# NEX-CARDBUS
# Bus Adapter Users Manual

## Including these Software Support packages:
## CARDBUS

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# 1.0 OVERVIEW

## 1.1 General Information

The NEX-CARDBUS adapter has been designed to provide quick and easy connections to interface a 68, 102, or 136 channel TLA600/700, a 92A96 or 92C96 acquisition module to a CARDBUS slot.

This manual assumes that the user is aware that the 92A96 and 92C96 modules from Tektronix are essentially identical. This manual therefore refers to the 92A96 but the 92C96 could be substituted in all cases. References to the TLA700 apply to a TLA704, 711, 714, 715, 720 or 721 chassis with one or more 7*2/3/4 acquisition cards as well as TLA600.

Appendix D is a silk-screen print of the NEX-CARDBUS Adapter board. Referring to this drawing while reading the manual is suggested.

This manual assumes that the user is familiar with the CARDBUS specification and the Tektronix DAS 9200 or TLA600/700 Logic Analyzer. Also in the case of the TLA600/700, it is expected that the user is familiar with Windows O.S.

If PCMCIA support is required a separate product is available (NEX-PCMCIA). It provides a quick connection and symbolic disassembly of the PCMCIA bus.

# 2.0 SOFTWARE INSTALLATION

One 3½" diskette has been included with the NEX-CARDBUS Bus Adapter. It is for use with the TLA600/700 series. Diskettes for the DAS9200 or TLA500 are available upon request. Please see Appendix E for contact information.

## 2.1 TLA600/700

The CARDBUS support software is loaded in the same method as other Windows programs. Place the NEX-CARDBUS Install disk in the floppy drive of the TLA600/700. Select **Control Panel** and run **Add/Remove Programs**, choose **Install**, **Next**, then **Finish**. Add/Remove will then run SETUP.EXE on the floppy and install the support in its proper place on the hard disk.

To load a support into the TLA600/700, first select the desired Logic Analyzer card in the Setup screen, select Load Support Package from the File pull-down, then choose CARDBUS and click on **Okay**. Note that the Logic Analyzer card must be at least 68-channels in width. The reference memory included on the installation disk requires TLA600/700 version 2.0 or later software.

### 2.2 DAS 9200

The included diskette should be loaded onto the DAS 9200 using the Install Application function. This function is available from the Disk Services menu of the DAS. For more information, refer to the Tektronix DAS 9200 System User's Manual.

Load the desired support from within the 92A96 Config menu. Select "CARDBUS Support", press <RETURN>, and the channel grouping, clocking and symbols will then be loaded.

## 3.0 CONFIGURING the NEX-CARDBUS ADAPTER

The NEX-CARDBUS adapter is longer than a standard CARDBUS module, and is designed to function both as signal break-out board and as an extender card. An external connector is available to supply power to the DUT (Device Under Test) that is separate from the power supplied by the target system. To use this feature simply wire the external power supply to the VPP1, VPP2, VCC, and GND connections on the terminal block. To power the DUT from external power move the jumpers at JP1, JP2, and JP3 from their default SYS setting (the lower two pins) to the EXT setting (the upper pair of pins).

## 4.0 CONNECTING to the NEX-CARDBUS ADAPTER

### 4.1 92A96

When using a 92A96, connect the grouped pods (8 podlets to a group) to their appropriate locations by following the silk-screen information printed on the adapter board. The 92A96 pods used are A0-A3, C2, C3, D0 and D1. Each pod has its proper location denoted on the silk-screen of the adapter board. When attaching the pods, follow the silk-screen information on the board showing the ground and signal pin locations. The colored sides of the podlets, the signal side, should face either the center of the adapter board or the board end that plugs into the host system.

Connect the two clock leads (CLK0, and CLK1) to their specified locations at J13 (the only connector with 4 locations). Again, follow the silk-screened information to properly connect the clock input and its ground. Table 1 shows the wiring and Channel Grouping for the 92A96 when used with CARDBUS Support.

### 4.2 TLA600/700

The TLA600/700 will be connected in the same method as an A96. Table 1 shows the Channel Grouping and wiring for the TLA600/700 when used with CARDBUS Support.

