

MCUEZMMDS0508/D
FEBRUARY 1998

MCUez
MMDS0508 TARGET
USER'S MANUAL

Important Notice to Users

While every effort has been made to ensure the accuracy of all information in this document, Motorola assumes no liability to any party for any loss or damage caused by errors or omissions or by statements resulting from negligence, accident, or any other cause. Motorola further assumes no liability arising out of the application or use of any information, product, or system described herein; nor any liability for incidental or consequential damages arising from the use of this document. Motorola disclaims all warranties regarding the information contained herein, whether expressed, implied, or statutory, including implied warranties of merchantability or fitness for a particular purpose. Motorola makes no representation that the interconnection of products in the manner described herein will not infringe on existing or future patent rights, nor do the descriptions contained herein imply the granting or license to make, use, or sell equipment constructed in accordance with this description.

Information contained in this document applies to REVision (1) MCUez.

The computer program contains material copyrighted by Motorola Inc., first published 1997, and may be used only under a license such as the License For Computer Programs (Article 14) contained in Motorola's Terms and Conditions of Sale, Rev. 1/79.

Trademarks

This document includes these trademarks:

MCUez is a trademark of Motorola Inc.

EXORciser is a trademark of Motorola Inc.

The MCUez development, emulation, and debugging application is based on Hi-Wave, a software technology developed by HIWARE. Hi-Wave is a registered trademark of HIWARE AG.

AIX, IBM, and PowerPC are trademarks of International Business Machines Corporation.

SPARC is a trademark of SPARC International, Inc.

Sun and SunOS are trademarks of Sun Microsystems, Inc.

UNIX is a trademark of Novell, Inc., in the United States and other countries, licensed exclusively through X/Open Company, Ltd.

X Window System is a trademark of Massachusetts Institute of Technology.

CONTENTS

CHAPTER 1 INTRODUCTION

1.1 INTRODUCTION	1-1
1.2 DEFINITIONS, ACRONYMS AND ABBREVIATIONS	1-1

CHAPTER 2 MMDS0508 TARGET COMPONENT

2.1 INTRODUCTION	2-1
2.2 TARGET/SYSTEM INTERFACE	2-1
2.2.1 Hardware Connection	2-1
2.2.2 Loading The MMDS0508 Target	2-1
2.3 CONFIGURATION DIALOG	2-3
2.3.1 Communication Configuration	2-3
2.3.2 Communication Device Specification Dialog	2-3
2.3.3 Data Format	2-4
2.4 MCUEZ STATUS BAR FOR THE MMDS	2-4
2.5 MMDS0508 MENU	2-4
2.5.1 MMDS0508 Menu Entries	2-5
2.5.1.1 Communication	2-5
2.5.1.1.1 Baud Rate	2-6
2.5.1.1.2 Show Protocol	2-6
2.5.1.2 Memory Map	2-6
2.5.1.2.1 Configuration	2-6
2.5.1.2.2 About Personality (.MEM) Files	2-6
2.5.1.2.3 Dual-Port RAM	2-8
2.5.1.2.4 Memory	2-9
2.5.1.3 Emul Signals	2-9
2.5.1.3.1 MCU Clock	2-9
2.5.1.3.2 Reset	2-10
2.5.1.4 Bus Trace	2-10
2.6 DEFAULT TARGET SETUP	2-10
2.6.1 Motorola ESL Parameters	2-10
2.6.1.1 COMDEV	2-10
2.6.1.2 BAUDRATE	2-11
2.6.1.3 SHOWPROT	2-11

CHAPTER 3 BUS ANALYZER

3.1 INTRODUCTION	3-1
3.1.1 Trace Modes	3-1
3.1.2 Trace Buffer	3-1
3.1.3 Textual Or Graphical	3-1
3.2 USING THE BUS ANALYZER	3-1
3.2.1 Trigger Setup	3-3
3.2.2 Sequencer Setup	3-4
3.2.3 Time Tag Clock Setup	3-7
3.3 COLLECTING DATA	3-8
3.3.1 Arming The Analyzer	3-8
3.3.2 Disarming The Analyzer	3-8
3.3.3 Start Emulation	3-8
3.3.4 Status Bar	3-8
3.3.5 Halt Data Collection	3-9
3.3.6 Halt Emulation	3-9
3.3.7 Recording Bus Data	3-9
3.3.8 Trigger Event	3-9
3.4 VIEWING COLLECTED DATA	3-9
3.4.1 Textual Display	3-10
3.4.2 Instructions Only Display	3-11
3.4.3 Graphical Display	3-11
3.4.4 Time Mesasuring	3-13
3.4.5 ShowLocation	3-13
3.5 ADD / REMOVE ITEMS IN THE TRACE WINDOW	3-13
3.6 SCROLLING THE DISPLAY	3-14
3.6.1 Search For A Frame	3-14
3.6.2 Search For Events	3-15
3.6.3 Next Event	3-16
3.6.4 Previous Event	3-16
3.6.5 Search For A Pattern	3-16
3.7 DUMPING THE BUS ANALYZER DATA TO A FILE	3-18

CHAPTER 4 MMDS COMMANDS

4.1 INTRODUCTION	4-1
4.2 BAUD RATE COMMAND	4-1
4.3 TRIGGER COMMANDS	4-2
4.4 BUS ANALYZER COMMANDS	4-7
4.5 TARGET SIGNAL EMULATION COMMANDS	4-15

4.6 RESET COMMANDS.....	4-15
4.7 PROTOCOL COMMANDS	4-16

FIGURES

Figure 2-1. Hardware Connection	2-1
Figure 2-2. Component Menu	2-2
Figure 2-3. Replacing The Target Menu	2-2
Figure 2-4. MotoSIL Menu	2-3
Figure 2-5. Communication Device Dialog.....	2-3
Figure 2-6. MCUEz Status Bar	2-4
Figure 2-7. MMDS0508 Menu	2-5
Figure 2-8. Communication Device Specification Dialog.....	2-5
Figure 2-9. Memory Configuration Dialog	2-6
Figure 2-10. Configuration Error Dialog.....	2-7
Figure 2-11. Open Personality File Dialog	2-7
Figure 2-12. Target Signals Dialog	2-9
Figure 3-1. Trace Window	3-2
Figure 3-2. Bus Analyzer Configuration Dialog	3-3
Figure 3-3. Bus Analyzer Configuration Dialog (Sequencer Tab)	3-5
Figure 3-4. Bus Analyzer Configuration Dialog (Time Tag Clock Tab).....	3-7
Figure 3-5. Trace Window Elements	3-10
Figure 3-6. Trace Window - Graphical Display.....	3-12
Figure 3-7. Trace Window - Zoom Out	3-12
Figure 3-8. Items Configuration Dialog	3-13
Figure 3-9. Item Content Dialog	3-14
Figure 3-10. Search For Event Or Pattern	3-14
Figure 3-11. Search Frame Dialog.....	3-15
Figure 3-12. Search Event Specification Dialog	3-15
Figure 3-13. Search For Pattern.....	3-16
Figure 3-14. Dump Bus Analyzer Frames Dialog.....	3-18



CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

MCUez features target system interfaces that give you the ability to load different target components of an embedded system. This manual introduces the interfaces related to the MMDS0508 Modular Development System for the MC68HC05 and MC68HC08 MCU Families.

The MMDS0508 is an emulator system that provides emulation memory and a bus state analyzer for MCUs with a CPU05 or CPU08. MCUez uses Motorola's MMDS to communicate with a target system.

Using the MMDS interface, an external target system based on a Motorola MCU can download an executable program from the MCUez environment, execute it, and relay the results of the real target system behavior to MCUez.

MCUez fully supervises and monitors the target system's MCU. It also controls CPU activities such as read and write in internal/external memory (even when the CPU is running) and single-step/run/stop processes.

NOTE

When an external MCU is executing code, the memory statistics are not available to the MMDS target component.

1.2 DEFINITIONS, ACRONYMS AND ABBREVIATIONS

DLL Dynamic Link Library: Windows library file used in dynamic linking.

Dynamic Linking Windows process used to link a function call in one module to the actual function in the library module at run time.

MMDS0508 Server The MMDS hardware access library responsible for interfacing across the RS-232 port to the MMDS0508 station.

Modal Dialog Dialog that requires a response before continuing.

MCU Micro Controller Unit

EM

Emulation Module

CHAPTER 2

MMDS0508 TARGET COMPONENT

2.1 INTRODUCTION

This chapter describes how set up communication between MCUez and the MMDS0508 and explains the windows and dialog boxes associated with the process.

2.2 TARGET/SYSTEM INTERFACE

The MMDS0508 box is connected to the RS-232 serial port of your system.

2.2.1 Hardware Connection

Use the serial link cables provided with the MMDS0508 to connect the host computer to the MMDS0508 box (see the following diagram). The host computer is configured as a data terminal, i.e. it sends data on the TxD lead and receives data on the RxD lead (refer to the MMDS0508 hardware manual).

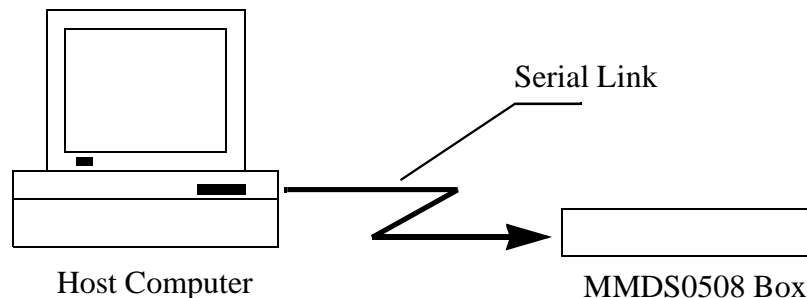


Figure 2-1. Hardware Connection

2.2.2 Loading The MMDS0508 Target

The target component is usually determined by the PROJECT.INI file. To make the MMDS the target, change the “Target=” line in the PROJECT.INI file to “Target=Motosil”. The MotoSIL driver automatically attempts to locate the MMDS. If the driver can not locate the target, an error message appears and informs you that the target is not connected to the expected port. The Communication Configuration dialog also appears. Using the Communication Configuration dialog, you can change the baud rate and communication port parameters. See the Communication Configuration section in this chapter for more details.

You can also load the MMDS0508 target by selecting *Set Target...* from the *Component Menu* (shown below) and choosing MotoSIL from the list of proposed targets.

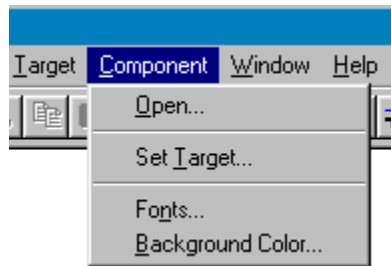


Figure 2-2. Component Menu

After the target is successfully loaded, the *Target Menu* is replaced by the *MMDS0508 Menu*.

