PCI 550 SYSTEM ANALYZER BOARD USER GUIDE

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P R E F A C E

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CHAPTER ONE - INTRODUCTION

1.0 INTRODUCTION

The **PCI550** System Analyzer is an advanced diagnostic tool for developing and debugging PCIbus systems. The **PCI550** supports both 32 and 64 bit systems and is available with several trace buffer sizes. It's many functions include the capture and storage of PCIbus signals - control of data capture/storage with sophisticated trigger and trace conditions, Bus Stimulus to assert bus cycles/signals on the bus, real time statistics/histograms, and much more. All on a single PCI board. This powerful combination of functions provides users with a state of the art tool for debugging complex PCI bus interactions simply and efficiently.

1.1 FEATURES

The **PCI550** combines the features of a sophisticated logic analyzer with the plug in ease of a PCI board. Furthermore, the **PCI550** adds key new features such as:

1) diagnostic functions of an onboard software debugger via Bus Stimulus functions
2) system debug functions such as backplane short test
3) and the flexibility of a CPU via programmability.

A GENERAL PURPOSE PCI BUS DIAGNOSTIC SYSTEM ON A BOARD!

FEATURES

* TRACE BUFFER OPTIONS	4MB, 8MB OR 16MB SAMPLE TRACE BUFFER, EACH SAMPLE IS 128 BITS WIDE - 96 PCI SIGNALS PLUS TIME TAGS, 4 EXTERNAL INPUTS;
* SAMPLING OPTIONS	133 MHZ SYNCHRONOUS SAMPLING 133 MHZ ASYNCHRONOUS SAMPLING
* DISPLAY OPTION	STATE DISPLAY WITH INTERVAL TIMES WAVEFORM DISPLAYS RAW DATA OUTPUT - BINARY OUTPUT/INPUT FOR UPLOADING TO HOST
* TERMINAL/INTERFACE REQUIREMENTS	USB and DB9 SERIAL PORT FOR STANDARD ASCII INTERFACE TO VT100, PC, MODEM, AND/OR PRINTER
* TRIGGER/TRACE QUALIFIERS	QUALIFY BASED ON SIGNALS OR COMBINATIONS OF SIGNALS, ADDRESSES OR ADDRESS RANGES, EXTERNAL TRIGGER INPUTS, INTERRUPTS, TRANSFER CONTROL SIGNALS; OCCURRENCE COUNTING FOR TRIGGERING; SEQUENTIAL TRIGGER SEQUENCES;VARIABLE TRIGGER POSITIONING IN TRACE BUFFER;
* BUS STIMULUS	PATTERN GENERATOR FOR PCIBUS SIGNALS,STIMULATE SIGNALS INC. SYS RESET, BACKPLANE SHORT TEST
* HISTOGRAMS/STATISTICS	COMPUTE REAL TIME HISTOGRAMS OF SIGNALS, COMBINATIONS OF SIGNALS, OR ADDRESS RANGES

1.2 OVERVIEW

During development, testing and support of a product, an engineer relies on general purpose test equipment such as oscilloscopes, logic analyzers, and emulators to investigate problem areas. Although such equipment is useful in debugging board and component level problems, it can prove cumbersome in analyzing system bus activity. General purpose test equipment requires a significant amount of set up time to physically connect to the many bus signals. Once this is accomplished, meaningful information may be hard to extract when complex interactions occur.

For PCI systems, Silicon Control's family of PCIbus System Analyzers provide not only a simple means of viewing bus activity, but also provide a convenient means of testing other boards in the system. Checking the backplane voltages or testing the backplane for shorts are examples of features which can assist you in analyzing your overall system performance. Furthermore, since the analyzers are PCI boards, simply install the analyzer in a slot in the PCI chassis, connect it to a terminal, and begin capturing PCIbus activity by typing "GO". No special setups or cabling are required - a real time saver!

In some cases the PCI550 can be effectively used in conjunction with other test equipment such as the VBAT Bus Anomaly Board (which detects PCIbus timing violations) or a high speed oscilloscope. The trigger inputs to the **PCI550** enable the user to monitor multiple external signals for tracing and/or triggering. The **PCI550** also outputs a level trigger on the front panel output port when the PCIbus trigger is encountered. This output can be used to trigger an oscilloscope.

The **PCI550** can be used in a wide range of applications throughout the product development cycle. During hardware development, the **PCI550** can be an invaluable tool for debugging both software and hardware. The **PCI550**'s sophisticated tracing controls allow it to zero in on specific sections of software code as well as isolate hardware faults on particular boards.

During the system integration process, the **PCI550** enables the user to access communications between boards for timing and protocol analysis - in addition to interrogating the performance of other boards in the system via the BUS MASTER functionality.

PCI550's can be used in conjunction with host computers such as PC's either directly or remotely via modem for production testing of PCI hardware or for field monitoring of equipment.

1.3 PCI550 SPECIFICATIONS

TRACE SIZE	32/64 BIT, 4 MB - P/N **PCI550-1**		
	32/64 BIT, 8 MB - P/N **PCI550-2**		
	32/64 BIT, 16 MB - P/N **PCI550-3**		
SAMPLING RATES CLOCK	**133 MHZ SYNCHRONOUS - CAPTURE DATA ON SYSTEM		
	**133 MHZ ASYNCHRONOUS - VARIABLE USER SPECIFIED SAMPLING FROM .781 MHZ TO 133 MHZ		
	**FULL TRIGGER AND TRACE QUALIFICATION APPLIES		
PCI TRACE SIGNALS	ADDRESS & DATA	INTERFACE CONTROL	ERROR REPORTING
	AD[31::00]	FRAME#	PERR#
	C/BE[3::00]#	TRDY#	SERR#
	PAR	IRDY#	
		STOP#	SYSTEM
	ARBITRATION	DEVSEL#	CLK
	REQ#	IDSEL#	RST#
	GNT#	LOCK#	
			64-BIT EXTENSION
	JTAG	CACHE SUPPORT	AD[63::32]
	TDI	SBO#	C/BE[7::4]#
	TDO	SDONE	PAR64#
	TCK		REQ64#
	TMS	INTERRUPTS	ACK64##
	TRST#	INTA#	
		INTB#	
		INTC#	
		INTD#	
TRACE QUALIFIERS OPTIONS;	8 SPECIFIERS (A,B,C,D,E,F,G,H) EACH WITH 100 SIGNAL SPECIFIERS AND'D, OR'D, XOR'D OR NOT; OCCURENCE COUNTING TO 64K; 8 LEVELS FOR SEQUENTIAL TRIGGERS		
EXTERNAL INTERFACE	USB PORT DB9 SERIAL PORT WITH HANDSHAKING AND BAUD RATE JUMPERS; ASCII- 8 BIT DATA, 1 STOP BIT, NO PARITY; 10 PIN CONNECTOR WITH 4 INPUT TRIGGER PORTS, 1 OUTPUT TRIGGER PORT PLUS GROUND; FRONT PANEL SYSTEM RESET; FRONT PANEL RUN (GREEN) AND USER DEFINED(RED) LED'S		
POWER	+5V 4.2 AMPS OPERATING /.5 AMP IDLE		
ENVIRONMENTAL	OPERATING TEMP: 0 TO 55 DEG C		
	STORAGE TEMP: -40 TO 85 DEG C		
	HUMIDITY: UP TO 90% NON-CONDENSING		
DIMENSIONS (INCL. FRONT PANEL)			
	HEIGHT 4.4 IN		
	WIDTH 7.0 IN		
	DEPTH .5 IN		

CHAPTER TWO - GETTING STARTED

2.0 UNPACKING AND INSPECTION

The PCI550 has been shipped in a specially constructed box to prevent damage during transit. If there is any evidence of mishandling, open the box in the presence of the carrier - if possible - and inspect the product for any damage which may have occurred. Check for any loose or broken parts to the main board and accessories. If any damage is evident, contact the shipping agent or Silicon Control immediately for further instructions.

2.1 PREPARATION

The PCI550 can be installed in any slot in a chassis with a PCI compatible backplane. The PCI550 Analyzer operates on +5V.

Prior to installing the analyzer in a slot, a number of jumper configurations should be reviewed. These include the reset jumper and the serial baud rate and handshaking jumpers. The following sections detail each of the jumper configurations.

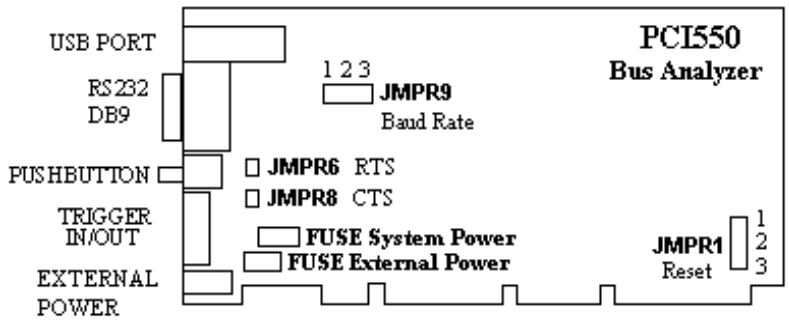
2.2 PCI550 JUMPER OPTIONS

2.2.1 Jumper Locations

Figure 2.1 on the following page illustrates the locations of the jumpers and switches on the **PCI550** Analyzer. In addition the locations of the serial ports, front panel switches and LED indicators are also noted.

2.2.2 Baud Rate Jumper

The Baud Rate jumper is JMPR9 and is located near the panel on the **PCI550**. Jumper block JMPR9 has 3 jumpers which are used to indicate the baud rate of the serial port on power up or reset. After power up, the serial port baud rate may be changed via keyboard command or downloaded from a host.



IMPORTANT!
Use only one FUSE - either in System or External Holder

Following are the jumper assignments for the various baud rates.

BAUD RATE	JMPR9-1	JMPR9-2	JMPR9-3
38.4K	OUT	OUT	OUT
19.2K	OUT	OUT	IN
9600**	IN	IN	IN
4800	IN	IN	OUT
2400	IN	OUT	IN
1200	IN	OUT	OUT
600	OUT	IN	IN
300	OUT	IN	OUT

Upon power up, the jumpers will determine the baud rate for the serial port. However, the user may then modify the baud rate for the port via the CF (configuration) command. Simply type CF, and using the space bar select the communications rate for the selected port. NOTE: upon power failure or if the board is reset, the analyzer will be reset to the baud rate established by the JMPR9 jumper block.

THE FACTORY DEFAULT SETTING FOR THE BAUD RATE IS 9600 BAUD - WITH ALL THREE JUMPERS (JMPR9-1, JMPR9-2, JMPR9-3 INSTALLED).

2.2.3 Handshaking Jumper Block

Jumper block JMPR6,8 is used to establish the handshaking protocol for the serial port. Jumper 6 connects RTS and jumper 8 connects CTS. Figure 2.2 provides the various handshaking options available, and the jumper configurations required. The options include Bypass, Monitor Carrier Detect (MODEM), No Hardware Handshaking (the default), and Full Handshaking.

The factory default setting is No Hardware handshaking with a software XON/XOFF protocol implemented via a two wire and ground connection on the RS232 ports.

Jumper block JMPR6,8 is normally referred to as the TERMINAL port - as this is the port which would typically be connected to a terminal, PC, modem, or host computer.

The format for the analyzer's serial communications is 8 data bits, 1 stop bit, and no parity. Communications is typically via ASCII characters except when binary or RAW mode has been selected for uploading of data or downloading of setup information to the analyzer.

2.2.4 Reset Jumper Block

Jumper Block JMPR1 (see figure 2.2) is used to establish the type of resets to be performed when either the user causes a RESET via the front panel or Bus Stimulus commands or when a SYS RESET is received via the backplane.

Be sure to carefully review the reset options before installing the analyzer in the PCI chassis. The RESET jumper block JMPR1 has 3 jumpers. Each jumper enables a different system reset option.

Jumper JMPR1-1 This jumper is used to hold the analyzer "off" while the system is powering up. To prevent the analyzer from hanging on power up due to power supply fluctuations etc. THIS JUMPER SHOULD TYPICALLY ALWAYS REMAIN INSTALLED IN THE BOARD.

Jumper JMPR1-2 The JMPR1-2 jumper causes the analyzer to reset when the front panel reset switch is pressed. Typically this jumper is installed so that the analyzer can be reset in the event the board hangs. Although the analyzer will be reset by the front panel reset when this jumper is installed, A SYSTEM RESET WILL NOT BE GENERATED ON THE BACKPLANE UNLESS JUMPER JMPR1-3 IS ALSO INSTALLED. NOTE: DO NOT HAVE JUMPERS 2,3, AND 4 INSTALLED AT THE SAME TIME TO AVOID MULTIPLE RESETS.

Jumper JMPR1-3 Jumper 4 is used to determine if resets from the backplane (such as a CPU SYS RESET) will cause the analyzer to reset. If the user wants monitor or perform bus activity during system resets, then this jumper should be removed. However, if the user wants the analyzer to reset whenever the system resets, this jumper should be installed.

Defaults The default settings for the RESET jumpers are as follows:

JMPR1-1 OUT
JMPR1-2 IN
JMPR1-3 IN

This configuration means that the only way to reset the analyzer is via the front panel reset switch.

2.2.5 Clock Jumper Block

Jumper Block 12 is used to select the clock used by the master function and on board processor. Normally this jumper should be in position 2 which selects the system bus clock. If no clock is present on the bus jumper 1 may be inserted which selects an on board 33 Mhz clock. This may be the case on a faulty backplane or if monitoring the power up sequence of a system since no clock is present before power up.

2.3 FRONT PANEL SWITCHES, INDICATORS, and PORTS

The front panel on the PCI550 has a wide variety of switches, LED indicators, and an RS232 port. Each of these is described in the following section. Figure 2.4 on the following page illustrates the location and designation of the front panel outputs/indicators.

2.3.1 LED Indicators

The PCI550 has two LED indicators on the front panel. The first is the user specified RED LED. The user can select any signal to be indicated via this LED. This enables the user to visually monitor the status of a signal/device during system operation. Any of the backplane signals or external inputs can be selected as the signal to be monitored with this LED. The signal is selected via the command LED ON and LED OFF. The indicator will be lit when the signal is true (I.E. grounded or =0 on the state display).

The second LED indicator is the Green Power indicator. This LED shows that the analyzer has power and that the onboard processor is running.

2.3.2 Reset Button

There is reset button on the PCI550's front panel. The operation of this button is determined by the configuration of the JMPR1 jumper block. If the B-3-2 jumper is installed, the front panel switch will reset the analyzer when depressed. When the B-3-3 jumper is installed, the front panel reset switch will also cause a SYS RESET on the backplane - resetting the entire PCI chassis. Be sure to check these jumpers prior to installing the analyzer in the system. Refer to section 2.2.3 for additional information.

2.3.3 External Trigger Inputs/Outputs

The PCI550 has a 20 pin connector port on the front panel to accommodate 8 external inputs, one output, 9 associated grounds and 2 unused. The inputs /outputs are standard TTL levels, and can be accessed via the cable provided. The pinout of the connector is shown below. The top row of signals (if you are looking straight towards the front panel with the LED's on the right) are the signal pins. The bottom row is the ground pins. The signal pins from left to right are : External Inputs 1,2,3,4 and Trigger Output.

EXT0	EXT1	EXT2	EXT3	EXT4	EXT5	EXT6	EXT7	OUT	
GND	GND	GND	GND	GND	GND	GND	GND	GND	

EXTERNAL INPUTS/OUTPUTS

The inputs are automatically monitored/captured during PCI data capture. These signals are displayed as part of the state display. In addition the external inputs can be selected as trigger signals and trace qualifiers via the event specifiers (A,B,C,D).

The External Output can be used to trigger an external device such as an oscilloscope or a host computer. The state of the output switches when a trigger is encountered. The output will change states only once per data capture sequence. The user can select whether to switch high or low via the CF (configuration) command on the analyzer.

2.3.4 Serial Ports

The PCI550 has one DB9 serial port on the front panel. This is the port which would typically be connected to a terminal, PC, modem, or host computer for communications.

The baud rate and handshaking for the serial port is controlled by the JMPR9 jumper block as described earlier in this chapter. The default settings for the handshake and baud rate are as follows:

DEFAULTS

9600 Baud (jumper JMPR9-1,JMPR9-2, and JMPR9-3 installed)
No hardware handshaking (no jumpers on JMPR6,8)
Protocol N-8-1 (No parity, 8 bits of data, 1 stop bit)

The standard communications is a software XON/XOFF 2 wire and ground serial communications scheme. Figure 2.5 contains the pinouts for the DB9 connector. See the sections on the baud rate and hand-shaking jumpers for details on configuring those options.

DB-9 TO DB-25 CABLE CONNECTION

RS232 Cable Pinouts

DB-9 Connector		DB-25 Connector
2	to	2
3	to	3
8	to	4
7	to	5
4	to	8
5	to	7
1	to	20
6	to	6

FIGURE 2.5

Connecting to a Terminal

In order to connect a standard ASCII terminal such as a VT100, or to use a PC with a terminal emulator such as PROCOMM or CROSSTALK, simply connect the serial port on the terminal/PC to the PRIMARY port on the analyzer with the serial cable provided with the analyzer. This cable has a DB9 connector on one end which will connect to the analyzer. The other end has a DB25 which will connect to terminal/PC. (Many PC's have DB9 connectors on their serial ports. In this situation, a DB9 to DB25 adapter will be required).

2.4 GETTING STARTED

The next step is to install the PCI550 in a slot in the PCI chassis. Power to the chassis should be off when installing the analyzer in a slot. Install the analyzer in the chassis, and then connect the terminal or PC to the primary serial port on the analyzer via the RS232 cable provided with the analyzer. Next, connect the DB25 end of the cable to the terminal or PC. If the terminal/PC is not already powered up, turn the power on at this point.

2.4.1 Power Up

Next, power up the PCI chassis. The GREEN RUN LED indicator on the front panel of the analyzer should be illuminated - indicating that the analyzer is powered and running. (Note: the analyzer utilizes only the +5V for operation). The terminal screen should display the following banner:

```
*********************************************************
*                                                       *
*                  PCI550 PCI BUS ANALYZER              *
*                                                       *
*                      SILICON CONTROL                  *
*                                                       *
*                        847-634-9313                   *
*                                                       *
*                       COPYRIGHT 1999                  *
*                                                       *
*********************************************************
```

In addition directly below the banner, the analyzer configuration will be displayed. The software and hardware revision, and the memory size will be displayed. This information can be reviewed at any time via the VER command.

If for any reason the banner does not appear on the screen or if it appears garbled, check the following items:

1) Power down and check the jumper settings on the analyzer, including the baud rate jumpers and the reset jumpers. Insure that the analyzer and terminal baud rates and protocols match. The analyzer factory default settings are 9600 baud with an N-8-1 protocol (no parity, 8 bits of data, 1 stop bit).

2) If the Green RUN indicator is illuminated but the analyzer does not appear to be communicating with the terminal, press the reset button on the analyzer. It is possible a power supply or battery problem may cause the analyzer to hang on power up. However, as long as the JMPR1-2 jumper is installed, the front panel reset switch will reset the analyzer circuitry.

2.4.2 Command Mode

Once the analyzer is powered up, it should be in COMMAND MODE - in which the "PCI>" prompt appears. At this point, the user can enter any of the analyzer commands. (For a complete listing of the commands on the screen- type "HELP" and return.)

Command mode is similar to interactive BASIC in that the user enters a command and it is immediately executed. The other analyzer mode is PROGRAM MODE - where a sequence of commands is created in a command file - and is executed upon command or (if selected) upon powerup/reset.

Execution of a command file can be terminated at any time by typing CTRL C. The analyzer should then return to COMMAND MODE.

In COMMAND MODE, there are editing features to assist the user if commands are entered incorrectly. Following is a list of control/editing function keys supported by the analyzer.

KEY	FUNCTION
BACKSPACE	Delete or erase characters on the same command line.
CTRL X	Delete an entire command line
ESC	Exit or abort and return to command mode. (Note: in specific instances CTRL C is required to abort an operation. These will be noted under the specific commands)

2.4.3 Initialization

To reset the analyzer to the factory default settings - the user must INITIALIZE the board via the "I" command. The default settings for the PCI550 parameters are SYNCHRONOUS sampling, trigger positioned at the midpoint of the trace buffer, and X's or Don't Cares for all trigger/trace qualifier options. Figure 2.6 illustrates the factory default/initialized settings for all of the PCI550 parameters.

```
PCI>DS
*************************** PCI MATCH CONDITIONS ****************************
                      TRANSFER           !   INTERRUPT  !        BUS     ! EXT
  R   ADDRESS     DATA   AM AS LW DS ER AK!  REQ  ACK ACK!GRANT REQ BSY CR!XXXX
  W                                       !7654321    I/O!3210 3210       !4321
-----------------------------------------!--------------!----------------!----
A:X  =XXXXXXXX =XXXXXXXX XX  X  X XX  X  X XXXXXXX X   X  XXXX XXXX  X   X XXXX
B:X  =XXXXXXXX =XXXXXXXX XX  X  X XX  X  X XXXXXXX X   X  XXXX XXXX  X   X XXXX
C:X  =XXXXXXXX =XXXXXXXX XX  X  X XX  X  X XXXXXXX X   X  XXXX XXXX  X   X XXXX
D:X  =XXXXXXXX =XXXXXXXX XX  X  X XX  X  X XXXXXXX X   X  XXXX XXXX  X   X XXXX

****************************** PROGRAM LEVELS ******************************
LEVEL   IF EVENT   OCCURS   THEN - TRIG?    ELSE - TRIG?    TRACE        CLOCK
-------------------------------------------------------------------------------
  1      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  2      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  3      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  4      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  5      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  6      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  7      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  8      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
PRESS ANY KEY FOR MORE SETUP INFORMATION (ESC TO EXIT)



************************ GENERAL SETUP INFORMATION ************************

TRIGGER POSITION =       1/2          TRACE DISPLAY      =    SIGNAL
TRACE QUALIFIER =        ALL          MASTER AM CODE     =    3D
OCCURRENCE COUNT =       00001        MASTER BUS REQUEST =    BR3
SAMPLE CLOCK =           SYNCH

******************* HIGH SPEED TRACE SETUP INFORMATION *******************
SAMPLE CLOCK =           200 MHZ
TRIGGER POSITION =       1/2
TRACE DISPLAY =          SIGNAL/TIME
SIGNAL GROUP NUMBER =    00
PCI>
```

FIGURE 2.6 DATA SUMMARY SCREEN

CHAPTER THREE OPERATIONAL OVERVIEW

3.0 OPERATIONAL OVERVIEW

This chapter provides a brief overview of the analyzers functions and includes a "GETTING ACQUAINTED" section which steps the first time user through the most commonly used analyzer features. Details of each of the analyzers functional areas is contained in subsequent chapters.

