Soundcraft Si Series Optical MADI Connectivity & Concepts

Contents

An Introduction to MADI

The Multi-channel Audio Digital Interface, or **MADI**, is an industry-standard electronic communications protocol that defines the data format and electrical characteristics of an interface carrying multiple channels of digital audio. The original specification (AES10-1991) defined the MADI link as a 56 channel transport for the purpose of linking large-format mixing consoles to digital multi-track recording devices but it soon found itself adopted by large broadcast studios for routing multi-channel audio throughout their facilities. Typically the format is transmitted over coaxial cable, fibre-optic lines or CAT5 cables; The MADI standard supports 28, 56, or 64 channels with sampling rates of up to 96 kHz and resolution of up to 24 bits per channel.

As noted, the original specification allowed 56 channels at sample rates from 28 to 54 kHz (32–48 kHz ±12.5%), the 2003 revision specifies a narrower sample rate range of 32–48 kHz but allows 64 channels. MADI offers a number of benefits over other digital protocols and standards such as AES/EBU (AES3), ADAT, TDIF, S/PDIF, CobraNet™ and similar including:

- Greater number of channels per line
- Use of coaxial and optical fibre media (enable the transmission of audio signals over extended Distances)
- It is a simple point-to-point system with no need to address channels within the packets
- Low latency

The use of MADI, with respect to mixing consoles, has changed little over the years but its popularity continues to grow as a reliable interface between two or more mixing consoles or between a mixing console and router or digital recording system.

The former example has increased dramatically in popularity as Pro Audio consoles moved into the digital domain and remote stageboxes became more common. This move has enabled a single stagebox to be shared amongst two or more consoles without the need for an analogue split system.

The latter example has seen strong growth as artists and record companies look to multi-track record almost every notable event for later publication and release whilst sound engineers frequently employ multi-channel playback of a rehearsal or previous event to do more comprehensive sound checks without need for the band (virtual sound-check).

Application Example1A, Sharing a stagebox

This section illustrates the principle behind a Vi series and Si series console sharing a Soundcraft Vi Stagebox:

In this example the Vi is connected to the MAIN MADI OUT and the Si connects to the AUX MADI OUT of the Vi Stage Box. The Vi has gain control of the mic pre amps and each desk has independent trim allowing levels to be balanced as each engineer prefers without interfering with the others mix.

NOTE: Stagebox INPUT SEL switch should be set to MAIN.

NOTE: Audio OUT of the Si must come from the Si analogue outputs.

The key benefit of this topology is that Vi and Si may operate fully independent of each other.

If the connection scenario is reversed, the Si console shall have control of the mic amps on the stagebox whilst the Vi shall see the inputs of the stagebox as line sources and offer gain trim function.

NOTE: Si requires V4.0 or higher software

Si channel patched to a Vi Stagebox

Si Patch screen showing patching to a Vi stage box mic card

The setting of the INPUT SEL switch on the stagebox determines which console 'sees' the stagebox inputs as either the controllable mic amp or simply an audio source, accordingly if the switch setting is changed the console that was the 'master' will no longer be able to 'see' the mic inputs and the card shall be reported as 'not present'
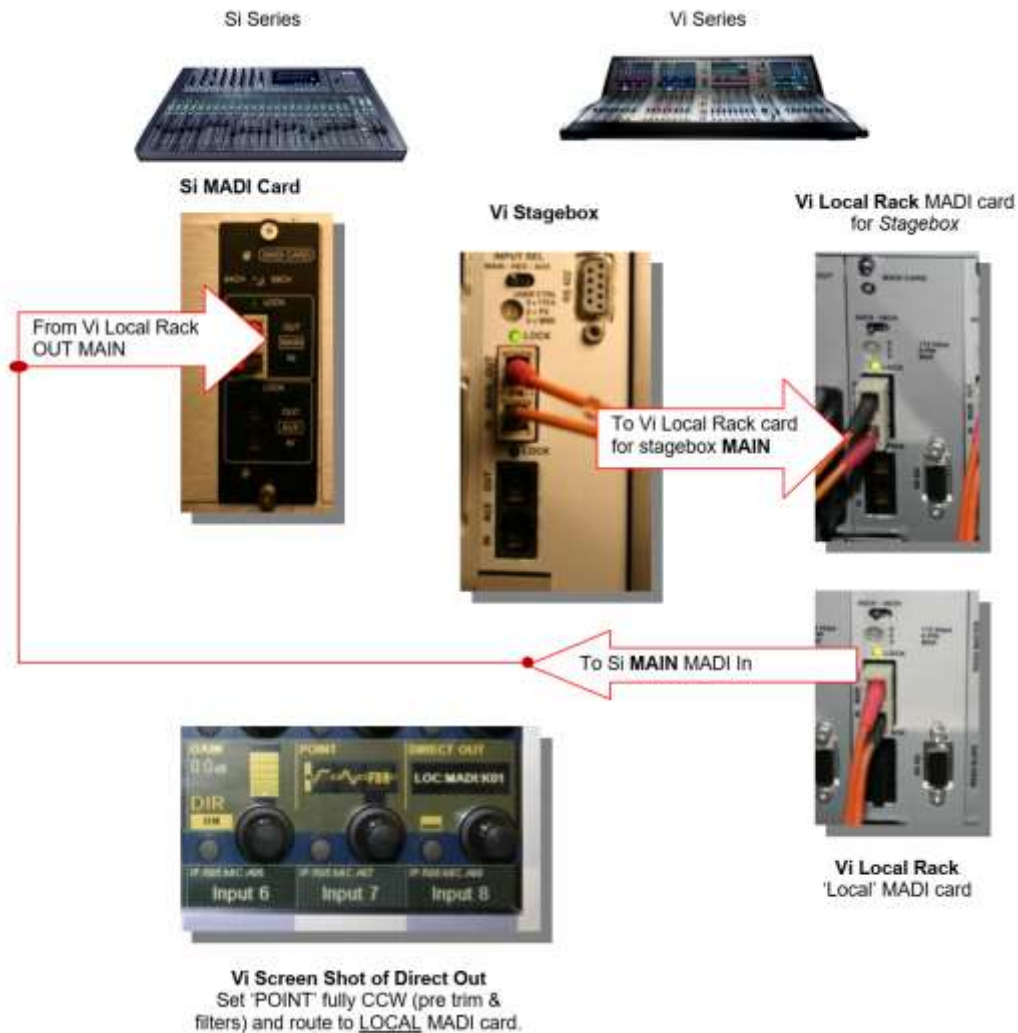

