ASNTu2s PCB with Tiger Board
USB to 2-Channel 3-Wire Interface Bridge
Application Notes

Table of Contents

Tiger Board Description

1. The Tiger Board shown in Fig. 1 is a universal USB-controlled Master/Slave SPI/I2C/JPIO interface. For the current application, it is configured as a 2-channel SPI interface. It includes a SPARTAN-6 FPGA with support components, a micro-USB connector, as well as a 40-pin and a 34-pin male connectors. The board measures approximately 3.2x2.4 inches. More details can be found on the Nano River Technology web site at http://www.nanoriverteChcom/tigerboard-software.html , specifically in the http://www.nanoriverteChcom/files/doc/TigerBoardUserGuide_ver_Nov12.pdf document.
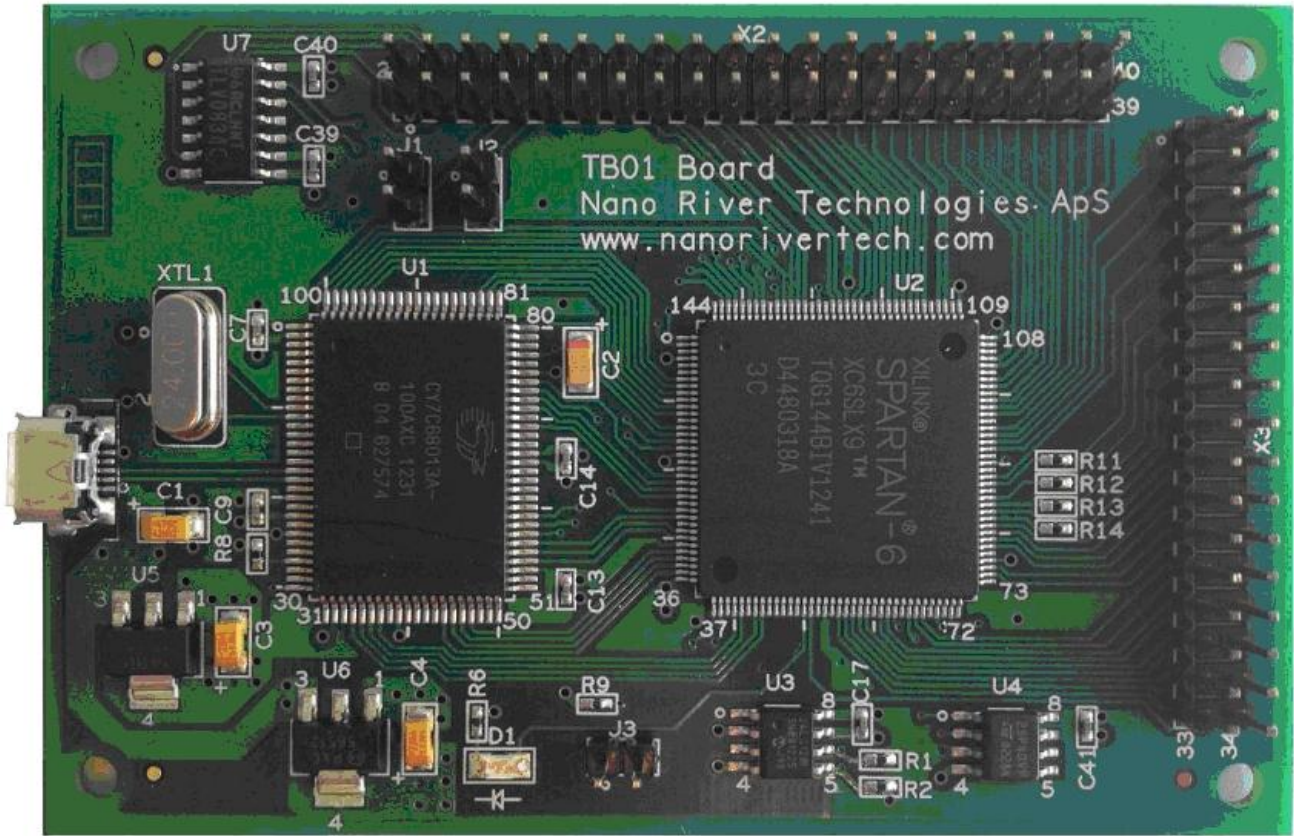
Fig. 1. Tiger Board

2. In the current configuration, the 34-pin male connector is used to deliver signals to the ASNTu2s PCB that serves as an adapter.

