

OS-9™ GMX III Support ROM

User's Manual

GIMIX Inc.
1337 W. 37th Place
Chicago, IL 60609
312-927-5510 * TWX 910-221-4055

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OS-9™ GMX™ III Support ROM

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The OS-9 GMX™ III Support ROM provides a number of system test functions for GIMIX OS-9 GMX™ III systems. In addition it gives the user the option of booting the system directly from a hard disk, once the bootstrap information has been stored there, or from the standard floppy disk. The ROM can be configured for systems with standard (ACIA) or intelligent I/O ports by a jumper option on the GMX™ 6809 CPU III. Note: The Support ROM uses the upper 1K of the scratchpad RAM on the CPU III, and will overwrite data stored there on power-up or after a system Reset.

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Chicago, Il 60609
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Hardware Configuration

The Support ROM is normally supplied as the upper 4K of an 8K ROM on the GIMIX 6809 CPU III. The lower 4K of the ROM will contain either the GMXBUG monitor (for OS-9/FLEX switching systems), or a special boot routine for booting the Support ROM version of OS-9 directly on power-up or reset (see the section on booting OS-9 directly).

Jumper area JA-8 on the CPU III must be configured to select the desired half of the ROM on power-up/reset. In switching systems, either half may be selected since both the Support ROM and GMXBUG include commands that switch to the other half. In OS-9 only applications, the upper half (Support ROM) should be selected to allow access to the Support ROM functions during initial setup. Once the system has been tested in the desired configuration JA-8 can be changed so the system will boot directly from disk (see Booting OS-9 Directly).

In order to initialize properly, the Support ROM must know what type of I/O board (standard or intelligent) is being used for the console I/O port. The monitor determines this by reading the user-defined bit the Task Select Register on the CPU III. If the bit reads as zero (jumper installed at JA-9) the monitor initializes for an intelligent I/O board. If the bit reads as a one (jumper removed), it assumes that a standard 6850 ACIA is installed. JA-9 must be configured for the type of board being used. Note: The type of board used for I/O other than the system console (TERM) has no effect on the configuration or operation of the Support ROM.

The Support ROM uses the upper 1K bytes of the scratchpad RAM on the CPU board. This RAM must be enabled by placing jumper JA-12 on the CPU III in the 2K position (Fig. "Y" in the CPU board documentation). See the section on scratchpad usage for more information.

OS-9 Requirements

The Support ROM requires special versions of the OS-9 kernel (OS9p1) and the "clock" module. Parts of the initialization section are removed from OS9p1 and both modules include changes necessary to make them compatible with the Support ROM. These changes should not affect the use of software written for the non-Support ROM version of OS-9. The Support ROM will not work with standard versions of OS9p1 and clock. In addition, OS9p1 (which is normally in ROM in systems without the Support ROM) must be included as the first module in the OS9Boot file on disks (floppy and/or hard) that are used to boot the operating system. The system will not boot if OS9p1 is not the first module in OS9Boot. Note: When building an OS9Boot file on a hard disk, the special "INIT.HD" version of the INIT module must be used (see the section on the "W" command).

In systems where an I/O processor is used as the console port (TERM) the I/O processor(s) must have revision 2.0 or later of the I/O processor firmware. The Support ROM will NOT work with revision 1.x IOP firmware. If your I/O processor(s) do not have revision 2.x firmware, contact GIMIX for information on firmware upgrades.

Support ROM Functions

On power-up or after a system reset the Support ROM prints a sign-on message, the time and date from the CPU board clock, and the total amount of RAM that it has located in the system. If the CPU clock contains invalid information, this is reported in place of the time and date. The monitor then prints a menu of available command options followed by the "CMD:" prompt to indicate that it is in the command mode, ready to accept commands.

The monitor accepts a number of single letter commands (upper or lower case) that may require one or more optional parameters separated by spaces. All command entries are terminated by a carriage return <CR>. Mistakes can be corrected by using backspace (control-h) to erase one or more characters or line-delete (control-x) to delete the entire line. All other control characters are ignored.

Memory address parameters are entered as one to three digit hexadecimal "block numbers". The 1 Megabyte address space is divided into 512 blocks of 2K bytes each, numbered 0 through \$1FF. The "block number" for a particular 2K memory block can be determined by dividing the full 20-bit starting address of the block by the block size (e.g. \$FC000/\$800 = block \$1F8). Commands that require two addresses will perform the indicated function over the range of blocks from <block#> to <block#> inclusive.

