

MULTICS
SOFTWARE RELEASE BULLETIN
RELEASE 12.0

PREPARED BY:
MULTICS SOFTWARE DEVELOPMENT

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SECTION 1

INTRODUCTION

Multics Release 12.0 (MR12.0) is a complete release and assumes the prior installation of MR11.0. That is, the library tapes are self-supporting and do not require any other information to run Multics.

This document includes descriptions of features included in Multics Release MR12.0.

A separate document, Software Installation Bulletin (SIB), is supplied with the release tapes. The SIB describes the contents of the release tapes and include procedures for installation of MR12.0.

Additional documentation, including a list of bugs fixed in MR12.0, is provided with the release tapes, either as printable segments on the tape (in a special directory >doc>MR12.0), or as paper copy.

Following is a summary of the remainder of sections in this document.

Section 2
summarizes important highlights.

Section 3
describes significant software changes.

Section 4
describes incompatible changes.

Appendix A
contains a partial list of new commands, active functions,
and subroutines.

Appendix B

contains a list of Priced Software Products. These items are available only through contractual actions with a Honeywell sales representative.

Appendix C

describes the associated documentation.

SECTION 2

HIGHLIGHTS OF MR12.0

This section contains a brief summary of the most important items in this release. Refer to Section 3 for a more detailed description.

A brief description of known bugs fixed in this release is available in the segment >doc>MR12.0>TRs_fixed_in_MR12.0.

HARDWARE SUPPORT

- Provides support for the Information Multiplexer Unit (IMU) and for Federal Information Processing Standards (FIPS) peripherals. [GET MORE INFORMATION FROM BILL FRINK]

SUPERVISOR

COMMUNICATIONS

-

ADMINISTRATIVE SOFTWARE

B2 SECURITY CERTIFICATION

- MR12.0 will not be recertified. Strict adherence to Configuration Management procedures developed in concert with the National Computer Security Center (NCSC) assure that MR12.0 remains as secure as MR11.0

MAINTAINABILITY FEATURES

- Provides Test and Diagnostic (T&D) support for the IMU and for FIPS devices. Provides a new subsystem for loading T&D test routines and firmware into the Multics Operating System.

PRICED SOFTWARE PRODUCTS

- Provides a native Multics C compiler conformant to the UNIX system V, release 2.0 C compiler.
- Provides Pascal, version 8.03, which includes bugfixes and implements new features.
- Enhances the support for personal computers to provide PC capability driver (IBM PC), background file transfer (IBM PC), and terminal emulator (IBM PC).
- Enhances Executive Mail, version 4.0, by providing new functions, improvements, and increased consistency with Executive Forum.
- Provides Executive Forum, version 2.0. This version offers additional menus and other enhancements.
- Installed Forum version 2.14 which includes new features and numerous bug fixes.

SOFTWARE CHANGE PROPOSALS

Multics Release 12.0 incorporates seventeen (19) SCPs:

- SCP 6250, allows a site to specify weekly cutoff periods for projects or users by modifying the PMF.
- SCP 6253, enhances the contents active function for selective inclusion or exclusion of lines from the return value.
- SCP 6258, modifies the LINUS set_scope request to be a settable parameter.
- SCP 6259, enhances the MRDS restructure_mrds_db subsystem.
- SCP 6265, allows wakeup interval for incremental volume dumper to be changed.
- SCP 6266, increases maximum value of wakeup interval for incremental volume dumper to 1440 minutes.
- SCP 6272, Increases the I/O Daemon's 136-character page width restriction to 200 characters.
- SCP 6276, modifies the read_mail list request to indicate whether a message has been read.
- SCP 6281, provides the save and display accept_messages options.

- SCP 6282, allows emacs to edit MSFs.
- SCP 6284, modifies the Fortran OPEN statement to allow extension of an existing file.
- SCP 6286, allows LINUS list_value request to be used as an active request.
- SCP 6287, allows LINUS open request to be used as an active request.
- SCP 6292, provides a subroutine interface for entering absentee requests.
- SCP 6296, enhances the dprint_ subroutine interface to return a request identifier (dprint_\$request_id).
- SCP 6297, allows a user to request the truncation of an absout segment prior to starting of the absentee job.
- SCP 6298, allows the use of the Pascal -interactive control argument in absentee mode.
- SCP 6168, allows reloading of Multics from disk following an initial boot of Bootload Command Environment (BCE) from tape.
- SCP 6196, extends the star convention and allows for many new combinations of "*" with character strings.

SECTION 3

CONTENTS OF MR12.0

HARDWARE SUPPORT

- A- 1. This release supports the new Information Multiplexer Unit (IMU) I/O Subsystem including the controllers and devices enumerated below on Multics systems with DPS8/M CPU's. This release also supports systems having a mixture of IMU and IOM I/O subsystems. The IMU is not supported on systems with Level 68 or DPS68 CPU's.
- A- 2. This release supports the new Peripheral Processing Unit (PPU) attached through either an IOM or IMU. The PPU supports a variety of configurations of the new low cost Disk Adapter Unit (DAU) and the single bucket buffered tape controller.
- A- 3. The MSU3380 and MSU3381 FIPS disk drives are now supported by the Multics system. For file system IO these devices are divided into subvolumes, two for the MSU3380 and three for the MSU3381. Each subvolume is equivalent to a physical volume. For user IO, the entire device may be attached as one entity.
- A- 4. The MTU8205, MTU8206, and MTU8208 tape drives are now supported by the Multics system. These devices are identified on the "prph tapX" card as model 8200.

Support Removal

- B- 1. Support for the IBM1050, IBM2741, ARDS terminals and Bell 202ETX protocol was declared removed in the MR11.0 SRB. The 963 and 029 preaccess commands were not removed at that time but have been removed in this release. The cv_ttf and cv_cmf commands will no longer accept these devices.

Online Test and Diagnostics

- C- 1. Enhanced online Test and Diagnostics to support test of all devices attached to an IMU subsystem. This testing includes peripheral tests for all current devices as well as the new FIPS disk and tape devices. Tolts testing will also include testing of the IMU channels via test pages for the Maintenance Channel Adaptor (MCA) of the IMU.
- C- 2. Added a deck file manager subsystem for improved maintenance of the T&D Deck File. This facility will enable loading a deckfile from either tape (IFAD or 355 deckfile) or MCA diskette. It will also provide for editing/patching of octal and hex object decks as well as deleting files from the deck file.

COMMUNICATIONS SYSTEM SOFTWARE

- D- 1. Added the `-output_etb_mode` attach description option to `bisync` to control the use of an ETB or ETX at the end of each record. The attach description will cause a whole segment to be interpreted as a block of data. It may be required to send the block of data out using many records. With this change, an ETB and ETX will be used to terminate each record as controlled by the presence or absence, respectively, of this option.
- D- 2. A number of new terminal types have been added to the TTF and a number of enhancements have been made to current ones.

New terminal types:

Anderson-Jacobson 520 CRT: `AJ520` (79 chars/24 lines) and `AJ520_132` (132 chars/24 lines).

