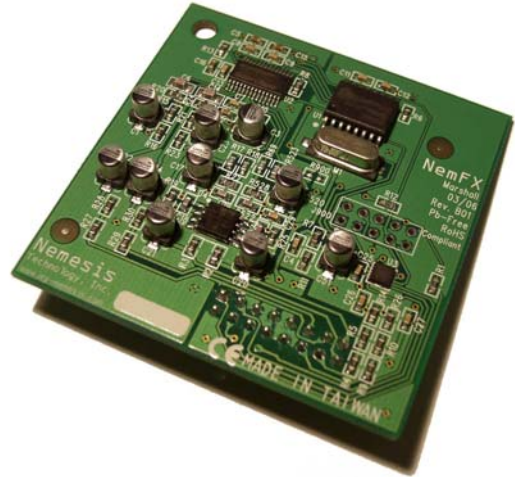


NemFX M-Type Version Digital Multi-Effects Module

Features

- Low cost and high performance Digital Multi-Effects Module
- Superior sound quality
- 16 built-in Reverb, Delay, Modulation, and Multi-Effect programs
- 24-bit, 48 kHz ADC/DAC
- Stereo input, stereo output
- Each Program has one Variable Parameter (adjustable via a potentiometer)
- Only requires a +5 V Power Supply
- **RoHS Compliant, Pb-Free!**



Applications

- Electric and Acoustic Guitar Amplifiers, Bass Amplifiers, Keyboard Amplifiers
- Portable PA Systems
- Mixing Consoles, Powered Audio Mixers, DJ Mixers
- Digital Pianos, Electric Pianos, Combo Organs
- Karaoke Systems

Description

Nemesis Technology, Inc. is proud to offer the M-Type Version of our popular NemFX Series of Digital Multi-Effects Modules. Available in two programming options, the NemFX M-Type features 16 high-quality programs including Reverbs, Delays, Modulations, and Multi-Effects. Each program has an adjustable parameter for a wide variety of sounds.

Theory of Operation

The NemFX M-Type Module is a tiny daughter card assembly which can be installed on main boards in products such as guitar amplifiers and portable PA systems. Connection to the NemFX is simple. It has two analog input pins and two analog output pins for easy stereo in and stereo out connection. Four digital input pins are used to select one of 16 DSP programs. An additional analog input is used for an adjustable parameter input to add a variable parameter per program.

Key Specifications*

Parameter	Typical
Dynamic Range, SNR (A-weighted)	97 dB
THD+N (A-weighted)	-88 dB
Frequency Response (Fs = 32 kHz)	20 Hz - 16 kHz, +0/-1 dB
Input Level	4.0 Vpp max
Output Level	4.6 Vpp max
Power Supply	5 V, 140 mA

*since we are continuously improving our products, specifications are subject to change without notice

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Detailed Specifications

(Typical audio performance numbers at nominal supply voltages, 25°C operating temperature, with suggested I/O circuitry, 'Bypass' DSP program, 997Hz signal unless otherwise specified. All DC voltages relative to ground)

Audio Performance*

Parameter	Typical
SNR (A-weighted)	97 dB
Dynamic Range (A-weighted, -60 dBFS)	97 dB
THD+N (A-weighted, -1 dBFS)	-88 dB
Frequency Response (Fs = 32 kHz)	20 Hz - 15 kHz, +/-1 dB
Full Scale Input Level	4.0 Vpp
Full Scale Output Level	4.6 Vpp

Recommended Operating Conditions*

Parameter	Min.	Typical	Max.	Unit
Source Impedance	-	-	< 1	Ω
Load Impedance	2 k	10 k	-	Ω
Full Scale Input Level	3.8	4.0	4.2	Vpp
Full Scale Output Level	4.4	4.6	4.8	Vpp
5V Power supply voltage	4.75	5	5.25	V
5V Power supply current	-	140	-	mA

Absolute Maximum Ratings*

Parameter	Min.	Max.	Unit
Analog Voltage Input Level	-0.3	5.3V	V
5V Power supply	-.3	5.3	V
Operating Temperature	0	70	°C

*since we are continuously improving our products, specifications are subject to change without notice