ASNTu2s Description

1. The ASNTu2s v2.0 PCB shown in Fig. 2 is a 2-channel converter for the SPI interface. It includes a MOLEX connector (J0) for a 1.2*V* power supply, a 34-pin female connector, and two 7-pin SATA connectors (J1-J2). The board measures approximately 3.2x2.4 inches.
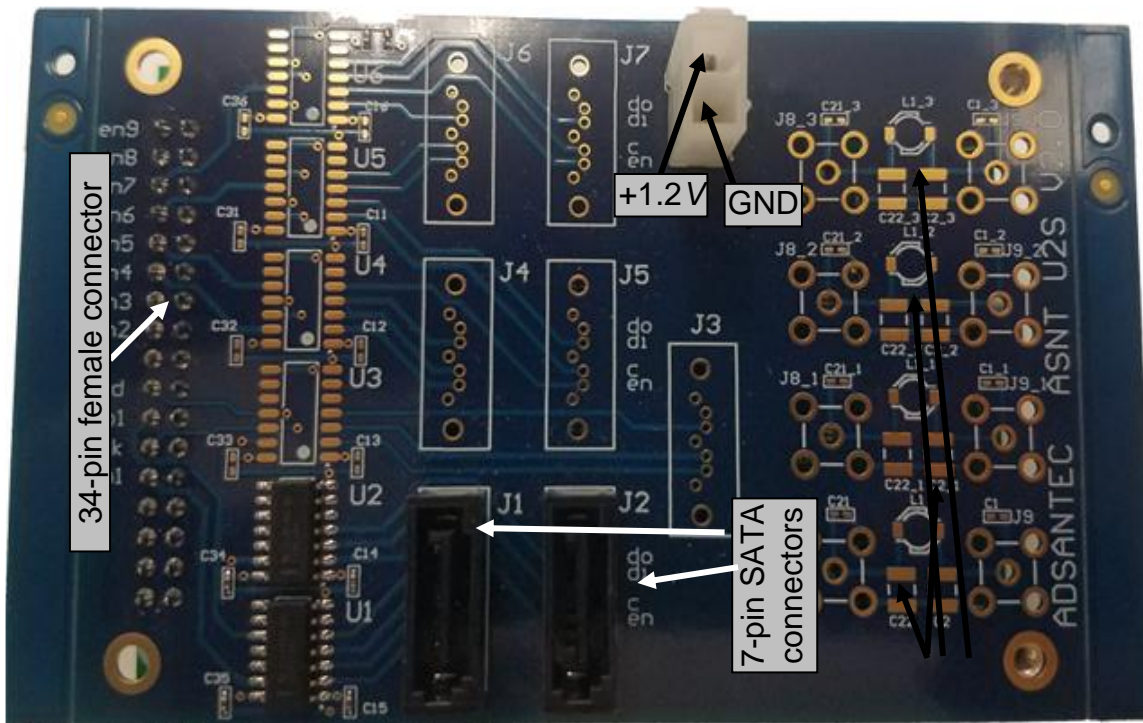
Fig. 2. ASNTu2s v2.0

2. The ASNTu2s PCB v2.0 allows for control of up to two DC-coupled 1.2*V* 3-wire SPI channels through a USB port. The board delivers the same clock (clk) and data (di or d) signals to both SATA connectors. Two enable signals (en1-en7) are delivered to connectors J1-J7 respectively. They correspond to Tiger board enable signals as shown in Table 1.

Table 1. Channel to Enable Signal Correspondence

u2s channel #	CH1	CH2	CH3	CH4	CH5	CH6	CH7
Tiger board enable signal #	0	2	4	6	8	10	12

3. The connector J1 provides access to the channel 1 output data signal (do1). The SATA connector mapping is shown in Table 2.

