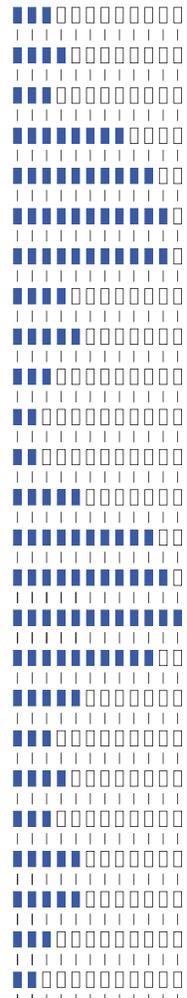


DIGITAL 31 BAND REAL TIME ANALYZER

Owners Manual

D-1500 Real Time
Analysis System



Safety Instructions/Consignes de sécurité/Sicherheitsvorkehrungen/Instrucciones de seguridad



WARNING: To reduce the risk of fire or electric shock, do not expose this unit to rain or moisture. To reduce the hazard of electrical shock, do not remove cover or back. No user serviceable parts inside. Please refer all servicing to qualified personnel. The lightning flash with an arrowhead symbol within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the products enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons. The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

Important Safety Instructions

1. Please read all instructions before operating the unit.
2. Keep these instructions for future reference.
3. Please heed all safety warnings.
4. Follow manufacturers instructions.
5. Do not use this unit near water or moisture.
6. Clean only with a damp cloth.
7. Do not block any of the ventilation openings. Install in accordance with the manufacturers instructions.
8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or third prong is provided for your safety. When the provided plug does not fit your outlet, consult an electrician for replacement of the obsolete outlet.
10. Protect the power cord from being walked on and pinched particularly at plugs, convenience receptacles and at the point at which they exit from the unit.
11. Unplug this unit during lightning storms or when unused for long periods of time.
12. Refer all servicing to qualified personnel. Servicing is required when the unit has been damaged in any way, such as power supply cord or plug damage, or if liquid has been spilled or objects have fallen into the unit, the unit has been exposed to rain or moisture, does not operate normally, or has been dropped.

ATTENTION: Pour éviter tout risque d'électrocution ou d'incendie, ne pas exposer cet appareil à la pluie ou à l'humidité. Pour éviter tout risque d'électrocution, ne pas ôter le couvercle ou le dos du boîtier. Cet appareil ne contient aucune pièce remplaçable par l'utilisateur. Confiez toutes les réparations à un personnel qualifié. Le signe avec un éclair dans un triangle prévient l'utilisateur de la présence d'une tension dangereuse et non isolée dans l'appareil. Cette tension constitue un risque d'électrocution. Le signe avec un point d'exclamation dans un triangle prévient l'utilisateur d'instructions importantes relatives à l'utilisation et à la maintenance du produit.

Consignes de sécurité importantes

1. Veuillez lire toutes les instructions avant d'utiliser l'appareil.
2. Conserver ces instructions pour toute lecture ultérieure.
3. Lisez avec attention toutes les consignes de sécurité.
4. Suivez les instructions du fabricant.
5. Ne pas utiliser cet appareil près d'une source liquide ou dans un lieu humide.
6. Nettoyez l'appareil uniquement avec un tissu humide.
7. Veillez à ne pas obstruer les fentes prévues pour la ventilation de l'appareil. Installez l'appareil selon les instructions du fabricant.
8. Ne pas installer près d'une source de chaleur (radiateurs, etc.) ou de tout équipement susceptible de générer de la chaleur (amplificateurs de puissance par exemple).
9. Ne pas retirer la terre du cordon secteur ou de la prise murale. Les fiches canadiennes avec polarisation (avec une lame plus large) ne doivent pas être modifiées. Si votre prise murale ne correspond pas au modèle fourni, consultez votre électricien.
10. Protégez le cordon secteur contre tous les dommages possibles (pincement, tension, torsion, etc.). Veillez à ce que le cordon secteur soit libre, en particulier à sa sortie du boîtier.
11. Déconnectez l'appareil du secteur en présence d'orage ou lors de périodes d'inutilisation prolongées.
12. Consultez un service de réparation qualifié pour tout dysfonctionnement (dommage sur le cordon secteur, baisse de performances, exposition à la pluie, projection liquide dans l'appareil, introduction d'un objet dans le boîtier, etc.).

ACHTUNG: Um die Gefahr eines Brandes oder Stromschlags zu verringern, sollten Sie dieses Gerät weder Regen noch Feuchtigkeit aussetzen. Um die Gefahr eines Stromschlags zu verringern, sollten Sie weder Deckel noch Rückwand des Geräts entfernen. Im Innern befinden sich keine Teile, die vom Anwender gewartet werden können. Überlassen Sie die Wartung qualifiziertem Fachpersonal. Der Blitz mit Pfeilspitze im gleichseitigen Dreieck soll den Anwender vor nichtisolierter "gefährlicher Spannung" im Geräterinnen warnen. Diese Spannung kann so hoch sein, dass die Gefahr eines Stromschlags besteht. Das Ausrufezeichen im gleichseitigen Dreieck soll den Anwender auf wichtige Bedienungs- und Wartungsanleitungen aufmerksam machen, die im mitgelieferten Informationsmaterial näher beschrieben werden.

Wichtige Sicherheitsvorkehrungen

1. Lesen Sie alle Anleitungen, bevor Sie das Gerät in Betrieb nehmen.
2. Bewahren Sie diese Anleitungen für den späteren Gebrauch gut auf.
3. Bitte treffen Sie alle beschriebenen Sicherheitsvorkehrungen.
4. Befolgen Sie die Anleitungen des Herstellers.
5. Benutzen Sie das Gerät nicht in der Nähe von Wasser oder Feuchtigkeit.
6. Verwenden Sie zur Reinigung des Geräts nur ein feuchtes Tuch.
7. Blockieren Sie keine Belüftungsöffnungen. Nehmen Sie den Einbau des Geräts nur entsprechend den Anweisungen des Herstellers vor.
8. Bauen Sie das Gerät nicht in der Nähe von Wärmequellen wie Heizkörpern, Wärmeclappen, Öfen oder anderen Geräten (inklusive Verstärkern) ein, die Hitze erzeugen.
9. Setzen Sie die Sicherheitsfunktion des polarisierten oder geerdeten Steckers nicht außer Kraft. Ein polarisierter Stecker hat zwei flache, unterschiedlich breite Pole. Ein geerdeter Stecker hat zwei flache Pole und einen dritten Erdungsstift. Der breitere Pol oder der dritte Stift dient Ihrer Sicherheit. Wenn der vorhandene Stecker nicht in Ihre Steckdose passt, lassen Sie die veraltete Steckdose von einem Elektriker ersetzen.
10. Schützen Sie das Netzkabel dahingehend, dass niemand darüber laufen und es nicht geknickt werden kann. Achten Sie hierbei besonders auf Netzstecker, Mehrfachsteckdosen und den Kabelanschluss am Gerät.
11. Ziehen Sie den Netzstecker des Geräts bei Gewittern oder längeren Betriebspausen aus der Steckdose.
12. Überlassen Sie die Wartung qualifiziertem Fachpersonal. Eine Wartung ist notwendig, wenn das Gerät auf irgendeine Weise, beispielsweise am Kabel oder Netzstecker beschädigt wurde, oder wenn Flüssigkeiten oder Objekte in das Gerät gelangt sind, es Regen oder Feuchtigkeit ausgesetzt war, nicht mehr wie gewohnt betrieben werden kann oder fallen gelassen wurde.

PRECAUCION: Para reducir el riesgo de incendios o descargas, no permita que este aparato quede expuesto a la lluvia o la humedad. Para reducir el riesgo de descarga eléctrica, nunca quite la tapa ni el chasis. Dentro del aparato no hay piezas susceptibles de ser reparadas por el usuario. Dirija cualquier reparación al servicio técnico oficial. El símbolo del relámpago dentro del triángulo equilátero pretende advertir al usuario de la presencia de "voltajes peligrosos" no aislados dentro de la carcasa del producto, que pueden ser de la magnitud suficiente como para constituir un riesgo de descarga eléctrica a las personas. El símbolo de exclamación dentro del triángulo equilátero quiere advertirle de la existencia de importantes instrucciones de manejo y mantenimiento (reparaciones) en los documentos que se adjuntan con este aparato.

Instrucciones importantes de seguridad

1. Lea todo este manual de instrucciones antes de comenzar a usar la unidad.
2. Conserve estas instrucciones para cualquier consulta en el futuro.
3. Cumpla con todo lo indicado en las precauciones de seguridad.
4. Observe y siga todas las instrucciones del fabricante.
5. Nunca utilice este aparato cerca del agua o en lugares húmedos.
6. Limpie este aparato solo con un trapo suave y ligeramente humedecido.
7. No bloquee ninguna de las aberturas de ventilación. Instale este aparato de acuerdo a las instrucciones del fabricante.
8. No instale este aparato cerca de fuentes de calor como radiadores, calentadores, hornos u otros aparatos (incluyendo amplificadores) que produzcan calor.
9. No anule el sistema de seguridad del enchufe de tipo polarizado o con toma de tierra. Un enchufe polarizado tiene dos bornes, uno más ancho que el otro. Uno con toma de tierra tiene dos bornes normales y un tercero para la conexión a tierra. El borne ancho o el tercero se incluyen como medida de seguridad. Cuando el enchufe no encaje en su salida de corriente, llame a un electricista para que le cambie su salida anticuada.
10. Evite que el cable de corriente quede en una posición en la que pueda ser pisado o aplastado, especialmente en los enchufes, receptáculos y en el punto en el que salen de la unidad.
11. Desconecte de la corriente este aparato durante las tormentas eléctricas o cuando no lo vaya a usar durante un periodo de tiempo largo.
12. Dirija cualquier posible reparación solo al servicio técnico oficial. Deberá hacer que su aparato sea reparado cuando esté dañado de alguna forma, como si el cable de corriente o el enchufe están dañados, o si se han derramado líquidos o se ha introducido algún objeto dentro de la unidad, si esta ha quedado expuesta a la lluvia o la humedad, si no funciona normalmente o si ha caído al suelo.

