MIDI Driver Boards

Models DC-24 and DC-48

Instructions for
Installation and Configuration

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1. Introduction

DesignTech Systems' DC-24 and DC-48 MIDI drivers are designed to designed to convert MIDI signals from software packages such as Hauptwerk into DC outputs. Outputs can be either continuous, for driving indicator lamps, or pulsed for driving Stop Action Magnets (SAMs).

DC-24 can drive up to 24 indicators, or 12 SAMs. DC-48 can drive up to 48 indicators, or 24 SAMs.

DC-24 is available in two versions, one for lamp mode and the other for magnet mode. On DC-48, the mode can be selected via a DIP switch.

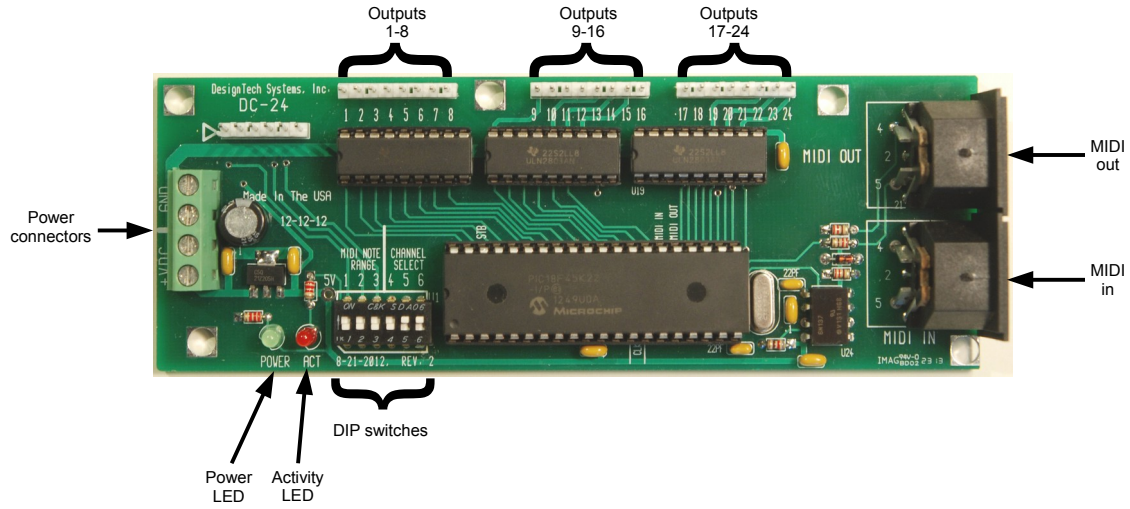
In *lamp mode*, a MIDI "note on" message will cause an output line to turn on, and a "note off" message will cause the output line to turn off.

In *magnet mode*, a MIDI "note on" message will cause an output "on" magnet to be energized for 150ms, and a "note off" message will cause the corresponding "off" magnet to be energized for 150ms. However, if used in combination with our encoder cards, DC-24 and DC-48 automatically implement *current save*. This means that they detect when a stop switch has moved and cut off the current to a coil as soon as that happens. This minimises power consumption and reduces wear on the SAM components.

