

## VRM USER'S GUIDE

### INTRODUCTION

VRM continuously listens to both the host and console ports for commands. It executes whatever it sees and understands. VRM echoes (to the console port) everything it receives on the console port. Since VRM assigns no meaning to spaces, line feeds, and carriage returns, these can be used to format console input.

The host port is intended to be used primarily for downloading; normal console commands can be sent over the host port to effect storage into memory. VRM echoes the console input stream in the console output stream, but does not echo the host input stream (since echoing might take so long that subsequent host-input-stream commands would be missed).

Comments can be inserted in the host input stream to be echoed in the console output stream. These comments are not executed. Such comments begin with a "!" in the host input stream, and end with a line-feed character.

Upper- and lower-case characters are equivalent in VRM commands.

VRM has a rotating accumulator 4 bytes long. Any valid hex digit is pushed into the accumulator on the right, causing one hex digit to fall out on the left.

VRM also has an address register, loaded from the accumulator by command. Various commands use the address register as a parameter.

VRM normally intercepts traps and prints the trap number and other critical information. In the case of a BERR trap, VRM prints the contents of the on-board error register.

In this document a "\$" preceding a number signifies hexadecimal numbers, a "byte" is an 8 bit quantity, a "word" is a 16 bit quantity, and a "longword" is a 32 bit quantity.

## SWITCH SETTINGS

The eight switches on the CPU board have meaning to VRM at RESET time, and when initializing the map.

The OFF position represents "true", or "1", and the ON position represents "false", or "0".

Switch	Bit	Meaning
8	0	1 means autoboot 0 means no autoboot
7	1	?
6	2	1 means do an XALLT command before anything else
5	3	0 means the board has a small (4MBy) map 1 means the board has a big (16MBy) map
4	4	0 means low Multibus memory does not exist 1 means low Multibus memory exists

VRM will take the CPU board out of boot state at RESET time iff low Multibus memory exists.

## SINGLE-KEYSTROKE VRM COMMANDS

### - Store Byte

The low-order byte in the rotating accumulator is stored at the logical address which is currently in the address register.

### = Store Word

The low-order word in the rotating accumulator is stored at the logical address which is currently in the address register. If that address is odd, VRM will print a ? and store nothing.

**L Load Address Register**

The long-word in the rotating accumulator is loaded into the address register, then the rotating accumulator is set to zero.

**N Display Next Byte**

The address register is incremented, and then the byte pointed to by the address register is read and displayed.

**P Display Previous Byte**

The address register is decremented, and then the byte pointed to by the address register is read and displayed.

**T Display This Byte**

The byte pointed to by the address register is read and displayed.

**J Jump**

The user trap vectors are copied to the trap-vector locations (\$0..3FF) iff the CPU board is not in boot state, then the user stack pointer, CPU registers, CPU status, on-board context register, and on board status register are restored from the monitor save area in local RAM, and control is transferred to the address in the address register.

**Z Zero Rotating Accumulator**

The rotating accumulator is set to zero.

**( Display Previous BAB Buffer Entry**

The BAB buffer pointer is decremented, then the corresponding BAB buffer entry is displayed.

**) Display Next BAB Buffer Entry**

The BAB buffer pointer is incremented, then the corresponding BAB buffer entry is displayed.

\* Display This BAB Buffer Entry

The BAB buffer entry corresponding to the current BAB buffer pointer is displayed.

<break> Step to Next Baud Rate

### MENU COMMANDS

- ? Print Main Menu
- X?. Print Menu of Basic Extended Commands
- X?TST. Print Menu of Diagnostic Commands
- X?BAB. Print Menu of Bus Analyzer Board Commands
- X?ECM. Print Menu of Error Correcting Memory Commands
- X?DK. Print Menu of Disk Commands
- X?TP. Print Menu of Tape Commands
- X?RF. Print Menu of Rimfire Disk/Tape Controller Commands

### BASIC EXTENDED COMMANDS

The character "X" initiates extended-command mode, and the character "." terminates it. Only the last four characters typed are interpreted as the body of the extended-command name, so corrections can be made by typing additional characters. If VRM does not understand the extended-command name, it will execute nothing and print a "?".

XMV. Initialize Monitor Trap Vectors

1KBy is copied from the bottom of on-board EPROM to the bottom of logical address space. The bottom 1KBy of on-board EPROM contains trap vectors which trap to VRM. The XMV command is automatically executed at RESET time iff the "Multibus-memory-exists" switch is set.