Module Block Diagram

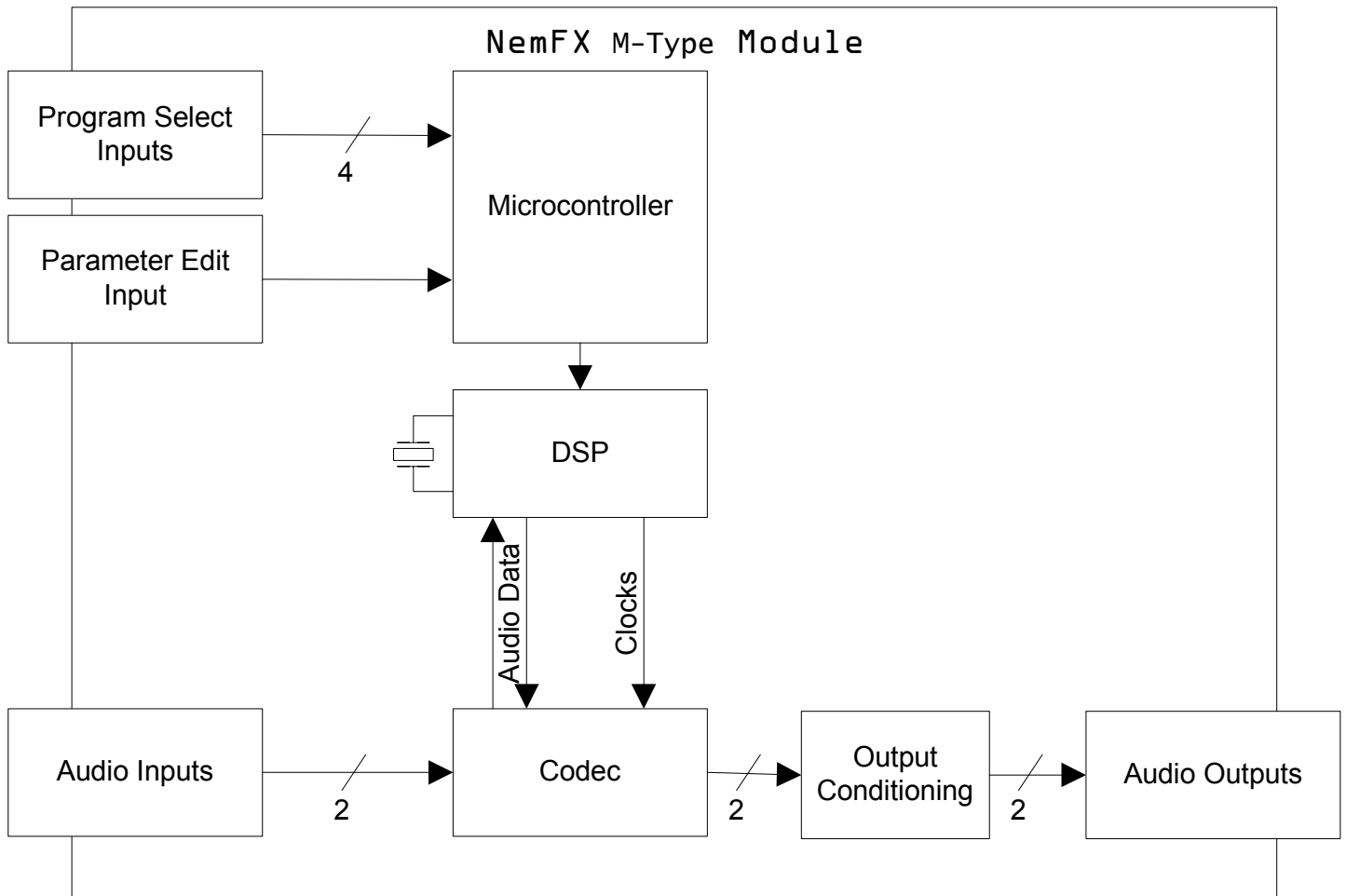


Figure 1: Block Diagram

Application Diagram

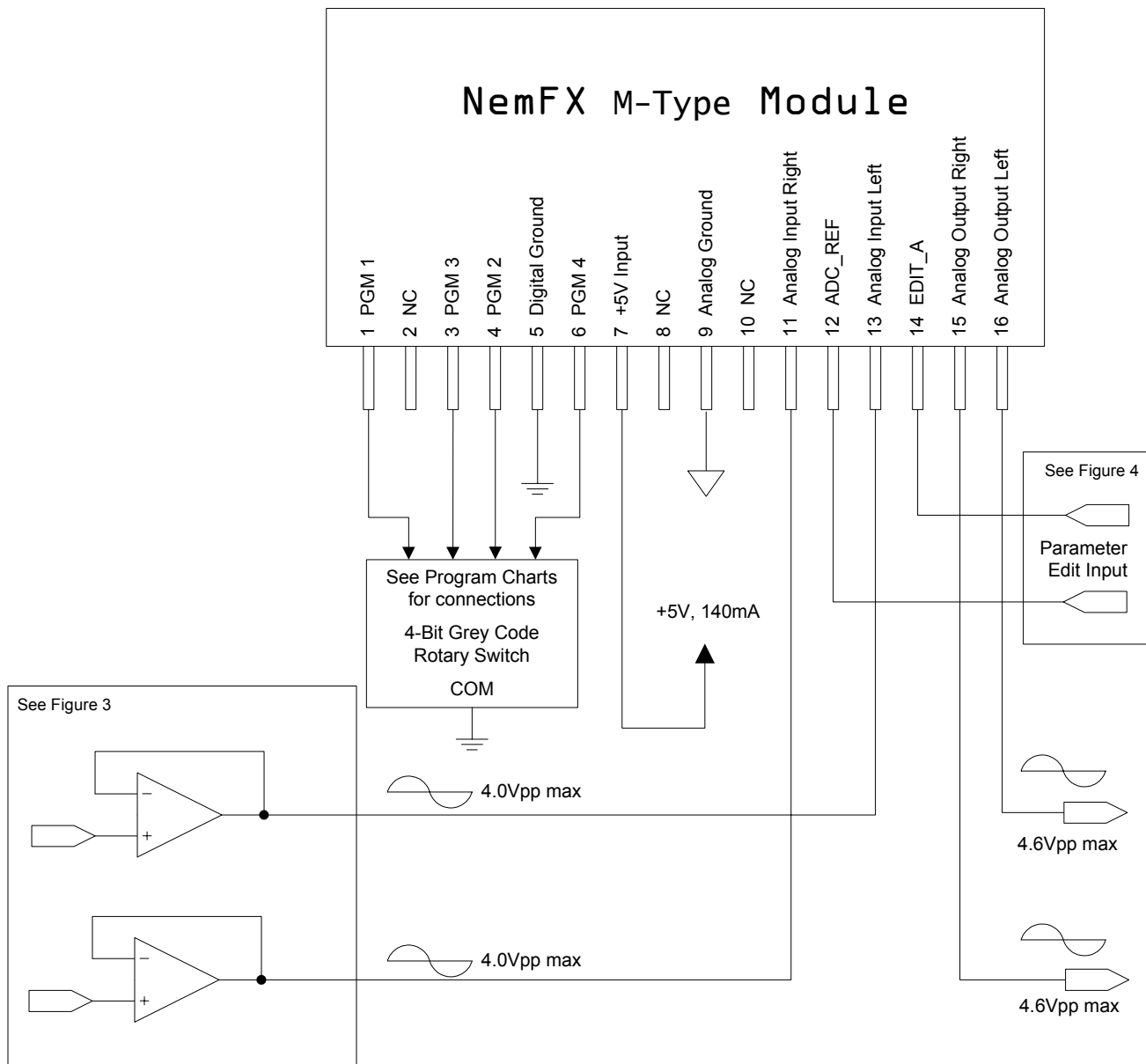


Figure 2: Application Diagram

Input Circuit

The NemFX Module requires a low impedance drive directly from the output of an opamp. Any resistance on the input connection to the NemFX Module will cause distortion on the input signal. The optional circuit shown in Figure 3 can be used if extra attenuation of high frequency noise is desired or if there is significant energy above 60 kHz in the input signal to the module. The input analog signal can be up to a maximum of 4.0 Vpp before clipping occurs. Analog input signals must stay within the voltage range listed

under 'Absolute Maximum Ratings' in the specifications section of the datasheet; otherwise, damage to the NemFX Module can occur.