### 4.3 Inserting / Removing CARDBUS DUT Cards

It is recommended that the NEX-CARDBUS adapter board be connected to the target system prior to inserting a CARDBUS DUT. Because the NEX-CARDBUS card does not have the mechanical guides typically found in CARDBUS designs, it is recommended that care be taken to insert and remove the DUT as smoothly as possible. When used in this fashion and when the DUT is powered from the target system (power jumpers in the SYS position) the power LEDs will not be on until a DUT is installed in the NEX-CARDBUS adapter.

| Group Name | Signal Name | CARDBUS Pin # | TLA600/700 / 92A96 input |
|---|---|---|---|
| Addr_Dat (Hex) | CAD31 | 66 | A3:7 |
| | CAD30 | 65 | A3:6 |
| | CAD29 | 31 | A3:5 |
| | CAD28 | 64 | A3:4 |
| | CAD27 | 30 | A3:3 |
| | CAD26 | 29 | A3:2 |
| | CAD25 | 28 | A3:1 |
| | CAD24 | 27 | A3:0 |
| | CAD23 | 26 | A2:7 |
| | CAD22 | 25 | A2:6 |
| | CAD21 | 24 | A2:5 |
| | CAD20 | 23 | A2:4 |
| | CAD19 | 56 | A2:3 |
| | CAD18 | 22 | A2:2 |
| | CAD17 | 55 | A2:1 |
| | CAD16 | 46 | A2:0 |
| | CAD15 | 45 | A1:7 |
| | CAD14 | 11 | A1:6 |
| | CAD13 | 44 | A1:5 |
| | CAD12 | 10 | A1:4 |
| | CAD11 | 9 | A1:3 |
| | CAD10 | 42 | A1:2 |
| | CAD9 | 8 | A1:1 |
| | CAD8 | 41 | A1:0 |
| | CAD7 | 6 | A0:7 |
| | CAD6 | 39 | A0:6 |
| | CAD5 | 5 | A0:5 |
| | CAD4 | 38 | A0:4 |
| | CAD3 | 4 | A0:3 |
| | CAD2 | 37 | A0:2 |
| | CAD1 | 3 | A0:1 |
| | CAD0 | 2 | A0:0 |

| Group Name | Signal Name | CARDBUS Pin # | TLA600/700 / 92A96 input |
|---|---|---|---|
| Control (Sym) | CRST# | 58 | C3:5 |
| | CFRAME# | 54 | C2:0 |
| | CDEVSEL# | 50 | C3:0 |
| | CSTOP# | 49 | C2:3 |
| | CIRDY# | 53 | C2:1 |
| | CTRDY# | 20 | C2:2 |
| | CCBE3# | 61 | C2:7 |
| | CCBE2# | 21 | C2:6 |
| | CCBE1# | 12 | C2:5 |
| | CCBE0# | 7 | C2:4 |
| Misc (Off) | CREQ# | 60 | D0:5 |
| | CGNT# | 15 | D0:6 |
| | CBLOCK# | 48 | C3:4 |
| | CPERR# | 14 | C3:3 |
| | CPAR | 13 | C3:2 |
| | CINT# | 16 | D0:0 |
| | CSERR# | 59 | C3:1 |
| | CCLK | 19 | C3:6 |
| | CAUDIO | 62 | D1:6 |
| | CCLKRUN# | 33 | D1:5 |
| | CSTSCHG | 63 | D1:4 |
| | CCD1# | 36 | D1:3 |
| | CCD2# | 67 | D1:2 |
| | CVS1 | 43 | D1:1 |
| | CVS2 | 57 | D1:0 |
| | RFU32 | 32 | D0:3 |
| | RFU47 | 47 | D0:2 |
| | RFU40 | 40 | D0:1 |
| Clock: 0 | CCLK | 19 | Clock:0 |
| Clock: 1 | CDEVSEL# | 50 | Clock:1 |
| Clock: 2 | Unused | ----- | |
| Clock: 3 | Unused | ----- | |

**Table 1- CARDBUS 92A96 / TLA600/700 Wiring**

# 5.0 CLOCK SELECTION

## 5.1 General Information

There are two clocking options available when using the NEX-CARDBUS support package. They are explained in detail below.

When using a TLA600/700, the clocking mode is selected by moving to the System window, clicking on Setup for the appropriate LA card, then clicking on **More** (a button to the right of the Clocking field). Choose the desired mode in the Clocking Select field.

When using a DAS9200 or TLA500, the clocking selection is made in the Clock menu. Open the select field labeled Support Software, choose CARDBUS, then press <RETURN>.

