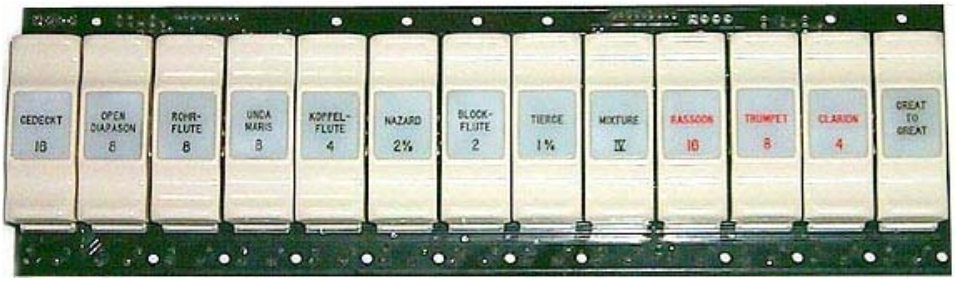
MIDI Lighted Rocker Tab

Installation Manual

2010-07-13

Classic ORGAN WORKS

MLRT-1



LRT-3A

LIMITED WARRANTY

Classic Organ Works warrants the MDKC1 and LRT-3A to be free from defects in materials and workmanship under normal use for a period of ONE YEAR from the delivery date. This warranty applies only if the product is owned by the original purchaser who has the bill of sale.

This warranty explicitly excludes any cables provided with the MDKC1and/or LRT-3A which may become defective as a result of normal wear and tear.

In the event of a defect in materials or workmanship, please contact Classic Organ Works immediately. In particular, defects due to shipping should be reported within 15 days for insurance claim purposes. For all other defects, Classic Organ Works agrees to repair or replace all defective parts of said products which are returned, transportation prepaid, for inspection at its service centre within the period of the warranty.

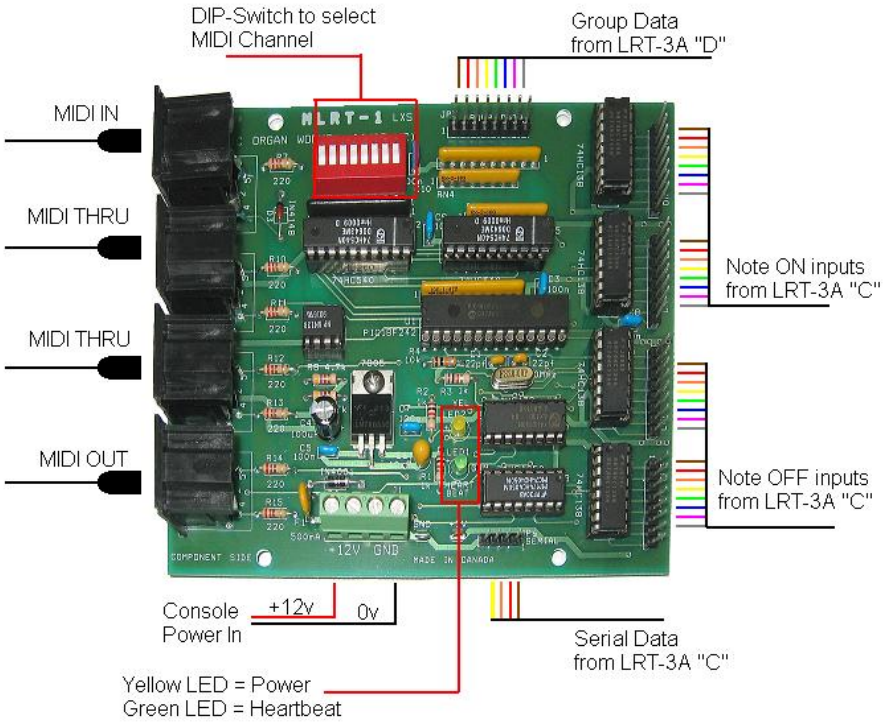
In the event that Classic Organ Works determines the product requires repair because of user misuse or regular wear, it will assess a fair repair or replacement fee. The customer will have the option to pay this fee and have the unit repaired and returned, or not pay this fee and have the unit returned un-repaired.

Classic Organ Works will not be liable for consequential, special, indirect, or similar damages or claims including loss of profit or any other commercial damage, and in no event will Classic Organ Works' liability for any damages to the purchaser or any other person exceed the price paid for the product, regardless of any form of the claim. Classic Organ Works specifically disclaims all other warranties, expressed or implied. Specifically, Classic Organ Works makes no warranty that the product is fit for any particular purpose.

This warranty shall be interpreted, and governed by applicable laws in the province of Ontario, Canada. If any provision of this warranty is found void, invalid or unenforceable, it will not affect the validity of the balance of the warranty, which shall remain valid and enforceable according to its terms. In the event any remedy hereunder is determined to have failed of its essential purpose, all limitations of liability and exclusion of damages set forth herein shall remain in full force and effect.

