User's Guide
SLLU120–March 2010

TLK100 Software GUI

This document provides a comprehensive overview of the TLK100 software graphic user interface (GUI). The document presents the different GUI functionalities that enable the user to activate the multiple special features and capabilities of the TLK100, a single-port Ethernet PHY for 10BaseT and 100Base TX signaling. This document also discusses the software specifications of the customer evaluation board.

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1 Overview

The TLK100 is an Ethernet PHY chip from Texas Instruments that consists of a single Fast Ethernet-phy (FE) core (10/100BT). The primary interfaces of the chip are:

1. One10/100BT port
2. Digital test-ports
3. A Medium-independent interface (MII)
4. Clock ports
5. Power-supply pins

This document describes the specifications of the software for the customer board.

2 Installation

2.1 Operating System

The recommended operating system for the software is Microsoft® Windows® 2000 / XP. There is no support for Microsoft Vista at this time.

2.2 SmartBits® 200/2000

The test partner for the TLK100 EVM is the Spirent SmartBits®-200/2000 (SMB-200/2000). The computer with the installed GUI software should be connected via an Ethernet cable to the SmartBits unit. The TLK100EVM evaluation board and the TLK100 chip are both controlled via the SMB-200/2000 analyzer. Figure 1 illustrates this setup.

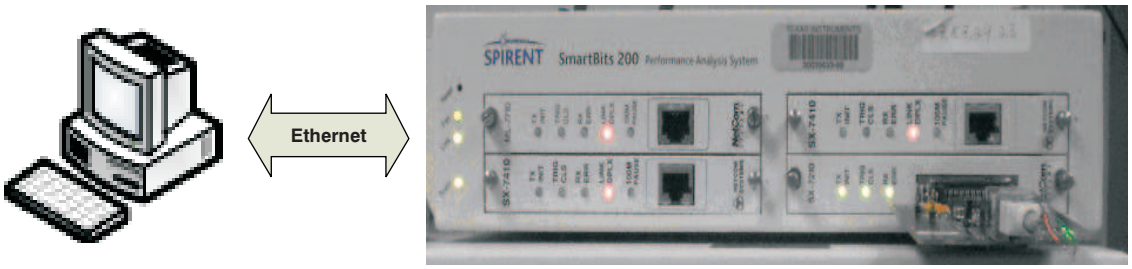

Figure 1. TLK100 Setup

Figure 2 and Figure 3 show the two different SmartBit devices.

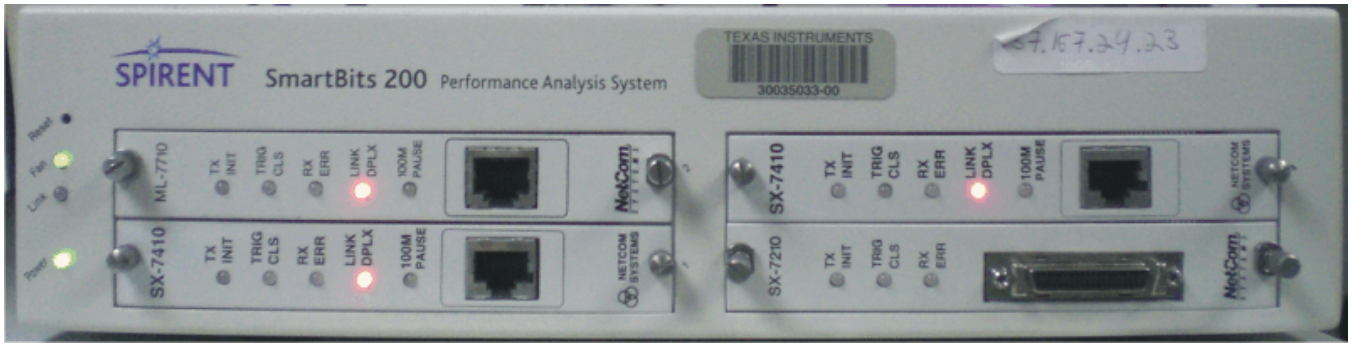

Figure 2. SMB 200

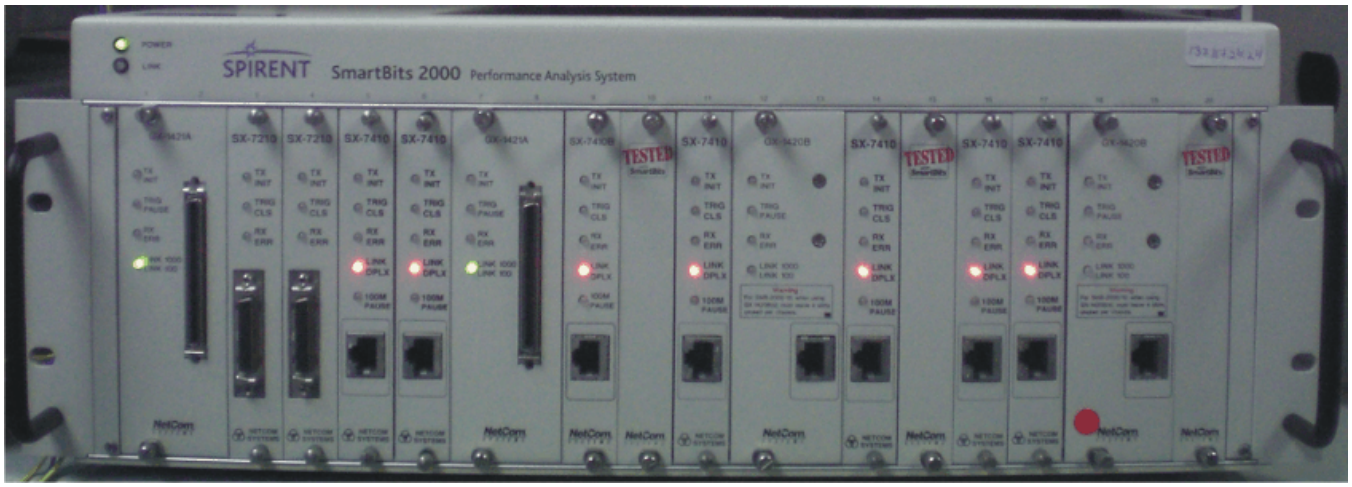

Figure 3. SMB 2000

Once you have verified that the SMB-200/2000 analyzer is connected to the PC, you must confirm that the SX-7210 MII card has been properly installed in the SMB chassis. Figure 4 shows the medium-independent interface (MII) card connected to the SMB 2000.

Figure 4. MII Card Connected to the SMB 2000

The next step is to verify that the SmartBits application *SmartLib* is installed on the computer. The GUI uses the 'SmartLib' libraries to control the SmartBits analyzer.

Once the ‘SmartLib’ has been installed, the user must check that no other application is currently communicating with the SMB analyzer. This visual check can be performed while verifying that the link indication on the SMB chassis is off, as seen in Figure 5.

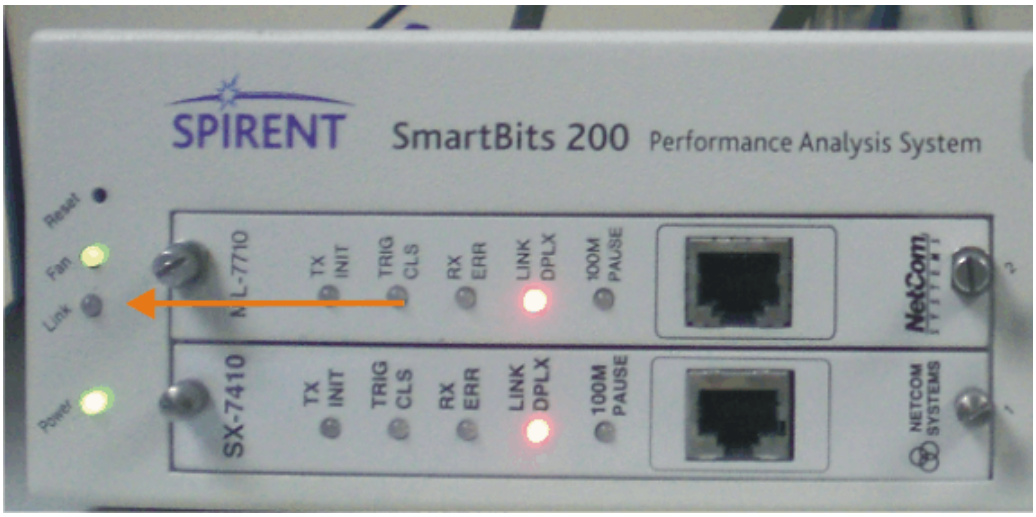

Figure 5. SmartBits Link Indication

2.3 Software Installation

Follow these steps to install the GUI software on the PC.

