S2 Family

Calibration, Adjustment and Performance Check

SERVICE MANUAL

SYS-2722 192 k

SYSTEM TWO CASCADE PLUS • 2722
DUAL DOMAIN

CASCADE 192k SYS-2522
SYSTEM TWO CASCADE DUAL DOMAIN

CASCADE SYS-2522
SYSTEM TWO CASCADE DUAL DOMAIN

SYSTEM TWO • 2322
DUAL DOMAIN

SVC

S2 Family
Service Manual

Versions 1.00,
1.10 and 1.10a

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Contents

Safety Information

Do NOT service or repair this product unless properly qualified. Only a qualified technician or an authorized Audio Precision distributor should perform servicing.

Do NOT defeat the safety ground connection. This product is designed to operate only from a 50/60 Hz ac power source (250 Vrms maximum) with an approved three-conductor power cord and safety grounding. Loss of the protective grounding connection can result in electrical shock hazard from the accessible conductive surfaces of this product.

For continuous fire hazard protection, fuses should be replaced only with the exact value and type as indicated on the rear panel of the product and in this document. The ac voltage selector also must be set to the same voltage as the nominal power source voltage (100, 120, 230, or 240 Vrms) with the appropriate fuses installed.

The International Electrotechnical Commission (IEC 1010-1) requires that measuring circuit terminals used for voltage or current measurement be marked to indicate their Installation Category. The Installation Category is defined by IEC 664 and is based on the amplitude of transient or impulse voltage that can be expected from the ac power distribution network. This product is classified as INSTALLATION CATEGORY II, abbreviated “CAT II” on the instrument front panel.

Do not substitute parts or make any modifications to this product without the written approval of Audio Precision. Doing so may create safety hazards.

This product is for indoor use only and has been evaluated for electrical safety using the most stringent environmental classification—degree 2—as defined by IEC 1010-1.

Chapter 1: General Information

1.1 Introduction

1.1.1 The SVC-S2Family service package

Service package SVC-S2Family supports the Audio Precision S2 family of test and measurement instruments. See Table 1.1 for a listing of the models and configurations included in the S2 family.

Many of these models and instruments were previously supported by dedicated service packages for System Two, System Two Cascade and System Two Cascade *Plus* instruments. This S2 Family Service Package adds support for the 2700 Series and replaces the earlier service packages, which have been deprecated.

The service package consists of this manual and the S2 Family Service CD-ROM, which contains adjustment, calibration, and performance check tests and macros and Calibration Report forms.

System Two instruments require APWIN version 2.24 control software to run the tests and macros in this package; all other S2 family instruments require AP2700 version 3.30 for compatibility with this service package. You can download APWIN or AP2700 software from our website at ap.com.

The service package provides sufficient information and tools to enable a qualified technician to perform calibration, adjustment, and diagnostic performance checks.

1.1.2 Calibration, Adjustment and Performance Check

Calibration is a formal procedure that verifies instrument performance against external test equipment. For your reference, the steps performed in the calibration macros and tests are listed in Chapter 2. Calibration reports for each of the five S2 family variants are provided in the Appendices.

Adjustment is a separate procedure that directs you to adjust variable components in one or more instrument modules to achieve optimum performance.

Perfomance check is a diagnostic procedure that uses the instrument's own measurement functions to indicate passing or failing performance in a module.

1.1.3 Copying the service files

The service package CD-ROM carries all the test, macro and other support files necessary for S2 family service, when used with the control software APWIN (for System Two service) or AP2700.

Copy the entire contents of the CD-ROM to a convenient location on your PC hard drive; normally to the C:\ root location. The files are all within the folder "AP S2 Family Service"; copying this folder with all its subfolders will maintain the organizational hierarchy of the subfolders and files.

NOTE: The Calibration, Adjustment and Performance Check procedures are driven by AP Basic macros. File-opening commands in AP Basic do not support path+file names longer than 128 characters, so if you copy the service files to a location deep in your folder heirarchy, you may experience file-opening errors.

1.1.4 Repair Authorization

Audio Precision authorizes field repair only for the power supply (PSA) and digital interface (IFM) modules. The repair of any other S2 Family circuit board assembly or module is **NOT** authorized except under very special circumstances. Defective modules or assemblies will be replaced through your local Audio Precision distributor or our USA factory. See Section 1.6 for a brief synopsis of the modules and assemblies contained in the S2 family of instruments.

1.1.5 Regarding Schematics and Design Documentation

Because repair authorization is limited to the power supply and digital interface modules, only those schematics will be provided upon request. Audio Precision considers many of the circuit designs used in the S2 family of instruments to be proprietary and state-of-the-art. Quite frankly, we desire to keep it that way. In the event that Audio Precision authorizes a field repair to one of the other modules, only information sufficient to locate and replace the defective component(s) will be provided. No other schematics or design related information will be released.

1.1.6 Organization of this manual

The S2 family, as mentioned, encompasses four distinct models and one additional variation (the two 192k Cascade models). See Table 1.1.

The calibration, adjustment and performance check macros automatically identify the instrument model and configuration and select the correct tests and settings.

The calibration, adjustment, performance check, electrical documentation and calibration report chapters of this manual are each separated into sections for each model. The sections are identified by paper of different colors.

- 2700 Series: white paper.
- System Two Cascade *Plus*: yellow paper.
- System Two Cascade: green paper.
- System Two Cascade (with 192k mod): gray paper.

- System Two: pink paper

1.2 Models Within The S2 Family

There are four model lines within the S2 family, as shown in the four columns of Table 1.1. Each of the model lines have four system configurations. Internal options are available, and upgrade paths may convert one model or configuration to another. An upgrade is also available to convert a System Two Cascade to one of two unique instruments: the SYS-2500 (192k) or the SYS-2522 (192k). System configurations are discussed in the next section.

	System Two	System Two Cascade	System Two Cascade *Plus*	2700 Series
analog only	SYS-2022	----	SYS-2122	SYS-2702
analog +DSP	SYS-2222	SYS-2422	SYS-2622	SYS-2712
digital only (w / DSP)	SYS-2300	SYS-2500	SYS-2700	SYS-2720
dual domain (analog, digital w / DSP)	SYS-2322	SYS-2522	SYS-2722 (96k)	SYS-2722 (192k)
digital only, mod to 192k		SYS-2500 (192k)		
dual domain, mod to 192k		SYS-2522 (192k)		

Table 1.1. S2 Family models and configurations.

1.2.1 System Two

System Two models were the earliest products in this family, and established the high baseline of performance and features with highly accurate analog generation and analysis, dual-domain performance with digital I/O at up to 48 kHz sample rates, and DSP generation and analysis.

1.2.2 System Two Cascade

System Two Cascade added 96 kHz sample rates to the digital I/O, and added dual-connector digital inputs and outputs. Since the analog-only configuration was unaffected by this feature change, no analog-only configuration was available with Cascade branding.

1.2.3 System Two Cascade *Plus*

System Two Cascade *Plus* brought higher-performance analog circuitry to the family, and added more memory for the DSP functions.

1.2.4 2700 Series

The 2700 Series added 192 kHz sample rate capability to the digital input and outputs.

1.3 System Configurations and Options

System model, configuration and option information will be found on the rear panel identification label.

The hardware packages have been manufactured in four standard configurations:

- analog only
- analog + DSP
- digital only
- dual domain

Table 1shows the nomenclature used across the family for the four standard configurations. Details follow.

1.3.1 Analog Only

Figure 1.1. Typical analog-only front panel; SYS-2702 shown as an example.

The analog-only configurations are dual-channel analog based generator and analyzer systems. All signal generation, filtering, and measurement utilizes analog technology. Analog-only configurations are:

- SYS-2022
- SYS-2122
- SYS-2702

In an analog-only instrument, the upper left front panel provides the generator output connectors and the upper right front panel provides the analyzer input connectors. The lower right front panel typically features 11 BNC connectors (some earlier models have only 9 connectors on this panel) that provide auxiliary signals from the generator and monitor output signals from the analyzer. The lower left front panel is blank. See Figure 1.1.

1.3.2 Analog+DSP

Figure 1.2. Typical analog+DSP front panel; SYS-2712 shown as an example.

The analog+DSP configurations have capability for high resolution spectrum analysis via FFT, waveform capture and display, and fast multitone testing.

Analog+DSP configurations are:

- SYS-2222
- SYS-2422

- SYS-2622
- SYS-2712

The analog+DSP front panel has the same appearance as an analog-only configuration. See Figure 1.2

1.3.3 Digital Only

Figure 1.3. Typical digital-only front panel; SYS-2720 shown as an example.

The digital-only configurations are digital-only audio test systems with no analog signal generation or analysis capability. They are similar to the dual-domain instruments except that the analog generator, analog input, and analog analyzer modules are deleted.

Digital-only configurations are:

- SYS-2300
- SYS-2500
- SYS-2500 (192k) [by UPG-0092 mod]
- SYS-2700
- SYS-2720

Because there is no analog testing capability, the upper left and right front connector panels are blank. See Figure 1.3.

NOTE: The System Two SYS-2300 is only fitted with one set of digital output and input connectors in the lower left front panel.

1.3.4 Dual Domain

Figure 1.4. Typical dual-domain front panel; SYS-2722 (192k) shown as an example.

The dual-domain configurations are the most common, and includes all of the enhanced analog signal generation and analysis capability of the analog+DSP configurations plus the added capability to generate and test AES3 / IEC60958 / SPDIF and optically encoded digital audio signals.

The front panel layouts are similar to the analog+DSP configurations except that the lower left front panel contains the various digital audio connectors. Additional signals, inputs, and a parallel interface are provided on a rear panel. See Figure 1.4.

Dualdomain configurations are:

- SYS-2322
- SYS-2522
- SYS-2522 (192k) [by UPG-0092 mod]
- SYS-2722 (96k)
- SYS-2722 (192k)

NOTE: The System Two SYS-2322 is only fitted with one set of digital output and input connectors in the lower left front panel.

1.4 Options

1.4.1 Analog options and filters

A number of major and minor options are available for S2 family models. Since these are analog options, they are not available for the digital only configurations. These are discussed in more detail in the Hardware Overview section.

- IMD, the intermodulation distortion generator/analyzer option.
- BUR, the tone burst / noise generator option.
- W&F, the wow and flutter generator/analyzer option.
- S-AES17 Option pre-analyzer filter.
- OPT-2020 Option pre-analyzer filter (also sold under the nomenclature S2-AES17-LP).
- option filters, up to 7 small analyzer filter cards.
- input and output impedance options.

1.5 The System

Each Audio Precision S2 family instrument functions in a system, controlled by a PC running Audio Precision control software, either APWIN or AP2700. The PC communicates to and from the instrument over a dedicated bus called the Audio Precision Interface Bus, or APIB.

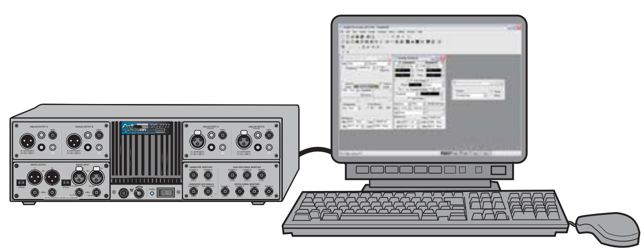

Figure 1.5. System

1.5.1 Control software: APWIN and AP2700

The service package calibration, adjustment and performance check files are tests and macros that require Audio Precision control software to operate.

For System Two instruments, the control software must be APWIN version 2.24

For all other S2 family instruments, the control software must be AP2700 version 3.10.

CD-ROM disks for installation of both APWIN and AP2700 are provided with the service package. See the CD booklet and the documents "Getting Started with APWIN" or "Getting Started with your 2700 Series Instrument" for instructions regarding control software installation. These documents are on the appropriate control software CD-ROM as PDF files, and are available from Audio Precision.

1.5.2 APIB PC interface cards

For APWIN version 2.24, ISA, PCI and PCMCIA-type APIB interface cards are supported. You can service System Two instruments (which require APWIN control software) with this service package using a PC fitted with any of the three types of APIB interface card.

To service any other S2 family instruments, you must use AP2700 control software. AP2700 version 3.10 only supports PCI and PCMCIA-type APIB interface cards; ISA cards are not supported. For service package puposes, this means that your PC must be fitted with a PCI or PCMCIA-type APIB interface card.

1.5.3 PC Requirements

See the documents "Getting Started with APWIN" or "Getting Started with your 2700 Series Instrument" for minimum PC requirements for Audio Precision control software.

Briefly,

APWIN requires:

- Windows 95/98, Windows 2000 or Windows NT 4.0 as the operating system. APWIN will also run on Windows XP but full compatibility has not been verified.

AP2700 requires:

- Windows 2000 or Windows XP as the operating system.

Both share these requirements:

- At least the minimum processor type and memory required by Microsoft for the installed operating system.
- At least 300 MB of free hard disk space.
- A CD-ROM drive.
- An open PCI or PCMCIA slot to mount the APIB interface card. For APWIN, an open ISA slot is an option.
- A color monitor and a video card with at least VGA capabilities. Video resolution of 1024 x 768 is recommended.

1.6 Hardware Overview

An S2 family instrument is composed of various internal modules and assemblies depending upon the instrument configuration (see Table 1.1). Diagrams in Chapter 7 show the physical location of the assemblies and modules in the instrument.

1.6.1 Functional Modules

The **PSA** module contains the regulated dc supplies and the variable speed fan control circuits. The PSA module is present in all configurations and is mounted to the main chassis plate under the U-shaped "tunnel" shield that bisects the lower half of the instrument into two bays.

The **GEN** module and **XBO** assembly are present in all instruments except the digital-only configurations. The GEN module contains the ultra-low distortion analog sinewave generator, amplitude control stages, and output amplifiers. The low distortion analog sinewave generator produces a constant amplitude signal that is normally fed to both output stages. The signal paths prior to the amplitude control stages can be interrupted to insert the output signal from an option board (for example: a square wave from the BUR assembly) or from the dual channel DACs located on the DSP module. The GEN module is closely associated and connects to the XBO front panel assembly containing the various analog output signal connectors.

The **INP** module and **XBI** assembly are present in all instruments except the digital-only configurations. The INP module contains two independent channels of analog input signal selection, terminations, attenuators, preamplifiers, level meters, and autoranging comparators. Each input channel provides a signal path gain of approximately –36 dB (160 V range) to +30 dB (40 mV range) in 6.02 dB steps. The autoranged input signals are fed into independent wideband true rms level meters, independent frequency counters, and a phase meter. These signals are also fed to the analog analyzer module for selection and subsequent additional processing before measurement. The INP module is closely associated and connects to the XBI front panel assembly containing the various analog input signal connectors.

The **ANL** module is present in all instruments except the digital-only configurations. The ANL module contains a single-channel enhanced analog signal analyzer including a programmable four-pole bandpass or bandreject filter, bandwidth limiting filters, option filters, 0 to 60 dB of additional gain in 12 dB steps, and selectable detectors. Because the analyzer is single channel, the ANL module also contains relay switching to select either the channel A or channel B input signal processed by the INP module.

The **DSP** module is present in the analog+DSP, the digital-only and the dual-domain configurations. The DSP module contains the basic digital signal processor (DSP) engine, dual channel high resolution (20-bit) or extended bandwidth (16-bit) analog-to-digital converters (ADCs), dual channel digital-to-analog converters (DACs), and sample rate clock generation. It also contains the multiplexers for the dual channel ADCs to select from a variety of internal signal sources from the other modules, and a separate multiplexer for the loudspeaker signal path.

The **DIO** module along with the **DDF** and **DDR** are present in the digital-only and dual-domain configurations only. The DIO module contains the audio digital interface generator and analyzer. The AES-EBU generator also contains circuits for injecting calibrated amounts of jitter and other forms of interface impairments. The DDF module and DDR panel assembly are functionally tied to the DIO module. The DDF module includes the digital I/O front panel, connectors, and an attached circuit board containing the various specialized digital I/O circuits. The DDR assembly includes the digital I/O rear panel, connectors, and an attached circuit board that connects to the DIO assembly.

The **IFM** module contains the receivers and drivers for the Audio Precision interface bus (APIB) and general power distribution for the various hardware modules. The IFM module is present in all configurations and is mounted to standoffs under the U-shaped “tunnel” shield that separates the upper half of the instrument into two bays.

The **HSM** module contains the loudspeaker amplifier, headphone jack, volume control circuits, and mounting for the blue led power indicator. It is mounted directly behind the power switch panel and is present in all configurations.

1.6.2 Major Options

Analog-equipped S2 family instruments may contain one or more of the following major hardware options: **BUR**, **IMD**, **W&F**. In addition, up to seven option filters may also be installed, along with a pre-analyzer filter. These are discussed in subsequent sections. The rear panel identification decal lists all factory installed options in a particular instrument.

Option “BUR” consists of a single board assembly called the **BUR** that adds the capability to generate sine burst, squarewave, white, pink, and bandpass noise signals. The BUR option is mounted on standoffs above the GEN analog generator module.

Option “IMD” consists of two circuit board assemblies. The **IMG** board is mounted on standoffs above the GEN (analog generator) module and adds special hardware required for analog IMD test signal generation. The **IMA** board is mounted on standoffs above the ANL (analog analyzer) module and contains special filter and demodulator circuits for intermodulation distortion analysis.

Option “W&F” is a single circuit board assembly called the **WFA** that adds the capability of measuring wow and flutter. It is mounted on standoffs above the ANL (analog analyzer) module.

1.6.3 Pre-analyzer filters

The pre-analyzer filter options are designed to be mounted at the same location (above the INP) and tap in and out at the same points in the instrument circuitry. They are incompatible with each other; only one can be mounted and operated within an instrument at any one time.

S-AES17

The “S-AES17” pre-analyzer filter option consists of a single board assembly called the **SLPX** that is mounted on standoffs above the **INP** module. S-AES17 also includes two specific option filters, the **FLP-B20K** and **FLP-B40K**, that are installed on the **ANL** module.

OPT-2020 / S2-AES17-LP

The “OPT-2020” (previously distributed under the name “S2-AES17-LP”) pre-analyzer filter option consists of a single board assembly called the **SAES** that is mounted on standoffs above the INP module.

1.6.4 Option Filters

Option filters are small circuit board assemblies that plug into sockets on the ANL module. Up to seven may be installed. Option filters are switchable (one at a time) in series with the analog analyzer signal path. Over 70 different designs are available. They are identified by a white or silver colored label attached to the option filter board.

1.6.5 Identification Labels

Within an S2 family instrument, every major circuit board assembly (except option filters) includes a white or silver colored identification label mounted in a clearly visible location. It contains a code with the format

“SABC-xxxxx-yyy-zz”

or

“RABC-xxxxx-yyy-zz”

The three letters “**ABC**” following the leading “S” or “R” specify the module type (for example **SGEN** or **RDSP**) as described in subsections 1.6.1 and 1.6.2. The next block of characters “**xxxxx**” (typically numbers) specifies the serial number of the assembly. The third block of characters “**yyy**” is the assembly revision level. The final two blocks of characters “**zz**”contain coded information for factory or service use only.

1.7 The APIB Digital Interface

The interface between the PCand the Audio Precision instrument is a byte-wide bi-directional link with multiplexed address and data information. This allows interfacing with any computer that has two available I/O ports. It consists of eight data/address lines, four host driven control lines and three open collector lines driven from Audio Precision equipment. All information is sent and received over these lines under the control of the PC. The PC controls direction of information flow and timing.

The interface allows for "daisy chaining" several pieces of equipment to the same host without additional interface cards in the PC. The drive capability of the lines is up to 24 receivers, depending on the cable lengths involved. The interface allows for up to 256 addresses, normally allocated in groups of 16 per functional module.

1.8 Note on the Service Kit SVC-KIT002

Several pieces of equipment are required to calibrate and adjust your Audio Precision instrument. Specific equipment is listed on the first page of each calibration section (Chapters 2a thru 2e) and on the first page of Chapter 3, the adjustment chapter.

Included in each list is the AP Service Kit, SVC-KIT002, which is available for purchase from Audio Precision. Contact your representative or the Audio Precision factory for more information about purchasing SVC-KIT002.

The Service Kit consists of several cables and adapters, and two custom fixtures. If you do not have the AP Service Kit, you will find that most of the components can be purchased from electronics parts vendors. The custom fixtures or adapters that may not be commonly available can be constructed from common electronics parts using the instructions provided below:

SVC-KIT002 includes:

2	110 Ω XLR male-to-female cables	pn CAB-AES
2	75 Ω male-to-male BNC cables	pn CAB-B75
1	110 Ω Fixture	pn SVC-FXTR-110
1	CMT Fixture	pn SVC-FXTR-CMT
1	75 Ω BNC termination, male	pn 4254.0006
1	BNC "T" adapter (F-M-F)	pn 4254.0007
2	BNC (F) to dual-banana adapters	pn 4254.0008

1.8.1 75 Ω BNC termination / "T" adapter

This adapter provides a 75 Ω termination to the Audio Precision instrument unbalanced digital output at the oscilloscope input. Figure 1-6 shows a typical 75 Ω BNC termination construction with its electrical schematic.

1.8.2 110 Ω Fixture

This fixture provides a 110 Ω termination to the Audio Precision instrument balanced digital output at the oscilloscope inputs. The two BNCs are connected so as to provide a differential signal to two input channels of the oscilloscope. Figure 1-7 shows a typical 110 Ω Fixture construction with its electrical schematic.

1.8.3 CMT Fixture

When a signal generator is connected to the BNC, this fixture provides a Common Mode Test (CMT) connection to an Audio Precision instrument balanced input. Figure 1-8 shows a typical CMT Fixture construction with its electrical schematic.

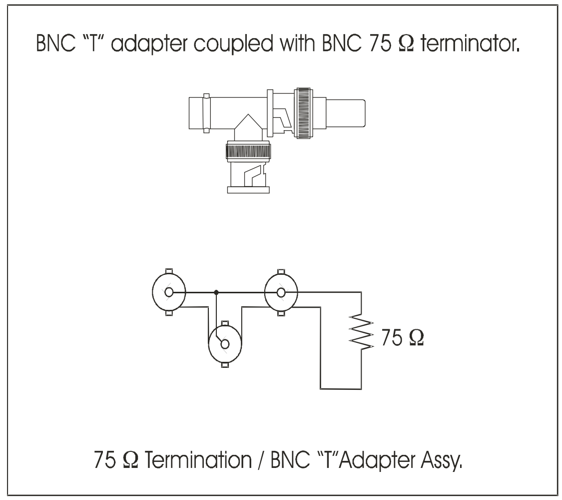

Figure 1.6. 75 Ω terminator.

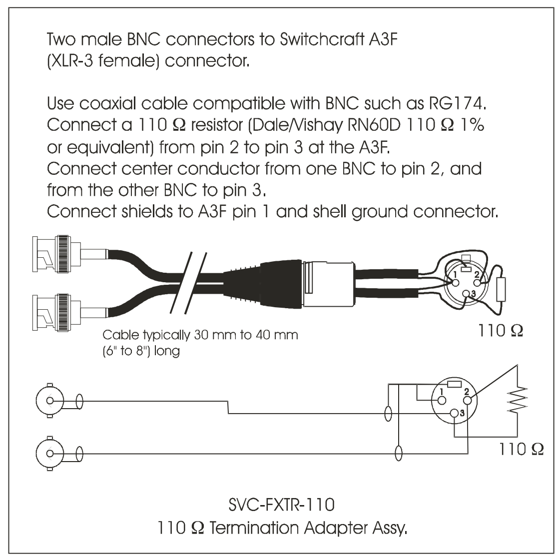

Figure 1.7. 110 Ω termination fixture.

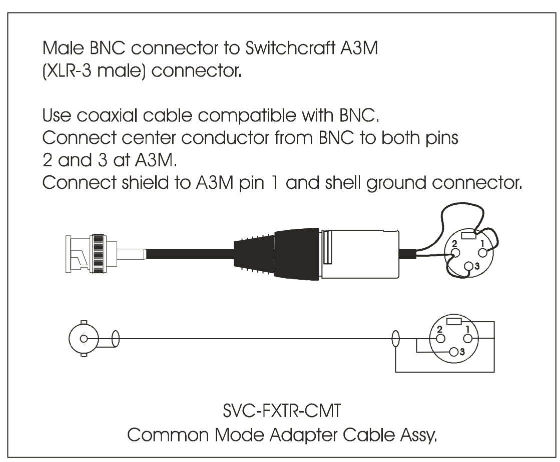

Figure 1.8. Common Mode Test fixture.

Chapter 2a: Calibration—2700 Series

2.1 Introduction

2.1.1 Models calibrated in this section

This section, Chapter 2a, is for the calibration of Audio Precision 2700 Series instruments only. The 2700 Series instruments include model numbers:

- SYS-2702
- SYS-2712
- SYS-2720
- SYS-2722 (192k)

2.1.2 Calibration Report Form

The process of calibration typically results in a *document* certifying that the unit meets all published specifications. With the growing emphasis on quality systems, it has become increasingly common to require calibration data in support of the certification document. This is usually presented in the form of a **Calibration Report** or **Performance Verification Report** in which the data is tabulated in comparison to acceptable limits derived from the instrument's published specifications or other criteria.

Suitable report forms for each S2 family model can be found in the appendices of this manual. These forms are also available as PDF files in the CD-ROM service folder "AP S2 Family Service\Calibration\ReportForms". Audio Precision hereby grants permission to copy or modify these forms.

NOTE: Audio Precision reserves the right to change specifications without prior notice.

2.1.3 Calibration versus Adjustment

The terms "Calibration" and "Adjustment" are often confused. They refer to two distinctly separate processes.

"Calibration" is the process of comparing or measuring actual performance using external references and test equipment that are traceable to national standards. This chapter describes the calibration procedure.

"Adjustment" is the process of changing variable hardware elements and/or stored software constants to compensate for the effects of component tolerances and drift. Adjustment does not necessarily imply calibration, nor does calibration necessarily require adjustment. Chapter 3 describes the adjustment procedure.

If adjustment is to be performed as part of calibration, the quality systems of some companies may require the preparation of *two* Calibration Reports (thus following the calibration procedure *twice*). In this situation, calibration reports must be generated both *before* and *after* adjustment. The first report is intended to document any out-of-tolerance conditions that existed as of the end of the instrument's previous duty period. The second report is intended to document instrument status as the unit is being returned to begin its next duty period.

2.1.4 Calibration Interval

Audio Precision normally recommends a 12-month calibration interval for S2 family instruments. A 24-month interval may be used only if the unit is installed and operated within a reasonably controlled environment (+15°C to +30°C) and is not exposed to adverse conditions such as mechanical vibration or condensing humidity.

2.2 Required Test Equipment

The following test equipment is required to calibrate an S2 family instrument. Each piece of equipment must itself be duly calibrated and operated in accordance with its manufacturer's recommendations.

1) AC Calibrator	Fluke 5520A. (Note: the Fluke 5500A is inadequate.)
2) Precision Multimeter	Agilent 3458A.
3) Counter	Agilent 53131A with timebase option 010. (Note: an external frequency reference may be used in lieu of option 010, provided its error is <0.0 PPM.)
4) Oscilloscope	Tektronix TDS 3032B or 3052B.
5) AP Service Kit	SVC-KIT002

Service Kit SVC-KIT002 includes the following cables, adapters and fixtures:

2	110 Ω XLR male-to-female cables	pn CAB-AES
2	75 Ω male-to-male BNC cables	pn CAB-B75
1	110 Ω Fixture	pn SVC-FXTR-110
1	CMT Fixture	pn SVC-FXTR-CMT
1	75 Ω BNC termination, male	pn 4254.0006
1	BNC "T" adapter (F-M-F)	pn 4254.0007
2	BNC (F) to dual-banana adapters	pn 4254.0008

See Section 1.8 for more information about Service Kit SVC-KIT002.

2.3 Calibration Procedure

The folder "…\AP S2 Family Service\Calibration" contains macros for each potential step of the overall calibration procedures outlined in this chapter. Each macro contains all necessary instructions and operator prompts, and provides automatic control of the hardware setups.

Although you can run any of these calibration macros individually, in most cases you will start a calibration by running the "BeginCal.apb" macro.

2.3.1 Preparing the instrument for Calibration

First, be sure that the instrument has been ON for at least 1/2 hour to warm up and stabilize its circuits.

You must have already installed the correct control software (APWIN for System Two; AP2700 for all other S2 family instruments) on the host PC. Verify that the APIB bus is connected and operating properly.

Check that the required test equipment and cables (listed in the previous section) are available. If you plan to make a calibration report, make available the PDF or hard copy of the the appropriate report form.

Launch the control software and open the macro "…\AP S2 Family Service\Calibration\BeginCal.apb". Run the macro.

NOTE: DO NOT open S2 Family Service files by "double-clicking" the file from Windows Explorer or from a folder window. Instead, run the control software and open the service file from the File menu. This assures that the control software working directory is properly set.

2.3.2 BeginCal.apb

Introductory dialog

BeginCal.apb first identifies the instrument connected to the PC via APIB, and asks you to verify this identification. If the automatic identification does not agree with the instrument labeling or configuration, (which is very unlikely) stop the calibration now and contact Audio Precision tech support.

Once the instrument is identified and verified, BeginCal.apb determines the correct tests and macros to calibrate this particular instrument model and configuration

Next BeginCal.apb recommends the correct calibration report to print and use, and describes the structure of the calibration procedure.

Beginning the calibration steps

When these preliminary steps are complete, you are prompted to press CONTINUE to begin with CAL01.apb, the first macro in the actual calibration procedure. CAL01.apb and the following macros are described in the next section starting with Step 1.

Once you click CONTINUE to start Step 1, the calibration procedure will move through all the appropriate steps until calibration is complete.

The entire calibration can be performed by reading the information and following the instructions in the dialog boxes provided by the calibration macros, without further reference to this manual. For your convenience, the calibration steps are outlined below as an overview and a guide when re-starting an interrupted calibration procedure.

The first dialog box of step lists the equipment and connections necessary for that step. As the macro proceeds, you are instructed to enter the results for each measurement on the Calibration Report.

You may stop the calibration procedure at any time by pausing or stopping the macro, and begin it again by starting the macro. You may also return to a specific step by opening and running its macro (CAL17.apb, for example). The calibration procedure outlines provided in the next section identify the macros associated with each calibration step.

NOTE: Some steps printed here pertain only to certain hardware configurations or options, and the calibration procedure will skip the steps that are not necessary for the particular instrument undergoing calibration.
As many as 450 measurements may be required for a complete calibration.

2.3.3 Calibration, Step-by-Step

2700 Series instruments

Step 1: Sine Generator Frequency Accuracy CAL01.apb

[for models with analog generator: SYS-2702, SYS-2712 & SYS-2722 (192k)]

☞ Use frequency counter (see list in section 2.2). Connect GENERATOR AUX SIGNALS Sync Ouptut to frequency counter using a BNC cable. Adjust the counter controls to obtain a stable frequency reading.

This macro prompts you to record a series of frequency measurements made across a wide range of frequencies, first in "FAST" generator mode, then in "HI-ACCURACY" generator mode.

Step 2: Sine D/A Generator Frequency Accuracy CAL02.apb

[for models with analog generator +DSP: SYS-2712 & SYS-2722 (192k)]

☞ Use frequency counter (see list in section 2.2). Connect GENERATOR AUX SIGNALS Sync Ouptut to frequency counter using a BNC cable.

Adjust the counter controls to obtain a stable frequency reading.

NOTE: The basic accuracy of many counters may not be sufficient unless they are locked to an external frequency reference or standard.

This macro prompts you to record a frequency measurement.

Step 3: Sine Generator Amplitude Accuracy CAL03.apb

[for models with analog generator: SYS-2702, SYS-2712 & SYS-2722 (192k)]

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL (first “A,” then “B”) to ac voltmeter using a BNC cable and a BNC-to-dual-banana adapter.

This macro prompts you to record a series of amplitude measurements made across a wide range of voltages, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B.

Step 4: Sine D/A Generator Amplitude Accuracy CAL04.apb

[for models with analog generator +DSP: SYS-2712 & SYS-2722 (192k)]

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL (first “A,” then “B”) to ac voltmeter using a BNC cable and a BNC-to-dual-banana adapter.

This macro prompts you to record two amplitude measurements, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B.

Step 5: Sine Generator Flatness CAL05.apb

[for models with analog generator: SYS-2702, SYS-2712 & SYS-2722 (192k)]

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL (first “A,” then “B”) to ac voltmeter using a BNC cable and a BNC-to-dual-banana adapter.

NOTE: The accuracy of some ac voltmeters may not be sufficient to directly verify flatness below about 50 Hz or above 10–20 kHz. If necessary, use an ac calibrator to prepare a table of suitable correction factors at 2.5 Vrms.

This macro prompts you to record a series of relative amplitude measurements made across a wide range of voltages, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B. If the precision ac voltmeter can be set for relative measurements, make it so.

If the ac voltmeter does not allow relative “dB” readings, note the voltage reading at 1 kHz (V_{ref}) and use it as the reference to calculate flatness at subsequent frequencies, using the formula:

$$\mathrm{dB} = 20\log_{10}\frac{V_{reading}}{V_{ref}}\ .$$

Step 6: Sine D/A Generator Flatness CAL06.apb

[for models with analog generator +DSP: SYS-2712 & SYS-2722 (192k)]

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL (first “A,” then “B”) to ac voltmeter using a BNC cable and a BNC-to-dual-banana adapter.

NOTE: The accuracy of some ac voltmeters may not be sufficient to directly verify flatness below about 50 Hz or above 10–20 kHz. If necessary, use an ac calibrator to prepare a table of suitable correction factors at 2.5 Vrms.

This macro prompts you to record a series of relative amplitude measurements made across a wide range of voltages, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B. If the precision ac voltmeter can be set for relative measurements, make it so.

If the ac voltmeter does not allow relative “dB” readings, note the voltage reading at 1 kHz (V_{ref}) and use it as the reference to calculate flatness at subsequent frequencies, using the formula:

$$\mathrm{dB} = 20\log_{10}\frac{V_{reading}}{V_{ref}}\ .$$

Step 7: Sine Generator Residual THD+N CAL07.apb

[for models with analog generator: SYS-2702, SYS-2712 & SYS-2722 (192k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Residual THD+N is a “system” specification including contributions from both generator and analyzer. The test conditions in this step have been chosen to maximize the generator contribution relative to the analyzer. Step 22 checks THD+N under conditions that maximize analyzer contribution.

This macro prompts you to record a series of band-limited residual THD+N measurements made across a wide range of frequencies, using the internal GenMon connections.

Step 8: Sine D/A Generator Residual THD+N CAL08.apb

[for models with analog generator +DSP: SYS-2712 & SYS-2722 (192k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog analyzer is used to verify DAC residual THD+N.

This macro prompts you to record a series of residual THD+N measurements made across a wide range of frequencies, using the internal GenMon connections.

Step 9: Output-related Crosstalk CAL09.apb

[for models with analog generator: SYS-2702, SYS-2712 & SYS-2722 (192k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog analyzer is used to verify generator crosstalk. Analyzer-related crosstalk is at least 10 times lower. (See Step 13).

This macro prompts you to record crosstalk measurements at 20 kHz and 100 kHz from Channel A into Channel B, and then from Channel B into Channel A, using the internal GenMon connections.

Step 10: Source Impedance Accuracy CAL10.apb

[for models with analog generator: SYS-2702, SYS-2712 & SYS-2722 (192k)]

☞ Use the ohmmeter function of a multimeter (see list in section 2.2). Connect ANALOG OUTPUT banana jacks (first "A," then "B") to ohmmeter using a BNC cable and two BNC-to-dual-banana adapters.

This macro prompts you to record a series of resistance measurements made at all output impedance and signal balance settings, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B.

*NOTE: In units with option **EGZ** installed, the 150 Ω selection is replaced with 200 Ω. The allowable limits are 198.0–202.0 Ω.*

Step 11: Input Termination Accuracy CAL11.apb

[for models with analog analyzer: SYS-2702, SYS-2712 & SYS-2722 (192k)]

☞ Use the ohmmeter function of a multimeter (see list in section 2.2). Connect ANALOG INPUT banana jacks (first "A," then "B") to ohmmeter using a BNC cable and two BNC-to-dual-banana adapters.

This macro prompts you to record a series of resistance measurements made at all input impedance settings, first for ANALOG INPUT A and then for ANALOG INPUT B.

Step 12: Input Common Mode Rejection CAL12.apb

[for models with analog analyzer: SYS-2702, SYS-2712 & SYS-2722 (192k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of CMRR measurements made at a range of amplitude and frequency settings, first for ANALOG INPUT A and then for ANALOG INPUT B.

NOTE: The "dBgA" unit expresses amplitude relative to the generator channel A output; likewise, "dBgB" is amplitude relative to the generator channel B output.

Step 13: Input Related Crosstalk CAL13.apb

[for models with analog analyzer: SYS-2702, SYS-2712 & SYS-2722 (192k)]

☞ Use the AC Calibrator (see list in section 2.2) as a high-voltage signal generator (for this test, accuracy is not important). Connect the AC Calibrator to the instrument ANALOG UNBAL INPUTS (first "B," then "A") using a BNC cable and a BNC-to-dual-banana adapter.

CAUTION: At high voltage settings, the AC Calibrator output can present hazardous potentials. Always set the AC Calibrator to a low voltage range before connecting or disconnecting cables. Be sure to orient the dual-banana connector for correct polarity (BNC center conductor to ac "high," BNC shield to ac "low" or ground.

This macro prompts you to record a series of crosstalk measurements made with a high-level input at two different frequencies, first for crosstalk into INPUT A from INPUT B, and then for crosstalk into INPUT B from INPUT A.

Step 14: Analyzer Level Meter Accuracy CAL14.apb

[for models with analog analyzer: SYS-2702, SYS-2712 & SYS-2722 (192k)]

☞ Use the AC Calibrator (see list in section 2.2). Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the BNC "T" adapter, and

using 2 BNC cables connect each of the "T" outputs to the instrument ANALOG INPUTS UNBAL A and B.

CAUTION: At high voltage settings, the AC Calibrator output can present hazardous potentials. Always set the AC Calibrator to a low voltage range before connecting or disconnecting cables. Be sure to orient the dual-banana connector for correct polarity (BNC center conductor to ac "high," BNC shield to ac "low" or ground.

This macro prompts you to record a series of level meter readings for both INPUT A and INPUT B at a range of AC Calibrator amplitude settings.

Step 15: Analyzer Level Meter Flatness CAL15.apb

[for models with analog analyzer: SYS-2702, SYS-2712 & SYS-2722 (192k)]

☞ Use the AC Calibrator (see list in section 2.2). Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the BNC "T" adapter, and using 2 BNC cables connect each of the "T" outputs to the instrument ANALOG INPUTS UNBAL A and B.

This macro prompts you to record a series of level meter readings for both INPUT A and INPUT B at a wide range of AC Calibrator frequency settings.

Step 16: Analyzer Level Meter Accuracy CAL16.apb

[for models with analog analyzer: SYS-2702, SYS-2712 & SYS-2722 (192k)]

☞ Use the AC Calibrator (see list in section 2.2). Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the BNC "T" adapter, and using 2 BNC cables connect each of the "T" outputs to the instrument ANALOG INPUTS UNBAL A and B.

This macro prompts you to record a series of analyzer AMPLITUDE function meter readings for both INPUT A and INPUT B at a range of AC Calibrator amplitude settings.

Step 17: Analyzer Amplitude Meter Flatness CAL17.apb

[for models with analog analyzer: SYS-2702, SYS-2712 & SYS-2722 (192k)]

☞ Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the instrument ANALOG INPUT A UNBAL connector.

This macro prompts you to record a series of analyzer AMPLITUDE function meter readings at a range of AC Calibrator amplitude and frequency settings.

Step 18: Analyzer Bandreject and THD+N Accuracy CAL18.apb

[for models with analog analyzer: SYS-2702, SYS-2712 & SYS-2722 (192k)]

☞ Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the instrument ANALOG INPUT A UNBAL connector.

This macro prompts you to record a series of analyzer BANDREJECT function meter readings at a range of AC Calibrator frequency settings, for each of several instrument notch filter settings.

Step 19: Analyzer Bandpass Accuracy CAL19.apb

[for models with analog analyzer: SYS-2702, SYS-2712 & SYS-2722 (192k)]

☞ Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the instrument ANALOG INPUT A UNBAL connector.

This macro prompts you to record a series of analyzer BANDPASS function meter readings at a range of AC Calibrator frequency settings, for each of several instrument bandpass filter settings.

Step 20: Analyzer Bandwidth Limiting Filters CAL20.apb

[for models with analog analyzer: SYS-2702, SYS-2712 & SYS-2722 (192k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of AMPLITUDE function meter measurements made at a range of frequency settings, for each of the analyzer bandwidth limiting filter settings.

NOTE: The "dBrA" unit expresses amplitude relative to the reference level established with no filters at the beginning of this step.

Step 21: Analyzer Residual Noise CAL21.apb

[for models with analog analyzer: SYS-2702, SYS-2712 & SYS-2722 (192k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The analyzer input terminations are provided by the system generator via internal signal paths.

This macro prompts you to record a series of analyzer residual noise measurements made at various analyzer bandwidth settings, for Channel A and Channel B.

Step 22: Analyzer Residual THD+N CAL22.apb

[for models with analog analyzer: SYS-2702, SYS-2712 & SYS-2722 (192k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of analyzer residual THD+N measurements made at various analyzer bandwidth settings and at various frequencies, for Channel A and Channel B.

Step 23: Analyzer Phase Measurement Accuracy CAL23.apb

[for models with analog analyzer: SYS-2702, SYS-2712 & SYS-2722 (192k)]

☞ No external test equipment required; however, external cabling is necessary. Connect a BNC "T" adapter to the instrument ANALOG OUTPUT A UNBAL. Using 2 BNC cables of equal length, connect each of the "T" outputs to the instrument ANALOG INPUTS UNBAL A and B.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of analyzer phase measurements at various frequencies.

Step 24: Analyzer Frequency Measurement Accuracy CAL24.apb

[for models with analog analyzer: SYS-2702, SYS-2712 & SYS-2722 (192k)]

☞ Use the frequency counter (see list in section 2.2). Using a BNC cable, connect the instrument GENERATOR AUX SIGNALS: SYNC OUTPUT to the input of the frequency counter.

NOTE: Frequency measurements of the internal sine wave generator are compared to that of an external frequency counter having <0.2 PPM of absolute error. Measurement accuracy will be checked in only one analyzer channel because both share the same internal timebase.

This macro prompts you to enter a frequency counter reading and then record the accuracy measured and calculated by the instrument.

Step 25: High-Resolution ADC Distortion CAL25.apb

[for models with analog analyzer +DSP: SYS-2712 & SYS-2722 (192k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup. A series of FFTs will be taken showing residual distortion as the signal amplitude of the high-resolution ADC is stepped from 0 dB (full scale) to –6 dB.

This macro prompts you to record the highest-level distortion component generated by a 5 kHz signal stepped over a series of amplitudes, first for Channel A and then for Channel B.

Step 26: High-Bandwidth ADC Distortion CAL26.apb

[for models with analog analyzer +DSP: SYS-2712 & SYS-2722 (192k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup. A series of FFTs will be taken showing residual distortion as the signal amplitude of the high-bandwidth ADC is stepped from 0 dB (full scale) to –6 dB.

This macro prompts you to record the highest-level distortion component generated by a 20 kHz signal stepped over a series of amplitudes, first for Channel A and then for Channel B.

Step 27: Burst OFF Ratio Accuracy (BUR option) CAL27.apb

[for models with analog analyzer and burst/square wave option: SYS-2702, SYS-2712 & SYS-2722 (192k)]. Instrument must have S2-BUR option installed.

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL A to ac voltmeter input using a BNC cable and a BNC-to-dual-banana adapter.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a reference reading in dB from the precision ac voltmeter, and then to record a series of voltmeter readings (in dB) made at various BURST: LOW LEVEL generator settings to measure the accuracy of the BURST ratios.

If the ac voltmeter does not allow relative "dB" readings, note the voltage reading at 1 kHz (V_{ref}) and use it as the

reference to calculate flatness at subsequent frequencies, using the formula:

$$dB = 20\log_{10}\frac{V_{reading}}{V_{ref}}.$$

Step 28: Square Wave Amplitude Accuracy (BUR option)
CAL28.apb

[for models with analog analyzer and burst/square wave option: SYS-2702, SYS-2712 & SYS-2722 (192k)]. Instrument must have S2-BUR option installed.

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL A to ac voltmeter input using a BNC cable and a BNC-to-dual-banana adapter.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record the voltmeter reading of the instrument's analog output, while generating a 1 Vrms 100 Hz square wave.

Step 29: Generator IMD Amplitude Accuracy (IMD option)
CAL29.apb

[for models with analog analyzer and IMD option: SYS-2702, SYS-2712 & SYS-2722 (192k)]. Instrument must have S2-IMD option installed.

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL A to ac voltmeter input using a BNC cable and a BNC-to-dual-banana adapter.

This macro prompts you to record the voltmeter reading of the instrument's analog output, while generating various IMD signals at a nominal amplitude.

Step 30: SMPTE LF Tone Accuracy (IMD option)
CAL30.apb

[for models with analog analyzer and IMD option: SYS-2702, SYS-2712 & SYS-2722 (192k)]. Instrument must have S2-IMD option installed.

☞ Use the frequency counter (see list in section 2.2). Using a BNC cable, connect the instrument GENERATOR AUX SIGNALS: SYNC OUTPUT to the input of the frequency counter.

This macro prompts you to record the frequency counter reading of the instrument's generator SYNC OUTPUT, while generating a series of SMPTE 4:1 signals with a range of low-frequency tones.

Step 31:DIM Square Wave Accuracy (IMD option)
CAL31.apb

[for models with analog analyzer and IMD option: SYS-2702, SYS-2712 & SYS-2722 (192k)]. Instrument must have S2-IMD option installed.

☞ Use the frequency counter (see list in section 2.2). Using a BNC cable, connect the instrument GENERATOR AUX SIGNALS: SYNC OUTPUT to the input of the frequency counter.

This macro prompts you to record the frequency counter reading of the instrument's generator SYNC OUTPUT, while generating first a DIM 100 and then a DIM B signal.

Step 32: IMD Measurement Accuracy (IMD option)
CAL32.apb

[for models with analog analyzer +DSP and IMD option: SYS-2712 & SYS-2722 (192k)]. Instrument must have S2-IMD option installed. DSP required for measurement technique employed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup. IMD analyzer calibration is checked using multitone signals synthesized by the internal DSP generator. These multitone signals include an IMD component at exactly 0.100% (–60 dB).

This macro prompts you to record a series of analyzer IMD readings (SMPTE, CCIF and DIM) made using optimized test waveforms to measure IMD analyzer accuracy.

Step 33: Residual IMD (IMD option)
CAL33.apb

[for models with analog analyzer and IMD option: SYS-2702, SYS-2712 & SYS-2722 (192k)]. Instrument must have S2-IMD option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Residual IMD is a "system" specification including contributions from both generator and analyzer.

This macro prompts you to record a series of analyzer IMD readings (SMPTE, DFD/CCIF and DIM) made using the IMD generator at a range of amplitude settings.

Step 34: Wow and Flutter Accuracy (W&F option)
CAL34.apb

[for models with analog analyzer +DSP and W&F option: SYS-2712 & SYS-2722 (192k)]. Instrument must have S2-W&F option installed. DSP required for measurement technique employed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup. W&F analyzer calibration is checked using a multitone signal synthesized by the internal DSP generator. This signal is a 3.000 kHz tone containing exactly 1.000% peak deviation of sine wave frequency modulation (FM) at 11.72 Hz.

This macro prompts you to record two W&F analyzer measurements made using an optimized test waveform.

Step 35: Residual Wow and Flutter (W&F option)
CAL35.apb

[for models with analog analyzer and W&F option: SYS-2702, SYS-2712 & SYS-2722 (192k)]. Instrument must have S2-W&F option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

This macro prompts you to record a series of W&F analyzer residiual measurements at various analyzer settings.

Step 36: S-AES17 Option Response
CAL36.apb

[for models with analog analyzer and S-AES17 option: SYS-2702, SYS-2712 & SYS-2722 (192k)]. Instrument must have S-AES17 option installed.

☞ No external test equipment required; however, external cabling is necessary. Connect a BNC cable from the ANALYZER SIGNAL MONITORS: READING connector to ANALOG INPUT B UNBAL.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of analyzer AMPLITUDE readings using different modes of the S-AES17 filter at various frequencies, measuring the response of the filter.

Step 37: S-AES17 Option Residual THD+N
CAL37.apb

[for models with analog analyzer and S-AES17 option: SYS-2702, SYS-2712 & SYS-2722 (192k)]. Instrument must have S-AES17 option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Residual THD+N is a "system" specification including contributions from both generator and analyzer.

This macro prompts you to record a series of AMPLITUDE readings made using different modes of the S-AES17 filter at various amplitudes, measuring the residual THD+N with the filter in-line.

Step 36a: OPT-2020 Option Response
CAL36.apb

[for models with analog analyzer and OPT-2020 option: SYS-2702, SYS-2712 & SYS-2722 (192k)]. Instrument must have OPT-2020 option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of analyzer AMPLITUDE made at various frequencies with the OPT-2020 filter enabled, measuring the response of the filter.

Step 37a: OPT-2020 Option Residual THD+N
CAL37.apb

[for models with analog analyzer and OPT-2020 option: SYS-2702, SYS-2712 & SYS-2722 (192k)]. Instrument must have OPT-2020 option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Residual THD+N is a "system" specification including contributions from both generator and analyzer.

This macro prompts you to record two AMPLITUDE measurements made at different amplitudes, measuring the residual THD+N with the OPT-2020 filter in-line.

Step 38: Digital Output Amplitude Accuracy
CAL38.apb

[for models with digital input and output capability: SYS-2720 & SYS-2722 (192k)]

☞ Requires a dual-channel oscilloscope, the "SVC-FXTR-110" test fixture, a digital audio XLR cable, 2 BNC cables and a 75 Ω BNC termination (see list in section 2.2).

This macro prompts you to connect the instrument, the test fixture and the oscilloscope and take amplitude readings from the scope screen.

Step 39: Digital Voltage Measurement Accuracy CAL39.apb

[for models with digital input and output capability: SYS-2720 & SYS-2722 (192k)]

☞ Requires a dual-channel oscilloscope, the "SVC-FXTR-110" test fixture, a digital audio XLR cable, 2 BNC cables and a 75 Ω BNC termination (see list in section 2.2).

This macro prompts you to connect the instrument, the test fixture and the oscilloscope and vary instrument settings while monitoring amplitudes from the scope screen. When scope amplitudes are attained, you are prompted to record instrument DIO amplitude readings.

Step 40: AES/EBU Variable Risetime CAL40.apb

[for models with digital input and output capability: SYS-2720 & SYS-2722 (192k)]

☞ Requires a dual-channel oscilloscope, 2 BNC cables and a 75 Ω BNC termination (see list in section 2.2).

This macro prompts you to connect the instrument, the 75 Ω termination and the oscilloscope using a BNC cable, and to record the risetime measurements from the oscilloscope.

Step 41: Normal Mode Noise Amplitude CAL41.apb

[for models with digital input and output capability: SYS-2720 & SYS-2722 (192k)]

☞ Requires a dual-channel oscilloscope, a BNC cable and a 75 Ω BNC termination (see list in section 2.2).

This macro prompts you to connect the instrument, the 75 Ω termination and the oscilloscope using a BNC cable, and to record the peak-to-peak amplitude measurements of the noise signal as displayed on the oscilloscope.

Step 42: Common Mode Sine Amplitude CAL42.apb

[for models with digital input and output capability: SYS-2720 & SYS-2722 (192k)]

☞ Requires a dual-channel oscilloscope, the "SVC-FXTR-110" test fixture and a digital audio XLR cable (see list in section 3.2).

This macro prompts you to connect the instrument, the test fixture and the oscilloscope using a digital audio XLR cable, and to record certain peak-to-peak amplitude measurements of the applied signal as displayed on the oscilloscope.

Step 43: Common Mode Voltage Measurement Accuracy CAL43.apb

[for models with digital input and output capability: SYS-2720 & SYS-2722 (192k)]

☞ Requires an AC Calibrator, the "SVC-FXTR-CMT" test fixture, a BNC cable and a BNC-to-dual-banana adapter. (see list in section 2.2).

This macro prompts you to connect the AC Calibrator to the test fixture, using the BNC cable and a BNC-to-dual-banana adapter, to plug the test fixture into one of the balanced digital inputs, and to record a series of DIO input voltages as the AC Calibrator is varied.

Step 44: Jitter Accuracy CAL44.apb

[for models with digital input and output capability: SYS-2720 & SYS-2722 (192k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Sine wave jitter causes FM sidebands to appear around the various frequency domain components of the composite AES3 signal. As jitter is increased, the relative amplitudes of the various components and their associated sidebands will follow a well known formula based upon Bessel functions. At mathematically predictable levels of sine wave jitter, certain frequency domain components will undergo sharp "Bessel" nulls. In this step you will be asked to vary the jitter generator amplitude while monitoring a repeating FFT display of the AES3 signal. When specified Bessel nulls occur, the jitter amplitude will be accurately known with an absolute error no worse than the setting resolution of the jitter generator: ±0.005 UI for settings <1.23 UI or ±0.05 UI for settings >1.23 UI. The required amplitude setting thus becomes a direct measure of the jitter generator calibration. Analyzer calibration can be simultaneously verified.

This macro prompts you to vary the Jitter Amplitude setting while viewing an FFT display, with the goal of finding the optimum setting (that which produces the best null in the display), and recording the Jitter Amplitude setting that produced this result. You are promted throught two tests of this sort, and then are prompted to record some analyzer readings.

Step 45: Jitter Flatness CAL45.apb

[for models with digital input and output capability: SYS-2720 & SYS-2722 (192k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Jitter Flatness is a "system" specification including contributions from both generator and analyzer.
A series of jitter readings will be averaged with the jitter generator set to 500 Hz and 300 mUI to establish a flatness reference. Subsequent readings at other jitter frequencies will then be averaged and converted into dB flatness results for recording. Jitter flatness will be checked via only one output channel because the jitter generator and analyzer are common to both signal paths.

This macro prompts you to record a series of jitter flatness readings made over a range of jitter frequencies.

Step 46: Residual Jitter CAL46.apb

[for models with digital input and output capability: SYS-2720 & SYS-2722 (192k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

This macro prompts you to record a series of residual jitter readings made at a range of sample rates.

END OF CALIBRATION

Chapter 2b: Calibration—Cascade *Plus*

2.1 Introduction

2.1.1 Models calibrated in this section

This section, Chapter 2b, is for the calibration of Audio Precision System Two Cascade *Plus* instruments only. The Cascade *Plus* instruments include model numbers:

- SYS-2122
- SYS-2622
- SYS-2700
- SYS-2722 (96k)

2.1.2 Calibration Report Form

The process of calibration typically results in a *document* certifying that the unit meets all published specifications. With the growing emphasis on quality systems, it has become increasingly common to require calibration data in support of the certification document. This is usually presented in the form of a **Calibration Report** or **Performance Verification Report** in which the data is tabulated in comparison to acceptable limits derived from the instrument's published specifications or other criteria.

Suitable report forms for each S2 family model can be found in the appendices of this manual. These forms are also available as PDF files in the CD-ROM service folder "AP S2 Family Service\Calibration\ReportForms". Audio Precision hereby grants permission to copy or modify these forms.

NOTE: Audio Precision reserves the right to change specifications without prior notice.

2.1.3 Calibration versus Adjustment

The terms "Calibration" and "Adjustment" are often confused. They refer to two distinctly separate processes.

"Calibration" is the process of comparing or measuring actual performance using external references and test equipment that are traceable to national standards. This chapter describes the calibration procedure.

"Adjustment" is the process of changing variable hardware elements and/or stored software constants to compensate for the effects of component tolerances and drift. Adjustment does not necessarily imply calibration, nor does calibration necessarily require adjustment. Chapter 3 describes the adjustment procedure.

If adjustment is to be performed as part of calibration, the quality systems of some companies may require the preparation of *two* Calibration Reports (thus following the calibration procedure *twice*). In this situation, calibration reports must be generated both *before* and *after* adjustment. The first report is intended to document any out-of-tolerance conditions that existed as of the end of the instrument's previous duty period. The second report is intended to document instrument status as the unit is being returned to begin its next duty period.

2.1.4 Calibration Interval

Audio Precision normally recommends a 12-month calibration interval for S2 family instruments. A 24-month interval may be used only if the unit is installed and operated within a reasonably controlled environment (+15°C to +30°C) and is not exposed to adverse conditions such as mechanical vibration or condensing humidity.

2.2 Required Test Equipment

The following test equipment is required to calibrate an S2 family instrument. Each piece of equipment must itself be duly calibrated and operated in accordance with its manufacturer's recommendations.

1) AC Calibrator	Fluke 5520A. (Note: the Fluke 5500A is inadequate.)
2) Precision Multimeter	Agilent 3458A.
3) Counter	Agilent 53131A with timebase option 010. (Note: an external frequency reference may be used in lieu of option 010, provided its error is <0.0 PPM.)
4) Oscilloscope	Tektronix TDS 3032B or 3052B.
5) AP Service Kit	SVC-KIT002

Service Kit SVC-KIT002 includes the following cables, adapters and fixtures:

2	110 Ω XLR male-to-female cables	pn CAB-AES
2	75 Ω male-to-male BNC cables	pn CAB-B75
1	110 Ω Fixture	pn SVC-FXTR-110
1	CMT Fixture	pn SVC-FXTR-CMT
1	75 Ω BNC termination, male	pn 4254.0006
1	BNC "T" adapter (F-M-F)	pn 4254.0007
2	BNC (F) to dual-banana adapters	pn 4254.0008

See Section 1.8 for more information about Service Kit SVC-KIT002.

2.3 Calibration Procedure

The folder "…\AP S2 Family Service\Calibration" contains macros for each potential step of the overall calibration procedures outlined in this chapter. Each macro contains all necessary instructions and operator prompts, and provides automatic control of the hardware setups.

Although you can run any of these calibration macros individually, in most cases you will start a calibration by running the "BeginCal.apb" macro.

2.3.1 Preparing the instrument for Calibration

First, be sure that the instrument has been ON for at least 1/2 hour to warm up and stabilize its circuits.

You must have already installed the correct control software (APWIN for System Two; AP2700 for all other S2 family instruments) on the host PC. Verify that the APIB bus is connected and operating properly.

Check that the required test equipment and cables (listed in the previous section) are available. If you plan to make a calibration report, make available the PDF or hard copy of the the appropriate report form.

Launch the control software and open the macro "…\AP S2 Family Service\Calibration\BeginCal.apb". Run the macro.

NOTE: DO NOT open S2 Family Service files by "double-clicking" the file from Windows Explorer or from a folder window. Instead, run the control software and open the service file from the File menu. This assures that the control software working directory is properly set.

2.3.2 BeginCal.apb

Introductory dialog

BeginCal.apb first identifies the instrument connected to the PC via APIB, and asks you to verify this identification. If the automatic identification does not agree with the instrument labeling or configuration, (which is very unlikely) stop the calibration now and contact Audio Precision tech support.

Once the instrument is identified and verified, BeginCal.apb determines the correct tests and macros to calibrate this particular instrument model and configuration

Next BeginCal.apb recommends the correct calibration report to print and use, and describes the structure of the calibration procedure.

Beginning the calibration steps

When these preliminary steps are complete, you are prompted to press CONTINUE to begin with CAL01.apb, the first macro in the actual calibration procedure. CAL01.apb and the following macros are described in the next section starting with Step 1.

Once you click CONTINUE to start Step 1, the calibration procedure will move through all the appropriate steps until calibration is complete.

The entire calibration can be performed by reading the information and following the instructions in the dialog boxes provided by the calibration macros, without further reference to this manual. For your convenience, the calibration steps are outlined below as an overview and a guide when re-starting an interrupted calibration procedure.

The first dialog box of step lists the equipment and connections necessary for that step. As the macro proceeds, you are instructed to enter the results for each measurement on the Calibration Report.

You may stop the calibration procedure at any time by pausing or stopping the macro, and begin it again by starting the macro. You may also return to a specific step by opening and running its macro (CAL17.apb, for example). The calibration procedure outlines provided in the next section identify the macros associated with each calibration step.

NOTE: Some steps printed here pertain only to certain hardware configurations or options, and the calibration procedure will skip the steps that are not necessary for the particular instrument undergoing calibration.
As many as 450 measurements may be required for a complete calibration.

2.3.3 Calibration, Step-by-Step

System Two Cascade *Plus* instruments

Step 1: Sine Generator Frequency Accuracy CAL01.apb

[for models with analog generator: SYS-2122, SYS-2622 & SYS-2722 (96k)]

☞ Use frequency counter (see list in section 2.2). Connect GENERATOR AUX SIGNALS Sync Ouptut to frequency counter using a BNC cable. Adjust the counter controls to obtain a stable frequency reading.

This macro prompts you to record a series of frequency measurements made across a wide range of frequencies, first in "FAST" generator mode, then in "HIGH-ACCURACY" generator mode.

Step 2: Sine D/A Generator Frequency Accuracy CAL02.apb

[for models with analog generator +DSP: SYS-2622 & SYS-2722 (96k)]

☞ Use frequency counter (see list in section 2.2). Connect GENERATOR AUX SIGNALS Sync Ouptut to frequency counter using a BNC cable.

Adjust the counter controls to obtain a stable frequency reading.

NOTE: The basic accuracy of many counters may not be sufficient unless they are locked to an external frequency reference or standard.

This macro prompts you to record a frequency measurement.

Step 3: Sine Generator Amplitude Accuracy CAL03.apb

[for models with analog generator: SYS-2122, SYS-2622 & SYS-2722 (96k)]

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL (first “A,” then “B”) to ac voltmeter using a BNC cable and a BNC-to-dual-banana adapter.

This macro prompts you to record a series of amplitude measurements made across a wide range of voltages, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B.

Step 4: Sine D/A Generator Amplitude Accuracy CAL04.apb

[for models with analog generator +DSP: SYS-2622 & SYS-2722 (96k)]

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL (first “A,” then “B”) to ac voltmeter using a BNC cable and a BNC-to-dual-banana adapter.

This macro prompts you to record two amplitude measurements, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B.

Step 5: Sine Generator Flatness CAL05.apb

[for models with analog generator: SYS-2122, SYS-2622 & SYS-2722 (96k)]

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL (first “A,” then “B”) to ac voltmeter using a BNC cable and a BNC-to-dual-banana adapter.

NOTE: The accuracy of some ac voltmeters may not be sufficient to directly verify flatness below about 50 Hz or above 10–20 kHz. If necessary, use an ac calibrator to prepare a table of suitable correction factors at 2.5 Vrms.

This macro prompts you to record a series of relative amplitude measurements made across a wide range of voltages, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B. If the precision ac voltmeter can be set for relative measurements, make it so.

If the ac voltmeter does not allow relative “dB” readings, note the voltage reading at 1 kHz (V_{ref}) and use it as the reference to calculate flatness at subsequent frequencies, using the formula:

$$\mathrm{dB} = 20\log_{10}\frac{V_{reading}}{V_{ref}}.$$

Step 6: Sine D/A Generator Flatness CAL06.apb

[for models with analog generator +DSP: SYS-2622 & SYS-2722 (96k)]

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL (first “A,” then “B”) to ac voltmeter using a BNC cable and a BNC-to-dual-banana adapter.

NOTE: The accuracy of some ac voltmeters may not be sufficient to directly verify flatness below about 50 Hz or above 10–20 kHz. If necessary, use an ac calibrator to prepare a table of suitable correction factors at 2.5 Vrms.

This macro prompts you to record a series of relative amplitude measurements made across a wide range of voltages, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B. If the precision ac voltmeter can be set for relative measurements, make it so.

If the ac voltmeter does not allow relative “dB” readings, note the voltage reading at 1 kHz (V_{ref}) and use it as the reference to calculate flatness at subsequent frequencies, using the formula:

$$\mathrm{dB} = 20\log_{10}\frac{V_{reading}}{V_{ref}}.$$

Step 7: Sine Generator Residual THD+N CAL07.apb

[for models with analog generator: SYS-2122, SYS-2622 & SYS-2722 (96k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Residual THD+N is a “system” specification including contributions from both generator and analyzer. The test conditions in this step have been chosen to maximize the generator contribution relative to the analyzer. Step 22 checks THD+N under conditions that maximize analyzer contribution.

This macro prompts you to record a series of band-limited residual THD+N measurements made across a wide range of frequencies, using the internal GenMon connections.

Step 8: Sine D/A Generator Residual THD+N CAL08.apb

[for models with analog generator +DSP: SYS-2622 & SYS-2722 (96k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog analyzer is used to verify DAC residual THD+N.

This macro prompts you to record a series of residual THD+N measurements made across a wide range of frequencies, using the internal GenMon connections.

Step 9: Output-related Crosstalk CAL09.apb

[for models with analog generator: SYS-2122, SYS-2622 & SYS-2722 (96k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog analyzer is used to verify generator crosstalk. Analyzer-related crosstalk is at least 10 times lower. (See Step 13).

This macro prompts you to record crosstalk measurements at 20 kHz and 100 kHz from Channel A into Channel B, and then from Channel B into Channel A, using the internal GenMon connections.

Step 10: Source Impedance Accuracy CAL10.apb

[for models with analog generator: SYS-2122, SYS-2622 & SYS-2722 (96k)]

☞ Use the ohmmeter function of a multimeter (see list in section 2.2). Connect ANALOG OUTPUT banana jacks (first "A," then "B") to ohmmeter using a BNC cable and two BNC-to-dual-banana adapters.

This macro prompts you to record a series of resistance measurements made at all output impedance and signal balance settings, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B.

*NOTE: In units with option **EGZ** installed, the 150 Ω selection is replaced with 200 Ω. The allowable limits are 198.0–202.0 Ω.*

Step 11: Input Termination Accuracy CAL11.apb

[for models with analog analyzer: SYS-2122, SYS-2622 & SYS-2722 (96k)]

☞ Use the ohmmeter function of a multimeter (see list in section 2.2). Connect ANALOG INPUT banana jacks (first "A," then "B") to ohmmeter using a BNC cable and two BNC-to-dual-banana adapters.

This macro prompts you to record a series of resistance measurements made at all input impedance settings, first for ANALOG INPUT A and then for ANALOG INPUT B.

Step 12: Input Common Mode Rejection CAL12.apb

[for models with analog analyzer: SYS-2122, SYS-2622 & SYS-2722 (96k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of CMRR measurements made at a range of amplitude and frequency settings, first for ANALOG INPUT A and then for ANALOG INPUT B.

NOTE: The "dBgA" unit expresses amplitude relative to the generator channel A output; likewise, "dBgB" is amplitude relative to the generator channel B output.

Step 13: Input Related Crosstalk CAL13.apb

[for models with analog analyzer: SYS-2122, SYS-2622 & SYS-2722 (96k)]

☞ Use the AC Calibrator (see list in section 2.2) as a high-voltage signal generator (for this test, accuracy is not important). Connect the AC Calibrator to the instrument ANALOG UNBAL INPUTS (first "B," then "A") using a BNC cable and a BNC-to-dual-banana adapter.

CAUTION: At high voltage settings, the AC Calibrator output can present hazardous potentials. Always set the AC Calibrator to a low voltage range before connecting or disconnecting cables. Be sure to orient the dual-banana connector for correct polarity (BNC center conductor to ac "high," BNC shield to ac "low" or ground.

This macro prompts you to record a series of crosstalk measurements made with a high-level input at two different frequencies, first for crosstalk into INPUT A from INPUT B, and then for crosstalk into INPUT B from INPUT A.

Step 14: Analyzer Level Meter Accuracy CAL14.apb

[for models with analog analyzer: SYS-2122, SYS-2622 & SYS-2722 (96k)]

☞ Use the AC Calibrator (see list in section 2.2). Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the BNC "T" adapter, and

using 2 BNC cables connect each of the "T" outputs to the instrument ANALOG INPUTS UNBAL A and B.

CAUTION: At high voltage settings, the AC Calibrator output can present hazardous potentials. Always set the AC Calibrator to a low voltage range before connecting or disconnecting cables. Be sure to orient the dual-banana connector for correct polarity (BNC center conductor to ac "high," BNC shield to ac "low" or ground.

This macro prompts you to record a series of level meter readings for both INPUT A and INPUT B at a range of AC Calibrator amplitude settings.

Step 15: Analyzer Level Meter Flatness CAL15.apb

[for models with analog analyzer: SYS-2122, SYS-2622 & SYS-2722 (96k)]

☞ Use the AC Calibrator (see list in section 2.2). Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the BNC "T" adapter, and using 2 BNC cables connect each of the "T" outputs to the instrument ANALOG INPUTS UNBAL A and B.

This macro prompts you to record a series of level meter readings for both INPUT A and INPUT B at a wide range of AC Calibrator frequency settings.

Step 16: Analyzer Level Meter Accuracy CAL16.apb

[for models with analog analyzer: SYS-2122, SYS-2622 & SYS-2722 (96k)]

☞ Use the AC Calibrator (see list in section 2.2). Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the BNC "T" adapter, and using 2 BNC cables connect each of the "T" outputs to the instrument ANALOG INPUTS UNBAL A and B.

This macro prompts you to record a series of analyzer AMPLITUDE function meter readings for both INPUT A and INPUT B at a range of AC Calibrator amplitude settings.

Step 17: Analyzer Amplitude Meter Flatness CAL17.apb

[for models with analog analyzer: SYS-2122, SYS-2622 & SYS-2722 (96k)]

☞ Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the instrument ANALOG INPUT A UNBAL connector.

This macro prompts you to record a series of analyzer AMPLITUDE function meter readings at a range of AC Calibrator amplitude and frequency settings.

Step 18: Analyzer Bandreject and THD+N Accuracy CAL18.apb

[for models with analog analyzer: SYS-2122, SYS-2622 & SYS-2722 (96k)]

☞ Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the instrument ANALOG INPUT A UNBAL connector.

This macro prompts you to record a series of analyzer BANDREJECT function meter readings at a range of AC Calibrator frequency settings, for each of several instrument notch filter settings.

Step 19: Analyzer Bandpass Accuracy CAL19.apb

[for models with analog analyzer: SYS-2122, SYS-2622 & SYS-2722 (96k)]

☞ Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the instrument ANALOG INPUT A UNBAL connector.

This macro prompts you to record a series of analyzer BANDPASS function meter readings at a range of AC Calibrator frequency settings, for each of several instrument bandpass filter settings.

Step 20: Analyzer Bandwidth Limiting Filters CAL20.apb

[for models with analog analyzer: SYS-2122, SYS-2622 & SYS-2722 (96k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of AMPLITUDE function meter measurements made at a range of frequency settings, for each of the analyzer bandwidth limiting filter settings.

NOTE: The "dBrA" unit expresses amplitude relative to the reference level established with no filters at the beginning of this step.

Step 21: Analyzer Residual Noise CAL21.apb

[for models with analog analyzer: SYS-2122, SYS-2622 & SYS-2722 (96k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The analyzer input terminations are provided by the system generator via internal signal paths.

This macro prompts you to record a series of analyzer residual noise measurements made at various analyzer bandwidth settings, for Channel A and Channel B.

Step 22: Analyzer Residual THD+N CAL22.apb

[for models with analog analyzer: SYS-2122, SYS-2622 & SYS-2722 (96k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of analyzer residual THD+N measurements made at various analyzer bandwidth settings and at various frequencies, for Channel A and Channel B.

Step 23: Analyzer Phase Measurement Accuracy CAL23.apb

[for models with analog analyzer: SYS-2122, SYS-2622 & SYS-2722 (96k)]

☞ No external test equipment required; however, external cabling is necessary. Connect a BNC "T" adapter to the instrument ANALOG OUTPUT A UNBAL. Using 2 BNC cables of equal length, connect each of the "T" outputs to the instrument ANALOG INPUTS UNBAL A and B.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of analyzer phase measurements at various frequencies.

Step 24: Analyzer Frequency Measurement Accuracy CAL24.apb

[for models with analog analyzer: SYS-2122, SYS-2622 & SYS-2722 (96k)]

☞ Use the frequency counter (see list in section 2.2). Using a BNC cable, connect the instrument GENERATOR AUX SIGNALS: SYNC OUTPUT to the input of the frequency counter.

NOTE: Frequency measurements of the internal sine wave generator are compared to that of an external frequency counter having <0.2 PPM of absolute error. Measurement accuracy will be checked in only one analyzer channel because both share the same internal timebase.

This macro prompts you to enter a frequency counter reading and then record the accuracy measured and calculated by the instrument.

Step 25: High-Resolution ADC Distortion CAL25.apb

[for models with analog analyzer +DSP: SYS-2622 & SYS-2722 (96k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup. A series of FFTs will be taken showing residual distortion as the signal amplitude of the high-resolution ADC is stepped from 0 dB (full scale) to –6 dB.

This macro prompts you to record the highest-level distortion component generated by a 5 kHz signal stepped over a series of amplitudes, first for Channel A and then for Channel B.

Step 26: High-Bandwidth ADC Distortion CAL26.apb

[for models with analog analyzer +DSP: SYS-2622 & SYS-2722 (96k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup. A series of FFTs will be taken showing residual distortion as the signal amplitude of the high-bandwidth ADC is stepped from 0 dB (full scale) to –6 dB.

This macro prompts you to record the highest-level distortion component generated by a 20 kHz signal stepped over a series of amplitudes, first for Channel A and then for Channel B.

Step 27: Burst OFF Ratio Accuracy (BUR option) CAL27.apb

[for models with analog analyzer and burst/square wave option: SYS-2122, SYS-2622 & SYS-2722 (96k)]. Instrument must have S2-BUR option installed.

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL A to ac voltmeter input using a BNC cable and a BNC-to-dual-banana adapter.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a reference reading in dB from the precision ac voltmeter, and then to record a series of voltmeter readings (in dB) made at various BURST: LOW LEVEL generator settings to measure the accuracy of the BURST ratios.

If the ac voltmeter does not allow relative "dB" readings, note the voltage reading at 1 kHz (V_{ref}) and use it as the

reference to calculate flatness at subsequent frequencies, using the formula:

$$\mathrm{dB} = 20 \log_{10} \frac{V_{reading}}{V_{ref}}.$$

Step 28: Square Wave Amplitude Accuracy (BUR option) CAL28.apb

[for models with analog analyzer and burst/square wave option: SYS-2122, SYS-2622 & SYS-2722 (96k)]. Instrument must have S2-BUR option installed.

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL A to ac voltmeter input using a BNC cable and a BNC-to-dual-banana adapter.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record the voltmeter reading of the instrument's analog output, while generating a 1 Vrms 100 Hz square wave.

Step 29: Generator IMD Amplitude Accuracy (IMD option) CAL29.apb

[for models with analog analyzer and IMD option: SYS-2122, SYS-2622 & SYS-2722 (96k)]. Instrument must have S2-IMD option installed.

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL A to ac voltmeter input using a BNC cable and a BNC-to-dual-banana adapter.

This macro prompts you to record the voltmeter reading of the instrument's analog output, while generating various IMD signals at a nominal amplitude.

Step 30: SMPTE LF Tone Accuracy (IMD option) CAL30.apb

(for models with analog analyzer and IMD option: SYS-2122, SYS-2622 & SYS-2722 (96k)]. Instrument must have S2-IMD option installed.

☞ Use the frequency counter (see list in section 2.2). Using a BNC cable, connect the instrument GENERATOR AUX SIGNALS: SYNC OUTPUT to the input of the frequency counter.

This macro prompts you to record the frequency counter reading of the instrument's generator SYNC OUTPUT, while generating a series of SMPTE 4:1 signals with a range of low-frequency tones.

Step 31: DIM Square Wave Accuracy (IMD option) CAL31.apb

[for models with analog analyzer and IMD option: SYS-2122, SYS-2622 & SYS-2722 (96k)]. Instrument must have S2-IMD option installed.

☞ Use the frequency counter (see list in section 2.2). Using a BNC cable, connect the instrument GENERATOR AUX SIGNALS: SYNC OUTPUT to the input of the frequency counter.

This macro prompts you to record the frequency counter reading of the instrument's generator SYNC OUTPUT, while generating first a DIM 100 and then a DIM B signal.

Step 32: IMD Measurement Accuracy (IMD option) CAL32.apb

[for models with analog analyzer +DSP and IMD option: SYS-2622 & SYS-2722 (96k)]. Instrument must have S2-IMD option installed. DSP required for measurement technique employed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup. IMD analyzer calibration is checked using multitone signals synthesized by the internal DSP generator. These multitone signals include an IMD component at exactly 0.100% (–60 dB).

This macro prompts you to record a series of analyzer IMD readings (SMPTE, DFD/CCIF and DIM) made using optimized test waveforms to measure IMD analyzer accuracy.

Step 33: Residual IMD (IMD option) CAL33.apb

[for models with analog analyzer and IMD option: SYS-2122, SYS-2622 & SYS-2722 (96k)]. Instrument must have S2-IMD option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Residual IMD is a "system" specification including contributions from both generator and analyzer.

This macro prompts you to record a series of analyzer IMD readings (SMPTE, CCIF and DIM) made using the IMD generator at a range of amplitude settings.

Step 34: Wow and Flutter Accuracy (W&F option)
CAL34.apb

[for models with analog analyzer +DSP and W&F option: SYS-2622 & SYS-2722 (96k)]. Instrument must have S2-W&F option installed. DSP required for measurement technique employed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup. W&F analyzer calibration is checked using a multitone signal synthesized by the internal DSP generator. This signal is a 3.000 kHz tone containing exactly 1.000% peak deviation of sine wave frequency modulation (FM) at 11.72 Hz.

This macro prompts you to record two W&F analyzer measurements made using an optimized test waveform.

Step 35: Residual Wow and Flutter (W&F option)
CAL35.apb

[for models with analog analyzer and W&F option: SYS-2122, SYS-2622 & SYS-2722 (96k)]. Instrument must have S2-W&F option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

This macro prompts you to record a series of W&F analyzer residiual measurements at various analyzer settings.

Step 36: S-AES17 Option Response
CAL36.apb

[for models with analog analyzer and S-AES17 option: SYS-2122, SYS-2622 & SYS-2722 (96k)]. Instrument must have S-AES17 option installed.

☞ No external test equipment required; however, external cabling is necessary. Connect a BNC cable from the ANALYZER SIGNAL MONITORS: READING connector to ANALOG INPUT B UNBAL.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of analyzer AMPLITUDE readings using different modes of the S-AES17 filter at various frequencies, measuring the response of the filter.

Step 37: S-AES17 Option Residual THD+N
CAL37.apb

[for models with analog analyzer and S-AES17 option: SYS-2122, SYS-2622 & SYS-2722 (96k)]. Instrument must have S-AES17 option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Residual THD+N is a "system" specification including contributions from both generator and analyzer.

This macro prompts you to record a series of AMPLITUDE readings made using different modes of the S-AES17 filter at various amplitudes, measuring the residual THD+N with the filter in-line.

Step 36a: OPT-2020 Option Response
CAL36.apb

[for models with analog analyzer and OPT-2020 option: SYS-2122, SYS-2622 & SYS-2722 (96k)]. Instrument must have OPT-2020 option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of analyzer AMPLITUDE made at various frequencies with the OPT-2020 filter enabled, measuring the response of the filter.

Step 37a: OPT-2020 Option Residual THD+N
CAL37.apb

[for models with analog analyzer and OPT-2020 option: SYS-2122, SYS-2622 & SYS-2722 (96k)]. Instrument must have OPT-2020 option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Residual THD+N is a "system" specification including contributions from both generator and analyzer.

This macro prompts you to record two AMPLITUDE measurements made at different amplitudes, measuring the residual THD+N with the OPT-2020 filter in-line.

Step 38: Digital Output Amplitude Accuracy
CAL38.apb

[for models with digital input and output capability: SYS-2700 & SYS-2722 (96k)]

☞ Requires a dual-channel oscilloscope, the "SVC-FXTR-110" test fixture, a digital audio XLR cable, 2 BNC cables and a 75 Ω BNC termination (see list in section 2.2).

This macro prompts you to connect the instrument, the test fixture and the oscilloscope and take amplitude readings from the scope screen.

Step 39: Digital Voltage Measurement Accuracy
CAL39.apb

[for models with digital input and output capability: SYS-2700 & SYS-2722 (96k)]

☞ Requires a dual-channel oscilloscope, the "SVC-FXTR-110" test fixture, a digital audio XLR cable, 2 BNC cables and a 75 Ω BNC termination (see list in section 2.2).

This macro prompts you to connect the instrument, the test fixture and the oscilloscope and vary instrument settings while monitoring amplitudes from the scope screen. When scope amplitudes are attained, you are prompted to record instrument DIO amplitude readings.

Step 40: AES/EBU Variable Risetime
CAL40.apb

[for models with digital input and output capability: SYS-2700 & SYS-2722 (96k)]

☞ Requires a dual-channel oscilloscope, 2 BNC cables and a 75 Ω BNC termination (see list in section 2.2).

This macro prompts you to connect the instrument, the 75 Ω termination and the oscilloscope using a BNC cable, and to record the risetime measurements from the oscilloscope.

Step 41: Normal Mode Noise Amplitude
CAL41.apb

[for models with digital input and output capability: SYS-2700 & SYS-2722 (96k)]

☞ Requires a dual-channel oscilloscope, a BNC cable and a 75 Ω BNC termination (see list in section 2.2).

This macro prompts you to connect the instrument, the 75 Ω termination and the oscilloscope using a BNC cable, and to record the peak-to-peak amplitude measurements of the noise signal as displayed on the oscilloscope.

Step 42: Common Mode Sine Amplitude
CAL42.apb

[for models with digital input and output capability: SYS-2700 & SYS-2722 (96k)]

☞ Requires a dual-channel oscilloscope, the "SVC-FXTR-110" test fixture and a digital audio XLR cable (see list in section 2.2).

This macro prompts you to connect the instrument, the test fixture and the oscilloscope using a digital audio XLR cable, and to record certain peak-to-peak amplitude measurements of the applied signal as displayed on the oscilloscope.

Step 43: Common Mode Voltage Measurement Accuracy
CAL43.apb

[for models with digital input and output capability: SYS-2700 & SYS-2722 (96k)]

☞ Requires an AC Calibrator, the "SVC-FXTR-CMT" test fixture, a BNC cable and a BNC-to-dual-banana adapter. (see list in section 2.2).

This macro prompts you to connect the AC Calibrator to the test fixture, using the BNC cable and a BNC-to-dual-banana adapter, to plug the test fixture into one of the balanced digital inputs, and to record a series of DIO input voltages as the AC Calibrator is varied.

Step 44: Jitter Accuracy
CAL44.apb

[for models with digital input and output capability: SYS-2700 & SYS-2722 (96k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Sine wave jitter causes FM sidebands to appear around the various frequency domain components of the composite AES3 signal. As jitter is increased, the relative amplitudes of the various components and their associated sidebands will follow a well known formula based upon Bessel functions. At mathematically predictable levels of sine wave jitter, certain frequency domain components will undergo sharp "Bessel" nulls. In this step you will be asked to vary the jitter generator amplitude while monitoring a repeating FFT display of the AES3 signal. When specified Bessel nulls occur, the jitter amplitude will be accurately known with an absolute error no worse than the setting resolution of the jitter generator: ±0.005 UI for settings <1.23 UI or ±0.05 UI for settings >1.23 UI. The required amplitude setting thus becomes a direct measure of the jitter generator calibration. Analyzer calibration can be simultaneously verified.

This macro prompts you to vary the Jitter Amplitude setting while viewing an FFT display, with the goal of finding the optimum setting (that which produces the best null in the display), and recording the Jitter Amplitude setting that produced this result. You are promted throught two tests of this sort, and then are prompted to record analyzer readings.

Step 45: Jitter Flatness
CAL45.apb

[for models with digital input and output capability: SYS-2700 & SYS-2722 (96k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Jitter Flatness is a "system" specification including contributions from both generator and analyzer.
A series of jitter readings will be averaged with the jitter generator set to 500 Hz and 300 mUI to establish a flatness reference. Subsequent readings at other jitter frequencies will then be averaged and converted into dB flatness results for recording. Jitter flatness will be checked via only one output channel because the jitter generator and analyzer are common to both signal paths.

This macro prompts you to record a series of jitter flatness readings made over a range of jitter frequencies.

Step 46: Residual Jitter
CAL46.apb

[for models with digital input and output capability: SYS-2700 & SYS-2722 (96k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

This macro prompts you to record a series of residual jitter readings made at a range of sample rates.

END OF CALIBRATION

Chapter 2c: Calibration—Cascade

2.1 Introduction

2.1.1 Models calibrated in this section

This section, Chapter 2c, is for the calibration of Audio Precision System Two Cascade instruments only. The Cascade instruments include model numbers:

- SYS-2422
- SYS-2500
- SYS-2522

For SYS-2500 or SYS-2522 instruments modified to 192k performance by upgrade UPG-0092, go to Chapter 2d.

2.1.2 Calibration Report Form

The process of calibration typically results in a *document* certifying that the unit meets all published specifications. With the growing emphasis on quality systems, it has become increasingly common to require calibration data in support of the certification document. This is usually presented in the form of a **Calibration Report** or **Performance Verification Report** in which the data is tabulated in comparison to acceptable limits derived from the instrument's published specifications or other criteria.

Suitable report forms for each S2 family model can be found in the appendices of this manual. These forms are also available as PDF files in the CD-ROM service folder "AP S2 Family Service\Calibration\ReportForms". Audio Precision hereby grants permission to copy or modify these forms.

NOTE: Audio Precision reserves the right to change specifications without prior notice.

2.1.3 Calibration versus Adjustment

The terms "Calibration" and "Adjustment" are often confused. They refer to two distinctly separate processes.

"Calibration" is the process of comparing or measuring actual performance using external references and test equipment that are traceable to national standards. This chapter describes the calibration procedure.

"Adjustment" is the process of changing variable hardware elements and/or stored software constants to compensate for the effects of component tolerances and drift. Adjustment does not necessarily imply calibration, nor does calibration necessarily require adjustment. Chapter 3 describes the adjustment procedure.

If adjustment is to be performed as part of calibration, the quality systems of some companies may require the preparation of *two* Calibration Reports (thus following the calibration procedure *twice*). In this situation, calibration reports must be generated both *before* and *after* adjustment. The first report is intended to document any out-of-tolerance conditions that existed as of the end of the instrument's previous duty period. The second report is intended to document instrument status as the unit is being returned to begin its next duty period.

2.1.4 Calibration Interval

Audio Precision normally recommends a 12-month calibration interval for S2 family instruments. A 24-month interval may be used only if the unit is installed and operated within a reasonably controlled environment (+15°C to +30°C) and is not exposed to adverse conditions such as mechanical vibration or condensing humidity.

2.2 Required Test Equipment

The following test equipment is required to calibrate an S2 family instrument. Each piece of equipment must itself be duly calibrated and operated in accordance with its manufacturer's recommendations.

1) AC Calibrator	Fluke 5520A. (Note: the Fluke 5500A is inadequate.)
2) Precision Multimeter	Agilent 3458A.
3) Counter	Agilent 53131A with timebase option 010. (Note: an external frequency reference may be used in lieu of option 010, provided its error is <0.0 PPM.)
4) Oscilloscope	Tektronix TDS 3032B or 3052B.
5) AP Service Kit	SVC-KIT002

Service Kit SVC-KIT002 includes the following cables, adapters and fixtures:

2	110 Ω XLR male-to-female cables	pn CAB-AES
2	75 Ω male-to-male BNC cables	pn CAB-B75
1	110 Ω Fixture	pn SVC-FXTR-110
1	CMT Fixture	pn SVC-FXTR-CMT
1	75 Ω BNC termination, male	pn 4254.0006
1	BNC "T" adapter (F-M-F)	pn 4254.0007
2	BNC (F) to dual-banana adapters	pn 4254.0008

See Section 1.8 for more information about Service Kit SVC-KIT002.

2.3 Calibration Procedure

The folder "…\AP S2 Family Service\Calibration" contains macros for each potential step of the overall calibration procedures outlined in this chapter. Each macro contains all necessary instructions and operator prompts, and provides automatic control of the hardware setups.

Although you can run any of these calibration macros individually, in most cases you will start a calibration by running the "BeginCal.apb" macro.

2.3.1 Preparing the instrument for Calibration

First, be sure that the instrument has been ON for at least 1/2 hour to warm up and stabilize its circuits.

You must have already installed the correct control software (APWIN for System Two; AP2700 for all other S2 family instruments) on the host PC. Verify that the APIB bus is connected and operating properly.

Check that the required test equipment and cables (listed in the previous section) are available. If you plan to make a calibration report, make available the PDF or hard copy of the the appropriate report form.

Launch the control software and open the macro "…\AP S2 Family Service\Calibration\BeginCal.apb". Run the macro.

NOTE: DO NOT open S2 Family Service files by "double-clicking" the file from Windows Explorer or from a folder window. Instead, run the control software and open the service file from the File menu. This assures that the control software working directory is properly set.

2.3.2 BeginCal.apb

Introductory dialog

BeginCal.apb first identifies the instrument connected to the PC via APIB, and asks you to verify this identification. If the automatic identification does not agree with the instrument labeling or configuration, (which is very unlikely) stop the calibration now and contact Audio Precision tech support.

Once the instrument is identified and verified, BeginCal.apb determines the correct tests and macros to calibrate this particular instrument model and configuration

Next BeginCal.apb recommends the correct calibration report to print and use, and describes the structure of the calibration procedure.

Beginning the calibration steps

When these preliminary steps are complete, you are prompted to press CONTINUE to begin with CAL01.apb, the first macro in the actual calibration procedure. CAL01.apb and the following macros are described in the next section starting with Step 1.

Once you click CONTINUE to start Step 1, the calibration procedure will move through all the appropriate steps until calibration is complete.

The entire calibration can be performed by reading the information and following the instructions in the dialog boxes provided by the calibration macros, without further reference to this manual. For your convenience, the calibration steps are outlined below as an overview and a guide when re-starting an interrupted calibration procedure.

The first dialog box of step lists the equipment and connections necessary for that step. As the macro proceeds, you are instructed to enter the results for each measurement on the Calibration Report.

You may stop the calibration procedure at any time by pausing or stopping the macro, and begin it again by starting the macro. You may also return to a specific step by opening and running its macro (CAL17.apb, for example). The calibration procedure outlines provided in the next section identify the macros associated with each calibration step.

NOTE: Some steps printed here pertain only to certain hardware configurations or options, and the calibration procedure will skip the steps that are not necessary for the particular instrument undergoing calibration.
As many as 450 measurements may be required for a complete calibration.

2.3.3 Calibration, Step-by-Step

System Two Cascade

Step 1: Sine Generator Frequency Accuracy CAL01.apb

[for models with analog generator: SYS-2422 & SYS-2522]

☞ Use frequency counter (see list in section 2.2). Connect GENERATOR AUX SIGNALS Sync Ouptut to frequency counter using a BNC cable. Adjust the counter controls to obtain a stable frequency reading.

This macro prompts you to record a series of frequency measurements made across a wide range of frequencies, first in "FAST" generator mode, then in "HIGH-ACCURACY" generator mode.

Step 2: Sine D/A Generator Frequency Accuracy CAL02.apb

[for models with analog generator +DSP: SYS-2422 & SYS-2522]

☞ Use frequency counter (see list in section 2.2). Connect GENERATOR AUX SIGNALS Sync Ouptut to frequency counter using a BNC cable.

Adjust the counter controls to obtain a stable frequency reading.

NOTE: The basic accuracy of many counters may not be sufficient unless they are locked to an external frequency reference or standard.

This macro prompts you to record a frequency measurement.

Step 3: Sine Generator Amplitude Accuracy CAL03.apb

[for models with analog generator: SYS-2422 & SYS-2522]

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL (first “A,” then “B”) to ac voltmeter using a BNC cable and a BNC-to-dual-banana adapter.

This macro prompts you to record a series of amplitude measurements made across a wide range of voltages, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B.

Step 4: Sine D/A Generator Amplitude Accuracy CAL04.apb

[for models with analog generator +DSP: SYS-2422 & SYS-2522]

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL (first “A,” then “B”) to ac voltmeter using a BNC cable and a BNC-to-dual-banana adapter.

This macro prompts you to record two amplitude measurements, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B.

Step 5: Sine Generator Flatness CAL05.apb

[for models with analog generator: SYS-2422 & SYS-2522]

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL (first “A,” then “B”) to ac voltmeter using a BNC cable and a BNC-to-dual-banana adapter.

NOTE: The accuracy of some ac voltmeters may not be sufficient to directly verify flatness below about 50 Hz or above 10–20 kHz. If necessary, use an ac calibrator to prepare a table of suitable correction factors at 2.5 Vrms.

This macro prompts you to record a series of relative amplitude measurements made across a wide range of voltages, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B. If the precision ac voltmeter can be set for relative measurements, make it so.

If the ac voltmeter does not allow relative “dB” readings, note the voltage reading at 1 kHz (V_{ref}) and use it as the reference to calculate flatness at subsequent frequencies, using the formula:

$$\mathrm{dB} = 20 \log_{10} \frac{V_{reading}}{V_{ref}} .$$

Step 6: Sine D/A Generator Flatness CAL06.apb

[for models with analog generator +DSP: SYS-2422 & SYS-2522]

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL (first “A,” then “B”) to ac voltmeter using a BNC cable and a BNC-to-dual-banana adapter.

NOTE: The accuracy of some ac voltmeters may not be sufficient to directly verify flatness below about 50 Hz or above 10–20 kHz. If necessary, use an ac calibrator to prepare a table of suitable correction factors at 2.5 Vrms.

This macro prompts you to record a series of relative amplitude measurements made across a wide range of voltages, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B. If the precision ac voltmeter can be set for relative measurements, make it so.

If the ac voltmeter does not allow relative “dB” readings, note the voltage reading at 1 kHz (V_{ref}) and use it as the reference to calculate flatness at subsequent frequencies, using the formula:

$$\mathrm{dB} = 20 \log_{10} \frac{V_{reading}}{V_{ref}} .$$

Step 7: Sine Generator Residual THD+N CAL07.apb

[for models with analog generator: SYS-2422 & SYS-2522]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Residual THD+N is a “system” specification including contributions from both generator and analyzer. The test conditions in this step have been chosen to maximize the generator contribution relative to the analyzer. Step 22 checks THD+N under conditions that maximize analyzer contribution.

This macro prompts you to record a series of band-limited residual THD+N measurements made across a wide range of frequencies, using the internal GenMon connections.

Step 8: Sine D/A Generator Residual THD+N CAL08.apb

[for models with analog generator +DSP: SYS-2422 & SYS-2522]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog analyzer is used to verify DAC residual THD+N.

This macro prompts you to record a series of residual THD+N measurements made across a wide range of frequencies, using the internal GenMon connections.

Step 9: Output-related Crosstalk CAL09.apb

[for models with analog generator: SYS-2422 & SYS-2522]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog analyzer is used to verify generator crosstalk. Analyzer-related crosstalk is at least 10 times lower. (See Step 13).

This macro prompts you to record crosstalk measurements at 20 kHz and 100 kHz from Channel A into Channel B, and then from Channel B into Channel A, using the internal GenMon connections.

Step 10: Source Impedance Accuracy CAL10.apb

[for models with analog generator: SYS-2422 & SYS-2522]

☞ Use the ohmmeter function of a multimeter (see list in section 2.2). Connect ANALOG OUTPUT banana jacks (first "A," then "B") to ohmmeter using a BNC cable and two BNC-to-dual-banana adapters.

This macro prompts you to record a series of resistance measurements made at all output impedance and signal balance settings, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B.

*NOTE: In units with option **EGZ** installed, the 150 Ω selection is replaced with 200 Ω. The allowable limits are 198.0–202.0 Ω.*

Step 11: Input Termination Accuracy CAL11.apb

[for models with analog analyzer: SYS-2422 & SYS-2522]

☞ Use the ohmmeter function of a multimeter (see list in section 2.2). Connect ANALOG INPUT banana jacks (first "A," then "B") to ohmmeter using a BNC cable and two BNC-to-dual-banana adapters.

This macro prompts you to record a series of resistance measurements made at all input impedance settings, first for ANALOG INPUT A and then for ANALOG INPUT B.

Step 12: Input Common Mode Rejection CAL12.apb

[for models with analog analyzer: SYS-2422 & SYS-2522]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of CMRR measurements made at a range of amplitude and frequency settings, first for ANALOG INPUT A and then for ANALOG INPUT B.

NOTE: The "dBgA" unit expresses amplitude relative to the generator channel A output; likewise, "dBgB" is amplitude relative to the generator channel B output.

Step 13: Input Related Crosstalk CAL13.apb

[for models with analog analyzer: SYS-2422 & SYS-2522]

☞ Use the AC Calibrator (see list in section 2.2) as a high-voltage signal generator (for this test, accuracy is not important). Connect the AC Calibrator to the instrument ANALOG UNBAL INPUTS (first "B," then "A") using a BNC cable and a BNC-to-dual-banana adapter.

CAUTION: At high voltage settings, the AC Calibrator output can present hazardous potentials. Always set the AC Calibrator to a low voltage range before connecting or disconnecting cables. Be sure to orient the dual-banana connector for correct polarity (BNC center conductor to ac "high," BNC shield to ac "low" or ground.

This macro prompts you to record a series of crosstalk measurements made with a high-level input at two different frequencies, first for crosstalk into INPUT A from INPUT B, and then for crosstalk into INPUT B from INPUT A.

Step 14: Analyzer Level Meter Accuracy CAL14.apb

[for models with analog analyzer: SYS-2422 & SYS-2522]

☞ Use the AC Calibrator (see list in section 2.2). Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the BNC "T" adapter, and

using 2 BNC cables connect each of the "T" outputs to the instrument ANALOG INPUTS UNBAL A and B.

CAUTION: At high voltage settings, the AC Calibrator output can present hazardous potentials. Always set the AC Calibrator to a low voltage range before connecting or disconnecting cables. Be sure to orient the dual-banana connector for correct polarity (BNC center conductor to ac "high," BNC shield to ac "low" or ground.

This macro prompts you to record a series of level meter readings for both INPUT A and INPUT B at a range of AC Calibrator amplitude settings.

Step 15: Analyzer Level Meter Flatness CAL15.apb

[for models with analog analyzer: SYS-2422 & SYS-2522]

☞ Use the AC Calibrator (see list in section 2.2). Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the BNC "T" adapter, and using 2 BNC cables connect each of the "T" outputs to the instrument ANALOG INPUTS UNBAL A and B.

This macro prompts you to record a series of level meter readings for both INPUT A and INPUT B at a wide range of AC Calibrator frequency settings.

Step 16: Analyzer Level Meter Accuracy CAL16.apb

[for models with analog analyzer: SYS-2422 & SYS-2522]

☞ Use the AC Calibrator (see list in section 2.2). Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the BNC "T" adapter, and using 2 BNC cables connect each of the "T" outputs to the instrument ANALOG INPUTS UNBAL A and B.

This macro prompts you to record a series of analyzer AMPLITUDE function meter readings for both INPUT A and INPUT B at a range of AC Calibrator amplitude settings.

Step 17: Analyzer Amplitude Meter Flatness CAL17.apb

[for models with analog analyzer: SYS-2422 & SYS-2522]

☞ Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the instrument ANALOG INPUT A UNBAL connector.

This macro prompts you to record a series of analyzer AMPLITUDE function meter readings at a range of AC Calibrator amplitude and frequency settings.

Step 18: Analyzer Bandreject and THD+N Accuracy CAL18.apb

[for models with analog analyzer: SYS-2422 & SYS-2522]

☞ Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the instrument ANALOG INPUT A UNBAL connector.

This macro prompts you to record a series of analyzer BANDREJECT function meter readings at a range of AC Calibrator frequency settings, for each of several instrument notch filter settings.

Step 19: Analyzer Bandpass Accuracy CAL19.apb

[for models with analog analyzer: SYS-2422 & SYS-2522]

☞ Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the instrument ANALOG INPUT A UNBAL connector.

This macro prompts you to record a series of analyzer BANDPASS function meter readings at a range of AC Calibrator frequency settings, for each of several instrument bandpass filter settings.

Step 20: Analyzer Bandwidth Limiting Filters CAL20.apb

[for models with analog analyzer: SYS-2422 & SYS-2522]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of AMPLITUDE function meter measurements made at a range of frequency settings, for each of the analyzer bandwidth limiting filter settings.

NOTE: The "dBrA" unit expresses amplitude relative to the reference level established with no filters at the beginning of this step.

Step 21: Analyzer Residual Noise CAL21.apb

[for models with analog analyzer: SYS-2422 & SYS-2522]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The analyzer input terminations are provided by the system generator via internal signal paths.

This macro prompts you to record a series of analyzer residual noise measurements made at various analyzer bandwidth settings, for Channel A and Channel B.

Step 22: Analyzer Residual THD+N CAL22.apb

[for models with analog analyzer: SYS-2422 & SYS-2522]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of analyzer residual THD+N measurements made at various analyzer bandwidth settings and at various frequencies, for Channel A and Channel B.

Step 23: Analyzer Phase Measurement Accuracy CAL23.apb

[for models with analog analyzer: SYS-2422 & SYS-2522]

☞ No external test equipment required; however, external cabling is necessary. Connect a BNC "T" adapter to the instrument ANALOG OUTPUT A UNBAL. Using 2 BNC cables of equal length, connect each of the "T" outputs to the instrument ANALOG INPUTS UNBAL A and B.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of analyzer phase measurements at various frequencies.

Step 24: Analyzer Frequency Measurement Accuracy CAL24.apb

[for models with analog analyzer: SYS-2422 & SYS-2522]

☞ Use the frequency counter (see list in section 2.2). Using a BNC cable, connect the instrument GENERATOR AUX SIGNALS: SYNC OUTPUT to the input of the frequency counter.

NOTE: Frequency measurements of the internal sine wave generator are compared to that of an external frequency counter having <0.2 PPM of absolute error. Measurement accuracy will be checked in only one analyzer channel because both share the same internal timebase.

This macro prompts you to enter a frequency counter reading and then record the accuracy measured and calculated by the instrument.

Step 25: High-Resolution ADC Distortion CAL25.apb

[for models with analog analyzer +DSP: SYS-2422 & SYS-2522]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup. A series of FFTs will be taken showing residual distortion as the signal amplitude of the high-resolution ADC is stepped from 0 dB (full scale) to –6 dB.

This macro prompts you to record the highest-level distortion component generated by a 5 kHz signal stepped over a series of amplitudes, first for Channel A and then for Channel B.

Step 26: High-Bandwidth ADC Distortion CAL26.apb

[for models with analog analyzer +DSP: SYS-2422 & SYS-2522]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup. A series of FFTs will be taken showing residual distortion as the signal amplitude of the high-bandwidth ADC is stepped from 0 dB (full scale) to –6 dB.

This macro prompts you to record the highest-level distortion component generated by a 20 kHz signal stepped over a series of amplitudes, first for Channel A and then for Channel B.

Step 27: Burst OFF Ratio Accuracy (BUR option) CAL27.apb

[for models with analog analyzer and burst/square wave option: SYS-2422 & SYS-2522]. Instrument must have S2-BUR option installed.

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL A to ac voltmeter input using a BNC cable and a BNC-to-dual-banana adapter.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a reference reading in dB from the precision ac voltmeter, and then to record a series of voltmeter readings (in dB) made at various BURST: LOW LEVEL generator settings to measure the accuracy of the BURST ratios.

If the ac voltmeter does not allow relative "dB" readings, note the voltage reading at 1 kHz (V_{ref}) and use it as the

reference to calculate flatness at subsequent frequencies, using the formula:

$$dB = 20 \log_{10} \frac{V_{reading}}{V_{ref}}.$$

Step 28: Square Wave Amplitude Accuracy (BUR option) CAL28.apb

[for models with analog analyzer and burst/square wave option: SYS-2422 & SYS-2522]. Instrument must have S2-BUR option installed.

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL A to ac voltmeter input using a BNC cable and a BNC-to-dual-banana adapter.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record the voltmeter reading of the instrument's analog output, while generating a 1 Vrms 100 Hz square wave.

Step 29: Generator IMD Amplitude Accuracy (IMD option) CAL29.apb

[for models with analog analyzer and IMD option: SYS-2422 & SYS-2522]. Instrument must have S2-IMD option installed.

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL A to ac voltmeter input using a BNC cable and a BNC-to-dual-banana adapter.

This macro prompts you to record the voltmeter reading of the instrument's analog output, while generating various IMD signals at a nominal amplitude.

Step 30: SMPTE LF Tone Accuracy (IMD option) CAL30.apb

[for models with analog analyzer and IMD option: SYS-2422 & SYS-2522]. Instrument must have S2-IMD option installed.

☞ Use the frequency counter (see list in section 2.2). Using a BNC cable, connect the instrument GENERATOR AUX SIGNALS: SYNC OUTPUT to the input of the frequency counter.

This macro prompts you to record the frequency counter reading of the instrument's generator SYNC OUTPUT, while generating a series of SMPTE 4:1 signals with a range of low-frequency tones.

Step 31:DIM Square Wave Accuracy (IMD option) CAL31.apb

[for models with analog analyzer and IMD option: SYS-2422 & SYS-2522]. Instrument must have S2-IMD option installed.

☞ Use the frequency counter (see list in section 2.2). Using a BNC cable, connect the instrument GENERATOR AUX SIGNALS: SYNC OUTPUT to the input of the frequency counter.

This macro prompts you to record the frequency counter reading of the instrument's generator SYNC OUTPUT, while generating first a DIM 100 and then a DIM B signal.

Step 32: IMD Measurement Accuracy (IMD option) CAL32.apb

[for models with analog analyzer +DSP and IMD option: SYS-2422 & SYS-2522]. Instrument must have S2-IMD option installed. DSP required for measurement technique employed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup. IMD analyzer calibration is checked using multitone signals synthesized by the internal DSP generator. These multitone signals include an IMD component at exactly 0.100% (–60 dB).

This macro prompts you to record a series of analyzer IMD readings (SMPTE, CCIF and DIM) made using optimized test waveforms to measure IMD analyzer accuracy.

Step 33: Residual IMD (IMD option) CAL33.apb

[for models with analog analyzer and IMD option: SYS-2422 & SYS-2522]. Instrument must have S2-IMD option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Residual IMD is a "system" specification including contributions from both generator and analyzer.

This macro prompts you to record a series of analyzer IMD readings (SMPTE, DFD/CCIF and DIM) made using the IMD generator at a range of amplitude settings.

Step 34: Wow and Flutter Accuracy (W&F option) CAL34.apb

[for models with analog analyzer +DSP and W&F option: SYS-2422 & SYS-2522]. Instrument must have S2-W&F option installed. DSP required for measurement technique employed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup. W&F analyzer calibration is checked using a multitone signal synthesized by the internal DSP generator. This signal is a 3.000 kHz tone containing exactly 1.000% peak deviation of sine wave frequency modulation (FM) at 11.72 Hz.

This macro prompts you to record two W&F analyzer measurements made using an optimized test waveform.

Step 35: Residual Wow and Flutter (W&F option)
CAL35.apb

[for models with analog analyzer and W&F option: SYS-2422 & SYS-2522]. Instrument must have S2-W&F option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

This macro prompts you to record a series of W&F analyzer residiual measurements at various analyzer settings.

Step 36: S-AES17 Option Response
CAL36.apb

[for models with analog analyzer and S-AES17 option: SYS-2422 & SYS-2522]. Instrument must have S-AES17 option installed.

☞ No external test equipment required; however, external cabling is necessary. Connect a BNC cable from the ANALYZER SIGNAL MONITORS: READING connector to ANALOG INPUT B UNBAL.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of analyzer AMPLITUDE readings using different modes of the S-AES17 filter at various frequencies, measuring the response of the filter.

Step 37: S-AES17 Option Residual THD+N
CAL37.apb

[for models with analog analyzer and S-AES17 option: SYS-2422 & SYS-2522]. Instrument must have S-AES17 option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Residual THD+N is a "system" specification including contributions from both generator and analyzer.

This macro prompts you to record a series of AMPLITUDE readings made using different modes of the S-AES17 filter at various amplitudes, measuring the residual THD+N with the filter in-line.

Step 36a: OPT-2020 Option Response
CAL36.apb

[for models with analog analyzer and OPT-2020 option: SYS-2422 & SYS-2522]. Instrument must have OPT-2020 option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of analyzer AMPLITUDE made at various frequencies with the OPT-2020 filter enabled, measuring the response of the filter.

Step 37a: OPT-2020 Option Residual THD+N
CAL37.apb

[for models with analog analyzer and OPT-2020 option: SYS-2422 & SYS-2522]. Instrument must have OPT-2020 option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Residual THD+N is a "system" specification including contributions from both generator and analyzer.

This macro prompts you to record two AMPLITUDE measurements made at different amplitudes, measuring the residual THD+N with the OPT-2020 filter in-line.

Step 38: Digital Output Amplitude Accuracy
CAL38.apb

[for models with digital input and output capability: SYS-2500 & SYS-2522]

☞ Requires a dual-channel oscilloscope, the "SVC-FXTR-110" test fixture, a digital audio XLR cable, 2 BNC cables and a 75 Ω BNC termination (see list in section 2.2).

This macro prompts you to connect the instrument, the test fixture and the oscilloscope and take amplitude readings from the scope screen.

Step 39: Digital Voltage Measurement Accuracy
CAL39.apb

[for models with digital input and output capability: SYS-2500 & SYS-2522]

☞ Requires a dual-channel oscilloscope, the "SVC-FXTR-110" test fixture, a digital audio

XLR cable, 2 BNC cables and a 75 Ω BNC termination (see list in section 2.2).

This macro prompts you to connect the instrument, the test fixture and the oscilloscope and vary instrument settings while monitoring amplitudes from the scope screen. When scope amplitudes are attained, you are prompted to record instrument DIO amplitude readings.