The Random Byte Test also requires a "pass count" which is entered as a one or two digit hex number from 0 to \$FF.

A - extended Address test (A <block#> <block#> <CR>)

This command performs a quick check for blocks of memory that appear at more than one extended address. The test writes the "block number" of each block specified, in the first locations in that block. It then checks each block to insure that it still contains the correct block number. If the test is successful the monitor returns to the command mode. If a difference is detected, the location of the block being checked and the block number found there are reported and the user is given the option of continuing the test or returning to the command mode.

This test is useful for checking extended address decoding on memory boards and to ensure that the extended addressing is enabled on all memory boards.

C - memory Convergence test (C <block#> <block#> <CR>)

This test writes a sequential pattern of data throughout each 2K block in the range specified and then checks the pattern written. The pattern is then rewritten in complemented form and checked again. This process is repeated 256 times per block with the pattern shifted on each

pass so that every possible 8-bit combination is written and checked at each location within the block. At the end of each pass the block being checked and a pass counter are printed on the terminal. If an error is encountered the location (relative to the beginning of the block being tested) along with the expected data and the actual data read are printed. At this time the user has the option of continuing the test or returning to the command mode.

This test will locate a variety of memory problems; however, since the pattern repeats every 256 locations, certain types of addressing problems may not be detected by this test. This test should be used in conjunction with the "Random" and "Extended" tests for a more thorough evaluation of the memory.

D - Delete block from memory map (D <block#> <CR>)

This command allows a selected 2K memory block to be deleted from the "memory map" built by the Support ROM. On power-up or after a system reset the monitor searches the entire address space (with the exception of the uppermost 8K (\$FE000-\$FFFFFF) which is reserved for the ROMS and I/O) to locate all blocks that contain RAM. It builds a map of the address space, marking those blocks that contain RAM. OS-9 later uses this map to locate the usable RAM in the system. (The memory map can be displayed using the "M" command, see below.) Since the monitor uses a rather simple test to locate blocks of RAM, it is possible for blocks containing one or more bad locations or incomplete blocks to pass the test and be marked as good in the memory map. Note: Since this initial test only checks the first few locations in each 2K block, RAM must always be installed in complete 2K blocks, on even 2K boundaries. Bad blocks, manually located with the memory tests in the Support ROM, can be deleted from the memory map to prevent OS-9 from using them. This allows partially good memory boards to be used until the board can be repaired or replaced. Caution: The memory map is rebuilt each time the system is powered-up or reset and any bad blocks must be deleted each time this occurs.

The "D" command accepts a single block# and deletes only one block at a time. If multiple blocks are to be deleted, they must be done individually.

NOTE: The first 4 blocks of memory (block# 0 through block# 3) must be good or the system will not boot properly. The "D" command will not allow these blocks to be deleted. If an attempt is made to delete one of them, a warning message is printed and no block is deleted. If one of these blocks is defective it must be replaced.

F - boot from Floppy disk (F <CR>)

This command attempts to boot OS-9 from a floppy disk in device "DD0". The disk must include a properly generated OS9Boot file, such as the one on the supplied system disk. Note: The Support ROM requires a special version of OS-9 and will not work with standard versions.

If an error occurs during the boot process, a warning message is printed and the monitor returns to the command mode.

G - go to GMXBUG (G <CR>)

In systems configured for software switching between monitor/operating systems, this command allows switching to the alternate ROM monitor (normally GMXBUG). In systems not configured for switching, this command will return to the support ROM through the reset vector, causing the memory map to be rebuilt.

H - Help! reprint menu (H <CR>)

This command simply reprints the command menu.

M - print Memory block map (M <CR>)

This command prints a complete map of the 1 Megabyte address space by 2K blocks. Each block that was found to contain RAM is indicated by an "M" in the appropriate position in the map. Blocks not containing RAM and any blocks deleted from the map using the "D" command will be marked with a "-".

This command is useful as a quick check to verify the locations of RAM boards installed in the system and to check to insure that the correct blocks were deleted when using the "D" command. If the expected amount of memory is not reported at the beginning of the monitor, this command can be used to determine which memory is missing.