Human Designed Systems Concept 108: `CONCEPT108` (also named `CONCEPT_AVT` and `CONCEPT_GVT`).

Cii-Bull ANSI CRTs `DKU7001`, `DKU7002` and `DKU7102`.

Ann Arbor GURU CRT in several configurations: `GURU_66L_80C` (also named `GURU_66L`), `GURU_66L_132C`, `GURU_66L_160C`, `GURU_48L_80C` (also named `GURU_48L` and `GURU`), `GURU_48L_132C`, `GURU_48L_160C`, `GURU_30L_80C` (also named `GURU_30L`), `GURU_30L_132C`, `GURU_30L_160C` and `GURU_24L_80C` (also named `GURU_24L`). Includes answerback definitions.

Heath CRTs: `HEATH19_ANSI` and `Z100`.

Apple MacIntosh Kermit VT102 emulator: `MACKERMIT`.

Nippon Electric Model 5525 Spinwriter: `NEC5525_OSR_10C6L`, `NEC5525_OSR_10C6L_CONSOLE` and `NEC5525_OSR_12C6L`.

Nippon Electric Model 7710 as receive only printer:
NEC7710_PRINTER_OSR.

Netronics Smarterm-80: SMARTERM.

TAB Products Company TAB 132/15: TAB_80C and TAB_132C.

Tektronix 4027: TEK4027.

Tektronix 4107 in ANSI mode: TEK4107_ANSI_80C (also named
TEK4107_ANSI), TEK4107_ANSI_132C, TEK4107_ANSI_80C_OFLOW
(also named TEK4107_ANSI_OFLOW) and TEK4107_ANSI_132C_OFLOW.

Teleray Model 7: TELERAY7

Texas Instruments Model 765: TI765.

TTE415.

VersaTerm (an Apple MacIntosh terminal emulator) Version 2.20:
VERSATERM220 (also named VERSATERM), VERSATERM220_OFLOW (also
named VERSATERM_OFLOW), VERSATERM220_132C (also named
VERSATERM_132C), VERSATERM220_132C_OFLOW (also named
VERSATERM_132C_OFLOW). Includes answerback definitions.

Versaterm Version 2.10 or less: VERSATERM210. Includes
answerback definition.

Honeywell VIPs: VIP7300, VIP7303, VIP7813, VIP7814 and
VIP7823. Includes answerback definitions.

Digital Equipment Model VT-220: VT220_80C (also named VT220),
VT220_80C_OFLOW (also named VT220_OFLOW), VT220_132C, and
VT220_132C_OFLOW. Includes answerback definitions.

Added WSTERM terminal type for support of PC terminal emulator
for PC support.

Wyse Technology WY50: WY50_80C, WY50_80C_OFLOW, WY50_132C and
WY50_132C_OFLOW.

Xerox 820: XEROX820.

Modified support for the following terminal types:

HEATH19 initial string enhanced.

Constant tab delays modified for LA120.

NEC5525_OBA_12C6L initial string enhanced.

Added a "clear tab stops" to initial string of

NEC5525_OSR_12C6L.

Removed "clear terminal" from initial string of VIP7201.

Corrected function key definitions for CLEAR and FORMAT keys on VIP7x03.

Removed support for the following terminal types:

Support for the IBM1050, IBM2741, ARDS terminals and Bell 202ETX protocol was declared removed in the MR11.0 SRB. The TTF was not updated at the time. The terminal type entries have been removed from the TTF in this release.

- D- 3. Users of IBM3270 multiplexers must use the mode "raw3270io" instead of "raw3270" to effect the full set of 3270 features.
- D- 4. Incompatibly changed the event message information which is set by tty when sending a wakeup to be structured as described in net_event_message.incl.pl1.
- D- 5. The structure used by the undocumented hcs_\$tty_order subroutine for the set_echo_break_table and get_echo_break_table control requests (as defined in mcs_echo_neg.incl.pl1) has been changed incompatibly in order to allow echo negotiation to work with characters above 177o. Specifically, the dimension of the pit array named break has been changed from (0:127) to (0:255). The new structure is version 2.

OPERATING SYSTEM SOFTWARE

BOS

- E- 1. BOS is not supported for MR12. BOS commands not supported by BCE functions are: BOSTAP, CARDS, CORE, DMP355, FD355, FMT, LOADDM, MPCD, NLABEL, PROMPT, QUIET, READY, TAPED, TST3BT, TSTCHN, and TTY.

BCE

- F- 1. Added the save and restore commands to BCE. They are replacing the current function of the BOS commands SAVE and RESTOR.
- F- 2. Added the copy_disk command to bce to replace the BOS SAVE COPY functions.

- F- 3. Modified the BCE fwload request to be capable of loading firmware into crossbarred DISK MPCs. Noncrossbarred DISK MPCs can be loaded by using the BCE reinitialize request.
- F- 4. Added the lock_mca and unlock_mca BCE commands. It is recommended that Maintenance Channel Adaptors (MCAs) on all system IMUs be placed on the Multidrop interface with the master console configured in the Multics configuration deck as either "on" or "alt". The MCA number assigned by the rocker switches on the MCA should be the same as the IMU number it is in. See the System Maintenance Procedures (SMP) manual and the System Console WIPC66LD Installation Manual, Order Number 58010084, for additional information.

Configuration Parameters

- G- 1. The model field of the iom card has changed. The value of "rsa" is being changed to "iom" for IOMs. If the iom card defines an IMU then the model is "imu".

Security

- H- 1. MR12.0 will not be recertified. Strict adherence to Configuration Management procedures developed in concert with the National Computer Security Center (NCSC) assure that MR12.0 remains as secure as MR11.0.
- H- 2. Added (display set edit)_process_audit_flags commands to allow manipulation of the security auditing flags in a privileged process. Permanent setting of flags should be accomplished by placing the appropriate PNT/SAT entries with the new_user and edit_proj commands.

ADMINISTRATIVE SOFTWARE

Accounting

- I- 1. Administrators may now set weekly cutoff periods for projects or users on projects. The keyword 'weekly' may be placed in the PMF for the project or user, the PMF re-converted with cv_pmf, and the new PDT installed. Sites which have specially modified software for accounting should examine how weekly cutoffs will affect their modifications. The modified modules are cv_pmf, act_ctl_, adjust_cutoff_, print_pdt, and proj_usage_report.

Answering Service

- J- 1. Added the `-process_id`, `-pid`, control argument to the operator `who`, and `privileged as_who`, command. When this control argument is specified, the `process_ids` will be displayed along with any other information normally returned. Added the `-connected` control argument to list those interactive processes currently connected to the system.