Step 40: AES/EBU Variable Risetime CAL40.apb

[for models with digital input and output capability: SYS-2500 & SYS-2522]

☞ Requires a dual-channel oscilloscope, 2 BNC cables and a 75 Ω BNC termination (see list in section 2.2).

This macro prompts you to connect the instrument, the 75 Ω termination and the oscilloscope using a BNC cable, and to record the risetime measurements from the oscilloscope.

Step 41: Normal Mode Noise Amplitude CAL41.apb

[for models with digital input and output capability: SYS-2500 & SYS-2522]

☞ Requires a dual-channel oscilloscope, a BNC cable and a 75 Ω BNC termination (see list in section 2.2).

This macro prompts you to connect the instrument, the 75 Ω termination and the oscilloscope using a BNC cable, and to record the peak-to-peak amplitude measurements of the noise signal as displayed on the oscilloscope.

Step 42: Common Mode Sine Amplitude CAL42.apb

[for models with digital input and output capability: SYS-2500 & SYS-2522]

☞ Requires a dual-channel oscilloscope, the “SVC-FXTR-110” test fixture and a digital audio XLR cable (see list in section 2.2).

This macro prompts you to connect the instrument, the test fixture and the oscilloscope using a digital audio XLR cable, and to record certain peak-to-peak amplitude measurements of the applied signal as displayed on the oscilloscope.

Step 43: Common Mode Voltage Measurement Accuracy CAL43.apb

[for models with digital input and output capability: SYS-2500 & SYS-2522]

☞ Requires an AC Calibrator, the “SVC-FXTR-CMT” test fixture, a BNC cable and a BNC-to-dual-banana adapter. (see list in section 2.2).

This macro prompts you to connect the AC Calibrator to the test fixture, using the BNC cable and a BNC-to-dual-banana adapter, to plug the test fixture into one of the balanced digital inputs, and to record a series of DIO input voltages as the AC Calibrator is varied.

Step 44: Jitter Accuracy CAL44.apb

[for models with digital input and output capability: SYS-2500 & SYS-2522]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Sine wave jitter causes FM sidebands to appear around the various frequency domain components of the composite AES3 signal. As jitter is increased, the relative amplitudes of the various components and their associated sidebands will follow a well known formula based upon Bessel functions. At mathematically predictable levels of sine wave jitter, certain frequency domain components will undergo sharp “Bessel” nulls. In this step you will be asked to vary the jitter generator amplitude while monitoring a repeating FFT display of the AES3 signal. When specified Bessel nulls occur, the jitter amplitude will be accurately known with an absolute error no worse than the setting resolution of the jitter generator: ±0.005 UI for settings <1.23 UI or ±0.05 UI for settings >1.23 UI. The required amplitude setting thus becomes a direct measure of the jitter generator calibration. Analyzer calibration can be simultaneously verified.

This macro prompts you to vary the Jitter Amplitude setting while viewing an FFT display, with the goal of finding the optimum setting (that which produces the best null in the display), and recording the Jitter Amplitude setting that produced this result. You are promted throught two tests of this sort, and then are prompted to record some analyzer readings.

Step 45: Jitter Flatness CAL45.apb

[for models with digital input and output capability: SYS-2500 & SYS-2522]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Jitter Flatness is a “system” specification including contributions from both generator and analyzer.
A series of jitter readings will be averaged with the jitter generator set to 500 Hz and 300 mUI to establish a flatness reference. Subsequent readings at other jitter frequencies will then be averaged and converted into dB flatness results for recording. Jitter flatness will be checked via only one output chan-

nel because the jitter generator and analyzer are common to both signal paths.

This macro prompts you to record a series of jitter flatness readings made over a range of jitter frequencies.

Step 46: Residual Jitter CAL46.apb

[for models with digital input and output capability: SYS-2500 & SYS-2522]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

This macro prompts you to record a series of residual jitter readings made at a range of sample rates.

END OF CALIBRATION

Chapter 2d: Calibration—Cascade (192k)

2.1 Introduction

2.1.1 Models calibrated in this section

This section, Chapter 2d, is for the calibration of Audio Precision System Two Cascade instruments that have been modified to 192k perfomance by UPG-0092 only. These include model numbers:

- SYS-2500 (192k)
- SYS-2522 (192k)

2.1.2 Calibration Report Form

The process of calibration typically results in a *document* certifying that the unit meets all published specifications. With the growing emphasis on quality systems, it has become increasingly common to require calibration data in support of the certification document. This is usually presented in the form of a **Calibration Report** or **Performance Verification Report** in which the data is tabulated in comparison to acceptable limits derived from the instrument's published specifications or other criteria.

Suitable report forms for each S2 family model can be found in the appendices of this manual. These forms are also available as PDF files in the CD-ROM service folder "AP S2 Family Service\Calibration\ReportForms". Audio Precision hereby grants permission to copy or modify these forms.

NOTE: Audio Precision reserves the right to change specifications without prior notice.

2.1.3 Calibration versus Adjustment

The terms "Calibration" and "Adjustment" are often confused. They refer to two distinctly separate processes.

"Calibration" is the process of comparing or measuring actual performance using external references and test equipment that are traceable to national standards. This chapter describes the calibration procedure.

"Adjustment" is the process of changing variable hardware elements and/or stored software constants to compensate for the effects of component tolerances and drift. Adjustment does not necessarily imply calibration, nor does calibration necessarily require adjustment. Chapter 3 describes the adjustment procedure.

If adjustment is to be performed as part of calibration, the quality systems of some companies may require the preparation of *two* Calibration Reports (thus following the calibration procedure *twice*). In this situation, calibration reports must be generated both *before* and *after* adjustment. The first report is intended to document any out-of-tolerance conditions that existed as of the end of the instrument's previous duty period. The second report is intended to document instrument status as the unit is being returned to begin its next duty period.

2.1.4 Calibration Interval

Audio Precision normally recommends a 12-month calibration interval for S2 family instruments. A 24-month interval may be used only if the unit is installed and operated within a reasonably controlled environment (+15°C to +30°C) and is not exposed to adverse conditions such as mechanical vibration or condensing humidity.

2.2 Required Test Equipment

The following test equipment is required to calibrate an S2 family instrument. Each piece of equipment must itself be duly calibrated and operated in accordance with its manufacturer's recommendations.

1) AC Calibrator	Fluke 5520A. (Note: the Fluke 5500A is inadequate.)
2) Precision Multimeter	Agilent 3458A.
3) Counter	Agilent 53131A with timebase option 010. (Note: an external frequency reference may be used in lieu of option 010, provided its error is <0.0 PPM.)
4) Oscilloscope	Tektronix TDS 3032B or 3052B.
5) AP Service Kit	SVC-KIT002

Service Kit SVC-KIT002 includes the following cables, adapters and fixtures:

2	110 Ω XLR male-to-female cables	pn CAB-AES
2	75 Ω male-to-male BNC cables	pn CAB-B75
1	110 Ω Fixture	pn SVC-FXTR-110
1	CMT Fixture	pn SVC-FXTR-CMT
1	75 Ω BNC termination, male	pn 4254.0006
1	BNC "T" adapter (F-M-F)	pn 4254.0007
2	BNC (F) to dual-banana adapters	pn 4254.0008

See Section 1.8 for more information about Service Kit SVC-KIT002.

2.3 Calibration Procedure

The folder "…\AP S2 Family Service\Calibration" contains macros for each potential step of the overall calibration procedures outlined in this chapter. Each macro contains all necessary instructions and operator prompts, and provides automatic control of the hardware setups.

Although you can run any of these calibration macros individually, in most cases you will start a calibration by running the "BeginCal.apb" macro.

2.3.1 Preparing the instrument for Calibration

First, be sure that the instrument has been ON for at least 1/2 hour to warm up and stabilize its circuits.

You must have already installed the correct control software (APWIN for System Two; AP2700 for all other S2 family instruments) on the host PC. Verify that the APIB bus is connected and operating properly.

Check that the required test equipment and cables (listed in the previous section) are available. If you plan to make a calibration report, make available the PDF or hard copy of the the appropriate report form.

Launch the control software and open the macro "…\AP S2 Family Service\Calibration\BeginCal.apb". Run the macro.

NOTE: DO NOT open S2 Family Service files by "double-clicking" the file from Windows Explorer or from a folder window. Instead, run the control software and open the service file from the File menu. This assures that the control software working directory is properly set.

2.3.2 BeginCal.apb

Introductory dialog

BeginCal.apb first identifies the instrument connected to the PC via APIB, and asks you to verify this identification. If the automatic identification does not agree with the instrument labeling or configuration, (which is very unlikely) stop the calibration now and contact Audio Precision tech support.

Once the instrument is identified and verified, BeginCal.apb determines the correct tests and macros to calibrate this particular instrument model and configuration

Next BeginCal.apb recommends the correct calibration report to print and use, and describes the structure of the calibration procedure.

Beginning the calibration steps

When these preliminary steps are complete, you are prompted to press CONTINUE to begin with CAL01.apb, the first macro in the actual calibration procedure. CAL01.apb and the following macros are described in the next section starting with Step 1.

Once you click CONTINUE to start Step 1, the calibration procedure will move through all the appropriate steps until calibration is complete.

The entire calibration can be performed by reading the information and following the instructions in the dialog boxes provided by the calibration macros, without further reference to this manual. For your convenience, the calibration steps are outlined below as an overview and a guide when re-starting an interrupted calibration procedure.

The first dialog box of step lists the equipment and connections necessary for that step. As the macro proceeds, you are instructed to enter the results for each measurement on the Calibration Report.

You may stop the calibration procedure at any time by pausing or stopping the macro, and begin it again by starting the macro. You may also return to a specific step by opening and running its macro (CAL17.apb, for example). The calibration procedure outlines provided in the next section identify the macros associated with each calibration step.

NOTE: Some steps printed here pertain only to certain hardware configurations or options, and the calibration procedure will skip the steps that are not necessary for the particular instrument undergoing calibration.
As many as 450 measurements may be required for a complete calibration.

2.4 Calibration, Step-by-Step

System Two Cascade (192k)

Step 1: Sine Generator Frequency Accuracy CAL01.apb

[for models with analog generator: SYS-2522 (192k)]

☞ Use frequency counter (see list in section 2.2). Connect GENERATOR AUX SIGNALS Sync Ouptut to frequency counter using a BNC cable. Adjust the counter controls to obtain a stable frequency reading.

This macro prompts you to record a series of frequency measurements made across a wide range of frequencies, first in "FAST" generator mode, then in "HIGH-ACCURACY" generator mode.

Step 2: Sine D/A Generator Frequency Accuracy CAL02.apb

[for models with analog generator +DSP: SYS-2522 (192k)]

☞ Use frequency counter (see list in section 2.2). Connect GENERATOR AUX SIGNALS Sync Ouptut to frequency counter using a BNC cable.

Adjust the counter controls to obtain a stable frequency reading.

NOTE: The basic accuracy of many counters may not be sufficient unless they are locked to an external frequency reference or standard.

This macro prompts you to record a frequency measurement.

Step 3: Sine Generator Amplitude Accuracy CAL03.apb

[for models with analog generator: SYS-2522 (192k)]

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL (first "A," then "B") to ac voltmeter using a BNC cable and a BNC-to-dual-banana adapter.

This macro prompts you to record a series of amplitude measurements made across a wide range of voltages, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B.

Step 4: Sine D/A Generator Amplitude Accuracy CAL04.apb

[for models with analog generator +DSP: SYS-2522 (192k)]

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL (first "A," then "B") to ac voltmeter using a BNC cable and a BNC-to-dual-banana adapter.

This macro prompts you to record two amplitude measurements, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B.

Step 5: Sine Generator Flatness CAL05.apb

[for models with analog generator: SYS-2522 (192k)]

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL (first "A," then "B") to ac voltmeter using a BNC cable and a BNC-to-dual-banana adapter.

NOTE: The accuracy of some ac voltmeters may not be sufficient to directly verify flatness below about 50 Hz or above 10–20 kHz. If necessary, use an ac calibrator to prepare a table of suitable correction factors at 2.5 Vrms.

This macro prompts you to record a series of relative amplitude measurements made across a wide range of voltages, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B. If the precision ac voltmeter can be set for relative measurements, make it so.

If the ac voltmeter does not allow relative "dB" readings, note the voltage reading at 1 kHz (V_{ref}) and use it as the reference to calculate flatness at subsequent frequencies, using the formula:

$$\mathrm{dB} = 20\log_{10}\frac{V_{reading}}{V_{ref}}.$$

Step 6: Sine D/A Generator Flatness CAL06.apb

[for models with analog generator +DSP: SYS-2522 (192k)]

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL (first "A," then "B") to ac voltmeter using a BNC cable and a BNC-to-dual-banana adapter.

NOTE: The accuracy of some ac voltmeters may not be sufficient to directly verify flatness below about 50 Hz or above 10–20 kHz. If necessary, use an ac calibrator to prepare a table of suitable correction factors at 2.5 Vrms.

This macro prompts you to record a series of relative amplitude measurements made across a wide range of voltages, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B. If the precision ac voltmeter can be set for relative measurements, make it so.

If the ac voltmeter does not allow relative "dB" readings, note the voltage reading at 1 kHz (V_{ref}) and use it as the reference to calculate flatness at subsequent frequencies, using the formula:

$$\mathrm{dB} = 20\log_{10}\frac{V_{reading}}{V_{ref}}.$$

Step 7: Sine Generator Residual THD+N CAL07.apb

[for models with analog generator: SYS-2522 (192k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Residual THD+N is a "system" specification including contributions from both generator and analyzer. The test conditions in this step have been chosen to maximize the generator contribution relative to the analyzer. Step 22 checks THD+N under conditions that maximize analyzer contribution.

This macro prompts you to record a series of band-limited residual THD+N measurements made across a wide range of frequencies, using the internal GenMon connections.

Step 8: Sine D/A Generator Residual THD+N CAL08.apb

[for models with analog generator +DSP: SYS-2522 (192k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog analyzer is used to verify DAC residual THD+N.

This macro prompts you to record a series of residual THD+N measurements made across a wide range of frequencies, using the internal GenMon connections.

Step 9: Output-related Crosstalk CAL09.apb

[for models with analog generator: SYS-2522 (192k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog analyzer is used to verify generator crosstalk. Analyzer-related crosstalk is at least 10 times lower. (See Step 13).

This macro prompts you to record crosstalk measurements at 20 kHz and 100 kHz from Channel A into Channel B, and then from Channel B into Channel A, using the internal GenMon connections.

Step 10: Source Impedance Accuracy CAL10.apb

[for models with analog generator: SYS-2522 (192k)]

☞ Use the ohmmeter function of a multimeter (see list in section 2.2). Connect ANALOG OUTPUT banana jacks (first “A,” then “B”) to ohmmeter using a BNC cable and two BNC-to-dual-banana adapters.

This macro prompts you to record a series of resistance measurements made at all output impedance and signal balance settings, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B.

*NOTE: In units with option **EGZ** installed, the 150 Ω selection is replaced with 200 Ω. The allowable limits are 198.0–202.0 Ω.*

Step 11: Input Termination Accuracy CAL11.apb

[for models with analog analyzer: SYS-2522 (192k)]

☞ Use the ohmmeter function of a multimeter (see list in section 2.2). Connect ANALOG INPUT banana jacks (first “A,” then “B”) to ohmmeter using a BNC cable and two BNC-to-dual-banana adapters.

This macro prompts you to record a series of resistance measurements made at all input impedance settings, first for ANALOG INPUT A and then for ANALOG INPUT B.

Step 12: Input Common Mode Rejection CAL12.apb

[for models with analog analyzer: SYS-2522 (192k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of CMRR measurements made at a range of amplitude and frequency settings, first for ANALOG INPUT A and then for ANALOG INPUT B.

NOTE: The “dBgA” unit expresses amplitude relative to the generator channel A output; likewise, “dBgB” is amplitude relative to the generator channel B output.

Step 13: Input Related Crosstalk CAL13.apb

[for models with analog analyzer: SYS-2522 (192k)]

☞ Use the AC Calibrator (see list in section 2.2) as a high-voltage signal generator (for this test, accuracy is not important). Connect the AC Calibrator to the instrument ANALOG UNBAL INPUTS (first “B,” then “A”) using a BNC cable and a BNC-to-dual-banana adapter.

CAUTION: At high voltage settings, the AC Calibrator output can present hazardous potentials. Always set the AC Calibrator to a low voltage range before connecting or disconnecting cables. Be sure to orient the dual-banana connector for correct polarity (BNC center conductor to ac “high,” BNC shield to ac “low” or ground.

This macro prompts you to record a series of crosstalk measurements made with a high-level input at two different frequencies, first for crosstalk into INPUT A from INPUT B, and then for crosstalk into INPUT B from INPUT A.

Step 14: Analyzer Level Meter Accuracy CAL14.apb

[for models with analog analyzer: SYS-2522 (192k)]

☞ Use the AC Calibrator (see list in section 2.2). Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the BNC “T” adapter, and using 2 BNC cables connect each of the “T” outputs to the instrument ANALOG INPUTS UNBAL A and B.

CAUTION: At high voltage settings, the AC Calibrator output can present hazardous potentials. Always set the AC Calibrator to a low voltage range before connecting or disconnecting cables. Be sure to orient the dual-banana connector for correct polarity (BNC center conductor to ac “high,” BNC shield to ac “low” or ground.

This macro prompts you to record a series of level meter readings for both INPUT A and INPUT B at a range of AC Calibrator amplitude settings.

Step 15: Analyzer Level Meter Flatness CAL15.apb

[for models with analog analyzer: SYS-2522 (192k)]

☞ Use the AC Calibrator (see list in section 2.2). Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the BNC “T” adapter, and using 2 BNC cables connect each of the “T” outputs to the instrument ANALOG INPUTS UNBAL A and B.

This macro prompts you to record a series of level meter readings for both INPUT A and INPUT B at a wide range of AC Calibrator frequency settings.

Step 16: Analyzer Level Meter Accuracy CAL16.apb

[for models with analog analyzer: SYS-2522 (192k)]

☞ Use the AC Calibrator (see list in section 2.2). Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the BNC “T” adapter, and using 2 BNC cables connect each of the “T” outputs to the instrument ANALOG INPUTS UNBAL A and B.

This macro prompts you to record a series of analyzer AMPLITUDE function meter readings for both INPUT A and INPUT B at a range of AC Calibrator amplitude settings.

Step 17: Analyzer Amplitude Meter Flatness CAL17.apb

[for models with analog analyzer: SYS-2522 (192k)]

☞ Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the instrument ANALOG INPUT A UNBAL connector.

This macro prompts you to record a series of analyzer AMPLITUDE function meter readings at a range of AC Calibrator amplitude and frequency settings.

Step 18: Analyzer Bandreject and THD+N Accuracy CAL18.apb

[for models with analog analyzer: SYS-2522 (192k)]

☞ Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the instrument ANALOG INPUT A UNBAL connector.

This macro prompts you to record a series of analyzer BANDREJECT function meter readings at a range of AC Calibrator frequency settings, for each of several instrument notch filter settings.

Step 19: Analyzer Bandpass Accuracy CAL19.apb

[for models with analog analyzer: SYS-2522 (192k)]

☞ Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the instrument ANALOG INPUT A UNBAL connector.

This macro prompts you to record a series of analyzer BANDPASS function meter readings at a range of AC Calibrator frequency settings, for each of several instrument bandpass filter settings.

Step 20: Analyzer Bandwidth Limiting Filters CAL20.apb

[for models with analog analyzer: SYS-2522 (192k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of AMPLITUDE function meter measurements made at a range of frequency settings, for each of the analyzer bandwidth limiting filter settings.

NOTE: The “dBrA” unit expresses amplitude relative to the reference level established with no filters at the beginning of this step.

Step 21: Analyzer Residual Noise CAL21.apb

[for models with analog analyzer: SYS-2522 (192k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The analyzer input terminations are provided by the system generator via internal signal paths.

This macro prompts you to record a series of analyzer residual noise measurements made at various analyzer bandwidth settings, for Channel A and Channel B.

Step 22: Analyzer Residual THD+N CAL22.apb

[for models with analog analyzer: SYS-2522 (192k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of analyzer residual THD+N measurements made at various analyzer bandwidth settings and at various frequencies, for Channel A and Channel B.

Step 23: Analyzer Phase Measurement Accuracy CAL23.apb

[for models with analog analyzer: SYS-2522 (192k)]

☞ No external test equipment required; however, external cabling is necessary. Connect a BNC "T" adapter to the instrument ANALOG OUTPUT A UNBAL. Using 2 BNC cables of equal length, connect each of the "T" outputs to the instrument ANALOG INPUTS UNBAL A and B.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of analyzer phase measurements at various frequencies.

Step 24: Analyzer Frequency Measurement Accuracy CAL24.apb

[for models with analog analyzer: SYS-2522 (192k)]

☞ Use the frequency counter (see list in section 2.2). Using a BNC cable, connect the instrument GENERATOR AUX SIGNALS: SYNC OUTPUT to the input of the frequency counter.

NOTE: Frequency measurements of the internal sine wave generator are compared to that of an external frequency counter having <0.2 PPM of absolute error. Measurement accuracy will be checked in only one analyzer channel because both share the same internal timebase.

This macro prompts you to enter a frequency counter reading and then record the accuracy measured and calculated by the instrument.

Step 25: High-Resolution ADC Distortion CAL25.apb

[for models with analog analyzer +DSP: SYS-2522 (192k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup. A series of FFTs will be taken showing residual distortion as the signal amplitude of the high-resolution ADC is stepped from 0 dB (full scale) to –6 dB.

This macro prompts you to record the highest-level distortion component generated by a 5 kHz signal stepped over a series of amplitudes, first for Channel A and then for Channel B.

Step 26: High-Bandwidth ADC Distortion CAL26.apb

[for models with analog analyzer +DSP: SYS-2522 (192k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup. A series of FFTs will be taken showing residual distortion as the signal amplitude of the high-bandwidth ADC is stepped from 0 dB (full scale) to –6 dB.

This macro prompts you to record the highest-level distortion component generated by a 20 kHz signal stepped over a series of amplitudes, first for Channel A and then for Channel B.

Step 27: Burst OFF Ratio Accuracy (BUR option) CAL27.apb

[for models with analog analyzer and burst/square wave option: SYS-2522 (192k)]. Instrument must have S2-BUR option installed.

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL A to ac voltmeter input using a BNC cable and a BNC-to-dual-banana adapter.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a reference reading in dB from the precision ac voltmeter, and then to record a series of voltmeter readings (in dB) made at various BURST: LOW LEVEL generator settings to measure the accuracy of the BURST ratios.

If the ac voltmeter does not allow relative "dB" readings, note the voltage reading at 1 kHz (V_{ref}) and use it as the

reference to calculate flatness at subsequent frequencies, using the formula:

$$\mathrm{dB} = 20\log_{10}\frac{V_{reading}}{V_{ref}}.$$

Step 28: Square Wave Amplitude Accuracy (BUR option) CAL28.apb

[for models with analog analyzer and burst/square wave option: SYS-2522 (192k)]. Instrument must have S2-BUR option installed.

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL A to ac voltmeter input using a BNC cable and a BNC-to-dual-banana adapter.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record the voltmeter reading of the instrument's analog output, while generating a 1 Vrms 100 Hz square wave.

Step 29: Generator IMD Amplitude Accuracy (IMD option) CAL29.apb

[for models with analog analyzer and IMD option: SYS-2522 (192k)]. Instrument must have S2-IMD option installed.

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL A to ac voltmeter input using a BNC cable and a BNC-to-dual-banana adapter.

This macro prompts you to record the voltmeter reading of the instrument's analog output, while generating various IMD signals at a nominal amplitude.

Step 30: SMPTE LF Tone Accuracy (IMD option) CAL30.apb

[for models with analog analyzer and IMD option: SYS-2522 (192k)]. Instrument must have S2-IMD option installed.

☞ Use the frequency counter (see list in section 2.2). Using a BNC cable, connect the instrument GENERATOR AUX SIGNALS: SYNC OUTPUT to the input of the frequency counter.

This macro prompts you to record the frequency counter reading of the instrument's generator SYNC OUTPUT, while generating a series of SMPTE 4:1 signals with a range of low-frequency tones.

Step 31:DIM Square Wave Accuracy (IMD option) CAL31.apb

[for models with analog analyzer and IMD option: SYS-2522 (192k)]. Instrument must have S2-IMD option installed.

☞ Use the frequency counter (see list in section 2.2). Using a BNC cable, connect the instrument GENERATOR AUX SIGNALS: SYNC OUTPUT to the input of the frequency counter.

This macro prompts you to record the frequency counter reading of the instrument's generator SYNC OUTPUT, while generating first a DIM 100 and then a DIM B signal.

Step 32: IMD Measurement Accuracy (IMD option) CAL32.apb

[for models with analog analyzer +DSP and IMD option: SYS-2522 (192k)]. Instrument must have S2-IMD option installed. DSP required for measurement technique employed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup. IMD analyzer calibration is checked using multitone signals synthesized by the internal DSP generator. These multitone signals include an IMD component at exactly 0.100% (–60 dB).

This macro prompts you to record a series of analyzer IMD readings (SMPTE, CCIF and DIM) made using optimized test waveforms to measure IMD analyzer accuracy.

Step 33: Residual IMD (IMD option) CAL33.apb

[for models with analog analyzer and IMD option: SYS-2522 (192k)]. Instrument must have S2-IMD option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Residual IMD is a "system" specification including contributions from both generator and analyzer.

This macro prompts you to record a series of analyzer IMD readings (SMPTE, DFD/CCIF and DIM) made using the IMD generator at a range of amplitude settings.

Step 34: Wow and Flutter Accuracy (W&F option) CAL34.apb

[for models with analog analyzer +DSP and W&F option: SYS-2522 (192k)]. Instrument must have

S2-W&F option installed. DSP required for measurement technique employed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup. W&F analyzer calibration is checked using a multitone signal synthesized by the internal DSP generator. This signal is a 3.000 kHz tone containing exactly 1.000% peak deviation of sine wave frequency modulation (FM) at 11.72 Hz.

This macro prompts you to record two W&F analyzer measurements made using an optimized test waveform.

Step 35: Residual Wow and Flutter (W&F option) CAL35.apb

[for models with analog analyzer and W&F option: SYS-2522 (192k)]. Instrument must have S2-W&F option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

This macro prompts you to record a series of W&F analyzer residiual measurements at various analyzer settings.

Step 36: S-AES17 Option Response CAL36.apb

[for models with analog analyzer and S-AES17 option: SYS-2522 (192k)]. Instrument must have S-AES17 option installed.

☞ No external test equipment required; however, external cabling is necessary. Connect a BNC cable from the ANALYZER SIGNAL MONITORS: READING connector to ANALOG INPUT B UNBAL.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of analyzer AMPLITUDE readings using different modes of the S-AES17 filter at various frequencies, measuring the response of the filter.

Step 37: S-AES17 Option Residual THD+N CAL37.apb

[for models with analog analyzer and S-AES17 option: SYS-2522 (192k)]. Instrument must have S-AES17 option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Residual THD+N is a "system" specification including contributions from both generator and analyzer.

This macro prompts you to record a series of AMPLITUDE readings made using different modes of the S-AES17 filter at various amplitudes, measuring the residual THD+N with the filter in-line.

Step 36a: OPT-2020 Option Response CAL36.apb

[for models with analog analyzer and OPT-2020 option: SYS-2522 (192k)]. Instrument must have OPT-2020 option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of analyzer AMPLITUDE made at various frequencies with the OPT-2020 filter enabled, measuring the response of the filter.

Step 37a: OPT-2020 Option Residual THD+N CAL37.apb

[for models with analog analyzer and OPT-2020 option: SYS-2522 (192k)]. Instrument must have OPT-2020 option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Residual THD+N is a "system" specification including contributions from both generator and analyzer.

This macro prompts you to record two AMPLITUDE measurements made at different amplitudes, measuring the residual THD+N with the OPT-2020 filter in-line.

Step 38: Digital Output Amplitude Accuracy CAL38.apb

[for models with digital input and output capability: SYS-2500 (192k) & SYS-2522 (192k)]

☞ Requires a dual-channel oscilloscope, the "SVC-FXTR-110" test fixture, a digital audio XLR cable, 2 BNC cables and a 75 Ω BNC termination (see list in section 2.2).

This macro prompts you to connect the instrument, the test fixture and the oscilloscope and take amplitude readings from the scope screen.

Step 39: Digital Voltage Measurement Accuracy CAL39.apb

[for models with digital input and output capability: SYS-2500 (192k) & SYS-2522 (192k)]

☞ Requires a dual-channel oscilloscope, the "SVC-FXTR-110" test fixture, a digital audio

XLR cable, 2 BNC cables and a 75 Ω BNC termination (see list in section 2.2).

This macro prompts you to connect the instrument, the test fixture and the oscilloscope and vary instrument settings while monitoring amplitudes from the scope screen. When scope amplitudes are attained, you are prompted to record instrument DIO amplitude readings.

Step 40: AES/EBU Variable Risetime CAL40.apb

[for models with digital input and output capability: SYS-2500 (192k) & SYS-2522 (192k)]

☞ Requires a dual-channel oscilloscope, 2 BNC cables and a 75 Ω BNC termination (see list in section 2.2).

This macro prompts you to connect the instrument, the 75 Ω termination and the oscilloscope using a BNC cable, and to record the risetime measurements from the oscilloscope.

Step 41: Normal Mode Noise Amplitude CAL41.apb

[for models with digital input and output capability: SYS-2500 (192k) & SYS-2522 (192k)]

☞ Requires a dual-channel oscilloscope, a BNC cable and a 75 Ω BNC termination (see list in section 2.2).

This macro prompts you to connect the instrument, the 75 Ω termination and the oscilloscope using a BNC cable, and to record the peak-to-peak amplitude measurements of the noise signal as displayed on the oscilloscope.

Step 42: Common Mode Sine Amplitude CAL42.apb

[for models with digital input and output capability: SYS-2500 (192k) & SYS-2522 (192k)]

☞ Requires a dual-channel oscilloscope, the "SVC-FXTR-110" test fixture and a digital audio XLR cable (see list in section 2.2).

This macro prompts you to connect the instrument, the test fixture and the oscilloscope using a digital audio XLR cable, and to record certain peak-to-peak amplitude measurements of the applied signal as displayed on the oscilloscope.

Step 43: Common Mode Voltage Measurement Accuracy CAL43.apb

[for models with digital input and output capability: SYS-2500 (192k) & SYS-2522 (192k)]

☞ Requires an AC Calibrator, the "SVC-FXTR-CMT" test fixture, a BNC cable and a BNC-to-dual-banana adapter. (see list in section 2.2).

This macro prompts you to connect the AC Calibrator to the test fixture, using the BNC cable and a BNC-to-dual-banana adapter, to plug the test fixture into one of the balanced digital inputs, and to record a series of DIO input voltages as the AC Calibrator is varied.

Step 44: Jitter Accuracy CAL44.apb

[for models with digital input and output capability: SYS-2500 (192k) & SYS-2522 (192k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Sine wave jitter causes FM sidebands to appear around the various frequency domain components of the composite AES3 signal. As jitter is increased, the relative amplitudes of the various components and their associated sidebands will follow a well known formula based upon Bessel functions. At mathematically predictable levels of sine wave jitter, certain frequency domain components will undergo sharp "Bessel" nulls. In this step you will be asked to vary the jitter generator amplitude while monitoring a repeating FFT display of the AES3 signal. When specified Bessel nulls occur, the jitter amplitude will be accurately known with an absolute error no worse than the setting resolution of the jitter generator: ±0.005 UI for settings <1.23 UI or ±0.05 UI for settings >1.23 UI. The required amplitude setting thus becomes a direct measure of the jitter generator calibration. Analyzer calibration can be simultaneously verified.

This macro prompts you to vary the Jitter Amplitude setting while viewing an FFT display, with the goal of finding the optimum setting (that which produces the best null in the display), and recording the Jitter Amplitude setting that produced this result. You are promted throught two tests of this sort, and then are prompted to record some analyzer readings.

Step 45: Jitter Flatness CAL45.apb

[for models with digital input and output capability: SYS-2500 (192k) & SYS-2522 (192k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Jitter Flatness is a "system" specification including contributions from both generator and analyzer.
A series of jitter readings will be averaged with the jitter generator set to 500 Hz and 300 mUI to establish a flatness reference. Subsequent readings at other jitter frequencies will then be averaged and converted into dB flatness results for recording. Jitter flatness will be checked via only one output chan-

nel because the jitter generator and analyzer are common to both signal paths.

This macro prompts you to record a series of jitter flatness readings made over a range of jitter frequencies.

Step 46: Residual Jitter CAL46.apb

[for models with digital input and output capability: SYS-2500 (192k) & SYS-2522 (192k)]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

This macro prompts you to record a series of residual jitter readings made at a range of sample rates.

END OF CALIBRATION

Chapter 2e: Calibration—System Two

2.1 Introduction

2.1.1 Models calibrated in this section

This section, Chapter 2e, is for the calibration of Audio Precision System Two instruments only. System Two instruments include model numbers:

- SYS-2022
- SYS-2222
- SYS-2300
- SYS-2322

2.1.2 Calibration Report Form

The process of calibration typically results in a *document* certifying that the unit meets all published specifications. With the growing emphasis on quality systems, it has become increasingly common to require calibration data in support of the certification document. This is usually presented in the form of a **Calibration Report** or **Performance Verification Report** in which the data is tabulated in comparison to acceptable limits derived from the instrument's published specifications or other criteria.

Suitable report forms for each S2 family model can be found in the appendices of this manual. These forms are also available as PDF files in the CD-ROM service folder "AP S2 Family Service\Calibration\ReportForms". Audio Precision hereby grants permission to copy or modify these forms.

NOTE: Audio Precision reserves the right to change specifications without prior notice.

2.1.3 Calibration versus Adjustment

The terms "Calibration" and "Adjustment" are often confused. They refer to two distinctly separate processes.

"Calibration" is the process of comparing or measuring actual performance using external references and test equipment that are traceable to national standards. This chapter describes the calibration procedure.

"Adjustment" is the process of changing variable hardware elements and/or stored software constants to compensate for the effects of component tolerances and drift. Adjustment does not necessarily imply calibration, nor does calibration necessarily require adjustment. Chapter 3 describes the adjustment procedure.

If adjustment is to be performed as part of calibration, the quality systems of some companies may require the preparation of *two* Calibration Reports (thus following the calibration procedure *twice*). In this situation, calibration reports must be generated both *before* and *after* adjustment. The first report is intended to document any out-of-tolerance conditions that existed as of the end of the instrument's previous duty period. The second report is intended to document instrument status as the unit is being returned to begin its next duty period.

2.1.4 Calibration Interval

Audio Precision normally recommends a 12-month calibration interval for S2 family instruments. A 24-month interval may be used only if the unit is installed and operated within a reasonably controlled environment (+15°C to +30°C) and is not exposed to adverse conditions such as mechanical vibration or condensing humidity.

2.2 Required Test Equipment

The following test equipment is required to calibrate an S2 family instrument. Each piece of equipment must itself be duly calibrated and operated in accordance with its manufacturer's recommendations.

1) AC Calibrator	Fluke 5520A. (Note: the Fluke 5500A is inadequate.)
2) Precision Multimeter	Agilent 3458A.
3) Counter	Agilent 53131A with timebase option 010. (Note: an external frequency reference may be used in lieu of option 010, provided its error is <0.0 PPM.)
4) Oscilloscope	Tektronix TDS 3032B or 3052B.
5) AP Service Kit	SVC-KIT002

Service Kit SVC-KIT002 includes the following cables, adapters and fixtures:

2	110 Ω XLR male-to-female cables	pn CAB-AES
2	75 Ω male-to-male BNC cables	pn CAB-B75
1	110 Ω Fixture	pn SVC-FXTR-110
1	CMT Fixture	pn SVC-FXTR-CMT
1	75 Ω BNC termination, male	pn 4254.0006
1	BNC "T" adapter (F-M-F)	pn 4254.0007
2	BNC (F) to dual-banana adapters	pn 4254.0008

See Section 1.8 for more information about Service Kit SVC-KIT002.

2.3 Calibration Procedure

The folder "…\AP S2 Family Service\Calibration" contains macros for each potential step of the overall calibration procedures outlined in this chapter. Each macro contains all necessary instructions and operator prompts, and provides automatic control of the hardware setups.

Although you can run any of these calibration macros individually, in most cases you will start a calibration by running the "BeginCal.apb" macro.

2.3.1 Preparing the instrument for Calibration

First, be sure that the instrument has been ON for at least 1/2 hour to warm up and stabilize its circuits.

You must have already installed the correct control software (APWIN for System Two; AP2700 for all other S2 family instruments) on the host PC. Verify that the APIB bus is connected and operating properly.

Check that the required test equipment and cables (listed in the previous section) are available. If you plan to make a calibration report, make available the PDF or hard copy of the the appropriate report form.

Launch the control software and open the macro "…\AP S2 Family Service\Calibration\BeginCal.apb". Run the macro.

NOTE: DO NOT open S2 Family Service files by "double-clicking" the file from Windows Explorer or from a folder window. Instead, run the control software and open the service file from the File menu. This assures that the control software working directory is properly set.

2.3.2 BeginCal.apb

Introductory dialog

BeginCal.apb first identifies the instrument connected to the PC via APIB, and asks you to verify this identification. If the automatic identification does not agree with the instrument labeling or configuration, (which is very unlikely) stop the calibration now and contact Audio Precision tech support.

Once the instrument is identified and verified, BeginCal.apb determines the correct tests and macros to calibrate this particular instrument model and configuration

Next BeginCal.apb recommends the correct calibration report to print and use, and describes the structure of the calibration procedure.

Beginning the calibration steps

When these preliminary steps are complete, you are prompted to press CONTINUE to begin with CAL01.apb, the first macro in the actual calibration procedure. CAL01.apb and the following macros are described in the next section starting with Step 1.

Once you click CONTINUE to start Step 1, the calibration procedure will move through all the appropriate steps until calibration is complete.

The entire calibration can be performed by reading the information and following the instructions in the dialog boxes provided by the calibration macros, without further reference to this manual. For your convenience, the calibration steps are outlined below as an overview and a guide when re-starting an interrupted calibration procedure.

The first dialog box of step lists the equipment and connections necessary for that step. As the macro proceeds, you are instructed to enter the results for each measurement on the Calibration Report.

You may stop the calibration procedure at any time by pausing or stopping the macro, and begin it again by starting the macro. You may also return to a specific step by opening and running its macro (CAL17.apb, for example). The calibration procedure outlines provided in the next section identify the macros associated with each calibration step.

NOTE: Some steps printed here pertain only to certain hardware configurations or options, and the calibration procedure will skip the steps that are not necessary for the particular instrument undergoing calibration.
As many as 450 measurements may be required for a complete calibration.

2.3.3 Calibration, Step-by-Step

System Two

Step 1: Sine Generator Frequency Accuracy CAL01.apb

[for models with analog generator: SYS-2022, SYS-2222 & SYS-2322]

☞ Use frequency counter (see list in section 2.2). Connect GENERATOR AUX SIGNALS Sync Ouptut to frequency counter using a BNC cable. Adjust the counter controls to obtain a stable frequency reading.

This macro prompts you to record a series of frequency measurements made across a wide range of frequencies, first in "FAST" generator mode, then in "HIGH-ACCURACY" generator mode.

Step 2: Sine D/A Generator Frequency Accuracy CAL02.apb

[for models with analog generator +DSP: SYS-2222 & SYS-2322]

☞ Use frequency counter (see list in section 2.2). Connect GENERATOR AUX SIGNALS Sync Ouptut to frequency counter using a BNC cable.

Adjust the counter controls to obtain a stable frequency reading.

NOTE: The basic accuracy of many counters may not be sufficient unless they are locked to an external frequency reference or standard.

This macro prompts you to record a frequency measurement.

Step 3: Sine Generator Amplitude Accuracy CAL03.apb

[for models with analog generator: SYS-2022, SYS-2222 & SYS-2322]

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL (first “A,” then “B”) to ac voltmeter using a BNC cable and a BNC-to-dual-banana adapter.

This macro prompts you to record a series of amplitude measurements made across a wide range of voltages, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B.

Step 4: Sine D/A Generator Amplitude Accuracy CAL04.apb

[for models with analog generator +DSP: SYS-2222 & SYS-2322]

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL (first “A,” then “B”) to ac voltmeter using a BNC cable and a BNC-to-dual-banana adapter.

This macro prompts you to record two amplitude measurements, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B.

Step 5: Sine Generator Flatness CAL05.apb

[for models with analog generator: SYS-2022, SYS-2222 & SYS-2322]

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL (first “A,” then “B”) to ac voltmeter using a BNC cable and a BNC-to-dual-banana adapter.

NOTE: The accuracy of some ac voltmeters may not be sufficient to directly verify flatness below about 50 Hz or above 10–20 kHz. If necessary, use an ac calibrator to prepare a table of suitable correction factors at 2.5 Vrms.

This macro prompts you to record a series of relative amplitude measurements made across a wide range of voltages, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B. If the precision ac voltmeter can be set for relative measurements, make it so.

If the ac voltmeter does not allow relative “dB” readings, note the voltage reading at 1 kHz (V_{ref}) and use it as the reference to calculate flatness at subsequent frequencies, using the formula:

$$dB = 20\log_{10}\frac{V_{reading}}{V_{ref}}.$$

Step 6: Sine D/A Generator Flatness CAL06.apb

[for models with analog generator +DSP: SYS-2222 & SYS-2322]

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL (first “A,” then “B”) to ac voltmeter using a BNC cable and a BNC-to-dual-banana adapter.

NOTE: The accuracy of some ac voltmeters may not be sufficient to directly verify flatness below about 50 Hz or above 10–20 kHz. If necessary, use an ac calibrator to prepare a table of suitable correction factors at 2.5 Vrms.

This macro prompts you to record a series of relative amplitude measurements made across a wide range of voltages, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B. If the precision ac voltmeter can be set for relative measurements, make it so.

If the ac voltmeter does not allow relative “dB” readings, note the voltage reading at 1 kHz (V_{ref}) and use it as the reference to calculate flatness at subsequent frequencies, using the formula:

$$dB = 20\log_{10}\frac{V_{reading}}{V_{ref}}.$$

Step 7: Sine Generator Residual THD+N CAL07.apb

[for models with analog generator: SYS-2022, SYS-2222 & SYS-2322]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Residual THD+N is a “system” specification including contributions from both generator and analyzer. The test conditions in this step have been chosen to maximize the generator contribution relative to the analyzer. Step 22 checks THD+N under conditions that maximize analyzer contribution.

This macro prompts you to record a series of band-limited residual THD+N measurements made across a wide range of frequencies, using the internal GenMon connections.

Step 8: Sine D/A Generator Residual THD+N CAL08.apb

[for models with analog generator +DSP: SYS-2222 & SYS-2322]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog analyzer is used to verify DAC residual THD+N.

This macro prompts you to record a series of residual THD+N measurements made across a wide range of frequencies, using the internal GenMon connections.

Step 9: Output-related Crosstalk CAL09.apb

[for models with analog generator: SYS-2022, SYS-2222 & SYS-2322]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog analyzer is used to verify generator crosstalk. Analyzer-related crosstalk is at least 10 times lower. (See Step 13).

This macro prompts you to record crosstalk measurements at 20 kHz and 100 kHz from Channel A into Channel B, and then from Channel B into Channel A, using the internal GenMon connections.

Step 10: Source Impedance Accuracy CAL10.apb

[for models with analog generator: SYS-2022, SYS-2222 & SYS-2322]

☞ Use the ohmmeter function of a multimeter (see list in section 2.2). Connect ANALOG OUTPUT banana jacks (first “A,” then “B”) to ohmmeter using a BNC cable and two BNC-to-dual-banana adapters.

This macro prompts you to record a series of resistance measurements made at all output impedance and signal balance settings, first for ANALOG OUTPUT A and then for ANALOG OUTPUT B.

*NOTE: In units with option **EGZ** installed, the 150 Ω selection is replaced with 200 Ω. The allowable limits are 198.0–202.0 Ω.*

Step 11: Input Termination Accuracy CAL11.apb

[for models with analog analyzer: SYS-2022, SYS-2222 & SYS-2322]

☞ Use the ohmmeter function of a multimeter (see list in section 2.2). Connect ANALOG INPUT banana jacks (first “A,” then “B”) to ohmmeter using a BNC cable and two BNC-to-dual-banana adapters.

This macro prompts you to record a series of resistance measurements made at all input impedance settings, first for ANALOG INPUT A and then for ANALOG INPUT B.

Step 12: Input Common Mode Rejection CAL12.apb

[for models with analog analyzer: SYS-2022, SYS-2222 & SYS-2322]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of CMRR measurements made at a range of amplitude and frequency settings, first for ANALOG INPUT A and then for ANALOG INPUT B.

NOTE: The “dBgA” unit expresses amplitude relative to the generator channel A output; likewise, “dBgB” is amplitude relative to the generator channel B output.

Step 13: Input Related Crosstalk CAL13.apb

[for models with analog analyzer: SYS-2022, SYS-2222 & SYS-2322]

☞ Use the AC Calibrator (see list in section 2.2) as a high-voltage signal generator (for this test, accuracy is not important). Connect the AC Calibrator to the instrument ANALOG UNBAL INPUTS (first “B,” then “A”) using a BNC cable and a BNC-to-dual-banana adapter.

CAUTION: At high voltage settings, the AC Calibrator output can present hazardous potentials. Always set the AC Calibrator to a low voltage range before connecting or disconnecting cables. Be sure to orient the dual-banana connector for correct polarity (BNC center conductor to ac “high,” BNC shield to ac “low” or ground.

This macro prompts you to record a series of crosstalk measurements made with a high-level input at two different frequencies, first for crosstalk into INPUT A from INPUT B, and then for crosstalk into INPUT B from INPUT A.

Step 14: Analyzer Level Meter Accuracy CAL14.apb

[for models with analog analyzer: SYS-2022, SYS-2222 & SYS-2322]

☞ Use the AC Calibrator (see list in section 2.2). Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the BNC “T” adapter, and

using 2 BNC cables connect each of the "T" outputs to the instrument ANALOG INPUTS UNBAL A and B.

CAUTION: At high voltage settings, the AC Calibrator output can present hazardous potentials. Always set the AC Calibrator to a low voltage range before connecting or disconnecting cables. Be sure to orient the dual-banana connector for correct polarity (BNC center conductor to ac "high," BNC shield to ac "low" or ground.

This macro prompts you to record a series of level meter readings for both INPUT A and INPUT B at a range of AC Calibrator amplitude settings.

Step 15: Analyzer Level Meter Flatness CAL15.apb

[for models with analog analyzer: SYS-2022, SYS-2222 & SYS-2322]

☞ Use the AC Calibrator (see list in section 2.2). Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the BNC "T" adapter, and using 2 BNC cables connect each of the "T" outputs to the instrument ANALOG INPUTS UNBAL A and B.

This macro prompts you to record a series of level meter readings for both INPUT A and INPUT B at a wide range of AC Calibrator frequency settings.

Step 16: Analyzer Level Meter Accuracy CAL16.apb

[for models with analog analyzer: SYS-2022, SYS-2222 & SYS-2322]

☞ Use the AC Calibrator (see list in section 2.2). Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the BNC "T" adapter, and using 2 BNC cables connect each of the "T" outputs to the instrument ANALOG INPUTS UNBAL A and B.

This macro prompts you to record a series of analyzer AMPLITUDE function meter readings for both INPUT A and INPUT B at a range of AC Calibrator amplitude settings.

Step 17: Analyzer Amplitude Meter Flatness CAL17.apb

[for models with analog analyzer: SYS-2022, SYS-2222 & SYS-2322]

☞ Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the instrument ANALOG INPUT A UNBAL connector.

This macro prompts you to record a series of analyzer AMPLITUDE function meter readings at a range of AC Calibrator amplitude and frequency settings.

Step 18: Analyzer Bandreject and THD+N Accuracy CAL18.apb

[for models with analog analyzer: SYS-2022, SYS-2222 & SYS-2322]

☞ Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the instrument ANALOG INPUT A UNBAL connector.

This macro prompts you to record a series of analyzer BANDREJECT function meter readings at a range of AC Calibrator frequency settings, for each of several instrument notch filter settings.

Step 19: Analyzer Bandpass Accuracy CAL19.apb

[for models with analog analyzer: SYS-2022, SYS-2222 & SYS-2322]

☞ Using a dual-banana-to-BNC adapter, connect the AC Calibrator to the instrument ANALOG INPUT A UNBAL connector.

This macro prompts you to record a series of analyzer BANDPASS function meter readings at a range of AC Calibrator frequency settings, for each of several instrument bandpass filter settings.

Step 20: Analyzer Bandwidth Limiting Filters CAL20.apb

[for models with analog analyzer: SYS-2022, SYS-2222 & SYS-2322]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of AMPLITUDE function meter measurements made at a range of frequency settings, for each of the analyzer bandwidth limiting filter settings.

NOTE: The "dBrA" unit expresses amplitude relative to the reference level established with no filters at the beginning of this step.

Step 21: Analyzer Residual Noise CAL21.apb

[for models with analog analyzer: SYS-2022, SYS-2222 & SYS-2322]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The analyzer input terminations are provided by the system generator via internal signal paths.

This macro prompts you to record a series of analyzer residual noise measurements made at various analyzer bandwidth settings, for Channel A and Channel B.

Step 22: Analyzer Residual THD+N
CAL22.apb

[for models with analog analyzer: SYS-2022, SYS-2222 & SYS-2322]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of analyzer residual THD+N measurements made at various analyzer bandwidth settings and at various frequencies, for Channel A and Channel B.

Step 23: Analyzer Phase Measurement Accuracy
CAL23.apb

[for models with analog analyzer: SYS-2022, SYS-2222 & SYS-2322]

☞ No external test equipment required; however, external cabling is necessary. Connect a BNC "T" adapter to the instrument ANALOG OUTPUT A UNBAL. Using 2 BNC cables of equal length, connect each of the "T" outputs to the instrument ANALOG INPUTS UNBAL A and B.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of analyzer phase measurements at various frequencies.

Step 24: Analyzer Frequency Measurement Accuracy
CAL24.apb

[for models with analog analyzer: SYS-2022, SYS-2222 & SYS-2322]

☞ Use the frequency counter (see list in section 2.2). Using a BNC cable, connect the instrument GENERATOR AUX SIGNALS: SYNC OUTPUT to the input of the frequency counter.

NOTE: Frequency measurements of the internal sine wave generator are compared to that of an external frequency counter having <0.2 PPM of absolute error. Measurement accuracy will be checked in only one analyzer channel because both share the same internal timebase.

This macro prompts you to enter a frequency counter reading and then record the accuracy measured and calculated by the instrument.

Step 25: High-Resolution ADC Distortion
CAL25.apb

[for models with analog analyzer +DSP: SYS-2222 & SYS-2322]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup. A series of FFTs will be taken showing residual distortion as the signal amplitude of the high-resolution ADC is stepped from 0 dB (full scale) to –6 dB.

This macro prompts you to record the highest-level distortion component generated by a 5 kHz signal stepped over a series of amplitudes, first for Channel A and then for Channel B.

Step 26: High-Bandwidth ADC Distortion
CAL26.apb

[for models with analog analyzer +DSP: SYS-2222 & SYS-2322]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup. A series of FFTs will be taken showing residual distortion as the signal amplitude of the high-bandwidth ADC is stepped from 0 dB (full scale) to –6 dB.

This macro prompts you to record the highest-level distortion component generated by a 20 kHz signal stepped over a series of amplitudes, first for Channel A and then for Channel B.

Step 27: Burst OFF Ratio Accuracy (BUR option)
CAL27.apb

[for models with analog analyzer and burst/square wave option: SYS-2022, SYS-2222 & SYS-2322]. Instrument must have S2-BUR option installed.

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL A to ac voltmeter input using a BNC cable and a BNC-to-dual-banana adapter.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a reference reading in dB from the precision ac voltmeter, and then to record a series of voltmeter readings (in dB) made at various BURST: LOW LEVEL generator settings to measure the accuracy of the BURST ratios.

If the ac voltmeter does not allow relative "dB" readings, note the voltage reading at 1 kHz (V_{ref}) and use it as the

reference to calculate flatness at subsequent frequencies, using the formula:

$$dB = 20\log_{10}\frac{V_{reading}}{V_{ref}}.$$

Step 28: Square Wave Amplitude Accuracy (BUR option)
CAL28.apb

[for models with analog analyzer and burst/square wave option: SYS-2022, SYS-2222 & SYS-2322]. Instrument must have S2-BUR option installed.

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL A to ac voltmeter input using a BNC cable and a BNC-to-dual-banana adapter.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record the voltmeter reading of the instrument's analog output, while generating a 1 Vrms 100 Hz square wave.

Step 29: Generator IMD Amplitude Accuracy (IMD option)
CAL29.apb

[for models with analog analyzer and IMD option: SYS-2022, SYS-2222 & SYS-2322]. Instrument must have S2-IMD option installed.

☞ Use precision ac voltmeter (see list in section 2.2). Connect ANALOG OUTPUT UNBAL A to ac voltmeter input using a BNC cable and a BNC-to-dual-banana adapter.

This macro prompts you to record the voltmeter reading of the instrument's analog output, while generating various IMD signals at a nominal amplitude.

Step 30: SMPTE LF Tone Accuracy (IMD option)
CAL30.apb

[for models with analog analyzer and IMD option: SYS-2022, SYS-2222 & SYS-2322]. Instrument must have S2-IMD option installed.

☞ Use the frequency counter (see list in section 2.2). Using a BNC cable, connect the instrument GENERATOR AUX SIGNALS: SYNC OUTPUT to the input of the frequency counter.

This macro prompts you to record the frequency counter reading of the instrument's generator SYNC OUTPUT, while generating a series of SMPTE 4:1 signals with a range of low-frequency tones.

Step 31:DIM Square Wave Accuracy (IMD option)
CAL31.apb

[for models with analog analyzer and IMD option: SYS-2022, SYS-2222 & SYS-2322]. Instrument must have S2-IMD option installed.

☞ Use the frequency counter (see list in section 2.2). Using a BNC cable, connect the instrument GENERATOR AUX SIGNALS: SYNC OUTPUT to the input of the frequency counter.

This macro prompts you to record the frequency counter reading of the instrument's generator SYNC OUTPUT, while generating first a DIM 100 and then a DIM B signal.

Step 32: IMD Measurement Accuracy (IMD option)
CAL32.apb

[for models with analog analyzer +DSP and IMD option: SYS-2222 & SYS-2322]. Instrument must have S2-IMD option installed. DSP required for measurement technique employed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup. IMD analyzer calibration is checked using multitone signals synthesized by the internal DSP generator. These multitone signals include an IMD component at exactly 0.100% (–60 dB).

This macro prompts you to record a series of analyzer IMD readings (SMPTE, CCIF and DIM) made using optimized test waveforms to measure IMD analyzer accuracy.

Step 33: Residual IMD (IMD option)
CAL33.apb

[for models with analog analyzer and IMD option: SYS-2022, SYS-2222 & SYS-2322]. Instrument must have S2-IMD option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Residual IMD is a "system" specification including contributions from both generator and analyzer.

This macro prompts you to record a series of analyzer IMD readings (SMPTE, DFD/CCIF and DIM) made using the IMD generator at a range of amplitude settings.

Step 34: Wow and Flutter Accuracy (W&F option)
CAL34.apb

[for models with analog analyzer +DSP and W&F option: SYS-2222 & SYS-2322]. Instrument must have S2-W&F option installed. DSP required for measurement technique employed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup. W&F analyzer calibration is checked using a multitone signal synthesized by the internal DSP generator. This signal is a 3.000 kHz tone containing exactly 1.000% peak deviation of sine wave frequency modulation (FM) at 11.72 Hz.

This macro prompts you to record two W&F analyzer measurements made using an optimized test waveform.

Step 35: Residual Wow and Flutter (W&F option) CAL35.apb

[for models with analog analyzer and W&F option: SYS-2022, SYS-2222 & SYS-2322]. Instrument must have S2-W&F option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

This macro prompts you to record a series of W&F analyzer residiual measurements at various analyzer settings.

Step 36: S-AES17 Option Response CAL36.apb

[for models with analog analyzer and S-AES17 option: SYS-2022, SYS-2222 & SYS-2322]. Instrument must have S-AES17 option installed.

☞ No external test equipment required; however, external cabling is necessary. Connect a BNC cable from the ANALYZER SIGNAL MONITORS: READING connector to ANALOG INPUT B UNBAL.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of analyzer AMPLITUDE readings using different modes of the S-AES17 filter at various frequencies, measuring the response of the filter.

Step 37: S-AES17 Option Residual THD+N CAL37.apb

[for models with analog analyzer and S-AES17 option: SYS-2022, SYS-2222 & SYS-2322]. Instrument must have S-AES17 option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Residual THD+N is a "system" specification including contributions from both generator and analyzer.

This macro prompts you to record a series of AMPLITUDE readings made using different modes of the S-AES17 filter at various amplitudes, measuring the residual THD+N with the filter in-line.

Step 36a: OPT-2020 Option Response CAL36.apb

[for models with analog analyzer and OPT-2020 option: SYS-2022, SYS-2222 & SYS-2322]. Instrument must have OPT-2020 option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: The instrument analog generator provides the necessary test signal for this setup.

This macro prompts you to record a series of analyzer AMPLITUDE made at various frequencies with the OPT-2020 filter enabled, measuring the response of the filter.

Step 37a: OPT-2020 Option Residual THD+N CAL37.apb

[for models with analog analyzer and OPT-2020 option: SYS-2022, SYS-2222 & SYS-2322]. Instrument must have OPT-2020 option installed.

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Residual THD+N is a "system" specification including contributions from both generator and analyzer.

This macro prompts you to record two AMPLITUDE measurements made at different amplitudes, measuring the residual THD+N with the OPT-2020 filter in-line.

Step 38: Digital Output Amplitude Accuracy CAL38.apb

[for models with digital input and output capability: SYS-2300 & SYS-2322]

☞ Requires a dual-channel oscilloscope, the "SVC-FXTR-110" test fixture, a digital audio XLR cable, 2 BNC cables and a 75 Ω BNC termination (see list in section 2.2).

This macro prompts you to connect the instrument, the test fixture and the oscilloscope and take amplitude readings from the scope screen.

Step 39: Digital Voltage Measurement Accuracy CAL39.apb

[for models with digital input and output capability: SYS-2300 & SYS-2322]

☞ Requires a dual-channel oscilloscope, the "SVC-FXTR-110" test fixture, a digital audio

XLR cable, 2 BNC cables and a 75 Ω BNC termination (see list in section 2.2).

This macro prompts you to connect the instrument, the test fixture and the oscilloscope and vary instrument settings while monitoring amplitudes from the scope screen. When scope amplitudes are attained, you are prompted to record instrument DIO amplitude readings.

Step 40: AES/EBU Variable Risetime CAL40.apb

[for models with digital input and output capability: SYS-2300 & SYS-2322]

☞ Requires a dual-channel oscilloscope, 2 BNC cables and a 75 Ω BNC termination (see list in section 2.2).

This macro prompts you to connect the instrument, the 75 Ω termination and the oscilloscope using a BNC cable, and to record the risetime measurements from the oscilloscope.

Step 41: Normal Mode Noise Amplitude CAL41.apb

[for models with digital input and output capability: SYS-2300 & SYS-2322]

☞ Requires a dual-channel oscilloscope, a BNC cable and a 75 Ω BNC termination (see list in section 2.2).

This macro prompts you to connect the instrument, the 75 Ω termination and the oscilloscope using a BNC cable, and to record the peak-to-peak amplitude measurements of the noise signal as displayed on the oscilloscope.

Step 42: Common Mode Sine Amplitude CAL42.apb

[for models with digital input and output capability: SYS-2300 & SYS-2322]

☞ Requires a dual-channel oscilloscope, the "SVC-FXTR-110" test fixture and a digital audio XLR cable (see list in section 2.2).

This macro prompts you to connect the instrument, the test fixture and the oscilloscope using a digital audio XLR cable, and to record certain peak-to-peak amplitude measurements of the applied signal as displayed on the oscilloscope.

Step 43: Common Mode Voltage Measurement Accuracy CAL43.apb

[for models with digital input and output capability: SYS-2300 & SYS-2322]

☞ Requires an AC Calibrator, the "SVC-FXTR-CMT" test fixture, a BNC cable and a BNC-to-dual-banana adapter. (see list in section 2.2).

This macro prompts you to connect the AC Calibrator to the test fixture, using the BNC cable and a BNC-to-dual-banana adapter, to plug the test fixture into one of the balanced digital inputs, and to record a series of DIO input voltages as the AC Calibrator is varied.

Step 44: Jitter Accuracy CAL44.apb

[for models with digital input and output capability: SYS-2300 & SYS-2322]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Sine wave jitter causes FM sidebands to appear around the various frequency domain components of the composite AES3 signal. As jitter is increased, the relative amplitudes of the various components and their associated sidebands will follow a well known formula based upon Bessel functions. At mathematically predictable levels of sine wave jitter, certain frequency domain components will undergo sharp "Bessel" nulls. In this step you will be asked to vary the jitter generator amplitude while monitoring a repeating FFT display of the AES3 signal. When specified Bessel nulls occur, the jitter amplitude will be accurately known with an absolute error no worse than the setting resolution of the jitter generator: ±0.005 UI for settings <1.23 UI or ±0.05 UI for settings >1.23 UI. The required amplitude setting thus becomes a direct measure of the jitter generator calibration. Analyzer calibration can be simultaneously verified.

This macro prompts you to vary the Jitter Amplitude setting while viewing an FFT display, with the goal of finding the optimum setting (that which produces the best null in the display), and recording the Jitter Amplitude setting that produced this result. You are promted throught two tests of this sort, and then are prompted to record some analyzer readings.

Step 45: Jitter Flatness CAL45.apb

[for models with digital input and output capability: SYS-2300 & SYS-2322]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

NOTE: Jitter Flatness is a "system" specification including contributions from both generator and analyzer.
A series of jitter readings will be averaged with the jitter generator set to 500 Hz and 300 mUI to establish a flatness reference. Subsequent readings at other jitter frequencies will then be averaged and converted into dB flatness results for recording. Jitter flatness will be checked via only one output chan-

nel because the jitter generator and analyzer are common to both signal paths.

This macro prompts you to record a series of jitter flatness readings made over a range of jitter frequencies.

Step 46: Residual Jitter CAL46.apb

[for models with digital input and output capability: SYS-2300 & SYS-2322]

☞ No external test equipment required. Disconnect all cables from instrument for best results.

This macro prompts you to record a series of residual jitter readings made at a range of sample rates.

END OF CALIBRATION

Chapter 3: Adjustment

All S2 Family Instruments

3.1 Preparatory Information

3.1.1 When is Adjustment Necessary?

Adjustment is the process of changing or resetting various hardware and/or software elements to compensate for the inevitable effects of component tolerances and drift.

Audio Precision recommends following a periodic adjustment schedule (typically combined with Calibration; see Chapter 2) to insure optimum instrument performance. Once every 24 months is generally sufficient if the unit is operated under controlled environmental conditions (+15°C to +30°C). This interval should be reduced to once every 12 months if the unit is operated under environmental extremes and/or exposed to mechanical vibration or condensing humidity.

Adjustment should always be performed following any major repair or module replacement.

When an adjustment procedure is completed, the instrument should have a performance check performed; see Chapter 4.

3.1.2 Physical Preparation

Unplug the ac power cord and remove both the top and bottom instrument covers. Remove the lower internal U-shaped “tunnel” shield enclosing the power supply only if the power supply (PSA module) is to be adjusted.

Position the unit as needed to gain access to the module being adjusted. Reconnect the ac power cord and turn the power switch on. Be sure the ac power line is within nominal limits.

WARNING!

Hazardous voltages exist inside the instument whenever it is plugged into an ac power source. DO NOT touch or probe any component associated with the power transformer primary circuit, unless the power cord has been unplugged.

If adjustment is taking place following a repair or module replacement, be sure that all mounting hardware and inter-connection cables have been replaced. Many of the modules depend upon grounding paths through the mounting hardware for proper operation.

3.1.3 Adjustment Location Drawings

Drawings of adjustment and test point locations can found in Chapter 6. Chapter 6 is divided into four sections by S2 Family models; be sure you are in the correct section for your instrument model.

Each module has an adjustments drawing that shows only adjustments, test points and wiring connections, and a component locator drawing that shows all the components on the module.

In some cases there may have been more than one version of a given module or assembly. Be sure to use the correct drawing within the section (see Section 1.6.5 to determine the revision level from the identification tag).

3.1.4 Test Points

Test points within Audio Precision instruments are typically composed of 200 Ω resistors mounted on end. These provide isolation from the capacitive loading effects or interference problems when connecting to external test equipment. Unless otherwise noted, any convenient chassis point may be used as the ground reference for all voltage and signal measurements.

3.1.5 Environmental Range

Adjustments should be performed only between +20°C and +25°C. Allow at least 60 minutes for circuit stabilization before proceeding with any adjustments.

3.2 Required Test Equipment

The following equipment is required to adjust an S2 family instrument. Minimum performance characteristics and suggested models are listed below:

1) Multimeter	ac/dc/ohms, 5½ digits (Fluke 8842A or Agilent 34401A).
2) Frequency Counter	7 digits min, ±0.2 PPM (Phillips PM6666 with external frequency standard).
3) Oscilloscope	≥100 MHz, dual channel. (Any suitable Tektronix or Agilent.)
4) AP Service Kit	SVC-KIT002

Service Kit SVC-KIT002 includes the following cables, adapters and fixtures:

2	110 Ω XLR male-to-female cables	pn CAB-AES
2	75 Ω male-to-male BNC cables	pn CAB-B75
1	110 Ω Fixture	pn SVC-FXTR-110
1	CMT Fixture	pn SVC-FXTR-CMT
1	75 Ω BNC termination, male	pn 4254.0006
1	BNC "T" adapter (F-M-F)	pn 4254.0007
2	BNC (F) to dual-banana adapters	pn 4254.0008

See Section 1.8 for more information about Service Kit SVC-KIT002.

3.3 Adjustment Procedure

To adjust an S2 Family instrument, simply load and execute the macro called "ADJUST.apb" found in the folder "…\AP S2 Family Service\Adjustment".

This top-level macro will prompt the operator to select the modules and/or options to be adjusted. It will then automatically invoke sub-procedures that include all necessary instructions and operator prompts.

NOTE: DO NOT open S2 Family Service files by "double-clicking" the file from Windows Explorer or from a folder window. Instead, run the control software and open the service file from the File menu. This assures that the control software working directory is properly set.

As adjustments are completed, the date and the operator's initials are recorded in the instrument's EEPROM memory. For certain digital adjustments, the adjustment setting is also recorded in EEPROM memory. Previous EEPROM adjustment data is deleted.

The remainder of this chapter contains brief summaries of the various sub-procedures for familiarization and reference purposes.

3.3.1 PSA (Power Supply) Module

[Steps 1–2] Prompts the operator to adjust R1306 (+15 V) and R4308 (–15 V).

*NOTE: Having exact nominal values for the ±15 V supplies does **not** enhance or improve instrument performance.*

[Steps 3–4] Prompts the operator to check (no adjustments) the other regulated power supplies for proper functionality.

3.3.2 GEN (Analog Generator) Module

[Step 1] Prompts the operator to adjust the generator's 20 MHz reference (C1101).

[Steps 2–3] Prompts the operator to adjust a bias compensation circuit in the low distortion oscillator (R8501) for minimum change in signal amplitude between 200 Hz and 210 Hz.

[Step 4] Prompts the operator to adjust the amplitude of the low distortion oscillator (R8101).

[Step 5] Prompts the operator to adjust the low distortion generator frequency accuracy in the 100 kHz band (R9506).

[Step 6] Prompts the operator to adjust the low distortion generator frequency accuracy in the 10 kHz band (R9505).

[Step 7] Prompts the operator to adjust the low distortion generator frequency accuracy in the 1 kHz band (R9507).

[Step 8] Prompts the operator to adjust the low distortion generator frequency accuracy in the 100 Hz band (R9508).

[Step 9] Prompts the operator to adjust the nulling of low frequency distortion introduced in the Channel A output coupling transformer (R7603).

[Step 10] Prompts the operator to adjust the nulling of low frequency distortion introduced in the Channel B output coupling transformer (R3603).

[Step 11] Prompts the operator to adjust the gain of the generator Channel A output stage at 1 kHz (R7602).

[Step 12] Prompts the operator to adjust the gain of the generator Channel B output stage at 1 kHz (R3602).

[Steps 13–14] Adjust the output balance in the balanced output configuration. Step 13 prompts the operator to adjust channel A (R7600) and step 14 prompts the operator to adjust channel B (R3600).

NOTE: Steps 13–14 are omitted for early System Two models, which do not have these adjustments.

3.3.3 INP (Analog Input) Module

[Step 1] Prompts the operator to adjust the on-board frequency reference (C8902).

[Steps 2–3] Prompts the operator to adjust the common mode rejection of the Channel A analog input stage (R4403 at 200 Hz, C4402 at 20 kHz).

[Steps 4–5] Prompts the operator to adjust the common mode rejection of the Channel B analog input stage (R8403 at 200 Hz, C8405 at 20 kHz).

[Steps 6–9] Prompts the operator to adjust the accuracy and linearity (offset) of the Channel A level meter (R1602 and R1601).

[Steps 10–13] Prompts the operator to adjust the accuracy and linearity (offset) of the Channel B level meter (R1605 and R1604).

[Step 14] Prompts the operator to adjust the phase meter low frequency compensation (R7601).

[Step 15] Prompts the operator to adjust the Channel A –12 dB input attenuator compensation at 20 kHz (C4201).

[Step 16] Prompts the operator to adjust the Channel B –12 dB input attenuator compensation at 20 kHz (C8202).

[Step 17] Prompts the operator to adjust the Channel A –24 dB input attenuator compensation at 20 kHz (C4202).

[Step 18] Prompts the operator to adjust the Channel B –24 dB input attenuator compensation at 20 kHz (C8203).

3.3.4 ANL (Analog Analyzer) Module

[Steps 1–4] Prompts the operator to adjust the accuracy of the function meter true rms detector (R6104 and R7101).

[Steps 5–8] Prompts the operator to adjust the accuracy of the function meter average detector (R8101 and R7102).

[Step 9] Prompts the operator to adjust the response accuracy of the 22 Hz highpass filter (R6401).

[Step 10] Prompts the operator to adjust the high frequency response accuracy of the analyzer signal path (R9504).

[Step 11] Prompts the operator to adjust notch filter fundamental rejection for best performance at 1 kHz (R1904 and R1907).

[Step 12] Prompts the operator to adjust notch filter high frequency compensation at 100 kHz (C5502).

3.3.5 DSP Module

[Step 1] Prompts the operator to adjust master clock accuracy (X262 or R2601).

[Step 2] Prompts the operator to adjust the amplitude accuracy of the D/A generators (R3409 for Channel A, R2402 for Channel B).

[Step 3] Prompts the operator to adjust the flatness of the D/A generators (R4405 for Channel A, R2406 for Channel B).

[Step 4] Prompts the operator to adjust summation amplifier gain (R3308).

[Step 5] Prompts the operator to adjust squarewave generator amplitude accuracy (R2203).

[Step 6] Resets internally stored offset and gain constants for both channels of the high bandwidth ADC.

[Step 7] Resets internally stored offset and gain constants for both channels of the high resolution ADC.

3.3.6 DIO (Digital Audio) Module

[Step 1] Prompts the operator to adjust AES-EBU signal generator amplitude accuracy (R3106 for Connector I, R5105 for Connection II).

[Step 2] Prompts the operator to adjust AES-EBU signal generator variable risetime accuracy (C5203 for Connector I, C6205 for Connector II).

[Step 3] Prompts the operator to adjust the reference output delay (R4507).

[Step 4] Prompts the operator to adjust jitter generator accuracy (R5406).

[Step 5] Prompts the operator to adjust jitter generator flatness (R5402, R4401).

[Step 6] Prompts the operator to adjust minimum spurious content in the jitter generator (R5508).

[Step 7] Prompts the operator to adjust jitter meter offset (R2211).

[Step 8] Prompts the operator to adjust AES/EBU common mode compensation (C1208 for Connector I, C1213 for Connector II).

NOTE: C1208 and C1213 are located on the bottom of the SDDF module.

[Step 9] Prompts the operator to adjust AES/EBU analyzer compensation (C1104 for Connector II, C2105 for Connector I).

[Steps 10–12] Resets internally stored constants affecting calibration of jitter meter and AES/EBU waveform analyzer.

3.3.7 BUR (Burst Option) Module

[Step 1] Prompts the operator to adjust squarewave amplitude (R9901).

[Step 2] Prompts the operator to adjust pink noise generator amplitude (R9902).

[Step 3] Prompts the operator to adjust white noise generator amplitude (R9903).

[Step 4] Prompts the operator to adjust the burst gate offset (R8903).

[Step 5] Prompts the operator to adjust the burst gate high frequency compensation (C8901).

3.3.8 IMD (IMD Option)

NOTE: The IMD Option consists of two circuit boards called the IMG and IMA. Only the IMG board contains adjustments.

[Step 1] Prompts the operator to adjust the DFD/CCIF test signal generator multiplier linearity (R5103 and R5201).

[Step 2] Prompts the operator to adjust the SMPTE test signal amplitude (R3203).

[Steps 3–6] Prompts the operator to adjust the DFD/CCIF test signal amplitude (R5301 and R5204).

[Step 7] Prompts the operator to adjust the DIM test signal amplitude (R2311).

[Step 8] Prompts the operator to adjust the IM frequency accuracy (R3204).

3.3.9 WFA (Wow & Flutter Analyzer Option)

[Steps 1–2] Prompts the operator to adjust analyzer detector offsets (R9601 and R9501).

[Step 3] Prompts the operator to adjust analyzer calibration (R9701).

3.3.10 S-AES17 (AES17 Filter Option)

[Step 1] Prompts the operator to adjust 20 kHz pre-analyzer filter rejection (R4402).

[Step 2] Prompts the operator to adjust 20 kHz pre-analyzer filter flatness (R5301).

[Step 3] Prompts the operator to adjust 40 kHz pre-analyzer filter rejection (R2402).

[Step 4] Prompts the operator to adjust 40 kHz pre-analyzer filter flatness (R2301).

[Step 5] Prompts the operator to adjust pre-analyzer filter insertion loss (R2101).

3.3.11 OPT-2020 (Pre-Analyzer Filter Option)

[Step 1–9] Prompts the operator to make adjustments optimizing the frequency response of the 9-pole elliptic low-pass filter. (R1016, R1025, R1038, R1065, R1041, R1049, R1042).

3.4 Adjustment And Performance Check Failures

Adjustment should always restore optimum instrument performance assuming the test equipment used has been properly calibrated. If adjustment does not correct a diagnostic performance check test failure, troubleshooting or module replacement is indicated.

Chapter 4: Performance Checks

All S2 Family Instruments

4.1 Usage & Precautions

The service package CD-ROM includes a set of diagnostic performance checks that are installed under "…\AP S2 Family Service\PerfChecks". These exploit the fact that a S2 Family instrument can be used to check major aspects of its own operation using with no external equipment other than commonly available cables.

To execute a diagnostic performance check, simply open the top level macro called "S2FamilyCheck.apb" from the above-mentioned folder and select the modules and/or options to be tested. Allow at least 20 minutes for warm-up and circuit stabilization for valid results.

NOTE: DO NOT open S2 Family Service files by "double-clicking" the file from Windows Explorer or from a folder window. Instead, run the control software and open the service file from the File menu. This assures that the control software working directory is properly set.

4.1.1 Not a Substitute for Calibration

The diagnostic performance checks are not a substitute for calibration because the instrument is used to test itself. The performance checks should only be used for assurance testing or as an aid during troubleshooting.

NOTE: Calibration can be established only using the procedure outlined in Chapter 2.

4.1.2 Test Failure Interpretation

The first test in most performance checks is generally a basic check of functionality. If a performance check aborts, inspect the cable hookup and repeat the check, if required. If the performance check aborts again, troubleshooting or module replacement is indicated.

NOTE: Certain types of failures may cause a performance check to abort.

4.2 Performance Check Summaries

This chapter contains brief summaries of the tests performed during each of the various performance checks. Each check requires approximately one to three minutes to execute, depending upon the number of tests to be performed.

4.2.1 GEN Module Tests

The GEN module performance check requires two XLR-to-XLR and two BNC cables, length not critical. The four cables are used to connect the generator Analog Outputs to their respective Analog Inputs. The banana jack connectors are not tested because they electrically parallel the XLR connectors.

[Test 1] Checks the generator output XLR signal paths.

[Test 2] Checks the generator output BNC signal paths.

NOTE: A failure in either Test 1 or Test 2 can be caused by an improper cable hookup. If the cable connections appear to be correct, check the generator signal amplitude using an independent DVM to determine whether the generator or analyzer is at fault.

[Test 3] Checks the internal generator monitor signal paths. Also checks the basic amplitude of the oscillator signal, the output amplitude control, and output attenuator operation by measuring amplitude over the range of 26 V to 10 mV.

[Test 4] Checks the low distortion oscillator frequency accuracy in each of its four frequency bands.

[Test 5] Checks the "High-Accuracy" tuning mode of the oscillator.

[Test 6] Checks the relative phase difference between the two analog outputs.

[Test 7] Checks operation of the Channel A Invert feature.

[Test 8] Checks operation of the Channel B Invert feature.

[Test 9] Checks the balanced 40 Ω output configuration by measuring the amplitude terminated into 300 Ω .

[Test 10] Checks the balanced 150 Ω (200 Ω in units with option EGZ installed) output configuration by measuring the amplitude terminated into 300 Ω.

[Test 11] Checks the balanced 600 Ω output configuration by measuring the amplitude terminated into 300 Ω.

[Test 12] Checks the unbalanced 20 Ω output configuration by measuring the amplitude terminated into 300 Ω.

[Test 13] Checks the unbalanced 600 Ω output configuration by measuring the amplitude as terminated in to 300 Ω.

NOTE: A failure in Tests 9–13 could be caused by excessive resistance in the external test cables. Cable resistance must be <1 Ω.

[Test 14] Checks the generator sinewave flatness at 4 Vrms using the 40 Ω balanced output configuration.

[Test 15] Checks the residual channel B-into-A crosstalk.

[Test 16] Checks the residual channel A-into-B crosstalk.

[Test 17] Checks the output coupling transformer distortion null at 20 Hz, 26.6 V.

[Test 18] Checks residual THD+N at 1 kHz as the output amplitude is swept from 26 V to 10 mV.

NOTE: Test 18 takes about 35–45 seconds to complete due to the number of data points.

[Test 19] Checks residual THD+N at high frequencies.

4.2.2 INP Module Tests

The INP module performance check procedure requires two XLR-XLR and two BNC cables, length not critical. The four cables are used to connect the generator Analog Inputs to their respective Analog Outputs. The banana jack connectors are not tested because they electrically parallel the XLR connectors.

[Test 1] Checks the analyzer input XLR signal paths.

[Test 2] Checks the analyzer input BNC signal paths

NOTE: A failure in either Test 1 or Test 2 can be caused by an improper cable hookup. If the cable connections appear to be correct, check the generator signal amplitude using an independent DVM to determine whether the generator or analyzer is at fault.

[[Test 3] Checks the level meter accuracy in the 2.5 V input range (via the internal generator monitor signal path).

[Test 4] Checks the level meter linearity in the 2.5 V input range (2.5 V to 25 mV).

[Test 5] Checks the 10 V input range by comparing the ratio of level meter readings to that of the 2.5 V range.

[Test 6] Checks the 5 V input range by comparing the ratio of level meter readings to that of the 2.5 V range.

[Test 7] Checks the 1.25 V input range by comparing the ratio of level meter readings to that of the 2.5 V range.

[Test 8] Checks the 600 mV input range by comparing the ratio of level meter readings to that of the 2.5 V range.

[Test 9] Checks the 300 mV input range by comparing the ratio of level meter readings to that of the 2.5 V range.

[Test 10] Checks the 160 mV input range by comparing the ratio of level meter readings to that of the 2.5 V range.

[Test 11] Checks the 80 mV input range by comparing the ratio of level meter readings to that of the 300 mV range.

[Test 12] Checks the 40 mV input range by comparing the ratio of level meter readings to that of the 300 mV range.

[Test 13] Checks the –12 dB input attenuator accuracy (used for the 20 V and 40 V input ranges).

[Test 14] Checks the –12 dB input attenuator compensation (used for the 20 V and 40 V input ranges).

[Test 15] Checks the –24 dB input attenuator accuracy (used for the 80 V and 160 V input ranges).

[Test 16] Checks the –24 dB input attenuator compensation (used for the 80 V and 160 V input ranges).

[Test 17] Checks CMRR in the 2.5 V input range (with dc coupling).

[Test 18] Checks CMRR in the 5 V input range (with ac coupling).

[Test 19] Checks CMRR in the 10 V input range (with ac coupling).

[Test 20] Checks CMRR with the –12 dB input attenuator enabled (20 V input range).

[Test 21] Checks CMRR with the –24 dB input attenuator enabled (80 V input range).

[Test 22] Checks the 600 Ω input termination by measuring the signal loss using the generator's 600 Ω output impedance.

[Test 23] Checks the 300 Ω input termination by measuring the signal loss using the generator's 600 Ω output impedance.

NOTE: A failure in Test 22 or 23 could be caused by excessive resistance in the external test cables. Resistance must be <1 Ω.

[Test 24] Checks residual input noise with a 22–22 kHz analyzer bandwidth.

[Test 25] Checks residual input noise with a 10–500 kHz analyzer bandwidth.

[Test 26] Checks frequency meter operation.

[Test 27] Checks phase meter operation.

[Test 28] Checks residual THD+N in each of the 40 mV to 40 V input ranges.

NOTE: This test is similar to Test 18 of the GEN module check procedure, except fewer data points are taken.

4.2.3 ANL Module Tests

The ANL module performance check procedure does not require any external cables. All tests are conducted using the internal generator monitor signal paths. For this procedure in particular, test results may be invalid if failures are detected during either the GEN or INP module performance check procedures.

[Test 1] Checks the channel A/B input selector.

[Test 2] Checks the five 12 dB range steps (0 to +60 dB).

[Test 3] Checks the RMS detector accuracy.

[Test 4] Checks the RMS detector linearity.

[Test 5] Checks the average detector accuracy.

[Test 6] Checks the average detector linearity.

[Test 7] Checks the quasi-peak detector accuracy.

[Test 8] Checks the quasi-peak detector linearity.

[Test 9] Checks operation of the "peak" detector (quasi-peak detector with a very short attack time constant).

[Test 10] Checks analyzer flatness (frequency response) with all filters disabled.

[Test 11] Checks response of both the 22 Hz highpass and 22 kHz lowpass filters.

[Test 12] Checks response of both the 100 Hz highpass and 30 kHz lowpass filters.

[Test 13] Checks response of both the 400 Hz highpass and 80 kHz lowpass filters.

[Test 14] Checks response of the 1/3-octave bandpass filter tuned to 1 kHz.

[Test 15] Checks the response of the 1/3-octave bandpass filter at center frequency from 20 Hz to 100 kHz.

[Test 16] Checks the residual noise in the bandpass mode.

[Test 17] Checks the response of the bandreject filter tuned to 1 kHz.

[Test 18] Checks the basic tuning accuracy of the bandreject filter by measuring notch rejection with the auto-tuning and auto-nulling servos disabled.

NOTE: The auto-tuning and auto-nulling servos are disabled in the "Bandreject" function of the analog analyzer.

[Test 19] Checks the tracking range of the THD+N bandreject filter auto-tuning servo.

NOTE: The auto-tuning and auto-nulling servos are active in the "THD+N" function.

[Test 20] Checks residual THD+N (system) from 20 Hz to 20 kHz using the 22–22 kHz analyzer bandwidth.

[Test 21] Checks bandreject filter auto-nulling operation at high frequencies by testing residual THD+N from 20 kHz to 100 kHz.

4.2.4 DSP Module Tests

The DSP module performance check procedure requires two BNC cables, length not critical. The two cables are used to connect the Digital Signal Monitors to the Analog Analyzer Inputs.

[Test 1] Checks the internal sample rate clock generator by measuring the frequency of a DAC based sinewave as the sample rate is varied.

[Test 2] Checks the amplitude accuracy of the DACs.

[Test 3] Checks the inter-channel phase difference between the two DACs.

[Test 4] Checks the response flatness of the DACs.

[Test 5] Checks the residual THD+N of the DACs.

[Tests 6–11] Checks the multiplexer and the internal signal paths that can be routed to the ADCs.

NOTE: Failures following DSP module servicing or installation are most commonly caused by a plug-in error of one or more of the internal signal cables.

[Test 12] Checks the high-resolution (low-bandwidth) ADC signal path gain.

[Test 13] Checks the frequency response of the high resolution ADCs.

[Test 14] Checks the residual distortion performance of the high resolution ADCs at 1 kHz as the signal amplitude is varied.

[Test 15] Checks the residual distortion performance of the high resolution ADCs at 20 kHz as the signal amplitude is varied.

[Test 16] Checks the high bandwidth ADC signal path gain.

[Test 17] Checks the frequency response of the high bandwidth ADCs.

[Test 18] Checks the residual distortion performance of the high bandwidth converters at 1 kHz as the signal amplitude is varied.

[Test 19] Checks the residual distortion performance of the high bandwidth converters at 20 kHz as the signal amplitude is varied.

[Tests 20 and 21] Checks the Digital Signal Monitors.

4.2.5 DIO Module Tests

The DIO module performance check procedure requires two 75 Ω BNC cables (50 Ω permitted if ≤1 meter in length) and two balanced XLR audio cables to connect the Digital Outputs to the Digital Inputs.

[Test 1] Checks the amplitude accuracy of the unbalanced digital output voltages.

[Test 2] Checks the amplitude accuracy of the balanced digital output voltages.

[Test 3] Checks the amplitude accuracy of the common mode signal sources.

[Test 4] Checks the amplitude accuracy of the interfering noise signal sources.

[Test 5] Checks the jitter meter AVG detector linearity.

[Test 6] Checks the jitter meter peak detector linearity.

[Test 7] Checks the overall jitter response through both digital interface I/O paths.

[Test 8] Checks jitter analyzer 120 Hz high-pass filter

[Test 9] Checks jitter analyzer 700 Hz high-pass filter.

[Test 10] Checks jitter analyzer 1.2 kHz high-pass filter.

[Test 11] Checks residual jitter at 48 k.

[Test 12] Checks residual jitter at 96 k.

[Test 13] Checks the spectrum of the residual jitter.

4.2.6 IMD Option Tests

The IMD option performance check procedure does not require any external cables. All tests are performed using the internal generator monitor signal paths and no external cables are required. Both the IMG (signal generator) and IMA (analyzer) option boards are checked.

[Test 1] Checks the frequency accuracy of the IM generator used as the LF tone with SMPTE (DIN) test signals.

NOTE: The IM generator is also used as the modulating frequency in the twin tone CCIF/DFD test signal generator.

[Test 2] Checks the amplitude accuracy of the SMPTE 4:1 test signal.

[Test 3] Checks the mix ratio accuracy of the SMPTE 4:1 test signal.

[Test 4] Checks the amplitude accuracy of the SMPTE 1:1 test signal.

[Test 5] Checks the mix ratio accuracy of the SMPTE 1:1 test signal.

[Test 6] Checks the amplitude accuracy of the CCIF/DFD test signal.

NOTE: The CCIF and DFD test signals are identical.

[Test 7] Checks the amplitude accuracy (flatness) of the CCIF/DFD test signal as the center frequency is varied between 20 kHz and 4 kHz.

[Test 8] Checks the amplitude accuracy of the DIM-100 test signal.

NOTE: The DIM-30 and DIM-B signals differ only in squarewave risetime and frequency.

[Test 9] Checks the 3.15 kHz squarewave frequency accuracy of the DIM-100 test signal.

[Test 10] Checks the 3.15 kHz squarewave frequency accuracy of the DIM-30 test signal.

[Test 11] Checks the 2.96 kHz squarewave frequency accuracy of the DIM-B test signal.

[Test 12] Checks SMPTE residual IMD as the LF tone is varied from 40 Hz to 500 Hz.

[Test 13] Checks CCIF residual IMD at a center frequency of 15 kHz as the difference frequency is varied from 80 Hz to 1 kHz.

[Test 14] Checks DFD residual IMD at a center frequency of 15 kHz as the difference frequency is varied from 80 Hz to 1 kHz.

[Test 15] Checks DIM-100 residual IMD.

[Test 16] Checks DIM-30 residual IMD.

[Test 17] Checks DIM-B residual IMD.

[Test 18] Checks the SMPTE analyzer accuracy and frequency response using a DAC generated two tone calibration signal.

[Test 19] Checks the DIM analyzer accuracy and frequency response using a DAC generated two tone calibration signal.

4.2.7 BUR Option Tests

The BUR option performance check requires two BNC cables, length not critical. One cable is used to connect the Sync Output signal to the channel A analog input. The other cable is used to connect the Trig/Gate Input to the channel B analog input.

[Test 1] Checks operation of the burst gate input.

NOTE: The switchable 300 Ω termination of the channel B analyzer input is used to test the Trig/Gate Input (active pull-up).

[Test 2] Checks operation of the On-cycles burst counter by measuring the frequency of the Sync Output signal.

[Test 3] Checks operation of the Interval burst counter by measuring the frequency of the Sync Output signal.

[Test 4] Checks burst on-off ratio accuracy.

[Test 5] Checks basic operation (frequency accuracy) of the squarewave signal generator.

[Test 6] Checks amplitude accuracy of the squarewave signal generator.

[Test 7] Checks amplitude accuracy of the pink noise generator.

[Test 8] Checks spectral flatness of the pink noise generator.

[Test 9] Checks amplitude accuracy of the white noise generator.

[Test 10] Checks spectral flatness of the white noise generator.

[Test 11] Checks amplitude accuracy of the bandpass noise generator.

[Test 12] Checks flatness of the bandpass noise generator versus frequency.

4.2.8 WFA Option Tests

The WFA option performance check procedure does not require any external cables. All tests are performed using the internal generator monitor signal paths.

[Tests 1 and 2] Checks unweighted and weighted residual W&F using the IEC detector and a 3.15 kHz test tone.

[Tests 3 and 4] Checks unweighted and weighted residual W&F using the NAB detector and a 3.00 kHz test tone.

[Test 5] Checks residual scrape flutter using a 12.5 kHz test tone.

[Test 6] Checks analyzer calibration with the IEC detector.

[Test 7] Checks analyzer calibration with the NAB detector.

[Test 8] Checks analyzer calibration with the JIS detector.

4.2.9 S-AES17 Option Tests

The S-AES17 Option performance check procedure does not require any external cables. All tests are performed using the internal generator monitor signal paths.

[Test 1] Checks response of the 20 kHz pre-analyzer filter.

[Test 2] Checks response of the 40 kHz pre-analyzer filter.

[Test 3] Checks response of the FLP-B20K option filter.

[Test 4] Checks response of the FLP-B40K option filter.

[Test 5] Checks residual THD+N at 1 kHz in the “20k AES17” mode.

[Test 6] Checks residual THD+N at 1 kHz in the “40k AES17” mode.

4.2.10 OPT-2020 Option Tests

The OPT-2020 Option performance check procedure does not require any external cables. All tests are performed using the internal generator monitor signal paths.

[Test 1] Checks response of the pre-analyzer filter.

[Test 2] Checks pre-analyzer filter residual THD+N at 1 kHz.

END OF
PERFORMANCE CHECK PROCEDURES

Chapter 5: Maintenance & Repair

All S2 Family Instruments

5.1 Cleaning

Audio Precision recommends that its measurement instruments be cleaned and examined at least once every two years for internal dust accumulation. Exposure to harsh or severe operating environments may dictate more frequent cleaning. Dust build-up interferes with the ability of many components to cool properly. In extreme cases dust can also create conductive paths that may adversely affect electrical performance.

5.1.1 Enclosure

Remove accumulated dust with a soft cloth or small brush. A mild detergent may be used to remove remaining dirt or stains. Do not use strong or abrasive cleaners. Wipe all surfaces clean with a damp cloth.

5.1.2 Connectors and Connector Panels

> ***CAUTION***
>
> *Do NOT use cleaning agents that contain petroleum based solvents or abrasive compounds. These can damage the paint and remove lettering. Use only isopropyl alcohol or water.*

Clean with a cotton swab or soft cloth dampened in isopropyl alcohol (IPA) or water. Digital signal connectors should be inspected for bent or damaged pins.

5.1.3 Internal Modules and Assemblies

Remove accumulated dust with clean, dry, low pressure air or a static free vacuum. A soft, dry brush may be required to loosen particles that resist removal. Always use good static control procedures when handling or cleaning circuit assemblies to avoid component damage.

Also examine the cooling fan (top tunnel cover must be removed) for dust accumulation on the leading edge of the blades. Dust build-up can unbalance the fan and increase acoustic noise. Clean the blades with a cotton swab dampened in isopropyl alcohol (IPA) or water.

5.2 Module Removal, Installation

> ***CAUTION***
>
> *Unplug the ac power cord before removing any module or assembly.*

In all cases it is assumed that the top and bottom covers and the top and bottom internal “tunnel” covers have already been removed to expose the internal assemblies of the unit. Please note that the loudspeaker mounts to the bottom tunnel cover and must have its cable disconnected for complete removal.

5.2.1 Module Locations

Figure 5.1 shows the locations of the circuit board assemblies. Depending on your instrument model, some of these modules may not be present. Further details and mounting hardware information may be found in Chapters 6 and 7.

5.2.2 PSA (Power Supply) Module

Unplug both the transformer secondary cable and the cable connecting the power supply outputs to the main interface module. On the top side, remove the four screws holding the +5 V and ±15 V regulators. On the bottom side, remove the four mounting screws securing the module to the chassis. Carefully lift the module straight up to avoid bending and mis-aligning the regulator pins.

> *NOTE: The TO-3 +5 V pass transistor should remain in place due to the adhesive action of the thermally conductive paste.*

Module installation is generally the opposite of removal. Install the two silicone insulator pads between the ±15 V regulators and the chassis. Carefully align the holes of the regulators with the chassis holes and the TO-3 pass transistor. It will be necessary to hold the pass transistor in place as the module is placed into position. Use insulating shoulder washers on the ±15 V regulator mounting screws.

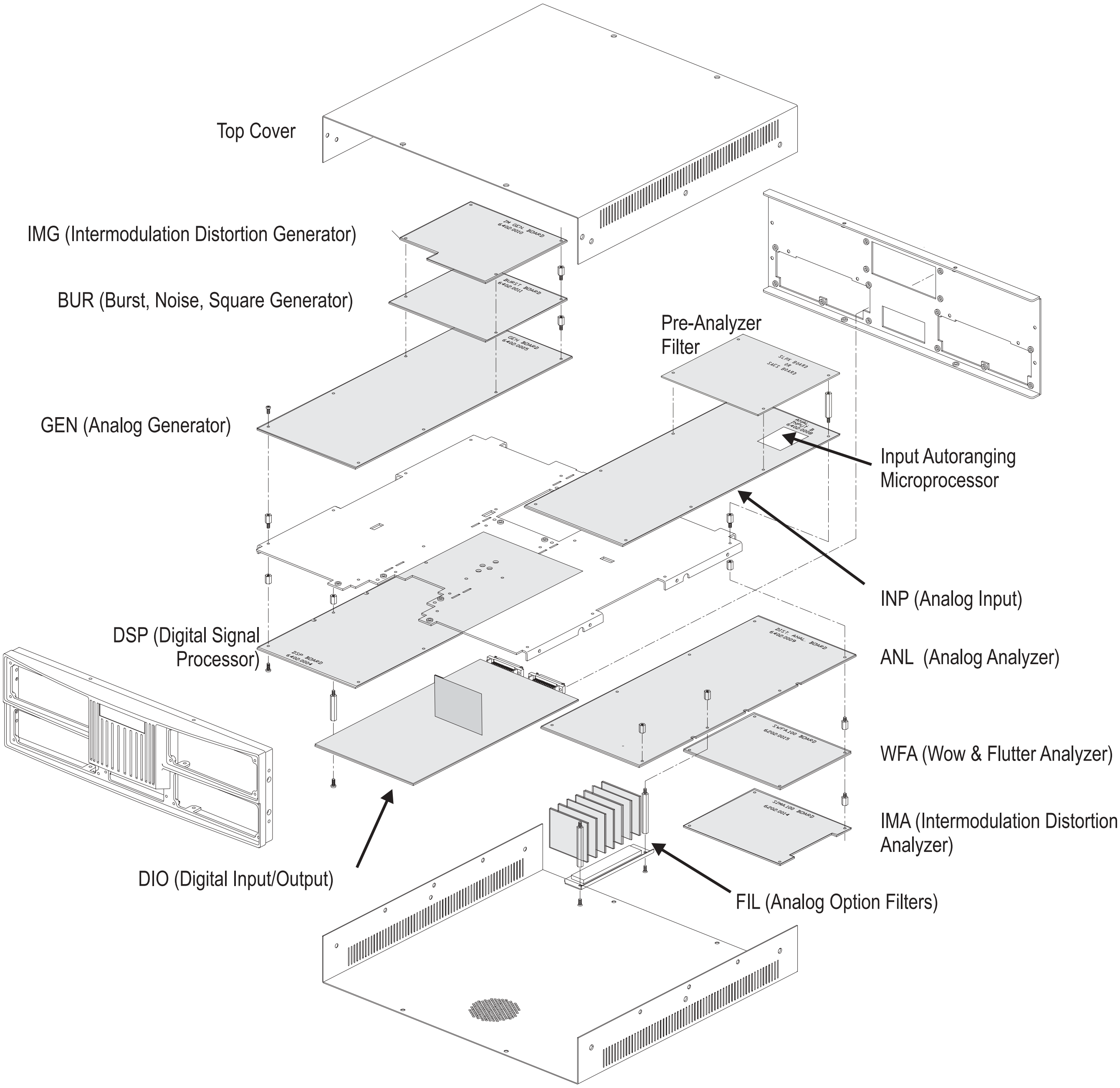

Figure 5-1. Instrument circuit board module locations

5.2.3 GEN (Analog Generator) Module

Remove any option boards that may be present (the BUR and/or the IMG). These are fastened by four screws and/or four threaded standoffs. Carefully lift them straight up to avoid bending the inter-connection pins.

Clip the plastic fastener attaching the coaxial cable bundle to the metal shield located on the GEN module. Unplug all cables and lay them over the front casting out of the way. Unplug the module's 40-conductor ribbon cable from the main interface board. Remove the eight mounting screws located around the perimeter of the module and carefully lift straight up to avoid bending inter-connection pins to the DSP module.

NOTE: The GEN module is significantly heavier than the other modules due to its output coupling transformers.

To install the GEN module, carefully position it over its mounting holes and align the inter-connection pins that pass through the chassis to the DSP module (if present). Replace the eight mounting screws. Do not tighten until all eight screws have been successfully threaded. Dress and plug the 40-conductor ribbon cable back into its designated position on the main interface module. Reattach all cables and replace the plastic cable tie to fasten the coaxial cable bundle to the shield. Replace any option boards that were originally present.

5.2.4 INP (Analog Input) Module

Remove the S-AES17, S2-AES17-LP or OPT-2020 pre-analyzer filter option board if present. Clip the two plastic fasteners attaching the coaxial cable bundle to the metal shield located on the INP module. Unplug all cables and lay them over the front casting or the rear panel out of the way. Unplug the module's 40-conductor ribbon cable from the main interface board. Remove the eight mounting screws located around the perimeter of the module and carefully lift straight up to avoid bending inter-connection pins to the ANL module.

NOTE: Avoid changing the physical orientation of components associated with the input circuit. Doing so may adversely affect high frequency common mode rejection.

To install the INP module, carefully position it over its mounting holes and align the inter-connection pins that pass through the chassis to the ANL module (if present). Replace the eight mounting screws. Do not tighten until all eight screws have been successfully threaded. Dress and plug the 40-conductor ribbon cable back into its designated position on the main interface module. Reattach all cables and replace the plastic cable ties to fasten the coaxial cable bundle to the shield.

5.2.5 ANL (Analog Analyzer) Module

Remove any option boards that may be present (the IMA and/or the WFA). The option boards are fastened by four screws and/or threaded standoffs. Carefully lift them straight up to avoid bending the inter-connection pins. Also remove the option filter retainer bracket and any option filters that may be installed.

Remove the eight mounting screws located around the perimeter of the module and carefully lift straight up to avoid bending inter-connection pins to the INP module.

To install the ANL module, carefully position it over its mounting holes and align the inter-connection pins that pass through the chassis to the INP module (if present). Replace the eight mounting screws. Do not tighten until all eight screws have been successfully threaded. Replace any option boards that were originally present. Also replace any option filters that were originally installed along with the option filter retainer bracket.

NOTE: Option filters should be installed in the same slots as recorded on the rear panel configuration label. New filters may be installed in any available slot.

5.2.6 DSP (Digital Signal Processor) Module

Remove the DIO, DDF, and DDR assemblies first if necessary. Unplug all cables and remove the eight mounting screws located around the perimeter of the board. Carefully lift the board straight up to avoid bending interconnection pins to the GEN module.

To install the DSP module, carefully position the board over its mounting holes and align the interconnection pins that pass through the chassis to the GEN module. Replace the eight mounting screws. Do not tighten until all eight have been successfully threaded. Re-attach the cables using the color guide shown on the DSP module drawing in Chapter 6.

5.2.7 DIO (Digital Audio) Module

Unplug the 20-conductor ribbon cable inter-connecting the DIO and DDF boards. Also unplug the short shielded cable interconnecting the DIO and DSP assemblies. Remove the six mounting screws located around the perimeter of the DIO assembly. Also remove the four small mounting screws from the back panel parallel output and parallel input connectors; on Cascade, Cascade *Plus* and 2700 series instruments also loosen the five DDR panel screws. Carefully lift the DIO board straight up slightly to disengage the inter-connection board between the sockets located on the top side of the DSP board and the underside of the DIO board. Before removing the DIO assembly completely, unplug two cables from the underside of the board.

To install the DIO module, first plug the interconnection board into the socket located on the DSP board. Re-attach the two cables on the underside of the DIO board and guide parallel interface connectors into their holes in the rear panel. Align the socket on the underside of the DIO board over the inter-connection board and press down firmly over the socket to engage. Connect the 20-conductor ribbon cable from the DDF Module to the DIO Module and the short shielded cable to the DSP Module. Thread the six mounting screws but do not tighten at this time. Thread and tighten the four back panel connector screws. Tighten the six mounting screws.

5.2.8 DDF Assembly

The DDF assembly forms an integral part of the digital I/O front panel. Unplug the ribbon cable from the DIO module then remove the four black finish screws from the front panel. Carefully slide the assembly forward until it clears the main casting. Installation is the reverse process.

5.2.9 IFM (Main Interface) Module

Unplug the 40-conductor ribbon cables providing power and communications with the various major modules. Also unplug the power supply cable from the power supply board. On the rear panel remove the jack screws from the digital interface connectors, then remove four screws securing the connector panel and remove the panel. Remove the two mounting screws and carefully slide the assembly slightly forward and up. During installation, be sure to tighten the rear panel digital interface connector jack screws before tightening the two main mounting screws.

5.2.10 HSM Assembly

The HSM assembly mounts to the front panel section containing the power switch, blue LED power indicator, headphone jack, and volume control. To remove, first unplug the eight-conductor ribbon cable from the DSP module. Remove the friction-fit volume control knob. Remove the two hex nuts on both the volume control potentiometer and headphone jack and carefully slide the board assembly free. Be careful to align the blue LED indicator in its front panel hole during installation. Also be careful to dress the eight-conductor ribbon cable to avoid physical interference and crushing when the bottom tunnel cover is re-installed.

5.2.11 MUX Assembly

The MUX assembly is only present in instruments that are not equpped with DSP (SYS-2022, SYS-2122 and SYS-2702).

5.2.12 BUR (Burst Option) Module

The BUR option board is mounted on standoffs above the GEN module. If only the BUR option board is present, simply unplug the Trig/Gate cable and remove the four mounting screws. Lift the board straight up to avoid bending any interconnection pins. If both the BUR and IMG options are present, the IMG board must be removed first. Threaded hex standoffs are used as spacers between the two boards.

To install, carefully align the BUR board and its interconnection pins above the mating socket on the GEN module. Replace mounting hardware and reattach the unplugged Trig/Gate cable.

5.2.13 IMG Board (IMD Option, Generator)

The IMG option board is mounted on standoffs above the GEN module. In all cases the IMG board will be on top. Remove the four mounting screws and carefully lift the board straight up to avoid bending interconnection pins.

To install, carefully align the IMG board and its interconnecting socket above the mating pins located on either the BUR option board or those plugged into the socket on the GEN module. Replace mounting hardware.

5.2.14 IMA Board (IMD Option, Analyzer)

The IMA option board is mounted on standoffs above the ANL module. In all cases the IMA board will be on top. Remove the four mounting screws and carefully lift the board straight up to avoid bending interconnection pins.

To install, carefully align the IMA board and its interconnecting socket above the mating pins located on either the WFA option board, or those plugged into the socket on the ANL module. Replace mounting hardware.

5.2.15 WFA (Wow and Flutter Analyzer Option) Module

The WFA option board is mounted on standoffs above the ANL module. If only the WFA option board is present, simply remove the four mounting screws and lift the board straight up to avoid bending interconnecting pins. If both the WFA and IMA option boards are present, the IMA board must be removed first. Threaded hex standoffs are used as spacers between the two boards.

To install, carefully align the WFA board and its interconnection pins above the mating socket on the ANL module. Replace mounting hardware.

5.2.16 SLPX or SAES (Pre-Analyzer Filter Assembly, S-AES17 or S2-AES17-LP / OPT-2020 Options)

The SLPX or SAES board is mounted on standoffs above the INP module. Remove the four mounting screws and carefully lift the board straight up to avoid bending interconnection pins.

To install, carefully align the SLPX or SAES board and the interconnection pin assembly so that the four mounting holes are directly above the four hex standoffs. Replace the four mounting screws. Double-check the interconnection pin assembly is properly mated to both the socket on the back side of the SLPX or SAES board and the socket on the INP module.

5.2.17 XBO Connector Panel Assembly

Unplug the four twisted wire cables from the GEN module carefully noting which was which. Remove the four black finish screws from the front panel and carefully slide the assembly forward until it clears the main casting. When re-installing, be careful to avoid pinching cables between the front panel and the main casting.

5.2.18 XBI Connector Panel Assembly

Unplug the four twisted-wire cables from the INP module carefully noting which was which. Remove the four black finish screws from the front panel and carefully slide the assembly forward until it clears the main casting. When re-installing, be careful to avoid pinching cables between the front panel and the main casting.

5.3 Troubleshooting Tips

5.3.1 If intermittent or no readings exist...

Be sure that ac power has been applied to the instrument and the front panel switch is ON. The control software can function in a demo mode in the absence of hardware giving the appearance of functionality.

Check the installation of the Audio Precision interface board in the host computer. Be sure that it is fully seated in its socket. Also check the condition of the digital interface cable and connectors. Particularly inspect the male 25-pin connectors for bent or missing pins. If the INP or DSP Modules have been replaced, check the coaxial cable running from the rear of the INP Module to the DSP Module for proper polarity.

5.3.2 If the unit is dead (blown fuse)...

Check the ac line voltage setting of power entry module on the back panel. If the fuse continues to blow, remove the top cover and top internal “tunnel” shield cover and unplug the 12-conductor power supply cable from the power supply module (located just behind the fan assembly). This will disconnect all of the internal functional modules from the power supply. If the fuse continues to blow upon application of ac power, the power supply module (PSA) is probably defective. If the front panel cooling fan now functions: turn off the power, replace the 12-conductor power supply cable, then unplug all but one of the 40-conductor ribbon cables. Continue testing with only one module at a time connected until the defective module is identified.

5.3.3 If the unit is alive but one or more modules does not function

Check the power supply voltages first. Remove the top cover and the top internal “tunnel” shield to expose the main interface board. The power supplies are marked and may be measured with any reasonable DVM. Be careful to avoid shorting supplies to each other. As a general guideline, the +5 V and +15 V/–15 V supplies should measure within 2 % of their nominal values, and the +22 V/–22 V supplies within 5 %. Low frequency ripple should be almost undetectable if a regulated supply is functioning properly; however, some high frequency noise is normal.

NOTE: Do not adjust the supplies unless absolutely necessary. If a supply is adjusted, all other modules must be re-adjusted and the unit must be re-calibrated. Having exact supply voltages does not improve overall instrument performance.

If one or more of the supplies appears to be shorted or is excessively low, use the procedure outlined in the previous section to identify the defective module.

5.3.4 Performance-related Problems

First run the diagnostic performance check macro “S2FamilyCheck.apb” that is installed under “…\AP S2 Family Service\PerfChecks”. A menu will appear to allow selection of the target module(s) to be tested. The appropriate diagnostic performance check macros will be run with test results displayed upon completion. See Chapter 4 for more information about running S2FamilyCheck.apb, including summaries of the actual tests performed during each macro.

The diagnostic performance check macros are extremely comprehensive. A test failure almost certainly indicates an out-of-tolerance condition requiring re-adjustment or troubleshooting. However, some test failures can result from a problem in many possible locations. For example, an amplitude reading error could be caused by a generator module problem or by a problem in either the input or analyzer modules. Careful analysis of performance check failures combined with corroborative measurements from an independent DMM or oscilloscope will usually confirm the diagnosis to a specific module.

5.3.5 Option Filters

Problems with option filters are quite rare. Therefore, no performance check procedures are included in the service manual software package. If a problem is suspected, an option filter can easily be tested by examining the results of a simple frequency response sweep.