Step 1. Unzip the package file.

Step 2. Run the setup program.

Step 3. When the screen shown in Figure 6 appears, choose *TLK100_SW*, then select *Continue*.

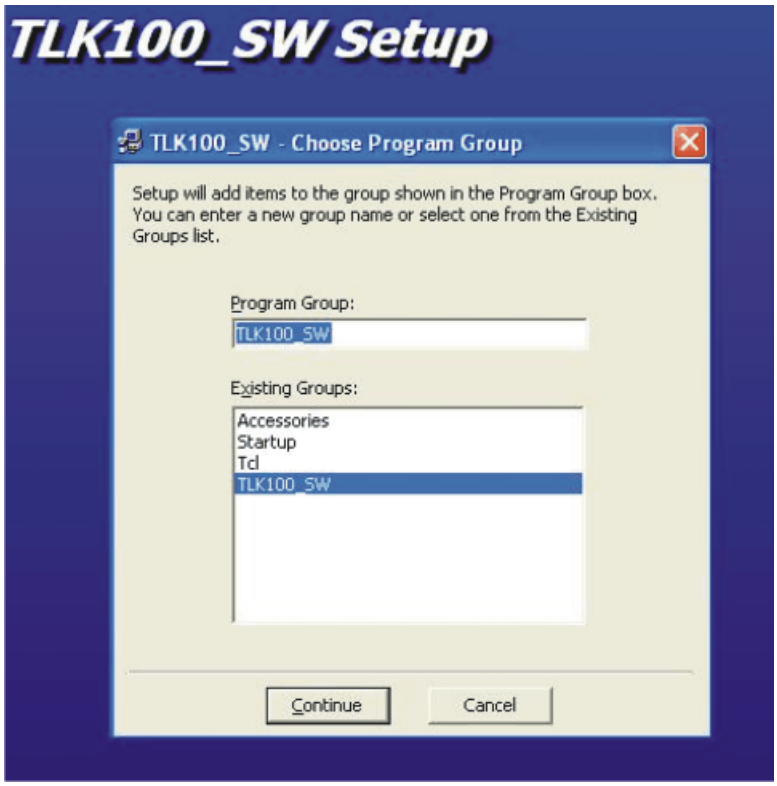

Figure 6. Software Setup Installation Screen

Once the installation completes, double-click the **TLK100_SW.exe** file added to your *C:\Program Files* folder, as Figure 7 illustrates. Then fill in the IP address and slot number of the SMB unit (see Section 3.1).

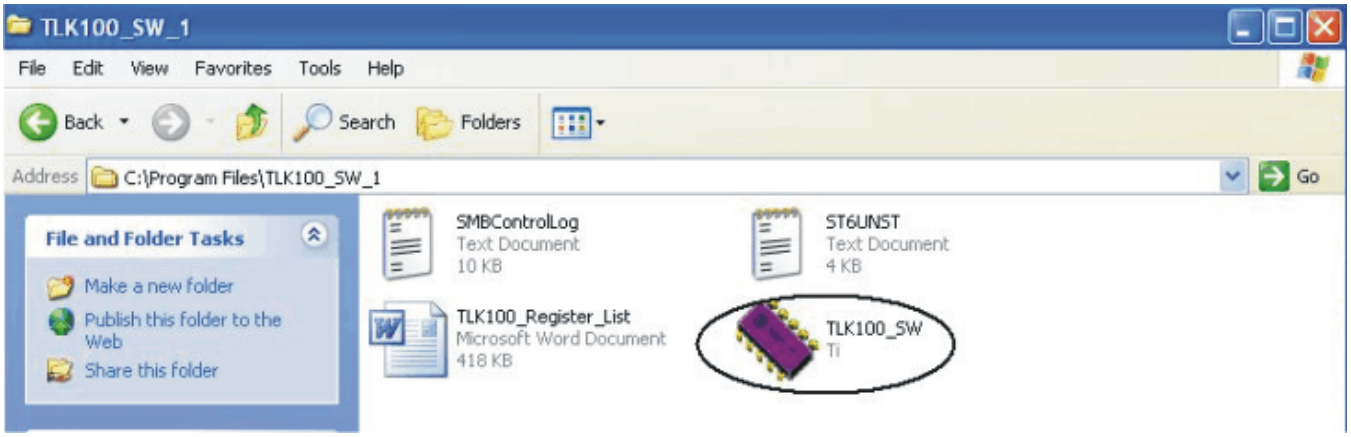

Figure 7. Application Folder

3 Software Functionality and Front Panel

The GUI is based on a tabbed interface. Each of the available tabs can be selected to display a window associated with each functional aspect of the TLK100 device.

3.1 Initialization Window

The initialization window appears when the program starts. You must enter the IP address of the connected PC and the relevant slot number of the MII card.

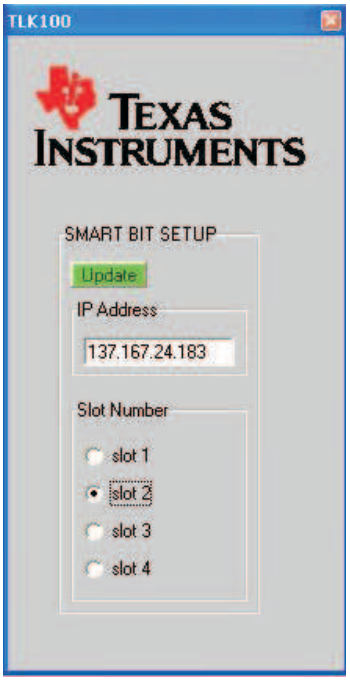

Figure 8. Initialization

3.2 PHY Control

There are eight available GUI tabs:

- **Summary:** Provides a brief operational overview and communicates the status of the device.
- **Setting:** Contains control buttons to enable the different operating modes of the TLK100 chip.
- **Registers:** Gives users the ability to read and write the contents of the registers.
- **Scripting:** Provides a scripting ability, which is enabled by loading a text file.
- **Loopback, PRBS, and Power Modes:** Enables loopback settings, a PRBS engine, and controls the different power modes.
- **CD:** This tab features cable diagnostic tools, including ALCD and PRBS functions.
- **DSA:** This tab contains a digital spectrum analyzer.
- **Pinout:** Functional description of each device pin.

Each tab is discussed in a subsequent section of this document.

3.2.1 Summary Tab

The Summary tab, shown in Figure 9, provides a brief operational status overview of the selected device on the TLK100EVM board.

