EXTERNAL REFERENCE SPECIFICATION

For

MP-60 COMPUTER SYSTEMS
Interactive Terminal Subsystem

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1.0 INTRODUCTION

The Interactive Terminal Subsystem (ITS) extends the full range of MPX/OS features from on-site batch to terminal access. The ITS 2.0 provides operator facilites to the remote terminal user and interactive capabilities to on-site operator. The ITS 2.0 is intended to be used for both software development and applications. Typical applications of the ITS 2.0 for software development are:

Source program entry.
Source program maintenance.
Compilation and assembly.
Listing inspection.
User task execution.
User task debug.
Documentation generation.

The Interactive Terminal Subsystem supports a wide variety of terminal devices. These may range from simple character mode keyboard/display units to extensive block mode multidevice remote job entry terminals. Terminals may be configured as local hardwired terminals or may be temporarily connected to the system through telephone lines and modems.

The number of interactive users is not limited by the amount of physical memory memory available in the system due to the incorporation of rollin/rollout. As users progress through periods of activity and inactivity, they share the same physical areas of memory.

The ITS 2.0 provides the terminal user with several facilities to monitor and control the MPX/OS. These facilities allow users to:

Communicate with jobs in the system.
Control remote and local input and output devices.
Monitor the system dayfile.
Control the system input, output, and execution queues.
Monitor file usage.
Monitor and control external peripheral devices.

2.0 APPLICABLE DOCUMENTS

The following list of Control Data manuals document the MP-60 Emulation, the MPX Operating System and the MPX Product Set:

17329110	MP-32 Computer System MP-60 Emulation Reference Manual
17329120	MP-60 Computer System MPX/OS Reference Manual
10992110	MP-60 Computer System MPX/OS Operator's Guide
11110000	MP-60 Computer System Installation Handbook
14291700	MP-60 Computer System Program Command Console Reference Manual
14063800	MP-60 Computer System Utility Reference Manual
14062200	MP-60 Computer System PRELIB Reference Manual
14061300	MP-60 Computer System COMPASS Reference Manual
14061100	MP-60 Computer System FORTRAN Reference Manual
17328900	MASS/MPSIM Reference Manual

3.0 FEATURE DESCRIPTION

3.1 PORT CONFIGURATION/USER VALIDATION

3.1.1 Abstract

The ability to reconfigure the Interactive Terminal Subsystem at system initialization is provided by the port setup file.

The user validation scheme is based on the Interactive Terminal Subsystem user validation file containing information needed to validate the Username and Password.

3.1.2 Description

Immediately upon system loading, a message will appear on the operator console requesting the name of the port setup file. The computer operator must respond to this message before the Interactive Terminal Subsystem will become active.

Each time a terminal user attempts to log on the user validation file is read to validate the username and password and obtain the user's validation mask.

3.1.3 Interfaces

The port setup file contains one record for each physical port in the system. The format of each record is as follows:

```
did,port,class,mask,p1,p2...pn#
```

where:

did	represents the device identification (e.g. BCLA01).
port	represents the port number on the device.
class	represents an ITS terminal class as defined for the CLASS command.
mask	represents a string of 0 to 32 hexidecimal characters defining the port's validation mask.
p1,p2...pn	represents a string of port setup parameters as defined for the SETUP command.

Username or NULL →

(AUTO LOGIN ALLOWED?)

represents an ETX ($03) character.

Each port has associated with it a validation mask that defines which ITS features may be utilized from that port. The validation mask consists of four words where each set bit indicates an ITS feature that is accessable from that port. The validation mask is defined by the mask parameter in the port setup file left justified zero filled. The correlation of mask bits to ITS features is as follows:

word 1	bit	0	- All ITS features.
		1	- Batch Control Facility.
		2	- Device Control Facility.
		3	- Dayfile Management Facility.
		4	- File Control Facility.
		5	- Interactive Communications Facility.
		6	- Operator Control Facility.
		7-9	- TBD.
		10-15	- Security Level.
		16-31	- TBD (to be used by BCF).
word 2	bit	0-15	- TBD (to be used by DCF).
		16-31	- TBD (to be used by DMF).
word 3	bit	0-15	- TBD (to be used by EBF).
		16-31	- TBD (to be used by ICF).
word 4	bit	0-15	- TBD (to be used by OCF).
	bit	16-31	- not used.

The port setup parameters are optional and are only needed if the terminals default port setup is to be different than the standard default port setup.

The user validation file contains one record for each user allowed access to the Interactive Terminal Subsystem. The format of each record is as follows:

userx,passx,mask#

where:

userx — represents a valid username consisting of 1 to 8 alphanumeric characters.

passx — represents the password associated with that username and consists of 0 to 8 alphanumeric characters.

mask — represents a string of 0 to 32 hexidecimal characters defining the user's validation mask.

— represents an ETX ($03) character.

Associated with each user name is a validation mask which is defined the same as the port validation mask. It serves to define what ITS features that user may have access to. However, what features a user has access to may vary depending upon what port the user is logged on to because accessability of a feature is a logical product of both the port and user validation masks.

3.1.4 Aborts and Recovery

Not applicable.

3.1.5 Errors

If the port setup file can not be opened a message is sent to the console requesting that the computer operator enter the name of another port setup file.

If the user validation file can not be opened during a user validation sequence the username is considered invalid.

An error in a port setup file record causes that record to be ignored which renders that port inoperative.

Errors are not detected in the user validation file.

3.1.6 Performance

Not applicable.

3.1.7 Installation Parameters

The standard default port setup for all terminals is an installation parameter.

The contents of the port setup file is dependent upon the terminal system configuration.

The contents of the user validation file is site dependent.

3.2 PORT ESTABLISHMENT

3.2.1 Abstract

The establishment of a port consists of connecting the terminal to the Interactive Terminal Subsystem and successfully passing a validation check.

3.2.2 Description

After the communications line has been initialized, connection of a terminal to the Interactive Terminal Subsystem is detected by entering any character at the terminal.

SHOULD BE ABLE TO SHUT THIS OFF ON A PORT BASIS. (SETUP)

Upon detection of the terminal connection, a banner message is output to the terminal. This message identifies the system and gives the current date and time. The user is then prompted for username and password entry.

After entering a username and password, the entries are validated using the user validation file. This file has been previously prepared by an external job and contains all valid username/password pairs.

If an entry is invalid, the user is so notified and given a second chance to enter the correct information. If the second attempt also results in an invalid entry, the terminal is disconnected and the user must reinitiate the above sequence to gain access to the system.

If both the username and password are valid, the terminal is established as a logical port in the system and the user has access to the Interactive Terminal Subsystem features.

The user may change passwords at any time follwing log on by entering the PASSWORD command. This command replaces the old password on the user validation file with the new password.

The validation check portion of this feature restricts system access to those users supplying a valid username and password pair. Continued system validation requires discretion on the part of the system users to prevent unathorized system access.

3.2.3 Interfaces

The terminal user causes the Interactive Terminal Subsystem to recognize the connection of the terminal by entering any character at the terminal.

A typical port establishment scenario proceeds as follows:

```
Banner Message:        CONTROL DATA      MPX/OS
                       RESIDENT 2A   LIBRARY 2A
                       04/13/79        17:39:24

Username prompt:       ENTER USERNAME
User entry:            JOHNSON
Password prompt:       ENTER PASSWORD
User entry:            8533635
```

At this point the terminal has been established as a port within the Interactive Terminal Subsystem and may utilize system features.

An abreviated form of username and password entry is available as shown below:

```
Banner Message:        CONTROL DATA      MPX/OS
                       RESIDENT 2A   LIBRARY 2A
                       04/13/79        17:39:24

Username prompt:       ENTER USERNAME
User entry:            JOHNSON,8533635
```

Both the username and password may be entered after the username prompt provided the username and password are separated by a comma.

The following scenerio illustrates failure to gain system access:

```
Banner Message:        CONTROL DATA      MPX/OS
                       RESIDENT 2A   LIBRARY 2A
                       04/13/79        17:39:24

Username prompt:       ENTER USERNAME
User entry:            JOHNSSON
Password prompt:       ENTER PASSWORD
User entry:            8533635
                       INVALID USER
Username prompt:       ENTER USERNAME
```

```
User entry:          JONSON
Password prompt:     ENTER PASSWORD
User entry:          8533635
                     LOGOFF AT   17:39:45
                     CONNECT TIME 0.00 SECONDS.
```

The user failed to enter a valid username and password in two attempts and was disconntected from the system. If a reattempt is desired, the user must reestablish connection of the terminal to the system.

All valid username/password combinations must reside in the User Validation File.

The format of the PASSWORD command is:

```
]PASSWORD opass,npass
```

where opass and npass represent the old password and new password respectively. The new password must consist of 0 to 8 alphanumeric characters.

3.2.4 Aborts and Recovery

Any port recovery attempt must be preceeded by port establishment. This feature does not participate in aborts. ← WHAT DOES THIS MEAN?

3.2.5 Errors

Any data entry errors made during the user validation sequence will produce the message INVALID USER. If the user fails to correctly enter the data on a second attempt, the terminal is disconnected from the system.

If the PASSWORD command is entered incorrectly the message INVALID COMMAND is produced.

3.2.6 Performance

Not applicable.

3.2.7 Installation Parameters

Not applicable.

3.3 TERMINAL DATA ENTRY/DISPLAY

3.3.1 Abstract

The Interactive Terminal Subsystem provides a common input/output format to tasks within the system and the terminal user.

3.3.2 Description

The Interactive Terminal Subsystem provides a central point in MPX/OS which handles all data transfers to and from terminals. This provides the means to standardize terminal input/output formats to both the terminal user and tasks within the system.

3.3.3 Interfaces

When the Interactive Terminal Subsystem is prepared to receive data, the terminal user is prompted with a line feed. The line feed may be transmitted immediately preceeding output data and therefore may not be apparent to the user. However, the Interactive Terminal Subsystem will not transmit data to the terminal until it is prepared to receive data. Therefore, any transmission of data to the terminal serves as a prompt.

The Interactive Terminal Subsystem provides the user with two modes of data entry, line mode and block mode. In line mode, the received data constitutes a single line, while in block mode the received data may constitute several lines.

Line mode is the normal mode of data entry. In line mode, data entry is terminated by a carraige return ($0D). Following the entry of a line the Interactive Terminal Subsystem performs some simple editing of the received data to make it correspond to what appears at the user's terminal. This includes processing backspace ($08), forward skip ($15), and cancel ($18) characters. The cancel character causes all previous characters to be ignored therefore producing the same result as backspacing to the beginning of the line. The user also has the ability to select either the 96 or 64 ASCII character set and parity.

In block mode, data entry is terminated by an ETX ($03) therefore allowing imbedded carraige returns ($0D) and line feeds ($0A). Data entered in block mode is considered to be 8 bit bytes and is not interpreted as characters except when

preceeded by the ITS command character. Therefore data received in block mode is not editted. In addition, character set selection is ignored and no parity is allowed.

Following data entry and any preliminary editing the first character is examined. If this character is the ITS command character the received data is folded into upper case and processed as an ITS command. The character string immediately following the ITS command character and up to but not including the first non-alphabetic character must be one of the following ITS commands or an error message is produced.

ACTIVE	HELP	PASSWORD
BATCH	JOB	PORT
CLASS	KEEP	QUIT
DELAY	LINK	RECOVER
DISPOSE	MESSAGE	SETUP
FACILITY	PAGE	

The terminal user need not enter the entire command word but must enter enough to uniquely identify the command. For commands which accept parameters, a space or comma must seperate the command word from the parameters.

If the first character is not the ITS command character the received data is passed to an ITS facility to be processed.

The transmission of output data is independent of input mode.

3.3.4 Aborts and Recovery

Not applicable.

3.3.5 Errors

Errors made while entering data in line mode may be corrected by using the backspace, forward skip, and cancel characters.

If the terminal user enters more than the maximum number of characters allowed in line mode the message LINE TOO LONG is displayed.

If the terminal user enters more than the maximum number of characters allowed in block mode the message BLOCK TOO LONG is displayed.

3.3.6 Performance

Not applicable.

3.3.7 Installation Parameters

The ITS command character is an installation parameter but is normally a right bracket ($5D).

The input buffer sizes for line and block modes are installation parameters. The normal buffer sizes are 140 characters for line mode and 2000 characters for block mode.

3.4 FACILITIES

3.4.1 Abstract

Within the Interactive Terminal Subsystem there are several facilities to provide an interface between the terminal user and the system.

3.4.2 Description

Each of the following facilities provides the terminal user with a different interface to the system and has its own commands.

BCF - Batch Control Facility
DCF - Device Control Facility
DMF - Dayfile Management Facility
File Control Facility
ICF - Interactive Communications Facility
OCF - Operator Control Facility

Following log on the terminal user is in communications with the default facility, however the terminal user may switch facilities at any time by entering the FACILITY command. If the terminal user is not validated to communicate with the requested facility the command is considered invalid and an error message is produced.