1.0 GENERAL DISCRIPTION

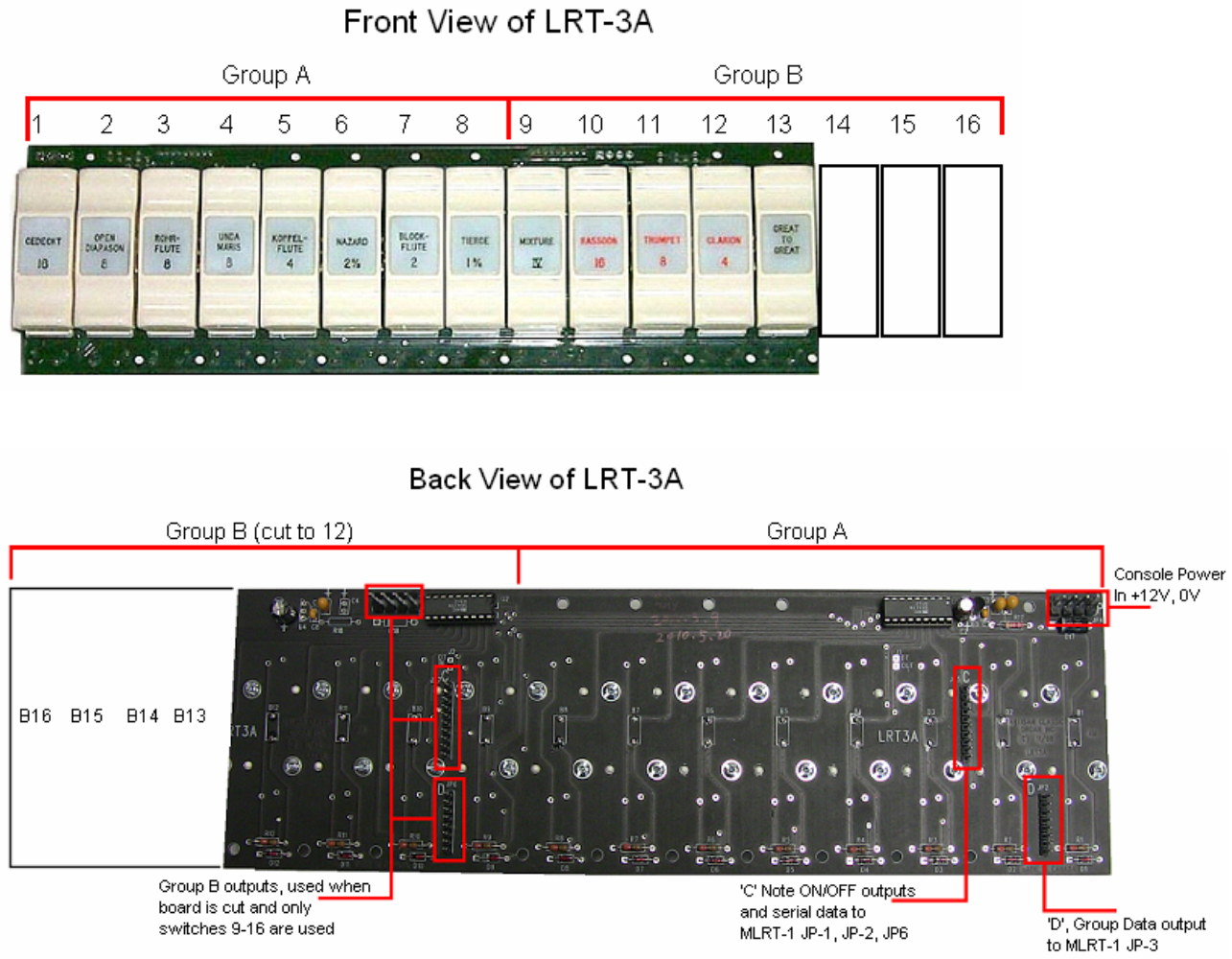
1.1 MIDI LIGHTED-ROCKER CONTROL BOARD (MLRT-1)



The MLRT-1 MIDI Lighted-Rocker Control board is an interface board between a control system such as Hauptwerk which sends and receives MIDI data and Classic Lighted Rocker Tab (LRT-3A) boards with send and receive parallel and serial data. It can control up to 128 Lighted Rocker Tabs. It generates a MIDI signal from the push-button switches to control an organ system, although it could be used to control almost anything via MIDI note-on/off (Patch) messages. Each LRT-3A switch has two momentary positions – On and Off – and they send different messages on the same MIDI channel.

The MLRT-1 also has a MIDI input that controls the lamps on the LRT-3A thus giving fool-proof indication that something happened. The 128 Note-On messages and 128 Note-Off messages received from the LRT-3A's are sent on one MIDI channel, these would normally be MIDI Patch commands.

1.2 CLASSIC LIGHTED ROCKER TABS (LRT-3A)



Each of the LRT-3A boards mounts up to 16 tabs in one row divided up into two groups of eight, switches 1-8 (A) and 9-16 (B), they can be butted into longer rows. These boards can also be cut down to a minimum of 4 contiguous tabs if necessary. The 16 tab switches are arranged in two groups of eight so that when each group is addressed in turn, all eight will appear simultaneously on the data bus. This common data bus return has only eight lines for all 128 switches and all LRT-3A boards in the system share this bus, being selected in turn.

The sequential switch addressing uses 16 wires for the On switches and another 16 for the corresponding Off switches.

The 128 lamps corresponding to the tab switches are driven by on-board serial-to-parallel conversion in the LRT-3As from serial data received from the MLRT-1, using data returned from the controlled system as a MIDI signal on the same channel as the switches. The lamps use the same codes as the switches.

A four-pin connector is used for the lamp serial data output from the MLRT-1 to the first LRT-3A "C" where it passes on to all others but with the data cascaded from one LRT-3A to the next.

2.0 MOUNTING THE BOARDS

Mounting holes are provided on both the MLRT-1 and LRT-3A for #4 screws. Holes for the screws should be pre-drilled to prevent wood from splitting.

2.1 MOUNTING THE MLRT-1

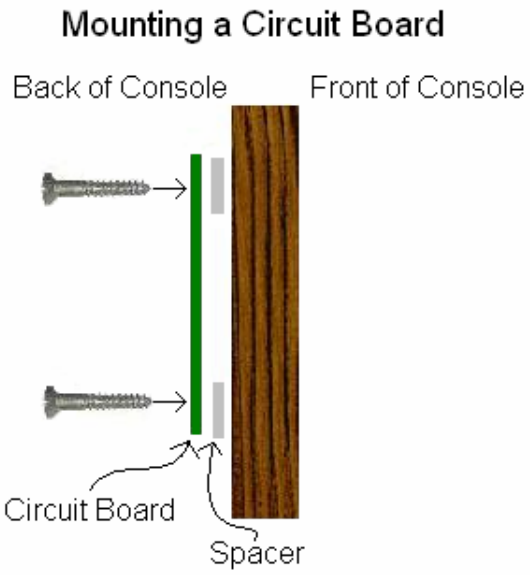
When mounting the MLRT-1, short spacers should be used to space the board up from the mounting surface. The board should be mounted reasonably close to the first LRT-3A board (at the left side of the organ console) so that the various connections can be easily made. It is not necessary to provide ventilation as the board consumes little power.

2.2 MOUNTING THE LRT-3A

Mounting the LRT-3A boards should be well planned out in advance. If you are fitting the LRT-3A's into pre-existing holes in the console they may simply be screwed into the back of the console, remember a board mounted on the far right side when viewed from behind the console will appear on the far left when viewed by the organist.

If the necessary holes do not currently exist in the console you will need to cut some. Each rocker tab is 0.95" or 2.413 cm.

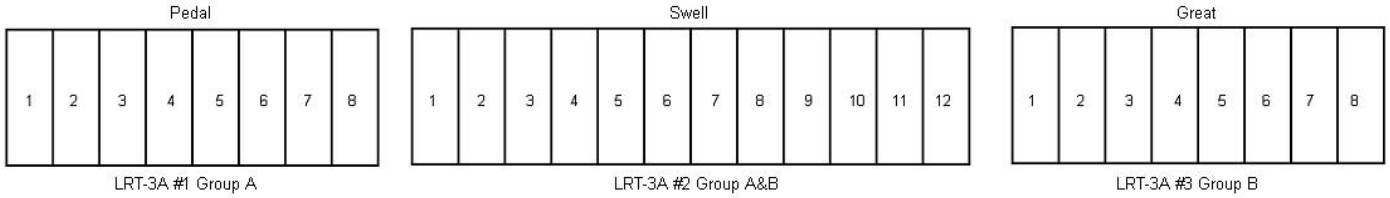
Depending on the thickness of the wood, spacers between the board and the surface may be needed for aesthetics when viewed by an organist. Check this before you screw anything into place.