3.1 INTRODUCTION

The PCI550's operational mode is based on execution of commands either interactively or via command files (programs). Similar to BASIC, the user simply enters an ASCII command via the keyboard - or creates a program via the command files.

The PCI550 Command Summary may be listed on the screen via the HELP commands (note: there are multiple HELP screens). Figure 3.1 illustrates the HELP screens. To execute a command, simply enter the ASCII characters via the keyboard.

For additional details on any of the commands, refer to the COMMAND SUMMARY chapter in this reference manual.

3.2 PCI TRANSFER MODES

The PCI550 Analyzer supports a wide variety of PCI transfers for both data capture and data transmission. The analyzer will capture or transfer PCIbus cycles in the following modes:

C/BE[3::0]#	COMMAND TYPE
0000	Interrupt Acknowledge
0001	Special Cycle
0010	I/O Read
0011	I/O Write
0100	Reserved
0101	Reserved
0110	Memory Read
0111	Memory Write
1000	Reserved
1001	Reserved
1010	Configuration Read
1011	Configuration Write
1100	Memory Read Multiple
1101	Dual Address Cycle
1110	Memory Read Line
1111	Memory Write and Invalidate

```
PCI>HELP

********************************** HELP **********************************
COMMAND:
****************************** COMMAND SUMMARY ******************************
----------- TRACE CAPTURE -----------        ----------- BUS CONTROL -----------
GO          -START EVENT CAPTURE             BR,BRS,BRL -WORD,BYTE,LONG READ
GO F        -START CAPTURE FOREVER           BW,BWS,BWL -WORD,BYTE,LONG WRITE
GO(TRIG)    -CAPTURE USING TRIGGER           BS,BSS,BSL -WORD,BYTE,LONG MODIFY
GO(LEVEL)   -CAPTURE USING LEVEL
GO HR(C)    -RANGE HISTOGRAM (COUNT)         BRB, BRBL  -WORD, LONG BLOCK READ
GO HS(C)    -SIGNAL HISTOGRAM (COUNT)        BWB, BWBL  -WORD, LONG BLOCK WRITE

----------- TRACE BUFFER ------------
P           -DISPLAY NEXT PAGE               BR64       -PCI64 BLOCK READ
P-          -DISPLAY PREVIOUS PAGE           BW64       -PCI64 BLOCK WRITE
P(F) (F1,F2)-DISPLAY AT FRAME NUM
PS(1-8)     -SEARCH TRACE                    BM         -BUS REQUEST/MODIFIER
PM(1-8)     -SET SEARCH CONDITION            BC(1-8)    -SET BUS CONDITION
PD          -SELECT TRACE DISPLAY            BA(1-8)    -SEND BUS CONDITION
PE(F1,F2)   -DISPLAY ELAPSED TIME            BI(1-7)    -SEND BUS INTERRUPT/ACK
----------- TRIGGER SETUP -----------        BT         -BACKPLANE TEST
A B C D     -SET MATCH CONDITIONS            BP         -BUS CONTROL ON/OFF
L(1-8)      -SET LEVEL CONDITIONS
TP          -TRIGGER POSITION
O           -OCCURRENCE COUNT
TO          -TRACE QUALIFIER
 TYPE "HELP MORE", "HELP VSB", "HELP GEN" OR "HELP VXI" FOR ADDITIONAL COMMANDS
******************************************************************************
PCI>HELP MORE

********************************** HELP **********************************
COMMAND:
************************** COMMAND SUMMARY CONTINUED ************************
----------- CONFIGURATION ---------          ---------- MISCELLANEOUS ---------
S         -SELECT SAMPLE CLOCK               CL(1-8)   -COMMAND LINE SETUP
H         -SELECT HISTOGRAM SIGNALS          CA(1-8)   -COMMAND LINE ACTIVATION
R(1-8)    -SELECT HISTOGRAM RANGES           T         -SELF TEST
W         -SELECT WAVEFORM SIGNALS           I         -CLEAR CURRENT SETUP
SS(1-8)   -STORE SETUPS                      SO        -TURN ON GO STATUS
RS(1-8)   -RECALL SETUPS                     SF        -TURN OFF GO STATUS
SP(1-8)   -STORE SCREEN PAGES                WR        -WRITE RAW SETUP DATA
RP(1-8)   -RECALL SCREEN PAGES               RR        -READ RAW SETUP DATA
DS        -DISPLAY SETUP                     VER       -READ VERSION NUMBER
CF        -CONFIGURE OPTIONS                 HELP(CMD) -HELP SUMMARY (DETAIL)
------- HIGH SPEED COMMANDS -------          V         -READ BUS VOLTAGES
HSP       -DISPLAY TRACE                     RT        -READ TEMPERATURE
HSPD      -SELECT TRACE DISPLAY              CS        -CLOCK SET
HSPE      -DISPLAY ELAPSED TIME              CR        -CLOCK READ
HSTP      -TRIGGER POSITION                  LED OFF/ON-RED LED CONTROL
HSS       -SELECT SAMPLE SPEED               ------ PRINTER/PASSTHRU PORT -----
HSW       -SELECT SIGNALS (8 MAX)            CTRL-T    -PASSTHRU TOGGLE
                                             CTRL-P    -PRINT SCREEN
M         -CAPTURE/COMMAND TOGGLE            CTRL-O    -PRINT ECHO TOGGLE
******************************************************************************
PCI>
```

FIGURE 3.1 HELP MENUS

3.3 COMMUNICATIONS

Communication with the PCI550 Analyzer is via the primary serial port on the front panel. This port may be connected to a standard 80 column ASCII terminal such as a VT100, to a modem for remote communications, or to a PC or other host computer. The PCI550 uses a straight forward two wire and ground serial communications scheme with a software XON/XOFF protocol implemented. Other handshaking options are available - including Full and ByPass Handshaking. For details on the configurations for these options, see Chapter 2.

To connect to a terminal (or a PC running a terminal emulator package or the new PCIWINDOW program) simply use the serial cable provided with the analyzer.

The factory default BAUD rate is 9600 - however the analyzer supports the range of 300 to 38.4kb. Refer to Chapter 2 for instructions on how to change the baud rate jumper settings. The jumpers establish the baud rate upon power up or reset, however, once the analyzer is powered up and communicating with the terminal or host, the baud rate may be changed via the CF command.

The communications ASCII protocol is N-8-1 or no parity, 8 bits of data, 1 stop bit.

For connecting to a modem, it may be necessary to use a hardware handshaking scheme, and to utilize additional control lines. Refer to the MODEM manual for instructions on the type of communications scheme to use. The pin outs for the serial connectors and cables are provided in Chapter 2.

3.3.1 Raw Mode/ Binary I/O

The PCI550 has a RAW mode output designed for uploading trace buffer data to a host computer in a condensed binary format. PCIWINDOW (the optional PC based software interface package for the PCI550) utilizes this mode when uploaded/downloading data from the analyzer. Trace buffer data can be uploaded in this condensed format for offline processing or archiving.

In addition, the analyzer can also be downloaded with setups in binary format. Care must be taken when loading setups to insure that valid patterns are downloaded. The command to download setup information in binary format is WR - Write Raw Setup Data. The host can also interrogate the analyzer for current setup information in binary mode. This is implemented via the RR - Read Raw Setup Data command. Detailed information on the binary formats for Raw Data Read and Write will be provided upon request. Contact Silicon Controls for details.

3.3.2 Using the Analyzer with a PC or Host

There are number of options when using a PC or other host such as a SUNworkstation with the PCI550 Analyzer. First is to utilize a terminal emulator package. There are a wide variety of these types of packages currently on the market - including PROCOMM, ZAP, CROSSTALK, and others. Most terminal emulators support a VT100 emulation mode - which is compatible with the analyzer. There are a number of benefits to using a host with a terminal emulator package versus a stand alone terminal. First of all, most emulator packages have command/programming facilities which enable the user to create custom programs to interface with other devices. Figure 3.2 illustrates a straightforward demo program for PROCOMM which interfaces with the analyzer, creates screens on the PC for prompts and messages, and uploads information from the analyzer. The program was created as a simple ASCII file which can be generated via EDLIN or most word processing packages. The program is invoked while under PROCOMM.

A second advantage to having a host with disk drives, is the ability to upload trace buffer data for offline analysis and archiving. Terminal emulators typically have built in facilities for opening and closing files. For example, with PROCOMM, the user simply opens the log file (via ALT F5) and then instructs the analyzer to upload data with a command such as P1,1000. This will upload samples 1 to 1000 inclusive.

This data will then be automatically stored into the log file for subsequent review. To close the log file simply type ALT F5 again.

For PC users, Silicon Control also offers PCIWINDOW - a PC based user interface package which provides point and click operation, support for high resolution graphical displays, file storage of data and setups, and much more. For details on this optional user interface package, consult the PCIWINDOW data sheet or user manual.

```
 1:  START:
 2:  MESSAGE  "************************************************************"
 3:  MESSAGE  "*                                                          *"
 4:  MESSAGE  "*                                                          *"
 5:  MESSAGE  "*                                                          *"
 6:  MESSAGE  "*                                                          *"
 7:  MESSAGE  "*               PCIBUS SYSTEM ANALYZER                    *"
 8   MESSAGE  "*                  DIAGNOSTIC TEST #1                      *"
 9:  MESSAGE  "*                                                          *"
10:  MESSAGE  "*                                                          *"
11:  MESSAGE  "*                                                          *"
12:  MESSAGE  "************************************************************"
13:  MESSAGE  "   "
14:  MESSAGE  "PRESS S TO BEGIN, PRESS E TO EXIT"
15:  MESSAGE  "   "
16:  GET S1
17:  SWITCH S1
18:     CASE  "S"
19:     GO TO TEST1
20:     ENDCASE
21:
22:     CASE "E"
23:     EXIT
24:     ENDCASE


25:
26:     DEFAULT
27:     GO TO START
28:     ENDCASE
29:
30:  TEST1
31:  TRANSMIT  "V            ; LOG BACKPLANE VOLTAGES
32:  WAITFOR  "*"
33: *TRANSMIT  "RT           ; LOG SYSTEM TEMPERATURE
34:  WAITFOR  "*"
35:  TRANSMIT  "RS1          ; LOAD PARAMETERS FOR DATA CAPTURE
36:  WAITFOR  "*"
37:  MESSAGE  " "
38:  TRANSMIT  "GO  A.B       ; CAPTURE BUS ACTIVITY WITH TRIGGER
39:  WAITFOR  "TRACE STOPPED"
40:  WAITFOR  "*********************"
41:  WAITFOR  "*"
42:  TRANSMIT  "PO,4000        ; UPLOAD CAPTURED BUS ACTIVITY
43:  WAITFOR   "TRACE STOPPED"
44:  WAITFOR   "**********************"
45:  WAITFOR   "*"             ; WAIT TILL DATA UPLOADING COMPLETE
46:  MESSAGE  "        ****        TEST CYCLE COMPLETE  ****"
47:  GOTO START
```

FIGURE 3.2

3.4 GETTING ACQUAINTED

This section provides a brief overview of the most commonly used features of the PCIbus Analyzer to enable the user to quickly become familiar with the general operation of the the PCI550. Subsequent chapters detail all of the analyzers functions.

3.4.1 Initialization

The first step in using the board is to perform an initialization to insure that all settings are reset to the factory default status. This is accomplished by typing "I" on the COMMAND line. (Note: a Command Line begins with a "PCI>".)

3.4.2 Capturing Bus Activity

The next step is to simply begin capturing PCIbus cycles. This is often the first step in debugging to gain insight as to what type of PCI transfers are occurring. Since the initialization reset the sampling mode to SYNCHRONOUS, with no trace qualifiers, we are now ready to proceed with data capture. SYNCHRONOUS sampling means that the backplane will be sampled on each system clock and that one sample will be stored per bus cycle, i.e. synchronous with bus activity.

To begin data capture, simply type "GO" and return. The analyzer will immediately begin to store PCIbus activity. If the display indicates that no cycles are being stored, check to insure that PCIbus activity is indeed occurring on the backplane, and the CPU is not simply performing onboard operations where the backplane is not accessed. Figure 3.3 illustrates the GO screen during data capture.

```
GO
********************* TRACE ACTIVE **********************
LEVEL   TRIGGERED   CYCLES BEFORE   CYCLES AFTER   BUFFER
                      TRIGGER         TRIGGER       FULL
---------------------------------------------------------
   1       NO          000000          000000        NO
```

FIGURE 3.3 GO SCREEN

Once the analyzer begins collecting data, it will continue to store data until the trace buffer is full. In this case, since the trigger is positioned in the middle of the trace buffer, the analyzer will fill HALF of the trace buffer only.(See the TP command to modify the trigger position setting.) If for any reason, you need to halt the data collection process, simply hit the ESC key.

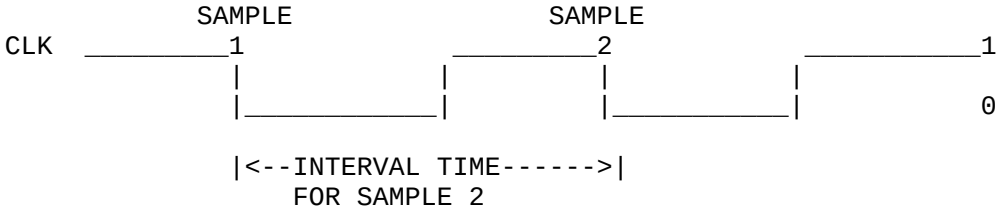
3.4.3 Viewing Bus Activity Data

Now that data has been stored in the analyzer's trace buffer, the user has a number of different options for viewing the data. First is the state display. The initialization reset the analyzer to this display mode. In the state or "SIGNAL" display all of the PCI signals are shown next to the frame or sample number. Figure 3.4 is an example of a typical signal display. In addition to the PCI signals, external signal inputs are also displayed. To view additional samples, simply type P followed by the starting sample number, a comma, and then the ending sample number. For example, to output samples 5 to 20 on the screen, simply type "P5,20" and hit enter. Another option is simply to type P or P- to scroll forward or backward one page at a time.

```
******************** TRACE STARTED AT  06:43:40   06/27/94 ********************
       CYCLES BEFORE TRIGGER = 065535       CYCLES AFTER TRIGGER = 065535
=======!<===== 64 BIT ====>!<===== 32 BIT ====>!F I T S L I D          P S!
       !              P R A!              P R G!R R R T O S S      C R E E!
 FRAME ! ADDRESS C/BE A E C! ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT
       !  DATA   7654 R Q K!  DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210
-------!------------------!------------------!-------------------------!----
-000007!3CFF7332 1110 0 1 1!000F3820 0110 0 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
-000006!3CFF7332 1110 0 1 1!000F3820 0110 0 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
-000005!3CFF7332 1110 0 1 1!000F3820 0110 0 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
-000004!3CFF7332 1110 0 1 1!00000004 0000 0 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
-000003!3CFF7332 1110 0 1 1!00000004 0000 1 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
-000002!3CFF7332 1110 0 1 1!00000004 0000 1 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
-000001!3CFF7332 1110 0 1 1!00000000 0000 1 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
+TRIG  !3CFF7332 1110 0 1 1!00000000 0000 0 1 1!0 1 1 1 1 0 1 1111 0 1 1 1!1111
+000001!3CFF7332 1110 0 1 1!00000000 1110 0 1 1!1 0 1 1 1 0 1 1111 0 1 1 1!1111
+000002!3CFF7332 1110 0 1 1!08080808 1110 0 1 1!1 0 1 1 1 0 0 1111 0 1 1 1!1111
+000003!3CFF7332 1110 0 1 1!08080808 1110 1 1 1!1 0 1 1 1 0 0 1111 0 1 1 1!1111
+000004!3CFF7332 1110 0 1 1!08080808 1110 1 1 1!1 0 1 1 1 0 0 1111 0 1 1 1!1111
+000005!3CFF7332 1110 0 1 1!08080808 1110 1 1 1!1 0 1 1 1 0 0 1111 0 1 1 1!1111
+000006!3CFF7332 1110 0 1 1!08080808 1110 1 1 1!1 0 1 1 1 0 0 1111 0 1 1 1!1111
+000007!3CFF7332 1110 0 1 1!08080808 1110 1 1 1!1 0 1 1 1 0 0 1111 0 1 1 1!1111
******************** TRACE STOPPED AT  06:43:40   06/27/94 ********************
```

FIGURE 3.4 BASIC SIGNAL DISPLAY

The next method of data display is SIGNAL/TIMING where the state information is displayed along with the interval or period time. The interval time is the time from the beginning of the prior sample to the beginning of the current sample as shown in the following figure.



To select the timing display, type "PD" and return. Then use the space bar to toggle the display options to "SIGNAL/TIMING". Figure 3.5 shows a typical signal/timing display.

The third method to display PCIbus data is via timing waveforms. This option is selected by toggling the display options under the "PD" command to "WAVEFORM".

Since it is not possible to view all the PCI signals simultaneously, it is necessary to select a subset of signals for viewing. This is accomplished via the "W" command. Type "W" and then using the ENTER or RETURN key, move the cursor to the signals of interest. To select a signal, hit the space bar. The "X" will change to "A" for active. Hit the space bar again to deactivate the signal. Up to 10 signals may be viewed simultaneously.

```
******************** TRACE STARTED AT  06:43:40   06/27/94 ********************
       CYCLES BEFORE TRIGGER = 065535       CYCLES AFTER TRIGGER = 065535
=======!<===== 64 BIT ====>!<===== 32 BIT ====>!F I T S L I D          P S!
       !              P R A!              P R G!R R R T O S S      C R E E!
 FRAME ! ADDRESS C/BE A E C! ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT
       !  DATA   7654 R Q K!  DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210
-------!------------------!------------------!--------------------------!----
+000008!3CFF7332 1110 0 1 1!08080808 1110 1 1 1!1 0 1 1 1 0 0 1111 0 1 1 1!1111
       !      000000080 NS                     !                          !
+000009!3CFF7332 1110 0 1 1!08080808 1110 1 1 1!1 0 0 1 1 0 0 1111 0 1 1 1!1111
       !      000000080 NS                     !                          !
+000010!3CFF7332 1110 0 1 1!08080808 1110 1 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
       !      000000080 NS                     !                          !
+000011!3CFF7332 1110 0 1 1!00000003 0000 1 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
       !      000000080 NS                     !                          !
+000012!3CFF7332 1110 0 1 1!00000003 0000 0 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
       !      000000080 NS                     !                          !
+000013!3CFF7332 1110 0 1 1!00000000 0000 0 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
       !      000000080 NS                     !                          !
+000014!3CFF7332 1110 0 1 1!00000000 0000 0 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
       !      000000080 NS                     !                          !
+000015!3CFF7332 1110 0 1 1!00000000 0000 0 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
       !      000000080 NS                     !                          !
******************** TRACE STOPPED AT  06:43:40   06/27/94 ********************
```

FIGURE 3.5 SIGNAL AND TIME TAG DSIPLAY

Figure 3.6 shows a typical waveform display. To page through the waveform data, simply type P or P-. (To continue to page forward or backward, simply hit the RETURN key repeatedly). After viewing the waveforms, change the display back to "SIGNAL" by toggling the options under the "PD" command.

3.4.4 Setting a Trigger

The next step is to set a trigger or reference event for data capture. This is the same as a trigger on a traditional logic analyzer. The event specifiers A,B,C, and D are used specify a trigger condition. The first step is to select the type of trigger to be used. Individual or combinations of signals may be used. Other options include address or data ranges, interrupts, or some combination of the above. In this example, an address range will be established for use as a trigger event.

The first step is to type "A" as shown in Figure 3.7. All of the available signals will then be displayed. Using the enter/return key, move the cursor to the field preceding the address field, which contains a =. Hit the space bar to change this to a >. This will establish the address as the lower end of the range of interest. Then hit return to move the cursor to the address field, and enter the lower end of the address range, and hit escape to exit this command. (Note: addresses are entered as HEX digits). Now, the upper boundary of the address range is to be entered. The event specifier "B" will be used to designate the upper boundary. Type "B" and then repeat the process used for setting up "A" except that < should be selected instead of >, and the upper address boundary is to be entered in the address field.

To actually use A and B as triggers, they are used in conjunction with the GO command. Furthermore, the A and B specifiers must be used in Logical combination. The PCI550 supports ANDing, ORing, and XORing. Type "GO A.B" and hit return. ("A.B" means A anded with B). This instructs the analyzer to begin collecting data, searching for bus activity which satisfies the condition "A.B" - i.e. the address is within the specified range. Once this address is detected, the cycle will be locked into the specified trigger position (which in this case is the middle of the trace buffer). The analyzer will then continue to store bus cycles until the buffer is full- or until the user aborts data capture via the ESC key. The trigger event is always stored as the "0" sample in the trace buffer. Samples which occurred before the trigger event, have a negative sample number. To view the trigger event, type "P0".

