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User's Manual

VBT-325 - VME Bus Analyzer

Including XMEM325-PB

Version 2.0 Valid for Firmware Version 5.5x / BusView 2.5x

VBT-325B	VMEbus Analyzer
VBT-325C	VMEbus & VSB/SCSI/P2 Analyzer
XMEM325-PB	Extended Trace memory for the VBT-325

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Preface

This Manual

This manual covers the VBT-325 and the XMEM325-PB piggyback module, and corresponds to firmware versions 5.5x / BusView 2.5x.

The XMEM325-PB is described separately only under the “XMEM325-PB Piggyback Module”, “Product overview” and “Installation”. All other instructions governing the operation of the piggyback module are identical to those for the VBT-325, and is found in the general text.

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The Bus Analyzer concept

A Bus Analyzer is a pre-configured logic analyzer designed as a plug-in card for a specific bus, conforming to the logical, electrical and mechanical specification of the target bus. The primary use of a Bus Analyzer is to monitor the activity on a back plane bus and provide a trace of bus cycles between modules on the bus, presenting this as alphanumeric trace lists or as waveforms on a standard ASCII terminal. This is done without the need for connecting and configuring large numbers of probes to the back plane, a time-consuming and error-prone process necessary with general-purpose logic analyzers. Statistics analysis in bus systems is also an important application for bus analyzers.

A basic idea behind bus analyzers is that the analyzer is "hard-wired" to capture the protocol of the target bus, thereby reducing the need for the user to understand all the details of the bus protocol in order to perform meaningful analysis of activity in the target system. This offers the user maximum productivity and convenience during development, debugging, testing and verification of bus based computer systems.

VMETRO is a company totally committed to building the finest Bus Analyzers, and is recognized in development labs around the world as providing superior tools for developers and manufacturers of bus based computer equipment. With the VBT-325, VMETRO offers the fourth generation, state-of-the art product based on 10 years of experience in building bus analyzers.

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1. GETTING STARTED

1.1 Getting Started with BusView

This is a short introduction to the VME Bus Analyzer VBT-325, including references to sections throughout the manual. The VBT-325 has a lot of powerful features (see Section 3.1.2), but the essence is that the user defines a signal pattern (in the Event Patterns window), the tracer recognizes the pattern when it occurs on the PCI bus (triggering), and then fills a trace buffer with samples of the PCI bus signals in an interval around the trigger sample.

The following steps have to be carried out before BusView is ready to run:

- Install the tracer according to Section 2.2.
- Install BusView according to the description in Section 2.5.2.
- Set the communication parameters, and connect the tracer as described in Section 2.5.3.

If everything is installed correctly, BusView should now display the setup window shown in Figure 1.1. The Setup window is divided in two, the Event Patterns window, and the Sequencer window. For further information about the Setup Window, read Section 5.3.3.

Sampling The VBT-325 has two sampling modes, STATE (default) and TIMING mode. Section 3.2 includes a detailed description of the sampling modes.

`Trace/Run` Select `Trace/Run` from the menu bar, (or press the “lightning” button at the tool bar), to get a snap shot of the current bus activity. The Trace window is displayed, see Figure 1.2. The contents of the Trace window depends on the current bus traffic.

Ctrl-Tab Switch back to the Setup window by pressing the **Ctrl**-key together with the **Tab**-key, or by using the mouse. Operating BusView is described in Section 5.2.

TIMING mode Change sampling mode to TIMING mode by selecting `Edit/Sampling mode/50MHz Timing` from the menu bar. Notice that the first line in the Sequencer window now displays “Sampling in TIMIMG mode”.

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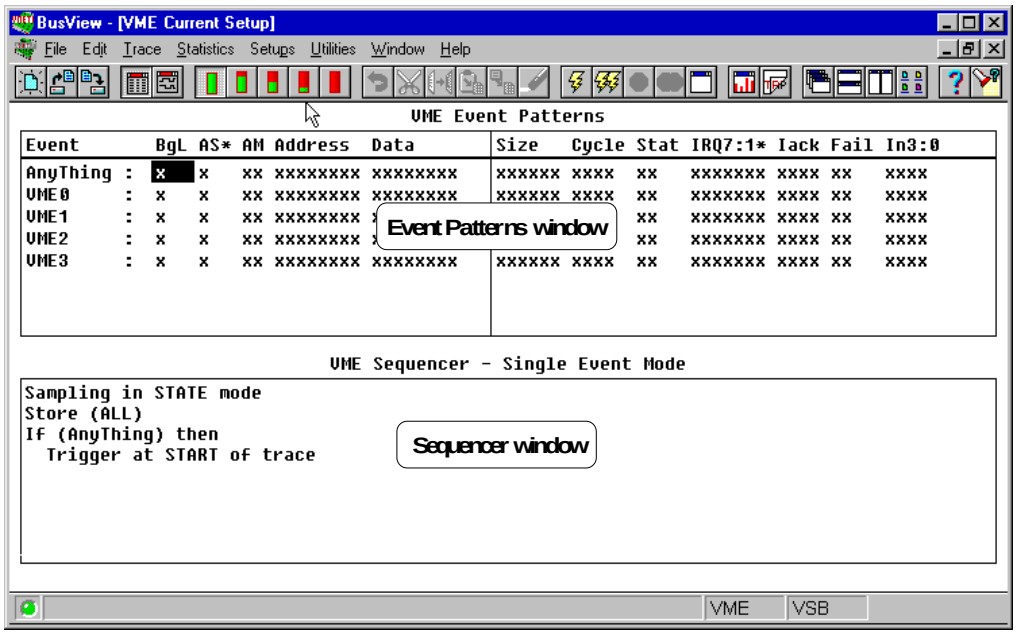


Figure 1.1 The Setup window

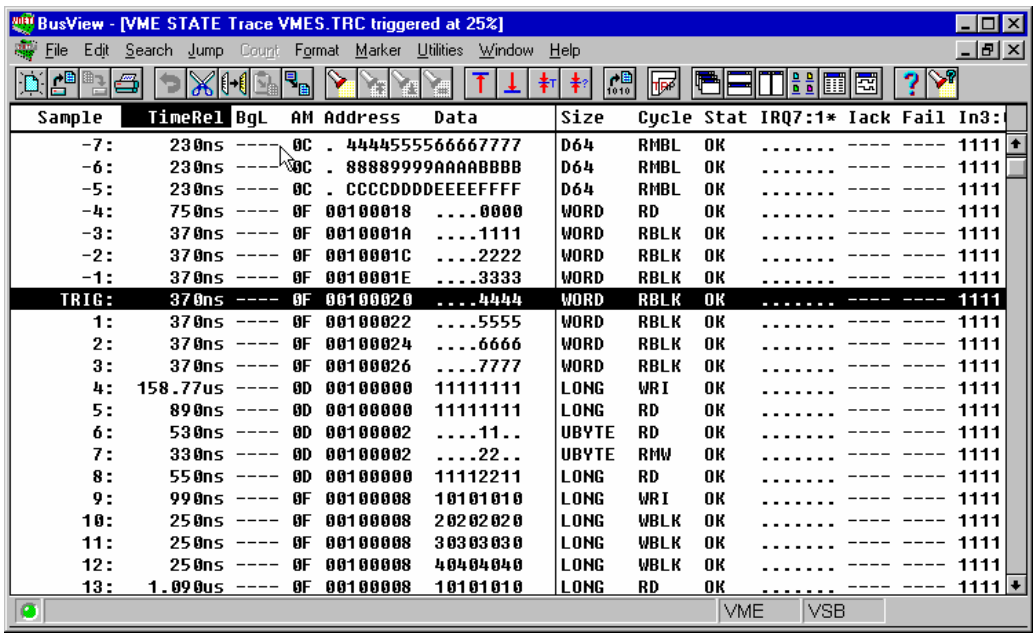


Figure 1.2 The Trace Display window

Trace/Run

Select `Trace/Run` once more, and after a few moments the **waveform** version of the Trace window appears. The waveform window is shown in Figure 1.3. To avoid sampling while the VME bus is idle, it is necessary to set up a trigger condition. Click on `AS*` in the Event Patterns window on the VME0 line and type a 0.

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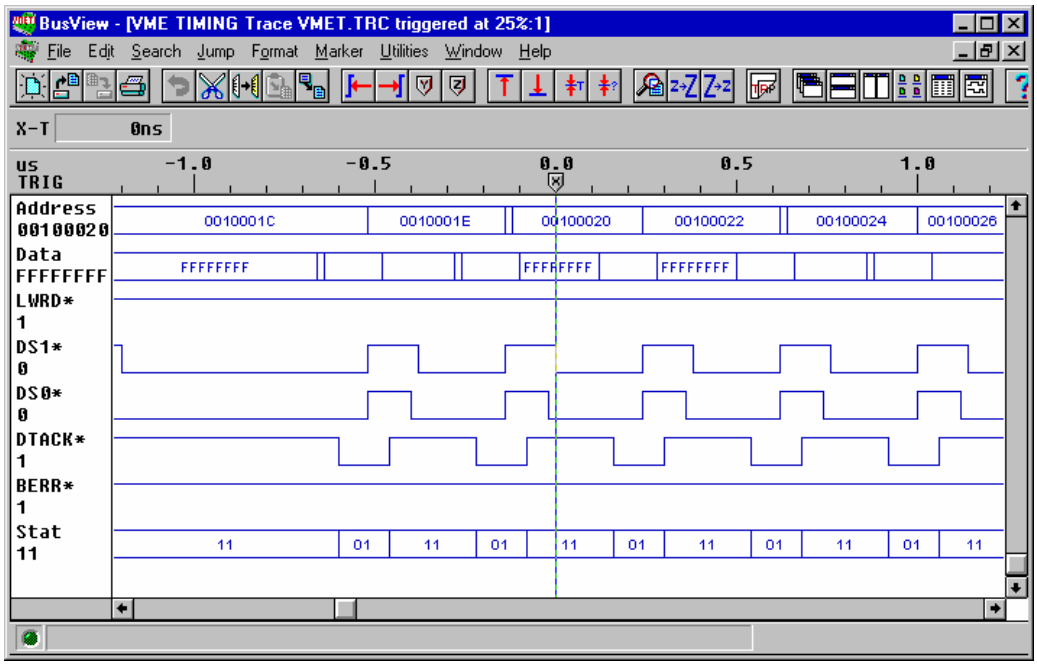


Figure 1.3 The waveform window

1.2 Getting Started Using a Terminal User Interface

The following steps have to be carried out before the terminal is ready to run:

- Install the tracer according to Section 2.2.
- Follow the instructions in Section 2.6.1 for establishing a connection between the terminal and the tracer.

If everything proceeded correctly the terminal should now display the setup screen shown in Figure 1.4. The Setup screen is divided in two, the Event Patterns window, and the Sequencer window. For further information about the Setup screen, read Section 5.3.3 and Section 9.1.3.

Sampling The VBT-325 has two main sampling modes, TIMING and STATE (default) mode. Section 3.2 includes a detailed description of the sampling modes.

`Trace/Run` Type <T> and <R> to execute the command `Trace/Run`. The Trace window displays a snap shot of the current bus activity, see Figure 1.5. The contents of the Trace window depends on the current bus traffic.

Quit Type <Q> to quit the Trace Display screen and return to the Setup screen.

TIMING mode Change sampling mode to TIMING mode by selecting `Edit/Sampling Mode/50MHz Timing` from the menu bar. Notice that the first line in the Sequencer window now displays “Sampling in TIMING mode”.

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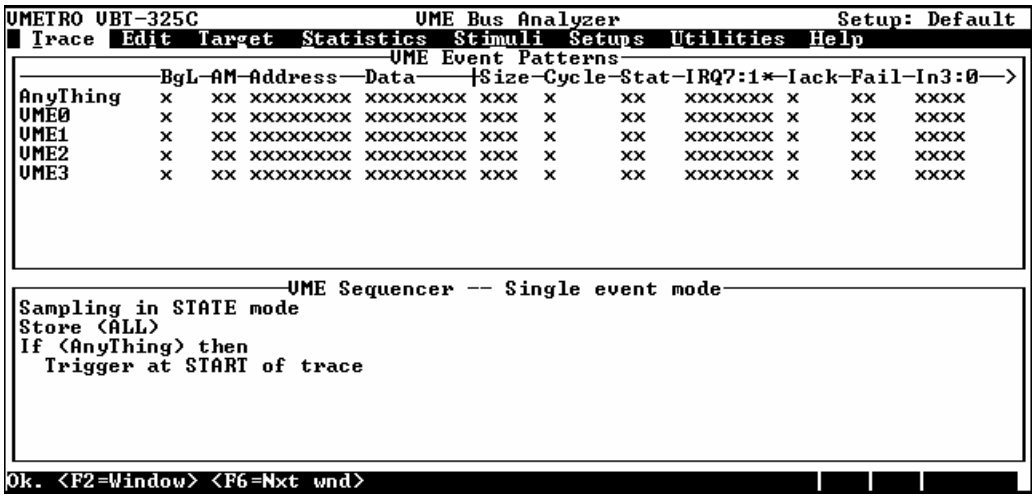


Figure 1.4 The Setup screen, terminal view

Trace/Run

Type <T> and <R> to execute the command Trace/Run once more. After a few moments the **waveform** version of the Trace window appears. The waveform window is shown in Figure 1.6. To avoid sampling while the VME bus is idle, it is necessary to set up a trigger condition. Type <i> and <e> to enable editing in the Event Patterns window. With the cursor keys, select the AS* field in the VME0 line, and type a 0.

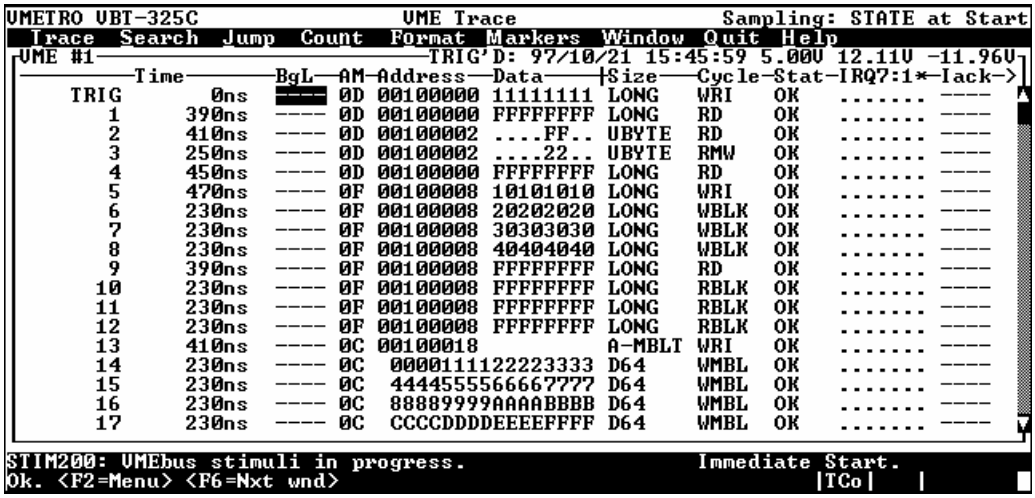


Figure 1.5 The Trace Display screen, terminal view

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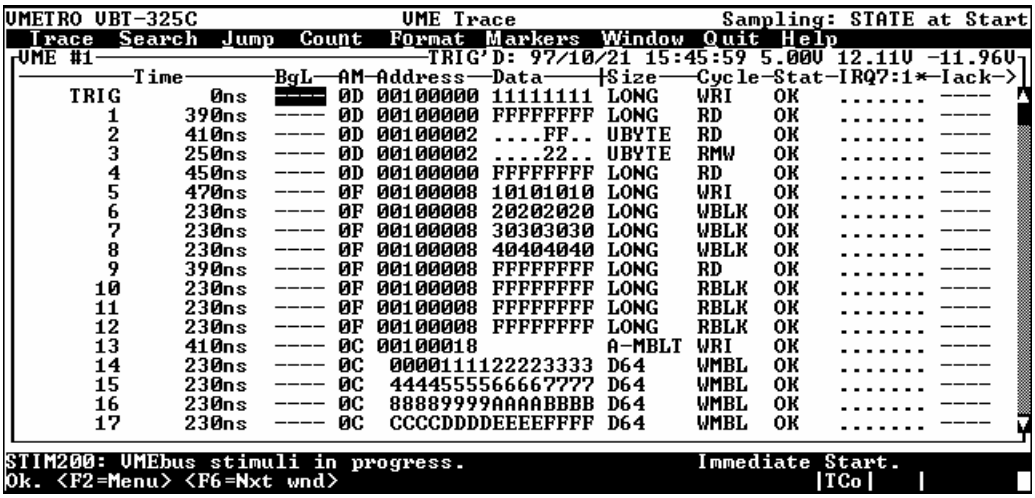


Figure 1.6 The Waveform window, terminal view

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2. INSTALLATION

2.1 Static Electricity - Precautions

Before unpacking the VBT-325 from its shipping container, make sure that it takes place in an environment with controlled static electricity. The following recommendations should be followed:

- Make sure your body is discharged to the static voltage level on the floor, table and system chassis by wearing the enclosed conductive wrist-strap, or similar.
- If a conductive wrist-strap is not available, touch the surface where the board is to be put (like table, chassis etc.) before unpacking the board.
- Leave the board only on surfaces with controlled static characteristics, i.e. specially designed anti-static table covers.
- If handing the board over to another person, touch this persons hand, wrist etc. to discharge any static potential.

2.2 Preparations

2.2.1 Inspection

Make sure that the VBT-325 you have received is according to your purchase order with respect to model. The VBT-325 model B and model C can be distinguished by looking at the label on the big MACH PLD device on the board. You will find either the text VBT-325B or VBT-325C on this label.

With the VBT-325 you should find the following accessories:

- A small plastic bag with spare jumpers (for reconfiguration of the board).
- A small plastic bag containing an anti-ESD wrist wrap.
- One BNC-to-MiniCoax cable 3ft/1m (for Ext. Input/Trigger Output).
- Diskette with the Simulator (Chapter 10) and the VT100 Terminal Emulator (Section 9.2).
- PC cable (part number 401-PC-232) if BusView is purchased.

Note! You should also inspect the board to verify that no mechanical damage appears to have occurred. Please report any discrepancies or damage to your distributor or to VMETRO immediately.

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2.2.2 Jumper Settings

Model	Target Bus	Mode (Wide/Twin)	Factory setting
VBT-325B	VME	-	x (only option)
VBT-325C	VME & VSB	Twin	x (only option)
VBT-325C	VME & SCSI	Twin	
VBT-325C	VME & P2	Twin	
VBT-325C	Futurebus+	Wide	

Table 2.1 Jumper settings

There are a number of jumpers on the VBT-325 board that define target bus, operating mode (Wide/Twin) and RS232 handshake bypass.

VBT-325C The factory setting for the VBT-325C is twin mode, VMEbus & VSB (except VSB `BGIN/OUT*` daisy-chain bypass, see Section 13.1.2).

VBT-325B For the VBT-325B, the only possible configuration is VMEbus, so there is never a need to reconfigure jumpers on this model, unless the board is upgraded to a model C or the RS232 handshake bypass between terminal/host is used.

Chapter 13 has the correct jumper setting for the other possibilities listed in Table 2.1.

2.2.3 P2 rows A and C

No pins on the P2 rows A and C are driven, connected, or grounded in the factory jumper setting. However, this may change after configuring the board for VSB and SCSI.

The jumper J64, for VSB `BGIN/OUT*`, (see Section 13.1.2) will connect P2a31-c32 when installed, and may cause problems in systems using other P2 configurations. Similarly, grounding of the SCSI bus takes place with four jumpers in field J51 (see Section 13.1.3), and these must not be in place when used with other P2 busses.

2.2.4 TTL/CMOS Input only (0-5V)

Warning! The input channels on the VBT-325 are designed for TTL/CMOS voltage levels only (0.0-5.0V), and **damage may occur if other voltages are applied**.

Max 5.25V Absolute maximum tolerated input voltage is 5.25V. If the P2 bus contains signals with voltage levels other than TTL/CMOS, (for example ECL, analogue or special power supply voltages as found in VXI systems), **these must be isolated from the VBT-325.**

(For this purpose, VMETRO offers a special adapter, the VXE-35C, which extends the VBT-325C to fit in C-size VXI systems and isolates the non-TTL signals from the back plane. Refer to a separate data sheet for detailed information.)

2.2.4.1 Isolation of P2 rows A and C

Isolation of the P2 pins with illegal voltage levels can be done in one of the following ways:

- Place the VBT-325 in a slot without the illegal voltages on the P2 connector.
- Place the VBT-325 on an extender board which isolates the signals with illegal voltage. (For VXI, use VMETRO's VXE-35C), see Section 2.2.4.

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- Customize your VBT-325 by cutting the copper tracks that are specially laid out for all P2 signals for this purpose. These can be found as a row of 32 pairs of solder pads connected with a thin copper track on each side of the board just next to the P2 connector. The pads on the bottom side are signals from P2 row C, and the pads on the top side row A. If a connection needs to be re-established, a short piece of un-isolated wire (AWG30 or similar) can be soldered between the two pads in a pair. See Section 8.3

2.3 Slot Selection

2.3.1 VMEbus

The VBT-325 can be installed in any slot in a VME back plane. However, it is recommended that the VBT-325 is located as far to the left (closest to slot #1) as possible. This ensures that the Bus Grants (`BG3-0IN/OUT*`) and `IACKIN/ OUT*` daisy-chains pass the VBT-325, and these signals are captured by the analyzer. The bus grants are of special interest since the VBT-325 contains special circuitry to sample these signals even in synchronous (STATE) sampling mode (see Section 3.2).

2.3.2 VSB

Similarly, for analysis of VSB back planes it is recommended to place the VBT-325C as far to the left as possible on the VSB back plane to ensure that the VSB Bus Grant (`BGIN/OUT*`) daisy-chain pass the VBT-325C. This is relevant if asynchronous sampling (TIMING mode) is used to see the bus arbitration process (serial arbitration).

2.3.3 Daisy-Chains

The VBT-325 will bypass the VMEbus daisy-chains `BG(3-0)IN/OUT*` and `IACKIN/OUT*` directly. The VSB `BGIN/OUT*` daisy-chain is not installed in the factory setting. The user may want to install this before using the board in a VSB system, see Section 13.1.2.

2.3.4 Slot 1

When the VDRIVE-PB piggyback module is installed, the VBT-325 may be placed in slot #1 if the VDRIVE-PB is configured as System Controller. Refer to the VDRIVE-PB User's Manual.

Note! Bus grants received by any Bus Master located to the left of the VBT-325 (lower slot number) will not be visible to the analyzer, due the nature of VME/VSB daisy-chaining. Similarly, `IACKIN/OUT*` received by any Interrupter located to the left of the VBT-325 (lower slot number) will not be visible to the analyzer.

2.3.5 User-defined P2

In order to perform bus analysis of a user-defined P2 bus, one must make sure that the slot where the VBT-325C is inserted has access to the user-defined bus on the A- and C- rows of the P2 connector. In many cases, the P2 bus is taken directly with a flat cable from the P2 connector on a VME board to an I/O device, without any form of bussing of the P2 bus

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along the back plane. In such cases, the user should insert the VBT-325C in a neighbor slot to the board that has the P2 bus, and provide an "L-shaped" extension of the flat cable to the slot of the VBT-325C (see Figure 2.1).

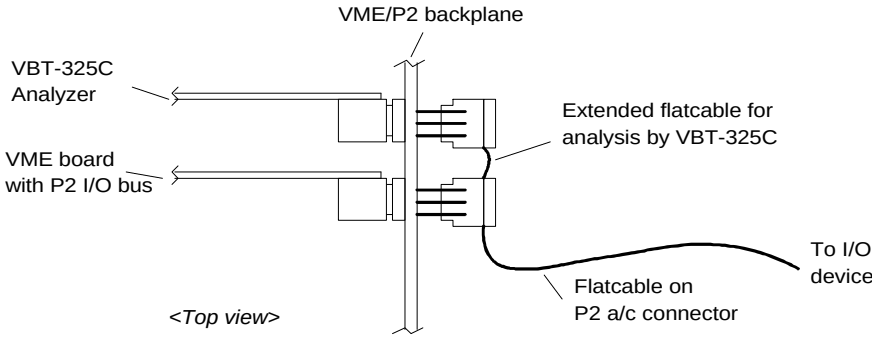


Figure 2.1 Sampling of User-defined P2 bus

Note! User-defined P2 is not supported under BusView.

2.4 Power Consumption

The VBT-325 is normally powered directly from the +5V and +/- 12V rails in the VME back plane, and it is important to make sure that the power supply in the card crate has sufficient capacity to supply the VBT-325. Current consumption is depending on operating mode, as given below:

+5V	2.8A typical when idle.
Sampling	3.7A typical @ 6MHz, VME only.
	4.8A typical @ 50MHz, VME only.
	5.4A typical @ 50MHz, VME and P2.
+/-12V	10mA typical.
	(+12V/120mA max. when programming FLASH EPROM only.)
VPC-MkII	The VPC-MkII consumes about 1.1A @ 5.0V. The consumption at 12V is as for the VBT-325.
Warning!	Make sure that the board is always powered both from the P1 and P2 connectors.

2.4.1 Air Cooling

Forced air cooling is necessary to keep the operating temperature of the VBT-325 board at reasonable levels. The power consumption varies depending on the state the board is in, from app. 14W when idle, to almost the double when sampling all channels at maximum speed.

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2.4.2 5V Readout

The front panel LED display will show the actual 5V voltage supplied to the VBT-325 when user interface is started. A reading of **at least 4.95V** is recommended when the board is idle. This normally gives sufficient margin for the increase in power consumption when the analyzer is running.

Be aware that if the VBT-325 is placed on an **extender board**, there may be excessive **voltage drop** which may need to be compensated by increasing the system voltage slightly.

2.4.3 +/-12V Supplies

The VBT-325 board uses +/-12V for powering the voltage and temperature monitoring circuitry, and it uses +12V for programming the onboard Flash EPROMs. The RS232 transceivers operate independently from the +/-12V supply.

Warning! **If the voltage on the +/- 12V pins in the back plane is higher than 12V, severe damage may occur!**

2.4.4 FLASH 12V Jumper

The +12V supply from the back plane is normally connected to the FLASH EPROM devices via jumper J67. This jumper is, by default, installed as shown in the illustration in Figure 2.2. The +12V supply is disconnected from the FLASH EPROM by moving jumper J67 to the opposite position.

Move jumper J67 to the upper position if the stability of the +12V supply is in doubt.

Moving J67 will not prevent damage to the voltage/temperature monitoring circuitry and de-coupling capacitors if the voltage exceeds +15V.

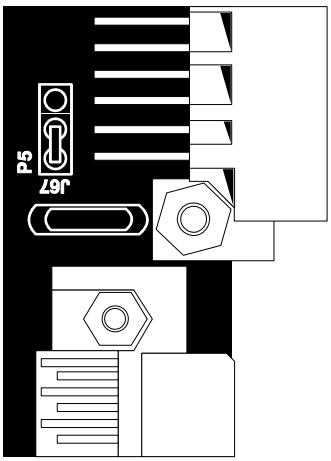


Figure 2.2 FLASH EPROM 12V jumper

2.4.5 External Power

By repositioning two power jumpers the VBT-325 can also be powered from an external +5V power source through a front panel inlet.[1] This is useful if there is insufficient

[1] Connector type: Molex, Part #5557-02R with 5556-TL terminals. VMETRO can supply cable with connector, VMETRO part # 401-325EPC.

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capacity in the power supply in the card crate to supply the additional current required by the VBT-325. External power supply also allows tracing the activity in a VME system during power up sequences.

When powered from an external 5V supply, the +/-12V is still supplied from the back plane. However, this is only used for powering the voltage and temperature readout circuitry, and for programming of FLASH EPROM during firmware upgrades. Thus, it is fully possible to operate the board only from an external 5V supply, keeping in mind that the functions mentioned above will not be operational.

There are two "heavy-duty" jumpers (blue, with handle) that connects 5V power to the board from the VME back plane or from the external power source through the front panel inlet, see Figure 2.3. The factory setting of these jumpers are in the Z1 and Z2 positions between the P1 and P2 connectors, supplying 5V from the VME back plane. To allow for external power supply, **move both jumpers** to the Z3 and Z4 positions on each side of the power inlet connector.

Warning!

Both jumpers have to be moved! Moving only one jumper will connect the external power supply's +5V to the system's +5V, causing excessive ground currents and other undesired effects.

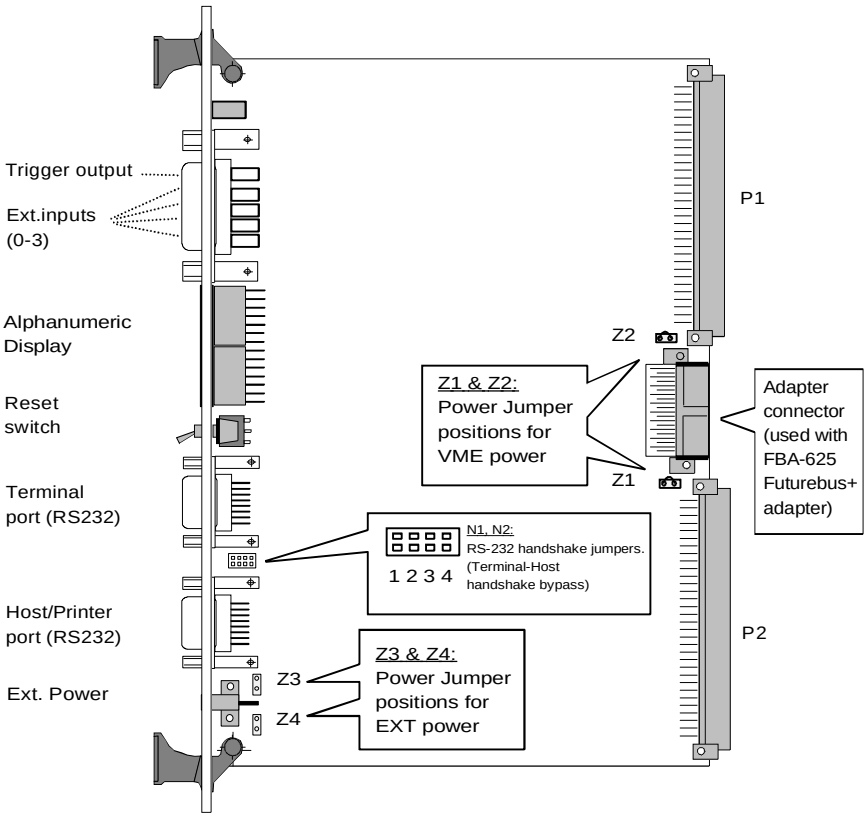


Figure 2.3 Powering the VBT-325 from an external power source

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2.5 BusView for Windows - Graphical User Interface

BusView is a graphical user interface for the VBT-325. It offers a user-friendly mouse operation of the analyzer system, higher resolution graphics than can be achieved with a normal terminal, a multi-window operating environment, and the capability to store trace data and setups on disk.

This chapter describes the procedures required to install BusView on a PC and to setup the VBT-325 for operation under BusView.

2.5.1 System Requirements

The PC system where BusView is to be installed, must meet the following requirements.

- Have Windows 3.1x, Windows 95, or Windows NT (3.5x or 4.0) installed and running. BusView also supports OS2/Warp 3.0 and higher.
- Pentium PC.
- Have at least 8 Mbytes RAM.
- Have at least 16 Mbytes of free disk space.
- Have at least one free serial port for connection to the VBT-325 (BusView can run in off-line mode even when no serial port is available).

2.5.2 Installing BusView on the PC

To install BusView on a PC, perform the following steps:

- Start Windows (if not already running). The BusView installation program runs under Windows.
- Insert the CD-ROM into the CD-ROM drive.
- Select the CD-ROM drive in the File Manager/Explorer.
- Run the installation program by double-clicking on the file SETUP.EXE.
- Follow the instructions in the installation program.

When the installation has finished, a new Windows program group with the name BusView will be displayed.

2.5.3 Connecting the VBT-325 to the PC

Communication Parameters

Before communication can be established between the PC and the analyzer, the communication parameters for the PC Serial Port must be set to the correct values. In BusView, select the command `Utilities/Communication /Port Settings`. To change any of the displayed options click on the field to change and hold until the menu appears. In the dialog box in Figure 2.4, select the COM Port to which the analyzer is connected, and press the OK button. The settings in Windows control panel have no effect in BusView for Windows.

Serial Cable

Connect a serial cable between the VBT-325 and a free COM port on the PC. The cable is discussed in Section 2.7.

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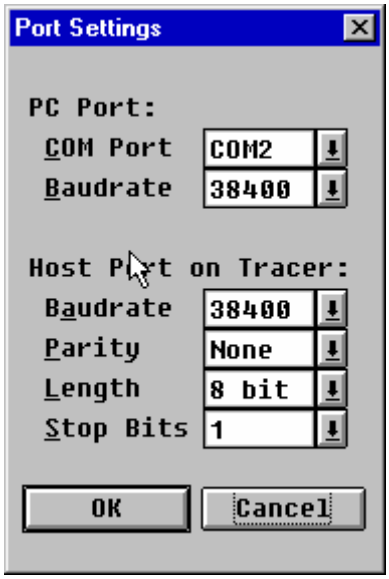


Figure 2.4 The BusView Communication Parameters

Connect

To connect to the VBT-325, choose `Utilities/Communication/Connect`. If the connection completed successfully, the Setup window of the analyzer will be displayed, and the unit is ready for use. For operation of the VBT-325, see Chapter 5.

2.5.4 Troubleshooting: Connection Problems

There may be several reasons why a connection attempt fails, but cabling and communication settings are the most obvious. The error message in Figure 2.5 indicates a connection failure.



Figure 2.5 Warning message indicating that BusView was not able to connect to the VBT-325

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2.5.4.1 Troubleshooting Checklist

- Check that the LED display on the analyzer is lit. If it is not, the analyzer is not booting due to a hardware malfunction or insufficient power.
- Verify that the cable used is correct.
- Check the communication parameters. If the firmware is version is older than 5.30 the only possible baud rates are `Auto` and 9600.
- Try a different COM port.
- Try slowing down the “baud rate while running”
- Use a multi meter and check the cable again.
- Try connecting in Terminal View to verify COM port and cable.
- Try connecting with a different PC.

2.6 Terminal User Interface

The VBT-325 is delivered standard with a user interface for operation from a terminal (VT100 or similar), or from a terminal emulator running on a PC or UNIX workstation. For this purpose, VMETRO supplies a VT100 emulator free of charge, included on the BusView CD or the simulator diskette. See Section 9.2.

2.6.1 Establish a Connection

In order to operate the VBT-325 from a terminal, do the following:

- Connect a terminal (or PC / Workstation running a terminal emulator) to the serial port as described in Section 2.7.
- Set the serial port of the terminal to 38K4 baud (or lower), 8 bits, 1 stop bit, no parity.
- Apply power to the system.

The VBT-325 can run with baud rates from 300 to 115k[2] baud. By default, it is in the “auto baud rate mode”, waiting for CR (i.e.↵) to be typed to determine the actual baud rate. Any baud rate between 38k4 and 4200 baud will be detected. The baud rate can also be manually changed by the command `Utilities/Serial ports`. This command can also be used to change the default 8-bits, one stop-bit, no parity communication mode.

Type ↵ once until text is written on the terminal screen. This text is called the start-up menu. Wait approximately 1 second between each CR due to the synchronization process.

No response? If the start-up menu does not appear on the screen, check that the cables are connected correctly, that the terminal / PC / WS is set to 8 bits per character, 1 stop bit and no parity, and that the baud rate is between 38k4 and 4200 baud. Flip the reset switch and try again.

[2] RTS/CTS handshake should be used when using speeds above 19K2. This feature is not implemented in the preliminary firmware. Using speeds above 19K2 is thus not recommended.

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Note! If the cable used has pins 7 and 8 connected, this might in some cases cause problems. The analyzer has a second RS232 port located on these pins. If the Terminal is powered up first and then the analyzer, there can in some cases appear random switching on these lines as the analyzer powers up. Some terminals interpret this as hardware handshaking and locks up. To avoid this problem use the cables specified in this manual in Section 2.7.

2.6.2 Start-up Menu

After power-on, the start-up menu is written to the terminal as shown in Figure 2.6. The menu identifies product model, firmware version, baud rate, the terminal type (default or previously selected type), and the type of installed piggyback module, if any.

The start-up menu contains two menu options described below. Both are activated with a single key as indicated. If no changes are required, type CR to enter the setup screen of the analyzer.

```
V M E T R O       VBT-325C VME+ ANALYZER   FIRMWARE VERSION: 5.01

TERMINAL PORT      : 19K2 81N
HOST PORT          : 9600 81N
TERMINAL TYPE      : DEC VT-100/VT-102
PIGGYBACK CONNECTED: (NONE)

START-UP OPTIONS:

T:  SELECT NEW TERMINAL TYPE.
C:  CLEAR NON-VOLATILE MEMORY.

SELECT AN OPTION OR TYPE <CR> TO CONTINUE:
```

Figure 2.6 The start-up menu

2.6.2.1 Select New Terminal Type

The user-interface of the VBT-325 is fully screen-oriented, taking advantage of the graphical properties of VT100 compatible, and similar, terminals. This requires that the user specify which terminal or terminal emulator is being used. By typing a T, a list of the supported terminal types is given, as shown in Figure 2.7.

The selected terminal type is stored in non-volatile memory, and unless this is cleared, it is not necessary to select the terminal type every time the board is powered up.

Terminal type Select the preferred terminal type by typing the correct number. Use option 1 when using a VT100 emulating terminal or a terminal emulation program other than the VT100.EXE from VMETRO. This option is the default.

```
USABLE TERMINAL TYPES ARE:

1. DEC VT-100/VT-102
2. VMETRO VT-100 EMULATOR / ANSI.SYS ON MDA SCREEN
3. VMETRO VT-100 EMULATOR / ANSI.SYS ON COLOR SCREEN
4. VMETRO VT-100 / ANSI.SYS VGA COLOR 50 LINES
5. TANDBERG TDV 1200, 2200, 2200/9, 2200S
6. DEC VT-220/320/420 W/ANSI KEYBOARD, 7-BIT MODE, 25 LINES
7. DEC VT-420 W/ANSI KEYBOARD, 7-BIT MODE, 48 LINES

TERMINAL TYPE:
```

Figure 2.7 Terminal selections

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Use option 2 or 3 depending on monitor type. This requires the VT100 emulator program VT100.EXE. Option 3 will give a blue display with white text.

Option 4 will give a 50 lines display with the VMETRO VT100 Terminal Emulator program, see Section 9.2 for more details on VT100.EXE.

CR: Continue As soon as a number has been typed the system will return to the startup screen as in Figure 2.6. Type CR to continue.

2.6.2.2 Clear Non-Volatile Memory

Type `C` to clear all contents of the Non-volatile RAM memory on the board. **This command will cause all user setups to be lost and all settings will be reset to defaults.** Use this command if a fatal software crash has occurred, e.g. if the operation of the user-interface does not behave correctly etc.

Jumper J8 In case of a total hang-up of the analyzer software, the non-volatile memory may need to be cleared by removing jumper J68. Do as follows: Shut down the system and turn off the power. Locate the backup-battery jumper, J68, as shown in Figure 13.1.

Move the jumper from the original left position, to the other right position, and let it remain there for a few seconds. Then, move the jumper back. When the power is re-applied, the tracer firmware should start as normal, and it will display the message "`Non volatile memory lost`" on the status line.

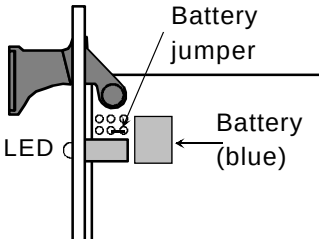


Figure 2.8 Back-up battery jumper

2.7 RS-232 Communication

There are two serial ports on the VBT-325. One is used for connection to a terminal, PC or workstation, and the other is used for connection to a host (like a CPU board in the VME system where the VBT-325 is installed) or a printer for dumping screen images or trace data.

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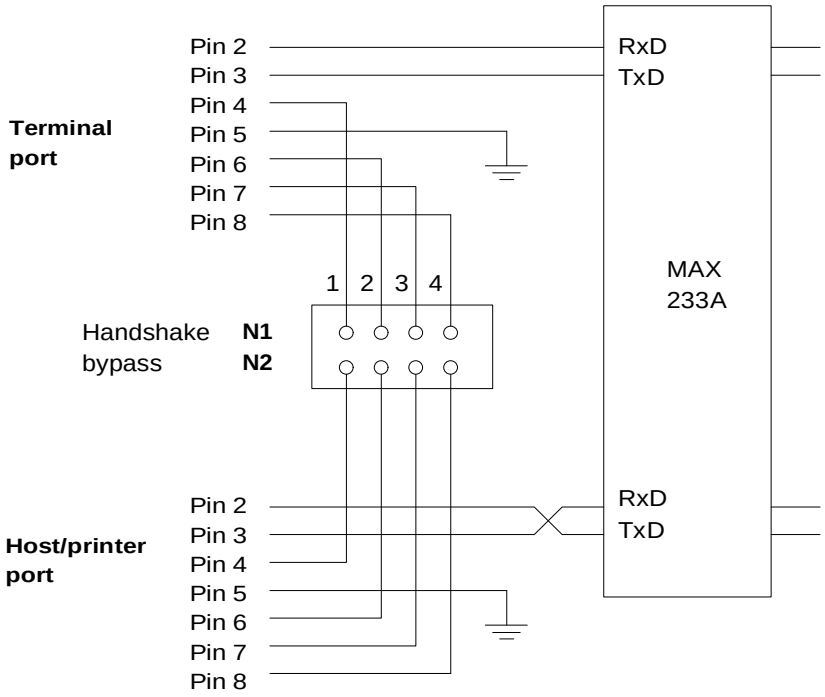


Figure 2.9 Serial ports on the VBT-325

The RS-232 ports are connected as shown in Figure 2.9. Normally, only the TxD, RxD and GND (pins 2, 3 and 5) need to be connected. As can be seen, the host/printer port have the transmit/receive signals swapped compared to the terminal port.

2.7.1 Terminal cable

Most terminals use a 25-pin connector (DB25) for the RS232 connection, and a cable as shown in the figure below should be used. (This cable can be purchased from VMETRO, part # 401-TER-232).

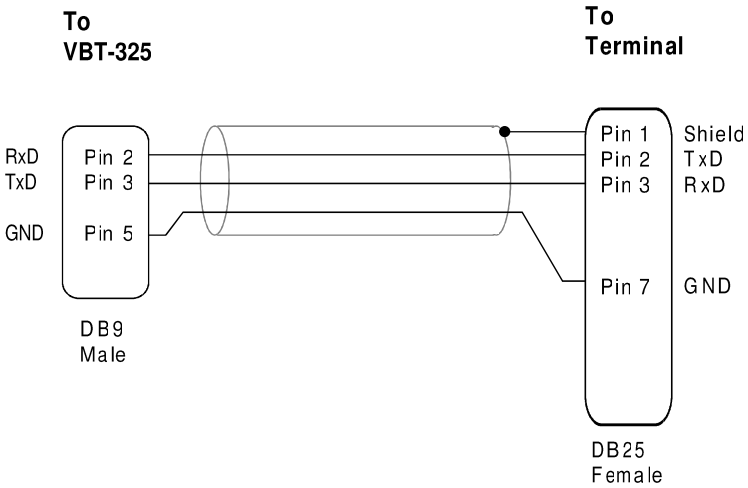


Figure 2.10 Terminal cable, DB9 to DB25 converter

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2.7.2 PC Cable

If a PC is used as a terminal, or when upgrading firmware through the RS232 port from a PC (see Chapter 12), a cable with crossed TxD and RxD lines must be used, see Figure 2.11. Note that the signals on pin 2 and 3 are crossed.

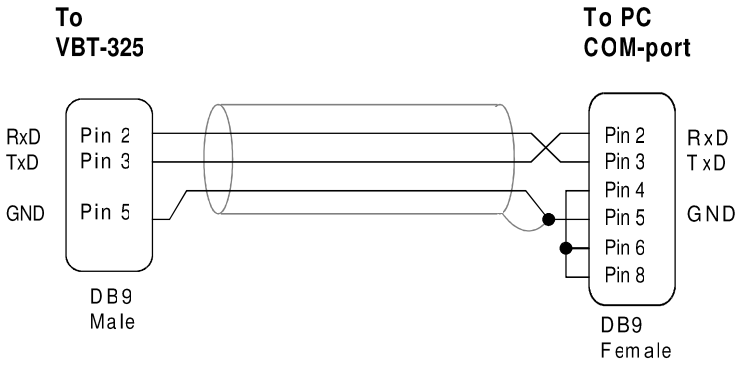


Figure 2.11 PC cable

2.7.3 Transparent mode

A convenient way of using the VBT-325 is to let the analyzer be inserted between the terminal and the CPU in your VMEbus system, so that the RS232 cable normally attached to the CPU board is instead connected to the Terminal port on the VBT-325. Then, a one-to-one RS232 cable (with pins 2, 3 and 5 connected) can be connected from the Host port of the VBT-325 to the Terminal port on the CPU. (This cable can be purchased from VMETRO, part # 401-TM-232).

Do not Dump or Load Trace while in Transparent mode.

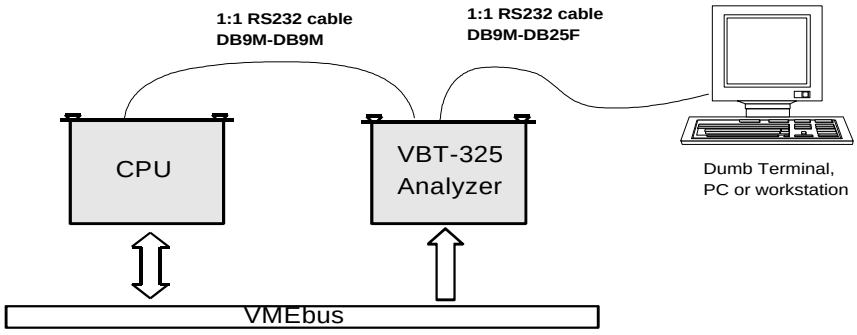


Figure 2.12 Transparent mode

2.7.3.1 Terminal-Host RS232 handshake

The VBT-325 does not use or provide any hardware handshake signal on RS232. However, when using transparent mode between a terminal and a CPU/host that utilizes DSR/DTR hardware handshake, a convenient way of retaining this connection is simply to bypass the handshake signals from the terminal port to the host port through the VBT-325. This can easily be done by installing jumpers in the N1 and N2 jumper field (N1-1 to N2-1 etc.), thereby making a one-to-one bypass of the handshake signals between the terminal

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and the host. (Note: Since a time delay is introduced between the two serial ports, this approach is only recommended when the handshake signals are used in a static manner.)

2.8 Accessories

VMETRO offers a complete set of cable accessories that will help the user to take full advantage of the VBT-325. For connection to a terminal, PC or workstation, various RS232 cables are available. A special cable is designed for External Power Supply, and a temperature probe is available. A five-way BNC-to-MiniCoax transition cable assembly allows convenient connection of four external input signals and one Trigger Output. Also single BNC-to-Mini-coax cables are available, one is delivered standard with the VBT-325 (Part #401-325-IOBN1).

Part Number	Description
401-TER-232	Terminal Cable (RS-232 DB9M-DB25F), 3m/9ft
401-TM-232	Transparent-Mode Cable (RS-232 DB9M-DB9M), 0.5m/1.5ft
401-PC-232	PC Cable (RS-232 DB9M-DB9F X), 3m/9ft
401-315-EPC	External Power Cable, 1m/3ft
401-325-IOBN5	5-way Trigger In/Out BNC Coax Cable Assembly, 1m/3ft
401-325-ETS-1	Temperature Sensor, 1m/3ft
401-325-ALL	Cable Package, includes all of the above
401-325-IOBN1	Single Ext. Input/Trigger output BNC Coax Cable. [3]
401-325-STA	VBT-325 to VPC-MkII Trigger Cable. [4]
401-SCSI-VSC8	SCSI P2 Cable w/five 50-pin connectors, incl. one D-Type Cannon, and three P2 64-pin DIN female for P2 connections in VME slots, 4m/12ft. See Section 8.2.1 for an illustration.
401-SCSI-VCS3	SCSI P2 Cable with two 50-pin connectors (male and female), and one P2 64-pin DIN female in between. Use to extend existing disk cable. See Section 8.2.1 for an illustration.

[3] One included with each VBT-325.

[4] One Included with each VPC-MkII.

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3. FUNCTIONAL DESCRIPTION

3.1 Product Overview

The VBT-325 "VME+ Analyzer" is a bus analyzer for VME and VSB, SCSI or other P2 busses, e.g. the TTL level signals on P2a/c on VXI (when used with a VXE-35C adapter). The board contains two separate independent analyzers, one 128-bit wide analyzer pre-configured for the VMEbus, and one 64-bit wide analyzer that can be configured either for VSB, SCSI or other busses on the P2 connector of VME boards. Both analyzers on the board have individual sampling logic, word recognizers, trace memories and triggering circuitry. An onboard 68EC020 microprocessor with 512 Kbytes (or 1 Mbytes) of FLASH EPROM, and 512 Kbytes static RAM, controls the hardware, communicates with BusView, and runs the Terminal user-interface.

3.1.1 Model B and C

The VBT-325 is available in two models, VBT-325B and VBT-325C. Model VBT-325C is the full-featured version that supports both VMEbus and VSB/ SCSI/P2, with upgradeability to other busses like VXI and Futurebus+. The VBT-325B is a lower-cost version, where only the VMEbus is supported, but otherwise with the same performance as the VBT-325C. The VBT-325B is field-upgradable to a VBT-325C by means of a firmware/PLD upgrade.

VBT-325B

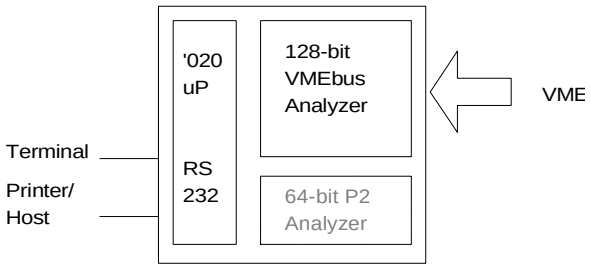
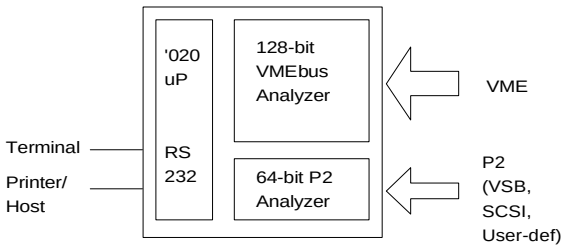


Figure 3.1 The VBT-325B

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VBT-325C in Twin Mode



VBT-325C in Wide Mode

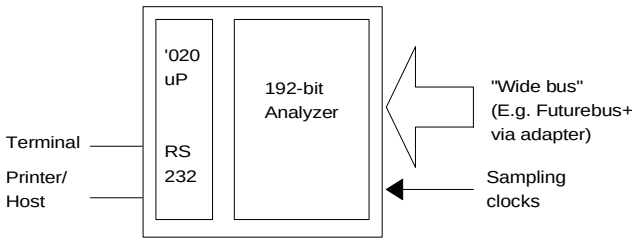


Figure 3.2 The VBT-325C

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3.1.2 Specification Highlights

VBT-325C

- 32K Trace memory, separate for VME and P2.
- 101 ch. VMEbus Analysis, plus 4 ext. inputs on mini-coax.
- 64 ch. VSB/SCSI/P2 Analysis with separate trigger Sequencer.
- Simultaneous VME and VSB/SCSI/P2 analysis with cross-triggering and integrated user-interface.
- 50MHz Timing Analysis on VME and VSB/SCSI/P2.
- State Analysis up to 25MHz on VME and VSB/SCSI/P2, up to 50MHz on Futurebus+ with full-speed trigger.
- VMEbus rev.D compatible, incl. VME64.

VBT-325B

- As VBT-325C, but without P2 support. Field upgradeable to VBT-325C by firmware/PLD replacement.

VBT-325B

- As VBT-325C, but without P2 support. Field upgradeable to VBT-325C by firmware/PLD replacement.

3.1.3 Piggyback modules

The VBT-325B/C is equipped with connectors that allow it to carry piggyback modules for added functionality or performance. Below is a short presentation of the piggyback modules currently available for the VBT-325.

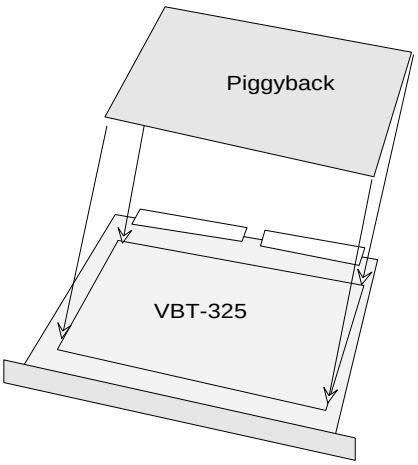


Figure 3.3 Piggyback modules

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TIM200-PB The TIM200-PB is a 200MHz Timing Analyzer piggyback module for the VBT-325 for high-speed analysis of the VMEbus *or* P2 bus. The TIM200-PB has a 32K or 128K trace buffer and samples up to 107 signals with 5ns resolution, and offers full-speed trigger on any bit or bit combination, including cross-trigger from the VBT-325. The trigger pattern can be qualified with a "duration filter", to specify valid pattern as greater than or less than in the range 5-635ns. Signals sampled are presented as graphical waveforms with zoom, cursors and timing markers. The TIM200-PB can be upgraded to a STIM200-PB.

STIM200-PB The STIM200-PB is a 200MHz Timing Analyzer and Bus Master / Pattern Generator piggyback module for the VBT-325. It is essentially a TIM200-PB with firmware that permits its trace memory to be put in reverse. The STIM200-PB can generate bus cycles on VME or VSB and has user-defined timing with 5ns edge-to-edge resolution, as well as true bus grant and slave handshake. By means of a screen-oriented pattern editor the user may create any type of cycles and signal sequences. Cycle templates are also provided that include all VMEbus cycles, including VME64 cycles.

VDRIVE-PB The VDRIVE-PB is a piggyback module that implements a true VMEbus Master/Slave and System Controller by means of the industry standard VIC068 chip. From the same user-interface as that of the VBT-325, the user can then generate any cycle type, perform memory tests, and generate interrupts, IACKs etc. The slave memory can also be set at user-defined limits, and there is a programmable DTACK* generator that can give DTACK* at any address with a user-defined delay.

VBAT-PB The VBAT-PB is a piggyback module that automatically monitors all VMEbus traffic, screening the bus for violations of the VME specification. The board contains rule-based parallel trigger elements that continuously, and simultaneously, detect bus timing violations, like address not stable while AS* asserted, bus granted to two masters, etc. Violations are directed to the trigger circuitry and trace memory of the VBT-325.

VBAT64-PB An enhanced VBAT-PB. Includes rules to detect violations of the VME64 specification.

TIMBAT-PB The TIMBAT-PB combines the VBAT64-PB and the TIM200-PB VMEbus functionality into one piggyback module.

XMEM325-PB The XMEM325-PB is described in Chapter 3.

3.1.4 Piggyback Carrier (VPC-MkII)

In many applications it is desirable to use more than one piggyback module at the same time. For this purpose, VMETRO offers a "Piggyback Carrier", part name VPC-MkII. This is essentially a VBT-325 board stripped for all the analyzer features, containing only the processor, serial ports and the piggyback connectors. A trigger in/output connector is also present, allowing cross-triggering to/from the VBT-325 or another instrument like an oscilloscope, logic analyzer etc.

A typical example where the VPC-MkII is used, is a 2-slot *State-Timing-Anomaly* analyzer solution, illustrated in Figure 3.4. This includes both a TIM200-PB and a VBAT-PB, where the 200MHz Timing Analyzer of the TIM200-PB is used for examination of bus violations found by the VBAT-PB, as well as P2 TIMING analysis (VSB, SCSI or UserP2).