Table 2. SATA Connector Mapping

Pin #	1	2	3	4	5	6	7
Signal	gnd	enX	clk	gnd	di	do1 for J1 or n/c for J2 to J9	gnd

Software Installation

1. Use the CD provided or Download the Tiger Board software for the required operation system (supported operation systems are Microsoft Windows XP with Service Pack 3 and newer) from Nano River Technology web site: http://www.nanoriverteChcom/tigerboard-software.html
2. Install the Tiger Board software following instructions:
   2.1. For Windows XP use the provided file WinXP_Installation_of_TigerBoard.pdf or the link http://www.nanoriverteChcom/files/winxp/WinXP_Installation_of_TigerBoard.pdf .
   2.2. For Windows 7 or newer use the provided file Win7_Installation_of_TigerBoard.pdf or the link http://www.nanoriverteChcom/files/win7/Win7_Installation_of_TigerBoard.pdf.

3. The latest revision of the ADSANTEC TigerBoard Shell can always be found on our website at the following link:

   https://www.adsantec.com/product/asntu2s-tiger-board/

4. Double-click the file TBshell_setup.exe and follow the instructions on the screen.

Bridge Operation

1. The part is static sensitive. Please observe the anti-static protection procedures!
2. Connect the Tiger Board to a computer using a micro USB cable.
3. Attach the ASNTu2s PCB to the Tiger Board as shown in Fig. 3. Standoffs between boards are recommended to provide additional support and are typically provided.
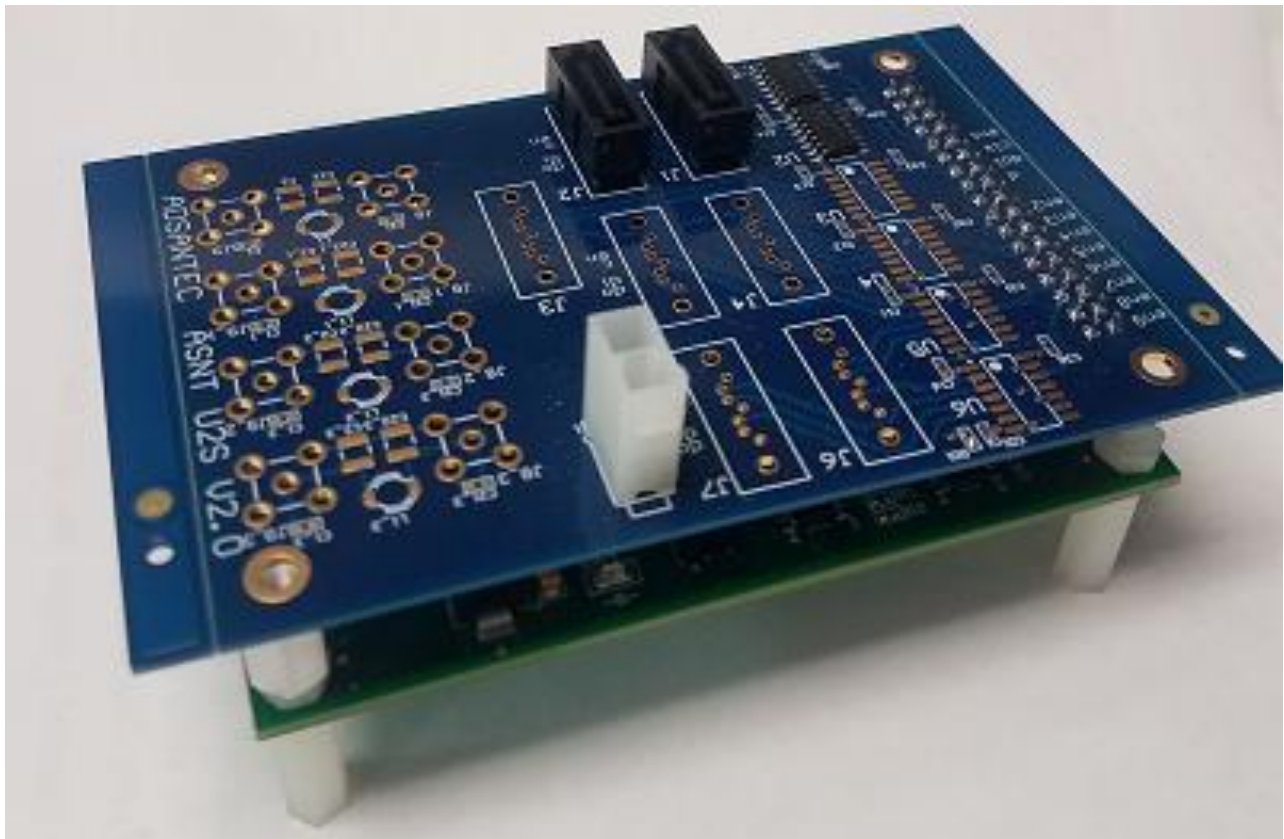