3.0 WIRING

There are many different ways that a series of LRT-3A boards can be mounted on a console, each of which will result is slight differences in how they would be wired to the MLRT-1. For the purposes of these instructions we will use the example shown below of a Pedal division with 8 tabs, a Swell division with 12 tabs and a Great division also with 8 tabs.

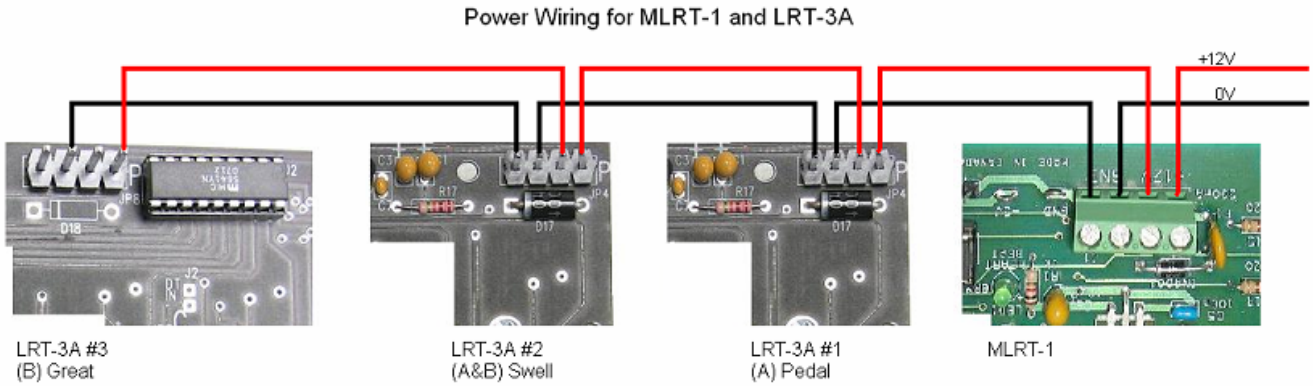
As mentioned above, the LRT-3A boards have 16 switches on them, divided up into 2 groups (A&B) of 8 switches each. In our example we will use the same board cut in half for 2 of the divisions; Group A for the Pedal and Group B for the Great.



While wiring your boards keep in mind that the label for each connector ie C or JP-3 will be beside pin 1 of that connector.

3.1 POWER

No power is necessary other than the console switched +12V and this should also power the LRT-3A boards. You can loop through from one board to another provided that there are not too many boards and the terminal block on the MLRT-1 has two pins for each rail voltage to help with this. If there are a lot of LRT-3A boards, the total lamp current could be substantial if all lamps will be lit at the same time and each board would then be better wired directly to the supply to minimise voltage drops across terminals.

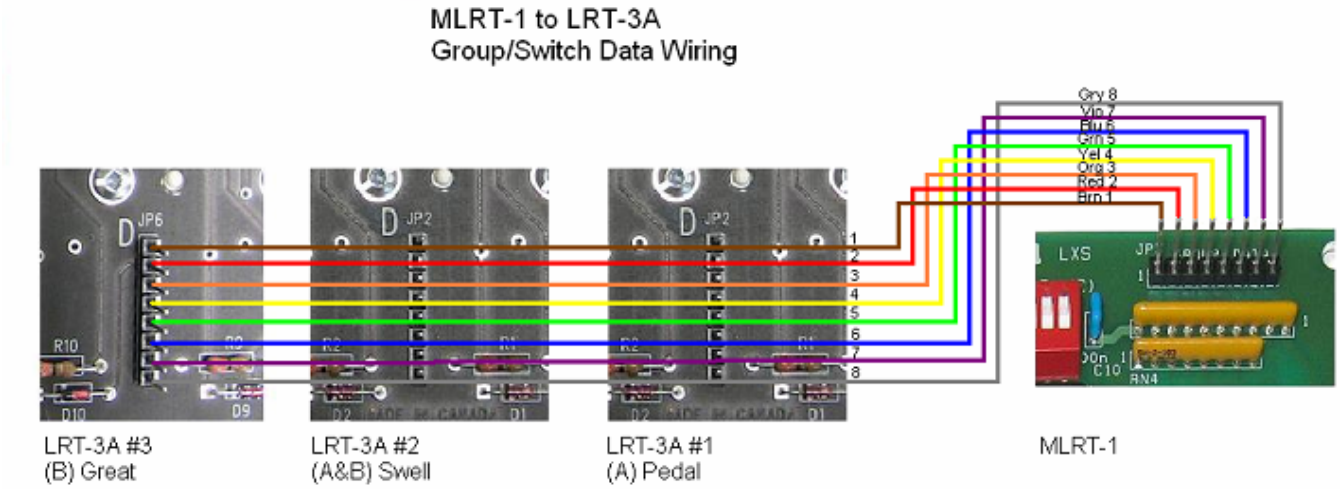


3.2 GROUP / SWITCH DATA WIRING

Wire the 8 Switch Data Pins on the MLRT-1 (JP-3) to the 'D' pins on the LRT-3A. This is pin for pin wiring, so:

MLRT-1 JP-3	Wire Colour	LRT-3A D
1	Brown (Brn)	1
2	Red	2
3	Orange (Org)	3
4	Yellow (Yel)	4
5	Green (Grn)	5
6	Blue (Blu)	6
7	Violet (Vio)	7
8	Grey (Gry)	8

Through type connectors will work best for this so an individual wired can go from the MLRT-1 to each of the LRT-3A boards.



3.3 ON AND OFF SWITCH WIRING

ON Sense Switches on the MLRT-1 are wired into JP-1 and JP-2, OFF Sense switches are wired into JP-4 and JP-5, each pin (in conjunction with the Switch Data) monitors 1 group of 8 LRT tabs. A full LRT-3A board with a total of 16 tabs would use 2 pins on the connector. The ON and OFF switches are wired into 'C' on the LRT-3A's on pins 5-8. Thus on the LRT-3A's:

PIN 5 ON Sense Switches for group A
PIN 6 ON Sense Switches for group B
PIN 7 OFF Sense Switches for Group A
PIN 8 OFF Sense Switches for Group B

MLRT-1 Connector		Colour	LRT-3A Board #	LRT-3A Connector	Comments
JP-1	1	Brn	1	C-5	ON Tabs 1-8 (A)
	2	Red		C-6	ON Tabs 9-16 (B)
	3	Org	2	C-5	ON Tabs 17-24 (A)
	4	Yel		C-6	ON Tabs 25-32 (B)
	5	Grn	3	C-5	ON Tabs 33-40 (A)
	6	Blu		C-6	ON Tabs 41-48 (B)
	7	Vio	4	C-5	ON Tabs 49-56 (A)
	8	Gry		C-6	ON Tabs 57-64 (B)