For applications that require a single channel, connect the input signal to both the Left and Right Analog Input pins. Otherwise, 6 dB of signal will be lost on DSP programs that expect a stereo input and sum the two inputs to mono.

Output Circuit

Interfacing to the analog output of the NemFX Module is also very simple. The output circuit on the module must drive a load greater than 2 k Ω . For applications that use only a single channel, connect only to the Left Analog Output. Additional filtering of signals above 60 kHz may be necessary on systems that are sensitive to high frequency noise.

Power Supply

The NemFX Module requires a regulated +5V power supply to achieve rated performance. Separate Analog and Digital Ground pins are provided to reduce the possibility of digital interference in the analog signal. The Analog and Digital Ground pins for the NemFX Module should be connected together near the power supply ground of the host system.

Application Information

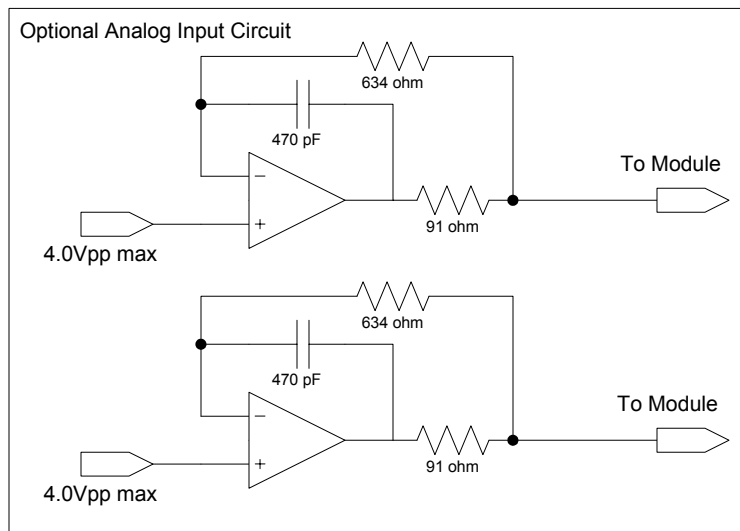


Figure 3: Optional Analog Input Circuit

The circuit show in Figure 3 should be used if any high frequency signals are present in the analog input to the NemFX Module. The module is sensitive to interference at 4.096MHz (for 32kHz sampling frequency) and any signals in this range must be attenuated.

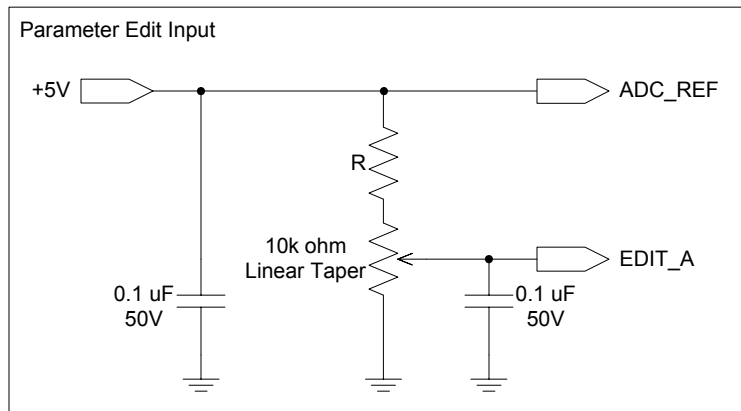


Figure 4: Parameter Edit Input

The NemFX M-Type Module is configured to use an analog input (for example, from a rotary potentiometer) for user-adjustable parameters.

The EDIT_A pin is a voltage input.

For Program Chart NV, the EDIT_A pin should range from 0V to +4.3V.

For Program Chart GD-48, the EDIT_A pin should range from 0V to +5V.