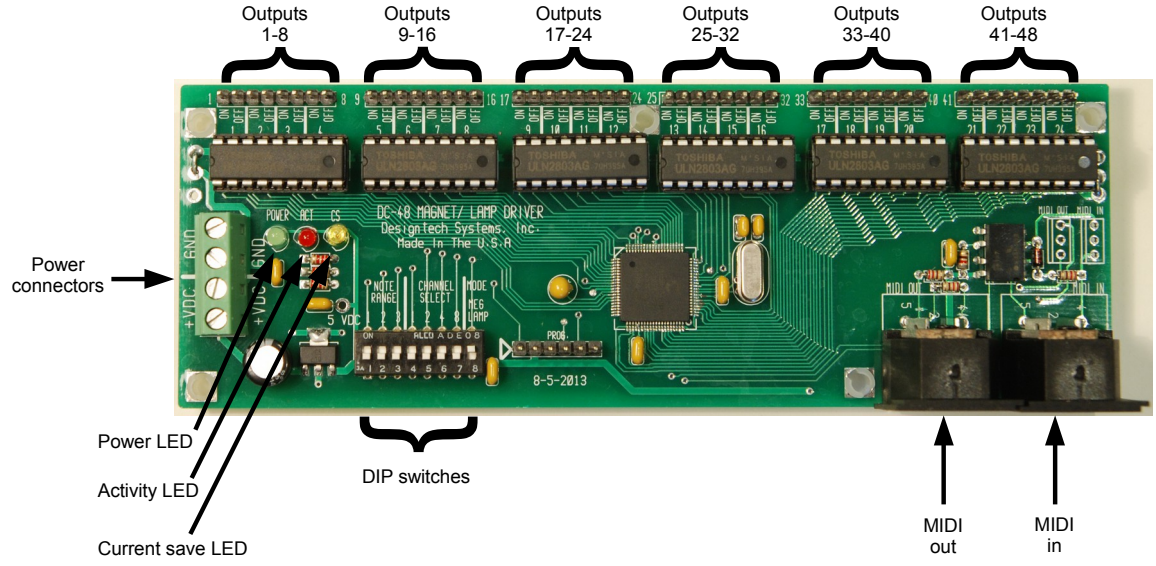
When current save is used, the 150ms pulse length no longer applies. Instead, each magnet receives the minimum pulse required to move the switch. However, if the switch fails to move, the current is cut off after 500ms and the error is reported to Hauptwerk.

2. Connections

DC-24



DC-48



Power in: An 8v to 15v DC supply should be connected to the screw terminals provided, with the positive line to the right.

MIDI in: A standard MIDI-compliant input. MIDI "note on" and "note off" messages which match the channel and note range settings on the DIP switches will cause the outputs to be energized. Any other MIDI messages will be forwarded to the MIDI out port.

MIDI out: A standard MIDI output. Any MIDI information received which does not match the channel and note range set on the DIP switches is forwarded to MIDI out..

DIP switches: These are used for setting the MIDI channel, note range and (on DC-48) whether the unit operates in lamp or magnet mode. The DIP switches are described in detail below.

Power LED: Green LED which lights to show that the board is supplied with power.

Activity LED: Red LED which flashes whenever a MIDI message is received. If the incoming message is a "note on" or "note off" message which matches the channel and note range selected on the DIP switches, you will see a clearly visible flash of about 50ms. If any other MIDI message is received, this will be forwarded to the MIDI out port and the LED will give a much shorter "wink" of about 8ms.

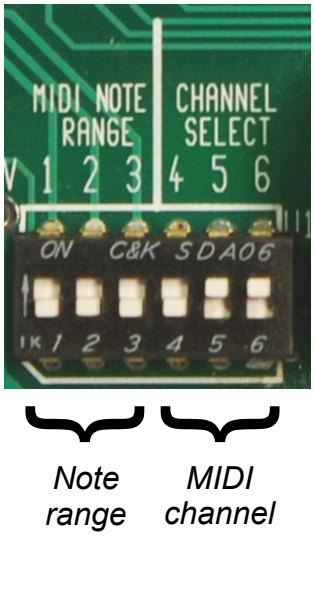
Current save LED: (Magnet mode only)

When the board is used in combination with an MIPC-1A or MK-03 encoder, and the encoder detects that the Stop Action Magnet (SAM) has moved in response to MIDI command, the decoder will turn off the magnet current. When this happens, the yellow current save LED flashes.

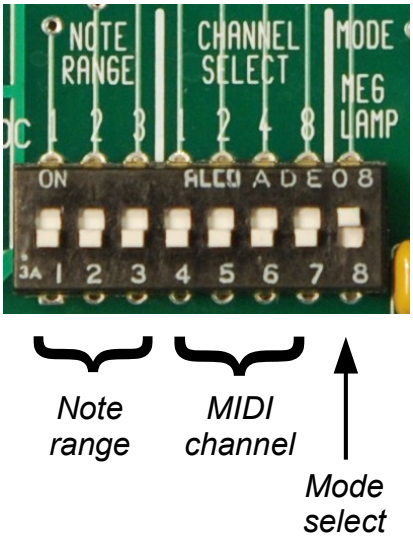
Our encoders send periodic messages to inform the decoders of the position of each SAM. When a message of this type is received, you will see a short "wink" from the current save LED.