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Introduction

Congratulations on purchasing the Samson D1500 dual channel, 1/3 Octave, Digital Real Time Analyzer! Although this product is designed for easy operation, we suggest you take some time out first to go through these pages so you can fully understand how we've implemented a number of unique features. If you don't know what kind of acoustic environment you are dealing with, even the best equipment can provide sound lacking in detail and presence. That's where the D1500 Real Time Analyzer comes in. The D1500 is a powerful and accurate audio measurement device with 31-bands of real time frequency analysis and Auto EQ correction. What would once take you hours to do, can now be performed in minutes. And the result, your audio system is set to a true, sonically flat frequency response, or to your own custom pre-set response curve that you've stored in the D1500's internal memory. This process is simplified with the D1500 thanks to its large LED display, (which is extremely easy to read in any live sound setting) simple user interface and powerful equalization correction algorithms. In addition to the RTA, the D1500 includes a Phase correlation meter, VU level meter, and a Signal Generator capable of producing White or Pink Noise as well as a tunable Sine Wave. The D1500 includes a balanced microphone input, with phantom power, that will work with just about any test measurement microphones, although we recommend a microphone with an extended and linear frequency response such as Samson's MM01 measurement microphone. The D1500 features standard MIDI implementation and Samson's D-Net, enabling device-to-device linking for creating larger audio systems, for interfacing to a personal computer. When linking the units you see the full power of the D-class system. With a basic MIDI connection, you can have the D1500 RTA display the fader positions of the D-2500 digital EQ, giving you the power of digital processing with a unique analog feel. For systems using many D class units, the D1500 can be fitted with the DN1 D-Net network card. Samson's D Net is a high-speed communication protocol for connected multiple D class units, like the D2500 digital equalizer or D3500 feedback management system. In addition to being 10 times faster than MIDI, the error rate is so close to zero, it's difficult to measure. All settings and parameters can be stored in any of the 99 user-preset locations providing instant recall of your favorite setups. Like all D class models, the D1500 features an advanced 32-bit point floating processor DSP interface to high quality converters with 24-bit audio resolution and sample rates up to 96kHz for pristine audio quality. You can even upgrade your D class units to premium Analog-to-Digital and Digital-to-Analog I/O (Input/Output) converter boards, keeping your D class system up to date with the best technology, and sound, far onto the future.

In this manual, you'll find a detailed description of the features of the D1500, as well as a guided tour through the front and rear panels, step-by-step instructions for using the unit and suggested applications for analyzing response curves of systems using digital or analog equalizers.

You'll also find a warranty card enclosed—please don't forget to fill it out and mail it so that you can receive online technical support and so we can send you updated information about other Samson products in the future. Also, be sure to check out our website (<http://www.samsontech.com>) for complete information about our full product line.

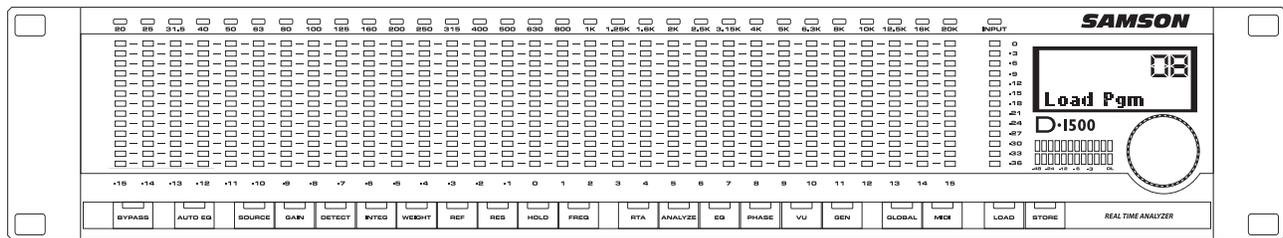
With proper care and adequate air circulation, your D1500 will operate trouble free for many years. We recommend you record your serial number in the space provided below for future reference.

Serial number: _____

Date of purchase: _____

Should your unit ever require servicing, a Return Authorization number (RA) must be obtained before shipping your unit to Samson. Without this number, the unit will not be accepted. Please call Samson at 1-800-3SAMSON (1-800-372-6766) for a Return Authorization number prior to shipping your unit. Please retain the original packing materials and if possible, return the unit in the original carton and packing materials.

D1500 Features

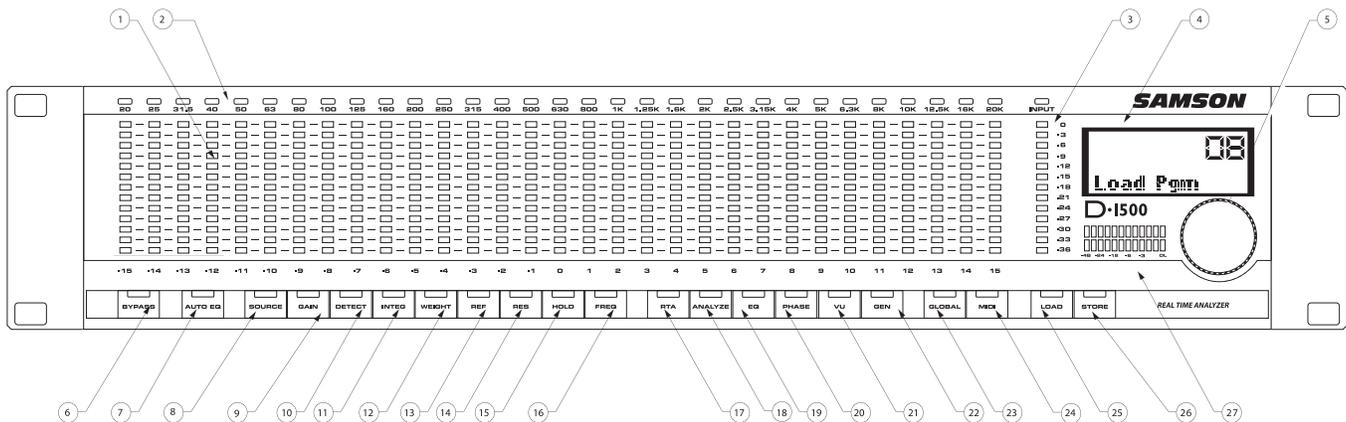


The Samson D1500 Digital Real Time Analyzer uses high quality audio converters along with state of the art 32-bit floating point DSP running powerful digital measurement algorithms to provide a powerful solution for a variety of audio measurement applications. Here are some of the main features:

- 31-band, multi-parameter, Digital Real Time Analyzer accurately measures the frequency response of any sound system.
- Large frequency LED display plus custom, back-lit Liquid Crystal Display for easy readability in any live sound environment.
- The RTA has adjustable meter Resolution that lets you zoom in and out on your measurement, and adjustable Frequency range for RTA allowing you to make tighter measurements.
- On-board Phase Correlation meter.
- The D1500's display can be converted to a large VU Level meter that simultaneously displays both Peak and VU levels.
- A comprehensive Signal Generator capable of producing White and Pink Noise, as well as a tunable Sine Wave can be used to flatten a system with a standard analog equalizer, or automatically with the D2500 digital equalizer.
- RTA mode lets you see the frequency response of your system in real time.
- EQ mode configures the LED Meters to display the fader positions of up to 15 connected D 2500 Digital Equalizers.
- Pristine audio quality thanks to the high quality Analog-to-Digital and Digital-to-Analog I/O audio converter boards with 24-bit resolution and sample rates up to 96kHz.
- XLR Balanced Microphone Input with phantom power for connecting a measurement microphone.
- Configure larger systems using multiple D class units which communicate over standard MIDI, or with Samson's optional high-speed D-Net interface card.
- A steel and aluminum chassis makes the D1500 eminently road-worthy.
- Three year extended warranty.

Controls and Functions

Front Panel Layout



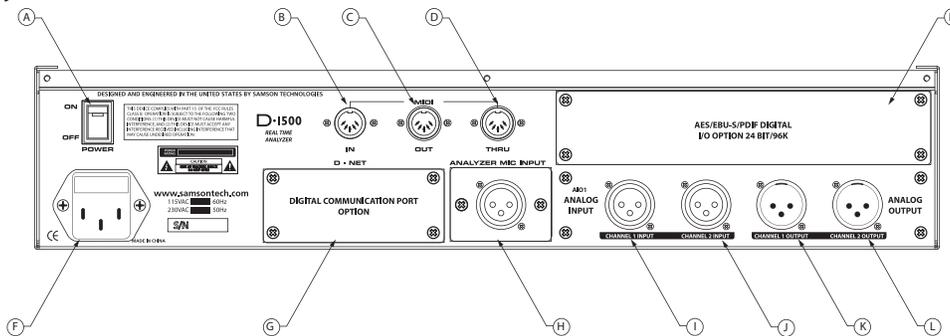
- 1 **LED METER** – 13-segment LED fader for each frequency band, which can be software set for the centers frequency and resolution.
- 2 **FREQUENCY LED** – Red LED indicating the frequency that is displayed in the LCD display.
- 3 **MASTER LED METER** -13-segment LED display for displaying the main level.
- 4 **LCD DISPLAY** – Backlit display that shows the various parameters under control by the operating system.
- 5 **DATA WHEEL** – Rotary encoder for entering parameter values.
- 6 **BYPASS** – When the red LED is on, the signal present at the Inputs will be sent directly to the Outputs defeating any DSP processing.
- 7 **AUTO EQ** – Used to engage the automatic room equalization feature when connected to a D2500 equalizer.
- 8 **SOURCE** – Assigns the input of the RTA for either the Left, Right, or Left and Right input to the LED Display.
- 9 **GAIN** – This parameter is used to manage the operating or reference level for the various function modes.
- 10 **DETECT** – Selects the RTA to operate with either RMS (average) or PEAK detection.
- 11 **INTER (INTEGRATION)**– Used in conjunction with DETECT to adjust the RTA meter’s response time from 15, 65, 250, 1000, 5,000 or 20,000 milliseconds.
- 12 **WEIGHT**– Used to set an input filter curve with either A, B, C or D weighted filters available.
- 13 **REF (REFERENCE)** - Selects the display scale of “DIG,” “+4u,” “-10V,” for digital maximum, +4 dBu and -10 dBV.
- 14 **RES (RESOLUTION)** -Selects the resolution of the LED meters, which can be set to operate in a range of 0.5, 1.0, 2.0, 3.0, or 6dB.
- 15 **HOLD**- When set to ON the top LED on each band will remain illuminated to assure that maximum level can be recognized, and when AUTO is selected the top LED stays lit then gradually falls.
- 16 **FREQ (FREQUENCY)** -This parameter is used to set the operating frequency for the various function modes.
- 17 **RTA** – When pressed, engages the LED lights indicating that the unit is operating as a Real Time Analyzer.
- 18 **ANALYZE**– When engaged, the LED and the snapshot of the frequency response is held on the LED display.