For Program Chart GT, the EDIT_A pin should range from 0V to +5V.

The ADC_REF input should be fixed at +5V.

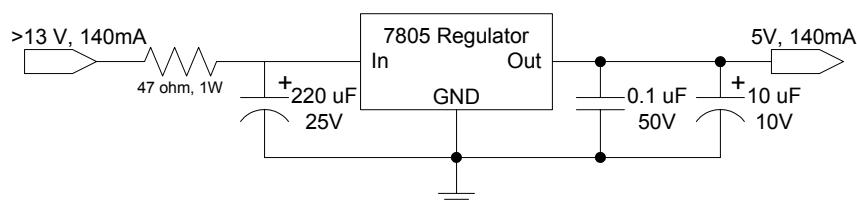


Figure 5: Suggested 5V Supply Circuit

The circuit shown in Figure 5 should be used when adding the NemFX Module to a design that currently does not have a 5V supply. This supply will isolate any digital noise that could be introduced into loosely regulated supplies that are commonly found inside guitar amplifiers. For systems that use regulators to supply other analog voltages, the low pass filter on the input of the regulator is not necessary to isolate any digital noise.

Ordering Options

NemFXMType- _

Programming Option

NV	- See Program Chart NV	(Profusion P/N: RA-FX1V)
GD-48	- See Program Chart GD-48	(Profusion P/N: RA-FX1D)
GT	- See Program Chart GT	(Profusion P/N: RA-FX16G)

Contact Nemesis Technology, Inc. for more information.

Program Chart NV

16 programs, 32 kHz sampling frequency only

Parallel effects configuration (i.e., dry signal is NOT mixed in the DSP).

Prog #	PGM 4	PGM 3	PGM 2	PGM 1	Program Description	Parameter Edit
1	1	1	1	1	Hall Reverb 1	Reverb Decay Time
2	1	0	1	1	Hall Reverb 2	Reverb Decay Time
3	1	0	0	1	Hall Reverb 3	Reverb Decay Time
4	1	1	0	1	Room Reverb 1	Reverb Decay Time
5	1	1	0	0	Room Reverb 2	Reverb Decay Time
6	1	0	0	0	Room Reverb 3	Reverb Decay Time
7	0	0	0	0	Plate Reverb 1	Reverb Decay Time
8	0	1	0	0	Plate Reverb 2	Reverb Decay Time
9	0	1	0	1	Plate Reverb 3	Reverb Decay Time
10	0	0	0	1	Nonlinear Reverb	Reverb Decay Time
11	0	0	1	1	Chorus	Chorus Depth
12	0	1	1	1	Flanger	Flanger Rate
13	0	1	1	0	Delay	Delay Time
14	0	0	1	0	Chorus->Room	Reverb Decay Time
15	1	0	1	0	Chorus->Delay->Room	Delay Time
16	1	1	1	0	Rotary Speaker->Room	Rotary Speaker Speed

Note: Programs are in grey-code order to interface with *CTS-style* 4-to-16 grey-code encoders. Encoder common pin should be tied low to Digital Ground.

Suggested rotary switch part number: CTS 288xxxxx162A2 or Belton BTDS20x-116-xxx-6 (where x=don't care) or electrical equivalent

Encoder Connections for Program Chart NV

CTS Series 288

Order the 4 BIT GRAY ENCODER CODE option (Option 2).

Connect encoder common pin to NemFX M-Type Pin 5 (Digital Ground).

Connect encoder A pin to NemFX M-Type Pin 6 (PGM 4).

Connect encoder B pin to NemFX M-Type Pin 1 (PGM 1).

Connect encoder E pin to NemFX M-Type Pin 3 (PGM 3).

Connect encoder F pin to NemFX M-Type Pin 4 (PGM 2).

Belton BTDS20 Series

Order the CTS Output Code option (Code 6).

Connect encoder common pin to NemFX M-Type Pin 5 (Digital Ground).

Connect encoder 1 pin to NemFX M-Type Pin 6 (PGM 4).

Connect encoder 2 pin to NemFX M-Type Pin 1 (PGM 1).

Connect encoder 3 pin to NemFX M-Type Pin 3 (PGM 3).

