DiGiCo
SD Rack

User Manual B - August 2013

Contents

DiGiCo UK Ltd

EC DECLARATION OF CONFORMITY

This is to certify that the:

SD-RACK AUDIO I/O INTERFACE

From serial number 770022-1009

Manufactured by:

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Conforms with the protection requirements of the Council Directive's 2004/108/EC and 2006/95/EC, relating to Electromagnetic Compatibility and Low Voltage Directive by the application of the following standards:

EN55103-1 1997 Emission standard
EN55103-2 1997 Immunity standard
EN60065 2002 Low voltage directive

Signed: ..... Position: Technical Director
John Robert Stadius

Date: 27 September 2010

1.1 Introduction

1.1.1 SD-Rack Unit and Modules, Installation Notes .....

The SD-Rack Unit is a 19-inch chassis with a control panel and PSUs at the top. It is a standard 19" rack mount wide, 365mm deep, excluding connectors and 10u (445mm) high.

Rack Mains Earthing

The SD-Rack Unit must be earthed to the mains earth according to the safety instructions included with the mixer system.
The rack has twin supplies each with their own separate mains power connections, with 2 IEC mains inputs per rack, which must be separately connected to the mains earth.

Rack Power Supply, Installation

The SD-Rack Unit contains 2 model MOD-SDR-PSU . From s/n 6221/1203 these are supplied with listed component approval to UL/EN/IEC/CSA 60950-1. Units built to this standard are marked with the ETL mark. These units are intended for operation ONLY in the SD-Rack. No attempt should be made to operate or install these supplies other than in the SD-Rack, only in the manner described here.
The rack will operate on only 1 supply. Supply units on the SD-Rack can be switched off, removed and replaced whilst the other is use (hot swappable)

Rack Power Supply, Cooling

The SD-Rack Unit has twin supplies each with their own separate mains power connections, with 2 IEC mains inputs per rack.
At least 1U (45mm) of space should be left above and below the rack unit to allow ventilation, and to prevent heat transfer from adjacent equipment. At least 100mm / 4” should allowed to side of the units to allow heat dissipation.
At least 100mm / 4" free air should be left at both the front (plain) side and the rear (connector) side of the rack to allow ventilation. However this clearance is usually required at a rack face and to allow connector access at the rear in any case.
Under no circumstances should the fan outlets be blocked or restricted.
The supply approval covers use in ambient air temperatures up to 35 deg C. Operation in temperatures above this should be avoided.

Rack Control Panel Connections

MADI I/O BNC 4 sockets (2 Pairs) of I/O to Console
MADI output / split BNC 2 sockets to Console or recorder etc.
Optocore HMA 2 Bidirectional dual connector (optional), Neutrik 2 x OpticalCON Duo (optional), ST Optical x 4 (optional)
Word Clock Out BNC socket 48/96 KHz 5V p-p
Word Clock In BNC socket 48/96 KHz 5V p-p max
USB type B
Mains Power IEC power x 2 Dual redundant supplies
Stage rack 200VA run
FOH rack 200VA run
100V-240V 50-60Hz auto sense
Requires 2 separate mains connections.

Input / Output Slots

Below the panel, the Rack Unit has Input and Output slots. Each of these slots can be filled with a different Rack Module, providing an I/O system which is configured according to model or user requirements. SD modules in the SD-Rack can be, removed and replaced whilst others are in use (hot swappable)