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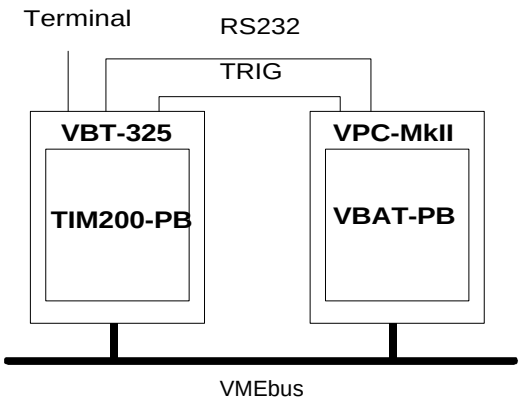


Figure 3.4 Example using the VPC-MkII

Note! For applications that do not need 200 MHz analysis of P2- buses like VSB, SCSI, or User-defined P2, the TIMBAT-PB can be used to achieve STATE-TIMING-Anomaly for VMEbus in only one slot.

3.2 Sampling Modes

Applications of the VBT-325 include hardware and software debugging and testing, system tuning, and performance analysis. Other applications are repair and field service of a number of different bus architectures, primarily VMEbus, with or without subsystem busses like VSB, SCSI, user-defined P2 bus, and VXI or Futurebus+ with the use of specially designed adapters.

Working with the product involves utilizing one of three basic analyzing capabilities:

- STATE sampling (capturing bus cycles synchronously one by one).
- TIMING sampling (capturing bus cycles at a fixed sampling rate asynchronously to the bus traffic).
- Statistical analysis (providing histograms of various bus activity).

The VBT-325 is equipped with protocol-sensitive STATE sampling logic for VMEbus, VSB and SCSI. Jumpers are used to select VSB or SCSI sampling. For user-defined P2 busses, the user must supply a proper sampling clock through a pin socket on the board. (See Section 13).

3.2.1 STATE (Synchronous) Sampling

Synchronous sampling is used for STATE analysis, and captures cycles from the target system one by one, so that each collected cycle forms one line in the trace buffer. This sampling mode requires that the sampling logic extract sampling clocks from the target bus at the correct times in order to store information like address, data, transfer size and status in a compact form in the trace buffer.

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3.2.2 TIMING (Asynchronous) Sampling

Asynchronous sampling is used for TIMING analysis, i.e. the bus is sampled at a fixed rate that can be selected at eight different speeds as fast as 50MHz or as slow as 97.7KHz. This sampling mode is available for all the possible target busses supported by the VBT-325.

With a sampling rate of 50MHz the bus is sampled every 20ns, which is sufficient to show the general timing relation between signals on a bus like VME or VSB. However, for really detailed timing analysis of difficult hardware problems like glitches etc., a faster sampling rate is required, like the 200MHz sampling rate offered by the S/TIM200-PB piggyback module. This gives 5ns resolution and the ability to trigger on any signal on the bus, also specifying a particular duration of the timing pattern.

3.3 Main Blocks

The VBT-325 contains two separate independent analyzers. One 128-bit wide analyzer pre-configured for the VMEbus, and one 64-bit wide analyzer that can be configured either for VSB, SCSI or other busses on the P2 connector. Both analyzers on the board have individual sampling logic, word recognizers, trace memories and triggering circuitry.

Each analyzer part of the VBT-325 consists of three main stages, through which samples are passing during the acquisition process:

- Sampling stage
- Word Recognition / Triggering stage
- Sample Storage / Statistics Counting stage

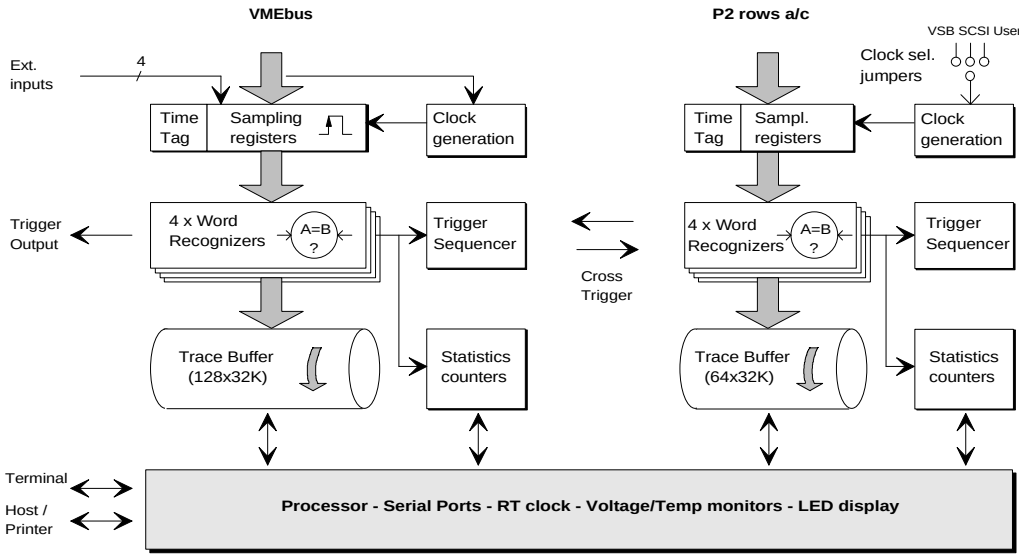


Figure 3.5 Block diagram of the vbt-325

As can be seen from the block diagram above, the VBT-325 contains substantial amount of hardware functionality. This is achieved through six advanced ASICs designed and developed by VMETRO called the Bus Tracer Chip (BTC). These devices implement all the sample acquisition, recognition and storage capabilities of the board, as well as numerous counters for statistics and time measurements. This gives the VBT-325 remarkable performance and functionality, like sampling rates up to 50MHz in STATE or

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TIMING mode, advanced triggers with NOT and Range capabilities, as well as storage filters and occurrence and delay counters.

Twin Mode

The two analyzer parts of the VBT-325 can be operated in "Twin Mode" or "Wide Mode", defined by jumper settings(see Chapter 13). In twin mode, the two analyzers operate independently (as shown in Figure 3.5), with separate acquisition paths, word recognizers, trigger Sequencer, time tags, statistics counters and trace memory. This allows independent and simultaneous analysis of the VMEbus and the P2 bus. Cross-triggering between the two analyzers is possible both ways by means of a dedicated trace channel bit which is hardwired directly from the trigger output of the other analyzer part.

Wide Mode

For use in applications that require one wide analyzer, the two analyzer parts can be configured with jumper settings (see Chapter 13) to operate as one wide analyzer with as many as 177 input channels. Together with a provision for externally generated sampling clocks (taken through a connector located between the P1 and P2 connectors), this gives flexibility to use the VBT-325 for other busses than VME/P2. As an example, the FBA-625 Futurebus+ Adapter transforms the VBT-325 into a complete, standalone Futurebus+ Bus Analyzer (the FBT-625).

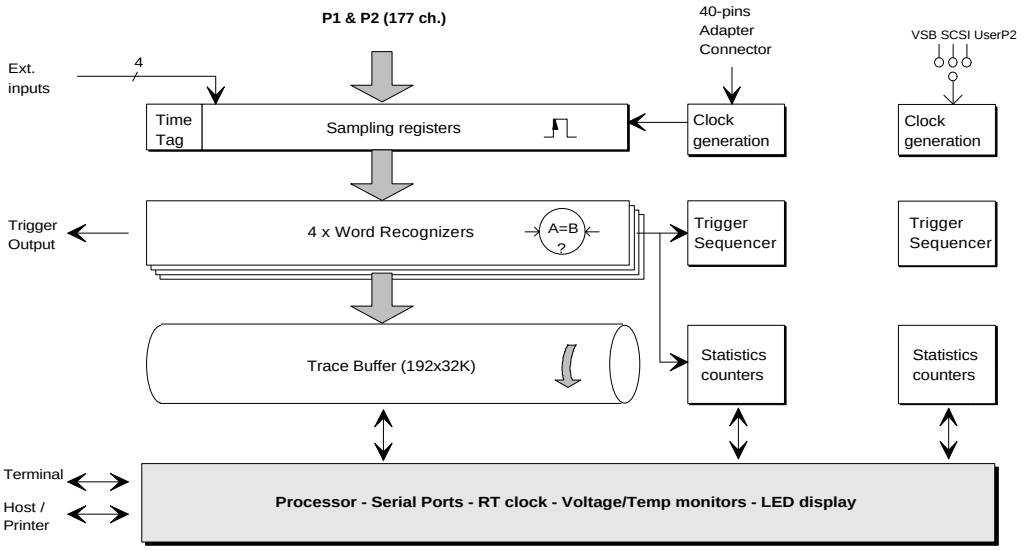


Figure 3.6 Wide mode

3.3.1 Sampling stage

The sampling stage contains sampling registers and clock generation circuitry that provides synchronous or asynchronous sampling of the target bus.

Time tag

In order to measure the elapsed time between each sample stored in the trace buffer, the sampling stage includes a "time tag counter". The value of the time tag counter is stored in separate bits in the trace buffer together with each sample. This allows the time to be displayed either as relative time between samples, or as absolute time from the trigger point.

Relative time

Absolute time

Note!

Time tags are only calculated in STATE mode.

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3.3.2 Word Recognition / Triggering stage

A central element of any logic analyzer is the ability to recognize events, i.e. a particular signal pattern, in the target system so that the acquisition of event samples can stop at the desired moment, i.e. the process referred to as "triggering". There are four full-width word recognizers both for the VME part and the 64-bit P2 part of the VBT-325, and these form the foundation not only for triggering, but also for store qualification (store filter) and counting purposes. Counting can be used to delay the triggering process until a particular number of bus cycles occur, and it is also used for statistical purposes. Thus, the three main purposes of the word recognizers are:

- Triggering
- Store qualification
- Occurrence counting

Busses, groups

Any signal or signal group can be included with a particular value or as "don't care" in the word recognizers. Signals from the target bus may be included in the word recognizers as a *bus* (like address and data), they may be combined into *groups*, like the `Size` group for VME, consisting of `DS1*`, `DS0*`, `LWORD*` and `A01`, or simply as individual signals.

VME64

The VBT-325 fully supports 64-bit address and data as defined in the VMEbus specifications, rev.D, which is used for the multiplexed block transfer modes MBLT. This means that the 32-bit data bus `D[31:0]` and the 31-bit address bus `A[31:1]`, plus the `LWORD*` signal acting as data bit 32, can be treated as one 64-bit entity in the word recognizers.

VME64 signal

A special signal called `VME64` is available in the word recognizers. This signal is asserted when an AM-code for VME64 is detected, and can be used as part of an event pattern.

Negation

When multiple signals are combined into a bus or group, a "Not" (!) operator is available in many cases, allowing the specified value to be treated as true if the condition does not occur. This allows conditions like:

`Data ≠ 0000 0000`

Range

Each of the four word recognizers allows ranges to be specified on both the VMEbus address and data, as well as for the VSB multiplexed address/data bus.

This allows functions like:

`X ≤Address ≤  Y`

Outside range

Outside range can also be obtained, by using the *n*ot operator on an address or data range.

The hardware allows four 32-bit VME address ranges, four 32-bit VME data ranges and four 32-bit VSB address or data ranges to be active simultaneously.

A64 range

Alternatively, 64-bit address ranges (A64 according to VMEbus rev.D) can be specified in each of the four word recognizers for the VMEbus part. (Since a 64-bit address is using the 32 data lines, no data range can be used together with A64.)

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3.3.2.1 Sequencer

The Sequencer is a triggering state machine that allows the analyzer to trigger not only on one particular event pattern or cycle, but also a sequence or combination of such. This allows the user to trigger on complex situations, for example when a particular memory cell is written to immediately after an interrupt occurred, while all other references to the same location are ignored.

15 states

Up to 15 states can be programmed in the Sequencer, and each state allows a level of "If..Elsif..Else" statements. See Section 5.6.2

3.3.3 Sample Storage stage

After the collected samples have passed the sampling stage and the word recognition/triggering stage, they will arrive either in the sample storage or statistics counting stage.

3.3.3.1 Trace Buffer

During normal trace sessions, the samples are stored in the trace buffer, a 32K deep circular memory addressed by an address counter which is incremented after each stored sample. This buffer is written to continuously until a trigger is found, overwriting previous samples when full.



Figure 3.7 The circular trace buffer

3.3.3.2 Trigger Position

When a trigger occurs, the process of storing further cycles depends on the selected **trigger position**. If the trigger position is set to "End of Trace" (100%), no more samples will be stored after the trigger, and the samples recorded in the trace buffer will be presented on the screen. By contrast, if the trigger position is set to "Start of Trace" (0%), the entire trace buffer will be filled with new cycles before the acquisition process stops. In between, there are possibilities to select trigger positions as 25, 50 and 75%.

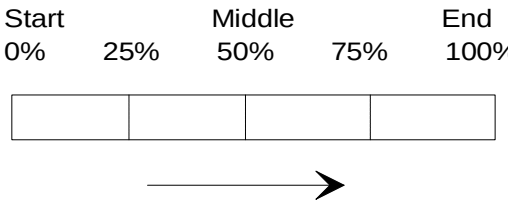


Figure 3.8 The selections of trigger positions

Note that the trigger may occur before the trace buffer has been filled completely ahead of its specified trigger position. In such cases the trace buffer will be only partly filled before the trigger. Imagine if the second sample collected was the trigger, and the trigger position

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was 50%, then 16K-1 cells in the first part of the trace buffer will be empty.

Note also that if the trace is not completely filled *after* trigger and then halted manually (possible in all cases except End of Trace), the unused post-trigger portion of the trace buffer may contain valid pre-trigger samples from the previous "round" of sampling (remember, the trace buffer is circular). If this is the case, these samples will be shown since they may contain useful information.

3.3.4 Statistics Counters

When the VBT-325 is used for statistical purposes rather than for storing samples in the trace buffer, the bank of counters will be incremented according to the values programmed into the word recognizers.

VMEbus There is a 20-bit counter attached to each of the word recognizers, as well as a similar counter for each of four VMEbus Bus Level detectors, for a total of eight statistics counters. In addition, there is a ninth counter used for counting the total sample count. For VMEbus statistics, these counters are used to provide histograms of four user-defined events at the same time as the distribution of VMEbus traffic among the four bus levels are shown. There are also statistics functions that use pre-defined event patterns to provide direct readout of e.g. Bus Utilization.

VSB/SCSI/P2 For the P2 part there is a 20-bit counter attached to each of the word recognizers. In addition, there is a fifth counter used for counting the total sample count. These counters are used to provide histograms of four user-defined events on VSB, SCSI or P2 bus.

3.4 Sampling Methods

The principal task of the VBT-325 is sampling the bus activity. While TIMING (asynchronous) sampling is straight forward in the sense that samples are taken at fixed time intervals, STATE (synchronous) sampling depends heavily on the bus protocol.

In order to fully interpret what is seen in the trace display when STATE sampling is used, it may be necessary to understand how the analyzer samples the bus. Thus, a detailed explanation of the employed state sampling methods is given below.

3.4.1 VMEbus STATE Sampling

To properly capture all information of the transactions on a VMEbus back plane during STATE analysis, the VMEbus sampling logic latches bus signals both at the completion of a bus arbitration, and at each data phase. This is for normal cycles, Read-Modify-Write cycles, and Block cycles.

3.4.1.1 Bus Request Latching

Normally, the active bus request signal (BRx*) on the VME back plane goes away immediately after the corresponding bus grant (BGx*) is taken low. This is too early for being sampled together with address, data etc. on the falling edge of DTACK* or BERR. To ensure capture of the active bus request(s) even during STATE sampling, the pending BRx* may be latched internally until DTACK* goes low.

(This feature can be turned off by the command `Edit/Sampling mode/Options/State Sampling options`.)

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3.4.1.2 Bus Grant Latching

A VME system arbiter completes an arbitration by issuing one of four Bus Grants (BG3-0*), and when this is received by a bus master with pending bus request, it asserts BBSY*. This causes the Bus Grant to go away immediately. In order to keep track on which bus level the following transactions belong to, it is necessary to store the actual bus grant at falling edge of BBSY*. The VBT-325 stores information about the active bus grant as an internal two-bit value called *Bus Level*, (or "Bus Grant Level"), shown as BgL in the trace. See the timing diagram in Figure 3.9. In addition there is an extra bit that is set if the VBT-325 sees BBSY* being asserted without any valid Bus Grant, a situation that will occur if the VBT-325 is located to the right of the granted bus master in the card crate. (See Section2.3.3). Information about the actual bus level is presented in the trace as the symbols "---0" to "3---", or as "----" signifying *no bus grant* detected.

Note! Do not activate the RESET button after VMEbus cycles has started on the back plane. This may cause BgL to be erroneously shown as BgL=0.

3.4.1.3 Data Cycle Sampling

Normally, bus transactions are sampled on the falling edge of DTACK* or BERR*, conditioned by DS1* or DS0* being low. This will capture all address, data and control signal information, as well as the stored Bus Level from the Bus Grant sampling.

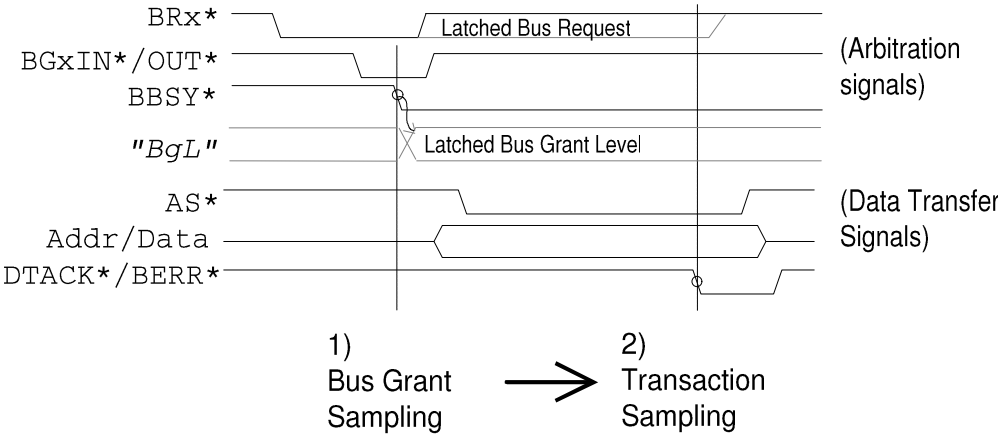


Figure 3.9 Data cycle sampling

3.4.1.4 IRQ -> IACK

Normally, the active interrupt request signal, IRQx*, on the VME back plane goes away immediately after IACK* is taken low, and too early for being sampled by the falling edge of DTACK*. To ensure capture of the active interrupt request line in interrupt acknowledge cycles (IACK) even during STATE sampling, the pending IRQx* may be latched internally until DTACK* goes low (actually until IACK* goes high).

This feature can be turned off by the command Edit/Sampling mode/ Options/State Sampling options (Note: HW ECO level B6 or higher is required for this feature to be available).

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3.4.1.5 RMW, Block

If a Read-Modify-Write cycle or Block cycle is transferred, this is signaled by keeping AS* asserted low between the cycles. This will be detected by special circuitry in the VBT-325, and a separate bit in the trace is set to indicate this. The address modifiers are then used by the trace decoding firmware to distinguish between RMW and Block cycles.

3.4.1.6 VME64

If an AM-code for VME64 is detected on the VME bus (i.e. AM = 00, 01, 03, 08 ,0C, 38, 3C), a special signal called VME64* (active low) is generated internally in the VBT-325. This signal is also available in the word recognizers.

3.4.2 VSB STATE Sampling

The VSB (VME Subsystem Bus) is a multiplexed bus defined on the P2 a/c rows on certain VME boards. The P2-part of the VBT-325 has protocol-sensitive sampling logic for VSB that will provide samples at three different phases of the bus protocol during state sampling. These are:

- Parallel arbitration.
- Address phase (DS* is ADDR in trace).
- Data phase (DS* is DTA in trace).

The parallel arbitration phase is clocked on the rising edge of the AC signal when an internally generated signal called ARB* is low . This will provide a sample in the trace buffer that will show the arbitration value found on the AD-bus, bits (30:24). The address phase is sampled at the falling edge of ASACK1* or ASACK0*, while the data phases are sampled at falling edge of ACK* (or ERR*).

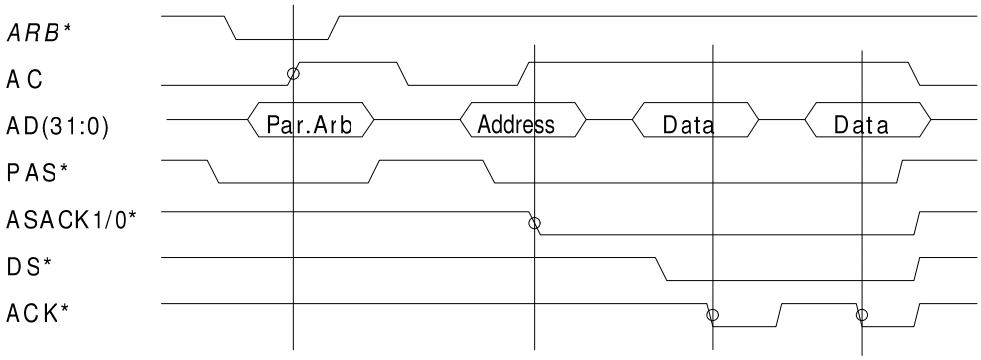


Figure 3.10 VSBbus STATE sampling

3.4.3 SCSI STATE Sampling

A single-ended SCSI-bus may be attached directly to the P2 a/c rows 8-32 by using a standard 50-lead flat cable. See Section 8.2 for actual pin-out. In synchronous (STATE) sampling mode, the SCSI bus is sampled both in the arbitration cycle, to capture the actual device number (ident), and then once for each of the command, data, status and message

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cycles. The arbitration cycle is sampled on the rising edge of the BSY* signal, while the other cycles are sampled at falling edge of ACK*.

Note! The VBT-325 generates an internal signal called ARB* with the logic function ARB = !I/O & SEL, used to sample the arbitration phase in synchronous mode. This signal can be found in the SCSI trace as ARB*.

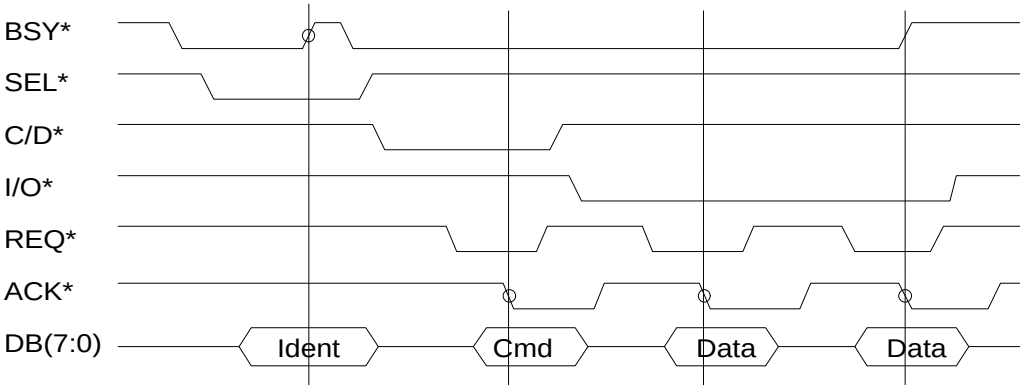


Figure 3.11 SCSI STATE sampling

3.4.3.1 SCSI Pin-out

The predefined pin-out follows the Motorola standard for an 8-bit single-ended SCSI. If another pin-out, or differential SCSI, is used by the application, it is possible to make a small adapter board that plugs on to the P2 connector, routing the signals properly. This could also include converters from differential to single-ended signals levels if necessary. (Note: To take advantage of the SCSI-bus specific sampling, it is essential that the signals SEL*, BSY*, I/O*, and ACK* are on the same predefined pins as defined in Section 8.2.)

3.4.3.2 SCSI-2 FAST

Both SCSI-1 and SCSI-2 with 8 and 16-bit data is supported, including FAST SCSI-2.

3.4.4 VXI Sampling

When used with the VXE-35C, the VBT 325C will sample the VMEbus portion of VXI just as when it is used as a pure VMEbus analyzer. The TTL signals (i.e. TTLTRG7:0* and LBUS11:0) on P2a/c of VXI systems may be sampled using up to 50MHz TIMING mode, or in STATE mode by using a user-defined sampling clock.

3.4.5 User-defined P2 STATE Sampling

For synchronous (STATE) sampling of the 64 pins on rows a/c on the P2 connector, a user-supplied clock must be connected to a pin socket on the board. See Section 9.3.3 for details. The P2 pins will then be sampled at each rising edge, (optional falling edge) of this signal.

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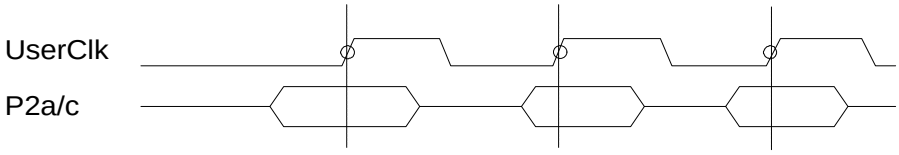


Figure 3.12 User-defined P2 sampling

Note! User-defined P2 is not supported under BusView.

3.5 External Inputs

3.5.1 In3:0 in VME Part

The VBT-325 has provision for four external signal inputs on its front panel, through mini-coax connectors labeled `In0-In3`. These inputs are available in the VME part of the VBT-325, found under the signal group `EXT`. One cable is supplied with the VBT-325 that fits these mini-coax connectors, and provides transition to a standard BNC connector.

3.5.2 In3:0 to P2 Part Using Cross-trigger

If the user wants to trigger on any of the `In3-0` signals together with the VSB/SCSI/P2 part (in twin mode), there is a cross trigger mechanism that can be used. This means that the VME part must be set to trigger on the `In3-0` signals, and the P2 analyzer set to trigger on the cross trigger signal `VMEtrg`. (See Section 5.9 for more information on cross triggering.)

3.5.3 Shared In3:0 and Time Tag Bits

Note that the four external input signals share four bits in the trace buffer with the "time tag counter", and are controlled by the user (command `Edit/Sampling mode/Options/State Sampling options`.) If these bits are dedicated to the time tag, i.e. "extended time tag" is selected, then time intervals between samples up to 1 hour 38 minutes can be measured by the time tag in the trace. This comes at the cost of not being able to see the value of the external inputs in the trace buffer, but the external inputs can still take part in the trigger or store qualifier etc. When "limited time tag" is selected, the max. time interval that can be measured is 6 minutes 8 seconds, and then the four external signals are present in the trace.

3.5.4 Shared In1 and Temperature Probe

One of the external signal inputs, the `In1`, is also shared with the optional temperature probe, controlled by two jumpers, J66 and the "V+T/V" jumper. See Section 6.6.7 for how to display voltages and temperatures on the LED display.

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4. XMEM325-PB

4.1 Product Overview

The XMEM325-PB is a piggyback module with 128K, 256K, 512K, or 1M samples extended trace memory with the same basic sampling capabilities as the VBT-325 model "B" or "C". It duplicates all the sampling circuitry from the VBT-325, allowing it to work as an independent tracer, with full cross-trigger capabilities between the tracers. The module does also offer 8 trigger events on VME (except for the 128K model). The XMEM325 supports the same bus architectures as the VBT-325, both in STATE- and TIMING modes. The unique depth of the trace memory makes it suitable for applications such as:

- Track events long before system crash.
- Post-mortem analysis.
- Data logging and documentation.
- Software verification tasks.

Models

The XMEM325 is available in two basic models, XMEM325-PB/B and XMEM325-PB/C. Model "C" is the full-featured version that supports both VMEbus and VSB/SCSI/P2, with upgradeability to other busses like VXI and Futurebus+. Model "B" is a lower-cost version, where only the VMEbus is supported, but otherwise with the same performance as the model "C".

A model "B" cannot be upgraded to a model "C" due to HW limitations.

Each model is delivered with 128K samples, 256K, 512K or 1 Msamples trace memory. The trace buffers are separate for the VMEbus and the P2-bus.

4.1.1 Main Blocks

The XMEM325-PB[5] contains all necessary HW to function as one VMEbus analyzer, model "B", or as two independent analyzers, model "C". Each analyzer part consists of three main stages, through which samples pass during the acquisition process:

- Sampling stage
- Word Recognition / Triggering stage
- Sample Storage / Statistics Counting stage

[5] The XMEM325-PB 128K low cost model supports extended VMEbus trace only. Support for simultanous state *and* timing analysis, and 8 events do not exist in this model.

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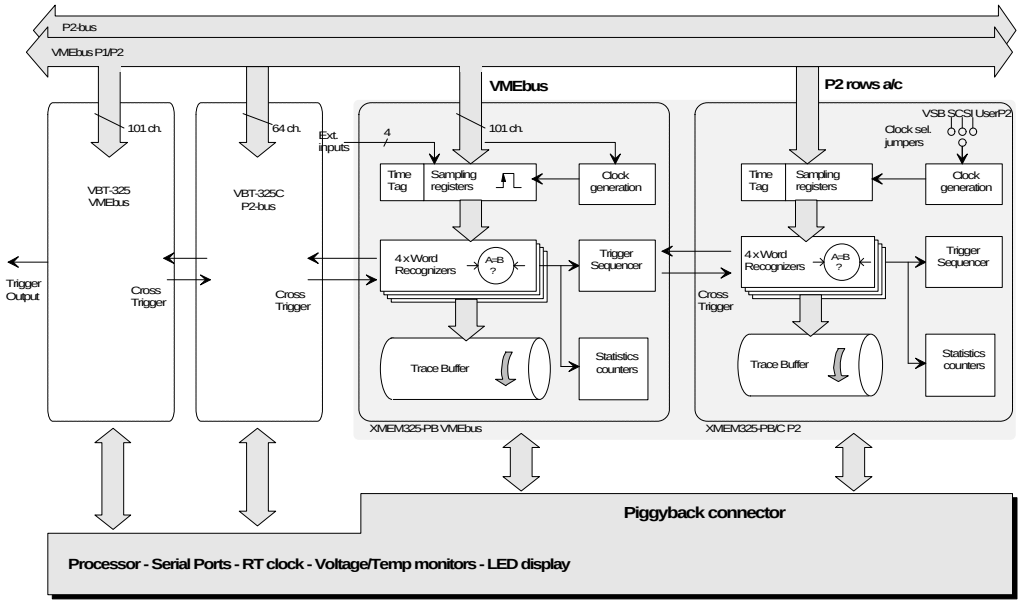


Figure 4.1 Block diagram of the XMEM325-PB

4 analyzers

Together with the VMEbus and P2 bus analyzers found on the VBT-325C, the XMEM325-PB/C provides simultaneously STATE *and* TIMING analysis on the VMEbus *and* a user selectable P2-bus. Full cross-trigger capabilities between the four analyzers exist.

4.2 Installation

This chapter describes how to install the XMEM325-PB on a VBT-325 or an VPC-MkII.

4.2.1 Mounting

Place the VBT-325 or VPC-MkII on a surface with controlled static environment (see Section 2.1). Place the VBT/VPC such that the P1/P2 connectors are facing towards you. Then align the XMEM325-PB, without applying any pressure, on the piggyback connectors on the VBT/VPC such that the BTCs (large, square devices) are closest to the P1 and P2 VMEbus connectors. The correct orientation of the XMEM325 piggyback is shown in Figure 4.2:

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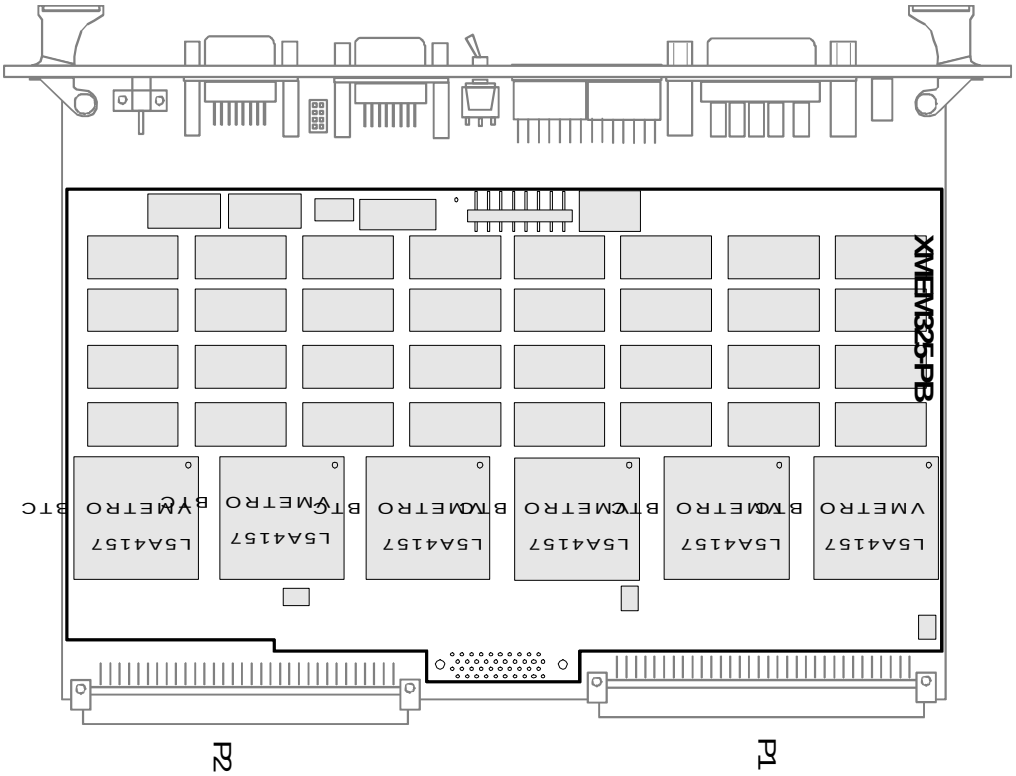


Figure 4.2 Mounting the XMEM325 piggyback module

Make sure that the table surface under the VBT/VPC is smooth, and while the boards are lying flat on the table, apply pressure with your hands gently around all the piggyback connectors to achieve proper seating of the module. Make sure that all the connectors are firmly seated.

4.2.2 Removal

A XMEM325-PB can be removed from the VBT-325 or VPC-MkII by means of a specially designed tool. The same tool can also be used to remove other piggybacks. To remove an XMEM325, always use the thick end of the tool as indicated in Figure 4.3.

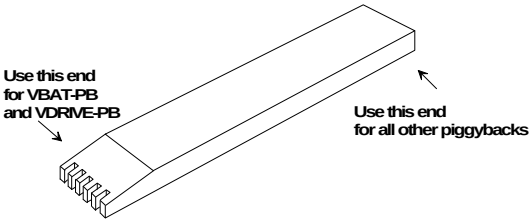


Figure 4.3 The piggyback removal tool

To remove a XMEM325 with this tool, place the *thick* end under the edge of the piggyback module, and press carefully, a little bit at a time at different locations around the board, while the tool rests on either the front panel or the P1/P2 connectors.Put a ruler etc. under the P1/P2 connectors to prevent bending of the VBT-325 board, as shown in the figure below. Never try to remove the XMEM325 or any other piggyback without the special removal tool!

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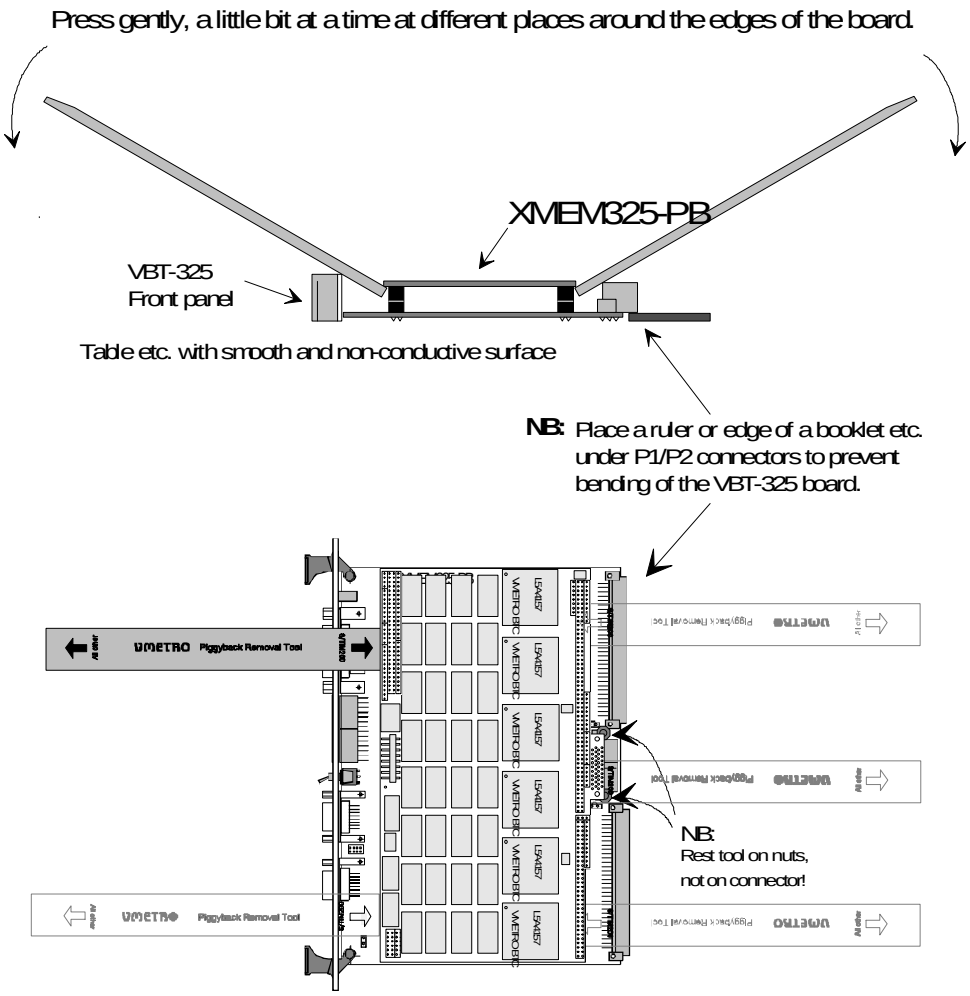


Figure 4.4 Removing the XMEM325 piggyback

4.2.3 Power Consumption

Table 4.1 gives the power consumption of the XMEM325-PB in various configurations and situations:

Mode, Async. sampling	Current consumption @5.00V XMEM325-PB/C	Current consumption @5.00V XMEM325-PB/B	Active Target
Idle	3.15A	2.15A	
6.125MHz	4.20A	3.20A	VME only
6.125MHZ	4.60A		VME and P2
25MHz	4.60A	3.60A	VME only
25MHz	5.50A		VME and P2

Table 4.1 Power consumption, XMEM325-PB

For total current consumption, add the consumption of the carrier board, see Section 2.4.

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5. OPERATION

5.1 Window Elements and Commands

The BusView graphical user interface employs mouse controlled menu bars, pull down menus, toolbars, dialog boxes and multiple windows. See Figure 5.1.

Menu bar All main commands are shown on a menu bar at the top of the window.

Pull-downs Most menu bar commands have pull-down menus attached, containing a list of sub-commands.

Dialog box Some sub-commands may present a dialog box for detailed specification of various parameters, while others may present a secondary pull-down menu for further selections.

Tool bar The tool bar contains most of the commands from the menu bar, displayed as icons below the menu bar. The function of each icon is displayed on the status line, when pointing at the icon with the mouse cursor.

Status line The bottom line of the window is used to present simple messages about the status of the analyzer and guide the user as to which keys can be typed etc. This line will also show error messages.

The status line shows which targets are open. Single click on a target, and its Setup window is activated. Double-click on a target, and the trace is displayed if there is a valid trace.

Each target has its associated LED. LED color codes:

- None: Empty trace.
- Dark green: Trace full.
- Light green: Tracer is running, but has not triggered.
- Yellow: Tracer is running and has found a trigger.

Annunciator At the end of the status line is the annunciator. The annunciator displays the status of the analyzer.

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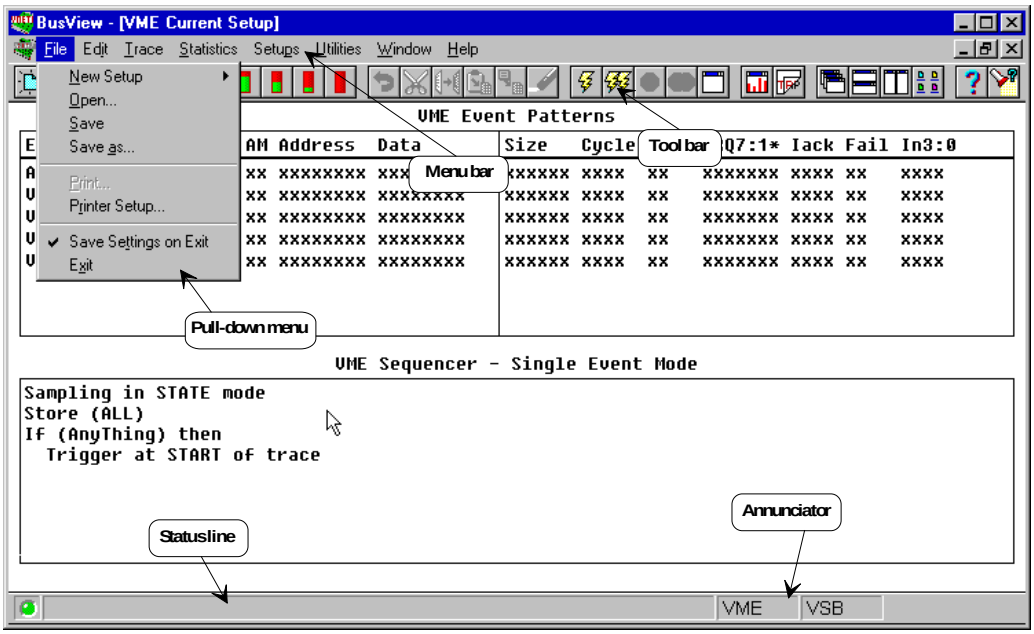
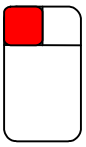


Figure 5.1 The BusView front panel

5.2 Using BusView

BusView can be mouse controlled, keyboard controlled, or a combination of the two. The principles are the same as for any other Windows application you might have used before.

5.2.1 Mouse Control



With the **left mouse button** almost everything can be done in BusView. By clicking the left mouse button you can make selections at the menu bar and at the tool bar, switch between windows, and move around in dialog boxes and pull down menus. The right mouse button has some interesting features too, it is for instance used to move the Y- and Z-marker in the waveform display window, as explained in Section 5.7.2.2.

5.2.2 Keyboard Control

¬ - ¯ ® The cursor keys move the cursor to the desired command. Type CR [i.e. ↵], or the down cursor key, ↓, to open the pull-down menu or dialog box. Alternatively use the **Alt-<key>** method described below.

Alt-<key> All the elements at the menu bar have one underlined character. By typing **Alt-<key>**, where **<key>** is the underlined character, the pull down menu or dialog box belonging to the specific element is activated.

¿ selects Place the cursor, by using the cursor keys, on the wanted command and type CR to select.

Grey text Commands that cannot be executed in the current context are shown in low intensity.

Ctrl-TAB In the same way as you change Windows applications with the Alt-TAB keys, the **Ctrl-TAB** keys result in switching between BusView child windows.

TAB Switches between the Event Patterns window and the Sequencer window.

Within dialog boxes

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TAB The TAB key moves the cursor from one editable field to another.

Space Makes selections, both select and deselect.

ESC The ESC key closes an unwanted dialog box or menu.

Undo, Copy, Cut and Paste

These very useful commands are implemented the same way, and with the same control characters, as in other Windows applications, and are available both in the `Edit` menu, with control characters, and at the tool bar.

5.3 User-Interface Structure

5.3.1 Functional Units

With the various piggyback options available for the VBT-325, the product may consist of up to four analyzers in its maximum configuration.

Analyzer	VBT-325B	VBT-325C	VBT-325 with TIM200-PB/TIMBAT-PB	VBT-325 with XMEM325-PB
VMEbus STATE/TIMING	x	x	x	x
P2 STATE/TIMING		x	x (model C)	x (model C)
200MHz TIMING			x	
Ext.trace VMEbus				x
Ext.trace P2				x (model C)

Table 5.1 The analyzer possibilities using the VBT-325 and its piggyback modules

5.3.2 Window Categories

The VBT-325 has a user-interface based on three different windows:

- The Setup window
- The Trace Display window
- The Statistics window

5.3.3 Setup Window

The Setup window is the "control panel" of the analyzer. In addition to the different menus and the tool bar, the setup window contains two major elements as shown in Figure 5.2.

- The **Event Patterns** window.
- The **Sequencer** window.

These windows are used to define triggers, store qualifiers etc., and are both described in detail later in this chapter.

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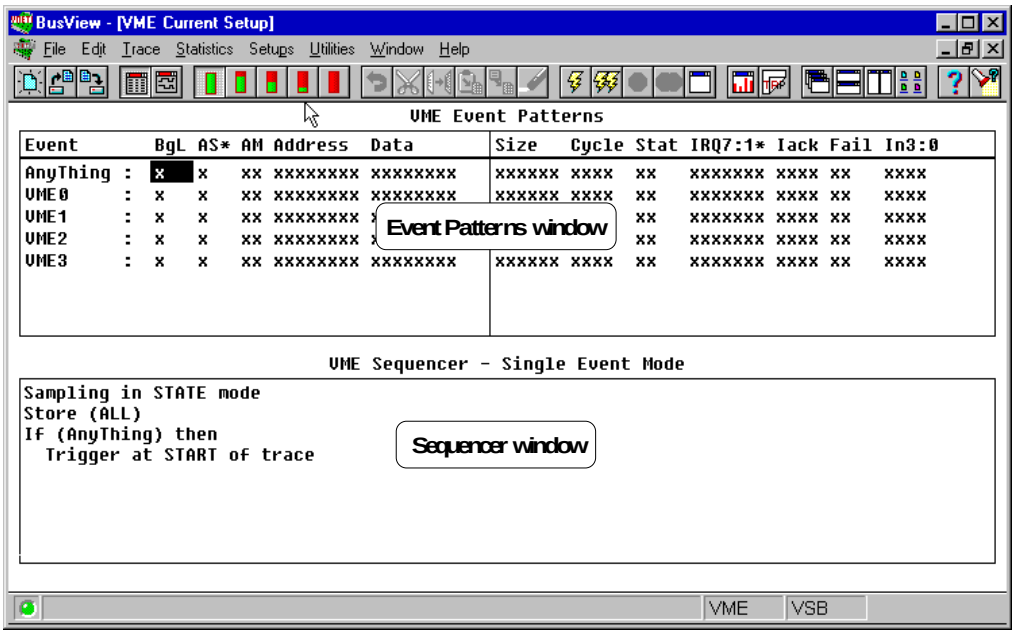


Figure 5.2 The Setup window

5.3.4 Trace Display Window

The Trace Display window is where the contents of the trace buffer are displayed. The trace data may be displayed as an alphanumeric trace list, as in Figure 5.3, or as waveforms. The waveform display is shown in Figure 5.37. Multiple trace windows of either type may also be created. The menu bar in the Trace Display window is tailored to perform efficient navigation, searching and formatting of the trace data contents.

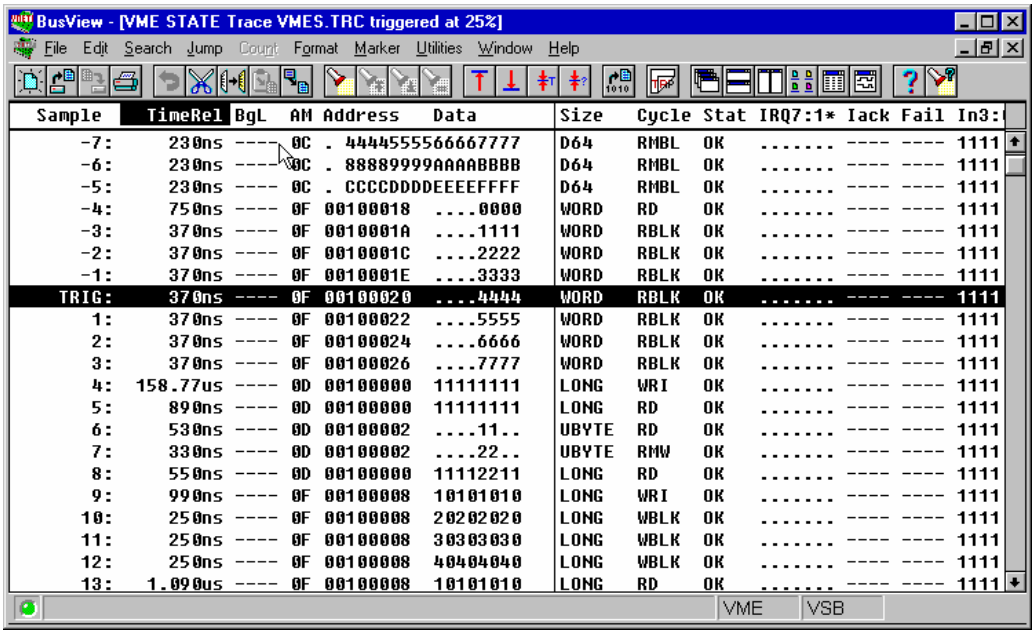


Figure 5.3 The trace display window, alphanumeric view

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5.3.5 Statistics Window

The Statistics window is used to control and see the results of a statistics operation. A special menu bar is given, providing a flexible and powerful environment for statistics measurements. The Statistics window is shown in Figure 5.4.

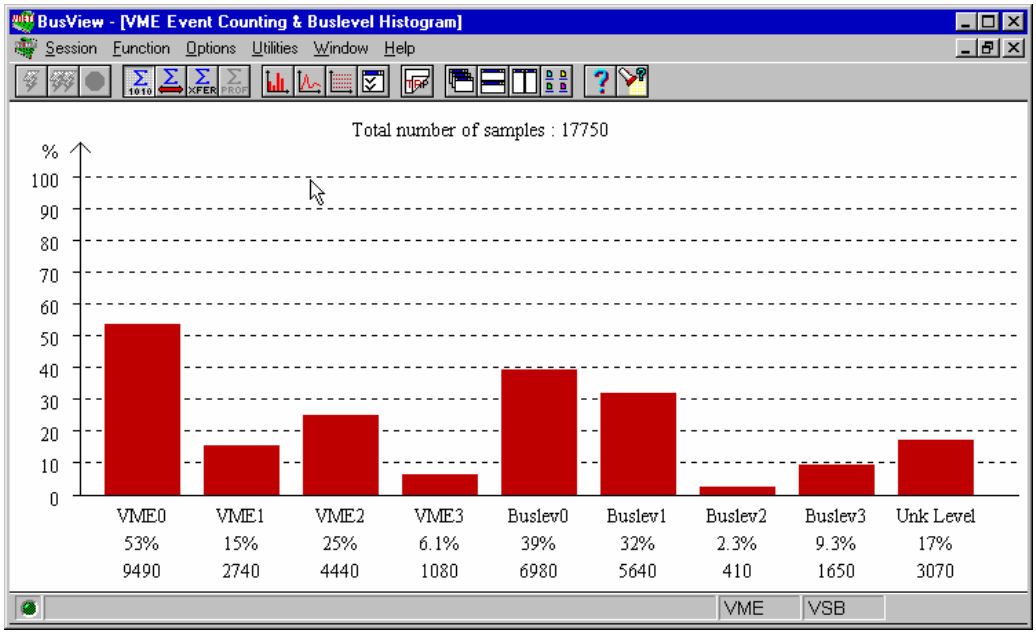


Figure 5.4 The Statistics window in "Event Counting" mode

5.4 Event Patterns

The Event Patterns window defines the patterns to be loaded into the word recognizers of the VBT-325. The hardware provides **four** parallel word recognizers, but the user may define a larger number of predefined patterns that can easily be taken into use.

VME0-VME3 By default, four user-editable patterns are provided. They are labeled **VME0-VME3**, and by default they are all *don't care* . See Figure 5.2.

AnyThing In addition, there is a fixed, i.e. not editable, event named **AnyThing**. This pattern will always be empty, i.e. contain an *all don't care* pattern, which makes it suitable to use as an unconditional trigger.

The default Event Patterns window contains the most important signals and signal groups for the current sampling mode. The user may insert additional signals or signal groups, as well as additional patterns with user-defined labels.

Active low: * Signals which are defined as active low in the target bus are indicated by a "*" after the signal name. (Example: AS*). This means that the signal is shown as a '0' in the trace when True.

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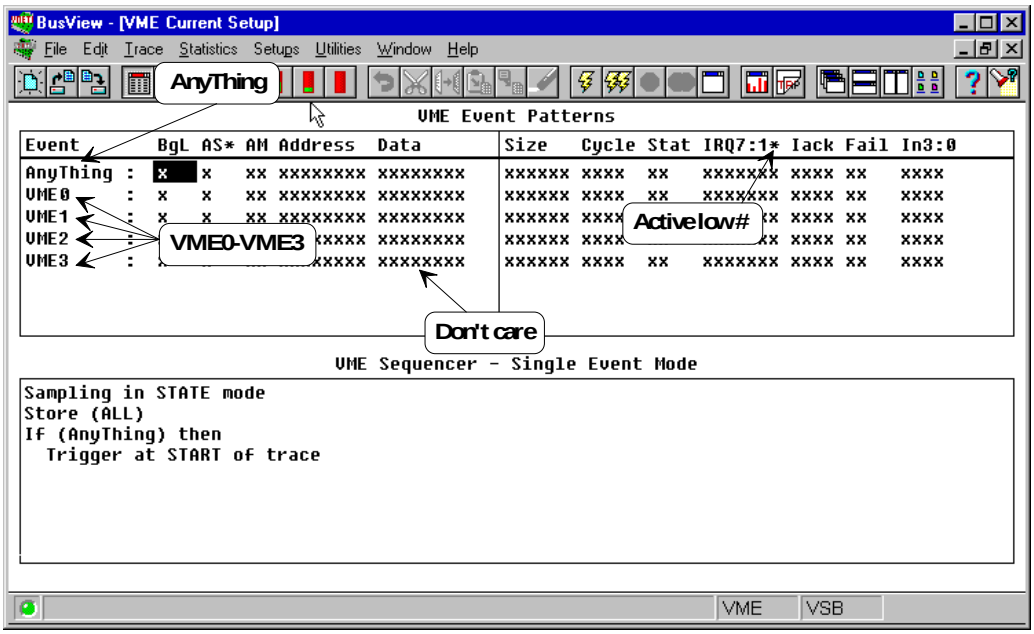


Table 5.2 Explaining the Event Patterns window

5.4.1 Editing Event Patterns

The user may fill in event patterns as binary, hexadecimal, or mnemonic values in the various signal fields in any of the predefined event patterns except *AnyThing*, which is unalterable. The user may delete or insert new event patterns and signal fields.

New event patterns may be given user-defined names. By inserting and/or deleting signal field columns, the sequence of the signal field columns may be altered.

The Event Patterns window is activated by clicking the left mouse button in it. Moving around is done with the mouse, or with the cursor keys.

5.4.1.1 Edit Fields

Place the cursor at the field you want to edit, and type in the new value. The new value may contain only digits, or a mixture of digits and don't cares (x = don't care). Typing errors are corrected by moving the cursor back to the start of the field, (either with the mouse or the cursor keys), and typing the value once more. Alternatively clear the field by selecting `Clear` from the `Edit` menu, and then retype the desired value.

Typing CR, or moving to another field, finishes the editing.

Used as a trigger condition, the edited event will cause the VBT-325 to trigger for bus cycles where the event pattern is equal to the edited event. Used as a store qualifier, the VBT-325 will store all cycles with the edited pattern, and skip all others.