Connect encoder 4 pin to NemFX M-Type Pin 4 (PGM 2).

Program Chart GD-48

16 programs, 48 kHz sampling frequency only

Parallel effects configuration (i.e., dry signal is NOT mixed in the DSP).

Prog #	PGM 4	PGM 3	PGM 2	PGM 1	Program Description	Parameter Edit
1	1	1	1	1	Mono Delay	Delay Time (0 to 11ms, 0.042ms steps)
2	1	1	1	0	Mono Delay	Delay Time (0 to 21ms, 0.083ms steps)
3	1	1	0	0	Mono Delay	Delay Time (0 to 43ms, 0.167ms steps)
4	1	1	0	1	Mono Delay	Delay Time (0 to 85ms, 0.333ms steps)
5	1	0	0	1	Mono Delay	Delay Time (0 to 171ms, 0.667ms steps)
6	1	0	0	0	Mono Delay	Delay Time (0 to 250ms, 1.000ms steps)
7	1	0	1	0	Mono Delay	Delay Time (0 to 341ms, 1.333ms steps)
8	1	0	1	1	Mono Delay	Delay Time (0 to 683ms, 2.667ms steps)
9	0	0	1	1	Dual Mono Delay	Delay Time (0 to 5ms, 0.021ms steps)
10	0	0	1	0	Dual Mono Delay	Delay Time (0 to 11ms, 0.042ms steps)
11	0	0	0	0	Dual Mono Delay	Delay Time (0 to 21ms, 0.083ms steps)
12	0	0	0	1	Dual Mono Delay	Delay Time (0 to 43ms, 0.167ms steps)
13	0	1	0	1	Dual Mono Delay	Delay Time (0 to 85ms, 0.333ms steps)
14	0	1	0	0	Dual Mono Delay	Delay Time (0 to 171ms, 0.667ms steps)
15	0	1	1	0	Dual Mono Delay	Delay Time (0 to 250ms, 1.000ms steps)
16	0	1	1	1	Dual Mono Delay	Delay Time (0 to 341ms, 1.333ms steps)

Note: Programs are in grey-code order to interface with standard 4-to-16 grey-code encoders. Encoder common pin should be tied low to Digital Ground.

Suggested rotary switch part number: Belton BTDS20x-116-xxx-5 or Alpha RE200F-x0xx-xxx-4G or Grayhill 25Lx22-G-x (where x=don't care) or electrical equivalent

Encoder Connections for Program Chart GD-48

Belton BTDS20 Series

Order the Gray Output Code option (Code 5).

Connect encoder common pin to NemFX M-Type Pin 5 (Digital Ground).

Connect encoder Output 1 pin to NemFX M-Type Pin 1 (PGM 1).

Connect encoder Output 2 pin to NemFX M-Type Pin 4 (PGM 2).

Connect encoder Output 3 pin to NemFX M-Type Pin 3 (PGM 3).

Connect encoder Output 4 pin to NemFX M-Type Pin 6 (PGM 4).

Encoder Connections for Program Chart GD-48 (continued)

Alpha RE200

Order the 16 Position Gray Code option (4G).

Connect encoder common pin to NemFX M-Type Pin 5 (Digital Ground).
Connect encoder Output 1 pin to NemFX M-Type Pin 1 (PGM 1).
Connect encoder Output 2 pin to NemFX M-Type Pin 4 (PGM 2).
Connect encoder Output 3 pin to NemFX M-Type Pin 3 (PGM 3).
Connect encoder Output 4 pin to NemFX M-Type Pin 6 (PGM 4).

One model is currently available through Mouser:

- MFG P/N: RE200F-40E2-155F-4G, Mouser P/N: 318-ENC200155F-4G
(Pricing as of March 27, 2009 \$4.40 @ 1U, \$2.58 @ 1KU)
 - vertical, PC mount, 4 bit gray, flat shaft, 15.5 mm shaft w/7.5 mm flat

Grayhill Series 25L

Order the 4-Bit Gray Code option (22-G).

