# Service Manual

Tektronix

# ASG 100
# Audio Signal Generator

## 070-8546-03

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

CE

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# OPERATOR'S 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** statements identify conditions or practices that could result in damage to the equipment or other property.

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

## Terms As Marked on Equipment

**CAUTION** indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property, including the equipment itself. Refer to the manual for information.

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

Protective ground (earth) terminal.

## SAFETY INFORMATION

**Use the Proper Power Source.** This product is intended to operate from a power source that will not apply more than 250 V 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.

**Ground the Product.** This product is grounded through the grounding conductor of the 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.

**Danger May Arise 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 of correct type, voltage rating, and current rating as specified in the parts list for your product. Refer fuse replacement to qualified service personnel.

**Do Not Operate in Explosive Atmospheres.** To avoid explosion, do not operate this product in an explosive atmosphere.

**Do Not Remove Covers.** To avoid personal injury, do not remove the product covers or panels. Do not operate the product without the covers and panels properly installed.

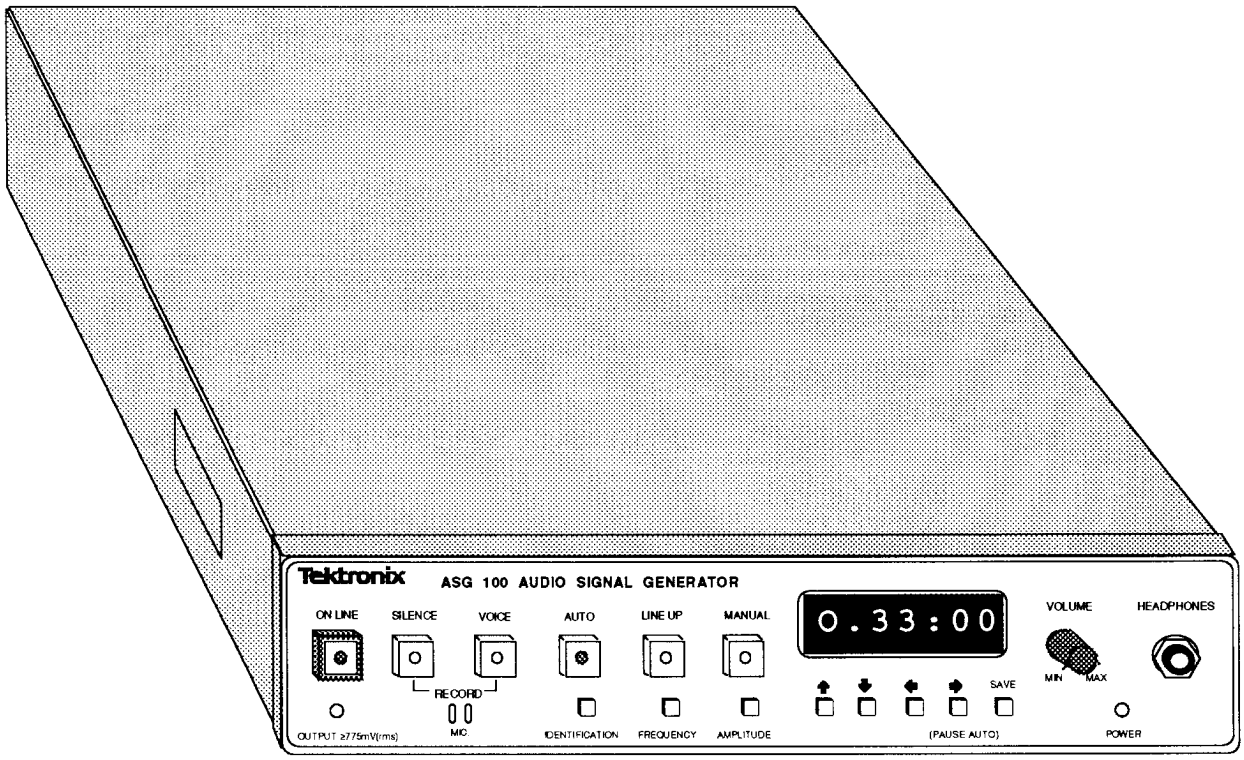
# SERVICING SAFETY SUMMARY

*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 exist at several points in this product. To avoid personal injury, do not touch exposed connections or components while power is on. Disconnect power before removing protective panels, soldering, or replacing components.

**Use the Proper Power Source.** This product is intended to operate from a power source that will not apply more than 250 V 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.




**The ASG 100 Audio Signal Generator.**

# Section 1
# INTRODUCTION AND SPECIFICATIONS

## INTRODUCTION

The ASG 100 Audio Signal Generator was developed by Tektronix to meet the audio testing requirements of commercial broadcasting. The ASG 100 reduces testing time by transmitting short, predefined audio test sequences that produce precise and easily reproduced results in its AUTO mode. It can also transmit source identification, a voice segment (either continually or as part of the AUTO test) and user defined tones. The user defined tones of LINE UP and MANUAL test signal operation provide the continuous signals needed for adjusting audio levels and manual checking of the left/right audio channels.

## AUTOMATIC AUDIO CHANNEL TESTING

Test equipment for sound programming and the sound channels of television programming must be capable of quickly checking the audio signal path to make sure of the circuit's quality. Automatic equipment must be able to rapidly measure the test signal in ways that give repeatable and meaningful test results.

To assist in the repeatablity area, standard test signal sequences have been defined. These sequences begin with the necessary components to start the measurement, identify the source of the test signals, and identify the stored automatic test that is to be done. Then the test signal portion of the sequence runs in predefined frequency, level, and timing patterns that permit automated testing of the signal path characteristics.

Each of the test signals in the automatic test sequence are used to check on the different parameters that are important to signal quality. The tests have defined sequences for both monaural and stereo audio testing, and are based on Recommendation O.33 of the *CCITT Specification For Measuring Equipment, Volume IV, Series O Recommendations–1988.*

When used with a CCITT O.33 compliant receiver, such as the Tektronix VM700A Option 40 or Option 41, the results of the AUTO testing sequence can be documented automatically without the need for human intervention (unless of course, an out–of–tolerance condition is found by the test).

The Tektronix VM700A Option 40 and Option 41 receiving and measuring equipment uses the test signals sent by the companion ASG 100 audio signal generator to measure the following parameters as defined in Recommendation O.33 for monophonic audio paths.

Insertion Gain

Frequency Response

Distortion

Signal-to-Noise Ratio

Compandor Linearity

Expanded Noise

For stereophonic audio paths, additional measurements are done to assure the A/B (left/right) channel parameters of the signal paths are sufficiently matched for proper transmission of the program audio.

The added measurements are:

Interchannel difference in gain and phase

Interchannel crosstalk and circuit transposition

# MANUAL SIGNAL TESTING

## Line Up

The Line Up test signal is selectable in both frequency and amplitude for use in providing a known line up signal for adjusting levels from various audio sources. This signal may be set for a house standard and then fixed (editing disabled) or it may remain controllable from the front panel. The frequency range is from 10 Hz to 20 kHz and the amplitude range is from –90 dBu to +24 dBu. As shipped from the factory (and the default if factory defaults are reloaded), the Line Up signal is 400 Hz at 0.0 dBu.

## Manual

### Tone

The Tone test signal comes as stereo, left tone, and right tone. The frequency and amplitude are selectable over the same range as the Line Up signal. The factory default for the Tone signals is 440 Hz at 0.0 dBu.

### Polarity

Polarity also comes as stereo, left polarity, and right polarity. The polarity test signal is the sum of a fundamental sine wave of 440 Hz and its equal amplitude second harmonic sine wave of 880 Hz. The amplitude of the polarity signal is selectable from –90 dBu to +24 dBu with a fixed fundamental frequency of 440 Hz. The factory default for the amplitude is 0.0 dBu.

### Multitone

The Multitone signals also come as stereo, and left and right channels. Multitone signals are composed of a selected set of sine wave frequencies. The amplitude of the multitude signal is selectable from –90 dBu to +24 dBu. The output signal amplitude for the Multitone signals is the rms value of signal set, not the amplitude of any single frequency component in the set. There are presently four sets of multitone signals covering different bandwidths and providing different sine wave components. The multitone signals are used to check for response and harmonic distortion of audio circuits and devices (amplifiers, tape recorders, cables, etc.). The factory default for the amplitude is 0.0 dBu.

# REMOTE CONTROL

There are two types of remote control possible with the ASG 100. The remote control connector on the rear panel of the instrument may be used as contact closure connections for minimal remote operation. Using contact closure remote, an AUTO sequence may be started and front panel editing may be enabled (if it is internally disabled). The second type of remote control uses the remote control connector as an RS-232C serial port, and the front panel operation may be controlled via a PC or terminal if serial communications is enabled in the ASG 100. The Audio/Video Timing signal synchronization feature is also controlled through the remote port. See *Appendix D* of the Operator's manual for information on the Audio/Video Timing feature.

# SPECIFICATIONS

## Electrical Characteristics

**Table 1-1**
**Electrical Characteristics**

| Characteristic | Performance Requirement | Comment |
|---|---|---|
| External Power | | |
| Voltage (Nom.) | 100 to 240 Vac. | Full range, no selector. |
| Input Freq Range | 47 Hz to 440 Hz. | |
| Power Consumption | 20 W Typical. | |
| RS-232C Interface | | |
| Baud Rates | 1200, 2400, 4800, and 9600 (factory default). | Front panel selection only, no switch settings for baud rate except the factory default of 9600. |
| Maximum Applied Voltage | 25 V (dc + peak ac). | |
| Signals | RXD (received data), TXD (transmitted data), and GND are used for serial remote control of the ASG 100. | RTS and CTS are not used in the ASG 100. Pins 4, 6, and 9 of the connector are not to be connected to the terminal interconnection cable. Those pins are used for contact closure remote control. |
| Levels | Compatible with RS-232C. | |
| Connector | DB-9 DTE (terminal communications device). | Requires a null modem for connection to a another DTE device. |
| Output Signal Frequency | | |
| Range | 10 Hz to 20 kHz. | |
| Multitone | See Table 1-2 | |
| Resolution | 1 Hz. | |
| Accuracy | ± 0.1 %. | |
| Output Signal Amplitude | | Output is approximately 0.17 dB lower with a 600 Ω load and is 6 dB lower with internal 600 Ω source resistance and a 600 Ω load. |
| Range | –90 dBu to +24 dBu (24.5 μV to 12.2 $V_{rms}$) balanced into a load resistance of 10 kΩ or greater with 12 Ω source resistance. | |
| Accuracy | ± 0.2 dB at 1 kHz from +24 dBu to –80 dBu into a load resistance of 10 kΩ or greater. | Multitone signal components are not sent at the specified amplitude; the amplitude specification is for the combined Multitone signal rms value. |
| Resolution | ± 0.1 dB. | |
| Flatness | ±0.2 dB, 10 Hz to 20 kHz*<br>+0.05/–0.2 dB, 10 Hz to 20 kHz (relative to 1 kHz)** | Typ. ±0.1 dB, 10 Hz to 19 kHz*<br>Typ. +0.05/–0.1 dB, 10 Hz to 15 kHz** |

* B039999 and below
** B040000 and above

**Table 1-1 (cont.)**

| Characteristic | Performance Requirement | Comment |
|---|---|---|
| Total Harmonic Distortion + Noise for outputs ≥ –10 dBu (245 $mV_{rms}$) (measured over an 80 kHz bandwidth) | < 0.01% (–80 dB), 20 Hz to 18 kHz*;<br>< 0.0.25% (–72 dB), 18 kHz to 20 kHz*;<br><br>< 0.015% (–76.5 dB), 10 Hz to 19 kHz**;<br>< 0.056% (–65 dB), >19 kHz to 20 kHz** | < 0.005% at 1 kHz at full output, measured over a 22 KHz bandwidth (see typical curve in Figure 1–1). This typical specification will also hold at +14 dBu and +4 dBu. |
| Signal–to–Noise, measured over a 22 kHz bandwidth. | > 90 dB at 1 kHz at 0 dBu output level. | $S/N = 20 \log \frac{V_{Manual}}{V_{Silence}}$<br><br>S/N improves as the output signal increases and decreases as output reduces, proportionally. |
| XLR Inputs | Balanced. | EMI capacitive load of 0.002 µF. Looped through to output if ASG 100 is not ON LINE. |
| XLR Outputs | Balanced. | |
| Output Impedance | 12 Ω, 600 Ω or User–defined; balanced. | |
| Level Difference Between Channels | ≤0.2 dB at +14 dBu. | |
| Phase Difference Between Channels | ≤1 °, 10 Hz to 20 kHz. | |
| Typical Crosstalk + Noise measured over 80 kHz band-width at +24 dBu | | |
| Generator to Output | <–90 dB at 1 kHz and 20 kHz. | Left tone into Right output or Right tone into Left output; generator source resistance 12 Ω and load termination either open or 600 Ω. |
| Input to Output (loop through; ASG 100 off line) | <–110 dB at 1 kHz and 20 kHz with both outputs unterminated.<br><br><–115 dB at 1 kHz and <–110 dB at 20 kHz with driven channel terminated into 600 Ω and the inactive channel unterminated.<br><br><–120 dB at 1 kHz and 20 kHz with the driven channel unterminated and the inactive channel terminated in 600 Ω.<br><br><–120 dB at 1 kHz and 20 kHz with both outputs terminated in 600 Ω. | Left channel input into Right channel output or Right channel input into Left channel output; source resistance 50 Ω.<br><br>Typ. < –130 dB measured over a 22 kHz bandwidth at 1 kHz. |

* B039999 and below
** B040000 and above

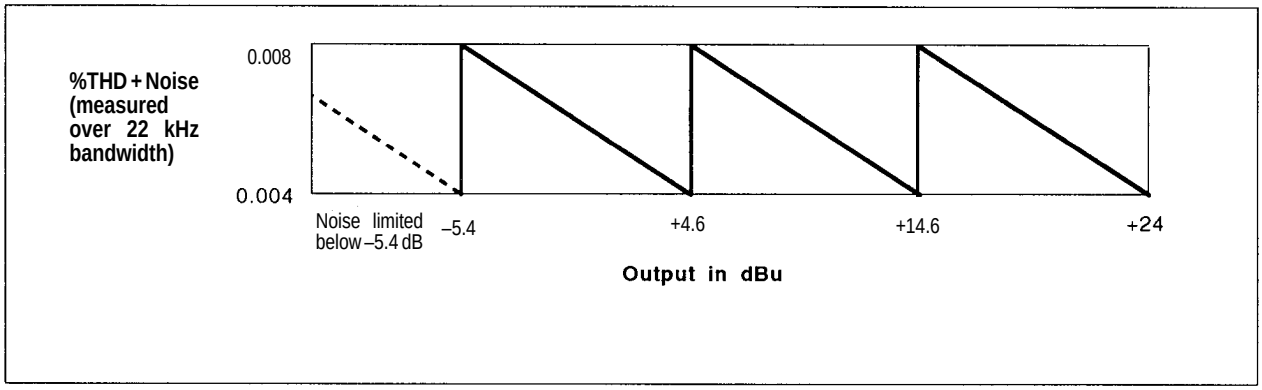



**Figure 1-1. Typical 1 kHz THD + Noise versus Output Level.**

**Table 1-2**
**ASG 100 Multitones**

| Multitone 1 | Multitone 2 | Multitone 3 | Multitione 4 |
|---|---|---|---|
| 59 | 23 | 47 | 23 |
| 117 | 94 | 141 | 117 |
| 187 | 141 | 281 | 234 |
| 246 | 223 | 656 | 750 |
| 293 | 270 | 1031 | 867 |
| 375 | 352 | 2016 | 1758 |
| 422 | 562 | 4031 | 3492 |
| 949 | 879 | 8019 | 6984 |
| 1184 | 1113 | 15000 | 13992 |
| 1512 | 1395 | | 20015 |
| 1887 | 1758 | | |
| 2391 | 2227 | | |
| 3000 | 2789 | | |
| 3785 | 3516 | | |
| 4758 | 4430 | | |
| 6012 | 5590 | | |
| 7570 | 7043 | | |
| 9539 | 8871 | | |
| 12012 | 11180 | | |
| 15000 | 14074 | | |
| | 17742 | | |
| | 19992 | | |

## *NOTE*

*The Multitone signals are combined in repetitive blocks. At the end of the block time, all the signals are in phase again for a seamless transition into the next signal block.*

# ENVIRONMENTAL CHARACTERISTICS

**Table 1–3**
**Environmental Characteristics**

| Characteristic | Limits |
|---|---|
| Operating Temp. | 0° C to +50° C. |
| Non–Operating. Temp. | –40° C to +65° C. |

# MECHANICAL CHARACTERISTICS

**Table 1–4**
**Physical Characteristics**

| Characteristic | Value |
|---|---|
| Length | 180 in. (458 mm). |
| Width | 8.1 in. (206 mm). |
| Height | 1.7 in. (43 mm). |
| Weight | 3.25 lb. (1.48 kg). |

**Table : Certifications and compliances**

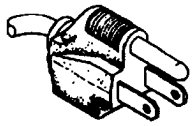
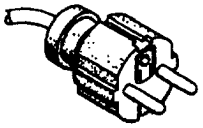
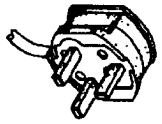
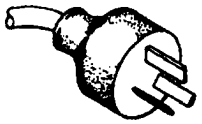
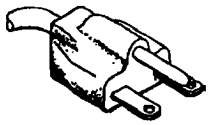
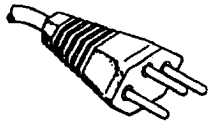
| Category | Standards or description |
|---|---|
| EC Declaration of Conformity – EMC | Meets intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Union:<br>EN 50081-1 Emissions:<br>EN 55022 Class B Radiated and Conducted Emissions<br>EN 50082-1 Immunity:<br>IEC 801-2 Electrostatic Discharge Immunity<br>IEC 801-3 RF Electromagnetic Field Immunity<br>IEC 801-4 Electrical Fast Transient/Burst Immunity<br>Must use high quality shielded cables to ensure conformance with EMC regulations. |
| Australia/New Zealand Declaration of Conformity – EMC | Complies with EMC provision of Radiocommunications Act per the following standard(s):<br>AN/NZS 2064.1/2 Industrial, Scientific, and Medical Equipment: 1992<br>AN/NZS 3548 Information Technology Equipment: 1995 |
| EMC Compliance | Meets the intent of Directive 89/336/EEC for Electromagnetic Compatibility when it is used with the product(s) stated in the specifications table. Refer to the EMC specification published for the stated products. May not meet the intent of the directive if used with other products. |
| FCC Compliance | Emissions comply with FCC Code of Federal Regulations 47, Part 15, Subpart B, Class A Limits. |
| EC Declaration of Conformity – Low Voltage | Compliance was demonstrated to the following specification as listed in the Official Journal of the European Union:<br>Low Voltage Directive 73/23/EEC, amended by 93/69/EEC<br>EN 61010-1:1993 Safety requirements for electrical equipment for measurement control and laboratory use. |
| U.S. Nationally Recognized Testing Laboratory Listing | UL3111-1 Standard for electrical measuring and test equipment.<br>UL1244 Standard for electrical and electronic measuring and testing equipment. |
| Canadian Certification | CAN/CSA C22.2 No. 231 CSA safety requirements for electrical and electronic measuring and test equipment. |
| Additional Compliance | IEC61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use. |
| Installation (Overvoltage) Category | Terminals on this product may have different installation (overvoltage) category designations. The installation categories are:<br>CAT III Distribution-level mains (usually permanently connected). Equipment at this level is typically in a fixed industrial location.<br>CAT II Local-level mains (wall sockets). Equipment at this level includes appliances, portable tools, and similar products. Equipment is usually cord-connected.<br>CAT I Secondary (signal level) or battery operated circuits of electronic equipment. |
| Pollution Degree | A measure of the contaminates that could occur in the environment around and within a product. Typically the internal environment inside a product is considered to be the same as the external. Products should be used only in the environment for which they are rated. |

**Table : Certifications and compliances (cont.)**

| Category | Standards or description | |
|---|---|---|
| | Pollution Degree 1 | No pollution or only dry, nonconductive pollution occurs. Products in this category are generally encapsulated, hermetically sealed, or located in clean rooms. |
| | Pollution Degree 2 | Normally only dry, nonconductive pollution occurs. Occasionally a temporary conductivity that is caused by condensation must be expected. This location is a typical office/home environment. Temporary condensation occurs only when the product is out of service. |
| | Pollution Degree 3 | Conductive pollution, or dry, nonconductive pollution that becomes conductive due to condensation. These are sheltered locations where neither temperature nor humidity is controlled. The area is protected from direct sunshine, rain, or direct wind. |
| | Pollution Degree 4 | Pollution that generates persistent conductivity through conductive dust, rain, or snow. Typical outdoor locations. |

# POWER CORD OPTIONS

**Table 1-5**
**Voltage, Fuse,[a] and Power Cord Data**

| Plug Configuration | Category | Power Cord and Plug Type | Voltage Range | Reference Standards [b] |
|---|---|---|---|---|
|  | U.S. Domestic Standard | U.S.<br>120 V<br>15 A | 115 V Nominal<br>90 V to 132 V | ANSI C73.11<br>NEMA 5-15-P<br>IEC 83<br>UL 198.6 |
|  | Option A1 | EURO<br>240 V<br>10-16 A | 230 V Nominal<br>180 V to 250 V | CEE(7), II, IV, VII<br>IEC 83<br>IEC 127 |
|  | Option A2 | UK [c]<br>240 V<br>6 A | 230 V Nominal<br>180 V to 250 V | BS 1363<br>IEC 83<br>IEC 127 |
|  | Option A3 | Australian<br>240 V<br>10 A | 230 V Nominal<br>180 V to 250 V | AS C112<br>IEC 127 |
|  | Option A4 | North American<br>240 V<br>15 A | 230 V Nominal<br>180 V to 250 V | ANSI C73.20<br>NEMA 6-15-P<br>IEC 83<br>UL 198.6 |
|  | Option A5 | Switzerland<br>220 V<br>6 A | 230 V Nominal<br>180 V to 250 V | SEV<br>IEC 127 |

[a] All options listed come with a factory-installed fuse for the selected operating voltage range.

[b] Reference Standards Abbreviations:

ANSI–American National Standards Institute
AS–Standards Association of Australia
BS–British Standards Institution
CEE–International Commission on Rules for the Approval of Electrical Equipment
IEC–International Electrotechnical Commission
NEMA–National Electrical Manufacturer's Association
SEV–Schweizervischer Elektrotechnischer Verein
UP–Underwriters Laboratories Inc.

[c] A 6 Ampere, type C fuse is also installed inside the plug of the Option A2 power cord.

# Section 2
# OPERATION AND SETUP

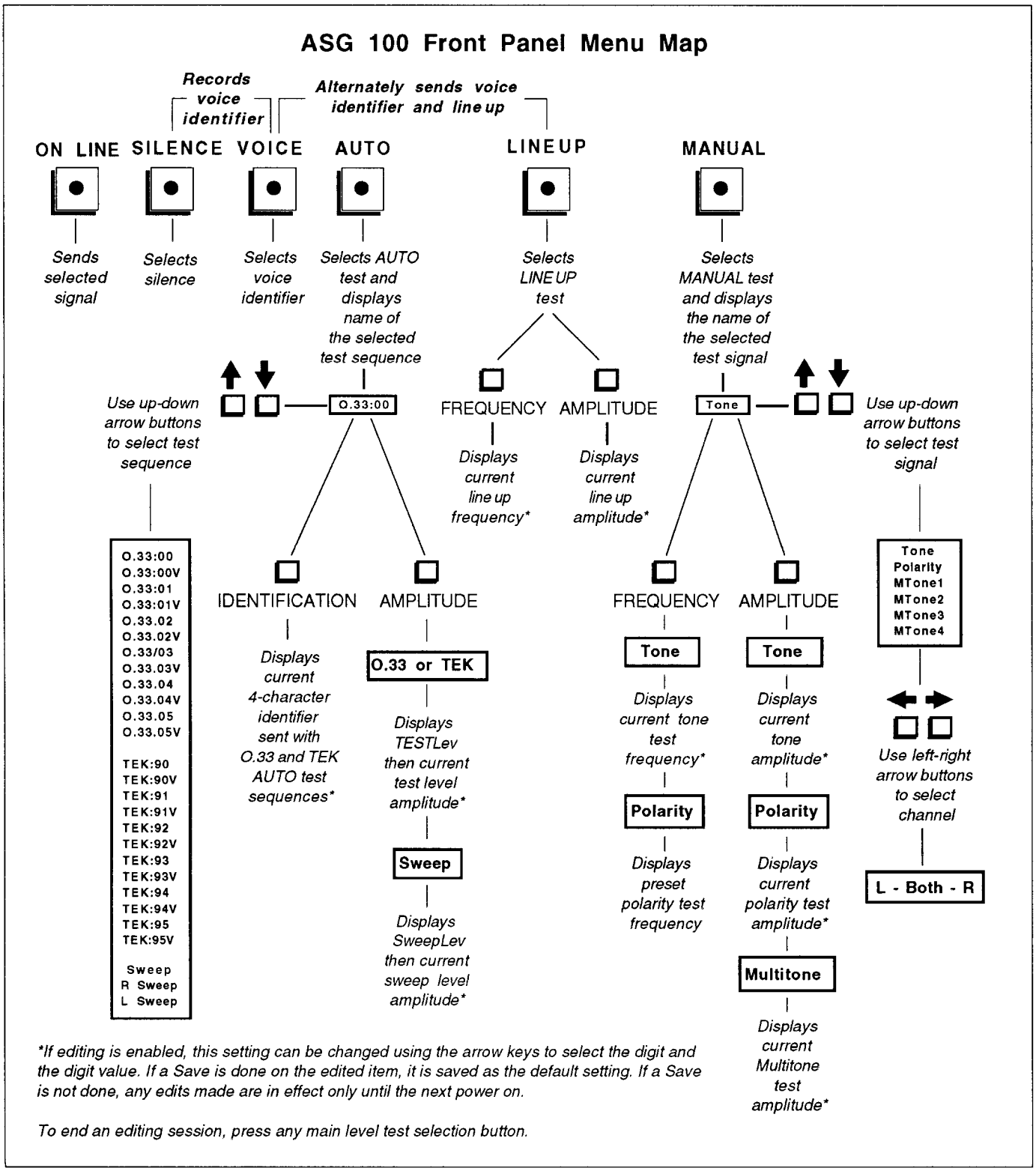



**Figure 2-1. ASG 100 Menu Map.**

## MAINS VOLTAGE

Plug the power cord into the outlet for any voltage source between 100 and 240 volts. You do not need to make any adjustments on the ASG 100 to accommodate different source voltages in the rated operating range. Various power cord options are available to match the ac various international AC mains. The power cord supplied with the ASG 100 is as ordered from the factory. See Section 1, *Introduction and Specification*, for the power cord options.

## FREEDOM OF OPERATION

The user definable states of the ASG 100 may be totally accessible or set to preselected setups that can not be accidentally altered in normal use. As shipped from the factory, the total range of user definable features are available. Once the application needs are determined and programmed, the editing feature may be selectively disabled to prevent accidental changes the frequency and output levels of the test signal. Refer to *Internal Settings and Setup Editing* for information on enabling and disabling the editing function.

## FRONT PANEL CONTROLS

The following text details the operation of the front-panel controls and indicators. A front-panel illustration is shown in Figure 2-2 for reference.

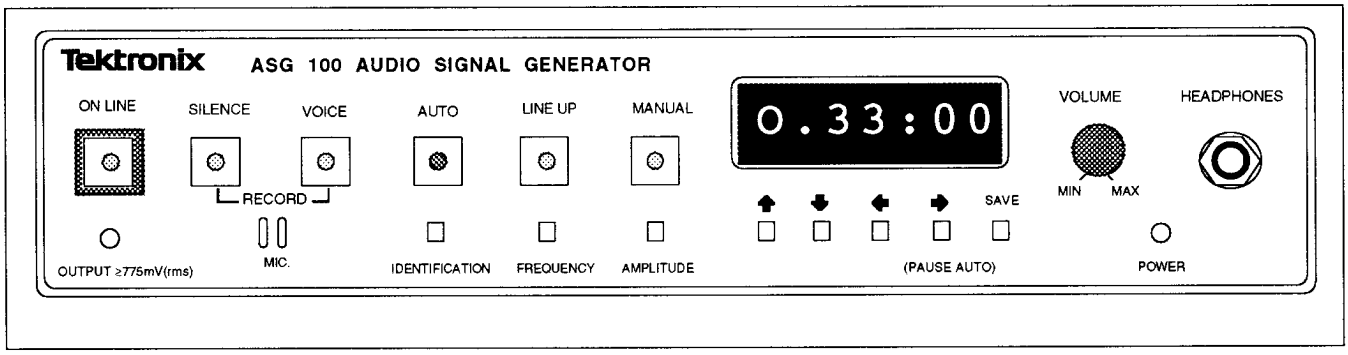



**Figure 2-2. ASG 100 Front Panel controls.**

## FUNCTIONS

The ASG 100 is powered on and off with the power switch to the right of the power receptacle on the back panel.

The ASG 100 functions are enabled from the front panel through the six larger buttons. These "main selection" buttons have LED in the center that indicates the choice is selected. The ON LINE LED is red; the remaining five are green. The smaller buttons are controls that let you display and adjust the values associated with the various test functions.

The test signal functions initiated by the five main selection buttons to the right of the ON-LINE button are mutually exclusive in most cases; enabling one of these five signal functions automatically disables the previously selected function. There are two exceptions to this:

- To initiate a continuously alternating voice ID and line-up tone, press the VOICE and LINE UP buttons simultaneously. (Both LEDs will be on and the display is **Voi + Lnup.** )

- To record four seconds of voice for identification purposes, press the VOICE and SILENCE buttons simultaneously. The recording process is cued with **Record:, Ready . . .** , and **Begin**; then a four-second countdown is displayed to time the recording. After that time, the selected function returns.

The ASG 100 outputs the selected signal only when the ON-LINE function is enabled. The lighted ON-LINE button indicates that the ASG 100 has interrupted the source signal and connected its own output circuit to the downstream audio path.

The ASG 100 sends all signals it generates to the signal ports on the back panel and to the headphones jack on the front panel. When the ASG 100 is not on line, the incoming program audio (if any is applied to the loop-through connectors) may be monitored at the headphone jack.

## ON LINE

When the ON LINE function is enabled (indicated by the red LED in the center of the button), the ASG 100 interrupts any source audio signal before it in the audio path, and sends the currently selected test tone or pattern to the audio equipment after it. Selecting any signal choice while on line is permitted. However, when AUTO is selected, that test must be completed before any other choice (except off line) is permitted. Off line is selected from the front panel by pressing the ON LINE button a second time.

When one of the AUTO mode automatic test sequences is selected, the ASG 100 reverts to off-line status (the red LED turns off) when the selected test sequence is finished and sends a message to that effect over the serial port. Off line reconnects the incoming source audio signal (if any) to the equipment following the ASG 100 in the audio path.

### NOTE

*The ASG 100 will not go on line when the front panel ON LINE is pressed when the AUTO ID, TESTLev, or SweepLev is being displayed. You must return to the AUTO Test Selection display or select another test signal.*

## SILENCE

The SILENCE function makes the ASG 100 generate *no* signal. With SILENCE enabled, any signal shown on the VM700A Option 40 and Option 41 or other monitoring equipment is the noise picked up along the audio path following the ASG 100. The ASG 100 must be ON LINE to send silence, just as for the other functions.

## VOICE

The VOICE function continuously replays the 4-second voice identifier the ASG 100 is currently programmed to send. The voice signal level follows the setting of the LINE UP signal amplitude setting.

## RECORD (PRESS SILENCE + VOICE)

The RECORD function records 4 seconds of voice input through the built in microphone.

You enable this function by pressing the SILENCE and VOICE buttons simultaneously; there is no remote RECORD command. While the two buttons are held in, the display window shows the prompt **Record:**. When the buttons are released, the display changes to **Ready. . .** , then **Begin**, and a countdown from **4. 0** to **0. 0**. During the four second countdown, the ASG 100 records any

sounds made within several feet of the microphone, but for best recording results speak directly into the microphone recording a VOICE identification. When RECORD is started, the front panel controls are disabled until the recording has finished. Upon finishing, the front panel state returns to the state in effect when the recording session was started except ON LINE.

### NOTE

*If the ASG 100 is ON LINE when a recording session is started, it is switched off line; it remains off line until ON LINE is again selected, either locally or remotely.*

## AUTO

The AUTO function generates the currently selected automatic predefined test signal sequence, such as CCITT O. 33 and TEK or one of the Sweep signals, when ON LINE.

### Auto Test Level

During off line, you may display the test level to which the amplitudes of the tones of the CCITT O. 33 and Tek AUTO test sequences are referenced.

For the O. 33 and TEK test sequences, the actual output levels in dBm0 of the ASG 100 test signals equals the sum of the test level and the step levels specified in Appendix B, *Test Sequences*. For example, the first step of the 0.33 test sequence is specified at –12 dBm0 However, if the test level is set to be +4. 0 dBu, the actual output level of this signal will be (–12 + 4) = –8. 0 dBm0. The test level can be set from a minimum of –6 dBu to a maximum of +14 dBu. The factory default test level is 0 dBu. This level is one that is usually made uneditable from the front panel so that the known reference for the automatic testing sequences is not easily changed.

Typically, if a TEST Lev change is needed, editing is enabled by a technician to allow an adjustment, then editing is disabled again to lock in the new values for use by operators in the field. For more information on enabling editing, refer to *Internal Settings and Setup Editing*.

### NOTE

*When monitoring the test signals with test equipment, such as a VM700A Option 40 or Option 41, to get correct readings of insertion gains, be sure the Test Level setting on the VM700A matches the Test Level setting on the ASG 100.*

To display the current **TEST Lev** value, from AUTO with an O. 33 or TEK AUTO Test selected, press the AMPLITUDE button. The TEST Lev label is displayed while the button is held in, and the test level setting is displayed when the AMPLITUDE button is released. When editing is enabled and you want to change the TEST Lev setting, move the blinking cursor to the digit you want to change by pressing the ⇐ or ⇒ buttons. Then change the value of the digit by pressing the ⇓ button or ⇑ button. If you wish to make the new setting your default value, you must also press the SAVE button after making the edit. You can not go ON LINE from the TEST Lev display; you can either press the AMPLITUDE button again or make another selection to clear the TEST Lev display.

### Sweep Test Level

The Sweep sequence test level reference is settable to a different level than the reference level for the CCITT O. 33 and TEK tests. When setting the **SweepLev** value, one of the sweep signals (Sweep, R Sweep, or L Sweep) must be the selected AUTO test. Editing is done as above for TEST

Lev when editing is enabled. As with TEST Lev, you cannot go ON LINE with the SweepLev displayed.

## LINE-UP

The LINE-UP function generates a single tone at a standard frequency and amplitude. The factory default setting is 400 Hz at 0 dBu.

Once you have pressed the LINE-UP button, you can display the frequency or amplitude of the tone by pressing the FREQUENCY or AMPLITUDE button. For information on adjusting their values (when editing is enabled to allow this), refer to the *FREQUENCY* and *AMPLITUDE* descriptions.

The frequency and amplitude of the LINE-UP tone may be programmable from the front panel. If you change the Line-up parameters and want to lock in the new values so they cannot subsequently be changed from the front panel, the editing function can be disabled. For more information, refer to *Internal Settings and Setup Editing.*

## Alternating VOICE and LINE-UP

This feature is not indicated on the front panel of the ASG 100. Pressing the VOICE and LINE UP buttons together makes the ASG 100 continuously send the recorded voice pattern alternated with the specified line-up tone when ON LINE. The voice amplitude level follows the level setting of the Line Up signal.

## MANUAL

The MANUAL function offers Tone, Polarity, and Multitone signals. Each of these has right and left channel only choices. The factory default option is **Tone**. To choose one of the other options, press either the up-arrow button or down-arrow button until the desired test name appears in the display window. Left and right channel signals are selected using the left-right arrow buttons. The first press of a left or right arrow button selects the left or right channel test signal. If a left or right channel test signal is selected, pressing the opposite arrow returns to stereo test signal. A second press then selects the opposite channel test signal (see Figure 2-3).

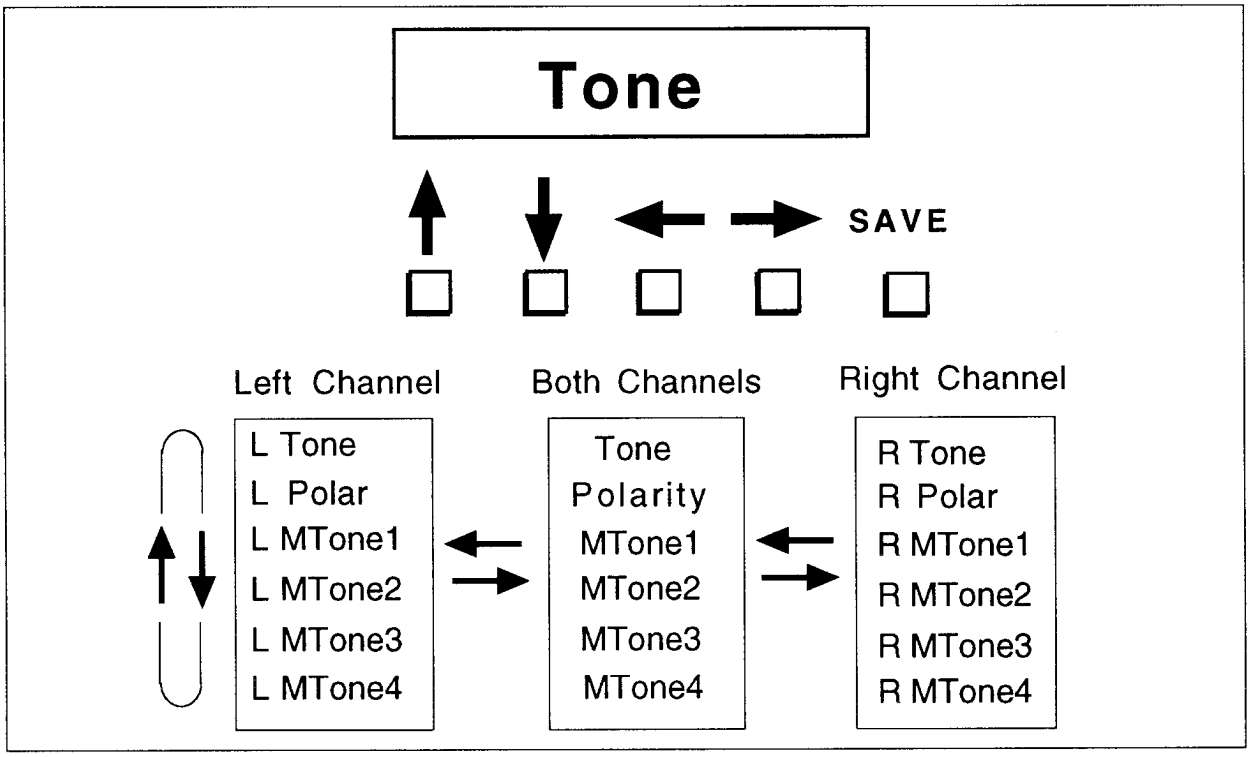



**Figure 2-3. Manual test signal selection using arrow keys.**

### Tone Tests

The Tone functions (**Tone, L Tone, and R Tone**), generates a single, continuous sine wave tone at a specified frequency and level. If a tone choice, is displayed, you can display the frequency or amplitude of the tone by pressing the FREQUENCY or AMPLITUDE button. If editing is enabled, you can then edit the value using the arrow buttons. For information on enabling editing, refer to *Internal Settings and Setup Editing*. For more information on adjusting frequency and amplitude values, refer to the *FREQUENCY* and *AMPLITUDE* descriptions.

### Polarity Tests

Most audio systems require signal polarity to be preserved through the distribution system. In stereo systems, polarity is especially important for stereo imaging and for monaural compatibility. If polarity is reversed in one channel of the stereo pair, monaural signals cancel.

The MANUAL Polarity functions (**Polarity**, **L Polar**, and **R Polar**) generate special polarity signals that make it easy to test polarity in the audio path and assure correct wire connections for balanced audio output. This is the same polarity signal included in the TEK automatic test sequence.

### Multitone Tests

The Multitone functions (**MTone1**, **MTone2**, **MTone3**, and **MTone4** and their right and left channel choices, **R MTone*n*** and **L MTone*n***) provide signals that are composed of selected sets of sine wave frequencies. These signals are used to check audio circuit frequency response and total harmonic distortion and noise levels in audio circuits.

### Manual Test Level

You can display the amplitude of the manual signals by pressing the AMPLITUDE button when a manual test name is displayed. You can edit the amplitude of any of the manual tests using the arrow buttons when manual test editing is enabled. In normal use, editing of the Manual Test may most often be enabled simply because of the nature of the testing being done when using one of the Manual Test signals. For information on enabling or disabling editing, refer to *Internal Settings and Setup Editing*. For more information on adjusting amplitude values, refer to the *AMPLITUDE* control description.

### Manual Test Frequency

You can display the frequency of the manual signals by pressing the FREQUENCY button when a manual test name is displayed. The frequency of the polarity signal is preset at the factory to at 440 Hz and cannot be changed, and there is no frequency indication for Multitone signals. You can edit the frequency of the Tone tests (Tone, R Tone and L Tone) using the arrow buttons when editing is enabled. For information on enabling editing, refer to *Internal Settings and Setup Editing*. For more information on adjusting the signal frequency, refer to the *FREQUENCY* control description.

## VOLUME

The VOLUME knob controls the level of the audio output through the headphones. It does *not* affect the level of the signal output through the other signal ports. To increase the volume, turn the knob clockwise.

## MIC. (Microphone)

When you enable the RECORD function, the microphone picks up 4 seconds of sound made in the vicinity of the ASG 100. Automatic gain control is built into the microphone circuit.

You can then make the ASG 100 replay the recorded sound pattern, either repeatedly with the VOICE function, or at the beginning of one of the standard test signal sequences with the AUTO function.

The AUTO test sequences that include a voice segment in the preamble are identified by a "V" suffix on the sequence name. For example the TEK mono test sequence that includes a voice segment is displayed as **TEK:90V**.

## IDENTIFICATION

The identification code, consisting of 4 alphanumeric characters and various punctuation characters, provides a way to identify the test signals generated. For example, you could use it to designate the location from which the signal is being generated. This feature is very useful when there may be multiple signal sources arriving at a central control point for testing audio signal paths.

The IDENTIFICATION control is active only when the AUTO function the selected, but off line. It lets you see what the current four-character code that is transmitted as part of the *preamble* is. The

preamble is a set of initializing data the ASG 100 prefixes to some of the standard test signal sequences it generates.

To see the current identification code, press the AUTO button, then the IDENTIFICATION button.

If editing is enabled, you can change the identification code using the Arrow Buttons. For information on enabling editing, refer to *Internal Settings and Setup Editing*. For more information on adjusting values using the arrow buttons, refer to *Arrow Buttons*.

## FREQUENCY

The FREQUENCY control displays either the frequency of the LINE-UP signal or the frequency of the MANUAL function signals of Tone and Polarity (there is no single frequency associated with Multitones ). To display the signal frequency, press either the LINE-UP button to view the LINE-UP signal frequency, or the MANUAL button to view the Tone or Polarity signal frequency. When viewing a MANUAL signal, use the ⇑ or ⇓ buttons to display the Tone or Polarity functions, then press the FREQUENCY button. All the Tone signals (Tone, R Tone, and L Tone) are set to the same frequency, but the LINE UP signal and the Tone signals are separately settable.

### NOTE

*The Polarity signal is the sum two equal-amplitude sine waves. One has a fundamental frequency of 440 Hz (the displayed frequency for Polarity) and the other is the second harmonic of that frequency, 880 Hz. The Polarity signal frequency is not editable.*

If the DIP switches are set to allow editing, you can change the signal frequency of the LINE UP or MANUAL Tone signals using the Arrow Buttons. The frequency of the tone signal may also be changed remotely as an argument to asking for the Tone signal via the serial interface. For information on enabling editing, refer to *Internal Settings and Setup Editing*. For more information on adjusting values using the arrow buttons, refer to *Arrow Buttons*.