These facilities process all data received from the terminal which does not constitute an ITS command.

3.4.3 Interfaces

The format of the FACILITY command is:

```
)FACILITY facname
```

where facname represents one of the following mnemonics.

BCF - Batch Control Facility
DCF - Device Control Facility
DMF - Dayfile Management Facility
FCF - File Control Facility
ICF - Interactive Communications Facility
OCF - Operator Control Facility

When the terminal user switches to the Interactive Communications Facility the message PROCESSX or NO CURRENT PROCESS is displayed where PROCESSX represents the name of the current process. When switching to any other facility the message FACX is displayed where FACX represents the facility mnemonic.

3.4.4 Aborts and Recovery

Not applicable.

3.4.5 Errors

An error in entering the FACILITY command produces the message INVALID COMMAND.

3.4.6 Performance

Not applicable.

3.4.7 Installation Parameters

The default facility is an installation parameter but is usually ICF.

3.5 BATCH CONTROL FACILITY

3.5.1 Abstract

The Batch Control Facility (BCF) provides the terminal user with the capability to control and monitor remote and local input, and output devices.

3.5.2 Description

The Batch Control Facility allows the terminal user to control files which are currently being read or printed. The Batch Control Facility user must enter enough characters to uniquely identify the particular command. A space or comma must separate the command from the parameters. The parameters are separated by commas and are usually order-dependent. Default values may be selected by entering two consecutive commas.

The valid BCF commands are:

BSP	causes a output file to be backspaced a specified number of 1920 character blocks.
END	stops file transfering and the file transfering to the device specified is evicted.
READ	causes a deck to be read from the local or terminal card reader and creates a file which is catalogued under the specified file. The file is then accessable to the interactive user or may be submitted for execution.
REPEAT	causes the file on the specified device to be reprinted the specified number of times.
REWIND	causes an output file to be rewound and returned to the output queue.
RETURN	causes a file being printed to be rewound and returned to the output queue with a specified priority.
SUPPRESS	results in the carriage control characters contained in the file being printed to be disregarded.

3.5.3 Interfaces

The format of the BSP command is:

```
BSP did,ss
```

where did is the device identifier of the output device, the default being LP1, and ss is the decimal number of 1920 character logical blocks to be backspaced.

The format of the END command is:

```
END did
```

where did is the device identifier of an input or output device. There is no default device. The END command when used for a line printer, terminates the current file transfer and evicts the file.

The format of the READ command is:

```
READ fname,fo,fed,fak,CRn
READ CRn
```

where:

fname represents the Name of the catalogued job file.

fo represents the Owner of the catalogued job file.

fed represents the Edition of the catalogued job file. The default is 01.

fak represents the Access Key of the catalogued job file. The default is an Access Key equal to the Owner.

CRn is the number of the Card Reader from which the file is to be read. The default is CR1.

The first form of the READ command is used to transfer card images into the specified file for later processing, while the second form is used to create a scratch input file to receive card images and and be submitted for execution.

The format of the REPEAT command is:

```
REPEAT did,m
```

where did is the device identifier of the output device, and m is a decimal number which specifies the number of additional copies desired. If m is omitted, 1 is assumed.

The format of the REWIND command is:

```
REWIND did
```

where did is the device identifier of an output device, the default being LP1. The file on the device specified is rewound and the device turned logically OFF. The device must be turned logically ON before output will continue.

The format of the RETURN command is:

```
RETURN did,p
```

where did is the device identifier of an output device, the default being LP1, and p is the priority. The default priority is the existing one, but the priority may be a decimal value from 0 to 65535.

Printing stops and the output file is rewound and returned to the output queue with priority p. The residual repeat count for that file is saved and printing resumes after command completion.

The format of the SUPPRESS command is:

```
SUPPRESS LPn
```

where n is the logical device number of the printer. The remainder of the file not already printed is single spaced.

3.5.4 Aborts and Recovery

Not applicable.

3.5.5 Errors

If a BCF command is not recognized or the format is incorrect, the command is ignored and the message INVALID COMMAND is displayed.

If the user enters the READ command while cards are reading, card reading continues and the message INVALID COMMAND is displayed.

3.5.6 Performance

Not applicable.

3.5.7 Installation Parameters

Not applicable.

3.6 DEVICE CONTROL FACILITY

3.6.1 Abstract

The Device Control Facility (DCF) provides the terminal user with the capability to control external peripheral devices.

3.6.2 Description

The Device Control Facility allows the terminal user to control the status of certain peripheral devices. The Device Control Facility user need not enter the entire command, but must enter enough to uniquely identify the entire command. For commands which accept parameters, a space or comma must separate the command word from the parameters, parameters are separated by commas, and except for the DEFINE command, parameters are order-dependent. Default values can be selected by entering two consecutive commas.

The valid DCF commands are:

CONTINUE — restarts file transmissions which have stopped because a message was sent to the CRT display or as a result of a command. Interrupted file transmissions are automatically restarted after any of the DCF commands or after successful completion of a Batch Control Facility (BCF) command.

DEFINE — specifies certain attributes of an output device. If the device is already configured, DEFINE modifies the attributes of the device. If the device is not configured, DEFINE configures the device with the specified attributes.

GO — causes operations suspended temporarily by the WAIT command to be resumed.

LIST — lists the configuration and status of devices currently defined in the system.

OFF — turns the specified equipment logically OFF, negating the effect of the ON command.

ON — turns the peripheral device specified logically ON, negating the effect of the OFF command or the Batch Control Facility command REWIND.

WAIT causes file transfering to be suspended until a GO command is received.

3.6.3 Interfaces

The format of the CONTINUE command is:

```
CONTINUE
```

The format of the DEFINE command is:

```
DEFINE did,p1,p2,p3
```

where did is the output device identifier, default being LP1. p1,p2,p3 represent a string of order-independent parameters which define nondefault characteristics.

Possible parameters are:

```
IP     - Impact Printer.
NIP    - NonImpact Printer.
LW=lw  - Line Width of the printer. lw can be 80 - 136.
         The default width depends upon the terminal type.
```

If a user enters a DEFINE command with only the did parameter, the device is returned to a default status. If the user enters a DEFINE command for a device already configured, only those attributes specified are altered.

For terminals with additional devices, the user needs a DEFINE command to configure each additional device.

The format of the GO command is:

```
GO did
```

where did is the device identifier of an input or output device or ALL, the default being LP1. Using the ALL parameter causes reading and printing on all devices temporarily suspended by a WAIT command to resume. A WAIT/GO sequence has no effect on the file contents, if WAIT stops file processing, the file continues from the point where it stopped. If no file activity is in progress when WAIT is entered, GO with an appropriate parameter ensures that printing is initiated as soon as an output file becomes available or when card input is available from the card reader.

The format of the LIST command is:

```
LIST
```

The output created by this command is depicted in Appendix A.

The format of the OFF command is:

```
OFF did
```

where did is the device identifier of an input or output device or ALL, the default being LP1. Using the ALL parameter turns all peripheral equipment logically OFF. Data transfers cannot occur on devices logically OFF. If a device is turned OFF while a data is being transfered, processing continues until the end of file is reached, and no subsequent files are transfered. A device is automatically turned OFF by the Batch Control Facility command REWIND.

The format of the ON command is:

```
ON did
```

where did is the device identifier of an input/output device or ALL, the default being LP1. Using the ALL parameter turns all peripheral equipment logically ON.

The format of the WAIT command is:

```
WAIT did
```

where did is the device identifier of an input or output device or ALL, the default being LP1. Using the ALL parameter causes reading and printing to be suspended at all devices. The transfers can be restarted the GO command.

3.6.4 Aborts and Recovery

Not applicable.

3.6.5 Errors

If a DCF command is not recognized or the format is incorrect, the command is ignored and the message INVALID COMMAND is produced. The command should then be corrected and retransmitted.

3.6.6 Performance

Not applicable.

3.6.7 Installation Parameters

The default set of configured peripheral devices is an installation parameter.

3.7 DAYFILE MANAGEMENT FACILITY

3.7.1 Abstract

The Dayfile Management Facility (DMF) provides the terminal user with the capability to monitor the system dayfile.

3.7.2 Description

The terminal user enters the Dayfile Management Facility to display the system dayfile, selectively dump the system dayfile, and reset the system dayfile. Upon entering the Dayfile Management Facility, system dayfiles messages will being appearing on the terminal as they are processed. The following paragraphs describe the valid Dayfile Management Facility commands.

The TYPE command allows the terminal user to specify a selection criteria. The available selection criteria include:

JOB Name
TASK Name
JOB Sequence number.
Entry TYPE code

The DUMP command allows the terminal user to selectively dump the system dayfile onto a file. The file may then be scanned and display using the Interactive Communications Facility.

3.7.3 Interfaces

The format of a system dayfile entry is as follows:

```
                                                                  1
                  1       1   2       2   2  3    3              3
  1 2       9     1       8   0       7   9  2    5              4
+-+---------+-+---------+-+---------+-+----+--+------  -------+
! ! time    !.!jobname !,!taskname!.!code!, !    message    !
+-+---------+-+---------+-+---------+-+----+--+------  -------+
```

character position	Definition
1	Blank.
2-9	time, hh:mm:ss
10	Period.
11-18	jobname, job identification.
19	Comma.
20-27	taskname, task identification.
28	Period.
29-32	code, defined as follows: 29 Message identification code. 30 Event code. 31-31 Action code.
33-34	Comma and Blank.
35-134	message, dayfile message.

The format of the TYPE command is as follows:

```
TYPE,JN=jobname,TN=taskname,SQ=seq#,ID=code,EV=code,AC=code
TYPE,ALL
```

where:

jobname	The job name selection criteria. Only entries with the job names matching will be displayed/dumped.
taskname	The task name selection criteria. Only entries with the task names matching will be displayed/dumped.
seq#	The unique sequence number generated by the system.
code	The TYPE code divided into the fields: Idenification, Event, and Action.
ALL	resets the selection criteria to all entries.

The Format of the DUMP command is as follows:

DUMP,start,stop,ALL

where:

start is the start time.

stop is the stop time.

ALL is a flag to disregard the the TYPE selection criteria.

3.7.4 Aborts and Recovery

This feature does not participate in any aborts or recovery.

3.7.5 Errors

If a DMF command is not recognized or the format is incorrect, the command is ignored and the message INVALID COMMAND is produced. The command should then be corrected and retransmitted.

3.7.6 Performance

Accessing the system dayfile will not degrade the real time capabilities of the MPX Operating System. In order to maintain the real time capabilities, this feature may not maintain an accurate dayfile message entry display at the terminal, i.e. dayfile entries may not be displayed due to dayfile messages entry rate.

3.7.7 Installation Parameters

Not applicable.

3.8 FILE CONTROL FACILITY

3.8.1 Abstract

The File Control Facility (FCF) provides the terminal user with the capability to monitor MPX/OS File Management.

3.8.2 Description

The File Control Facility allows a terminal user to display status information about mass storage files. The command provided to accomplish this is the LIST command, which displays information about files under a particular owner name on a particular disk pack, or lists the device identifiers of the packs currently mounted.

3.8.3 Interfaces

The format of the LIST command is:

```
LIST O,owner,pack
LIST A,owner,pack
LIST D
```

where O selects a display of all files currently open, A selects a display of all allocated files, and D selects a display of device ID's for all disk packs currently mounted. The owner parameter represents a four character owner name and is optional. If an owner name is specified only files with the designated owner name are listed. The did parameter represents a disk pack device identification and is optional. If a device identification is specified only files residing on that pack are listed.

Examples of the possible displays are provided in Appendix A.

3.8.4 Aborts and Recovery

Not applicable.

3.8.5 Errors

If the LIST command is entered incorrectly the command is ignored and the message INVALID COMMAND is produced.

If an invalid owner name or device identifier is specified, the message NULL LIST is produced.

3.8.6 Performance

Not applicable.

3.8.7 Installation Parameters

Not applicable.

3.9 INTERACTIVE COMMUNICATIONS FACILITY

3.9.1 Abstract

The Interactive Communications Facility (ICF) provides the terminal user with the capability to communicate with jobs in the system.

3.9.2 Description

The Interactive Communications Facility does not process any commands. All data received by the ICF is passed to the current process provided there exists a current process and the current process has a read request pending. When a read request is received from the current process the Interactive Communications Facility outputs a prompt. The prompt may be the default ICF prompt or a prompt defined by the process.

PROMPT BEFORE REQ RCD PLEASE!

When in communications with ICF write requests from the current process are output to the terminal.