Controls and Functions

- 19 EQ** – When selected, the unit is ready to display the equalization curve from any connected Samson Digital EQ.
- 20 PHASE**– When pressed in, the LED switch lights indicating the operating mode is set to Phase meter.
- 21 VU** – When engaged, the LED switch lights indicating the operating mode is set to VU meter displaying both PEAK and Average levels.
- 22 GEN (GENERATE)** – Press this button and the LED will light indicating the Generator mode is selected, making the Pink Noise and Sine wave generators ready for operation.

- 23 GLOBAL** – When engaged, the red LED will illuminate indicating that the unit is in GLOBAL mode, and that the operating system parameters are under control and displayed in the LCD window.
- 24 MIDI switch** - This switch is used to page through the MIDI parameters. When selected, the red LED will illuminate and the MIDI parameters will be displayed in the LCD window.
- 25 LOAD switch** – Used to load one of the 100 programs from the internal memory.
- 26 STORE switch** - Used to store up to 99 programs into the internal memory.
- 27 Main Level Meter** - Twelve segment LED meter displays the input level.

Rear Panel Layout



- A POWER SWITCH** – When set to the ON position, the D1500 is powered up and ready for operation.
- B MIDI IN DIN connector** – The D1500 receives standard, or system exclusive, MIDI data here.
- C MIDI OUT DIN connector** - The D1500 transmits standard, or system exclusive, MIDI data here.
- D MIDI THRU DIN connector** - The D1500 passes standard, or system exclusive, MIDI data here.
- E I/O Accessory Blank Panel** – Removable blanking panel accesses option bay for adding additional Analog-to-Digital or Digital Input/Output boards.
- F AC input fuseholder** - Connect the supplied heavy gauge 3-pin “IEC” power cable here.
- G D-NET Accessory Blank Panel** – removable blanking panel accesses option bay for adding the DNET interface card for controlling multiple D class units.
- H ANALYZER MIC INPUT** - Balanced XLR microphone input with phanom power.
- I CH1 Balanced XLR jack input** - Electronically balanced XLR jack input.
- J CH2 Balanced XLR jack input** - Electronically balanced XLR jack input.
- K CH1 Balanced XLR jack output** - Electronically balanced XLR jack output.
- L CH2 Balanced XLR jack output**- Electronically balanced XLR jack output.

D1500 Quick Start

Using the D1500 as an RTA.

This section will take you through a quick set-up using the D1500 as a real time frequency analyzer.

First, remove all packing materials (save them in case of need for future service) and decide where the unit is to be physically placed—it can be used free-standing or mounted in a standard 19" rack.

Before you move ahead, you should become familiar with the various control switch sections. The D1500 front panel switches are set up in groups related to the function or parts of the operating system they control. Some switches are placed individually, since they are dedicated to a single function, and other switches, are arranged in groups since their functionality is related. The D1500 function switch sections are arranged on the front panel as follows:

BY PASS
AUTO EQ
PARAMETERS
NAVIGATION
GLOBAL
MIDI
LOAD and STORE

In this quick start example, we'll take you through the BYPASS and GLOBAL sections, as well as the NAVIGATION and PARAMETER sections. AUTO EQ, MIDI and the LOAD and STORE switches and functions will be covered in detail later on in this manual.

You should know this!

Several of the modes that are controlled by the Navigation switches, have a number of parameters associated that can be adjusted for finer control. Each of these parameters will be explained in detail later on in this manual, however you should know that you can see these parameters by holding the mode switch for 2 seconds. For example, if you press and hold the RTA switch for 2 seconds, you will see all the LED's on the parameter switches light. That indicates that all these parameters can be adjusted in the RTA mode. If you press and hold the EQ switch for two seconds, no parameter switches LED's light, indicating there are no adjustable parameters.

You should know this too !

Many of the D1500 control buttons are capable of accessing more than one parameter, so as you press the switch, you will page through the available parameters. For example, the GLOBAL switch will toggle

between the parameters Input selection and Mic Gain. You can edit the parameters of any of these functions by using the large Data Wheel located by the main LCD display.

GLOBAL

The GLOBAL control allows you to set up the various system parameters including selecting the input/output and control for the measurement microphone input.

The Global Switch Has Two Clicks!

Click	Menu Function	Value
1	Inp. Input	Opt 1, Opt 2, Mic
2	MG. Mic Gain	0 to + 60dB

Selecting the Input

The D1500 accepts inputs from any of the installed I/O boards including the optional DIO1 Digital I/O or AIO2, I/O board with premium analog-to-digital and digital-to-analog converters. You can load any combination of these I/O boards in each of the Option 1 or Option 2 card slots. You can also select the input from a connected measurement microphone here. To access the input follow these steps:

- Press the GLOBAL control switch once or twice until you see the: Inp
- Use the Data Wheel to select OPT 1, OPT 2 or MIC.



NOTE: Once you make an edit to the Global set-up, the red GLOBAL LED will flash indicating that a change has been made to the original set-up. You will also see that the red STORE LED is illuminated.

- To keep the new changes, press STORE again to confirm the change to be saved and you will exit the GLOBAL mode and both the STORE and GLOBAL the LED's will turn off.

Using the Microphone Input

You can use the D1500 as an "in-line device" using the rear panel XLR balanced inputs and outputs, but for many RTA applications, you will want to use a measurement, (test), microphone to analyze the response, phase or level of a sound system. A measurement microphone is a special microphone (usually a condenser microphone), designed to pick-up sound with an extended frequency range, linear or flat response, and a natural sound. A perfect choice for this is the Samson MM01 Measurement Microphone. For a quick set up for using a measurement microphone with the D1500, follow these steps.

- Press the RTA switch located in the Navigation section so the amber LED lights.



- Plug the measurement microphone into the MIC INPUT located on the D1500 rear panel.

Note: The D1500's microphone input includes phantom power, which is always on, for operating condenser microphones.

- To set the D1500 for microphone input, press the GLOBAL switch until you see the menu: Inp. xxx.
- Now, use the Data Wheel to select MIC. You know the input is set to mic when the LCD menu reads: Inp. MIC. Press STORE.



- Depending on the type of sound system you are measuring you will want to position the microphone approximately 5-10 feet from the speaker system.
- Once the mic is in place, play your program music through your speaker system.

- Next, set the MIC GAIN by pressing the GLOBAL switch until you see the menu: MG. 0 dB.
- While the music is playing, you should see the input level from the measurement microphone reading on the VU meter located under the LCD display. If not, use the Data Wheel to adjust the gain from 0dB through +60 dB.



- To keep the new change, press STORE to confirm the change to be saved and you will exit the GLOBAL mode and both the STORE and GLOBAL LED's will turn off.
- The VU meter should deflect about half way. If not, repeat the above steps until it does.

Operating the D1500

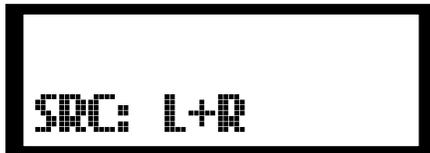
Adjusting the RTA parameters

Before you get started using the RTA function, press and hold the RTA switch for about two seconds and take notice of the parameters that can be adjusted while using the RTA. You'll notice that the SOURCE, GAIN, DETECT, INTEG, WEIGHT, REF, RES, HOLD and FREQ are all illuminated indicating that the parameters can be edited.

SOURCE

The D1500 can analyze an audio signal from its Left and Right inputs or from the Mic input when connected to a measurement microphone. The SOURCE switch allows you to select one of the three input configurations; LEFT, RIGHT, or LEFT + RIGHT. If you want to measure a mono signal from either the LEFT or RIGHT inputs select LEFT or RIGHT respectively.

If you want to measure the response curve from a stereo source select LEFT + RIGHT.



For measuring room response using a test microphone select MIC from the Global menu as described in section "Selecting the input" on the previous page.

Note: The D1500 can also analyze a digital audio signal when fitted with the optional DIO1 digital input and output interface card.

GAIN

The GAIN control is used to set the reference point of the RTA display. You can slide the scale of the RTA display using the GAIN. Once you confirm that you have set the correct operating level for your line or mic input (using the GLOBAL set up and the main input meter), you can adjust the GAIN so the RTA response is in a good range with most of the readings averaging halfway up the display. The D1500's GAIN

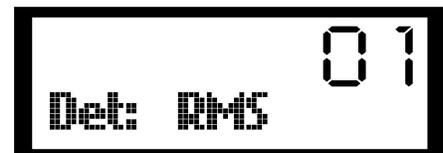
control offers a wide range of control covering from 0 dB to 120 dB. Press the GAIN switch and use the Data Wheel to adjust the level either up or down .



DETECT

The D1500 RTA can respond using both PEAK and RMS detection. The detection algorithm determines the speed, or ballistics at which the RTA reacts to the incoming signal. When set to PEAK the RTA will respond quickly to the absolute highest level. When RMS is selected, the RTA uses *root mean square* averaging which will cause the meters to react slower. To set the detection mode, press the DETECT switch and use the Data Wheel to select either PEAK or RMS.

