24DSI

24-bit, 4 to 32 channel, 200KS/S/Ch Delta-Sigma A/D Input

PCI/PMC/CPCI/PC104P/PCIE104-…
…-24DSI32/12/6

Linux Application Note
Multi-Board Synchronization

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Preface

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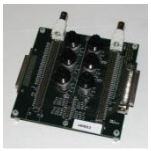
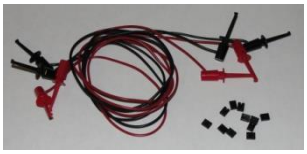
1. Introduction

This application note is intended to provide assistance for synchronizing two boards using the mbsync sample application. Included here is information on the equipment use by General Standards to demonstrate synchronization of two boards in a Daisy Chain configuration.

1.1. Equipment

The following table lists the equipment used by General Standards to successfully synchronize two PMC-24DSI12-PLL boards using the mbsync sample application.

Item	Description
	Two PMC-24DSI12-PLL boards were used. The mbsync application can synchronize from two to eight boards. The boards do not have to be the same form factor or the same model. Two PMC-24DSI12-PLL boards can be synchronized just as easily as PCI-24DSI6LN and three PCI-24DSI32 boards. The only difference would be cabling.
	The 24DSI12 test fixture is used for signal routing. It routes the clock and sync signals from the initiator to the target. It also routes the 5KHz signal from a signal generator to each board's first channel. The test fixture is used merely for its convenience
	Two 24DSI12 cables with 68-pin SCSI connectors on each end. These cables are used for their convenience in connecting the boards to the test fixture.
	A signal generator is used to generate a sine wave for the 24DSI12 boards. The frequency must be 5KHz, plus or minus 250Hz. The amplitude must be from ±9.0 volts to ±9.5 volts. If mbsync detects one or more low power boards, then the voltage range must be from ±4.5 volts to ±4.9 volts.
	An Oscilloscope is used to visually observe and measure the output of the signal generator.
	RG58 cabling is used to feed the output of the signal generator to the Oscilloscope and the test fixture.
	A variety of jumpers and test leads are used to route the sync and clock signals on the test fixture. The jumpers are used to connect the clock and sync signals in the Daisy Chain configuration. This is the configuration demonstrated for preparation of this application note. The test leads are used for the Star configuration, which is not discussed in this application note.

2. Setup

This section provides setup information about synchronizing two boards using the mbsync sample application.

2.1. Basic

The illustration below depicts how the equipment is connected for the mbsync application. The 24DSI12 ribbon cables connect each 24DSI12 to the test fixture. The RG58 cables connect the signal generator to the oscilloscope and the two Analog Input connectors on the test fixture. The test fixture rotary switches are each set to channel zero.

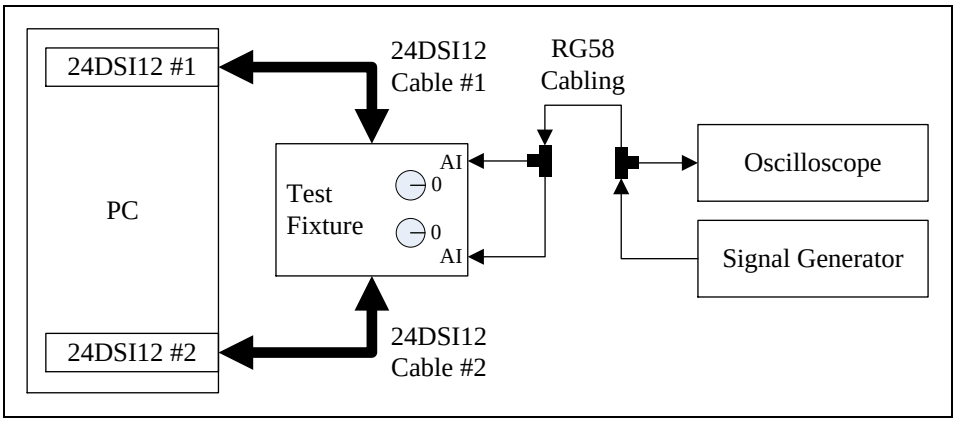


Figure 1 The basic setup for the mbsync application.