## 5.2 Clocking Options - Explanation

**Bus Cycle Acquisition** - This is the default clocking selection. In this mode only one address cycle is expected. All Wait and Idle states are ignored. In this clocking mode the High Address cycle of a Dual Address cycle will ***not*** be acquired as it will be considered a Wait state. The Low Address portion of the cycle will be properly acquired and displayed, as will all data associated with the cycle. This clocking selection offers the best use of your acquisition memory by ignoring all Wait and Idle states. Data is acquired on the rising edge of CCLK, with CDEVSEL#, CFRAME#, CIRDY#, and CTRDY# used as qualifiers to determine when valid information is present. These signals must be present for bus cycle acquisitions to be made properly.

**Every CLK Rising Edge** - In this mode, data will be acquired on every rising edge of the CARDBUS CCLK signal. The disassembly will filter and display these cycles accordingly, incorrect decoding may occur because of the numerous duplicated cycles. This clocking mode shows *all* bus cycles, including Wait and Idle states. Since no clocking qualification is done only the CCLK signal is required.

# 6.0 VIEWING DATA

## 6.1 Viewing Timing Data on the TLA600/700

By default, the TLA600/700 will display an acquisition in the Disassembly mode. However, the same data can be displayed in Timing form by adding a Waveform Display window. This is done by clicking on the Window pull-down, selecting New Data Window, clicking on Waveform Window Type, then choosing the Data Source. Two choices are presented: CARDBUS and CARDBUS-MagniVu. The first will show the exact same data (same acquisition mode) as that shown in the Disassembly window, except in Timing format. The second selection, CARDBUS-MagniVu, will show all of the channels in 2GHz/8GHz MagniVu mode, so that edge relationships can be examined at the module's trigger point. With either selection, all channels can be viewed by scrolling down the window. Refer to the TLA600/700 System User's Manual for additional information on formatting the Waveform display.

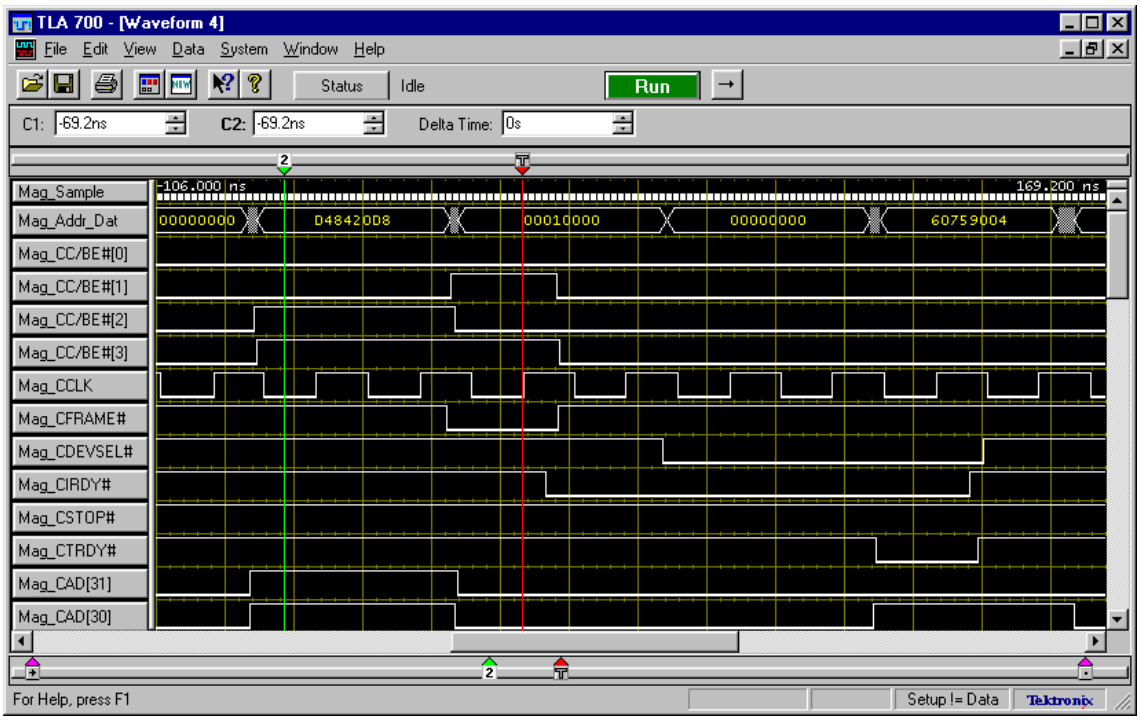



**Figure 1- CARDBUS MagniVu Display on TLA600/700**

## 6.2 Viewing State Data on the DAS9200/TLA500

After an acquisition is made the DAS9200 Logic Analyzer will display the data in State Display mode (as a default only). Address / Data information is displayed in hexadecimal format; Control data is displayed using symbols; Interrupt, Miscellaneous, and both Auxiliary data groups default to OFF.