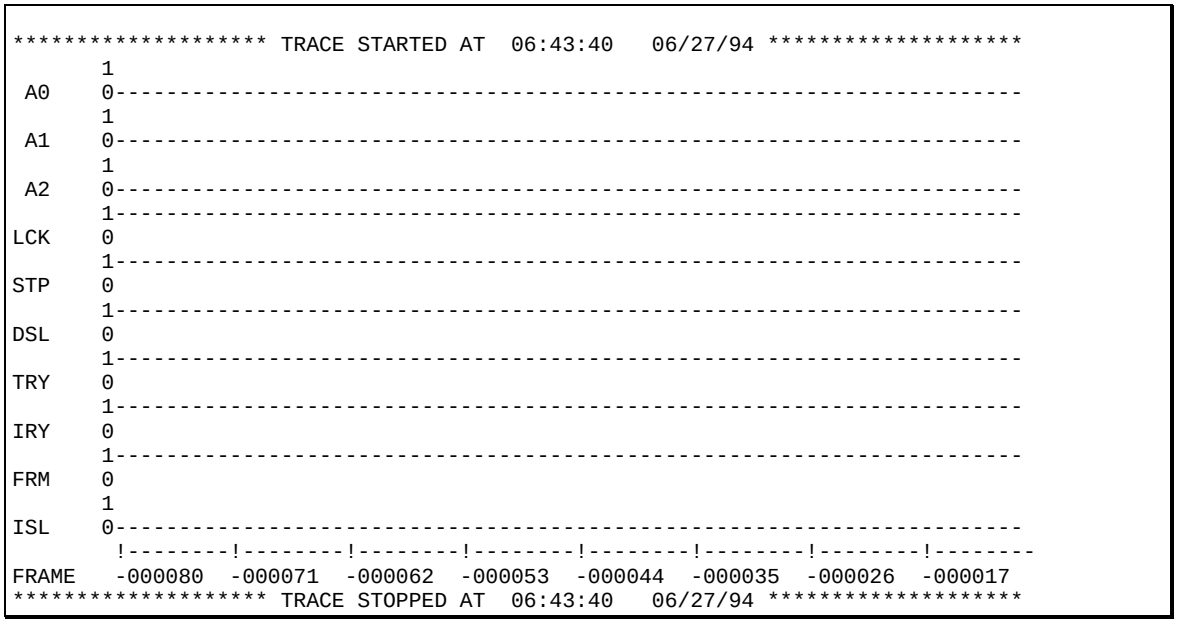


FIGURE 3.6 WAVEFORM DISPLAY

3.4.5 Trace Qualification

To qualify the trace or data captured on the PCI550, a process similar to specifying a trigger is used. In this example, we will instruct the analyzer not only to trigger on the address range specified in the previous section, but also to store only accesses to this address range. To do this, type "TO" to enter the Trace Only command. In the field containing "ALL", enter "A.B" then hit return. This instructs the analyzer to store only events which satisfy the condition "A.B" - i.e. within the address range specified.

To actually begin collecting data, type "GO A.B" as outlined in the pre-vious section. Now, "A.B" will be used as a trigger, and also used to qualify the trace.

3.4.6 Histograms

The PCI550 can capture data in real time and compute statistics of signals, combinations of signals, and of address ranges. The data can be collected synchronously or asynchronously for analysis.

Signal Histograms

The PCI550 can determine the number of samples in which signals and/or combinations of signals are true. As an example, to monitor Bus Utilization, the user might monitor the FRAME signal. To do this follow these simple steps:

1) Select 25 or 50Mhz sampling via the "S" command.
2) Type "H" and use the return/enter to move the cursor to the FRAME line. Then use the space bar to select the signal(s) as active. Then hit ESC to return to command mode.
3) Check to insure that the trace is not qualified - i.e. type "TO" and insure that ALL is present in the qualification field.
4) Type GO HS to begin analyzing what % of the bus samples(and in this case - what % of time) the bus is busy.

Address Histograms

The PCI550 can monitor accesses of up to 8 address ranges at a time. To establish the address ranges, simply type "R1", and enter the address range of interest. Repeat this process for "R2"..."R8". Next, select synchronous sampling via the "S" command. To begin monitoring accesses to the specified address ranges, simply type "GO HR" for percentages, or "GO HRC" for counts.

```
PCI MATCH SPECIFICATION A
 <===== 64 BIT ====>! <===== 32 BIT ====>!F I T S L I D          P S!
               P R A!               P R G!R R R T O S S      C R E E!
  ADDRESS C/BE A E C!  ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT
   DATA   7654 R Q K!   DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210
--------------------!--------------------!--------------------------!----
=XXXXXXXX XXXX X X X >XXXXX100 XXXX X X X 0 X X X X X X XXXX X X X X XXXX
PCI MATCH SPECIFICATION B
 <===== 64 BIT ====>! <===== 32 BIT ====>!F I T S L I D          P S!
               P R A!               P R G!R R R T O S S      C R E E!
  ADDRESS C/BE A E C!  ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT
   DATA   7654 R Q K!   DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210
--------------------!--------------------!--------------------------!----
=XXXXXXXX XXXX X X X <XXXXX200 XXXX X X X X X X X X X X XXXX X X X X XXXX
```

FIGURE 3.7 EVENT SPECIFIERS IDENTIFYING ADDRESS RANGE

3.4.7 Bus Stimulus

The PCI550 can act as a pattern generator on the PCIbus. In this mode, the user selects what signals are to be asserted, the duration of the assertion, and the time until the next assertion. The user can specify sequences and loops of signal assertions. This function is useful for generating ILLEGAL bus conditions, or for debugging prototype boards when a CPU is not present in a system, and test software is not available.

To select the signals to be asserted, type "BC1" for the first condition, "BC2" for the second, and so on up to 8. Use the enter/return key to move to the fields of interest, and use the space bar to toggle the field to either true (0) or false (1).

The signals may be chained together via the last field, which points to the next set of signals. A 0 in this field means to terminate the sequence.

To initiate the sequence, type "BA#" where the # is the first condition to be executed.

Care should be taken when utilizing the Bus Stimulus commands as the signals will be asserted regardless of what other activity is present in the system. Also - be sure to check that the Bus Protect is OFF ("BP" command) otherwise no signals will be generated on the backplane.

3.4.8 Summary

This concludes the overview of the commonly used features on the PCI550. The following chapters contain detailed information on all of the analyzer functions, including creating complex and sequential triggers, and using the command files to create diagnostic routines for repetitive or time consuming tasks.

CHAPTER FOUR - DATA CAPTURE AND DISPLAY

4.0 INTRODUCTION

The PCI550 Logic Analyzer is a powerful full function logic analyzer - which can capture PCIbus signal information at rates up to 133 Mhz with full trigger and trace qualification.

Furthermore, the PCI550 can operate in multiple modes at the same time. While the analyzer is capturing data via one of the GO commands, the user can switch to command mode (by typing M) and using Bus Stimulus modes. This permits the analyzer to both capture and transmit data simultaneously. Note: the M command puts the capture mode in the "background" - so that the user can activate other analyzer functions. However, the M command only works when capture mode has been activated. Therefore, if the user wants to perform master and data capture functions simultaneously, the capture functions should be initiated first.

This chapter covers the capture of trace data, setting triggers and trace qualifiers, and display of data.

4.1 SAMPLING MODES

The PCIbus 500 Analyzer supports two modes of data capture on the PCIbus: Synchronous sampling and Asynchronous Sampling. The Synchronous and Asynchronous modes support full trigger and trace qualification. This means the user can specify event(s) to trigger data capture, and also specify trace qualifiers to restrict what data is stored in the trace buffer.

4.1.1 Synchronous Sampling

Synchronous sampling means that the PCIbus data is sampled on each rising edge of the system clock. One sample per bus cycle is captured. Once the data is captured, it is then analyzed to determine if the trigger condition(s) and trace qualification conditions are satisfied. The first time the trigger condition is encountered, that event is latched in to the trace buffer in the specified position. If the sample meets the trace qualifier conditions, that sample is stored in the trace buffer - otherwise it is discarded.

The PCI550 supports synchronous sampling up to 50Mhz - which exceeds the PCIbus specification. Therefore, the PCI550 can handle even the fastest PCI hardware. Typical PCI systems operate at 33 Mhz.

Synchronous sampling is selected via the "S" command (except when using the levels commands where synchronous sampling is selected in the sampling field of the level setup.) Type "S" and return. Then hit the space bar to select "SYNCH" and then hit return/enter.

4.1.2 Asynchronous Sampling

Asynchronous Sampling means that the PCIbus signals are sampled in fixed time increments independent of bus activity. The PCI550 supports a range of sampling rates from .78Mhz to 50 Mhz. The following table shows the sampling rate options and associated sample times.

ASYNCHRONOUS SAMPLING SELECTIONS

Frequency	Period
133 Mhz	7.5 nanoseconds
66 Mhz	15 nanoseconds
33 Mhz	30 nanoseconds
15 Mhz	60 nanoseconds
7.5 Mhz	120 nanoseconds
3.75 Mhz	240 nanoseconds
1.875 Mhz	480 nanoseconds

With PCIbus systems typically operating in the range of 33 / 66 Mhz, the PCI550's 133 Mhz sampling capability provides the user with the tools to capture detailed bus timing - sampling approximately 2 times the system's bandwidth - an important parameter.

Asynchronous sampling is selected via the "S" command (except when using the levels commands where asynchronous sampling is selected in the sampling field.) Type "S" and return. Then hit the space bar to select the desired sampling frequency and then hit return/enter.

Once the analyzer has sampled the bus signals, the data is then analyzed to determine if it meets the trigger conditions, and also to determine if it satisfies the trace qualification conditions and should therefore be stored in the trace buffer.

4.2 EVENT SPECIFIERS

To specify trigger and trace qualifiers, the PCI550 uses 4 event specifiers (A,B,C, and D). Each event specifier displays all of the PCIbus signals plus the 4 external inputs. Shown in Figure 4.2 is the display for event specifier "A". To select signals, the user types the event specifier, either "A", "B", "C" or "D" and return/enter. Then the enter/return key is used to position the cursor under the fields of interest. In the case of the address, data, and address modifier fields, the user enters the HEX digits in the field. (Note: if the user wants to trigger on a specific address modifier, address, or data BIT, select "BINARY" mode via the "CF" command. The analyzer will then "EXPLODE" these fields for the user to specify bits of interest rather than the nibbles.)

```
PCI MATCH SPECIFICATION A
 <===== 64 BIT ====>! <===== 32 BIT ====>!F I T S L I D          P S!
              P R A!               P R G!R R R T O S S      C R E E!
  ADDRESS C/BE A E C!  ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT
   DATA   7654 R Q K!   DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210
--------------------!--------------------!--------------------------!----
=XXXXXXXX XXXX X X X >XXXXX100 XXXX X X X 0 X X X X X X XXXX X X X X XXXX
PCI MATCH SPECIFICATION B
 <===== 64 BIT ====>! <===== 32 BIT ====>!F I T S L I D          P S!
              P R A!               P R G!R R R T O S S      C R E E!
  ADDRESS C/BE A E C!  ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT
   DATA   7654 R Q K!   DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210
--------------------!--------------------!--------------------------!----
=XXXXXXXX XXXX X X X <XXXXX200 XXXX X X X X X X X X X XXXX X X X X XXXX
```

FIGURE 4.2 EVENT SPECIFIERS DEFINING ADDRESS RANGE

The address and data fields are preceded by the qualifying symbols - <,>, and +. This enables the user to specify ranges of interest. For all of the other fields, the user toggles the status of the signals via the SPACE

bar. The signals may be selected as 0,1, or X. The 0 is considered "TRUE" as PCI is a ground true system. The "X" symbol means DON'T CARE.

To exit from the event specifier field, hit the ESC key.

To move to the previous field in the event specifier screen, input "<". To quickly through the fields, hold the ">" key to repeat. Another option is holding the enter/return key - if the terminal in use has a repeat function.

The event specifier fields can be used alone or in logical combination when specifying a trigger or trace qualifier. They can be AND'd, OR'd, or XOR'd. The following table shows the logical operators and their definitions.

OPERATOR	DEFINITION
.	AND
+	OR
X	XOR
~	NOT

Figure 4.2 illustrates how two events would be defined and used in logical combination to define an address range.

4.3. DATA CAPTURE MODES

There are two different modes of trigger specification on the PCI550. The first is to trigger on the nth occurrence of an event which satisfies the trigger condition. The second mode uses the "Level" commands and enables the use to trigger on a sequence of events. Both modes of trigger specification work with either synchronous or asynchronous sampling. In fact using the level commands, the user can switch sampling modes at different levels - giving the user the opportunity to look for an event asynchronously at one level, then switch to synchronous mode at the next level.

4.4 CAPTURING DATA ON THE NTH OCCURRENCE OF AN EVENT

In this mode, the analyzer samples the bus and compares each sample stored to the trigger condition to determine if it satisfies the condition. If yes, then the analyzer is triggered. In addition, the sample is compared to the trace qualifier to determine if it should be stored in the trace buffer.

The following sections describe how to setup a trigger, qualify the trace, specify the Nth occurrence of an event, select a sampling mode , set the trigger position, and how to actually begin the data capture sequence.

4.4.1 Specifying the Nth Occurrence of an Event as a Trigger

To specify a trigger, the event specifiers (A,B,C, and/or D) -as described in Section 4.2 - are used. The event specifiers are entered either individually or in logical combination into the field following the GO command.

The event specifiers provide the user with the ability to specify a wide range of PCIbus events as triggers including address or data ranges, interrupts, Bus Control commands, etc. In addition the 4 external inputs can be selected as trigger conditions. The following table provides examples of the GO command with different triggers.

Command	Event Specifier	Trigger Description
GO A.B	A SET TO ADDR> 80000 B SET TO ADDR< 90000	TRIGGER ON ADDRESS BETWEEN 80000 AND 90000
GO A	A HAS EXTERNAL INPUT #1 SET TO "0" OR TRUE	TRIGGER ON EXTERNAL INPUT LINE "TRUE"
GO A.B+C	A SET TO ADDR>80000 B SET TO ADDR<90000 C SET TO DATA=A9A9A9	TRIGGER ON ADDR BETWEEN 80000 AND 90000 OR THE OCCURRENCE OF DATA PATTERN A9A9A9

To specify that the analyzer trigger on the Nth occurrence of the event specified as a trigger, the "O" command is used. Type "O" and enter/return. Then enter the occurrence you wish to trigger on . For instance to trigger on the 10th occurrence of an event, enter 10 in the field and hit return to exit the command.

The range of values for occurrence counting is 1 to 65,535. The values are entered in decimal - not hexadecimal.

The other parameters which are used for data capture in this mode are the sampling mode, the trigger position, and the trace qualifier fields.

4.4.2 Qualifying the Trace

The user can specify what data is to be stored in the trace buffer via the "TO" or Trace Only command. This field is specified in exactly the same manner as a trigger is specified - via the event specifiers. The options are "ALL" or the user can enter event specifiers individually or in logical combination. "ALL" means to store all samples captured. To qualify or restrict the data sampled, the user enters event specifiers. Following are several examples of trace qualifiers and how they might be used.

1) Set up event specifier "A" so that the "FRAME" signal is "0" or true. Then enter "A" in the "TO" field and type return. Using this trace qualifier when the analyzer is sampling the PCIbus asynchronously would insure that data is stored only during valid bus transactions - and not in between bus transactions.

2) Set up event specifiers A and B to define an address range. Then enter "A.B" in the "TO" field. Usingthis qualifier when capturing data synchronously would mean that only data in the address range of interest would be stored.

4.4.3 Setting the Trigger Position

Data may be stored before and/or after the occurrence of the trigger event. This is specified via the "TP" command. The options are START, 1/4, 1/2, 3/4, and END. START means that the trigger would be positioned at the beginning of the trace buffer, and data would only be stored after the trigger. The 1/4, 1/2, and 3/4 selections would enable the user to store data before and after the trigger, just in varying proportions. The END option means that data would be stored only BEFORE the trigger- i.e. data capture would halt when the trigger occurred.

To select an option, hit the space bar to toggle through the choices. Then hit return/enter to exit the command.

4.4.4 Sampling Mode

The user must also select the sampling mode prior to capturing data. This is done via the "S" command as described in Section 4.1.

4.4.5 Initiating the Data Capture

The GO commands are used for all data capture sequences. As shown in the examples in Section 4.4.1, the GO command is to be followed by the trigger event.

Once data capture has been initiated, the analyzer will begin capturing data, and checking to see if the data meets the trigger conditions. If it does, the display will show "YES" in the trigger field. Figure 4.3 shows the screen during data capture. The data is also compared to the trace qualifier to determine if it should be stored in the trace buffer.

```
GO

******************** TRACE ACTIVE **********************
LEVEL   TRIGGERED   CYCLES BEFORE   CYCLES AFTER   BUFFER
                      TRIGGER         TRIGGER       FULL
---------------------------------------------------------
   1       NO          000000          000000         NO
```

FIGURE 4.3 GO SCREEN

After the trigger is encountered, the trigger event is latched at the appropriate location in the trace buffer, and data continues to be captured until the end of the trace buffer is reached. Note, that if the TP is set to END, the analyzer will halt data collection when the trigger occurs - and only data which occurred prior to the trigger will be stored.

The number of cycles stored before and after the trigger are noted on the display.

The analyzer will halt data capture when the trigger has been encountered, and latched into position, and the remainder of the trace buffer filled.

To halt data capture at any time, hit "ESC".

4.5 CAPTURING DATA VIA THE LEVEL COMMANDS

4.5.1 Setting Up the Level Commands

The Level commands on the PCI550 provide the user with the ability to create a sequence of events to use as a trigger, or to create a loop - where only certain information is stored. The Level commands are "IF" statements - and it is often useful to create a flow chart first, noting the following information at each "IF" condition:

1) What event(s) are you looking for and what occurrence (nth) of that event
2) What mode of data capture is to be used (synch or asynch)
3) What data is to be stored while executing on this level (i.e. what data if any is to be stored in the trace buffer while waiting for the event(s) of interest)
4) Do you want to trigger when the event occurs

There are 8 levels on the PCI550, which are setup via the L# (#=1-8) commands. Figure 4.4 illustrates the Level setup screens for a typical application - a sequential trigger. Figure 4.5 is a flowchart which illustrates the sequence of events which the Level setup in Figure 4.4 implements.

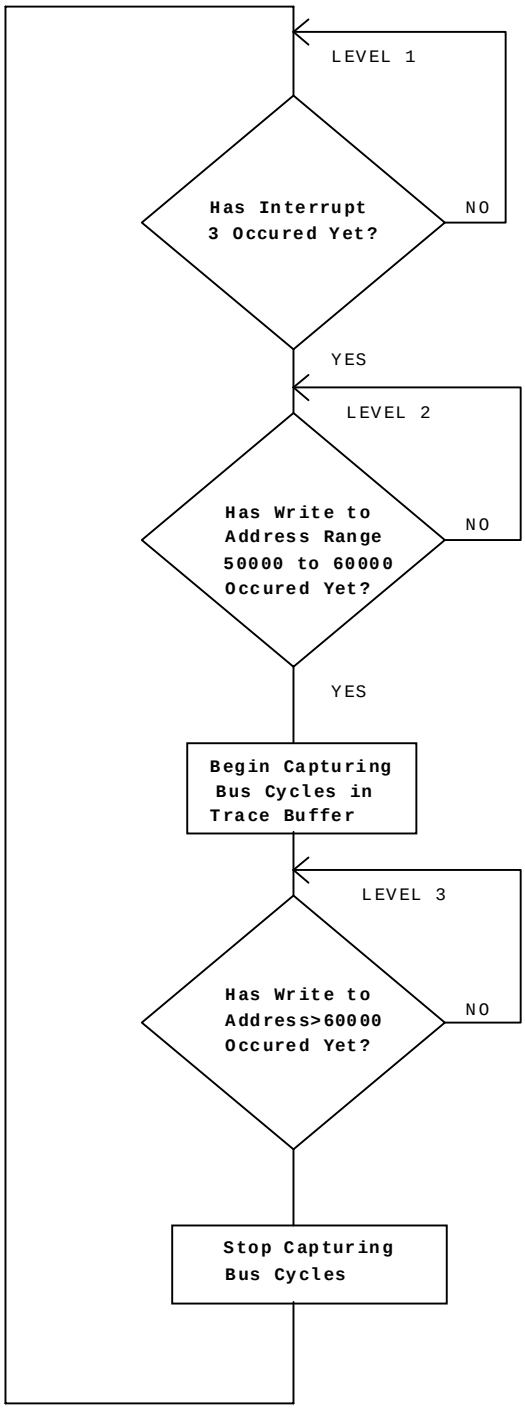
```
*************************** PCI MATCH CONDITIONS ****************************
  <===== 64 BIT ====>! <===== 32 BIT ====>!F I T S L I D          P S!
              P R A!               P R G!R R R T O S S      C R E E!
   ADDRESS C/BE A E C!  ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT
    DATA   7654 R Q K!   DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210
--------------------!-------------------!-------------------------!----
A=XXXXXXXX XXXX X X X =XXXXXXXX XXXX X X X 0 X X X X X X XXXX X X X X XXXX
B=XXXXXXXX XXXX X X X =XXXXXXXX XXXX X X X X X X X X X X XXXX X X X X XXXX
C=XXXXXXXX XXXX X X X =XXXXXXXX XXXX X X X X X X X X X X XXXX X X X X XXXX
D=XXXXXXXX XXXX X X X =XXXXXXXX XXXX X X X X X X X X X X XXXX X X X X XXXX

***************************** PROGRAM LEVELS ******************************
LEVEL   IF EVENT   OCCURS   THEN - TRIG?    ELSE - TRIG?    TRACE        CLOCK
-------------------------------------------------------------------------------
  1      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  2      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  3      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  4      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  5      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  6      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  7      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  8      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
PRESS ANY KEY FOR MORE SETUP INFORMATION (ESC TO EXIT)
```

FIGURE 4.4 TYPICAL LEVEL SETUP

The first step in setting up the level commands is to enter an L# command followed by return. Next, the user specifies the event(s) of interest. This is done via the event specifiers - exactly as described in the prior section for the GO command. The user can enter event specifiers individually or in Logical Combination. After entering the event of interest, hit the return key to move to the "Occurrence" counting field. The range of values is 1-65535. Note - when the Level commands are executed, the value in this field is used - not the value entered via the "O" command. The third field if the "THEN" field, where the user decides what action to take when the event of interest occurs. The choices are to jumps to different levels. To toggle through the options, simply hit the space bar. The user can remain at the same level, or jump to a different level.