MAINTENANCE SOFTWARE

- K- 1. Deleted the undocumented library maintenance commands `object_submission_test`, `source_submission_test`, `acceptance_test`, and `abs_control`.
- K- 2. Added the `-io_command`, `-ioc`, control argument to `io_error_summary` to display the I/O command being executed when an abnormal status occurs. The command will be displayed in octal, in parenthesis, prior to the interpreted status.
- K- 3. Added the `-fill` and `-no_fill` control arguments to the `update_seg` initiate operation to control filling of the `-log` operation.
- K- 4. Added `-desc` as the short name for the `-descriptor` control argument accepted by the `library_cleanup`, `library_descriptor`, `library_fetch`, `library_info`, `library_map`, `library_pathname`, and `library_print` commands.

Added `-comp` as the short name for the `-components` control argument accepted by the `library_fetch`, `library_info`, `library_map`, and `library_print` commands.

Added short names of `-bc` for `-bit_count`, `-cont` for `-container`, `-iacl` for `-initial_acl`, `-lev` for `-level`, `-ml` for `-max_length`, and `-uid` for `-unique_id` control arguments accepted by the `library_info`, `library_map`, and `library_print` command.

OPERATOR INTERFACE SOFTWARE

- L- 1. Modified the `bound_dumper_subroutine`, `hierarchy_dumper`, to allow the operator to retype a mistyped tape label, or to enter quit in response to the tape label query to signal the intent that the current invocation of the dumper is to be abandoned. Also, modified `bound_dumper` to abort the invocation of the dumper in case of unrecoverable tape errors, tape mount denials, or if the operator gives quit as a tape label.

USER SOFTWARE

Languages

- M- 1. Changed the binder to only resolve links internally based on the names of the components and any synonyms given in the bindfile.
- M- 2. Modified ALM to support double word constants for octal and decimal numbers. The 'even' pseudo-op should precede the use of the 'oct' or 'dec' pseudo-op when defining double word constants to ensure that labels will refer to the appropriate location. Double word constants will be identified by having a trailing capital L. Example: '1234567891234L'.
- M- 3. Added the ext_entry pseudo-operation to ALM to provide support for the Multics C Compiler and Runtime Facility. Added the dec_unal and oct_unal pseudo-operations to define unaligned constants.
- M- 4. Modified the oct and dec psuedo-operations to no longer automatically align double precision contants on double word boundaries.

Commands

- N- 1. Modified the set_fortran_common, date_compiled, and print_link_info commands to support object multisegment files.
- N- 2. Modified the salvage_dir command to no longer require the message_path argument. If not supplied, output will be displayed on the terminal.
- N- 3. Modified the validate_info_seg command to no longer accept the -output_file (-of), -brief (-bf), -long (-lg), -force (-fc), -no_force (-nfc), -fill (-fi), and -no_fill (-nfi) control arguments. Added the -names (-nm) and -no_names (-nnm) control arguments to determine whether or not vis will change the names on the info segment to match the names used in the info segment.

- N- 4. Extended the do command to allow use of &0, &r0, &q0, or &control_string (equivalent to &q0) to insert the unexpanded controls_string into the result string. Because the meaning of &r&n and &q&n become ambiguous when no arguments are given (when &n = 0), the do command was incompatibly changed to make those forms an error; use &rf&n and &qf&n instead.

The behavior of requoting constructs like &r1 was changed so that when such constructs are consecutive with no intervening space no spurious quotes are created.

Added the -abort_line and -no_abort_line control arguments to affect subsystem behavior. The default is -abort_line so that the standard behavior is unchanged. With -abort_line, an error in a request line invoked by "do" will abort not only the request line invoked by "do" but also the request line invoking the "do" command. Extended the "do" command to allow control arguments to precede the control string. The control arguments apply only to that invocation of the "do" command.

- N- 5. Added the new commands/active functions execute_string, exs and substitute_arguments, sbag to separate "do's" string execution function from it's argument substitution function.

Added the new requests execute_string, exs, and substitute_arguments, sbag, to ssu_request_tables_\$standard_requests, which is likely to be used by SSU subsystems developed at sites. Subsystem maintainers should be made aware that local documentation should be updated to include the new requests, or if the subsystem explicitly replaces or disables the "do" request, that their request tables may need to be updated.

Added the -control_string, -cs, control argument to the execute_string command and active function and the substitute_arguments command. The substitute_arguments active function does not attach special meaning to control arguments and will not be changed.

- N- 6. Modified the -repeat control argument of memo to no longer repeatedly apply new maturity date intervals until it catches up with the present. It will now apply only to the next interval that matures in the future.

Modified memo so that the default memo segment will be in the users home directory rather than the default working directory.

- N- 7. Added the object_segments and nonobject_segments commands to return only the names of object, or nonobject, segments. Similarly, object_msf and nonobject_multisegment files. The object_files and nonobject_files return names of object or nonobject segments and msfs.

N- 8. Added keywords to the exists command/active function to return true if there are any object/non-object files in the specified directory matching the specified star name, respectively. The key words are object_segments (obseg), object_msf (obmsf), object_file (obfile), nonobject_segment (nobseg), nonobject_msf (nobmsf), nonobject_file (nobfile).

N- 9. Added the -on, -off, -profile, -escape control arguments to the abbrev command. The -on control argument enables abbreviation expansion while -off disables expansion. The -profile control argument changes the pathname of the profile segment. The -escape control argument changes the abbrev escape character.

Added, or modified, the .debug, .delete, .edit, .escape, .forget, .l, .la, .probe, .profile, .quit, .remember, .show, .switch_on, .switch_off, .terminate_process, and .use control requests to the abbrev command.

N-10. Modified the enter_abs_request command to accept non-positional arguments, to allow the -argument as well as -arguments control argument as the long forms of -ag, and to accept multisegment files as about output.

The -truncate and -extend arguments have been added to the enter_abs_request command, to effect the truncation of the absentee request's about file when the request is run. Type "help ear" for usage.

N-11. For list_abs_requests -long, the new indicators of 'absentee_restarted' and 'absout_truncation' will be displayed if it is a segment, and may be used as keyword arguments to the user command.

N-12. Two new keywords have been added to the 'user' program, 'absentee_restarted', to indicate the absentee job is being restarted due to a system crash, and the keyword 'absout_truncation', to indicate the absentee request has the truncate about indicator set, each returning 'true' or 'false' depending on the value of the respective indicator.

N-13. Modified general ready to accept the -fr short name for the -frame control argument.

N-14. Modified the help command to allow "List of" sections to have multiple consecutive list item lines starting in the left margin. Item descriptions are no longer required, but if present, must be indented three spaces.

Modified the -brief control argument for the help command to always return some information, even for general info (gi) segments.

- N-15. Installed the `history_comment`, `hcom`, `command` and `active` function to manage software change documentation in source programs.
- N-16. Changed the `-version` control argument for the `display_subsystem_usage` command to accept starnames. This will allow a user to obtain usage information on minor versions of a subsystem with one invocation.
- N-17. Multiple `-field` control arguments to the `sort_seg` and `sort_strings` commands now aggregate rather than override each other.
- N-18. Added the `-from`, `-to`, `-match`, and `-exclude` control arguments to the `contents` command/active function to allow selective inclusion or exclusion of lines in or from output.
- N-19. Changed the `indent` command to implement the `format_pl1` convention for specifying comments which are to be changed. Comments beginning with `/****^` will be copied directly into the indented source without modification.
- N-20. Added the `reverse_substr` command/active function to count characters from right to left. The returned string has its characters in the same order as the input string.
- N-21. Added `-force`, `-no_force`, `-input_tabs`, and `-no_output_tabs` control arguments to the `canonicalize` command. The `canonicalize` command will no longer delete nonprinting characters. It will no longer overwrite input segments unless the `-force` control argument is used, or the user replies yes to a query. The `-tabs` control argument has been changed to `-output_tabs`. The old name will be retained for at least one release.