Fig. 3. ASNTu2s and Tiger Board Assembly

4. Switch on an external power supply unit and set it to a positive supply voltage with a value of $+0.0V$ (negative output pin of the unit must be shorted to ground).
5. Connect the supply unit's output pins to the PCB's Molex connector as shown in Fig. 2.
6. Connect the ASNTu2s channels to controlled PCBs following the GUI descriptions below.

Note 1: The GUI will function correctly even if some PCBs are not connected.

7. Gradually increase the positive supply voltage to $+1.3V$.

SPI Operation

The Serial Peripheral Interface Bus (SPI) is a synchronous serial data link that operates in full duplex mode. SPI devices communicate in master/slave mode where the master device initiates the data frame. The simplest SPI configuration is shown in Fig. 4.
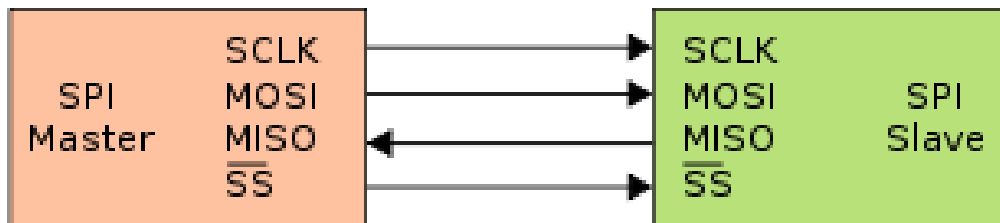
- SCLK — Serial Clock (output from master)
- MOSI — Master Output, Slave Input (output from master)
- MISO — Master Input, Slave Output (output from slave)
- SSn — Slave Select (active low; output from master)

Fig. 4. SPI Bus: Single Master and Single Slave

A typical hardware setup uses shift registers to form an inter-chip circular buffer. If system does not require reading from the slave, MISO output can be used for functional test purpose as shown in Fig. 5.
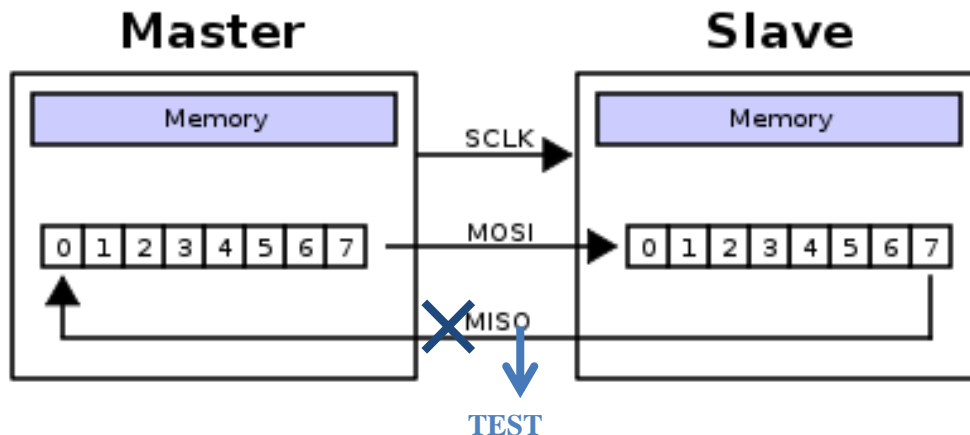