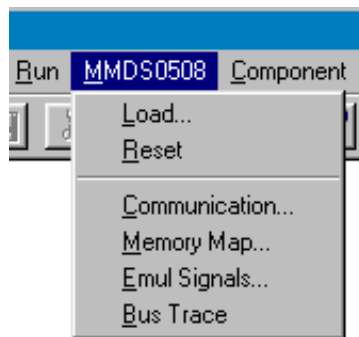


Figure 2-3. Replacing The Target Menu

If the MotoSIL driver does not detect a target, the *MotoSIL* Menu replaces the *Target* Menu:

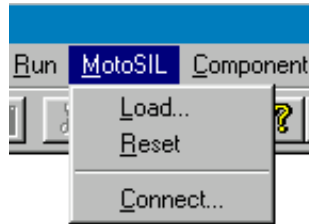


Figure 2-4. MotoSIL Menu

The *MMDS0508* Menu will replace the *MotoSIL* Menu if the MMDS target is successfully located during later attempts.

2.3 CONFIGURATION DIALOG

Ensure the parameters on the host computer are correctly configured and that the serial communication device is set correctly. If the configurations and settings are not correct, communication between MCUEz and the target is not possible.

2.3.1 Communication Configuration

In a general way, the communication between MCUEz and the MMDS is set automatically. If MCUEz does not detect a target, the Communication Device Specification dialog will open. This dialog can also be opened selecting the *MotoSIL* menu and choosing *Connect...*

2.3.2 Communication Device Specification Dialog

If the host and target are not connected or the communication device is not properly indicated, a dialog box, Communications Device Specification, appears:

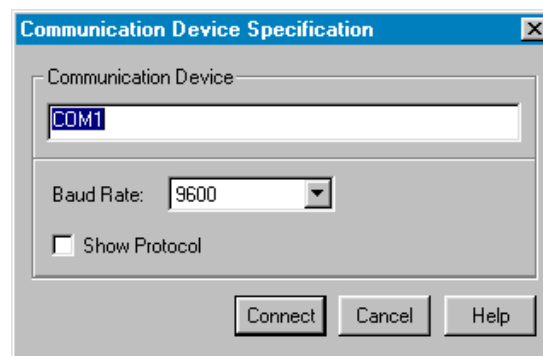


Figure 2-5. Communication Device Dialog

The default device is COM1. To choose another available communication device, enter the device name in the *Communication Device* edit box, scroll for the corresponding *Baud Rate*, select it, and click *Connect*.

After the connection with the chosen communication device is established, the settings for that device are saved for later debug sessions. If the connection fails, a message box will be displayed and a new communication device can be defined. To close the dialog box without attempting a new connection, select *Cancel*.

NOTE

The communication device and baud rate, which are saved through this dialog, override the environment variables BAUDRATE and COMDEV in the default.env file.

2.3.3 Data Format

MCUez uses the data format: 8 data bits, 1 stop bit, no parity, and a variable baud rate. The default baud rate is 9600 baud unless it has been redefined through the Communications Device Specification dialog.

2.4 MCUEZ STATUS BAR FOR THE MMDS

When the MMDS Target Component has been successfully loaded, the MCUez status bar displays specific information:

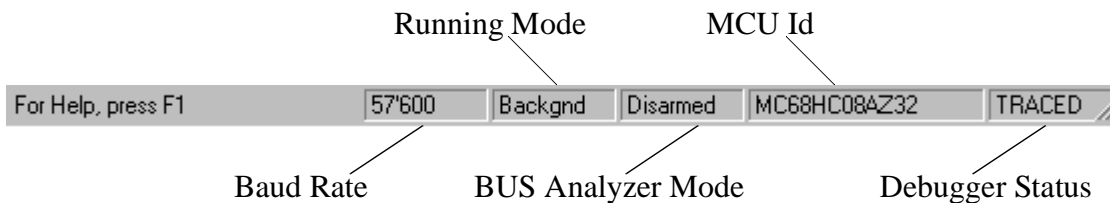


Figure 2-6. MCUez Status Bar

Displayed from left to right are: the baud rate of serial communication, the MCUez running mode, the BUS analyzer mode, the name of the connected MCU (depending on the MCU-Id), and the debugger status.

2.5 MMDS0508 MENU

When the MMDS0508 is successfully set as the target, the *MMDS0508* menu appears (see Loading the MMDS0508 Target in this chapter). The *MMDS0508* menu contains functions specific to the MMDS0508.

2.5.1 MMDS0508 Menu Entries

The functions in the *MMDS0508* menu are specific to the MMDS0508 and are only available with this emulator component. To use an item in the *MMDS0508* menu, select the menu and choose the desired function:

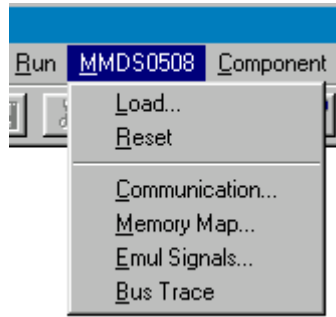


Figure 2-7. MMDS0508 Menu

The *Communication...*, *Memory Map...*, *Emul Signals...*, and *Bus Trace* functions are part of the MMDS0508 Motorola Modular Development System and are supported by libraries that consist of dialog boxes and routines that interface with the debugger and hardware.

2.5.1.1 Communication

The system operates most efficiently when the baud rate of the host computer is at its maximum. To display the Communication Device Specification dialog, select *Communication...* from the *MMDS0508* menu. Select the maximum baud rate your host supports or 115200, the maximum baud rate currently supported. If communication fails, the previous baud rate is used.

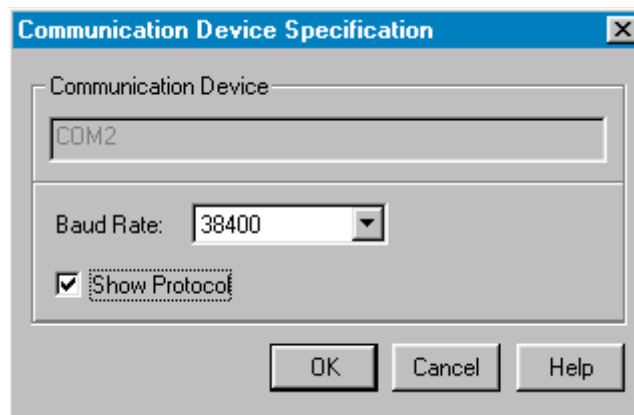


Figure 2-8. Communication Device Specification Dialog

2.8.0.0.1 Baud Rate

The maximum baud rate depends on the speed and the interrupt load of the host computer. The default value is 9600.

2.8.0.0.2 Show Protocol

Check the *Show Protocol* box to display the communication protocol in the Command line Component. Display from the communication protocol results in superfluous output in the in the Command Line component. This feature should only be used for advanced debugging issues.

2.5.1.2 Memory Map

Choose *Memory Map...* from the *MMDS0508* menu to open the Memory Configuration dialog:

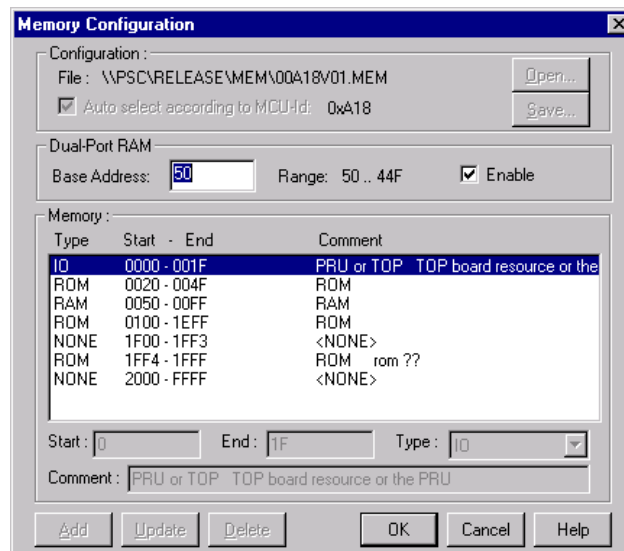


Figure 2-9. Memory Configuration Dialog

2.9.0.0.1 Configuration

Configuration contains the target's memory setup. The target memory setup is automatically loaded if the *Auto select according to MCU-Id* box is checked. MCUEz identifies and sets the memory map through the MCU-Id. To open another configuration, select the *Load...* button. To save modifications to the current configuration, select the *Save...* button.

2.9.0.0.2 About Personality (.MEM) Files

To work properly, the Motosil target has to load the personality file (.MEM file) matching with the connected Emulation Module (EM).

The .MEM file filename is build as follows:

0nnnnVxx.MEM

where 'nnnn' is the four hex digit 'MCU-Id' number of the MCU connected, and 'xx' is a two digit version number.

If this file is not found or is not valid, the 'Configuration Error' dialog box shown below is displayed:

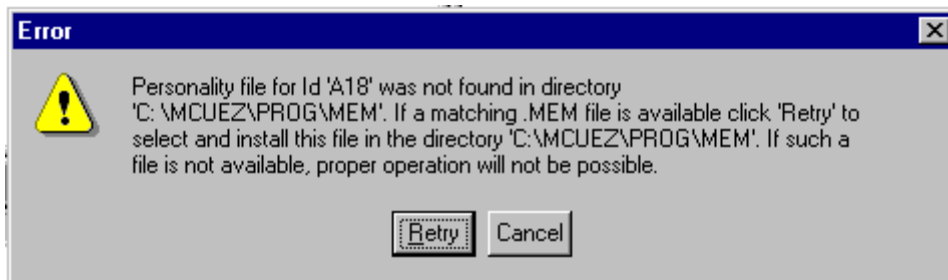


Figure 2-10. Configuration Error Dialog

When choosing 'Cancel', the connection is not established and the 'Communication Device Specification' dialog is opened.

When choosing 'Retry', the 'Open Personality File' shown below is displayed

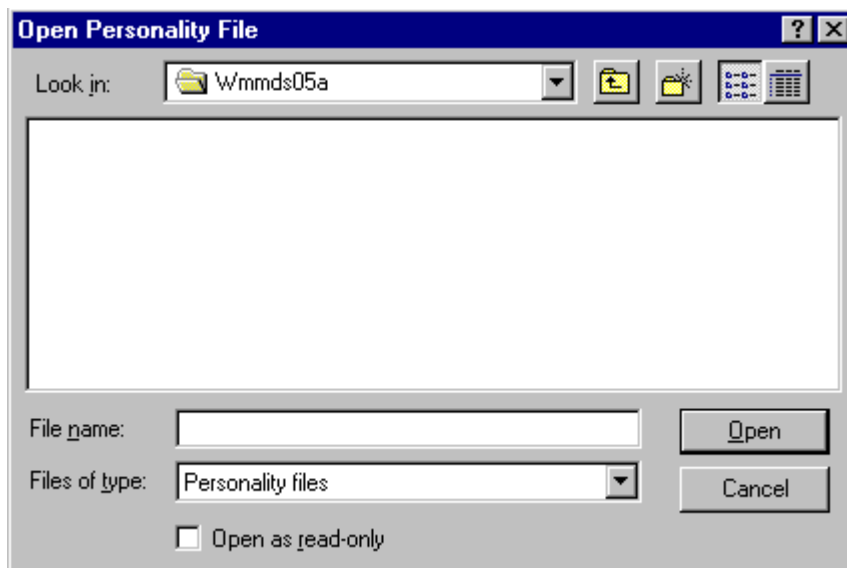


Figure 2-11. Open Personality File Dialog

You can browse to open the required .MEM file.

If the .MEM file that you selected is not valid, an error message box pops up, and then the ‘Configuration Error’ dialog box is opened again.

If the selected .MEM file is valid, it is loaded and copied into the \PROG\MEM directory with ‘V00’ as version number (e.g. 00A18V00.MEM).

