NVISION®

DA4040 D/A Converter User Guide

INTRODUCTION

The DA4040 Digital-to-Analog Converter module converts two 24-bit AES/EBU digital audio streams to analog audio. It supports sample rates from 28kHz to 96kHz.

The DA4040 provides 24-bit digital-to-analog conversion quality with a frequency response of ±0.25dB from 20Hz to 20kHz, high signal-to-noise ratio, and low total harmonic distortion. In addition to exceptional conversion quality, the DA4040 provides flexibility with selectable four channel output FSD level adjustment from +12dBu to +24dBu in 1dB increments.

On-board converters lock to the two AES inputs separately, thus allowing each channel pair to run at a different sample rate. Additionally, the DA4040:

- Locks to sample rates from 28kHz to 96kHz.
- Provides selectable digital de-emphasis curves.
- Output mute switch allows analog output to be switched off.
- Provides either loop-thru or on-board selectable termination of the AES inputs.

The DA4040 module consists of a Processing Card and an I/O card. The Processing Card, installed at the front of the 4000 Series frame and connected to the motherboard, occupies one slot. This card receives ±15VDC through the motherboard and generates the ±12, +6, and +5 VDC power for the module.

Installed at the 4000 Series frame rear panel, the I/O card occupies the slot opposite the slot for the Processing Card and connects to the motherboard. Two configurations of I/O cards are available to provide for either an AES balanced or unbalanced interface.

Processing Card Panel Description

Figure 1 illustrates the DA4040 Processing Card front panel. Front panel LEDs, visible when the 4000 Series frame door is open, are described below.

1 - The green Power LED is normally On to indicate that the module is receiving power from the NV4001/2 frame power supply through the motherboard. On-board supplies then generate the ±12, +6, and +5 VDC required by the module.

2 - These green LEDs are normally On to indicate that the module is receiving and locked onto AES 1 and AES 2 inputs.

Figure 1. DA4040 Processing Card Panel

I/O Card Panel Descriptions

Balanced (twisted pairs) or unbalanced (coaxial) AES inputs selection, made at the time the DA4040 is ordered, depends on the requirements and capabilities of your facility. The analog audio outputs are twisted pairs for both cards. Figure 2 illustrates the balanced and unbalanced DA4040 I/O Card panels.

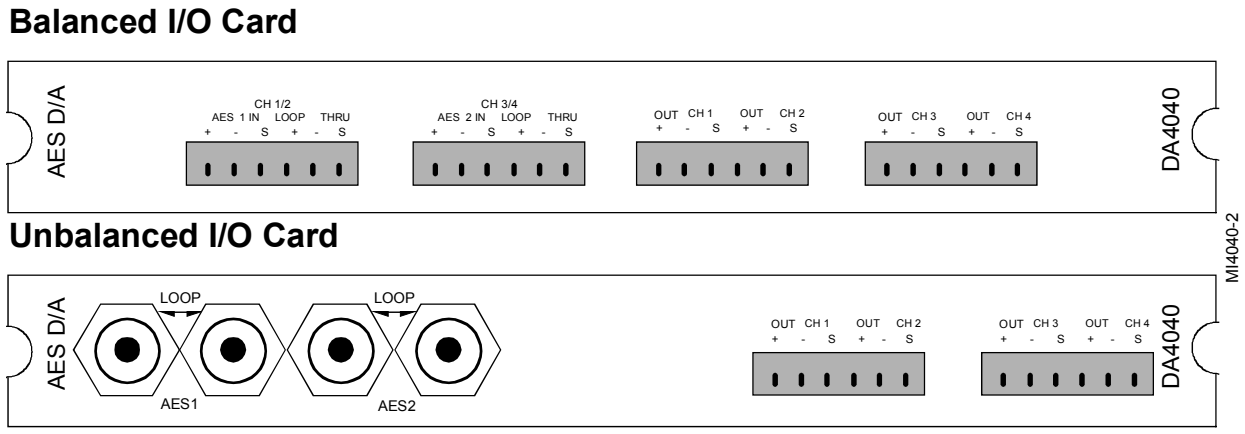


Figure 2. DA4040 I/O Card Panels

The balanced I/O Card provides:

- Two Phoenix connectors for AES 1 and AES 2 inputs (with loop-thru).

- Two Phoenix connectors for channels 1 and 2 analog outputs and channels 3 and 4 analog outputs.