5.4 Module Repair

5.4.1 Field Repair Policy

As stated in Chapter 1, Audio Precision does NOT generally authorize the repair of modules and assemblies (other than the PSA or IFM). In those cases where a problem can be clearly diagnosed or traced to a defective component that is commonly available from a local commercial source, Audio Precision may choose to waive this policy. Subject to a consultation with our USA factory and confirmation that the diagnosis is indeed correct, only documentation sufficient to identify the defective component(s) and specify a suitable replacement will be released.

5.4.2 Replacement Parts and Modules

Exploded diagrams and tables of replaceable modules and parts can be found in Chapter 7. All replaceable modules and parts can be obtained directly from Audio Precision or through an authorized Audio Precision distributor. When ordering a replacement part or component, please use the exact part number as shown on the drawings in Chapter 7.

When ordering a replacement function module or circuit board assembly, please include the following:

The Audio Precision assembly nomenclature exactly as shown on the drawings in Chapter 7.

The coded sequence found on the identification label of the defective assembly.

Audio Precision requires the return of defective modules and circuit board assemblies for examination and/or failure analysis as part of our ongoing commitment to quality.

5.4.3 Static Sensitivity

Many of the electrical components contained in the various circuit board modules and assemblies are susceptible to static electricity damage. Static discharges can degrade the ultra-low noise and distortion performance of some op-amps. Static discharges can also cause precision resistors to shift out of tolerance.

Please observe the following precautions to reduce the possibility of accidental static damage:

Minimize the handling of components or assemblies. Store in static-free containers until needed.

Avoid handling components by their leads.

Wear a wrist strap.

Use a grounded soldering iron and anti-static suction type or wick type desoldering tools.

Maintain a static-free work station and environment. Do not allow any object capable of generating or holding a static charge on the work station surface.

5.4.4 Soldering

A good soldering technique is essential to insure high reliability and performance.

A 15–25 watt, pencil type soldering iron is strongly recommended for most repairs. A 40–60 watt soldering iron may be required to remove certain larger components such as the signal transformers on the analog generator module, or the filter capacitors on the power supply board. Using a soldering iron with too high a wattage can melt wiring insulation or cause the etched circuit paths to separate from the board base material. Multi-layer circuit boards require extreme care to prevent breaking inner layer connections.

> ***CAUTION***
>
> *Save the circuit board, not a suspected bad component! Clip out ICs or components to the extent possible before un-soldering. The remaining lead stubs will be much easier to remove with less chance of board damage.*

Always keep the soldering iron tip properly tinned to insure good heat transfer. Protect heat sensitive components by holding the component lead with a pair of long-nose pliers between the component body and the solder joint. Apply only enough heat to remove the component or to make a good solder joint. Solder should flow smoothly into the joint. Avoid using too much solder. Excess solder should be removed from connections to minimize stray capacitance effects.

Use only an electronics grade 60/40 rosin-core solder. Audio Precision strongly discourages the use of solders containing water soluble flux for repair work. Water soluble flux residues can be very conductive, even when diluted. They can be extremely difficult to remove without washing the entire circuit board multiple times.

Excessive flux residues should be removed by flushing the repair area with a suitable solvent such as isopropyl alcohol (IPA), followed by clean water. Be sure that the spaces under sockets, ICs, and large components are thoroughly rinsed to remove accumulated flux residues.

5.4.5 Surface Mount Boards

Many of the circuit boards use surface mount technology. Use only appropriate de-soldering tools when removing multi-pin components such as integrated circuits. Exercise extreme care when soldering to avoid overheating and lifting pads off the circuit board substrate. Also minimize exposure to physical stresses that may cause solder joints to develop hairline fractures.

5.5 Cooling Fan Replacement

The cooling fan is shock mounted to an aluminum bracket that also contains a steel magnetic shield to reduce interference from the rotating magnetic fields. To remove, unplug the two-conductor cable from the power supply board and remove the two screws attaching the L-brackets to the chassis. The fan is mounted using four long screws and rubber grommets to minimize noise transmission. Please note the orientation of the steel magnetic shield before removing the fan screws.

During re-assembly, replace the steel magnetic shield in the same orientation as noted during disassembly. Tighten the nuts of the four long mounting screws only finger-tight, then apply a suitable thread-locking compound to prevent loosening from mechanical vibration.

Chapter 6a: Electronics Diagrams, 2700 Series

This chapter contains main printed circuit board (PCB) drawings showing the location of adjustments and cables, and option circuit board assemblies and main PCB detail drawings showing component designators. All information is believed to be accurate as of the publication date; however, Audio Precision reserves the right to make changes without prior notice.

COMPONENT AND ASSEMBLY DESIGNATIONS

A	Assembly	**L**	Inductor, fixed or variable
BT	Battery	**P**	Connector, male
C	Capacitor, fixed or variable	**Q**	Transistor, FET, or SCR
D	Diode	**R**	Resistor, fixed or variable
E	Socket or mechanical part	**S**	Switch or contact
F	Fuse	**TP**	Test Point
H	Heat sink or radiator	**U**	Integrated Circuit
HS	Heat sink or mounting hardware	**W**	Wire strap or Cable
J	Connector, female	**X**	Transformer
K	Relay	**Y**	Crystal

2700 Series

FUSE SPECIFICATION

A	5X20 MM, TYPE T (S B), 6.3 A
B	5X20 MM, TYPE T (S B), 2.5 A

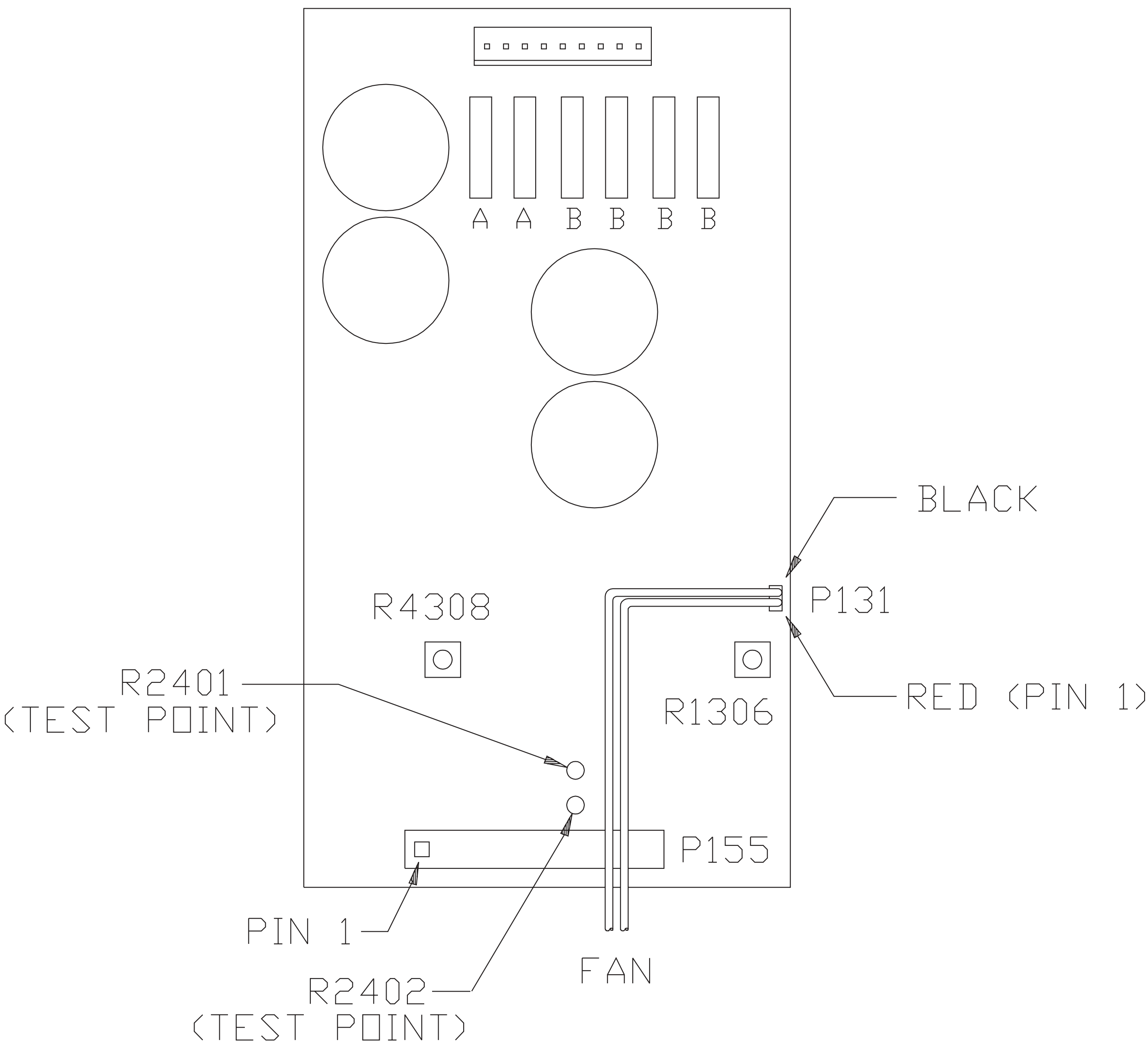

Figure 6-1. 2700 Series PSA module test points and adjustment locations.

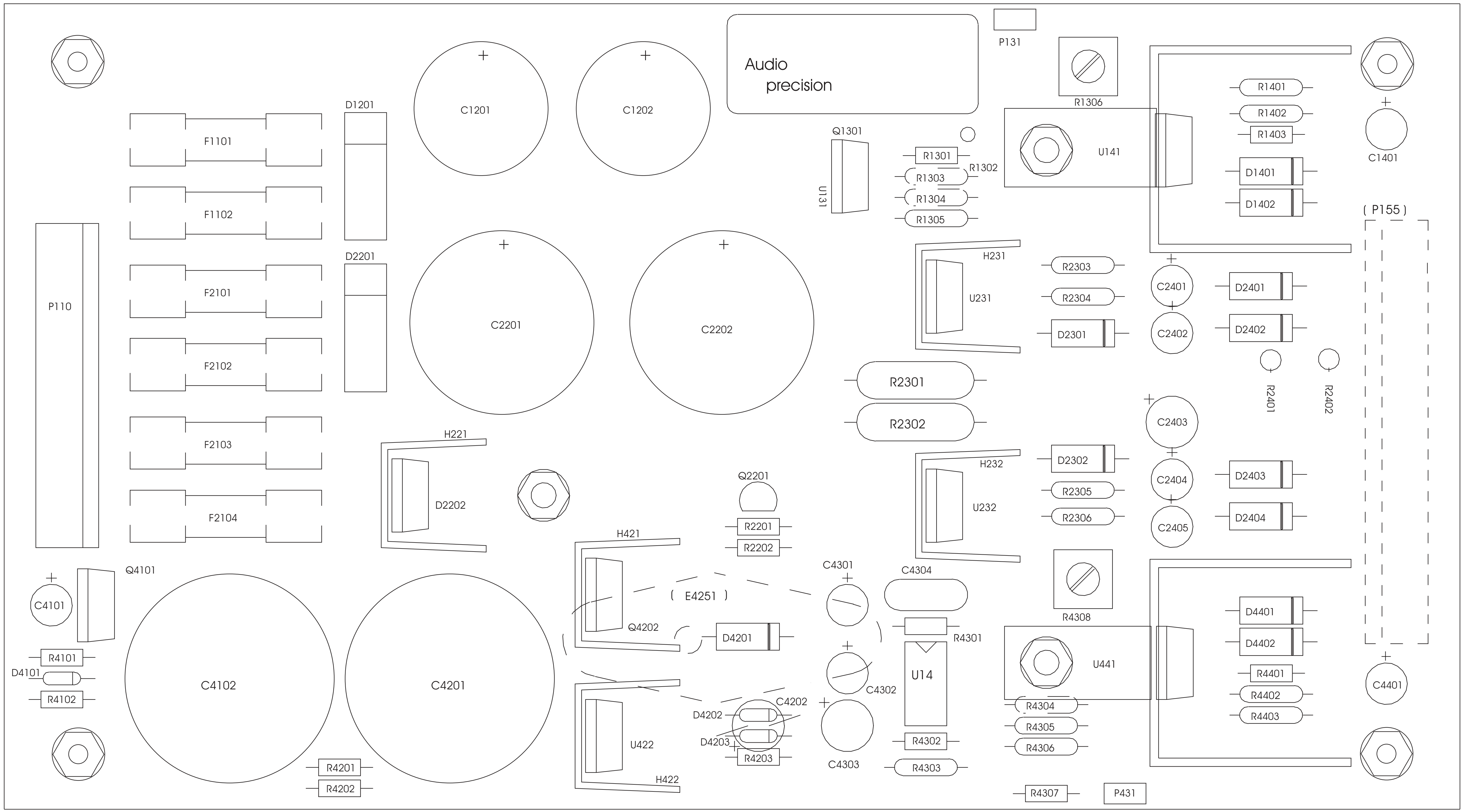

Figure 6-2. 2700 Series PSA module component locations.

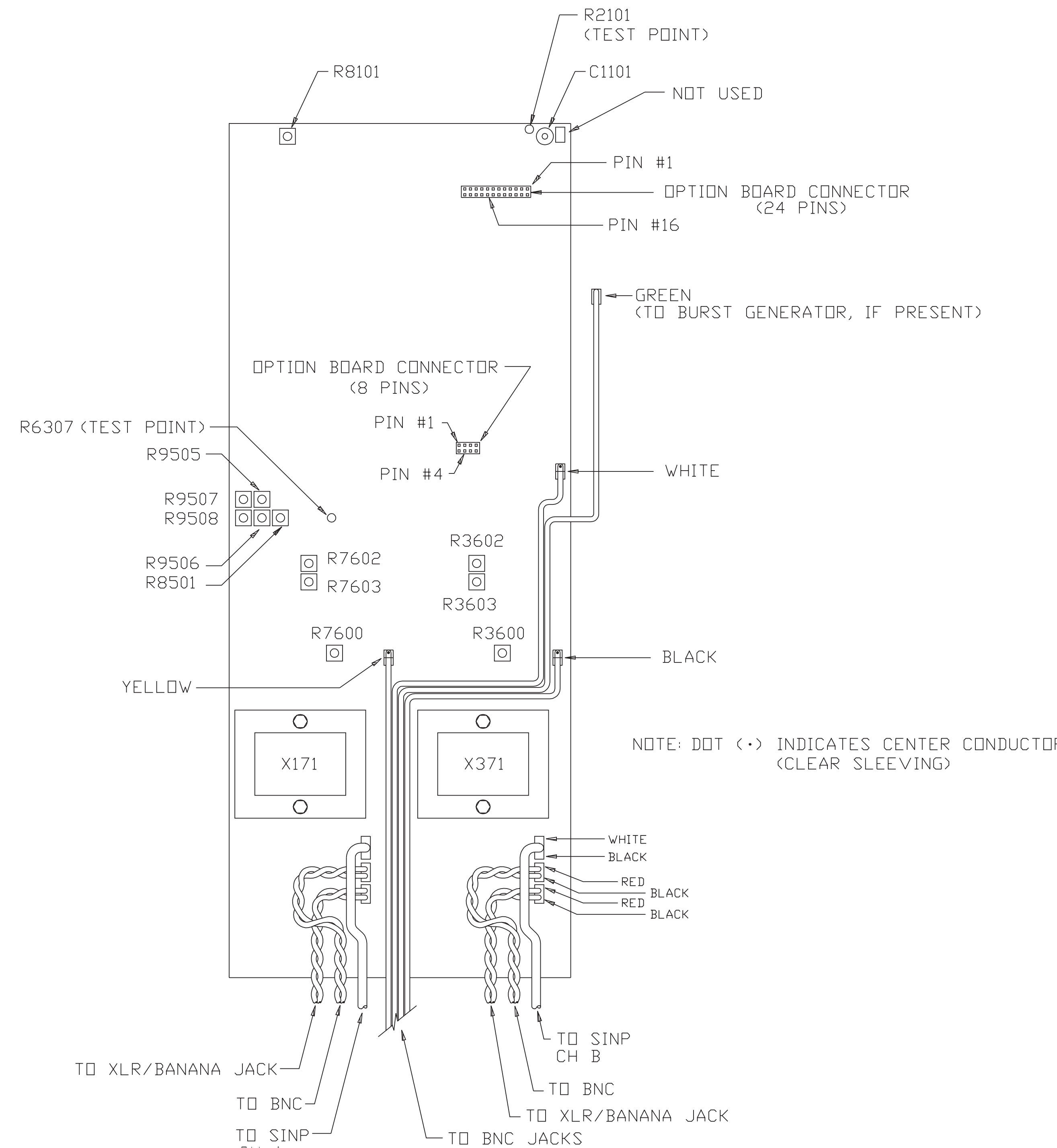

Figure 6-3. 2700 Series GEN module adjustment locations and connections.

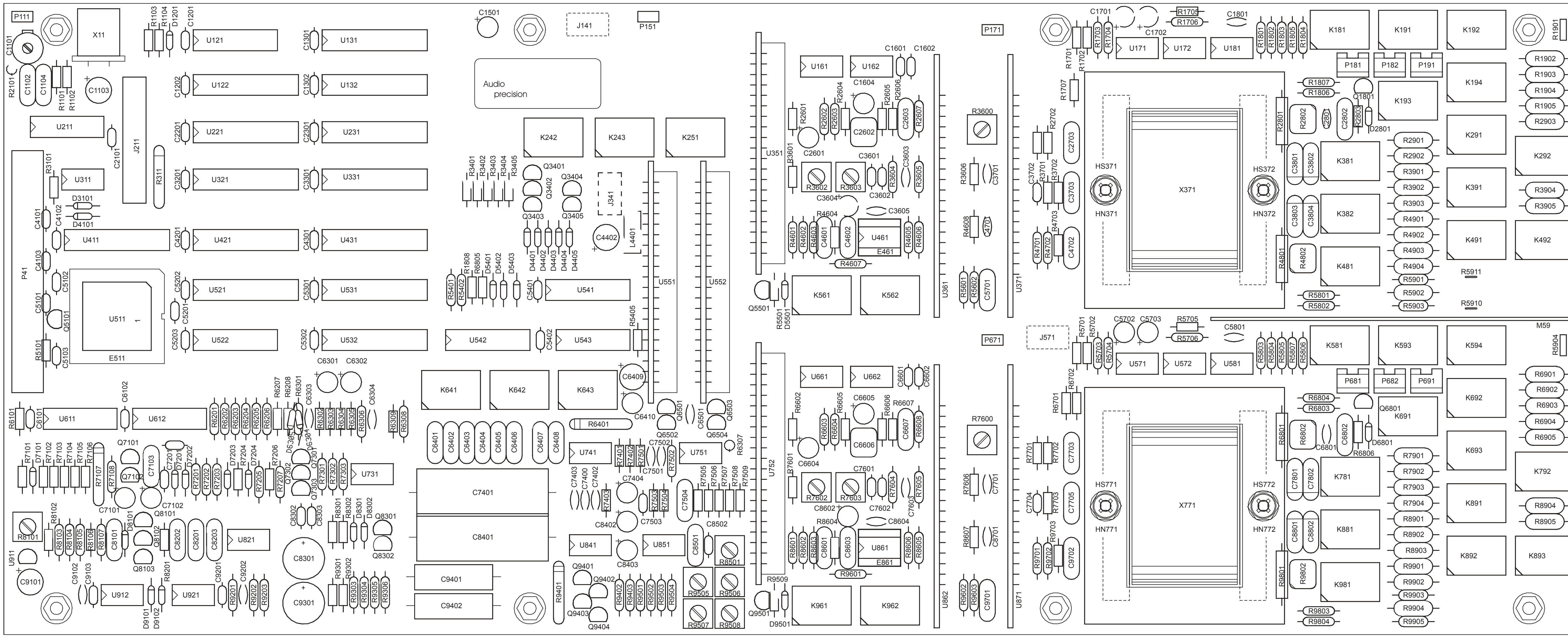

Figure 6-4. 2700 Series GEN module component locations.

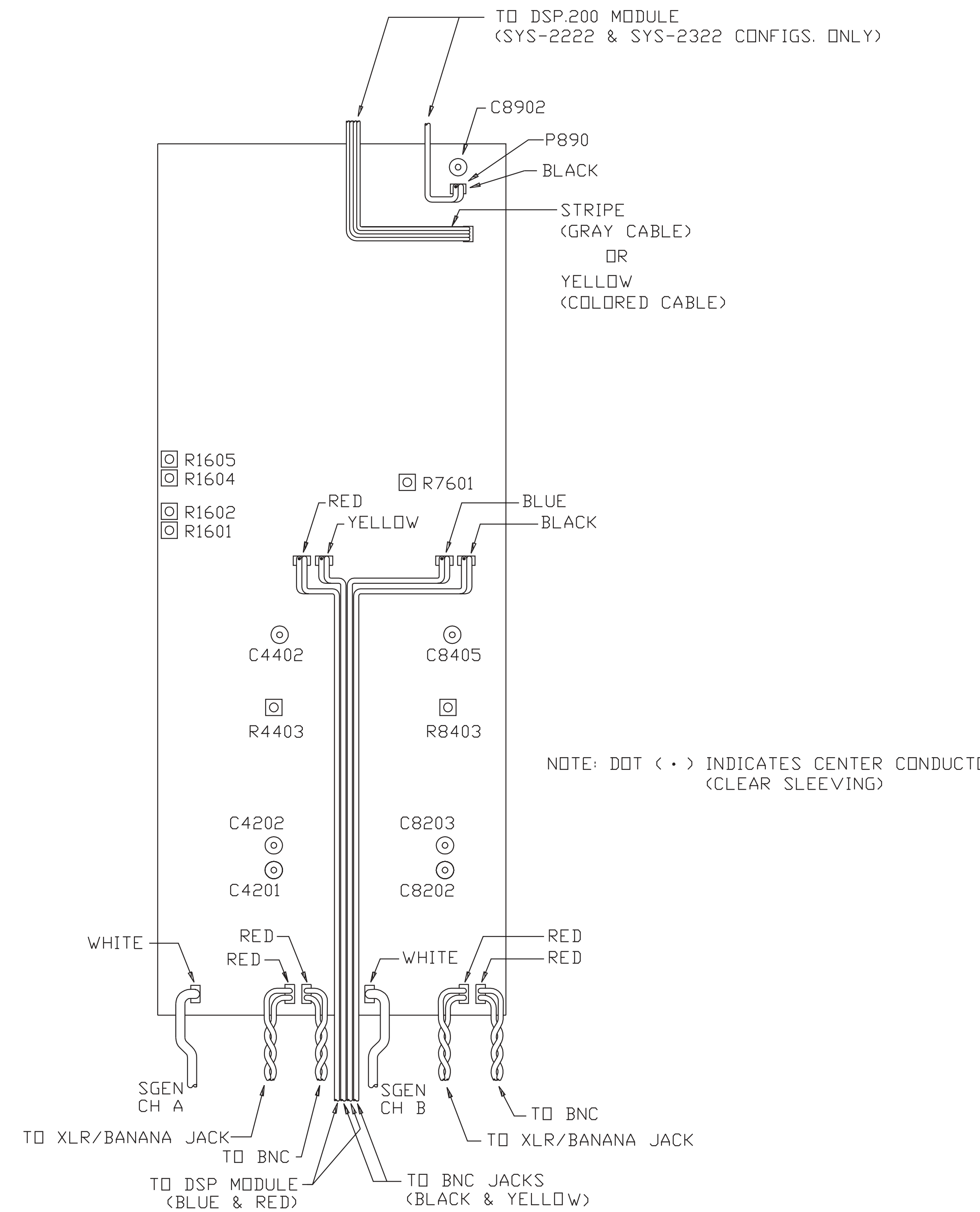

Figure 6-5. 2700 Series INP module adjustment locations and connections.

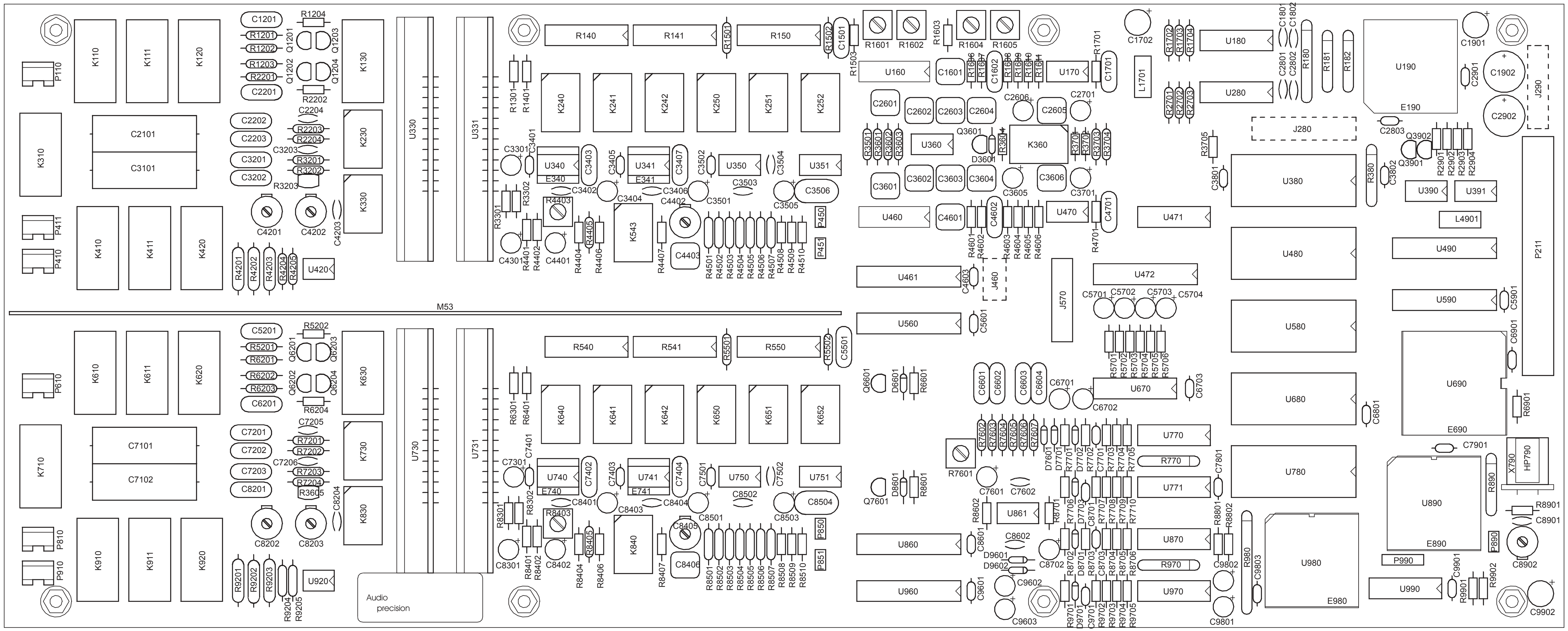

Figure 6-6. 2700 Series INP module component locations.

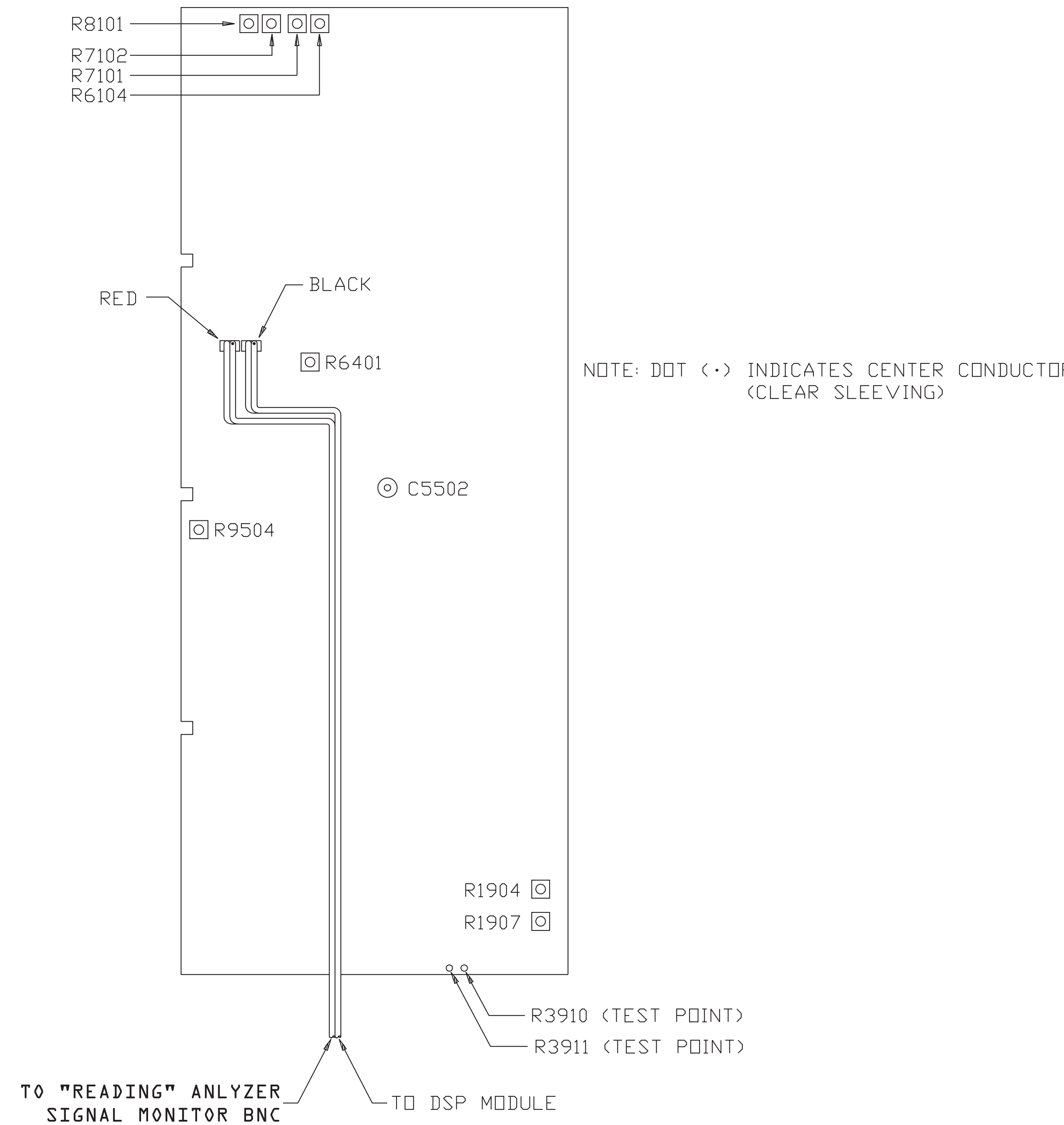

Figure 6-7. 2700 Series ANL module adjustment locations and connections.

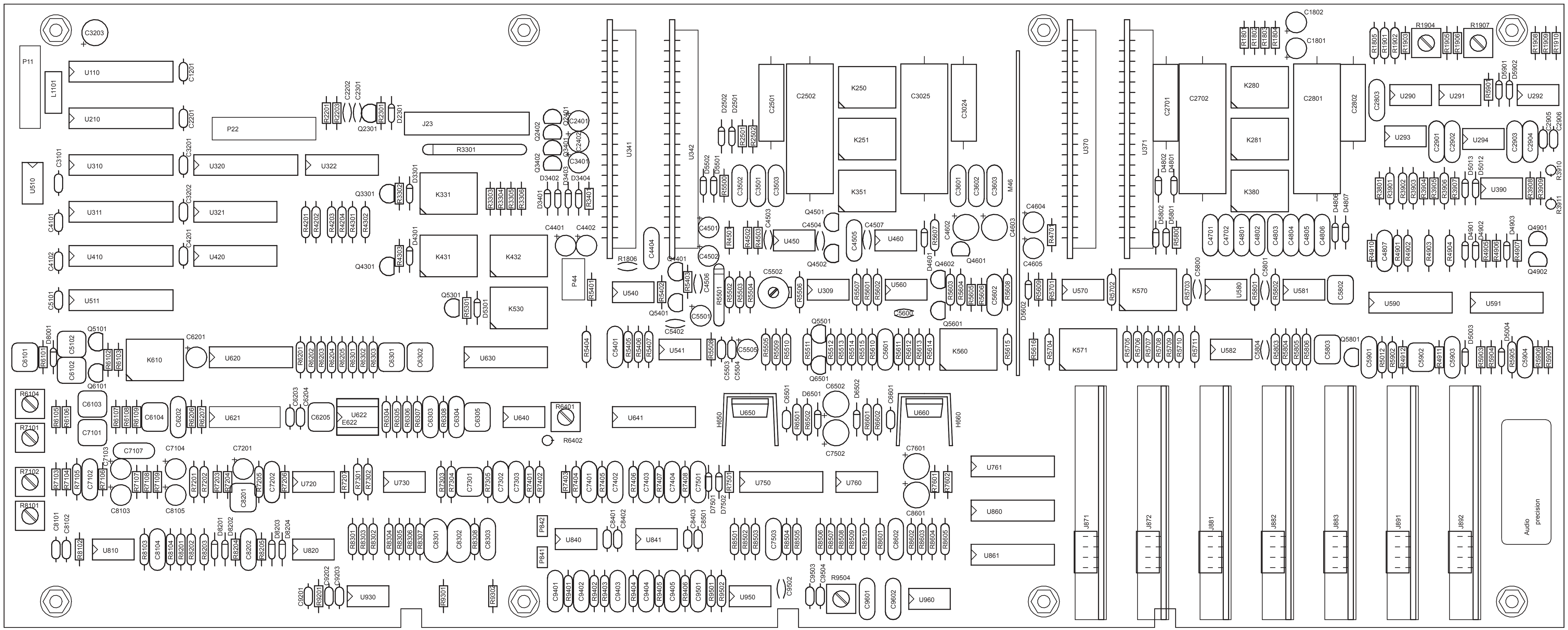

Figure 6-8. 2700 Series ANL module component locations.

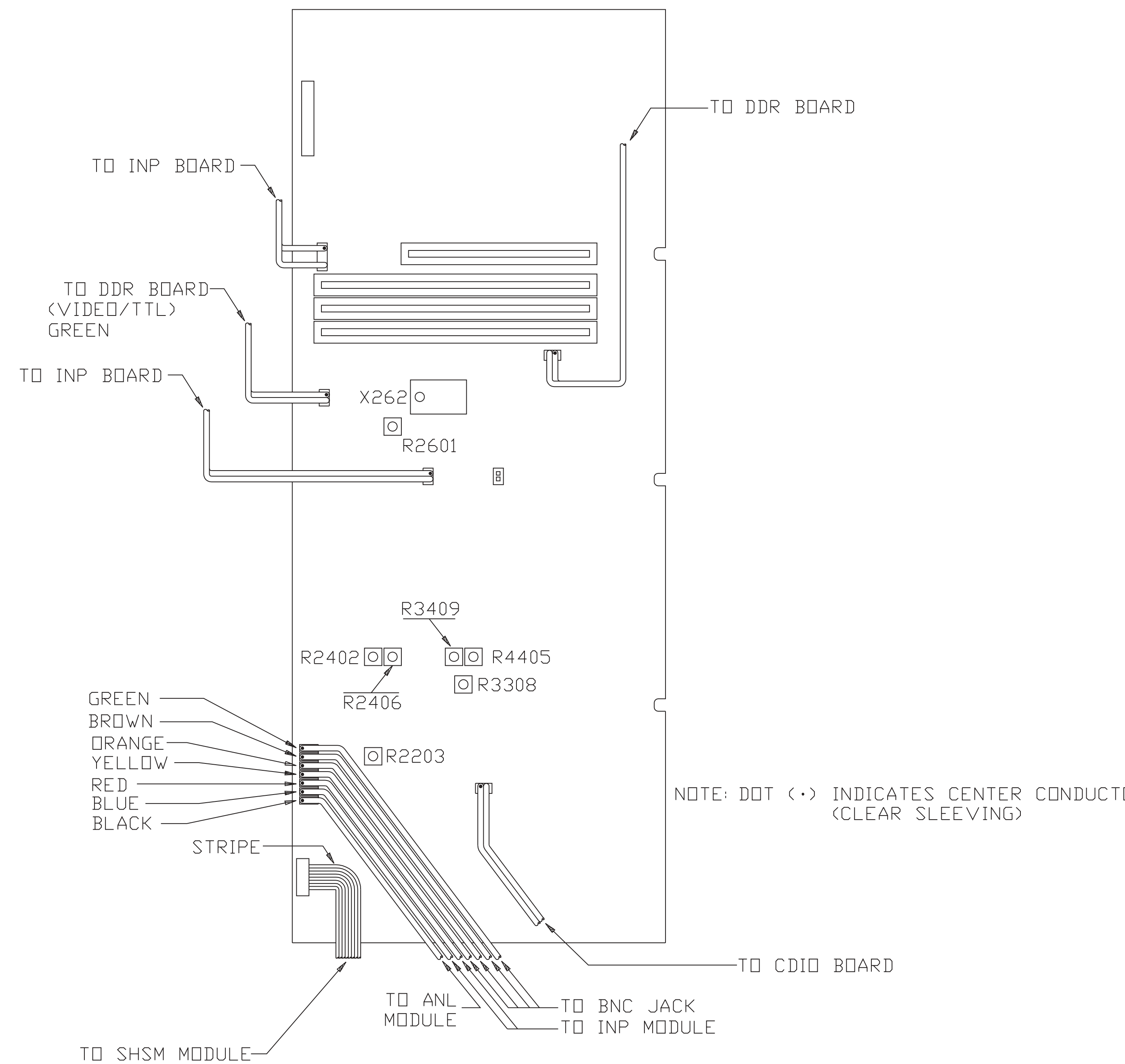

Figure 6-9. 2700 Series DSP module adjustment locations and connections.

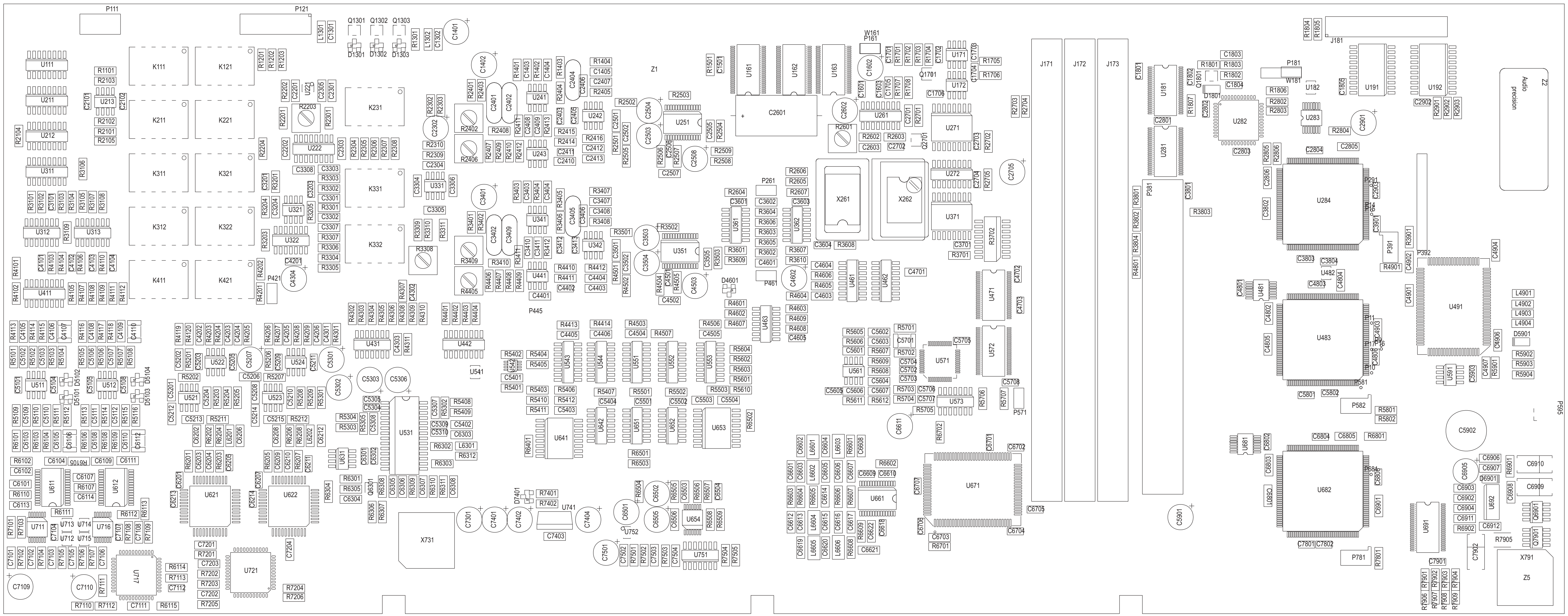

Figure 6-10. 2700 Series DSP module component locations

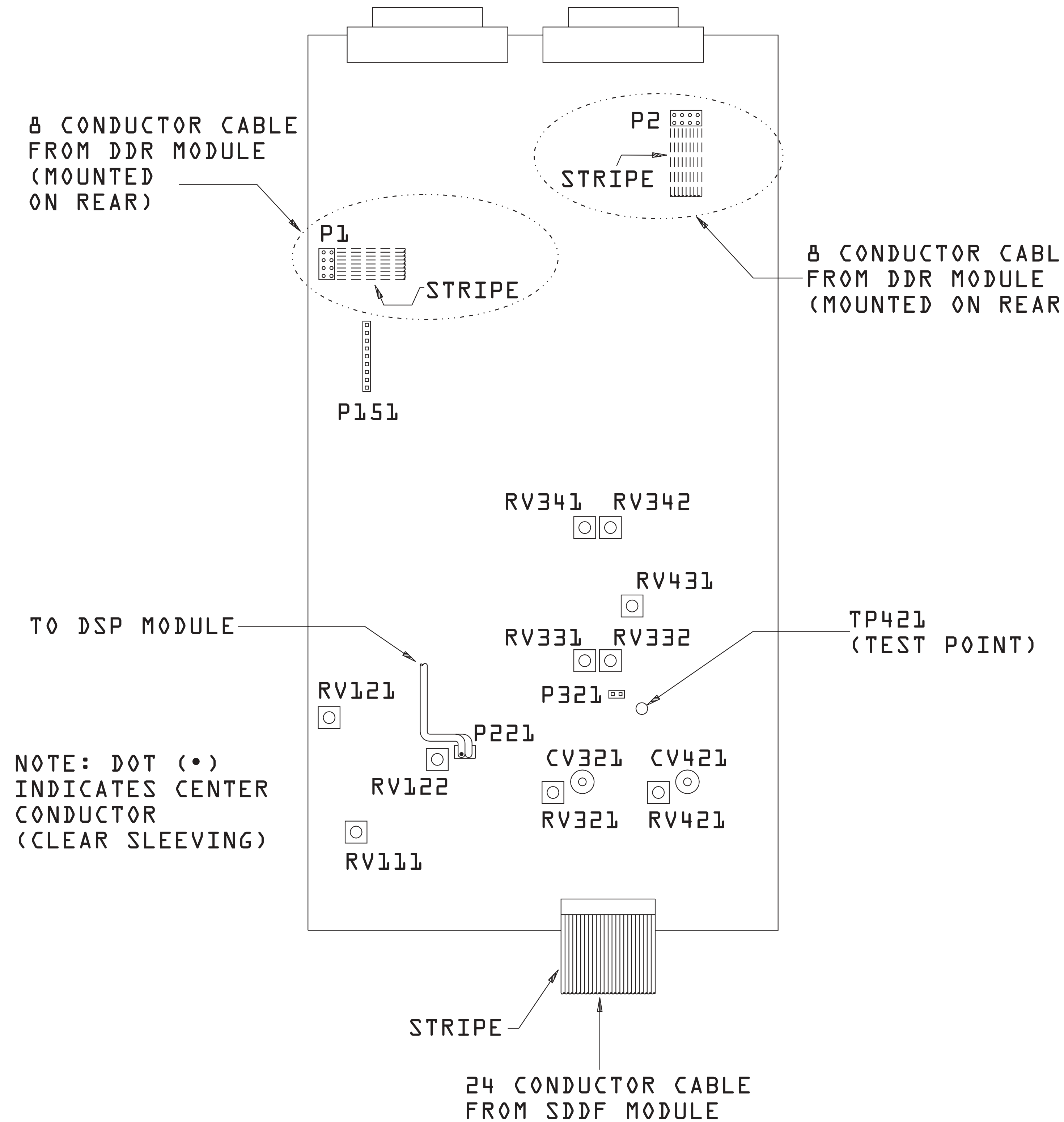

Figure 6-11. 2700 Series DIO module adjustment locations and connections.

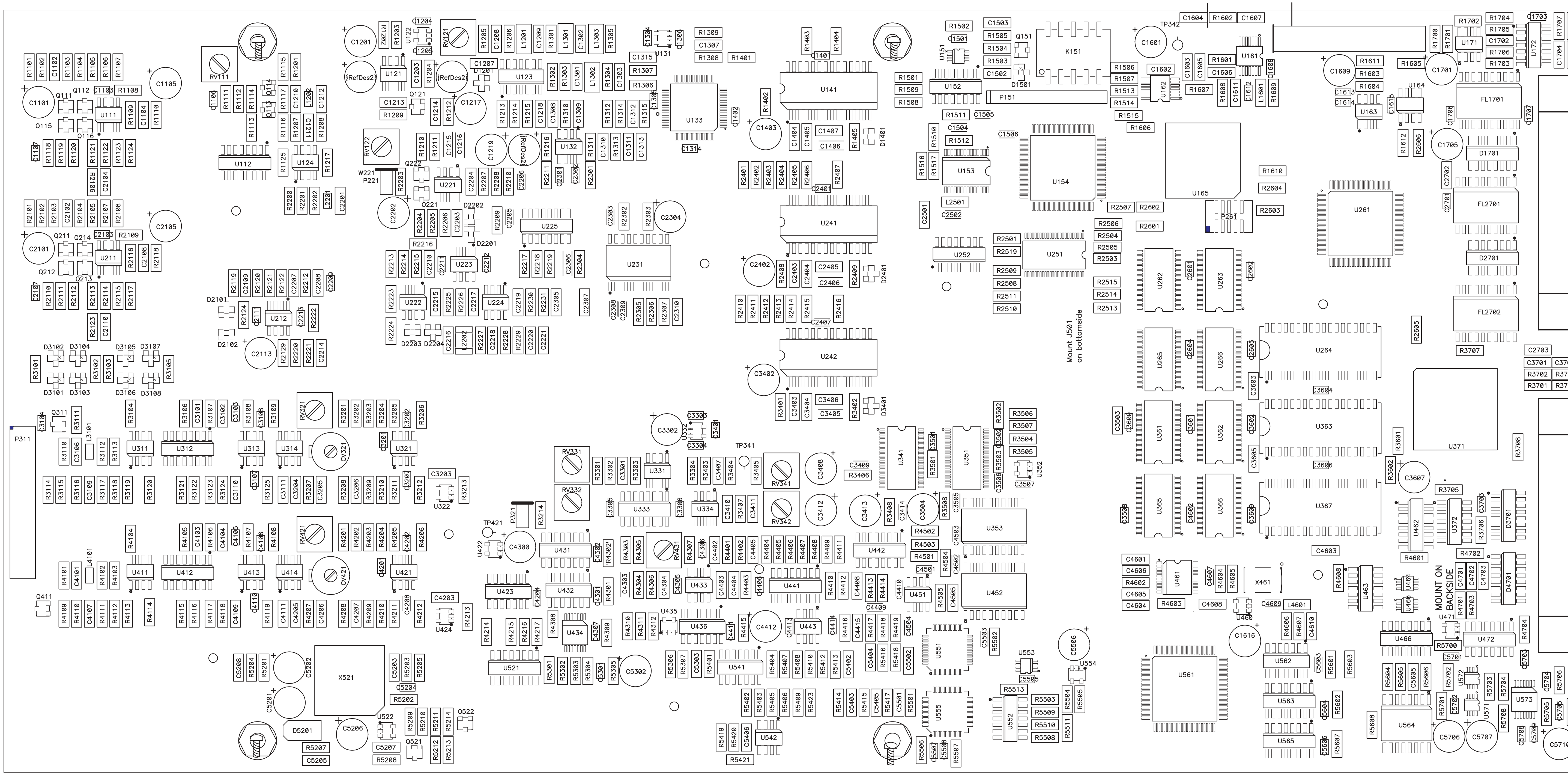

Figure 6-12. 2700 Series DIO module component locations.

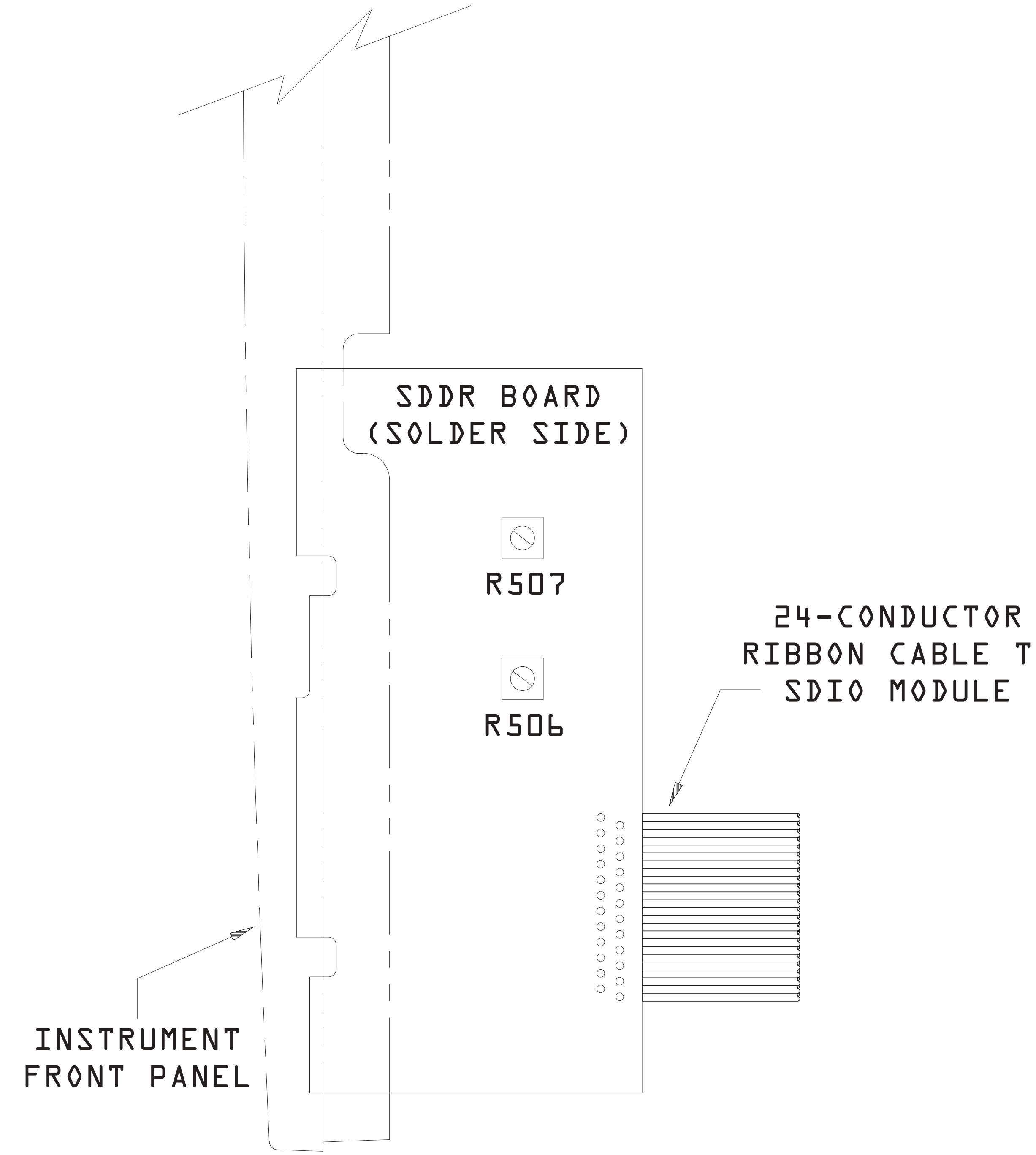

Figure 6-13. 2700 Series DDF module adjustment locations (on solder side of board).

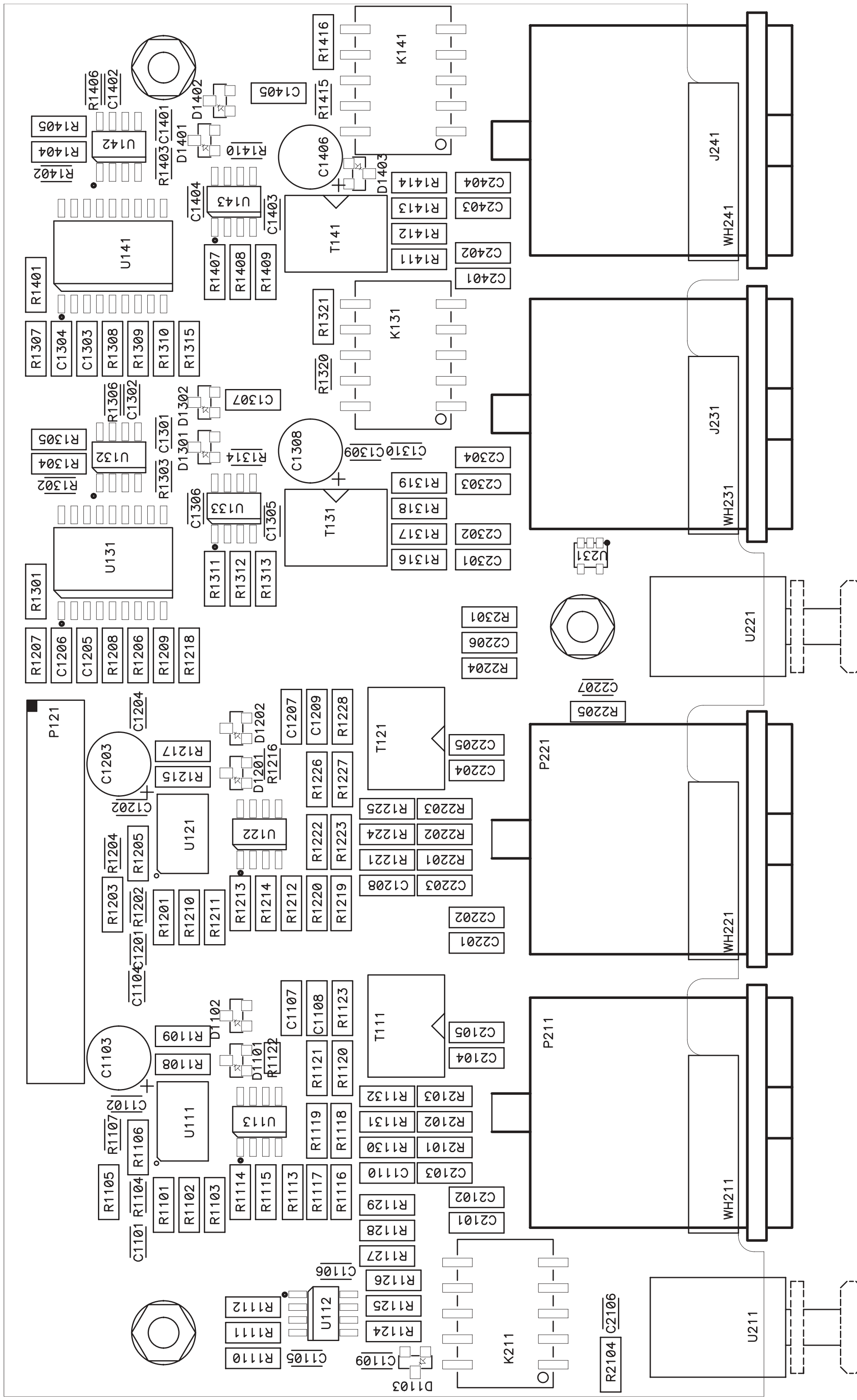

Figure 6-14. 2700 Series DDF module component locations.

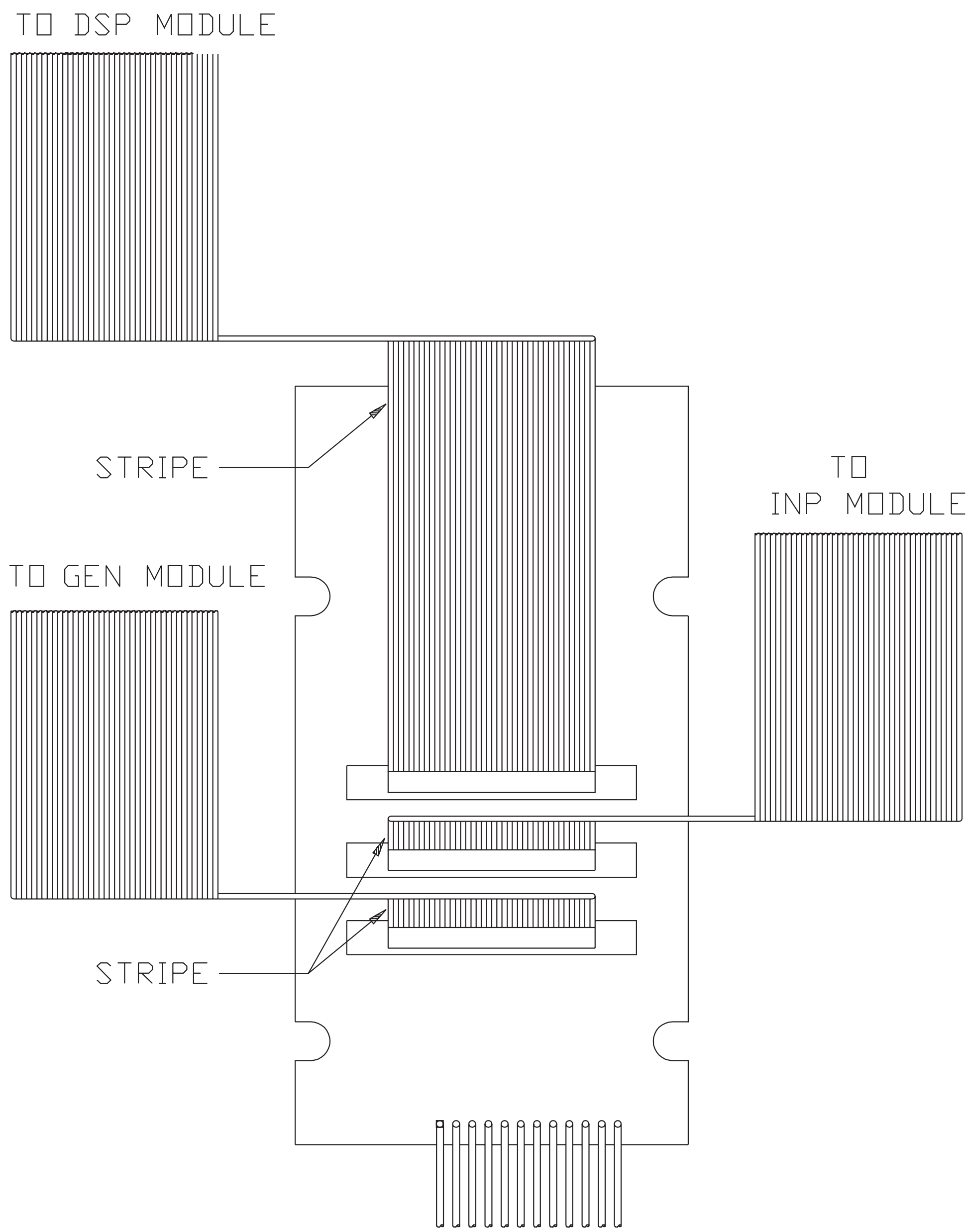

Figure 6-15. 2700 Series IFM module connections.

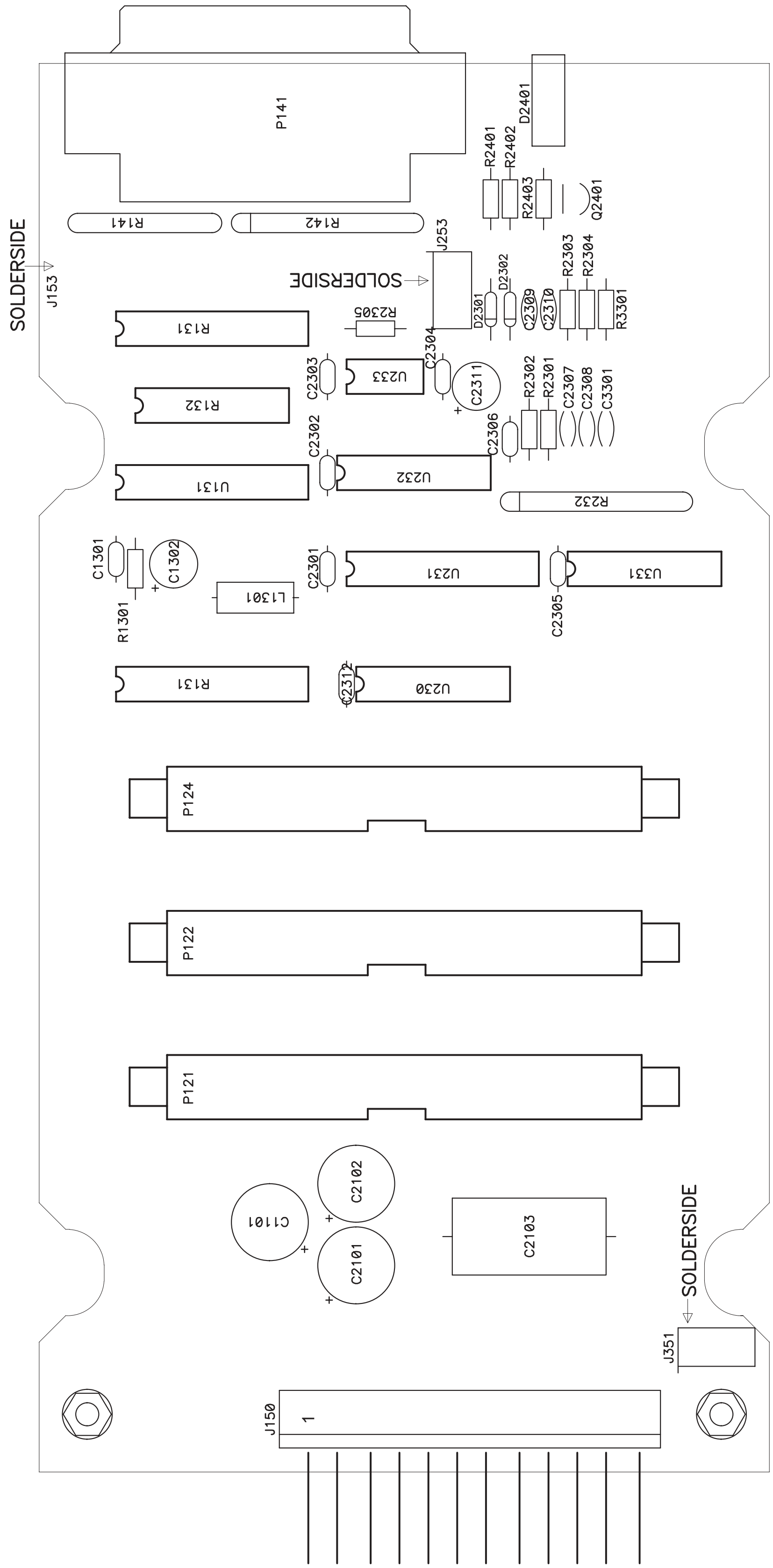

Figure 6-16. 2700 Series IFM module component locations.

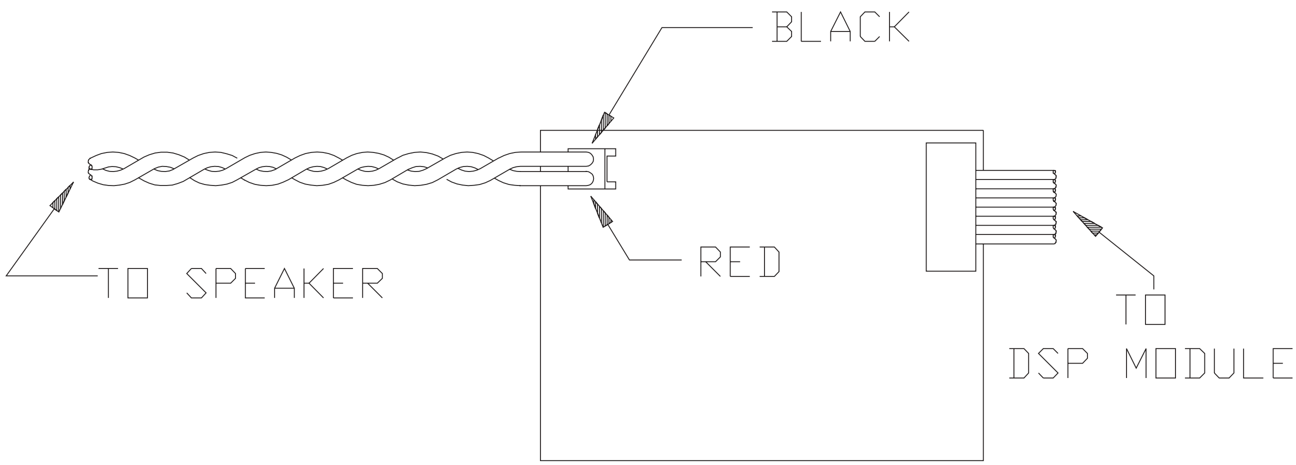

Figure 6-17. 2700 Series HSM module connections.

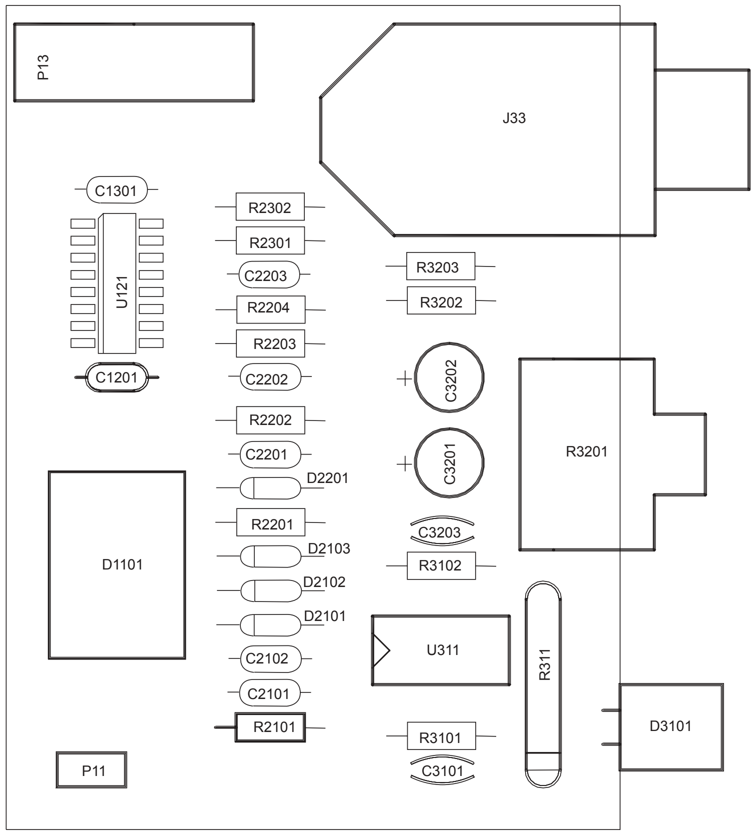

Figure 6-18. 2700 Series HSM module component locations.

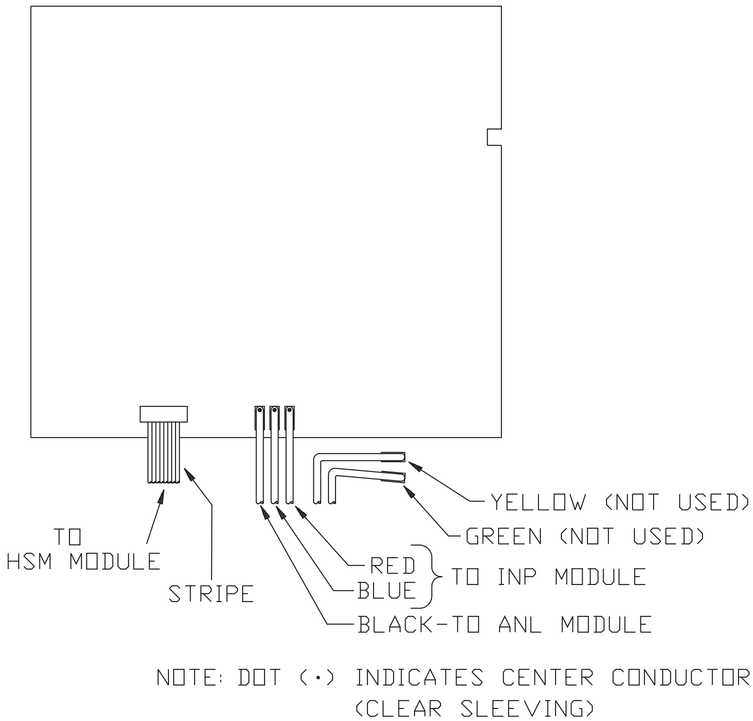

Figure 6-19. 2700 Series MUX module connections.

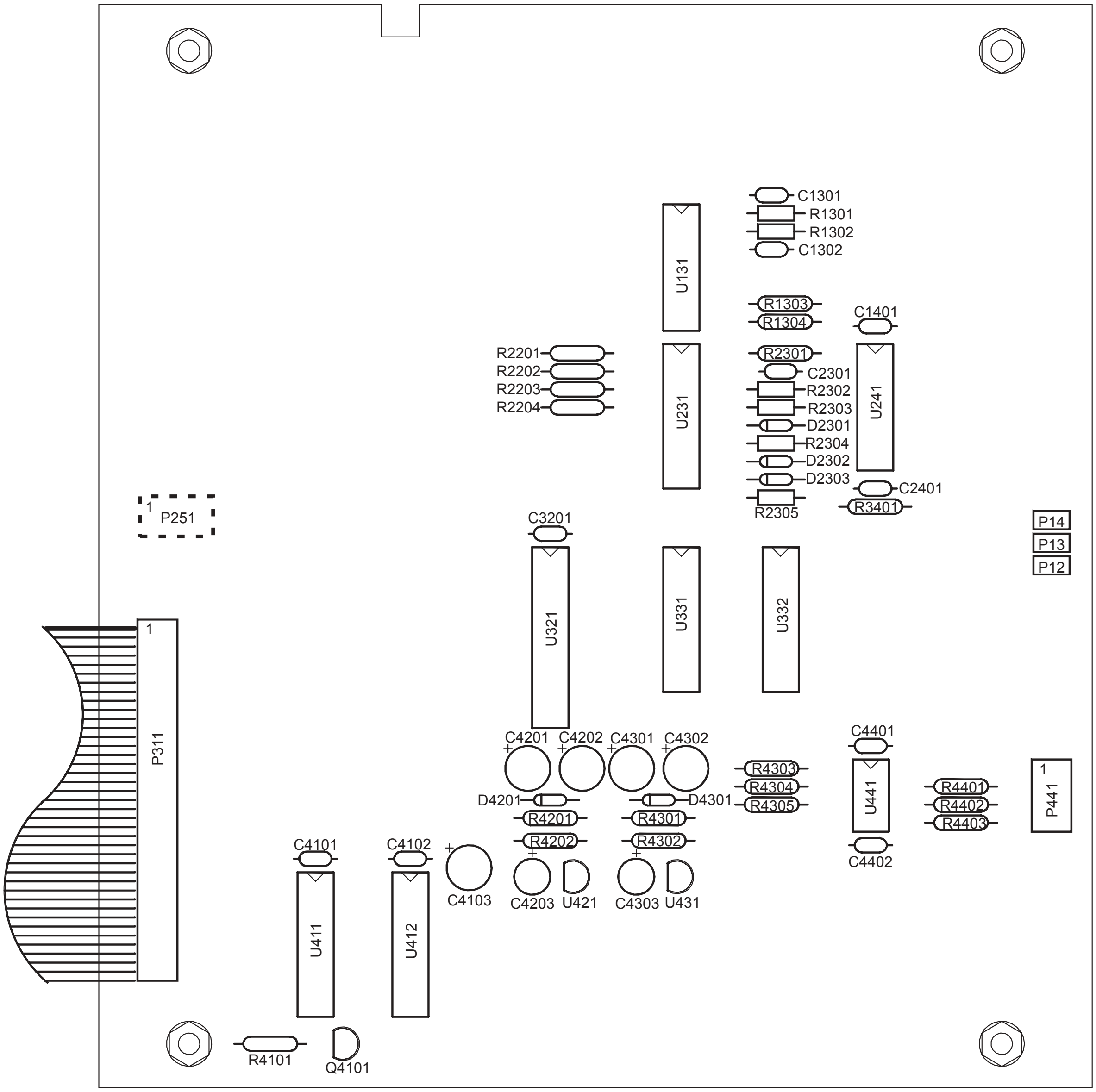

Figure 6-20. 2700 Series MUX module component locations.

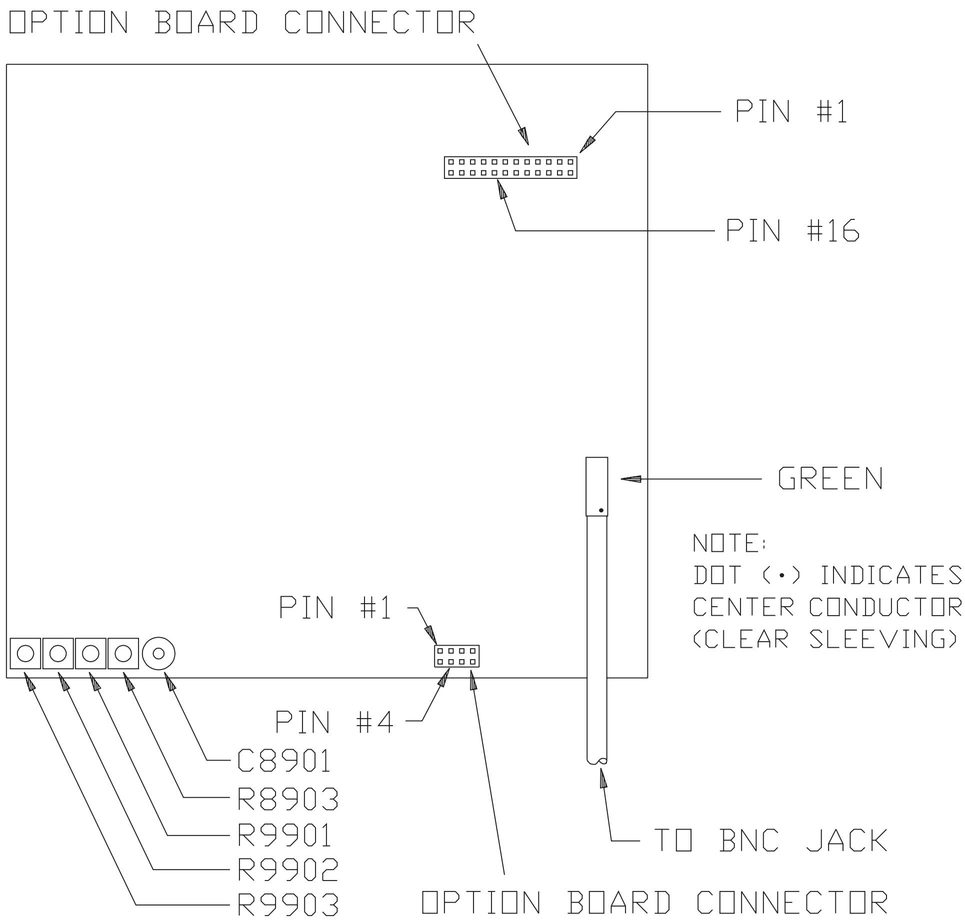

Figure 6-21. 2700 Series BUR module adjustment locations and connections.

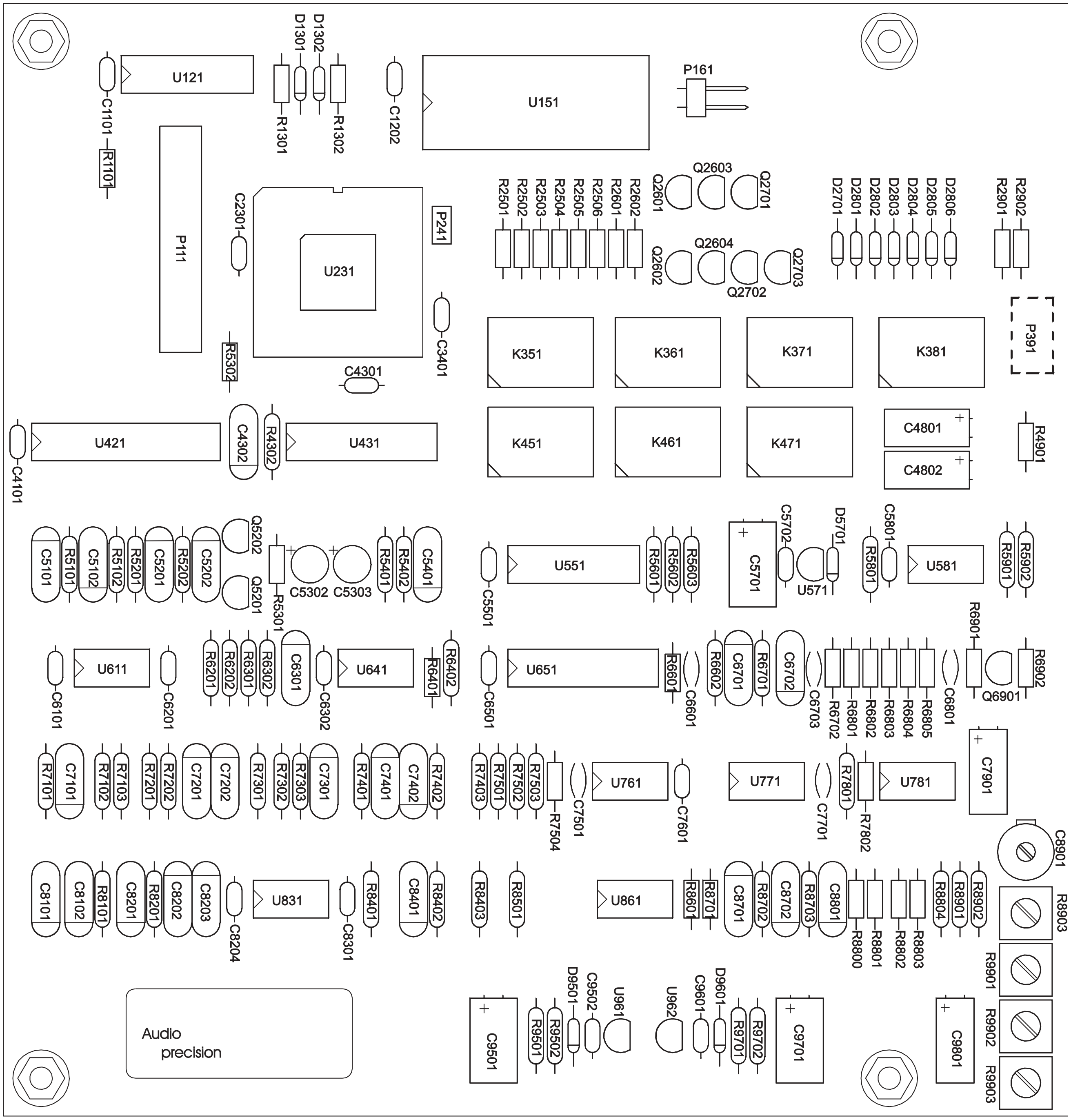

Figure 6-22. 2700 Series BUR module component locations.

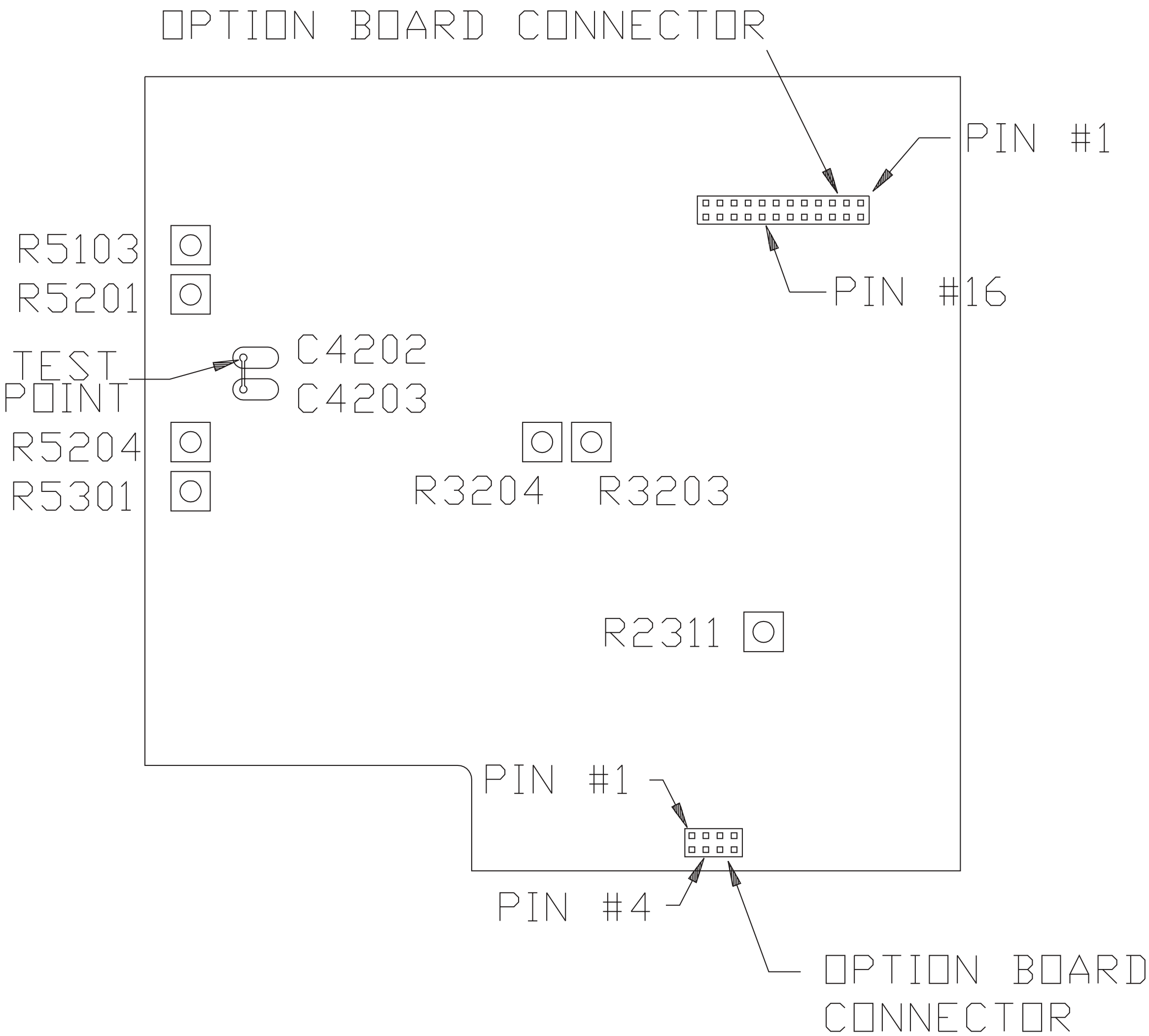

Figure 6-23. 2700 Series IMG module adjustment locations and connections

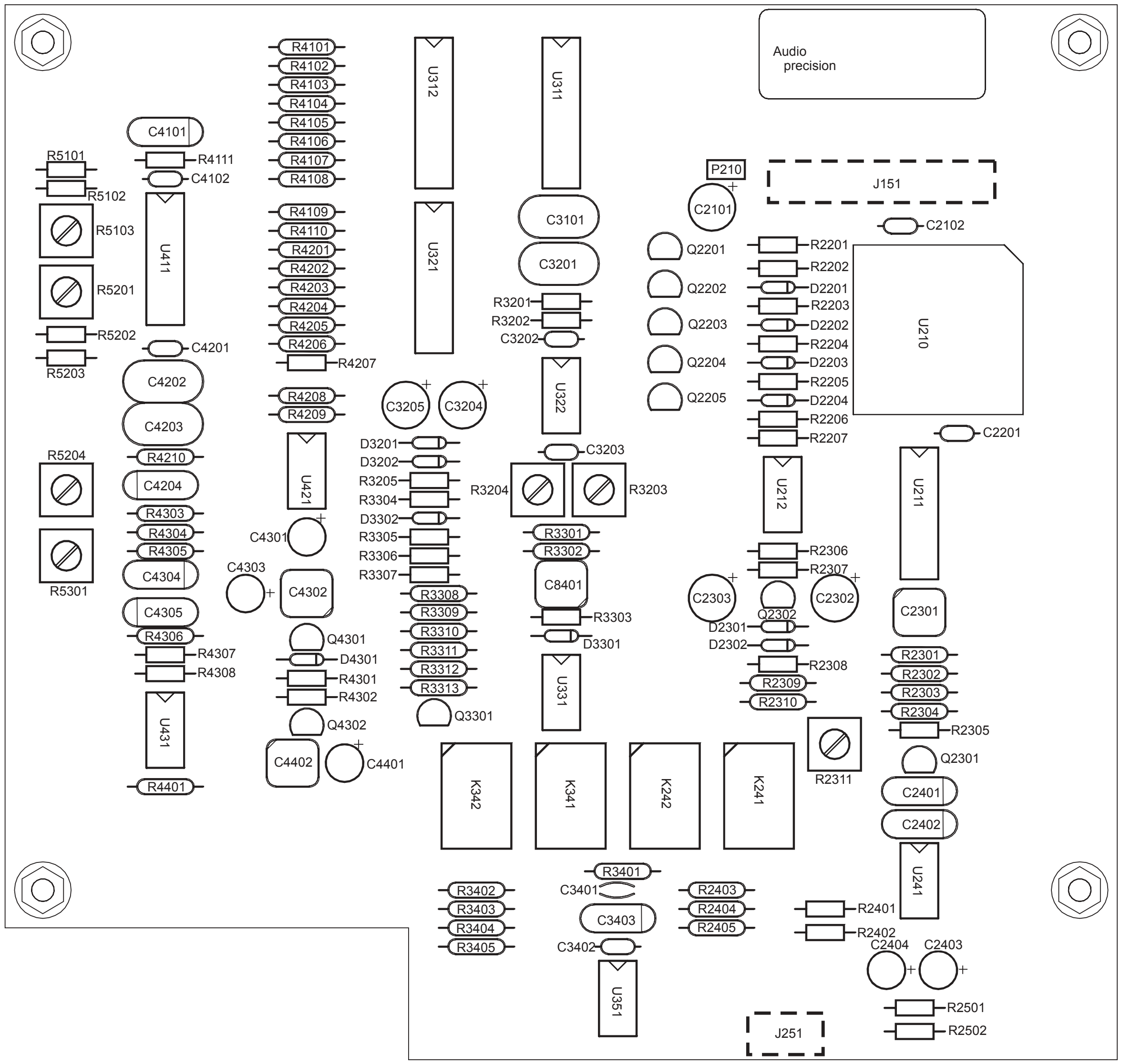

Figure 6-24. 2700 Series IMG module component locations.

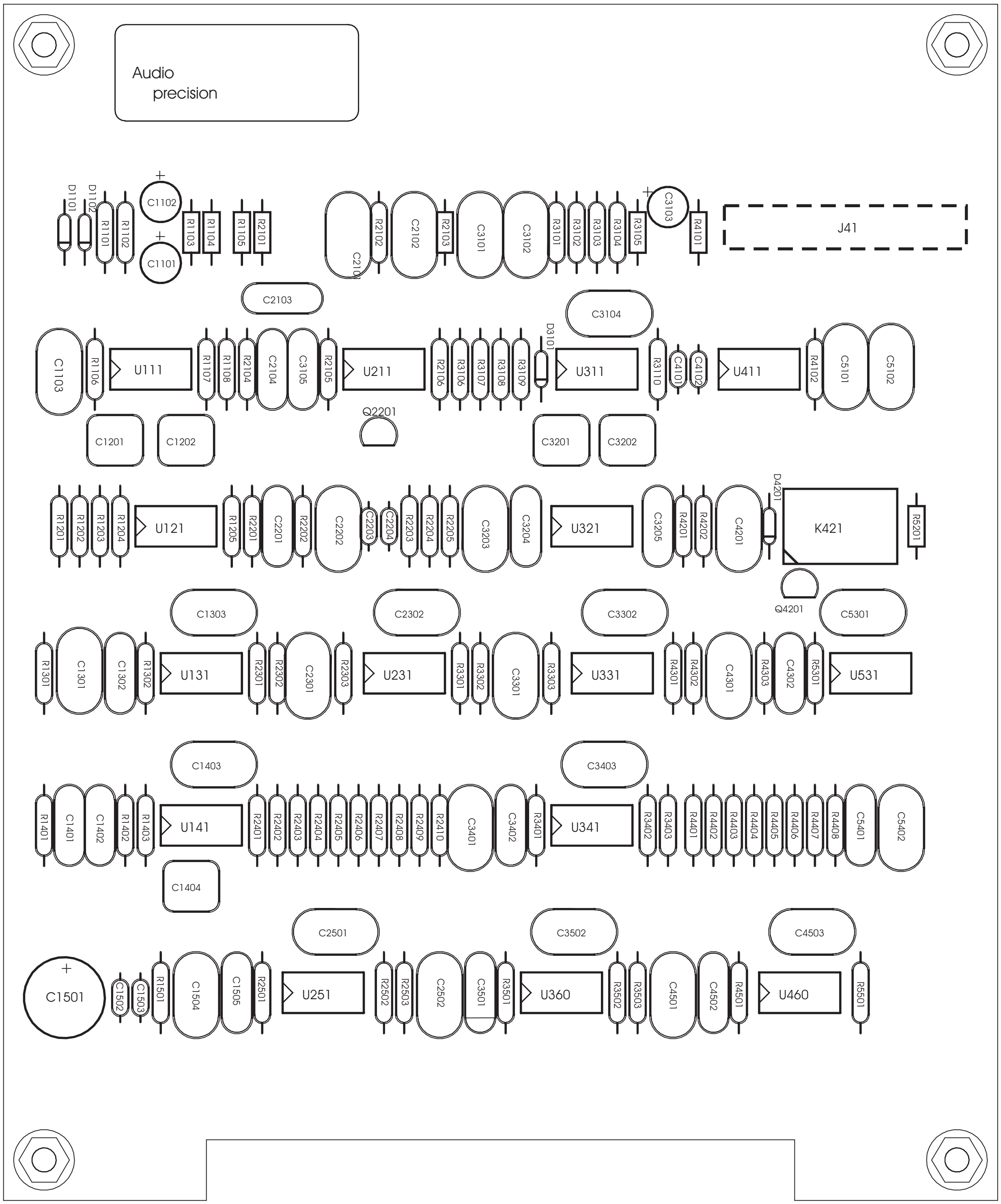

Figure 6-25. 2700 Series IMA module component locations.

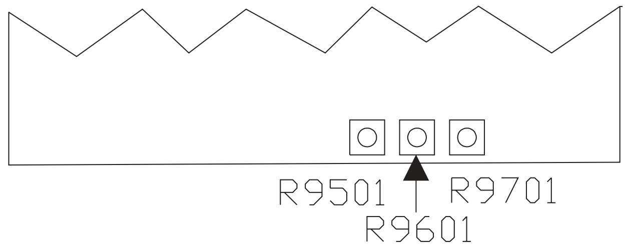

Figure 6-26. 2700 Series WFA module adjustmen locations.

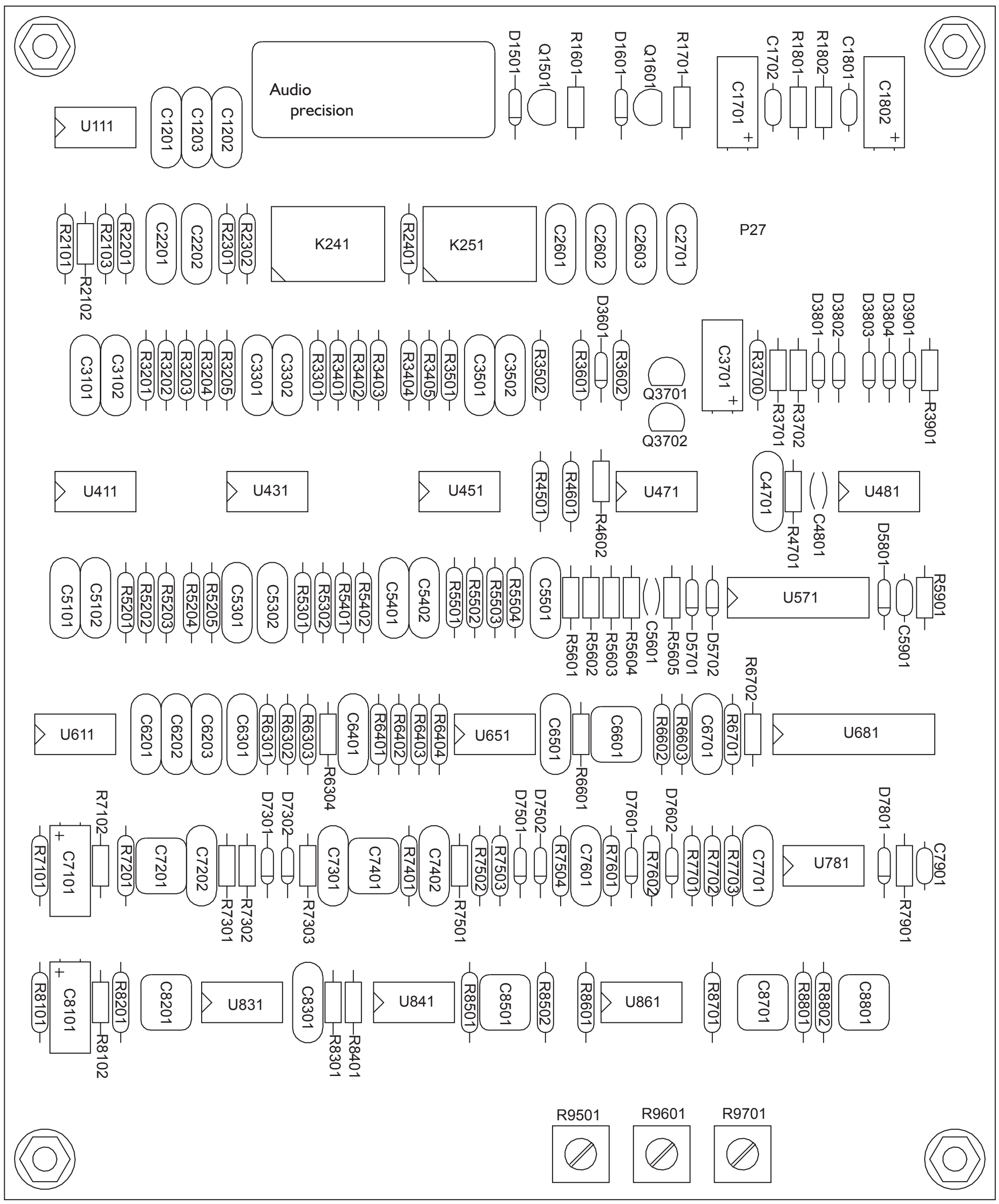

Figure 6-27. 2700 Series WFA module component locations.

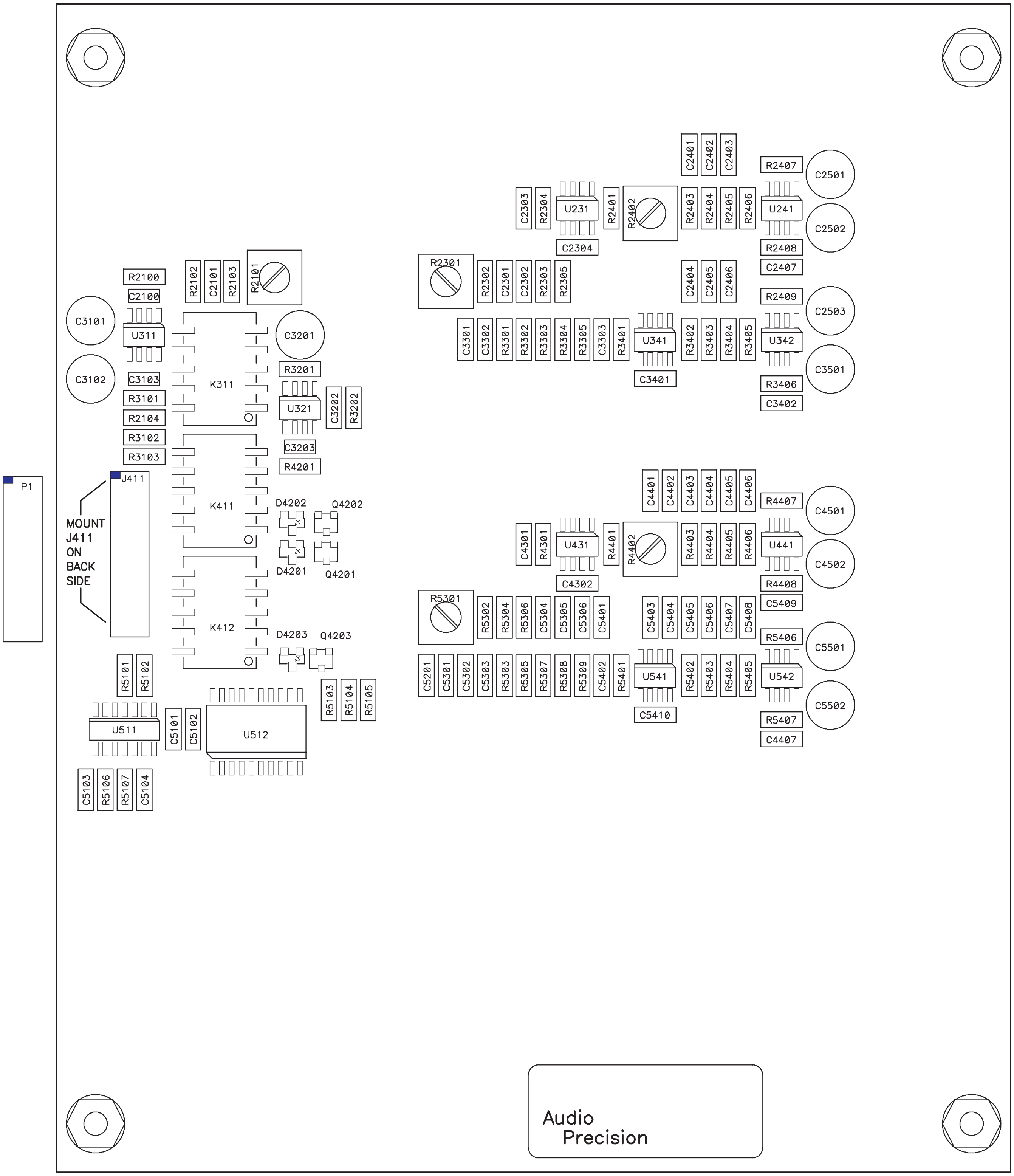

Figure 6-28. 2700 Series SLPX module component and adjustment locations.

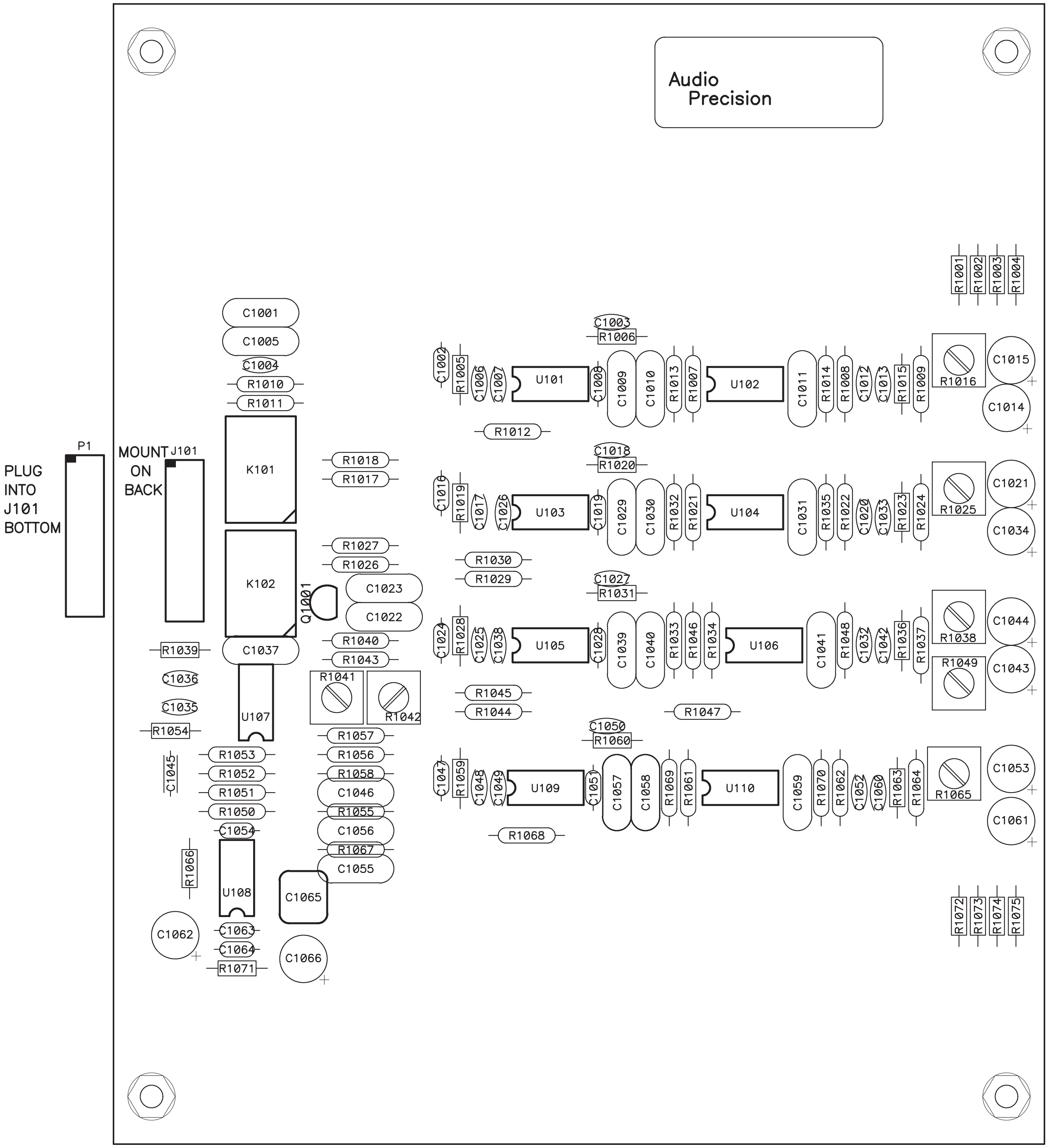

Figure 6-29. 2700 Series SAES module component and adjustment locations.

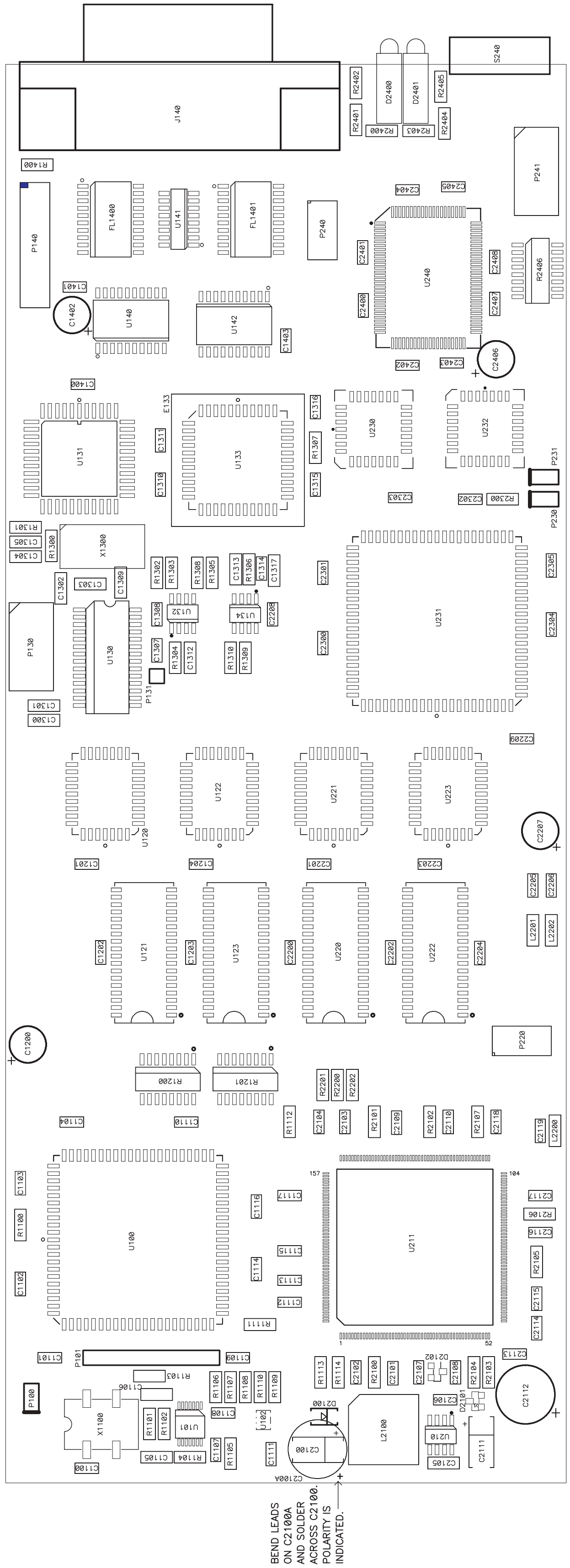

Figure 6-30. 2700 Series SIFG module component locations.

Chapter 6b: Electronics Diagrams, Cascade *Plus*

This chapter contains main printed circuit board (PCB) drawings showing the location of adjustments and cables, and option circuit board assemblies and main PCB detail drawings showing component designators. All information is believed to be accurate as of the publication date; however, Audio Precision reserves the right to make changes without prior notice.

COMPONENT AND ASSEMBLY DESIGNATIONS

A	Assembly
BT	Battery
C	Capacitor, fixed or variable
D	Diode
E	Socket or mechanical part
F	Fuse
H	Heat sink or radiator
HS	Heat sink or mounting hardware
J	Connector, female
K	Relay
L	Inductor, fixed or variable
P	Connector, male
Q	Transistor, FET, or SCR
R	Resistor, fixed or variable
S	Switch or contact
TP	Test Point
U	Integrated Circuit
W	Wire strap or Cable
X	Transformer
Y	Crystal

Cascade *Plus*

FUSE SPECIFICATION

A	5X20 MM, TYPE T (S B), 6.3 A
B	5X20 MM, TYPE T (S B), 2.5 A

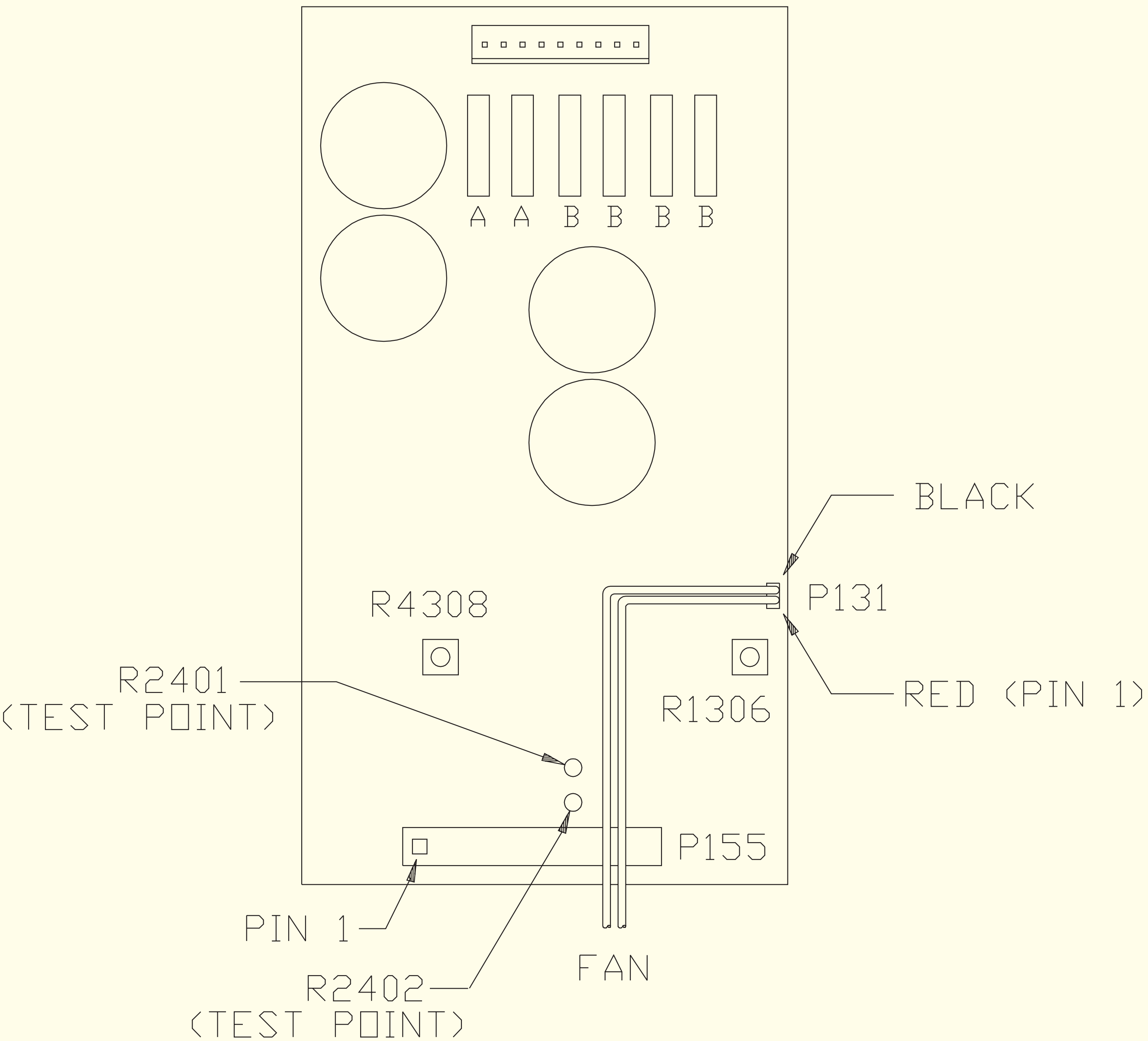

Figure 6-31. Cascade Plus PSA module test points and adjustment locations.