Rack Module Inputs and Outputs

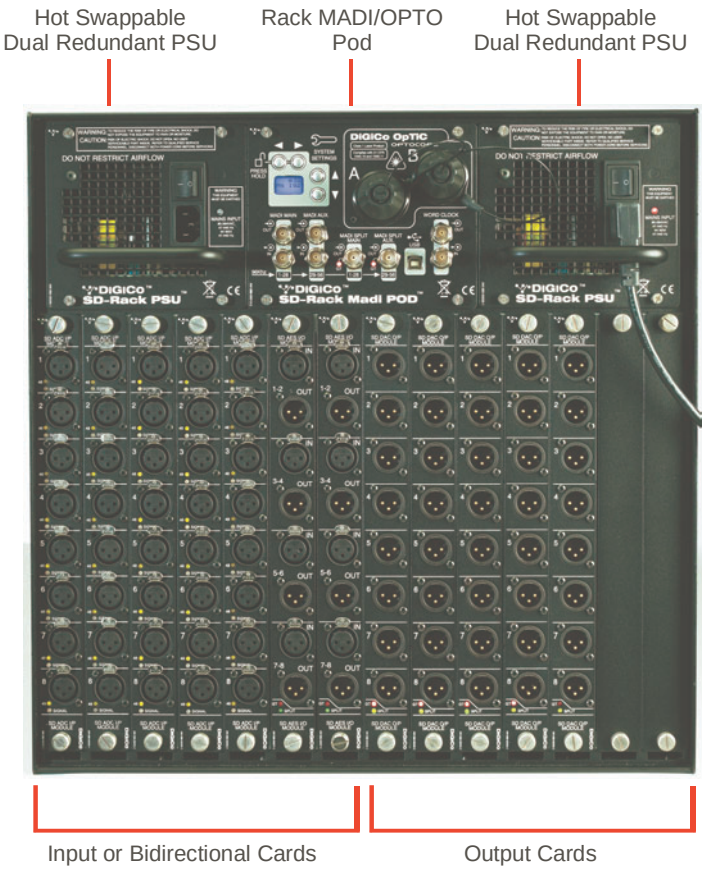
There are different Rack Modules for interfacing to different digital and analogue devices. Each Rack Module carries eight channels of audio.
The modules fall into two broad groups - those which carry only inputs or outputs, and those which carry both input and output signals. Output modules must be installed in Output slots, while Input and I/O modules must be installed in Input slots. The rack can be fitted with up to 7 input or I/O modules and 7 output modules (less where I/O modules fitted)

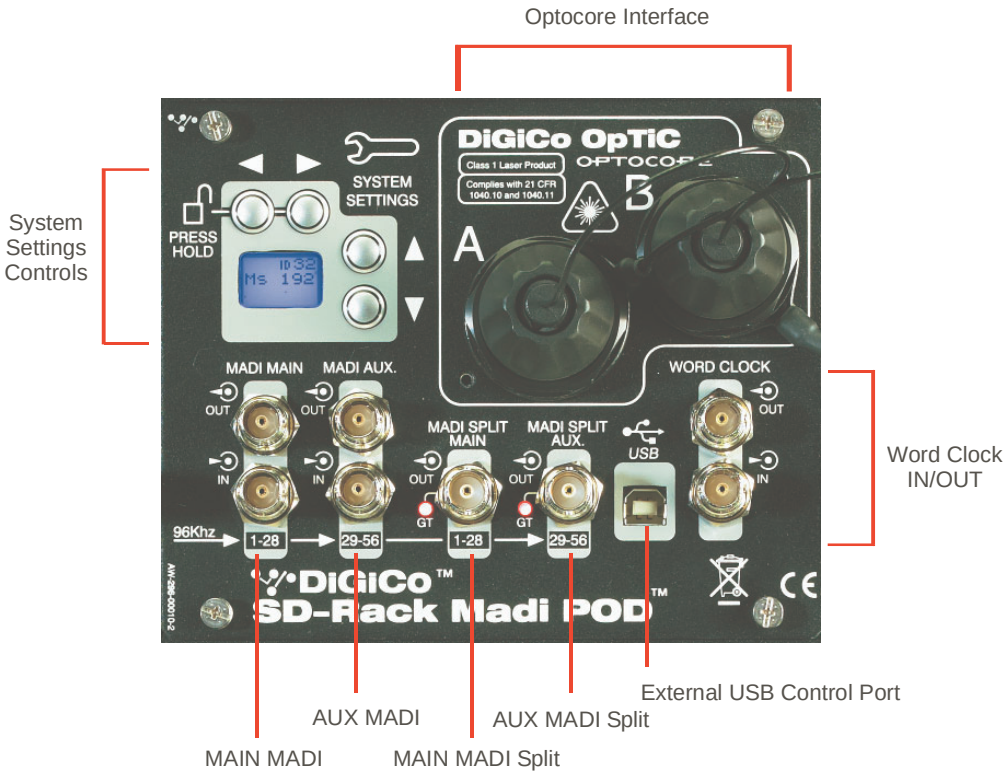
Rack Module Connections

Audio connections to the Rack Modules are made using appropriate connectors for the type of module. See the specifications for a list of the different connectors used in the Rack Modules.