The unbalanced I/O Card consists of:

- Four BNC connectors for AES 1 and AES 2 inputs (with loop-thru).
- Two Phoenix connectors for channels 1 and 2 analog outputs and channels 3 and 4 analog outputs.

Specifications

Table 4040-1 lists the specifications for the 4000 Series DA4040 D/A Converter module.

Table 1. DA4040 D/A CONVERTER SPECIFICATIONS

TYPE	PARAMETER
General	
Power	±15VDC input from 4000 Series frame, ±12, +6, +5 VDC on-board
Power Consumption	3.5 Watts
Size	Processing Card: 0.563” (14.3mm) H x 6.125” (155.6mm) W x 12.375” (314.3mm) D
	I/O Card: 0.563” (14.3mm) H x 6.125” (155.6mm) W x 2.938” (76.6mm) D
Weight	1.25 lbs (0.6kg) max.
Inputs	
2, AES3, Loop-thru OR	Input Impedance 110Ω, ±20%, 0.1MHz to 6.0MHz Minimum Input Signal 200mVpp for 50% of cell period, ±20%. Maximum Input Signal 10Vpp, ±20%.
2 AES-3ID, Loop-thru	Input Impedance 75Ω Minimum Input Signal 320mVpp for 50% of cell period Maximum Input Signal 1Vpp, ±20% Return Loss - >15dB, 0.1MHz to 6.0MHz.
Outputs	
4 Analog, Balanced	Output Impedance 38Ω Full Scale Digital Level +12dBu to +24dBu selectable in 1dB increments Output Current Limit 80mA.
Conversion Quality	Frequency Response ±0.25dB at 20Hz to 20kHz Signal-to-Noise Ratio -106dB, -109dB A-weighted THD + Noise -95dB.

CONFIGURATION

Configuring the DA4040 entails setting DIP switch S1 and jumpers J1 - J6 as instructed below.

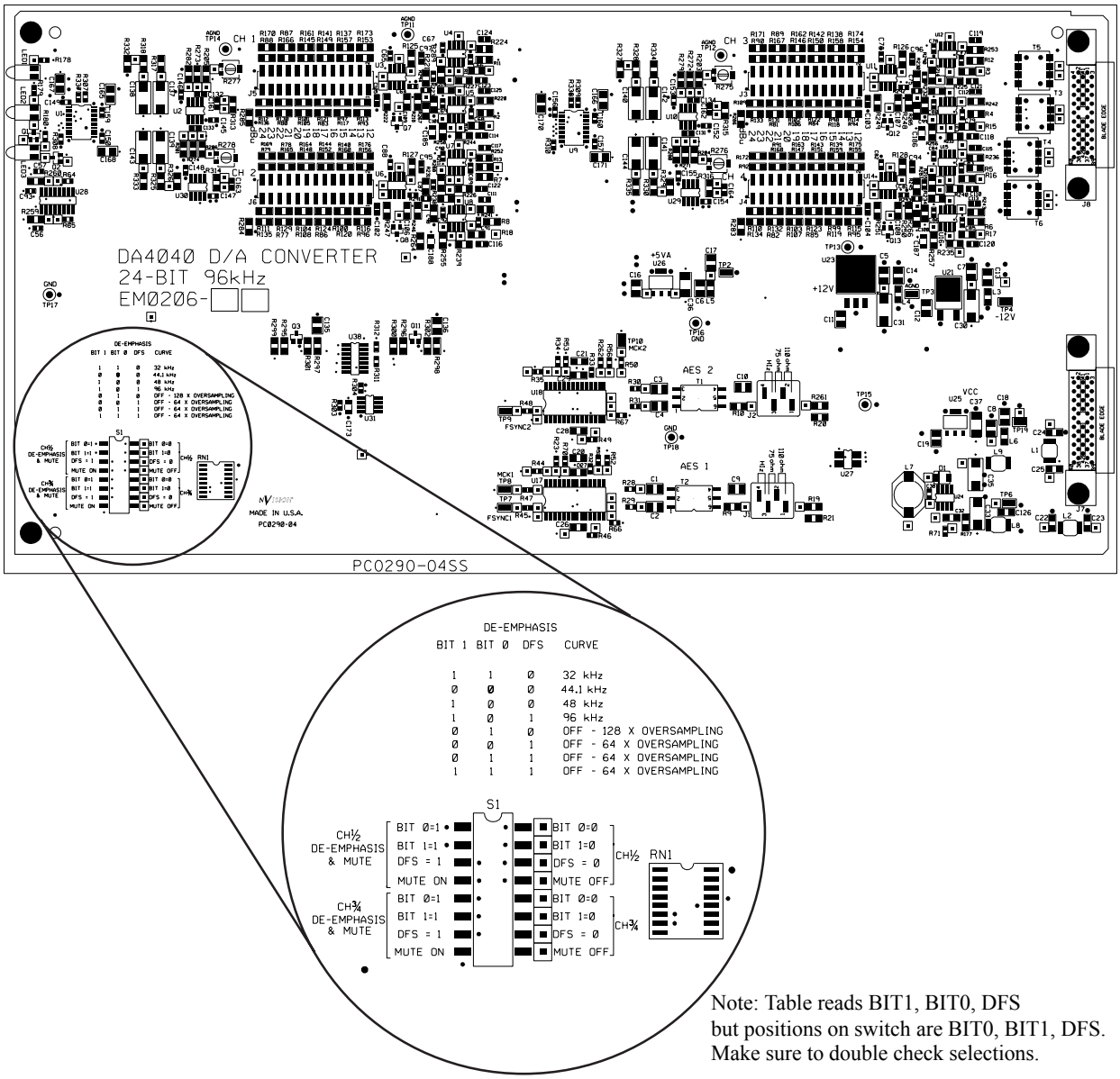
Note: To properly set the DIP switch and jumpers for your facility, you must first know whether you are using a Balanced or Unbalanced DA4040 I/O Card and whether you want loop-thru on the AES input.