## AMPLITUDE

The AMPLITUDE control displays the amplitude of the tone generated by the LINE UP function, the MANUAL Tone function, the MANUAL Polarity function. To display these amplitudes, press the LINE UP button, or the MANUAL button and the ⇑ or ⇓ buttons to display the Tone or Polarity function, then press the AMPLITUDE button.

As with FREQUENCY (discussed in the preceding subsection), once you display the LINE UP, MANUAL Tone or Polarity amplitude, if editing is enabled, you can change the amplitude using the Arrow Buttons. For information on enabling editing, refer to *Internal Settings and Setup Editing*. For more information on adjusting values using the arrow buttons, refer to *Arrow Buttons*.

When the ASG 100 is ON LINE, and you press the ⇑ button to increase the amplitude, if the displayed value is greater than or equal to 0 dBu, the cursor automatically locks onto the least significant digit and increases the level by that increment only. This protects against sudden, unintended jumps in volume.

## Arrow Buttons

The Arrow Buttons let you select options and specify values for the AUTO, LINE UP, and MANUAL functions.

For example, the AUTO function offers many standard test signal sequences you can choose. Similarly, the MANUAL function lets you choose a test signal or specify a number of parameters for you can make the ASG 100 generate. The Arrow Buttons let you cycle through the available choices and specify characters or numbers.

### ⇑(Up Arrow), ⇓ (Down Arrow)

When the currently selected function offers a set of choices, pressing the ⇑ or ⇓ button cycles up or down through those choices, displaying them in the display window.

If the currently selected function displays a value that may be edited, such as frequency , test level, or the identification code, a blinking cursor indicates the currently editable character. Pressing the ⇑ or ⇓ button cycles up or down through the available characters or numerals.

When editing numbers or alpha characters, pressing and immediately releasing the button increments or decrements the value by one number or alpha character. Pressing and holding the button for 1 second initiates automatic incrementing or decrementing, which continues until you release the button. The frequency and level settings have upper and lower limits and cease changing when those limits are reached. The list the character selections for ID are circular and return to the starting point when continuing a change in the same direction.

When making test name selections, the buttons must be pressed and released for each new choice. The list of test names is also circular and returns to the starting point when continuing a change in the same direction.

### ⇐(Left Arrow), ⇒(Right Arrow)

The ⇐ and ⇒ buttons are used to select the left or right manual test signal and allow you to select a digit for editing when editing is enabled

If a value you can edit is displayed, pressing the ⇐ or ⇒ buttons moves a blinking cursor one character to the left or the right. When the cursor is on a character, the character blinks off and on, indicating you can edit it. When editing the alphanumeric encoded IDENTIFICATION, the character to edit must be explicitly selected to be controlled by the ⇑ and ⇓ buttons. When editing a number value, the selected digit to edit will increment and decrement the total value of the displayed value, not just the digit column selected.

If editing is not enabled, there will be no flashing digit or space in the display.

## PAUSE AUTO

During an AUTO test signal sequence, pressing the ⇒ button pauses the sequence at the signal step the ASG 100 is generating at that moment.

For example, suppose you press the ⇒ (PAUSE AUTO) button during the step of the O. 33 sequence when the ASG 100 is generating a tone of 80 Hz at –12 dB. The ASG 100 will continue generating that tone, rather than progressing to the next step in the sequence.

Once you have paused the test sequence, you can increment it one step at a time by pressing the ⇑ button. You can decrement the sequence by pressing the ⇓ button. You can increment to the last test in the sequence or decrement to the first test in a sequence, but you cannot step the test sequence offline.

To resume automatic generation of the rest of the test sequence, press the (PAUSE AUTO) button a second time.

### SAVE

If SAVE is pressed when saving is not enabled, the word **Disabled** will be displayed.

If the SAVE function is enabled, pressing the SAVE button stores the function value currently displayed as the default and **Saved** will appear in the display. Once you save a function value, powering on the unit restores that value if user-defined settings are enabled. If user-defined settings are not enabled, the new value saved will be in effect for the time the power is on only. When the power is turned off and back on, the factory defaults will be returned. The normal setting is for user-defined settings to be enabled and recalled on power on.

#### NOTE

*When the factory defaults are restored, all user selected values are written over in the NVRAM, and the user defaults become the same as the factory defaults.*

Saving can be done either from the main selection level or at the level of the individual parameter. For example, if the LINE UP function is currently displayed and you press the SAVE button, the frequency and the amplitude parameters currently specified for the line up tone are stored. If the frequency value itself is displayed and you press the SAVE button, only the frequency value is stored.

A selected auto test sequence may be saved as the power-on choice as well as a selected manual test signal. Just select the one you want the start-up setting to be and press SAVE. The ASG 100 powers up each time with the AUTO choice selected, and the selected test will be the one that you saved. When MANUAL is selected, the test name you selected and saved will be the one that appears.

For more information on the enabling edits and saves refer to *Internal Settings and Setup Editing*.

## STATUS FEEDBACK

### POWER

When the ASG 100 is powered on, the POWER LED lights up.

### Power-On Diagnostics

When you power on the ASG 100, it performs a numbered series of tests of its memories and their interconnections, and then tests the backup battery.

The display window shows the number of each test as the ASG 100 performs it, in the format shown below:

DSP 1/4. . . 2/4. . . 3/4. . . 4/4

The sequence of messages above indicates the ASG 100 is performing the self tests, but only the first and last will be evident in the display for normal power-ons. When it completes the numbered tests, the ASG 100 tests its backup battery. A status message is displayed if the battery is not good.

If the ASG 100 fails one of the numbered self tests, it keeps trying to perform that test and displaying its number. When the ASG 100 indicates a failed selftest, you cannot make it perform its other functions. Contact your Tektronix representative for service information.

After repeated iterations, the unit may pass a test it failed initially, and proceed to the next test in the sequence. However, you should still stop using the unit and have it serviced.

## OUTPUT ≥775mV(rms)

The LED above this label blinks when the amplitude of the selected signal is greater than or equal to 0 dBu, as required by the CCITT 0. 33 Standard. This is to alert you to the possibility of levels that could overload or damage equipment. Whenever this LED is blinking, the signal level is increased in tenth dBu steps only when you raise the level using the front panel controls. It may be decreased normally.

## Display Window

The ASG 100 lets you set a number of parameters affecting the signal it generates. Using the panel controls you can specify the parameter you want to check or modify. The display window shows the current signal pattern for whatever signal parameter you last chose. When you select the RECORD function, the window also displays instructions for inputting a four-second voice pattern.

When you power up the ASG 100, the display window shows the name of the default automatic test sequence, (either the factory default of O. 33:01 or a user selected automatic test sequence).

## Headphones

The HEADPHONES port outputs whatever signal is currently being output through the external output ports. If the ASG 100 is ON LINE, this is the signal pattern currently selected on the ASG 100. If it is off line, it is the program signal being looped through the ASG 100. The VOLUME knob controls the level of the signal through this port. It has no effect on the signal level through the ASG 100.


*It is possible to set levels and adjust the volume so the output through the headphones is excessively loud. For safety, use minimum volume level setting when making level adjustments.*

# REAR PANEL POWER SWITCH AND SIGNAL CONNECTORS

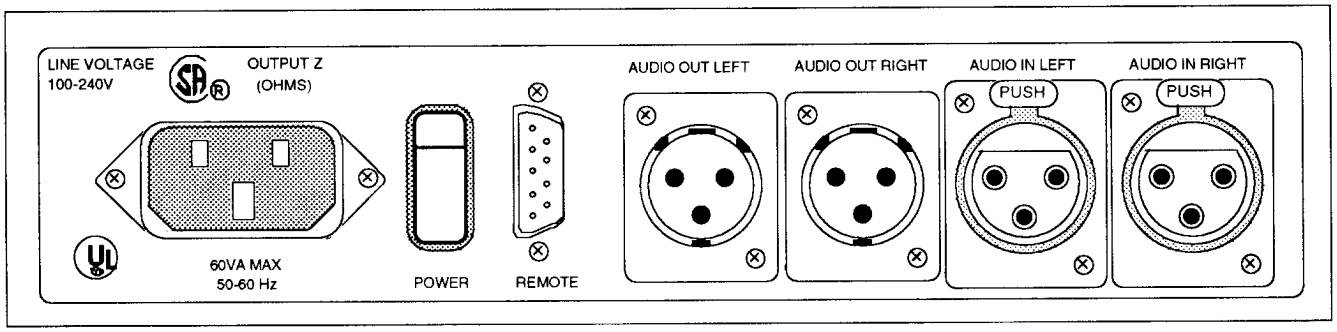



**Figure 2-4. ASG 100 Rear Panel connectors.**

## Power Switch

The ASG 100 power switch is immediately to the right of the power plug receptacle on the back panel (see Figure 2-4). In the off position, the top of the switch, which has a red "O" engraved in it, is out. When the ASG 100 is connected to a power source, power it up by pressing the top of the switch. Power it off by pressing the bottom of the switch.

### NOTE

*When power is turned on, the selections for the settings will be determined by the stored defaults that are recalled. However, the ASG 100 will be off line, and any signal applied will be automatically connected to the output via the loop-through circuitry.*

## Audio Signal Connectors

The input and output connectors for the AUDIO IN and AUDIO OUT connectors for the left and right channels are loop-through connectors. When the ASG 100 is off line, the signals applied to the input connectors are connected directly to the output connectors via the internal loop-through circuitry of the ASG 100. A small sample of the incoming program signal is fed to the headphones output connector (on the front panel) so the program audio may be monitored.

## Remote Connector

This DB-9 connector is used to access two types of remote control. It may be used to connect switching contacts that are used to start the AUTO Test or to override the editing locked feature so new setups may be saved without removing the ASG 140 from a rack installation to reset the internal DIP switches. Its second purpose is to provide an RS-232C interface for remote control of all the instruments functions. See Appendix A, *Remote Control*, for using the RS-232C interface to control the operation of the ASG 140 remotely. An additional feature controlled via the remote connector is the Audio/Video Timing measurement signal synchronization. See Appendix D, *Audio/Video Timing*, in the Operator's manual for information on how this feature is used.

# INTERNAL SETTINGS AND SETUP EDITING

The ASG 100 allows you to enable and disable editing of various signal features, such as amplitude, frequency and signal identification. Front panel control or remote control or both may also be either enabled or disabled. You can also change the output impedance of the ASG 100. This section describes how to make these changes.

You control signal editing and output impedance through two components found on the circuit board inside the ASG 100:

- The 10-pole DIP switch labeled "S1" on the circuit board. The settings of the first four switches control editability of the user definable test variables and the default values used when the ASG 100 is powered on.
- The DIP resistor package that sets the output impedance of the ASG 100, located in the socket labeled "R167." Information on setting the output impedance is found in this section of the manual.

## Enabling and Disabling Signal Editing

On the ASG 100 circuit board is a DIP switch you can set to enable or disable editing of ASG 100 functions, and to select the type of values used as the defaults for user-definable functions.

As you face the ASG 100, on the left side, near the front is a small screw-on door. Removing the side panel reveals the DIP switch, as shown in Figure 2-5. The individual switches that affect editing and what each does are shown in Figure 2-6.

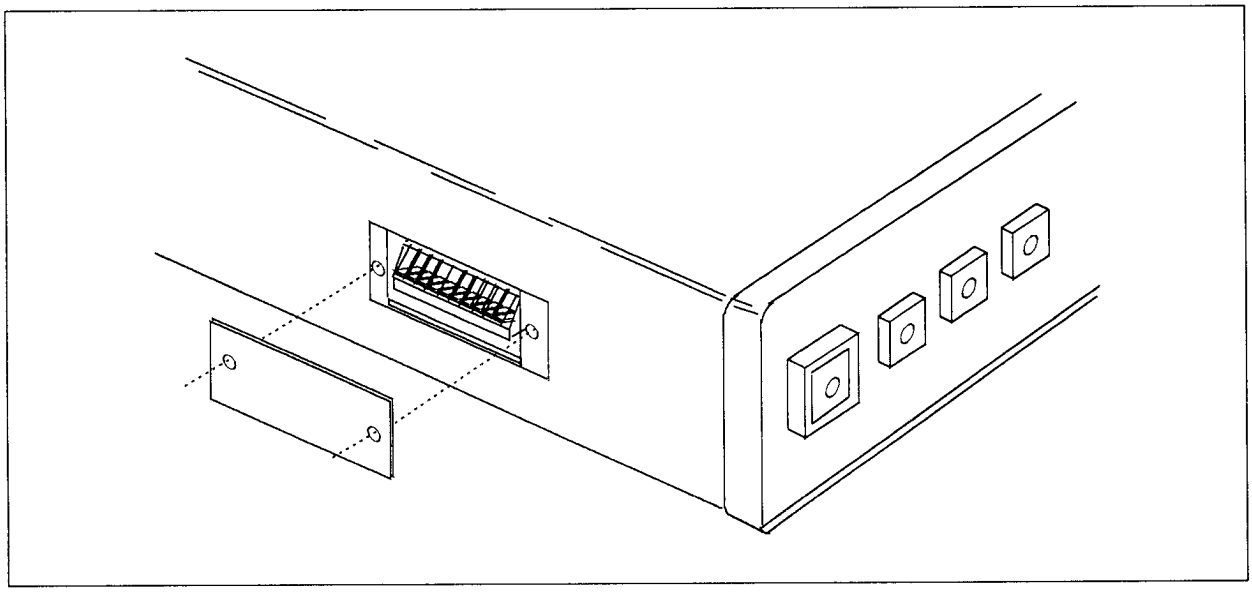
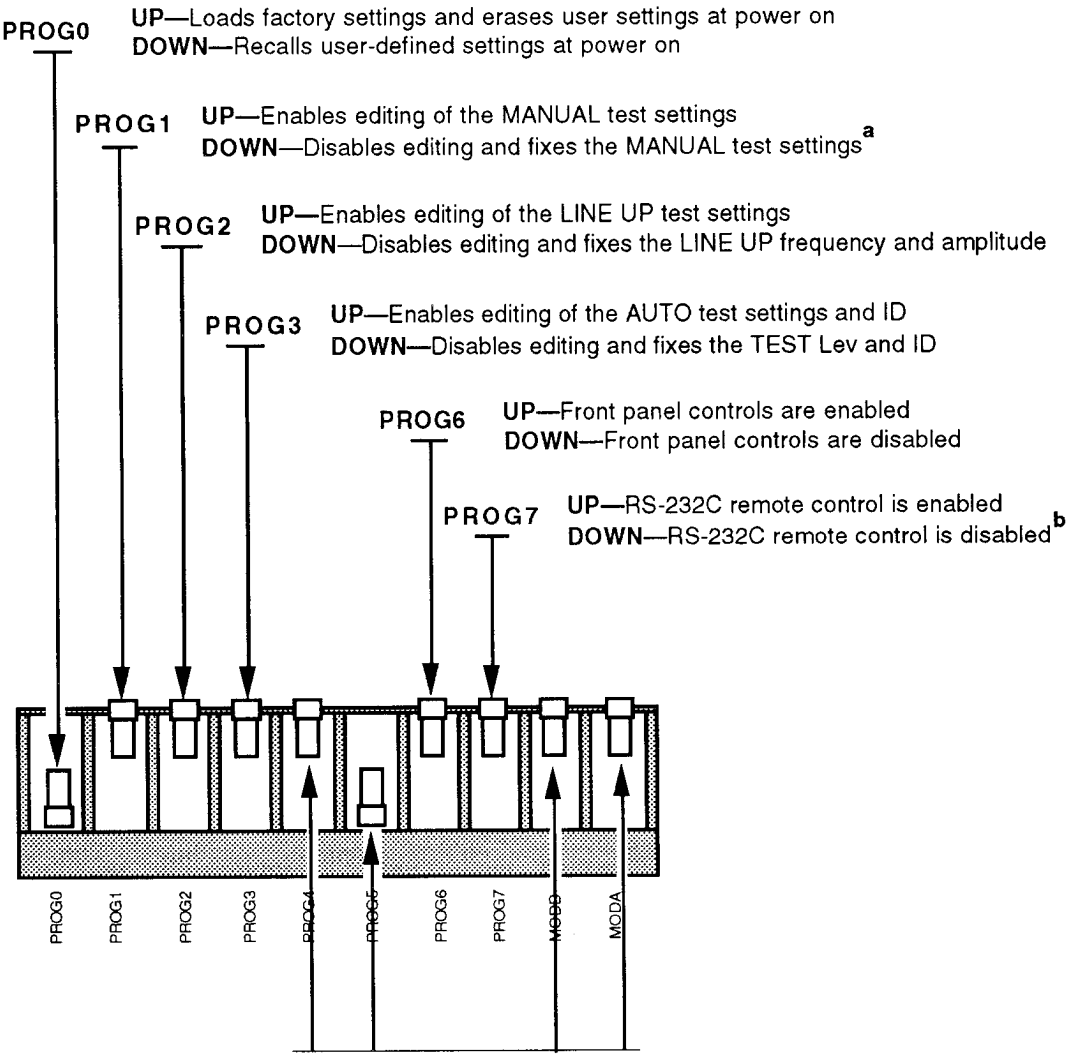


**Figure 2-5 Remove side panel door to access DIP switch.**




[a] Editing may be enabled via the remote connector by using contact closure to connect pin 6 and pin 9 of the rear panel remote control connector. While the pins are connected, the disables are overridden. Edits and saves may then be done to make the needed change(s). When the contacts are opened, editing is again controlled by the settings of switches PROG1 – PROG3.

[b] With PROG6 and PROG7 both down, the contact closure remote operation for sending an AUTO TEST sequence and enabling editing when editing is internally disabled are still operational.

**Figure 2-6. DIP switch settings for editing.**

## Editing Signal Parameters

After you enable editing of a signal parameter, you can adjust that parameter value from the front panel. To edit a signal parameter, press the front panel buttons required to display the current value. For example, to edit the frequency of the line-up tone, press the LINE UP button and then the FREQUENCY button.

The digit currently active for editing is indicated by a blinking character, numeral or underscore. To change the active digit, use the ⇐ and ⇒ buttons. To change the value of the active digit, press either the ⇑ or ⇓ button to increment or decrement the value until you get the desired character or number.

## Saving Signal Parameters

When you have changed the parameter to the value you want, save it as the default by pressing the SAVE button.

If a top-level function (**Line Up** or one of the **Manual** test signals) is displayed, pressing the button saves as defaults the values of all parameter settings beneath that function (both frequency and amplitude in the case of **Line Up**).

If it is a test signal parameter, such as the frequency, that is displayed, pressing the SAVE button saves only that parameter value as a default; the default values of any other parameters under the function (such as the amplitude) are not updated.

To leave a signal parameter you have been editing, press any of the main-level function buttons: SILENCE, VOICE, AUTO, LINE UP, or MANUAL.

When you finish editing signal parameters and saving the desired default values, ensure the DIP switches are set as follows:

**PROG 0** **Down**. This preserves the saved values as defaults that will be restored whenever the operator powers up the instrument. (Placing DIP switch S-1 in the up position erases all user-defined settings and returns factory settings when the operator powers up the instrument.)

**PROG 1**
**PROG 3** **Down.** This prevents further editing of signal parameters.

### NOTE

*You may choose to leave all, any, or none of the user-definable frequency and level choices of a testing option editable from the front panel by the technician or engineer using the ASG 100. A normal choice may be to fix the AUTO and LINE UP test to known settings and leave the MANUAL test editable for setting levels and frequencies that may be needed for manual testing. Your application will determine how you decide to customize the test signals and the freedom of operation for the user.*

Table 2-1 shows the present assignment of all the switches of the DIP switch package, and the factory setting of each switch.

**Table 2-1**
**Dip Switch Functions**

| Switch Name | Switch Action | | Factory Setting |
|---|---|---|---|
| | Up | Down | |
| Prog 0 | At power up, ASG 100 recalls factory settings for all functions. | At power up, ASG 100 recalls values last saved (with the SAVE button) for user-definable functions.[a] | Down |
| Prog 1 | MANUAL functions can be edited. | MANUAL functions can NOT be edited. | Up |
| Prog 2 | LINE UP function can be edited. | LINE UP function can NOT be edited. | Up |
| Prog 3 | AUTO TEST Level and SOURCE ID can be edited. | AUTO TEST Level and SOURCE ID can NOT be edited. | Up |
| Prog 4 | Normal operating state. | Reserved. | Up |
| Prog 5 | Reserved. | Normal operating state. | Down |
| Prog 6 | Front Panel Controls Enabled. | Front Panel Controls Disabled. | Up |
| Prog 7 | Remote Control Enabled. | Remote Control Disabled. | Up |
| MOD B | Factory setting required for correct performance. DO NOT CHANGE. | | Up |
| MOD A | Factory setting required for correct performance. DO NOT CHANGE. | | Up |

[a] As shipped from the factory, the factory default settings are stored in the memory reserved for custom settings. This means that when you use the ASG 100 for the first time, the factory defaults will be used, even if DIP switch 1 is in the DOWN (user-defined settings enabled) position.

## External Edit Enable

When the editing features are disabled internally, they may be enabled via the rear-panel REMOTE connector. This method of operation permits editing from the front panel when needed without having to remove the installed equipment to access the side panel and internal switches. Editing is enabled by connecting pins 4 and 6 of the Remote connector together. This connection may be made via a jumper, switch, or remote-controlled relay contact.

If activation of the AUTO test sequence using external contact closures is a part of your normal operation, you may also want to add the Remote Edit enable capability. If the need to change a programmed frequency, amplitude, or ID, etc., arises, the feature can be enabled, the edit made by the on-site operator, and then disabled again. When the connection between pin 4 and pin 6 is removed, the settings of internal dip switches again control the state of the editing and saving function for the AUTO, LINE UP, and MANUAL test settings. Note however, that the settings that were edited will now be in effect for the remainder of the test session. If those edits were also SAVED, they will be in effect when the ASG 100 is again turned on.

Front-panel editing may not be enabled via the RS-232C serial commands. However, even with front-panel editing disabled, the remote command arguments for editing still function.

**NOTE**

*There is no remote command for saving an edit to make it a new default, so at the next power on of the ASG 100, the previously "saved" defaults are restored.*

## Front Panel and Remote Control Enabling

Depending on the mode of operation needed, you may choose to disable the control capabilities of the ASG 100. If remote control alone is needed, and you want no local front panel access, you may disable the front panel controls by setting PROG6, section 7, of S1 to the down position. This effectively prevents any changes from the front panel of the instrument; the front panel is locked out.

The remote control capability of the ASG 100 may be locked out by setting PROG7, section 8, of S1 to the down position. If access is attempted when the RS-232C serial port is shut off, a message is sent to that effect. The ASG 100 still responds to the control signals it recognizes (control C, control Q, and control S) and sends out the sign on messages, but it will not respond to any commands.

Even if both the front panel and the remote access are disabled, the contact closure operation via the remote connector for sending an auto test sequence and enabling the editing features still work. This state of the controls provides minimal access to making any signal level or auto test type changes, and may be used when those sort of changes to operation are to be restricted.

## Setting the Output Impedance

The factory setting for output impedance is 12 Ω. If your audio system's configuration requires some other impedance level, you can change the resistor network on the ASG 100 circuit board to create the required impedance.

The output impedance of the ASG 100 is controlled by a resistor network located in the socket marked "R167" and labeled "ACTIVE" on the circuit board. This socket is centered in front of the XLR connectors labeled "J11" and "J14" on the circuit board. You can change the factory output impedance of the ASG 100 by changing the resistor package in the ACTIVE socket.

Tektronix manufactures the ASG 100 with a 10 Ω DIP resistor package in the R167 socket. That resistance in added in series with the resistance of the EMI filters creating a default output impedance of 12 Ω (5 Ω per side of each balanced output plus the 0.8 Ω each of the two filters). The resistor package is marked "100G" (meaning 10.0 Ω, ±2%).

For your convenience, an alternate resistor package for producing an output impedance 600 Ω is provided. This resistor package comes installed in socket "R168," which is also labeled "SPARE" on the circuit board. The spare resistor package itself is marked "601G" (meaning 600 Ω ±2%). To create a 600 Ω output impedance, remove this resistor package from the "SPARE" socket and insert it in the "ACTIVE" socket in place of the 10 Ω resistor package.

In addition, in case you want to create a custom output impedance, the ASG 100 also provides a blank 16 pin header in the socket marked "R173" and labeled "USER" on the circuit board. This socket is adjacent to the "SPARE" socket. To create a custom output impedance, solder your own resistors to this header and insert it in the "ACTIVE" socket in place of the factory-supplied resistor package.

Figure 2-7 below shows the resistor network and how the socket is wired.

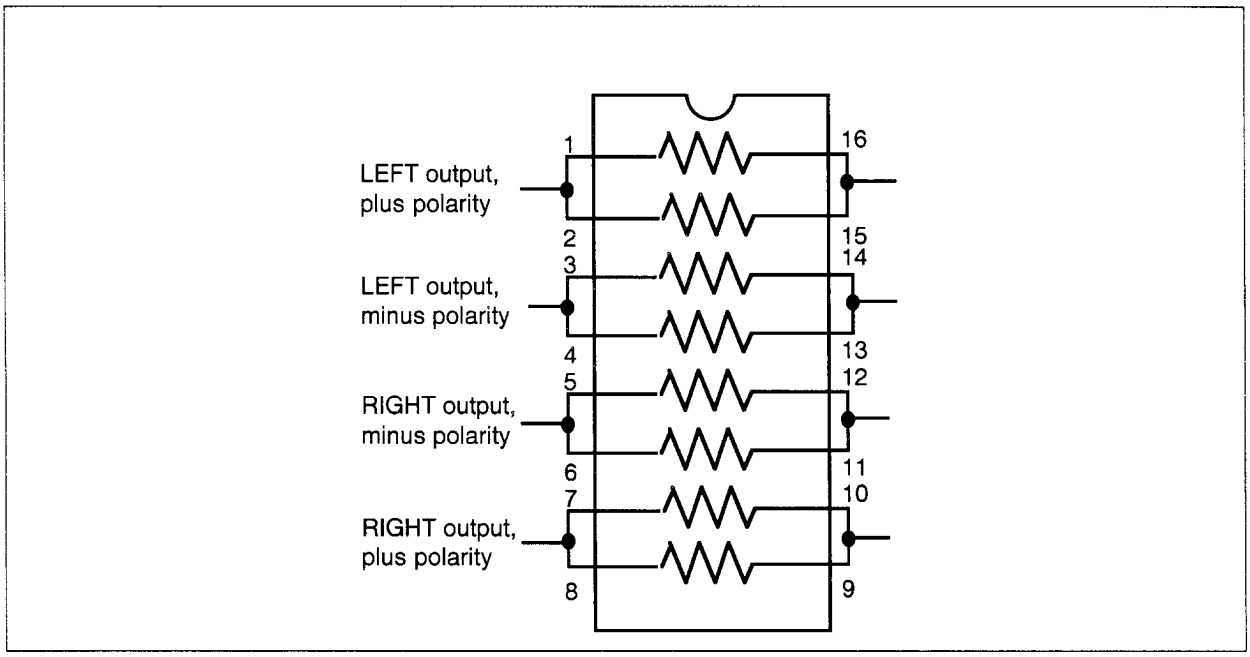



**Figure 2-7. Output impedance resistor network.**

If you make your own resistor network, it must consist of resistors of equal value. As shown in Figure 2-3, for each output in the XLR connectors, a pair of resistors are wired together in parallel for power handling purposes.

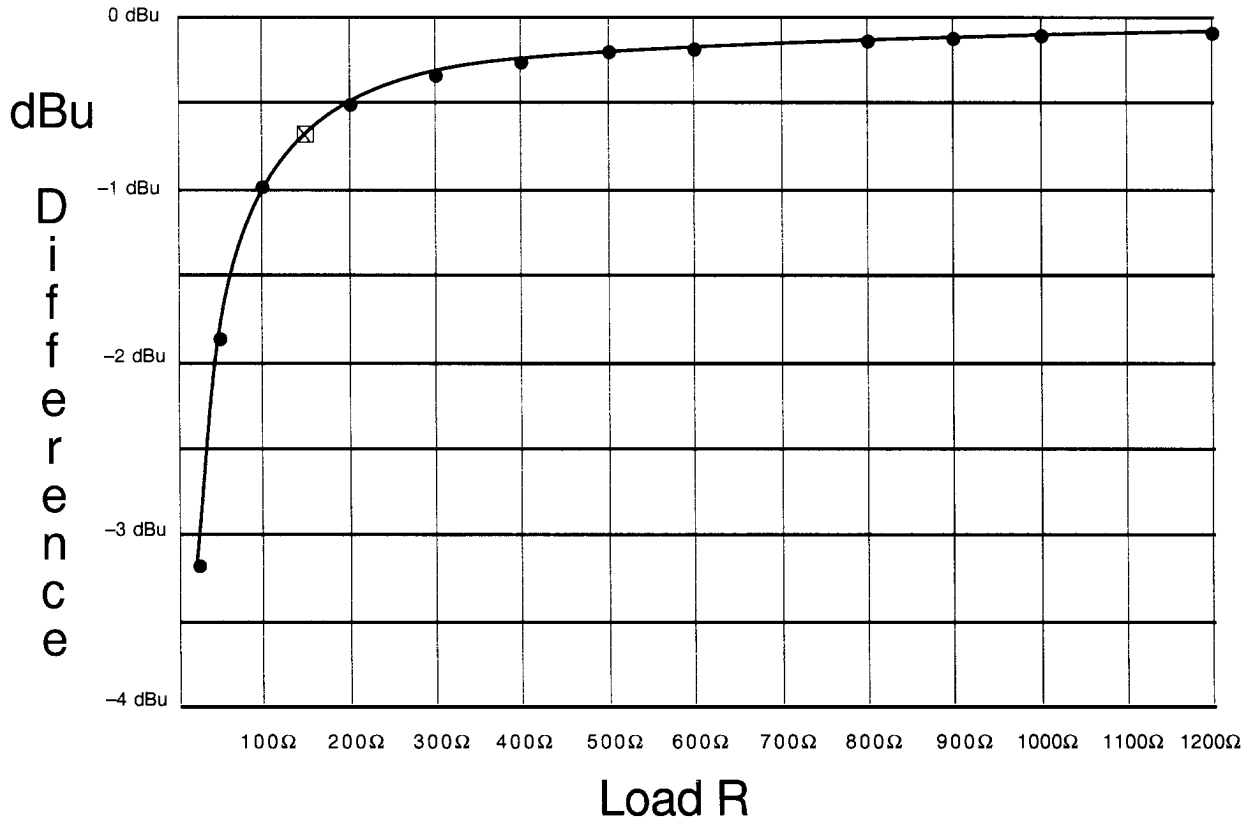
Use parallel resistors with values equal to the output impedance you want to achieve. The resistor pairs are wired in parallel, so the impedance produced on each output pin is one-half the resistance value of each resistor. However, each output port sums the signals on each of its two signal lines to produce a differential signal. This results in an output impedance equal to the resistance value of the resistors used in the resistor package.

## NOTE

*The output levels indicated by ASG 100 display are in dBu, not dBm, and do not compensate for changing source or load impedances. The levels displayed by the ASG 100 are correct when used with the 12 Ω source impedance and a high impedance load (>1200 Ω). With a 600 Ω load, the output will be reduced by 0.17 dB (see Figure 2-8).*

*If you change the source impedance to 600 Ω and use the unit in a power-matched system (with 600 Ω loads), the actual output delivered to the load will be 6 dB less than the displayed value.*

*If you use a custom resistor network to implement some other source impedance, the output levels will be reduced by a different factor, which you must calculate and take into account when reading the displayed values (see Figure 2-9)*



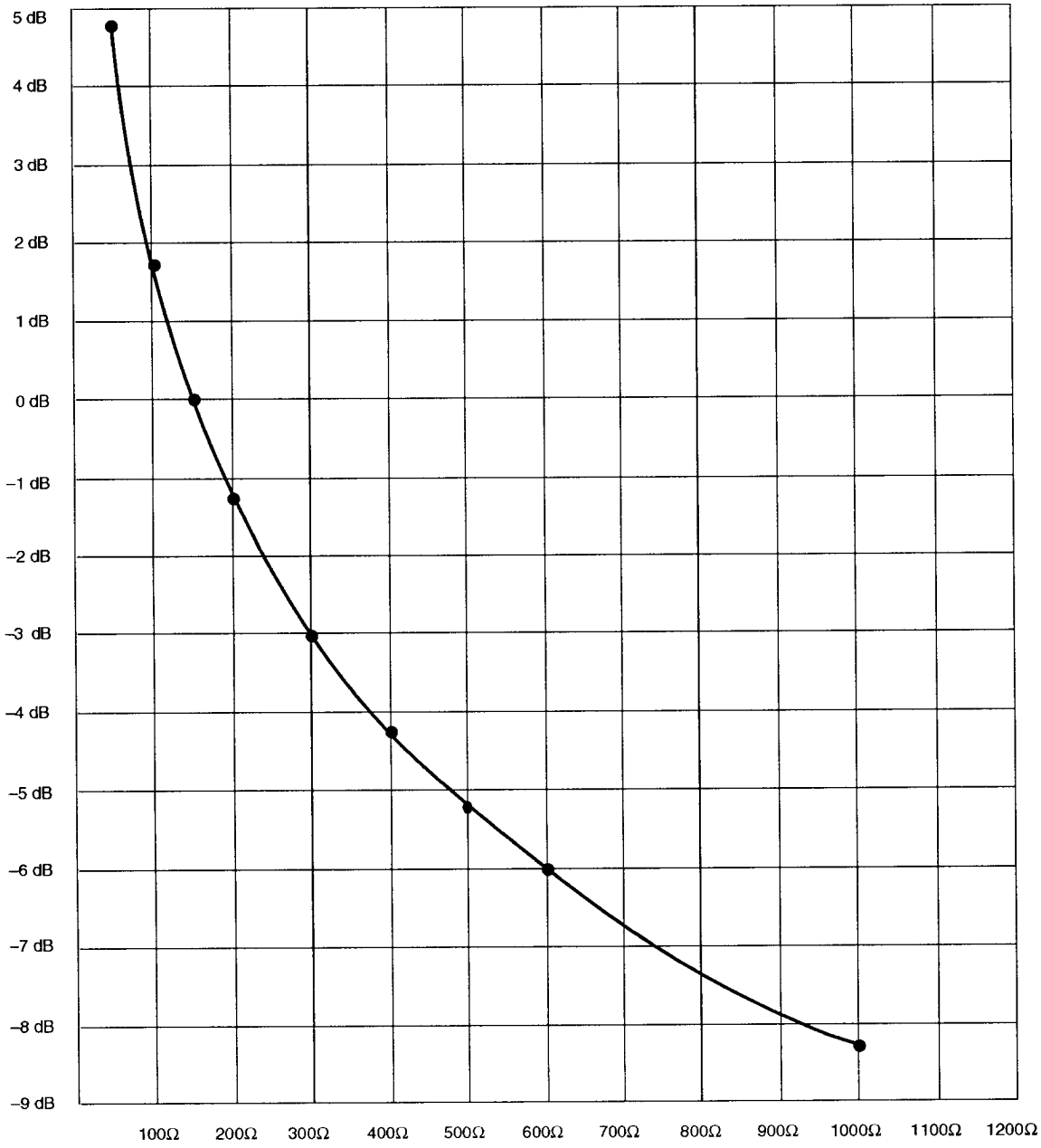

The general formula for calculating the dBu difference when the source resistance is held at 12 Ω and the load resistance varies is:

$$dBu_{diff} = 20 \log\left(1 - \frac{12\ \Omega}{R_{Load} + 12\ \Omega}\right)$$

Using the above formula it can be seen that the front panel ASG 100 dBu reading approximately corresponds to dBm when driving a 600 Ω load. The difference between actual dBm and the ASG 100 readout is –0.17 dB with a 600 Ω load.

The output amplifiers of the ASG 100 are current limited. The load resistance should not be less than 150 Ω.

**Figure 2-8. Effects of a changing load resistance on the dBu output of the ASG 100.**




Difference between displayed dBu and output dBm as a function of source resistance and load resistance changes when matching source and load.

**NOTE:** Points of interest. At 150 Ω, dBu and dBm match. At 300 Ω, subract 3 dB from the reading, and at 600 Ω subtract 6 dB.

The source resistance should never be made greater than the load resistance.

**Figure 2-9. Effects of matching load and source impedances in the ASG 100.**

# Section 3
# MAINTENANCE

This section contains instructions for preventive maintenance, general troubleshooting, and corrective maintenance. If the instrument does not function properly, troubleshooting and corrective measures should be taken immediately to circumvent additional problems.

## LITHIUM BATTERY

### Battery Disposal

The ASG100 stores default values when powered off by means of its lithium battery, located on the circuit board, immediately behind the headphones jack. If you need to replace the battery, observe the warnings and instructions in this section.

**WARNING**

*Improper handling may cause fire, explosion or severe burns. To avoid personal injury, observe proper procedures for the handling of lithium batteries. Do not recharge, crush, disassemble, hear the battery above 212°F (100°C), incinerate, or expose the contents to water.*

If you replace the ASG 100 lithium battery, dispose of the old battery as required by local, state and federal agencies.

**NOTE**

*Typically, small quantities of the battery (less than 20) can be safely disposed of with ordinary garbage in a sanitary landfill.*

*Larger quantities must be sent by surface transport to a hazardous waste disposal facility. The batteries should be individually packaged to prevent shorting. Then, pack them into a sturdy container that is clearly labeled as follows:*

***Lithium Batteries - DO NOT OPEN***

### Battery Emergency and First Aid Information

Manufacturer: Eagle Picher

Battery Type: Lithium

In case of emergency, follow the instructions in Table 3-1 below.

**Table 3-1**
**Emergency Procedures for Contact with Lithium Battery Contents**

| Contact | Procedure |
|---|---|
| Skin | Wash promptly with plenty of water. |
| Eyes | Flush immediately with plenty of water and use an emergency eye wash, if available. Report to a medical professional for treatment. |
| Inhalation | Leave the area and get fresh air. Report to a medical professional for treatment. |
| Ingestion | Non-toxic according to laboratory testing. However, report to a medical professional for advice. |

In case of venting, clear the immediate area. Venting will usually last only a few seconds.

## FUSE

The power supply for the ASG 140 is internally fused. Refer all internal servicing to a qualified service person.

Use only the specified fuse or equivalent if replacing the fuse. Physically, the fuse is a DIN metric size fuse; but electrically, it is UL and CSA rated for correct protection of the fused circuitry.

**Specified Replacement Fuse**

Tektronix part number 159-0296-00

**Replacement Fuse Description**

Fuse, Cartridge: MT4, 2A, 5.2 X 20 mm, NORMAL blow.

**Electrical Characteristics:**

Rating: 250 V maximum, 2A.

Blow Time at 25°C Ambient:

| | |
|---|---|
| 110% of rated current | 4 hour minimum |
| 135% of rated current | 60 minutes maximum |
| 200% of rated current | 5 seconds |

Interrupting Capacity (short circuit current)

10,000 A at 125 V; 100 A at 250 V.

## PREVENTIVE MAINTENANCE

Preventive maintenance consists of cleaning, visual inspection, performance checking, and, if needed, readjustment. The preventive maintenance schedule established for the instrument should be based on the environment in which it is operated and the amount of use. Under average conditions, scheduled preventive maintenance should be performed every 2000 hours of operation.

### Cleaning

The instrument should be cleaned often enough to prevent dust or dirt from accumulating. Dirt acts as a thermal insulating blanket that prevents effective heat dissipation, and can provide high-resistance electrical leakage paths between conductors or components in a humid environment.

Exterior — Clean the dust from the outside of the instrument by wiping with a soft cloth or small brush. A brush is especially useful to remove dust from around the selector buttons, knobs, and connectors. Hardened dirt may be removed with a cloth dampened in water that contains a mild detergent. Abrasive cleaners should not be used.

Interior — Clean the interior of the instrument by loosening the accumulated dust with a dry, soft brush. Once the dirt is loosened remove it with low-pressure air (high-velocity air can damage some parts). Hardened dirt or grease may be removed with a cotton-tipped applicator dampened with a solution of mild detergent and water. Abrasive cleaners should not be used. If the circuit board assemblies must be removed for cleaning, follow the instructions for removal/replacement under the heading of Corrective Maintenance.

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


*Do not allow water to get inside any enclosed assembly or component. Do not clean any plastic materials with organic cleaning solvents, such as benzene, toluene, xylene, acetone, or similar compounds, because they may damage the plastic.*

## Visual Inspection

After cleaning, carefully check the instrument for defective connections, damaged parts, and improperly seated transistors or integrated circuits. The remedy for most visible defects is obvious; however, if heat-damaged parts are discovered, determine the cause of overheating before replacing the damaged part, to prevent additional damage.

Periodic checks of the transistors and integrated circuits are not recommended. The best measure of performance is the actual operation of the component in the circuit.

# STATIC-SENSITIVE COMPONENTS

This instrument contains electrical components that are susceptible to damage from static discharge. Static voltages 1 kV to 30 kV are common in unprotected environments. Table 3-2 shows the relative static discharge susceptibility of various semiconductor classes.

**Table 3-2**
**Static Susceptibility**

| Relative Susceptibility Levels[a] | Voltage |
|---|---|
| MOS and CMOS | 100 - 500 V |
| ECL | 200 - 500 V |
| Schottky Signal Diodes | 250 V |
| Schottky TTL | 500 V |
| HF Bipolar Transistors | 400 - 600 V |
| JFETs | 600 - 800 V |
| Linear microcircuits | 400 - 1,000 V (est.) |
| Low-Power Schottky TTL | 900 V |
| TTL | 1,200 V |

[a]Voltage equivalent for levels (voltage discharged from a 100 pF capacitor through a 100Ω resistance.

Observe the following precautions to avoid damage:

1. Minimize handling of static-sensitive components.
2. Transport and store static-sensitive components or assemblies in their original containers, on a metal rail, or on conductive foam. Label any package that contains static-sensitive components or assemblies.
3. Discharge the static voltage from your body, by wearing a wrist grounding strap, while handling these components. Servicing static-sensitive assemblies or components should be done only at a static-free work station by qualified personnel.
4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.
5. Keep the component leads shorted together whenever possible.
6. Pick up the components by the body, never by the leads.
7. Do not slide the components over any surface.
8. Avoid handling components in areas that have a floor or work surface covering capable of generating a static charge.
9. Use a soldering iron that is connected to earth ground.
10. Use only special antistatic, suction, or wick-type desoldering tools.

# TROUBLESHOOTING

The material contained here is general and is not intended to cover specific cases. Note that the manual itself is considered a troubleshooting aid, and as such a brief discussion of its contents is in order.

## Troubleshooting Aids

### Foldout Pages

The foldout pages at the back of the manual contain information that is useful in troubleshooting the instrument. Schematic diagrams, circuit board illustrations, and parts locating charts are found there.

**Diagrams** - Schematic diagrams are the most often used troubleshooting aids. The circuit number and electrical value of each component is shown on the diagram. The first page has definitions of the symbology used on the schematic diagrams. Refer to the Replaceable Electrical Parts list for a complete description of each component. Circuits that are mounted on circuit boards or assemblies are enclosed in a border, with the name and assembly number shown on the border.

**NOTE**

*Check the Change Information section in the rear of the manual for corrections and modifications to the instrument and the manual.*

**Board Illustrations** - Electrical components, connectors, and test points are identified on circuit board illustrations, which are located on the back of a preceding schematic diagram. Circuit boards are grid numbered, with the lowest number in the upper left corner; highest number in the lower right.

**Parts Locating Charts** - Generally, components mounted on etched circuit boards are assigned circuit numbers according to their geographic location within the assembly, beginning with the lowest numbers at the upper left corner (as pictured in the illustration). The schematic diagrams are assigned location grids, and a parts locating chart (for each schematic diagram) gives grid locations of components on that schematic.

### Parts Lists

There are two separate parts lists in this manual. The List of Replaceable Electrical Parts precedes the schematic diagrams and circuit board illustrations. The List of Replaceable Mechanical Parts accompanied by exploded view drawings, follows the schematic diagrams and circuit board illustrations.

**Replaceable Electrical Parts** - This list is arranged by assembly as designated in ANSI Standard Y32.16-1975. The list begins with the part numbers for the major assemblies (etched circuit boards). Each circuit board is identified by an A# (Assembly Number).

The circuit numbers of the individual components in the parts list is made up by combining the assembly number with the individual circuit number.

EXAMPLE: R117 on Assembly (circuit board) A3 would be listed in the Replaceable Electrical Parts list as A3R117.