XIMAP. Initialize Memory Map

XLSPE. Load Scratch-Page Entry

XBOOT. Boot Versabug and UNIX

You will be asked for a boot device. Primary stands for the primary boot block on your disk, and is the one you'll almost always be using. The other options are for booting if the primary area is corrupt. The next prompt will ask for the startup mode. Auto means it will boot all the way to multi-user (asking a few questions along the way.) Parms means it will ask you which UNIX to boot and bring that UNIX up single user. Generally you'll want to boot "rim45(0,6)unix". From single user UNIX type control D to start multi-user UNIX.

XBDL. Begin Down-Load from CPU Host Port

XEDL. End Down-Load from CPU Host Port

#### DIAGNOSTIC COMMANDS

Diagnostics below \$200 are executed by the XALLT. command, and at RESET time. The remaining diagnostics must be executed individually.

Whenever a diagnostic executes, VRM will attempt to light the red LED and print an "F" if it fails, and will attempt to light the green LED and print a "P" if it passes.

Parameters can be delivered to a diagnostic which requires them by typing L commands before the test name. Each L command stacks an additional parameter.

XLLAT. Loop on Logical Address (write and read)

XLRT. Execute Local RAM Diagnostic (destroying save area)

XMEMT. Execute Memory-Test Diagnostic

use 20000 as the starting address and xy0000 as the ending address. Where:

x= number of memory boards/2 (throw away the fraction)

y=8 iff number of boards is odd

y=0 iff number of boards is even

XECMT. Test Every Error Correcting Memory Board Using Signature Analysis

XONET. Execute One Diagnostic

One diagnostic is executed. The name of the diagnostic is taken from the address register, and the repetition count is taken from the rotating accumulator.

XALLT. Execute "All" Diagnostics

All the diagnostics with test numbers less than \$200 are executed sequentially. The sequence of tests is repeated a number of times taken from the rotating accumulator. The XALLT. command is automatically executed at RESET time iff the "execute diagnostics" switch is true. Diagnostics with test numbers greater or equal to \$200 either require parameters or are not safe to execute at RESET time.

DIAGNOSTIC TEST NUMBERS

0 Check Local RAM

Local RAM is checked using a random pattern and its complement. The test is destructive.

1 Check Context Register

All bits in the context register are checked. The test is non-destructive.

2 Check Switches

The switches are not allowed to be all zeroes. This is checked.

3 Check Segment Map

All locations in the segment map are checked using a random pattern and its complement. Either a big map or a small map is checked, depending upon the switch settings. After checking, the segment map is reinitialized to the identity map.

4 Check Page Map

All locations in the page map are checked using a random pattern and its complement. Either a big map or a small map is checked, depending upon the switch settings. After checking, the segment map is reinitialized to the identity map.

## 5 Check Timer

An internal location in the timer chip is checked using a random pattern and its complement.

## 6 Check UARTs

For each UART, an internal location is checked using a random pattern and its complement.

## 203 Check Status Register

The on-board status register is checked using a random pattern and its complement. The test is non-destructive.

**BUS ANALYZER BOARD COMMANDS**

## XIBAO. Initialize BAB Origin to Default

The BAB origin (stored in local RAM) is initialized to its default value (\$3E0000). The BAB origin can be changed by using the XLBAO command. The XIBAO command is automatically executed at RESET time.

## XLBAO. Set Arbitrary BAB Origin

The BAB origin (stored in local RAM) is set to the value in the rotating accumulator.

## XLBP. Load Value into BAB Buffer Pointer

The buffer pointer in the BAB is set to the value in the low-order 12 bits of the rotating accumulator.

## XDBP. Display BAB Buffer Pointer

The BAB buffer pointer is displayed.

## XBBA. Begin Recording All Bus Cycles

The BAB is set to record all Multibus cycles by setting the four enable bits in the BAB status register. The upper status register bits are not affected.

## XEBA. End Recording Bus Cycles

The BAB is set to record no Multibus cycles by resetting the four enable bits in the BAB status register. The upper status register bits are not affected.

## ERROR CORRECTING MEMORY COMMANDS

- XDES. Display Status of Every Error Correcting Memory Board
- XIECM. Initialize Every Error Correcting Memory Board

## DISK COMMANDS

- XSDUN. Set Disk Unit Number  
  
VRM will prompt for the number you want as the new default disk unit number. VRM initially defaults to disk 0.
- XDDUN. Display Disk Unit Number
- XDSTA. Print Disk Status (from parameter block)
- XDNOP. Do Disk No-op (and return resulting status)
- XDPB. Print Disk Parameter Block
- XDREC. Print Disk Record
- XDUP. Spin Up Disk Drive
- XDDN. Spin Down Disk Drive
- XMAPD. Map Out Defective Track
- XDR. Read From Disk
- XSEEK. Disk Seek
- XRID. Read Next Sector ID on Current Cylinder/Head
- XDRST. Reset Disk Drive
- XDCMD. Do Disk Command (using existing parameter block)