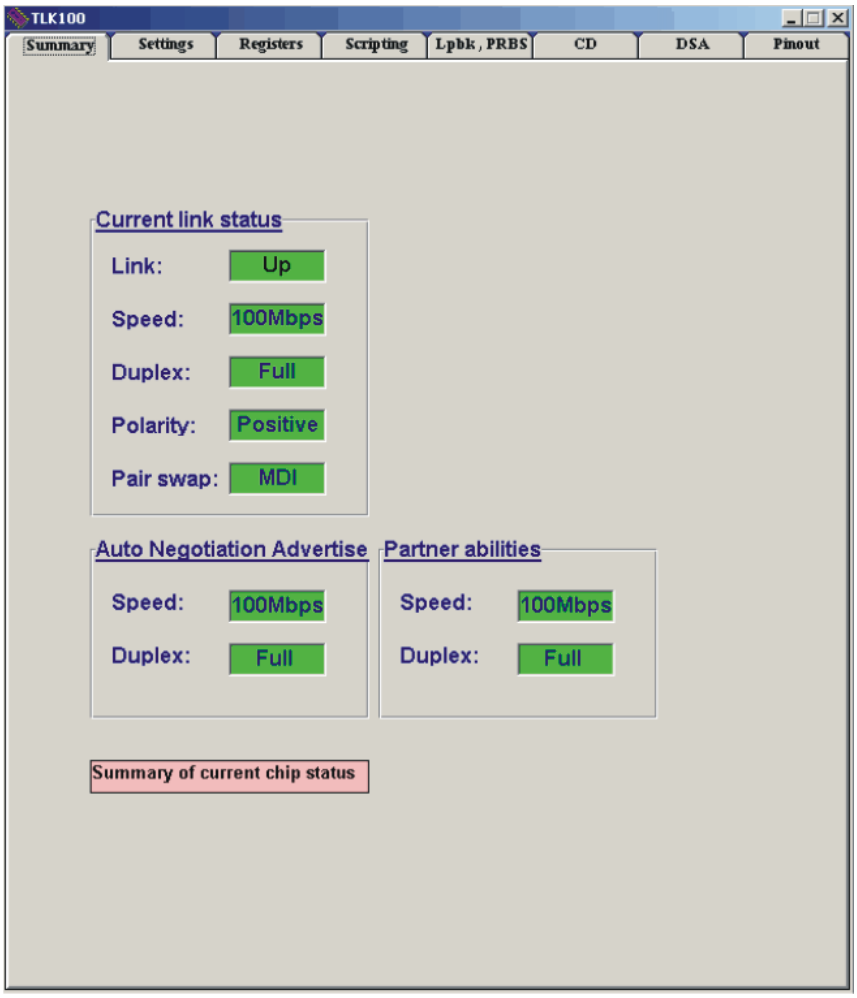

Figure 9. Summary Tab

The summary window refreshes automatically every second to provide continual updates.

There are three primary fields in this tab:

- **Current link status:**
  - Link: Up/Down
  - Speed: 100 Mbps/10 Mbps
  - Duplex: Full/Half
  - Polarity: Positive/Negative
  - Pair swap: MDI/MDI-X
- **Auto negotiation advertise:**
  - Speed: 100 Mbps/10 Mbps
  - Duplex: Full/Half
- **Partner abilities:**
  - Speed: 100 Mbps/10 Mbps
  - Duplex: Full/Half

3.2.2 Settings Tab

The Settings tab (illustrated in Figure 10) allows the user to easily modify the primary device settings and operation modes via several different option buttons.

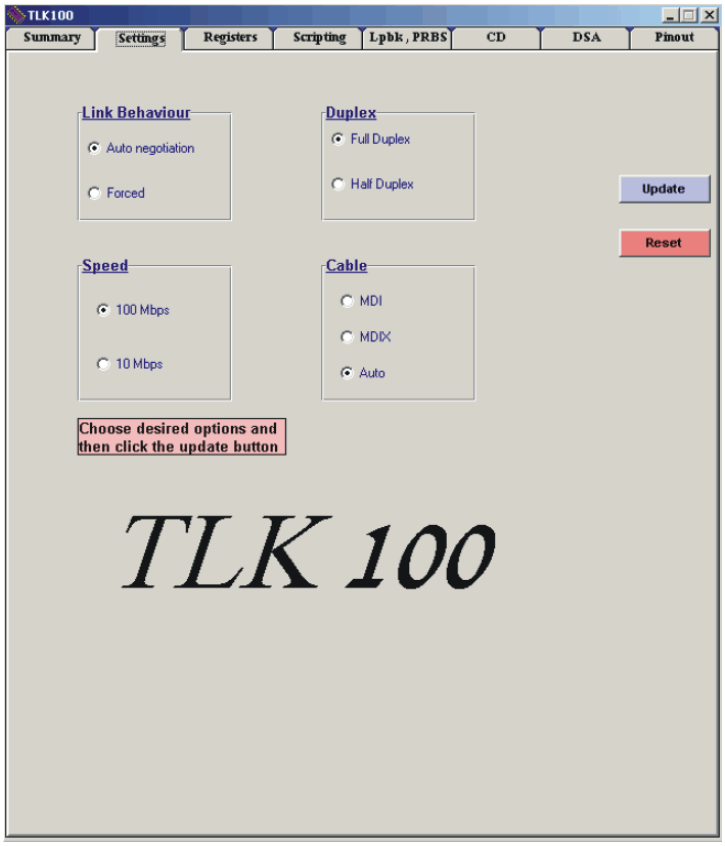

Figure 10. Settings Tab

The Settings tab is updated every time it is accessed by the user. The following options are controlled in this tab:

- **Link Behavior:**
  - Auto Negotiation/Forced
    Link behavior is set via Register 0x0, BMCR bits 12, 9.
- **Speed:**
  - 10 Mbps/100 Mbps
- **Duplex:**
  - Full or Half duplex
    Speed and duplex selection for Auto Negotiation is set via Register 0x4, ANAR. For forced mode, speed is set via Register 0x0, BMCR bit 13 and duplex via Bit 8.
- **Cable Crossover:**
  - Force Straight (MDI)
  - Force Crossover (MDIX)
  - Automatic
    Cable crossover is set through Register 0x10, PHYCR bits 6, 5.

The **Update** button writes the setting to the device registers.

The **Reset** button writes a *'reset'* to Register 0x0, BMCR bit 15 and a *'Software global reset'* to Register 0x1f, PDR bit 15.

3.2.3 Registers Tab

This tab provides the user the ability to select various device registers as well as to read and write the contents of the registers for evaluation and experimentation. As Figure 11 shows, the Register List also allows the user the option of reading a detailed (verbose) description of each register.

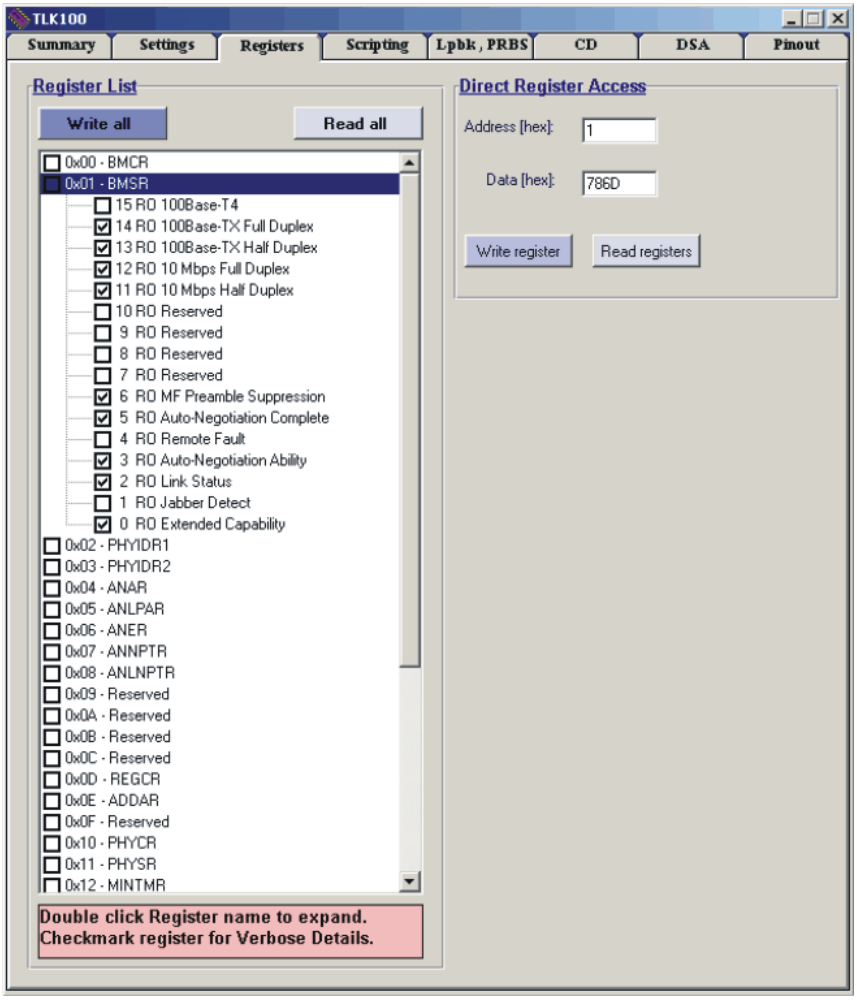

Figure 11. Registers Tab

Note that this window updates every time that it is accessed. There are two primary fields in this tab:

- **Register List:**
  - Registers address 0x0 up to address 0x0F, IEEE802.3-specific registers
  - Registers address 0x10 up to address 0x1F, manufacturer-specific registers
- **Direct Register Access:**
  - Enables the user to read from or write to any register

The Register List is a drop-down list of the device registers. Double-click a specific register name to expand that register. Check the box next to the register name to see a detailed description of that register; a separate window opens with a description of the selected register from the TLK100 product data sheet, as Figure 12 shows.