NOTE

The ‘Memory Configuration’ dialog displays the current memory map.

When starting MCUEz:

If the ‘Auto Select according MCU-ID’ check box is checked, the default personality file matching with the MCU-ID is automatically loaded. If this check box is not checked, the previous opened or saved memory map file is automatically loaded.

The memory configuration can be modified within this ‘Memory Configuration’ dialog and saved into a memory configuration file when clicking the ‘SAVE’ button .

You can load a different memory configuration file (e.g. that you defined yourself and saved previously) when clicking the ‘LOAD’ button of the ‘Memory Configuration’ dialog.

Also Personality files or any memory configuration files can be loaded with the LOADMAP command line command.

2.11.0.0.1 Dual-Port RAM

Dual-Port RAM allows you to specify the base address and enable “Real-Time Memory”.

To specify the base address, enter the desired value in the *Base Address* edit box. To Enable the “Real-Time Memory”, check the *Enable* check box. The size of the “Real-Time Memory” is frozen to 1 kilobyte.

NOTE

Periodical update mode in the Data or Memory component is only possible for variables or memory positions located in the Dual Port RAM area.

2.11.0.0.2 Memory

Memory allows you to specify the “Real-Time Memory”. The MMDS0508 “Real-Time Memory” consists of dual-ported memory that can be assigned to any valid RAM or ROM memory address. While the MMDS0508 is running, MCUEz can display and modify the “Real-Time Memory”. If a portion of the memory overlays internal MCU I/O, RAM, or EEPROM, that portion can only be displayed, not monitored.

2.5.1.3 Emul Signals

Choose *Emul Signals...* from the *MMDS0508* menu to open the Target Signals dialog shown below:

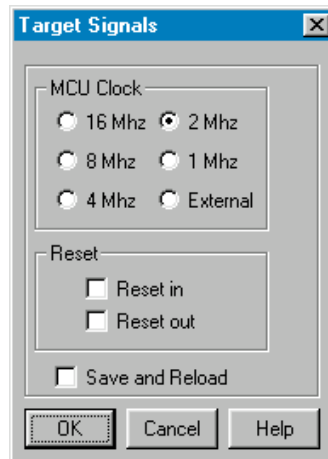


Figure 2-12. Target Signals Dialog

The MMDS0508 emulator signals can be specified through this dialog. When the Target Signals dialog is accessed, the settings are read from the MMDS0508. If you alter the displayed values and select *Ok*, the values are written to the MMDS0508. If you check *Save and Reload*, the configuration is reloaded when the MCUEz debugger is started.

Target Signals dialog can also be used to alter the MCU clock and reset signal connection.

2.12.0.0.1 MCU Clock

MCU Clock allows you to change the MCU clock if the EM is correctly configured (Please refer to your EM manual).

2.12.0.0.2 Reset

Reset allows you to control the reset signal connection with the target system.

2.5.1.4 Bus Trace

Select *Bus Trace* from the *MMDS0508* menu to run the Bus Analyzer. See the *Using The Bus Analyzer* chapter of this document for more details.

2.6 DEFAULT TARGET SETUP

The MMDS target component can be loaded from the *Target* menu or set as a default target in the `project.ini` file, which should be in the working directory.

Example `project.ini` file:

```

[DEFAULTS]
Window0=Source      0   0  50  40
Window1=Assembly   50   0  50  40
Window2=Register   50  40  50  30
Window3=Memory     50  70  50  30
Window4=Data       0   40  50  25
Window5=Command    0   65  50  20
Window6=Module     0   85  50  15
Target=Motosil
[Motorola ESL]
COMDEV=COM2
BAUDRATE=57600
SHOWPROT=0

```

2.6.1 Motorola ESL Parameters

Normally, the *Motorola ESL* parameters are interactively set during installation. The settings are stored in the `project.ini` file and used in the future debugging sessions.

2.6.1.1 COMDEV

The *COMDEV* parameter specifies the communication device to be used between the host and MM0508. COM1 is the default communication device for PCs. The default for UNIX systems is `/dev/ttya`.

For a PC: Any valid communication device (COM1,COM2,etc.).

Example:COMDEV=COM2

For SUN:Any valid communication device (`/dev/ttya`, etc.).

Example:comdev=/dev/ttyb



2.6.1.2 BAUDRATE

BAUDRATE, the rate of serial communication between the target and host systems, is preset to 9600 bauds and may be overwritten by one of the following baud rates:

1200, 2400, 4800, 9600, 19200, 28800, 38400, 57600, or 115200.

Example:BAUDRAUTE=19200

2.6.1.3 SHOWPROT

SHOWPROT determines the display of the communication protocol. The value is set to 0 or 1 (1 to show the communication protocol, 0 to hide it) at the first communication attempt with the target. You can check the *Show Protocol* checkbox in the Communication Device Specification dialog if you want to display the communication protocol in a Command Line window.





CHAPTER 3

BUS ANALYZER

3.1 INTRODUCTION

Except for the emulation of the target system MCU, the most important feature that can be offered by a microcontroller development tool is an instrument to analyze program execution activities on the target MCU bus. This analysis allows the user to determine what is occurring in a system without actually affecting it.

NOTE

The Bus analyzer in the *MMDS0508* shows the logical state of the MCU bus. It does not show signal hold and setup times.

3.1.1 Trace Modes

To gather pertinent bus data, the Bus analyzer can be operated in different modes. The various trace modes of the Bus analyzer make it possible to choose the actions to take when a certain pattern (event) or sequence of patterns appears on the bus. To trigger the Bus analyzer, define the desired bus state(s) as terms and select the desired sequence of terms as a trigger event.

3.1.2 Trace Buffer

The trace buffer contains 8,192 entries, or frames, each of which stores 96 bits. When the Bus analyzer is activated and the emulator is running, a frame of the selected type is strobed into the trace buffer for each bus cycle. When the event(s) to trigger the analyzer has occurred in the specified sequence, only the specified number of additional frames are stored.

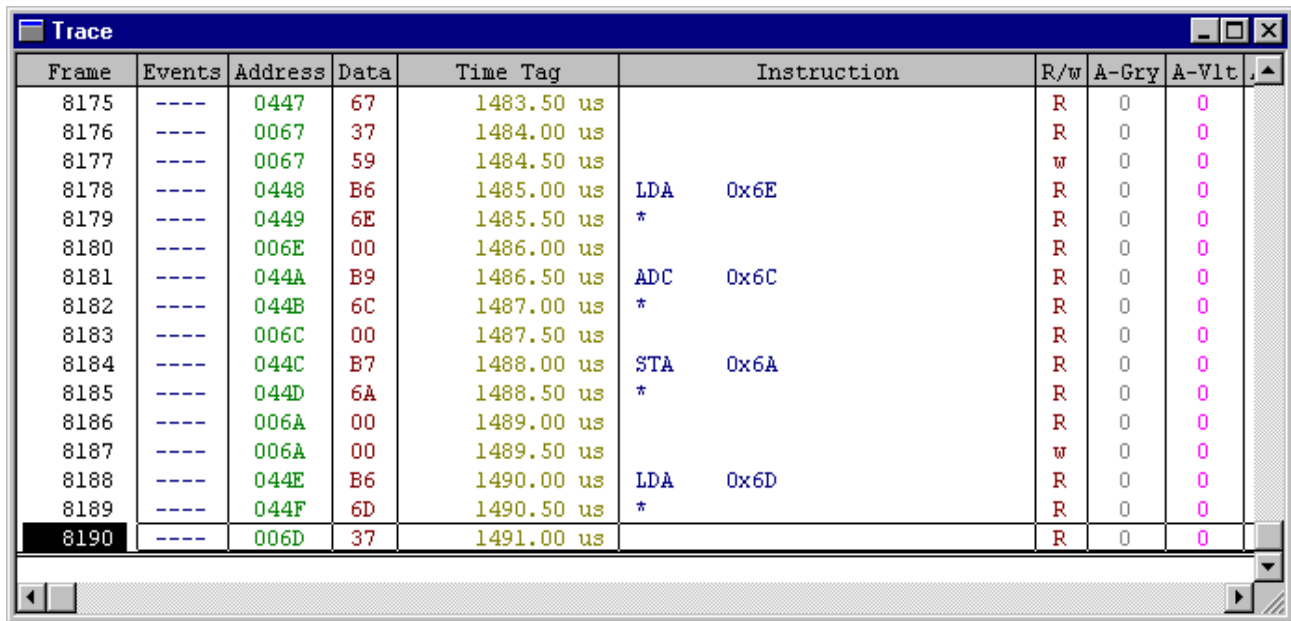
3.1.3 Textual Or Graphical

The Bus analyzer can display the data either textually or graphically. Use the horizontal and vertical scroll bars, as in other Windows applications, to move around the display.

3.2 USING THE BUS ANALYZER

The Bus analyzer functions like any MCUEz component, and has its own menu to control the features of the MMDS0508 Bus analyzer hardware. The Bus Analyzer window is also called Trace. Indeed the Bus Analyzer matches with the Trace Component and can also be loaded by choosing *Open... Trace* from the *Component* menu. Choose the *MMDS0508* menu and select *Bus Trace* to open the Trace window or the Bus Analyzer.

From the user's perspective, using the Bus analyzer requires three steps. These steps are, defining the data collection parameters, collecting the desired bus data (running the program), and viewing the collected data.



Frame	Events	Address	Data	Time Tag	Instruction	R/w	A-Gry	A-Vlt
8175	----	0447	67	1483.50 us		R	0	0
8176	----	0067	37	1484.00 us		R	0	0
8177	----	0067	59	1484.50 us		w	0	0
8178	----	0448	B6	1485.00 us	LDA 0x6E	R	0	0
8179	----	0449	6E	1485.50 us	*	R	0	0
8180	----	006E	00	1486.00 us		R	0	0
8181	----	044A	B9	1486.50 us	ADC 0x6C	R	0	0
8182	----	044B	6C	1487.00 us	*	R	0	0
8183	----	006C	00	1487.50 us		R	0	0
8184	----	044C	B7	1488.00 us	STA 0x6A	R	0	0
8185	----	044D	6A	1488.50 us	*	R	0	0
8186	----	006A	00	1489.00 us		R	0	0
8187	----	006A	00	1489.50 us		w	0	0
8188	----	044E	B6	1490.00 us	LDA 0x6D	R	0	0
8189	----	044F	6D	1490.50 us	*	R	0	0
8190	----	006D	37	1491.00 us		R	0	0

Figure 3-1. Trace Window

The Bus analyzer contains setup pages for these functions:

- Triggers
- Pattern
- Sequencer
- Time Tag Clock

These setup pages are shown as tabs in the *Bus Analyzer Configuration* dialog box.

The *Bus Analyzer Configuration* dialog box allows you to define symbolic names for address values. When you change setup pages in the dialog box, the address and symbolic name values must match. If there is an inconsistency, you will be prompted to:

- Use the address and remove the symbol.

- Replace the address with the symbol address.
- Fix the inconsistency by returning to the dialog box and clicking the symbol button.

3.2.1 Trigger Setup

The sequencer mode requires one or more terms to define the trigger events. To define these events (triggers) select *Trace | Setup...* and the Bus analyzer dialog box is displayed as shown below.