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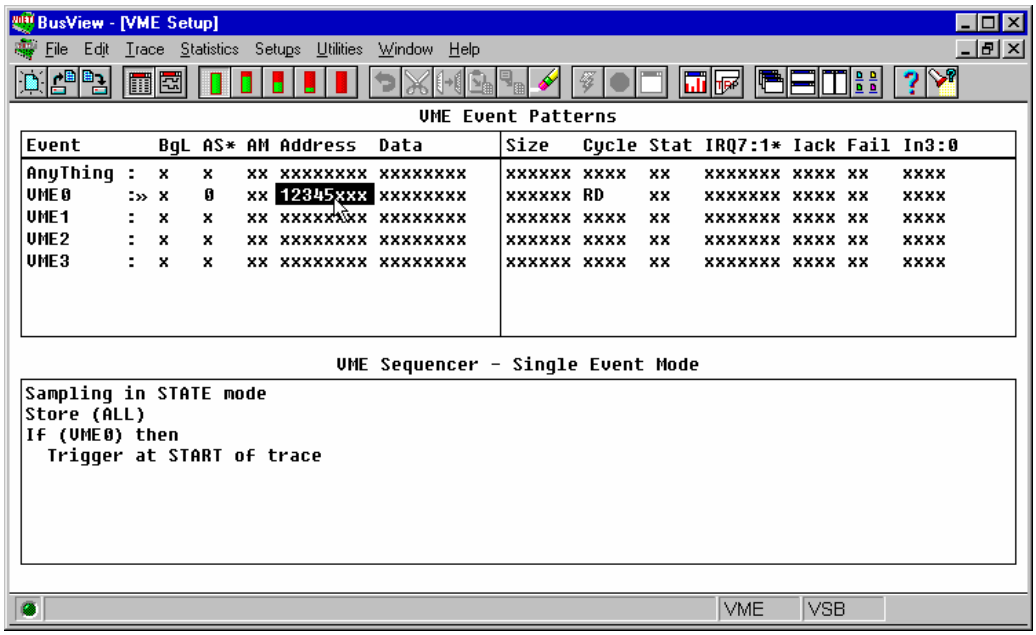


Figure 5.5 Editing a signal field

5.4.1.2 Field Options

Most fields have a dialog box for selection of predefined values, assert negation and other field options.

Select for instance the `Cycle` field, and double click on the left mouse button, or type CR. The dialog box in Figure 5.6 is displayed. Select the preferred choice and press the OK button, or double click on the preferred choice. A mnemonic will be displayed in the `Cycle` field.

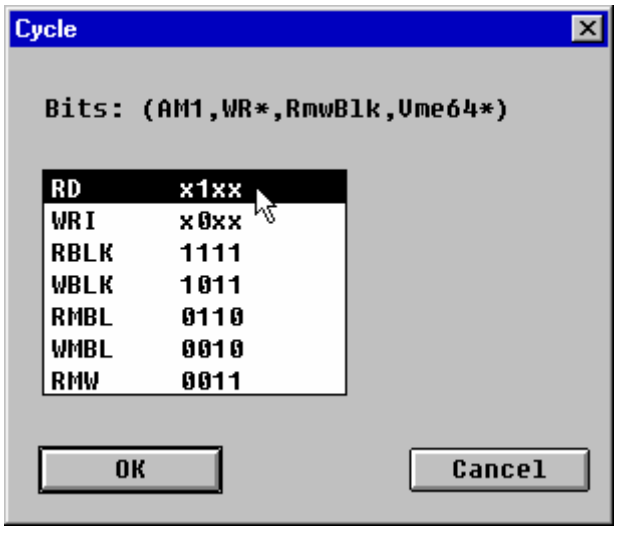


Figure 5.6 Edit the Cycle field in the Event Patterns window

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5.4.1.3 Clearing Contents of Signal Fields

Typing an x into a field will set the corresponding bit(s) to don't care. An x means that this bit (signal on the bus) will be ignored when the tracer is looking for a trigger, or when using this event as storage qualifier. Clear the field by selecting `Clear` from the tool bar or the `Edit` menu, or by pressing the DEL key.

5.4.1.4 Hiding Signal Field Columns

Select an entire field column by clicking on the name at the top of the column. Selecting `Cut` from the tool bar or the `Edit` menu, or pressing the DEL key, will make the field column disappear. It can be re-inserted later, at any place in the event window.

5.4.1.5 Adding Signal Field Columns

Select an entire field column by clicking on the name at the top of the column. Selecting `Insert` from the tool bar or the `Edit` menu, or pressing the INS key, makes the dialog box in Figure 5.7, containing a signal list, appear. Select the signal you want to insert, press the OK button, and the field column of the new signal will appear to the left of the cursor.

Note 1 By typing the first letter of the signal to be inserted, the cursor moves to the first signal starting with that specific letter.

Note 2 More than one signal can be inserted in one operation. Hold down the **Ctrl** key and select the desired signals with the mouse, alternatively hold down the **Shift** key, and use the up/down cursor keys to select the signals.

The same signal can be inserted more than once. Inserting many signals may cause the Event Patterns window to become too small. A scroll bar will show up at the bottom of the window enabling the user to scroll through all the field columns, as shown in Figure 5.8.



Figure 5.7 The Insert Signal dialog box

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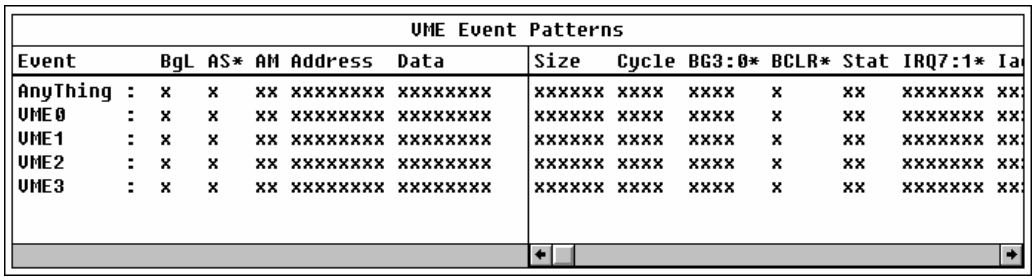


Figure 5.8 Scrolling through the field columns

5.4.1.6 Renaming, Deleting, Adding and Copying Entire Events

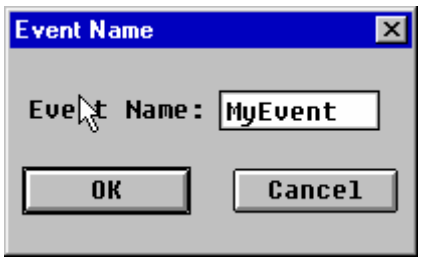


Figure 5.9 Renaming an event

Rename Select an entire event by clicking on the name of it, for instance select event VME0 by clicking on the name VME0. The event is highlighted. Double click on the name, or press CR. The Rename Event dialog box appears, as shown in Figure 5.9. Change the name and press the OK button.

Delete Select the undesired event by clicking on it's name. Select `Cut` from the tool bar, from the `Edit` menu, or press the DEL key.

Add When adding a new event, it will be added above the current event, i.e. to place a new event at the bottom of the list, place the cursor below the last event. Select `Insert` from the tool bar, from the `Edit` menu, or press the INS key. A Name Event dialog box appears. Type a name and press the OK button

Copy Select the desired event, and select `Copy` from the tool bar or the `Edit` menu. Place the cursor below the event where you want to insert the copied event and select `Paste` from the tool bar or the `Edit` menu. A dialog box asking for a new name for the event appears. Give it a new name, and press the OK button.

5.4.2 Address/Data Options

Typing `CR` in the `Address` field brings up a dialog box that will give the options for the `Address` field. A similar dialog box will also be displayed for the `Data` field. All

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examples given for the Address, except for some A64/D64 details, are also valid for the Data field:

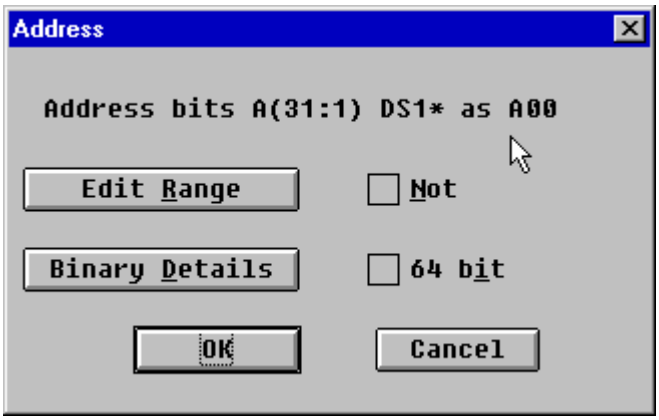


Figure 5.10 The Address options dialog box

The NOT operator <!>

Negation, i.e. the NOT operator, can be specified for the data, the address and some other fields. The NOT operator, if not chosen in a dialog box, is activated by typing a note of exclamation <!> in front of the field. The event pattern will then give match for all values except the chosen one.

Edit Range

By editing the Address field, an event can include a range of patterns. Press the Edit Range button in the dialog box in Figure 5.10, and a new dialog box, shown in Figure 5.11, appears. Accommodate the range to your needs, choose whether you want 64 bits, and press the NOT button if the desired range is everything but the chosen range.

By selecting the Address field, and typing a hyphen (-), the field will automatically expand to include a range. Negating the range is done by typing a note of exclamation (!).

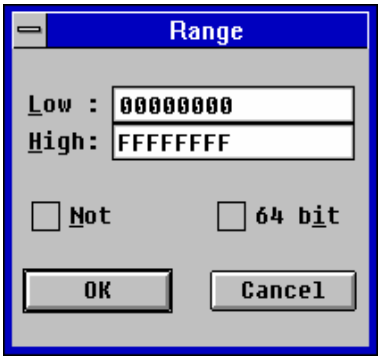


Figure 5.11 Defining Range

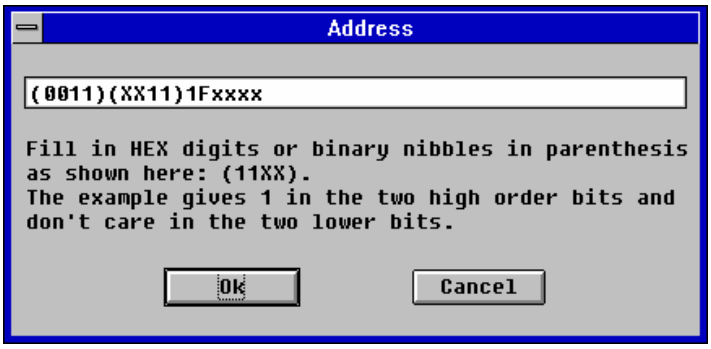


Figure 5.12 Binary details

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Binary Details

Binary details makes it possible to specify don't care values at the bit level. Specifying binary details is done by clicking on the `Binary Details` button in Figure 5.10 (or by typing a left bracket "(" in front of a hex digit in the Event Patterns window). The dialog box in Figure 5.12 appears. The example above shows how the two first hexadecimal digits are expanded to the binary level, making it possible to have don't care values at the bit level. Digits containing binary don't cares will be displayed as a "$" in the Event Patterns window.

64-bits Address/Data

For use in VME64 applications, the VBT-325 allows 64-bit addresses or data to be specified in the event patterns. Enabling for the 64 bit option on the `Address` field makes the following change to the event.

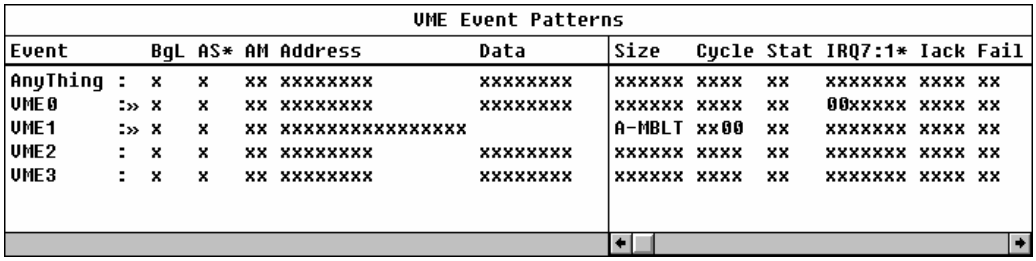


Figure 5.13 64-bits addressing

Since VME64 is a multiplexing of the address and data lines, it is not possible to define anything in the data when a 64-bit address is specified, and vice versa.

A64

A64 uses `A[31:1]` as the lower address bits, then `D[31:1]` as the upper address bits, `A[63:32]`.

D64

Uses `D[31:0]` as the lower 32 data bits (as ordinary 32 bit cycles), `LWORD*` as D32, then `A[31:1]` as `D[63:33]`.

A64 bit range

For the `Address` field, it is also possible to set ranges on A64.

64-bit range is not allowed on the `Data` field.

5.5 Single Event Mode

The default state of the Sequencer is "Single Event mode". Single Event mode is the simplest way of using the tracer to trigger on an event, by simply pointing at the desired event in the Event Patterns window. In Single Event mode the user can edit the sampling mode, which event to trigger on, and the trigger position. The sampling mode and the trigger position is edited with tool bar buttons, or from the `Edit` menu on the menu bar. The event is edited and selected in the Event Patterns window.

In Figure 5.14, Event1 is chosen to be the trigger condition, and the trigger position is set to 25% of trace.

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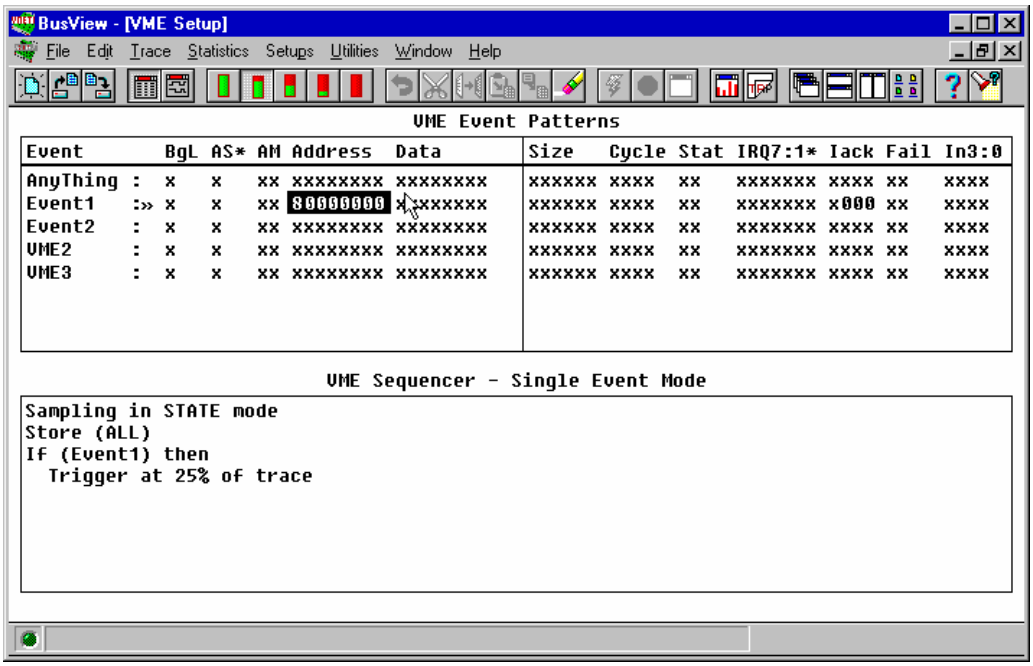


Figure 5.14 VME setup with the Sequencer in Single Event mode

5.5.1.1 Editing the Single Event

Sampling Mode

The sampling mode is changed by choosing `Edit/Sampling Mode/50 MHz TIMING`, or by pressing the TIMING mode tool bar button.

Trigger Position

The default trigger position is at “Start of Trace”, which means that when the trace is displayed, no samples are shown before the trigger. Alternative trigger positions can be chosen under `Edit/Trigger Position`, or selected with tool bar buttons. The choices are Start of Trace, 25% of Trace, Middle of Trace, 75% of Trace, and End of Trace.

Trigger Condition

The default trigger condition is “AnyThing”. Changing it to another event is done by selecting one of the other events in the Event Patterns window.

5.6 Sequencer Mode

Very often the tracer is simply used to see whether a certain transaction (an event) occurs on the bus, and if it does not, what is actually happening. For this purpose Single Event Mode is sufficient.

Why?

In more complex cases, one may want to see what is happening **only** when a certain event occurs **after** a series of other events, or one may want to filter out samples of no interest, or count a certain number of occurrences of an event before the trigger. These are a few examples of situations where the Sequencer is taken into use.

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What?

The Sequencer is state machine which enables the user to define complex triggers, store qualifiers, count conditions, etc. The Sequencer program allows event patterns to be combined sequentially using IF… Elsif… Else statements, or combinatorial, using AND, OR and NOT operators. It is also possible to switch sampling mode and trigger position directly in the Sequencer program.

5.6.1 Tutorial

The easiest way of understanding the Sequencer, is to define an example program, and explain it step by step:

Trigger condition

Consider a software routine that goes like this:

```
If(a==b) {
   Write to Addr1;
   Read from Addr2;
   ….
}else if(a==c) {
   Write to Addr1;
   Read from Addr3;
   Read from Addr2;
   ….
} else ….
```

What happens after the "Read from Addr2" when a equals b, and **only** then?

Obviously it is not sufficient to make a single event trigger on "Read from Addr2", since this also occurs in the second branch when a equals c. So, we need to define a trigger condition as a series of events made up of a write access towards Addr1 immedialtely followed by a read access from Addr2. The Sequencer program in Figure 5.15 will do exactly this.

Define events

Before entering the Sequencer, the events needed for the trigger condition have to be defined in the Event Patterns window. See Figure 5.15.

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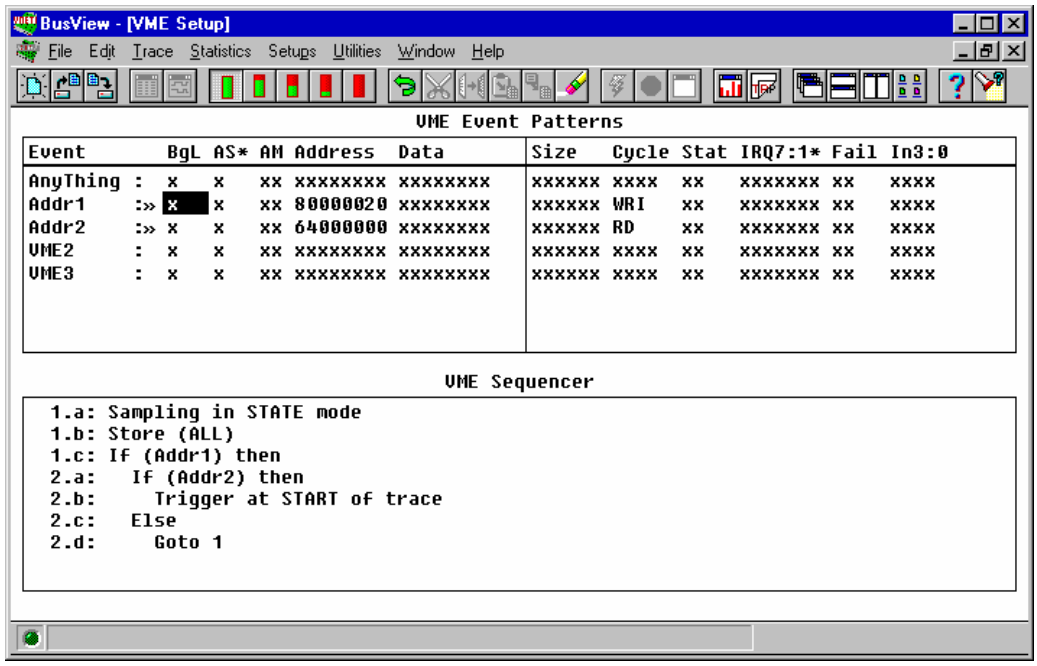


Figure 5.15 Sequencer example program

Leaving Single Event mode

The Sequencer is entered by double-clicking in the Sequencer window, by selecting `Open Sequencer` from the `Edit` menu, or simply by pressing the TAB key. The dialog box in Figure 5.16 appears. Press the OK button.

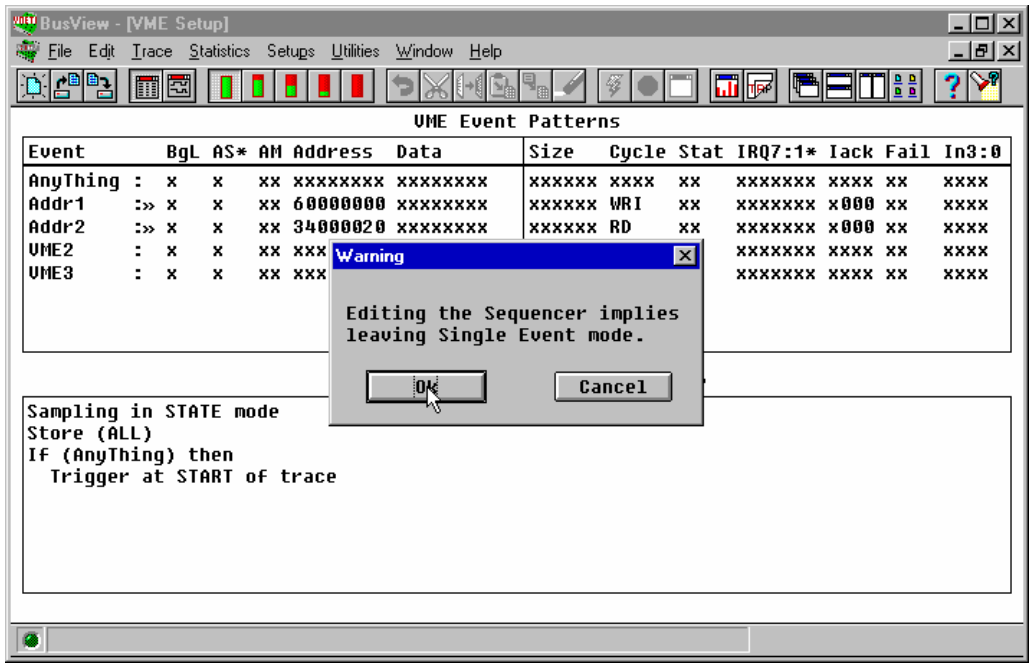


Figure 5.16 Leaving Single Event mode

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Appearance/Contents

The default Sequencer program has the same contents as Single Event mode, but it has changed appearance. All lines start with a number and a letter. The number refers to the fact that the Sequencer is a state machine with 16 (only 15 user-editable) possible states (This is described thoroughly in Section 5.6.2), which means that the number indicates which state the Sequencer is in. The letter indicates line number within each state.

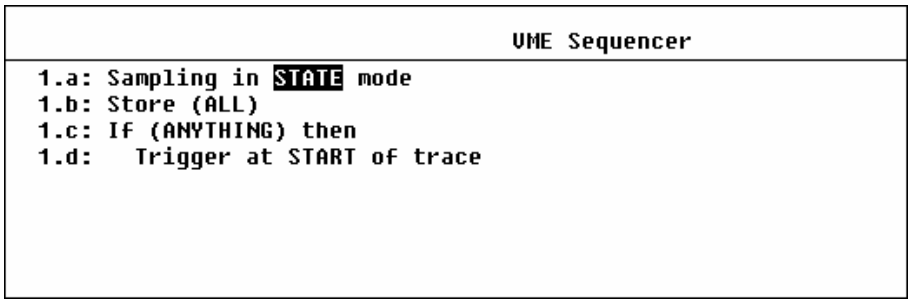


Figure 5.17 The default Sequencer program

Edit event expressions

All If operators are inserted with the default event expression, ANYTHING. To change this, double-click on ANYTHING (or single-click and press CR). The dialog box in Figure 5.18 appears. Press the down cursor key (↓) to get the menu over possible events to insert. Select Addr1 and press the OK button.

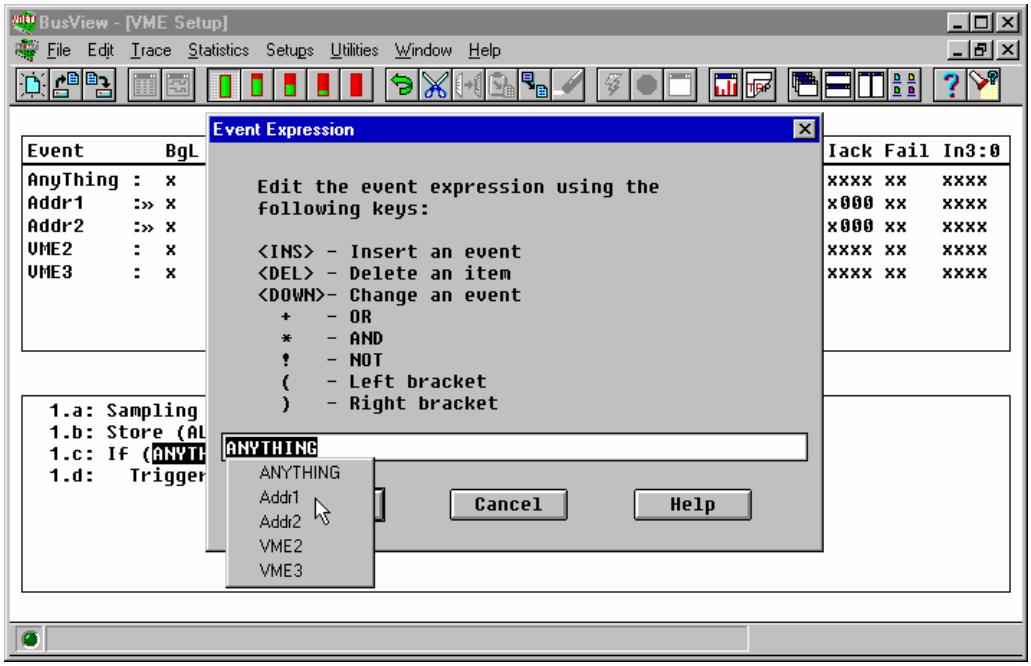
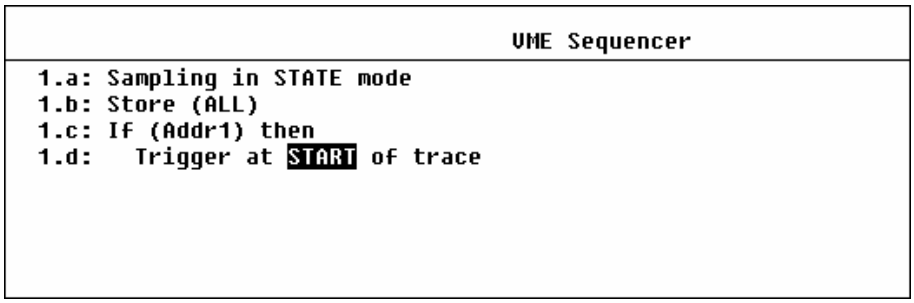


Figure 5.18 Editing an Event Expression



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Figure 5.19 Addr1 is inserted in line 1.c

New operators

All new operators are inserted above the current cursor position, i.e. to insert the next If operator, mark the START keyword, and press the INS key (or select `Insert` from the tool bar, or the `Edit` menu). A list over possible operators appears. Select the If operator, and press the OK button.

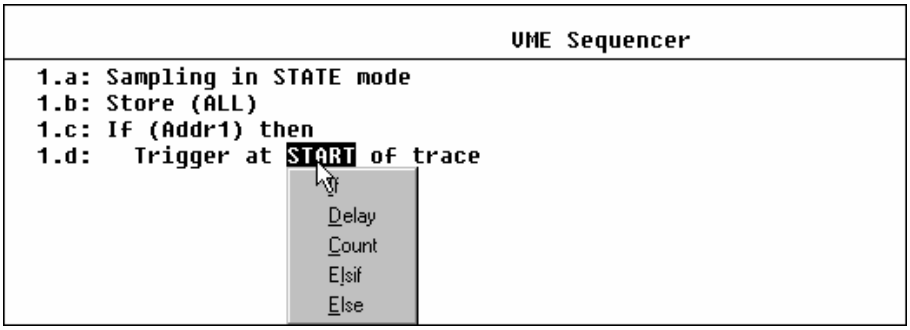


Figure 5.20 Insert another If-test above the Trigger statement

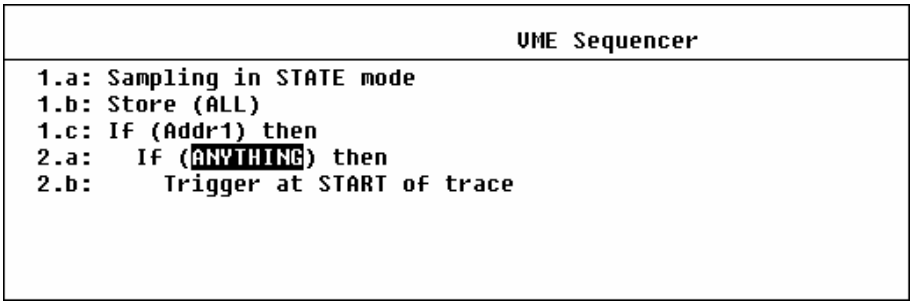


Figure 5.21 If-statement inserted

Addr2

Change the event expression from ANYTHING to Addr2, as described for Addr1 above.

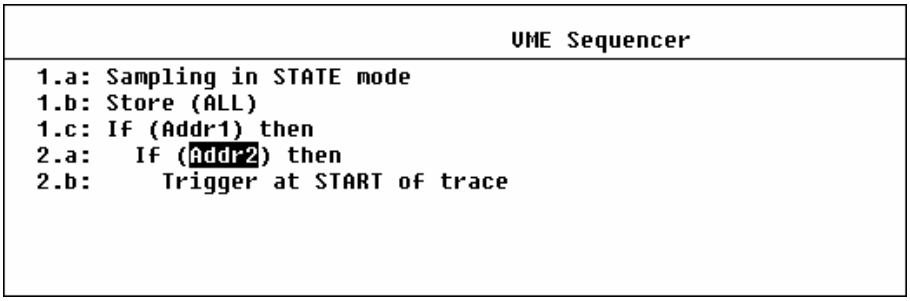


Figure 5.22 Addr2 is the next event to look for

Trigger Position

If the trigger position is set to START of trace, it means that no samples before the trigger sample is visible in the trace. Setting the trigger position to 25% of trace means that 25% of the trace is filled up before the trigger sample, and thus it is possible to see what happened some time before the trigger.

Double-click on the START keyword (or select and press CR). Select 25% from the pop-up menu that appears.

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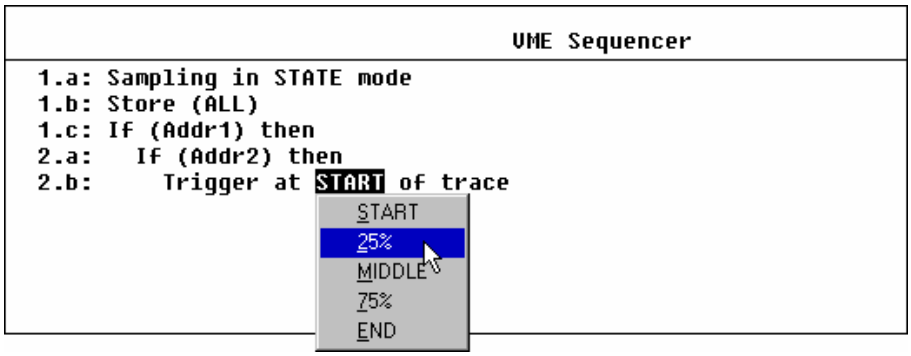


Figure 5.23 Changing the trigger position

The software routine which is the basis for this tutorial, has both an If branch, and an Else branch. If there was not for the Else branch ,which contains both the accesses from the If branch, the Sequencer program could end here. It would then search for Addr1, and it would trigger whenever Addr2 occurred on the bus after that. (This is because an implicit "Else goto current state" is always present after an If statement if no Else is specified.)

To prevent triggering on both the If and the Else branch, we need an Else branch in the Sequencer program as well.

Inserting new operators at the bottom

To insert new operators at the bottom of the Sequencer, double-click below the last line, or place the cursor after the last line, and press the INS key (or select `Insert` from the tool bar or the `Edit` menu).

Select the Else operator.

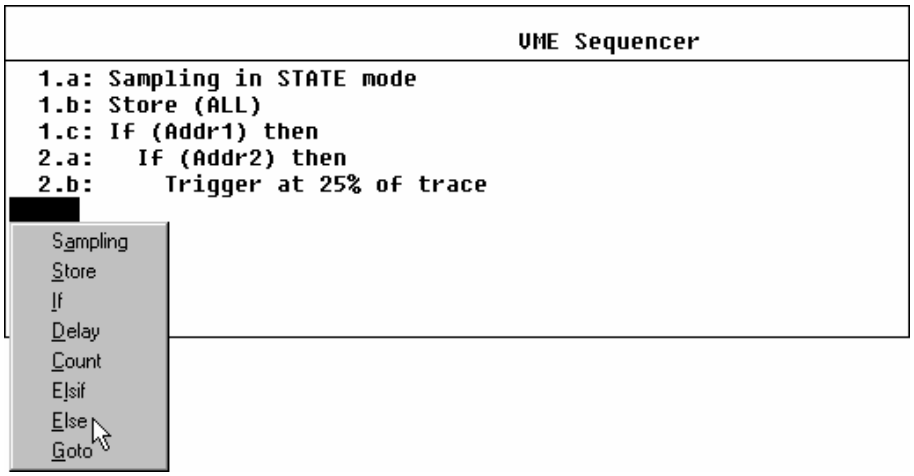


Figure 5.24 Insert the Else operator

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Else which state?

After selecting the Else operator, a list over possible states the Else is for, appears, as shown in Figure 5.25. To select the right state, one has to think of what was the intention of the Sequencer program, and what is the result of choosing one or the other.

To be able to decide, suppose that the Goto 1 statement is to be inserted after the Else operator.

Intention: Search for Addr1. When found, check if the next is Addr2. If so trigger, if not, start searching for Addr1 again.

State_1: Selecting State_1 will make the Else branch hit until Addr1 appears on the bus, and if Addr2 is not appearing on the bus, the tracer will never trigger.

State_2: Selecting State_2 will make the tracer search for Addr1, and if Addr2 is the next event on the bus, the tracer triggers, if not, it will start searching for Addr1 again, which matches the intention.

Select State_2.

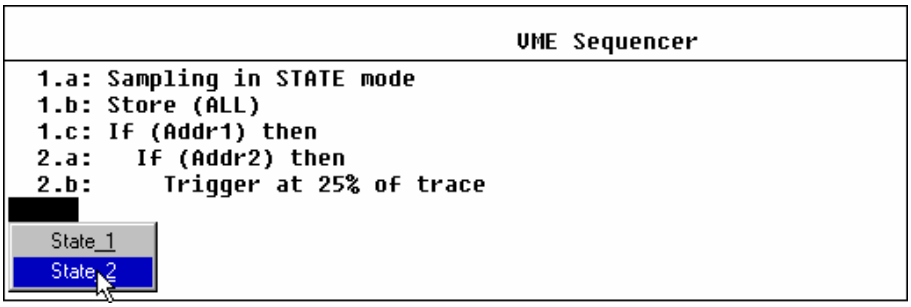


Figure 5.25 Select which Sequencer state the Else is for

Goto 1

Insert the Goto operator below the Else operator, as described for the Else operator above. The number following the Goto operator indicates the state number to go to.

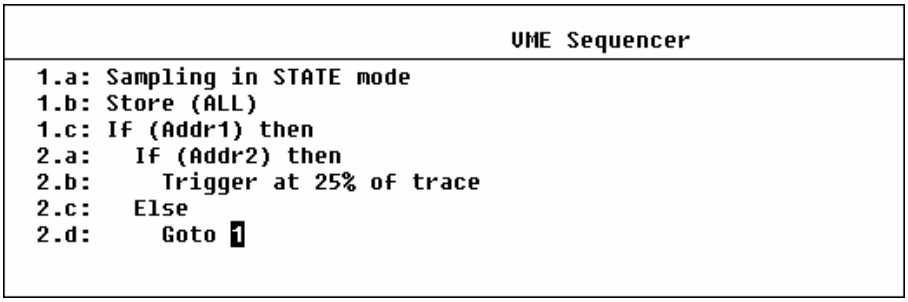


Figure 5.26 If Addr2 does not show, start looking for Addr1 again

5.6.2 Sequencer - a State Machine

The Sequencer is a state machine which can be in one of 16 possible states, of which 15 can be programmed by the user. Certain rules controls the transition from one state to another. The Sequencer is able to change state between each sample, even when operating at full speedFigure 5.27 tries to visualize each state in a Sequencer program.

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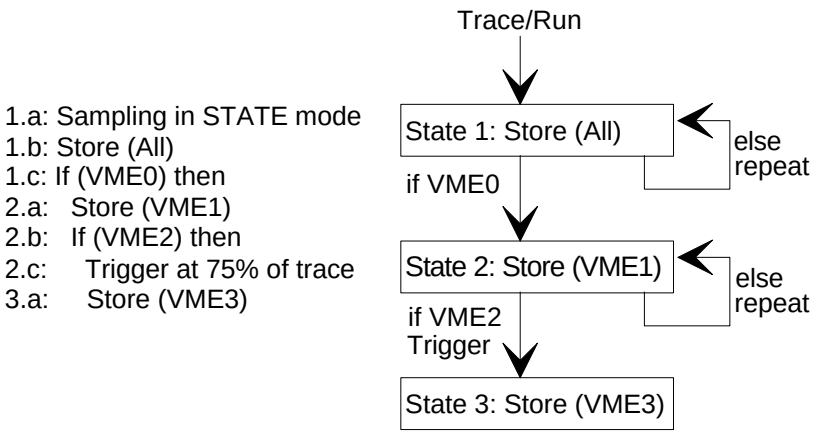


Figure 5.27 The Sequencer as a state machine

State 1 When started, the tracer samples in STATE mode. Line 1.b sets the tracer to store all samples in the trace memory. Each sample is compared to the patterns in the current event comparator, VME0. The Sequencer program will stay in state 1, storing all cycles until a cycle matching VME0 occurs. When equal to VME0, the Sequencer will change to state 2.

State 2 The tracer will compare all incoming bus cycles with the pattern VME1. Only samples that are equal to VME1 will be stored. The Sequencer will stay in state 2 until a sample matching VME2 occurs.

2 Þ 3 When VME2 occurs, the tracer triggers during the transition from state 2 to state 3. Then, the tracer starts to fill the rest of the trace buffer. Note that the trigger sample will also be stored.

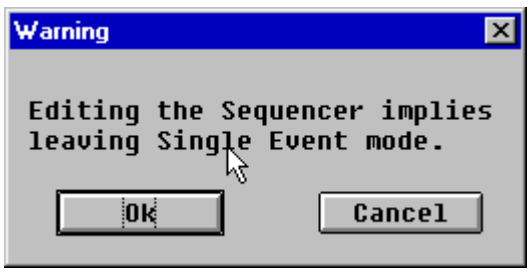
State 3 Only samples matching VME3 will be stored. Before the sampling stops, a given number of samples (matching VME3) are stored. The Sequencer program in the example stores 25% of the samples *after* the trigger. When the trace is full, the tracer will stop and display the captured trace.

5.6.3 Open Sequencer

The Sequencer is opened in one of three ways:

- Double-click in the Sequencer window.
- Select `Open Sequencer` from the `Edit` menu.
- Press the TAB key.

The warning in Figure 5.28 appears. Press the OK button.



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Figure 5.28 Leaving Single Event mode

5.6.3.1 Return to Single Event Mode

Returning to Single Event mode is done in one of three ways:

- Press the DEL key anywhere in the Sequencer window.
- Select `Cut` from the `Edit` menu.
- Press the `Cut` button at the tool bar.
- Initialize the setup by selecting `Initialize` from the `Setups` menu. Be aware of that this will also initialize the Event Patterns window!


The "Cut" tool bar button

The three first methods opens a pull-down menu in the Sequencer where one of the options is "Set Single Event mode".

5.6.4 Edit Sequencer

After opening the Sequencer, according to Section 5.6.3, the Sequencer is editable from the tool bar, the menu bar, and with the DEL and INS keys.

Change sampling mode

- Double-click on the keyword STATE.

  or

- Select the Keyword STATE, and press CR.

A pop-up menu with the two sampling modes appear. Select the desired sampling mode.

Change frequency

If the selection is TIMING, the sampling frequency can be changed from the `Edit/Sampling Mode/Options` pull-down menu.

Change event expression

- Double-click on any event expression in the Sequencer. Event expressions are displayed in brackets.

  or

- Select an event expression, and press CR.

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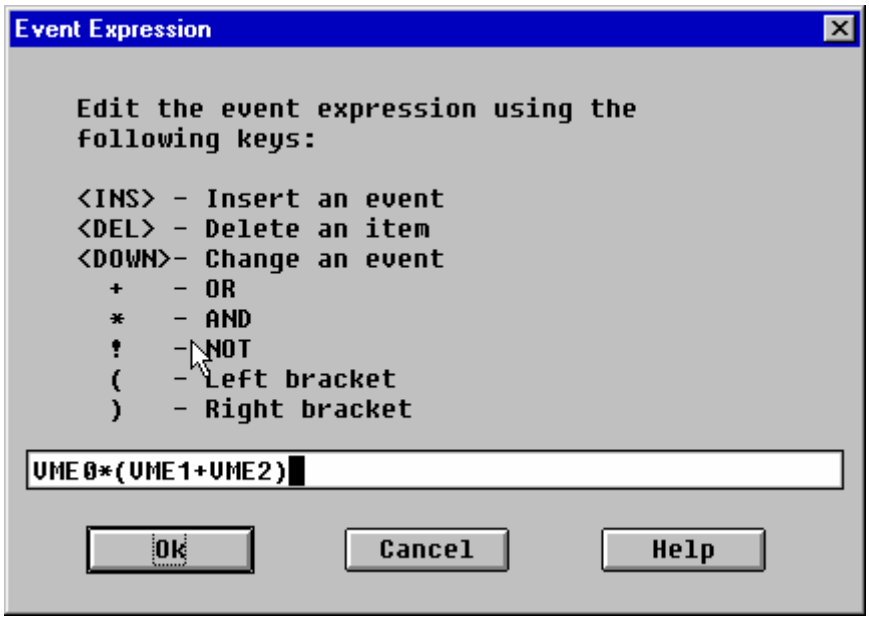


Figure 5.29 Edit event expressions

The dialog box appears, with possibilities to create complex event expressions from the events defined in the Event Patterns window.

Using the combinatorial operators, AND, OR and NOT are explained in Section 5.6.5.5.

New operators are inserted above the current cursor position.

Insert new operators

- Press the INS key

  or


The "Insert" tool bar button

- Select `Insert` from the tool bar

  or

- Select `Insert` from the `Edit` menu
- Double-click below the last line if inserting states at the bottom of the Sequencer.

A pop-up menu with all the available operators to insert at that state level appears. Select the desired operator.

Operators are deleted by placing the cursor on the line to be deleted and doing one of the following:

Deleting operators

- Press the DEL key

  or

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The "Cut" tool bar button

- Select `Cut` from the tool bar

  or

- Select `Cut` from the `Edit` menu

A pop-up menu with all the available actions appears. The actions are explained below:

- CANCEL: Cancels the delete operation.
- Current line: Deletes the current line. (This action is only visible if it is possible to delete the current line and still have a valid Sequencer. For example deleting the If-line and leaving the Else-line creates an invalid Sequencer.)
- Current "operator" with sub-tree: Deletes the sub-tree starting with current line.
- Restore default program: Returns the Sequencer to the state it was after leaving Single Event mode.
- Set Single Event mode: Closes the Sequencer, and returns it to Single Event mode.

It is possible to undo the last edit operation:

Undo editing

- Press the **Ctrl-z** keys

  or


The "Undo" tool bar button

- Select `Undo` from the tool bar

  or

- Select `Undo` from the `Edit` menu

5.6.5 Sequencer Reference

5.6.5.1 General Structure of a State

Possible actions In each state, a number of **actions** can be defined to take place, like:

`Sampling` Sampling in `STATE` or `TIMING` mode.

`Store` Store samples matching given event patterns.

`Count` Count occurrences of given event patterns.

`Delay` Delay a certain time.

Transitions Actions may take place as a function of event pattern match and next state number. However, `Sampling` and `Delay` will only be a function of the current state number as a self-imposed restriction.

In addition to actions, each state may lead to **transitions**, i.e.:

`Goto` Goto another state in the Sequencer.

`Trigger` Trigger the analyzer.

`Halt` Halt the sampling.

Transitions may occur as a function of event pattern match (`If-Elsif-Else` tests), counter carry, delay carry and next state number.

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The general structure and capabilities of one *state* in the Sequencer program is as shown below:

Sampling in {*STATE*|*TIMING*} mode

Store (<*Event Expression*>)

If (<*Event expression*>) then

Trigger | **Goto** <*State*> | **Halt**

:

or

Sampling in {*STATE*|*TIMING*} mode

Store (<*Event Expression*>)

Count <*Numeric expression*> of (<*Event expression*>) then

Trigger | **Goto** <*State*> | **Halt**

:

or

Sampling in {*STATE*|*TIMING*} mode

Store (<*Event Expression*>)

Delay <*Time expression*> then **If** (<*Event expression*>) then

Trigger | **Goto** <*State*> | **Halt**

:

Each `If`, `Count` or `Delay` may also have an `Elsif` .. `Else` branch as shown below. More than one `Elsif` can be used.

Elsif (<*Event Expression*>) then

Trigger | **Goto** <*State*> | **Halt**

:

Else

Trigger | **Goto** <*State*> | **Halt**

:

- The colon "`:`" indicates that other states of the same construction can be entered at this location.
- Multiple branch conditions are possible by combining an `If`, `Count` or `Delay` statement followed by a number of `Elsif`, optionally ending with an `Else`. Note that `Count` and `Delay` only may come as an alternative to the `If`, and that `Elsif` and `Else` are allowed after `Count` and `Delay`.
- `Halt` may only be used alone.

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5.6.5.2 Sequencer Notation

UPPER/lower case

Keywords Parametric keywords are shown in UPPER CASE letters for better visibility, like `STATE`, `50MHz TIMING` (except the z in MHz!) and `START`, `MIDDLE`, `END`.

Event expressions Both predefined, as `VME0,` and user-defined events are shown as in Event Patterns window.

Operators Operators are shown with initial Caps, otherwise lower case.

Filler words Filler words, like `in, then, of` etc. are shown in lower case.

Brackets Brackets are used to indicate that fields are expandable, like event expressions where event terms can be expanded with a logical expression like '+', '*', '!' (OR, AND, NOT). Both predefined events and user-defines events are available in the Sequencer, as shown in Figure 5.30. Select an event expression in the Sequencer, type CR, and the Event Expression dialog box appears.Creating an event expression is done according to the rules in Section 5.6.5.5.

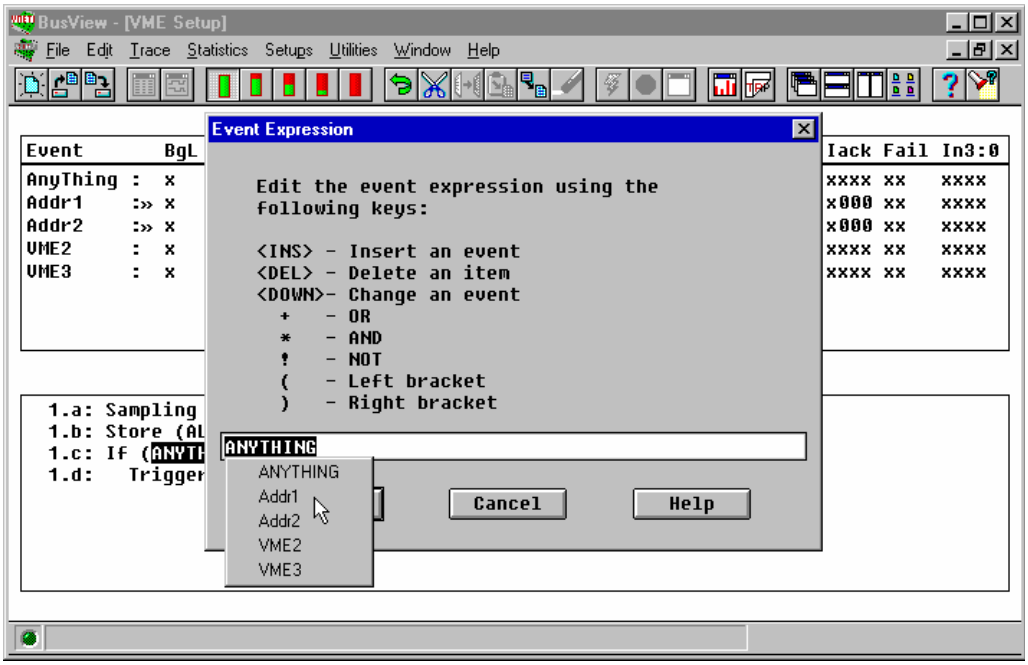


Figure 5.30 Brackets in the Sequencer are expandable

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State/Line numbers Each line in the Sequencer has a number consisting of state number and line within state as a lower-case letter, separated by a dot '.'. (e.g. 1.a etc.). Two letters (e.g. 1.aa etc.) are used if more than 26 lines used. Line numbers are used in the Sequencer except when in Single Event Mode.

Indents Indents are used after `If`, `Count`, `Delay`, `Elsif` and `Else` statements. Example:

```
2.a:  If (VME2) then
2.b:     Trigger ...
3.a:     Sampling ...
```

Current state indicator During sampling an arrow "`>`" will mark all lines in the current active state.

Note! Note that it is not possible to use more than **four different event names** in the Sequencer program at the same time. A warning will be given when the fifth event is taken into use. There is no limit on how many times one event name can be used in event expressions in the same program. The same event may serve both as both as Trigger condition(s), Store and Count conditions.

XMEM325-PB The XMEM325-PB allows up to 8 events to be used in the "XMEM_VME" (not "VME") Sequencer program in STATE mode. This is done by sharing resources with the VBT-325 itself. For this reason the *Dual analyzer* capability of the XMEM325 cannot be used at the same time as more than 4 events are used.

5.6.5.3 Operators

Sampling The `Sampling` operator is used to specify sampling mode. The first line in the Sequencer program must always be a `Sampling` line, so this line cannot be deleted. The sampling mode can be changed dynamically by entering a new `Sampling` statement inside the Sequencer program.

Syntax `Sampling in <Mode> mode`

Parameter The `<Mode>` parameter can be selected here as one of:

`STATE`

`<Speed> TIMING`

The TIMING sampling speed, `<Speed>`, is selected by executing `Edit/ Sampling Mode`, and then selecting one of the indicated speeds.

Note! A `Sampling` expression is implicitly valid for all subsequent states in the Sequencer program, until superseded by a new `Sampling` condition.

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Store

The `Store` operator is used to achieve *filtering* of the captured samples.
A `Store` expression is implicitly valid for the rest of the Sequencer program, until superseded by a new `Store`. The second line in the Sequencer program must always be a `Store` condition, so this line cannot be deleted. The predefined expressions `ALL` and `NOTHING` are available as *Event Expressions*. `ALL` and `NOTHING` is programmed in a special way in the Sequencer hardware, so that it does not consume a separate event (out of the four usable).

Syntax `Store (<Event expression>)`

Note!

A `Store` expression is implicitly valid for all subsequent states in the Sequencer program, until superseded by a new `Store` condition.

Note!

A sample causing a `Trigger` is always stored.

If/Elsif/Else

`If Elsif Else` statements may be used to control the branching of the Sequencer program. Multiple `Elsif` is possible, limited only by the number of possible *Event Expressions*. Both `Elsif` and `Else` are optional after an `If`.

The predefined expression `AnyThing` is available as an *Event expression*. `AnyThing` is programmed a special way in the Sequencer hardware, so it does not consume a separate event (out of the four usable).

Syntax

```
If (<Event expression>) then
:
Elsif (<Event expression>) then
:
Else
:
```

Indents

When multiple `If` states exist ahead of a point in the Sequencer program where an `Elsif` or `Else` is to be inserted, there is a need to determine which `If` state the `Elsif` or `Else` shall belong to. In such cases, the user will be asked to confirm the state number.

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Note!

An `If .. Elsif` sequence without an `Else` will always repeat itself if none of the conditions were met, so that a statement like

```
Else
    Goto Current state
```

can be considered as an implicit closing statement.

If no states follow an `If .. then`, `Trigger` in the Sequencer program, like in the default program, an implicit jump to an "invisible" state where the prevailing store condition is repeated takes place. This is to avoid storing both the specified store condition and the trigger condition if the trigger condition should occur again (according to the rule saying that trigger samples are stored.)

Goto

The `Goto` statement moves the execution of the Sequencer program to the beginning of another state. `Goto 1` will function as a restart of the Sequencer program.

Syntax `Goto StateNumber`

`StateNumber` = `2`, means `2.a`.

Warning!

`Goto` cannot be used to repeat `Count` or `Delay` statements, since the counters are not re-loadable during sampling.

Count

`Count` controls counters that can be used to count occurrences of specific cycles/events on the target bus. If a count statement is used, the Sequencer program will not advance until the specified number of cycles that matches the event pattern attached to the `Count` statement, occurs.

Syntax *`Count`* `N occurrences of(<Event Expression>)then`

Where *`N`* is a number from `2` to `1048575`. An `If` statement is equivalent to a "`Count 1`" statement. Up to 4 `Count` statements can be used in a Sequencer program.

Delay

`Delay` controls timers that can be used to delay a certain time before the Sequencer program is allowed to advance to the next state.

Syntax `Delay` *`N`* `{ns|us|ms} then if(<Event Expression>)then`

Where *`N`* is a number of the given delay unit, *ns*, *ms or ms*. The delay time can be minimum 80ns, maximum 335ms. Up to 3 `Delay` statements can be used in a Sequencer program.

Note!

When state 1 contains a delay statement, the delay counter starts to count between 500-900 µs before the sampling is started. This means that delays less than this time have no meaning in state 1.

The delay counter can be synchronized by putting an `If(ANYTHING)then` before the first delay. The delay counter will then start to count when the first sample occurs on the bus after the sampling is started.

A construction like `Delay ... Elsif` can be used to exit a delay interval on a certain condition, before the delay time expires.

A sample is required after the delay time is counted down, before the Sequencer will proceed to the next state, or a trigger will occur.

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Trigger

The `Trigger` operator determines where in the Sequencer program the trigger should be. It is possible to program a `Trigger` statement at different places in the Sequencer program, but only one of these will actually lead to a trigger, depending on the progress through the specified trigger sequence.

Syntax `Trigger at <position> of trace`

Parameter The *position* parameter can be:

START

25%

MIDDLE

75%

END

Even if multiple trigger statements exist, the trigger position will be kept the same throughout the Sequencer. Modifying one of the trigger statements will then result in a modification of the other trigger statements as well.

As the parameter for `Trigger` must be the same throughout the Sequencer program, `Halt` can be used to replace "`Trigger at END of trace`" if `Trigger` already has been used with one of the other parameters. You should, however, use "`Trigger at END of trace`" where possible.

Note!

The trigger sample is always stored!

Halt

The `Halt` operator causes the tracer to halt and display the trace.

Syntax `Halt`

5.6.5.4 Implicit Actions/Transitions

The Sequencer is no programming language, but a compact practical way of controlling the operation of the tracer. Thus, to minimize the need for user programming, there are a number of implicit actions in the Sequencer that gives the user the desired results in the absence of explicit commands:

- A `Sampling` expression is implicitly valid for all subsequent states in the Sequencer program, until superseded by a new `Sampling` condition.
- A `Store` expression is implicitly valid for all subsequent states in the Sequencer program, until superseded by a new `Store` condition.
- The sample causing a `Trigger` is always stored.
- If no states follow an `If .. then`, `Trigger` in the Sequencer program, like in the default program, an implicit jump to a state where the prevailing store condition is repeated takes place. This is to avoid storing both the specified store condition and the trigger condition if the trigger condition should occur again (according to the above rule saying that trigger samples are stored.)
- An implicit `Else Goto` *`current state`* is always present after an `If-Elsif` sequence if no `Else` is specified, so that the If-test will always be *repeated for the next sample* if none of the conditions were met.

