Q1041	151-5001-00			TRANSISTOR, SIG: NPN, 40V, 200MA, 300MHZ	04713	MMBT3904T1/T2
A7Q1042	151-5000-00			TRANSISTOR, SIG: PNP, 40V, 200MA, 250MHZ	04713	MMBT3906LT1
A7Q1043	151-5001-00			TRANSISTOR, SIG: NPN, 40V, 200MA, 300MHZ	04713	MMBT3904T1/T2
A7Q1070	151-0476-00			TRANSISTOR: NPN, SI, TO-220, TIP31C,100V, 3A	01295	TIP31C
A7Q1080	151-0476-00			TRANSISTOR: NPN, SI, TO-220, TIP31C,100V, 3A	01295	TIP31C
A7Q2040	151-1161-01			TRANSISTOR, PWR: MOS, N-CH, 100V, 28A	04713	IRF540
A7Q2041	151-5000-00			TRANSISTOR, SIG: PNP, 40V, 200MA, 250MHZ	04713	MMBT3906LT1
A7Q2042	151-5000-00			TRANSISTOR, SIG: PNP, 40V, 200MA, 250MHZ	04713	MMBT3906LT1
A7Q2043	151-5000-00			TRANSISTOR, SIG: PNP, 40V, 200MA, 250MHZ	04713	MMBT3906LT1
A7Q2050	151-0482-00			TRANSISTOR: PNP, SI, TO-220	04713	TIP32C
A7Q2051	151-5000-00			TRANSISTOR, SIG: PNP, 40V, 200MA, 250MHZ	04713	MMBT3906LT1
A7Q2070	151-0476-00			TRANSISTOR: NPN, SI, TO-220, TIP31C,100V, 3A	01295	TIP31C
A7Q2090	151-5001-00			TRANSISTOR, SIG: NPN, 40V, 200MA, 300MHZ	04713	MMBT3904T1/T2
A7Q3020	151-5001-00			TRANSISTOR, SIG: NPN, 40V, 200MA, 300MHZ	04713	MMBT3904T1/T2
A7Q3090	151-5001-00			TRANSISTOR, SIG: NPN, 40V, 200MA, 300MHZ	04713	MMBT3904T1/T2
A7Q4040	151-5001-00			TRANSISTOR, SIG: NPN, 40V, 200MA, 300MHZ	04713	MMBT3904T1/T2
A7Q4050	151-0482-00			TRANSISTOR: PNP, SI, TO-220	04713	TIP32C
A7Q4060	151-0482-00			TRANSISTOR: PNP, SI, TO-220	04713	TIP32C
A7Q4070	151-0476-00			TRANSISTOR: NPN, SI, TO-220, TIP31C,100V, 3A	01295	TIP31C
A7Q5010	151-5030-00			TRANSISTOR, SIG: PNP, 60V, 600MA, 200MHZ	04713	MMBT2907ALT1
A7Q5020	151-5000-00			TRANSISTOR, SIG: PNP, 40V, 200MA, 250MHZ	04713	MMBT3906LT1
A7Q5040	151-5030-00			TRANSISTOR, SIG: PNP, 60V, 600MA, 200MHZ	04713	MMBT2907ALT1
A7Q5041	151-5027-00			TRANSISTOR, SIG: NPN, 160V, 600MA, 100MHZ	04713	MMBT5551LT1
A7Q5042	151-5030-00			TRANSISTOR, SIG: PNP, 60V, 600MA, 200MHZ	04713	MMBT2907ALT1
A7Q5043	151-5027-00			TRANSISTOR, SIG: NPN, 160V, 600MA, 100MHZ	04713	MMBT5551LT1

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A7R1000	321-0751-06			RES, FXD, FILM: 50 OHM, 0.25%, 0.125W	57668	CRB14CZE50.0
A7R1001	321-0816-07			RES, FXD, FILM: 5K OHM, 0.1%, 0.125W	TK1727	MPR24-2322-141-5K0
A7R1002	321-0247-07			RES, FXD, FILM: 3.65K OHM, 0.1%, 0.125W	57027	3.65K CM55 T9.1%
A7R1010	321-5026-00			RES, FXD, FILM: 4.75K OHM, 1%, 0.125W	91637	CRCW12064751FT
A7R1011	321-5026-00			RES, FXD, FILM: 4.75K OHM, 1%, 0.125W	91637	CRCW12064751FT
A7R1012	321-5019-00			RES, FXD, FILM: 1.21K OHM, 1%, 0.125W	91637	CRCW12061211FT
A7R1013	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A7R1020	321-5026-00			RES, FXD, FILM: 4.75K OHM, 1%, 0.125W	91637	CRCW12064751FT
A7R1021	321-5026-00			RES, FXD, FILM: 4.75K OHM, 1%, 0.125W	91637	CRCW12064751FT
A7R1022	321-5019-00			RES, FXD, FILM: 1.21K OHM, 1%, 0.125W	91637	CRCW12061211FT
A7R1030	321-5043-00			RES, FXD, FILM: 47.5 OHM, 1%, 0.125W	91637	CRCW120647R5FT
A7R1040	321-5025-00			RES, FXD, FILM: 3.92K OHM, 1%, 0.125W	91637	CRCW12063921FT
A7R1041	321-5014-00			RES, FXD, FILM: 475 OHM, 1%, 0.125W	91637	CRCW12064750FT
A7R1042	321-5029-00			RES, FXD, FILM: 8.25K OHM, 1%, 0.125W	91637	CRCW12068251FT
A7R1043	321-5023-00			RES, FXD, FILM: 2.74K OHM, 1%, 0.125W	91637	CRCW12062741FT
A7R1044	321-5030-00			RES, FXD, FILM: 10.0K OHM, 1%, 0.125W	91637	CRCW12061002FT
A7R1045	321-5025-00			RES, FXD, FILM: 3.92K OHM, 1%, 0.125W	91637	CRCW12063921FT
A7R1050	321-5020-00			RES, FXD, FILM: 1.50K OHM, 1%, 0.125W	91637	CRCW12061501FT
A7R1051	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A7R1052	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A7R1053	321-5006-00			RES, FXD, FILM: 100 OHM, 1%, 0.125W	91637	CRCW12061000FT
A7R1060	311-2234-00			RES, VAR, NONWW: 5K OHM, 20%, 0.5W	TK2073	GF06UT2 502 M L20
A7R1061	321-5028-00			RES, FXD, FILM: 6.81K OHM, 1%, 0.125W	91637	CRCW12066811FT
A7R1062	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A7R1070	308-0961-00			RES, FXD, WW: 10 OHM, 1%, 3W	91637	RS2B-10R00F
A7R1071	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A7R1072	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A7R1073	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A7R1074	321-5022-00			RES, FXD, FILM: 2.21K OHM, 1%, 0.125W	91637	CRCW12062211FT
A7R1075	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A7R1076	321-5025-00			RES, FXD, FILM: 3.92K OHM, 1%, 0.125W	91637	CRCW12063921FT
A7R1080	308-0756-00			RES, FXD, WW: 100 OHM, 1%, 3W	91637	RS2B 100R0F T/R
A7R1081	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A7R1082	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A7R1083	321-5019-00			RES, FXD, FILM: 1.21K OHM, 1%, 0.125W	91637	CRCW12061211FT
A7R1084	321-5026-00			RES, FXD, FILM: 4.75K OHM, 1%, 0.125W	91637	CRCW12064751FT
A7R1085	321-5014-00			RES, FXD, FILM: 475 OHM, 1%, 0.125W	91637	CRCW12064750FT
A7R1086	321-5030-00			RES, FXD, FILM: 10.0K OHM, 1%, 0.125W	91637	CRCW12061002FT
A7R1087	321-5025-00			RES, FXD, FILM: 3.92K OHM, 1%, 0.125W	91637	CRCW12063921FT
A7R1090	311-2234-00			RES, VAR, NONWW: 5K OHM, 20%, 0.5W	TK2073	GF06UT2 502 M L20
A7R2000	321-0247-07			RES, FXD, FILM: 3.65K OHM, 0.1%, 0.125W	57027	3.65K CM55 T9.1%
A7R2001	321-0816-07			RES, FXD, FILM: 5K OHM, 0.1%, 0.125W	TK1727	MPR24-2322-141-5K0
A7R2002	321-0751-06			RES, FXD, FILM: 50 OHM, 0.25%, 0.125W	57668	CRB14CZE50.0
A7R2010	321-5030-00			RES, FXD, FILM: 10.0K OHM, 1%, 0.125W	91637	CRCW12061002FT
A7R2011	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A7R2020	321-5019-00			RES, FXD, FILM: 1.21K OHM, 1%, 0.125W	91637	CRCW12061211FT
A7R2021	321-5019-00			RES, FXD, FILM: 1.21K OHM, 1%, 0.125W	91637	CRCW12061211FT
A7R2040	321-5023-00			RES, FXD, FILM: 2.74K OHM, 1%, 0.125W	91637	CRCW12062741FT
A7R2041	321-5032-00			RES, FXD, FILM: 15.0K OHM, 1%, 0.125W	91637	CRCW12061502FT
A7R2042	321-5023-00			RES, FXD, FILM: 2.74K OHM, 1%, 0.125W	91637	CRCW12062741FT
A7R2043	321-5023-00			RES, FXD, FILM: 2.74K OHM, 1%, 0.125W	91637	CRCW12062741FT
A7R2044	321-5030-00			RES, FXD, FILM: 10.0K OHM, 1%, 0.125W	91637	CRCW12061002FT
A7R2045	321-5026-00			RES, FXD, FILM: 4.75K OHM, 1%, 0.125W	91637	CRCW12064751FT
A7R2050	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A7R2060	321-5028-00			RES, FXD, FILM: 6.81K OHM, 1%, 0.125W	91637	CRCW12066811FT
A7R2061	321-5014-00			RES, FXD, FILM: 475 OHM, 1%, 0.125W	91637	CRCW12064750FT
A7R2070	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A7R2080	307-1584-00			RES, FXD, FILM: 50 OHM, 10W	03888	PPR 500-10-3 50Ω
A7R2090	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A7R3010	321-5030-00			RES, FXD, FILM: 10.0K OHM, 1%, 0.125W	91637	CRCW12061002FT
A7R3011	321-5014-00			RES, FXD, FILM: 475 OHM, 1%, 0.125W	91637	CRCW12064750FT
A7R3012	321-5023-00			RES, FXD, FILM: 2.74K OHM, 1%, 0.125W	91637	CRCW12062741FT
A7R3013	321-5014-00			RES, FXD, FILM: 475 OHM, 1%, 0.125W	91637	CRCW12064750FT
A7R3014	321-5022-00			RES, FXD, FILM: 2.21K OHM, 1%, 0.125W	91637	CRCW12062211FT
A7R3015	321-5033-00			RES, FXD, FILM: 18.2K OHM, 1%, 0.125W	91637	CRCW12061822FT
A7R3016	321-5022-00			RES, FXD, FILM: 2.21K OHM, 1%, 0.125W	91637	CRCW12062211FT
A7R3017	308-0764-00			RES, FXD, WW: 2.7 OHM, 5%, 2W	11502	SPF 2.7 OHM + -5PE

Component Number	Tektronix Part Number	Serial No. Effective	Dscont	Name & Description	Mfr. Code	Mfr.Part No.
A7R3020	321-5006-00			RES, FXD, FILM: 100 OHM, 1%, 0.125W	91637	CRCW12061000FT
A7R3030	321-5012-00			RES, FXD, FILM: 332 OHM, 1%, 0.125W	91637	CRCW12063320FT
A7R3031	321-5049-00			RES, FIXD, FILM: 1M OHM, 1%, 0.125W	91637	CRCW12061004FT
A7R3032	321-5049-00			RES, FIXD, FILM: 1M OHM, 1%, 0.125W	91637	CRCW12061004FT
A7R3033	321-5012-00			RES, FXD, FILM: 332 OHM, 1%, 0.125W	91637	CRCW12063320FT
A7R3034	321-0637-00			RES, FXD, FILM: 9.9K OHM, 0.5%, 0.125W	19701	5033RC9K900D
A7R3040	321-5030-00			RES, FXD, FILM: 10.0K OHM, 1%, 0.125W	91637	CRCW12061002FT
A7R3041	321-5030-00			RES, FXD, FILM: 10.0K OHM, 1%, 0.125W	91637	CRCW12061002FT
A7R3042	321-0234-03			RES, FXD, FILM: 2.67K OHM, 0.25%, 0.125W	91637	CRCW12062671FT
A7R3043	321-5209-00			RES, FXD, FILM: 243 OHM, 1%, 0.125W	91637	CRCW 12062430FT
A7R3050	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A7R3051	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A7R3052	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A7R3053	321-5022-00			RES, FXD, FILM: 2.21K OHM, 1%, 0.125W	91637	CRCW12062211FT
A7R3054	321-5022-00			RES, FXD, FILM: 2.21K OHM, 1%, 0.125W	91637	CRCW12062211FT
A7R3060	321-5050-00			RES, FXD, FILM: 33.2 OHM, 1%, 0.125W	91637	CRCW120633R2FT
A7R3061	321-5050-00			RES, FXD, FILM: 33.2 OHM, 1%, 0.125W	91637	CRCW120633R2FT
A7R3090	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A7R4010	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A7R4011	321-5034-00			RES, FXD, FILM: 22.1K OHM, 1%, 0.125W	91637	CRCW12062212FT
A7R4012	321-5034-00			RES, FXD, FILM: 22.1K OHM, 1%, 0.125W	91637	CRCW12062212FT
A7R4013	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A7R4014	308-0420-00			RES, FXD, WW: 1.8 OHM, 3%, 1.5W	91637	RS-1A-91
A7R4020	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A7R4021	321-5022-00			RES, FXD, FILM: 2.21K OHM, 1%, 0.125W	91637	CRCW12062211FT
A7R4022	321-5034-00			RES, FXD, FILM: 22.1K OHM, 1%, 0.125W	91637	CRCW12062212FT
A7R4023	321-5014-00			RES, FXD, FILM: 475 OHM, 1%, 0.125W	91637	CRCW12064750FT
A7R4030	321-5038-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW12064752FT
A7R4031	321-5090-00			RES, FXD, FILM: 20K OHM, 1%, 0.125W	91637	CRCW12062002FT
A7R4032	321-5029-00			RES, FXD, FILM: 8.25K OHM, 1%, 0.125W	91637	CRCW12068251FT
A7R4033	321-5090-00			RES, FXD, FILM: 20K OHM, 1%, 0.125W	91637	CRCW12062002FT
A7R4034	321-5029-00			RES, FXD, FILM: 8.25K OHM, 1%, 0.125W	91637	CRCW12068251FT
A7R4035	321-5029-00			RES, FXD, FILM: 8.25K OHM, 1%, 0.125W	91637	CRCW12068251FT
A7R4040	321-5295-00			RES, FXD, FILM: 5.6M OHM, 5%, 0.125W	91637	CRCW12065604JT
A7R4041	321-5043-00			RES, FXD, FILM: 47.5 OHM, 1%, 0.125W	91637	CRCW120647R5FT
A7R4042	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A7R4043	321-5026-00			RES, FXD, FILM: 4.75K OHM, 1%, 0.125W	91637	CRCW12064751FT
A7R4044	321-5003-00			RES, FXD, FILM: 18.2 OHM, 1%, 0.125W	91637	CRCW120618R2FT
A7R4045	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A7R4046	321-5006-00			RES, FXD, FILM: 100 OHM, 1%, 0.125W	91637	CRCW12061000FT
A7R4050	308-0756-00			RES, FXD, WW: 100 OHM, 1%, 3W	91637	RS2B 100R0F T/R
A7R4051	321-0751-06			RES, FXD, FILM: 50 OHM, 0.25%, 0.125W	57668	CRB14CZE50.0
A7R4052	321-5043-00			RES, FXD, FILM: 47.5 OHM, 1%, 0.125W	91637	CRCW120647R5FT
A7R4053	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A7R4060	308-0756-00			RES, FXD, WW: 100 OHM, 1%, 3W	91637	RS2B 100R0F T/R
A7R4061	321-5021-00			RES, FXD, FILM: 1.82K OHM, 1%, 0.125W	91637	CRCW12061821FT
A7R4062	321-5021-00			RES, FXD, FILM: 1.82K OHM, 1%, 0.125W	91637	CRCW12061821FT
A7R4070	308-0756-00			RES, FXD, WW: 100 OHM, 1%, 3W	91637	RS2B 100R0F T/R
A7R4071	321-5021-00			RES, FXD, FILM: 1.82K OHM, 1%, 0.125W	91637	CRCW12061821FT
A7R4072	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A7R4073	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A7R4074	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A7R4080	307-1584-00			RES, FXD, FILM: 50 OHM, 10W	03888	PPR 500-10-3 50Ω
A7R4081	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A7R4082	321-0751-06			RES, FXD, FILM: 50 OHM, 0.25%, 0.125W	57668	CRB14CZE50.0
A7R5010	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A7R5011	321-5011-00			RES, FXD, FILM: 274 OHM, 1%, 0.125W	91637	CRCW12062740FT
A7R5012	321-5044-00			RES, FXD, FILM: 56.2 OHM, 1%, 0.125W	91637	CRCW 120656R2FT
A7R5013	321-5043-00			RES, FXD, FILM: 47.5 OHM, 1%, 0.125W	91637	CRCW120647R5FT
A7R5020	321-5022-00			RES, FXD, FILM: 2.21K OHM, 1%, 0.125W	91637	CRCW12062211FT
A7R5030	321-5029-00			RES, FXD, FILM: 8.25K OHM, 1%, 0.125W	91637	CRCW12068251FT
A7R5031	321-5090-00			RES, FXD, FILM: 20K OHM, 1%, 0.125W	91637	CRCW12062002FT
A7R5032	321-5038-00			RES, FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	CRCW12064752FT
A7R5033	321-5090-00			RES, FXD, FILM: 20K OHM, 1%, 0.125W	91637	CRCW12062002FT
A7R5034	321-5026-00			RES, FXD, FILM: 4.75K OHM, 1%, 0.125W	91637	CRCW12064751FT
A7R5040	321-5006-00			RES, FXD, FILM: 100 OHM, 1%, 0.125W	91637	CRCW12061000FT
A7R5041	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT

Component Number	Tektronix Part Number	Serial No. Effective	Dscont	Name & Description	Mfr. Code	Mfr.Part No.
A7R5042	321-5003-00			RES, FXD, FILM: 18.2 OHM, 1%, 0.125W	91637	CRCW120618R2FT
A7R5050	311-2234-00			RES, VAR, NONWW: 5K OHM, 20%, 0.5W	TK2073	GF06UT2 502 M L20
A7R5051	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A7R5052	321-5022-00			RES, FXD, FILM: 2.21K OHM, 1%, 0.125W	91637	CRCW12062211FT
A7R5053	321-5026-00			RES, FXD, FILM: 4.75K OHM, 1%, 0.125W	91637	CRCW12064751FT
A7R5054	321-5022-00			RES, FXD, FILM: 2.21K OHM, 1%, 0.125W	91637	CRCW12062211FT
A7R5055	321-5026-00			RES, FXD, FILM: 4.75K OHM, 1%, 0.125W	91637	CRCW12064751FT
A7R5056	321-5022-00			RES, FXD, FILM: 2.21K OHM, 1%, 0.125W	91637	CRCW12062211FT
A7R5060	311-2234-00			RES, VAR, NONWW: 5K OHM, 20%, 0.5W	TK2073	GF06UT2 502 M L20
A7R5061	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A7R5062	321-5018-00			RES, FXD, FILM: 1.00K OHM, 1%, 0.125W	91637	CRCW12061001FT
A7R5063	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A7R5064	321-5022-00			RES, FXD, FILM: 2.21K OHM, 1%, 0.125W	91637	CRCW12062211FT
A7R5070	311-2234-00			RES, VAR, NONWW: 5K OHM, 20%, 0.5W	TK2073	GF06UT2 502 M L20
A7R5071	321-5028-00			RES, FXD, FILM: 6.81K OHM, 1%, 0.125W	91637	CRCW12066811FT
A7R5072	321-5022-00			RES, FXD, FILM: 2.21K OHM, 1%, 0.125W	91637	CRCW12062211FT
A7R5073	321-5022-00			RES, FXD, FILM: 2.21K OHM, 1%, 0.125W	91637	CRCW12062211FT
A7R5074	321-5026-00			RES, FXD, FILM: 4.75K OHM, 1%, 0.125W	91637	CRCW12064751FT
A7R5075	321-5030-00			RES, FXD, FILM: 10.0K OHM, 1%, 0.125W	91637	CRCW12061002FT
A7R5076	321-5029-00			RES, FXD, FILM: 8.25K OHM, 1%, 0.125W	91637	CRCW12068251FT
A7R5077	321-5000-00			RES, FXD, FILM: 10 OHM, 1%, 0.125W	91637	CRCW120610R0FT
A7R5080	308-0720-00			RES, FXD, WW: 50 OHM, 1%, 3W	91637	RS2B-B50R00F
A7U1020	156-5138-01			IC, LINEAR: OP AMP, BIFET, DUAL	01295	TL082CD
A7U1030	156-6282-00			IC, CONVERTER: D/A, 12 BIT, CURRENT OUT	06665	PM7545FPC
A7U1031	156-5854-00			IC, LINEAR: OP AMP, HIGH SPEED	51640	AD42356
A7U1050	156-5095-01			IC, LINEAR: OP AMP, LOW NOISE	18324	NE5534DT
A7U1070	156-5138-01			IC, LINEAR: OP AMP, BIFET, DUAL	01295	TL082CD
A7U1080	156-5138-01			IC, LINEAR: OP AMP, BIFET, DUAL	01295	TL082CD
A7U2000	156-5095-01			IC, LINEAR: OP AMP, LOW NOISE	18324	NE5534DT
A7U2010	156-5043-01			IC, CONVERTER: D/A, 8 BIT, CURRENT OUT	06665	DAC08-360SR
A7U2011	156-5480-00			IC, DIGITAL: SHIFT REG, 8-BIT W/LATCHES	04713	MC74HC595AD
A7U2020	156-5043-01			IC, CONVERTER: D/A, 8 BIT, CURRENT OUT	06665	DAC08-360SR
A7U2021	156-5480-00			IC, DIGITAL: SHIFT REG, 8-BIT W/LATCHES	04713	MC74HC595AD
A7U2030	156-5480-00			IC, DIGITAL: SHIFT REG, 8-BIT W/LATCHES	04713	MC74HC595AD
A7U2031	156-6219-00			IC, MISC: ANALOG SWITCH, SPDT	34371	HI4P051-S
A7U2032	156-5480-00			IC, DIGITAL: SHIFT REG, 8-BIT W/LATCHES	04713	MC74HC595AD
A7U2040	156-0312-00			IC, LINEAR: BIPLOAR, VOLTAGE REGULATOR; POSITIVE	04713	MC7815CT
A7U3010	156-6281-00			IC, LINEAR: VOLTAGE REGULATOR, VARIABLE	04713	MC1723CD
A7U3020	156-5588-01			IC, LINEAR: VOLTAGE REF, 2.5V, 1%	04713	MC1403D
A7U3030	156-5480-00			IC, DIGITAL: SHIFT REG, 8-BIT W/LATCHES	04713	MC74HC595AD
A7U3040	156-5095-01			IC, LINEAR: OP AMP, LOW NOISE	18324	NE5534DT
A7U3041	156-5082-01			IC, LINEAR: OP AMP, LOW OFFSET	01295	OP07CDR
A7U3050	156-6219-00			IC, MISC: ANALOG SWITCH, SPDT	34371	HI4P051-S
A7U3051	156-5431-00			MICROCKT, LINEAR: DIFF AMP, UNITY GAIN	13919	INA105KU
A7U4010	156-5095-01			IC, LINEAR: OP AMP, LOW NOISE	18324	NE5534DT
A7U4030	156-5142-01			IC, DIGITAL: DEMUX/DECODER, DUAL 2-TO-4	18324	74HCT139DT
A7U4031	156-5138-01			IC, LINEAR: OP AMP, BIFET, DUAL	01295	TL082CD
A7U4032	156-5726-01			IC, MISC: TIMER, SINGLE	01295	TLC555CDR
A7U4040	156-5464-01			IC, DIGITAL: QUAD 2-INPUT NAND	TK0198	74ACT00
A7U4050	156-6219-00			IC, MISC: ANALOG SWITCH, SPDT	34371	HI4P051-S
A7U5030	156-5019-01			IC, LINEAR: COMPARATOR, DUAL	01295	LM393D
A7U5050	156-5138-01			IC, LINEAR: OP AMP, BIFET, DUAL	01295	TL082CD
A7U5070	156-5138-01			IC, LINEAR: OP AMP, BIFET, DUAL	01295	TL082CD

Replaceable Mechanical Parts

Figure & Index No.	Tektronix Part Number	Serial No. Effective	Dscont	Qty	Name and Description	Mfr. Code	Mfr. Part No.
1-1	337-2665-01			2	SHIELD, ELEC: SIDE	0J260	ORDER BY DESCR
-2	366-1851-01			2	KNOB, LATCH: IVORY GY, 0.625 X 0.25 X 1.09	0JR05	ORDER BY DESCR
-3	105-0865-00			2	BAR, LATCH RLSE:	0JR05	ORDER BY DESCR
-4	105-0866-00			2	LATCH, RETAINING: SAFETY	0JR05	ORDER BY DESCR
-5	214-3143-00			2	SPRING, HLEXT: 0.125 OD X 0.545 L, XLOOP	TK0508	ORDER BY DESCR
-6	131-1315-01			3	CONN, RCPT, ELEC: BNC, FEMALE (W/HDWR)	24931	28JR306-1
-7	366-2136-00			1	KNOB: DOVE GRAY, 0.156 ID X 0.7 OD X 0.6 H	80009	366-2136-00
-8	198-5762-00			1	WIRE SET, ELEC: 6, 50 OHM COAX, 14.0 L, FRONT PANEL OUTPUT CONN ASSY (CABLE ASSY W/HDWR)	80009	198-5762-00
-9	210-0241-00			1	TERMINAL, LUG: 0.515 ID, PLAIN, STL CD PL	TK1665	ORDER BY DESCR
-10	015-2350-00	B010100	B010350	1	HYBRID ASSY: LEVELING HEAD, SG5030	80009	ORDER BY DESCR
	015-2350-01	B010351		1	HYBRID ASSY: LEVELING HEAD, SG5030	80009	ORDER BY DESCR
-11	333-3897-00			1	PANEL, REAR: SG5030	80009	
-12	213-0882-00			4	SCREW, TPG, TR: 6-32 X 0.437 TAPTITE, PNH	TK0858	ORDER BY DESCR
-13	386-3657-01			4	SUPPORT, PLUG-IN	83486	ORDER BY DESCR
-14	255-0581-00			1.57'	PLASTIC CHANNEL: 0.156 X 0.156, POLYETHYLENE	TK1643	ORDER BY DESCR
-15	214-3089-01			4	LOCKOUT, PLUG-IN: PLASTIC	80009	214-3089-00
-16	214-1061-00			2	CONTACT, ELEC: GROUNDING CU BE	80009	214-1061-00
-17	426-2423-00			2	FRAME SECT CAB: TOP, SG5030 3 WIDE	80009	426-2423-00
-18	211-0541-00			12	SCREW, MACHINE: 6-32 X 0.25, FLH, 100 DEG, STL	TK0435	ORDER BY DESCR
-19	337-3699-00			1	SHIELD, ELEC: TOP, SG5030	80009	337-3699-00
-20	426-2424-00			2	FRAME SECT CAB: BOTTOM, SG5030, 3 WIDE	80009	426-2424-00
-21	337-3700-00			1	SHIELD, ELEC: BOTTM, SG5030	80009	337-3700-00
-22	386-6265-00			1	SUBPANEL, FRONT: W/LEXAN, SG5030	80009	386-6265-00
-23	366-0732-00			4	KNOB, KEYCAP: LIGHTED	TK1319	ORDER BY DESCR
-24	———	———			SWITCH, ROTARY: (SEE A1SW2030 REPL)		
-25	366-0733-00			22	KNOB, KEYCAP: UNLIT	TK1319	ORDER BY DESCR
-26	———	———			CKT BOARD ASSY: FRNT PNL (SEE A1 REPL)		
-27	211-0325-00			11	SCREW, ASSEM WASHER: 4-40 X 0.25, PNH, STL, TORX T9	TK0435	ORDER BY DESCR
-28	———	———			CKT BOARD ASSY: OUTPUT (SEE A7 REPL)		
-29	———	———			SKT, PL-IN ELEK: 48 PIN (SEE A7H3070 REPL)		
-30	129-0129-00			4	SPACER, POST: 1.125 L, 4-40 BOTH ENDS, AL, 0.25 HEX	TK0858	ORDER BY DESCR
-31	———	———			CKT BOARD ASSY: TIMEBASE (SEE A6 REPL)		
-32	———	———			CKT BOARD ASSY: RF (SEE A5 REPL)		
-33	337-3683-00				SHIELD, ELEC: RF CIRCUIT BOARD	80009	337-3683-00
-34	211-0101-00			5	SCREW, MACHINE: 4-40 X 0.25, FLH, 100 DEG, STL	TK0435	ORDER BY DESCR
-35	211-0325-00			34	SCREW, ASSEM WASHER: 4-40 X 0.25, PNH, STL, TORX T9	TK0858	ORDER BY DESCR
-36	———	———			CKT BOARD ASSY: DDS (SEE A4 REPL)		
-37	337-3337-00			1	SHIELD, ELEC: (SEE A4SH4020/SH5000 REPL)	0J9P9	337-3337-00
-38	211-0087-01			4	SCREW, MACHINE: 2-56 X 0.188, FLH, 82 DEG, STL	TK0435	ORDER BY DESCR
-39	211-0180-00			4	SCREW, ASSEM WASHER: 2-56 X 0.25, PNH, BRS, NP, POZ	TK0435	ORDER BY DESCR
-40	129-0301-00			4	SPACER, POST: 0.312 L, 2-56 THRU, BRS, CU SN ZN	0J260	129-0301-00

Figure & Index No.	Tektronix Part Number	Serial No. Effective	Dscont	Qty	Name and Description	Mfr. Code	Mfr. Part No.
-41	———— —	———			CKT BOARD ASSY: CPU (SEE A3 REPL)		
-42	———— —	———			CKT BOARD ASSY: INTRCNCT (SEE A2 REPL)		
-43	———— —	———			IC, LINEAR: (SEE A2U2060 REPL)		
-44	214-2518-01			1	HEAT SINK, XSTR: TO-202/TO-220, AL	TK0303	332-012
-45	———— —	———			IC, LINEAR: (SEE A2U4050 REPL)		
-46	211-0101-00			1	SCREW, MACHINE: 4-40 X 0.25, FLH, 100 DEG, STL	TK0435	ORDER BY DESCR
-47	210-0406-00			4	NUT, PLAIN, HEX: 4-40 X 0.188, BRS CD PL	7343	12161-50
-48	210-1178-00			6	WASHER, SHLDR: U/W TO-220 TRANSISTOR	13103	7721-7PPS
-49	342-0831-00			4	INSULATOR, PLATE: TRANSISTOR TO-220	55285	K6AC-54
-50	214-4461-00			1	HEAT SINK: OUTPUT, REAR	80009	214-4461-00
-51	361-1603-00			5	SPACER: RESISTOR BRACKET	TK0858	361-1603-00
-52	210-0586-00			2	NUT, PL, ASSM WA: 4-40 X 0.25, STL CD PL	TK0435	ORDER BY DESCR
-53	214-4438-00			3	HEATSINK, XSTR: ALUMINUM, TO-220	30161	576802B03100
-54	211-0008-00			2	SCREW, MACHINE: 4-40 X 0.25, PNH, STL CD PL, POZ	TK0435	ORDER BY DESCR
-55	214-4450-00			1	HEAT SINK: ALUMINUM	80009	214-4450-00
-56	361-0041-00			1	SPACER, POST: 0.375 L W/4-40 THUR, AL, 0.25	80009	361-0041-00
-57	214-2868-00			1	HEATSINK: MICROCKT (A4U4030)	05820	650-B
	214-4426-00			1	BLOCK, HEAT SINK: ALUMINUM	TK1465	ORDER BY DESCR
	214-4462-00			1	HEAT SINK, MULTIPLE: OUTPUT CKT BD	30161	ORDER BY DESCR
	211-0022-00			4	SCREW, MACHINE: 2056 X 0.188, PNH, STL CD PL, POZ	TK0435	ORDER BY DESCR

Accessories

Standard Accessories

Tektronix Part Number	Serial No. Effective	Dscont	Name and Description	Mfr. Code	Mfr. Part No.
070-7705-01			SG 5030 Operator's Manual	80009	070-7705-01
070-7704-00			SG 5030 Instrument Interfacing Guide	80009	070-7704-00
070-7706-00			SG 5030 Reference Card	80009	070-7706-00

Optional Accessories

Tektronix Part Number	Serial No. Effective	Dscont	Name and Description	Mfr. Code	Mfr. Part No.
070-7703-01			SG 5030 Service Manual	80009	070-7703-01
067-0175-00			Extender Board	80009	067-0175-00
015-0221-00			DC Blocking Capacitor	18203	B266S

DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

Symbols

Graphic symbols and class designation letters are based on ANSI Standard Y32.2-1975.

