

1. Introduction

The **mm productions** Relay Controller is a versatile programmable unit for remotely controlling non-MIDI equipment that respond to timed pulses. Coupled to an **mm productions** IFX Controller the Relay Controller unit offers a simple to operate system offering tremendous control over all aspects of a theatre audio and lighting rig.

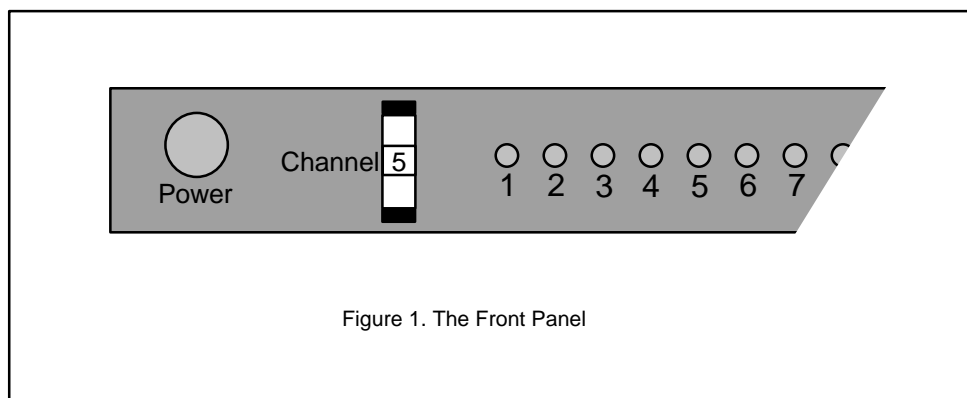
2. Connections, controls & displays

The simplicity of the MRC-16 means that there are few controls and connections are reduced to an absolute minimum. The front panel is uncluttered, the rear functional.

2.1 The front

There are only two controls on the front panel, the power switch and the MIDI channel selector. The MRC-16 receives only on the channel shown on the thumbwheel, so ensure that the correct channel number is displayed before transmitting any MIDI data to the unit. Note that MIDI data on channel 16 is received when the thumbwheel is set to '0'. There is no OMNI mode available.

There are 16 LEDs on the front panel which display the current state of each relay. The LED is lit up if the associated relay is closed, ie contact is made. Since the default (ie power up) sense of the relay is programmable some LEDs will remain lit and others unlit after power is applied. When a relay is pulsed the LED will briefly flash into the opposite state.



2.2 The rear

The rear of the unit contains the power connection. Also located here are the 16 pairs of screw terminals for connecting the unit to the devices to be controlled. After connecting a two wire cable to the slave device firmly screw the other end of the cable into a terminal pair on the rear of the MRC-16. Please consult the manual supplied with the device to be controlled for connection requirements.

The MIDI IN and THRU sockets are found on the rear panel as well. No MIDI OUT socket is present because the unit does not generate any MIDI data. Connect the MIDI IN via a MIDI cable

to the OUT of the previous MIDI device in the chain (ie an **mm productions** IFX unit) and the THRU to the next MIDI device, if one is in use.

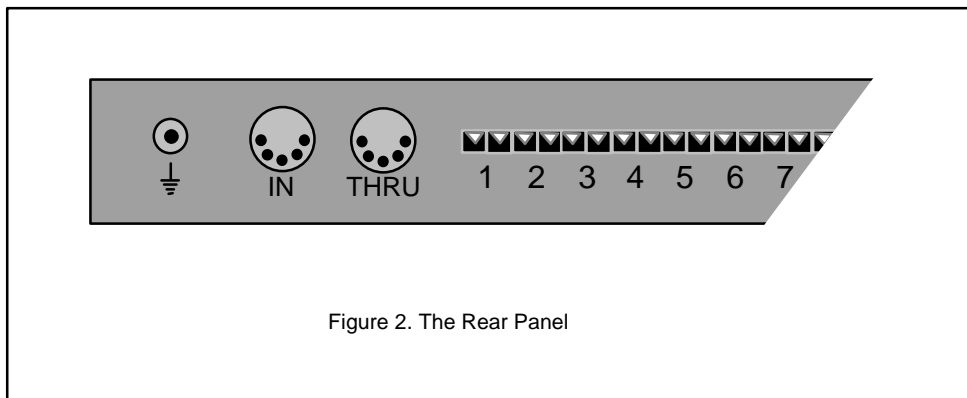


Figure 2. The Rear Panel

Note that the 16 screw terminals are *not* related in a one for one fashion to the 16 MIDI channels. The fact that there are 16 of each is purely coincidental. Data on MIDI channel 1 only effects screw terminal 1 if the thumbwheel is set to receive MIDI data on channel 1, in which case MIDI data on channel 1 can effect *any* screw terminal.