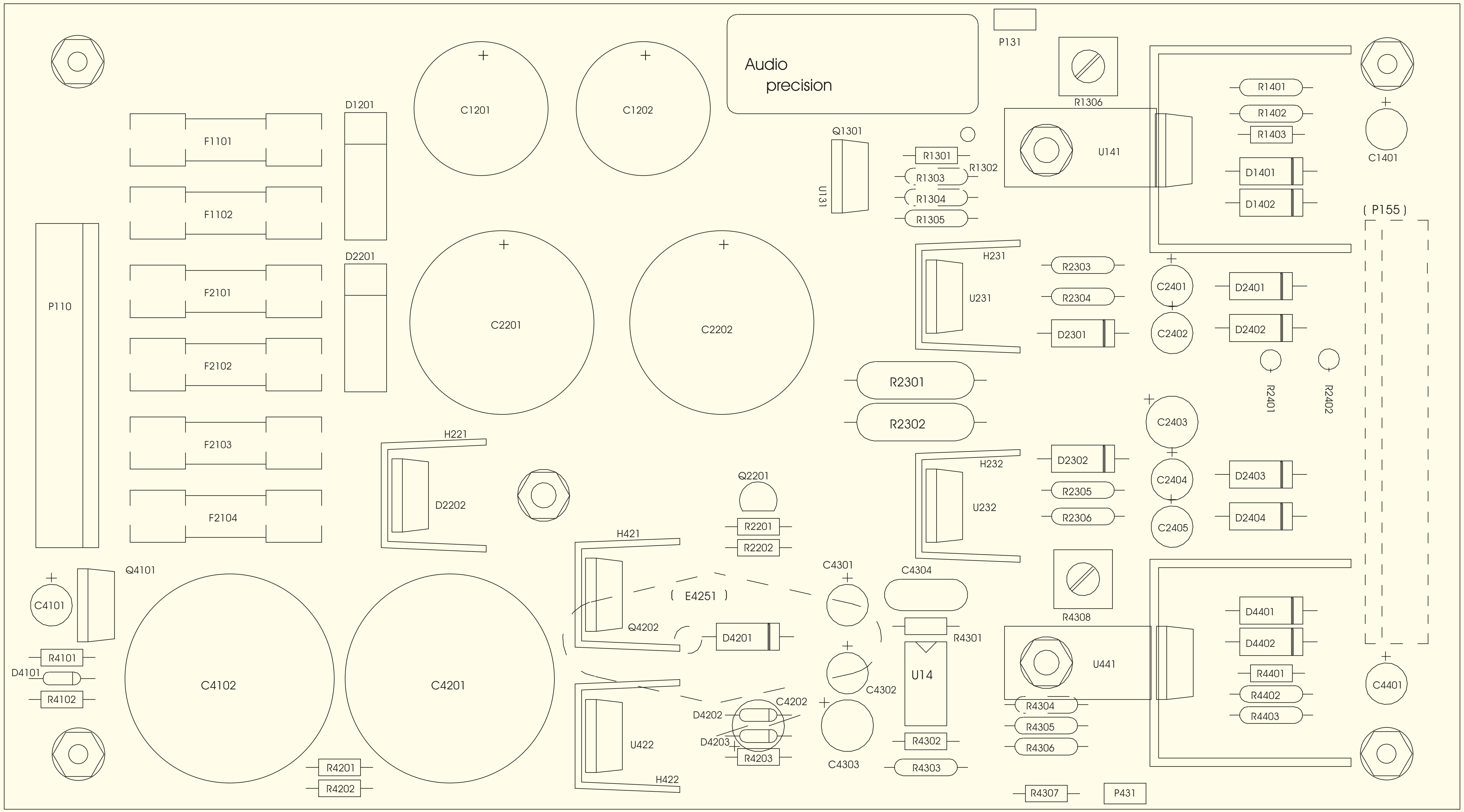

Figure 6-32. Cascade Plus PSA module component locations.

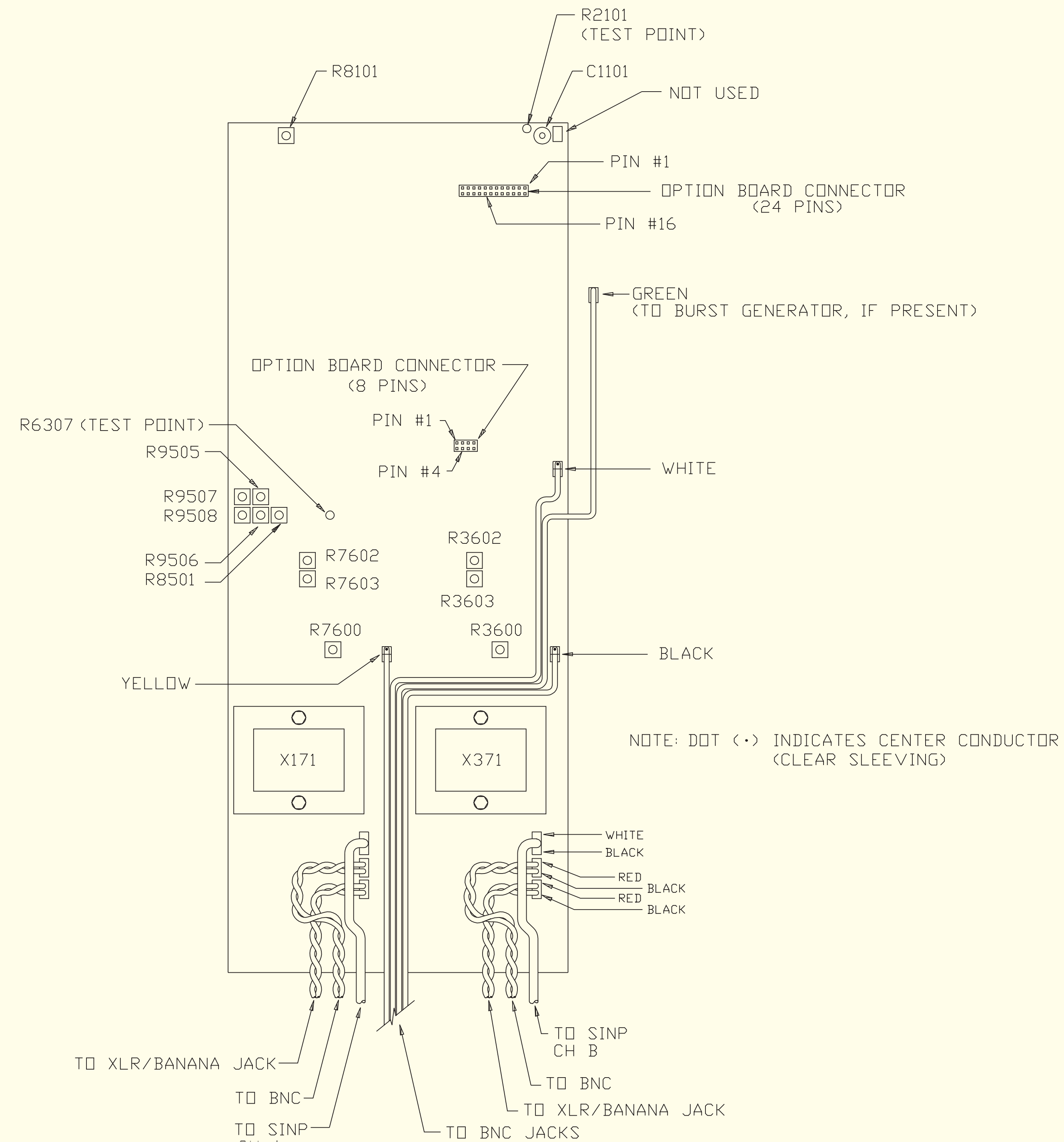

Figure 6-33. Cascade Plus GEN module adjustment locations and connections.

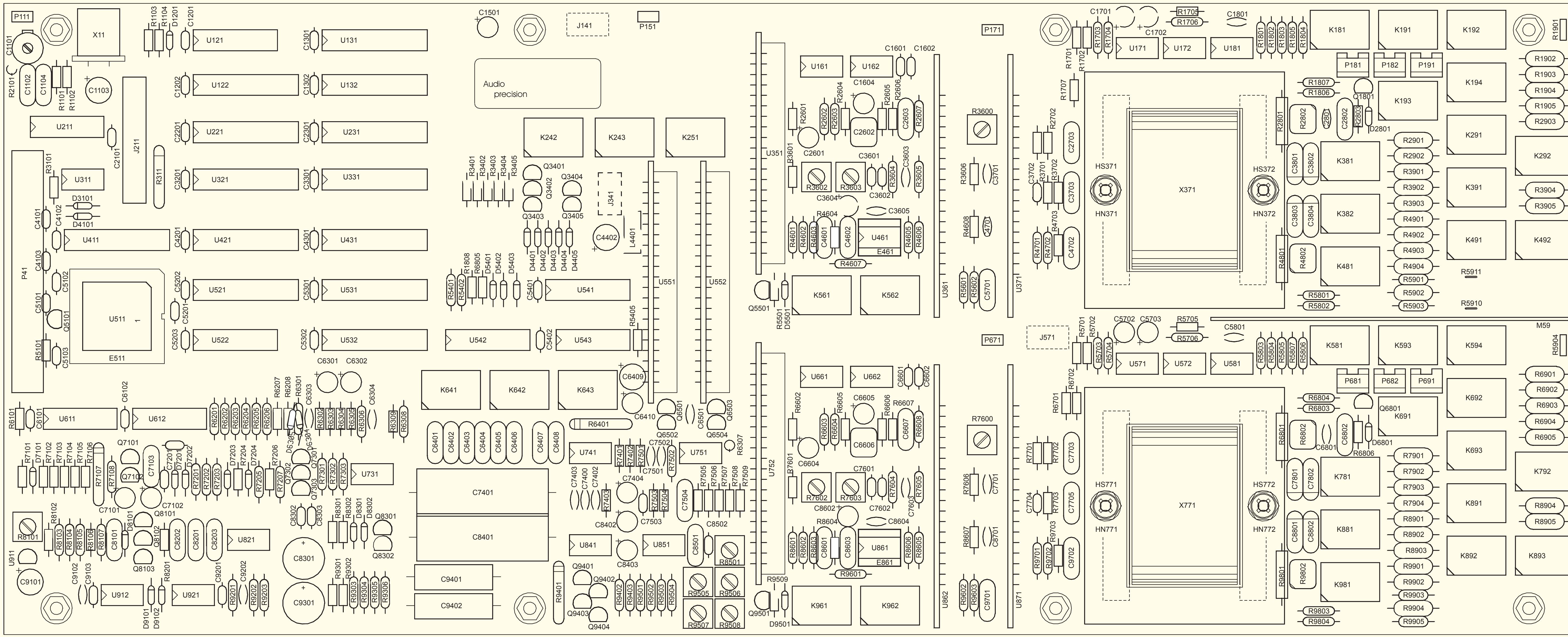

Figure 6-34. Cascade Plus GEN module component locations.

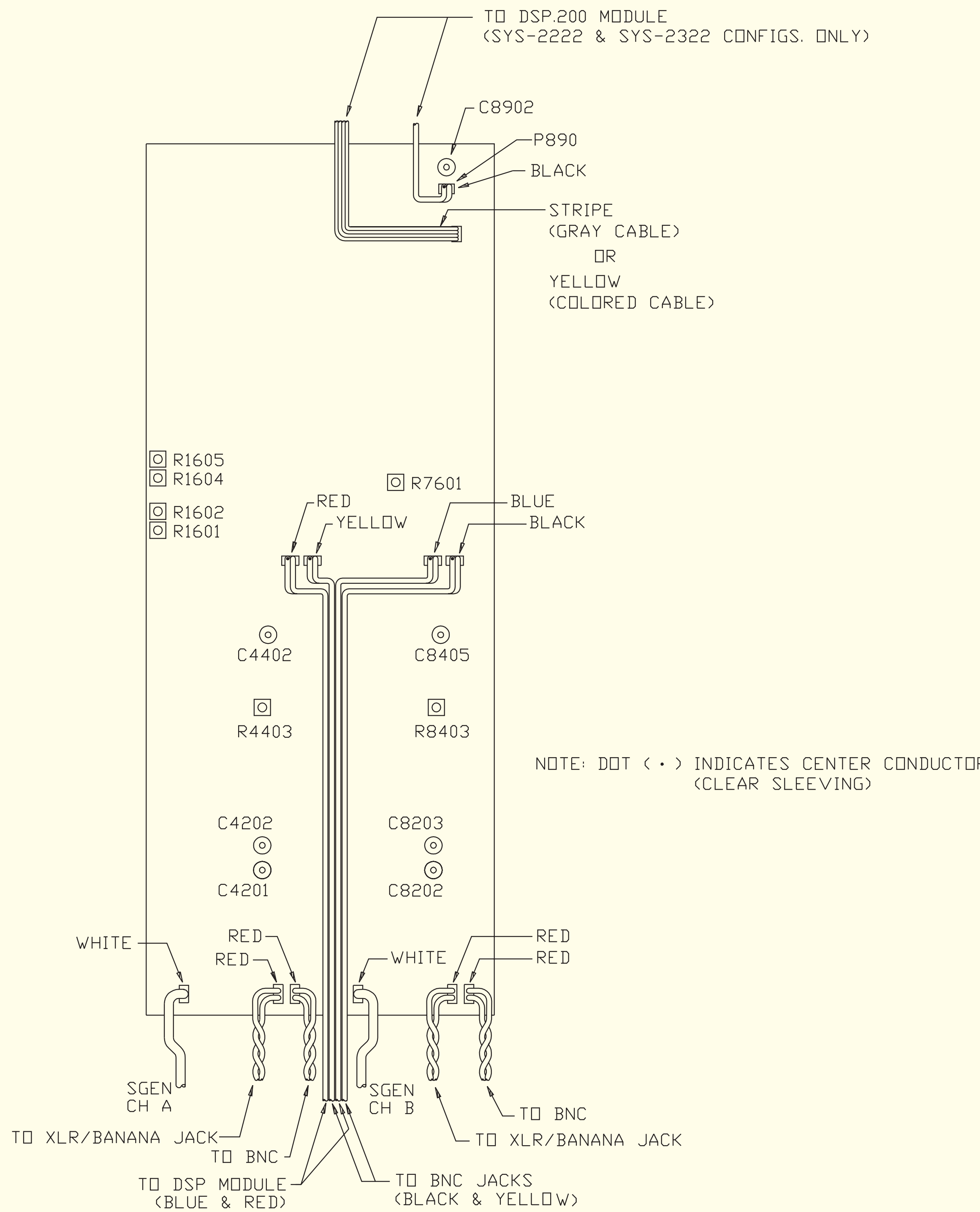

Figure 6-35. Cascade Plus INP module adjustment locations and connections.

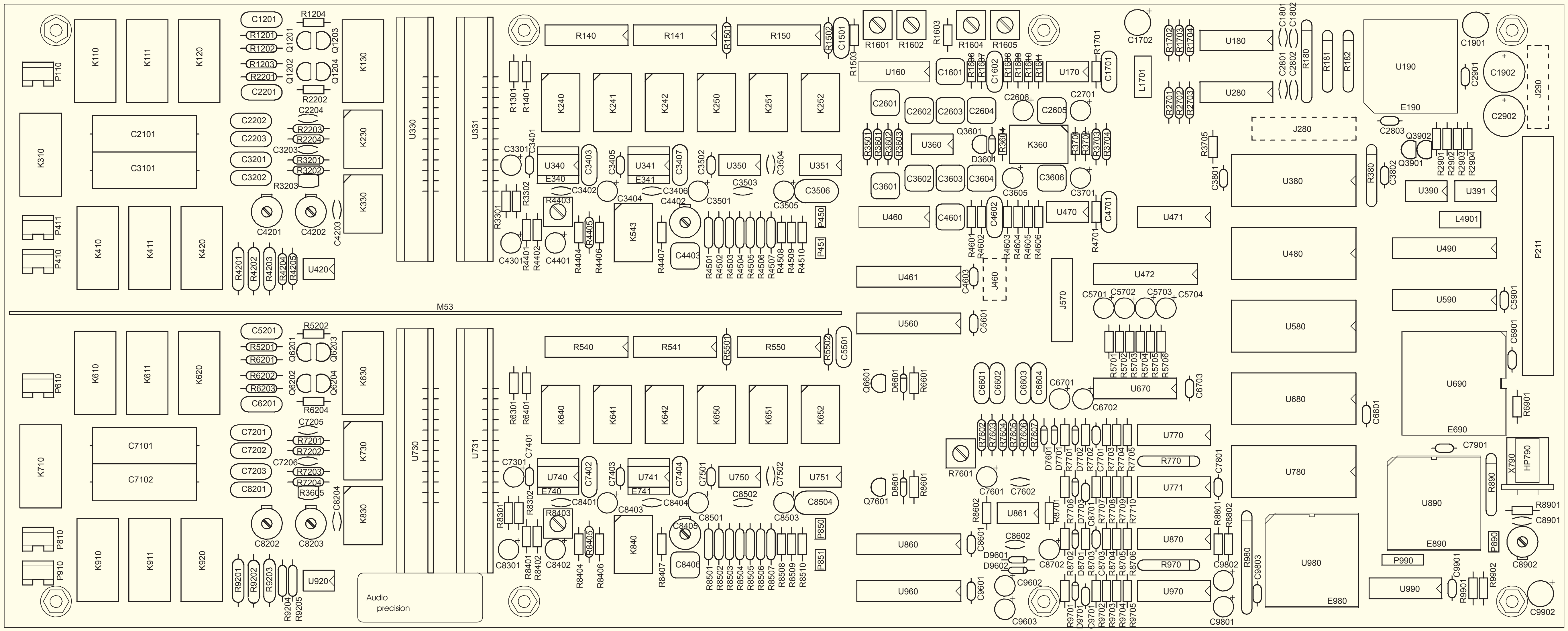

Figure 6-36. Cascade Plus INP module component locations.

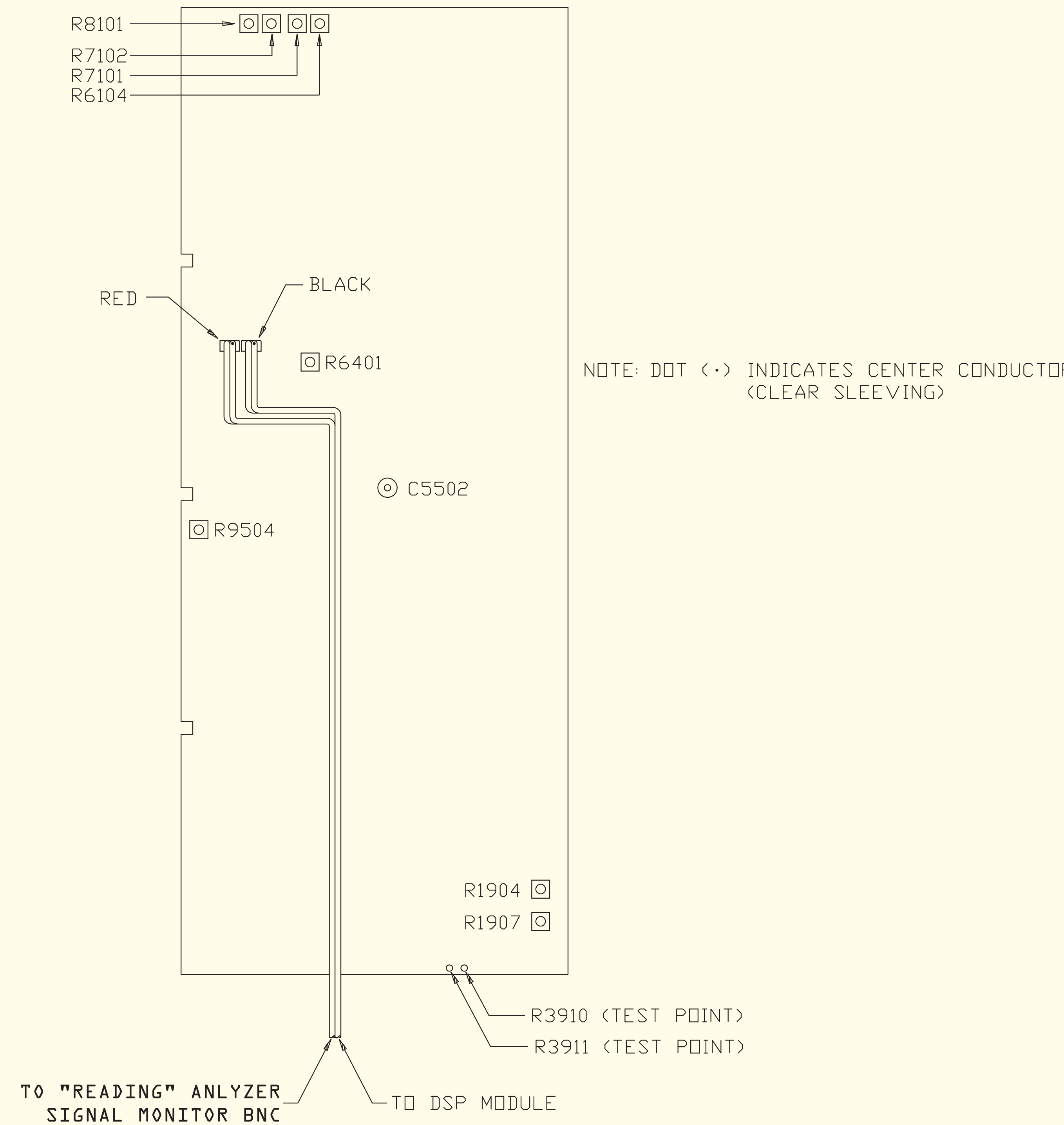

Figure 6-37. Cascade Plus ANL module adjustment locations and connections.

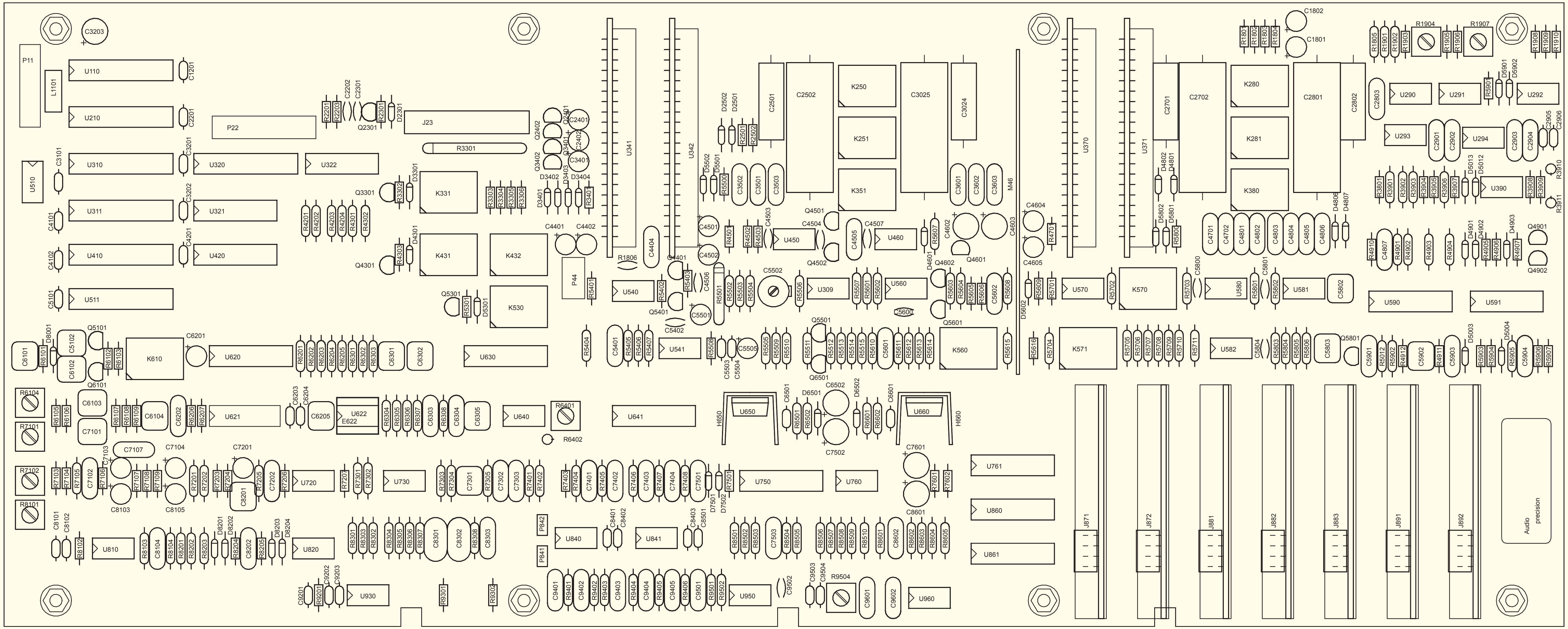

Figure 6-38. Cascade Plus ANL module component locations.

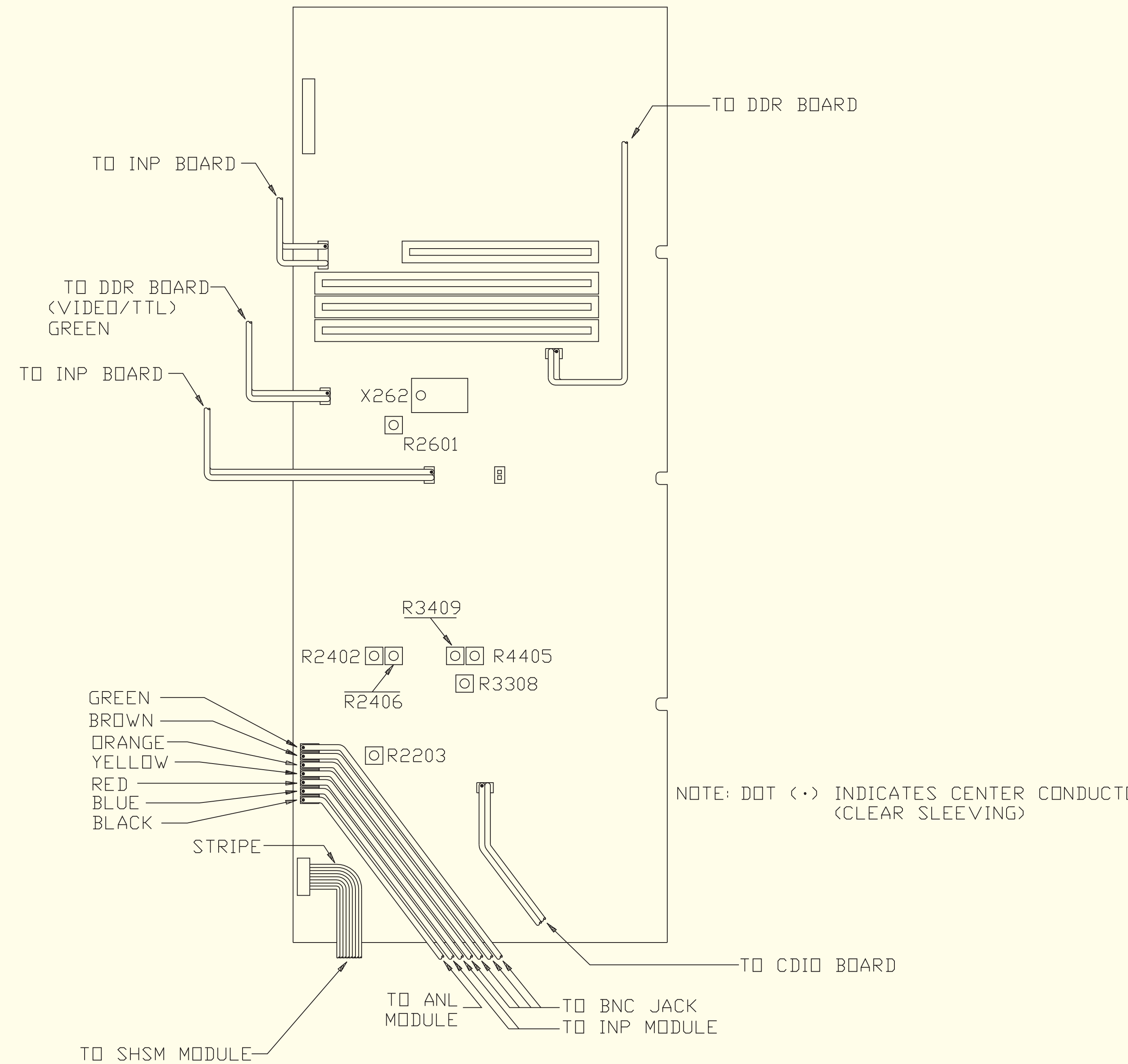

Figure 6-39. Cascade Plus DSP module adjustment locations and connections.

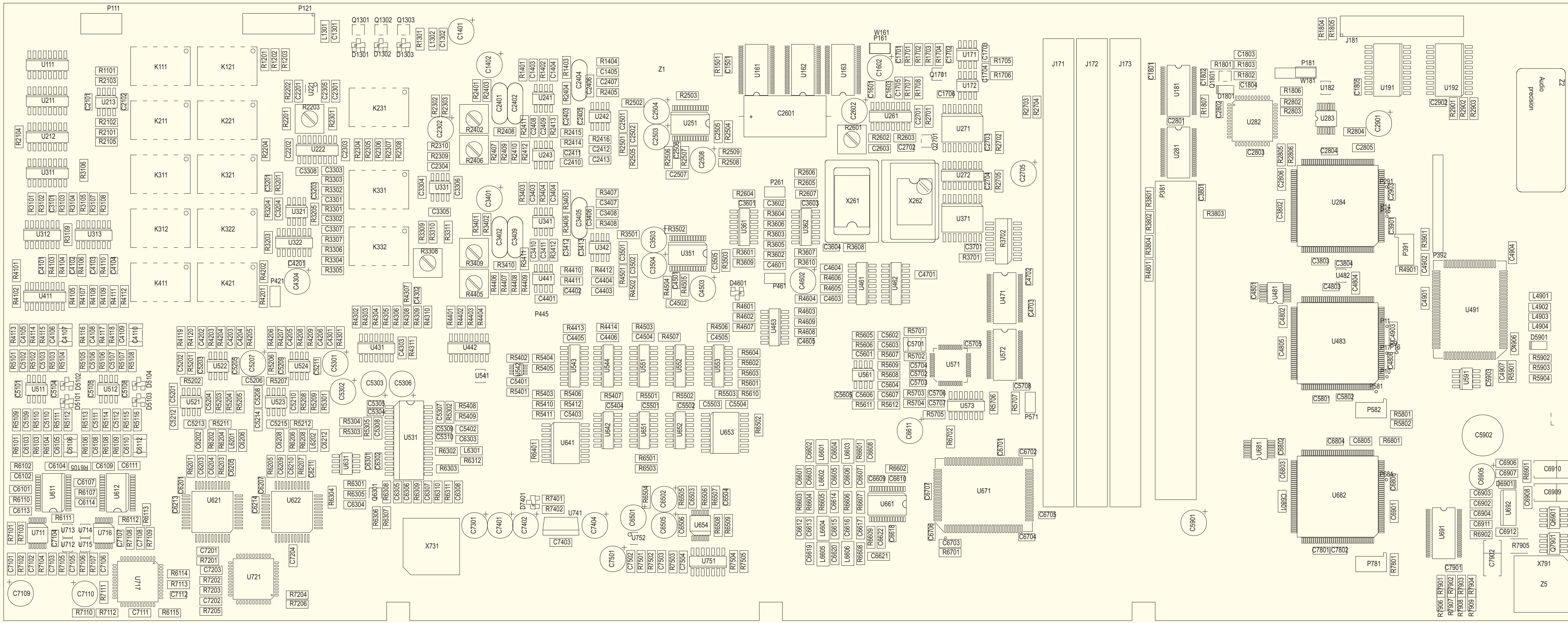

Figure 6-40. Cascade Plus DSP module component locations.

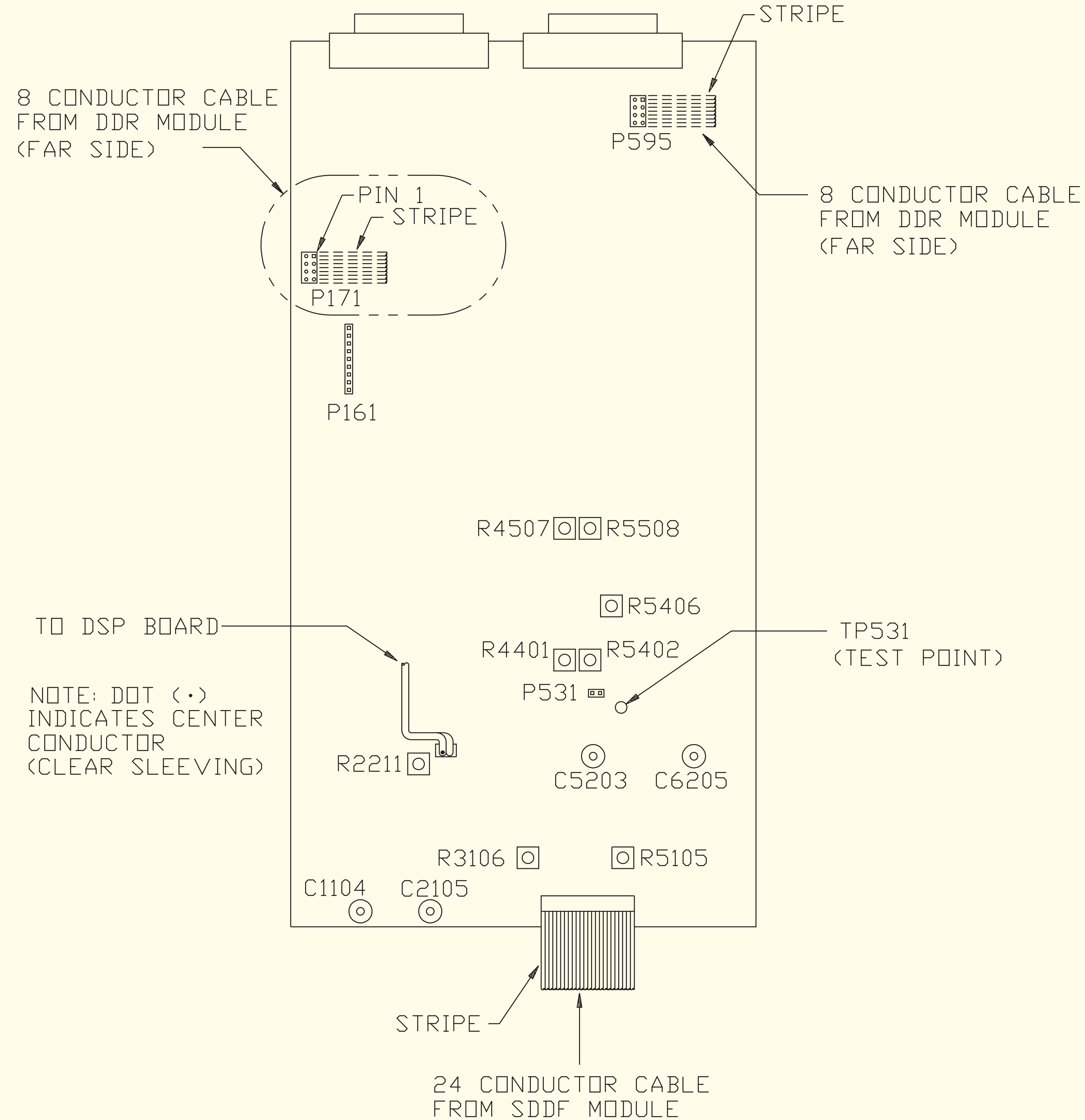

Figure 6-41. Cascade Plus DIO module adjustment locations and connections.

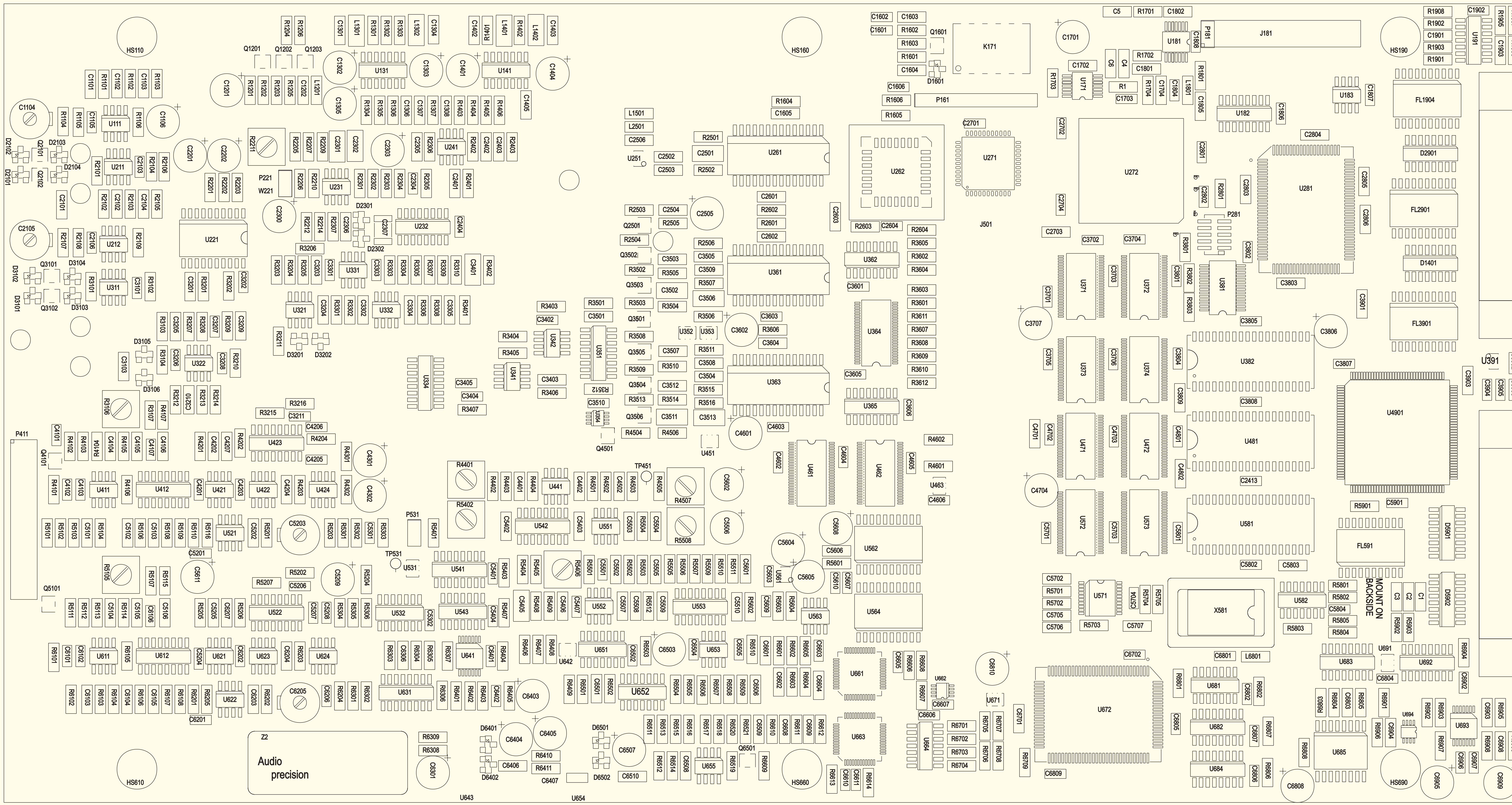

Figure 6-42. Cascade Plus DIO module component locations.

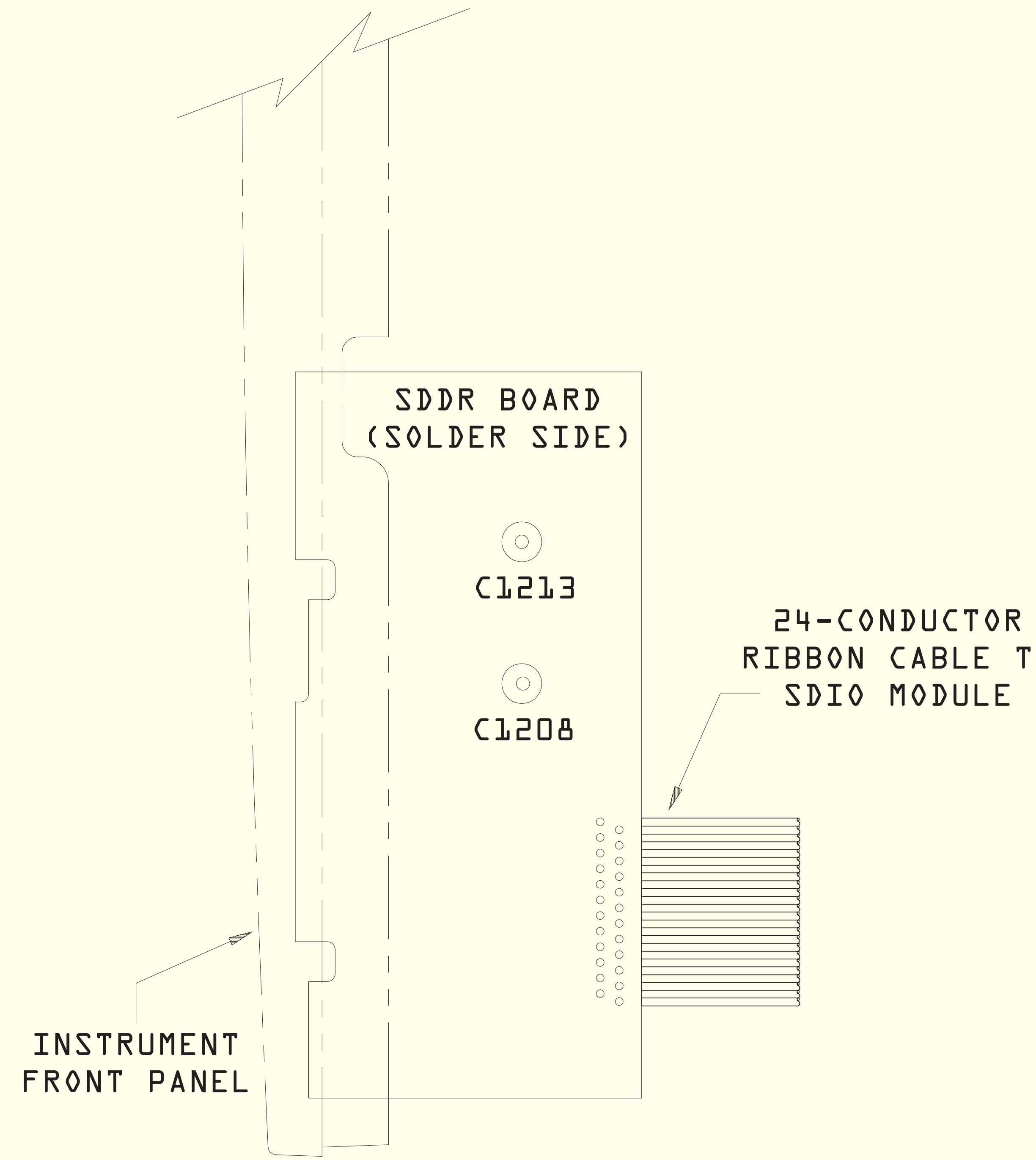

Figure 6-43. Cascade Plus DDF module adjustment locations (on solder side of board).

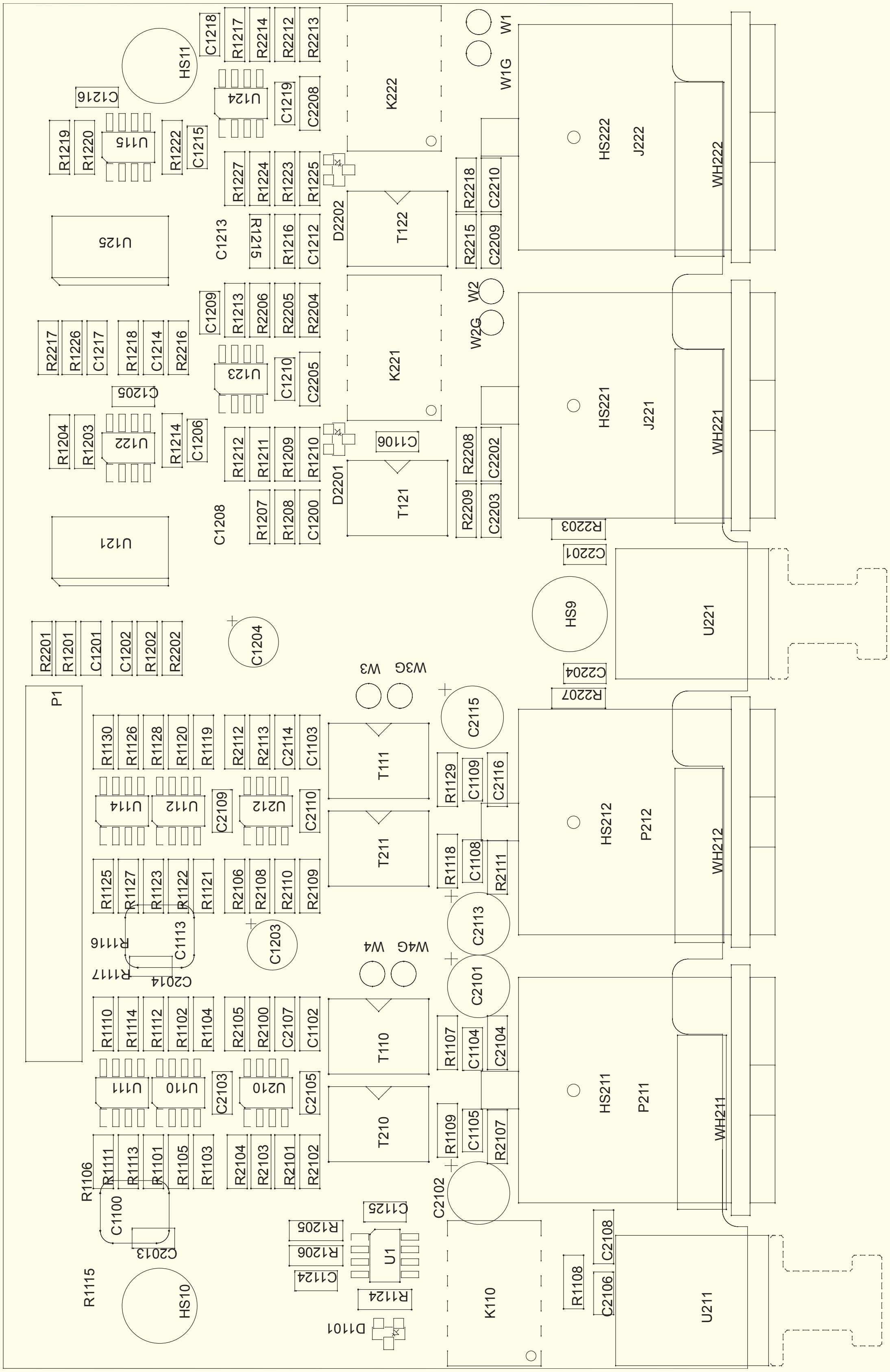

Figure 6-44. Cascade Plus DDF module component locations.

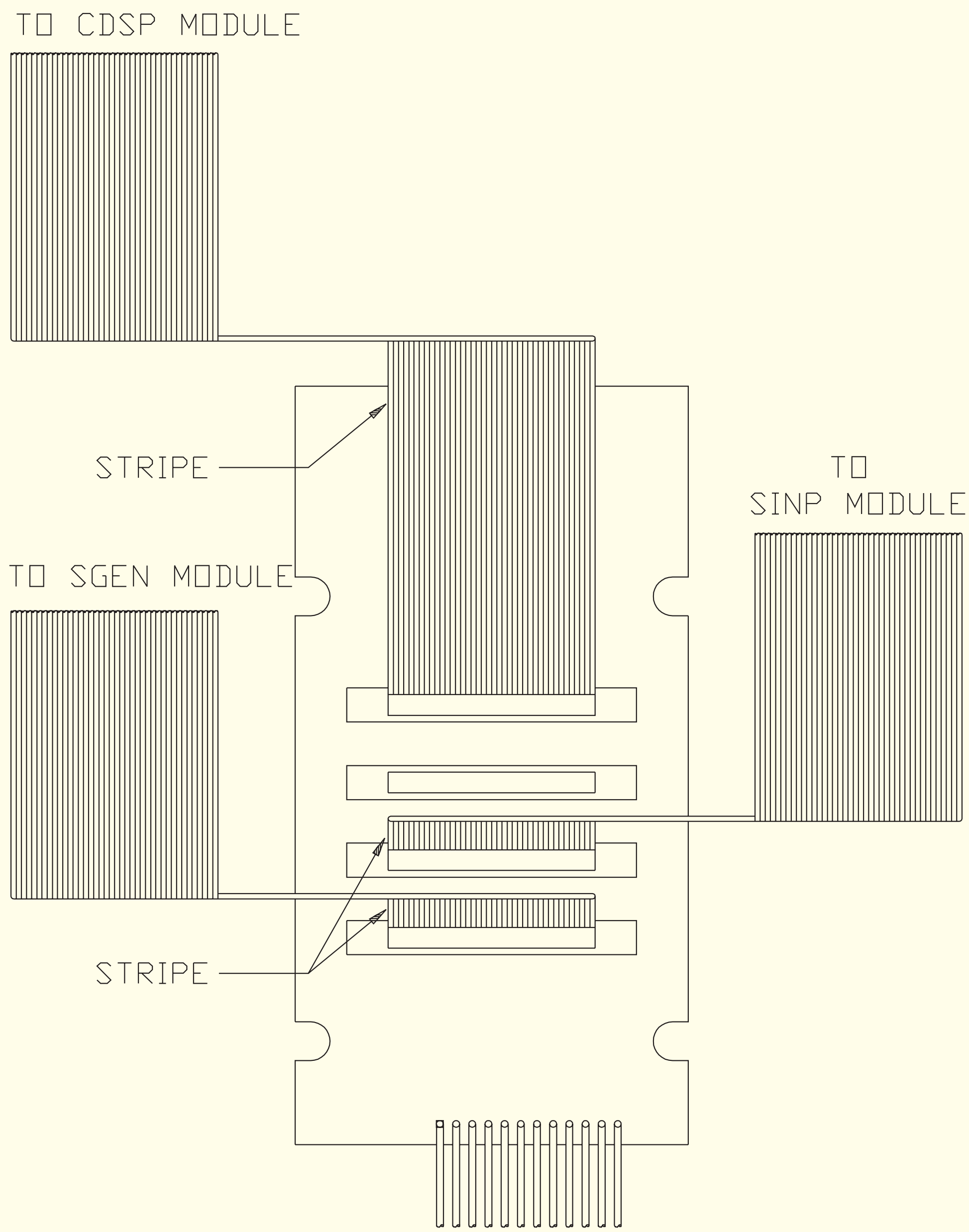

Figure 6-45. Cascade Plus IFM module connections.

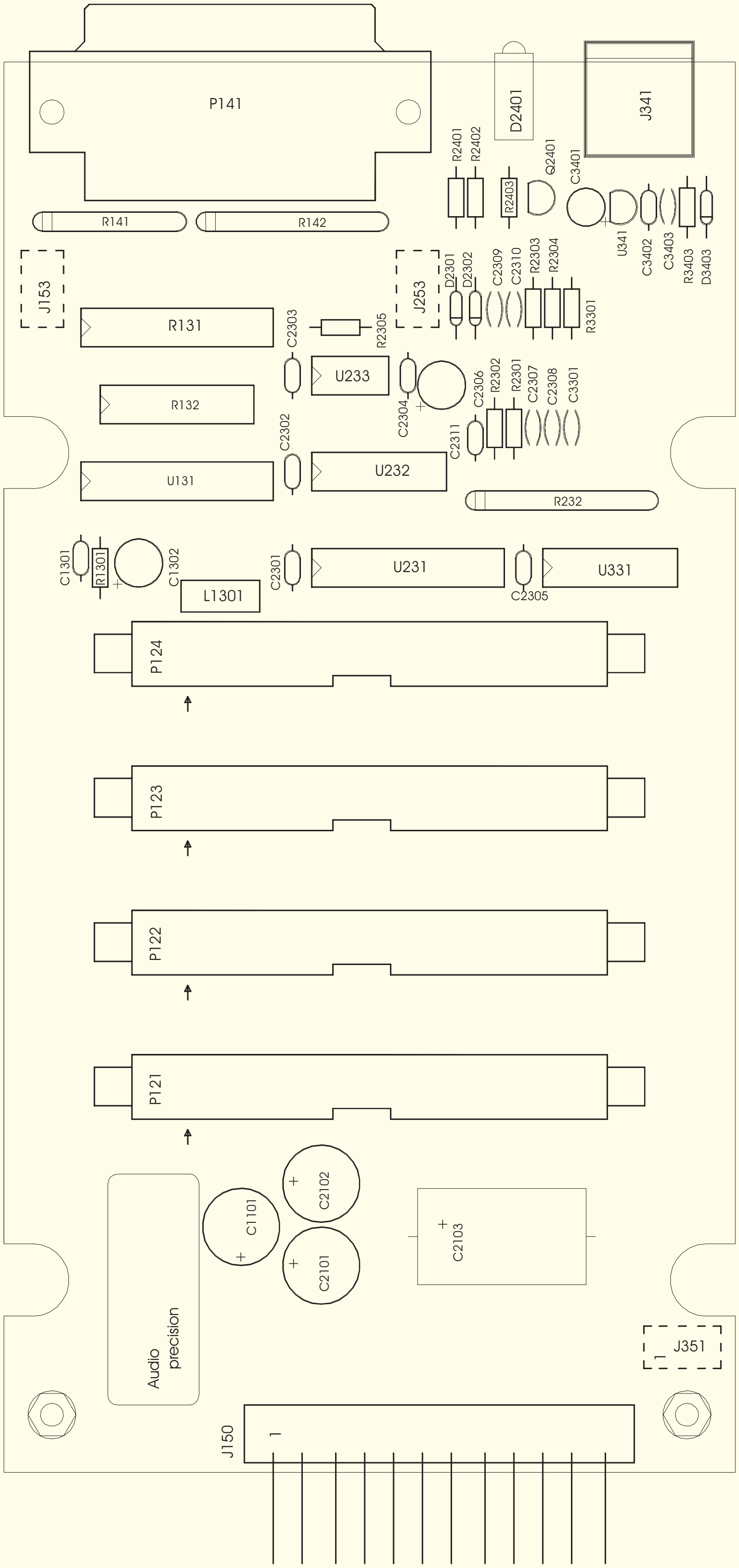

Figure 6-46. Cascade Plus IFM module component locations.

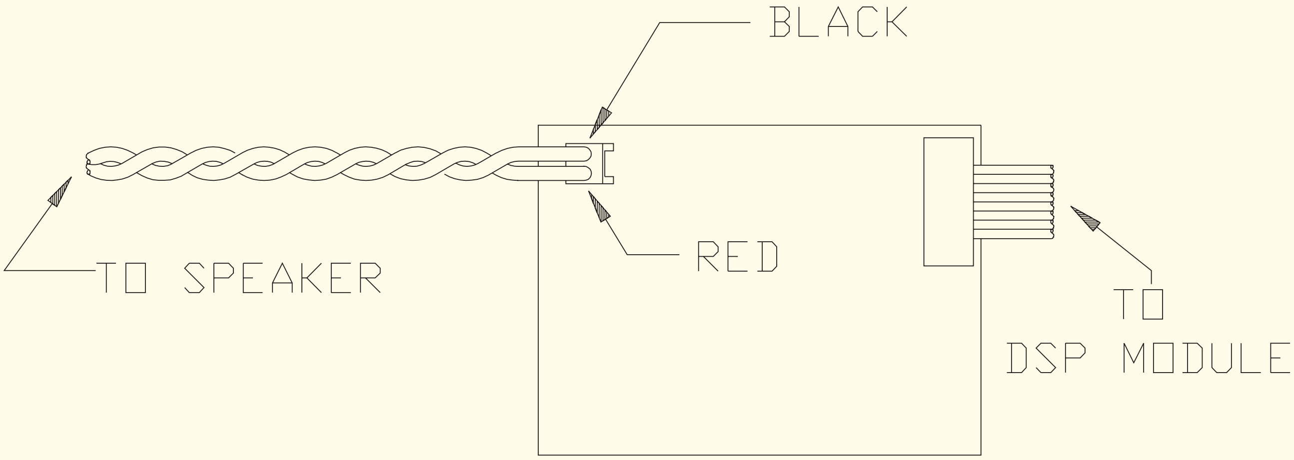

Figure 6-47. Cascade Plus HSM module connections.

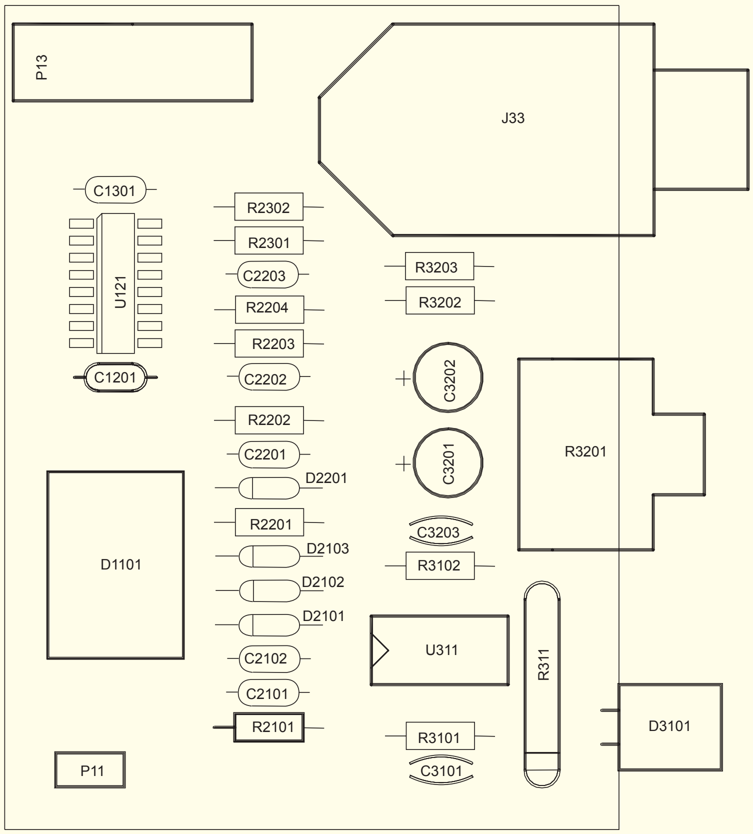

Figure 6-48. Cascade Plus HSM module component locations.

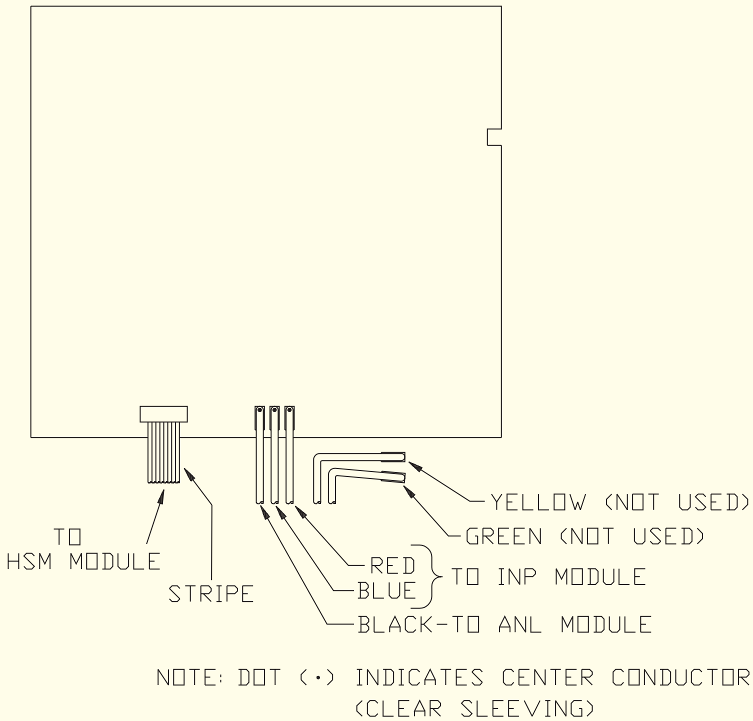

Figure 6-49. Cascade Plus MUX module connections.

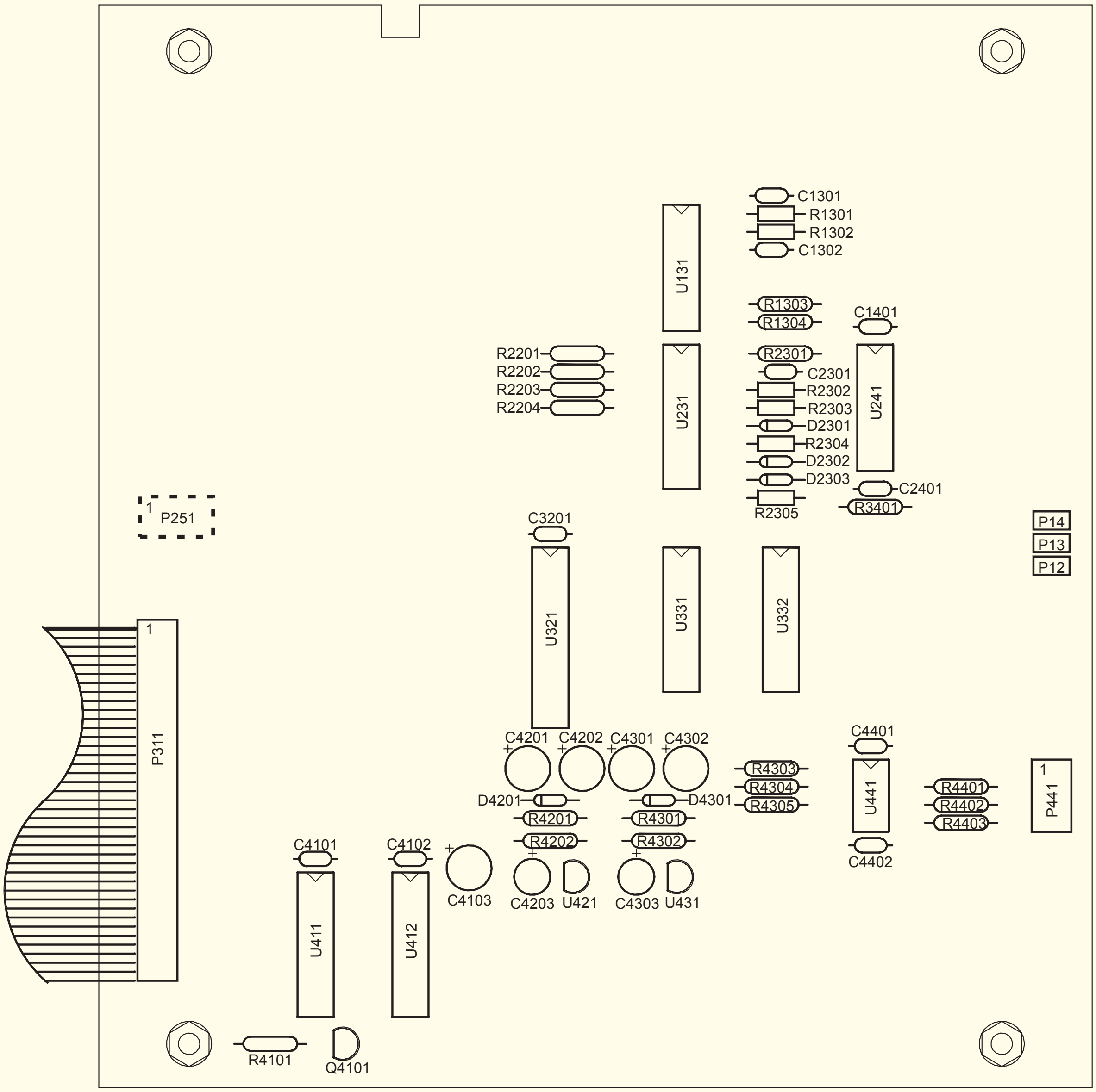

Figure 6-50. Cascade Plus MUX module component locations.

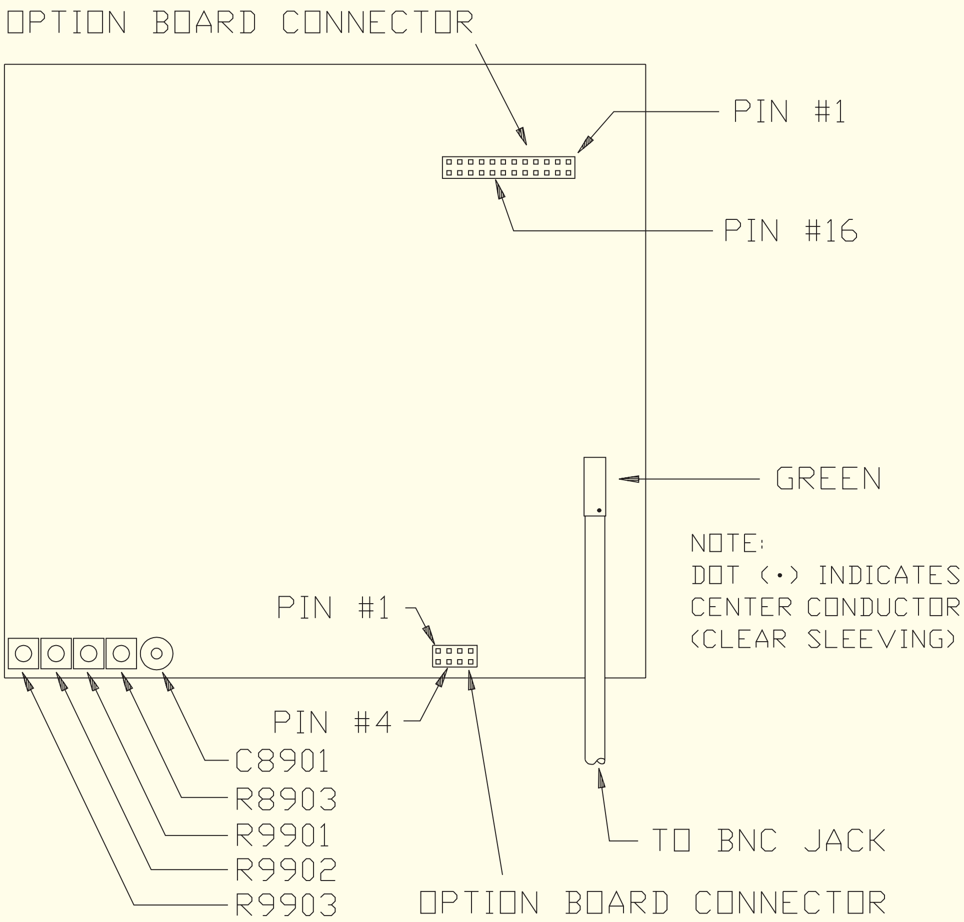

Figure 6-51. Cascade Plus BUR module adjustment locations and connections.

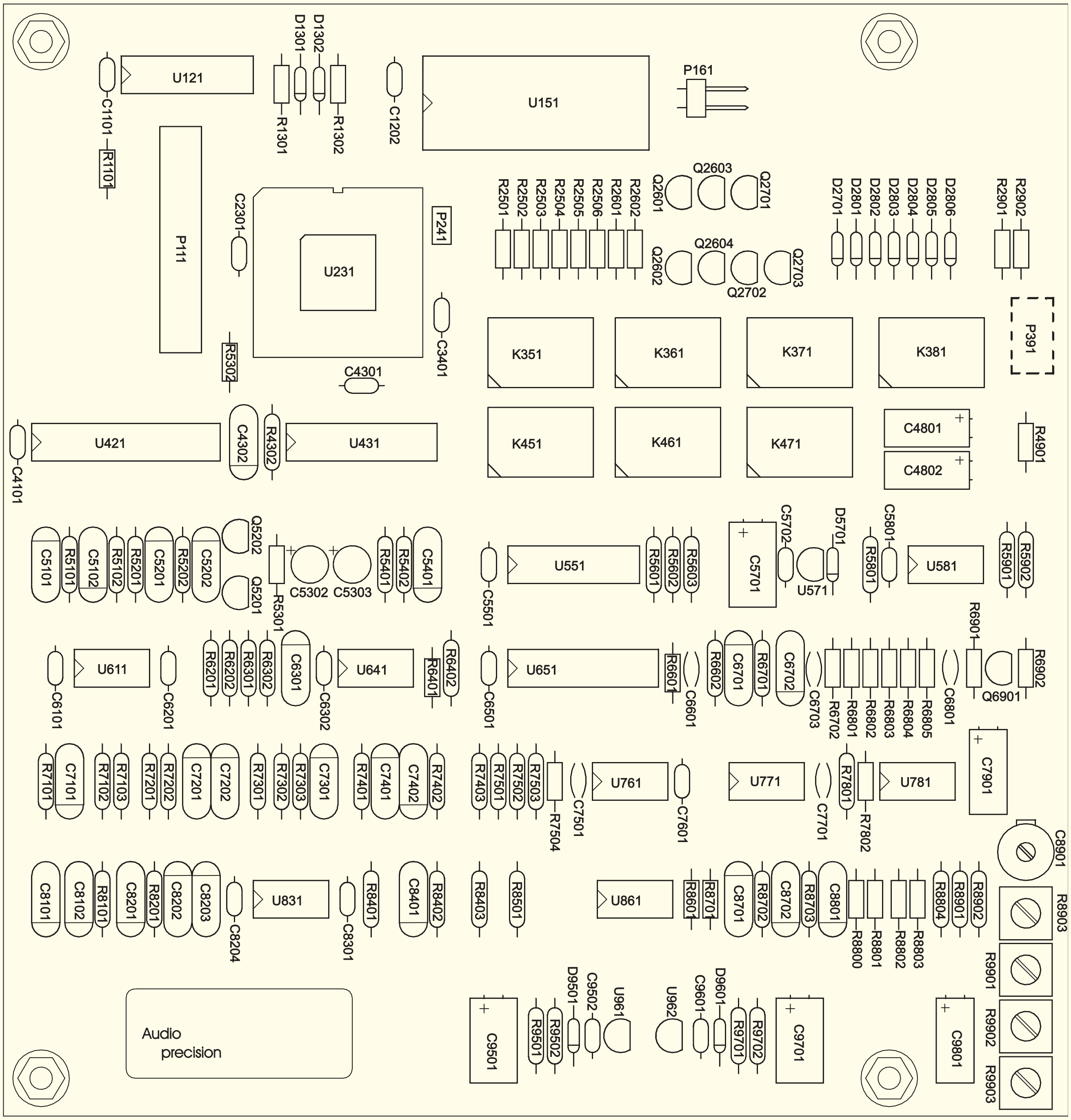

Figure 6-52.Cascade Plus BUR module component locations.

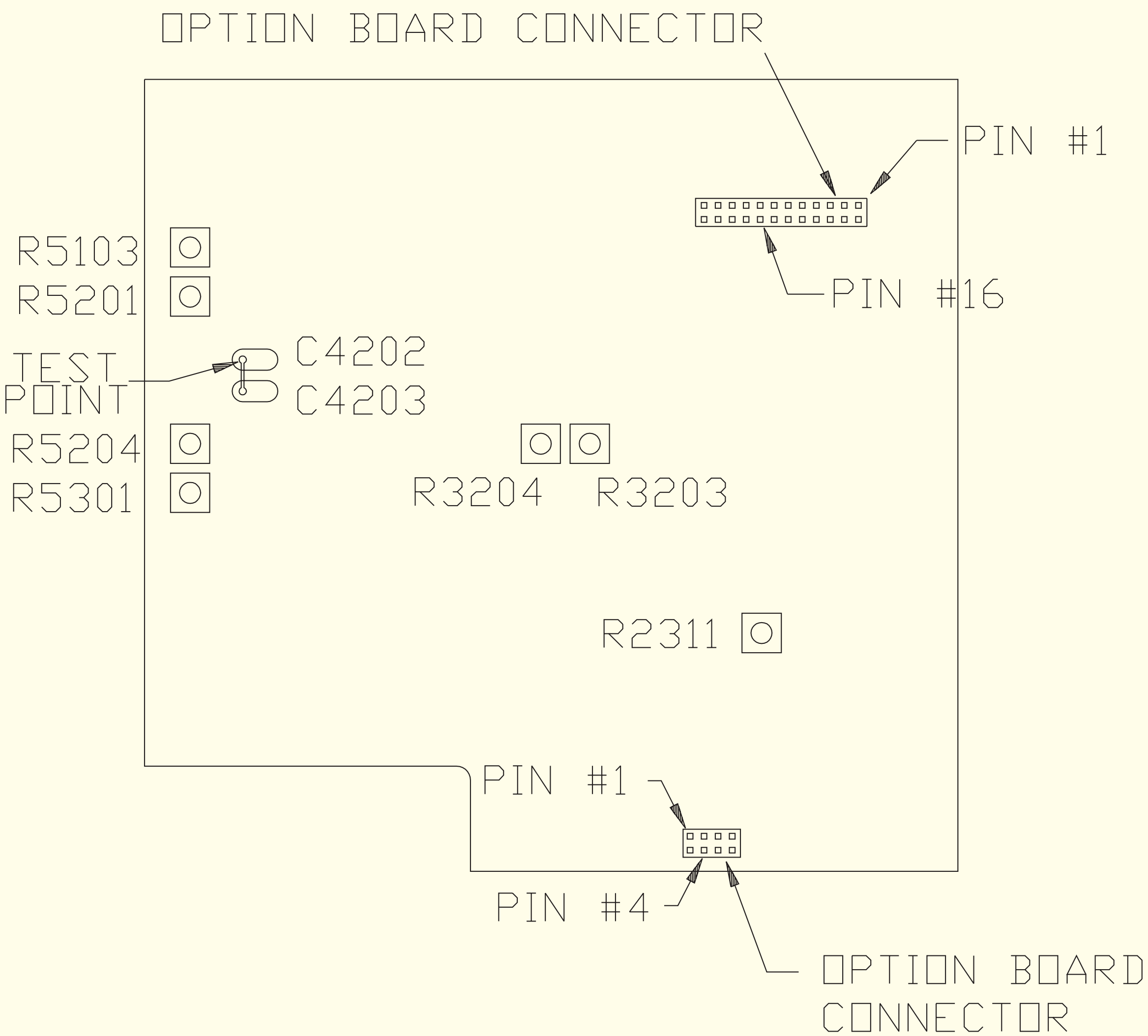

Figure 6-53. Cascade Plus IMG module adjustment locations and connections.

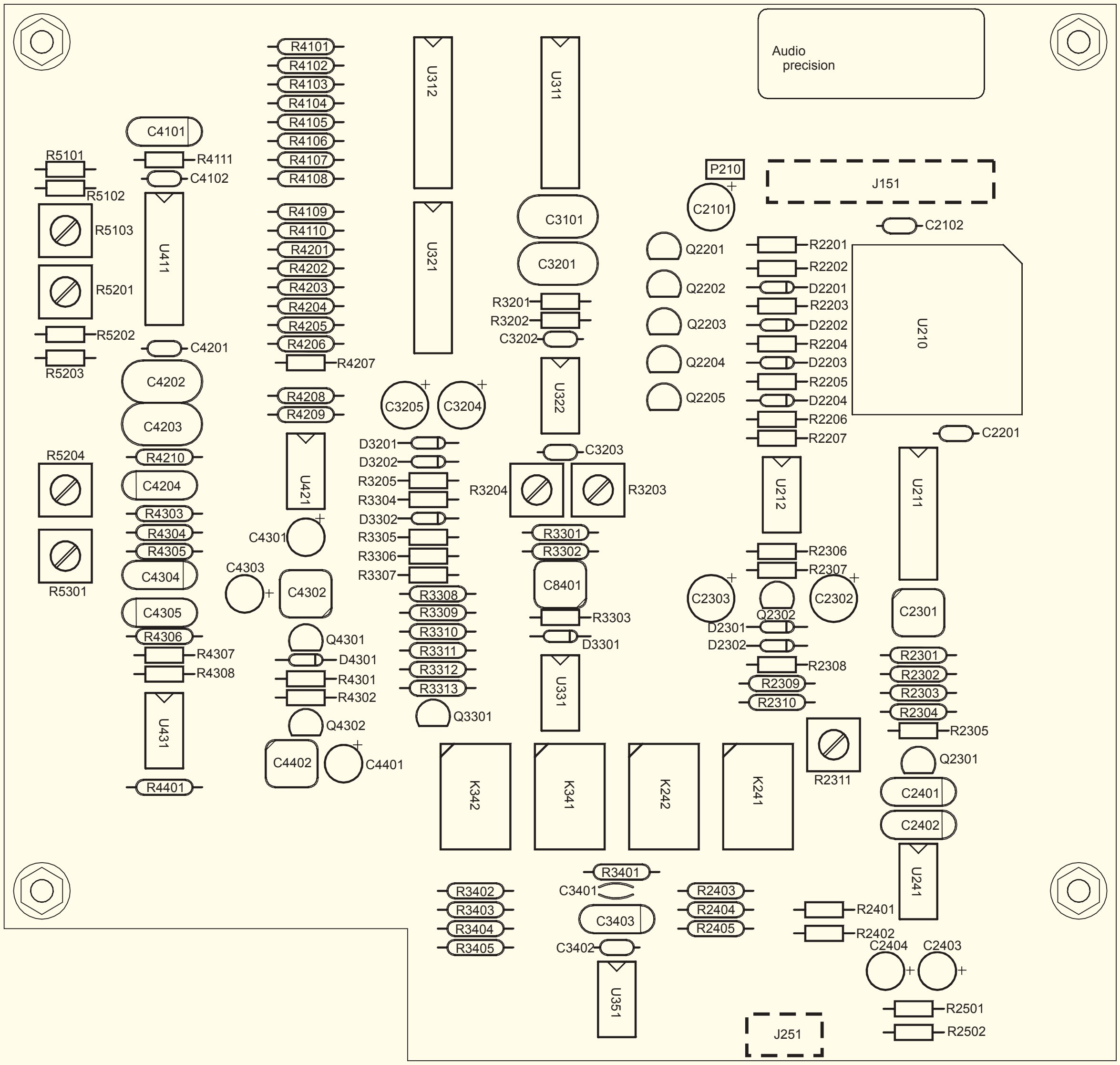

Figure 6-54. Cascade Plus IMG module component locations.

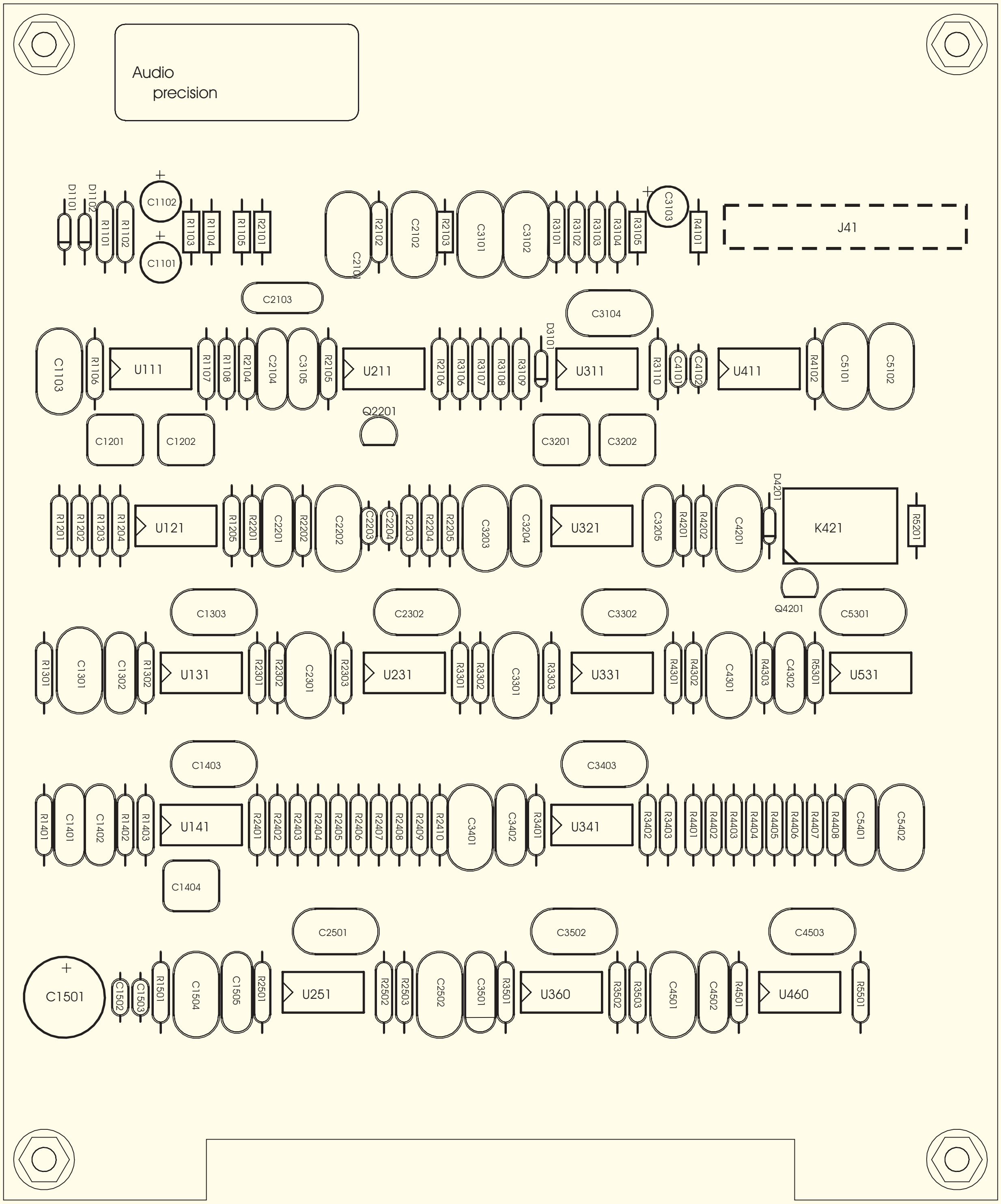

Figure 6-55. Cascade Plus IMA module component locations.

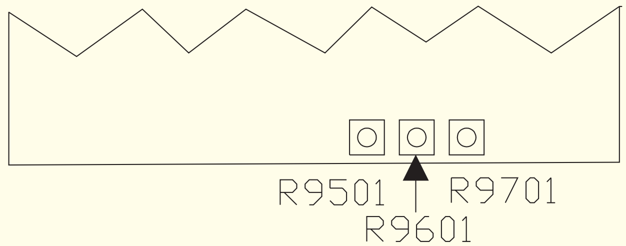

Figure 6-56. Cascade Plus WFA module adjustmen locations.

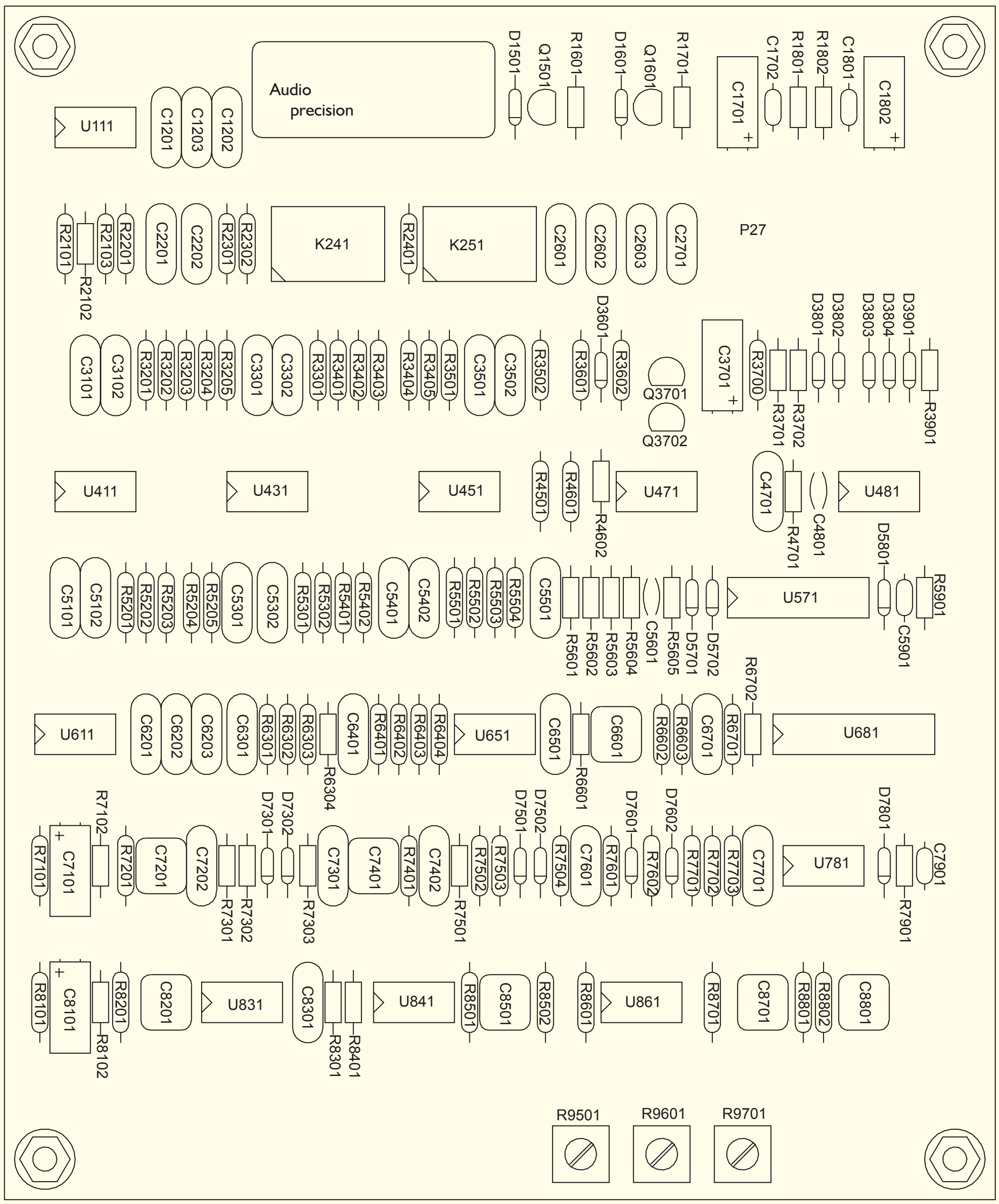

Figure 6-57. Cascade Plus WFA module component locations.

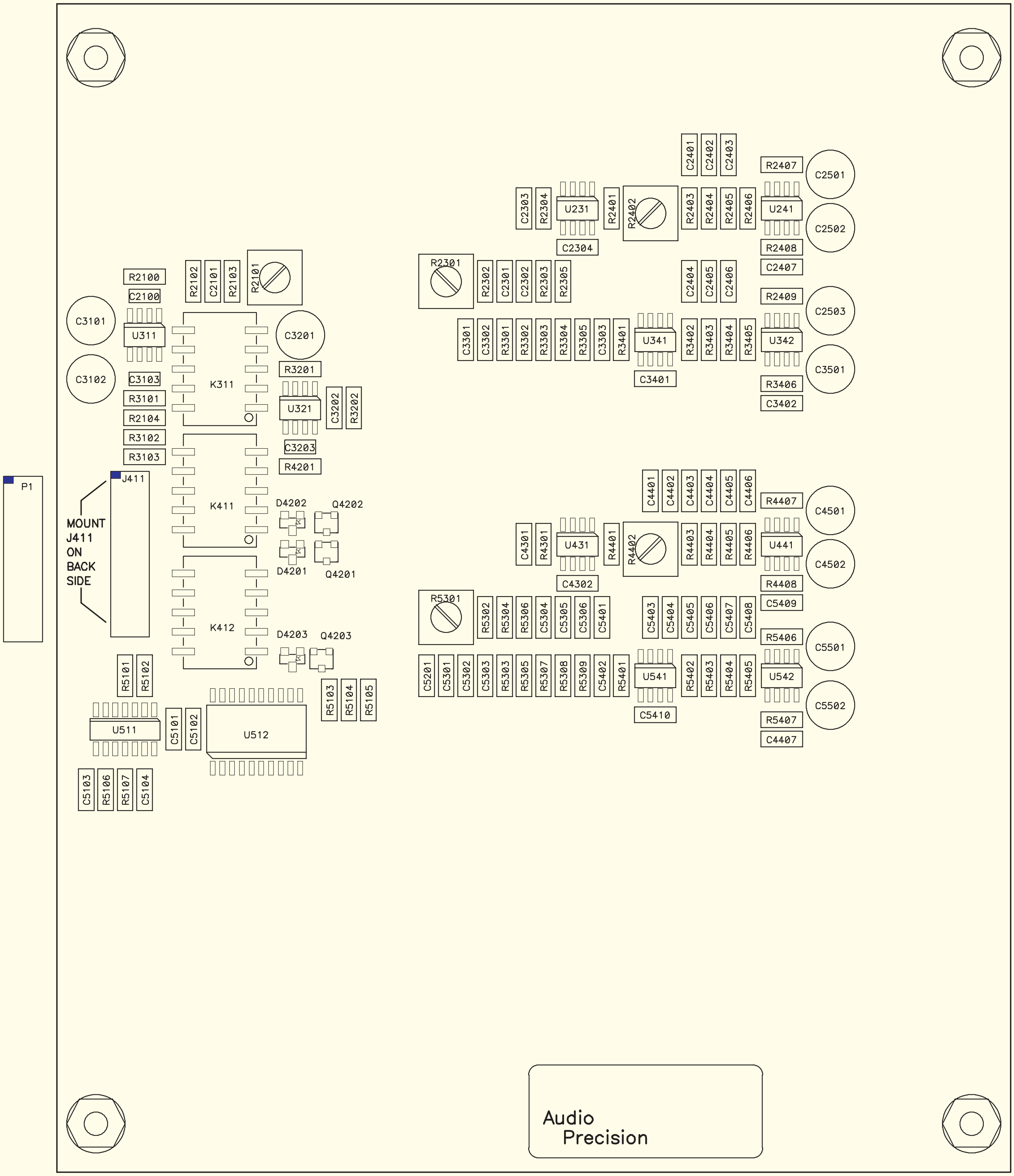

Figure 6-58. Cascade Plus SLPX module component and adjustment locations.

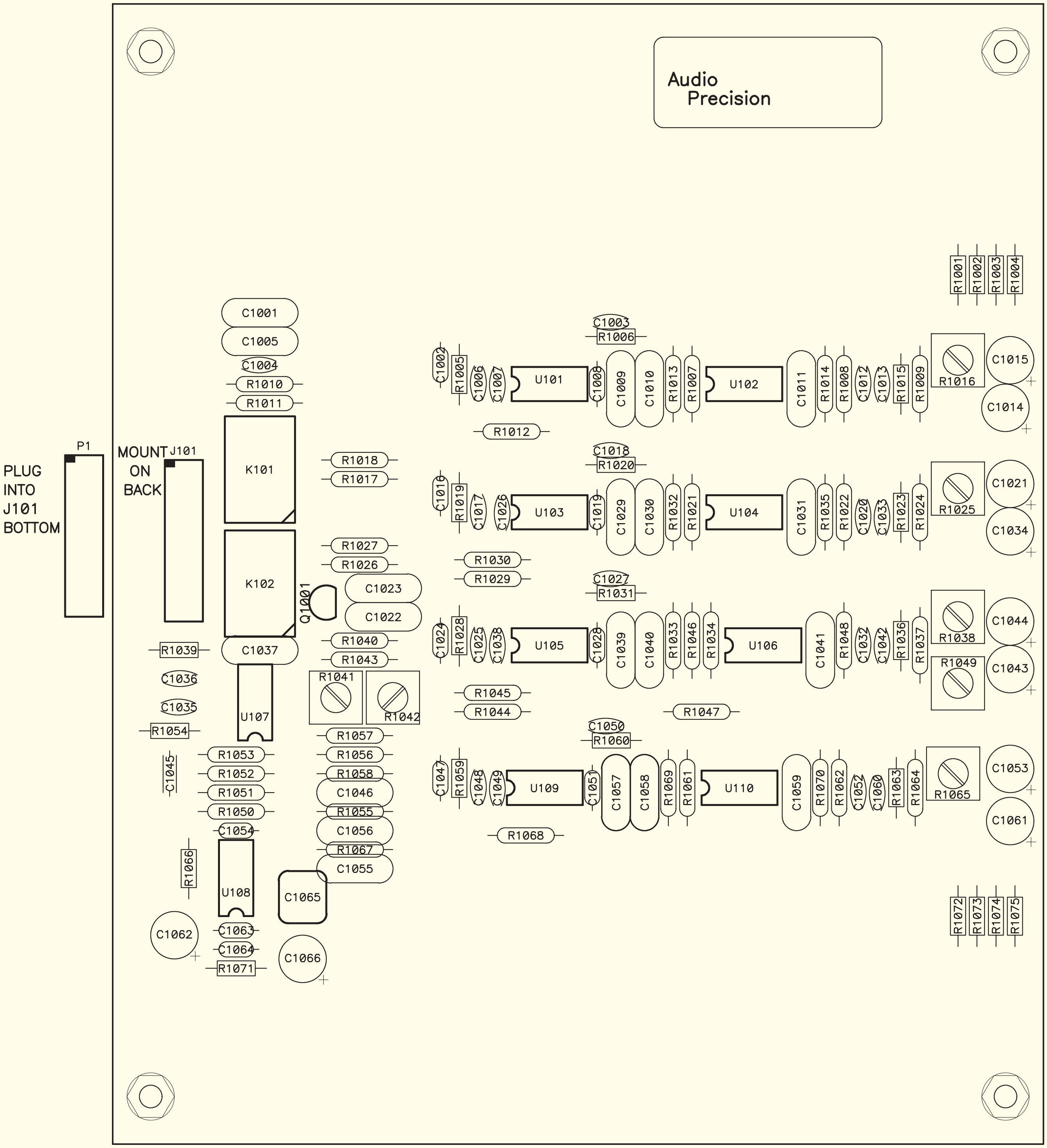

Figure 6-59. Cascade Plus SAES module component and adjustment locations.

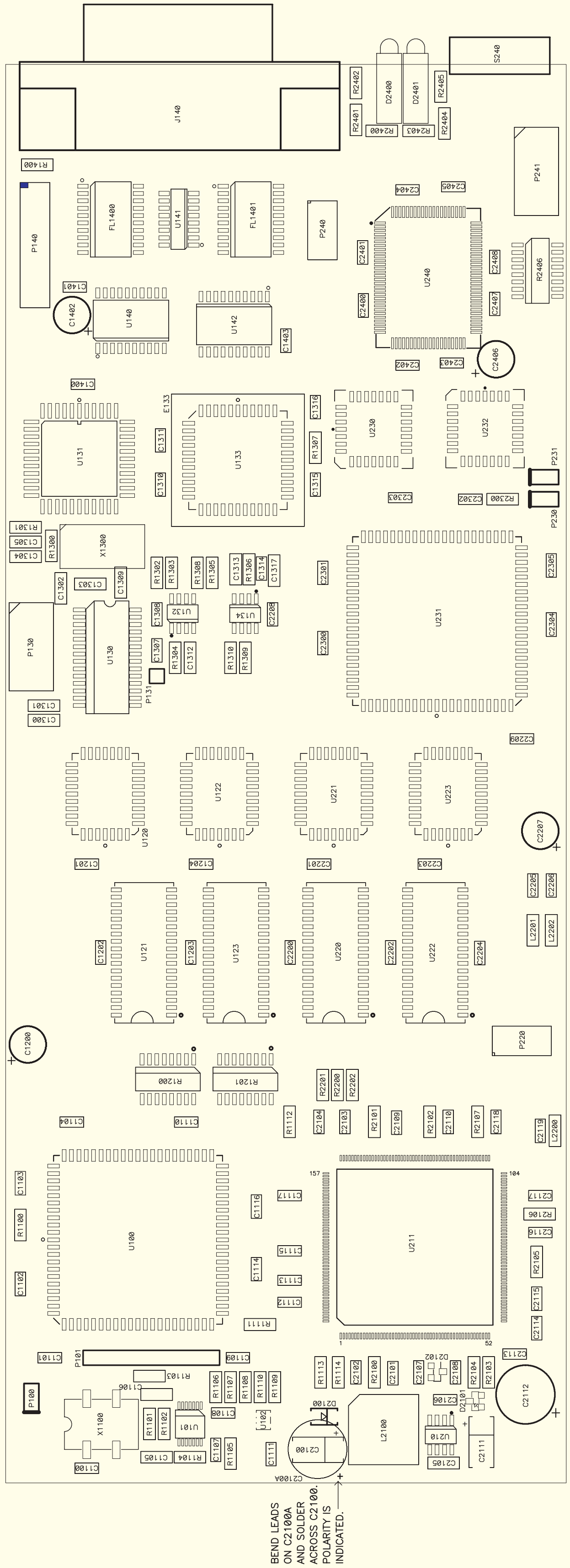

Figure 6-60. Cascade Plus SIFG module component locations.

Chapter 6c/d: Electronics Diagrams, Cascade

This chapter contains main printed circuit board (PCB) drawings showing the location of adjustments and cables, and option circuit board assemblies and main PCB detail drawings showing component designators. All information is believed to be accurate as of the publication date; however, Audio Precision reserves the right to make changes without prior notice.

COMPONENT AND ASSEMBLY DESIGNATIONS

A	Assembly	**L**	Inductor, fixed or variable
BT	Battery	**P**	Connector, male
C	Capacitor, fixed or variable	**Q**	Transistor, FET, or SCR
D	Diode	**R**	Resistor, fixed or variable
E	Socket or mechanical part	**S**	Switch or contact
F	Fuse	**TP**	Test Point
H	Heat sink or radiator	**U**	Integrated Circuit
HS	Heat sink or mounting hardware	**W**	Wire strap or Cable
J	Connector, female	**X**	Transformer
K	Relay	**Y**	Crystal

Cascade

FUSE SPECIFICATION

A	5X20 MM, TYPE T (S B), 6.3 A
B	5X20 MM, TYPE T (S B), 2.5 A

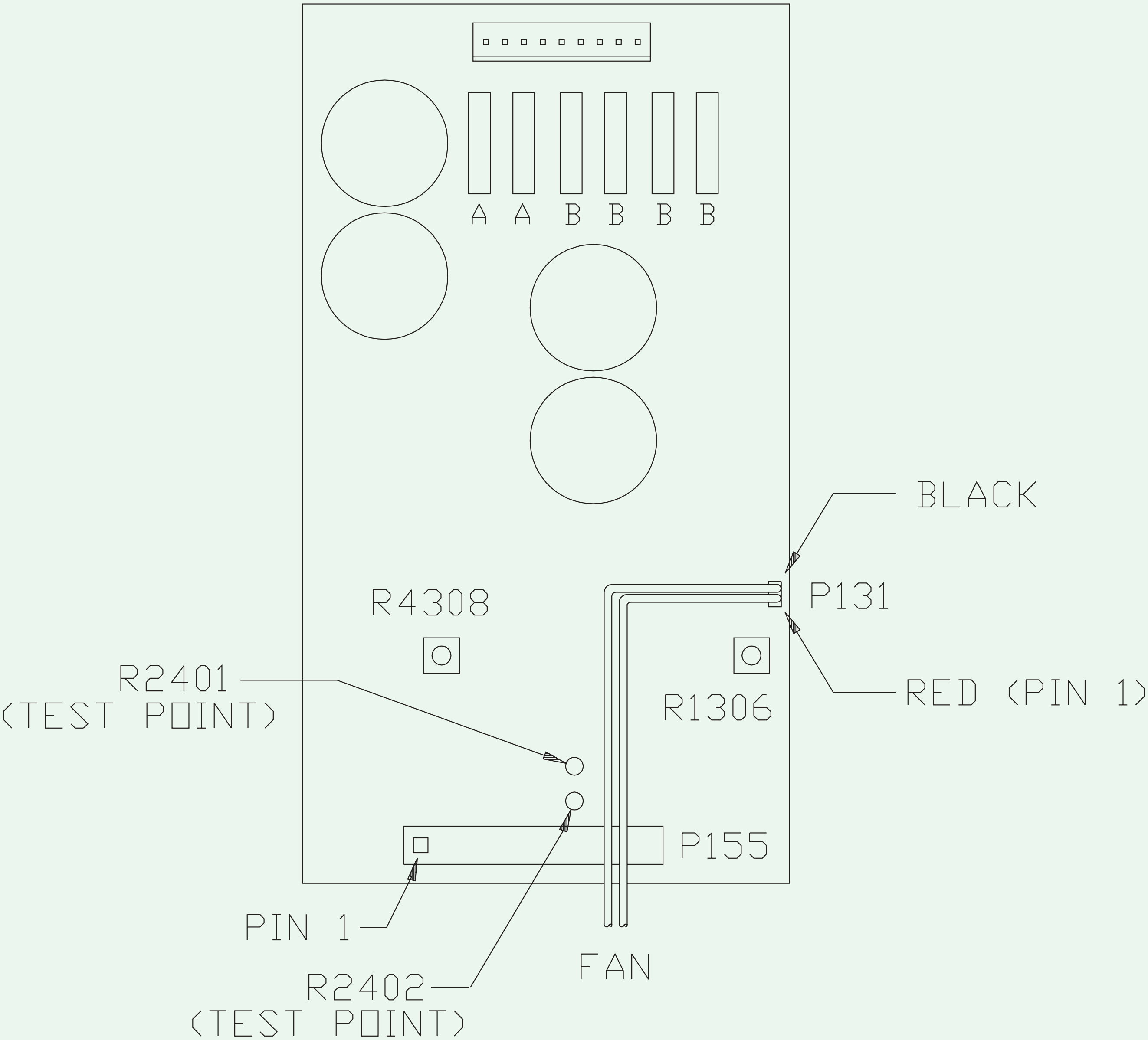

Figure 6-61. Cascade PSA module test points and adjustment locations.

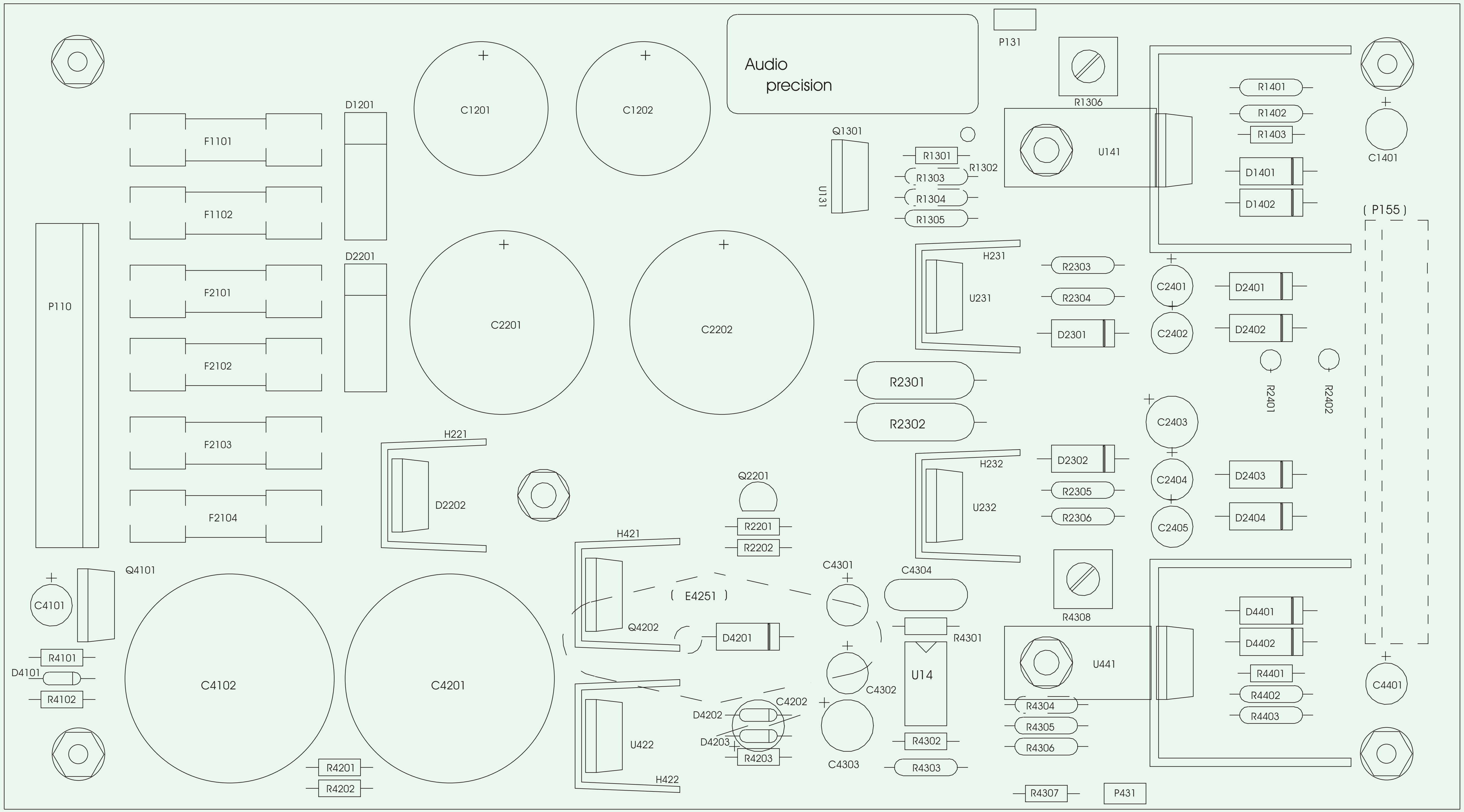

Figure 6-62. Cascade PSA module component locations.

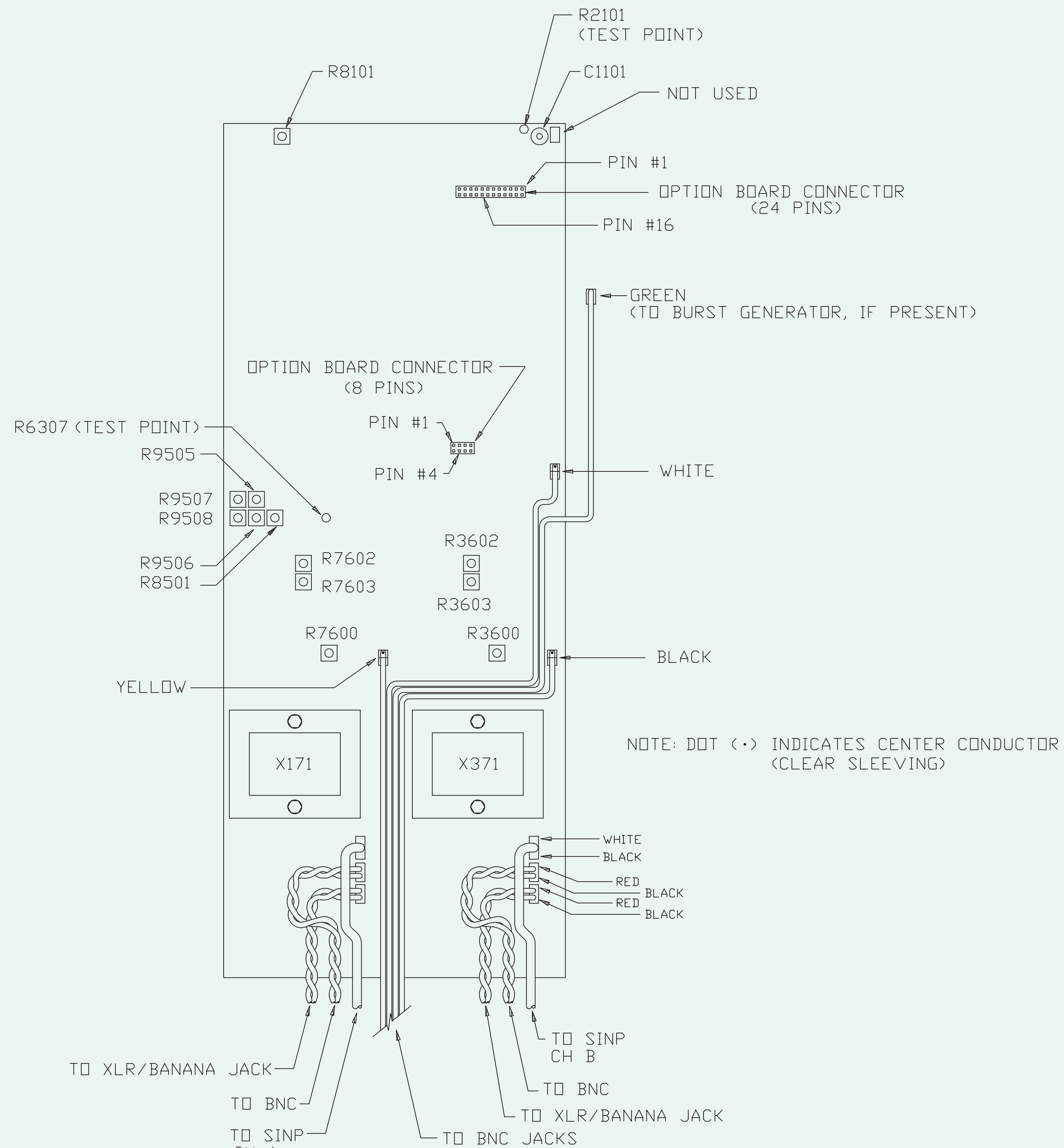

Figure 6-63. Cascade GEN module adjustment locations and connections.