Logic symbology is based on ANSI Y32.14-1973 in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

The overline on a signal name indicates that the signal performs its intended function when it is in the low state.

Abbreviations are based on ANSI Y1.1-1972.

Other ANSI standards that are used in the preparation of diagrams by Tektronix are:

Y14.15, 1966 Drafting Practices

Y14.2, 1973 Line Conventions and Lettering

Y10.5, 1968 Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering

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

Component Values

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

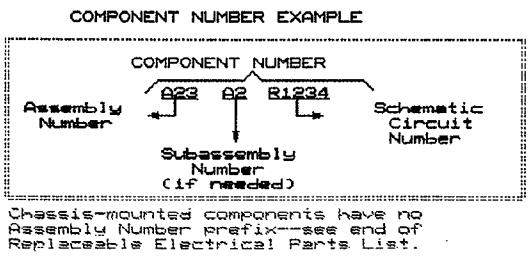
Capacitors = Values one or greater are in picofarads (pF). Values less than one are in microfarads (μF).

Resistors = Ohms (Ω).

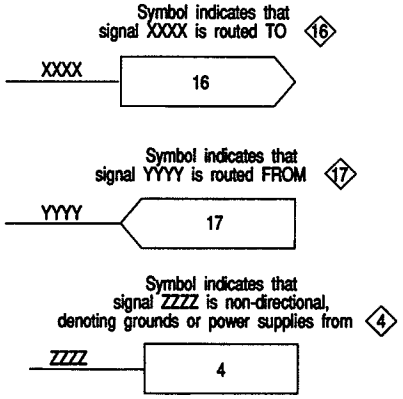
The information and special symbols below may appear in this manual.

Assembly Numbers and Grid Coordinates

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



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



A4 DDS BOARD AND A7 OUTPUT BOARD PLUG-IN REAR VIEW

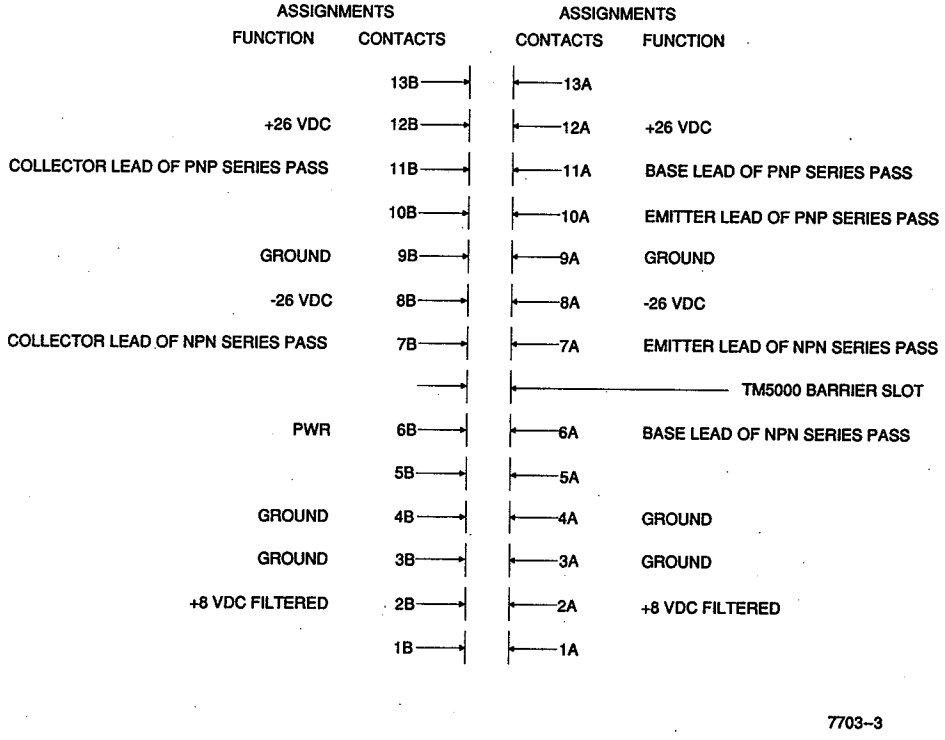


Figure 10-1: DDS and Output Board Rear Interface

REAR INTERFACE GPIB CONNECTOR A3 CPU BOARD PLUG-IN REAR VIEW

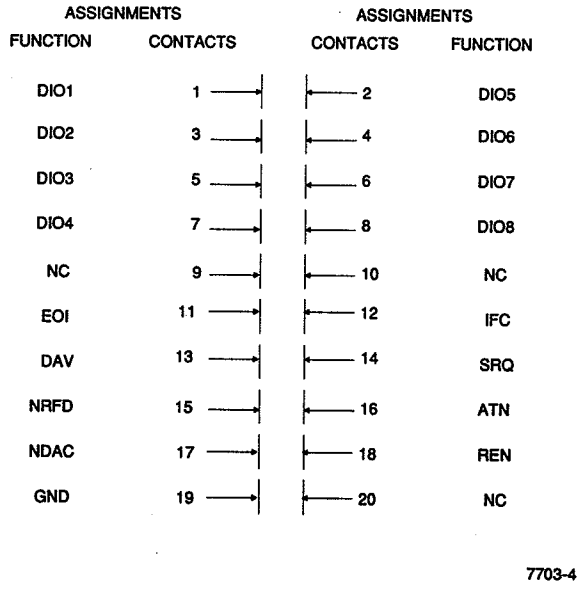
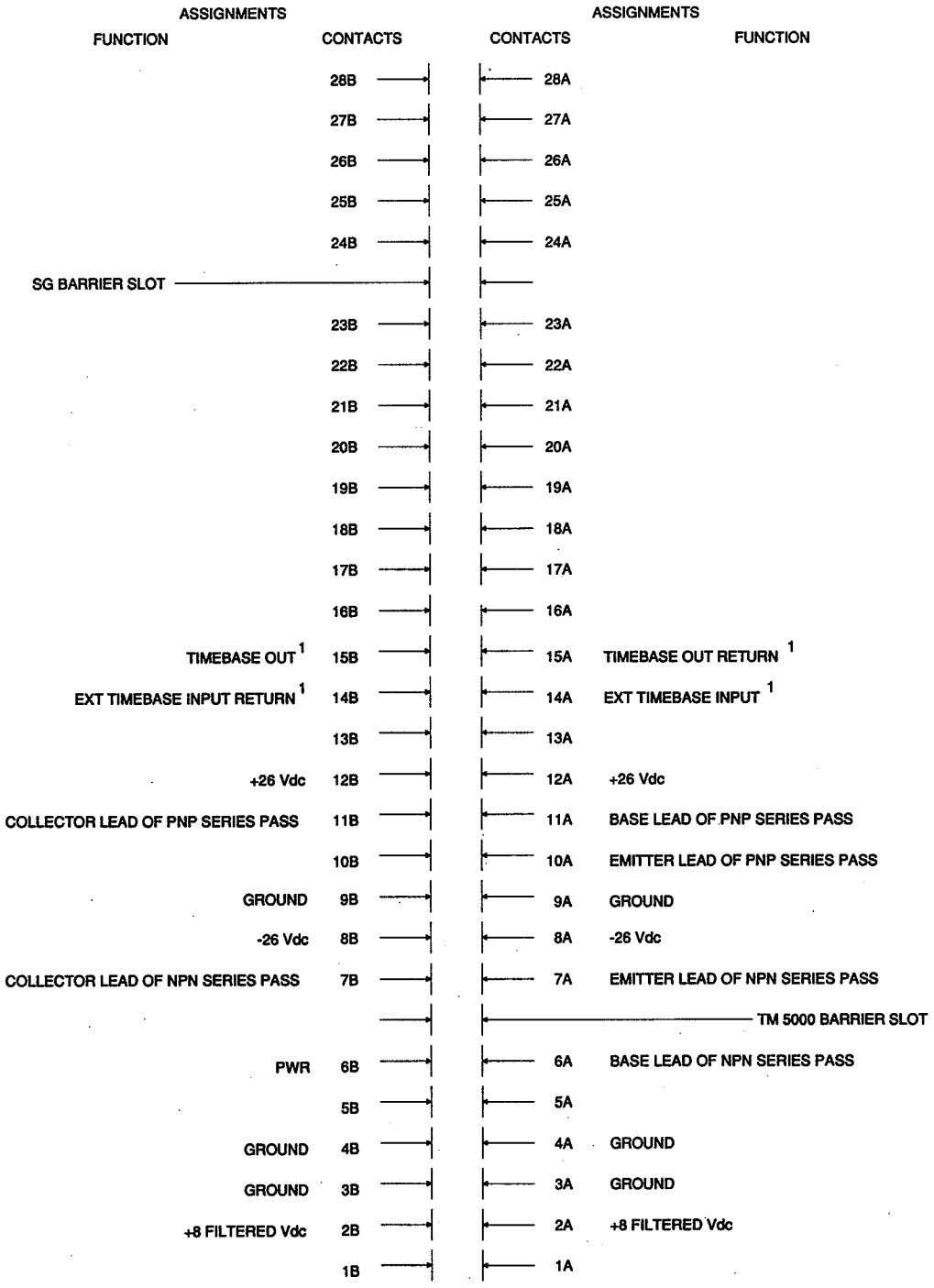


Figure 10-2: CPU Board GPIB Rear Interface

A6 TIMEBASE BOARD
PLUG-IN REAR VIEW



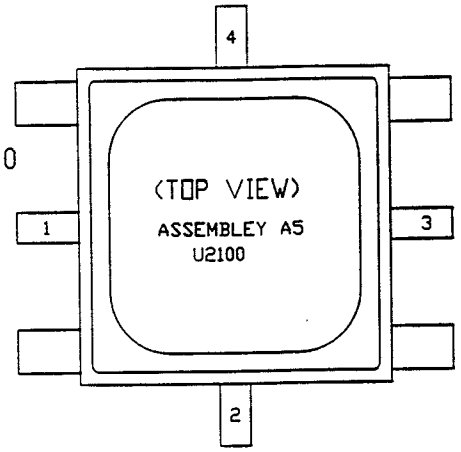
[1] These rear connector functions are active only when the coaxial cables are removed from the front-panel connectors and reconnected to J3050 and J3051 on the A6-Timebase board.

7703--10

Figure 10-3: Timebase Board Rear Interface

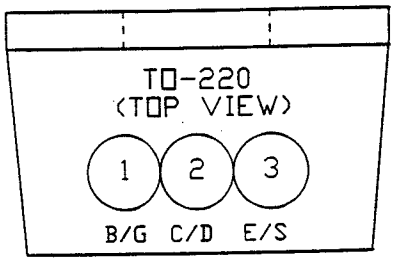
Transistor and Diode Pinout Diagrams

119-3921-00

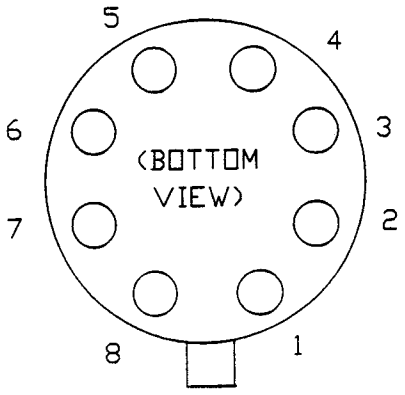


BIPOLAR { 151-0476-00 / 151-0482-00

MOSFET { 151-1161-00 (N-CH) / 151-1257-00 (P-CH)

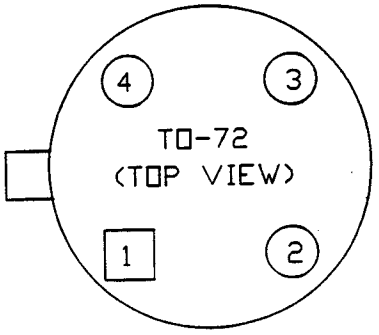


148-0198-00
RF RELAY

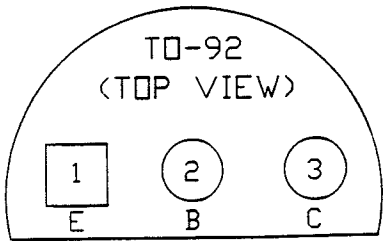


151-1012-00

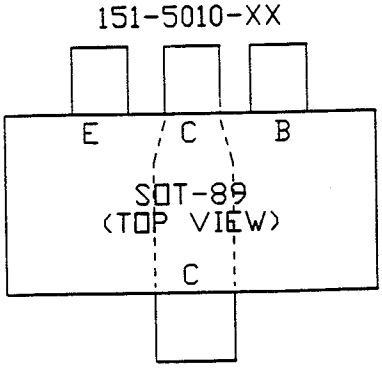
PIN
1 S
2 D
3 G
4 CASE



151-0188-00
151-0190-00

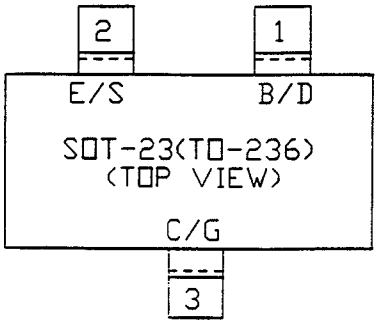


151-5010-XX

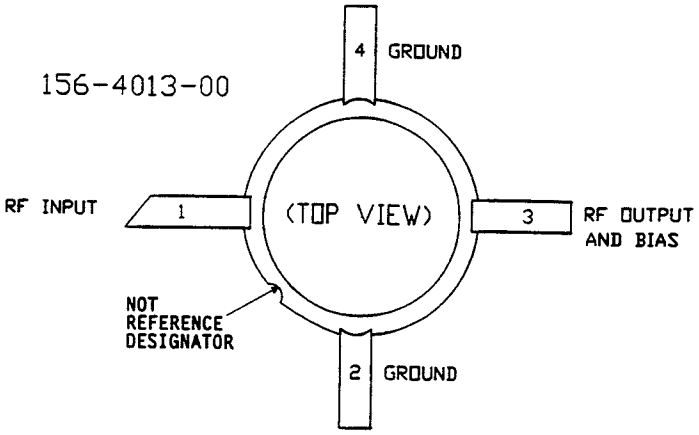


BIPOLAR { 151-5000-XX, 151-5001-XX, 151-5027-XX, 151-5030-XX }

MOSFET { 151-5002-XX }

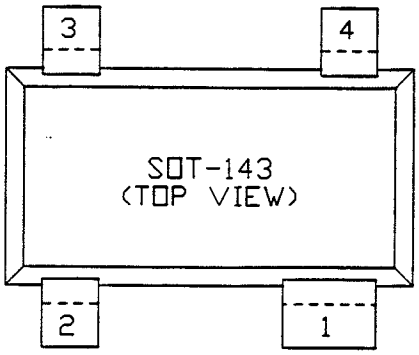


156-4013-00



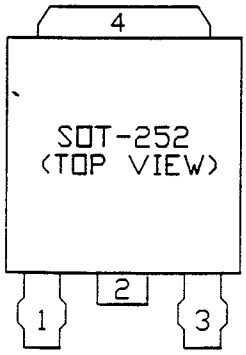
156-5922-00

PIN
1 GND
2 OUTPUT
3 Vcc
4 INPUT

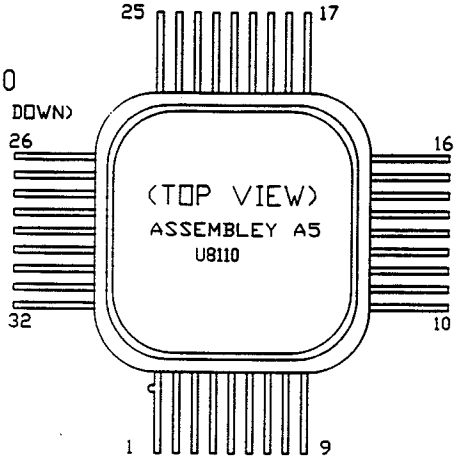


MOSFET 151-5045-00

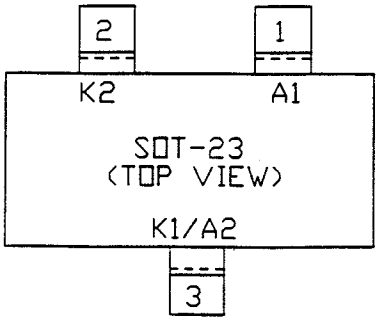
PIN
1 BASE / GATE
2 COLLECTOR / DRAIN
3 EMITTER / SOURCE
4 COLLECTOR / DRAIN



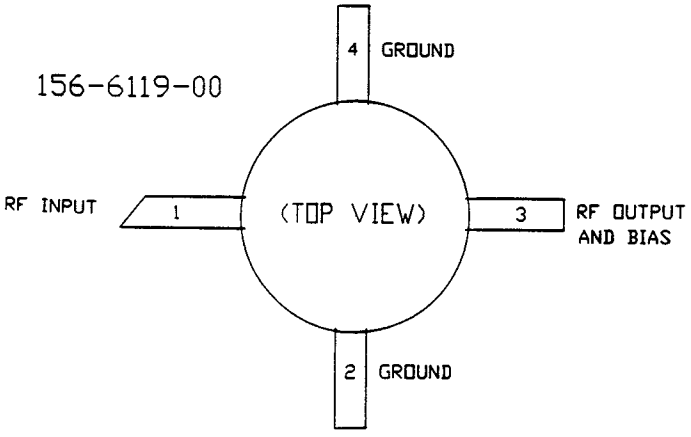
156-5928-00
(MOUNTED UPSIDE DOWN)



152-5018-00

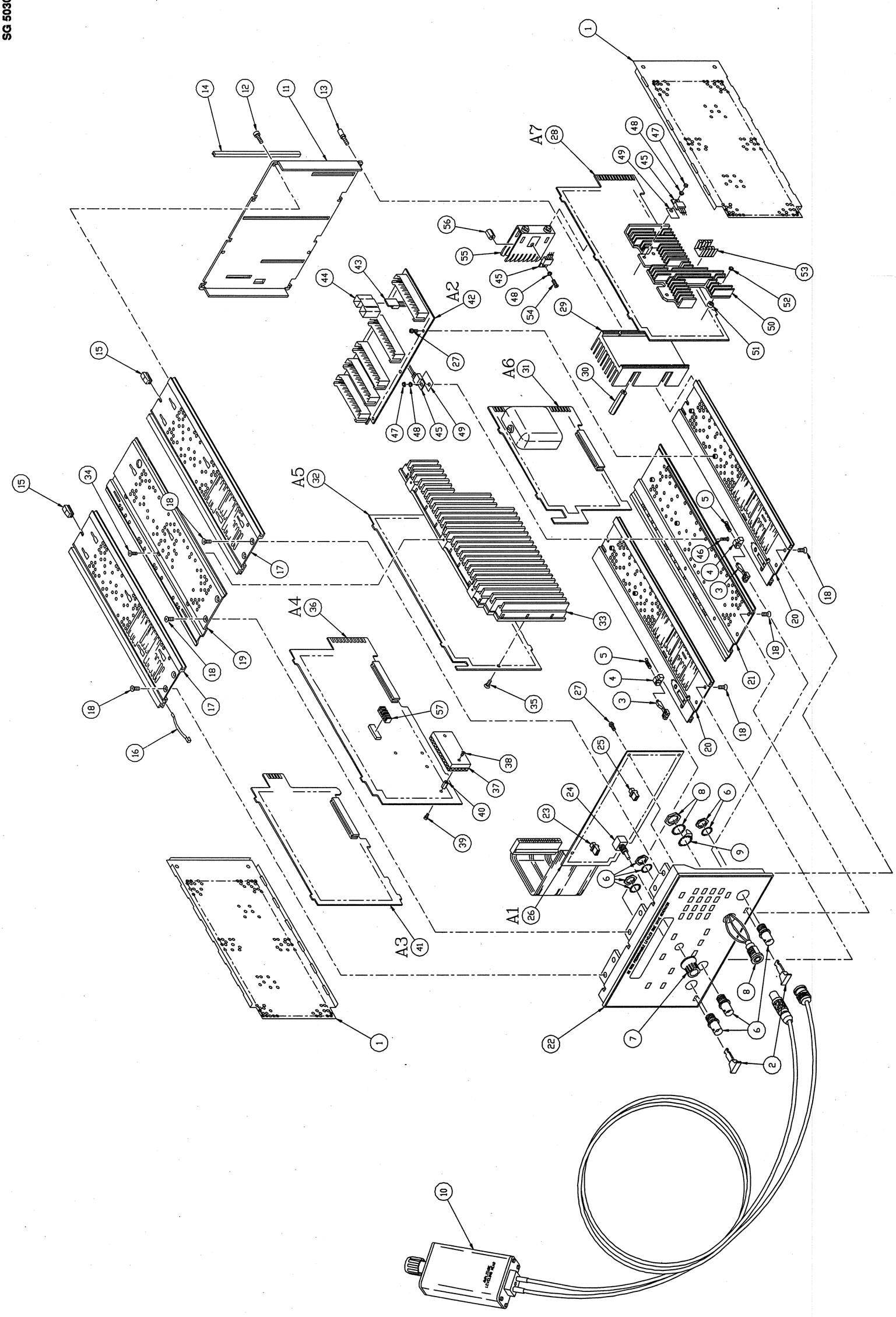


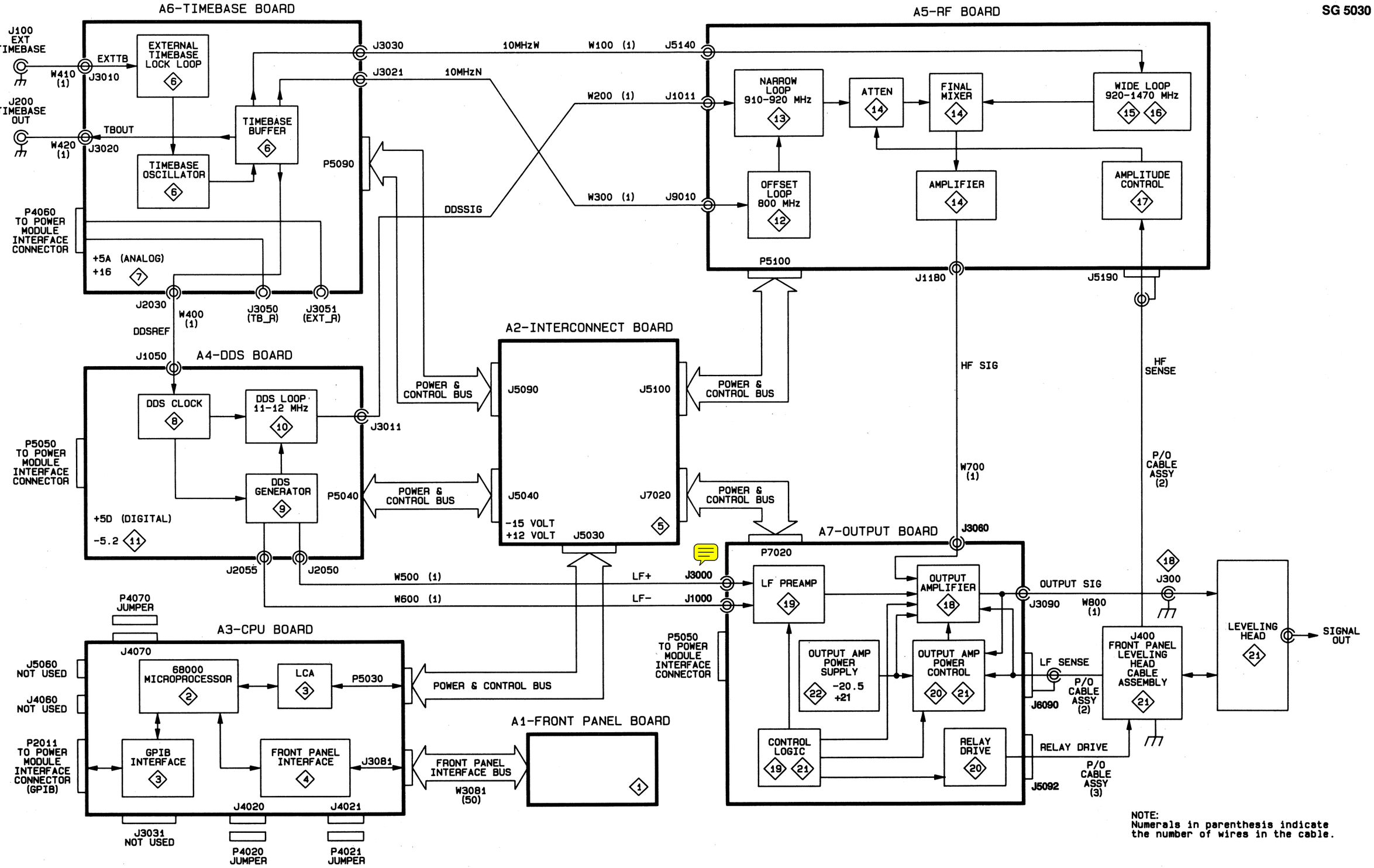
156-6119-00



SG 5030

FIG. 1 EXPLODED VIEW





NOTE:
Numerals in parenthesis indicate the number of wires in the cable.

REV JUL 1991

Fig. 10-4. SG 5030 basic block/cabling diagram.

7703-6

Fig. 10-5. A1 - Front Panel board.