3.9.3 Interfaces

There is no command interface between the terminal user and the ICF. The interface to the terminal user consists of data received from the terminal that is not an ITS command and data output to the terminal because of a write request from the current process. The interface between the ICF and the current process is described in Section 3.17 Task/Terminal Communications.

Control of which process is the current process is provided by the LINK and KEEP ITS commands.

3.9.4 Aborts and Recovery

Not applicable.

3.9.5 Errors

If data is received and the terminal user has no current process the message NO CURRENT PROCESS is produced.

If data is received and the current process has no read request pending the message PROCESSX BUSY is produced where PROCESSX represents the name of the current process.

3.9.6 Performance

Not applicable.

3.9.7 Installation Parameters

The default ICF prompt is an installation parameter but is usually a question mark and back space ($3F & $08).

3.10 OPERATOR CONTROL FACILITY

3.10.1 Abstract

The Operator Control Facility (OCF) provides the terminal user with the capability to monitor and alter the MPX/OS input, output, and execution queues, display and alter memory, and respond to operator messages.

3.10.2 Description

The Operator Control Facility allows terminal users to monitor system activities. The Operator Control Facility user need not enter the entire command word, but must enter enough to uniquely identify the command. A space or a comma must separate the command word from the parameters.

The valid OCF commands are:

ABORT	causes an executing job to be terminated.
EVICT	removes a file from the input or output queue.
IDLE	causes execution of a task to be suspended until a RUN command is received.
LIST	displays the current contents of the input, output, execution and operator message queues.
MEMORY	lists and/or alters the current contents of memory in hexadecimal format.
PRIORITY	changes the priority of a file in the input or output queue.
RUN	resumes execution of a task that was suspended by the IDLE command.
WATCH	displays the status of jobs and tasks in execution.

3.10.3 Interfaces

The format of the ABORT command is:

```
ABORT jobid
```

where jobid is the job identifier.

The format of the EVICT command is:

```
EVICT jobid,q
```

where jobid is the job identifier and q is the first initial of the queue in which the file currently resides. Valid q parameters are:

```
I   Input queue
O   Print queue
```

If q is omitted, all files with the job identifier jobid are eliminated from the input, and output queues.

The format of the IDLE command is:

```
IDLE jobid,taskid
```

where jobid is the job identifier and taskid is the task identifier of the task within the job that is to be idled.

The format of the LIST command is:

```
LIST q
```

where q is the first initial of the queue to be displayed or A. The valid q parameters are:

```
I   Input queue
O   Output queue
```

The format of the MEMORY command is:

```
MEMORY S,locn,v1,v2,v3,...
MEMORY D,locn,n
MEMORY +m,n
MEMORY -m,n
```

where S designates memory is to be altered by storing v1,v2,v3...vn into memory starting at location locn. The S parameter causes all altered memory to be displayed up to a screen full. The D parameter causes memory to be displayed starting with location locn and displaying n words. The +m and -m parameters cause memory to be displayed starting with a location relative to the previous location displayed. Locn may be an arithmetic expression with values in Hexadecimal. The n is the number of locations to display, while m is the hexidecimal number to be added to the last starting address. The values to be stored into memory v1,v2,v3...vn must be in hexidecimal but may be preceeded by a decimal repeat count. The value 10*0 would result in 0 being stored in 10 successive locations in memory.

The format of the PRIORITY command is:

```
PRIORITY jobid,q,p
```

where jobid is the job identifier, q is the first initial of the queue in which the file currently resides, and p is the new priority to be assigned to the file.

Valid q parameters are:

```
I   Input queue
O   Output queue
```

The format of the RUN command is:

```
RUN jobid,taskid
```

where jobid is the job identifier and taskid is the task identifier.

The format for the WATCH command is:

```
WATCH
WATCH jobid
WATCH jobid,taskid
```

where jobid is a job identifier and taskid is a task identifier. If no job identifier is specified status information is displayed for all jobs in execution. If a job identifier is specified but no task identifier status information is displayed for all tasks within the job. If a task identifier is specified status information is displayed for that task only. Once the command has been accepted as

valid, the display will be updated each time the job progresses to a new control card until a new OCF command is entered.

3.10.4 Aborts and Recovery

Not applicable.

3.10.5 Errors

If a OCF command is not recognized or the format is incorrect, the command is ignored and the message INVALID COMMAND is produced. The command should then be corrected and resubmitted.

3.10.6 Performance

Not applicable.

3.10.7 Installation Parameters

Not applicable.

3.11 JOB SUBMISSION

3.11.1 Abstract

The terminal user must submit cataloged jobs to the system in order to perform work. At the time of submission, disposition of output files may be specified. Files disposed to mass storage may be retained on the system for future use or may be printed or otherwise disposed of.

The command which submits a cataloged job file to the system determines whether the job may be placed into the system input queue and whether the job has an originating port. The first job control statement of the cataloged job determines whether the job will execute as a memory resident job or is subject to rollin/rollout.

3.11.2 Description

All work to be done by the terminal user must begin with the submission of a cataloged job to the system. The cataloged job may be created using the *SAVE control card from the system standard input device, or it may be created by a job executing within the system. The terminal user can create cataloged jobs with the text editor or other utility programs.

Two commands are provided to perform job submission from the terminal: the BATCH command and the JOB command. These commands require input file identification and allow the specification of standard output file and standard file dispositions.

If an output or file is created with mass storage disposition, a message is produced giving the name by which the file may be retrieved. These files are not accessible through the normal file management job control statements because they have special file identifications.

The BATCH command is intended to submit jobs which do not interact with the terminal. The Batch command attempts to place the job in the named file into immediate execution. If the job cannot be placed into immediate execution then the file is added to the system input queue. If the file cannot be placed into the queue, a diagnostic message is produced which indicates the difficulty. A job submitted using the BATCH command does not have the originating port information.

The JOB command is intended to submit jobs which will interact with the terminal. The JOB command attempts to place the job contained in the named file to be placed into immediate execution if the resources required by the job's SCHED cards are available. If the job cannot be placed into immediate execution, or if an submission error occurs then a diagnostic message is produced indicating the difficulty. A job submitted using the JOB command has the originating port information.

The first statement of a cataloged job file must be one of the following: *JOB, *RJOB, *IJOB, or *IRJOB. The *JOB and *RJOB statements are described in the MPX/OS Reference Manual and they define a normal memory resident job. The *IJOB and *IRJOB statements are the non-memory resident equivalent statements.

The *IJOB and *IRJOB statements differ from the *JOB and *RJOB statements as follows:

1. Jobs beginning with *IJOB and *IRJOB utilize memory pages from the rollin pool for execution and their initiation is not delayed due to unavailable memory.

2. Jobs beginning with *IJOB and *IRJOB are either placed into immediate execution (resources available) or their submission is rejected (resources unavailable). These jobs are never placed into the system input queue.

3. Jobs beginning with *IJOB and *IRJOB cannot be submitted from the system standard input device.

The JOB command is intended to submit a cataloged job beginning with a *IJOB or *IRJOB statement, and the BATCH command is intended to submit a cataloged job beginning with a *JOB or *RJOB statement; however, these conventions are not enforced.

3.11.3 Interfaces

The formats of the BATCH and JOB commands are:

```
)BATCH fname,fo,fed,fak,printdisp[,batchid]
)JOB fname,fo,fed,fak,printdisp[,runerrors]
```

where:

fname - represents the name of the cataloged job file.

fo represents the owner of the cataloged job file.

fed represents the edition of the cataloged job file.

fak represents the access key of the cataloged job file.

printdisp represents the disposition code for standard output.

The file disposition codes must be legal MPX/OS file disposition codes.

If the mass storage disposition (MS) is selected, the message

```
      OUTPUT: xxMS
 or   PUNCH:  xxMS
```

is produced as appropriate, where xxMS is a unique identifier of the file and may be used to subsequently access the file with the DISPOSE command.

The default fields available with the BATCH and JOB commands differ when the fo field is specified. When the fo field is specified the fed defaults to 01 while the fak field defaults to the value specified in the fo field. The default fields for the BATCH and JOB command are as follows:

```
]BATCH BATCH-DEFAULT,SAVE,00, ,MS,SC
]JOB JOB-DEFAULT,SAVE,00, ,SC,SC
```

Examples of the default field usage is as follows:

```
]BATCH
```

Results in the file BATCH-DEFAULT,SAVE,00, , being submitted with the output disposition of mass storage and disposition of scratch.

```
]BATCH MYJOB,,,,PR
```

Results in the file MYJOB,SAVE,00, , being submitted with the output disposition of the printer and disposition of scratch.

```
]BATCH MYJOB,FDR
```

Results in the file MYJOB,FDR,01,FDR being submitted with the output disposition of the printer and disposition of

scratch.

If a job submitted by the BATCH command is placed in the system input queue the following messages will be produced:

```
JOB IN INPUT QUEUE.
XXX NOT AVAILABLE.
```

where XXX represents the standard MPX/OS hardware type of the unavailable resource.

The formats of the *IJOB and *IRJOB job control statements are

```
*IJOB(ID= ,AC= )
*IRJOB(ID= ,AC= )
```

where the parameters are the same as those for the standard *JOB job control statement.

3.11.4 Aborts and Recovery

Not applicable.

3.11.5 Errors

If an error is made entering the BATCH or JOB command the message INVALID COMMAND is produced.

If the file specified in a BATCH or JOB statement cannot be successfully submitted to the system, the message JOB NOT INITIATED is produced followed by the appropriate message from the following list indicating why the submit failed.

```
FILE MANAGER ERROR XX.
FILE FORMAT ERROR.
JOB STATEMENT ERROR.
SCHED STATEMENT ERROR.
INPUT QUEUE FULL.
NO TABLE SPACE AVAILABLE.
```

3.11.6 Performance

Not applicable.

3.11.7 Installation Parameters

Not applicable.

3.12 FILE DISPOSITION

3.12.1 Abstract

The DISPOSE command may be used to print or otherwise dispose of mass storage files.

3.12.2 Description

The DISPOSE command allows a terminal user to route a file to the system output queue or release a file which is no longer needed. The file being disposed may either be a catalogued file or a file created by BATCH or JOB commands whose disposition was to mass storage. In either case the file cannot be disposed if it is open, and once a file has been disposed it no longer exists.

3.12.3 Interfaces

The format of the DISPOSE command is:

```
)DISPOSE disp,fid
        or
)DISPOSE disp,fname,fo,fed,fak
```

where:

disp	represents a an MPX/OS file disposition code.
fid	represents the identifier of the output file as received from the BATCH or JOB command.
fname	represents the name of the catalogued job file.
fo	represents the owner of the catalogued job file.
fed	represents the edition of the catalogued job file.
fak	represents the access key of the catalogued job file.

For a file to be released or routed to an output device it must not be open.

3.12.4 Aborts and Recovery

Not applicable.

3.12.5 Errors

Errors encountered by the execution of DISPOSE commands result in the appropriate message from the following list:

```
FILE MANAGER ERROR XX.
UNKNOWN DISPOSITION.
QUEUE FULL.
```

3.12.6 Performance

Not applicable.

3.12.7 Installation Parameters

Not applicable.

3.13 PORT STATUS AND CONTROL

3.13.1 Abstract

The Interactive Terminal Subsystem provides the terminal user with several commands to control port input and output and monitor port status.

3.13.2 Description

Each port established in the MPX/OS system has associated with it various status and parameter information. The following commands allow the user to display and modify this information.

The PORT command produces a display of the user's port number, username, log on time, terminal class, facility, and connected processes.

The ACTIVE command produces an abbreviated display of this information for all active ports in the system.

At the time of port establishment, the terminal class and default port setup is established as defined for that terminal in the port setup file.

The user may declare the terminal to be of a different terminal class at any time by entering the CLASS command.

The user may display or change the port setup information by entering the SETUP command. The port setup is used to control the mode of data transmission to and from the terminal in those implementations which provide variable transmission mode selection.

The user may request a time delay between outputs by entering the DELAY command. This is intended to allow time for the carraige return on terminals which produce a hard copy.

The PAGE command allows the user to define the terminal display size and enables paged output. When paged output is enabled consecutive outputs will be halted when the terminal display is full and will continue when the user enters a carraige return (line mode) or ETX (block mode).

ADD

TIME: 15:32:46 DATE: 12/25/79

3.13.3 Interfaces

The format of the PORT command is:

```
)PORT
```

Entry of the PORT command produces a display similar to the following:

```
PORT: 6     USERNAME: JOHNSON     LOG ON: 14:37:46

CLASS:       7
FACILITY:    ICF
PROCESSES:   EDITOR      *PCC
```

where EDITOR and PCC are connected processes. The asterisk (*) denotes the current process.

The format of the ACTIVE command is:

```
)ACTIVE
```

Entry of the ACTIVE command produces a display similar to the following:

```
 PT   USER      LOG ON    FAC PROCESS
  1 JONES      14:32:47   ICF EDITOR
  5 SMITH      13:23:12   OCF
  6 JOHNSON    14:10:59   DCF PCC
```

where ports 1, 5, and 6 are the only active ports.

