CRAY RESEARCH, INC.

CRAY X-MP™ AND CRAY-1® COMPUTER SYSTEMS

COS FRONT-END PROTOCOL INTERNAL REFERENCE MANUAL

SM-0042

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Revision	Description
	October 1980 - Original printing; supports COS Version 1.09. Changes since Version 1.08 are noted with change bars. This manual obsoletes portions of the CRAY-OS Version 1 System Programmers Manual, publication 2240012.
A	June 1981 - Reprint with revision. This printing adds the HYPERchannel network adapter, Request Pending Flag, Statclass Request and Reply, and Station Message and Response. Miscellaneous editorial and technical changes have been made to bring documentation into agreement with COS Version 1.10. This printing obsoletes all previous editions.
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C	June 1983 - Rewrite; supports COS Version 1.12. This printing adds station message processing (section 5), type 3 messages (section 6), interactive protocol (section 7), and the station slot format (section 8); and changes for security features and fast secondary storage. Parts of existing chapters have been rewritten, and technical changes have been made to bring documentation into agreement with COS Version 1.11. This printing obsoletes all previous editions.
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D-01	November 1984 - This change packet supports COS version 1.14. Changes include a new stream control byte, HLD, minor modifications to message codes, and new messages and message numbers added to interactive error terminal messages.

D-02 January 1986 - This change packet supports the Cray operating system COS version 1.15. Changes include new diagrams showing possible stream control byte exchanges, and changes to the Logon, Start, and Enter Logfile Request message codes. The station slot size was increased to a maximum size of 255 Cray words. Miscellaneous technical and editorial changes have also been made.

E May 1987 - Reprint with revision. Major changes include the addition of message codes 17, 20, 100, and 101, the redefinition of message codes 64 and 65, standardization of the station slot format, and the addition of a new appendix. This printing supports the Cray operating system COS version 1.16. This printing also supports the Cray operating system UNICOS, release 3.0 running on the CRAY X-MP, CRAY-1, and CRAY-2 computer systems (see appendix A). Technical changes are noted by change bars.

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PREFACE

Specifications for the communications protocol between a front-end computer system and the CRAY X-MP computer system or the CRAY-1 computer system are required by programmers designing front-end stations that interface with the Cray mainframe.

Implementation of the protocol on the Cray mainframe is described with the Station Call Processor (SCP) task in the COS Internal Reference Manual, Volume II: STP.

This manual is part of a set of manuals that describes the internal design of the Cray operating systems COS and UNICOS and the product set. All publications referenced within this manual are produced by Cray Research Inc. (CRI), unless otherwise noted.

Manuals in the following set describe the internal design of COS and UNICOS:

SM-0045	COS Table Descriptions Internal Reference Manual†
SM-0046	IOS Software Internal Reference Manual
SM-0140	COS Internal Reference Manual, Volume I: EXEC
SM-0141	COS Internal Reference Manual, Volume II: STP
SM-0142	COS Internal Reference Manual, Volume III: CSP
SD-2023	UNICOS Internal Reference Manual for the CRAY-2 Computer System

Manuals that define procedures and external features of tools needed for installing and maintaining CRI software are as follows:

SM-0043	COS Operational Procedures Reference Manual
SM-0044	Operational Aids Reference Manual
SR-0073	Cray Simulator (CSIM) Reference Manual

† This manual is also available on magnetic tape. See your CRI site analyst for information.

This manual assumes the reader is familiar with the contents of the COS Version 1 Reference Manual, publication SR-0011, and the following UNICOS reference manuals:

SR-2011	UNICOS User Commands Reference Manual
SR-2012	UNICOS System Calls Reference Manual
SR-2014	UNICOS File Formats and Special Files Reference Manual
SR-2015	UNICOS Kernel Error Message Manual
SG-2018	UNICOS System Administrator Guide for CRAY X-MP and CRAY-1 Computer Systems
SG-2019	UNICOS System Administrator Guide for CRAY-2 Computer Systems
SR-2022	UNICOS Administrator Commands Reference Manual

In addition, the reader might find the following publications helpful: HYPERchannel Driver Design Specification Technical Note, CRI publication SN-2046, and A130 Adapter Reference Manual, Network Systems Corporation, publication 42990011.

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COS 1.16/UNICOS 3.0 Enhancements

The 1.16 release of COS includes several enhancements of and additions to previous versions of the operating system. Those enhancements that affect the Front-end Protocol Manual are presented in this description.

The major enhancement affecting the manual were several features being added to the Station Call Processor (SCP):

- Variable segment support for FEI connections - Allows stations to receive only the meaningful part of a segment. this is defined by the segment bit count.

- Station operator support - Allows a station to define a password to be associated with a station user who has the ability to issue operator commands on the behalf of the station to SCP. The password is sent to SCP at logon time in the logon segment.

- Group ID Feature - Allows for a group of stations to be viewed as a single entity. Commands issued to SCP are evaluated as a group. The first character (the major letter) associates a set of stations as a group; the second character (the minor letter) uniquely identifies a station group.

- Forced Segment Transfers - This reduces the number of I/O requests made by stations to the host system, thereby improving system performance. This feature must be requested when the stations logs on.

Variable segments, operator station, and forced segment transfers are all features that have to be enabled by a station. Use of the group ID feature may require that a station change its ID to match the group ID.

Other enhancements to the Front-end Protocol Manual include Fast Secondary Storage (FSS) Preemption and N-packet Driver. The FSS feature provides the ability to overscribe FSS devices that are configured as generic resources. Station segments for the RSTAT display and for Operator Requests are altered in such a way that all stations will continue to work without modification.

The design of the N-packet driver allows for the implementation of a protocol-independent interface to the NSC A130 HYPERchannel adapter. The design allows the protocols for SCP interface and the non-SCP (protocol-independent) interface to share a single A130 adapter. Enhanced error recovery was also added for SCP.

The 3.0 release UNICOS includes support for the UNICOS Station Call Processor, described in Appendix A of this manual. In addition, USCP support of SCP functions described elsewhere in the manual is as noted. USCP information is also included in the UNICOS User Commands Reference Manual, publication SR-2011; the UNICOS Administrator Commands Reference Manual, publication SR-2022; the UNICOS File Formats and Special Files Reference Manual, publication SR-2014; and the UNICOS Supplemental Information Technical Note, publication SN-2027.

INTRODUCTION 1

This manual describes the communications protocol required for communication between the Cray operating system COS and any front-end computer system. Appendix A describes the communications protocol for communication between the Cray operating system UNICOS and a front-end system.

Communication between the front-end system and the Cray computer system is through a front-end interface (FEI). This 6-Mbyte/s channel can be connected directly to the Cray mainframe (figure 1-1), or, for a system with an I/O Subsystem (IOS), the channel can be connected to the IOS (figure 1-2).

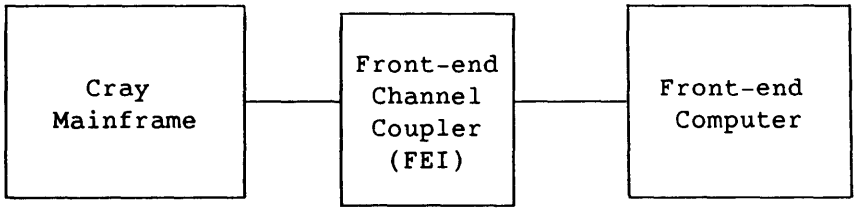


Figure 1-1. Front-end Linkage to the Cray Computer System

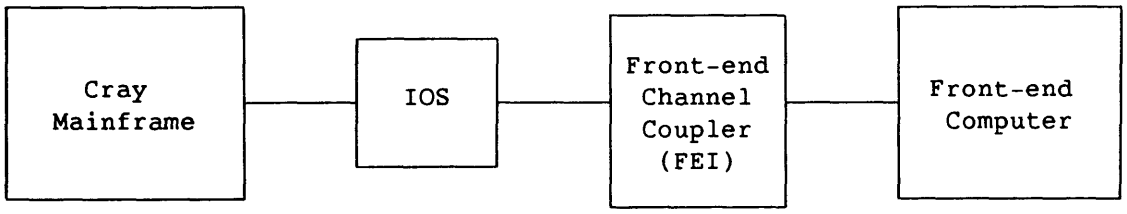


Figure 1-2. Front-end Linkage to a Cray Computer System Through the IOS

Any Cray mainframe can be connected to front-end computers through the Network Systems Corporation (NSC) HYPERchannel network. This network connects to the Cray mainframe either directly (figure 1-3) or through the IOS (figure 1-4), by means of the NSC A130 network adapter.

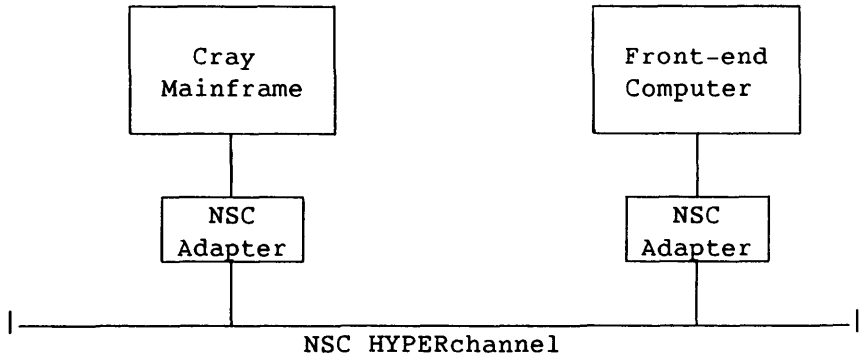


Figure 1-3. Front-end Linkage Without an IOS

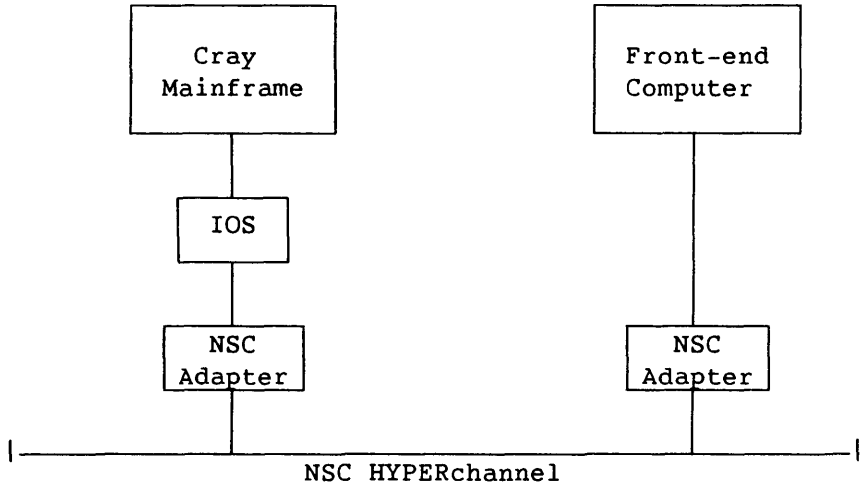


Figure 1-4. Front-end Linkage with an IOS

The protocol is the same for each front-end configuration. The COS task that handles communication at the Cray mainframe is the Station Call Processor (SCP). The front-end interface is transparent to the SCP. For a complete discussion of the SCP and its processing flow, see the COS Internal Reference Manual, Volume III: CSP.

The UNICOS Station Call Processor (USCP) is a privileged user job that handles communication with the front end. See appendix A for a complete description of USCP.

A front-end system initiates communication with the Cray mainframe, after the channel is turned on, by sending it a message; the mainframe interprets the message and returns a message. (Both messages contain control information and, possibly, data.) The message sent by the Cray mainframe can be based on previously received information or can be developed by a COS operation.

The front-end system examines the message it receives and uses control information to develop the next message to send to the Cray mainframe. Except for the first message sent by the front-end system, neither the Cray mainframe nor the front end sends messages spontaneously. Either computer can, however, cause further transactions by means of control information or data within the message being sent.

GENERAL PROTOCOL 2

2.1 TRANSMISSION

The front-end system communicates with the Cray mainframe over a Cray I/O channel pair. Each input or output operation is termed a *transmission.* The maximum data in one transmission is determined by buffer sizes at the front-end system.

A single transmission (figure 2-1) can be any one of the following:

- A set of control information called a *link control package* (LCP)
- A unit of data called a *subsegment*
- An optional set of checksum information called a *link trailer package* (LTP)

For the HYPERchannel network, a single transmission (figure 2-2) can be one of the following:

- A set of control information called a *message proper,* consisting of the *link control package extension* (LCPE) and the LCP
- A unit of data called a *segment*

2.2 MESSAGE

A *message* is a group of related transmissions sent in the same direction.

At logon, a front-end system adopts a message protocol that is either checksummed or non-checksummed. Under checksummed protocol, a message must include at least an LCP and an LTP. (This minimum does not apply to logon.) Under non-checksummed protocol, a message can be simply an LCP, or an LCP followed by one or more subsegment data transmissions in the same direction.

When the NSC HYPERchannel network is in use, checksumming is unnecessary because the hardware detects and corrects errors. Therefore, only non-checksummed protocol is allowed, with one subsegment per segment.

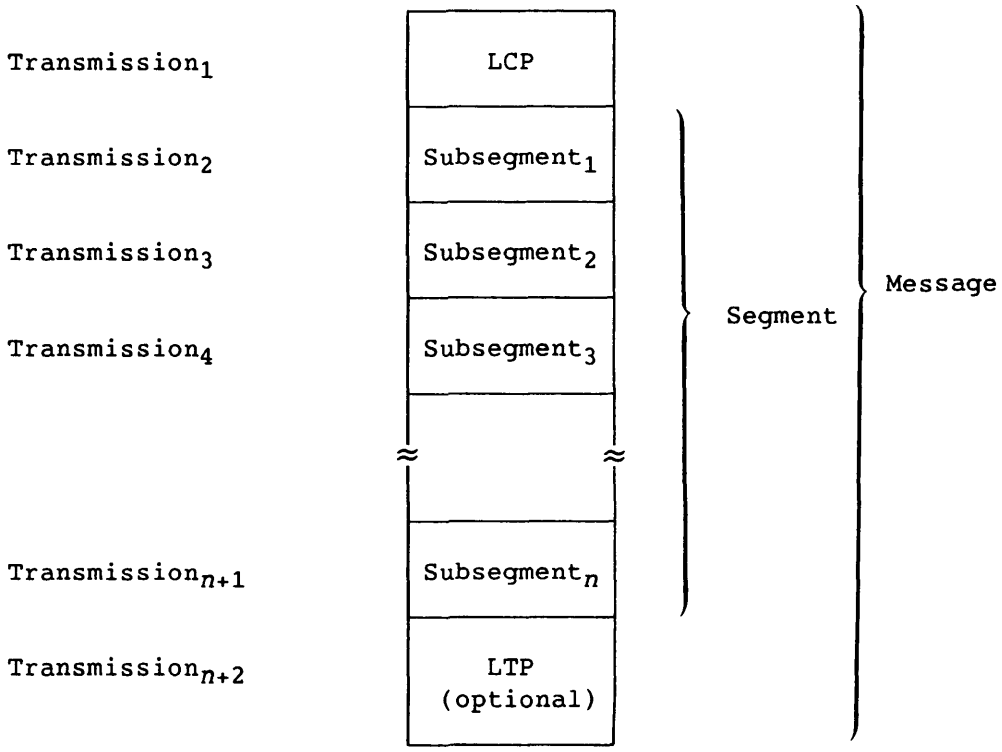


Figure 2-1. Transmission Units

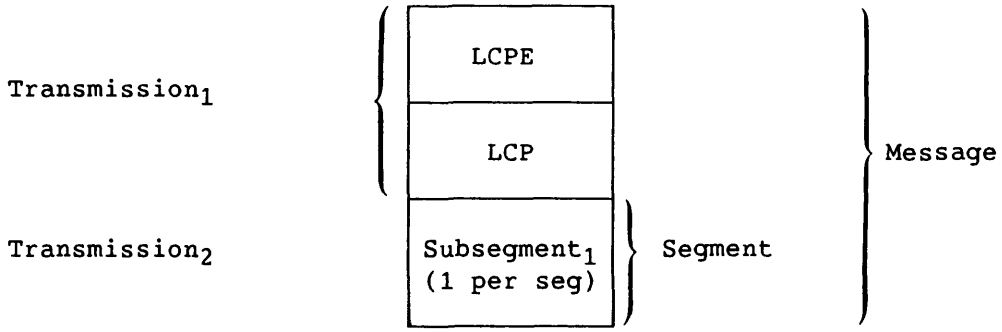


Figure 2-2. Transmission Units for the NSC HYPERchannel Network Adapter

An entire message is sent in one direction. The computer receiving the message waits for the complete message before sending its own message in the opposite direction. This procedure is called *two-way alternate protocol;* it is also called *half-duplex protocol* because data travels in one direction at a time.

A *segment* is the group of one or more data subsegments in a single message. The station specifies the subsegment size and number of subsegments per segment in the Logon segment. For example, a segment can be set to the size of a disk unit track.

A logon option allows a station to send and receive variable length segments. A second option allows a station to request forced segment transmission from COS. This option results in an LCP and segment transmission for each outgoing message. This reduces the number of I/O requests made by stations to COS, thus improving system performance. Both options are specified in the logon segment.

COS concurrently processes a number of datasets, commands, and responses by interleaving messages associated with them. Messages for one dataset are interleaved with messages for other datasets and with messages unrelated to datasets.

2.3 STREAM

A *stream* is a software path that includes all messages related to a single dataset. Each stream is identified by a stream number. The number of streams is determined by front-end parameters, with a maximum of eight streams for either input or output. Thus, in communication protocol, each channel is logically divided into a maximum of 16 unidirectional paths. Interleaved datasets pass concurrently between two computers over these paths.

The terms *input* and *output* are used relative to the Cray mainframe; an input stream is the flow of data from a front-end system to the Cray mainframe, and an output stream is the flow from the Cray mainframe to a front end. The front end sets the maximum number of input and output streams at logon. Among the factors influencing the maximum setting is the amount of table space allotted by the site on the front end and in central memory; the space allotment is influenced in turn by the station's resources and transfer requirements.

The sender assigns a stream by notifying the receiver of its readiness to send on that stream. The stream is not active (no messages are allocated to it) until the receiver replies that it is ready to receive on that stream. The stream remains active until the receiver receives all of the dataset and saves it. Either computer can release a stream prematurely.

Messages are not allocated to unassigned or inactive streams. Operational request and response messages do not require a stream for transmission. However, only one operational request can be outstanding from the front-end station for each logged-on station.

2.4 SEGMENT

A *segment* comprises the data in one message. It is preceded by an LCP. All datasets are transmitted in segments (figure 2-1). At the driver level, a segment is broken into *subsegments* for separate transmission across the interface. When communication is initiated, the maximum number of subsegments per segment is specified by the front-end system. The HYPERchannel network allows only one subsegment per segment.

The maximum size of a segment is an integer multiple of the size of a subsegment; both sizes are specified in the Logon message. The Logon and Start messages have a fixed segment size of 6 words; section 4 discusses these messages.

2.5 SUBSEGMENT

A *subsegment* is a block of data that is part of a segment and is the largest amount of data transmitted across the interface at the driver level. Only the first subsegment of a segment is preceded by the LCP.

The number of 64-bit words in a subsegment is specified by the front-end system at initiation of communications. This size must conform to the word boundaries of the front-end system and the Cray mainframe. For example, to meet the boundary requirement for the CDC 7600 computer system, the size must be a multiple of 960 (fifteen 64-bit words or sixteen 60-bit words).

The complete subsegment length is transmitted, even if only a portion of it is valid data. The segment bit count (SGBC field) in the LCP distinguishes the valid data from the fill bits in the last subsegment. The transmission length must be constant to allow length checks, which are a means of detecting hardware errors. If the Variable Segment Size Transfer Enable (VARS) flag is set in the Logon segment, however, the transmission length is represented by the segment bit count rounded up to the next multiple of 64 bits; in this case, the driver checks for hardware transmission errors.

2.6 LINK CONTROL PACKAGE (LCP)

The LCP consists of six 64-bit words preceding the first subsegment of a segment. When no data follows the LCP (null segment) and non-checksumming protocol is used, the transmitted message includes only the LCP. In the case of a null segment and checksummed protocol, an LTP follows the LCP. Any unused fields (shown in the following table by slashed lines) contain 0's.

A 2-character destination identifier (DID) identifies the message receiver; a 2-character source identifier (SID) identifies the message sender.

If the installation parameter I@GROUP (see the COS Operational Procedures Reference Manual) is turned on, the first character of the DID or SID is referred to as the station's major letter. The second character of the DID or SID is referred to as the the station's minor letter. Stations which are I@GROUP-enabled can be viewed as a logical entity. This entity then has the privileges associated with a single station.

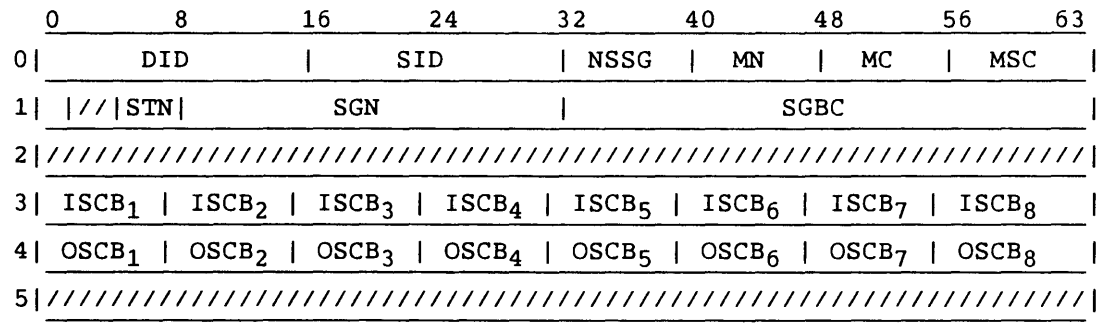
The NSSG field holds a count of the subsegments in the segment to follow. This field is zeroed when there are no subsegments. The HYPERchannel network allows only one subsegment per segment. The SGBC field specifies the number of valid data bits in the segment.

The message number (MN) field contains a modulo 256 number assigned to the message by the sender. The Logon message from the front-end system and the responding Start message from the Cray mainframe are always numbered 1. The sender forms the current message number by incrementing the number of its previous message by 1. A Message Error message uses the expected message number of the message in error and does not increment the number.

COS sets the Request Pending flag (RQP) when station messages are queued to be sent. The RQP flag is needed because certain front-end messages, such as operator function requests and display requests, require SCP to reply with the requested message, and no other. If a station is sending these requests continually, they block the transmission of a Station Message (MC=46) by SCP. The RQP flag requests the station not to send operator requests to SCP. When COS receives an LCP not requiring a response, SCP sends the queued station messages. The stream control bytes (SCBs) should be specified in the station message LCP. (See section 3 for a description of SCBs.)

The stream number (STN) field is an ordinal specifying a particular data stream. This field is used for message codes dealing with data transmissions; for other operations, the field contains 0's. Input and output streams are numbered 1 through 8.

The segment number (SGN) field is the ordinal of the data segment for this message. This field is used only for data messages; for other operations, the field contains 0's.



Field	Word	Bits	Description
DID	0	0-15	Destination mainframe identifier; 2 ASCII alphanumeric characters.
SID	0	16-31	Source mainframe identifier; 2 ASCII alphanumeric characters.
NSSG	0	32-39	Number of subsegments in segment (0-*n*)
MN	0	40-47	Message number (0-255)
MC	0	48-55	Message code (see section 4)
MSC	0	56-63	Message subcode (see section 4)
RQP	1	0	Request Pending flag. Station messages are queued by COS and sent on receipt of any message not requiring a response, such as a control message. See preceding text for additional information.
STN	1	4-7	Stream number (1-8)
SGN	1	8-31	Segment number (0-total number of segments)
SGBC	1	32-63	Number of data bits in segment
$ISCB_m$	3	0-7, 8-15,etc.	Input stream *m* control byte (stream ordinal *m*+8)
$OSCB_n$	4	0-7, 8-15,etc.	Output stream *n* control byte (stream ordinal *n*+8)

2.7 LINK CONTROL PACKAGE EXTENSION (LCPE)

The LCPE controls the NSC HYPERchannel network adapter; it is used only on channels configured with these adapters. The LCPE consists of two 64-bit words preceding the LCP. The 8 words of the LCPE and LCP taken together comprise the network message header (the message proper). Any unused fields (shown in the following table by slashed lines) contain 0's.

The 8-bit trunk control (TC) field selects all available trunks.

The Exception Message (EM) flag is not used in processor-to-processor communications.

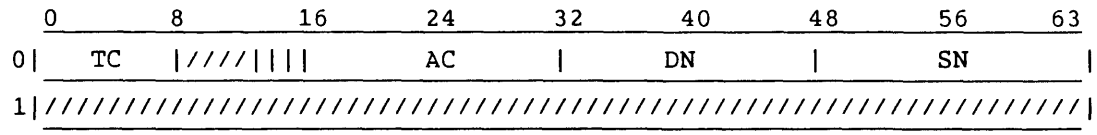
Burst mode (BM) is not selected; the trunk operates in multiplex mode, which allows two or more messages to be transmitted at the same time.

The Associated Data (AD) flag is set when a data segment accompanies the message proper.

The access code (AC) is disabled; therefore, any destination adapter that is physically addressable can be accessed.

When the Cray mainframe receives an input message, the source unit number is placed in the destination unit number (DN) field for the return message to the front-end system.

When the front-end system receives a message, the source unit number (SN) is placed in the DN field for the return message to the Cray mainframe.



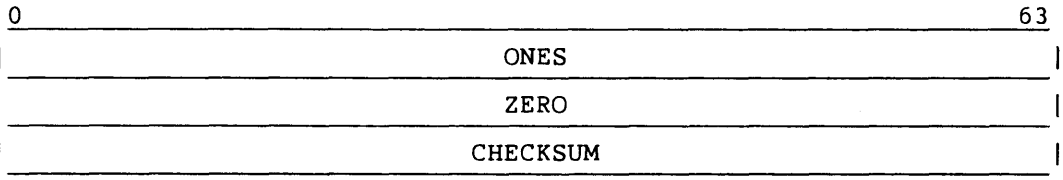
Field	Bits	Description
TC	0-7	Trunk control
EM	13	Exception Message flag (unused)
BM	14	Burst Mode flag (unused)
AD	15	Associated Data flag
AC	16-31	Access code (unused)
DN	32-47	Destination address
SN	48-63	Source address

2.8 LINK TRAILER PACKAGE (LTP)

The link trailer package (LTP) contains the checksum when checksummed protocol is used, and appears only under checksummed protocol. (The LTP and checksummed protocol are not supported over the HYPERchannel network.) In checksummed mode, the Start message and all subsequent messages must have an LTP. The following do not use LTPs:

- The logon LCP and segment
- A message error response to an invalid Logon message

The LTP consists of three 64-bit words that follow the last subsegment or the LCP if there are no subsegments.



To request LCP and segment checksumming, set the checksum size field of the Logon segment to a nonzero value at logon time. The allowed sizes are 64, 32, 16, and 8.

The checksum algorithm is as follows:

1. Clear the checksum accumulator.

2. Exclusive OR (XOR) the next 64 bits of message with the accumulator; repeat until the entire message is processed.

3. Reduce the checksum by XOR of the upper half of the checksum with the lower half until the desired width is obtained.

2.9 OPTIONAL HYPERCHANNEL SUPPORT

The Cray mainframe can support the HYPERchannel local network in addition to or instead of the standard Cray channel coupler. The HYPERchannel network offers the following features:

- Connections to many other computer systems

- Multidrop capability on a single trunk

- Connection to other HYPERchannel local networks through the NSC communications adapters

In the implementation of the HYPERchannel, one or more NSC A130 network adapters are connected to the Cray mainframe through I/O channels on the mainframe or the IOS.

COS protocol is used with the following restrictions.

- LTPs are not supported.
- Only one data subsegment per segment is allowed.
- Restart messages are not supported.

The UNICOS Station Call Processor (USCP) can communicate with a front-end station through either the NSC HYPERchannel or the FEI. See appendix A for a discussion of USCP.

DATA FLOW ACROSS THE INTERFACE 3

3.1 STREAM CONTROL BYTE (SCB)

A *stream control byte* (SCB) is an 8-bit octal code associated with each input stream and each output stream, indicating one of the following:

- The status of the stream
- A request to the other computer to take action on that stream
- A response to a request on that stream

The SCBs (table 3-1) for all defined streams are included in every Link Control Package (LCP). SCBs are meaningful for every message in a defined stream, but they are ignored for undefined streams. The defined input and output streams include streams 1 through the maximum number of input and output streams, respectively, as defined in the Start message (or no defined streams if the maximum is 0).

In the following descriptions of SCBs, the input and output stream designations are relative to the sender. For example, if the front end assigns output stream 3 for staging a dataset to the Cray mainframe, messages from the front-end station to COS use the SCB for output stream 3 and messages from COS to the station use the SCB for input stream 3. See appendix A for a discussion of UNICOS Station Call Processor (USCP) data flow.

3.1.1 IDLE (IDL=0)

An IDL SCB indicates an inactive and available stream.

3.1.2 REQUEST TO SEND (RTS=1)

RTS from the sender indicates readiness to initiate a data transfer. RTS from the receiver is invalid.

Table 3-1. Stream Control Bytes

Octal Code	Mnemonic	Request/Response	Sender	Receiver
00	IDL	Idle	X	X
01	RTS	Request to send	X	
02	PTR	Preparing to receive		X
03	SND	Sending	X	
04	RCV	Receiving		X
05	SUS	Suspend		X
06	END	End-of-data	X	
07	SVG	Saving data		X
10	SVD	Data saved		X
11	PPN	Postpone	X	X
12	CAN	Cancel	X	X
13	MCL	Master clear	X	X
14	HLD	Hold		X

3.1.3 PREPARING TO RECEIVE (PTR=2)

PTR is the normal response to RTS. PTR indicates that the receiver can accept the initiation of a data transfer but cannot currently begin to receive. PTR from the sender is invalid.

3.1.4 SENDING (SND=3)

SND, from the sender, indicates that a data transfer is initiated and is in progress. SND is invalid from the receiver.

3.1.5 RECEIVING (RCV=4)

RCV, from the receiver, indicates that a data transfer is initiated and is in progress. RCV is invalid from the sender.

3.1.6 SUSPEND (SUS=5)

The receiver temporarily stops data transfer on the stream marked SUS. The receiver signals the end of suspension by returning an RCV SCB on the same stream. By not sending, the sender implicitly suspends the transfer; therefore, the sender does not need to use SUS.

3.1.7 END DATASET (END=6)

The sender uses END to signal the end of the data transfer. END may accompany the last segment of the data transfer, or it may be sent on a subsequent message. END is invalid from the receiver.

3.1.8 SAVING DATASET (SVG=7)

The receiver uses SVG to notify the sender that the data transfer is being saved. SVG is invalid from the sender.

3.1.9 DATASET SAVED (SVD=10)

The receiver uses SVD to notify the sender that data transfer is complete and the data has been saved. SVD is invalid from the sender.

3.1.10 POSTPONE (PPN=11)

The sender uses PPN to request that the receiver delete all data received so far; the sender will retransmit. The receiver uses PPN to request the abnormal termination of a data transfer or a stream assignment. The receiver deletes the partial dataset received; the sender should retransmit.

3.1.11 CANCEL (CAN=12)

The sender uses CAN to request that the receiver delete all data received so far; the data will not be retransmitted, and the job requesting the data transfer (if there is one) will be dropped. The receiver uses CAN to request the termination of the data transfer and the deletion of all data received so far.

3.1.12 MASTER CLEAR (MCL=13)

Either the sender or the receiver may issue MCL. MCL can be issued at any time to indicate an irreconcilable error condition on a specific stream. MCL has the effect of an immediate PPN.

3.1.13 HOLD (HLD=14)

The receiver issues HLD when it encounters an exception condition for a data transfer requiring operator intervention. One example of such a condition is when the disk is full. The sender does not attempt to send the dataset again until the hold condition has been cleared by the operator. For a data transfer from COS, a Release Held Job (RL) operator function request for the file clears the HOLD condition (see section 4). HLD may not be used by the sender.

3.2 STREAM CONTROL BYTE FLOW

The sending computer reserves a stream before transmitting a dataset. A dataset sent by the front end contains one of the following:

- An input job destined for processing on the Cray mainframe
- Associated job data to be maintained on mass storage, originating from a front-end peripheral device
- Data destined for mass storage and not associated with a job

A dataset sent by the Cray mainframe to the front end consists of output from a Cray mainframe job, such as data to be printed, punched, or plotted. Regardless of the sender, all data is treated the same at the driver and interface levels.

Sending a dataset is a decision of the sender (as when the front end sends an input job dataset to the Cray mainframe) or is a response to an earlier request for a dataset sent by the other computer. In either case, a higher-level system routine requests the driver to send data.

Figure 3-1 shows the sequence of SCBs. The diagram flows down. The following paragraphs describe the sequence.

A free stream at the interface level requires acceptance of the request to send data. The receiver uses IDL SCBs to indicate which streams are idle. The sender assigns a stream by entering an RTS in the stream's SCB in the next LCP (point C in the figure). The message is otherwise unrelated to this stream. Interleaving allows the next message to contain data for a different dataset sent on another stream.

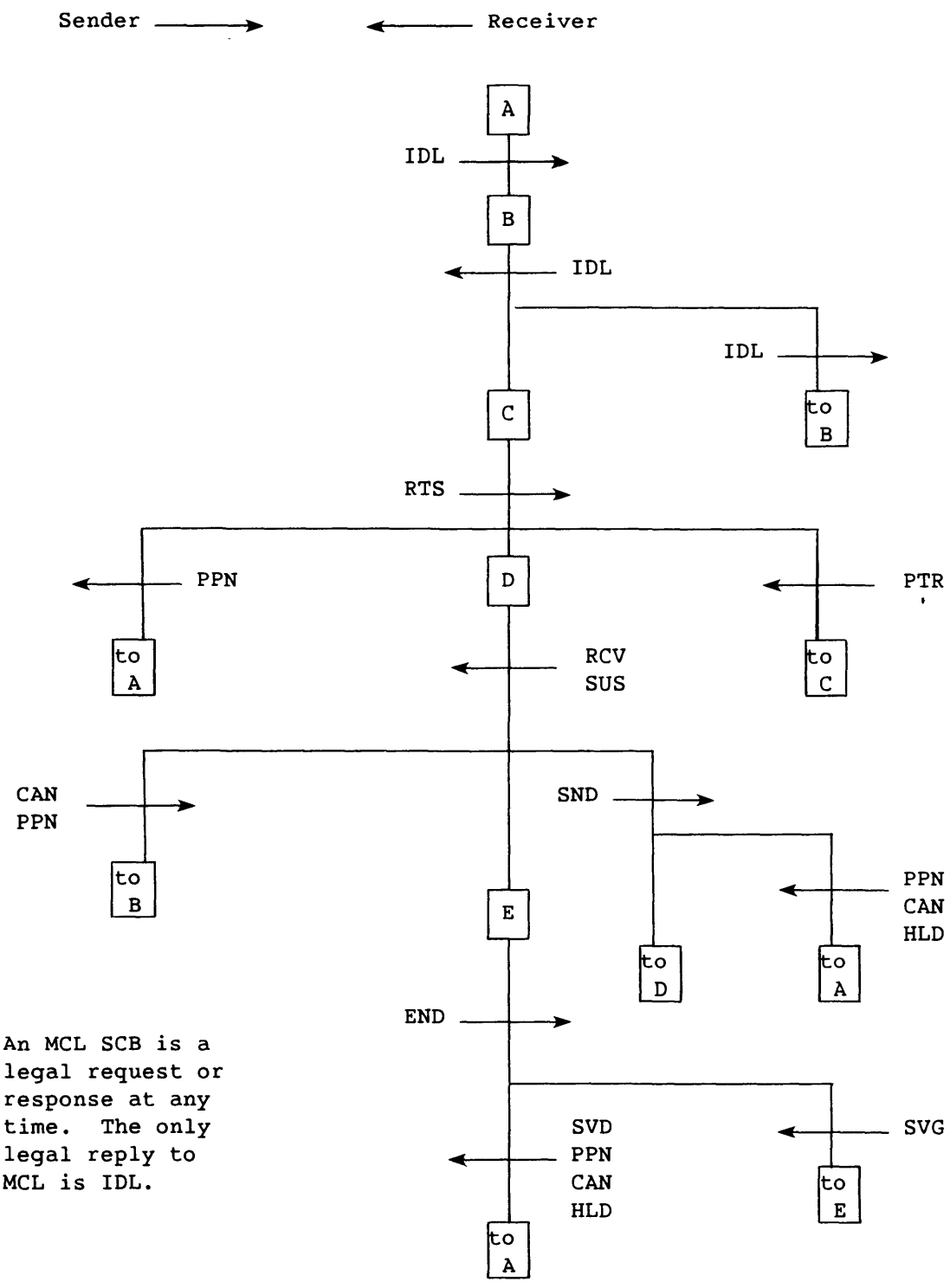


Figure 3-1. Stream Control Byte Flow

In response to the RTS, the receiver can do the following:

- Abort the RTS by replying with a PPN SCB for that stream
- Acknowledge the sender's RTS by responding with a PTR SCB without actually being able to receive data
- Acknowledge the request by replying with RCV or SUS when its conditions and resources are available (point D in figure 3-1)

On receiving the RCV or SUS reply, the sender immediately leaves the RTS state. If the sender has data to send, the SCB is changed to SND for sending. When data is available and sent with a message, the segment information in the LCP is set for the stream, and the segment itself contains data associated with the dataset. The first segment sent (segment 0) contains dataset header information. This information includes the name of the dataset, the disposition code, the terminal identifier, format information, dataset size, and so on. Subsequent segments contain the data in the dataset. See section 4, code 6 (dataset header message).

After the initial segment transmission, the receiver performs overhead functions; these include assigning buffer space and delaying transmission by replying with SUS. When the receiver is ready to accept data sent on the stream, it issues RCV. The receiver can suspend at any time, but the normal flow is in the SND/RCV exchange.

Three additional options are available to the receiver. With the first option, a receiver requests a postponement by issuing PPN to inform the sender of a temporarily irrecoverable situation and discards the partial dataset already received. The sender replies to PPN with IDL and later reinitiates the dataset transmission. With the second option, the receiver cancels by issuing CAN, which resembles PPN except that it deletes the dataset with no option for retransmission. With the third option, if the receiver is the front end, it can request that the dataset be held pending operator action by issuing an HLD SCB, in which case the sender replies with IDL.

During the SND/RCV process, the sender also has three other SCB options.

With the first option, the sender cancels (CAN) to direct the receiver to delete the partial dataset already received, drop the job that requested the dataset (on an ACQUIRE or FETCH to COS), and return the stream to IDL.

With the second option, the sender issues a postpone (PPN) to inform the receiver to delete the partial dataset already received and return the stream to IDL. The sender decides whether the cancellation is temporary or permanent. The postpone function is used when a transfer can be tried again; the cancel function specifies that there will be no subsequent tries.

With the third option, the sender indicates end-of-data transfer on the stream (END) (point E in figure 3-1). In response, the receiver normally performs the overhead chores required to preserve the dataset, and responds with SVG until that activity is complete. When disposition of the dataset is complete, the receiver responds with SVD. However, after any number of END/SVG exchanges, and before dataset disposition is complete, the receiver can cancel or postpone, with the implications previously described. The sender acknowledges SVD, PPN, or CAN by returning the stream to IDL. The receiver replies with IDL; the transmission is complete, and the stream is free.

MCL is the only stream status that is issued by either sender or receiver at any time and indicates at any stage of communications that an irrecoverable error has occurred. MCL requires immediate termination of data transfer on the stream. The other computer is expected to respond to MCL with IDL.

Tables 3-2 and 3-3 summarize the response SCBs for the sender and receiver.

Errors are indicated in the LCP message code rather than on a stream basis. See the description of the Message Error code (012) in section 4. No segment is associated with a Message Error LCP, and the SCBs in this LCP are ignored. The sender has the option to repeat the message transmission.

Table 3-2. Receiver SCB Response as a Function of Sender SCB

RECEIVER SCB RESPONSE†

SENDER SCB RESPONSE†	IDL	PTR	RCV	SUS	SVG	SVD	PPN	CAN	HLD
IDL	N								
RTS		N	C	C			A		
SND			N	N			A	A	A
END					N	C	A	A	A
PPN	C								
CAN	C								

N = Normal receiver SCB response
C = Normal receiver SCB response; requires change in sender SCB.
A = Abnormal receiver SCB response; requires change in sender SCB.
† Master clear (MCL) is a special case described in the preceding text.

Table 3-3. Sender SCB Response as a Function of Receiver SCB

SENDER SCB RESPONSE†

RECEIVER SCB RESPONSE†	IDL	RTS	SND	END	PPN	CAN	HLD
IDL	N	C					
PTR		N					
RCV			N	C	A	A	A
SUS			N	C	A	A	A
SVG				N			
SVD	C						
PPN	C						
CAN	C						

N = Normal sender SCB response
C = Normal sender SCB response; requires change in receiver SCB.
A = Abnormal sender SCB response; requires change in receiver SCB.
† MCL is a special case described in the preceding text.

Figures 3-2 and 3-3 show the possible exchange of SBCs between the sender and the receiver. Arrows represent state transitions. Circles represent possible sender states and the actions taken when in those states. Two types of possible actions are as follows:

- Send an SCB
- Make a decision about the stream

In figure 3-2, if the sender has sent an SCB, the possible state transitions correspond to SCBs received on the stream. If the sender made a decision about the stream, the transitions correspond to possible outcomes. Figure 3-3 shows the corresponding actions for the receiving side.