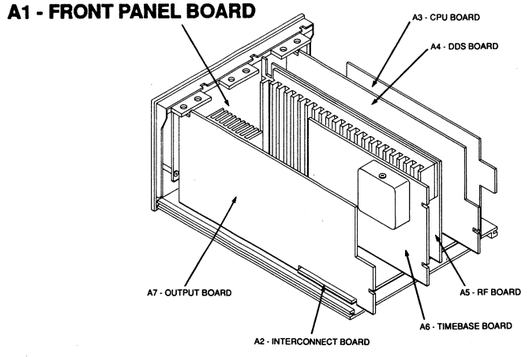
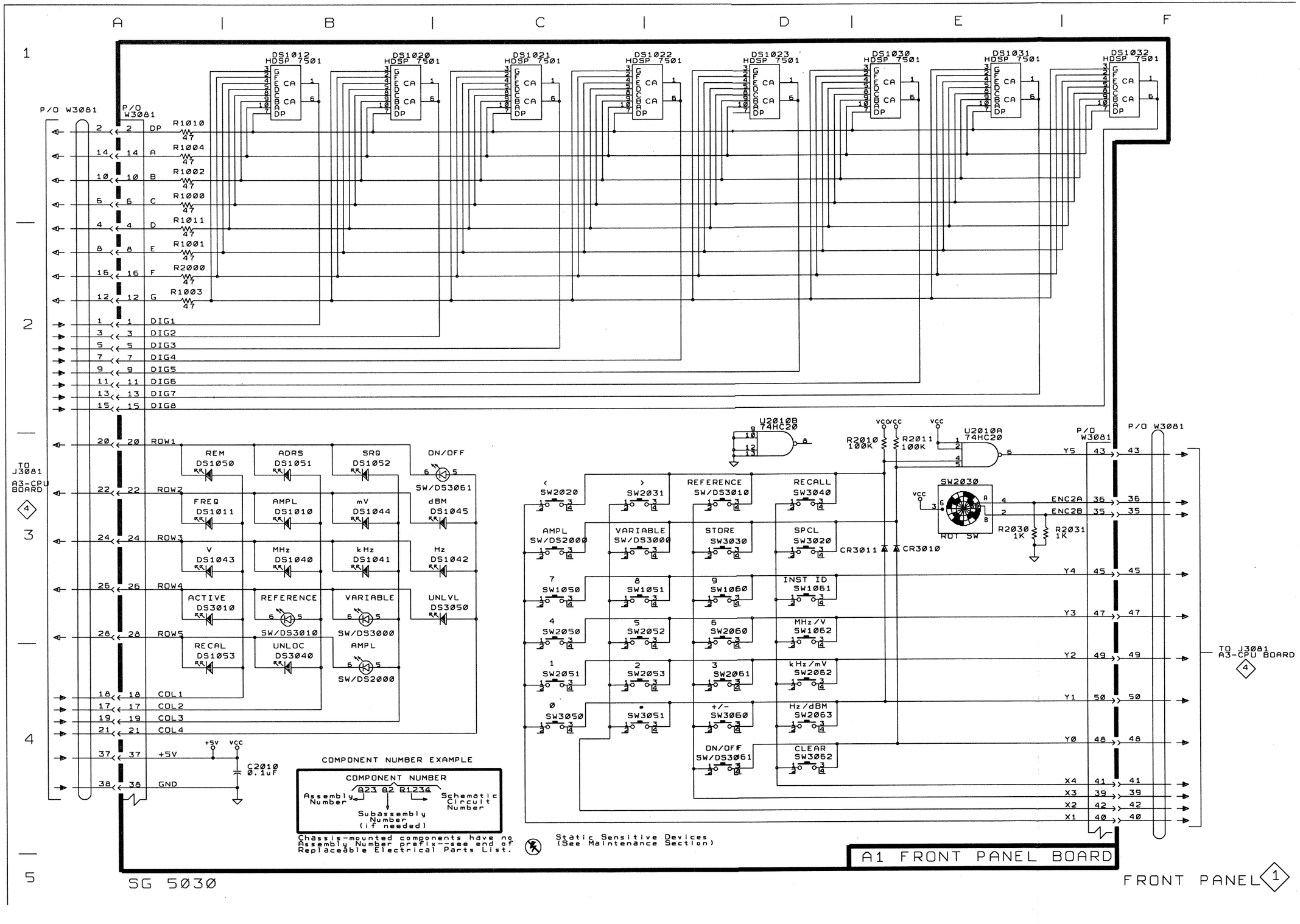


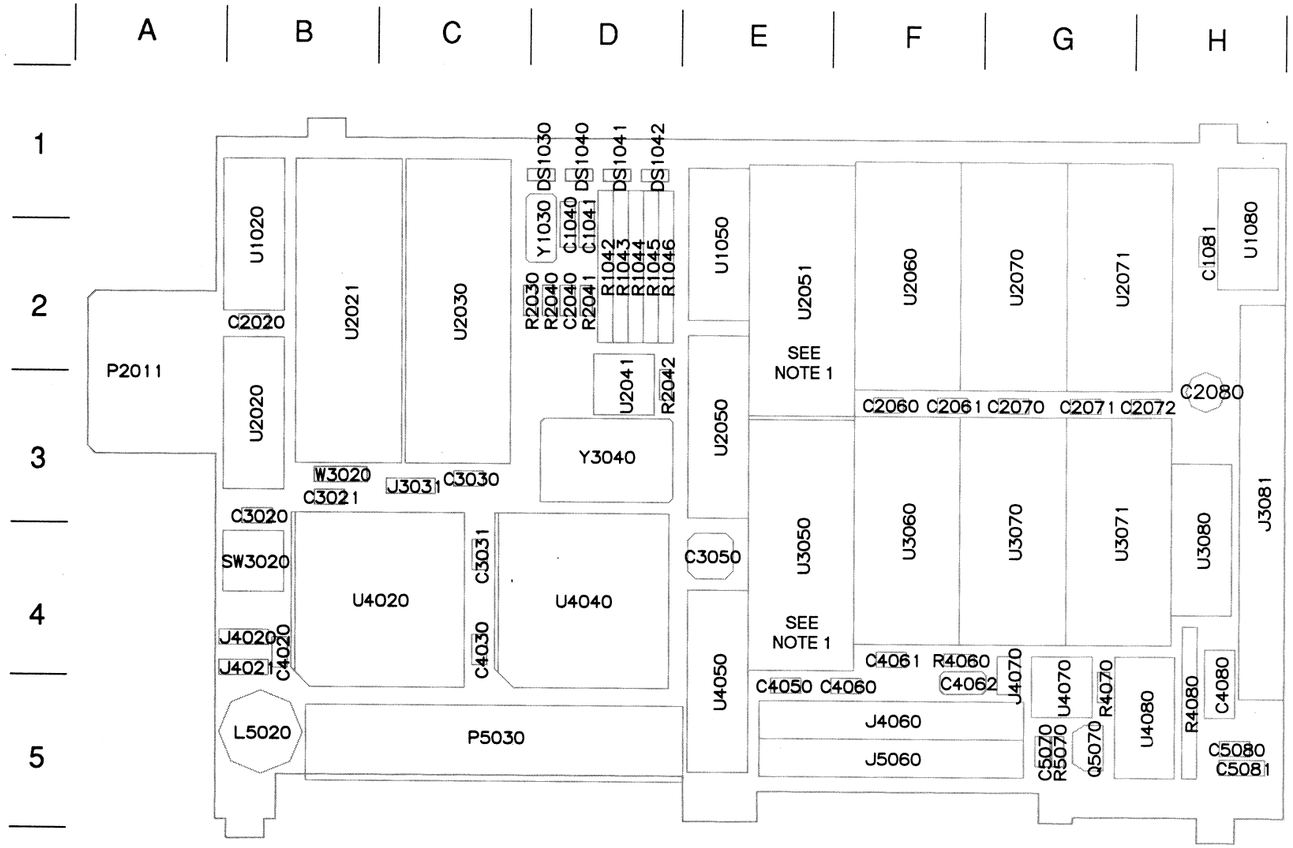
Table 10-1
Component Reference Chart

P/O A1 ASSY — **Front Panel (Schematic 1)**

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C2010	B4	C2
CR3010	E3	C3
CR3011	E3	C3
DS1010	B3	B1
DS1011	A3	B1
DS1012	B1	C1
DS1020	B1	C1
DS1021	C1	C1
DS1022	D1	D1
DS1023	D1	D1
DS1030	E1	D1
DS1031	E1	E1
DS1032	F1	E1
DS1040	B3	E1
DS1041	B3	E1
DS1042	C3	E1
DS1043	A3	F1
DS1044	B3	F1
DS1045	C3	F1
DS1050	A3	F1
DS1051	B3	F1
DS1052	B3	F1
DS1053	A4	G1
DS3010	A3	C4
DS3040	B4	F4
DS3050	C3	F4
R1000	A1	B1
R1001	A2	B1
R1002	A1	B2
R1003	A2	B2
R1004	A1	B2
R1010	A1	B1
R1011	A1	B1
R2000	A2	B2

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
R2010	E3	C2
R2011	E3	C3
R2030	E3	D3
R2031	E3	D3
SW/DS2000	C3,B4	B2
SW/DS3000	D3,B4	B3
SW/DS3010	D3,B4	C3
SW/DS3061	D4,C3	G4
SW1050	C3	F2
SW1051	D3	F2
SW1060	D3	G2
SW1061	D3	G1
SW1062	D3	G2
SW2020	C3	D2
SW2030	D4	D3
SW2031	D3	E2
SW2050	C3	F2
SW2051	C4	F3
SW2052	D3	F2
SW2053	D4	F3
SW2060	D3	G2
SW2061	D4	G3
SW2062	D4	G2
SW2063	D4	G3
SW3020	D3	D4
SW3030	D3	D4
SW3040	D3	E4
SW3050	C4	F3
SW3051	D4	F3
SW3060	D4	G3
SW3062	D4	G3
U2010A	E3	C2
U2010B	E3	C2
W3081	A1,F3	A2


A
B
C
D
E
F
1
2
3
4
5
DS1012 HDSP 7501
DS1020 HDSP 7501
DS1021 HDSP 7501
DS1022 HDSP 7501
DS1023 HDSP 7501
DS1030 HDSP 7501
DS1031 HDSP 7501
DS1032 HDSP 7501
P/O W3081
R1010 47
R1004 47
R1002 47
R1000 47
R1011 47
R1001 47
R2000 47
R1003 47
DP
A
B
C
D
E
F
G
DIG1
DIG2
DIG3
DIG4
DIG5
DIG6
DIG7
DIG8
ROW1
ROW2
ROW3
ROW4
ROW5
COL1
COL2
COL3
COL4
+5V
GND
REM DS1050
ADRS DS1051
SRQ DS1052
ON/OFF SW/DS3061
FREQ DS1011
AMPL DS1010
mV DS1044
dBM DS1045
V DS1043
MHz DS1040
kHz DS1041
Hz DS1042
ACTIVE DS3010
REFERENCE SW/DS3010
VARIABLE SW/DS3000
UNLVL DS3050
RECAL DS1053
UNLOC DS3040
AMPL SW/DS2000
TO J3081 A3-CPU BOARD
C2010 0.1uF
U2010B 74HC20
U2010A 74HC20
R2010 100K
R2011 100K
SW2030
ROT SW
R2030 1K
R2031 1K
ENC2A
ENC2B
CR3011
CR3010
< SW2020
> SW2031
REFERENCE SW/DS3010
RECALL SW3040
AMPL SW/DS2000
VARIABLE SW/DS3000
STORE SW3030
SPCL SW3020
7 SW1050
8 SW1051
9 SW1060
INST ID SW1061
4 SW2050
5 SW2052
6 SW2060
MHz/V SW1062
1 SW2051
2 SW2053
3 SW2061
kHz/mV SW2062
0 SW3050
. SW3051
+/- SW3060
Hz/dBM SW2063
ON/OFF SW/DS3061
CLEAR SW3062
Y5
Y4
Y3
Y2
Y1
Y0
X4
X3
X2
X1
TO J3081 A3-CPU BOARD
COMPONENT NUMBER EXAMPLE
COMPONENT NUMBER
A23 A2 R1234
Assembly Number
Subassembly Number (if needed)
Schematic Circuit Number
Chassis-mounted components have no Assembly Number prefix--see end of Replaceable Electrical Parts List.
Static Sensitive Devices (See Maintenance Section)
A1 FRONT PANEL BOARD
SG 5030
FRONT PANEL 1



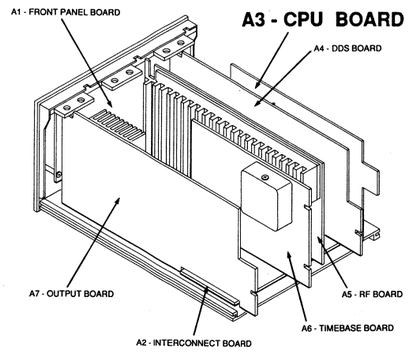
NOTE 1 Pins 1, 2, and 31, 32 on this socket are not used. The 28-pin EPROM is properly inserted into its socket when the top four socket pins are empty.

Fig. 10-6. A3 - CPU board.

Table 10-2
Component Reference Chart

P/OA3 ASSY			6800 Microprocessor (Schematic 2)		
CIRCUIT NUMBER	**SCHEMATIC LOCATION**	**BOARD LOCATION**	**CIRCUIT NUMBER**	**SCHEMATIC LOCATION**	**BOARD LOCATION**
C1081	F4	H2	DS1042	F3	D1
C2020	E4	B2	J4060	A1	F5
C2040	E4	D2	J4070	A1	G4
C2060	D4	F3	J5060	A1	F5
C2061	D4	F3	Q5070	B1	G5
C2070	E4	G3	R1042	B3	D2
C2071	E4	G3	R1043	E1	D2
C2080	D4	H3	R2030	F2	D2
C3020	D4	B3	R2040	F2	D2
C3021	F4	B3	R2041	F2	D2
C3030	F4	C3	R2042	F2	D3
C3031	E4	C4	R4070	B1	G5
C3050	C4	E4	SW3020	F1	B4
C4020	D4	B4	U1050	F2	E2
C4030	E4	C4	U2051	C2	E2
C4050	D4	E5	U2060	E2	F2
C4060	D4	F5	U2070	E3	G2
C4061	F4	F4	U3050	C3	E4
C5070	E4	G5	U3060	D2	F4
C5080	E4	H5	U3070	D3	G4
DS1030	F3	D1	U4040	B2	D4
DS1040	F3	D1	U4070	B1	G5
DS1041	F3	D1	Y3040	B1	D3

P/O A3 ASSY also shown on Schematics 3 & 4.



A3-CPU circuit board illustration to be used with diagram 2 through diagram 4

Not connected in normal use

J4070 P4070 PBRST

U4070 DS1232 PBRST TD TOL ST RST

J4060 RESET

J5060 HALT R/W CLK CONFIGCS RAMAH UDS RAMAL RAMBH RAMBL EPROMA

NOT USED

U4040 68000CC

CLK VPA IPL0 IPL1 IPL2 BGACK BR DTACK BERR FC0 FC1 FC2 BG VMA E AS LDS R/W HALT RESET A1-A23 D0-D15

Y3040 OSC NC OUT

R4070 1K

Q5070

R1042 10K BERR BR BGACK DTACK HALT RESET NOOP PWRDWN MO

SEE NOTE 1 U2051 EPROM

U3050 EPROM1 SEE NOTE 1

SOCKET PINOUT SHOWN.

SEE EPROM CHART FOR 27512 PINOUT

U3060 NVRAM

U3070 NVRAM

U2060 RAM

U2070 RAM

R/W RAMAH RAMAL RAMBH RAMBL UDS LDS CE OE WE VPP PGM VCC NC EPROMA

CONFIGCS

SW3020 1234 8765

R1043 10K

Reinitialize firmware
Diagnostic Bypass
Enable Adjustments
Not Used

SPARE2 LPTBUSY ACCLR NOIACK CCLK

U1050 16L8

DS1030 DS1040 DS1041 DS1042

R2030 R2040 R2041 R2042 330

C3050 220uF C2080 47uF C4060 C2060 C2061 C2070 C2071 C2020 C5070 C1081 C3030 C3020 C4050 C4020 C2040 C3031 C4030 C5080 C3021 C4061 .1uF

EPROM

Socket PIN	27C512 PIN	SIGNAL
1		
2		
3	1	A15
4	2	A12
5	3	A7
6	4	A6
7	5	A5
8	6	A4
9	7	A3
10	8	A2
11	9	A1
12	10	A0
13	11	D0
14	12	D1
15	13	D2
16	14	GND
17	15	D3
18	16	D4
19	17	D5
20	18	D6
21	19	D7
22	20	/CE
23	21	A10
24	22	/OE
25	23	A11
26	24	A9
27	25	A8
28	26	A13
29	27	A14
30	28	VCC
31		
32		

POWER PIN TABLE

DEVICE TYPE	VCC +5V	GND
16L8	20	10
68000CC	14.52	16,17 56,57
DS1232	8	4
OSC	14	7

NOTE 1

Pins 1,2 and 21,32 on this socket are not used. The 28-pin EPROM is properly inseted into the socket when the top four socket pins are empty.

COMPONENT NUMBER EXAMPLE

COMPONENT NUMBER A23 A2 R1234

Assembly Number — Schematic Circuit Number — Subassembly Number (if needed)

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

Static Sensitive Devices (See Maintenance Section)

P/O A3 CPU BOARD

SG 5030

68000 MICROPROCESSOR 2

Note: A3 - CPU circuit board illustration located on reverse side of Schematic 1.

Table 10-3
Component Reference Chart

P/O A3 ASSY — **LCA/GPIB Interface (Schematic 3)**

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1040	D1	D2
C1041	D1	D2
C2072	B4	H3
C4062	C4	F4
J3031	F1	C3
J4020	A3	B4
J4021	A3	B4
J4060	A1,A2,A3,B1	F5
J5030	B1,F1,F3	p/o Assy A2
J5060	A2,A3,A4,F3	F5
L5020	D4	B5
P4020	A3	B4
P4021	A4	B4
P2011	F3	A3

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
P5030	B1,D3,F1,F3	C5
R1044	F2	D2
R4060	C4	F4
R5070	B4	G5
U1020	E4	B2
U2020	F3	B3
U2021	E3	B2
U2030	E1	C2
U2041	B4	D3
U4020	C3	B4
U4050	B2	E5
W3020	D3	B3
Y1030	D1	D2

P/O A3 ASSY also shown on Schematics 2 & 4.

POWER PIN TABLE		
DEVICE TYPE	VCC +5V	GND
68681	40	20
75160	20	10
75161	20	10
9914	40	20
CPULCA	18,52	1,35
ICM7555	8	1

Static Sensitive Devices (See Maintenance Section)

COMPONENT NUMBER EXAMPLE

COMPONENT NUMBER: A23 A2 R1234 — Assembly Number; Subassembly Number (if needed); Schematic Circuit Number

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

Not used on SG5030

TO EXECUTE ALL NOOP'S PLACE JUMPERS BETWEEN PINS 1 & 2 ON BOTH NOOP AND DTACK PINS

P/O A3 CPU BOARD

LCA & GPIB INTERFACE 3

SG 5030

Note: A3-CPU circuit board illustration located on reverse side of Schematic 1

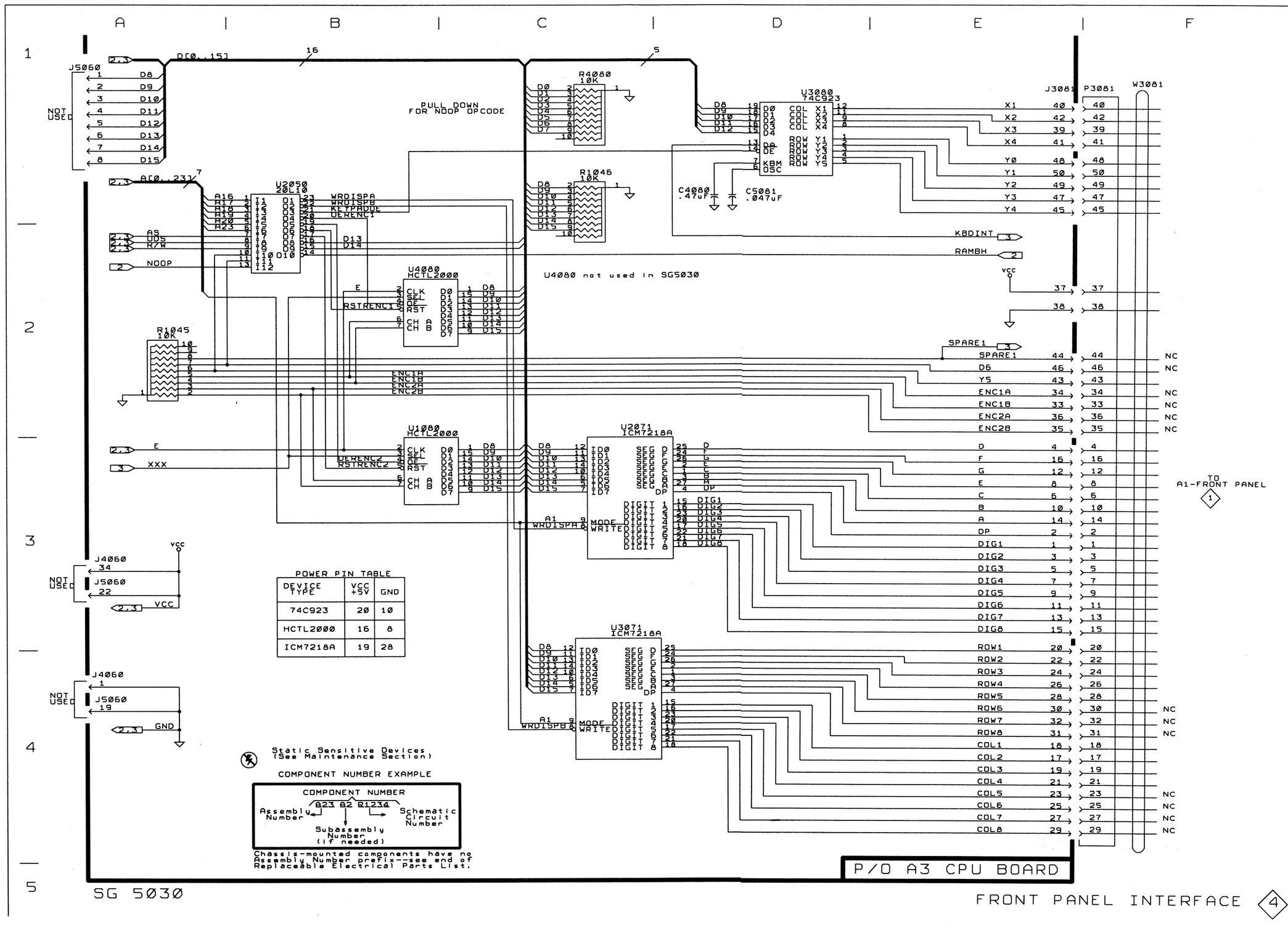
Table 10-4
Component Reference Chart

P/O A3 ASSY — **Front Panel Interface (Schematic 4)**

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C4080	D1	H5
C5081	D1	H5
J3081	E1	H3
J4060	A3,A4	F5
J5060	A1,A3,A4	F5
P3081	F1	p/o Assy A1
R1045	A2	D2
R1046	C1	D2

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
R4080	C1	H5
U1080	B3	H2
U2050	B1	E3
U2071	C3	G2
U3071	C4	G4
U3080	D1	H4
U4080	B2	H5
W3081	F1	p/o Assy A1

P/O A3 ASSY also shown on Schematics 2 & 3


A
B
C
D
E
F
1
2
3
4
5
J5060
NOT USED
D[0..15]
16
5
PULL DOWN FOR NOOP OPCODE
R4080 10K
R1045 10K
U3080 74C923
C4080 .47uF
C5081 .047uF
J3081
P3081
W3081
X1
X2
X3
X4
Y0
Y1
Y2
Y3
Y4
KBDINT
RAMBH
VCC
SPARE1
D6
Y5
ENC1A
ENC1B
ENC2A
ENC2B
A[0..23]
7
U2050 20L10
WRDISPA
WRDISPB
KEYPRMODE
DERENC1
AS
UDS
R/W
NOOP
D13
D14
U4080 HCTL2000
E
RSTRENC1
U4080 not used in SG5030
R1045 10K
ENC1A
ENC1B
ENC2A
ENC2B
U1080 HCTL2000
E
XXX
DERENC2
RSTRENC2
U2071 ICM7218A
A1
WRDISPA
MODE WRITE
DIG1
DIG2
DIG3
DIG4
DIG5
DIG6
DIG7
DIG8
U3071 ICM7218A
A1
WRDISPB
ROW1
ROW2
ROW3
ROW4
ROW5
ROW6
ROW7
ROW8
COL1
COL2
COL3
COL4
COL5
COL6
COL7
COL8
NC
TO A1-FRONT PANEL
1
J4060
34
J5060
22
NOT USED
2,3
VCC
J4060
1
J5060
19
NOT USED
2,3
GND
POWER PIN TABLE
DEVICE TYPE
VCC +5V
GND
74C923
20
10
HCTL2000
16
8
ICM7218A
19
28
Static Sensitive Devices
(See Maintenance Section)
COMPONENT NUMBER EXAMPLE
COMPONENT NUMBER
A23 A2 R1234
Assembly Number
Schematic Circuit Number
Subassembly Number (If needed)
Chassis-mounted components have no Assembly Number prefix-see end of Replaceable Electrical Parts List.
P/O A3 CPU BOARD
SG 5030
FRONT PANEL INTERFACE
4

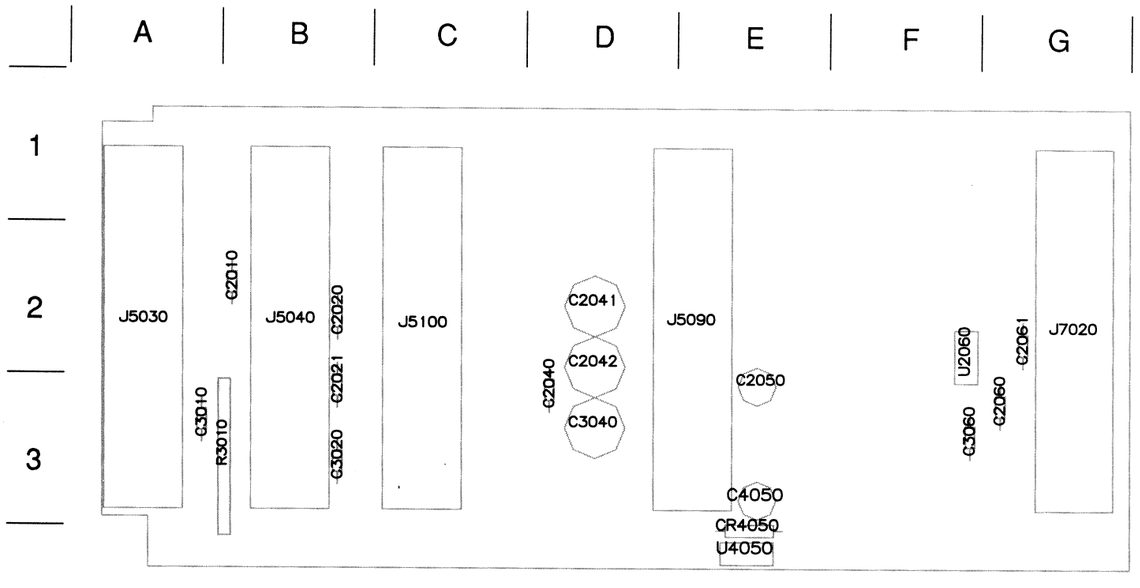


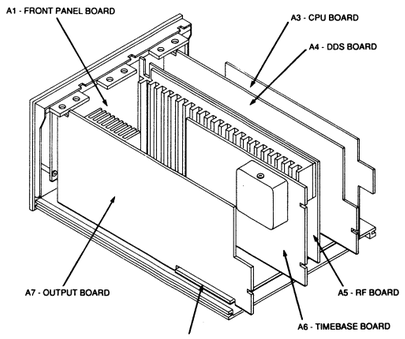
Fig. 10-7. A2 - Interconnect board.

Table 10-5
Component Reference Chart

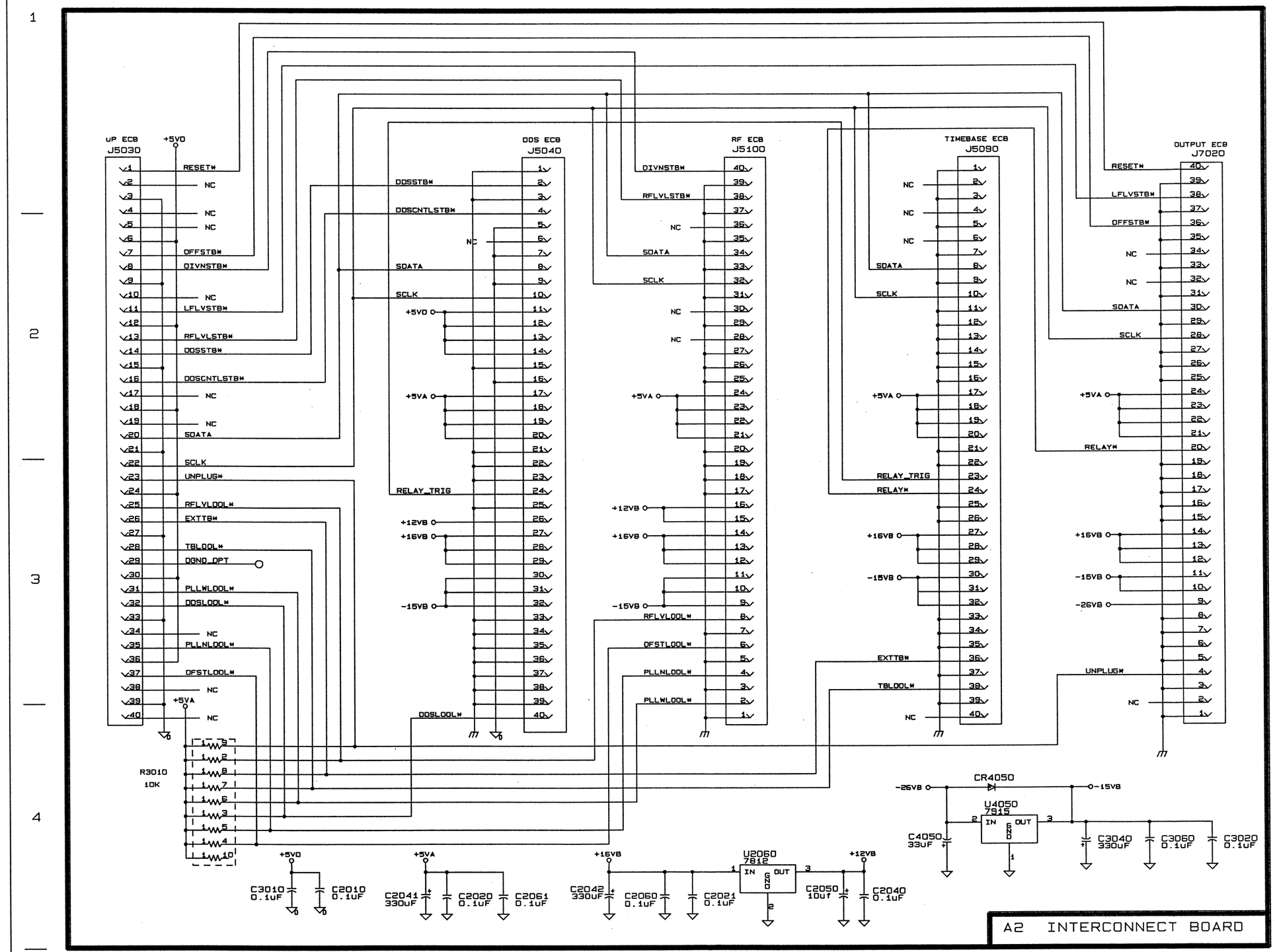
P/O A2 ASSY — **Interconnect (Schematic 5)**

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
CR4050	D4	E3
C2010	B4	B2
C2020	B4	B2
C2021	C4	B3
C2040	D4	D3
C2041	B4	D2
C2042	C4	D2
C2050	D4	E2
C2060	C4	G3
C2061	C4	G2
C3010	B4	A3
C3020	E4	B3
C3040	E4	D3
C3060	E4	F3
C4050	D4	E3
J5030	A1	A2

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
J5040	C1	B2
J5090	D1	E2
J5100	C1	C2
J7020	E1	G2
R3010A	A4	B3
R3010B	A4	B3
R3010C	A4	B3
R3010D	A4	B3
R3010E	A4	B3
R3010F	A4	B3
R3010G	A4	B3
R3010H	A4	B3
R3010I	A4	B3
U4050	E4	E4
U2060	D4	F2



A2 - INTERCONNECT BOARD


uP ECB
J5030
+5VD
DDS ECB
J5040
RF ECB
J5100
TIMEBASE ECB
J5090
OUTPUT ECB
J7020
RESETM
NC
OFFSTBM
DIVNSTBM
LFLVSTBM
RFLVLSTBM
DDSSTBM
DDSCNTLSTBM
SDATA
SCLK
UNPLUGM
RFLVLOOLM
EXTTBM
TBLOOLM
DGND_OPT
PLLWLOOLM
DDSLOOLM
PLLNLOOLM
OFSTLOOLM
RELAY_TRIG
RELAYM
+5VA
+12VB
+15VB
-15VB
-26VB
R3010
10K
CR4050
U4050
7915
U2060
7812
C4050
33uF
C3040
330uF
C3060
0.1uF
C3020
0.1uF
C3010
0.1uF
C2010
0.1uF
C2041
330uF
C2020
0.1uF
C2061
0.1uF
C2042
330uF
C2060
0.1uF
C2021
0.1uF
C2050
10uF
C2040
0.1uF
A2 INTERCONNECT BOARD
SG 5030
Static Sensitive Devices
(See Maintenance Section)
COMPONENT NUMBER EXAMPLE
COMPONENT NUMBER
Assembly Number
A23 A2 R1234
Schematic Circuit Number
Subassembly Number (if needed)
Chassis-mounted components have no Assembly Number prefix--see end of Replaceable Electrical Parts List.