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- `Goto` ***`next state`*** is implicit after a `then` or after an `Else`, where ***`next state`*** is the state belonging to the next line containing an `If`.

5.6.5.5 Edit Event Expressions

An event expression is a combinatorial expression made by one or more of the events defined in the Event Patterns window. A simple example is:

A+B*C

The logical AND operator, "*", have precedence over the OR operator, "+". Brackets can be used to change the order of evaluation:

A+(B*C) = A+B*C, but (A+B)*C ≠A+B*C

due to the order of evaluation. The parenthesis around the OR expression forces the OR to be evaluated before the AND.

!(A+B)*C≠!A+B*C

Negation, i.e. the logical NOT operator, can be used on single event names, or on sub-expressions within brackets. The logical NOT operator, "!" is always evaluated first.

5.6.6 Sequencer Programming Examples

5.6.6.1 Loose and Tight Sequences

A *loose sequence* is defined as a sequence of events (bus cycles) that simply occur sequentially, without any constraints on other events appearing in between. For example, the events A, B, C and D come in a loose sequence if they occur mixed with the events X and Y like

`A ⇒ B ⇒ X ⇒ C ⇒ Y ⇒ D`

The following Sequencer program will trigger on a loose sequence of the events A,B,C and D:

```
1.a: If (A) then
2.a     If (B) then
3.a        If (C) then
4.a           If (D) then
4.b              Trigger at ..
```

On the other hand, a *tight sequence* is defined as a sequence of events (bus cycles) that occur *without* any other event appearing in between, strictly like

`A ⇒ B ⇒ C ⇒ D`

The Sequencer on the VBT-325 can be programmed to trigger on tight sequences by using `Goto 1` and `Goto 2` operators as shown below:

```
1.a: If (A) then
2.a:    If (B) then
3.a:       If (C) then
4.a:          If (D) then
```


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```
4.b:              Trigger at ..
4.c:           Elsif (A) then
4.d:              Goto 2
4.e:           Else
4.f:              Goto 1
3.b:        Elsif (A) then
3.c:            Goto 2
3.d:        Else
3.e:           Goto 1
2.b:     Elsif (A) then
2.c:        Goto 2
2.d:     Else
2.e:        Goto 1
```

If the `Else Goto 1` terms were missing, the trigger would be reached even if a cycle X occurred in between the A,B,C or D cycles (a loose sequence). The `Goto 2` statements are necessary to trigger if the actual sequence is partially fulfilled, and then immediately followed by the sought sequence, like A ⇒ B ⇒ C ⇒ A ⇒ B ⇒ C ⇒ D. If the `Goto 2` were missing, the second A would give a `Goto`, starting a new search for A, but this time the A does not come again before the B ⇒ C ⇒ D.

Note that it is not necessary to include an `Else Goto 1` at the outer `If` level (bottom), because of the implicit `Else Goto current` in an `If` statement not ending with an `Else`.

5.6.6.2 Count, Delay and Switch Sampling mode

The Sequencer program below will count 10 occurrences of `VME0` or `VME1`, then cause a trigger if `VME2` is found, then switch to 50MHz timing sampling for 760ns after the trigger, for detailed review of what happened in this period after the trigger cycle. Then, revert to state sampling.