N-22. Changed `add_pnotice` to not automatically apply default copyrights. Added the `-default_copyright` (`-dc`) and `-default_trade_secret` (`-dts`) arguments to allow specifying of default pnotices.

Changed `add_pnotice` to issue an error message if there are no existing pnotices in the software and if no arguments are specified, i.e., `-nm`, `-dts`, or `-dc`.

Changed `add_pnotice` to accept the `-long` and `-brief` arguments. `-brief` displays nothing. `-long` is the default and it displays the primary name, without the "pnotice" suffix, of the pnotice that was added.

Changed the pnotice templates to use a generic year indicator, `<yr>`, in place of a specific date; consequently, all template names no longer include the year. All sites are responsible for ensuring that their own pnotices meet this requirement. Use `list_pnotice_names -check -all` to get a listing of the valid template names and those template names that have to be changed to follow the new rules.

Data Management

O- 1. Removed the undocumented `get_tuples_by_spec`, `get_tuple_array_by_spec`, `get_tuples_and_ids`, and `get_tuple_array_and_ids` entrypoints from the `relation_manager` subroutine.

Date/Time Software

P- 1. Incompatibly changed some of the time zones defined in `time_info.cds`. The following changes were made:

delete	zone	'AHST'	(GMT-10,	Alaska-Hawaii Standard Time)
add	zone	'HST'	(GMT-10,	Hawaiian Standard Time)
add	zone	'HDT'	(GMT -9,	Hawaiian Daylight Time)
add	zone	'YDT'	(GMT -8,	Yukon Daylight Time)
add	zone	'NDT'	(GMT -2.5,	Newfoundland Daylight Time)
delete	zone	'NZT'	(GMT+12,	New Zealand Time)
add	zone	'NZST'	(GMT+12,	New Zealand Standard Time)
add	zone	'NZDT'	(GMT+13,	New Zealand Daylight Time)

P- 2. Added the `debug` keyword to `set_time_default` and `print_time_defaults` commands to enable the debugging facilities of the date/time software. See `set_time_default.info` for details.

Extended Entry Software

Q- 1.

Mail/Message Facility

- R- 1. Added `-message_status` and `-no_message_status` control arguments to the `delete_message` command to control printing of "All messages have been deleted" when the command deletes the last message in the mailbox.
- R- 2. Changed the `message_status` command to work as an active function returning a command string which will set the current message acceptance state.
- R- 3. Added the `-acknowledge_if_deferred`, `-no_update_destination`, and `-update_destination` control arguments to the `send_message` command.
- R- 4. Changed mail system to send Version 4 messages. Refer to `MAIL_FORMAT_VERSION_4` in the `include` file `mail_format.incl.plt`. Private software which sends or reads mail must be changed to send and accept version 4 messages.

Preaccess Commands

- S- 1.

Process Environment

- T- 1. Added a newlink type with a type of 5 and a class of 6. This new link is called a *heap link and references to variables defined in a user controlled area called the heap.
- T- 2. Added the `list_heap_variables`, `lhv`, command to return the heap variables allocated at the current heap execution level.
- T- 3. Defined a new type of IPC event channel, the asynchronous event call channel. A wakeup sent on this type of channel causes an IPS `wkp_signal` to also be sent to the destination process. The `wkp_signal` handler will cause any call handlers for async event channels, which have pending wakeups, to be run. This type of event channel is especially useful for applications which interpret data in one process and then want to notify another process of some important event. Normally, the interpreting process would send an IPC wakeup. However, the destination process will only receive the wakeup when it goes blocked. If the information should interrupt the destination process, regardless of its blocking state, the new async event channel should be used. Also, a new entry in `ipc_`, `create_event_channel`, has been added to allow the creation of `wait`, `call`, and `async call` channels.

Subroutines

- U- 1. Modified the dynamic linking mechanism to support executable Multi segment Files. Added the `object_lib_subroutine` library to support Object MSFs as well as standard single segment objects. The `initiate` entrypoint initiates an executable binary with a given `refname`, forcing the `refname` if required. The `get_def_target` entrypoint searches an object segment for a given `definition` and returns a pointer to the definition target. The `get_component_info` entrypoint returns pointers and `object_info` for object segments or MSFs.
- U- 2. Added a series of entry points to manage operations in `heap_style` allocation areas. These entry points are grouped into the new `heap_manager_` subroutine located in `bound_heap_manager_`.
- U- 3. External pointers can now be initialized to nonconstant values via `list_init_`. The calling sequence for `list_init_` and entry points in `set_ext_variable_` have been altered. All routines that use `system_link_names.incl.pl1` would be recompiled due to a change to the `variable_node` structure. The `name_size` field in the `variable_node` has also been redefined as `fixed bin(21)` rather than `fixed bin`.
- U- 4. Deleted the `set_ext_variable_$allocate` entry point. Any program using this entry point should be changed to use `set_ext_variable_`.
- U- 5. Added `absentee_restarted` and `absout_truncation` entrypoints to `user_info_`. Both require one argument, bit (1) aligned, to return the value of the respective PIT bit value.

- U- 6. Added the `find_char` subroutine to provide an efficient mechanism for doing PL/1 search and verify operations when the search/verify characters are unknown at compile time. Type `"help find_char_"` for details.

Renamed the undocumented `tct` subroutine to have a new name, `find_char`. Site specific programs which called `tct` should be changed to call an entrypoint in the new `find_char` subroutine according to the table below:

<code>tct</code> ENTRYPOINT NAME	NEW NAME
<code>tct</code>	<code>find_char_\$first_in_table</code>
<code>tct_\$reverse</code>	<code>find_char_\$last_in_table</code>
<code>tct_\$translate</code>	<code>find_char_\$translate_first_in_table</code>
<code>tct_\$reverse_translate</code>	<code>find_char_\$translate_last_in_table</code>
<code>tct_\$search</code>	<code>find_char_\$first_in_list</code>
<code>tct_\$reverse_search</code>	<code>find_char_\$last_in_list</code>
<code>tct_\$verify</code>	<code>find_char_\$first_not_in_list</code>
<code>tct_\$reverse_verify</code>	<code>find_char_\$last_not_in_list</code>
<code>tct_\$not_ascii</code>	<code>find_char_\$not_ascii_table</code>

Note that the replacement entrypoints for `tct_$reverse`, `tct_$reverse_translate`, `tct_$reverse_search`, and `tct_$reverse_verify` return a standard PL/1 character index (character position from the left end of the string), whereas the `tct` entrypoints used to return a character position from the right end of the string. Also, the `tct_$quote_search` table has been deleted.