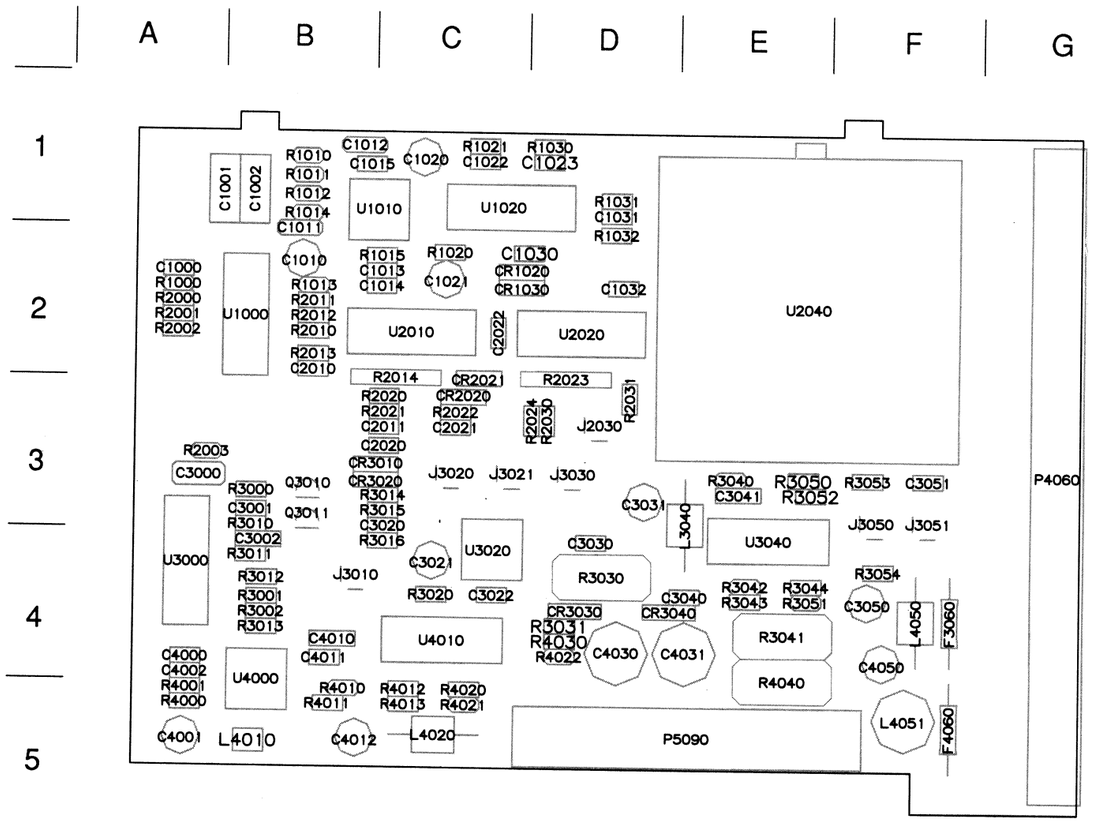
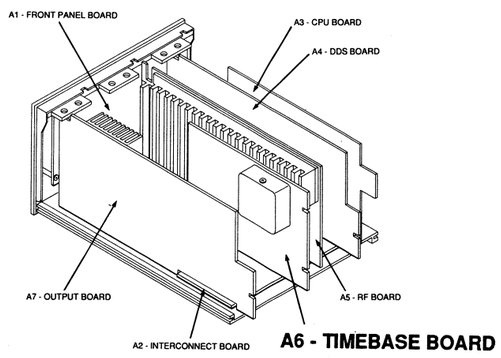


Fig. 10-8. A6 - Timebase board.



A6 - TIMEBASE BOARD

A6-Timebase circuit board illustration to be used with diagram 6 and diagram 7

Table 10-6
Component Reference Chart

P/O A6 ASSY — **External Timebase Lockloop/Timebase Buffer/ Timebase Oscillator (Schematic 6)**

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
CR1020	C2	C2
CR1030	C2	C2
CR2020	E2	C3
CR2021	E2	C2
CR3010	B1	C3
CR3020	B1	C3
C1000	B2	A2
C1001	B2	A1
C1002	B2	B1
C1010	B2	B2
C1011	B2	B2
C1012	C2	B1
C1013	B2	C2
C1014	E2	C2
C1015	C2	B1
C1020	C2	C1
C1021	C2	C2
C1022	E2	C1
C1023	D1	D1
C1030	E1	D2
C1031	D2	D1
C1032	E2	D2
C2010	E4	B2
C2011	B1	C3
C2020	B1	C3
C2021	F2	C3
C2022	E3	C2
C3000	E4	A3
C3001	C1	B3
C3002	C1	B4
C3020	B1	C3
C3051	D2	F3
C4000	C4	A4
C4002	C4	A4
C4011	D4	B4
J1050	F3	CHASSIS
J2030	F3	D3
J3010	A1	B4
J3020	F2	C3
J3021	F3	C3
J3030	F3	D3
J5140	F3	CHASSIS
J5090	A3,F1,F4	CHASSIS
J9010	F3	CHASSIS
P2030	F3	CHASSIS
P3010	A1	CHASSIS
P3020	F2	CHASSIS
P3021	F3	CHASSIS
P3030	F3	CHASSIS
P5090	A3,F1,F4	E5
Q3010	C1	B3
Q3011	C1	B3
R1000	B2	A2
R1010	C2	B1
R1011	B2	B1
R1012	B2	B1
R1013	B2	B2
R1014	B2	B1
R1015	C2	C2
R1020	C2	C2
R1021	C2	C1
R1030	E2	D1
R1031	D2	D1
R1032	D2	D2
R2000	B3	A2
R2001	B3	A2
R2002	C4	A2
R2003	E4	A3
R2010	C4	B2
R2011	B3	B2
R2012	B3	B2
R2013	E3	B2
R2014	E1	C2
R2020	B1	C3
R2021	B1	C3
R2022	E2	C3
R2023	E3	D2
R2024	F3	D3
R2030	F3	D3
R2031	F3	D3
R3000	C1	B3
R3001	D2	B4
R3002	D3	B4
R3010	C1	B3
R3011	C1	B4
R3012	D2	B4
R3013	D4	B4
R3014	B1	C3
R3015	B1	C3
R3016	B1	C4
R3053	D2	F3
R4000	D4	A5
R4001	D4	A5
R4011	D4	B5
U1000	A2	B2
U1010	C2	C1
U1020A	C2	C1
U1020B	E1	C1
U1020C	D1	C1
U1020D	D2	C1
U2010A	B1	C2
U2010B	E2	C2
U2010C	E2	C2
U2020A	E3	D2
U2020B	E3	D2
U2020C	E3	D2
U2020D	E3	D2
U2040	D2	E2
U3000A	E4	A4
U3000B	C1	A4
U4000A	D4	B4
U4000B	D3	B4
CHASSIS MOUNTED PARTS		
J100	A1	CHASSIS
J200	F2	CHASSIS
W100	F3	CHASSIS
W300	F3	CHASSIS
W400	F3	CHASSIS
W410	A1	CHASSIS
W420	F2	CHASSIS

P/O A6 ASSY also shown on Schematic 7

EXTERNAL TIMEBASE DETECTOR

EXTTB (Selectable) 10MHz

J100 W410 P3010 INPUT J3010 PELTOLA

EXT TIMEBASE +10dbm to -10dbm

R3016 510 C3020 0.022uF

R3015 51 R3014 100 C2020 0.022uF

R2021 1K C2011 0.1uF

CR3010 CR3020

R2020 3.3K

U2010A MC10116

R3000 51 Q3011 Q3010 R3011 330 C3002 22pF

R3010 1K C3001 0.022uF

U3000B HC4538

+16V +5V -15V

C1023 0.1uF C1030 0.1uF

U1020C LF13333 U1020B LF13333

R2014 510

P5090 J5090 EXTTB* 36 36 5

HI => ON

U1020D LF13333

R1030 1K +2.5VREF

C1022 0.1uF

R3053 51 C3051 0.022uF

C1014 0.022uF

U2040 VCXO

R1031 1K R1032 1K C1031 0.022uF

C1032 0.022uF

U2010B MC10116

U2010C MC10116

C1000 0.022uF C1010 47uF

U1000 MC12040

R1000 16.5K R1011 16.5K R1010 348K C1012 0.47uF

C1013 0.022uF R1015 10 -15V C1021 47uF

C1001 0.22uF C1002 0.22uF

U1010 LF356N

CR1030 U1020A LF13331

R1013 16.5K R1012 16.5K R1014 348K C1011 0.47uF

C1015 0.022uF R1021 10 +16V C1020 47uF

R1020 3.3K CR1020

EXTERNAL TIMEBASE LOOP

R3001 1K R3012 51

50 OHM LINE =>

U2020C MC10115

C2022 0.022uF

U2020A MC10115

U2020D MC10115

U2020B MC10115

R2031 43 J2030 P2030 W400 J1050 TO DDS DDSREF PELTOLA 8

R2024 43 J3021 P3021 W300 J9010 10MHzN TO OFFSET LOOP PELTOLA 12

R2030 43 J3030 P3030 W100 J5140 10MHzW TO WIDE LOOP PELTOLA 16

R2013 51 C2010 0.1uF

65432 R2023 510

R3002 10K U4000B LM393

C4011 0.022uF R3013 1M U4000A LM393 R4011 10K

P5090 J5090 TBLOOL* 38 38

R2000 510 R2001 510 R2011 510 R2012 510

R2002 10K C4000 0.1uF R4000 10K

R2010 10K C4002 0.1uF R4001 10K

+5V R2003 100K 1% C3000 0.1uF 10% U3000A HC4538 RELAY*

P5090 J5090 RELAY_TRIG 24 24

J5090 P5090 NC GND

Static Sensitive Devices (See Maintenance Section)

COMPONENT NUMBER EXAMPLE

COMPONENT NUMBER A23 A2 R1234

Assembly Number — Schematic Circuit Number — Subassembly Number (if needed)

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

POWER PIN TABLE

DEVICE TYPE	+16V	+5V	GND	-15V
MC10115		1,16	8	
MC10116		1,16	8	
LF13333	12		4	5
HC4538		16	8	

P/O A6 TIMEBASE BOARD

SG 5030

EXTERNAL TIMEBASE LOOP/ TIMEBASE BUFFER/ TIMEBASE OSCILLATOR 6

Table 10-7
Component Reference Chart

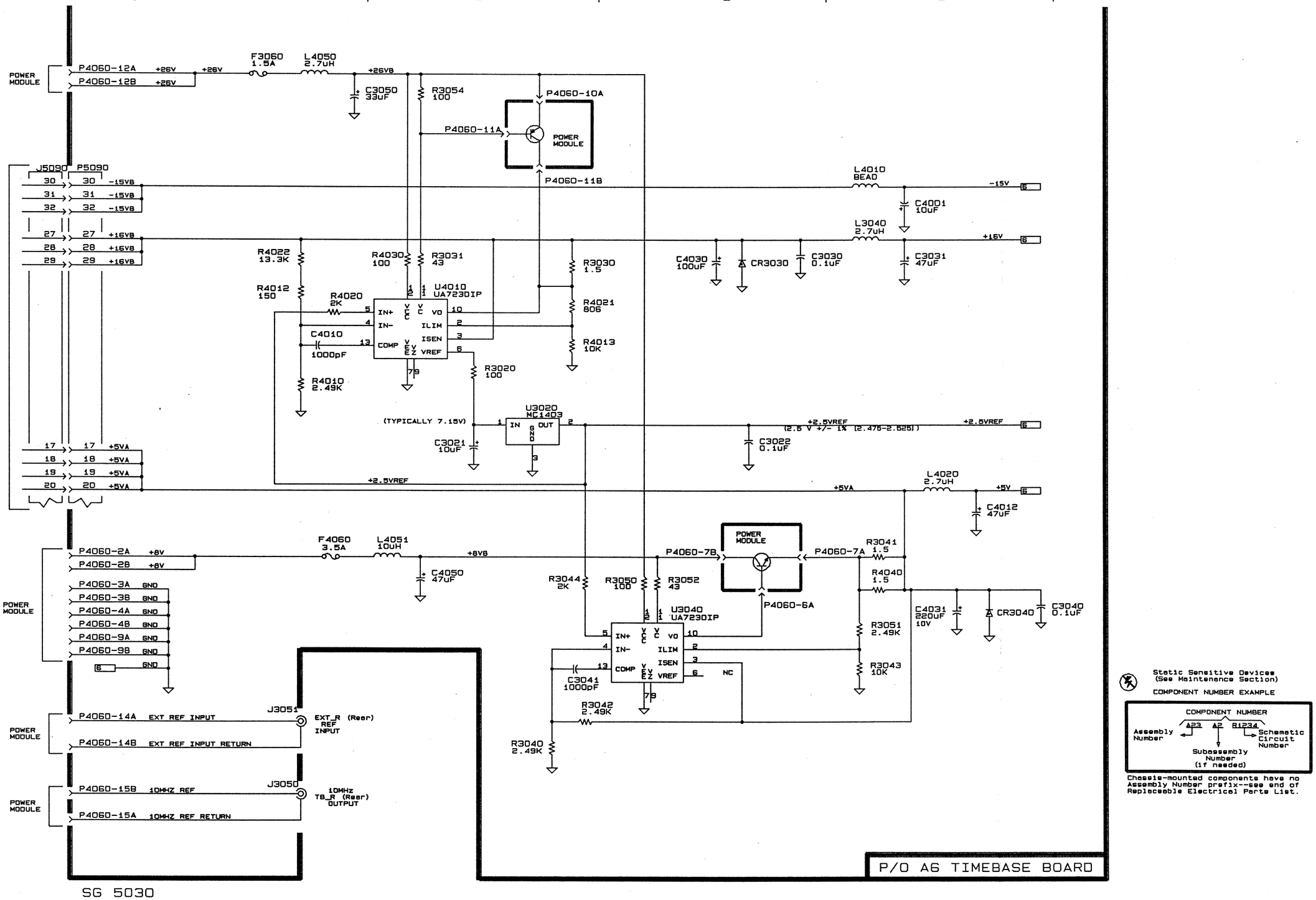
P/O A6 ASSY — **Timebase (Schematic 7)**

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
CR3030	D2	D4
CR3040	E3	D4
C3021	C2	C4
C3022	D2	C4
C3030	D2	D4
C3031	E2	D3
C3040	E3	E4
C3041	C3	E3
C3050	B1	F4
C4001	E1	A5
C4010	B2	B4
C4012	E3	B5
C4030	D2	D4
C4031	E3	E4
C4050	C3	F4
F3060	B1	F4
F4060	B3	F5
J3050	B4	F3
J3051	B4	F3
J5090	A1	CHASSIS
L3040	E2	E3
L4010	E1	B5
L4020	E3	C5
L4050	B1	F4
L4051	C3	F5

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
P4060	A1,A3,A4, C1,D3	G3
P5090	A1	E5
R3020	C2	C4
R3030	C2	D4
R3031	C2	D4
R3040	C4	E3
R3041	E3	E4
R3042	C4	E4
R3043	E3	E4
R3044	C3	E4
R3050	D3	E3
R3051	E3	E4
R3052	D3	E3
R3054	C1	F4
R4010	B2	B5
R4012	B2	C5
R4013	C2	C5
R4020	B2	C5
R4021	C2	C5
R4022	B2	D4
R4030	C2	D4
R4040	E3	E4
U3020	C2	C4
U3040	D3	E4
U4010	C2	C4

P/O A6 ASSY also shown on Schematic 6

Note: A6 - Timebase circuit board illustration located on reverse side of Schematic 5.



Static Sensitive Devices (See Maintenance Section)

COMPONENT NUMBER EXAMPLE

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

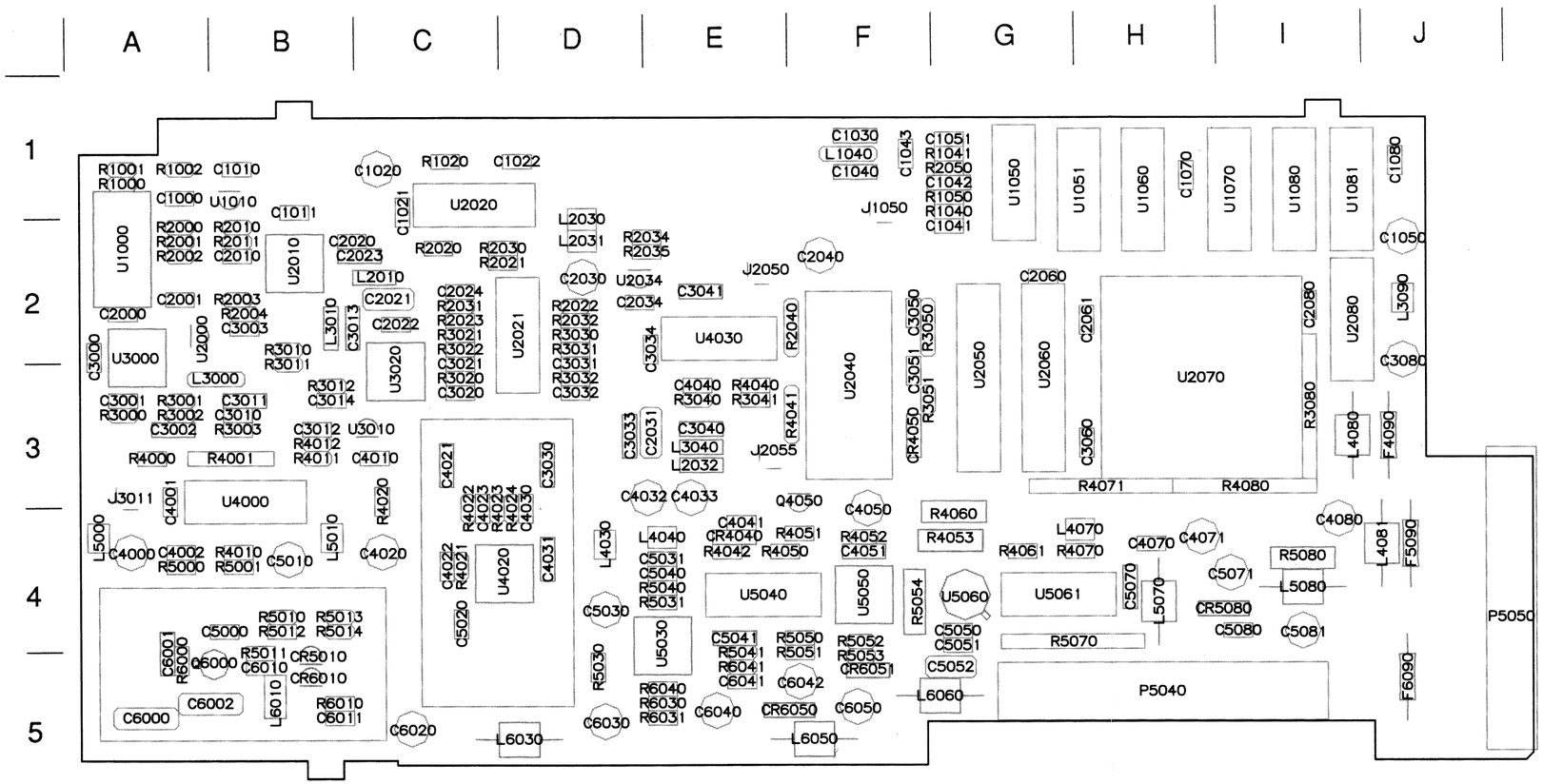
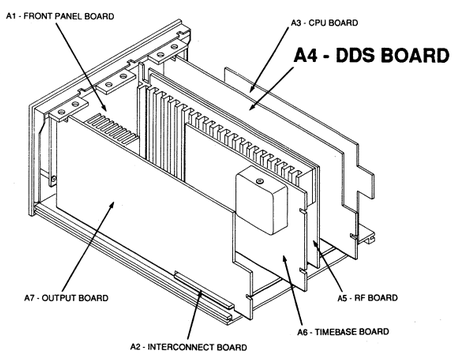


Fig. 10-9. A4 - DDS board.



A4-DDS circuit board illustration to be used with diagrams 8 through 11

Table 10-8
Component Reference Chart

P/O A4 ASSY DDS Clock (Schematic 8)

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1030	D4	F1
C1040	D4	F1
C1041	B3	G2
C1042	B3	G1
C1043	D4	F1
C1050	D2	J2
C1051	C3	G1
C1070	E3	H1
C2040	D2	F2
C4071	B2	H4
C6030	D2	D5
C6050	D2	F5
J1050	B3	F1
J5040	A1,A3,B3,F2	p/o Assy A2
L1040	D4	F1
L3090	C1	J2
L4070	C1	H4
L5070	B1	H4
L6050	C2	F5
L6060	C2	G5
P1050	A3	CHASSIS
P2030	A3	CHASSIS
P5040	B1,B3,E2	H5
R1040	C3	G1
R1041	D4	G1
R1050	B3	G1
R2050	C4	G1
U1050A	C3	G1
U1050B	C4	G1
U1050C	C4	G1
U1050D	C3	G1
U1051	D3	H1
U1060	E3	H1
U1081	C2	I1
CHASSIS MOUNTED PARTS		
W400	A3	CHASSIS

P/O A4 ASSY also shown on Schematics 9, 10 & 11.

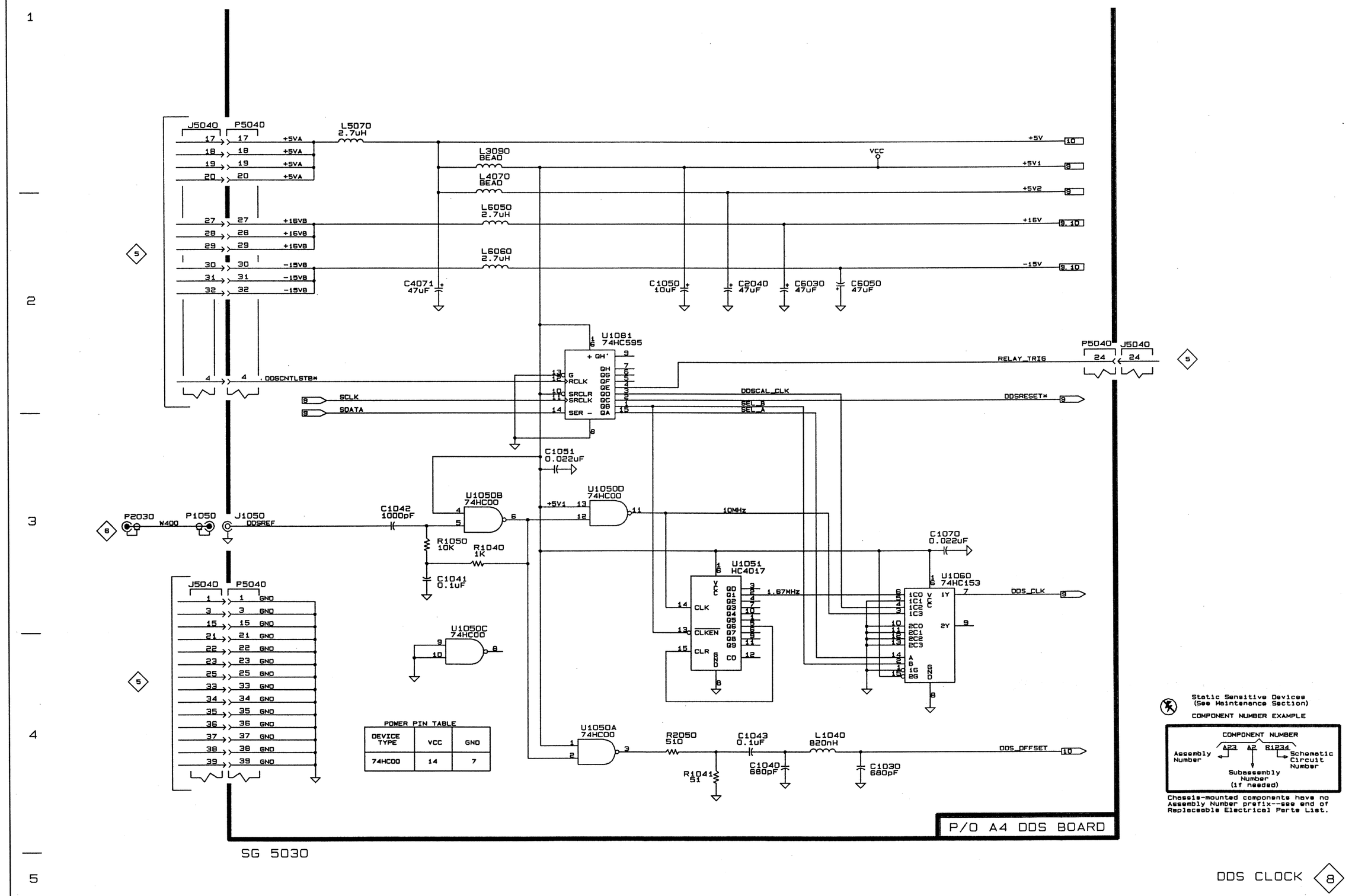

J5040
P5040
L5070
2.7uH
+5VA
+15VB
-15VB
L3090
BEAD
L4070
BEAD
L5050
2.7uH
L6060
2.7uH
+5V
+5V1
+5V2
+15V
-15V
VCC
C4071
47uF
C1050
10uF
C2040
47uF
C6030
47uF
C6050
47uF
U1081
74HC595
DDSCNTLSTB*
SCLK
SDATA
RELAY_TRIG
DDSCAL_CLK
SEL_B
SEL_A
DDSRESET*
C1051
0.022uF
U1050B
74HC00
U1050D
74HC00
P2030
W400
P1050
J1050
DDSREF
C1042
1000pF
R1050
10K
R1040
1K
C1041
0.1uF
10MHz
C1070
0.022uF
U1051
HC4017
1.67MHz
U1060
74HC153
DDS_CLK
U1050C
74HC00
U1050A
74HC00
R2050
510
C1043
0.1uF
L1040
820nH
R1041
51
C1040
680pF
C1030
680pF
DDS_OFFSET
GND
POWER PIN TABLE
DEVICE TYPE
VCC
GND
74HC00
14
7
P/O A4 DDS BOARD
SG 5030
Static Sensitive Devices
(See Maintenance Section)
COMPONENT NUMBER EXAMPLE
COMPONENT NUMBER
A23
A2
R1234
Assembly Number
Schematic Circuit Number
Subassembly Number
(if needed)
Chassis-mounted components have no Assembly Number prefix--see end of Replaceable Electrical Parts List.
DDS CLOCK
8

Table 10-9
Component Reference Chart

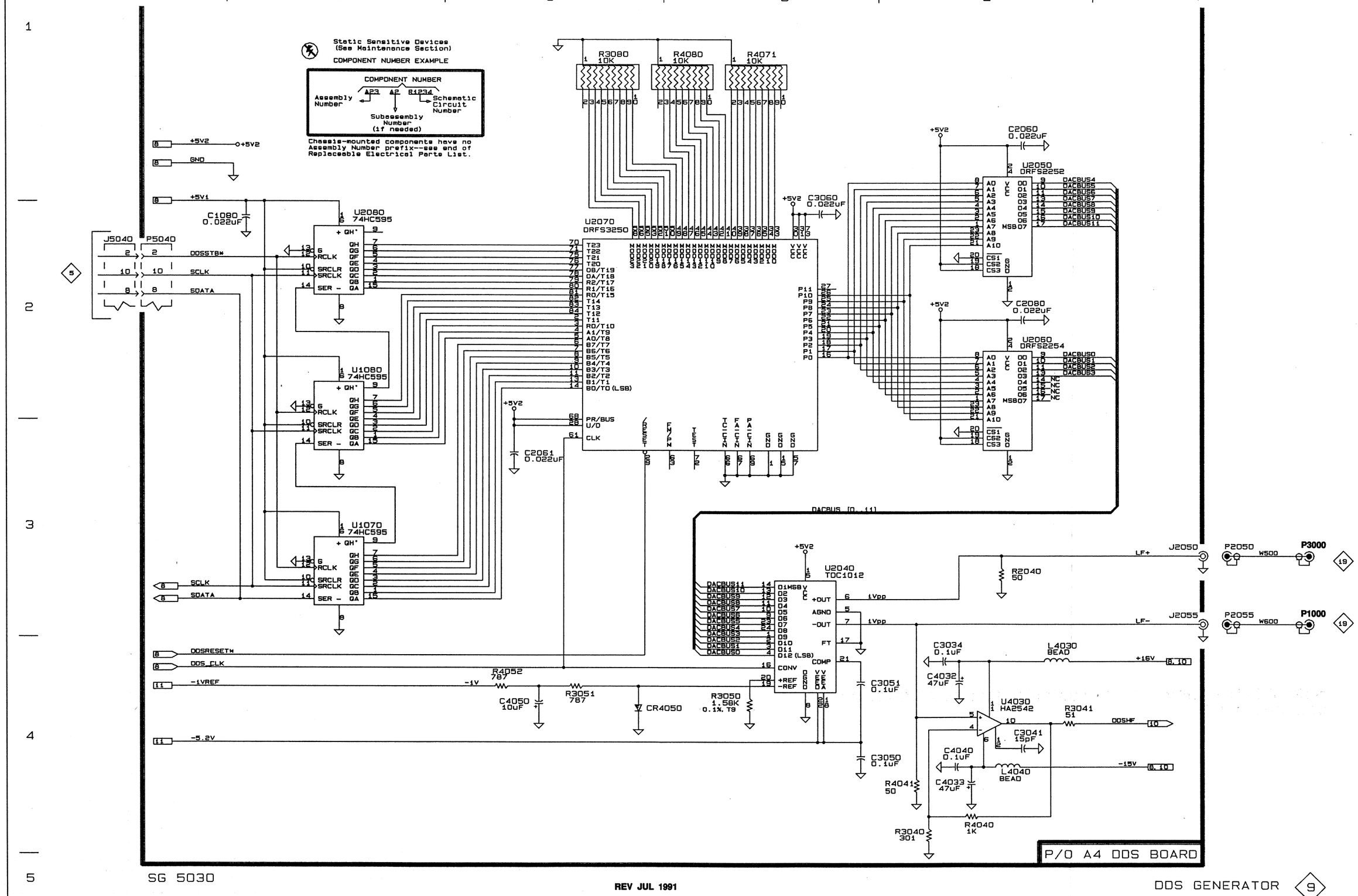
P/O A4 ASSY — **DDS Generator (Schematic 9)**

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
CR4050	C4	F3
C1080	B2	J1
C2060	E1	G2
C2061	C3	H2
C2080	E2	I2
C3034	E4	E2
C3041	E4	E2
C3050	D4	F2
C3051	D4	F3
C3060	D2	H3
C4032	E4	D3
C4033	E4	E3
C4040	E4	E3
C4050	C4	F4
J2050	F3	E2
J2055	F3	E3
J5040	A2	p/o Assy A2
L4030	E4	D4
L4040	E4	E4
P1012	F3	CHASSIS
P2010	F3	CHASSIS
P2050	F3	CHASSIS
P2055	F3	CHASSIS

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
P5040	A2	H5
R2040	E3	F2
R3040	E4	E3
R3041	E4	E3
R3050	D4	F2
R3051	C4	F3
R3080	C1	I3
R4040	E4	E3
R4041	E4	F3
R4052	C4	F4
R4071	D1	H3
R4080	D1	I3
U1070	B3	I1
U1080	B2	I1
U2040	D3	F3
U2050	E1	G3
U2060	E2	G3
U2070	C2	H3
U2080	B2	I2
U4030	E4	E2
CHASSIS MOUNTED PARTS		
W500	F3	CHASSIS
W600	F3	CHASSIS

P/O A4 ASSY also shown on Schematics 8, 10 & 11.