Connect encoder common pin to NemFX M-Type Pin 5 (Digital Ground).
Connect encoder Output 1 pin to NemFX M-Type Pin 1 (PGM 1).
Connect encoder Output 2 pin to NemFX M-Type Pin 4 (PGM 2).
Connect encoder Output 4 pin to NemFX M-Type Pin 3 (PGM 3).
Connect encoder Output 8 pin to NemFX M-Type Pin 6 (PGM 4).

One model is currently available through Digi-Key:

- MFG P/N: 25LB22-G, Digi-Key P/N: GH7299-ND
(Pricing as of March 27, 2009 \$5.09 @ 1U, \$2.547 @ 250U)
 - black housing, 22.5 degree 16 positions, gray code output, no bracket

Program Chart GT

16 programs, 32 kHz sampling frequency only

Parallel effects configuration (i.e., dry signal is NOT mixed in the DSP).

Prog #	PGM 4	PGM 3	PGM 2	PGM 1	Program Description	Parameter Edit
1	1	1	1	1	Spring Reverb	Reverb Decay Time
2	1	1	1	0	Room Reverb	Reverb Decay Time
3	1	1	0	0	Hall Reverb	Reverb Decay Time
4	1	1	0	1	Slapback Reverb	Reverb Decay Time
5	1	0	0	1	Delay	Delay Time
6	1	0	0	0	Delay Reverb	Delay Time
7	1	0	1	0	Chorus	Chorus Depth
8	1	0	1	1	Chorus Reverb	Reverb Decay Time
9	0	0	1	1	Flanger	Flanger Rate
10	0	0	1	0	Phaser	Phaser Rate
11	0	0	0	0	LFO Wah	Wah Rate
12	0	0	0	1	Tremolo	Tremolo Rate
13	0	1	0	1	Reverb Tremolo	Tremolo Rate
14	0	1	0	0	Rotary Speaker	Rotary Speaker Speed Fast/Slow
15	0	1	1	0	Rotary Speaker Reverb	Rotary Speaker Speed Fast/Slow
16	0	1	1	1	Octave	Octave Up/Down

Note: Programs are in grey-code order to interface with standard 4-to-16 grey-code encoders. Encoder common pin should be tied low to Digital Ground.

Suggested rotary switch part number: Belton BTDS20x-116-xxx-5 or Alpha RE200F-x0xx-xxx-4G or Grayhill 25Lx22-G-x (where x=don't care) or electrical equivalent

Encoder Connections for Program Chart GT

Belton BTDS20 Series

Order the Gray Output Code option (Code 5).

Connect encoder common pin to NemFX M-Type Pin 5 (Digital Ground).

Connect encoder Output 1 pin to NemFX M-Type Pin 1 (PGM 1).

Connect encoder Output 2 pin to NemFX M-Type Pin 4 (PGM 2).

Connect encoder Output 3 pin to NemFX M-Type Pin 3 (PGM 3).

Connect encoder Output 4 pin to NemFX M-Type Pin 6 (PGM 4).

Encoder Connections for Program Chart GT (continued)

Alpha RE200

Order the 16 Position Gray Code option (4G).

Connect encoder common pin to NemFX M-Type Pin 5 (Digital Ground).
Connect encoder Output 1 pin to NemFX M-Type Pin 1 (PGM 1).
Connect encoder Output 2 pin to NemFX M-Type Pin 4 (PGM 2).
Connect encoder Output 3 pin to NemFX M-Type Pin 3 (PGM 3).
Connect encoder Output 4 pin to NemFX M-Type Pin 6 (PGM 4).

One model is currently available through Mouser:

- MFG P/N: RE200F-40E2-155F-4G, Mouser P/N: 318-ENC200155F-4G
(Pricing as of March 27, 2009 \$4.40 @ 1U, \$2.58 @ 1KU)
 - vertical, PC mount, 4 bit gray, flat shaft, 15.5 mm shaft w/7.5 mm flat

Grayhill Series 25L

Order the 4-Bit Gray Code option (22-G).