MLRT-1 Connector		Colour	LRT-3A Board #	LRT-3A Connector	Comments
JP-2	1	Brn	5	C-5	ON Tabs 65-72 (A)
	2	Red		C-6	ON Tabs 73-80 (B)
	3	Org	6	C-5	ON Tabs 81-88 (A)
	4	Yel		C-6	ON Tabs 89-96 (B)
	5	Grn	7	C-5	ON Tabs 97-104 (A)
	6	Blu		C-6	ON Tabs 105-112 (B)
	7	Vio	8	C-5	ON Tabs 113-120 (A)
	8	Gry		C-6	ON Tabs 121-128 (B)

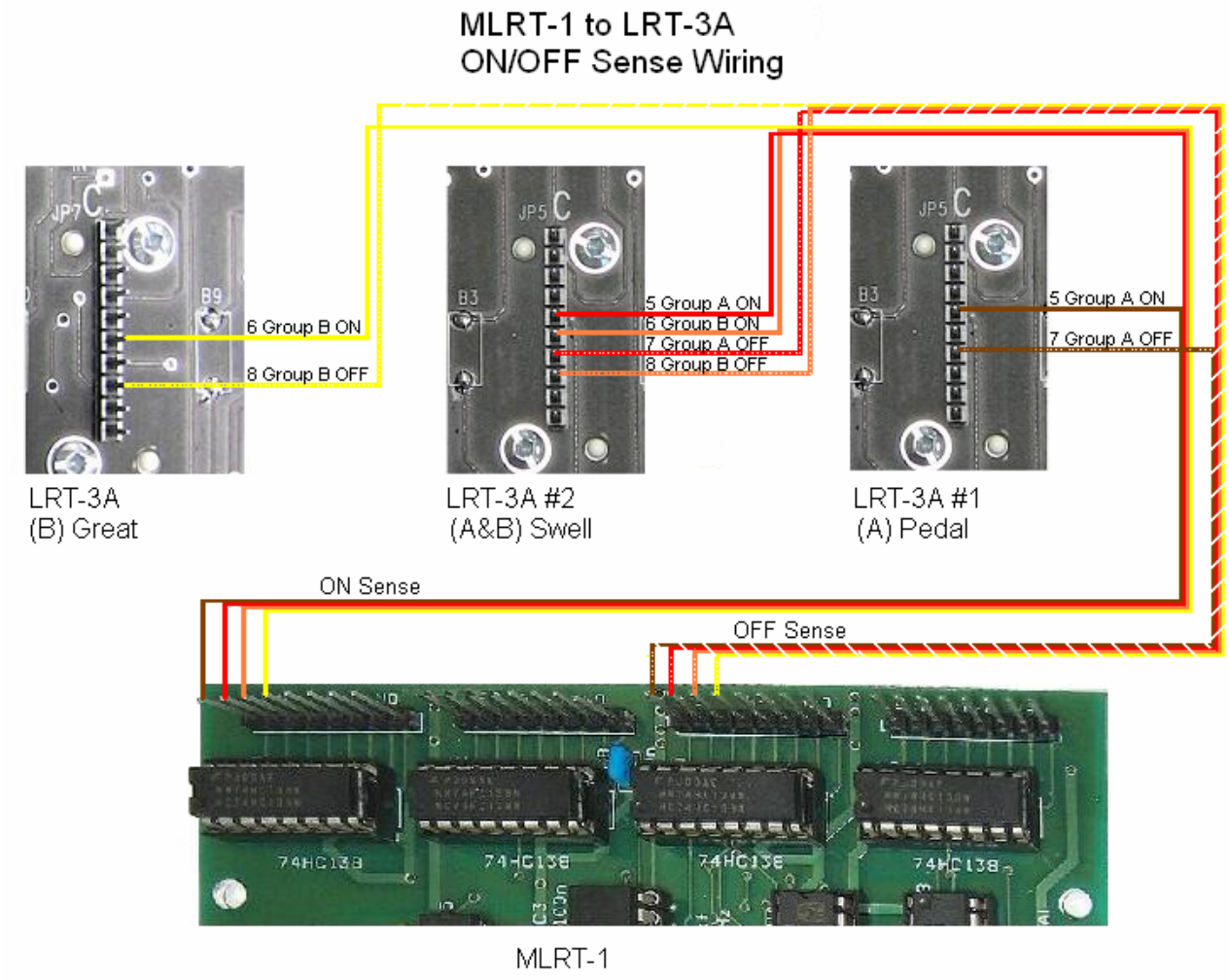
MLRT-1 Connector		Colour	LRT-3A Board #	LRT-3A Connector	Comments
JP-4	1	Wht/Brn	1	C-7	OFF Tabs 1-8 (A)
	2	Wht/Red		C-8	OFF Tabs 9-16 (B)
	3	Wht/Org	2	C-7	OFF Tabs 17-24 (A)
	4	Wht/Yel		C-8	OFF Tabs 25-32 (B)
	5	Wht/Grn	3	C-7	OFF Tabs 33-40 (A)
	6	Wht/Blu		C-8	OFF Tabs 41-48 (B)
	7	Wht/Vio	4	C-7	OFF Tabs 49-56 (A)
	8	Wht/Gry		C-8	OFF Tabs 57-64 (B)

MLRT-1 Connector		Colour	LRT-3A Board #	LRT-3A Connector	Comments
JP-5	1	Wht/Brn	5	C-7	OFF Tabs 65-72 (A)
	2	Wht/Red		C-8	OFF Tabs 73-80 (B)
	3	Wht/Org	6	C-7	OFF Tabs 81-88 (A)
	4	Wht/Yel		C-8	OFF Tabs 89-96 (B)
	5	Wht/Grn	7	C-7	OFF Tabs 97-104 (A)
	6	Wht/Blu		C-8	OFF Tabs 105-112 (B)
	7	Wht/Vio	8	C-7	OFF Tabs 113-120 (A)
	8	Wht/Gry		C-8	OFF Tabs 121-128 (B)

In the example being used, the Pedal only has the A group of tabs, the Swell has the A & B and the Great only has the B group so it will be wired as follows:

MLRT-1 Connector		Colour	LRT-3A Board #	LRT-3A Connector	Comments
JP-1	1	Brn	1 (Pedal)	C-5	ON Tabs 1-8 (A)
	2	Red	2 (Swell)	C-5	ON Tabs 9-16 (A)
	3	Org		C-6	ON Tabs 17-24 (B)
	4	Yel	3 (Great)	C-6	ON Tabs 25-32 (B)
JP-4	1	Wht/Brn	1 (Pedal)	C-7	OFF Tabs 1-8 (A)
	2	Wht/Red	2 (Swell)	C-7	OFF Tabs 9-16 (A)
	3	Wht/Org		C-8	OFF Tabs 17-24 (B)
	4	Wht/Yel	3 (Great)	C-8	OFF Tabs 25-32 (B)