Note: A4 - DDS circuit board illustration located on reverse side of Schematic 7.


Static Sensitive Devices
(See Maintenance Section)
COMPONENT NUMBER EXAMPLE
COMPONENT NUMBER
A23 A2 R1234
Assembly Number
Schematic Circuit Number
Subassembly Number (if needed)
Chassis-mounted components have no Assembly Number prefix--see end of Replaceable Electrical Parts List.
R3080 10K
R4080 10K
R4071 10K
C1080 0.022uF
U2080 74HC595
U1080 74HC595
U1070 74HC595
U2070 DRFS3250
C2061 0.022uF
C3060 0.022uF
C2060 0.022uF
C2080 0.022uF
U2050 DRFS2252
U2060 DRFS2254
MSB07
J5040
P5040
DDSSTB*
SCLK
SDATA
+5V2
GND
+5V1
DACBUS [0..11]
U2040 TDC1012
R2040 50
J2050
J2055
P2050
P2055
P3000
P1000
W500
W600
LF+
LF-
C3034 0.1uF
L4030 BEAD
C4032 47uF
U4030 HA2542
R3041 51
DDSHF
C3041 15pF
C4040 0.1uF
L4040 BEAD
C4033 47uF
R4041 50
R4040 1K
R3040 301
DDSRESET*
DDS_CLK
-1VREF
-1V
R4052 787
R3051 787
C4050 10uF
CR4050
R3050 1.58K 0.1% T9
C3051 0.1uF
C3050 0.1uF
-5.2V
P/O A4 DDS BOARD

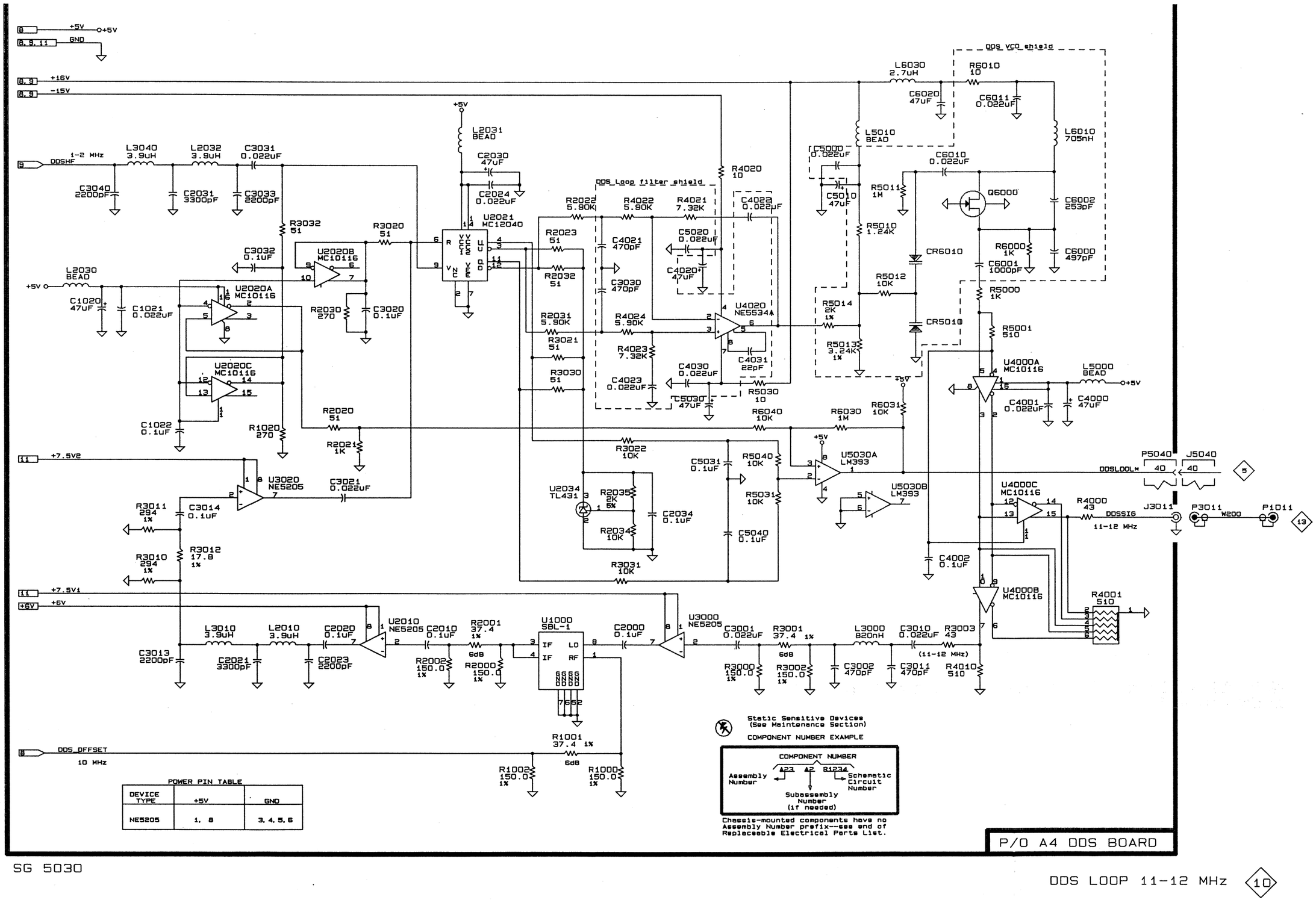
Note: A4 - DDS circuit board illustration located on reverse side of Schematic 7.

Table 10-10
Component Reference Chart

P/O A4 ASSY — **DDS Loop (Schematic 10)**

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
CR5010	E2	B5
CR6010	E2	B5
CR6050	C2	E5
C1020	A2	C1
C1021	A2	C1
C1022	B3	D1
C2000	D4	A2
C2010	C4	B2
C2020	B4	B2
C2021	B4	C2
C2023	B4	C2
C2024	C2	C2
C2030	C1	D2
C2031	B2	E3
C2034	D3	D2
C3001	D4	A3
C3002	E4	A3
C3010	E4	B3
C3011	E4	B3
C3013	B4	B2
C3014	B3	B3
C3020	B2	C3
C3021	B3	C3
C3030	D2	D3
C3031	B1	D3
C3032	B2	D3
C3033	B2	D3
C3040	A2	E3
C4000	F2	A4
C4001	F2	A3
C4002	E3	A4
C4020	D2	C4
C4021	D2	C3
C4022	D2	D4
C4023	D2	C4
C4030	D2	D4
C4031	D2	D4
C5000	E1	B4
C5010	E1	B4
C5020	D2	D4
C5030	D2	D4
C5031	D3	E4
C5040	D3	E4
C6000	F2	A5
C6001	E2	A5
C6002	F2	A5
C6010	E1	B5
C6011	E1	B5
C6020	E1	C5
J3011	F3	A3
J5040	F3	p/o Assy A2
L2010	B4	C2
L2030	A2	D1
L2031	C1	D2
L2032	B1	E3
L3000	E4	B3
L3010	B4	B3
L3040	A1	E3
L5000	F2	A4
L5010	E1	B4
L6010	F1	B5
L6030	E1	D5
P1011	F3	CHASSIS
P3011	F3	CHASSIS
P5040	F3	H5
Q6000	E2	A5
R1000	D4	A1
R1001	C4	A1
R1002	C4	A1
R1020	B3	C1
R2000	C4	A2
R2001	C4	A2
R2002	C4	A2
R2020	B3	C2
R2021	B3	D2
R2022	C2	D2
R2023	C2	C2
R2030	B2	D2
R2031	C2	C2
R2032	C2	D2
R2034	D3	E2
R2035	D3	E2
R3000	D4	A3
R3001	D4	A3
R3002	D4	A3
R3003	E4	B3
R3010	A3	B2
R3011	A3	B3
R3012	B3	B3
R3020	C2	C3
R3021	C2	C2
R3022	D3	C2
R3030	C2	D2
R3031	D3	D2
R3032	B2	D3
R4000	F3	A3
R4001	F3	B3
R4010	E4	B4
R4020	D1	C3
R4021	D2	C4
R4022	D2	C4
R4023	D2	C4
R4024	D2	D4
R5000	E2	A4
R5001	E2	B4
R5010	E2	B4
R5011	E2	B5
R5012	E2	B4
R5013	E2	B4
R5014	E2	B4
R5030	D2	D5
R5031	D3	E4
R5040	D3	E4
R6000	E2	A5
R6010	E1	B5
R6030	E3	E5
R6031	E2	E5
R6040	D3	E5
U1000	C4	A2
U2010	C3	B2
U2020A	B2	C1
U2020B	B2	C1
U2020C	B2	C1
U2021	C2	D2
U2034	C3	D2
U3000	D4	A2
U3020	B3	C3
U4000A	E2	B3
U4000B	E3	B3
U4000C	E3	B3
U4020	D2	D4
U5030A	E3	E4
U5030B	E3	E4
CHASSIS MOUNTED PARTS		
W200	F3	CHASSIS

P/O A4 ASSY also shown on 8, 9, & 11.



SG 5030

DDS LOOP 11-12 MHz 10

Note: A4 - DDS circuit board illustration located on reverse side of Schematic 7.

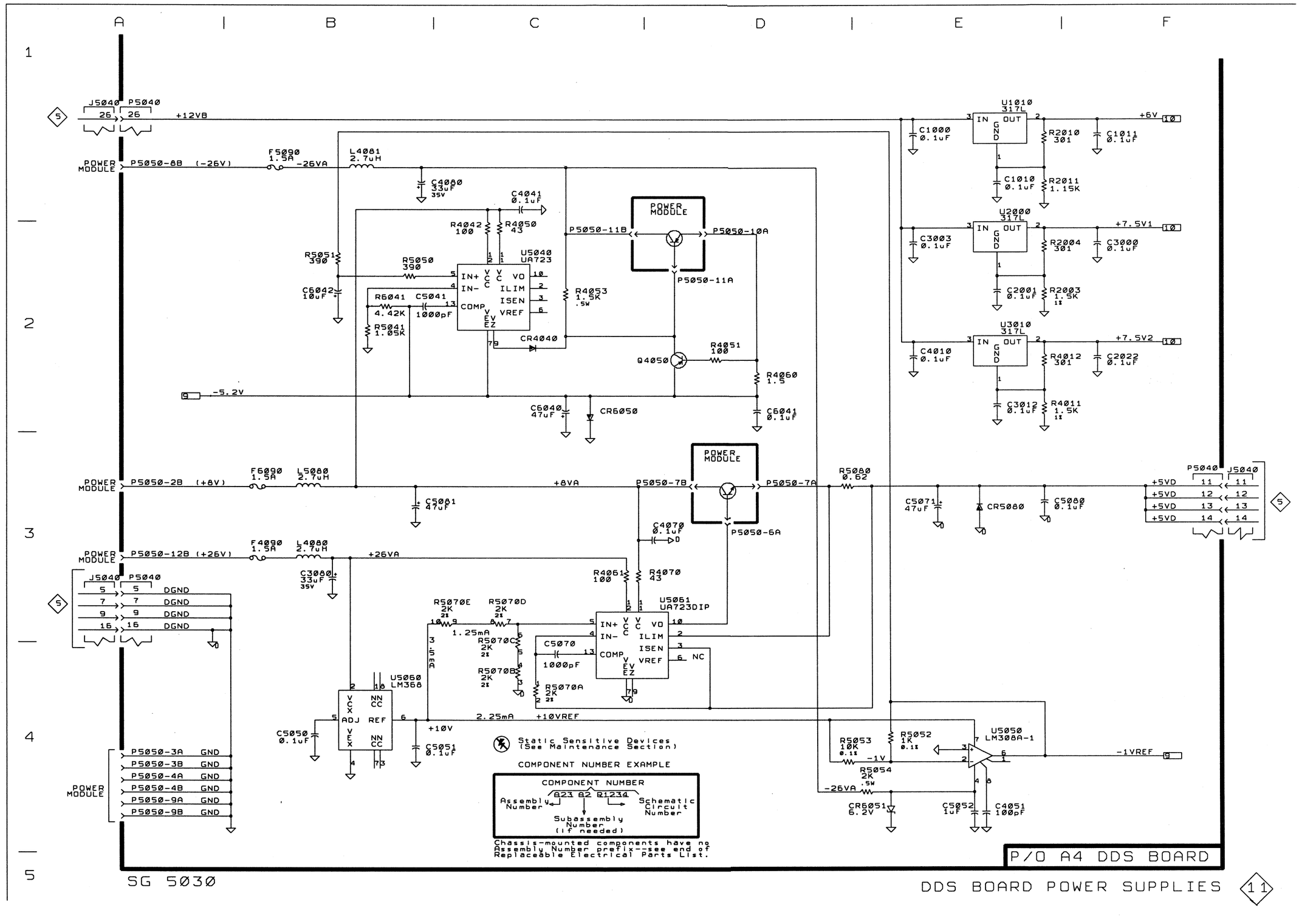
Table 10-11
Component Reference Chart

P/O A4 ASSY — **DDS (Schematic 11)**

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
CR4040	C2	E4
CR5080	E3	I4
CR6051	E4	F5
C1000	E1	A1
C1010	E1	B1
C1011	F1	B1
C2001	E2	A2
C2022	F2	C2
C3000	F2	A2
C3003	E2	B2
C3012	E2	B3
C3080	B3	J3
C4010	E2	C3
C4041	C1	E4
C4051	E4	F4
C4070	D3	H4
C4080	B1	I4
C5041	B2	E4
C5050	B4	G4
C5051	B4	G4
C5052	E4	G5
C5070	C4	H4
C5071	E3	I4
C5080	E3	I4
C5081	B3	I4
C6040	C2	E5
C6041	D2	E5
C6042	B2	F5
F4090	B3	J3
F5090	B1	J4
F6090	B3	J5
J5040	A1,A3,F3	p/o Assy A2
L4080	B3	I3
L4081	B1	J3
L5080	B3	J4
P5040	A1,A3,F3	H5

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
P5050	A1,A3,A4, C2,D2,D3	J4
Q4050	D2	F3
R2003	E2	B2
R2004	E2	B2
R2010	E1	B2
R2011	E1	B2
R4011	E2	B3
R4012	E2	B3
R4042	C2	E4
R4050	C2	E4
R4051	D2	F4
R4053	C2	G4
R4060	D2	G4
R4061	C3	G4
R4070	C3	H4
R5041	B2	E5
R5050	B2	F4
R5051	B2	F5
R5052	E4	F4
R5053	D4	F5
R5054	E4	F4
R5070A	C4	G4
R5070B	C4	G4
R5070C	C3	G4
R5070D	C3	G4
R5070E	C3	G4
R5080	E3	I4
R6041	B2	E5
U1010	E1	B1
U2000	E1	A2
U3010	E2	C3
U5040	C2	E4
U5050	E4	F4
U5060	B4	G4
U5061	C3	G4

P/O A4 ASSY also shown on Schematics 8, 9, & 10.


A
B
C
D
E
F
1
2
3
4
5
J5040
P5040
26
26
+12VB
POWER MODULE
P5050-8B (-26V)
F5090 1.5A
-26VA
L4081 2.7uH
C4080 33uF 35V
C4041 0.1uF
R4042 100
R4050 43
R5051 390
R5050 390
U5040 UA723
IN+
IN-
COMP
VCC
VEE
VC
VO
ILIM
ISEN
VREF
NC
C6042 10uF
R6041 4.42K
C5041 1000pF
R5041 1.05K
R4053 1.5K .5W
CR4040
P5050-11B
P5050-10A
P5050-11A
R4051 100
Q4050
R4060 1.5
-5.2V
C6040 47uF
CR6050
C6041 0.1uF
P5050-2B (+8V)
F6090 1.5A
L5080 2.7uH
+8VA
C5081 47uF
P5050-7B
P5050-7A
R5080 0.62
C4070 0.1uF
P5050-6A
P5050-12B (+26V)
F4090 1.5A
L4080 2.7uH
+26VA
C3080 33uF 35V
R4061 100
R4070 43
U5051 UA723DIP
R5070E 2K 2%
R5070D 2K 2%
R5070C 2K 2%
R5070B 2K 2%
R5070A 2K 2%
1.25mA
C5070 1000pF
U5060 LM368
VCX
VEX
ADJ
REF
C5050 0.1uF
C5051 0.1uF
+10V
2.25mA
+10VREF
Static Sensitive Devices
(See Maintenance Section)
COMPONENT NUMBER EXAMPLE
COMPONENT NUMBER
A23 A2 R1234
Assembly Number
Subassembly Number (if needed)
Schematic Circuit Number
Chassis-mounted components have no Assembly Number prefix--see end of Replaceable Electrical Parts List.
DGND
P5050-3A GND
P5050-3B GND
P5050-4A GND
P5050-4B GND
P5050-9A GND
P5050-9B GND
U1010 317L
U2000 317L
U3010 317L
IN
OUT
GND
C1000 0.1uF
R2010 301
C1011 0.1uF
C1010 0.1uF
R2011 1.15K
+6V
C3003 0.1uF
R2004 301
C3000 0.1uF
C2001 0.1uF
R2003 1.5K 1%
+7.5V1
C4010 0.1uF
R4012 301
C2022 0.1uF
C3012 0.1uF
R4011 1.5K 1%
+7.5V2
C5071 47uF
CR5080
C5080 0.1uF
+5VD
R5053 10K 0.1%
R5052 1K 0.1%
-1V
R5054 2K .5W
U5050 LM308A-1
-1VREF
-26VA
CR6051 6.2V
C5052 1uF
C4051 100pF
P/O A4 DDS BOARD
SG 5030
DDS BOARD POWER SUPPLIES
11

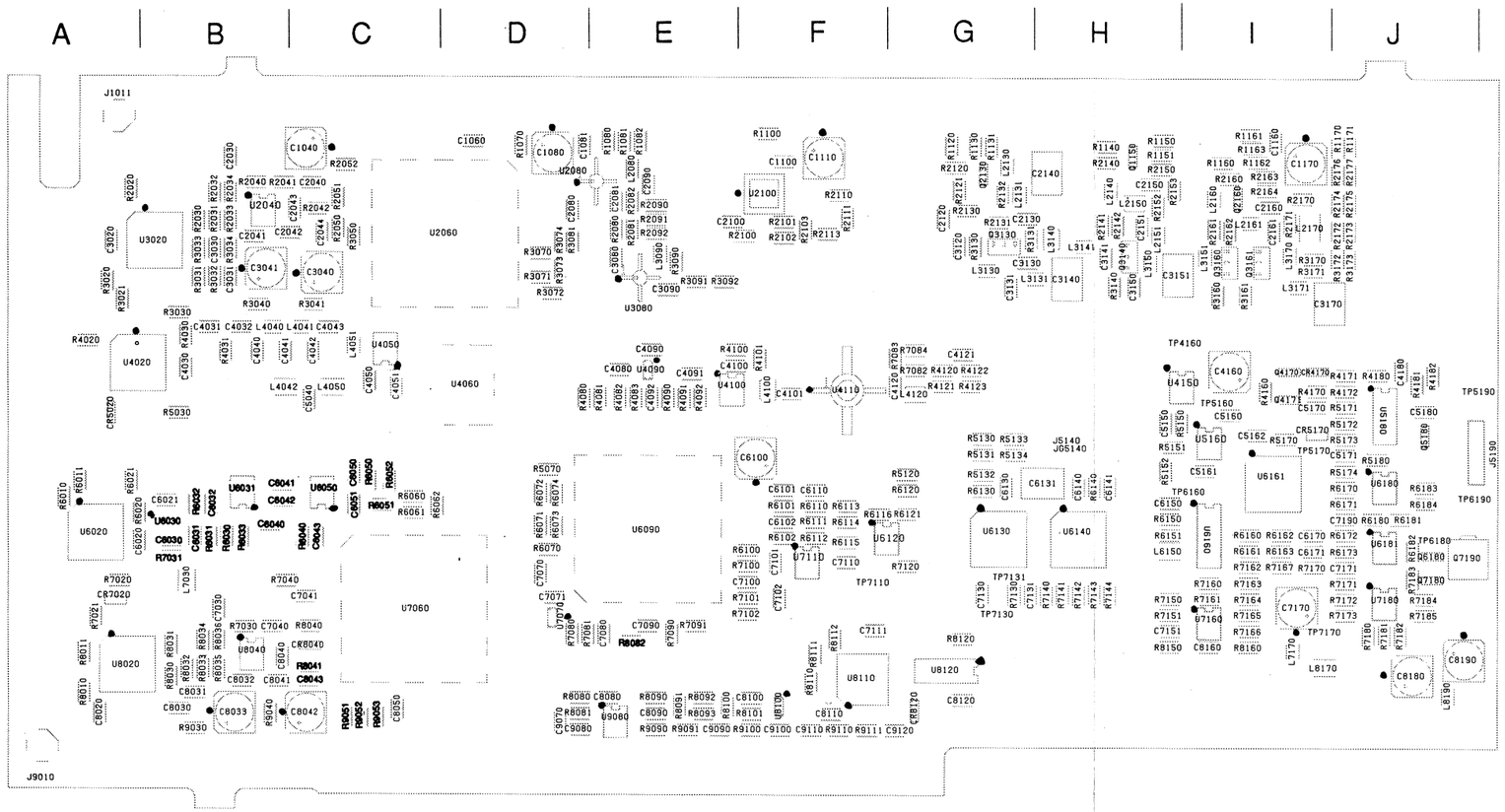
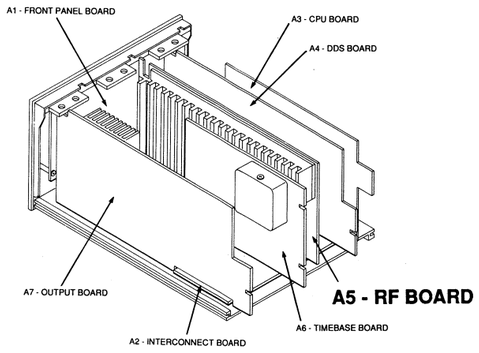


Fig. 10-10. A5 - RF board (front view).



REAR VIEW

Front view of A5-RF circuit board to be used with diagrams 12 through 17

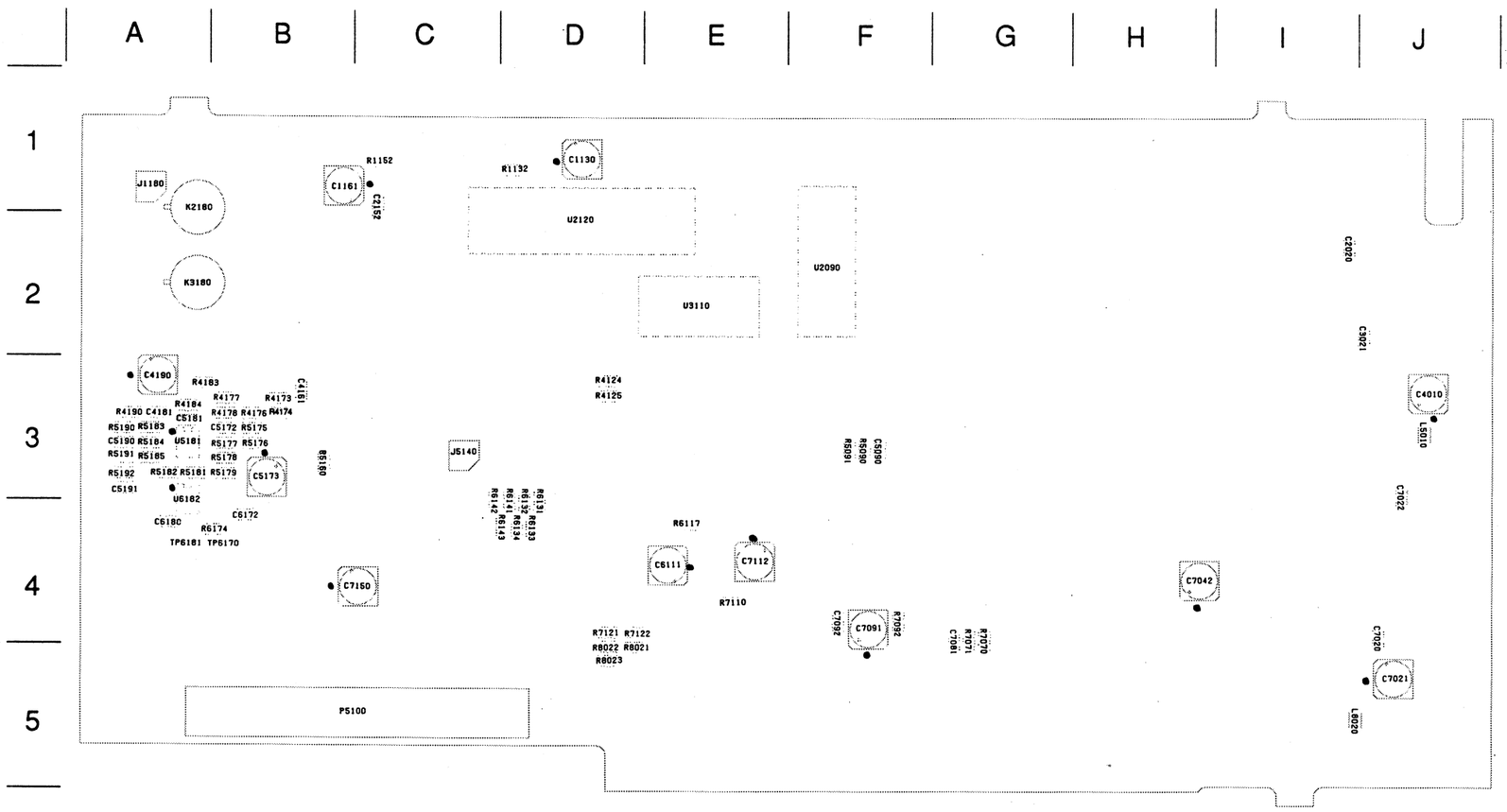


Fig. 10-11. A5 - RF board (rear view).

Rear view of A5-RF circuit board to be used with diagrams 12 through 17

Note: A5 - RF circuit board illustrations (front and rear views) located between Schematics 11 & 12.