Since the console had once 'seen' the I/O card in the stagebox the cards shall continue to appear on the screen in 'anticipation' that the stagebox may be reconnected, this is the same scenario as if the stagebox was disconnected or turned off.

Application Example1B, Sharing a stagebox

An alternate configuration is to use the Direct Out of the Vi routed out of the Local Rack MADI card; the Si receives these 'direct outputs' and the signal is subsequently processed/routed as described in Example 1A. The key difference in this scenario is that the Tie Line function on the Vi may be used to return up to 24 signals from the Si and route them 'through' to the stagebox.

The key benefit of this topology is that the Vi stagebox may be used for outputs from both consoles and redundant links may be used.

Si Series

Vi Series

Si MADI Card

Vi Stagebox

Vi Local Rack MADI card
for *Stagebox*

From Vi Local Rack
OUT MAIN

To Vi Local Rack card
for stagebox **MAIN**

To Si **MAIN** MADI In

Vi Local Rack
'Local' MADI card

Input 6   Input 7   Input 8

Vi Screen Shot of Direct Out
Set 'POINT' fully CCW (pre trim &
filters) and route to LOCAL MADI card.

Application Example 2, Linking Two Si Consoles

This section illustrates the principle behind linking two Si consoles:

In this example, two Si consoles are linked via MADI. The 'Master' console has inputs via the usual analogue inputs and has control of the mic gain. Audio is fed to the 'Slave' Si console via DIRECT OUT signals from the Master, the 'Slave' console takes its inputs from the MADI card 'IN' signals with levels being balanced by the TRIM function.
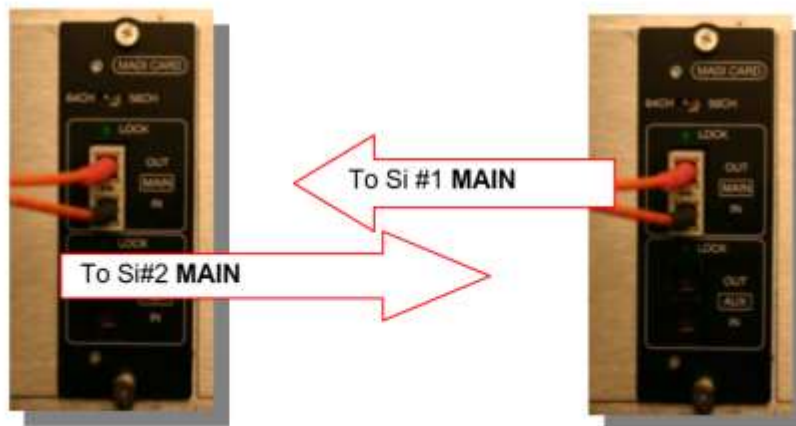
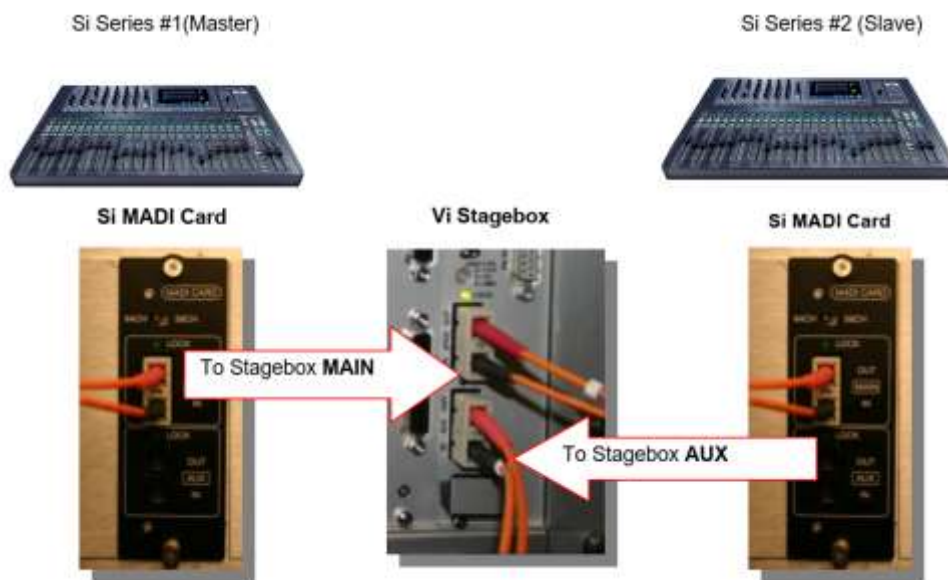NOTE: It is not possible to word clock lock two Si consoles.