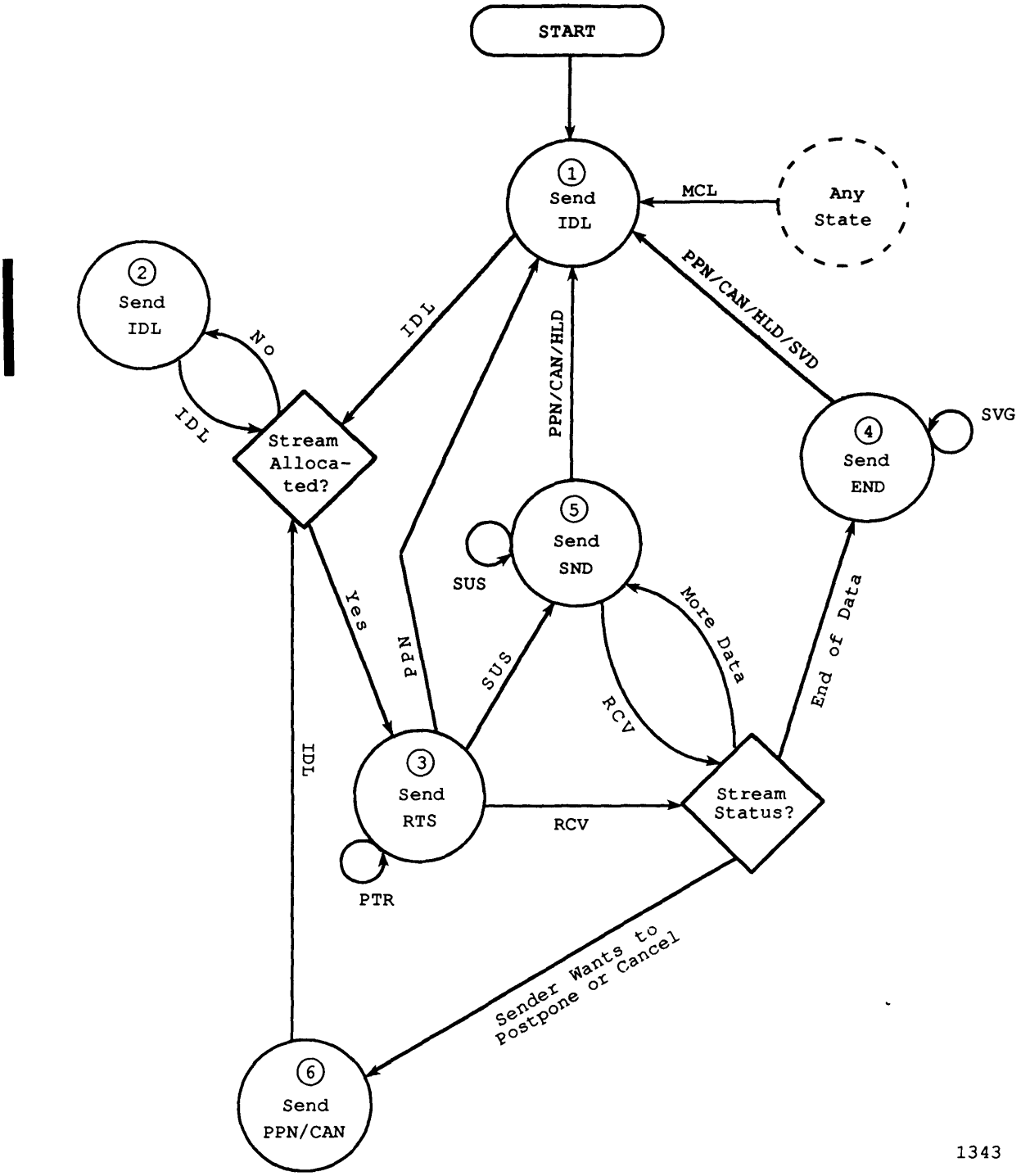


Figure 3-2. Sender SCB State Diagram

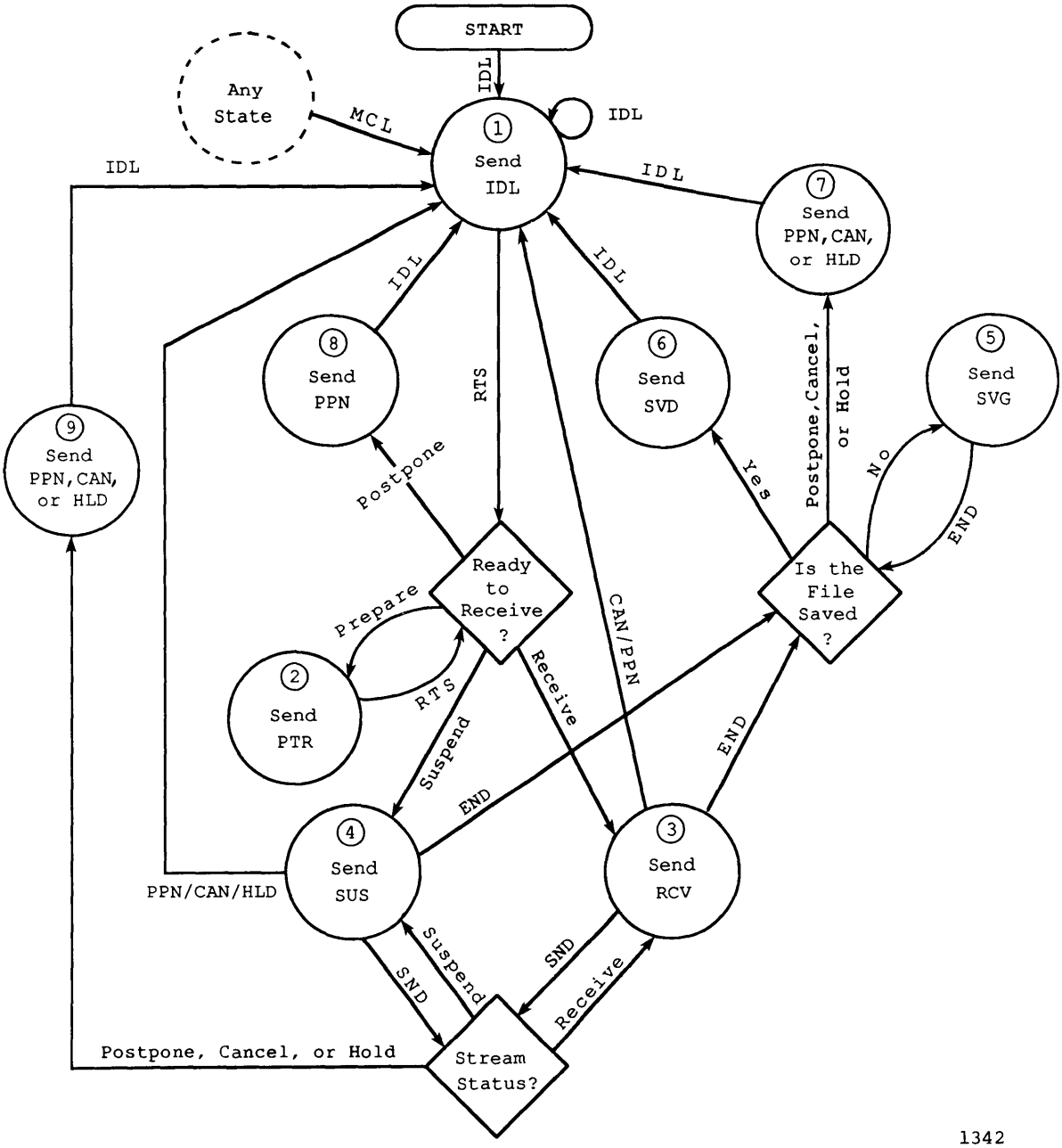


Figure 3-3. Receiver SCB State Diagram

MESSAGE CODES 4

A message code identifies a message on the communication link, sent by either the front-end station or COS. The message can have one of the following functions:

- Initialize, shut down, resynchronize, or recover the link
- Specify the initiation and transfer of datasets
- Request or reply with status for a dataset transfer, a job, or COS
- Exercise control over COS, jobs, and dataset transfers

The message code occupies an 8-bit field in the link control package (LCP). Certain codes indicate the existence and content of an associated data segment. A stream and segment are required for certain message codes related to data transfer. One group, the synchronous message codes, can be distinguished from the other message codes. The synchronous request codes are generally processed immediately; the return message to the front end is the message reply. If it is not possible to reply immediately, or a higher-priority message (such as a dataset transfer request or a station message) preempts the reply, the Station Call Processor (SCP) returns the highest-priority message available. The reply to the synchronous request is made when the request is processed and no higher priority messages are queued.

SCP permits only one synchronous request to be outstanding at any time. If a synchronous request is received while a previous synchronous request is being processed, SCP replies immediately with a message error. All other message types are processed normally under this condition. Table 4-1 summarizes the message codes. See appendix A for a list of the message codes currently supported by the UNICOS Station Call Processor (USCP).

Table 4-1. Message Codes

Code	Function	Sender		Segment	Stream Required	Synchronous Request
		Station	COS			
001	Logon	X				
003	Logoff					
004	Start	X				
005	Restart	X				
006	Dataset Header	X	X			
007	Dataset Segment	X	X	X		
011	Control	X	X			
012	Message Error	X	X			
013	Dataset Transfer Request	X	X			
014	Dataset Transfer Reply	X	X			
015	Enter Logfile Request	X†		X		
016	Enter Logfile Reply	X	X			
017	Unsolicited Operator Message	X				
020	Unsolicited Operator Reply	X				
021	Job Status Request	X†	X	X		
022	System Status Request	X†	X	X		
023	Dataset Status Request††	X†	X	X		
024	Link Status Request	X†	X	X		
025	Mass Storage Status Request	X†	X	X		
026	Operator Function Request	X†	X	X		
027	Debug Function Request	X†	X	X		
031	Job Status Reply		X	X		
032	System Status Reply		X	X		
033	Dataset Status Reply††		X	X		
034	Link Status Reply		X	X		
035	Mass Storage Status Reply		X	X		
036	Operator Function Reply		X	X		
037	Debug Function Reply		X	X		
040	Diagnostic Echo Request	X†				
041	Diagnostic Echo Reply		X	X		
042	Interactive Request	X†		X		X
043	Interactive Reply	X		X		

† Optional; the front-end station is not required to send.

†† Codes 056 and 057 replace codes 023 and 033 for implementation of the security features introduced in COS version 1.12. Codes 023 and 033 are still supported.

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Table 4-1. Message Codes (continued)

Code	Function	Sender		Segment	Stream Required	Synchronous Request
		Station	COS			
044	Statclass Request	x†		x		x
045	Statclass Reply		x	x		
046	Station Message†††		x	x		
047	Station Reply	x†		x		
050	Tape Configuration Request	x†	x			x
051	Tape Configuration Reply		x	x		
052	Tape Job Status Request	x†		x		x
053	Tape Job Status Reply		x	x		
054	Configure Request	x†		x		x
055	Configure Reply		x	x		
056	Dataset Status Request (Ownership)††	x†		x		x
057	Dataset Status Reply (Ownership)††			x		
060	Job Information Request	x†		x		
061	Job Information Reply	x		x		
062	Stream Status Request	x¶		x	x	
063	Stream Status Reply	x	x			
064	Generic Resource Status Request	x†		x		
065	Generic Resource Status Reply	x	x			
066	Task Display Request	x	x	x		
067	Task Display Reply	x				
070-077	Reserved for site use¶¶					
100	Swap Space Status Request		x			
101	Swap Space Status Reply	x				

† Optional; the front-end station is not required to send.

†† Codes 056 and 057 replace codes 023 and 033 for implementation of the security features introduced in COS version 1.12. Codes 023 and 033 are still supported.

††† COS does not send if the front-end station logged on with message receive disabled (Logon field MRE=0).

¶ Reserved for CRI

¶¶ Message codes 070 through 077 are reserved for site use, and are maintained exclusively by the site. COS prevents COS products from using these codes, but is otherwise unaffected by them.

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Figure 4-1 illustrates the order of message codes. The flow of the diagram is downward. Notice that front-end station actions alternate with COS actions.

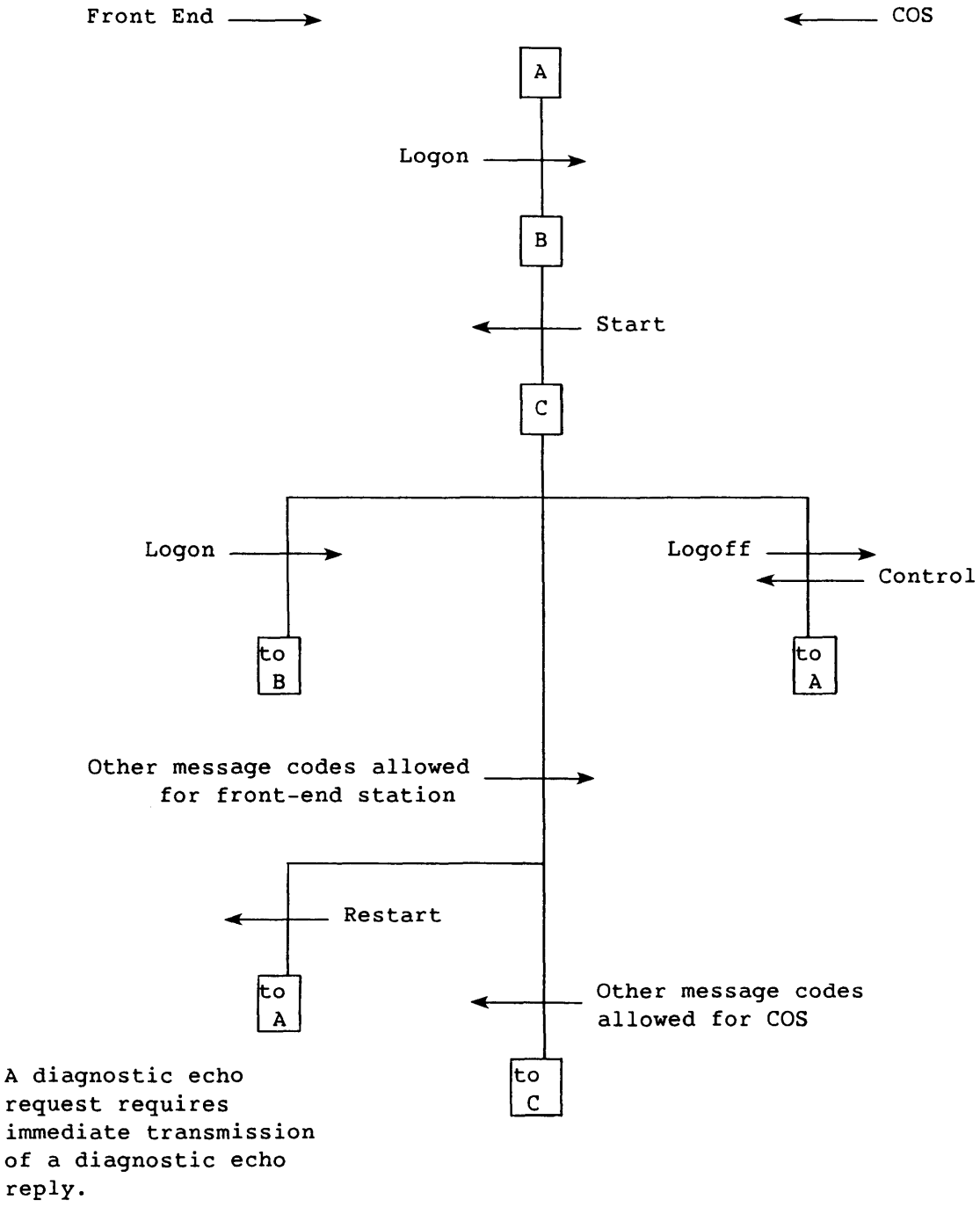


Figure 4-1. Message Code Flow

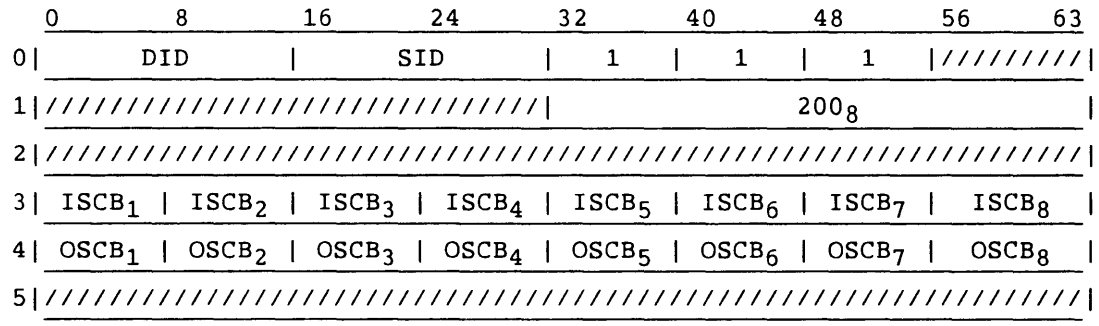
Logon (1)

Logon is the initial message code sent by the front-end station to COS to begin communication. COS never sends a Logon but must respond to one with a Start code. If a Logon follows a front-end failure (that is, if it is received unexpectedly by COS), COS terminates all previously active input and output stream transfers.

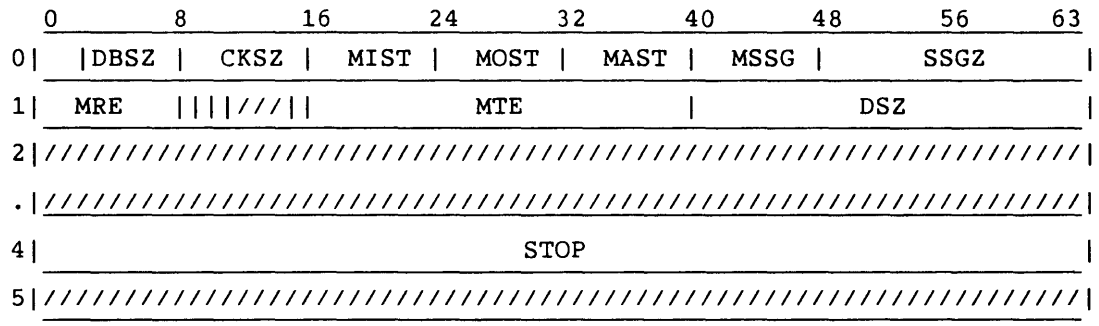
The SCBs in the Logon LCP must indicate Idle for all defined input and output streams.

Logon consists of one subsegment of six 64-bit words.

LCP:



Segment:



Field	Word	Bits	Description
STYP	0	0-1	Station type: 0 Batch only 1 Interactive only 2 Both
DBSZ	0	2-7	Disk buffer size to be used by COS for each stream; indicates the number of 512-word blocks to use for a disk buffer for each active stream. If the field is 0, the installation default (I@NDSKBF) is used.

Field	Word	Bits	Description
CKSZ	0	8-15	Request for checksum of segments with the indicated checksum width. 64, 32, 16, and 8 are the only values allowed; 0 implies no checksumming.
MIST	0	16-23	Maximum number of input streams (0-8) relative to the front end
MOST	0	24-31	Maximum number of output streams (0-8) relative to the front end
MAST	0	32-39	Maximum number of active streams (0-16); cannot exceed sum of MIST and MOST.
MSSG	0	40-47	Maximum number of subsegments comprising a segment (1-*n*)
SSGZ	0	48-63	Subsegment size in 64-bit words
MRE	1	0-7	Message receive enable; contains the maximum number of station messages that can be received in a single segment. If 0, station messages are disabled for this station.
SLOT	1	8	Station Slot Enable flag; section 8 discusses the station slot.
ISLT	1	9	Interactive Station Slot Enable flag; see section 8 for a description of the station slot.
VARS	1	10	Variable Segment Size Transfer Enable flag. If 1, COS returns only valid data defined by the segment bit count.†
FRCE	1	15	Force segment flag on all LCPs. If 1, COS always returns an LCP and segment. For messages with only an LCP, COS returns a full segment.†

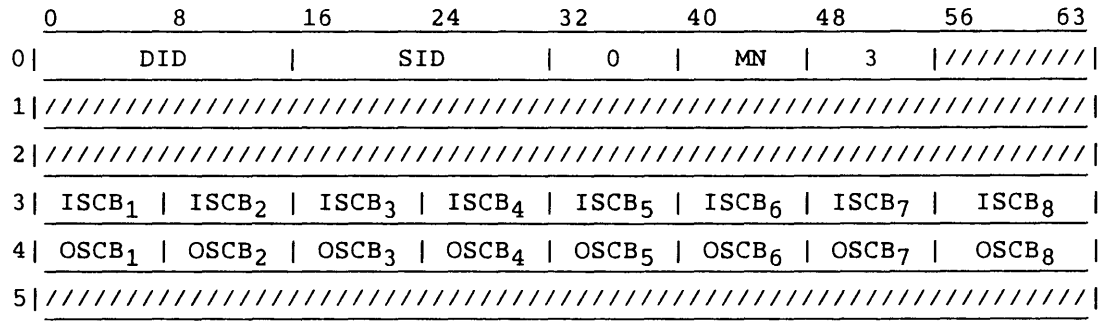
† If VARS and FRCE are both enabled, COS returns only one word in the segment.

Field	Word	Bits	Description
MTE	1	16-39	Message type enable (see sections 5 and 6): Bit 16 = Message type 0 Bit 17 = Message type 1 and so on
DSZ	1	40-63	Maximum dataset size that front end can receive in 512-word blocks; 0 indicates no limit.
STOP	4	0-63	Station operator terminal password

Logoff (3)

Logoff terminates communication and is the final message code from the front-end station to COS. COS never sends a Logoff. The SCBs in the Logoff LCP indicate Idle for all defined input and output streams.

LCP:

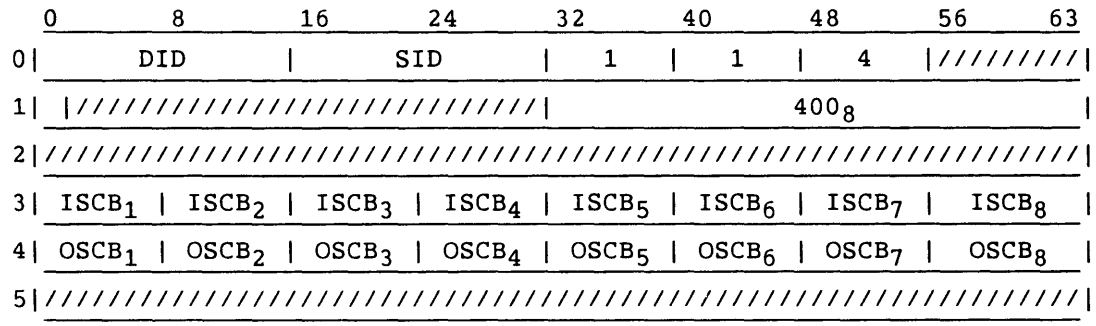


Start (4)

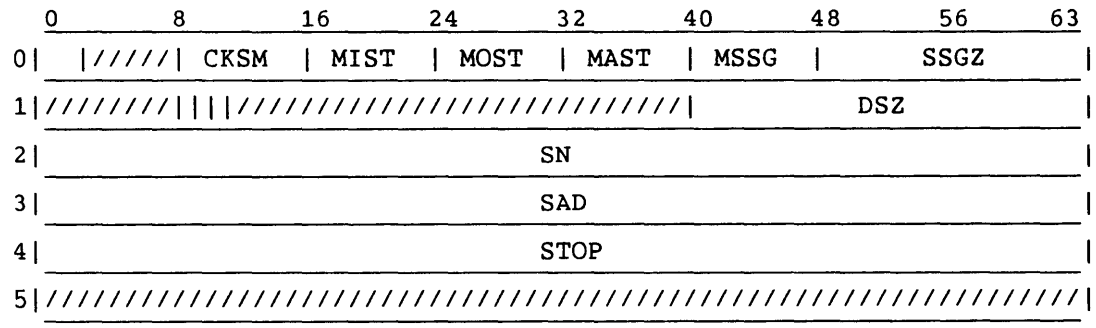
Start is the first message code sent by COS to the front-end station following a Logon. The SCBs in the Start LCP indicate Idle for all defined input and output streams. All fields in words 0 and 1 are copied from the Logon.

For Start, one subsegment of six 64-bit words is sent.

LCP:



Segment:



Field	Word	Bits	Description
STYP	0	0-1	Station type: 0 Batch only 1 Interactive only 2 Both
CKSM	0	8-15	Logon checksum size; 64, 32, 16, and 8 are the only values allowed; 0 implies no checksumming.
MIST	0	16-23	Maximum number of input streams (0-8) relative to the front end

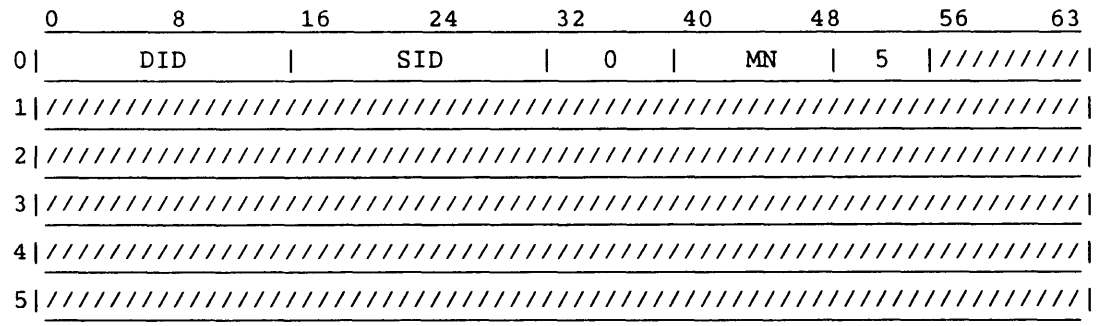
Field	Word	Bits	Description
MOST	0	24-31	Maximum number of output streams (0-8) relative to the front end
MAST	0	32-39	Maximum number of active streams (0-16); must not exceed sum of MIST and MOST.
MSSG	0	40-47	Maximum number of subsegments comprising a segment (1-*n*)
SSGZ	0	48-63	Subsegment size in 64-bit words
SLOT	1	8	Station Slot Enable flag; section 8 describes the Station Slot
ISLT	1	9	Interactive Station Slot Enable flag; section 8 describes the Station Slot
VARS	1	10	Variable Segment Size Transfer Enable flag
DSZ	1	40-63	Maximum output dataset size that is sent to the front end in 512-word blocks
SN	2	0-63	System name in ASCII
SAD	3	0-63	Date of system generation (*mm/dd/yy*) in ASCII
STOP	4	0-63	Station operator terminal password

Restart (5)

Restart requests a Logon from the front-end station after the Cray mainframe is deadstarted or the channel is turned on. The Restart message is provided to end a deadlock in which the front-end station waits for a response after the Cray mainframe goes down. The DID and MN fields are always 0 in a Restart LCP, because the station identifier is not known. This message is the first output LCP appearing on any front-end channel.

The maintenance control unit (MCU) channel is turned on automatically at Startup; no operator command is necessary. Other channels also can be turned on automatically. Restart messages are not supported for channels connected to NSC adapters.

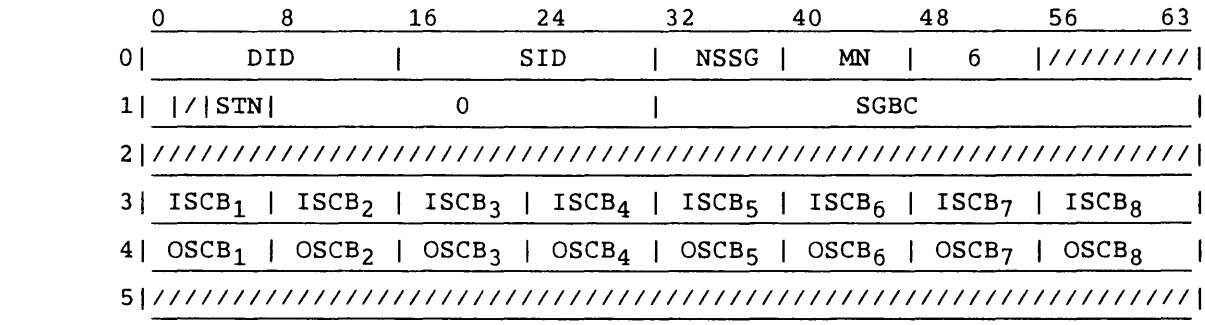
LCP:



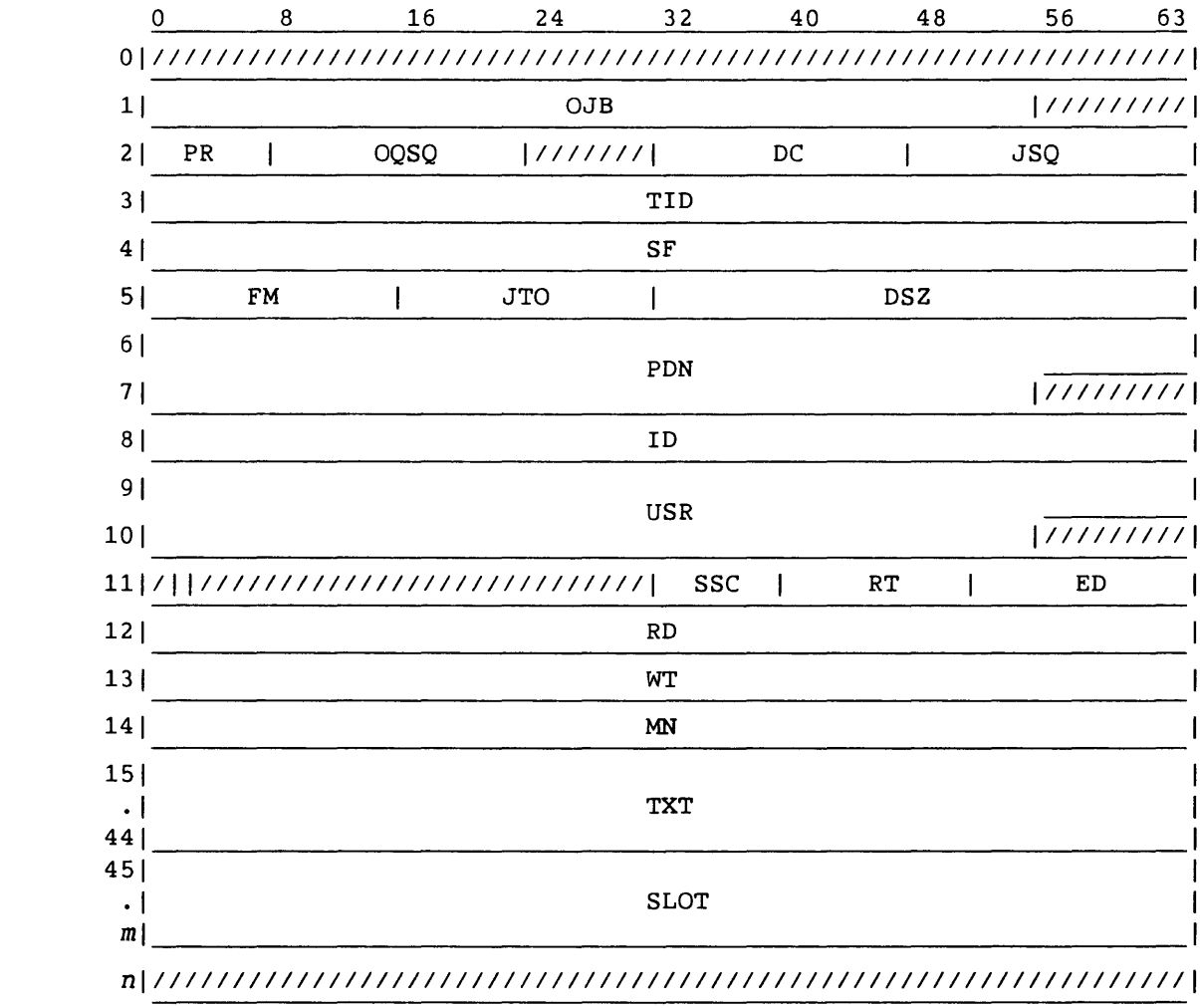
Dataset Header (6)

The Dataset Header is the message code preceding a dataset transfer. The segment, referred to as segment 0, contains descriptive information about the dataset. The corresponding SCB must indicate sending.

LCP:



Segment:



Field	Word	Bits	Description
OJB	1	0-55	Originating jobname; 1-7 alphanumeric characters, left-justified and zero-filled; must be returned if a transfer was originated by dataset transfer request.
PR	2	0-7	Output queue priority
OQSQ	2	8-23	Output queue sequence number (assigned by COS)
DC	2	32-47	Disposition code (2 characters): IN Dataset is to be executed as a job by the receiving system unless the TR flag is set. If the TR flag is set, the dataset is a requested dataset. IT Dataset is to be disposed to a front-end task for processing. MT Dataset is to be disposed to a magnetic tape by the receiving system. PR Dataset is to be disposed to a printer by the receiving system. PT Dataset is to be disposed to a plotter by the receiving system. PU Dataset is to be disposed to a card punch by the receiving system. ST Dataset is to be placed on the receiving system's mass storage. If TR is set and the request originated from an ACQUIRE control statement, the dataset is made permanent. If TR is not set, the dataset is not made permanent. Other disposition codes can be defined as required. COS accepts only datasets with disposition codes of IN, IT, MT, or ST. (See table 4-2 for fields associated with each disposition code.)

Field	Word	Bits	Description
JSQ	2	48-63	Originating job sequence number
TID	3	0-63	Terminal identifier of the requester
SF	4	0-63	Special forms identifier; 1-8 alphanumeric characters, left-justified and zero-filled.
FM	5	0-15	Dataset format (2 characters): BB Binary blocked BD Binary deblocked CB Character blocked CD Character deblocked TR Transparent
JTO	5	16-31	Job task ordinal. If the dataset header in a dataset transfer request uses this field, it must be returned.
DSZ	5	32-63	Dataset size in 64-bit words
PDN	6 7	0-63 0-55	Permanent dataset name
ID	8	0-63	User identification; 1-8 alphanumeric characters, left-justified and zero-filled.
USR	9 10	0-63 0-55	User number; 1-15 alphanumeric characters, left-justified and zero-filled.
TR	11	2	Transfer Request flag (set only if the transfer originated from a dataset transfer request). When set, all valid DC codes are treated logically as ST.
SSC	11	32-39	Station slot length in 64-bit words; the maximum value is 255. A nonzero value is permitted only if SLOT is set to 1 in the Logon segment. Section 8 describes the station slot.
RT	11	40-51	Retention period in days; 0-4095.

Field	Word	Bits	Description
ED	11	52-63	Edition number; 0-4095. If the sending system specifies 0, the receiving system uses the default edition number. The default value is 1 if a permanent dataset with the same PDN and ID does not already exist, or one greater than the latest edition number if a permanent dataset with the same PDN and ID does exist. If the sending system specifies 1-4095, and a permanent dataset with the same PDN, ID, and ED already exists, the receiving system must cancel the stream, and the sending system must delete that dataset as a candidate for transfer to the receiving system.
RD	12	0-63	Read permission control word (COS datasets only); 1-8 alphanumeric characters, left-justified and zero-filled.
WT	13	0-63	Write permission control word (COS datasets only); 1-8 alphanumeric characters, left-justified and zero-filled.
MN	14	0-63	Maintenance permission control word (COS datasets only); 1-8 alphanumeric characters, left-justified and zero-filled.
TXT	15-44	0-63	Text to be interpreted by the station for FETCH, DISPOSE, and ACQUIRE processing. The field can contain label information, routing, etc., possibly in the form of control statements for the station.
SLOT	45-*m*	0-63	Station-controlled slot information. Section 8 discusses the station slot.

Table 4-2. Dataset Header Field Usage

DC	SF	OJB TID	FM	DSZ†	PDN,ID RT,ED RD,WT,MN	USR	JSQ	PR	TXT
IN		x	x	x					
MT,PR PT,PU	x	x	x	x		x	x	x	
ST††		x	x	x	x	x	x		x
IT††		x	x	x		x	x		x

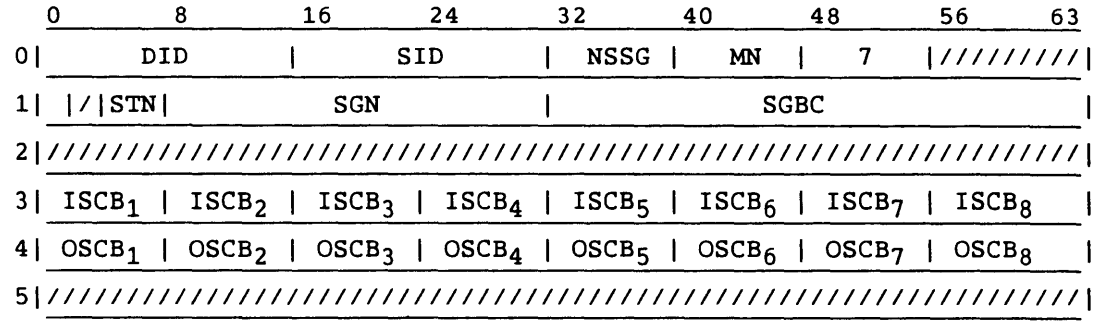
† Optional

†† TR must be nonzero if the header results from a dataset transfer request.

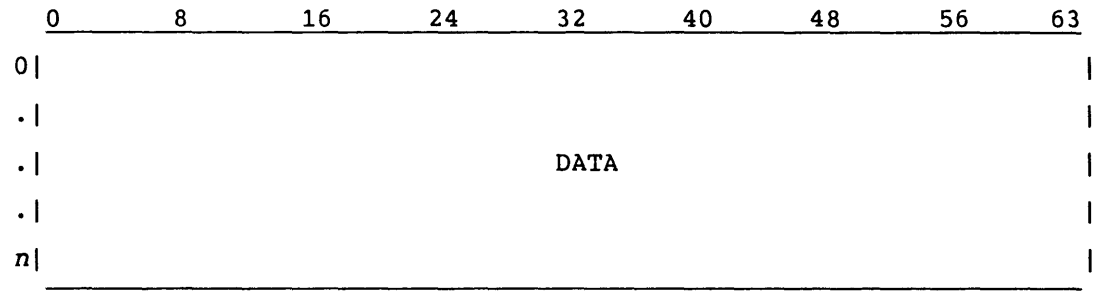
Dataset Segment (7)

The Dataset Segment message code indicates the associated segment contains data for the specified stream.

LCP:



Segment:

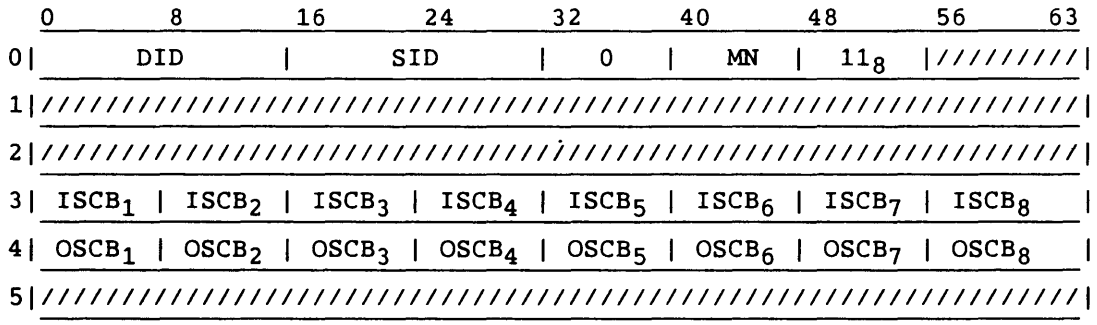


Control (11)

The Control message code maintains communication when no other specific action is requested. No stream number is specified, and no segment is associated with the LCP. SCBs are still valid.

The Control message is also sent as a reply to the Logoff message. The front-end station should read in this message to ensure that the Logoff was received and processed.

LCP:



Message Error (12)

The Message Error code indicates that the previously received message was in error and was ignored. The MSC field indicates the cause of the error. No segment is sent with this LCP, and the SCBs are invalid.

Message Error messages do not increment the message number. The expected message number for the message in error is used.

LCP:

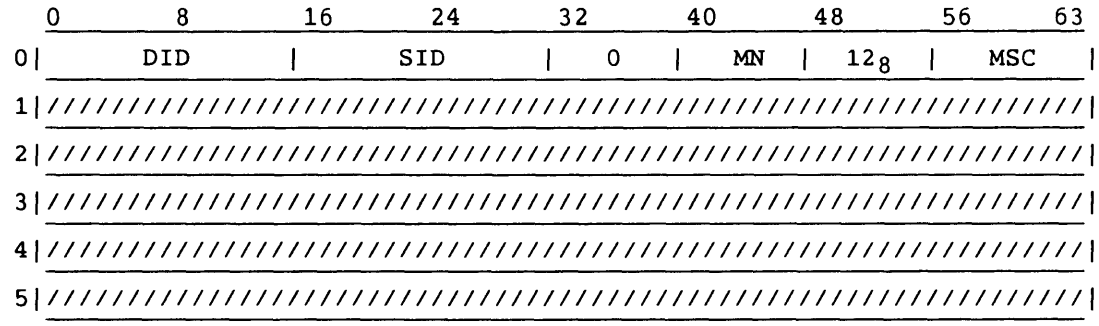


Table 4-3 lists the MSC codes handled by the Station Call Processor (SCP). See the COS Internal Reference Manual, Volume II: STP, for detailed information on SCP.

Table 4-3. SCP Message Error Codes

Octal Code	Description
010	Message/function not available
100	Invalid LCP field values (can be used in lieu of any 1xx code)
101	Destination identifier (DID) field error
102	Source identifier (SID) field error
103	Number of subsegments error
104	Message number error
105	Message code error

Table 4-3. SCP Message Error Codes (continued)

Octal Code	Description
106	Message subcode error
107	Stream number error
110	Segment number error
111	Segment bit count error
112	Stream control byte error
113	Segment size error
114	Station message limit error
115	Logon parameter error
116	Resource not available (no buffer space)
120	Unable to down streams on Logon/Logoff
140	Checksum error
200	Segment data error (can be used in place of any 2xx code)
201	Operator function not available
202	Debug function not available
203	Function restricted to COS master operator
204	EXEC detected error
205	Undefined station ID
206	Undefined channel
210	Undefined device
211	Breakpoint number too large
212	Breakpoint busy

Table 4-3. SCP Message Error Codes (continued)

Octal Code	Description
213	Address too large
214	Too many bits
215	Register number too large
216	Unknown register designator
217	Breakpoint address too large
220	Breakpoint not set
221	Breakpoint address busy
222	Breakpoint inactive
223	No JXT offset in SDT
224	Bad SDT pointer in JXT
226	Operator function request segment error
227	Attempt to kill or drop locked job
230	Job not found
231	Task not found in job
232	Account not validated for job
233	Dump range exceeds segment size
250	Unsupported USCP message (USCP only)
251	Startup not complete
252	Error detected by DQM
253	Error detected by PDM
314	Generic resource preemption not available

Table 4-4 lists the MSC codes handled by the front-end driver (FED). For more information on FED, see the COS Internal Reference Manual, Volume I: EXEC.

Table 4-4. FED Message Error Codes

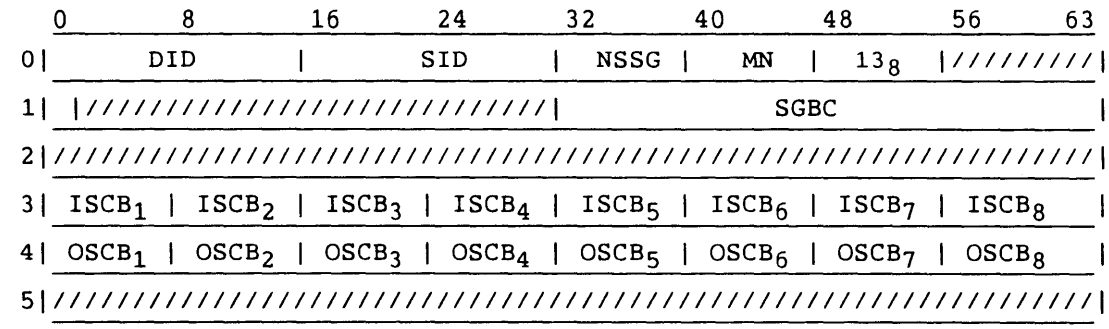
Octal Code	Description
300	Hardware error (can be used in lieu of any 3xx code)
301	Transfer length error
302	6 Mbyte channel error
303	Not logged on
304	Maximum number of front ends already logged on
305	Already logged on another channel
306	Attempted to send out of sequence
307	NSC adapter error
310	Logon parameter error: checksumming is set in a system using a HYPERchannel.
311	No data expected: a message was sent to COS with the associated data bit set, but the LCP message type does not support a segment.
312	Waiting process completion: the Logon message received cannot be processed until completion of a current process. The front-end station must resend the Logon after a delay.
313	No data received: COS did not receive the next expected LCP and segment from the front end. The front end should retransmit the last LCP and segment.

Dataset Transfer Request (13)

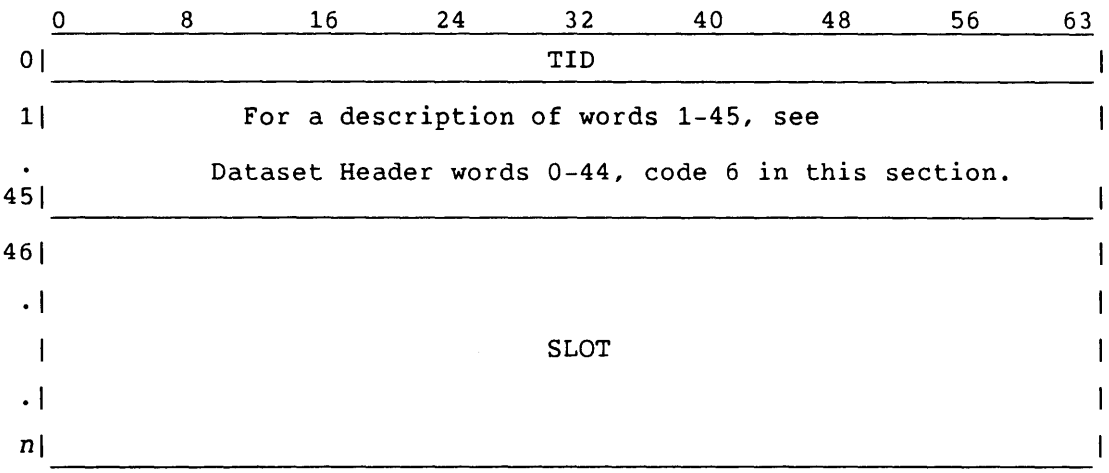
A Dataset Transfer Request requests a specific dataset from the front-end computer. Identifying information about the dataset is contained in the associated segment and is the same as that contained in the Dataset Header. No stream number is specified, but SCBs are valid for defined streams.

After sending a request, COS waits indefinitely for a Dataset Transfer Reply (code 14) and suspends the job. It resends the request only if communication is lost and reestablished; that is, if the front end logs off and back on, if the channel is turned off and back on, or if COS is restarted.

LCP:



Segment:



Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester, as known to the requesting front end
SLOT	46-*n*	0-63	Section 8 describes the station slot.

Words 1 through 44 contain the information needed to identify the dataset at the receiving front-end system, and to provide necessary links between the dataset and the requesting COS job. The front end returns this information in the Dataset Header message, if it sends the dataset to COS. The information returned should not include the station slot.