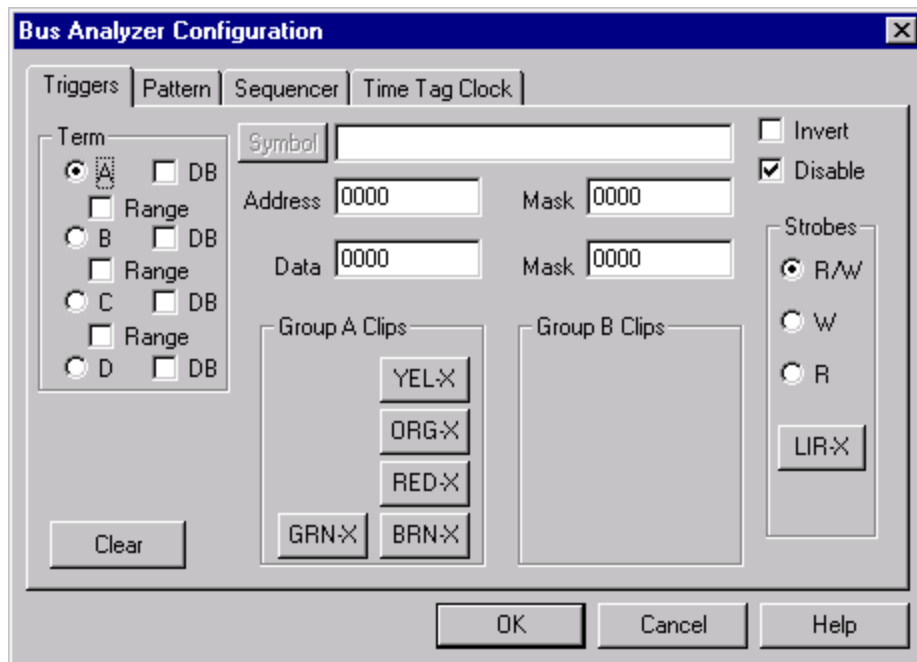


Figure 3-2. Bus Analyzer Configuration Dialog

Use the *Triggers* tab to define a trigger in terms of from one to four events. For each term, you may define the read-write actions and clips.

Note that you can use these terms as ranged or non-ranged triggers. When using ranges, you can use A and B together or C and D together to give two different ranges, or B and C together for one range.

The address masks and data masks can be edited to provide a “don’t care” on any address or data signal. For example, if a trigger is set up for an address of 0x1000, but the corresponding mask is 0xFFFE, then the trigger will be qualified when address is 0x1000 or 0x1001.

Terms Specify the term to be displayed for editing. The term is used to identify an event (A frame which satisfies the term is called an event).

Address Specify the trigger address .

-
-
- Data** Specify the trigger data .
- Strobes** Specify the state of *R/W* on which to trigger.
- Group A Clips** Toggle to specify each logic clip as High, Low or Don't Care.
- The clips buttons show the Group A logic clips with their respective colors.
- Logic clips are used to trace the signals in your target system as it runs under the control of the software. When a trigger occurs, a breakpoint is provided that shows you the states of significant logic signals before, at, and after the breakpoint.
- Invert** To specify that a term, previously defined as triggered within a range, is to be triggered outside that range, select *Invert*.
- Disable** To disable the trigger for a specific term, select *Disable*.
- Clear** To clear all the changes on the *Bus Analyzer Configuration* press *Clear*.

3.2.2 Sequencer Setup

To choose one of the recording modes, select the menu item *Trace | Setup...* which pops up the *Bus Analyzer Configuration* dialog box and then click on the tab labelled *Sequencer* (see figure below).

In Non-triggered modes (continuous and counted modes), the collection does not stop until the analyzer is terminated (Analyze stops when execution of the application stops or when the bus analyzer is disarmed).

In triggered modes, the defined terms are used to track the occurrence of events, and the collection of data is stopped based on some combination of the events. Each term has an associated Pre Event count which will count events for that term. The sequencer condition will use that term when the count is reached.

An event is a pattern of bus signals (which can include addresses and data values) to which the analyzer is connected by logic clips and miscellaneous MCU signals. An event can also be the negation of a defined pattern. Each signal can be defined as asserted, negated, or ignored (don't care).

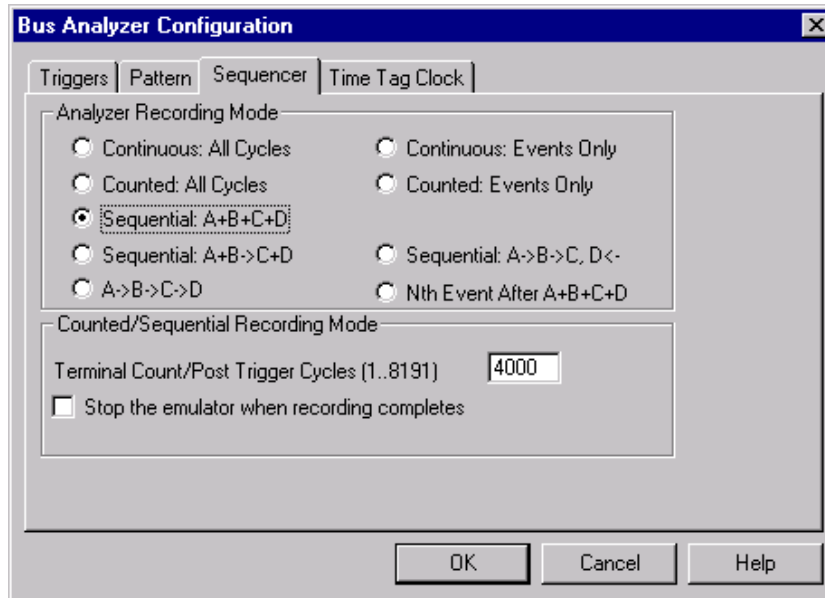


Figure 3-3. Bus Analyzer Configuration Dialog (Sequencer Tab)

Click on one of the nine option buttons to select the recording mode:

Non-Triggered Modes:

Continuous: All Cycles Provides a real-time, non-invasive trace of MCU bus activities. The Bus analyzer stores all cycles. When used in this way, the Bus analyzer continuously records bus data in the trace buffer whenever the user target system is being emulated. No qualifications for triggering or halting data collection can be defined.

Continuous: Events Only Stores all events. Events are defined by the terms set up in the Triggers dialog box.

Counted Modes:

Counted: All Cycles Configures the Bus analyzer to record a specified number of cycles. The user can trace a specified number of cycles of all types.

Counted: Events Only Stores all events until the specified count is reached, then collection stops.

Triggered/Sequential Modes:**Sequential: A + B + C + D**

Select this option for the bus analyzer to start recording after either event A or B or C or D. Storing data terminates after the specified number of post-trigger cycles.

Sequential: A + B -> C + D

Select this option to start the bus analyzer on either of two events (event A or B) followed by either of two other events (event C or D). The sequencer can be simplified to involve fewer than four events by leaving unused events defined with all signals ignored. Data storage ends after the specified number of post-trigger cycles.

Sequential: A -> B -> C -> D

Select this option to start the bus analyzer after four events, A then B then C then D, occurring in sequence. Storing data terminates after specified number of post-trigger cycles.

Sequential: A -> B -> C, D<-

Select this option to start the bus analyzer on cycles of 3 events in sequence, A then B then C, provided that the fourth event, D remains false. When the fourth event, D occurs, the sequence starts again with the first event. This sequence can be used as a three-event sequence by leaving event D defined with all signals ignored. Storing data terminates after specified number of post-trigger cycles.

Nth Event After A+B+C+D

Select this option for the bus analyzer to begin storing data that matches event A, event B, event C, and event D, until Nth event is stored. Then the next 4096 cycles are stored. This allows for a maximum of 4096 events to be stored (including the Nth event), followed by 4096 cycles.

For all Triggered/Sequential modes, data storage ends after the specified number of post-trigger cycles.

Counted/Sequential Recording Mode:**Terminal Count/Post Trigger Cycles (1..8191)**

Enter a number in the range of 1 to 8191. If one of the counted modes was selected, this number is the count of bus cycles to trace. If one of the sequential modes was selected, this is the number of post-trigger cycles to trace. If one of the continuous recording modes was selected, this value is ignored.

Stop the emulator when recording completes

The stop of the collection of bus cycles does not stop the emulation unless this check box is checked. Click on the check box *Stop the emulator when recording completes* to enable or disable this feature. Then click the *OK* button to apply your choice and close the dialog box.

NOTE

The terminal count or **post trigger cycles** are valid only for counted or sequential modes. For a counted mode, this field specifies the number of cycles to be stored. For a sequential mode, this field specifies the number of cycles to be stored after the trigger sequence occurs.

3.2.3 Time Tag Clock Setup

The Bus analyzer uses a clock for the time tag, which provides a time reference value in every frame of the trace buffer. To change the clock, select the menu entry *Trace | Setup...* and then click on the tab labelled *Time Tag Clock*.

Use this dialog box to specify the clock frequency for time stamping frames in the Bus analyzer.

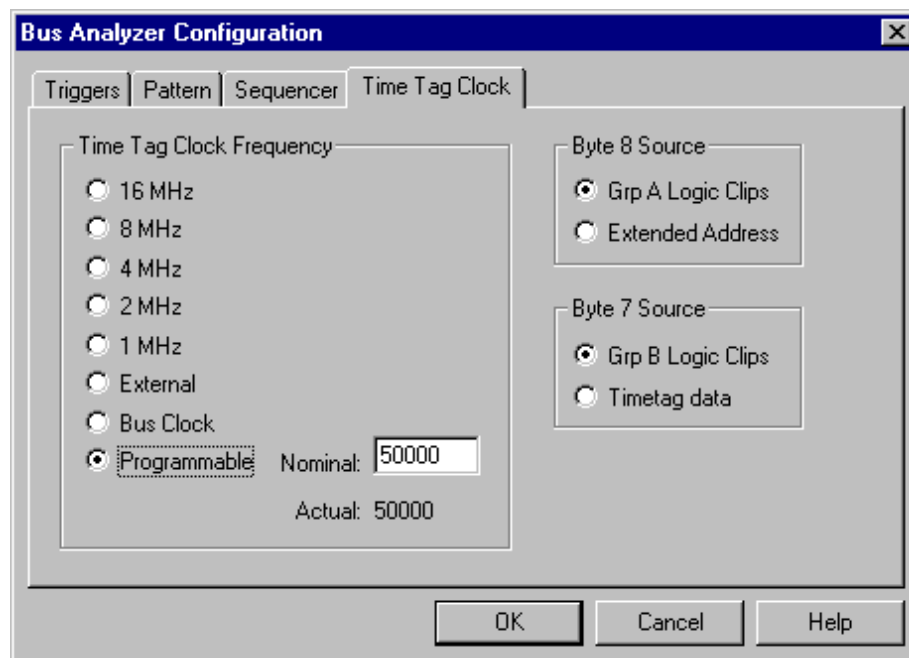


Figure 3-4. Bus Analyzer Configuration Dialog (Time Tag Clock Tab)

Clock Frequency In the Clock Frequency area, select one clock frequency to be used; either an internal oscillator at 1, 2, 4, 8, or 16 Mhz, a bus Clock or a Programmable clock. In general, the faster clock rates provide higher resolution and are appropriate for faster emulator clock rates.