The use of Symbol Tables when displaying state data enables the user to quickly determine what type of bus cycle was acquired. A symbol table (CARDBUS_Ctrl, Table 2) has been provided to show the type of transaction that occurred on CARDBUS. This symbol table quickly shows whether the acquisition was a memory or I/O operation, a read or a write, etc.

It is important to note that changing the group, channel, or wiring of the Control group can result in incorrect symbol information being displayed.

## 6.3 Viewing Timing Data on the DAS9200/TLA500

It may be useful to display acquired information using the Timing Diagram display of the DAS9200. (Note that, unlike some other logic analyzers, with the DAS9200 there is no need to re-acquire CARDBUS data when changing from one display mode to another. The same data can be viewed in either format.) This method of data display can be particularly useful when an asynchronous acquisition has been made (using the DAS9200 internal acquisition clock) to determine the relationships between signal edges.

Refer to the appropriate Tektronix DAS 92A96 Module User's Manual for more detailed information on formatting the display of the acquired data.

| Pattern | TLA600/700 / 92A96 Symbols | Meaning |
|---|---|---|
| 0xxxxxxxxx | RESET | Reset |
| 1011110000 | INTERRUPT ACK | Interrupt Acknowledge |
| 1011110001 | SPECIAL CYCLE | Special Cycle |
| 1011110010 | I/O READ ADDRESS | I/O Read |
| 1011110011 | I/O WRITE ADDRESS | I/O Write |
| 101111010x | RESERVED | Reserved |
| 1011110110 | MEMORY READ ADDRESS | Memory Read |
| 1011110111 | MEMORY WRITE ADDRESS | Memory Write |
| 101111100x | RESERVED | Reserved |
| 1011111010 | CONFIG READ ADDRESS | Configuration Read |
| 1011111011 | CONFIG WRITE ADDRESS | Configuration Write |
| 1011111100 | MEMORY READ MULTIPLE | Memory Read Multiple |
| 1011111110 | MEMORY READ LINE | Memory Read Line |
| 1011111111 | MEMORY WRITE & INVALIDATE | Memory Write & Invalidate |
| 1x0x001110 | DATA - BYTE 0 | Byte 0 valid (D0-7) |
| 1x0x001101 | DATA - BYTE 1 | Byte 1 valid (D8-15) |
| 1x0x001011 | DATA - BYTE 2 | Byte 2 valid (D16-23) |
| 1x0x000111 | DATA - BYTE 3 | Byte 3 valid (D24-31) |
| 1x0x001100 | DATA - BYTES 0 & 1 | Bytes 0 & 1 valid (D0-15) |
| 1x0x000011 | DATA - BYTES 2 & 3 | Bytes 2 & 3 valid (D16-31) |
| 1x0x000000 | DATA - BYTES 0-3 | Bytes 0-3 valid (D0-31) |
| 1x0x001111 | INVALID DATA | Invalid Data |
| 11xxxxxxxx | FRAME HI | Frame Hi |
| 10xxxxxxxx | FRAME LO | Frame Lo |

**Table 2- NEX-CARDBUS Control Symbol Table**

Signals, from left to right: CRST#, CFRAME#, CSTOP#, CDEVSEL#, CIRDY#, CTRDY#, CC/BE#[3], CC/BE#[2], CC/BE#[1], CC/BE#[0]

# 7.0 USING the DISASSEMBLY SOFTWARE

## 7.1 General

The NEX-CARDBUS support software decodes bus transactions and displays information in easily understood text form, just like a typical Tektronix microprocessor disassembler (see Figure 2). All CARDBUS Cycle types are identified and Config Cycles are decoded to reflect the meaning of the registers. For instance, Command and Status registers are completely evaluated, with each bit's state being presented in easy-to-read text. Device information is translated according to Class, sub-Class, and Type to inform the user as to what device (network interface, etc.) is being accessed. The CC/BE bus signals are also monitored to determine which data bytes are valid for any given transaction. Invalid bytes are indicated by dashes in the display, making it much easier for the designer to determine what data is actually present on the bus at any given time.

It is also possible to filter the data display to show only those cycle types of interest (Figure 3). The user can choose to display or suppress Memory, I/O, or Config cycles to permit easy and quick analysis of only those cycles of interest.