Fig. 5. SPI 8-bit circular transfer

Multiple slave devices are allowed with individual slave select lines SSn as shown in Fig. 6.
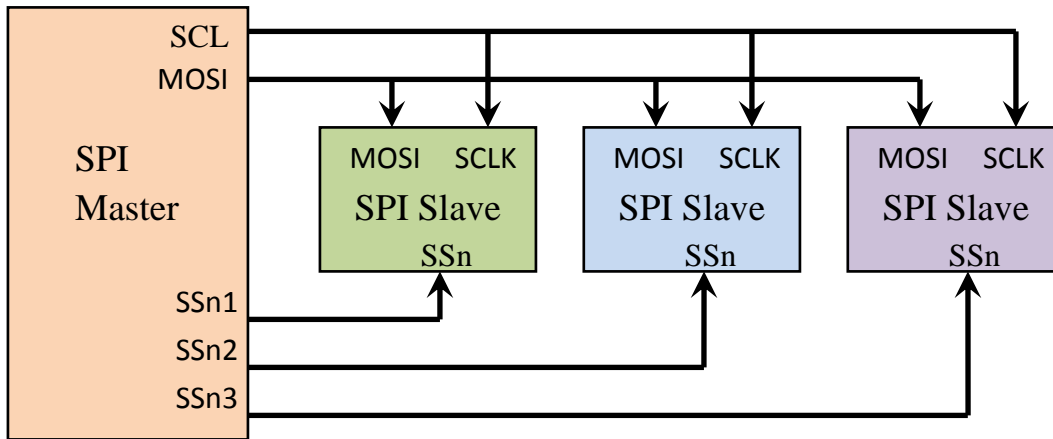
Fig. 6. SPI with Three Slaves

SPI can operate in different modes defined by clock polarity CPOL and clock phase CPHA parameters as shown in

Table 3. SPI Operational Modes

CPOL	CPHA	The first clock edge is:	Data is sampled by:
0	0	Rising	the leading (first) clock edge
0	1	Rising	the trailing (second) clock edge
1	0	Falling	the leading (first) clock edge
1	1	Falling	the trailing (second) clock edge

The on-chip SPI modules operates only in slave mode with CPOL=0 and CPHA=0, as shown in Fig. 7.
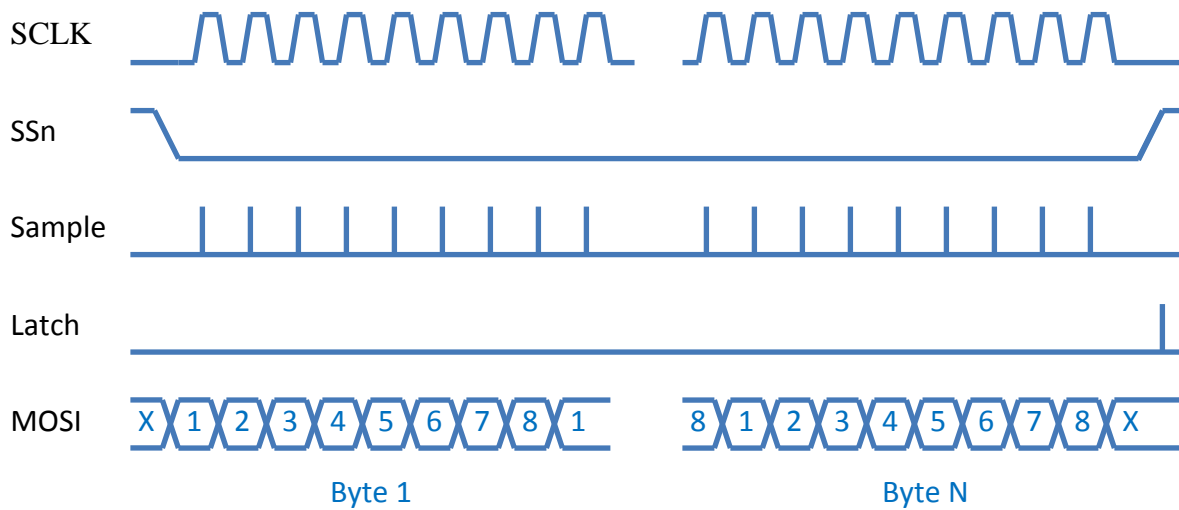

Fig. 7. SPI Transfer Mode

TBshell Dashboard Description

5. To run the dashboard, select the "ADSANTEC TigerBoard Shell" icon on the desktop or in the "ADSANTEC TigerBoard Shell" Start menu.