The programmable clock has to be programmed over a range of clock rates from 50 to 50,000 Hz. Entering a *Nominal* value causes the closest *Actual* value to be calculated and used. If the nominal value is an integer that is a quotient of dividing 500,000 Hz by an integer, the nominal value is also the actual value. If this is not the case, the nominal value is rounded up to the next valid frequency and that frequency is displayed as the actual value.

Click on the *OK* button to apply your choice.

Close the dialog box.

3.3 COLLECTING DATA

When the emulator and the Bus analyzer have been initialized, and the logic clips in the defined events that are used (if any) have been connected, emulation can begin.

3.3.1 Arming The Analyzer

To collect data the Bus analyzer has to be armed. Choose the menu entry *Trace | Arm Analyzer* to arm the Bus analyzer. After the Arm Analyzer entry is clicked, the entry changes to Disarm Analyzer.

3.3.2 Disarming The Analyzer

To stop the analyzer, select the entry *Trace | Disarm Analyzer*. After the Disarm Analyzer entry is clicked, the entry changes to Arm Analyzer.

The status of the Bus analyzer is shown in the status bar of the main window.

3.3.3 Start Emulation

To begin emulation use the command *Run | Continue* in MCUEz or any other command that starts program execution. Emulation continues until it is stopped by either a breakpoint by the Bus analyzer or manually. When the emulation stops, the data in the Bus analyzer window is updated (see below).

3.3.4 Status Bar

When the Bus analyzer is activated, the Bus analyzer status shown on the status bar at the bottom of the main window changes to **Armed**, to indicate that the Bus analyzer is ready to collect data. When emulation begins, the MCU status shown on the status bar changes to **RUNNING**. Whenever the Bus analyzer collects data, the Bus analyzer state changes to **ANALYZING**.



3.3.5 Halt Data Collection

To manually halt data collection, the user must select the submenu *Trace | Disarm Analyzer*.

Disarming the analyzer stops data collection without stopping emulation.

3.3.6 Halt Emulation

The stop halts data collection and emulation, but leaves the analyzer armed. When data collection has ceased, the Bus analyzer state changes to DISARMED. Data collection is resumed when emulation starts again.

3.3.7 Recording Bus Data

When data collection begins, the Bus analyzer starts recording bus data into the buffer. When the end of the buffer is reached, the Bus analyzer wraps around to the first frame in the buffer and continues recording. This process continues until the Bus analyzer is manually disarmed, the specified number of frames have been recorded, or the specified number of post-trigger cycles following the trigger event, have been recorded.

3.3.8 Trigger Event

When a trigger event is detected, the event cycle is latched into the buffer and the Bus analyzer continues recording data until the specified number of post-trigger cycles has been collected. When the required post-trigger cycles have been collected, the Bus analyzer stops collecting data, and the status changes to DISARMED.

With the first post-trigger cycle, the Bus analyzer automatically begins searching for the next trigger event.

If other events occur while collecting the post-trigger cycles for the first event, the Bus analyzer marks those event cycles while continuing to collect the post-trigger cycles.

3.4 VIEWING COLLECTED DATA

View Cycles

When the desired cycles have been collected, the Bus analyzer software provides a variety of methods to view those cycles. At this point, the trace buffer contains up to 8192 of the most recently stored frames. The highest numbered frames are usually the post-trigger frames. The lower-numbered frames are those frames stored before the trigger occurred, if any were stored.

When the Bus analyzer is deactivated (not in ANALYZING state), the data is displayed in the *Trace* window.

Textual, Graphical or Instructions

To specify, select one in the *Trace* popup menu to set the display of the bus data.

NOTE

If the sequencer is set up *not* to collect all frames (e.g. Event only modes) the instructions may not be displayed.

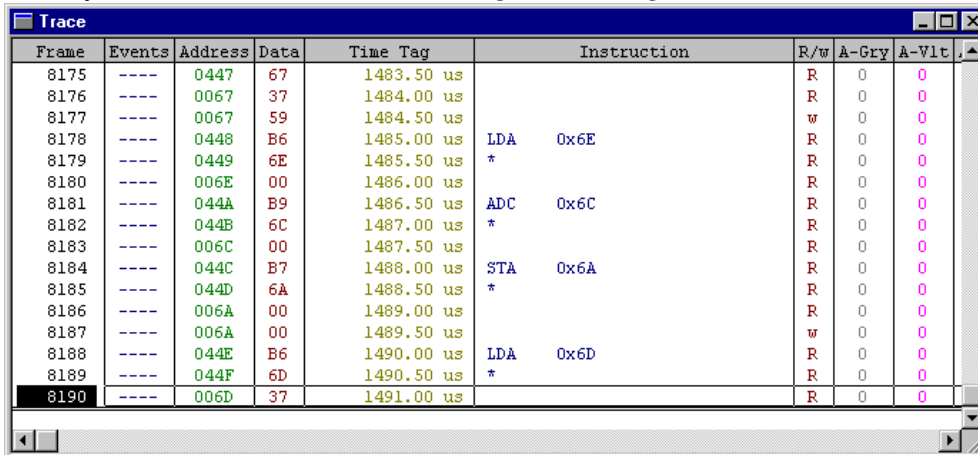
The contents of the Bus analyzer can be displayed as text or as a graphic. In the text representation, all frames or just the frames where an instruction starts, can be displayed. The user can also in the *Trace | Items...* dialog select the items which have to be displayed.

3.4.1 Textual Display

If the *Textual* format is chosen the software displays all the frames of the trace buffer contents in a textual form, as shown below. Use the scroll bar at the right to display other frames. Use the scroll bar at the bottom to display other signals.

The marker consists of two horizontal lines, which are used to mark a specific frame. The frame number of the marked frame is inverted. A line of the display corresponds to the data of a frame.

The Trace window contains the following basic items described below. It is possible to add or remove any item. Please see section *Adding / Removing Items in the Trace Window*.



Frame	Events	Address	Data	Time Tag	Instruction	R/w	A-Gry	A-Vlt
8175	----	0447	67	1483.50 us		R	0	0
8176	----	0067	37	1484.00 us		R	0	0
8177	----	0067	59	1484.50 us		w	0	0
8178	----	0448	B6	1485.00 us	LDA 0x6E	R	0	0
8179	----	0449	6E	1485.50 us	*	R	0	0
8180	----	006E	00	1486.00 us		R	0	0
8181	----	044A	B9	1486.50 us	ADC 0x6C	R	0	0
8182	----	044B	6C	1487.00 us	*	R	0	0
8183	----	006C	00	1487.50 us		R	0	0
8184	----	044C	B7	1488.00 us	STA 0x6A	R	0	0
8185	----	044D	6A	1488.50 us	*	R	0	0
8186	----	006A	00	1489.00 us		R	0	0
8187	----	006A	00	1489.50 us		w	0	0
8188	----	044E	B6	1490.00 us	LDA 0x6D	R	0	0
8189	----	044F	6D	1490.50 us	*	R	0	0
8190	----	006D	37	1491.00 us		R	0	0

Figure 3-5. Trace Window Elements

Frame The cycle or the frame number is 0 - 8191, which identifies the frame. The most recently stored frame is frame 8191 (or the highest-numbered frame that has been stored when less than 8192 frames have been stored).

Events The defined Trigger identifier is A, B, C, or D. When the corresponding data in the frame matches the data defined for an event, the identifier of that event is displayed in the event column, along with identifiers of events that also match the data.

Address The address bus value is stored in the frame; displayed as four hexadecimal digits. This is the address on the address bus when the frame is strobed into the trace buffer.



- Data** The data bus value is stored in the frame; displayed as two hexadecimal digits. This is the value on the data bus when the frame is strobed into the trace buffer.
- Time Tag** Contains a representation of the time tag count stored when the frame is strobed into the trace buffer. When the bus clock is the time tag clock, the time tag is a number of time tag clock cycles. When a clock other than the bus clock is chosen, the time tag is displayed as a number of seconds or fractions of seconds.
- Control Signals** The remaining fields in the *Trace* dialog box contain the values of the control signals or of the two groups of the logic clips.

3.4.2 Instructions Only Display

If the *Instructions* format is chosen the software only displays those frames of the trace buffer contents in a text format where an instruction starts. The *Instructions* format is not possible in the *Events Only* recording mode.

3.4.3 Graphical Display

The figures 3-6 and 3-7 below shows the graphical display of the Bus analyzer data. The graphical representation of the Bus analyzer data gives a better overview than the textual one. Switching between the different display formats can easily be done at any time by selecting the menu entries in the *Trace* menu. The leftmost sections of the figure display a textual description of the current frame with information about frame number, events, values on the data and address bus, time tag value, etc.

In the graphical display it is possible to 'zoom in' or 'zoom out' either to see more details or to get a better general view. *Zoom in / Zoom out* are available in the *Trace* popup menu.

To zoom in select *Trace | Zoom In* or type 'I' on the keyboard.

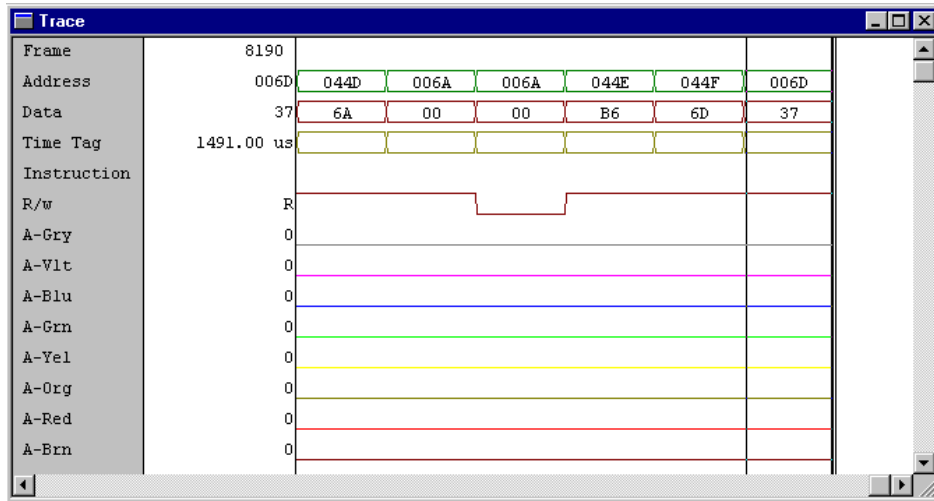


Figure 3-6. Trace Window - Graphical Display

The figure above shows the graphical display of the Bus analyzer data which is zoomed in and therefore shows more detail.

To zoom out select *Trace | Zoom Out* or type 'O' on the keyboard.