NOTE: Even though the Swell does not have a full set of 16 tabs, the software will assume a full byte, filling out tabs 13-16 which don't actually exist. The first tab on any LRT-3A regardless if it is an A or B will always be the start of a new byte (1, 9, 17, 25, 33 etc)



3.4 LAMP WIRING

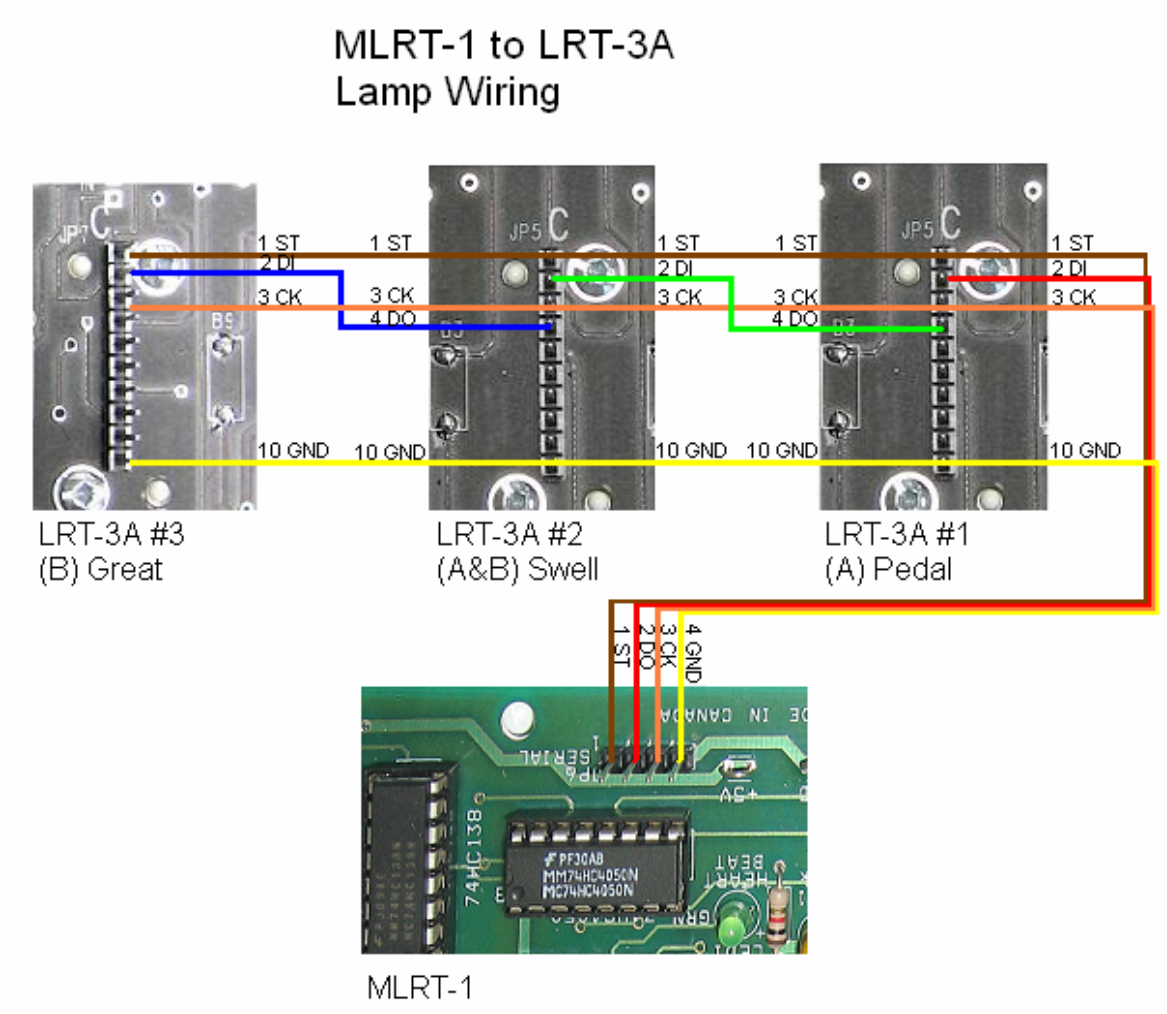
Lamps for the LRT tabs are wired from MLRT-1 JP-6 to LRT-3A 'C' (along with ON/OFF's). The Lamps are serially driven, with a Strobe, Data, Clock and Ground.

Wire the Strobe, Clock and Ground from one board to the next using connectors that can pass the wired through.

The Data Out from the MLRT-1 only goes to the first LRT-3A board. All other LRT-3A boards are cascaded ('daisy-chained') by wiring their Data Out pin (C-4) to the Data In pin (C-2) of the next one. The final Data Out is not used. We recommend you change the wire colour each time you wire out from one board into the next board.

MLRT-1		
JP-6	1	Strobe (ST)
	2	Data Out (DO)
	3	Clock (CK)
	4	Ground (GND)

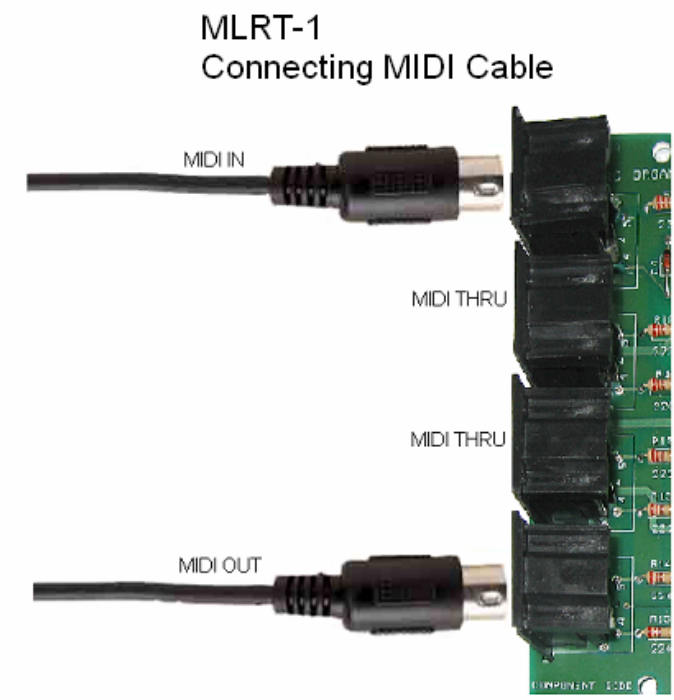
LRT-3A #1			
C-	1	Strobe (ST)	Pins 5-8, ON/OFF for Groups A & B, see Section 3.3. Pin 9 is a duplicate Ground
	2	Data In (DI)	
	3	Clock (CK)	
	4	Data Out (DO)	
	10	Ground (GND)	



3.5 MIDI CONNECTION

Connect MIDI OUT on the MLRT-1 to the MIDI IN of the system being controlled using a standard 5-pin DIN MIDI cable.