The format of the CLASS command is:

```
)CLASS n
```

where n represents one of the following ITS terminal classes.

1	M33, M35, M37, or M38 TTY
2	CDC 713-10
3	reserved
4	IBM 2741
5	M40 TTY
6	Hazeltine 2000
7	CDC 751-1
8	Tektronix 4000
9	HASP Protocol
10	200 User Terminal

11	CDC 214
12	CDC 711-10
13	CDC 714
14	CDC 731-12, 732-12
15	CDC 734

The format of the SETUP command is:

```
)SETUP p1,p2...pn
```

where p1,p2...pn represents a string of parameters from the following list.

HALF - half duplex	110 - 110 baud
FULL - full duplex	300 - 300 baud
ODD - odd parity	600 - 600 baud
EVEN - even parity	1200 - 1200 baud
NONE - no parity	2400 - 2400 baud
LINE - line mode	4800 - 4800 baud
BLK - block mode	9600 - 9600 baud
96 - 96 character set	19.2 - 19200 baud
64 - 64 character set	

If two or more parameters conflict, the last parameter is used. If an invalid parameter is entered the entire command is considered invalid and no changes are made. If no parameters are present, the SETUP command produces a display of the current port setup information similar to the following:

```
MODE:   LINE
CHAR:   64
BAUD:   9600
DUPLEX: FULL
PARITY: EVEN
```

The actual transmission mode used with a terminal is subject to individual site implementation, and the setup parameters may not be used in all implementations.

The format of the DELAY command is:

```
)DELAY n
```

where n specifies the delay time in hundreths of a second and is a value between 0 and 99.

WHAT IS BEING DELAYED?

The format of the PAGE command is:

```
]PAGE n,m
```

where n is the number of lines in a page and m is the page width in characters. The maximum number of lines per page is 63 and the page width must be between 1 and 136. Paging is disabled by setting the number of lines per page to 0.

3.13.4 Aborts and Recovery

Not applicable.

3.13.5 Errors

If errors are made entering these commands the message INVALID COMMAND is produced.

3.13.6 Performance

Not applicable.

3.13.7 Installation Parameters

Port setup parameters must be configured to agree with the actual site implementation.

3.14 INTERPORT COMMUNICATIONS

3.14.1 Abstract

The Interactive Terminal Subsystem allows terminal users to communicate with other terminal users connected to the system.

3.14.2 Description

A terminal user may send messages to other ports and may also receive messages from other ports. The user can utilize the ACTIVE command to determine which ports are active and which user is logged on to each port. Sending messages to an inactive port causes an error message to be produced.

PLEASE ALLOW ! AS SEPARATOR

3.14.3 Interfaces

The format of the MESSAGE command is:

```
]MESSAGE n text of message
```

where n represents the number of the port the message is to be sent to or "ALL" if the message is to be sent to all active terminals.

The format of a received message is as follows:

```
n text of message
```

where n is the number of the port which sent the message.

3.14.4 Aborts and Recovery

Not applicable.

3.14.5 Errors

An error in the entry of the MESSAGE command produces the display INVALID COMMAND.

3.14.6 Performance

Not applicable.

3.14.7 Installation Parameters

Not applicable.

3.15 JOB TERMINAL REQUEST

3.15.1 Abstract

In order for communications between a job and a terminal to begin, a logical connection or linkage must be established between the terminal and the job. Normally for this linkage to be established action is required by both the job and the terminal user. The actions required by the job to establish communications is described in the following paragraphs.

3.15.2 Description

The establishment of the job and terminal linkage begins with a terminal request by the job. The job uses the DEVICE control card or Executive Service Request (ESR) to initaite the terminal request. The ability of the job to place restrictions upon the port, terminal, and user is also supplied by the DEVICE control card or ESR. Before the job regains control of the CPU the terminal request parameters are validated.

If the job requested immediate connection to a port, the job may begin communications with the terminal. If the job did not request immediate connection to the port then communications with the terminal will be delayed until the user links with this request.

3.15.3 Interfaces

For Requesting a terminal the format of the DEVICE control card is:

LU

*DEVICE(lu=TERM,IC,~~LP=port~~/PP=port,VAL0=mask,VAL1=mask,
CLASS=mask,UN=username)

P

P = ANY

where:

lu is the logical unit.

IC is the immediate connection flag.

~~LP=port, port is the logical port number~~. This parameter may not be supplied if the PP=port parameter is supplied. If the port string is an asterisk then the submitting logical port is used.

PP=port, port is the physical port number, and this parameter string may not be supplied with the LP=port parameter.

VAL0=mask, the mask is a hexidecimal string where the linkage is restricted to ports and user which satisfy the following equation:

VAL0 mask .AND. USER validation mask = 0

VAL0 = 1 = CAN'T USE THIS VALIDATION

VAL1=mask, the mask is a hexidecimal string where the linkage is restricted to ports and user which satisfy the following equation:

VAL1 mask .AND. .NOT. USER validation mask = 0

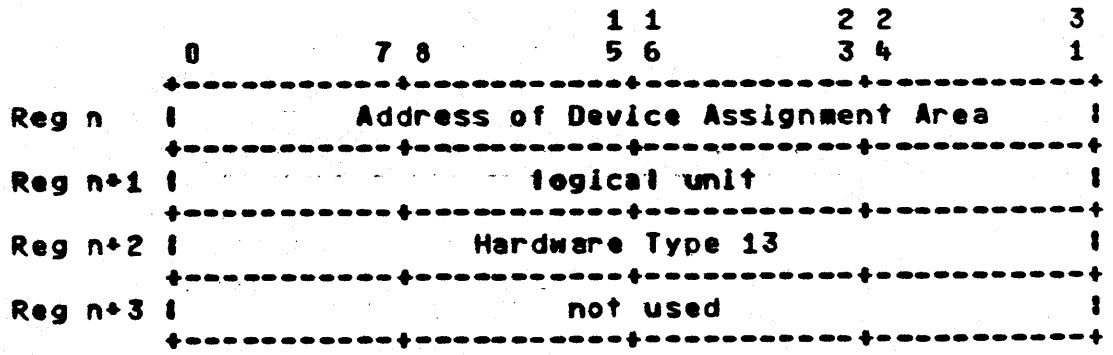
VAL1 = 1 = MUST HAVE THIS VALIDATION

CLASS=mask, the mask is a hexidecimal string where the linkage is restricted to terminals which satisfy the following equation:

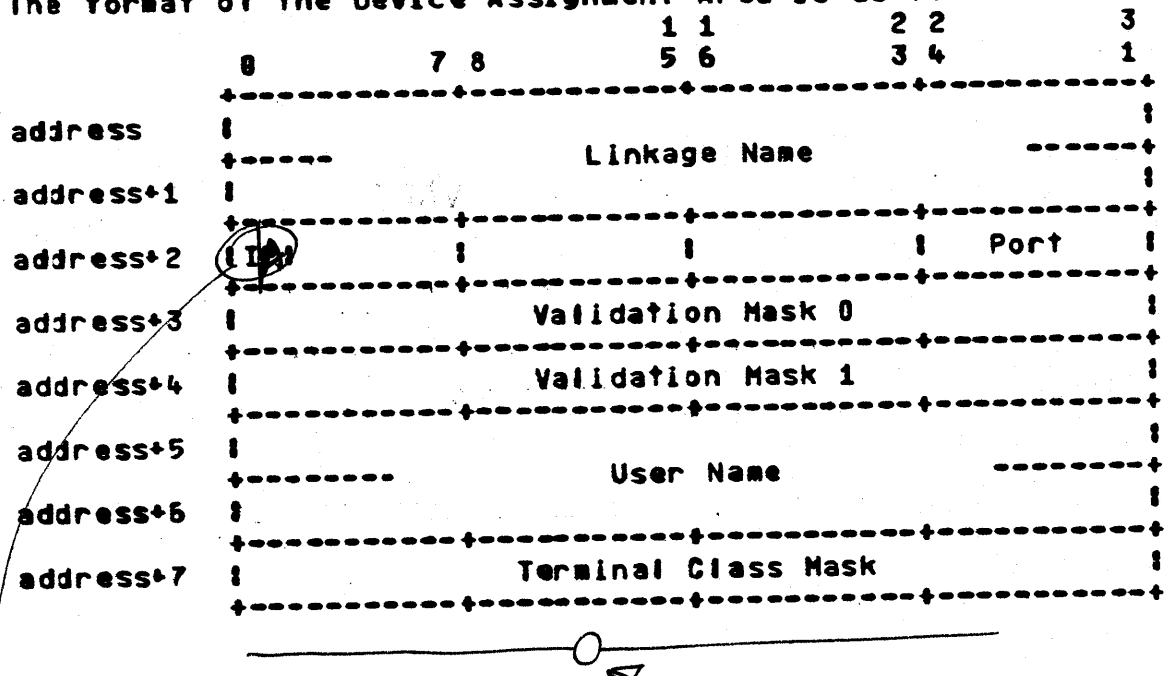
.NOT. mask .AND. 2**terminal class = 0

UN=username, if supplied the linkage to the terminal will be restricted to the specified username. To specify a group of usernames question marks are substituted for characters which need not match.

A request for a terminal using the DEVICE ESR has the following format:



The format of the Device Assignment Area is as follows:



3.15.4 Aborts and Recovery

The job is aborted if the device assignment area is in a fully protected page of memory or the logical unit is already assigned.

3.15.5 Errors

Not applicable.

WHAT IS THE RETURN (IN PARM?) FROM THIS ESR?

3.15.6 Performance

Not applicable.

3.15.7 Installation Parameters

Not applicable.

I = Immed
A = Any Port

3.16 USER/JOB CONNECTION

3.16.1 Abstract

The terminal user may communicate with a process only after the job has requested a terminal. If the job did not request immediate connection to a port, then the user must use the LINK or KEEP command in conjunction with the linkage name to establish the process/terminal connection.

3.16.2 Description

The terminal user may have more than one processes connected to his port. One of these processes may be the current process, and it alone may communicate with the terminal. The LINK and KEEP commands are used to manipulate the connected processes.

The Link and KEEP command differ only in how the current process is handled. The LINK command disconnects the current process from the terminal, allowing no further communications between the terminal and that process to occur. The KEEP command, on the other hand, saves the connection to the current process for later terminal and process communications. Both the KEEP and LINK commands result in the specified linkage name process to become the current process, provided the specified process was a connected process or had been a process waiting for connection. If no process with the specified linkage name is available for connection or there is a validation confilict, then a diagnostic message is produced at the terminal.

A job may only become the current process of a port through one of the following sequences of events:

1. The *DEVICE control statement is encountered with immediate connection requested.

2. The job requests immediate connection to a port through the DEVICE ESR.

3. The job requests connection to a port with the *DEVICE control statement or the DEVICE ESR, without requesting immediate connection, and the terminal user requests connection to the job using the LINK or KEEP command.

As previously described, the terminal user may disconnect from a process by using the LINK command to connect to another process.

The *CLOSE job control statement causes the specified logical units to be unlinked from the port. If no logical units remain linked, the job disconnects itself from the port.

3.16.3 Interfaces

The formats of the LINK and KEEP commands are:

```
)LINK PROCESSX
)KEEP PROCESSX
```

where PROCESSX represents the name of the process to which connection is desired. The process name of a job is the job id specified in the job's *JOB statement.

Successful connection is indicated by a message of the form:

```
PROCESSX.
```

An unsuccessful connection attempt results in a message of the form:

```
NO PROCESSX.
```

The format of the *CLOSE job control statement is:

```
*CLOSE(lu,lu,...,lu)
```

where lu represents a logical unit number which is to be disconnected from the port.

3.16.4 Aborts and Recovery

Normal or abnormal job termination results in all logical units to be disconnected from the port.

Port recovery may only be performed on a port which had a connected process.

3.16.5 Errors

If the LINK and KEEP statements cannot be deciphered, the message INVALID COMMAND is produced.

If the desired process cannot be connected by the LINK or KEEP statements, the message NO PROCESSX. is produced where PROCESSX represents the requested process name. This results in the port having no current process.

3.16.6 Performance

Not applicable.

3.16.7 Installation Parameters

Not applicable.

3.17 TASK/TERMINAL COMMUNICATIONS

3.17.1 Abstract

After the terminal and job linkage has been established, a task may communicate with the terminal by using the MPX/OS Input/Output Subsystem. The valid MPX/OS I/O ESRs for a terminal are described in the follwoing paragraphs.

3.17.2 Description

Busy Status Executive Service Request (BSY)

The BSY ESR returns the busy/not busy status of the specified logical unit. The status is not a function of a particular I/O request but rather of the logical unit itself. The requesting task is scheduled after the request is completed.