## TAPE COMMANDS

- XTSTA. Print Tape Status (from parameter block)
- XTNOP. Do Tape No-op (and return the resulting status)
- XTPB. Print Tape Parameter Block
- XREW. Rewind Tape
- XBKUP. Backup Disk to Tape

VRM will ask you for start and end cylinders. The start cylinder for the system area is 0 and the end cylinder is AC (hex) for a 35 megabyte disk system. The start cylinder for the user area on a 35 Mby system is AD (hex). A 0 will mean the end of 35 Mby drive if entered as the end cylinder. 20C (hex) is the last cylinder on a 35 Mby drive. (Cylinder numbers of the file system are subject to change) To backup a 70 Mby drive go from 0 to 202 (hex) on one tape then repeat with 203 to 3F0 (hex). A 2400 ft. reel of tape will hold about 40 Mby. If you have more than one disk and you want to "XBKUP." a disk other than disk 0, you will have to change to default disk unit number with the "XSDUN." (set disk unit number) VRM command. Note also that there is a "XDDUN." (display disk unit number) VRM command.

- XRSTR. Restore Disk from Tape

This prompts for start and end cylinders just like "XBKUP." above. The same cylinder numbers as used in the "XBKUP." should be used.

- XTR. Read from Tape
- XTW. Write to Tape

VRM will prompt for a "Starting Bus Address" Enter a memory address (hex) It will then prompt for an "Ending Bus Address" Enter another memory address (hex). "Default Buffer Size" will appear. 0 defaults to 4K bytes, anything else and the buffer size is set to that number (hex). After you write the tape you will want to type "XWFM." to put a tape file mark at the end of the tape.

- XWFM. Write Tape File Mark
- XTCMD. Do Tape Command (using existing parameter block)

**RIMFIRE DISK/TAPE CONTROLLER COMMANDS**

XTRF. Test Rimfire Disk/Tape Controller  
XTDIF. Test Disk Interface  
XORFG. Open Rimfire Disk/Tape Controller Gate

**ALPHABETICAL LISTING OF VRM COMMANDS**

( display previous bus analyzer board location  
) display next bus analyzer board location  
- store a byte  
\* display this bus analyzer board location  
<break> step to next baud rate  
= store a word  
? print main menu  
J restore and jump  
L load address register from accumulator  
N display next byte  
P display previous byte  
T display this byte  
X?. print menu of basic extended commands  
X?BAB. print menu of bus analyzer board commands  
X?DK. print menu of disk commands  
X?ECM. print menu of error correcting memory commands  
X?RF. print menu of rimfire disk/tape controller commands  
X?TP. print menu of tape commands  
X?TST. print menu of diagnostic commands  
XALLT. execute all diagnostics  
XBBA. begin recording all bus cycles

XBDL. begin down-load from CPU host port

XBKUP. backup disk to tape

XBOOT. boot versabug and UNIX

XDBP. display bus analyzer board buffer pointer

XDCMD. do a disk command using existing parameter block

XDDN. spin down a disk drive

XDDUN. display the disk unit number

XDES. display status of every error correcting memory board

XDNOP. do a disk no-op (and return resulting status)

XDPB. print the disk parameter block

XDR. read from disk

XDREC. print the disk record

XDRST. reset disk drive

XDSTA. print the disk status (from parameter block)

XDUP. spin up a disk drive

XEBA. end recording bus cycles

XECMT. test every Error Correcting Memory board using signature analy

XEDL. end down-load from CPU host port

XIBAO. initialize bus analyzer board origin

XIECM. initialize every error correcting memory board

XIMAP. initialize memory map

XLBA0. set bus analyzer board origin from accumulator

XLBP. set bus analyzer board buffer pointer from accumulator

LLAT. loop on logical address (write and read)

XLRT. execute local RAM diagnostic (destroying save area)

XLSPE. load scratch-page entry

XMAPD. map out a defective track

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XMEMT. execute memory-test diagnostic  
XMV. initialize monitor vectors  
XONET. execute one diagnostic  
XORFG. open rimfire disk/tape controller gate  
XREW. rewind the tape  
XRID. read next sector ID on current cylinder:head  
XRSTR. restore disk from tape  
XSDUN. set the disk unit number  
XSEEK. disk seek  
XTCMD. do a tape command using existing parameter block  
XTDIF. test disk interface  
XTNOP. do a tape no-op (and return the resulting status)  
XTPB. print the tape parameter block  
XTR. read from tape  
XTRF. test rimfire disk/tape controller  
XTSTA. print the tape status (from parameter block)  
XTW. write to tape  
XWFW. write tape file mark  
Z set accumulator to zero