

DMIX-41 User Guide

Four channel Digital Mixer



GRAHAM-PATTEN
SoundPals



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Introduction

What are SoundPals?

Each Graham-Patten SoundPals module is essentially a digital audio *building block* that can be used independently, or interconnected to perform more advanced mixing and audio processing functions.

SoundPals can be used in both standalone and system configurations:

- In a “standalone” configuration, each SoundPals module is designed to perform a specific audio processing function such as ADAT-to-Analog conversion. In this way, each module functions as a perfect low-cost adjunct to larger mixing consoles (such as the Graham-Patten D/ESAM series) — for single-purpose processing tasks.
- In a “system” configuration, SoundPals can be *linked* to form more comprehensive digital audio tools. For field recording, studio applications, and workstation applications, SoundPals can be used to seamlessly perform functions that would otherwise require extensive peripheral gear. Best of all, SoundPals “systems” can be re-configured quickly and easily — to suit your changing audio production requirements.

All SoundPals modules are extremely compact, rugged, and identical in size for ease of installation, interconnection, and use. In addition, SoundPals support AES3id. This allows longer, more robust AES signal distribution using standard coaxial cable. Error free distances of 1000 feet can be attained using inexpensive coaxial cables.

Documentation Conventions

The following documentation conventions are used in this guide:

- Buttons, knobs, connectors, and switches are indicated in bold-faced capital letters. For example:

Adjust the left **GAIN TRIM** to ...

- Primary sections are listed in bold text, with a line above:

Primary Section

- Secondary sections are listed in bold text, with no line:

Secondary Section

Signals and Values

Note the following important information regarding audio signal level:

- AES3 = Balanced output with 2 channels of digital audio (left and right)
- AES3id = Unbalanced output with 2 channels of digital audio (left and right)

Warnings

Please observe the following important warnings:

- Heed all warnings on the unit and in the instructions.
- Do not use this product in or near water.
- Route power cords and other cables so that they are not likely to be damaged. Disconnect power before cleaning. Do not use liquid or aerosol cleaners; use only a damp cloth.

Unpacking and Inspection

When you receive your SoundPals modules, inspect the cartons for signs of damage. Contact your dealer and the shipper *immediately* if you suspect any damage has occurred during shipping. Check the contents of each box to be sure that all parts are included. If any items are missing, contact your dealer immediately.

Power Supply Note

SoundPals are delivered with a power connector *only*. A separate power supply must be obtained. Graham-Patten offers several power solutions for both domestic and international customers. Refer to “**External Power**” for detailed power specifications for users who wish to configure their own power source, rather than purchase one from Graham-Patten.

DMIX-41

About the DMIX-41

The SoundPals DMIX-41 is a four stereo-channel digital sample rate converter and mixer that mixes up to four, balanced AES inputs down to one balanced or unbalanced AES (or DATS) output. Optionally, the unit accommodates up to four unbalanced inputs, remote input selection, and remote timing master selection.

All “enabled” inputs (in any combination) are mixed onto the output bus with unity gain — levels are *not* adjusted. Any signal that is not active is automatically muted. In addition, inputs need not be synchronous if the optional sample rate converters (SRCs) are installed. Output timing is derived from the designated master input.

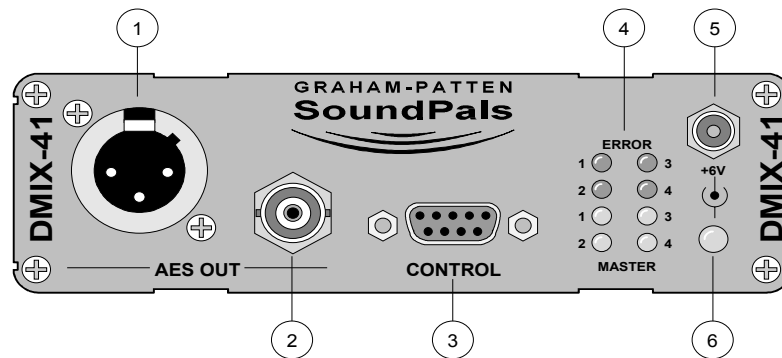
The DMIX-41 offers the following features:

- Optional remote input selection
- Optional remote timing master selection
- 20-bit or 24-bit processing
- Active balanced and unbalanced outputs
- Continuous input status display via LED indicators
- Terminating or bridging inputs
- Four balanced AES inputs on XLR connectors, or (optionally) four DATS unbalanced inputs on BNC connectors
- One AES balanced output (XLR), plus one simultaneous unbalanced output (DATS on BNC)
- 0 (zero) or 4 Sample Rate Converters (SRCs)
- Optional rack mounting tray (1 RU)
- Compact size, rugged construction

Four different DMIX-41 models are available, per your specific studio or field requirements. Select between balanced inputs on XLR connectors, or unbalanced inputs on BNC (DATS) connectors. For both configurations, choose between 0 (zero) or 4 SRCs (Sample Rate Converters).

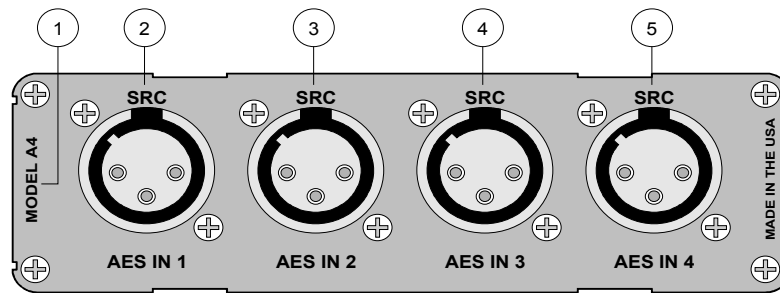
Model	Description
A0	0 (zero) SRCs, balanced inputs (XLR)
A4	4 SRCs, balanced inputs (XLR)
B0	0 (zero) SRCs, unbalanced inputs (BNC)
B4	4 SRCs, unbalanced inputs (BNC)

The figure below illustrates the DMIX-41's front panel:



- 1) **AES Balanced Output** — provides AES balanced output via XLR connector. Output is concurrent with the unbalanced output (BNC) — both can be used simultaneously.
- 2) **AES Unbalanced Output** — provides AES unbalanced output via BNC. Output is concurrent with the balanced output (XLR) — both can be used simultaneously.
- 3) **Remote Control** — provides remote channel muting, and timing master selection. Refer to the “**DMIX-41 Remote Control**” section for details.
- 4) **Indicator LEDs** — eight indicators are provided:
 - ERROR** — four red LEDs are provided, one for each input. The following LED conditions are possible:
 - An **ERROR** LED lights when *no signal* is applied to the input, or when the signal is *not valid*. A non-valid signal exhibits errors such as format violations, bit errors, low level, or incorrect frequency.
 - An **ERROR** LED blinks *slowly* when that input has been muted via the remote control interface.
 - When an input **ERROR** LED is lit (either continuously or blinking), the input signal is muted.
 - MASTER** — four green LEDs are provided, one for each input. The following LED conditions are possible:
 - A **MASTER** LED lights continuously when the input signal *may* be used as the output timing reference.
 - A **MASTER** LED blinks *slowly* when that input signal is *in use* as the output timing reference.
 - A **MASTER** LED is off when that input has been *disabled* as a timing master (via remote control).
- 5) **Power Connector** — accepts the power jack from the 6VDC power supply. Refer to “**External Power**” for more information regarding external power.
- 6) **Power LED** — the large green LED below the power jack lights when power is applied.

The figure below illustrates the DMIX-41's rear panel:



- 1) **DMIX-41 Model** — the printed legend indicates the model: A0, A4, B0 or B4.
- 2) **AES Input #1**
- 3) **AES Input #2**
- 4) **AES Input #3**
- 5) **AES Input #4**

Note the following important points regarding each DMIX-41 input:

- In models A0 and A4, each input is balanced and equipped with an XLR connector.
- In models B0 and B4, each input is unbalanced and equipped with a BNC connector.
- If the label **SRC** appears above a connector, the input is equipped with a **Sample Rate Converter**.