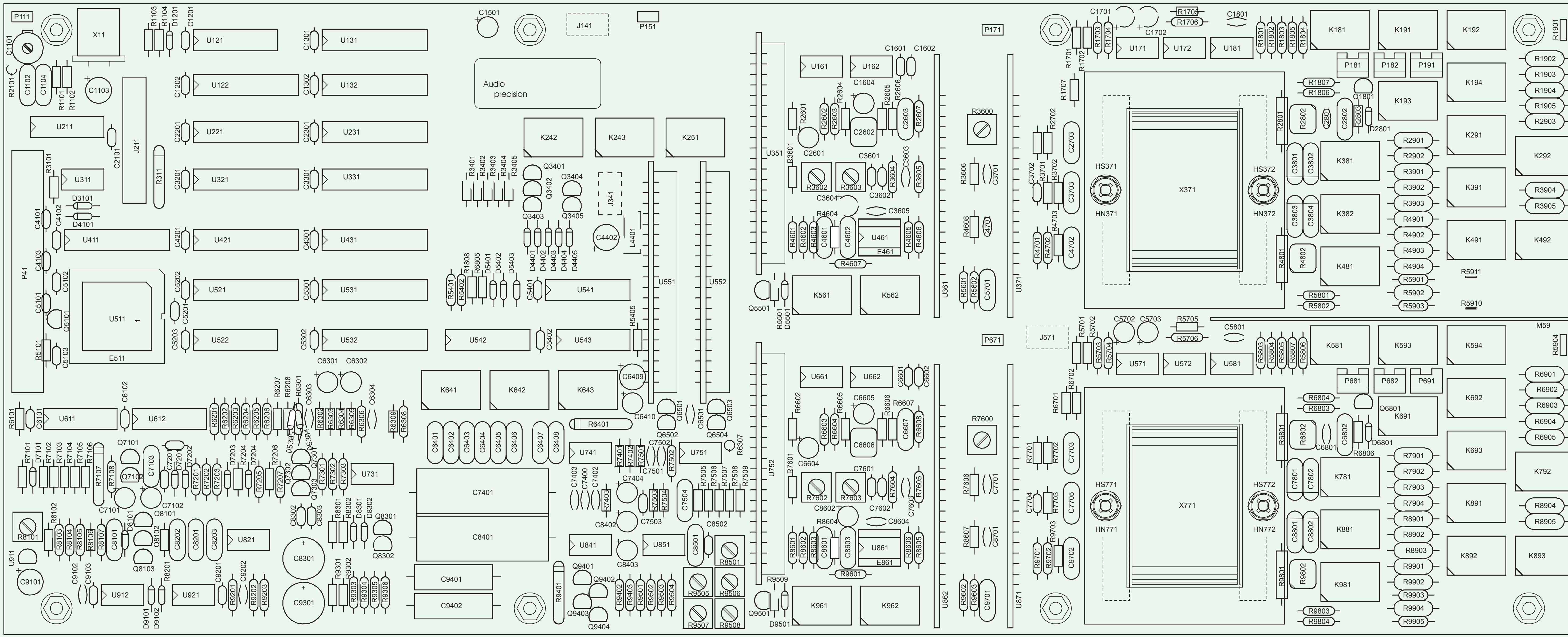

Figure 6-64. Cascade GEN module component locations.

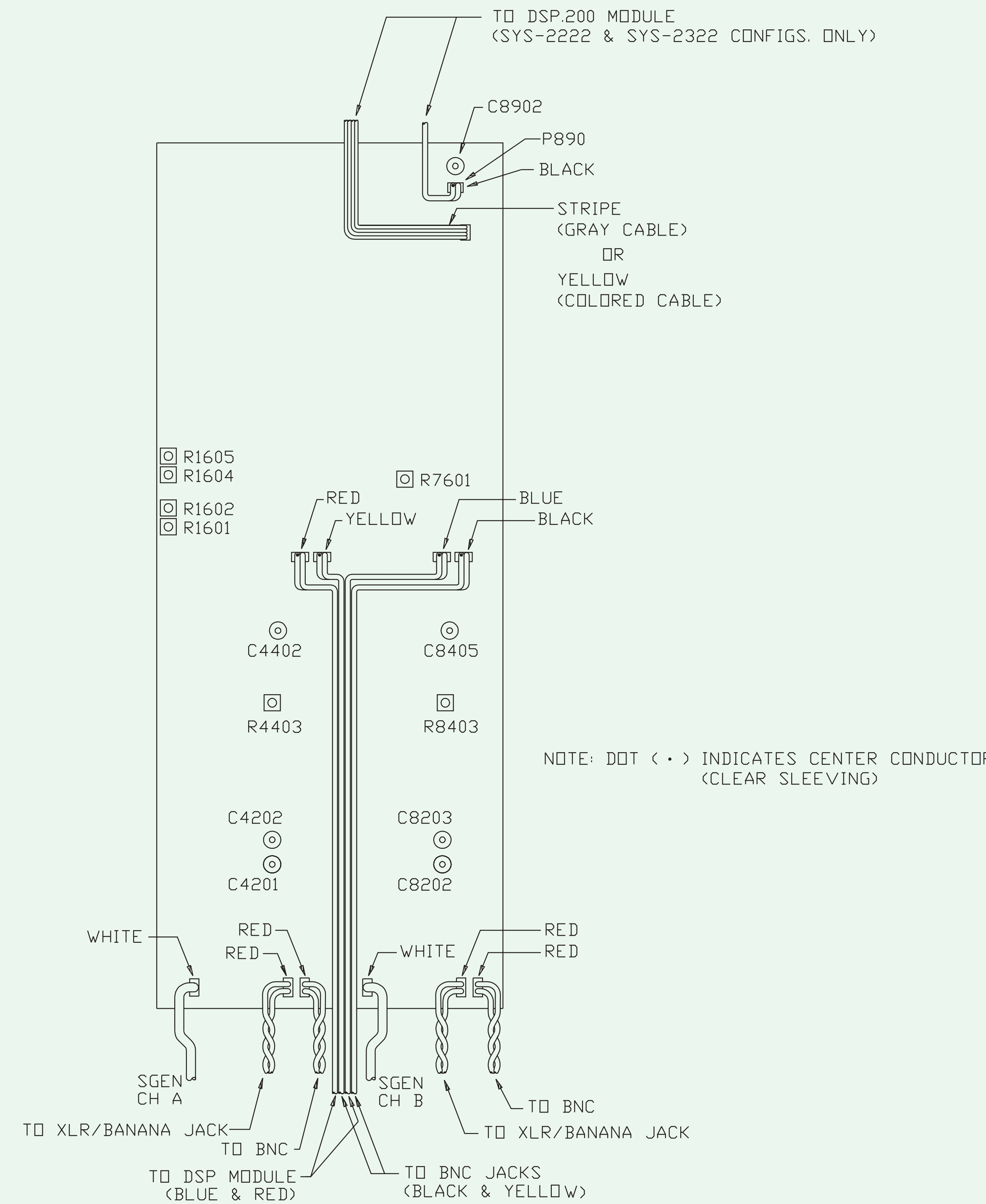

Figure 6-65. Cascade INP module adjustment locations and connections.

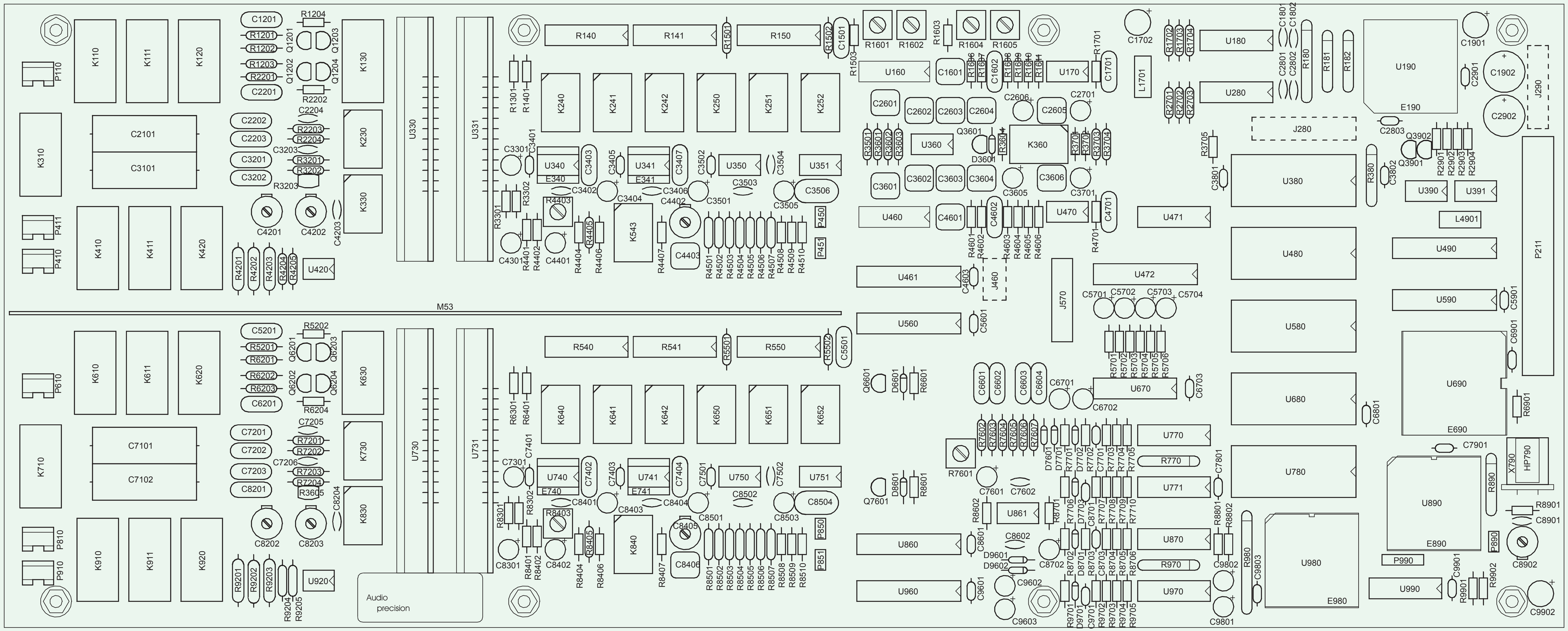

Figure 6-66. Cascade INP module component locations.

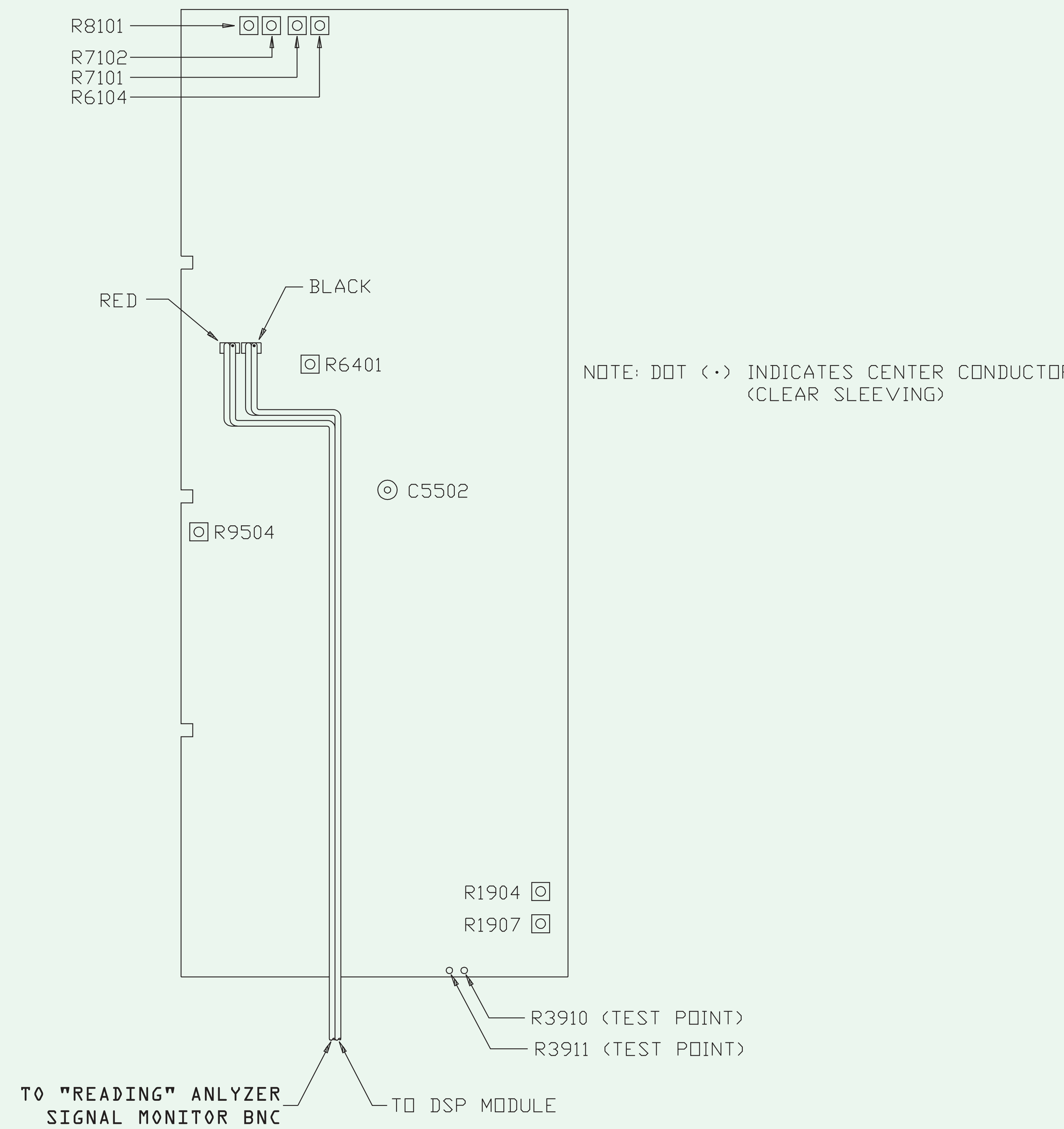

Figure 6-67. Cascade ANL module adjustment locations and connections.

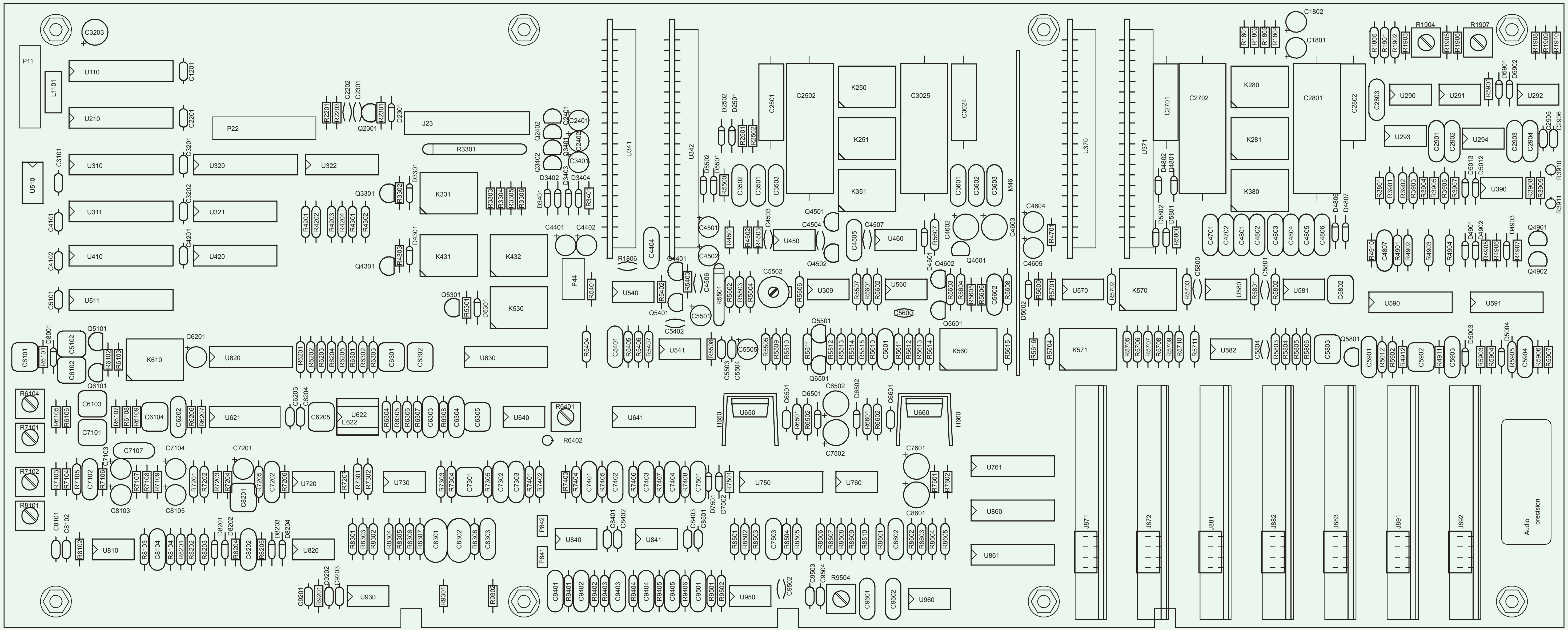

Figure 6-68. Cascade ANL module component locations.

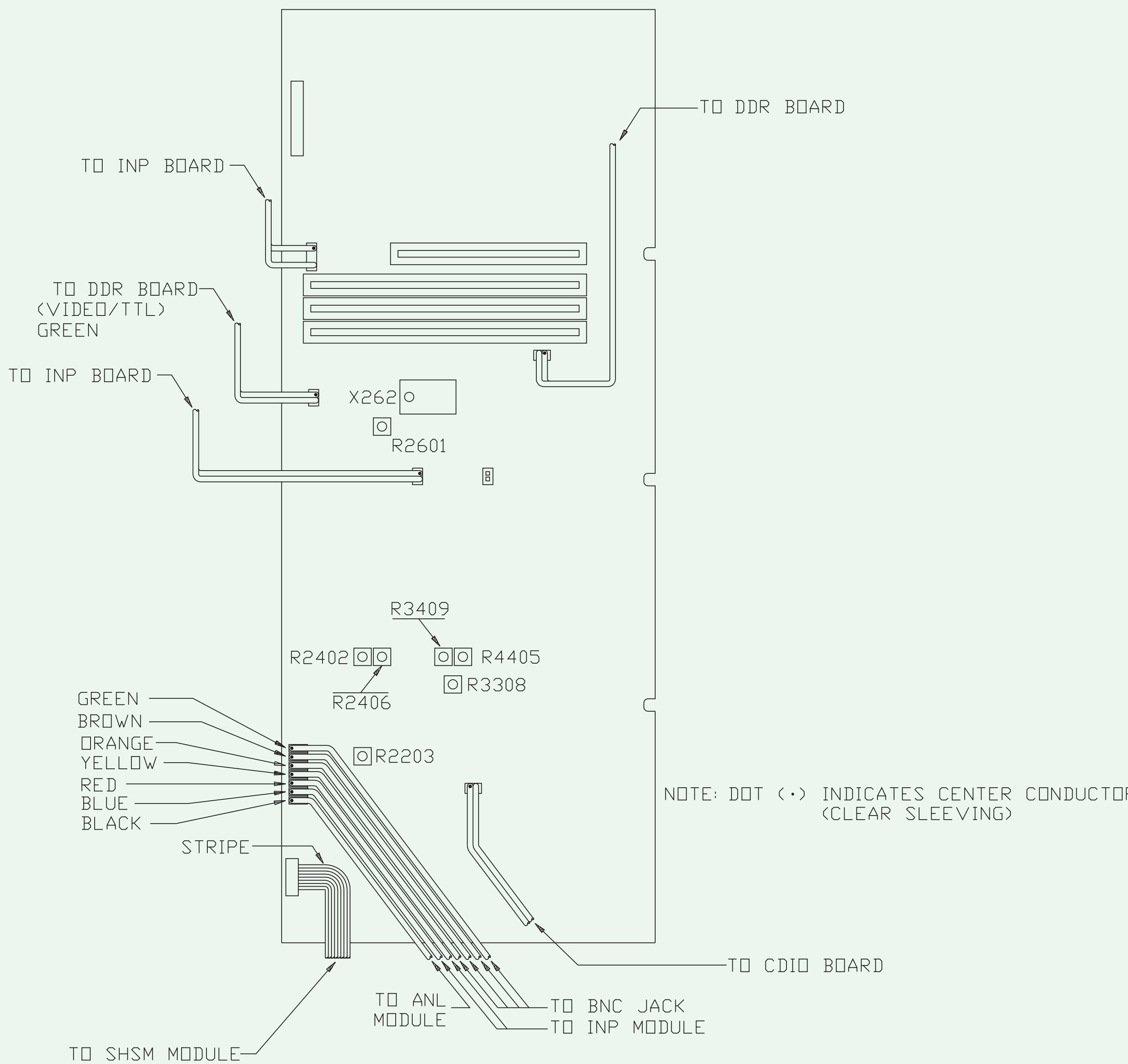

Figure 6-69. Cascade DSP module adjustment locations and connections.

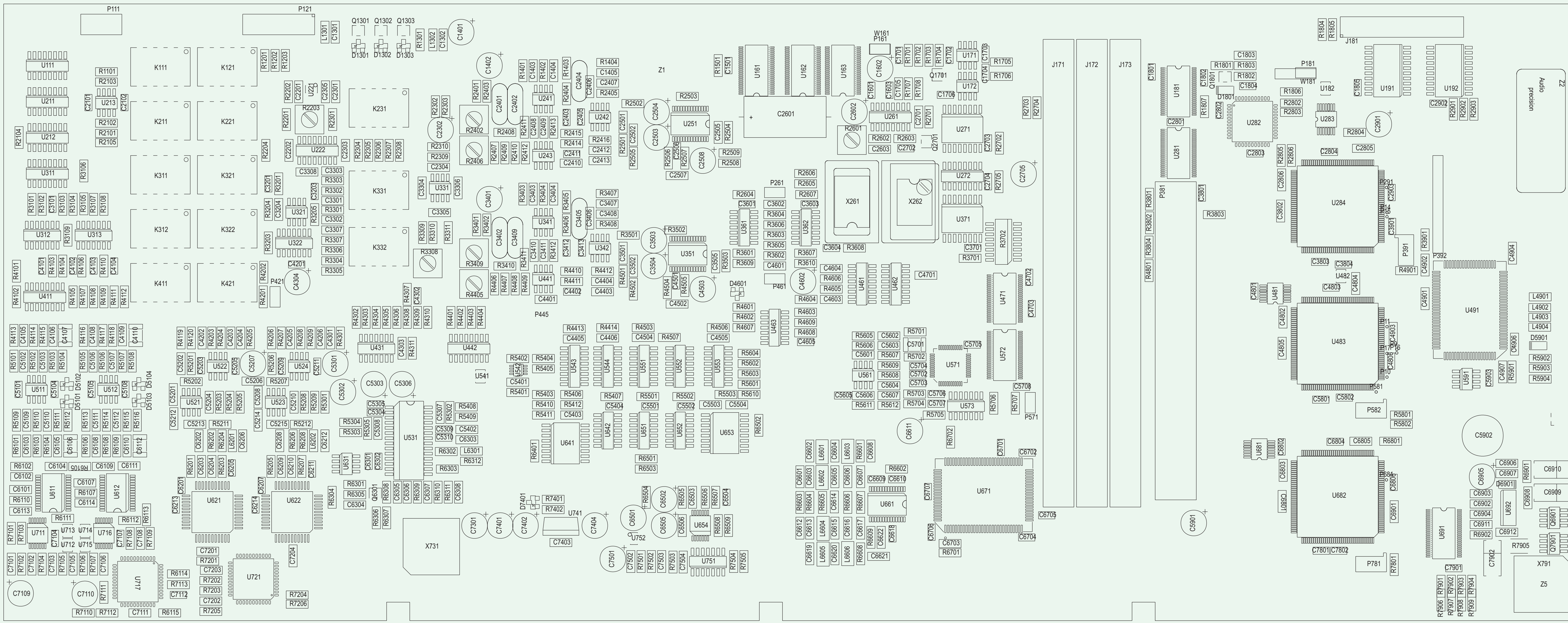

Figure 6-70. Cascade DSP module component locations.

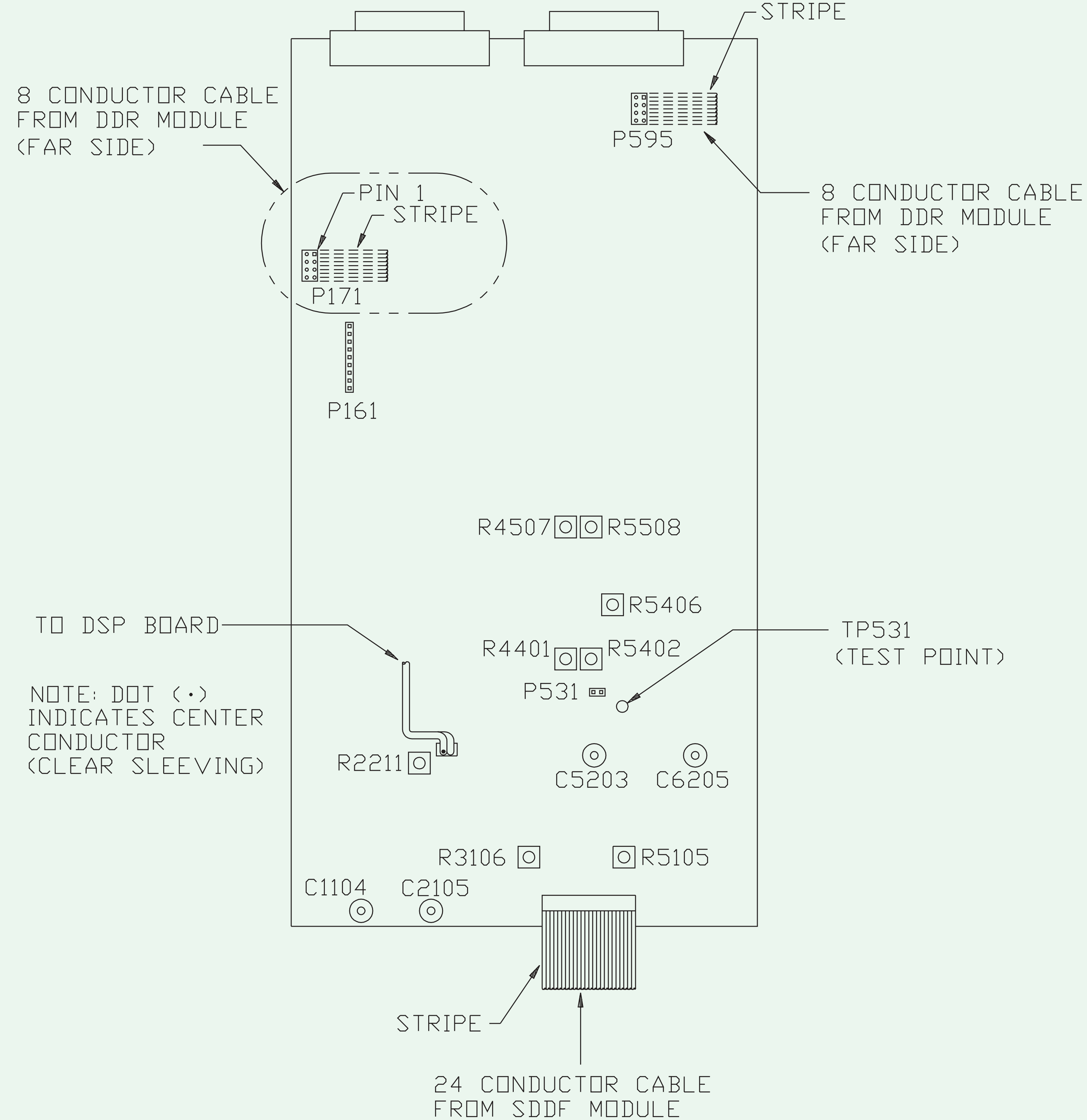

Figure 6-71. Cascade (96k) DIO module adjustment locations and connections.

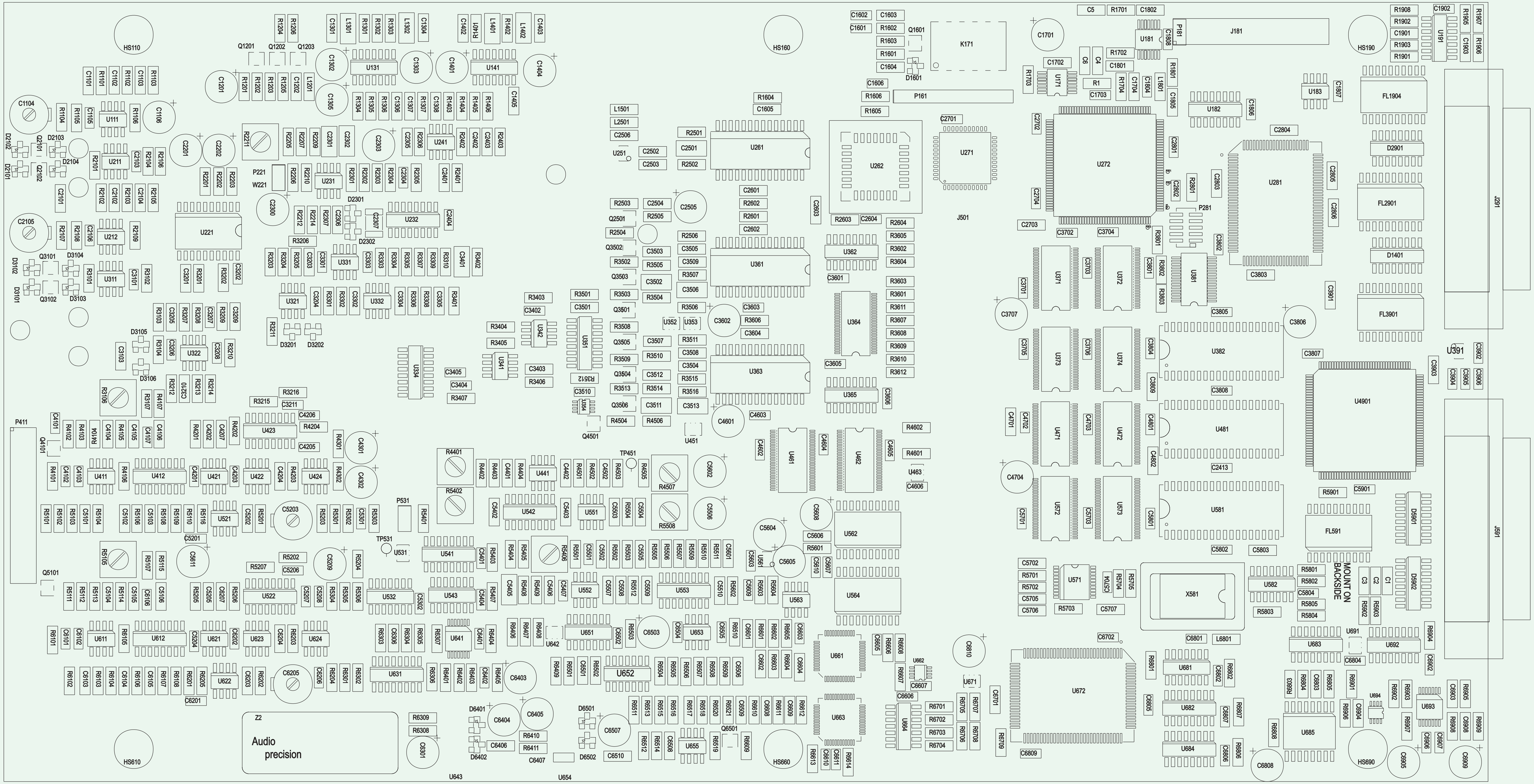

Figure 6-72. Cascade (96k) DIO module component locations.

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Cascade 192k-specific information follows.

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Cascade 192k-specific information follows.

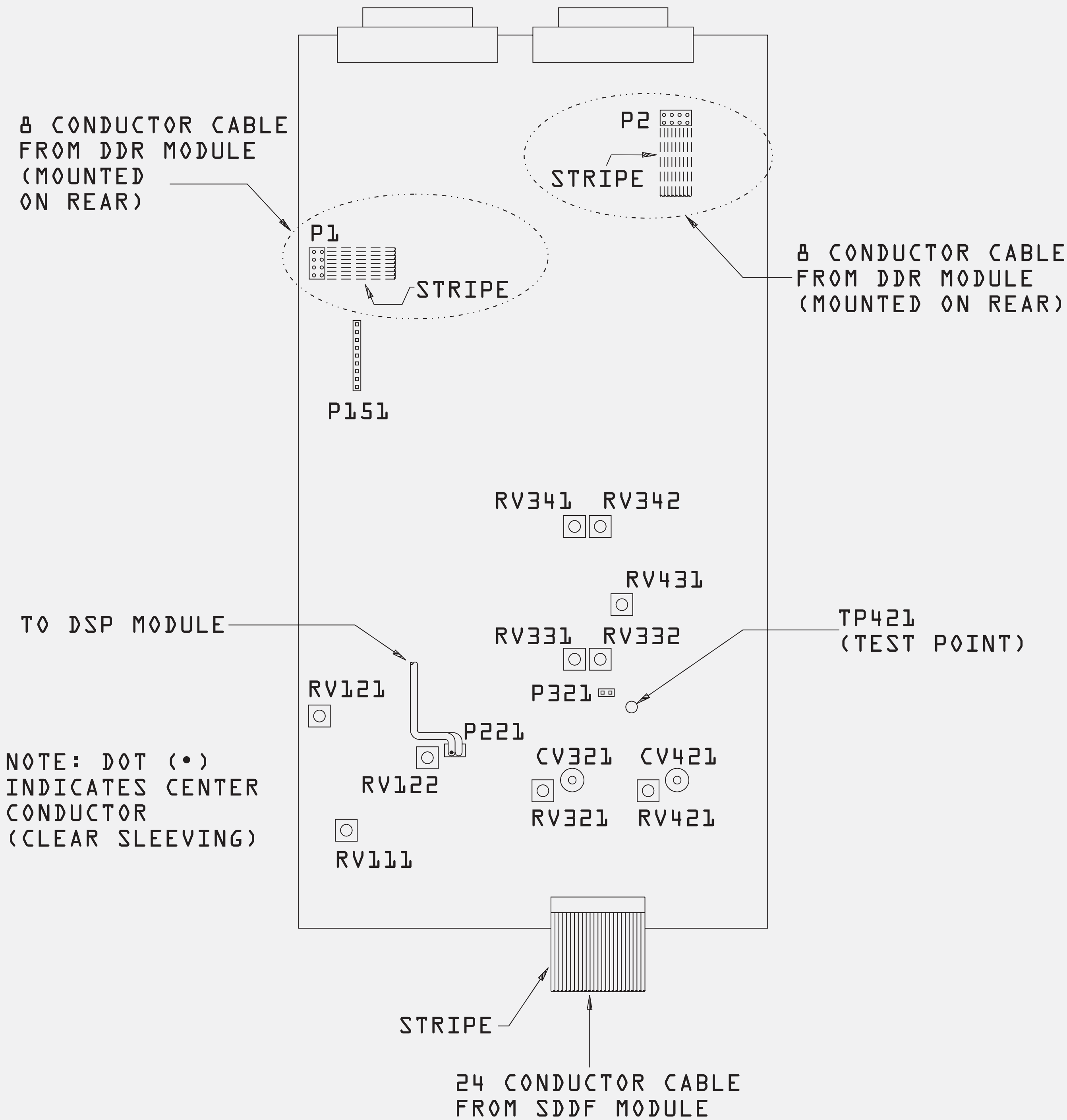

Figure 6-73. Cascade (192k) DIO module adjustment locations and connections.

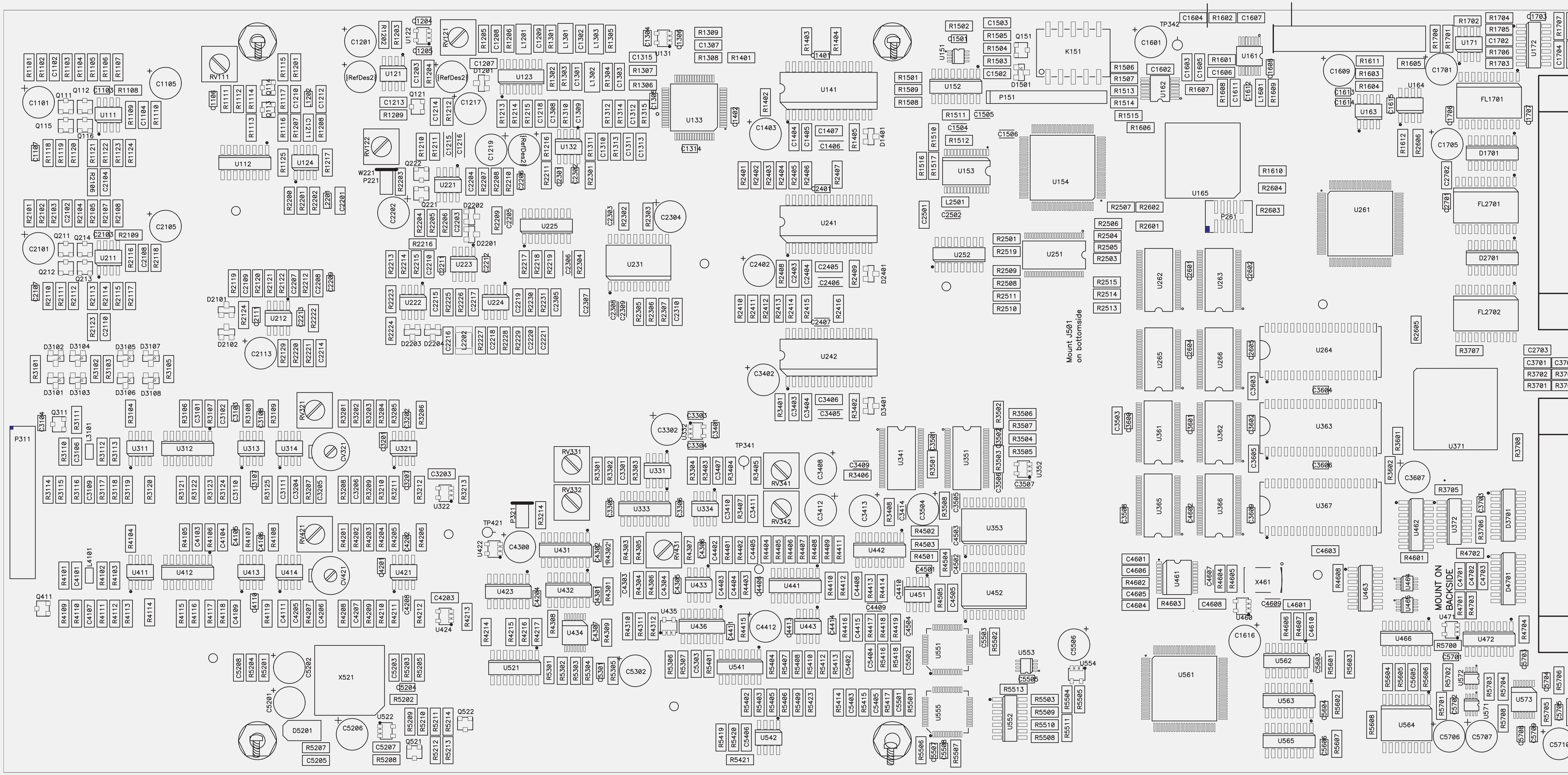

Figure 6-74. Cascade (192k) DIO module component locations.

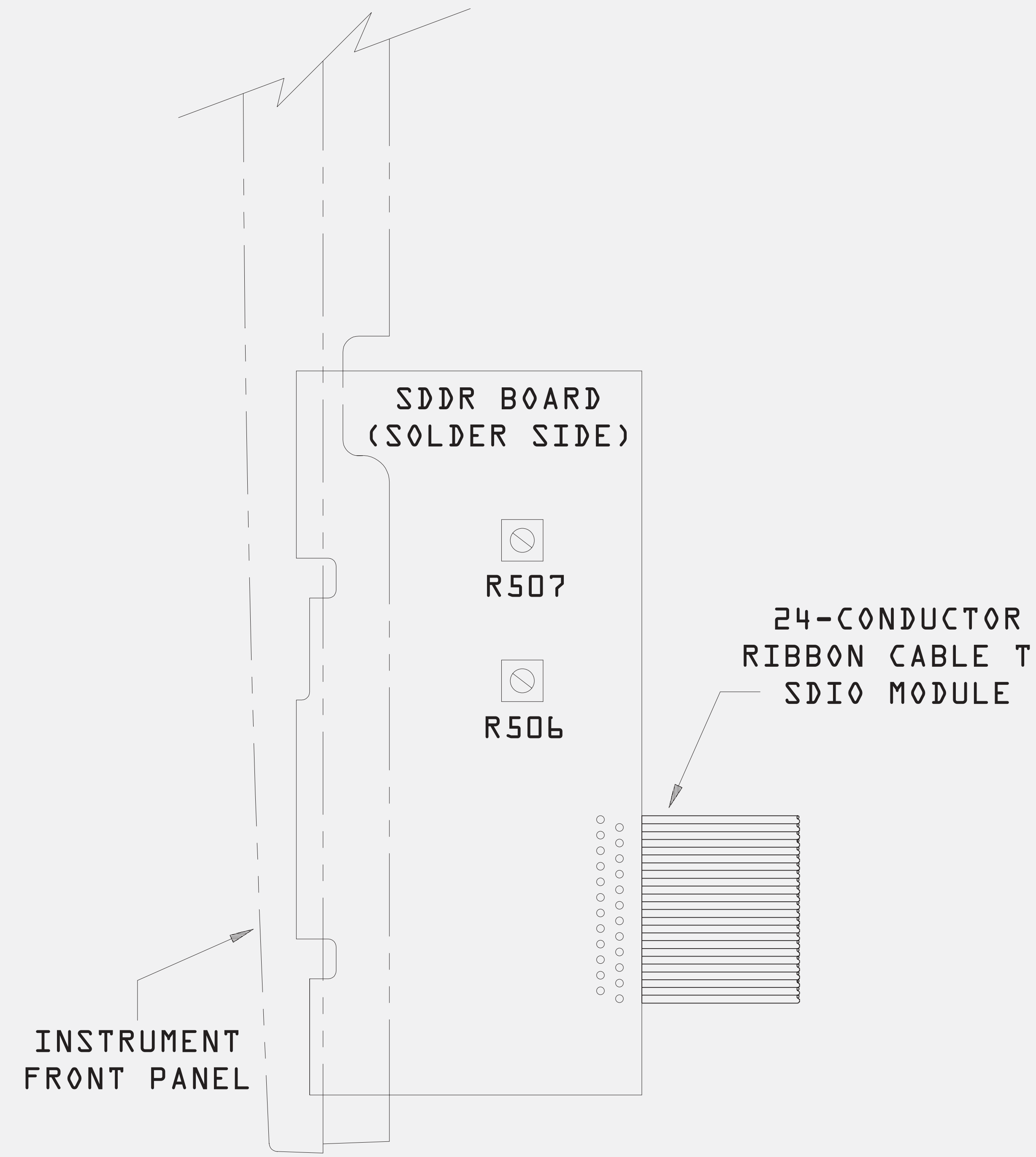

Figure 6-75. Cascade (192k) DDF module adjustment locations (on solder side of board).

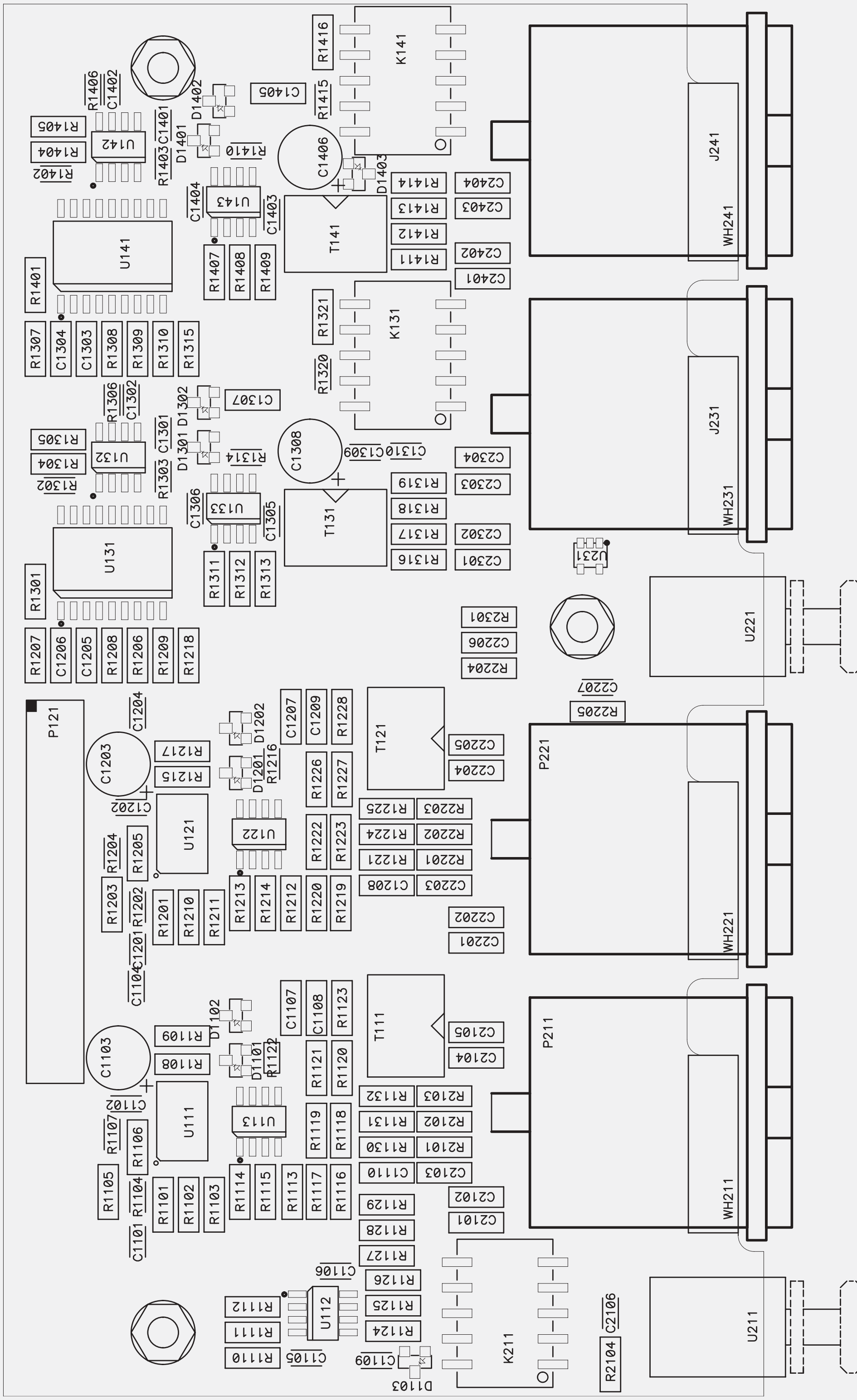

Figure 6-76. Cascade (192k) DDF module component locations.

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End of Cascade 192k-specific information.

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End of Cascade 192k-specific information.

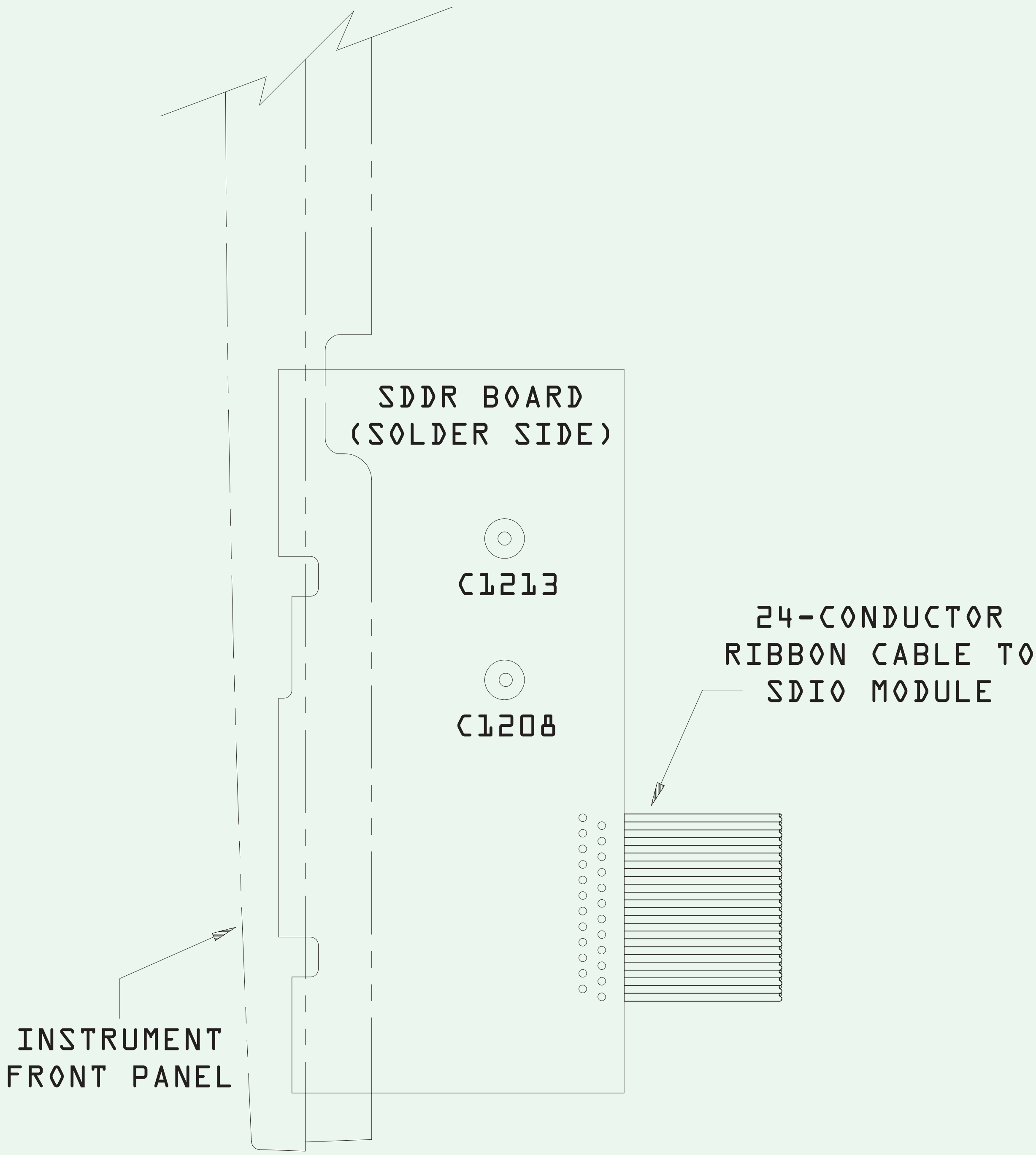


Figure 6-77. Cascade (96k) DDF module adjustment locations (on solder side of board).

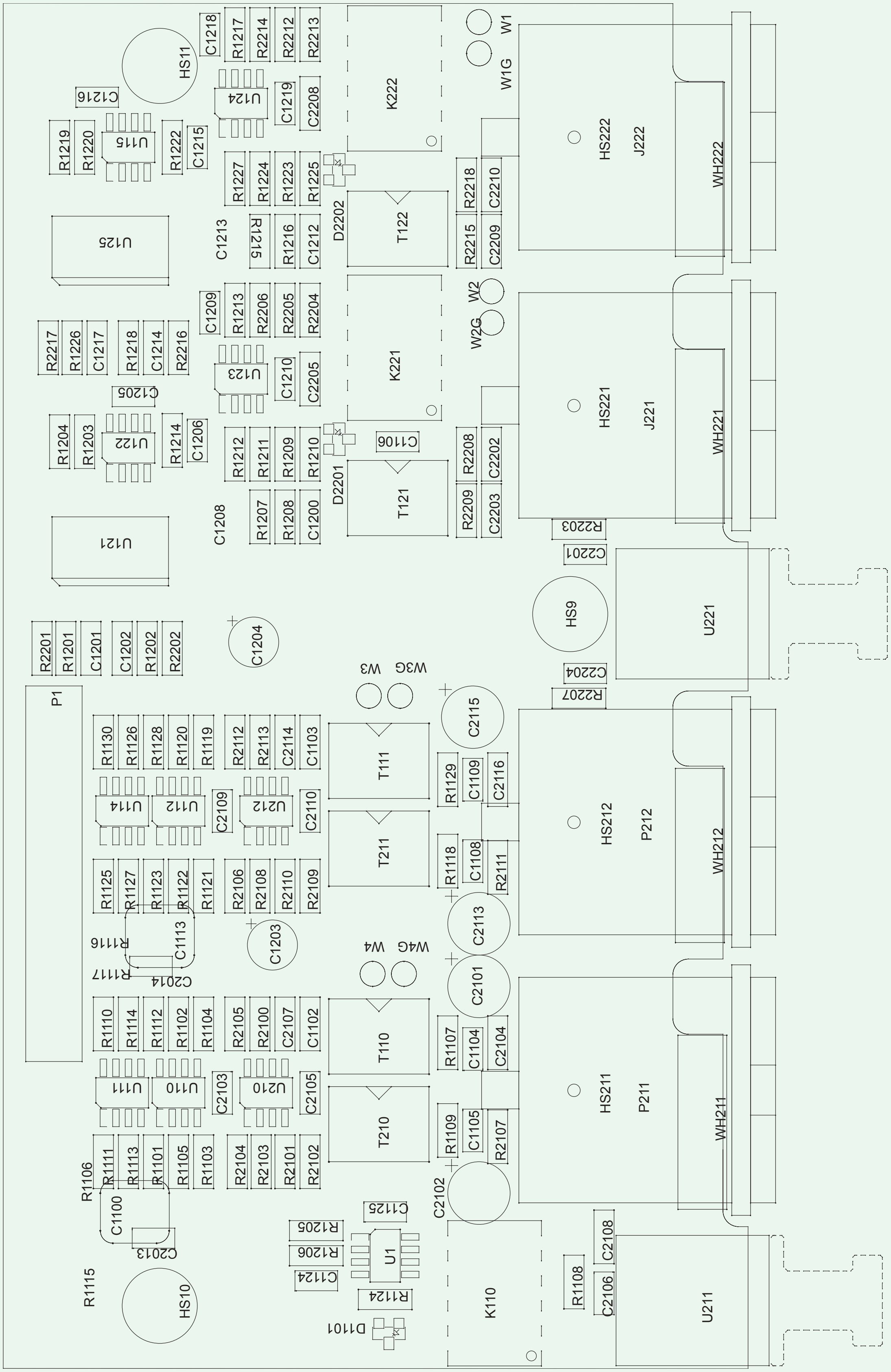


Figure 6-78. Cascade (96k) DDF module component locations.

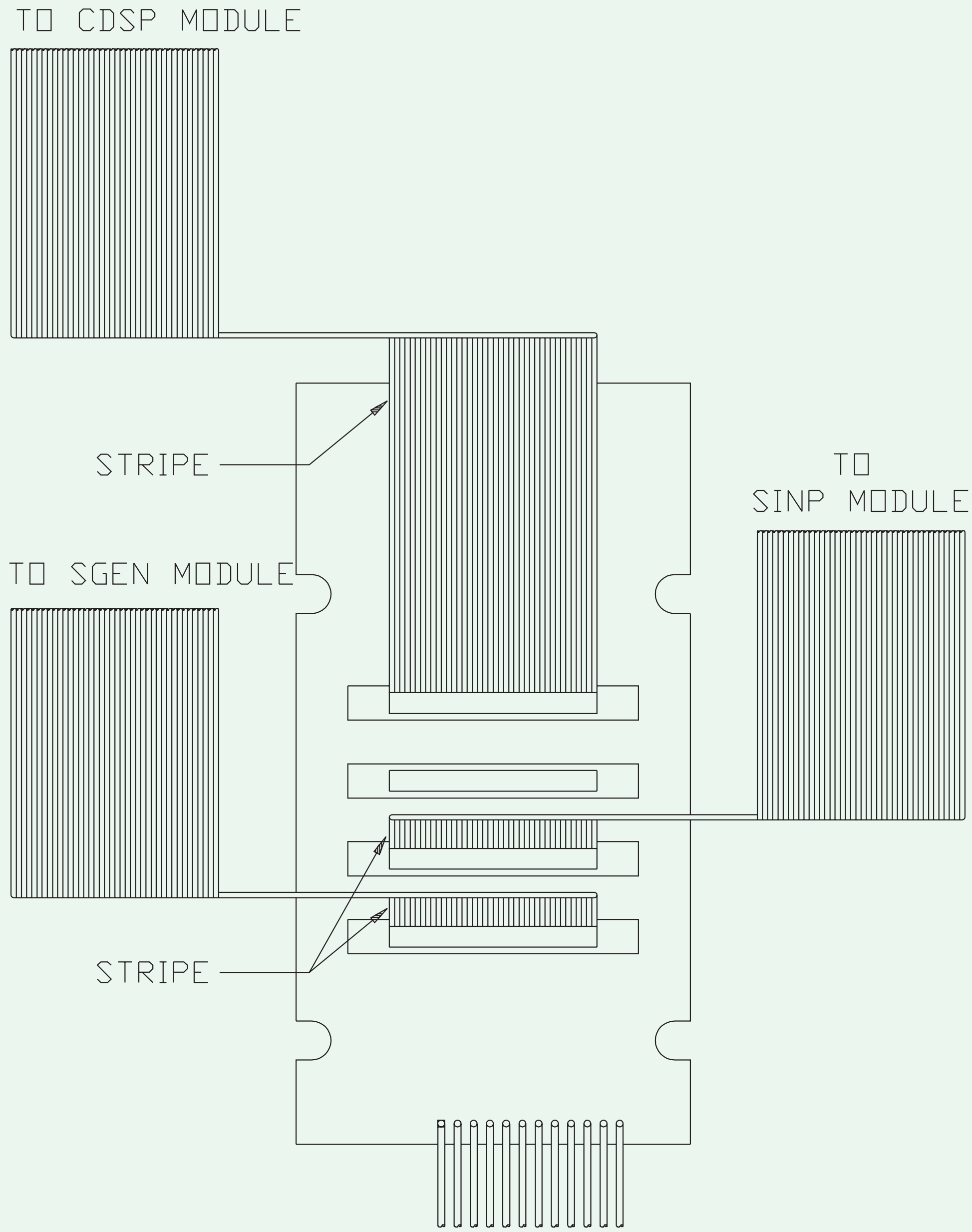


Figure 6-79. Cascade IFM module connections.

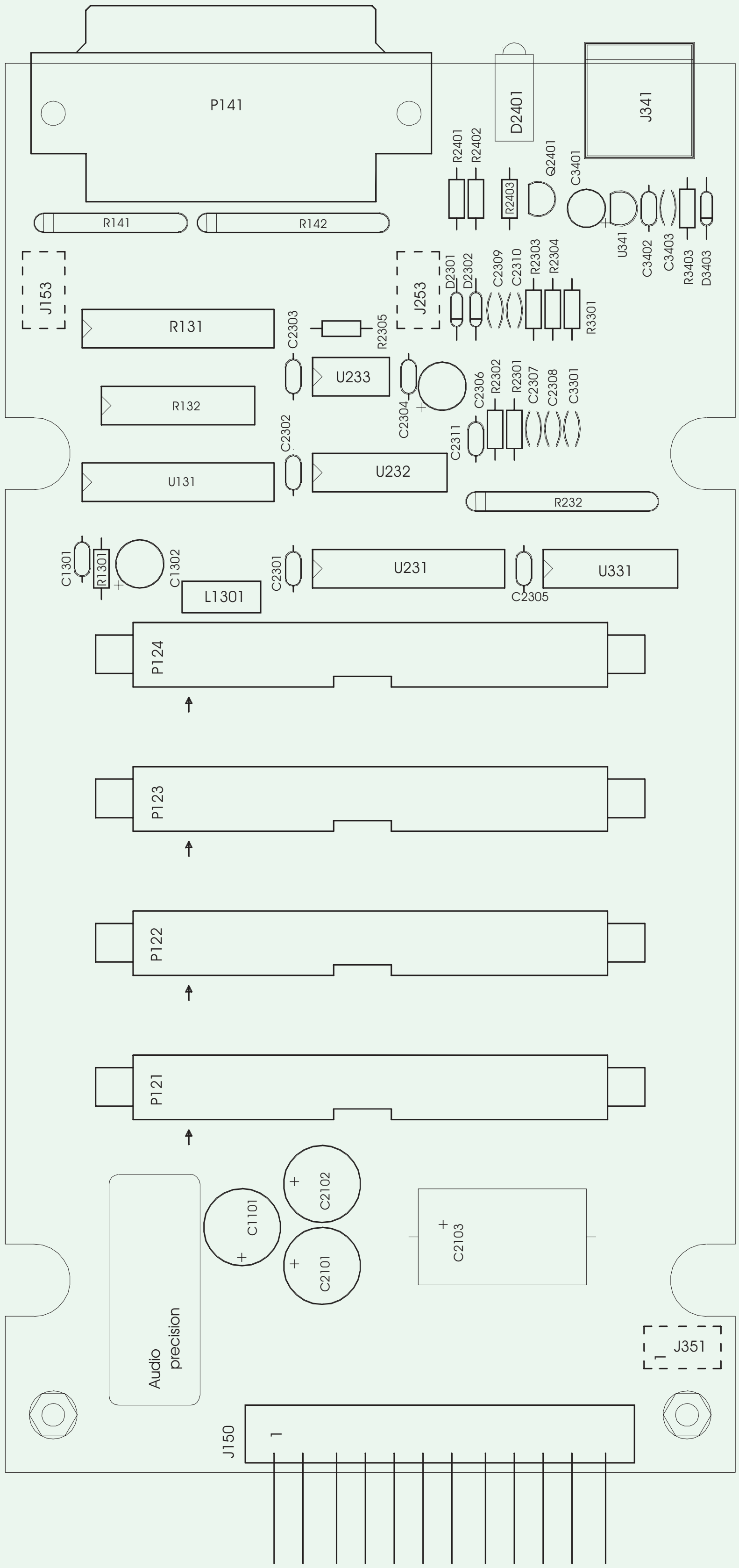


Figure 6-80. Cascade IFM module component locations.

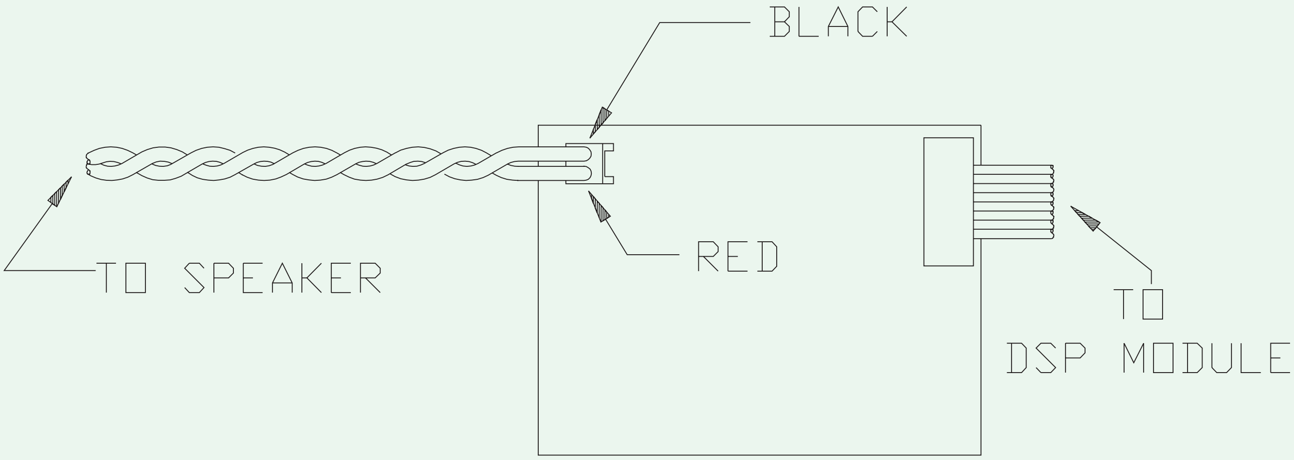


Figure 6-81. Cascade HSM module connections.

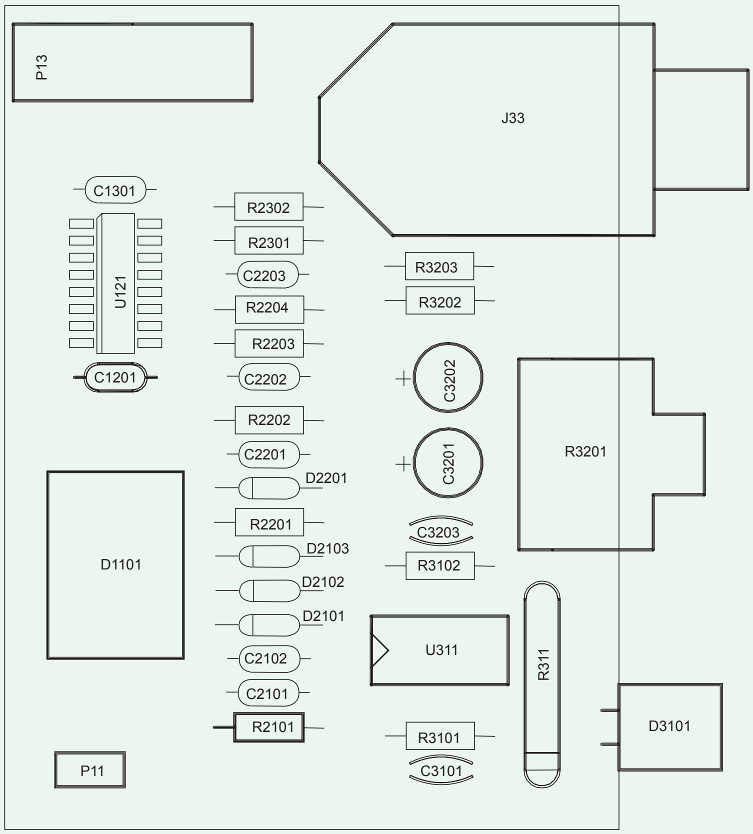


Figure 6-82. Cascade HSM module Component locations.

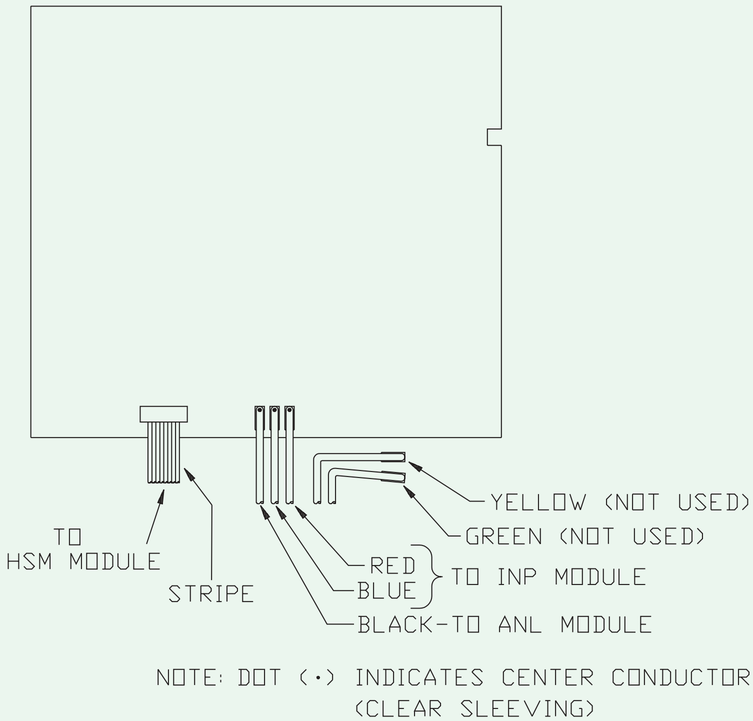


Figure 6-83. Cascade MUX module connections.

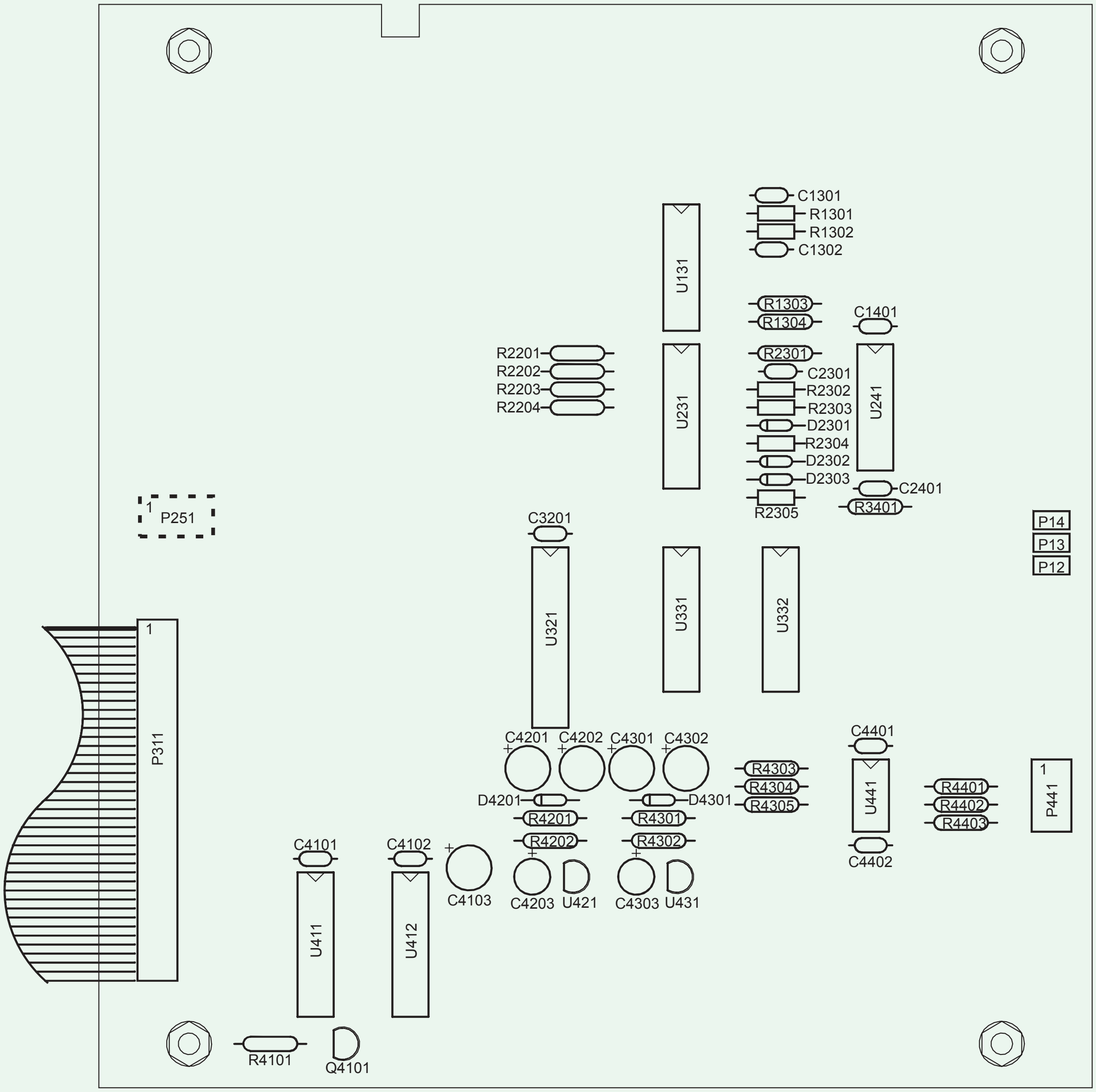


Figure 6-84. Cascade MUX module component locations.

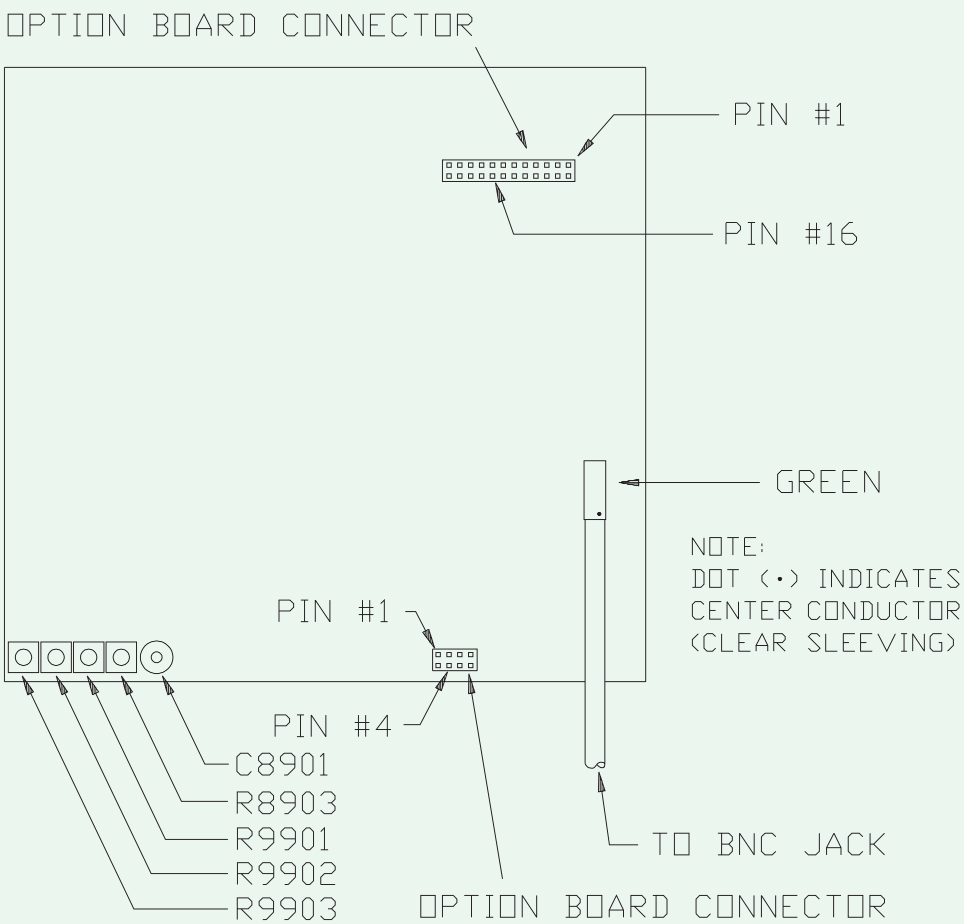


Figure 6-85. Cascade BUR module adjustment locations and connections.

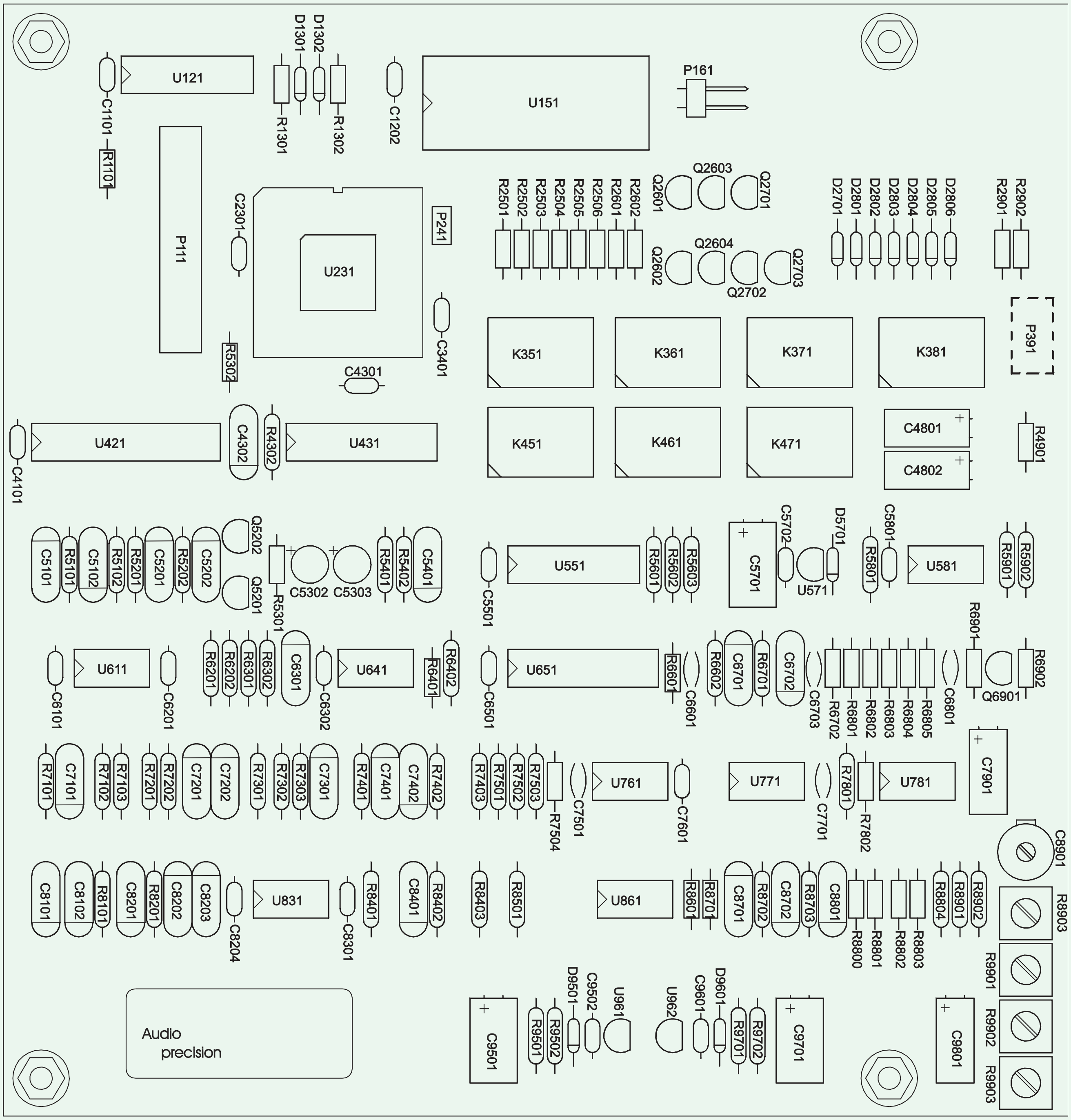


Figure 6-86. Cascade BUR module component locations.

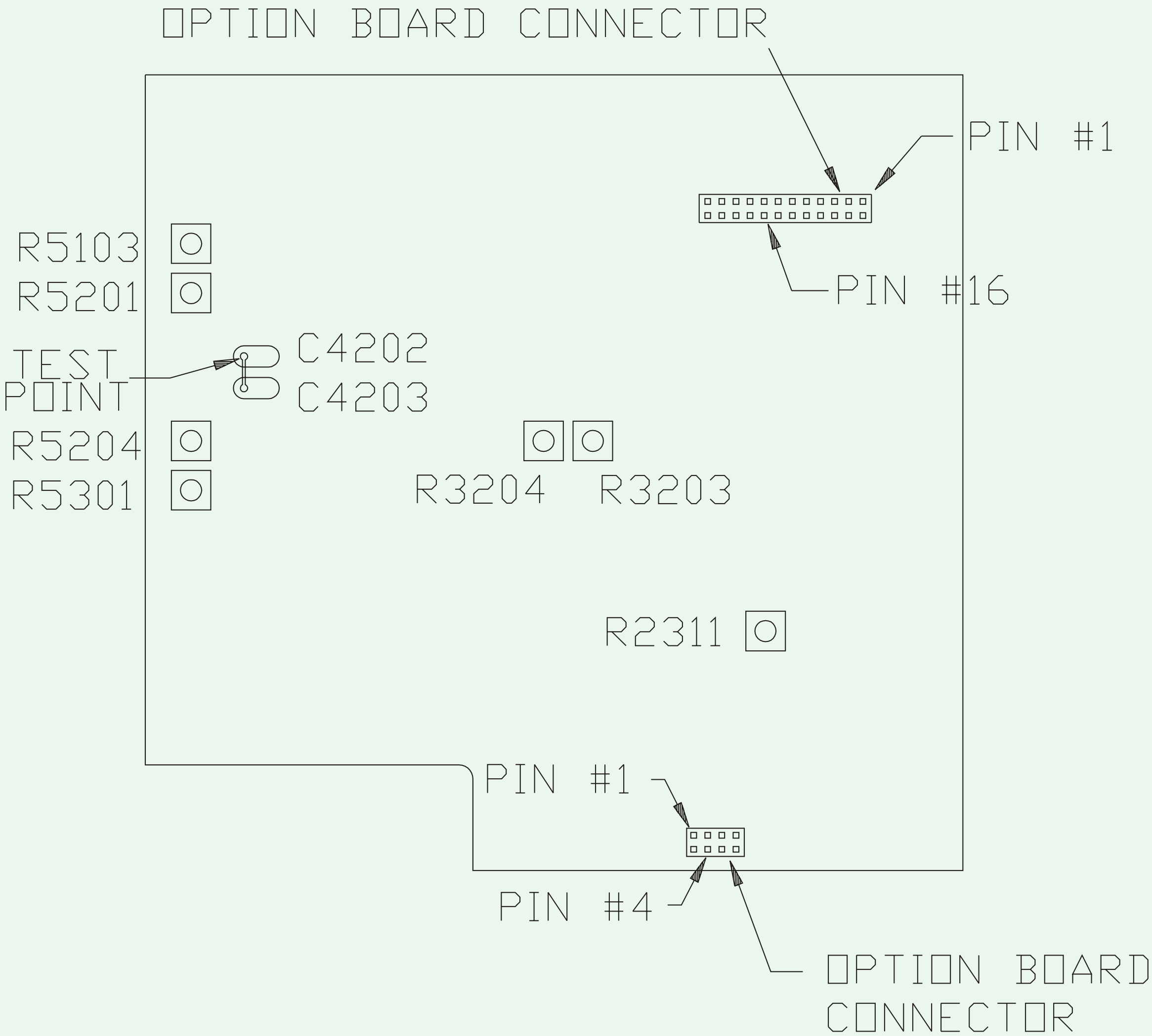


Figure 6-87. Cascade IMG module adjustment locations and connections.

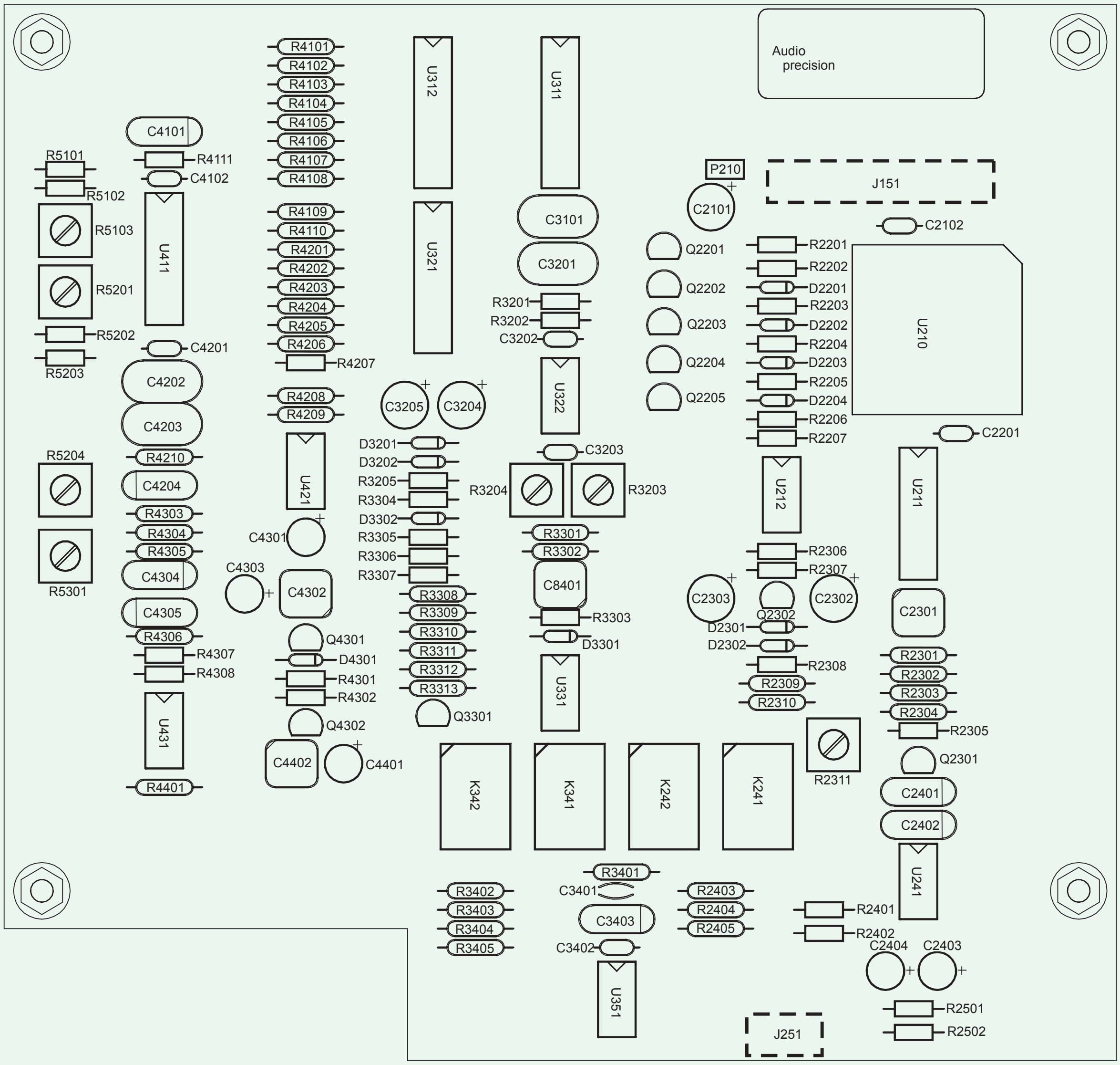


Figure 6-88. Cascade IMG module component locations.

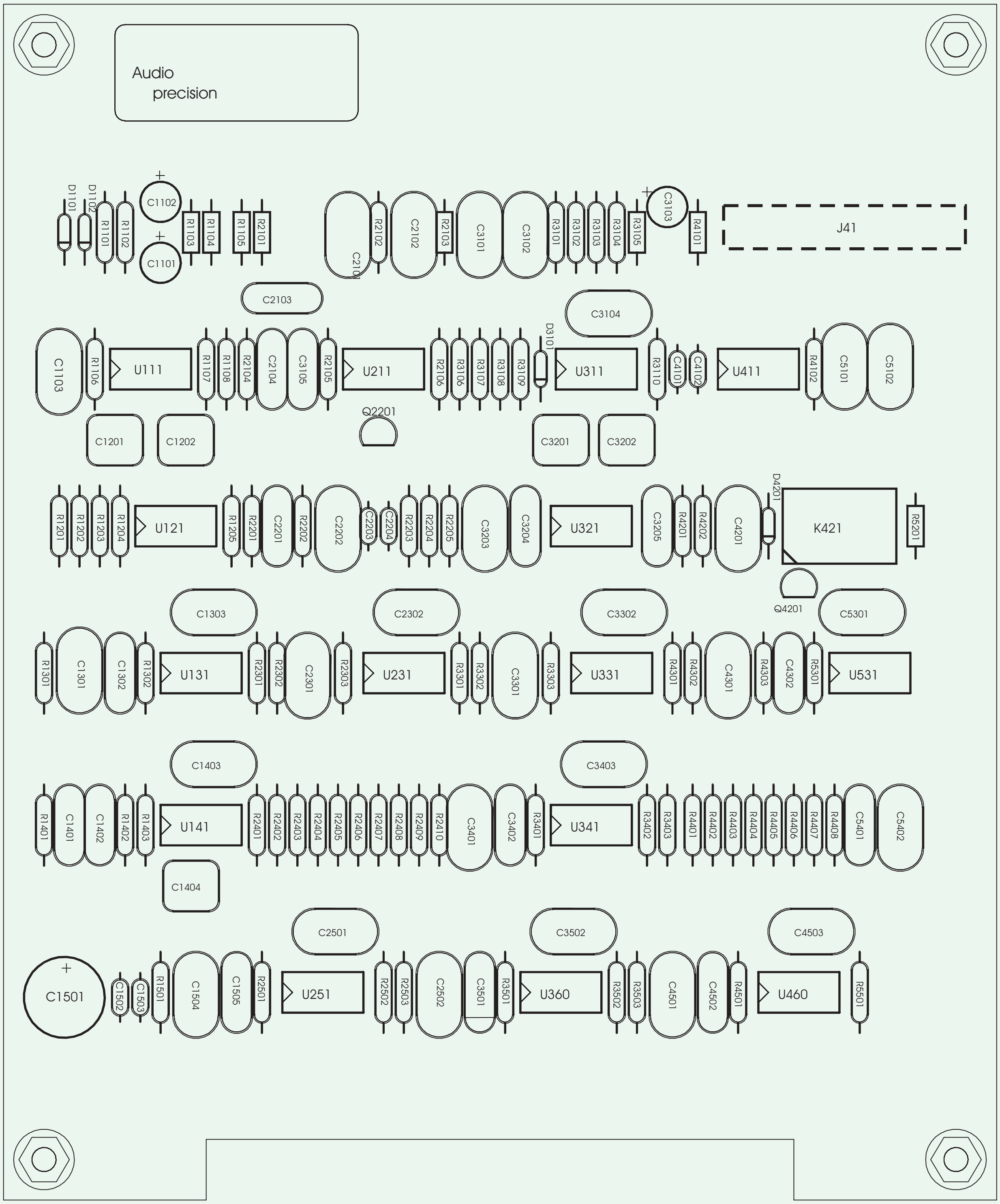


Figure 6-89. Cascade IMA module component locations.

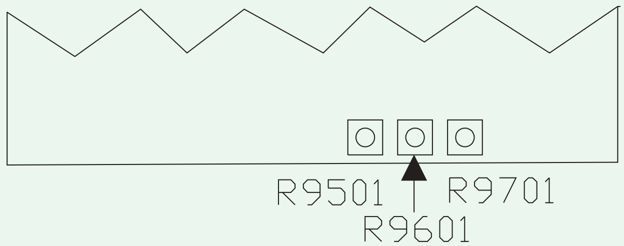


Figure 6-90. Cascade WFA module adjustmen locations.

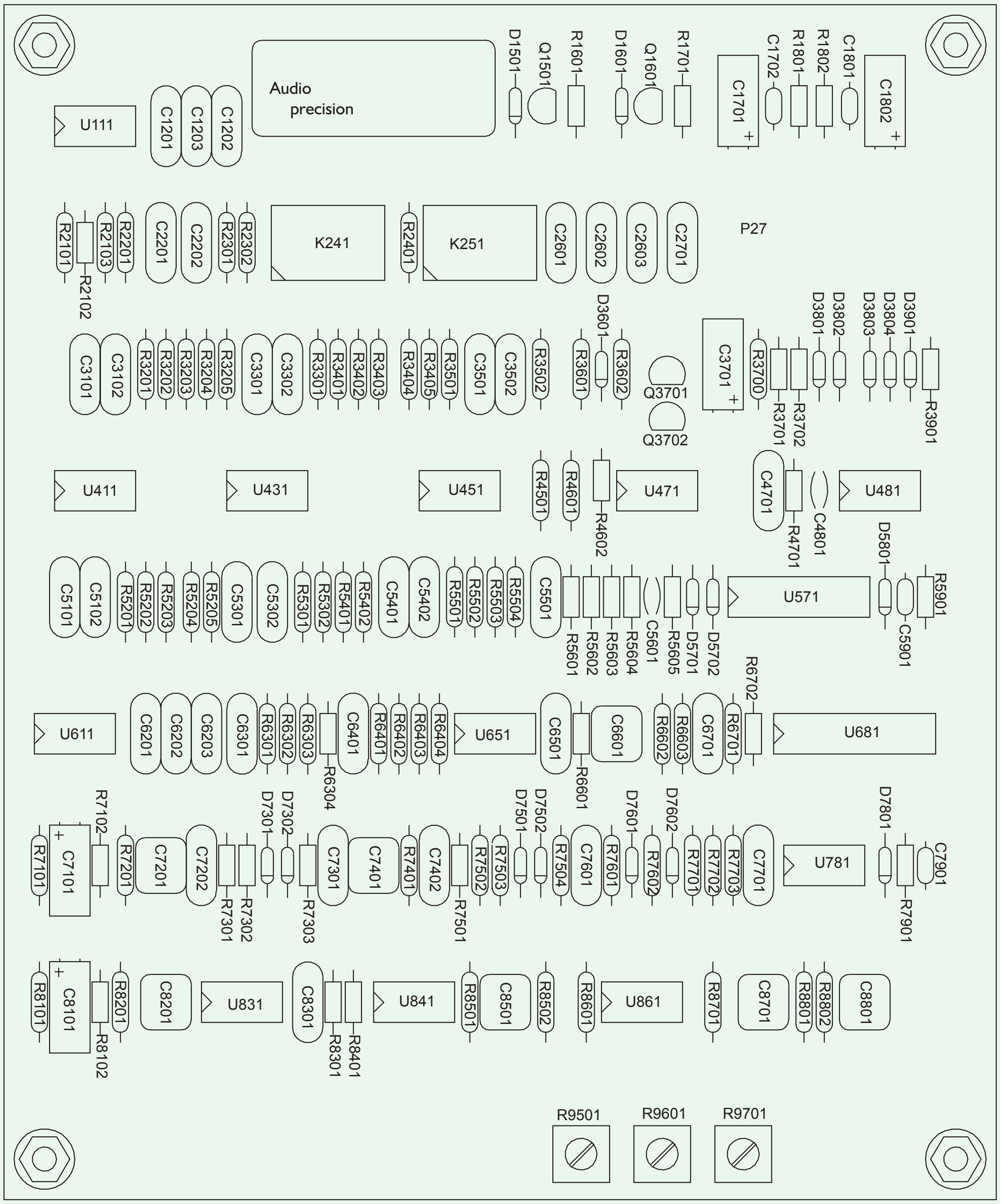


Figure 6-91. Cascade WFA module component locations.

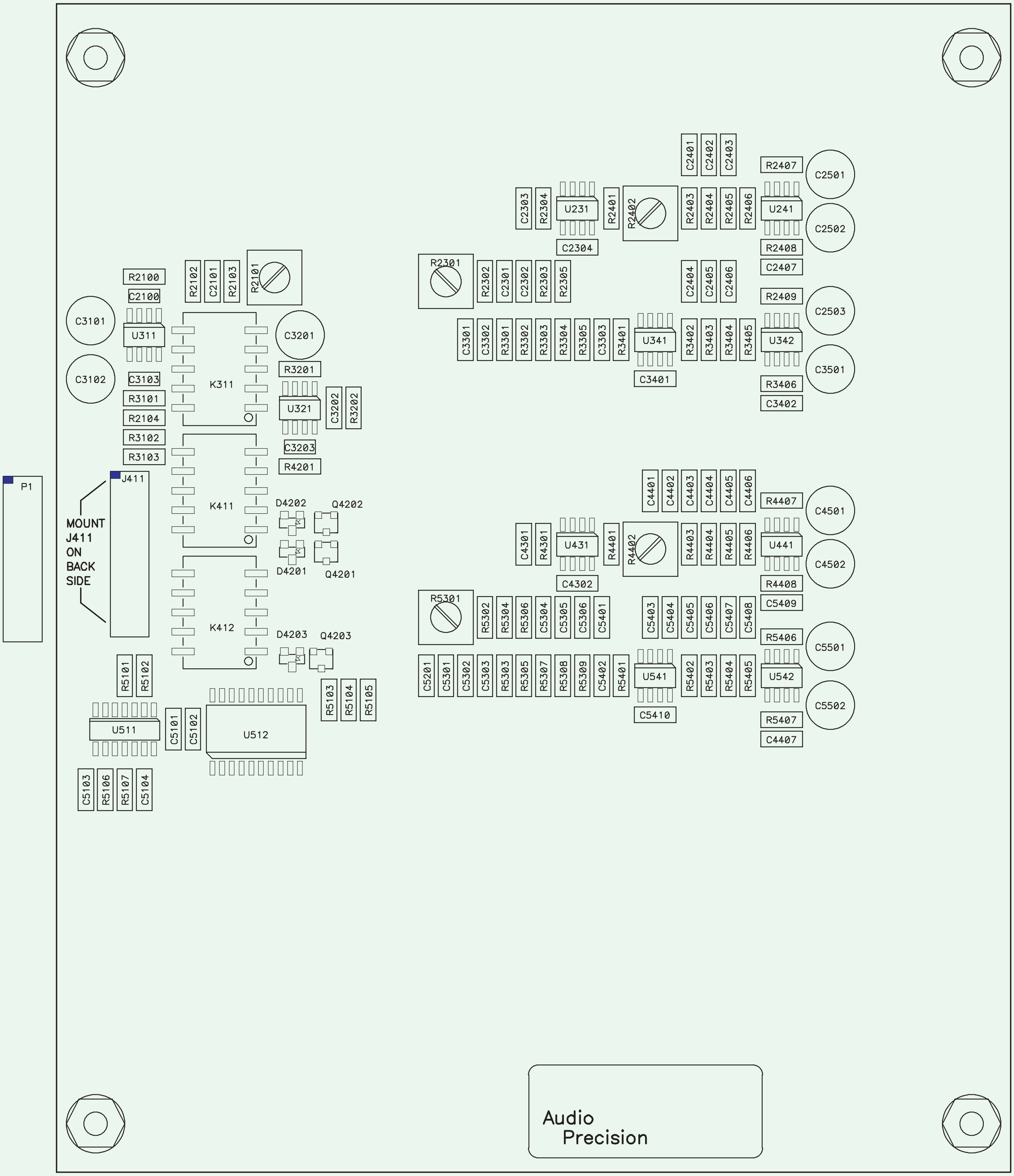


Figure 6-92. Cascade SLPX module component and adjustment locations.

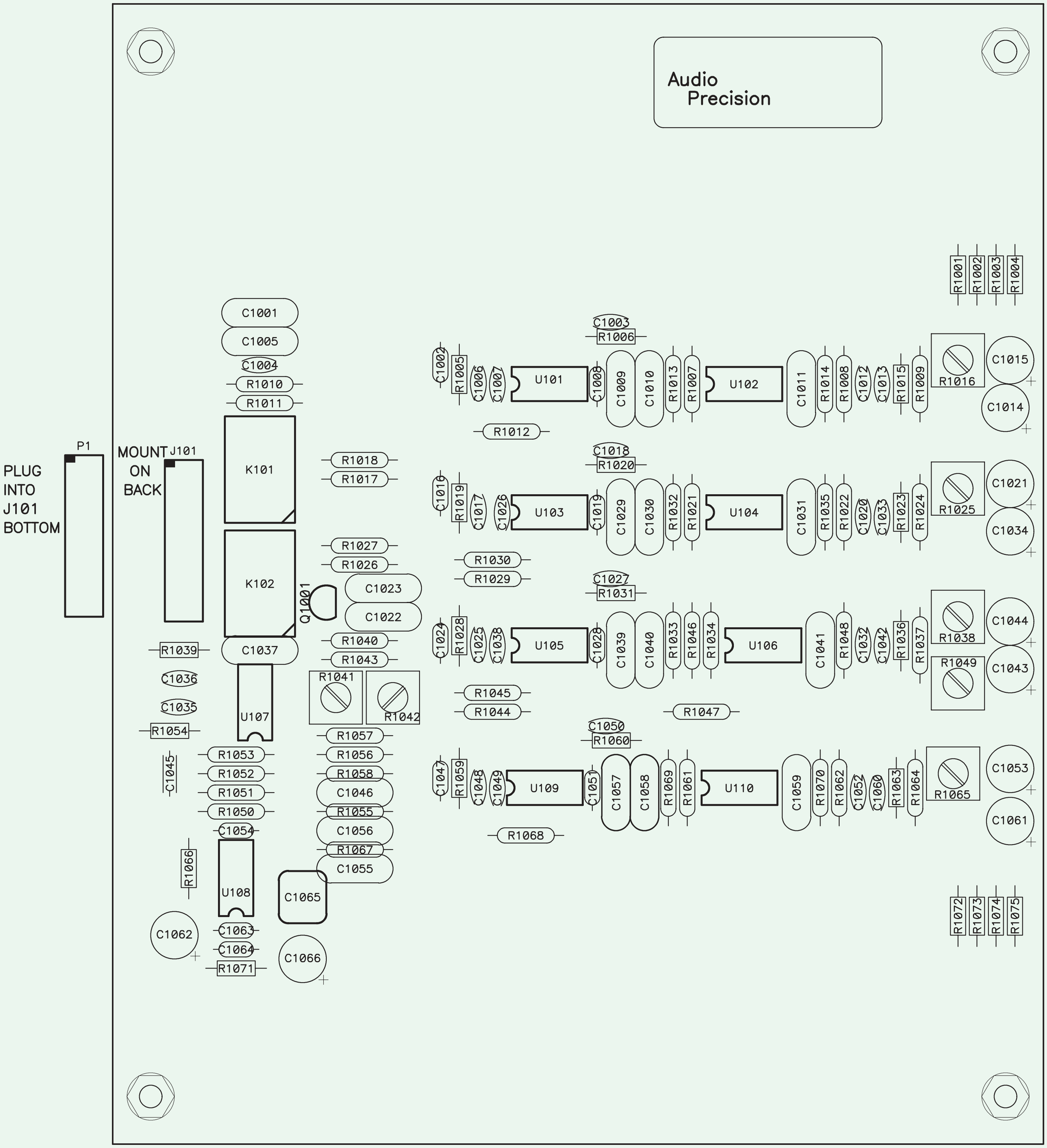


Figure 6-93. Cascade SAES module component and adjustment locations.

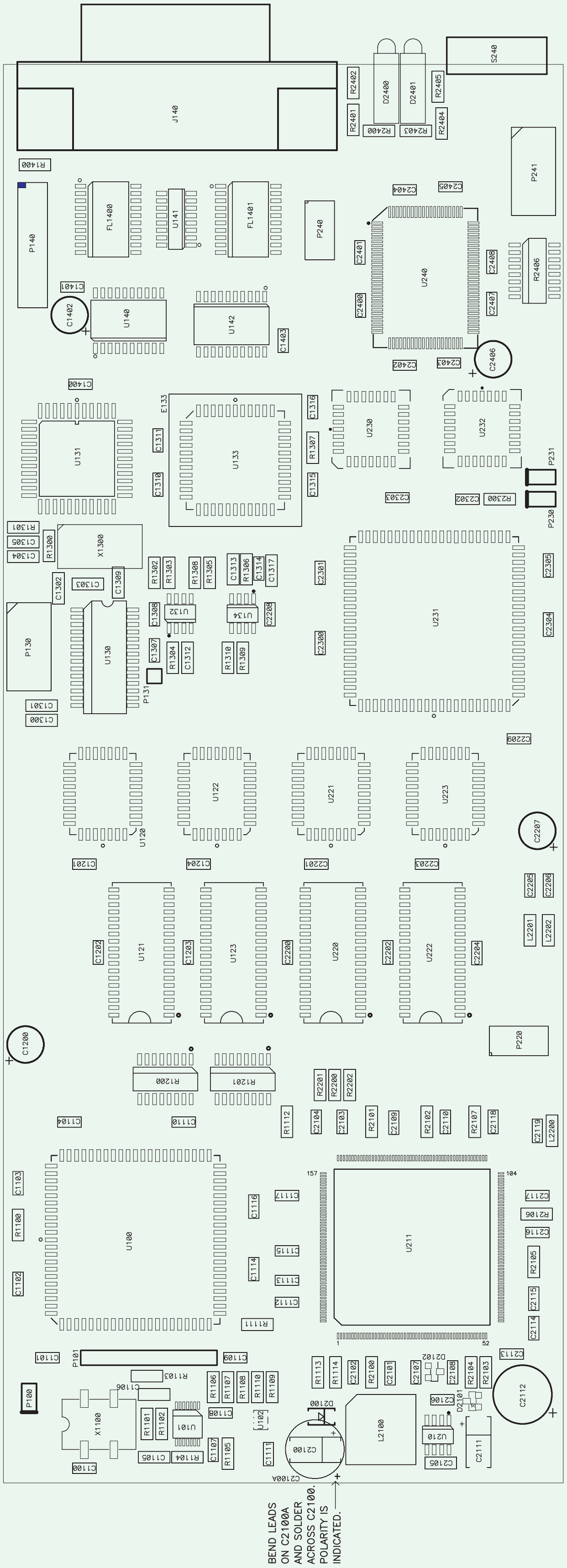


Figure 6-94. Cascade SIFG module component locations.

Chapter 6e: Electronics Diagrams, System Two

This chapter contains main printed circuit board (PCB) drawings showing the location of adjustments and cables, and option circuit board assemblies and main PCB detail drawings showing component designators. All information is believed to be accurate as of the publication date; however, Audio Precision reserves the right to make changes without prior notice.

COMPONENT AND ASSEMBLY DESIGNATIONS

A	Assembly	**L**	Inductor, fixed or variable
BT	Battery	**P**	Connector, male
C	Capacitor, fixed or variable	**Q**	Transistor, FET, or SCR
D	Diode	**R**	Resistor, fixed or variable
E	Socket or mechanical part	**S**	Switch or contact
F	Fuse	**TP**	Test Point
H	Heat sink or radiator	**U**	Integrated Circuit
HS	Heat sink or mounting hardware	**W**	Wire strap or Cable
J	Connector, female	**X**	Transformer
K	Relay	**Y**	Crystal

System Two

FUSE SPECIFICATION

A	5X20 MM, TYPE T (S B), 6.3 A
B	5X20 MM, TYPE T (S B), 2.5 A

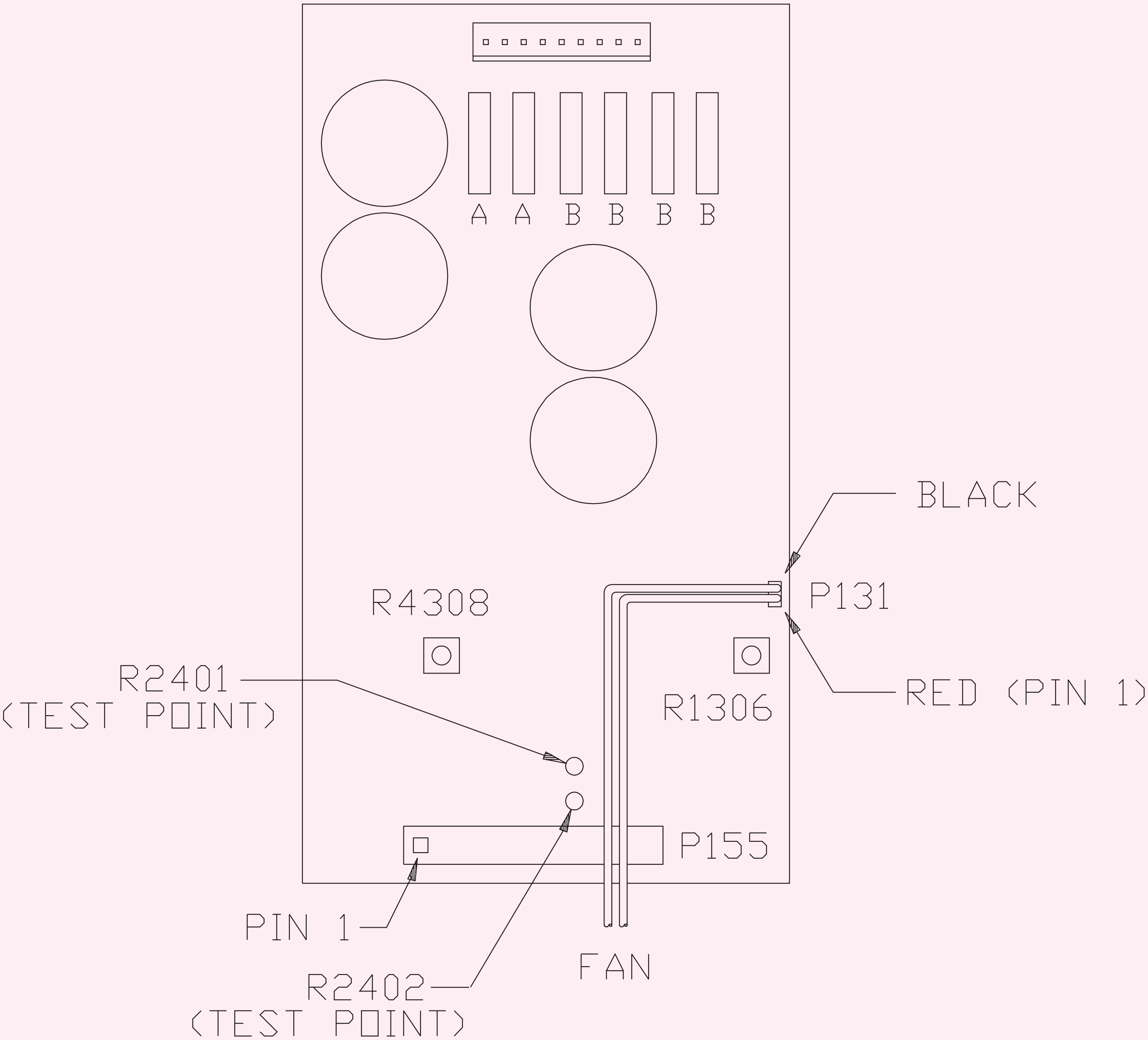


Figure 6-95. System Two PSA module test points and adjustment locations.