Write all button: Updates all registers with new settings.

Read all button: Reads all device registers and updates the Register List.

Note that the Write all and Read all buttons may take up to 2 seconds to complete the respective request, because these functions refresh all registers shown in the list.

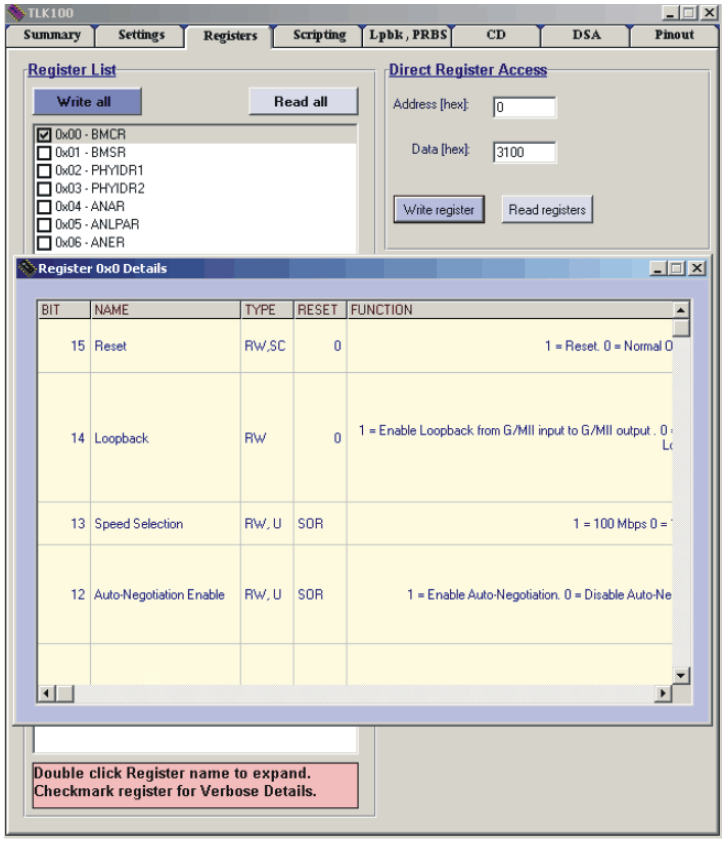

Figure 12. Verbose Register Details

The Direct Register Access dialog allows the user to write to or read from a specific register and data without first going through the Register List. To use the Direct Register Access option, do the following:

- To write to a specific register: Enter the register address and relevant data in the appropriate fields, then press the **Write register** button. After writing the value, the software reads the same register and will also update the entire Register List.
- To read from a specific register: Specify the register address and press the **Read registers** button.

Figure 13. Direct Registers Access Dialog

3.2.4 Scripting Tab

This tab (as seen in Figure 14) provides the user with a scripting function via a text file.

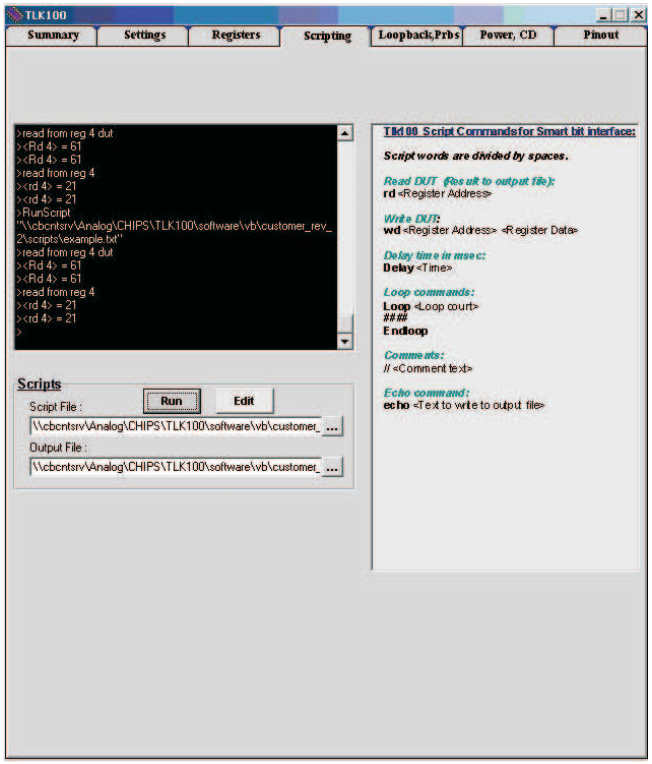

Figure 14. Scripting Tab

The Scripting tab contains these fields:

- **Shell Window:**
  - Allows the user to input commands directly to a shell window
  - Outputs the value of registers when a read transaction is executed (script and shell). Figure 15 shows the syntax for script files and shell commands.

Figure 15. Command Syntax

- **Scripts:**
  - Enter the path for the script file (note that any script file should be in .txt format)
  - Enter the name of the output file. The output file holds the value of read transactions performed as a result of executing the script. Figure 16 shows the Scripts dialog section of the tab.

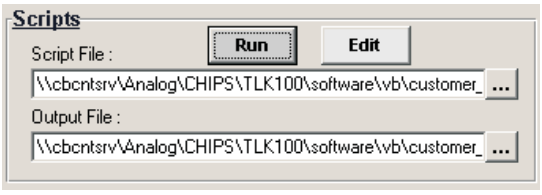

Figure 16. Scripts Dialog

Figure 17 illustrates an example script file in text format.

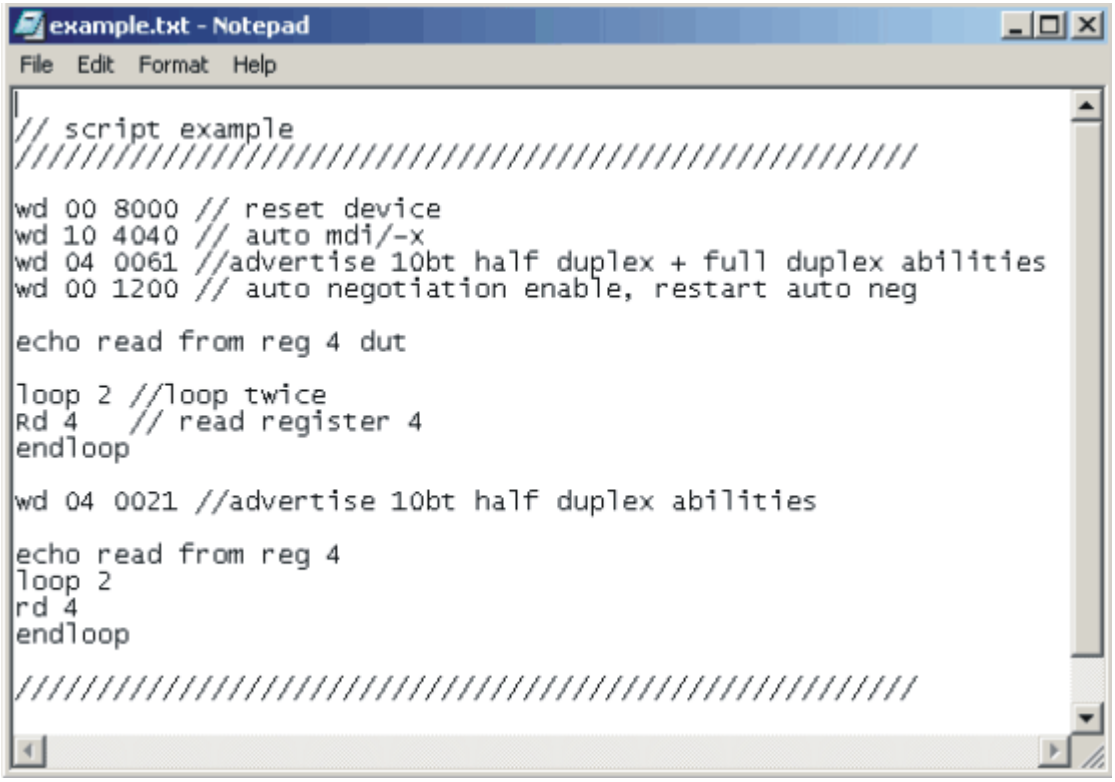

Figure 17. Example Script

The software translates commands loaded from the shell or a script to register transactions. Commands should adhere to the proper syntax (see Figure 15); otherwise, there will be an error.