Rack Signal Earthing

The analogue earthing requirements of the Rack unit is similar to those of a conventional large analogue console. All analogue inputs and outputs are balanced and symmetrical, but not floating, because of their transformerless design. Installers should use good earthing practice, as with any large audio installation. Digico can provide copies of AES papers on this subject upon request.


Hot Swappable
Dual Redundant PSU
Rack MADI/OPTO
Pod
Hot Swappable
Dual Redundant PSU
Input or Bidirectional Cards
Output Cards


Optocore Interface
System
Settings
Controls
Word Clock
IN/OUT
External USB Control Port
AUX MADI
AUX MADI Split
MAIN MADI
MAIN MADI Split
SYSTEM
SETTINGS
PRESS
HOLD
MADI MAIN
MADI AUX.
MADI SPLIT
MAIN
MADI SPLIT
AUX.
USB
WORD CLOCK
96Khz
1-28
29-56
1-28
29-56
DiGiCo
SD-Rack Madi POD

1.2 SD Rack Power

The SD rack has dual redundant hot swappable power supplies. The rack should be operated with both powersupplies on whenever possible.

1.3 SD Rack Clocking

The SD Rack will receive clock sync from the connected console in normal operation. It can run run at 48KHz or 96khz when clocked by the console. It is capable of running at 192KHz but this has not yet been implemented in current console software.

The SD Rack can also receive sync from its own internal clock at several different sample rates - see section 1.6.9 Rack Sample Rate

Additionally the rack can receive sync from an external word clock source when the word clock is connected to the rack's word clock in port.

1.4 SD Rack Cards

Several rack I/O card options are available - I/O cards normally provide blocks of 8 signals.

A rack can be fitted with up to 14 I/O cards providing up to 56 inputs and 56 outputs.

Card options are:

Analogue Mic/Line Input card on XLR

Analogue Line Output card on XLR

AES Input card on XLR or BNC

AES Output card on XLR or BNC

AES Bidirectional I/O card on XLR or BNC

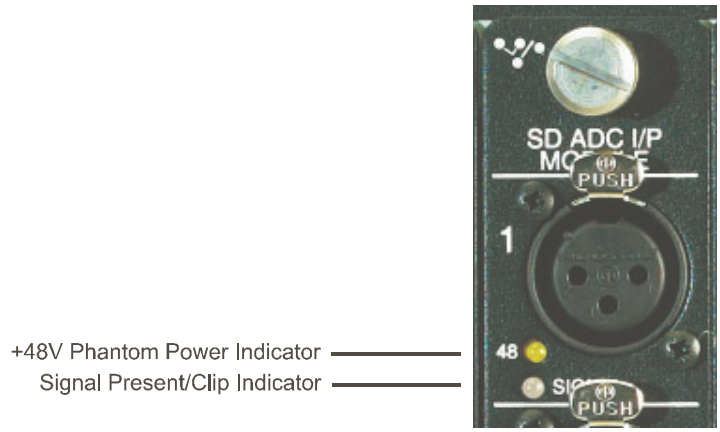
Aviom card (16 outputs occupying 2 rack slots) - CAT5 connector

AES42 Mic Input card on XLR

HD/SDI 8 Channel Embed/De-Embed I/O card on BNC

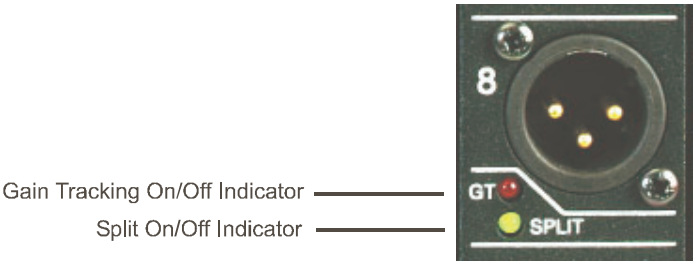
1.4.1 Analogue Mic/Line Input card (ADC) .....