3. DIP switches

DC-24



DC-48



Note range switches

The settings for the note range switches are shown below:

DC-24

Switch			Note range (lamp mode)	Note range (magnet mode)
1	2	3		
			0 - 23	0 - 11
		X	24 - 47	12 – 23
	X		48 - 71	24 - 35
	X	X	72 - 95	36 - 47
X			96 - 120	48 - 59
X		X		60 - 71
X	X			72 - 83
X	X	X		84 - 95

DC-48

Switch			Note range (lamp mode)	Note range (magnet mode)
1	2	3	*DC-48*	*DC-48*
			0 - 47	0 - 23
X			48 - 95	24 - 47
	X		96 - 127	48 - 71
X	X			72 - 95
		X		96 - 120

MIDI channel switches

DC-24 can operate on MIDI channels 9 to 16. DC-48 can operate on any MIDI channel.

DC-24

Switch			MIDI channel
4	5	6	
			9
		X	10
	X		11
	X	X	12
X			13
X		X	14
X	X		15
X	X	X	16

DC-48

Switch				MIDI channel
4	5	6	7	
				1
X				2
	X			3
X	X			4
		X		5
X		X		6
	X	X		7
X	X	X		8
			X	9
X			X	10
	X		X	11
X	X		X	12
		X	X	13
X		X	X	14
	X	X	X	15
X	X	X	X	16

Mode switch (DC-48 only)

If this switch is off, the DC-48 will operate in magnet mode. If it is on, the board will operate in lamp mode.

4. Output wiring

DC-24 and DC-48 are normally supplied to work with a "pull to ground" (a.k.a. "common positive") configuration. This means that you connect one side of each lamp or magnet to positive (typically +12v) and the board energizes an output by connecting the other side to ground. We can supply a "pull to positive" version of DC-48 to special order.

Each driver is rated at 50v and 500mA. The driver circuits incorporate freewheel diodes, so they can be safely connected to inductors (i.e. magnets). We recommend that the outputs for each card be connected to common via a slow-blow fuse of appropriate rating.

Lamp mode

In lamp mode, the lowest note value in the selected range will drive output 1, the next lowest will drive output 2, and so on.

Magnet mode

In magnet mode, the lowest note value in the selected range will drive output 1 for the "on" magnet and output 2 for the "off" magnet, the next lowest will drive output 3 for the "on" magnet and output 4 for the "off" magnet, and so on.

5. MIDI connections

We recommend using a high quality, recognized brand device to convert between MIDI and USB. We have found two midrange units to be reliable in many different configurations: the Cakewalk UM-1G and the M-Audio MIDIsport 2x2. Both are available from most music retailers. We have no connection with either company.

In theory, it is possible to "daisy-chain" any number of DC-24 and DC-48 cards together by connecting the MIDI out port of one to the MIDI in port of the next. However, for best performance, we recommend that no more than four decoder cards be connected together in this way. If you use more cards than this, we recommend use of a multi-way MIDI converter such as an M-Audio MIDIsport 4x4.

6. Current Save *(magnet mode only)*

When operating in magnet mode, the default behavior is for DC-24 and DC-48 to send a 150ms pulse of current to the "on" magnet when a MIDI "note on" message is received, and a 150ms pulse to the "off" magnet when a "note off" message is received. Although this normally works well, a Stop Action Magnet (SAM) in good condition will normally operate much faster than this. Conversely, a badly worn SAM might require a longer pulse, or might not move at all.

It can be time-consuming to maintain dozens or hundreds of SAMs in good condition, especially if some or all were acquired secondhand in the first place. A more robust solution is to monitor the switch position and turn off the current to the coil shortly after the SAM has moved. This both minimises energy consumption and wear on good SAMs, and keeps tired ones operating until they can be serviced.