Table 10-12
Component Reference Chart

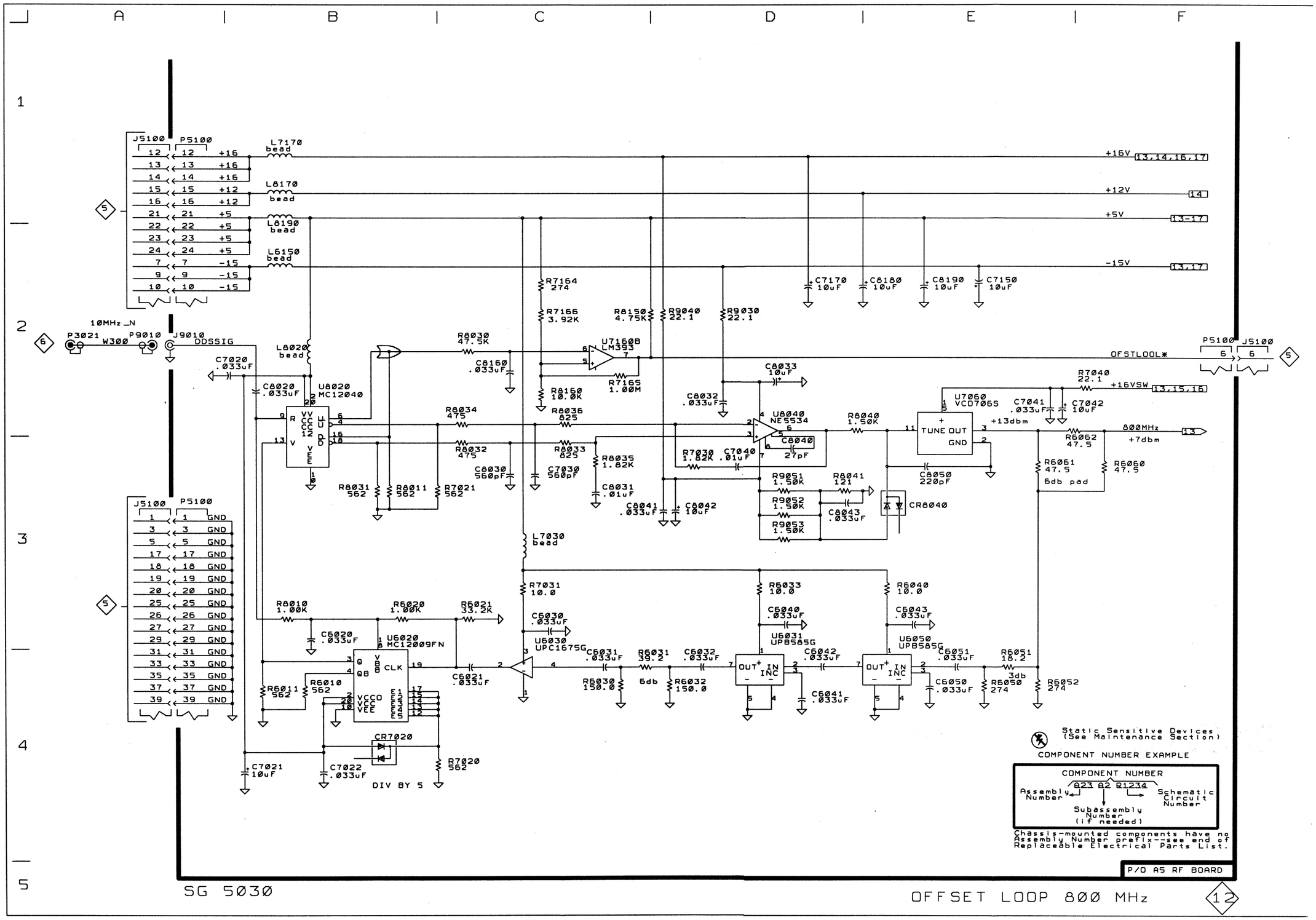
P/O A5 — **Offset Loop (Schematic 12)**

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C6020	B3	A4
C6021	C4	B3
C6030	C3	B4
C6031	C4	B4
C6032	D4	B3
C6040	D3	B4
C6041	D4	B3
C6042	D4	B3
C6043	E3	C4
C6050	E4	C3
C6051	E4	C3
C7020	B2	J4*
C7021	B4	J5*
C7022	B4	J4*
C7030	C3	B4
C7040	D3	B4
C7041	E2	C4
C7042	E2	H4*
C7150	E2	C4*
C7170	D2	I4
C8020	B2	A5
C8030	C3	B5
C8031	C3	B5
C8032	D2	B5
C8033	D2	B5
C8040	D3	B4
C8041	D3	B5
C8042	D3	B5
C8043	D3	C5
C8050	E3	C5
C8160	C2	I4
C8180	E2	J5
C8190	E2	J4
CR7020	B4	A4
CR8040	E3	C4
J5100	A1,A3,F2	CHASSIS
J9010	A2	A5
L6150	B2	H4
L7030	C3	B4
L7170	B1	I4
L8020	B2	J5*
L8170	B1	I4
L8190	B1	J5
P3021	A2	CHASSIS
P5100	A1,A3,F2	B5
P9010	A2	CHASSIS
R6010	B4	A3
R6011	B4	A3

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
R6020	B3	A3
R6021	C3	A3
R6030	C4	B4
R6031	C4	B4
R6032	D4	B3
R6033	D3	B4
R6040	E3	C4
R6050	E4	C3
R6051	E4	C3
R6052	E4	C3
R6060	F3	C3
R6061	E3	C3
R6062	E2	C3
R7020	C4	A4
R7021	C3	A4
R7030	D3	B4
R7031	C3	B4
R7040	F2	B4
R7164	C2	I4
R7165	C2	I4
R7166	C2	I4
R8010	B3	A5
R8011	B3	A4
R8030	C2	B5
R8031	B3	B4
R8032	C3	B5
R8033	C3	B5
R8034	C2	B4
R8035	C3	B5
R8036	C2	B4
R8040	D2	C4
R8041	D3	C4
R8150	C2	H4
R8160	C2	I4
R9030	D2	B5
R9040	D2	B5
R9051	D3	C5
R9052	D3	C5
R9053	D3	C5
U6020	B4	A4
U6030	C4	B3
U6031	D4	B3
U6050	E4	C3
U7060	E2	C4
U7160B	C2	I4
U8020	B2	A4
U8040	D2	B4

*Denotes component mounted on back of circuit board. Refer to rear view.

P/O A7 ASSY also shown on Schematics 19, 20, 21, & 22


A
B
C
D
E
F
1
2
3
4
5
J5100
P5100
L7170 bead
L8170 bead
L8190 bead
L6150 bead
+16V
+12V
+5V
-15V
13,14,16,17
14
13-17
13,17
C7170 10uF
C8180 10uF
C8190 10uF
C7150 10uF
R7164 274
R7166 3.92K
R8150 4.75K
R9040 22.1
R9030 22.1
10MHz_N
P3021
W300
P9010
J9010
DDSSIG
C7020 .033uF
C8020 .033uF
L8020 bead
U8020 MC12040
R8030 47.5K
C8160 .033uF
U7160B LM393
R8160 10.0K
R7165 1.00M
OFSTLOOL*
C8033 10uF
C8032 .033uF
U8040 NE5534
C8040 27pF
R8040 1.50K
R7040 22.1
+16VSW
13,15,16
U7060 VCO706S
TUNE OUT
GND
C7041 .033uF
C7042 10uF
+13dbm
800MHz
+7dbm
13
R6052 47.5
R6061 47.5
6db pad
R6060 47.5
C8050 220pF
R8034 475
R8032 475
R8033 825
R8035 1.82K
C8030 560pF
C7030 560pF
C8031 .01uF
R8031 562
R8011 562
R7021 562
R7030 1.82K
C7040 .01uF
C8041 .033uF
C8042 10uF
R9051 1.50K
R9052 1.50K
R9053 1.50K
R8041 121
C8043 .033uF
CR8040
L7030 bead
R7031 10.0
R6033 10.0
R6040 10.0
C6040 .033uF
C6043 .033uF
R8010 1.00K
R6020 1.00K
R6021 33.2K
C6020 .033uF
U6020 MC12009FN
U6030 UPC1675G
U6031 UPB585G
U6050 UPB585G
C6030 .033uF
C6031 .033uF
C6032 .033uF
C6042 .033uF
C6041 .033uF
C6051 .033uF
C6050 .033uF
R6031 39.2
R6032 150.0
R6030 150.0
6db
R6051 18.2
3db
R6050 274
R6052 274
R6010 562
R6011 562
CR7020
C7021 10uF
C7022 .033uF
R7020 562
DIV BY 5
Static Sensitive Devices
(See Maintenance Section)
COMPONENT NUMBER EXAMPLE
COMPONENT NUMBER
A23 A2 R1234
Assembly Number
Schematic Circuit Number
Subassembly Number (if needed)
Chassis-mounted components have no Assembly Number prefix-see end of Replaceable Electrical Parts List.
P/O A5 RF BOARD
SG 5030
OFFSET LOOP 800 MHz
12

Note: A5 - RF circuit board illustrations (front and rear views) located between Schematics 11 & 12.

Table 10-13
Component Reference Chart

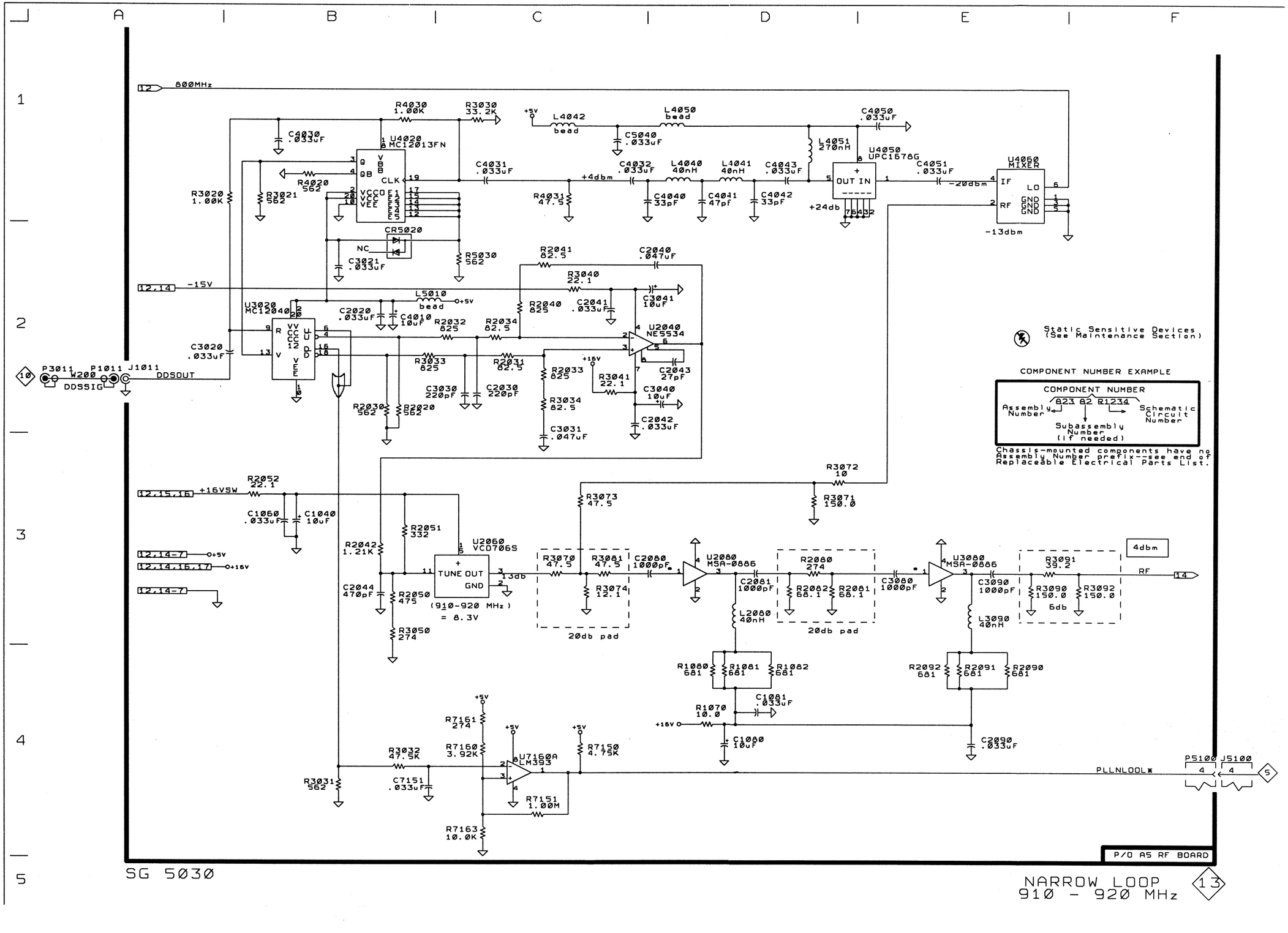
P/O A5 ASSY — **Narrow Loop 910-920 MHz (Schematic 13)**

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
CR5020	B2	A3
C1040	B3	C1
C1060	B3	D1
C1080	D4	D1
C1081	D4	D1
C2020	B2	I2*
C2030	C2	B1
C2040	D2	C1
C2041	C2	B2
C2042	C2	B2
C2043	D2	B1
C2044	B3	C2
C2080	C3	D1
C2081	D3	E1
C2090	E4	E1
C3020	A2	A2
C3021	B2	J2*
C3031	C2	B2
C3040	D2	C2
C3041	D2	B2
C3080	E3	E2
C3090	E3	E2
C4010	B2	J3*
C4030	B1	B2
C4031	C1	B2
C4032	D1	B2
C4040	D1	B2
C4041	D1	B2
C4042	D1	C2
C4043	D1	C2
C4050	E1	C3
C4051	E1	C3
C5040	C1	C3
C7151	B4	H4
J1011	A2	A1
J5100	F4	p/o Assy A2
L2080	D3	E1
L3090	E3	E2
L4040	D1	B2
L4041	D1	C2
L4042	C1	B3
L4050	D1	C3
L4051	D1	C2
L5010	B2	J3*
P1011	A2	CHASSIS
P3011	A2	CHASSIS
P5100	F4	B5*
R1070	D4	D1
R1080	D4	E1
R1081	D4	E1
R1082	D4	E1
R2020	B2	A1
R2030	B2	B2
R2031	C2	B2
R2032	C2	B1

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
R2033	C2	B2
R2034	C2	B1
R2040	C2	B1
R2041	C2	B1
R2042	B3	C1
R2050	B3	C2
R2051	B3	C1
R2052	B3	C1
R2080	D3	E2
R2081	D3	E2
R2082	D3	E1
R2090	E4	E1
R2091	E4	E2
R2092	E4	E2
R3020	B1	A2
R3021	B1	A2
R3030	C1	B2
R3031	B4	B2
R3032	B4	B2
R3033	B2	B2
R3034	C2	B2
R3040	C2	B2
R3041	C2	C2
R3050	B3	C2
R3070	C3	D2
R3071	D3	D2
R3072	D3	D2
R3073	C3	D2
R3074	C3	D2
R3081	C3	D2
R3090	E3	E2
R3091	E3	E2
R3092	F3	E2
R4020	B1	A2
R4030	B1	B2
R4031	C1	B2
R5030	C1	B3
R7150	C4	H4
R7151	C4	H4
R7160	C4	I4
R7161	C4	I4
R7163	C4	I4
U2040	C2	B1
U2060	C3	C2
U2080	D3	D1
U3020	B2	B2
U3080	E3	E2
U4020	B1	A2
U4050	D1	C2
U4060	E1	D3
U7160A	C4	I4
CHASSIS MOUNTED PARTS		
W200	A2	CHASSIS

*Denotes component mounted on back of circuit board. Refer to rear view

P/O A5 ASSY also shown on Schematics 12, 14, 15, 16, & 17.


800MHz
R4030 1.00K
R3030 33.2K
C4030 .033uF
U4020 MC12013FN
R4020 562
R3020 1.00K
R3021 562
C4031 .033uF
+4dbm
L4042 bead
L4050 bead
C5040 .033uF
C4050 .033uF
L4051 270nH
U4050 UPC1676G
C4032 .033uF
L4040 40nH
L4041 40nH
C4043 .033uF
C4051 .033uF
-20dbm
U4060 MIXER
IF
LO
RF
GND
-13dbm
+24db
R4031 47.5
C4040 33pF
C4041 47pF
C4042 33pF
CR5020
NC
C3021 .033uF
R5030 562
-15V
L5010 bead
+5V
U3020 MC12040
C2020 .033uF
C4010 10uF
R2032 825
R2034 82.5
R2041 82.5
C2040 .047uF
R3040 22.1
C3041 10uF
R2040 825
C2041 .033uF
U2040 NE5534
C2043 27pF
C3040 10uF
C2042 .033uF
C3020 .033uF
P3011
W200
P1011 J1011
DDSSIG
DDSOUT
R3033 825
R2031 82.5
C3030 220pF
C2030 220pF
R2033 825
R3041 22.1
R3034 82.5
C3031 .047uF
R2030 562
R2020 562
+15V
Static Sensitive Devices (See Maintenance Section)
COMPONENT NUMBER EXAMPLE
COMPONENT NUMBER
A23 A2 R1234
Assembly Number
Schematic Circuit Number
Subassembly Number (If needed)
Chassis-mounted components have no Assembly Number prefix--see end of Replaceable Electrical Parts List.
R3072 10
R3071 150.0
R3073 47.5
R2052 22.1
+16VSW
C1060 .033uF
C1040 10uF
R2051 332
U2060 VCO706S
TUNE OUT
GND
13db
(910-920 MHz) = 8.3V
R2042 1.21K
C2044 470pF
R2050 475
R3050 274
R3070 47.5
R3081 47.5
R3074 12.1
20db pad
C2080 1000pF
U2080 MSA-0886
C2081 1000pF
L2080 40nH
R2080 274
R2082 68.1
R2081 68.1
20db pad
C3080 1000pF
U3080 MSA-0886
C3090 1000pF
L3090 40nH
R3091 39.2
R3090 150.0
R3092 150.0
6db
4dbm
RF
R1080 681
R1081 681
R1082 681
R2092 681
R2091 681
R2090 681
C1081 .033uF
R1070 10.0
C1080 10uF
C2090 .033uF
R7161 274
R7160 3.92K
U7160A LM393
R7150 4.75K
R3032 47.5K
R3031 562
C7151 .033uF
R7151 1.00M
R7163 10.0K
PLLNLOOL*
P5100 J5100
P/O A5 RF BOARD
SG 5030
NARROW LOOP 910 - 920 MHz
13

Note: A5 - RF circuit board illustrations (front and rear views) located between Schematics 11 & 12.

Table 10-14
Component Reference Chart

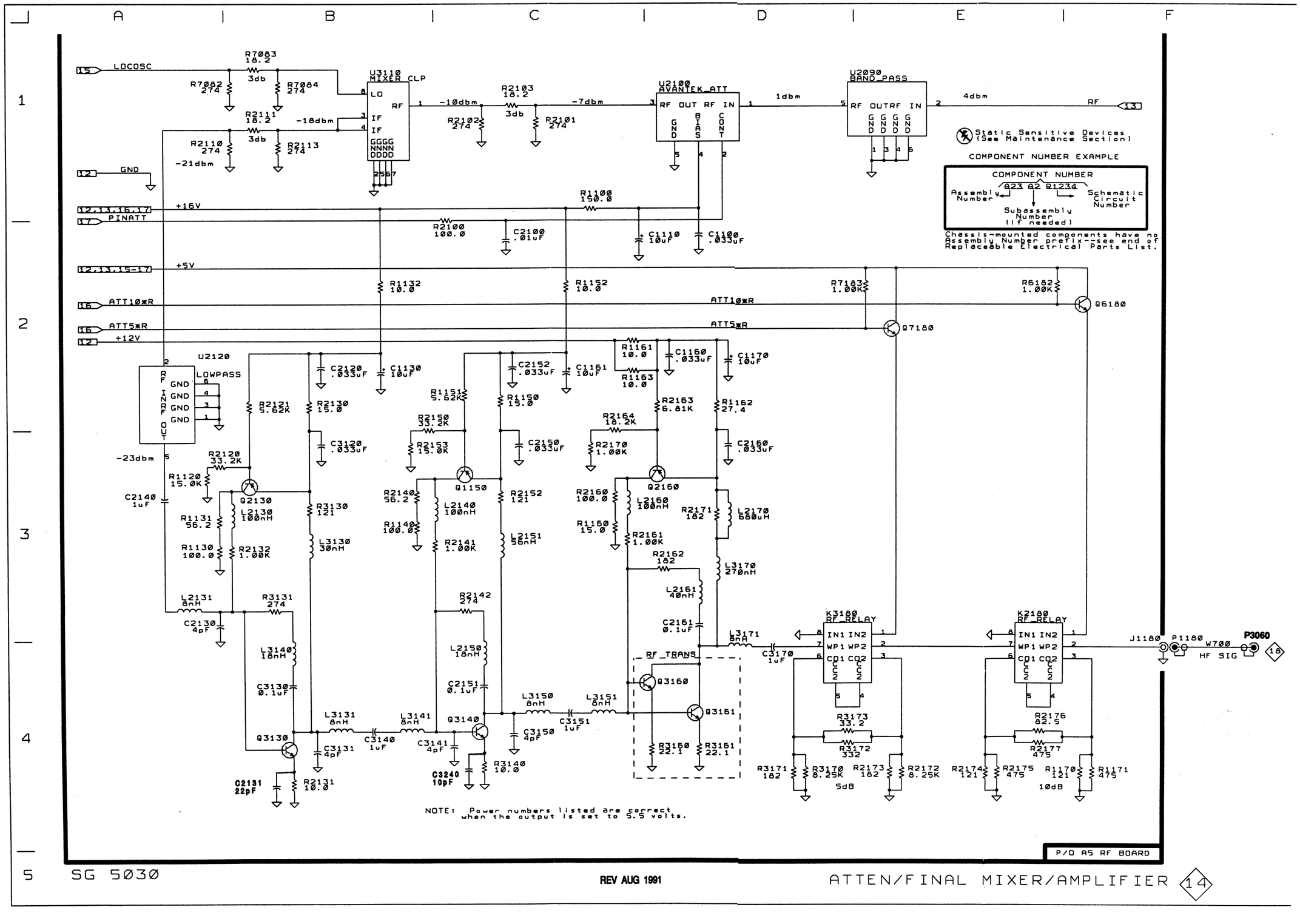
P/O A5 ASSY — **Atten/Final Mixer/Amplifier (Schematic 14)**

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1100	D2	F1
C1110	C2	F1
C1130	B2	D1*
C1160	D2	I1
C1161	C2	B1*
C1170	D2	I1
C2100	C2	E2
C2120	B2	G2
C2130	A3	G1
C2140	A3	H1
C2150	B2	H1
C2151	C4	H2
C2152	C2	C1*
C2160	D3	I1
C2161	D3	I2
C3120	B3	G2
C3130	B4	G2
C3131	B4	G2
C3140	B4	H2
C3141	C4	H2
C3150	C4	H2
C3151	C4	H2
C3170	D4	I2
J1180	F4	A1*
K2180	E3	A1*
K3180	D3	A2
L2130	B3	G1
L2131	A3	G1
L2140	B3	H1
L2150	C4	H1
L2151	C3	H2
L2160	C3	H1
L2161	D3	I1
L2170	D3	I2
L3130	B3	G2
L3131	B4	G2
L3140	B4	H2
L3141	B4	H2
L3150	C4	H2
L3151	C4	I2
L3170	D3	I2
L3171	D4	I2
P1180	F4	CHASSIS
P4062	F4	CHASSIS
Q1150	C3	H1
Q2130	B3	G1
Q2160	D3	I1
Q3130	B4	G2
Q3140	C4	H2
Q3160	D4	I2
Q3161	D4	I2
Q6180	F2	J4
Q7180	E2	J4
R1100	C1	F1
R1120	A3	G1
R1130	A3	G1
R1131	A3	G1
R1132	B2	D1*
R1140	B3	H1
R1150	C2	H1

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
R1151	C2	H1
R1152	C2	C1*
R1160	C3	H1
R1161	C2	I1
R1162	D2	I1
R1163	C2	I1
R1170	F4	I1
R1171	F4	I1
R2100	C2	E2
R2101	C1	F2
R2102	C1	F2
R2103	C1	F2
R2110	B1	F1
R2111	B1	F2
R2113	B1	F2
R2120	A3	G1
R2121	B2	G1
R2130	B2	G1
R2131	B4	G2
R2132	B3	G1
R2140	B3	H1
R2141	C3	H2
R2142	C3	H2
R2150	B2	H1
R2152	C3	H1
R2153	B3	H1
R2160	C3	I1
R2161	C3	I2
R2162	D3	I2
R2163	D2	I1
R2164	C2	I1
R2170	C3	I1
R2171	D3	I2
R2172	E4	I2
R2173	E4	J2
R2174	E4	I1
R2175	E4	J1
R2176	E4	I1
R2177	E4	J1
R3130	B3	G2
R3131	B3	G2
R3140	C4	H2
R3160	D4	I2
R3161	D4	I2
R3170	D4	I2
R3171	D4	I2
R3172	E4	I2
R3173	E4	J2
R6182	E2	J4
R7082	B1	G3
R7083	B1	G2
R7084	B1	G2
R7183	E2	J4
U2090	E1	F2*
U2100	D1	F1
U2120	A2	D2*
U3110	B1	E2*
CHASSIS MOUNTED PARTS		
W700	F4	CHASSIS

*Denotes component mounted on back of circuit board. Refer to rear view

P/O A5 ASSY also shown on Schematics 12, 13, 15, 16 & 17.


A
B
C
D
E
F
1
2
3
4
5
LOCOSC
GND
+16V
PINATT
+5V
ATT10*R
ATT5*R
+12V
R7063 18.2
R7062 274
R7064 274
R2111 18.2
R2110 274
R2113 274
3db
-10dbm
-21dbm
U3110 MIXER CLP
LO
RF
IF
IF
GGGG NNNN DDDD
-10dbm
R2102 274
R2103 18.2
R2101 274
-7dbm
U2100 AVANTEK_ATT
RF OUT RF IN
GND BIAS CONT
1dbm
U2090 BAND_PASS
RF OUTRF IN
GND GND GND GND
4dbm
RF
Static Sensitive Devices (See Maintenance Section)
COMPONENT NUMBER EXAMPLE
COMPONENT NUMBER
A23 Q2 R1234
Assembly Number
Schematic Circuit Number
Subassembly Number (If needed)
Chassis-mounted components have no Assembly Number prefix--see end of Replaceable Electrical Parts List.
R1100 150.0
R2100 100.0
C2100 .01uF
C1110 10uF
C1100 .033uF
R1132 10.0
R1152 10.0
R7183 1.00K
R6182 1.00K
Q6180
Q7180
ATT10*R
ATT5*R
U2120
LOWPASS
GND GND GND GND
IN OUT
-23dbm
R2120 33.2K
R1120 15.0K
C2140 1uF
Q2130
R1131 56.2
L2130 100nH
R1130 100.0
R2132 1.00K
L2131 8nH
C2130 4pF
R3131 274
L3140 18nH
C3130 0.1uF
Q3130
C2131 22pF
R2131 10.0
R2121 5.62K
R2130 15.0
C2120 .033uF
C1130 10uF
C3120 .033uF
R3130 121
L3130 30nH
L3131 8nH
C3131 4pF
C3140 1uF
R1151 5.62K
R2150 33.2K
R2153 15.0K
Q1150
R2140 56.2
L2140 100nH
R1140 100.0
R2141 1.00K
L3141 8nH
Q3140
C3141 4pF
C3240 10pF
R3140 10.0
C2152 .033uF
C1151 10uF
C2150 .033uF
R1150 15.0
R2152 121
L2151 56nH
R2142 274
L2150 18nH
C2151 0.1uF
L3150 8nH
L3151 8nH
C3151 1uF
C3150 4pF
R1161 10.0
R1163 10.0
C1160 .033uF
C1170 10uF
R2163 6.81K
R1162 27.4
R2164 10.2K
R2170 1.00K
C2160 .033uF
Q2160
R2160 100.0
L2160 100nH
R1160 15.0
R2161 1.00K
R2171 182
L2170 680uH
R2162 182
L3170 270nH
L2161 40nH
C2161 0.1uF
L3171 8nH
RF_TRANS
Q3160
Q3161
R3160 22.1
R3161 22.1
C3170 1uF
K3180 RF_RELAY
IN1 IN2
WP1 WP2
CO1 CO2
K2180 RF_RELAY
R3173 33.2
R3172 332
R3171 182
R3170 8.25K
5dB
R2173 182
R2172 8.25K
R2176 82.5
R2177 475
R2174 121
R2175 475
10dB
R1170 121
R1171 475
J1180
P1180
W700
HF SIG
P3060
18
NOTE: Power numbers listed are correct when the output is set to 5.5 volts.
P/O A5 RF BOARD
SG 5030
REV AUG 1991
ATTEN/FINAL MIXER/AMPLIFIER
14

Note: A5 - RF circuit board illustrations (front and rear views) located between Schematics 11 & 12.