An SRC-equipped input does not have to be synchronous — in this way, mixing inputs at various sample rates is allowed. The selected timing master determines the output sample rate. Refer to the “**DMIX-41 Remote Control**” section for instructions on selecting the timing master, and a description of the default timing master logic.

DMIX-41 Installation

This section provides instructions for connecting power, digital inputs and digital outputs.

- NOTE**
- For details on connecting remote control, see the “**DMIX-41 Remote Control**” section.

Connecting Power

Plug a 6VDC power supply into the appropriate voltage outlet for *your specific country*, and connect the end of the cord into the DMIX-41 jack marked **+6V**. Secure the locking ring finger tight. The green LED below the jack lights when power is applied.

Connecting Inputs

Connect digital audio input signals to the 4 rear connectors marked **AES IN 1** through **AES IN 4**. Only the inputs marked **SRC** have internal sample rate converters. Please note:

- When using model **A4** or **B4** in an asynchronous environment, any signal may be connected to any input. Any input can be assigned as the master. If no master is assigned, the lowest-numbered, error-free input becomes the master.
- When using model **A0** or **B0** in a synchronous environment, any signal may be connected to any input, but all four inputs must be synchronous. Once again, any input can be assigned as the master.

NOTE Synchronous digital audio signals must be at exactly the same frequency (locked to the same reference source), but they need not be in the same phase. Neither AES bit phase, frame phase, nor block phase is important.

For all input connections, the corresponding red **ERROR** LED on the front panel will extinguish when valid input signals are applied.

DMIX-41 normally terminates all digital inputs with 110Ω (75Ω for B models). When it is necessary to loop a signal to several SoundPals the signal must be terminated only once, and always at the last unit in the chain. Refer to the “**DMIX-41 Internal Jumpers**” section for information on changing the input from terminating to bridging.

Connecting Outputs

Take the digital audio output from one of the two connectors marked **AES OUT**, and route it to the input of the desired destination device. Both AES3 and AES3ID outputs may be used simultaneously.

Refer to the “**DMIX-41 Internal Jumpers**” section for information on changing the output channel status bits and processing accuracy.

DMIX-41 Operation

This section provides information for local operation (when *no remote control* is connected), and AC-3 operation.

NOTE For details on remote control connection and operation, please refer to the “**DMIX-41 Remote Control**” section.

Local Operation

In the full “local” mode with your desired inputs connected (in an essentially “hands-off” environment), the following mixing conditions are in effect:

- All valid inputs are mixed at unity gain onto the output bus.
- Any input that is not present (or not valid) is automatically muted, and its corresponding red **ERROR** LED on the front panel will be lit.
- The lowest-numbered error free input is automatically assigned as the master, and the AES output is timed to the master.
- Inputs can *not* be muted locally.
- A master can *not* be assigned locally.

AC-3 Operation

AC-3 is an audio compression system (designed by Dolby Labs) that transports up to 6 audio channels. The AC-3 signal is compressed and passed through a single AES transport stream, and a special decoder is required. The DMIX-41 can *not* mix AC-3 audio, but it *can* pass and switch up to four AC-3 streams under the following conditions:

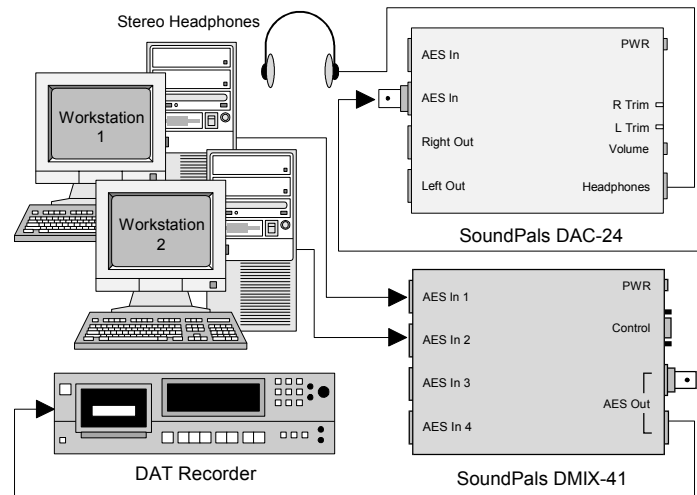
- Inputs are *not* equipped with SRCs (sample rate converters).
- Remote control “input mute” switches are connected. Refer to the “**DMIX-41 Remote Control**” section for details.
- The unit is set for 24-bit processing. Refer to the “**DMIX-41 Internal Jumpers**” section for details.