INTEG – INTEGRATION



The speed at which the D1500 LED meters respond can be adjusted using the INTEGRATION parameter. The INTEGRATION time can be set in a range from 15 milliseconds, all the way to 20 seconds.

WEIGHT



The D1500 lets you apply audio industry standard equalization curve filters to the input of the RTA. You can select A, B, C or D filter curves or NONE if you choose. To select the input filter curve, press the WEIGHT switch and use the DATA Wheel to select the desired filter curve.



Operating the D1500

REF - REFERENCE LEVEL

Sets the LCD display reference level for use with the ANALYZE mode.

RES - RESOLUTION

The D1500 RTA LED meter's can be software set to display different ranges of level using the RESOLUTION parameter. For many applications, you'll want to set the LED meters to operate with a resolution of 6dB, where each LED in the meter represents 6dB of change. For a fine look, you can set the resolution to .5 dB, where each LED represents .5 dB of change. To set the resolution, press the RES switch and use the Data Wheel to select 0.5dB, 1dB, 2dB, 3dB or 6dB per LED.

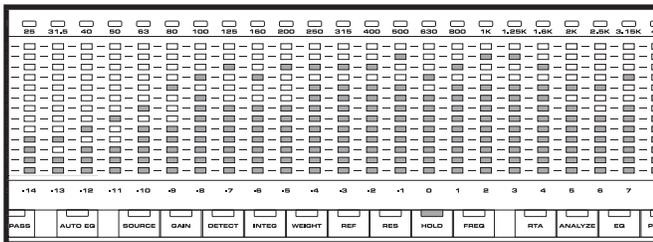


HOLD

The D1500 incorporates a HOLD feature that lets you monitor the maximum level of each band. The HOLD parameter has three modes OFF, ON, and AUTO. When set to HOLD is set to ON, the LED representing the highest level of each frequency band will stay lit so that frequency band's maximum level can be easily recognized. When HOLD is set to AUTO, the maximum level is frozen on the display, then it will fall down again very slowly. No peak LED is displayed when HOLD is set to OFF

FREQ - FREQUENCY

The D1500 is easy to use, and you can make precise audio measurements as you get deeper into the pow-



er of the unit. You can actually change the frequency range of the LED display allowing you to microscope down on certain frequencies. For example, you can set the FREQUENCY to be read at the standard 20 Hz to 20 kHz, or (for example) you can set the entire LED display to read from 1k to 1.6k dividing that range by 31 smaller bands.

Using the ANALYZE Mode

Before you get started using the ANALYZE mode, press and hold the ANALYZE switch for about two seconds and take notice of the parameters that can be adjusted while using the ANALYZE mode. You'll notice that the GAIN, RES, and HOLD are illuminated indicating that these parameters can be edited.

The ANALYZE mode lets you take a snap shot of the frequency response curve, at a particular instant in time, and freeze it into memory for a closer look. When using the ANALYZE mode, you can use the parameters GAIN, RESOLUTION and HOLD. These parameters will be set in the same values as they were set for RTA mode, however if you need to adjust them you can do so in ANALYZE mode by simply pressing the associated parameter switch.

- Select an input source from either the MIC or line inputs and play some program material through your sound system.
- With the microphone or line connected, press the RTA mode switch to get a reading.
- Now, at the place in the program material where you want to make your measurement, press ANALYZE to freeze the response curve.
- At this point, you can use the Data Wheel to scroll through the various frequency bands and get an exact reading on their levels, relative to the level set in the RTA mode.

Operating the D1500

Using the D1500's EQ Display

The D1500 can be used to display the equalization curve from 1, or up to 16, D2500 Digital Equalizers. The D class units communicate to each other using MIDI or Samson's D-Net communication protocol. Once you connect the MIDI or D net between the D1500 and D2500, you can monitor the D2500's eq curve on the D1500's large LED display. Press the EQ button. When you load in an EQ curve or move a fader on the D2500, you will see the corresponding position of each frequency band displayed on the D1500.

For a detailed explanation of connecting the D1500's MIDI and D-net to display the D2500 curve see page 14 in this manual.

Operating the PHASE meter

Before you get started using the PHASE METER, press and hold the PHASE switch for about two seconds and take notice of the parameters that can be adjusted while using the PHASE METER. You'll notice that only the WEIGHT is illuminated indicating that this parameter can be edited.

The D1500 includes a powerful meter for measuring phase response, which is accessed by pressing the PHASE switch. The Phase meter displays positive phase when the LED's to the right of center illuminate. The Phase meter displays negative phase when the LED's to the left of center light. The Phase meter is simple to use, just follow these steps.

- Apply a signal to the D1500's Left and Right input.
- Press the PHASE switch to select the D1500 to phase meter mode.

If the audio is *in-phase*, the Phase meter will read all the way to the right. When the D1500 measures an *out-of-phase* signal, the meter will read all the way to the left.

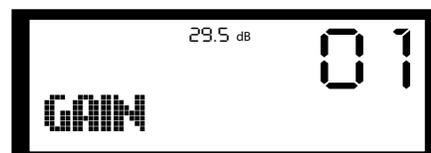
When the Phase switch is lit by itself, you can use the Data Wheel to scroll through and monitor Correlation, as well as Peak and RMS values. Correlation gives an indication of the degree to which the two signals are alike. Higher numbers indicate more difference between the two signals than lower ones.

- Press the WEIGHT switch to change to a weighted response curve.
- Once you set the response curve, if any, press the WEIGHT switch again to exit and go back to the Phase mode.

Using the D1500 as a VU Meter

The D1500 can be turned into a massive level meter measuring both PEAK and RMS levels simultaneously. The inside narrow meter shows the PEAK level and wide outside meter displays the RMS or average. If you press and hold the VU switch for two seconds, you'll see that the parameters GAIN, REF and RES can be adjusted when using the VU meter.

- Press the VU switch to select the D1500 to VU level meter mode.
- Set the proper operation reference level by pressing the REF switch and select 10dBV, +4 dBU or Digital Maximum.
- Now, press GAIN and adjust the the RTA's reference point from 0dB to 120dB. You can watch the response of the meter and use the Data Wheel to get the meter to respond in a good range.
- Press the RES switch to change the resolution 0.5, 1dB, 2dB, 3dB or 6dB per LED.



Using the D1500 as a Signal Generator

Before you get started using the Generator, press and hold the GEN switch for about two seconds and take notice of the parameters that can be adjusted while using the Generator. You'll notice that the SOURCE, GAIN, REF and FREQ are illuminated indicating that these parameters can be edited.

The D1500 is a sophisticated, lab quality, Signal Generator capable of producing PINK or WHITE noise, as well as a tunable Sine Wave. To access the D1500's Signal Generator press the GEN switch. When you press and hold the GEN switch you will see that the parameters SOURCE, GAIN, REF and FREQ are available for adjustment for the signal generator.

- Press the GEN switch to enable the Signal Generator.
- Select the proper operation reference level by pressing the REF switch and select -10 dBV, +4dBu or Digital Maximum.
- Next, select the signal you want to generate by pressing the SOURCE switch and selecting either WHITE, PINK or SINE WAVE.
- If you are using a SINE Wave, you can change the frequency by pressing the FREQ switch and using the Data Wheel to tune in the frequency you want.
- Now, adjust the level by pressing the GAIN switch and then using the Data Wheel to adjust the level from -98 dB to 22 dB when the Reference scale is set to -10 dBV, from +16 to -104 when the Reference scale is set to +4 dBu, and from -120 dB to 0 dB when the Reference scale is set to Digital Maximum.

Operating the D1500

Storing Programs in the D1500

The D1500 has 99 memory locations for storing user presets. You can save the equalization curve, as well as all the parameters for the routing and the onboard effects that may be active. Saving the preset is a simple procedure which is accomplished with the following easy steps.

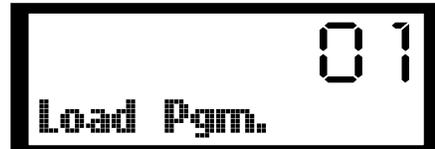
- Press the STORE button and the LED will begin to flash indicating that the D1500 is ready to store the current set-up into one of the 99 memory locations.
- Now, you need to decide if you want to save the set-up in the current memory location, or if you want to choose a new memory location. If you want to use the current location go on to the next step. If you want to choose a new memory location, use the Data Wheel to scroll through the 99 preset numbers until you reach the number you want to save under.
- Once you select the program number to save under, simply press the STORE button again and your set up is saved and can be easily recalled using the LOAD function.



Loading Programs in the D1500

You can load presets with stored set-ups, as well as all the parameters for the onboard display processors that may have been used. Loading a preset is a simple procedure, which is accomplished with the following easy steps.

- Press the LOAD button and the LED will begin to flash indicating that the D1500 is ready to load one of the 99 memory locations.



- Now, you need to decide if you want to load the set-up in the current memory location, or if you want to choose a preset saved in a different memory location. If you want to use the current location go on to the next step. If you want to choose a new memory location, use the Data Wheel to scroll through the 99 preset numbers until you reach the number you want to recall into memory.
- Once you select the program number to load, simply press the LOAD button again and your preset is loaded into memory.

Operating the D1500

MIDI and D Net

For expanded system control, the D1500 uses standard MIDI, as well as Samson's D-Net communication protocols, to transmit and receive digital control information to and from additional D class units, other MIDI devices, or personal computers. You can use standard MIDI cables for IN, OUT and THRU to configure a system using traditional MIDI protocol. For critical applications where high-speed communication is needed, you can install optional DN1, D net interface cards and use standard XLR cables to configure a high-speed, bi-directional data hook-up using Samson D-net protocol. The MIDI and D-Net control parameters are configured by accessing the various menus with the MIDI switch, located on the D1500's front panel in the lower left of the LCD.