- U- 7. Added the `find_bit` subroutine to efficiently search for the first or last on bit ("1"b) or off bit ("0"b) in a long bit string. This routine uses a more efficient algorithm than PL/1 for performing these specialized bit string search operations. Type `"help find_bit_"` for details.
- U- 8. Added the `alm` subroutine interface to the ALM assembler. Added a new pseudo-operation called `init_link` to allow users to join to the definition section of the object. Added support for references to `*heap` links.
- U- 9. Modified the `rcp_priv_$attach` gate entry used for T&D and MPC attachments to check for proper discretionary access on the device ACS segments in `>sc1>rcp` as is done when using `rcp_$attach`. The `rcp_admin` and `rcp_sys` gate entries are the only ones allowed to bypass ACS segment discretionary access checking.

- U-10. Extended the Multics Star Convention. Starnames can now contain multiple doublestars, and components can contain multiple stars. See `starname.gi.info` for a more complete description of the extension.
- Modified the `match_star_name` subroutine to implement the extended Multics Star Convention. The `match_star_name` subroutine can now match names longer than 32 characters and names containing null components, although these are not permitted for file names. See `match_star_names.info` for a complete description of the subroutine.
- U-11. Added the `check_star_name` subroutine for flexible validation of starnames, entrynames, and pathnames. The old entrypoints `check_star_name $entry` and `check_star_name $path` are obsolete and should not be used in new programs. They will be retained indefinitely for compatibility. See `check_star_name.info` for a complete description of the subroutine.
- U-12. Changed the `error_table $badstar` message to "Invalid syntax in starname." The new codes `error_table $bad_file_name` and `error_table $null_name_component` have been added to diagnose errors that were formerly lumped together with `error_table $badstar`'s old definition, "Illegal entry name."
- U-13. Added the `request_id` entrypoint to the `dprint` subroutine to return, in an argument provided by the caller, the fixed `bin(71)` message identifier of the request being enqueued.
- U-14. Changed `set_lock $lock` and `set_lock $unlock` to set up condition handlers for `no_write_permission` and `not_in_write_bracket` returning `error_table $no_w_permission`. It is recommended that `set_lock` be used as follows for applications where efficiency is important:
- ```

if ^stacq (lock_word, static_var_initialized_to_lock_id, ""b)
 then call set_lock $lock (lock_word, wait_time, code);
 else code = 0;

if ^stacq (lock_word, ""b, static_var_initialized_to_lock_id)
 then call set_lock $unlock (lock_word, code);
 else code = 0;

```
- U-15. Added the `get_block_data_info` entrypoint to `area_info` to allow a caller to step through an area and look at each block whether allocated or free.
- U-16. Changed the `discard_IO` module to accept all opening modes and operations rather than only output type modes and operations.
- U-17. Modified the `print_data` subroutine to make it externally callable. This subroutine takes the output of the PL/1 `put data` statement and formats it into a more readable form.

- U-18. Added the `get_command_name` and `get_command_name_rel` entrypoints to the `cu_subroutine` to allow access to the command name given on the command line. These entrypoints were added in support of the C compiler and runtime.
- U-19. Added the `enter_abs_request` subroutine to add a request to create an absentee process.
- U-20. Modified `command_query` subroutine to accept case insensitive user responses to a yes or no question.
- U-21. Modified `cv_ptr` to allow the use of archive component pathnames.

### Tape Software

- V- 1. It is now possible to reconstruct `tape_archive` tables from the tape volume set. See the documentation for the `tape_archive` reconstruct operation.

### PRICED SOFTWARE PRODUCTS

#### Basic

- W- 1.

#### COMPOSE

- X- 1.

#### EMACS

- Y- 1. Incompatibly changed `emacs` to allow editing of multisegment files. The changes required to implement this were extensive. Users who have written extensions that call undocumented functions in the module `e_multics_files.lisp` will probably have to recode them because this module was redesigned.

- Y- 2. Modified emacs to be more cautious when writing the buffer into an existing file: `^X^S`, save-same-file, and `^X^W`, write-file, with no pathname will query if the file has been modified since it was last read into the buffer. `^X^W` with a pathname will query if the file already exists. The queries are skipped, and the old behavior retained, if the commands are given a numeric argument or if the options `save-same-file-check-dtcm` or `write-file-overwrite` are turned on. The `save-same-file-check-dtcm` option is on by default and must be off to suppress the check. `^X^F`, find-file, will query the user if it finds the specified file already in a buffer where the file has been modified since it was last read into the buffer. This query may be prevented, and the old behavior retained, by turning the option `find-file-check-dtcm` off. `^XI`, insert-file, will set the mark at the beginning of the inserted text.
- Y- 3. Modified Emacs fill-mode and speedtype so that CR and TAB now cause the line to be filled or the word to be expanded, respectively, as is already done by space and punctuation characters
- Y- 4. Added support for VersaTerm (tm), version 12.6e, a terminal emulator for the Apple Macintosh personal computer. The Emacs `ctl versaterm` supports VersaTerm(tm) version 2.20 and higher. The Emacs `ctl versaterm210` supports VersaTerm(tm) versions 2.10 and lower. The difference between the two `ctls` is that `versaterm210` does not support proper scrolling or 132 column mode.
- Y- 5. Added a history comment emacs extension to allow adding history comments while within the emacs editor. To add a history comment, type: `ESC-X add-hcom CR`.

### Executive Forum

- Z- 1. Added the "Personalize Exec Forum" and "Attend Meeting" menu to Executive Forum, version 2.0.

## Executive Mail

- a- 1. New features have been added to the Executive Mail Facility, version 4.0, in three categories: new functions, improvements to existing functions and changes to menus.

New Functions: Ability to read mail in other mailboxes, new options for selecting messages, an option to include the original in a reply, the ability to file the original before the reply, and more printing options.

Improvements to Existing Functions: consistent behavior for Send, Forward and Reply, creation of a new profile segment if required, messages marked for deletion are not deleted on cleanup conditions, more informative help menu, and clearer messages and screen presentations.

Added three new personalization menus: Personalization of Printing Options, Personalization of Outgoing Message Options, and Personalization of Processing Options. Changed the Personalize Executive Mail and General Help menus.

## FORTRAN

- b- 1. Installed Fortran, version 12.0b, which provides new features and enhancements.
- b- 2. Changed Fortran to return `error_table_$noentry` instead of `fortran_io_error_$status_field_error` when non-existent files are opened with `status="old"`.
- b- 3. Changed the meaning of Fortran's "external" statement in ansi66 mode. The compiler now processes "external" declarations of built-in functions in ansi66 mode according to the ANSI-66 (X3.9-1966) standard. Built-in functions which appear in an "external" statement are required by the standard to refer to Fortran built-in functions rather than user supplied functions.
- b- 4. Added the `-la_auto`, `-la_static`, `-vla_auto`, `-vla_static`, and `-very_large_common` control arguments to FORTRAN to enable the selection of individual storage classes to be large arrays or very large arrays. Added the append option to the status-specifier in OPEN statements to allow the file to be positioned to the end of the file when opened. Changed control argument syntax to allow either `-severity N` or `-severityN` format. Increased the number of items allowed in a FORMAT statement from 512 to 1023. Increased the maximum character string size from 256 to 512.