The fourth field queries the user whether or not to trigger when the event of interest occurs. The user may trigger on any event in a sequence. For instance, the user may opt to trigger on a write to an address range which occurs after an interrupt. Then at Level 1 the user would look for an interrupt. When the interrupt occurs, the user would NOT trigger, but would jump to level 2 to wait for the occurrence of the write to an address range. When the write to the address range occurs, then the user would trigger. On Level 2, this field would be YES, but on Level 1 would be NO. The field is toggled via the space bar.


LEVEL 1
Has Interrupt 3 Occured Yet?
NO
YES
LEVEL 2
Has Write to Address Range 50000 to 60000 Occured Yet?
NO
YES
Begin Capturing Bus Cycles in Trace Buffer
LEVEL 3
Has Write to Address>60000 Occured Yet?
NO
Stop Capturing Bus Cycles

The fifth field is the "ELSE" field, which queries the user how to proceed if the event just captured is not the event of interest. This enables the user to jump to a different level when a bus event does not meet the requirements set in the "IF EVENT". The options are jumps to other levels, and the user can toggle through the choices via the space bar.

Sixth, is the TRACE field. This field determines what data is stored in the trace buffer when the analyzer is executing at this Level. The options include ALL, NONE, or qualifying the trace via the event specifiers. ALL means to store all samples unconditionally. NONE means to store NO data at this level. This option is very useful for insuring that the analyzer only store data at a particular spot in the sequence.

Qualifying the trace is done exactly like specifying a trigger - where event specifiers are used either individually or in logical combination. NOTE: when Levels are used for data capture, this field determines whether data is to be stored, not the "TO" command field. The reason for this is that the TRACE qualification field can be changed at every level.

The last field in the Level command is the CLOCK field, where the user specifies the sampling mode. This field has options similar to the "S" command, except that the maximum asynchronous sampling rate is 50 Mhz. To toggle through the CLOCK options, hit the space bar. Note, the sampling mode may be different at every level - giving the user the opportunity to look for an event asynchronously at one level, then switch to synchronous mode at the next level. NOTE: when Levels are used for data capture, this field determines how data is to be sampled, not the "S" command field. The reason for this is that the CLOCK or sampling mode field can be changed at every level.

When setting up the Level commands, the user can utilize the following keys to move through the fields:

Key	Description
>	Go to the next field
Enter/Return	Go to the next field
ESC	Exit command
<	Go back to previous field

4.5.2 Setting the Trigger Position

There is only one trigger even though events which satisfy the trigger condition may occur any number of times. The analyzer can be triggered only once. Once the trigger event occurs, the analyzer latches this event at the specified position in the trace buffer. The "TP" command is used to specify this position for both the "GO with trigger" commands and the "GO with Level" commands. The choices are START, 1/4, 1/2, 3/4, and END. To toggle through the options, use the space bar.

START means that the trigger would be positioned at the beginning of the trace buffer, and data would only be stored after the trigger. The 1/4, 1/2, and 3/4 selections would enable the user to store data before and after the trigger, just in varying proportions. The END option means that data would be stored BEFORE the trigger only - i.e. data capture would halt when the trigger occurred.

4.5.3 Capturing Data with the Level Commands

To initiate data capture with the level commands, use the GO L# command where the # is either 1,2,3 or 4. As the analyzer is capturing data the current level will be displayed. The analyzer will capture data until the trigger has been detected and the trace buffer subsequently filled.

The execution of the Level commands can be halted at any time during the data capture process by hitting ESC.

4.6 CAPTURING DATA WITH NO TRIGGER

The PCI550 supports two modes of data capture where no trigger specification is required: GO and GO F.

4.6.1 GO Mode

The GO command enables the user to begin capturing data without looking for a specific trigger event. The analyzer uses the first data captured as the trigger event and latches this into position in the trace buffer in the position specified via the "TP" command. This mode is particularly useful at the beginning of a debug session to get an overview of the type of bus activity present in the system, the type of transactions occurring, etc. The "TO" command fields apply to this mode - and so only data which is satisfies the trace qualifier conditions would be stored in the trace buffer. Typically the "TO" field is set to ALL for initial debugging so that all data would be stored. However, to qualify or restrict the data sampled, the user enters event specifiers.

The user must also specify the mode of data capture when using the GO command. This is done via the "S" command as described in Section 4.1. To simply begin capturing bus cycles, select SYNCH mode.

To initiate data capture, simply type "GO" and return. The analyzer will sample the data- latching the first sample in the specified position in the trace buffer - and continue storing data which satisfies the trace qualifier conditions in the buffer until the buffer is full.

To halt the data capture at any time, simply hit ESC.

4.6.2 GO F - Go Forever Mode

GO F or Go Forever Mode was added specifically to facilitate data capture until a system halted or crashed, and then review the data prior to the crash. When using this command, the SYNCH sampling mode is typically selected with no trace qualifier (i.e. ALL in the "TO" field). This means that the analyzer will sample the bus only when bus transactions are occurring. Therefore, when the crash occurs, no additional data will be stored.

To initiate the data capture, type "GO F" and return. Then when the system has halted, hit enter or ESC to stop the data capture mode. The analyzer's trace buffer will contain the most recent bus transactions prior to the system halting.

4.7 DATA DISPLAY

The PCI550 Analyzer supports a number of different modes of displaying, printing, and/or uploading data once it is captured in the trace buffer. The PCIbus data may be displayed on the terminal screen in any of three formats: Signal or state display, Signal plus Timing display, or Waveform Display. The display mode is selected via the "PD" commands. Use the space bar to toggle through the options.

Data is displayed by frame or sample # - with the trigger as the "0" frame number. Samples captured before the occurrence of the trigger have a negative frame number.

To print or scroll through the collected data in any of the formats described in the following sections, the "P" commands are used. Following is a list of the "P" commands and their use.

COMMAND	DESCRIPTION
P	DISPLAY THE NEXT PAGE OF DATA
P-	DISPLAY THE PREVIOUS PAGE OF DATA
P#	DISPLAY THE PAGE BEGINNING WITH FRAME #
P START#,END#	DISPLAY DATA FROM FRAME START# TO END# (EX. P1,1000 TO DISPLAY DATA FROM FRAME 1 TO 1000); DATA WILL SCROLL ON SCREEN, MAY ALSO BE USED FOR PRINTER OR DATA UPLOADING

NOTE: AFTER TYPING P or P-, THE USER SIMPLY HITS RETURN TO SCROLL THROUGH SUBSEQUENT PAGES.

4.7.1 Searching through Data

The user can automatically search through the PCI trace buffer data (not the high speed data which is in a separate trace buffer) for specific information or sequences of information. The first step is to establish the search information via the "PM#" commands. Figure 4.6 shows the setup of several of the match conditions. The user simply selects the signals to search for by moving the cursor to the signal or field, and either entering the data or using the space bar to select the signal as active. The last field is the "NEXT" field which enables the user to link together match conditions, so that the analyzer will search for a sequence of conditions. The example shown in Figure 4.6 shows 2 match conditions being used together in a sequence. Note that the NEXT field in the second condition is "0" which indicates the end of the search sequence.

```
TRACE BUFFER MATCH SPECIFICATION 1
 <===== 64 BIT ====>! <===== 32 BIT ====>!F I T S L I D          P S!    !NXT
              P R A!               P R G!R R R T O S S      C R E E!    !
  ADDRESS C/BE A E C!  ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT!
   DATA   7654 R Q K!   DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210!
--------------------!--------------------!-------------------------!----!---
=XXXXXXXX XXXX X X X =XXXXXXXX XXXX X X X X X X X X X XXXX X X X X XXXX  0
```

FIGURE 4.6 CHAINED SEARCH SETUP

Before initiating the search, reset the "current frame" pointer to the frame where the search is to begin. This is accomplished by typing "P#" where the # is the frame number where the search is to begin. The analyzer searches forward from the current frame. For instance, typing "P0" would set the pointer at the trigger point.

To initiate the search, type "PS#" where the # is the match condition to be searched for. Once the analyzer has found the first occurrence of the condition, simply type "PS#" again to search for the next occurrence.

4.7.2 Signal Display

The "SIGNAL" display option under the "PD" command provides the user with a complete state display of PCIbus signals plus the 4 external inputs. Figure 4.7 illustrates the signal display. To move through the display use the P commands as described in section 4.8.1.

4.7.3 Signal/Timing Display

The "SIGNAL/TIMING" display provides the user with not only the state information but also the period timing information. The period is defined to be the time from the beginning of the prior cycle to the beginning of the current cycle. Figure 4.8 is an example of the "SIGNAL/TIMING" display. Note the time displayed below the state information. In the case of Synchronous data capture, this time would be the time from the Clock of the prior sample to the Clock of the current sample. This is true even if the trace is qualified - as the period is always the time between consecutive samples in the trace buffer. In the case of asynchronous sampling, the period is typically the same as the sample rate (unless the trace is qualified).

The resolution of the time period measurement is dependent on the length of the period. When qualifying the trace data, remember that this typically lengthens the time between sequentially stored samples - thus lengthening the periods. Therefore, to maintain the highest resolution on the timing measurement, keep the time between individual samples to a minimum, and use the "PE" command to compute the time between two samples in the buffer which are not sequential. The "PE" command will sum the individual periods. Therefore, if the accuracy of the individual periods is high, the elapsed time accuracy will also be high. The following table shows the resolution versus the range of time intervals.

INTERVAL RANGE	RESOLUTION
0 TO 20 MSEC	20 NANOSECONDS
20 MSEC TO 20 SEC	20 MICROSECONDS
20 SEC TO 519 MIN.	20 MILLISECONDS

Note: the time intervals are defined to be the times between consecutive samples stored in the trace buffer. These intervals are added in computing the elapsed time between samples are described in the following paragraph.

The "PE" command or "PRINT ELAPSED" time is used to compute the time between any two frame numbers. The format for the command is "PE #,#". The #'s are the frame numbers for the interval to be measured. This is called the "ELAPSED" time.

```
******************** TRACE STARTED AT  06:43:40   06/27/94 ********************
       CYCLES BEFORE TRIGGER = 065535       CYCLES AFTER TRIGGER = 065535
=======!<===== 64 BIT ====>!<===== 32 BIT ====>!F I T S L I D          P S!
       !              P R A!              P R G!R R R T O S S      C R E E!
 FRAME ! ADDRESS C/BE A E C! ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT
       !  DATA   7654 R Q K!  DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210
-------!------------------!------------------!-------------------------!----
-000007!3CFF7332 1110 0 1 1!000F3820 0110 0 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
-000006!3CFF7332 1110 0 1 1!000F3820 0110 0 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
-000005!3CFF7332 1110 0 1 1!000F3820 0110 0 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
-000004!3CFF7332 1110 0 1 1!00000004 0000 0 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
-000003!3CFF7332 1110 0 1 1!00000004 0000 1 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
-000002!3CFF7332 1110 0 1 1!00000004 0000 1 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
-000001!3CFF7332 1110 0 1 1!00000000 0000 1 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
+TRIG  !3CFF7332 1110 0 1 1!00000000 0000 0 1 1!0 1 1 1 1 0 1 1111 0 1 1 1!1111
+000001!3CFF7332 1110 0 1 1!00000000 1110 0 1 1!1 0 1 1 1 0 1 1111 0 1 1 1!1111
+000002!3CFF7332 1110 0 1 1!08080808 1110 0 1 1!1 0 1 1 1 0 0 1111 0 1 1 1!1111
+000003!3CFF7332 1110 0 1 1!08080808 1110 1 1 1!1 0 1 1 1 0 0 1111 0 1 1 1!1111
+000004!3CFF7332 1110 0 1 1!08080808 1110 1 1 1!1 0 1 1 1 0 0 1111 0 1 1 1!1111
+000005!3CFF7332 1110 0 1 1!08080808 1110 1 1 1!1 0 1 1 1 0 0 1111 0 1 1 1!1111
+000006!3CFF7332 1110 0 1 1!08080808 1110 1 1 1!1 0 1 1 1 0 0 1111 0 1 1 1!1111
+000007!3CFF7332 1110 0 1 1!08080808 1110 1 1 1!1 0 1 1 1 0 0 1111 0 1 1 1!1111
******************** TRACE STOPPED AT  06:43:40   06/27/94 ********************
```

FIGURE 4.7 BASIC TRACE / SIGNAL DISPLAY

4.7.4 Waveform Display

The third display option for the signal data is "WAVEFORMS". The first step in using the waveform display is to select the signals for viewing. Up to 10 signals may be viewed simultaneously. To select the signals of interest, type "W" and move the cursor to the signals of interest via the return/enter key, and then hit the space bar to select the signal (change the "X" to and "A" for active). After selecting the signals, hit ESC to exit the "W" command.

To print the waveform display, use the "P" commands as described at the beginning of section 4.8. Figure 4.9 illustrates a typical timing waveform.

```
******************** TRACE STARTED AT  06:43:40   06/27/94 ********************
       CYCLES BEFORE TRIGGER = 065535       CYCLES AFTER TRIGGER = 065535
=======!<===== 64 BIT ====>!<===== 32 BIT ====>!F I T S L I D          P S!
       !              P R A!              P R G!R R R T O S S      C R E E!
 FRAME ! ADDRESS C/BE A E C! ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT
       !  DATA   7654 R Q K!  DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210
-------!------------------!------------------!-------------------------!----
+000008!3CFF7332 1110 0 1 1!08080808 1110 1 1 1!1 0 1 1 1 0 0 1111 0 1 1 1!1111
       !      000000080 NS                     !                           !
+000009!3CFF7332 1110 0 1 1!08080808 1110 1 1 1!1 0 0 1 1 0 0 1111 0 1 1 1!1111
       !      000000080 NS                     !                           !
+000010!3CFF7332 1110 0 1 1!08080808 1110 1 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
       !      000000080 NS                     !                           !
+000011!3CFF7332 1110 0 1 1!00000003 0000 1 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
       !      000000080 NS                     !                           !
+000012!3CFF7332 1110 0 1 1!00000003 0000 0 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
       !      000000080 NS                     !                           !
+000013!3CFF7332 1110 0 1 1!00000000 0000 0 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
       !      000000080 NS                     !                           !
+000014!3CFF7332 1110 0 1 1!00000000 0000 0 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
       !      000000080 NS                     !                           !
+000015!3CFF7332 1110 0 1 1!00000000 0000 0 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
       !      000000080 NS                     !                           !
******************** TRACE STOPPED AT  06:43:40   06/27/94 ********************
```

FIGURE 4.8 SIGNAL / TIMING DISPLAY

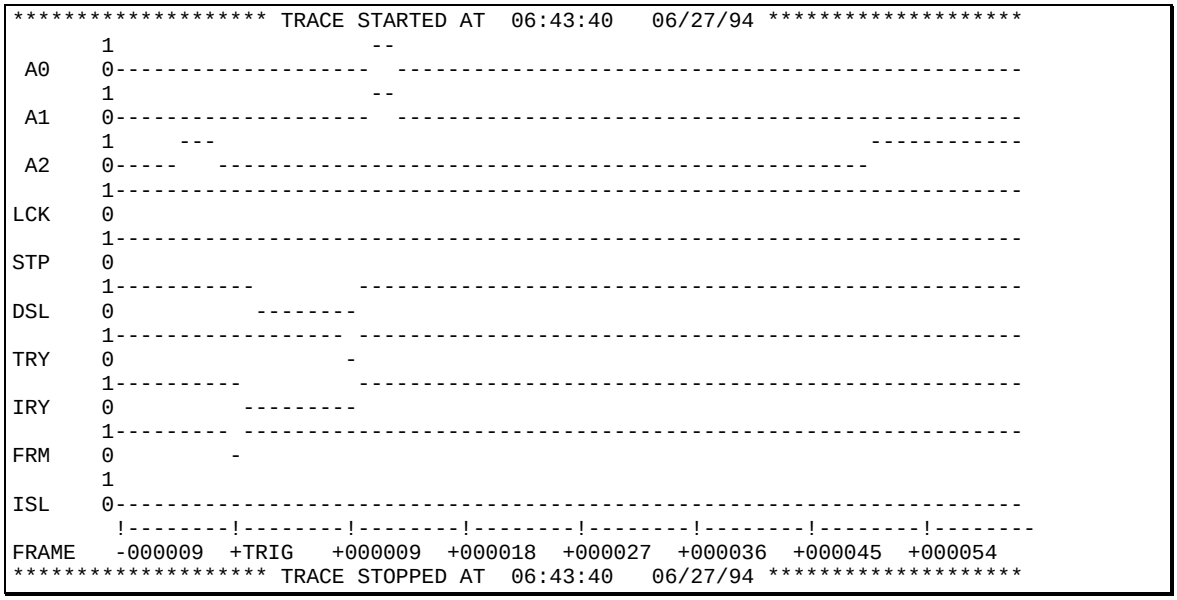


FIGURE 4.9 WAVEFORM DISPLAY

4.8 UPLOADING DATA TO HOST

4.8.1 Uploading to a Host

The user has a number of options as far as uploading data to a host. The data can be uploaded in ASCII format or it can be uploaded in binary format also called "RAW" mode. ASCII mode (the normal analyzer output mode) would be useful for storing data to a file which the user wanted to view subsequently. For example, if the user was communicating with the analyzer using a terminal emulator program on a PC such as PROCOMM, then the user could simply open a log file (ALT F5 when using PROCOMM) and type P#,# to upload data from the analyzer to a file on the PC. To close the log file, just type ALT F5 again. Appendix A contains a tech note on using the analyzer with a terminal emulator of data via the P#,# or HSP#,# commands. In echo mode, the second port echoes package such as PROCOMM. Once the data was stored to file, the user could simply review the file off line on the PC - or output it to printer.

The second mode of uploading data is in BINARY format. This mode is enabled via the "RAW" option under the "PD" command. After selecting "RAW" mode, the data can be uploaded via the "P#,#" or "HSP#,#" command where #,# are beginning and ending frame numbers. The key advantage to using BINARY data format is that it is compressed. Each frame entry is only 128 bits, where as a typical ASCII line is 80 x 4 or 320 bits and requires at least two lines to display state and timing information. Another advantage of RAW mode is that only the frame data is output and not the formatting characters/lines which are typically displayed on the screen.

4.9 MODE SWITCHING

The PCI550 can function in multiple modes at the same time. If the user wants to perform another operation while the analyzer is capturing data, the M mode switch can be used to jump to the command mode (denoted by the PCI> prompt). To switch from capture mode to command mode, simply type M. When the user switches out of data capture mode, the analyzer is still performing data capture in the background, just not outputting status information to the user. Once back in command mode, the user can perform any of the NON-DATA CAPTURE or DISPLAY commands.

To return to the DATA CAPTURE screen, simply type M.

Note, in order to capture data simultaneously with Bus Stimulus functions, the user must first initiate the capture activity - and then switch to command mode. The M command will only work when capture mode has been activated.

This is an important feature as it enables the user to perform any of the stimulus functions while the analyzer is capturing data. In fact the user can initiate data capture, then go to command mode and execute a command file which will repetitively perform bus stimulus functions. The user can then trace the information which it is outputting on the bus.

CHAPTER FIVE - HISTOGRAMS

5.0 HISTOGRAMS

The PCI550 System Analyzer features real time histogram capability for signals, combinations of signals, and for address ranges. The analyzer captures bus data in the mode specified by the user, and then updates the statistical data either in counts or in percentages - until the user halts the data collection process.

The histograms can be used for a wide variety of tasks including Bus Utilization, monitoring equipment usage, analyzing the frequency which software routines are executed and much more.

There are two basic types of histograms: SIGNALS and ADDRESS RANGES. Both types of histograms can be measured either in terms of counts or in terms of percentages. Data for the histograms may be collected synchronously or asynchronously at a user specified rate up to 50 Mhz.

5.1 SIGNAL HISTOGRAMS

The PCI550 provides the user with the ability to monitor up to 8 signals or combinations of signals. The user may select any of the 96 backplane signals, 4 external input signals, or the 4 event specifiers to monitor. The 4 event specifiers (A,B,C,or D) enable the user to specify a state or event on the bus to monitor. This may be any combination of signals on the bus. For example, the user may want to know how often a particular data pattern is occurring on the bus. This could be accomplished by selecting Synchronous analysis, specifying A as an event to be monitored, and then specifying the data bit pattern of interest for the event specifier A.

5.1.1 Specifying the Signals of Interest

To specify the signals and/or combination of signals to be monitored, type "H" and return. The analyzer will prompt the user with a full screen selection of the PCI550 backplane signals, the 4 external inputs, and the 4 event specifiers (A,B,C, and D). The user hits the enter/return key to move to the signals of interest, and then hits the space bar to ACTIVATE that signal. (An "A" will replace the "X" when the signal is selected. To deactivate a signal, simply hit the space bar again to toggle the setting back to "X" or off). The user may also select A,B,C, or D - the event specifiers. If one or more of these is selected, the user must then proceed to specify the signals in each of the selected specifiers. Figure 5.1 shows the signal selection screen which is generated by typing "H". Note that a number of signals have been selected - these are denoted by the "A" for active - directly below the signal name. The event specifier "A" has also been selected. Figure 5.2 shows the signals which define the "A" condition which will monitored. In the example shown, a data pattern "XXXXXXAB" was entered. The "X"'s in the most significant nibbles indicate "DON'T CARE" for those bits. The analyzer will monitor the bus for an "AB" in the least significant nibbles.

```
SELECT HISTOGRAM SIGNALS

 <=========== 64 BIT ===========>! <=========== 32 BIT ===========>
 AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA! AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
 DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD! DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD
 6666555555555444444444333333333! 33222222222211111111110000000000
 32109876543210987654321098765432! 10987654321098765432109876543210
 ---------------------------------!---------------------------------
 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

 <= 64 BIT => ! <= 32 BIT => !F I T S L I D          P S!    !
       P R A !        P R G !R R R T O S S      C R E E!    !  MATCH
   C/BE A E C !   C/BE A E N !M D D O C E E INTR L S R R! EXT!CONDITION
   7654 R Q K !   3210 R Q T !E Y Y P K L L DCBA K T R R!3210! A B C D
--------------!--------------!-------------------------!----!---------
   XXXX X X X     XXXX X X X  X X X X X X X XXXX X X X X XXXX  X X X X
```

FIGURE 5.1

```
PCI MATCH SPECIFICATION A
 <===== 64 BIT ====>! <===== 32 BIT ====>!F I T S L I D          P S!
              P R A!               P R G!R R R T O S S      C R E E!
  ADDRESS C/BE A E C!  ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT
   DATA   7654 R Q K!   DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210
--------------------!--------------------!-------------------------!----
=XXXXXXXX XXXX X X X =XXXXXXXX XXXX X X X X X X X X X XXXX X X X X XXXX
```

FIGURE 5.2

5.1.2 Sampling Mode

The PCI550 Analyzer can capture data for statistical analysis either synchronously or asynchronously. There are different applications for both methods.