Connect encoder common pin to NemFX M-Type Pin 5 (Digital Ground).
Connect encoder Output 1 pin to NemFX M-Type Pin 1 (PGM 1).
Connect encoder Output 2 pin to NemFX M-Type Pin 4 (PGM 2).
Connect encoder Output 4 pin to NemFX M-Type Pin 3 (PGM 3).
Connect encoder Output 8 pin to NemFX M-Type Pin 6 (PGM 4).

One model is currently available through Digi-Key:

- MFG P/N: 25LB22-G, Digi-Key P/N: GH7299-ND
(Pricing as of March 27, 2009 \$5.09 @ 1U, \$2.547 @ 250U)
 - black housing, 22.5 degree 16 positions, gray code output, no bracket

Mechanical Drawing

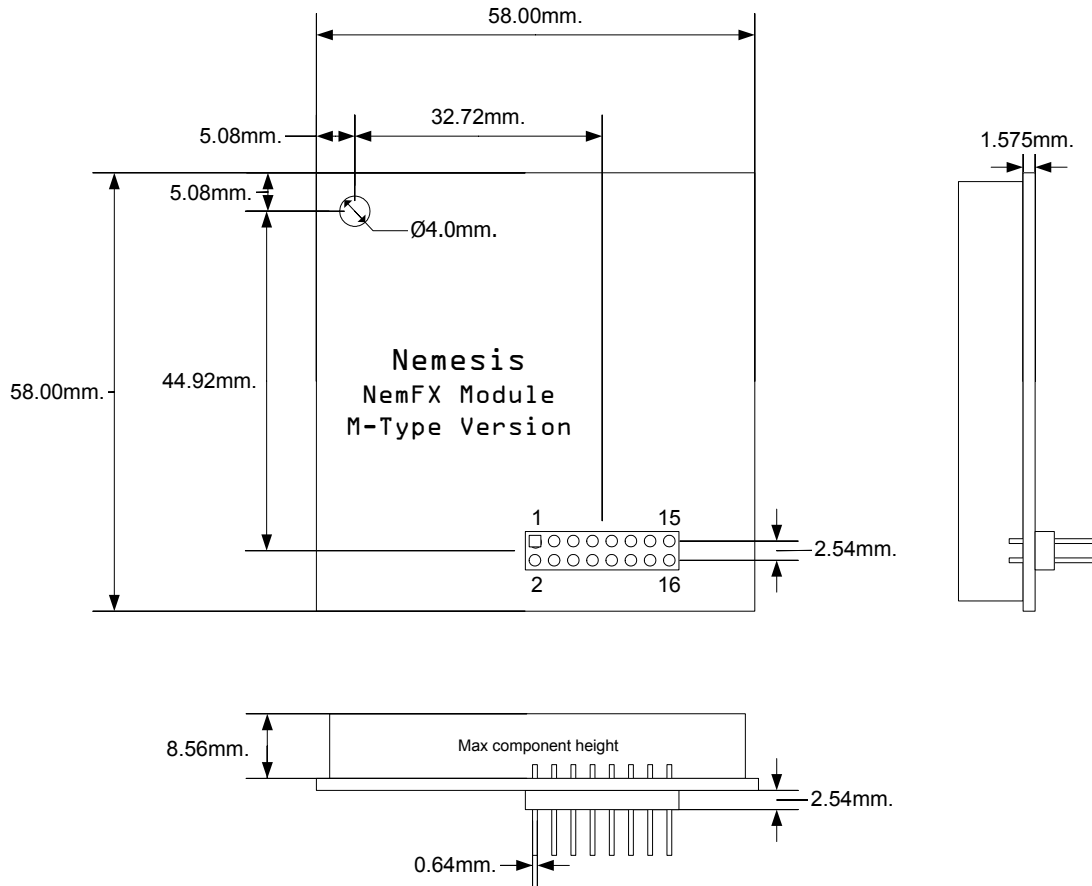


Figure 6: Mechanical Drawing

Important Information

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NemFX Modules are electronic devices and should be handled in static safe and otherwise appropriate manner. Nemesis Technology, Inc. will not be held responsible for any mishandling of NemFX Modules.

Nemesis Technology, Inc. will, however, accept responsibility for adding the sweet sounds of reverb and other effects to your audio products.

Contact Information

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