R - Random byte test (R <block#> <block#> <passcount> <CR>)

This test writes a random pattern of data to each 2K block in the selected range and then checks each byte against the regenerated pattern. This process is repeated <passcount> times using a different random number seed each time. At the end of each pass the block being tested and the passcount are printed. If an error is detected, the location of the error (relative to the beginning of the block being tested) along with the data is printed and the user is given the option of continuing the test or returning to the command mode.

Since the pattern written by this test is random, it will locate problems that might be missed by other tests. However, to be most effective the test must be run with as large a passcount as possible. A larger passcount improves the chances of finding certain errors.

T - multiple Memory test (T <block#> <block#> <CR>)

This command executes all three memory tests (A, C, and R) sequentially over the block range specified. The Random test is run with a passcount of \$FF. This command is useful for running an overnight or weekend test since it will perform a complete test series without operator intervention, stopping only if an error is encountered.

W - boot from Winchester (W <CR>)

This command attempts to load and run OS-9 from a hard disk (device "HO"). The hard disk must include a properly generated OS9Boot file. The OS-9 command "OS9Gen" is used to generate the boot file on the hard disk. Note: The OS9Boot on the hard disk must include the special "INIT.HD" file supplied on the system floppy disk. If a standard version of "INIT" is used, the system will attempt to transfer to the floppy disk on boot-up.

**** IMPORTANT ****

In order to boot directly from a hard disk the hard disk must be, or have been, formatted using edition 6 or later of the hard disk drivers (XBC). All hard disk systems using 19 megabyte drives must be checked for the correct format. Other sizes of hard disk already have the correct format, as they were only implemented in the later editions of XBC. The earlier drivers (pre edition 6) did not place certain information required by the Support ROM on the hard disk. In order to check a drive for the proper format, use the OS-9 command

OS9:DUMP /HO@

to display the contents of the first sector on the disk. The contents of locations \$0041 and \$0043 on the disk must match the values show in the chart below. If the values match those shown, the disk has the necessary format and can be used to boot the system directly. If the values do not match those show, the disk will not boot directly unless it is re-formatted, or the contents of the two locations are changed to the correct values. Note: While it is possible to modify the two locations, this is a dangerous procedure which, if improperly done, can cause the loss of the data on the hard disk. Do not attempt to modify the hard disk unless you are sure of what you are doing and have backup copies of the data on the hard disk!

DRIVE TYPE	LOCATION	
	\$0041	\$0043
CMI 19 Mbyte	\$04	\$00
IMI 19 Mbyte	\$07	\$05

If a disk error occurs during the boot operation, a message and the error status information from the hard disk controller are printed and the monitor returns to the command mode.

Scratchpad RAM Usage

In order to allow the Support ROM memory tests to be used on any portion of the normal system RAM area (\$00000-\$FDFFF), it uses the upper 1K of the 2K scratchpad RAM on the CPU board for stack space, buffers, etc. Because of this, the upper 1K of the scratchpad can not be used if the data stored there must be retained during power-down, using the battery backup feature. This area is not used by OS-9 once it has been loaded and is available to the user at that time, but any data written there may be destroyed when the system is powered down or reset.

The lower 1K of the scratchpad RAM is not used by the Support ROM or OS-9 and may be used in battery backup applications.

Booting OS-9 Directly

In some situations it may be unnecessary and/or inconvenient to enter the monitor each time the system is powered-up or reset; which requires a command entry to boot the operating system. This is especially true in systems that run un-attended or must automatically resume operation after a power failure. To eliminate the need to enter a command to boot the system each time, Support ROMs for systems that do not include GMXBUG/FLEX have a special bootstrap routine in the lower half of the ROM. This routine automatically boots OS-9 from either the floppy or hard disk on power-up or reset. Since the boot-only routine does not perform any console I/O, the same CPU board jumper (JA-9) used by the Support ROM to determine the I/O type (see the section on hardware configuration) is used to select floppy or hard disks.

To boot OS-9 directly, the software select jumper (JA-8) on the CPU III must be set to select the lower 4K of the ROM on reset and JA-9 must be set for the desired boot disk type (floppy or hard). If JA-9 is installed, the ROM will attempt to boot from the hard disk. If JA-9 is removed, the floppy disk is used.

Note: When switching between the Support ROM and the boot-only ROM, be sure that JA-9 is properly configured (I/O type for the Support ROM or disk type for the boot-only ROM).