The 8 Mic/Line input ADC card has 2 indicators on each socket.
The orange indicator shows the status of +48V Phantom Power On/Off.
The green indicator shows signal present and this turns red when the signal is close to clipping.



1.4.2 Analogue Line Output card (DAC) .....

The 8 Line output DAC card has 2 indicators at the bottom of the card.
The red indicator shows the status of Gain Tracking On/Off.
The yellow indicator shows the status of the card Split On/Off.



1.5 Splits & Gain Tracking

1.5.1 Split Options .....

The SD Rack has several different Split options.

1) Each input slot (block of 8 sockets on an input card) can be split to its relevant output slot. So slot 1 would be split to slot 8, slot 2 to slot 9 and so on. These split signals can be automatically Gain Tracked so that any change in the analogue gain on the input socket is compensated by the opposite change in digital trim on the relevant output socket.
The output cards have LED indicators showing Split ON/OFF and Gain Tracking ON/OFF status.

2) There are 2 dedicated MADI split ports on BNC connectors labelled MADI Split Main (MadiSM) and MADI Split Aux (MadiSX).
These ports can provide either 2 independent split signals at 48KHz or a pair of split signals that contain MADI channels 1-28 and 29-56 at 96KHz.
These outputs can also have automatic Gain Tracking applied to them on a per split basis. Eg. Main Split with Gain Tracking On and Aux Split with Gain Tracking Off

1.5.2 Gain Tracking .....

Gain Tracking can be controlled from the Rack LCD Menu system or optionally by an SD Series console.
With Gain Tracking switched ON the digital trim on the split outputs works in direct relation to the analogue gain that is applied to the relevant (same numbered) input socket. Any change in the analogue gain at the input results in the opposite change being applied to the digital trim of the output split socket.
If the analogue gain of an input socket starts at 0dB and with Gain Tracking On is raised to +10dB, the output split level will remain constant because it will have had a -10dB change applied to it in real time.

The correct procedure to follow is to set an acceptable level of analogue gain on each input before switching the Gain Tracking function on. Once the Gain Tracking function is active it should not be switched off without careful consideration.

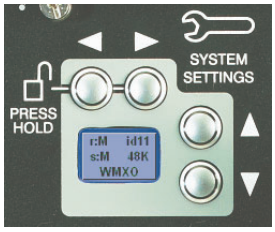
There is also a Gain Track Reset function which sets the split output digital trim to zero. This function should also be treated with due care because using it on an active split will potentially change the output level by a large amount.

1.6 Using the SD Rack Menu System

The LCD Menu System on the rack MADIPod is normally in a locked state and cannot be accessed.

The main display will be visible and if the rack is not connected to an SD console the background colour will be light blue.

If an SD console is connected and the rack is correctly receiving control data from it, the display will flash green.