Application Example 3, Linking two Si Consoles sharing a stagebox

This section illustrates the principle behind linking two Si consoles to a stagebox:

In this example two Si consoles are sharing a Vi Stagebox linked via MADI. Both consoles take their inputs from the stagebox, The 'Master' console has control of the mic pre amps whilst the slave console inputs appear as MADI sources and a local gain trim is offered.

NOTE: It is not possible to word clock lock two Si consoles

Application Example 4, Linking 2 Si Consoles & recording via MADI

This section illustrates the principle behind linking two Si consoles whilst simultaneously making a multi-track recording

In this example two Si consoles are linked via MADI in a similar manner to Example #2, but in this case one of the consoles is fitted with a second MADI card.

If the second MADI card is fitted to the MASTER console there is no need for further set-up and the recorder shall receive the exact same signals as the SLAVE console. This is the ideal placement for the card as it is possible to use the MADI IN of the second card as a second input source allowing multi-track playback (virtual sound-check).

If the second MADI card is fitted to the SLAVE the recorder will be fed from whatever signals the SLAVE console routes to its MADI OUT feeds, this can be either the direct outputs OR bus outputs

1. The DIP switch settings of the 1st MADI card (link to slave console) must be set so as its 'INPUTS' are disabled to avoid collisions; see the Si Option Slot & Card User Guide on the 'Expansion Slot' for further information.
2. The DIP switch settings of the 2nd MADI (link to recorder) card must be set so as its 'INPUTS' are disabled to avoid collisions; see the Si Option Slot & Card User Guide on the 'Expansion Slot' for further information.

NOTE: It is not possible to word clock lock two Si consoles

General Notes
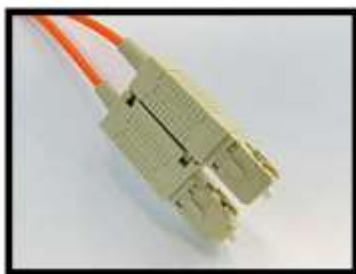
IMPORTANT: In all of the above illustrations it is noted that the consoles are not locked by word clock, sync is maintained by the PLL systems of each MADI card. Where possible systems should be locked by word clock for improved system performance and to prevent against potential dropout or spurious noise. Soundcraft do not condone operating any digital audio systems without suitable locking systems being implemented.

In Example 1A it is not possible to have a dual redundant link between the stagebox and Si & Vi consoles, In all other examples redundancy is possible through use of a second cable set (not shown).

There are many MADI recorders and interfaces on the market that may allow the MADI stream to be re-distributed or converted into other formats such as an ADAT or analogue that add additional functionality or flexibility to examples outlined above.

HARMAN

The type of connector used by the Si and Vi optical MADI cards is the 'SC' type as shown. The transceivers and fiber cable (unless otherwise specified) are the 'Multi Mode' type; offering typical distance between nodes of up to 1500m using a single run of multimode 50/125 optical fiber, 600m using 3 X 200m reels of multimode 50/125 optical fiber joined in series.

The most common type of connector & cable are the 'Duplex' type where the fibres are bonded together in a 'figure of 8' shape with the connectors clipped together as a pair.

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