Similarly connect the MIDI OUT of the system being controlled to the MIDI IN of the MLRT-1. The two MIDI THROUGH connectors have buffered duplicates of this signal if it needs to be passed on to other equipment.



4.0 SET-UP AND OPERATION

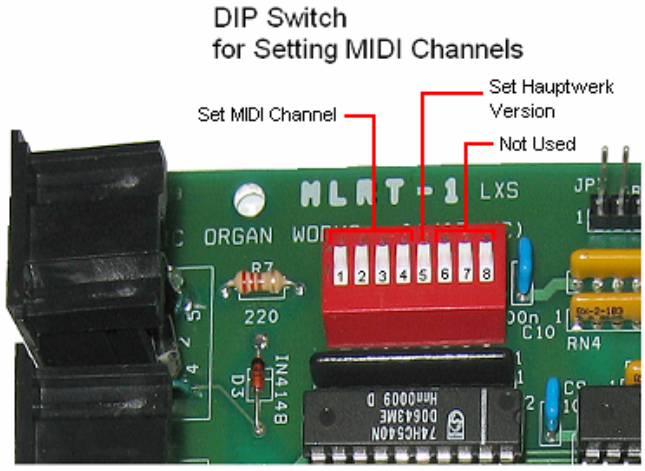
4.1 SET MIDI CHANNEL

The first 4 switches on the 8 position DIP-Switch are used to set which channel number the MLRT-1 will send and receive data. Switch-1 is nearest to the MIDI connectors. The MLRT-1 is shipped with all switches off thus MIDI Channel 1 is the default.

Channel (Binary)	Channel Number	Switch-4	Switch-3	Switch-2	Switch-1
0	1	Off	Off	Off	Off
1	2	Off	Off	Off	**On**
2	3	Off	Off	**On**	Off
3	4	Off	Off	**On**	**On**
4	5	Off	**On**	Off	Off
5	6	Off	**On**	Off	**On**
6	7	Off	**On**	**On**	Off
7	8	Off	**On**	**On**	**On**
8	9	**On**	Off	Off	Off
9	10	**On**	Off	Off	**On**
10	11	**On**	Off	**On**	Off
11	12	**On**	Off	**On**	**On**
12	13	**On**	**On**	Off	Off
13	14	**On**	**On**	Off	**On**
14	15	**On**	**On**	**On**	Off
15	16	**On**	**On**	**On**	**On**

Switch-5 should be Off for Hauptwerk Version-3 (or earlier) and On for Version-4. Version-3 sends back a confirming message from the MLRT-1 to say that the lamp has turned on. Version-4 does not.

The remaining three switches do nothing at this time and are reserved for future use.

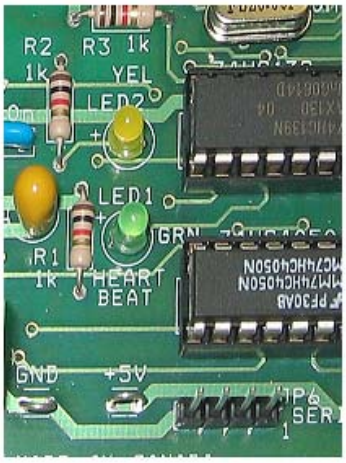


4.2 LED'S

There are 2 LED's on the MLRT-1 to aid in trouble shooting

LED1 'Heartbeat' - GREEN = when flashing it indicates that the board is operating

LED2 - YELLOW = there is power on the board



4.3 MIDI MESSAGES

Output:

A Tab-On gives (Bn 51 xx), where 'xx' is the tab number from 0 to 127 and 'n' is the Channel (0 to 15).

Tab-Off gives (Bn 50 xx).

Input:

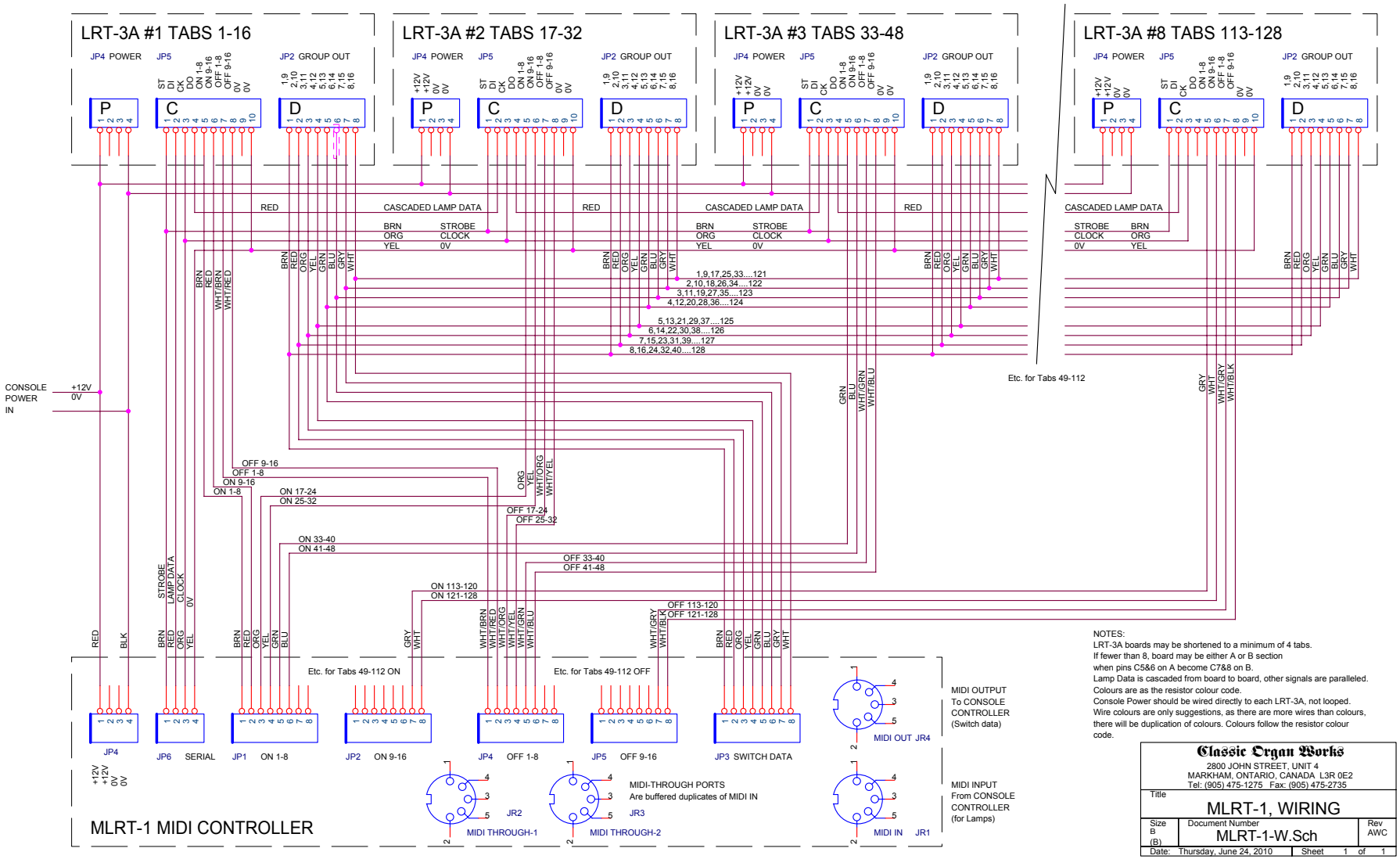
Lamp-On I (Bn 51 xx), where 'xx' is the lamp number from 0 to 127 and 'n' is the Channel (0 to 15).