6. The default TBshell dashboard window is shown in Fig. 8. It has seven drop-down lists one for each ASNTu2s channel, buttons "Apply" and "Run" and drop-down menu "File".
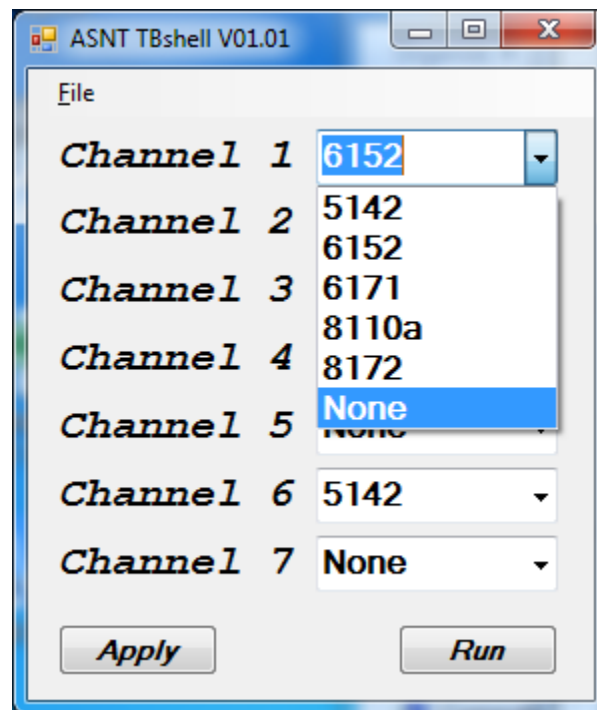

Fig. 8. TBshell dashboard Window

7. The ADSANTEC TigerBoard Shell can work on a computer with or without connection to a Tiger Board.

8. Up to 7 independent products can be controlled from a TigerBoard-u2s assembly. Some products also may require more than one channel for their control.

9. To run a particular product's GUI from the TBshell, click the channel to which the product is connected and select the product name from the menu. Select "None" for all non-used channels. Press "Apply" or "Run" button to activate the GUI. "Apply" button preserve dashboard on the desktop, "Run" button closes it.

10. Last product selection is saved automatically and loaded with next dashboard run. The current selection can also be saved and then loaded back. To save the current selection to a file, click on "File" menu, then select "Save state" from the pull-down menu. Using Windows navigator, select a directory and enter a filename or select an existing file. To load selection from a file, click on "File" menu, then select "Load state" from the pull-down menu. Using Windows navigator, select a file to load.

11. Each GUI can be also activated without dashboard. To run the particular GUI without running dashboard, select the "ASNT####" icon on in the "ADSANTEC TigerBoard Shell" Start menu, where #### is a 4-digit product number.

Rev. 4.4.2   7   September 2021

Common GUI Description

This section describes common properties and controls of all ADSANTEC GUIs.

1. If a Tiger Board is not connected, the GUI will operate in a Demo mode and the red warning note "Board not connected. Demonstration Mode Only" will be displayed.

2. The warning will disappear when a Tiger Board is connected.

3. After GUI activation for a particular product, a pre-defined default state is loaded.

4. The current state of the GUI can be saved and then loaded back. To save the current state in a file, click on "File" menu, then select "Save state" from the pull-down menu. Using Windows navigator, select a directory and enter a filename or select an existing file.

5. To load a state from a file, click on "File" menu, then select "Load state" from the pull-down menu. Using Windows navigator, select a file to load. The new data will be sent automatically.

6. Modify the GUI control values as required. The controls can be manipulated as follows:

   a. Checkboxes can be clicked ON (checked) or Off (empty).

   b. Radio buttons can be clicked ON (checked) or Off (empty).

   c. Sliders in the scrollbars may be shifted.

   d. The arrows in the numeric up-downs and scrollbars may be clicked (1-step change) or clicked-and-hold (constant change).

   e. The number in the numeric up-downs can be directly typed in. Click Enter to confirm.