Switch S1

Figure 3 illustrates the DA4040 Processing Card with the configuration DIP switch, S1, highlighted. The DIP switch settings are as follows:

Table 2. Table 4040-1. DIP Switch S1 Settings

CHANNEL	DESCRIPTION
CH1/2	Set these 3 switches together to select the digital de-emphasis curve: S1-1 (Bit 0) / S1-2 (Bit 1) / S1-3 (DSF) / Function 1 1 0 De-emphasis on, 32 kHz curve 0 0 0 De-emphasis on, 44.1 kHz curve 1 0 0 De-emphasis on, 48 kHz curve 1 0 1 De-emphasis on, 96 kHz curve 0 1 0 De-emphasis OFF, <50kHz sample rates 0 0 1 De-emphasis OFF, >50kHz sample rates 0 1 1 De-emphasis OFF, >50kHz sample rates 1 1 1 De-emphasis OFF, >50kHz sample rates
	S1-4 Muting ON = output muted. OFF = normal.
CH3/4	Set these 3 switches together to select the digital de-emphasis curve: S1-1 (Bit 0) / S1-2 (Bit 1) / S1-3 (DSF) / Function 1 1 0 De-emphasis on, 32 kHz curve 0 0 0 De-emphasis on, 44.1 kHz curve 1 0 0 De-emphasis on, 48 kHz curve 1 0 1 De-emphasis on, 96 kHz curve 0 1 0 De-emphasis OFF, <50kHz sample rates 0 0 1 De-emphasis OFF, >50kHz sample rates 0 1 1 De-emphasis OFF, >50kHz sample rates 1 1 1 De-emphasis OFF, >50kHz sample rates
	S1-4 Muting ON = output muted. OFF = normal.



Note: Table reads BIT1, BIT0, DFS
but positions on switch are BIT0, BIT1, DFS.
Make sure to double check selections.

Figure 3. DA4040 Configuration Switch S1

Jumpers

The DA4040 uses jumpers to select the input impedance of AES 1 and AES 2 and to select the output levels of the four analog channels. Figure 4 illustrates the DA4040 Processing Card with the jumpers highlighted. The jumpers positions are described in the table below;

Table 3. DA4040 Configuration Jumpers J1-J6

JUMPER	SETTINGS	FUNCTION
J1	Pins 1-2110 ohms, non-looping, balanced I/O card Pins 2-475 ohms, non-looping, unbalanced I/O card Pins 3-4Hi-Z, loop-thru, termination downstream	AES 1 digital audio input impedance.
J2	Pins 1-2110 ohms, non-looping, balanced I/O card Pins 2-475 ohms, non-looping, unbalanced I/O card Pins 3-4Hi-Z, loop-thru, termination downstream	AES 2 digital audio input impedance.
J3	Set to one of 13 positions from +12 dBU to +24 dBU CH 3 output level.	Channel 3 Full Scale Digital reference level.
J4	Set to one of 13 positions from +12 dBU to +24 dBU CH 4 output level.	Channel 4 Full Scale Digital reference level.
J5	Set to one of 13 positions from +12 dBU to +24 dBU CH 1 output level.	Channel 1 Full Scale Digital reference level.
J6	Set to one of 13 positions from +12 dBU to +24 dBU CH 2 output level.	Channel 2 Full Scale Digital reference level.