Unit Status Executive Service Request (UST)

The UST ESR returns the status of the requesting task's last I/O request on the specified logical unit. If the I/O is still pending, the requesting task is placed in I/O wait until the I/O is completed.

Multiple Unit Status Executive Service Request (MUST)

The MUST ESR allows the requesting task to be placed in a wait state pending the occurance of the specified event(s). The requesting task supplies a 128 bit mask where bits 1-63 correspond with the end of operation on logical units 1-63 respectively. The other bit (0, 64-127) correspond to the user defined events (DEFEVNTQ ESR).

Unit Hardware Type Executive Service Request (UTYP)

The UTYP ESR returns the hardware type of the specified logical unit. ~~If the hardware type is a disk file, additional file description information is also returned.~~ The requesting task is scheduled for execution after the request is completed.

IN THIS CASE = IT ?

~~Standard files such as standard input, output, and are disk files not the card reader, or line printer.~~

Status Logical Unit Executive Service Request (STATUS)

The STATUS ESR is called by a task to issue a status command to a specified logical unit. If the device is busy, the request is queued and the task is put into I/O wait. If the device is not busy, the current status is requested from the device and the task is put into I/O wait and not scheduled for execution until the operation is complete.

Read Record from Logical Unit Executive Service Request (READLU)

The READLU ESR initiates a data transfer from a specified logical unit to a buffer residing in the requesting task's memory. The requesting task is scheduled for execution after the request is initiated, and must issue a BSY, UST, or MUST ESR to determine when the request is completed.

Write Record to Logical Unit Executive Service Request (WRITLU)

The WRITLU ESR initiates a data transfer to a specified logical unit from a buffer residing in the requesting task's memory. The requesting task is scheduled for execution after the request is initiated, and must issue a BSY, UST, or MUST ESR to determine when the operation is completed.

Clear a Logical Unit Executive Service Request (CLEAR)

The CLEAR ESR is called by a task to clear out the current I/O operation for a specified device. The command or data transfer is terminated at the point of receipt of the clear command. The task is put into I/O wait and not scheduled for execution until an end-of-operation interrupt is recevied. If the device is not busy, the clear request results in no action and the task is scheduled for immediate execution.

Select Operating Modes Executive Service Request (SELECT)

The SELECT ESR is used to set the operating mode for a logical unit. For terminals the SELECT ESR may be used to:

1. Request 96 or 64 ASCII character set on input.

2. Request line or block mode on input.

3. Request disabling of prompts.

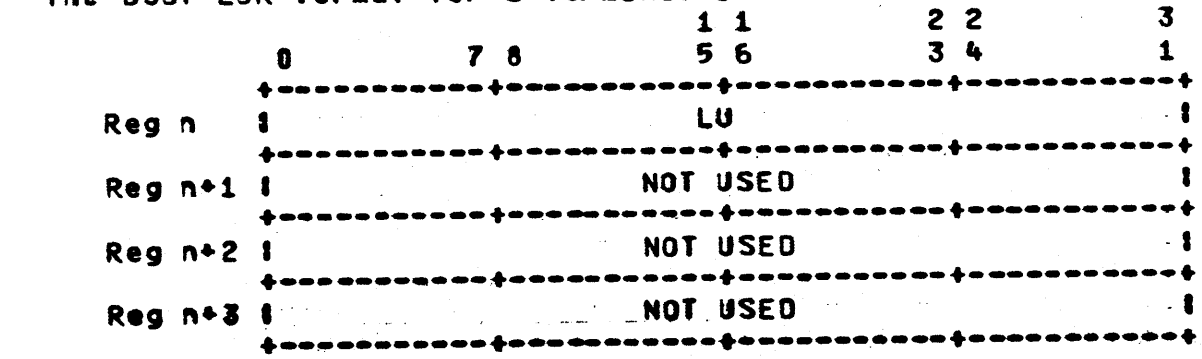
4. Define prompt string.

Unsolicited Interrupt Request Executive Service Request (UINT)

The UINT ESR allows the requesting task to be notified when an unsolicited interrupt occurs on a logical unit. The unsolicited interrupt could be used to signal the occurance of a mal-function.

3.17.3 Interfaces

The BUSY ESR format for a terminal is as follows:

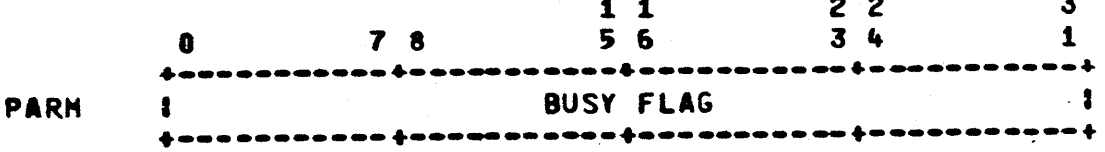


LU Logical unit for which busy status is requested.

An example of a calling sequence is as follows:

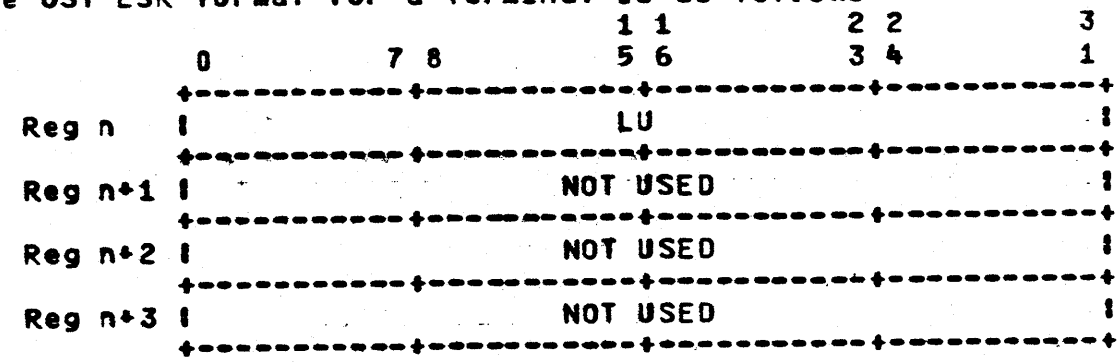
```
        EXT       BSY          Externally defined symbol
        LDI,R0    10           Logical unit number
        MON,R0    BSY          Monitor request
```

The parameters returned in PARM are as follows:



Busy Flag = Zero, unit not busy.
= Non-zero, unit busy.

The UST ESR format for a terminal is as follows:

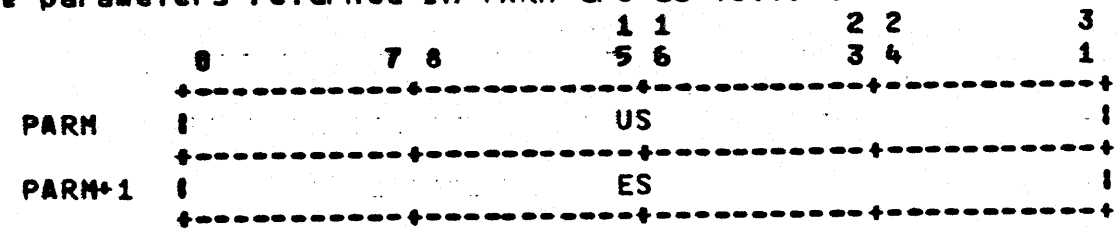


LU Logical unit for which status is to be returned.

An example of a calling sequence is as follows:

```
        EXT     UST             Externally defined symbol
        LDI,R0  10              Logical unit number
        MON,R0  UST             Monitor request
```

The parameters returned in PARM are as follows:

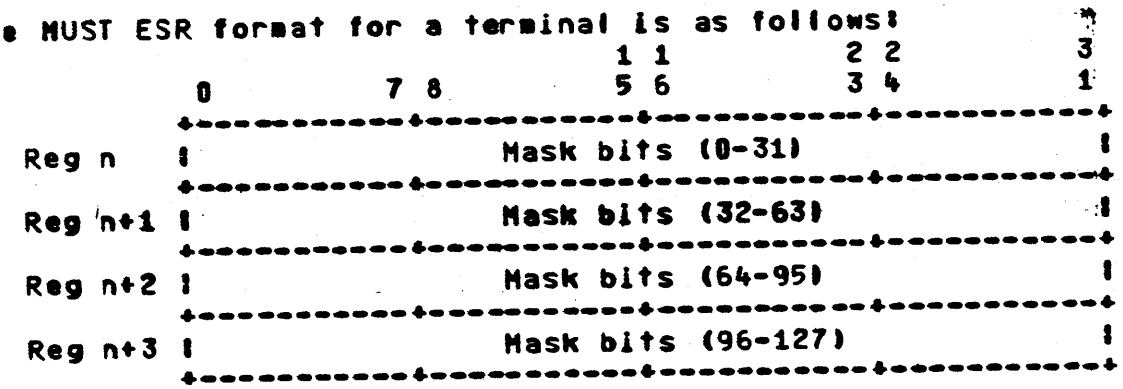


US Normal unit status
bit 21 = 0.
22 = 1, if BREAK detected.
23 = 1, if terminal connection lost.
24 = 0.
25 = 0.

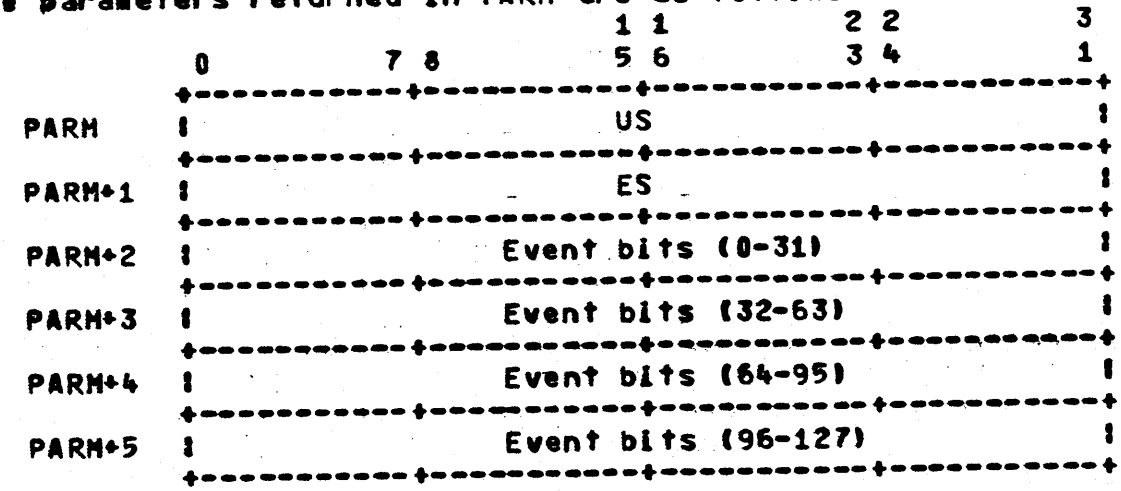
26 = 0.
27 = 0.
28 = 0.
29 = 0.
30 = 0.
31 = 0.

ES Expanded status
Number of bytes transfered.

The MUST ESR format for a terminal is as follows:



The parameters returned in PARM are as follows:



US Unit status as described for the UST ESR.

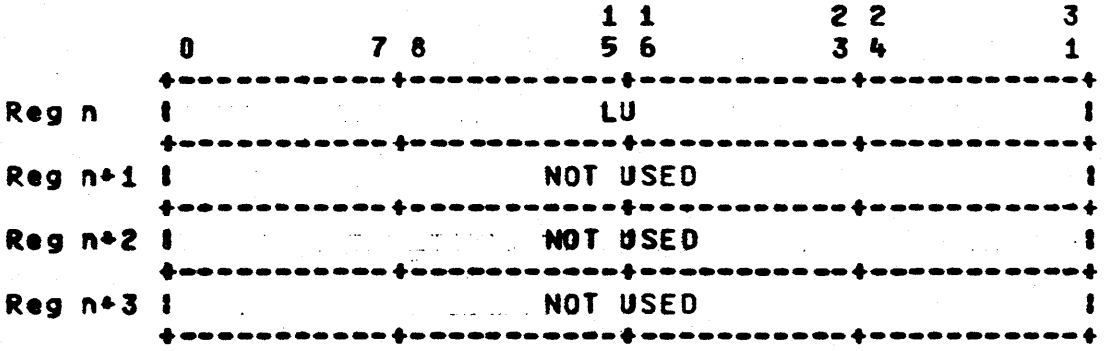
ES Expanded status as described for the UST ESR.

The Event bits (0-127) are set to a one for each event which has occurred.

