



## RHS2000

# Application Note: Adapting Stim SPI Cables to a Commutator



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**Q:**

How can the Intan RHS2000 Stimulation/Recording System be wired to a commutator or other custom connector using the Intan Stim SPI interface cables?

**A:**

Intan Technologies provides simple hardware that allows signals from standard RHS2000 Stim SPI interface cables to be adapted to commutators or other user-specific connectors with ease. This application note describes how to use the **Stim SPI cable adapter board** (part #M4430) to accomplish this.

The RHS2000 Stimulation/Recording System uses custom Stim SPI (Serial Peripheral Interface) cables to link the Stimulation/Recording Controller to headstages. These cables provide both power and low-voltage differential signals (LVDS) conveying digital data. The details of these cables and associated connectors are described in the **RHS2000 Stim SPI Cable/Connector Specification** available from the Intan Technologies website.

Figures 1 and 2 below show the Stim SPI cable adapter board connected to an RHS2000 Stim SPI interface cable. The adapter board contains no active circuitry; it simply breaks out all 12 signals from an SPI interface cable to easily accessible gold-plated holes with a 0.1" pitch. Wires or other connectors may be soldered to these holes.



Figure 1. Stim SPI cable adapter board



Figure 2. Stim SPI cable adapter board plugged into RHS2000 Stim SPI interface cable.

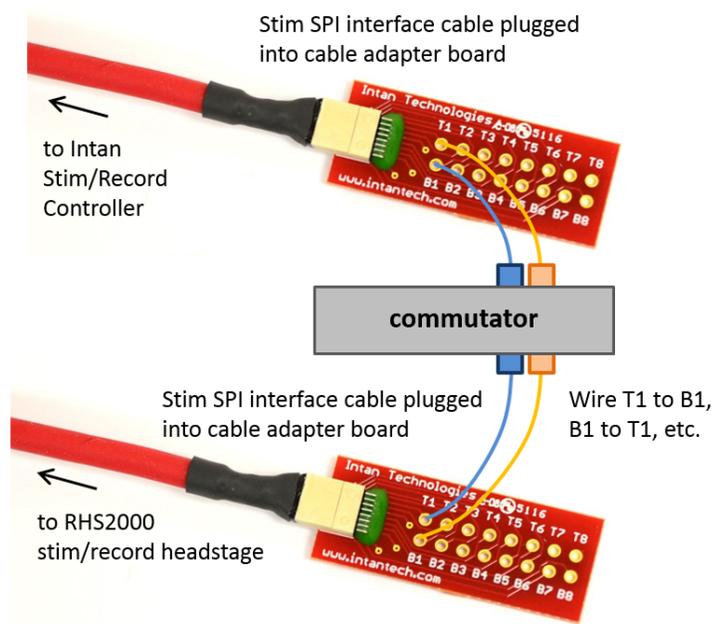
The signals on each Stim SPI cable adapter board are labeled T1 – T8 and B1 – B8. Note that the ‘T’ and ‘B’ pin names refer to the top and bottom row of pins on the connector attached to the adapter board. Due to the daisy chaining capability of these connectors, signals will alternate between ‘top’ and ‘bottom’ depending on how the adapter is connected to the system. The following table provides a quick reference to these signal locations:

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**Table 1:** Stim SPI cable adapter signals

SPI adapter pin number	Signal with cable adapter plugged into stim/record headstage	Signal with cable adapter plugged into Stim/Recording Controller
B1	VSTIM- (-9V)	VSTIM+ (+9V)
T1	VSTIM+ (+9V)	VSTIM- (-9V)
B2	SCLK-	MISO2+
T2	MISO2+	SCLK-
B3	SCLK+	MISO2-
T3	MISO2-	SCLK+
B4	MOSI1-	MOSI2+
T4	MOSI2+	MOSI1-
B5	MOSI1+	MOSI2-
T5	MOSI2-	MOSI1+
B6	MISO1-	$\overline{CS}$ +
T6	$\overline{CS}$ +	MISO1-
B7	MISO1+	$\overline{CS}$ -
T7	$\overline{CS}$ -	MISO1+
B8	Power (+3.3V)	Ground
T8	Ground	Power (+3.3V)

To adapt Stim SPI cables to a commutator or other custom connector, two Stim SPI cable adapter boards may be used in the manner depicted in Figure 3:



**Figure 3.** Two Stim SPI interface cables and two Stim SPI cable adapter boards are used to pass signals through a commutator or other custom connector.

Note that 'T' signals from one cable adapter board must be wired to 'B' signals in the other board. (See Table 1 above.)

These cables require 16 signals to pass through the commutator or custom connector to support the 32-channel stim/record headstage.

If a 16-channel stim/record headstage is used, the MOSI2+/- and MISO2+/- lines can be omitted, reducing the total number of required pass-through signals to 12.

Wires between each Stim SPI cable adapter board and the commutator should be kept short to maintain high signal integrity. If long wires are required, twisted pairs should be used for each differential data signal (e.g., SCLK+ and SCLK-, etc.).