The 24DSI12 board index numbers are provided on the mbsync command line. The first board index given is the initiator. All other board index numbers represent successive targets. For some models of the 24DSI family it is relatively easy to associate a board with its board index number. For example, the PCIE104-24DSI12 flashes an LED on the board while performing auto-calibration. For others, such as the PMC-24DSI12, it may be necessary to determine the numbering experimentally. For example, with only one ribbon cable attached in the above figure, run the savedata sample application on one of the boards, then examine the output file, data.txt. If the text file's first column shows relatively constant data, then the referenced board isn't the board connected by ribbon cable. If the first column shows a continuously changing pattern, then is likely the referenced board.

2.2. Daisy Chain Configuration

If the boards are to be connected using the Daisy Chain configuration, then the signals are connected according to the below table. These setting are illustrated in the photograph to the table's right. In the table and the photograph, the initiator is to the right and the target is to the left. If mbsync fails to read data, then reverse the board index numbers on the mbsync command line, or swap the ribbon cable connections on the test fixture.

Board #2 (Outputs)	**Board #1 (Inputs)**
Ext Clock Output Low	Ext Clock Input Low
Ext Clock Output High	Ext Clock Input High
Ext Sync Output Low	Ext Sync Input Low
Ext Sync Output High	Ext Sync Input High

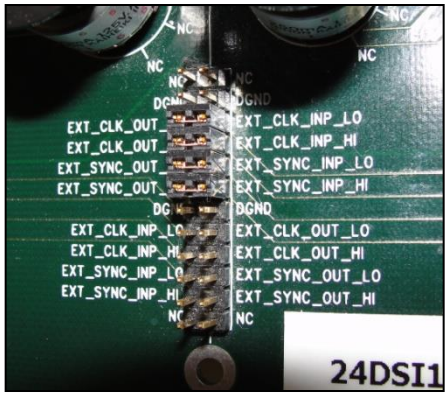


Figure 2 The Daisy Chain jumper configuration.

2.3. Star Configuration

The Star configuration was also tested with the mbsync applications. With only two boards, the differences are only additional signal routings. The change includes wiring the initiator's output clock and sync signals so they also go back to its input clock and sync signal. No other changes are necessary when using only two boards.

Board #2 (Outputs)	Board #2 (Inputs)	Board #1 (Inputs)
Ext Clock Output Low	Ext Clock Input Low	Ext Clock Input Low
Ext Clock Output High	Ext Clock Input High	Ext Clock Input High
Ext Sync Output Low	Ext Sync Input Low	Ext Sync Input Low
Ext Sync Output High	Ext Sync Input High	Ext Sync Input High