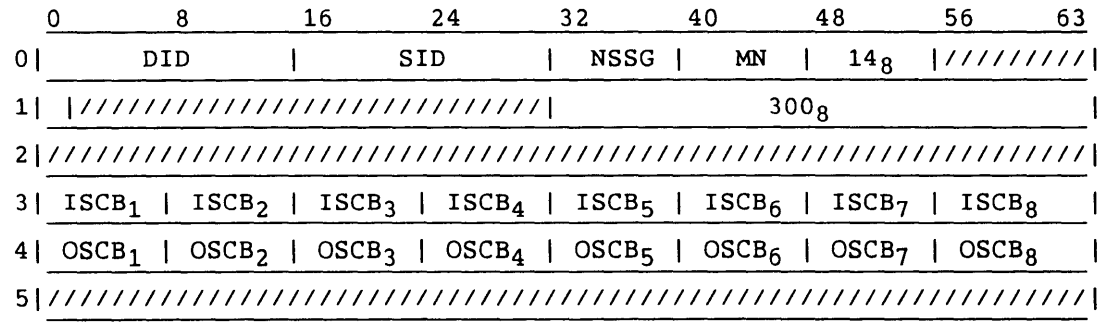
Security features do not affect the Dataset Transfer Request.

Dataset Transfer Reply (14)

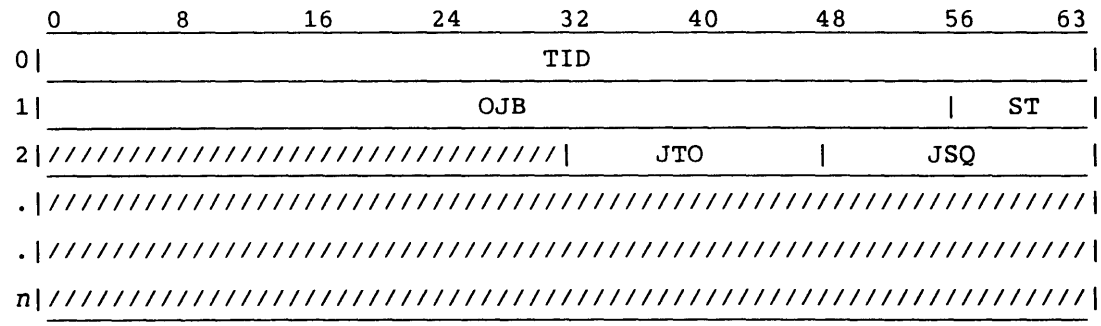
A Dataset Transfer Reply responds to the Dataset Transfer Request and indicates the availability of a requested dataset. The segment contains identifying information. No stream number is specified, but SCBs are valid for defined streams.

If the status field of the front-end station's Dataset Transfer Reply shows P for postpone, there is a delay. The length of this delay is specified by installation parameter I@DTRDLY (dataset transfer delay). The SDT request is put at the end of the request queue. COS processes it when the delay expires.

LCP:



Segment:



Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester, as specified in the Dataset Transfer Request message
OJB	1	0-55	Originating jobname; 1-7 alphanumeric characters, left-justified and zero-filled.

Field	Word	Bits	Description
ST	1	56-63	Dataset transfer reply status (1 character): Y Dataset is or will be transferred. N Dataset will not be transferred. P Dataset Transfer Request should be postponed.
JTO	2	32-47	Job task ordinal (from dataset header in request message)
JSQ	2	48-63	Sequence number of originating job

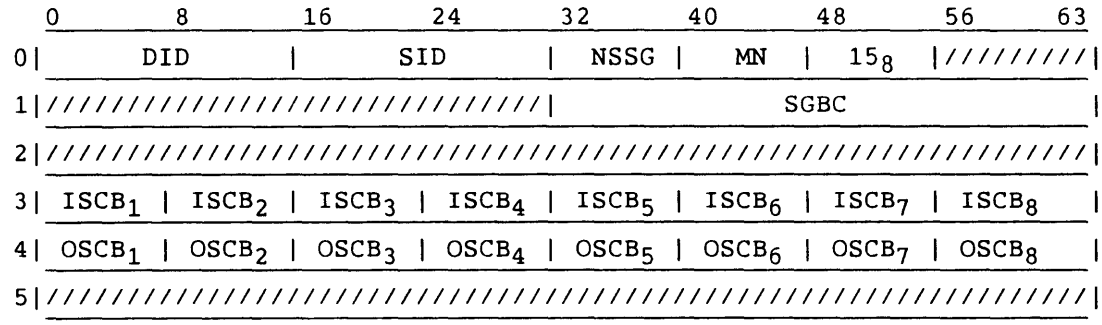
Enter Logfile Request (15)

An Enter Logfile Request requests permission to enter messages into the system and/or a job logfile. This is a synchronous request.

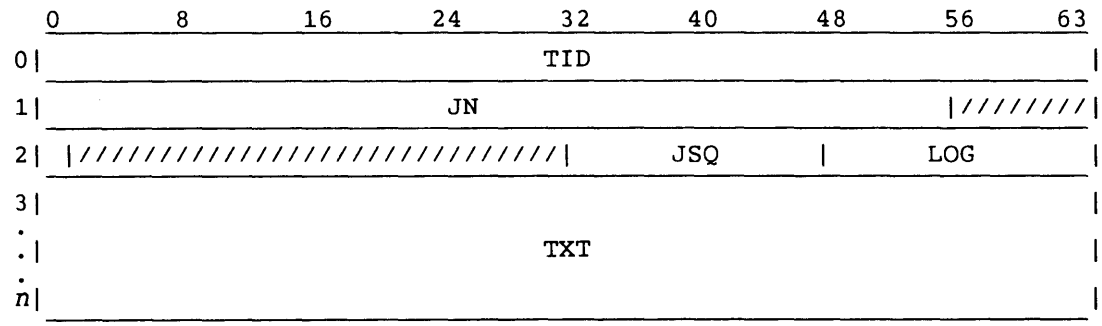
If LOG=2 or 3, and the requester is not the COS Master Operator, this message is honored only in one of the following cases:

- The job SID and TID match those of the requester and the job is still active.
- The ACT flag is set, and the message is for both the system and the user. (For example, the information in the message is for accounting.)
- The COS installation parameter I@LOGRQ is nonzero, and the job is still active.

LCP:



Segment:

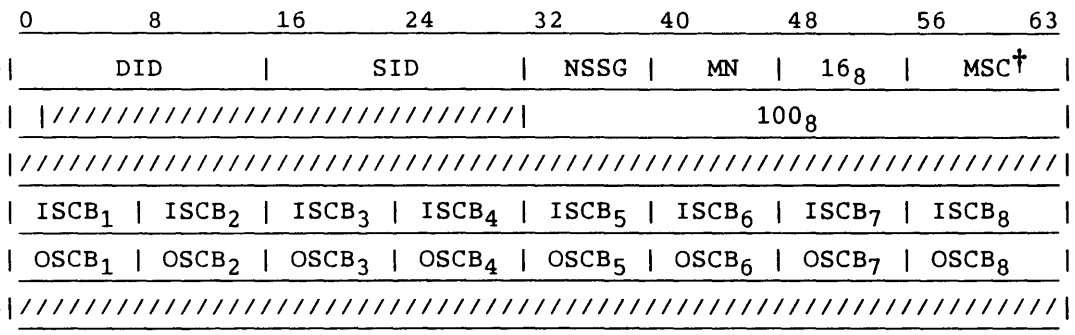


Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester
JN	1	0-55	Jobname as specified on the COS JOB statement (LOG=2,3)
ACT	2	0	Accounting Information flag
JSQ	2	32-47	Job sequence number
LOG	2	48-63	Logfile designator: 1 System logfile 2 Job logfile 3 Both
TXT	3-*n*	0-63	Messages consisting of variable-length records up to 79 characters each and delimited by a carriage return (15_8). Messages must be contained in a single segment and are entered into the logfile in the order encountered in TXT.

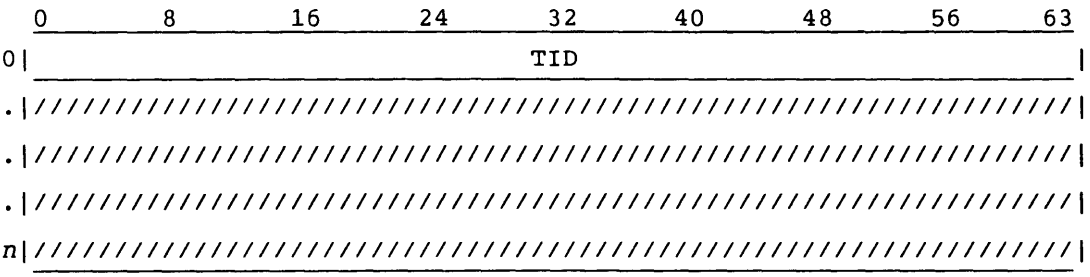
Enter Logfile Reply (16)

An Enter Logfile Reply responds to the Enter Logfile Request. No stream number is specified, but SCBs are valid for defined streams.

LCP:



Segment:



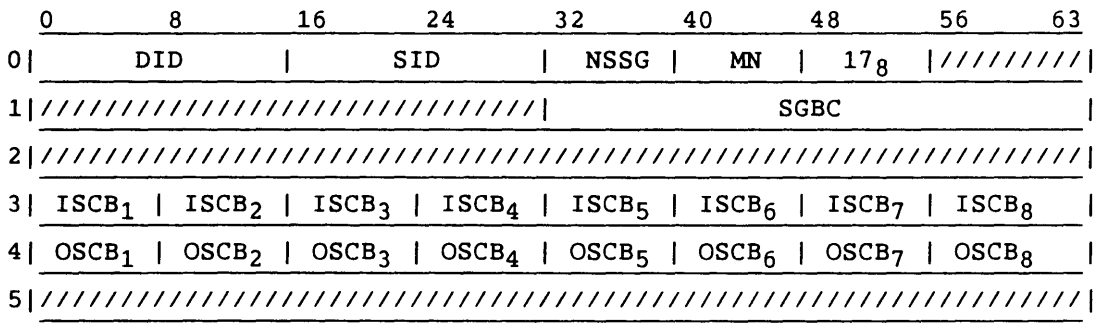
Field	Bits	Description
TID	0-63	Terminal identifier of the requester, as specified in the Enter Logfile Request message

† All message subcodes are described in table 4-3.

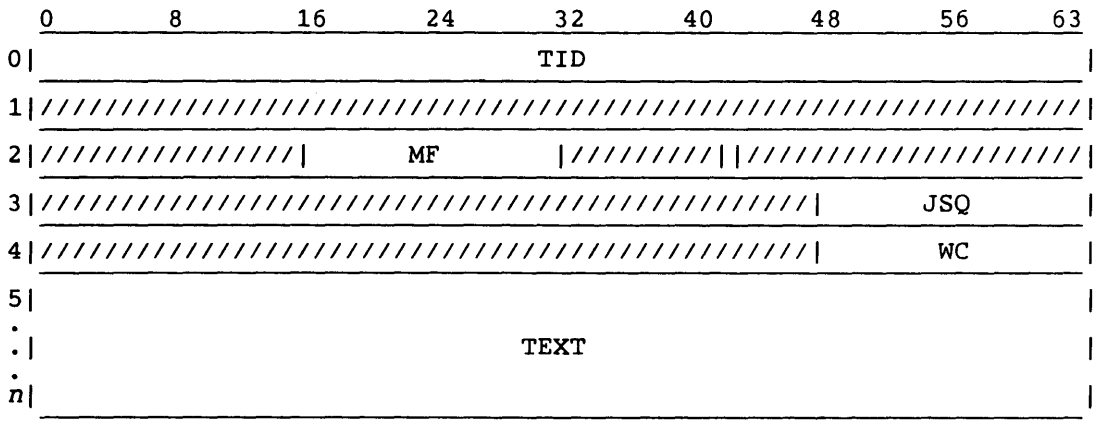
Unsolicited Operator Message (17)

The Unsolicited Operator Message allows the operator to send an unsolicited message to a user job. SCP verifies the LCP and segment and sends a request to EXP. EXP notifies the receptive user job that a message has been received. For more information about COS processing of operator messages, see the COS Internal Reference Manual, Volume I: EXEC.

LCP:



Segment:



Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of message destination
MF	2	16-31	Destination Station ID
UOMF	2	42	Unsolicited operator message flag
JSQ	3	48-63	Job sequence number of the receptive job
WC	4	48-63	Text length in 64-bit words; does not include the message header words. The message cannot exceed the station's segment size minus 5.

Unsolicited Operator Reply (20)

The Unsolicited Operator Reply acknowledges the receipt of an Unsolicited Operator Message.

LCP:

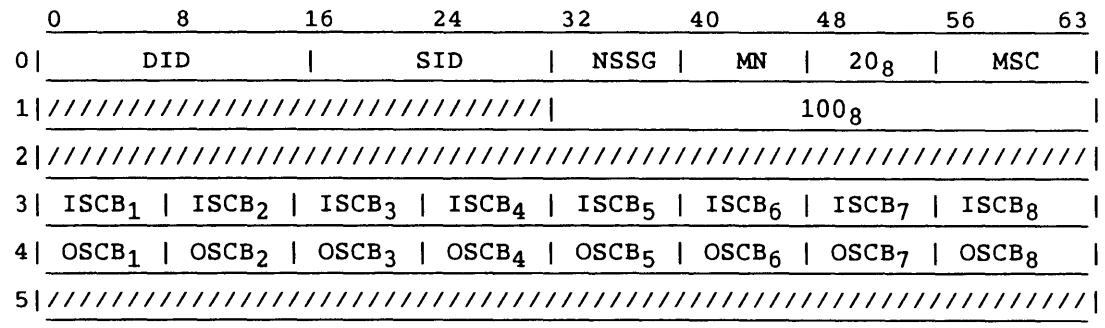
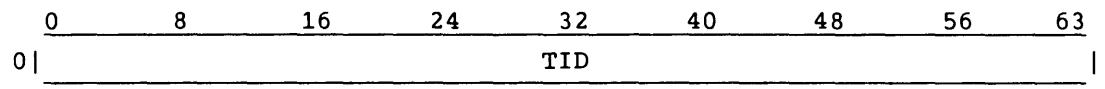


Table 4-5 lists the request status codes returned in the MSC field of the LCP in the Unsolicited Operator Reply.

Table 4-5. Unsolicited Operator Reply Message Error Codes

Octal Code	Description
0	OK
240	Unsolicited Operator Message flag not set
241	JSQ not found
242	Memory pool not available
243	Zero JSQ
244	Segment bit error
245	Word count error
246	User not authorized

Segment:

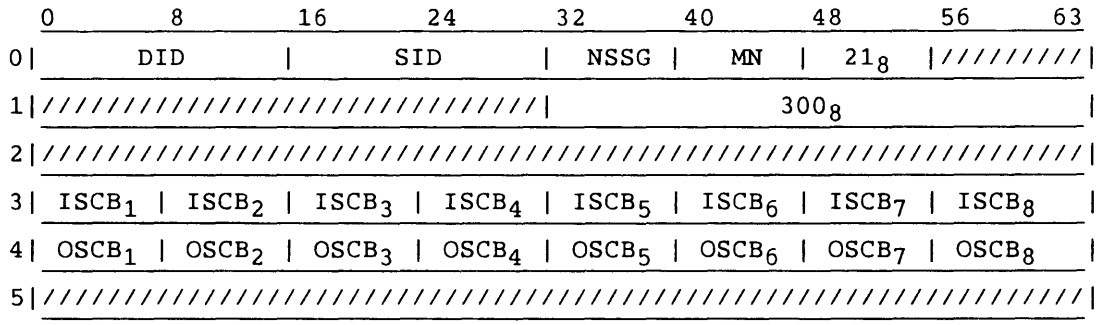


Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of message destination

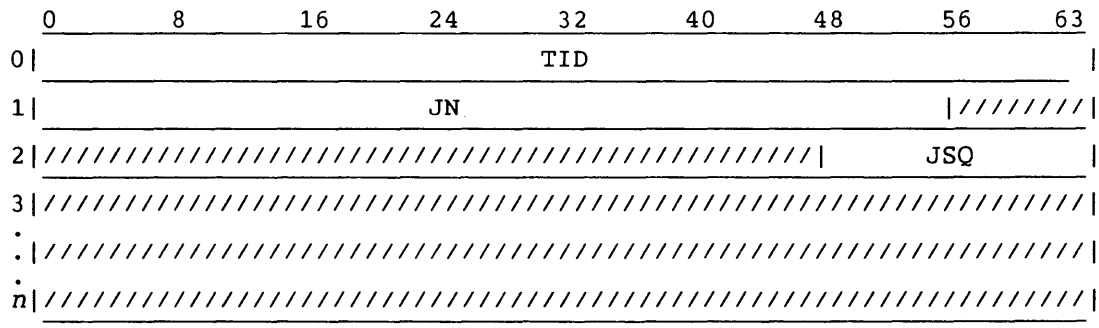
Job Status Request (21)

A Job Status Request code requests the current status of a specific job that has been sent to COS. The segment contains identifying information about the job. No stream number is specified, but SCBs are valid for defined streams. This is a synchronous request.

LCP:



Segment:

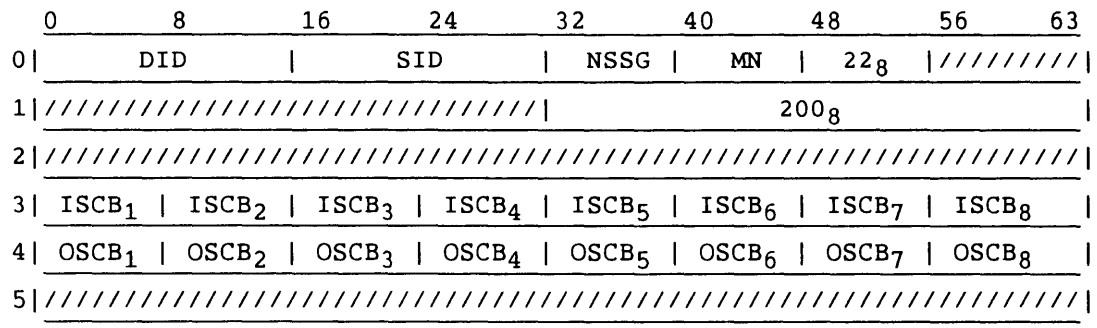


Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester, as known to the requesting front end
JN	1	0-55	Jobname as specified on COS JOB statement
JSQ	2	48-63	Job sequence number to start search

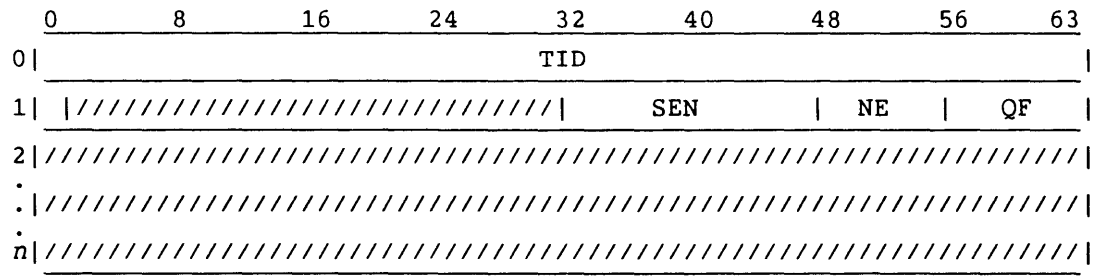
System Status Request (22)

The front-end station sends a System Status Request code to request general system status information from COS. No stream number is specified, but SCBs are valid for defined streams. This is a synchronous request.

LCP:



Segment:

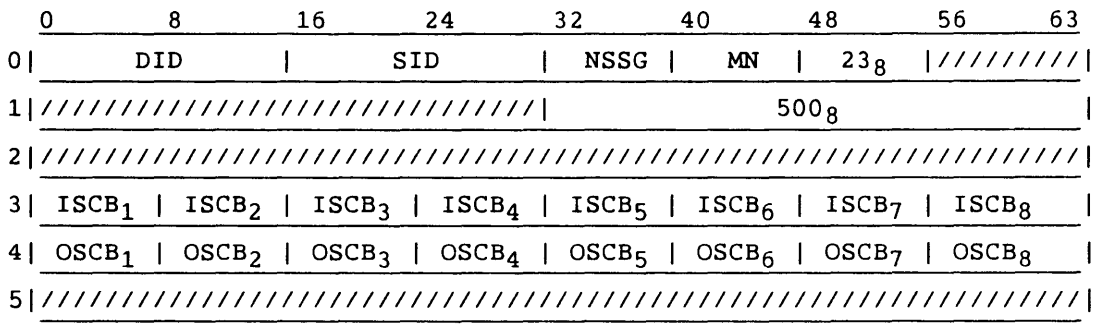


Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester, as known to the requesting front end
ESR	1	0	Extended Status Request flag. If set, reply entries can include extended status.
SEN	1	32-47	Starting entry number
NE	1	48-55	Number of entries
QF	1	56-63	Queue type flags:
	1	56,57	Reserved
I	1	58	Input Queue flag
O	1	59	Output Queue flag
E	1	60	Execution Queue flag
		61	Reserved
R	1	62	Receiving Queue flag
S	1	63	Sending Queue flag

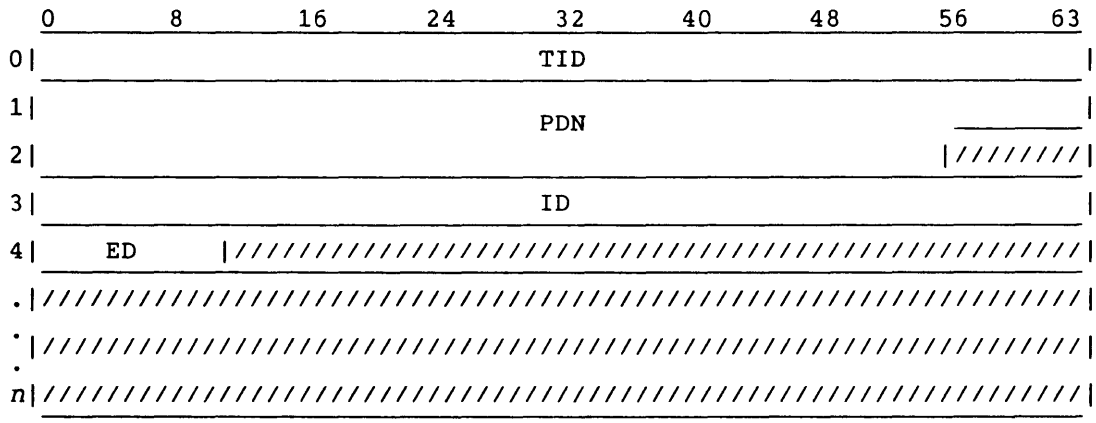
Dataset Status Request (23)

The front-end station sends the Dataset Status Request to request the current disposition of the dataset identified by the associated segment. No stream number is specified, but SCBs are valid for defined streams. For implementation of security features in COS release 1.12, code 23 is replaced by code 56; however, code 23 is still supported when those features are not in use. This is a synchronous request.

LCP:



Segment:

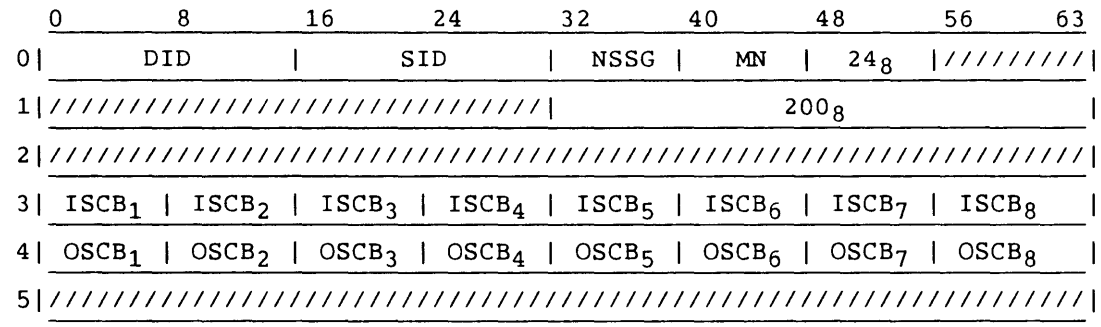


Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester, as known to the requesting front end
PDN	1 2	0-63 0-55	Permanent dataset name as known to the requestee
ID	3	0-63	User identifier, as known to the requestee
ED	4	0-11	Edition number, as known to the requestee

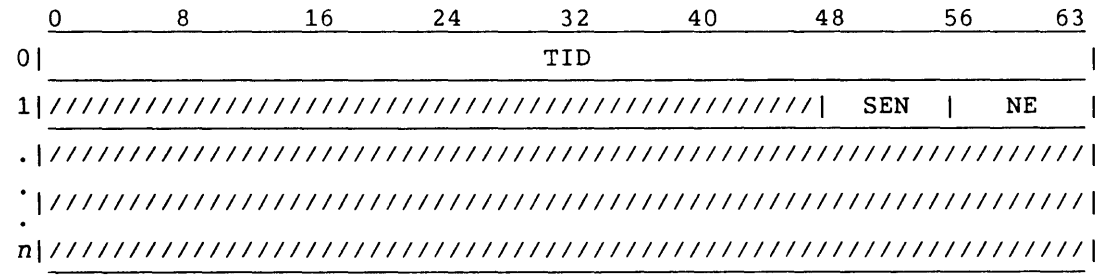
Link Status Request (24)

The front-end station sends the Link Status Request code to request link status information from COS. No stream number is specified, but SCBs are valid for defined streams. This is a synchronous request.

LCP:



Segment:

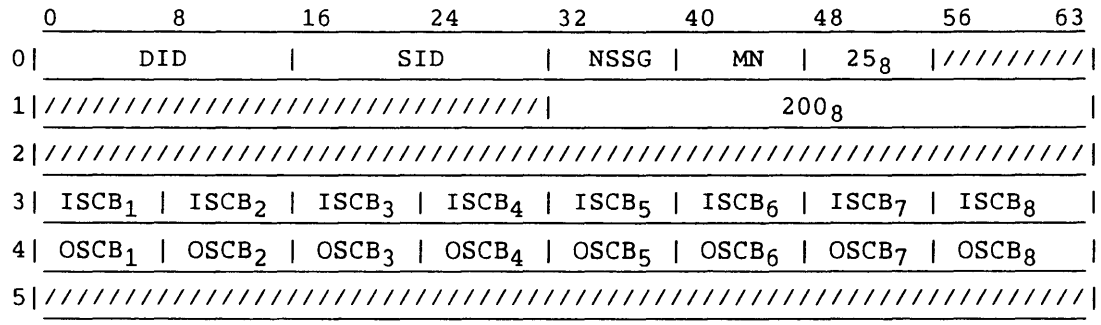


Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester, as known to the requesting front end
SEN	1	48-55	Starting entry number
NE	1	56-63	Number of entries

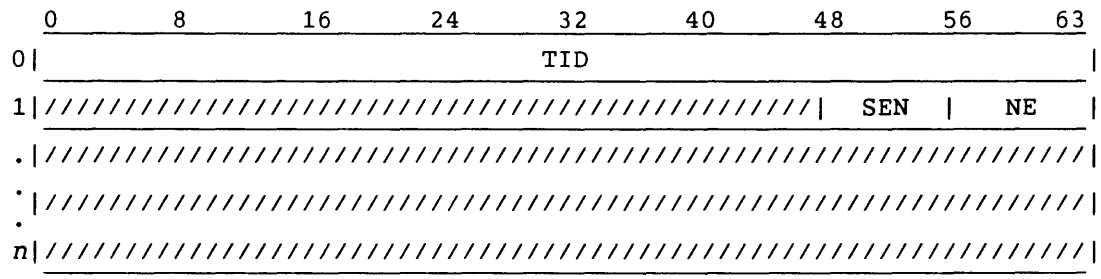
Mass Storage Status Request (25)

A Mass Storage Status Request code requests the current status of the Cray mass storage devices. No stream number is specified, but SCBs are valid for defined streams. This is a synchronous request.

LCP:



Segment:

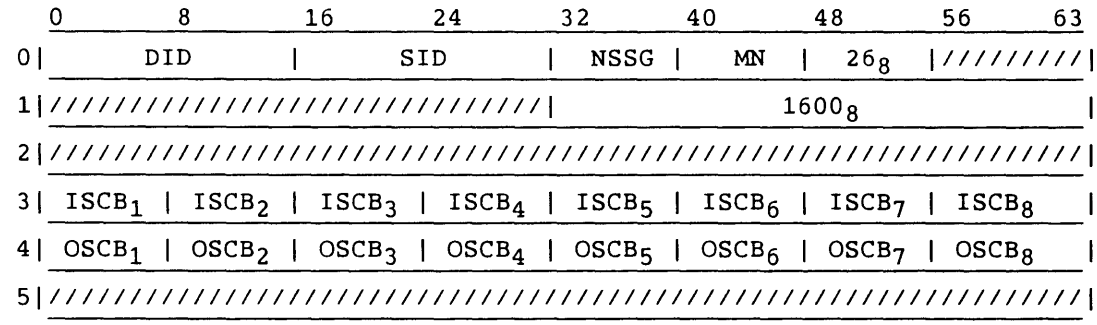


Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester, as known to the requesting front end
SEN	1	48-55	Starting entry number
NE	1	56-63	Number of entries

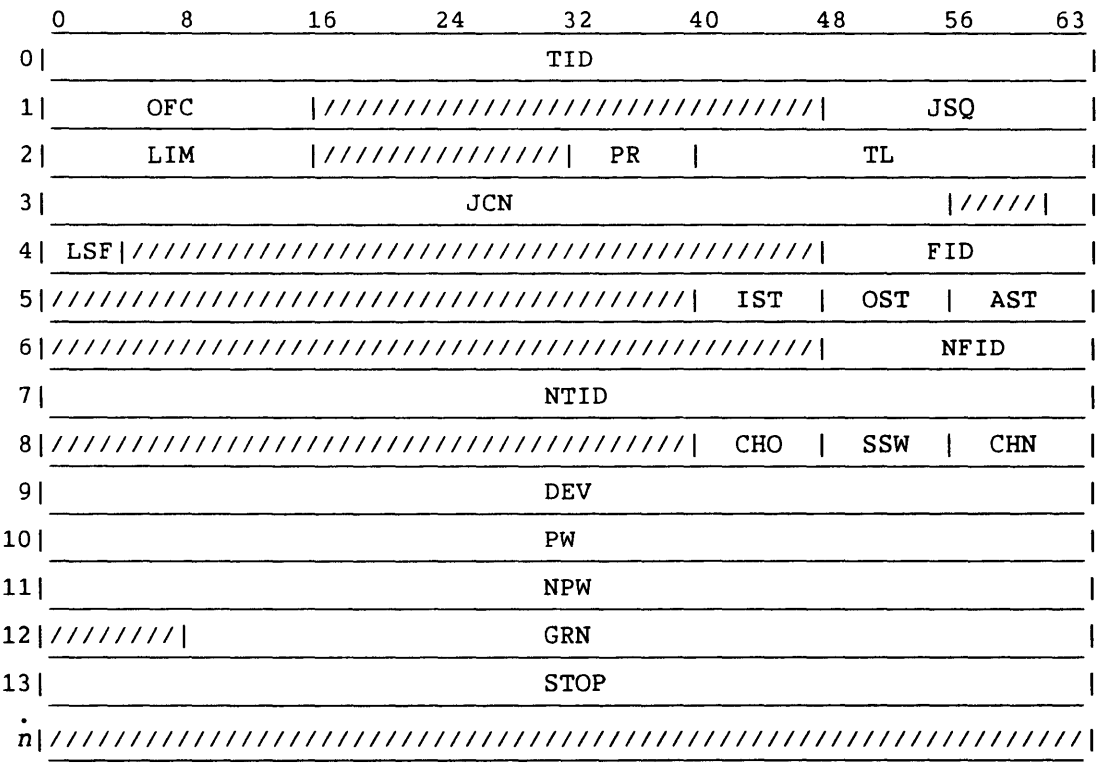
Operator Function Request (26)

An Operator Function Request code requests that a specific operator function be performed. Information required to perform the function is contained in the associated segment. No stream number is specified, but SCBs are valid for defined streams. This is a synchronous request.

LCP:



Segment:



Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester, as known to the requesting front end. If the Logon segment also contained an operator TID, the TIDs must match before the request can be fulfilled.
OFC	1	0-15	Operator function code (2 characters). Table 4-6 shows codes, required fields, and corresponding MCU station commands.
JSQ	1	48-63	Job sequence number (0-65535)
LIM	2	0-15	COS job limit (0-63)
PR	2	32-39	Job priority (0-15)
TL	2	40-63	Time limit in seconds (0-16777215)
JCN	3	0-55	Job class name; 1-7 characters left-justified and zero-filled. If JCN=ALL, turn all classes ON/OFF.
CL	3	63	Job class ON/OFF indicator: 0 ON 1 OFF
LSF	4	0-3	Logoff modifier (OFC=LA only): 0 Hold (save output) 1 Quit (terminate job) 2 Continue (discard output)
FID	4	48-63	Front-end identifier (2 characters)
IST	5	40-47	Maximum number of input streams (0-8) relative to the Cray mainframe
OST	5	48-55	Maximum number of output streams (0-8) relative to the Cray mainframe
AST	5	56-63	Maximum number of active streams (0-16); must not exceed sum of IST and OST.
NFID	6	48-63	New front-end identifier; 2 characters. ID is not changed if NFID=0 and OFC=OP.

Field	Word	Bits	Description
NTID	7	0-63	New terminal identifier 1-8 characters, left-justified, zero-filled. This ID is not changed if NTID=0 and OFC=OP.
CHO	8	40-47	Channel ordinal (0-255)
SSW	8	48-55	Sense switch number (1-6)
CHN	8	56-63	Channel pair number (1-12)
DEV	9	0-63	Device name; 1-8 characters, left-justified and zero-filled.
PW	10	0-63	Password; 1-8 characters, left-justified and zero-filled.
NPW	11	0-63	New password; 1-8 characters, left-justified and zero-filled. The password is not changed if NPW=0.
GRN	12	8-63	Generic resource name; 1-7 characters, left justified and zero filled.
STOP	13	0-63	Station operator password. If not enabled at logon time, the segment bit count could be 1500_8 to reflect only valid data.

Table 4-6 shows the operator functions that can be requested by the Operator Function Request. The fifth column shows the message fields required for each function request. The rightmost column shows the corresponding commands issued by the DGS station or the Cray I/O Subsystem (IOS), either of which can serve as the Maintenance Control Unit (MCU) for the Cray mainframe. Most MCU command parameters correspond to fields in the Operator Function Request.

Table 4-6. Operator Functions

Master Op. or Same Front End	Master Operator	Code	Function	Required Fields†	Station Commands
X		CI	Change job's destination mainframe ID	JSQ, NFID, NTID	ENTER,*jsq*,ID,*id*[,*tid*]
	X	CL	Turn class ON/OFF	JCN, CL	CLASS,{*jcn* / ALL},{ON / OFF}
X		CP	Change job priority	JSQ, PR	ENTER,*jsq*,PRIORITY,*pri*
X		CT	Change job's executing time limit	JSQ, TL	ENTER,*jsq*,TIME,*tl*
	X	DC	Down channel	CHN,CHO (IOS channel only)	CHANNEL,*chan*[,*ordinal*],OFF
	X	DD	Down device (make disk read-only)	DEV	DEVICE,*device*,OFF
X		DP	Drop job	JSQ	DROP,*jsq*
	X	ID	Reroute to specified mainframe ID	FID, NFID	ROUTE,*oid*,*nid*
	X	FL	Volatile device to backup dataset	DEV	---
X		JC	Change job class name	JCN,JSQ	ENTER,*jsq*,CLASS,*jcl*
	X	JL	Limit number of executing jobs	LIM	LIMIT[,*n*]
X		KL	Kill job or dataset	JSQ	KILL,*jsq*
X		LA	Log off all interactive jobs connected through the specified front end	FID,LSF	---
X		LK	Change link stream parameters	FID, IST,OST, AST	STREAM,*id*,*ni*,*no*,*na*
X		ON	Set job sense switch	SSW, JSQ	SWITCH,*jsq*,*ssw*,ON
X		OF	Clear job sense switch	SSW, JSQ	SWITCH,*jsq*,*ssw*,OFF
		OP	Change Master Operator station IDs	NFID, NTID, PW, NPW, FID	OPERATOR,*id*,*tid*,*pw*[,*npw*]
	X	PR	Device private	DEV	DEVICE,*device*,PRIVATE††
	X	PV	Device public	DEV	DEVICE,*device*,PUBLIC††
	X	RA	Resume all jobs	None	RESUME,ALL
	X	RC	Recover	None	RECOVER
	X	RE	Restore all resources	None	RESTORE,ALL
	X	RF	Restore a specified resource	GRN	RESTORE,GN grn
	X	RG	Restore JSQ to resources	JSQ	RESTORE,jsq
X		RL	Release held job	JSQ	RELEASE,*jsq*
X		RN	Rerun job	JSQ	RERUN,*jsq*
X		RS	Resume job	JSQ	RESUME,*jsq*
	X	SA	Suspend all jobs	None	SUSPEND,ALL
X		SD	Suspend a specified job	JSQ	SUSPEND,*jsq*
	X	SH	Shutdown	None	SHUTDOWN
	X	UC	Up channel	CHN, CHO (IOS channel only)	CHANNEL,*chan*[,*ordinal*],ON
	X	UD	Up device (allow allocation to disk)	DEV	DEVICE,*device*,ON
	X	WA	Sweep all resources	None	SWEEP,ALL
	X	WB	Sweep a specified resource	GRN	SWEEP,grn
	X	WC	Sweep JSQ	JSQ	SWEEP,jsq

† All commands require the TID field.

†† See the COS Version 1 Reference Manual for a detailed discussion.

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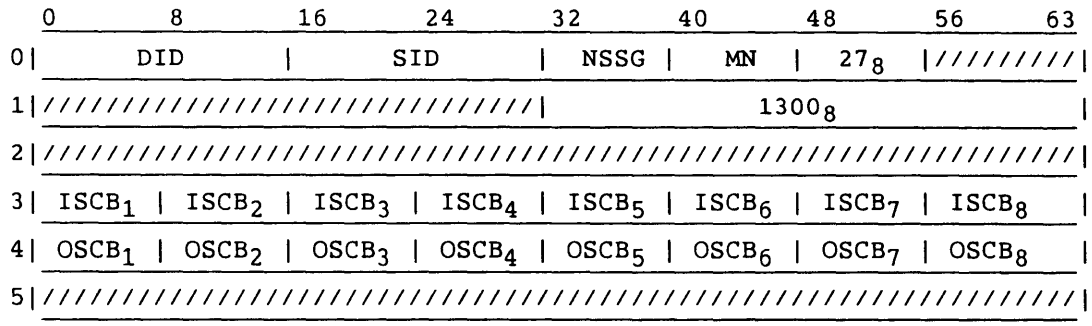
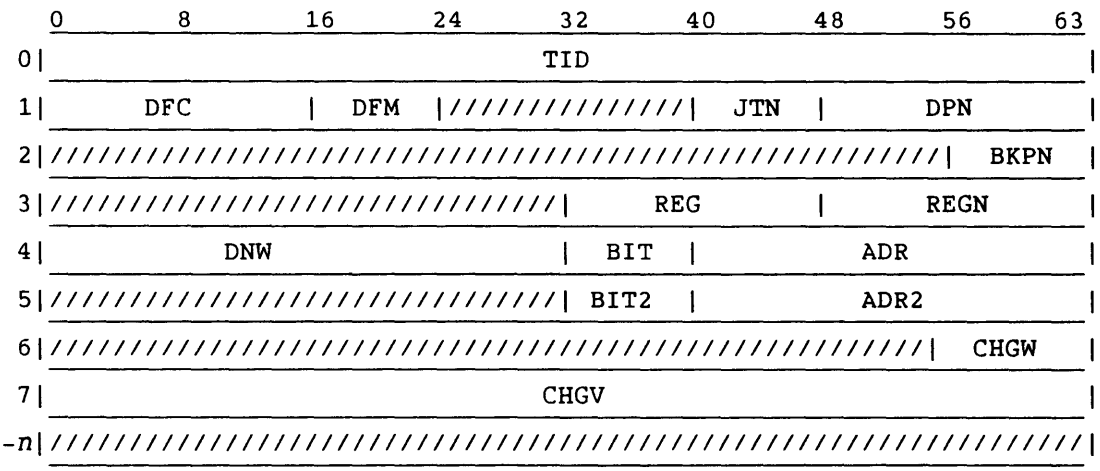
Debug Function Request (27)

The Debug Function Request code requests that a specific debug function be performed. Information required to perform the function is contained in the associated segment. No stream number is specified, but SCBs are valid for defined streams. This is a synchronous request.

LCP:



Segment:



Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester, as known to requesting front end
DFC	1	0-15	Debug function code. See table 4-7 for fields used by each debug function code. The options are as follows: CB Clear breakpoint CM Change memory CR Change register DM Dump memory DR Dump register

Field	Word	Bits	Description
DFC (continued)			IN Initiate task SB Set breakpoint SP Stop SR Start
DFM	1	16-23	Debug function mode (1 character); options are as follows: E EXEC J Job S System Task Processor (STP)
JTN	1	40-47	Job task number. Zero for the first or only task in the job. Nonzero to debug a specific task of a multitask job. Valid only if field DFM=J (job mode).
DPN	1	48-63	Debug program number. If DFM=J, the field contains the job sequence number (JSQ) (0-65535). If DFM=S, the field contains the STP task number.
BKPN	2	56-63	Breakpoint number (0-7)
REG	3	32-47	Register designator (2 characters); options are as follows: AA A register BB B register CL Cluster register FF Interrupt bits MM Mode flags PP P register SS S register TT T register VL Vector Length register VM Vector Mask register VV V register XP Exchange Package
REGN	3	48-63	Register and element number (0-777)
DNW	4	0-31	Number of words to dump if DCF='DM'; if 0, the default value (16_{10} words) is supplied. Value cannot exceed (segment size)-1.
BIT	4	32-39	Bit number (0-63). If DFC=CR, the value is limited to the size of the register.

Field	Word	Bits	Description
ADR	4	40-63	Cray mainframe word address
BIT2	5	32-39	Bit number (0-63)
ADR2	5	40-63	Cray mainframe word address
CHGW	6	55-63	Change width in bits (1-64). The sum of BIT and CHGW must not exceed word or register size.
CHGV	7	0-63	Change value, right-justified

Table 4-7. Debug Function Request Field Usage

DFC	DFM	JTN	DPN	BKPN	REG	REGN	DNW	BIT2 BIT	CHGW ADR	ADR2	CHGV
CB	J	x	x	x							
CM	E J S		_ x					x	x		x
CR	J S		x x		_ _ _ _	x		x		x	
DM	E J S		_ x			† 	x x x		x††		
DR	J S		x x		XP,BB, TT,VV XP	x					
IN	S		x								
SB	J S		x	x	x	x		x	x		x
SP	J		x								
SR	J S		x								

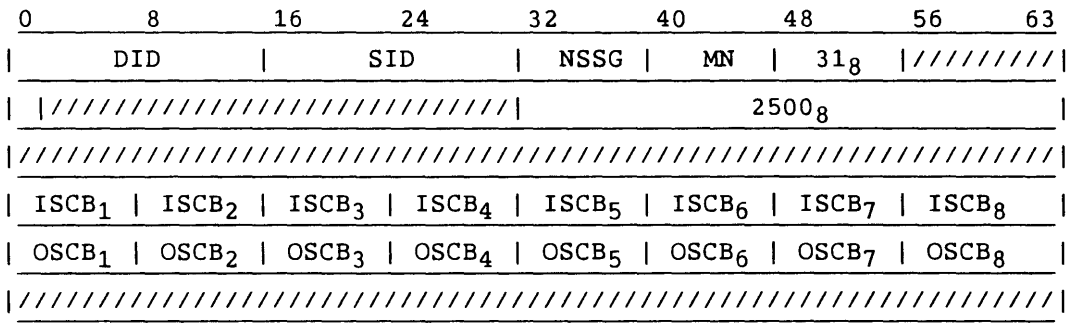
† PP, AA, SS, BB (B_{00} only), LA, FF and VL

†† The contents of the ADR field plus 16 must be within the job's field length, for use in job mode.