```
   1.a: Sampling in STATE mode
   1.b: Store (ALL)
   1.c: Count 10 of (VME0 + VME1) then
   2.a:    If (VME2) then
   2.b:       Trigger at START of trace
=> 3.a:       Sampling in 50MHz TIMING mode
   3.b:       Delay 760ns then if (ANYTHING) then
   4.a:          Sampling in STATE mode
```

5.6.6.3 VSB Sequencer Examples

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Multiplexed bus

The VSBbus is a multiplexed bus, meaning that both the address and the data is transferred on the same physical lines. The VSBbus cycle is divided into two phases, the address phase where the signal DS*=1, and the data phase, where DS*=0. The multiplexing makes triggering on a specific address *and* data pattern a bit more complex than for the VMEbus, since one event must be used to specify the address, and another event must be used to specify the data. The following examples show how to solve some of the VSBbus difficulties.

Trigger on Address range and Data

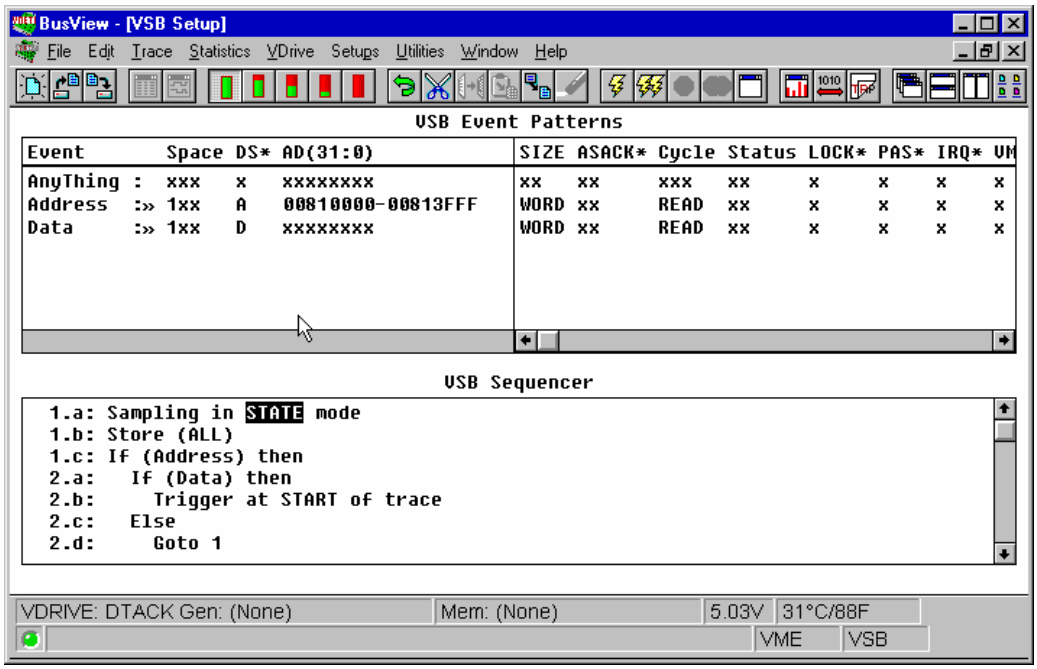


Figure 5.31 VSB bus Sequencer Example 1

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Store data only when address within given range (no Trigger)

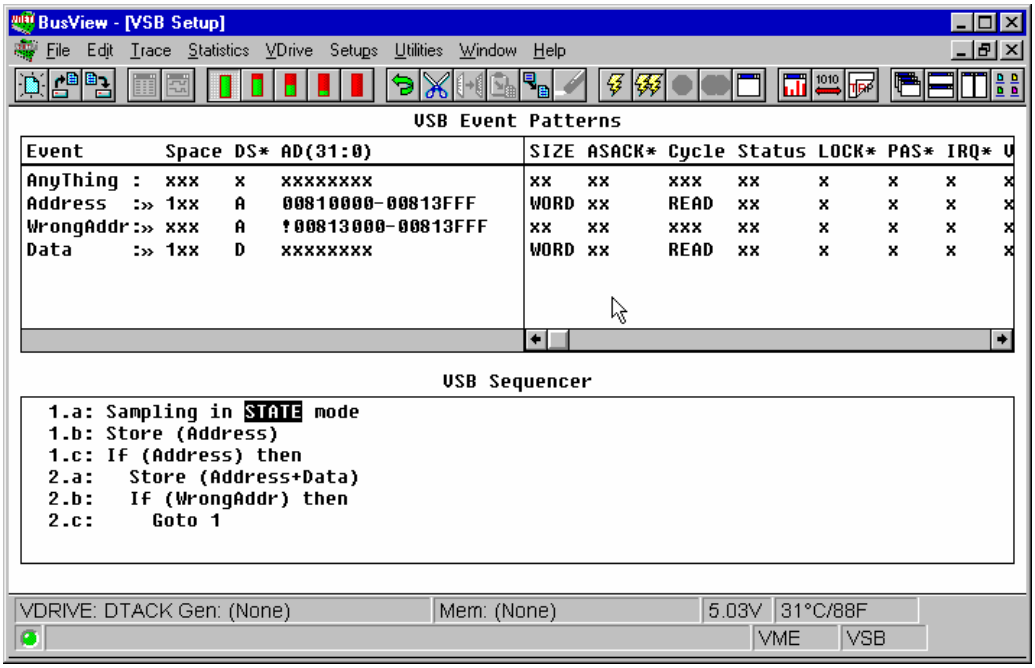


Figure 5.32 VSB bus Sequencer Example 2

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Store and trigger on data when address within given range

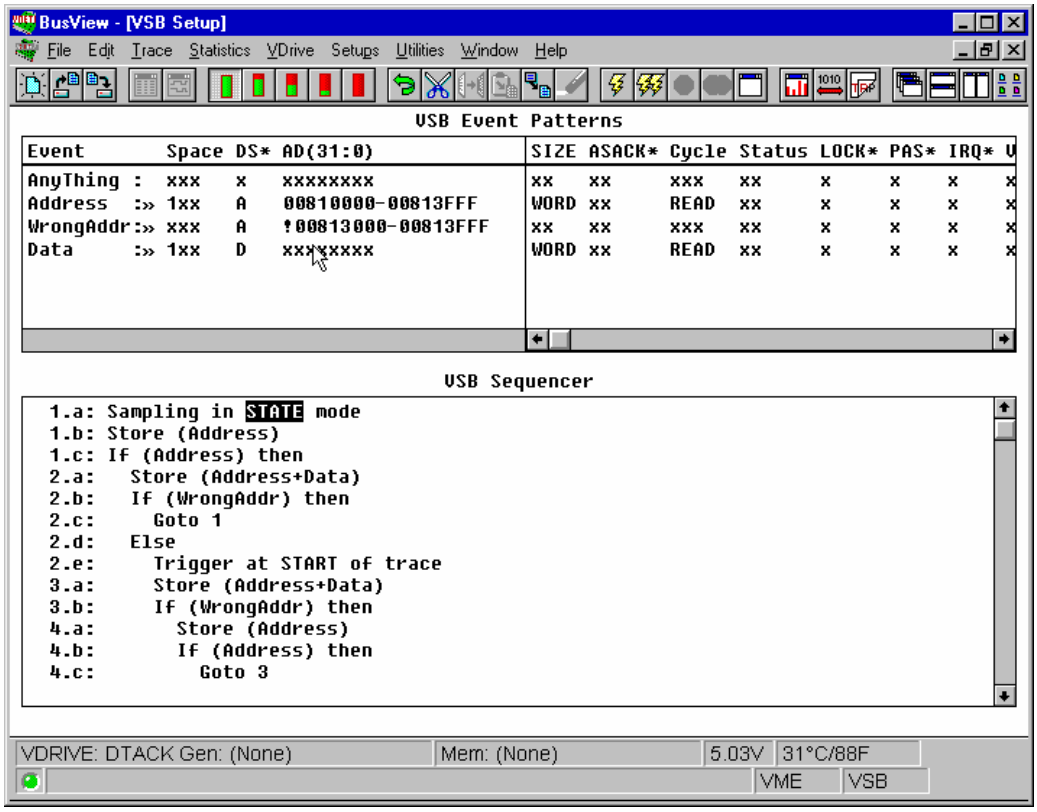


Figure 5.33 VSB bus Sequencer example 3

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Store data when address within given range, trigger on other data

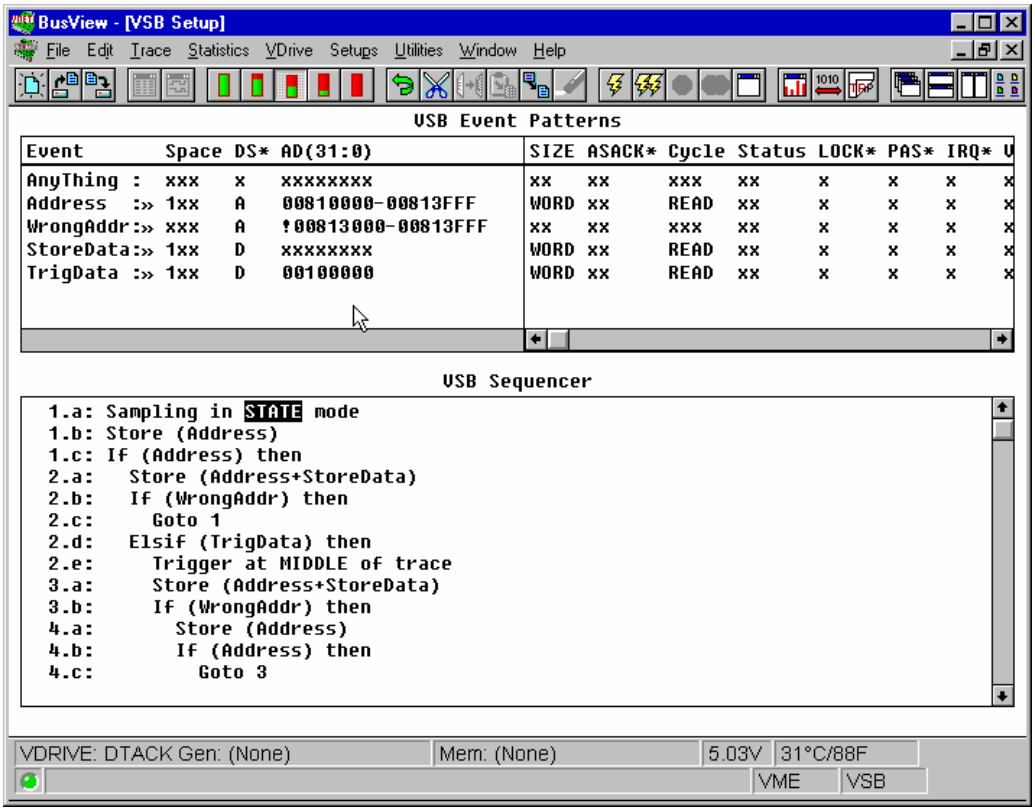


Figure 5.34 VSB bus Sequencer example 4

5.7 Trace Display

The data in the trace display is automatically displayed when the current target has filled its trace buffer. (It may happen that the trace buffer is not filled, or that it takes a very long time. The trace buffer status dialog box then gives the option to `Halt` manually. The part of the trace buffer that is filled is displayed by selecting `Show` from the `Trace` menu, or by pressing the `Show` tool bar button).

Alphanumeric The Alphanumeric display format, is by default used for presenting STATE sampling.

Waveform The Waveform display format, is by default used for TIMING sampling. STATE sampling can not be displayed in waveform format.

5.7.1 Alphanumeric Trace List

The alphanumeric trace list shows the samples collected in the trace buffer as a list of binary or hex values for each signal group. The alphanumeric trace list presentation form

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can be selected independently of the selected sampling mode. Figure 5.35 shows an example of an alphanumeric trace list.

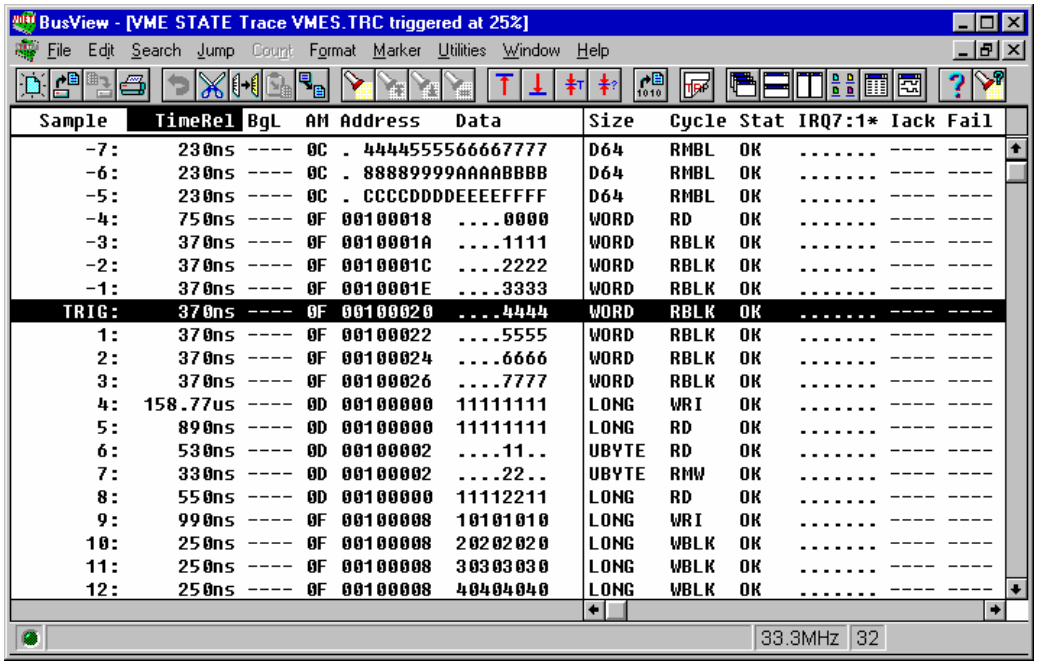


Figure 5.35 The Trace Display in Alphanumeric mode

5.7.1.1 Navigation and Signal Selection

The default VBT-325 trace display will show a selection of signals and signal groups in the trace list that are most relevant. However, if more signals/groups are displayed than there is space for on the screen, a scroll bar appears at the bottom of the trace display.

Edit the Trace window

The Trace window, both in alphanumeric and waveform mode, can be edited in the same way as the Event Patterns window. Signals can be added, removed and reorganized according to the wishes of the user.

Add

Place the cursor on the signal name to the right of (below in the case of waveform mode) the place you want to insert a new signal. Select `Insert` from the `Edit` menu or the tool bar, or press the INS key. The same dialog box as when editing the Event Patterns window appears. Select the desired signal, and press the OK button.

Remove

Place the cursor on the signal name you want to delete. Select `Cut` from the `Edit` menu or the tool bar, or press the DEL key.

Reorganize

A combination of the previous explained Add and Remove actions, will give the desired results.

5.7.1.2 Absolute or Relative Time in the Trace Window

The trace may be displayed either with absolute time from the trigger sample, relative time between the samples, or both. The `TimeRel` (relative time) option is default, and it is displayed as a field column in the Trace Display window. See Figure 5.35. The `TimeAbs` (absolute time) option is inserted into the Trace window in the same way as a signal field is inserted, i.e. as explained in Section 5.7.1.1.

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5.7.1.3 Formatting Options

There are two different ways of presenting the control signals in the trace list. Either as mnemonics, (like `Size`, `Cycle`, and `Stat` in Figure 5.35) or as bit patterns (like `Address`, and `Data`). The user can decide whether to display the signals with mnemonics or not. In STATE mode, when sampling only once per data cycle, it is very convenient to display the signals with mnemonics. For example the `Cycle` field , displaying what kind of cycle it is, is much easier to read when using mnemonics, as can be seen in Figure 5.35.

5.7.1.4 Changing the Alphanumeric Formatting Template

Select the signal name you want to change. Select `Decoding and Formatting` from the `Format` menu, or press the equivalent tool bar button. The dialog box in Figure 5.36 appears. The top most option enables or disables decoding and formatting globally, i.e. it concerns all the signals fields. The next option enables/disables the current signal field. Of course, if decoding and formatting are turned off globally, it is impossible to enable the current signal field.

Default By default the global decoding and formatting is ON in STATE mode, and OFF in TIMING mode.

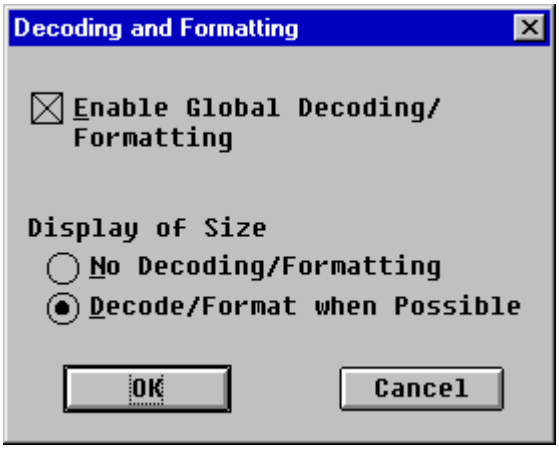


Figure 5.36 The Decoding and Formatting dialog box

5.7.1.5 Navigating the Trace Buffer in Alphanumeric Mode

There are three ways of moving around in the trace buffer.

- With the mouse and the cursor keys.
- With the `Jump` tools.
- With the `Search` tools.

Mouse There are scroll bars at the sides of the trace buffer for moving around, and everything can be selected with a single mouse click.

¬ - ® ¯ The *right* and *left* keys select signal fields, and the *up* and *down* keys scroll the buffer.

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The Jump tools

The Jump tools are available both at the Jump menu, and at the tool bar. The Jump tools can take you to the first line, the last line, the trigger line, and to a user-specified line.

The Search tools

The Search tools are available both at the Search menu, and at the tool bar. The Search commands offer powerful search and extract functions. Search locates a particular pattern in the trace buffer, while Extract provides a qualified presentation of samples from the trace buffer, so that only samples matching the specified pattern are displayed. When selecting the Search tools for the first time, the Edit Search Pattern is the only available option, i.e. the other commands can only be executed after a valid search pattern has been defined. The Search/Extract edit window supports a subset of the functionality in the Event Patterns window. Most keys function as in the Event Patterns window, with these exceptions: The names of the Search and Extract events cannot be changed. Neither of these events can be deleted. No new events can be inserted. All other functions and keys are supported.

Searching

After editing the Search pattern, select Search from the Search menu to start searching from the current line. If found, the cursor will be placed at the first matching trace line. All matching lines are highlighted. The next match is found by selecting Next Match from the Search menu or from the tool bar, or by pressing the F3 key. Searching backwards is done by selecting Previous Match from the Search menu or the tool bar, or by pressing the F4 key.

The highlighting is turned off by selecting Search from the Search menu once more.

Extracting

After editing the Extract pattern, select Extract from the Search menu or the tool bar, to start extracting from the current line. All matching samples in the trace buffer will be displayed and highlighted. The extract (and thus the highlighting) is turned off by selecting Extract from the Search menu once more.

5.7.2 Waveforms

Waveforms are provided to show the logic level of individual signals graphically as a function of time. This is particularly useful to show timing relations between different signals for hardware analysis. Busses are presented as *ladders*. The values of the individual signals in a bus, are shown below the signal name, see Figure 5.37. The ladder will contain a *step* when the bus changes value. Hint: To be sure of capturing some traffic, trigger the tracer with an event where AS* is set to zero, because there is always traffic when AS* is active.

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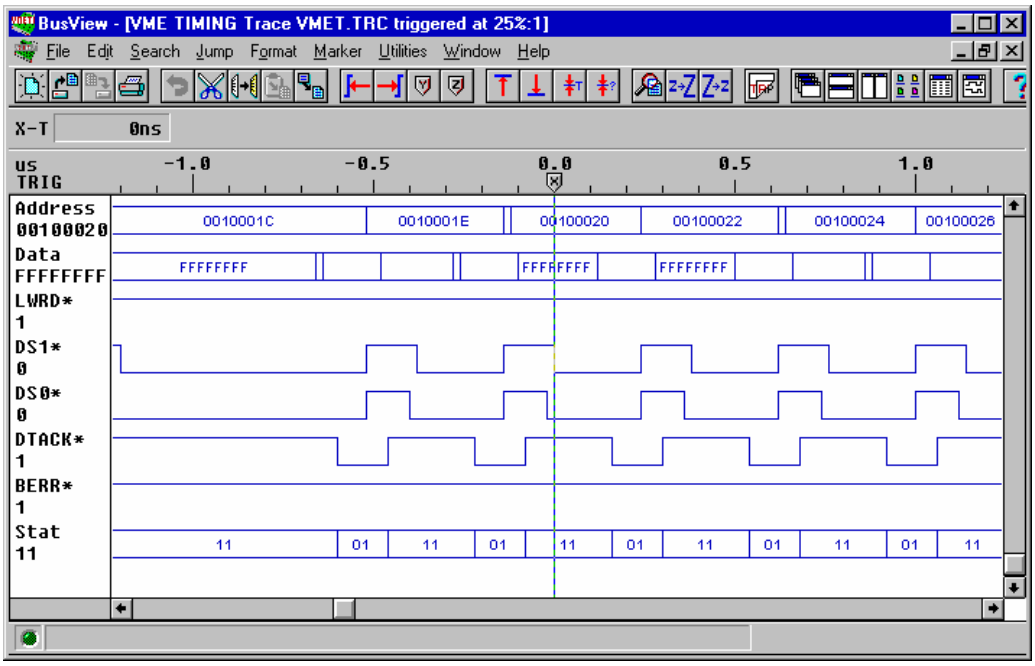


Figure 5.37 The trace display in waveform mode

5.7.2.1 Navigating the Trace Buffer in Waveform Mode

The navigation tools available in waveform mode are the regular mouse and cursor keys, the `Jump` tools, and the `Edge Jumping` tools.

¬ - ® ¯ The *right* and *left* cursor keys move the cursor, marked *x*, one *step*, or time division. By default, one step is one sample. The scale of the axis can be changed by selecting `Scale` from the `Format` menu or from the tool bar, but the time step remains one sample (30ns). The *up* and *down* keys select the signal fields.

Mouse Moves around with scroll bars at the sides of the waveform window.

`Jump` tools The `Jump` tools work the same way as in alphanumeric mode, except for two additional options. The additional options are for jumping to two user-positioned markers. See the section about setting markers below.

Edge Jumping The `Edge Jumping` tools are available from the `Search` menu or from the tool bar. The user can choose whether to search for a falling edge, a rising edge, or any edge, both forwards and backwards.

To search for a rising edge in the forward direction, mark the desired signal(s), and select `Next Edge` from the `Search` menu or the tool bar, after first having set `Rising Edge` in the `Edge Options` dialog box (also available form the `Search` menu).

If several signals are marked, the search will stop at the first rising edge in the selection of signals. (For busses, the edge option is ignored.)

Note! For editing of the waveform window, see the section about editing under alpha-numeric mode, Section 5.7.1.1.

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5.7.2.2 Setting Markers

By default, two markers are positioned on top of each other in the waveform window. They are the T-marker, which shows the trigger line, and the X-marker, telling the distance from the T-marker. The difference X-T is displayed above the waveforms, as shown in Figure 5.38.

Y, Z marker

Two additional markers are available. They are found in the `Marker` menu, or at the tool bar. The time difference X-Y, X-Z, and Z-Y are displayed above the waveform window as in Figure 5.38.

Markers are convenient for marking places of interest in the trace buffer. Two markers can also be used to limit statistics functions to a given area, or to measure the time between two places. For instance they are very convenient for measuring the time between two signal edges.

Moving the X-marker

The X-marker is moved with the **left mouse button**, either by clicking anywhere in the waveform window, or by clicking on the marker, and without releasing the mouse, dragging the marker to the desired place.

Moving the Y(Z)-marker

When only one of the Y and Z-markers are present, they are moved with the **right mouse button**, in the same way as the X-marker is moved with the left mouse button. When both the Y and the Z-markers are present, the marker which is closest to the mouse cursor is moved. In the case where the markers are placed on top of each other, the Y-marker is moved if the cursor is at the left side of the markers, and the Z-marker is moved if the cursor is at the right side of the markers.

Inserting

Place the X-marker where you want the new marker to be. Select `Set Marker Y(Z)` from the `Markers` menu or press the Y(Z) marker button at the tool bar, and the new marker appears on top of the X-marker.

Removing

The markers are removed by selecting `Remove Marker Y(Z)` from the `Markers` menu.

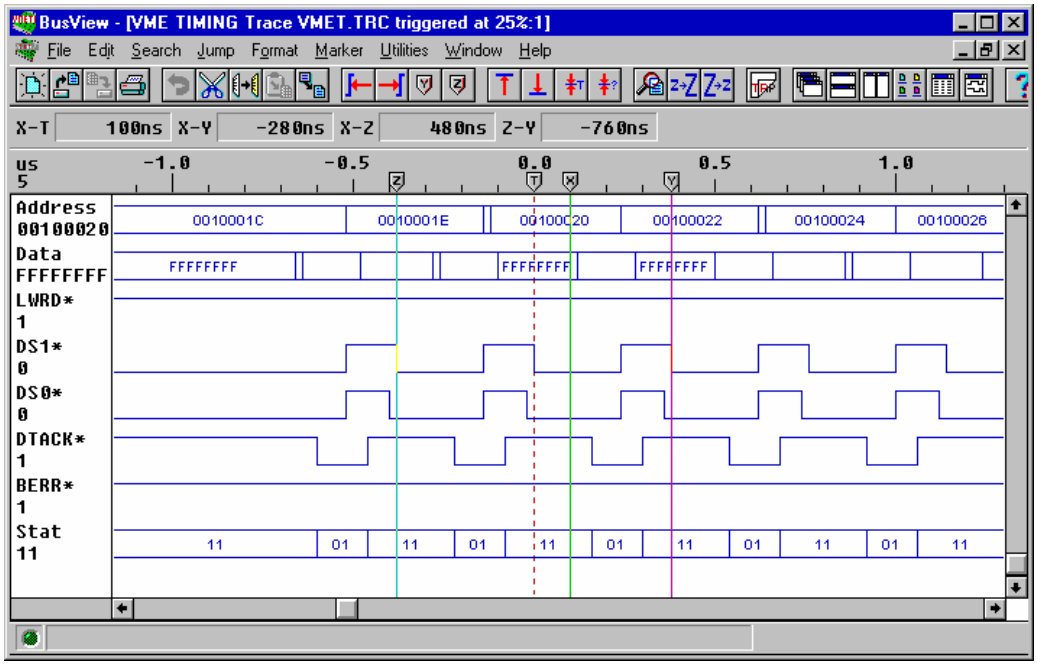


Figure 5.38 Using markers

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5.7.3 Additional Windows

Additional windows, or views of the current trace buffer, may be opened and closed when needed. A new view of the trace buffer is displayed by selecting `Alphanumeric List` or `Waveform` from the `Window` menu or the tool bar. When having more than one window of the trace open at the same time, the windows are numbered 1, 2 etc. The windows are totally independent views of the same trace memory and can be scrolled individually, see Figure 5.39.

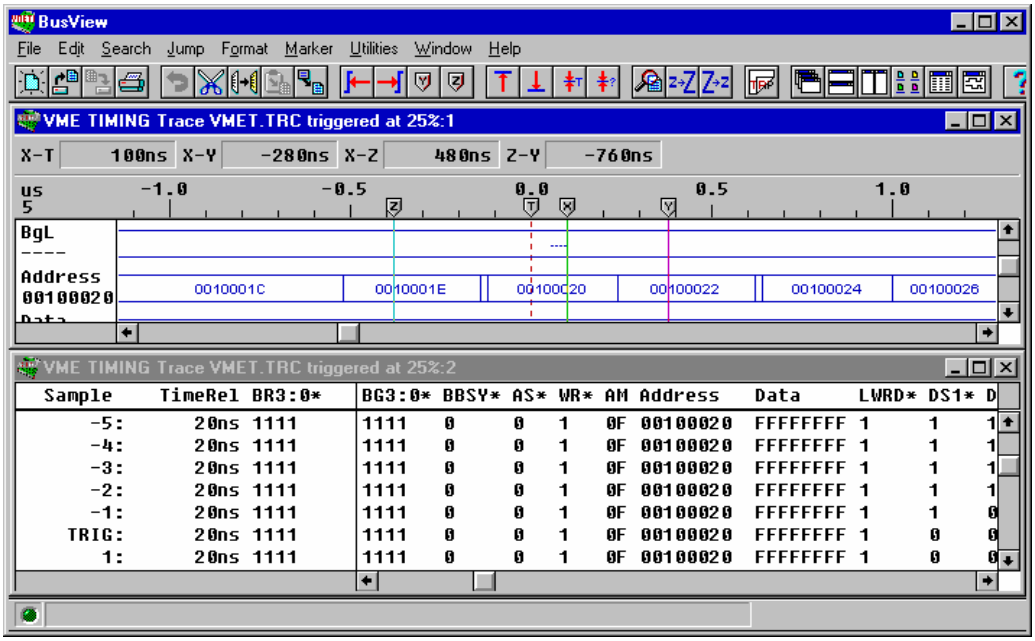


Figure 5.39 Displaying a trace in several windows

5.7.4 Trace Dump to PC/Host

Trace buffer data can be dumped to a file on a PC. The file format contains a header with target type, sampling mode, trigger position, trigger line number etc., so that the file can be reviewed exactly as captured.

Save as

Choose `Save as`, type a file name, and press the OK button. The dialog box in Figure 5.40 appears. Type how many lines you want to save and press the OK button, or simply press the OK button to save the whole trace.

Note!

The trace can be saved both as binary files, and as ASCII files. The ASCII files can then be opened and edited in any other text editor, but because they have not saved all the vital information about the trace, they can not be opened in BusView again.

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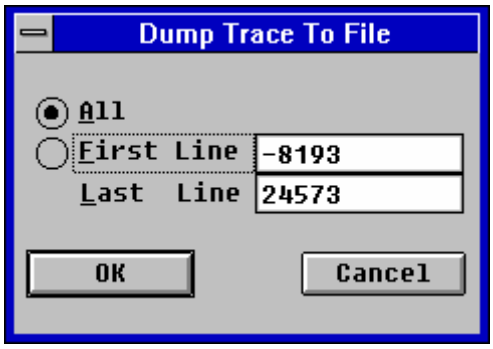


Figure 5.40 Dumping a trace to file

5.8 Statistics

The VBT-325 provides powerful statistical measurements of target bus activity:

- Event Counting (counter driven).
- Bus Utilization (counter driven).
- Bus Transfer Rate (trace driven).

5.8.1 Counters Operation

The VBT-325 implements eight 20-bit wide statistics counters for VMEbus and four 20-bit counters for the P2 bus:

- Four VMEbus Event counters.
- Four VMEbus Bus Level counters.
- Four P2 Event counters.

Each of these counters may count up to 1048576 (1M). A counter is incremented only when a bus sample matches the criteria assigned to its word recognizer. For the event counters, one particular event pattern is assigned to each counter, and for the bus level counters, one of the four VMEbus bus levels is assigned to each counter. (The VMEbus bus levels are derived from the bus grant lines `BG3:0*`, see Section 3.4.1.2 for details).

The block diagram in Figure 5.41 highlights the parts of the VBT-325 which take part in the counter driven statistics measurements.

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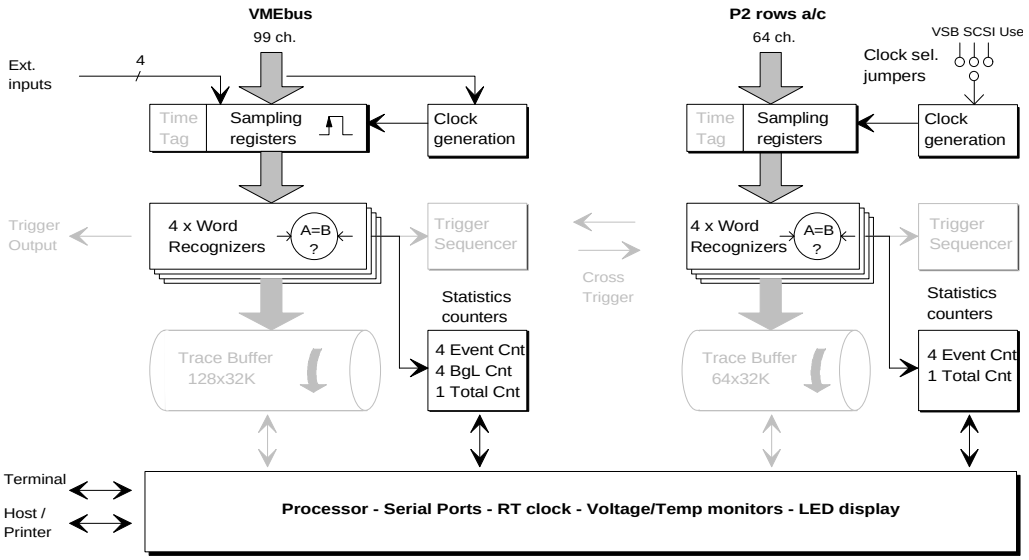


Figure 5.41 Counters Operation

5.8.2 Event Counting

The Event Counting statistics is selected under `Functions/Event Counting`, or by pressing the `Event Counting` button at the tool bar, and allows statistical measurements to be taken. using both STATE and TIMING sampling methods.

The counters , discussed in Section 5.8.1 and 5.8.5.4, count the occurrences of four user-selectable events. The events are defined in the Event Patterns window. The results are displayed in a histogram, or optionally, a time history diagram. The Event Counting histogram is shown in Figure 5.42. Various options exist regarding count method, update rates, etc. These are described in Section 5.8.5.

Select events

By choosing `Select Events` from the `Options` menu, the dialog box in in Figure 5.43 appears. A list of all the events from the Event Patterns window is displayed by clicking on the arrow at the left side of each event. Both predefined and user-defined events may be used. See Section 5.4.1.6 for how to rename and add events. Configure the `Event Selection` dialog box as desired, and press the OK button.

Session/Run

In the Setup window a trace is started with `Trace/Run`, in the Statistics window the task is called a session, so the statistics are started by choosing `Session/Run`, or by pressing the button showing a lightning bolt at the tool bar.

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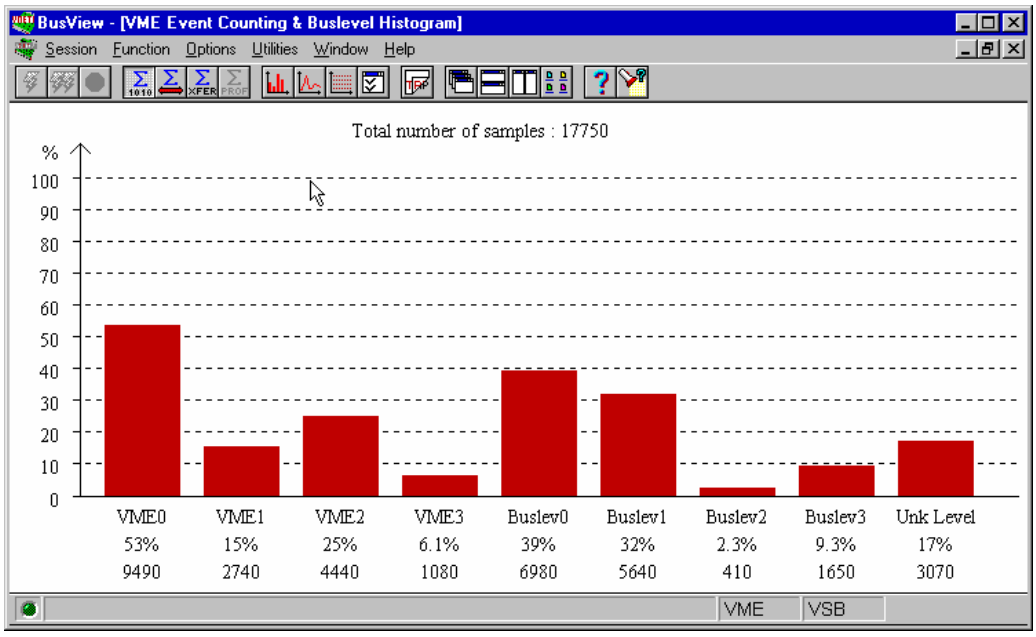


Figure 5.42 An Event Counting histogram

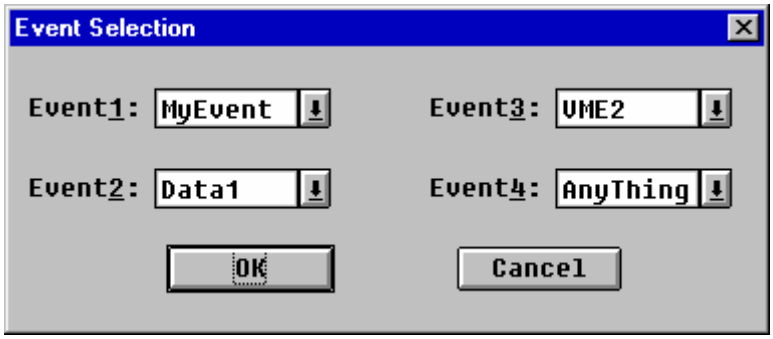


Figure 5.43 Selecting events

Note! The Event Counting statistics is available for all supported target busses in the VBT-325C.

5.8.3 Bus Utilization, VME

The Bus Utilization statistics is selected by choosing `Bus Utilization` from the `Functions` menu, or by pressing the `Bus Utilization` button at the tool bar, and performs its function using **pre-determined** signal parameters. Also, a fixed timing (asynchronous) sampling rate of 25MHz is used. As such, this mode does not require the user to provide any signal state specifications prior to initiating a measurement, meaning that configuration and manipulation of this utility is accomplished exclusively from the VBT-325 Statistics window.

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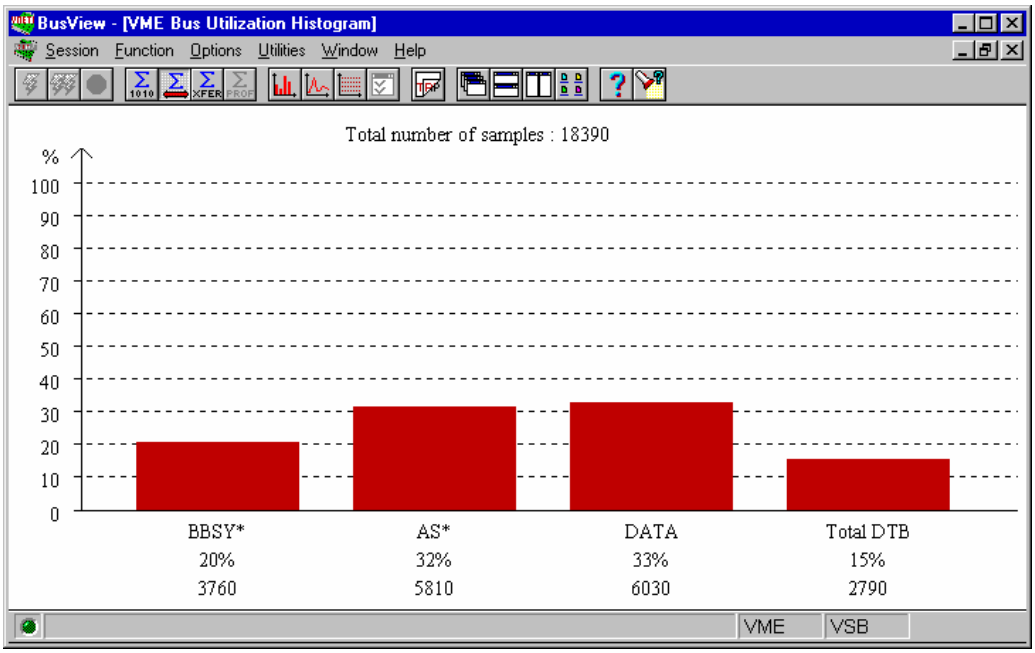


Figure 5.44 The Bus Utilization histogram

Four histograms are provided in the VMEbus Bus Utilization statistics, each measuring the percentage of time when a signal or signal combination is active on the bus:

BBSY* Indicates percentage of time when the VMEbus signal BBSY* signal is active, i.e. when there is a bus master that "owns" the bus.

AS* Indicates percentage of time when the VMEbus address strobe, AS*, is active. This not only shows how much of the time the address bus is utilized, it also includes total time spent on block (BLT/MBLT) transfers and RMW cycles, since AS* is active throughout these cycle types.

DATA The logical OR of DS1*, DS0*, DTACK* and BERR*, indicating percentage of time when the VMEbus Data bus is utilized.

Total DTB The logical OR of AS*, DS1*, DS0*, DTACK* and BERR, indicating percentage of time when the Data Transfer Bus of the VMEbus is utilized.

Note! The Bus Utilization statistics is only available on VME and VSB. See Section 5.8.3.1 for VSB.

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5.8.3.1 Bus Utilization, VSB

The principle of the Bus Utilization statistics on VSB, is the same as for VME, but the histogram bars display other signals.

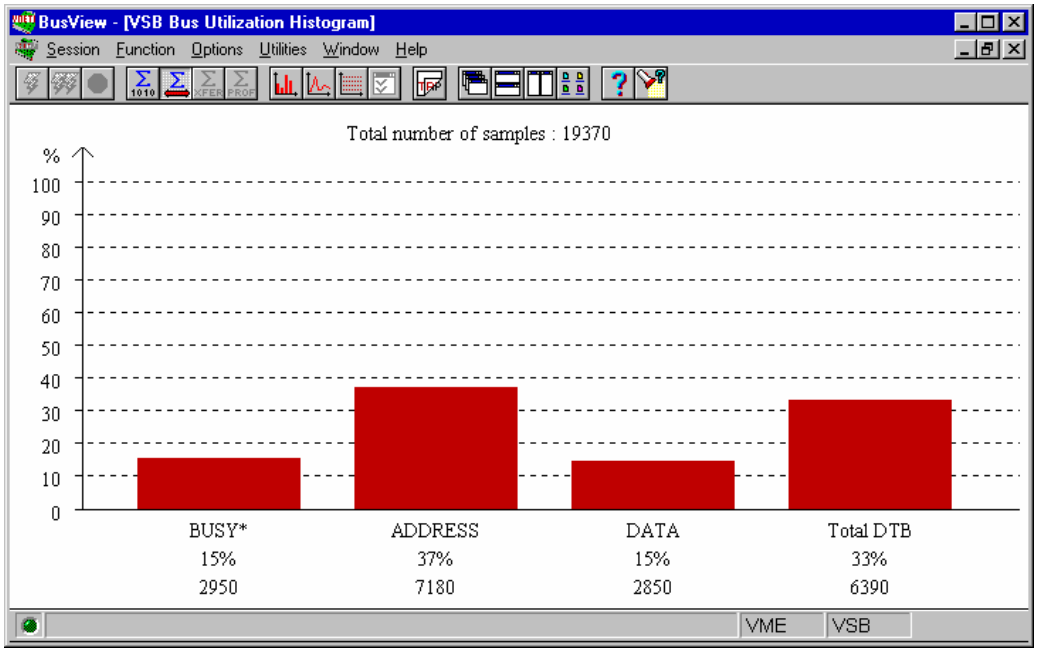


Figure 5.45 The Bus Utilization histogram, VSB

Four histograms are provided, each showing the percentage of time when the following signal conditions are found:

BUSY* BUSY*=0.

ADDRESS PAS*=0 and AC=0.

DATA DS*=0 or ACK*=0 or ERR*=0.

Total DTB PAS*=0 or DS*=0 or ACK*=0 or ERR*=0.

5.8.4 Bus Transfer Rate

The Bus Transfer Rate statistics takes a series of samples with state (synchronous) sampling and calculates the transfer rate in MTransfers/Sec or Mbytes/Sec.

Note that the tracer does not collect samples in a period between each trace when the collected data is being processed.

The Bus Transfer Rate statistics is activated by selecting Function/Bus Transfer Rate, or pressing the Bus Transfer Rate tool bar button.

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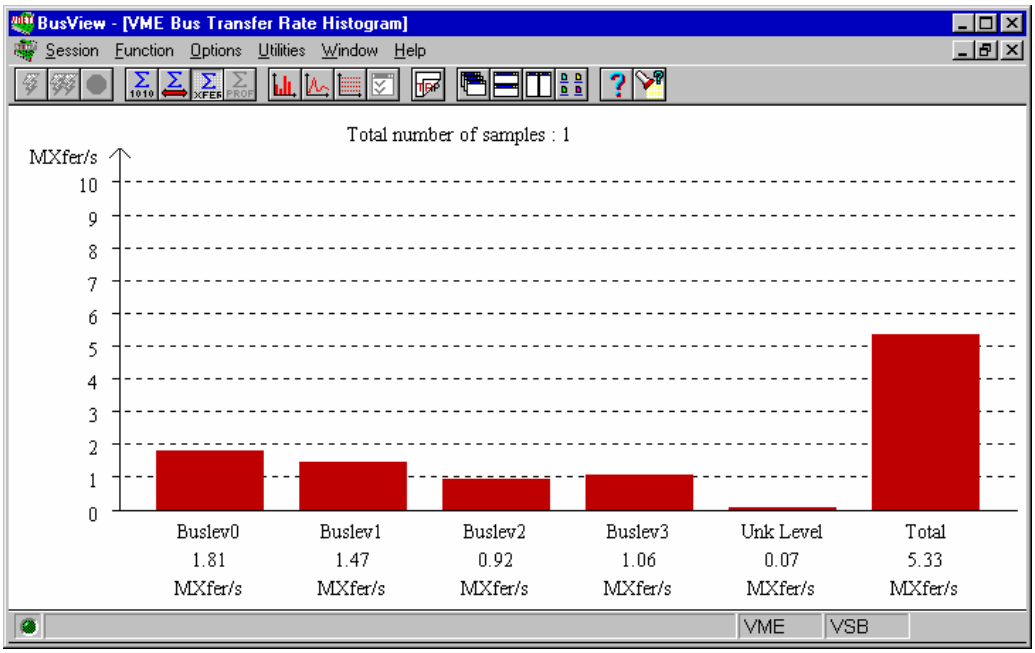


Figure 5.46 The Bus Transfer Rate histogram

5.8.5 Statistics Options

5.8.5.1 Statistics Window

Interactive control and operation of the statistics functions is provided in a dedicated window which may be accessed by selecting `Statistics` from the menu bar, or the tool bar. in the Setup window. The user is then presented with the Statistics window, like the one illustrated in Figure 5.47.

The Statistics window consists of a menu bar along the top of the window, a tool bar, and a window section.

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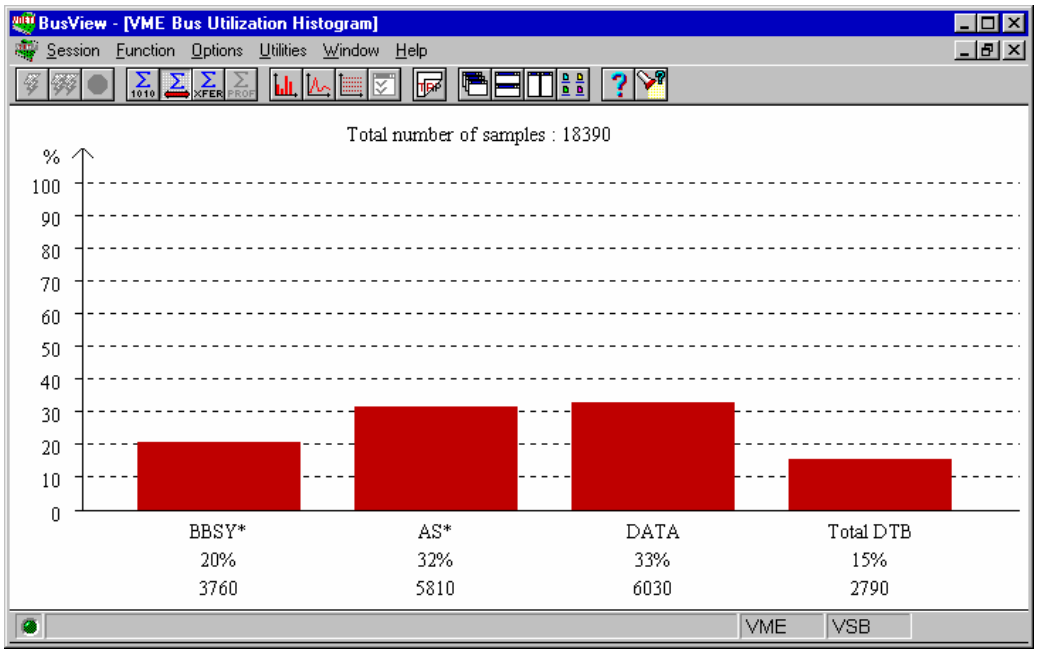


Figure 5.47 The Statistics window in Bus Utilization mode

5.8.5.2 Histograms or Time History Curves

The statistics are presented either in a standard histogram, or in a Time History curve. Figure 5.47 is an example of the former, and Figure 5.48 of the latter. The time history diagram shows the variations of the bus signals with respect to time. Histograms are default for all statistics presentation. The time history curves are selected by choosing `Options/Time History Curves`.

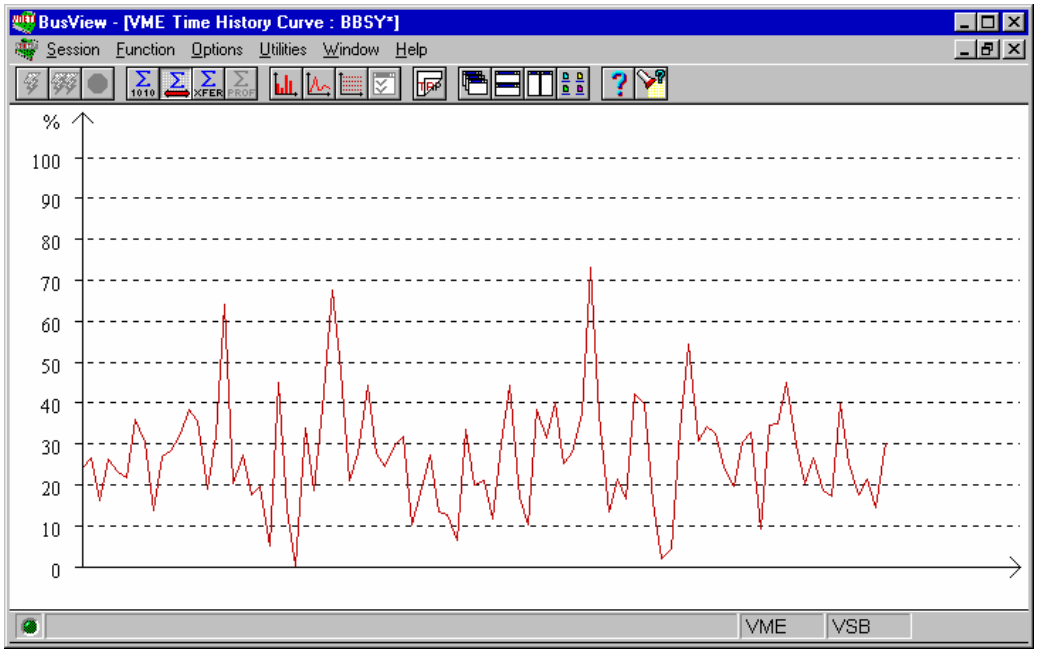


Figure 5.48 BBSY displayed in a Time History Curve*

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Max. scale

By default, the histogram diagram has 100% as the maximum horizontal scale. For better resolution of low readings, the scale can be adjusted in steps down to 5% as the max. reading. Select `Options/Maximum scale`.

5.8.5.3 Bar Markers

Normally, the histogram is shown as a horizontal bar where the end point represents the last value read from the statistics counters. A statistics session normally involves a series of counter readings, so it may be desirable to get an indication of the lowest and highest values recorded, and the average of all the counts. The command `Options/Bar Markers/Show` gives the user a choice of minimum, maximum and average markers on the histogram bars. The bar markers are shown in Figure 5.49.

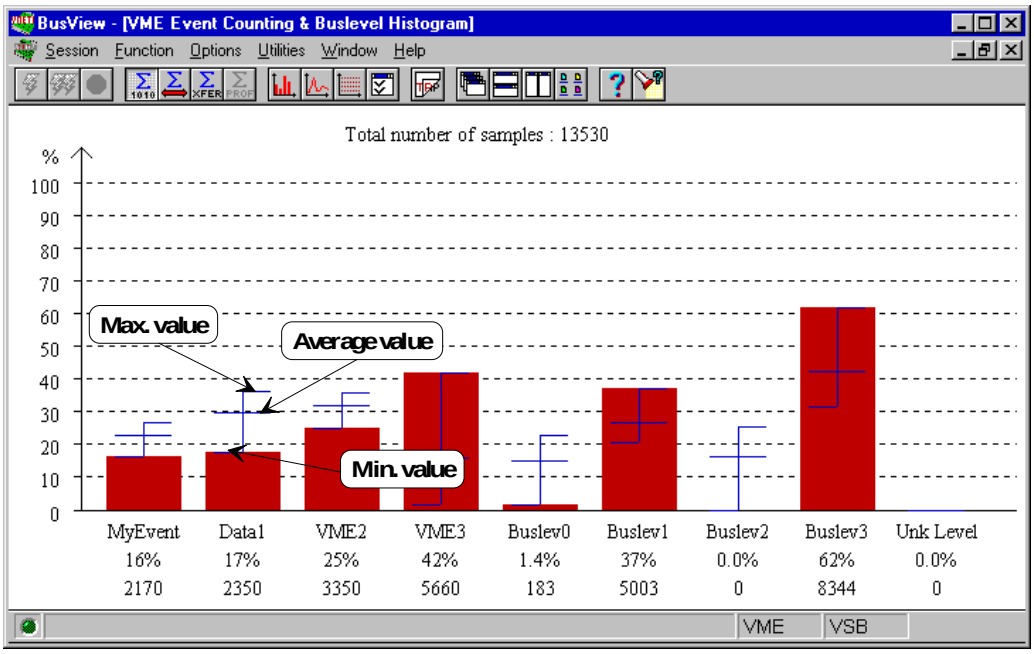


Figure 5.49 Bar markers showing minimum, maximum, and average values

Reset bar markers

The bar markers can be reset separately or all together, manually or auto-reset every "time interval". See Figure 5.50.



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Figure 5.50 Reset bar markers

5.8.5.4 Counter Driven

The most accurate method to collect data for the histograms is the counter driven method. It is based on hardware counters which are programmed to increment on certain VMEbus events. There are eight 20 bit hardware counters which count the occurrences of each of the events or the granted bus levels. In addition, there is a ninth 20-bit counter counting the total number of samples taken. Every time this counter reaches its maximum count, user programmable up to 1 million samples, the eight counters are disabled; their values read, and immediately re-enabled to resume counting while the histograms are computed and displayed. This method ensures that only a minimal amount of bus activity is missed from the measurement between each update of the histograms, giving a capture ratio of close to 100%. This mode is therefore called real-time Statistics.

5.8.5.5 Count Options

In Event Counting mode, there are several user-selectable options available. Select `Options/Count Options`, and the dialog box in Figure 5.51 appears.

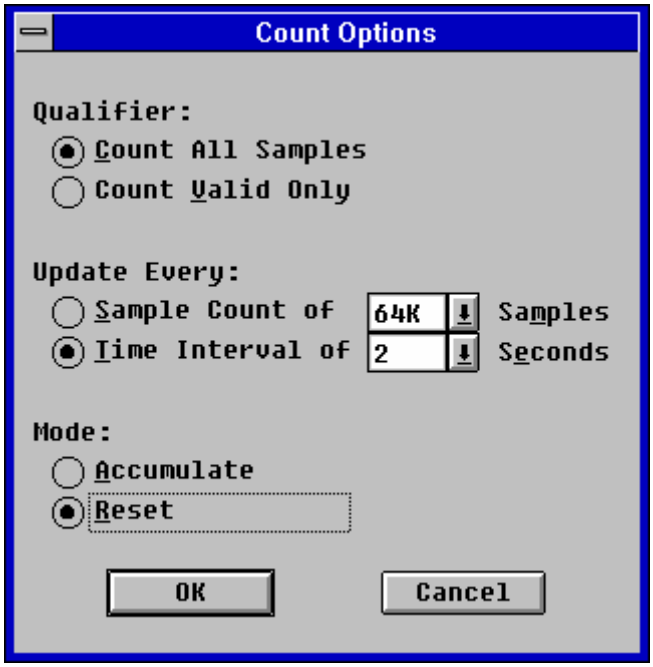


Figure 5.51 The Count Options dialog box

Qualifier The `Qualifier` selects whether "all samples" or "valid samples" should be sampled. Valid samples are samples matching the selected events in the `Select Events` dialog box shown in Figure 5.43.

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Update Every

The user may choose if the window should be updated after a number of samples, or after a given time. Updating after a given time insures a steady update rate. Simple experimentation with the display control will assist the user to quickly determine the optimum parameter needed to acquire the maximum recording resolution for the application under test. Applications generating low bus cycle frequencies will typically require a smaller window update parameter. As bus cycle frequency increases, the window update parameter should be increased to prevent the utility from updating the window unnecessarily and to reduce the effect of the "idle interval".

It is important to note that during histogram updates, there is an **idle interval** of approximately 225 µs when the counters are being read by the processor. During this interval, the counters are inactive, and **no bus traffic is recorded**. Normally, this idle interval is negligible, especially when high update rates and/or Reset mode is used.

Although the counters are re-enabled before any screen update takes place (which is inherently slow due to the serial line), the idle interval may influence the measurements in certain applications. Especially if the application calls for accurate counting of bus cycles, one should restrict this kind of measurement to a number of cycles less than the update rate (up to 1M cycles).

Note!

The update rate will automatically be reduced if BusView is not able to refresh the window. Activating menus or other applications, reduce the CPU time left for refreshing the Statistics window.

Reset Mode

In Reset mode the displayed value is the counter reading shown as a percentage of the total number of samples, i.e.:

Displayed Value = (EventCount / Total Count) * 100%

This gives a "dynamic activity indicator", showing a new "fresh" measurement at every update.

Accumulate

In Accumulate mode, the displayed value is the cumulative sum of all previous counter readings shown as a percentage of the accumulated total number of samples, i.e.:

Displayed Value = (∑ Event Counts / Total Counts * N) * 100%

where N is the number of updates in the session.

Which mode to choose?

Selection of the Accumulate versus Reset mode is typically driven by the total number of samples to be observed in the measurement. Measurements made with timing (asynchronous) sampling typically require the use of the Accumulate mode to yield significant results because the counters reach terminal count very rapidly in response to the fixed frequency of the sampling clock. Bus cycle measurements made with the state (synchronous) sampling option may or may not require the Accumulate option to yield significant results.

Bus cycle measurements are affected by two key application specific factors: The total number of cycle operations occurring on the back plane and the frequency at which the cycles occur. The measurement of applications consisting of less than 1048576 (1M) bus cycles may be accomplished within the limits of the Reset mode of operation. This mode is often quite sufficient to support detailed characterization of new software and firmware in an isolated environment. However, characterization of applications inside fully operational

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system environments typically require use of the Accumulate mode to achieve the desired measurements.

5.8.5.6 Trace Driven

The other method for collecting data is based on taking a series of traces, each with 32 K samples. This gives greater flexibility of what to present, since it is all up to the software to process the collected data in the trace buffer. However, only a smaller part of all bus activity is captured, so in order to give a true picture of the behavior of the target bus, this mode should be left running for a while to collect a reasonable number of samples. The necessary time depends on the size and nature of the bus traffic to be analyzed. For small, repetitive programs it will be sufficient with only a few traces, while larger programs may require a substantial number of traces to give an accurate reading. The total number of samples are always displayed on the screen during these measurements.

5.9 Cross-triggering

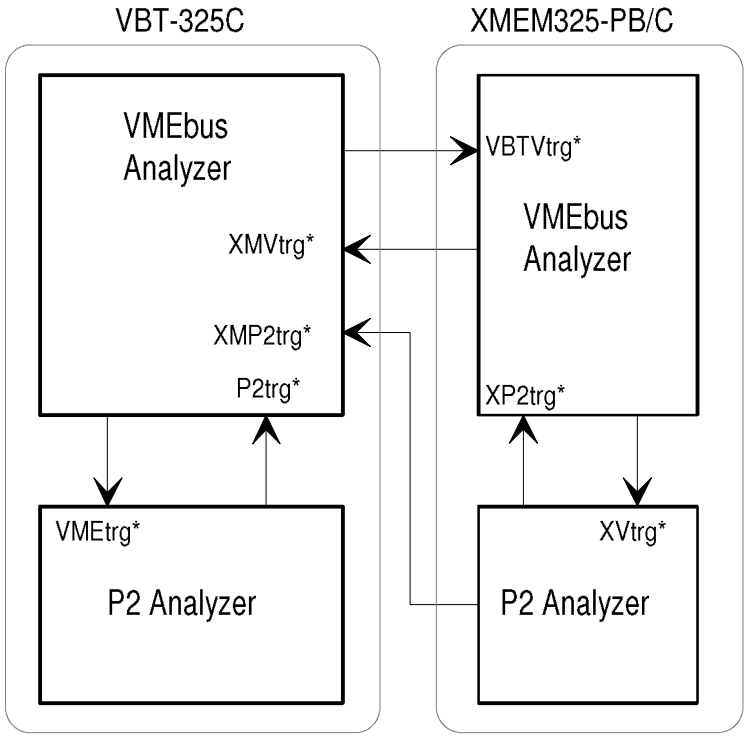


Figure 5.52 Cross-triggering

Cross-triggering is possible between the VME and P2 analyzers on the VBT-325, as well as to/from the XMEM325-PB/C piggyback module. Cross trigger signals do also exist between the VBT-325 and other piggyback modules.

See Table 7.9 for cross trigger signal names for the different targets.

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5.9.1 Cross-trigger VSB from VME

To specify that the P2 analyzer (e.g. VSB) should trigger when the VME analyzer triggers, edit the `VMEtrg*` signal field in the Event Patterns window as shown in Figure 5.53.

VSB Event Patterns

Event		Space	DS*	AD(31:0)	SIZE	ASACK*	Cycle	Status	LOCK*	PAS*	IRQ*	VMEtrg*
AnyThing	:	xxx	x	xxxxxxxx	xx	xx	xxx	xx	x	x	x	x
VSB0	:»	xxx	x	xxxxxxxx	xx	xx	xxx	xx	x	x	x	TRIG
VSB1	:	xxx	x	xxxxxxxx	xx	xx	xxx	xx	x	x	x	x
VSB2	:	xxx	x	xxxxxxxx	xx	xx	xxx	xx	x	x	x	x
VSB3	:	xxx	x	xxxxxxxx	xx	xx	xxx	xx	x	x	x	x

Figure 5.53 Cross-triggering VSB from VME

Select `Run Multiple` from the `Trace` menu or the tool bar, to start both tracers simultaneously.

Programmed as above, the VSB tracer will wait until the VME tracer triggers. Combined with other event and Sequencer programming, it is possible to capture concurrent data from both busses in one operation.

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6. COMMANDS REFERENCE

6.1 File Menu

BusView handles files for storage of Setups and Traces. The `File` menu contains all the commands for saving, printing and exiting.

6.1.1 New Setup


The "New Setup" tool bar button

The `New setup` command creates a new setup in the default configuration. This is useful if the user wants to create a number of different setups for different measurement tasks, and store these on various files. Before a new setup can be used for a trace capture, select the setup and choose `Setups/Make Current`.

6.1.2 Open


The "Open" tool bar button

The `Open` command returns a dialog box where the user may select which file to open.

6.1.3 Save, Save as


The "Save" tool bar button

Binary/ASCII

The `Save` or `Save as` command saves the current setup or trace, depending on which window is active. A dialog box where the user can type a file name and location appears. If a trace is being saved, there will also be a question of how many lines of the trace are going to be saved.

Trace files can be saved both as binary files (with extension ".trc") and as ASCII files (with extension ".tra"). ASCII files can then be opened and edited in any other text editor.

6.1.4 Print


The "Print" tool bar button

The `Print` command returns a dialog box asking for a name of the trace file/trace buffer, and how many lines to print, see Figure 6.1. It is not possible to print the setup window. The print icon is only visible in the Trace Display window.

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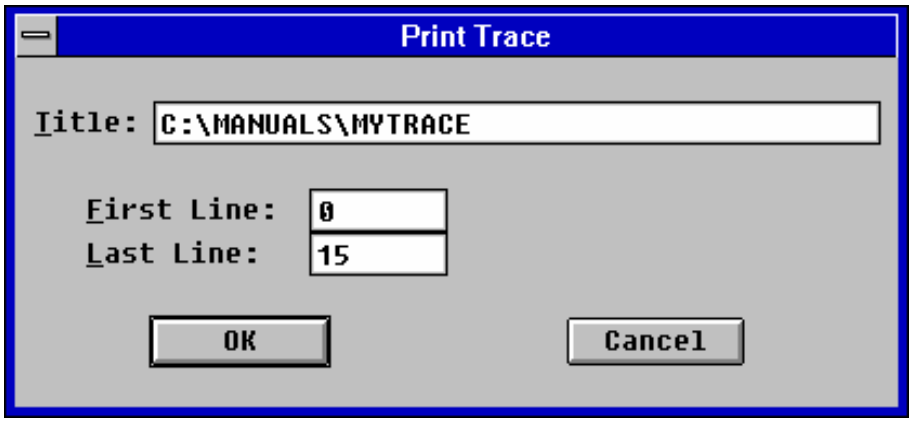


Figure 6.1 The Print Trace dialog box

6.1.5 Printer Setup

The `Printer Setup` command returns a dialog box where the user may define which printer to use.

6.1.6 Save Settings on Exit

Saves the BusView settings on exit.

6.1.7 Exit

The `Exit` command exits BusView.

6.2 Edit Menu

The `Edit` menu contains all the necessary tools for editing event patterns, the Sequencer, etc. The `Edit` menu is the same both in the Setup window and in the Trace window, except that some fields are grayed out in the Trace window.

Note! The Trace buffer data can not be manipulated with these operators. If trace buffer screens are to be copied/pasted into other applications, like a Word document etc., use the <Alt>-<Print Screen> function to copy a screen image into the Windows clipboard.

All these commands are very carefully described in Chapter 5**.** Read the section concerning the Event Patterns window for editing in the Event Patterns window, the section concerning the Sequencer for editing of the Sequencer, etc.

6.2.1 Undo


The "Undo" tool bar button

The `Undo` command undoes the last executed `Edit`-command.

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6.2.2 Cut


The "Cut" tool bar button

The Cut command allows the user to remove event patterns, signal fields, etc. Select the item to be deleted with the mouse, and choose Edit/Cut, press the Cut button at the tool bar, press the DEL key on the keyboard, or press the Ctrl-x keys.

6.2.3 Copy


The "Copy" tool bar button

The Copy command allows the user to copy event patterns, signal fields, etc. Select the item to be copied with the mouse, and choose Edit/Copy, press the Copy button at the tool bar, or press the Ctrl-c keys.

6.2.4 Paste


The "Paste" tool bar button

The Paste command allows the user to paste event patterns, signal fields, etc., or whatever previously has been copied into the clipboard, into the appropriate window.

Event patterns

When pasting event patterns, place the cursor below the event pattern where the new pattern should be inserted, and select Edit/Paste, press the Paste button at the tool bar, press the INS key at the keyboard, or press the Ctrl-v keys.

Signal fields

When pasting signal fields, place the cursor on the signal field to the right of where the new one should be inserted, and select Edit/Paste, press the Paste button at the tool bar, press the INS key at the keyboard, or press the Ctrl-v keys.

6.2.5 Clear


The "Clear" tool bar button

The Clear command allows the user to clear event patterns, i.e. reset them to all "don't care" values. Select the event pattern to be cleared and select Edit/Clear, or press the Clear button at the tool bar. The Cut command can be used for clearing one signal field at a time in an event pattern.

6.2.6 Insert


The "Insert" tool bar button

The Insert command is used to insert new event patterns and signal fields into the Event Patterns window, and signal fields into the Trace Display window.

Event patterns

When inserting event patterns, place the cursor below the event pattern where the new pattern should be inserted, and select Edit/Insert, press the Insert button at the tool bar, or press the INS key at the keyboard.

Signal fields

When inserting signal fields, place the cursor on the signal field to the right of where the new one should be inserted, and select Edit/Insert, press the Insert button at the tool bar, or press the INS key at the keyboard.

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6.2.7 Open Sequencer

The `Open Sequencer` command opens the Sequencer for editing. A dialog box appears, asking whether it is OK to leave Single Event mode. The Sequencer can also be opened by pressing the TAB key in the Setup window, or by double-clicking in the Sequencer window.

For further information regading the Sequencer and Single Event mode, see Sections 5.5 and 5.6

6.2.8 Trigger Position

The `Trigger Position` is defined in a secondary pull-down menu, with selections for Start (0%), 25%, Middle (50%), 75% and End (100%) of trace. The selected trigger position is reflected in the Sequencer program.



- At Start of Trace



- At 25% of Trace



- At 50% of Trace



- At 75% of Trace



- At End of Trace

6.2.9 Sampling Mode



The "STATE Mode" Tool Bar button

The `Sampling mode` is selected in a secondary pull-down menu, and allows the user to select between the two major sampling modes:

STATE sampling



The "TIMING Mode" tool bar button

TIMING sampling

To change sampling frequency, see Section 6.2.9.1.

6.2.9.1 Options

To change sampling frequency, select `Edit/Sampling Mode/Options`, and a list of possible sampling frequencies for the TIMING sampling mode appears. The frequencies are from 97.7kHz to 50MHz.

By selecting the option at the top of the sampling frequency list, STATE options, the sampling options for the STATE sampling mode appears, see the dialog box in Figure 6.2.

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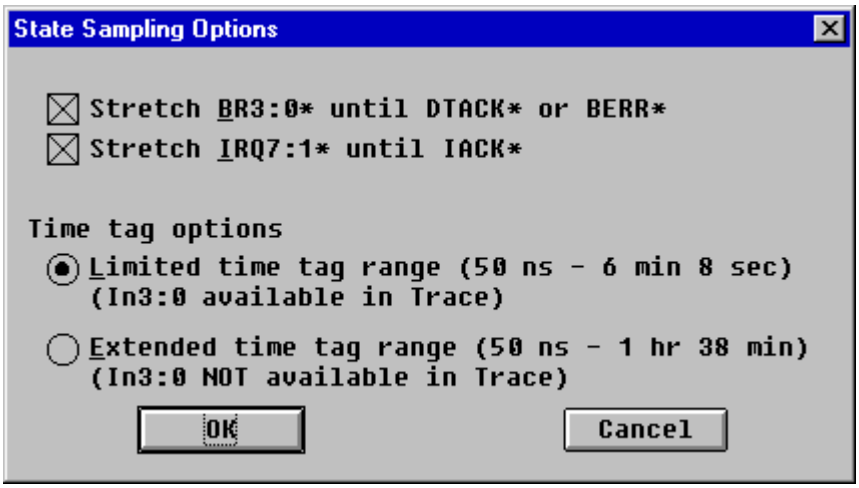


Figure 6.2 The STATE Options dialog box.

This command controls whether the BR* and IRQ* signals shall be stretched for capture on DTACK*/BERR* in VMEbus STATE sampling. It also controls the Limited/Extended time tag options vs. the availability of four shared signals in the trace

The *time-tag counter* can operate in either 16-bit or 12-bit modes. 16-bit mode gives the best resoulution and the largest measuarble time interval. Four bits in the time tag counter on the VME part of the VBT-325 are shared with the external inputs, In0...In3. Similarly, VBTtrg* and ExtIn0, are shared with the time-tag bits on the VME part of the XMEM325-PB.

With 16 bits time tag, the tag counter operates at its highest resolution, and with its largest measuarable time interval. Time intervals up to 1 hour and 38 minutes can be measured.The indicated signal names are not sampled, and thus not presented in the Trace window. The signals are still available in the Event patterns. See Section 11.4.

6.3 Trace Menu

The Trace menu controls starting, stopping, and displaying of the trace.

6.3.1 Run <Target>


The "Run" tool bar button

To start the analyzer for the target currently selected, simply execute Trace/Run <Target>. The Target can be VME or P2 (VSB, SCSI, VXI).

6.3.2 Run Multiple


The "Run Multiple" tool bar button

The Run Multiple command exists on the VBT-325C, or on the VBT-325B when a piggyback tracer, such as the S/TIM200-PB, the TIMBAT-PB, or the XMEM325-PB is installed.

Execute the command to start simultaneous operation of all the analyzers present in the actual hardware configuration.

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6.3.3 Halt


The "Halt" tool bar button

Normally, the trace acquisition will stop by itself and present the Trace Display window after the trigger is found and the trace buffer is filled. However, if the trigger is never found, or the trace buffer does not get completely filled after the trigger, one may want to stop the trace manually. Use the `Halt` command when a single analyzer is running (i.e. the current target).

6.3.4 Halt All


The "Halt All" tool bar button

If the `Run/Multiple` was used to start all analyzers, it is possible to stop all of them (or the ones still running) through the `Halt All` button in the Sampling Status box, or by the command `Trace/Halt All.`

6.3.5 Show <Target>


The "Show" tool bar button

To see the contents of the trace buffer if the trace was manually halted, use the `Show <Target>` command. The Target can be VME or P2 (VSB, SCSI, VXI). The command will bring up the Trace Display window for the currently selected target. This window has its own set of commands, described in Section 6.9

6.3.6 Sampling Status

A `Sampling Status` box appears on the window when the `Trace/Run` command is executed, indicating the target bus, and the analyzer status. See Figure 6.3.



Figure 6.3 The Sampling Status dialog box

In order to access other commands during sampling (e.g. to enter Transparent Mode), the Sampling Status box may be hidden with the `Hide` button.

Note 1 The Sampling Status box may be hidden permanently from the `Utilities/User Interface Options` dialog box.

Note 2 The sampling status is also shown on the status line as explained in Section 5.1.

6.4 Statistics

The Statistics window menu bar is described after the Trace Display window menu bar, i.e. in Section 6.10.

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6.5 Setups Menu

The `Setups` commands are used to initialize, store, delete or retrieve user-defined setups of event patterns and Sequencer programs stored in the Non-Volatile Memory on the analyzer. The number of storable setups vary with the complexity of the setups, but at least 50 setups with four events each may be stored.

(The `File` command can be used to store setup information on files on the PC.)

6.5.1 Initialize

`Initialize` will reset all values that have been entered into the Setup window. The event patterns, Sequencer, trigger position, sampling mode, and the Statistics options are returned to the default conditions, as seen after initial power up, or after clearing non-volatile memory.

6.5.2 Load

The `Load` command displays a dialog box containing all stored setups, as shown in Figure 6.4. There is always one setup called `Default` present. The default setup can not be deleted.



Figure 6.4 Loading a setup

6.5.3 Store

The `Store` command will ask for a setup name (like the one “MySetup” in Figure 6.4), and store the current setup. The selected name will then appear in the `Setups/Load` dialog box.

6.5.4 Delete

A setup can be deleted from the list by the `Delete` command. The same dialog box as the `Load` dialog box appears, containing all stored setups except the default setup.

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6.5.5 Make Current

The `Make Current` command has to be used to choose which setup to run if there is more than one setup open.

6.6 Utilities Menu

Under the `Utilities` menu, a number of utility functions are available.

Note! The BusView software supports both the VBT-325 VMEbus Analyzer, and the PBT(X)-315 PCI Bus Analyzer. This section will only deal with the commands that apply to the VBT-325 .

6.6.1 Communication

The `Communications` menu contains all the options for connecting the BusView software on the PC to the VBT-325.

6.6.1.1 Connect

The `Connect` command connects the PC to the VBT-325. Before connecting, make sure that the options under Port Settings are correct.

6.6.1.2 Disconnect

The Disconnect command disconnects the PC from the VBT-325.

6.6.1.3 Port Settings

The baud rate etc. of the two serial ports can be defined independently of each other by the `Port Settings` command.

6.6.2 Update Tracer Firmware

When `Update Tracer Firmware` is selected, it displays a dialog box giving a step by step guide for how to update the Tracer Firmware.

Refer to Chapter 12 for a detailed description**.**

Note! The analyzer is always shipped with all necessary firmware loaded into FLASH PROMs on the board. Reloading of firmware is only necessary if a new firmware version is issued, or a fatal system error has occurred.

6.6.3 Clear Non-Volatile Memory

Clearing the Non-Volatile Memory will reset the tracer, and cause all trace data and setups to be lost.

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6.6.4 Transparent Mode


The "Transparent Mode" tool bar button

The `Transparent Mode` is used to communicate with another CPU board, etc. through the second serial port on the VBT-325. In this mode, the processor on the VBT-325 will simply pass all characters between the terminal and the host CPU. It is important to note that transparent mode is not a VT100 like terminal, but a simple line oriented terminal featuring only CR and LF as control characters.

6.6.5 Target Reconfigure

The Target Reconfigure command sets the P2 bus. Selections are VSB, SCSI and VXI.

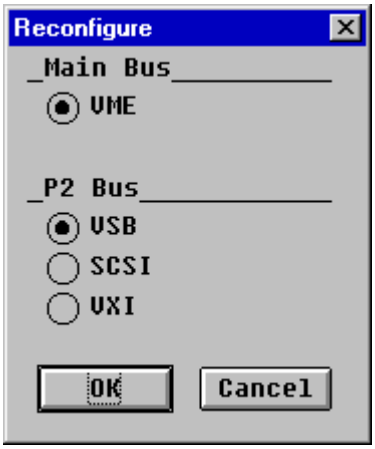


Figure 6.5 The Target Reconfigure dialog box

Changing the P2 bus requires a change of jumper settings, as explained in Section 2.2.3.

6.6.6 Trigger Output Options

The front panel trigger output may be programmed to change on trigger, or to follow the trigger or the store condition that prevails in the current state of the Sequencer, and to be active high or low. This is selected by the `Trigger Output Options` dialog box.

Actions on the Trigger Output signal:

Level on Trigger

Signal will go active when the trigger sample occurs, and will stay active until new `Trace/Run` is given.

Follow Trigger

Signal will go active the first time the trigger sample occurs, but will revert to inactive state on the next sample that does not match the trigger condition.

Follow Store

Signal will go active on all samples satisfying the Store Condition in the current state of the Sequencer. Signal reverts to an inactive state on samples not satisfying the prevailing store condition.

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Note! When the *Follow Trigger* or *Follow Store* is selected, a short pulse is generated on the TRIGGER output signal when the tracer is started with `Trace/Run`.

6.6.7 LED Display

The LED display on the front panel of the VBT-325 can display the time of day, voltages, temperature, and any user-defined text string.

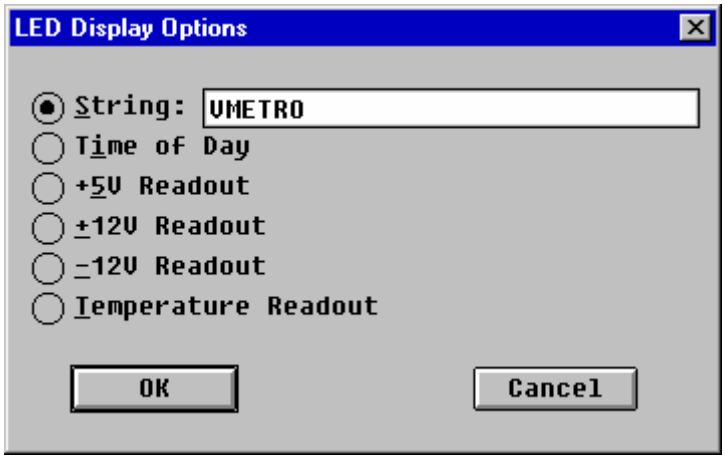


Figure 6.6 LED display

V+T/V jumper The jumper with the yellow label "**V+T** and **V"** (see Figure 13.1) must be in the **V** position (factory setting) to get correct voltage and temperature measurements.

Temperature Select `Temperature`, then install the optional temperature probe (part number 401-325ETS-1) in the **In1/T** input on the front panel.

The valid range of the temperature reading is **0-80°C / 32-176F**.

Note 1 Jumper J66 (located just inside of the mini-coax connectors, as shown in Figure 13.1) must be in position closest to the front panel to allow temperature measurements. In the other position, In1 is used as one of the four possible "External signal inputs" to the tracer (factory setting).

Note 2 Boards with ECO level lower than B8 does not have the yellow "**V+T** and **V"** labeled jumper. On boards with ECO level lower than B8, the temperature probe ***must not be present*** when doing voltage measurements.

Boards with ECO level C0 and higher does not have the V+T and V jumper.

6.6.8 Simulated Hardware

Displays a dialog box telling which hardware modules are available for simulating an analyzer when the tracer is off-line.

6.6.9 User Interface Options

The User Interface Options are presented in a dialog box, as shown in Figure 6.7. There are four options, none of which are crucial for the BusView behavior.

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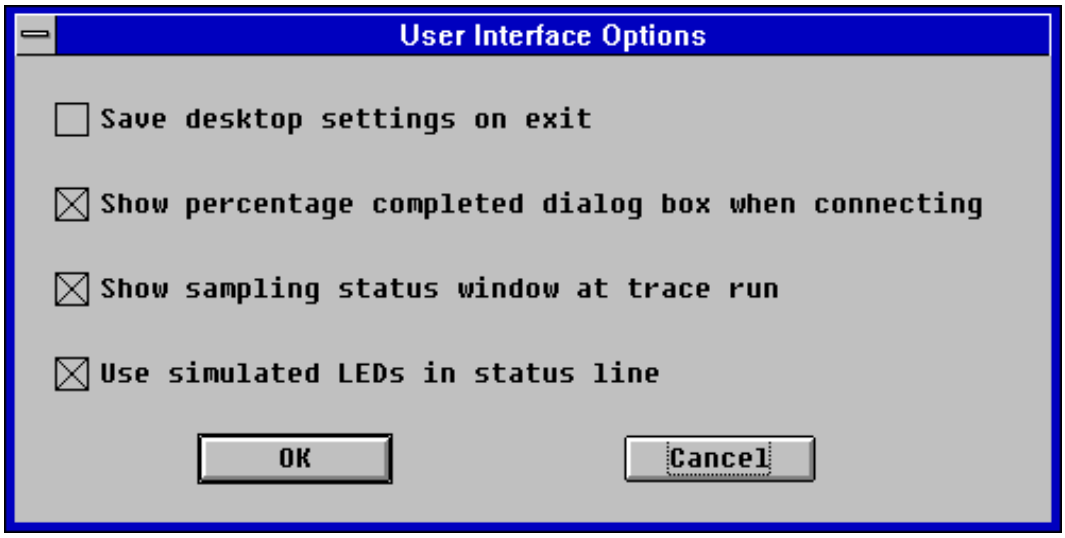


Figure 6.7 The User Interface Options dialog box

Save desktop settings on exit

BusView will start up with the same window and setup as last time it was running.

Show percentage completed dialog box when connecting

At startup BusView loads the tracer status. With this option activated BusView displays a dialog box showing the percentage of the tracer status that has been loaded.

Show sampling status window at trace run

The dialog box in Figure 6.3 is displayed during trace run when this option is selected. The dialog box continuously displays the current sampling status.

Use simulated LEDs in status line

This is a purely esthetic option selecting whether the status “lamps” at the status line should look “three dimensional” or not. (This option is turned off when using a black and white screen).

6.6.10 Selftest

The `Selftest` command starts an extensive test of the analyzer. Running the selftest for the VBT-325 VME and P2 analyzer will take about 50 seconds. The test procedure displays which device is currently being tested.

The Selftest procedure finishes with a Reset, causing all trace data to be lost.

6.6.11 Reset Analyzer

This command resets the VBT-325. All trace data will be lost.

6.6.12 Specials

The `Specials` command allows the user to read and set the current ECO (Engineering Change Order) level, PCB revision, Time and Date, and hardware/software version. The ECO level is normally set during manufacturing, and if a hardware ECO upgrade has been performed.

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The Time and Date need to be set if the non-volatile memory has been lost due to back-up battery failure.

6.7 Window Menu

The `Window` menu contains help for the user to arrange the open windows and icons in the best possible way.

6.7.1 Cascade


The "Cascade" tool bar button

The `Cascade` command arranges all the open windows in a cascade.

6.7.2 Tile Horizontally


The "Tile Horizontally" tool bar button

The `Tile Horizontally` command puts the open windows side by side horizontally.

6.7.3 Tile Vertically


The "Tile Vertically" tool bar button

The `Tile Vertically` command puts the open windows side by side Vertically.

6.7.4 Arrange Icons


The "Arrange Icons" tool bar button

The `Arrange Icons` command arranges all the iconized windows nicely at the bottom of the BusView main window.

6.7.5 Alphanumeric List


The "Alphanumeric List" tool bar button

The `Alphanumeric List` command opens an alphanumeric list of the current trace buffer. More than one list can be open at the same time.

6.7.6 Waveform


The "Waveform" tool bar button

The `Waveform` command opens a waveform display of the current trace buffer. More than one waveform display can be open at the same time.

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6.7.7 Select Window

The `Select Window` command opens the dialog box in Figure 6.8, where the user can select which window to be displayed in front.

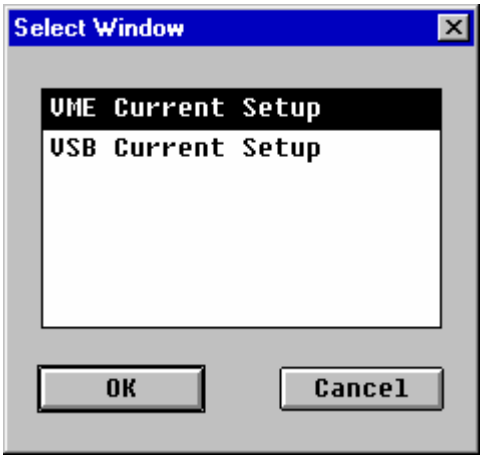


Figure 6.8 The Select Window dialog box

6.8 Help Menu

The `Help` menu contains a full featured On-line Help manual for BusView.

6.8.1 Index


The "Help Index" tool bar button

The `Index` command opens the List of Contents of the Help file.

6.8.2 Topic Search


The "Topic Search" tool bar button

The `Topic Search` command enables a list of Help items where the user can search for a desired item.

6.8.3 Using Help

The `Using Help` command offers a guide to how the help feature works.

6.9 Trace Display

When a trace is taken and displayed, BusView enters the Trace window. The Trace window features some new menu bar items, and some new tool bar items. The Trace

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window is slightly different when the trace is displayed as an alphanumeric list compared to when it is displayed as a waveform.

6.9.1 Search menu

BusView features a `Search` and `Extract` mechanism where the user can define search/extract patterns.

`Edge Jumping` is a feature in Waveform display, which allows the user to jump to the nearest falling or rising edge of the selected signal(s).

6.9.1.1 Edit Search Pattern


The "Edit Search Pattern" tool bar button

The `Edit Search Pattern` command displays the window in Figure 6.9, which allows the user to define one search pattern and one extract pattern.

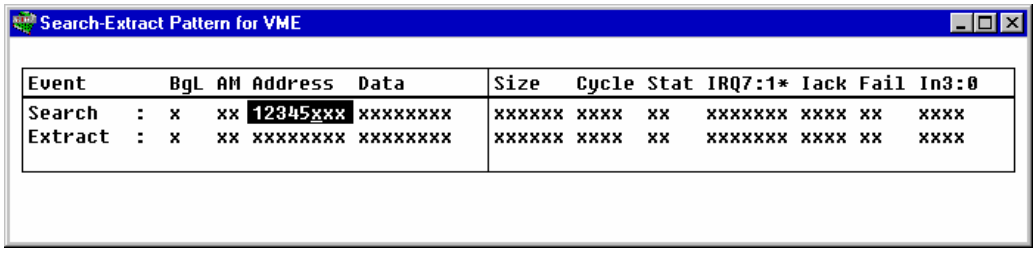


Figure 6.9 The Edit Search Pattern window

6.9.1.2 Extract


The "Extract" tool bar button

The `Extract` command extracts all trace lines from the current trace buffer which match the extract pattern defined in Section 6.9.1.1, and displays them in an alphanumeric trace list.

Esc can be used to cancel the Extract operation.

6.9.1.3 Search

The `Search` command searches for the first trace line in the current trace buffer that matches the search pattern defined in Section 6.9.1.1. The cursor jumps to the matching trace line.

Esc can be used to cancel the Search operation.

6.9.1.4 Next Match


The "Next Match" tool bar button

The `Next Match` command makes the cursor jump to the next line in the current trace buffer that matches the search pattern defined in Section 6.9.1.1.

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6.9.1.5 Previous Match


The "Previous Match" tool bar button

The `Previous Match` command makes the cursor jump to the previous line in the current trace buffer that matches the search pattern defined in Section 6.9.1.1.

6.9.1.6 Previous Edge


The "Previous Edge" tool bar button

The `Previous Edge` command is only available in Waveform display mode, and makes the cursor jump to the previous edge of the currently selected signals. If it searches for a rising edge, a falling edge, or any edge, is set with the "Edge Options" command. See Section 6.9.1.8 below.

6.9.1.7 Next Edge


The "Next Edge" tool bar button

The `Next Edge` command is only available in Waveform display mode, and makes the cursor jump to the next edge of the currently selected signals. If it searches for a rising edge, falling edge, or any edge, is set with the "Edge Options" command. See Section 6.9.1.8 below.

6.9.1.8 Edge Options

The `Edge Options` command defines if the Search commands "Next Edge" and "Previous Edge" should search for a rising edge, a falling edge, or any edge. The command is only available in Waveform display mode.

6.9.2 Jump Menu

To allow the user to jump easily from one place in the trace buffer to another, a set of "jump" tools are developed.

6.9.2.1 First Line


The "First Line" tool bar button

The `First Line` command makes the cursor jump to the first line of the trace buffer.

6.9.2.2 Last Line


The "Last Line" tool bar button

The `Last Line` command makes the cursor jump to the last line of the trace buffer.

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6.9.2.3 Trigger Line


The "Trigger Line" tool bar button

The `Trigger Line` command makes the cursor jump to the trigger line. The trigger line can be at Start of Trace, 25% of Trace, 50% of Trace, 75% of Trace, and End of Trace, according to Section 6.2.7.

6.9.2.4 Marker Y

The `Marker Y` command makes the cursor jump to the position of the Y-marker in the trace buffer. For more information about markers, see Section 5.7.2.2.

6.9.2.5 Marker Z

The `Marker Z` command makes the cursor jump to the position of the Y-marker in the trace buffer. For more information about markers, see Section 5.7.2.2.

6.9.2.6 Line Number


The "Line Number" tool bar button

The `Line Number` command opens the Jump to Line dialog box, which gives the user the opportunity to type in which line in the trace buffer the cursor should jump to.

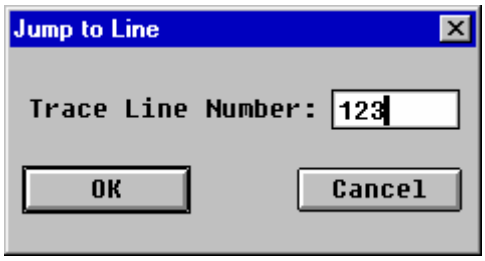


Figure 6.10 The Jump to Line dialog box

6.9.3 Count

The `Count` command returns the dialog box in Figure 6.11, asking for start and stop lines. Type two line numbers and click OK.

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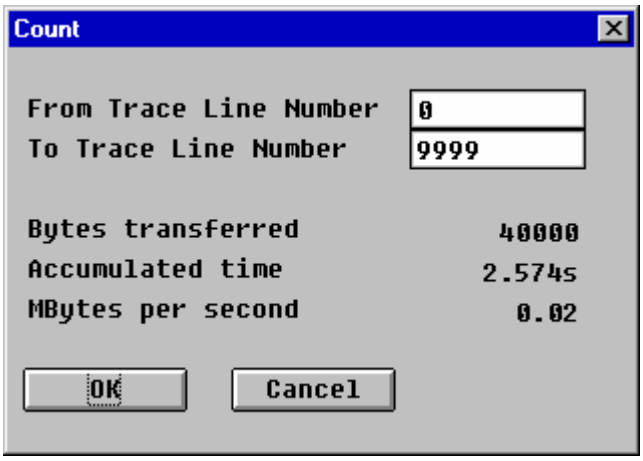


Figure 6.11 The Count dialog box

Note! This command operates only on traces that reside in the trace buffer, *not on trace files.*

6.9.4 Format Menu

The `Format` menu contains items suitable for formatting the Trace window to the taste of the user. It applies to both the alphanumeric, and the waveform Trace window.

6.9.4.1 Scale


The "Scale" tool bar button

The `Scale` command opens the dialog box in Figure 6.12. By using the slide control, by changing the percentage, or by clicking at the "Zoom In/Out" buttons at each end of the slide control, the user may change the axis of the waveforms in the Trace Display window. The "Zoom In/Out" buttons increase/decrease the sample size by a factor of 2.

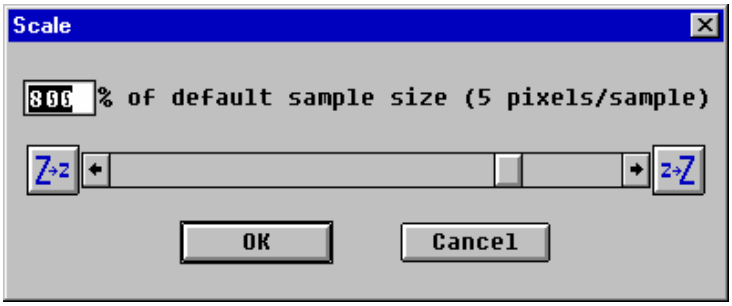


Figure 6.12 The Scale dialog box

6.9.4.2 Zoom In


The "Zoom In" tool bar button

The `Zoom In` command increases the sample size by a factor of 2, i.e. it is used to get a closer look at the waveform diagrams.

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6.9.4.3 Zoom Out


The "Zoom Out" tool bar button

The `Zoom Out` command decreases the sample size with a factor of 2, i.e. it is used to get an overview of the trace buffer.

6.9.4.4 Decoding and Formatting


The "Decoding & Formatting" tool bar button

The `Decoding and Formatting` command allows the signal at the cursor position to be presented in a decoded form (with mnemonics). A dialog box appears, with one or two options, depending on which signal field is selected. The first option enables/disables *global* decoding/formatting, and the second option enables/ disables decoding/formatting for that specific signal field.

6.9.4.5 Trace Signal

A trace signal template (your special setup of mnemonic and/or hex/binary signal fields) can be saved, opened, and deleted.

6.9.5 Marker Menu

Markers can be placed in the waveform diagram to perform delta-time measurements.

6.9.5.1 Set Marker Y


The "Marker Y" tool bar button

The `Marker Y` command inserts the Y-marker into the waveform window.

6.9.5.2 Set Marker Z


The "Marker Z" tool bar button

The `Marker Z` command inserts the Z-marker into the waveform window.

6.9.5.3 Delete Marker Y

The `Delete Marker Y` command removes the Y-Marker from the waveform window.

6.9.5.4 Delete Marker Z

The `Delete Marker Z` command removes the Z-Marker from the waveform window.

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6.10 Statistics


The "Statistics" tool bar button

Selecting `Statistics` from the menu bar means entering the Statistics window. The Statistics window has three new items in the menu bar, containing commands for controlling all the Statistics options and capabilities.

6.10.1 Session Menu

The `Session` command in the Statistics window menu bar is the functional equivalent of the `Trace` menu in the Setup window, providing `Run`, and `Halt` commands for operating the statistics.

6.10.1.1 Run


The "Run" tool bar button

Choosing `Session/Run` will cause all the statistics counters for the target currently selected to count from zero, and the histograms will be updated according to the options set by the command `Options/Count Options`.

6.10.1.2 Continue


The "Continue" tool bar button

`Continue` resumes counting from the values reached the last time the statistics was stopped with `Halt`.

6.10.1.3 Halt


The "Halt" tool bar button

`Halt` stops the statistics session and freezes the histogram window.

6.10.1.4 Immediate Start

This command is active for the trace based Bus Transfer Rate statistics. The default selection, `Immediate Start`, causes the statistics to start counting immediately.

6.10.1.5 Start On Trigger

This command is active for the trace based Bus Transfer Rate statistics. Selecting `Start On Trigger` causes the Bus Transfer Rate statistics to wait for the trigger defined in the user Sequencer program before it starts counting. The user Sequencer program must provide `Trigger at Start of Trace`, and `Sampling Mode STATE`. The Sequencer program should *not* contain any `Halt` statement.

6.10.2 Function Menu

The `Function` command is used to select between the statistics functions. Three functions are available, `Event Counting`, `Bus Utilization`, and `Bus Transfer Rate`.

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6.10.2.1 Event Counting


The "Event Counting" tool bar button

The `Event Counting` command invokes the statistics function that provides real-time histograms of the occurrence of four user-specified events. The Event Counting statistics is described in Section 5.8.2.

6.10.2.2 Bus Utilization


The "Bus Utilization" tool bar button

The `Bus Utilization` command invokes the pre-configured statistics function providing real-time histograms of the BBSY*, AS*, DATA, and Total DTB for VME, and BUSY*, ADDRESS, DATA, and Total DTB for VSB. The Bus Utilization statistics is described in Section 5.8.3 and 5.8.3.1.

6.10.2.3 Bus Transfer Rate


The "Bus Transfer Rate" tool bar button

The `Bus Transfer Rate` command invokes the pre-configured statistics function providing trace-based bus transfer rate histograms in bytes and cycles per second. The Bus Transfer Rate statistics is described in Section 5.8.4.

6.10.3 Options

The `Options` commands are used to configure various window control and display features. They include `Bar Markers, Graph Display Options, Max. Scale, Count Options` and `Select Events`, in addition to the selection of `Standard Histograms` or `Time History Curves.`

6.10.3.1 Histograms


The "Standard Histogram" tool bar button

Two graphical display options are available. The `Histograms` option (default) uses histogram bars, showing the current reading of the statistics counters, or the calculations from the last trace, depending on which statistics mode is running.

6.10.3.2 Time History Curves


The "Time History Curves" tool bar button

`Time History Curves` show how the values change in time, by means of a curve in an X-Y diagram, where the X-axis represents time.

The available parameters to be displayed in a time history curve changes with the currently selected statistics mode, i.e. when the Event Counting mode is selected, the `Time History Curves` options list, is the events from the Event Patterns window. When Bus Utilization mode is selected, the list contains the parameters from the Bus Utilization histogram, etc.

6.10.3.3 Bar Markers

The `Bar Marker` function calculates minimum, maximum and average values for the ongoing series of counter readings. The calculated values are indicated in the proper positions in the histograms.

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Show To make a bar marker visible, perform the command `Bar Markers/Show`. A dialog box with the three markers appears, and the user may select which ones should be displayed.

Reset Execute `Bar Markers/Reset` to reset the recorded values for the selected marker(s), so that only subsequent count values will be taken into account when displaying new bar markers.

Note! The bar markers are not active in Time History Curves.

6.10.3.4 Graph Display Options


The "Grid" tool bar button

The Graph Display Option available is the `Grid` option, i.e. whether to display the Histograms and Time History Curves with a grid or not.

6.10.3.5 Unit

The `Unit` command has two options, the `Mxfers/s`, and the `Mbytes/s`. They are only active when running in Bus Transfer Rate mode.

6.10.3.6 Maximum Scale

`Maximum Scale` provides graduated horizontal scaling of the histograms, ranging from 5% to 100%. Choosing lower maximum scale allows for better resolution of measurements with mostly low count values. For Bus Transfer Rate, the scale options are 1-10MXfer/s and 5-80 Mbytes/s.

6.10.3.7 Count Options


The "Count Options" tool bar button

To optimize a statistics session to the actual system behavior, there are several `Count Options` that can be selected.

Note! **`Count Options` only apply to Event Counting.**

Qualifier The `Qualifier` selects whether "all samples" or "valid samples" should be sampled. Valid samples are samples matching the selected events in the `Select Events` dialog box described in Section 6.10.3.8.

Update Every The `Update Every` feature, provides control of the screen update interval. The screen may be updated every time interval, or every sample interval. The sample interval begins at 1K and increases to a maximum of 16M Samples. The time interval begins at 1 second and increases to 60 seconds.

Simple experimentation with this display control will assist the user to quickly determine the optimum parameter needed to acquire the maximum recording resolution for the application under test. Applications generating low bus cycle frequencies will typically require a smaller screen update parameter.

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Note! **Use the `Update Every Time Interval` feature to get a constant refresh rate, independent of bus activity.**

Mode The count values to be shown as histograms may be calculated as a percentage of the total sample count in *each update*, or as a *cumulative* percentage of the total sample count in the current session. The first mode is referred to as the **Reset mode**, while the latter is referred to as **Accumulate** .

6.10.3.8 Select Events

The user may select any four events from the Event Patterns window in the Setup window to be used in the Statistics measurements by means of the `Select Events` command. By default, the first four events in the Event Patterns window, except the one named AnyThing, are used.

6.10.3.9 Sampling Mode

This is the same command as under `Edit/Sampling Mode` in the Setup window. See Section 6.2.9.

Changing the statistics sampling mode does not change the settings in the Setup window.

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7. SIGNAL REFERENCE

7.1 VMEbus Signal Fields

This chapter gives you a complete reference to all the signals used by the VME targets on the VBT-325 *and* the XMEM325-PB Piggyback Module.

7.1.1 Default Signal Fields in STATE Mode

BgL

BG[3:0]*, internally latched. This field contains bus grant information latched on the falling edge of BBSY*.

Predefined Symbol	Comment
---0	BG0* active
--1-	BG1* active
-2--	BG2* active
3---	BG3* active
----	No BG* active seen from the tracer

Table 7.1 VME, the BgL signal field

AM

AM[5:0], the Address Modifier bits.

Predef. Symb.	AM (5:0)	Comment
SBLTE	07	Long supervisory block transfer.
SBLTL	06	Long supervisory program access.
SU64B	38	Standard non-privileged 64-bit block transfer.
SS64B	3C	Standard supervisory 64-bit block transfer.
LU64B	00	Long non-privileged 64-bit block transfer.
LS64B	04	Long supervisory 64-bit block transfer.
EU64B	08	Extended non-privileged 64-bit block transfer.
ES64B	0C	Extended supervisory 64-bit block transfer.
SUA	29	Short non-privileged access.
SSA	2D	Short supervisory access.
SUD	39	Standard non-privileged data access.
SUP	3A	Standard non-privileged program access.
SUB	3B	Standard non-privileged block transfer.
SSD	3D	Standard supervisory data access.
SSP	3E	Standard supervisory program access.
SSB	3F	Standard supervisory block transfer.
EUD	09	Extended non-privileged data access.
EUP	0A	Extended non-privileged program access.
EUB	0B	Extended non-privileged block transfer.
ESD	0D	Extended supervisory data access.
ESP	0E	Extended supervisory program access.
ESB	0F	Extended supervisory block transfer.

Table 7.2 The AM codes

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Address A[31:1], plus DS1* acting as virtual A00. Address ranges and field negation is supported. A64 cycles, including A64 range is also supported.

Data D[31:0]. Data range and negation is supported. D64 cycles may be specified, but no D64 range.

Size RmwBlk, Vme64*, A01 DS1*, DS0*, LWORD*.

These control signals are combined into the field called Size. This group also takes into account the address bit A01, since this bit, together with the ones mentioned above determine the transfer size and the data aligning on the VMEbus. The internally generated bit RmwBlk is also included in this group, set during Read-Modify-Write and Block cycles (in second cycle).

Vme64 This, internally generated, signal is used to identify cycles with VME64 AM-codes, i.e. AM = 00, 01, 03, 06, 07 ,08, 0C, 38, or 3C.

Predef. Symb.	RmwBlk	Vme64*	A01	DS1*	DS0*	LWORD	Comment
UNAL3L	x	1	0	1	0	0	
UNAL3H	x	1	0	0	1	0	
UNAL2	x	1	1	0	0	0	
UBYTE	x	1	x	0	1	1	
LBYTE	x	1	x	1	0	1	
WORD	x	1	x	0	0	1	
LONG	x	1	0	0	0	0	
A-MBLT	0	0	x	x	x	x	VME64
D64	1	0	x	0	0	x	VME64

Table 7.3 VME, the Size signal field

Cycle AM1, Vme64*, RmwBlk, WRITE*.

The Cycle field contains the bus signals that define the current cycle type. The internally generated bits RmwBlk and Vme64* are also included in this group.

RmwBlk RmwBlk is asserted during Read-Modify-Write and Block cycles (in second cycle). Together with address modifier bit AM1, this field can be used directly to set mnemonics for Read, Write, RMW and Block cycles.

Predef. Symb.	AM1	Vme64*	RmwBlk	WR*	Comment
RD	x	x	x	1	Generic Read cycle.
WRI	x	x	x	0	Generic Write cycle.
RBLK	1	1	1	1	Block Read cycle.
WBLK	1	1	1	0	Block Write cycle.
RMBL	0	0	1	1	VME64 Block read.
WMBL	0	0	1	0	VME64 Block Write
RMW	0	1	1	0	Read-Modify-Write cycle.

Table 7.4 VME, the Cycle signal field

Stat DTACK*, BERR*.

The bus cycle status field.

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Predef. Symb.	DTACK*	BERR*	Comment
OK	0	1	DTACK* asserted. Cycle ended OK.
BERR	x	0	BERR* asserted by master.
Err!	0	0	Illegal combination of signaøs.
Off	1	1	Neither DTACK* nor BERR* asserted.

Table 7.5 VME, the `Stat` *signal field*

IRQ7:1

`IRQ[7:1]*`, the IRQ field can be negated. There are no predefined symbols, but special formatting applies. When an IRQ* signal is asserted (i.e. low value), it is displayed with its IRQ number, non-asserted, (i.e. high value) are displayed as a dot ".".

For example, `IRQ5*` asserted, and `IRQ1*` as don't care, and the rest non-asserted, will be displayed "`..5...X`".

Iack

`A03, A02,A01, IACK*.`

Interrupt acknowledge is defined as a numeric code on the signals `A[3:1]` and driving `IACK*` low.

Predef. Symb.	A03	A02	A01	IACK*	Comment
----	x	x	x	1	No Interrupt Acknowledge cycle.
IACKx	x	x	x	0	Any Interrupt Acknowledge cycle.
IACK7	1	1	1	0	IACK cycle on level 7
IACK6	1	1	0	0	IACK cycle on level 6
IACK5	1	0	1	0	IACK cycle on level 5
IACK4	1	0	0	0	IACK cycle on level 4
IACK3	0	1	1	0	IACK cycle on level 3
IACK2	0	1	0	0	IACK cycle on level 2
IACK1	0	0	1	0	IACK cycle on level 1
UnDef	0	0	0	0	Spurious or undefined interrupt.

Table 7.6 VME, the `Iack` *signal field*

Fail

`ACFAIL*, SYSFAIL*.`

The `Fail` group contains the two VMEbus fail signals `ACFAIL*` and `SYSFAIL*`. These are available as a group to occupy less screen space horizontally, but the signals may also be shown individually as `SYSF*` and `ACF*`.

Predef.Symb.	ACF*	SYSF*	Comment
AcSy	0	0	Both SYSFAIL* and ACFAIL* asserted.
--Sy	1	0	SYSFAIL* asserted.
Ac--	0	1	ACFAIL* asserted.
----	1	1	None asserted.

Table 7.7 VME, the `Fail` *signal field*

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In3:0 In3, In2, In1, In0.

These are the external inputs in the mini-coax connector on the front panel. Note that In1 is shared with the temperature probe, so if the probe is used, In1 is not available. (Determined by jumper J66 and, for the VBT-325 PCB revision “B”, the "V+T, V" jumper, see Figure 13.1. Also note that In3:0 is not available in the trace if *Extended Time Tag* is selected.

P2trg* P2Trg*, the cross trigger signal from the VBT-325C P2 part. This signal is not available on the VBT-325B.

Predef. Symb.	P2trg*	Comment
-	1	No trigger from the P2 part.
TRIG	0	The P2 tracer has triggered.

Table 7.8 VME, the P2trg signal field

7.1.2 Cross-trigger Signals

Cross trigger signals are asserted, i.e. set as TRIG, when the associated tracer triggers. Table 7.9 gives an overview of all possible cross trigger signals between the VBT-325 and the associated piggybacks:

Signal name	Produced by	Appears on targets
VMEtrg*	VBT-325 VME	VBT-325 P2
P2trg*	VBT-325 P2	VBT-325 VME
XMVtrg*	XMEM325 VME	VBT-325 VME
XMP2trg*	XMEM325 P2	VBT-325 VME
XVtrg*	XMEM325 VME	XMEM325 P2
XP2trg*	XMEM325 P2	XMEM325 VME
VBTVtrg*	VBT-325 VME	XMEM325 VME
TIMtrg*	TIM-200	VBT-325 VME

Table 7.9 Cross-trigger signals

Vbat Trigger signal from the VBAT piggyback. This signal is asserted whenever the VBAT detects a violation to the VMEbus protocol specification. The following predefined symbols applies:

Predef. Symb.	Vbat	Comment
OK	1	No VMEbus protocol violation detected by the VBAT
VIOL	0	One or more VMEbus protocol violations detected by the VBAT

Table 7.10 VME, the Vbat signal field

7.1.3 Default Signal Fields in Timing Mode

BR3:0 BR3*, BR2*, BR1*, BR0*, the Bus Request signals.

BG3:0 BR3*, BR2*, BR1*, BR0*, the Bus Grant signals.

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Latched BG information is also available as BgL. See Section 7.1.1.

Other signals

The other default signals in TIMING mode use the standard VMEbus signal names. Signals ending in an asterix, "*", are active low.

BBSY* BBSY*

AS* AS*

WR* WRITE*

AM See Section 7.1.1.

Address See Section 7.1.1.

Data See Section 7.1.1.

LWORD* LWORD*

DS1* DS1*

DS0* DS0*

DTACK* DTACK*

BERR* BERR*

IRQ7:1* See Section 7.1.1.

P2trg* See Section 7.1.1.

7.1.4 Signal Fields not Included by Default

7.1.4.1 Signal Fields Available in Event Patterns and Trace Display

The following signals are not, by default, included in the STATE or TIMING screen templates. Use the INS key, or select Insert from the tool bar or the Edit menu, to open a list of signals when in the Event Patterns, Trace Display, or Search/Extract window:

ACF* ACFAIL*

BBSY* BUSBUSY*

BCLR* BCLR*

SCLK SYSCLOCK

SYSR* SYSRESET*

SYSF* SYSFAIL*

IACK* IACK*

IACKIO* IACKIO*

RETRY* RETRY*

Vme64

This, internally generated, signal is used to identify cycles with VME64 AM-codes, i.e. AM = 00, 01, 03, 06, 07 ,08, 0C, 38, or 3C. VME64* is a component of the **Size** and the **Cycle** fields.

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RmwBlk Internally generated. Asserted when AS* is not taken high between cycles. This means that the current cycle is the second (or subsequent) cycle in a VMEbus Read-Modify-Write cycle sequence, or a block cycle. RmwBlk is a component of the **Size** and the **Cycle** fields.

7.1.4.2 Signals Available in Trace Display only

DataASCII D[31:0], decoded as ASCII.

AM5..AM0 The AM5, AM4, AM3, AM2, AM1 and AM0, normally grouped as AM, are also available as individual signals.

Other individual signals are:

BG3*.. BG0* BG3*, BG2*, BG1* and BG0*.

BR3*.. BR0* BR3*, BR2*, BR1* and BR0*.

In3.. In0 The external inputs, In3 .. In0.

IRQ7*.. IRQ1* IRQ7* .. IRQ1*.

StateMode Indicates the sampling mode of the current sample; STATE when high (1). When low (0), the sampling mode is TIMING. This bit is useful if a mixture of STATE and TIMING sampling is used within a trace (according to Sequencer program.).

7.2 VSB Signal Fields

This chapter gives you a complete reference to all the signals used by the VSB targets on VBT-325C *and* the XMEM325 piggyback.

7.2.1 VSB, Default Signal Fields in STATE Mode

Space WR*, SPACE1, SPACE0

This group select between the different address spaces: System, I/O and Alternative. In addition, the WR* signal is included in this field to be able to select Interrupt Acknowledge cycles.

Predef. Symb.	WR*	SPC1	SPC0	Comment
SYS	x	1	1	System address space.
I/O	x	1	0	I/O address space.
ALT	x	0	1	Alternative address space.
IACK	1	0	0	Interrupt Acknowledge cycle.

Table 7.11 VSB, the Space signal field

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DS*

The data strobe, DS*, determines the phase of the VSBbus cycle. A cycle consist of one Address phase ,ADDR, where the address information is driven by the master on the AD[31:0] lines. The Data phase, DATA, follows directly after where the master or the slave drives data on the same AD[31:0] lines. Block transfers consist of additional Data phases.

Predef. Symb.	DS*	Comment
ADDR	1	Address phase.
DATA	0	Data phase.

Table 7.12 VSB, the DS signal field*

Editing this field, will change the contents of the Address and Data fields. If something is filled into the Address field, and DS* is changed to 1 or DATA, the contents of the Address field will be moved into the Data field - and vice versa.

Address

AD[31:0], Address phase.

When editing this field, the Data field will automatically be cleared and the DS* set to ADDR.

Data

AD[31:0], Data phase.

When editing this field, the Address field will automatically be cleared and the DS* set to DATA.

Size

SIZE1, SIZE0.

The master asserts these signals to indicated wanted data transfer size.

Predef. Symb.	SIZ1	SIZ0	Comment
LONG	0	0	32-bits data transfer.
3BYT	1	1	24-bits data transfer.
WORD	1	0	16-bits data transfer.
BYTE	0	1	8-bits transfer.

Table 7.13 VSB, the Size signal field

ASACK*

ASACK1*, ASACK0*.

Slave data transfer size acknowledge. The slave asserts these signals to answer on the master's Size demand.

Predef. Symb.	ASACK1*	ASACK0*	Comment
None	1	1	Slave doesn't respond.
D08	1	0	Response from 8-bits slave.
D16	0	1	Response from 16-bits slave.
D32	0	0	Response from 32-bits slave.

Table 7.14 VSB, the ASACK signal field*

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Cycle

WR*, PARB*, BLK.

VSBbus cycle type. The BLK signal is internally generated and asserted in the data phase(s) of the cycle when a block cycle is detected.

Predef. Symb.	WR*	PARB*	BLK	Comment
Read	1	x	x	Read cycle.
Write	0	x	x	Write cycle.
WBLK	0	x	1	Wite Block.
RBLK	1	x	1	Read Block.
ARB	x	0	x	Arbitration cycle.

Table 7.15 VSB, the Cycle signal field

Status

ERR*, ACK*.

VSBbus cycle completion status.

Predef. Symb.	ERR*	ACK*	Comment
ERR	0	x	Error status.
-	1	1	Neither signal asserted.
OK	1	0	OK status.

Table 7.16 VSB, the Status signal field

LOCK*

VSBbus LOCK* signal.

IRQ*

VSBbus IRQ* signal.

VMEtrg*

The cross trigger signal from the VBT-325C VME part.

Predef. Symb.	VMEtrg*	Comment
-	1	No trigger from the VMEpart.
TRIG	0	The VME tracer has triggered.

Table 7.17 VSB, the VMEtrg signal field*

7.2.2 VSB, Default Signal Fields in TIMING Mode

Space, DS*

As in STATE mode.

Address/ Data

AD[31:0].

VSBbus Address and Data signals, any phase. Specify phase in the DS* signal.

Other signals

The other default signals in TIMING mode use the standard VSBbus signal names with some exceptions. Signals ending in an asterix, "*", are active low.

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BREQ* BREQ*

BGIO* BGIO*

BUSY* BUSY*

PAS* BGIO*

ASACK* See Section 7.2.1.

ACK* ACK*

ERR* ERR*

WR* WR*

Size* See Section 7.2.1.

LOCK* LOCK*

WAIT* WAIT*

IRQ* IRQ*

VMEtrg* Cross trigger from VME part.

7.2.3 VSB, Signal Fields not Included by Default

7.2.3.1 Signal Fields Available in Event Patterns and Trace Display

The following signals are not, by default, included in the STATE or TIMING templates. Use the INS key, or select Insert from the tool bar or the Edit menu, to open a list of signals when in the Event Patterns, Trace Display, or Search/Extract window:

AC VSBbus AC signal.

BLK Internally generated. Asserted when a block cycle is detected in the data phase(s) of the VSBbus cycle.

7.2.3.2 Signals Available in Trace Display only

StateMode Indicates the sampling mode of the current sample; STATE when high (1). When low (0), the sampling mode is TIMING. This bit is useful if a mixture of STATE and TIMING sampling is used within a trace (according to Sequencer program.).

7.3 SCSI Signal Fields

This chapter gives you a complete reference to all the signals used by the SCSI targets on VBT-325C *and* the XMEM325 piggyback.

7.3.1 SCSI, Default Signal Fields in STATE Mode

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DBP* DBP*, data bus parity. Presented as-is.

DB7:0 DB[7:0]*, the transferred data. Presented in inverted form.

Phase MSG*, CD*, IO*. This group select between the different SCSI phases.

Predef. Symb.	MSG*	CD*	IO*	Comment
MSG_IN	0	0	0	Message In phase.
MSG_OUT	0	0	1	Message Out phase.
STATUS	1	0	0	Status phase.
COMMAND	1	0	1	Command phase.
DATA_IN	1	1	0	Data In phase (i.e. Read data from target).
DATA_OUT	1	1	1	Data Out phase (i.e. Write data to target).

Table 7.18 SCSI, the Phase signal field

Other signals Other SCSI single bit signals.

ATN* ATN*

RST* RST*

REQ* REQ*

SEL* SEL*

ACK* ACK*

BSY* BSY*

VMEtrg* VMETrg*, the cross trigger signal from the VBT-325C VME part.

7.3.2 SCSI, Default Signal Fields in TIMING Mode

MSG* CD* IO* The signal field layout in TIMING mode is as in STATE mode, with the exception of the Phase field is missing. The single bits MSG*, CD* and IO* are presented in its place.

7.3.3 SCSI, Signal Fields not Included by Default

The following signals are not, by default, included in the STATE or TIMING templates. Use the INS key, or select Insert from the tool bar or the Edit menu, to open a list of signals when in the Event Patterns, Trace Display, or Search/Extract window.

DBP1* Parity for the upper 8 data bits for 16-bit Wide SCSI-II. Presented as-is.

DB15:8 DB[15:8]*, inverted. The upper 8 data bits for 16-bit Wide SCSI-II. Presented in inverted form.

7.4 VXI Signal Groups

This chapter gives you a complete reference to all the signals used by the VXI targets on VBT-325C *and* the *XMEM325* piggyback using theVXE-35C VXI adapter. Only TTL level signals are routed via the adapter to the VBT-325. The VMEbus portion of the VXIbus is sampled as a normal VMEbus. ECL and ANALOG level signals are isolated from the VBT-325 by the VXI adapter.

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7.4.1 VXI, Default Signal Fields in STATE and TIMING Modes

LBUS11:0 A 12-bit local, daisy-chained, bus. The VXE-35C connects the Local bus input pins directly to the corresponding output pins, allowing the VBT-325C / VXE-35C to be installed *between* two VXI hosts without breaking the LBUS connection.

TTRGx* TTRG7* .. TTRG0*, eight, TTL level, open collector, trigger lines.

VMEtrg* VMETrg*, the cross trigger signal from the VBT-325C VME part.

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8. PINOUT P1/P2

8.1 VME & VSB Connection on P1 & P2

Names in *italics* denotes VSB signals.

Pin #	P1 A	P1 B	P1 C	P2 A	P2 B	P2 C
1	D00	BBSY*	D08	*AD00*	+5V	*AD01*
2	D01	BCLR*	D09	*AD02*	GND	*AD03*
3	D02	ACFAIL*	D10	*AD04*	RETRY*	*AD05*
4	D03	BG0IN*	D11	*AD06*	A24	*AD07*
5	D04	BG0OUT*	D12	*AD08*	A25	*AD09*
6	D05	BG1IN*	D13	*AD10*	A26	*AD11*
7	D06	BG1OUT*	D14	*AD12*	A27	*AD13*
8	D07	BG2IN*	D15	*AD14*	A28	*AD15*
9	GND	BG2OUT*	GND	*AD16*	A29	*AD17*
10	SYSCLK	BG3IN*	SYSFAIL*	*AD18*	A30	*AD19*
11	GND	BG3OUT*	BERR*	*AD20*	A31	*AD21*
12	DS1*	BR0*	SYSRES*	*AD22*	GND	*AD23*
13	DS0*	BR1*	LWORD*	*AD24*	+5V	*AD25*
14	WRITE	BR2*	AM5	*AD26*	D16	*AD27*
15	GND	BR3*	A23	*AD28*	D17	*AD29*
16	DTACK*	AM0	A22	*AD30*	D18	*AD31*
17	GND	AM1	A21	*GND*	D19	GND
18	AS*	AM2	A20	*IRQ**	D20	GND
19	GND	AM3	A19	*DS**	D21	GND
20	IACK*	GND	A18	*WR**	D22	GND
21	IACKIN*	SERA	A17	*SPACE0*	D23	*SIZE0*
22	IACKO*	SERB	A16	*SPACE1*	GND	*PAS**
23	AM4	GND	A15	*LOCK**	D24	*SIZE1*
24	A07	IRQ7*	A14	*ERR**	D25	GND
25	A06	IRQ6*	A13	GND	D26	*ACK*
26	A05	IRQ5*	A12	GND	D27	*AC*
27	A04	IRQ4*	A11	GND	D28	*ASACK1**
28	A03	IRQ3*	A10	*GA0*	D29	*ASACK0**
29	A02	IRQ2*	A09	*GA1*	D30	*CACHE**
30	A01	IRQ1*	A08	*GA2*	D31	*WAIT**
31	-12V	+5V STBY	+12V	*BGIN**	GND	*BUSY**
32	+5V	+5V	+5V	*BREQ**	+5V	*BGOUT**

Table 8.1 Pinout P1/P2

8.2 SCSI Connection on P2

There is no industry standard connection for SCSI on P2 of VME boards. This is not so strange, since the SCSI-bus is rarely (or never) *bussed* in the back plane, it goes normally only out from one board (CPU w/SCSI interface, or specific SCSI controller VME board like DVME-718). If the connection matches the VBT-325C, then the arrangement shown in Figure 8.1 can be as used for SCSI analysis.

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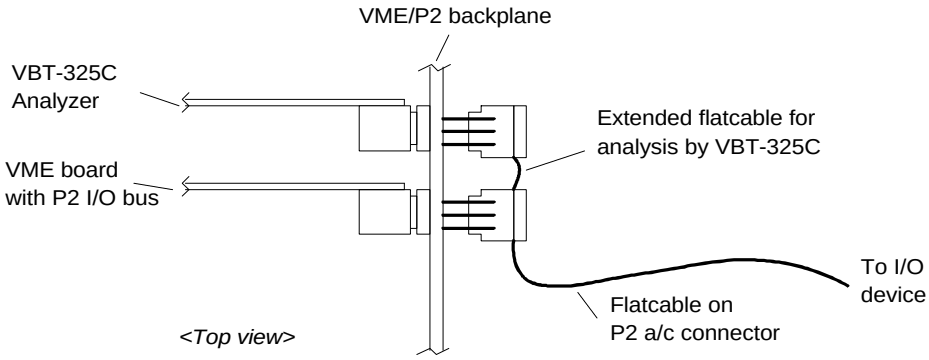


Figure 8.1 SCSI connection on P2

The connection of the SCSI bus on the VBT-325C is taken from the Motorola SCSI I/F board DVME-718, and is chosen since it maps easily on to a 50-lead flat cable, as done by VMETRO's SCSI cable "VSC-8", see Figure 8.2. When this is used as shown above, it is the *cable* which creates the "bus" between the adjacent P2 connectors (on rows a,c).

For CPU boards like Motorola MVME147/167/187 etc., the SCSI connection on P2 is rather random, since it is intended to go via a "P2 paddle board", supplied by the CPU board vendor, to convert all the I/O, including Ethernet, serial etc., to industry standard connectors.

In order to connect a VBT-325C to the SCSI cable in such systems, this requires that a 64-pin DIN connector is pressed on to the existing 50 lead flat cable, or that VMETRO's "VSC-3" cable (see Figure 8.3) is used to extend an existing SCSI cable to allow it to pass the slot where the VBT-325C is located.

The pins shown in **BOLD** text are connected to the VBT-325 when the board is configured for SCSI.

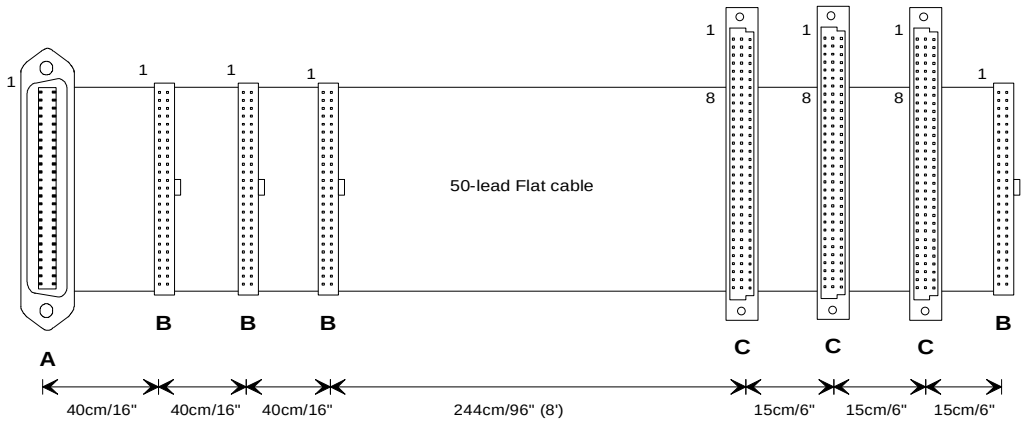
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Pin #	P2 A	P2 C
8	**DB0***	GND
9	**DB1***	GND
10	**DB2***	GND
11	**DB3***	GND
12	**DB4***	GND
13	**DB5***	GND
14	**DB6***	GND
15	**DB7***	GND
16	**DPB***	GND
17	**GND**	**GND**
18	GND	**GND**
19	GND	**GND**
20	TermPWR	
21	GND	GND
22	GND	GND
23	**ATN***	**DB8***
24	GND	**DB9***
25	**BSY***	**DB10***
26	**ACK***	**DB11***
27	**RST***	**DB12***
28	**MSG***	**DB13***
29	**SEL***	**DB14***
30	**C/D***	**DB15***
31	**REQ***	**DPB1***
32	**I/O***	GND

Table 8.2 SCSI connection on P2

8.2.1 VBT-325 SCSI P2 adapter

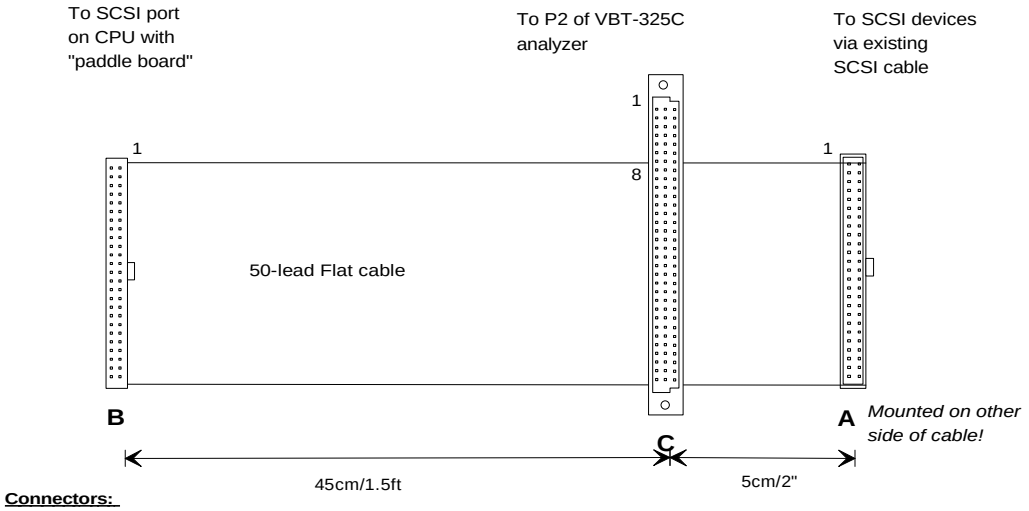
VMETRO is developing an adapter to be plugged on the P2, where the VBT-325 connection is converted to standard SCSI and SCSI-2 plugs, including support for differential SCSI. This will provide conversion to industry standard connectors, so there will be no need to cramp a special 64-pin DIN to the SCSI cable. A standard SCSI/SCSI-2 cable which normally has a number of connectors attached to it, can be used.



Connectors:
Type A: 50-pin D-shape Male SCSI connector (Amphenol etc)
Type B: 50-pin Female FC-50P or similar (3M etc.) NB: With polarizer as shown!
Type C: 64-pin DIN Female with A and C row only, B row empty. Pins 1-7 unconnected.

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Figure 8.2 SCSI cable type VSC-8



Connectors:
Type A: 50-pin Male FC-50P or similar (3M etc.) NB: With polarizer as shown!
Type B: 50-pin Female FC-50P or similar (3M etc.) NB: With polarizer as shown!
Type C: 64-pin DIN Female with A and C row only, B row empty. Pins 1-7 unconnected.

Figure 8.3 SCSI cable type VSC-3

8.3 Customized Isolation of P2a/c

The input channels on the VBT-325 are designed for TTL/CMOS voltage levels only (0.0-5.0V), and **damage may occur if other voltages are applied**. If the P2 bus contains signals with voltage levels other than TTL/CMOS, (for example ECL, analogue or special power supply voltages as found in VXI systems), **these must be isolated from the VBT-325.**

If the P2 pins cannot be isolated by means of selecting another slot or by using an isolating extender board, your VBT-325 board can be customized by cutting copper tracks that are specially laid out for all P2 signals for this purpose. These can be found as a row of 32 pairs or solder pads connected with a thin copper track on each side of the board just next to the P2 connector. The pads on the bottom side are signals from P2 row C, and the top side row A See Figure 8.4.

Warning! **Cut very carefully with a thin, sharp surgeon knife, and cut the surface only, to avoid damaging inner layers.**

If a connection needs to be re-established, a short piece of un-isolated wire (AWG30 or similar) can be soldered between the two pads in a pair.

Warning! **Before performing any cuts, please contact VMETRO Support for approval regarding warranty.**

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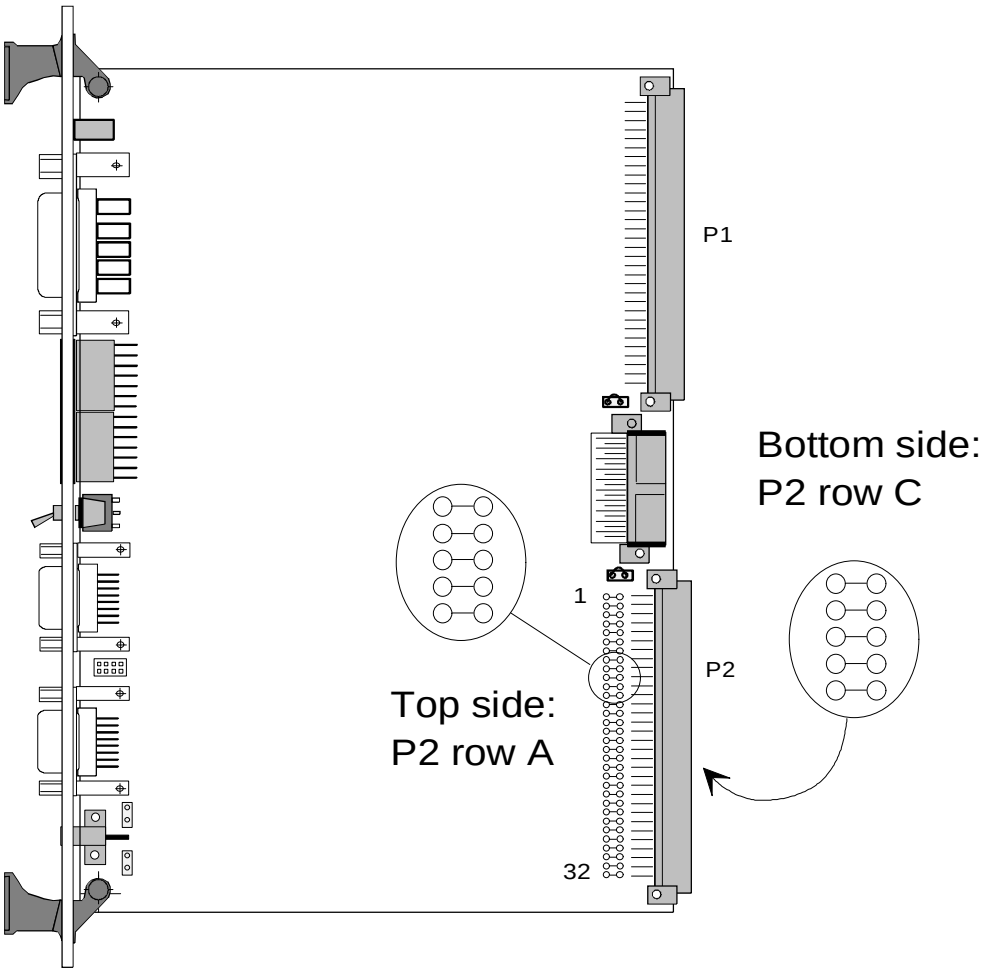


Figure 8.4 Customizing P2 rows a/c

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9. TERMINAL USER INTERFACE

9.1 Using a Terminal Instead of BusView

The terminal user interface is very similar to the BusView user interface, the menus are approximately the same, and the various screens are the same. The main difference is that the `File` command and the tool bar are missing, and the fact that there is no mouse for control.

This section will explain the differences between running a terminal and running BusView. Menu options that are equal for the two cases will not be mentioned, the reader has to use the BusView manual in the earlier chapters.

9.1.1 Keyboard Control

Underline All the items at the menu bar have one underlined or highlighted character, the "accelerator key". A menu is opened by pressing this character, i.e. pressing "`t`" opens the `Trace` menu. Alternatively, use the *left* and *right* cursor keys to select the preferred item, and open the menu by pressing the *down* cursor key, or CR.

- ¯ Moving around in the pull down menu is done with the cursor keys, or by pressing the underlined/highlighted key of the preferred item in the list, a selection is made by pressing CR.

¬ ® Using the *left* and *right* cursor keys makes the cursor move from one item at the menu bar to the next.

Esc or **.** Pressing the **Esc** key or simply a "**.**" makes the current menu close.

\\ Type a backslash twice to refresh the screen. This is useful if characters are lost, when changing terminal, etc.

? A question mark brings up the Help screens. These can also be activated by the `Help` command in the main command bar.

9.1.1.1 Keyboard Control Within Dialog Boxes

Tab Pressing the **Tab** key makes the cursor move from one editable field to the next. Alternatively the cursor keys can be used.

Space Pressing the **Space** key makes a selection (pressing CR will only close the dialog box).

CR Press **CR** to close the dialog when finished.

ESC or **.** Press the **ESC** key or a "**.**" to close the dialog box without editing, or select the Cancel button and press CR

9.1.2 Screen Categories

The user-interface is based on three different screens:

- The Setup screen

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- The Trace Display screen
- The Statistics screen

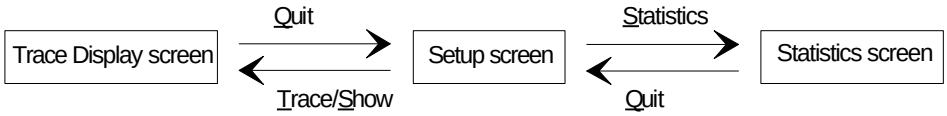


Figure 9.1 Switching between the different screens

9.1.3 Setup Screen

The Setup screen contains the same menu items as the BusView Setup screen except for the Window and the File items. The next sections cover the differences, including some very useful short-cut keys.

9.1.3.1 Trace

Run

F5 or Ctrl-R Short-cut for the command `Trace/Run`.

Show Saved Trace

Shows the trace that is saved in the Non-Volatile RAM. A portion of a trace (up to 2K samples, i.e. 2048 trace lines) can be saved to the Non-Volatile RAM from the Trace Display screen.

Save Trace Options

Displays the dialog box in Figure 9.2 containing trace options for saving to the Non-Volatile RAM. The first option makes the tracer run a trace at power up. The second option makes the tracer automatically save the trace to NV RAM, as soon as the trace is full.

To the second option it is possible to specify which part of the trace to be saved, but in any case only 2K samples are saved. **Follow trigger position** means that the 2K samples are saved in the same way as a regular trace is sampled, i.e. if the trigger position is at 50% of trace, the tracer saves 1K samples before the trigger, and 1K samples after the trigger. **Save lines** enables the user two specify a number of lines, up to 2K, to be saved.

Note! If the **Save lines** option is selected, and the trigger is not at start of trace, the trigger sample will not be saved because 2K samples is not enough to reach the trigger sample.

These save trace options are useful if the system is monitoring a remote application somewhere. If, for instance, the power goes down on the remote system all data will not be lost because it is still possible to get the trace saved to the NV RAM.

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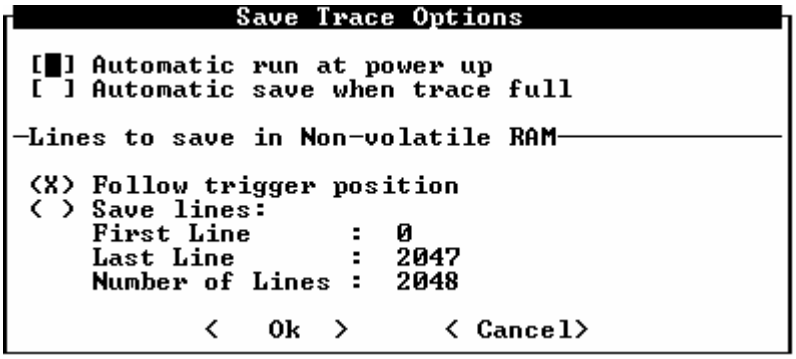


Figure 9.2 The Save Trace Options dialog box

9.1.3.2 Edit

Pull downs

Most of the editing in the Event Patterns window and the Sequencer window can be done the same way as for BusView, by using the keyboard version. An exception is shown in Figure 9.3. Open the dialog box by pressing CR on the `Size` field. The "`v`" at the end of the editable field indicates a pull down menu. Press the *down* cursor key to display the pull down menu. Make a selection and press **CR**, or press **ESC**, or "**.**", to cancel.

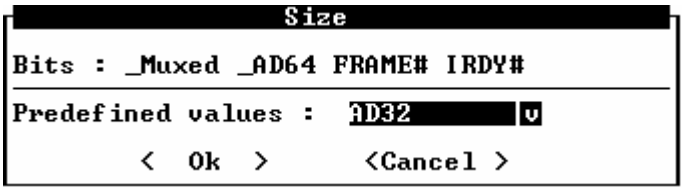


Figure 9.3 The `Size` field dialog box

Function Keys

VT100, VT220 etc. have function keys labeled PF1..PF4, while the corresponding keys on PC keyboards normally are labeled F1..F4, with additional functions keys labeled F5..F12.

PF2 or F2 Moves the cursor between the menu bar and the last edited window.

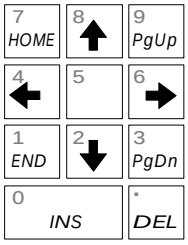
F6 or Ctrl-W Moves cursor to the next (editable) window. Especially handy to switch quickly between the *Event patterns* and the *Sequencer* windows, or between opened trace windows.

Del or Ctrl-BS (Ctrl+BackSpace) Deletes an object. A context sensitive dialog box will appear that explains the delete options at the actual cursor position.

Ins or Ctrl-N Inserts an object. A context sensitive dialog box will appear that explains the insert options at the actual cursor position.

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Numeric Keypad



When using a VT100 terminal (i.e. terminal type #1) the numeric keypad can be used just as on PC keyboards for cursor movements

Note! Remember to turn off "NUM LOCK".

9.1.3.3 Edit Event Patterns

The command Edit/Event Patterns moves the cursor into the Event Patterns window.

The user may fill in event patterns as binary, hexadecimal or mnemonic values in the various signal fields in any of the predefined event patterns except *AnyThing*, which is unalterable. The user may delete or insert new event patterns and signal fields. New event patterns may be given user-defined names. By inserting and/or deleting signal field columns, the sequence of the signal field columns may be altered.

PF2 or F2 will move the cursor *between* the menu bar and the *last edited window*. Initially, the "last edited" window is the Event Patterns window, so typing <F2> is an alternative way of moving the cursor to this window. Another <F2> will bring the cursor back to the menu bar.

¯ ® - ¬ Move around with the cursor keys.

Edit a field Edit a field by typing only digits, or a combination of digits and *don't cares* (x). Type CR to finish editing of the field.

Notice the ¨ The diamond indicates that the event pattern contains a pattern different from all don't care. This is important if a field which is scrolled off the screen has a value other than "x".

Notice the divider between the Data and the Size fields. This divider marks the border between the fixed area, to the left, and the scrollable area of the Events Patterns window.

Clearing Contents of Fields

Typing X's into a field will set the corresponding bit(s) to don't care. By typing DEL, all bits in a field will be set to X.

Hiding Field Columns

If positioned on an empty (all X) field, you will be asked to hide the field column. Type DEL to hide the a field column.

Adding Field Columns

Type INS to insert a field column to the *left of* the cursor. Type CR to select a signal and close the list box. Typing ESC closes the list without making any selection.

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Renaming, Clearing, Deleting and Copying Entire Events

Rename event Move the cursor to the name of the event. Type CR to open editing. Type the new name, MyEvent, and then CR to close.

DEL Type DEL to clear or delete the event.

Clear/Remove Select <Clear contents> to set all fields in the event to don't care. Select <Remove event> to remove the event pattern entirely. Type ESC to close the box without doing anything.



Adding Events

INS Type INS to insert an event above the current event. The new event will be a copy of the current one. Events can also be added at the end of the list. Place the cursor one line beyond the last event, and then type INS.

9.1.3.4 Edit the Sequencer, Single Event Mode

The Sequencer can be described as a state machine, as explained in Section 5.6.2. In Single Event mode the Sequencer contains only one state, which sets a Trigger Condition, a Store condition, and which Sampling mode to use

Change of Trigger Condition

To change the *trigger condition* to another event name, simply enter the Event Patterns window, and move the cursor to the wanted trigger event.

Change of Sampling Mode

The default sampling mode is TRANSFER. To change sampling mode to CLOCK, execute the command `Edit/Sampling Mode/Clock`.

Change of Trigger Position

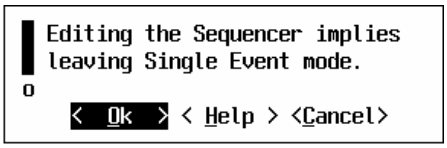
The default Trigger position is *Start of Trace*. Change the trigger position by selecting `Edit/Trigger Position.`

9.1.3.5 Edit the Sequencer, Sequencer Mode

When a complex trigger condition is required, the Sequencer must be explicitly edited. This is done by entering Sequencer mode. The Sequencer, and Sequencer mode, is explained in Section 5.6.3.

The command `Edit/Sequencer` displays the following dialog box.

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Type CR to enter the Sequencer window. As soon as the Sequencer window is entered, the tracer is forced into *Sequencer Mode*. In this mode, the lock to the current event in the Event Patterns window is broken. Everything is fully controlled within the Sequencer program window. In order to **return to Single Event mode**, type DEL and select the option `<Single Event Mode>`.

When entering the Sequencer, the cursor will be placed at the first editable line. Press CR to open editing of the current Sequencer statement.

Editing Keys

INS Inserts a event name into the event expression at the cursor position.

DEL Deletes the current symbol, i.e. event name, operator, or bracket.

Ctrl-O Type Ctrl+O to undo your last editing.

ESC Type ESC to cancel all changes made to the event expression.

¿ Type CR to confirm and close editing of the event expression.

Home Moves the cursor to the leftmost column of the event expression.

End Moves the cursor to the right of the rightmost column of the event expression.

¬ ® Move the cursor one token to the left or right.

Operators

+ * ! Symbols for the logical operators **OR** (+), **AND** (*), and **NOT** (!). Parenthesis can be used to change the order of how the expression is evaluated, see Section 5.6.5.5.

9.1.3.6 Target

The VBT-325C allows simultaneous analysis of both the VMEbus and a P2 bus like VSB, SCSI, VXI, and User-defined P2. Use the `Target` command to switch control of the user interface between the different analyzers present in the VBT-325 and the installed piggyback. After execution, the *current target* will have its Setup screen, containing the Event patterns and the Sequencer program, displayed.

During and after sampling, the sampling status of the different targets are shown directly in the `Target` menu. The current target is shown in low intensity, since it is already selected.

VBT-325B VBT-325B supports VMEbus only. The `Target` command is not present unless a analyzer piggyback, such as the S/TIM200-PB, the TIMBAT-PB, or the XMEM325-PB, is installed.

VME The primary target bus for the VBT-325 is VMEbus, and this is the first entry in the `Target` command.

P2 bus The P2 bus on VBT-325C can be selected to be VSB, SCSI, VXI_P2ac, and User-defined P2ac. Only the target currently selected is shown in the Target pull down menu, and by default, this is VSB.

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XMEM_VME This entry is available when the XMEM325-PB is installed. The primary target bus for the XMEM325-PB is VMEbus.

XMEM_P2 This entry is available when the XMEM325-PB/C is installed. The P2 bus on XMEM325-PB/C can be selected to be VSB, SCSI, and VXI_P2ac. Only the target currently selected is shown in the `Target` menu, and by default, this is VSB.

TIM200 bus When the TIMBAT-PB or S/TIM200-PB is installed, it can be selected in the `Target` command. If the P2 option is purchased, it can be enabled by the `Reconfigure` command as described below.

9.1.3.7 Reconfigure

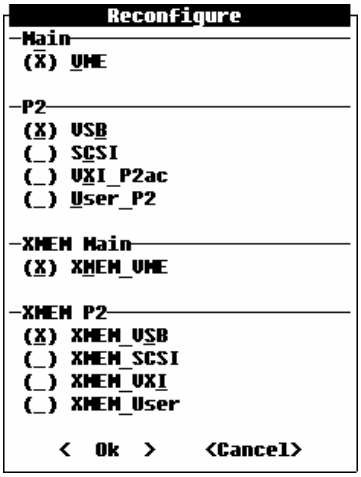


Figure 9.4 Target reconfigure, terminal

The default setting on the P2 bus of the VBT-325C is VSB. To use another P2 bus, like SCSI, VXI_P2ac, or User-defined P2ac, the `Reconfigure` command must be used. This command is also used to switch the bus for the TIM200-PB and the XMEM325-PB.

Reconfiguring the `P2` and `XMEM_P2` busses normally requires some jumpers to be moved, so a warning about this is given when closing this command if changes have been made.

The selection of `P2` and `XMEM_P2` must match. Thus, if `SCSI` is selected, XMEM_P2 must be selected as `XMEM_SCSI`.

9.1.3.8 Utilities

PF1 Enter Transparent Mode

9.1.3.9 Setups

The setups are stored in the Non-Volatile RAM on the tracer, and will not be lost by resetting of the analyzer, only by clearing the Non-Volatile RAM.

Initialize, Store and Delete

The stored setups are displayed in the Setups menu, so selecting a new setup is done directly from the menu.

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Dump to PC/Host

Windows 3.1x Terminal Emulator

Follow these instructions if operating the VBT-325 using the Windows Terminal Emulator, “terminal.exe”.

XMODEM: The Windows terminal program should be setup to receive data using the XMODEM protocol. Select `Settings/Binary Transfers` from the menu bar, and click on `XMODEM/CRC`.

Select the `Dump to PC/Host` option. The dialog box in Figure 9.5 appears.

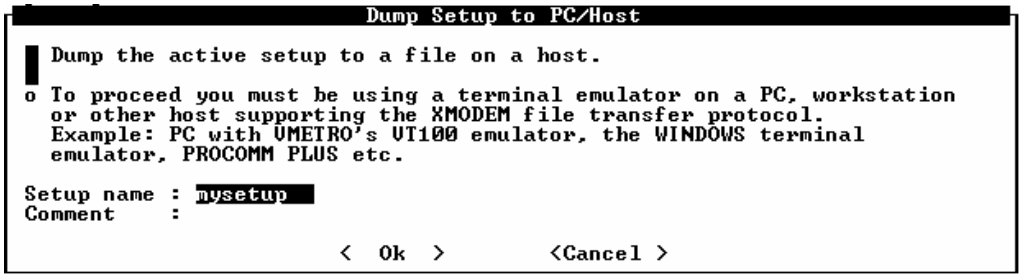


Figure 9.5 Dump a setup to PC/Host

Type the name of the setup you want to save, add a comment if you want a description of the setup, and choose OK. The following line appears on the screen:

```
Start XMODEM Receive on PC now
```

From the Windows terminal menu bar, select `Transfer/Receive Binary File`. A Windows dialog box asking for a name of the setup appears. Type a name and click OK.

Note! Remember to give the setup name an extension, e.g. *.stp.

The transfer is monitored at the bottom line of the terminal window. When the transfer is finished, the screen should be refreshed by typing “\\” (double backslash).

Errors: If the setup file does not get an extension, the file will not be transferred, and the error message in Figure 9.6 appears. Click OK, and try again with the correct spelling.



Figure 9.6 Non valid file name error message

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If the Dump to PC/Host option is selected, and the `Transfers/Send Binary File` is chosen, the transfer will not be done. Clicking on the STOP button in the bottom left corner of the terminal screen, will display the error message in Figure 9.7.



Figure 9.7 Send or Receive error message

VMETRO Terminal Emulator

Follow these instructions if operating the VBT-325 using the VT100 Terminal Emulator from VMETRO.

The VT100 has a built-in XMODEM CRC protocol for transferring files. Select the `Dump to PC/Host` option, and the dialog box in Figure 9.5 appears. Type a name and choose OK. The following line appears on the screen:

```
Start XMODEM Receive on PC now
```

Press **<ALT>-r**, (i.e. the <Alt> key together with an "r", for receive). You are asked for the name of the setup file. Type a name, and press CR. When the file is received, the screen refreshes automatically.

Load from PC/Host

Windows 3.1x Terminal Emulator

Follow these instructions if operating the VBT-325 using the Windows Terminal Emulator, "terminal.exe".

XMODEM: The Windows terminal program should be setup to send data using the XMODEM protocol. Select `Settings/Binary Transfers` from the menu bar, and click on `XMODEM/CRC`.

Select the `Load from PC/Host` option, and the dialog box in Figure 9.8 appears.

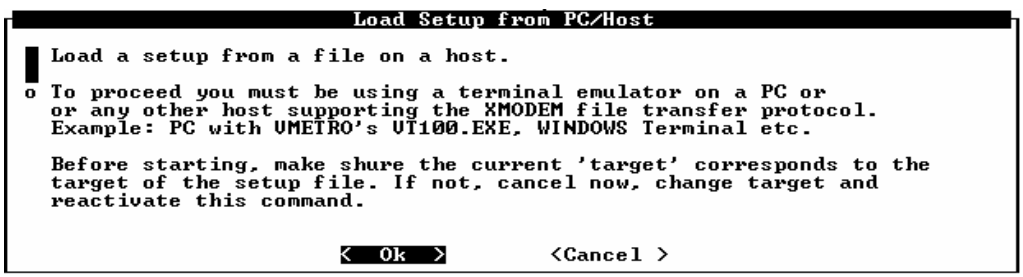


Figure 9.8 Load a Setup from PC/Host

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Click OK, and the following line appears on the screen:

```
Start XMODEM Transmit on PC now
```

From the Windows terminal menu bar, select `Transfer/Send Binary File`. A Windows dialog box asking for a name of the setup appears. Type a name and click OK. If a setup with the same name exists on the tracer, the dialog box in Figure 9.9 appears. If the "no" option is selected, the transfer is aborted. To be able to load the setup without overwriting the already existing one, the existing setup has to be stored under a new name before the load.



Figure 9.9 Overwrite setups on load

VMETRO Terminal Emulator

Follow these instructions if operating the VBT-325 using the VT100 Terminal Emulator from VMETRO.

The VT100 has a built-in XMODEM CRC protocol for transferring files. Select the `Dump to PC/Host` option, and the dialog box in Figure 9.8 appears. Click OK, and the following line appears on the screen:

```
Start XMODEM Transmit on PC now
```

Press **<ALT>-s**, (i.e. the <Alt> key together with an "s", for send). You are asked for the name of the setup file. Type a name, and press CR. When the file is sent, the screen refreshes automatically.

Note! If a non-valid name is typed, the VT100 emulator terminates.

9.1.4 Trace Display Screen

Function Keys

Two short-cut commands can be wise to keep in mind.

PF3 or Ctrl-F Finds the next match to the search pattern when searching in the trace buffer. Or, finds the previous edge when positioned in a waveform window.

PF4 Finds the next edge when positioned in a waveform window.

9.1.4.2 Trace

Dump to PC/Host

The procedure is equivalent to the `Dump to PC/Host` option in the Setup screen, except that the dialog box in Figure 9.10 appears instead of the one in Figure 9.5. Type how many lines to dump, and choose OK.

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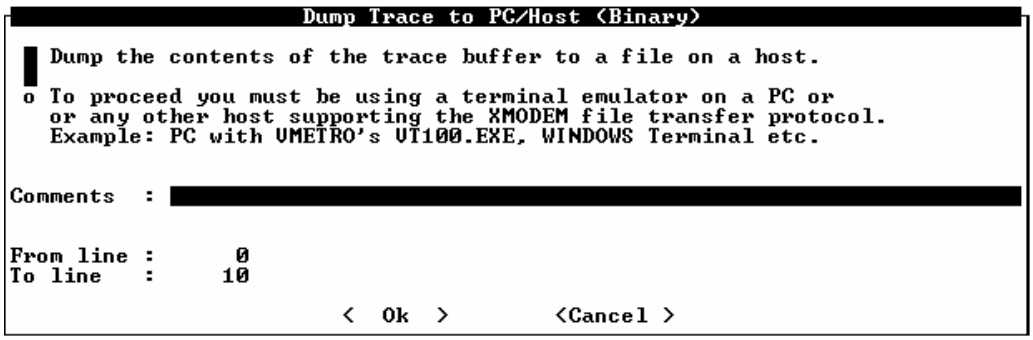


Figure 9.10 Dump a trace to PC/Host

Load from PC/Host

The procedure is equivalent to the `Load from PC/Host` option in the Setup screen.

Save to NV RAM

A portion of a trace (up to 2K samples) can be saved in the Non-Volatile RAM on the board itself. Only one trace at a time can be saved, i.e. saving trace number two will overwrite the trace already saved. See Section 9.1.3.1 for a description of automatic trace save options.

9.1.4.3 Jump

Marker Y(Z)

Moves the cursor to the marker.

Edge Options

It is possible to jump to either falling edge, rising edge, or any edge.

9.1.4.4 Format

Time/Div

The user may change the x-axis of a waveform. The option is only available in TIMING mode.

Absolute/Relative Time Tags

The trace can be displayed with absolute or relative time tags. Absolute time tags means that every trace line is displayed with absolute time elapsed from the trigger sample. Relative time tags means that the elapsed time from last sample is indicated.

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9.1.4.5 Statistics Screen

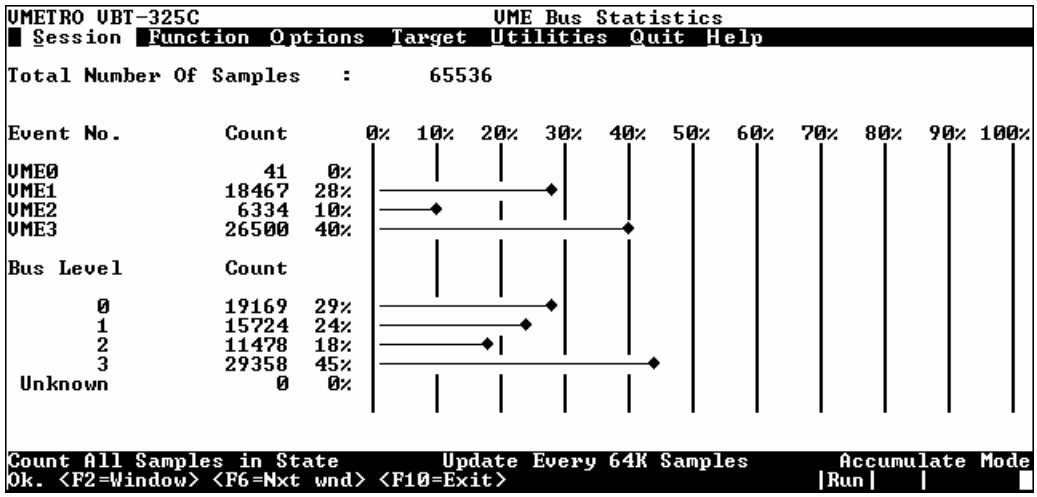


Figure 9.11 The Statistics screen displaying a standard histogram

The Statistics screens for the Terminal User Interface are basically the same as explained in the earlier BusView chapters. The only difference is the layout of the histograms and time history curves.

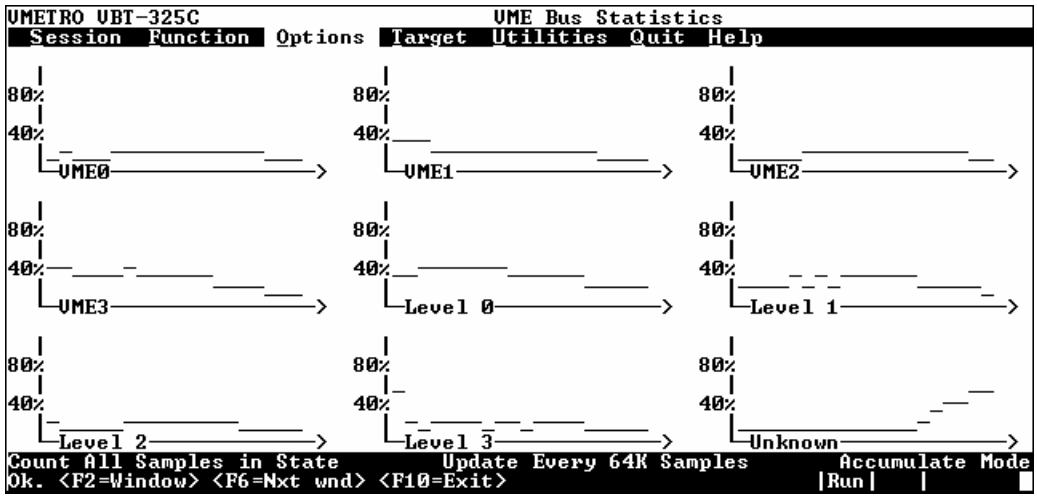


Figure 9.12 The Statistics screen displaying a Time History curve

9.2 VMETRO VT100 Terminal Emulator

The program `VT100.EXE` on the Simulator Diskette is a VT100 terminal emulator program for IBM-compatible PCs. It offers a number of valuable features that help you take full advantage of the VBT-325 product:

- A VT100 emulator program tailored for the VBT-325.
- Facilitates firmware upgrade through the serial port.
- Allows trace dump/load to/from file on a PC.

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- A powerful script language.

In addition to emulating a standard 25 lines x 80 character VT100 screen, the `VT100` also allows you to take advantage of a 50 lines x 80 character display on VGA and VGA compatible display adapters.

Serial port

The `VT100` will by default use the `COM1` port. Using the `COM2` port is controlled by the `-P` option. `COM3` and `COM4` are not supported.

ANSI emulation

`VT100` is dependent of the driver `ANSI.SYS`. Make sure that your `config.sys` file includes the following statement:

```
device=c:\dos\ansi.sys
```

If you do not find this or a similar statement, locate the directory where `ansi.sys` resides on your PC, normally `c:\` or `c:\dos`, and add the above statement (with correct path) to `config.sys`. The PC needs to be restarted to reflect changes in `config.sys.`

Command line option	Default	Explanation
-?	-	Display all options
-P ?	-	Display all baud rates
-P {1|COM1|COM2}	COM1	Select communication port
-P {300|1200|2400|4800|	9600	Select baud rate
9600|19k2|38k4|57k6|115k}		
-x {on|off}	on	XON/XOFF protocol
-H {on|off}	off	Use CTS/RTS hand shake
-c {on|off}	on	^C or BREAK handling
-v {CO80|MOMO}	*)	Set display adapter mode. 16 color mode [CGA, EGA, VGA, SVGA] or mono-chrome mode [MDA or Hercules only]
-h {25|43|50}	25	Number of lines on the screen. 43 can be used on EGA or VGA screens, 50 on VGA screens only. Use terminal type 4 when using `-h 50`
-D {on|off}	on	Display messages while transferring files
-t {on|off}	on	Follow strict XMODEM standards regarding to time-outs. When off, XMODEM transfers will never time out. This may be necessary when downloading timing traces using trace data compression
-s file		Send file from PC to tracer using XMODEM CRC protocol
-r file		Receive a file from thetracer using XMODEM CRC protocol
-i file		Read from file instead of the keyboard
-o file		Output to file instead of the screen

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*Table 9.1 VT100 command line options. *)Depends on the video adapter. Defaults to MONO on MDA adapters, and CO80 on CGA, EGA, VGA, SVGA and others.*

9.2.1 Starting the VT100

Start the program directly from the diskette by executing the following command:

```
a:vt100 ↵
```

or copy the `VT100.exe` file into your disk drive and start it from there. The program will by default use the `COM1` port at 9600 baud. Other baud-rates can be selected by the `-p` option, for example:

```
c:\ vt100 -p 19k2 ↵
```

Starts the emulator with a baud rate of 19200. Notice the space between the option `-p` and the baud rate, `19k2`.

9.2.1.1 Options

To display all options, start VT100 as indicated below:

```
c:\ vt100 -? ↵
```

Notation An option consist of a hyphen, the option character, a space, and a modifier. The option characters are case significant.

9.2.2 VT100 Environment Variable

VT100 looks for the environment variable VT100 (or vt100) when started. The environment variable is set before the command line, allowing command line options to override options set in the environment variable.

Typing the command

```
c:\ set vt100=-p 38k4 -H on ↵
```

once, and then

```
c:\ vt100 ↵
```

is equivalent to

```
c:\ vt100 -p 38k4 -H on ↵
```

but saves you from tedious writing every time `VT100` is started.

No space should be present between the word `VT100` and the equal sign, "=". Setting the VT100 environment variable in the `autoexec.bat` file, sets the VT100 defaults every time the PC is started.

9.2.3 Terminal Types to Use on the Tracer

If your PC has a color or monochrome CGA, EGA or VGA screen, you should select terminal type # 3. Select terminal type #2 if you have a monochrome screen (MDA display adapter).

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9.2.3.1 Built-in XMODEM CRC Protocol

When started, VT100 displays the following lines:

```
Options: Type Alt-R to receive a file, type Alt-S to send a file.
Type Alt-X or Ctrl-Z to end communication.
```

These commands are to be used when dumping a trace file to the PC, or loading a trace file from the PC.

<Alt>-S Type Alt+S to send a file to the host (i.e. the tracer). The host must have been set in receive mode before the command is issued.

<Alt>-R Type Alt+R to receive a file from the host (i.e. the tracer). The host must have been set in transmit mode before the command is issued.

<Alt>-X Exit VT100.

9.2.4 Built-in Script Language

Script files contain VBT-325 commands and function keys which are sent to the VBT-325 exactly as they were typed on the keyboard. Special **script control commands** control the execution of the script, making it possible to take action after interpreting how the VBT-325 responds to a given command. For example the command line

```
c:\ vt100 -i script.inp ↵
```

will start the VT100 emulator, using the input from the file `script.inp` instead of the keyboard.

9.2.4.1 Script Control Commands

The script file should be standard ASCII text. All the keywords and options are **case significant**. The script control commands are shown in Table 9.2.

`"italics"` Replace with the actual file name, baud-rate or string.

Italics Replace with actual numeric argument.

`{on|off}` Use one of the listed modifiers.

`[options]` Parameters between square brackets are optional.

`;` Semicolon separates multiple statements in one line.

stmt A statement, or statement separated by semicolon.

Host output is read completely (and echoed to the screen if `ECHO ON`) between the execution of each script line, so

```
SEND "string"; AWAIT "response"
```

should be written as one line to avoid missing the expected response.

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% Comment	Comment
:label	Label. Target for the GOTO statement. 8 significant characters.
AWAIT "string"	Wait for string. Use TIME-OUT to set AWAIT time-out.
BAUD baud rate	Set new baud rate. Should be followed by a PAUSE
	statement to settle the I/O before continuing.
DOWNLOAD "file"	Start XMODEM download (receive) of the given file.
ECHO {ON|OFF}	Echo ON (default) or OFF. When ON, all output from the host (I.e. the tracer) is directed to the screen. When OFF. all output from the host is ignored.
EXIT {exit code}	Exit the program. The numeric exit code may be tested by the controlling environment.
GOTO label	Go to named label. the ":" in the label statement should not be used here.
IF AWAIT; stmt	If the last AWAIT statement found a match, execute the statement (or statements) that follows.
IF "string"; stmt	Compare last user input (READ or READCH) with string. If match, execute the statement (or statements) that follows.
PAUSE time	Wait time * 10ms before continuing. Output from the host will be ignored in the meantime.
READ	Read line from keyboard (or stdin, if redirected).
READCH	Read one character from the keyboard (or stdin, if redirected). Useful for "(Y/N)" type of questions.
SEND "string"	Send string to host (i.e. the tracer). Ampersands, "&" in the string are translated to CR. See also table "Function keys in script files" for how to specify function and navigation keys.
TIME-OUT seconds	Set the time-out period for AWAIT, i.e. how long the AWAIT should wait for a given string in seconds.
UPLOAD "file"	Start XMODEM upload (send) of the given file.
USER	Enter user mode. In user mode, keyboard input are transmitted
	to the host and the host output directed to the screen. The
	script continues when the user types ^C or Alt-x.
WRITE "text"	Print text on the screen. "\n" in the string is treated as newline.

Table 9.2 Script control commands

9.2.4.2 Function Keys in Script Files

The Table 9.3 explains how to specify function keys in scripts. This way of specifying function keys is not specific for the VT100.EXE. It is built into the tracer firmware, not the VT100.EXE itself.

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Name in script file	Keystroke	Function
\U	Cursor	
\D	Cursor	
\R	Cursor	
\L	Cursor	
\H	HOME	
\1	Function key F1	Help
\2	Function key F2	Edit last window / go to menu
\3	Function key F3	(Trace Display menu only) Find next search pattern.
\4	Function key F4	
\\		Refresh screen
\F1	Function key F1	
\F2	Function key F2	
\F3	Function key F3	
\F4	Function key F4	
\F5	Function key F5	Trace/Run
\F6	Function key F6	Edit next window
\PU	PgUp	Page Up
\PD	PgDn	Page down
\I	INS	Insert object
\E	END	Go to end of line/page /trace.

Table 9.3 Function keys in script files

9.2.4.3 Script Example #1

The following example shows most of the features of the script language:

```
TIME-OUT 5
ECHO OFF
:Start
  WRITE "\n\nReset the PBT(X)-315."
  WRITE "\nDoes the display blink '19k2' and 'Type CR' (Y/N)? "
  READCH
  IF "Y"; GOTO Auto
  IF "N"; GOTO Count
  GOTO Start

:Auto
  SEND "&"; PAUSE 10; SEND "&"; AWAIT "TO CONTINUE: "
  IF AWAIT; GOTO Count
  WRITE "\nCannot establish contact with tracer.."
  GOTO Start

:Cont
  SEND "@"; AWAIT "Version 2.00"
  IF AWAIT; GOTO Cont2
  WRITE "\nCannot establish contact with tracer.."
  GOTO Start

:Cont2
  PAUSE 50
  SEND "debug&"; AWAIT "XMON> "
  WRITE "\nEntering interactive mode.."
  ECHO ON
  SEND "&"
```


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```
:UserMode
  USER
  WRITE "Finished? (Y/N) "
  READ
  IF "N"; GOTO UserMode
  EXIT 0
```

9.2.4.4 Script Example #2

The following example shows how to change the baud rate:

```
%
% Select baud rate:
%
:Baud rate
  WRITE "\n Please select a baud-rate: \n"
  WRITE "\n 1. 38k4                "
  WRITE "\n 2. 19k2                "
  WRITE "\n 3. 9600                "
  WRITE "\n 0. Abort installation."
  WRITE "\n Your Choice (1,2,3 or 0 to Abort)? "
  READCH
  IF "0"; GOTO Exit
  IF "1"; SEND "speed 38K4&"; PAUSE 5; BAUD 38k4; GOTO Upload
  IF "2"; SEND "speed 19K2&"; PAUSE 5; BAUD 19k2; GOTO Upload
  IF "3"; SEND "speed 9600&"; PAUSE 5; BAUD 9600; GOTO Upload
  GOTO Baud rate

:Upload
```

`upload.inp`

Look at the two files `upload.bat` and `upload.inp` on the Firmware Distribution Diskette for a more elaborate example.