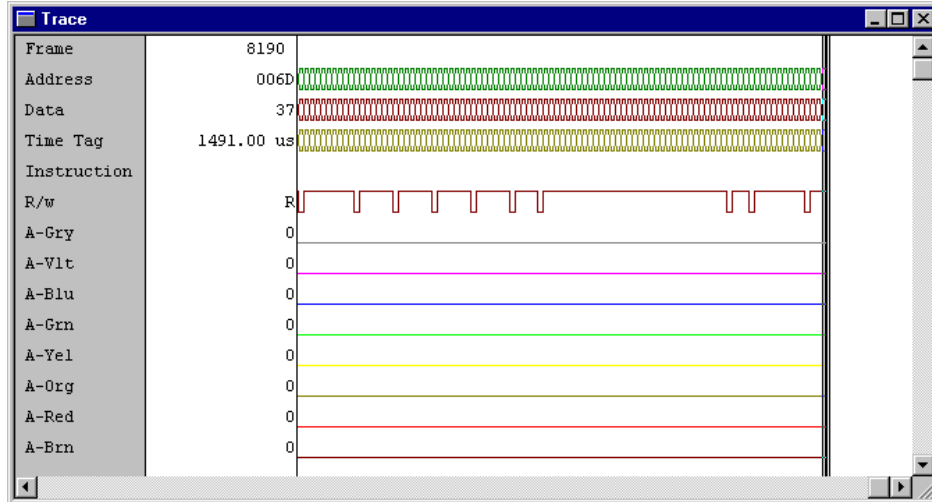


Figure 3-7. Trace Window - Zoom Out

Dragging the marker over the display of the Bus analyzer data may also generate updates in component windows, e.g. the source and assembly windows. Thus the Bus analyzer data can be viewed and thoroughly examined in the continually updated windows as the marker is moved with the help of the cursor over the graphic or text display of the Bus analyzer data. In *Graphical* mode, the vertical bar indicates the position of the marker and displays all the information of the current frame. In *Textual* and *Instructions* modes, the horizontal bar indicates the position of the marker and displays the information for the current trace buffer.

3.4.4 Time Mesasuring

To reference a frame with a tag value of zero, hold the mouse arrow over an entry and click the right mouse button. The *Trace* menu appears. Select *Set Time Base* and the time tag values will be displayed relative to the bus cycle of the frame.

3.4.5 ShowLocation

To activate the *ShowLocation* selection for a frame, select the frame, click the right mouse button to activate the *Trace* menu, and select *ShowLocation*. The marker can be positioned with a left mouse click. The source and assembly windows are automatically updated.

3.5 ADD / REMOVE ITEMS IN THE TRACE WINDOW

The *Trace* window can be supplied with new items. In the default configuration, the following items are displayed in the window: *Frame*, *Events*, *Address*, *Data*, *Time Tag*, *Instruction* and *R/W*. It is possible to add new items (predefined and given in a list box in this dialog) and to remove them. It is possible to permute items in text or graphic mode simply by dragging them into the window.

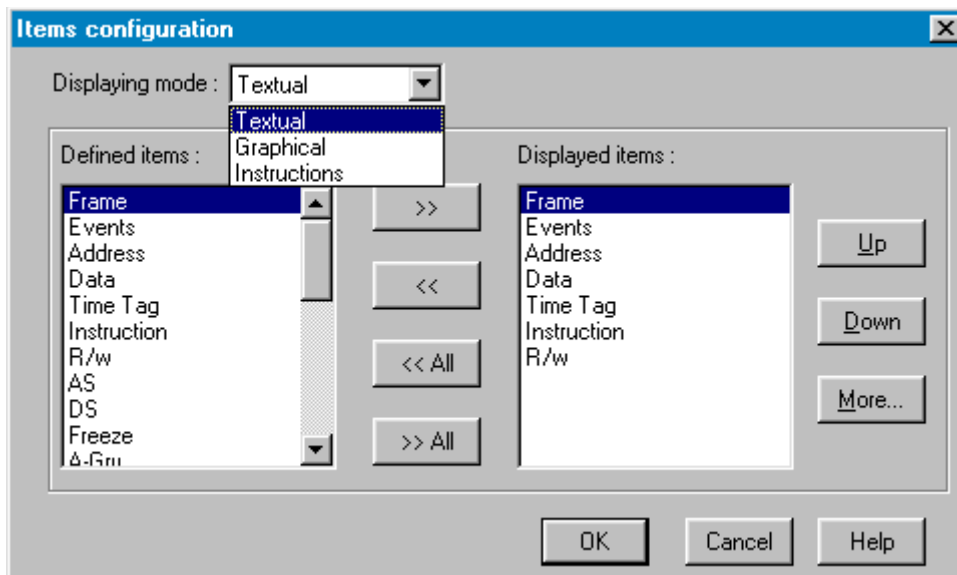


Figure 3-8. Items Configuration Dialog

To edit an item, to set its color or to give a specific name, select *More*.

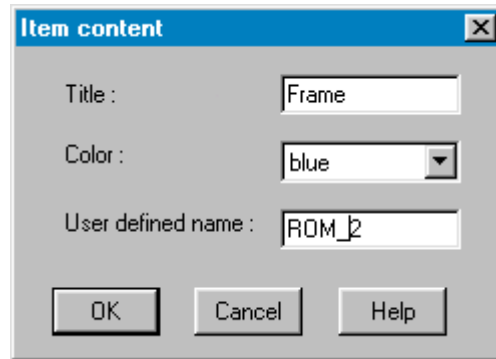


Figure 3-9. Item Content Dialog

3.6 SCROLLING THE DISPLAY

Scrolling can be done in different ways. The scrollbars can be used as in Windows applications or the display can be scrolled to a specific trace buffer frame. It is also possible to search for one or more of the events that are defined to trigger the Bus analyzer or to search for a specific pattern (see below).

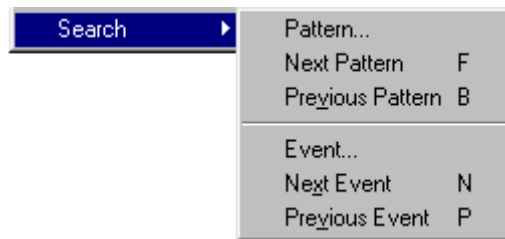


Figure 3-10. Search For Event Or Pattern

3.6.1 Search For A Frame

Select *Trace | Go to Frame...* to search for an occurrence of a frame and enter the desired frame number. If a frame with this number is found, the frame is selected. If the selected frame is not visible, the Bus analyzer window is scrolled to make the frame visible. If the frame number is bigger than the last frame stored in the trace buffer, the Bus Analyzer scrolls to display the last frame available in the trace buffer.

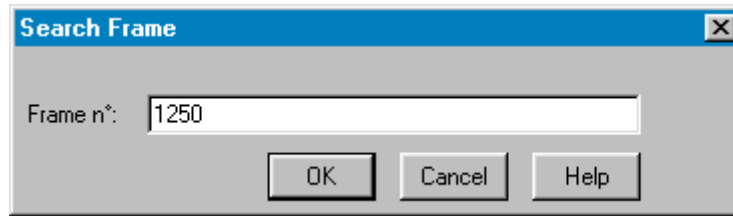


Figure 3-11. Search Frame Dialog

3.6.2 Search For Events

To search for an occurrence of an event select one or more events in the *Search Event Specification* box.

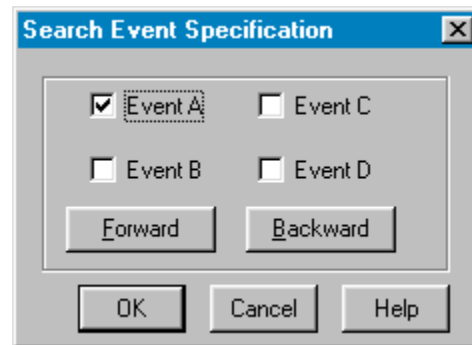


Figure 3-12. Search Event Specification Dialog

OK Button If you press the OK button, the selected event(s) is(are) stored and the dialog box closes.

Forward To search forward select *Forward* and the search event is set to the selected event and a search is done to find the next frame which matches the specified event.

Backward To search backward select *Backward* and the search event is set to the selected event and a search is done to find the previous frame which matches the specified event.

3.6.3 Next Event

To search for the next occurrence of the selected events, open the *Trace* pup-up menu and select *Search | Next Event*. This command searches forward from the selected frame to find the next frame which matches the specified event. The Next Event command can also be activated without opening the *Trace* menu by pressing the key *N* on the keyboard, without activating the *Trace* menu. If a frame is found, this frame is selected. If the selected frame is not visible, the Bus analyzer window scrolls to make the frame visible. If no frame is found, an error message appears in an error dialog box.

3.6.4 Previous Event

Open the *Trace* pop-up menu and select *Search | Previous Event* to search for the previous occurrence of the event. This command searches backwards from the selected frame to find a previous frame which matches the specified event. The Previous Event command can also be activated by pressing the key *P* on the keyboard, without activating the *Trace* menu. If a frame is found, this frame is selected. If the selected frame is not visible, the Bus analyzer window is scrolled to make the frame visible. If no frame can be found, an error message is shown in an error dialog box.

3.6.5 Search For A Pattern

To search for a frame with a specific pattern, define the search pattern, to find all stored bus cycles that match the pattern. The pattern consists of an address, a data word, logic clips and four miscellaneous signals. Select *Trace | Search|Pattern...*

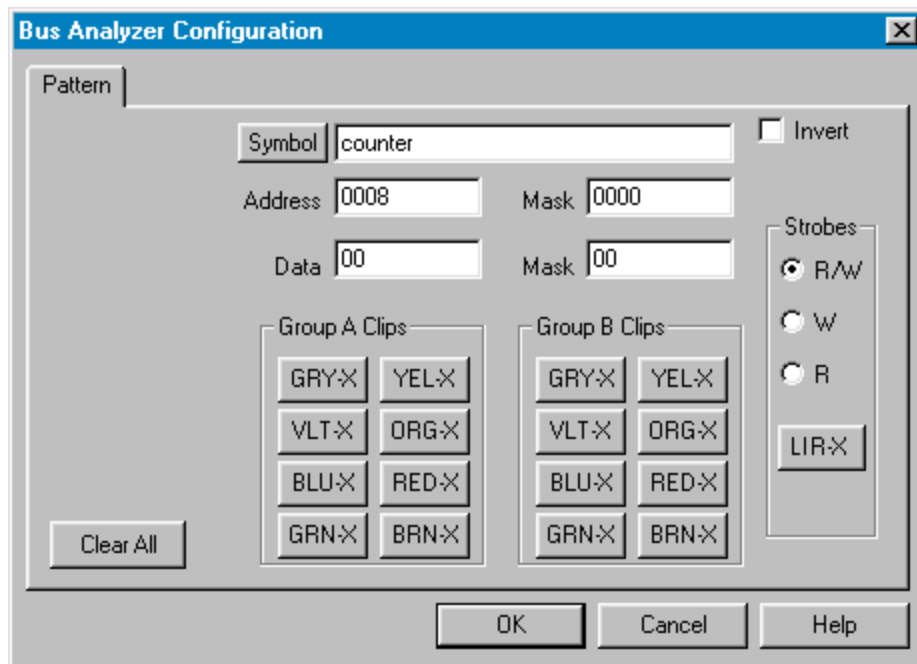


Figure 3-13. Search For Pattern

Within the above dialog box, the search pattern can be defined in the same way as it is defined in the Trigger Specification Dialog Box.

The Bus analyzer will look at specific collected cycles, match the specific frame that shows the pattern and display this area in the window of the Debugger.

Address Specify the *Address* that should be matched.

Data Specify the *Data* value that should be matched.



Strobes Specify the state of *R/W* and *LIR-X* that should be matched.

Group A Clips Toggle to specify each logic clip as *High*, *Low* or *Don't Care*.

The clips buttons show the Group A and B logic clips with their respective colors.

Logic clips are used to trace the signals in your target system; the way they run under the control of the software. When a trigger occurs, a breakpoint is provided that shows the states of significant logic signals before, at, and after the breakpoint. That can be used as a pattern to match.