3.2.5 Loopback and PRBS Tab

The Loopback and PRBS tab accesses several of the more advanced chip functions as well as the device power mode. It updates every time it is selected.

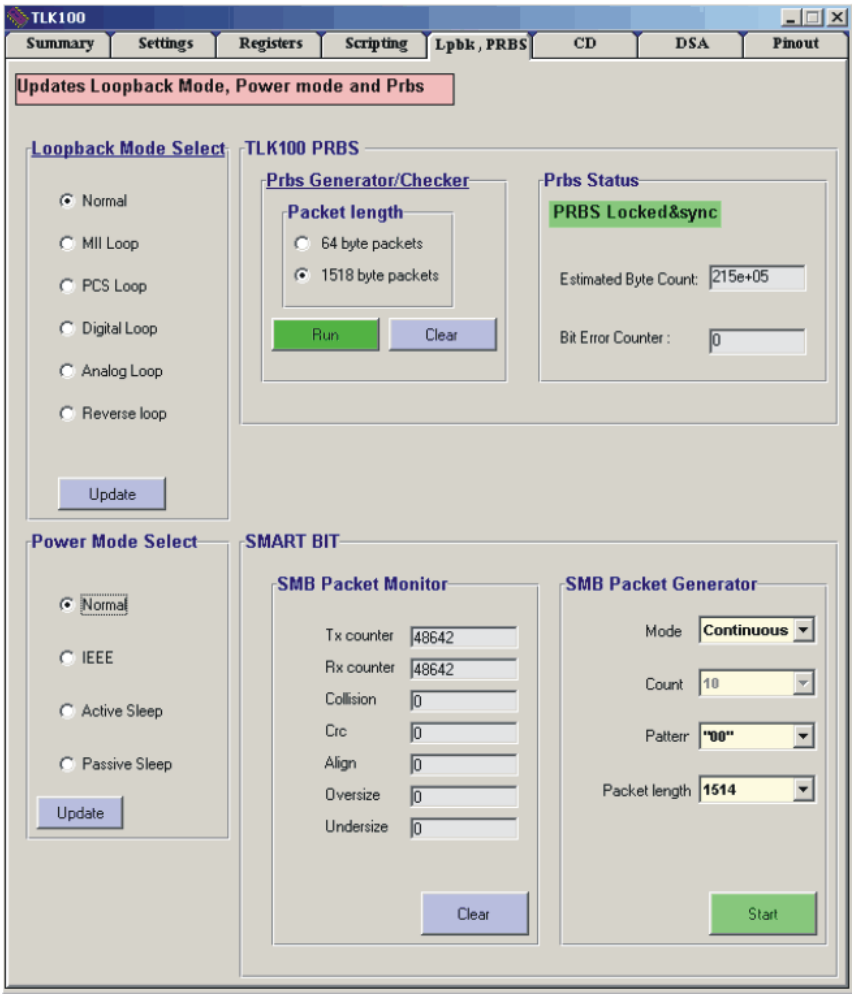

Figure 18. Loopback, PRBS Tab

This tab contains these fields:

- Loopback mode select
- PRBS Generator/Checker
- Power-save mode select
- SmartBit packet generator/monitor

Loopback mode select

The TLK100 provides several options for loopback that test and verify various functional blocks within the PHY. Generally, the TLK100 may be configured either to one of the near-end loopback modes or to one of the far-end (reverse) loopback modes. Figure 19 shows the Loopback Mode selection options.

Figure 19. Loopback Mode

The Loopback Mode selections include the following options:

- **Normal:** No loopback is selected
- **MII Loop:** The device can establish a link with itself at 10/100BT speed using the Force link (refer to Figure 10).
- **PCS Loop:** The device can establish a link with itself at 100BT speed using the Force link (see Figure 10).
- **Digital Loop:** The device can establish a link with itself at 100BT speed using the Force link (see Figure 10).
- **Analog Loop:** The device can establish a link with itself at 10/100BT speed using the Force link (refer to Figure 10).
- **Reverse Loop (Far-End Loopback):** This option is a special test mode that allows the user to test the PHY from the link partner side.

Figure 20 and Figure 21 show the forward and reverse loopback schemes, respectively.

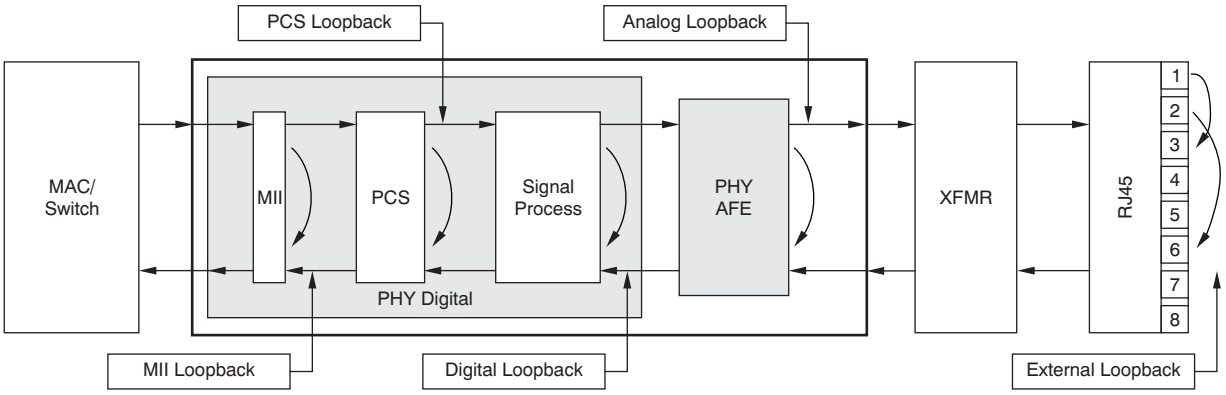

Figure 20. Loopback Scheme

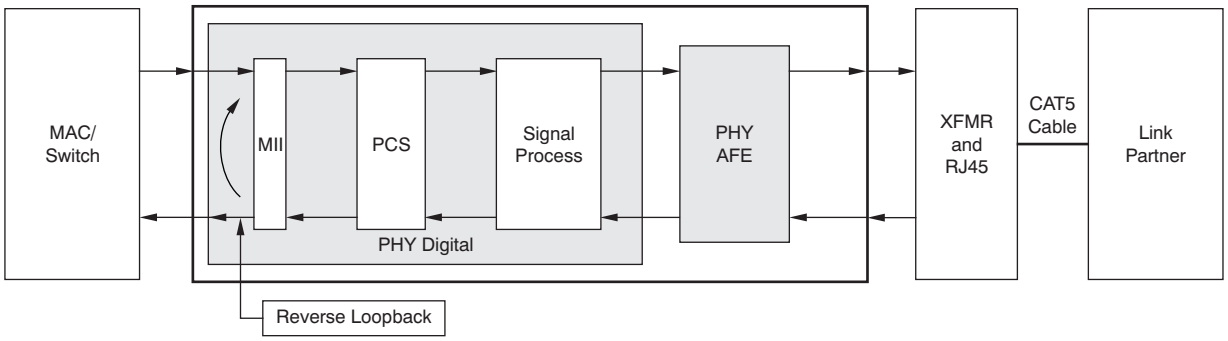

Figure 21. Reverse Loopback

PRBS Generator/Checker

To send data from the Pseudo-Random Bit Sequence (PRBS) generator, the user must first establish a link and a loopback. The user can choose one of the inner loopbacks, force the device to establish a link with itself, and then operate the PRBS generator. Another option is to configure a link with a partner and then set the partner to work in reverse loopback mode. Figure 22 shows the PRBS dialog section of the tab.