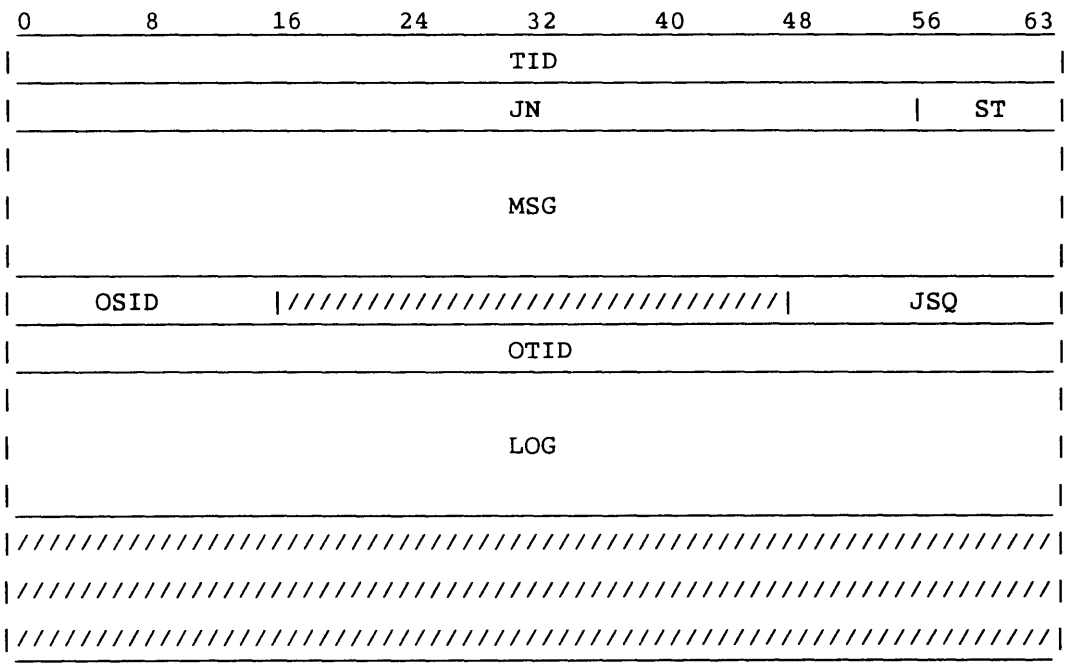
Job Status Reply (31)

A Job Status Reply represents the COS response to the front-end Job Status Request (code 21). The associated segment contains information about the job's current state. No stream number is specified, but SCBs are valid for the defined streams. If the SID and TID are not those of the COS Master Operator, the SID must match that of the job.

LCP:



Segment:



Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester, as specified in the Job Status Request

Field	Word	Bits	Description
JN	1	0-55	Jobname as specified in the Job Status Request
TID	0	0-63	Terminal identifier of the requester, as specified in the Job Status Request
JN	1	0-55	Jobname as specified in the Job Status Request
ST	1	56-63	Job status (1 ASCII character): A Awaiting CPU B Suspended by recovery C Locked by Startup because the current job is incompatible with the version of COS in use D Dormant; waiting for the time delay or an event. F Job does not exist on COS system G Locked for a memory change when an earlier configuration is insufficient for the current job H Output dataset is being held by station request, awaiting operator action I Waiting for I/O L Rolling in M Awaiting memory O Operator-suspended P Queued for tape Q Queued for execution R Rolled out S Suspended; awaiting dataset transfer or momentarily suspended by COS U Rolling out X Executing Z Multitasking job resident in memory
MSG	2-10	0-63	Job status message (72 ASCII characters)
OSID	11	0-15	Originating station ID
JSQ	11	48-63	Job sequence number
OTID	12	0-63	Originating terminal ID
LOG	13-20	0-63	Last logfile message in COS blocked format (see the COS Version 1 Reference Manual)

System Status Reply (32)

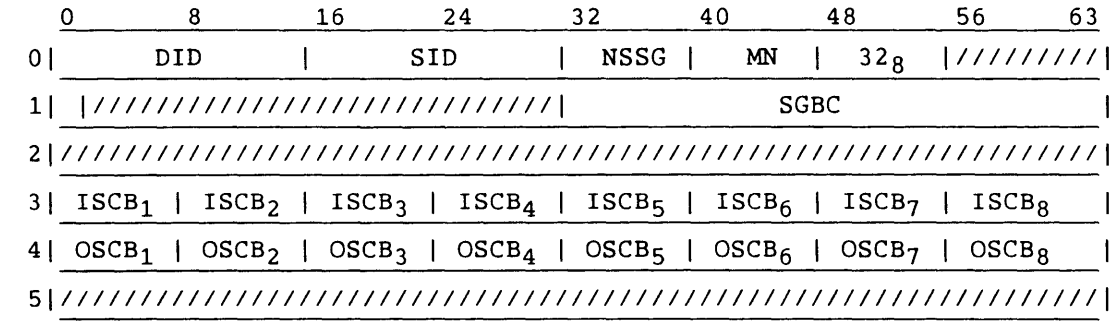
The System Status Reply is the COS response to the front-end System Status Request (code 22). No stream number is specified, but SCBs are valid for the defined streams.

The system status of COS is expressed in terms of the status of the mainframe's system datasets (input datasets awaiting execution, jobs executing, output datasets awaiting transfer to the front end, and datasets currently transferring to or from COS). If there is no system dataset activity, no segment is sent.

The request specifies the number of the first system dataset entry and the number of entries to be returned. Several requests and replies might be required to include all jobs. The number of entries, if not specified, is limited by the segment size of the reply.

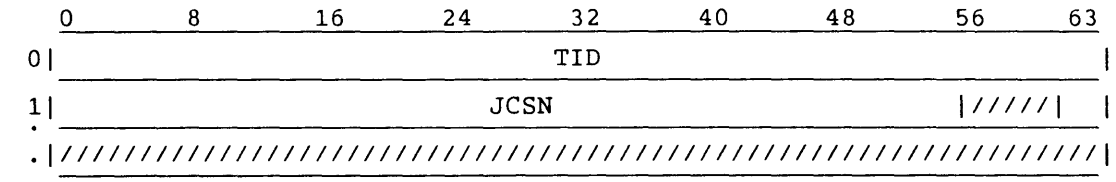
If the SID of the System Status Request was that of the COS Master Operator station, or if the installation parameter I@ALLSDT is set, the segment contains a status entry for each system dataset. If neither condition is true, the segment contains a status entry for each system dataset that matches the requesting SID.

LCP:

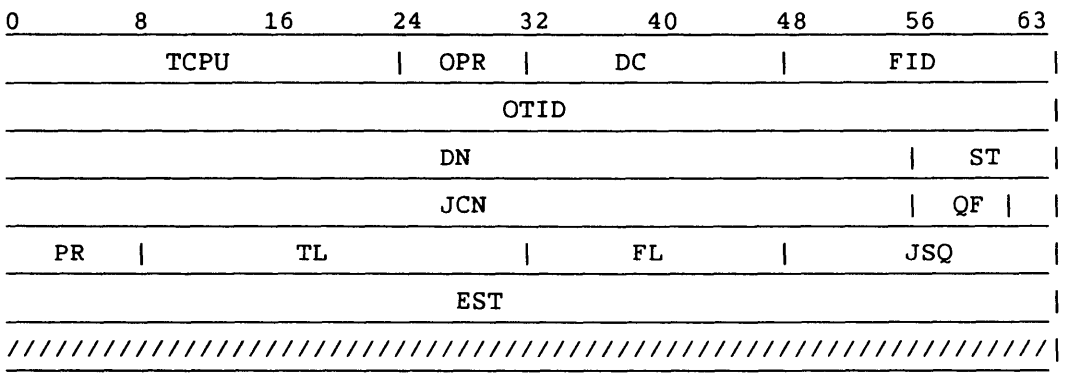


Segment:

Header:



Entry:



Header:

Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester, as specified in the System Status Request
JCSN	1	0-55	Job class structure name; 1-7 alphanumeric characters, left-justified and zero-filled.
ESR	1	63	Extended Status Reply flag. If set, reply entries include extended status.

Entry:

Field	Word	Bits	Description
TCPU	0	0-23	Cray mainframe time in seconds for this job is DC=IN; otherwise, not used.
OPR†	0	24-31	Requested operator action; 0 if none requested.
DC	0	32-47	Disposition code: IN Job dataset MT Dataset is disposed to magnetic tape by the receiver. PR Dataset is disposed to printer by the receiver. PU Dataset is disposed to card punch by the receiver.

† Deferred implementation

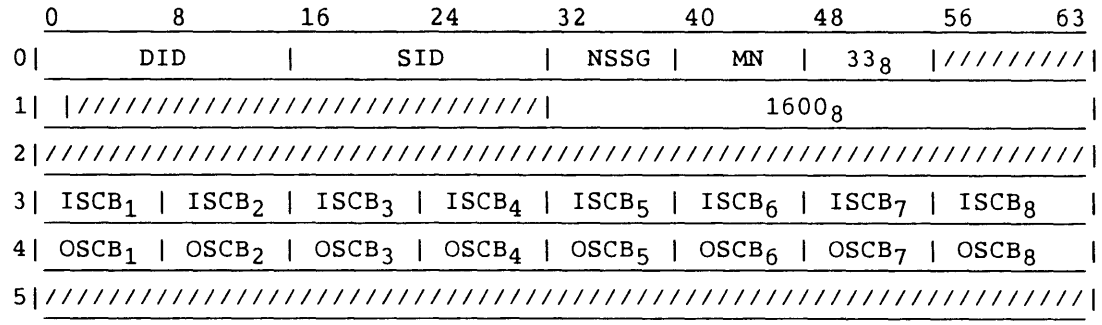
Field	Word	Bits	Description
FID	0	48-63	Front-end identifier associated with the dataset (2 alphanumeric characters)
OTID	1	0-63	Originating terminal identifier associated with this dataset; 1-7 alphanumeric characters, left-justified and zero-filled.
DN	2	0-55	Dataset name; 1-7 alphanumeric characters, left-justified and zero-filled.
ST	2	56-63	Status (1 character): A Awaiting CPU B Recovery suspended C Locked by Startup because the current job is incompatible with the version of COS in use D Dormant; waiting for the time delay or an event E Waiting for an event F Job does not exist on COS system G Locked for a memory change when an earlier configuration is insufficient for the current job H Output dataset is being held by station request, awaiting operator action. I Waiting for I/O L Rolling in M Awaiting memory O Operator-suspended P Queued for tape Q Queued for execution R Rolled out S Suspended; awaiting dataset transfer or momentarily suspended by COS T Transfer in progress U Rolling out W Awaiting transfer X Executing Z Multitasking job resident in memory

Field	Word	Bits	Description
JCN	3	0-55	Job class name; 1-7 alphanumeric characters, left-justified and zero-filled.
QF	3	56-61	Queue type flag:
I		56	Input Queue
O		57	Output Queue
E		58	Extension Queue
		59	Reserved
R		60	Receiving Queue
S		61	Sending Queue
PR	4	0-7	Priority (0-255)
TL	4	8-31	Time limit in seconds (0-16777215). Used only when DN=IN.
FL	4	32-47	Current field length in 1000-word (octal) blocks (0-65535); used only when DN=IN
JSQ	4	48-63	Job sequence number (0-65535)
EST	5	0-63	Extended status (8 ASCII characters). Present only if ESR flag is set in the reply header; if present, the entry is 1 word longer.

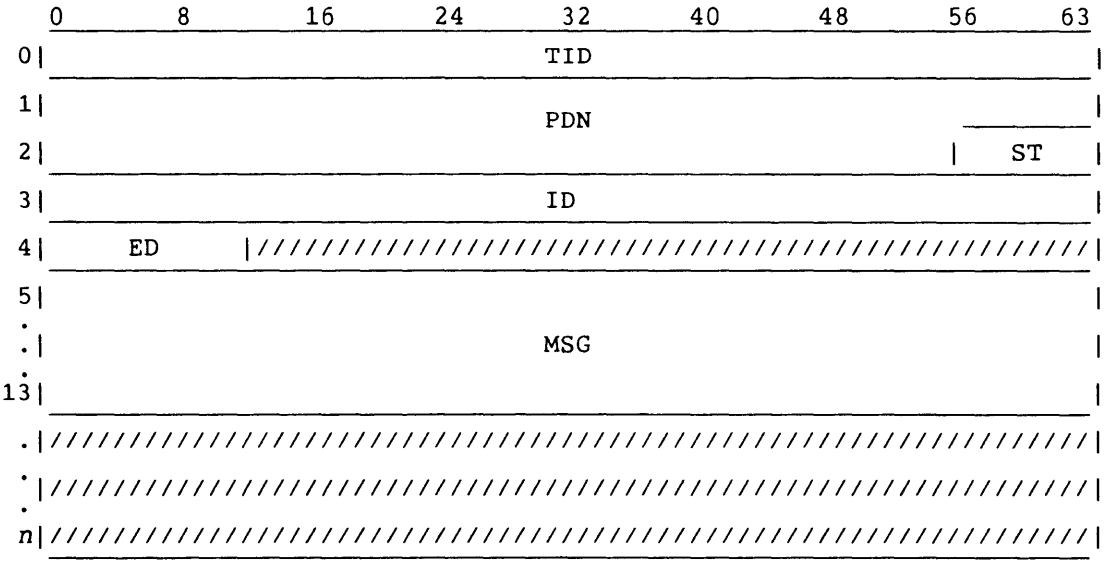
Dataset Status Reply (33)

COS sends the Dataset Status Reply code in response to a Dataset Status Request (code 23). The associated segment contains the current disposition of the dataset. No stream number is specified, but SCBs are valid for defined streams. For implementation of security features introduced in COS release 1.12, message code 33 is replaced by code 57; code 33 is still supported when those features are not in use.

LCP:



Segment:



Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester, as specified in the Dataset Status Request
PDN	1 2	0-63 0-55	Permanent dataset name, as specified in the Dataset Status Request

Field	Word	Bits	Description
ST	2	56-63	Dataset status (1 character): P Exists as a permanent dataset on COS F Does not exist on COS
ID	3	0-63	User identification, as specified in the Dataset Status Request
ED	4	0-11	Edition number. If the dataset does not exist, or if the dataset exists and the specified edition number was nonzero, the edition number is returned as specified in the Dataset Status Request. If the dataset exists and the specified edition number was 0, the latest edition number is returned.
MSG	5-13	0-63	Dataset status message (72-character message explaining dataset status)

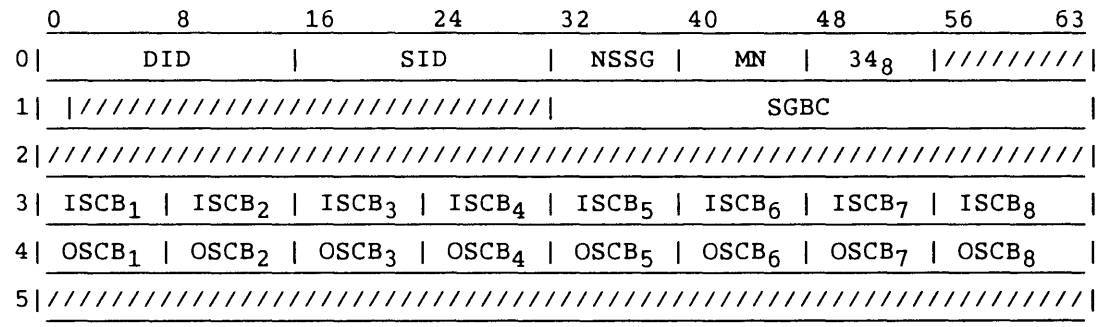
Link Status Reply (34)

A Link Status Reply is the COS response to the front-end Link Status Request (code 24). No stream number is specified, but SCBs are valid for the defined streams.

If the SID of the Link Status Request is that of the COS Master Operator, the segment contains a link status entry for each ID logged on to COS. If not, the segment contains the link status entry for the requesting ID.

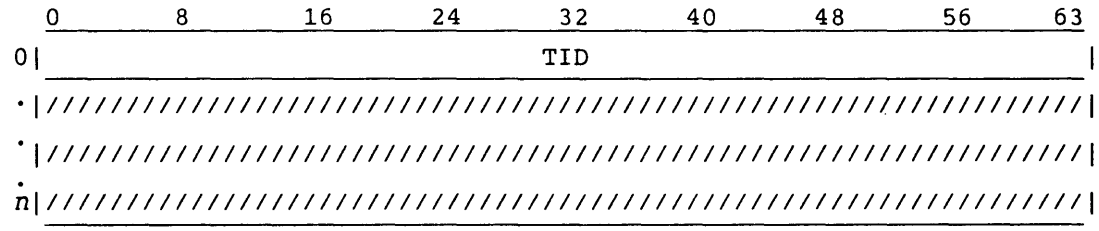
The Link Status Reply is truncated, if necessary, to fit into one segment.

LCP:

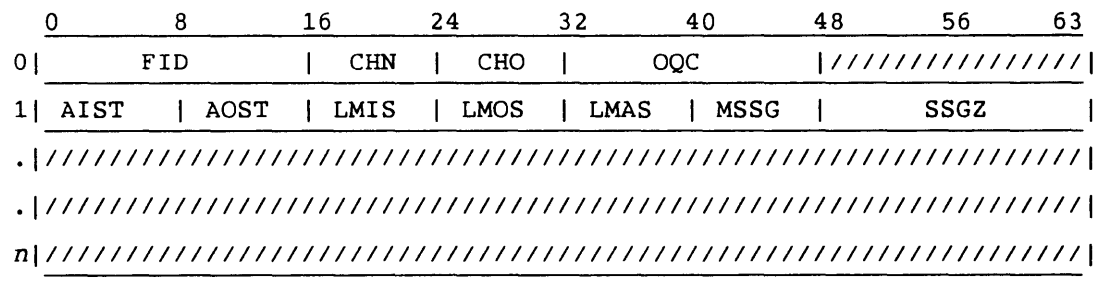


Segment:

Header:



Entry:



Header:

Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester, as specified in the Link Status Request

Entry:

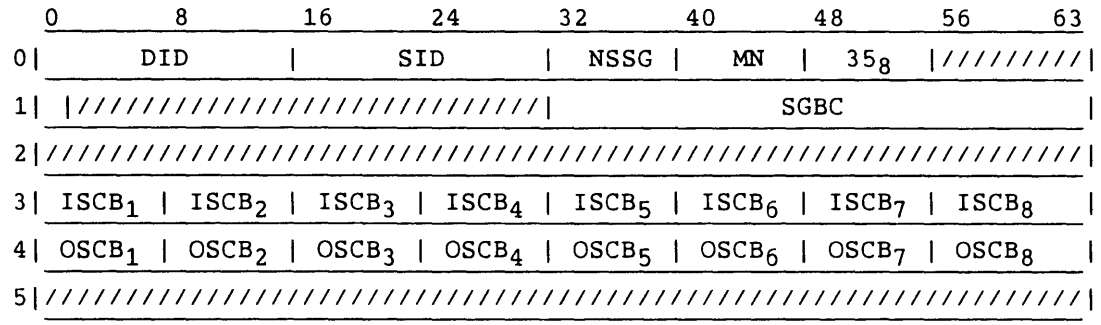
Field	Word	Bits	Description
FID	0	0-15	Front-end identifier (2 characters)
CHN	0	16-23	Cray mainframe channel pair number (1-12)
CHO	0	24-31	Channel ordinal number, if associated with an I/O Processor
OQC	0	32-47	Output queue count (0-65535)
AIST	1	0-7	Number of active input streams (0-8) relative to the Cray mainframe
AOST	1	8-15	Number of active output streams (0-8) relative to the Cray mainframe
LMIS	1	16-23	Maximum number of input streams (0-8) relative to the Cray mainframe
LMOS	1	24-31	Maximum number of output streams (0-8) relative to the Cray mainframe
LMAS	1	32-39	Maximum number of active streams (0-16); must not exceed sum of LMIS and LMOS
MSSG	1	40-47	Maximum number of subsegments comprising a segment (1-*n*)
SSGZ	1	48-63	Subsegment size in 64-bit words

Mass Storage Status Reply (35)

A Mass Storage Status Reply responds to the Mass Storage Status Request (code 25). No stream number is specified, but SCBs are valid for defined streams.

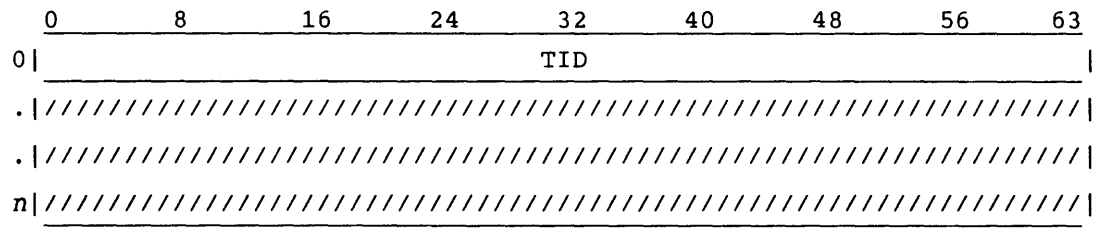
The Mass Storage Status Reply is truncated, if necessary, to fit into one segment.

LCP:

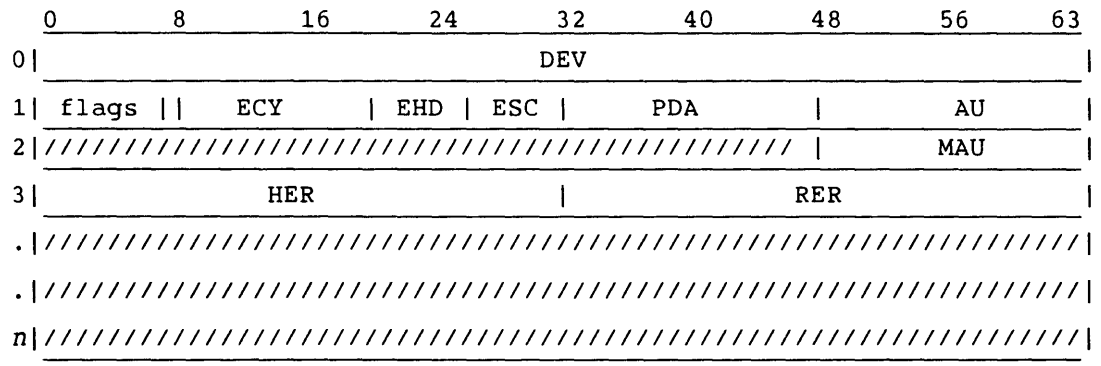


Segment:

Header:



Entry:



Header:

Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester, as specified in the Mass Storage Status Request

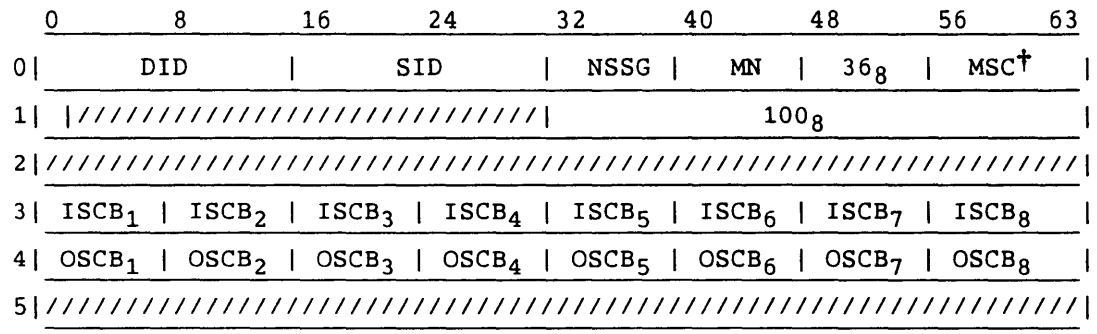
Entry:

Field	Word	Bits	Description
DEV	0	0-63	Device name; 1-8 characters, left-justified and zero-filled.
Flags	1	0-6	
M		0	Master Device flag; 1=master device.
R		1	Read flag; 1=read only.
D		2	Device status. A character is displayed if this bit is set. 0 UP 1 DOWN
P		3	Request by name only
S		4	Scratch Device flag; 1=local datasets only.
V		5	Volatile Device flag; 1=data can be saved on a backup dataset.
C		6	Controlled Device flag; 1=the device is subject to resource control.
ECY	1	8-19	Cylinder number of last error
EHD	1	20-25	Head number of last error
ESC	1	26-31	Sector number of last error
PDA	1	32-47	Number of allocation units containing permanent datasets
AU	1	48-63	Number of allocation units available on the device
MAU	2	48-63	Initial number of allocation unit available on device; theoretical maximum minus flaws and diagnostic surfaces.
HER	3	0-31	Total number of unrecovered disk errors
RER	3	32-63	Total number of recovered disk errors

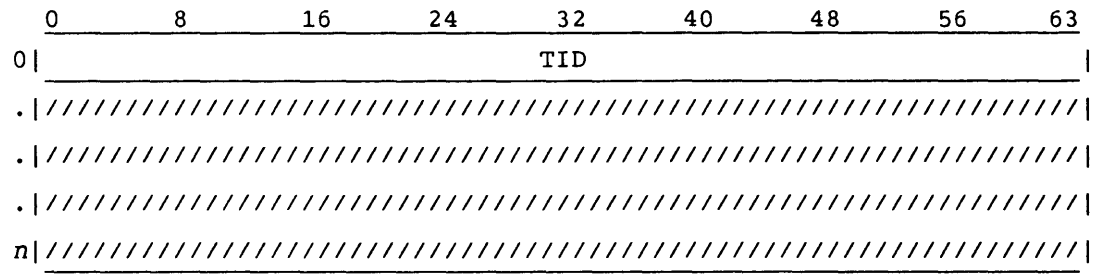
Operator Function Reply (36)

The Operator Function Reply responds to the Operator Function Request (code 26). No stream number is specified, but SCBs are valid for defined streams.

LCP:



Segment:



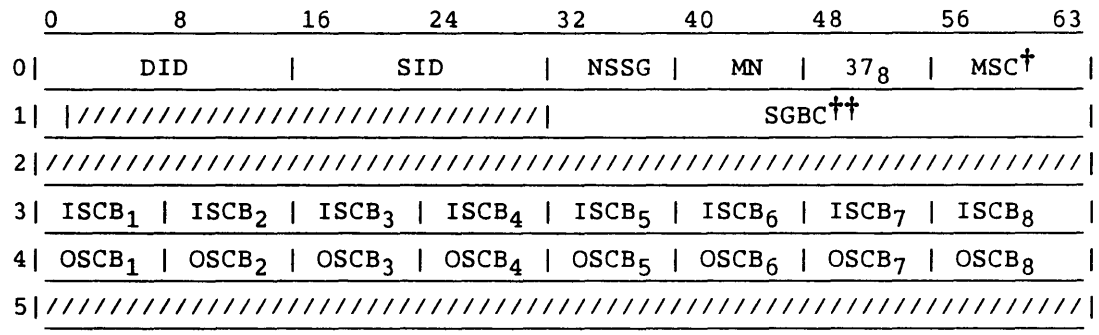
Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester, as specified in the Operator Function Request message

† All message subcodes are described in table 4-3.

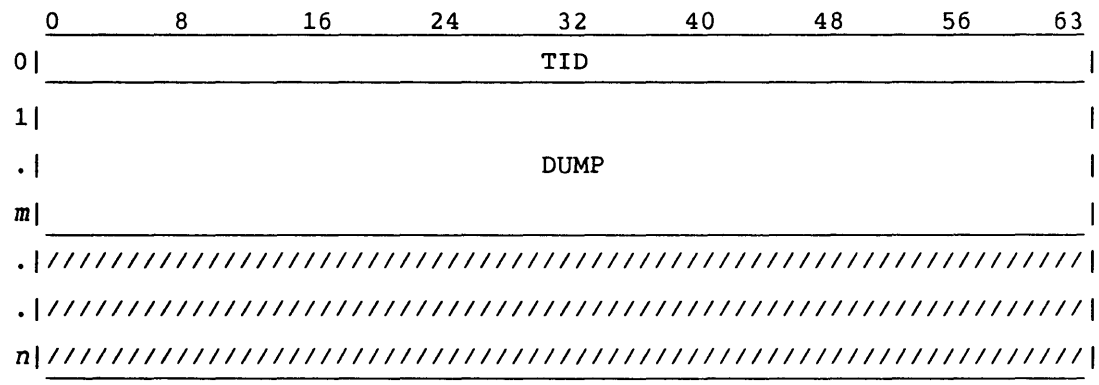
Debug Function Reply (37)

The Debug Function Reply responds to the Debug Function Request (code 27). Requested dump information is returned in the associated segment. If no dump is requested, the TID is returned as the segment. No stream number is specified, but SCBs are valid for defined streams.

LCP:



Segment:



Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of requester as specified in the Debug Function Request message
DUMP	1-*m*	0-63	If a memory dump was requested, words 1 through DNW (default 16) contain the requested memory area.

† All message subcodes are described in table 4-3.

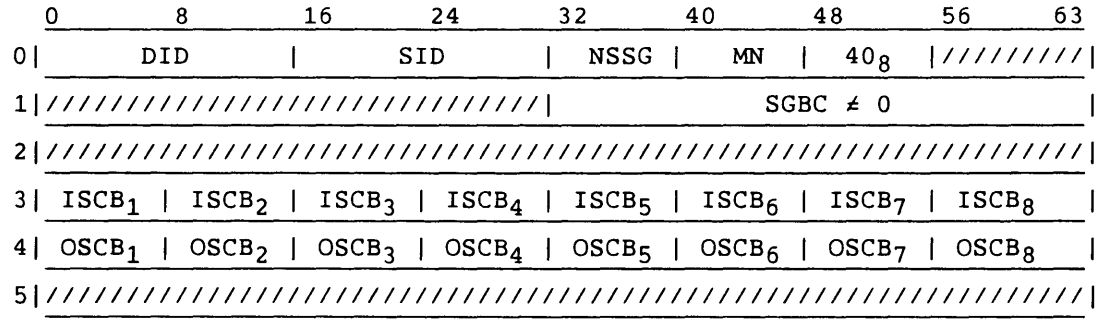
†† SGBC=100_8 when MSC≠0; 2300_8 when DFC is DR or DM and DNW=0; 100_8+DNW*100_8 when DM≠0 and DNW≡0. Otherwise, SGBC=100_8.

Field	Word	Bits	Description
DUMP (continued)			If an Exchange Package dump was requested, words 1-16 contain the contents of the specified Exchange Package. Word 17 contains the CPU type (bits 32-39) and the contents of B0 (bits 40-63). The CPU type is set to installation parameter C@CPTYPE: 1 (@CRAY1) CRAY-1 models A, B 2 (@CRAY1S) CRAY-1 S series 3 (@CRAYXMP) CRAY X-MP series 4 (@CRAYIM) CRAY-1 M series If a cluster register dump was requested, word 1 contains the semaphore registers (left-justified), words 2-9 contain the shared B registers (right-justified), and words 10-17 contain the shared T registers.

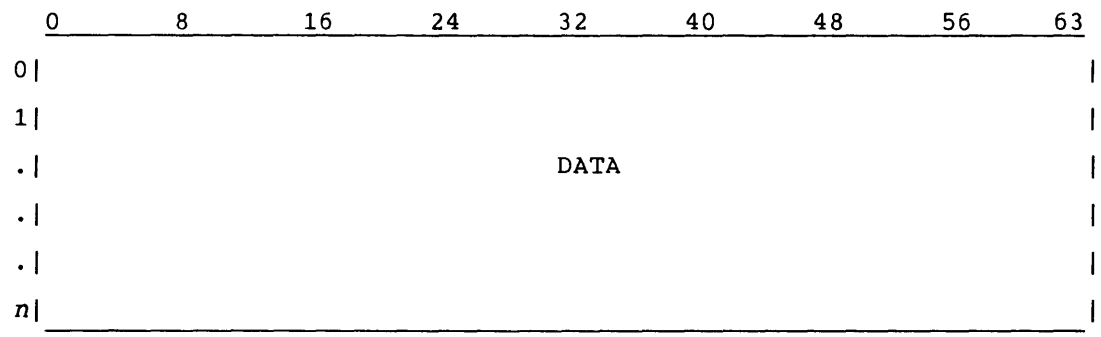
Diagnostic Echo Request (40)

The Diagnostic Echo Request requests the accompanying segment to be returned on the next transmission. The segment bit count can be any nonzero value.

LCP:



Segment:

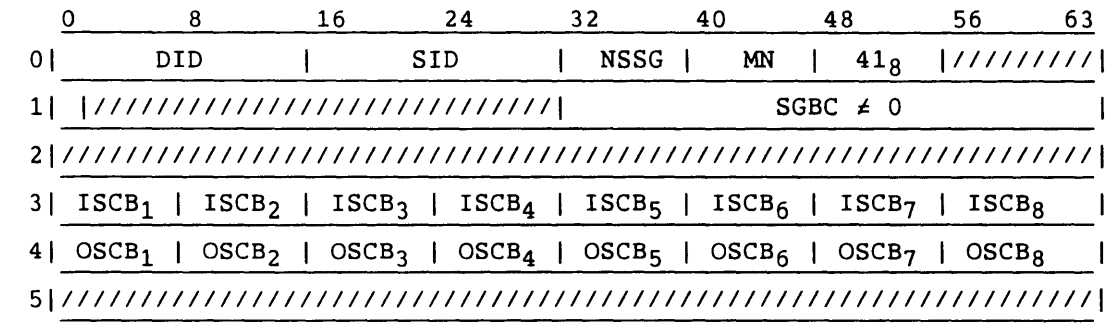


Field	Word	Bits	Description
DATA	0-*n*	0-63	Data test pattern

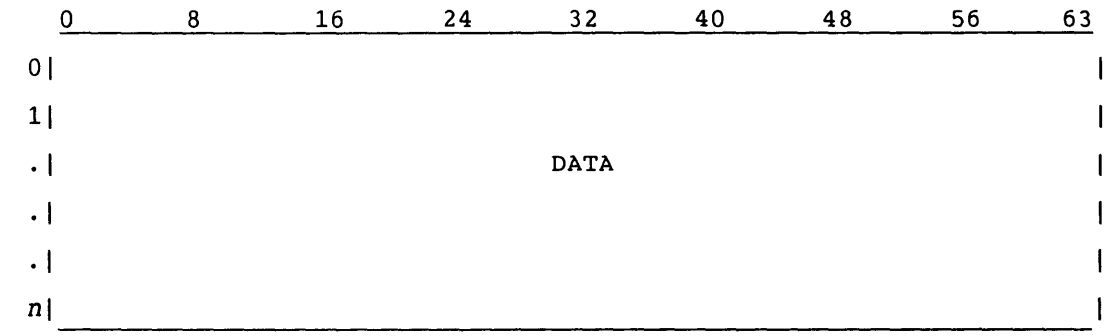
Diagnostic Echo Reply (41)

The Diagnostic Echo Reply responds to the Diagnostic Echo Request. No stream number is specified, and the SGBC is that of the received Diagnostic Echo Request.

LCP:



Segment:

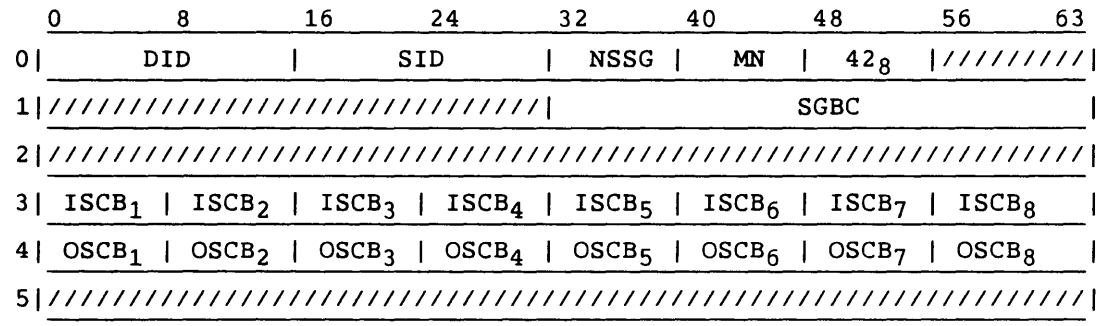


Field	Word	Bits	Description
DATA	0-*n*	0-63	Returned data test pattern

Interactive Request (42)

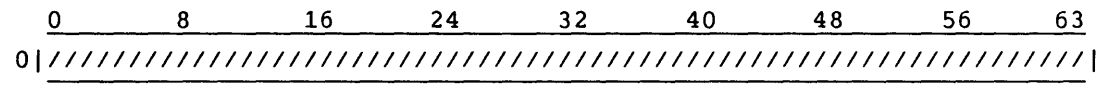
The Interactive Request indicates that the associated segment contains a set of variable-length interactive terminal requests. No stream number is associated with this request. If the segment bit count is 0, no segment is sent. SCBs are valid. This is a synchronous request. See section 7 for a complete discussion of the COS interactive system.

LCP:

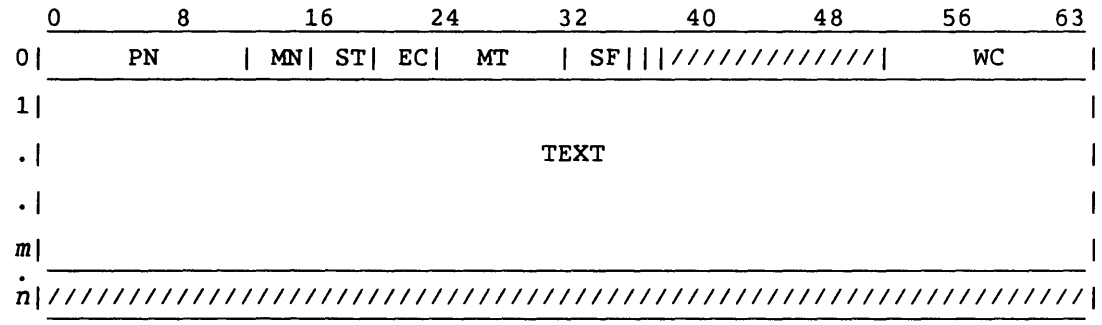


Segment:

Header:



Entry:



Entry:

Field	Word	Bits	Description
PN	0	0-11	Process number assigned by COS; 0 for Logon.
MN	0	12-15	Message number (0-15)

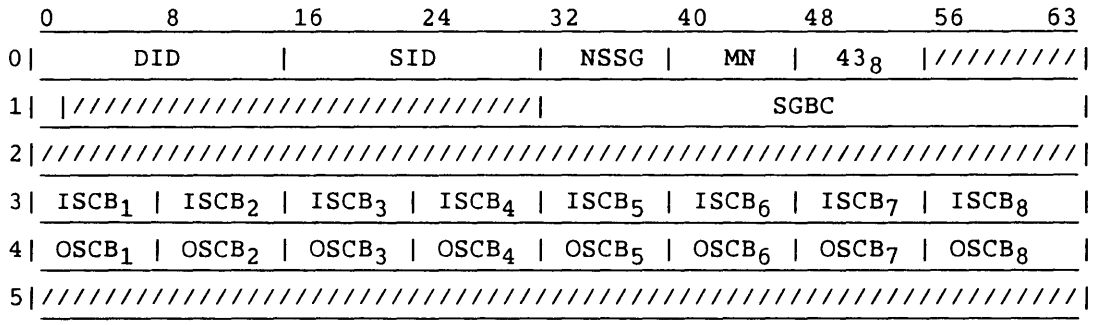
Field	Word	Bits	Description
ST	0	16-19	Terminal state: 0 Receive 1 Suspend
EC	0	20-23	Error code; (valid only if MT=13): 1 Invalid message number 2 Sent to suspended terminal 3 Invalid message type 4 Inactive process number
MT	0	24-31	Message type (octal): 1 Logon 4 Data 5 Special function 6 Logoff 12 Control 13 Error
SF	0	32-35	Special function and Logoff modifier Special function: 1 Abort 2 Status 3 Attention Logoff modifier: 0 Hold (job continues; no messages are lost) 1 Quit (job terminates) 2 Continue† (job continues; only the most recent messages are retained)
MODE	0	36	Terminal Mode flag: 0 Buffered 1 Unbuffered
CHN	0	37	Chain flag; if set, the next word is control, not data.
WC	0	52-63	64-bit word count for text associated with this entry, not including the terminal/header word or any chain words
TEXT	1-*m*	0-63	COS-format blocked text from the terminal

† Deferred implementation; Continue is treated as Hold.

Interactive Reply (43)

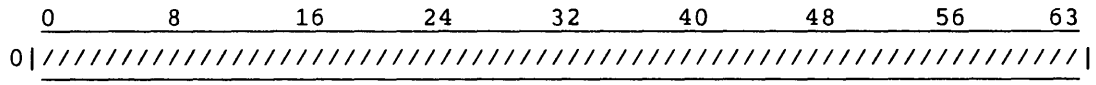
An Interactive Reply indicates that the associated segment contains a set of variable-length interactive terminal replies. No stream number is associated with this request. If the segment bit count is 0, no segment is sent. SCBs are valid. See section 7 for a complete discussion of COS interactive protocol.

LCP:

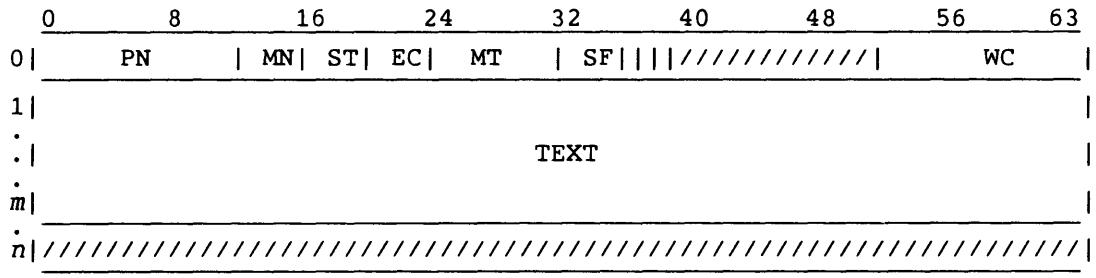


Segment:

Header:



Entry:



Entry:

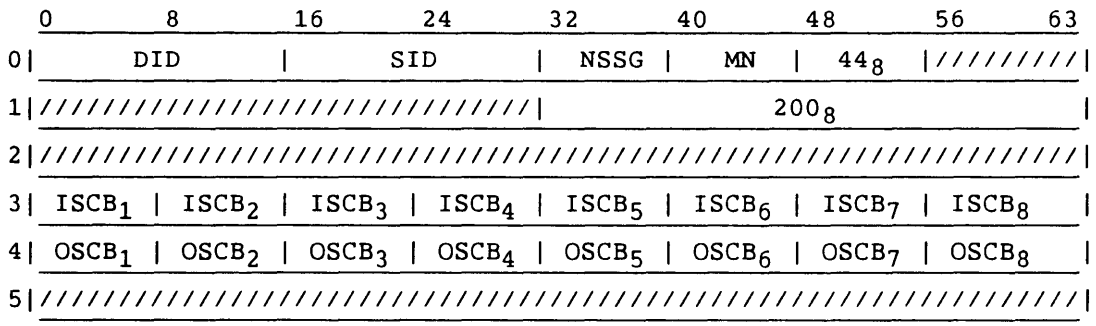
Field	Word	Bits	Description
PN	0	0-11	Process number assigned by COS
MN	0	12-15	Message number (0-15)
ST	0	16-19	Job state: 0 Receive 1 Suspend

Field	Word	Bits	Description
EC	0	20-23	Error code; valid only if MT=3 or 13 (octal): 1 Invalid message number 2 Sent to suspended job 3 Invalid message type 5 Invalid user name 6 Invalid password 7 Already logged on 10 No buffer space 11 Not logged on 12 User logged on but job does not exist 13 No more interactive users allowed 14 Invalid special function 15 Unexpected message received 16 Maximum message length error 17 Zero data length sent
MT	0	24-31	Message type (octal): 2 Start 3 Restart 4 Data 5 Special function 7 Logoff reply 12 Control 13 Error
SF	0	32-35	Special function: 4 Issue prompt (prompt is unblocked text; 1-8 ASCII characters, left-justified and zero-filled). 5 Operator killed the job
MODE	0	36	Buffered/unbuffered flag: 0 Buffered 1 Unbuffered
CHN	0	37	Chain flag; if set, the next word is control and not data.
FT	0	38	Format type: 0 Blocked 1 Unblocked
WC	0	52-63	64-bit word count for text associated with this entry, not including the terminal/header word or any chain words
TEXT	1-*m*	0-63	COS-format blocked text for the terminal

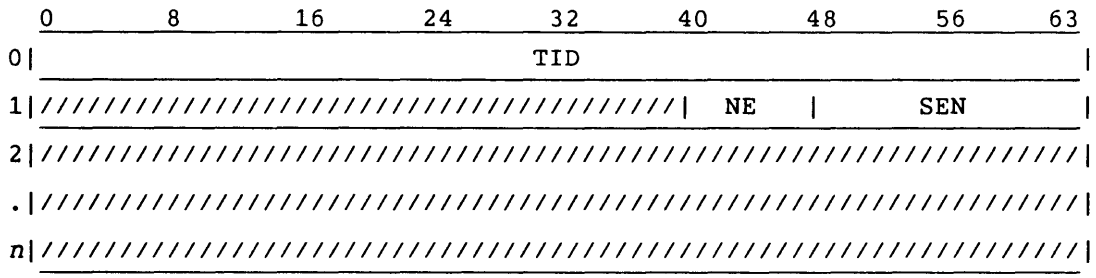
Statclass Request (44)

The front-end station sends the Statclass Request to request general job class status information from COS. No stream number is specified, but SCBs are valid for defined streams. This is a synchronous request.