Lamp-Off is (Bn 50 xx). All Lamps Off uses (Bn 79 00) or (FF).

Keep in mind when observing the tab number or channels that the software begins counting at 0, thus the first rocker tab on the LRT-3A is tab '0',

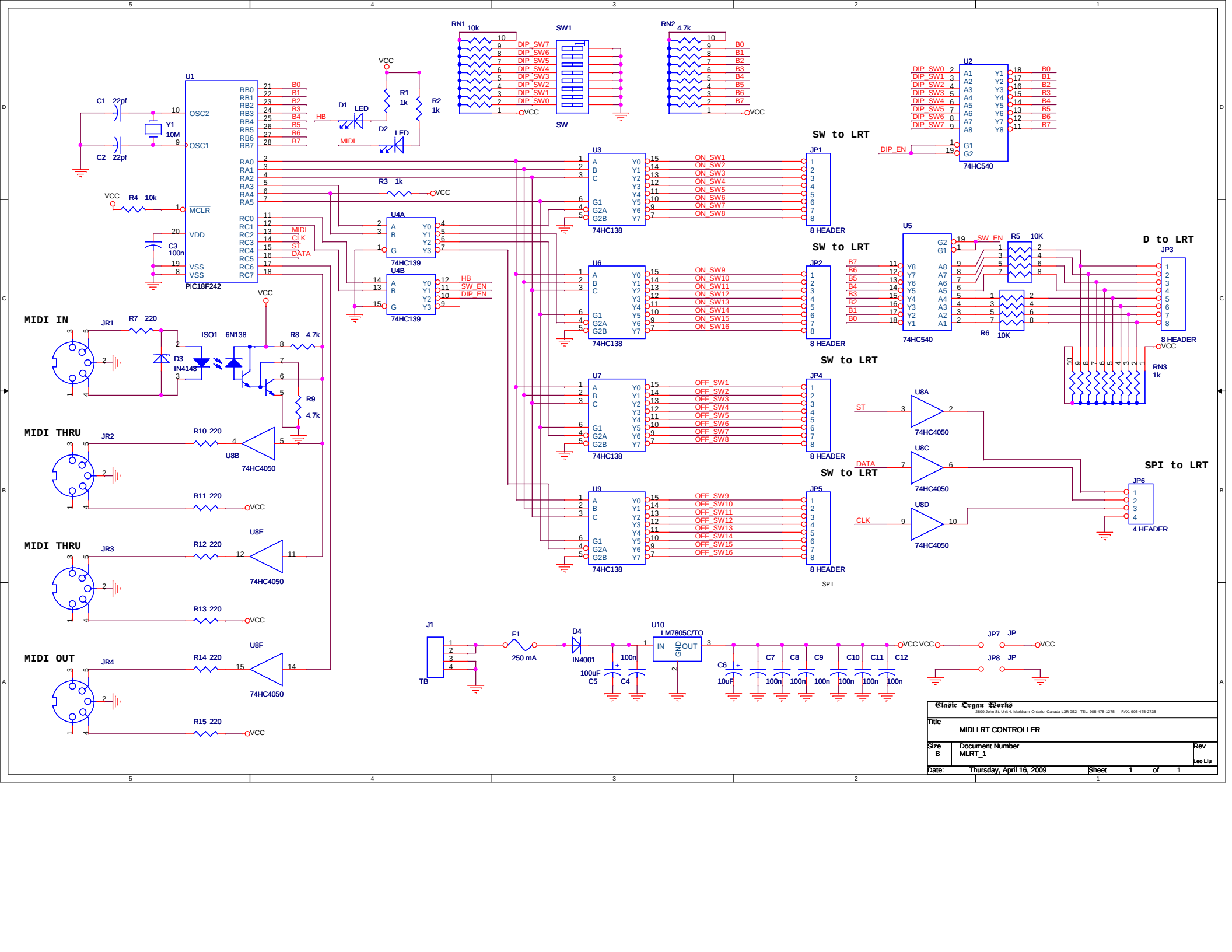
You can observe these messages on a computer by using MIDI Medic, a free software program for Windows, downloadable from the Classic Organ website.