Synchronous

In this mode, the bus is sampled once per bus transfer or bus cycle. To select Synchronous sampling, type "S" and return. Then hit the space bar to toggle through the selections until SYNCH appears. Then hit the return or ESC keys. For examples such as the one described in the previous section where the user wants to monitor the frequency of particular data pattern, synchronous sampling would be appropriate. The user wants to monitor the number of times a data pattern occurs as a percentage of the total number of bus cycles - therefore synchronous sampling is selected so that only one sample per bus cycle will be captured.

Note: the user may also qualify the trace when capturing data synchronously for histograms. This means that the user can screen out information - collecting statistical information only on samples of interest. To check as to whether the trace is qualified, type "TO" and return. If "ALL" appears in the field, then all data will be considered. If there are event specifiers alone or in combination, then they will determine which samples are to be considered. For example, if "C" appears in the field, and "C" has address of "3D" then only samples with this address will be considered in the statistical computations.

Asynchronous

The signals may also be monitored in asynchronous mode - sampled at rates from .78Mhz to 50 Mhz. To specify an asynchronous sampling mode, type "S" and return. Then use the space bar to toggle through the options. The user may specify sampling rates from .78Mhz up to 50 Mhz. The analyzer will then sample the bus, update the statistics, and repeat.

Note: the user may also qualify the trace when capturing data asynchronously for histograms. This means that the user can screen out information - collecting statistical information only on samples of

interest. To check as to whether the trace is qualified, type "TO" and return. If "ALL" appears in the field, then all data will be considered. If there are event specifiers alone or in combination, then they will determine which samples are to be considered. For example, if "C" appears in the field, and "C" has address of "3D" then only samples with this address will be considered in the statistical computations.

Asynchronous sampling of signals is very useful for applications such as monitoring overall bus utilization, or for monitoring the occurrences of asynchronous events. Bus Utilization can be monitored via a number of different signals, including FRAME.

Asynchronous sampling is also handy for monitoring the number of occurrences of asynchronous signals. For example, if the user has opted to monitor one or more of the external inputs, asynchronous sampling would enable the user to determine what percentage of time the input(s) were true/false. The inputs can be used to monitor any TTL signal - possibly a signal on another board in the system, or a non-PCI550 signal on the backplane.

5.1.3 Running the Signal Histograms

Once the signals and/or combinations of signals have been specified, and the user has selected the sampling mode - the GO commands are used to begin running the histograms. The user has the option of collecting "COUNTS" or "PERCENTAGES". In the case of "COUNTS", the actual number of samples where the selected signals are true is displayed and accumulated. The COUNT histograms are initiated with the "GO HSC" command. In the case of "PERCENTAGES", the percentage of samples where the selected signals is true is computed. The percentages are then averaged every cycle to provide an accurate reflection of the overall percentage - not just the percentage for that sample set. The PERCENTAGE signal histogram is run using the "GO HS" command.

The histograms will continue to run until stopped by the user. This is accomplished simply by hitting the ESC key or the enter/return key.

Figure 5.3 shows examples of both the COUNT and PERCENTAGE histograms.

```
SIGNAL HISTOGRAM
SAMPLES   SIGNAL1  SIGNAL2  SIGNAL3  SIGNAL4  SIGNAL5  SIGNAL6  SIGNAL7  SIGNAL8
             A0       A1       A2      LCK      STP      DSL      TRY      IRY
-------------------------------------------------------------------------------
 00001       50%      22%      10%       0%       0%      60%      10%      50%
```

FIGURE 5.3 SIGNAL HISTOGRAMS

5.2 ADDRESS RANGE HISTOGRAMS

The second mode of histograms supported by the PCI550 is Address Range histograms. In this mode the user can monitor the number or percentage of samples in which the specified address ranges were accessed. This mode is typically used in conjunction with SYNCHRONOUS sampling, as the user is generally interested in the statistics as a function of the total number of bus cycles, not as a function of time.

To enter the address ranges of interest, the "R#" commands are used - where the #'s are from 1 to 8, designating the 8 ranges. To enter the first range, type "R1" and return. Next enter the address range of interest as shown in Figure 5.4.

```
PCI550>R1
HISTOGRAM RANGE 1
LOW VALUE  = FF0F0000
HIGH VALUE = FF080060

PCI550>R2
HISTOGRAM RANGE 2
LOW VALUE  = FF080000
HIGH VALUE = FF090000
PCI550>
```

FIGURE 5.4 SPECIFYING RANGES FOR ADDRESS HISTOGRAMS

After the address ranges of interest have been entered, the sampling mode must be specified. This is done via the "S" command. "SYNCH" mode would be most commonly used for the address range histograms.

5.2.1 Running Address Range Histograms

The address range histograms may also be run in either of two modes: counts or percentages. The command "GO HR" enacts the percentage histogram. After the samples have been stored, the percentages for each address range are computed, then the process is repeated - with the percentages being averaged with prior ones to reflect overall performance, not just the statistics from the last sample. "GO HRC" enacts the address range histogram where actual counts are displayed instead of percentages.

Figure 5.5 shows both types of address range histograms.

```
PCI550>GO HR
ADDRESS RANGE HISTOGRAM
SAMPLES   RANGE 1  RANGE 2  RANGE 3  RANGE 4  RANGE 5  RANGE 6  RANGE 7  RANGE 8
         FF080000 FF080000 00000000 00000000 00000000 00000000 00000000 00000000
         FF080060 FF090000 00000000 00000000 00000000 00000000 00000000 00000000
-------------------------------------------------------------------------------
 00001     100%     100%      23%      43%      19%      00%      00%      00%
PCI550>GO HRC
ADDRESS RANGE HISTOGRAM
SAMPLES   RANGE 1  RANGE 2  RANGE 3  RANGE 4  RANGE 5  RANGE 6  RANGE 7  RANGE 8
         FF080000 FF080000 00000000 00000000 00000000 00000000 00000000 00000000
         FF080060 FF090000 00000000 00000000 00000000 00000000 00000000 00000000
-------------------------------------------------------------------------------
 00001     01024    01024    00234    00440    00192    00000    00000    00000
PCI550>
```

FIGURE 5.5 ADDRESS RANGE HISTOGRAMS

The histograms will continue to run until stopped by the user. This is accomplished simply by hitting the ESC key or the enter/return.

CHAPTER SIX - BUS MASTER

6.0 BUS MASTER

In addition to being a powerful, full function logic analyzer for the PCI bus, the PCI550 also provides Bus Master capabilities- enabling the user to perform Reads and Writes to other boards in the PCI system. This enables the engineer to interrogate other boards in the system, check registers, perform memory tests, and much more - providing powerful diagnostic tools to aid in system test and debug.

This chapter covers the following Bus Master capabilities in detail including : transfer types, address and data widths and values.

6.1 SETUP PARAMETERS

Prior to beginning a Bus Master task, there are a number of setup parameters to specify using the **BM** (Bus Master) command. This command allows you to select the type and values for the master command. The following display appears after tying BM.

```
PCI>BM
MASTER COMMAND    = I/O READ
DATA WIDTH        = 8 BIT
ADDRESS WIDTH     = 32 BIT
START ADDRESS     = 0000000000000000
END ADDRESS       = 0000000000000000
DATA VALUE        = 0000000000000000
```

6.1.1 MASTER COMMAND

The master command specifies the type of command. Using the space bar rotates thru the possible choices. Pressing Enter selects that choice and allows you to set the next selection. The command types are as follows:

```
MASTER COMMAND    = I/O READ
                  = I/O WRITE
                  = MEMORY READ
                  = MEMORY WRITE
                  = CONFIGURATION READ
                  = CONFIGURATION WRITE
                  = MEMORY READ MULTIPLE
                  = MEMORY READ LINE
                  = MEMORY WRITE AND INVALIDATE
```

6.1.2 DATA WIDTH

The data width can be either 8, 16, 32 or 64 bits. Use the space key to toggle thru these choices and the Enter key to select that value.

6.1.3 ADDRESS WIDTH

The address width can be either 32 or 64 bits. Use the space key to toggle thru these choices and the Enter key to select that value.

6.1.4 ADDRESS AND DATA VALUES

The start and end address for a block transfer is specified in hexidecimal. These fields can be typed over the current value. The data value is used only during a write command.

6.2 INITIATING A MASTER TRANSFER

The **BB** command performs the transfer specified in the BM setup. During a read command a display shows the addresses read and the data in both hexidecimal and ASCII. Figure 6.1 shows a read command.

```
PCI>BB
START ADDRESS = 00400000
END   ADDRESS = 00400050
00400000 1234 1234 1234 1234 1234 1234 1234 1234        .4.4.4.4.4.4.4.4
00400010 1234 1234 1234 1234 1234 1234 1234 1234        .4.4.4.4.4.4.4.4
00400020 1234 1234 1234 1234 1234 1234 1234 1234        .4.4.4.4.4.4.4.4
00400030 1234 1234 1234 1234 1234 1234 1234 1234        .4.4.4.4.4.4.4.4
00400040 1234 1234 1234 1234 1234 1234 1234 1234        .4.4.4.4.4.4.4.4
PCI>
```

FIGURE 6.1 BUS READS

6.3 BUS PROTECT

The last item to review is the Bus Protect. The Bus Protect feature allows the user to disable all Bus Master and Bus Stimulus functions - so that no signals can accidentally be asserted on the backplane. This is an important feature in an embedded installation. Check to insure that the Bus Protect is "OFF" prior to performing the Bus Master functions. This is accomplished by typing "BP" and return. If the field says "ON" then hit the space bar to toggle the field to "OFF" and then hit return. The analyzer is now ready to perform the Bus Master functions.

6.4 SIMULTANEOUS MASTER/CAPTURE

As mentioned in Chapter 4, the PCI500 can perform Bus Master and Bus Stimulus functions simultaneously with the data capture functions (except the histogram functions). First, the data capture function should be invoked via one of the "GO" commands. Once the analyzer is in data capture mode, type "M" to switch to command mode - effectively putting the capture activity into the background. At this point the user can perform any of the bus control functions including the reads, writes, interrupts, and bus stimulus. The command files can be used in this mode also to perform repetitive bus master functions. However, the command file can not contain any commands which affect bus capture mode - including loading new setups or printing data.

NOTE: THE GO HR(C) AND GO HS(C) COMMANDS CAN NOT BE EXECUTED SIMULTANEOUSLY WITH THE BUS MASTER COMMAND. THE GO, GO F, GO WITH TRIGGER, AND GO LEVEL COMMANDS CAN BE EXECUTED IN BACKGROUND MODE.

CHAPTER SEVEN - BUS STIMULUS

7.0 BUS STIMULUS

The PCI550 has a Bus Stimulus capability which enables the analyzer to act as a pattern generator on the PCI backplane. The user can specify any signals, combinations of signals, or sequences of signals to be asserted on the backplane. The signals will be asserted regardless of whatever else bus activity may be taking place on the backplane. Therefore, the user must exercise caution when using the Stimulus feature. An advantage however, is that there does not need to be a system controller or CPU in the system.

The Bus Stimulus capability has many different applications. First, the user may simulate PCI cycles such as reads, interrupts, etc. This is very useful when doing hardware debug - where the engineer may be debugging a prototype circuit and requires a set of signals to test the design. The analyzer can generate patterns repetitively - thus eliminating the need for special test software and/or hardware. Furthermore, no CPU or system controller needs to be present in the system to use the stimulus function. Since the analyzer can generate patterns at rates up to 66 Mhz - the engineer can use Stimulus mode to test even the fastest PCI hardware.

A second application is to generate illegal bus conditions. PCI boards are designed to generate "LEGAL" bus transfers - transfers which adhere to the PCIbus specification. However, an illegal condition may be occurring - or the engineer may simply wish to test what happens in the system under different conditions.

A third application of the Bus Stimulus is to run the backplane short test - where every PCI signal is asserted, and checked to insure that no signals are shorted. This test checks for backplane shorts only. In order to test for opens - two analyzers would be required - one in the first slot, and one in the last slot. The analyzer in the first slot would use the bus stimulus to assert all of the lines, and then the analyzer in the last slot would use the asynchronous data capture mode to check that there were no opens.

7.1 SETTING UP PATTERNS

The BC# commands are used to setup the patterns to be generated on the backplane. Up to 8 patterns can be generated for each "SETUP" . However, using the command files to load in new setups, and then running the BC command, the user can generate even longer patterns.

To specify the first pattern, type BC1, and return. A screen with all of the signal options will be displayed on the screen as shown in Figure 7.1. To select a signal, use the return/enter key to move the cursor to the signal of interest. Then, hit the space bar to toggle the setting to either 0 or 1. (Note: PCI is a ground true system, and so 0 is considered true). The user may select any number of signals to be asserted. After the signals have been selected, move to the NEXT field. This field enables the user to link together patterns to form sequences, and to specify loops. For example if two patterns are to be used in conjunction, the NEXT field of the BC1 command would be changed to "2" - which means to execute the BC2 condition next. Entering a "0" in this field means to terminate or stop the sequence after the current condition. Figure 7.2 shows a sequence of 4 events which are to be performed repetitively in a loop until halted by the user via a CTRL C.

```
BUS CONDITION SPECIFICATION 1
 <===== 64 BIT ====>! <===== 32 BIT ====>!F I T S L I D          P S!    !NXT
              P R A!               P R G!R R R T O S S      C R E E!    !
  ADDRESS C/BE A E C!  ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT!
   DATA   7654 R Q K!   DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210!
-------------------!-------------------!-------------------------!----!---
=XXXXXXXX XXXX X X X =XXXXXXXX XXXX X X X X X X X X X XXXX X X X X XXXX  0
ACTIVATION TIME (US) = 00
WAIT TIME (MS) = 00
```

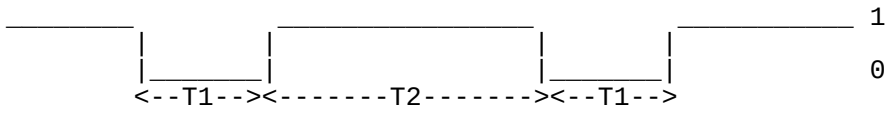
FIGURE 7.1 BUS STIMULUS SETUP

```
BUS CONDITION SPECIFICATION 1
 <===== 64 BIT ====>! <===== 32 BIT ====>!F I T S L I D          P S!    !NXT
              P R A!               P R G!R R R T O S S      C R E E!    !
  ADDRESS C/BE A E C!  ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT!
   DATA   7654 R Q K!   DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210!
-------------------!-------------------!-------------------------!----!---
=XXXXXXXX XXXX X X X =12345678 XXXX X X X X X X X X X XXXX X X X X XXXX  2
ACTIVATION TIME (US) = 00
WAIT TIME (MS) = 00


BUS CONDITION SPECIFICATION 1
 <===== 64 BIT ====>! <===== 32 BIT ====>!F I T S L I D          P S!    !NXT
              P R A!               P R G!R R R T O S S      C R E E!    !
  ADDRESS C/BE A E C!  ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT!
   DATA   7654 R Q K!   DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210!
-------------------!-------------------!-------------------------!----!---
=XXXXXXXX XXXX X X X =ABCDEF01 XXXX X X X X X X X X X XXXX X X X X XXXX  1
ACTIVATION TIME (US) = 00
WAIT TIME (MS) = 00
```

FIGURE 7.2 SEQUENTIAL LOOP OF STIMULUS COMMANDS

After the user has selected the signals to be asserted, the analyzer prompts for the Activation Time, and the Next Time. The Activation time is defined to be the time period during which the signals are to be asserted. The Next Time is the time from the end of one assertion to the beginning of the next assertion - i.e. the WAIT time. Following is a diagram which illustrates the timing for a signal which is being repeatedly asserted true in a loop .



T1 = Activation Time
T2 = Next/Wait Time

The activation time is specified in microseconds in the range 1 to 99 microseconds. The Wait time is specified in milliseconds in the range 1 to 99 milliseconds.

7.2 ACTIVATING THE BUS STIMULUS

To begin generating patterns (i.e. asserting the specified patterns on the backplane), the BA# commands are used. The # denotes the first pattern or set of signals to be asserted. For instance in the example in Figure 7.2, the BA1 command would be used to initiate the sequence.

7.3 HALTING THE BUS STIMULUS

The patterns will be asserted only once if the last pattern in the sequence has a "0" in the NEXT field. However, if the sequence is set up to repeat as shown in the example in Figure 7.2, then the user must terminate the stimulus by entering CTRL C.

7.4 BACKPLANE SHORT TEST

A special diagnostic function which has been embedded in the PCI550 Analyzer is the Backplane Short Test. The short test is a special case of the stimulus mode, as each line is systematically asserted, and all of the other lines checked to insure they are not asserted (i.e. shorted).

7.4.1 Preparing to Run the Backplane Short Test

The Backplane Short Test should be run in a PCI chassis with no other boards. The reason for this is that the analyzer will be checking lines to in-sure that they are not asserted. If there are other boards present in the system, they may be holding/asserting certain lines - and can cause false shorts to be detected. The analyzer may be inserted in any slot in the chassis to run the Backplane Short Test.

To activate the test, type "BT" and return. The analyzer will display all the signals as they are tested and list any signals which are shorted.

CHAPTER EIGHT - COMMAND FILES

8.0 COMMAND FILES

The PCI550 supports an on board programming capability via Command Files. The command files are similar in structure to writing a program in Basic - where a line number is followed by a command to be executed. For each line of the PCI550's command file, a line number is selected, the command to be executed is entered followed by the delay time if any, and the line number of the next command, if any, to be executed.

The Command Files enable the user to create diagnostic programs which can be executed automatically. This is very useful for repetitive applications where a task needs to be performed again and again over a period of time. Another application for command files is to capture/log data when the events of interest occur infrequently. Using command files enables the analyzer to capture data or voltages, print this information, and then setup to repeat the process - without intervention by the user.

Command files can also be executed automatically on power up or reset. This is very useful for embedded applications where the analyzer is to perform the same task over and over - and is communicating results to a host. When the target system in which the analyzer is embedded resets or powers up, the analyzer can automatically be configured with the proper setups and begin testing or monitoring the system.

8.1 SETTING UP A COMMAND FILE

The analyzer can have up to 8 command files (one for each on board setup) - and each command file can have up to 8 commands. The command files can be linked together for form longer command files by incorporating the RS (restore setup) commands in the command file. See section 8.5 for details on linking command files. As with setups, the command files are battery backed up. The command file which was active upon power down or reset, will be reloaded as the active setup on power up.

The CL# commands are used to create the command files. Each # indicates line in the command file. For instance, CL1 would list the first line in the command file. Each line has 3 fields - the command field, the wait field, and the next field. Figure 8.1 shows the CL1 screen before a command has been entered in the command field. The first step is to enter the command in the first field - the command field. Any of the commands listed in the HELP screens may be incorporated in the command field. Figure 8.2 shows the CL1 screen with a GO with trigger command entered in the command field. After entering the command, hit enter/return to proceed to the "WAIT" field. The "WAIT" field allows the user to specify a delay before the command is executed. The time delay increment is in seconds. For example, if 5 is entered in this field, then the analyzer will wait 5 seconds before executing the specified command. For no delay, simply leave a 0 in this field. After entering the wait time, hit enter/return to move to the "NEXT" field. The NEXT field is used to specify the next command line to be executed. For example, if a 2 is entered as shown in Figure 8.2, then command line 2 will be executed immediately upon completion of command line 1.

The user can chain command lines together via the NEXT field. In addition, loops can be created which will operate continuously until terminated by the user via a CTRL C.

```
CL1
COMMAND LINE  1
    COMMAND   ! WAIT ! NEXT !
--------------!------!------!
                00      0
PCI>
```

FIGURE 8.1 COMMAND LINE FORMAT

```
 CL2
COMMAND LINE  2
    COMMAND   ! WAIT ! NEXT !
--------------!------!------!
GO              05      2
PCI>
```

FIGURE 8.2 GO COMMAND WITH POINTER TO CL2

A 0 in the NEXT field will cause the command file to halt upon completion of the current command.

Following is a command file which performs the following sequence of steps once and then halts:

```
LOAD IN SETUP #1
CAPTURE DATA USING A TRIGGER
PRINT 100 CAPTURED SAMPLES
READS OUT THE TIME AND DATE
```

COMMAND LINE	COMMAND	WAIT	NEXT	COMMENT
CL1	RS1	0	2	LOAD IN TRIGGER/TRACE PARAMETERS
CL2	GO A.B	0	3	CAPTURE DATA WITH TRIGGER A.B
CL3	P1,100	0	4	PRINT SAMPLES 1 TO 100
CL4	CR	0	0	READ TIME/DATE

8.2 EXECUTING A COMMAND FILE

Command files can be executed either via command or automatically on power up/reset. To begin executing via command, type "CA#" where the # is the command line where execution is to begin. Typically, #=1, as with the example listed in the prior section. The current command file will then begin execution. However, the user may want to run a command file which has been stored previously. In this case the user must first load in the command file to active status. This is accomplished via the RS# command, where the # refers to the setup/command file to be reloaded. The analyzer can store up to 8 setups and command files.