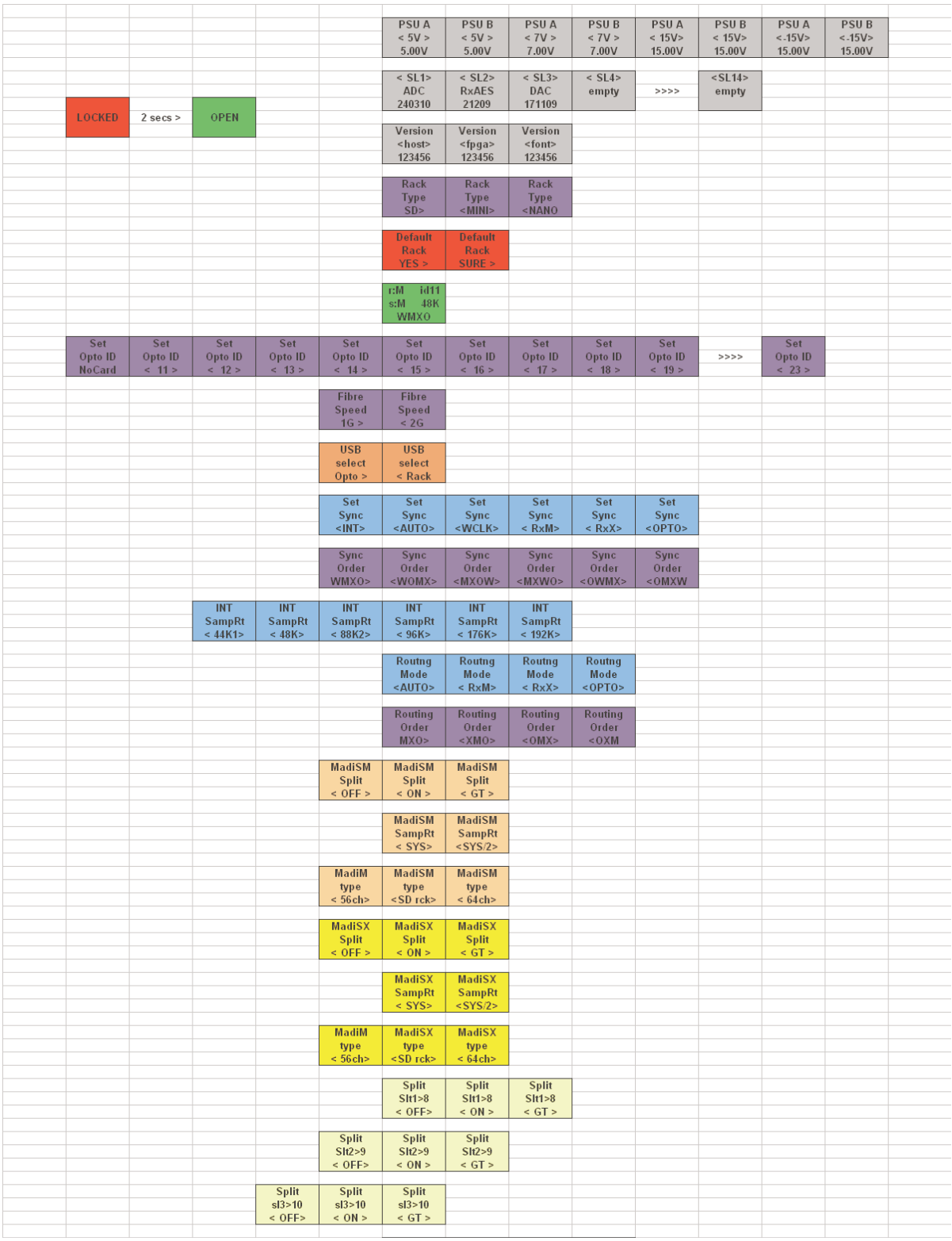


Pressing and holding the 2 buttons marked with left and right arrows for 2 seconds unlocks the Menu System. During the 2 seconds the display will be red and say "Locked" and when unlocked, the display will turn green and say "Unlocked".

The Up/Down buttons scroll through the pages in the Menu System and the Left/Right buttons are used to select each item within pages that have multiple items. When an item's value can be changed the Up/Down arrows are used for this.

If the rack is left in an idle state for 2 minutes, it will relock itself.

Please refer to the following diagram for menu navigation details.