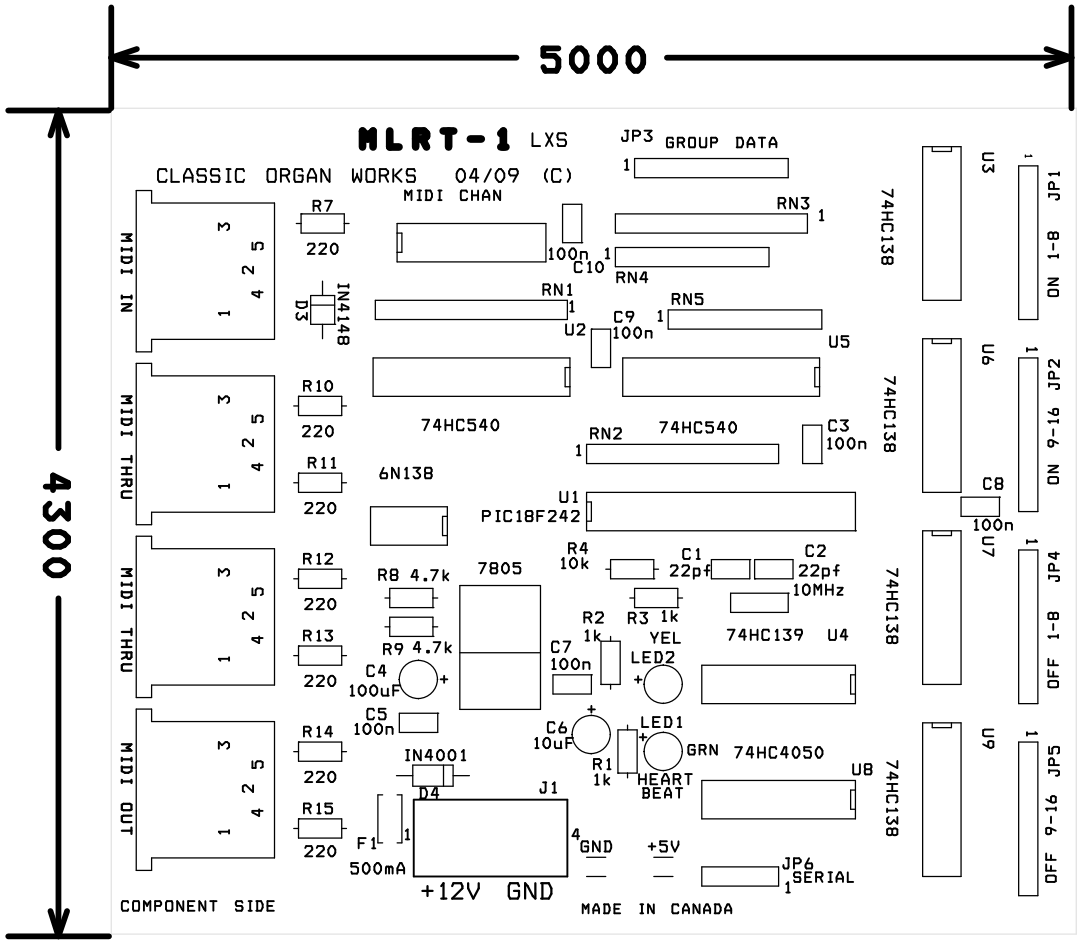
MLRT-1, WIRING



NOTES:
LRT-3A boards may be shortened to a minimum of 4 tabs.
If fewer than 8, board may be either A or B section
when pins C5&6 on A become C7&8 on B.
Lamp Data is cascaded from board to board, other signals are paralleled.
Colours are as the resistor colour code.
Console Power should be wired directly to each LRT-3A, not looped.
Wire colours are only suggestions, as there are more wires than colours,
there will be duplication of colours. Colours follow the resistor colour code.

Classic Organ Works 2800 JOHN STREET, UNIT 4 MARKHAM, ONTARIO, CANADA L3R 0E2 Tel: (905) 475-1275 Fax: (905) 475-2735		
Title: MLRT-1, WIRING		
Size: B (B)	Document Number: MLRT-1-W.Sch	Rev: AWC
Date: Thursday, June 24, 2010	Sheet 1 of 1	


U1
PIC18F242
C1 22pf
C2 22pf
Y1 10M
C3 100n
R4 10k
MCLR
OSC1
OSC2
VDD
VSS
RB0 RB1 RB2 RB3 RB4 RB5 RB6 RB7
RA0 RA1 RA2 RA3 RA4 RA5
RC0 RC1 RC2 RC3 RC4 RC5 RC6 RC7
MIDI
CLK
ST
DATA
HB
MIDI
D1 LED
D2 LED
R1 1k
R2 1k
R3 1k
RN1 10k
DIP_SW7 DIP_SW6 DIP_SW5 DIP_SW4 DIP_SW3 DIP_SW2 DIP_SW1 DIP_SW0
SW1
SW
RN2 4.7k
B0 B1 B2 B3 B4 B5 B6 B7
U2
74HC540
DIP_SW0 DIP_SW1 DIP_SW2 DIP_SW3 DIP_SW4 DIP_SW5 DIP_SW6 DIP_SW7
DIP_EN
U3
U4A
U4B
74HC139
U6
U7
U9
74HC138
ON_SW1 ON_SW2 ON_SW3 ON_SW4 ON_SW5 ON_SW6 ON_SW7 ON_SW8
ON_SW9 ON_SW10 ON_SW11 ON_SW12 ON_SW13 ON_SW14 ON_SW15 ON_SW16
OFF_SW1 OFF_SW2 OFF_SW3 OFF_SW4 OFF_SW5 OFF_SW6 OFF_SW7 OFF_SW8
OFF_SW9 OFF_SW10 OFF_SW11 OFF_SW12 OFF_SW13 OFF_SW14 OFF_SW15 OFF_SW16
SW to LRT
JP1
JP2
JP4
JP5
8 HEADER
SPI
U5
74HC540
SW_EN
R5 10K
R6 10K
D to LRT
JP3
8 HEADER
RN3 1k
SPI to LRT
JP6
4 HEADER
U8A
U8C
U8D
74HC4050
ST
DATA
CLK
MIDI IN
JR1
R7 220
ISO1 6N138
D3 IN4148
R8 4.7k
R9 4.7k
MIDI THRU
JR2
R10 220
U8B
R11 220
JR3
R12 220
U8E
R13 220
MIDI OUT
JR4
R14 220
U8F
R15 220
J1
TB
F1
250 mA
D4
IN4001
U10
LM7805C/TO
IN
GND
OUT
C4 100n
C5 100uF
C6 10uF
C7 100n
C8 100n
C9 100n
C10 100n
C11 100n
C12 100n
VCC
JP7 JP
JP8 JP
Classic Organ Works
2800 John St. Unit 4, Markham, Ontario, Canada L3R 0E2 TEL: 905-475-1275 FAX: 905-475-2735
Title
MIDI LRT CONTROLLER
Size B
Document Number MLRT_1
Rev
Leo Liu
Date: Thursday, April 16, 2009
Sheet 1 of 1


5000
4300
MLRT-1 LXS
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MIDI CHAN
JP3 GROUP DATA
MIDI IN
MIDI THRU
MIDI THRU
MIDI OUT
R7 220
R10 220
R11 220
R12 220
R13 220
R14 220
R15 220
D3 IN4148
100n
C10
RN3
RN4
RN1
RN5
U2
C9 100n
U5
74HC540
RN2 74HC540
C3 100n
6N138
U1 PIC18F242
C8 100n
R4 10k
C1 22pf
C2 22pf
10MHz
R8 4.7k
R9 4.7k
7805
R2 1k
R3 1k
YEL
LED2
74HC139 U4
C7 100n
C4 100uF
C5 100n
C6 10uF
LED1
GRN
R1 1k
HEART BEAT
74HC4050
U8
IN4001
D4
J1
F1 500mA
GND
+5V
JP6 SERIAL
+12V GND
74HC138
U3
JP1
ON 1-8
U6
JP2
ON 9-16
U7
JP4
OFF 1-8
U9
JP5
OFF 9-16
COMPONENT SIDE
MADE IN CANADA