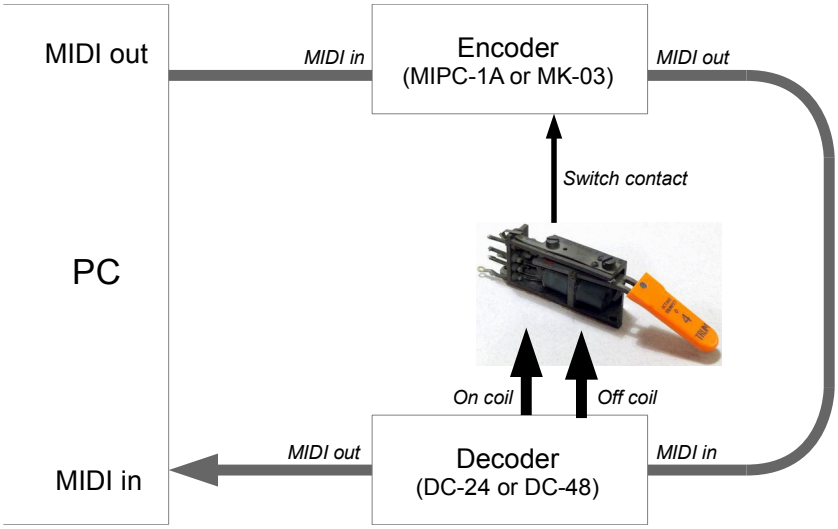
When used in conjunction with our MIPC-1A and MK-03 encoder boards, DC-24 and DC-48 implement exactly this type of "closed loop" system. No additional configuration is needed: DC-24 and DC-48 automatically enter current save mode when a suitable encoder card is detected.

Two conditions need to be met in order for current save to work.

1. The DC-24/48 needs to be able to “see” MIDI messages generated by the MIPC-1A or MK-03. Since MIDI is a unidirectional communications link, this means that the DC-24/48 needs to be connected “downstream” of the encoder.

2. The MIDI channel and note used to energize the magnets must be the same as the ones used to read the switch position. For example, if a particular stop switch is read as MIDI note 22 on channel 12, then the “on” and “off” coils must also be energized by MIDI “note on” and “note off” messages to note 22 on channel 12.

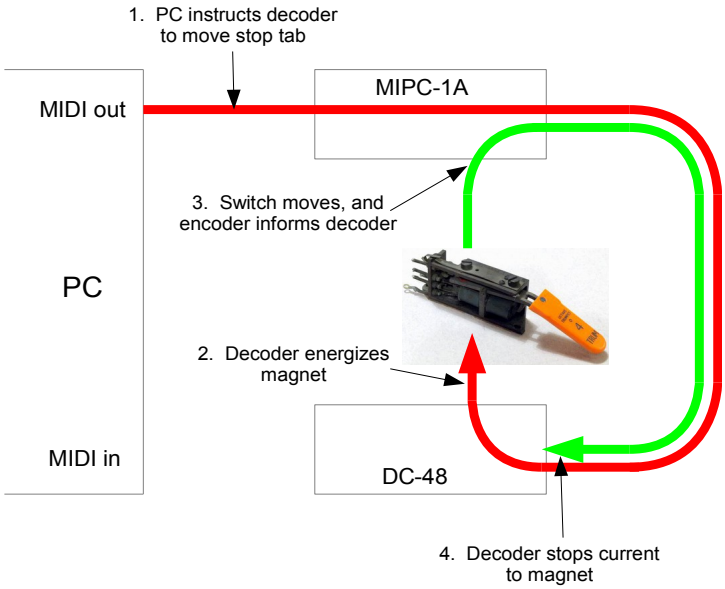
A recommended configuration to meet requirement (1) is shown below. When the encoder and decoder cards are correctly connected, you will see a periodic “wink” from the yellow LED on the decoder.



The Hauptwerk MIDI echo feature should preferably be turned off for each stop in turn, in order to minimise MIDI traffic.

The sequence of steps is as follows:

1. Hauptwerk sends a MIDI "note on" or "note off" message instructing the stop tab to move.
2. The DC-24/48 decoder activates the "on" or "off" magnet, as appropriate.
3. The stop tab moves, and the MIPC-1A or MK-03 encoder generates a corresponding MIDI message.
4. The DC-24/48 receives this message as confirmation that the tab has moved, and turns off the magnet.



When the decoder detects that the SAM has moved, the yellow LED will flash. If the stop tab fails to move, the DC-24/48 will turn the coil off after 500ms to prevent damage.

Error notification

DC-24 and DC-48 can also inform Hauptwerk if a tab fails to move. If a tab fails to move after 500ms, the DC-24/48 will generate a MIDI "note off" or "note on" message opposite to one originally received from Hauptwerk. This will return the tab on the computer screen to its original position, and ensure that the real and virtual stop positions do not get out of sequence. This is illustrated below.