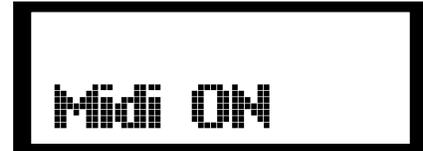
You can use MIDI for controlling one D2500 with a D1500, but in larger systems the D1500 and other D class units should be configured with an optional DN1 D-Net interface card for high-speed and bi-directional communications. For ease of use, D-Net follows a similar user interface as MIDI, but in reality they are very different. The beauty of the D-net interface is, not only is it 30 times faster than MIDI, but both send and receive are covered using a single standard XLR cable making it possible to daisy chain several D class units together without the needs for hubs or external mergers. Also, the super fast D-net bus is fast enough to easily communicate with an external PC for Real Time Analysis and display on an external monitor. Plus as an added bonus, the error rate on the D-net is virtually zero; guaranteeing reliable performance during critical applications.

When you press the MIDI switch repeatedly, you will be paging through the various MIDI setup menu items including MIDI enable, Channel, Omni, System Exclusive and Program. The following section details each of these modes and their associated parameters.

Setting the D1500 to Transmit and Receive MIDI

To enable the D1500 to send and receive MIDI data follow these steps:

- Press the MIDI switch until that LCD reads Midi:Off, or Midi On, or D net.
- Use the Data Wheel to select Midi: ON.



Setting the D1500 to Transmit and Receive Data Using D net

To enable the D1500 to send and receive D net data follow these steps:

- Press the MIDI switch until that LCD reads Midi: Off.
- Use the Data Wheel to select D NET
- Press STORE



Now that you have enabled the D1500 for MIDI or D Net, as described in the previous section, you can select additional MIDI parameters that may be necessary for your exact application or system set-up. The D1500's MIDI has three basic modes of operation Channel, Omni and System Exclusive. The D1500 can operate in any of these three MIDI modes.

One of the most used MIDI modes is Channel MIDI, which allows you to assign up to sixteen different devices to individual MIDI channels 1 through 16.

Selecting a MIDI Channel

You can program the D1500 to receive MIDI messages on a specific MIDI channel by following the next steps.

- Press the MIDI switch until that LCD reads M: Chn. 1.
- Press STORE



Operating the D1500

Selecting MIDI Omni mode

You can program the D1500 to receive MIDI messages in Omni mode by following the next steps.

- Press the MIDI switch until that LCD reads OMNI.
- Use the Data Wheel to select Omni ON.
- Press STORE



Selecting MIDI System Exclusive Mode

You can program the D1500 to receive or transmit MIDI System Exclusive messages. Program the D1500 for System Exclusive operation by following these simple steps.

- Press the MIDI switch until that LCD reads Sys Ex. Off: to access the MIDI System Exclusive menu.
- Now, select one of the transmit and receive modes.
- If you want the D1500 to transmit system exclusive messages, use the Data Wheel to select SysEx. Tr. Press STORE
- In order to set the D1500 to receive system exclusive messages, use the Data Wheel to select SysEx. Rc. Press STORE
- If you want the D1500 to receive and transmit system exclusive messages, use the Data Wheel to select SysEx. T + R. Press STORE



- Use the Data Wheel to select SysEx. OFF and the D1500 will not transmit or receive any system exclusive messages. Press STORE

Selecting MIDI Program Change

You can program the D1500 to receive or transmit MIDI Program messages. Program the D1500 for MIDI Program Change operation by following these simple steps.

- Press the MIDI switch until that LCD reads: PgmCh.
- Now, select one of the transmit and receive modes.
- If you want the D1500 to transmit system exclusive messages, use the Data Wheel to select: PgmCh.Tr.
- Press STORE

- In order to set the D1500 to receive system exclu-



sive messages, use the Data Wheel to select: PgmCh. Rc. Press STORE

- If you want the D1500 to receive and transmit MIDI Program Change, use the Data Wheel to select: PgmCh. T + R. Press STORE
- Use the Data Wheel to select: PgmCh. OFF and the D1500 will not transmit or receive any program change information. Press STORE

Operating the D1500 with the D2500 Digital EQ

Using the D1500 with the D2500

In order for the D1500 and D2500 to communicate with each other it is necessary to configure the MIDI parameters so that the units are communicating properly. Follow the steps below to configure the MIDI parameters for communication between one D1500 RTA and one D2500 Digital EQ. Let's start with the D1500:

- Press the MIDI switch until you get to the "MIDI" screen and use the DATA WHEEL to select "ON."

NOTE: You may notice the MIDI light flashing which is indicating that you are editing the MIDI set up.

- Now, press the MIDI again and set the MIDI CHANNEL number to "1".
- Press the MIDI switch once again and use the DATA WHEEL to set the "OMNI" mode to "OFF".
- Next, you need to configure the D1500 to transmit and receive MIDI System Exclusive messages, so press the MIDI switch again and use the DATA WHEEL to set the SysEx to select "T+R".
- Press the MIDI switch once again and use the DATA WHEEL to set the "Pgm Ch."(MIDI Program Change) to "OFF".
- Once you have all the parameters set, press the STORE button to save the changes to the MIDI set up.

- Now, Let's set up the D2500.
- Press the D2500's Global switch a few times until the display reads: F.R.
- Now, turn the Data Wheel until the display reads +/-12 dB.
- Press the D2500's Global switch a few times until the display reads: F.Bw.

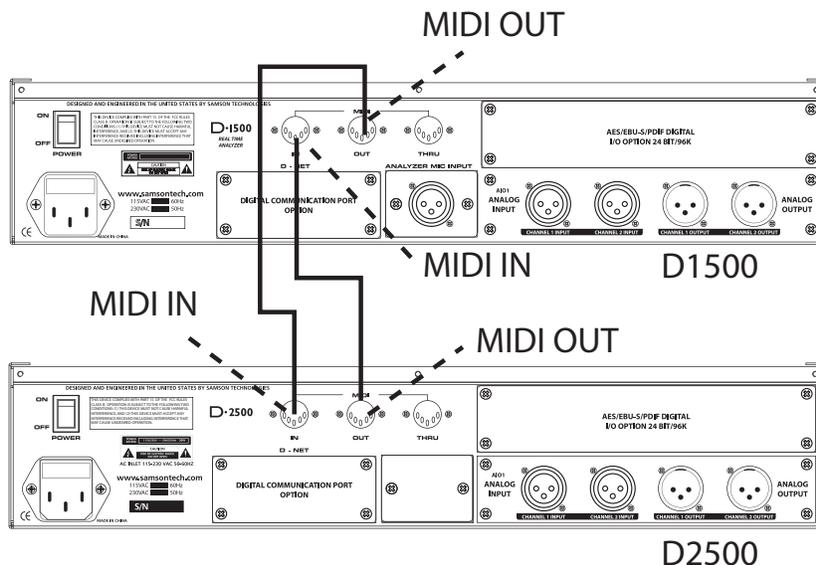
- Then, turn the Data Wheel until the display reads 1/3 Oct.

- Press STORE to confirm the Global changes.

- Press the MIDI switch until you get to the "MIDI" screen and use the DATA WHEEL to select "ON."

NOTE: You may notice the MIDI light flashing which is indicating that you are editing the MIDI set up.

- Now, press the MIDI again and set the MIDI CHANNEL number to "1".
- Press the MIDI switch once again and use the DATA WHEEL to set the "OMNI" mode to "OFF".
- Next, you need to configure the D1500 to transmit and receive MIDI System Exclusive messages, so press the MIDI switch again and use the DATA WHEEL to set the SysEx to select "T+R".
- Press the MIDI switch once again and use the DATA WHEEL to set the "Pgm Ch."(MIDI Program Change) to "OFF".
- Once you have all the parameters set, press the STORE button to save the changes to the MIDI set up.



The diagram above shows the MIDI connections for using a D1500 RTA with a D2500.

Operating the D1500 with the D2500 Digital EQ

Using the D1500's EQ Display

The D1500 can be used to display the equalization curve from 1, or up to 16, D2500 Digital Equalizers using the standard MIDI or optional D-Net interface.

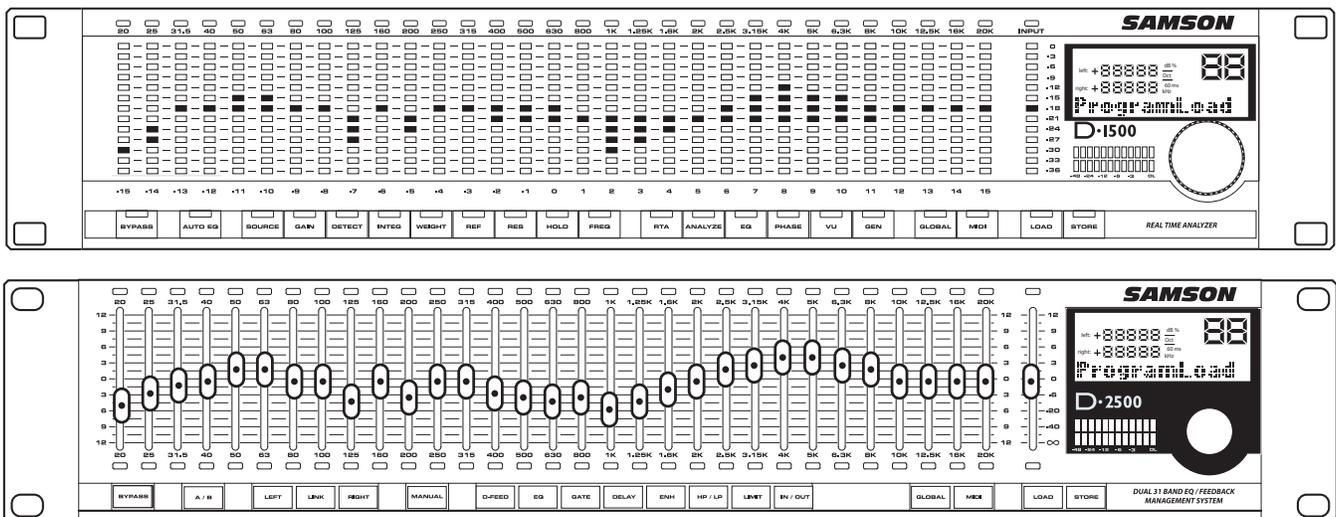
Before you get started using the EQ display feature, press and hold the EQ switch for about two seconds and take notice of the parameters that can be adjusted while using the Generator. You'll notice that the SOURCE and RES are illuminated indicating that these parameters can be edited.