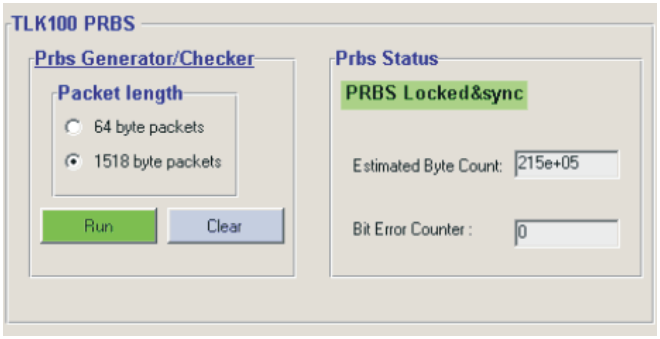

Figure 22. PRBS Dialog

To use the PRBS generator, follow these steps:

Step 1. Select desired packet length.
Step 2. Choose the loopback mode, if desired.
Step 3. Click the **Run** button
Step 4. Observe the byte counters and error counters.
Step 5. Click the **Clear** button to set the byte and error counters to '0'.

The flashing text (in the shaded green area) states that the PRBS engine is locked and synchronized on the incoming data.

The error counter either shows a value below 256 or states that there are more than 256 errors.

SMB Packet Generator/Monitor

The SmartBit Packet Generator (illustrated in Figure 23) allows the user to set up transmission parameters through the SMB packet generator and monitor the counters through the packet monitor.

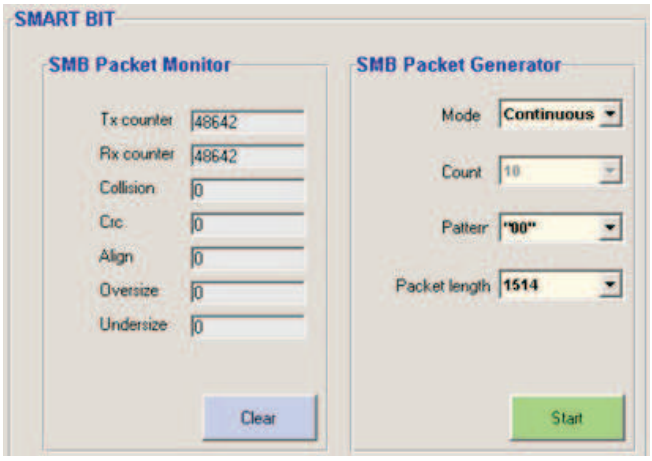

Figure 23. SmartBit Packet Generator Dialog

There are several options to choose from for the SMB Packet Generator:

- **Mode:**
  - Single burst: Select the number of packets to be delivered in a single burst
  - Continuous: Continuously transmit packets
  - Pattern: Select from available patterns
  - Packet length: Select from available lengths
- **SMB Packet Monitor:**
  - Tx counter: Packets sent
  - Rx counter: Packets received
  - Collision: Cumulative number of collisions that have occurred on the transmitting port of the SmartCard
  - CRC: Number of packets received with a faulty CRC
  - Align: An alignment error is a packet that does not end on the octet boundary (regardless of the CRC results)
  - Oversize: The cumulative number of oversized packets (greater than 1518 octets) that have arrived on the receiving port of the SmartCard or module
  - Undersize: The cumulative number of undersized packets (less than 64 bytes) that have arrived on the receiving port of the SmartCard or module

Power Mode Select

This tab also allows users to set the operating power mode. Figure 24 shows the four Power Mode select options.

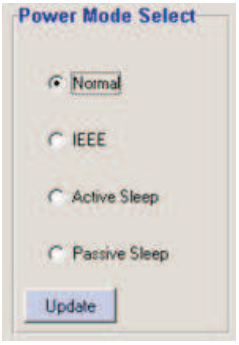

Figure 24. Power Mode Select Options

The Power Mode options are:

- **Normal Mode:** Normal operation
- **IEEE Mode:** Powering down all digital and analog blocks initiates a write to PHY Control Register address 0x0010 bits '9:8' = '01'
- **Active Sleep:** This mode is the same as Passive Sleep mode, but also sends an NLP every 1.4 seconds (approximately) to wake up a link-partner. Initiates a write to PHY Control Register address 0x0010 bits '9:8' = '10'
- **Passive Sleep:** This option powers down all digital and analog blocks. Automatic power-up is done when the link partner is detected. Initiates a write to PHY Control Register address 0x0010 bits '9:8' = '11'

3.2.6 CD Tab

This tab contains the cable diagnostic functions, as Figure 25 shows.

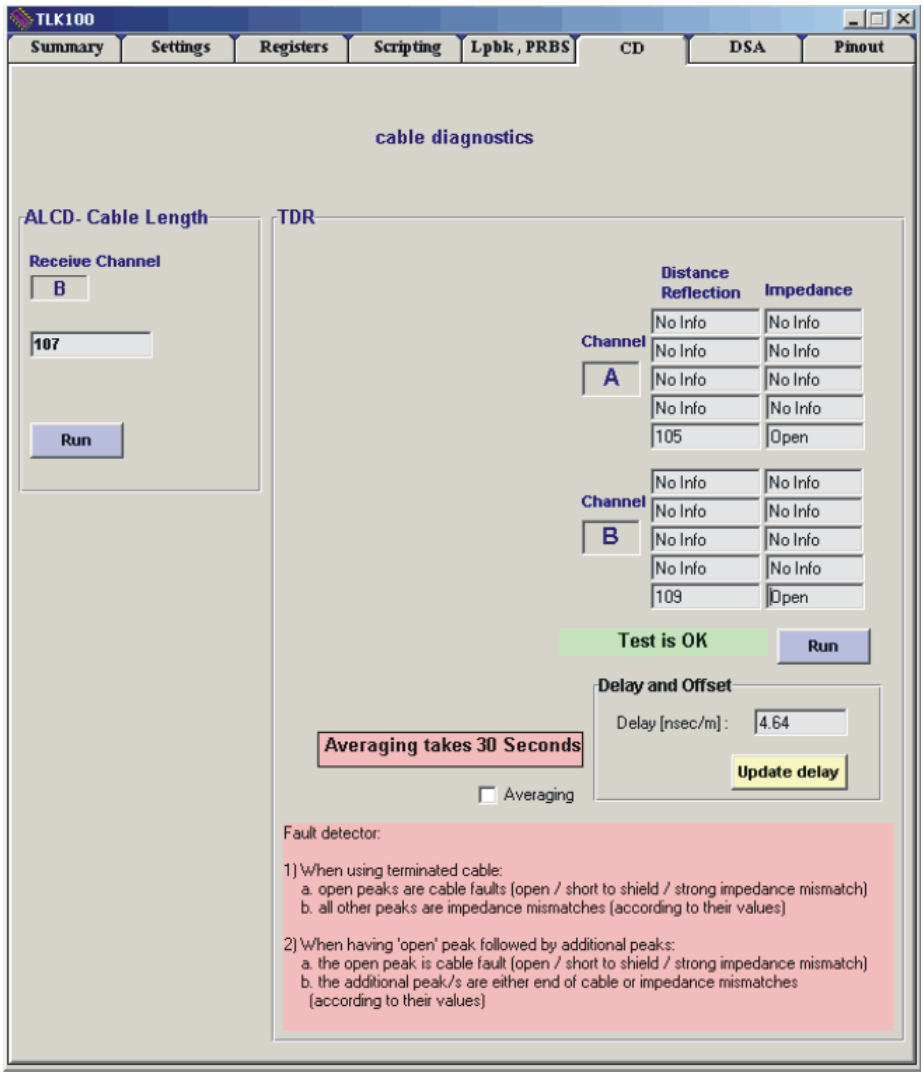

Figure 25. CD Tab

There are two primary functions on this tab:

- **ALCD:** An active link cable length measurement tool
- **TDR:** A time domain reflectometer

ALCD: Active Link Cable Diagnostic

The ALCD (as shown in Figure 26) offers a passive method to estimate the cable length present during an active link. It uses passive digital signal processing based on adapted data, thus enabling the measurement of cable length with an active link partner. The ALCD cable length measurement accuracy is ±5 m for the pair used in the Rx path (as a result of the passive nature of the test, only the pair on the Rx path is measured).