**NOTE**

*Always consult the parts list for part numbers and descriptions when ordering replacement parts. Some parts may have been replaced or have a different part number in an individual instrument. Also check the "Change Information" at the back of the manual for the most recent changes.*

**Replaceable Mechanical Parts** - This list is arranged so that it corresponds to the exploded view drawing for major instrument components. Standard Accessories, which are included in the parts list, are also included in the exploded view drawing.

## Major Assembly Interconnection

Signals and power supply voltages are passed through the instrument by a system of interconnecting cables. The connector holders on these cables have numbers that identify terminal connectors; numerals used are from 2 up. A triangular key symbol is used to identify pin 1 on the circuit board to assist in aligning connectors with correct square pins.

## General Troubleshooting Techniques

The following procedure is designed to assist in isolating problems, which in turn expedites repairs and minimizes down time.

1. Ensure that the malfunction actually exists. This is done by making sure that the instrument is operating as intended by Tektronix.
2. Determine and evaluate all trouble symptoms. This is accomplished by isolating the problem to a general area such as an assembly. The block diagram is a valuable aid in signal tracing and circuit isolation.

**CAUTION**

*Use extreme care when probing with meter leads or probes, because of the high component density and limited access within the instrument. The inadvertent movement of leads or a probe could cause a short circuit or transient voltage capable of destroying components.*

3. Determine the nature of the problem. Attempt to make the determination of whether the instrument is out of calibration or if there has been a component failure. Once the type of failure has been determined, proceed on to identify the functional area most likely at fault.
4. Visually inspect the suspect assembly for obvious defects. Most commonly these will be broken or loose components, improperly seated components, overheated or burned components, chafed insulation, etc. Repair or replace all obvious defects. In the case of overheated components, determine the cause of overheating and correct the cause before re-applying power.
5. Use successive electrical checks to locate the source of the problem. At times it may be necessary to change a calibration adjustment to determine if a circuit is operational, but since this can destroy instrument calibration, care should be exercised. Before changing an adjustment, note its position so that it can be returned to its original setting.
6. Determine the extent of the repair. If the necessary repair is complex, it may be advisable to contact your local Tektronix field office or representative before continuing. If the repair is minor, see the parts list for replacement information.

## Power-On Diagnostics

When you power on the ASG 100, it performs a numbered series of tests of its memories and their interconnections, and then tests the backup battery.

The display window shows the number of each test as the ASG 100 performs it, in the format shown below:

DSP 1/4. . . 2/4. . . 3/4. . . 4/4

The sequence of messages above indicates the ASG 100 is performing the self tests. The 2/4 and 3/4 test normally occur too quickly to be seen in the display. The tests performed are described in Table 3-3.

**Table 3-3**
**Self Diagnostic Tests**

| Test Number | Description |
|---|---|
| DSP 1/4 | Read-only memory |
| DSP 2/4 | Data Bus |
| DSP 3/4 | Address Bus |
| DSP 4/4 | Non-volatile memory |

When it completes the numbered tests, the ASG 100 tests its backup battery. A status message is displayed if the battery is not good.

If the ASG 100 fails one of the numbered self tests, it keeps trying to perform that test and displaying its number. When the ASG 100 indicates a failed test, you cannot make it perform its other functions. Contact your Tektronix representative for service information.

After repeated iterations, the unit may pass a test it failed initially, and proceed to the next test in the sequence. However, you should still stop using the unit and have it serviced.

# CORRECTIVE MAINTENANCE

**NOTE**

*Repair should not be attempted by the customer during the warranty period.*

## Obtaining Replacement Parts

Replacement parts are available through the local Tektronix, Inc. field office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components, as they become available, and to improve circuit performance. Therefore, it is important to include the following information when ordering parts:

1. Part Number
2. Instrument Type or Number
3. Serial Number
4. Modification or Option Number (if applicable)

If a part has been replaced with a new or improved part, the new part will be shipped (if it is a direct replacement). If the part is not directly replaceable, the local Tektronix field office or representative will contact the customer concerning any changes. After any repair, circuit readjustment may be required.

## Removal and Replacement Procedures

**Tools required:**

| | |
|---|---|
| 1/2 inch open-end wrench | 1/16 inch hexagonal wrench |
| 3/32 inch flat-bit screwdriver | 1P POZIDRIV screwdriver |
| 3/16 inch nutdriver | |

### Cabinet Removal and Replacement

1. Disconnect the power cord from the rear of the instrument.
2. Remove the six POZIDRIV screws holding the top cover to the chassis. Do not remove the two screws that hold the small access plate on the left side. Lift the top cover off the instrument.

### Front Panel Removal and Replacement

1. Disconnect J20 (headphone connector) from the main board, and disconnect J2 (microphone cable) from the front panel board.
2. Use a small, flat-bit screwdriver to pry gently on both ends of connector J8 (the large ribbon cable to the front panel) to disengage the connector from the main board mating pins.
3. Turn the instrument over and remove the two POZIDRIV screws that hold the front panel assembly to the chassis.
4. If you wish to further disassemble the front panel board assembly, remove the four POZIDRIV screws holding the circuit board to the front panel ring. The circuit board may then be separated from the ring.
5. Remove the 1/2 inch retaining nut and washer on the headphone jack and the volume control knob to separate the front panel from the front panel circuit board. A 1/16 inch Allen wrench is needed to loosen the retaining screw in the volume control knob.

**To reinstall the front panel assembly use the following procedure.**

1. Reassemble the front panel to the front panel circuit board. Reinstall the retainer nut on the headphone connector and the volume control knob.
2. Insert the assembled front panel and front panel circuit board into the front panel ring and reinstall the four holding screws. Make sure that the headphone connector ground lug is connected to the front panel ring by the holding screw near that connector.
3. Position the front panel assembly on the front of the chassis and reinstall the two holding screws on the bottom side of the chassis. Start both screws then tighten firmly. Do not over tighten.

### Main Board Removal and Replacement

1. Remove the front panel assembly (see the Front Panel Removal and Replacement procedure).
2. Disconnect connectors J23 (to the power supply) and J25 (to the rear panel) from the main board.

3. Remove the eight POZIDRIVscrews holding the main board to the chassis.
4. Use a 3/32 inch flat-bit screwdriver to release the four XLR connectors from their housings on the rear panel. Insert the screwdriver into the small slot in the center of the XRL connectors and turn counterclockwise (less than 1/4 turn required) to release the latch.
5. Lift up the front of the main board slightly to clear the mounting studs and press on the connectors while sliding the board toward the front to remove the connectors from their housing on the rear panel. A slight wiggle of the front of the board helps to release the connectors from the housings.

**To reinstall the main board use the following procedure.**

1. Slide the main board XLR connectors straight into the connector housing on the rear panel.
2. Align the screw holes in the main board with the mounting studs, and start all eight retaining screws. After all the screws are started, tighten all eight screws. Do not over tighten.
3. Use the 3/32 inch small bit screwdriver to reengage the XLR connector release by inserting the bit into the small slot in the center of the connectors and turning clockwise until the latch is engaged (less than 1/4 turn).
4. Reconnect J23 and J25 to the main board.
5. Reinstall the front panel assembly.

### Power Supply Removal and Replacement

1. Disconnect connector J23 from the main board.
2. Remove the three POZIDRIVE screws holding the power supply to the chassis.
3. Slide the plastic shield forward and off the power supply.
4. Disconnect connector J1 (ON/OFF switch) from the power supply board and remove the power supply from the instrument.

**To reinstall the power supply use the following procedure.**

1. Position the power supply board over the mounting studs and reconnect J1 to the board.
2. Slide the plastic shield back in place, aligning the holes in the bottom of the shield to the mounting stud holes.
3. Reinstall the three retaining screws in the power supply board. Start all three, then tighten firmly. Do not over tighten.

### Serial Connector EMI Board Removal and Replacement

1. Disconnect connector J25 (1/2 inch wide ribbon cable) from the main board.
2. Use a 3/16 inch nutdriver to remove the connector retaining screws.
3. Remove the serial connector, EMI board, and attached ribbon cable from the instrument.

**To reinstall the serial connector EMI board assembly use the following procedure.**

1. Place the serial connector through the hole in the rear panel and reinstall the two connector retaining screws. Tighten the two screws firmly, but do not over tighten.
2. Reconnect J25 to the main board.

# Section 4
# VERIFICATION AND ADJUSTMENT

This section is divided into two sets of procedures. The first set is used to verify the operation of the ASG 100. The second and shorter procedure that follows verification is used to return the ASG 100 to specification if adjustment is needed. The test equipment shown in Table 4-1 or an equivalent substitute is that required for both verification and adjustment. If the example test equipment is not available, check the minimum specifications to determine if another piece of test equipment might be used. If other test equipment is used, controls and connectors for that equipment may be different than called out for the example test equipment. Refer to the appropriate operator's manuals for operation of the test equipment.

**Table 4-1**
**Test Equipment Required for Verification and Adjustment**

| Equipment | Minimum Specification | Purpose | Example |
|---|---|---|---|
| Low Distortion Oscillator | Balanced output, sine wave output, 20 Hz to 20 kHz. | Check loop-through. | Tektronix SG5010[a] or SG 505.[a] |
| Distortion Analyzer | Balanced input, THD accuracy > 0.001%, 22 Hz to 22 kHz audio bandpass. | Check/Adjust signal. | Tektronix AA5001[a] or AA501A. |
| Digital Multimeter with test leads | Accuracy 0.05%, 4-1/2 digit display. | Check power supply. | Tektronix DM504A.[a] |
| Frequency Counter | Accuracy 0.01%, 8-digit display. | Check frequency accuracy. | Tektronix DC 503A[a] or equivalent. |
| RMS Meter | Accuracy 1%, resolution 5 digits; balanced input. | Check amplitude accuracy and flatness. | Fluke 8506A or 8505A-09 or equivalent. |
| Test Oscilloscope | Dual Channel: 60 MHz bandwidth. | Check channel phase difference. | Tektronix 2465B or 2246A. |
| Stereo Headphones | 10 Hz to 20 kHz response standard stereo phono plug connector. | Check headphone output and auto test sequences. | |
| Serial Communications Terminal with RS-232C interconnection cable. | RS-232C serial ASCII communications. | Check RS-232C serial port and remote operation. | IBM or compatible with terminal software program. |
| Audio Signal Cable (2 required) | XLR-male-to-triple-banana adapter cable. | Signal connections for frequency and loop-through checks. | E-Z-Hook 5023-24. |
| Audio Signal Cable (2 required) | XLR-female-to-triple-banana adapter cable. | Signal connections for frequency and loop-through checks. | E-Z-Hook 5023F-24. |
| Adapter | BNC-male-to-dual-binding-post-banana adapter. | Signal interconnection for channel phase check. | Tektronix Part Number 103-0035-00. |

[a] A Tektronix TM500 power supply is required to power the plug in test equipment.

# VERIFICATION PROCEDURE

These verification procedures are designed to be done with the cover of the ASG 100 installed, using the normal operating controls only. If a verification check fails, it may mean that the instrument needs repair and/or adjustment. Refer any repairs or adjustments to a qualified service person.

## Preparation

Remove the small access plate on the left side of the ASG 100 to set the internal dip switch for performing the verification procedure.

Set the switch sections of S1 as follows to enable the editing and save features of the ASG 100 so they can be checked. Note the switch positions prior to setting them if it is necessary to restore the setup.

| | |
|---|---|
| PROG0 (section 1) | up |
| PROG1 through PROG3 (sections 2, 3, 4) | up |
| PROG4 (section 5) | up |
| PROG5 (section 6) | down |
| PROG6 (section 7) | up |
| PROG7 (section 8) | up |
| MODA and MODB (sections 9, 10) | up |

## Procedures

### 1. Power Up Check

a. Connect the power cord to the ASG 100 and turn on the ASG 100.

b. Check that the ASG 100 initializes normally and finishes with the AUTO LED lit.

c. Set PROG0 (section 1) of the internal dip switch to the down position. This enables user's front panel settings to be restored on power up. With PROG0 in the up position, factory defaults for front panel settings are stored in the NVRAM at each power up.

### 2. Check Frequency Accuracy (±0.1%)

a. Connect the Audio Out Left connector to the frequency counter BNC input via the XLR-female-to-triple-banana-connector adapter and the BNC male-to-dual-binding-post banana adapter. Connect pin 1 of the XLR connector (green) to ground of the BNC dual-binding-post adapter. Connect pin 2 of the XLR connector (black) to the red post of the BNC dual-binding-post adapter. Do not connect pin 3 of the XLR connector; leave it open.

**NOTE**

*The color of the conductors for the pins in the XLR connector apply to the example cable. If a substitute XLR to triple banana connector adapter is used, the correct pin-to-conductor color must be verified.*

b. Select the LINE UP signal from the ASG 100 and check the current frequency setting (factory default is 400 Hz).

c. Press the ON LINE button and check that the frequency counter is triggered correctly.

d. Check that the output frequency is as noted in part b within ±0.1%. Example: 400 Hz ± 0.4 Hz (399.6 to 400.4 Hz).

e. Disconnect the test signal from the frequency counter.

## 3. CHECK AMPLITUDE ACCURACY (±0.2 DB AT 1000 HZ)

a. Connect the Audio Out Left connector to the balanced input connectors of the rms voltmeter via the XLR-female-to-triple-banana-connector adapter cable. Pin 1 of the XLR adapter cable (green) is ground, pin 2 (black) is + and pin 3 (red) is –.

b. Set the ASG 100 for a MANUAL L Tone output of 1 kHz at 0 dBu and press the ON LINE button (LED indicator in the button should light).

c. Set the rms meter appropriately to measure 0 dBu (0.7746 V rms) unterminated. (If a 600 Ω termination is used, the amplitude will be 0.17 dB lower, 0.7594 V rms.)

d. Check that the amplitude is 0 dBu ±0.2 dBu (0.75697 to 0.79264 V rms).

e. Set the ASG 100 to the other dBu values given in Table 4-2, and check that the rms meter reads within the amplitude tolerance shown. Use either Auto Range or an appropriate voltage range setting of the rms meter to make the measurement.

f. Move the XLR connector to the Audio Out Right connector, set the ASG 100 for a MANUAL R Tone output signal of 1 kHz at 0 dBu, and repeat parts c through e to check the right channel signal amplitude accuracy.

**Table 4-2**
**Amplitude Accuracy Check Points**

| dBu | Volts RMS | Tolerance (±0.2 dB) |
|---|---|---|
| –40 dBu | 0.00775 V | 0.00757 to 0.00793 V |
| –30 dBu | 0.02450 V | 0.02394 to 0.02507 V |
| –20 dBu | 0.07746 V | 0.07570 to 0.07926 V |
| –10 dBu | 0.24495 V | 0.23937 to 0.25066 V |
| 0 dBu | 0.7746 V | 0.75697 to 0.79264 V |
| +10 dBu | 2.4495 V | 2.39374 to 2.50656 V |
| +20 dBu | 7.7460 V | 7.5696 to 7.92643 V |

## 4. CHECK AMPLITUDE FLATNESS (+0.05/–0.2 DB, 10 HZ TO 20 KHZ)

a. Move the XLR connector to the Audio Out Left connector. Set the ASG 100 for a MANUAL L Tone output of 1 kHz at +14 dBu.

b. Note the amplitude of the test signal as indicated by the rms meter (+14 dBu is 3.8822 V).

c. Set the ASG 100 frequency to the values given in Table 4-3 and note the output amplitude as indicated on the rms meter for each frequency.

**Table 4-3**
**Test Frequencies for Amplitude Flatness**

| ASG 100 Frequency | Left Tone Amplitude | Right Tone Amplitude |
|---|---|---|
| 20 Hz | | |
| 100 Hz | | |
| 400 Hz | | |
| 1000 Hz (reference) | | |
| 5000 Hz | | |
| 10000 Hz | | |
| 15000 Hz | | |
| 20000 Hz | | |

d. Check that the amplitude is flat within +0.05/–0.2 dB at each test frequency with respect to the 1000 Hz 14 dBu amplitude noted in part a. The amplitude accuracy specification permits the 14 dBu amplitude at 1000 Hz to be 3.7938 to 3.9726 V, and the flatness has to be calculated using the measured voltage to check the actual flatness over frequency. (More or other frequencies may be checked as considered necessary. The empty columns of Table 4–3 are provided to enter the amplitude for each frequency if you wish.)

The voltage-to-dB conversion is done using the following formula:

$$dB = 20 \log \frac{Measured\ voltage}{Reference\ voltage}$$

The reference voltage value is that noted for the 1 kHz +14 dBu MANUAL Tone signal. The Measured voltage is the signal amplitude at each of the other frequencies checked.

**For example:**

Assume the reference voltage (1 kHz, +14 dBu) is 3.87 V and that the measured voltage for a different frequency signal is found to be 3.854 V. Substituting these values into the equation gives:

$$dB = 20 \log \frac{3.854}{3.87} = -0.036\ dB$$

e. Move the XLR connector to the Audio Out Right connector. Set the ASG 100 for a MANUAL R Tone of 1 kHz at +14 dBu.

f. Repeat parts b through d to check the right channel amplitude flatness.

**5. Check Channel-to-Channel Level Difference (≤0.2 dB at +14 dBu)**

a. With the XLR connector on the Audio Output Right signal, set the ASG 100 for a MANUAL Tone output signal of 1 kHz at +14 dBu. Using the Tone test signal places the same signal on the left and right channel output amplifiers.

b. Note the output amplitude of the right channel Tone signal on the rms meter.

c. Move the XLR connector from the Audio Out Right connector to the Audio Out Left connector.

d. Note the output amplitude of the left channel Tone signal on the rms meter.

e. Check that the amplitude of the Tone signal is the same for both channels within ±0.2 dB. The calculation for dB is as given in step 4.

f. Set the ASG 100 for a MANUAL L Tone signal and note the output amplitude of the L TONE signal on the rms meter. Using the L Tone test signal verifies the left channel signal-generating circuitry.

g. Check that the amplitude of the L Tone signal is within ±0.2 dB of the Tone signal amplitude noted in part d. The calculation for dB is as given in step 4.

h. Take the ASG 100 off line and disconnect the test signal connector from the rms meter.

**6. Check Total Harmonic Distortion + Noise (< 0.015%, 20 Hz to 19 kHz; < 0.056%, > 19 kHz to 20 kHz)**

a. Connect the Audio Out Left connector to the balanced input connectors of the audio distortion analyzer (AA5501 or AA501) via an XLR female-to-triple-banana connector adapter cable. Pin 1 of the XLR adapter cable (green) is ground, pin 2 (black) is + and pin 3 (red) is –.

b. SET Distortion Analyzer

| | |
|---|---|
| Input Range | AUTO RANGE |
| Function | THD + N |
| Response | RMS |
| Filters | AUDIO BAND PASS or 30 kHz LOW PASS * |
| Attenuation | None |

c. SET ASG 100

| | |
|---|---|
| MANUAL | L TONE |
| AMPLITUDE | +14.0 dBu |
| FREQUENCY | Table 4-4 |
| ON LINE | On line (LED lit and OUTPUT ≥775 mV(rms) LED flashes) |

d. Check for a THD + N of less than 0.015% for each of the frequencies listed in Table 4–4. (Other frequencies may be used if considered necessary. The empty columns of Table 4–4 are provided to enter the THD + N reading for each frequency if you wish.)

**Table 4-4**
**Test Frequencies for THD + Noise**

| Frequency | Left Channel THD + N Reading | Right Channel THD + N Reading |
|---|---|---|
| 20 Hz | | |
| 100 Hz | | |
| 400 Hz | | |
| 1000 Hz | | |
| 5000 Hz | | |
| 10000 Hz* | | |
| 15000 Hz* | | |
| 18000 Hz* | | |
| 19000 Hz* | | |

* Measurements above 7 kHz should be made using the 80 kHz Low Pass Filter.

e. Set the ASG 100 for a frequency of 20000 Hz and check for a THD + N of less than 0.056%.

f. Move the XLR connector to the Audio Out Right connector. Set the ASG 100 for a MANUAL R Tone signal and repeat the measurements of parts d and e.

### 7. Check Signal-to-Noise Ratio (>80 dB at 0 dBu at 1 kHz)

a. Move the XLR connector to the Audio Out Left connector.

b. Set the ASG 100 for a MANUAL L Tone output of 1000 Hz at 0 dBu.

c. Set the distortion analyzer for dB RATIO and LEVEL. Select the AUDIO BAND PASS filter.

d. Press SET REF on the distortion analyzer. The reading should now be 0.0.

e. Select SILENCE from the ASG 100.

f. Check that the noise floor is more than 80 dB down from the signal level.

g. Move the XLR connector to the Audio Out Right connector.

h. Set the ASG 100 for a MANUAL R Tone output of 1000 Hz at 0 dBu and repeat parts c through f to check the right channel Signal-to-Noise ratio.

i. Set the ASG 100 to off line and disconnect the signal from the distortion analyzer.

### 8. Check Channel-to-Channel Phase Difference (≤1°, 10 Hz to 20 kHz)

a. Connect the Audio Out Left connector to the CH1 input of the test oscilloscope via an XLR-to-banana adapter cable and BNC-male-to-dual-binding-post-banana-connector adapter. Connect pin 1 of the XLR adapter cable (green) to ground, and connect pin 2 (black) to the + input binding post.

b. Connect the Audio Out Right connector to the CH2 input of the test oscilloscope via an XLR-to-banana adapter cable and BNC-male-to-dual-binding-post-banana-connector adapter. Connect pin 1 of the XLR adapter cable (green) to ground, and connect pin 2 (black) to the + input binding post.

c. Set the test oscilloscope

| | |
|---|---|
| Input Coupling | GND |
| CH 1 and CH 2 VOLTS/DIV | 1 V |
| Trigger SOURCE | CH 2 |
| Trigger MODE | AUTO |
| Vertical MODE | CH 1 and CH 2 |
| Horizontal MODE | A |
| SEC/DIV | 5 µs |

d. SET ASG 100

| | |
|---|---|
| MANUAL | Tone |
| AMPLITUDE | +14.0 dBu |
| FREQUENCY | 20000 Hz |
| ON LINE | On line (LED lit and OUTPUT ≥775 mV(rms) LED flashes) |

e. Adjust the Horizontal POSITION to place the beginning of the sweep on the leftmost vertical graticule line.

f. Adjust the Vertical POSITION of both channels to align the baseline traces with the center horizontal graticule line.

g. Set the Input Coupling to DC (both channels).

h. Set the Trigger MODE to NORM and adjust the Trigger LEVEL so that the zero crossing point of the signal is at the beginning of the trace on the center horizontal graticule line.

i. Press the X10 MAG control of the oscilloscope.

j. Check that the difference between the two channel traces is less than 0.28 horizontal division. $(0.28\ div\ X\frac{36\ deg\ per\ div}{10} = 1.00\ degree)$

k. Set the ASG 100 frequency to 10 Hz and set the oscilloscope to 10 ms (with X10 MAG on). Make sure the trigger point and trace still start at the beginning of the trace on the center horizontal graticule line.

l. Check that the difference between the two channel traces is less than 0.28 horizontal division.

m. Disconnect the test oscilloscope setup.

## 9. Check Loop-Through

a. Provide a test signal of known amplitude (check or set with the rms meter).

b. Apply the test signal to the Audio In Left XLR loop-through input and connect the Audio Out Left connector to an rms voltage meter.

c. Check the test signal for the signal level set in part a.

d. Move the test signal input to the Audio In Right XLR connector and connect the Audio Out Right signal to the rms voltage meter.

e. Check the test signal for the signal level set in part a.

### NOTE

*An additional check of the loop through may be done if considered necessary. Perform a THD + N check of the signal before and after the loop through to verify no additional distortion of the signal occurs and no additional noise is added to the signal.*

## 10. Check SAVE Operation

### NOTE

*If the SAVE feature is enabled, the word "Saved" appears when the SAVE button is pressed. It SAVE is disabled internally, the word "Disabled" appears when the SAVE button is pressed. The SAVE feature must be enabled to perform this check.*

a. Select the MANUAL L Tone signal. Set the Frequency for 2 kHz and the Amplitude for –12 dBu.

b. Press SAVE (the word Saved should appear), then turn off the ASG 100 (off switch on the rear panel).

c. Turn on the ASG 100. When the initialization has completed, press MANUAL.

d. Check that the L Tone signal is selected, the frequency is 2000 Hz, and the amplitude is –12 dBu.

## 11. Check RECORD and Headphones Operation

a. Connect a set of stereo headphones to the front panel HEADPHONES connector and turn the VOLUME control to minimum.

b. Press and release the SILENCE and VOICE buttons at the same time.

c. Check that the recording sequence begins and record a voice test signal for the 4 second recording session. Speak normally about two or three feet from the front of the ASG 100 to record a test message during the recording period.

d. Press VOICE , then ON LINE. Slowly increase the Volume control to a comfortable listening level.

e. Check that the recorded test message is continually repeated while the ASG 100 is on line.

f. Press ON LINE again to turn off the voice test signal.

### 12. Check Audio/Video Timing Control

a. Set the ASG 100 for a MANUAL Tone of 400 Hz.

b. Listen to the signal in the headphones and ground pin 1 of the rear panel remote connector.

c. Check that the output signal turns off when pin 1 is grounded.

d. Unground pin 1 of the remote connector and check that the signal turns on again.

### 13. Check AUTO Test O.33 and Tek Sequences and AUTO TEST LVL Operation

a. Set the ASG 100 for the O.33:01 Auto Test.

**NOTE**

*If the editing is disabled, you will not be able to make edits to the frequency or test levels, and the word "Disabled" appears when the SAVE button is pressed. The SAVE feature must be enabled to perform this check.*

b. Press IDENTIFICATION and edit the displayed text to a new ID.

c. Press AUTO again to return to the O.33:01 display and press and hold the Amplitude button. The message TEST Lev should be displayed. Release the button.

d. Check that the TEST Lev maximum value is +14.0 dBu and its minimum value is –6.0 dBu. Edit the TEST Lev to +1 dBu.

e. Press the AUTO button to return to the top of the menu, then press the SAVE button (Saved message should appear).

f. Reset the ASG 100 by pressing the left and right arrow buttons at the same time.

g. Check that the ASG 100 initializes with the O.33:01 test displayed in the readout window, that the TEST Lev is +1 dBu, and that the Identification is as set in part b.

h. Press the ON LINE button and listen in the headphones for the test sequence to occur and that at the end of the test sequence, the ASG 100 goes off line.

### 14. Check AUTO Test Sweep and SweepLev Operation

a. Set the ASG 100 for the Sweep Auto Test.

b. Press and hold the AMPLITUDE button. The message SweepLev should be displayed. Release the button.

c. Check that the SweepLev maximum value is +24.0 dBu and its minimum value is –90.0 dBu. Edit the SweepLev to +1 dBu.

d. Press the AUTO button to return to the top of the menu, then press the Save button (Saved message should appear).

e. Reset the ASG 100 by pressing the left and right arrow buttons at the same time.

f. Check that the ASG 100 initializes with the Sweep test displayed in the readout window, and that the SweepLev is +1 dBu.

g. Press the ON LINE button and listen in the headphones for the Sweep test sequence to occur and that at the end of the test sequence, the ASG 100 goes off line.

### 15. Check Remote Operation

a. Connect the ASG 100 to an ASCII terminal or PC running terminal communications software. See Appendix A for serial communications setup and remote operation if necessary.

b. Turn the power off and back on again to check the power up messages.

c. Type `?` to obtain the ASG 100 Remote Command Menu.

d. Type `tone l:-4 f:2000 (cr)`. Check that the ASG 100 goes on line with the word Tone displayed.

e. Type `offline (cr)`. Check that the ASG 100 goes off line.

f. Type `tone?`. Check that the returned Tone frequency is 2000 Hz and that the Tone level is –4.0 dBu.

g. Turn off the ASG 100 and disconnect the serial communications cable.

h. Restore any settings and dipswitch positions needed to return the ASG 100 to its needed state for operation and replace the access plate over the dipswitch.

# ADJUSTMENT PROCEDURE

## Preparation

a. Disconnect the power cord from the ASG 100 and remove the top cover of the instrument.

b. Set the switch sections of S1 as follows:

| | |
|---|---|
| PROG0 (section 1) | up (stores factory defaults on power up) |
| PROG1 through PROG3 (sections 2, 3, 4) | up (enables editing and saving) |
| PROG4 (section 5) | up (factory setting) |
| PROG5 (section 6) | down (factory setting) |
| PROG6 (section 7) | up (enables remote control) |
| PROG7 (section 8) | up (enables front panel) |
| MODA and MODB (sections 9, 10) | up (factory settings) |

c. Connect the power cord to the ASG 100 and turn on the power switch. Check that DS1, near the power supply connector, comes on.

d. Set PROG0 of S1 to the down position. This enable the user-settable defaults. With the PROG0 up, the factory defaults are restored at each power on.

## Procedures

### 1. Check Supply Voltages

**Test Equipment Required**

Power Supply (TM500) Digital Multimeter (DM504A)

a. Use the digital multimeter to check the power supply voltages at J23.

| | | |
|---|---|---|
| +15 V | Pin 1 | 14.55 V to 16.5 V (–3%, +10%) |
| –15 V | Pin 6 | –14.25 V to –15.75 V (±5%) |
| +5 V | Pins 2 and 3 | 4.90 V to 5.10 V (±2%) |

b. Check the following supplemental regulated voltages at the points indicated.

| | | |
|---|---|---|
| +12 V | Out Pin of U68 | +12 V ± 0.6 V |
| +12 V | Out Pin of U69 | +12 V ± 0.6 V |
| +5 $V_A$ | Out Pin of U7 | +5 V ± 0.25 V |
| –5 $V_A$ | Out Pin of U8 | –5 V ± 0.25 V |
| –12 V | Out Pin of U70 | –12 V ± 0.6 V |

## 2. Adjust Gain

**Test Equipment Required**

| | |
|---|---|
| Distortion Analyzer (AA5001) | RMS Meter |
| Power Supply (TM500) | Audio Signal Cables (XLR-Male-to-banana-connector) |

a. Connect the ASG 100 Audio Out Right XLR connector to the rms meter via an XLR-to-banana-connector adapter cable. Pin 1 is ground, pin 2 is the +output and pin 3 is the –output of the ASG 100.

b. Set the rms meter to measure rms voltage (unterminated). Use either Auto Range or an appropriate range setting to measure the expected rms voltage.

c. SET ASG 100:

| | |
|---|---|
| MANUAL | R Tone |
| AMPLITUDE | +14.0 dBu |
| FREQUENCY | 1000 Hz |
| ON LINE | On line (LED lit and OUTPUT ≥775 mV(rms) LED flashes) |

d. Adjust the Right Channel Gain potentiometer, R24, for an amplitude of 3.89 volts.

e. Press ON LINE to turn off the test signal (ON LINE LED off).

f. Disconnect the XLR connector from the Audio Out Right connector and move it to the Audio Out Left connector.

g. Set the ASG 100 MANUAL test signal to L Tone and press ON LINE to turn on the test signal.

h. Adjust the Left Channel Gain potentiometer, R26, for an amplitude of 3.89 volts.

i. Press ON LINE to turn off the test signal (ON LINE LED off).

j. Disconnect the test cable from the rms meter.

## 3. Adjust Distortion

a. Connect the XLR-to-banana-connector test cable from the Audio Out Left connector to the distortion analyzer balanced inputs. In the adapter cable, pin 1 (green) is ground, pin 2 (black) is the +output and pin 3 (red) is the –output of the ASG 100.

b. SET Distortion Analyzer:

| | |
|---|---|
| Input Range | AUTO RANGE |
| Function | THD+N |
| Response | RMS |
| Filters | 30 kHz LOW PASS or AUDIO BAND PASS |

c. Set the ASG 100 MANUAL test signal to L Tone and press ON LINE to turn on the test signal.

d. Adjust the Left Channel MSB potentiometer, R28, for minimum THD reading (<0.01 %).

e. Press ON LINE to turn off the test signal (ON LINE LED off).

f. Disconnect the XLR connector from the Audio Out Left connector and move it to the Audio Out Right connector.

g. Set the ASG 100 MANUAL test signal to R Tone and press ON LINE to turn on the test signal.

h. Adjust the Right Channel MSB potentiometer, R27, for minimum THD reading (<0.01 %).

i. Press ON LINE to turn off the test signal (ON LINE LED off) and disconnect the test equipment from the ASG 100.

# Section 5
# THEORY OF OPERATION

## CONTROL PROCESSOR (Diagram 1)

### Front Panel Processor

The front panel processor monitors the front panel buttons, lights the LED indicators as appropriate, produces the character displays in the display window, handles the serial interface processing, and commands the DSP processor to generate the requested signal or sequence.

The processor is a special purpose microprocessor with built in RAM and bit manipulation registers. The built in RAM can be programmed to operate the processor without the need to have further bus accessed to fetch instructions from external RAM. The bit manipulation registers are addressable, 8-bit registers, and the individual bits can be checked, compared, complemented, zeroed, etc., as needed by the task being performed.

The processor also has built in timers. One of these is used to generate the interrupts needed for the front panel scanning that checks for switch presses.

There are three main buses to and from the processor. These are the 16-bit address bus (AD0-AD7 and A8-A15), the 8-bit data bus (AD0-AD7), and the 8-bit control bus (PROG0-PROG5, /DCR and /DSR).

Notice that the lower 8 bits of the address are multiplexed with the data on the AD0-AD7 pins. The data is separated from the address information by address latch U47 when the ALE (address latch enable) bit is high. When the ALE bit is low (/PROG) the data on the bus is valid. The /PSEN control line dictates when the EPROM, U63 is enabled to output data to the data bus. It is also one of the input signals to the address decoder, U49, that are decoded to produce the various enable strobes for the digital devices on the processor buses.

Another bus to the processor is the one that handles the serial communications (/RDX, /TDX, /INT0, /RTS, /CTS, and /RI) and provides the /RD and /WR (read and write) control signals to the devices on the data bus of the processor.

Subsets of the various bus signals are used to communicate with the DSP processor and the front panel character display device.

Crystal Y2 generates the 11.059 MHz operating frequency for the front panel processor.

### Reset Circuit U54 and Inverting Buffer

The Reset circuit delays processor operation until the voltage stabilizes. When the operating voltage reaches a stable level, the reset is removed from the front panel processor allowing it to access its memory for initialization commands. The output of U54 is true low, so an inverter, U40C, provides the necessary logic level to the processor's Reset input.

### Address Latch (Address/Data Demultiplexer)

The eight bits of the data bus, DATA0 through DATA7, are multiplexed with the lower eight bits of the 16 address bits. Multiplexer U47 is enabled by ALE (address latch enable) when the bus has valid address data, and those eight bits are latched. The latched bits plus the remaining eight bits from the unmultiplexed address bus combine to produce the 16-bit addresses on the address bus, ADDR0 through ADDR15.

## RAM

RAM U64 is a static RAM device with a 15-bit Address Bus and an 8-bit Data Bus. The RAM device is connected to a backup battery to hold the stored data in memory during power off. The backup battery makes this RAM a non-volatile device, and it is used to store the user-selectable operating states for the ASG 100. When user selectable defaults are enabled, the state of the instrument on power up is restored from the saved data in this device.

## EPROM

EPROM U63 stores the program memory. The processor gets it operating instructions from this memory device. The EPROM has a 16-bit address bus and an 8-bit data bus. When factory defaults are selected, the state of the instrument on power up is restored from data stored in this device.

## Battery Backup

Level Monitor U62 checks the +5 V line. If the voltage on this line is more that 0.3 V above battery voltage (BATT), the power for operating the static RAM is supplied from the +5 V line. If the +5 V line voltage drops low enough, U62 disables the chip select to the RAM and supplies the holding power for memory from the battery.

When data is to be accessed by the processor, the NVRCE chip select is generated via address decoder U49. Until power comes up to the correct operating level the chip select is disabled through U62.

## Address Decoder

The PAL address decoder, U49, decodes ADDR8 through ADDR15 plus (RESETA), (PSEN), (RD), and (WR) to generate the control signals that address the individual devices on the processor's bus.

**Decoded Signals:**

SW0EN) and (SW1EN) enable switch buffers U51 and U52 when the processors scans the front panel for switch activity

(HPCHEN) and (HPFLEN) are used to control the LED alphanumeric display device (U1 on the front panel)

LEDCLK controls clocking the data about which LED is to be lit into the LED buffer (U50)

(DSPEN), (DSPRST) , and (DSPWR) are used to control communication between the front panel processor and the digital signal processor (U1 on the main board).

(ROMCE) selects the EPROM, U63, for access by the processor.

(NVRCE) selects the RAM, U64, for access by the processor.

## Front Panel Interface

LED driver U50 is an octal D flip-flop register. The processor loads U50 with the LED(s) that are to be lit. There is no physical connection between the front panel button switches and the LED associated with the button. The switches are scanned for presses, and the processor determines the LED that must be turned on and off via its software instructions. Data on the input is transferred to the output on the rising edge of the LEDCLK. A reset signal (RESETA) clears the register at power on and when the front-panel reset button is pressed.

Switch buffers U51 and U52 are read at regular intervals to determine if a front panel button has been pressed. The two, 8-bit buffers share the data bus and are read at different times by the processor. Each buffer has its own enable — SW0EN for U52 and SW1EN for U51. Eight switches on U52 and six on U51 provide the 14 front panel buttons. The remaining two positions on U51 are PROG6 and PROG7, which come from DIP switch S1.

The main board signals are connected to the front panel via a 50-pin connector (J8 on the main board to J1 on the front panel board).

### DIP Switch

DIP switch S1 sets some instrument operating states. This switch may be accessed by removing an instrument side panel. After setting normal operating frequencies and levels, S1 may be set to disable editing and maintain a known operational state. Editing may also be enabled via the remote connector using contact closures to connect pins 6 and 9. While these pins are connected, the normally editable signals may be changed as needed. When the contact is opened to disconnect pins 6 and 9, editing is again controlled by internal switch settings. See Section 2, *Operation and Setup,* for more information on DIP switch settings.

### Remote Connector

Serial interface U67 is a level translator between the serial port and the rear panel remote connector.

When contact closure remote operation is used, just two serial lines are used for remote control: pins 4 and 6. Connecting pin 4 to pin 9 (ground) starts an auto test sequence; connecting pin 6 to pin 9 overrides the internal editing disable if it was set. Overriding the internal editing disable lets you change frequencies, levels, or ID numbers without having to access the internal DIP switch. This remote override is not necessary when editing is enabled, but in normal operation, the ability to edit parameters will usually be disabled after initial setup.

Serial Filter board A8 provides individual EMI filters on each of the remote control lines. These filters keep the ASG 100 from radiating digital noise and also keep external noise from entering via the remote connector.

## DIGITAL SIGNAL PROCESSOR (Diagram 2)

### Digital Signal Processor (DSP)

**Address and Data Buses.** The address and data buses of U1 are not multiplexed. The DSP has a 16-bit address bus (A0 - A15) and a 24-bit data bus (D0 - D23). Three 8-bit EPROM devices are stacked to provide the 24-bit firmware to the DSP. A set of three pull-up resistor packs (R1, R2, R3) are connected to the data bus to pull the data lines high when the lines are not being driven.

**Host Port PB0 - PB14.** The data handled by this port on PB0 - PB7 is 8 bits wide and 8 bytes deep. It allows communication between the DSP and the control processor without the need to do bus request/bus grant data handling. This port is mainly used to handshake control signals between the front panel processor and the DSP. Addressing of the 8 bytes of DSP to write is done by ADDR (0 - 2) from the control processor. The DSP uses the interrupt INT0 to generate an interrupt to the control processor.

**Serial Ports PC0 - PC8.** There are two serial ports. Pins PC0 (RXD), PC1 (TXD), and PC2 (SCLK) are unused, but are available on J310 for testing and future expansion. Serial communications via the remote connector is handled by the front panel processor. The remaining pins (PC3 - PC8) are a synchronous serial port. Output bits from this port are used to drive the data

formatter/synchronizer that shifts digital data to align it properly for the digital-to-analog converters.

Bits SC0, SC1, and SC2 are called flag bits and are used by the address decoder (U12) to determine which device on the serial bus is being addressed. One of the bits, SCK, is the serial bit clock. This bit clocks the serial data in the data formatter/synchronizer and the CODEC, U9. The serial digital data from the CODEC (SRD) is applied to the DSP via pin 42 (PC7). The serial output data line from the DSP is STD (PC8). This data stream is applied to the data formatter/synchronizer to be formatted for application to the digital-to-analog converters.

**Oscillator**. A crystal oscillator device, Y3, produces an 18.432 MHz clock signal that is applied to the EXTAL (external clock input) pin of U1.

## Address Decoder

Address decoder U12 is a programmable array logic device. It has inputs from the DSP and the control register latch. The various chip selects to the devices on the DSP bus are decoded by depending on the state of all the input signals. These control signals are:

1. CODEC: Enables the CODEC device, U9, when an audio signal is being recorded for the audio ID.
2. (CTRL): Clocks the control registers, U10 and U11, to latch new control data for the CH 1 and CH 2 gain, attenuation, and relay states.
3. (PCMLE): Enables the data latches for the left and right digital-to-analog converters, U15 and U14.
4. (CEEXTO), (CEEXT1), and (CEEXT2): Unused signals to J310.
5. (CEROM): Chip enable to the EPROM devices, U2, U3, and U4.
6. (CERAM): Chip enable to the RAM. This signal is applied to the battery backup level monitor, U5. The level monitor acts to prevent the RAM from being enabled and switches to the backup battery when power to the ASG 100 is switched off.

## Control Register Latches

Control signals that select the gain, attenuation, and relay states for the CH 1 and CH 2 signal paths (diagram 4, A2) are latched from the data bus into latches U10 and U11. When control data states must be updated, the DSP places the data on the lower 16 bits of the data bus and generates a (CTRL) clock output from the PAL address decoder, U12. At power up, the (DSPRST) signal from the control processor circuitry goes low to clear the latches to a known state before the DSP writes the correct control data.

## EPROM

The three 64-Kbyte EPROM memory devices, U2, U3, and U4, store the DSP's operating firmware. They are addressed in parallel on the 16-bit address bus, and their 8-bit data bus outputs are stacked to yield the 24-bit word used by the DSP.

## DSP RAM

The DSP RAM, U6, is a 32-Kbyte memory chip. A 15-bit address selects the RAM memory space to be written to or read from. The (DWR) and (DRD) (write and read) signals from the DSP select the direction; the (CEO), also from the DSP via the level monitor, U5, enables the RAM to output or input data on the lower 8 bits of the data bus.

### Battery Backup

The DSP RAM, U6, has its stored memory maintained during power off by a backup battery BT1. A level monitor, U5, controls the CE (chip enable) input to the RAM. When normal power is applied to the monitor, the chip enable signal from the DSP (CERAM) and the +5 V VCCI source are applied to the DSP RAM. When the +5 V power is removed, the level monitor disables the chip select into to the RAM to prevent random writing or reading and applies the backup battery to the RAM to hold the stored data in memory. The RAM is held disabled until power rises to the correct operating level.

### CODEC

During a record session, the 4-second audio signal from the front panel microphone is amplified and level controlled in the Mic Preamp and AGC circuitry (diagram 6, A2). That analog signal is applied to the CODEC device, U9, where is is digitized and output in a serial data stream. The digitized audio signal is processed by the DSP, U1, for storage into RAM U6, a battery-backed memory device. On command from the control processor, the stored digital audio data is retrieved and applied to the digital-to-analog converter (DAC) circuitry where it is converted to an analog signal for output to the CH 1 and CH 2 output connectors.

The clock signal for the digitizing rate of the CODEC is provided by the SCK clock signal developed by the DSP. The CODEC and the DACs run at different rates, but the firmware is programmed to perform sample rate conversion of the sampled audio data.

## DIGITAL-TO-ANALOG CONVERTER (Diagrams 3 and 3a)

### Digital Formatter/Synchronizer

The serial data from the DSP section comes into U66A, pin 2, a D flip-flop used as a data synchronizer. The incoming serial data is synchronized to the PCM clock (PCMCLK) and sent to a shift register consisting of U16, 17, 18, and 19.

The first shift register (U16) takes the 24-bit DSP serial data with trailing zeros and shifts it six places. This gives the data string leading zeros for input to the 18-bit DAC. This six-place shift moves the 24-bit input data to the 18-bit data positions used by the DACs. Data exiting U16 may be jumper configured for either 18-bit or 20-bit data format (18-bit is used).