Another feature of the NEX-CARDBUS software is its ability to intelligently acquire CARDBUS data. By taking advantage of the data clocking power built in to the Tektronix Logic Analyzers the CARDBUS software is able to acquire only the CARDBUS bus cycles and ignore Idle and Wait states. This means that the user is able to make optimum use of the acquisition card's memory and see more bus transactions. For debug purposes. the user also has the ability to override this function and acquire data on every CARDBUS CCLK rising edge to permit the user to see all of the bus traffic including the Idle and Wait states. (See Section 5.3 Clocking Options for further information.)

Every stored cycle (bus or rising clock edge, depending upon clocking selection) has a timestamp value stored with it. This time information, accurate to 125ps/500ps in the TLA600/700 series, and to 10ns in the DAS9200 / TLA500, permits precise measurements of bus throughput during burst read transactions, etc. Because of the design of Tektronix Logic Analyzers there is no need to worry about trading off acquisition memory depth when making these measurements, as the timestamp memory is separate from the acquisition memory.

## 7.2 Disassembly Using the TLA600/700

The TLA600/700, since it is a Windows program, has the same type of user interface as other Windows-based applications. In the Disassembly Listing window, a tool bar at the top of the window contains buttons that allow the user to modify the display. These buttons, from left to right, perform the following functions:

Add Column - Adds a column to the display
Add Mark - Adds a user mark to the display
Cut - (may be grayed out) - Cuts the selection to the Clipboard

Copy - (may be grayed out) - Copies the selection to the Clipboard
Paste - (may be grayed out) - Inserts the contents of the Clipboard
Go To - Moves the display to the item of interest
Properties - Edits the current Listing Display properties
Smaller Font - Decreases the displayed font size
Larger Font - Increases the displayed font size
Search Backward - Moves to a previous data match
Define Search - Define data to be matched
Search Forward - Moves to the next data match
Mark Opcode - Permits placing an opcode mark (disabled in PCI32SW)

The format (or display properties) of each displayed column can be changed by putting the mouse cursor on the heading of the column, clicking the left mouse button to select that column, clicking the right mouse button to bring up the editing dialog, then selecting Properties. The column to be modified can also be selected by clicking on the Column tab, selecting the column of interest in the Column field, then making any desired modifications to that display column. The modification or selections possible will vary from column to column.

Two display columns of particular interest are the Timestamp and Mnemonics columns. Timestamp shows a time value associated with the acquisition. By default, Timestamp shows the time from System Trigger. Clicking on the From window in the Timestamp Reference field shows all available selections: Absolute (from when the Logic Analyzer was started), Previous (the time from the present sequence to the previous displayed one), and three selections that permit time to be displayed from different reference points: System Trigger, Cursor 1 Current Position, and Cursor 2 Current Position. Selecting the desired mode with the mouse, and then clicking the left mouse button, will make the selection the present Timestamp display mode.

The other column of interest is the Mnemonics column, where the CARDBUS disassembly information is displayed. As mentioned previously, it is possible to choose which CARDBUS cycles are displayed. This is done via selections made in the Disassembly tab of the Properties window. By default the display is in Hardware mode, and Memory, I/O, and Config cycles are set to Highlight. By choosing something other than Hardware in the Show select field, any cycle type set to Normal (instead of Highlight) will not be displayed. It is possible, for instance, to display only Config Cycles by setting Memory and I/O Cycles to Normal, leaving Config Cycles set to Highlight, and setting the Show select field to Software. All of the data still exists, some has just been suppressed from view. To return all of the data to visibility, set all Cycle selections to Highlight.

Note that when data is suppressed in this fashion that Timestamp information (in Previous form) will be updated to show the time between displayed cycles.

### 7.3 Disassembly Using the DAS9200 / TLA500

To view CARDBUS data in Disassembly form, simply click on the DISASM button in the lower part of the DAS/TLA display, or select Disasm in the Display column of the Main Menu. All CARDBUS transactions will be displayed and disassembled, and the Timestamp between each acquisition is displayed (Relative mode). To change the Timestamp format, press (or click) **F5**

(Display Format) and open the Timestamp select field. The options available are: Relative (time from the previous sample), Delta (time from a user definable Delta mark), Absolute (time from when the acquisition card was started), and Off. Making a choice, closing the field, then pressing (or clicking) **F8** to Exit and Save will modify the Disassembly display appropriately.