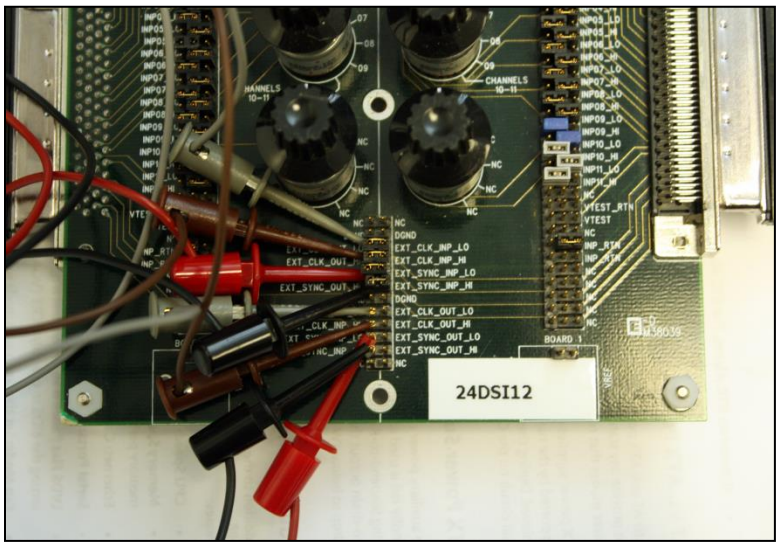
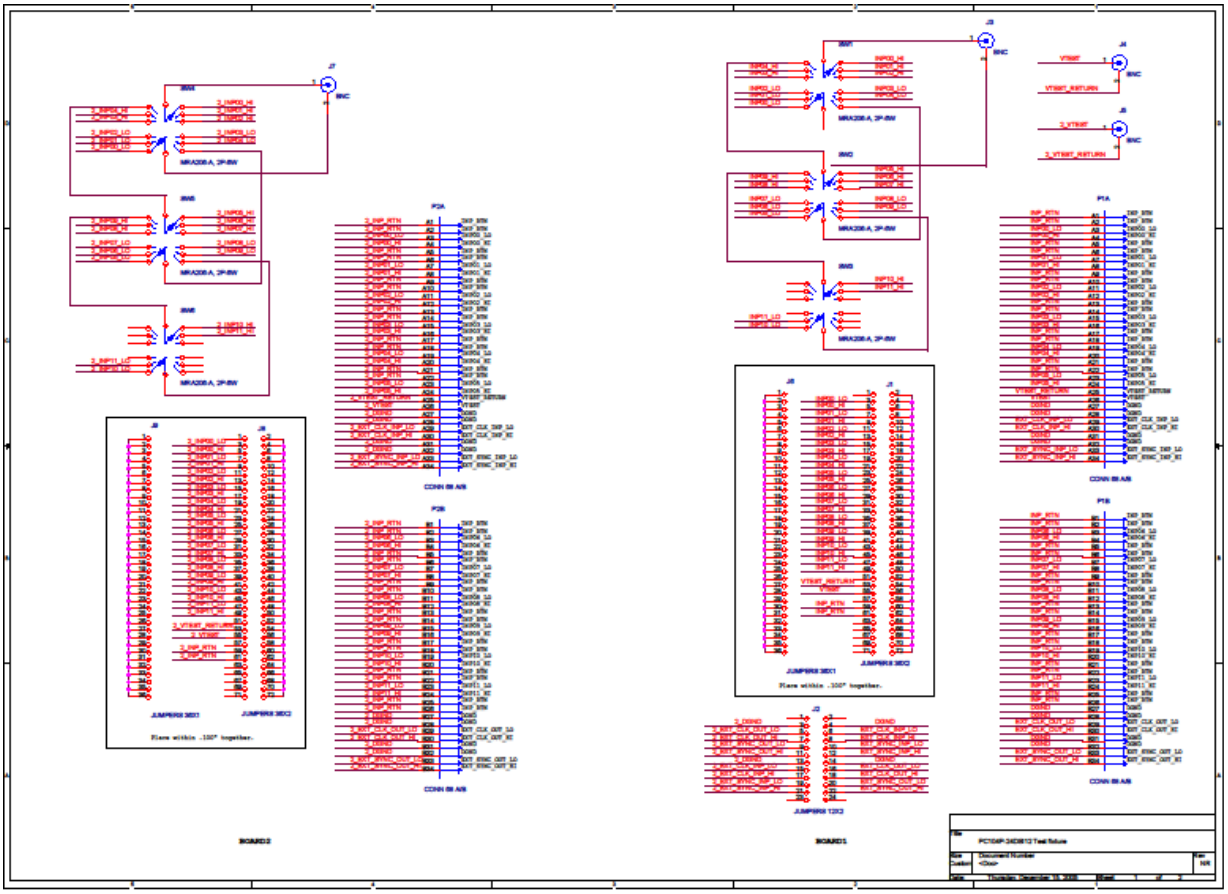
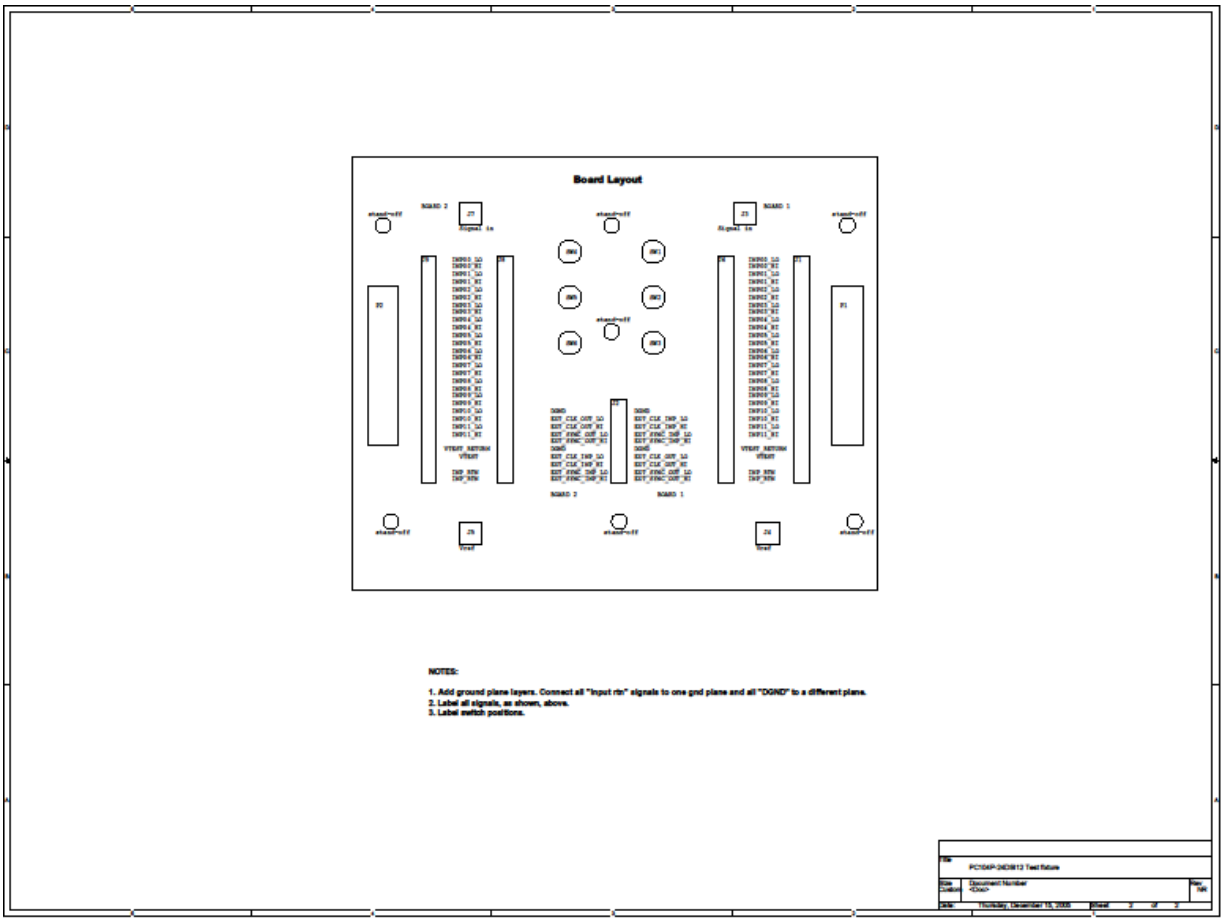


Figure 3 The Star signal routing configuration.

3. Test Fixture

The test fixture is available from General Standards. The following are the available diagrams.




Board Layout
NOTES:
1. Add ground plane layers. Connect all "Input rtn" signals to one gnd plane and all "DGND" to a different plane.
2. Label all signals, as shown, above.
3. Label switch positions.

Document History

Revision	Description
November 21, 2022	Minor editorial updates.
April 25, 2022	Updated release date.
April 25, 2019	Updated release date.
April 22, 2019	Updated release date.
November 5, 2018	Updated the inside cover page.
August 21, 2012	This is the initial release.