Invert To match any frame without the defined pattern select *Invert*.

OK Button To store the specified values, select *OK* then close the box.

Cancel Button To remove the dialog box without any parameter being changed, select *Cancel*.

Next Pattern To search for the next occurrence of the pattern select the entry *Trace | Search | Next Pattern*. If the pattern is not found, an error message is shown in an error dialog box.

Previous Pattern Select *Trace | Search | Previous Pattern* to search for the previous occurrence of the pattern. If the pattern is not found, an error message is shown in an error dialog box.

3.7 DUMPING THE BUS ANALYZER DATA TO A FILE

To dump the Bus analyzer data to a file, open the *Trace* pop-up menu and select *Dump...*

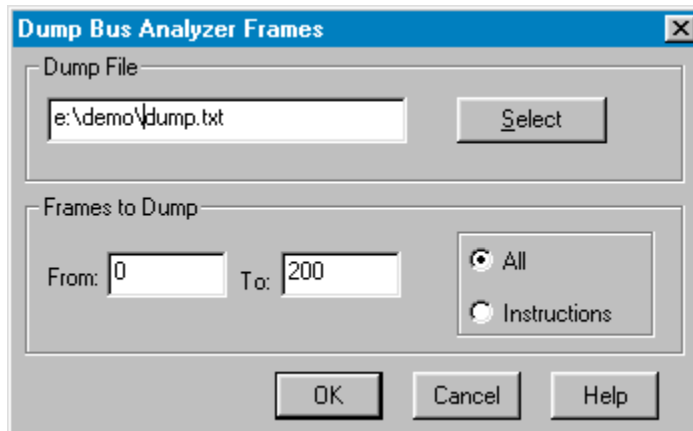


Figure 3-14. Dump Bus Analyzer Frames Dialog

- Dump File** The group box *Dump File* contains an edit field where the name of the file to which the data is to be written, can be entered.

- Select** When the button *Select* is pressed, a standard file select box is opened and the selected file is displayed in the edit field.

- Frames to Dump** The elements in the group box *Frames to Dump* allow you to select the frames that will be dumped to the file.

 Just the frames within the range defined by the two edit fields *From:* and *To:* are dumped to the file.

- All** To dump all the frames within the selected range to the file, select *All*.

- Instructions** To dump just the frames where an instruction starts (and instruction is in the selected range), select *Instructions*.

- OK Button** When the *OK* button is pressed, the dialog box is removed and the Bus analyzer data is dumped to the file.

- Cancel Button** When the *Cancel* button is pressed, the dialog box is removed without any data being dumped to a file.

CHAPTER 4

MMDS COMMANDS

4.1 INTRODUCTION

This section describes MMDS-specific commands. MMDS-specific commands are typed in the Command Line component or inserted into a command file.

For further details about commands, refer to the *MCUez Debugger User's Manual*.

4.2 BAUD RATE COMMAND

BAUD

Description:	baud rate.
Syntax:	BAUD [rate]
	rate : Specifies the new baud rate, and must be an integer constant with one of the following specific values (decimal): 1200, 2400, 4800, 9600, 19200, 28800, 38400, 57600, 115200.

Description:

The BAUD command sets the baud rate for communication between the system controller and the host computer. For maximum performance, the baud rate should be set as high as the host computer can accommodate. The maximum rate is 115200; the default baud rate is 9600.

If no baud rate is entered, the command displays the Communications Baud Rate Specification dialog window for interactive selection of the baud rate. If the system does not support a baud rate, a red error message, "Error: <baud rate> is not a supported baud rate." is displayed in the Command Line window.

Example:

```
BAUD 57600
```

Changes the communication baud rate to 57600.

4.3 TRIGGER COMMANDS

CT

Description:	clear trigger.
Syntax:	CT <list> *
	list : A list of trigger identifiers. *: All triggers (A, B, C and D).

Description:

The CT command clears the values of specified bus analyzer triggers (events), A, B, C and/or D. The command also disables the cleared triggers. The trigger values are set by the Set Trigger (ST) command, and the bus analyzer configuration dialog windows. Triggers are enabled by the Trigger Enable (TE) command; Triggers are disabled by the Trigger Disable (TD) command.

Examples:

```
CT A B
```

Clears triggers A and B.

```
CT *
```

Clears all triggers.

When clearing a trigger which is part of a range, the second trigger in the range is cleared at the same time.

Example:

If a range is defined between triggers C and D, CT C clears both trigger C and D.

ST

Description:	set trigger.
Syntax:	ST [<id> [[!]] [(<address> <address range> ,) [(<data> <data range> ,) [(<clips> ,) [LIR= (X H L)]]]] [;R ;W ;RW] [;D]]]

Description:

The ST command sets the value of one of the four bus analyzer triggers. If value is set, or if only the triggered id is entered, the command interpreter displays the Trigger Specification dialog window, with which the user sets a trigger value interactively.

id Specifies the trigger id of the analyzer trigger, A, B, C, or D.

! The inversion operator, which applies to the entire trigger, as defined. When **!** is specified, and an address, data value, and clip value are specified, the trigger occurs when the address is not the specified value, or the data value is not the specified value, or the clip value is not the specified value. When **!** is specified and a range is specified, the trigger occurs at values outside the range and also at the lowest value in the range.

address An address to which a trigger is set. The address is specified with an address constant, as follows:

<address>[:<mask>]

When a mask is entered, only the bits of the address that correspond to ones in the mask are used in the comparison.

address range A range of addresses within which a trigger is set. The address range can be specified with a start and end address constant, or with a starting address and a length value, as follows:

<start-address>[:<mask>][.<end-address>]

or

<start-address>[:<mask>][:length]

When a mask is entered, only the bits of the address that correspond to one bits (1s) in the mask are used in the comparison. When a length and mask are entered, the length is added to the start address and the mask is applied to the start address and sum to obtain the end address.

, The comma indicates that the address, address range, data, data range, clips, or clips range has been omitted. The omitted item is ignored in the trigger.

data A data value that defines the trigger. The value is specified as follows:

<value>[:<mask>]

When a mask is entered, only the bits of the value that correspond to ones in the mask are used in the comparison.

data-range A range of data values that defines the trigger. The data range can be specified with a start value and an end value, or with a starting value and a length, as follows:

<start-value>[:<mask>][.<end-value>]

or

<start-value>[:<mask>][:<length>]

When a mask is entered, only the bits of the value that correspond to one bits (1s) in the mask are used in the comparison. When a length and a mask are entered, the length is added to the start value; the mask is applied to the start value and to “start-value + length” to obtain the end address.

clips A15-bit value that defines logic clip signals on the MMDS0508 analyzer for the trigger. The value is specified as follows:

<clips>[:<mask>]

When a mask is entered, only the bits of the value that correspond to ones in the mask are used in the comparison. For example, the code 0x1F:0x1F, sets all clips of Term A to H. If a mask is not specified, the value 0x1F will be assigned by default.

Each trigger clip line has three options:

- H - High
- L - Low
- X - Don't Care

The bits of the clips and mask words are as follows:

Bit:	Group A-	Signal:
0		BRN
1		RED
2		ORG
3		YEL
4		GRN
6		LIR (active low)

- ;R** Trigger on a read bus cycle only.
- ;W** Trigger on a write bus cycle only.
- ;RW** Trigger on a read or write bus cycle.
- ;D** Disable trigger; i.e., set trigger value and disable trigger.
- LIR** Trigger on a specific value for LIR signal.



- LIR=H triggers when LIR is high.
- LIR=L triggers when LIR is low.
- ; LIR=X triggers when LIR is high or low.

When you specify a range for one of the address or data options, the other option is also seen as a range. For example, the command `STC 8 20..40` is interpreted as `STC 8..8 20..40`, and the command `STC 8..9 20` is interpreted as `STC 8..9 20..20`.

If neither R nor W is specified, the trigger defaults to a read/write bus cycle.

You can set the LIR signal with the clips (bit 6) or the LIR option.

The address, data, or clips will be ignored if the matching mask is specified as zero.

If a bit is set in both the clips and masks, the trigger is set to high (-H). If a bit is not set in clips and is set in masks, the trigger is set to low (-L). If a bit is not set in mask, the trigger does not depend on the state of the clip.

Examples:

```
STA 0x1000
```

Sets analyzer trigger A to match accesses at address \$1000.

```
STB , 4
```

Sets analyzer triggers B to match accesses with a value of 4, at any address.

```
STC 8 20..40
```

Sets analyzer triggers C and D to match accesses using a value from 20 to 40 at address 8.

```
STC 8..10 20
```

Sets analyzer triggers C and D to match accesses using value 20 at an address from 8 to 10.

NOTE

Bits set to 0 are “Don’t Care” bits. Bits set to 1 are bits that expect the value for Address, Data, or Clip. Bits set to 0 are in a position that accepts 0 or 1. Bits set to 1 are in a position that only accepts values from the address fields. For the code: `Address 0xC000 Mask 0xFFFFC`, the trigger is detected for `0xC000` and `0xC001`, `0xC002`, or `0xC003` is loaded in the address bus. For the code: `Address 0x00B0 Mask 0x00F0`, the trigger is detected when an address in the range `[0xB0..0xBF]` is loaded.

TD

Description:	trigger disable.
Syntax:	TD <list> *
	<p>list: A list of triggers to disable; each trigger is either A, B, C or D, separated from following triggers by a comma or space character.</p> <p>*: All triggers (A, B, C and D).</p>

Description:

The TD command disables specified triggers. Triggers are set by the Set Trigger (ST) command, and are enabled by the Trigger Enable (TE) command. Another related command, the Trigger Clear (CT) command, clears all triggers.

Examples:

TD A,B
Disables triggers A and B.

TD *
Disables all triggers.

TE

Description:	trigger enable.
Syntax:	TE <list> *
	<p>list: A list of triggers to enable; each trigger is either A, B, C or D, separated from following triggers by a comma or a space character.</p> <p>*: All triggers (A, B, C and D).</p>

Description:

The TE command enables specified triggers. Triggers are set by the Set Trigger (ST) command, and are disabled by the Trigger Disable (TD) command. Another related command, the Trigger Clear (CT) command, clears all triggers.

Examples:

TE A B
Enables triggers A and B.

TE *
Enables all triggers.

4.4 BUS ANALYZER COMMANDS

ARM

Description:	arm bus analyzer.
Syntax:	ARM

Description:

The ARM command arms the bus analyzer. When armed, the analyzer records bus cycles when the emulator is executing user code. Arming the analyzer clears the current contents of the trace buffer. Use the disarm analyzer (DARM) command to disarm the analyzer.

DARM

Description:	disarm bus analyzer.
Syntax:	DARM

Description:

DARM disarms the bus analyzer. When disarmed, the analyzer does not record bus cycles. If the bus analyzer is disarmed, this command does nothing. ARM arms the analyzer.

GE

Description:	go to event.
Syntax:	GE <list> * [;B]
	;B : Specifies backward search. When this option is omitted, a forward search is performed. list : A list of events (A , B , C and D) separated by a space character or a comma.

Description:

The GE command searches forward or backward in the analyzer trace buffer for a frame that matches the search event defined with this command. For a forward search, the search begins at the frame immediately following the current frame; a backward search begins at the frame immediately preceding the current frame. This is a specific bus analyzer command and can not be used if the bus analyzer is not opened.