LCP:



Segment:

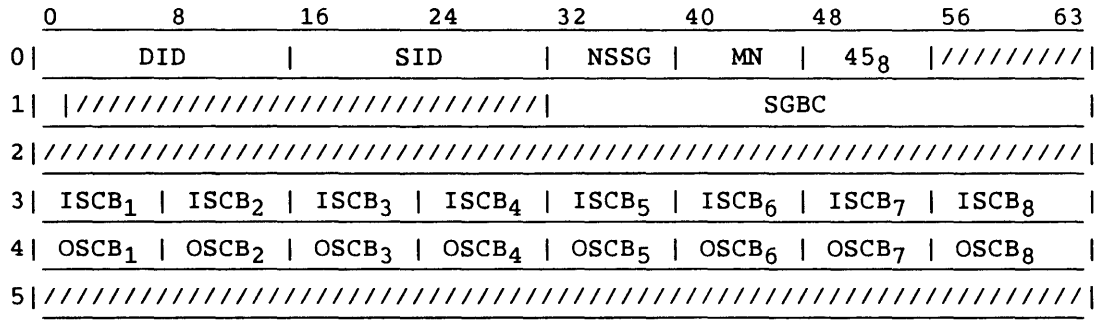


Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester, as known to the requesting front end
NE	1	40-47	Number of entries
SEN	1	48-63	Starting entry number

Statclass Reply (45)

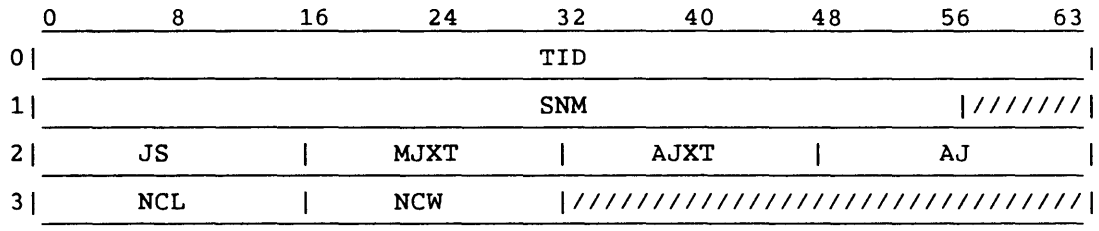
COS responds to a job class status request from the front-end station with the Statclass Reply. No stream number is specified, but SCBs are valid for defined streams.

LCP:

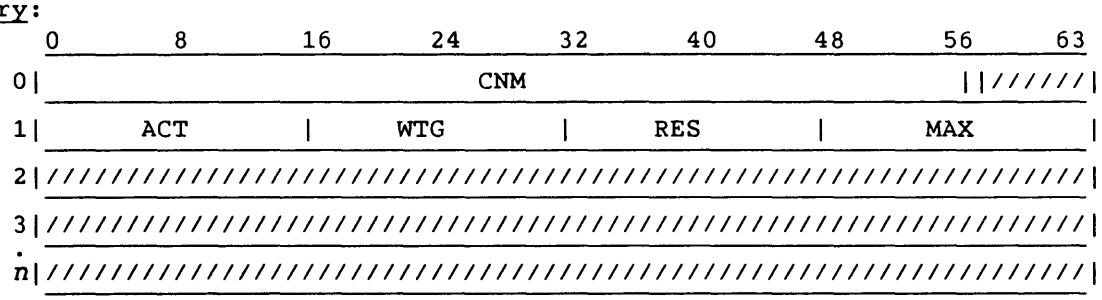


Segment:

Header:



Entry:



Header:

Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester, as specified in the Statclass Request
SNM	1	0-56	Job class structure name

Field	Word	Bits	Description
JS	2	0-15	Number of jobs in the system
MJXT	2	16-31	Maximum JXTs allowed by the system
AJXT	2	32-47	Number of available pool JXTs
AJ	2	48-63	Number of active jobs
NCL	3	0-15	Number of defined classes
NCW	3	16-31	Number of classes waiting for JXTs

Entry:

Field	Word	Bits	Description
CNM	0	0-56	Job class name
OFF	0	57	Status: 0 On 1 Off
ACT	1	0-15	Number of active jobs at JXTs
WTG	1	16-31	Number of waiting JXTs
RES	1	32-47	Number of reserved JXTs
MAX	1	48-63	Maximum JXTs allowed by the class

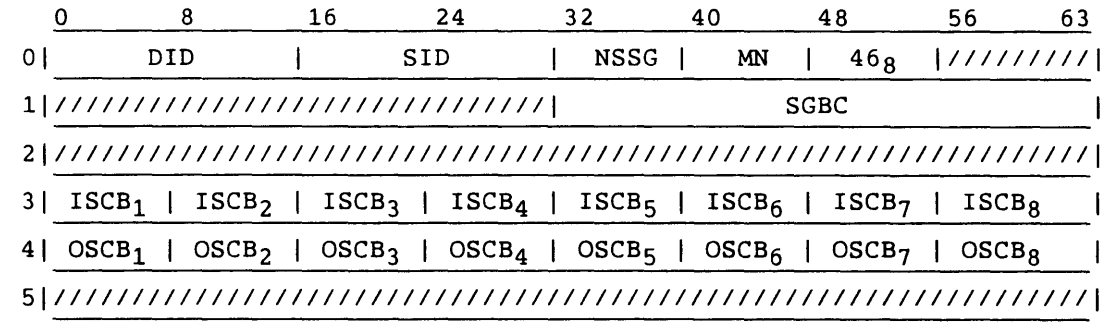
Station Message (46)

The station message allows COS tasks to send messages to front-end stations. Messages are accepted by the message queue handler from tasks only. Any COS tasks that communicate with jobs provide the mechanisms for required communications. Processing of the messages, if any, is determined by the operating system under which the station is running, and the message type and function code of the message.

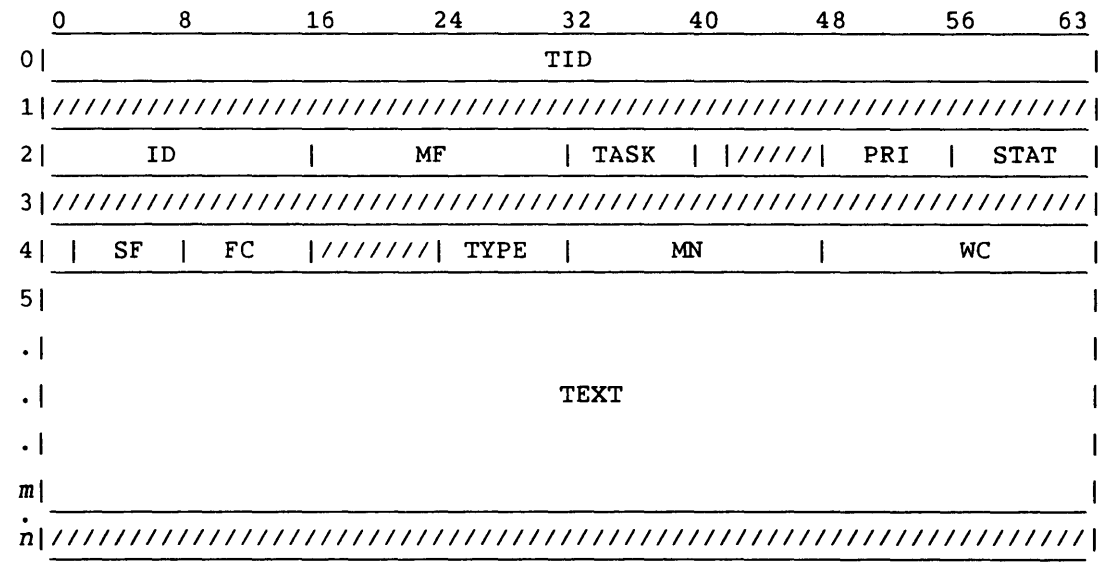
If message receiving is disabled (MRE=0 in the Logon segment), station messages are not issued. The message types processed by any particular station are determined by bit settings in Logon field MTE. See section 5 for a description of station message processing.

The Station Message code indicates that the associated segment contains one or more station messages of variable length. No stream number is associated with this request. SCBs are valid for defined streams.

LCP:



Segment:



Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of message destination
ID	2	0-15	Message ID assigned and maintained by the calling task
MF	2	16-31	Destination station ID
TASK	2	32-39	Originating task ID; a number in the range 0-35, assigned at startup. Can vary from one COS version level to another, and from site to site.
LOG	2	40-41	COS Log flag (for SCP use): 0 Log the entire message 1 Do not log the message 2 Log only the message header; no station action required. The type is enabled at logon by bits in the Logon segment.
PRI	2	48-55	Message priority assigned by the issuing task; not used by message types 0, 1, and 2.
STAT	2	56-63	Station response status; 0 for a message going to the station.
UR	4	0	Urgent Request flag. Priority is ignored if this bit is set.
SF	4	1-7	Special function†
FC	4	8-15	Task-defined function code; not used for message types 0, 1, and 2
TYPE	4	24-31	Message type: 0 Information only 1 Operator request 2 Outstanding request cancel 3 Tape service messages defined by TQM (see section 6) 4-*n* Reserved for special-format messages

† Deferred implementation

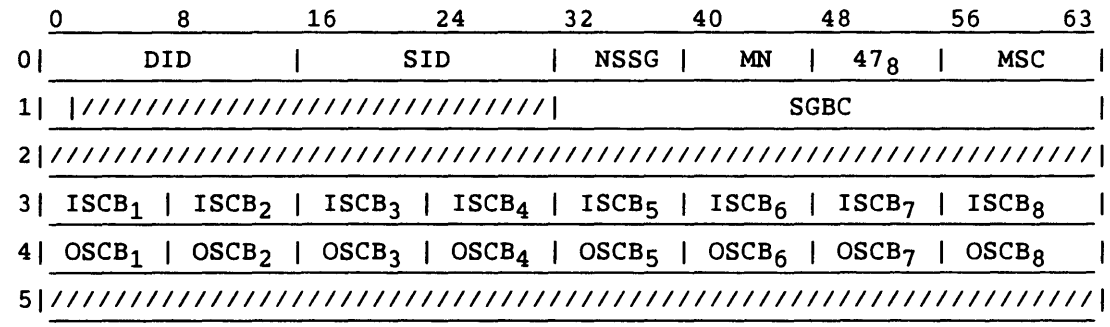
Field	Word	Bits	Description
MN	4	32-47	Message number assigned by COS
WC	4	48-63	Text length in 64-bit words; does not include message header words. The message cannot exceed the station's segment size minus 5.
TEXT	5-*m* (WC+5)	0-63	Message text; either ASCII text or task-defined data. The text is in ASCII for message types 0 and 1. Type 2 messages have no text. Message type 3 is defined by TQM. Message types 4 through *n* are reserved for task-defined usage.

Station Response (47)

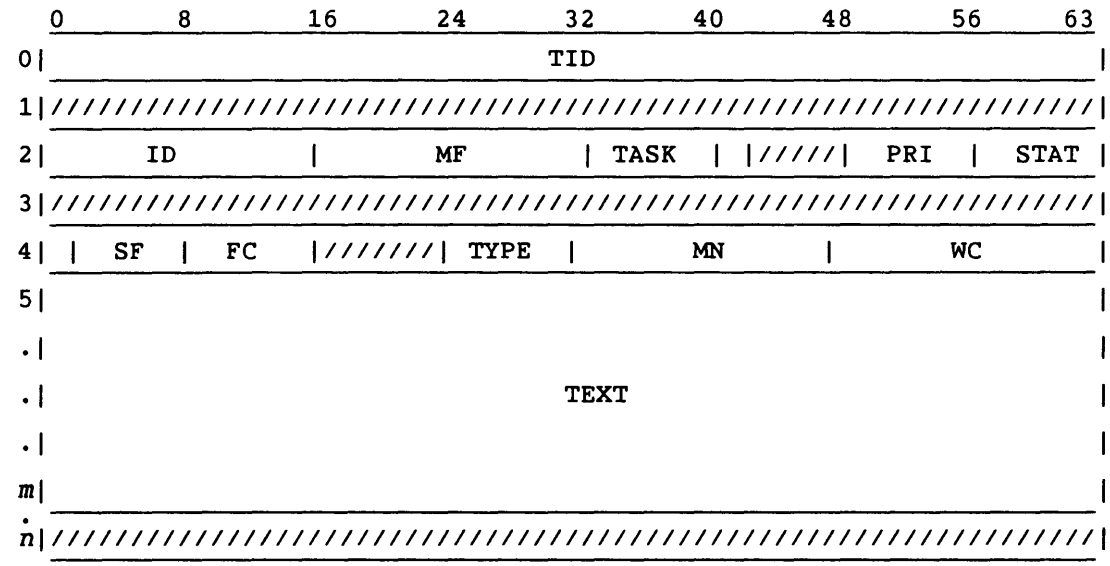
The Station Response message code accompanies a station's response to a Station Message sent from COS (code 46). No stream number is associated with this request. SCBs are valid for defined streams. See section 5 for a description of station message processing.

The fields TID, ID, MF, TASK, LOG, PRI, UR, SF, and TYPE are set from the station message header sent by COS. Fields STAT, FC, and WC, and the TEXT are set by operator input or station action. The SGBC field can equal 0. On any received Station Response LCP, a nonzero value in the MSC field is processed as a new station message limit. (377_8 disables station messages until a new limit is received. A station response can be sent even when no request has been received.) A new limit greater than that specified at logon is rejected with a Message Error code 114_8.

LCP:



Segment:



Field	Word	Bits	Description
TID	0,1	0-63	Terminal identifier of message destination
ID	2	0-15	Message ID assigned and maintained by the calling task
MF	2	16-31	Destination station ID
TASK	2	32-39	Originating task ID. A number in the range 0-35, defined at startup. Task IDs can vary.
LOG	2	40-41	COS Log flag (for SCP use): 0 Log the entire message 1 Do not log the message 2 Log only the message header
PRI	2	48-55	Message priority assigned by the issuing task; not used for message types 0, 1, and 2.
STAT	2	56-63	Station response status: 000 Normal response (text included) 300 Message number error Statuses for type 3 messages only (passed to the task without being processed by SCP): 100 Unsupported function code 101 Function code invalid for task 102 Station Message subtask could not process this message completely. 103 Word count error; message extends beyond segment length as given by SGBC in LCP, implying a link error, as this is checked by SCP.† 104 Inappropriate message 105 Message text failed validity check.
UR	4	0	Urgent Request flag. Priority is ignored when this bit is set.

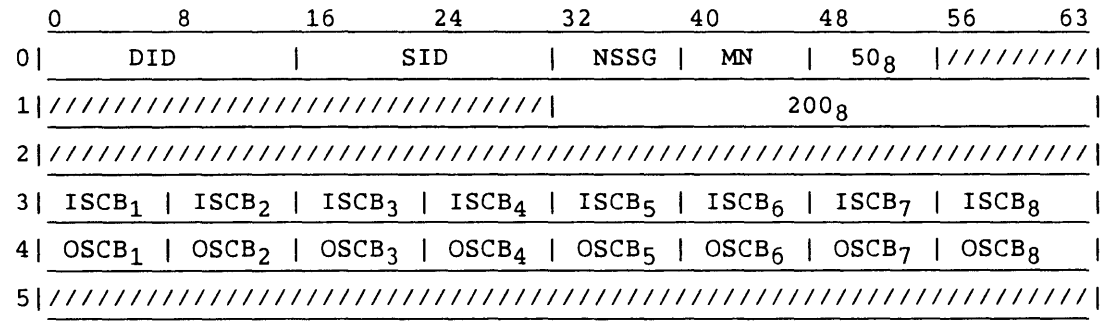
† Deferred implementation

Field	Word	Bits	Description
SF	4	1-7	Special function†
FC	4	8-15	Task-defined function code; not used for message types 0, 1, and 2.
TYPE	4	24-31	Message type: 0 Information only 1 Operator request 2 Outstanding request cancel 3 TQM-defined formatted data 4-*n* Reserved for special format messages
MN	4	32-47	Message number assigned by COS
WC	4	48-63	Text length in 64-bit words; does not include message header words of the reply. The message cannot exceed the station's segment size minus 5.
TEXT	5-*m* (WC+5)	0-63	Message text; either ASCII text or task-defined data. The reply message text is ASCII for type 1 messages. Type 2 messages have no text. The message text is defined by TQM for type 3 messages and is reserved for task definition by message types 4 through *n*. Zero-filled.

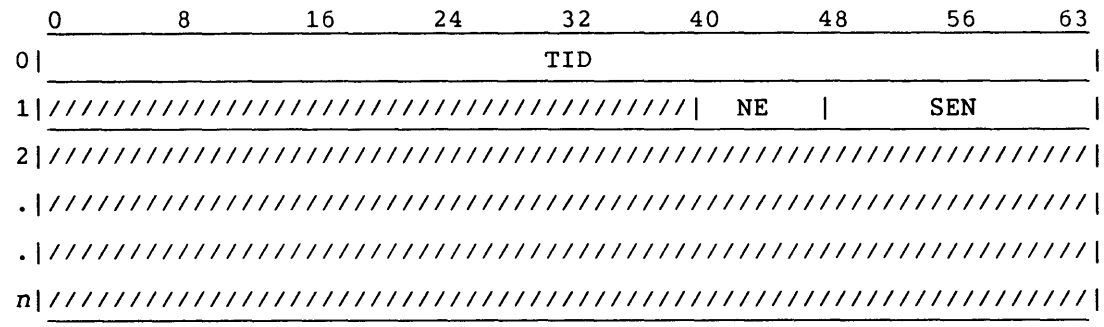
Tape Configuration Request (50)

The front-end station sends the Tape Configuration Request to request the current configuration of the tape device(s) identified by the associated segment. No stream number is specified, but SCBs are valid for defined streams. This is a synchronous request.

LCP:



Segment:

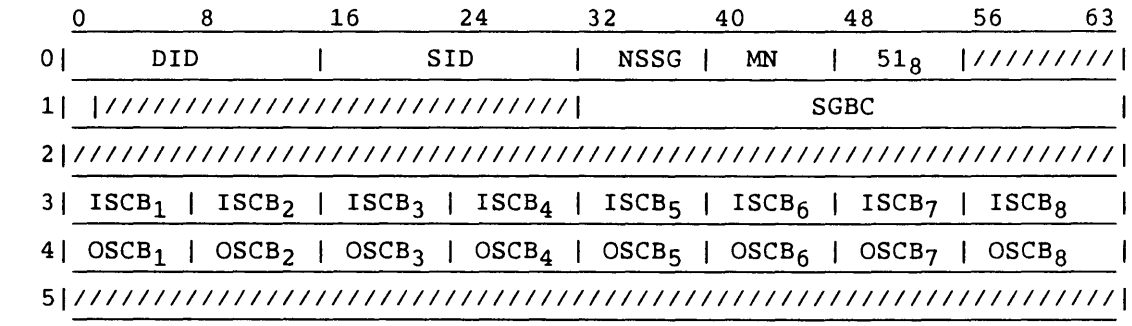


Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester, as known to the requesting front end
NE	1	40-47	Number of entries
SEN	1	48-63	Starting entry number

Tape Configuration Reply (51)

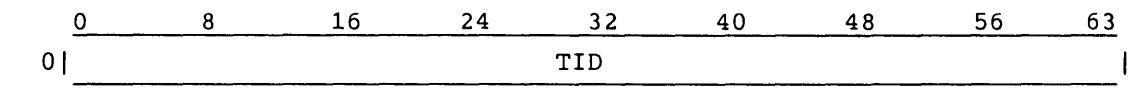
A Tape Configuration Reply code is the COS response to a Tape Configuration Request from the front-end station. No stream number is specified, but SCBs are valid for the defined streams.

LCP:

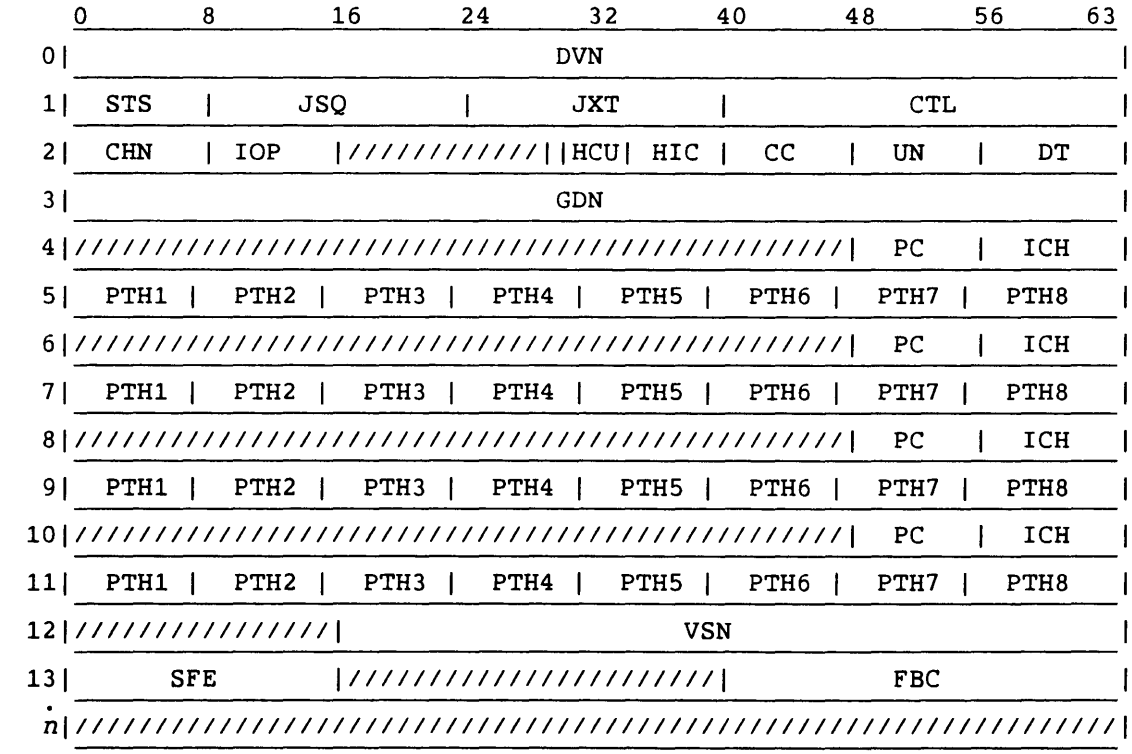


Segment:

Header:



Entry:



Header:

Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of requester as known to the requesting front end

Entry:

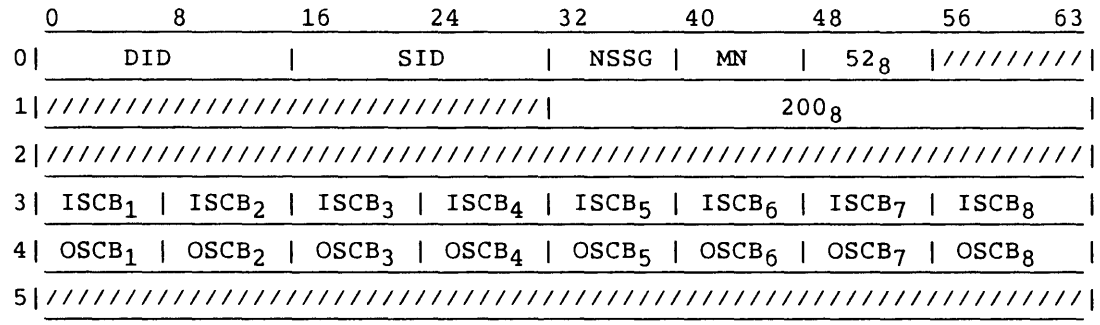
Field	Word	Bits	Description
DVN	0	0-63	Device name
STS	1	0-7	Current device status. One of the following conditions exists if its corresponding bit is set to 1:
DWN	1	0	Device down
DBO	1	1	Downed by operator
RDO	1	2	Read only
MNT	1	3	Maintenance mode
DBS	1	4	Downed by system
NA	1	5	Not available
JSQ	1	8-23	Associated job sequence number
JXT	1	24-39	JXT ordinal
CTL	1	40-63	Control table address
CHN	2	0-7	CPU channel number
IOP	2	8-15	I/O Subsystem/I/O Processor (IOP) number
HST	2	29	Host control unit ID; present if flag set.
HCU	2	30-33	Host control unit
HIC	2	34-39	Host IOP channel
CC	2	40-47	Count of IOP channels
UN	2	48-55	Unit number or device ID
DT	2	56-63	Device type or capability
GDN	3	0-63	Generic device name
PC	4	48-55	Count of control unit paths through this IOP channel: 1 to 4

Field	Word	Bits	Description
ICH	4	56-63	IOP channel number
PTH1-PTH8	5	0-63	Control unit ID and status
PC	6	48-63	Count of control unit paths through this IOP channel: 1 to 4
ICH	6	56-63	IOP channel number
PTH1-PTH8	7	0-63	Control unit ID and status
PC	8	48-63	Count of control unit paths through this IOP channel: 1 to 4
ICH	8	56-63	IOP channel number
PTH1-PTH8	9	0-63	Control unit ID and status
PC	10	48-63	Count of control unit paths through this IOP channel: 1 to 4
ICH	10	56-63	IOP channel number
PTH1-PTH8	11	0-63	Control unit ID and status
VSN	12	16-63	Volume serial number
SFE	13	0-15	Servicing front end
FBC	13	40-63	File block count

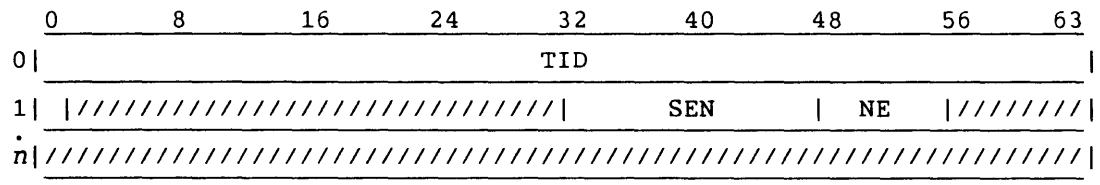
Tape Job Status Request (52)

The front-end station sents the Tape Job Status Request code to request general status information on all COS jobs requiring tape devices. No stream number is specified, but SCBs are valid for defined streams. This is a synchronous request.

LCP:



Segment:



Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester, as known to the requesting front end
EXR	1	0	Extended Status Request flag; if set, extended status is returned with each entry.
SEN	1	32-47	Starting entry number
NE	1	48-55	Number of entries

Tape Job Status Reply (53)

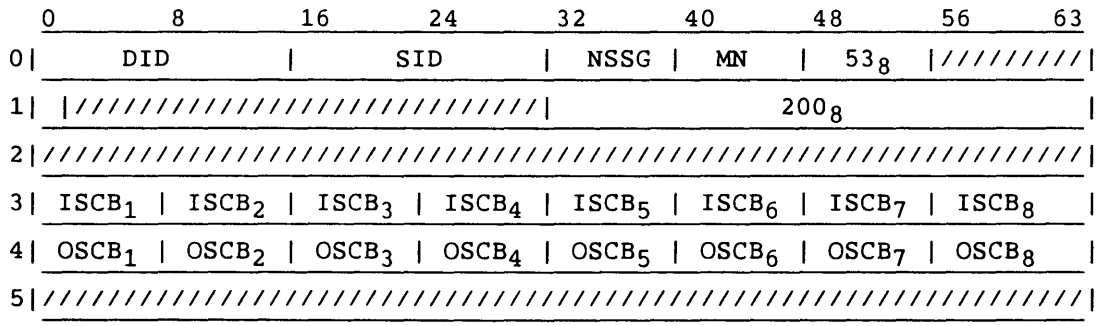
The Tape Job Status Reply is the COS response to a Tape Job Status Request from the front-end station. No stream number is specified, but SCBs are valid for defined streams.

Tape Job Status is expressed in terms of the status of COS system datasets (input datasets awaiting execution or jobs in execution) that require tape devices. If the SSD solid-state storage device is installed as a generic resource, this segment also includes jobs that use SSD and the amount of SSD used and required. If there is no system dataset activity, no segment is sent.

The number of dataset entries returned, if not specified on the request, is limited by the segment size of the reply.

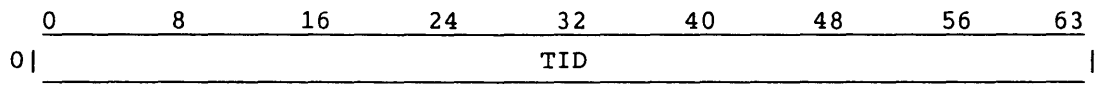
If the requester is the COS Master Operator, the segment contains a status entry for each tape system dataset. If not, the segment contains a status entry for each tape system dataset matching the requesting station ID.

LCP:

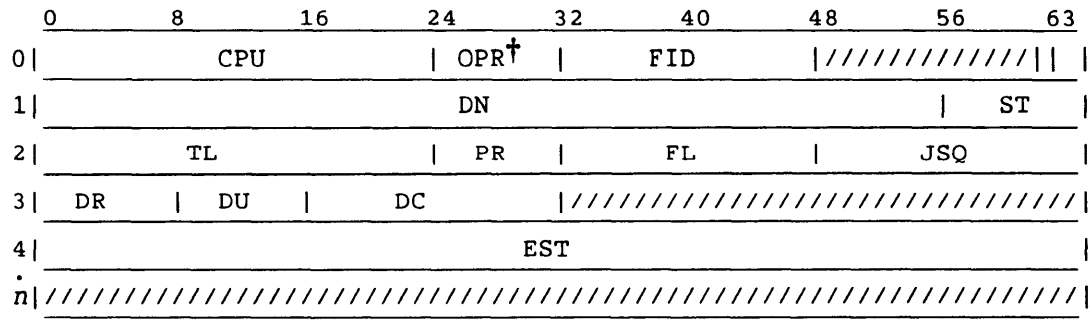


Segment:

Header:



Entry:



Header:

Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester, as known to the requesting front end

Entry:

Field	Word	Bits	Description
CPU	0	0-23	CPU time in seconds for this job if DC=IN; otherwise, not used.
OPR†	0	24-31	Requested operator actions; 0 if none requested.
FID	0	32-47	Front-end mainframe identifier associated with the dataset
EXR	0	62	Extended Status Reply flag; if set, extended status is returned with each entry.
RR	0	63	Rerun flag; 0 if rerunnable.
DN	1	0-55	Dataset name; 1-7 alphanumeric characters.

† Deferred implementation

Field	Word	Bits	Description
ST	1	56-63	Status (1 character): A Awaiting CPU B Recovery suspended C Locked by Startup because the current job is incompatible with the version of COS in use D Dormant; waiting for the time delay or an event. E Waiting for an event F Job does not exist in COS system G Locked for a memory change when an earlier configuration is insufficient for the current job I Waiting for I/O L Rolling in M Awaiting memory O Operator-suspended P Queued for tape Q Queued for execution R Rolled out S Suspended; awaiting dataset transfer or momentarily suspended by COS. T Transfer in progress U Rolling out W Awaiting transfer X Executing
TL	2	0-23	Time limit in seconds (0-16777215); used only when DN=IN.
PR	2	24-31	Priority (0-255)
FL	2	32-47	Current field length in 512-word blocks (0-65535); used only when DN=IN.
JSQ	2	48-63	Job sequence number (0-65535)
DR	3	0-7	Number of tape devices required†
DU	3	8-15	Number of tape devices currently in use†

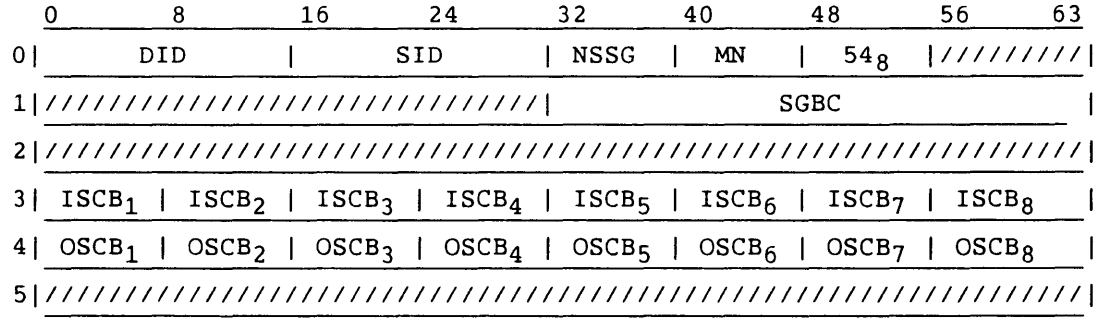
† If SSD is installed as a generic resource, DR and DU can also be the amount of SSD required and in use.

Field	Word	Bits	Description
DC	3	16-31	Disposition code: IN Job dataset MT Receiver disposes dataset to a magnetic tape. PR Receiver disposes dataset to a printer. PU Receiver disposes dataset to a card punch.
EST	4	0-63	Extended status (8 ASCII characters). Present only if the ESR flag is set in the reply header. If present, the entry is one word longer.

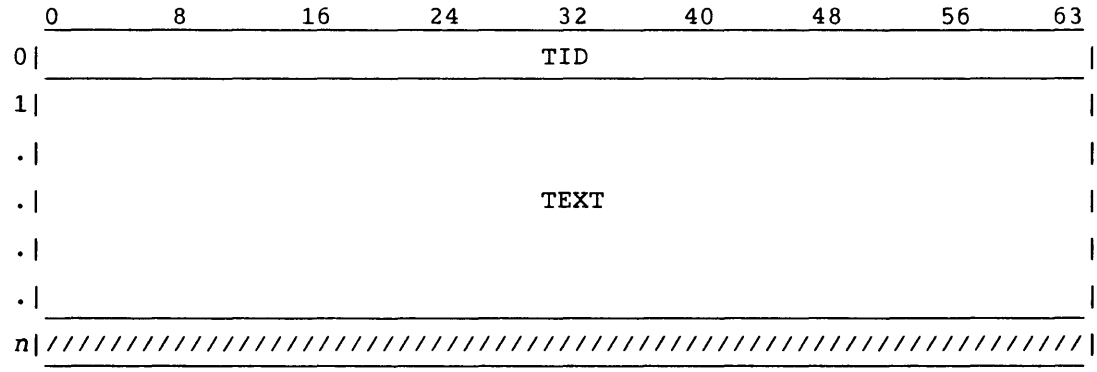
Configure Request (54)

The front-end station sends the Configure Request after Startup completes, to alter the STP-resident Configuration Table. No stream number is specified, but SCBs are valid for defined streams.

LCP:



Segment:

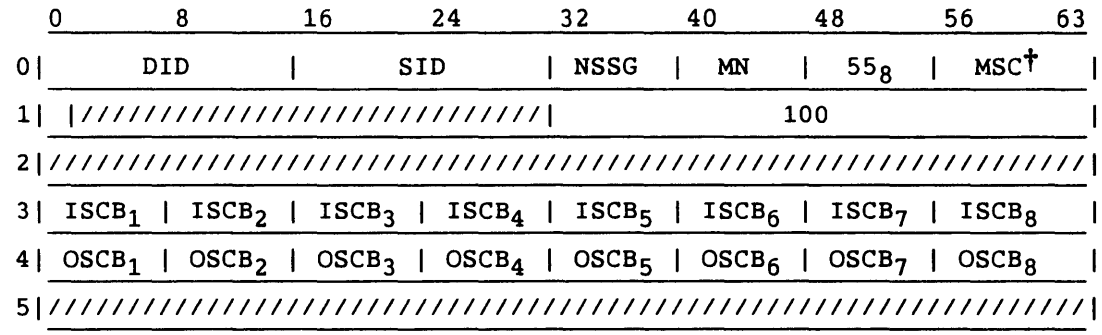


Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester, as known to the requesting front end
TEXT	1-*n*	0-63	Text field; up to 71 ASCII characters can be entered. Terminated by a 0 byte.

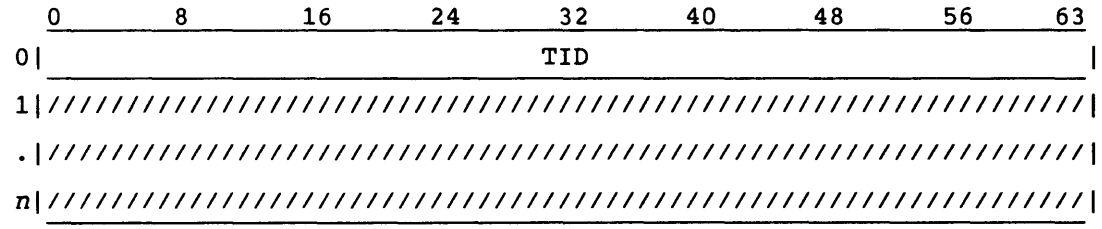
Configure Reply (55)

A Configure Reply represents the COS response to the front-end Configure Request. No stream number is specified, but SCBs are valid for the defined streams.

LCP:



Segment:



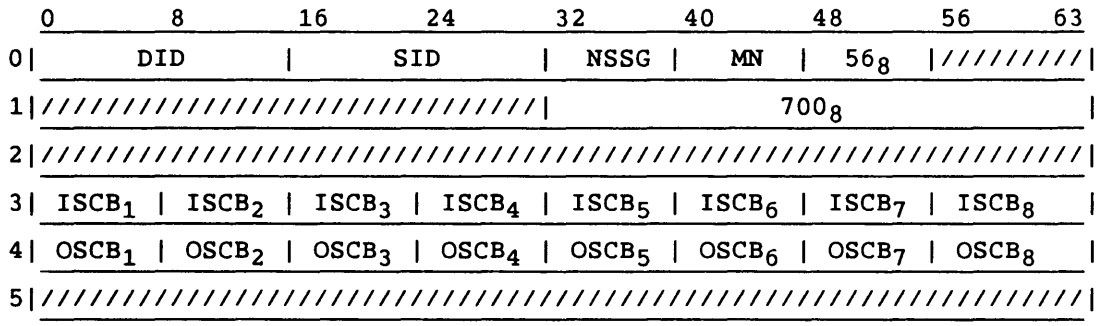
Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester, as known to the requesting front end

† All message subcodes are described in table 4-3.

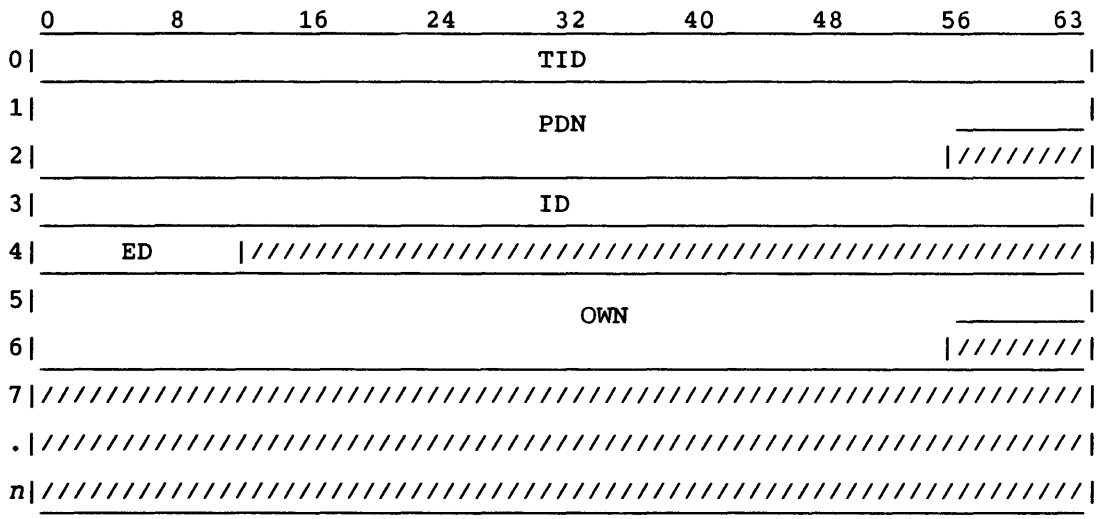
Dataset Status Request (ownership) (56)

The front-end station sends the Dataset Status Request to request the current ownership status of the dataset identified by the associated segment. No stream number is specified, but SCBs are valid for defined streams. This is a synchronous request. This code replaces code 23 to enable implementation of the security features in COS 1.12.

LCP:



Segment:



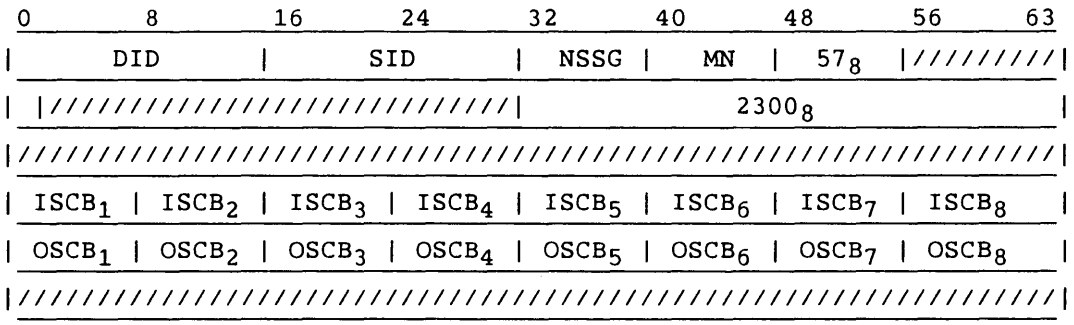
Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester, as known to the requesting front end

Field	Word	Bits	Description
PDN	1	0-63	Permanent dataset name, as known to COS
	2	0-55	
ID	3	0-63	User identifier, as known to COS
ED	4	0-11	Edition number, as known to COS
OWN	5	0-63	Ownership identifier, as known to COS
	6	0-55	

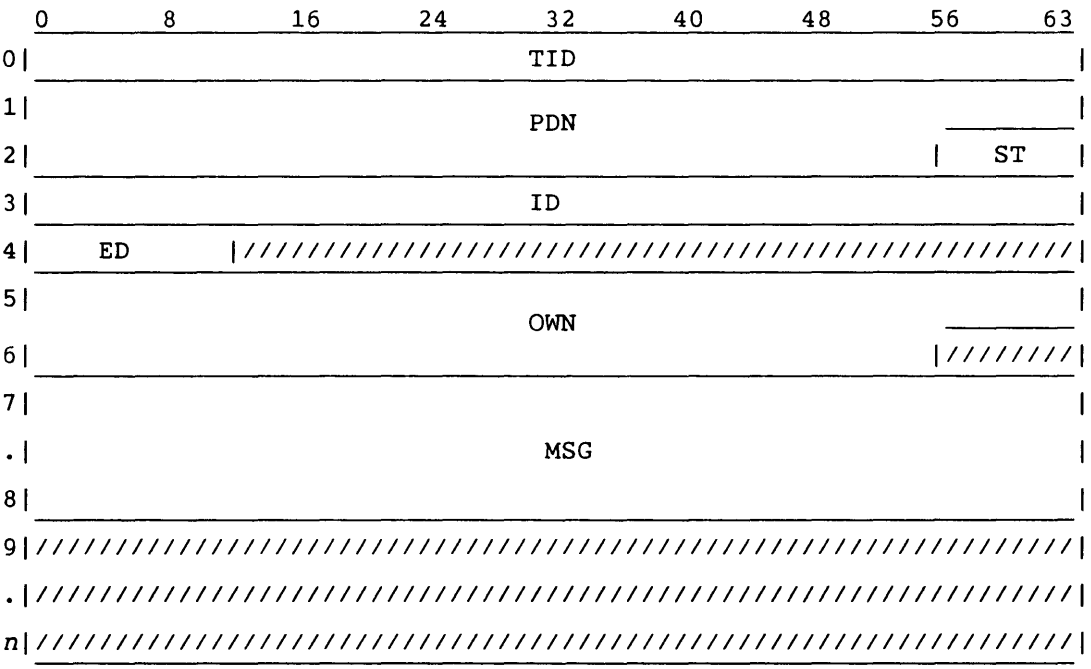
Dataset Status Reply (ownership) (57)

COS sends the Dataset Status Reply code in response to a Dataset Status Request (code 56). The associated segment contains the current ownership status of the dataset. No stream number is specified, but SCBs are valid for defined streams. This code replaces code 33 to enable implementation of the security features in COS 1.12.

