MULTICS

SOFTWARE RELEASE BULLETIN

RELEASE 12.0

PREPARED BY:

MULTICS SOFTWARE DEVELOPMENT

December 15, 1986

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CONTENTS

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 "nsa" 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 absout output.

The -truncate and -extend arguments have been added to the enter_abs_request command, to effect the truncation of the absentee request's absout 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 absout 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.pl1. 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 new link 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 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:

tct_ ENTRYPOINT NAME	NEW NAME
tct_	find_char_$first_in_table
tct_$reverse	find_char_$last_in_table
tct_$translate	find_char_$translate_first_in_table
tct_$reverse_translate	find_char_$translate_last_in_table
tct_$search	find_char_$first_in_list
tct_$reverse_search	find_char_$last_in_list
tct_$verify	find_char_$first_not_in_list
tct_$reverse_verify	find_char_$last_not_in_list
tct_$not_ascii	find_char_$not_ascii_table

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. Incompatibably 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. Incompatibably 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
: establishs 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 (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 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	Mulitics/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