Table 10-15
Component Reference Chart

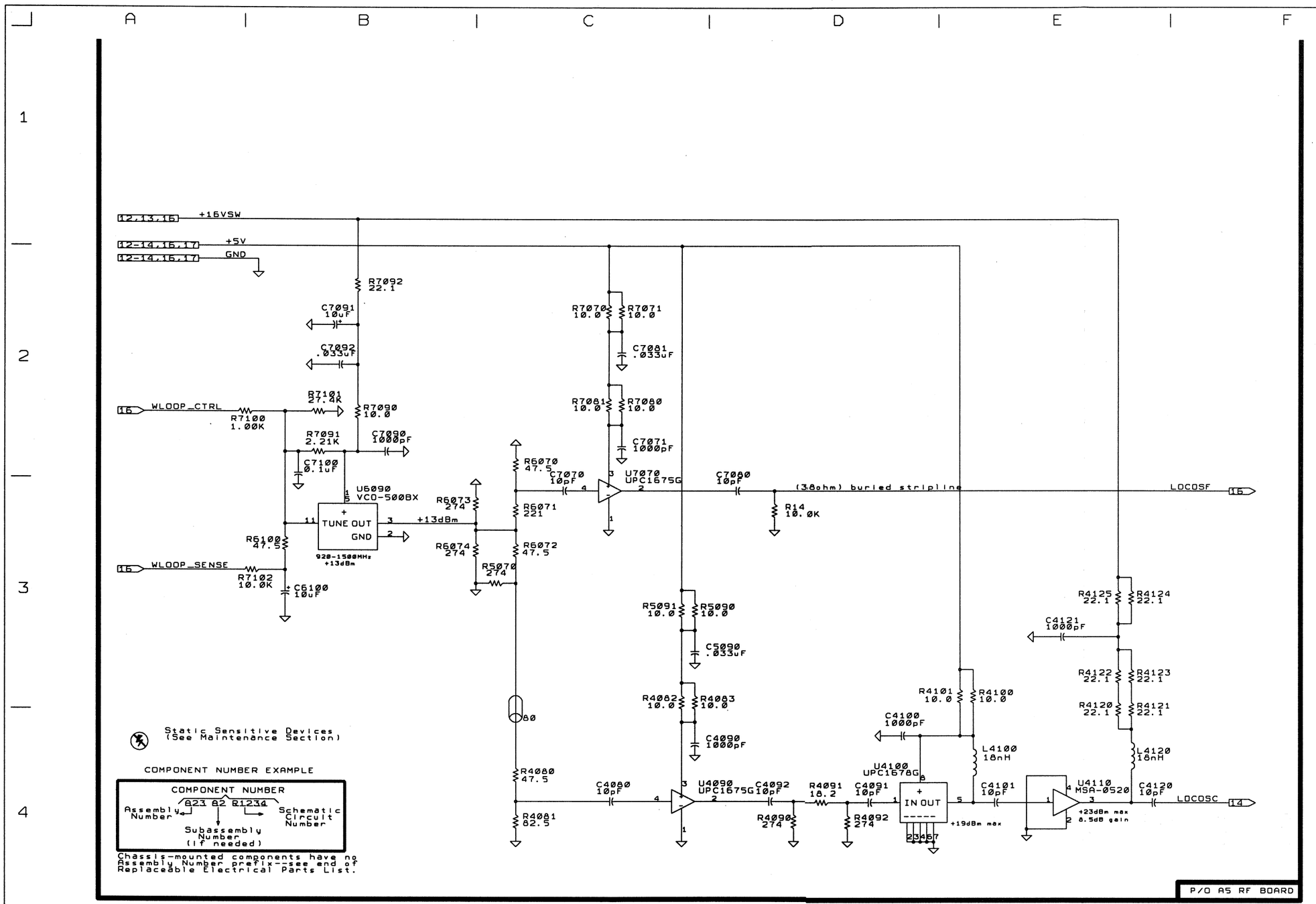
P/O A5 ASSY — **Wide Loop 920-1470 MHz (Schematic 15)**

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C4080	C4	E3
C4090	C4	E2
C4091	D4	E3
C4092	D4	E3
C4100	D4	E2
C4101	E4	F3
C4120	E4	F2
C4121	E3	G2
C5090	C3	F3*
C6100	B3	F3
C7070	C3	D4
C7071	C2	D4
C7080	D3	E4
C7081	C2	G4*
C7090	B2	E4
C7091	B2	F4*
C7092	B2	F4*
C7100	B2	F4
L4100	E4	F3
L4120	E4	G3
R4080	C4	D3
R4081	C4	E3
R4082	C4	E3
R4083	C4	E3
R4090	D4	E3
R4091	D4	E3
R4092	D4	E3
R4100	E3	E2
R4101	E3	F2
R4120	E4	G3
R4121	E4	G3

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
R4122	E3	G3
R4123	E3	G3
R4124	E3	D3*
R4125	E3	D3*
R5070	C3	D3
R5090	C3	F3*
R5091	C3	F3*
R6070	C2	D4
R6071	C3	D4
R6072	C3	D3
R6073	B3	D4
R6074	B3	D3
R6100	B3	F4
R7070	C2	G4*
R7071	C2	G4*
R7080	C2	D4
R7081	C2	D4
R7090	B2	E4
R7091	B2	E4
R7092	B2	F4*
R7100	A2	F4
R7101	B2	F4
R7102	A3	F4
U4090	C4	E3
U4100	D4	E3
U4110	E4	F3
U6090	B3	E4
U7070	C3	D4

*Denotes component mounted on back of circuit board. Refer to rear view

P/O A5 ASSY also shown on Schematics 12, 13, 14, 16 & 17.



SG 5030

920-1470 MHz
WIDE LOOP

15

Note: A5 - RF circuit board illustrations (front and rear views) located between Schematics 11 & 12.

Table 10-16
Component Reference Chart

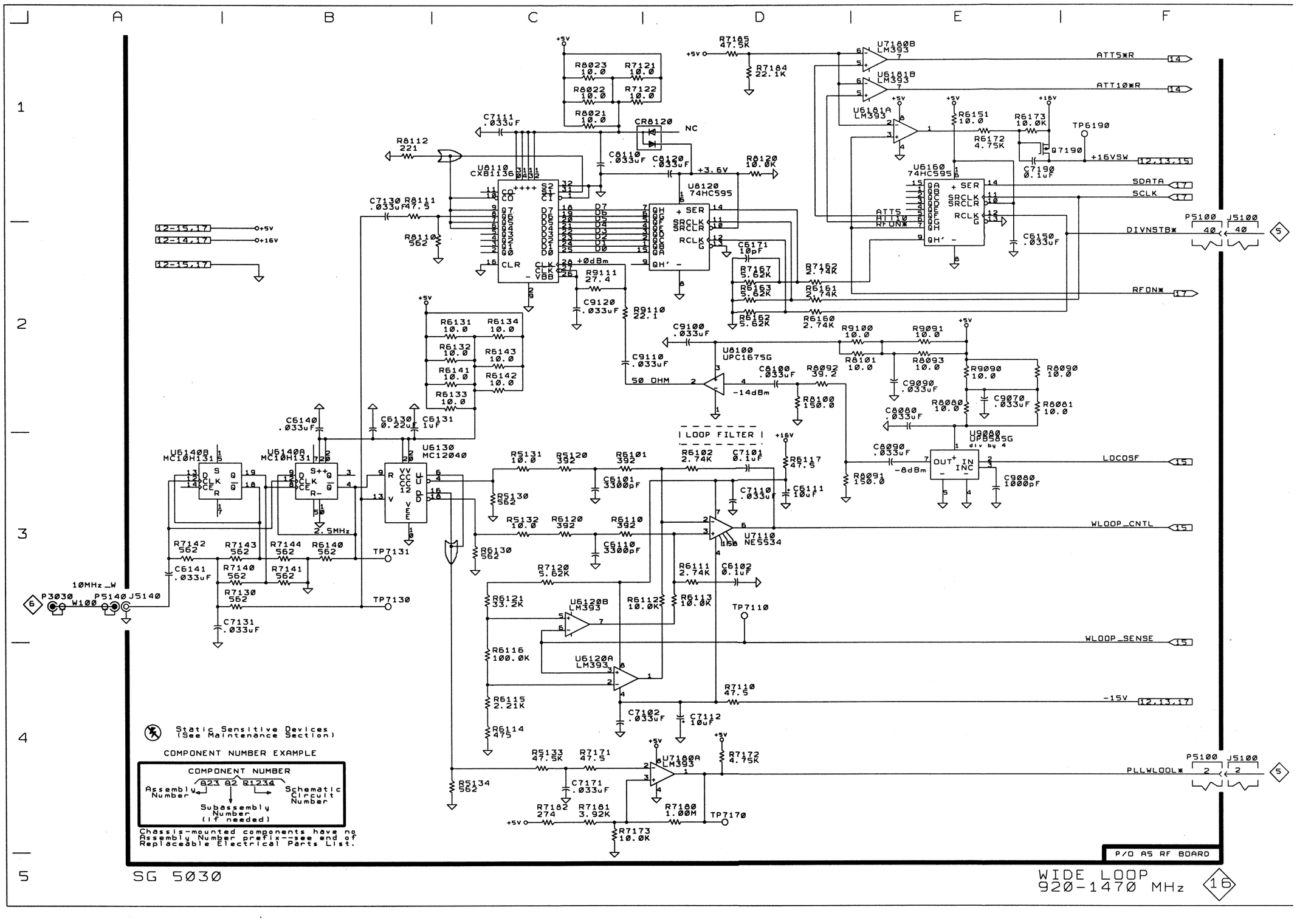
P/O A5 ASSY — **Wide Loop 920-1470 MHz (Schematic 16)**

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
CR8120	C1	G5
C6101	C3	F3
C6102	D3	F4
C6110	C3	F3
C6111	D3	E4*
C6130	B2	G3
C6131	B2	G3
C6140	B2	H3
C6141	A3	H3
C6150	E1	H3
C6171	D2	I4
C7101	D3	F4
C7102	C4	F4
C7110	D3	F4
C7111	C1	F4
C7112	D4	E4*
C7130	B1	G4
C7131	A3	G4
C7171	C4	J4
C7190	E1	J3
C8080	E2	E5
C8090	E3	E5
C8100	D2	F5
C8110	C1	F5
C8120	D1	G5
C9070	E2	D5
C9080	E3	D5
C9090	E2	E5
C9100	D2	F5
C9110	C2	F5
C9120	C2	G5
J5100	F1,F4	p/o Assy A2
J5140	A3	C3*
P3030	A3	CHASSIS
P5100	F1,F4	B5*
P5140	A3	CHASSIS
Q7190	E1	J4
R5120	C3	G3
R5130	C3	G3
R5131	C3	G3
R5132	C3	G3
R5133	C4	G3
R5134	C4	G3
R6101	C3	F3
R6102	D3	F4
R6110	C3	F3
R6111	D3	F4
R6112	D3	F4
R6113	D3	F3
R6114	C4	F4
R6115	C4	F4
R6116	C4	F3
R6117	D3	E4*
R6120	C3	G3
R6121	C3	G3
R6130	C3	G3
R6131	C2	D4*
R6132	C2	D4*
R6133	C2	D4*
R6134	C2	D4*
R6140	B3	H3
R6141	C2	D4*
R6142	C2	C4*
R6143	C2	D4*
R6151	E1	H4
R6160	D2	I4
R6161	D2	I4
R6162	D2	I4
R6163	D2	I4
R6172	E1	J4
R6173	E1	J4
R7110	D4	E4*
R7120	C3	G4
R7121	C1	D4*
R7122	C1	D4*
R7130	B3	G4
R7140	B3	H4
R7141	B3	H4
R7142	A3	H4
R7143	B3	H4
R7144	B3	H4
R7162	D2	I4
R7167	D2	I4
R7171	C4	J4
R7172	D4	J4
R7173	C4	J4
R7180	D4	J4
R7181	C4	J4
R7182	C4	J4
R7184	D1	J4
R7185	D1	J4
R8021	C1	D5*
R8022	C1	D5*
R8023	C1	D5*
R8080	E2	D5
R8081	E2	D5
R8090	E2	E5
R8091	D3	E5
R8092	D2	E5
R8093	E2	E5
R8100	D2	E5
R8101	E2	F5
R8110	C2	F5
R8111	B1	F4
R8112	B1	F4
R8120	D1	G4
R9090	E2	E5
R9091	E2	E5
R9100	E2	F5
R9110	C2	F5
R9111	C2	F5
TP6190	F1	J3
TP7110	D3	F4
TP7130	B3	G4
TP7131	B3	G4
TP7170	D4	I4
U6120A	C4	F4
U6120B	C3	F4
U6130	B3	B3
U6140A	B3	H4
U6140B	A3	H4
U6160	E1	I4
U6181A	E1	J4
U6181B	E1	J4
U7110	D3	F4
U7180A	D4	J4
U7180B	E1	J4
U8100	D2	F5
U8110	C1	F5
U8120	D1	G4
U9080	E3	E5

CHASSIS MOUNTED PARTS		
W100	A3	CHASSIS

*Denotes component mounted on back of circuit board. Refer to rear view

P/O A5 ASSY also shown on Schematics 12, 13, 14, 15 & 17


A
B
C
D
E
F
1
2
3
4
5
+5V
+16V
12-15,17
12-14,17
12-15,17
R8023 10.0
R7121 10.0
R8022 10.0
R7122 10.0
R8021 10.0
C7111 .033uF
CR8120
NC
R8112 221
C8110 .033uF
C8120 .033uF
+3.6V
R8120 10.0K
U8110 CX81136
U8120 74HC595
C7130 .033uF
R8111 47.5
R8110 562
CLR
+0dBm
R9111 27.4
C9120 .033uF
R9110 22.1
C9110 .033uF
50 OHM
R7185 47.5K
R7184 22.1K
U7100B LM393
U6101B LM393
U6101A LM393
ATT5*R
ATT10*R
R6151 10.0
R6173 10.0K
TP6190
R6172 4.75K
Q7190
+16VSW
12,13,15
C7190 0.1uF
U6160 74HC595
SDATA
SCLK
ATT5
ATT10
RFON*
RCLK
C6150 .033uF
DIVNSTB*
P5100 40
J5100 40
5
C6171 10pF
R7167 5.62K
R6163 5.62K
R6162 5.62K
R7152 2.74K
R6161 2.74K
R6160 2.74K
RFON*
R6131 10.0
R6134 10.0
R6132 10.0
R6143 10.0
R6141 10.0
R6142 10.0
R6133 10.0
C6140 .033uF
C6130 0.22uF
C6131 1uF
C9100 .033uF
U8100 UPC1675G
R9100 10.0
R9091 10.0
R8101 10.0
R8093 10.0
C8100 .033uF
R8092 39.2
-14dBm
R8100 150.0
R9090 10.0
R8090 10.0
C9090 .033uF
R8080 10.0
C9070 .033uF
R8081 10.0
C8080 .033uF
U9080 UPB585G
div by 4
C8090 .033uF
-8dBm
R8091 150.0
OUT IN INC
LOCOSF
15
C9080 1000pF
U6140B MC10H131
U6140A MC10H131
U6130 MC12040
2.5MHz
LOOP FILTER
R5131 10.0
R5120 392
R6101 392
R6102 2.74K
C7101 0.1uF
+16V
R6117 47.5
C6101 3300pF
C7110 .033uF
C6111 10uF
R5130 562
R5132 10.0
R6120 392
R6110 392
C6110 3300pF
U7110 NE5534
WLOOP_CNTL
15
R6130 562
R7142 562
R7143 562
R7144 562
R6140 562
TP7131
C6141 .033uF
R7140 562
R7141 562
R7130 562
TP7130
C7131 .033uF
10MHz_W
P3030
P5140
J5140
W100
6
R7120 5.62K
R6111 2.74K
C6102 0.1uF
R6121 33.2K
R6112 10.0K
R6113 10.0K
U6120B LM393
TP7110
WLOOP_SENSE
15
R6116 100.0K
U6120A LM393
R6115 2.21K
R6114 475
R7110 47.5
-15V
12,13,17
C7102 .033uF
C7112 10uF
R5133 47.5K
R7171 47.5
U7100A LM393
R7172 4.75K
PLLWLOOL*
P5100 2
J5100 2
5
R5134 562
C7171 .033uF
R7182 274
R7181 3.92K
R7180 1.00M
TP7170
R7173 10.0K
Static Sensitive Devices
(See Maintenance Section)
COMPONENT NUMBER EXAMPLE
COMPONENT NUMBER
A23 A2 R1234
Assembly Number
Subassembly Number (if needed)
Schematic Circuit Number
Chassis-mounted components have no Assembly Number prefix--see end of Replaceable Electrical Parts List.
P/O A5 RF BOARD
SG 5030
WIDE LOOP
920-1470 MHz
16

Note: A5 - RF circuit board illustrations (front and rear views) located between Schematics 11 & 12.

Table 10-17
Component Reference Chart

P/O A5 ASSY — **Amplitude Control (Schematic 17)**

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
CR4170	C3	I2
CR5170	D4	I3
C4160	F3	I2
C4161	D3	B3*
C4180	C4	J3
C4181	D3	A3*
C4190	B4	A3*
C5150	B1	H3
C5160	D1	I3
C5161	D1	I3
C5162	C2	I3
C5170	C3	I3
C5171	D3	J3
C5172	E2	B3*
C5173	B4	B3*
C5180	C4	J3
C5181	C2	A3*
C5190	B2	A3*
C5191	B3	A3*
C6170	B1	I4
C6172	D2	B4*
C6180	C2	A4*
J5100	A2,F3	p/o Assy A2
J5190	A2	J3
P5100	A2,F3	B5*
P5190	A2	CHASSIS
Q4170	F4	I2
Q4171	D4	I3
Q5180	C3	J3
R4160	F3	I3
R4170	C3	I3
R4171	D4	J3
R4172	B3	J3
R4173	E3	B3*
R4174	B4	B3*
R4176	B3	B3*
R4177	E3	B3*
R4178	E3	B3*
R4180	C4	J3
R4181	B1	J3
R4182	B1	J3
R4183	D2	A3*
R4184	D2	A3*
R4190	B2	A3*
R5150	C1	H3
R5151	C1	H3
R5152	C1	H3
R5160	B4	B3*
R5170	C2	I3

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
R5171	B3	J3
R5172	D4	J3
R5173	D3	J3
R5174	E3	J3
R5175	B3	B3*
R5176	C3	B3*
R5177	E2	B3*
R5178	D2	B3*
R5179	D2	B3*
R5180	E3	J3
R5181	D3	A3*
R5182	D3	A3*
R5183	D2	A3*
R5184	D2	A3*
R5185	D3	A3*
R5190	B2	A3*
R5191	B2	A3*
R5192	B3	A3*
R6150	D4	H3
R6170	E3	J3
R6171	E3	J3
R6174	B4	B4*
R6180	E3	J3
R6181	E3	J3
R6183	F3	J3
R6184	E3	J3
R7170	C1	I4
TP4160	F4	H2
TP5160	B1	I3
TP5170	D2	I3
TP5190	B1	J3
TP6160	D1	H3
TP6170	C3	B4*
TP6180	F3	J4
TP6181	C2	A4*
U4150	B1	H3
U5160A	C1	I3
U5160B	C2	I3
U5180A	C3	J3
U5180B	D3	J3
U5180C	B3	J3
U5180D	B1	J3
U5180E	C4	J3
U5181A	D2	A3*
U5181B	E2	A3*
U6161	C2	I3
U6180A	E3	J3
U6180B	E3	J3
U6182A	C2	A4*
U6182B	C3	A4*

*Denotes component mounted on back of circuit board. Refer to rear view

P/O A5 ASSY also shown on Schematics 12, 13, 14, 15, & 16.

Static Sensitive Devices
(See Maintenance Section)

COMPONENT NUMBER EXAMPLE

COMPONENT NUMBER
A23 A2 R1234
Assembly Number
Subassembly Number (If needed)
Schematic Circuit Number

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

TO FRONT PANEL LEVELING HEAD CABLE ASSEMBLY

P/O A5 RF BOARD

SG 5030

AMPLITUDE CONTROL 17

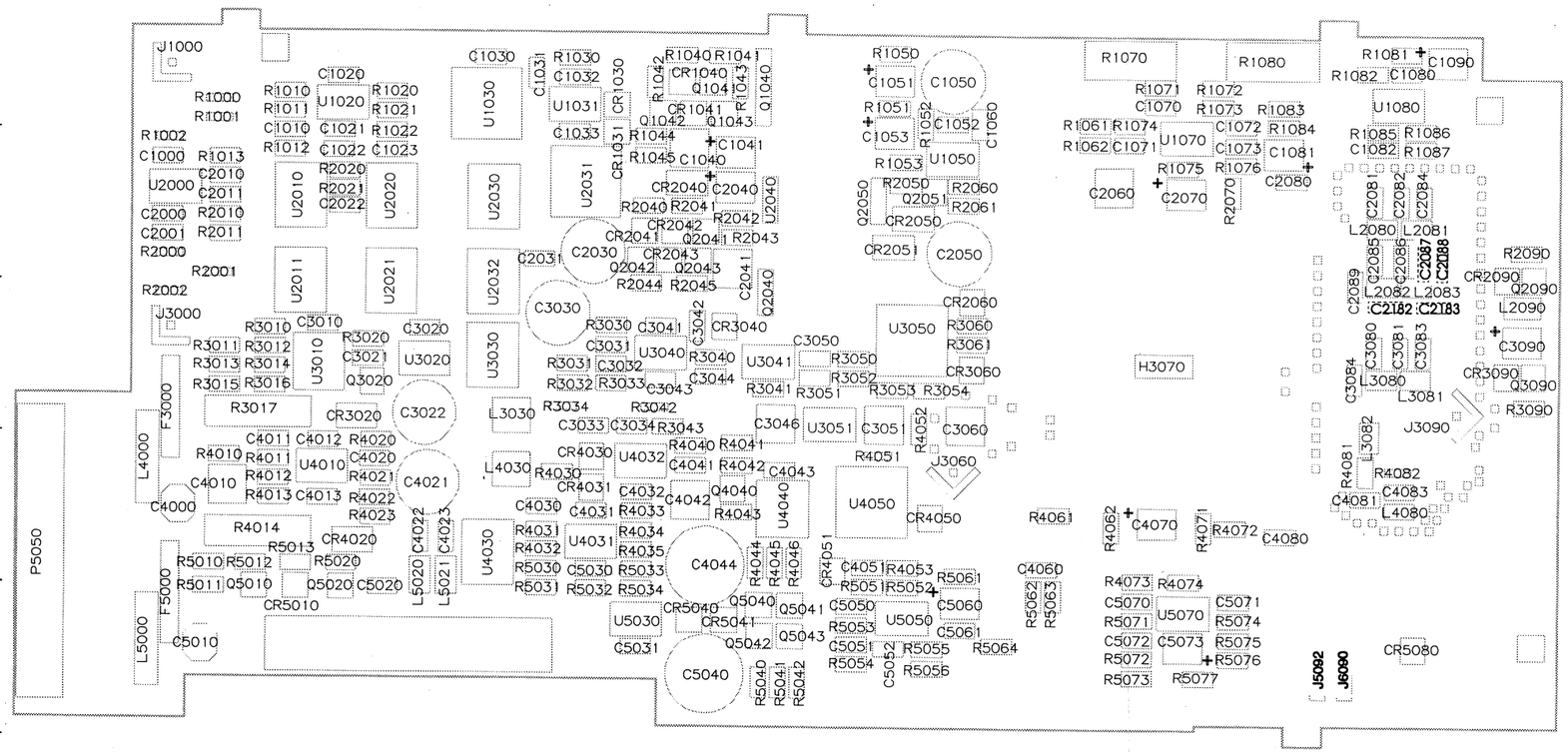
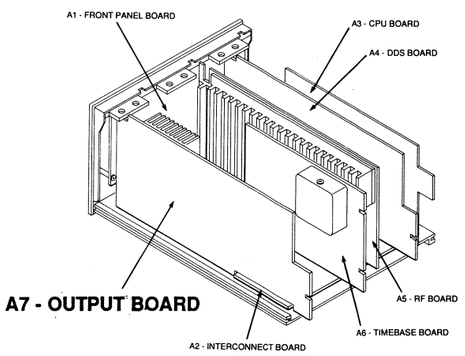


Fig. 10-12. A7 - Output board (front view)



Front view of A7-Output circuit board illustration to be used with diagrams 18 through 22

REAR VIEW

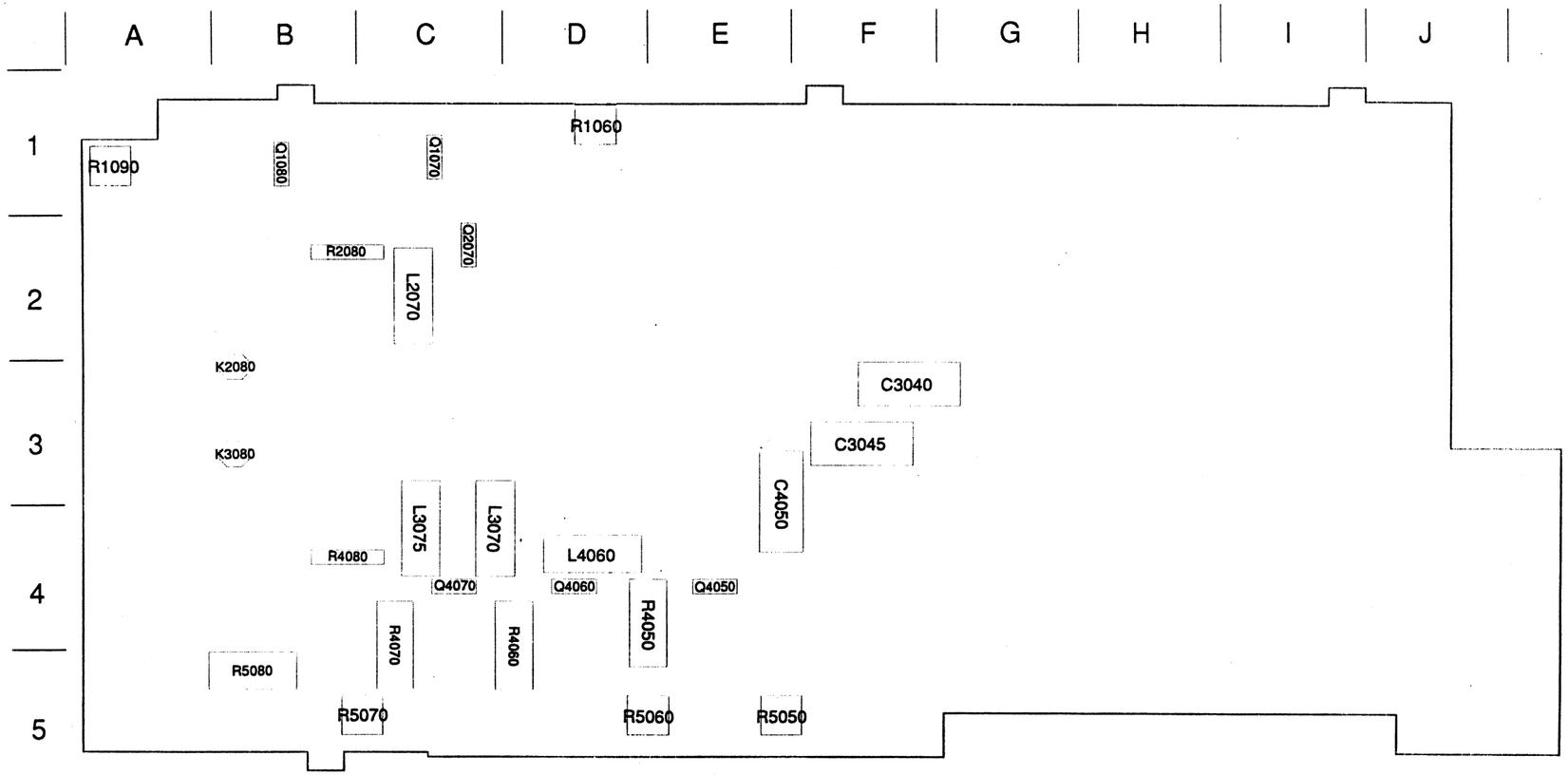


Fig. 10-13. A7 - Output board (rear view)

Rear view of A7-Output circuit board illustration to be used with diagrams 18 through 22

Table 10–18A
Component Reference Chart

P/O A7 ASSEMBLY — **OUTPUT FEEDBACK 18A**

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1041	B4	E2
C1050	E4	G1
C1051	C4	F1
C1052	D3	G1
C1053	D4	F1
C1060	D4	G1
C2040	C4	E2
C2050	D4	G2
C3031	C2	D3
C3032	C2	E3
C3033	C3	D3
C3034	C3	E3
C3040	D2	E3**
C3041	C2	E3
C3042	D2	E3
C3043	C2	E3
C3044	D2	E3
C3045	D2	E3**
C3046	B2	F3
C3050	D2	F3
C3051	B2	F3
C4050	D2	F4**
C5031	B3	E5
CR2040	B4	E2
CR2050	E4	G2
CR2051	E4	F2
CR2060	C1	G3
CR3040	D2	E3
CR3060	B1	G3
CR4050	D1	G4
CR4051	C1	F4
J6090	A3	I5
Q2050	E4	F2
Q2051	E4	G2
R1050	D4	F1
R1051	D3	F1
R1052	D4	G1
R1053	E3	F2
R2050	D4	F2
R2060	C4	G2

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
R2061	E4	G2
R3030	C2	D3
R3031	B2	D3
R3032	C2	D3
R3033	C2	E3
R3034	C2	D3
R3040	D2	E3
R3041	D2	F3
R3042	C2	E3
R3043	B3	E3
R3050	E2	F3
R3051	D2	F3
R3052	E2	F3
R3053	C3	F3
R3054	C3	G3
R3060	E2	G3
R3061	E2	G3
R4041	B2	E4
R4052	B2	G3
R5032	B3	D4
R5034	C3	E4
U1050	D4	G2
U1080B	C4	J1
U2040	C4	F2
U3040	C2	E3
U3041	D2	F3
U3050A	E2	F3
U3050B	C2	F3
U3050C	C2	F3
U3050D	E2	F3
U3050E	B1	F3
U3051	B2	F3
U4050A	B2	F4
U4050B	B3	F4
U4050C	B3	F4
U4050D	B3	F4
U4050E	C1	F4
U5030A	C3	E5
U5030B	C3	E5

NOTE:
**=BACK OF BOARD

P/O A7 ASSEMBLY also shown on Schematics 18B,19,20,21A, & 22

SG 5030

OUTPUT FEEDBACK 18 A

Table 10–18B
Component Reference Chart
P/O A7 ASSEMBLY OUTPUT AMPLIFER 18B

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1070	B4	H1
C1071	B4	H2
C1072	C4	I1
C1073	D4	I2
C1080	D4	J1
C1081	D4	I2
C1082	D4	J2
C1090	D4	J1
C2060	C3	H2
C2070	B4	H2
C2080	D3	I2
C2081	E4	J2
C2082	E4	J2
C2083	E4	J2
C2084	F4	J2
C2085	E4	J2
C2086	E4	J2
C2087	E4	J2
C2088	F4	J2
C2089	E4	I2
C2182	E4	J3
C2183	E4	J2
C3060	C2	G3
C3080	E3	J3
C3081	E3	J3
C3082	E3	J3
C3083	F3	J3
C3084	E3	I3
C3085	E3	I3
C3090	E2	K3
C4051	B3	F4
C4060	B1	G4
C4070	C1	H4
C4080	D2	I4
C4081	E2	I4
C4083	E2	J4
C5050	B3	F5
C5051	A3	F5
C5052	A1	F5
C5060	B3	G5
C5061	B1	G5
C5070	D1	H5
C5071	C1	I5
C5072	D1	H5
C5073	D1	H5
CR2090	E3	J2
CR3090	E2	J3
CR5080	D2	J5
H3070	D2	H3
J300	F3	OFF BD.
J3060	A2	G4
J3090	F2	J3
K2080	E3	J3
K3080	E2	J3
L2070	C4	I2**
L2080	E4	I2
L2081	E4	J2
L2082	E4	J3
L2083	E4	J2
L2090	E2	K3
L3070	B1	H4**
L3075	E1	H4**
L3080	E3	J3
L3081	E3	J3
L3082	E2	J3
L4060	B3	G4**
L4080	E2	J4
P1180	A2	OFF BD.
P3060	A2	OFF BD.
P3090	F2	OFF BD.
Q1070	C4	H1**
Q1080	D4	I1**
Q2070	C4	H2**
Q2090	F3	K2
Q3090	F2	K3

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
Q4050	B3	F4**
Q4060	B1	G4**
Q4070	E1	H4**
R1060	A3	K1**
R1061	A4	H1
R1062	B4	H1
R1070	C4	H1
R1071	B4	H1
R1072	C4	I1
R1073	C4	I1
R1074	B4	H1
R1075	B4	H2
R1076	C4	I2
R1080	C4	I1
R1081	D4	J1
R1082	D4	J1
R1083	C4	I1
R1084	D4	I1
R1085	D4	J1
R1086	E4	J1
R1087	E4	J2
R1090	E4	G1**
R2070	C4	I2
R2080	D3	I2**
R2090	F3	K2
R3090	F2	K3
R4050	B3	G4**
R4051	E2	F4
R4053	B3	G4
R4060	B1	H5**
R4061	B3	G4
R4062	B1	H4
R4070	E1	I5**
R4071	E1	H4
R4072	C1	I4
R4073	E1	H4
R4074	E1	H4
R4080	D2	I4**
R4081	E2	I4
R4082	D2	J4
R5050	A3	F5**
R5051	B3	F4
R5052	B3	G4
R5053	A3	F5
R5054	A3	F5
R5055	A1	G5
R5056	A1	G5
R5060	A1	G5**
R5061	B3	G4
R5062	B1	G5
R5063	B1	G5
R5064	B1	G5
R5070	C1	I5**
R5071	D1	H5
R5072	D1	H5
R5073	D1	H5
R5074	C1	I5
R5075	B1	I5
R5076	C1	I5
R5077	D1	H5
R5080	D2	J5**
U1070A	B4	H1
U1070B	C4	H1
U1080A	D4	J1
U5050A	B3	F5
U5050B	A1	F5
U5070A	D1	H5
U5070B	C1	H5
W700	A2	OFF BD.
W800	F2	OFF BD.