LCP:



Segment:



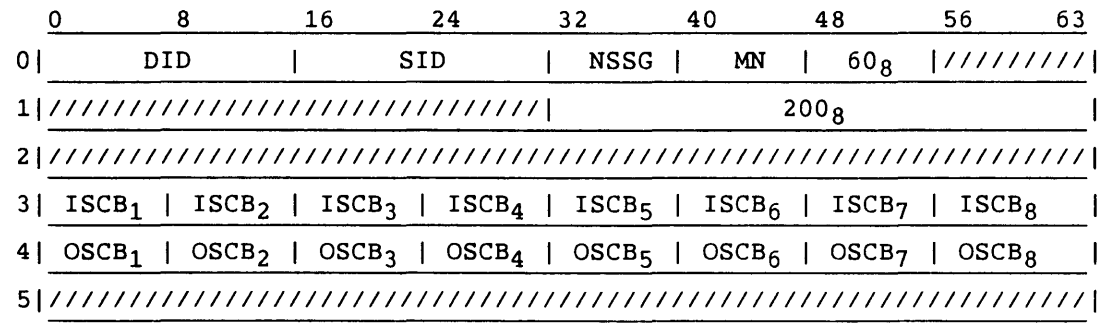
Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester, as specified in the Dataset Status Request

Field	Word	Bits	Description
PDN	1 2	0-63 0-55	Permanent dataset name, as specified in the Dataset Status Request
ST	2	56-63	Dataset status (1 character): P Exists as permanent dataset on COS F Does not exist on COS
ID	3	0-63	User identification, as specified in the Dataset Status Request
ED	4	0-11	Edition number. If the dataset does not exist, or if the dataset exists and the specified edition number was nonzero, the edition number is returned as specified in the Dataset Status Request. If the dataset exists and the specified edition number was 0, the latest edition number is returned.
OWN	5 6	0-63 0-55	Ownership identification, as specified in the Dataset Status Request
MSG	7-18	0-63	Dataset status message (96-character message explaining dataset ownership status)

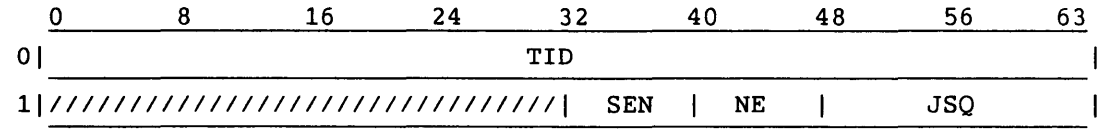
Job Information Request (60)

The Job Information Request requests current detailed information about a specific COS job. The segment contains identifying information about the job. No stream number is specified, but SCBs are valid for defined streams. If the SID and TID are not those of the COS Master Operator, the job's source ID or destination ID must match the front-end ID of the request; the TID values do not have to match. This is a synchronous request.

LCP:



Segment:

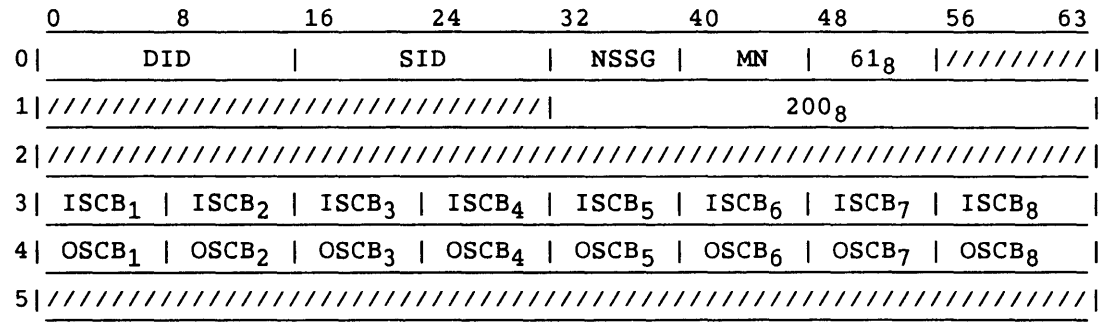


Field	Word	Bits	Description
TID	0	0-63	Terminal ID of the request, as known to the requesting front end
SEN	1	32-39	Starting entry number requested (0 is first entry)
NE	1	40-47	Number of entries requested
JSQ	1	48-63	Job sequence number

Job Information Reply (61)

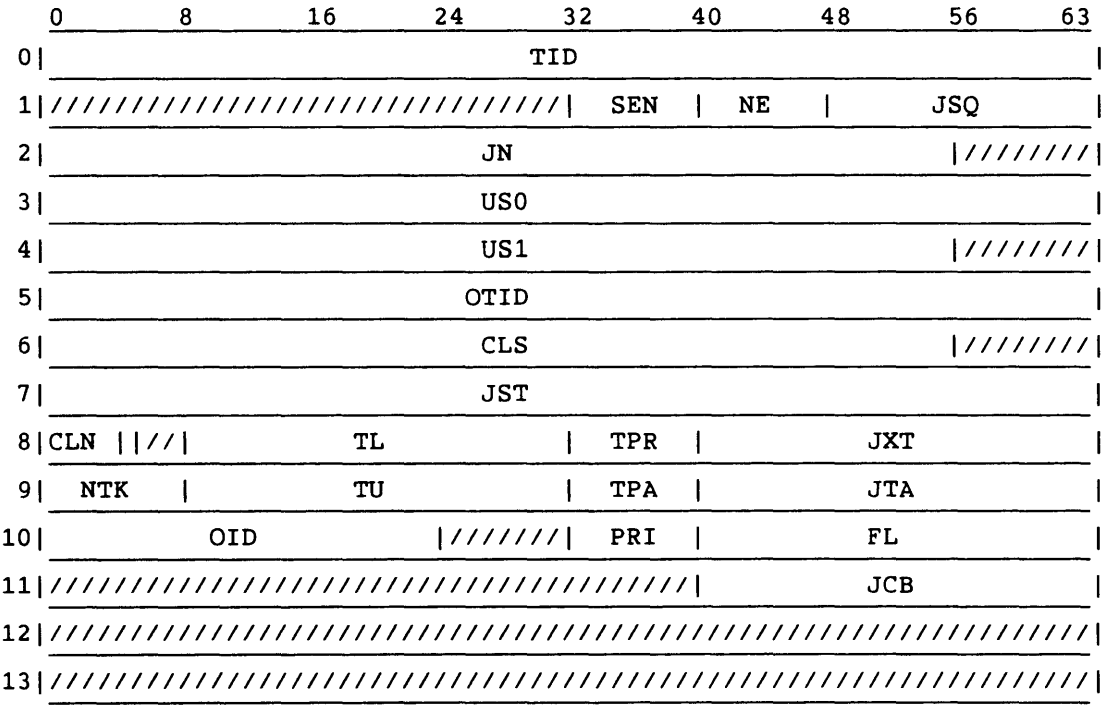
The Job Information Reply is the COS response to the front-end Job Information Request. The associated segment contains detailed information about the job's current state. No stream number is specified, but SCBs are valid for defined streams.

LCP:

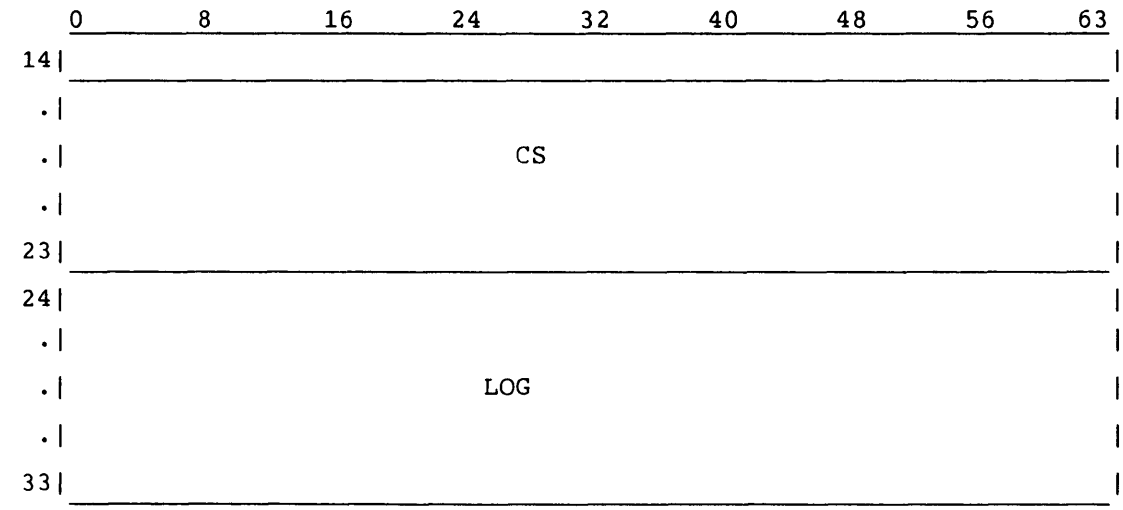


Segment:

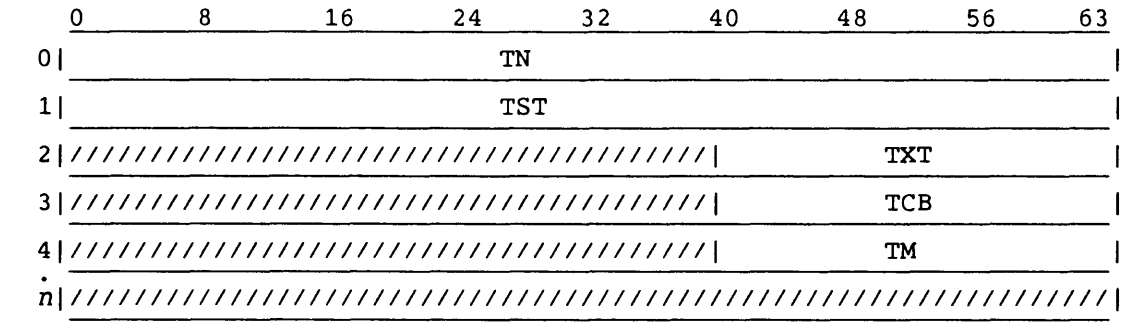
Header:



Header (continued):



Entry:



Header:

Field	Word	Bits	Description
TID	0	0-63	TID of requesting station (8 ASCII characters
SEN	1	32-39	Starting entry number returned (0 is first entry)
NE	1	40-47	Number of entries returned
JSQ	1	48-63	Job sequence number
JN	2	0-55	Jobname (7 ASCII characters)
USO	3	0-63	User number (first 8 characters)
US1	4	0-55	User number (last 7 characters)

Field	Word	Bits	Description
OTID	5	0-63	Originating TID of job (8 ASCII characters)
CLS	6	0-55	Job class name (7 ASCII characters)
JST	7	0-63	Job status (8 ASCII characters)
CLN	8	0-3	Cluster number
RES	8	4	Resident In Memory flag
TL	8	8-31	Time limit (seconds)
TPR	8	32-39	Number of tapes requested
JXT	8	40-63	Job Execution Table (JXT) entry address
NTK	9	0-7	Number of tasks
TU	9	8-31	Time used (seconds)
TPA	9	32-39	Number of tapes assigned
JTA	9	40-63	Job Table Area (JTA) address (0 if not in memory)
OID	10	0-23	Originating ID of job (2 ASCII characters)
PRI	10	32-39	Priority of job
FL	10	40-63	Field length of job
JCB	11	40-63	Job Communication Block (JCB) address (0 if not in memory)
CS	14-23	0-63	Last control statement processed (80 ASCII characters)
LOG	24-33	0-63	Last logfile message written (80 ASCII characters)

Entry:

Field	Word	Bits	Description
TN	0	0-63	Task number
TST	1	0-63	Task status (8 ASCII characters)

Field	Word	Bits	Description
TXT	2	40-63	Task Execution Table (TXT) entry address
TCB	3	40-63	Task Control Block (TCB) address (0 if not in memory)
TM	4	40-63	Time used by task (seconds)

Stream Status Request (62)

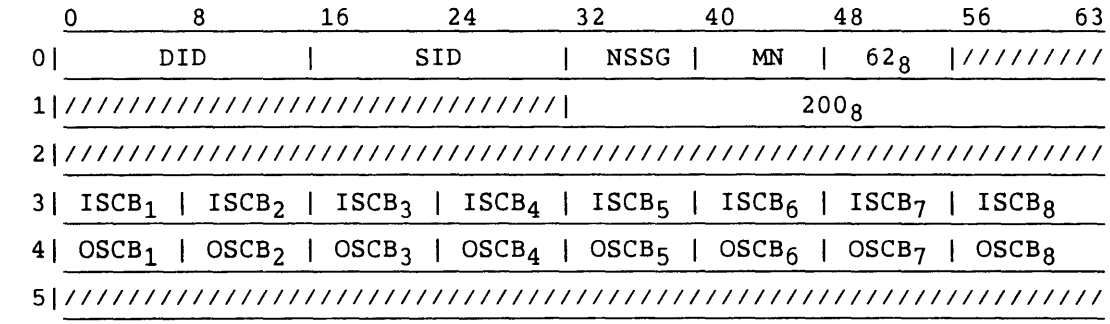
The front-end station sends the Stream Status Request, requesting information about all active front-end streams. No stream is specified, but SCBs are valid for defined streams. This is a synchronous request.

The Stream Status Request is intended for front-end performance monitoring and not for general use.

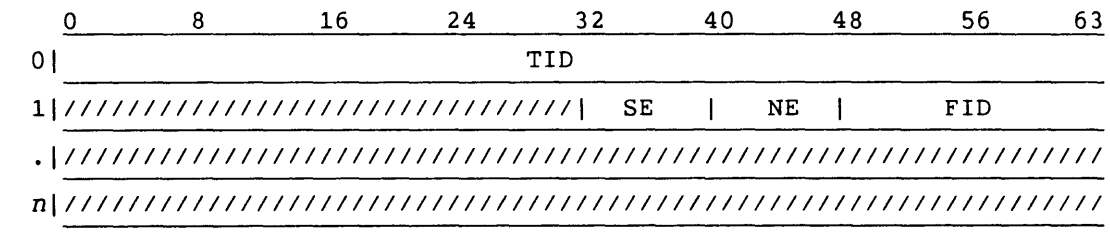
NOTE

This request is reserved for CRI use and is subject to modification without notice.

LCP:



Segment:



Field	Word	Bits	Description
TID	0	0-63	Terminal ID of requester
SE	1	32-39	Starting entry number
NE	1	40-47	Number of entries requested
FID	1	48-63	Front-end ID (2 ASCII characters; binary 0 if not specified)

Stream Status Reply (63)

The Stream Status Reply is the COS response to the Stream Status Request issued by the front end. No stream number is specified, but SCBs are valid for defined streams.

The stream status of COS is expressed in terms of the status of currently-transferring datasets.

If the station which issued the Stream Status Request was the COS Master Operator and no FID was specified in the request, the segment contains stream information for all stations. If an FID was specified, the segment contains stream information for the designated station ID only.

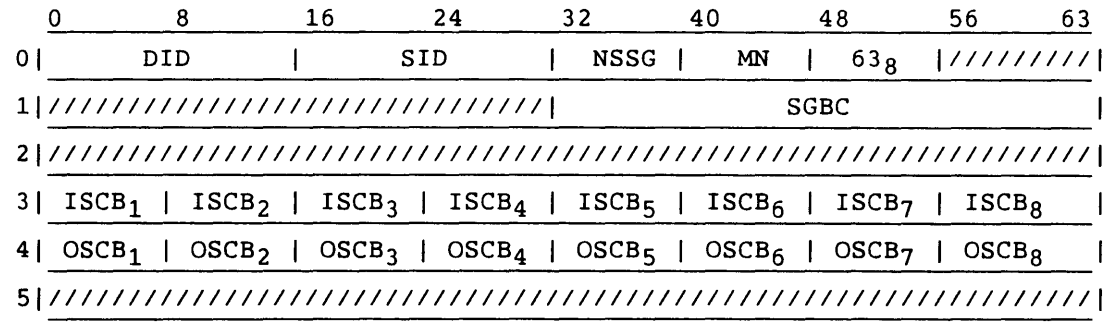
If the station which issued the Stream Status Request was not the COS Master Operator, the segment contains information on the issuing station if the FID was not specified or if the FID matches the issuing station's logon ID; otherwise, an error is returned. The number of entries returned is limited by the segment size of the reply.

The megabit rates are updated at an interval specified by I@SCPTCR, an installation parameter. The transfer rate might appear to vary, depending on the value of this parameter. The transfer rate total specified in the header is the total for all active streams if no FID was specified in the request and the request was from the Master Operator. If an FID was specified, the total is for that ID only.

NOTE

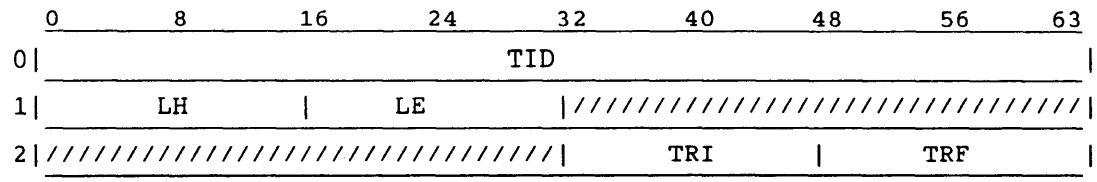
This request is reserved for CRI use and is subject to modification without notice.

LCP:

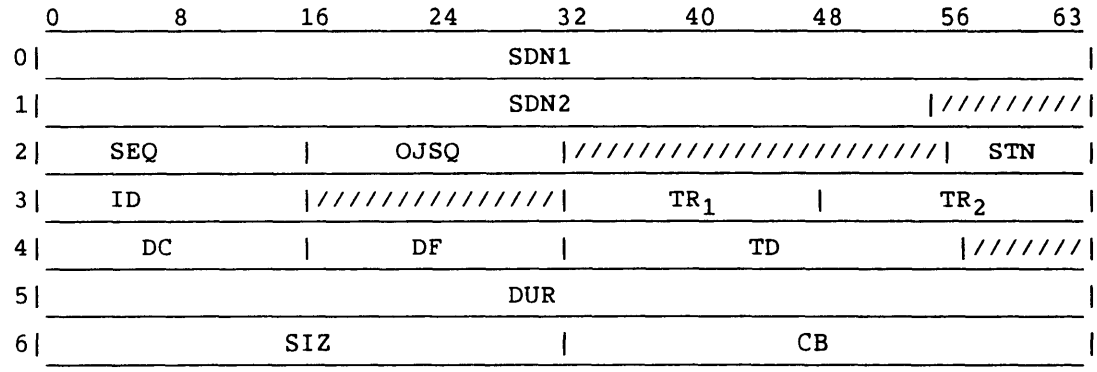


Segment:

Header:



Entry:



Header:

Field	Word	Bits	Description
TID	0	0-63	Terminal ID of the requester
LH	1	0-15	Number of words in header
LE	1	16-31	Number of words in entry
TRI	2	32-47	Transfer rate; total megabits/s integer portion (0-99)
TRF	2	48-63	Transfer rate; fractional portion (integer 000-999)

Entry:

Field	Word	Bits	Description
SDN1	0	0-63	Staged dataset name, part 1 (8 ASCII characters)
SDN2	1	0-55	Staged dataset name, part 2 (7 ASCII characters)

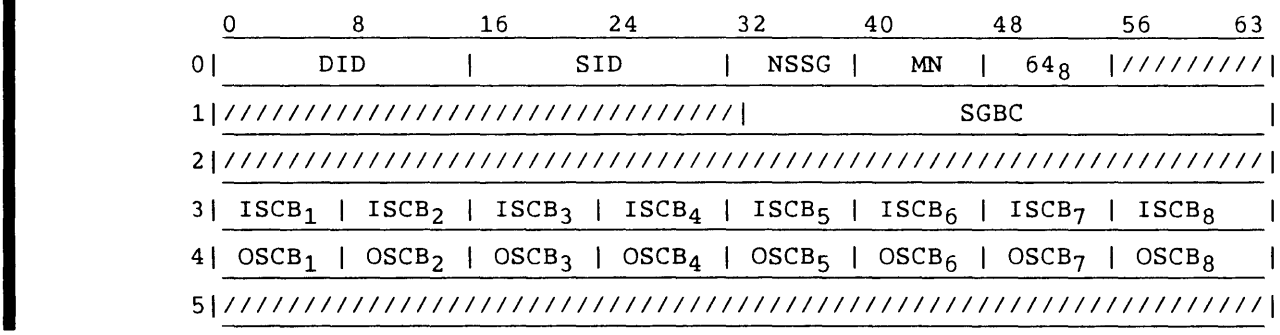
Entry (continued):

Field	Word	Bits	Description
SEQ	2	0-15	Sequence number (integer 0-65535)
OJSQ	2	16-31	Originating job sequence number (integer 0-65535)
STN	2	56-63	Stream number (integer 1-8)
ID	3	0-15	Front-end ID (2 ASCII characters)
TR_1	3	32-47	Transfer rate, megabits/s, integer portion (0-99)
TR_2	3	48-63	Transfer rate; megabits/s, fractional portion (integer 000-999)
DC	4	0-15	Disposition code (2 ASCII characters)
DF	4	16-31	Dataset format (2 ASCII characters)
TD	4	32-56	Direction (3 ASCII characters; "IN" or "OUT")
DUR	5	0-63	Length of time the stream has been active (8 ASCII characters; "*hh:mm:ss*")
SIZ	6	0-31	Dataset size (integer blocks)
CB	6	32-63	Current block number (integer)

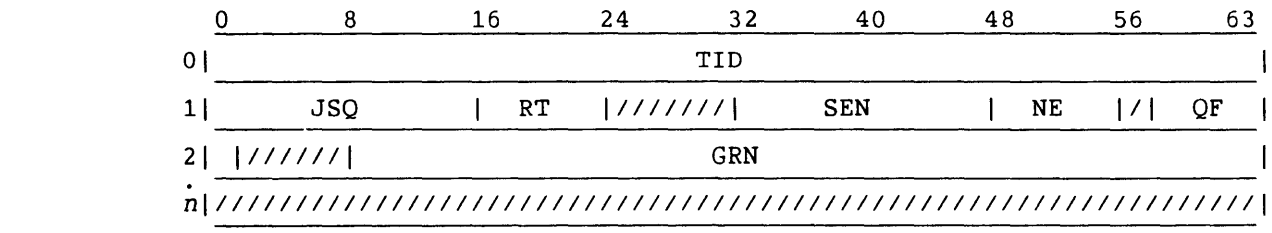
Generic Resource Status Request (64)

The front-end station sends the Generic Resource Status Request to request the current status of generic resources defined in COS. No stream is specified, but SCBs are valid for defined streams. This is a synchronous request.

LCP:



Segment:



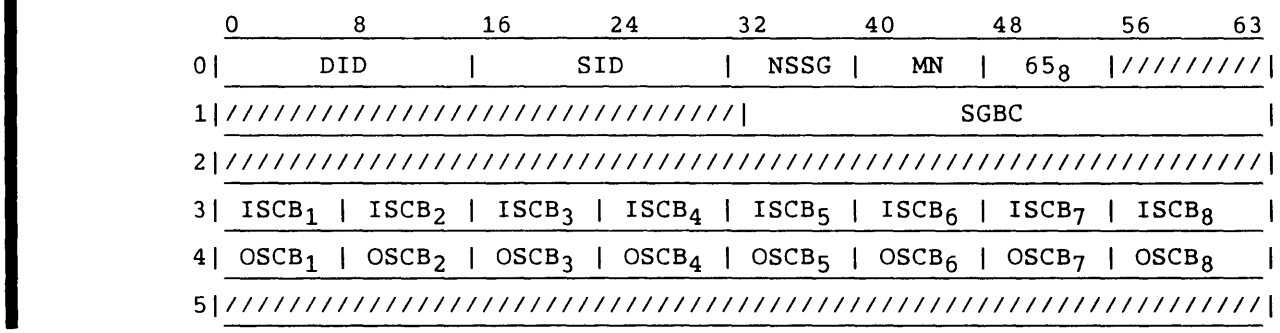
Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester
JSQ	1	0-15	Job sequence number
RT	1	16-23	Request type (octal): GRQRTQ=200 Requested by queue GRQRTJ=100 Requested by JSQ GRQRTP=40 Request a profile GRQRTG=20 Request by generic resource
SEN	1	32-47	Starting entry number
NE	1	48-55	Number of entries
QF	1	58-63	Queue flags (octal): GRQQIE=50 Input/Execute GRQQI =40 Input GRQQE =10 Execute

Field	Word	Bits	Description
ESR	2	0	Extended Status Request flag. If ESR is set, fields PGR, FLU, SWE, SUA, OS, and SST in the reply can be nonzero.
GRN	2	8-63	Generic resource name

Generic Resource Status Reply (65)

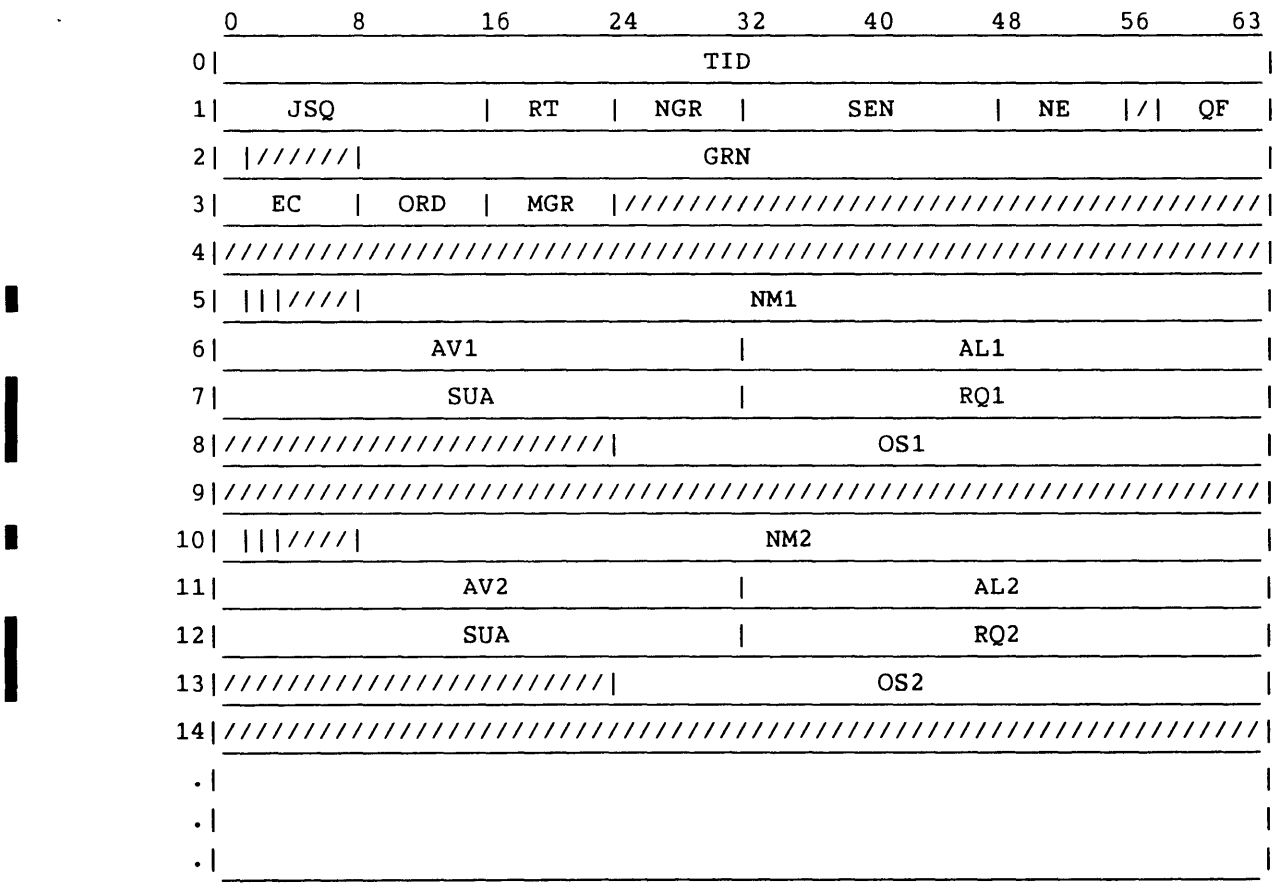
COS sends the Generic Resource Status Reply code in response to a Generic Resource Status Request (code 64).

LCP:

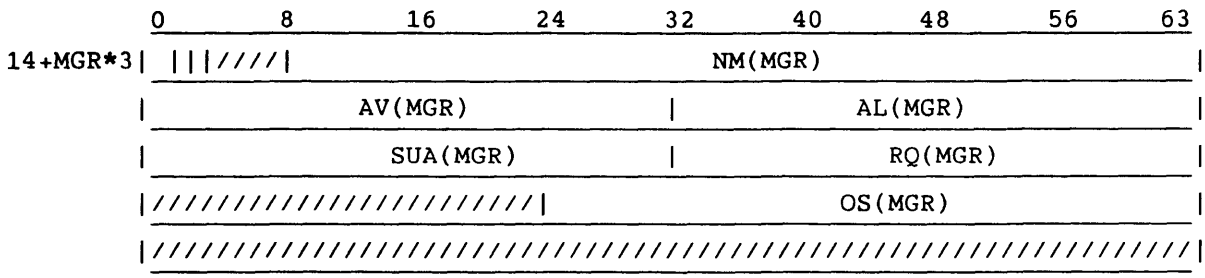


Segment:

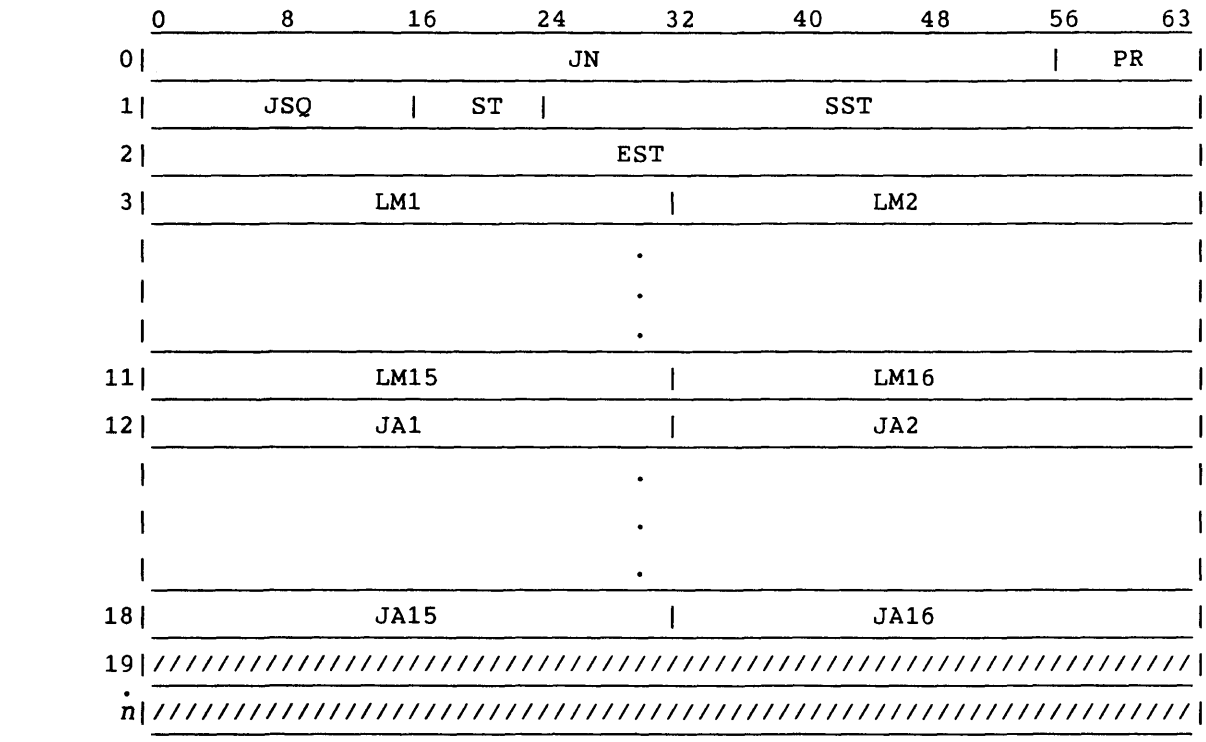
Header:



Header (continued):



Entry:
(MGR*5+5-1)



Header:

Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester
JSQ	1	0-15	Job sequence number
RT	1	16-23	Request type (octal) GRQRTQ=200 Requested by queue GRQRTJ=100 Requested by JSQ GRQRTP=40 Request a profile GRQRTG=20 Requested by generic resource

Header (continued):

Field	Word	Bits	Description
NGR	1	24-31	Number of resources used
SEN	1	32-47	Starting entry number
NE	1	48-55	Number of entries
QF	1	58-63	Queue flags (octal) GRQQIE=50 Input/Execute GRQQI =40 Input GRQQE =10 Execute
ESR	2	0	Extended Status Request flag. If ESR is set, fields PGR, FLU, SWE, SUA, OS, and SST can be nonzero.
GRN	2	8-63	Generic resource name
EC	3	0-7	Error code: GRRECJ=1 Specified JSQ not found GRRECN=2 Specified name not found
ORD	3	8-15	Ordinal of specified resource
MGR	3	16-23	Number of resources defined
PGR1	5	0	Preemptable generic resource if set
FLU1	5	1	FLUSH available if set
SWE1	5	2	Resource in SWEEP mode if set (if PGR=1)
NM1	5	8-63	Generic resource name
AV1	6	0-31	Available units
AL1	6	32-63	Allocated units
SUA1	7	0-31	Current swap units allocated (if PGR=1)
RQ1	7	32-63	Requested unit total
OS1	8	24-63	Current oversubscription ratio; 5 ASCII characters (if PGR=1)
PGR2	10	0	Preemptable generic resource if set

Header (continued):

Field	Word	Bits	Description
FLU2	10	1	FLUSH available if set
SWE2	10	2	Resource in SWEEP mode if set (if PGR=1)
NM2	10	8-63	Generic resource name
AV2	11	0-31	Available units
AL2	11	32-63	Allocated units
SUA2	12	0-31	Current swap units allocated (if PGR=1)
RQ2	12	32-63	Requested unit total
OS2	13	24-63	Current oversubscription ratio; 5 ASCII characters (if PGR=1)
.			
.			
.			
PGR(MGR)	MGR*5	0	Preemptable generic resource if set
FLU(MGR)	MGR*5	1	FLUSH available if set
SWE(MGR)	MGR*5	2	Resource in SWEEP mode if set (if PGR=1)
NM(MGR)	MGR*5	8-63	Generic resource name
AV(MGR)	MGR*5+1	0-31	Available units
AL(MGR)	MGR*5+1	32-63	Allocated units
SUA(MGR)	MGR*5+2	0-31	Current swap units allocated (if PGR=1)
RQ(MGR)	MGR*5+2	32-63	Requested unit total
OS(MGR)	MGR*5+2	24-63	Current oversubscription ratio; 5 ASCII characters (if PGR=1)

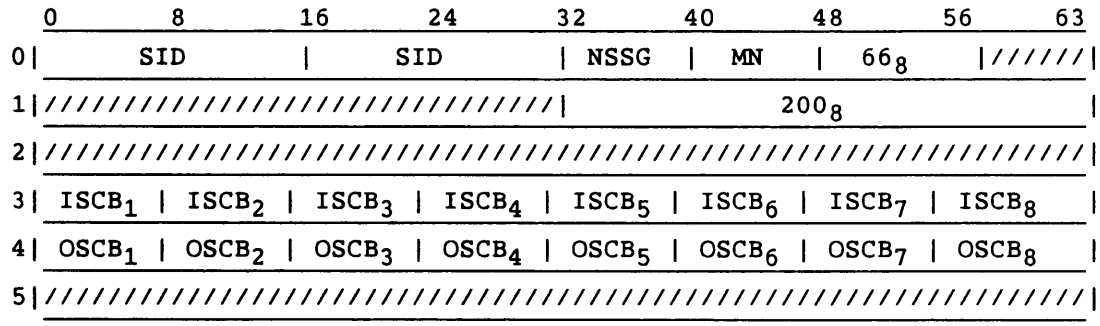
Entry:

Field	Word	Bits	Description
JN	0	0-55	Jobname (in ASCII)
PR	0	56-63	Job priority
JSQ	1	0-15	Job sequence number
ST	1	16-23	Job status (1 ASCII character)
SST	1	24-63	Swap status for resource name in GRN if PGR=1 (5 ASCII characters)
EST	2	0-63	Extended job status (8 ASCII characters)
LM1	3	0-31	Job statement limit for RN1
LM2	3	32-63	Job statement limit for RN2
.			
.			
.			
LM15	11	0-31	Job statement limit for RN15
LM16	11	32-63	Job statement limit for RN16
JA1	12	0-31	Number of units of RN1 allocated to the job
JA2	12	32-63	Number of units of RN2 allocated to the job
.			
.			
.			
JA15	18	0-31	Number of units of RN15 allocated to the job
JA16	18	32-63	Number of units of RN16 allocated to job

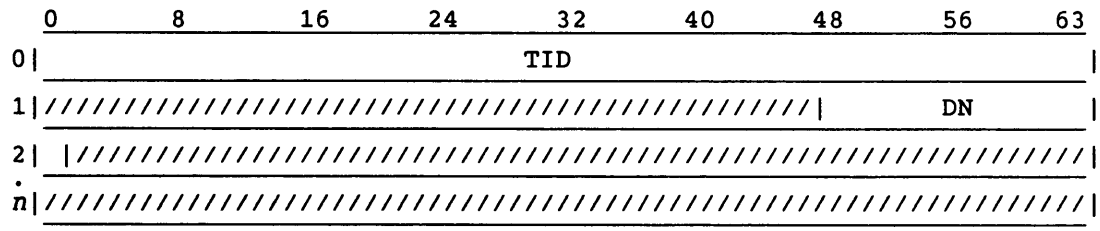
Task Display Request (66)

A Task Display Request code is sent by the front-end station to request a specified task display reply. This is a synchronous request.

LCP:



Segment:



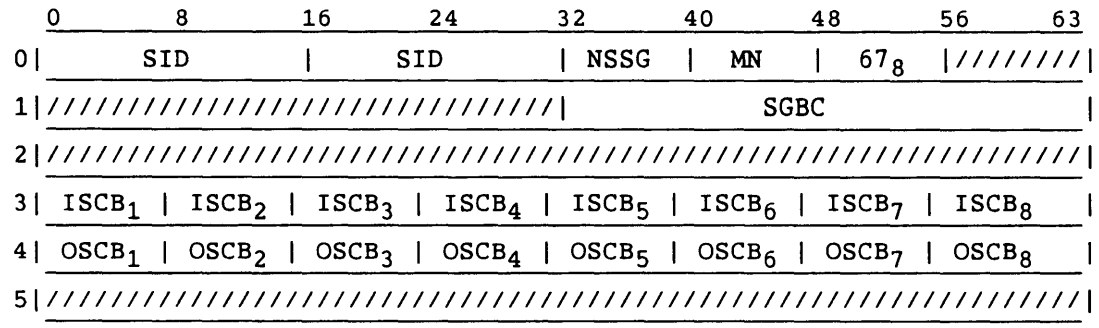
Field	Word	Bits	Description
TID	0	0-63	Terminal identifier as known to the requesting front end
DN	1	48-63	ASCII display name

Task Display Reply (67)

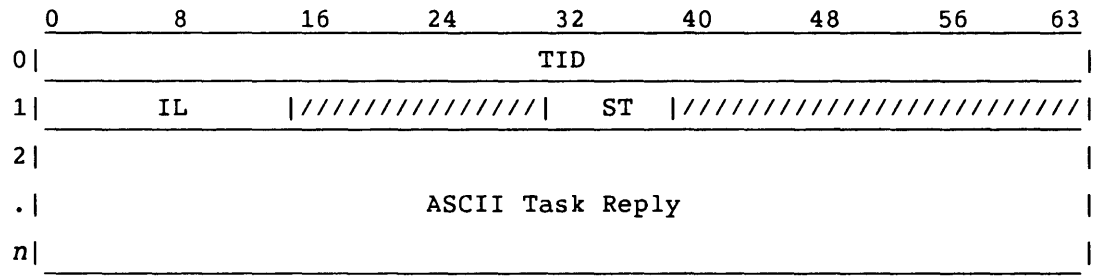
The Task Display Reply is the COS response to the front-end Task Display Request (code 66). No stream number is specified, but the SCBs are valid for the defined streams.

The Task Display Reply is composed of header followed by the actual display text (status = 3).

LCP:



Segment:

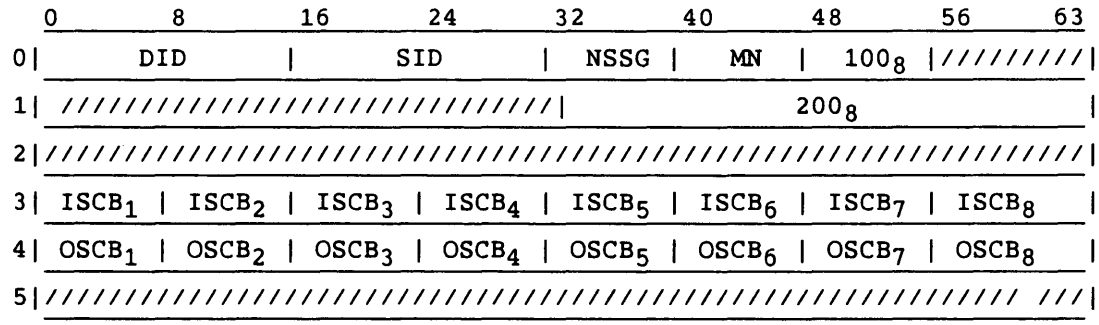


Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of requestor as known to the requesting front end
IL	1	0-16	Image length in characters
ST	1	32-39	Status: 1 Display not ready 2 Not from master operator 3 Display ready

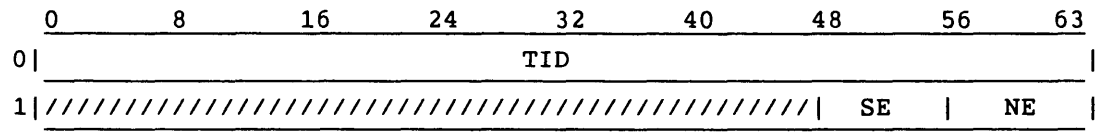
Swap Space Status Request (100)

The front-end station sends the Swap Space Status Request to request the current availability of swap space for preemptable generic resources configured on COS. No stream is specified, but SCBs are valid for defined streams. This is a synchronous request.