DMIX-41 Interconnection

This section provides basic and advanced interconnection diagrams.

- **Basic — Mixing Workstation Audio**

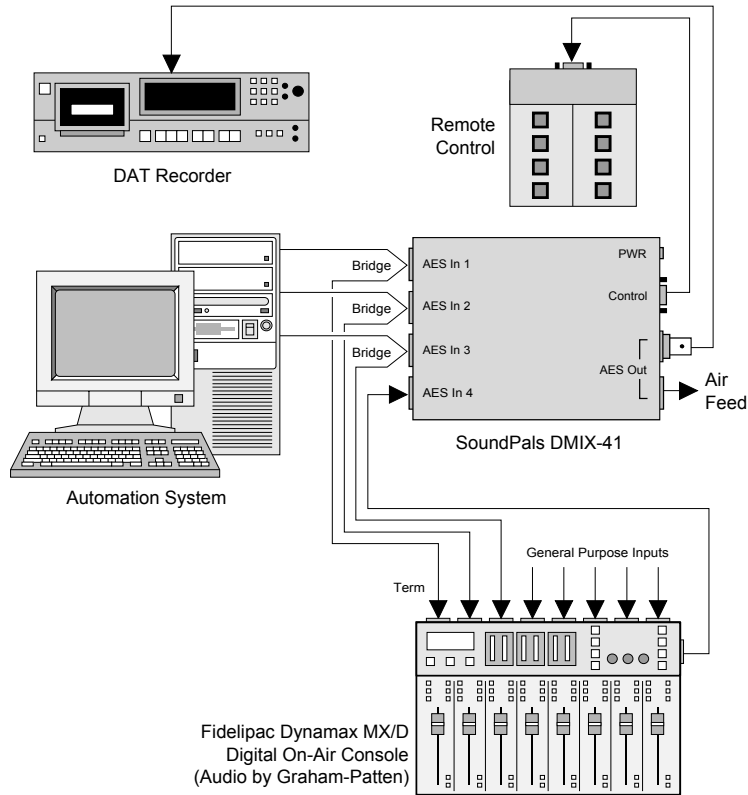
In this application, digital audio from two workstations is combined, mixed in the DMIX-41, and recorded on DAT. The DAC provides monitoring capability. Remote switching is not required. If the DMIX is equipped with SRCs, inputs can be asynchronous. If the DMIX is *not* equipped with SRCs, all inputs must be synchronous.