## Forum

- c- 1. Installed Forum version 2.14 which includes new features and numerous bug fixes.
- c- 2. Added the rechain and unchain requests and forum\_\$rechain entrypoint to the forum subsystem to allow meeting chairman to correct transaction chains.
- c- 3. Changed the forum\_info structure to accept a version 2 structure which does not return the removal\_count field. This speeds up the call. The information may be obtained with the forum\_\$list\_users gate.
- c- 4. The list of changed meetings created by the check\_meetings request is now available to user applications.
- c- 5. Added the beforeref, bref, transaction specifier which refers to all transactions preceeding the current one in the current chain.
- c- 6. Added the -trailer\_format control argument to the forum command and the write and print requests to specify the format of the trailer line to be returned.
- c- 7. Added the -before control argument to the list\_meetings request.
- c- 8. Added the -exclude and -from control arguments to the check\_meetings request.
- c- 9. Added the -brief and -long control arguments to the add\_meeting and remove\_meeting requests.
- c-10. Added the -current\_meeting control argument to the remove\_meeting request.
- c-11. Added the -count control argument to the next\_meeting request.
- c-12. Added the -no\_header control argument to the write request.
- c-13. Added the -no\_notify control argument and last\_seen sort type to the list\_users request.
- c-14. Added the forum\_\$previous\_transaction and forum\_\$next\_transaction gates to find unexpunged transactions.
- c-15. Deleted the forum\_chairman\_gate. User programs that call entries in this gate should be changed to call the corresponding entrypoint in the forum\_gate.

### Logical Inquiry Update System (LINUS)

- d- 1. Changed the default wait time for the LINUS, version 4.5, set\_scope request to be a settable parameter in linus\_data\_\$lock\_wait\_time.
- d- 2. The LINUS keywords select, from, where, union, inter, differ, dup, and unique are now replaceable with other keywords. To take advantage of this new feature, edit the source of linus\_lila\_tokens.cds to contain the new keywords, and then use the resulting linus\_lila\_tokens\_ instead of the Honeywell provided linus\_lila\_tokens\_.
- d- 3. The linus assign\_values del\_scope, list\_scope, list\_values, open, and set\_scope requests may now be used as active requests. A new active request, opened\_database, has been provided.

### Megacalc

- e- 1. Installed Megacalc version 4.0a which contains numerous bug fixes.

### MRDS

- f- 1. Added the create\_domain, create\_attribute, delete\_domain, delete\_attribute, rename\_domain, rename\_attribute, rename\_relation requests to the restructure\_mrds\_db subsystem, version 2.0. In addition, rmdb is able to create empty databases, the display\_data\_model request and display\_mrds\_dm command have been modified. See the MRDS manual, Order Number AW53, or the rmdb subsystem info segments for further details.

### MRPG

- g- 1.

### PASCAL

- h- 1. Added Pascal version 8.03 which incorporates bugfixes and provides new features.
- h- 2. Added the pascal\_cross\_reference command to separately check compiled modules, object modules, for identical variables having unlike declarations.
- h- 3. Added the pascal\_display command to display the execution stack and the values of symbolic variables declared in the active Pascal procedures.

- h- 4. Modified Pascal to be in closer conformance to the ISO Pascal standard definition by including more precise goto usage control, checking for unallowed definitions, and dynamic verification of function assignments.
- h- 5. Enhanced support for inter-language calls through the passing of parameter descriptors, and their values, when a Pascal program calls a PL/1 or Fortran procedure.
- h- 6. Enhanced support of I/O processing to include immediate output if I/O module is not vfile\_, add end\_of\_line if not present, process I/O buffer content when closing I/O, and provide dynamic initializing of files even if MAIN program is not called.
- h- 7. Provides full support of string variables and types.

#### Personal Computer Support Facility

- i- 1. Multics Online Work Station Environment (MOWSE) provides the means for cooperating processes on Multics and an IBM PC, or compatible, to communicate with each other and to exchange requests for information or processing. MOWSE is designed in such a way that, given the limitations of the operating systems under which it operates, these processes may be active in the background while other foreground activities, not necessarily related to MOWSE, take place.
- i- 2. MOWSE does not assume that one of the processes is dominant over the other, or that certain functionality is only available on one of the machines. Every attempt has been made during the design to ensure that the same functionality, in terms of MOWSE requests, exists on both machines. Naturally, the manner in which this functionality is delivered to, or requested by, a process depends on the operating system that governs the process.
- i- 3. The functionality of Background File Transfer (BFT) exists equally on both machines, so transfer operations can be initiated from both the local and the remote machine (either the personal computer or Multics).
- i- 4. BFT maintains a store queue and fetch queue on each system. These queues are independent and contain no redundant information. The queues contain only the requests that were initiated on that machine. Due to the separate queues, cancellation of a remote queue entry will not be allowed. Each queue will hold one request on each the PC and Multics.

- i- 5. All external input to the BFT program will occur through a single MOWSE entrypoint. On Multics this MOWSE entrypoint will be called via Multics entrypoints which formulate the requests to BFT and provide a more Multics-like interface.
- i- 6. If either the computer or the network crashes a recovery may be attempted. Recovery after a crash will attempt to retransmit the remaining portion of the file that was being transferred at the time of the crash. The transfer recovery is performed by a simple byte count to adjust the pointer in the source file to the same location as the last received byte in the destination file.



## SECTION 4

### INCOMPATIBLE CHANGES

#### ADMINISTRATIVE SOFTWARE

- A- 1.
- A- 2.

#### MAINTENANCE SOFTWARE

- B- 1.

#### COMMUNICATIONS SYSTEM SOFTWARE

- C- 1. Incompatibly changed the event message information which is set by tty when sending a wakeup to be structured as described in net\_event\_message.incl.pl1.
- C- 2. The structure used by the undocumented hcs\_tty control orders set\_echo\_break\_table and get\_echo\_break\_table and defined in mcs\_echo\_neg.incl.pl1 has been changed incompatibly in order to allow echo negotiation to work with characters above 177o. Specifically, the dimension of the pit array named break has been changed from (0:127) to (0:255). The new structure is version 2. Version 1 structures will be rejected by ring 0.

## USER SOFTWARE

### Commands

- D- 1. Extended the do command to allow use of &0, &r0, &q0, or &control\_string (equivalent to &q0) to insert the unexpanded control string into the control string. Because the meaning of &r&n and &q&n become ambiguous when no arguments are given (when &n = 0), the do command was incompatibly changed to make those forms an error; use &rf&n and &qf&n instead.

The behavior of requoting constructs like &r1 was changed so that when such constructs are consecutive with no intervening space, no spurious quotes are created.