To filter the displayed data, again move to the Display Format screen (press or click **F5**). The Hardware Display Mode (default) will display all CARDBUS cycles by default.

By default the display is in Hardware mode, and Memory, I/O, and Config cycles are set to Highlight. By choosing something other than Hardware in the Display Mode select field, any cycle type set to Normal (instead of Highlight) will not be displayed. It is possible to display only Config Cycles by setting Memory and I/O Cycles to Normal, leaving Config Cycles set to Highlight, and setting the Display Mode select field to Software. All of the data still exists, some has just been suppressed from view. To return all of the data to visibility, set all Cycle selections to Highlight.

Note that when data is suppressed in this fashion that Timestamp information (in Relative form) will be updated to show the time between displayed cycles.

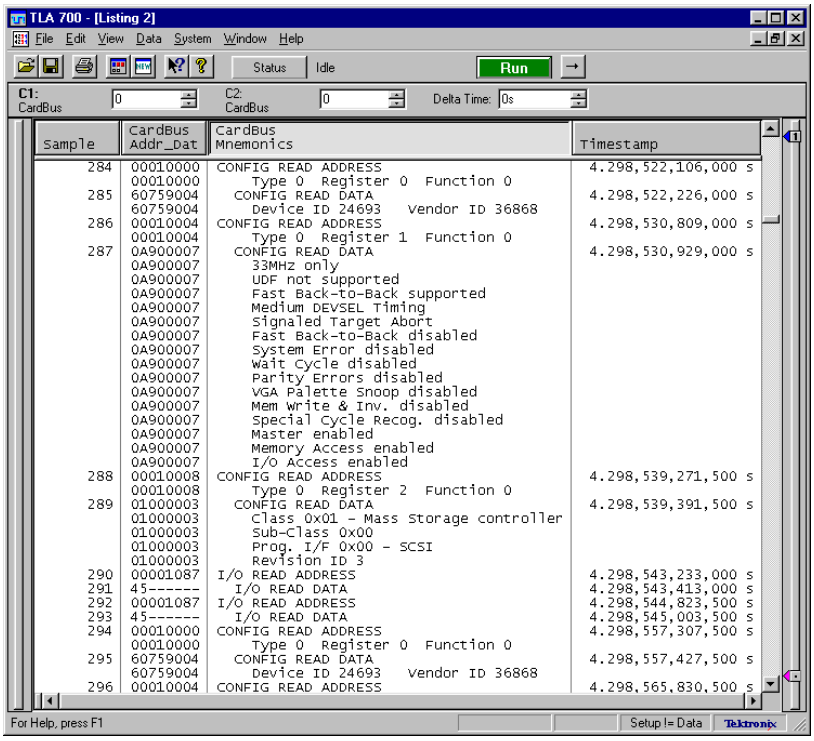



**Figure 2- CARDBUS Disassembly**

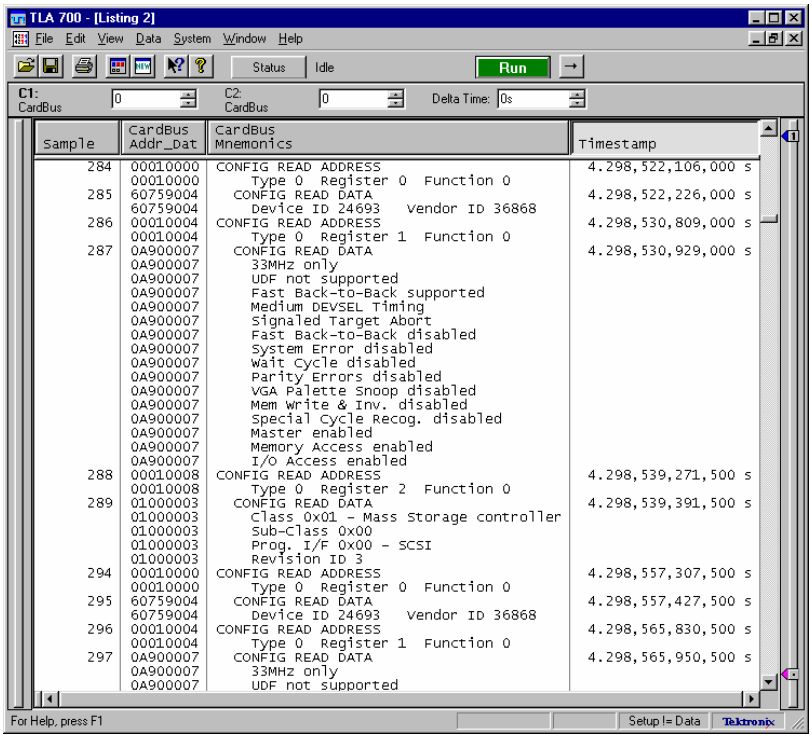



**Figure 3- CARDBUS Disassembly with suppressed Memory annd I/O Cycles**

## APPENDIX A - Necessary Signals for Clocking

To properly acquire CARDBUS bus activity, the following signals must be provided: CCLK, CDEVSEL#, CFRAME#, CIRDY#, and CTRDY#. The rising edge of CCLK is used as the only active clocking edge; all other signals are used to properly qualify the acquisition of data.