- Connect the MIDI OUT of the D1500 to the MIDI IN of the D2500, and connect the MIDI OUT of the D2500 to the MIDI IN of the D1500.
- Now, press the D1500's EQ switch.

- Press RES and use the Data Wheel to select 2.0 dB, which will correspond to the D2500 provided that the Frequency Range (Global Menu) of the D2500 is set to the default +/- 12 dB setting.
- Press the SOURCE switch and choose the MIDI channel number that corresponds to the D2500 you want to display on the D1500. Since the D2500 is a stereo equalizer there is a left and right selection for each equalizer assigned to a MIDI channel, select CH 1L for the left side.

Note: *If MIDI OMNI ON is selected, the RTA will respond to the D2500 that has most recently been changed.*

- Now when you load in an EQ curve or move a fader on the D2500 you will see the corresponding position of each frequency band displayed on the D1500.



The diagram above shows a D1500 RTA displaying the fader positions of a D2500 digital equalizer.

Operating the D1500

Using the signal Generator

The D 1500's internal Signal Generator can be used to produce Pink Noise, White Noise or a tunable Sine Wave.

You can use the Generator for a variety of applications including using the Pink Noise signal to flatten the response curve of a speaker system with an analog equalizer, or using the Sine Wave to output a sine wave for tuning a crossover at a specific frequency.

Before you get started using the Generator, press and hold the GEN switch for about two seconds and take notice of the parameters that can be adjusted while using the Generator. You'll notice that the SOURCE, GAIN, REF and FREQ are illuminated indicating that these parameters can be edited.

The following example outlines a typical application for using the D1500's RTA and Pink Noise Generator to flatten a loudspeaker system in a small to medium size venue using a traditional analog graphic equalizer.

- Connect your mixer, equalizer and power amplifiers as you normally would and confirm that you have normal output by playing a signal like that from a mic, MP3, or CD player. It's a good idea to set the system to the same level that you will be ultimately using during normal operation. Once you get the system up and running mute the mic/MP3/CD, but keep set up so you can use it to set the measurement mic level.
- Connect a measurement microphone like the Samson MM01 to the D1500 rear panel MIC INPUT. Place the microphone on a stand and position it about ear level, approximately 3 meters, or 10 feet, from your speaker.

Note: *The proper spot to position the measurement microphone will vary depending on the size of the space the loudspeaker system is operating in.*

- Press the Global switch once or twice until you see Inp in the LCD display, then select Mic and press STORE
- Press Global again, and use the Data Wheel to set a Mic Gain of +20 dB to start. Press store. You may need to adjust the Mic GAIN up or down depending on your exact situation.

- Now run your mic, MP3, or CD player signal, press RTA on the D1500 and check the LCD Meters on the D1500.
- While the D1500 is set to RTA, you may need to adjust the GAIN to set the reference point of the display.

Once you confirm that the system is operating normally and that the RTA can read the system response with the test mic, you can move ahead and generate the Pink Noise to help you flatten the system.

- Connect the D1500 Left and Right Outputs to a pair of inputs on your mixing console.
- Now make sure that the input gain controls and faders on the inputs on your mixers have the D1500 outputs connected and turned up to about 0dB.
- Press the GEN switch on the D1500.
- To change the operating level reference scale press the REF switch and use the Data Wheel to make the change.
- To be extra safe with your gear (this may get really loud! really!), start with a very low signal level by selecting the GAIN switch and turning the Data Wheel counter-clockwise all the way to -98dB.
- Next, press the SOURCE switch and turn the Data Wheel until the display reads: SRC: PINK.
- To turn up the Pink Noise signal, make sure that GEN is still selected and then press the GAIN switch and turn the Data Wheel clockwise until your hear the level of the pink Noise get about as loud as the system was when you played your mic, MP3, or CD player signal,
- Now, press the RTA switch and you should see the various frequency meters bouncing along.

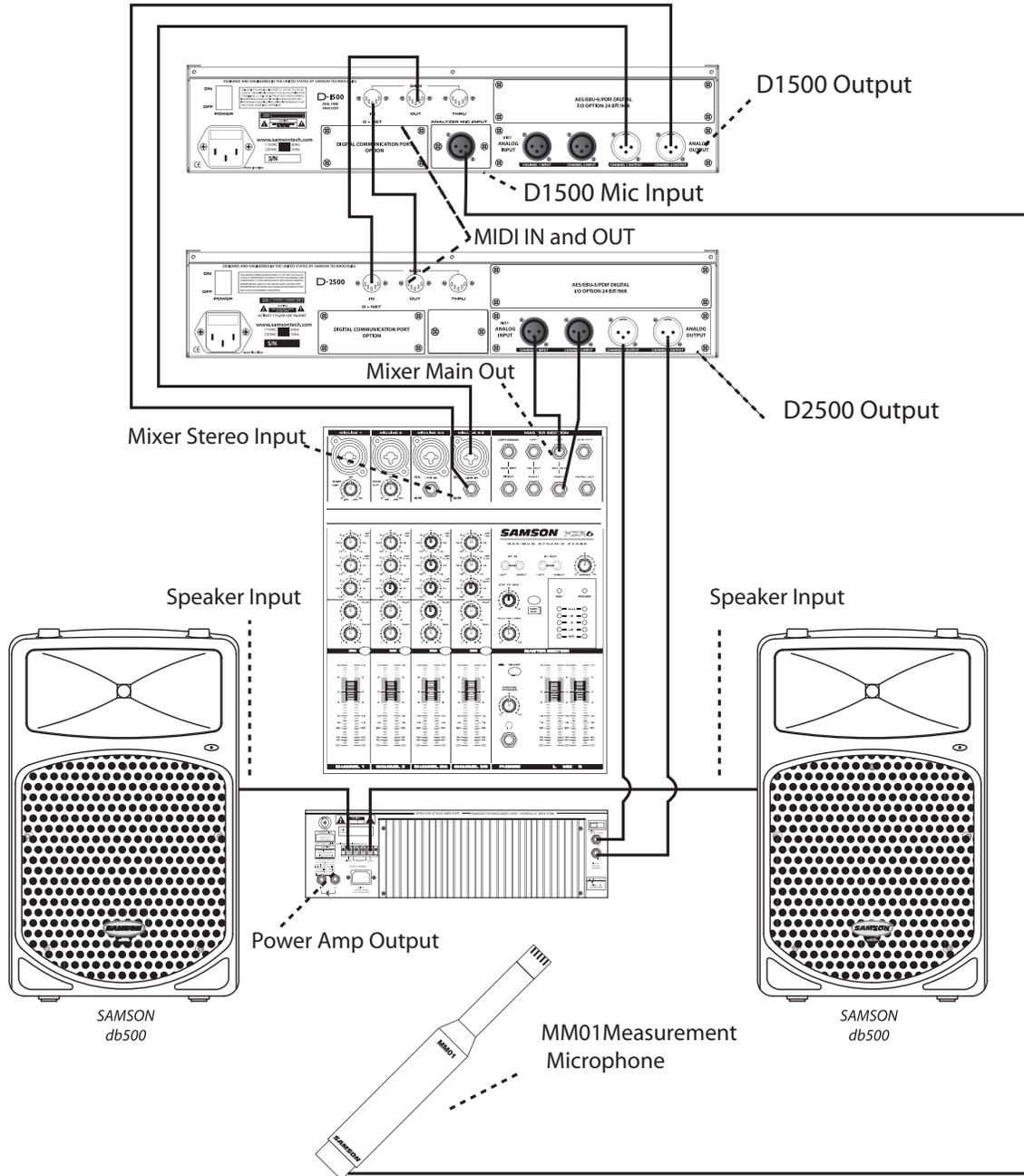
If the LED meters read very low on the display, or you don't see them at all, you will need to do one, or a combination, of the following:

1 - Press Global and use the data wheel to select MG (Mic Gain). Next, turn the Data Wheel clockwise to increase the Mic Gain in 10 dB steps. Press the STORE switch to accept the change. Repeat this step until the LED indicators are operating in a range approximately halfway up the display.

2 - Press the RTA switch and then the GAIN switch. Turn the Data Wheel clockwise until the LED indicators are operating in a range approximately halfway up the display.

Operating the D1500 with the D2500 Equalizer

When you use the D1500 RTA and the D2500 digital EQ together they combine to create a powerful automatic equalization system. You simply connect the two units using D-Net or MIDI, and then the D1500's AUTO EQ feature to let the onboard DSP's measure your system response and adjust the equalizer for a flat response, or for any EQ response curve that you may have saved in memory.



The diagram above shows a typical set up for using a D1500 RTA with a D2500 digital equalizer to auto-equalize the loudspeaker system.

Operating the D1500 with the D2500 Equalizer

Using AUTO EQ with the D2500 Digital Equalizer

When you use the D1500 RTA and the D2500 digital EQ together they combine to create a powerful automatic equalization system. You simply connect the two units using D-Net or MIDI, connect a high quality measurement microphone, like the Samson MM01, and then use the D1500's AUTO EQ feature to let the onboard DSP's measure your system response and adjust the equalizer for a flat response, or for any EQ response curve that you may have saved in memory. Follow the steps below to use the AUTO EQ feature.

Setting up Your Test Mic

- Using a standard XLR microphone cable, plug a high quality measurement microphone, like the Samson MM01, into the Mic Input located on the D1500's rear panel.
- Position your measurement microphone approximately 10 feet from your loudspeaker array, half-way between the low and high frequency drivers.
- Next select the MIC input by pressing the GLOBAL button until the display reads "Inp." And use the DATA WHEEL to choose "Mic".
- Now, you may need to adjust the microphone input gain so press the Global switch again until you see "MG" and select +30dB to start, then press STORE.

NOTE: You may need to come back to this to make the final mic gain adjustment once you start generating the PINK NOISE at the desired operating level.