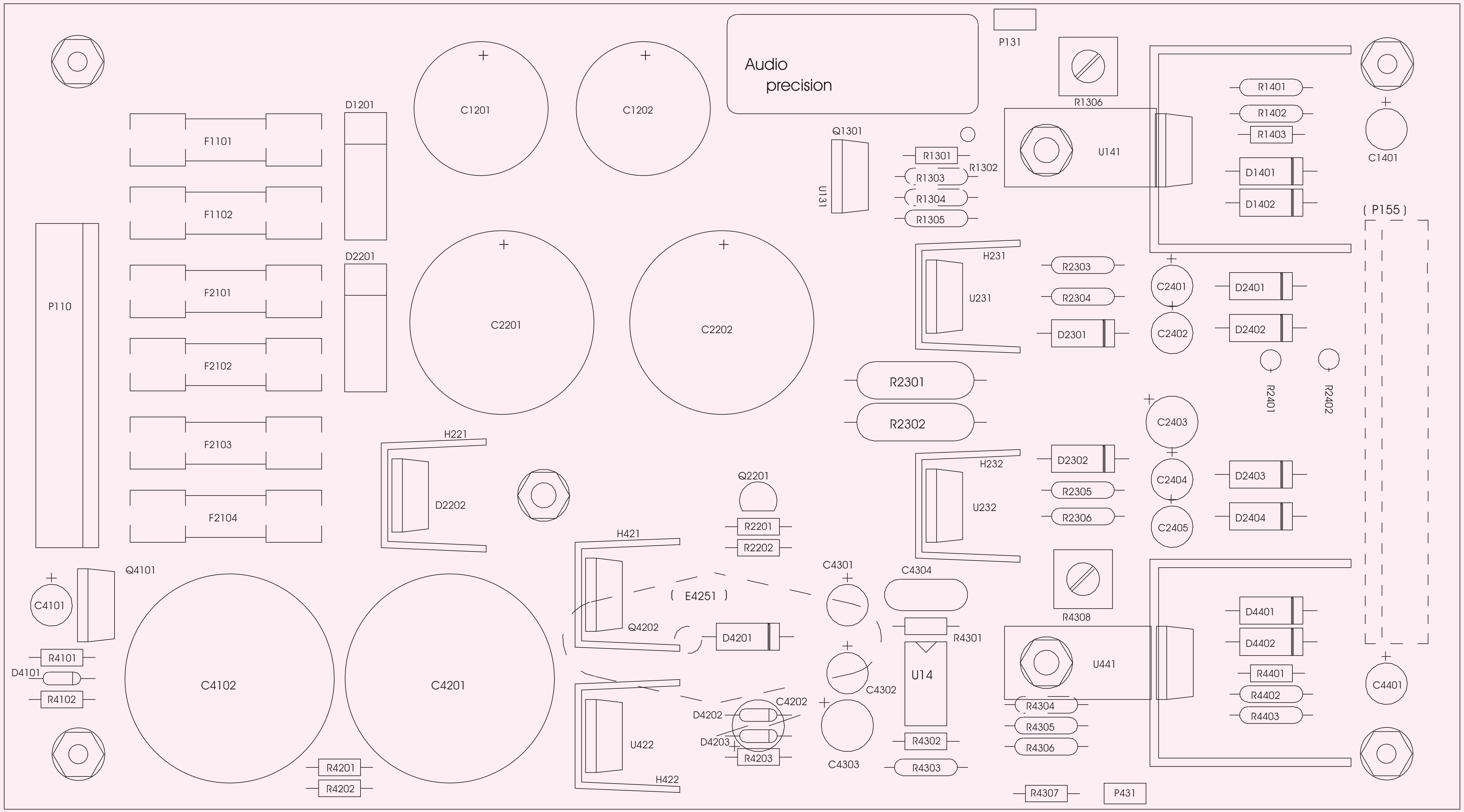
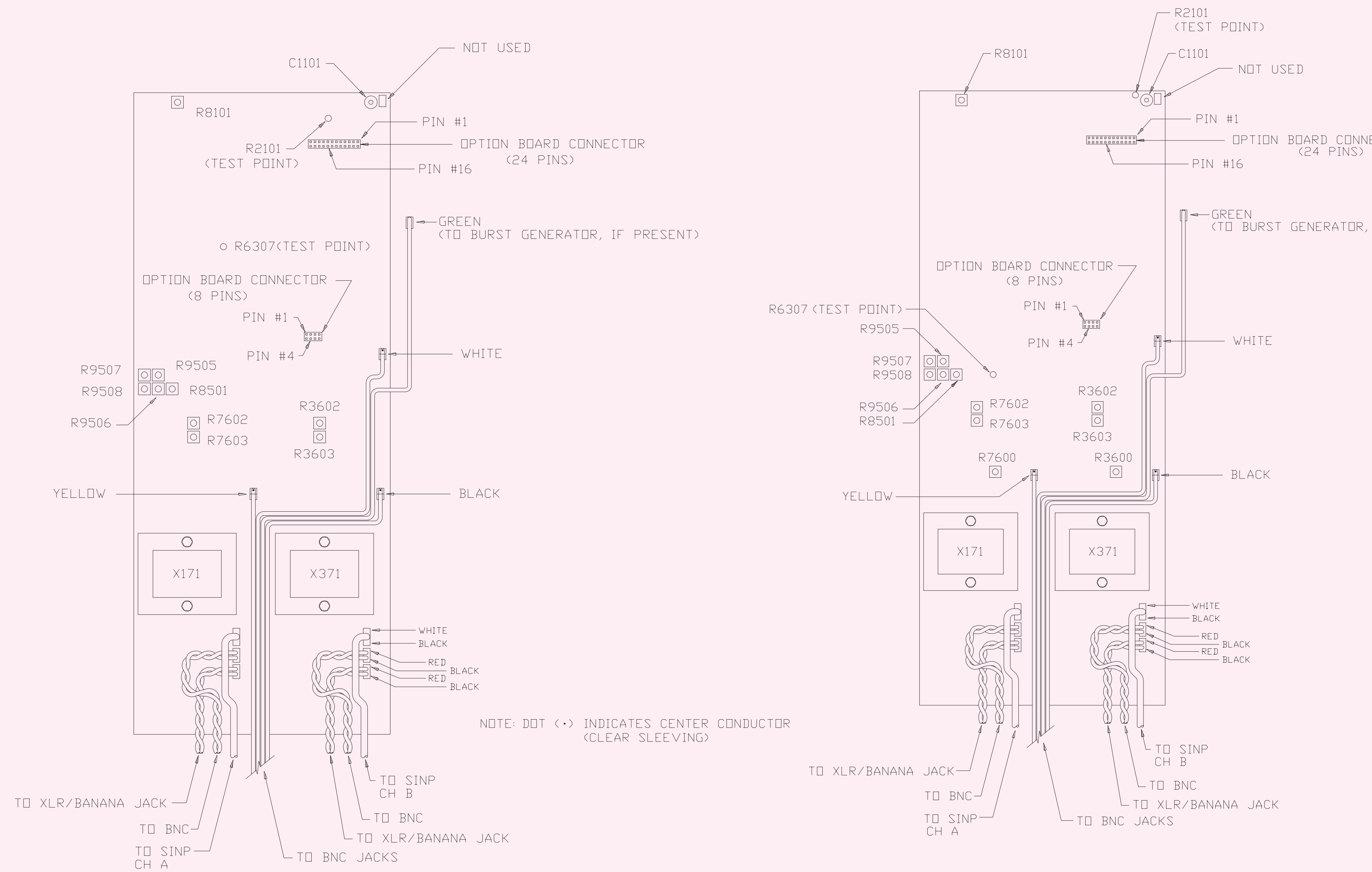


Figure 6-96. System Two PSA module component locations.



Rev 0 Rev 1

Figure 6-97. System Two GEN module adjustment locations and connections.
Most instruments are fitted with the Rev 1 module. Some earlier instruments are fitted with the Rev 0 module.

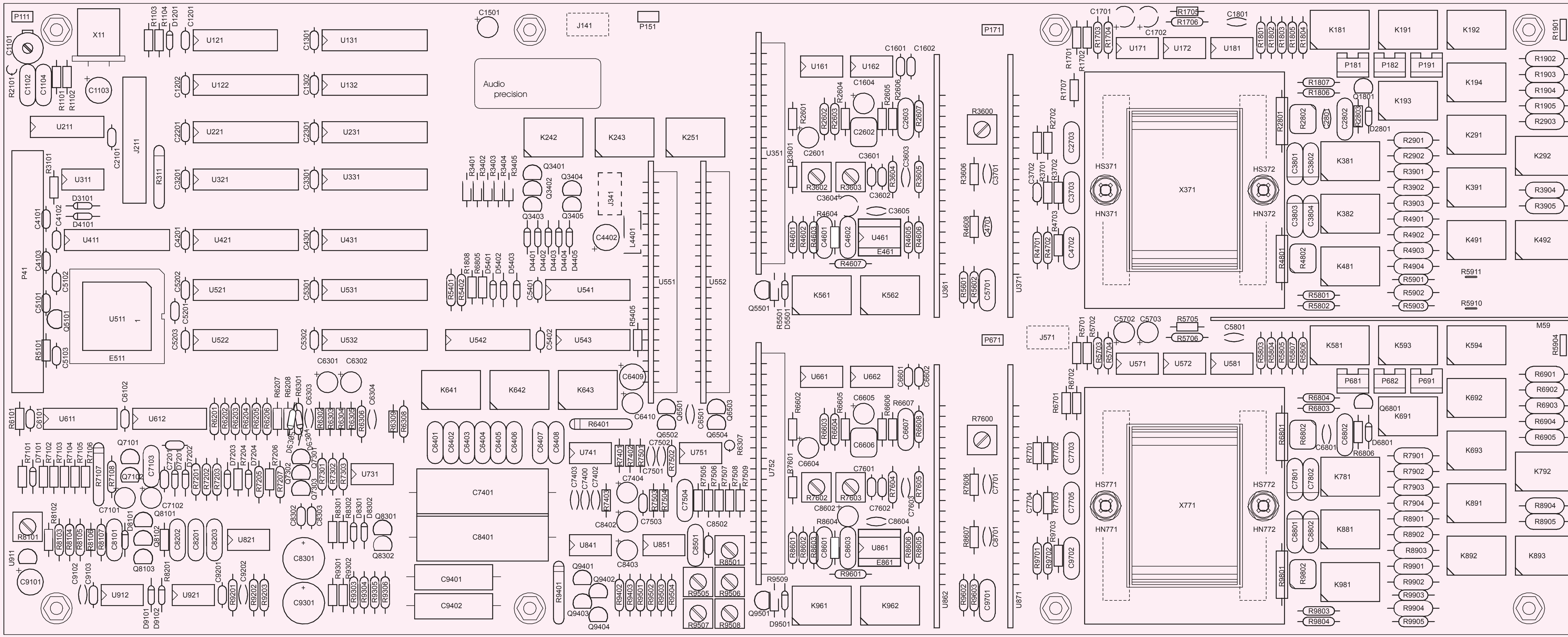


Figure 6-98. System Two GEN module component locations, most instruments. See next pages for earlier instruments.

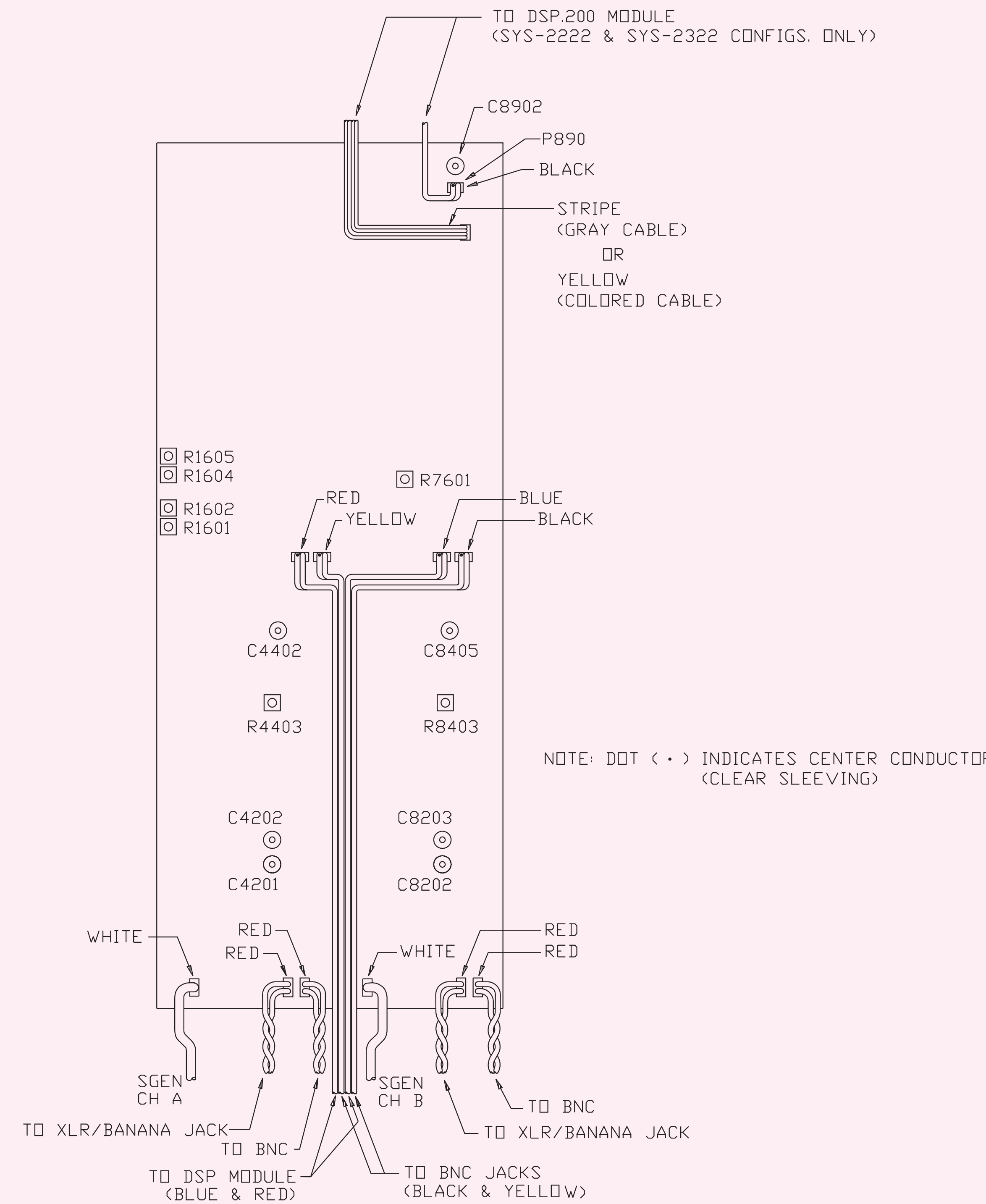


Figure 6-99. System Two INP module adjustment locations and connections.

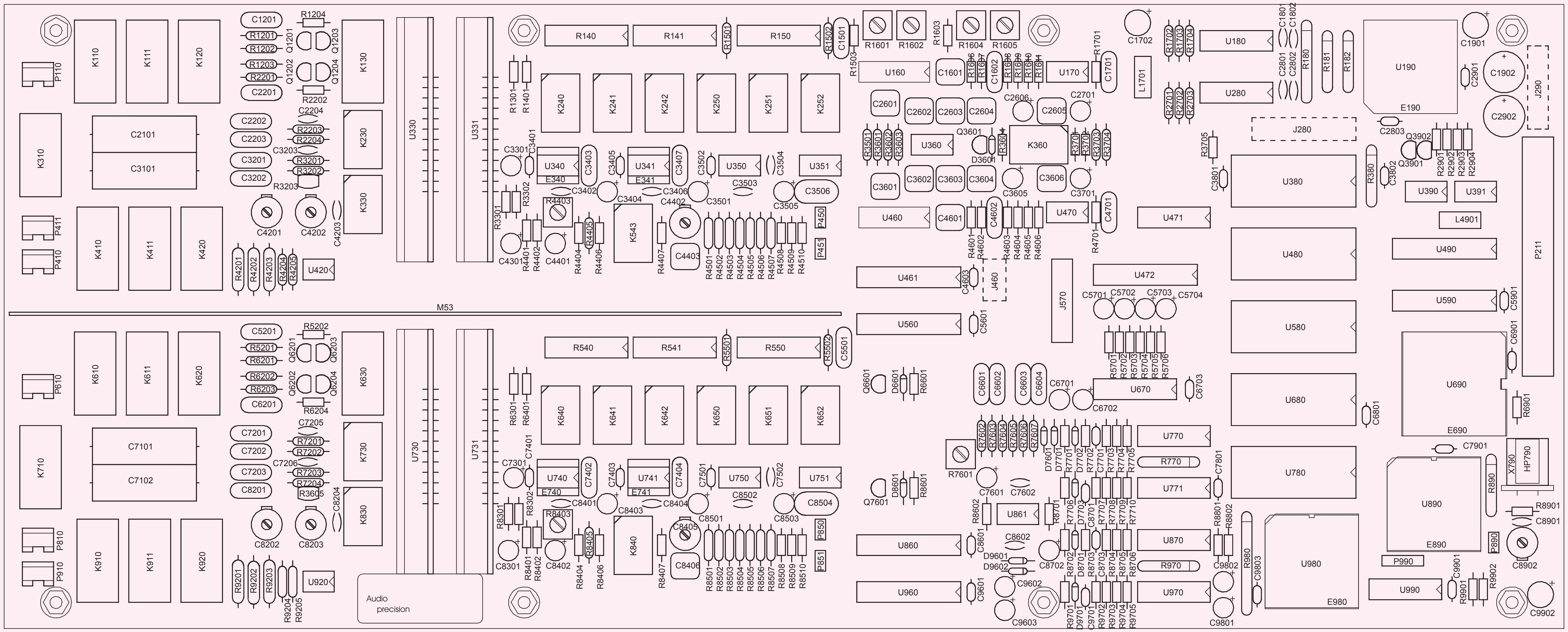


Figure 6-100. System Two INP module component locations.

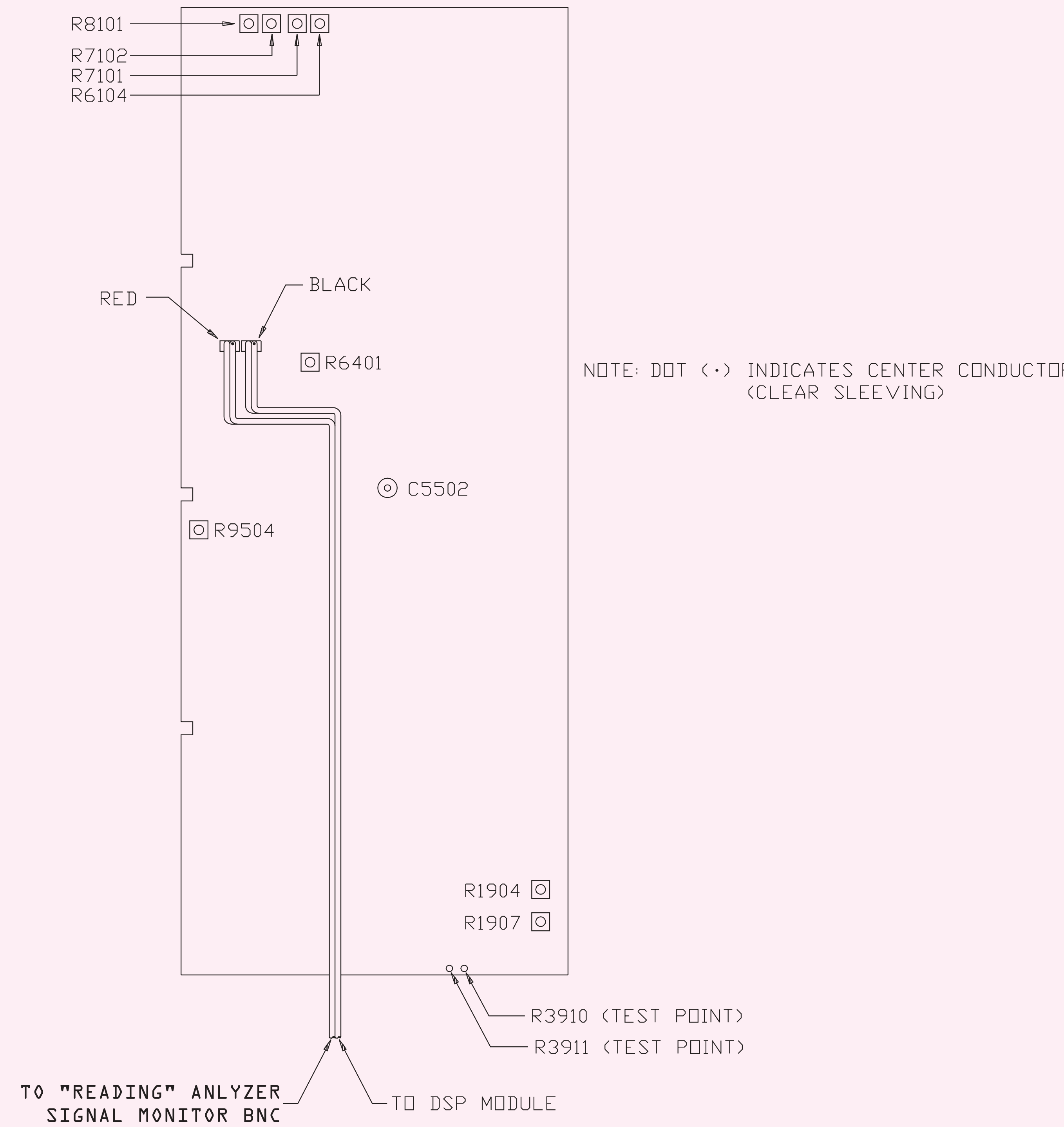


Figure 6-101. System Two ANL module adjustment locations and connections.

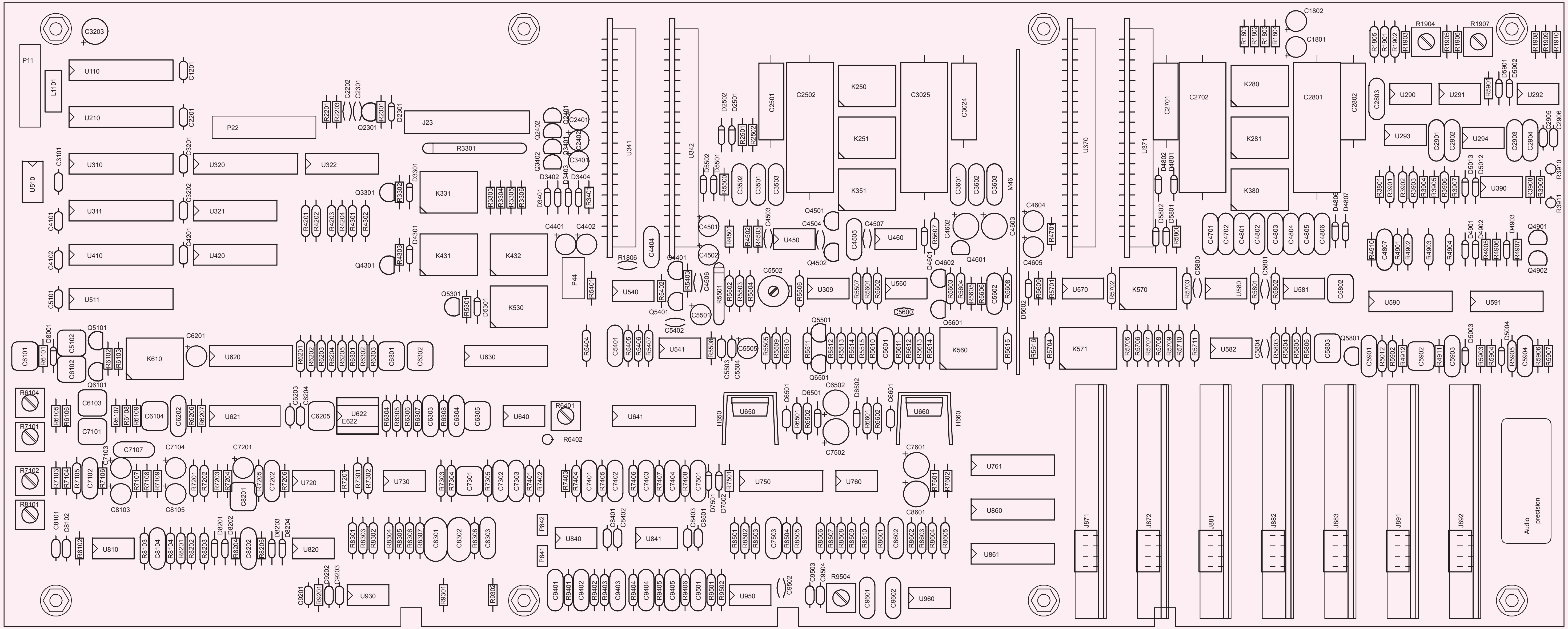


Figure 6-102. System Two ANL module component locations.

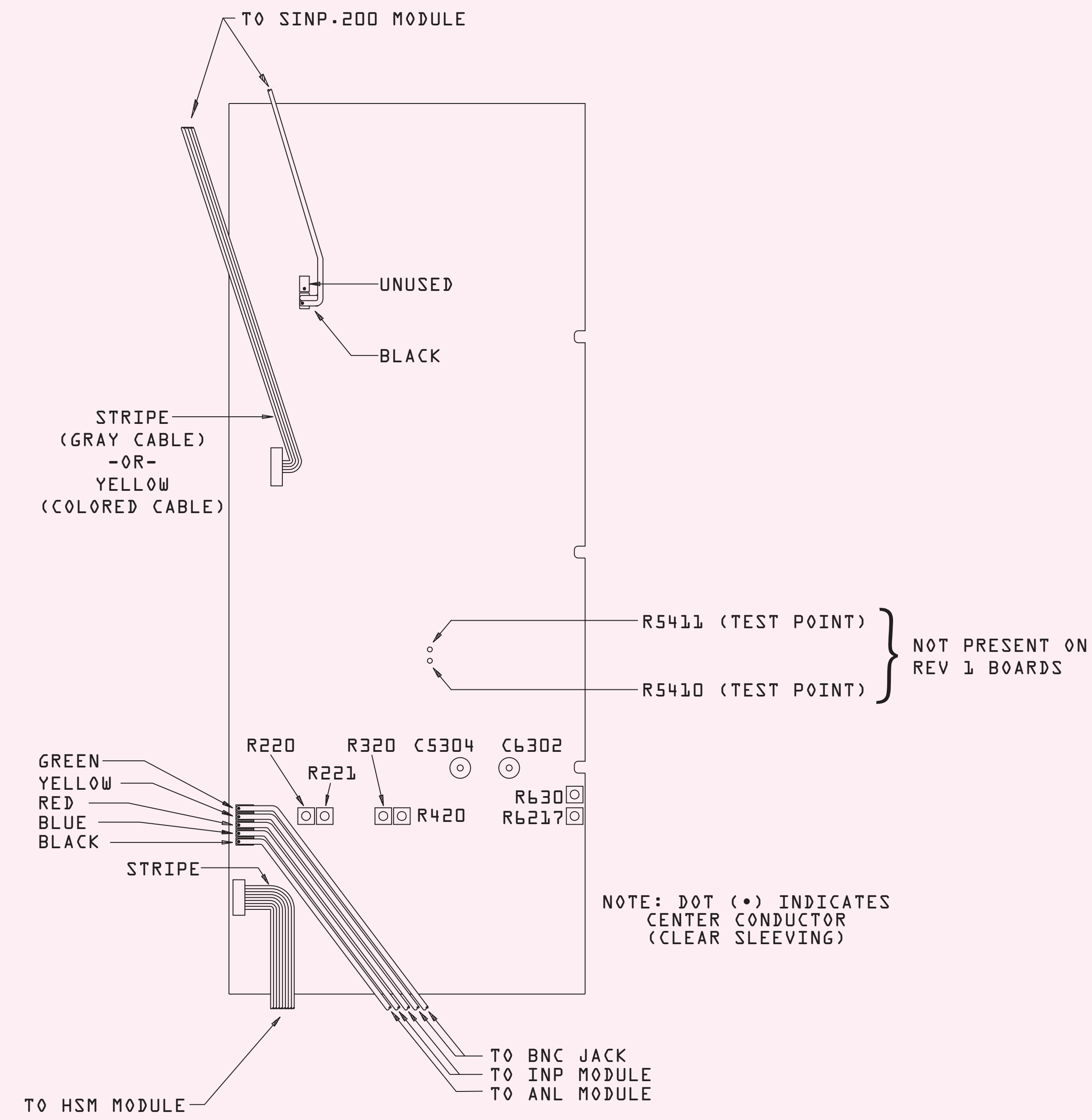


Figure 6-103. System Two DSP module adjustment locations and connections.

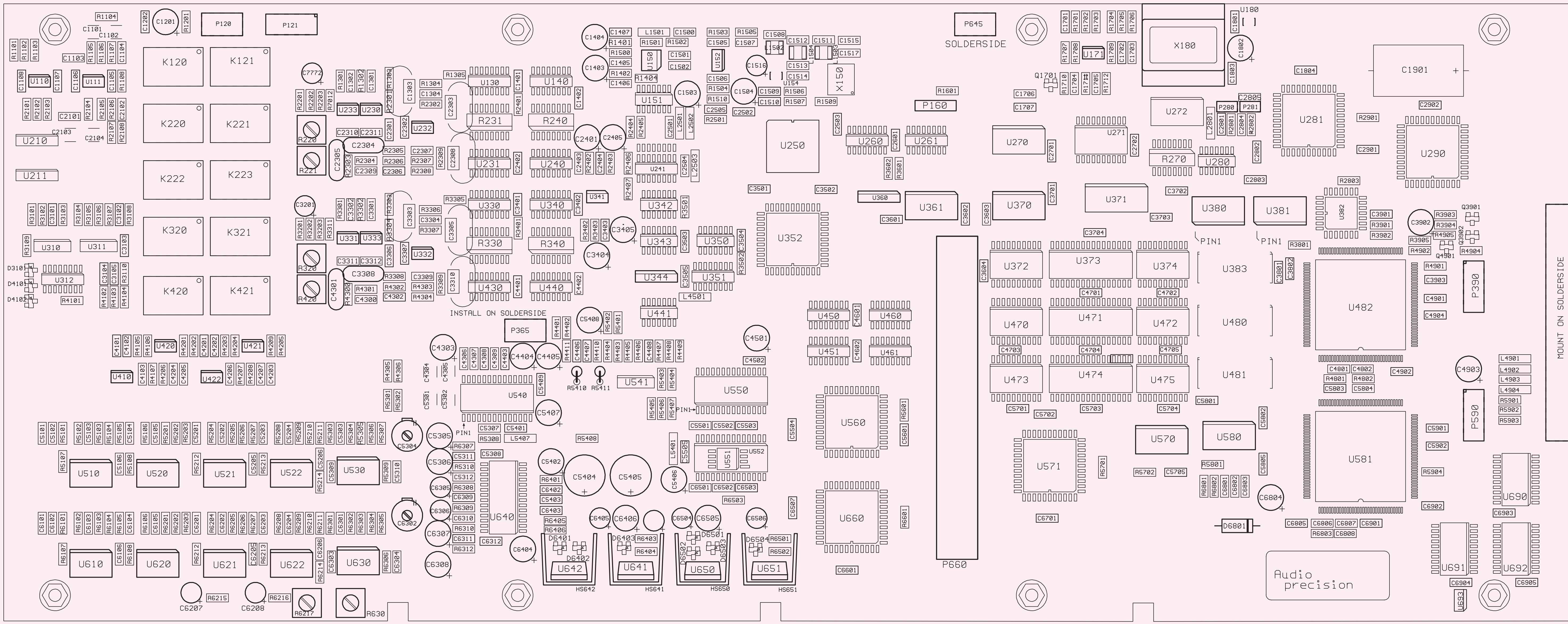


Figure 6-104. System Two DSP module component locations.

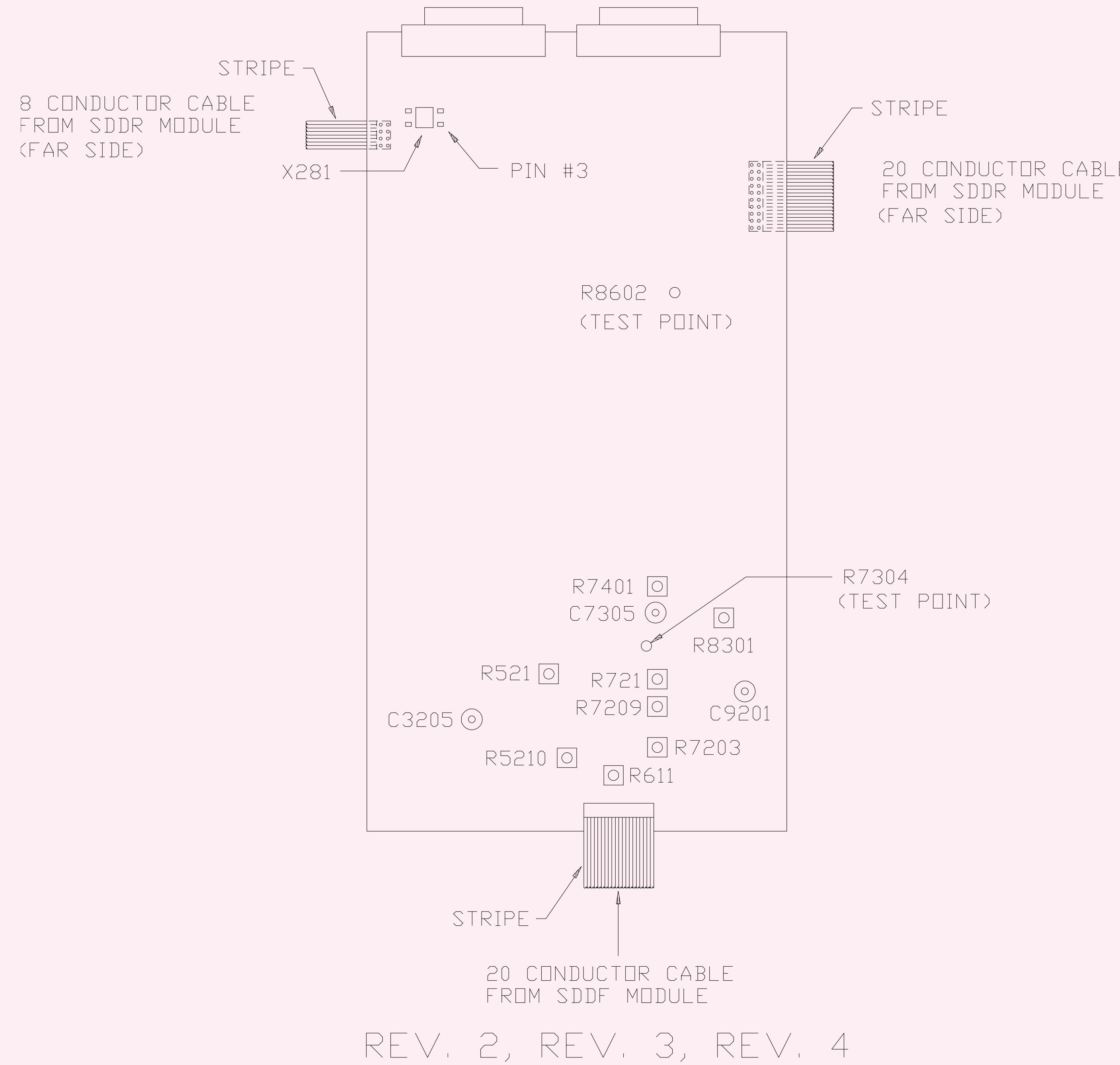


Figure 6-105. System Two DIO module adjustment locations and connections, later instruments (revs 2, 3 and 4).

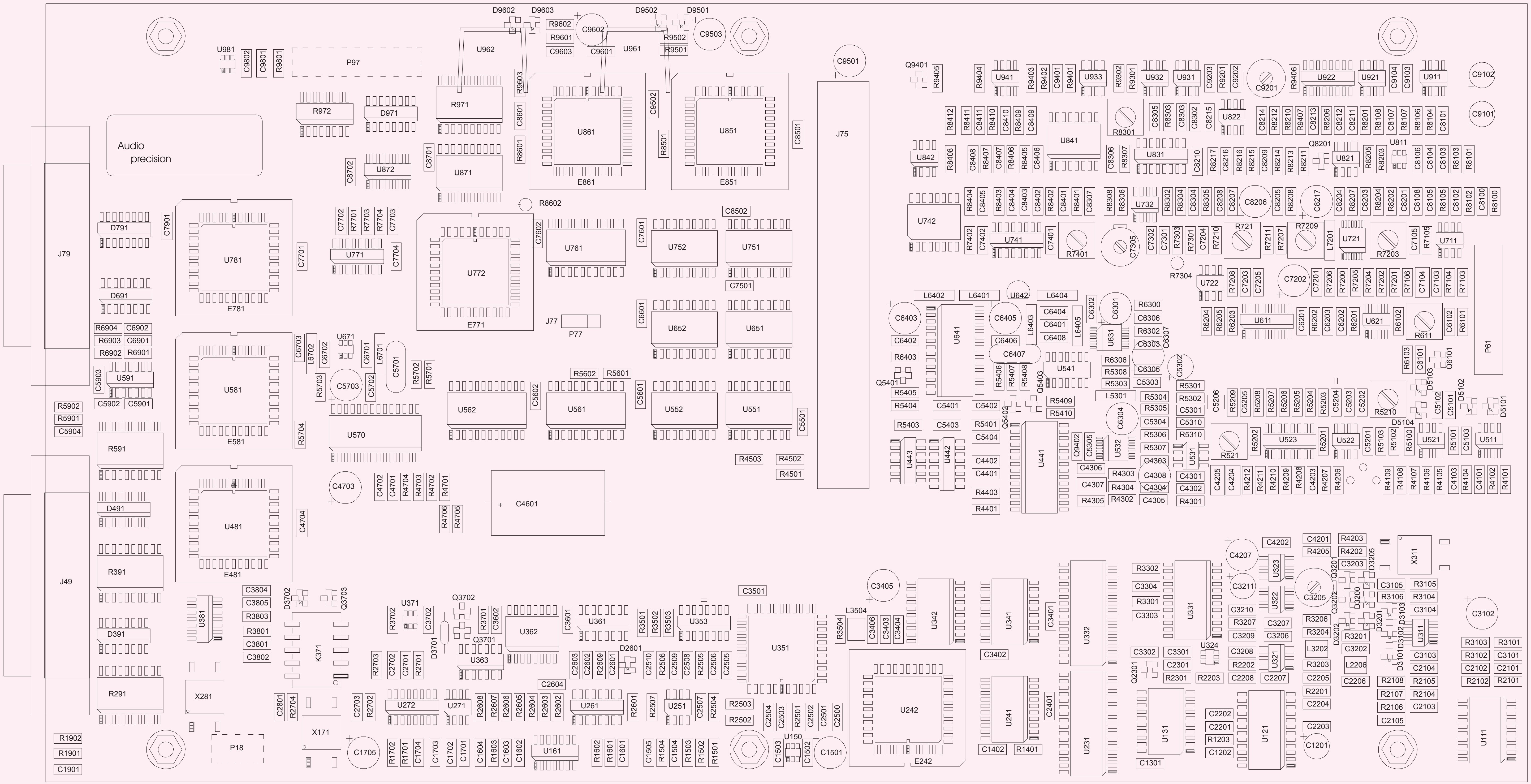


Figure 6-106. System Two DIO module component locations, later instruments (revs 2, 3 and 4).

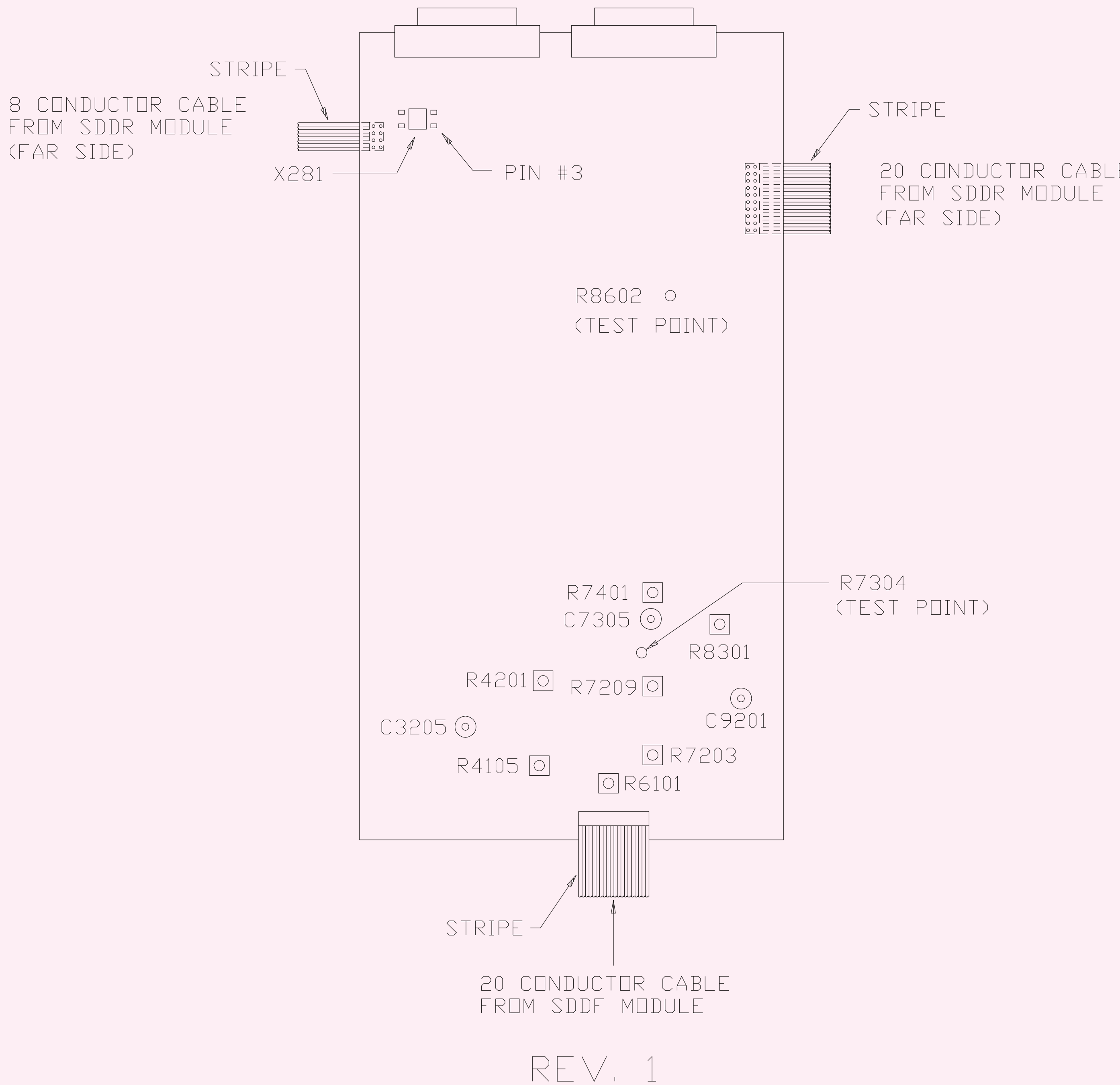


Figure 6-107. System Two DIO module adjustment locations and connections, earlier instruments (rev 1).

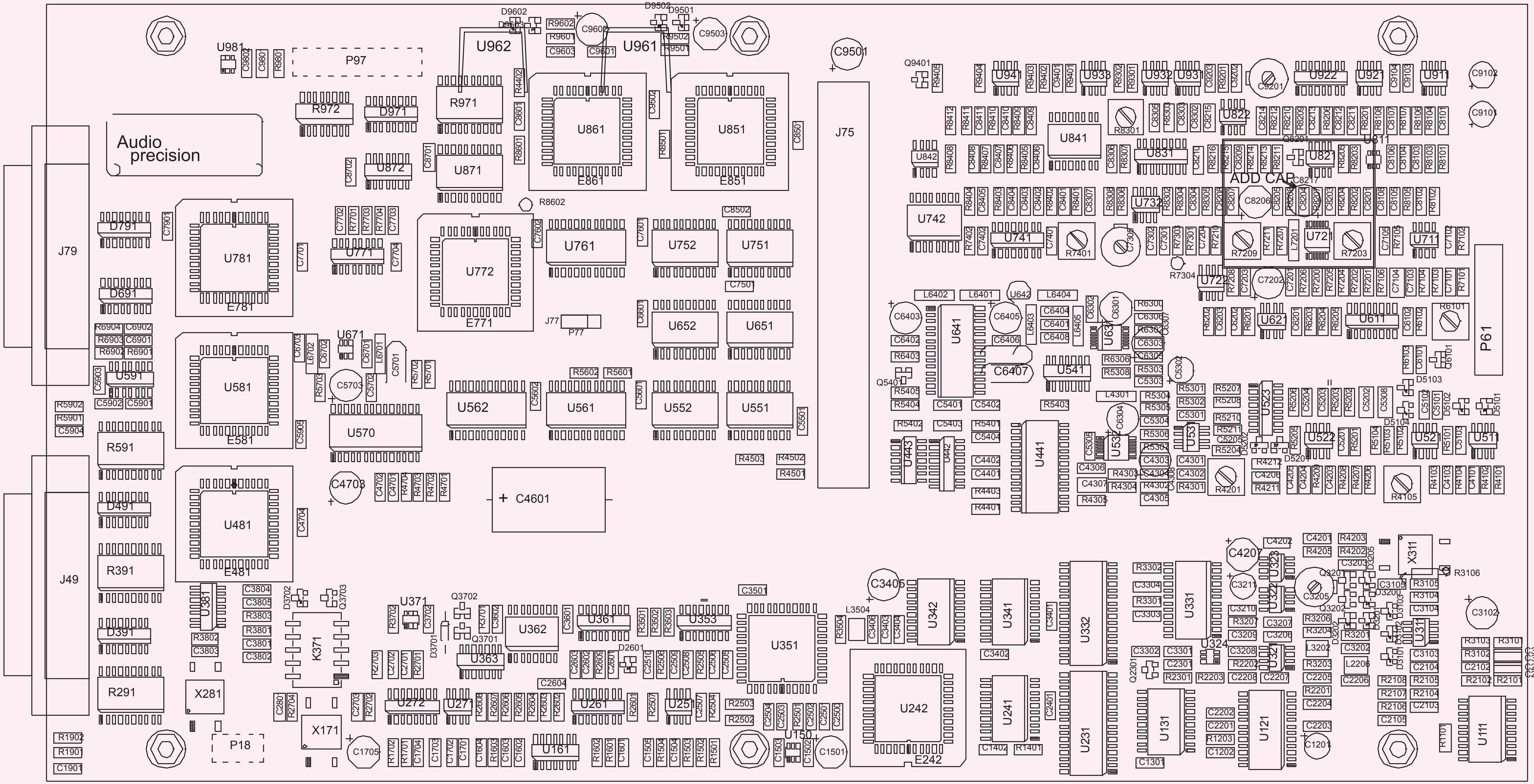


Figure 6-108. System Two DIO module component locations, earlier instruments (rev 1).

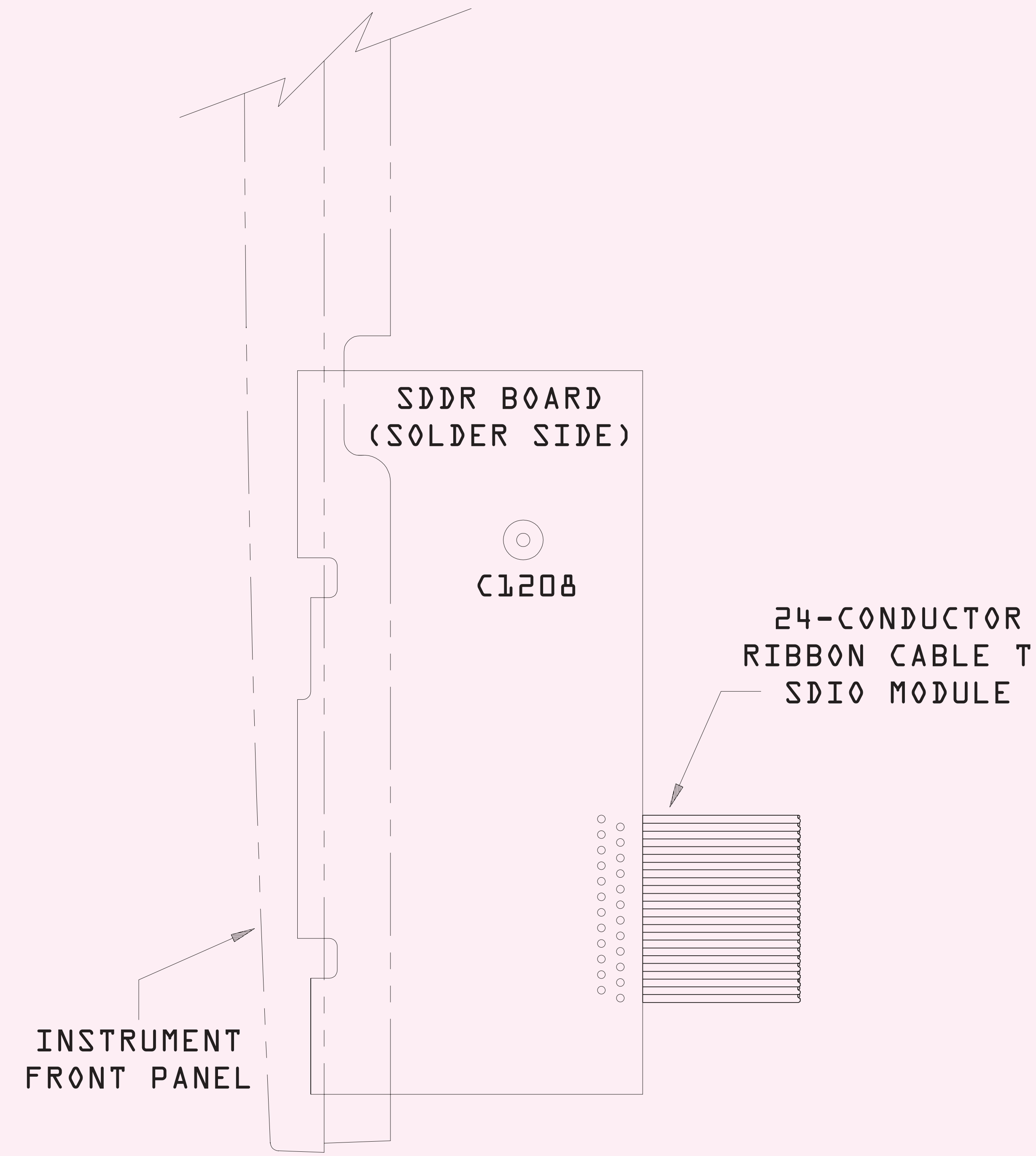


Figure 6-109. System Two DDF module adjustment location (on solder side of board).

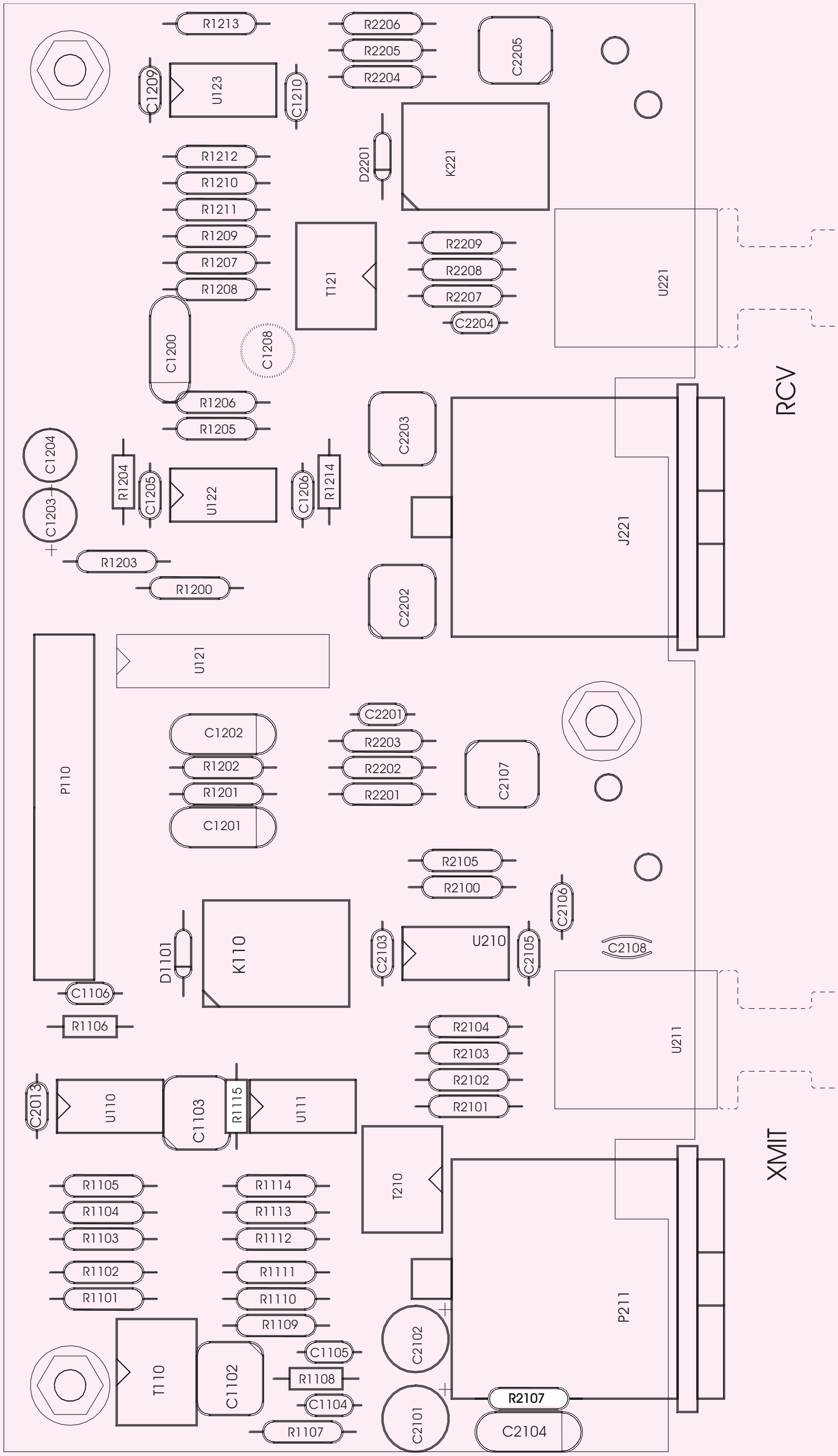


Figure 6-110. System Two DDF module component locations.

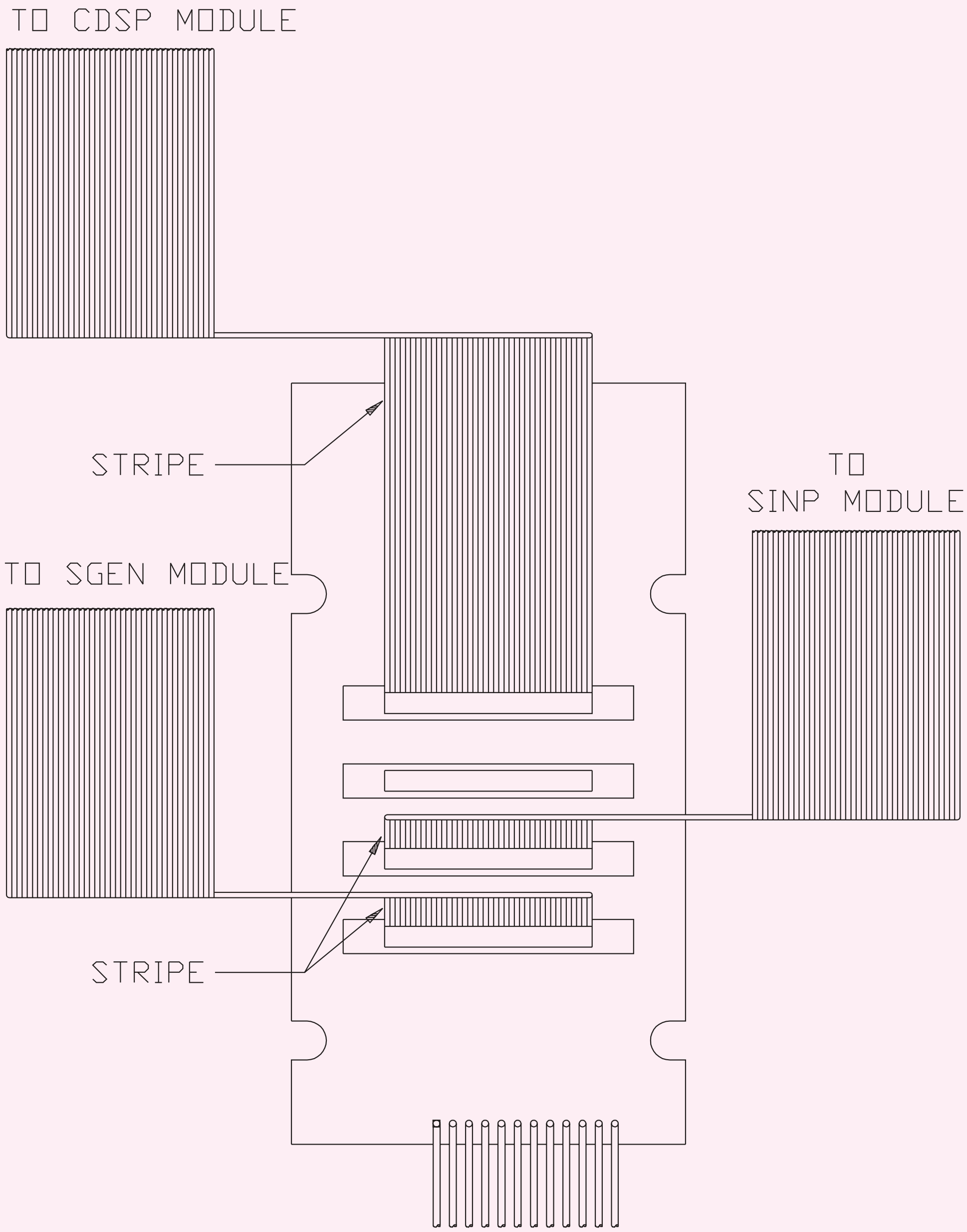


Figure 6-111. System Two IFM module connections.

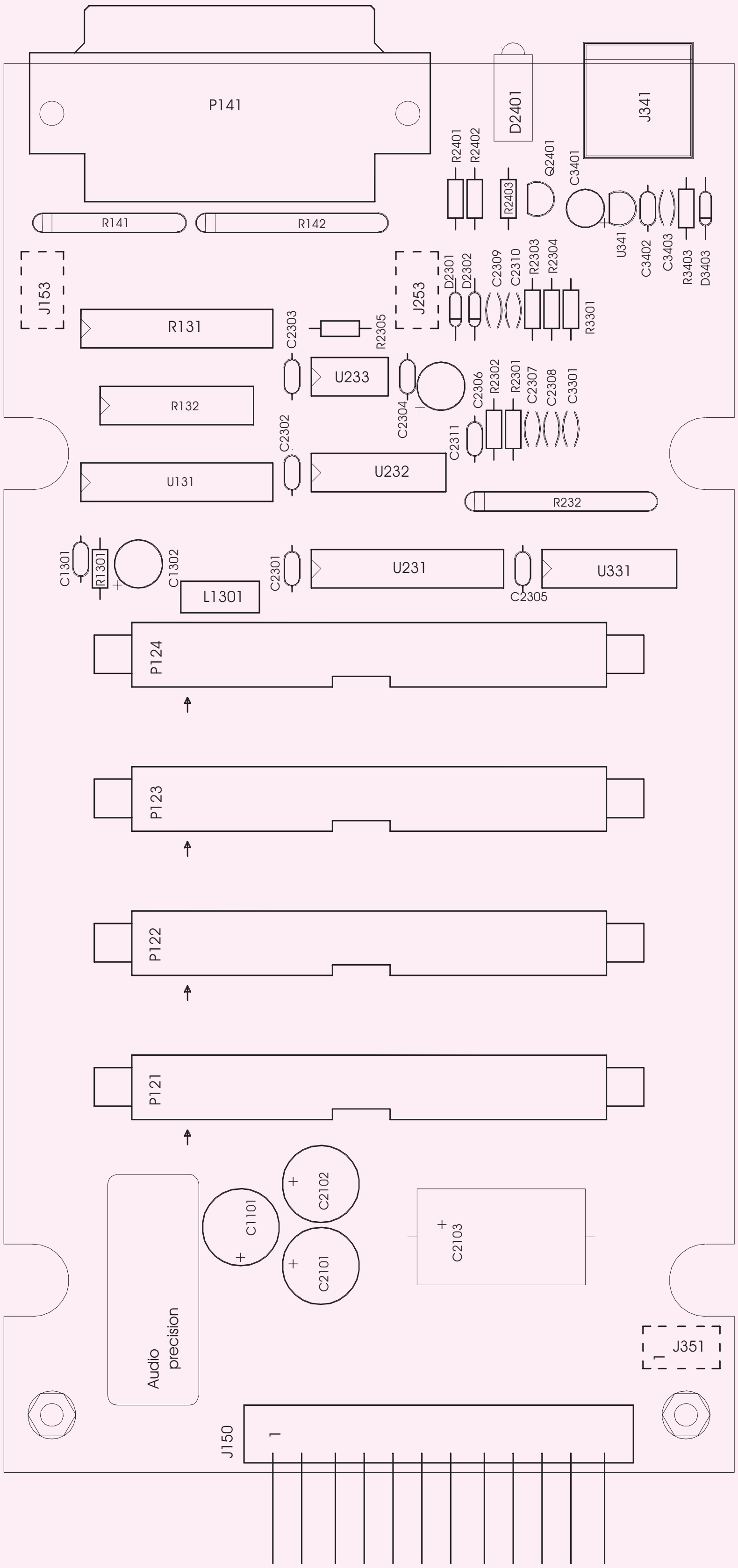


Figure 6-112. System Two IFM module component locations.

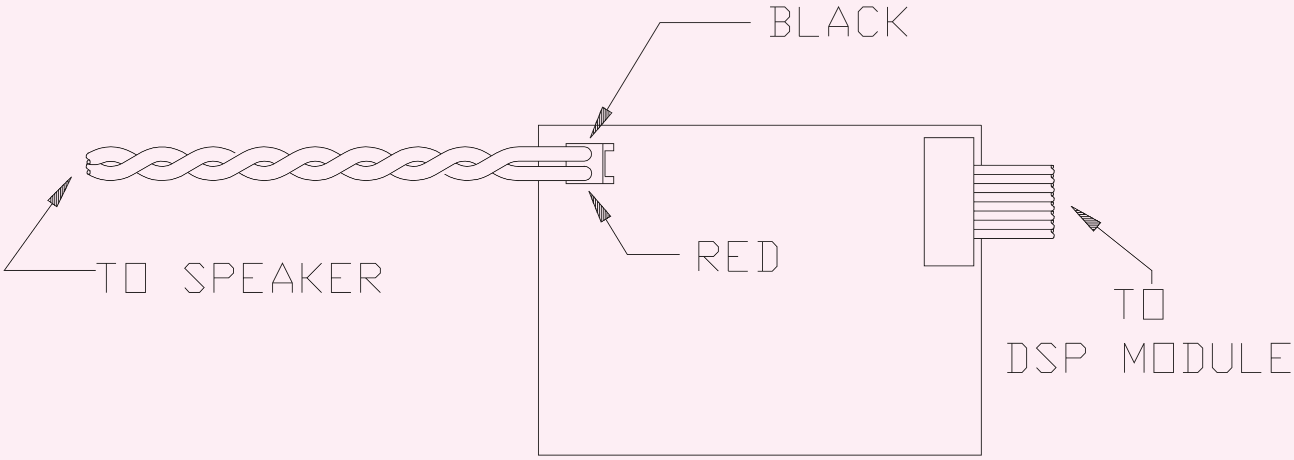


Figure 6-113. System Two HSM module connections.

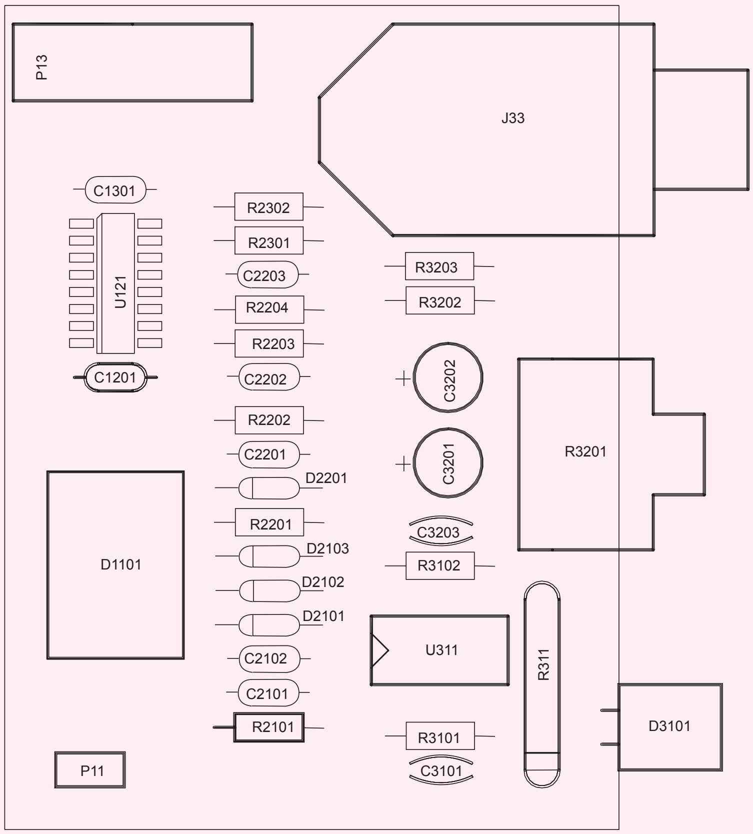


Figure 6-114. System Two HSM module Component locations.

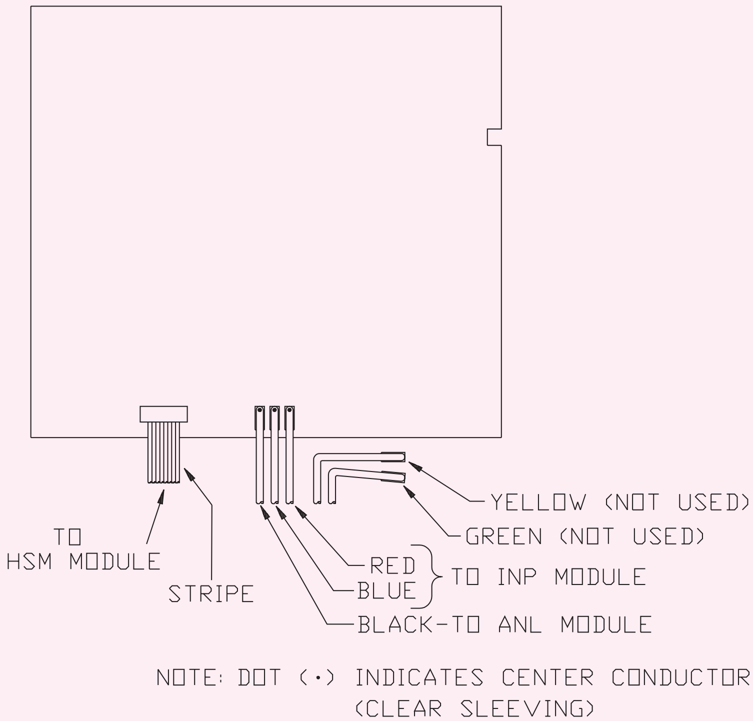


Figure 6-115. System Two MUX module connections.

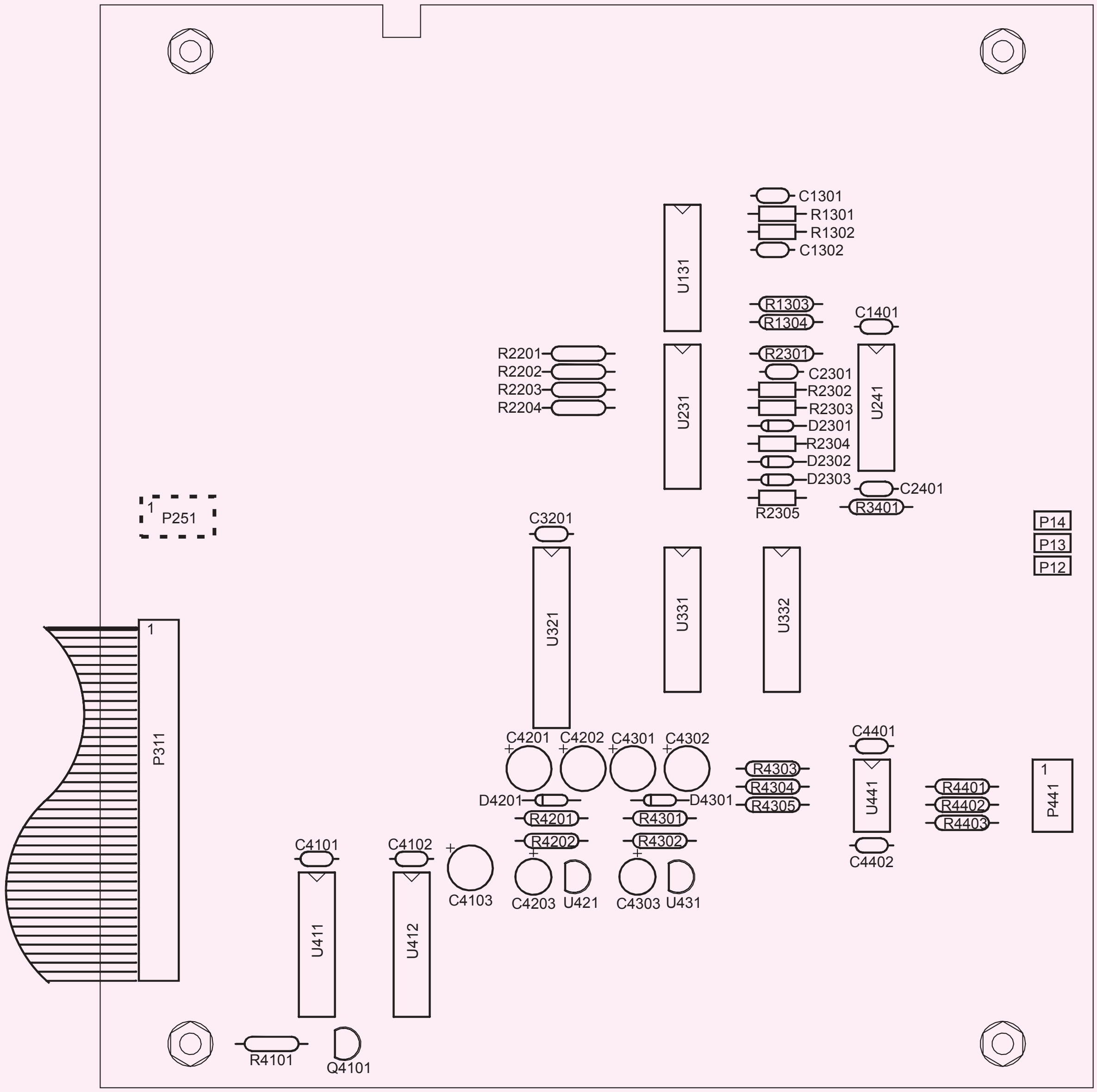


Figure 6-116. System Two MUXmModule component locations.

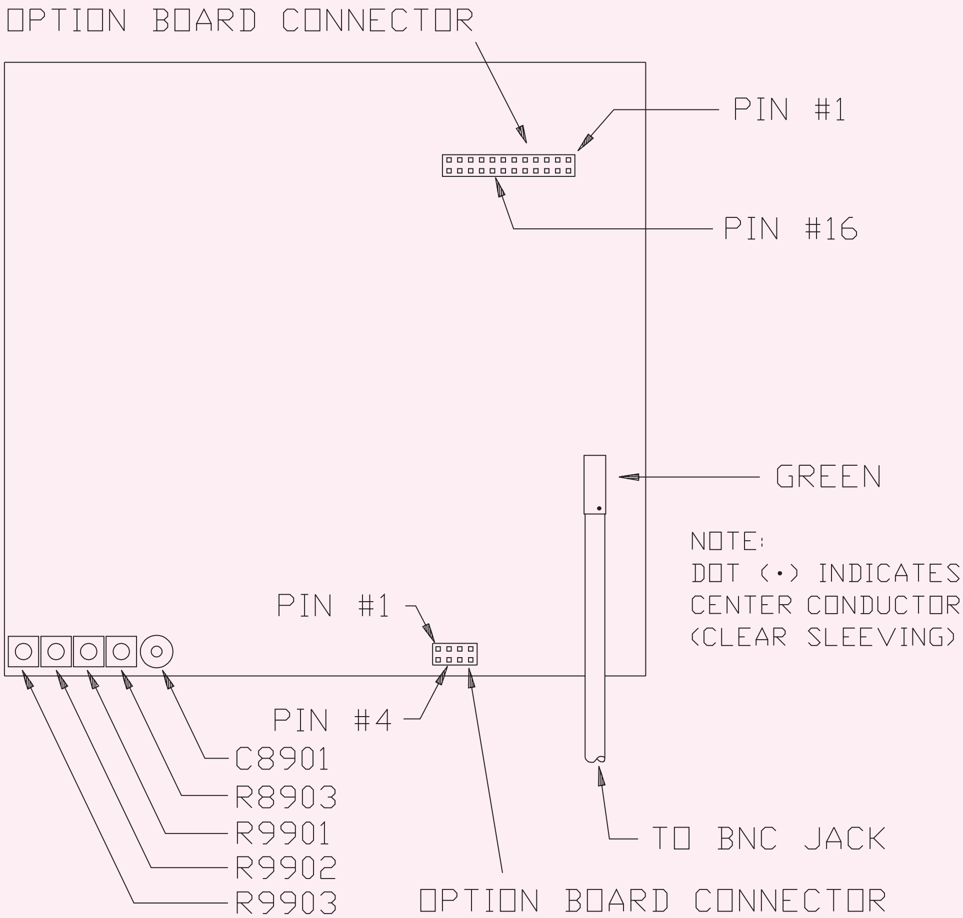


Figure 6-117. System Two BUR module adjustment locations and connections.

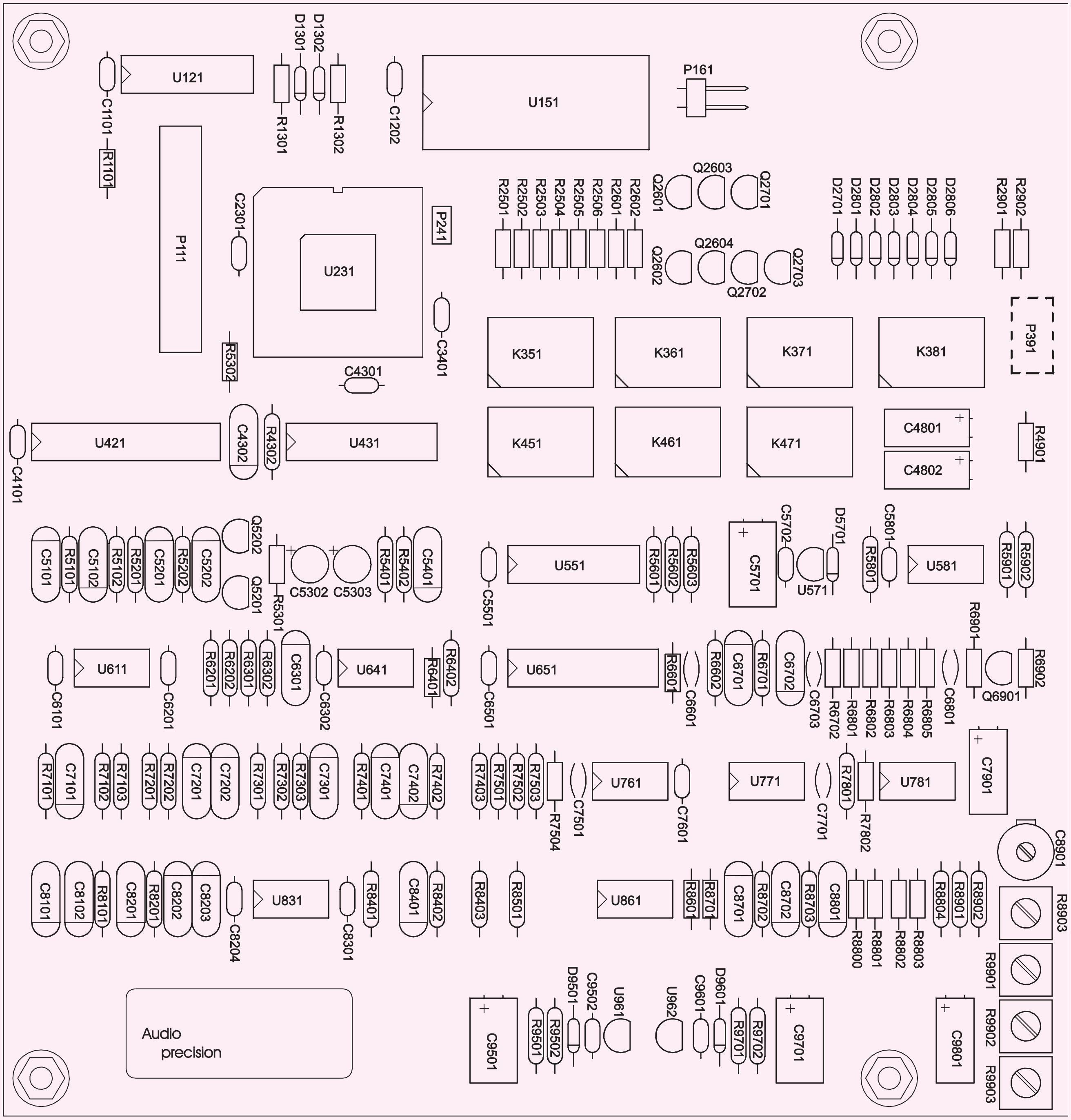


Figure 6-118. System Two BUR module component locations.

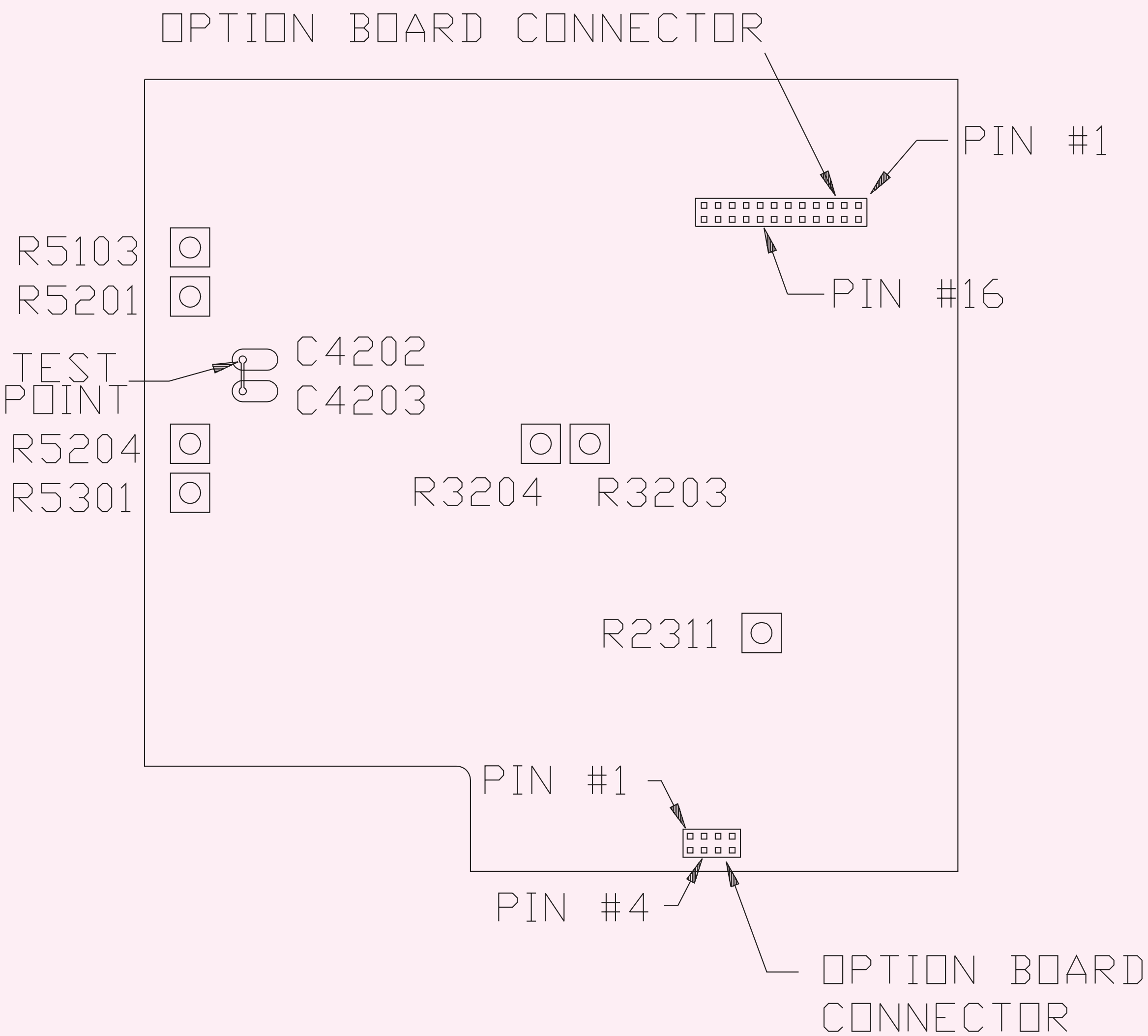


Figure 6-119. System Two IMG module adjustment locations and connections.

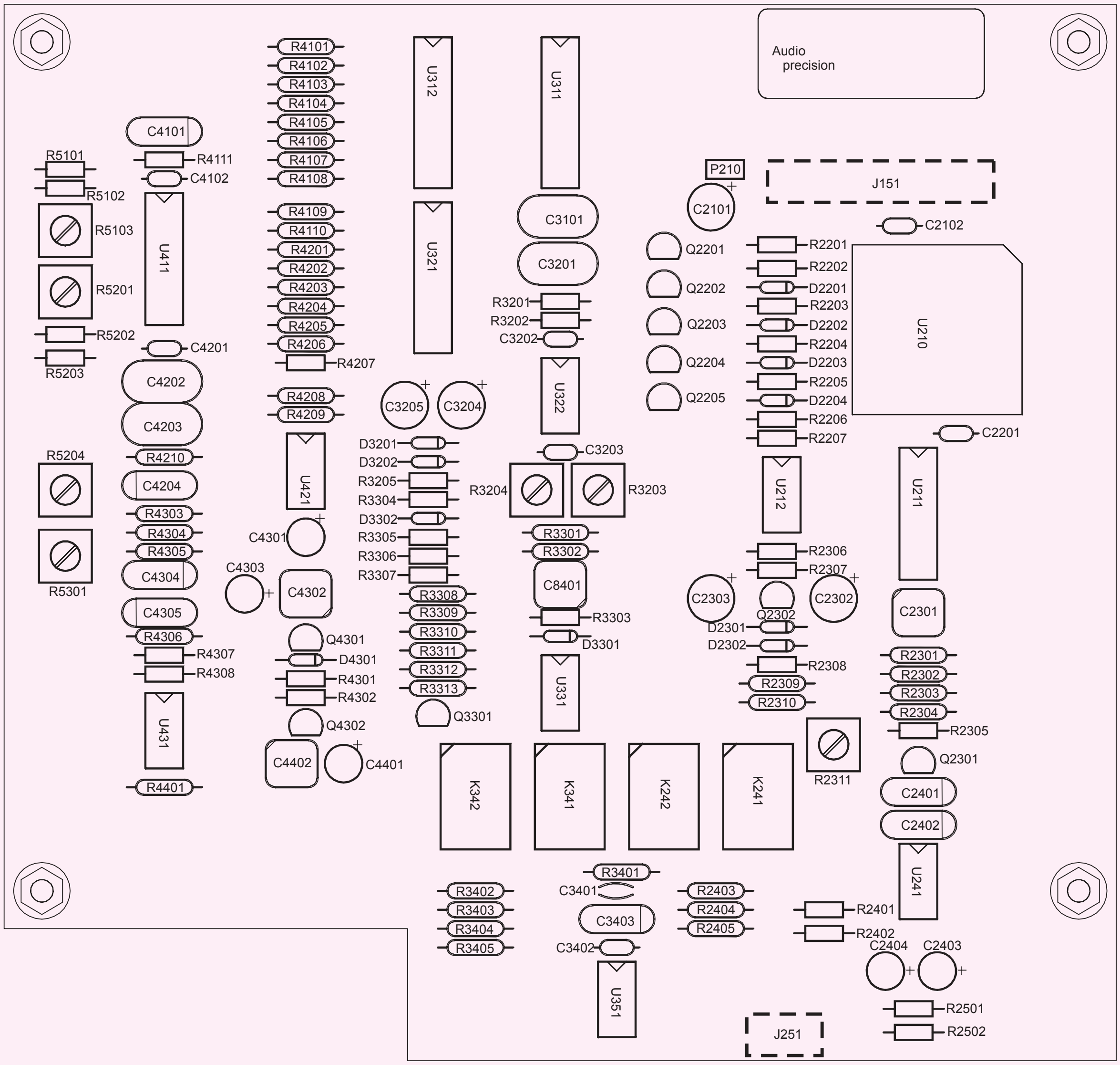


Figure 6-120. System Two IMG module component locations.

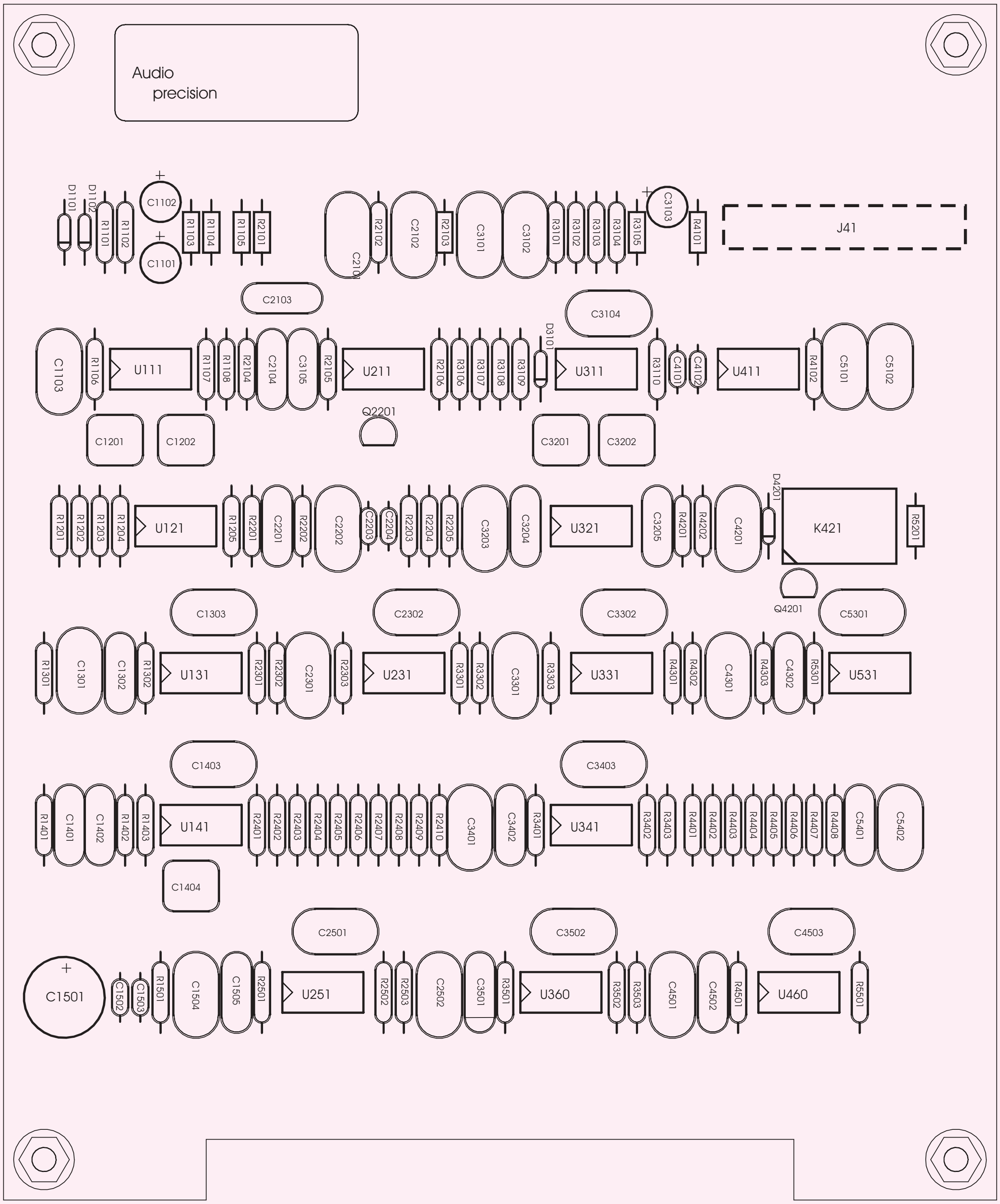


Figure 6-121. System Two IMA module component locations.

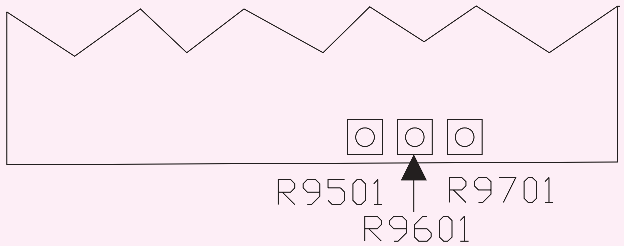


Figure 6-122. System Two WFA module adjustmen locations.

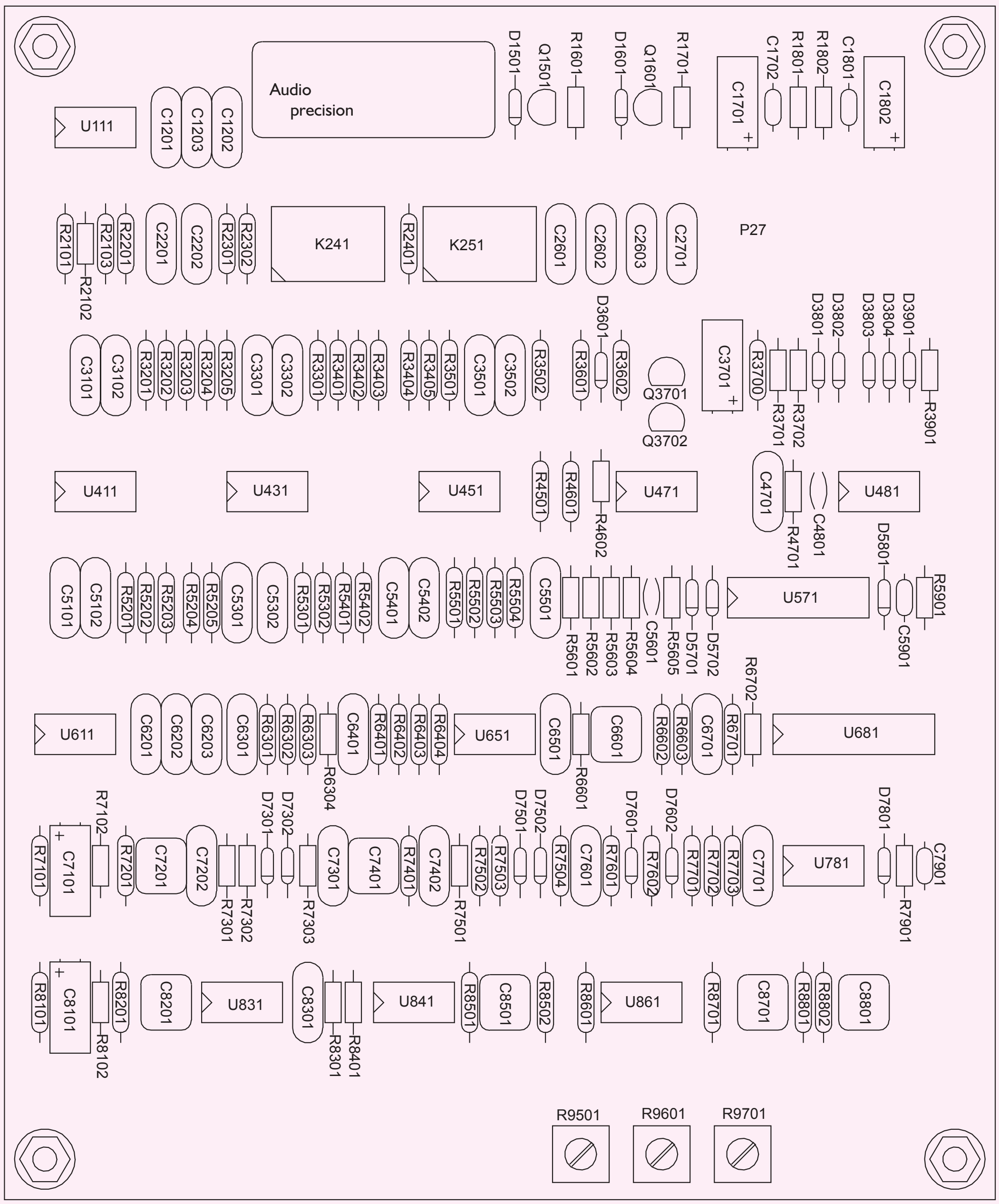


Figure 6-123. System Two WFA module component locations.

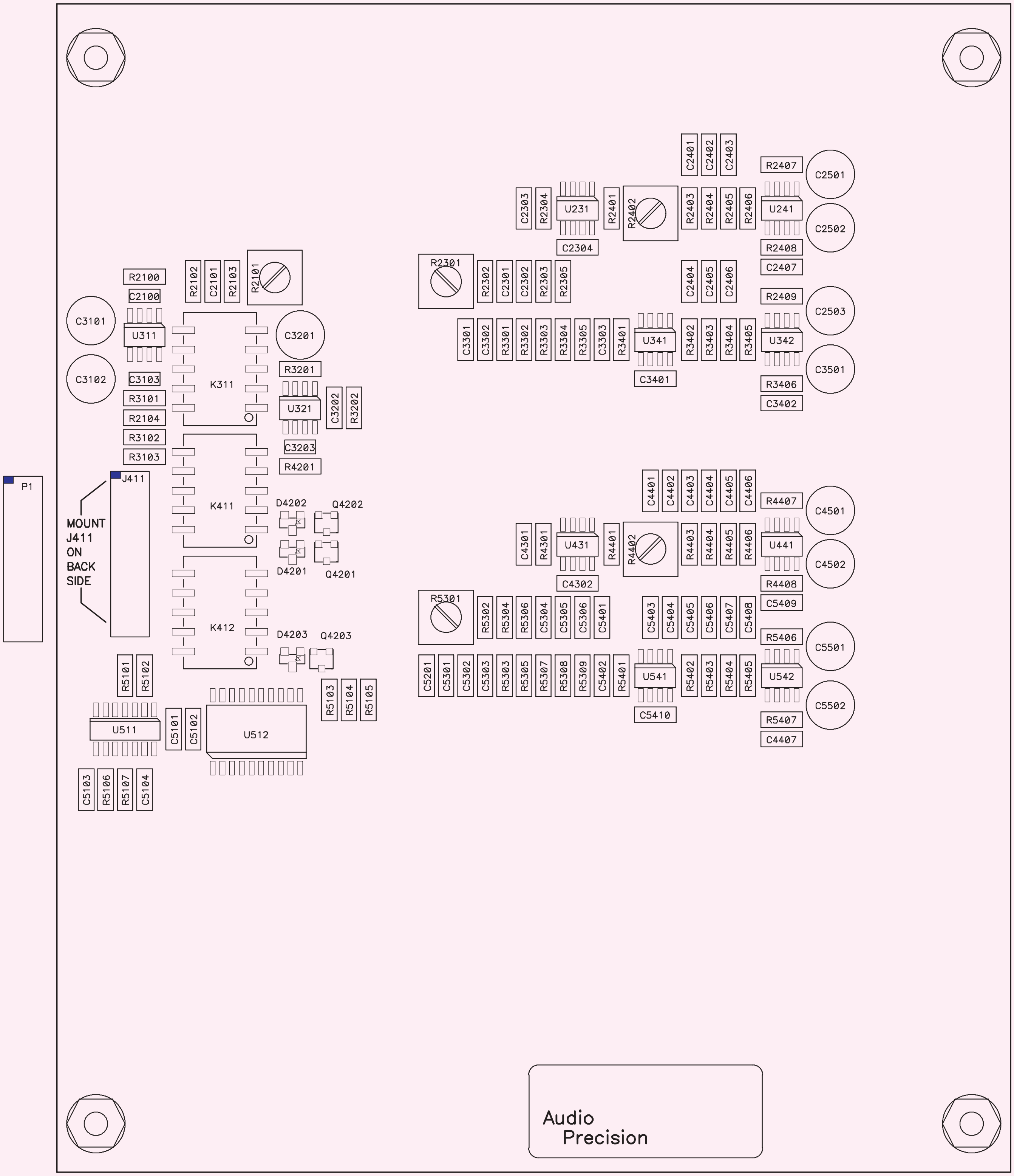


Figure 6-124. System Two SLPX module component and adjustment locations.

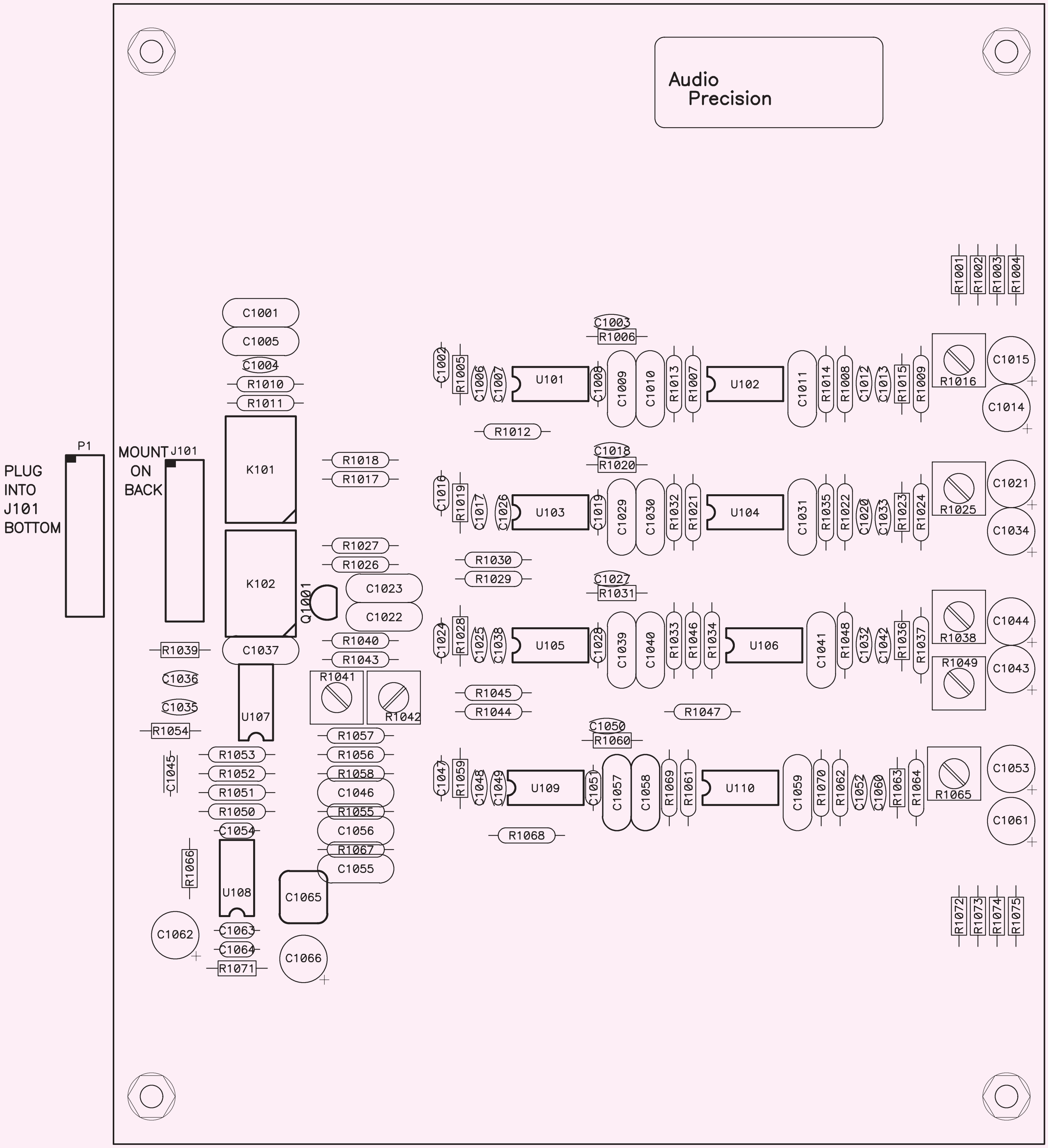


Figure 6-125. System Two SAES module component and adjustment locations.

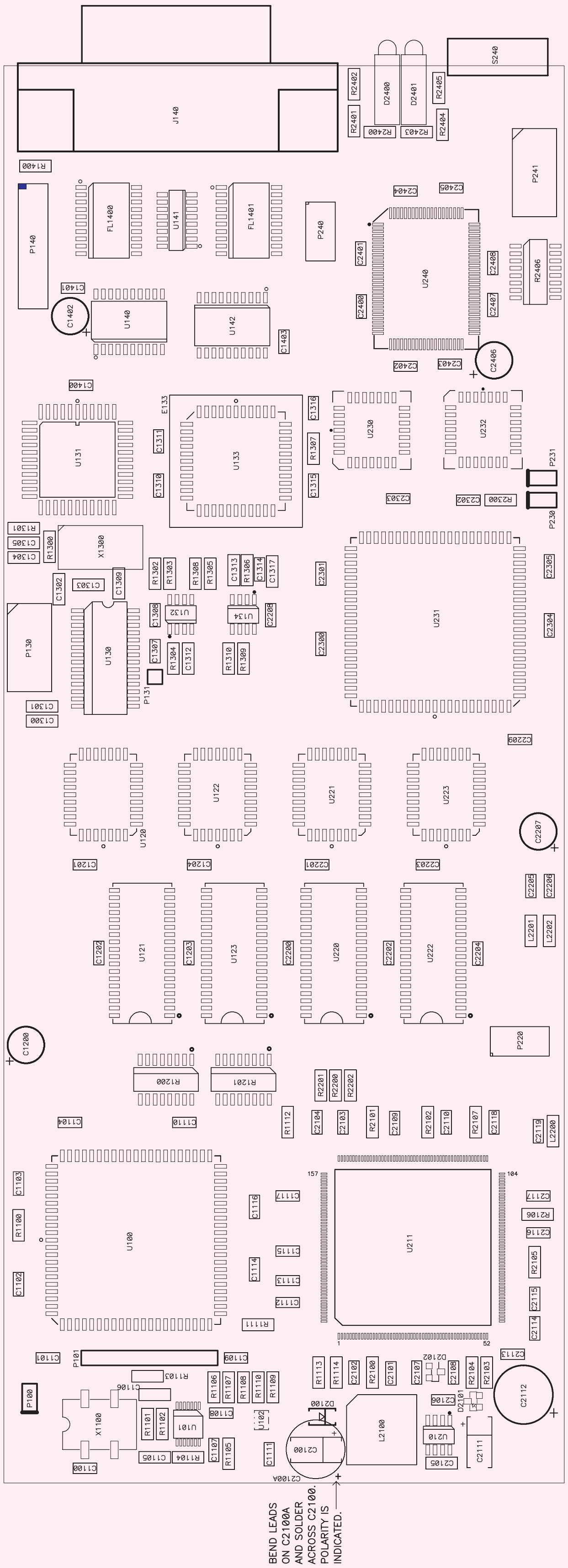


Figure 6-126. System Two SIFG module component locations.

Chapter 7: Mechanical Diagrams

This chapter contains selected mechanical drawings and replaceable parts lists for the System Two Cascade Plus. Unless otherwise specified, all dimensions are in inches. When ordering a replacement part please include the instrument or system nomenclature in addition to the Audio Precision part number and item description.