The U16 18-bit serial data goes two places: to U14 as the input data to the right channel, and; to three more stages of 8-bit shift registers, U17, 18 and 19. These registers shift the data another 24 bits before it goes to the left-channel DAC. The output of the DSP is interleaved right- and left-channel data. The time needed to shift the left-channel data an extra 24 bits allows the left- and right-channel data to arrive at the same time for conversion. Since both DACs (U15, left and U14, right) have their data registers filled at the same time, they both use the same latch enable signal (PCMLE) to latch the data.

### Digital-to-Analog Converters

This section discusses the right channel DAC, U14, and it associated circuitry. The left-channel circuitry (U15, U21) is identical. DAC U14 is an 18-bit digital-to-analog converter. The output is a current signal from pin 13 that has nominal values of ± 1 mA peak. That current is input to the summing node of U20 where it is converted to a voltage signal at the output of U20, pin 10.

The feedback circuit that sets the loop gain of the DAC and the current-to-voltage converter is formed by resistors R24 (an adjustable potentiometer) and R23.

With input data bits equal to 10000, the MSB is one, and the output should be 0 mA. The DAC has a most significant bit adjust potentiometer, R27, called Distortion Adjust. An audio distortion analyzer must be used to set the signal distortion to its minimum value.

## Low-Pass Filters

The signal voltage from U20 is applied to FL3, an 11-pole, low-pass filter with a 23 kHz cutoff. The upper output signal frequency is 20 kHz, but a 23 kHz low-pass filter is used to move the ripple effect of the filter above 20 kHz.

The DAC sends a new output every 1/(48 kHz), which approximates a sine wave. The filter smooths the steps to a sine wave.

The signal then enters buffer amplifier U13A. The buffer has a gain of four to compensate for a 6 dB loss in the filter and to provide the proper operating amplitude. At TP7 the signal is twice the amplitude as it is at U20 pin 10.

## Filter Voltage Reference Regulators

The filters are powered by +12 and –12 volts. The power source is derived from the + and –15 volt supplies by three-terminal regulators U69 and U70.

# CHANNEL 1 AND CHANNEL 2 ATTENUATOR (Diagram 4)

## Step Attenuators

From the output of U13, the signal is applied to a stepped attenuator, U22 (left) and U28 (right). The right channel circuitry is discussed; the left channel is identical.

The signal enters at CH2. It is AC coupled through C99 to remove any DC offset that might be present in the buffer amplifier. The time constant of the AC coupling is very long, and the capacitor does not affect the lower audio frequencies.

### Attenuation Range Steps

The attenuation is done by a string of resistors to ground. Each step or tap of the attenuator is 10 dB lower than the previous step, and there are five steps, making the lowest step of the attenuator at –50 dB. Multiplexer U28 selects the various taps of the attenuator under software control. Operator selection of a dBu range causes the software to locate the appropriate attenuator tap and switch the multiplexer to that tap.

There are two additional taps on the step attenuators. On U22, the left-channel step attenuator (pin 9) has a signal line that sends the output of the right channel step attenuator to the left channel. In effect, the left channel of U22 has the same signal as the right channel, and everything works off of the right-channel DAC. When a stereo signal is required for a stereo test sequence, separate channel signals are generated. The multiplexer selects between S1 and S8 for output, depending on the address sent in the control lines.

### Switching Control Signals

In response to request from the front panel or through the remote control port for a new signal level, the DSP generates the needed switching signals on its data bus. These control signals (CTRL4–CRTL11) are latched into U10 and U11 (diagram 2) where they are held until a different

signal level is called for. The control signals switch the left and right attenuators (U22 and U28) for the needed attenuation step, and set the gain of the left and right channel output buffers. The gain of the buffer stages is controlled by switching in the feedback loop of the amplifiers to produce either 0 dB or +10 dB gain.

## Output Buffers

The output of the multiplexers, U22 left and U28 right, is a step-attenuated sine wave of operator-selected amplitude. The multiplexer output signal goes to the output buffers (U23A and Q2–Q5, left; U29A and Q10–Q13 right).

On the right channel, the first stage of the output buffer is U29A, an op-amp driving a push-pull output stage that is current limited to 50 mA peak (current limit is set by R80 and R79). A 50 mA current through R80 and R79 develops 0.6 V, causing Q10 or Q11 to switch on and divert drive current away from the output transistors (Q12 and Q13). This protects the output transistors from load short circuits. Normal maximum output at unity gain is +14 dBu, which is 1.9457 volts RMS per side. This buffer's output is the plus polarity side of the CH2 differential output.

Inverting amplifiers U23B and Q6–Q9 (left negative) and U29B and Q14–Q17 (right negative) provide the negative side of the differential audio signal to the CH1 and CH2 output connectors. Again on the right channel, at the output of the first buffer, R85 applies the plus polarity output signal to U29B pin 6, the inverting input pin, where it is inverted with unity gain. For example, a 1 V peak, positive-going sine wave out of the first buffer produces a 1 V peak, negative-going sine wave at the output of the second buffer. Together, the two buffers produce the differential audio signal outputs.

### Gain Switching

The feedback for the output buffer goes through either of two FET switches, U25B or C. When U25C is closed (U25B open), unity feedback goes from pin 10 to pin 11 of the multiplexer. The output of the buffer is connected to the summing node, making it a unity gain buffer.

When U25C is open (U25B closed), the feedback is divided by R108 and R107, causing the gain to increase by 10 dB (because it is a non-inverting amplifier, the gain increases by 2.162 plus 1, or 10 dB). This gain is switched in for outputs above +14 dBu.

### Output Impedance Resistor Arrays

The differential output signal from the right output buffer is sent through a resistor array, R167 G and H for the plus and E and F for the minus polarity. These resistors provide the output impedance for the ASG 100. The ASG 100 is shipped from the factory with 10 Ω resistors in these circuits (5 Ω in each half because they are paralleled). That resistance is in series with ≈0.8 Ω in the EMI filters on each differential output line, so the overall output impedance is ≈12 Ω.

Resistor arrays R168 and R173 are sets of 600 Ω resistors. If the application needs 600 Ω output impedance instead of 12 Ω, the 600 Ω resistor arrays are used to configure the ASG 100 for 600 Ω output impedance. Custom output impedances may be made for other applications, see Section 2, *Operation and Setup,* for more information on output impedance.

## Relay Driver

### Output Switching Relays

After passing through the output load resistors, the differential signal goes to a set of relays (K2 on the right channel, K5 on the left). With the relay enabled, the generated signal is connected to the output jacks (J14 on the right channel). With the relay disabled, the audio on J13 is routed directly to the output at J14.

In broadcasting, much of the time the program signal is routed straight through the ASG 100 (the signal generated by the ASG 100 is not used). To perform a test, the user touches the ON-LINE button. Relays energize and re-route the output to the signal generator circuitry rather than to the incoming program signal. The test or tones the ASG 100 has been configured to send are then sent on the audio signal line.

If the tone being sent is one of the AUTO TEST sequences, when the sequence is complete, the ASG 100 automatically switches off line and program audio is switched on line. When the output switching relay is not energized, the user's input signal is passed through. This prevents interruptions to the user's signal if the ASG 100 loses power or is switched off.

#### EMI Filters

A choke and a capacitor in series with the relay coils help reduce high frequency interference. Other filter devices consist of ferrite beads and bypass capacitors to ground in series with the outputs and inputs. These devices also reduce radiated EMI from the remote connector on the ASG 100 rear panel.

#### Control Signals (CTRL0–CRTL3)

A relay driver IC, U27, converts logic signals from the DSP to voltages that actuate output switching relays. The control signals that run the relays and step the multiplexers enter through the CTRL (0-15) bus from latches U10 and U11, diagram 2.

#### PREVIEW (CRTL12)

The PREVIEW signal is used to switch the headphone output off during recording of the VOICE identification.

## HEADPHONE AMPLIFIER (Diagram 5)

### Input Differential to Single-Ended Amplifiers

Two buffers receive the CH1PHO and CH2PHO differential signals and convert them to single-ended outputs. The left-channel buffer is U35A (channel 1) and the right-channel buffer is U38A (channel 2). The single-ended output is routed to the headphone jack, where it allows the user to monitor the feed-through audio instead of the ASG 100 output tones.

### Signal/Preview Multiplexer

The buffer outputs (on pin 1) are routed to a multiplexer, U41, for signal selection between Norm and Preview. At this time the Preview signal is used only to send Silence to the headphones when making a VOICE identification recording.

### Channel 1 and Channel 2 Voltage Controlled Amplifiers

Multiplexer outputs are passed to DBX voltage-controlled amplifiers U33 and U36. The DC control level (AUD_LEVEL) enters at the lower left-hand corner of the schematic. The front panel volume control potentiometer, R5 (diagram 7), swings the voltage between ±15 V. The voltage is buffered and filtered by U39.

The AUD_LEVEL voltage is by series resistor R132 and capacitor C51. This circuit produces a large time constant filtering action that keeps digital signals and high frequency noise from entering the DC control line.

#### Audio Level Control Buffer

At the output of U39, the DC control range is +0.48 V to –0.12 V. The +0.48 V corresponds to an attenuation of 80 dB when the volume control is rotated fully counterclockwise. When the DC voltage is –0.12 volts, the voltage-controlled amplifier, U36, has a gain of 20 dB that sets the headphone volume range.

### Current-to-Voltage Amplifiers

The signal output of the U36 is a current that is sent to U38B and converted to a voltage. The voltage passes through series resistor R118 to drive the right side of the headphones.

The purpose of R118 is to equalize the gain difference between low- and high-impedance headphones.

### Preview Termination Transistors

In Normal, the PREV1 and PREV2 signals are terminated by Q18 and Q19. The low PREVIEW control signal is inverted by U40A, and the high NORM signal forward biases Q18 and Q10. With these transistors on, the PREV1 and PREV2 signals are shunted to ground through the transistors. In Preview, Q18 and Q19 are biased off, and the PREV1 and PREV2 signals are switched to the input of the headphone amplifiers, U33 and U36. The current use for this Preview circuit is to send Silence to the headphones during VOICE recording. In Normal, either the ASG 100 output signal or the program signal is applied to the headphones.

## MICROPHONE PREAMPLIFIER (Diagram 6)

### Microphone Input Amplifier

In the preamp and AGC part of the microphone circuitry, the front-panel microphone connects to the main board via J7. Input amplifier U42B provides relatively low-level amplification for the microphone input signal (about 12.4 dB). The gain of this stage is low to reduce extra background noise, so the user must speak directly into the microphone to record the VOICE identification signal with good amplitude.

A 5.1 V Zener diode (VR3 through resistor R137) connected to the microphone input supplies voltage to power the FET amplifier inside the condenser microphone.

### AGC and Output Amplifier

The output of the microphone preamp (U42B pin 7) is applied to U46A, an AGC (automatic gain control) circuit. The AGC circuit operates with op-amp U42A to convert the signal current to a voltage.

The feedback loop of U42A has two series resistors a 10 µF capacitor to ground from the center of the two series resistors. The feedback network gives the AGC circuit unity gain at DC for its bias. The 10-µF capacitor bypasses any audio AC to ground. This forces the audio signal to pass through the AGC circuit for gain control while allowing DC to pass through the RC network to bias the op-amp. The audio output of U42A to the CODEC, U9 diagram 2, is 1 V rms and is capacitively coupled via C70.

The AGC circuit uses a pair of back-to-back clamps, (VR4 and VR5) in the feedback path to prevent a large voltage overshoot that can be generated by abrupt volume changes. Without the clamps, the voltage overshoot can overdrive the CODEC.

## POWER DISTRIBUTION (Diagram 6)

The power supply module, A3, provides + and –15 V and +5 V to the main board via J23. From the +15 V supply, three-terminal regulator U68 develops +12 V for the RS-232 serial port device, U67 in diagram 1. The +15 V supply provides power to a three-terminal regulator, U7, that develops the analog +5 V supply, and the –15 V supply provides power to three-terminal regulator U8. That device develops the analog –5 V. These analog voltages run the DACs (U14 and U15) and the high-speed op-amp of the CODEC, U9 in diagram 2. The +5 V digital supply is filtered and decoupled by C108 and C69. An indicator LED, DS1, on the +5 V supply line is lit to show at a glance that the +5 V supply is active. The decoupling capacitors for the supplies are indicated.

## FRONT PANEL (Diagram 7)

Volume Control R5 adjusts the headphone volume, but has no affect on test signal output.

The front panel processor loads display data and addresses display device U1, on the processor data and address bus. A subset of addresses, (ADDR0 — ADDR4) are used to address the display. The eight data bus lines are used to transfer display data to U1.

Microphone MK1 provides the audio test signal that is digitized for transmission later either when VOICE ID is selected ON LINE or during an auto test when VOICE ID is part of the selected automatic test sequence.

The LEDs associated with the front panel buttons are not directly connected. The data to control LED lighting is provided from the front panel processor via a buffer (U50, schematic page 1).

The 14 front panel buttons are buffered to the front-panel processor by U51 and U52 (diagram 1). These buffers are read at intervals to check for button presses. Each button press is interpreted by programing instructions.

The main board interconnect (J1) provides 50 pins that interconnect the front panel to the main board.

## SERIAL FILTER BOARD (Diagram 8)

The serial filter board provides an EMI filter on each of the 8 lines of the remote control serial interface lines. These filters reduce the conducted radiation (through the serial interface) of high-frequency components.

## POWER SUPPLY (No diagram provided)

The power supply is a high-efficiency switching supply. It produces regulated outputs of +15V, –15V and +5V. A protection fuse is located at the input of the power supply board. The power distribution and decoupling circuits shown on schematic page 6 provide further filtering and regulated +12V and +5V from the power supply's +15V supply line. A –5V supply is developed by a regulator on the power supply's –15 V line.

# Section 6
# Replaceable Electrical Parts

This section contains a list of the components that are replaceable for the ASG 100. Use this list to identify and order replacement parts. There is a separate Replaceable Electrical Parts list for each instrument.

## Parts Ordering Information

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

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available and to give you the benefit of the latest circuit improvements. Therefore, when ordering parts, it is important to include the following information in your order.

- Part number
- Instrument type or model number
- Instrument serial number
- Instrument modification number, if applicable

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

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

## Using the Replaceable Electrical Parts List

The tabular information in the Replaceable Electrical Parts list is arranged for quick retrieval. Understanding the structure and features of the list will help you find all of the information you need for ordering replaceable parts.

### Cross Index–Mfr. Code Number to Manufacturer

The Mfg. Code Number to Manufacturer Cross Index for the electrical parts list is located immediately after this page. The cross index provides codes, names, and addresses of manufacturers of components listed in the electrical parts list.

### Abbreviations

Abbreviations conform to American National Standards Institute (ANSI) standard Y1.1.

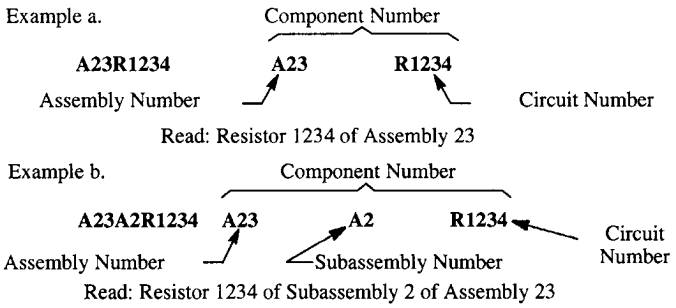
### List of Assemblies

A list of assemblies can be found at the beginning of the electrical parts list. The assemblies are listed in numerical order. When the complete component number of a part is known, this list will identify the assembly in which the part is located.

# Column Descriptions

**Component No. (Column 1)**

The component circuit number appears on the diagrams and circuit board illustrations, located in the diagrams section. Assembly numbers are also marked on each diagram and circuit board illustration, in the Diagram section and on the mechanical exploded views, in the mechanical parts list. The component number is obtained by adding the assembly number prefix to the circuit number.




The electrical parts list is arranged by assemblies in numerical sequence (A1, with its subassemblies and parts, precedes A2, with its subassemblies and parts).

Mechanical subparts to the circuit boards are listed in the electrical parts list. These mechanical subparts are listed with their associated electrical part (for example, fuse holder follows fuse).

Chassis-mounted parts and cable assemblies have no assembly number prefix and are located at the end of the electrical parts list.

**Tektronix Part No. (Column 2)**

Indicates part number to be used when ordering replacement part from Tektronix.

**Serial/Assembly No. (Column 3 and 4)**

Column three (3) indicates the serial or assembly number at which the part was first used. Column four (4) indicates the serial or assembly number at which the part was removed. No serial or assembly number entered indicates part is good for all serial numbers.

**Name and Description (Column 5)**

An item name is separated from the description by a colon (:). Because of space limitations, an item name may sometimes appear as incomplete. Use the U.S. Federal Catalog handbook H6-1 for further item name identification.

The mechanical subparts are shown as *ATTACHED PARTS* / *END ATTACHED PARTS* or *MOUNTING PARTS* / *END MOUNTING PARTS* in column five (5).

**Mfr. Code (Column 6)**

Indicates the code number of the actual manufacturer of the part. (Code to name and address cross reference can be found immediately after this page.)

**Mfr. Part No. (Column 7)**

Indicates actual manufacturer's part number.

# CROSS INDEX – MFR. CODE NUMBER TO MANUFACTURER

| Mfr. Code. | Manufacturer | Address | City, State, Zip Code |
|---|---|---|---|
| 00853 | SANGAMO WESTON INC<br>COMPONENTS DIV | SANGAMO RD<br>PO BOX 128 | PICKENS SC 29671–9716 |
| 01121 | ALLEN–BRADLEY CO<br>INDUSTRIAL CONTROL PRODUCTS | 1201 S 2ND ST | MILWAUKEE WI 53204–2410 |
| 04222 | AVX CERAMICS<br>DIV OF AVX CORP | 19TH AVE SOUTH<br>P O BOX 867 | MYRTLE BEACH SC 29577 |
| 05397 | UNION CARBIDE CORP<br>MATERIALS SYSTEMS DIV | 11901 MADISON AVE | CLEVELAND OH 44101 |
| 05828 | GENERAL INSTRUMENT CORP<br>GOVERNMENT SYSTEMS DIV | 600 W JOHN ST | HICKSVILLE NY 11802 |
| 07716 | TRW INC<br>TRW IRC FIXED RESISTORS/BURLINGTON | 2850 MT PLEASANT AVE | BURLINGTON IA 52601 |
| 09922 | BURNDY CORP | RICHARDS AVE | NORWALK CT 06852 |
| 0B0A9 | DALLAS SEMICONDUCTOR CORP | 4350 BELTWOOD PKWY SOUTH | DALLAS TX 75244 |
| 22526 | BERG ELECTRONICS INC (DUPONT) | 857 OLD TRAIL RD | ETTERS PA 17319 |
| 24165 | SPRAGUE ELECTRIC CO | 267 LOWELL ROAD | HUDSON NH 03051 |
| 24546 | DALE ELECTRONICS<br>A VISHAY INTERTECHNOLOGY INC CO | 550 HIGH ST | BRADFORD PA 16701–3737 |
| 26364 | COMPONENTS CORP | 6 KINSEY PLACE | DENVILLE NJ 07834–2611 |
| 27014 | NATIONAL SEMICONDUCTOR CORP | 2900 SEMICONDUCTOR DR | SANTA CLARA CA 95051–0606 |
| 32997 | BOURNS INC<br>TRIMPOT DIV | 1200 COLUMBIA AVE | RIVERSIDE CA 92507–2114 |
| 34361 | OMRON ELECTRONICS INC. | | SUNNYVALE CA |
| 51406 | MURATA ERIE NORTH AMERICA INC<br>HEADQUARTERS AND GEORGIA OPERATIONS | 2200 LAKE PARK DR | SMYRNA GA 30080 |
| 53387 | MINNESOTA MINING MFG CO | PO BOX 2963 | AUSTIN TX 78769–2963 |
| 54473 | MATSUSHITA ELECTRIC CORP OF AMERICA | ONE PANASONIC WAY<br>PO BOX 1501 | SECAUCUS NJ 07094–2917 |
| 54583 | TDK ELECTRONICS CORP | 12 HARBOR PARK DR | PORT WASHINGTON NY 11550 |
| 55680 | NICHICON /AMERICA/ CORP | 927 E STATE PKY | SCHAUMBURG IL 60195–4526 |
| 57027 | INTERNATIONAL RESISTIVE PRODUCTS INC | 4222 S STAPLES | CORPUS CHRISTI TX 78411–2702 |
| 57668 | ROHM CORP | 8 WHATNEY<br>PO BOX 19515 | IRVINE CA 92713 |
| 78488 | STACKPOLE CORP THE | 201 STACKPOLE ST | ST MARYS PA 15857–1401 |
| 80009 | TEKTRONIX INC | 14150 SW KARL BRAUN DR<br>PO BOX 500 | BEAVERTON OR 97077–0001 |
| 81855 | EAGLE–PICHER INDUSTRIES INC<br>ELECTRONICS DIV | COUPLES DEPT C AND PORTER STS<br>PO BOX 47 | JOPLIN MO 64801 |
| 82389 | SWITCHCRAFT INC<br>SUB OF RAYTHEON CO | 5555 N ELSTRON AVE | CHICAGO IL 60630–1314 |
| 86928 | SEASTROM MFG CO INC | 701 SONORA AVE | GLENDALE CA 91201–2431 |
| 91506 | AUGAT IPD | 452 JOHN DIETSCH BLVD<br>PO BOX 2510 | ATTLEBORO FALLS MA 02763 |
| 91637 | DALE ELECTRONICS INC | 2064 12TH AVE<br>PO BOX 609 | COLUMBUS NE 68601–3632 |
| 93907 | TEXTRON INC<br>CAMCAR DIV | 600 18TH AVE | ROCKFORD IL 61108–5181 |
| 98159 | RUBBER TECK INC | 19115 HAMILTON AVE<br>PO BOX 389 | GARDENA CA 90247 |
| TK0768 | SUPERTEX INC | 1225 BORDEAUX DRIVE | SUNNYVALE CA 94086 |
| TK1345 | ZMAN & ASSOCIATES | | |
| TK1450 | TOKYO COSMOS ELECTRIC CO LTD | 2–268 SOBUDAI ZAWA | KANAGAWA 228 JAPAN |
| TK2058 | TDK CORPORATION OF AMERICA | 2055 GATEWAY PLACE<br>SUITE 200 | SAN JOSE CA 95110 |

## Replaceable Electrical Parts

| Component Number | Tektronix Part Number | Serial / Assembly Number Effective | Discontinued | Name & Description | Mfr. Code | Mfr. Part Number |
|---|---|---|---|---|---|---|
| A1 | 671-1763-00 | | | CIRCUIT BD ASSY:FRONT PANEL | 80009 | 671-1763-00 |
| A2 | 671-1758-00 | B010100 | B010107 | CIRCUIT BD ASSY:MAIN | 80009 | 671-1758-00 |
| A2 | 671-1758-01 | B010108 | B010123 | CIRCUIT BD ASSY:MAIN | 80009 | 671-1758-01 |
| A2 | 671-1758-02 | B010124 | B010231 | CIRCUIT BD ASSY:MAIN | 80009 | 671-1758-02 |
| A2 | 671-1758-03 | B010232 | B010409 | CIRCUIT BD ASSY:MAIN | 80009 | 671-1758-03 |
| A2 | 671-1758-04 | B010410 | B020649 | CIRCUIT BD ASSY:MAIN | 80009 | 671-1758-04 |
| A2 | 671-1758-05 | B020650 | B031031 | CIRCUIT BD ASSY:MAIN | 80009 | 671-1758-05 |
| A2 | 671-1758-06 | B031032 | B031126 | CIRCUIT BD ASSY:MAIN | 80009 | 671-1758-06 |
| A2 | 671-1758-07 | B031127 | B031760 | CIRCUIT BD ASSY:MAIN | 80009 | 671-1758-07 |
| A2 | 671-1758-08 | B031761 | B039999 | CIRCUIT BD ASSY:MAIN | 80009 | 671-1758-08 |
| A2 | 671-1758-09 | B040000 | | CIRCUIT BD ASSY:MAIN | 80009 | 671-1758-09 |
| A3 | 119-4112-00 | | | POWER SUPPLY:SWING,AUTO IN 85-264VAC, 47-440HZ,OUT 5VDC 5A,+15V 2A, -15V 0.5A | 80009 | 119-4112-00 |
| A4 | 671-2106-00 | | | CIRCUIT BD ASSY:SERIAL FILTER | 80009 | 671-2106-00 |
| A1 | 671-1763-00 | | | CIRCUIT BD ASSY:FRONT PANEL | 80009 | 671-1763-00 |
| A1C1 | 281-0775-01 | | | CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL | 04222 | SA105E104MAA |
| A1C2 | 281-0775-01 | | | CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL | 04222 | SA105E104MAA |
| A1C3 | 290-1271-00 | | | CAP,FXD ALUM:3300UF,20%,10V,0.492 X 1.575;AXIAL,BULK | 80009 | 290-1271-00 |
| A1DS1 | 150-1259-00 | | | DIO,OPTO:LED;YEL,585NM,3.0VF @ 10MA;HLMP-1819 | 80009 | 150-1259-00 |
| A1DS2 | 150-1258-00 | | | DIO,OPTO:LED;GRN,569NM,3.0VF @ 10MA;HLMP-1840 | 80009 | 150-1258-00 |
| A1J1 | 174-2266-00 | | | CA ASSY,SP,ELEC:RBN;IDC,50,28 AWG,3.0 L,2X25 PCB X 2X25 RCPT 0.1 CTR,ACCOM 0.025 SQ PIN | 80009 | 174-2266-00 |
| A1J2 | 131-0608-00 | | | TERM,PIN:0.365 L X 0.025 BRZ GLD PL<br>(QUANTITY 2) | 80009 | 131-0608-00 |
| A1MK1 | 119-4087-00 | | | MICROPHONE: | 80009 | 119-4087-00 |
| A1R1 | 307-0542-00 | | | RES NTWK,FXD,FI:(5)10K OHM,5%,0.125W | 01121 | 106A103OR706A103 |
| A1R2 | 307-0542-00 | | | RES NTWK,FXD,FI:(5)10K OHM,5%,0.125W | 01121 | 106A103OR706A103 |
| A1R3 | 307-0594-00 | | | RES NTWK,FXD,FI:(8)220 OHM,2%,0.125W | 80009 | 307-0594-00 |
| A1R4 | 307-0542-00 | | | RES NTWK,FXD,FI:(5)10K OHM,5%,0.125W | 01121 | 106A103OR706A103 |
| A1R5 | 311-2482-00 | | | RES,VAR,NONWW:100K OHM,20%,0.25 W,LIN | 80009 | 311-2482-00 |
| A1R6 | 315-0221-00 | | | RES,FXD,FILM:220 OHM,5%,0.25W | 80009 | 315-0221-00 |
| A1R7 | 307-0793-00 | 671-1763-00 | 671-1763-00 | RES,FXD,CMPSN:0.5 OHM,5%,0.5W | 57668 | TR50J-E0E5E |
| A1R7 | 308-0793-00 | 671-1763-00 | | RES,FXD:0.51 OHM,5%,1WTC=150PPM/DEG C,MI T&R | 80009 | 308-0793-00 |
| A1S1 | 260-2384-00 | | | SW,PUSH:SPST;MOM,NO,100 GRM FRC,COND RBR CONT,RED LED,W/KEYCAP;HL20-LSR | 80009 | 260-2384-00 |
| | | | | *ATTACHED PARTS* | | |
| | 366-0671-00 | | | PUSH BTN:W/LENS,HL20-1101 | 80009 | 366-0671-00 |
| | | | | *END ATTACHED PARTS* | | |
| A1S2 | 260-2442-00 | | | SW,PUSH:SPST;MOM,NO,100 GRM FRC,COND RBR CONT,GRN LED,W/KEYCAP;HL20-LSG | 80009 | 260-2442-00 |
| | | | | *ATTACHED PARTS* | | |
| | 366-0671-00 | | | PUSH BTN:W/LENS,HL20-1101 | 80009 | 366-0671-00 |
| | | | | *END ATTACHED PARTS* | | |
| A1S3 | 260-2442-00 | | | SW,PUSH:SPST;MOM,NO,100 GRM FRC,COND RBR CONT,GRN LED,W/KEYCAP;HL20-LSG | 80009 | 260-2442-00 |
| | | | | *ATTACHED PARTS* | | |
| | 366-0671-00 | | | PUSH BTN:W/LENS,HL20-1101 | 80009 | 366-0671-00 |
| | | | | *END ATTACHED PARTS* | | |
| A1S4 | 260-2442-00 | | | SW,PUSH:SPST;MOM,NO,100 GRM FRC,COND RBR CONT,GRN LED,W/KEYCAP;HL20-LSG | 80009 | 260-2442-00 |
| | | | | *ATTACHED PARTS* | | |
| | 366-0671-00 | | | PUSH BTN:W/LENS,HL20-1101 | 80009 | 366-0671-00 |
| | | | | *END ATTACHED PARTS* | | |

| Component Number | Tektronix Part Number | Serial / Assembly Number Effective | Discontinued | Name & Description | Mfr. Code | Mfr. Part Number |
|---|---|---|---|---|---|---|
| A1S5 | 260-2442-00 | | | SW,PUSH:SPST;MOM,NO,100 GRM FRC,COND RBR CONT,GRN LED,W/KEYCAP;HL20-LSG | 80009 | 260-2442-00 |
| | | | | *ATTACHED PARTS* | | |
| | 366-0671-00 | | | PUSH BTN:W/LENS,HL20-1101 | 80009 | 366-0671-00 |
| | | | | *END ATTACHED PARTS* | | |
| A1S6 | 260-2442-00 | | | SW,PUSH:SPST;MOM,NO,100 GRM FRC,COND RBR CONT,GRN LED,W/KEYCAP;HL20-LSG | 80009 | 260-2442-00 |
| | | | | *ATTACHED PARTS* | | |
| | 366-0671-00 | | | PUSH BTN:W/LENS,HL20-1101 | 80009 | 366-0671-00 |
| | | | | *END ATTACHED PARTS* | | |
| A1S7 | 260-2300-00 | | | SW,PUSH:SPST,25MA,15VAC | 34361 | B3F1152 |
| | | | | *ATTACHED PARTS* | | |
| | 366-0716-00 | | | PUSH BTN: | 80009 | 366-0716-00 |
| | | | | *END ATTACHED PARTS* | | |
| A1S8 | 260-2300-00 | | | SW,PUSH:SPST,25MA,15VAC | 34361 | B3F1152 |
| | | | | *ATTACHED PARTS* | | |
| | 366-0716-00 | | | PUSH BTN: | 80009 | 366-0716-00 |
| | | | | *END ATTACHED PARTS* | | |
| A1S9 | 260-2300-00 | | | SW,PUSH:SPST,25MA,15VAC | 34361 | B3F1152 |
| | | | | *ATTACHED PARTS* | | |
| | 366-0716-00 | | | PUSH BTN: | 80009 | 366-0716-00 |
| | | | | *END ATTACHED PARTS* | | |
| A1S10 | 260-2300-00 | | | SW,PUSH:SPST,25MA,15VAC | 34361 | B3F1152 |
| | | | | *ATTACHED PARTS* | | |
| | 366-0716-00 | | | PUSH BTN: | 80009 | 366-0716-00 |
| | | | | *END ATTACHED PARTS* | | |
| A1S11 | 260-2300-00 | | | SW,PUSH:SPST,25MA,15VAC | 34361 | B3F1152 |
| | | | | *ATTACHED PARTS* | | |
| | 366-0716-00 | | | PUSH BTN: | 80009 | 366-0716-00 |
| | | | | *END ATTACHED PARTS* | | |
| A1S12 | 260-2300-00 | | | SW,PUSH:SPST,25MA,15VAC | 34361 | B3F1152 |
| | | | | *ATTACHED PARTS* | | |
| | 366-0716-00 | | | PUSH BTN: | 80009 | 366-0716-00 |
| | | | | *END ATTACHED PARTS* | | |
| A1S13 | 260-2300-00 | | | SW,PUSH:SPST,25MA,15VAC | 34361 | B3F1152 |
| | | | | *ATTACHED PARTS* | | |
| | 366-0716-00 | | | PUSH BTN: | 80009 | 366-0716-00 |
| | | | | *END ATTACHED PARTS* | | |
| A1S14 | 260-2300-00 | | | SW,PUSH:SPST,25MA,15VAC | 34361 | B3F1152 |
| | | | | *ATTACHED PARTS* | | |
| | 366-0716-00 | | | PUSH BTN: | 80009 | 366-0716-00 |
| | | | | *END ATTACHED PARTS* | | |
| A1U1 | 150-1253-00 | | | DIO,OPTO:DSPL;GRN,5BY7,8 DIG-IT,CMOS,RAM,ASCII DCDR;HDSP-2113 | 80009 | 150-1253-00 |
| A2 | 671-1758-00 | B010100 | B010107 | CIRCUIT BD ASSY:MAIN | 80009 | 671-1758-00 |
| A2 | 671-1758-01 | B010108 | B010123 | CIRCUIT BD ASSY:MAIN | 80009 | 671-1758-01 |
| A2 | 671-1758-02 | B010124 | B010231 | CIRCUIT BD ASSY:MAIN | 80009 | 671-1758-02 |
| A2 | 671-1758-03 | B010232 | B010409 | CIRCUIT BD ASSY:MAIN | 80009 | 671-1758-03 |
| A2 | 671-1758-04 | B010410 | B020649 | CIRCUIT BD ASSY:MAIN | 80009 | 671-1758-04 |
| A2 | 671-1758-05 | B020650 | B031031 | CIRCUIT BD ASSY:MAIN | 80009 | 671-1758-05 |
| A2 | 671-1758-06 | B031032 | B031126 | CIRCUIT BD ASSY:MAIN | 80009 | 671-1758-06 |
| A2 | 671-1758-07 | B031127 | B031760 | CIRCUIT BD ASSY:MAIN | 80009 | 671-1758-07 |
| A2 | 671-1758-08 | B031761 | B039999 | CIRCUIT BD ASSY:MAIN | 80009 | 671-1758-08 |
| A2 | 671-1758-09 | B040000 | | CIRCUIT BD ASSY:MAIN | 80009 | 671-1758-09 |
| A2BT1 | 146-0049-00 | | | BTRY,STORAGE:3.5V,750MAH | 81855 | LIC-7P |
| A2C3 | 281-0775-02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C4 | 281-0775-02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X | 04222 | SA205C104MAA |

## Replaceable Electrical Parts

| Component Number | Tektronix Part Number | Serial / Assembly Number Effective | Discontinued | Name & Description | Mfr. Code | Mfr. Part Number |
|---|---|---|---|---|---|---|
| A2C5 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C6 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C7 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C8 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C9 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C11 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C12 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C13 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C14 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C15 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C16 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C21 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C22 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C23 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C24 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C25 | 290–0974–00 | | | CAP,FXD,ELCTLT:10UF,20%,50VDC | 55680 | UVX1H100MAA |
| A2C26 | 290–0974–00 | | | CAP,FXD,ELCTLT:10UF,20%,50VDC | 55680 | UVX1H100MAA |
| A2C27 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C28 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C29 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C30 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C31 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C32 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C34 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C35 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C36 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C37 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C38 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C39 | 283–0599–00 | | | CAP,FXD,MICA DI:98PF,5%,500V | 80009 | 283–0599–00 |
| A2C40 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C41 | 283–0642–00 | | | CAP,FXD,MICA DI:33PF,2%,500V,0.370 X 0.340;RDL | 00853 | D105E330G0 |
| A2C42 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |

| Component Number | Tektronix Part Number | Serial / Assembly Number Effective | Discontinued | Name & Description | Mfr. Code | Mfr. Part Number |
|---|---|---|---|---|---|---|
| A2C43 | 290–0848–00 | | | CAP,FXD,ALUM:47UF,+100%–20%,16V,0.681 X 0.414;RDL | 80009 | 290–0848–00 |
| A2C45 | 283–0599–00 | | | CAP,FXD,MICA DI:98PF,5%,500V | 80009 | 283–0599–00 |
| A2C46 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C47 | 283–0642–00 | | | CAP,FXD,MICA DI:33PF,2%,500V,0.370 X 0.340;RDL | 00853 | D105E330G0 |
| A2C48 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C49 | 290–0848–00 | | | CAP,FXD,ALUM:47UF,+100%–20%,16V,0.681 X 0.414;RDL | 80009 | 290–0848–00 |
| A2C51 | 290–0990–00 | | | CAP,FXD,ELCTLT:10UF,20%,50V | 80009 | 290–0990–00 |
| A2C52 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C53 | 290–0848–00 | | | CAP,FXD,ALUM:47UF,+100%–20%,16V,0.681 X 0.414;RDL | 80009 | 290–0848–00 |
| A2C54 | 290–0973–00 | | | CAP,FXD,ELCTLT:100UF,20%,25VDC | 24165 | 513D107M025BB4D |
| A2C55 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C56 | 290–0778–00 | | | CAP,FXD,ALUM:1UF,20%,50V,5 X 11 MM;RDL | 54473 | ECE–A50N1 |
| A2C57 | 281–0765–00 | | | CAP,FXD,CER DI:100PF,5%,100V | 04222 | SA102A101JAA |
| A2C59 | 290–0891–00 | | | CAP,FXD,ELCTLT:1UF,+75 –10%,50V | 24165 | 513D105M063JA4D |
| A2C60 | 290–0891–00 | | | CAP,FXD,ELCTLT:1UF,+75 –10%,50V | 24165 | 513D105M063JA4D |
| A2C61 | 290–0974–00 | | | CAP,FXD,ELCTLT:10UF,20%,50VDC | 55680 | UVX1H100MAA |
| A2C62 | 290–0891–00 | | | CAP,FXD,ELCTLT:1UF,+75 –10%,50V | 24165 | 513D105M063JA4D |
| A2C63 | 290–0891–00 | | | CAP,FXD,ELCTLT:1UF,+75 –10%,50V | 24165 | 513D105M063JA4D |
| A2C64 | 290–0974–00 | | | CAP,FXD,ELCTLT:10UF,20%,50VDC | 55680 | UVX1H100MAA |
| A2C65 | 283–0167–00 | | | CAP,FXD,CER DI:0.1UF,10%,100V | 80009 | 283–0167–00 |
| A2C66 | 290–0974–00 | | | CAP,FXD,ELCTLT:10UF,20%,50VDC | 55680 | UVX1H100MAA |
| A2C67 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C68 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C69 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C70 | 290–0891–00 | | | CAP,FXD,ELCTLT:1UF,+75 –10%,50V | 24165 | 513D105M063JA4D |
| A2C71 | 281–0819–00 | | | CAP,FXD,CER:MLC;33 PF,5%,50V,0.100 X 0.170;AXIAL,MI | 04222 | SA102A330JAA |
| A2C72 | 281–0819–00 | | | CAP,FXD,CER:MLC;33 PF,5%,50V,0.100 X 0.170;AXIAL,MI | 04222 | SA102A330JAA |
| A2C77 | 290–0950–00 | 671–1758–00 | 671–1758–03 | CAP,FXD,ELCTLT:100UF,+50–20%,50WVDC | 80009 | 290–0950–00 |
| A2C78 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C79 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C80 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C81 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C82 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C83 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C84 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C85 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C86 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C87 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |

| Component Number | Tektronix Part Number | Serial / Assembly Number Effective | Discontinued | Name & Description | Mfr. Code | Mfr. Part Number |
|---|---|---|---|---|---|---|
| A2C88 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C89 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C93 | 283–0359–00 | | | CAP,FXD,CER DI:1000PF,10%,200V | 04222 | SR212A102KAA |
| A2C94 | 281–0765–00 | | | CAP,FXD,CER DI:100PF,5%,100V | 04222 | SA102A101JAA |
| A2C95 | 281–0765–00 | | | CAP,FXD,CER DI:100PF,5%,100V | 04222 | SA102A101JAA |
| A2C96 | 281–0765–00 | | | CAP,FXD,CER DI:100PF,5%,100V | 04222 | SA102A101JAA |
| A2C97 | 290–0990–00 | | | CAP,FXD,ELCTLT:10UF,20%,50V | 80009 | 290–0990–00 |
| A2C98 | 281–0765–00 | | | CAP,FXD,CER DI:100PF,5%,100V | 04222 | SA102A101JAA |
| A2C99 | 290–0990–00 | | | CAP,FXD,ELCTLT:10UF,20%,50V | 80009 | 290–0990–00 |
| A2C100 | 281–0765–00 | | | CAP,FXD,CER DI:100PF,5%,100V | 04222 | SA102A101JAA |
| A2C101 | 281–0765–00 | | | CAP,FXD,CER DI:100PF,5%,100V | 04222 | SA102A101JAA |
| A2C102 | 283–0642–00 | | | CAP,FXD,MICA DI:33PF,2%,500V,0.370 X 0.340;RDL | 00853 | D105E330G0 |
| A2C103 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C105 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C106 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C108 | 290–0944–01 | | | CAP,FXD,ELCTLT:220UF,20%,10V | 55680 | UVX1C221MPA1TA |
| A2C109 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C110 | 290–0974–00 | | | CAP,FXD,ELCTLT:10UF,20%,50VDC | 55680 | UVX1H100MAA |
| A2C111 | 290–0782–00 | | | CAP,FXD,ELCTLT:4.7UF,+75–20%,35VDC | 55680 | UVX1V4R7MAA |
| A2C112 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C113 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C114 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C115 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C116 | 281–0819–00 | | | CAP,FXD,CER:MLC;33 PF,5%,50V,0.100 X 0.170;AXIAL,MI | 04222 | SA102A330JAA |
| A2C117 | 281–0819–00 | | | CAP,FXD,CER:MLC;33 PF,5%,50V,0.100 X 0.170;AXIAL,MI | 04222 | SA102A330JAA |
| A2C118 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C119 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C120 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C121 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C124 | 283–0067–00 | | | CAP,FXD,CER DI:0.001UF,10%,200V | 51406 | |
| A2C125 | 283–0067–00 | | | CAP,FXD,CER DI:0.001UF,10%,200V | 51406 | |
| A2C126 | 283–0067–00 | 671–1758–00 | 671–1758–03 | CAP,FXD,CER DI:0.001UF,10%,200V | 51406 | |
| A2C127 | 283–0067–00 | 671–1758–00 | 671–1758–03 | CAP,FXD,CER DI:0.001UF,10%,200V | 51406 | |
| A2C128 | 283–0067–00 | 671–1758–00 | 671–1758–03 | CAP,FXD,CER DI:0.001UF,10%,200V | 51406 | |
| A2C129 | 283–0067–00 | 671–1758–00 | 671–1758–03 | CAP,FXD,CER DI:0.001UF,10%,200V | 51406 | |
| A2C130 | 283–0067–00 | 671–1758–00 | 671–1758–03 | CAP,FXD,CER DI:0.001UF,10%,200V | 51406 | |
| A2C131 | 283–0067–00 | 671–1758–00 | 671–1758–03 | CAP,FXD,CER DI:0.001UF,10%,200V | 51406 | |
| A2C132 | 283–0067–00 | 671–1758–00 | 671–1758–03 | CAP,FXD,CER DI:0.001UF,10%,200V | 51406 | |
| A2C133 | 283–0067–00 | 671–1758–00 | 671–1758–03 | CAP,FXD,CER DI:0.001UF,10%,200V | 51406 | |
| A2C134 | 283–0067–00 | 671–1758–00 | 671–1758–03 | CAP,FXD,CER DI:0.001UF,10%,200V | 51406 | |
| A2C137 | 281–0775–02 | | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C138 | 281–0775–02 | 671–1758–04 | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 0.100;AXIAL,T&R | 04222 | SA205C104MAA |

| Component Number | Tektronix Part Number | Serial / Assembly Number Effective | Discontinued | Name & Description | Mfr. Code | Mfr. Part Number |
|---|---|---|---|---|---|---|
| A2C139 | 281–0775–02 | 671–1758–04 | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C140 | 281–0775–02 | 671–1758–04 | | CAP,FXD,CER:MLC;0.1UF,20%,50V,X7R,0.265 X 0.100;AXIAL,T&R | 04222 | SA205C104MAA |
| A2C141 | 283–0047–00 | 671–1758–00 | 671–1758–03 | CAP,FXD,CER DI:270PF,5%,500V | 80009 | 283–0047–00 |
| A2C141 | 281–0765–00 | 671–1758–04 | | CAP,FXD,CER DI:100PF,5%,100V | 04222 | SA102A101JAA |
| A2C142 | 290–0973–00 | 671–1758–04 | | CAP,FXD,ELCTLT:100UF,20%,25VDC | 24165 | 513D107M025BB4D |
| A2C143 | 283–0047–00 | 671–1758–00 | 671–1758–03 | CAP,FXD,CER DI:270PF,5%,500V | 80009 | 283–0047–00 |
| A2C143 | 281–0765–00 | 671–1758–04 | | CAP,FXD,CER DI:100PF,5%,100V | 04222 | SA102A101JAA |
| A2CR4 | 152–0141–02 | | | DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35,T&R | 80009 | 152–0141–02 |
| A2CR5 | 152–0141–02 | | | DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35,T&R | 80009 | 152–0141–02 |
| A2CR6 | 152–0141–02 | | | DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35,T&R | 80009 | 152–0141–02 |
| A2CR7 | 152–0141–02 | | | DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35,T&R | 80009 | 152–0141–02 |
| A2CR8 | 152–0141–02 | | | DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35,T&R | 80009 | 152–0141–02 |
| A2CR9 | 152–0141–02 | | | DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35,T&R | 80009 | 152–0141–02 |
| A2CR10 | 152–0141–02 | | | DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35,T&R | 80009 | 152–0141–02 |
| A2CR11 | 152–0141–02 | | | DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35,T&R | 80009 | 152–0141–02 |
| A2CR14 | 152–0066–00 | 671–1758–00 | 671–1758–03 | DIO,RECT:400V,1A,IFSM=30A,1.2VF,2US;GP10G/1 N5060,T&R,SAF CONT | 05828 | GP10G–020 |
| A2CR15 | 152–0141–02 | 671–1758–00 | 671–1758–03 | DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO–35,T&R | 80009 | 152–0141–02 |
| A2DS1 | 150–1033–00 | | | DIO,OPTO:LED;AMBER,585NM,2MCD AT 10MA;HLMP–1401,T–1,T&R | 80009 | 150–1033–00 |
| A2FL2 | 119–4080–00 | 671–1758–00 | 671–1758–08 | FILTER,LOWPASS | 80009 | 119–4080–00 |
| A2FL2 | 671–4081–00 | 671–1758–09 | | FILTER,LOWPASS | 80009 | 671–4081–00 |
| A2FL3 | 119–4080–00 | 671–1758–00 | 671–1758–08 | FILTER,LOWPASS | 80009 | 119–4080–00 |
| A2FL3 | 671–4081–00 | 671–1758–09 | | FILTER,LOWPASS | 80009 | 671–4081–00 |
| A2FL4 | 119–4225–00 | 671–1758–04 | | FILTER,EMI: | 80009 | 119–4225–00 |
| A2FL5 | 119–4225–00 | 671–1758–04 | | FILTER,EMI: | 80009 | 119–4225–00 |
| A2FL6 | 119–4225–00 | 671–1758–04 | | FILTER,EMI: | 80009 | 119–4225–00 |
| A2FL7 | 119–4225–00 | 671–1758–04 | | FILTER,EMI: | 80009 | 119–4225–00 |
| A2FL8 | 119–4225–00 | 671–1758–04 | | FILTER,EMI: | 80009 | 119–4225–00 |
| A2FL9 | 119–4225–00 | 671–1758–04 | | FILTER,EMI: | 80009 | 119–4225–00 |
| A2FL10 | 119–4225–00 | 671–1758–04 | | FILTER,EMI: | 80009 | 119–4225–00 |
| A2FL11 | 119–4225–00 | 671–1758–04 | | FILTER,EMI: | 80009 | 119–4225–00 |
| A2FL12 | 119–4225–00 | 671–1758–04 | | FILTER,EMI: | 80009 | 119–4225–00 |
| A2FL13 | 119–4225–00 | 671–1758–04 | | FILTER,EMI: | 80009 | 119–4225–00 |
| A2J2 | 131–0608–00 | | | TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 3) | 80009 | 131–0608–00 |
| A2J7 | 131–0608–00 | | | TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 3) | 80009 | 131–0608–00 |
| A2J8 | 131–0608–00 | | | TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 50) | 80009 | 131–0608–00 |
| A2J11 | 131–5230–00 | | | CONN,CIRC: | 80009 | 131–5230–00 |
| | | | | *MOUNTING PARTS* | | |
| | 213–0055–00 | | | SCR,TPG,TF:2–32 X 0.188,TYPE B,PNH,STL | 93907 | ORDER BY DESCR |
| | | | | *END MOUNTING PARTS* | | |
| A2J12 | 131–3987–00 | | | CONN,CIRC:PCB,AUDIO;MALE,RTANG,3 POS,1.22 H X 1.024 W,CTR PLZ,LATCHING | 82389 | E3MRA |
| | | | | *MOUNTING PARTS* | | |
| | 213–0055–00 | | | SCR,TPG,TF:2–32 X 0.188,TYPE B,PNH,STL | 93907 | ORDER BY DESCR |