9.3 P2ac User defined tracer, Terminal only

This section describes the User Defined P2A/C software, available in firmware version 5.10 and newer. The User Defined P2A/C software supports:

- Definition of tracers for proprietary busses on the P2 A/C connector for the VBT-325C, the XMEM325-PB/C and S/TIM200-PB/C piggybacks.
- Dump and load setups, *signal field definitions*, and traces, to and from a PC or other hosts supporting the XMODEM-CRC protocol.

9.3.1 Slot Selection

In order to perform bus analysis of a user-defined P2 bus, one must make sure that the slot where the tracer is inserted has access to the user-defined bus on the a- and c- rows of the P2 connector. In many cases, the P2 bus is taken directly with a flat cable from the P2 connector on a VME board to an I/O device, without any form of bussing of the P2 bus along the back plane. In such cases, the user should insert the tracer in a neighboring slot to

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the board that has the P2 bus, and provide an "L-shaped" extension of the flat cable to the slot of the tracer.

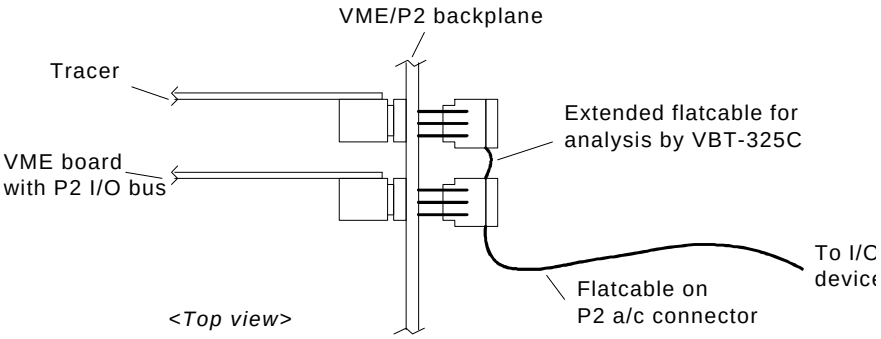


Figure 9.13 User-defined P2 bus, slot selection

9.3.2 Jumper Settings

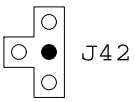
By default, the VBT-325C is shipped with the P2 tracer configured for VSB. This is indicated by a label, P2=VSB, on the P2 connector itself. In order to use the P2 part of the VBT-325C for proprietary busses, the jumper configuration must be changed. See Section 13.1.5 and 13.1.8. Check on the bottom of the PCB for the print version. The B print is labeled PCB-B, and the C print is labeled PCB-C.

Warning! If the P2-bus consists of TTL level [0-5V] signals only, this is all that needs to be done regarding configuring of the HW. However, if the bus includes ECL-level, or other non-TTL level signals, these pins ***must*** be isolated from the VBT-325. Ignoring to do so may cause major HW damage to the VBT-325, and possibly to other boards connected to the proprietary P2-bus. See Section 8.3 for instructions.

9.3.3 Sampling Clock Select

The sampling clock needed for STATE sampling is normally connected to jumper J43. (See Section 13.1.5 and 13.1.8 for the VBT-325C and the XMEM325-PB, respectively.)

VBT-325C only Connect a wire from the wanted P2ac signal to jumper J43. The P2ac User defined tracer will sample the state of the P2ac signals at every rising edge of the J43 clock signal.



If sampling on a falling edge is wanted, remove jumper J42 and insert the wire of the clock signal into the middle position of the jumper J42 field as indicated.

9.3.4 P2 Cross Trigger Jumper

The cross trigger is controlled with a jumper on both the VBT-325C and the XMEM325-PB/C. The S/TIM200-PB has only one channel used for the cross trigger, so jumper settings are not necessary to use the cross trigger.

Note! The figures below show the jumper position to connect a cross trigger to the analyzer. Since the analyzer only has 64 inputs [sampling channels], the input P2-c32 may be alternatively used as sampling input, or as a cross-trigger input.

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VBT-325C The P2 cross trigger on the VBT-325C is controlled by the jumper `J61` as shown below. See Section 13.1.5 13.1.8 to locate this jumper.


`P2-c32.`


VBT-VME Cross trigger.


Piggyback Cross trigger.

XMEM325 The P2 cross trigger on the XMEM325-PB/C is controlled by the jumper `J61` as shown below. See Section 13.1.8 to locate this jumper.


`P2-c32.`


XMEM325-VME Cross trigger.


VBT-VME Cross trigger.

9.3.5 Commands Reference

In this chapter a complete reference of all additional menu commands, necessary to control the user defined P2 software, can be found.

9.3.5.1 Selecting Target

The VBT-325C and the XMEM325-PB/C allow simultaneous analysis of both the VMEbus and a P2ac user-defined bus (or other P2 busses like VSB, SCSI or VXI). If the S/TIM200-PB is present, 200MHz analysis can be performed on VME or a P2 user defined bus (or other P2 busses like VSB, SCSI or VXI). The `Target` command is used to switch between the different analyzers present in the tracer hardware configuration

The `Target` command selects to which bus the Setup screen (containing Event patterns and Sequencer) and Trace Display screens apply.

Note that during and after sampling, the sampling status of the different targets is shown directly in the `Target` pull down menu. Current target is shown in low intensity, since it is already selected.

VME The primary target bus for the VBT-325 is VMEbus, and this is the first entry under the Target command.

VME P2 bus The P2 bus on the VBT-325C can be selected from User P2, VSB, SCSI, and VXI_P2ac. Only the target currently selected is shown in the `Target` pull down menu, and by default, this is VSB. Other P2 busses can be selected by using the `Reconfigure` command.

XMEM_VME The primary target bus for the XMEM325-PB/C is XMEM_VME. This can be selected simultaneously with the VBT-325 VMEbus (except for the 128K model).

XMEM P2 bus The XMEM_P2 bus can be selected from User P2, VSB, SCSI, and VXI_P2ac If the XMEM_P2 option is purchased, it can be enabled by the `Reconfigure` option. This can be selected simultaneously with the VBT-325 P2 bus (except for the 128K model).

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TIM200 bus When the S/TIM200-PB 200MHz Timing Analyzer is installed, it can be selected under the `Target` command. If the P2 option is purchased, it can be enabled by the `Reconfigure` option.

9.3.5.2 Reconfigure

The default setting on the P2 bus of the VBT-325C is VSB. If the user wants to use another P2 bus, like User P2 (SCSI or VXI_P2ac), the `Reconfigure` command must be used. (This command is also used to switch the bus for the XMEM325-PB/C and the S/TIM200-PB.) Reconfiguring the P2 bus on the VBT-325C normally requires moving some jumpers, therefore a warning is given when closing this command if changes have been made. See Chapter 2.2.2 for a more detailed description.

Note! All P2 targets must be configured to the same bus in order to exit.

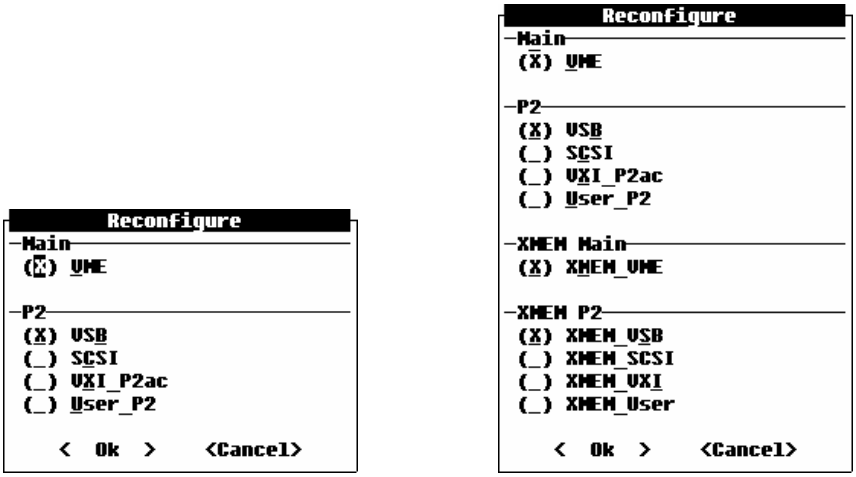


Figure 9.14 Target Reconfigure, VBT325C to the left, VBT325C with XMEM325-PB/C to the right

9.3.5.3 Defining Signal Fields

The signal fields can be defined or edited from the event editor or a trace window (alphanumeric or waveform). To be able to do this, select the target User Defined P2.

INS/Ctrl-N Type the INS key or the Ctrl-N keys, to insert a new signal.



Figure 9.15 Insert new signal fields

The dialog box above will be displayed when there are signal fields to insert in the current window. Select <Signal field...> to display the list of insertable signals. Select `<New Signal Field...>` to enter the signal edit dialog:

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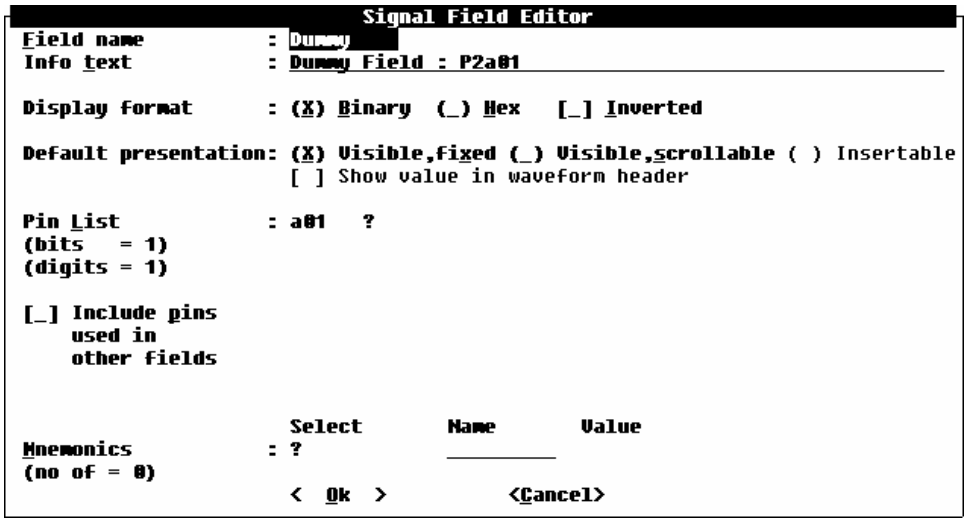


Figure 9.16 The signal field editor

Field name This item contains the name of the signal field that will be used in the event editor or trace window. The maximum length of the name is 9 characters. To make the event editor and trace window readable this field must be filled in.

Info text The information text is the text displayed in the detailed editing dialog box. This is shown when pressing CR on a signal in the event editor. If no information text is given, a list of names of the selected pins is provided. (Note that the detail editing dialog box is shown only if the field is a hex field, or if mnemonics are defined.).

Display format A signal field can be displayed either as a binary or hex number. By default low levels on the pins are displayed as 0, and high levels as 1. This can be inverted by selecting the check box **Inverted**.

Default Presentation These items control how the signal fields are presented after **Setup/ Initialize** or clearing the non-volatile memory. The STIM does not have the **Setup/Initialize** command, but each time the tracer is reset or powered up, the signal fields are reset as specified by the default presentation parameters.

Fields can be displayed in the fixed area on the left side of the screen, in the scrollable area to the right side of the screen, or be in the insert list (which means it is not visible). **The Show value in waveform header** controls if the signal field should be present in the header line of the trace waveform window. The value under the cursor will be displayed. This is normally used for signal fields like address and data.

Include pins used in other fields This check box controls the selection list for the ‘Pin list’. When it is not set (default), only those pins not used by other signals and signal fields are shown in the selection list. When it is set all pins except the pins used by the signal itself are shown in the selection list.

Pin List This is a list of all the pins assigned to the signal field definition. The number of bits is a count of the bits in the list. The number of digits is the width of the field on the screen.[6]

– To add a new pin place the cursor on the last pin which contains **“?”** and type the down cursor key.

[6] The default field, **Dummy**, which uses the A01 pin, may be deleted when the first “real” field is defined.

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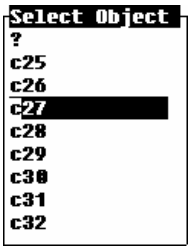


Figure 9.17 Selecting pins for user defined fields

- ¯ then ¿ Use the arrow keys to select the pin and press CR to select. To change an already defined pin, move the cursor to that pin and follow the steps described above.

INS A new pin can be added between the pin currently pointed to by the cursor and the previous pin by typing INS. The first pin in the selection list is then inserted. To edit this, use the down cursor key as described above.

DEL Type DEL to remove the pin pointed to by the cursor. All pins to the right of the one deleted are shifted one position to the left.

Mnemonics Mnemonics, or predefined values with a specific bit pattern, can be entered for each field. Example: A signal named `Write` can be defined to have the mnemonics `WR` with value `"0"` and `RD` with value `"1"`. When editing a signal in the event editor these values can be selected. The signal will also be displayed as `WR` or `RD` in an alphanumeric trace window when signal decoding is on.

An accelerator key (the underlined character in the example above) can be defined for each value by typing `"&"` in front of the letter to be used.

Select mnemonics Type the down cursor key on this item to see a list of the defined mnemonics:



Figure 9.18 Defined mnemonics list

Select the `"?"` mark to add a new one in the bottom, or select one of those already defined, i.e. `WR` or `RD`, to change the name or the value.

INS A new mnemonic can be inserted by typing INS in the select item (The selection list must not be open). The mnemonic receives the name (NEW) and the value is set to “X”, i.e. all bits don’t care.

DEL Type DEL to delete the currently selected mnemonic. The next in the list or ‘?’ will become the current.

Note! The first value defined should always be the most stringent one because this is the one the analyzer compares the sampled data to first.

Name The name should be defined when the wanted mnemonic is selected (eventually ‘?’ for a new one). Use `"&"` in front of a letter to define it as the accelerator key.

Value Fill in the defined value (pattern) the mnemonic in this item. Digits and ‘X’-s (do not care) can be used. Go back to the select area and select ‘?’ to define the next mnemonic.

Note! Type **F7** or **Ctrl-V** to edit the current signal field.

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9.3.5.4 Deleting a Signal Field Definition

DEL Move the cursor to a signal field and type DEL to deleted it. If the field contains any values these will be cleared the first time DEL is pressed. The second time it is pressed or if no values are defined, the dialog box below appears on the screen.



Figure 9.19 Deleting signal fields

Delete… Select `<Delete Signal Field>` to delete the signal field from the list of signal fields.

This will delete the signal field from all windows it is used in and redraw the windows. The signal field can not be inserted again later, since the definition of it is removed from memory!

Hide… Select `<Hide Signal Field>` to remove the signal field from the current window. The signal field will not be hidden in other trace windows. It can later be inserted again by pressing the INS key and select `<Signal Field...>`.

9.3.6 Using time tags

The time tag is supported for user defined P2 on the VBT-325C and the XMEM325-PB/C (same as for other targets). Storing the time tag requires 12 or 16 bits of the trace memory, which must be taken from the P2 pins. The pins that will be used is controlled by the dialog box shown in Figure 9.20 below.

Execute the command `Edit/Sampling Mode/Options/State Options...` to open the dialog box:

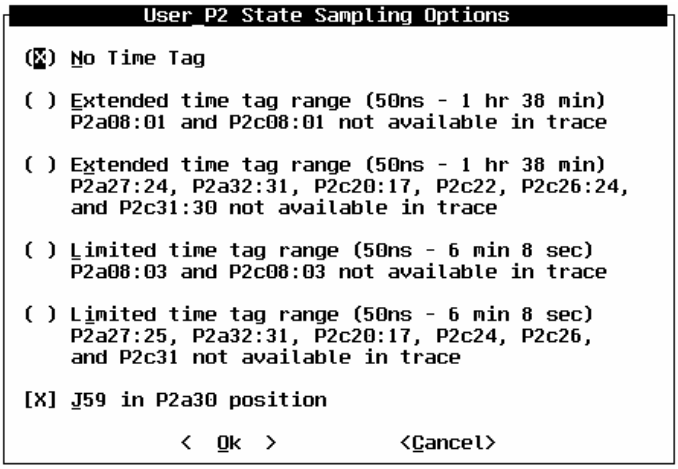


Figure 9.20 User P2 STATE sampling options

`No time tag` When `No Time Tag` is selected, all pins on the P2 connector can be used.
The time tag field will be displayed as `"...."` indicating that no time tag is available..

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Extended The next two selections give the largest range of the time tags (50ns -1hr 38min). These require 16 bits to store are therefore 16 pins are not available in the trace memory. If they still are used, they will be displayed as '.' (dots) or '$' (hex digits where not all bits are used by the time tag) in the trace windows.

Limited The last two selections provide a much smaller range (50ns-6min 8sec). They require only 12 bits to be stored, therefore the number of pins not available in the trace buffer is also reduced to 12.

[x] J59 in .. The jumper J59 (see Section 13.1.5) is by default installed in the lower position to allow sampling of the P2a30 signal. To be able to use time tags in *mixed sampling mode*, the J59 should be installed in the upper position. In this case, the P2a30 signal is not sampled, but replaced by the internally generated signal StateMode.

Note! Signal fields with pins also used by the time tags, can still be used in an event pattern as part of the trigger- or store-condition.

9.3.7 Dump/Load Setup to/from PC/Host

The Utilities/Dump Setup to PC/Host command stores the same way as the Setup/Store... command. Instead of storing it in non-volatile memory, it uses the X-modem protocol to dump it to a file on the PC/host. The dump setup to PC/host is a feature that is available for all user defined P2 targets and all other targets except the STIM. The following parameters belong to a setup:

- Signal field definitions must be the same for all setups loaded into the tracer simultaneously. They are only stored for user defined P2, since they are fixed for other targets. For the STIM, only the signal field definitions are stored. This means the Setup command is not available for other STIM targets than user defined P2.
- Events with the inserted list of signal fields and their values (one for state and one for timing analysis).
- The Sequencer program.
- The selected sampling frequency.
- Trigger input options for the TIMBAT
- The statistics option parameters, one for each statistics function.

The Load from PC/Host works in the opposite direction.

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10. SIMULATOR FOR PC

10.1 Installation

To use the Simulator you must install it to a hard disk. Put the diskette in drive A: and type:

`install ↵`

The user is asked to enter the path to where to install the program. The path may also be given directly at the command line, e.g. if you type

`install c: ↵`

the directory `C:\VMETRO` will be created, and the program will be installed there. Note that the Simulator requires about 2.5 Mbytes of hard disk space. Start the simulator by changing the current directory to the simulator directory and type:

`vmetro ↵`

It is not necessary to go to the directory where the simulator is located, but all files used by the simulator must be in the current active directory.

10.2 Simulate Bus Activity

When operating the simulator, one may emulate actual analyzing activity to get a trigger, to see a trace display etc. Three commands are used to simulate such activity:

`Trace/Simulate Trigger` (or `Ctrl-T`)

simulates **TRIGGER FOUND**. Reads the demonstration trace files described below if they exist or creates random trace data.

`Pbat/Simulate Violation` (or `Ctrl-V`)

simulates **VIOLATIONS FOUND** on the bus when the PBAT is active.

`Session/Simulate Count` (or `Ctrl-A`)

simulates **STATISTICS UPDATE** when the bus statistics is running.

10.3 Trace Files

Trace files captured in real bus environments by the VBT-325 are included to show examples of the analyzing capabilities. When the user simulates a trigger with Ctrl-T or executes "`Simulate Trace Full`" from the `Trace` menu, the corresponding file from the table above will be loaded. The simulator will generate a random trace if the files for the selected target does not exist.

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View Trace files

The simulator is a powerful tool to use on a PC for viewing/post-processing captured trace-files. When a trace is captured on a VMETRO analyzer, a terminal emulator can be used (like the VT100 emulator from VMETRO, Windows Terminal etc.) to dump the trace, or part of it, to a PC. The file contains all data needed to redisplay the trace as first captured. The file can be reloaded to the analyzer, or loaded into the simulator with the command Trace/Load From PC/Host located in the trace display menu.

ASCII Trace files

When a trace is loaded into the simulator, there is yet another feature that will ease post processing of traces. The command `Trace/Print To File`, also located in the trace display menu, will print the trace in ASCII characters to a file. The new file can easily be loaded into a text editor or a spread-sheet program, such as Microsoft® Excel®, or Lotus 123®.

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11. TRACE FILE FORMAT

11.1 Trace File Format

This section describes the file format used by the Dump/Load commands. The file format is built up of a set of records starting with a record ID and a record length. This makes it possible for an older version of the product to read a new version of a file just by skipping the unknown records. New features will therefore be added as new records when the file format is changed.

Note! **All numbers in the file format use Motorola layout (big endian).**

File ID The file ID header contains the following text fields:

VMETRO TRACE	MODEL *Tag*	*Comments*	^Z

The "VMETRO TRACE" identifies the file type. The *Tag* is the first parameter in Table 11.2. This copy of the string makes it easy to recognize the type of trace when typing the file. The "Comments" are private user comments that may be added when the file is created. The Ctrl Z is added at the end of the strings to make it possible to type the file and just get the header text strings displayed. Use the DOS command TYPE *<File name>*. The File ID string is followed by records with the following layout:

ID	W	Data with length W bytes

The ID is always a byte that describes the contents of the data field. The W (Width) parameter is always four bytes (long word). It is the width (or length) of the data field in bytes. This makes it possible to skip unknown records.

Record IDs The following ID values are defined in the current format:

ID number	Width	Description of the data field
1	319	Main Header
200	1)	Unpacked Trace buffer data
201	2)	Run length packed Trace buffer data

1) The "Unpacked Trace buffer data" record will always have the width (nhLastValTrcLine - nhFirstValTrcLine + 1) * nhTrcWidth.

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2) The width of the "Run length packed Trace buffer data" will always be 0xFFFFFFFF which means the rest of the file is read as data for record 201. The record width is not calculated because the software needs to read the whole trace buffer and find out how much it can be packed to calculate it. Run length packed trace buffer data is packed on the basis of trace buffer lines that follows (the size of the "Runs" parameter is 2 bytes).

Runs	Data
1-65536	Trace line data to be repeated "Runs" times.

Main Header The Main Header has the data fields shown in Table 11.2. The nhLastRunScrPad-field is shown in Table 11.1.

The nhLastRunScrPad for PCI (only 12 first bytes used):		
Name of field	**Size/bytes**	**Description**
FLAGS	4	NPCI_TDWODTR 0x00000800L Target disconnect w/o data and traget retry cycles are included NPCI_64BIT 0x00001000L Tracer in 64 bits bus. NPCI_GNTLTCH 0x00002000L EXT3:0 are latched and shown as GNT# NPCI_PERREN_ 0x00004000L If set, parity cycles only are NOT stored. If cleared they are stored.
UINT16 LtcCntIdx	2	Latency counter mode used in trace. Only valid value is: 2-FRAME# to TRDY#.
UIN16 TtBase	2	Time tag and latency count base in ns.
UINT32 BusSpeed	4	Bus speed in KHz.

Table 11.1 The nhLastRunScrPad-field

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Main Header		
Name of field	**Size/bytes**	**Description**
char nlTag[10]	10	Target ID
FLAGS nlLastRunFlags	4	Trace control flags: NF_TIMETAG 0x00010000 Time tag used NF_TAG16 0x00020000 16-bts time tag NF_XMEMADJ 0x01000000 XMEM tag
BYTE nhLastRunSampMode	1	Sampling mode used during trace: 0x00 TRANSFER sampling 0x01 CLOCK sampling 0x02 TRANSFER DETAILS sampling (only 32-bits busses) 0x20 MIXED sampling between TRANSFER and TRANSFER DETAILS.
BYTE nhLastRunTimingIdx	1	Only for the VBT-325.
BYTE nhLastRunTrigPos	1	Trigger position used for run.
BYTE nhTrcWidth	1	Width of sample in bytes.
INT32 nhDelay	4	Trig delay (given by trig position).
INT32 nhFirstTrig	4	Trig address in trace memory (abs).
INT32 nhFirstValTrcLine	4	First valid line (log) in trace buffer.
INT32 nhLastValTrcLine	4	Last valid line (log) in trace buffer.
BOOLEAN nhTrgFound	2	Indicates trigger found.
BOOLEAN nhTrcCompleted	2	Indicates trace completed.
char nhTrigLineTxt[10]	10	Trigger line text.
char nhTime[8]	8	Time when trace trigged or was halted. The bytes are coded as follows: 0=RTC_64HZ=64Hz counter 1=RTC_SEC=Seconds BCD coded [0..59] 2=RTC_MIN=Minutes BCD coded [0..59] 3=RTC_HR=Hour BCD coded [0..23] 4=RTC_DOW=Day of week [0..6]=[Sunday…Saturday] 5=RTC_DAY=Day of month BCD coded [1..31] 6=RTC_MNTH=Month BCD coded [1..12] 7=RTC_YEAR=Year BCD coded [0..99]
INT16 nhCalcADCVal[4]	8	Tuned ADC values when trace trigged or was halted. The 4 values are coded as follows: 0=ADC_5V = 5V value * 100 1=ADC_12V = 12V value * 100 2=ADC_N12V = -12V value * 100 3=ADC_TEMP = Temperature in degrees C.
BYTE nhLastRunSrcPad[256	256	Target (HW) dependent data

Table 11.2 The Main Header

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11.2 Trace Data Line format, VBT-325

Each trace data struct consist of several `Header->nhTrcWidth` wide *trace lines*. For the VBT-325 VME target, the structure of each trace data line is as follows.

```
typedef unsigned char BYTE;
typedef unsigned long UINT32;

typedef packed struct _VMETRACE {
   union {
      BYTE cAddr [4];    /* LSB in cAddr[0], MSB in cAddr[3] */
      UINT32 Addr;
   };
   union {
      BYTE cData [4];    /* LSB in cAddr[0], MSB in cAddr[3] */
      UINT32 Data;
   };
   BYTE TagL, TagU;      /* Time-tag. See below */
   BYTE Am, Irq, Str, Bg;
   BYTE St2, St3;
} VMETRACE;
```

The trace address and data is stored as *Intel format* long integers, i.e. the least significant byte is byte `cAddr[0]` or `cData[0]`, the most significant byte is byte `cAddr[3]` or `cData[3]`.

11.3 Details of the Time Tag Variables

The format of the time tag is the same for all targets. Check the `Header->nlLastRunFlags`, bit `NF_TIMETAG` to see whether the time tag is in use or not. If this bit is 1, check the bit `NF_TAG16`. If this bit is 1, the 16-bit time tag is used. For traces sampled in TIMING mode, the time tag is not in use. Check the `Header->nlLastRunFlags` bit `NF_TRCASYNC`. A one in this bit indicates TIMING mode.

The default 12-bit tag maps the four external inputs into the four lower bits of the `TagL` byte:

Bit#	7	6	5	4	3	2	1	0
TagL	Tag[3:0]				Ext3	Ext2	Ext1	Ext0
TagU	Tag prescale[3:0]				Tag[7:4]			

Table 11.3 Default 12 bits tag

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Bit#	7	6	5	4	3	2	1	0
TagL	Tag[7:4]				Tag[3:0]			
TagU	Tag prescale[3:0]				Tag[11:8]			

Table 11.4 Default 16 bits tag

11.4 Converting the Time Tag to a Time Value

The counter starts out with a resolution that is equal to the time tag and latency count base, **TtBase** (see Table 11.1). The TtBase can vary from 20ns-10,24µs, depending on the operating frequency of the VME bus. When time gets larger, the frequency automatically changes.

The **Time Tag** is a 12 or 16 bits variable consisting of the Tag Prescale[3:0], and the Tag[7:0]/Tag[11:0] bits, of the TagL and TagU variables shown in Table 11.3 and Table 11.4.

The four most significant bits of the Time Tag, the **Tag Prescale**, **P**, tell the frequency the counter last used, and thereby the counter **Resolution**, **R(P)**.

When calculating the **Time**, **T(Time Tag)**, the resolution is needed, plus a **Base Value**, **B(P)**, which is the maximum time tag value from the previous prescale value.

B(P), expressed as a function of the prescale value:

B(P) = MTC*R(P-1)+B(P-1), P>0,

B(P=0)=TtBase

where R(P-1) is the resolution at the previous prescale value (see Table 11.5), P is the prescale value, and the MTC (Maximum Tag Count from the previous prescale value) is 0x100 for 12 bits time tag and 0x1000 for 16 bits time tag.

This gives a formula for the total Time:

Time Value

T(Time Tag) = B(P)+C*R(P),

where **C** is the Tag[7:0]/Tag[11:0], i.e. the Tag Count.

Example

A 12 bits Time Tag is found to be 0x223, which gives a Tag Prescale value, P=2, and a Tag Count value, C=0x23:

T(0x223) = B(P=2) + (0x23 * R(P=2))

With a TtBase value of 20ns, this yields 18,18µs.

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Prescale(P)	Resolution(R)
0x0	2^{P}*TtBase
0x1	2^{P}*TtBase
0x2	2^{P}*TtBase
0x3	2^{P}*TtBase
0x4	2^{P}*TtBase
0x5	2^{P}*TtBase
0x6	2^{P}*TtBase
0x7	2^{P}*TtBase
0x8	2^{P}*TtBase
0x9	2^{P+1}*TtBase
0xA	2^{P+2}*TtBase
0xB	2^{P+3}*TtBase
0xC	2^{P+4}*TtBase
0xD	2^{P+6}*TtBase
0xE	2^{P+8}*TtBase
0xF	2^{P+11}*TtBase

Table 11.5 Converting time tags to time values

11.5 Details of Internally Generated Bits

_SAMP Indicates the sampling mode for the current trace line. The bit is set to 1 for STATE mode, and to 0 for TIMING mode. Useful for traces sampled in *mixed STATE and TIMING mode.*. Check the `Header->nlLastRunFlags` bit `NF_TRCMIXED`. A one in this bit indicates mixed STATE and TIMING mode.

_RMW Indicates that the current sample contains a read-modify-write cycle.

_BGVAL* If 0, the contents in the `_MLEV1` and `_MLEV0` bits are valid. These two bits give granted the bus level of the sample, ranging from 0..3 If `_BGVAL*` is `1`, the tracer could not see the bus grants when the trace was sampled.

_A01 A copy of the `A01` bit, also found in the `cAddr[0]` byte.

_XTRG1* Cross trigger from S/TIM200-PB or TIMBAT-PB.

_XTRG2 Cross trigger from VBAT-PB or VBAT part of if TIMBAT-PB, or XMEM.

_XTRG3* Cross trigger from VBT-325C P2 tracer, i.e VSB, SCSI etc.

11.6 Details of the Am, Irq, Str, Bg, St2 and St3 bytes

The signal names conforms mostly to VMEbus signal names. Signal names ending in an asterix, *, are active low. Signal names having an underscore as the first letter are internally generated signals. Bit #0 is the least significant bit, bit #7 is the most significant bit.

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Bit#	7	6	5	4	3	2	1	0
Am	IAIO*	AM5	AM4	AM3	SYSRES*	AM2	AM1	AM0
Irq	IACK*	IRQ7*	IRQ6*	IRQ5*	IRQ4*	IRQ3*	IRQ2*	IRQ1*
Str	_SAMP		WR*	_RMW	RETRY*	_BGVAL*	_MLEV0	_MLEV1
Bg	BR3*	BR2*	BR1*	BR0*	BG3*	BG2*	BG1*	BG0*
St2	SYSF*	ACF*	BCLR*	BBSY*	_A01	LWORD*	DS1*	DS0*
St3	SYSCLK	_XTRG1*	_XTRG2*	_XTRG3*		AS*	DTACK*	BERR*

Table 11.6 Am, Irq, Str, Bg, St2, and St3 bytes

11.7 Differences for the XMEM325-PB VME

Some signals are different for the XMEM325-PB VME target. The differences are indicated below:

In 12-bit tag mode, the cross trigger from the VBT-325 VME part, _XVBTV*, replaces EXT1:

Bit#	7	6	5	4	3	2	1	0
TagL	Tag[3:0]						_XVBTV*	

Table 11.7 12 bits time tag changes for XMEM325-PB

When the time tag is unused, as in TIMING mode, the SERCLK and the SERDAT signals are sampled as shown here:

Bit#	7	6	5	4	3	2	1	0
TagU	SERCLK	SERDAT						
St3	SYSCLK			_XP2*		AS*	DTACK*	BERR*

Table 11.8 Unused time tag XMEM325-PB

_XP2* _XP2* is the cross trigger from the XMEM325-P2 part. Blank spaces are unused bits, which value should be ignored.

11.8 Trace Data Line Format, VSB targets

For the VSB targets, the structure of each trace data line is as follows.

```
typedef unsigned char BYTE;
typedef unsigned long UINT32;

typedef packed struct _VSBTRACE {
   union {
      BYTE cAD [4]; /* ... LSB in cAD[0], MSB in cAD[3] */
      UINT32 AD;    /* ..... Multiplexed Address & Data */
   };
   BYTE TagL, TagU; /* ............ Time-tag. See below */
```


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```
   BYTE St4, St5;   /* ............. Strobes. See below */
} VSBTRACE;
```

Intel format As for the VME target, the trace address/data is stored as an *Intel format* long integer. The main difference is that the VBS bus is multiplexed, i.e the `AD(31:0)` holds data when the `DS*=0` and an address when `DS*=1`.

Time tag The time tag bytes do also follow the same format with the following exceptions: In 12-bit tag mode, or when not used at all (as in TIMING mode), the following VSBbus signals are mapped into the `TagL` and `TagU` bytes:

Bit#	7	6	5	4	3	2	1	0
TagL		BGIO*	BUSY*	BREQ*	WAIT*	ERR*	PAS*	ACK*
TagU	AC*							

Table 11.9 12 bits time tag, VSB target

11.8.1 Details of St4 and St5 bytes

_BLK Set to 1 when a the trace line contains data belonging to a VSB block cycle.

_SAMP As for the VBT-325 VME part.

Bit#	7	6	5	4	3	2	1	0
St4	_BLK	ARB*	DS*	WR*	SIZE1*	SIZE0*	SPACE1*	SPACE0*
St5	ExtInp	_SAMP	CACHE*	IRQ*	_TRG	LOCK*	ASACK1*	ASACK0*

Table 11.10 St4 and St5, VSB target

11.9 Trace Data Line format, SCSI targets

For the SCSI targets, the structure of each trace data line is as follows.

```
typedef unsigned char BYTE;
typedef unsigned long UINT32;

typedef packed struct _SCSITRACE {
   BYTE TagL, TagU;          /* ..... Time-tag. See below */
   BYTE Da0, Da1;
   BYTE St6, St7, St8, St9;
} SCSITRACE;
```

The SCSI target will always use the 16-bit time tag format:

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Bit#	7	6	5	4	3	2	1	0
TagL	Tag[7:0]							
TagU	Tag prescale[3:0]				Tag[11:8]			

Table 11.11 16 bits time tag, SCSI target

Bit#	7	6	5	4	3	2	1	0
Da0		DB4*		DB3*		DB2*	DB0*	DB1*
Da1		DBP*		DB7*		DB6*		DB5*

Table 11.12 Details, Da0 and Da1 bytes

Bit#	7	6	5	4	3	2	1	0
St6		REQ*	DBP1*	I/O*	DB15*			DB10*
St7	DB11*	BUSY*	ACK*	RST*	DB9*		DB8*	
St8	SEL*	MSG*		TERMPWR			C/D*	
St9		_SAMP	DB14*			ATN*	DP12*	DB13*

Table 11.13 Details, St6, St7, St8, and St9

Blank fields indicates unassigned bits. _SAMP works as for the VBT-325 VME target.

_Start 0 in the address phase, indicating the start of a transaction.

11.10 BusView Trace File Format

The following code example shows how to "decode" the BusView trace file. The trace line data layout is the same as for terminal. (Note that the absolute time tag is added at the end.)

```
#include <stdlib.h>
#include <stdio.h>
#include <string.h>

typedef int BOOLEAN;
typedef unsigned long  UINT32;
typedef unsigned short UINT16;
typedef unsigned char  UINT8;

typedef struct {
   UINT32 ms;                    // Millisecond part
   UINT32 ps;                    // Picosecond part
   UINT16 flags;                 // Flags
} TIME;


//-----------------------------------------------------
```


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```
// Possible flags
//-----------------------------------------------------
#define NT_NEG          0x0001   // Time is negative (before trigger)
#define NT_MAXTAG       0x0002   // Time to long to be save in timetag
#define NT_ASYNCQ        0x0004   // Time invalid because of asyncrounous store
qualifier (VBT only)



typedef struct {
   char id[16];                  // Current is "BusView TRACE V"
   UINT32 verMain;               // Main version number, current is 1
   UINT32 verSub;                // Sub version number, current is 9
   UINT32 traceDataOffset;       // Offset in file from start to trace data
   UINT32 first;                 // First saved trace line (relative)
   UINT32 noSavedSamples;        // The number of saved samples in the trace
   UINT32 triggerPos;             // The trigger position in the original trace
(absolute)
   UINT32 noSamplesInTrace;      // Mumber of samples in the original trace
   UINT8  modelIndex;            // The modelindex for the trace, see below
   BOOLEAN extendedTimetag;  // True if 16 bits timetag, false if 12 bit timetag
   TIME samlingSpeed;        // Sampling speed used if VBT asyncronous sampling
   UINT16 setupTriggerPos;   // Trigger position used by setup. 0 - Start,1-50%,
                                                              2-End, 3-25%, 4-75%.
   UINT16 setupSamplingMode; // Setup sampling mode used for trace window header
   UINT16 formatScale;      // Scale value for waveform used when file was saved
   UINT16 formatFlag; // Indicates if global decoding was on in an alphan. trace
} TRACE_FILE_HEADER;


//-----------------------------------------------------
// Trace file header ID
//-----------------------------------------------------
#define TRACE_FILE_ID   "BusView TRACE V"


//-----------------------------------------------------
// Possible models indexes
//-----------------------------------------------------
#define MODIDX_VME         1
#define MODIDX_VSB         2
#define MODIDX_SCSI        3
#define MODIDX_TIMVMENO    8
#define MODIDX_TIMVME      9
#define MODIDX_TIMSCSI     10
#define MODIDX_VXI         14
#define MODIDX_TIMVSB      16
#define MODIDX_TIMBATVME   17
#define MODIDX_XVME        18
#define MODIDX_XVSB        19
#define MODIDX_XSCSI       20
#define MODIDX_XVXI        21
```


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```
#define MODIDX_PCI         22
#define MODIDX_TIMPCI      23
#define MODIDX_PCI400      24

//-----------------------------------------------------
// Setup Sampling Mode values
//-----------------------------------------------------
#define N_SYNC          0x0000   // VBT only
#define N_TRANSFER      0x0000   // PBT
#define N_ASYNC         0x0001   // VBT and Timing Analyzers
#define N_CLOCK         0x0001   // PBT
#define N_SAMPMODIF     0x0002   // Both N_CLOCK and N_SAMPMODIF set is TRANSFER
DETAILS
#define N_SAMPMASK      0x001F   // Mask for sampling bits
#define  N_MIXED           0x0020    // Set if sequencer contains a mix of the
sampling modes
// Info just to show correct status.
#define N_USEWAVEFORM   0x0040   // Show default as waveform
#define N_ALTEVENTS     0x0080   // Alternative events used in setup

//-----------------------------------------------------
// Format Flags
//-----------------------------------------------------
#define FMT_DECODE      0x00001  // global decoding on

//-----------------------------------------------------
// Trace width
//-----------------------------------------------------
#define TRCWIDTH_VME         24  // 16 + 8 as abstime
#define TRCWIDTH_VSB         17  //  8 + 1 + 8 as abstime
#define TRCWIDTH_SCSI         8
#define TRCWIDTH_TIMVMENO    14
#define TRCWIDTH_TIMVME      14
#define TRCWIDTH_TIMSCSI     10
#define TRCWIDTH_VXI          8
#define TRCWIDTH_TIMVSB      10
#define TRCWIDTH_TIMBATVME   12
#define TRCWIDTH_XVME        24  // 16 + 8 as abstime
#define TRCWIDTH_XVSB        17  //  8 + 1 + 8 as abstime
#define TRCWIDTH_XSCSI        8
#define TRCWIDTH_XVXI         8
#define TRCWIDTH_PCI         24  // 16 + 8 as abstime
#define TRCWIDTH_TIMPCI       8
#define TRCWIDTH_PCI400       8

//-----------------------------------------------------
// VSB and XVSB Trace
//-----------------------------------------------------
```


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```
// Byte 8 in the trace is a SW added byte, whwre
// channel 64 set indicates that data byte 0 is invalid,
// channel 65 set indicates that data byte 1 is invalid,
// channel 66 set indicates that data byte 2 is invalid,
// channel 67 set indicates that data byte 3 is invalid,
// channel 68-71 is not used.

//-----------------------------------------------------
// Abstime bytes layout (ms-millisecond, ps-picosecond)
//-----------------------------------------------------
// This is the 8 last byte in each trace line for the
// targets above with +8 bytes in the comments.
// Byte 0 is ms part bit 31-24
// Byte 1 is ms part bit 23-16
// Byte 2 is ms part bit 15-8
// Byte 3 is ms part bit 7-0
// Byte 4 bit 31 is the sign flag of the time
// Byte 4 bit 30 is the overflow flag of the time
// Byte 4 bit 5-0 is ps part bit 29-24 (31-30 is 0)
// Byte 5 is ps part bit 23-16
// Byte 6 is ps part bit 15-8
// Byte 7 is ps part bit 7-0



// Status messages for 'read_trace_header'
#define OK                      0
#define ERR_CANNOT_OPEN_FILE    1
#define ERR_ILL_TRACE_FILE_ID   2
#define ERR_ILL_TRACE_FILE_VER  3

int read_trace_header(char *filename, TRACE_FILE_HEADER *header)
{
   FILE *fp;
   char string[256];

   if ((fp=fopen(filename,"rb"))==NULL) return ERR_CANNOT_OPEN_FILE;

   //***** load FILE ID , type, and version and check if legal *****/
   fread(header->id,sizeof(char),strlen(TRACE_FILE_ID),fp);
   header->id[strlen(TRACE_FILE_ID)] = 0;
   if(strcmp(header->id, TRACE_FILE_ID)) {
      fclose(fp);
      return ERR_ILL_TRACE_FILE_ID;
   }
   fscanf(fp, "%d.%d ",&header->verMain, &header->verSub);
   if    (header->verMain    !=    1    ||    header->verSub    !=    9)    return
ERR_ILL_TRACE_FILE_VER;
```


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```
   /* Get sample begin offset */
   fscanf(fp,"%lu ",&header->traceDataOffset);

   /***** load trace info *****/
   fscanf(fp,"%lu %lu",&header->first,&header->noSavedSamples);
   fscanf(fp,"%lu %lu",&header->triggerPos,&header->noSamplesInTrace);

   /***** load setup info (if setup not correct load setup) *****/
   header->modelIndex=(UINT8)fgetc(fp);
   fscanf(fp,"%s ",string); /* Skip old setup reference, not used anymore */
   fscanf(fp,"%d ",&header->extendedTimetag);

   /****** load and copy runsampspeed, sampmode and trigpos *****/
   /****** For PCI this is the PCI clock on the bus when the trace was collected
*/
   fscanf (fp, "%lu %lu %d",
           &header->samlingSpeed.ms,
           &header->samlingSpeed.ps,
           &header->samlingSpeed.flags);
   fscanf (fp, "%d %d ", &header->setupTriggerPos, &header->setupSamplingMode);

   /***** load format ****/
   fscanf(fp,"%d %d ", &header->formatScale, &header->formatFlag);

   /* Clean up and return */
   fclose(fp);
   return OK;
}
```


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12. FIRMWARE UPGRADE

12.1 Firmware Upgrade Preparations

12.1.1 Diskette for PCs

The firmware in the VBT-325 is normally executed out of the onboard Flash Memory. Firmware upgrades are distributed on a diskette for IBM-compatible PCs, to be loaded via the serial port of the PC. When an upgrade is done, the new firmware is copied from the distribution diskette into the Flash memory by the means of code resident in a Boot PROM on the board.

12.1.2 Boot PROM

The Boot PROM serves two purposes: 1) Boot the board at power up and reset and transfer control to the main program which resides in Flash memory, and 2) to receive new firmware through the serial port during firmware upgrades. Normally, the Boot PROM does not need to be changed during FW upgrades. The software checks that the Boot PROM version is correct before a firmware upgrade takes place.

12.1.3 RS232 Connection

Before starting the upgrade procedure, connect a RS232 cable from the COM1 or COM2 port on an IBM compatible PC to the terminal port of the VBT-325. The recommended cable is discussed in Section 2.7.

12.1.4 Power on the FLASH EPROMs

Before starting the upgrade procedure, make sure that +12V is supplied to the VBT-325 (at least 120mA). Check jumper J67. It should be installed as indicated in Figure 13.1 with the "12V to FLASH on".

12.2 Firmware Upgrade Using BusView

To upgrade the FLASH firmware from BusView, select the command `Utilities/Update Tracer Firmware`. BusView will display the dialog box in Figure 12.1, which contains instructions for the firmware installation.

It is important to remember to toggle the Reset switch on the VBT-325 as specified in point 2 in the installation dialog box.

When the actions in the dialog box have been performed, press the OK button to start the firmware installation. The progress of the installation will be reported to the screen.

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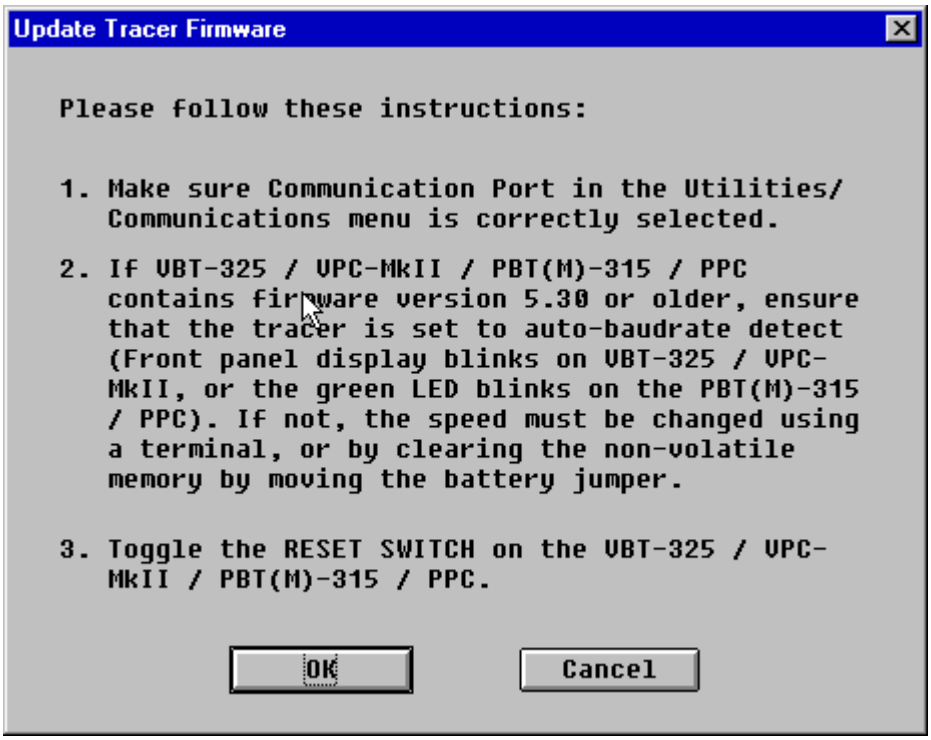


Figure 12.1 Firmware installation dialog box

12.3 Firmware Upgrade Using MS-DOS

Insert the Firmware diskette into the floppy drive. Type A: and CR to set the floppy drive as the current drive. (Replace the A with B if the diskette was inserted in drive B.)

uplvbt ¿

Type `uplvbt` and `CR` to start the Firmware upload procedure. The message in Figure 12.2 is displayed.

```
VBT-325 Firmware          Version 5.40          27. May 1997

Welcome to the VBT-325 Firmware Upload Procedure.

 PLEASE READ ALL INSTRUCTIONS CAREFULLY BEFORE
 PROCEEDING AT ANY STEP!

Select a number from the menu below that match the COM port
which is connected to the TERMINAL port of the Tracer:

1. COM1
2. COM2

0. Abort installation.

COM3 and COM4 are not supported.
```

Figure 12.2 Loading firmware and select COM port

Type `<1>` to select `COM1`, or `<2>` to select `COM2`, dependent of which port that is connected to the Terminal port of the VBT-325.

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Reset the tracer and select the correct baud rate, by studying the front panel display. Type the number of the menu item that match the text on the front panel display.

```
VBT-325 Firmware          Version 5.40          27. May 1997

PLEASE READ ALL INSTRUCTIONS CAREFULLY BEFORE PROCEEDING!

* Reset the VBT-325 (or the VPC-MkII)

* Select a number from the menu below that match the text
  (i.e baud rate) displayed on the front panel display:

  1. Blinking '19k2 81n' .. 'Type CR'
  2. Displaying '19k2 81n'
  3.        ..  '9600 81n' or 'BootProm'
  4.        ..  '4800 81n'
  5.        ..  '2400 81n'
  6.        ..  '1200 81n'

  0. Abort installation.

If none of the above match the text on the front panel
display, select '0' to abort the installation.
```

Figure 12.3 Reset and select baud rate

The next step performed by the upload procedure is to wipe the current firmware from the Flash memory

```
W A R N I N G

The Flash EPROMS will now be erased. While erasing,
the text XMERASE is displayed in the front panel display.

DO NOT TURN OFF THE POWER
OR RESET THE TRACER AS LONG
AS 'XMERASE' IS DISPLAYED!

Erasing may take up to 60 seconds to complete.
```

Figure 12.4 Erasing Flash EPROMs

Do not attempt to reset the tracer or turn off the power as long as the text in Figure 12.4 is displayed. If you do, tuning parameters, vital to the operation of the tracer, will be lost. If the tuning parameters are lost, call VMETRO Support to get new values.

```
I N F O

The next step is to load the firmware into the Flash EPROMs
on the tracer.

Please select a baud-rate to be used during the load:

1. 38k4
2. 19k2
3. 9600

0. Abort installation.
```

Figure 12.5 Select baud rate during upload

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Type <1>, <2> or <3> to select the baud rate to be used during the actual firmware file upload. On most PCs, 38k4 can be selected. Another INFO box is displayed before the upload starts. The uploading is monitored as shown below.

```
vt100: Sending file "flash.bin" using XMODEM CRC.
vt100: Sending block 4089 of 4088 Ok.
```

Wait a while when the firmware is uploaded into the tracer. After a few minutes, the following screen will be displayed:

```
I N F O
The firmware has been sucessfully uploaded.
Please reset the Tracer.
```

Reset the Tracer and type CR.

Upload finished

When typing the last CR, the following information is displayed:

```
I N F O
READ THIS IF UPGRADING FROM 4.99.10 (OR OLDER) FIRMWARE:

The firmware will ask for Tuning Parameters, the PCB
revision, and the ECO level when first started.

The Serial Number label is located on the underside
if the Tracer. If will look something like this:

       250106N B8 <- ECO level
          ___  |
Serial no   |   `- PCB revision

Tuning Parameters are provided by VMETRO Support.