- **Basic — Audio Bypass Switch**

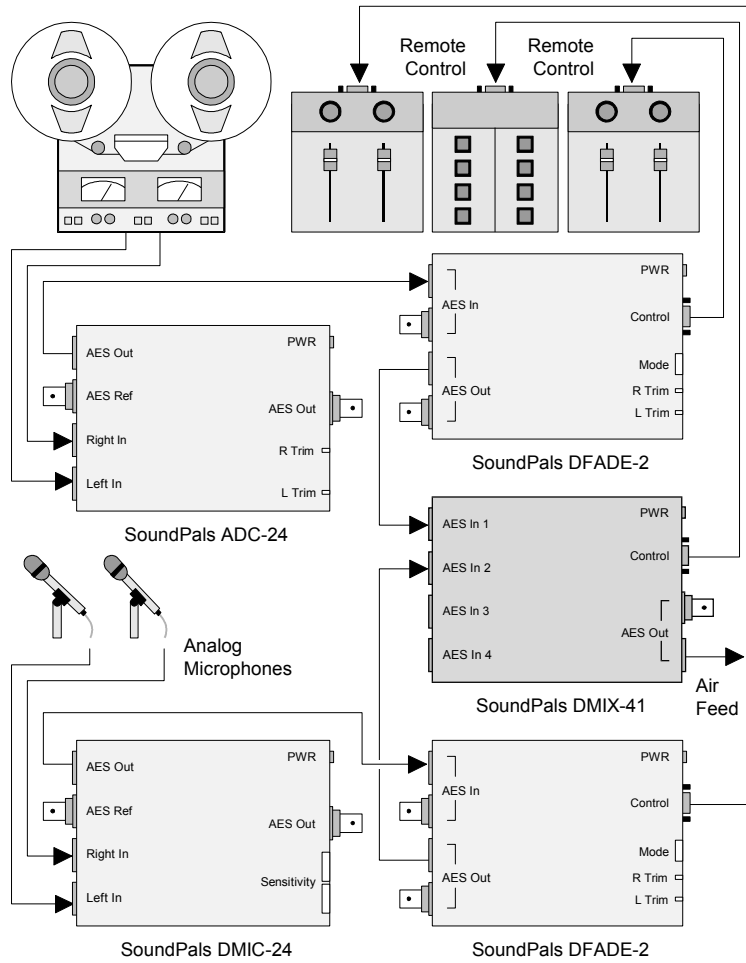
In this application, the DMIX allows you to bypass a digital audio console, routing the air feed either “direct” from the automation system or through the console. Remote switching is required.

Three channels from the automation system are routed to both the DMIX and the console, via bridging inputs on the DMIX. Additional general purpose inputs feed the console. The console’s output is routed to the DMIX, and the DMIX output feeds the air signal and the DAT. With the ability to mute any input, the remote control unit effectively determines which set of outputs are routed to air. Similarly, the remote unit can determine which input is assigned as master.



- Advanced — Fade, Mix and Switch**

In this advanced application, several SoundPals are combined to provide fade, mix, and switching capability. An analog ATR is converted to digital in the ADC, routed to a DFADE, and then to the DMIX. Dual mics are converted to digital in the DMIC, routed to a second DFADE, and then to the DMIX. The DMIX remote control allows you to switch between AES inputs 1 and 2, and select the timing master. The DFADE remotes allow you to adjust levels.



DMIX-41 Remote Control

This section provides remote control information for the DMIX-41.

Remote Control Connection

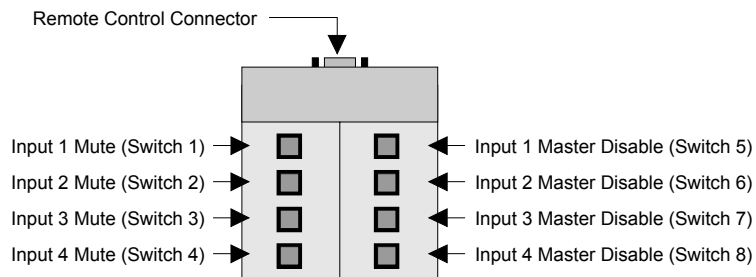
A remote controller unit (customer supplied) can be designed and connected to the 9-pin “D” **CONTROL** connector on the front of DMIX-41 module. Once connected and properly wired, the following remote control capabilities are provided:

- **Input muting** — this function sets which audio inputs are mixed to the audio output.
- **Input master disable** — this function determines which input is assigned as the output timing reference.