LCP:



Segment:

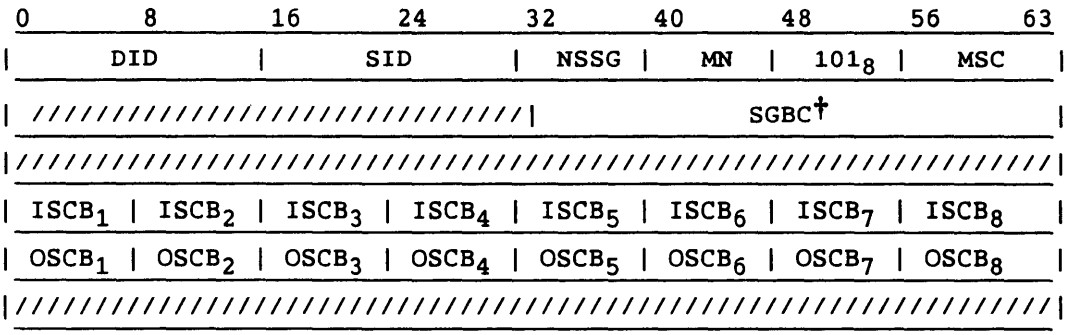


Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester
SE	1	48-55	Starting entry
NE	1	56-63	Number of entries

Swap Space Status Reply (101)

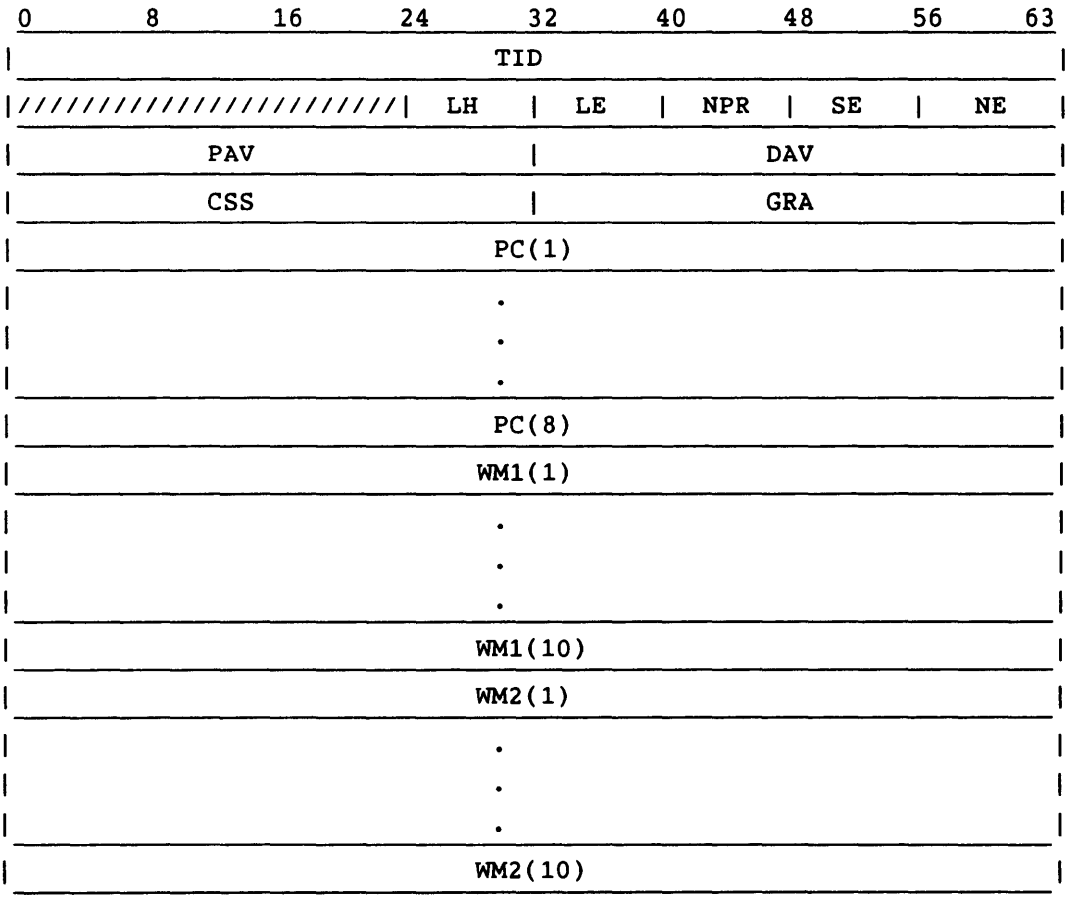
COS sends the Swap Space Status Reply in response to a Swap Space Status Request (code 100). No stream number is specified, but SCBs are valid for the defined streams.

LCP:



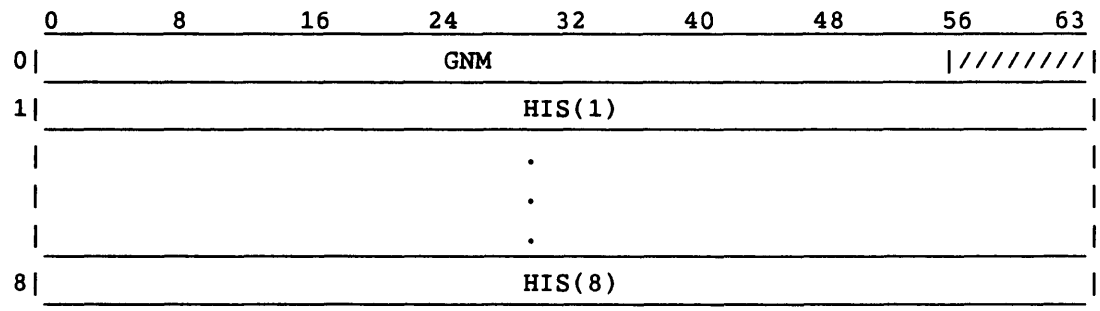
Segment:

Header:



† SGBC = 100_8 when MSC≠ 0; SGBC = 40_8 + (NE * 11_8) otherwise

Entry:



Header:

Field	Word	Bits	Description
TID	0	0-63	Terminal identifier of the requester
LH	1	24-31	Number of words in header
LE	1	32-39	Number of words in entry
NPR	1	40-47	Number of preemptable resources
SE	1	48-55	Starting entry
NE	1	56-63	Number of entries
PAV	2	0-31	Preferred space available
DAV	2	32-63	Default space available
CSS	3	0-31	Total swap space available (PAV + DAV)
GRA	3	32-63	Current device allocation on preemptable generic resources
PC	4	0-63	Histogram header line (8 words of ASCII characters)
.			
.			
.			
WM1	6	0-63	Warning message line 1 (10 words of ASCII characters)
.			
.			
.			
WM2	16	0-63	Warning message line 2 (10 words of ASCII characters)

Entry:

Field	Word	Bits	Description
GNM	0	0-55	Generic resource name
HIS	1	0-63	Histogram for resource (8 words of ASCII characters)

PROCESSING OF STATION MESSAGES 5

This section describes communication between COS tasks and station subroutines. The description gives specifics of implementation which, though outside the category of protocol, are included in this manual for the convenience of programmers.

Processing is described separately for the COS side and the station side. Message formats are shown in section 4 under codes 46 and 47. Type 3 messages are further described in section 6.

NOTE

The UNICOS Station Call Processor (USCP) does not currently support station messages.

5.1 COS PROCESSING

The station message feature allows COS tasks to pass information through the Station Call Processor (SCP) to front-end stations. A message can provide either text for an operator display or a communication path between the task and front-end software systems.

The COS task formats the header and message, and calls the Message Queue Handler (by means of the MSGQ macro) to queue the message. The message type specified by the requesting task in the message header determines the following:

- The format of the message text field
- The need for other parameters in the message header
- Required station processing

Message types 0 and 1 are ASCII-formatted text suitable for display. Message type 2 cancels an outstanding type 1 or 3 message. Type 3 messages are reserved for front-end servicing of datasets and are formatted by agreement between the Tape Queue Manager (TQM) and the station. Other message types allow tasks to communicate through the station to front-end software systems.

5.1.1 MESSAGE QUEUE HANDLER PROCESSING

Before queueing a message, the Message Queue Handler (COS common routine) verifies and processes it as follows. Fields named are in the station message.

1. If the terminal identifier (TID) and mainframe identifier (MF) fields are 0, the Master Operator TID and MF are entered in these fields.

2. The message number is entered into the MN field; this is a count of the messages queued to all front ends. Message numbers are not entered for type 2 messages.

3. The word count (text length) is checked. An error status is returned to the task if the message length exceeds the station segment size.

4. If LOG=1, the entire message is logged in the system logfile. If LOG=2, only the message header is logged. Messages are not logged during Startup. The LOG field is also processed when a response is received.

5. Errors that prevent the message from being queued are as follows:

   - The station is logged off or is currently logging on.

   - The station does not accept messages or does not accept the particular message type.

6. The message is put at the end of the current queue for the requested front end. If the urgent (UR) bit is set in the message header, the message is placed at the head of the queue.

5.1.2 ASCII MESSAGE TEXT FORMAT

Message types 0 and 1 transmit explanatory text from a task to a front-end station. The station displays the text, which contains no special characters or carriage control. Some consoles may require a limit of 64 characters per line.

5.1.3 MESSAGE QUEUE HANDLER RESPONSE FORMAT

The Message Queue Handler responds to the requesting task with the assigned message number and status in S1:

```
S1=32/0,16/MN,16/STATUS
```

MN is the message number and STATUS is the return status. If the status is nonzero, MN is undefined. See Station Message (46) in section 4 for a complete description of these fields.

Possible values for the return status are as follows:

Status	Meaning
000	Normal reply
100	The station is logging on, logging off, or not logged on.
101	This station does not accept any station messages.
102	Message buffer format error; there is no such message type.
104	The message is larger than the station segment size.
105	Message type not supported by the front end; the front end did not enable this message type at logon.

5.1.4 TASK MESSAGE TYPES

The task message type selects the kind of station processing desired by routing a message to the appropriate processor. There are two groups of message service:

- Group one, consisting of types 0, 1, and 2, allows COS to communicate with an operator or front-end console.
- Group two includes types 3 through *n*. The only message service currently in use is type 3 (used by TQM for front-end servicing of tapes). This group is intended for communication with front-end software systems.

The following paragraphs describe the different kinds of processing. Reply processing is described under message type 1.

5.1.4.1 Message type 0

Message type 0 informs the operator of important system activity, and does not require a response. The following is an example of such an informative message.

```
EQ DN20 90% FULL
```

The station displays a type 0 message and discards it after it has been displayed.

5.1.4.2 Message type 1

Message type 1 allows the task to request and receive a response associated with the message. The request should specify the acceptable responses in the message text. For example:

```
ERROR WRITING SYSTEM DUMP
Enter  GO    to reallocate and recopy the dump.
Enter  QUIT  to give up the dump copy operation.
```

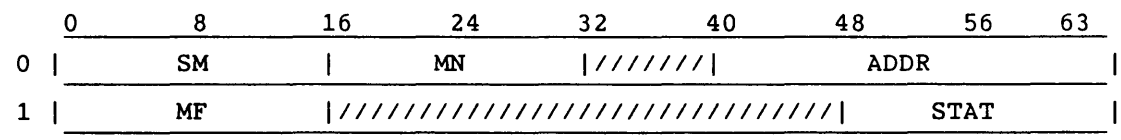
A default response should be included to allow processing to continue when the operator cannot intervene.

5.1.4.2.1 Response processing - The message and response are associated by the message number, which is returned by the response from the Message Queue Handler. The response header from the station includes the message number. The response text (ASCII) is in the text field.

If the response is unacceptable, the request should be repeated, indicating that the first response is in error and asking for a corrected reply. All requests should receive valid responses.

5.1.4.2.2 Response format - SCP passes the response message from the station to the task. The response message contains the station status code, message number, mainframe ID, and buffer address of the response.

Format:



Field	Word	Bits	Description
SM	0	0-15	ASCII characters SM
MN	0	16-31	Message number

Field	Word	Bits	Description
ADDR	0	40-63	Buffer address
MF	1	0-15	Mainframe ID
STAT	1	48-63	Status code (see following paragraph on response status)

5.1.4.2.3 Response status - The status field of the response header indicates the front-end status, which is transferred to the response reply. The normal value for this field is 000, which is accompanied by text.

5.1.4.2.4 Response logging - When the LOG field in a message header is nonzero, the header for the response is always logged. The remainder of the response is not logged.

5.1.4.2.5 Response guarantee - Type 1 messages that are queued or sent to a front-end station can be lost if there is a break in communication or if the station logs off. If a station logs off or on, or the channel is turned off or on, one reply is always sent to any task that has sent any type 1 message to that station. The Message Queue Handler guarantees that this reply is sent. The reply contains no buffer address or message number. The task determines which messages must be reissued for the station, and takes action.

5.1.4.3 Message type 2

Message type 2 cancels outstanding type 1 or 3 messages. The request includes a type 2 message code and the message number of the request to be cancelled. No text is included with a type 2 request, and no response is given. The message queueing routine does not assign message numbers to type 2 messages.

5.1.4.4 Message type 3

Type 3 messages, described in section 6, are reserved for tape service request (TSR) messages. TQM uses these messages to communicate with the station and a tape management system. Stations are not required to accept type 3 messages even if other types are accepted. All type 3 messages are handled as response-required messages.

5.1.4.5 Message types 4 through *n* (special format)

Special-format messages, types 4 through *n*, are reserved for communication between tasks and front-end software systems. Not currently in use, they are intended for use by COS in accessing special front-end software.

The message format must be acceptable to both the sending task and the receiving station; stations are not required to accept task-defined messages, even if other messages are accepted. Message types 0, 1, and 2 should be used when the purpose of a message is to communicate with the operator.

5.2 STATION PROCESSING

To process messages, the station performs the following functions:

- Determines the acceptable message types and specifies these types by means of the message type bits during logon
- Enables message processing at logon, which allows COS to send messages of the specified types
- Handles the flow of messages by specifying the maximum number of messages per segment
- Processes messages as required by each message type

5.2.1 PROCESSING DESCRIPTION

Message processing functions are performed as described in the following subsections.

5.2.1.1 Station message enabling

The station enables messages by entering a nonzero value in the message receive enable (MRE) field of the Logon segment, which is shown in section 4 under code 1. The value in MRE also specifies the maximum number of messages per segment. This maximum is based on the station's ability to buffer and process messages and on the expected message types. The number of messages in a segment can be changed by the message subcode field in the LCP of the station reply message, but this field cannot exceed the MRE value in the Logon segment.

5.2.1.2 Message type selection

Also in the Logon segment, the station specifies message types that it will receive, by setting bits in the message type enable (MTE) field.

Each bit specifies one type: the leftmost bit indicates type 0, and so on. The message type defines the characteristics of the message header and text field. Processing requirements for each type are discussed in subsection 5.2.2.

5.2.1.3 Request Pending flag

COS sets the Request Pending flag (RQP) when station messages are queued to be sent. The RQP flag is needed because certain front-end messages, such as operator function requests and display requests, require SCP to reply with the requested message, and no other. If a station is sending these requests continually, they block the transmission of a Station Message (MC=46) by SCP. The RQP flag therefore requests the station not to send operator requests to SCP. When COS receives an LCP which does not require a response, SCP sends the queued station messages. The stream control bytes (SCBs) should be specified in the Station Message LCP.

5.2.1.4 Message flow control

The station controls the message flow by means of the message subcode field of the message response LCP. This field specifies the number of messages per segment that can be sent with a station request. A value of 377 disables station messages. A value can be entered in the message subcode field even if no responses are included. The new limit cannot exceed the logon limit.

5.2.2 PROCESSING REQUIREMENTS FOR MESSAGE TYPES

Station messages have the following types:

- Type 0 is informative.
- Type 1 requests information.
- Type 2 cancels a request of type 1 or types 3 through *n*.
- Type 3 is used by TQM for tape service request messages.
- Types 4 through *n* are currently unused.

Types 0 through 2 are typically accepted by any stations that accept messages, especially those that provide Master Operator capabilities through command and display processing.

The station is not required to recover messages it has not replied to if communication is broken or the station is logged off. COS ensures that necessary messages are reissued when the station logs on again.

5.2.2.1 Message type 0

Message type 0 allows tasks to inform the operator about current system operation. The station posts the message and, depending on the station, can determine when the operator has displayed it. No reply is possible. Display of message type 0 is described under message type 1.

5.2.2.2 Message type 1

Message type 1 allows tasks to request information from an operator. It normally includes text explaining the message's purpose and acceptable responses. The station reacts as follows:

1. Displays the message
2. Accepts a response from an operator
3. Enters, in the response header, a word count for the response
4. Sets the status field to the correct status
5. Returns the response in the text field of the message

The message header for the response is otherwise the same as the header in the message request that prompted it. The station is not responsible for the correctness or applicability of the response. The task determines if the response is suitable.

For message types 0 and 1, the station can display the message number, the message text, and an indication of the urgency of the request. Urgent messages, indicated by the urgent (UR) bit, should be intensified or flashing, or put on a separate display.

5.2.2.3 Message type 2

Message type 2 allows a task to cancel an outstanding type 1 or 3 request. The request includes a type 2 code and the message number of the request to be cancelled. No text accompanies the request, and no response is possible.

5.2.2.4 Message type 3

Type 3 messages, described in section 6, are reserved for tape service request. Type 3 request messages are issued by the TQM and sent to a station, which interprets the station message text as a tape management system request. The tape management system reply is reformatted by the station, returned to COS, and passed back to the TQM.

5.2.2.5 Message types 4 through *n*

Message types 4 through *n*, which are currently unused, are reserved for stations and tasks with special communication needs. These message types can be displayable or non-displayable. The station makes a request to the host operating system or a host-resident software package. The host's reply, if any, is formatted as required by the station, returned to COS, and passed to the originating task.

TAPE SERVICE REQUESTS 6

This section describes type 3 station messages, which are generated by the Tape Queue Manager (TQM) for tape servicing. Tape servicing provides information about datasets and volumes that is needed for various cataloging schemes. The kind of type 3 message is determined by the function code (FC) field in the station message (see section 4, message code 46). Each kind of message consists of one or more tables. This section presents descriptions of the different messages and the tables used in each, then shows each table in detail.

TQM manages tape I/O between one or more user jobs and the I/O Subsystem (IOS). TQM is responsible for operator communications in the form of mount messages and device, controller, and channel reconfiguration processing.

NOTE

The UNICOS Station Call Processor (USCP) does not currently support station messages.

6.1 MESSAGE SUMMARIES

Each message text consists of one or more tables, described in subsection 6.2. This subsection describes the different kinds of messages and identifies the tables used in each. The function code shown after each heading is an octal representation of the FC field from the station message. Each message has a request version and a reply version. The two versions use the same format, so that when a front end does not accept these message types, the request message can act as a reply in which no processing occurred.

6.1.1 MOUNT REQUEST (100) AND REMOUNT REQUEST (102)

The Mount and Remount Requests indicate that a tape volume should be mounted on a particular drive. TQM sends the message to the servicing front-end and/or Master Operator station. The message does not invoke

any auxiliary servicing other than issuance of a message to an operator console. The servicing front end can transform the information in the message into a displayable operator message which is equivalent to an operator message on the host system. TQM provides an ASCII-displayable default message for stations which do not format the information.

Table	Word Count	Description
FSH	Variable	Front-end service message header
RMX	Variable	(Re)mount auxiliary information table

6.1.2 MOUNT REPLY (101) AND REMOUNT REPLY (103)

The Mount Reply and Remount Reply tell TQM that the operator has intervened. The reply is sent by the servicing front end or Master Operator station. TQM honors the RESELECT or ABORT options; for other values TQM reissues the original Mount or Remount Request.

Table	Word Count	Description
REP	1	Operator response: 'ABORT'L Abort job 'RESELECT'L Select different device

6.1.3 DATASET ENQUIRY REQUEST (200)

The Dataset Enquiry Request tells the servicing front end that a certain job requests a certain tape dataset. The message is issued when TQM processes an ACCESS request.

Table	Word Count	Description
FSH	Variable	Front-end service header
DEX	2	Dataset Enquiry Information Table
LDT	Variable	Label Definition Table

6.1.4 DATASET ENQUIRY REPLY (201)

The Dataset Enquiry Reply returns information, including DEX and LDT, to TQM after a TQM request. DEX contains servicing statuses; the returned LDT, which overwrites the user LDT, can contain new information about the

dataset and its characteristics. For example, it can contain a VSN list or change the block size of the dataset. The supplementary logfile message, if present, is sent to the user or system logfile; this message is independent of the return status.

Table	Word Count	Description
FSH	Variable	Front-end service header
DEX	2	Dataset Enquiry Information Table
LDT	Variable	Label Definition Table
TMSG	Variable	Supplementary logfile message

6.1.5 DATASET UPDATE REQUEST (202)

TQM sends the Dataset Update Request to the front end when the dataset is released. This message contains the following information:

- Volumes used
- Catalog function to be performed, derived from the SAVE, DELETE, or ACCESS statements
- Characteristics used while the dataset was being accessed
- Error conditions existing while the dataset was being accessed

Table	Word Count	Description
FSH	Variable	Front-end service header
DUX	3	Dataset Update Auxiliary Information Table
LDT	Variable	Label Definition Table

6.1.6 DATASET UPDATE REPLY (203)

The Dataset Update Reply tells TQM whether the requested update was successful. An error status causes TQM to abort the job. The supplementary logfile message, if present, is sent to the user or system logfile; this message is independent of the return status.

Table	Word Count	Description
FSH	Variable	Front-end service header
DUX	3	Dataset Update Information Table
TMSG	Variable	Supplementary logfile message

6.1.7 VOLUME ACCESS REQUEST (300)

The Volume Access Request from TQM tells the servicing front end that TQM is about to perform its first I/O operation on the volume, and requests that the front end allow COS to read or write the volume. Every field in the LDT contains a value, which is either a system default, a user specification, or a value from the first volume label group.

Table	Word Count	Description
FSH	Variable	Front-end service header
VAX	3	Volume Access Auxiliary Information Table
LDT	Variable	Label Definition Table
LBL	Variable	Label Group Table

6.1.8 VOLUME ACCESS REPLY (301)

The servicing front-end sends the Volume Access Reply in response to a Volume Access Request. The reply includes the following:

- Access information
- Indication of the existence of the volume in a tape management catalog (TMC)
- Expiration of the volume
- Protection status of the volume
- A supplementary set of logfile messages concerning the request

The supplementary logfile message, if present, is sent to the user or system logfile; this message is independent of the return status.

Table	Word Count	Description
FSH	Variable	Front-end service header
VAX	3	Volume Access Auxiliary Information Table
TMSG	Variable	Supplementary logfile message

6.1.9 VOLUME UPDATE REQUEST (302)

TQM sends the Volume Update Request after processing the Beginning of Volume (BOV) label group, indicating that the job will process the specified volume. For read mode datasets, the message is sent after BOV label processing is complete; for write mode datasets, it is sent after the new label group is written.

Table	Word Count	Description
FSH	Variable	Front-end service header
VUX	4	Volume Access Auxiliary Information Table
LDT	Variable	Label Definition Table

6.1.10 VOLUME UPDATE REPLY (303)

The Volume Update Reply tells TQM whether the requested update was successful. An error status causes TQM to abort the job. The supplementary logfile message, if present, is sent to the user or system logfile; this message is independent of the return status.

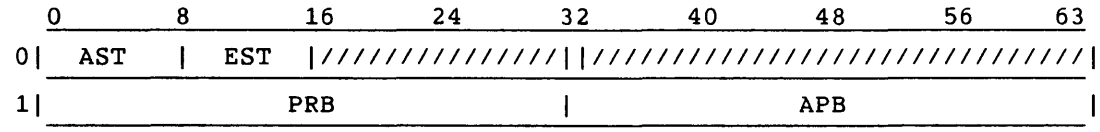
Table	Word Count	Description
FSH	Variable	Front-end service header
VUX	4	Volume Update Auxiliary Information Table
TMSG	Variable	Supplementary logfile message

6.2 MESSAGE TABLE DESCRIPTIONS

This subsection, arranged alphabetically by table name, shows formats for type 3 message tables that are used in more than one kind of message. Subsections 6.1.1 through 6.1.10 list the tables used in each kind of message.

6.2.1 DATASET ENQUIRY AUXILIARY INFORMATION TABLE (DEX)

The Dataset Enquiry Auxiliary Information Table is used in the Dataset Enquiry handshake (Request and Reply).



Fields used in the Request:

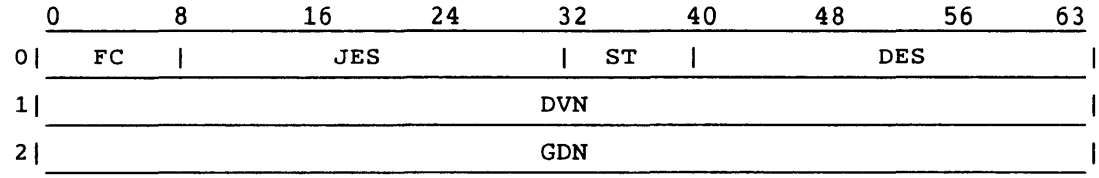
Field	Word	Bits	Description
PRB	1	0-31	Requested permission bits: 31 Read 30 Write 29 Read/write 28 Write/read 27 Extend (append/modify) 26 Delete (uncatalog) 25 Recatalog 24 Characteristic change

Fields used in the Reply:

Field	Word	Bits	Description
AST	0	0-7	Accessibility status: 0 Not implemented 1 Yes, and mainframe is secure 2 No 3 Yes, but mainframe is not secure
EST	0	8-15	Existence status: 0 Not implemented 1 Exists in catalog 2 Does not reside in catalog 3 Mainframe has no dataset catalog
ARG	0	32	Allowable ring status: 0 In 1 Out
APB	1	32-63	Allowable permission bits: 31 Read 30 Write 29 Read/write 28 Write/read 27 Extend (append/modify) 26 Delete (uncatalog) 25 Recatalog 24 Characteristic change

6.2.2 DATASET UPDATE AUXILIARY TABLE (DUX)

The Dataset Update Auxiliary Table is used in the Dataset Update handshake (Request and Reply).



Fields used in the Request:

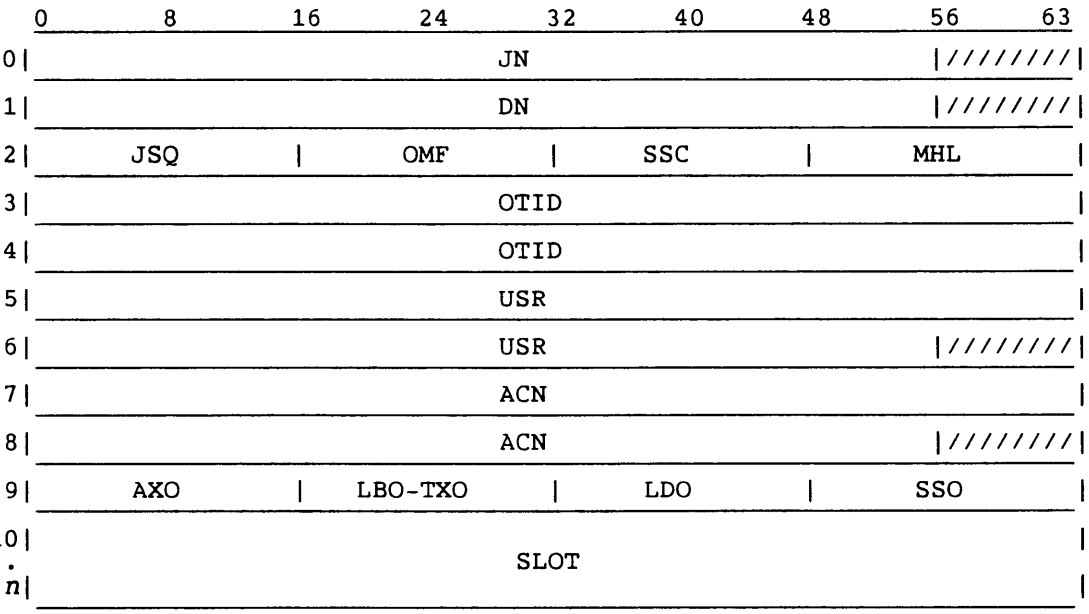
Field	Word	Bits	Description
FC	0	0-7	Update function code: 0 No operation 1 Enter into catalog 2 Update catalog entry 3 Delete from catalog
JES	0	8-31	Job error state/last abort code
DES	0	40-63	Dataset error state/last error code
DVN	1	0-63	Logical device name
GDN	2	0-63	Generic device name

Fields used in the Reply:

Field	Word	Bits	Description
FC	0	0-7	Update function code: 0 No operation 1 Enter into catalog 2 Update catalog entry 3 Delete from catalog
ST	0	32-39	Update completion status: 0 Not performed 1 Pass 2 Fail 3 Already cataloged 4 Not cataloged 5 Mainframe has no dataset catalog

6.2.3 FRONT-END SERVICE MESSAGE HEADER (FSH)

The front-end service message header identifies the job that is using the dataset or volume referenced in a particular type 3 message. All type 3 messages include an FSH. All offsets in the following table are from the beginning of FSH.



Field	Word	Bits	Description
JN	0	0-55	Jobname
DN	1	0-55	Local dataset name
JSQ	2	0-15	Job sequence number
OMF	2	16-31	Mainframe of job origin
SSC	2	32-47	Station slot count
MHL	2	48-63	Overall message header length: station slot count plus the length of the FSH, up to the slot area
OTID	3-4	0-63	Terminal ID of job origin
USR	5 6	0-63 0-55	User number
ACN	7 8	0-63 0-55	Account number

Field	Word	Bits	Description
AXO	9	0-15	Auxiliary Information Table offset
LBO or TXO	9	16-31	Label group offset (request) Text message offset (reply)
LDO	9	32-47	LDT offset
SSO	9	48-63	Station slot offset
SLOT	10-*n*	0-63	Optional station slot information; station slot is described in section 8.

6.2.4 LABEL DEFINITION TABLE (LDT)

The Label Definition Table describes the tape label, and consists of four parts: the LDT header, volume header (VOL1), header 1 entry (HDR1), and header 2 entry (HDR2). Except for the LDT header, which points to the other entries, these entries are optional and can appear anywhere after the header. The following conditions must be met for the proper construction of an LDT:

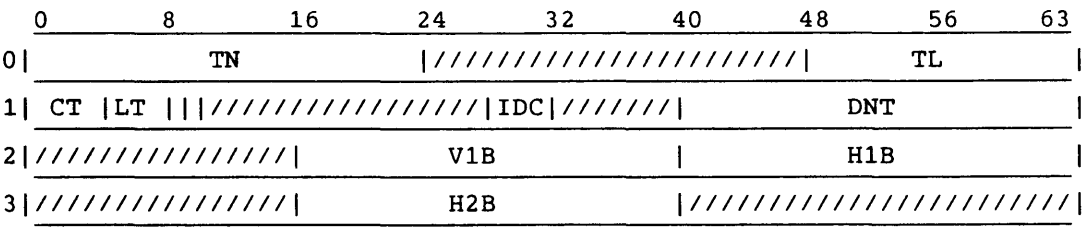
- The header must be present.
- The header must precede each entry (VOL1, HDR1, and HDR2).
- Each entry must be pointed to by the offset value in the LDT header. Zero is used for absent entries.
- The lengths of the whole LDT and of each entry must be set in the proper fields.
- The length of the VOL1 entry can be set to include up to 255 VSNs, but must be sufficient to include at least one VSN.
- The length value for either header 1 or header 2 must be at least the defined length of the respective entry.

6.2.4.1 LDT header

The LDT header, required on all LDTs, serves the following functions:

- Specifies the beginning and end of the LDT

- Specifies the location of each LDT entry with respect to the LDT base
- Identifies nonstandard aspects of a dataset

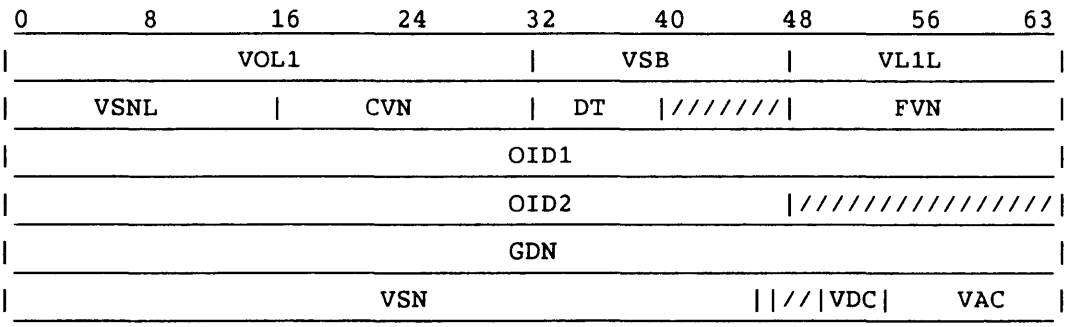


Field	Word	Bits	Description
LDTN	0	0-23	Table name ("LDT" in ASCII)
LDTL	0	48-63	Table length (variable)
LDCT	1	0-3	Numeric conversion type: 0 No conversion (DPCTNONE) 1 32-bit conversion (DPCTIBM)
LDLT	1	4-7	Requested label type: 0 Nonlabeled (TPLNL) 1 ANSI standard labels (TPLAL) 2 IBM standard labels (TPLSL)
LDPROT	1	8	Protected access indicator. If nonzero for a new tape dataset, the dataset is to be protected on the servicing front end.
LDCAT	1	9	Cataloged dataset indicator
LDIDC	1	28-31	Initial dataset disposition: 0 Old dataset (TPOLD) 1 New dataset (TPNEW) 2 Mod dataset (TPMOD)
LDDNT	1	40-63	Dataset Name Table (DNT) pointer. The field value is JTA-relative.
LDV1B	2	16-39	Offset of volume 1 entry, relative to LDT base. If the LDT does not contain a VOL1 entry, this field must be 0.

Field	Word	Bits	Description
LDH1B	2	40-63	Offset of header 1 entry, relative to LDT base; must be 0 if there is no HDR1 entry.
LDH2B	3	16-39	Offset of header 2 entry, relative to LDT base; must be 0 if there is no HDR2 entry.

6.2.4.2 Volume 1 entry

The volume 1 entry corresponds to volume 1 labels for all volumes in the dataset. This optional entry can be placed anywhere after the header, as long as the LDV1B header field points to it properly.



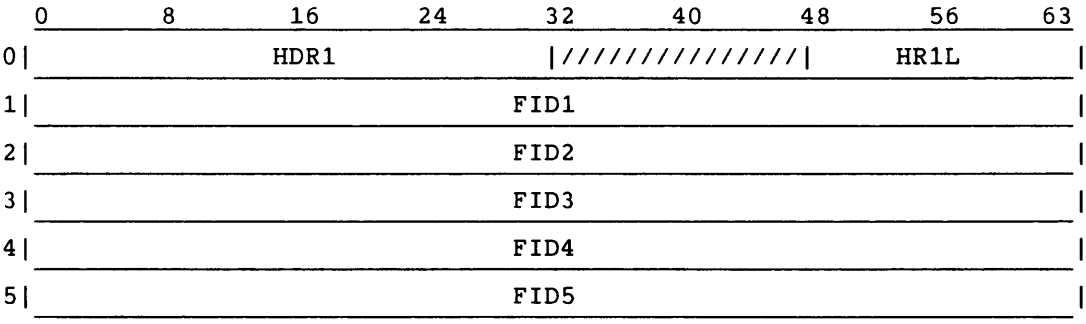
Field	Word	Bits	Description
LDVOL1	0	0-31	Entry name ("VOL1" in ASCII)
LDVSB	0	32-47	Volume serial list base offset (*m*)
LDVL1L	0	48-63	Volume 1 length (*m*+1)
LDVSNL	1	0-15	Number of VSNs in entry
LDCVN	1	16-31	Current VSN ordinal
LDDT	1	32-39	Device type: 0 TPD62 - 6250 bpi 1 TPD16 - 1600 bpi
LDFVN	1	48-63	First VSN ordinal: ordinal of VSN corresponding to the volume sequence number in the access condition.

Field	Word	Bits	Description
LDOID	2-3		Owner identifier:
LDOID1	2	0-63	Characters 1-8
LDOID2	3	0-47	Characters 9-14
LDGDN	4	0-63	Generic device name
LDVSN	*m-n*	0-47	Volume serial number
LDVRG	*m-n*	48	Volume Registered flag, set by a servicing front end. When set, the VSN is from the front-end catalog.
LDVDC	*m-n*	52-55	Volume disposition: 0 Existing dataset (TPOLD) 1 New volume to dataset (TPNEW)
LDVAC	*m-n*	56-63	Volume accessibility character, obtained from the label group

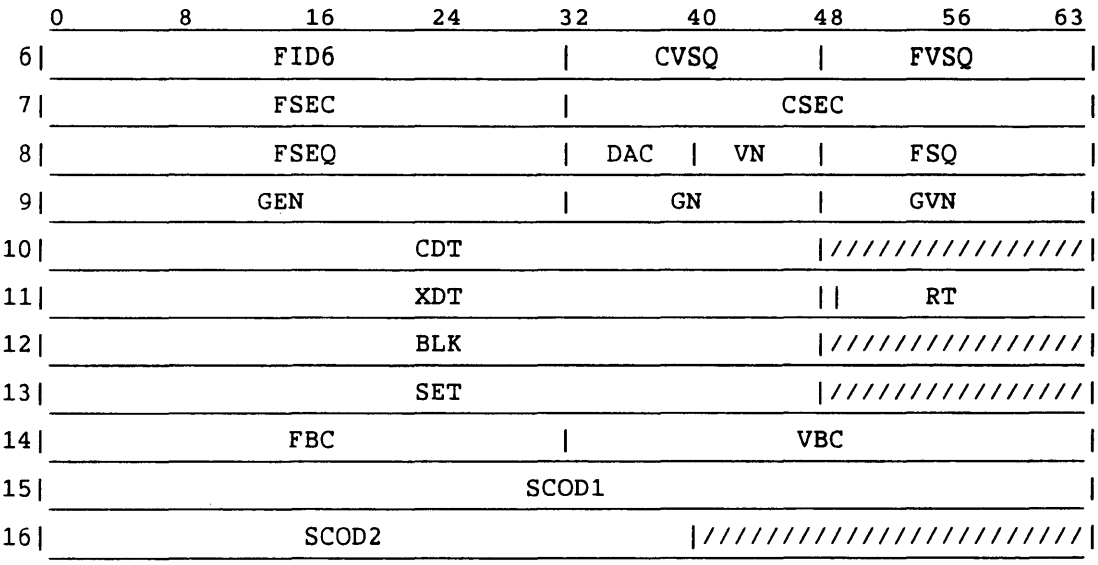
6.2.4.3 Header 1 entry

The header 1 entry describes dataset attributes and corresponds to the HDR1, EOF1, and EOV1 labels for all volumes in the dataset. Header 1 shows numeric fields in both binary and ASCII. COS uses ASCII for generating and validating the label group. If a field is changed, both versions must be changed. ASCII fields are right-justified with leading 0's.

The header 1 entry is optional and can be placed anywhere after the header, as long as it is pointed to by header field LDH1B.



Header 1 entry (continued):



Field	Word	Bits	Description
LDHDR1	0	0-31	Entry name ("HDR1" in ASCII)
LDHR1L	0	48-63	Header 1 length
LDFID	1-6		File identifier (dataset name)
LDFID1	1	0-63	Characters 1-8
LDFID2	2	0-63	Characters 9-16
LDFID3	3	0-63	Characters 17-24
LDFID4	4	0-63	Characters 25-32
LDFID5	5	0-63	Characters 33-40
LDFID6	6	0-31	Characters 41-44
LDCVSQ	6	32-47	Current volume sequence number (file section number); binary equivalent of LDCSEC.
LDFVSQ	6	48-63	First volume sequence number (file section number); binary equivalent of LDFSEC.
LDFSEC	7	0-31	First volume sequence number (file section number), in ASCII; the ordinal number of the volume to be mounted first
LDCSEC	7	32-63	Current volume sequence number (file section number), in ASCII; the ordinal number of the currently-mounted volume.

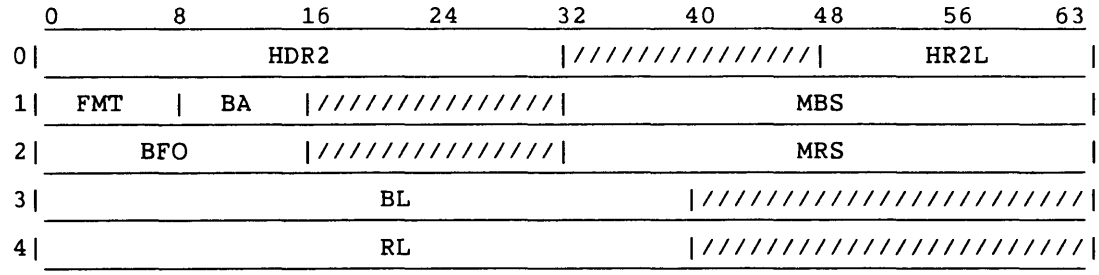
Field	Word	Bits	Description
LDFSEQ	8	0-31	File sequence number (ASCII) ordinal of the dataset being accessed. If FSEQ > 1, the volume has more than one dataset.
LDDAC	8	32-39	Dataset accessibility character
LDVN	8	40-47	Generation version number; numeric equivalent of LDGVN.
LDFSQ	8	48-63	File sequence number; numeric equivalent of LDFSEQ.
LDGEN	9	0-31	Generation number. Any value other than 1 indicates that a dataset is in a generation data group.
LDGN	9	32-47	Generation number; numeric equivalent of LDGEN.
LDGVN	9	48-63	Generation version number (ASCII). Any value other than 0 indicates that the dataset is in a generation data group.
LDCDT	10	0-47	Creation date (ASCII). This field indicates the creation date of the dataset in the Julian form: ' *yyddd*'. Note that the space (LDCSP) must be present.
LDCSP		0-7	Space
LDCYR		8-23	Year
LDCDY		24-47	Day
LDXDT	11	0-47	Expiration date; same format as creation date (LDCDT).
LDXSP	11	0-7	Space
LDXYR	11	8-23	Year
LDXDY	11	24-47	Day
LDUXD	11	48	User-specified XDT (Expiration Date) flag. If set, the user explicitly coded XDT on the access statement.
LDRT	11	49-63	Retention period in integer days

Field	Word	Bits	Description
LDBLK	12	0-47	Volume block count (ASCII); number of user data blocks present, read from or written into the label. Can be inaccurate because overflow causes it to be cleared; see LDVBC for an accurate count.
LDSET	13	0-47	File set identifier; normally set to the serial number of the first volume in the dataset.
LDFBC	14	0-31	File block count (binary)
LDVBC	14	32-63	Volume block count (binary); number of blocks written on the volume so far.
LDSCOD	15-16		System identification code, to identify the operating system or computer system that generated the tape volume:
LDSCOD1	15	0-63	Characters 1-8
LDSCOD2	16	0-39	Characters 9-13

6.2.4.4 Header 2 entry

The header 2 entry describes dataset attributes and corresponds to the HDR2, EOF2, and EOV2 labels for all volumes in the dataset. Header 2 shows numeric fields in both binary and ASCII characters. COS uses the ASCII equivalents for generating and validating the label group. If a field is changed, both versions must be changed. ASCII fields are right-justified with leading 0's.

The header 2 entry is optional and can be placed anywhere after the header, as long as it is pointed to by header field LDH2B.

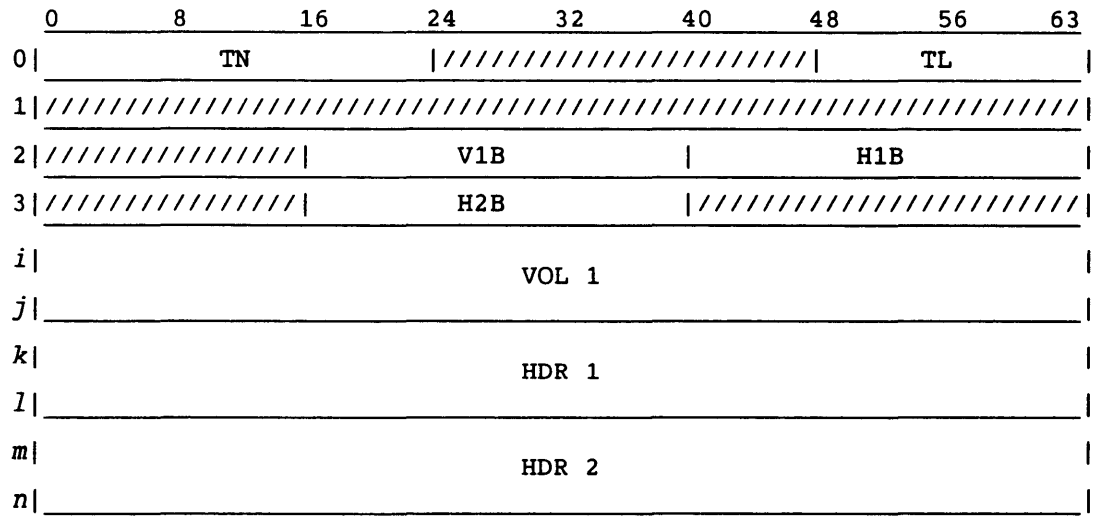


Field	Word	Bits	Description
LDHDR2	0	0-31	Entry name ("HDR2" in ASCII)
LDHR2L	0	48-63	Header 2 length
LDFMT	1	0-7	Record format; a character identifying the structure of the logical records. IBM label types: F Fixed-length records V Variable-length records U Undefined record format ANSI label types: F Fixed-length records D Variable-length records S Records span tape blocks.
LDBA	1	8-15	Blocking attributes; a character identifying how the logical records are placed in tape blocks (IBM label types only): B Blocks are an integral multiple of the record size. S Records span tape blocks. R Records span tape blocks, and the records are an integral multiple of the block size.
LDMBS	1	32-63	Maximum block size (binary), maximum size of any tape block that can be read or written
LDBFO	2	0-15	Buffer offset, ANSI only (not currently supported by COS)
LDMRS	2	32-63	Maximum record size (binary); maximum size of any record that can be read or written.
LDBL	3	0-39	Maximum block size (ASCII); maximum number of bytes in a tape block, read from or written into the label. Can be inaccurate because overflow causes it to be cleared; see LDMBS for an accurate count.

Field	Word	Bits	Description
LDRL	4	0-39	Maximum record size (ASCII); maximum number of bytes in a tape record, read from or written into the label. Can be inaccurate because overflow causes it to be cleared; see LDMRS for an accurate count.