An example of a calling sequence is as follows:

```
        EXT       MUST          Externally defined symbol
        LOD,R0    MASK1         Event Mask Bits
        LOD,R2    MASK3         Event Mask Bits
        MON,R0    MUST          Monitor Request
```

The UTYP ESR format for a terminal is as follows:

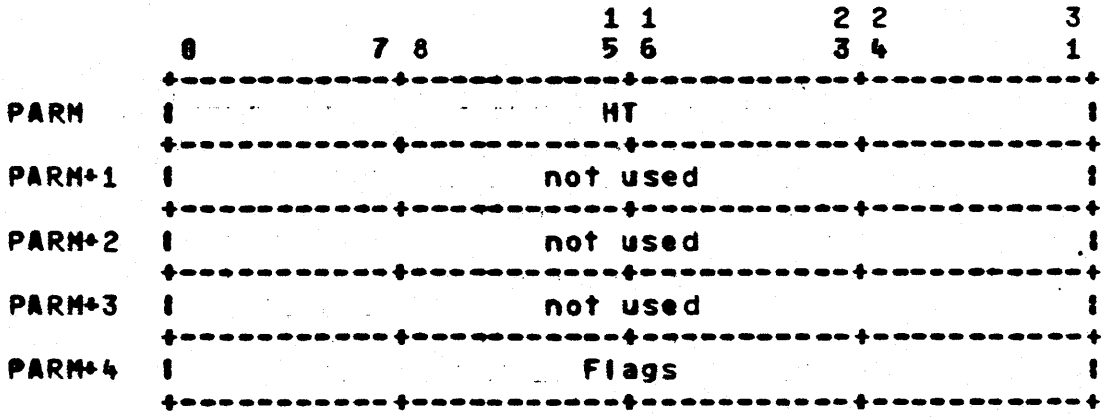


LU Logical unit for which hardware type is requested.

An example of a calling sequence is as follows:

```
        EXT       UTYP          Externally defined symbol
        LDI,R0    10            Logical unit number
        MON,R0    UTYP          Monitor request
```

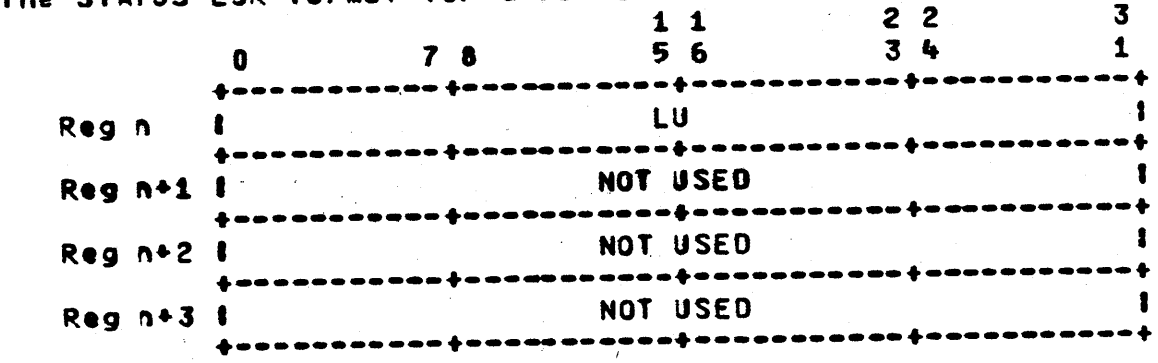
The parameters returned in PARM are as follows:



HT Hardware type
= 14, terminal

Flags
Bit 0 = 0.
Bit 1 = 0.
Bit 2 = 0.
Bit 3 = 0.
Bit 4 = 1, if terminal is a receive-only terminal.
Bit 5 = 1.
Bit 6 = 1, if terminal is an interactive terminal.
Bit 7 = 1, if terminal is a remote batch terminal.

The STATUS ESR format for a terminal is as follows:

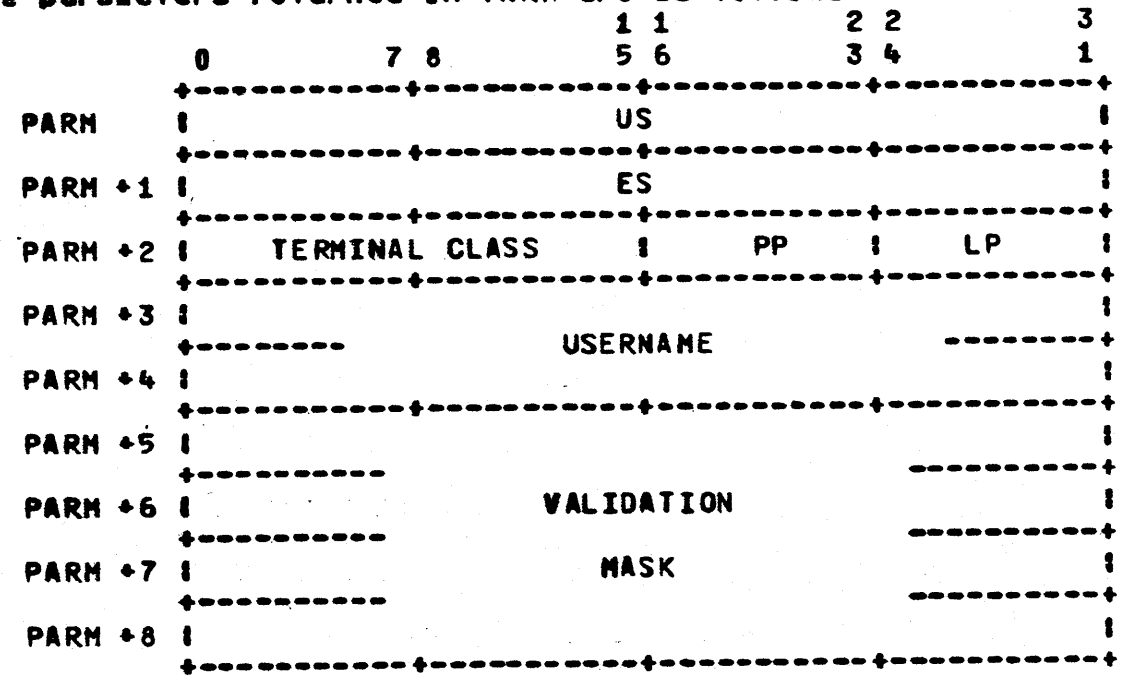


LU Logical unit

An example of a calling sequence is as follows:

```
EXT       STATUS        Externally defined symbol
LDI,R0    10            Logical unit number
MON,R0    STATUS        Monitor request
```

The parameters returned in PARM are as follows:



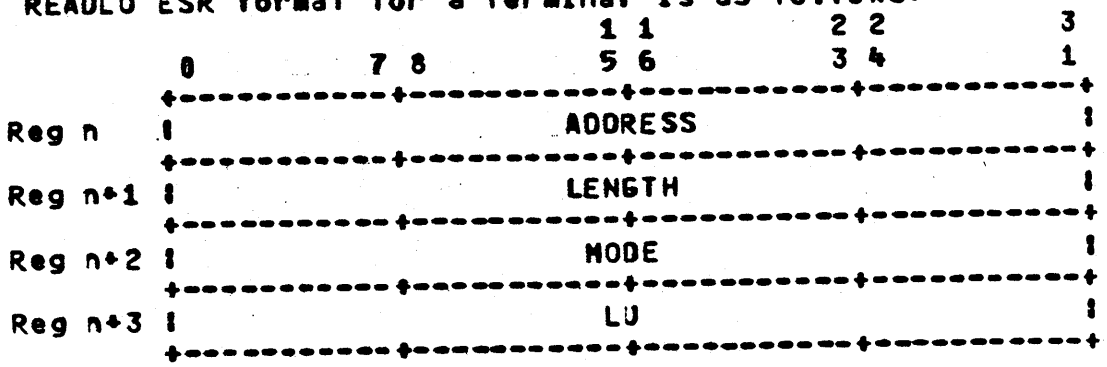
US — Normal unit status as described for UST ESR.

ES — Expanded status, as described for UST ESR.

PP — Physical port number.

LP — Logical port number.

The READLU ESR format for a terminal is as follows:



ADDRESS The address of the first element (word or byte) of the buffer is determined by the MODE parameter.

LENGTH The number of words (bytes) to be transfered. LENGTH values may be from 0 to 4096 words (0 to 16,384 bytes). A value of zero (0) is treated as the maximum LENGTH value of 4096 words (16,384 bytes).

MODE The data Transmission Mode (format) code:

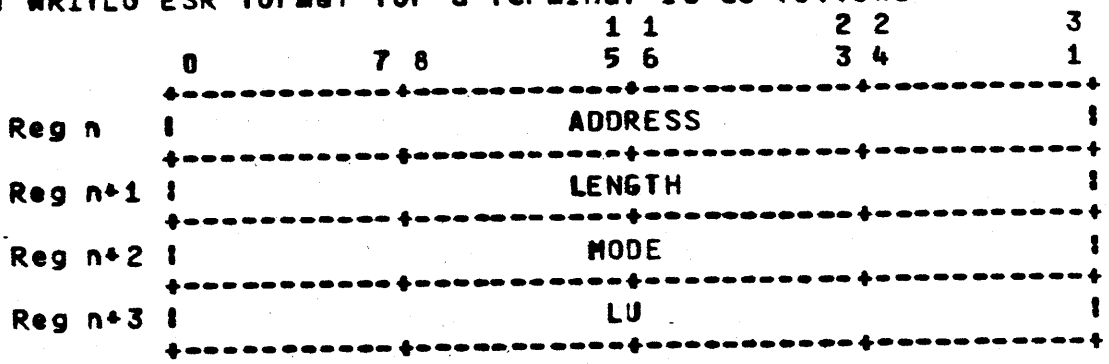
0 ASCII record, word format
16 ASCII record, byte format
32 Binary record, word format

LU Logical unit to be read.

An example of the calling sequence is as follows:

```
EXT       READLU      Externally defined symbol
LDCA,R0   BUFA        Byte address of buffer
LDI,R1    48          Number of bytes
LDI,R2    16          ASCII records in byte format
LDI,R3    15          Logical unit number
MON,R0    READLU      Monitor request
```

The WRITLU ESR format for a terminal is as follows:



ADDRESS The address of the first element (word or byte) of the buffer is determined by the MODE parameter.

LENGTH The number of words (bytes) to be transfered. LENGTH values may be from 0 to 4096 words (0 to 16,384 bytes). A value of zero (0) is treated as the maximum LENGTH value of 4096 words (16,384 bytes).

MODE The data Transmission Mode (format) code:

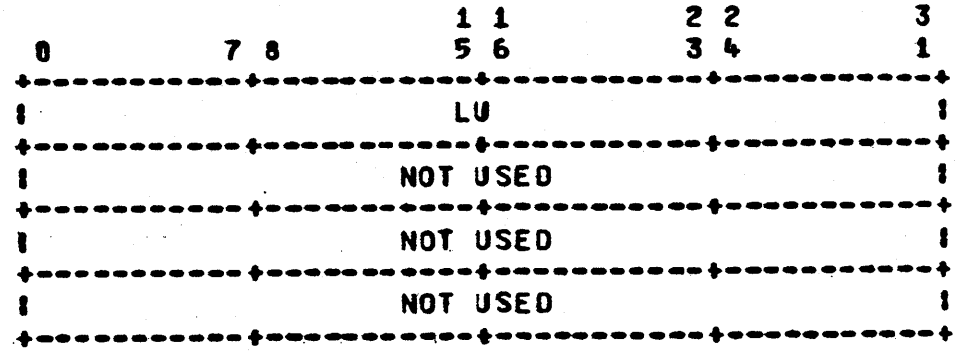
0 ASCII record, word format
16 ASCII record, byte format
32 Binary record, word format

LU Logical unit to be read.