To automatically execute a command file on powerup or reset, type "CF" to enter the configuration command. This command contains a number of setup parameters. Hit the return/enter key to move down to the option "Execute Command File on Power Up" and hit the space bar to set this option to "ON". When using the automatic execution it is important to insure that the command file to be executed is loaded as the

current active command file just prior to reset/power down. When using the automatic feature, be sure to review the setting of the reset jumpers to insure that the analyzer will reset under the desired conditions. Options include resetting on SYS Reset, on front panel reset, on bus stimulus, and combinations thereof.

8.3 HALTING A COMMAND FILE

To halt or abort the execution of a command file, type "CTRL C". This will stop the command file at the current command. To resume execution of the command file, the user can either reenter at a particular step in the middle of the command file, or the user can restart at the beginning. Execution is started via the CA# command, where the # indicates the command line where execution is to begin.

8.4 STORING/RESTORING THE COMMAND FILES

Command files are stored as part of a setup. To store the command file, type "SS#" and return. The # denotes the setup number and may be in the range 1-8. In addition to the command file, all the trigger and trace parameters , the status of the print modes, and serial output modes are also stored. The setups which are stored along with the command files are the parameters which will be used when the command file executes after reloading. For example, in the command file listed in section 8.1, the "A and B" event specifiers which are used as triggers, would have been specified as part of the setup, at the time the command file was stored. To restore/reload command file and setup parameters, use the "RS#" command, where the # denotes the setup to be loaded. The range is 1-8.

8.5 LINKING COMMAND FILES

Command files can be linked together to create longer sequences. This is accomplished via the RS command. A new setup is loaded as part of the first command file, thus loading in a new setup and a new command file which then begins executing. Following is an example of two command files where the first command file loads in the 2nd, which then begins executing. This process can be expanded to include all 8 setups.

LINKED COMMAND FILES EXAMPLE

	COMMAND LINE	COMMAND	WAIT	NEXT	DESCRIPTION
FILE #1	CL1	CR	0	2	READ TIME
	CL2	GO A.B	0	3	CAPTURE DATA
	CL3	P1,100	0	4	PRINT DATA
	CL4	GO C.D	0	5	CAPTURE DATA
	CL5	P1,100	0	6	PRINT DATA
	CL6	RS2	0	1	LOAD SETUP #2 POINT TO CL1
FILE #2	CL1	GO A.B	0	2	CAPTURE DATA
	CL2	P1,100	0	3	PRINT DATA
	CL3	GO L1	0	4	CAPTURE DATA
	CL4	P1,200	0	5	PRINT DATA
	CL5	CR	0	0	LAST STEP

In this example, the command file sequence will halt at the end of execution of the second command file. Prior to rerunning this sequence, be sure to reload the first setup/command file. When the second file is completed, it is the active file. To begin again with the first setup/file, it must first be reloaded.

CHAPTER NINE - MISCELLANEOUS FUNCTIONS

9.0 MISCELLANEOUS FUNCTIONS

This chapter covers a range of additional features on the PCI550 including the Configuration Command, the setup and screen store/restore functions, self test, voltage/temperature monitor, clock/calendar, and secondary serial port control functions.

9.1 CONFIGURATION COMMAND

The configuration command - "CF" - contains a number of setup and operational parameters including the following:

1) A32:D32 or A64:D64 Setup
This option allows the user to select either mode for data capture activities. Selecting either option will effect the use of the most significant data and address bits in the setting of triggers, trace qualifiers, histograms, and displays.

2) HEX or BINARY Setup
The binary option enables the user to specify address, or data BITS to trigger or qualify the trace - rather than the nibbles which are defined by HEX digits.

3) Baud Rate - Port 1
The baud rate for the serial port can be modified under software control. Simply use the space bar to toggle through the options available. The range of baud rates is from 300 to 38.4Kb. The new baud rate is in effect as soon as the return key is hit.

4) Trigger Out Polarity
The PCI550 has a trigger output port. This port provides a TTL level change when the analyzer is triggered. The user can select whether to have the output go high or low when the analyzer is triggered. Active high indicates that the output will switch from ground to +5V when the analyzer is triggered.

5) Execute Command File at Startup
This option specifies that the active command file will be automatically executed on powerup/reset. If yes is selected, the first command line (CL1) of the active command file will be executed upon reset/power up. Note: the active command file is the file which was current at the time of the power down/reset.

6) Decode Trace Display
Displays the names of the types of data transfers versus the DS codes

7) Command Prompt
Modify the command prompt from a > to user selectable character. All of the configuration options can be changed by hitting the space bar to toggle through the choices. When the desired option appears, hit the enter/return key to select that option, and proceed to the next configuration parameter.

Figure 9.1 shows the configuration screen with the default/initialized parameters.

```
PCI>CF
A32/D32 OR A64/D64 SETUP = A32/D32
HEXADECIMAL OR BINARY SETUP = HEXADECIMAL
BAUD RATE - PORT 1 (PRIMARY) = 9600
TRIGGER OUT POLARITY = LOW
EXECUTE COMMAND FILE AT STARTUP = NO
DECODE TRACE DISPLAY TRANSFER TYPE = NO
PCI COMMAND PROMPT = PCI>
PCI>
```

FIGURE 9.1 CONFIGURATION SCREEN

9.2 CLOCK/CALENDAR

The PCI550 has an onboard clock/calendar chip which provides current time and date tags for the data capture functions. This enables the user to tag data for archiving purposes. To set the clock calendar, type "CS" and return. The user is then prompted to enter the hours, minutes, seconds, month, day, and year. To read the clock calendar (useful for logging purposes), type "CR" and return. The clock/calendar functions have battery backup.

9.3 SETUP STORE/RESTORE

The PCI550 can store up to 8 complete setups. A setup includes the following information:

1) Event Specifiers (A,B,C,D)
2) Sampling mode
3) Trace qualification field
4) Command files
5) Print display state
6) Serial port mode
7) Level Setups
8) Trigger Position
9) Occurrence Count

The setups are stored via the "SS#" command, where the # is in the range 1-8. To restore/reload a setup, use the "RS#" command.

9.4 SCREEN STORE/RESTORE

The PCI550 can also save up to 8 screens. The screens may contain trace information, timing waveforms, voltage data, etc. - any information of interest. The user may need to save a limited amount of data, but may not have a printer to make a hard copy. The screen store option may be used to save this data for later review. To save a screen, type "SP#" and return. The # is in the range 1-8. To restore this screen for subsequent viewing, type "RP#" and return.

9.5 SETUP DISPLAY

The PCI550 has numerous setup parameters to handle the various trigger, trace, and print options. For a summary overview of the current setting of all these parameters, use the "DS" command. "DS" (Display Setup) gives an overview of all the parameters in a concise screen display. Figure 9.2 is the screen generated by the DS command.

9.6 INITIALIZATION

Initializing the PCI550 Analyzer resets all of the parameters and the command file to factory default settings. Note however, that stored setups are NOT reset. Only the current active setting is reset. All trigger and trace qualifiers are set to X's (Don't Care). The trigger position is set to the mid point of the trace buffer. The sampling mode is set to SYNCH, and the display mode is set to SIGNAL. This analyzer is initialized by typing "I" and return. This is the easiest way to reset the analyzer to factory default settings. The only other method is to individually change/reset each parameter.

```
*************************** PCI MATCH CONDITIONS ****************************
  <===== 64 BIT ====>! <===== 32 BIT ====>!F I T S L I D          P S!
               P R A!               P R G!R R R T O S S      C R E E!
   ADDRESS C/BE A E C!  ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT
    DATA   7654 R Q K!   DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210
--------------------!--------------------!--------------------------!----
A=XXXXXXXX XXXX X X X =XXXXXXXX XXXX X X X 0 X X X X X X XXXX X X X X XXXX
B=XXXXXXXX XXXX X X X =XXXXXXXX XXXX X X X X X X X X X X XXXX X X X X XXXX
C=XXXXXXXX XXXX X X X =XXXXXXXX XXXX X X X X X X X X X X XXXX X X X X XXXX
D=XXXXXXXX XXXX X X X =XXXXXXXX XXXX X X X X X X X X X X XXXX X X X X XXXX

****************************** PROGRAM LEVELS ******************************
LEVEL   IF EVENT   OCCURS   THEN - TRIG?    ELSE - TRIG?    TRACE        CLOCK
-------------------------------------------------------------------------------
  1      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  2      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  3      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  4      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  5      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  6      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  7      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  8      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
PRESS ANY KEY FOR MORE SETUP INFORMATION (ESC TO EXIT)


********************** GENERAL SETUP INFORMATION **********************

TRIGGER POSITION =       1/2
TRACE DISPLAY      =    WAVEFORM
TRACE QUALIFIER =        ALL
OCCURRENCE COUNT =       00001
SAMPLE CLOCK =           SYNCH
```

FIGURE 9.2

9.7 SELF TEST

The PCI550 has built in self diagnostics which can check many of the key functional areas on the analyzer. The self test is enacted by typing "T" and return. Testing the bus interface (transceivers) requires the analyzer to output signals on the bus. This may disrupt the function of other boards in the system. Therefore, if the system is running/operating, the analyzer's self test should not be executed.

CHAPTER TEN - COMMANDS

10.0 COMMANDS

This chapter presents a detailed description of each PCI550 command. The format consists of the command name in the upper right hand corner of each page, followed by a description of its syntax, description of its operation, and where applicable, screens of the displays generated.

A,B,C,D
Event Specifiers

SYNTAX: A, B, C, OR D
DESCRIPTION:

The commands A,B,C, and D are used to setup and display the status of the 4 event specifiers. The event specifiers are used for the following:

1) Setting Triggers
2) Trace Qualification
3) Signal Histograms to monitor bus states or combinations of signals on the bus

After typing one of the event specifier names (either A,B,C, or D), then hit return/enter. As shown on in Figure 10.1, the status of the current setting will be displayed. The user can then change any of the parameter settings or simply hit ESC to exit the command. (The status of all of the event specifiers can be listed via the DS command). The address modifier, address, and data fields require entry of either Hex digits (0-F) or X for don't care. All other fields are toggled between 0 (true), 1 (false), and X (don't care) via the space bar. To move to the next field in the display, type either return/enter or >. To move back to a previous field, type <.

Note the fields prior to the address and data fields. These include the operators >,<, or =. These operators enable a user to specify a range of values for consideration. The range may simply be greater than or less than, or when using the event specifiers in logical combination, the operators can define a range - as shown in Figure 10.2 - where A and B are AND'ED together.

In the address, data, and address modifier fields, the user normally enters hex digits which specify 4 bits in the field. However, the user may wish to trigger or qualify the trace based on a single bit/signal. To do this, the user selects the "BINARY" mode via th "CF" command. When "BINARY" mode (vs. "HEX" mode) is selected, the displays will be expanded to show all of the address, data, and address modifier bits. The user can then select any individual bit(s) as the trigger or trace qualifier. Following is a summary table of key strokes and the actions associated with them when using the A,B,C, and D commands.

KEY	ACTION
>	GO TO NEXT FIELD
<	GO TO PRIOR FIELD
SPACE BAR	TOGGLE THROUGH FIELD OPTIONS
RETURN/ENTER	GO TO NEXT FIELD
ESC	EXIT COMMAND

```
PCI MATCH SPECIFICATION A
 <===== 64 BIT ====>! <===== 32 BIT ====>!F I T S L I D         P S!
              P R A!              P R G!R R R T O S S     C R E E!
  ADDRESS C/BE A E C!  ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT
   DATA   7654 R Q K!   DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210
--------------------!--------------------!-------------------------!----
=XXXXXXXX XXXX X X X =XXXXXXXX XXXX X X X 0 X X X X X X XXXX X X X X XXXX
```

FIGURE 10.1 EVENT SPECIFIER A

```
PCI MATCH SPECIFICATION A
 <===== 64 BIT ====>! <===== 32 BIT ====>!F I T S L I D          P S!
               P R A!               P R G!R R R T O S S      C R E E!
  ADDRESS C/BE A E C!  ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT
   DATA   7654 R Q K!   DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210
--------------------!--------------------!-------------------------!----
=XXXXXXXX XXXX X X X >XXXXX100 XXXX X X X 0 X X X X X X XXXX X X X X XXXX

PCI MATCH SPECIFICATION B
 <===== 64 BIT ====>! <===== 32 BIT ====>!F I T S L I D          P S!
               P R A!               P R G!R R R T O S S      C R E E!
  ADDRESS C/BE A E C!  ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT
   DATA   7654 R Q K!   DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210
--------------------!--------------------!-------------------------!----
=XXXXXXXX XXXX X X X <XXXXX200 XXXX X X X 0 X X X X X X XXXX X X X X XXXX
```

FIGURE 10.2 EVENT SPECIFIERS A AND B USED TO DEFINE AN ADDRESS RANGE

B A
A C T I V A T E B U S S T I M U L U S

S Y N T A X : B A # (# R A N G E I S 1 - 8)
D E S C R I P T I O N :

The BA command starts bus activation according to the stimulus condition specified. The user may specify up to 8 conditions to be asserted on the bus via the BC commands. The stimulus to be activated is specified via the # field of the command. For example, to activate bus condition #1, type BA1. Note, that the bus conditions may be chained together, and may be specified to run either once through or in a continuous loop. The condition specified in the BA command, may only be one step in a sequence.

If the sequence is specified to run only once (i.e. a 0 appears in the NEXT field of the last condition in the string), then the bus stimulus will be performed once, and halted. If a continous loop is specified, the user must hit the CTRL C key to halt bus activation.

BC
SPECIFY BUS STIMULUS CONDITION

SYNTAX: BC# (# RANGE IS 1-8)
DESCRIPTION:

The BC commands are used to define the bus stimulus conditions. The user selects what signals will be asserted on the PCIbus. A single set of signals can be defined, or a sequence of signals can be defined. For each analyzer setup, up to 8 conditions may be specified.

Figure 10.3 shows the screen for establishing Bus Conditions. Note that all of the signal fields are listed. In the address, data, and address modifier fields, hex digits are entered unless "BINARY" mode is selected via the "CF" command. If "BINARY" mode is selected, the fields will be expanded to enable the user to specify selected bits within these fields. In all of the other fields, the user has the option of selecting 0 (true/ground), 1 (false/+5v), or don't care. The space bar is used to toggle through the options in each field. The last field is the NEXT field which is used to chain conditions together. This field points to the next condition to be executed. If there is a 0 in this field, then this condition will be the last one executed. This field may also point to the current condition, if the user wants to repetitively output this one condition.

After the signals have been specified, the user is prompted to enter the "ACTIVATION TIME" and the "NEXT TIME". The activation time is the assertion time - the time period for which the analyzer will assert the signals on the bus. The activation time is denoted in microseconds and ranges from 1 to 99 microseconds. Next, the "NEXT TIME" is specified. This is the wait time between assertions. This field is specified in milliseconds and the range is 1 to 99 milliseconds. Figure 10.4 shows a set of chained bus conditions which will execute in a continuous loop until halted by the user.

```
BUS CONDITION SPECIFICATION 1
 <===== 64 BIT ====>! <===== 32 BIT ====>!F I T S L I D          P S!    !NXT
              P R A!               P R G!R R R T O S S      C R E E!    !
  ADDRESS C/BE A E C!  ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT!
   DATA   7654 R Q K!   DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210!
--------------------!--------------------!-------------------------!----!---
=XXXXXXXX XXXX X X X =XXXXXXXX XXXX X X X X X X X X X XXXX X X X X XXXX  0
ACTIVATION TIME (US) = 00
WAIT TIME (MS) = 00
```

FIGURE 10.3 BUS STIMULUS SETUP CONDITION

```
BUS CONDITION SPECIFICATION 1
 <===== 64 BIT ====>! <===== 32 BIT ====>!F I T S L I D          P S!    !NXT
               P R A!               P R G!R R R T O S S      C R E E!    !
  ADDRESS C/BE A E C!  ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT!
   DATA   7654 R Q K!   DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210!
--------------------!--------------------!-------------------------!----!---
=XXXXXXXX XXXX X X X =XXXXXXXX XXXX X X X X X X X X X XXXX X X X X XXXX  2
ACTIVATION TIME (US) = 00
WAIT TIME (MS) = 00

BUS CONDITION SPECIFICATION 2
 <===== 64 BIT ====>! <===== 32 BIT ====>!F I T S L I D          P S!    !NXT
               P R A!               P R G!R R R T O S S      C R E E!    !
  ADDRESS C/BE A E C!  ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT!
   DATA   7654 R Q K!   DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210!
--------------------!--------------------!-------------------------!----!---
=XXXXXXXX XXXX X X X =XXXXXXXX XXXX X X X X X X X X X XXXX X X X X XXXX  1
ACTIVATION TIME (US) = 00
WAIT TIME (MS) = 00
```

FIGURE 10.4 CHAINED BUS CONDITIONS

B I
B U S I N T E R R U P T

S Y N T A X : B I # (# R A N G E 1 - 7)
D E S C R I P T I O N :

The Bus Interrupt Command is used to generate an interrupt on the PCIbus. The command will cause an interrupt to be generated and will respond to the interrupt acknowledge generated by the responding board in the system.

The status ID which the analyzer (as the interrupter) is to acknowledge the interrupt with is specified via the "BM" command. Be sure to set this parameter before generating an interrupt.

To use this command, simply enter BI#, where the # is in the range of 1-7.

B P
B U S P R O T E C T

S Y N T A X : B P
D E S C R I P T I O N :

The Bus Protect command allows the user to inhibit the bus control commands. This prevents a user from accidentally affecting normal system operation - an important consideration if the analyzer is installed in an embedded application for monitoring purposes.

The factory default setting for this parameter is "OFF" - thus enabling the Bus Master and Bus Stimulus functions to be performed.

To change the status of the Bus Protect - type "BP" and return. Then use the space bar to toggle the status.

B T
B A C K P L A N E T E S T

S Y N T A X : B T
D E S C R I P T I O N :

The Backplane Test command tests the PCIbus backplane for shorts. The Backplane Test asserts each of the PCIbus signals (not including the user defined pins on the P2) individually and checks every other signal to see if it is also asserted - indicating a short.

This command should normally be used in a system with NO OTHER BOARDS installed. The reason for this is twofold. First, the analyzer will be asserting signals without regard to bus timing and this may cause problems with the system if other boards are present and running. Second, other boards in the system may be asserting lines during the backplane test which could result in False Shorts being repeated.

When running the Backplane Test, the analyzer first looks at all bus signals to map out any signals which are asserted or in the active state -and lists these signals. Next the analyzer drives each inactive signal to its active state individually and monitors all of the others signals for activity. If for some reason the signal which is being asserted can not be driven, the analyzer also notes this.

If any signals are found active, shorted, or unable to be driven, the analyzer indicates a FAILED backplane test.

CA
COMMAND LINE ACTIVATION

SYNTAX: CA# (# RANGE IS 1-8)
DESCRIPTION:

The CA commands are used to execute the commands specified in the command lines. Command lines are specified via the "CL" command. Command lines enable the user to execute analyzer commands or sequences of commands repetitively or upon power up/reset.

Command lines can be executed individually, or in sequences. In addition, command lines (or sequences) can be performed once through or repetitively in loops.

The user enters "CA" and a number identifying the command line to be executed. The analyzer will execute that command line, and continue to the line specified in the "NEXT" field. If a 0 is found in the "NEXT" field, then execution will halt.

If the user has specified that a command line sequence be performed repetitively in a loop, then the user can halt operation of the loop by hitting the CTRL C key.

Another means of activating a command line - is by using the power up/reset option. Under the "CF" command, the user has the option of selecting execution of the command file which was loaded at power down (or prior to reset) automatically. When the analyzer is powered up (or reset), the analyzer will automatically begin executing command line 1 of the command file which is active. Note: the user can have as one of the command lines, to load in a new setup ("RS" command), which will cause a new command file to be loaded. This enables the user to "CHAIN" together command files for longer sequences. See the "CL" commands for details on this feature.

C F
C O N F I G U R E A N A L Y Z E R

S Y N T A X : C F
D E S C R I P T I O N :

The "CF" or configure command allows the user to specify a number of different PCI550 features. Listed below are the functions specified via the "CF" command.

1. A32/D3 OR A64/D64 DATA CAPTURE FORMAT

This option allows the user to capture data in systems with full 32 bit address/data busses or in systems with A64/D64 data busses. All trace displays and histograms are adjusted to show the correct number of signals for address and data fields. In addtion, the histogram address ranges are adjusted according to these fields.

2. HEX OR BINARY SPECIFICATION OF ADDRESS, DATA, AND ADDRESS MODIFIER FIELDS

When specifying a trigger or trace qualifier, the user may wish to select only individual bits/signals. By selecting the binary option, the display fields will be expanded to bit mode, to enable the user to select one or more bits - rather than the nibbles (4 bits) normally defined by the entry of HEX digits.

3. BAUD RATE - PRIMARY SERIAL PORT

Once communication has been established, the user can modify the baud rate on the primary serial port via this command. Simply use the space bar to select the desired baud rate. The range of rates is from 38.4kbytes/sec down to 300 bytes/sec. NOTE: THE NEW RATE WILL BE IN EFFECT IMMEDIATELY AFTER PRESSING THE RETURN KEY - NOT AFTER COMPLETION OF THE CF COMMAND. The baud rate of the primary serial port is established on power up or reset by the baud rate jumpers on the analyzer. If you have modified the analyzer's baud rate after powerup, and then reset the analyzer or power down the system, the baud rate will reset to the rate defined by the baud rate jumpers.

4. TRIGGER OUT POLARITY

The user may select the polarity of the external trigger output on the PCI550. The analyzer can be set to change to either a high (+5v) or a low (GND) state when the trigger is encountered. Once the level transitions upon the occurrence of a trigger, it will remain at this level until the analyzer is reset to collect a new set of data. The factory default value for the trig-er out polarity is LOW.

5. EXECUTE COMMAND FILES ON POWER UP/RESET

This option specifies the automatic power up/reset execution of the "active" command file. If "YES" is selected, the analyzer will automatically begin executing command line 1 of the active command file immediately after a power up or reset. If no command file/line has been entered, the analyzer will return to the "COMMAND" state - with an ">" as the left side of the line.

6. DECODE TRACE DISPLAY FOR TRANSFER TYPE

The user may select the display of data transfer names in the trace display instead of a "BIT" display of signals.