The following table lists the pin-outs for the remote control interface:

Pin #	Function
1	Input 1 master disable
2	Input 4 mute
3	Input 3 mute
4	Input 2 mute
5	Input 1 mute
6	Common
7	Input 4 master disable
8	Input 3 master disable
9	Input 2 master disable

The figure below illustrates one *example* of a remote control unit:



The following parts are required to build your remote control unit:

- Remote housing (case)
- 8 switches
- 1 (one) 9-pin “D” control connector
- Shielded multi-conductor cable
- Power is *not required*

Using the previous “pin-out” table as a guide, the following connections can be made:

- Connect the bottom lead of all switches to **Common** (pin 6)
- Connect the top lead of switch 1 to **Input 1 Mute** (pin 5)
- Connect the top lead of switch 2 to **Input 2 Mute** (pin 4)
- Connect the top lead of switch 3 to **Input 3 Mute** (pin 3)
- Connect the top lead of switch 4 to **Input 4 Mute** (pin 2)
- Connect the top lead of switch 5 to **Input 1 Disable** (pin 1)
- Connect the top lead of switch 6 to **Input 2 Disable** (pin 9)
- Connect the top lead of switch 7 to **Input 3 Disable** (pin 8)
- Connect the top lead of switch 8 to **Input 4 Disable** (pin 7)

NOTE Remote control signals are standard +5V CMOS logic levels or contact closures to common.

Remote Control Operation

With the remote control unit (customer supplied) connected to the DMIX-41, two remote operating modes are provided:

- The remote “**Mute**” function allows you to select which inputs are mixed to the audio output:
- The remote “**Master disable**” function allows you to determine which input is used as the output timing reference.

To mute inputs:

1. Using the appropriate “**Mute**” switches on the DMIX remote control, turn the desired combination of inputs *off*. Inputs that remain on are mixed to the audio output.

- NOTE**
- An input’s associated red **ERROR** LED will blink *slowly* when that input has been muted via the remote control.
 - If an input is muted, it can still be the master.

To disable inputs as the master:

1. Using the appropriate “**Master Disable**” switches on the DMIX remote control, disable the desired combination of inputs from being assigned as the master timing reference.

Note the following important points regarding the master assignment:

- One of the four inputs must always be assigned as the master. If all error-free inputs are disabled via remote control, the output signal will be muted.
- Any input that is *not* displaying an error condition (as shown by a red **ERROR** LED) may be used as the master.
- If an input is enabled as master, its associated green **MASTER** LED lights continuously.
- If an input is *in use* as the timing reference, its associated **MASTER** LED blinks *slowly*.
- If an input is disabled from being the master, its associated **MASTER** LED is off.

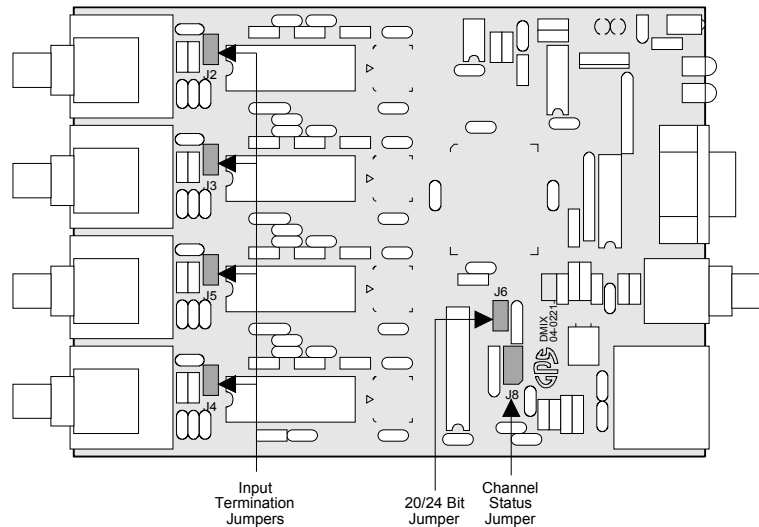
IMPORTANT The DMIX uses a *priority* system for assigning the master. Of all the inputs “enabled” as master, the lowest-numbered, error-free input is used as the master timing reference. If the current master develops an error, the next lowest-numbered error-free input automatically becomes the master.

DMIX-41 Internal Jumpers

This section provides information about the DMIX-41's internal jumpers and adjustments.

NOTE For detailed instructions on opening and closing the DMIX-41, see “**Inside the Module.**”

The figure below shows the DMIX-41's internal jumper locations:



- To change AES inputs from terminating to bridging, remove the desired combination of jumpers **J2**, **J3**, **J4**, and **J5**.
- To change processing from 20 to 24 bits, install jumper **J6**.
- To change output channel status, change jumper **J8** according to the table on the following page.