An example of the calling sequence is as follows:

```
EXT       WRITLU      Externally defined symbol
LDCA,R0   BUFA        Byte address of buffer
LDI,R1    48          Number of bytes
LDI,R2    16          ASCII records in byte format
LDI,R3    15          Logical unit number
MON,R0    WRITLU      Monitor request
```

The CLEAR ESR format for a terminal is as follows:

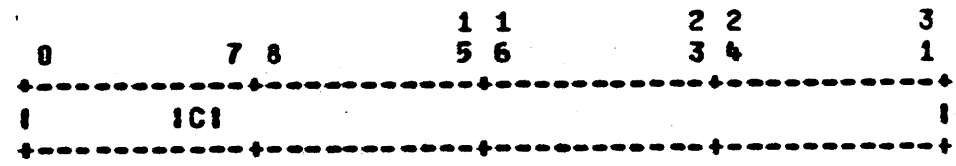


LU Logical unit

An example of a calling sequence is as follows:

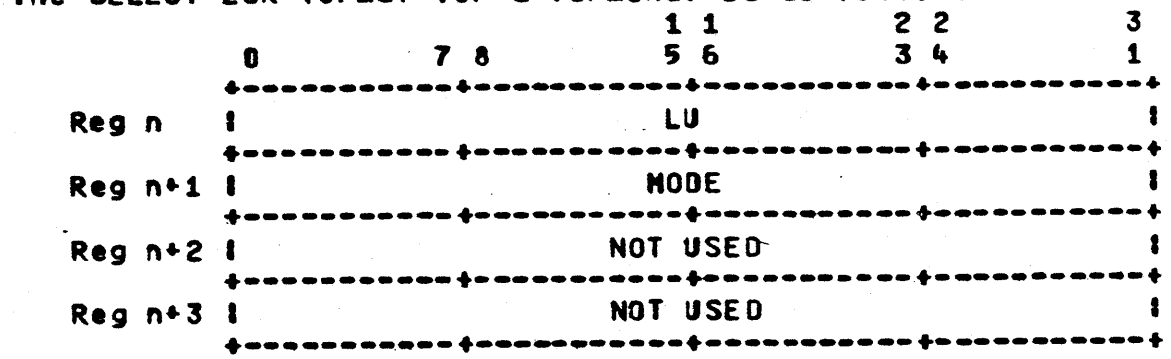
```
        EXT       CLEAR          Externally defined symbol
        LDI,R0    20             Logical unit number
        MON,R0    CLEAR          Monitor request
```

The parameters returned in PARM are as follows:



C Clear status, if set an operation in progress was cleared, otherwise the device was not busy.

The SELECT ESR format for a terminal is as follows:



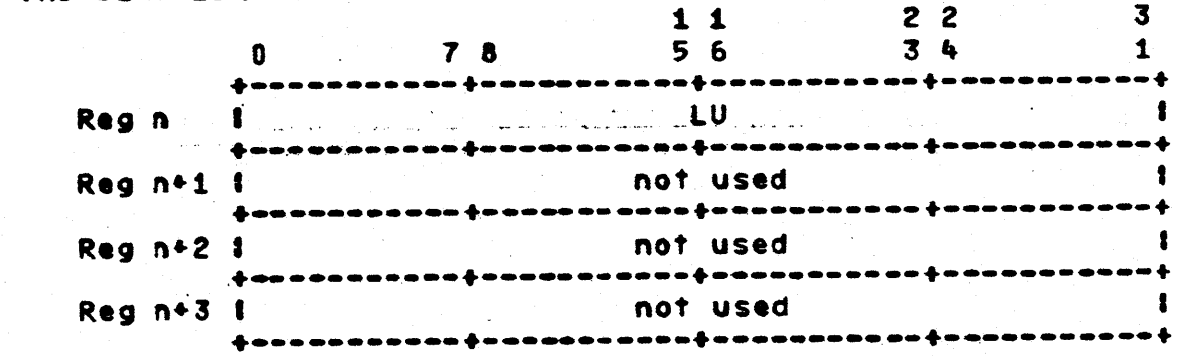
LU — Logical unit

MODE — bit 31 set; 64 ASCII character set requested.
clear; 96 ASCII character set requested.
30 set; Block mode requested on input.
clear; Line mode requested on input.
29 set; Disable prompting.
28 set; next WRITLU defines prompt string.

An example of a calling sequence is as follows:

```
        EXT       SELECT          Externally defined symbol
        LDI,R0    12              Logical unit number
        LDI,R1    1               Select mode
        MON,R0    SELECT          Monitor request
```

The UINT ESR format for a terminal is as follows:



LU — Logical Unit assigned to the monitored device.

An example of the calling sequence is as follows:

```
        EXT       UINT          Externally defined symbol
        LDI,R0    15            Logical unit number
        MON,R0    UINT          Monitor request
```

3.17.4 Aborts and Recovery

Errors made in an ESR may cause the job to be aborted, refer to the MPX/OS Reference Manual.

3.17.5 Errors

Errors made in an ESR are detected by the MPX/OS, refer to the MPX/OS Reference Manual.

3.17.6 Performance

Not applicable.

3.17.7 Installation Parameters

Not applicable.

3.18 INTERACTIVE JOB PROCESSING

3.18.1 Abstract

Interactive job processing allows the terminal user to enter job control statements from the terminal for immediate execution and to receive job standard output at the terminal.

3.18.2 Description

Interactive job processing provides for the entry of job control statements and the display of job standard output at the terminal. Whenever the standard input (logical unit 63) of the job is connected to the terminal, job control statements are read from the terminal; and whenever standard output (logical unit 62) of the job is connected to the terminal, job standard output is routed to the terminal. The connections of standard input and standard output to the terminal are independent.

Connection of standard input to the terminal allows the terminal user to directly enter job control statements to the Job Manager. Each statement is executed immediately after entry, and the appearance of the Job Manager prompt at the terminal indicates completion of the previous statement and the user may enter the next job control statement. The following job control statements may not be entered from the terminal and must be read from the cataloged job file before the standard input is connected to the terminal: *JOB, *RJOB, *IJOB, *IRJOB, and *SCHED. All other job control statements may be entered from the terminal in the interactive mode. The statement *CLOSE(63) causes job control statement input to be reconnected to the original input file, where the next statement to be read is the statement immediately following the *DEVICE statement which connected the job standard input to the terminal.

Connection of standard output to the terminal allows the terminal user to directly view job standard output. While this connection exists, no information is written on the job standard output file. All standard output from the job is displayed at the terminal with the following exceptions:

1. Job control statements are not output to the terminal.

2. Load maps are not output to the terminal.

The statement *CLOSE(62) causes job standard output to be reconnected to the original output file.

In the event of job termination, either normal or abnormal, all job logical units connected to the terminal are automatically disconnected and the job terminates as if no terminal had been connected. If the job standard output is connected to a terminal at the time of an abnormal job termination, an abort message is output to the terminal before the disconnection is performed.

3.18.3 Interfaces

All MPX/OS job control statements may be entered from the terminal with the following exceptions:

*JOB
*RJOB
*IJOB
*IRJOB
*SCHED

These statements must come from the cataloged job file.

The Job Manager prompt appears as

*?

and the user entry overwrites the prompt when the job control statement is entered.

The job abort message output to the terminal appears as

JOB ABORTED ABORT TYPE = XX ABORT CODE = XX TASK = XXXX

3.18.4 Aborts and Recovery

In the event of a job abort, an abort message is output to the terminal and all logical units are disconnected from the terminal. Any resulting abort dumps are placed into the job standard output file.

Port recovery may be performed on ports which are connected to a job.

3.18.5 Errors

Errors are detected by the Job Manager, refer to the MPX/OS Reference Manual.

3.18.6 Performance

Interactive job processing affects system performance to the extent that the job requires system resources.

3.18.7 Installation Parameters

Not applicable.

3.19 PORT DISESTABLISHMENT

3.19.1 Abstract

Port disestablishment is the disconnection of a terminal from the Interactive Terminal Subsystem. This disconnection may occur due to an explicit user command, failure to pass the validation check, or because of communications problems between the terminal and the system.

3.19.2 Description

A logical port can be disestablished in three ways: by entry of the QUIT command, by entry error durring the validation check, or by loss of communications with the system.

At any time during the terminal session, the user may enter the QUIT command to terminate the session and disconnect the terminal from the Interactive Terminal Subsystem. A logoff message is output to the terminal to indicate the terminal disconnection. After this command is entered, any jobs in the system which attempt to communicate with this port are notified that the port has become disconnected.

Continued entry errors during the validation check has the same results as entering the QUIT command.

Loss of communication with the system results in either of two actions: if the port was not in communication with any jobs in the system, the effect is the same as entering the quit command. However, if the port was in communications with one or more jobs in the system, the port is placed in a recoverable condition. All port/job linkage information is retained and any outstanding and subsequent input/output requests are saved for future recovery of the port. The recovery information is retained within the system for a predefine period of time. When this retention period has elapsed, if the port has not been recovered, all processes trying to comunicate with the port are notified that the port has become disconnected. Detection of a communications lose is dependent upon specific site terminal input/output implementation.

3.19.3 Interfaces

The format of the QUIT command is:

```
]QUIT
```

Whenever the terminal is diconnected from the system, the following message containing the current time of day and total connect time is produced:

```
LOGOFF AT 4:32:53
CONNECT TIME 98.03 SECONDS.
```

3.19.4 Aborts and Recovery

If the port is connected to a job when communications are lost between the terminal and the system, then the port will be placed in a recoverable condition. The Port Recovery feature describes the method of recovering the port. This feature does not participate in aborts.

3.19.5 Errors

If the QUIT command is entered incorrectly, the message INVALID COMMAND is displayed.

3.19.6 Performance

Not applicable.

3.19.7 Installation Parameters

The port recovery time-out is an installation parameter.

3.20 PORT RECOVERY

3.20.1 Abstract

The terminal user may recover a previously interrupted terminal session.

3.20.2 Description

After establishing the terminal as a logical port within the Interactive Terminal Subsystem, the user may enter the RECOVER command to attempt recovery of a previously interrupted terminal session. The user must not have any connected processes when the recovery is attempted and the user's username must match the username of the port to be recovered. The user can recover an interrupted terminal session from any terminal, therefore the user must specify the number of the logical port to be recovered.

Recovery is limited to ports which were in communications with jobs in the MPX/OS system at the time of communications loss, and the port recovery must be initiated within a limited time interval (see Port Disestablishment).

3.20.3 Interfaces

The format of the RECOVER command is:

```
]RECOVER n
```

where n represents the number of the port to be recovered.

A typical port recovery scenario proceeds as follows:

```
Recovery Command:    ]RECOVER 2
Response:            RECOVERY COMPLETE.
```

At this point, the user has regained control of the interrupted terminal session. However, since recovery of a terminal session may be made from any terminal, the baud rate, parity, and duplex are not recoverable. Input mode and character set are recovered.

3.20.4 Aborts and Recovery

The port recovery feature provides the only means of recovering an interrupted terminal session. In the event of a system abort, all terminal sessions are lost and cannot be recovered.

3.20.5 Errors

If the RECOVER command is entered incorrectly, the INVALID COMMAND message is produced.

If the port can not be recovered the message RECOVERY NOT POSSIBLE is produced. This may be caused by incorrect entry of the port number, by attempted recovery with a different username, or because the port is not in a recoverable condition.

3.20.6 Performance

Not applicable.

3.20.7 Installation Parameters

The recovery time out value is an installation parameter, changable by recreating the system resident.

3.21 TERMINAL USER ASSISTANCE

3.21.1 Abstract

The terminal user may get on-line assistance in the use of ITS features.

3.21.2 Description

The HELP command allows users to get immediate assistance from the Interactive Terminal Subsystem on using ITS commands and features. The HELP command displays commands their parameters and options and a description of what the command does.

3.21.3 Interfaces

The format of the HELP command is:

```
]HELP cmd
```

where cmd represents the command the user wants information on. If no command is specified a list of all ITS commands with a brief description about each is displayed.

3.21.4 Aborts and Recovery

Not applicable.

3.21.5 Errors

If the command specified is not a valid ITS command the message NO SUCH COMMAND is produced.

If the help command is not recognizable the message INVALID COMMAND is produced.

3.21.6 Performance

Not applicable.

3.21.7 Installation Parameters

Not applicable.

4.0 PRODUCT-LEVEL DESCRIPTION

4.1 PUBLICATIONS AFFECTED

14306500 MP-60 Computer System Family Reference Manual

10817300 MP-60 Computer System MPX/OS Reference Manual

10992100 MP-60 Computer System MPX/OS Operator's Guide

11110000 MP-60 Computer System Installation Handbook

14291700 MP-60 Computer System Program Command Console Reference Manual

MP-60 Computer System Text Editor Reference Manual

4.2 EQUIPMENT CONFIGURATION

Equipment configurations for the MPX/OS system with the Interactive Terminal Subsystem are as follows:

	MINIMUM	TARGET	MAXIMUM
Number of CPUs	1	1	8
Program states	6	6	48
Memory (32-bit words)	98,304	131,072	4,194,304
Card reader	1	1	1
Line printer	1	1	2
Display console	1	1	1
Interactive terminals	0	48	256
Mass storage (megabytes)	10	400	1500
Magnetic tapes	0	2	8

4.3 INTERFACES TO OTHER SOFTWARE PRODUCTS

The amount of memory memory available for user job allocation is divided into two pools during system initialization. The rollin pool is used for the initiation and execution of jobs beginning with the job control statements *IJOB and *IRJOB. The remaining memory pool is available to the system for normal usage.

Rollin/Rollout file space is allocated during system initialization. This file space receives the pages of rolled out jobs at a 1 page per block usage rate.

Jobs may be rolled out when they are waiting for the receipt of buffered messages. They are rolled in upon the receipt of a message or upon system operator termination.