7. COMMAND PROMPT

This command enables the user to change the command mode prompt from the default ">" to any ASCII character. This can be particularly helpful if developing host programs to interact with the analyzer - and the user wants to specify a unique character to flag "command" mode. Figure 10.5 shows the default values for all of the parameters specified via the CF command.

```
PCI>CF

A32/D32 OR A24/D16 SETUP = A64/D64
HEXADECIMAL OR BINARY SETUP = HEXADECIMAL
BAUD RATE - PORT 1 (PRIMARY) = 9600
TRIGGER OUT POLARITY = LOW
EXECUTE COMMAND FILE AT STARTUP = NO
DECODE TRACE DISPLAY TRANSFER TYPE = NO
PCI COMMAND PROMPT = PCI>
PCI>
```

FIGURE 10.5 CONFIGURATION DEFAULTS

CL
COMMAND LINE

SYNTAX: CL# (# RANGE 1-8)
DESCRIPTION:

The CL# command is used to specify the command lines. Up to 8 command lines may be specified in one command file (a command file is the 8 command lines associated with a specific setup). The command lines can be executed singly or in sequences. In addition, the user can specify whether to execute a command file once through or repetitively. To specify a command line, type CL and the command line number, then hit enter. The analyzer will prompt for the command name, the wait time, and the next line to be executed. Any of the ASCII commands listed in the HELP summaries may be entered on the command lines. For example, following is a command line which specifies to wait 1 second, then log the backplane voltages, and then proceed to execute command line 2.

```
PCI>CL1
      COMMAND          WAIT        NEXT
         V               1           2
```

The user may opt to enter a delay in the wait field, or enter a 0 for no delay. The delays are in one second increments from 1 to 99. The delay is enacted prior to the execution of the command. The NEXT field contains the number of the next command line to be executed. The user may enter any number from 0 to 8. 0 means that the command file will terminate execution after the completion of the current command line. This field may also be used to point to the current field, or another command line. By having the last line in the command file point to the first line, a loop may be established. This is handy for repetitively performing diagnostic tasks.

Since every analyzer setup has an associated command file, the user may "chain" together command files by having the last command in one file load in a new setup and point to the first command in that file. As shown in the next example, the user has created two command files and stored them under setups 1 and 2. The user can then chain together these two command files, which can then be run in a continuous loop.

COMMAND FILE #1

Line #	Command	Wait	Next
CL1	CR	1	2
CL2	RT	0	3
CL3	GO A.B	0	4
CL4	P1,100	0	5
CL5	P0	0	6
CL6	PS1	0	7
CL7	P	0	8
CL8	RS2	0	1

COMMAND FILE #2

Line #	Command	Wait	Next
CL1	GO C+D	0	2
CL2	P1,1000	0	3
CL3	GO L1	0	4
CL4	P1,1000	0	5
CL5	GO A.B	0	6
CL6	P1,1000	0	7
CL7	RS1	0	1

The user also has the option of executing the active command file on powerup or reset. The active command file is the one which was loaded just prior to powerup or reset. The first line of the command file will be executed if this option is selected. See the CF command to enable powerup execution of the active command file. This option is particularly helpful in embedded monitoring applications where the analyzer will be automatically performing the same test - or must be initialized automatically to a particular state on reset.

C R , C S
C L O C K R E A D / C L O C K S E T

S Y N T A X : C R O R C S
D E S C R I P T I O N :

The CR and CS commands enable the user to read and set the onboard clock calendar. The clock/calendar is battery backed up and therefore continues timekeeping even when power is removed from the PCI210. The clock/calendar is used as a time stamp for trace data.

The CR - Clock Read - command reads and displays the time and date.

The CS - Clock Set - command allows the user to set/reset the clock/calendar. To set the clock, type CS and return. The user is then promped for the time and date information as follows:

*CS

```
  HOURS    MINUTES    SECONDS     MONTH      DATE       YEAR
 (00-23)  (00-59)    (00-59)    (01-12)    (01-31)    (00-99)
 ------------------------------------------------------------------
   12        10         30         12         30          01
```

DS
DISPLAY SETUP

SYNTAX: DS
DESCRIPTION:

The DS command is used to provide a summary of the current setup of all of the analyzer parameters. The DS screen displays the status of the following:

4 EVENT SPECIFIERS (A,B,C,D)
8 LEVEL SETUPS (L1,L2,L3,L4)
TRIGGER POSITION IN MAIN TRACE BUFFER
SAMPLING SPEED/MODE
DISPLAY SPEED/MODE
TRACE QUALIFIER
OCCURRENCE COUNT

Figure 10.7 is the factory default DS screen.

```
*************************** PCI MATCH CONDITIONS ****************************
  <===== 64 BIT ====>! <===== 32 BIT ====>!F I T S L I D          P S!
               P R A!               P R G!R R R T O S S      C R E E!
   ADDRESS C/BE A E C!  ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT
    DATA   7654 R Q K!   DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210
--------------------!--------------------!-------------------------!----
A=XXXXXXXX XXXX X X X =XXXXXXXX XXXX X X X 0 X X X X X X XXXX X X X X XXXX
B=XXXXXXXX XXXX X X X =XXXXXXXX XXXX X X X X X X X X X X XXXX X X X X XXXX
C=XXXXXXXX XXXX X X X =XXXXXXXX XXXX X X X X X X X X X X XXXX X X X X XXXX
D=XXXXXXXX XXXX X X X =XXXXXXXX XXXX X X X X X X X X X X XXXX X X X X XXXX

****************************** PROGRAM LEVELS ******************************
LEVEL   IF EVENT   OCCURS   THEN - TRIG?    ELSE - TRIG?    TRACE        CLOCK
-------------------------------------------------------------------------------
  1      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  2      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  3      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  4      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  5      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  6      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  7      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  8      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
PRESS ANY KEY FOR MORE SETUP INFORMATION (ESC TO EXIT)



********************** GENERAL SETUP INFORMATION **********************

TRIGGER POSITION =       1/2
TRACE DISPLAY      =    WAVEFORM
TRACE QUALIFIER =        ALL
OCCURRENCE COUNT =       00001
SAMPLE CLOCK =           SYNCH
```

FIGURE 10.7 DISPLAY SETUP SCREENS

GO
START DATA CAPTURE

SYNTAX: GO / GO F / GO with trigger (A,B,C,D)
GO L# (LEVEL # in range 1-8)
GO HR(C) / GO HS(C)
DESCRIPTION:

The GO commands are used to initiate data capture for state/timing analysis or for histograms. Once a GO command has been entered, the user can halt the data capture process simply by typing CTRL C or ESC. For state and timing analysis, the analyzer will stop capturing data when the buffer is full (except in the case of the GO F command which will run as a FIFO for trace data until halted by the user).

GO

The GO command starts data capture without looking for a specific trigger event. This command is often used initially to get a quick look at the bus activity - before deciding what signals to use for triggers. To begin capturing data, simply type "GO" and return. The analyzer will then begin capturing data (in the sampling mode specified via the "S" command). The first sample captured will be considered the trigger, and will be stored at the position in the trace buffer specified by the "TP" command. (Note: be careful to insure that the trigger position is not at the end of the trace buffer or data capture will halt after storing the first event). To simply capture bus cycle data with no restrictions, type "I" to initialize the analyzer, and then type "GO". This will cause the analyzer to fill half of the trace buffer with the current bus activity.

GO F

The GO F command will cause the analyzer to capture data in FIFO fashion until stopped by the user via a keyboard entry. This command is very useful for capturing BUS CYCLES leading up to a system crash/hanging. This command is typically used in synchronous mode so that when the PCI system hangs and there is no bus activity, the analyzer will not store any additional data. The user can then halt the analyzer and investigate the bus activity leading up to the system crash.

GO with Trigger

This is the command to capture data with a simple trigger - via the events specifiers. The trigger field may contain either a single event specifier (A,B,C, or D) or multiple event specifiers used in logical combination. The event specifiers may be AND'd (.), OR'd (+), NOT'd (~) or Exclusive OR'd (X). For example, GO A would look for the event specified in the A field as a trigger. GO A.B would use "A.B" or A and'd with B as a trigger. This is useful for specifying an address or data range to trigger as shown in Figure 10.8. The high speed sampling mode will work in parallel with the main data capture activity and will be keyed on the occurrence of the trigger event.

GO LEVEL

In the GO Level command, the user enters the Level at which data capture is to begin. (Since there are 8 levels the user could configure one or more loops where each loop used only several of the levels - and then simply specify a different beginning point when typing GO). For example, GO L1 would start executing at L1. See the L# commands for detailed information on setting up the Levels. The level commands are very useful for executing sequential triggers, where a specific sequence of bus activity is used to generate an interrupt. Shown in Figure 10.9 is a flow chart of a typical application which can be accomplished via the Level commands. The high speed sampling mode will work in parallel with the Go Level data capture activity, keying on the occurrence of the trigger event.

GO HS(C)

The GO HS and GO HSC commands initiate data capture for the histogram analysis of signals. GO HS will compute percentages for the histogram values. GO HSC will display the actual counts. The GO HS(C) commands will capture data in the mode specified by the "S" command. To monitor the Bus Usage by bus grant level, the user would select Synchronous sampling, and select the 4 BG signals for monitoring via the "H" command. Next, type "GO HS" and the system will show the percentage of bus cycles at each Bus Grant level. Up to 8 signals or combinations of signals may be monitored using the GO HS commands. It can be very useful to specify combinations of signals (or states on the bus). The user can specify any combination of signals via the event specifiers (A,B,C, and D) and then select these conditions as histogram signals. The user may specify particular data patterns, address modifiers, or other signal combinations for histogram analysis. Figure 10.10 shows GO HSC screens. The trace qualifiers can also be used when running the histograms. This enables the user to select only certain bus activity for analysis.

GO HR(C)

The GO HR and GO HRC commands initiate data capture for the histogram analysis of address ranges. GO HR will compute percentages for the histogram values. GO HRC will display the actual counts. The GO HR(C) commands will capture data in the mode specified by the "S" command - although address range usage is typically monitored in synchronous mode - so that only one sample per bus cycle is stored. Up to 8 address ranges may be monitored at the same time via the GO HR commands.The address ranges to be monitored are specified via the R# commands. Figure 10.11 is a typical GO HR(C) command. The trace qualifiers can also be used when running the address range histograms. This enables the user to select only certain bus activity for analysis. For example, to monitor specific address ranges when capturing data asynchronously-Simply qualify the trace so that only cycles with FRAME true are considered. Then select the address ranges of interest via the R commands.

```
PCI MATCH SPECIFICATION A
 <===== 64 BIT ====>! <===== 32 BIT ====>!F I T S L I D          P S!
              P R A!               P R G!R R R T O S S      C R E E!
  ADDRESS C/BE A E C!  ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT
   DATA   7654 R Q K!   DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210
--------------------!--------------------!-------------------------!----
=XXXXXXXX XXXX X X X >XXXXX100 XXXX X X X X X X X X X XXXX X X X X XXXX

PCI MATCH SPECIFICATION B
 <===== 64 BIT ====>! <===== 32 BIT ====>!F I T S L I D          P S!
              P R A!               P R G!R R R T O S S      C R E E!
  ADDRESS C/BE A E C!  ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT
   DATA   7654 R Q K!   DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210
--------------------!--------------------!-------------------------!----
=XXXXXXXX XXXX X X X <XXXXX200 XXXX X X X X X X X X X XXXX X X X X XXXX

GO A.B
```

FIGURE 10.8 GO WITH TRIGGER A.B

```
PCI>GO HS

SIGNAL HISTOGRAM
SAMPLES   SIGNAL1  SIGNAL2  SIGNAL3  SIGNAL4  SIGNAL5  SIGNAL6  SIGNAL7  SIGNAL8
            FRM       A2       A3       A4       D1       D4      IRY      TRY
-------------------------------------------------------------------------------
 00001      50%      50%      50%      41%      00%      00%      65%      65%
PCI>GO HSC

SIGNAL HISTOGRAM
SAMPLES   SIGNAL1  SIGNAL2  SIGNAL3  SIGNAL4  SIGNAL5  SIGNAL6  SIGNAL7  SIGNAL8
            FRM       A2       A3       A4       D1       D4      IRDY     TRY
-------------------------------------------------------------------------------
 00001     00512    00512    00416    00000    00000    00000    00664    00664
PCI>
```

FIGURE 10.10 SIGNAL HISTOGRAMS

```
PCI>GO HR

ADDRESS RANGE HISTOGRAM
SAMPLES   RANGE 1  RANGE 2  RANGE 3  RANGE 4  RANGE 5  RANGE 6  RANGE 7  RANGE 8
         FF080000 FF080000 00000000 00000000 00000000 00000000 00000000 00000000
         FF080060 FF090000 00000000 00000000 00000000 00000000 00000000 00000000
-------------------------------------------------------------------------------
 00001     100%     100%      23%      43%      19%      00%      00%      00%
PCI>GO HRC

ADDRESS RANGE HISTOGRAM
SAMPLES   RANGE 1  RANGE 2  RANGE 3  RANGE 4  RANGE 5  RANGE 6  RANGE 7  RANGE 8
         FF080000 FF080000 00000000 00000000 00000000 00000000 00000000 00000000
         FF080060 FF090000 00000000 00000000 00000000 00000000 00000000 00000000
-------------------------------------------------------------------------------
 00001     01024    01024    00234    00440    00192    00000    00000    00000
PCI>
```

FIGURE 10.11 ADDRESS RANGE HISTOGRAMS

H
SELECT HISTOGRAM SIGNALS

SYNTAX: H
DESCRIPTION:

The H command is used to select the signals and or combinations of signals to be monitored via the GO HS(C) commands. The user may select any of the PCIbus signals, the external inputs, or the event specifiers for performance analysis.

To use the H command, simply type "H" and return. The complete selection of available signals will be displayed. Use the return key to position the cursor under the signals of interest, and select the signal to active (A) by hitting the space bar.

To move to a previous field in the display, type <. To exit the H command, and return to command mode, hit ESC.

To move to the next field in the display, hit return/enter.

Note, if the user selects an event specifier as one of the signals, be sure to set the event specifier to the signals or bus state.

Figure 10.12 illustrates the H screen.

```
SELECT HISTOGRAM SIGNALS

 <=========== 64 BIT ===========>! <============ 32 BIT ===========>
 AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA! AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
 DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD! DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD
 6666555555555444444444333333333! 33222222222211111111110000000000
 3210987654321098765432109876543 2! 10987654321098765432109876543210
 ---------------------------------!---------------------------------
 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

 <= 64 BIT => ! <= 32 BIT => !F I T S L I D          P S!    !
       P R A !        P R G !R R R T O S S      C R E E!    !  MATCH
   C/BE A E C !   C/BE A E N !M D D O C E E INTR L S R R! EXT!CONDITION
   7654 R Q K !   3210 R Q T !E Y Y P K L L DCBA K T R R!3210! A B C D
--------------!--------------!-------------------------!----!---------
   XXXX X X X     XXXX X X X  X X X X X X X XXXX X X X X XXXX  X X X X
```

FIGURE 10.12

HELP / HELP MORE

SYNTAX: HELP / HELP MORE
DESCRIPTION:

The Help and Help More commands display summary listings of all of the PCIbus Analyzer commands. Figure 10.13 shows the two HELP screens.

The Help commands also provide on-line help to the user for all of the key analyzer commands. For instance, on-line information regarding the GO command can be obtained by typing HELP GO. This is a valuable tool to assist the user when the manual is not readily available.

```
PCI>HELP


********************************** HELP **********************************
COMMAND:
****************************** COMMAND SUMMARY ******************************
----------- TRACE CAPTURE -----------        ----------- BUS CONTROL -----------
GO          -START EVENT CAPTURE            BR,BRS,BRL -WORD,BYTE,LONG READ
GO F        -START CAPTURE FOREVER          BW,BWS,BWL -WORD,BYTE,LONG WRITE
GO(TRIG)    -CAPTURE USING TRIGGER          BS,BSS,BSL -WORD,BYTE,LONG MODIFY
GO(LEVEL)   -CAPTURE USING LEVEL
GO HR(C)    -RANGE HISTOGRAM (COUNT)        BRB, BRBL  -WORD, LONG BLOCK READ
GO HS(C)    -SIGNAL HISTOGRAM (COUNT)       BWB, BWBL  -WORD, LONG BLOCK WRITE


----------- TRACE BUFFER ------------
P           -DISPLAY NEXT PAGE              BR64       -PCI64 BLOCK READ
P-          -DISPLAY PREVIOUS PAGE          BW64       -PCI64 BLOCK WRITE
P(F) (F1,F2)-DISPLAY AT FRAME NUM
PS(1-8)     -SEARCH TRACE                   BM         -BUS REQUEST/MODIFIER
PM(1-8)     -SET SEARCH CONDITION           BC(1-8)    -SET BUS CONDITION
PD          -SELECT TRACE DISPLAY           BA(1-8)    -SEND BUS CONDITION
PE(F1,F2)   -DISPLAY ELAPSED TIME           BI(1-7)    -SEND BUS INTERRUPT/ACK
----------- TRIGGER SETUP -----------       BT         -BACKPLANE TEST
A B C D     -SET MATCH CONDITIONS           BP         -BUS CONTROL ON/OFF
L(1-8)      -SET LEVEL CONDITIONS
TP          -TRIGGER POSITION
O           -OCCURRENCE COUNT
TO          -TRACE QUALIFIER
 TYPE "HELP MORE", "HELP VSB", "HELP GEN" OR "HELP VXI" FOR ADDITIONAL COMMANDS
******************************************************************************
PCI>HELP MORE


********************************** HELP **********************************
COMMAND:
************************** COMMAND SUMMARY CONTINUED ************************
----------- CONFIGURATION ---------          ---------- MISCELLANEOUS ---------
S         -SELECT SAMPLE CLOCK              CL(1-8)   -COMMAND LINE SETUP
H         -SELECT HISTOGRAM SIGNALS         CA(1-8)   -COMMAND LINE ACTIVATION
R(1-8)    -SELECT HISTOGRAM RANGES          T         -SELF TEST
W         -SELECT WAVEFORM SIGNALS          I         -CLEAR CURRENT SETUP
SS(1-8)   -STORE SETUPS                     SO        -TURN ON GO STATUS
RS(1-8)   -RECALL SETUPS                    SF        -TURN OFF GO STATUS
SP(1-8)   -STORE SCREEN PAGES               WR        -WRITE RAW SETUP DATA
RP(1-8)   -RECALL SCREEN PAGES              RR        -READ RAW SETUP DATA
DS        -DISPLAY SETUP                    VER       -READ VERSION NUMBER
CF        -CONFIGURE OPTIONS                HELP(CMD) -HELP SUMMARY (DETAIL)
------- HIGH SPEED COMMANDS -------         V         -READ BUS VOLTAGES
HSP       -DISPLAY TRACE                    RT        -READ TEMPERATURE
HSPD      -SELECT TRACE DISPLAY             CS        -CLOCK SET
HSPE      -DISPLAY ELAPSED TIME             CR        -CLOCK READ
HSTP      -TRIGGER POSITION                 LED OFF/ON-RED LED CONTROL
HSS       -SELECT SAMPLE SPEED              ------ PRINTER/PASSTHRU PORT -----
HSW       -SELECT SIGNALS (8 MAX)           CTRL-T    -PASSTHRU TOGGLE
                                            CTRL-P    -PRINT SCREEN
M         -CAPTURE/COMMAND TOGGLE           CTRL-O    -PRINT ECHO TOGGLE
******************************************************************************
PCI>
```

FIGURE 10.13 HELP SCREENS

I
INITIALIZE ANALYZER

SYNTAX: I
DESCRIPTION:

The "I" command initializes the analyzer and resets all of the analyzer parameters to factory default settings. Following is a summary of the factory default settings:

```
S = SYNC
      TP= 1/2
      A,B,C, and D SET TO X's (Don't Cares)
      OCCURRENCE COUNT = 1
      TRACE DISPLAY = SIGNAL
      TRACE QUALIFIER = ALL
```

L#
LEVEL SETUP

SYNTAX: L# (# is in the range 1-8)
DESCRIPTION:

The L# commands are used to setup the data capture parameters for each of the 8 different program levels. At each level the user can specify the following information :

Sampling Mode
Trace Qualifier
Occurrence Count
Trigger Event
Trigger Yes/No

The Level commands are basically IF or CASE statements as commonly used in programming. They enable the user to perform tasks such as triggering on a sequence of events, or capturing very specific data in a loop. Once the L# commands are setup, the GO L# commands are used to initiate data capture. Figure 10.14 shows a typical setup of the level commands and associated setup parameters.

```
*************************** PCI MATCH CONDITIONS ****************************
  <===== 64 BIT ====>! <===== 32 BIT ====>!F I T S L I D          P S!
               P R A!               P R G!R R R T O S S      C R E E!
   ADDRESS C/BE A E C!  ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT
    DATA   7654 R Q K!   DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210
--------------------!--------------------!--------------------------!----
A=XXXXXXXX XXXX X X X =XXXXXXXX XXXX X X X 0 X X X X X X XXXX X X X X XXXX
B=XXXXXXXX XXXX X X X =XXXXXXXX XXXX X X X X X X X X X X XXXX X X X X XXXX
C=XXXXXXXX XXXX X X X =XXXXXXXX XXXX X X X X X X X X X X XXXX X X X X XXXX
D=XXXXXXXX XXXX X X X =XXXXXXXX XXXX X X X X X X X X X X XXXX X X X X XXXX

***************************** PROGRAM LEVELS ******************************
LEVEL   IF EVENT   OCCURS   THEN - TRIG?    ELSE - TRIG?    TRACE        CLOCK
-------------------------------------------------------------------------------
  1      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  2      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  3      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  4      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  5      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  6      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  7      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
  8      ALL        00001  GO TO 1   NO    GO TO 1   NO    ALL          SYNCH
PRESS ANY KEY FOR MORE SETUP INFORMATION (ESC TO EXIT)
```

FIGURE 10.14

LED ON/OFF
FRONT PANEL RED USER LED ON/OFF

SYNTAX: LED ON, LED OFF
DESCRIPTION:

The PCI550 has a RED user switchable LED. This LED may be turned on/off by the user via the LED ON and LED OFF commands. This is very useful as a visual indicator that an event has occurred in the system.