AUTO EQ YOUR SYSTEM

Once you have the Mic Input and Generator GAIN set you can easily set the equalization curve for any loudspeaker or system at the press of the single button. Just follow these simple steps.

- With the measurement microphone in position and the PINK NOISE Generator on, press the AUTO EQ button. The display will read "Start: no". Turn the data wheel to select "Start: yes". Press STORE and the Auto EQ process begins.
- Now watch, and listen, as the D1500 actually measures the system frequency performance and adjusts the filters on the D2500 for a flat response. You can see the D2500's EQ filters being automatically set on the D1500's large LED display.
- You'll see on the D1500 that the D2500 curves are changing and that the equalizer filters are being set. After a few minutes you'll see that the process is slowing down to a stop and no filters are being set. Now, press AUTO EQ again and the AUTO EQ switch will stop flashing and you will see the new equalization curve displayed on the D1500.

Operating the D1500 with an Analog 31-band Equalizer

- If the Pink Noise sounds very loud already, adjust the reference point of the display by pressing the RTA switch, then GAIN and then turn the Data Wheel clockwise until you see LED Meters operating around 0.
- If the Pink Noise still sounds loud but you still don't see the LEDs, check the Mic gain by pressing Global once or twice until you see MG., then turn the data wheel clockwise, and confirm by pressing STORE. Be sure to Check the D1500's Main VU meter as well to set the proper mic level.
- If the Pink Noise sounds low in level, make the Pink Noise louder by raising the input faders and/or gains on the mixer.
- If the Pink Noise still sounds low in level, add more GAIN from the D1500 Pink Noise generator by pressing GEN, then GAIN and then turning the Data Wheel clockwise to raise the level.

Of course, good gain staging is the key to any great sounding loudspeaker system, so be careful to check your meters at the various inputs and outputs on your mixer, equalizer and power amplifiers to avoid any clipped signals.

If the LED meters read very high on the display, or if all the LEDs are illuminated, you will need to do one, or a combination, of the following:

- If the Pink Noise sounds too loud in level, make the Pink Noise lower by lowering the input faders and/or gains on the mixer.
- If the Pink Noise still sounds too loud in level, reduce the GAIN from the D1500 Pink Noise generator by pressing GEN, then GAIN and then turning the Data Wheel counter clockwise to lower the level.
- If the Pink Noise is at a good level (about the same level that you expect the system to be at during normal operation), adjust the reference point of the LCD display by pressing the RTA switch, then GAIN and turn the Data Wheel counter-clockwise until you see LED Meters operating around 0.
- If the Pink Noise is at a good level (about the same level that you expect the system to be at during normal operation) , check the Mic gain by pressing Global once or twice until you see MG., then turn the data wheel counter-clockwise to lower the input of the measurement microphone, and confirm by pressing STORE. Be sure to Check the D1500's Main VU meter as well to set the proper mic level.

Now that you have set good levels for the mixer, and the D1500 Pink Noise generator, Mic input and RTA reference point, you can begin to measure the response of your system and adjust your graphic equalizer for a flat response. At this point you should see that some of the D1500 frequency bands will be displaying different levels. The goal is to make all the LCD meters read as close to 0 as possible.

Assuming you are using a 31-band graphic, you will get a one-to-one correlation between your graphic EQ's and the D1500's LED meters. So, if you see the particular frequency on the D1500 band that has a meter showing a high level, select the corresponding fader on your graphic and pull it down. While lowering that fader, watch corresponding LED meter on the D1500 and lower the fader until the LED meter reaches zero.

Conversely, if you see a particular frequency on the D1500 band that has a meter showing a low level, select the corresponding fader on your graphic and push it up. While raising that fader, watch the corresponding LED meter on the D1500 and raise the fader until the LED meter reaches zero.

Now perform the same procedure for each frequency band until all of the D1500's LED meters are set to 0. Once all the D1500's LED meters are set to 0, your system is flat.

Using the D1500 to Tune an Electronic Crossover

Using the D1500 to Tune an Electronic Crossover

A REAL TIME ANALYZER (RTA) is an especially useful tool for setting up your crossover, as it will enable you to set parameters like DELAY and LEVEL more accurately. Some Audio Engineers can use their ears to tune a loudspeaker system. Some will even use the crossover to create the over-all system curve using the crossover like an equalizer. For the rest of us, an accurately set crossover with a flat response is the best way to start, and using an RTA like the D1500 is the best way to get there.

Using the 1500 to Set Crossover DELAY Time

In the real world, no single or multiple speaker system is perfect. If there were such a perfect system, it would more than likely be comprised of a single transducer that alone could faithfully reproduce the entire frequency spectrum. Because no such system exists, we have to deal with the problems associated with multiple transducers. The first problem that you will encounter, whether you know it or not, is time travel. That's when the delay circuit from a good electronic crossover, like the Samson Audio S• 3-way, becomes especially useful.

Ideally, the sound reproduced by each driver in the loudspeaker system would be traveling through the air ultimately reaching the listeners at the same time. To accomplish this in a system using multiple drivers or enclosures, the voice coils of all the drivers would have to be lined up on the same vertical axis. This is very difficult to achieve in many cases because of the physical size of the different components, and the position of the drivers in their enclosures. It is not uncommon to have a physical distance of 2" to 24" or more between the low and high frequency drivers. For example, front loaded low frequency drivers and compression drivers mounted on a large horn. With no correction, the low frequency signal can be traveling through the air 2" to 24" in front of the high frequencies and thereby reaching the listeners at different times because it is the spacial relationship between the different drivers' voice coils that determine the time it takes for the sound to reach the listener. Although the delay time between the low and high frequency signal may be relatively small, the negative effects can be substantial. The problem is that both drivers are reproducing frequencies at and around the crossover point, which arrive at the listener at different times. Typically, the resulting problem is comb filtering or cancellations at the crossover frequencies.

A good crossover like the Samson S 3-way features a DELAY control allowing you to dial up-to 2 milliseconds of delay. By using the D1500 and the S•3-way's DELAY you can time align the drivers in your system and minimize the possibilities of comb filtering. Now follow these steps, separately, for both the left and right sides of your loudspeaker system:

Note: *The following example is for a two-way loudspeaker system in a small to medium size room.*

- Set the crossover to the desired frequencies and press all the Mute switches to the ON position, turning all of the S•3-ways outputs off. Position your measurement microphone approximately 10-15 feet from your loudspeaker array, halfway between the low and high frequency drivers. Now turn all the GAIN controls to the fully counter clockwise position.
- Use the D1500's Signal Generator to produce a frequency tone tuned to the crossover frequency, or use the Pink Noise generator and connect the test tone to your loudspeaker system, either from your mixer or directly in the crossover's input. Now turn off the Low Frequency Mute switch and adjust the S•3-way's INPUT GAIN to "0". Adjust the LOW GAIN control so that the signal is playing at a loud, but not too painful level. Make sure you only hear sound from the low frequency driver.
- Adjust the GAIN control of the crossover until the D1500 reads 0dB at the crossover frequency. Now press the LOW MUTE switch turning off the low frequency output.
- Turn off the High Frequency MUTE switch and turn up the High Frequency Level control until the D1500 reads 0dB at the crossover frequency.
- Now, press the LOW MUTE switch again turning on the low frequency output. Notice the reading on the RTA at the crossover frequency. If the reading is +3dB, there is no need to adjust the delay time and you can assume that the speakers are in phase. If the D1500 reads less than +3dB you'll need to delay the low frequency.
- While watching the D1500 RTA display, slowly turn the DELAY control counter-clockwise until the display reads +3dB.

Using the D1500 to Tune an Electronic Crossover

Setting the Crossover Level Controls Using the D1500

It is critical to set the GAIN output controls so that all the frequency bands combine to create an overall flat system response. Using the D1500 to set the GAIN control will make it much easier for you to accomplish a flat system response. Follow the steps below, separately for each side of your system, to set the GAIN controls using the D1500 RTA.

Note: *The following example is for a two-way loudspeaker system in a small to medium size room.*

- With the crossover set to the desired frequencies, press all the Mute switches to the ON position, turning all of the crossover's outputs off. Position your measurement microphone approximately 15 feet from your loudspeaker array at a level ranging from your chest to your ear. Now turn all the GAIN controls to the fully counter clockwise position.
- Use the D1500's Signal Generator to produce a frequency tone tuned to the crossover frequency, or use the Pink Noise generator and connect the test tone to your loudspeaker system, either from your mixer or directly in the crossover's input. Now turn off the Low Frequency Mute switch and adjust the crossover's INPUT GAIN to "0".
- Adjust the LOW GAIN control until the RTA has an average reading of 0dB at and below the frequency of the LOW crossover point.
- Turn off the Mid Frequency Mute switch and turn up the MID Frequency GAIN control until the RTA reads the same average level in the MID band.
- Adjust the HIGH GAIN control until the RTA has an average reading of 0dB at and above the frequency of the HIGH crossover point.

At this point all of the frequency bands will be at the same level and your system will have a flat response. After setting the levels you can use a graphic equalizer, like the Samson D2500, if you want set a particular response curve to tune the speaker system for a specific sound.

Grounding Techniques

Hum and buzz are the biggest enemies you face when interconnecting a large number of different pieces of equipment to one another. This is because each piece of equipment's common reference point (ground) may operate at a marginally different voltage (this difference is called potential) and, when two devices at slightly different potential are physically connected with audio cabling, the end result can be nasty, extraneous noise (mind you, connecting two devices at very different potential can result in a major electrical shock!).

However, there are several steps you can take to avoid grounding problems. First, assuming you have an isolated electrical circuit that can handle the electrical demands of all connected audio equipment (these needs will usually be modest), you should always plug all connected equipment into the same circuit. If possible, nothing else but this equipment should be connected to that circuit. If you can't do this, at least avoid plugging your audio equipment into the same circuit that is already powering things like heavy machinery, air conditioners, heaters, refrigerators, washing machines, neon signs or fluorescent light fixtures. One particular culprit that will almost certainly create problems is the standard light dimmer (the kind that uses silicon controlled rectifiers). Where low-level lighting is desired, use incandescent fixtures with auto-transformer-type dimmers (sometimes called Variacs) instead—these cost considerably more than the standard dimmer you'll find at your local hardware store, but are well worth the extra expense.