PSU A < 5V > 5.00V
PSU B < 5V > 5.00V
PSU A < 7V > 7.00V
PSU B < 7V > 7.00V
PSU A < 15V> 15.00V
PSU B < 15V> 15.00V
PSU A <-15V> 15.00V
PSU B <-15V> 15.00V
< SL1> ADC 240310
< SL2> RxAES 21209
< SL3> DAC 171109
< SL4> empty
>>>>
<SL14> empty
LOCKED
2 secs >
OPEN
Version <host> 123456
Version <fpga> 123456
Version <font> 123456
Rack Type SD>
Rack Type <MINI>
Rack Type <NANO
Default Rack YES >
Default Rack SURE >
r:M id11 s:M 48K WMXO
Set Opto ID NoCard
Set Opto ID < 11 >
Set Opto ID < 12 >
Set Opto ID < 13 >
Set Opto ID < 14 >
Set Opto ID < 15 >
Set Opto ID < 16 >
Set Opto ID < 17 >
Set Opto ID < 18 >
Set Opto ID < 19 >
>>>>
Set Opto ID < 23 >
Fibre Speed 1G >
Fibre Speed < 2G
USB select Opto >
USB select < Rack
Set Sync <INT>
Set Sync <AUTO>
Set Sync <WCLK>
Set Sync < RxM>
Set Sync < RxX>
Set Sync <OPTO>
Sync Order WMXO>
Sync Order <WOMX>
Sync Order <MXOW>
Sync Order <MXWO>
Sync Order <OWMX>
Sync Order <OMXW
INT SampRt < 44K1>
INT SampRt < 48K>
INT SampRt < 88K2>
INT SampRt < 96K>
INT SampRt < 176K>
INT SampRt < 192K>
Routng Mode <AUTO>
Routng Mode < RxM>
Routng Mode < RxX>
Routng Mode <OPTO>
Routing Order MXO>
Routing Order <XMO>
Routing Order <OMX>
Routing Order <OXM
MadiSM Split < OFF >
MadiSM Split < ON >
MadiSM Split < GT >
MadiSM SampRt < SYS>
MadiSM SampRt <SYS/2>
MadiM type < 56ch>
MadiSM type <SD rck>
MadiSM type < 64ch>
MadiSX Split < OFF >
MadiSX Split < ON >
MadiSX Split < GT >
MadiSX SampRt < SYS>
MadiSX SampRt <SYS/2>
MadiM type < 56ch>
MadiSX type <SD rck>
MadiSX type < 64ch>
Split Slt1>8 < OFF>
Split Slt1>8 < ON >
Split Slt1>8 < GT >
Split Slt2>9 < OFF>
Split Slt2>9 < ON >
Split Slt2>9 < GT >
Split sl3>10 < OFF>
Split sl3>10 < ON >
Split sl3>10 < GT >

1.6.1 PSU Readings

This page shows readings for all rack PSU voltages. No adjustment is possible from the menu.

PSU A	PSU B	PSU A	PSU B	PSU A	PSU B	PSU A	PSU B
< 5V >	< 5V >	< 7V >	< 7V >	< 15V>	< 15V>	<-15V>	<-15V>
5.00V	5.00V	7.00V	7.00V	15.00V	15.00V	15.00V	15.00V

1.6.2 I/O Card Code Versions

This page shows the type of card detected in each rack slot and the firmware version installed on the card.
SLx indicates slot number in the range SL1 to SL14 reading left to right in the rack. Date codes are DD/MM/YY.
No adjustment is possible from the menu.

< SL1>	< SL2>	< SL3>	< SL4>		<SL14>
ADC	RxAES	DAC	empty	>>>>	empty
240310	21209	171109			

1.6.3 MADI Card Code Versions

This page shows the MADIPod firmware versions installed on the rack. HOST, FPGA and FONT date codes are DD/MM/YY.
No adjustment is possible from the menu.

Version	Version	Version
<host>	<fpga>	<font>
123456	123456	123456

1.6.4 Rack Type

This page shows the SD Rack type that the MADIPod is currently for. Options are SD Rack, SD MINI Rack and SD NANO Rack. Set this according to the rack type being used.

Rack	Rack	Rack
Type	Type	Type
SD>	<MINI>	<NANO

1.6.5 Rack Defaults

This page allows the user to set all rack parameters to their DEFAULT values.
When the display shows **Default Rack - Yes>,** press the Right arrow button to confirm.
The display will now show **Default Rack - Sure>,** press the Right arrow button to confirm.
Using the Left arrow button will navigate back from **Sure>** to **Yes>.**

Default	Default
Rack	Rack
YES >	SURE >

1.6.6 Main Display

The main display is always visible when the Menu System is in a locked state.
It indicates:
r: = The type of input/output being routed (M=MADI, O=Optocore)
s: = The rack sync source (M=MADI, O=Optocore, Int=Internal, W=Word Clock
idxx = The Optocore ID of the rack
xxK = The sample rate being used by the rack (eg 48KHz)
WMXO = The sync priority order which defaults to Word Clock, MADI Main, MADI Aux, Optocore
An upward arrow (^) will appear underneath each of the available sources of sync.