For example, in a command file, the user could set the analyzer up to trigger on the occurrence of a certain event, have the TP at the end of the buffer, and then turn the LED ON and then off as a visual indicator that the event occurred. The LED could also be a visual indicator that a loop which is being performed is complete. A typical command file use for this feature follows:

STEP #	COMMAND	DELAY	NEXT
CL1	RS1	0	2
CL2	GO A	0	3
CL3	LED ON	0	4
CL4	LED OFF	3	1

M
MODE SWITCH

SYNTAX: M
DESCRIPTION:

The PCIbus Analyzer can perform different operations simultaneously. For example, the analyzer can be capturing data or histograms - and simultaneously be outputting data on the bus in master or bus stimulus mode. To do this the user switches between "modes" of operation by typing M.

One example, is to enter a GO command which will initiate one of the analyzer's data capture functions. Then, type CTRL M which returns the user to command mode. At this point the user can do a variety of tasks including checking the voltage or temperature, or running the Bus Master functions. To return to capture mode to check the status of the data capture, simply type M again.

Note: the data capture function must be activated in for the M command to operate. The M command causes the data capture mode to work in the background - so that other operations can be performed. If the user wants to capture and transmit data simultaneously over the PCIbus - the data capture activity must be initiated first via a GO command. Then the user can jump back to command mode - putting the capture activity into the background. THE ANALYZER HISTOGRAM FUNCTIONS CAN NOT BE RUN IN BACKGROUND MODE. THE GO, GO F, GO WITH TRIGGER, AND GO LEVEL COMMANDS CAN BE RUN IN CONJUNCTION WITH THE "M" FUNCTION.

O
OCCURRENCE COUNTING

SYNTAX: O
DESCRIPTION:

The occurrence count command "O" is used in conjunction with the GO, and GO with Trigger commands. This command specifies the number of times the trigger event must occur before the analyzer is actually triggered. After typing "O" and return, the message "TRIGGER AFTER 01 TIMES" appears. The cursor is under the 01 field, which can then be changed to a number in the range 1 to 65535 via the keyboard. After entering a new number, hit return to exit the command.

When the Level commands are being used, the occurrence count which is specified as part of the Level setup is used - not the count specified via the "O" command.

P/PD/PS/PM/PE
PRINT COMMANDS

SYNTAX: P/HSP
P#,#
PS# (# RANGE IS 1-8)
PM# (# RANGE IS 1-8)
PE#,#
PD
DESCRIPTION:

The Print commands provide the tools to search and output the trace buffer data from the trace buffer.

PD

The PD commands are used to select which data to display and the format for the display. There are 4 types of trace display for both the primary trace buffer - SIGNAL, SIGNAL/TIMING, WAVEFORM, AND RAW. To select a display mode, type PD and hit return. The analyzer will prompt with the following screen:

PCI>PD
TRACE DISPLAY TYPE = SIGNAL

Use the space bar to toggle between the display options and then hit return to exit the command.

SIGNAL is basically a state display of the PCIbus signals captured in the trace buffer. Figure 10.15 is a typical PCI signal display.

SIGNAL/TIMING provides the interval between consecutive cycles in addition to the state information. The interval time is defined to be the time from the beginning of the prior sample to the beginning of the current sample. In the case of SYNCHRONOUS sampling, the time interval would be the time from the Clock for the prior sample to the Clock of the current sample. Figure 10.16 is a typical signal/timing display.

WAVEFORM display provides a graphical waveform output of signals. Figure 10.17 is a typical waveform display. To scroll through the data, simply hit return.

RAW mode is a binary output mode and is used primarily for uploading data to a host rather than for display to a screen or printer. The format for the RAW mode data is available upon request.

P/P#

The P commands output the data in the trace buffer to the screen. There are a number of different options for outputting the data of interest. The P command will display a page of data beginning at the current pointer location in the format selected via the PD command. P- will output the prior page. Once a page is output, the user can repetitively hit RETURN to scroll through the data in the buffer. The P#,# command will output data beginning with the first sample specified after the command name. For example P1 will output a screen of data beginning at the first sample after the trigger. (The TRIGGER is always the 0 sample). If a second number is specified, the analyzer will output data up to the sample number specified by the second number. For example, 10,1000 will output the data for samples 10 to 1000 from the buffer. This is useful for visually scanning data, or for uploading the data to a host. The data will be output in the format specified by the PD command. *To HALT printing, hit CTRL C.*

NOTE: AFTER TYPING A P, P+, P-, COMMAND, THE USER MAY SIMPLY HIT THE RETURN KEY TO SCROLL TO THE NEXT SCREEN.

PE#,#

The PE commands compute a delta time or elapsed time between the sample numbers specified. For example, PE10,1000 will compute the elapsed time between samples 10 and 1000 by adding up the individual interval times.

PS#/PM#

The PS command enables the user to search through the trace buffer data for specific information. The user may search for one condition or for a sequence of information. Up to 8 conditions can be specified. To specify a condition for searching, type PM# where the # is in the range 1 to 8. The analyzer will prompt with all of the available signal choices. Use the return/enter key to position the cursor under the signals of interest and use the space bar to toggle the signal to the desired state (0 or 1) - or in the case of the address, data, and address modifier fields, enter hex digits.To search for a sequence of signals, the field at the end of the PM display is used. By entering a number between 1 and 8 in this field the user can point to the next condition to be searched for. The analyzer will automatically begin looking for this condition after detecting the current one. To search for only one condition, or to flag that this is the last condition in the sequence - enter 0 in the NEXT field. To actually begin the search, type PS# - where the number is the condition which the user wishes to search for. Repeating the PS# command will search for next occurrence in the buffer. Figure 10.18 is a typical PM screen for searching for a sequence of events in the buffer.

```
******************** TRACE STARTED AT  06:43:40   06/27/94 ********************
       CYCLES BEFORE TRIGGER = 065535       CYCLES AFTER TRIGGER = 065535
=======!<===== 64 BIT ====>!<===== 32 BIT ====>!F I T S L I D          P S!
       !              P R A!              P R G!R R R T O S S      C R E E!
 FRAME ! ADDRESS C/BE A E C! ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT
       !  DATA   7654 R Q K!  DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210
-------!-------------------!-------------------!-------------------------!----
-000007!3CFF7332 1110 0 1 1!000F3820 0110 0 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
-000006!3CFF7332 1110 0 1 1!000F3820 0110 0 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
-000005!3CFF7332 1110 0 1 1!000F3820 0110 0 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
-000004!3CFF7332 1110 0 1 1!00000004 0000 0 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
-000003!3CFF7332 1110 0 1 1!00000004 0000 1 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
-000002!3CFF7332 1110 0 1 1!00000004 0000 1 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
-000001!3CFF7332 1110 0 1 1!00000000 0000 1 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
+TRIG  !3CFF7332 1110 0 1 1!00000000 0000 0 1 1!0 1 1 1 1 0 1 1111 0 1 1 1!1111
+000001!3CFF7332 1110 0 1 1!00000000 1110 0 1 1!1 0 1 1 1 0 1 1111 0 1 1 1!1111
+000002!3CFF7332 1110 0 1 1!08080808 1110 0 1 1!1 0 1 1 1 0 0 1111 0 1 1 1!1111
+000003!3CFF7332 1110 0 1 1!08080808 1110 1 1 1!1 0 1 1 1 0 0 1111 0 1 1 1!1111
+000004!3CFF7332 1110 0 1 1!08080808 1110 1 1 1!1 0 1 1 1 0 0 1111 0 1 1 1!1111
+000005!3CFF7332 1110 0 1 1!08080808 1110 1 1 1!1 0 1 1 1 0 0 1111 0 1 1 1!1111
+000006!3CFF7332 1110 0 1 1!08080808 1110 1 1 1!1 0 1 1 1 0 0 1111 0 1 1 1!1111
+000007!3CFF7332 1110 0 1 1!08080808 1110 1 1 1!1 0 1 1 1 0 0 1111 0 1 1 1!1111
******************** TRACE STOPPED AT  06:43:40   06/27/94 ********************
```

FIGURE 10.15 BASIC SIGNAL DISPLAY

```
******************** TRACE STARTED AT  06:43:40   06/27/94 ********************
       CYCLES BEFORE TRIGGER = 065535       CYCLES AFTER TRIGGER = 065535
=======!<===== 64 BIT ====>!<===== 32 BIT ====>!F I T S L I D          P S!
       !              P R A!              P R G!R R R T O S S      C R E E!
 FRAME ! ADDRESS C/BE A E C! ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT
       !  DATA   7654 R Q K!  DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210
-------!------------------!------------------!-------------------------!----
+000008!3CFF7332 1110 0 1 1!08080808 1110 1 1 1!1 0 1 1 1 0 0 1111 0 1 1 1!1111
       !      000000080 NS                     !                           !
+000009!3CFF7332 1110 0 1 1!08080808 1110 1 1 1!1 0 0 1 1 0 0 1111 0 1 1 1!1111
       !      000000080 NS                     !                           !
+000010!3CFF7332 1110 0 1 1!08080808 1110 1 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
       !      000000080 NS                     !                           !
+000011!3CFF7332 1110 0 1 1!00000003 0000 1 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
       !      000000080 NS                     !                           !
+000012!3CFF7332 1110 0 1 1!00000003 0000 0 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
       !      000000080 NS                     !                           !
+000013!3CFF7332 1110 0 1 1!00000000 0000 0 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
       !      000000080 NS                     !                           !
+000014!3CFF7332 1110 0 1 1!00000000 0000 0 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
       !      000000080 NS                     !                           !
+000015!3CFF7332 1110 0 1 1!00000000 0000 0 1 1!1 1 1 1 1 0 1 1111 0 1 1 1!1111
       !      000000080 NS                     !                           !
******************** TRACE STOPPED AT  06:43:40   06/27/94 ********************
```

FIGURE 10.16 SIGNAL AND TIME TAG DISPLAY

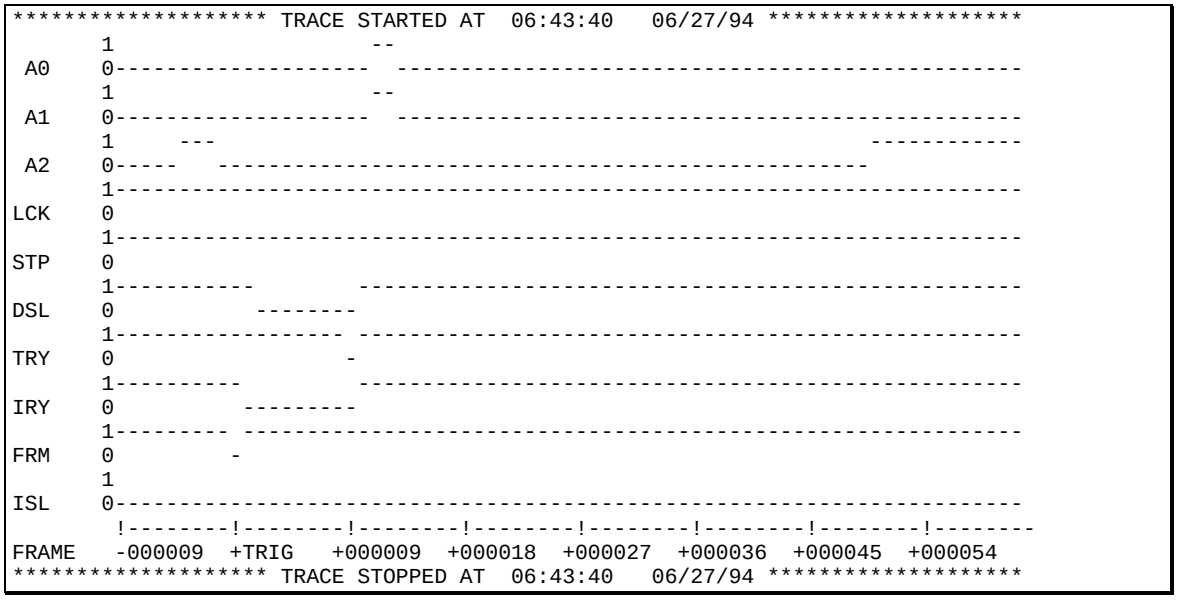


FIGURE 10.17 WAVEFORM DISPLAY

```
TRACE BUFFER MATCH SPECIFICATION 1
 <===== 64 BIT ====>! <===== 32 BIT ====>!F I T S L I D          P S!    !NXT
              P R A!              P R G!R R R T O S S      C R E E!    !
  ADDRESS C/BE A E C!  ADDRESS C/BE A E N!M D D O C E E INTR L S R R! EXT!
   DATA   7654 R Q K!   DATA   3210 R Q T!E Y Y P K L L DCBA K T R R!3210!
--------------------!--------------------!-------------------------!----!---
=XXXXXXXX XXXX X X X =XXXXXX20 XXXX X X X X X X X X X XXXX X X X X XXXX  0
```

FIGURE 10.18 MATCH CONDITION TO SEARCH FOR BUS CYCLE WITH ADDR 20 IN LAST 2 DIGITS

R
ADDRESS RANGE SETUP

SYNTAX: R# (# IS IN THE RANGE 1-8)
DESCRIPTION:

The R commands setup the address ranges to be monitored by the address range histogram function. Up to 8 address ranges can be monitored by the analyzer.

To enter an address range, type R# where the # is in the range 1-8, then hit return. The analyzer will prompt for the starting address and the ending address.

After specifying the address ranges, the GO HR(C) commands are used to activate the address range histograms.

Figure 10.19 shows a typical address specification screen.

```
PCI>R1

HISTOGRAM RANGE 1
LOW VALUE  = FF0F0000
HIGH VALUE = FF080060

PCI>R2

HISTOGRAM RANGE 2
LOW VALUE  = FF080000
HIGH VALUE = FF090000
PCI>
```

FIGURE 10.19

RR/WR
READ RAW/WRITE RAW

SYNTAX: RR#,# OR WR#,#

DESCRIPTION:

In order to facilitate efficient setup of the analyzer when a computer is used as a host, two commands are available which enable the user to read and write from the analyzer's setup RAM directly. These locations store the analyzer setup parameters, and also store the cache data which may be output on the PCIbus via Bus Writes.

The Read Raw and Write Raw commands read and write binary user setup data directly in to the analyzer's ram. A memory range of locations is specified as part of the command.

For example, WR 100,200 will write data to analyzer memory locations 100 to 200 in binary format. The binary string of data would follow the command.

Care must be taken when using these commands, as the RAM contains all of the analyzer setup information, and loading incorrect or bogus data, can cause the analyzer to perform incorrectly.

A list of the setup parameters is available on request.

S
SAMPLING MODE

SYNTAX: S
DESCRIPTION:

The "S" command specifies the sampling mode for the PCIbus 500 Analyzer. The analyzer may either clock data in synchronously with bus activity, or asynchrously in fixed time increments. To select the sampling mode, type "S" and then return. The analyzer screen will display:

SAMPLING CLOCK = SYNC

The underlined field can be toggled through the available options by hitting the space bar.

SYNCHRONOUS

In synchronous mode, the analyzer will sample the bus upon the rising edge of the sysstem clock. This will store one sample per bus cycle. The analyzer can sample synchronously at up to 50 Mhz - exceeding the PCIbus specification. This insures that the analyzer will not miss any bus cycles in even the fastest PCI systems.

ASYNCHRONOUS

In asynchronous mode, the analyzer will sample the bus in fixed time increments. The PCI550 provides a range of sampling speed options, from .78Mhz up to 50 Mhz. The user selects the sampling speed by hitting the space bar. Following is a matrix of the sampling speed options vs the sampling period:

FREQUENCY	PERIOD
50 Mhz	20 nanoseconds
25 Mhz	40 nanoseconds
12.5 Mhz	80 nanoseconds
6.25Mhz	160 nanoseconds
3.13 Mhz	320 nanoseconds
1.56 Mhz	640 nanoseconds
.78 Mhz	1280 nanoseconds

SO/SF
STATUS ON/OFF

SYNTAX: SO / SF
DESCRIPTION:

The SO and SF commands turn on/off the status display which is shown after the GO command while the analyzer is capturing data. The Status display outputs the trigger status, the number of cycles before the trigger, and the number of signals after the trigger. Turning this display off, helps to minimize the amount of data output/uploaded via the serial port - which can be important when the analyzer is connected to a modem in a remote application or connected to a host computer.

The status would typically be ON when the analyzer is used interactively with a terminal.

SP/RP
STORE/RECALL PAGE

SYNTAX: SP# (# IS IN THE RANGE 1-8)
RP# (# IS IN THE RANGE 1-8)
DESCRIPTION:

The PCI550 Analyzer can store up to 8 terminal screens in memory for recall. Any screens may be stored - including waveform displays, histograms, command file listings etc. This feature is very useful for storing information for subsequent review. For instance, if the user does not have a printer, and wants a copy of the results of a histogram analysis for comparison to other tests, the SP command can be used to store the histogram screen. The user can then recall this screen at will.

Another use for this feature is to store command file listings or bus stimulus condition summary for review.

Each screen is 80 columns by 24 lines.

To store a screen or page, type SP# where the number is in the range 1-8. To recall the screen or page to the terminal for display, type RP#.

SS/RS
STORE/RECALL SETUPS

SYNTAX: SS# (# IS IN THE RANGE 1-8)
RS# (# IS IN THE RANGE 1-8)

DESCRIPTION:

The SS and RS commands store and restore the analyzer's setup parameters and command files. All user selectable parameters are stored - including the current command file setting.

The analyzer will store up to 8 complete setups, in addition to the current setup. To store the current setup, simply type "SS#" where the # is in the range 1-8. To restore a previously stored setup as the ACTIVE setup, type "RS#".

The RS commands can be used as part of a command file, to load in a new command file and setup. Using this feature, command files can be "CHAINED" together to form longer programs. To do this, simply have the RS command be the last entry in the command file, and have the NEXT field point to command line 1. When the RS command is executed, a new command file will be loaded - and begin executing at the first line in that command file.

T
SELF TEST

SYNTAX: T

DESCRIPTION:

The analyzer has built in diagnostics to test the analyzer's key circuitry. The analyzer can perform a complete end to end test - including a test of the transciever logic. Note however, testing the transceiver logic entails outputting signals on the backplane.

Following is the self test screen:

```
PCI> T

  BUS INTERFACE TEST..............PASS
  PROCESSOR TEST..................PASS
  LCA TEST........................PASS
  TRACE BUFFER TEST...............PASS
  SELF TEST SUMMARY...............PASS
```

TO
TRACE QUALIFIER

SYNTAX: TO
DESCRIPTION:

The TO (TRACE ONLY) command is used to setup the trace qualifiers for the analyzer. The trace qualifiers determine which samples will actually be stored in the trace buffer or used for the histogram analysis. To enter a trace qualifier, type "TO" and return. The screen will prompt as follows:

```
PCI> TO
       TRACE ALL  EVENTS
```

The underlined field can be changed via keyboard entry. The options for this field are as follows:

OPTION	DESCRIPTION
ALL	STORE ALL SAMPLES WITHOUT ANY RESTRICTIONS
EVENT SPECIFIERS	ENTER THE A,B,C,OR D EVENT SPECIFIERS EITHER SINGLY OR IN LOGICAL COMBINATION (EX."A.B+C" WHICH MEANS (A AND'D WITH B) OR C).

To exit the command hit escape or return.

The TO field is used for specifying the qualifier for the GO, and Go with Trigger commands. When the level commands are used, the trace qualifiers specified in the Level setups are used.

TP
TRIGGER POSITION

SYNTAX: TP
DESCRIPTION:

The TP command specifies the position of the trigger event in the trace buffer. The trigger can be stored at the beginning,1/4, 1/2, 3/4, or end of the trace buffer. To specify the trigger position, type "TP" and return. The following screen will be displayed:

```
PCI>TP
          TRIGGER POSITION = START
```

To change the trigger position, hit the space bar to toggle through the options. Once the desired option is selected, hit retun to exit the command.

Setting the trigger position to START, would cause the analyzer to store data only AFTER the occurrence of the trigger. Setting the trigger position to END, would cause data capture to halt upon the occurrence of the trigger - with only pre-trigger data stored. Selecting the mid-buffer option, would enable the analyzer to capture data both before and after the trigger.

V E R
S O F T W A R E / H A R D W A R E R E V

S Y N T A X : V E R
D E S C R I P T I O N :

The VER command provides a listing of the current hardware and software versions of the PCI550. The cuurent revision of the software, hardware and memory configuration will be displayed.

W
SELECT WAVEFORM DISPLAY SIGNALS

SYNTAX: W
DESCRIPTION:

The "W" command is used to select the signals for display in waveform format. Up to 10 signals can be selected for simultaneous display. To select the signals, type "W" and return. The analyzer will prompt with all of the signal options. Simply move the cursor under the signals of interest via the enter/return key, and then hit the space bar to select the signal to ACTIVE (an A will appear under the signal name). To deselect a signal, just hit the space bar to toggle the "A" to an "X".

To move to a prior field in the "W" display, type "<". To exit the command or move to the additional signal options , hit the ESC key.

Figure 10.27 illustrates the waveform selection screen.

```
SELECT TIMING WAVEFORM SIGNALS

 <=========== 64 BIT ===========>! <============ 32 BIT ===========>
 AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA! AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
 DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD! DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD
 6666555555555444444444333333333! 33222222222211111111110000000000
 32109876543210987654321098765432! 10987654321098765432109876543210
 ---------------------------------!---------------------------------
 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

 <= 64 BIT => ! <= 32 BIT => !F I T S L I D          P S!
       P R A !        P R G !R R R T O S S     C R E E!
   C/BE A E C !   C/BE A E N !M D D O C E E INTR L S R R! EXT
   7654 R Q K !   3210 R Q T !E Y Y P K L L DCBA K T R R!3210
--------------!--------------!-------------------------!----
   XXXX X X X     XXXX X X X  X X X X X X X XXXX X X X X XXXX
```

FIGURE 10.27