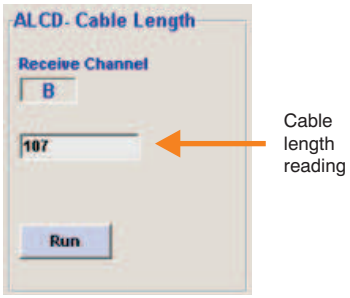

Figure 26. ALCD Dialog

To perform an ALCD test, do the following:

1. Ensure the device is currently under a 100BT link. If the user has performed a DSA or TDR before performing an ALCD test, the user is advised to reset the device (see Section 3.2.2).
2. Initiate the test by pressing the **Run** button.
3. The receive channel window shows the current RX pair, either a channel A pair: 1, 2 (MDIX) or a channel B pair: 3, 6 (MDI).

TDR: Time Domain Reflectometer

The TLK100 uses time domain reflectometry (TDR) to determine the quality of the cables, connectors, and terminations in addition to estimating the cable length. Figure 27 illustrates the TDR dialog area of the tab.

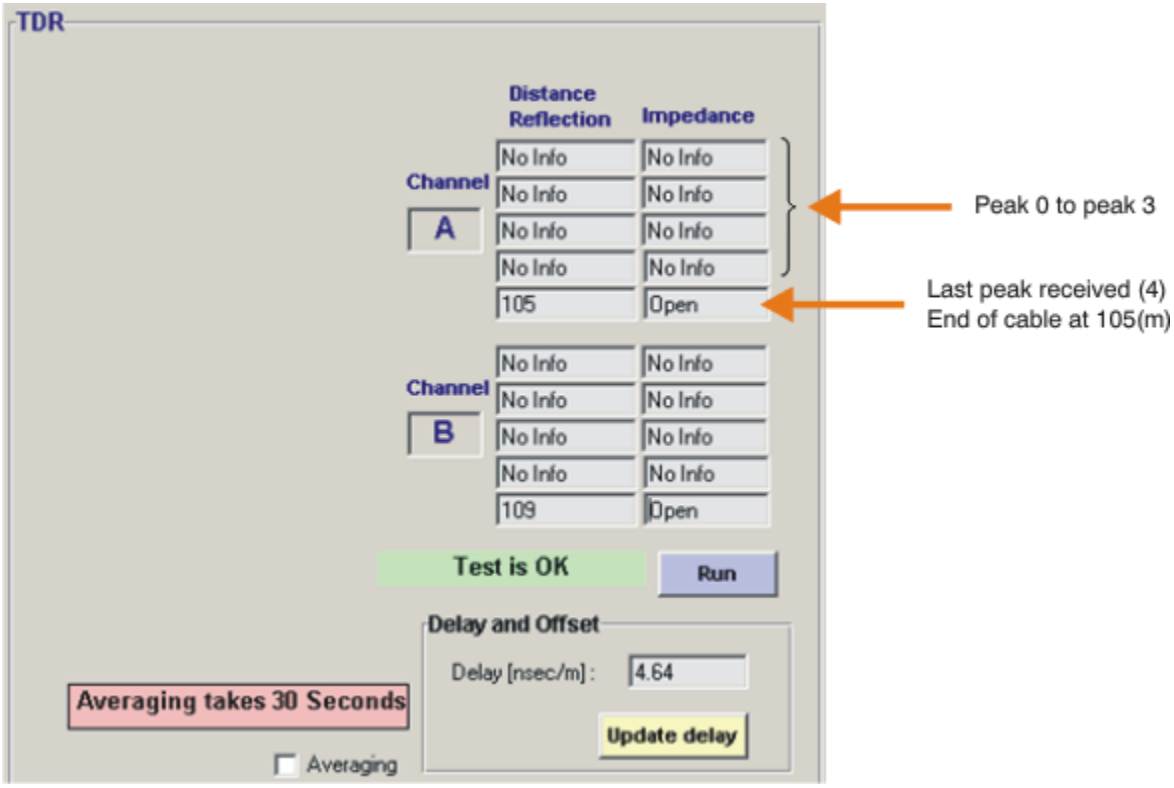

Figure 27. TDR Dialog

Some of the possible problems that can be diagnosed include opens, shorts, cable impedance mismatches, bad connectors, termination mismatches, and any discontinuities on the cable.

The TLK100 device transmits a test pulse of known amplitude (1 V) down each of the two pairs of an attached cable. The transmitted signal continues down the cable and reflects from each cable imperfection, fault, bad connector, and the end of the cable itself. After the pulse transmission is completed, the TLK100 measures the return time and amplitude of all these reflected pulses. This technique enables measuring the distance and magnitude (impedance) of non-terminated cables (open or short), discontinuities (bad connectors), and improperly-terminated cables.

Run a TDR test while there is no link and when you suspect a cable fault exists. The TDR measurement accuracy is ±1 m when using averaging (note that using the averaging process takes up to 30 seconds) or ±2 m without averaging (requires up to 10 seconds).

Fault detector:

1. When using a terminated cable:
   - Open peaks are cable faults (open/short to shield/strong impedance mismatch)
   - All other peaks are impedance mismatches (according to the respective values)

   Figure 28 shows an example of a terminated cable where channel B is faulty; one of its wires is shorted to the shield.

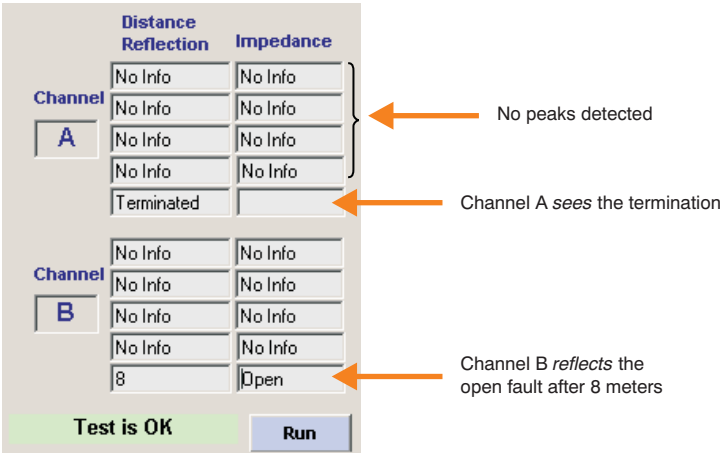

Figure 28. Faulty Cable Detection, Example 1

2. When you see an 'open' peak followed by additional peaks:
   - The open peak is a cable fault (open/short to shield/strong impedance mismatch)
   - The additional peak(s) is/are either the end of the cable or the result of impedance mismatches (according to the respective values)

   Figure 29 illustrates an example of an 'open' cable (not terminated at its end), 33 ms long, with a poor interconnection at 11 m.

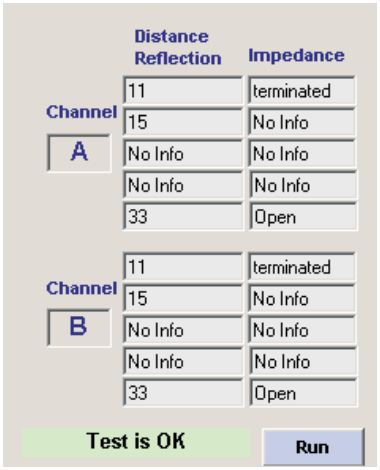

Figure 29. Faulty Cable Detection, Example 2

3.2.7 DSA Tab

The Digital Spectrum Analyzer (DSA) tab is shown in Figure 30.