## Replaceable Electrical Parts

| Component Number | Tektronix Part Number | Serial / Assembly Number Effective | Discontinued | Name & Description | Mfr. Code | Mfr. Part Number |
|---|---|---|---|---|---|---|
| | | | | *END MOUNTING PARTS* | | |
| A2J13 | 131-5230-00 | | | CONN,CIRC: | 80009 | 131-5230-00 |
| | | | | *MOUNTING PARTS* | | |
| | 213-0055-00 | | | SCR,TPG,TF:2-32 X 0.188,TYPE B,PNH,STL | 93907 | ORDER BY DESCR |
| | | | | *END MOUNTING PARTS* | | |
| A2J14 | 131-3987-00 | | | CONN,CIRC:PCB,AUDIO;MALE,RTANG,3 POS,1.22 H X 1.024 W,CTR PLZ,LATCHING | 82389 | E3MRA |
| | | | | *MOUNTING PARTS* | | |
| | 213-0055-00 | | | SCR,TPG,TF:2-32 X 0.188,TYPE B,PNH,STL | 93907 | ORDER BY DESCR |
| | | | | *END MOUNTING PARTS* | | |
| A2J20 | 131-0608-00 | | | TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 3) | 80009 | 131-0608-00 |
| A2J23 | 131-5227-00 | | | CONN,HDR PWR: | 80009 | 131-5227-00 |
| A2J25 | 131-3520-00 | | | CONN,HDR: | 53387 | 2510-6002UB |
| A2J26 | 131-0608-00 | | | TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 2) | 80009 | 131-0608-00 |
| A2J28 | 131-0608-00 | | | TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 12) | 80009 | 131-0608-00 |
| A2J29 | 131-0608-00 | | | TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 2) | 80009 | 131-0608-00 |
| A2J30 | 131-0608-00 | | | TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 18) | 80009 | 131-0608-00 |
| A2J31 | 131-5228-00 | 671-1758-00 | 671-1758-05 | CONN,DIN:PCB;MALE,STR,2 X 32,0.1 CTR,0.457 H X 0.114 TAIL,ROWS A & C LOADED | 80009 | 131-5228-00 |
| A2J32 | 131-0608-00 | | | TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 12) | 80009 | 131-0608-00 |
| A2K2 | 148-0235-00 | | | RELAY,ARM: | 80009 | 148-0235-00 |
| A2K5 | 148-0235-00 | | | RELAY,ARM: | 80009 | 148-0235-00 |
| A2L1 | 108-0543-00 | 671-1758-04 | | COIL,RF:FIXED,1.1UH | TK1345 | 108-0543-00 |
| A2L2 | 108-0543-00 | 671-1758-04 | | COIL,RF:FIXED,1.1UH | TK1345 | 108-0543-00 |
| A2L3 | 108-0543-00 | 671-1758-04 | | COIL,RF:FIXED,1.1UH | TK1345 | 108-0543-00 |
| A2P2 | 131-0993-00 | | | CONN,BOX:SHUNT/SHORTING;FEM,STR,1 X 2,0.1 CTR,0.385 H,30 GLD,BLK,JUMPER | 22526 | 65474-006 |
| A2Q2 | 151-0190-00 | | | XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO-92 EBC | 80009 | 151-0190-00 |
| A2Q3 | 151-0188-00 | | | XSTR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ, AMPL;2N3906,TO-92 EBC | 80009 | 151-0188-00 |
| A2Q4 | 151-0136-00 | | | XSTR,SIG:BIPOLAR,NPN;40V,700MA,100MHZ, AMPL;2N3053,TO-39 | 80009 | 151-0136-00 |
| A2Q5 | 151-0235-00 | | | XSTR,SIG:BIPOLAR,PNP;80V,1.0A,150MHZ, AMPL;2N4033,TO-39 | 80009 | 151-0235-00 |
| A2Q6 | 151-0190-00 | | | XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO-92 EBC | 80009 | 151-0190-00 |
| A2Q7 | 151-0188-00 | | | XSTR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ, AMPL;2N3906,TO-92 EBC | 80009 | 151-0188-00 |
| A2Q8 | 151-0136-00 | | | XSTR,SIG:BIPOLAR,NPN;40V,700MA,100MHZ, AMPL;2N3053,TO-39 | 80009 | 151-0136-00 |
| A2Q9 | 151-0235-00 | | | XSTR,SIG:BIPOLAR,PNP;80V,1.0A,150MHZ, AMPL;2N4033,TO-39 | 80009 | 151-0235-00 |
| A2Q10 | 151-0190-00 | | | XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO-92 EBC | 80009 | 151-0190-00 |
| A2Q11 | 151-0188-00 | | | XSTR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ, AMPL;2N3906,TO-92 EBC | 80009 | 151-0188-00 |
| A2Q12 | 151-0136-00 | | | XSTR,SIG:BIPOLAR,NPN;40V,700MA,100MHZ, AMPL;2N3053,TO-39 | 80009 | 151-0136-00 |
| A2Q13 | 151-0235-00 | | | XSTR,SIG:BIPOLAR,PNP;80V,1.0A,150MHZ, AMPL;2N4033,TO-39 | 80009 | 151-0235-00 |
| A2Q14 | 151-0190-00 | | | XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO-92 EBC | 80009 | 151-0190-00 |

| Component Number | Tektronix Part Number | Serial / Assembly Number Effective | Discontinued | Name & Description | Mfr. Code | Mfr. Part Number |
|---|---|---|---|---|---|---|
| A2Q15 | 151–0188–00 | | | XSTR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ, AMPL;2N3906,TO–92 EBC | 80009 | 151–0188–00 |
| A2Q16 | 151–0136–00 | | | XSTR,SIG:BIPOLAR,NPN;40V,700MA,100MHZ, AMPL;2N3053,TO–39 | 80009 | 151–0136–00 |
| A2Q17 | 151–0235–00 | | | XSTR,SIG:BIPOLAR,PNP;80V,1.0A,150MHZ, AMPL;2N4033,TO–39 | 80009 | 151–0235–00 |
| A2Q18 | 151–0190–00 | | | XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC | 80009 | 151–0190–00 |
| A2Q19 | 151–0190–00 | | | XSTR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ, AMPL;2N3904,TO–92 EBC | 80009 | 151–0190–00 |
| A2Q20 | 151–1121–00 | 671–1758–04 | | XSTR,PWR:MOS,N–CH;60V,0.5A,3.0 OHM;VN0106N3/VN0606L,TO–92 SGD | TK0768 | VN0106N3 |
| A2R1 | 307–0445–00 | | | RES,NTWK:THICK FILM;(9) 4.7K OHM,2%,0.2W EACH,TC=100 PPM;SIP10,PIN 1 COM | 91637 | MSP10A01472GD03 |
| A2R2 | 307–0445–00 | | | RES,NTWK:THICK FILM;(9) 4.7K OHM,2%,0.2W EACH,TC=100 PPM;SIP10,PIN 1 COM | 91637 | MSP10A01472GD03 |
| A2R3 | 307–0445–00 | | | RES,NTWK:THICK FILM;(9) 4.7K OHM,2%,0.2W EACH,TC=100 PPM;SIP10,PIN 1 COM | 91637 | MSP10A01472GD03 |
| A2R5 | 322–3258–00 | | | RES,FXD:MET FILM;4.75K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 80009 | 322–3258–00 |
| A2R6 | 322–3318–00 | | | RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 20K0 |
| A2R7 | 322–3318–00 | | | RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 20K0 |
| A2R13 | 322–3318–00 | 671–1758–00 | 671–1758–08 | RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 20K0 |
| A2R14 | 322–3450–00 | | | RES,FXD,FILM:475K OHM,1%,0.2W,TC=T0 | 80009 | 322–3450–00 |
| A2R15 | 322–3450–00 | | | RES,FXD,FILM:475K OHM,1%,0.2W,TC=T0 | 80009 | 322–3450–00 |
| A2R16 | 322–3414–00 | | | RES,FXD:MET FILM;200K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 91637 | CCF501G20002F |
| A2R17 | 322–3414–00 | | | RES,FXD:MET FILM;200K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 91637 | CCF501G20002F |
| A2R18 | 322–3318–00 | 671–1758–00 | 671–1758–08 | RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 20K0 |
| A2R19 | 322–3222–07 | | | RES,FXD,FILM:2K OHM,0.1%,0.2W TC=T9 | 80009 | 322–3222–07 |
| A2R20 | 322–3222–07 | 671–1758–00 | 671–1758–08 | RES,FXD,FILM:2K OHM,0.1%,0.2W TC=T9 | 80009 | 322–3222–07 |
| A2R20 | 322–3176–00 | 671–1758–09 | | RES,FXD,FILM:665 OHM,0.1%,0.2W TC=T0MI | 80009 | 322–3176–00 |
| A2R21 | 322–3222–07 | | | RES,FXD,FILM:2K OHM,0.1%,0.2W TC=T9 | 80009 | 322–3222–07 |
| A2R22 | 322–3222–07 | 671–1758–00 | 671–1758–08 | RES,FXD,FILM:2K OHM,0.1%,0.2W TC=T9 | 80009 | 322–3222–07 |
| A2R22 | 322–3176–00 | 671–1758–09 | | RES,FXD,FILM:665 OHM,0.1%,0.2W TC=T0MI | 80009 | 322–3176–00 |
| A2R23 | 322–3001–00 | 671–1758–00 | 671–1758–08 | RES,FXD,META FILM:10 OHM,0.1%,0.2W TC=100 | 80009 | 322–3001–00 |
| A2R23 | 322–3201–00 | 671–1758–09 | | RES,FXD,META FILM:1.21K OHM,0.1%,0.2W TC=T9 | 80009 | 322–3201–00 |
| A2R24 | 311–1895–00 | | | RES,VAR,NONWW:TRMR2K OHM,10%,0.5,LIN | 32997 | 3299W–1–202 |
| A2R25 | 322–3001–00 | 671–1758–00 | 671–1758–08 | RES,FXD,META FILM:10 OHM,0.1%,0.2W TC=100 | 80009 | 322–3001–00 |
| A2R25 | 322–3201–00 | 671–1758–09 | | RES,FXD,META FILM:1.21K OHM,0.1%,0.2W TC=T9 | 80009 | 322–3201–00 |
| A2R26 | 311–1895–00 | | | RES,VAR,NONWW:TRMR,2K OHM,10%,0.5,LIN | 32997 | 3299W–1–202 |
| A2R27 | 311–2239–00 | | | RES,VAR,TRMR:CERMET;100K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST;T&R | TK1450 | GF06UT 100K |
| A2R28 | 311–2239–00 | | | RES,VAR,TRMR:CERMET;100K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST;T&R | TK1450 | GF06UT 100K |
| A2R29 | 322–3112–00 | | | RES,FXD,FILM:143 OHM,1%,0.2W,TC=T0 | 80009 | 322–3112–00 |
| A2R30 | 321–1762–07 | | | RES,FXD,FILM:6.695K OHM,0.1%,0.125W,TC=T9 | 57027 | RC55–D–6K695–B–R |
| A2R31 | 322–3509–07 | | | RES,FXD,FILM:2.162K OHM,0.1%,0.2W,TC=T9 TAPED & REELED,SM BODY | 91637 | 2.162K OHM |
| A2R32 | 321–1611–07 | | | RES,FXD,FILM:550 OHM,0.1%,0.125W,TC=T9 | 80009 | 321–1611–07 |
| A2R33 | 321–1708–01 | | | RES,FXD,FILM:133.3 OHM,0.5%,0.125W,TC=T0 | 80009 | 321–1708–01 |
| A2R34 | 322–3126–07 | | | RES,FXD,FILM:200 OHM,0.1%,0.2W,TC=T9 | 91637 | CCF50–2–C200ROBT |
| A2R35 | 321–0021–00 | | | RES,FXD,FILM:16.2 OHM,1%,0.125W,TC=T0 | 80009 | 321–0021–00 |
| A2R36 | 321–0811–07 | | | RES,FXD,FILM:56.3 OHM,0.1%,0.125W,TC=T9 | 80009 | 321–0811–07 |
| A2R37 | 322–3239–00 | | | RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0 | 57668 | CRB20 FXE 3K01 |
| A2R38 | 322–3239–00 | | | RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0 | 57668 | CRB20 FXE 3K01 |

## Replaceable Electrical Parts

| Component Number | Tektronix Part Number | Serial / Assembly Number Effective | Discontinued | Name & Description | Mfr. Code | Mfr. Part Number |
|---|---|---|---|---|---|---|
| A2R39 | 322-3009-00 | | | RES,FXD:MET FILM;12.1 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20FXE475E |
| A2R40 | 322-3009-00 | | | RES,FXD:MET FILM;12.1 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20FXE475E |
| A2R41 | 322-3239-00 | | | RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0 | 57668 | CRB20 FXE 3K01 |
| A2R42 | 322-3239-00 | | | RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0 | 57668 | CRB20 FXE 3K01 |
| A2R43 | 322-3009-00 | | | RES,FXD:MET FILM;12.1 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20FXE475E |
| A2R44 | 322-3009-00 | | | RES,FXD:MET FILM;12.1 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20FXE475E |
| A2R45 | 322-3222-07 | | | RES,FXD,FILM:2K OHM,0.1%,0.2W TC=T9 | 80009 | 322-3222-07 |
| A2R46 | 322-3222-07 | | | RES,FXD,FILM:2K OHM,0.1%,0.2W TC=T9 | 80009 | 322-3222-07 |
| A2R66 | 322-3226-00 | | | RES,FXD:MET FILM;2.21K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 2K21 |
| A2R67 | 322-3193-07 | | | RES,FXD,FILM:1K OHM,0.1%,0.2W,TC=T9 | 80009 | 322-3193-07 |
| A2R68 | 322-3509-07 | | | RES,FXD,FILM:2.162K OHM,0.1%,0.2W,TC=T9 TAPED & REELED,SM BODY | 91637 | 2.162K OHM |
| A2R69 | 322-3112-00 | | | RES,FXD,FILM:143 OHM,1%,0.2W,TC=T0 | 80009 | 322-3112-00 |
| A2R70 | 321-1762-07 | | | RES,FXD,FILM:6.695K OHM,0.1%,0.125W,TC=T9 | 57027 | RC55-D-6K695-B-R |
| A2R71 | 322-3509-07 | | | RES,FXD,FILM:2.162K OHM,0.1%,0.2W,TC=T9 TAPED & REELED,SM BODY | 91637 | 2.162K OHM |
| A2R72 | 321-1611-07 | | | RES,FXD,FILM:550 OHM,0.1%,0.125W,TC=T9 | 80009 | 321-1611-07 |
| A2R73 | 321-1708-01 | | | RES,FXD,FILM:133.3 OHM,0.5%,0.125W,TC=T0 | 80009 | 321-1708-01 |
| A2R74 | 322-3126-07 | | | RES,FXD,FILM:200 OHM,0.1%,0.2W,TC=T9 | 91637 | CCF50-2-C200ROBT |
| A2R75 | 321-0021-00 | | | RES,FXD,FILM:16.2 OHM,1%,0.125W,TC=TO | 80009 | 321-0021-00 |
| A2R76 | 321-0811-07 | | | RES,FXD,FILM:56.3 OHM,0.1%,0.125W,TC=T9 | 80009 | 321-0811-07 |
| A2R77 | 322-3239-00 | | | RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0 | 57668 | CRB20 FXE 3K01 |
| A2R78 | 322-3239-00 | | | RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0 | 57668 | CRB20 FXE 3K01 |
| A2R79 | 322-3009-00 | | | RES,FXD:MET FILM;12.1 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20FXE475E |
| A2R80 | 322-3009-00 | | | RES,FXD:MET FILM;12.1 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20FXE475E |
| A2R81 | 322-3239-00 | | | RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0 | 57668 | CRB20 FXE 3K01 |
| A2R82 | 322-3239-00 | | | RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0 | 57668 | CRB20 FXE 3K01 |
| A2R83 | 322-3009-00 | | | RES,FXD:MET FILM;12.1 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20FXE475E |
| A2R84 | 322-3009-00 | | | RES,FXD:MET FILM;12.1 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20FXE475E |
| A2R85 | 322-3222-07 | | | RES,FXD,FILM:2K OHM,0.1%,0.2W TC=T9 | 80009 | 322-3222-07 |
| A2R86 | 322-3222-07 | | | RES,FXD,FILM:2K OHM,0.1%,0.2W TC=T9 | 80009 | 322-3222-07 |
| A2R107 | 322-3193-07 | | | RES,FXD,FILM:1K OHM,0.1%,0.2W,TC=T9 | 80009 | 322-3193-07 |
| A2R108 | 322-3509-07 | | | RES,FXD,FILM:2.162K OHM,0.1%,0.2W,TC=T9 TAPED & REELED,SM BODY | 91637 | 2.162K OHM |
| A2R109 | 322-3114-00 | | | RES,FXD:MET FILM;150 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 91637 | CCF50-2-G1500F |
| A2R110 | 322-3318-00 | | | RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 20K0 |
| A2R111 | 322-3318-00 | | | RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 20K0 |
| A2R112 | 322-3318-00 | | | RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 20K0 |
| A2R113 | 322-3097-00 | | | RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 100E |
| A2R114 | 322-3318-00 | | | RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 20K0 |
| A2R115 | 322-3265-00 | 671-1758-00 | 671-1758-01 | RES,FXD:MET FILM;5.62K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 80009 | 322-3265-00 |
| A2R115 | 322-3361-00 | 671-1758-02 | | RES,FXD:MET FILM;56.2K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 91637 | CCF50-2F56201F |

| Component Number | Tektronix Part Number | Serial / Assembly Number Effective | Discontinued | Name & Description | Mfr. Code | Mfr. Part Number |
|---|---|---|---|---|---|---|
| A2R117 | 322-3289-00 | 671-1758-00 | 671-1758-01 | RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 80009 | 322-3289-00 |
| A2R117 | 322-3385-00 | 671-1758-02 | | RES,FXD:MET FILM;100K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 100K |
| A2R118 | 322-3114-00 | | | RES,FXD:MET FILM;150 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 91637 | CCF50-2-G1500F |
| A2R119 | 322-3318-00 | | | RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 20K0 |
| A2R120 | 322-3318-00 | | | RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 20K0 |
| A2R121 | 322-3318-00 | | | RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 20K0 |
| A2R122 | 322-3097-00 | | | RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 100E |
| A2R123 | 322-3318-00 | | | RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 20K0 |
| A2R124 | 322-3265-00 | 671-1758-00 | 671-1758-01 | RES,FXD:MET FILM;5.62K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 80009 | 322-3265-00 |
| A2R124 | 322-3361-00 | 671-1758-02 | | RES,FXD:MET FILM;56.2K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 91637 | CCF50-2F56201F |
| A2R126 | 322-3289-00 | 671-1758-00 | 671-1758-01 | RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 80009 | 322-3289-00 |
| A2R126 | 322-3385-00 | 671-1758-02 | | RES,FXD:MET FILM;100K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 100K |
| A2R127 | 322-3248-00 | | | RES,FXD,FILM:3.74K OHM,1%,0.2W,TC=T0 | 80009 | 322-3248-00 |
| A2R128 | 322-3289-00 | | | RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 80009 | 322-3289-00 |
| A2R129 | 322-3289-00 | | | RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 80009 | 322-3289-00 |
| A2R130 | 322-3248-00 | | | RES,FXD,FILM:3.74K OHM,1%,0.2W,TC=T0 | 80009 | 322-3248-00 |
| A2R132 | 322-3385-00 | | | RES,FXD:MET FILM;100K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 100K |
| A2R133 | 322-3243-00 | | | RES,FXD:MET FILM;3.32K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 91637 | CCF50-1-G33200F |
| A2R134 | 322-3193-00 | | | RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 1K00 |
| A2R135 | 322-3145-00 | | | RES,FXD,FILM:316 OHM,1%,0.2W,TC=T0 | 80009 | 322-3145-00 |
| A2R136 | 322-3226-00 | | | RES,FXD:MET FILM;2.21K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 2K21 |
| A2R137 | 322-3226-00 | | | RES,FXD:MET FILM;2.21K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 2K21 |
| A2R138 | 322-3289-00 | | | RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 80009 | 322-3289-00 |
| A2R140 | 321-0307-00 | | | RES,FXD,FILM:15.4K OHM,1%,0.125W,TC=T0 | 80009 | 321-0307-00 |
| A2R141 | 322-3193-00 | | | RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 1K00 |
| A2R142 | 322-3285-00 | | | RES,FXD,FILM:9.09K OHM,1%,0.2W,TC=T0 | 80009 | 322-3285-00 |
| A2R143 | 322-3285-00 | | | RES,FXD,FILM:9.09K OHM,1%,0.2W,TC=T0 | 80009 | 322-3285-00 |
| A2R144 | 322-3289-00 | | | RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 80009 | 322-3289-00 |
| A2R145 | 322-3301-00 | | | RES,FXD,FILM:13.3K OHM,1%,0.2W,TC=T0 | 80009 | 322-3301-00 |
| A2R148 | 307-0446-00 | | | RES NTWK,FXD,FI:10K OHM,20%,(9)RES | 80009 | 307-0446-00 |
| A2R149 | 322-3481-00 | | | RES,FXD,FILM:1M OHM.1%,0.2W,TC=T0 | 80009 | 322-3481-00 |
| A2R153 | 321-0140-00 | 671-1758-00 | 671-1758-03 | RES,FXD,FILM:280 OHM,1%,0.125W,TC=T0 | 07716 | CEAD280R0F |
| A2R154 | 322-3179-00 | 671-1758-00 | 671-1758-03 | RES,FXD,FILM:715 OHM,1%,0.2W,TC=T0 | 80009 | 322-3179-00 |
| A2R158 | 322-3193-00 | | | RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 1K00 |
| A2R159 | 322-3258-00 | | | RES,FXD:MET FILM;4.75K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 80009 | 322-3258-00 |

| Component Number | Tektronix Part Number | Serial / Assembly Number Effective | Discontinued | Name & Description | Mfr. Code | Mfr. Part Number |
|---|---|---|---|---|---|---|
| A2R160 | 322-3097-00 | | | RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 100E |
| A2R161 | 322-3097-00 | | | RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 100E |
| A2R162 | 322-3356-00 | | | RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=T0 | 80009 | 322-3356-00 |
| A2R163 | 322-3289-00 | 671-1758-00 | 671-1758-01 | RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 80009 | 322-3289-00 |
| A2R163 | 322-3385-00 | 671-1758-02 | | RES,FXD:MET FILM;100K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 100K |
| A2R164 | 322-3265-00 | 671-1758-00 | 671-1758-01 | RES,FXD:MET FILM;5.62K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 80009 | 322-3265-00 |
| A2R164 | 322-3361-00 | 671-1758-02 | | RES,FXD:MET FILM;56.2K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 91637 | CCF50-2F56201F |
| A2R165 | 322-3289-00 | 671-1758-00 | 671-1758-01 | RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 80009 | 322-3289-00 |
| A2R165 | 322-3385-00 | 671-1758-02 | | RES,FXD:MET FILM;100K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 100K |
| A2R166 | 322-3265-00 | 671-1758-00 | 671-1758-01 | RES,FXD:MET FILM;5.62K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 80009 | 322-3265-00 |
| A2R166 | 322-3361-00 | 671-1758-02 | | RES,FXD:MET FILM;56.2K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 91637 | CCF50-2F56201F |
| A2R167 | 307-1223-00 | | | RES NTWK,FXD,FI:8,10 OHM,2%,0.3W,16 DIP | 91637 | MDP1603-100G |
| | | | | *MOUNTING PARTS* | | |
| | 136-0971-00 | | | SKT,PL-IN ELEK:DIP,16 PIN,2 X 8,0.3 X 0.1 SP,T/G,0.095 H X 0.1 TAIL | 80009 | 136-0971-00 |
| | | | | *END MOUNTING PARTS* | | |
| A2R174 | 322-3193-00 | | | RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 1K00 |
| A2R175 | 322-3318-00 | | | RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 20K0 |
| A2R176 | 322-3318-00 | | | RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 20K0 |
| A2R177 | 307-0542-00 | | | RES NTWK,FXD,FI:(5)10K OHM,5%,0.125W | 01121 | 106A103OR706A103 |
| A2R178 | 307-0542-00 | | | RES NTWK,FXD,FI:(5)10K OHM,5%,0.125W | 01121 | 106A103OR706A103 |
| A2R179 | 322-3289-00 | | | RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 80009 | 322-3289-00 |
| A2R180 | 321-0793-07 | | | RES,FXD,FILM:37.5 OHM 0.1%,0.125W TC=T9 | 24546 | NE55E37R5B |
| A2R181 | 322-3009-00 | | | RES,FXD:MET FILM;12.1 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20FXE475E |
| A2R182 | 322-3126-07 | | | RES,FXD,FILM:200 OHM,0.1%,0.2W,TC=T9 | 91637 | CCF50-2-C200ROBT |
| A2R183 | 322-3009-00 | | | RES,FXD:MET FILM;12.1 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20FXE475E |
| A2R184 | 322-3126-07 | | | RES,FXD,FILM:200 OHM,0.1%,0.2W,TC=T9 | 91637 | CCF50-2-C200ROBT |
| A2R185 | 321-0793-07 | | | RES,FXD,FILM:37.5 OHM 0.1%,0.125W TC=T9 | 24546 | NE55E37R5B |
| A2R186 | 322-3318-00 | | | RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 20K0 |
| A2R187 | 322-3318-00 | | | RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 57668 | CRB20 FXE 20K0 |
| A2R188 | 322-3147-00 | | | RES,FXD:MET FILM;332 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 80009 | 322-3147-00 |
| A2R189 | 322-3258-00 | | | RES,FXD:MET FILM;4.75K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 80009 | 322-3258-00 |
| A2R190 | 322-3289-00 | 671-1758-00 | 671-1758-03 | RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 80009 | 322-3289-00 |
| A2R191 | 322-3289-00 | 671-1758-04 | | RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 80009 | 322-3289-00 |
| A2R192 | 322-3114-00 | 671-1758-01 | | RES,FXD:MET FILM;150 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY | 91637 | CCF50-2-G1500F |
| A2S1 | 260-2544-00 | | | SW,RKR:SPST,10 PIN,PIANO DIP | 80009 | 260-2544-00 |

| Component Number | Tektronix Part Number | Serial / Assembly Number Effective | Discontinued | Name & Description | Mfr. Code | Mfr. Part Number |
|---|---|---|---|---|---|---|
| A2TP1 | 214-4085-00 | | | TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR | 26364 | 104-01-02 |
| A2TP2 | 214-4085-00 | | | TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR | 26364 | 104-01-02 |
| A2TP3 | 214-4085-00 | | | TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR | 26364 | 104-01-02 |
| A2TP4 | 214-4085-00 | | | TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR | 26364 | 104-01-02 |
| A2TP5 | 214-4085-00 | | | TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR | 26364 | 104-01-02 |
| A2TP6 | 214-4085-00 | | | TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR | 26364 | 104-01-02 |
| A2TP7 | 214-4085-00 | | | TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR | 26364 | 104-01-02 |
| A2TP8 | 214-4085-00 | | | TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR | 26364 | 104-01-02 |
| A2U1 | 156-6157-00 | 671-1758-00 | 671-1758-07 | IC,PROCESSOR:CMOS,DSP;24-BITS,20MHZ,512 X 24 RAM;DSP56001,CQFP132 | 80009 | 156-6157-00 |
| A2U1 | 156-6157-01 | 671-1758-08 | | DSP56001 ON ADAPTER | | |
| A2U2 | 160-7395-00 | 671-1758-00 | 671-1758-00 | MICROCKT,DGTL:CMOS,EPROM;64K X 8,250NS;27C512,DIP28.6 | 80009 | 160-7395-00 |
| A2U2 | 160-7395-01 | 671-1758-01 | 671-1758-01 | MICROCKT,DGTL:CMOS,EPROM;64K X 8,250NS;27C512,DIP28.6 | 80009 | 160-7395-01 |
| A2U2 | 160-7395-02 | 671-1758-02 | 671-1758-04 | MICROCKT,DGTL:CMOS,EPROM;64K X 8,25NS;27C512,DIP28.6 | 80009 | 160-7395-02 |
| A2U2 | 160-7395-03 | 671-1758-05 | 671-1758-05 | IC,DGTL:CMOS,EPROM;64K X 8,25NS;27C512,DIP28.6 | 80009 | 160-7395-03 |
| A2U2 | 160-7395-04 | 671-1758-06 | | IC,DGTL:CMOS,EPROM;64K X 8,25NS;27C512,DIP28.6 | 80009 | 160-7395-04 |
| | | | | *MOUNTING PARTS* | | |
| | 136-0755-00 | | | SKT,DIP: | 09922 | DILB28P-108 |
| | | | | *END MOUNTING PARTS* | | |
| A2U3 | 160-7396-00 | 671-1758-00 | 671-1758-00 | MICROCKT,DGTL:CMOS,EPROM;64K X 8,250NS;27C512,DIP28.6 | 80009 | 160-7396-00 |
| A2U3 | 160-7396-01 | 671-1758-01 | 671-1758-01 | MICROCKT,DGTL:CMOS,EPROM;64K X 8,250NS;27C512,DIP28.6 | 80009 | 160-7396-01 |
| A2U3 | 160-7396-02 | 671-1758-02 | 671-1758-04 | MICROCKT,DGTL:CMOS,EPROM;64K X 8,25NS;27C512,DIP28.6 | 80009 | 160-7396-02 |
| A2U3 | 160-7396-03 | 671-1758-05 | 671-1758-05 | IC,DGTL:CMOS,EPROM;64K X 8,25NS;27C512,DIP28.6 | 80009 | 160-7396-03 |
| A2U3 | 160-7396-04 | 671-1758-06 | | IC,DGTL:CMOS,EPROM;64K X 8,25NS;27C512,DIP28.6 | 80009 | 160-7396-04 |
| | | | | *MOUNTING PARTS* | | |
| | 136-0755-00 | | | SKT,DIP: | 09922 | DILB28P-108 |
| | | | | *END MOUNTING PARTS* | | |
| A2U4 | 160-7397-00 | 671-1758-00 | 671-1758-00 | MICROCKT,DGTL:CMOS,EPROM;64K X 8,250NS;27C512,DIP28.6 | 80009 | 160-7397-00 |
| A2U4 | 160-7397-01 | 671-1758-01 | 671-1758-01 | MICROCKT,DGTL:CMOS,EPROM;64K X 8,250NS;27C512,DIP28.6 | 80009 | 160-7397-01 |
| A2U4 | 160-7397-02 | 671-1758-02 | 671-1758-04 | MICROCKT,DGTL:CMOS,EPROM;64K X 8,25NS;27C512,DIP28.6 | 80009 | 160-7397-02 |
| A2U4 | 160-7397-03 | 671-1758-05 | 671-1758-05 | IC,DGTL:CMOS,EPROM;64K X 8,25NS;27C512,DIP28.6 | 80009 | 160-7397-03 |
| A2U4 | 160-7397-04 | 671-1758-06 | | IC,DGTL:CMOS,EPROM;64K X 8,25NS;27C512,DIP28.6 | 80009 | 160-7397-04 |
| | | | | *MOUNTING PARTS* | | |
| | 136-0755-00 | | | SKT,DIP: | 09922 | DILB28P-108 |
| | | | | *END MOUNTING PARTS* | | |
| A2U5 | 156-2760-00 | | | IC,MISC: | 0B0A9 | DS1210 |
| A2U6 | 156-3850-00 | | | IC,MEM:CMOS,SRAM;32K X 8,120NS,3UA,OE;,DIP28.6 | 80009 | 156-3850-00 |

| Component Number | Tektronix Part Number | Serial / Assembly Number Effective | Discontinued | Name & Description | Mfr. Code | Mfr. Part Number |
|---|---|---|---|---|---|---|
| A2U7 | 156-0991-00 | | | IC,LIN:BIPO-LAR,VR;POS,5.0V,100MA,5%;MC78L05ACP,TO-92 | 80009 | 156-0991-00 |
| A2U8 | 156-1150-00 | | | IC,LIN:BIPO-LAR,VR;NEG,-5.0V,100MA,4%;MC79L05ACP,TO-92 | 80009 | 156-1150-00 |
| A2U9 | 156-4044-00 | | | IC,MISC:CMOS,TELECOM;ULAW PCM CODEC AND FILTER;TCM29C18N,DIP16.3 | 80009 | 156-4044-00 |
| A2U10 | 156-0865-02 | | | IC,DGTL:LSTTL,FLIP FLOP;74LS273,DIP20.3,TUBE | 80009 | 156-0865-02 |
| A2U11 | 156-0865-02 | | | IC,DGTL:LSTTL,FLIP FLOP;74LS273,DIP20.3,TUBE | 80009 | 156-0865-02 |
| A2U12 | 160-7393-00 | | | MICROCKT,DGTL:STTL,PLD;10NS,180MA;22V10 | 80009 | 160-7393-00 |
| | | | | *MOUNTING PARTS* | | |
| | 136-0925-00 | | | SKT,DIP: | 91506 | 224-AG30D |
| | | | | *END MOUNTING PARTS* | | |
| A2U13 | 156-1191-00 | | | IC,LIN:BIFET,OP-AMP;DUAL;TL072CN/LF353N,DIP08.3 | 80009 | 156-1191-00 |
| A2U14 | 156-4040-00 | | | IC,CONV: | 80009 | 156-4040-00 |
| | | | | *MOUNTING PARTS* | | |
| | 136-0729-00 | | | SKT,DIP:PCB;FEM,STR,2 X 8,16 POS,0.1 X 0.3 CTR,0.175 H X 0.130 TAIL,BECU,TIN | 09922 | DILB16P-108T |
| | | | | *END MOUNTING PARTS* | | |
| A2U15 | 156-4040-00 | | | IC,CONV: | 80009 | 156-4040-00 |
| | | | | *MOUNTING PARTS* | | |
| | 136-0729-00 | | | SKT,DIP:PCB;FEM,STR,2 X 8,16 POS,0.1 X 0.3 CTR,0.175 H X 0.130 TAIL,BECU,TIN | 09922 | DILB16P-108T |
| | | | | *END MOUNTING PARTS* | | |
| A2U16 | 156-0651-02 | | | IC,DGTL:LSTTL,SHIFT RGSTR;74LS164,DIP14.3,TUBE | 80009 | 156-0651-02 |
| A2U17 | 156-0651-02 | | | IC,DGTL:LSTTL,SHIFT RGSTR;74LS164,DIP14.3,TUBE | 80009 | 156-0651-02 |
| A2U18 | 156-0651-02 | | | IC,DGTL:LSTTL,SHIFT RGSTR;74LS164,DIP14.3,TUBE | 80009 | 156-0651-02 |
| A2U19 | 156-0651-02 | | | IC,DGTL:LSTTL,SHIFT RGSTR;74LS164,DIP14.3,TUBE | 80009 | 156-0651-02 |
| A2U20 | 156-4043-00 | | | IC,LIN:BIPOLAR,OP-AMP;40MHZ,UNITY GAIN STABLE,LOW OFFSET;AD841KN,DIP14.3 | 80009 | 156-4043-00 |
| A2U21 | 156-4043-00 | | | IC,LIN:BIPOLAR,OP-AMP;40MHZ,UNITY GAIN STABLE,LOW OFFSET;AD841KN,DIP14.3 | 80009 | 156-4043-00 |
| A2U22 | 156-1270-00 | | | IC,MISC:BIFET,ANALOG MUX;8 CHANNEL, 850 OHM, 1.6US;LF13508,DIP16.3 | 80009 | 156-1270-00 |
| A2U23 | 156-1272-00 | | | IC,LIN:BIPOLAR,OP-AMP;DUAL,HI OUT DRV,LOW NOISE;NE5532N,DIP08.3 | 80009 | 156-1272-00 |
| A2U25 | 156-1211-00 | | | IC,MISC:BIFET,ANALOG SW;QUAD;LF13333,DIP16.3 | 80009 | 156-1211-00 |
| A2U27 | 156-1245-00 | | | IC,LIN: | 80009 | 156-1245-00 |
| A2U28 | 156-1270-00 | | | IC,MISC:BIFET,ANALOG MUX;8 CHANNEL, 850 OHM, 1.6US;LF13508,DIP16.3 | 80009 | 156-1270-00 |
| A2U29 | 156-1272-00 | | | IC,LIN:BIPOLAR,OP-AMP;DUAL,HI OUT DRV,LOW NOISE;NE5532N,DIP08.3 | 80009 | 156-1272-00 |
| A2U33 | 156-3098-00 | | | IC,MISC:BIPOLAR,MISC;DBX NOISE REDUCTION SYS V CONT AMP;UPC1252HA2,SIP8 | 80009 | 156-3098-00 |
| A2U35 | 156-1272-00 | | | IC,LIN:BIPOLAR,OP-AMP;DUAL,HI OUT DRV,LOW NOISE;NE5532N,DIP08.3 | 80009 | 156-1272-00 |
| A2U36 | 156-3098-00 | | | IC,MISC:BIPOLAR,MISC;DBX NOISE REDUCTION SYS V CONT AMP;UPC1252HA2,SIP8 | 80009 | 156-3098-00 |
| A2U38 | 156-1272-00 | | | IC,LIN:BIPOLAR,OP-AMP;DUAL,HI OUT DRV,LOW NOISE;NE5532N,DIP08.3 | 80009 | 156-1272-00 |
| A2U39 | 156-1149-00 | | | IC,LIN:BIFET,OP-AMP;;LF351N,DIP08.3 | 27014 | LF351N/GLEA134 |
| A2U40 | 156-0385-02 | 671-1758-00 | 671-1758-03 | IC,DGTL:LSTTL,GATES;74LS04,DIP14.3,TUBE | 80009 | 156-0385-02 |
| A2U40 | 156-0645-02 | 671-1758-04 | | IC,DGTL:LSTTL,GATES;74LS14,DIP14.3,TUBE | 80009 | 156-0645-02 |
| A2U41 | 156-3166-00 | | | IC,MISC:CMOS,ANALOG SW;DUAL DPST,55 OHM,+/-15V;DG405,DIP16.3 | 80009 | 156-3166-00 |