3. In use

The MRC-16 receives all its instructions via its MIDI IN socket except the MIDI channel selection which is performed using the thumbwheel on the front panel. The MRC-16 can hold a relay normally open or closed. This is selected using a Control Change message, see *Setting the default sense* below. The relay may be pulsed into the opposite sense by sending a either a Note On (followed by, in some cases, a Note Off) or a Program Change, see *Generating a pulse* below. The length of time the pulse lasts is programmable and is set using a Control Change message, see *Setting the default time* below.

3.1 Generating a pulse

Pulses are always initiated by either:

1. A Note On message with any velocity greater than 0. Relay 1 is triggered by, for instance, Middle C (Note C3, or 60 in decimal or 3C in hexadecimal) relay 16 by D# (MIDI note D#4 or 75 in decimal or 4B in hexadecimal) just over an octave above. The end of the pulse is caused by one of two events; the timeout maturing if the timeout is not 0, or a Note Off (if the timeout is 0).
2. A Program Change message. Relay 1 is triggered by Program 0, relay 16 by Program 15. The end of the pulse is always caused by the timeout maturing.

Regardless of the number of Note On messages received by a relay, only one is ever required for the release. This is only an issue when a timeout has been set to 0.

The note number associated with each relay may be set using continuous controller 32, with a data value of the note number to use for relay 1. For compatibility with earlier versions of the Relay Controller, it defaults to Middle C. The program number associated with the relays may be

set with controller 49, with a data value of the program number to use for relay 1. While this feature sounds a little obscure it allows several MRC-16s to exist on one MIDI channel number and still be controlled completely independently thus increasing control options without compromising an already crowded MIDI environment.

3.1.1 Timed pulses

Timed pulses exist for a number of milliseconds set by a Control Change message with a Controller ID of 0 through to 15 decimal (0 through to F hexadecimal). See Appendix A for details of the pulse length given the Controller data value.

3.1.2 Unlimited pulses

If a Controller ID of 0 through to 15 decimal (0 through to F hexadecimal) is sent with a data value of 0 the MRC-16 will require a Note Off message on the same note to terminate the pulse. Unlimited pulses cannot be terminated if using Program Changes so are not recommended in this mode.

3.2 Permitting configuration changes

On power up the unit will *not* allow any changes to be made to the pulse configurations. In order to enable the making and saving of changes the value 98 decimal (62 hex) must be written to Controller 102 decimal (66 hex). Following any changes made, the memory should be re-locked by writing any value *except* 98 (62) to the same Controller.

If changes are being ignored, please ensure that you have write enabled the memory *before* calling for technical support!

The reason for this feature is that many other units share the Controller numbers used by the Relay Controller for configuring the relays and any changes to the other units will, unfortunately, also be reflected on the relays.

3.3 Setting the default sense

The default sense of a relay determines whether it is opened or closed when the MRC-16 is powered up. A closed relay has an illuminated LED, an open one has an extinguished LED. Some slave equipment may need a break (open) to provide a signal, most will require a make (close) so normally most of the LEDs should be off except during a pulse. The default sense may be set using Controller Change messages to Controllers 16 through to 31 decimal (10 through to 1F hexadecimal). Relay 1 responds to Controller 16 messages and so on. Values of 0 to 63 decimal (0 to 3F hexadecimal) will set the default to break (or open) and values of 64 through to 127 decimal (40 to 7F hexadecimal) will set the default to made (or closed).

3.4 Setting the default time

The length of time that a pulse will last may be set using Controller Change messages to Controllers 0 through to 15 decimal (0 through to F hexadecimal). Relay 1 responds to Controller 0 and so on. The value sent as the Controller data is not itself the delay count, but an index into a list of delay counts. See Appendix A below for details on the mapping of indices to delays in milliseconds. If the delay index is 0 the pulse lasts until a Note off is sent to the same note number.

3.5 Setting the first relay note number

The note number that will activate relay 1 may be set using Controller Change messages to Controller 32 decimal (20 hexadecimal). The value sent as the Controller data is used to identify relay 1, the value plus 15 is used to identify relay 16. Note that this means that if a value greater than 111 is sent, some of the relays (those whose note number would be greater than 127) will be inaccessible.

3.6 Setting the first relay program number

The program number that will activate relay 1 may be set using Controller Change messages to Controller 49 decimal (31 hexadecimal). The value sent as the Controller data is used to identify relay 1, the value plus 15 is used to identify relay 16. Note that this means that if a value greater than 111 is sent, some of the relays (those whose program number would be greater than 127) will be inaccessible.

3.7 Setting the All Notes Off response

Each relay may individually be programmed to respond to or ignore All Notes Off messages. This is set using Controller Change messages to Controllers 33 through to 48 decimal (21 through to 30 hexadecimal). Relay 1 responds to Controller 33 and so on. When an All Notes Off message is received the responding relays immediately carry out their programmed pulse.