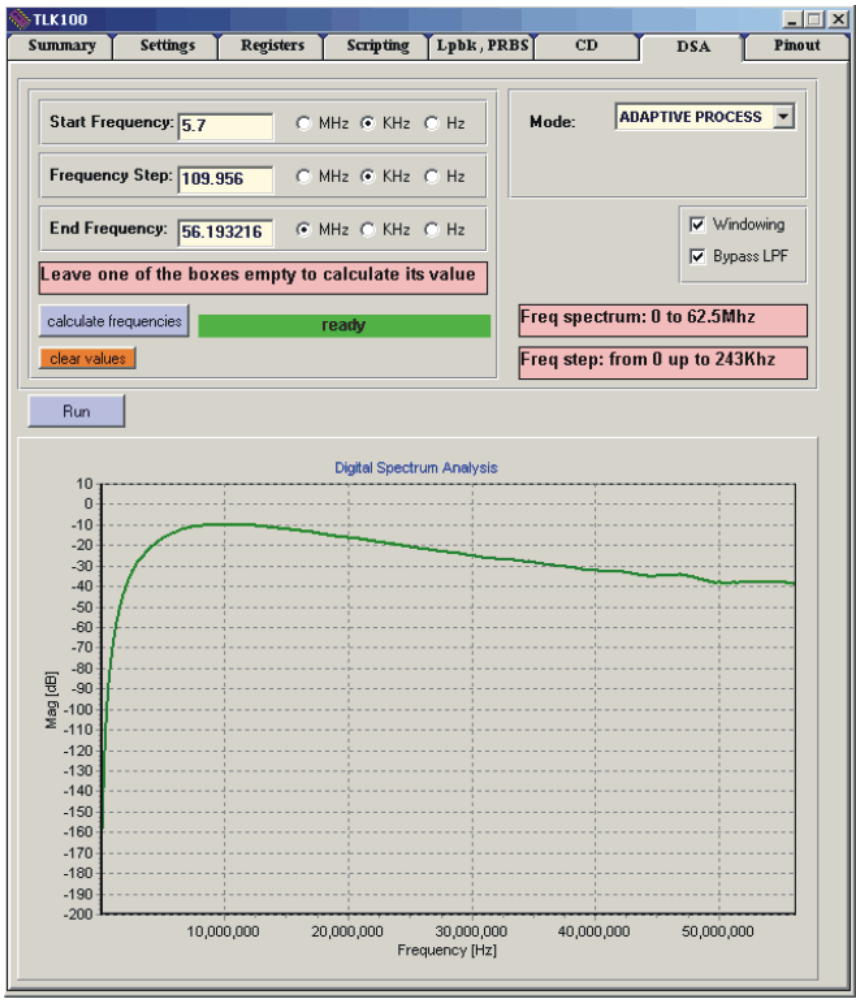

Figure 30. DSA Tab

The DSA feature enables the user to analyze the channel response in the spectrum (magnitude only). To perform this analysis, the DSA uses the DFT engine in the TLK100. For more information, refer to the product data sheet (available for download at www.ti.com).

Follow these steps to operate the DSA:

Step 1. Ensure that you have established a valid 100BT link.

Step 2. Enter data in two of the three text boxes in the frequency calculator dialog (see Figure 31): Start Frequency, Step Frequency, or End Frequency. Leave the third text box empty.

- Enter a frequency between 0 to 62.5 MHz for the Start and End Frequency text boxes.
- Enter a frequency between 0 to 243 kHz for the Step Frequency text box.

Step 3. Either press the **calculate frequencies** button to view the calculated value, or press the **Run** button to activate the DSA.

The DSA operation takes approximately 20 seconds to complete.

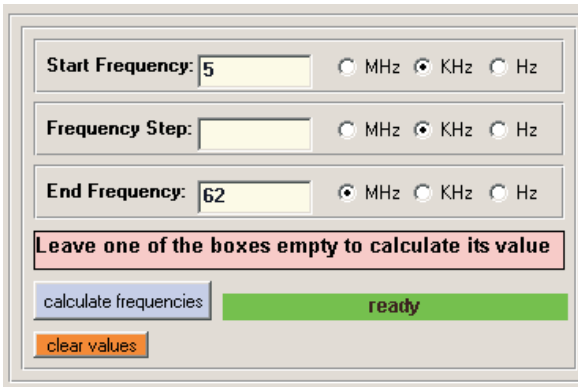

Figure 31. Frequency Calculator

Lastly, choose the desired operating mode, either the adaptive process or ADC mode. Select the appropriate options for windowing and bypass LPF, as Figure 32 illustrates. (Refer to the product data sheet for a detailed explanation about these options.)

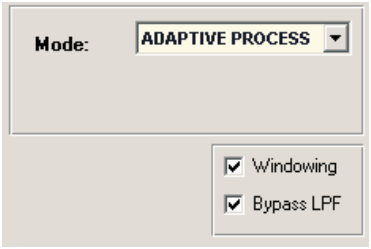

Figure 32. DSA Mode

DSA Chart Options:

Zoom: To zoom in on a chart, press the left mouse button at the top left hand corner of the area you wish to zoom in on. Holding down the mouse button, drag out the rectangle to the bottom right hand corner of the zoom area. Release the mouse button and the chart will redraw the area selected.

To undo the zoom, press the left mouse button anywhere on the chart area. Drag up and left with the mouse button depressed. Release the button and the chart will return to the originally defined chart area.

Scroll: To scroll across a chart, press the right mouse button. Holding down the mouse button, drag the mouse in the direction you wish to scroll the chart. When you release the mouse button, the chart will remain at the new location.

To undo the scroll, press the left mouse button anywhere on the chart area, then drag up and left with the mouse button pressed. Release the button and the chart will return to the originally defined chart area.

3.2.8 Pinout Tab

This tab features an interactive diagram of the device package with a pin-by-pin functional description, as Figure 33 shows. Select any pin and click on it to see a description of the pin functions.

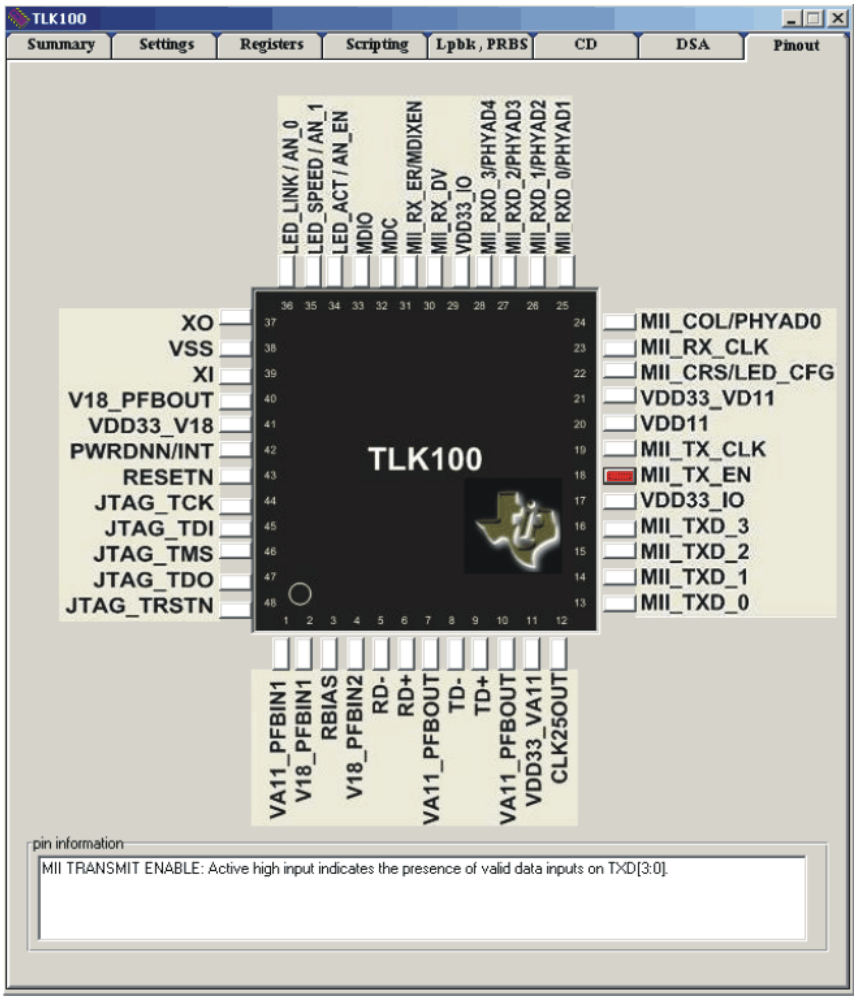

Figure 33. Pinout Tab

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