# APPENDIX B - Considerations

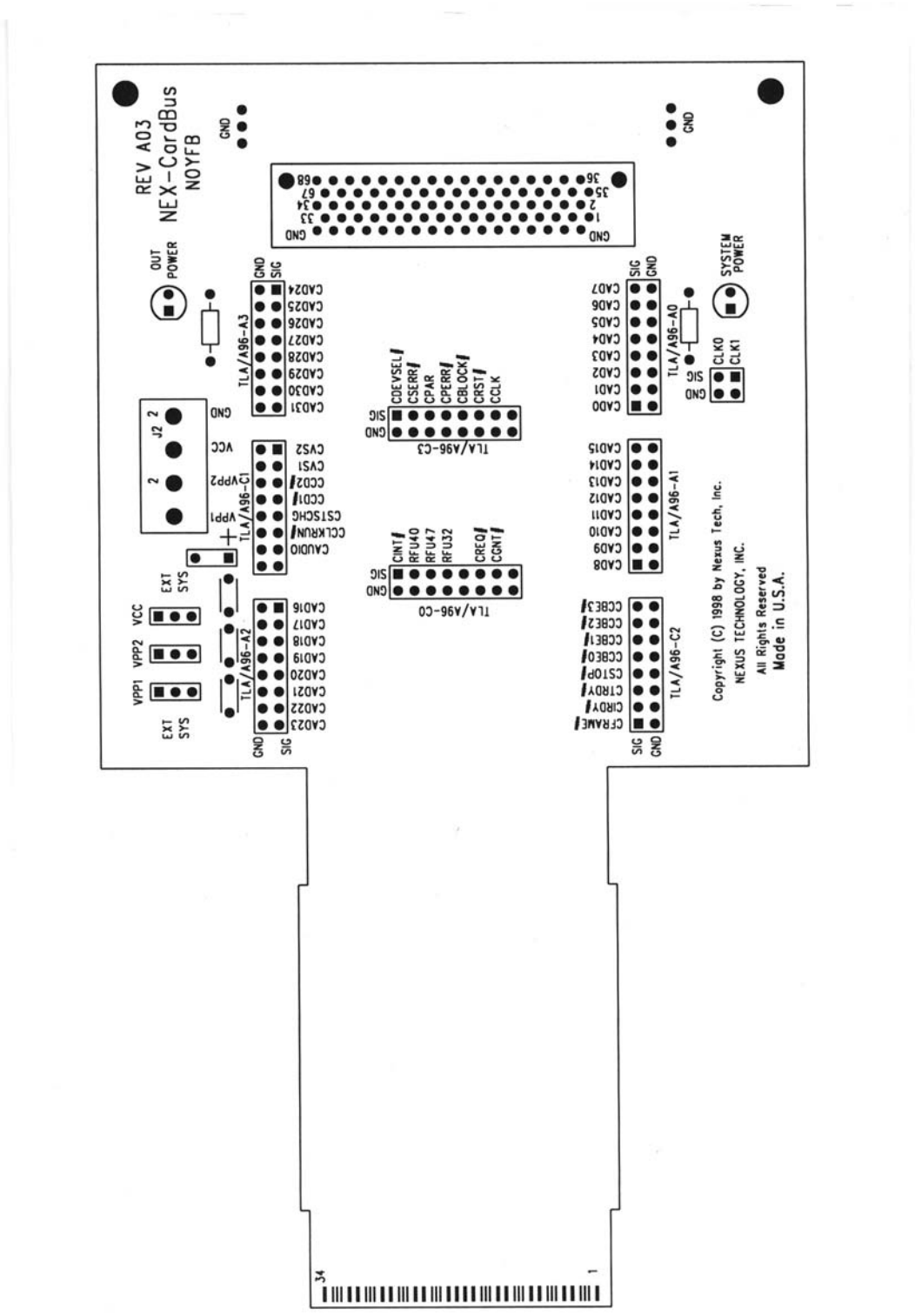
## B.1 CARDBUS Loading

It must be noted that the NEX-CARDBUS Adapter does not provide any buffering of the CARDBUS signals. This was a conscious design decision that was made by balancing the tradeoffs of possible loading versus signal acquisition accuracy. By not introducing signal buffers it is possible, using the NEX-CARDBUS adapter, to see the exact timing relationships and signal waveforms from the CARDBUS slot. It is believed that the signal loading of the TLA600/700 or 92A96 acquisition cards is low enough so that CARDBUS signal degradation will not occur.

## APPENDIX C - CARDBUS Pinout

| Pin | CardBus Signal | Pin | CardBus Signal |
|---|---|---|---|
| 1 | GND | 35 | GND |
| 2 | CAD0 | 36 | CCD1# |
| 3 | CAD1 | 37 | CAD2 |
| 4 | CAD3 | 38 | CAD4 |
| 5 | CAD5 | 39 | CAD6 |
| 6 | CAD7 | 40 | RFU |
| 7 | CCBE0# | 41 | CAD8 |
| 8 | CAD9 | 42 | CAD10 |
| 9 | CAD11 | 43 | CVS1 |
| 10 | CAD12 | 44 | CAD13 |
| 11 | CAD14 | 45 | CAD15 |
| 12 | CCBE1# | 46 | CAD16 |
| 13 | CPAR | 47 | RFU |
| 14 | CPERR# | 48 | CBLOCK# |
| 15 | CGNT# | 49 | CSTOP# |
| 16 | CINT# | 50 | CDEVSEL# |
| 17 | Vcc | 51 | Vcc |
| 18 | Vpp1 | 52 | Vpp2 |
| 19 | CCLK | 53 | CTRDY# |
| 20 | CIRDY# | 54 | CFRAME# |
| 21 | CCBE2# | 55 | CAD17 |
| 22 | CAD18 | 56 | CAD19 |
| 23 | CAD20 | 57 | CVS2 |
| 24 | CAD21 | 58 | CRST# |
| 25 | CAD22 | 59 | CSERR# |
| 26 | CAD23 | 60 | CREQ# |
| 27 | CAD24 | 61 | CCBE3# |
| 28 | CAD25 | 62 | CAUDIO |
| 29 | CAD26 | 63 | CSTSCHG |
| 30 | CAD27 | 64 | CAD28 |
| 31 | CAD29 | 65 | CAD30 |
| 32 | RFU | 66 | CAD31 |
| 33 | CCLKRUN# | 67 | CCD2# |
| 34 | GND | 68 | GND |