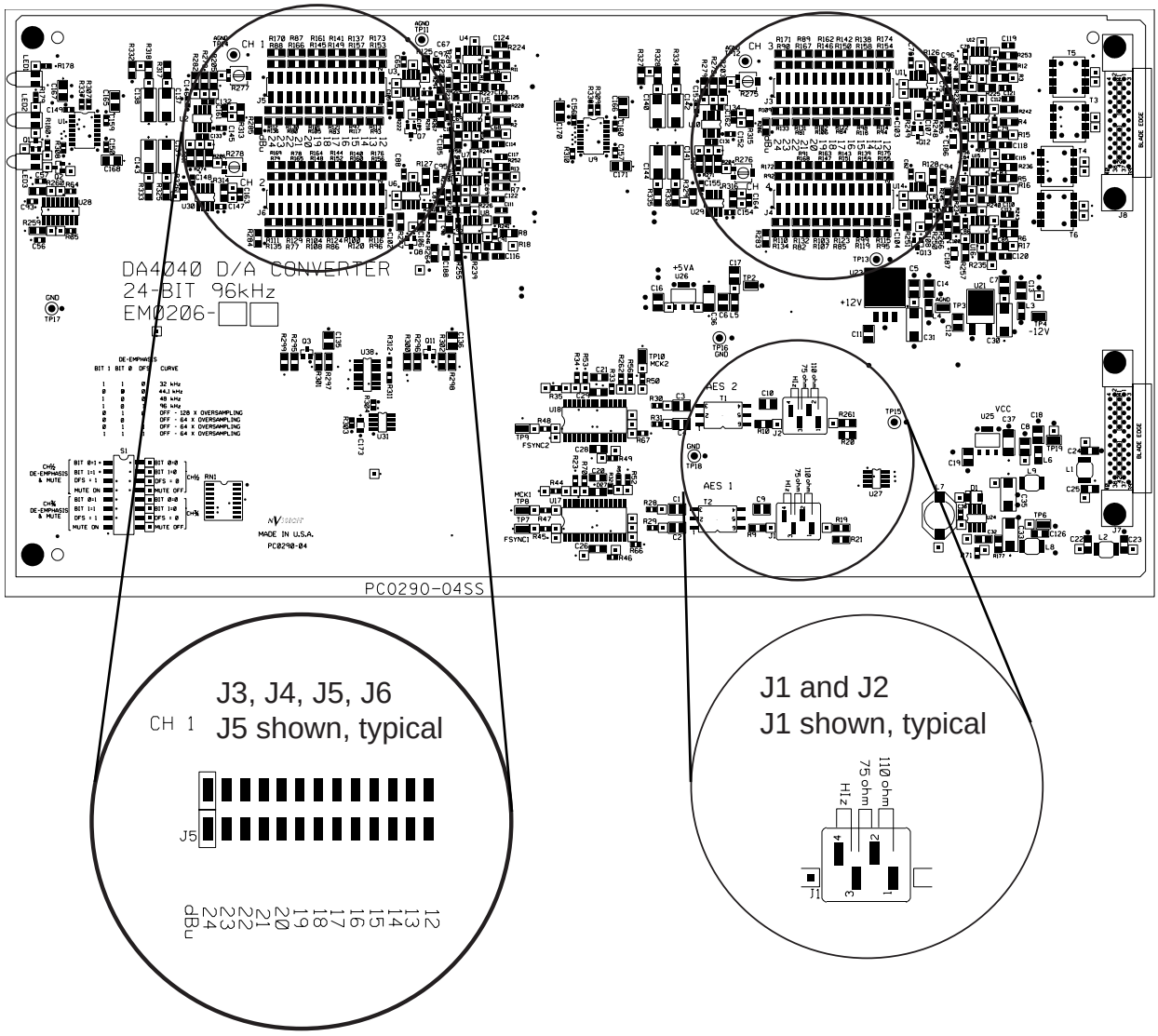


Figure 4. DA4040 Configuration Jumpers

INSTALLATION

The module can be installed (by qualified personnel only) with frame power on. Installation entails inserting the processing module into an available front slot of the 4000 frame and inserting the I/O module in the rear slot directly behind the processing module.