Added the -abort\_line and -no\_abort\_line control arguments to affect subsystem behavior. The default is -abort\_line so that the standard behavior is unchanged. With -abort\_line, an error in a request line invoked by do will abort not only the request line invoked by do but also the request line invoking the do command. Extended the do command to allow control arguments to precede the control string. The control arguments apply only to that invocation of the do command.

### Date/Time Software

- E- 1. Incompatibly changed some of the time zones defined in time\_info\_.cds.

## SECURITY

- F- 1.

## USER ENVIRONMENT

### Date/Time Software

- G- 1.

### Subroutines

- H- 1.

## EMACS

- I- 1. Incompatibly changed emacs to allow editing of multisegment files. The changes required to implement this were extensive. Users who have written extensions that call undocumented functions in the module `e_multics_files.lisp` will probably have to recode them. as the module was redesigned.

## APPENDIX A

### COMMANDS AND SUBROUTINES

This is a partial listing of new commands and subroutines for MR12. A brief description of the command and subroutine functionality is included. Refer to info segments or the appropriate manuals for more information.

#### NEW COMMANDS

attach\_mowse,  
atm

establishes the MOWSE environment on Multics by attaching the MOWSE\_io switch and initializing the protocol.

backup\_file\_transfer,  
bft

transfers files in blocks of the max data length allowed for the MOWSE communications protocol.

detach\_mowse,  
dtm

deinitializes the MOWSE IPC protocol communications and detach the MOWSE\_io switch.

copy\_disk

a BCE command to replace the BOS SAVE COPY functions.

display\_process\_audit\_flags

a privileged process command to display the current state of process security audit control flags.

edit\_process\_audit\_flags

a privileged process command to turn on or off only those security audit control flags specified.

execute\_string,  
 exs  
 substitutes arguments into a control string. The expanded control string is then passed to the command processor or the subsystem request processor for execution.

history\_comment,  
 hcom  
 adds, checks, displays, formats and updates software change history comments within a given source module.

list\_heap\_variables,  
 lhv  
 prints information concerning heap variables. Only variables at the specified execution level(s) are printed. The default information is the location and size of each specified variable. A level description is printed for each execution level specified. The heap variables will be displayed starting at the lowest execution level specified.

lock\_mca  
 a BCE command to lock, or disable, input to the MCA from the console.

nonobject\_files,  
 nobfiles  
 returns the entrynames or absolute pathnames of files that are not executable object files and that match one or more star names.

nonobject\_msfs,  
 nobmsfs  
 returns the entrynames or absolute pathnames of multisegment files that are not object multisegment files and that match one or more star names.

nonobject\_segments,  
 nobseg  
 returns the names of non-object segments only.

object\_files,  
 obfiles  
 returns the entrynames or absolute pathnames of files that are executable object files and that match one or more star names.

object\_msfs,  
 obmsfs  
 returns the entrynames or absolute pathnames of multisegment files that are executable object msfs and that match one or more star names.

object\_segments,  
 obseg  
     returns the names of object segments only.

pascal\_cross\_reference,  
 pascal\_cref  
     separately checks object modules for identical variables having unlike declarations.

pascal\_display  
     displays the execution stack and values of symbolic variables declared in active Pascal procedures.

restore  
     a BCE command to replace the BOS RESTOR function.

reverse\_substr  
     counts characters from right to left. The returned string has its characters in the same order as the input string.

save  
     a BCE command to replace the BOS SAVE function.

set\_process\_audit\_flags  
     a privileged process command to turn on specified flags and turn off all others.

substitute\_arguments,  
 substitute\_args,  
 sbag

unlock\_mca  
     a BCE command to unlock, or enable, input to the MCA from the console.

### NEW SUBROUTINES

alm\_  
     provides a subroutine level interface to the alm assembler.

check\_star\_name  
     provides flexible validation of starnames, entrynames, and pathnames.

cu\_\$get\_command\_name  
     returns a command name used on the command line for the callers argument list.

cu\_\$get\_command\_name\_rel  
     returns a command name on the command line for the passed argument list.

enter\_abs\_request  
adds a request to create an absentee process.

find\_bit  
searchs efficiently for the first or last on or off bit in a long bit string.

heap\_manager  
controls operations for the users heap.

object\_lib  
supports standard single and MSF objects for initiation, definition searches, and info extraction.

print\_data  
formats output of a PL/1 put data statement into readable form.

## APPENDIX B

### MULTICS PRICED SOFTWARE PRODUCTS

PRODUCT  
NUMBER

TITLE

#### OPERATING SYSTEM SOFTWARE

|         |                                                       |
|---------|-------------------------------------------------------|
| SGS6800 | Multics Operating System EXEC (see Note 1 below)      |
| SGS6801 | GCOS (III) Timesharing Environment Facility           |
| SGS6802 | Transaction Processing Tools                          |
| SGS6803 | FAST/DFAST (Fast Access System for Timesharing)       |
| SGS6804 | GCOS (III) Batch Environment Facility<br>(see Note 1) |

#### OPERATING SYSTEM SOFTWARE EXTENSIONS

|         |                                                 |
|---------|-------------------------------------------------|
| SGC6823 | Inter Multics File Transfer Facility            |
| SGE6800 | Multics System Software Extensions (see Note 4) |
| SGE6802 | Remote Job Entry Facility                       |

#### COMMUNICATIONS SOFTWARE

|         |                                            |
|---------|--------------------------------------------|
| SGC6800 | Multics Communications System (Multics CS) |
| SGC6801 | Autocall Support Option to Multics CS      |
| SGC6802 | 3270 Support Option to Multics CS          |
| SGC6803 | Basic Bisync Support Option to Multics CS  |
| SGC6804 | G115 Support Option to Multics CS          |
| SGC6805 | File Transfer Facility                     |
| SGC6807 | Multics HASP Facility                      |
| SGC6822 | Multics Communications Support for X.25    |
| SGC6827 | Personal Computer Support Facility         |
| SGC6828 | Multics Online Workstation Environment     |



## PROGRAMMING LANGUAGE SOFTWARE

|         |                                        |
|---------|----------------------------------------|
| SGL6801 | FORTRAN Compiler and Runtime Facility  |
| SGL6802 | Basic Compiler and Runtime Facility    |
| SGL6803 | COBOL-74 Compiler and Runtime Facility |
| SGL6805 | MRPG (Report Generator) Facility.      |
| SGL6806 | APL (Version 5.02)                     |
| SGL6807 | Pascal Compiler and Runtime Facility   |
| SGL6808 | C Compiler and Runtime                 |

## OPERATING SYSTEM UTILITIES AND TOOLS

|         |                                               |
|---------|-----------------------------------------------|
| SGD6806 | Executive Mail System                         |
| SGD6807 | Format Document Facility                      |
| SGU6800 | WORDPRO Comprehensive Facility                |
| SGU6801 | SORT/MERGE Facility                           |
| SGU6803 | LISTER Facility                               |
| SGU6804 | SPEEDTYPE Facility                            |
| SGU6805 | Dictionary Tools                              |
| SGU6807 | Extended Mail Facility                        |
| SGU6820 | Compose Facility                              |
| SGU6833 | TED (Text Editor)                             |
| SGU6834 | Emacs Text Processing Facility                |
| SGU6835 | Offline Page Printing System Support Facility |