| Component Number | Tektronix Part Number | Serial / Assembly Number Effective | Discontinued | Name & Description | Mfr. Code | Mfr. Part Number |
|---|---|---|---|---|---|---|
| A2U42 | 156-1272-00 | | | IC,LIN:BIPOLAR,OP-AMP;DUAL,HI OUT DRV,LOW NOISE;NE5532N,DIP08.3 | 80009 | 156-1272-00 |
| A2U46 | 156-2815-00 | | | IC,MISC:BIPOLAR,MISC;ANALOG COMPANDOR;NE572N,DIP16.3 | 80009 | 156-2815-00 |
| A2U47 | 156-1065-00 | | | IC,DGTL:LSTTL,LATCH;OCTAL D TRANS, 3-STATE;74LS373,DIP20.3,TUBE | 80009 | 156-1065-00 |
| A2U48 | 156-4046-00 | | | IC,PROCESSOR:CMOS,MICROCOMPTR;8-BIT, 16MHZ,256 X 8,ROMLESS;80C32,DIP40.6,TUBE | 80009 | 156-4046-00 |
| | | | | *MOUNTING PARTS* | | |
| | 136-0757-00 | | | SKT,DIP: | 09922 | DILB40P-108 |
| | | | | *END MOUNTING PARTS* | | |
| A2U49 | 160-7392-00 | 671-1758-00 | 671-1758-01 | IC,DGTL:CMOS,PLD;EEPLD,22V10,25NS,33.3MHZ, 90MA;22V10-25,DIP24.3 | 80009 | 160-7392-00 |
| A2U49 | 160-7392-01 | 671-1758-02 | 671-1758-03 | IC,DGTL:CMOS,PLD;EEPLD,22V10,25NS,33.3MHZ, 90MA;22V10-25,DIP24.3 | 80009 | 160-7392-01 |
| A2U49 | 160-7392-02 | 671-1758-04 | 671-1758-04 | IC,DGTL:CMOS,PLD;EEPLD,22V10,25NS,33.3MHZ, 90MA;22V10-25,DIP24.3 | 80009 | 160-7392-02 |
| A2U49 | 160-7392-03 | 671-1758-05 | 671-1758-06 | IC,DGTL:CMOS,PLD;EEPLD,22V10,25NS,33.3MHZ, 90MA;22V10-25,DIP24.3 | 80009 | 160-7392-03 |
| A2U49 | 160-7392-04 | 671-1758-07 | | IC,DGTL:CMOS,PLD;EEPLD,22V10,25NS,33.3MHZ, 90MA;22V10-25,DIP24.3 | 80009 | 160-7392-04 |
| | | | | *MOUNTING PARTS* | | |
| | 136-0925-00 | | | SKT,DIP: | 91506 | 224-AG30D |
| | | | | *END MOUNTING PARTS* | | |
| A2U50 | 156-0865-02 | | | IC,DGTL:LSTTL,FLIP FLOP;74LS273,DIP20.3,TUBE | 80009 | 156-0865-02 |
| A2U51 | 156-0956-02 | | | IC,DGTL:LSTTL,BFR/DRVR;74LS244,DIP20.3,TUBE | 80009 | 156-0956-02 |
| A2U52 | 156-0956-02 | | | IC,DGTL:LSTTL,BFR/DRVR;74LS244,DIP20.3,TUBE | 80009 | 156-0956-02 |
| A2U54 | 156-3547-00 | | | IC,MISC: | 80009 | 156-3547-00 |
| A2U55 | 156-0991-00 | 671-1758-00 | 671-1758-00 | IC,LIN:BIPOLAR,VR;POS,5.0V,100MA,5%;MC78L05ACP,TO-92 | 80009 | 156-0991-00 |
| A2U62 | 156-2760-00 | | | IC,MISC: | 0B0A9 | DS1210 |
| A2U63 | 160-7394-00 | 671-1758-00 | 671-1758-01 | MICROCKT,DGTL:CMOS,EPROM;64K X 8,250NS;27C512,DIP28.6 | 80009 | 160-7394-00 |
| A2U63 | 160-7394-01 | 671-1758-02 | 671-1758-02 | MICROCKT,DGTL:CMOS,EPROM;64K X 8,250NS;27C512,DIP28.6 | 80009 | 160-7394-01 |
| A2U63 | 160-7394-02 | 671-1758-03 | 671-1758-04 | MICROCKT,DGTL:CMOS,EPROM;64K X 8,250NS;27C512 | 80009 | 160-7394-02 |
| A2U63 | 160-7394-03 | 671-1758-05 | 671-1758-05 | IC,DGTL:CMOS,EPROM;64K X 8,25NS;27C512,DIP28.6 | 80009 | 160-7394-03 |
| A2U63 | 160-7394-04 | 671-1758-06 | | IC,DGTL:CMOS,EPROM;64K X 8,PRGM,25NS;27C512,DIP28.6 | 80009 | 160-7394-04 |
| | | | | *MOUNTING PARTS* | | |
| | 136-0755-00 | | | SKT,DIP: | 09922 | DILB28P-108 |
| | | | | *END MOUNTING PARTS* | | |
| A2U64 | 156-3850-00 | | | IC,MEM:CMOS,SRAM;32K X 8,120NS,3UA,OE;,DIP28.6 | 80009 | 156-3850-00 |
| A2U66 | 156-2009-00 | | | IC,DGTL:HCMOS,FLIP FLOP;DUAL D-TYPE;74HC74,DIP14.3,TUBE | 80009 | 156-2009-00 |
| A2U67 | 156-4048-00 | | | IC,MISC: | 80009 | 156-4048-00 |
| | | | | *MOUNTING PARTS* | | |
| | 136-0925-00 | | | SKT,DIP: | 91506 | 224-AG30D |
| | | | | *END MOUNTING PARTS* | | |
| A2U68 | 156-2735-00 | | | IC,LIN:BIPOLAR,VR;POS,12V,100MA,5%;MC78L12ACP,TO-92 | 80009 | 156-2735-00 |
| A2U69 | 156-1160-00 | | | IC,LIN:BIPOLAR,VR;POS,12V,100MA,4%;LM78L12ACH,TO-39 | 80009 | 156-1160-00 |
| A2U70 | 156-1207-00 | | | IC,LIN:BIPOLAR,VR;NEG,-12V,500MA,3%;LM320H-12,TO-39 | 80009 | 156-1207-00 |
| A2VR3 | 152-0195-00 | | | DIO,ZENER:5.1V,5%,0.4W;1N751A FMLY,DO-35 OR 7 | 80009 | 152-0195-00 |

| Component Number | Tektronix Part Number | Serial / Assembly Number Effective | Discontinued | Name & Description | Mfr. Code | Mfr. Part Number |
|---|---|---|---|---|---|---|
| A2VR4 | 152-0395-00 | | | DIO,ZENER:4.3V,5%,0.4W;1N749A,DO-35 OR 7,TR | 80009 | 152-0395-00 |
| A2VR5 | 152-0395-00 | | | DIO,ZENER:4.3V,5%,0.4W;1N749A,DO-35 OR 7,TR | 80009 | 152-0395-00 |
| A2W1 | 131-0566-00 | | | BUS,CNDCT:DUM RES,0.094 OD X 0.225 L | 80009 | 131-0566-00 |
| A2W5 | 131-4566-00 | 671-1758-01 | 671-1758-03 | BUS,CNDCT:0 OHM,300 SPACING,SM BODY | 80009 | 131-4566-00 |
| A2W123 | 131-0566-00 | | | BUS,CNDCT:DUM RES,0.094 OD X 0.225 L | 80009 | 131-0566-00 |
| A2Y2 | 158-0393-00 | | | XTAL UNIT,QTZ:11.0592 MHZ,+/- 0.005,SER,ESR MAX 30 OHMS,HC-49/U PKG | 80009 | 158-0393-00 |
| | | | | *ATTACHED PARTS* | | |
| | 346-0032-00 | | | STRAP,RETAINING:0.075 DIA X 4.0 L,MLD RBR | 98159 | 2829-75-4 |
| | | | | *END ATTACHED PARTS* | | |
| A2Y3 | 119-4072-00 | | | OSC,XTAL,CLK:18.432MHZ,+/- 0.01%,HCMOS,0 TO 70 DEG C,4 PIN 14 PIN DIP COMPATIBLE | 80009 | 119-4072-00 |
| A3 | 119-4112-00 | | | POWER SUPPLY:SWING,AUTO IN 85-264VAC, 47-440HZ,OUT 5VDC 5A,+15V 2A, -15V 0.5A | 80009 | 119-4112-00 |
| A4 | 671-2106-00 | | | CIRCUIT BD ASSY:SERIAL FILTER | 80009 | 671-2106-00 |
| A4C1 | 283-0197-00 | | | CAP,FXD,CER DI:470PF,5%,50V | 05397 | C320C471J5G5CA |
| A4C2 | 283-0197-00 | | | CAP,FXD,CER DI:470PF,5%,50V | 05397 | C320C471J5G5CA |
| A4C3 | 283-0197-00 | | | CAP,FXD,CER DI:470PF,5%,50V | 05397 | C320C471J5G5CA |
| A4C4 | 283-0197-00 | | | CAP,FXD,CER DI:470PF,5%,50V | 05397 | C320C471J5G5CA |
| A4C5 | 283-0197-00 | | | CAP,FXD,CER DI:470PF,5%,50V | 05397 | C320C471J5G5CA |
| A4C6 | 283-0197-00 | | | CAP,FXD,CER DI:470PF,5%,50V | 05397 | C320C471J5G5CA |
| A4C7 | 283-0197-00 | | | CAP,FXD,CER DI:470PF,5%,50V | 05397 | C320C471J5G5CA |
| A4C8 | 283-0197-00 | | | CAP,FXD,CER DI:470PF,5%,50V | 05397 | C320C471J5G5CA |
| A4C9 | 283-0197-00 | | | CAP,FXD,CER DI:470PF,5%,50V | 05397 | C320C471J5G5CA |
| A4C10 | 283-0197-00 | | | CAP,FXD,CER DI:470PF,5%,50V | 05397 | C320C471J5G5CA |
| A4C11 | 283-0197-00 | | | CAP,FXD,CER DI:470PF,5%,50V | 05397 | C320C471J5G5CA |
| A4C12 | 283-0197-00 | | | CAP,FXD,CER DI:470PF,5%,50V | 05397 | C320C471J5G5CA |
| A4C13 | 283-0197-00 | | | CAP,FXD,CER DI:470PF,5%,50V | 05397 | C320C471J5G5CA |
| A4C14 | 283-0197-00 | | | CAP,FXD,CER DI:470PF,5%,50V | 05397 | C320C471J5G5CA |
| A4C15 | 283-0197-00 | | | CAP,FXD,CER DI:470PF,5%,50V | 05397 | C320C471J5G5CA |
| A4C16 | 283-0197-00 | | | CAP,FXD,CER DI:470PF,5%,50V | 05397 | C320C471J5G5CA |
| A4C17 | 283-0197-00 | | | CAP,FXD,CER DI:470PF,5%,50V | 05397 | C320C471J5G5CA |
| A4C18 | 283-0197-00 | | | CAP,FXD,CER DI:470PF,5%,50V | 05397 | C320C471J5G5CA |
| A4FL1 | 119-3580-00 | | | FILTER,EMI: | TK2058 | ZJSR-5101-102TA |
| A4FL2 | 119-3580-00 | | | FILTER,EMI: | TK2058 | ZJSR-5101-102TA |
| A4FL3 | 119-3580-00 | | | FILTER,EMI: | TK2058 | ZJSR-5101-102TA |
| A4FL4 | 119-3580-00 | | | FILTER,EMI: | TK2058 | ZJSR-5101-102TA |
| A4FL5 | 119-3580-00 | | | FILTER,EMI: | TK2058 | ZJSR-5101-102TA |
| A4FL6 | 119-3580-00 | | | FILTER,EMI: | TK2058 | ZJSR-5101-102TA |
| A4FL7 | 119-3580-00 | | | FILTER,EMI: | TK2058 | ZJSR-5101-102TA |
| A4FL8 | 119-3580-00 | | | FILTER,EMI: | TK2058 | ZJSR-5101-102TA |
| A4FL9 | 119-3580-00 | | | FILTER,EMI: | TK2058 | ZJSR-5101-102TA |
| A4J1 | 174-2353-00 | | | CA ASSY,SP,ELEC:10,28 AWG,9.25 L (CONNECTED TO A1J25) | 80009 | 174-2353-00 |
| A4J2 | 131-3926-00 | | | CONN,DSUB: | 80009 | 131-3926-00 |
| C135 | 283-0067-00 | B010100 | B010409 | CAP,FXD,CER DI:0.001UF,10%,200V | 51406 | |
| C135 | 283-0067-00 | B040000 | | CAP,FXD,CER D1:0.001UF,10%,200V | 51046 | 283-0067-00 |
| C136 | 283-0067-00 | B010100 | B010409 | CAP,FXD,CER D1:0.001UF,10%,200V | 51046 | 283-0067-00 |
| C136 | 283-0067-00 | B040000 | | CAP,FXD,CER D1:0.001UF,10%,200V | 51046 | 283-0067-00 |
| C200 | 283-0067-00 | B010410 | | CAP,FXD,CER D1:0.001UF,10%,200V | 51046 | 283-0067-00 |
| E200 | 276-0647-00 | B010410 | B039999 | CORE,EM:TOROID,FERRITE | 78488 | 57-0126 |

| Component Number | Tektronix Part Number | Serial / Assembly Number Effective | Discontinued | Name & Description | Mfr. Code | Mfr. Part Number |
|---|---|---|---|---|---|---|
| FL100 | 119–1536–00 | | | FILTER,RFI:3A,250VAC,50/60HZ | 54583 | ZUB2203–00 |
| J200 | 131–5233–00 | | | CONN,JACK,PHONE:<br>*ATTACHED PARTS* | 80009 | 131–5233–00 |
| | 210–0201–00 | | | TERM,LUG:0.12 ID,LOCKING,BRZ TIN PL<br>*END ATTACHED PARTS* | 86928 | A373–157–2 |
| J230 | 174–2338–00 | | | CA ASSY,SP,ELEC:<br>(CONNECTED FROM A1J23 TO A3J2) | 80009 | 174–2338–00 |
| S100 | 260–2553–00 | | | SW,RKR:DPDT,6A,125VAC,POWER,W/QUICK CONNECT TERMS | 80009 | 260–2553–00 |
| W1 | 174–2497–00 | | | CA ASSY,SP,ELEC:2,18 AWG,3.25 L<br>(CONNECTED FROM A3J1 TO S100) | 80009 | 174–2497–00 |
| W7 | 174–2451–00 | | | CA ASSY,RF:COAXIAL;RFD,50 OHM,0.083 DIA,11.0 L,1X3,0.1 CTR,RCPT BOTH ENDS<br>(CONNECTED FROM A1J7 TO A2J2) | 80009 | 174–2451–00 |
| W200 | 174–2494–00 | B010100 | B010409 | CA ASSY,SP,ELEC:PHONE JACK CABLE | 80009 | 174–2494–00 |
| W200 | 174–2552–00 | B010410 | | CA ASSY,SP,ELEC:3,26 AWG,3.1 L,RBN | 80009 | 174–2552–00 |

# DIAGRAMS/CIRCUIT BOARD ILLUSTRATIONS

## Symbols

Graphic symbols and class designation letters are based on ANSI Standard Y32.2-1975.

Logic symbology is based on ANSI Y32.14-1973 in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

Both overline and parenthesis indicate a low asserting state.

Example: $\overline{\text{ID,CONTROL}}$ or (ID CONTROL)

Abbreviations are based on ANSI Y1.1-1972.

Other ANSI standards that are used in the preparation of diagrams by Tektronix, Inc. are:

Y14.15, 1966 — Drafting Practices.
Y14.2, 1973 — Line Conventions and Lettering.
Y10.5, 1968 — Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering.

American National Standard Institute
1430 Broadway, New York, New York 10018

## Component Values

Electrical components shown on the diagrams are in the following units unless noted otherwise:

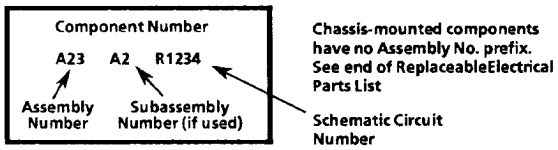
Capacitors:
Values one or greater are in picofarads (pF).
Values less than one are in microfarads ($\mu$F).
Resistors = Ohms ($\Omega$).

**The following information and special symbols may appear in this manual.**

## Assembly Numbers

Each assembly in the instrument is assigned an assembly number (e.g., A20). The assembly number appears on the diagram (in circuit board outline), circuit board illustration title, and lookup table for the schematic diagram.

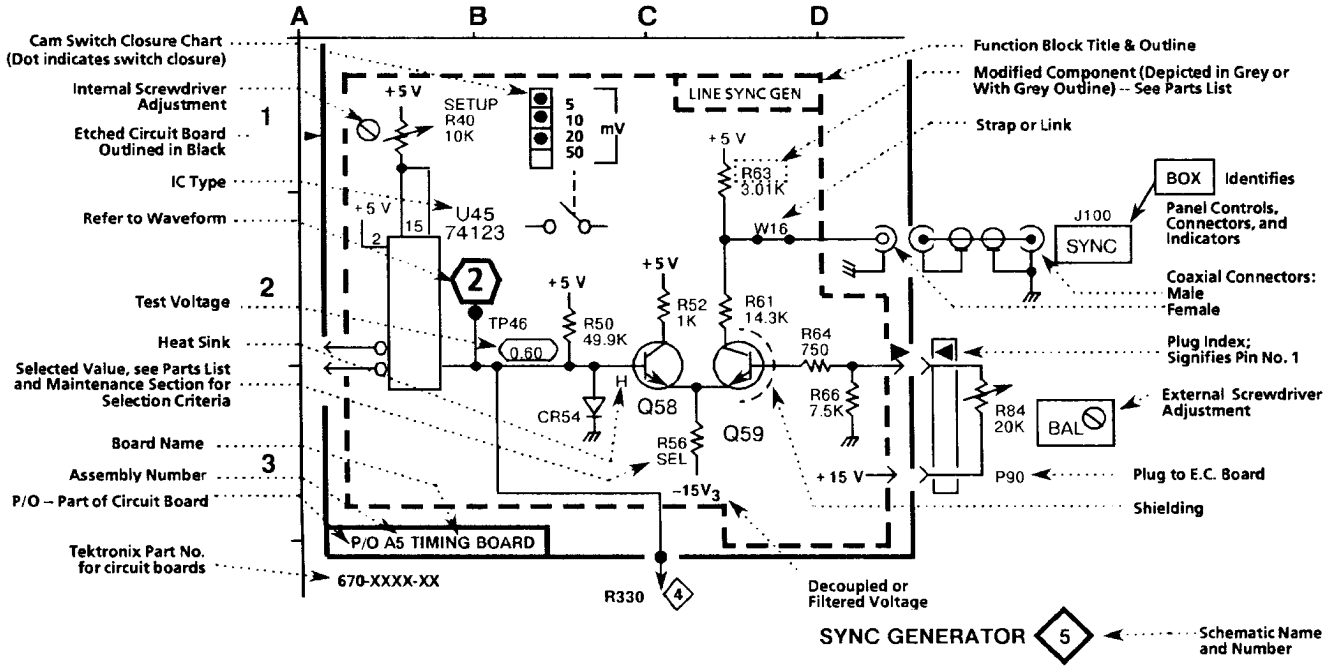
The Replaceable Electrical Parts List is arranged by assembly number in numerical sequence; the components are listed by component number. Example:

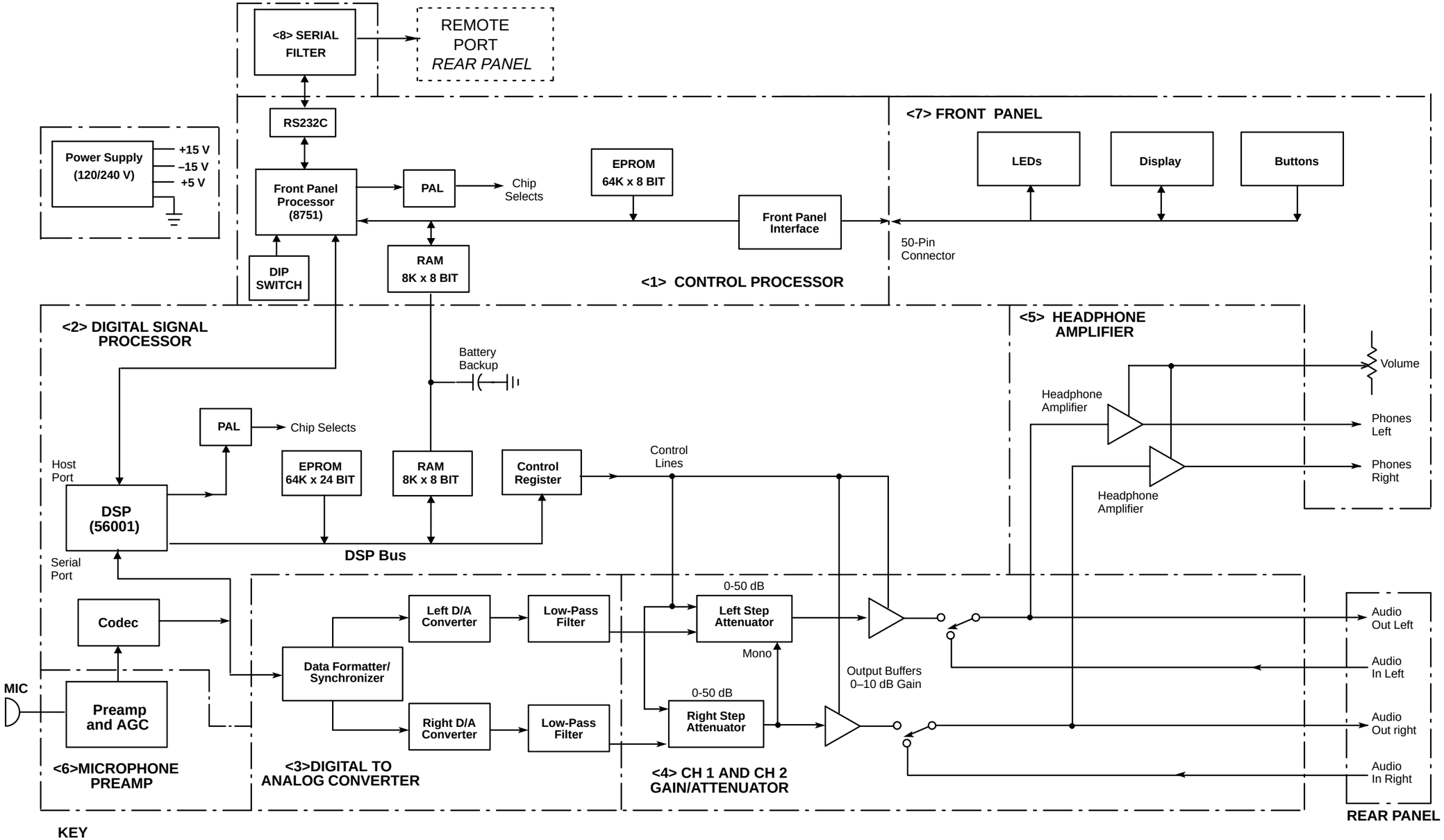



## Grid Coordinates

The schematic diagram and circuit board component location illustration have grids. A lookup table with the grid coordinates is provided for ease of locating the component. Only the components illustrated on the facing diagram are listed in the lookup table.

When more than one schematic diagram is used to illustrate the circuitry on a circuit board, the circuit board illustration may only appear opposite the first diagram; the lookup table will list the diagram number of other diagrams that the other circuitry appears on.





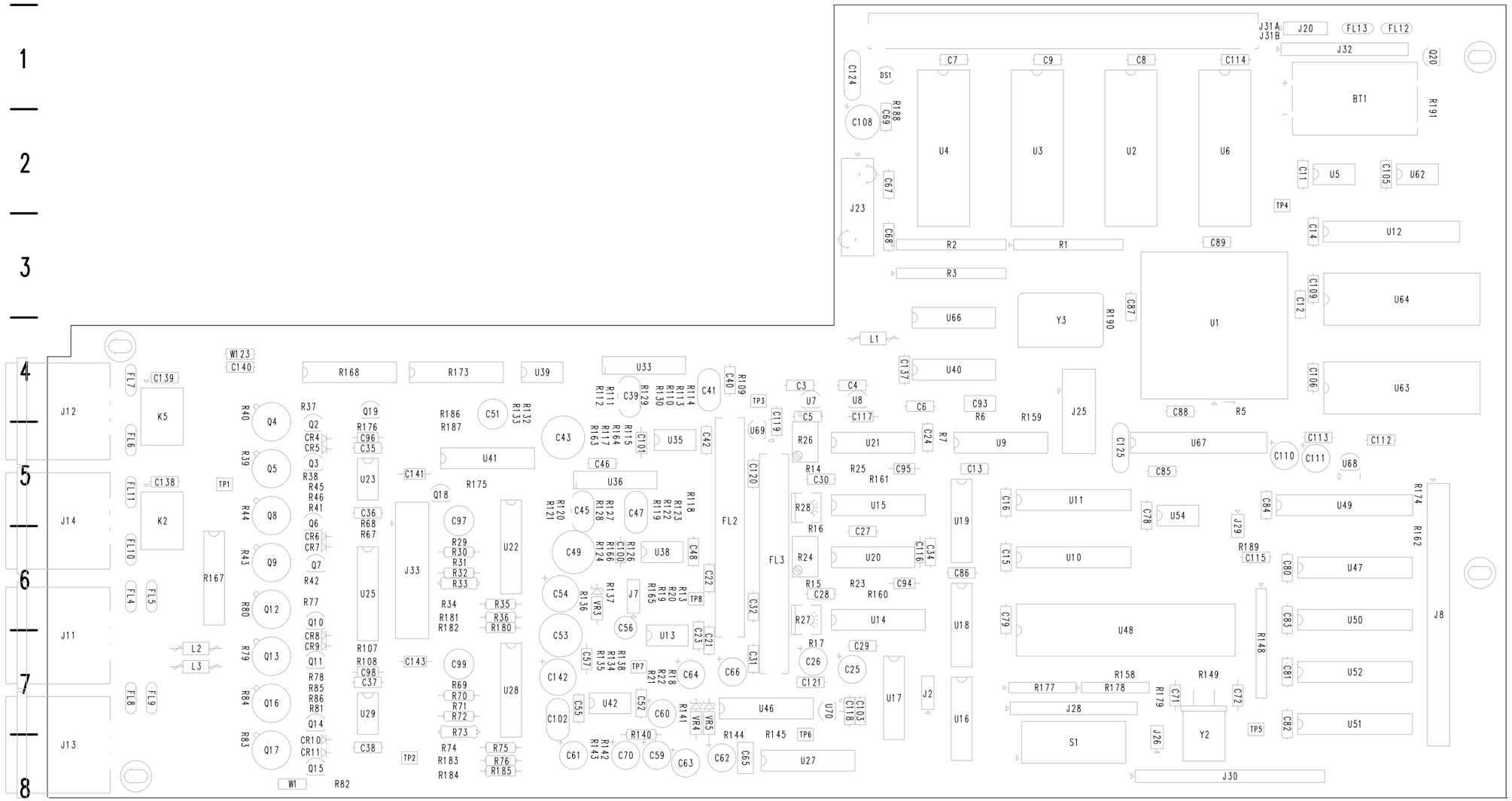

**KEY**

SIGNAL LINE

CONTROL LINE

SCHEMATIC DIAGRAM NUMBER <n>

**ASG 100 Block Diagram**




**Static Sensitive Devices**
*See Maintenance Section*

## A2 MAIN BOARD
## 671-1758-04 & UP

### Schematic Diagram <1> Component Locator Chart

**Main Board, Assembly A2.** Partial Assembly A2 also shown on Diagrams 2, 3, 4, 5, and 6.

| Comp No | Diag Loc | Bd Loc | Comp No | Diag Loc | Bd Loc | Comp No | Diag Loc | Bd Loc | Comp No | Diag Loc | Bd Loc | Comp No | Diag Loc | Bd Loc | Comp No | Diag Loc | Bd Loc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C71 | B3 | K7 | C115 | B3 | L6 | | | | R177 | B1 | J7 | U40E | D3 | G4 | | | |
| C72 | B3 | L7 | | | | R148 | C1 | L6 | R178 | B1 | J7 | U40F | D3 | G4 | U54 | C4 | K6 |
| C77 * | B4 | L6 | CR14 * | B4 | K6 | R149 | B3 | L7 | R179 | A3 | K7 | U47 | D2 | L6 | U55 * | B4 | K6 |
| C78 | B4 | K5 | | | | R153 * | B4 | L5 | R189 | B3 | L6 | | | | U62 | E4 | M2 |
| C103 | G2 | N5 | J8 | H1 | N5 | R154 * | B4 | L5 | | | | U48 | B2 | J7 | U63 | F4 | M5 |
| | | | J25 | C5 | J4 | R158 | A2 | K7 | S1 | A1 | J8 | U49 | E2 | L6 | U64 | F3 | M4 |
| C109 | F4 | M3 | J26 | A3 | K7 | | | | | | | U50 | G3 | L7 | U67 | B5 | K5 |
| C110 | B5 | L5 | J28 | A1 | J7 | R162 | G2 | N6 | U40B | D3 | G4 | U51 | G5 | L8 | | | |
| C111 | B5 | M5 | J29 | B3 | L5 | R174 | H1 | N5 | U40C | B3 | G4 | U52 | G4 | L7 | Y2 | B2 | K8 |

*The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.*

*See parts list for earlier values and serial number ranges.

BLOCK DIAGRAM

# FRONT PANEL PROCESSOR

## DIP SWITCH

J28 — FOR TEST ONLY

R177 10K, R178 10K (+5V)

MODA → U1−123

MODB → U1−121

S1

## FRONT PANEL INTERFACE

AUD LEVEL → R132 → C103 0.1uF → R162 49.9K (+15V, −15V)

J8 → J1 FRONT PANEL BOARD

## RAM

## BATTERY BACKUP

## EPROM

## RS232 PORT

## FRONT PANEL PROCESSOR

U48 80C32T2−1

U47 74LS373

U49 PAL22V10

R148 10K

R158 1.00K

R179 10.0K

INTERNAL EPROM — J26

Y2 11.059MHz

C71 33pF, R149 1M, C72 33pF

U40C 74LS04

RESET

EXT. RESET — J29 — R189 4.75K — C115 0.1uF — (EXTRST) → J31A−31

U40B, U40E, U40F 74LS04

U55 — CR14, C77, R154, R153

U54 MAX690 — 671−1758−01 & BELOW — C78 0.1uF — R191 — (RESET)

U62 DS1210 — BATT → U5−2 — C109 0.1uF

U64 43256−12LL

U63 27C512

U50 74LS273

U52 74LS244

U51 74LS244

U67 MAX239 — C111 4.7uF, C110 10uF

J25 → J1 SERIAL FILTER BOARD

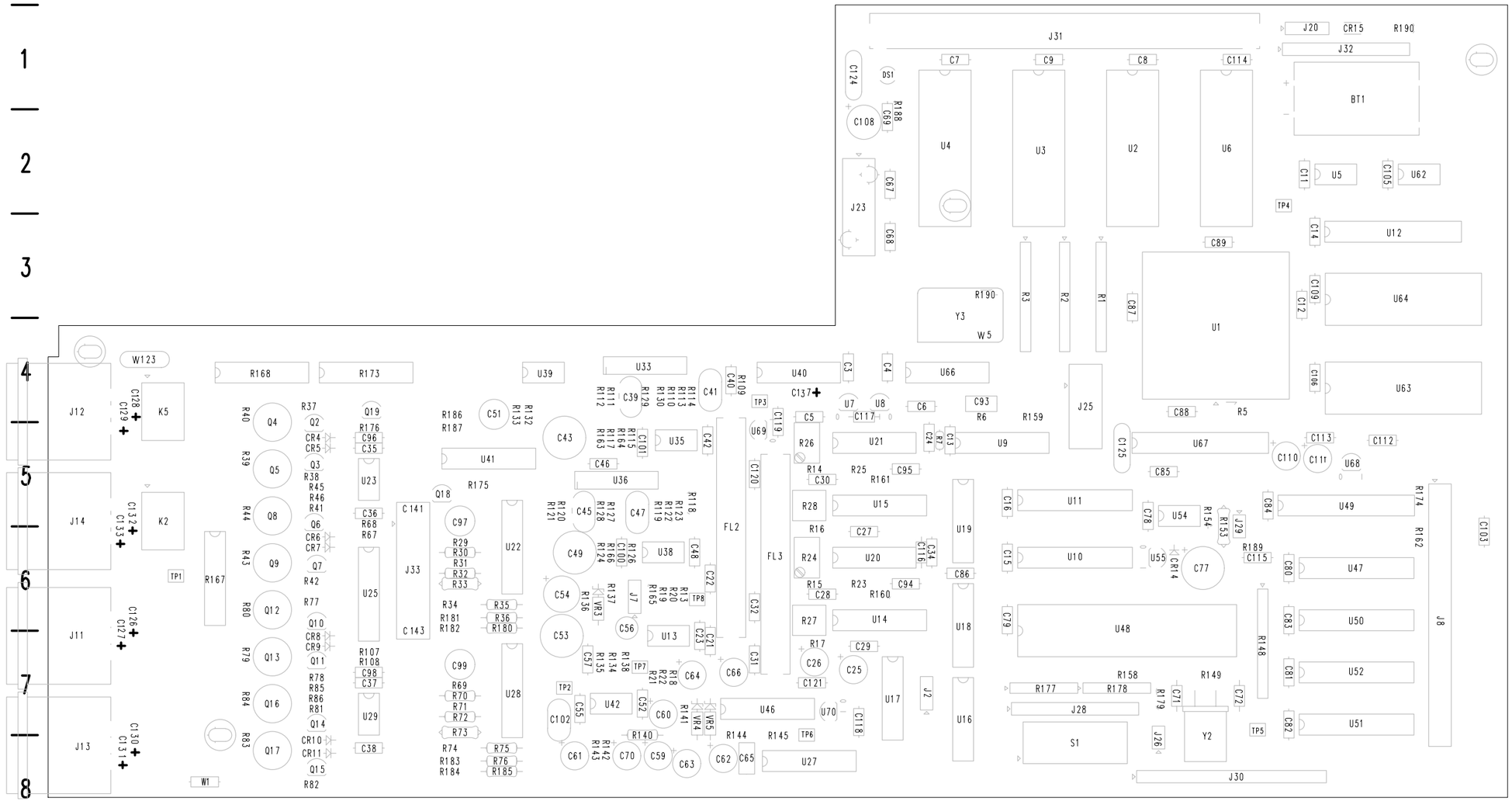
U66−1 — DCD

= ANALOG GROUND

= DIGITAL GROUND

SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES.

P/O A2 MAIN BOARD




**Static Sensitive Devices**
*See Maintenance Section*

**+** Back of board.

**A2 MAIN BOARD**
**671-1758-00 – 03**

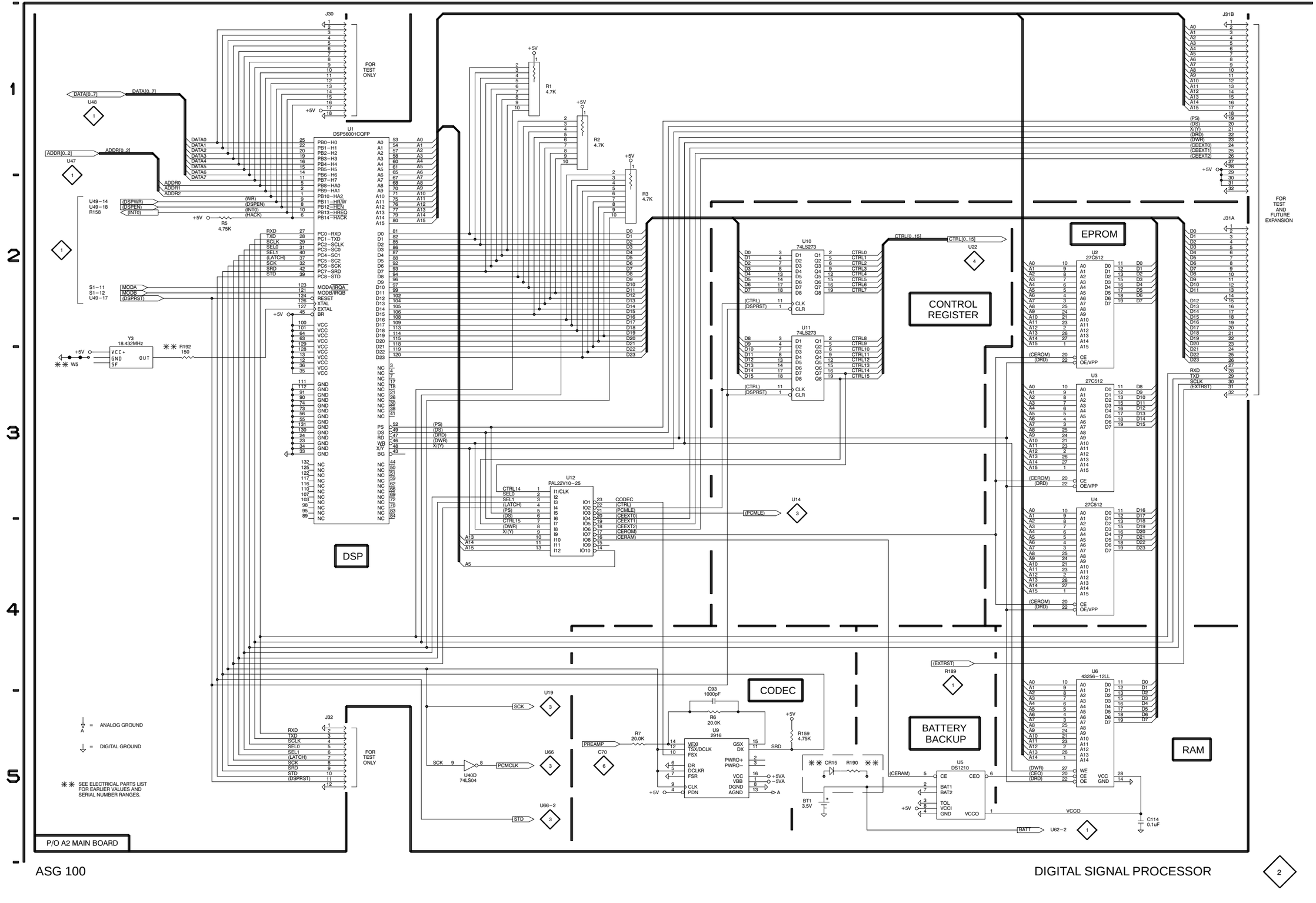
**Schematic Diagram <2> Component Locator Chart**

**Assembly A2.** Partial Assembly A2 also shown on Diagrams 1, 3, 4, 5, and 6.

| Comp No | Diag Loc | Bd Loc | Comp No | Diag Loc | Bd Loc | Comp No | Diag Loc | Bd Loc | Comp No | Diag Loc | Bd Loc |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BT1 | E5 | L2 | J31B | H1 | L1 | R159 | E5 | J4 | U9 | E5 | I5 |
| | | | J32 | B5 | L1 | R190 * | A3 | M1 | U10 | E2 | J6 |
| C93 | E5 | I4 | | | | | | | U11 | E2 | J6 |
| C114 | G5 | L1 | R1 | D1 | J3 | U1 | B1 | L4 | U12 | D3 | M3 |
| | | | R2 | D1 | J3 | U2 | G2 | K1 | U40D | C5 | G4 |
| CR15 * | F5 | M1 | R3 | D1 | J3 | U3 | G3 | J1 | | | |
| | | | R5 | B2 | L4 | U4 | G3 | I1 | W5 * | A3 | I4 |
| J30 | B1 | K8 | R6 | E5 | I4 | U5 | F5 | M2 | | | |
| J31A | H2 | L1 | R7 | D5 | I5 | U6 | G5 | L1 | Y3 | A3 | I3 |

*The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.*

*See parts list for earlier values and serial number ranges.


J30
FOR TEST ONLY
DATA[0..7]
U48
ADDR[0..2]
U47
U1
DSP56001CQFP
DSP
R1 4.7K
R2 4.7K
R3 4.7K
R5 4.75K
+5V
(DSPWR)
(DSPEN)
(INT0)
(HACK)
(WR)
(DSPEN)
(INT0)
(HACK)
R158
MODA/IRQA
MODB/IRQB
RESET
EXTAL
BR
Y3
18.432MHz
R192
150
W5
VCC
GND
U12
PAL22V10-25
CODEC
(PCMLE)
U14
U10
74LS273
U11
74LS273
CTRL[0..15]
U22
CONTROL REGISTER
EPROM
U2
27C512
U3
27C512
U4
27C512
J31B
J31A
FOR TEST AND FUTURE EXPANSION
(PS)
(DS)
X/Y
(DRD)
(DWR)
(CEEXT0)
(CEEXT1)
(CEEXT2)
(CEROM)
(CERAM)
RXD
TXD
SCLK
(EXTRST)
J32
FOR TEST ONLY
U40D
74LS04
PCMCLK
U19
U66
U66-2
SCK
STD
C93
1000pF
R6
20.0K
R7
20.0K
PREAMP
C70
U9
2916
R159
4.75K
CR15
R190
BT1
3.5V
U5
DS1210
BAT1
BAT2
TOL
VCCI
VCCO
BATT
U62-2
C114
0.1uF
R189
(EXTRST)
BATTERY BACKUP
U6
43256-12LL
RAM
= ANALOG GROUND
= DIGITAL GROUND
SEE ELECTRICAL PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES.
P/O A2 MAIN BOARD

## Schematic Diagram <3>

## Component Locator Chart

*The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram.*

**Main Board, Assembly A2.**
Partial Assembly A2 also shown on Diagrams 1, 2, 4, 5, and 6.

| Comp No | Diag Loc | Bd Loc | Comp No | Diag Loc | Bd Loc |
|---|---|---|---|---|---|
| C21 | F3 | G7 | | | |
| C22 | F3 | G6 | R23 | E3 | H6 |
| C23 | H4 | G6 | R24 | E4 | H6 |
| C24 | E3 | I5 | R25 | E2 | H5 |
| C31 | F4 | G7 | R26 | E2 | H5 |
| | | | R27 | C4 | H6 |
| C32 | F4 | G6 | | | |
| C34 | E4 | I6 | R28 | C3 | H5 |
| C94 | E4 | I6 | R66 * | B1 | |
| C95 | E3 | I5 | R160 | E4 | H6 |
| C116 | E4 | I6 | R161 | E3 | H5 |
| C117 | E2 | H4 | TP7 | H4 | F7 |
| C118 | E5 | H7 | TP8 | H3 | G6 |
| C119 | E5 | G4 | | | |
| C120 | F5 | G5 | U13A | H4 | F7 |
| C121 | F5 | H7 | U13B | H3 | F7 |
| | | | U14 | C4 | I6 |
| FL2 | F3 | G5 | U15 | C2 | I5 |
| FL3 | F4 | G5 | U16 | B1 | I7 |
| J2 | C1 | I7 | U17 | B1 | H7 |
| | | | U18 | B2 | I6 |
| R14 | C3 | H5 | U19 | B2 | I5 |
| R15 | C4 | H6 | U20 | E4 | I6 |
| R16 | C3 | H6 | U21 | E3 | I4 |
| R17 | C4 | H7 | | | |
| | | | U66A | B1 | I4 |
| R19 | H2 | F6 | U66B | A1 | I4 |
| R20 | G2 | F6 | U69 | E5 | G5 |
| R21 | H4 | F7 | U70 | E5 | H7 |
| R22 | G4 | F7 | | | |

*See parts list for earlier values and serial number ranges.

DATA FORMATTER/SYNCHRONIZER

LEFT D/A CONVERTER

LEFT LOW PASS FILTER

RIGHT D/A CONVERTER

RIGHT LOW PASS FILTER

= ANALOG GROUND

= DIGITAL GROUND

NOTE: ** SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES.

P/O A2 MAIN BOARD

## Schematic Diagram <3a>

## Component Locator Chart

*The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram.*

**Main Board, Assembly A2.**
Partial Assembly A2 also shown on Diagrams 1, 2, 4, 5, and 6.

| Comp No | Diag Loc | Bd Loc | Comp No | Diag Loc | Bd Loc |
|---|---|---|---|---|---|
| C21 | F3 | G7 | R22 | G4 | F7 |
| C22 | F3 | G6 | | | |
| C23 | H4 | G6 | R23 | E3 | H6 |
| C24 | E3 | I5 | R24 | E4 | H6 |
| C31 | F4 | G7 | R25 | E2 | H5 |
| | | | R26 | E2 | H5 |
| C32 | F4 | G6 | R27 | C4 | H6 |
| C34 | E4 | I6 | | | |
| C94 | E4 | I6 | R28 | C3 | H5 |
| C95 | E3 | I5 | R66 * | B1 | |
| C116 | E4 | I6 | R160 | E4 | H6 |
| | | | R161 | E3 | H5 |
| C117 | E2 | H4 | | | |
| C118 | E5 | H7 | TP7 | H4 | F7 |
| C119 | E5 | G4 | TP8 | H3 | G6 |
| C120 | F5 | G5 | | | |
| C121 | F5 | H7 | U13A | H4 | F7 |
| | | | U13B | H3 | F7 |
| FL2 | F3 | G5 | U14 | C4 | I6 |
| FL3 | F4 | G5 | U15 | C2 | I5 |
| | | | U16 | B1 | I7 |
| J2 | C1 | I7 | | | |
| | | | U17 | B1 | H7 |
| R13 | G3 | G6 | U18 | B2 | I6 |
| R14 | C3 | H5 | U19 | B2 | I5 |
| R15 | C4 | H6 | U20 | E4 | I6 |
| R16 | C3 | H6 | U21 | E3 | I4 |
| R17 | C4 | H7 | | | |
| | | | U66A | B1 | I4 |
| R18 | G4 | F7 | U66B | A1 | I4 |
| R19 | H2 | F6 | U69 | E5 | G5 |
| R20 | G2 | F6 | U70 | E5 | H7 |
| R21 | H4 | F7 | | | |

*See parts list for earlier values and serial number ranges.