If connecting to Phoenix connectors, use the flat-bladed screwdriver to attach cable wires to the connector.

Connect cables from the AES signal source(s) to the I/O Card input connectors.

Connect cables from the I/O Card analog outputs to the desired destinations.

Connect a stable source of AES digital audio to the AES Reference input.

THEORY OF OPERATION

The DA4040 is a dual 24-bit two-channel AES digital audio to analog audio converter. Figure 5 is a block diagram of the module.

The AES 1 and AES 2 digital audio streams enter the module via the I/O backplane connectors and are applied to AES Receivers U17 and U18. The Receivers buffer and break down the AES signals into their constituent parts, including the audio data and its clock and sync signals. Each of the two streams contains two channels of audio data, for a total of four audio channels.

Digital-to-Analog Converters U1 and U9 convert the serial audio data into four channels of analog audio. Differential amplifiers U2, U30, U10, and U29 turn the differential outputs of the DACs into single-ended analog audio signals. Adjustable amplifiers in the same packages as the differential amplifiers amplify the audio signals and present them to Programmable Gain Amplifiers U3, U6, U11, and U14 whose output gain is set by jumpers J3 - J6. These jumpers set the Full Scale Digital (FSD) level of the audio outputs to any one of thirteen levels from +12 dBu to +24 dBu, silkscreened beside the jumpers.

Low Pass Filters U3, U6, U11, and U14 remove high frequency components from the four audio signals to reconstruct clean audio outputs. Balanced Output Drivers U4/U5, U7/U8, U12/U13 and U15/U16 drive analog audio channel outputs 1 - 4, respectively, into the I/O connectors at the rear of the 4000 electronics frame.

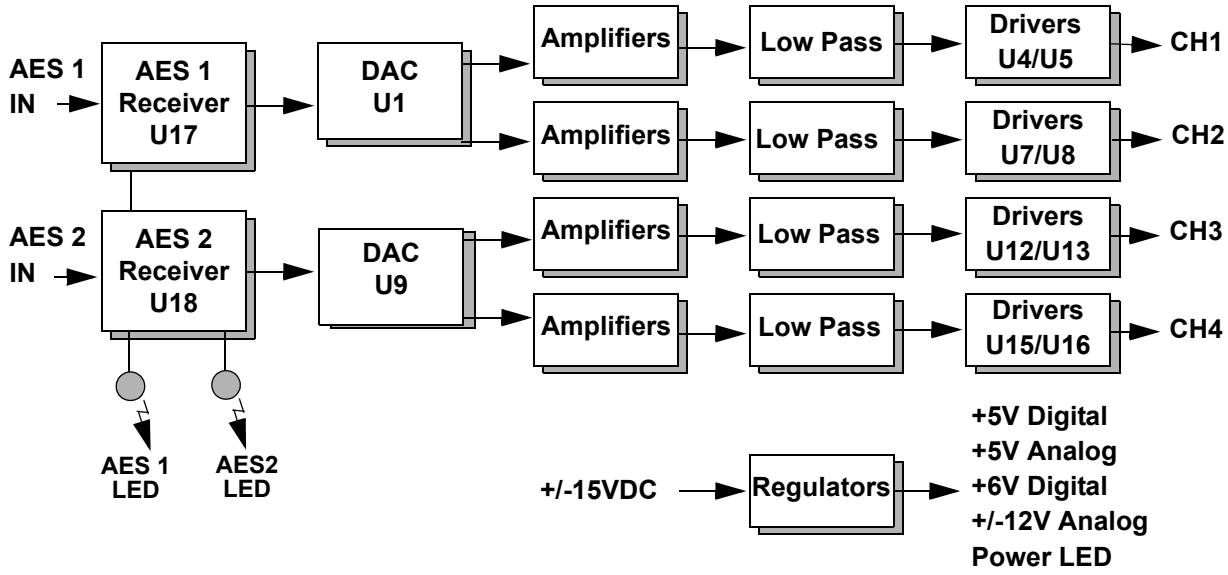


Figure 5. DA4040 Module Block Diagram

TROUBLESHOOTING & MAINTENANCE

The module requires no routine maintenance. If it does not appear to operate correctly, first reseat the module in the frame to ensure good internal connections and then check that the Power indicator on the front of the module is lit. If the signal exhibits problems, check signal sources, cables, and terminations. Also check switch and jumper settings. For technical assistance, send email to *nvsupport@nvision1.com* or call 1-530-265-1000.

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