Whenever a job is executing, its full amount of scheduled memory is available for expansion. Only those pages actually in use are rolled out. The pages of a job are rolled out as rollin requirements demand additional space: the system attempts to maintain enough free space to rollin the average sized job.

In the event that a task sends a message to a job which is in a rollout state, the system processes the message if the recipient buffer pages are resident, otherwise the sending task is placed in a rollin wait state until the recipient has been returned to memory.

The Task Control Table contains the rollout file location of each page which is not memory resident.

4.4 RESTRICTIONS AND LIMITATIONS

Detection of a communications loss with a terminal and control of transmission formats between the terminal and the system are dependent upon specific site implementation. Therefore, the port recovery and port setup functions may not be available in all implementations.

Line editing, prompting, and terminal display formats have been chosen to be compatible with most terminal hardware types. Currently available Control Data terminal types 751, 752, and 756 are among the compatible terminals.

The introduction of interactive processing to any system greatly increases mass storage requirements as users place information into mass storage files which was previously maintained in card, listing, and magnetic tape media.

The execution of lengthy compute bound tasks should be restricted to the normal batch environment. Execution of these tasks in rollin pool memory will significantly degrade the system performance observed by terminal users.

4.5 RELIABILITY, AVAILABILITY AND MAINTAINABILITY REQUIREMENTS

Upon installation, the Interactive Terminal Subsystem becomes an integral part of the MPX/OS system, and therefore meets the reliability, availability, and maintainability requirements of the MPX/OS system.

5.0 GLOSSARY

Abort	The premature termination of a process whenever an irrecoverable situation occurs.
Absolute	Refers to actual machine address.
ASCII	American Standard Code for Information Interchange. The standard code, using a coded character set consisting of 7-bit coded characters. See American National Standard X3.4-1977.
Assemble	The process by which an object (binary) module is created from the symbolic language program.
Asynchronous	Refers to a type of serial transmission in which bit synchronization is accomplished for each character.
Batch	Class of tasks which run on a time available basis.
BCLA	Buffered Communications Line Adapter is the controller interface to the RS-232C asynchronous communications lines.
Bit	A binary digit.
Block	A group of machine words or bytes. Usually a collection of one or more records used in I/O to reduce the number of physical operations.
Buffer	A portion of memory used to collect data in order to compensate for speed differences between the processor and peripheral devices.
Byte	Eight (8) contiguous bits.
CALL	The tranfer of control to a closed routine or task. A Executive Service Request, CALL, is used to activate a specific task.

Callee	The task initiated by the CALL Executive Service Request.
Caller	The task initiating another routine or task.
CLA	Communication Line Adapter, the hardware interface between the CPU and the communications line.
Compile	The process by which an assembly module is created from a problem solving language. A compiler usually generates several machine instructions from a single symbolic statement.
Common	An area of memory that may be shared between tasks or routines. Tasks may communicate through common areas.
Control Point Zero	CYBER System Control Point.
CPU	Central Processing Unit.
CRC	Cyclic Redundancy Check.
Data	An area of memory that may be prestored with information at load time and may be shared between routines of a task.
Dispatcher	An operating system routine that unthreads a task from the top of the ready list and places the task into execution.
ESR	Executive Service Request, name given to the MPX Operating System routines invoked by the MON instruction.
File	A collection of blocks and/or records, usually of related data. Each mass storage file has an entry in the system Label File.
Interrupt	A break in the normal processing flow usually caused by a hardware signal. Interrupts can be enabled or disabled and occur with an associated priority. Processes that are interrupted are later

	resumed at the point of interruption.
ITS	Interactive Terminal Subsystem.
IOC	Input/Output Controller.
Job	The sequential and/or parallel execution of tasks. Begins with a *JOB card and ends with a *EOJ card.
JCT	Job Control Table is an area of memory containing information controlling a given job.
Job Manager	A system task that processes the input stream of the job. The Job Manager is a set of reentrant routines shared by all user jobs.
Library	A collection of frequently used, checked-out programs maintained on an external device that can be loaded and executed separately or in conjuction with a user's program. Libraries must be arranged to minimize searching.
Linkage	The interconnection between routines or devices. The loader matches externals and entry points to establish program linkage. The Interactive Terminal Subsystem match job terminal requests with terminal user connection requests to establish port linkage.
Loader	A system task that is used to load, relocate, and link binary object modules.
LU	Logical Unit, a number representing the user connection to a device.
MPX/OS	The MPX Operating System.
MP-32	MP-60 CPU Emulation device.

MPP	MP-60 CPU Emulation device (Militarized, or Ruggidized).
Ordinal	The relative location of an entry in a table. The absolute location of an entry can be obtained by multiplying the ordinal by the number of machine words per entry and adding the starting address of the table.
Page	A 4096 word block of contiguous memory. Paging is a technique where a logical address is transformed via a set of page registers into a physical address.
PMAC	Programmable Multiple Access Controller.
Port	The communications line between the CPU and the user.
PPU	CDC CYBER/6000 Peripheral Processor Unit.
Process	A software program equivalent to the MPX/OS terms tasks and job.
Priority	A value assigned to an item in the system which facilitiates scheduling and processing within the operating system.
Queue	A list used to control the processing to be done.
Ready list	A prioritized list of tasks waiting for control of the CPU.
Relocatable	Refers to a program that has been prepared by a source language compiler or assembler to be loaded into any area of available memory.
Resident	The portion of the operating system which resides permanently in memory.
RETURN	A Executive Service Request that terminates a task and transfers control to the point in the caller where the call originated. A task may return with or without release of memory.

Schedule	The determination of which processing is required next.
Stack	A last-in, first-out queue.
Status	A stage or condition of an I/O request or a task.
Synchronous	Serial transmission in which characters are sent bitwise without start and stop bits.
System Initialize	Refers to the intial system load process where the resident is loaded, memory initialized, and the system tasks are started.
Task	An independent unit of work that can compete for the resources of the system. A task may call and be called by other tasks.
TCT	Task Control Table is an area of memory containing information used to control a task.
Terminal	The device connected to the user end of the PORT.
Terminate	The process of completing a job. A job may terminate normally or abnormally.
Thread	A linked list of elements, the contents of each thread cell contains the address of the next thread cell and so on until a thread cell contains a value indicating the end of the list.
Utility	A routine, procedure or program that supports the operation of a system.

APPENDIX A

The following pages contain examples of the various Facility displays.

The Device Control Facility LIST command provides information about the status of peripheral devices. The IEU column provides the IOC, Equipment and Unit Numbers. The OWNER collumn serves two purposes. When an entry is present it indicates the device is assigned and whether it is a system or user device. When it is blank it indicates that the device is available to a user but is not currently assigned.

```
MPX-OS  RES R1  LIB L1      08.00.09    06/15/79  MEMORY AVAIL 10     USED 25

IEU     TYPE    OWNER   STATUS  ID

000     8SPD    SYS     UP      SYSTEM01
001     8SP     USER    UP      TESTPACK
101     CR      SYS     UP
102     LP      SYS     UP
200     MT7             DOWN
300     MT9     USER    UP
```

Fig. A-1 DCF LIST DISPLAY

The File Control Facility LIST command provides the terminal user with status information about mass storage files.

The "O" and "A" displays provide information about files under a specified owner on a particular SMD which are either open or allocated, respectively.

```
LBN OWNER  FILE NAME       ED  ACC   TYPE   DEVICE ID
211 MINE   AFILE           01  MINE  850D   SYSTEM01
285 MINE   BLD-NEW-FILE     01  MINE  850D   SYSTEM01
286 MINE   OLD-FILE         01  MINE  850D   SYSTEM01
325 MINE   OLD-FILE         02  MINE  850D   SYSTEM01
```

The "O" display provides a list of the current SMD labels.

```
DEVICE ID
SYSTEM01
SYSTEM02
```

Fig. A-2 FCF LIST DISPLAYS

The Operator Control Facility LIST command provides several possible displays. The Input, Output, and Execution Queues may either be displayed individually or they may be displayed together.

The "I" display will provide expanded information about the INPUT queue.

```
MPX-OS  RES R1  LIB L1      08.00.20    06/15/79   MEMORY AVAIL 10     USED 25

NXTJOB   CM=15,TL=70000,PL=10000,SCR=100,MT
@NCHMRK  CM=20,TL=99999,PL=200,SCR=10,TESTPACK
QUIKONE  CM=5,TL=100,PL=100
```

The "M" display provides a list of the messages requiring operator response. Each entry has a unique message identifier which will be used to respond to the message. The identifier will be assigned to the message and will remain with the message until it receives some operator action.

```
01 08.00.04 YOURJOB  PAUSE CONTROL CARD MESSAGE APPEARS HERE
02 08.00.07 MYJOB    EQUIP
```

If just LIST is entered, all queues will be displayed.

```
MPX-OS  RES R1  LIB L1      08.00.15    06/15/79   MEMORY AVAIL 10     USED 25

INPUT            OUTPUT      DESTIN        EXECUTION

01 NEXTJOB       01 NEXTOUT  CENTRL        01 MYJOB
02 @NCHMRK       02 SYSLIST  REMOTE        02 YOURJOB
03 QUIKONE       03 TESTJOB  DISK
                 04 JOBTWO   CENTRL

01 08.00.04 YOURJOB  PAUSE CONTROL CARD MESSAGE APPEARS HERE
02 08.00.07 MYJOB    EQUIP
```

Fig. A-3 OCF LIST DISPLAYS

The Operator Control Facility WATCH command provides information about active jobs and their associated tasks.

The WATCH command with no parameters displays general information about all active jobs.

```
MPX-OS  RES R1  LIB L1       08.00.07    06/15/79   MEMORY AVAIL 10  USED 25

YOURJOB     MEM  SCHED 15  USED 07  **  TIME  SCHED INFINITE   USED 02.56.53
0D5E        ORIGIN 0000  IN DISP SC  PL 1000  PL DISP PR  PC 00000 PC DISP PU

MYJOB       MEM  SCHED 10  USED 06  **  TIME  SCHED 00.30.21   USED 00.04.07
0D70        ORIGIN 0000  IN DISP SC  PL 10000 PL DISP PR  PC 00000 PC DISP PU
```

If a "jobid" is specified, information about that particular job and all its associated tasks is displayed.

```
MPX-OS  RES R1  LIB L1       08.00.07    06/15/79   MEMORY AVAIL 10  USED 25

YOURJOB     MEM  SCHED 15  USED 07  **  TIME  SCHED INFINITE   USED 02.56.53
   1   JMTR      STATUS 000    P 0279     CPU 1      STATE 06  PRIORTY 000
   2   USERTASK  STATUS 001    P D041     CPU 1      STATE 03  PRIORTY 000
```

If "jobid,taskid" is entered, information about that particular job and task is displayed.

```
MPX-OS  RES R1  LIB L1       08.00.08    06/15/79   MEMORY AVAIL 10  USED 25

YOURJOB     MEM  SCHED 10  USED 06  **  TIME  SCHED INFINITE   USED 02.56.53
0D5E        ORIGIN 0000  IN DISP SC  PL 1000  PL DISP PR  PC 00000 PC DISP PU
   2   USERTASK  STATUS 001    P D041     CPU 1      STATE 03  PRIORTY 000
           0FD6      IN CNT 001    FLAGS 8100           TIME 00.03.00
                     EVENT BITS       00000000 00000000 00000000 00000000
                     EVENT WAIT BITS  00000000 00000000 00000000 00000000
```

Fig. A-4 OCF WATCH DISPLAYS

The Operator Control Facility MEMORY command provides the capability to display and alter memory.

The "S" display provides a Hexadecimal dump of those memory locations altered by a OCF MEMORY command. Up to a full screen will be displayed.

```
MPX-OS  RES R1  LIB L1      08.00.10    06/15/79   MEMORY AVAIL 10     USED 25

20E8  00000000 00000000 00000000 00000000 00000000.00000000 00000000 00000000
```

The other displays provided through the OCF MEMORY command provide a Hexadecimal dump of memory starting at a specified location and ending at either a full screen or once the requested number of locations to be dumped has been displayed if less than a full screen.

```
MPX-OS  RES R1  LIB L1      08.00.30    06/15/79   MEMORY AVAIL 10     USED 25

20E8  00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
20F0  BCC03E8A 2650003F BC940003F BC940000 BCC020B4 0EDE0011 C016B00E C00E7006
20F8  C0143004 0AB0004C E05507BF 72B5000E 22B53463 22B53463 27150007 13200000
2100  8A960001 1320FFFF 47370003 23970003 0FB30013 13C00001 BD000BAE BD000A3E
2108  13800000 BD3F3E6A BD000BAE BCC03E8A 72B50005 22B5355E 27150001 13200000
```

Fig. A-5 OCF MEMORY DISPLAYS