Setting Output Channel Status

Output channel status bits and processing accuracy are set using jumpers **J6** and **J8**.

IMPORTANT The factory default for jumper **J6** and **J8** is OFF. Note that 24-bit processing may be used *only* if the source is 24-bits, if the source is *not using* the 4 auxiliary bits, and if the next set of equipment (in the audio chain) is set to use 24-bits as audio data. In addition, 24-bit processing is only effective on inputs without SRC's.

The table below lists the output channel status functions for jumpers **J6** and **J8**:

J#	Position	Function
J6	Off	Internal processing is 20-bit. Auxiliary data on input signals is discarded. Output channel status bits are set to 20-bit mode.
	On	Internal processing is 24-bit. All 24-bits of input signals are used. Output channel status bits are set to 24-bit mode.
J8a/b	Off/Off	Output emphasis not indicated.
	On/Off	Output indicates no emphasis.
	Off/On	Output indicates 50/15 μ s emphasis.
	On/On	Output indicates CCITT J.17 emphasis.
J8c/d	Off/Off	Output sampling frequency not indicated.
	On/Off	Output indicates 44.1 kHz sampling freq.
	Off/On	Output indicates 48 kHz sampling freq.
	On/On	Output indicates 32 kHz sampling freq.
J8e	Off	Output channel mode not indicated.
	On	Output indicates stereophonic mode.

DMIX-41 Troubleshooting

The table below lists DMIX-41 problems and solutions.

Problem	Procedure
No signal at either AES output.	<ul style="list-style-type: none"> Is power applied? Check LED and supply. Is there a current timing master? Check for flashing green LED. If yes, consult factory. Is at least one input enabled as timing master? Check for a lit green master LED. If none, remove remote control interface connector. Check connections. Does at least one input enabled as master have an error-free input? Check for at least one continuously lit green LED with associated blinking or extinguished red LED. If none, check AES input signal associated with each enabled master showing errors.
No audio on AES output.	<ul style="list-style-type: none"> Is at least one error-free input not muted? Check for an extinguished red LED. If none, remove remote control interface connector. Check connections. If still none, check AES inputs for valid signals. Are all signals being mixed silent? Use DAC to check audio on all mixed inputs.
Remote interface not active.	<ul style="list-style-type: none"> Remove the remote connector. Using a short wire connect pin 6 to each pin in turn. If operation is correct check remote wiring and perform the following tests. Is remote interface driven with logic levels? If yes, check that the low level is between 0V and +1V with respect to the chassis. Check high level is between +4V and +5V with respect to the chassis. Is remote interface driven with contact closures? If yes, check that the common is correctly connected. Check that the contact resistance is $<100\Omega$.

NOTE Please contact the GPS factory if the problem still exists after completing the above procedures.

DMIX-41 Specifications

This section provides audio, remote, and environmental specifications.

Audio Specifications

Parameter	Specification
Digital inputs	Terminating (110 Ω AES3, 75 Ω AES3id) or bridging
Digital outputs	Terminated (110 Ω AES3, 75 Ω AES3id)
Sample Rate	30 KHz – 50 KHz
Dynamic Range	138dB (24-bit processing without SRC) 120dB (24-bit processing with SRC) 120dB (20-bit processing without SRC) 118dB (20-bit processing with SRC)
Options	
RT-2, 1RU rack tray for mounting up to 3 units	
Power supplies: <ul style="list-style-type: none">• PSU-1, 90-260V 50/60Hz in-line power supply with detachable IEC power cord (preferred)• PS-2A, 220V/50Hz wall mount power supply• PS-3A, 115V/60Hz wall mount power supply	

NOTE All specifications listed above subject to change without notice.