DATA FORMATTER/SYNCHRONIZER

LEFT D/A CONVERTER

LEFT LOW PASS FILTER

RIGHT D/A CONVERTER

RIGHT LOW PASS FILTER

= ANALOG GROUND

= DIGITAL GROUND

NOTE: ✳✳ SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES.

P/O A2 MAIN BOARD

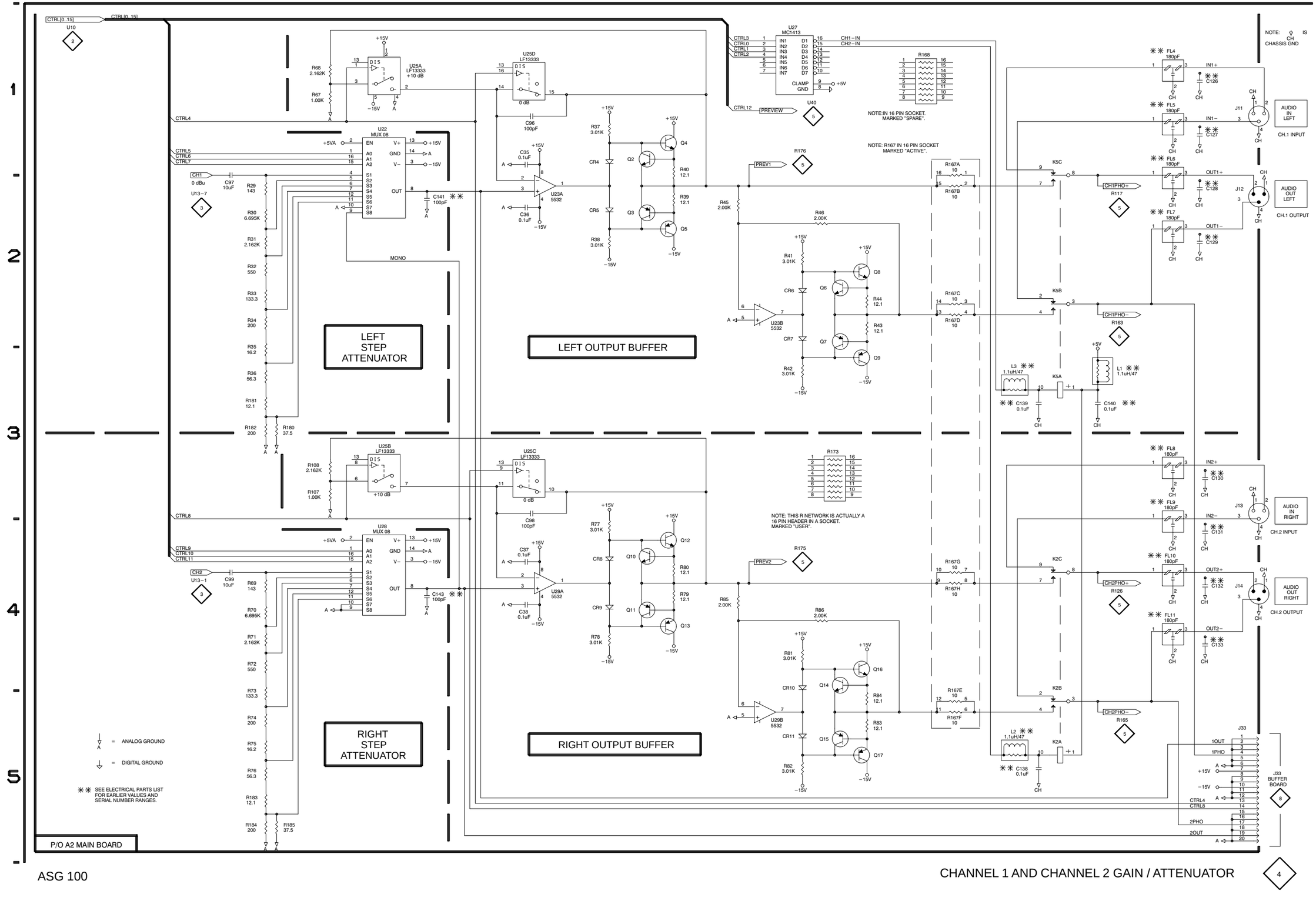
## Schematic Diagram <4> Component Locator Chart

*The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.*

**Main Board, Assembly A2.**
Partial Assembly A2 also shown on Diagrams 1, 2, 3, 5, and 6.

| Comp No | Diag Loc | Bd Loc |
|---|---|---|
| C35 | D1 | D5 |
| C36 | D2 | D5 |
| C37 | D4 | D7 |
| C38 | D4 | D8 |
| C96 | D1 | D5 |
| C97 | B1 | D6 |
| C98 | D3 | D7 |
| C99 | B4 | D7 |
| C126 * | H1 | A6 |
| C127 * | H1 | A6 |
| C128 * | H1 | A4 |
| C129 * | H1 | A4 |
| C130 * | H3 | A8 |
| C131 * | H4 | A8 |
| C132 * | H4 | A5 |
| C133 * | H4 | A5 |
| C137 | F4 | H4 |
| C138 * | G5 | B5 |
| C139 * | G3 | B4 |
| C140 * | G3 | B4 |
| C141 * | C2 | D5 |
| C143 * | C4 | D6 |
| CR4 | D1 | C5 |
| CR5 | D2 | C5 |
| CR6 | E2 | C6 |
| CR7 | E2 | C6 |
| CR8 | D4 | C7 |
| CR9 | D4 | C7 |
| CR10 | E4 | C8 |
| CR11 | E5 | C8 |
| FL4 * | H1 | A6 |
| FL5 * | H1 | B6 |
| FL6 * | H2 | A5 |
| FL7 * | H2 | A5 |
| FL8 * | H3 | A7 |
| FL9 * | H3 | B7 |
| FL10 * | H4 | A6 |
| FL11 * | H4 | A5 |
| J11 | H1 | A6 |
| J12 | H2 | A4 |
| J13 | H3 | A7 |
| J14 | H4 | A5 |
| J33 | H5 | D5 |
| K2A | G5 | B5 |
| K2B | G5 | B5 |
| K2C | G4 | B5 |
| K5A | G3 | B4 |
| K5B | G2 | B4 |
| K5C | G1 | B4 |
| L1 * | C3 | H4 |
| L2 * | C5 | B7 |
| L3 * | G3 | B7 |
| Q2 | D1 | C5 |
| Q3 | D2 | C5 |
| Q4 | D1 | C4 |
| Q5 | D2 | C5 |
| Q6 | F2 | C5 |
| Q7 | F2 | C6 |
| Q8 | F2 | B5 |
| Q9 | F3 | B6 |
| Q10 | D4 | C6 |
| Q11 | D4 | C7 |
| Q12 | D4 | B6 |
| Q13 | D4 | B7 |
| Q14 | F4 | C7 |
| Q15 | F5 | C8 |
| Q16 | F4 | B7 |
| Q17 | F5 | B7 |
| Q20 * | G4 | N1 |
| R29 | B2 | D6 |
| R30 | B2 | D6 |
| R31 | B2 | D6 |
| R32 | B2 | D6 |
| R33 | B2 | D6 |
| R34 | B2 | D6 |
| R35 | B2 | E6 |
| R36 | B3 | E6 |
| R37 | D1 | C4 |
| R38 | D2 | C5 |
| R39 | E2 | B5 |
| R40 | E1 | B4 |
| R41 | E2 | C5 |
| R42 | E3 | C6 |
| R43 | F2 | B6 |
| R44 | F2 | B5 |
| R45 | E2 | C5 |
| R46 | E2 | C5 |
| R67 | B1 | D6 |
| R68 | B1 | D6 |
| R69 | B4 | D7 |
| R70 | B4 | D7 |
| R71 | B4 | D7 |
| R72 | B4 | D7 |
| R73 | B4 | D8 |
| R74 | B5 | D8 |
| R75 | B5 | E8 |
| R76 | B5 | E8 |
| R77 | D4 | C6 |
| R78 | D4 | C7 |
| R79 | E4 | B7 |
| R80 | E4 | B6 |
| R81 | E4 | C7 |
| R82 | E5 | C8 |
| R83 | F5 | B7 |
| R84 | F5 | B7 |
| R85 | E4 | C7 |
| R86 | E4 | C7 |
| R107 | B3 | D7 |
| R108 | B3 | D7 |
| R167A | F1 | B6 |
| R167B | F2 | B6 |
| R167C | F2 | B6 |
| R167D | F2 | B6 |
| R167E | F5 | B6 |
| R167F | F5 | B6 |
| R167G | F4 | B6 |
| R167H | F4 | B6 |
| R168 | F1 | B4 |
| R173 | E3 | C4 |
| R180 | B3 | E7 |
| R181 | B3 | D6 |
| R182 | B3 | D7 |
| R183 | B5 | D8 |
| R184 | B5 | D8 |
| R185 | B5 | E8 |
| R191 * | G4 | N1 |
| U22 | C1 | E5 |
| U23A | D2 | C5 |
| U23B | E2 | C5 |
| U25A | C1 | C6 |
| U25B | C3 | C6 |
| U25C | D3 | C6 |
| U25D | D1 | C6 |
| U27 | E1 | G8 |
| U28 | C4 | E7 |
| U29A | D4 | C7 |
| U29B | E5 | C7 |
| CHASSIS | | |
| C135 * | H3 | — |
| C136 * | H3 | — |
| C200 * | H3 | — |
| E200 * | H3 | — |

*See parts list for earlier values and serial number ranges.




ASG 100

CHANNEL 1 AND CHANNEL 2 GAIN / ATTENUATOR

4

## Schematic Diagram <5>

## Component Locator Chart

*The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram.*

**Main Board, Assembly A2.**
Partial Assembly A2 also shown on Diagrams 1, 2, 3, 4, and 6.

| Comp No | Diag Loc | Bd Loc | Comp No | Diag Loc | Bd Loc |
|---|---|---|---|---|---|
| C39 | D3 | F4 | R119 | F4 | F5 |
| C40 | E3 | G4 | | | |
| C41 | F3 | G4 | R120 | D4 | E5 |
| C42 | C1 | G5 | R121 | C2 | E5 |
| C43 | C1 | E4 | R122 | F4 | F5 |
| | | | R123 | F4 | G5 |
| C45 | D4 | F5 | R124 | B2 | F6 |
| C46 | E4 | F5 | | | |
| C47 | F4 | F5 | R126 | B2 | F6 |
| C48 | C2 | G6 | R127 | E4 | F5 |
| C49 | C2 | E6 | R128 | E4 | F5 |
| | | | R129 | E3 | F4 |
| C51 | C5 | E4 | R130 | E3 | F4 |
| C100 | B2 | F6 | | | |
| C101 | B1 | F5 | R132 | B5 | E4 |
| C135 | BH | | R133 | B5 | E4 |
| C136 | BH | | R163 | B1 | F5 |
| C200 | CH | | R164 | B1 | F5 |
| | | | R165 | B2 | F6 |
| E200 | BH | | | | |
| | | | R166 | B2 | F6 |
| J20 | H3 | L1 | R175 | B3 | E5 |
| J200 | BH | | R176 | B3 | D5 |
| | | | R186 | C3 | D4 |
| Q18 | C3 | D5 | R187 | C3 | D5 |
| Q19 | C3 | C4 | | | |
| | | | U33 | E3 | F4 |
| R109 | G3 | G4 | U35A | B1 | F5 |
| R110 | F3 | F4 | U35B | F3 | F5 |
| R111 | D3 | F4 | U36 | E4 | E5 |
| R112 | C1 | F4 | U38A | B2 | F6 |
| R113 | F3 | G4 | | | |
| | | | U38B | F4 | F6 |
| R114 | F3 | G4 | U39 | C5 | E4 |
| R115 | B1 | F5 | U40A | B3 | G4 |
| R117 | B1 | F5 | U41 | D3 | D5 |
| R118 | G4 | G5 | | | |

*See parts list for earlier values and serial number ranges.

# HEADPHONE AMPLIFIER

K5-3 → 4 CH1PHO-
K5-8 → 4 CH1PHO+
C101 100pF; R115 ** 56.2K; R163 ** 100.0K; R117 ** 100.0K; R164 ** 56.2K
U35A 5532 (+15V, −15V)
C43 47uF; R112 20.0K
C42 0.1uF

K2-3 → 4 CH2PHO-
K2-8 → 4 CH2PHO+
C100 100pF; R124 ** 56.2K; R165 ** 100.0K; R126 ** 100.0K; R166 ** 56.2K
U38A 5532 (+15V, −15V)
C49 47uF; R121 20.0K
C48 0.1uF

U27 → 4 PREVIEW
U40A 74LS04
Norm
4 → R45 PREV1, R85 PREV2
R176 20.0K; R175 20.0K
Prev
Q19; R186 20.0K
Q18; R187 20.0K
U41 DG405 (+15V, −15V, V+, V−, VL, GND, +5VA)

J8-6 → 1 AUD LEVEL
R132 100K; R133 3.32K
C51 10uF
U39 LF351 (+15V, −15V)

U33 DBX 2151 (VCC, GND, I IN, SC1, SC2, SC3, I SET, I OUT)
C40 0.1uF; R111 20.0K; C39 98pF; R129 10.0K; R130 3.74K (−15V)
U36 DBX 2151 (VCC, GND, I IN, SC1, SC2, SC3, I SET, I OUT)
C46 0.1uF; R120 20.0K; C45 98pF; R128 10.0K; R127 3.74K (−15V)

C41 33pF; R110 20.0K; R113 100; R114 20.0K; U35B 5532; R109 150
C47 33pF; R119 20.0K; R122 100; R123 20.0K; U38B 5532; R118 150

U54-7 → 1 (RESET)
R191 ** 10.0K
Q20 VN0106

LPHO, RPHO → J20 (T 1, R 2, S 3, 4)

NOTE: PIN 3 OF J20 NOT INSERTED ON ECB.

EFF B010409 & BELOW
HEADPHONES JACK MOUNTED ON FRONT CASTING
J200; C135 .001; C136 .001; CH

EFF B010410 THRU B032422
HEADPHONES JACK MOUNTED ON FRONT CASTING
J200; E200 **; C200 0.001; CH

J20 → J200; C135 .001; C136 .001; C200 0.001; CH
HEADPHONES JACK MOUNTED ON FRONT CASTING

** SEE ELECTRICAL PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES.

A = ANALOG GROUND

= DIGITAL GROUND

P/O A2 MAIN BOARD

## Schematic Diagram <6>

## Component Locator Chart

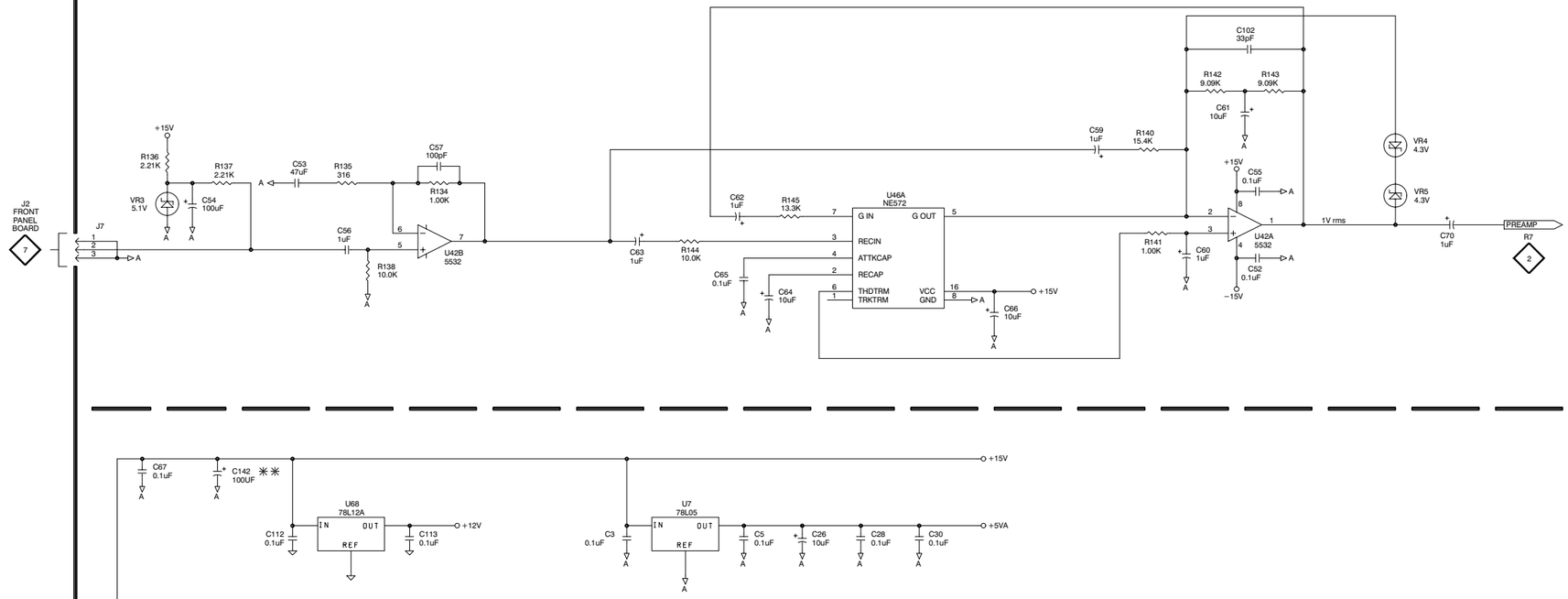
*The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram.*

**Main Board, Assembly A2.**
Partial Assembly A2 also shown on Diagrams 1, 2, 3, 4, and 5.

| Comp No | Diag Loc | Bd Loc | Comp No | Diag Loc | Bd Loc |
|---|---|---|---|---|---|
| C3 | D3 | H4 | C102 | G1 | E7 |
| C4 | D5 | I4 | C105 | F4 | M2 |
| C5 | D3 | H4 | | | |
| C6 | D5 | I4 | C106 | F4 | M4 |
| C7 | D3 | I1 | C108 | C3 | H1 |
| | | | C112 | C3 | M5 |
| C8 | D3 | K1 | C113 | C3 | M5 |
| C9 | E3 | J1 | C124 | D4 | H1 |
| C11 | E3 | M2 | | | |
| C12 | E3 | L3 | C125 | D4 | K5 |
| C13 | E3 | I5 | C134 | D4 | N8 |
| | | | C137 | F4 | H4 |
| C14 | F3 | M3 | C142 * | B3 | F7 |
| C15 | F3 | J6 | | | |
| C16 | F3 | J5 | DS1 | C4 | H1 |
| C25 | E5 | H7 | | | |
| C26 | E3 | H7 | J7 | B2 | F6 |
| | | | J23 | B4 | H2 |
| C27 | E5 | H6 | | | |
| C28 | E3 | H6 | R134 | C2 | F7 |
| C29 | E5 | H7 | R135 | C2 | F7 |
| C30 | E3 | H5 | R136 | B2 | F6 |
| C52 | G2 | F7 | R137 | B2 | F6 |
| | | | R138 | C2 | F7 |
| C53 | C2 | E7 | | | |
| C54 | B2 | E6 | R140 | F1 | F8 |
| C55 | G2 | F7 | R141 | F2 | G7 |
| C56 | C2 | F7 | R142 | F1 | F8 |
| C57 | C2 | F7 | R143 | G1 | F8 |
| | | | R144 | D2 | G8 |
| C59 | F1 | F8 | | | |
| C60 | F2 | G7 | R145 | E2 | G8 |
| C61 | F1 | E8 | R188 | C3 | I1 |
| C62 | D2 | G8 | | | |
| C63 | D2 | G8 | TP1 | C4 | B6 |
| | | | TP2 | C4 | E7 |
| C64 | E2 | G7 | TP3 | C4 | G4 |
| C65 | D2 | G8 | | | |
| C66 | E2 | G7 | TP4 | E4 | L2 |
| C67 | B3 | I2 | TP5 | E4 | L8 |
| C68 | B5 | I3 | TP6 | C4 | H7 |
| | | | | | |
| C69 | B3 | I2 | U7 | D3 | H4 |
| C70 | G2 | F8 | U8 | D5 | H4 |
| C79 | D4 | J6 | U42A | F2 | F7 |
| C80 | D4 | L6 | | | |
| C81 | D4 | L7 | U42B | C2 | F7 |
| | | | U46A | E2 | G7 |
| C82 | E4 | L7 | U68 | C3 | M5 |
| C83 | E4 | L6 | | | |
| C84 | E4 | L5 | VR3 | B2 | F6 |
| C85 | E4 | K5 | VR4 | G1 | G7 |
| C86 | F4 | I6 | VR5 | G2 | G7 |
| | | | | | |
| C87 | F3 | K3 | W1 | E4 | B8 |
| C88 | G3 | K4 | W123 * | D4 | B4 |
| C89 | G3 | L3 | | | |

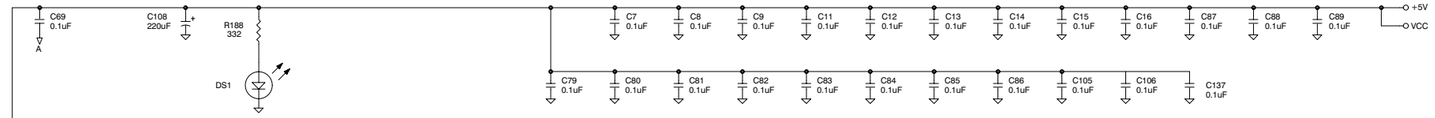
*See parts list for earlier values and serial number ranges.

## MIC PREAMP AND AGC



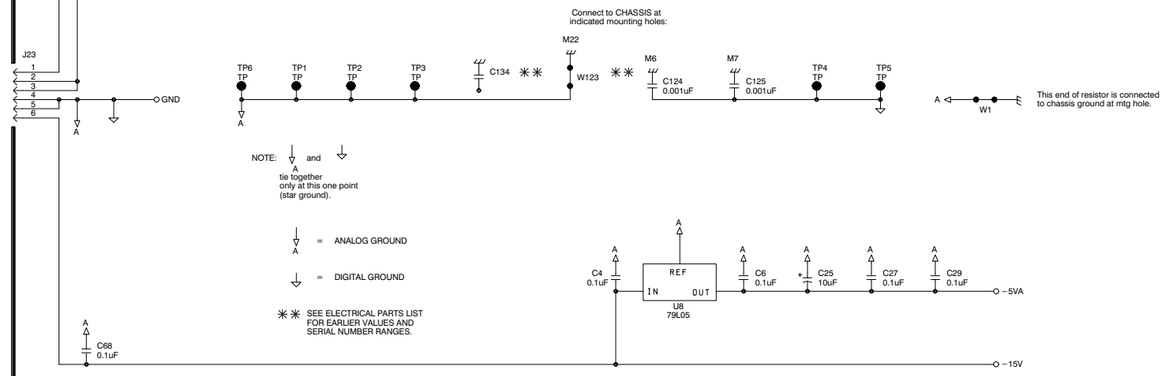






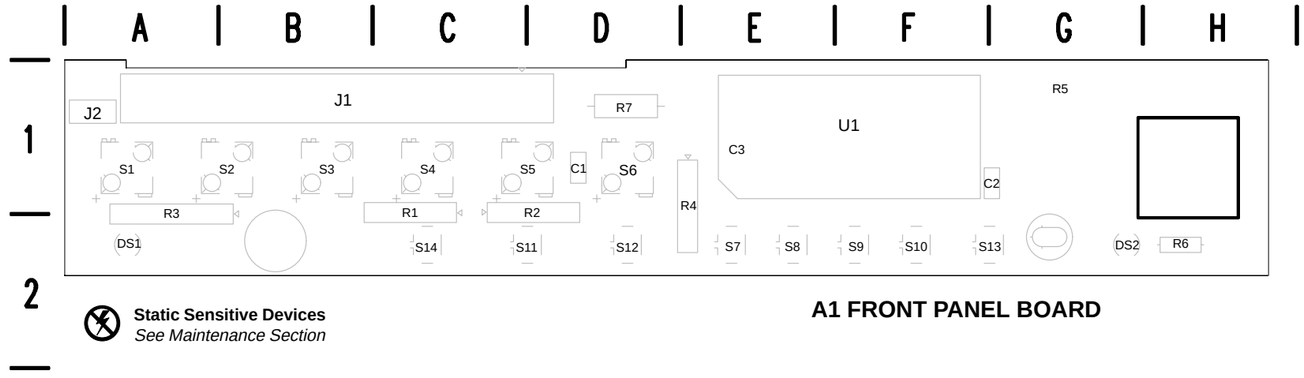

## POWER DISTRIBUTION AND DECOUPLING

A3
POWER SUPPLY




P/O A2 MAIN BOARD

ASG 100




**Static Sensitive Devices**
*See Maintenance Section*

**A1 FRONT PANEL BOARD**

**Schematic Diagram <7>**

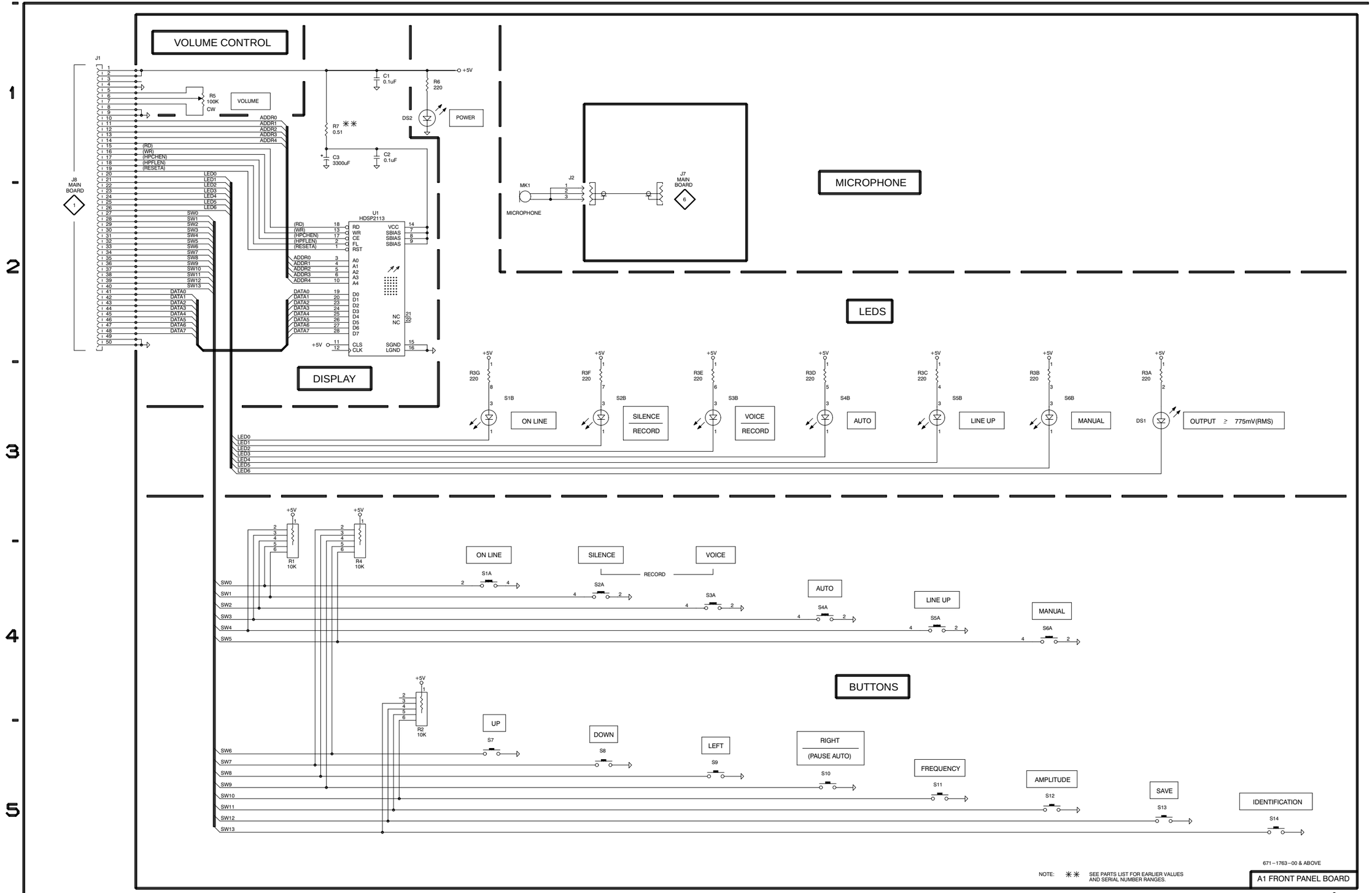
**Component Locator Chart**

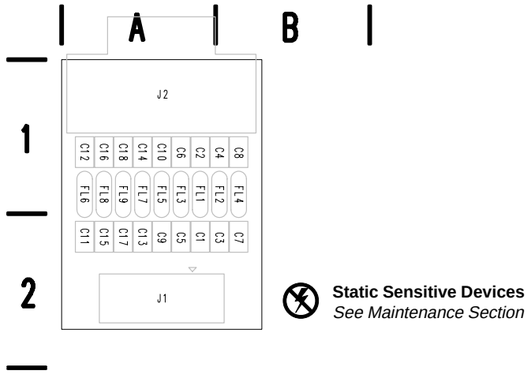
*The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram.*

**Front Panel Board, Assembly A1**

| Comp No | Diag Loc | Bd Loc | Comp No | Diag Loc | Bd Loc |
|---|---|---|---|---|---|
| C1 | C1 | D1 | S1A | C4 | A1 |
| C2 | C1 | G1 | S1B | C3 | A1 |
| C3 | B1 | D1 | S2A | D4 | B1 |
| | | | S2B | D3 | B1 |
| DS1 | G3 | A2 | S3A | E4 | B1 |
| DS2 | C1 | G2 | | | |
| | | | S3B | D3 | B1 |
| J1 | A1 | D1 | S4A | E4 | C1 |
| J2 | D2 | A1 | S4B | E3 | C1 |
| | | | S5A | F4 | C1 |
| R1 | B3 | C2 | S5B | F3 | C1 |
| R2 | C4 | C2 | | | |
| R3A | G3 | B2 | S6A | G4 | D1 |
| R3B | G3 | B2 | S6B | F3 | D1 |
| R3C | F3 | B2 | S7 | C5 | E2 |
| | | | S8 | D5 | E2 |
| R3D | E3 | B2 | S9 | E5 | F2 |
| R3E | E3 | B2 | | | |
| R3F | D3 | B2 | S10 | E5 | F2 |
| R3G | C3 | B2 | S11 | F5 | D2 |
| R4 | B3 | E1 | S12 | G5 | D2 |
| | | | S13 | G5 | G2 |
| R5 | B1 | G1 | S14 | H5 | C2 |
| R6 | C1 | H2 | | | |
| R7 | B1 | D1 | U1 | B2 | E2 |

*See parts list for earlier values and serial number ranges.


VOLUME CONTROL
J1
J8 MAIN BOARD
VOLUME
R5 100K CW
C1 0.1uF
R6 220
+5V
DS2
POWER
R7 ** 0.51
C3 3300uF
C2 0.1uF
ADDR0
ADDR1
ADDR2
ADDR3
ADDR4
(RD)
(WR)
(HPCHEN)
(HPFLEN)
(RESETA)
LED0
LED1
LED2
LED3
LED4
LED5
LED6
SW0
SW1
SW2
SW3
SW4
SW5
SW6
SW7
SW8
SW9
SW10
SW11
SW12
SW13
DATA0
DATA1
DATA2
DATA3
DATA4
DATA5
DATA6
DATA7
U1
HDSP2113
RD
WR
CE
FL
RST
A0
A1
A2
A3
A4
D0
D1
D2
D3
D4
D5
D6
D7
NC
NC
VCC
SBIAS
SBIAS
SBIAS
CLS
CLK
SGND
LGND
DISPLAY
MK1
MICROPHONE
J2
J7 MAIN BOARD
MICROPHONE
LEDS
R3G 220
R3F 220
R3E 220
R3D 220
R3C 220
R3B 220
R3A 220
S1B
S2B
S3B
S4B
S5B
S6B
DS1
ON LINE
SILENCE
RECORD
VOICE
RECORD
AUTO
LINE UP
MANUAL
OUTPUT ≥ 775mV(RMS)
R1 10K
R4 10K
R2 10K
S1A
S2A
S3A
S4A
S5A
S6A
S7
S8
S9
S10
S11
S12
S13
S14
UP
DOWN
LEFT
RIGHT
(PAUSE AUTO)
FREQUENCY
AMPLITUDE
SAVE
IDENTIFICATION
BUTTONS
NOTE: ** SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES.
671-1763-00 & ABOVE
A1 FRONT PANEL BOARD




**A4 SERIAL FILTER BOARD**

**Schematic Diagram <8>**

**Component Locator Chart**

*The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram.*

**Serial Filter Board, Assembly A2A1**

| Comp No | Diag Loc | Bd Loc | Comp No | Diag Loc | Bd Loc |
|---|---|---|---|---|---|
| C1 | D2 | A2 | C16 | D4 | A1 |
| C2 | E2 | A1 | C17 | D4 | A2 |
| C3 | D2 | B2 | C18 | E4 | A1 |
| C4 | E2 | B1 | | | |
| C5 | D2 | A2 | FL1 | D2 | A1 |
| | | | FLS | D2 | B1 |
| C6 | E2 | A1 | FL3 | D2 | A1 |
| C7 | D3 | B2 | FL4 | D3 | B1 |
| C8 | E3 | B1 | FL5 | D3 | A1 |
| C9 | D3 | A2 | | | |
| C10 | E3 | A1 | FL6 | D3 | A1 |
| | | | FL7 | D4 | A1 |
| C11 | D3 | A2 | FL8 | D4 | A1 |
| C12 | E3 | A1 | FL9 | D4 | A1 |
| C13 | D4 | A2 | | | |
| C14 | E4 | A1 | J1 | B2 | A2 |
| C15 | D4 | A2 | J2 | F2 | A1 |

*See parts list for earlier values and serial number ranges.

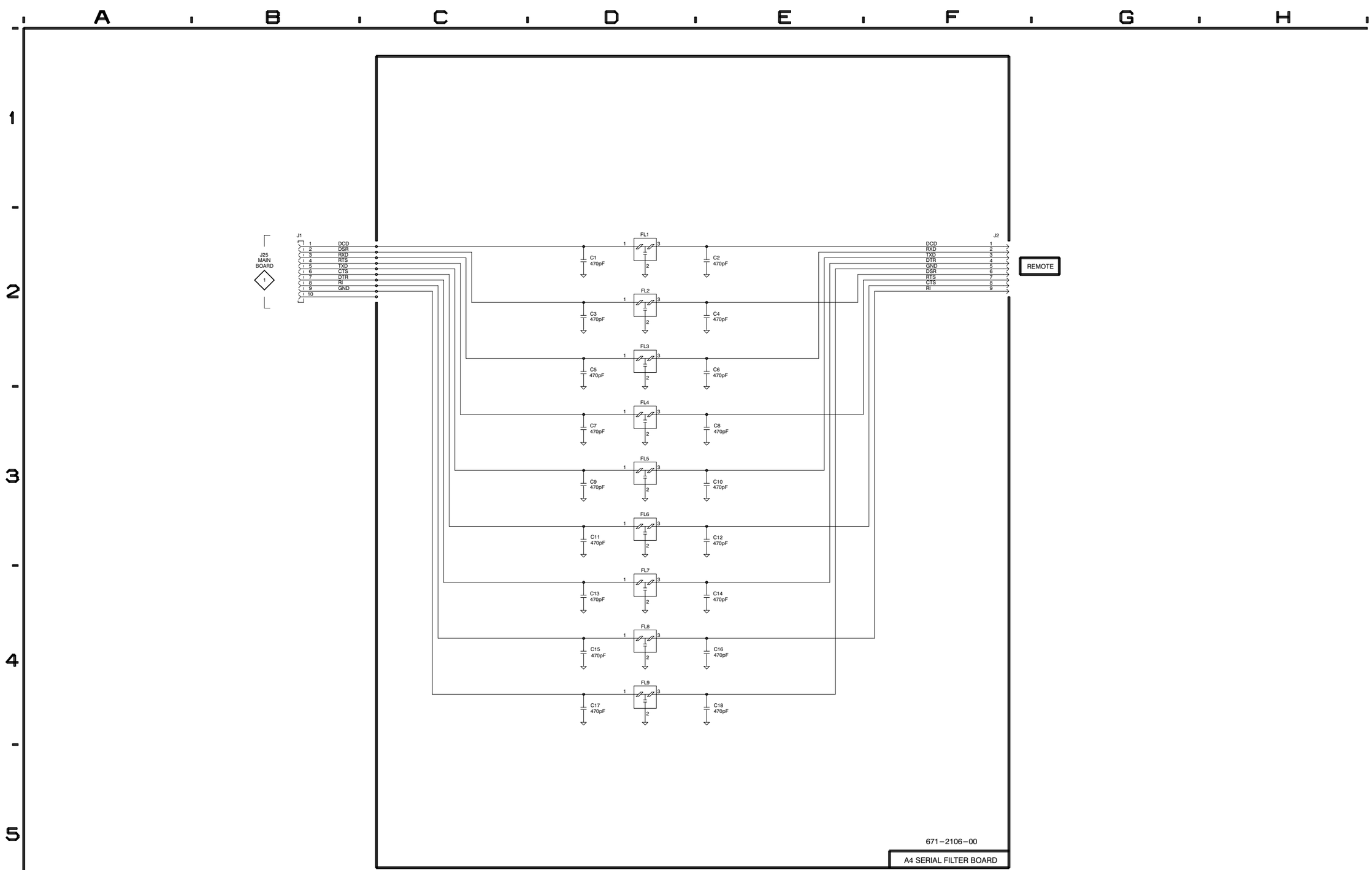
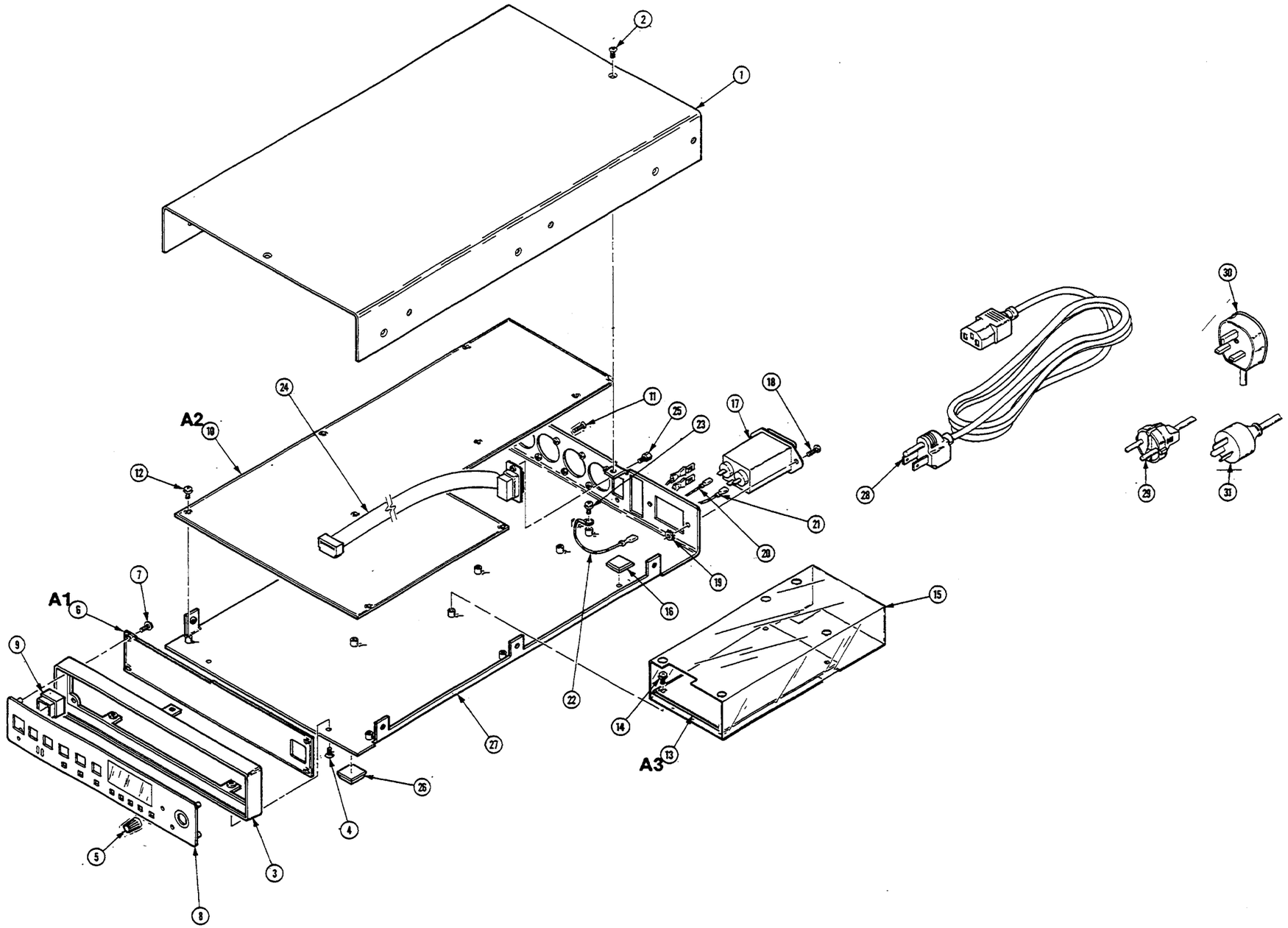

A
B
C
D
E
F
G
H
1
2
3
4
5
J25
MAIN
BOARD
J1
DCD
DSR
RXD
RTS
TXD
CTS
DTR
RI
GND
FL1
FL2
FL3
FL4
FL5
FL6
FL7
FL8
FL9
C1 470pF
C2 470pF
C3 470pF
C4 470pF
C5 470pF
C6 470pF
C7 470pF
C8 470pF
C9 470pF
C10 470pF
C11 470pF
C12 470pF
C13 470pF
C14 470pF
C15 470pF
C16 470pF
C17 470pF
C18 470pF
J2
DCD
RXD
TXD
DTR
GND
DSR
RTS
CTS
RI
REMOTE
671–2106–00
A4 SERIAL FILTER BOARD

FIG 1 EXPLODED VIEW




ASG 100

# Section 8
# Replaceable Mechanical Parts

This section contains a list of the components that are replaceable for the ASG 100. Use this list to identify and order replacement parts. There is a separate Replaceable Mechanical Parts list for each instrument.

## Parts Ordering Information

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

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available and to give you the benifit of the latest circuit improvements. Therefore, when ordering parts, it is important to include the following information in your order.

- Part number
- Instrument type or model number
- Instrument serial number
- Instrument modification number, if applicable

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

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

## Using the Replaceable Mechanical Parts List

The tabular information in the Replaceable Mechanical Parts list is arranged for quick retrieval. Understanding the structure and features of the list will help you find all of the information you need for ordering replaceable parts.

**Cross Index–Mfr. Code Number to Manufacturer**

The Mfg. Code Number to Manufacturer Cross Index for the mechanical parts list is located immediately after this page. The cross index provides codes, names, and addresses of manufacturers of components listed in the mechanical-parts list.

**Abbreviations**

Abbreviations confrorm to American National Standards Institute (ANSI) standard Y1.1.

**Chassis Parts**

Chassis–mounted parts and cable assemblies are located at the end of the Replaceable Electrical Parts list.

## Column Descriptions

**Figure & Index No. (Column 1)**

Items in this section are referenced by figure and index numbers to the illustrations.

**Tektronix Part No. (Column 2)**

Indicates part number to be used when ordering replacement part from Tektronix.

**Serial No. (Column 3 and 4)**

Column three (3) indicates the serial number at which the part was first used. Column four (4) indicates the serial number at which the part was removed. No serial number entered indicates part is good for all serial numbers.

**Qty (Column 5)**

This indicates the quantity of mechanical parts used.