ABBREVIATIONS USED IN THE MECHANICAL PARTS LISTS

"	Inch	INTF	Interface
#	Number or Size	I/O	Input/Output
A	Ampere	LED	Light Emitting Diode
AL	Aluminum	M	Male
ANLR	Analyzer	MC	Machine
ASSY	Assembly	M/F	Male/Female
AUX	Auxiliary	MOD	Module
BAN	Banana	MON	Monitor
BGE	Beige	MT	Mount
BLK	Black	PAN	Pan Head
BO	Black Oxide	PC	Printed Circuit
BZ	Black Zinc	PH	Phillips
COND	Conductor	PNL	Panel
CONN	Connector	POLY	Polyethylene
CONT	Continuous	PSA	Pressure Sensitive Adhesive
C&S	Cut and Strip	RBN	Ribbon
D-SUB	D-Submarine	RND	Round
ECB	Etched Circuit Board	RT	Right
EL	Electro-luminescent	SEM	SEMS Captive Washer
F	Female	SHLD	Shield
FLT	Flat Head	SS	Stainless Steel
Ga	Gauge	TF	Thread Forming
GEN	Generator	THRD	Thread or Threaded
GNDED	Grounded	TRS	Truss Head
GRY	Grey	VSEL	Voltage Selector
HDWR	Hardware	W/	With
HEX	Hexagonal	W/O	Without
INSUL	Insulated	XFMR	Transformer
INT	Internal	ZN	Zinc

Table 7-1. Parts list for Figure 7-1

INDEX #	A–P NUMBER	DESCRIPTION
1	7400.0001	FRONT PANEL, DIE CAST
2	7110.0201	CHASSIS PLATE, MAINFRAME
3	7310.0201	FAN BRACKET
4	7120.0201	SIDE PANEL, LEFT
5	7120.0202	SIDE PANEL, RIGHT
6	7140.0201	REAR PANEL
7	7150.0203	COVER, TUNNEL TOP
8	7150.0204	COVER, TUNNEL BOTTOM
9	4522.0003	XFRM, POWER PLUS MTG. HRDW.
10	7110.0002	BRACKET, XFRM MOUNTING
11	4560.0029	SPEAKER
12	5621.0006	SPEAKER FOAM
13	7310.0204	BRACKET, 5/8 X 5/8 #6-32
14	7150.0201	COVER, TOP MAINFRAME
15	7150.0202	COVER, BOTTOM MAINFRAME
16	5522.1212	STANDOFF, HEX THRD
17	5532.1212	STANDOFF, HEX M/F
18	5113.7112	SCREW, MC SEM PH ZN #6-32 X 3/8
19	5523.1276	STANDOFF, HEX THRD 1/4 X 2 3/8 #6-32
20	5533.1276	STANDOFF, HEX M/F
21	5113.1108	SCREW, MC FLT PH ZN #6-32 X 1/4
22	5115.8880	SCREW, MC HEX HX ZN #10-32 X 2 1/2
23	5113.1108.6	SCREW, MC FLT PH GRY #6-32 X 1/4
24	5113.1110	SCREW, MC FLT PH ZN #6-32 X 5/16
25	5532.1240	STANDOFF, HEX M/F 1/4 X 1 1/4
26	5620.0201	GROMMET
27	7161.0001	SHIELD
28	5112.3144	SCREW, MC PAN PH ZN #4-40 X 1 3/8
29	5222.0001	NUT, KEPS #4-40
30	4801.1315	FAN
31	5611.0001	TIE WRAP

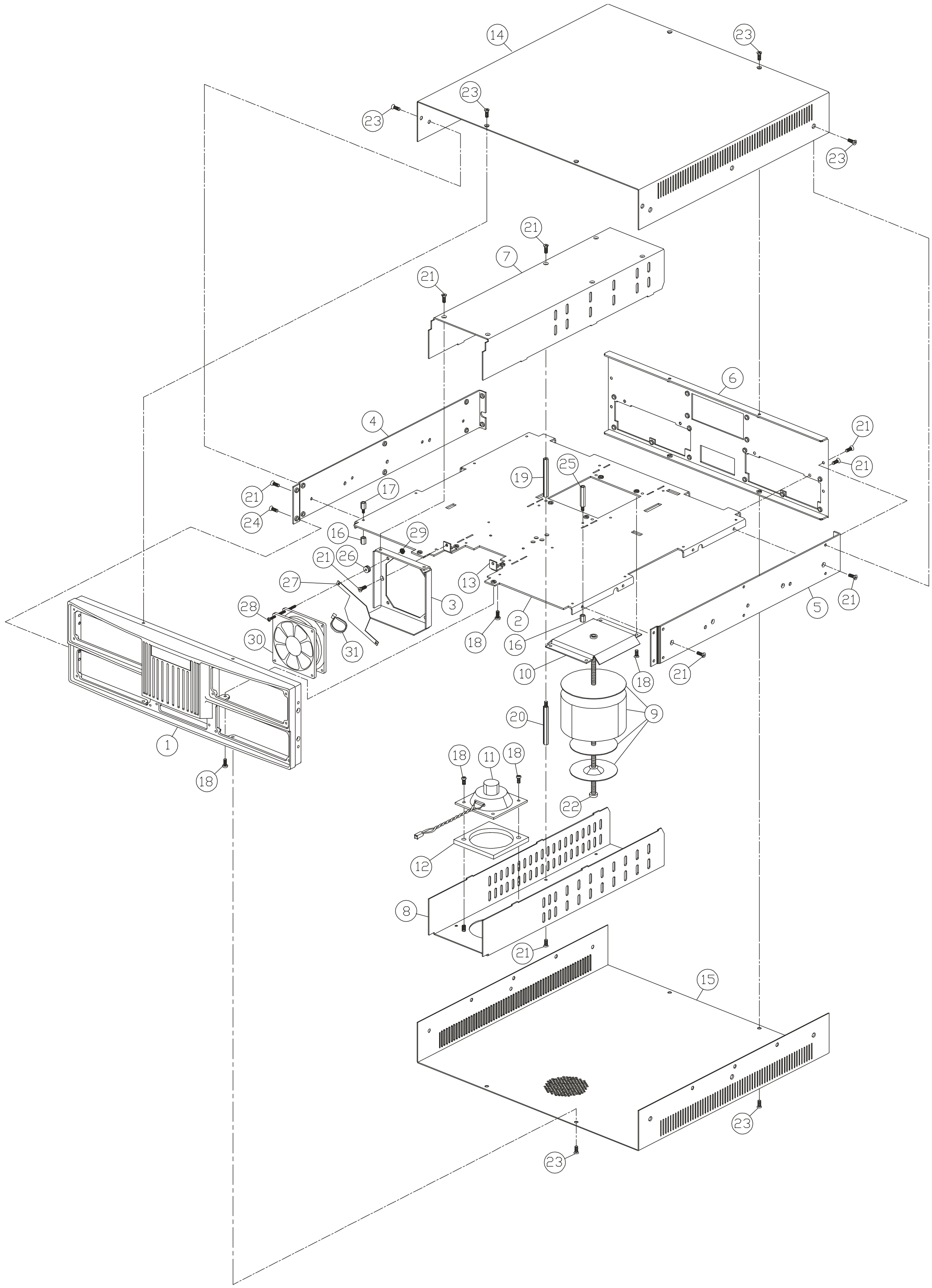


Figure 7.1. Basic Exploded View

Table 7-2. Parts list for Figure 7-2

ITEM	A–P NUMBER	DESCRIPTION
1	SXBO.200	ANALOG OUTPUT CONNECTOR PANEL ASSEMBLY
2	SXBI.200	ANALOG INPUT CONNECTOR PANEL ASSEMBLY
3	SDDF.192 / SDDF.200	DIGITAL FRONT CONNECTOR PANEL ASSEMBLY, S2C, S2C+, 2700
3a	SDDF.100	DIGITAL FRONT CONNECTOR PANEL ASSEMBLY, S2
4	SBNC.110	BNC CONNECTOR PANEL ASSEMBLY, S2C, S2C+, 2700
4a	SBNC.900	BNC CONNECTOR PANEL ASSEMBLY, S2
5	SHSM.200	HEADPHONE & SPEAKER MONITOR MODULE
6	SDDR.110 r300	DIGITAL REAR CONNECTOR PANEL ASSEMBLY, 2700
6a	SDDR.110	DIGITAL REAR CONNECTOR PANEL ASSEMBLY, S2C, S2C+
6b	SDDR.100	DIGITAL REAR CONNECTOR PANEL ASSEMBLY, S2
7	5112.1310.2	SCREW, MC FLT AL BO #4-40 X 5/16
8	5112.1108	SCREW, MC FLT PH #4-40 X 1/4
9	5532.1240	STANDOFF, HEX M/F 1/4 X 1.25
10	5532.1212	STANDOFF, HEX THRD
11	5532.1106.1	STANDOFF, HEX M/F JACK SCREW
12	SIFM.002 r100	MAIN INTERFACE MODULE, 2700
12a	SIFM.002	MAIN INTERFACE MODULE, S2, S2C, S2C+
13	5112.7108	SCREW, MC SEM PH ZN #4-40 X 1/4
14	SIFA.100	APIB CONNECTOR ASSEMBLY
15	7140.0202 r002	APIB CONNECTOR PANEL, 2700
15A	7140.0202	APIB CONNECTOR PANEL, S2, S2C, S2C+
16	7134.0100	REAR CONNECTOR PANEL
17	SIFG.000	GPIB OPTION INTERFACE MODULE
18	7140.0203	GPIB/APIB CONNECTOR PANEL

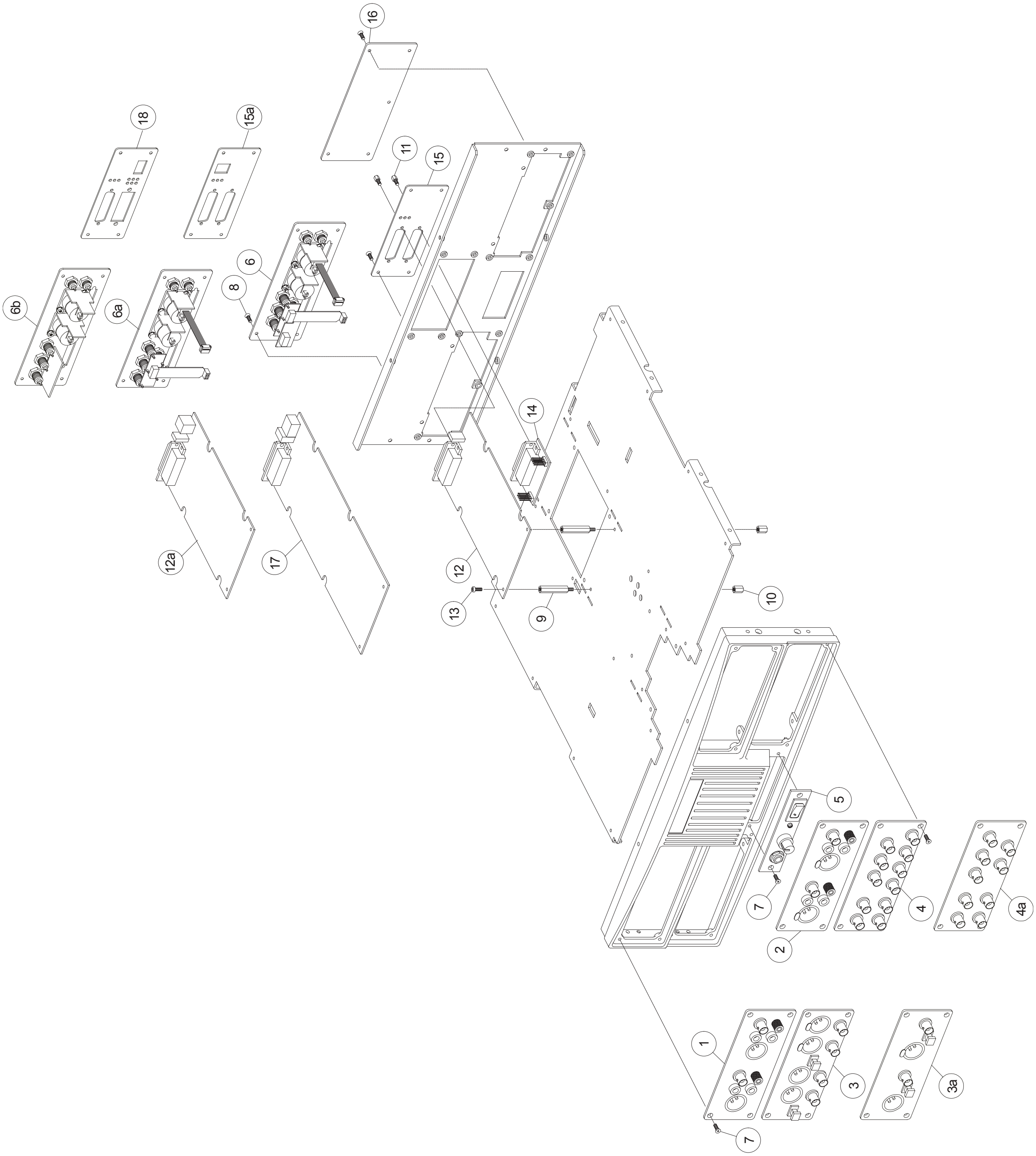


Figure 7.2. Front and Rear Panel Mounting Detail

Table 7-3. Parts list for Figure 7-3

ITEM	A–P NUMBER	DESCRIPTION
1	SGEN.200	ANALOG GENERATOR MODULE, S2
	SGEN.220	ANALOG GENERATOR MODULE, CASCADE, CASCADE PLUS, 2700
2	SINP.200	ANALOG INPUT MODULE, S2
	SINP.220	ANALOG INPUT MODULE CASCADE, CASCADE PLUS, 2700
3	SDSP.210	DIGITAL SIGNAL PROCESSOR MODULE, S2
	SDSP.220	DIGITAL SIGNAL PROCESSOR MODULE CASCADE, CASCADE PLUS, 2700
4	SDIO.210	DIGITAL INPUT / OUTPUT MODULE, S2
	SDIO.220	DIGITAL INPUT / OUTPUT MODULE, CASCADE, CASCADE PLUS
	SDIO.192	DIGITAL INPUT / OUTPUT MODULE, CASCADE (192k), 2700
5	SANL.100	ANALOG ANALYZER MODULE, S2
	SANL.220	ANALOG ANALYZER MODULE, CASCADE, CASCADE PLUS, 2700
6	7310.0203	ANL FILTER BRACKET
7	5112.1108	SCREW, MC FLT PH #4-40 X 1/4
8	5532.1264	STANDOFF, HEX M/F #4-40 X 2.00
9	5522.1212	STANDOFF, HEX M/F
10	5532.1212	STANDOFF, HEX THRD
11	5112.1112.4	SCREW, MC FLT PH SS #4-40 X 3/8
12	SWFA.100	WOW & FLUTTER OPTION FOR ANALOG ANALYZER
13	5112.7108	SCREW, MC SEM PH ZN #4-40 X 1/4
14	5532.1240	STANDOFF, HEX M/F 1/4 X 1.25
15	XXXX.XXXX	OPTIONAL FILTER BOARD
16	SIMA.100	IMD OPTION FOR ANALOG ANALYZER
17	SIOB.000	INTERCONNECT BOARD
18	SIMG.100	IMD OPTION FOR ANALOG GENERATOR
19	SBUR.100	BURST OPTION FOR ANALOG GENERATOR
20, 20a, 20b	SDDR.110	DUAL DOMAIN REAR PANEL
21	SLPX.000	AES17 FILTER PRE-ANALYZER FILTER MODULE
22	SAES.170	OPT-2020 PRE-ANALYZER FILTER MODULE

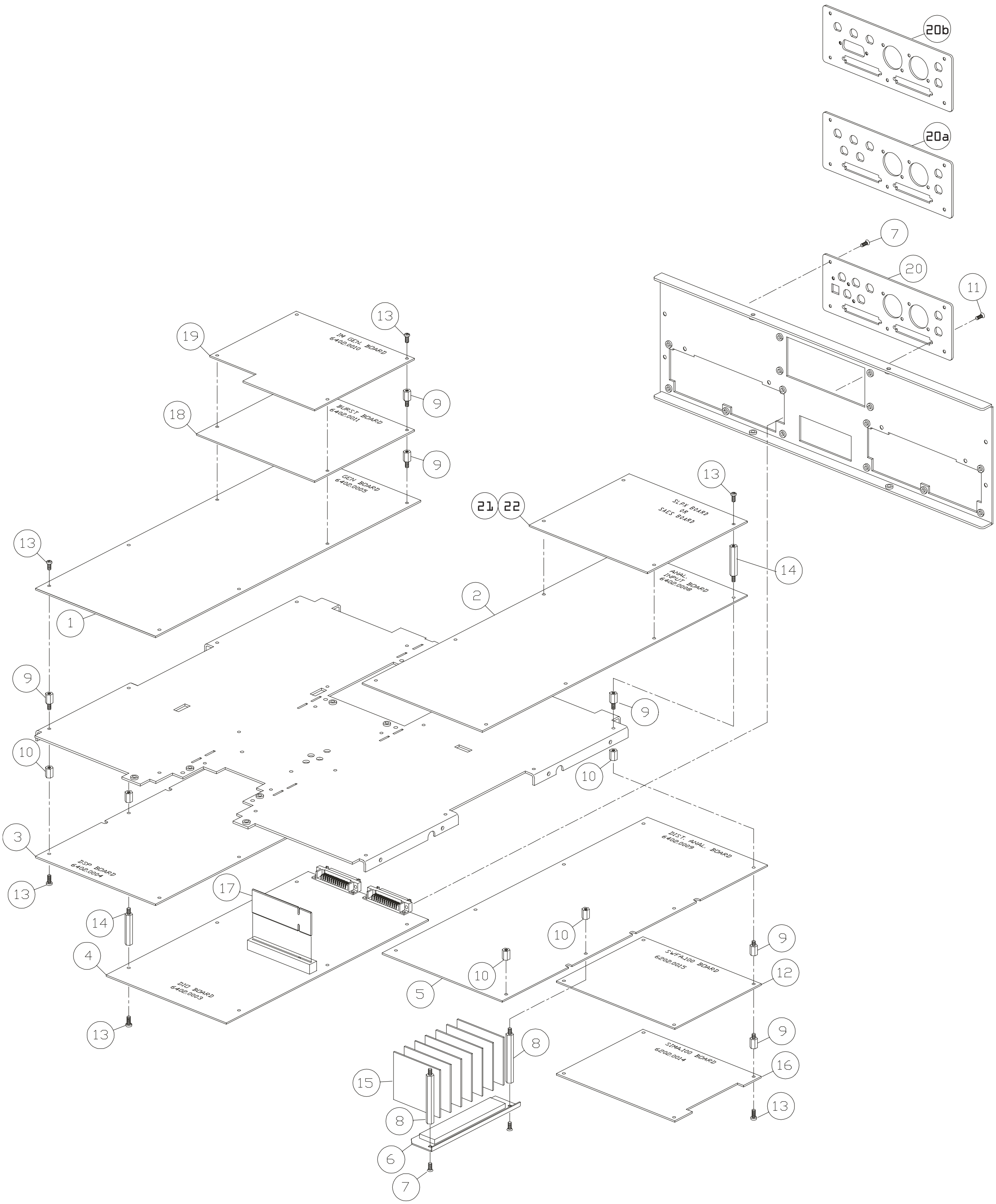


Figure 7.3. Functional Modules

Table 7-4. Parts list for Figure 7-4

INDEX #	A–P NUMBER	DESCRIPTION
1	4540.0005	POWER ENTRY MODULE
2	7110.0201	CHASSIS PLATE, MAINFRAME
3	7310.0201	FAN BRACKET
4	7120.0201	SIDE PANEL, LEFT
5	7120.0202	SIDE PANEL, RIGHT
6	7140.0201	REAR PANEL
7	7110.0002	BRACKET, XFER MOUNTING
8	7310.0204	BRACKET, 5/8 X 5/8 #6-32
9	5522.1212	STANDOFF, HEX THRD
10	5532.1212	STANDOFF, HEX M/F
11	5113.7112	SCREW, MC SEM PH ZN #6-32 X 3/8
12	5113.1108	SCREW, MC FLT PH ZN #6-32 X 1/4
13	5620.0201	GROMMET
14	7161.0001	SHIELD
15	5112.3144	SCREW, MC PAN PH ZN #4-40 X 1 3/8
16	5222.0001	NUT, KEPS #4-40
17	4801.1315	FAN
18	5611.0001	TIE WRAP
19	5113.1110	SCREW, MC FLT PH ZN #6-32 X 5/16
20	5223.0000	NUT, KEPS #6-32
21	5622.0003	FISH PAPER

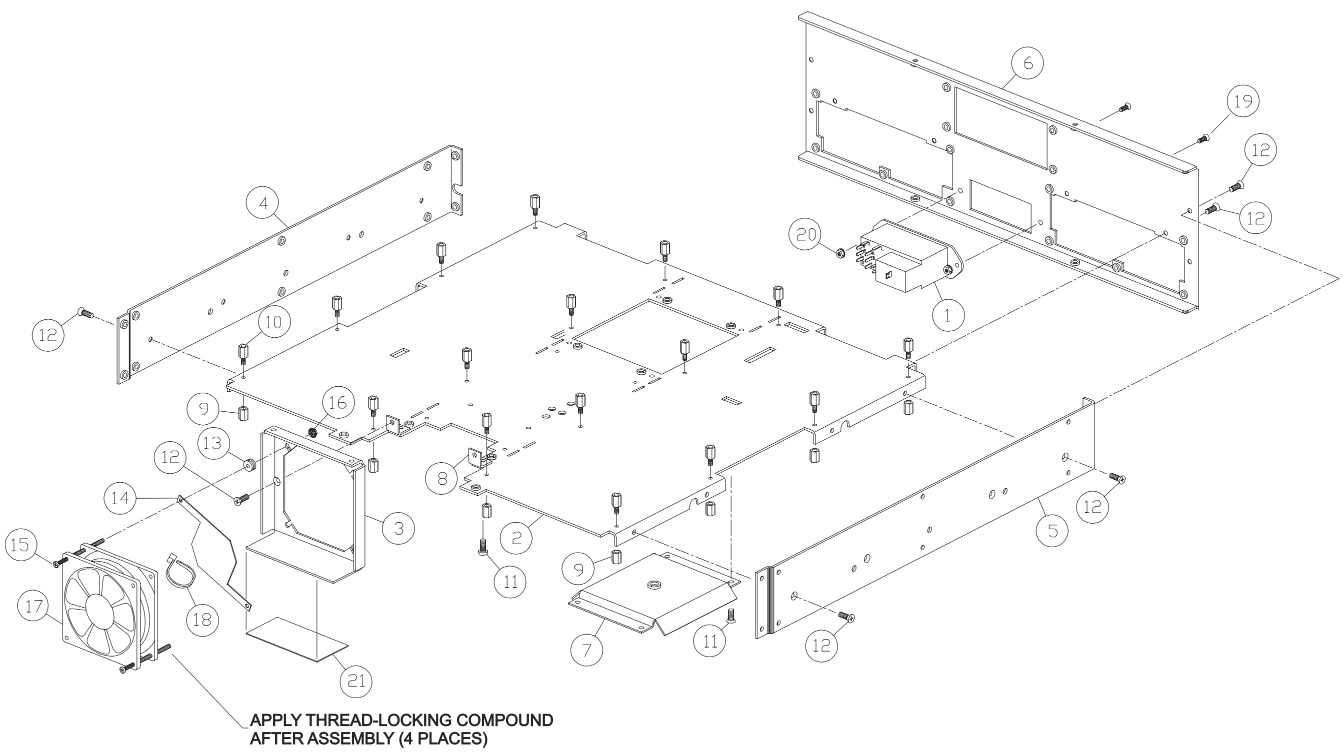


Figure 7-4. Chassis and Fan Mounting Detail

Table 7-5. Parts list for Figure 7-5

ITEM	A–P NUMBER	DESCRIPTION
1	SPSA.000	POWER SUPPLY MODULE
2	5620.0002	INSULATOR, SILICONE
3	5346.0002	WASHER, SHOULDER #4
4	5620.0001	INSULATOR, MICA T-03
5	3221.5883	TRANSISTOR, PNP T-03 2N5883
6	5113.7116	SCREW, MC SEM PH ZN #6-32 X 1/2
7	5112.3110	SCREW, MC PAN PH #4-40 X 5/16
8	5112.7108	SCREW, MC SEM PH ZN #4-40 X 1/4
9	5522.1212	STANDOFF #4-40 1/4 X 3/8

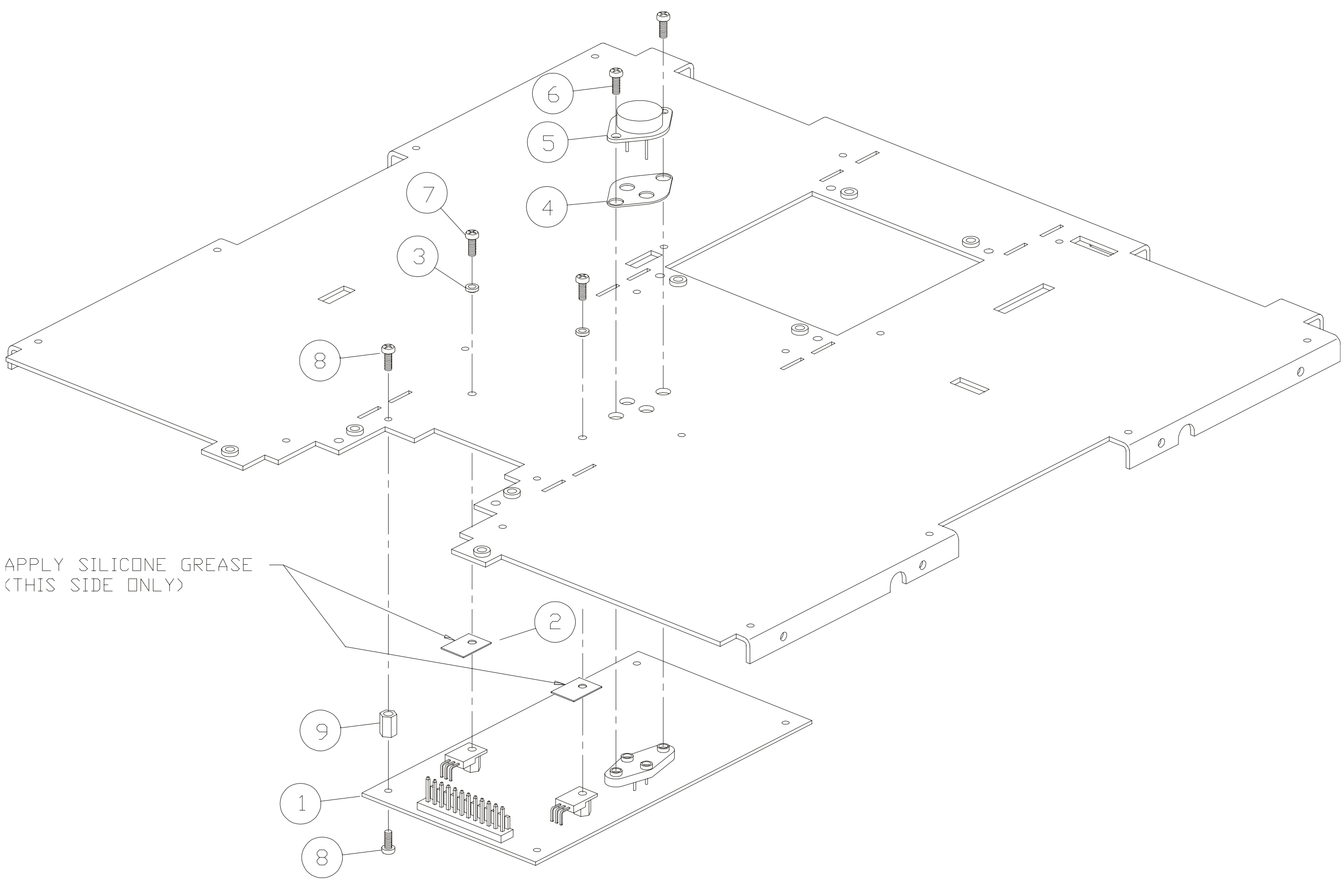


Figure 7-5. PSA Mounting Detail

Table 7-6. Parts list for Figure 7-6

ITEM	A–P NUMBER	DESCRIPTION
1	7170.0202	RACK EAR BRACKET, RH
2	7170.0201	RACK EAR BRACKET, LH
3	5113.1110.6	SCREW #6-32 X 5/16 MC FLT PH DGY
4	5115.4110.6	SCREW #10-32 X 5/16 MC TRUSS PH DGY
5		SLIDE—STATIONARY SECTION
6	7320.0006	HANDLE
7	5114.1108	SCREW MC FLT PH ZN #8-32 X 1/4

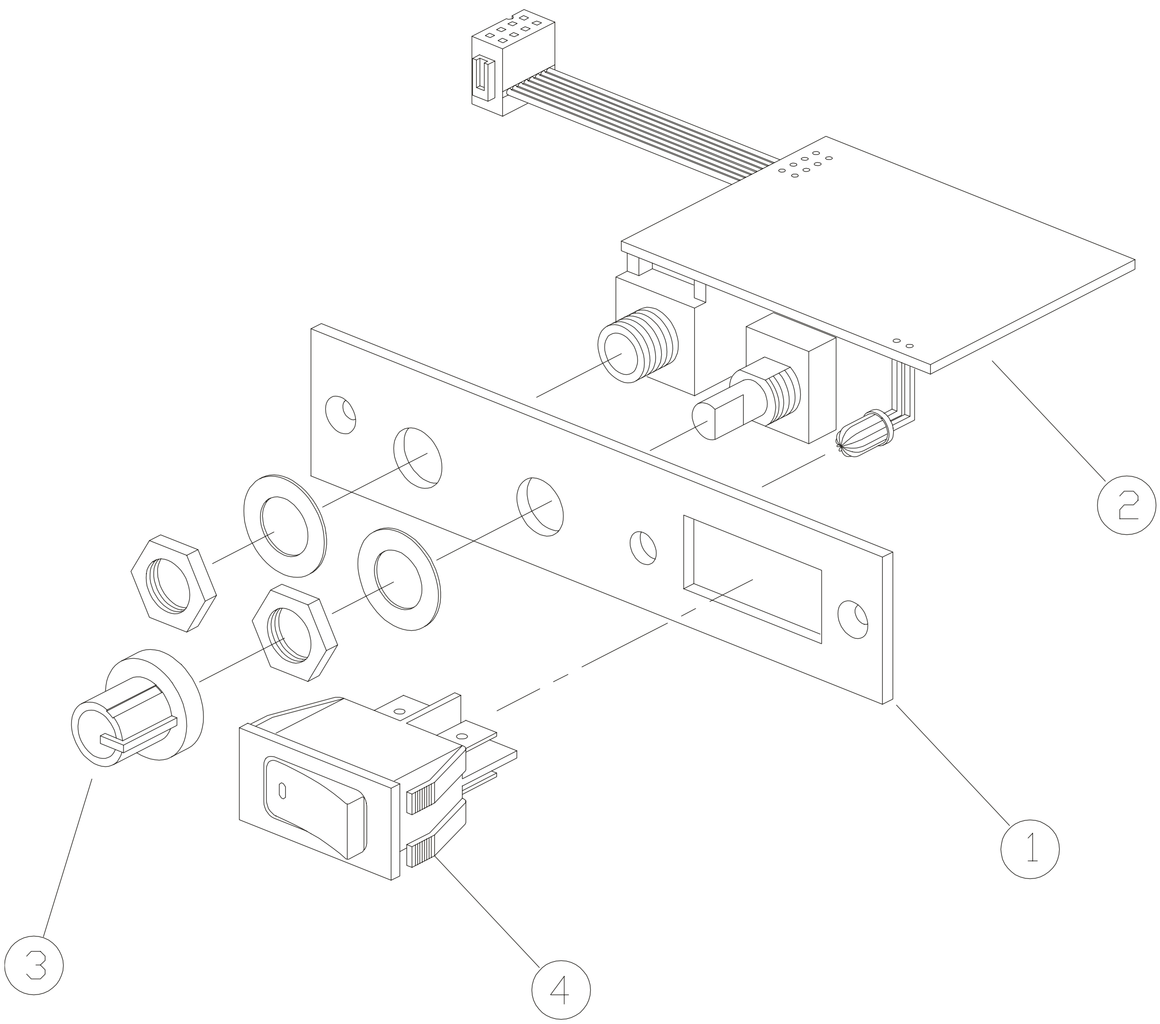


Figure 7-6. Front Switch Panel

Table 7-7. Parts list for Figure 7-7

ITEM	A–P NUMBER	DESCRIPTION
1	7170.0204	RACK EAR BRACKET, RH
2	7170.0203	RACK EAR BRACKET, LH
3	5113.1110.6	SCREW #6-32 X 5/16 MC FLT PH DGY
4	5115.4110.6	SCREW #10-32 X 3/8 MC TRUSS PH DGY
5	5114.1108	SCREW MC FLT PH ZN #8-32 1/4
6	7320.0006	HANDLE

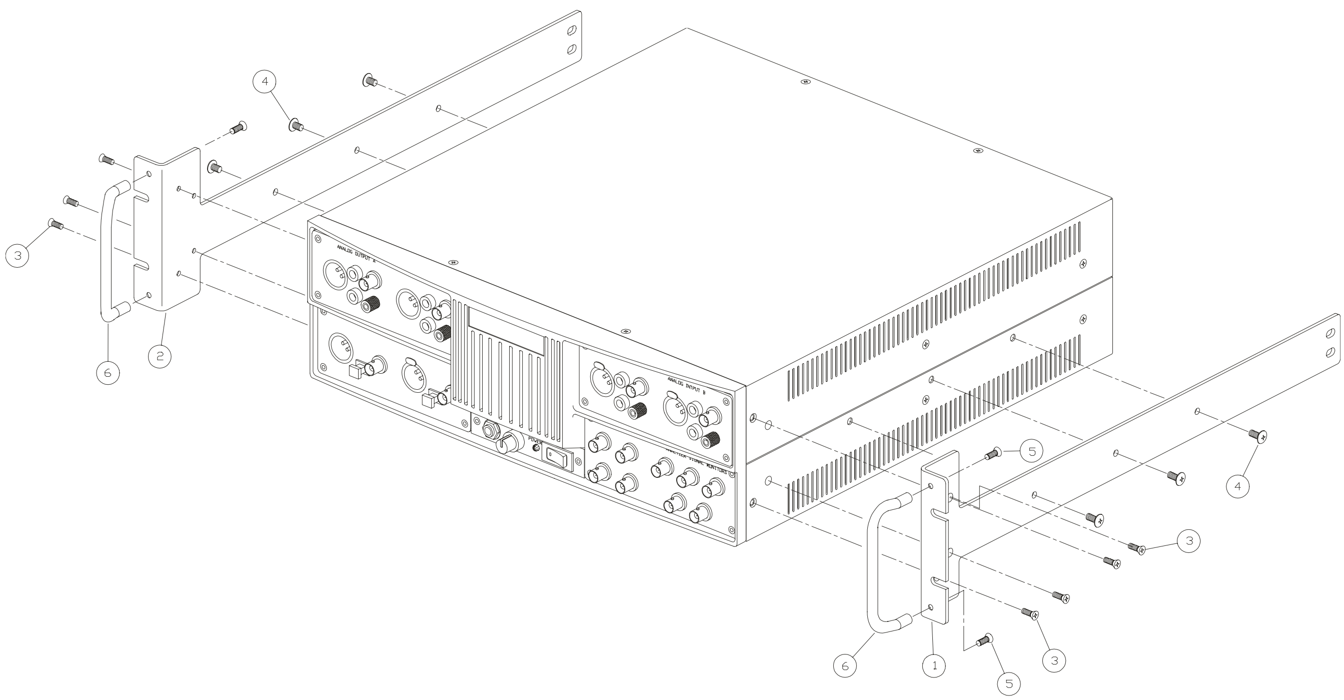


Figure 7-7. Rack Assembly (stationary)

Table 7-8. Parts list for Figure 7-8

ITEM	A–P NUMBER	DESCRIPTION
1	7170.0202	RACK EAR BRACKET, RH
2	7170.0201	RACK EAR BRACKET, LH
3	5113.1110.6	SCREW #6-32 X 5/16 MC FLT PH DGY
4	5115.4110.6	SCREW #10-32 X 5/16 MC TRUSS PH DGY
5		SLIDE—STATIONARY SECTION
6	7320.0006	HANDLE
7	5114.1108	SCREW MC FLT PH ZN #8-32 X 1/4

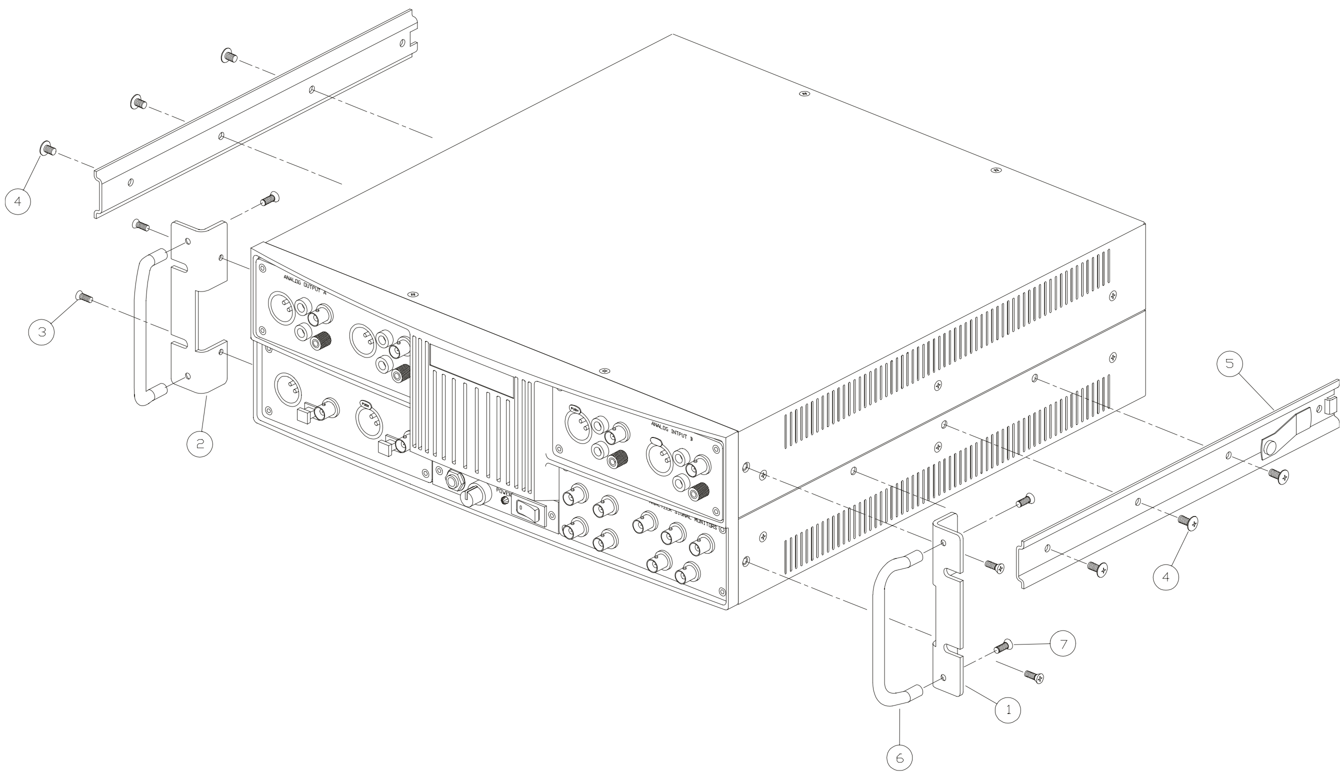


Figure 7-8. Rack Assembly (slide)

Appendices: Calibration Reports

The following appendices are intended to be photocopied, the copy to be completed and signed for each instrument calibration. These pages are also available on the CD-ROM as Adobe Acrobat PDF files. These files may be viewed or printed using Adobe Acrobat Reader.

2700 Series Calibration Report

SYS-2702 / SYS-2712 / SYS-2720 / SYS-2722 (192k)

Calibration laboratory or equivalent facility:

(name) ____

(address) ____

____

____

Customer: ____ PO No. ________________________

Unit under test: (Model No.) ______________________________ (Serial No.) ____________________

Report Identifier ____________________________ consisting of 14 pages. Calibration Date: ________________

The instrument as received ❑ was / ❑ was not functioning within specifications.

Procedure used: S2 Family Service Manual Calibration V1.00, 2700 Series, pages 2-1 to 2-10.

Ambient temperature during calibration: ________ ° C.

Calibration equipment used:

Model	Description	Last Calibration Date	Calibration Due

This report shall not be reproduced except in full, without the written approval of the laboratory named above.

Calibration certified by (signature) ____________________________________

(print name) ____________________________________

(title) ____________________________________

2700 Series Calibration Report

SYS-2702 / SYS-2712 / SYS-2720 / SYS-2722 (192k)

ANALOG GENERATOR CHARACTERISTICS

SYS-2702 / SYS-2712 / SYS-2722 (192k)

Sine Frequency, Step 1	Low Limit		High Limit	PASS	FAIL
Fast Mode					
10.0 Hz	9.9500	________	10.050 Hz	☐	☐
100 Hz	99.500	________	100.500 Hz	☐	☐
1.00 kHz	0.9950	________	1.0050 kHz	☐	☐
10.0 kHz	9.9500	________	10.050 kHz	☐	☐
100 kHz	99.500	________	100.50 kHz	☐	☐
200 kHz	199.000	________	201.000 kHz	☐	☐
High-Accuracy Mode					
10 Hz	9.9970	________	10.0030 Hz	☐	☐
100 Hz	99.970	________	100.030 Hz	☐	☐
1.00 kHz	0.99970	________	1.00030 kHz	☐	☐
10.0 kHz	9.9970	________	10.0030 kHz	☐	☐
100 kHz	99.970	________	100.030 kHz	☐	☐
200 kHz	199.940	________	200.060 kHz	☐	☐

Sine (D/A) Frequency Accuracy, Step 2

10.000 kHz	9999.970	________	10000.030 Hz	☐	☐

Sine Amplitude Accuracy, Step 3

Channel A					
10.00 V	9.9300	________	10.070 Vrms	☐	☐
5.000 V	4.9650	________	5.0350 Vrms	☐	☐
2.500 V	2.4830	________	2.5170 Vrms	☐	☐
1.200 V	1.1920	________	1.2080 Vrms	☐	☐
600 mV	595.80	________	604.20 mVrms	☐	☐
300 mV	297.90	________	302.10 mVrms	☐	☐
150 mV	149.00	________	151.00 mVrms	☐	☐
80 mV	79.440	________	80.560 mVrms	☐	☐
40 mV	39.720	________	40.280 mVrms	☐	☐
20 mV	19.860	________	20.140 mVrms	☐	☐
10 mV	9.9300	________	10.070 mVrms	☐	☐
Channel B					
10.00 V	9.9300	________	10.070 Vrms	☐	☐
5.000 V	4.9650	________	5.0350 Vrms	☐	☐
2.500 V	2.4830	________	2.5170 Vrms	☐	☐
1.200 V	1.1920	________	1.2080 Vrms	☐	☐
600 mV	595.80	________	604.20 mVrms	☐	☐
300 mV	297.90	________	302.10 mVrms	☐	☐
150 mV	149.00	________	151.00 mVrms	☐	☐
80 mV	79.440	________	80.560 mVrms	☐	☐
40 mV	39.720	________	40.280 mVrms	☐	☐
20 mV	19.860	________	20.140 mVrms	☐	☐
10 mV	9.9300	________	10.070 mVrms	☐	☐

Sine (D/A) Amplitude Accuracy, Step 4	Low Limit		High Limit	PASS	FAIL
Channel A	2.4830	________	2.5170 Vrms	☐	☐
Channel B	2.4830	________	2.5170 Vrms	☐	☐

Sine Flatness, Step 5

Channel A					
10 Hz	–0.008	________	+0.008 dB	☐	☐
20 Hz	–0.008	________	+0.008 dB	☐	☐
50 Hz	–0.008	________	+0.008 dB	☐	☐
10 kHz	–0.008	________	+0.008 dB	☐	☐
20 kHz	–0.008	________	+0.008 dB	☐	☐
50 kHz	–0.030	________	+0.030 dB	☐	☐
100 kHz	–0.100	________	+0.100 dB	☐	☐
200 kHz	–0.300	________	+0.200 dB	☐	☐
Channel B					
10 Hz	–0.008	________	+0.008 dB	☐	☐
20 Hz	–0.008	________	+0.008 dB	☐	☐
50 Hz	–0.008	________	+0.008 dB	☐	☐
10 kHz	–0.008	________	+0.008 dB	☐	☐
20 kHz	–0.008	________	+0.008 dB	☐	☐
50 kHz	–0.030	________	+0.030 dB	☐	☐
100 kHz	–0.100	________	+0.100 dB	☐	☐
200 kHz	–0.300	________	+0.200 dB	☐	☐

D/A Sine Flatness, Step 6

Channel A					
10 Hz	–0.030	________	+0.030 dB	☐	☐
20 Hz	–0.010	________	+0.010 dB	☐	☐
10 kHz	–0.010	________	+0.010 dB	☐	☐
20 kHz	–0.010	________	+0.010 dB	☐	☐
30 kHz	–0.030	________	+0.030 dB	☐	☐
50 kHz	–0.100	________	+0.100 dB	☐	☐
Channel B					
10 Hz	–0.010	________	+0.010 dB	☐	☐
20 Hz	–0.010	________	+0.010 dB	☐	☐
10 kHz	–0.010	________	+0.010 dB	☐	☐
20 kHz	–0.010	________	+0.010 dB	☐	☐
30 kHz	–0.030	________	+0.030 dB	☐	☐
50 kHz	–0.100	________	+0.100 dB	☐	☐

SineTHD+N, Step 7

Channel A					
Vout = 26.66 V bal, 22 kHz analyzer BW					
20 Hz	0.00000	________	0.00200 %	☐	☐
30 Hz	0.00000	________	0.00032 %	☐	☐
1 kHz	0.00000	________	0.00025 %	☐	☐
5 kHz	0.00000	________	0.00032 %	☐	☐
Vout = 26.66.00 V bal, 80 kHz analyzer BW					
1 kHz	0.00000	________	0.00050 %	☐	☐
20 kHz	0.00000	________	0.00050 %	☐	☐
Vout = 13.33 V bal, 500 kHz analyzer BW					
10 Hz	0.00000	________	0.00400 %	☐	☐
20 Hz	0.00000	________	0.00100 %	☐	☐
20 kHz	0.00000	________	0.00100 %	☐	☐
100 kHz	0.00000	________	0.00400 %	☐	☐

	Low Limit		High Limit	PASS	FAIL
Channel B					
Vout = 26.66 V bal, 22 kHz analyzer BW					
20 Hz	0.00000	________	0.00200 %	☐	☐
30 Hz	0.00000	________	0.00032 %	☐	☐
1 kHz	0.00000	________	0.00025 %	☐	☐
5 kHz	0.00000	________	0.00032 %	☐	☐
Vout = 26.66.00 V bal, 80 kHz analyzer BW					
1 kHz	0.00000	________	0.00050 %	☐	☐
20 kHz	0.00000	________	0.00050 %	☐	☐
Vout = 13.33 V bal, 500 kHz analyzer BW					
10 Hz	0.00000	________	0.00400 %	☐	☐
20 Hz	0.00000	________	0.00100 %	☐	☐
20 kHz	0.00000	________	0.00100 %	☐	☐
100 kHz	0.00000	________	0.00400 %	☐	☐

Sine D/A Residual THD+N, Step 8

	Low Limit		High Limit	PASS	FAIL
Channel A					
20 Hz	0.00000	________	0.00070 %	☐	☐
1 kHz	0.00000	________	0.00070 %	☐	☐
5 kHz	0.00000	________	0.00070 %	☐	☐
20 kHz	0.00000	________	0.00070 %	☐	☐
Channel B					
20 Hz	0.00000	________	0.00070 %	☐	☐
1 kHz	0.00000	________	0.00070 %	☐	☐
5 kHz	0.00000	________	0.00070 %	☐	☐
20 kHz	0.00000	________	0.00070 %	☐	☐

Output Crosstalk, Step 9

	Low Limit		High Limit	PASS	FAIL
Ch B into Ch A					
20 kHz	–999.9	________	–120.0 dB	☐	☐
100 kHz	–999.9	________	–106.0 dB	☐	☐
Ch A into Ch B					
20 kHz	–999.9	________	–120.0 dB	☐	☐
100 kHz	–999.9	________	–106.0 dB	☐	☐

Source Impedance Accuracy, Step 10

	Low Limit		High Limit	PASS	FAIL
Channel A					
40 Ω bal	39.00	________	41.00 Ω	☐	☐
150 (200) Ω bal	148.5	________	151.5 Ω	☐	☐
	(198.0)	________	(202.0) Ω	☐	☐
600 Ω bal (Opt EGZ)	597.0	________	603.0 Ω	☐	☐
20 Ω unbal	19.00	________	21.00 Ω	☐	☐
600 Ω unbal	597.0	________	603.0 Ω	☐	☐
Channel B					
40 Ω bal	39.00	________	41.00 Ω	☐	☐
150 (200) Ω bal	148.5	________	151.5 Ω	☐	☐
	(198.0)	________	(202.0) Ω	☐	☐
600 Ω bal (Opt EGZ)	597.0	________	603.0 Ω	☐	☐
20 Ω unbal	19.00	________	21.00 Ω	☐	☐
600 Ω unbal	597.0	________	603.0 Ω	☐	☐

ANALOG ANALYZER CHARACTERISTICS

Input Termination Accuracy, Step 11	Low Limit		High Limit	PASS	FAIL
Channel A					
600 Ω	594.0	________	606.0 Ω	☐	☐
300 Ω	297.0	________	303.0 Ω	☐	☐
Channel B					
600 Ω	594.0	________	606.0 Ω	☐	☐
300 Ω	297.0	________	303.0 Ω	☐	☐
Input Common Mode Rejection, Step 12					
Channel A					
2.5 V range, 10 Hz	–999.9	________	–80.0 dBgA	☐	☐
2.5 V range, 1 kHz	–999.9	________	–80.0 dBgA	☐	☐
2.5 V range, 20 kHz	–999.9	________	–80.0 dBgA	☐	☐
10 V range, 1 kHz	–999.9	________	–65.0 dBgA	☐	☐
10 V range, 20 kHz	–999.9	________	–65.0 dBgA	☐	☐
40 V range, 1 kHz	–999.9	________	–50.0 dBgA	☐	☐
160 V range, 1 kHz	–999.9	________	–50.0 dBgA	☐	☐
Channel B					
2.5 V range, 10 Hz	–999.9	________	–80.0 dBgB	☐	☐
2.5 V range, 1 kHz	–999.9	________	–80.0 dBgB	☐	☐
2.5 V range, 20 kHz	–999.9	________	–80.0 dBgB	☐	☐
10 V range, 1 kHz	–999.9	________	–65.0 dBgB	☐	☐
10 V range, 20 kHz	–999.9	________	–65.0 dBgB	☐	☐
40 V range, 1 kHz	–999.9	________	–50.0 dBgB	☐	☐
160 V range, 1 kHz	–999.9	________	–50.0 dBgB	☐	☐
Input Residual Crosstalk, Step 13					
Ch B into Ch A					
20 kHz	–999.9	________	–140.0 dB	☐	☐
100 kHz	–999.9	________	–126.0 dB	☐	☐
Ch A into Ch B					
20 kHz	–999.9	________	–140.0 dB	☐	☐
100 kHz	–999.9	________	–126.0 dB	☐	☐
Level Meter Accuracy, Step 14					
Channel A					
120.00 Vrms (160 V range)	119.4	________	120.6 V	☐	☐
60.00 Vrms (80 V range)	59.70	________	60.30 V	☐	☐
30.00 Vrms (40 V range)	29.85	________	30.15 V	☐	☐
16.00 Vrms (20 V range)	15.92	________	16.08 V	☐	☐
8.000 Vrms (10 V range)	7.960	________	8.040 V	☐	☐
4.000 Vrms (5 V range)	3.980	________	4.020 V	☐	☐
2.000 Vrms (2.5 V range)	1.990	________	2.010 V	☐	☐
1.000 Vrms (1.2 V range)	0.995	________	1.005 V	☐	☐
500 mVrms (600 mV range)	497.5	________	502.5 mV	☐	☐
240 mVrms (300 mV range)	238.8	________	241.2 mV	☐	☐
120 mVrms (160 mV range)	119.4	________	120.6 mV	☐	☐
60 mVrms (80 mV range)	59.70	________	60.30 mV	☐	☐
30 mVrms (40 mV range)	29.85	________	30.15 mV	☐	☐
5.0 mVrms (40 mV range)	4.975	________	5.025 mV	☐	☐

	Low Limit		High Limit	PASS	FAIL
Channel B					
120.00 Vrms (160 V range)	119.4	__________	120.6 V	☐	☐
60.00 Vrms (80 V range)	59.70	__________	60.30 V	☐	☐
30.00 Vrms (40 V range)	29.85	__________	30.15 V	☐	☐
16.00 Vrms (20 V range)	15.92	__________	16.08 V	☐	☐
8.000 Vrms (10 V range)	7.960	__________	8.040 V	☐	☐
4.000 Vrms (5 V range)	3.980	__________	4.020 V	☐	☐
2.000 Vrms (2.5 V range)	1.990	__________	2.010 V	☐	☐
1.000 Vrms (1.2 V range)	0.995	__________	1.005 V	☐	☐
500 mVrms (600 mV range)	497.5	__________	502.5 mV	☐	☐
240 mVrms (300 mV range)	238.8	__________	241.2 mV	☐	☐
120 mVrms (160 mV range)	119.4	__________	120.6 mV	☐	☐
60 mVrms (80 mV range)	59.70	__________	60.30 mV	☐	☐
30 mVrms (40 mV range)	29.85	__________	30.15 mV	☐	☐
5.0 mVrms (40 mV range)	4.975	__________	5.025 mV	☐	☐

Level Meter Flatness, Step 15

Channel A					
10 Hz	–0.100	__________	+0.100 dBrA	☐	☐
15 Hz	–0.030	__________	+0.030 dBrA	☐	☐
20 Hz	–0.008	__________	+0.008 dBrA	☐	☐
50 Hz	–0.008	__________	+0.008 dBrA	☐	☐
20 kHz	–0.008	__________	+0.008 dBrA	☐	☐
50 kHz	–0.030	__________	+0.030 dBrA	☐	☐
100 kHz	–0.100	__________	+0.100 dBrA	☐	☐
500 kHz	–0.500	__________	+0.200 dBrA	☐	☐
Channel B					
10 Hz	–0.100	__________	+0.100 dBrB	☐	☐
15 Hz	–0.030	__________	+0.030 dBrB	☐	☐
20 Hz	–0.008	__________	+0.008 dBrB	☐	☐
50 Hz	–0.008	__________	+0.008 dBrB	☐	☐
20 kHz	–0.008	__________	+0.008 dBrB	☐	☐
50 kHz	–0.030	__________	+0.030 dBrB	☐	☐
100 kHz	–0.100	__________	+0.100 dBrB	☐	☐
500 kHz	–0.500	__________	+0.200 dBrB	☐	☐

Amplitude Meter Accuracy, Step 16

Channel A (2.5 V input range)					
2.000 Vrms	1.980	__________	2.020 V	☐	☐
500 mVrms	495.0	__________	505.0 mV	☐	☐
120 mVrms	118.8	__________	121.2 mV	☐	☐
30 mVrms	29.70	__________	30.30 mV	☐	☐
8.0 mVrms	7.920	__________	8.080 mV	☐	☐
2.0 mVrms	1.980	__________	2.020 mV	☐	☐
Channel B (2.5 V input range)					
2.000 Vrms	1.980	__________	2.020 V	☐	☐
500 mVrms	495.0	__________	505.0 mV	☐	☐
120 mVrms	118.8	__________	121.2 mV	☐	☐
30 mVrms	29.70	__________	30.30 mV	☐	☐
8.0 mVrms	7.920	__________	8.080 mV	☐	☐
2.0 mVrms	1.980	__________	2.020 mV	☐	☐

Amplitude Meter Flatness, Step 17	**Low Limit**		**High Limit**	**PASS**	**FAIL**
2.000 Vrms					
15 Hz	–0.050	________	+0.050 dBrA	☐	☐
20 Hz	–0.020	________	+0.020 dBrA	☐	☐
20 kHz	–0.020	________	+0.020 dBrA	☐	☐
50 kHz	–0.050	________	+0.050 dBrA	☐	☐
100 kHz	–0.150	________	+0.150 dBrA	☐	☐
200 kHz	–0.300	________	+0.200 dBrA	☐	☐
120 mVrms					
15 Hz	–0.050	________	+0.050 dBrA	☐	☐
20 Hz	–0.020	________	+0.020 dBrA	☐	☐
20 kHz	–0.020	________	+0.020 dBrA	☐	☐
50 kHz	–0.050	________	+0.050 dBrA	☐	☐
100 kHz	–0.150	________	+0.150 dBrA	☐	☐
200 kHz	–0.300	________	+0.200 dBrA	☐	☐
8 mVrms					
15 Hz	–0.050	________	+0.050 dBrA	☐	☐
20 Hz	–0.020	________	+0.020 dBrA	☐	☐
20 kHz	–0.020	________	+0.020 dBrA	☐	☐
50 kHz	–0.050	________	+0.050 dBrA	☐	☐
100 kHz	–0.150	________	+0.150 dBrA	☐	☐
200 kHz	–0.300	________	+0.200 dBrA	☐	☐

Bandreject & THD+N Accuracy, Step 18

20 Hz notch					
40 Hz	–0.300	________	+0.300 dBV	☐	☐
60 Hz	–0.300	________	+0.300 dBV	☐	☐
20 kHz	–0.300	________	+0.300 dBV	☐	☐
120 kHz	–0.300	________	+0.300 dBV	☐	☐
1 kHz notch					
20 Hz	–0.300	________	+0.300 dBV	☐	☐
500 Hz	–0.300	________	+0.300 dBV	☐	☐
2.0 kHz	–0.300	________	+0.300 dBV	☐	☐
3.0 kHz	–0.300	________	+0.300 dBV	☐	☐
20 kHz	–0.300	________	+0.300 dBV	☐	☐
120 kHz	–0.300	________	+0.300 dBV	☐	☐
20 kHz notch					
20 Hz	–0.300	________	+0.300 dBV	☐	☐
10 kHz	–0.300	________	+0.300 dBV	☐	☐
40 kHz	–0.300	________	+0.300 dBV	☐	☐
60 kHz	–0.300	________	+0.300 dBV	☐	☐
120 kHz	–0.300	________	+0.300 dBV	☐	☐
100 kHz notch					
20 Hz	–0.300	________	+0.300 dBV	☐	☐
20 kHz	–0.300	________	+0.300 dBV	☐	☐
50 kHz	–0.300	________	+0.300 dBV	☐	☐

Bandpass Accuracy, Step 19

20 Hz					
19.60 Hz bandpass	–0.300	________	+0.300 dBV	☐	☐
20.00 Hz bandpass	–0.300	________	+0.300 dBV	☐	☐
20.40 Hz bandpass	–0.300	________	+0.300 dBV	☐	☐
1 kHz					
0.980 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
1.000 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
1.020 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐

	Low Limit		High Limit	PASS	FAIL
20 kHz					
19.60 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
20.00 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
20.40 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
100 kHz					
98.0 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
100.0 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
102.0 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐

Bandwidth Limiting Filters, Step 20

	Low Limit		High Limit	PASS	FAIL
22 Hz Highpass					
22.4 Hz	–6.000	________	–0.000 dBrA	☐	☐
31.5 Hz	–0.500	________	+0.500 dBrA	☐	☐
50 Hz	–0.500	________	+0.500 dBrA	☐	☐
100 Hz Highpass					
95 Hz	–999.9	________	–3.000 dBrA	☐	☐
105 Hz	–3.000	________	–0.000 dBrA	☐	☐
400 Hz Highpass					
380 Hz	–999.9	________	–3.000 dBrA	☐	☐
420 Hz	–3.000	________	–0.000 dBrA	☐	☐
22 kHz Lowpass					
5 kHz	–0.500	________	+0.500 dBrA	☐	☐
16 kHz	–0.500	________	+0.500 dBrA	☐	☐
22.4 kHz	–6.000	________	–0.000 dBrA	☐	☐
30 kHz Lowpass					
28.5 kHz	–3.000	________	–0.000 dBrA	☐	☐
31.5 kHz	–999.9	________	–3.000 dBrA	☐	☐
80 kHz Lowpass					
76.0 kHz	–3.000	________	–0.000 dBrA	☐	☐
84.0 kHz	–999.9	________	–3.000 dBrA	☐	☐

Residual Noise, Step 21

	Low Limit		High Limit	PASS	FAIL
Channel A					
22–22 kHz bandwidth	0.000	________	1.000 μV	☐	☐
10–80 kHz bandwidth	0.000	________	2.000 μV	☐	☐
Full bandwidth	0.00	________	6.00 μV	☐	☐
5 kHz bandpass	0.000	________	0.250 μV	☐	☐
20 kHz bandpass	0.000	________	0.500 μV	☐	☐
200 kHz bandpass	0.000	________	1.500 μV	☐	☐
Channel B					
22–22 kHz bandwidth	0.000	________	1.000 μV	☐	☐
10–80 kHz bandwidth	0.000	________	2.000 μV	☐	☐
Full bandwidth	0.00	________	6.00 μV	☐	☐
5 kHz bandpass	0.000	________	0.250 μV	☐	☐
20 kHz bandpass	0.000	________	0.500 μV	☐	☐
200 kHz bandpass	0.000	________	1.500 μV	☐	☐

Residual THD+N, Step 22	Low Limit		High Limit	PASS	FAIL
Channel A					
Vin = 1.50 V, 22 kHz analyzer BW					
20 Hz	0.00000	__________	0.00032 %	☐	☐
1 kHz	0.00000	__________	0.00025 %	☐	☐
5 kHz	0.00000	__________	0.00032 %	☐	☐
20 kHz	0.00000	__________	0.00032 %	☐	☐
Vin = 1.50 V, 80 kHz analyzer BW					
1 kHz	0.00000	__________	0.00050 %	☐	☐
20 kHz	0.00000	__________	0.00050 %	☐	☐
Vin = 1.50 V, 500 kHz analyzer BW					
1 kHz	0.00000	__________	0.00100 %	☐	☐
20 kHz	0.00000	__________	0.00100 %	☐	☐
50 kHz	0.00000	__________	0.00400 %	☐	☐
100 kHz	0.00000	__________	0.00400 %	☐	☐
Channel B					
Vin = 1.50 V, 22 kHz analyzer BW					
20 Hz	0.00000	__________	0.00032 %	☐	☐
1 kHz	0.00000	__________	0.00025 %	☐	☐
5 kHz	0.00000	__________	0.00032 %	☐	☐
20 kHz	0.00000	__________	0.00032 %	☐	☐
Vin = 1.50 V, 80 kHz analyzer BW					
1 kHz	0.00000	__________	0.00050 %	☐	☐
20 kHz	0.00000	__________	0.00050 %	☐	☐
Vin = 1.50 V, 500 kHz analyzer BW					
1 kHz	0.00000	__________	0.00100 %	☐	☐
20 kHz	0.00000	__________	0.00100 %	☐	☐
50 kHz	0.00000	__________	0.00400 %	☐	☐
100 kHz	0.00000	__________	0.00400 %	☐	☐
Phase Measurement Accuracy, Step 23					
10 Hz, dc coupled	–0.50	__________	+0.50 deg	☐	☐
10 Hz, ac coupled	–0.50	__________	+0.50 deg	☐	☐
1 kHz	–0.50	__________	+0.50 deg	☐	☐
5 kHz	–0.50	__________	+0.50 deg	☐	☐
20 kHz	–1.00	__________	+1.00 deg	☐	☐
50 kHz	–2.00	__________	+2.00 deg	☐	☐
Frequency Measurement Accuracy, Step 24					
20 kHz	–6.0	__________	+6.0 PPM	☐	☐
	(±30 PPM is allowed for Model SYS-2702)				
High Resolution A/D Residual Distortion, Step 25					
Channel A (5 kHz)	–999.9	__________	–105.0 dBrA	☐	☐
Channel B (5 kHz)	–999.9	__________	–105.0 dBrB	☐	☐
High Bandwidth A/D Residual Distortion, Step 26					
Channel A (20 kHz)	–999.9	__________	–90.0 dBrA	☐	☐
Channel B (20 kHz)	–999.9	__________	–90.0 dBrB	☐	☐

OPTION "BUR" RELATED

Burst OFF Ratio Accuracy, Step 27	Low Limit		High Limit	PASS	FAIL
0 dB	–0.300	______	+0.300 dB	☐	☐
–10 dB	–10.300	______	–9.700 dB	☐	☐
–20 dB	–20.300	______	–19.700 dB	☐	☐
–40 dB	–40.300	______	–39.700 dB	☐	☐
–60 dB	–60.300	______	–59.700 dB	☐	☐
Squarewave Amplitude Accuracy, Step 28					
1.000 V (100 Hz)	1.3859	______	1.4425 Vrms	☐	☐

OPTION "IMD" RELATED

Generator IMD Amplitude Accuracy, Step 29					
SMPTE 4:1 Signal (60/7k)	0.8081	______	0.8411 Vrms	☐	☐
SMPTE 1:1 Signal (60/7k)	0.6930	______	0.7212 Vrms	☐	☐
DFD/CCIF Signal (15k/15.08k)	0.6859	______	0.7283 Vrms	☐	☐
DIM Signal (DIM-100)	1.1150	______	1.1605 Vrms	☐	☐
SMPTE LF Tone Accuracy, Step 30					
40 Hz	39.40	______	40.60 Hz	☐	☐
50 Hz	49.25	______	50.75 Hz	☐	☐
60 Hz	59.10	______	60.90 Hz	☐	☐
70 Hz	68.95	______	71.05 Hz	☐	☐
100 Hz	98.50	______	101.50 Hz	☐	☐
125 Hz	123.13	______	126.88 Hz	☐	☐
250 Hz	246.25	______	253.75 Hz	☐	☐
500 Hz	492.50	______	507.50 Hz	☐	☐
DIM Squarewave Accuracy, Step 31					
DIM-B (2.96 kHz)	2.9304	______	2.9896 kHz	☐	☐
DIM-100 (3.15 kHz)	3.1185	______	3.1815 kHz	☐	☐
IMD Measurement Accuracy, Step 32					
SMPTE	–60.5	______	–59.5 dB	☐	☐
DFD/CCIF	–60.5	______	–59.5 dB	☐	☐
DIM, u4 component	–60.7	______	–59.3 dB	☐	☐
DIM, u5 component	–60.7	______	–59.3 dB	☐	☐
Residual IMD, Step 33					
Channel A					
SMPTE (60/7k, 4:1), 26.66 V bal	0.00000	______	0.00150 %	☐	☐
SMPTE (60/7k, 4:1), 1.00 V bal	0.00000	______	0.00150 %	☐	☐
SMPTE (60/7k, 4:1), 200 mV bal	0.00000	______	0.00150 %	☐	☐
DFD (14k/15k), 26.66 V bal	0.00000	______	0.00020 %	☐	☐
DFD (14k/15k), 1.00 V bal	0.00000	______	0.00020 %	☐	☐
DFD (14k/15k), 200 mV bal	0.00000	______	0.00020 %	☐	☐
DIM (DIM-100), 26.66 V bal	0.00000	______	0.00200 %	☐	☐
DIM (DIM-100), 1.00 V bal	0.00000	______	0.00200 %	☐	☐
DIM (DIM-100), 200 mV bal	0.00000	______	0.00200 %	☐	☐

	Low Limit		High Limit	PASS	FAIL
Channel B					
SMPTE (60/7k, 4:1), 26.66 V bal	0.00000	__________	0.00150 %	☐	☐
SMPTE (60/7k, 4:1), 1.00 V bal	0.00000	__________	0.00150 %	☐	☐
SMPTE (60/7k, 4:1), 200 mV bal	0.00000	__________	0.00150 %	☐	☐
DFD (14k/15k), 26.66 V bal	0.00000	__________	0.00020 %	☐	☐
DFD (14k/15k), 1.00 V bal	0.00000	__________	0.00020 %	☐	☐
DFD (14k/15k), 200 mV bal	0.00000	__________	0.00020 %	☐	☐
DIM (DIM-100), 26.66 V bal	0.00000	__________	0.00200 %	☐	☐
DIM (DIM-100), 1.00 V bal	0.00000	__________	0.00200 %	☐	☐
DIM (DIM-100), 200 mV bal	0.00000	__________	0.00200 %	☐	☐

OPTION “W&F” RELATED

Wow and Flutter Accuracy, Step 34

IEC detection	0.9500	__________	1.0500 %	☐	☐
NAB/JIS detection	0.6718	__________	0.7425 %	☐	☐

Residual Wow and Flutter, Step 35

IEC, weighted	0.00000	__________	0.00100 %	☐	☐
IEC, unweighted	0.00000	__________	0.00200 %	☐	☐
NAB, weighted	0.00000	__________	0.00100 %	☐	☐
NAB, unweighted	0.00000	__________	0.00200 %	☐	☐
Scrape (12.5 kHz test tone)	0.00000	__________	0.00500 %	☐	☐

OPTION “S-AES17” RELATED

S-AES17 Option Response, Step 36

20 kHz Pre-Analyzer Filter					
1 kHz	–0.100	__________	+0.100 dBrA	☐	☐
15 kHz	–0.100	__________	+0.100 dBrA	☐	☐
20 kHz	–0.100	__________	+0.100 dBrA	☐	☐
25 kHz	–4.000	__________	–2.000 dBrA	☐	☐
40 kHz Pre-Analyzer Filter					
1 kHz	–0.100	__________	+0.100 dBrA	☐	☐
30 kHz	–0.100	__________	+0.100 dBrA	☐	☐
40 kHz	–0.100	__________	+0.100 dBrA	☐	☐
50 kHz	–4.000	__________	–2.000 dBrA	☐	☐
“20 kHz AES17” Mode					
20 Hz	–0.100	__________	+0.100 dBrB	☐	☐
10 kHz	–0.100	__________	+0.100 dBrB	☐	☐
15 kHz	–0.100	__________	+0.100 dBrB	☐	☐
20 kHz	–0.100	__________	+0.100 dBrB	☐	☐
24 kHz	–999	__________	–60.0 dBrB	☐	☐
27 kHz	–999	__________	–60.0 dBrB	☐	☐
200 kHz	–999	__________	–60.0 dBrB	☐	☐

	Low Limit		High Limit	PASS	FAIL
"40 kHz AES17" Mode					
20 Hz	–0.100	___________	+0.100 dBrB	☐	☐
20 kHz	–0.100	___________	+0.100 dBrB	☐	☐
30 kHz	–0.100	___________	+0.100 dBrB	☐	☐
40 kHz	–0.100	___________	+0.100 dBrB	☐	☐
48 kHz	–999	___________	–60.0 dBrB	☐	☐
54 kHz	–999	___________	–60.0 dBrB	☐	☐
200 kHz	–999	___________	–60.0 dBrB	☐	☐

S-AES17 Option Residual THD+N, Step 37

"20 kHz AES17" mode					
8 Vrms	0.00000	___________	0.00030 %	☐	☐
50 mVrms	0.00000	___________	0.00200 %	☐	☐
"40 kHz AES17" mode					
8 Vrms	0.00000	___________	0.00040 %	☐	☐
50 mVrms	0.00000	___________	0.00280 %	☐	☐

OPTION "OPT-2020" RELATED

OPT-2020 Option Response, Step 36a

"20 kHz AES17" Mode					
20 Hz	–0.100	___________	+0.100 dBrB	☐	☐
10 kHz	–0.100	___________	+0.100 dBrB	☐	☐
15 kHz	–0.100	___________	+0.100 dBrB	☐	☐
20 kHz	–0.100	___________	+0.100 dBrB	☐	☐
24 kHz	–999	___________	–60.0 dBrB	☐	☐
27 kHz	–999	___________	–60.0 dBrB	☐	☐
200 kHz	–999	___________	–60.0 dBrB	☐	☐

OPT-2020 Option Residual THD+N, Step 37a

"20 kHz AES17" mode					
8 Vrms	0.00000	___________	0.00080 %	☐	☐
50 mVrms	0.00000	___________	0.00200 %	☐	☐

AES/EBU GENERATOR & ANALYZER CHARACTERISTICS

SYS-2720 / SYS-2722 (192k)

Digital Output Amplitude Accuracy, Step 38	Low Limit		High Limit	PASS	FAIL
Connector I Balanced Output					
8.00 Vpp	7.20	__________	8.80 V	☐	☐
800 mVpp	640	__________	960 mV	☐	☐
Connector II Balanced Output					
8.00 Vpp	7.20	__________	8.80 V	☐	☐
800 mVpp	640	__________	960 mV	☐	☐
Connector I Unbalanced Output					
2.000 Vpp	1.840	__________	2.160 V	☐	☐
200 mVpp	168.0	__________	232.0 mV	☐	☐
Connector II Unbalanced Output					
2.000 Vpp	1.840	__________	2.160 V	☐	☐
200 mVpp	168.0	__________	232.0 mV	☐	☐
Voltage Measurement Accuracy, Step 39					
INPUT I (balanced)					
8.00 Vpp	7.60	__________	8.40 V	☐	☐
800 mVpp	735	__________	865 mV	☐	☐
INPUT II (balanced)					
8.00 Vpp	7.60	__________	8.40 V	☐	☐
800 mVpp	735	__________	865 mV	☐	☐
INPUT I (unbalanced)					
2.000 Vpp	1.900	__________	2.100 V	☐	☐
200 mVpp	184.0	__________	216.0 mV	☐	☐
INPUT II (unbalanced)					
2.000 Vpp	1.900	__________	2.100 V	☐	☐
200 mVpp	184.0	__________	216.0 mV	☐	☐
Variable Risetime, Step 40					
Connector I (Unbal)					
25 ns	22.50	__________	27.50 ns	☐	☐
100 ns	90.00	__________	110.0 ns	☐	☐
Connector II (Unbal)					
25 ns	22.50	__________	27.50 ns	☐	☐
100 ns	90.00	__________	110.0 ns	☐	☐
Normal Mode Noise Amplitude, Step 41					
Connector I					
500 mVpp, unbalanced	450.0	__________	550.0 mV	☐	☐
100 mVpp, unbalanced	75.0	__________	125.0 mV	☐	☐
Connector II					
500 mVpp, unbalanced	450.0	__________	550.0 mV	☐	☐
100 mVpp, unbalanced	75.0	__________	125.0 mV	☐	☐
Common Mode Sine Amplitude, Step 42					
Connector I					
20.00 Vpp	18.00	__________	22.00 V	☐	☐
1.200 Vpp	1.000	__________	1.400 V	☐	☐

	Low Limit		High Limit	PASS	FAIL
Connector II					
20.00 Vpp	18.00	__________	22.00 V	☐	☐
1.200 Vpp	1.000	__________	1.400 V	☐	☐

CM Voltage Measurement Accuracy, Step 43

	Low Limit		High Limit	PASS	FAIL
Connector I					
20.00 Vpp	18.00	__________	22.00 V	☐	☐
1.200 Vpp	1.030	__________	1.370 V	☐	☐
Connector II					
20.00 Vpp	18.00	__________	22.00 V	☐	☐
1.200 Vpp	1.030	__________	1.370 V	☐	☐

Jitter Accuracy, Step 44

	Low Limit		High Limit	PASS	FAIL
Jitter Generator					
4.90 UI	4.45	__________	5.35 UI	☐	☐
305 mUI	275	__________	335 mUI	☐	☐
Jitter Analyzer, Average Detector					
305 mUI	275.0	__________	335.0 mUI	☐	☐
Jitter Analyzer, Peak Detector					
305 mUI	275.0	__________	335.0 mUI	☐	☐

Jitter Flatness, Step 45

	Low Limit		High Limit	PASS	FAIL
100 Hz	–1.00	__________	+1.00 dB	☐	☐
200 Hz	–1.00	__________	+1.00 dB	☐	☐
1 kHz	–1.00	__________	+1.00 dB	☐	☐
5 kHz	–1.00	__________	+1.00 dB	☐	☐
20 kHz	–1.00	__________	+1.00 dB	☐	☐
50 kHz	–1.00	__________	+1.00 dB	☐	☐

Residual Jitter, Step 46

	Low Limit		High Limit	PASS	FAIL
OUTPUT I					
48 kS, peak detection	0.000	__________	1000 ps	☐	☐
96 kS, peak detection	0.000	__________	1000 ps	☐	☐
192 kS, peak detection	0.000	__________	1000 ps	☐	☐
OUTPUT II					
48 kS, peak detection	0.000	__________	1000 ps	☐	☐
96 kS, peak detection	0.000	__________	1000 ps	☐	☐
192 kS, peak detection	0.000	__________	1000 ps	☐	☐

END OF CALIBRATION

System Two Cascade *Plus* Calibration Report

SYS-2122 / SYS-2622 / SYS-2700 / SYS-2722 (96k)

Calibration laboratory or equivalent facility:

(name) ____

(address) ____

____

____

Customer: ____ PO No. __________________________

Unit under test: (Model No.) ______________________________ (Serial No.) ______________________

Report Identifier ____________________________ consisting of 14 pages. Calibration Date: __________________

The instrument as received ❑ was ❑ was not functioning within specifications.

Procedure used: S2 Family Service Manual Calibration V1.00, System Two Cascade *Plus*, pages 2-11 to 2-20.

Ambient temperature during calibration: ________ ° C.

Calibration equipment used:

Model	Description	Last Calibration Date	Calibration Due

This report shall not be reproduced except in full, without the written approval of the laboratory named above.

Calibration certified by (signature) ____________________________________

(print name) ____________________________________

(title) ____________________________________

Cascade *Plus* Calibration Report

SYS-2122 / SYS-2622 / SYS-2700 / SYS-2722 (96k)

ANALOG GENERATOR CHARACTERISTICS

SYS-2122 / SYS-2622 / SYS-2722 (96k)

Sine Frequency, Step 1	Low Limit		High Limit	PASS	FAIL
Fast Mode					
10.0 Hz	9.9500	______	10.050 Hz	☐	☐
100 Hz	99.500	______	100.500 Hz	☐	☐
1.00 kHz	0.9950	______	1.0050 kHz	☐	☐
10.0 kHz	9.9500	______	10.050 kHz	☐	☐
100 kHz	99.500	______	100.50 kHz	☐	☐
200 kHz	199.000	______	201.000 kHz	☐	☐
High-Accuracy Mode					
10 Hz	9.9970	______	10.0030 Hz	☐	☐
100 Hz	99.970	______	100.030 Hz	☐	☐
1.00 kHz	0.99970	______	1.00030 kHz	☐	☐
10.0 kHz	9.9970	______	10.0030 kHz	☐	☐
100 kHz	99.970	______	100.030 kHz	☐	☐
200 kHz	199.940	______	200.060 kHz	☐	☐
Sine (D/A) Frequency Accuracy, Step 2					
10.000 kHz	9999.970	______	10000.030 Hz	☐	☐
Sine Amplitude Accuracy, Step 3					
Channel A					
10.00 V	9.9300	______	10.070 Vrms	☐	☐
5.000 V	4.9650	______	5.0350 Vrms	☐	☐
2.500 V	2.4830	______	2.5170 Vrms	☐	☐
1.200 V	1.1920	______	1.2080 Vrms	☐	☐
600 mV	595.80	______	604.20 mVrms	☐	☐
300 mV	297.90	______	302.10 mVrms	☐	☐
150 mV	149.00	______	151.00 mVrms	☐	☐
80 mV	79.440	______	80.560 mVrms	☐	☐
40 mV	39.720	______	40.280 mVrms	☐	☐
20 mV	19.860	______	20.140 mVrms	☐	☐
10 mV	9.9300	______	10.070 mVrms	☐	☐
Channel B					
10.00 V	9.9300	______	10.070 Vrms	☐	☐
5.000 V	4.9650	______	5.0350 Vrms	☐	☐
2.500 V	2.4830	______	2.5170 Vrms	☐	☐
1.200 V	1.1920	______	1.2080 Vrms	☐	☐
600 mV	595.80	______	604.20 mVrms	☐	☐
300 mV	297.90	______	302.10 mVrms	☐	☐
150 mV	149.00	______	151.00 mVrms	☐	☐
80 mV	79.440	______	80.560 mVrms	☐	☐
40 mV	39.720	______	40.280 mVrms	☐	☐
20 mV	19.860	______	20.140 mVrms	☐	☐
10 mV	9.9300	______	10.070 mVrms	☐	☐

Sine (D/A) Amplitude Accuracy, Step 4	Low Limit		High Limit	PASS	FAIL
Channel A	2.4830	________	2.5170 Vrms	☐	☐
Channel B	2.4830	________	2.5170 Vrms	☐	☐

Sine Flatness, Step 5

Channel A					
10 Hz	–0.008	________	+0.008 dB	☐	☐
20 Hz	–0.008	________	+0.008 dB	☐	☐
50 Hz	–0.008	________	+0.008 dB	☐	☐
10 kHz	–0.008	________	+0.008 dB	☐	☐
20 kHz	–0.008	________	+0.008 dB	☐	☐
50 kHz	–0.030	________	+0.030 dB	☐	☐
100 kHz	–0.100	________	+0.100 dB	☐	☐
200 kHz	–0.300	________	+0.200 dB	☐	☐
Channel B					
10 Hz	–0.008	________	+0.008 dB	☐	☐
20 Hz	–0.008	________	+0.008 dB	☐	☐
50 Hz	–0.008	________	+0.008 dB	☐	☐
10 kHz	–0.008	________	+0.008 dB	☐	☐
20 kHz	–0.008	________	+0.008 dB	☐	☐
50 kHz	–0.030	________	+0.030 dB	☐	☐
100 kHz	–0.100	________	+0.100 dB	☐	☐
200 kHz	–0.300	________	+0.200 dB	☐	☐

D/A Sine Flatness, Step 6

Channel A					
10 Hz	–0.030	________	+0.030 dB	☐	☐
20 Hz	–0.010	________	+0.010 dB	☐	☐
10 kHz	–0.010	________	+0.010 dB	☐	☐
20 kHz	–0.010	________	+0.010 dB	☐	☐
30 kHz	–0.030	________	+0.030 dB	☐	☐
50 kHz	–0.100	________	+0.100 dB	☐	☐
Channel B					
10 Hz	–0.010	________	+0.010 dB	☐	☐
20 Hz	–0.010	________	+0.010 dB	☐	☐
10 kHz	–0.010	________	+0.010 dB	☐	☐
20 kHz	–0.010	________	+0.010 dB	☐	☐
30 kHz	–0.030	________	+0.030 dB	☐	☐
50 kHz	–0.100	________	+0.100 dB	☐	☐

SineTHD+N, Step 7

Channel A					
Vout = 26.66 V bal, 22 kHz analyzer BW					
20 Hz	0.00000	________	0.00200 %	☐	☐
30 Hz	0.00000	________	0.00032 %	☐	☐
1 kHz	0.00000	________	0.00025 %	☐	☐
5 kHz	0.00000	________	0.00032 %	☐	☐
Vout = 26.66.00 V bal, 80 kHz analyzer BW					
1 kHz	0.00000	________	0.00050 %	☐	☐
20 kHz	0.00000	________	0.00050 %	☐	☐
Vout = 13.33 V bal, 500 kHz analyzer BW					
10 Hz	0.00000	________	0.00400 %	☐	☐
20 Hz	0.00000	________	0.00100 %	☐	☐
20 kHz	0.00000	________	0.00100 %	☐	☐
100 kHz	0.00000	________	0.00400 %	☐	☐

	Low Limit		High Limit	PASS	FAIL
Channel B					
Vout = 26.66 V bal, 22 kHz analyzer BW					
20 Hz	0.00000	________	0.00200 %	☐	☐
30 Hz	0.00000	________	0.00032 %	☐	☐
1 kHz	0.00000	________	0.00025 %	☐	☐
5 kHz	0.00000	________	0.00032 %	☐	☐
Vout = 26.66.00 V bal, 80 kHz analyzer BW					
1 kHz	0.00000	________	0.00050 %	☐	☐
20 kHz	0.00000	________	0.00050 %	☐	☐
Vout = 13.33 V bal, 500 kHz analyzer BW					
10 Hz	0.00000	________	0.00400 %	☐	☐
20 Hz	0.00000	________	0.00100 %	☐	☐
20 kHz	0.00000	________	0.00100 %	☐	☐
100 kHz	0.00000	________	0.00400 %	☐	☐

Sine D/A Residual THD+N, Step 8

	Low Limit		High Limit	PASS	FAIL
Channel A					
20 Hz	0.00000	________	0.00070 %	☐	☐
1 kHz	0.00000	________	0.00070 %	☐	☐
5 kHz	0.00000	________	0.00070 %	☐	☐
20 kHz	0.00000	________	0.00070 %	☐	☐
Channel B					
20 Hz	0.00000	________	0.00070 %	☐	☐
1 kHz	0.00000	________	0.00070 %	☐	☐
5 kHz	0.00000	________	0.00070 %	☐	☐
20 kHz	0.00000	________	0.00070 %	☐	☐

Output Crosstalk, Step 9

	Low Limit		High Limit	PASS	FAIL
Ch B into Ch A					
20 kHz	–999.9	________	–120.0 dB	☐	☐
100 kHz	–999.9	________	–106.0 dB	☐	☐
Ch A into Ch B					
20 kHz	–999.9	________	–120.0 dB	☐	☐
100 kHz	–999.9	________	–106.0 dB	☐	☐

Source Impedance Accuracy, Step 10

	Low Limit		High Limit	PASS	FAIL
Channel A					
40 Ω bal	39.00	________	41.00 Ω	☐	☐
150 (200) Ω bal	148.5	________	151.5 Ω	☐	☐
	(198.0)	________	(202.0) Ω	☐	☐
600 Ω bal (Opt EGZ)	597.0	________	603.0 Ω	☐	☐
20 Ω unbal	19.00	________	21.00 Ω	☐	☐
600 Ω unbal	597.0	________	603.0 Ω	☐	☐
Channel B					
40 Ω bal	39.00	________	41.00 Ω	☐	☐
150 (200) Ω bal	148.5	________	151.5 Ω	☐	☐
	(198.0)	________	(202.0) Ω	☐	☐
600 Ω bal (Opt EGZ)	597.0	________	603.0 Ω	☐	☐
20 Ω unbal	19.00	________	21.00 Ω	☐	☐
600 Ω unbal	597.0	________	603.0 Ω	☐	☐

ANALOG ANALYZER CHARACTERISTICS

Input Termination Accuracy, Step 11	Low Limit		High Limit	PASS	FAIL
Channel A					
600 Ω	594.0	________	606.0 Ω	☐	☐
300 Ω	297.0	________	303.0 Ω	☐	☐
Channel B					
600 Ω	594.0	________	606.0 Ω	☐	☐
300 Ω	297.0	________	303.0 Ω	☐	☐

Input Common Mode Rejection, Step 12

Channel A					
2.5 V range, 10 Hz	–999.9	________	–80.0 dBgA	☐	☐
2.5 V range, 1 kHz	–999.9	________	–80.0 dBgA	☐	☐
2.5 V range, 20 kHz	–999.9	________	–80.0 dBgA	☐	☐
10 V range, 1 kHz	–999.9	________	–65.0 dBgA	☐	☐
10 V range, 20 kHz	–999.9	________	–65.0 dBgA	☐	☐
40 V range, 1 kHz	–999.9	________	–50.0 dBgA	☐	☐
160 V range, 1 kHz	–999.9	________	–50.0 dBgA	☐	☐
Channel B					
2.5 V range, 10 Hz	–999.9	________	–80.0 dBgB	☐	☐
2.5 V range, 1 kHz	–999.9	________	–80.0 dBgB	☐	☐
2.5 V range, 20 kHz	–999.9	________	–80.0 dBgB	☐	☐
10 V range, 1 kHz	–999.9	________	–65.0 dBgB	☐	☐
10 V range, 20 kHz	–999.9	________	–65.0 dBgB	☐	☐
40 V range, 1 kHz	–999.9	________	–50.0 dBgB	☐	☐
160 V range, 1 kHz	–999.9	________	–50.0 dBgB	☐	☐

Input Residual Crosstalk, Step 13

Ch B into Ch A					
20 kHz	–999.9	________	–140.0 dB	☐	☐
100 kHz	–999.9	________	–126.0 dB	☐	☐
Ch A into Ch B					
20 kHz	–999.9	________	–140.0 dB	☐	☐
100 kHz	–999.9	________	–126.0 dB	☐	☐

Level Meter Accuracy, Step 14

Channel A					
120.00 Vrms (160 V range)	119.4	________	120.6 V	☐	☐
60.00 Vrms (80 V range)	59.70	________	60.30 V	☐	☐
30.00 Vrms (40 V range)	29.85	________	30.15 V	☐	☐
16.00 Vrms (20 V range)	15.92	________	16.08 V	☐	☐
8.000 Vrms (10 V range)	7.960	________	8.040 V	☐	☐
4.000 Vrms (5 V range)	3.980	________	4.020 V	☐	☐
2.000 Vrms (2.5 V range)	1.990	________	2.010 V	☐	☐
1.000 Vrms (1.2 V range)	0.995	________	1.005 V	☐	☐
500 mVrms (600 mV range)	497.5	________	502.5 mV	☐	☐
240 mVrms (300 mV range)	238.8	________	241.2 mV	☐	☐
120 mVrms (160 mV range)	119.4	________	120.6 mV	☐	☐
60 mVrms (80 mV range)	59.70	________	60.30 mV	☐	☐
30 mVrms (40 mV range)	29.85	________	30.15 mV	☐	☐
5.0 mVrms (40 mV range)	4.975	________	5.025 mV	☐	☐

	Low Limit		High Limit	PASS	FAIL
Channel B					
120.00 Vrms (160 V range)	119.4	__________	120.6 V	☐	☐
60.00 Vrms (80 V range)	59.70	__________	60.30 V	☐	☐
30.00 Vrms (40 V range)	29.85	__________	30.15 V	☐	☐
16.00 Vrms (20 V range)	15.92	__________	16.08 V	☐	☐
8.000 Vrms (10 V range)	7.960	__________	8.040 V	☐	☐
4.000 Vrms (5 V range)	3.980	__________	4.020 V	☐	☐
2.000 Vrms (2.5 V range)	1.990	__________	2.010 V	☐	☐
1.000 Vrms (1.2 V range)	0.995	__________	1.005 V	☐	☐
500 mVrms (600 mV range)	497.5	__________	502.5 mV	☐	☐
240 mVrms (300 mV range)	238.8	__________	241.2 mV	☐	☐
120 mVrms (160 mV range)	119.4	__________	120.6 mV	☐	☐
60 mVrms (80 mV range)	59.70	__________	60.30 mV	☐	☐
30 mVrms (40 mV range)	29.85	__________	30.15 mV	☐	☐
5.0 mVrms (40 mV range)	4.975	__________	5.025 mV	☐	☐

Level Meter Flatness, Step 15

	Low Limit		High Limit	PASS	FAIL
Channel A					
10 Hz	–0.100	__________	+0.100 dBrA	☐	☐
15 Hz	–0.030	__________	+0.030 dBrA	☐	☐
20 Hz	–0.008	__________	+0.008 dBrA	☐	☐
50 Hz	–0.008	__________	+0.008 dBrA	☐	☐
20 kHz	–0.008	__________	+0.008 dBrA	☐	☐
50 kHz	–0.030	__________	+0.030 dBrA	☐	☐
100 kHz	–0.100	__________	+0.100 dBrA	☐	☐
500 kHz	–0.500	__________	+0.200 dBrA	☐	☐
Channel B					
10 Hz	–0.100	__________	+0.100 dBrB	☐	☐
15 Hz	–0.030	__________	+0.030 dBrB	☐	☐
20 Hz	–0.008	__________	+0.008 dBrB	☐	☐
50 Hz	–0.008	__________	+0.008 dBrB	☐	☐
20 kHz	–0.008	__________	+0.008 dBrB	☐	☐
50 kHz	–0.030	__________	+0.030 dBrB	☐	☐
100 kHz	–0.100	__________	+0.100 dBrB	☐	☐
500 kHz	–0.500	__________	+0.200 dBrB	☐	☐

Amplitude Meter Accuracy, Step 16

	Low Limit		High Limit	PASS	FAIL
Channel A (2.5 V input range)					
2.000 Vrms	1.980	__________	2.020 V	☐	☐
500 mVrms	495.0	__________	505.0 mV	☐	☐
120 mVrms	118.8	__________	121.2 mV	☐	☐
30 mVrms	29.70	__________	30.30 mV	☐	☐
8.0 mVrms	7.920	__________	8.080 mV	☐	☐
2.0 mVrms	1.980	__________	2.020 mV	☐	☐
Channel B (2.5 V input range)					
2.000 Vrms	1.980	__________	2.020 V	☐	☐
500 mVrms	495.0	__________	505.0 mV	☐	☐
120 mVrms	118.8	__________	121.2 mV	☐	☐
30 mVrms	29.70	__________	30.30 mV	☐	☐
8.0 mVrms	7.920	__________	8.080 mV	☐	☐
2.0 mVrms	1.980	__________	2.020 mV	☐	☐

Amplitude Meter Flatness, Step 17	Low Limit		High Limit	PASS	FAIL
2.000 Vrms					
15 Hz	–0.050	________	+0.050 dBrA	☐	☐
20 Hz	–0.020	________	+0.020 dBrA	☐	☐
20 kHz	–0.020	________	+0.020 dBrA	☐	☐
50 kHz	–0.050	________	+0.050 dBrA	☐	☐
100 kHz	–0.150	________	+0.150 dBrA	☐	☐
200 kHz	–0.300	________	+0.200 dBrA	☐	☐
120 mVrms					
15 Hz	–0.050	________	+0.050 dBrA	☐	☐
20 Hz	–0.020	________	+0.020 dBrA	☐	☐
20 kHz	–0.020	________	+0.020 dBrA	☐	☐
50 kHz	–0.050	________	+0.050 dBrA	☐	☐
100 kHz	–0.150	________	+0.150 dBrA	☐	☐
200 kHz	–0.300	________	+0.200 dBrA	☐	☐
8 mVrms					
15 Hz	–0.050	________	+0.050 dBrA	☐	☐
20 Hz	–0.020	________	+0.020 dBrA	☐	☐
20 kHz	–0.020	________	+0.020 dBrA	☐	☐
50 kHz	–0.050	________	+0.050 dBrA	☐	☐
100 kHz	–0.150	________	+0.150 dBrA	☐	☐
200 kHz	–0.300	________	+0.200 dBrA	☐	☐

Bandreject & THD+N Accuracy, Step 18					
20 Hz notch					
40 Hz	–0.300	________	+0.300 dBV	☐	☐
60 Hz	–0.300	________	+0.300 dBV	☐	☐
20 kHz	–0.300	________	+0.300 dBV	☐	☐
120 kHz	–0.300	________	+0.300 dBV	☐	☐
1 kHz notch					
20 Hz	–0.300	________	+0.300 dBV	☐	☐
500 Hz	–0.300	________	+0.300 dBV	☐	☐
2.0 kHz	–0.300	________	+0.300 dBV	☐	☐
3.0 kHz	–0.300	________	+0.300 dBV	☐	☐
20 kHz	–0.300	________	+0.300 dBV	☐	☐
120 kHz	–0.300	________	+0.300 dBV	☐	☐
20 kHz notch					
20 Hz	–0.300	________	+0.300 dBV	☐	☐
10 kHz	–0.300	________	+0.300 dBV	☐	☐
40 kHz	–0.300	________	+0.300 dBV	☐	☐
60 kHz	–0.300	________	+0.300 dBV	☐	☐
120 kHz	–0.300	________	+0.300 dBV	☐	☐
100 kHz notch					
20 Hz	–0.300	________	+0.300 dBV	☐	☐
20 kHz	–0.300	________	+0.300 dBV	☐	☐
50 kHz	–0.300	________	+0.300 dBV	☐	☐

Bandpass Accuracy, Step 19					
20 Hz					
19.60 Hz bandpass	–0.300	________	+0.300 dBV	☐	☐
20.00 Hz bandpass	–0.300	________	+0.300 dBV	☐	☐
20.40 Hz bandpass	–0.300	________	+0.300 dBV	☐	☐
1 kHz					
0.980 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
1.000 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
1.020 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐

	Low Limit		High Limit	PASS	FAIL
20 kHz					
19.60 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
20.00 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
20.40 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
100 kHz					
98.0 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
100.0 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
102.0 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐

Bandwidth Limiting Filters, Step 20

	Low Limit		High Limit	PASS	FAIL
22 Hz Highpass					
22.4 Hz	–6.000	________	–0.000 dBrA	☐	☐
31.5 Hz	–0.500	________	+0.500 dBrA	☐	☐
50 Hz	–0.500	________	+0.500 dBrA	☐	☐
100 Hz Highpass					
95 Hz	–999.9	________	–3.000 dBrA	☐	☐
105 Hz	–3.000	________	–0.000 dBrA	☐	☐
400 Hz Highpass					
380 Hz	–999.9	________	–3.000 dBrA	☐	☐
420 Hz	–3.000	________	–0.000 dBrA	☐	☐
22 kHz Lowpass					
5 kHz	–0.500	________	+0.500 dBrA	☐	☐
16 kHz	–0.500	________	+0.500 dBrA	☐	☐
22.4 kHz	–6.000	________	–0.000 dBrA	☐	☐
30 kHz Lowpass					
28.5 kHz	–3.000	________	–0.000 dBrA	☐	☐
31.5 kHz	–999.9	________	–3.000 dBrA	☐	☐
80 kHz Lowpass					
76.0 kHz	–3.000	________	–0.000 dBrA	☐	☐
84.0 kHz	–999.9	________	–3.000 dBrA	☐	☐

Residual Noise, Step 21

	Low Limit		High Limit	PASS	FAIL
Channel A					
22–22 kHz bandwidth	0.000	________	1.000 μV	☐	☐
10–80 kHz bandwidth	0.000	________	2.000 μV	☐	☐
Full bandwidth	0.00	________	6.00 μV	☐	☐
5 kHz bandpass	0.000	________	0.250 μV	☐	☐
20 kHz bandpass	0.000	________	0.500 μV	☐	☐
200 kHz bandpass	0.000	________	1.500 μV	☐	☐
Channel B					
22–22 kHz bandwidth	0.000	________	1.000 μV	☐	☐
10–80 kHz bandwidth	0.000	________	2.000 μV	☐	☐
Full bandwidth	0.00	________	6.00 μV	☐	☐
5 kHz bandpass	0.000	________	0.250 μV	☐	☐
20 kHz bandpass	0.000	________	0.500 μV	☐	☐
200 kHz bandpass	0.000	________	1.500 μV	☐	☐

Residual THD+N, Step 22	Low Limit		High Limit	PASS	FAIL
Channel A					
Vin = 1.50 V, 22 kHz analyzer BW					
20 Hz	0.00000	__________	0.00032 %	☐	☐
1 kHz	0.00000	__________	0.00025 %	☐	☐
5 kHz	0.00000	__________	0.00032 %	☐	☐
20 kHz	0.00000	__________	0.00032 %	☐	☐
Vin = 1.50 V, 80 kHz analyzer BW					
1 kHz	0.00000	__________	0.00050 %	☐	☐
20 kHz	0.00000	__________	0.00050 %	☐	☐
Vin = 1.50 V, 500 kHz analyzer BW					
1 kHz	0.00000	__________	0.00100 %	☐	☐
20 kHz	0.00000	__________	0.00100 %	☐	☐
50 kHz	0.00000	__________	0.00400 %	☐	☐
100 kHz	0.00000	__________	0.00400 %	☐	☐
Channel B					
Vin = 1.50 V, 22 kHz analyzer BW					
20 Hz	0.00000	__________	0.00032 %	☐	☐
1 kHz	0.00000	__________	0.00025 %	☐	☐
5 kHz	0.00000	__________	0.00032 %	☐	☐
20 kHz	0.00000	__________	0.00032 %	☐	☐
Vin = 1.50 V, 80 kHz analyzer BW					
1 kHz	0.00000	__________	0.00050 %	☐	☐
20 kHz	0.00000	__________	0.00050 %	☐	☐
Vin = 1.50 V, 500 kHz analyzer BW					
1 kHz	0.00000	__________	0.00100 %	☐	☐
20 kHz	0.00000	__________	0.00100 %	☐	☐
50 kHz	0.00000	__________	0.00400 %	☐	☐
100 kHz	0.00000	__________	0.00400 %	☐	☐
Phase Measurement Accuracy, Step 23					
10 Hz, dc coupled	–0.50	__________	+0.50 deg	☐	☐
10 Hz, ac coupled	–0.50	__________	+0.50 deg	☐	☐
1 kHz	–0.50	__________	+0.50 deg	☐	☐
5 kHz	–0.50	__________	+0.50 deg	☐	☐
20 kHz	–1.00	__________	+1.00 deg	☐	☐
50 kHz	–2.00	__________	+2.00 deg	☐	☐
Frequency Measurement Accuracy, Step 24					
20 kHz	–6.0	__________	+6.0 PPM	☐	☐
	(±30 PPM is allowed for Model SYS-2122)				
High Resolution A/D Residual Distortion, Step 25					
Channel A (5 kHz)	–999.9	__________	–105.0 dBrA	☐	☐
Channel B (5 kHz)	–999.9	__________	–105.0 dBrB	☐	☐
High Bandwidth A/D Residual Distortion, Step 26					
Channel A (20 kHz)	–999.9	__________	–90.0 dBrA	☐	☐
Channel B (20 kHz)	–999.9	__________	–90.0 dBrB	☐	☐

OPTION "BUR" RELATED

Burst OFF Ratio Accuracy, Step 27	**Low Limit**		**High Limit**	**PASS**	**FAIL**
0 dB	–0.300	________	+0.300 dB	☐	☐
–10 dB	–10.300	________	–9.700 dB	☐	☐
–20 dB	–20.300	________	–19.700 dB	☐	☐
–40 dB	–40.300	________	–39.700 dB	☐	☐
–60 dB	–60.300	________	–59.700 dB	☐	☐
Squarewave Amplitude Accuracy, Step 28					
1.000 V (100 Hz)	1.3859	________	1.4425 Vrms	☐	☐

OPTION "IMD" RELATED

Generator IMD Amplitude Accuracy, Step 29					
SMPTE 4:1 Signal (60/7k)	0.8081	________	0.8411 Vrms	☐	☐
SMPTE 1:1 Signal (60/7k)	0.6930	________	0.7212 Vrms	☐	☐
DFD/CCIF Signal (15k/15.08k)	0.6859	________	0.7283 Vrms	☐	☐
DIM Signal (DIM-100)	1.1150	________	1.1605 Vrms	☐	☐
SMPTE LF Tone Accuracy, Step 30					
40 Hz	39.40	________	40.60 Hz	☐	☐
50 Hz	49.25	________	50.75 Hz	☐	☐
60 Hz	59.10	________	60.90 Hz	☐	☐
70 Hz	68.95	________	71.05 Hz	☐	☐
100 Hz	98.50	________	101.50 Hz	☐	☐
125 Hz	123.13	________	126.88 Hz	☐	☐
250 Hz	246.25	________	253.75 Hz	☐	☐
500 Hz	492.50	________	507.50 Hz	☐	☐
DIM Squarewave Accuracy, Step 31					
DIM-B (2.96 kHz)	2.9304	________	2.9896 kHz	☐	☐
DIM-100 (3.15 kHz)	3.1185	________	3.1815 kHz	☐	☐
IMD Measurement Accuracy, Step 32					
SMPTE	–60.5	________	–59.5 dB	☐	☐
DFD/CCIF	–60.5	________	–59.5 dB	☐	☐
DIM, u4 component	–60.7	________	–59.3 dB	☐	☐
DIM, u5 component	–60.7	________	–59.3 dB	☐	☐
Residual IMD, Step 33					
Channel A					
SMPTE (60/7k, 4:1), 26.66 V bal	0.00000	________	0.00150 %	☐	☐
SMPTE (60/7k, 4:1), 1.00 V bal	0.00000	________	0.00150 %	☐	☐
SMPTE (60/7k, 4:1), 200 mV bal	0.00000	________	0.00150 %	☐	☐
DFD (14k/15k), 26.66 V bal	0.00000	________	0.00020 %	☐	☐
DFD (14k/15k), 1.00 V bal	0.00000	________	0.00020 %	☐	☐
DFD (14k/15k), 200 mV bal	0.00000	________	0.00020 %	☐	☐
DIM (DIM-100), 26.66 V bal	0.00000	________	0.00200 %	☐	☐
DIM (DIM-100), 1.00 V bal	0.00000	________	0.00200 %	☐	☐
DIM (DIM-100), 200 mV bal	0.00000	________	0.00200 %	☐	☐

	Low Limit		High Limit	PASS	FAIL
Channel B					
SMPTE (60/7k, 4:1), 26.66 V bal	0.00000	__________	0.00150 %	☐	☐
SMPTE (60/7k, 4:1), 1.00 V bal	0.00000	__________	0.00150 %	☐	☐
SMPTE (60/7k, 4:1), 200 mV bal	0.00000	__________	0.00150 %	☐	☐
DFD (14k/15k), 26.66 V bal	0.00000	__________	0.00020 %	☐	☐
DFD (14k/15k), 1.00 V bal	0.00000	__________	0.00020 %	☐	☐
DFD (14k/15k), 200 mV bal	0.00000	__________	0.00020 %	☐	☐
DIM (DIM-100), 26.66 V bal	0.00000	__________	0.00200 %	☐	☐
DIM (DIM-100), 1.00 V bal	0.00000	__________	0.00200 %	☐	☐
DIM (DIM-100), 200 mV bal	0.00000	__________	0.00200 %	☐	☐

OPTION “W&F” RELATED

Wow and Flutter Accuracy, Step 34

IEC detection	0.9500	__________	1.0500 %	☐	☐
NAB/JIS detection	0.6718	__________	0.7425 %	☐	☐

Residual Wow and Flutter, Step 35

IEC, weighted	0.00000	__________	0.00100 %	☐	☐
IEC, unweighted	0.00000	__________	0.00200 %	☐	☐
NAB, weighted	0.00000	__________	0.00100 %	☐	☐
NAB, unweighted	0.00000	__________	0.00200 %	☐	☐
Scrape (12.5 kHz test tone)	0.00000	__________	0.00500 %	☐	☐

OPTION “S-AES17” RELATED

S-AES17 Option Response, Step 36

20 kHz Pre-Analyzer Filter					
1 kHz	–0.100	__________	+0.100 dBrA	☐	☐
15 kHz	–0.100	__________	+0.100 dBrA	☐	☐
20 kHz	–0.100	__________	+0.100 dBrA	☐	☐
25 kHz	–4.000	__________	–2.000 dBrA	☐	☐
40 kHz Pre-Analyzer Filter					
1 kHz	–0.100	__________	+0.100 dBrA	☐	☐
30 kHz	–0.100	__________	+0.100 dBrA	☐	☐
40 kHz	–0.100	__________	+0.100 dBrA	☐	☐
50 kHz	–4.000	__________	–2.000 dBrA	☐	☐
“20 kHz AES17” Mode					
20 Hz	–0.100	__________	+0.100 dBrB	☐	☐
10 kHz	–0.100	__________	+0.100 dBrB	☐	☐
15 kHz	–0.100	__________	+0.100 dBrB	☐	☐
20 kHz	–0.100	__________	+0.100 dBrB	☐	☐
24 kHz	–999	__________	–60.0 dBrB	☐	☐
27 kHz	–999	__________	–60.0 dBrB	☐	☐
200 kHz	–999	__________	–60.0 dBrB	☐	☐

	Low Limit		High Limit	PASS	FAIL
"40 kHz AES17" Mode					
20 Hz	–0.100	________	+0.100 dBrB	☐	☐
20 kHz	–0.100	________	+0.100 dBrB	☐	☐
30 kHz	–0.100	________	+0.100 dBrB	☐	☐
40 kHz	–0.100	________	+0.100 dBrB	☐	☐
48 kHz	–999	________	–60.0 dBrB	☐	☐
54 kHz	–999	________	–60.0 dBrB	☐	☐
200 kHz	–999	________	–60.0 dBrB	☐	☐

S-AES17 Option Residual THD+N, Step 37

"20 kHz AES17" mode					
8 Vrms	0.00000	________	0.00030 %	☐	☐
50 mVrms	0.00000	________	0.00200 %	☐	☐
"40 kHz AES17" mode					
8 Vrms	0.00000	________	0.00040 %	☐	☐
50 mVrms	0.00000	________	0.00280 %	☐	☐

OPTION "OPT-2020" RELATED

OPT-2020 Option Response, Step 36a

"20 kHz AES17" Mode					
20 Hz	–0.100	________	+0.100 dBrB	☐	☐
10 kHz	–0.100	________	+0.100 dBrB	☐	☐
15 kHz	–0.100	________	+0.100 dBrB	☐	☐
20 kHz	–0.100	________	+0.100 dBrB	☐	☐
24 kHz	–999	________	–60.0 dBrB	☐	☐
27 kHz	–999	________	–60.0 dBrB	☐	☐
200 kHz	–999	________	–60.0 dBrB	☐	☐

OPT-2020 Option Residual THD+N, Step 37a

"20 kHz AES17" mode					
8 Vrms	0.00000	________	0.00080 %	☐	☐
50 mVrms	0.00000	________	0.00200 %	☐	☐

AES/EBU GENERATOR & ANALYZER CHARACTERISTICS

SYS-2700 / SYS-2722 (96k)

Test	Low Limit	Reading	High Limit	PASS	FAIL
Digital Output Amplitude Accuracy, Step 38					
Connector I Balanced Output					
8.00 Vpp	7.20	________	8.80 V	☐	☐
800 mVpp	640	________	960 mV	☐	☐
Connector II Balanced Output					
8.00 Vpp	7.20	________	8.80 V	☐	☐
800 mVpp	640	________	960 mV	☐	☐
Connector I Unbalanced Output					
2.000 Vpp	1.840	________	2.160 V	☐	☐
200 mVpp	168.0	________	232.0 mV	☐	☐
Connector II Unbalanced Output					
2.000 Vpp	1.840	________	2.160 V	☐	☐
200 mVpp	168.0	________	232.0 mV	☐	☐
Voltage Measurement Accuracy, Step 39					
INPUT I (balanced)					
8.00 Vpp	7.60	________	8.40 V	☐	☐
800 mVpp	735	________	865 mV	☐	☐
INPUT II (balanced)					
8.00 Vpp	7.60	________	8.40 V	☐	☐
800 mVpp	735	________	865 mV	☐	☐
INPUT I (unbalanced)					
2.000 Vpp	1.900	________	2.100 V	☐	☐
200 mVpp	184.0	________	216.0 mV	☐	☐
INPUT II (unbalanced)					
2.000 Vpp	1.900	________	2.100 V	☐	☐
200 mVpp	184.0	________	216.0 mV	☐	☐
Variable Risetime, Step 40					
Connector I (Unbal)					
25 ns	20.00	________	30.00 ns	☐	☐
100 ns	80.00	________	120.0 ns	☐	☐
Connector II (Unbal)					
25 ns	20.00	________	30.00 ns	☐	☐
100 ns	80.00	________	120.0 ns	☐	☐
Normal Mode Noise Amplitude, Step 41					
Connector I					
500 mVpp, unbalanced	450.0	________	550.0 mV	☐	☐
100 mVpp, unbalanced	75.0	________	125.0 mV	☐	☐
Connector II					
500 mVpp, unbalanced	450.0	________	550.0 mV	☐	☐
100 mVpp, unbalanced	75.0	________	125.0 mV	☐	☐
Common Mode Sine Amplitude, Step 42					
Connector I					
20.00 Vpp	18.00	________	22.00 V	☐	☐
1.200 Vpp	1.000	________	1.400 V	☐	☐

	Low Limit		High Limit	PASS	FAIL
Connector II					
20.00 Vpp	18.00	________	22.00 V	☐	☐
1.200 Vpp	1.000	________	1.400 V	☐	☐
CM Voltage Measurement Accuracy, Step 43					
Connector I					
20.00 Vpp	18.00	________	22.00 V	☐	☐
1.200 Vpp	0.900	________	1.500 V	☐	☐
Connector II					
20.00 Vpp	18.00	________	22.00 V	☐	☐
1.200 Vpp	0.900	________	1.500 V	☐	☐
Jitter Accuracy, Step 44					
Jitter Generator					
4.90 UI	4.45	________	5.35 UI	☐	☐
305 mUI	275	________	335 mUI	☐	☐
Jitter Analyzer, Average Detector					
305 mUI	275.0	________	335.0 mUI	☐	☐
Jitter Analyzer, Peak Detector					
305 mUI	275.0	________	335.0 mUI	☐	☐
Jitter Flatness, Step 45					
100 Hz	–1.00	________	+1.00 dB	☐	☐
200 Hz	–1.00	________	+1.00 dB	☐	☐
1 kHz	–1.00	________	+1.00 dB	☐	☐
5 kHz	–1.00	________	+1.00 dB	☐	☐
20 kHz	–1.00	________	+1.00 dB	☐	☐
50 kHz	–1.00	________	+1.00 dB	☐	☐
Residual Jitter, Step 46					
OUTPUT I					
48 kS, peak detection	0.000	________	1.628 ns	☐	☐
96 kS, peak detection	0.000	________	1.628 ns	☐	☐
OUTPUT II					
48 kS, peak detection	0.000	________	1.628 ns	☐	☐
96 kS, peak detection	0.000	________	1.628 ns	☐	☐

END OF CALIBRATION

System Two Cascade Calibration Report

SYS-2422 / SYS-2500 / SYS-2522 (96k)

Calibration laboratory or equivalent facility:

(name) ____

(address) ____

____

____

Customer: ____ PO No. __________________________

Unit under test: (Model No.) ______________________________ (Serial No.) ______________________

Report Identifier ____________________________ consisting of 14 pages. Calibration Date:__________________

The instrument as received ❑ was / ❑ was not functioning within specifications.