NOTE: **= BACK OF BOARD
P/O A7 ASSEMBLY also shown on Schematics 18A,19,20,21A & 22

COMPONENT NUMBER EXAMPLE

COMPONENT NUMBER
A23 A2 R1234
Assembly Number
Schematic Circuit Number
Subassembly Number (if needed)

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

P/O A7 OUTPUT BD.

SG 5030

OUTPUT AMPLIFER 18 B

Table 10–19
Component Reference Chart

P/O A7 ASSEMBLY — LOW FREQUENCY PREAMP 19

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOACATION
C1000	B2	B2
C1010	D4	B1
C1020	E4	C1
C1021	E4	C1
C1022	B4	C2
C1030	D1	D1
C1031	C1	D1
C1032	D1	D1
C1033	D2	D1
C2000	B1	B2
C2001	B1	B2
C2010	C1	B2
C2011	B1	B2
C2022	B4	C2
C2031	B4	D1
CR1030	E1	E1
CR1031	E2	E2
J1000	A1	B1
J3000	A1	B3
P1000	A1	OFF BD.
P2050	A1	OFF BD.
P2055	A1	OFF BD.
P3000	A1	OFF BD.
P7020	A2	B5
P7020	A4	B5
R1000	B1	B1
R1001	B1	B1
R1002	C2	B2

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOACATION
R1010	E3	B1
R1011	D4	B1
R1012	C4	B2
R1013	C1	B2
R1030	C1	D1
R2000	C1	B2
R2001	B1	B2
R2002	B1	B3
R2010	E3	B2
R2011	C2	B2
R2020	C4	C2
U1020A	E4	C1
U1030	C1	D1
U1031A	D1	D1
U1031B	F1	D1
U2000	B1	B2
U2010	D4	B2
U2011	B4	B2
U2030	B2	D2
U2031A	E2	D1
U2031B	E2	D1
U2031C	E2	D1
U2031D	E2	D1
U2031E	E2	D1
U2032	B3	D1
U3030	C3	D3
W500	A1	OFF BD.
W600	A1	OFF BD.

P/O A7 ASSEMBLY also shown on Schematics 18A,18B,20,21A, & 22

NOTE: THERE MUST BE A RUN CONNECTED TO RETURN RUNNING BETWEEN PINS 19 AND 20 OF THE AD7545A

COMPONENT NUMBER EXAMPLE

COMPONENT NUMBER
Assembly Number A23 A2 R1234 Schematic Circuit Number
Subassembly Number (if needed)

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

P2050 W500 P3000 J3000 LFSIG+
P2055 W600 P1000 J1000 LFSIG-

R2001 5.0K,T9
R1001 5.0K,T9
R1000 50,T9
R2002 50,T9
R2000 3.65K,T9
R1002 3.65K,T9
R1013 10
C2001 10pF
C2011 0.022uF
C2000 0.022uF
C1000 10pF
C2010 22pF
U2000 NE5534

U1030 AD7545A
R1030 47.5
C1031 0.1uF
C1030 15pF
R2011 10
DB[0..11]

U1031A AD712
C1032 0.022uF
C1033 0.022uF

CR1030
CR1031
U2031E HS151CPE
U1031B AD712

U2031A HS151CPE
U2031C HS151CPE
U2031B HS151CPE
U2031D HS151CPE

P/O J7020 P/O P7020
30 SDATA
28 SCLK
38 LFLVSTB*

U2030 74HC595
U2032 74HC595
U3030 74HC595
U2011 74HC595

21A SCLK
21A OFFSTB*

R2020 1.21K
R1012 1.21K
U2010 DAC0800
C1010 0.01uF

R1010 4.75K
R2010 10.0K
R1011 4.75K
U1020A TL072
+/-10 V
C1020 0.022uF
C1021 0.022uF

C1022 0.022uF
C2022 0.022uF
Power Connections for U2010 (pin 7:-15VD, pin 1:+16VD)

C2031 0.022uF

+2.5VREF 18A,20,21A,22

● Only switches closed in LF mode (0.1 Hz to 49.999 kHz)
●● Only switches closed in HF mode (50.00 kHz to 550 MHz)

PREAMPOUT 18A
LFON 18A
OUTAMPON 20
RSEL 20
RSTATE 20
FILTER1 18B
FILTER2 18B
OFFDATA 21A

P/O A7 OUTPUT BD.

Table 10–20
Component Reference Chart

P/O A7 ASSEMBLY — RELAY DRIVER 20

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C4030	B2	D4
C4031	C1	D4
C4032	C3	E4
C4041	B4	E4
C4042	C4	E4
C4043	D1	F4
C4044	D1	E4
C5030	D1	D4
C5040	D3	E5
CR4030	B4	D4
CR4031	B3	D4
CR5040	D2	E5
CR5041	D2	E5
J5092	F2	I5
P7020	A4	B5
P7020	F4	B5
P7020	A2	B5
Q4040	D4	E4
Q5040	E2	E5
Q5041	E2	F5
Q5042	E2	E5
Q5043	E2	F5
R4030	B3	D4
R4031	D2	D4
R4032	C2	D4

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
R4033	D1	E4
R4034	C2	E4
R4035	C2	E4
R4040	C3	E4
R4042	D3	E4
R4043	C4	E4
R4044	D2	E4
R4045	E1	F4
R4046	E1	F4
R5030	C2	D4
R5031	C3	D4
R5033	C2	E4
R5040	E3	E5
R5041	E3	F5
R5042	D2	F5
U4030A	B2	D4
U4030B	B2	D4
U4031A	D2	D4
U4031B	D2	D4
U4032	C4	E4
U4040A	D3	F4
U4040B	D3	F4
U4040C	E4	F4
U4040D	C3	F4

P/O A7 ASSEMBLY also shown on Schematics 18A,18B,19,21A, & 22

POWER PIN TABLE

CIRCUIT NUMBER	DEVICE TYPE	+5VA	GND
U4030	74HC139	16	8
U4040	74AC00	14	7
U4032	TLC555CP	8	1

S	R	Q	~Q
L	L	H	H
L	H	L	H
H	L	Q'	~Q'
H	H	AVOID	

RSEL	RSTATE	MAG LATCHES
0	0	RDRVA-
0	1	RDRVA+
1	0	RDRVB-
1	1	RDRVB+

+16VB (for TL072) C4031 0.022uF
-15VB (for TL072) C5030 0.022uF
+5VA (for 74AC00) C4043 0.022uF

U4030A 74HC139
U4030B 74HC139
C4030 0.022uF

RSTATE (L-1X or H-10X)
RSEL (L-A or H-B relay)
P/O J7020 P/O P7020
RELAY*
(H-disable, L-fire)

A1X R4034 8.25K
A10X R4035 8.25K
B1X R4032 8.25K
B10X R5030 8.25K

U4031B TL072
U4031A TL072
R4033 20.0K
R4031 20.0K
R5033 20.0K
R5031 20.0K

CR5040
CR5041

+26VB
C4044 220uF 50V
R4045 10
R4046 100
R4044 18.2
R5042 18.2
R5041 10
C5040 220uF 50V
R5040 100
-26VB

Q5041
Q5040
Q5043
Q5042

RDRVA
RDRVB

J5092 P5092
TO FRONT PANEL LEVELING HEAD CABLE ASSEMBLY
21 B

OUTAMPON
U4040D 74AC00
OUTAMPON*
U4040A 74AC00
U4040B 74AC00
U4040C 74AC00

UNPLUGGED*
CR4031
CR4030
R4030 47.5K
C4032 0.1uF
R4040 5.6M
U4032 TLC555CP
C4041 0.01uF
C4042 0.47uF
R4043 4.75K
R4042 1.0K
Q4040

Q* UNPLUG 21A
UNPLUG* 21A
P/O P7020 P/O J7020
RESET*

+26VB
+16VB
+5VA
-15VB
-26VB
POWERGND

COMPONENT NUMBER EXAMPLE

COMPONENT NUMBER
A23 A2 R1234
Assembly Number
Subassembly Number (if needed)
Schematic Circuit Number

Static Sensitive Devices (See Maintenance Section)

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

(ECB P/N 309-0526-00, ASSMB P/N 671-XXXX-00)

P/O A7 OUTPUT BD.

SG 5030

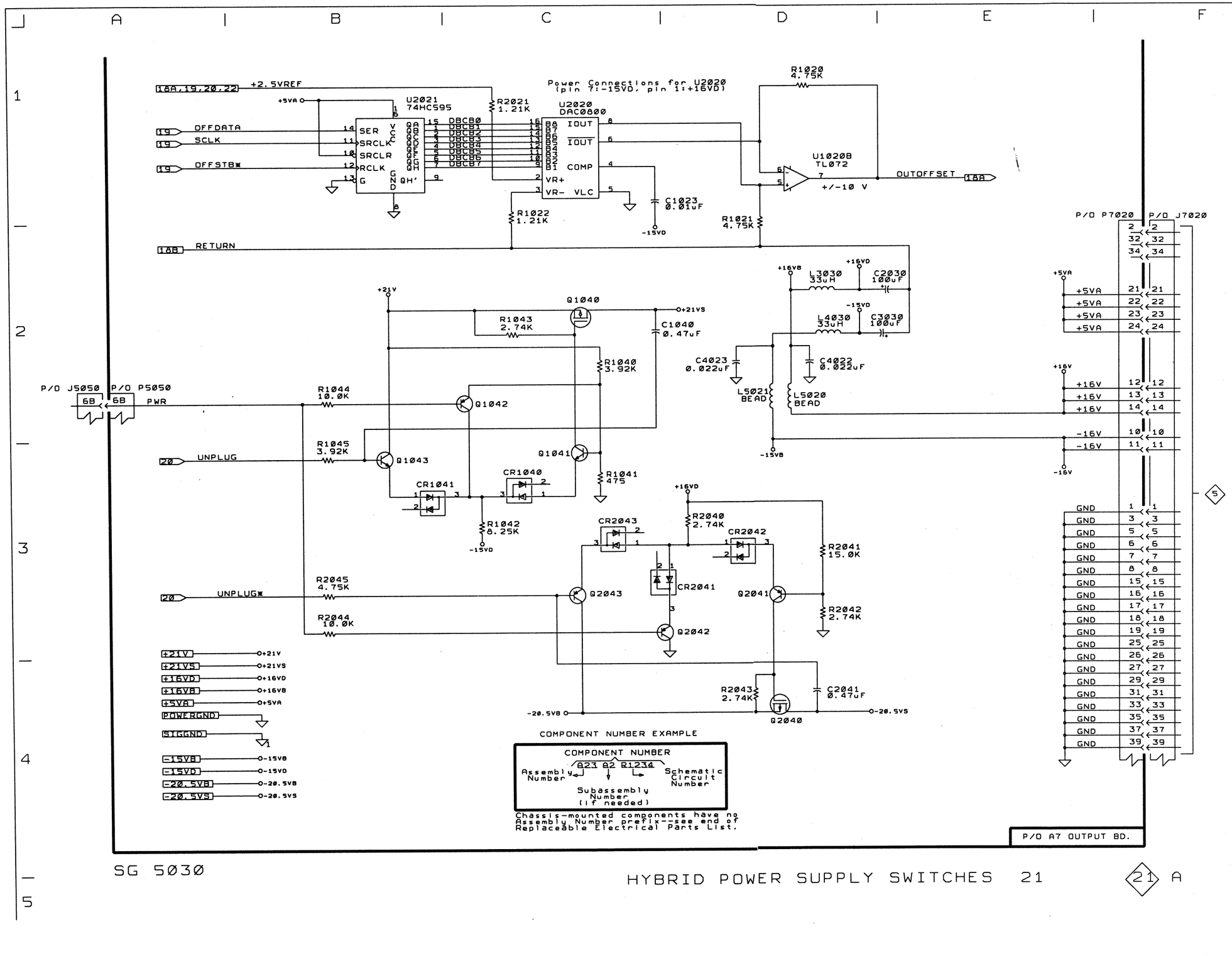
RELAY DRIVER 20

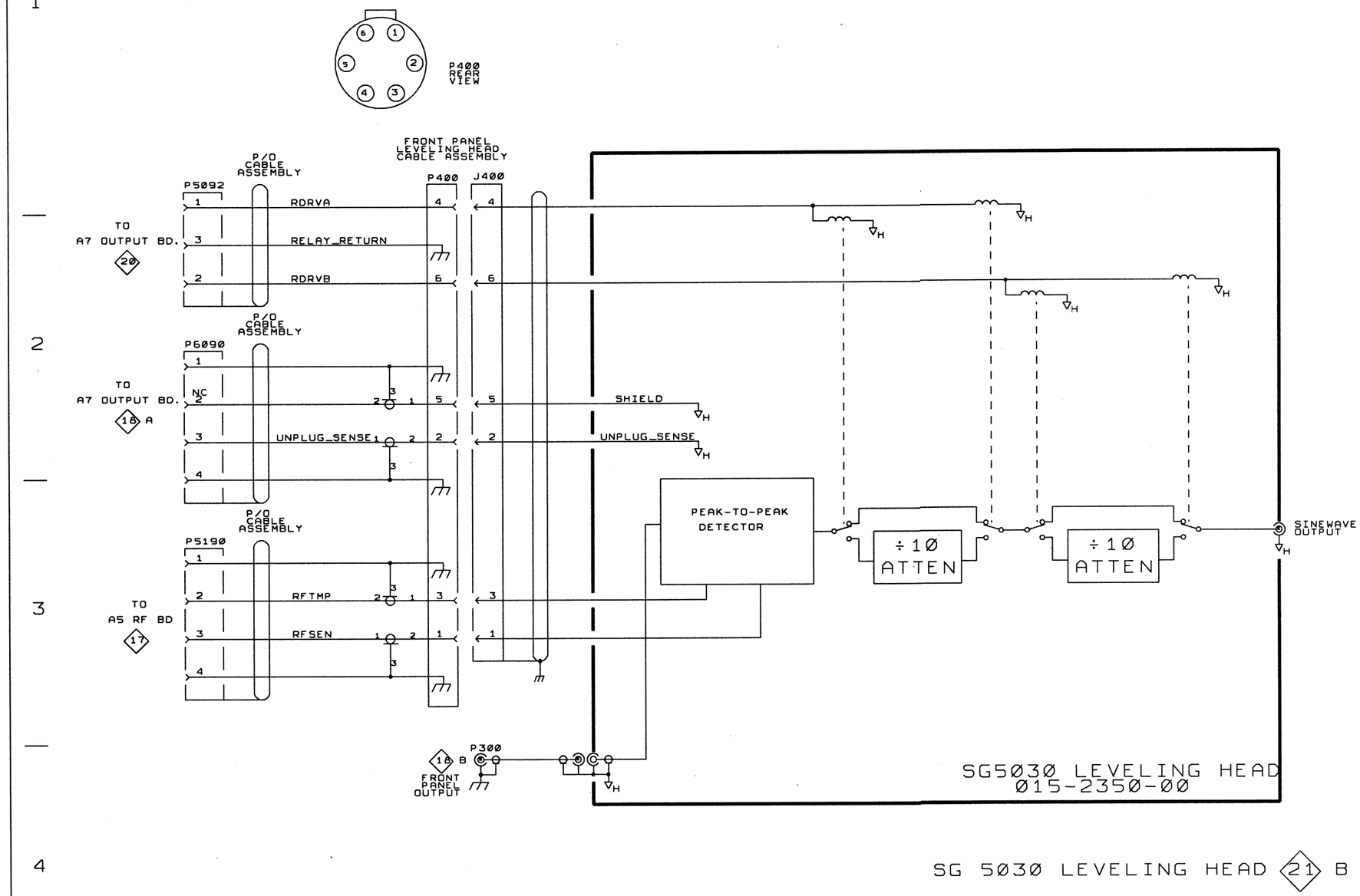
Table 10–21A
Component Reference Chart

P/O A7 ASSEMBLY — **HYBRID POWER SUPPLY SWITCHES 21**

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1023	C1	C2
C1040	C2	E2
C2030	E2	D1
C2041	D4	E2
C3030	E2	D3
C4022	D2	C4
C4023	D2	C4
CR1040	C3	E1
CR1041	B3	E1
CR2041	D3	E2
CR2042	D3	E2
CR2043	C3	E2
L3030	D2	D3
L4030	D2	D4
L5020	D2	C4
L5021	D2	C4
P5050	A2	A4
P7020	F2	B5
Q1040	C2	E1
Q1041	C3	E1
Q1042	C2	E1
Q1043	B3	E1
Q2040	D4	F3
Q2041	D3	E2
Q2042	D3	E2
Q2043	C3	E2
R1020	D1	C1
R1021	D2	C1
R1022	C1	C1
R1040	C2	E1
R1041	C3	E1
R1042	C3	E1
R1043	C2	E1
R1044	B2	E1
R1045	B3	E2
R2021	C1	C2
R2040	D3	E2
R2041	D3	E2
R2042	D3	E2
R2043	D4	E2
R2044	B3	E2
R2045	B3	E2
U1020B	D1	C1
U2020	C1	C2
U2021	B1	C2

P/O A7 ASSEMBLY also shown on Schematics 18A,18B,19,20, & 22


A
B
C
D
E
F
1
2
3
4
5
+2.5VREF
16A,19,20,22
+5VA
U2021
74HC595
R2021
1.21K
Power Connections for U2020
(pin 7:-15VD, pin 1:+16VD)
U2020
DAC0800
R1020
4.75K
OFFDATA
SCLK
OFFSTB*
19
SER
SRCLK
SRCLR
RCLK
G
GND
QH'
DBCB0
DBCB1
DBCB2
DBCB3
DBCB4
DBCB5
DBCB6
DBCB7
B8 IOUT
B7
B6
B5
B4
B3
B2
B1 COMP
VR+
VR- VLC
IOUT
U1020B
TL072
+/-10 V
OUTOFFSET
16A
C1023
0.01uF
-15VD
R1022
1.21K
R1021
4.75K
16B
RETURN
+21V
Q1040
+21VS
R1043
2.74K
C1040
0.47uF
R1040
3.92K
P/O J5050
P/O P5050
6B
PWR
R1044
10.0K
Q1042
R1045
3.92K
20
UNPLUG
Q1043
Q1041
R1041
475
CR1040
CR1041
R1042
8.25K
+16VD
CR2043
R2040
2.74K
CR2042
R2041
15.0K
R2045
4.75K
UNPLUG*
Q2043
CR2041
Q2041
R2042
2.74K
R2044
10.0K
Q2042
R2043
2.74K
C2041
0.47uF
Q2040
-20.5VB
-20.5VS
+16VB
L3030
33uH
C2030
100uF
L4030
33uH
C3030
100uF
C4023
0.022uF
C4022
0.022uF
L5021
BEAD
L5020
BEAD
-15VB
P/O P7020
P/O J7020
+5VA
+16V
-16V
GND
+21V
+21VS
+16VD
+16VB
+5VB
POWERGND
SIGGND
-15VB
-15VD
-20.5VB
-20.5VS
COMPONENT NUMBER EXAMPLE
COMPONENT NUMBER
A23 A2 R1234
Assembly Number
Schematic Circuit Number
Subassembly Number (if needed)
Chassis-mounted components have no Assembly Number prefix--see end of Replaceable Electrical Parts List.
P/O A7 OUTPUT BD.



SG 5030 LEVELING HEAD 21 B

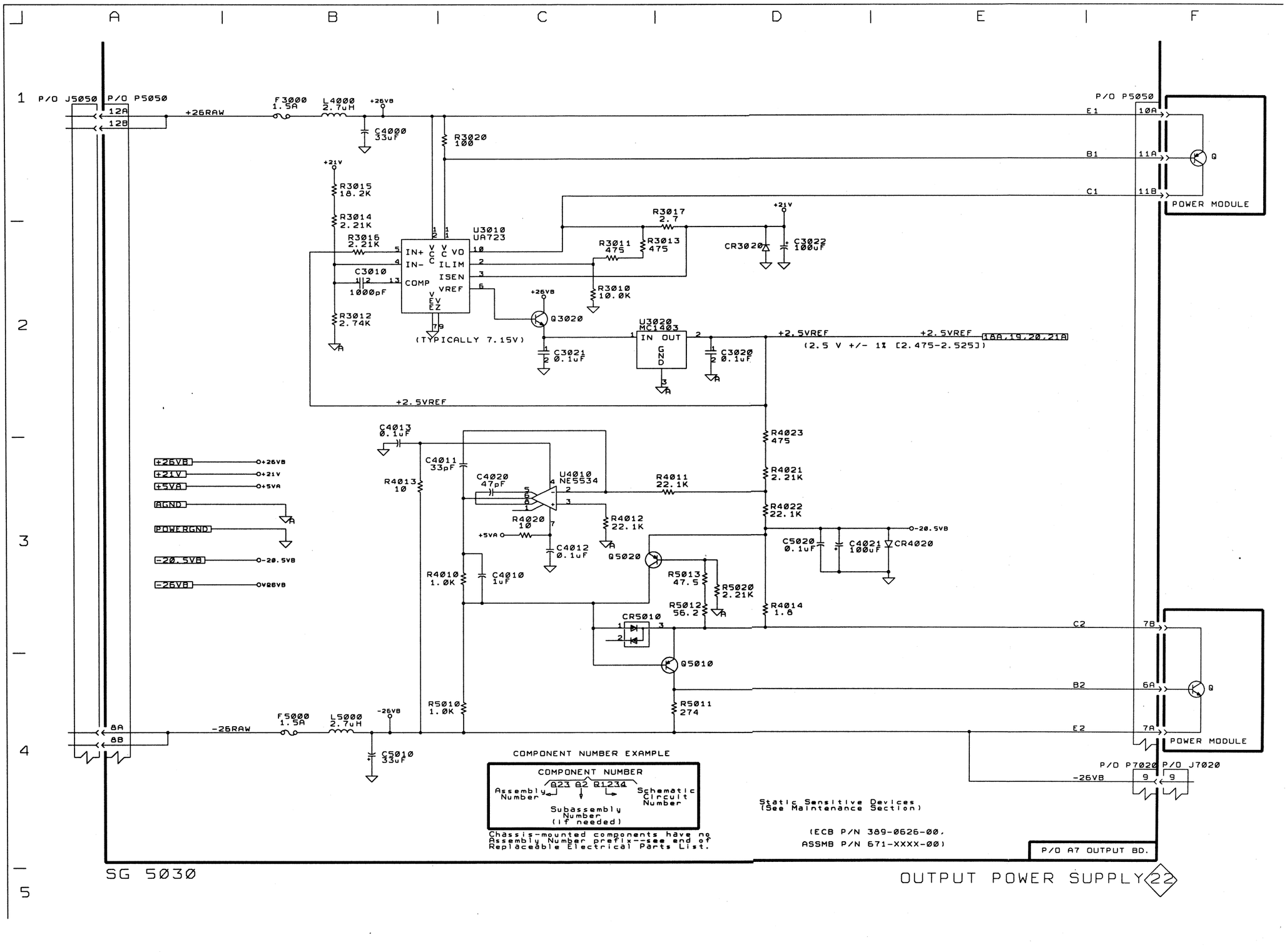
Table 10–22
Component Reference Chart

P/O A7 ASSEMBLY — **OUTPUT POWER SUPPLY 22**

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C3010	B2	C3
C3020	D2	C3
C3021	C2	C3
C3022	D2	C3
C4000	B1	B4
C4010	C3	B4
C4011	C3	B4
C4012	C3	C4
C4013	B3	C4
C4020	C3	C4
C4021	D3	C4
C5010	B4	B5
C5020	D3	C4
CR3020	D2	C3
CR4020	E3	C4
CR5010	C3	B5
F3000	B1	B3
F5000	B4	B5
L4000	B1	A4
L5000	B4	A5
P5050	F1	A4
P5050	A4	A4
P5050	F4	A4
P5050	A1	A4
P7020	F4	B5
Q3020	C2	C3
Q5010	D4	B4
Q5020	C3	C4

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
Q??	F1	OFF BD.
Q???	F4	OFF BD.
R3010	C2	B3
R3011	C2	B3
R3012	B2	B3
R3013	C2	B3
R3014	B1	B3
R3015	B1	B3
R3016	B2	B3
R3017	D2	B3
R3020	C1	C3
R4010	C3	B4
R4011	D3	B4
R4012	C3	B4
R4013	B3	B4
R4014	D3	B4
R4020	C3	C4
R4021	D3	C4
R4022	D3	C4
R4023	D2	C4
R5010	C4	B4
R5011	D4	B5
R5012	D3	B4
R5013	D3	B4
R5020	D3	C4
U3010	B2	C3
U3020	D2	C3
U4010	C3	C4

P/O A7 ASSEMBLY also shown on Schematics 18A,18B,19,20, & 21A


P/O J5050
P/O P5050
12A
12B
+26RAW
F3000
1.5A
L4000
2.7uH
+26VB
C4000
33uF
R3020
100
P/O P5050
E1
10A
B1
11A
Q
C1
11B
POWER MODULE
+21V
R3015
18.2K
R3014
2.21K
R3016
2.21K
C3010
1000pF
R3012
2.74K
U3010
UA723
IN+
IN-
COMP
VCC
VEE
VC
VO
ILIM
ISEN
VREF
(TYPICALLY 7.15V)
R3017
2.7
R3011
475
R3013
475
CR3020
C3022
100uF
R3010
10.0K
Q3020
U3020
MC1403
IN
OUT
GND
C3021
0.1uF
C3020
0.1uF
+2.5VREF
+2.5VREF
(2.5 V +/- 1% [2.475-2.525])
18A,19,20,21A
+2.5VREF
C4013
0.1uF
C4011
33pF
C4020
47pF
U4010
NE5534
R4013
10
R4020
10
R4011
22.1K
R4012
22.1K
C4012
0.1uF
+5VA
R4023
475
R4021
2.21K
R4022
22.1K
C5020
0.1uF
C4021
100uF
CR4020
-20.5VB
Q5020
R4010
1.0K
C4010
1uF
R5013
47.5
R5020
2.21K
R5012
56.2
R4014
1.8
CR5010
Q5010
C2
7B
B2
6A
Q
E2
7A
POWER MODULE
R5010
1.0K
R5011
274
8A
8B
-26RAW
F5000
1.5A
L5000
2.7uH
-26VB
C5010
33uF
P/O P7020
P/O J7020
-26VB
9
9
+26VB
+21V
+5VA
AGND
POWERGND
-20.5VB
-26VB
COMPONENT NUMBER EXAMPLE
COMPONENT NUMBER
A23 A2 R1234
Assembly Number
Schematic Circuit Number
Subassembly Number (if needed)
Chassis-mounted components have no Assembly Number prefix--see end of Replaceable Electrical Parts List.
Static Sensitive Devices (See Maintenance Section)
(ECB P/N 389-0626-00, ASSMB P/N 671-XXXX-00)
P/O A7 OUTPUT BD.
SG 5030
OUTPUT POWER SUPPLY
22

MANUAL CHANGE INFORMATION

At Tektronix, we continually strive to keep up with latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages.

A single change may affect several sections. Since the change information sheets are carried in the manual until all changes are permanently entered, some duplication may occur. If no such change pages appear following this page, your manual is correct as printed.

Tektronix
COMMITTED TO EXCELLENCE

MANUAL CHANGE INFORMATION

Date: Nov 1991 **Change Reference:** M76521

Product: SG 5030 Sine Wave Generator **Manual Part Number:** 070-7703-01

DESCRIPTION

Product Group 75

For serial numbers B010218 and above, please make the following changes:

Section 9
REPLACEABLE ELECTRICAL PARTS

Page 9-10

Replace the current information with the following:

Component No.	Tektronix Part Number	Serial Number Effect	Serial Number Discont	Part Name & Description	Mfr Code	Mfr Part Number
A4	671-1440-00	B010100	B010217	CIRCUIT BD ASSY:DDS	80009	671-1440-00
A4	671-1440-01	B010218		CIRCUIT BD ASSY:DDS	80009	671-1440-01

Page 9-11

Replace the current information with the following:

Component No.	Tektronix Part Number	Serial Number Effect	Serial Number Discont	Part Name & Description	Mfr Code	Mfr Part Number
A4C6011	281-0909-00	B010100	B010217	CAP,FXD,CER:0.022µF,20%,50V	04222	SA105C223MAA
A4C6011	281-0913-00	B010218		CAP,FXD,CER:0.1µF,50V	04222	SA105E104ZAA

Page 9-13

Replace the current information with the following:

Component No.	Tektronix Part Number	Serial Number Effect	Serial Number Discont	Part Name & Description	Mfr Code	Mfr Part Number
A4R5000	313-1102-00	B010100	B010217	RES,FXD,FILM:1KΩ,5%,0.2W	91637	CCF50-2-10000J
A4R5000	313-1182-00	B010218		RES,FXD,FILM:1.8KΩ,5%,0.2W	91637	CCF501G18000J