**Name and Description (Column 6)**

An item name is separated from the description by a colon (:). Because of space limitations, an item name may sometimes appear as incomplete. Use the U.S. Federal Catalog handbook H6-1 for further item name identification.

Following is an example of the indentation system used to indicate relationship.

```
1  2  3  4  5        Name & Description
Assembly and/or Component
Mounting parts for Assembly and/or Component
*MOUNTING PARTS*/*END MOUNTING PARTS*
    Detail Part of Assembly and/or Component
    Mounting parts for Detail Part
    *MOUNTING PARTS*/*END MOUNTING PARTS*
        Parts of Detail Part
        Mounting parts for Parts of Detail Part
        *MOUNTING PARTS*/*END MOUNTING PARTS*
```

Mounting Parts always appear in the same indentation as the Item it mounts, while the detail parts are indented to the right. Indented items are part of and included with, the next higher indentation. **Mounting parts must be purchased separately, unless otherwise specified.**

**Mfr. Code (Column 7)**

Indicates the code number of the actual manufacturer of the part. (Code to name and address cross reference can be found immediately after this page.)

**Mfr. Part Number (Column 8)**

Indicates actual manufacturer's part number.

## CROSS INDEX – MFR. CODE NUMBER TO MANUFACTURER

| Mfr. Code. | Manufacturer | Address | City, State, Zip Code |
|---|---|---|---|
| 52152 | MINNESOTA MINING AND MFG CO<br>INDUSTRIAL SPECIALTIES DIV | 3M CENTER | ST PAUL MN 55144–0001 |
| 54583 | TDK ELECTRONICS CORP | 12 HARBOR PARK DR | PORT WASHINGTON NY 11550 |
| 71468 | ITT CANNON<br>DIV OF ITT CORP | 666 E DYER RD | SANTA ANA CA 92702 |
| 78189 | ILLINOIS TOOL WORKS INC<br>SHAKEPROOF DIV | ST CHARLES ROAD | ELGIN IL 60120 |
| 80009 | TEKTRONIX INC | 14150 SW KARL BRAUN DR<br>PO BOX 500 | BEAVERTON OR 97077–0001 |
| 93907 | TEXTRON INC<br>CAMCAR DIV | 600 18TH AVE | ROCKFORD IL 61108–5181 |
| TK0858 | STAUFFER SUPPLY CO (DIST) | | |
| TK1373 | PATELEC–CEM (ITALY) | 10156 TORINO | VAICENTALLO 62/45S ITALY |

## Replaceable Mechanical Parts

| Fig. & Index No. | Tektronix Part No. | Serial Number Effective | Dscont | Qty | 12345 Name & Description | Mfr. Code | Mfr. Part No. |
|---|---|---|---|---|---|---|---|
| 1–1 | 200–3870–00 | | | 1 | COVER,TOP:ALUMINUM,ASG100 | 80009 | 200–3870–00 |
| | | | | | *MOUNTING PARTS* | | |
| –2 | 211–0119–00 | | | 8 | SCREW,MACHINE:4–40 X 0.25,FLH,100 DEG,STL | 93907 | ORDER BY DESCR |
| | | | | | *END MOUNTING PARTS* | | |
| –3 | 426–2420–00 | | | 1 | FRAME,FRONT:ALUMINUM,ASG100 | 80009 | 426–2420–00 |
| | | | | | *MOUNTING PARTS* | | |
| –4 | 211–0119–00 | | | 2 | SCREW,MACHINE:4–40 X 0.25,FLH,100 DEG,STL | 93907 | ORDER BY DESCR |
| | | | | | *END MOUNTING PARTS* | | |
| –5 | 366–2167–00 | | | 1 | KNOB:GRAY,0.125 ID X 0.392 OD X | 80009 | 366–2167–00 |
| –6 | ——— ——— | | | 1 | CIRCUIT BD ASSY:FRONT PANEL | | |
| | | | | | (SEE A1 REPL) | | |
| | | | | | *MOUNTING PARTS* | | |
| –7 | 211–0244–00 | | | 4 | SCR,ASSEM WSHR:4–40 X 0.312,PNH STL | TK0858 | 211–0244–00 |
| | | | | | *END MOUNTING PARTS* | | |
| –8 | 333–3881–00 | | | 1 | PANEL,FRONT:ASG100 | 80009 | 333–3881–00 |
| –9 | 337–3749–00 | | | 1 | PROTECTOR,SW:TV GRAY,POLYCARBONATE | 80009 | 337–3749–00 |
| –10 | ——— ——— | | | 1 | CIRCUIT BD ASSY:MAIN | | |
| | | | | | (SEE A2 REPL) | | |
| | | | | | *MOUNTING PARTS* | | |
| –11 | 211–0101–00 | | | 8 | SCREW,MACHINE:4–40 X 0.25,FLH,100 DEG,STL | 93907 | ORDER BY DESCR |
| –12 | 211–0244–00 | | | 8 | SCR,ASSEM WSHR:4–40 X 0.312,PNH STL | TK0858 | 211–0244–00 |
| | | | | | *END MOUNTING PARTS* | | |
| –13 | ——— ——— | | | 1 | POWER SUPPLY:SWITCHING,AUTO IN | | |
| | | | | | 85–264VAC,47–440HZ,OUT 5VDC 5A,+15V 2A, –15V 0.5A | | |
| | | | | | (SEE A3 REPL) | | |
| | | | | | *MOUNTING PARTS* | | |
| –14 | 211–0244–00 | | | 3 | SCR,ASSEM WSHR:4–40 X 0.312,PNH STL | TK0858 | 211–0244–00 |
| | | | | | *END MOUNTING PARTS* | | |
| –15 | 337–3738–00 | | | 1 | SHIELD,ELEC:POWER SUPPLY | 80009 | 337–3738–00 |
| –16 | 348–0844–00 | | | 1 | PAD,CUSHIONING:0.05 SQ X 0.23 H,POLYURETHANE W/ PRESSURE SENS ADHESIVE | 52152 | SJ–5018–GRAY |
| –17 | ——— ——— | | | 1 | FILTER,RFI:3A,250VAC,50/60HZ | | |
| | | | | | (SEE FL100 REPL) | | |
| | | | | | *MOUNTING PARTS* | | |
| –18 | 211–0012–00 | | | 2 | SCREW,MACHINE:4–40 X 0.375,PNH,STL | 93907 | ORDER BY DESCR |
| –19 | 210–0586–00 | | | 2 | NUT,PL,ASSEM WA:4–40 X 0.25,STL CD PL | 78189 | 211–041800–00 |
| | | | | | *END MOUNTING PARTS* | | |
| –20 | 174–2495–00 | | | 1 | CA ASSY,SP,ELEC:18 AWG,3.3 L,8–0 | 80009 | 174–2495–00 |
| –21 | 174–2496–00 | | | 1 | CA ASSY,SP,ELEC:18 AWG,3.3 L,8–9 | 80009 | 174–2496–00 |
| –22 | 196–1213–00 | | | 1 | LEAD,ELECTRICAL:18 AWG,2.5 L,5–4 | 80009 | 196–1213–00 |
| | | | | | *MOUNTING PARTS* | | |
| –23 | 211–0244–00 | B010100 | B032105 | 1 | SCR,ASSEM WSHR:4–40 X 0.312,PNH STL | TK0858 | 211–0244–00 |
| –23 | 211–0722–00 | B032106 | | 1 | SCREW,MACHINE:6–32 X 0.250,PNH,STL,CDPL | | |
| | | | | | *END MOUNTING PARTS* | | |
| –24 | ——— ——— | | | 1 | CA ASSY,SP,ELEC:10,28 AWG,9.25 L | | |
| | | | | | (SEE A4J1 REPL) | | |
| | | | | | *MOUNTING PARTS* | | |
| –25 | 214–3903–01 | | | 2 | SCREW,JACK:4–40 X 0.312 EXT THD, 4–40 INT THD, 0.188 HEX,STEEL,CAD PLATE | | |
| –26 | 348–0844–00 | | | 5 | PAD,CUSHIONING:0.05 SQ X 0.23 H,POLYURETHANE W/ PRESSURE SENS ADHESIVE | 52152 | SJ–5018–GRAY |
| –27 | 200–3869–00 | B010100 | B031903 | 1 | COVER,BOTTOM:ALUMINUM,ASG100 | 80009 | 200–3869–00 |
| –27 | 200–3869–01 | B031904 | B032105 | 1 | COVER,BOTTOM,ALUMINUM,ASG100 | 80009 | 200–3869–01 |
| –27 | 200–3869–02 | B032106 | | 1 | COVER,BOTTOM,ALUMINUM,ASG100 | 80009 | 200–3869–02 |

| Fig. & Index No. | Tektronix Part No. | Serial Number Effective | Serial Number Dscont | Qty | 12345 | Name & Description | Mfr. Code | Mfr. Part No. |
|---|---|---|---|---|---|---|---|---|
| | | | | | | STANDARD ACCESSORIES | | |
| -28 | 161-0066-00 | | | 1 | | CA ASSY,PWR:3,18AWG,98 L,SVT,GREY/BLK,60 DEG C,IEC BME X STR,IEC RCPT,10A/125V (STANDARD ONLY) | 80009 | 161-0066-00 |
| | 070-8152-0X | | | 1 | | MANUAL,TECH:INSTR,ASG100 | 80009 | 070-8152-0X |
| | 070-8546-0X | | | 1 | | MANUAL,TECH:SERVICE,ASG100 | 80009 | 070-8546-0X |
| | | | | | | OPTIONAL ACCESSORIES | | |
| -29 | 161-0066-09 | | | 1 | | CA ASSY,PWR:3,0.75MM SQ,220V,99.0 L (EUROPEAN OPTION A1 ONLY) | 80009 | 161-0066-09 |
| -30 | 161-0066-10 | | | 1 | | CA ASSY,PWR: (UNITED KINGDOM OPTION A2 ONLY) | TK1373 | 24230 |
| -31 | 161-0066-11 | | | 1 | | CA ASSY,PWR:3,0.75MM,240V,96.0 L (AUSTRALIAN OPTION A3 ONLY) | 80009 | 161-0066-11 |

# Appendix A
# REMOTE OPERATION

## REMOTE CONTROL FROM A TERMINAL

You can control the ASG 100 from a terminal, a computer running terminal emulation software, or a VM700A Video Measurement Set via the RS-232C serial interface. Remote control via a modem is also possible using the RS-232C serial port of the ASG 100. These operations are:

- AUTO test selection and level setting
- LINE UP test tone
- MANUAL test tone in left, right or both channels plus level and frequency setting
- MANUAL polarity test tone in left, right, or both channels plus level setting
- MANUAL multi-tone test in left, right, or both channels plus level setting
- SILENCE function
- VOICE playback
- VOICE plus LINE UP test tone, alternating
- ID setting and queries
- Queries of test signal settings
- OFFLINE

## LIMITED LOCAL REMOTE CONTROL

Limited remote control of the ASG 100 is possible using contact closures on the remote connector. One closure activates the auto sequence, and the other enables front panel editing of a setting when editing is internally disabled. Remote connections for these functions are explained in the following text.

## INSTALLATION FOR REMOTE CONTROL

### Connect a Properly Configured Communications Cable

On the back panel of the ASG 100, to the right of the power switch, is a 9-pin male connector labeled "REMOTE." This DB-9 connector is used to access two types of remote control. It may be used to connect switching contacts that are used to start the AUTO Test or to override the editing locked feature so new setups may be saved without removing the ASG 100 from a rack installation to reset the internal DIP switches. Its second, and most versatile, purpose is to provide an RS-232C interface for remote control the instrument's signal generation functions.

When used for RS-232C serial data transfer, the remote port is configured as a 9-pin (DB-9) DTE (Data Terminal Equipment) connector. You can set up remote control by connecting this serial port to the serial port of a terminal (or terminal-emulating computer) through a properly configured communications cable.

The functions of the pins on the remote connector are shown in Table A-1. On the ASG 100 end, the DTE cable you use must be connected to a 9-pin female connector conforming to this configuration.

**Table A-1**
**Pin Connections for Remote Connector**

| Pin Number | Signal Name | Signal Description |
|---|---|---|
| 1 | DCD | Data Carrier Detect (not connected) |
| 2 | RXD | Received Data (connected) |
| 3 | TXD | Transmitted Data (connected) |
| 4 | DTR | Contact closure with pin 6 enables editing of function settings. Contact closure with pin 9 starts AUTO test. Do not connect this pin with the remote terminal via the RS-232C interconnection cable. |
| 5 | GND | Signal Ground/Common Return (connected) |
| 6 | DSR | Contact closure with pin 4 enables editing of function settings. Do not connect this pin to the remote terminal via the RS-232C interconnection cable. |
| 7 | RTS | Request to Send (not used in the ASG 100) |
| 8 | CTS | Clear to Send (not used in the ASG 100) |
| 9 | RI | Contact closure with pin 4 starts AUTO test. Do not connect this pin to the remote terminal via the RS-232C interconnection cable. |

On the remote terminal end, the configuration of the cable connector should match that of the terminal's serial port. The cable configurations for communication between the ASG 100 and IBM PCs and compatibles operating as data terminal equipment are shown in Figure A-1 and Figure A-2.

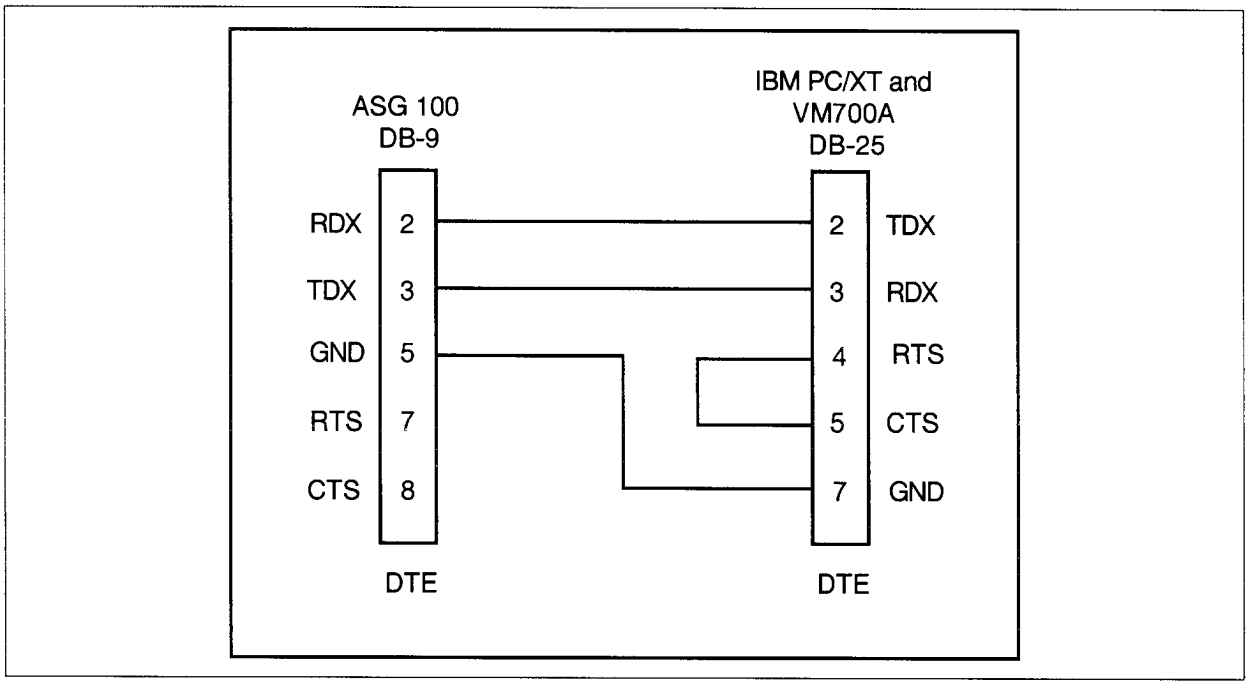



**Figure A-1. Cabling to IBM PC/XT or Compatibles and the VM700A.**

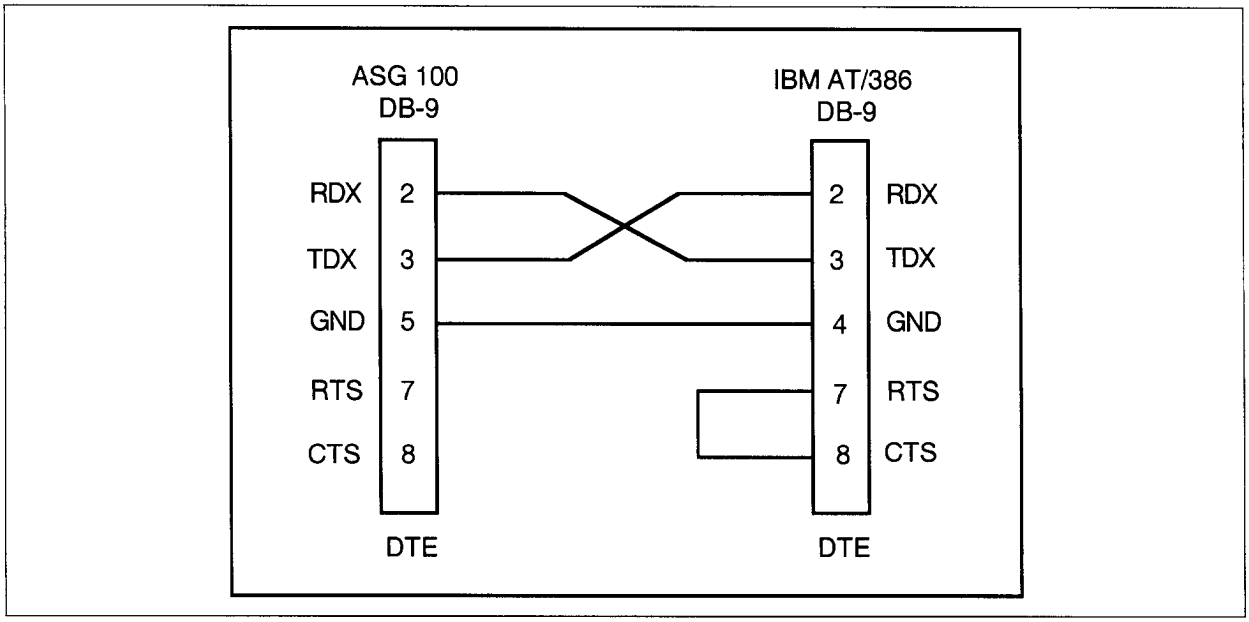



**Figure A-2. Cabling to IBM AT/386 and Compatibles.**

## NOTE

*In all configurations pins 4, 6 and 9 on the ASG 100 serial port must not be connected to the serial port on the remote terminal or computer; they are reserved for remotely enabling function editing and initiating the AUTO test. Typically, if you establish remote control through a terminal or computer, you will perform these operations through remote commands, rather than through shorting these pins.*

### Set DIP Switch to Enable Remote Control

As explained in Section 2, *Operation and Setup*, certain functions are enabled and disabled by the positions of the switches on the 10-switch DIP labeled "S1" on the circuit board. You access this switch through the cover on the left panel of the ASG 100. As with all servicing, refer the internal adjustments to a qualified service person.

Remote operation of the ASG 100 through its remote port is enabled when switch S1, position 8 (labeled "PROG7" on the circuit board) is in the up position.

### Set Serial Communication Parameters on the Terminal

Using the commands appropriate for your terminal or terminal emulator, set the communication parameters to the values shown below in Table A-2.

**Table A-2**
**Serial Communication Parameters**

| Parameter | Value |
|---|---|
| Baud Rate | 9600[a] |
| Data Bits | 8 |
| Parity | None |
| Stop Bits | 1 |

[a]Baud rate for the ASG 100 is selectable for 1200, 2400, 4800, or 9600 baud. The factory setting is 9600 baud.

### Setting Baud Rate of the ASG 100

The baud rate of the ASG 100 is user settable from the front panel so that lower baud rate modems not capable of the factory default of 9600 baud may be used for remote control. Four choices are available: 1200, 2400, 4800, and 9600 baud. The data bits, parity, and stop bits parameters for the ASG 100 are fixed.

## NOTE

*If you need to operate the ASG 100 on a baud rate setting other than 9600, PROG0 of S1 must be set to the user defaults position (down) to make the needed baud rate setting. Leave the switch set to user defaults to prevents the baud rate (and the other user selectable front panel settings as well) from being changed to factory defaults in the event of a loss of power to the ASG 100. The factory default baud rate setting of 9600 is restored at power on if PROG0 of S1 is set to the factory default (up) position*

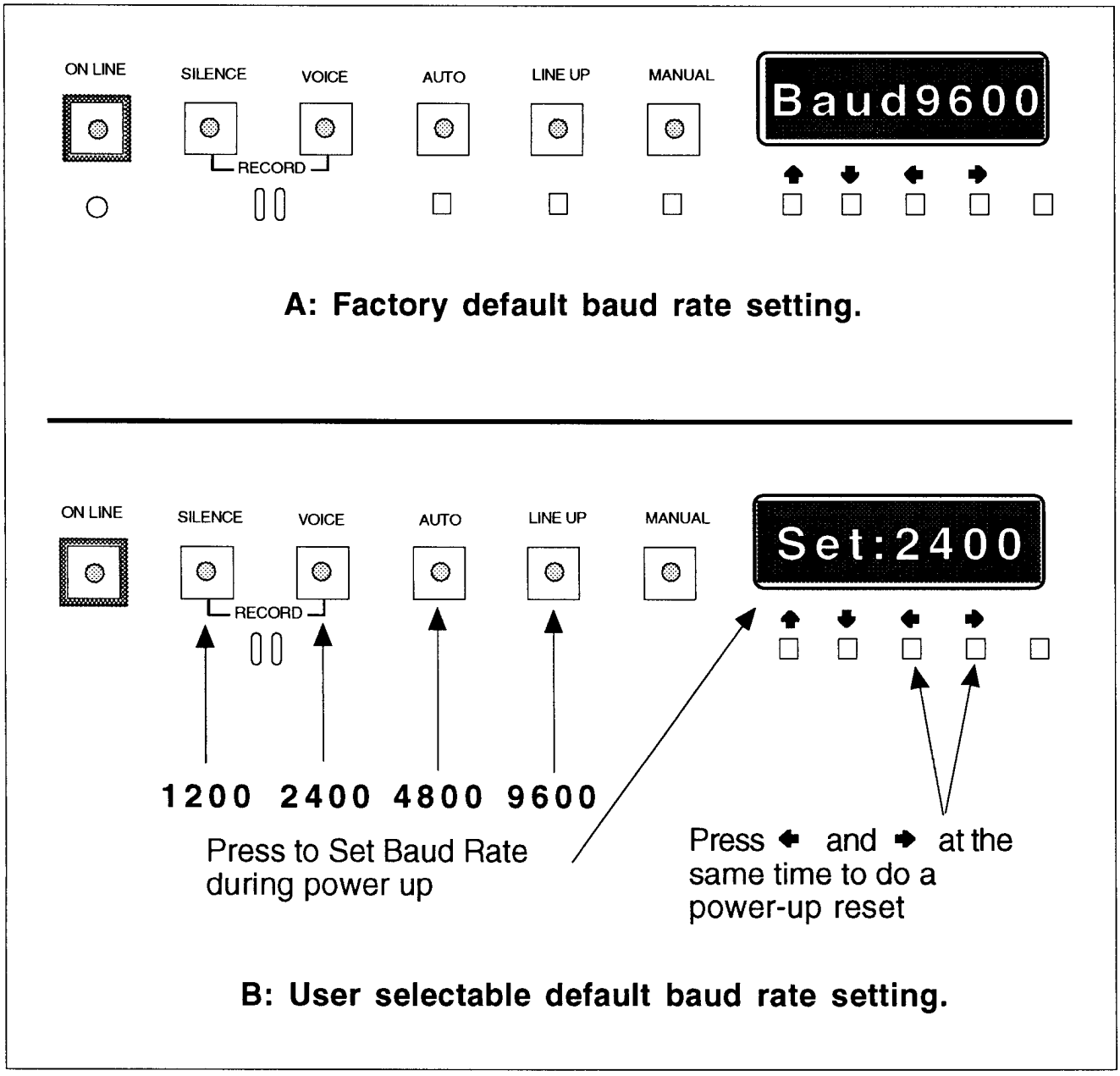



**Figure A-3. Setting baud rate during power on.**

The baud rate may be set during power up only if PROG0 of S1, the default settings switch (factory defaults up and user defaults down), is set to the user default position (down). At power up, the current baud rate setting (for example, Baud9600) appears in the display window for about 3 seconds. A front panel button that selects baud rate must be pressed to change the setting (see Figure A-3, A) before that message is removed from the display. Setting a new baud rate automatically saves it as the user selectable power-on setting.

When a baud rate selection button is pressed, the message "Set:nnnn" (where nnnn is the new baud rate) will be displayed. Holding a button in keeps the setting associated with that button displayed until it is released. When released, the new baud rate is displayed. If that is not the required setting, immediately pressing another baud rate choice selects the baud rate associated with that front panel button (see Figure A-3, B).

If a another baud rate selection button is not pressed within the 3-second time period after a baud rate setting has been made, the ASG 100 continues with the power-on routine and initialization of the front panel settings.

It is not necessary to turn off the ASG 100 at the rear panel ON/OFF switch to get a power up restart for resetting the baud rate. Pressing the left and right arrow buttons at the same time resets the ASG 100 and restores the enabled defaults (factory or user). This is the same action that occurs when a control C is sent to the ASG 100 via the RS-232C serial port.

Once the ASG 100 baud rate has been set to a different choice, the device communicating with the ASG 100 must also be set to that same baud rate (or be able to auto baud) to communicate with the ASG 100. If the baud rate selected matches the baud rate expected by the device that the ASG 100 is sending to, the remote display will print out the DSP Firmware version number, the DSP diagnostics version number, and the the FP Controller version number. If nothing is seen, either the serial communication path is not connected, or the baud rate is incorrect. If only garbled ascii characters are seen, try another baud rate.

## REMOTE OPERATION

Once installation is complete, when you power on the ASG 100 the screen of the remote terminal transcripts the self-test the ASG 100 performs, then displays the following prompt:

```
ASG100\fp>
```

When this prompt is displayed, you can enter the remote commands. Any command that is not understood will cause the error line "Unrecognized command." to appear. Other error messages appear when arguments to the command are not within limits or errors in the syntax of the arguments are found.

The RS-232C interface of the ASG 100 permits only one command per line, and a command line is terminated by a carriage return. If the command sent requires a reply from the ASG 100 or starts an AUTO test sequence (i.e., Sweep which needs about 32 seconds to finish), an appropriate time delay must be permitted before another command is sent. Attempting to batch load a set of commands to the ASG 100 may cause command data to be lost while the ASG 100 is sending its reply. Also, *any* command sent the ASG 100 while an AUTO test is being executed will terminate the AUTO test.

## Remote Commands

There are commands that take arguments to permit the parameters of the command to be altered. The commands also have associated queries to determine the parameters of a test signal. Several of the commands are queries only. There are also three control characters that the ASG 100 recognizes to assist in remote operation of the instrument. A concise list of the commands, arguments, queries, and special control characters is given in Tables A-3, A-4, and A-5 for quick reference. The text following the tables explains the commands in more detail.

**Table A-3**
**List of ASG 100 Commands, Arguments, and Queries**

| Commands | Argument | Argument | Queries | Responses |
|---|---|---|---|---|
| auto | l:[*level*] | [*test name*] | auto?<br>auto help | Auto with no arguments starts the selected auto test at the current level setting. The level argument sets a new TEST Lev for the O.33 and Tek tests from –6 dBu to +14 dBu. The test name argument selects the test sequence.<br>If the test signal for auto is a Sweep signal, the level argument sets a new SweepLev from –90 dBu to +24 dBu.<br>When help is on, the ASG 100 sends a reply of "*Auto sequence done." when the auto sequence has completed.<br>auto? returns the selected test sequence, the current ID, and the level settings for Test Level and Sweep Level.<br>auto help returns a list of valid arguments for the auto command. |
| help | | | help?<br>? | All forms of this command return a list of ASG 100 commands. |
| helpoff | | | | Turns off the help replies, error messages, and prompts. Test signal queries are answered. |
| helpon | | | | Turns the help replies, error messages, and prompts back on. |
| id "****" | | | id? | Sets a new 4-character ID. All printable ASCII characters are valid and all four characters must be used. Spaces are valid.<br>The query returns the 4-character ID. |

Table A-3 (cont)

| Commands | Argument | Argument | Queries | Responses |
|---|---|---|---|---|
| lineup | | | lineup? | Sends the line up signal to both channels. The frequency and level cannot be changed remotely. If a variable tone signal is needed for a special line up, use the tone test signal.<br>The query returns the present level and frequency for the lineup signal. |
| lmtone<1\|2\|3\|4> | l:[*level*] | | lmtone[n]? | Sends the selected multi-tone (1, 2, 3, or 4) to the left channel at the current level. The level argument sets the new signal level from –90 dBu to +24 dBu.<br>The query returns the present level for the multi-tone test signals. |
| lpolr | l:[*level*] | | lpolr? | Sends the polarity signal to the left channel. The level argument sets the new signal level from –90 dBu to +24 dBu.<br>The query returns the present level for the polarity test signals. |
| ltone | l:[*level*] | f:[*frequency*] | ltone? | Sends the tone signal to the left channel. The level argument sets the new signal level from –90 dBu to +24 dBu. The frequency argument sets a new frequency from 10 Hz to 20 kHz.<br>The query returns the present level for the tone test signals. |
| mtone<1\|2\|3\|4> | l:[*level*] | | mtone[n]? | Sends the selected multi-tone (1, 2, 3, or 4) to both channel (channels A and B). The level argument sets the new signal level from –90 dBu to +24 dBu.<br>The query returns the present level for the multi-tone test signals. |
| offline | | | offline? | Takes the ASG 100 offline and restores the input program (if any) to the downstream equipment.<br>The query replies that there are no variables for offline. |

**Table A-3 (cont)**

| Commands | Argument | Argument | Queries | Responses |
|---|---|---|---|---|
| rmtone<1\|2\|3\|4> | l:[*level*] | | rmtone[n]? | Sends the selected multi-tone signal (1, 2, 3, or 4) to the right channel. The level argument sets the new signal level from –90 dBu to +24 dBu.<br>The query returns the present level for the multi-tone test signals. |
| rpolr | l:[*level*] | | rpolr? | Sends the polarity signal to the right channel. The level argument sets the new signal level from –90 dBu to +24 dBu.<br>The query returns the present level for the polarity test signals. |
| rtone | l:[*level*] | f:[*frequency*] | rtone? | Sends the tone signal to the right channel. The level argument sets the new signal level from –90 dBu to +24 dBu.The frequency argument sets a new frequency from 10 Hz to 20 kHz.<br>The query returns the present level for the tone test signals. |
| silence | | | silence? | Sends silence on the output signal lines.<br>The query replies that there are no variables for the silence command. |
| tone | l:[*level*] | f:[*frequency*] | tone? | Sends the tone signal to both channels. The level argument sets the new signal level from –90 dBu to +24 dBu. The frequency argument sets a new frequency from 10 Hz to 20 kHz.<br>The query returns the present level for the tone test signals. |
| voi+lu | | | voi+lu? | Sends the recorded voice id alternately with the line up signal.<br>The query returns the present line up level which is also the voice level. |
| voice | | | voice? | Sends the recorded voice id.<br>The query returns the present line up level which is also the voice level. |

**Table A-4**
**Special Queries**

| Query | Response |
|---|---|
| display? | Returns the present display text. |
| leds? | Returns the LED or LEDs that are on. NOTE: If an auto sequence is on, it is aborted. |
| version? | Returns the front panel controller firmware version number and date the version was created. |

**Table A-5**
**Control Signals**

| Control Signal | Response |
|---|---|
| control C | Restarts the ASG 100 and restores the default front panel settings (either factory or user selected as determined by the setting PROG0 of DIP switch S1). |
| control S | Halts serial port communication from the ASG 100. Normally used by a terminal or host computer to prevent an input buffer overflow. |
| control Q | Restores serial port communications that have been stopped by a control S. |

## Command Description

### Help Commands

To display a list of the remote test signal commands on the terminal screen, enter:

```
help[cr]   or   ?
```

Figure A-4 shows the resulting menu.

Sending help with the auto command in the following form:

```
auto  help
```

returns a list of the legal arguments that may be used with the auto command (see Table A-5 for test names).

Help mode can be disabled to eliminate the output of the help menu and the normal prompts. The command to disable the help menu is:

```
helpoff[cr]
```

All error messages and prompts are disabled. The ASG 100 still responds to the direct queries for information on frequency or levels when given as shown below, but it will not respond to help, ?, or auto help and does not return error messages on incorrect commands with help turned off.

Help is turned on again using the command:

```
helpon[cr]
```

```
                    ASG 100 REMOTE COMMAND MENU

offline ..............................Takes  unit  offline.
silence ..............................Sends  silence.
voice ................................Sends  the  stored  voice  sequence.
auto  [l:level]  [test_name] .........Starts  auto  sequence.
id  "*****" ..........................Assigns  identification  code.
lineup ...............................Sends  the  preset  line  up  tone.
voi+lu ...............................Alternately  sends  voice  and  line  up.
[r  |  l]tone  [f:freq]  [l:level] .....Sends  a  tone  to  respective  channel(s).
[r  |  l]polr  [l:level] ..............Sends  polarity  to  respective  channel(s).
[r  |  l]mtone<1|2|3|4>  [l:level] ....Sends  multi-tone  to  respective  channel(s).
Where:
test_name    is  an  auto  sequence  argument.  Type  "auto  help"  for  list.
             Example:       "auto  tek:91"     will  generate  the  tek:91  sequence.
freq         is  the  frequency  in  Hz.
             Example:       "tone  f:440"  sends  a  tone  at  440Hz,  default  level.
level        is  the  level  in  dBu.  The  level  must  be  entered  to  the  nearest  tenth
             of  a  dBu.
             Example:    "lmtone  l:+2.3"  sends  left  channel  multi-tone  at  +2.3dBu.
*            is  any  ASCII  character  from  "  "  to  "~".
```

**Figure A-4. Help screen of remote commands.**

### Queries

There are several remote queries available. They are associated with the test signal commands. The form of the query is:

```
tone?
```

and the return is the present setting for the Manual Tone frequency and the Manual Tone Level. Similar information is returned when the question mark is used to make a query of one of the other test signal commands. The query associated with the commands of voice, voi+lu, and lineup that have no arguments return the current line-up signal level and frequency.

A query of `Auto?` returns the currently selected test sequence, the 4-character id of the ASG 100 queried, and the Test Level and Sweep Level settings associated with the auto test sequences.

### Unit Identification

There is an id command and an id query. The id command sends a four-character identification code to the ASG 100. That identification code will be used in the preamble of the auto tests that make use of the unit identifier. Note: The new id sent via remote control is not saved; if the ASG 100 is reset, the identifier will default to the previously saved id.

The form of the command is:

```
id  "*****"
```

Any 4-character combination of ASCII figures, letters, or punctuation is permitted. All four characters are needed, but they may be spaces. Note: if you use a space for all four characters, the the display will be blank. An error message is generated when an argument syntax error is found if help is on.

The query `id?` returns the 4-character identification code of the ASG 100.

### Special Queries

There are two queries that let the remote operator determine the display state of the ASG 100. They are :

`display?` and `leds?`

The `display?` query returns the present display seen on the front panel, and the `leds?` query returns all the front panel indicators that are on.

## NOTE

*The power-on LED is not firmware controlled, so it is not reported in the return.*

Either of these commands may prove useful for determining the state of the ASG 100 without sending a command to cause the state to change. Coupled with the queries regarding the present signal parameters (tone?, lineup?, etc?,), it is possible to determine the state of the ASG 100 front panel and the signal parameters without sending a command that will put it on line or change its state if it is on line.

## NOTE

*If an auto sequence is in progress, the auto sequence is aborted if any communication is received during the test sequence. This includes asking the ASG 100 what its present state is.*

A third special query, `version?`, returns the front panel controller firmware version and the date it was generated. This query is provided because any version related firmware questions that arise may be more easily addressed when the installed version is known.

### Restoring Defaults

The remote commands with arguments change the setup from the power-on setup. To restore the power-on state, either the factory defaults or the user selected settings, whichever is enabled, type control C. This restarts the ASG 100 and restores the power-on control settings.

## Flow Control

The ASG 100 responds to X ON/X OFF software flow control. When a control S is received for X OFF, the ASG 100 stops sending on its serial port. When a control Q is received for X ON, serial communications is resumed. If there is a message pending from the ASG 100, it is sent. Only the first message is queued for output. During the time communication is off, incoming commands are processed, but not echoed.

# REMOTE COMMAND SYNTAX

The commands **offline, silence, voice, lineup,** and **voi+lu** take no arguments and perform the requested operation just as from the front panel.

The remote **auto** and remote **tone, polarity,** and **mtone** commands allow you to specify optional arguments, as indicated by the bracketed text in Figure A-4 (shown previously). The following text describe the syntax for these remote commands. Type in the commands exactly, one command to a line; do not add extra spaces or other punctuation in front of a command. After the command, use one space before an argument and as a separator when two arguments are used, as in the case of setting both amplitude and frequency for tone. For example:

```
tone  f:1000  l:-2.5
```

The order of the arguments does not matter, and the arguments are not case sensitive. The command may be all upper case, all lower case, or mixed. The command line terminator is the carriage return [cr]. The special control characters, control C, control S, and control Q, are received immediately without waiting for a carriage return.

**auto [l:***level***][***test_name***]**

Level is an optional argument. The test level reference for the auto test sequence is specified. If the argument is not used, the auto test level reference remains at the last selected value. The valid arguments are +14 dBu to –6 dBu in whole integer values. For example, `l:5, l:0, l:-3,` etc.). Error messages are generated if a limit violation is detected in the argument if help is on.

Test_name is also an optional argument. The argument is a text string specifying which automatic test sequence you want to send. If you do not specify a test name, the auto command initiates the test last selected. The level and test name arguments for auto are not order sensitive, and either may be used first.

The text strings to use for the test sequences supplied by Tektronix are listed below in Table A-6. Enter the arguments with punctuation exactly as shown. The command to send the TEK:90 test at 0.0 dBu will look like this: `auto tek:90 l:0` or `AUTO TEK:90 L:0.` A help query of the auto command in the form of `auto help` returns a list of the legal arguments available with the auto command. An error in the test name argument also results in a display of the legal arguments if help is on.

When the sequence is done, the ASG 100 sends the below message followed by the ASCII bell character:

```
*Auto  sequence  done.
```

A programmer may choose to watch for the * so that all other commands are held off until the test sequence is done. Another option is to put in a wait state long enough for the test sequence to finish. A wait state would be required if the helpoff command is in effect as the ASG 100 will not return any messages or prompts in this state.

### Aborting an Auto Sequence

An auto test sequence is aborted if ANY communication is received after the command is given until the auto test sequence is done. The message "`Aborting time sequence, executing new command`" is generated. Sending a carriage return only halts the AUTO sequence, and the ASG 100 waits for a second carriage return or a new command to execute before returning the prompt.

Aborting the auto test sequence is a precaution, because the processor of the ASG 100 is also sending the commands needed to generate the test signals in the proper time sequence. Any interruption to handle communications may corrupt the timing of the test sequence.

**Table A-6**
**Test Name Arguments to Remote "AUTO" Command**

| O.33:00 Test Type | Argument | Tek Test Type | Argument |
|---|---|---|---|
| Mono | O.33:00 | Mono | Tek:90 |
| Mono with Voice ID | O.33:00V | Mono with Voice ID | Tek:90V |
| Stereo | O.33:01 | Stereo | Tek:91 |
| Stereo with Voice ID | O.33:01V | Stereo with Voice ID | Tek:91V |
| Medium Band Sound Program | O.33:02 | Microphone | Tek:92 |
| Medium Band Sound Program with Voice ID | O.33:02V | Microphone with Voice ID | Tek:92V |
| Narrow Band | O.33:03 | Line Level | Tek:93 |
| Narrow Band with Voice ID | O.33:03V | Line Level with Voice ID | Tek:93V |
| Narrow Band Sound Program with Compandor | O.33:04 | Transmitter | Tek:94 |
| Narrow Band Sound Program with Compandor with Voice ID | O.33:04V | Transmitter with Voice ID | Tek:94V |
| 3-Level Alignment Signal for International Sound Program without Station Identifier | O.33:05 | Stereo with Crosstalk | Tek:95 |
| | | Stereo with Crosstalk and Voice ID | Tek:95V |
| | | Sweep | Sweep<br>Sweepr<br>Sweepl |

**[rll][tone** [f:*frequency*] [l:*level*]

The **tone** remote command with no arguments makes the ASG 100 send the currently selected MANUAL test tone through the right and left channels at the same time. The **rtone** and **ltone** versions of this command send the MANUAL test tone through the right and left channels, respectively. A query of any of the tone commands in the form of `tone?` returns the current frequency and level setting of the manual tone signals.

The frequency argument specifies a desired frequency for the manual test tone. Enter the initial characters of this argument, **f:**, literally, as shown. Specify *frequency* as an positive integer number representing the desired frequency in Hertz. An error in the frequency argument, a number outside the legal range or bad syntax, will result in an error message being generated if help is on.

The level argument specifies a desired amplitude for the manual test tone. Enter the initial characters of this argument, **l:**, literally, as shown. Specify *level* as a number representing the amplitude in dBu. You can specify values to tenths of a decibel, for example **5.3**. Do not add extra numbers after the tenths. An error in the argument, specifying a number outside the legal range or incorrect syntax, will result in an error message being generated if help is on.

If you want to specify a negative amplitude, you must prefix the value with a – (minus sign), for example, **–4**. Otherwise the value is assumed to be positive. You can also explicitly specify a positive amplitude with a + (plus sign) prefix, for example, **+6**. A change in the level applies to all the tone signals.

### [r|l]polr [l:*level*]

The **polr** remote command with no argument makes the ASG 100 send the polarity tone at the currently selected level through both channels. The **rpolr** and **lpolr** versions of this command send the polarity tone through the right and left channels, respectively. A query of any of the polarity commands in the form of `polr?` returns the fixed frequency of 440 Hz and the current level setting of the manual polarity signals.

The level argument specifies a desired amplitude for the polarity test tone. Enter the initial characters of this argument, **l:**, literally, as shown. Specify *level* as a number representing the amplitude in dBu. You can specify values to tenths of a decibel, for example **5.3**. Do not add extra numbers after the tenths. An error in the level argument, specifying a level outside the legal range or incorrect syntax, will result in an error message being generated if help is on.

If you want to specify a negative amplitude, you must prefix the value with a – (minus sign), for example, **–4**. Otherwise the value is assumed to be positive. You can also explicitly specify a positive amplitude with a + (plus sign) prefix, for example, **+6**. A change in the level applies to all the polarity signals.

There is no frequency argument for polarity. The polarity testing signal is composed of two equal-amplitude sine waves of 440 Hz and 880 Hz, and frequency changes are not permitted. Attempting to send a frequency argument to polarity will result in an error message being generated if help is on.

### [r|l]mtone<1|2|3|4> [l:*level*]

The **mtone<1|2|3|4>** remote commands makes the ASG 100 send the selected multi-tone signal at the currently selected amplitude through both channels. The **rmtone <1..4>** and **lmtone <1..4>** versions of this command send the selected test multi-tone through the right and left channels, respectively. The multi-tone signal wanted must be designated. Sending mtone alone does not cause a default multi-tone to be sent. A query of any of the multi-tone commands in the form of `mtone1?` returns the current level setting of the manual multi-tone signals.

The level argument specifies a desired amplitude for the multi-tone test signal. Enter the initial characters of this argument, **l:**, literally, as shown. Specify *level* as a number representing the amplitude in dBu. A change in the level applies to all the multi-tone signals. An error in the level argument, specifying a level outside the legal range or bad syntax, will result in an error message being generated if help is on.

If you want to specify a negative amplitude, you must prefix the value with a – (minus sign), for example, **–4**. Otherwise the value is assumed to be positive. You can also explicitly specify a positive amplitude with a + (plus sign) prefix, for example, **+6**.

There is no frequency argument for multi-tone. The test signals are composed of sets of equal-amplitude sine waves at predetermined frequencies, and there is no specific frequency associated with multi-tones. Attempting to send a frequency argument to multi-tone will result in an error message being generated if help is on.