Example:

```
GE A B
```

Moves the cursor to the next frame which contains the event A and/or B.

GF

Description:	go to frame.
Syntax:	GF <frame>
	frame: Specifies a frame number in the range of 1..8191. The frame is always specified as a decimal number, regardless of the current default number base.

Description:

GF moves the cursor to a specified trace buffer frame. When the number of the specified frame is greater than the number of frames currently stored in the buffer, the command moves to the last frame. This is a specific bus analyzer command and can not be used if the bus analyzer is not opened.

Examples:

```
GF 4096
```

Moves the cursor to frame 4096.

```
GF 32768
```

Moves the cursor to the last frame in the buffer.

GP

Description:	Go to Analyzer Search Pattern.
Syntax:	GP [;B]
	;B: Specifies a backward search. When this option is omitted, a forward search is performed.

Description:

GP searches forward or backward in the analyzer trace buffer for a frame that matches the search pattern defined with the SP command. A forward search, begins at the frame following the current frame. A backward search begins at the frame preceding the current frame. When the search finds a frame that matches the search pattern, the command positions the line cursor on the matching frame in the center of the screen, vertically. When a matching frame is not found, the line cursor is not moved. When no search pattern is defined, the command searches for any pattern, i.e. the line cursor moves to the next line (or preceding line). This is a specific bus analyzer command and can not be used if the bus analyzer is not opened.

Examples:

```
GP
```

Searches forward for the next frame that matches the search pattern.

```
GP ;B
```

Searches backward for the previous frame that matches the search pattern.



LT

Description:	log trace.
Syntax:	LT [<range>]
	range: Specifies a range of frames to be copied. If range is omitted, all frames in the trace buffer are copied. The default number base for range is decimal.

Description:

The LT command copies the content of the bus analyzer trace buffer to the log file. The trace buffer is logged in the current view format. An LF command to initiate logging must be executed before entering an LT command. The target must be stopped to execute an LT command. This is a specific bus analyzer command and can not be used if the bus analyzer is not opened.

Examples:

```
LF logfile  
Open the logging file.
```

```
LT  
Copy all the trace buffer to the logging file.
```

```
NOLF  
Close the logging file.
```

SC

Description:	set analyzer clock.
Syntax:	SC [<timetag> [<frequency>]]
	<p>timetag: Specifies one of the sources of the time tag clock:</p> <p>OSC1MHZ: Selects the 1 Mhz oscillator.</p> <p>OSC2MHZ: Selects the 2 Mhz oscillator.</p> <p>OSC4MHZ: Selects the 4 Mhz oscillator.</p> <p>OSC8MHZ: Selects the 8 Mhz oscillator.</p> <p>OSC16MHZ: Selects the 16 Mhz oscillator.</p> <p>EXT: Selects the external clock.</p> <p>BUS: Selects the bus clock.</p> <p>PROGRAM: Selects the programmable clock. When the programmable clock is selected and the <frequency> parameter is omitted, the default frequency is 50 Hz.</p> <p>frequency: Specifies the time tag clock frequency for the programmable clock, which is in the range of 50 Hz to 50 kHz. The frequency is entered as a decimal hertz value. The programmable clock source has a fundamental frequency of 500,000 Hz, and the frequency should be the quotient of division of 500,000 Hz by an integer. Thus, 50000 is valid, but 49000 is invalid; an invalid frequency is rounded up to the next higher frequency, 50000 in this case.</p>

Description:

The SC command sets the source for the time tag clock, which increments the trace buffer time tag. If no parameters are specified, the command interpreter displays the Bus Analyzer Configuration dialog window. From the Bus Analyzer Configuration dialog, select the Time Tag Clock to reach the Clock Specification dialog and set the clock sources interactively.

Examples:

```
SC PROGRAM 100
```

Sets the programmable clock, running at 100Hz, as the time clock source.

```
SC OSC8MHZ
```

Sets the 8 Mhz oscillator as the time tag clock source.

SP

Description:	set analyzer search pattern.
Syntax:	SP [!] [(<address> ,) [(<data> ,) [(<clips> ,) [LIR = (X L H)]]]] [; R ; W ; RW]

Description:

The SP command defines a pattern for searching the bus analyzer trace buffer. The go to search pattern (GP) command performs the search for the pattern defined by the most recent SP command. If no parameter is specified for the command, the Bus Analyzer Search Pattern Specification dialog window is displayed for defining the pattern interactively.

! The inversion operator, which applies to a specified single address or data value. When **!** is specified, the command sets a pattern on addresses and/or data values other than the specified address or data value.

address An address to which a pattern is set. The address is specified with a constant:

`address [:mask]`

When a mask is entered, only the bits corresponding to one bits (1s) in the mask are effective in the pattern.

, The comma indicates that the address, data, or clips byte has been omitted. The omitted item matches any value of the omitted type (don't care).

data Data value that defines the trigger. The value is specified as follows:

`value [:mask]`

When a mask is entered, only the bits corresponding to one bits (1s) in the mask are effective in the pattern.

clips 16-bit value that defines logic clip signals on the for the trigger. The value is specified as follows:

`clips [:mask]`

When a mask is entered, only the bits corresponding to one bits (1s) in the mask are effective in the pattern.

The bits of the clips and mask words are as follows:

Bit:		Signal:	Bit:		Signal:
0	Group A -	BRN	8	Group B -	BRN
1		RED	9		RED
2		ORG	10		ORG
3		YEL	11		YEL
4		GRN	12		GRN
5		BLU	13		BLU
6		LIR	14		VLT
7		GRY	15		GRY

- ;R** Search for a read bus cycle only.
- ;W** Search for a write bus cycle only.
- ;RW** Trigger on a read or write bus cycle.
- ;D** Disable trigger; i.e., set trigger value and disable trigger.
- LIR** Trigger on a specific value for LIR signal.
LIR=H triggers when LIR is high.
LIR=L triggers when LIR is low.
LIR=X triggers when LIR is high or low.

If a bit is set in both “clips” and “masks”, the pattern is detected when the bit is high (-H). If a bit is set in “masks” but not in “clips”, the pattern is detected when the bit is low (-L). If a bit is not set in “masks”, the pattern does not depend on the state of the clip.

Examples:

```
SP 0x1000
```

Sets analyzer search pattern to search for accesses at address \$1000.

```
SP , 4
```

Sets analyzer search pattern to search for accesses with a data value of 4, at any address.

```
SP 8 20
```

Sets analyzer search pattern to search for accesses using a value of 20 at address 8.

NOTE

Bits set to 0 are “Don’t Care” bits. Bits set to 1 are bits that expect the value for Address, Data, or Clip. Bits set to 0 accept 0 or 1. Bits set to 1 only accept values from address fields. For Address 0xC000 Mask 0xFFFFC, the search pattern is detected for 0xC000 and 0xC001, 0xC002, or 0xC003 is loaded in the address bus. For Address 0x00B0 Mask 0x00F0, the search pattern is detected when an address in the range [0x00B0..0xFFBF] is loaded.

SQ

Description:	set sequencer.
Syntax:	SQ [<mode> [<count>] [;S]]
	<p>mode: Selects the sequencer mode, one of the following:</p> <p>ALL Records all bus cycles.</p> <p>EVENT Records events only.</p> <p>SEQ0 Sequential recording mode "A+B+C+D".</p> <p>SEQ1 Sequential recording mode "A+B->C+D".</p> <p>SEQ2 Sequential recording mode "A->B->C D<-".</p> <p>SEQ3 Sequential recording mode "A->B->C ->D".</p> <p>SEQ4 <i>n</i>th event after "A+B+C+D".</p> <p>count: Specifies terminal count for the ALL and EVENT modes as a decimal value. Causes count frames of the appropriate type to be recorded. Then the analyzer stops recording and is disarmed. If count is omitted, the analyzer records continuously whenever the emulator is running. Specifies post-trigger count (decimal) for the sequential modes. Causes count bus cycles to be recorded after the trigger point. If count is omitted, the default is 1. If <count> is not included after ALL, the frames for all cycles are recorded. If <count> is not included after EVENT, all the events are recorded.</p> <p>;S: Specifies stopping the emulator when recording stops. Thus the analyzer can be used as a sequenced breakpoint machine.</p>

Description:

The SQ command sets the analyzer sequencer mode. If no parameters are specified, the command interpreter displays the Bus Analyzer Configuration Dialog, so you can select the Sequencer Setup dialog window and program the sequencer interactively. The Sequencer Setup dialog window can also be invoked from the Setup menu.

Examples:

```
SQ ALL 100
```

Specifies 100 bus cycles. After 100 cycles, the analyzer disarms and stops recording.

```
SQ EVENT 10 ;S
```

Specifies recording 10 event cycles, then stopping the emulator.

TT

Description:	display time tag difference.
Syntax:	TT [<sframe> [<eframe>]]
	sframe: The starting frame number. eframe: The ending frame number. When eframe is omitted, the end frame in the trace buffer is used in calculating the difference.

Description:

The TT command displays the difference between the time tags in the two trace frames of the analyzer display. When frame numbers are not entered, the command displays the difference between the beginning and ending frames.

Examples:

TT

Displays the difference between the beginning and ending frames in the trace buffer.

TT 80

Displays the difference between frame 80 and the ending frame in the trace buffer.

TT 10 40

Displays the difference between frames 10 and 40 in the trace buffer.

VA

Description:	analyzer view.
Syntax:	VA [MODE=(MIX INS GRAPH)]
	MODE=: When followed by one of the three following keywords, selects the mode of the bus analyzer window display. MIX: Mixed view mode. INS: Instruction view mode. GRAPH: Graphical view mode.

Description:

The VA command selects the display format of the analyzer trace buffer. This is a specific bus analyzer command and can not be used if the bus analyzer is not opened.

Example:

VA MODE=MIX

Selects mixed view mode.

4.5 TARGET SIGNAL EMULATION COMMANDS

SIG

Description:	set emulator signals.
Syntax:	SIG [[ENABLE] <signal> {<signal>}] [DISABLE <signal> {<signal>}]
	<p>signal: The signal to be enabled or disabled. Available signals are RESETIN and RESETOUT.</p> <p>ENABLE: Connect the signal from the target system.</p> <p>DISABLE: Disconnect the signal from the target system.</p>

Description:

The **SIG** command enables or disables control signals from the target MCU, and controls emulation. If a signal or list of signals is entered with neither **ENABLE** nor **DISABLE**, the signal(s) are enabled.

Example:

```
SIG ENABLE RESETIN
```

Enables the 'reset in' signal from the target system.

4.6 RESET COMMANDS

RESET

Description:	reset target MCU.
Syntax:	reset [GO STOP]
	<p>GO: Resets the MCU and does a Go from Reset.</p> <p>STOP: Resets the MCU and stops (default).</p>

Description:

The **RESET** command resets the target MCU.

Examples:

```
Reset Go
```

Resets the MCU and does a GO from Reset.

```
Reset
```

Resets the MCU and stops (default setting).

4.7 PROTOCOL COMMANDS

PROTOCOL

Description:	Display communication protocol between the server and the debugger in the Command Line component Window.
Syntax:	PROTOCOL [ON OFF]
	ON : Protocol displayed in the command line window (default value). OFF : Protocol is not displayed in the command line window or logged in the log file.

Description:

The PROTOCOL command allows user to display or not the communication protocol between the debugger and the server in the command line window. If no parameter is specified, the default is ON.