In the Americas, call:
   VMETRO Inc, Houston, TX, (713) 584 0728

In the rest of the world call:
   VMETRO A/S, Oslo, Norway, +47 2210 6090
```

The proposed settings for the VT100 emulator reflects the choices you have made during the firmware upload.

The VBT-325 is now ready to run, and can be operated immediately from the VT100 emulator that comes with the distribution diskette, or you can move to a familiar terminal.

Note! **The same firmware supports both the Terminal User Interface and BusView. Thus it is possible to switch between the two without reloading firmware. It is sufficient to reset the board to make the switch.**

12.4 Troubleshooting - Firmware Upgrade

12.4.1 If Upload Stops

If the upload stops, start the upload procedure from the beginning, and try a slower baud-rate. If you are running the upload procedure in a Windows DOS box, and run into

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problems, try to exit Windows before making another attempt. Also, if you have special TSR programs bound to the used COM port, or network drivers, try a *clean boot*[7] of the PC before making another attempt.

12.4.2 Communication Errors

The message in Figure 12.6 indicates communication problems.

- Check the cable. It should be according to Section 2.7.
- Check that the cable is connected to the COM-port being used.

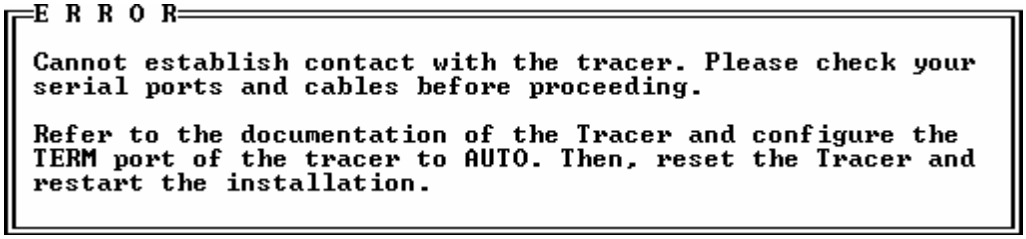
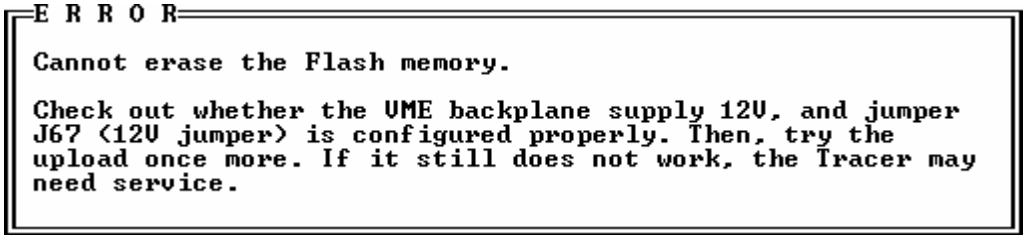


Figure 12.6 Error message indicating no contact with the tracer

12.4.3 Flash Memory Errors

The following message indicates that 12V is missing or some other problem with the Flash memory:



- Check if the system provides 12V.
- Check if jumper J67 is installed properly. See Figure 13.1.

If both of these items check out OK, see Section 12.1.4, the FLASH memory *may* be damaged. Please call VMETRO Support for further instructions.

12.4.4 Tuning Parameters Lost

If the dialog box in Figure 12.7 is displayed when the tracer is restarted, the tuning parameters are lost.

---

7 With MS-DOS 6.00 or later, this can be accomplished with holding both SHIFT-keys while the texts “Starting MS-DOS...” is displayed when the PC is booted.

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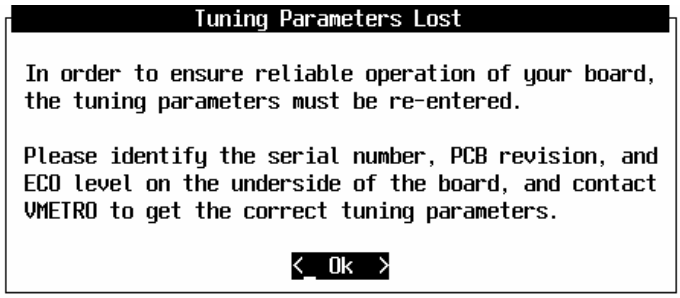


Figure 12.7 Missing the tuning parameters

Press CR and the dialog box in Figure 12.8 is displayed.

Call VMETRO Support, or your distributor, to get the correct tuning parameters for the Tracer. Without it, the tracer still works, but may show inaccurate results. The firmware is dependent of a correct PCB revision and ECO level to fully utilize the hardware configuration of the tracer.

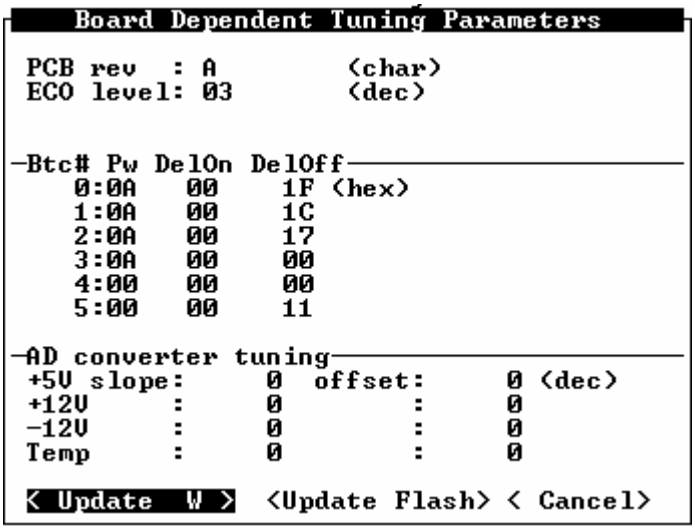


Figure 12.8 The Tuning parameters

12.4.4.1 Missing PCB and ECO Level

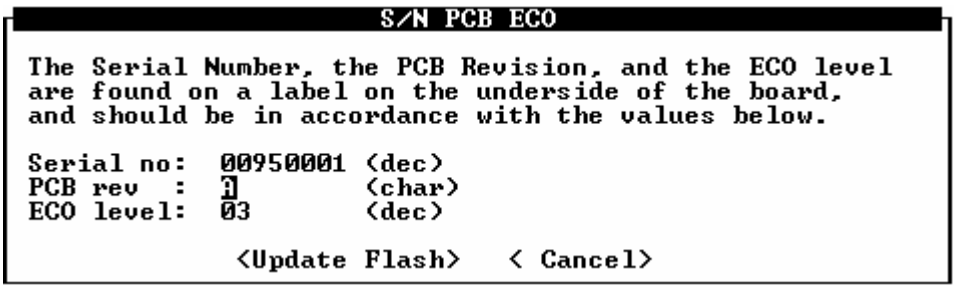


Figure 12.9 Configuring PCB and ECO level

The firmware is dependent on a correct PCB revision and ECO level to fully utilize the hardware configuration of the tracer. If the dialog box in Figure 12.9 is displayed when the

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tracer is restarted, fill in the correct PCB revision and the ECO level. Then select `<Update Flash>` to store these parameters. The command `Utilities/Specials/ECO Level` will allow you to enter or verify this at a later time if needed.

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13. JUMPER SETTINGS

13.1 Jumper Settings

The VBT-325 has a number of jumpers that define the operating mode (wide/twin), P2 target bus (VSB/SCSI/UserDef), and functions like Temperature probe/External input, boot PROM size etc. The jumpers have a slightly different layout for different PCB versions of the VBT-325. Use the `Utilities/Specials/ECO level` command to find the PCB version of your VBT-325.

13.1.1 VBT-325

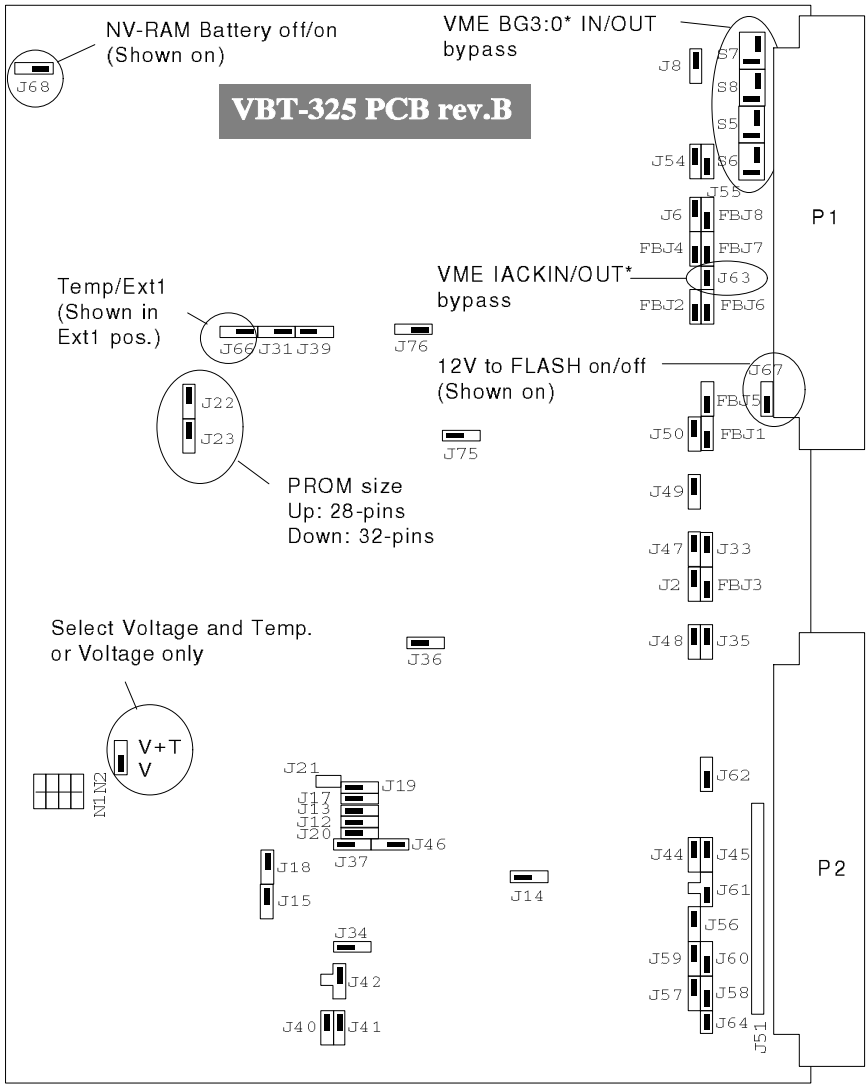


Figure 13.1 Jumper settings, VBT-325 rev. B

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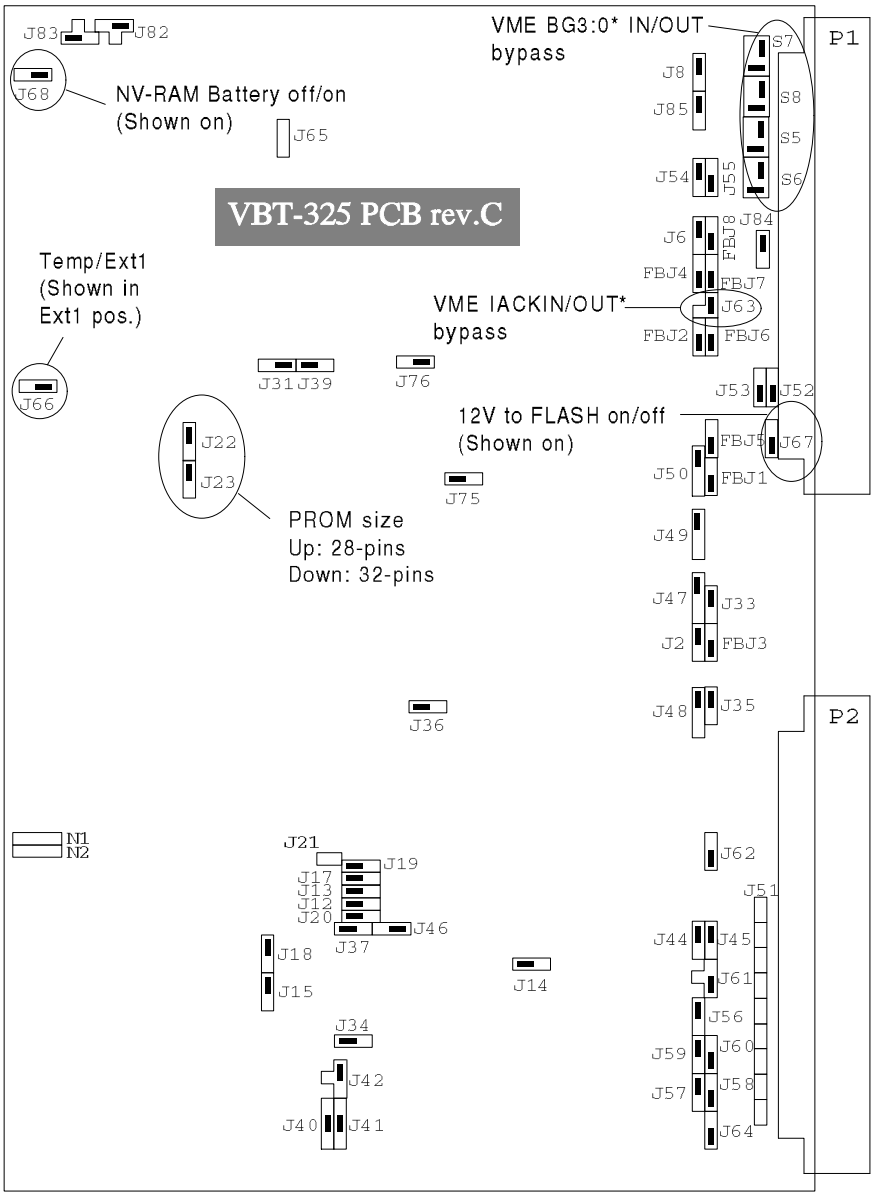


Figure 13.2 Jumper settings, VBT-325 rev. C

13.1.2 VME & VSB (Twin mode)

The VBT-325 is default configured for VSB (factory setting) except the BGIN/OUT daisy chain jumper in pos. J64 as shown. (This is to avoid damage if the board is inserted in a crate with other use of the P2 connector.)

Unless the VSB BGIN/OUT is bypassed in the back plane, a jumper should be inserted in J64 before installing the VBT-325 in a system with VSB.

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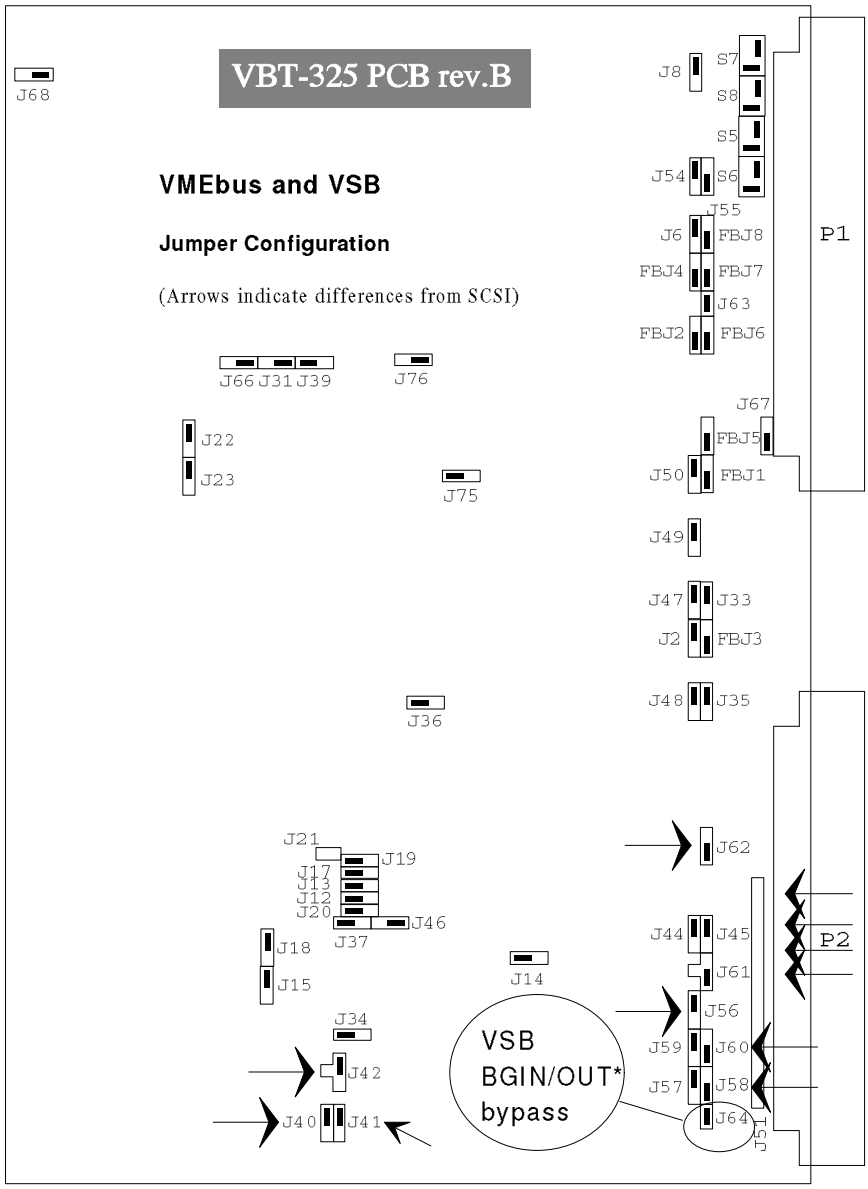


Figure 13.3 Jumper settings, VME and VSB, VBT-325 rev. B

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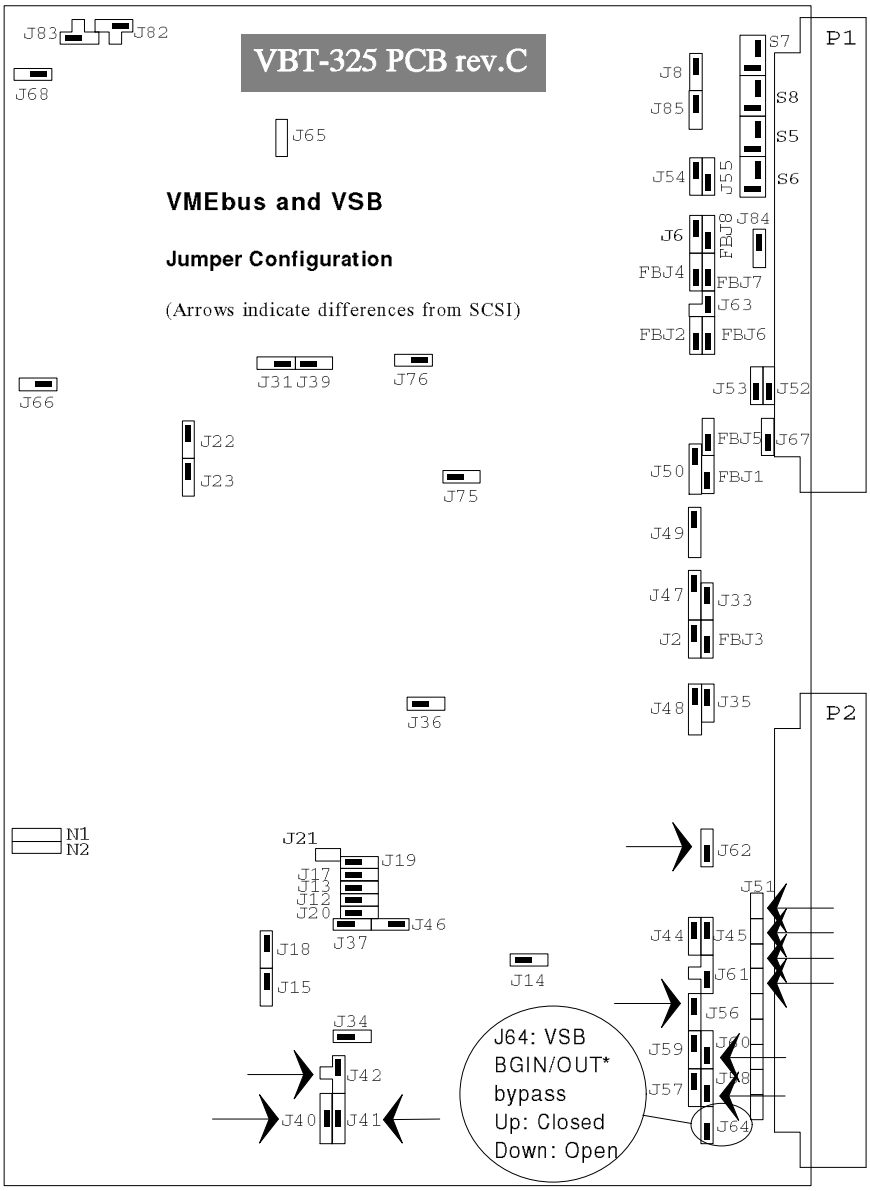


Figure 13.4 Jumper settings, VME and VSB, VBT-325 rev. C

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13.1.3 VME & SCSI (Twin mode)

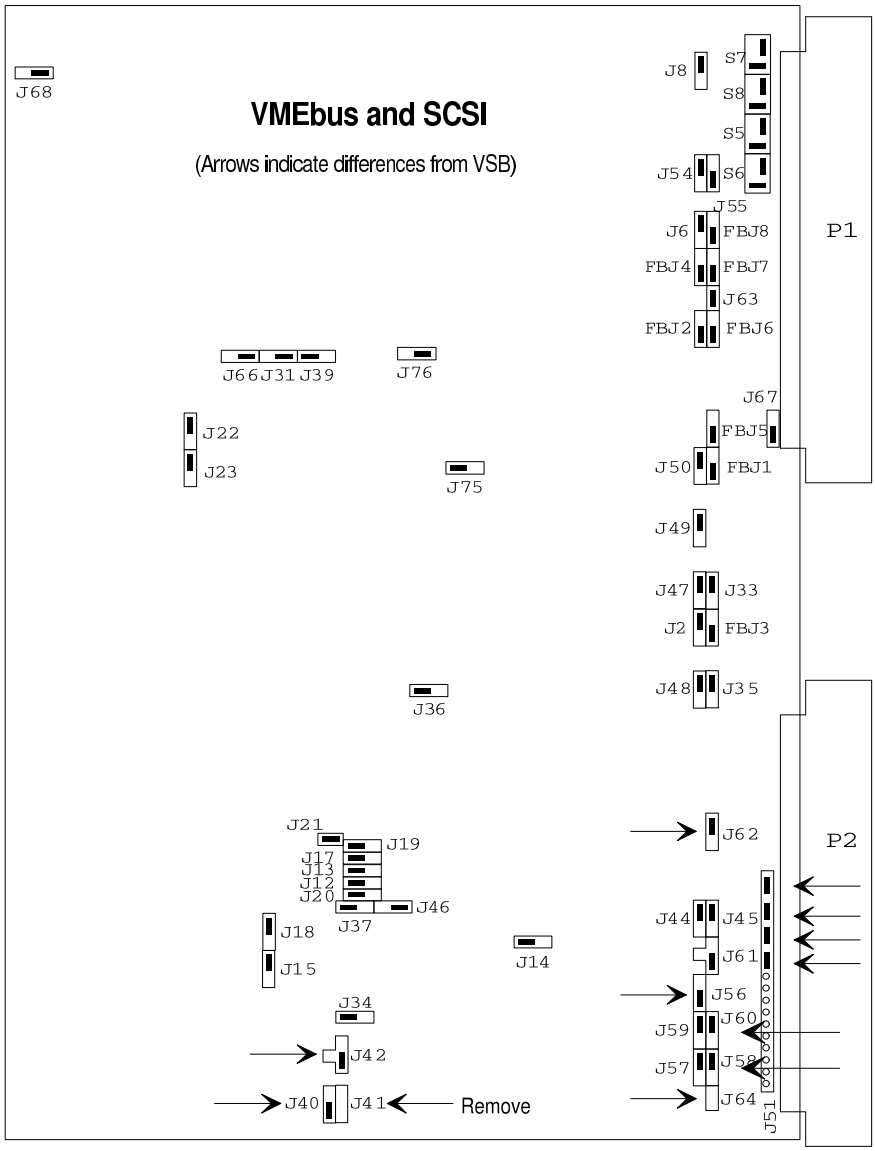


Figure 13.5 Jumper settings, VME and SCSI, VBT-325 rev. B

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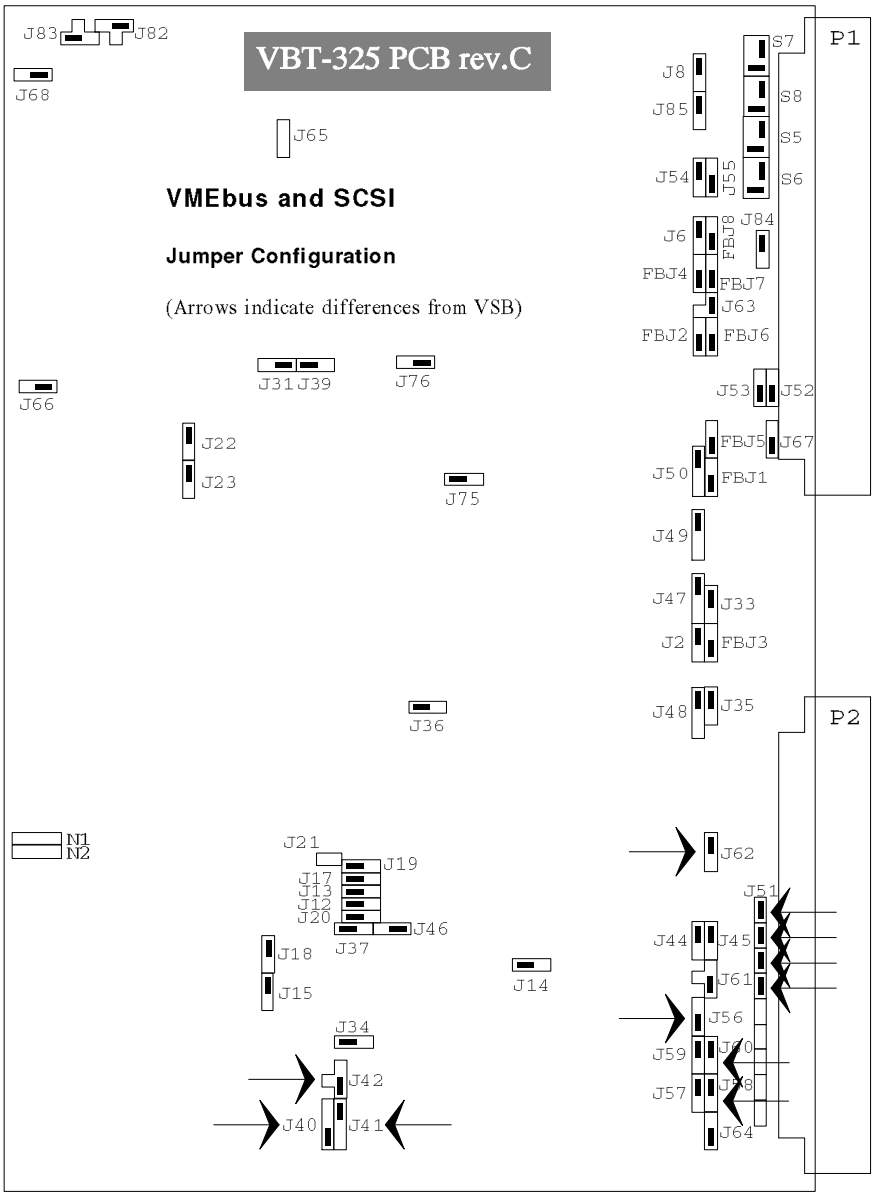


Figure 13.6 Jumper settings, VME and SCSI, VBT-325 rev. C

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13.1.4 VME & VXI (Twin mode)

VXI Jumper configuration for VXI_P2ac *State* analysis on VBT-325 PCB revision “B”. VXI_P2ac *Timing* analysis can use VSB jumper settings. Connect sampling clock to pin socket J43.

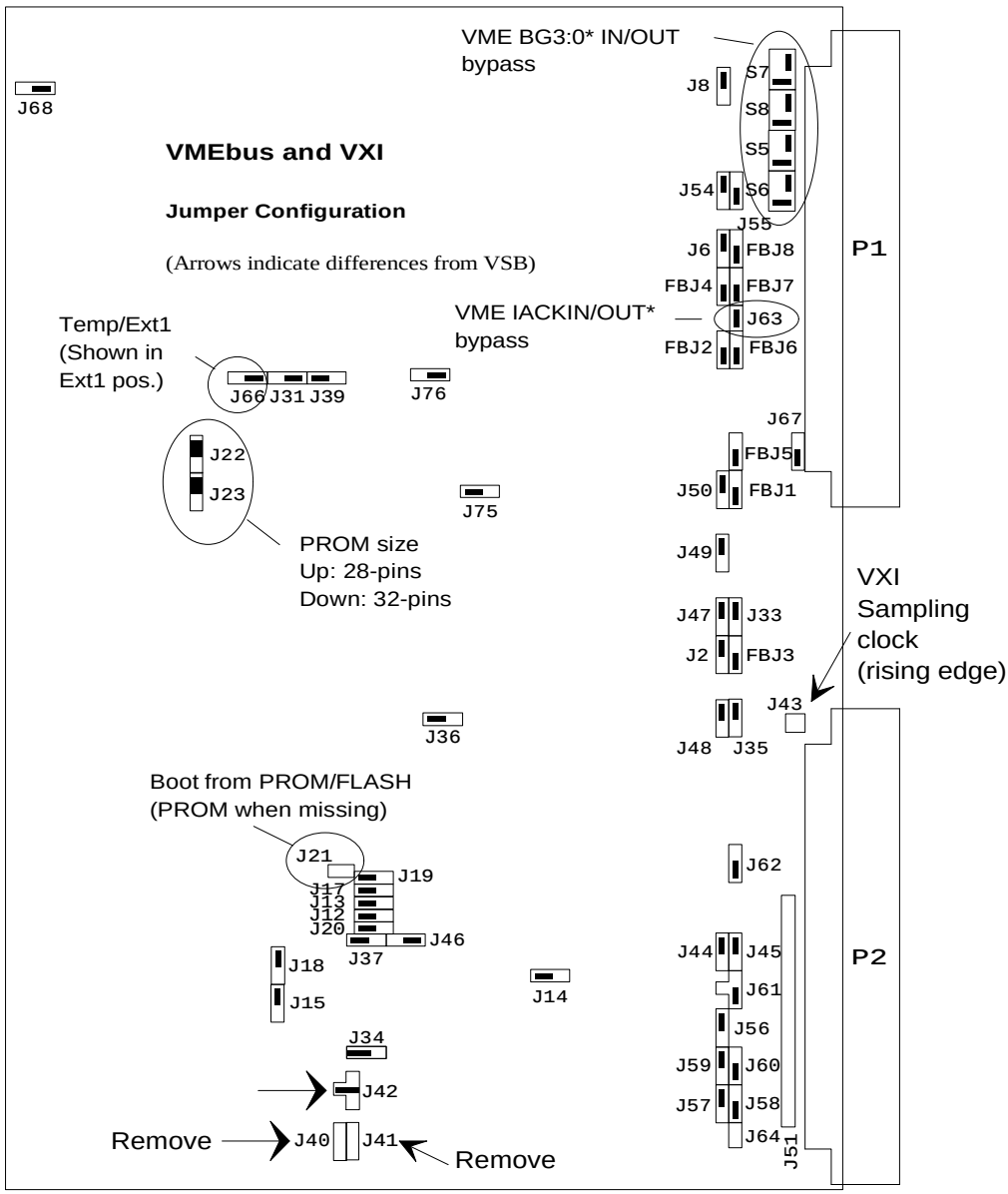


Figure 13.7 Jumper settings, VME and VXI, VBT-325 rev.B

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VXI Jumper configuration for VXI_P2ac *State* analysis on VBT-325C PCB revision “C”. VXI_P2ac Timing analysis can use VSB jumper settings. Connect sampling clock to pin socket J43.

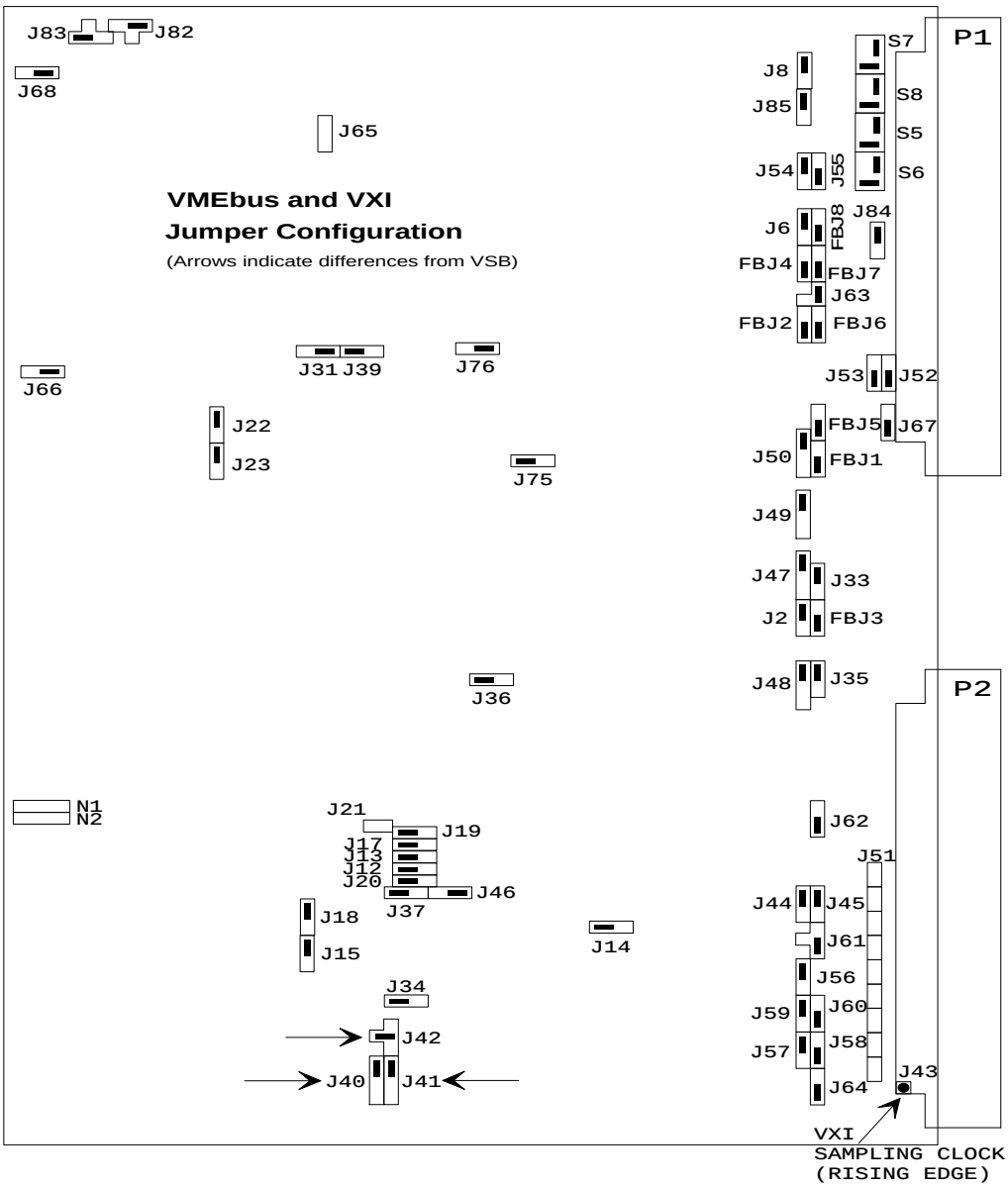


Figure 13.8 Jumper settings, VME and VXI , VBT-325 rev. C

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13.1.5 VME & P2ac User-defined (Twin mode)

Jumper configuration for User P2ac on VBT-325C PCB revision “B”. Connect P2AC sampling clock to pin socket J43.

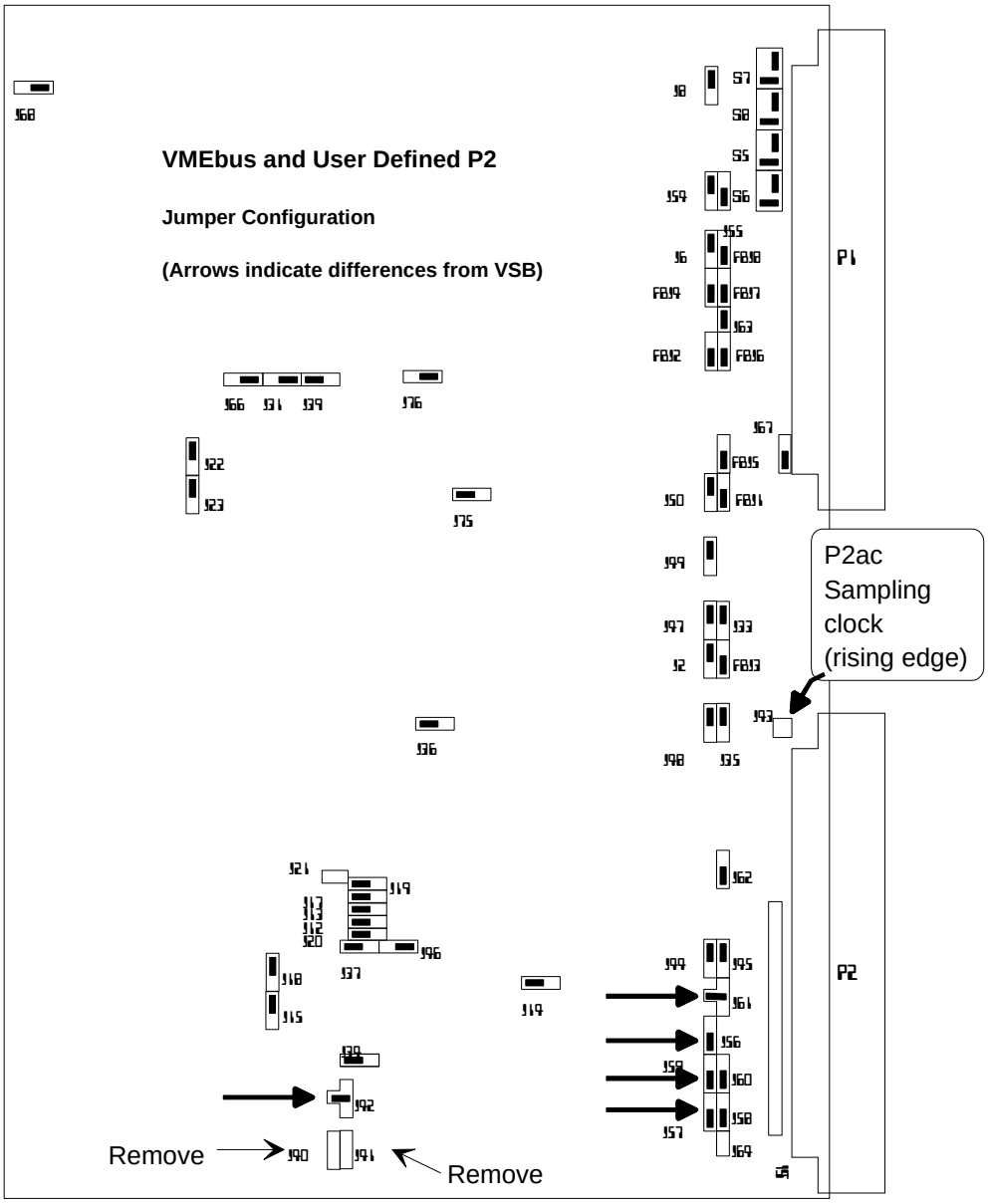


Figure 13.9 Jumper settings, VME and User P2ac, VBT-325 rev. B

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Jumper configuration for User P2ac on VBT-325C PCB revision “C”. Connect P2AC sampling clock to pin socket J43.

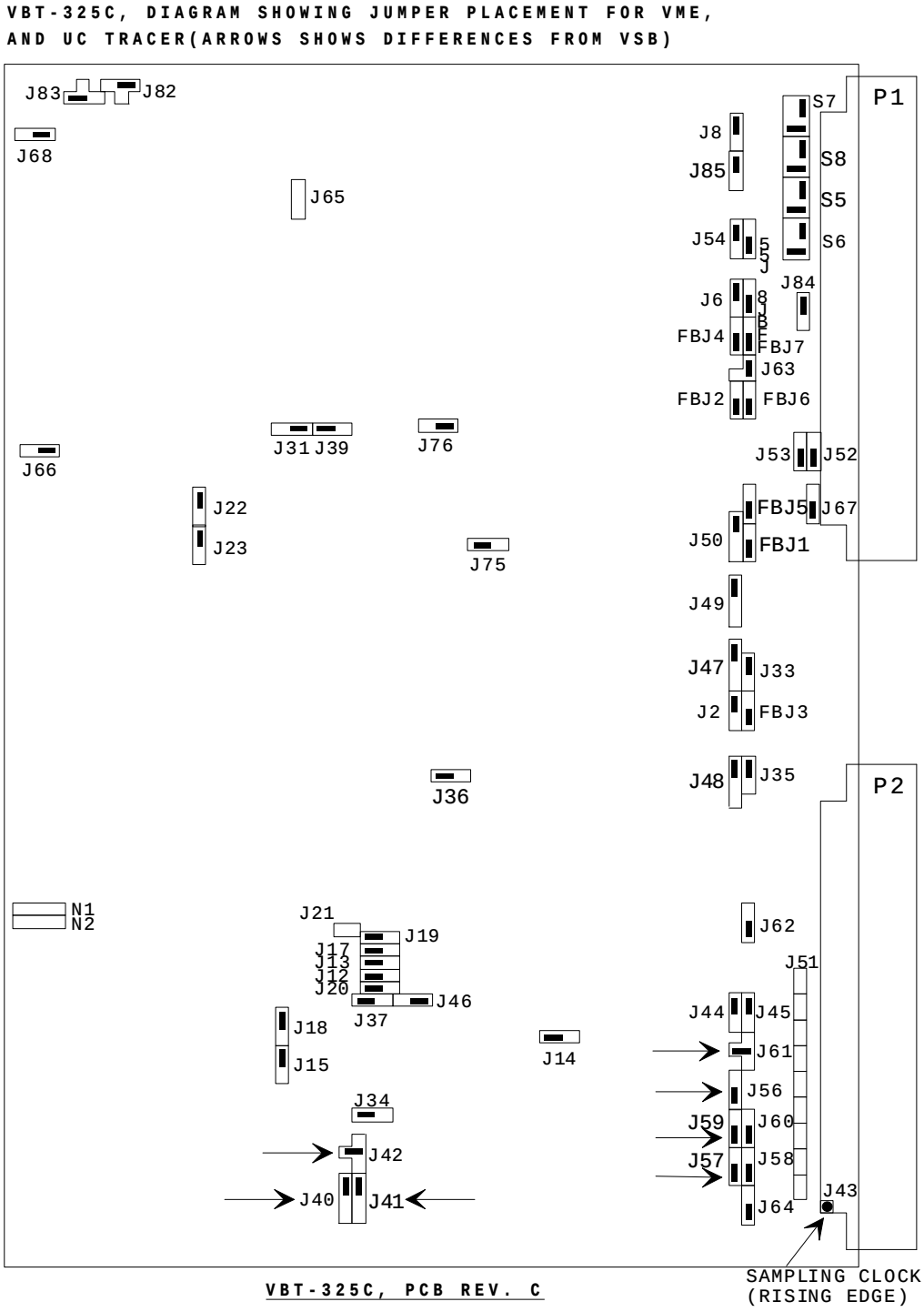


Figure 13.10 Jumper settings, VME and User P2ac, VBT-325 rev. C

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13.1.6 XMEM325-VME, VSB & VXI

Jumper configuration for VME, VSB and VXI (default) on XMEM325-PB PCB revision. “A”. Connect VXI sampling clock to pin-socket J43 (indicated as circle in the lower right corner).

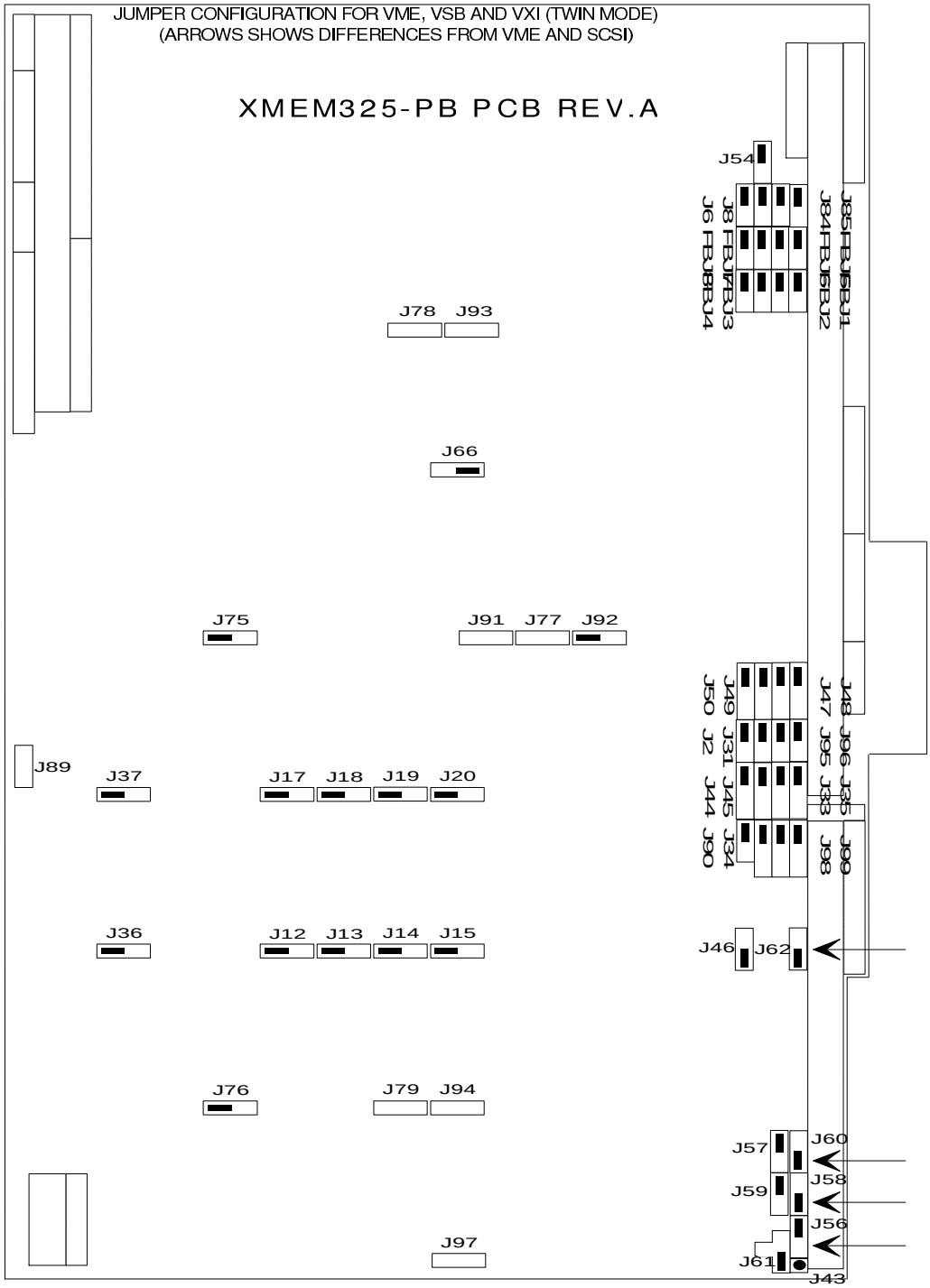


Figure 13.11 Jumper settings, VME, VSB, and VXI, XMEM325-PB rev. A

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13.1.7 XMEM325-VME & SCSI

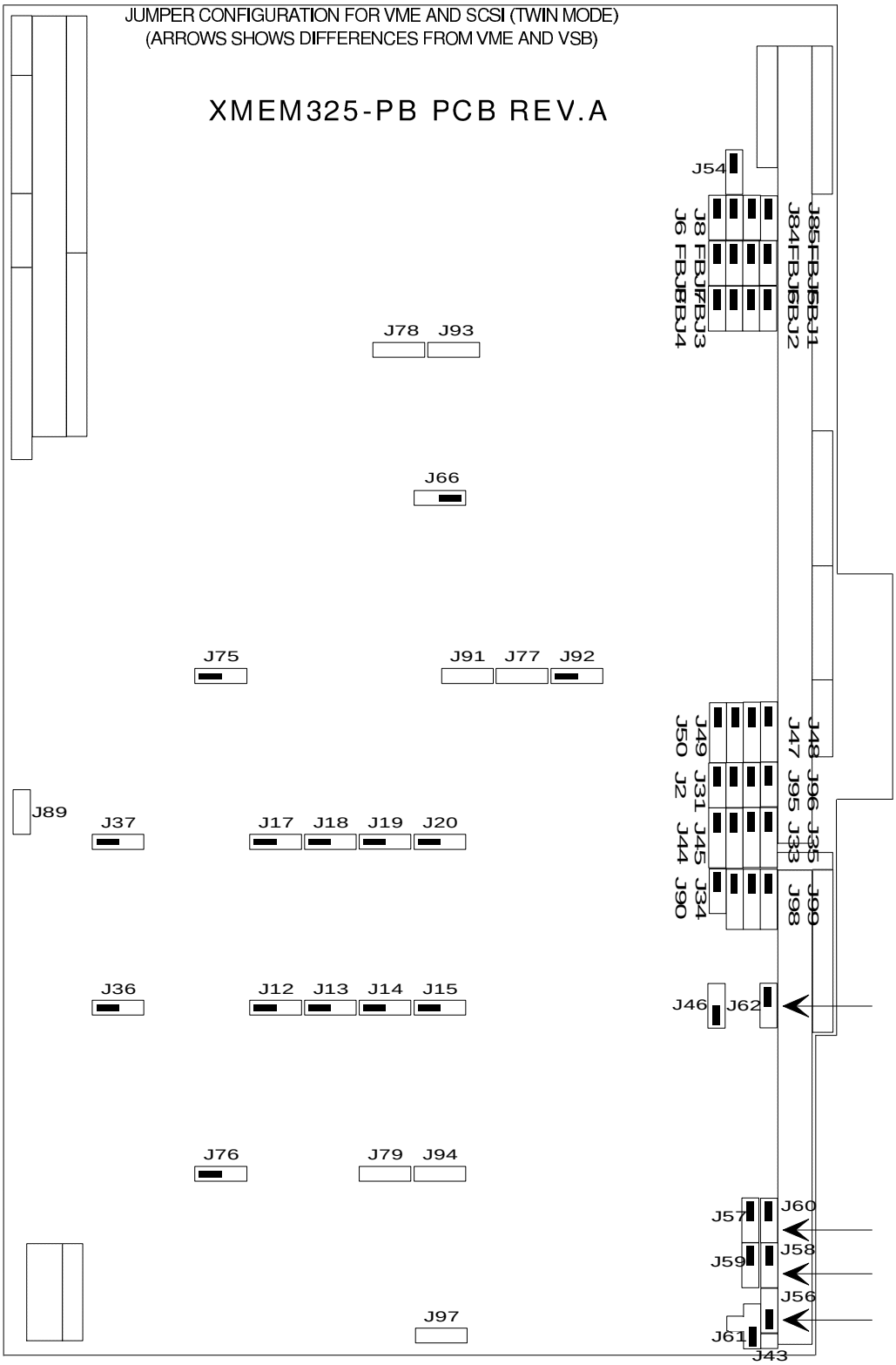


Figure 13.12 Jumper settings, VME and SCSI, XMEM-325-PB rev. A

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13.1.8 XMEM325-VME & P2ac User-defined

Jumper configuration for VME and P2ac User-def. on XMEM325-PB PCB revision “A”. Connect P2AC sampling clock to pin socket J43.

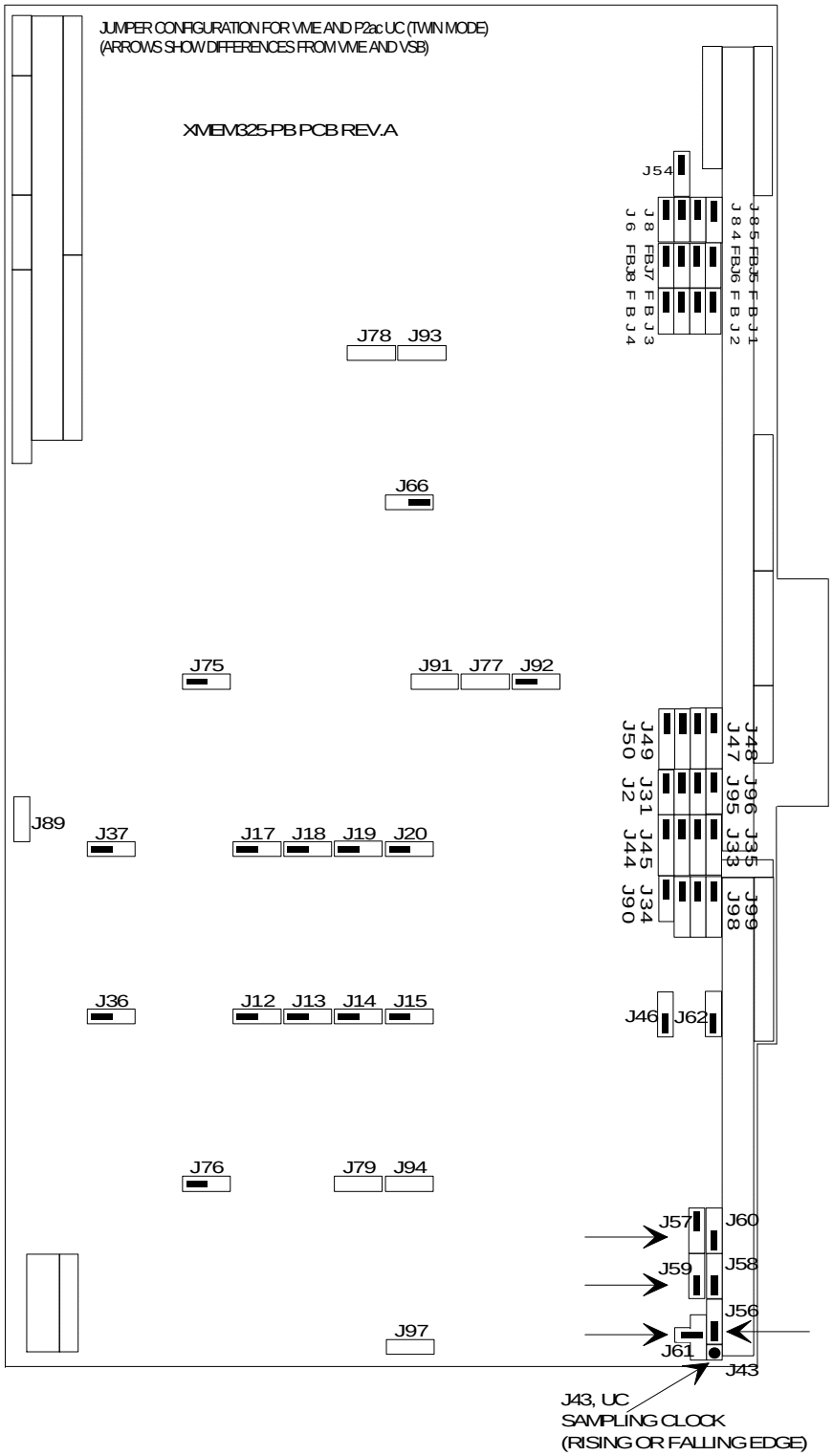


Figure 13.13 Jumper settings, VME and User def. P2ac, XMEM325-PB rev. A

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