## DATA MANAGEMENT SOFTWARE

|         |                                           |
|---------|-------------------------------------------|
| SGC6824 | Multics Forum Facility                    |
| SGD6800 | MRDS (Multics Relational Data Store)      |
| SGD6801 | LINUS (Logical Inquiry and Update System) |
| SGC6826 | Multics Executive Forum Facility          |

## APPLICATIONS SOFTWARE

|         |                                                                          |
|---------|--------------------------------------------------------------------------|
| AGS6801 | Timesharing Library (see Note 3)                                         |
| AGS6802 | ISTAT (Interactive Statistics) (see Note 3)                              |
| AGS6803 | Graphics Facility                                                        |
| AGS6805 | SCICONIC Mathematical Programming Package                                |
| AGS6806 | SCICONIC Matrix Generator Facility                                       |
| SGH6801 | Simplified Computing and Filing Facility                                 |
| SGH6802 | TEXTO Document Management System and<br>LOGOTEL User Interface for TEXTO |
| SGH6804 | MegaCalc Spread Sheet Package                                            |

### Notes:

1. Licensed for use without separate charge to users acquiring a central processor system from Honeywell.

2. Class II - Maintained only.
3. Class III - Unsupported.
4. Required for normal Multics operation and to support any additional separately priced software products.

## APPENDIX C

### DOCUMENTATION CHANGES

#### CURRENT MULTICS DOCUMENTATION STATUS

A complete list of manuals (including current availability status) is provided in >doc>info>manuals.info as part of MR12.0. Subsequent to this release a SiteSA may obtain an updated list of available manuals at >doc>info>manuals.info on System M.

#### MR12.0 Documentation

The following new and updated publications support MR12.

| Order No. | Document Title                                    |
|-----------|---------------------------------------------------|
| AG91-04A  | Multics Programmer's Reference Manual             |
| AG92-06A  | Multics Commands and Active Functions             |
| AG93-05A  | Multics Subroutines and I/O Modules               |
| AK51-02A  | Multics Project Administrator's Guide             |
| AM81-04   | Multics System Maintenance Procedures             |
| AT58-03D  | Multics FORTRAN Manual                            |
| AU77-03B  | Multics Online Test and Diagnostics Ref Manual    |
| AW53-04D  | Multics Relational Data Store Reference Manual    |
| AZ49-03A  | Logical Inquiry and Update System Ref Manual      |
| CC70-01D  | Multics FORTRAN User's Guide                      |
| CH23-02A  | Multics Extended Mail System User's Guide         |
| CH27-00F  | Emacs Text Editor User's Guide                    |
| CX20-06   | Fundamentals of Multics Executive Mail            |
| DX71-01   | Fundamentals of Multics Executive Forum           |
| GB61-01A  | Operator's Guide to Multics                       |
| GB62-00A  | Multics Pascal User's Guide                       |
| GB64-00A  | Multics Admin, Maint, and Operations Commands     |
| GB66-00   | Multics On-Line Work Station Env User's Guide     |
| HH07-00   | Multics C Compiler User's Guide                   |
| HM28-00   | Multics On-Line Work Station Env Appl Prog Manual |

The following manuals are NO LONGER AVAILABLE for ordering purposes:

Transaction Processing Ref Manual (last update CC96-01)  
Remote Batch Facility (Lev 68 to Lev 6) (last update CG18-00)

For the convenience of new user sites, a complete list of Multics manuals, is provided below. For information about how to order manuals, type "help order\_manuals," on your system.

AG90 Introduction to Programming on Multics  
AG91 Multics Programmer's Reference Manual  
AG92 Multics Commands and Active Functions  
AG93 Multics Subroutines and Input/Output Modules  
AG94 Multics PL/I Language Specification  
AK50 Multics System Administration Procedures  
AK51 Multics Project Administrator's Guide  
AK95 Multics APL User's Guide  
AL39 Multics Processor Manual  
AM81 Multics System Maintenance Procedures  
AM82 Multics BASIC  
AM83 Multics PL/I Reference Manual  
AN05 Multics GCOS Environment Simulator  
AN50 Guide to Multics Manuals  
AS40 Multics Graphics System  
AS43 Multics COBOL User's Guide  
AS44 Multics COBOL Reference Manual  
AT58 Multics FORTRAN Manual  
AT59 Multics DFAST Subsystem User's Guide  
AU25 Multics FAST Subsystem Reference Guide  
AU77 Multics Online Test and Diagnostics Reference Manual  
AW17 Multics Commands and Active Functions Quick Ref Guide  
AW32 Multics SORT/MERGE  
AW53 Multics Relational Data Store Reference Manual  
AZ49 Multics Logical Inquiry and Update System Ref Manual  
AZ98 Multics WORDPRO Reference Manual  
CC69 Multics Report Program Generator Reference Manual  
CC70 Multics FORTRAN User's Guide  
CC75 Multics Communications Administration  
CG40 Multics qedx Text Editor User's Guide  
CH23 Multics Extended Mail System User's Guide  
CH24 New User's Introduction to Multics--Part I  
CH25 New User's Introduction to Multics--Part II  
CH26 Multics Error Messages: Primer and Reference Manual  
CH27 Emacs Text Editor User's Guide  
CJ52 Multics Emacs Extension Writer's Guide  
CJ97 Multics Page Processing System Utility Manual  
CP31 Level 68 Introduction to Emacs Text Editor  
CP50 Multics Text Editor (Ted) Reference Manual  
CP51 Multics Menu Creation Facilities  
CX20 Fundamentals of Multics Executive Mail  
CX72 Executive Mail Editing Operations (Reference Card)

CY73 Inter-Multics File Transfer Facility Reference Guide  
 CY74 Multics Forum Interactive Meeting System User's Guide  
 DJ18 Guide to Multics WORDPRO for New Users  
 DU06 Fund of Multics Forum Interactive Meeting System  
 DW19 Multics MegaCalc User's Guide  
 DX71 Fundamentals of Multics Executive Forum  
 GB58 Multics Common Commands  
 GB59 DPS 6/Multics Satellite 6M Reference Manual  
 GB60 Multics HASP Service and Utility Manual  
 GB61 Operator's Guide to Multics  
 GB62 Multics Pascal User's Guide  
 GB63 Multics Report Writer Reference Manual  
 GB64 Multics Administration, Maintenance, and Operations Cmds  
 GB65 Multics/Personal Computer File Transmission Facilities  
 GB66 Multics On-Line Work Station Env User's Guide  
 GL71 Multics Simplified Computing and Filing Facility  
 GN08 Multics Emacs Reference Card  
 HH07 Multics C Compiler User's Guide  
 HM28 Multics On-Line Work Station Env Appl Prog Manual