Thus if there is no valid Word Clock or MADI input to the rack, it will automatically sync to Optocore if present.
If a valid Word Clock input is then connected to the rack, this will automatically become the sync source for the entire Optocore system.
If multiple valid Word Clock inputs are connected to different racks, the rack with the lowest optocore ID that is receiving a Word Clock will become the sync source for the entire Optocore system.

1.6.7 Optocore ID & Fibre Speed .....

These pages show the Optocore ID of the rack in range of 11 to 24 and the fibre speed which is either 1GB or 2 GB.
Each rack requires a unique ID so that it can be recognised by the rest of the Optocore system. To change the ID, scroll with the Left/ Right buttons until you reach the required number.

The rack fibre speed needs to be set to the same value as all other devices in the Optocore system. The Default is 2GB and this should not be changed unless you have special requirements. There are two possible reasons to change the fibre speed to 1GB:
1) If you require distances of optical fibre greater than 350M between individual devices.
2) You require compatibility with Optocore's own I/O units, some of which will only operate at the 1GB fibre speed. Please consult your Optocore device documentation for the fibre speed specifications.

NOTE: Using a fibre speed of 1GB will restrict the system's Optocore fibre channel count to 224 I/O at 96KHz.

Set Opto ID NoCard	Set Opto ID < 11 >	Set Opto ID < 12 >	Set Opto ID < 13 >	Set Opto ID < 14 >	Set Opto ID < 15 >	Set Opto ID < 16 >	Set Opto ID < 17 >	Set Opto ID < 18 >	Set Opto ID < 19 >	>>>>	Set Opto ID < 23 >
				Fibre Speed 1G >	Fibre Speed < 2G						

1.6.8 USB Rack Control .....

This page allows selection of which rack component can be addressed by the rack USB port.
When set to **Opto >**, the internal Optocore board can be addressed for the reprogramming of Optocore firmware - this is not required unless under specific instruction from your distributor or DiGiCo Support.
When set to **< Rack**, the general rack control system can be addressed - this feature is not yet implemented (Nov 2010).
The Default setting is **< Rack.**

USB select Opto >	USB select < Rack

1.6.9 Rack Sync Source .....

This page allows selection of the rack sync source.
The Default setting is **<AUTO>** which allows automatic sync selection in the order selecetd in the Rack Sync order page where the default setting is **WMXO** as detailed in **Main Display** above.
This setting can be manually overridden and a specific sync source can be set as either:
<INT> = Internal sync - Rack is Master
<WCLK> = External Word Clock sync - Word Clock input is Master
<RxM> = MADI Main sync - MADI Main input is Master
<RxX> = MADI Aux sync - MADI Aux input is Master
<OPTO> = Optocore sync - Optocore is Master (normally the lowest numbered Optocore ID on the system)

Set Sync <INT>	Set Sync <AUTO>	Set Sync <WCLK>	Set Sync < RxM>	Set Sync < RxX>	Set Sync <OPTO>

1.6.10 Rack Sync Order .....

This page allows selection of the rack sync priority order when the the Rack Sync setting is **AUTO**.
The Default setting is **WMXO>** which allows automatic selection of sync order priority to Word Clock, Main MADI, Aux MADI and finally Optocore.
This means that if a valid Word Clock is present at the Word Clock input, the rack will sync to that and if not present the rack will look for a valid sync on the MADI Ports. If that is also not present, sync will be derived from Optocore.
This setting can be manually overridden and a specific sync priority order can be set as any of the combinations in the picture below where:
W = Word Clock
M = Main MADI
X = Aux MADI
O = Optocore

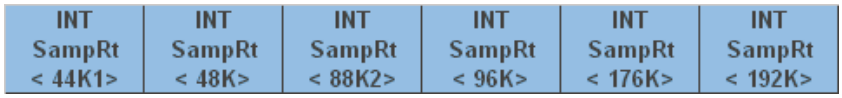
Sync Order WMXO>	Sync Order <WOMX>	Sync Order <MXOW>	Sync Order <MXWO>	Sync Order <OWMX>	Sync Order <OMXW

1.6.11 Rack Sample Rate .....

This page allows selection of the rack sample rate.