Procedure used: S2 Family Service Manual Calibration V1.00, System Two Cascade, pages 2-21 to 2-30.

Ambient temperature during calibration: ________ ° C.

Calibration equipment used:

Model	Description	Last Calibration Date	Calibration Due

This report shall not be reproduced except in full, without the written approval of the laboratory named above.

Calibration certified by (signature) ____________________________________

(print name) ____________________________________

(title) ____________________________________

System Two Cascade Calibration Report

SYS-2422 / SYS-2500 / SYS-2522 (96k)

ANALOG GENERATOR CHARACTERISTICS

SYS-2422 / SYS-2522 (96k)

Sine Frequency, Step 1	Low Limit		High Limit	PASS	FAIL
Fast Mode					
10.0 Hz	9.9500	______	10.050 Hz	☐	☐
100 Hz	99.500	______	100.500 Hz	☐	☐
1.00 kHz	0.9950	______	1.0050 kHz	☐	☐
10.0 kHz	9.9500	______	10.050 kHz	☐	☐
100 kHz	99.500	______	100.50 kHz	☐	☐
200 kHz	199.000	______	201.000 kHz	☐	☐
High-Accuracy Mode					
10 Hz	9.9970	______	10.0030 Hz	☐	☐
100 Hz	99.970	______	100.030 Hz	☐	☐
1.00 kHz	0.99970	______	1.00030 kHz	☐	☐
10.0 kHz	9.9970	______	10.0030 kHz	☐	☐
100 kHz	99.970	______	100.030 kHz	☐	☐
200 kHz	199.940	______	200.060 kHz	☐	☐
Sine (D/A) Frequency Accuracy, Step 2					
10.000 kHz	9999.970	______	10000.030 Hz	☐	☐
Sine Amplitude Accuracy, Step 3					
Channel A					
10.00 V	9.9300	______	10.070 Vrms	☐	☐
5.000 V	4.9650	______	5.0350 Vrms	☐	☐
2.500 V	2.4830	______	2.5170 Vrms	☐	☐
1.200 V	1.1920	______	1.2080 Vrms	☐	☐
600 mV	595.80	______	604.20 mVrms	☐	☐
300 mV	297.90	______	302.10 mVrms	☐	☐
150 mV	149.00	______	151.00 mVrms	☐	☐
80 mV	79.440	______	80.560 mVrms	☐	☐
40 mV	39.720	______	40.280 mVrms	☐	☐
20 mV	19.860	______	20.140 mVrms	☐	☐
10 mV	9.9300	______	10.070 mVrms	☐	☐
Channel B					
10.00 V	9.9300	______	10.070 Vrms	☐	☐
5.000 V	4.9650	______	5.0350 Vrms	☐	☐
2.500 V	2.4830	______	2.5170 Vrms	☐	☐
1.200 V	1.1920	______	1.2080 Vrms	☐	☐
600 mV	595.80	______	604.20 mVrms	☐	☐
300 mV	297.90	______	302.10 mVrms	☐	☐
150 mV	149.00	______	151.00 mVrms	☐	☐
80 mV	79.440	______	80.560 mVrms	☐	☐
40 mV	39.720	______	40.280 mVrms	☐	☐
20 mV	19.860	______	20.140 mVrms	☐	☐
10 mV	9.9300	______	10.070 mVrms	☐	☐

Sine (D/A) Amplitude Accuracy, Step 4	**Low Limit**		**High Limit**	**PASS**	**FAIL**
Channel A	2.4830	__________	2.5170 Vrms	☐	☐
Channel B	2.4830	__________	2.5170 Vrms	☐	☐

Sine Flatness, Step 5

Channel A					
10 Hz	–0.010	__________	+0.010 dB	☐	☐
20 Hz	–0.008	__________	+0.008 dB	☐	☐
50 Hz	–0.008	__________	+0.008 dB	☐	☐
10 kHz	–0.008	__________	+0.008 dB	☐	☐
20 kHz	–0.008	__________	+0.008 dB	☐	☐
50 kHz	–0.030	__________	+0.030 dB	☐	☐
100 kHz	–0.100	__________	+0.100 dB	☐	☐
200 kHz	–0.300	__________	+0.200 dB	☐	☐
Channel B					
10 Hz	–0.010	__________	+0.010 dB	☐	☐
20 Hz	–0.008	__________	+0.008 dB	☐	☐
50 Hz	–0.008	__________	+0.008 dB	☐	☐
10 kHz	–0.008	__________	+0.008 dB	☐	☐
20 kHz	–0.008	__________	+0.008 dB	☐	☐
50 kHz	–0.030	__________	+0.030 dB	☐	☐
100 kHz	–0.100	__________	+0.100 dB	☐	☐
200 kHz	–0.300	__________	+0.200 dB	☐	☐

D/A Sine Flatness, Step 6

Channel A					
10 Hz	–0.030	__________	+0.030 dB	☐	☐
20 Hz	–0.010	__________	+0.010 dB	☐	☐
10 kHz	–0.010	__________	+0.010 dB	☐	☐
20 kHz	–0.010	__________	+0.010 dB	☐	☐
30 kHz	–0.030	__________	+0.030 dB	☐	☐
50 kHz	–0.100	__________	+0.100 dB	☐	☐
Channel B					
10 Hz	–0.010	__________	+0.010 dB	☐	☐
20 Hz	–0.010	__________	+0.010 dB	☐	☐
10 kHz	–0.010	__________	+0.010 dB	☐	☐
20 kHz	–0.010	__________	+0.010 dB	☐	☐
30 kHz	–0.030	__________	+0.030 dB	☐	☐
50 kHz	–0.100	__________	+0.100 dB	☐	☐

SineTHD+N, Step 7

Channel A					
Vout = 26.66 V bal, 22 kHz analyzer BW					
20 Hz	0.00000	__________	0.00200 %	☐	☐
30 Hz	0.00000	__________	0.00040 %	☐	☐
1 kHz	0.00000	__________	0.00040 %	☐	☐
5 kHz	0.00000	__________	0.00040 %	☐	☐
Vout = 26.66.00 V bal, 80 kHz analyzer BW					
1 kHz	0.00000	__________	0.00060 %	☐	☐
20 kHz	0.00000	__________	0.00060 %	☐	☐
Vout = 13.33 V bal, 500 kHz analyzer BW					
10 Hz	0.00000	__________	0.00400 %	☐	☐
20 Hz	0.00000	__________	0.00150 %	☐	☐
20 kHz	0.00000	__________	0.00150 %	☐	☐
100 kHz	0.00000	__________	0.00400 %	☐	☐

	Low Limit		High Limit	PASS	FAIL
Channel B					
Vout = 26.66 V bal, 22 kHz analyzer BW					
20 Hz	0.00000	___________	0.00200 %	☐	☐
30 Hz	0.00000	___________	0.00040 %	☐	☐
1 kHz	0.00000	___________	0.00040 %	☐	☐
5 kHz	0.00000	___________	0.00040 %	☐	☐
Vout = 26.66.00 V bal, 80 kHz analyzer BW					
1 kHz	0.00000	___________	0.00060 %	☐	☐
20 kHz	0.00000	___________	0.00060 %	☐	☐
Vout = 13.33 V bal, 500 kHz analyzer BW					
10 Hz	0.00000	___________	0.00400 %	☐	☐
20 Hz	0.00000	___________	0.00150 %	☐	☐
20 kHz	0.00000	___________	0.00150 %	☐	☐
100 kHz	0.00000	___________	0.00400 %	☐	☐

Sine D/A Residual THD+N, Step 8

Channel A					
20 Hz	0.00000	___________	0.00070 %	☐	☐
1 kHz	0.00000	___________	0.00070 %	☐	☐
5 kHz	0.00000	___________	0.00070 %	☐	☐
20 kHz	0.00000	___________	0.00070 %	☐	☐
Channel B					
20 Hz	0.00000	___________	0.00070 %	☐	☐
1 kHz	0.00000	___________	0.00070 %	☐	☐
5 kHz	0.00000	___________	0.00070 %	☐	☐
20 kHz	0.00000	___________	0.00070 %	☐	☐

Output Crosstalk, Step 9

Ch B into Ch A					
20 kHz	–999.9	___________	–120.0 dB	☐	☐
100 kHz	–999.9	___________	–106.0 dB	☐	☐
Ch A into Ch B					
20 kHz	–999.9	___________	–120.0 dB	☐	☐
100 kHz	–999.9	___________	–106.0 dB	☐	☐

Source Impedance Accuracy, Step 10

Channel A					
40 Ω bal	39.00	___________	41.00 Ω	☐	☐
150 (200) Ω bal	148.5	___________	151.5 Ω	☐	☐
	(198.0)	___________	(202.0) Ω	☐	☐
600 Ω bal (Opt EGZ)	597.0	___________	603.0 Ω	☐	☐
20 Ω unbal	19.00	___________	21.00 Ω	☐	☐
600 Ω unbal	597.0	___________	603.0 Ω	☐	☐
Channel B					
40 Ω bal	39.00	___________	41.00 Ω	☐	☐
150 (200) Ω bal	148.5	___________	151.5 Ω	☐	☐
	(198.0)	___________	(202.0) Ω	☐	☐
600 Ω bal (Opt EGZ)	597.0	___________	603.0 Ω	☐	☐
20 Ω unbal	19.00	___________	21.00 Ω	☐	☐
600 Ω unbal	597.0	___________	603.0 Ω	☐	☐

ANALOG ANALYZER CHARACTERISTICS

Input Termination Accuracy, Step 11	Low Limit		High Limit	PASS	FAIL
Channel A					
600 Ω	594.0	________	606.0 Ω	☐	☐
300 Ω	297.0	________	303.0 Ω	☐	☐
Channel B					
600 Ω	594.0	________	606.0 Ω	☐	☐
300 Ω	297.0	________	303.0 Ω	☐	☐
Input Common Mode Rejection, Step 12					
Channel A					
2.5 V range, 10 Hz	–999.9	________	–80.0 dBgA	☐	☐
2.5 V range, 1 kHz	–999.9	________	–80.0 dBgA	☐	☐
2.5 V range, 20 kHz	–999.9	________	–80.0 dBgA	☐	☐
10 V range, 1 kHz	–999.9	________	–65.0 dBgA	☐	☐
10 V range, 20 kHz	–999.9	________	–65.0 dBgA	☐	☐
40 V range, 1 kHz	–999.9	________	–50.0 dBgA	☐	☐
160 V range, 1 kHz	–999.9	________	–50.0 dBgA	☐	☐
Channel B					
2.5 V range, 10 Hz	–999.9	________	–80.0 dBgB	☐	☐
2.5 V range, 1 kHz	–999.9	________	–80.0 dBgB	☐	☐
2.5 V range, 20 kHz	–999.9	________	–80.0 dBgB	☐	☐
10 V range, 1 kHz	–999.9	________	–65.0 dBgB	☐	☐
10 V range, 20 kHz	–999.9	________	–65.0 dBgB	☐	☐
40 V range, 1 kHz	–999.9	________	–50.0 dBgB	☐	☐
160 V range, 1 kHz	–999.9	________	–50.0 dBgB	☐	☐
Input Residual Crosstalk, Step 13					
Ch B into Ch A					
20 kHz	–999.9	________	–140.0 dB	☐	☐
100 kHz	–999.9	________	–126.0 dB	☐	☐
Ch A into Ch B					
20 kHz	–999.9	________	–140.0 dB	☐	☐
100 kHz	–999.9	________	–126.0 dB	☐	☐
Level Meter Accuracy, Step 14					
Channel A					
120.00 Vrms (160 V range)	119.4	________	120.6 V	☐	☐
60.00 Vrms (80 V range)	59.70	________	60.30 V	☐	☐
30.00 Vrms (40 V range)	29.85	________	30.15 V	☐	☐
16.00 Vrms (20 V range)	15.92	________	16.08 V	☐	☐
8.000 Vrms (10 V range)	7.960	________	8.040 V	☐	☐
4.000 Vrms (5 V range)	3.980	________	4.020 V	☐	☐
2.000 Vrms (2.5 V range)	1.990	________	2.010 V	☐	☐
1.000 Vrms (1.2 V range)	0.995	________	1.005 V	☐	☐
500 mVrms (600 mV range)	497.5	________	502.5 mV	☐	☐
240 mVrms (300 mV range)	238.8	________	241.2 mV	☐	☐
120 mVrms (160 mV range)	119.4	________	120.6 mV	☐	☐
60 mVrms (80 mV range)	59.70	________	60.30 mV	☐	☐
30 mVrms (40 mV range)	29.85	________	30.15 mV	☐	☐
5.0 mVrms (40 mV range)	4.975	________	5.025 mV	☐	☐

	Low Limit		High Limit	PASS	FAIL
Channel B					
120.00 Vrms (160 V range)	119.4	________	120.6 V	☐	☐
60.00 Vrms (80 V range)	59.70	________	60.30 V	☐	☐
30.00 Vrms (40 V range)	29.85	________	30.15 V	☐	☐
16.00 Vrms (20 V range)	15.92	________	16.08 V	☐	☐
8.000 Vrms (10 V range)	7.960	________	8.040 V	☐	☐
4.000 Vrms (5 V range)	3.980	________	4.020 V	☐	☐
2.000 Vrms (2.5 V range)	1.990	________	2.010 V	☐	☐
1.000 Vrms (1.2 V range)	0.995	________	1.005 V	☐	☐
500 mVrms (600 mV range)	497.5	________	502.5 mV	☐	☐
240 mVrms (300 mV range)	238.8	________	241.2 mV	☐	☐
120 mVrms (160 mV range)	119.4	________	120.6 mV	☐	☐
60 mVrms (80 mV range)	59.70	________	60.30 mV	☐	☐
30 mVrms (40 mV range)	29.85	________	30.15 mV	☐	☐
5.0 mVrms (40 mV range)	4.975	________	5.025 mV	☐	☐

Level Meter Flatness, Step 15

	Low Limit		High Limit	PASS	FAIL
Channel A					
10 Hz	–0.100	________	+0.100 dBrA	☐	☐
15 Hz	–0.030	________	+0.030 dBrA	☐	☐
20 Hz	–0.008	________	+0.008 dBrA	☐	☐
50 Hz	–0.008	________	+0.008 dBrA	☐	☐
20 kHz	–0.008	________	+0.008 dBrA	☐	☐
50 kHz	–0.030	________	+0.030 dBrA	☐	☐
100 kHz	–0.100	________	+0.100 dBrA	☐	☐
500 kHz	–0.500	________	+0.200 dBrA	☐	☐
Channel B					
10 Hz	–0.100	________	+0.100 dBrB	☐	☐
15 Hz	–0.030	________	+0.030 dBrB	☐	☐
20 Hz	–0.008	________	+0.008 dBrB	☐	☐
50 Hz	–0.008	________	+0.008 dBrB	☐	☐
20 kHz	–0.008	________	+0.008 dBrB	☐	☐
50 kHz	–0.030	________	+0.030 dBrB	☐	☐
100 kHz	–0.100	________	+0.100 dBrB	☐	☐
500 kHz	–0.500	________	+0.200 dBrB	☐	☐

Amplitude Meter Accuracy, Step 16

	Low Limit		High Limit	PASS	FAIL
Channel A (2.5 V input range)					
2.000 Vrms	1.980	________	2.020 V	☐	☐
500 mVrms	495.0	________	505.0 mV	☐	☐
120 mVrms	118.8	________	121.2 mV	☐	☐
30 mVrms	29.70	________	30.30 mV	☐	☐
8.0 mVrms	7.920	________	8.080 mV	☐	☐
2.0 mVrms	1.980	________	2.020 mV	☐	☐
Channel B (2.5 V input range)					
2.000 Vrms	1.980	________	2.020 V	☐	☐
500 mVrms	495.0	________	505.0 mV	☐	☐
120 mVrms	118.8	________	121.2 mV	☐	☐
30 mVrms	29.70	________	30.30 mV	☐	☐
8.0 mVrms	7.920	________	8.080 mV	☐	☐
2.0 mVrms	1.980	________	2.020 mV	☐	☐

Amplitude Meter Flatness, Step 17	Low Limit		High Limit	PASS	FAIL
2.000 Vrms					
15 Hz	–0.050	________	+0.050 dBrA	☐	☐
20 Hz	–0.020	________	+0.020 dBrA	☐	☐
20 kHz	–0.020	________	+0.020 dBrA	☐	☐
50 kHz	–0.050	________	+0.050 dBrA	☐	☐
100 kHz	–0.150	________	+0.150 dBrA	☐	☐
200 kHz	–0.300	________	+0.200 dBrA	☐	☐
120 mVrms					
15 Hz	–0.050	________	+0.050 dBrA	☐	☐
20 Hz	–0.020	________	+0.020 dBrA	☐	☐
20 kHz	–0.020	________	+0.020 dBrA	☐	☐
50 kHz	–0.050	________	+0.050 dBrA	☐	☐
100 kHz	–0.150	________	+0.150 dBrA	☐	☐
200 kHz	–0.300	________	+0.200 dBrA	☐	☐
8 mVrms					
15 Hz	–0.050	________	+0.050 dBrA	☐	☐
20 Hz	–0.020	________	+0.020 dBrA	☐	☐
20 kHz	–0.020	________	+0.020 dBrA	☐	☐
50 kHz	–0.050	________	+0.050 dBrA	☐	☐
100 kHz	–0.150	________	+0.150 dBrA	☐	☐
200 kHz	–0.300	________	+0.200 dBrA	☐	☐

Bandreject & THD+N Accuracy, Step 18

20 Hz notch					
40 Hz	–0.300	________	+0.300 dBV	☐	☐
60 Hz	–0.300	________	+0.300 dBV	☐	☐
20 kHz	–0.300	________	+0.300 dBV	☐	☐
120 kHz	–0.300	________	+0.300 dBV	☐	☐
1 kHz notch					
20 Hz	–0.300	________	+0.300 dBV	☐	☐
500 Hz	–0.300	________	+0.300 dBV	☐	☐
2.0 kHz	–0.300	________	+0.300 dBV	☐	☐
3.0 kHz	–0.300	________	+0.300 dBV	☐	☐
20 kHz	–0.300	________	+0.300 dBV	☐	☐
120 kHz	–0.300	________	+0.300 dBV	☐	☐
20 kHz notch					
20 Hz	–0.300	________	+0.300 dBV	☐	☐
10 kHz	–0.300	________	+0.300 dBV	☐	☐
40 kHz	–0.300	________	+0.300 dBV	☐	☐
60 kHz	–0.300	________	+0.300 dBV	☐	☐
120 kHz	–0.300	________	+0.300 dBV	☐	☐
100 kHz notch					
20 Hz	–0.300	________	+0.300 dBV	☐	☐
20 kHz	–0.300	________	+0.300 dBV	☐	☐
50 kHz	–0.300	________	+0.300 dBV	☐	☐

Bandpass Accuracy, Step 19

20 Hz					
19.60 Hz bandpass	–0.300	________	+0.300 dBV	☐	☐
20.00 Hz bandpass	–0.300	________	+0.300 dBV	☐	☐
20.40 Hz bandpass	–0.300	________	+0.300 dBV	☐	☐
1 kHz					
0.980 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
1.000 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
1.020 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐

	Low Limit		High Limit	PASS	FAIL
20 kHz					
19.60 kHz bandpass	–0.300	__________	+0.300 dBV	☐	☐
20.00 kHz bandpass	–0.300	__________	+0.300 dBV	☐	☐
20.40 kHz bandpass	–0.300	__________	+0.300 dBV	☐	☐
100 kHz					
98.0 kHz bandpass	–0.300	__________	+0.300 dBV	☐	☐
100.0 kHz bandpass	–0.300	__________	+0.300 dBV	☐	☐
102.0 kHz bandpass	–0.300	__________	+0.300 dBV	☐	☐

Bandwidth Limiting Filters, Step 20

	Low Limit		High Limit	PASS	FAIL
22 Hz Highpass					
22.4 Hz	–6.000	__________	–0.000 dBrA	☐	☐
31.5 Hz	–0.500	__________	+0.500 dBrA	☐	☐
50 Hz	–0.500	__________	+0.500 dBrA	☐	☐
100 Hz Highpass					
95 Hz	–999.9	__________	–3.000 dBrA	☐	☐
105 Hz	–3.000	__________	–0.000 dBrA	☐	☐
400 Hz Highpass					
380 Hz	–999.9	__________	–3.000 dBrA	☐	☐
420 Hz	–3.000	__________	–0.000 dBrA	☐	☐
22 kHz Lowpass					
5 kHz	–0.500	__________	+0.500 dBrA	☐	☐
16 kHz	–0.500	__________	+0.500 dBrA	☐	☐
22.4 kHz	–6.000	__________	–0.000 dBrA	☐	☐
30 kHz Lowpass					
28.5 kHz	–3.000	__________	–0.000 dBrA	☐	☐
31.5 kHz	–999.9	__________	–3.000 dBrA	☐	☐
80 kHz Lowpass					
76.0 kHz	–3.000	__________	–0.000 dBrA	☐	☐
84.0 kHz	–999.9	__________	–3.000 dBrA	☐	☐

Residual Noise, Step 21

	Low Limit		High Limit	PASS	FAIL
Channel A					
22–22 kHz bandwidth	0.00	__________	1.00 μV	☐	☐
10–80 kHz bandwidth	0.00	__________	2.00 μV	☐	☐
Full bandwidth	0.00	__________	6.00 μV	☐	☐
5 kHz bandpass	0.000	__________	0.250 μV	☐	☐
20 kHz bandpass	0.000	__________	0.500 μV	☐	☐
200 kHz bandpass	0.000	__________	1.500 μV	☐	☐
Channel B					
22–22 kHz bandwidth	0.00	__________	1.00 μV	☐	☐
10–80 kHz bandwidth	0.00	__________	2.00 μV	☐	☐
Full bandwidth	0.00	__________	6.00 μV	☐	☐
5 kHz bandpass	0.000	__________	0.250 μV	☐	☐
20 kHz bandpass	0.000	__________	0.500 μV	☐	☐
200 kHz bandpass	0.000	__________	1.500 μV	☐	☐

Residual THD+N, Step 22	Low Limit		High Limit	PASS	FAIL
Channel A					
Vin = 1.50 V, 22 kHz analyzer BW					
20 Hz	0.00000	________	0.00040 %	☐	☐
1 kHz	0.00000	________	0.00040 %	☐	☐
5 kHz	0.00000	________	0.00040 %	☐	☐
20 kHz	0.00000	________	0.00040 %	☐	☐
Vin = 1.50 V, 80 kHz analyzer BW					
1 kHz	0.00000	________	0.00060 %	☐	☐
20 kHz	0.00000	________	0.00060 %	☐	☐
Vin = 1.50 V, 500 kHz analyzer BW					
1 kHz	0.00000	________	0.00150 %	☐	☐
20 kHz	0.00000	________	0.00150 %	☐	☐
50 kHz	0.00000	________	0.00400 %	☐	☐
100 kHz	0.00000	________	0.00400 %	☐	☐
Channel B					
Vin = 1.50 V, 22 kHz analyzer BW					
20 Hz	0.00000	________	0.00040 %	☐	☐
1 kHz	0.00000	________	0.00040 %	☐	☐
5 kHz	0.00000	________	0.00040 %	☐	☐
20 kHz	0.00000	________	0.00040 %	☐	☐
Vin = 1.50 V, 80 kHz analyzer BW					
1 kHz	0.00000	________	0.00060 %	☐	☐
20 kHz	0.00000	________	0.00060 %	☐	☐
Vin = 1.50 V, 500 kHz analyzer BW					
1 kHz	0.00000	________	0.00150 %	☐	☐
20 kHz	0.00000	________	0.00150 %	☐	☐
50 kHz	0.00000	________	0.00400 %	☐	☐
100 kHz	0.00000	________	0.00400 %	☐	☐
Phase Measurement Accuracy, Step 23					
10 Hz, dc coupled	–0.50	________	+0.50 deg	☐	☐
10 Hz, ac coupled	–0.50	________	+0.50 deg	☐	☐
1 kHz	–0.50	________	+0.50 deg	☐	☐
5 kHz	–0.50	________	+0.50 deg	☐	☐
20 kHz	–1.00	________	+1.00 deg	☐	☐
50 kHz	–2.00	________	+2.00 deg	☐	☐
Frequency Measurement Accuracy, Step 24					
20 kHz	–6.0	________	+6.0 PPM	☐	☐
High Resolution A/D Residual Distortion, Step 25					
Channel A (5 kHz)	–999.9	________	–105.0 dBrA	☐	☐
Channel B (5 kHz)	–999.9	________	–105.0 dBrB	☐	☐
High Bandwidth A/D Residual Distortion, Step 26					
Channel A (20 kHz)	–999.9	________	–90.0 dBrA	☐	☐
Channel B (20 kHz)	–999.9	________	–90.0 dBrB	☐	☐

OPTION “BUR” RELATED

Burst OFF Ratio Accuracy, Step 27	Low Limit		High Limit	PASS	FAIL
0 dB	–0.300	__________	+0.300 dB	☐	☐
–10 dB	–10.300	__________	–9.700 dB	☐	☐
–20 dB	–20.300	__________	–19.700 dB	☐	☐
–40 dB	–40.300	__________	–39.700 dB	☐	☐
–60 dB	–60.300	__________	–59.700 dB	☐	☐
Squarewave Amplitude Accuracy, Step 28					
1.000 V (100 Hz)	1.3859	__________	1.4425 Vrms	☐	☐

OPTION “IMD” RELATED

Generator IMD Amplitude Accuracy, Step 29					
SMPTE 4:1 Signal (60/7k)	0.8081	__________	0.8411 Vrms	☐	☐
SMPTE 1:1 Signal (60/7k)	0.6930	__________	0.7212 Vrms	☐	☐
DFD/CCIF Signal (15k/15.08k)	0.6859	__________	0.7283 Vrms	☐	☐
DIM Signal (DIM-100)	1.1150	__________	1.1605 Vrms	☐	☐
SMPTE LF Tone Accuracy, Step 30					
40 Hz	39.40	__________	40.60 Hz	☐	☐
50 Hz	49.25	__________	50.75 Hz	☐	☐
60 Hz	59.10	__________	60.90 Hz	☐	☐
70 Hz	68.95	__________	71.05 Hz	☐	☐
100 Hz	98.50	__________	101.50 Hz	☐	☐
125 Hz	123.13	__________	126.88 Hz	☐	☐
250 Hz	246.25	__________	253.75 Hz	☐	☐
500 Hz	492.50	__________	507.50 Hz	☐	☐
DIM Squarewave Accuracy, Step 31					
DIM-B (2.96 kHz)	2.9304	__________	2.9896 kHz	☐	☐
DIM-100 (3.15 kHz)	3.1185	__________	3.1815 kHz	☐	☐
IMD Measurement Accuracy, Step 32					
SMPTE	–60.5	__________	–59.5 dB	☐	☐
DFD/CCIF	–60.5	__________	–59.5 dB	☐	☐
DIM, u4 component	–60.7	__________	–59.3 dB	☐	☐
DIM, u5 component	–60.7	__________	–59.3 dB	☐	☐
Residual IMD, Step 33					
Channel A					
SMPTE (60/7k, 4:1), 26.66 V bal	0.00000	__________	0.00150 %	☐	☐
SMPTE (60/7k, 4:1), 1.00 V bal	0.00000	__________	0.00150 %	☐	☐
SMPTE (60/7k, 4:1), 200 mV bal	0.00000	__________	0.00150 %	☐	☐
DFD (14k/15k), 26.66 V bal	0.00000	__________	0.00020 %	☐	☐
DFD (14k/15k), 1.00 V bal	0.00000	__________	0.00020 %	☐	☐
DFD (14k/15k), 200 mV bal	0.00000	__________	0.00020 %	☐	☐
DIM (DIM-100), 26.66 V bal	0.00000	__________	0.00200 %	☐	☐
DIM (DIM-100), 1.00 V bal	0.00000	__________	0.00200 %	☐	☐
DIM (DIM-100), 200 mV bal	0.00000	__________	0.00200 %	☐	☐

	Low Limit		High Limit	PASS	FAIL
Channel B					
SMPTE (60/7k, 4:1), 26.66 V bal	0.00000	__________	0.00150 %	☐	☐
SMPTE (60/7k, 4:1), 1.00 V bal	0.00000	__________	0.00150 %	☐	☐
SMPTE (60/7k, 4:1), 200 mV bal	0.00000	__________	0.00150 %	☐	☐
DFD (14k/15k), 26.66 V bal	0.00000	__________	0.00020 %	☐	☐
DFD (14k/15k), 1.00 V bal	0.00000	__________	0.00020 %	☐	☐
DFD (14k/15k), 200 mV bal	0.00000	__________	0.00020 %	☐	☐
DIM (DIM-100), 26.66 V bal	0.00000	__________	0.00200 %	☐	☐
DIM (DIM-100), 1.00 V bal	0.00000	__________	0.00200 %	☐	☐
DIM (DIM-100), 200 mV bal	0.00000	__________	0.00200 %	☐	☐

OPTION “W&F” RELATED

Wow and Flutter Accuracy, Step 34

IEC detection	0.9500	__________	1.0500 %	☐	☐
NAB/JIS detection	0.6718	__________	0.7425 %	☐	☐

Residual Wow and Flutter, Step 35

IEC, weighted	0.00000	__________	0.00100 %	☐	☐
IEC, unweighted	0.00000	__________	0.00200 %	☐	☐
NAB, weighted	0.00000	__________	0.00100 %	☐	☐
NAB, unweighted	0.00000	__________	0.00200 %	☐	☐
Scrape (12.5 kHz test tone)	0.00000	__________	0.00500 %	☐	☐

OPTION “S-AES17” RELATED

S-AES17 Option Response, Step 36

20 kHz Pre-Analyzer Filter					
1 kHz	–0.100	__________	+0.100 dBrA	☐	☐
15 kHz	–0.100	__________	+0.100 dBrA	☐	☐
20 kHz	–0.100	__________	+0.100 dBrA	☐	☐
25 kHz	–4.000	__________	–2.000 dBrA	☐	☐
40 kHz Pre-Analyzer Filter					
1 kHz	–0.100	__________	+0.100 dBrA	☐	☐
30 kHz	–0.100	__________	+0.100 dBrA	☐	☐
40 kHz	–0.100	__________	+0.100 dBrA	☐	☐
50 kHz	–4.000	__________	–2.000 dBrA	☐	☐
“20 kHz AES17” Mode					
20 Hz	–0.100	__________	+0.100 dBrB	☐	☐
10 kHz	–0.100	__________	+0.100 dBrB	☐	☐
15 kHz	–0.100	__________	+0.100 dBrB	☐	☐
20 kHz	–0.100	__________	+0.100 dBrB	☐	☐
24 kHz	–999	__________	–60.0 dBrB	☐	☐
27 kHz	–999	__________	–60.0 dBrB	☐	☐
200 kHz	–999	__________	–60.0 dBrB	☐	☐

	Low Limit		High Limit	PASS	FAIL
"40 kHz AES17" Mode					
20 Hz	–0.100	__________	+0.100 dBrB	☐	☐
20 kHz	–0.100	__________	+0.100 dBrB	☐	☐
30 kHz	–0.100	__________	+0.100 dBrB	☐	☐
40 kHz	–0.100	__________	+0.100 dBrB	☐	☐
48 kHz	–999	__________	–60.0 dBrB	☐	☐
54 kHz	–999	__________	–60.0 dBrB	☐	☐
200 kHz	–999	__________	–60.0 dBrB	☐	☐

S-AES17 Option Residual THD+N, Step 37

	Low Limit		High Limit	PASS	FAIL
"20 kHz AES17" mode					
8 Vrms	0.00000	__________	0.00040 %	☐	☐
50 mVrms	0.00000	__________	0.00200 %	☐	☐
"40 kHz AES17" mode					
8 Vrms	0.00000	__________	0.00050 %	☐	☐
50 mVrms	0.00000	__________	0.00280 %	☐	☐

OPTION "OPT-2020" RELATED

OPT-2020 Option Response, Step 36a

	Low Limit		High Limit	PASS	FAIL
"20 kHz AES17" Mode					
20 Hz	–0.100	__________	+0.100 dBrB	☐	☐
10 kHz	–0.100	__________	+0.100 dBrB	☐	☐
15 kHz	–0.100	__________	+0.100 dBrB	☐	☐
20 kHz	–0.100	__________	+0.100 dBrB	☐	☐
24 kHz	–999	__________	–60.0 dBrB	☐	☐
27 kHz	–999	__________	–60.0 dBrB	☐	☐
200 kHz	–999	__________	–60.0 dBrB	☐	☐

OPT-2020 Option Residual THD+N, Step 37a

	Low Limit		High Limit	PASS	FAIL
"20 kHz AES17" mode					
8 Vrms	0.00000	__________	0.00080 %	☐	☐
50 mVrms	0.00000	__________	0.00200 %	☐	☐

AES/EBU GENERATOR & ANALYZER CHARACTERISTICS

SYS-2700 / SYS-2722 (96k)

Digital Output Amplitude Accuracy, Step 38	Low Limit		High Limit	PASS	FAIL
Connector I Balanced Output					
8.00 Vpp	7.20	________	8.80 V	☐	☐
800 mVpp	640	________	960 mV	☐	☐
Connector II Balanced Output					
8.00 Vpp	7.20	________	8.80 V	☐	☐
800 mVpp	640	________	960 mV	☐	☐
Connector I Unbalanced Output					
2.000 Vpp	1.840	________	2.160 V	☐	☐
200 mVpp	168.0	________	232.0 mV	☐	☐
Connector II Unbalanced Output					
2.000 Vpp	1.840	________	2.160 V	☐	☐
200 mVpp	168.0	________	232.0 mV	☐	☐

Voltage Measurement Accuracy, Step 39

INPUT I (balanced)					
8.00 Vpp	7.60	________	8.40 V	☐	☐
800 mVpp	710	________	790 mV	☐	☐
INPUT II (balanced)					
8.00 Vpp	7.60	________	8.40 V	☐	☐
800 mVpp	710	________	790 mV	☐	☐
INPUT I (unbalanced)					
2.000 Vpp	1.900	________	2.100 V	☐	☐
200 mVpp	178.0	________	222.0 mV	☐	☐
INPUT II (unbalanced)					
2.000 Vpp	1.900	________	2.100 V	☐	☐
200 mVpp	178.0	________	222.0 mV	☐	☐

Variable Risetime, Step 40

Connector I (Unbal)					
25 ns	20.00	________	30.00 ns	☐	☐
100 ns	80.00	________	120.0 ns	☐	☐
Connector II (Unbal)					
25 ns	20.00	________	30.00 ns	☐	☐
100 ns	80.00	________	120.0 ns	☐	☐

Normal Mode Noise Amplitude, Step 41

Connector I					
500 mVpp, unbalanced	450.0	________	550.0 mV	☐	☐
100 mVpp, unbalanced	75.0	________	125.0 mV	☐	☐
Connector II					
500 mVpp, unbalanced	450.0	________	550.0 mV	☐	☐
100 mVpp, unbalanced	75.0	________	125.0 mV	☐	☐

Common Mode Sine Amplitude, Step 42

Connector I					
20.00 Vpp	18.00	________	22.00 V	☐	☐
1.200 Vpp	1.000	________	1.400 V	☐	☐

	Low Limit		High Limit	PASS	FAIL
Connector II					
20.00 Vpp	18.00	______	22.00 V	☐	☐
1.200 Vpp	1.000	______	1.400 V	☐	☐
CM Voltage Measurement Accuracy, Step 43					
Connector I					
20.00 Vpp	18.00	______	22.00 V	☐	☐
1.200 Vpp	0.900	______	1.500 V	☐	☐
Connector II					
20.00 Vpp	18.00	______	22.00 V	☐	☐
1.200 Vpp	0.900	______	1.500 V	☐	☐
Jitter Accuracy, Step 44					
Jitter Generator					
4.90 UI	4.45	______	5.35 UI	☐	☐
305 mUI	275	______	335 mUI	☐	☐
Jitter Analyzer, Average Detector					
305 mUI	275.0	______	335.0 mUI	☐	☐
Jitter Analyzer, Peak Detector					
305 mUI	275.0	______	335.0 mUI	☐	☐
Jitter Flatness, Step 45					
100 Hz	–1.00	______	+1.00 dB	☐	☐
200 Hz	–1.00	______	+1.00 dB	☐	☐
1 kHz	–1.00	______	+1.00 dB	☐	☐
5 kHz	–1.00	______	+1.00 dB	☐	☐
20 kHz	–1.00	______	+1.00 dB	☐	☐
50 kHz	–1.00	______	+1.00 dB	☐	☐
Residual Jitter, Step 46					
OUTPUT I					
48 kS, peak detection	0.000	______	1.628 ns	☐	☐
96 kS, peak detection	0.000	______	1.628 ns	☐	☐
OUTPUT II					
48 kS, peak detection	0.000	______	1.628 ns	☐	☐
96 kS, peak detection	0.000	______	1.628 ns	☐	☐

END OF CALIBRATION

System Two Cascade (192k) Calibration Report

SYS-2500 (192k) / SYS-2522 (192k)

Calibration laboratory or equivalent facility:

(name) ____

(address) ____

____

____

Customer: ____ PO No. ______________________

Unit under test: (Model No.) ______________________________ (Serial No.) ____________________

Report Identifier ____________________________ consisting of 14 pages. Calibration Date:_______________

The instrument as received ❑ was / ❑ was not functioning within specifications.

Procedure used: S2 Family Service Manual Calibration V1.00, System Two Cascade (192k), pages 2-31 to 2-40.

Ambient temperature during calibration: ________ ° C.

Calibration equipment used:

Model	Description	Last Calibration Date	Calibration Due

This report shall not be reproduced except in full, without the written approval of the laboratory named above.

Calibration certified by (signature) ____________________________________

(print name) ____________________________________

(title) ____________________________________

System Two Cascade (192k) Calibration Report

SYS-2500 (192k) / SYS-2522 (192k)

ANALOG GENERATOR CHARACTERISTICS

SYS-2522 (192k)

Sine Frequency, Step 1	Low Limit		High Limit	PASS	FAIL
Fast Mode					
10.0 Hz	9.9500	________	10.050 Hz	☐	☐
100 Hz	99.500	________	100.500 Hz	☐	☐
1.00 kHz	0.9950	________	1.0050 kHz	☐	☐
10.0 kHz	9.9500	________	10.050 kHz	☐	☐
100 kHz	99.500	________	100.50 kHz	☐	☐
200 kHz	199.000	________	201.000 kHz	☐	☐
High-Accuracy Mode					
10 Hz	9.9970	________	10.0030 Hz	☐	☐
100 Hz	99.970	________	100.030 Hz	☐	☐
1.00 kHz	0.99970	________	1.00030 kHz	☐	☐
10.0 kHz	9.9970	________	10.0030 kHz	☐	☐
100 kHz	99.970	________	100.030 kHz	☐	☐
200 kHz	199.940	________	200.060 kHz	☐	☐
Sine (D/A) Frequency Accuracy, Step 2					
10.000 kHz	9999.970	________	10000.030 Hz	☐	☐
Sine Amplitude Accuracy, Step 3					
Channel A					
10.00 V	9.9300	________	10.070 Vrms	☐	☐
5.000 V	4.9650	________	5.0350 Vrms	☐	☐
2.500 V	2.4830	________	2.5170 Vrms	☐	☐
1.200 V	1.1920	________	1.2080 Vrms	☐	☐
600 mV	595.80	________	604.20 mVrms	☐	☐
300 mV	297.90	________	302.10 mVrms	☐	☐
150 mV	149.00	________	151.00 mVrms	☐	☐
80 mV	79.440	________	80.560 mVrms	☐	☐
40 mV	39.720	________	40.280 mVrms	☐	☐
20 mV	19.860	________	20.140 mVrms	☐	☐
10 mV	9.9300	________	10.070 mVrms	☐	☐
Channel B					
10.00 V	9.9300	________	10.070 Vrms	☐	☐
5.000 V	4.9650	________	5.0350 Vrms	☐	☐
2.500 V	2.4830	________	2.5170 Vrms	☐	☐
1.200 V	1.1920	________	1.2080 Vrms	☐	☐
600 mV	595.80	________	604.20 mVrms	☐	☐
300 mV	297.90	________	302.10 mVrms	☐	☐
150 mV	149.00	________	151.00 mVrms	☐	☐
80 mV	79.440	________	80.560 mVrms	☐	☐
40 mV	39.720	________	40.280 mVrms	☐	☐
20 mV	19.860	________	20.140 mVrms	☐	☐
10 mV	9.9300	________	10.070 mVrms	☐	☐

Sine (D/A) Amplitude Accuracy, Step 4	Low Limit		High Limit	PASS	FAIL
Channel A	2.4830	________	2.5170 Vrms	☐	☐
Channel B	2.4830	________	2.5170 Vrms	☐	☐

Sine Flatness, Step 5

Channel A					
10 Hz	–0.010	________	+0.010 dB	☐	☐
20 Hz	–0.008	________	+0.008 dB	☐	☐
50 Hz	–0.008	________	+0.008 dB	☐	☐
10 kHz	–0.008	________	+0.008 dB	☐	☐
20 kHz	–0.008	________	+0.008 dB	☐	☐
50 kHz	–0.030	________	+0.030 dB	☐	☐
100 kHz	–0.100	________	+0.100 dB	☐	☐
200 kHz	–0.300	________	+0.200 dB	☐	☐
Channel B					
10 Hz	–0.010	________	+0.010 dB	☐	☐
20 Hz	–0.008	________	+0.008 dB	☐	☐
50 Hz	–0.008	________	+0.008 dB	☐	☐
10 kHz	–0.008	________	+0.008 dB	☐	☐
20 kHz	–0.008	________	+0.008 dB	☐	☐
50 kHz	–0.030	________	+0.030 dB	☐	☐
100 kHz	–0.100	________	+0.100 dB	☐	☐
200 kHz	–0.300	________	+0.200 dB	☐	☐

D/A Sine Flatness, Step 6

Channel A					
10 Hz	–0.030	________	+0.030 dB	☐	☐
20 Hz	–0.010	________	+0.010 dB	☐	☐
10 kHz	–0.010	________	+0.010 dB	☐	☐
20 kHz	–0.010	________	+0.010 dB	☐	☐
30 kHz	–0.030	________	+0.030 dB	☐	☐
50 kHz	–0.100	________	+0.100 dB	☐	☐
Channel B					
10 Hz	–0.010	________	+0.010 dB	☐	☐
20 Hz	–0.010	________	+0.010 dB	☐	☐
10 kHz	–0.010	________	+0.010 dB	☐	☐
20 kHz	–0.010	________	+0.010 dB	☐	☐
30 kHz	–0.030	________	+0.030 dB	☐	☐
50 kHz	–0.100	________	+0.100 dB	☐	☐

SineTHD+N, Step 7

Channel A					
Vout = 26.66 V bal, 22 kHz analyzer BW					
20 Hz	0.00000	________	0.00200 %	☐	☐
30 Hz	0.00000	________	0.00040 %	☐	☐
1 kHz	0.00000	________	0.00040 %	☐	☐
5 kHz	0.00000	________	0.00040 %	☐	☐
Vout = 26.66.00 V bal, 80 kHz analyzer BW					
1 kHz	0.00000	________	0.00060 %	☐	☐
20 kHz	0.00000	________	0.00060 %	☐	☐
Vout = 13.33 V bal, 500 kHz analyzer BW					
10 Hz	0.00000	________	0.00400 %	☐	☐
20 Hz	0.00000	________	0.00150 %	☐	☐
20 kHz	0.00000	________	0.00150 %	☐	☐
100 kHz	0.00000	________	0.00400 %	☐	☐

	Low Limit		High Limit	PASS	FAIL
Channel B					
Vout = 26.66 V bal, 22 kHz analyzer BW					
20 Hz	0.00000	________	0.00200 %	☐	☐
30 Hz	0.00000	________	0.00040 %	☐	☐
1 kHz	0.00000	________	0.00040 %	☐	☐
5 kHz	0.00000	________	0.00040 %	☐	☐
Vout = 26.66.00 V bal, 80 kHz analyzer BW					
1 kHz	0.00000	________	0.00060 %	☐	☐
20 kHz	0.00000	________	0.00060 %	☐	☐
Vout = 13.33 V bal, 500 kHz analyzer BW					
10 Hz	0.00000	________	0.00400 %	☐	☐
20 Hz	0.00000	________	0.00150 %	☐	☐
20 kHz	0.00000	________	0.00150 %	☐	☐
100 kHz	0.00000	________	0.00400 %	☐	☐
Sine D/A Residual THD+N, Step 8					
Channel A					
20 Hz	0.00000	________	0.00070 %	☐	☐
1 kHz	0.00000	________	0.00070 %	☐	☐
5 kHz	0.00000	________	0.00070 %	☐	☐
20 kHz	0.00000	________	0.00070 %	☐	☐
Channel B					
20 Hz	0.00000	________	0.00070 %	☐	☐
1 kHz	0.00000	________	0.00070 %	☐	☐
5 kHz	0.00000	________	0.00070 %	☐	☐
20 kHz	0.00000	________	0.00070 %	☐	☐
Output Crosstalk, Step 9					
Ch B into Ch A					
20 kHz	–999.9	________	–120.0 dB	☐	☐
100 kHz	–999.9	________	–106.0 dB	☐	☐
Ch A into Ch B					
20 kHz	–999.9	________	–120.0 dB	☐	☐
100 kHz	–999.9	________	–106.0 dB	☐	☐
Source Impedance Accuracy, Step 10					
Channel A					
40 Ω bal	39.00	________	41.00 Ω	☐	☐
150 (200) Ω bal	148.5	________	151.5 Ω	☐	☐
	(198.0)	________	(202.0) Ω	☐	☐
600 Ω bal (Opt EGZ)	597.0	________	603.0 Ω	☐	☐
20 Ω unbal	19.00	________	21.00 Ω	☐	☐
600 Ω unbal	597.0	________	603.0 Ω	☐	☐
Channel B					
40 Ω bal	39.00	________	41.00 Ω	☐	☐
150 (200) Ω bal	148.5	________	151.5 Ω	☐	☐
	(198.0)	________	(202.0) Ω	☐	☐
600 Ω bal (Opt EGZ)	597.0	________	603.0 Ω	☐	☐
20 Ω unbal	19.00	________	21.00 Ω	☐	☐
600 Ω unbal	597.0	________	603.0 Ω	☐	☐

ANALOG ANALYZER CHARACTERISTICS

Input Termination Accuracy, Step 11	Low Limit		High Limit	PASS	FAIL
Channel A					
600 Ω	594.0	________	606.0 Ω	☐	☐
300 Ω	297.0	________	303.0 Ω	☐	☐
Channel B					
600 Ω	594.0	________	606.0 Ω	☐	☐
300 Ω	297.0	________	303.0 Ω	☐	☐
Input Common Mode Rejection, Step 12					
Channel A					
2.5 V range, 10 Hz	–999.9	________	–80.0 dBgA	☐	☐
2.5 V range, 1 kHz	–999.9	________	–80.0 dBgA	☐	☐
2.5 V range, 20 kHz	–999.9	________	–80.0 dBgA	☐	☐
10 V range, 1 kHz	–999.9	________	–65.0 dBgA	☐	☐
10 V range, 20 kHz	–999.9	________	–65.0 dBgA	☐	☐
40 V range, 1 kHz	–999.9	________	–50.0 dBgA	☐	☐
160 V range, 1 kHz	–999.9	________	–50.0 dBgA	☐	☐
Channel B					
2.5 V range, 10 Hz	–999.9	________	–80.0 dBgB	☐	☐
2.5 V range, 1 kHz	–999.9	________	–80.0 dBgB	☐	☐
2.5 V range, 20 kHz	–999.9	________	–80.0 dBgB	☐	☐
10 V range, 1 kHz	–999.9	________	–65.0 dBgB	☐	☐
10 V range, 20 kHz	–999.9	________	–65.0 dBgB	☐	☐
40 V range, 1 kHz	–999.9	________	–50.0 dBgB	☐	☐
160 V range, 1 kHz	–999.9	________	–50.0 dBgB	☐	☐
Input Residual Crosstalk, Step 13					
Ch B into Ch A					
20 kHz	–999.9	________	–140.0 dB	☐	☐
100 kHz	–999.9	________	–126.0 dB	☐	☐
Ch A into Ch B					
20 kHz	–999.9	________	–140.0 dB	☐	☐
100 kHz	–999.9	________	–126.0 dB	☐	☐
Level Meter Accuracy, Step 14					
Channel A					
120.00 Vrms (160 V range)	119.4	________	120.6 V	☐	☐
60.00 Vrms (80 V range)	59.70	________	60.30 V	☐	☐
30.00 Vrms (40 V range)	29.85	________	30.15 V	☐	☐
16.00 Vrms (20 V range)	15.92	________	16.08 V	☐	☐
8.000 Vrms (10 V range)	7.960	________	8.040 V	☐	☐
4.000 Vrms (5 V range)	3.980	________	4.020 V	☐	☐
2.000 Vrms (2.5 V range)	1.990	________	2.010 V	☐	☐
1.000 Vrms (1.2 V range)	0.995	________	1.005 V	☐	☐
500 mVrms (600 mV range)	497.5	________	502.5 mV	☐	☐
240 mVrms (300 mV range)	238.8	________	241.2 mV	☐	☐
120 mVrms (160 mV range)	119.4	________	120.6 mV	☐	☐
60 mVrms (80 mV range)	59.70	________	60.30 mV	☐	☐
30 mVrms (40 mV range)	29.85	________	30.15 mV	☐	☐
5.0 mVrms (40 mV range)	4.975	________	5.025 mV	☐	☐

	Low Limit		High Limit	PASS	FAIL
Channel B					
120.00 Vrms (160 V range)	119.4	______	120.6 V	☐	☐
60.00 Vrms (80 V range)	59.70	______	60.30 V	☐	☐
30.00 Vrms (40 V range)	29.85	______	30.15 V	☐	☐
16.00 Vrms (20 V range)	15.92	______	16.08 V	☐	☐
8.000 Vrms (10 V range)	7.960	______	8.040 V	☐	☐
4.000 Vrms (5 V range)	3.980	______	4.020 V	☐	☐
2.000 Vrms (2.5 V range)	1.990	______	2.010 V	☐	☐
1.000 Vrms (1.2 V range)	0.995	______	1.005 V	☐	☐
500 mVrms (600 mV range)	497.5	______	502.5 mV	☐	☐
240 mVrms (300 mV range)	238.8	______	241.2 mV	☐	☐
120 mVrms (160 mV range)	119.4	______	120.6 mV	☐	☐
60 mVrms (80 mV range)	59.70	______	60.30 mV	☐	☐
30 mVrms (40 mV range)	29.85	______	30.15 mV	☐	☐
5.0 mVrms (40 mV range)	4.975	______	5.025 mV	☐	☐

Level Meter Flatness, Step 15

	Low Limit		High Limit	PASS	FAIL
Channel A					
10 Hz	–0.100	______	+0.100 dBrA	☐	☐
15 Hz	–0.030	______	+0.030 dBrA	☐	☐
20 Hz	–0.008	______	+0.008 dBrA	☐	☐
50 Hz	–0.008	______	+0.008 dBrA	☐	☐
20 kHz	–0.008	______	+0.008 dBrA	☐	☐
50 kHz	–0.030	______	+0.030 dBrA	☐	☐
100 kHz	–0.100	______	+0.100 dBrA	☐	☐
500 kHz	–0.500	______	+0.200 dBrA	☐	☐
Channel B					
10 Hz	–0.100	______	+0.100 dBrB	☐	☐
15 Hz	–0.030	______	+0.030 dBrB	☐	☐
20 Hz	–0.008	______	+0.008 dBrB	☐	☐
50 Hz	–0.008	______	+0.008 dBrB	☐	☐
20 kHz	–0.008	______	+0.008 dBrB	☐	☐
50 kHz	–0.030	______	+0.030 dBrB	☐	☐
100 kHz	–0.100	______	+0.100 dBrB	☐	☐
500 kHz	–0.500	______	+0.200 dBrB	☐	☐

Amplitude Meter Accuracy, Step 16

	Low Limit		High Limit	PASS	FAIL
Channel A (2.5 V input range)					
2.000 Vrms	1.980	______	2.020 V	☐	☐
500 mVrms	495.0	______	505.0 mV	☐	☐
120 mVrms	118.8	______	121.2 mV	☐	☐
30 mVrms	29.70	______	30.30 mV	☐	☐
8.0 mVrms	7.920	______	8.080 mV	☐	☐
2.0 mVrms	1.980	______	2.020 mV	☐	☐
Channel B (2.5 V input range)					
2.000 Vrms	1.980	______	2.020 V	☐	☐
500 mVrms	495.0	______	505.0 mV	☐	☐
120 mVrms	118.8	______	121.2 mV	☐	☐
30 mVrms	29.70	______	30.30 mV	☐	☐
8.0 mVrms	7.920	______	8.080 mV	☐	☐
2.0 mVrms	1.980	______	2.020 mV	☐	☐

Amplitude Meter Flatness, Step 17	Low Limit		High Limit	PASS	FAIL
2.000 Vrms					
15 Hz	–0.050	________	+0.050 dBrA	☐	☐
20 Hz	–0.020	________	+0.020 dBrA	☐	☐
20 kHz	–0.020	________	+0.020 dBrA	☐	☐
50 kHz	–0.050	________	+0.050 dBrA	☐	☐
100 kHz	–0.150	________	+0.150 dBrA	☐	☐
200 kHz	–0.300	________	+0.200 dBrA	☐	☐
120 mVrms					
15 Hz	–0.050	________	+0.050 dBrA	☐	☐
20 Hz	–0.020	________	+0.020 dBrA	☐	☐
20 kHz	–0.020	________	+0.020 dBrA	☐	☐
50 kHz	–0.050	________	+0.050 dBrA	☐	☐
100 kHz	–0.150	________	+0.150 dBrA	☐	☐
200 kHz	–0.300	________	+0.200 dBrA	☐	☐
8 mVrms					
15 Hz	–0.050	________	+0.050 dBrA	☐	☐
20 Hz	–0.020	________	+0.020 dBrA	☐	☐
20 kHz	–0.020	________	+0.020 dBrA	☐	☐
50 kHz	–0.050	________	+0.050 dBrA	☐	☐
100 kHz	–0.150	________	+0.150 dBrA	☐	☐
200 kHz	–0.300	________	+0.200 dBrA	☐	☐
Bandreject & THD+N Accuracy, Step 18					
20 Hz notch					
40 Hz	–0.300	________	+0.300 dBV	☐	☐
60 Hz	–0.300	________	+0.300 dBV	☐	☐
20 kHz	–0.300	________	+0.300 dBV	☐	☐
120 kHz	–0.300	________	+0.300 dBV	☐	☐
1 kHz notch					
20 Hz	–0.300	________	+0.300 dBV	☐	☐
500 Hz	–0.300	________	+0.300 dBV	☐	☐
2.0 kHz	–0.300	________	+0.300 dBV	☐	☐
3.0 kHz	–0.300	________	+0.300 dBV	☐	☐
20 kHz	–0.300	________	+0.300 dBV	☐	☐
120 kHz	–0.300	________	+0.300 dBV	☐	☐
20 kHz notch					
20 Hz	–0.300	________	+0.300 dBV	☐	☐
10 kHz	–0.300	________	+0.300 dBV	☐	☐
40 kHz	–0.300	________	+0.300 dBV	☐	☐
60 kHz	–0.300	________	+0.300 dBV	☐	☐
120 kHz	–0.300	________	+0.300 dBV	☐	☐
100 kHz notch					
20 Hz	–0.300	________	+0.300 dBV	☐	☐
20 kHz	–0.300	________	+0.300 dBV	☐	☐
50 kHz	–0.300	________	+0.300 dBV	☐	☐
Bandpass Accuracy, Step 19					
20 Hz					
19.60 Hz bandpass	–0.300	________	+0.300 dBV	☐	☐
20.00 Hz bandpass	–0.300	________	+0.300 dBV	☐	☐
20.40 Hz bandpass	–0.300	________	+0.300 dBV	☐	☐
1 kHz					
0.980 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
1.000 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
1.020 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐

	Low Limit		High Limit	PASS	FAIL
20 kHz					
19.60 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
20.00 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
20.40 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
100 kHz					
98.0 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
100.0 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
102.0 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
Bandwidth Limiting Filters, Step 20				☐	☐
22 Hz Highpass					
22.4 Hz	–6.000	________	–0.000 dBrA	☐	☐
31.5 Hz	–0.500	________	+0.500 dBrA	☐	☐
50 Hz	–0.500	________	+0.500 dBrA	☐	☐
100 Hz Highpass					
95 Hz	–999.9	________	–3.000 dBrA	☐	☐
105 Hz	–3.000	________	–0.000 dBrA	☐	☐
400 Hz Highpass					
380 Hz	–999.9	________	–3.000 dBrA	☐	☐
420 Hz	–3.000	________	–0.000 dBrA	☐	☐
22 kHz Lowpass					
5 kHz	–0.500	________	+0.500 dBrA	☐	☐
16 kHz	–0.500	________	+0.500 dBrA	☐	☐
22.4 kHz	–6.000	________	–0.000 dBrA	☐	☐
30 kHz Lowpass					
28.5 kHz	–3.000	________	–0.000 dBrA	☐	☐
31.5 kHz	–999.9	________	–3.000 dBrA	☐	☐
80 kHz Lowpass					
76.0 kHz	–3.000	________	–0.000 dBrA	☐	☐
84.0 kHz	–999.9	________	–3.000 dBrA	☐	☐
Residual Noise, Step 21					
Channel A					
22–22 kHz bandwidth	0.00	________	1.00 μV	☐	☐
10–80 kHz bandwidth	0.00	________	2.00 μV	☐	☐
Full bandwidth	0.00	________	6.00 μV	☐	☐
5 kHz bandpass	0.000	________	0.250 μV	☐	☐
20 kHz bandpass	0.000	________	0.500 μV	☐	☐
200 kHz bandpass	0.000	________	1.500 μV	☐	☐
Channel B					
22–22 kHz bandwidth	0.00	________	1.00 μV	☐	☐
10–80 kHz bandwidth	0.00	________	2.00 μV	☐	☐
Full bandwidth	0.00	________	6.00 μV	☐	☐
5 kHz bandpass	0.000	________	0.250 μV	☐	☐
20 kHz bandpass	0.000	________	0.500 μV	☐	☐
200 kHz bandpass	0.000	________	1.500 μV	☐	☐

Residual THD+N, Step 22	**Low Limit**		**High Limit**	**PASS**	**FAIL**
Channel A					
Vin = 1.50 V, 22 kHz analyzer BW					
20 Hz	0.00000	__________	0.00040 %	☐	☐
1 kHz	0.00000	__________	0.00040 %	☐	☐
5 kHz	0.00000	__________	0.00040 %	☐	☐
20 kHz	0.00000	__________	0.00040 %	☐	☐
Vin = 1.50 V, 80 kHz analyzer BW					
1 kHz	0.00000	__________	0.00060 %	☐	☐
20 kHz	0.00000	__________	0.00060 %	☐	☐
Vin = 1.50 V, 500 kHz analyzer BW					
1 kHz	0.00000	__________	0.00150 %	☐	☐
20 kHz	0.00000	__________	0.00150 %	☐	☐
50 kHz	0.00000	__________	0.00400 %	☐	☐
100 kHz	0.00000	__________	0.00400 %	☐	☐
Channel B					
Vin = 1.50 V, 22 kHz analyzer BW					
20 Hz	0.00000	__________	0.00040 %	☐	☐
1 kHz	0.00000	__________	0.00040 %	☐	☐
5 kHz	0.00000	__________	0.00040 %	☐	☐
20 kHz	0.00000	__________	0.00040 %	☐	☐
Vin = 1.50 V, 80 kHz analyzer BW					
1 kHz	0.00000	__________	0.00060 %	☐	☐
20 kHz	0.00000	__________	0.00060 %	☐	☐
Vin = 1.50 V, 500 kHz analyzer BW					
1 kHz	0.00000	__________	0.00150 %	☐	☐
20 kHz	0.00000	__________	0.00150 %	☐	☐
50 kHz	0.00000	__________	0.00400 %	☐	☐
100 kHz	0.00000	__________	0.00400 %	☐	☐
Phase Measurement Accuracy, Step 23					
10 Hz, dc coupled	–0.50	__________	+0.50 deg	☐	☐
10 Hz, ac coupled	–0.50	__________	+0.50 deg	☐	☐
1 kHz	–0.50	__________	+0.50 deg	☐	☐
5 kHz	–0.50	__________	+0.50 deg	☐	☐
20 kHz	–1.00	__________	+1.00 deg	☐	☐
50 kHz	–2.00	__________	+2.00 deg	☐	☐
Frequency Measurement Accuracy, Step 24					
20 kHz	–6.0	__________	+6.0 PPM	☐	☐
High Resolution A/D Residual Distortion, Step 25					
Channel A (5 kHz)	–999.9	__________	–105.0 dBrA	☐	☐
Channel B (5 kHz)	–999.9	__________	–105.0 dBrB	☐	☐
High Bandwidth A/D Residual Distortion, Step 26					
Channel A (20 kHz)	–999.9	__________	–90.0 dBrA	☐	☐
Channel B (20 kHz)	–999.9	__________	–90.0 dBrB	☐	☐

OPTION "BUR" RELATED

Burst OFF Ratio Accuracy, Step 27	Low Limit		High Limit	PASS	FAIL
0 dB	–0.300	__________	+0.300 dB	☐	☐
–10 dB	–10.300	__________	–9.700 dB	☐	☐
–20 dB	–20.300	__________	–19.700 dB	☐	☐
–40 dB	–40.300	__________	–39.700 dB	☐	☐
–60 dB	–60.300	__________	–59.700 dB	☐	☐
Squarewave Amplitude Accuracy, Step 28					
1.000 V (100 Hz)	1.3859	__________	1.4425 Vrms	☐	☐

OPTION "IMD" RELATED

Generator IMD Amplitude Accuracy, Step 29					
SMPTE 4:1 Signal (60/7k)	0.8081	__________	0.8411 Vrms	☐	☐
SMPTE 1:1 Signal (60/7k)	0.6930	__________	0.7212 Vrms	☐	☐
DFD/CCIF Signal (15k/15.08k)	0.6859	__________	0.7283 Vrms	☐	☐
DIM Signal (DIM-100)	1.1150	__________	1.1605 Vrms	☐	☐
SMPTE LF Tone Accuracy, Step 30					
40 Hz	39.40	__________	40.60 Hz	☐	☐
50 Hz	49.25	__________	50.75 Hz	☐	☐
60 Hz	59.10	__________	60.90 Hz	☐	☐
70 Hz	68.95	__________	71.05 Hz	☐	☐
100 Hz	98.50	__________	101.50 Hz	☐	☐
125 Hz	123.13	__________	126.88 Hz	☐	☐
250 Hz	246.25	__________	253.75 Hz	☐	☐
500 Hz	492.50	__________	507.50 Hz	☐	☐
DIM Squarewave Accuracy, Step 31					
DIM-B (2.96 kHz)	2.9304	__________	2.9896 kHz	☐	☐
DIM-100 (3.15 kHz)	3.1185	__________	3.1815 kHz	☐	☐
IMD Measurement Accuracy, Step 32					
SMPTE	–60.500	__________	–59.500 dB	☐	☐
DFD/CCIF	–60.500	__________	–59.500 dB	☐	☐
DIM, u4 component	–60.700	__________	–59.300 dB	☐	☐
DIM, u5 component	–60.700	__________	–59.300 dB	☐	☐
Residual IMD, Step 33					
Channel A					
SMPTE (60/7k, 4:1), 26.66 V bal	0.00000	__________	0.00150 %	☐	☐
SMPTE (60/7k, 4:1), 1.00 V bal	0.00000	__________	0.00150 %	☐	☐
SMPTE (60/7k, 4:1), 200 mV bal	0.00000	__________	0.00150 %	☐	☐
DFD (14k/15k), 26.66 V bal	0.00000	__________	0.00020 %	☐	☐
DFD (14k/15k), 1.00 V bal	0.00000	__________	0.00020 %	☐	☐
DFD (14k/15k), 200 mV bal	0.00000	__________	0.00020 %	☐	☐
DIM (DIM-100), 26.66 V bal	0.00000	__________	0.00200 %	☐	☐
DIM (DIM-100), 1.00 V bal	0.00000	__________	0.00200 %	☐	☐
DIM (DIM-100), 200 mV bal	0.00000	__________	0.00200 %	☐	☐

	Low Limit		High Limit	PASS	FAIL
Channel B					
SMPTE (60/7k, 4:1), 26.66 V bal	0.00000	________	0.00150 %	☐	☐
SMPTE (60/7k, 4:1), 1.00 V bal	0.00000	________	0.00150 %	☐	☐
SMPTE (60/7k, 4:1), 200 mV bal	0.00000	________	0.00150 %	☐	☐
DFD (14k/15k), 26.66 V bal	0.00000	________	0.00020 %	☐	☐
DFD (14k/15k), 1.00 V bal	0.00000	________	0.00020 %	☐	☐
DFD (14k/15k), 200 mV bal	0.00000	________	0.00020 %	☐	☐
DIM (DIM-100), 26.66 V bal	0.00000	________	0.00200 %	☐	☐
DIM (DIM-100), 1.00 V bal	0.00000	________	0.00200 %	☐	☐
DIM (DIM-100), 200 mV bal	0.00000	________	0.00200 %	☐	☐

OPTION “W&F” RELATED

Wow and Flutter Accuracy, Step 34

IEC detection	0.9500	________	1.0500 %	☐	☐
NAB/JIS detection	0.6718	________	0.7425 %	☐	☐

Residual Wow and Flutter, Step 35

IEC, weighted	0.00000	________	0.00100 %	☐	☐
IEC, unweighted	0.00000	________	0.00200 %	☐	☐
NAB, weighted	0.00000	________	0.00100 %	☐	☐
NAB, unweighted	0.00000	________	0.00200 %	☐	☐
Scrape (12.5 kHz test tone)	0.00000	________	0.00500 %	☐	☐

OPTION “S-AES17” RELATED

S-AES17 Option Response, Step 36

20 kHz Pre-Analyzer Filter					
1 kHz	–0.100	________	+0.100 dBrA	☐	☐
15 kHz	–0.100	________	+0.100 dBrA	☐	☐
20 kHz	–0.100	________	+0.100 dBrA	☐	☐
25 kHz	–4.000	________	–2.000 dBrA	☐	☐
40 kHz Pre-Analyzer Filter					
1 kHz	–0.100	________	+0.100 dBrA	☐	☐
30 kHz	–0.100	________	+0.100 dBrA	☐	☐
40 kHz	–0.100	________	+0.100 dBrA	☐	☐
50 kHz	–4.000	________	–2.000 dBrA	☐	☐
“20 kHz AES17” Mode					
20 Hz	–0.100	________	+0.100 dBrB	☐	☐
10 kHz	–0.100	________	+0.100 dBrB	☐	☐
15 kHz	–0.100	________	+0.100 dBrB	☐	☐
20 kHz	–0.100	________	+0.100 dBrB	☐	☐
24 kHz	–999	________	–60.0 dBrB	☐	☐
27 kHz	–999	________	–60.0 dBrB	☐	☐
200 kHz	–999	________	–60.0 dBrB	☐	☐

	Low Limit		High Limit	PASS	FAIL
"40 kHz AES17" Mode					
20 Hz	–0.100	________	+0.100 dBrB	☐	☐
20 kHz	–0.100	________	+0.100 dBrB	☐	☐
30 kHz	–0.100	________	+0.100 dBrB	☐	☐
40 kHz	–0.100	________	+0.100 dBrB	☐	☐
48 kHz	–999	________	–60.0 dBrB	☐	☐
54 kHz	–999	________	–60.0 dBrB	☐	☐
200 kHz	–999	________	–60.0 dBrB	☐	☐

S-AES17 Option Residual THD+N, Step 37

	Low Limit		High Limit	PASS	FAIL
"20 kHz AES17" mode					
8 Vrms	0.00000	________	0.00040 %	☐	☐
50 mVrms	0.00000	________	0.00200 %	☐	☐
"40 kHz AES17" mode					
8 Vrms	0.00000	________	0.00050 %	☐	☐
50 mVrms	0.00000	________	0.00280 %	☐	☐

OPTION "OPT-2020" RELATED

OPT-2020 Option Response, Step 36a

	Low Limit		High Limit	PASS	FAIL
"20 kHz AES17" Mode					
20 Hz	–0.100	________	+0.100 dBrB	☐	☐
10 kHz	–0.100	________	+0.100 dBrB	☐	☐
15 kHz	–0.100	________	+0.100 dBrB	☐	☐
20 kHz	–0.100	________	+0.100 dBrB	☐	☐
24 kHz	–999	________	–60.0 dBrB	☐	☐
27 kHz	–999	________	–60.0 dBrB	☐	☐
200 kHz	–999	________	–60.0 dBrB	☐	☐

OPT-2020 Option Residual THD+N, Step 37a

	Low Limit		High Limit	PASS	FAIL
"20 kHz AES17" mode					
8 Vrms	0.00000	________	0.00080 %	☐	☐
50 mVrms	0.00000	________	0.00200 %	☐	☐

AES/EBU GENERATOR & ANALYZER CHARACTERISTICS

SYS-2500 (192k) / SYS-2522 (192k)

Digital Output Amplitude Accuracy, Step 38	Low Limit		High Limit	PASS	FAIL
Connector I Balanced Output					
8.00 Vpp	7.20	__________	8.80 V	☐	☐
800 mVpp	640	__________	960 mV	☐	☐
Connector II Balanced Output					
8.00 Vpp	7.20	__________	8.80 V	☐	☐
800 mVpp	640	__________	960 mV	☐	☐
Connector I Unbalanced Output					
2.000 Vpp	1.840	__________	2.160 V	☐	☐
200 mVpp	164.0	__________	236.0 mV	☐	☐
Connector II Unbalanced Output					
2.000 Vpp	1.840	__________	2.160 V	☐	☐
200 mVpp	164.0	__________	236.0 mV	☐	☐
Voltage Measurement Accuracy, Step 39					
INPUT I (balanced)					
8.00 Vpp	7.60	__________	8.40 V	☐	☐
800 mVpp	735	__________	865 mV	☐	☐
INPUT II (balanced)					
8.00 Vpp	7.60	__________	8.40 V	☐	☐
800 mVpp	735	__________	865 mV	☐	☐
INPUT I (unbalanced)					
2.000 Vpp	1.900	__________	2.100 V	☐	☐
200 mVpp	184.0	__________	216.0 mV	☐	☐
INPUT II (unbalanced)					
2.000 Vpp	1.900	__________	2.100 V	☐	☐
200 mVpp	184.0	__________	216.0 mV	☐	☐
Variable Risetime, Step 40					
OUTPUT I					
25 ns	22.50	__________	27.50 ns	☐	☐
100 ns	90.00	__________	110.0 ns	☐	☐
OUTPUT Ii					
25 ns	22.50	__________	27.50 ns	☐	☐
100 ns	90.00	__________	110.0 ns	☐	☐
Normal Mode Noise Amplitude, Step 41					
OUTPUT I (unbalanced)					
500 mVpp	450.0	__________	550.0 mV	☐	☐
100 mVpp	75.0	__________	125.0 mV	☐	☐
OUTPUT II (unbalanced)					
500 mVpp	450.0	__________	550.0 mV	☐	☐
100 mVpp	75.0	__________	125.0 mV	☐	☐
Common Mode Sine Amplitude, Step 42					
OUTPUT I (balanced)					
20.00 Vpp	18.00	__________	22.00 V	☐	☐
1.200 Vpp	0.920	__________	1.480 V	☐	☐

	Low Limit		High Limit	PASS	FAIL
OUTPUT II (balanced)					
20.00 Vpp	18.00	________	22.00 V	☐	☐
1.200 Vpp	0.920	________	1.480 V	☐	☐

CM Voltage Measurement Accuracy, Step 43

INPUT I (balanced)					
20.00 Vpp	18.00	________	22.00 V	☐	☐
1.200 Vpp	1.030	________	1.370 V	☐	☐
INPUT iI (balanced)					
20.00 Vpp	18.00	________	22.00 V	☐	☐
1.200 Vpp	1.030	________	1.370 V	☐	☐

Jitter Accuracy, Step 44

Jitter Generator					
4.90 UI	4.45	________	5.35 UI	☐	☐
305 mUI	275	________	335 mUI	☐	☐
Jitter Analyzer, Average Detector					
305 mUI	275.0	________	335.0 mUI	☐	☐
Jitter Analyzer, Peak Detector					
305 mUI	275.0	________	335.0 mUI	☐	☐

Jitter Flatness, Step 45

100 Hz	–1.00	________	+1.00 dB	☐	☐
200 Hz	–1.00	________	+1.00 dB	☐	☐
1 kHz	–1.00	________	+1.00 dB	☐	☐
5 kHz	–1.00	________	+1.00 dB	☐	☐
20 kHz	–1.00	________	+1.00 dB	☐	☐
50 kHz	–1.00	________	+1.00 dB	☐	☐

Residual Jitter, Step 46

OUTPUT I					
48 kS, peak detection	0.000	________	1000 ps	☐	☐
96 kS, peak detection	0.000	________	1000 ps	☐	☐
192 kS, peak detection	0.000	________	1000 ps	☐	☐
OUTPUT II					
48 kS, peak detection	0.000	________	1000 ps	☐	☐
96 kS, peak detection	0.000	________	1000 ps	☐	☐
192 kS, peak detection	0.000	________	1000 ps	☐	☐

END OF CALIBRATION

System Two Calibration Report

SYS-2022 / SYS-2222 / SYS-2300 / SYS-2322

Calibration laboratory or equivalent facility:

(name) ____

(address) ____

____

____

Customer: ____ PO No. __________________________

Unit under test: (Model No.) ______________________________ (Serial No.) ______________________

Report Identifier ____________________________ consisting of 14 pages. Calibration Date:________________

The instrument as received ❑ was / ❑ was not functioning within specifications.

Procedure used: S2 Family Service Manual Calibration V1.00, System Two, pages 2-41 to 2-50.

Ambient temperature during calibration: ________ ° C.

Calibration equipment used:

Model	Description	Last Calibration Date	Calibration Due

This report shall not be reproduced except in full, without the written approval of the laboratory named above.

Calibration certified by (signature) ____________________________________

(print name) ____________________________________

(title) ____________________________________

System Two Calibration Report

SYS-2022 / SYS-2222 / SYS-2300 / SYS-2322

ANALOG GENERATOR CHARACTERISTICS

SYS-2022 / SYS-2222 / SYS-2322

Sine Frequency, Step 1	Low Limit		High Limit	PASS	FAIL
Fast Mode					
10.0 Hz	9.9500	__________	10.050 Hz	☐	☐
100 Hz	99.500	__________	100.500 Hz	☐	☐
1.00 kHz	0.9950	__________	1.0050 kHz	☐	☐
10.0 kHz	9.9500	__________	10.050 kHz	☐	☐
100 kHz	99.500	__________	100.50 kHz	☐	☐
200 kHz	199.000	__________	201.000 kHz	☐	☐
High-Accuracy Mode					
10 Hz	9.9970	__________	10.0030 Hz	☐	☐
100 Hz	99.970	__________	100.030 Hz	☐	☐
1.00 kHz	0.99970	__________	1.00030 kHz	☐	☐
10.0 kHz	9.9970	__________	10.0030 kHz	☐	☐
100 kHz	99.970	__________	100.030 kHz	☐	☐
200 kHz	199.940	__________	200.060 kHz	☐	☐
Sine (D/A) Frequency Accuracy, Step 2					
10.000 kHz	9999.970	__________	10000.030 Hz	☐	☐
Sine Amplitude Accuracy, Step 3					
Channel A					
10.00 V	9.9300	__________	10.070 Vrms	☐	☐
5.000 V	4.9650	__________	5.0350 Vrms	☐	☐
2.500 V	2.4830	__________	2.5170 Vrms	☐	☐
1.200 V	1.1920	__________	1.2080 Vrms	☐	☐
600 mV	595.80	__________	604.20 mVrms	☐	☐
300 mV	297.90	__________	302.10 mVrms	☐	☐
150 mV	149.00	__________	151.00 mVrms	☐	☐
80 mV	79.440	__________	80.560 mVrms	☐	☐
40 mV	39.720	__________	40.280 mVrms	☐	☐
20 mV	19.860	__________	20.140 mVrms	☐	☐
10 mV	9.9300	__________	10.070 mVrms	☐	☐
Channel B					
10.00 V	9.9300	__________	10.070 Vrms	☐	☐
5.000 V	4.9650	__________	5.0350 Vrms	☐	☐
2.500 V	2.4830	__________	2.5170 Vrms	☐	☐
1.200 V	1.1920	__________	1.2080 Vrms	☐	☐
600 mV	595.80	__________	604.20 mVrms	☐	☐
300 mV	297.90	__________	302.10 mVrms	☐	☐
150 mV	149.00	__________	151.00 mVrms	☐	☐
80 mV	79.440	__________	80.560 mVrms	☐	☐
40 mV	39.720	__________	40.280 mVrms	☐	☐
20 mV	19.860	__________	20.140 mVrms	☐	☐
10 mV	9.9300	__________	10.070 mVrms	☐	☐

Sine (D/A) Amplitude Accuracy, Step 4	Low Limit		High Limit	PASS	FAIL
Channel A	2.4830	________	2.5170 Vrms	☐	☐
Channel B	2.4830	________	2.5170 Vrms	☐	☐

Sine Flatness, Step 5

Channel A					
10 Hz	–0.010	________	+0.010 dB	☐	☐
20 Hz	–0.008	________	+0.008 dB	☐	☐
50 Hz	–0.008	________	+0.008 dB	☐	☐
10 kHz	–0.008	________	+0.008 dB	☐	☐
20 kHz	–0.008	________	+0.008 dB	☐	☐
50 kHz	–0.030	________	+0.030 dB	☐	☐
100 kHz	–0.100	________	+0.100 dB	☐	☐
200 kHz	–0.300	________	+0.200 dB	☐	☐
Channel B					
10 Hz	–0.010	________	+0.010 dB	☐	☐
20 Hz	–0.008	________	+0.008 dB	☐	☐
50 Hz	–0.008	________	+0.008 dB	☐	☐
10 kHz	–0.008	________	+0.008 dB	☐	☐
20 kHz	–0.008	________	+0.008 dB	☐	☐
50 kHz	–0.030	________	+0.030 dB	☐	☐
100 kHz	–0.100	________	+0.100 dB	☐	☐
200 kHz	–0.300	________	+0.200 dB	☐	☐

D/A Sine Flatness, Step 6

Channel A					
10 Hz	–0.030	________	+0.030 dB	☐	☐
20 Hz	–0.030	________	+0.030 dB	☐	☐
10 kHz	–0.030	________	+0.030 dB	☐	☐
18 kHz	–0.030	________	+0.030 dB	☐	☐
20 kHz	–0.150	________	+0.030 dB	☐	☐
Channel B					
10 Hz	–0.030	________	+0.030 dB	☐	☐
20 Hz	–0.030	________	+0.030 dB	☐	☐
10 kHz	–0.030	________	+0.030 dB	☐	☐
18 kHz	–0.030	________	+0.030 dB	☐	☐
20 kHz	–0.150	________	+0.030 dB	☐	☐

SineTHD+N, Step 7

Channel A					
Vout = 26.66 V bal, 22 kHz analyzer BW					
20 Hz	0.00000	________	0.00200 %	☐	☐
30 Hz	0.00000	________	0.00040 %	☐	☐
1 kHz	0.00000	________	0.00040 %	☐	☐
5 kHz	0.00000	________	0.00040 %	☐	☐
Vout = 26.66.00 V bal, 80 kHz analyzer BW					
1 kHz	0.00000	________	0.00060 %	☐	☐
20 kHz	0.00000	________	0.00060 %	☐	☐
Vout = 13.33 V bal, 500 kHz analyzer BW					
10 Hz	0.00000	________	0.00400 %	☐	☐
20 Hz	0.00000	________	0.00150 %	☐	☐
20 kHz	0.00000	________	0.00150 %	☐	☐
100 kHz	0.00000	________	0.00400 %	☐	☐

	Low Limit		High Limit	PASS	FAIL
Channel B					
Vout = 26.66 V bal, 22 kHz analyzer BW					
20 Hz	0.00000	______	0.00200 %	☐	☐
30 Hz	0.00000	______	0.00040 %	☐	☐
1 kHz	0.00000	______	0.00040 %	☐	☐
5 kHz	0.00000	______	0.00040 %	☐	☐
Vout = 26.66.00 V bal, 80 kHz analyzer BW					
1 kHz	0.00000	______	0.00060 %	☐	☐
20 kHz	0.00000	______	0.00060 %	☐	☐
Vout = 13.33 V bal, 500 kHz analyzer BW					
10 Hz	0.00000	______	0.00400 %	☐	☐
20 Hz	0.00000	______	0.00150 %	☐	☐
20 kHz	0.00000	______	0.00150 %	☐	☐
100 kHz	0.00000	______	0.00400 %	☐	☐

Sine D/A Residual THD+N, Step 8

	Low Limit		High Limit	PASS	FAIL
Channel A					
20 Hz	0.00000	______	0.00150 %	☐	☐
1 kHz	0.00000	______	0.00150 %	☐	☐
5 kHz	0.00000	______	0.00150 %	☐	☐
20 kHz	0.00000	______	0.00150 %	☐	☐
Channel B					
20 Hz	0.00000	______	0.00150 %	☐	☐
1 kHz	0.00000	______	0.00150 %	☐	☐
5 kHz	0.00000	______	0.00150 %	☐	☐
20 kHz	0.00000	______	0.00150 %	☐	☐

Output Crosstalk, Step 9

	Low Limit		High Limit	PASS	FAIL
Ch B into Ch A					
20 kHz	–999.9	______	–120.0 dB	☐	☐
100 kHz	–999.9	______	–106.0 dB	☐	☐
Ch A into Ch B					
20 kHz	–999.9	______	–120.0 dB	☐	☐
100 kHz	–999.9	______	–106.0 dB	☐	☐

Source Impedance Accuracy, Step 10

	Low Limit		High Limit	PASS	FAIL
Channel A					
40 Ω bal	39.00	______	41.00 Ω	☐	☐
150 (200) Ω bal	148.5	______	151.5 Ω	☐	☐
	(198.0)	______	(202.0) Ω	☐	☐
600 Ω bal (Opt EGZ)	597.0	______	603.0 Ω	☐	☐
20 Ω unbal	19.00	______	21.00 Ω	☐	☐
600 Ω unbal	597.0	______	603.0 Ω	☐	☐
Channel B					
40 Ω bal	39.00	______	41.00 Ω	☐	☐
150 (200) Ω bal	148.5	______	151.5 Ω	☐	☐
	(198.0)	______	(202.0) Ω	☐	☐
600 Ω bal (Opt EGZ)	597.0	______	603.0 Ω	☐	☐
20 Ω unbal	19.00	______	21.00 Ω	☐	☐
600 Ω unbal	597.0	______	603.0 Ω	☐	☐

ANALOG ANALYZER CHARACTERISTICS

Input Termination Accuracy, Step 11	Low Limit		High Limit	PASS	FAIL
Channel A					
600 Ω	594.0	________	606.0 Ω	☐	☐
300 Ω	297.0	________	303.0 Ω	☐	☐
Channel B					
600 Ω	594.0	________	606.0 Ω	☐	☐
300 Ω	297.0	________	303.0 Ω	☐	☐
Input Common Mode Rejection, Step 12					
Channel A					
2.5 V range, 10 Hz	–999.9	________	–80.0 dBgA	☐	☐
2.5 V range, 1 kHz	–999.9	________	–80.0 dBgA	☐	☐
2.5 V range, 20 kHz	–999.9	________	–80.0 dBgA	☐	☐
10 V range, 1 kHz	–999.9	________	–65.0 dBgA	☐	☐
10 V range, 20 kHz	–999.9	________	–65.0 dBgA	☐	☐
40 V range, 1 kHz	–999.9	________	–50.0 dBgA	☐	☐
160 V range, 1 kHz	–999.9	________	–50.0 dBgA	☐	☐
Channel B					
2.5 V range, 10 Hz	–999.9	________	–80.0 dBgB	☐	☐
2.5 V range, 1 kHz	–999.9	________	–80.0 dBgB	☐	☐
2.5 V range, 20 kHz	–999.9	________	–80.0 dBgB	☐	☐
10 V range, 1 kHz	–999.9	________	–65.0 dBgB	☐	☐
10 V range, 20 kHz	–999.9	________	–65.0 dBgB	☐	☐
40 V range, 1 kHz	–999.9	________	–50.0 dBgB	☐	☐
160 V range, 1 kHz	–999.9	________	–50.0 dBgB	☐	☐
Input Residual Crosstalk, Step 13					
Ch B into Ch A					
20 kHz	–999.9	________	–140.0 dB	☐	☐
100 kHz	–999.9	________	–126.0 dB	☐	☐
Ch A into Ch B					
20 kHz	–999.9	________	–140.0 dB	☐	☐
100 kHz	–999.9	________	–126.0 dB	☐	☐
Level Meter Accuracy, Step 14					
Channel A					
120.00 Vrms (160 V range)	119.4	________	120.6 V	☐	☐
60.00 Vrms (80 V range)	59.70	________	60.30 V	☐	☐
30.00 Vrms (40 V range)	29.85	________	30.15 V	☐	☐
16.00 Vrms (20 V range)	15.92	________	16.08 V	☐	☐
8.000 Vrms (10 V range)	7.960	________	8.040 V	☐	☐
4.000 Vrms (5 V range)	3.980	________	4.020 V	☐	☐
2.000 Vrms (2.5 V range)	1.990	________	2.010 V	☐	☐
1.000 Vrms (1.2 V range)	0.995	________	1.005 V	☐	☐
500 mVrms (600 mV range)	497.5	________	502.5 mV	☐	☐
240 mVrms (300 mV range)	238.8	________	241.2 mV	☐	☐
120 mVrms (160 mV range)	119.4	________	120.6 mV	☐	☐
60 mVrms (80 mV range)	59.70	________	60.30 mV	☐	☐
30 mVrms (40 mV range)	29.85	________	30.15 mV	☐	☐
5.0 mVrms (40 mV range)	4.975	________	5.025 mV	☐	☐

	Low Limit		High Limit	PASS	FAIL
Channel B					
120.00 Vrms (160 V range)	119.4	__________	120.6 V	☐	☐
60.00 Vrms (80 V range)	59.70	__________	60.30 V	☐	☐
30.00 Vrms (40 V range)	29.85	__________	30.15 V	☐	☐
16.00 Vrms (20 V range)	15.92	__________	16.08 V	☐	☐
8.000 Vrms (10 V range)	7.960	__________	8.040 V	☐	☐
4.000 Vrms (5 V range)	3.980	__________	4.020 V	☐	☐
2.000 Vrms (2.5 V range)	1.990	__________	2.010 V	☐	☐
1.000 Vrms (1.2 V range)	0.995	__________	1.005 V	☐	☐
500 mVrms (600 mV range)	497.5	__________	502.5 mV	☐	☐
240 mVrms (300 mV range)	238.8	__________	241.2 mV	☐	☐
120 mVrms (160 mV range)	119.4	__________	120.6 mV	☐	☐
60 mVrms (80 mV range)	59.70	__________	60.30 mV	☐	☐
30 mVrms (40 mV range)	29.85	__________	30.15 mV	☐	☐
5.0 mVrms (40 mV range)	4.975	__________	5.025 mV	☐	☐

Level Meter Flatness, Step 15

	Low Limit		High Limit	PASS	FAIL
Channel A					
10 Hz	–0.100	__________	+0.100 dBrA	☐	☐
15 Hz	–0.030	__________	+0.030 dBrA	☐	☐
20 Hz	–0.008	__________	+0.008 dBrA	☐	☐
50 Hz	–0.008	__________	+0.008 dBrA	☐	☐
20 kHz	–0.008	__________	+0.008 dBrA	☐	☐
50 kHz	–0.030	__________	+0.030 dBrA	☐	☐
100 kHz	–0.100	__________	+0.100 dBrA	☐	☐
500 kHz	–0.500	__________	+0.200 dBrA	☐	☐
Channel B					
10 Hz	–0.100	__________	+0.100 dBrB	☐	☐
15 Hz	–0.030	__________	+0.030 dBrB	☐	☐
20 Hz	–0.008	__________	+0.008 dBrB	☐	☐
50 Hz	–0.008	__________	+0.008 dBrB	☐	☐
20 kHz	–0.008	__________	+0.008 dBrB	☐	☐
50 kHz	–0.030	__________	+0.030 dBrB	☐	☐
100 kHz	–0.100	__________	+0.100 dBrB	☐	☐
500 kHz	–0.500	__________	+0.200 dBrB	☐	☐

Amplitude Meter Accuracy, Step 16

	Low Limit		High Limit	PASS	FAIL
Channel A (2.5 V input range)					
2.000 Vrms	1.980	__________	2.020 V	☐	☐
500 mVrms	495.0	__________	505.0 mV	☐	☐
120 mVrms	118.8	__________	121.2 mV	☐	☐
30 mVrms	29.70	__________	30.30 mV	☐	☐
8.0 mVrms	7.920	__________	8.080 mV	☐	☐
2.0 mVrms	1.980	__________	2.020 mV	☐	☐
Channel B (2.5 V input range)					
2.000 Vrms	1.980	__________	2.020 V	☐	☐
500 mVrms	495.0	__________	505.0 mV	☐	☐
120 mVrms	118.8	__________	121.2 mV	☐	☐
30 mVrms	29.70	__________	30.30 mV	☐	☐
8.0 mVrms	7.920	__________	8.080 mV	☐	☐
2.0 mVrms	1.980	__________	2.020 mV	☐	☐

Amplitude Meter Flatness, Step 17	Low Limit		High Limit	PASS	FAIL
2.000 Vrms					
15 Hz	–0.050	________	+0.050 dBrA	☐	☐
20 Hz	–0.020	________	+0.020 dBrA	☐	☐
20 kHz	–0.020	________	+0.020 dBrA	☐	☐
50 kHz	–0.050	________	+0.050 dBrA	☐	☐
100 kHz	–0.150	________	+0.150 dBrA	☐	☐
200 kHz	–0.300	________	+0.200 dBrA	☐	☐
120 mVrms					
15 Hz	–0.050	________	+0.050 dBrA	☐	☐
20 Hz	–0.020	________	+0.020 dBrA	☐	☐
20 kHz	–0.020	________	+0.020 dBrA	☐	☐
50 kHz	–0.050	________	+0.050 dBrA	☐	☐
100 kHz	–0.150	________	+0.150 dBrA	☐	☐
200 kHz	–0.300	________	+0.200 dBrA	☐	☐
8 mVrms					
15 Hz	–0.050	________	+0.050 dBrA	☐	☐
20 Hz	–0.020	________	+0.020 dBrA	☐	☐
20 kHz	–0.020	________	+0.020 dBrA	☐	☐
50 kHz	–0.050	________	+0.050 dBrA	☐	☐
100 kHz	–0.150	________	+0.150 dBrA	☐	☐
200 kHz	–0.300	________	+0.200 dBrA	☐	☐

Bandreject & THD+N Accuracy, Step 18					
20 Hz notch					
40 Hz	–0.300	________	+0.300 dBV	☐	☐
60 Hz	–0.300	________	+0.300 dBV	☐	☐
20 kHz	–0.300	________	+0.300 dBV	☐	☐
120 kHz	–0.300	________	+0.300 dBV	☐	☐
1 kHz notch					
20 Hz	–0.300	________	+0.300 dBV	☐	☐
500 Hz	–0.300	________	+0.300 dBV	☐	☐
2.0 kHz	–0.300	________	+0.300 dBV	☐	☐
3.0 kHz	–0.300	________	+0.300 dBV	☐	☐
20 kHz	–0.300	________	+0.300 dBV	☐	☐
120 kHz	–0.300	________	+0.300 dBV	☐	☐
20 kHz notch					
20 Hz	–0.300	________	+0.300 dBV	☐	☐
10 kHz	–0.300	________	+0.300 dBV	☐	☐
40 kHz	–0.300	________	+0.300 dBV	☐	☐
60 kHz	–0.300	________	+0.300 dBV	☐	☐
120 kHz	–0.300	________	+0.300 dBV	☐	☐
100 kHz notch					
20 Hz	–0.300	________	+0.300 dBV	☐	☐
20 kHz	–0.300	________	+0.300 dBV	☐	☐
50 kHz	–0.300	________	+0.300 dBV	☐	☐

Bandpass Accuracy, Step 19					
20 Hz					
19.60 Hz bandpass	–0.300	________	+0.300 dBV	☐	☐
20.00 Hz bandpass	–0.300	________	+0.300 dBV	☐	☐
20.40 Hz bandpass	–0.300	________	+0.300 dBV	☐	☐
1 kHz					
0.980 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
1.000 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
1.020 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐

	Low Limit		High Limit	PASS	FAIL
20 kHz					
19.60 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
20.00 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
20.40 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
100 kHz					
98.0 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
100.0 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐
102.0 kHz bandpass	–0.300	________	+0.300 dBV	☐	☐

Bandwidth Limiting Filters, Step 20

22 Hz Highpass					
22.4 Hz	–6.000	________	–0.000 dBrA	☐	☐
31.5 Hz	–0.500	________	+0.500 dBrA	☐	☐
50 Hz	–0.500	________	+0.500 dBrA	☐	☐
100 Hz Highpass					
95 Hz	–999.9	________	–3.000 dBrA	☐	☐
105 Hz	–3.000	________	–0.000 dBrA	☐	☐
400 Hz Highpass					
380 Hz	–999.9	________	–3.000 dBrA	☐	☐
420 Hz	–3.000	________	–0.000 dBrA	☐	☐
22 kHz Lowpass					
5 kHz	–0.500	________	+0.500 dBrA	☐	☐
16 kHz	–0.500	________	+0.500 dBrA	☐	☐
22.4 kHz	–6.000	________	–0.000 dBrA	☐	☐
30 kHz Lowpass					
28.5 kHz	–3.000	________	–0.000 dBrA	☐	☐
31.5 kHz	–999.9	________	–3.000 dBrA	☐	☐
80 kHz Lowpass					
76.0 kHz	–3.000	________	–0.000 dBrA	☐	☐
84.0 kHz	–999.9	________	–3.000 dBrA	☐	☐

Residual Noise, Step 21

Channel A					
22–22 kHz bandwidth	0.000	________	1.000 μV	☐	☐
10–80 kHz bandwidth	0.000	________	2.000 μV	☐	☐
Full bandwidth	0.00	________	6.00 μV	☐	☐
5 kHz bandpass	0.000	________	0.250 μV	☐	☐
20 kHz bandpass	0.000	________	0.500 μV	☐	☐
200 kHz bandpass	0.000	________	1.500 μV	☐	☐
Channel B					
22–22 kHz bandwidth	0.000	________	1.000 μV	☐	☐
10–80 kHz bandwidth	0.000	________	2.000 μV	☐	☐
Full bandwidth	0.00	________	6.00 μV	☐	☐
5 kHz bandpass	0.000	________	0.250 μV	☐	☐
20 kHz bandpass	0.000	________	0.500 μV	☐	☐
200 kHz bandpass	0.000	________	1.500 μV	☐	☐

Residual THD+N, Step 22	Low Limit		High Limit	PASS	FAIL
Channel A					
Vin = 1.50 V, 22 kHz analyzer BW					
20 Hz	0.00000	___________	0.00040 %	☐	☐
1 kHz	0.00000	___________	0.00040 %	☐	☐
5 kHz	0.00000	___________	0.00040 %	☐	☐
20 kHz	0.00000	___________	0.00040 %	☐	☐
Vin = 1.50 V, 80 kHz analyzer BW					
1 kHz	0.00000	___________	0.00060 %	☐	☐
20 kHz	0.00000	___________	0.00060 %	☐	☐
Vin = 1.50 V, 500 kHz analyzer BW					
1 kHz	0.00000	___________	0.00150 %	☐	☐
20 kHz	0.00000	___________	0.00150 %	☐	☐
50 kHz	0.00000	___________	0.00400 %	☐	☐
100 kHz	0.00000	___________	0.00400 %	☐	☐
Channel B					
Vin = 1.50 V, 22 kHz analyzer BW					
20 Hz	0.00000	___________	0.00040 %	☐	☐
1 kHz	0.00000	___________	0.00040 %	☐	☐
5 kHz	0.00000	___________	0.00040 %	☐	☐
20 kHz	0.00000	___________	0.00040 %	☐	☐
Vin = 1.50 V, 80 kHz analyzer BW					
1 kHz	0.00000	___________	0.00060 %	☐	☐
20 kHz	0.00000	___________	0.00060 %	☐	☐
Vin = 1.50 V, 500 kHz analyzer BW					
1 kHz	0.00000	___________	0.00150 %	☐	☐
20 kHz	0.00000	___________	0.00150 %	☐	☐
50 kHz	0.00000	___________	0.00400 %	☐	☐
100 kHz	0.00000	___________	0.00400 %	☐	☐
Phase Measurement Accuracy, Step 23					
10 Hz, dc coupled	–0.50	___________	+0.50 deg	☐	☐
10 Hz, ac coupled	–0.50	___________	+0.50 deg	☐	☐
1 kHz	–0.50	___________	+0.50 deg	☐	☐
5 kHz	–0.50	___________	+0.50 deg	☐	☐
20 kHz	–1.00	___________	+1.00 deg	☐	☐
50 kHz	–2.00	___________	+2.00 deg	☐	☐
Frequency Measurement Accuracy, Step 24					
20 kHz	–6.0	___________	+6.0 PPM	☐	☐
	(±30 PPM is allowed for Model SYS-2022)				
High Resolution A/D Residual Distortion, Step 25					
Channel A (5 kHz)	–999.9	___________	–100.0 dBrA	☐	☐
Channel B (5 kHz)	–999.9	___________	–100.0 dBrB	☐	☐
High Bandwidth A/D Residual Distortion, Step 26					
Channel A (20 kHz)	–999.9	___________	–85.0 dBrA	☐	☐
Channel B (20 kHz)	–999.9	___________	–85.0 dBrB	☐	☐

OPTION “BUR” RELATED

Burst OFF Ratio Accuracy, Step 27	Low Limit		High Limit	PASS	FAIL
0 dB	–0.300	________	+0.300 dB	☐	☐
–10 dB	–10.300	________	–9.700 dB	☐	☐
–20 dB	–20.300	________	–19.700 dB	☐	☐
–40 dB	–40.300	________	–39.700 dB	☐	☐
–60 dB	–60.300	________	–59.700 dB	☐	☐
Squarewave Amplitude Accuracy, Step 28					
1.000 V (100 Hz)	1.3859	________	1.4425 Vrms	☐	☐

OPTION “IMD” RELATED

Generator IMD Amplitude Accuracy, Step 29					
SMPTE 4:1 Signal (60/7k)	0.8081	________	0.8411 Vrms	☐	☐
SMPTE 1:1 Signal (60/7k)	0.6930	________	0.7212 Vrms	☐	☐
DFD/CCIF Signal (15k/15.08k)	0.6859	________	0.7283 Vrms	☐	☐
DIM Signal (DIM-100)	1.1150	________	1.1605 Vrms	☐	☐
SMPTE LF Tone Accuracy, Step 30					
40 Hz	39.40	________	40.60 Hz	☐	☐
50 Hz	49.25	________	50.75 Hz	☐	☐
60 Hz	59.10	________	60.90 Hz	☐	☐
70 Hz	68.95	________	71.05 Hz	☐	☐
100 Hz	98.50	________	101.50 Hz	☐	☐
125 Hz	123.13	________	126.88 Hz	☐	☐
250 Hz	246.25	________	253.75 Hz	☐	☐
500 Hz	492.50	________	507.50 Hz	☐	☐
DIM Squarewave Accuracy, Step 31					
DIM-B (2.96 kHz)	2.9304	________	2.9896 kHz	☐	☐
DIM-100 (3.15 kHz)	3.1185	________	3.1815 kHz	☐	☐
IMD Measurement Accuracy, Step 32					
SMPTE	–60.500	________	–59.500 dB	☐	☐
DFD/CCIF	–60.500	________	–59.500 dB	☐	☐
DIM, u4 component	–60.700	________	–59.300 dB	☐	☐
DIM, u5 component	–60.700	________	–59.300 dB	☐	☐
Residual IMD, Step 33					
Channel A					
SMPTE (60/7k, 4:1), 26.66 V bal	0.00000	________	0.00150 %	☐	☐
SMPTE (60/7k, 4:1), 1.00 V bal	0.00000	________	0.00150 %	☐	☐
SMPTE (60/7k, 4:1), 200 mV bal	0.00000	________	0.00150 %	☐	☐
DFD (14k/15k), 26.66 V bal	0.00000	________	0.00020 %	☐	☐
DFD (14k/15k), 1.00 V bal	0.00000	________	0.00020 %	☐	☐
DFD (14k/15k), 200 mV bal	0.00000	________	0.00020 %	☐	☐
DIM (DIM-100), 26.66 V bal	0.00000	________	0.00200 %	☐	☐
DIM (DIM-100), 1.00 V bal	0.00000	________	0.00200 %	☐	☐
DIM (DIM-100), 200 mV bal	0.00000	________	0.00200 %	☐	☐

	Low Limit		High Limit	PASS	FAIL
Channel B					
SMPTE (60/7k, 4:1), 26.66 V bal	0.00000	__________	0.00150 %	☐	☐
SMPTE (60/7k, 4:1), 1.00 V bal	0.00000	__________	0.00150 %	☐	☐
SMPTE (60/7k, 4:1), 200 mV bal	0.00000	__________	0.00150 %	☐	☐
DFD (14k/15k), 26.66 V bal	0.00000	__________	0.00020 %	☐	☐
DFD (14k/15k), 1.00 V bal	0.00000	__________	0.00020 %	☐	☐
DFD (14k/15k), 200 mV bal	0.00000	__________	0.00020 %	☐	☐
DIM (DIM-100), 26.66 V bal	0.00000	__________	0.00200 %	☐	☐
DIM (DIM-100), 1.00 V bal	0.00000	__________	0.00200 %	☐	☐
DIM (DIM-100), 200 mV bal	0.00000	__________	0.00200 %	☐	☐

OPTION “W&F” RELATED

Wow and Flutter Accuracy, Step 34

IEC detection	0.9500	__________	1.0500 %	☐	☐
NAB/JIS detection	0.6718	__________	0.7425 %	☐	☐

Residual Wow and Flutter, Step 35

IEC, weighted	0.00000	__________	0.00100 %	☐	☐
IEC, unweighted	0.00000	__________	0.00200 %	☐	☐
NAB, weighted	0.00000	__________	0.00100 %	☐	☐
NAB, unweighted	0.00000	__________	0.00200 %	☐	☐
Scrape (12.5 kHz test tone)	0.00000	__________	0.00500 %	☐	☐

OPTION “S-AES17” RELATED

S-AES17 Option Response, Step 36

20 kHz Pre-Analyzer Filter					
1 kHz	–0.100	__________	+0.100 dBrA	☐	☐
15 kHz	–0.100	__________	+0.100 dBrA	☐	☐
20 kHz	–0.100	__________	+0.100 dBrA	☐	☐
25 kHz	–4.000	__________	–2.000 dBrA	☐	☐
40 kHz Pre-Analyzer Filter					
1 kHz	–0.100	__________	+0.100 dBrA	☐	☐
30 kHz	–0.100	__________	+0.100 dBrA	☐	☐
40 kHz	–0.100	__________	+0.100 dBrA	☐	☐
50 kHz	–4.000	__________	–2.000 dBrA	☐	☐
“20 kHz AES17” Mode					
20 Hz	–0.100	__________	+0.100 dBrB	☐	☐
10 kHz	–0.100	__________	+0.100 dBrB	☐	☐
15 kHz	–0.100	__________	+0.100 dBrB	☐	☐
20 kHz	–0.100	__________	+0.100 dBrB	☐	☐
24 kHz	–999	__________	–60.0 dBrB	☐	☐
27 kHz	–999	__________	–60.0 dBrB	☐	☐
200 kHz	–999	__________	–60.0 dBrB	☐	☐

	Low Limit		High Limit	PASS	FAIL
"40 kHz AES17" Mode					
20 Hz	–0.100	__________	+0.100 dBrB	☐	☐
20 kHz	–0.100	__________	+0.100 dBrB	☐	☐
30 kHz	–0.100	__________	+0.100 dBrB	☐	☐
40 kHz	–0.100	__________	+0.100 dBrB	☐	☐
48 kHz	–999	__________	–60.0 dBrB	☐	☐
54 kHz	–999	__________	–60.0 dBrB	☐	☐
200 kHz	–999	__________	–60.0 dBrB	☐	☐

S-AES17 Option Residual THD+N, Step 37

"20 kHz AES17" mode					
8 Vrms	0.00000	__________	0.00040 %	☐	☐
50 mVrms	0.00000	__________	0.00200 %	☐	☐
"40 kHz AES17" mode					
8 Vrms	0.00000	__________	0.00050 %	☐	☐
50 mVrms	0.00000	__________	0.00280 %	☐	☐

OPTION "OPT-2020" RELATED

OPT-2020 Option Response, Step 36a

"20 kHz AES17" Mode					
20 Hz	–0.100	__________	+0.100 dBrB	☐	☐
10 kHz	–0.100	__________	+0.100 dBrB	☐	☐
15 kHz	–0.100	__________	+0.100 dBrB	☐	☐
20 kHz	–0.100	__________	+0.100 dBrB	☐	☐
24 kHz	–999	__________	–60.0 dBrB	☐	☐
27 kHz	–999	__________	–60.0 dBrB	☐	☐
200 kHz	–999	__________	–60.0 dBrB	☐	☐

OPT-2020 Option Residual THD+N, Step 37a

"20 kHz AES17" mode					
8 Vrms	0.00000	__________	0.00080 %	☐	☐
50 mVrms	0.00000	__________	0.00200 %	☐	☐

AES/EBU GENERATOR & ANALYZER CHARACTERISTICS

SYS-2300 / SYS-2322

Digital Output Amplitude Accuracy, Step 38	Low Limit		High Limit	PASS	FAIL
Balanced Output					
8.00 Vpp	7.20	________	8.80 V	☐	☐
800 mVpp	640	________	960 mV	☐	☐
Unbalanced Output					
2.000 Vpp	1.840	________	2.160 V	☐	☐
200 mVpp	168.0	________	232.0 mV	☐	☐
Voltage Measurement Accuracy, Step 39					
Balanced Input					
8.00 Vpp	7.60	________	8.40 V	☐	☐
800 mVpp	710	________	890 mV	☐	☐
Unbalanced Input					
2.000 Vpp	1.900	________	2.100 V	☐	☐
200 mVpp	178.0	________	222.0 mV	☐	☐
Variable Risetime, Step 40					
25 ns	20.00	________	30.00 ns	☐	☐
100 ns	80.00	________	120.0 ns	☐	☐
Normal Mode Noise Amplitude, Step 41					
500 mVpp, unbalanced	450.0	________	550.0 mV	☐	☐
100 mVpp, unbalanced	75.0	________	125.0 mV	☐	☐
Common Mode Sine Amplitude, Step 42					
20.00 Vpp	18.00	________	22.00 V	☐	☐
1.200 Vpp	1.000	________	1.400 V	☐	☐
CM Voltage Measurement Accuracy, Step 43					
20.00 Vpp	18.00	________	22.00 V	☐	☐
1.200 Vpp	0.900	________	1.500 V	☐	☐
Jitter Accuracy, Step 44					
Jitter Generator					
4.90 UI	4.45	________	5.35 UI	☐	☐
305 mUI	275	________	335 mUI	☐	☐
Jitter Analyzer, Average Detector					
305 mUI	275.0	________	335.0 mUI	☐	☐
Jitter Analyzer, Peak Detector					
305 mUI	275.0	________	335.0 mUI	☐	☐
Jitter Flatness, Step 45					
100 Hz	–1.00	________	+1.00 dB	☐	☐
200 Hz	–1.00	________	+1.00 dB	☐	☐
1 kHz	–1.00	________	+1.00 dB	☐	☐
5 kHz	–1.00	________	+1.00 dB	☐	☐
20 kHz	–1.00	________	+1.00 dB	☐	☐

Residual Jitter, Step 46	Low Limit		High Limit	PASS	FAIL
Average Detection					
120 Hz to 100 kHz BW	0.000	__________	0.0175 UI	☐	☐
1200 Hz to 100 kHz BW	0.000	__________	0.0035 UI	☐	☐
Peak Detection					
120 Hz to 100 kHz BW	0.000	__________	0.0450 UI	☐	☐
1200 Hz to 100 kHz BW	0.000	__________	0.0150 UI	☐	☐

END OF CALIBRATION