# APPENDIX D - NEX-CARDBUS Silk Screen



# APPENDIX E - Support

## About Nexus Technology, Inc.

Established in 1991, Nexus Technology, Inc. is dedicated to developing, marketing, and supporting Bus Analysis applications for Tektronix Logic Analyzers.

We can be reached at:

Nexus Technology, Inc.
78 Northeastern Blvd. #2
Nashua, NH  03062

TEL: 877-595-8116
FAX: 877-595-8118

Web site:  http://**www.nexustechnology.com**

## Support Contact Information

| | |
|---|---|
| Technical Support | **techsupport@nexustechnology.com** |
| General Information | **support@nexustechnology.com** |
| Quote Requests | **quotes@nexustechnology.com** |

We will try to respond within one business day.

## If Problems Are Found

Document the problem and e-mail the information to us. If at all possible please forward a Saved System Setup (with acquired data) that shows the problem. Do not send a text listing alone as that does not contain enough data for analysis. To prevent corruption during the mailing process it is strongly suggested that the Setup be zipped before transmission.

# APPENDIX F - References


Tektronix TLA600/700 System User's Manual

Tektronix TLA600/700 Module User's Manual

Tektronix DAS9200 / TLA500 System User's Manual

Tektronix 92A96 / 92C96 Module User's Manual

CARDBUS System Architecture
Mindshare, Inc. (Tom Shanley / Don Anderson)
Published by Addison Wesley
ISBN 0-201-40997-6

PCI Local Bus Specification
Production Version; Revision 2.1s - June 1, 1995
Published by:
PCI Special Interest Group
PO Box 14070
Portland OR 97214
800-433-5177 (U.S.)
503-797-4207 (International)
503-234-6762 (FAX)

PCI System Architecture
Third Edition
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