7. The GUI sends new data after any move of the slider, arrow click, or data confirmation.

8. The GUI can also operate in an Expert mode. To activate the Expert mode, click on "File" menu and select "Enter Expert Mode" from the pull-down menu.

9. In the Expert mode, the following additional options are available:

   a. Selection of certain pre-assigned operational frequencies for the interface. To change the interface operational frequency, click the Frequency arrow and select the desired value from the pull-down menu.

   b. Assignment of the active TB-u2s channel number. To assign a different channel to a particular GUI, click the corresponding Channel arrow and select the desired value from the pull-down menu.

   c. Visual control of the clock polarity (CPOL) and phase (CPHA) parameters. For the current application, both parameters are set to 0. For more details see the EQ_3w_AN document.

   d. Visual control of the sent and received data packets (Writing: and Reading: lines in the additional panel at the bottom of the GUI window). The transmission information (panel name and channel number) precedes the Writing: and Reading: lines.

   e. In some GUIs there are additional controls in the expert mode for ADSANTEC internal use for testing and debugging.

10. **Note 1**: Data reading is delayed by one cycle compared to data writing. In case of the correct SPI operation, the previous writing (top line) should be equal to the current reading (bottom line).

11. **Note 2**: Full received data is displayed for channel 1 only.

12. To return to the Standard mode, click on "File" menu, then select "Enter Standard Mode" from the pull-down menu.

13. Example of a GUI running in the expert mode is shown in Fig. 9.

14. Further information regarding the operation of these devices can be found in their respective documentation.
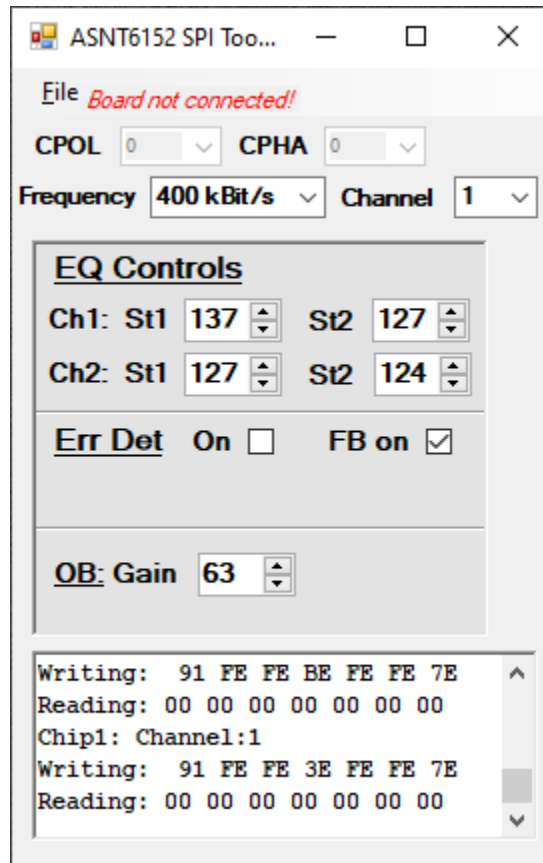

Fig. 9. GUI in the expert mode example

REVISION HISTORY

Revision	Date	Changes
4.4.2	09-2021	Added Tiger board enables to u2s channels correspondence
4.3.1	05-2021	Updated Figures 2 and 3
4.2.1	02-2021	Reconfigured Formatting Updated for use with Two-Channel u2s v2.0
4.1.1	09-2020	Added ASNT8161 GUI description
4.0.2	05-2020	Added Common GUI description
4.0.1	04-2020	Corrected GUI descriptions for all parts
3.0.1	05-2018	TBshell dashboard added
2.0.1	03-2018	Corrected SPI coding tables
1.6.1	07-2017	Added new GUI descriptions
1.5.1	10-2016	Updated Figure 13
1.4.1	06-2016	Corrected Table 10
1.3.1	05-2016	New version of the GUI. Updated Figure 13. Updated GUI description.
1.2.1	04-2016	Modified PCB layout (7 channels, 4 additional LPFs). Corrected Fig. 2. Corrected title. Corrected PCB description.
1.1.1	01-2016	Corrected GUI window drawing
1.0.1	01-2016	First release