Three-prong plugs (such as the one used by the D1500) should always be used as is; don't use adapters. If you are using rack-mounted audio devices such as the D1500 and are experiencing hum or buzz, there's a simple test to determine the source of the problem: while keeping all devices powered on and connected with audio cabling, physically remove each device, one by one, from the rack. If the hum disappears when a particular device is removed, that device is the culprit.

We also recommend that you use balanced audio cabling and connectors wherever possible. D1500 provides electronically balanced inputs and outputs. The diagram on pg. 24 shows how XLR connectors should be wired for use with these inputs and outputs.

In addition, you can minimize possible interference by planning your audio, electrical, and computer cable runs so that they are as far apart from one another as possible and so they don't run parallel to one another. If they have to cross, try to ensure that they do so at a 90° angle (that is, perpendicular to one another). In particular, try to keep audio cabling away from external AC/DC adapters.

If your D1500 is in a fixed location such as a recording studio, you may want to invest the time and money into creating a star ground network. This is by far the best technique for avoiding grounding problems. It involves using a formidable ground source such as a cold water pipe or a copper spike driven into the earth. A thick grounding cable is connected to that source and is then brought to a central distribution point; from there, individual cables are connected to each piece of equipment. This setup also requires that you lift the ground plug of all three-prong AC connectors, so there is the possibility of danger if it is done incorrectly. We strongly recommend that you contract with a qualified professional to carry out this or any kind of electrical work.

Another, less common problem you may encounter is that of oscillation (a ringing tone), which, apart from being annoying, is potentially dangerous to your speakers. This is generally caused either by poor outside wiring or by having an out of phase signal (most commonly from an outboard signal processor). If audible oscillation occurs, you should be able to eliminate the problem by reversing that signal's phase (many signal processors have a switch that allows you to do this).

Using the D1500 with a Patchbay

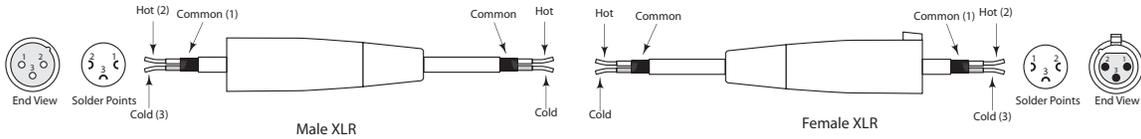
If you are using the D1500 with an audio patchbay (such as S patch or S patch plus), you may find it advantageous to connect its inputs and outputs directly to a pair of patch points. This way, you can opt to route signal to the equalizer from any source. For example, in a recording environment where you are using the D1500 to "tune" the room, you may typically want to have the control room outputs routed to the equalizer inputs and the equalizer outputs routed to the power amplifier(s) driving the control room speakers. For maximum convenience and flexibility, we recommend that you half-normal these connections to the D1500 patchpoints, so that the routing will automatically be made unless a patch cable is inserted. If a different signal (such as a bus output or insert) needs to be substituted, you can then override the half-normalled connection simply by inserting a patch cable.

D1500 Wiring Guide

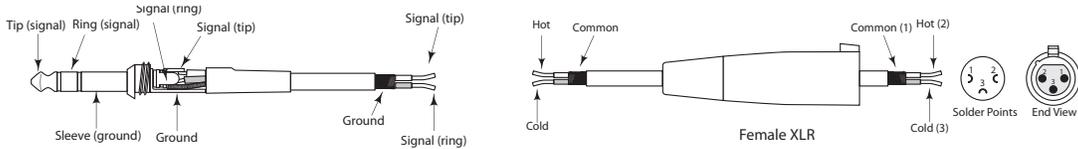
D1500 Wiring Guide

There are several ways to interface the D1500, depending on your exact monitoring set-up. In order to achieve the lowest possible noise and to take advantage of CMR (Common Mode Rejection), we recommend using balanced cables when ever and where ever possible. Follow the cable diagrams below for connecting your RTA.

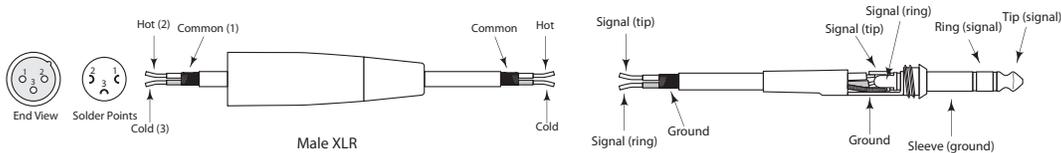
Balanced - XLR to XLR Cable



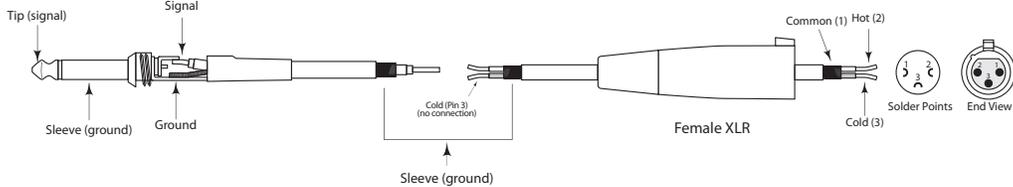
Balanced - 1/4" to FEMALE XLR Cable



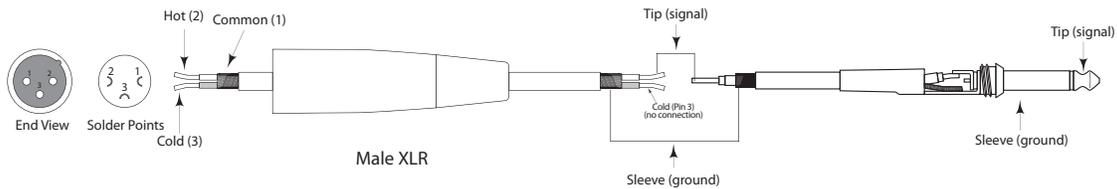
Balanced - MALE XLR to 1/4" Cable



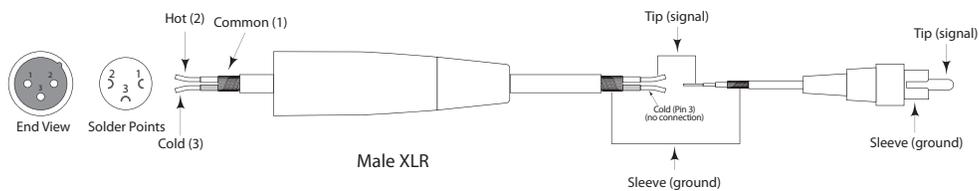
Unbalanced - 1/4" to FEMALE XLR Cable



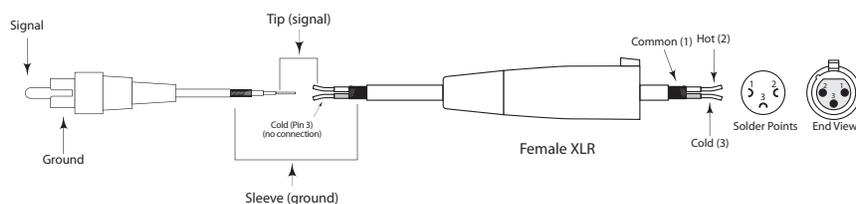
Unbalanced - XLR to 1/4" Cable



Unbalanced - MALE XLR to RCA Cable



Unbalanced - RCA to FEMALE XLR Cable



Specifications

Inputs

Type	electronically balanced
Connector	XLR
Impedance	22 k Ω at 1 kHz
Max. input level	+22
AIO1:	+14dBu
AIO2:	+20dBu

Outputs

Type	electronically balanced
Connector	XLR
Impedance	100 Ohms at 1 kHz
Max. output level	'
AIO1:	+14dBu
AIO2:	+20dBu
Frequency Response	10 Hz to 35 kHz (-1dB) @ 96 kHz sampling rate

Signal-to-noise-ratio

AIO1:	Noise floor (unweighted) < -92 dBFS (-78 dBU) Noise floor (A-weighted) < -100 dBFS (-86 dBU)
AIO2:	Noise floor (unweighted) < -106 dBFS (-86 dBU) Noise floor (A-weighted) < -112 dBFS (-92 dBU)
THD	0.007 % typ. @ +4 dBu, 1 kHz, unity gain

Measurement Microphone Input

Type	electronically balanced
Input impedance	2 k Ω
Max. input level (MIC)	variable from 0 dB to +60 dB
Phantom power	+24 V

Digital Processing

Converter	24-bit Delta-Sigma, 64/128-oversampling
Sample rate	32, 44.1, 48, 64, 88.2, 96 kHz
AIO1 & AIO2	96 kHz
DIO1	digital 31-band FFT analyzer 20 Hz to 20 kHz, 31 bands on ISO standard frequencies
Type	Peak and RMS
Frequency range	White Noise, Pink Noise, Frequency Tunable Sine Wave
Detectors	
Noise generator	
Display	32 Largesize 13-segment LED Frequency band, plus LCD for parameter control
Type	

Memory

Presets	100 memory locations, 99 user programmable
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Midi interface

Type	5-pin. DIN jacks In/Out/Thru
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Power Supply

Mains voltage	115 V, 60 Hz, 230 V, 50 Hz
Power consumption	20 W typ.
Fuse	T 630mA for 100- 120 Volt / T315mA for 220 - 240 Volt
Mains connector	Standard IEC receptacle

Dimensions

	19 in. (w) x 10.5 (d) x 3.5 (h) 482 mm (w) x 267 (d) x 89 (h) 5.1 lb.(2.31 kg)
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Weight

All specifications are subject to change without notice.

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES CLASS B. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS: (1) THIS DEVICE MUST NOT CAUSE HARMFUL INTERFERENCE, AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRE OPERATION. SUITABLE FOR HOME OR OFFICE USE.

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