Remote Control Specifications

Parameter	Specification
High Logic Level	>4V (Iout <50 μ A)
Low Logic Level	<1V (Iout <200 μ A)

Environmental Specifications and Dimensions

Parameter	Specification
Dimensions (less connectors)	5.2W x 1.62H x 6.625D 13.2 x 4.1 x 16.8 cm
Power	300mA @ 6Vdc
Operating Temp	10 – 50 $^{\circ}$ C
Operating Humidity	10 – 90%RH non-condensing

Inside the Module

In This Section

This section provides instructions for opening and closing the SoundPals HDDM-8 module to gain access to the internal circuit board.

NOTE The internal circuit board should only be removed from the module if you want to adjust the analog audio levels.

Before You Begin

Check the following items before opening the module and attempting to remove the internal circuit board:

- If required, remove the SoundPals module from the rack tray.
- Disconnect the power supply from the front of the product.
- Disconnect all input and output cables.
- Perform the remaining steps *only* in a static free environment. Make sure that *you and the product* are both grounded.

The following tools are required:

- #2 Philips screwdriver

Opening the Module

Use the following steps to open a SoundPals module:

1. On the rear panel, remove the four Phillips screws from the four corners of the module.
2. On the rear panel, remove all Phillips XLR mounting screws from the module.
3. On the rear panel remove the BNC nuts and associated lock washers.
4. Remove the rear panel.
5. On the front panel, remove four Phillips screws from the four corners of the module.
6. Pulling the front panel, carefully draw the internal circuit board and front panel assembly from the housing.

CAUTION Keep the case horizontal so that the BNC bushings stay with the connectors.

7. Set the housing and all mounting hardware in a safe place.

Closing the Module

Use the following steps to close a SoundPals module:

1. Ensure that product label is on the bottom.
2. Carefully slide the internal circuit board and front panel assembly through the housing. Keep the case horizontal so that the BNC bushings stay with the connectors.
3. Replace, but do not tighten, the four Phillips screws in the front corners of the SoundPals module.
4. Replace the rear panel.
5. Replace, but do not tighten, the four Phillips screws in the rear corners of the SoundPals module.

6. Tighten the four front plate corner screws making sure that the plate is aligned with the housing. Repeat with the four rear plate corner screws.
7. Replace all Phillips XLR mounting screws at the rear of the SoundPals module.
8. Replace all BNC nuts and associated lock washers at the rear of the SoundPals module.

CAUTION Do not over tighten the screws.

External Power

About Power Supplies

An external power supply conforming to the specifications listed in the following “**Power Supply Specifications**” section *must be used* to guarantee that published SoundPals performance figures are met. Any power supply meeting these specifications will supply adequate power for a single SoundPals module. Although the specification is written for power supplies running from AC line inputs, DC (battery) sources may be used if they meet all of the listed requirements.

CE Compliance

For CE compliance, the power supply that you use *must comply* with the following requirements:

- Low Voltage Directive 73/23/EEC
- EMC Directive 89/336/EEC
- EMC Directive 93/68/EEC
- The connector locking ring must be tight.

Portable Power Sources

For portable SoundPals power sources, sealed lead-acid, nickel cadmium or alkaline primary batteries may be used. However, the maximum voltage must *not* exceed 8.6 volts, and a minimum of 5.6 volts is required for normal operation. Maximum current drain will be 321 mA.

Power Supply Specifications

The following specifications must be met over all anticipated operating conditions including AC power line range, temperature range, etc.

Parameter	Specification
Output voltage	5.6V minimum (measured at trough of ripple) at 321 mA constant current. 8.6V maximum (measured at peak of ripple) at 209 mA constant current.
Ripple voltage	2V p-p at 700 mA constant current. 400mV p-p at 700mA constant current with external 2200 μ F capacitor.
Connector	Switchcraft 761K with center positive, sleeve negative.

Power Supply Sources

In addition to the GPS-supplied universal power supply, the following power supplies meet the SoundPals requirements:

Company	Model	Note
Stancor	STA-4860	120V AC, 60 Hz
Stancor	STAF-0797F	220V AC, 50 Hz with European wall plug (CE compliant).
Elpac	MI2007	95-250V AC, 47-63 Hz with IEC inlet (line cord required). Will power up to six units (CE compliant).