This is only possible if the **Rack Sync Source** is set to internal.

Available options are 44.1KHz, 48KHz, 88.2KHz, 96KHz, 176KHz and 192KHz



1.6.12 Rack Routing Mode .....

This page allows selection of the rack routing mode - which external source (MADI or Optocore) is being routed in and out of the rack.

The Default setting is **<AUTO>** which allows automatic routing selection where the routing mode follows the Rack Routing Order setting (see next section).

This setting can be manually overridden and a specific routing source can be set as either:

<RxM> = MADI Main routing - Input and output routing via MADI Main

<RxX> = MADI Aux routing - Input and output routing via MADI Aux

<OPTO> = Optocore routing - Input and output routing via Optocore

1.6.13 Rack Routing Order .....

This page allows selection of the rack routing priority order which is used when the Rack Routing Mode is set to **AUTO**.

The Default setting is **MXO>** which allows automatic selection of routing order priority to Main MADI, Aux MADI and finally Optocore.

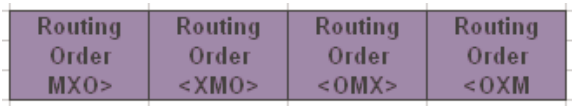
This means that if a valid MADI stream is detected on the Main MADI, then this is used. If that is not present, then the Aux MADI will be used and if neither are present then Optocore will be used.

This setting can be manually overridden and a specific sync priority order can be set as any of the combinations in the picture below where:

M = Main MADI

X = Aux MADI

O = Optocore



1.6.14 Rack Main and Aux Splits .....

This page controls the Main **(MadiSM)** and Aux **(MadiSX)** MADI Split functions.

1) Each split can be **< OFF >**, **< ON >** or ON with automatic Gain Tracking enabled (**< GT >**).

2) The sample rate of the split signal can also be set to be either the same as the rack's current sample rate **< SYS >** eg 96Khz or **< SYS/2 >** which is half of the rack's current sample rate. eg Rack at 96KHz and split at 48KHz.

3) The **MADI Type** of the split can be set to standard 56 channel **< 56ch >**, 64 channel **< 64ch >** or **< SD rck >** which will emulate the output of the SD rack and be recognised as such by the receiving MADI device. This last type would be useful if the split was feeding an SD series console.

MadiSM Split < OFF >	MadiSM Split < ON >	MadiSM Split < GT >
	MadiSM SampRt < SYS>	MadiSM SampRt <SYS/2>
MadiM type < 56ch>	MadiSM type <SD rck>	MadiSM type < 64ch>

MadiSX Split < OFF >	MadiSX Split < ON >	MadiSX Split < GT >
	MadiSX SampRt < SYS>	MadiSX SampRt <SYS/2>
MadiM type < 56ch>	MadiSX type <SD rck>	MadiSX type < 64ch>

1.6.15 Rack Card Splits .....

This page controls the individual output card Split functions.

Each card split can be **< OFF >**, **< ON >** or ON with automatic Gain Tracking enabled (**< GT >**).

Each input slot (block of 8 sockets on an input card) can be split to its relevant output slot. So slot 1 would be split to slot 8, slot 2 to slot 9 and so on.

		Split Slt1>8 < OFF>	Split Slt1>8 < ON >	Split Slt1>8 < GT >
	Split Slt2>9 < OFF>	Split Slt2>9 < ON >	Split Slt2>9 < GT >	
Split sl3>10 < OFF>	Split sl3>10 < ON >	Split sl3>10 < GT >		