4. Appendix A: Pulse lengths

Controllers 0 through to 15 decimal (0 through to F hexadecimal) inclusive set the timer length. The Controller ID selects which relay timer is updated, the value sets the timer length in milliseconds as per the following table.

Note that a value of 0 means that a Note Off message is required to end a pulse, and that, if using Program Change messages to start the pulse, there will be no way to end it..

Cntrl data	Pulse time	Cntrl data	Pulse time	Cntrl data	Pulse time	Cntrl data	Pulse time
0	Unlimited	32	480	64	960	99	1440
1	15	33	495	65	975	97	1455
2	30	34	510	66	990	98	1470
3	45	35	525	67	1005	99	1485
4	60	36	540	68	1020	100	1500
5	75	37	555	69	1035	101	1515
6	90	38	570	70	1050	102	1530
7	105	39	585	71	1065	103	1545
8	120	40	600	72	1080	104	1560
9	135	41	615	73	1095	105	1575
10	150	42	630	74	1110	106	1590
11	165	43	645	75	1125	107	1605
12	180	44	660	76	1140	108	1620
13	195	45	675	77	1155	109	1635
14	210	46	690	78	1170	110	1650
15	225	47	705	79	1185	111	1665
16	240	48	720	80	1200	112	1680
17	255	49	735	81	1215	113	1695
18	270	50	750	82	1230	114	1710
19	285	51	765	83	1245	115	1725
20	300	52	780	84	1260	116	1740
21	315	53	795	85	1275	117	1755
22	330	54	810	86	1290	118	1770
23	345	55	825	87	1305	119	1785
24	360	56	840	88	1320	120	1800
25	375	57	855	89	1335	121	1815
26	390	58	870	90	1350	122	1830
27	405	59	885	91	1365	123	1845
28	420	60	900	92	1380	124	1860
29	435	61	915	93	1395	125	1875
30	450	62	930	94	1410	126	1890
31	465	63	945	95	1425	127	1905

Some examples are:

MIDI Controller value	Approximate Pulse length
7	1/10 th second
17	1/4 second
22	1/3 rd second
33	1/2 second
50	3/4 second
67	1 second
100	1.5 seconds

Function		Transmitted	Recognized	Remarks
Basic channel	Default	✗	○	Set by the front panel thumbwheel, 1..16
	Changed	✗	✗	
Mode	Default	✗	✗	
	Messages	✗	✗	
	Altered	✗	✗	
Note number		✗	○	60..75 (Unless CC32 != 60)
	True voice	✗	✗	
Velocity	Note On	✗	✗	
	Note Off	✗	✗	
After touch	Key's	✗	✗	
	Ch's	✗	✗	
Pitch bender		✗	✗	
Control change ²	0..15	✗	○	Pulse length ¹
	16..31	✗	○	0..127:Default relay sense, 00..63: Normally Open 64..127: Normally Closed
	32	✗	○	First relay number ³
	33..48	✗	○	0..127 All Notes Off action, 00..63: Ignore 64..127: Release relay
	49	✗	○	First relay number ⁴
	102	✗	○	98 = Memory unlocked
Prog change		✗	○	0..15 (Unless CC49 != 0)
	True #	✗	✗	
System exclusive		✗	✗	
System common	Song Pos	✗	✗	
	Song Sel	✗	✗	
	Tune	✗	✗	
System real time	Clock	✗	✗	
	Commands	✗	✗	
Aux messages	Local On/Off	✗	✗	Responding relays pulsed
	All Notes OFF	✗	○	
	Active Sense	✗	✗	
	Reset	✗	✗	
Notes		1. The pulse length is selected by an index number, the index number is not related to the pulse length. See Appendix A for an index to length map. If the index is 0 the pulse is not timed but waits for a Note Off. 2. After sending any control change wait 10 mSecs before sending any other message. 3. Used to identify relays for Note On/Offs 4. Used to identify relays for Program Changes		

mm productions

MIDI Relay Controller

User manual

Version 1.40

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mm productions maintains a policy of continuous improvement, certain details may differ from this manual. Be sure to read all supplied documentation before applying power to the unit.

Table of Contents

1.	Introduction	1
2.	Connections, controls & displays	1
2.1	The front	1
2.2	The rear	1
3.	In use	2
3.1	Generating a pulse	2
3.1.1	Timed pulses	3
3.1.2	Unlimited pulses	3
3.2	Permitting configuration changes	3
3.3	Setting the default sense	3
3.4	Setting the default time	4
3.5	Setting the first relay note number	4
3.6	Setting the first relay program number	4
3.7	Setting the All Notes Off response	4
4.	Appendix A: Pulse lengths	5

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