6.2.5 LABEL GROUP TABLE (LBL)

The Label Group Table lists the labels on the tape. The LBL header points to the actual tape labels: VOL1, HDR1, and HDR2. The header is named LBL.

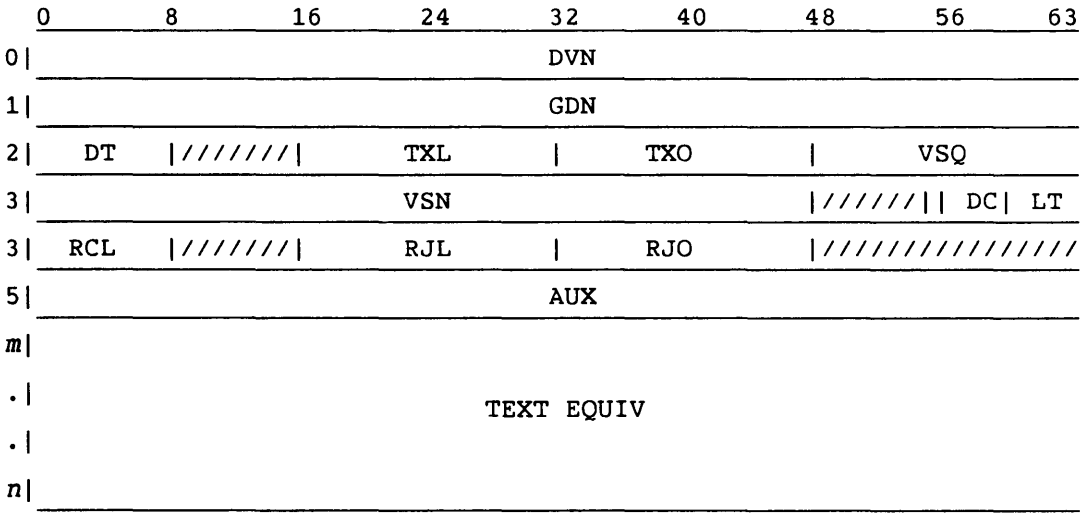


Field	Word	Bits	Description
TN	0	0-23	Table name ('LBL' in ASCII)
TL	0	48-63	Table length (variable)
V1B	2	16-39	Location of volume 1 entry; offset relative to LBL base (*i*).
H1B	2	40-63	Location of header 1 entry; offset relative to LBL base (*k*).
H2B	3	16-39	Location of header 2 entry; offset relative to LBL base (*m*).

Field	Word	Bits	Description
VOL 1	*i-j*	0-63	Volume 1 label
HDR 1	*k-l*	0-63	Header 1 label
HDR 2	*m-n*	0-63	Header 2 label

6.2.6 (RE)MOUNT AUXILIARY INFORMATION TABLE (RMX)

The (Re)mount Auxiliary Information Table is used in the Mount Request and Remount Request for constructing an operator message concerning the mounting of a tape volume.

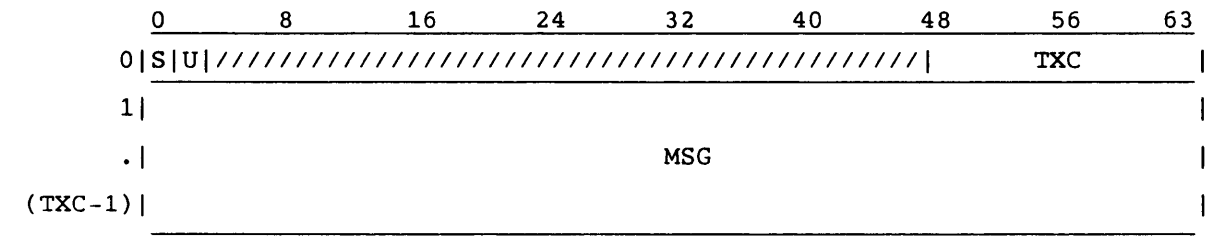


Field	Word	Bits	Description
DVN	0	0-63	Device name
GDN	1	0-63	Generic device type
DT	2	0-7	Device type (see LDT)
TXL	2	16-31	Length of text equivalent
TXO	2	32-47	Offset to text equivalent (*m*)
VSQ	2	48-63	Volume sequence number
VSN	3	0-47	Volume serial number

Field	Word	Bits	Description
RG	3	55	Ring Status: 0 In 1 Out
DC	3	56-59	Disposition: 0 Old 1 New
LT	3	60-63	Label type: 0 Nonlabeled 1 ANSI standard label 2 IBM standard label
RCL	4	0-7	Reject class: 0 No reject condition 1 Wrong VSN 2 Wrong label type 3 Ring change 4 Not scratchable 5 Label data error 6 Reset hit
RJL	4	16-31	Length of reject reason
RJO	4	32-47	Offset to reject reason
AUX	5	0-63	Reject reason. Contents vary according to reject class (RCL field): RCL — AUX field contents 1 — Actual VSN of volume 2 — Actual label type of volume 3 — Remove/insert 4 — Abort code 5,6 — Blanks
TEXT EQUIV	*m-n*	0-63	Formatted message in ASCII; size specified by TXL field.

6.2.7 SUPPLEMENTARY LOGFILE MESSAGE (TMSG)

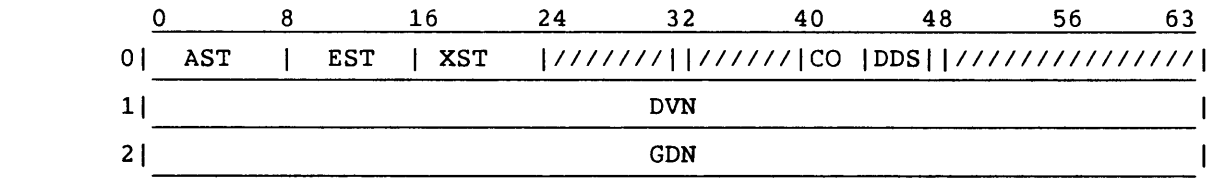
The supplementary logfile contains all messages to be logged, and can be supplied on all servicing replies from the servicing station. One or all of the supplied messages can be independent, depending on the action (status) communicated in the reply.



Field	Word	Bits	Description
S	0	0	System Log Issue flag: 0 Do not issue to system logfile 1 Issue to system logfile
U	0	1	User Log Issue flag: 0 Do not issue to user logfile 1 Issue to user logfile
TXC	0	48-63	Message text length in words
MSG	1-(TXC-1)	0-63	Message to issue. Each message line occupies 80 bytes (10 words). A zero byte is used to terminate the message before 80 bytes.

6.2.8 VOLUME ACCESS AUXILIARY INFORMATION TABLE (VAX)

The Volume Access Auxiliary Information Table is used in the Volume Access handshake (Request and Reply).



Fields used in the Request:

Field	Word	Bits	Description
CO	0	40-43	Current operation: 1 Read 2 Write

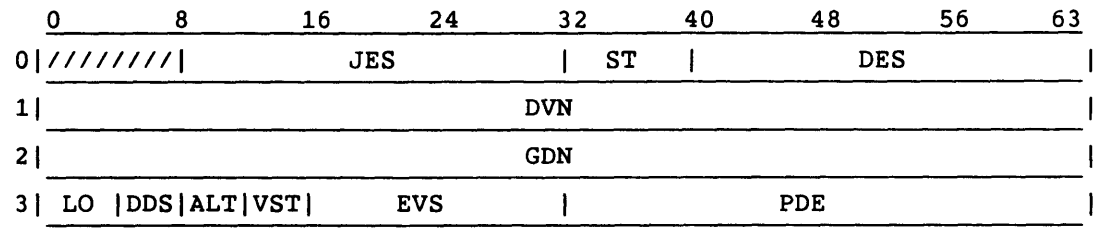
Field	Word	Bits	Description
DDS	0	44-47	Dataset disposition: 0 Old 1 New 2 Mod
DVN	1	0-63	Logical device name
GDN	2	0-63	Generic device name

Fields used in the Reply:

Field	Word	Bits	Description
AST	0	0-7	Accessibility status: 0 Not implemented 1 Yes, and mainframe/station is secure 2 No 3 Yes, but mainframe/station is not secure
EST	0	8-15	Existence status: 0 Not implemented 1 Resides in volume catalog; accept. 2 Does not reside in volume catalog; reject. 3 No volume catalog; accept.
XST	0	16-23	Expiration status: 0 Not implemented 1 Volume is expired 2 Volume is not expired 3 Invalid expiration date
ARG	0	32	Allowable Ring Status: 0 In 1 Out
FAT	0	48	Fatal Access flag: 0 Access to continue 1 Abort access

6.2.9 VOLUME UPDATE AUXILIARY INFORMATION TABLE (VUX)

The Volume Update Auxiliary Information Table is used in the Volume Update handshake (Request and Reply).



Fields used in the Request:

Field	Word	Bits	Description
JES	0	8-31	Job error state/last abort code
DES	0	40-63	Dataset error state/last error code
DVN	1	0-63	Logical device name
GDN	2	0-63	Generic device name
LO	3	0-3	Last I/O operation: 1 Read 2 Write
DDS	3	4-7	Dataset disposition (original/access): 0 Old 1 New 2 Mod
ALT	3	8-11	Actual label type: 0 Nonlabeled 1 ANSI standard label 2 IBM standard label
VST	3	12-15	Volume state: 0 Beginning-of-volume (BOV) 1 End-of-volume (EOV) 2 End-of-file (EOF) 3 Close (read only) 4 Rewind (read only)
EVS	3	16-31	Cumulative volume states, which correspond to previous VSTs. Bits are numbered from the right.
PDE	3	32-63	Permanent data errors

Field used in the Reply:

Field	Word	Bits	Description
ST	0	32-39	Update completion status: 0 Not performed 1 Pass 2 Fail

COS INTERACTIVE SYSTEM 7

This section describes how a COS interactive system is implemented. Though outside the category of protocol, this description is included for the convenience of programmers. A COS interactive system consists of a Cray computer system connected to a front-end computer, provided the front end is defined internally as an interactive system. The front end serves as an *interactive concentrator* for one or more user terminals. The COS interactive protocol serves the following functions:

- Initiates interactive jobs on the Cray computer system
- Routes messages from a terminal to its job
- Routes each message from a job to its terminal
- Monitors and controls interactive jobs
- Terminates interactive jobs

Refer to appendix A for a discussion of UNICOS Station Call Processor (USCP) interactive support.

7.1 INTERACTIVE STATION

An *interactive station* is a program residing on a front-end computer, which handles COS interactive protocol and allows users to communicate interactively with the Cray computer system. Most interactive stations consist of two major parts:

- The *concentrator* is the software that logs on to the Cray mainframe and handles the COS interactive protocol. The concentrator can stand alone or be combined with a batch station.
- The *terminal driver* accepts user input, makes requests of the concentrator, and displays output from the Cray mainframe. There is typically one copy of the terminal driver for each active terminal.

A station logon, which is distinct from an interactive terminal logon, initiates the logical link between the station and COS, and permits the station to send messages and receive replies. See section 4 for details of the station logon.

7.1.1 STATION TYPES

When a front-end station logs on to the Cray computer system, it must specify a *station type*. This type can be batch-only, interactive-only, or both.

Batch-only stations cannot send Interactive Request or receive Interactive Reply messages.

Interactive-only stations can send and receive messages listed in table 7-1. An interactive-only station logs on to the Cray mainframe with its own station ID. Since an interactive-only station cannot have active streams, the station should log on with no streams; that is, the maximum number of streams in the Logon segment (MAST) should be 0.

A station that supports both batch and interactive processing is allowed but not required to exchange all messages defined in table 4-1.

7.1.2 INTERACTIVE PROTOCOL MESSAGE CODES

Table 7-1 lists the message codes comprising the interactive portion of COS front-end protocol. The codes are described in section 4.

Table 7-1. Interactive Protocol Message Codes

Octal Code	Message	Sender
001	Logon	Front end
003	Logoff	Front end
004	Start	Cray mainframe
005	Restart	Cray mainframe
011	Control†	Both
012	Message Error	Both
040	Diagnostic Echo Request††	Front end
041	Diagnostic Echo Reply††	Cray mainframe
042	Interactive Request	Front end
043	Interactive Reply	Cray mainframe

† Optional, except when sent by COS as a stop message (Logoff Reply)

†† Optional

7.2 INTERACTIVE MESSAGE

An *interactive message* consists of a link control package (LCP) with a message code indicating either Interactive Request (code 42) or Interactive Reply (code 43). The LCP can be associated with a data segment containing one or more terminal messages, described in subsection 7.2.1. If the LCP lacks a data segment, it is an interactive control message, described in subsection 7.2.2.

7.2.1 TERMINAL MESSAGE

A *terminal message* is the smallest message unit sent between an interactive terminal on the front end and an interactive job on the Cray computer system. Terminal messages are sent in the data segment of the Interactive Request and Interactive Reply messages. Each terminal message includes at least a header, optionally followed by text.

A segment can contain more than one terminal message, but may contain only one for any particular user. Terminal messages do not cross segment boundaries; that is, a terminal message must fit within one segment. The segment bit count (SGBC) in the LCP indicates how much of the segment is used for terminal messages. Figure 7-1 shows an interactive message (request or reply).

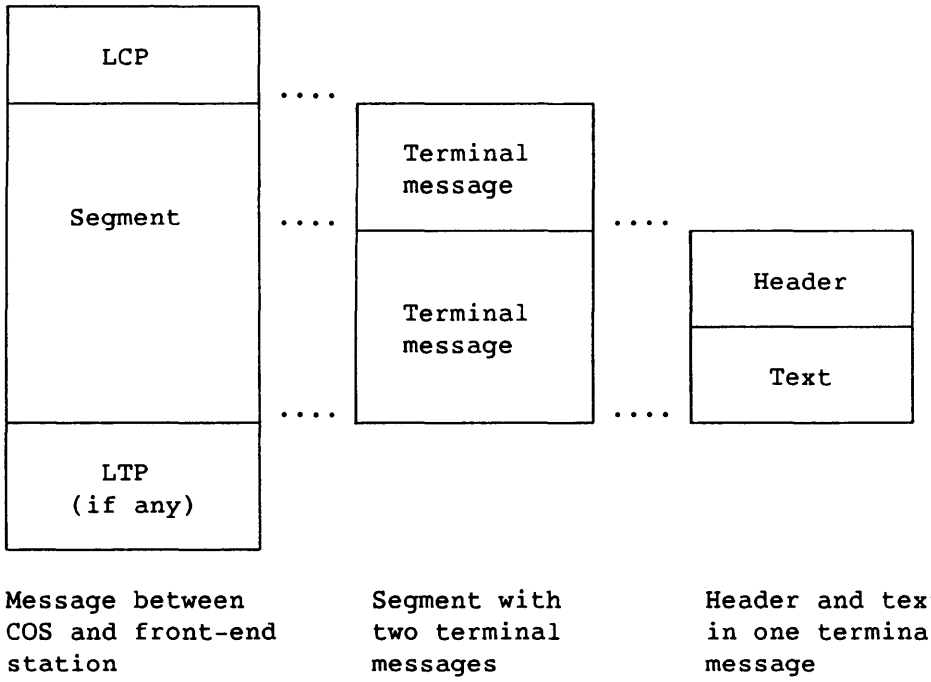


Figure 7-1. Interactive Message

7.2.2 INTERACTIVE CONTROL MESSAGE

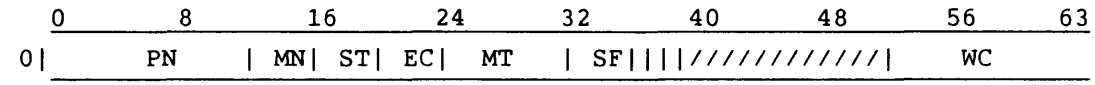
The *interactive control message* consists of an LCP with no segment. The front-end sends an Interactive Request LCP (MC=42); the Cray mainframe sends an Interactive Reply LCP (MC=43). Both the number of subsegments (NSSG) and the segment bit count (SGBC) are 0.

When the front end sends an interactive control message, it indicates that there are no terminal messages for COS, but that COS can reply with outgoing terminal messages.

COS can send an interactive control message whenever it has no terminal messages to send. It sends an interactive reply only in response to an interactive request; it cannot send an unsolicited reply.

7.3 TERMINAL MESSAGE HEADER

The *terminal message header* contains control and routing information; each terminal message must include at least this header. The fields of the header are described in section 4, Interactive Request (code 42) and Interactive Reply (code 43). The header uses the following format. The text, which follows the header, is described in subsection 7.4.



Field	Bits	Description
PN	0-11	Process number assigned by Cray mainframe; 0 for Logon.
MN	12-15	Message number (0-15)
ST	16-19	Job or terminal state (see section 7.3.5): 0 Receive 1 Suspend
EC	20-23	Error code; valid only if message type is 3 (Restart) or 13 (Error). Error codes valid for Restart messages are as follows: 5 Invalid user name 6 Interactive station slot error 7 Already logged on 12 User logged on, but job does not exist 13 No more interactive users allowed 16 Maximum message length error

Field	Bits	Description
EC (continued)		Error codes valid for Error messages are as follows: 1 Invalid message number 2 Sent to suspended terminal or job 3 Invalid message type 4 Inactive process number 10 No buffer space 11 Not logged on 12 User logged on, but job does not exist 14 Invalid special function 15 Unexpected message received 17 Zero data length sent
MT	24-31	Message type. See table 7-2.
SF	32-35	Special function (MT=005) and Logoff modifier (MT=006) Special function: Sent by front end only: 1 Abort 2 Status 3 Attention Sent by COS only: 4 Prompt 5 Kill Logoff modifier: 0 Hold 1 Quit 2 Continue
MODE	36	Buffered/Unbuffered flag: 0 Buffered 1 Unbuffered
CHN	37	Chain flag; if set, the next word is control, not data.
FT	38	Format type: 0 Blocked 1 Unblocked
WC	52-63	Cray mainframe word count for text associated with this entry, not including the terminal/header word or any chain words

7.3.1 PROCESS NUMBER (PN)

COS assigns the process number (PN) to a terminal to associate the terminal with a job. The range of the number is from 1 to a limit defined by an installation parameter in COS (I@IAAUT). No more than one terminal message can have the same process number in the same segment.

This field must have a nonzero value for all message types except Logon and Restart, which must have a zero value.

7.3.2 MESSAGE NUMBER (MN)

The message number (MN) allows the station or COS to detect lost terminal messages. MN has a value of 1 for Logon, Start, or Restart message types, and is incremented, modulo 16, for all subsequent messages. The range, therefore, is from 0 to 15. The input message number (from the terminal to COS) and the output message number (from COS to the terminal) are not related.

This field is valid for all message types. See subsection 7.5 for information on the message number sent with messages of type Error.

7.3.3 STATE (ST)

The state field (ST) indicates whether the sender of a message is prepared to receive a Data terminal message. Two states can be indicated: receive (the normal setting) and suspend. Logon and Logoff messages should have a receive state. This field is valid for all message types.

Both the job and the terminal have states, so ST is valid in both directions.

7.3.3.1 Job state

COS sets the ST field to suspend if it cannot guarantee buffer space for another Data terminal message from the user terminal. The new state is indicated in any outgoing message for that terminal. If no message goes out, COS generates a Control message to ensure that the state change goes out. While a job is in a suspend state, the concentrator cannot send Data messages to that job.

7.3.3.2 Terminal state

The concentrator sets the ST field to suspend if it cannot guarantee buffer space for another Data terminal message to the user job. The suspend state is necessary only for buffered terminals (MODE=0). The new state is indicated in any incoming message to COS. If no message arrives for COS, the concentrator generates a Control message to ensure that the state change is sent in. While a terminal is suspended, COS does not send Data messages to that terminal. However, messages with MT=5 and SF=5 (Kill) can be sent to suspended terminals.

7.3.4 ERROR CODE (EC)

The error code (EC) field gives information about an error condition. It is valid for the Error and Restart message types; the other message types do not use this field. Each code corresponds to a message, as shown in the table description at the beginning of subsection 7.3. See subsection 7.5 for a detailed description of the interactive error processing.

7.3.5 MESSAGE TYPE (MT)

The message type indicates what action is to be taken when a terminal message is received; each terminal message requires a specific action. The message types are listed in table 7-2.

Table 7-2. Terminal Message Types

Octal Code	Message	Sender	Word Count
001	Logon	Front end	Nonzero
002	Start	Cray mainframe	Nonzero
003	Restart	Cray mainframe	Nonzero
004	Data	Both	Nonzero
005	Special Function	Both	Zero or nonzero
006	Logoff	Front end	Zero
007	Logoff Reply	Cray mainframe	Nonzero
012	Control	Both	Zero
013	Error	Both	Zero

7.3.5.1 Logon message (001)

The Logon terminal message connects a user terminal to a job on the Cray mainframe. There are two kinds of Logon message:

- The *initial Logon* initiates a new job on the Cray mainframe.
- The *reconnect* reconnects the user to a job, for example after a system failure, or after a user Logoff that did not discard the job.

The concentrator cannot distinguish between the two forms of Logon; after a Cray system restart, an interactive job might or might not have been recovered.

The Logon terminal header always precedes 5 words of text. If the terminal header is recognizable as a Logon when COS receives it, there are only two possible responses: Start and Restart. The Start message indicates a successful logon, and the Restart message indicates an error. Both replies include the 5 words of Logon text that were sent in, so that the concentrator can determine which user receives the reply.

Logon is a synchronous message; that is, the user terminal cannot send any further terminal messages until a Start, Restart, or Error terminal message is received from COS. See subsection 7.4 for details of the Logon text.

7.3.5.2 Start message (002)

The Start terminal message acknowledges a successful user logon, and includes the 5 words of Logon text that were sent in. The concentrator associates the returned COS process number (PN) with the user terminal until the user or the station logs off, ending the session.

7.3.5.3 Restart message (003)

The Restart terminal message indicates an unsuccessful user logon, and includes the 5 words of Logon text that were sent in. The concentrator interprets the error code (EC) in the terminal header and informs the user of the problem. No process number (PN) is returned with this message.

7.3.5.4 Data message (004)

The Data terminal message passes lines of text or blocks of data between the user terminal and the COS job. This message always has text associated with it; see subsection 7.4.2 for details of that text.

7.3.5.5 Special Function message (005)

The Special Function terminal message passes control information between the user terminal and the COS job. The special function field (SF) contains a code defining the action to be taken. See section 7.3.6 for details on this field.

7.3.5.6 Logoff message (006)

The Logoff terminal message disconnects a user terminal from its COS job. The Logoff modifier/special function field (SF) selects one of the Logoff options. See subsection 7.3.6 for details on this field. Logoff is a synchronous message; that is, the user terminal cannot send any further terminal messages until it receives a Logoff Reply or Error terminal message from COS.

7.3.5.7 Logoff reply message (007)

The Logoff Reply terminal message acknowledges a Logoff and includes a text message that can be displayed on the user's terminal for confirmation; see subsection 7.4.2 for details about the associated text.

7.3.5.8 Control message (012)

The Control terminal message, described in detail in subsections 7.3.3 and 7.3.7, is used for the following purposes:

- Polling for output if the user terminal is unbuffered (MODE=1)
- Changing the state (ST) of a buffered terminal (MODE=0)

7.3.5.9 Error message (013)

The Error terminal message signals an invalid or exceptional condition in the message just received. If a message is badly formed, or if the recipient cannot perform the requested action, an Error message is returned with an explanatory code in the error code (EC) field.

Many indicated errors are not fatal. In the case of a nonfatal error, the concentrator allows the user to recover from the error, rather than terminating that user. The station interprets the error code and informs the user of the problem. See subsection 7.5 for further information on the interactive error processing.

7.3.6 LOGOFF MODIFIER/SPECIAL FUNCTION (SF)

The SF field serves either of two functions, depending on the message type: Logoff or Special Function. The other message types do not make use of this field.

7.3.6.1 Continue (Logoff modifier)†

When a Logoff message includes the Continue modifier, the user terminal disconnects from its COS job, but the job continues. If the job generates output messages or data, only the most recent messages are retained. If the job needs input, it is suspended. The user can reconnect to the job by sending a Logon terminal message with the same user name (UN) and terminal ID (TID) from the same front end.

7.3.6.2 Hold (Logoff modifier)

When a Logoff message includes the Hold modifier, the user terminal disconnects from its COS job, but the job continues. If the job reaches a Cray system threshold for output messages, the job is suspended. If the job needs input, it is suspended. The user can reconnect to the job by sending a Logon terminal message with the same user name (UN) and terminal ID (TID) from the same front end.

7.3.6.3 Quit (Logoff modifier)

A Logoff message including the Quit modifier terminates the COS job and releases all Cray resources allocated to it.

7.3.6.4 Status (special function)

The Status special function causes a Data terminal message to be formatted and sent to the user terminal. This function is sent only by the front end and does not affect the job. The message contains the following information (in ASCII):

- Jobname
- Current status (for example, waiting for memory, executing, etc.)
- CPU time used (in seconds)
- Last logfile message

† Deferred implementation; Continue is treated as Hold.

Because COS does not treat the Status special function as a command, a Status Request has no effect on the issuing of a prompt. If a prompt is outstanding at the time of the Status Request, COS does not issue an additional prompt after supplying the status information.

7.3.6.5 Abort (special function)

The Abort special function interrupts the current COS job step and returns to the Control Statement Processor (CSP) for further user commands. This special function is sent only by the front end.

7.3.6.6 Attention (special function)

The Attention special function interrupts the current COS job step and enters its reprieve processing, if any. For example, if the job is running a simulation, the program can interrupt its current operation and prompt for additional user commands. If no reprieve processing is specified by the currently executing program, this special function behaves like an abort. See the COS Version 1 Reference Manual for a description of reprieve processing. This special function is sent only by the front end.

7.3.6.7 Prompt (special function)

The Prompt special function indicates that the COS job is waiting for input from the user terminal. This terminal message includes text containing the prompt (see subsection 7.4.3 for details) and is sent only by COS.

7.3.6.8 Kill (special function)

The Kill special function warns the concentrator that a user job on the Cray mainframe has been terminated by the system operator. The concentrator informs the user and ensures that no more messages with the process number of the terminated job are sent to COS. The process number can be reassigned by COS when it next receives a terminal logon. This special function is sent only by COS, and is unrelated to error code 12 (see the beginning of subsection 7.3 and subsection 7.3.4).

7.3.7 MODE FLAG

The mode flag indicates the mode of operation for a user terminal. It is set by the concentrator and echoed by COS. Two modes can be indicated: buffered and unbuffered. This field is valid for all message types. The flag value (buffered or unbuffered) can be changed any time after Logon.

7.3.7.1 Buffered mode (0)

When a terminal is in buffered mode, any interactive request to COS makes the terminal eligible to receive a Data terminal message from COS, even if there is no terminal message for that process number in the request's segment. An interactive control message (with no segment) serves to make all buffered terminals, except any in a suspended state, eligible for output (see subsection 7.3.3).

A typical means of implementing a buffered terminal is to use a circular output buffer, with pointers indicating First, In, Out, and Last. The concentrator places text from COS in the buffer and updates the IN pointer. The terminal driver displays the text (or other data) and updates the OUT pointer.

The concentrator determines whether each terminal's output buffer can accept a message of the maximum message length (MML, set at logon time) each time it sends an interactive message. The concentrator informs COS when a terminal is suspended and when it can again accept a message (see subsection 7.3.3).

Implementation of a buffered terminal can be performed as follows. Establish a *high water mark* (write) and a *low water mark* (read) on each terminal's output buffer; each mark is set at half the size of the buffer. Then, for every interactive message sent to COS, check each buffer to see if a state change is necessary. This method decreases the control traffic between the station and COS, especially for a slow terminal or device.

7.3.7.2 Unbuffered mode (1)

When a terminal is in unbuffered mode, COS sends no unsolicited Data terminal messages to it. In this case, COS sends data only on receiving a terminal message with an interactive request; the concentrator must therefore send at least a Control terminal message to get the next Data message from COS.

7.3.8 CHAIN FLAG (CHN)

The chain flag, valid for all message types, allows the terminal header to be expanded. If it is set, the word which follows is part of the terminal header. If the Chain flag of the next word is set, the word following that is part of the terminal header, and so on. COS does not currently use this field, but accepts multiword terminal headers.

7.3.9 FORMAT TYPE (FT)

The format type indicates whether a data message (MT=4) is in blocked (FT=0) or unblocked (FT=1) format. See subsection 7.4.2 for a complete discussion of COS interactive blocked format and unblocked text.

7.3.10 WORD COUNT (WC)

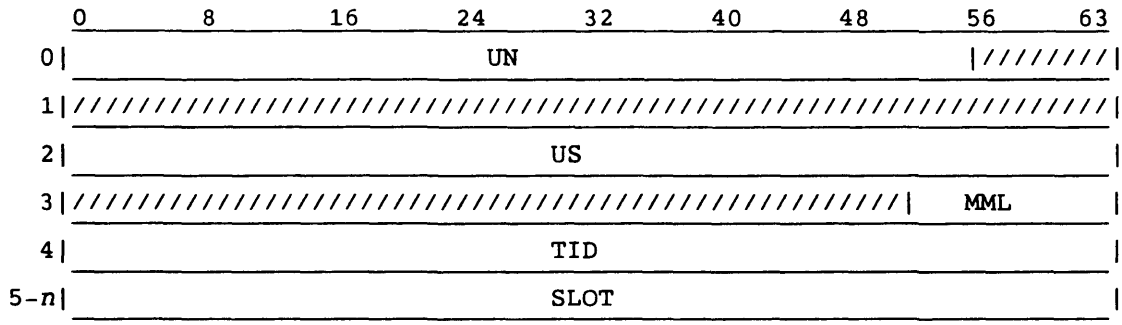
Word count (WC) is the number of 64-bit words in the text following the header. WC has a value of 0 when no text is associated with the terminal header. The CHN field affects only the header and therefore does not change the count. WC is also used to find the next terminal header, if the segment bit count (SGBC) in the LCP indicates more data in the segment. This field is valid for all message types.

7.4 TERMINAL MESSAGE TEXT

The text segment of a terminal message follows the header when the word count (WC) field is nonzero. The format of the text depends on the message type.

7.4.1 LOGON, START, AND RESTART TEXT

The Logon, Start, and Restart messages use the same text format. The text logs a terminal on to the Cray mainframe; it is returned with either Start or Restart to indicate the kind of logon to the front end. The text format follows.



Field	Word	Bits	Description
UN	0	0-55	User name; 1-7 ASCII characters, left-justified and zero-filled; same as *jobname* on a batch JOB card.
US	2	0-63	User number; 1-8 ASCII characters, left-justified and zero-filled; consists of the first 8 characters of the *user number* on a batch JOB card.
MML	3	52-63	Maximum message length; binary integer; defines the largest terminal message that this terminal can handle. Cannot exceed segment size.
TID	4	0-63	Terminal ID; 1-8 ASCII characters, left-justified and zero-filled; all datasets staged by this job will have this terminal ID.
SLOT	5-*n*	0-63	Station-controlled slot information. See section 8 for a description of the station slot. The slot is included in the Logon message only.

7.4.2 DATA AND LOGOFF REPLY TEXT

The Data and Logoff reply messages transmit data using the COS interactive blocked format. The Data message can also use unblocked text; both formats are described in the following subsections.

7.4.2.1 COS interactive blocked format

The COS interactive blocked format resembles the COS blocked dataset format, shown in the COS Version 1 Reference Manual.

Control words describe the data format in the terminal message text. Each 512-word block of text starts with a *block control word* (BCW). Each record in the text is terminated with a *record control word* (RCW). The appropriate type of control word is selected by the Mode flag. The data can be ASCII or binary.

The minimum size for a blocked text is 2 words: a BCW and an RCW. The maximum size is 4095 words. The maximum can be a smaller value if limited by any of the following:

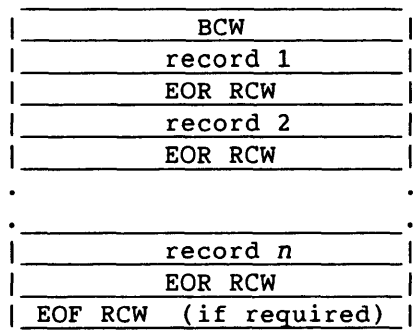
- The Interactive Buffer Table (IBT) size in COS
- The segment size selected by the station when it logs on
- The maximum message length (MML) selected when a terminal logs on

The RCW has two types: *end-of-file* (EOF) and *end-of-record* (EOR). The EOF record control word signals the end of information being input to COS programs and utilities. EOF can either follow an EOR record control word or be sent separately (usually at user request).

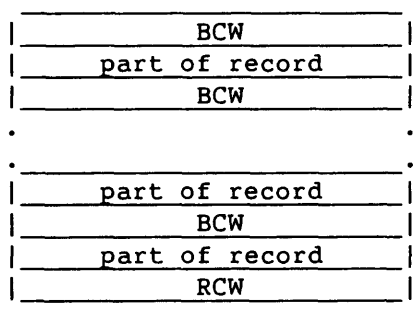
A *line record* is an ASCII character string, with an implied carriage return and line feed at the end. This record can contain blank compression characters if the site has selected this option. Refer to the COS Version 1 Reference Manual for a description of blank compression.

A *transparent* record is a character string in an unspecified code; it can contain ASCII or non-ASCII data. An example of non-ASCII use is control of a graphic device. The user must ensure that a specific device can process a record sent to it.

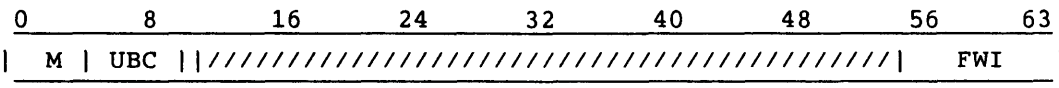
A schematic example of a blocked terminal message text of less than 512 words follows.



A terminal message of more than 512 words contains only a single record and is depicted in the following schematic example.



The format of the BCW or RCW is as follows:



Field	Word	Bits	Description
M	0	0-3	Mode (octal values given): 00 BCW 10 EOR RCW 16 EOF RCW
UBC	0	4-9	Unused bit count of the previous record; number of bits to be disregarded in the last word of the preceding record. Used by an RCW only.
TRAN	0	10	Transparent Record flag: 0 Line (default); the record is in ASCII and ends with an implied carriage return and line feed. 1 Transparent; the record can be ASCII or non-ASCII, and a carriage return line feed sequence at the end of the record is not assumed. This field is used by an RCW only.
FWI	0	55-63	Forward index. This field points to the next control word (BCW or RCW) and consists of a count of the number of data words up to the control word; that is, if the next word is a control word, FWI is 0.

7.4.2.2 Restrictions on COS interactive blocked format

COS does not support multiple records on input; that is, there can be only one EOR record control word in a terminal message sent to COS.

COS does not support transparent records (TRAN=1) on input.

7.4.2.3 Unblocked text

If a dataset is assigned to be both interactive (ASSIGN statement parameter DT=CRT) and unblocked (ASSIGN statement parameter U) format, the user can read and write in any format that the front-end station can handle. All I/O on unblocked datasets must be in multiples of 512 words.

7.4.3 PROMPT SPECIAL FUNCTION TEXT

Following the terminal header, the Prompt special function has one word of text, containing the COS prompt. The word contains from 1 to 8 ASCII characters, left-justified and zero-filled. The CSP is assigned a prompt as a system installation parameter; the default is '!'.

A user program is assigned a default prompt ('?') as a system installation parameter; this default can be modified by the user program, before any read from the user terminal, if word JCPROM is changed in the user's job control block (JCB). See the COS Version 1 Reference Manual for additional information.

7.5 INTERACTIVE ERROR PROCESSING

This subsection describes interactive error protocol and lists the errors detected by the front end and by the Cray computer system.

7.5.1 ERRORS DETECTED BY THE FRONT END

The interactive protocol permits the station to report errors in terminal messages received from the Cray computer system. Error codes 1, 2, 3, and 4 can be sent by the station to the Cray system to report an invalid message number, a message sent to a suspended terminal, an invalid message type, or an inactive process number. Such an error indicates either a Cray system or a station software problem, or a hardware error in forming or transmitting the message. These errors are most easily traced with the contents of the Active User Table (AUT) and LXT entries after the message has been sent. This information can be obtained if the station hangs (without logging off) upon receipt of an erroneous terminal header. In this case, the LXT and AUT entries can be examined with the debug facilities of the Master Operator or with a system dump.

When the Cray computer system receives an Error terminal message, it verifies that the process is logged on and has an associated SDT entry. The sent message ID (AUSMID in the AUT entry) is then cleared. Any outstanding Data message is retransmitted once the terminal is eligible to receive data. The Cray system replies to a received Error message by sending one of the following:

- An Error message of 'not logged on'
- An Error message of 'user logged on, but no job exists'
- The last Data message that was sent
- No message

7.5.2 ERRORS DETECTED BY THE CRAY COMPUTER SYSTEM

When the Cray computer system detects an error in a received terminal header, the error is reported to the station with an Error terminal message. The station then reports the error to the user, who can choose to take action. Sometimes the station itself takes action, especially when the user cannot be located. Table 7-3 describes the meaning of the error codes sent by the Cray computer system in Error terminal messages and suggests corrective actions for the station or the user.

The message number (MN) field in Error terminal messages sent by the Cray mainframe contains the message number of the last valid message received. The station calculates the message number that the Cray computer system is expecting by adding one modulo 16 to this value.

Table 7-3. Cray Computer System Error Codes

Error Code	Meaning
1	Invalid Message Number: The message number in the last terminal message does not equal the value of the expected message number. The message in question was ignored.
2	Sent to Suspended Job: The station sent a Data message to a job that the Cray computer system suspended. The outstanding Data message is ignored and can be retransmitted once the suspension has been lifted.
3	Invalid Message Type: The message type of the last received message was out of range and the message was ignored.
5	Invalid User Name: The Cray computer system received a Logon Request with a user name of binary 0.
6	Interactive Station Slot Error: Either the Cray mainframe received an interactive station slot from a station that did not have ISLT set in the station logon message, or the slot length was greater than 60 Cray words.

Table 7-3. Cray Computer System Error Codes (continued)

Error Code	Meaning
10	No Buffer Space: As a reply to a Data message, this error message means that there is not enough room in the Interactive Buffer Table (IBT) to enqueue the received Data message. Consequently, the Data message was ignored and should be sent again. As a reply to a Status special function request, this error message means that there was not enough room in the IBT to enqueue the reply to the Status request; the user must repeat the Status request to receive a reply.
11	Not Logged On: The process number in the message is not associated with an AUT entry that is active and logged on. The station informs the user that no connection exists and clears any entry for this user so that the user can log on.
12	User Logged on but Job Does Not Exist: The AUT entry located for the given process number contains no SDT pointer. All messages except Logoff are ignored.
13	No More Interactive Users Allowed: The Cray mainframe is unable to create an interactive job.
14	Invalid Special Function: The special function modifier was not Attention, Status or Abort.
15	Unexpected Message Received: This message is issued when the Interactive Request segment contained more than one terminal message for the process number. The second (and any subsequent) terminal messages are ignored.
16	Maximum Message Length Error: The MML field in the Logon segment either exceeded the segment size or was smaller than the minimum message length.
17	Zero Data Length Sent: The Cray mainframe received a Data terminal message specifying a word count of 0.

STATION SLOT 8

This section describes the format and content of the station slot. Although the use of the station slot has previously been site-determined, a standardized header format is defined in this section. The use of this format, while not mandatory, prevents problems arising between stations using incompatible formats.

The station slot is an extension to the Dataset Header or Interactive Logon text. It is designed for station use, and it holds information needed by the station for processing datasets transferred to or from the Cray mainframe, job output files, and other station functions. This information may include the front-end user ID, account number, and routing information. Without use of the station slot, such information can be put in the text field of COS DISPOSE and ACQUIRE control statements and specified for a job's output dataset by the following:

```
DISPOSE(DN=$OUT,DEFER,TEXT=...)
```

When the station slot is used, the TEXT parameter can be made unnecessary for most ordinary DISPOSE and ACQUIRE or FETCH operations.

A COS job that submits another job to the COS input queue duplicates the slot to the new job; that is, the slot is inherited.

A typical use for the slot is to store routing information, such as the ID of a remote batch entry station from which an input job originates. When the job's output is returned to the front end, this station slot information can be used to print the output at the same remote batch terminal. Another station slot field can hold the user ID or other identification to be printed on the banner page of the output. Although it is inconvenient for the user to supply this kind of information for each output, needed data is generally available to the station at the time the input job is submitted.

See appendix A for a discussion of how the UNICOS Station Call Processor (USCP) handles the station slot.

8.1 USAGE

When logging on to the Cray mainframe, the station enables the batch station slot by setting the SLOT bit in the Logon segment being sent. For interactive jobs, the station slot is enabled by setting the ISLT bit in the Logon segment.

The slot length, determined by the station, can be from 1 to 255 Cray words.

For a batch job, the station specifies the slot length (in Cray words) in the SSC field of the dataset header, and increases the segment bit count field (SGBC) in the Link Control Package (LCP) accordingly.

An interactive station slot is inserted after the Logon text. The length of the station slot is included in the word count of the Logon message and in the SGBC field of the Interactive Request LCP.

The station inserts information into the slot for input jobs it sends to COS. COS saves the slot contents with the job. It returns the contents within any dataset header it sends to a front end when the job does a DISPOSE, ACQUIRE, or FETCH, when its output file returns to the front end, or on type 3 Station messages. COS itself does not use the slot contents.

The station should not send a slot with a dataset header that has the Transfer Request flag set. This flag is associated with an ACQUIRE or FETCH from COS. Since the slot already resides on the Cray mainframe, it does not need to be sent by the station, and COS ignores it.

8.2 ORGANIZATION

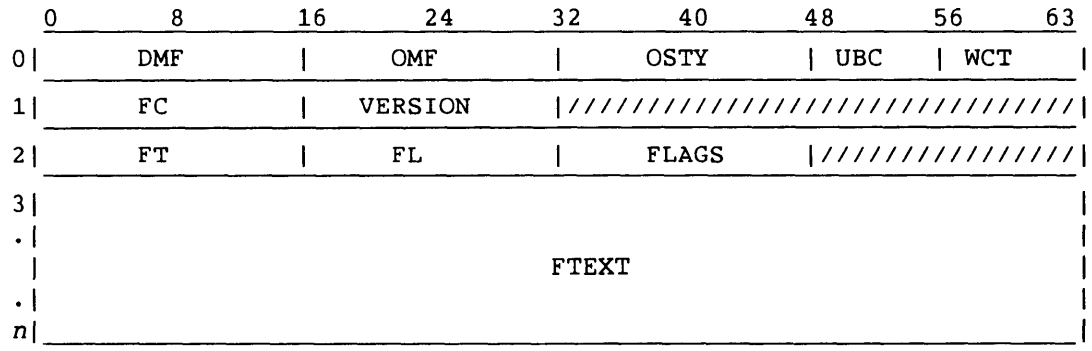
NOTE

While CRI recommends that sites and locally-coded stations follow the descriptions given below, COS makes no attempt to enforce them.

The station slot is organized into one or more records of variable length. Each record contains a header and a text field. The content and format of the text field are determined by the station that builds the record. The record is never interpreted by COS and is not necessarily meaningful to any other station.

The station slot header identifies the originator and the format of the text area. In a multistation setting, the station slot header is needed when a station receives a dataset header from a job that originated at another station. This dataset header might contain a station slot with records that are unintelligible to the station receiving them. By validating the station slot header, a station recognizes slot records that are meaningful to it.

The slot format accommodates multiple records of different types, possibly directed to stations of different types or carrying different meanings to the same station. These uses are decided by specific stations and sites.



Field	Word	Bits	Description
DMF	0	0-15	Destination mainframe ID for this record; 2 alphanumeric ASCII characters.
OMF	0	16-31	Originating mainframe ID for this record; 2 alphanumeric ASCII characters.
OSTY	0	32-47	Originating station type; 2 alphanumeric ASCII characters: MV IBM MVS station VM IBM VM station VX DEC VAX/VMS station NO CDC NOS station BE CDC NOS/BE station AA APOLLO AEGIS station U* Reserved for installation use
UBC	0	48-55	Unused bit count (value from 0 through 63)
WCT	0	56-63	Length of record in Cray words, including header

Field	Word	Bits	Description
FC	1	0-15	Function code; 2 ASCII characters: U* Reserved for installation use ST Station control statement PJ Standard PJR format A station defines its own function codes for different record types. See the appropriate station documentation for details.
VERSION	1	15-31	Indicates the current software release version for the station. Its value is left up to each station.
FT†	2	0-15	Indicates the field type. FT values are as follows: 0-377 Common fields 400-777 IBM MVS 1000-1377 IBM VM 1400-1777 CDC NOS 2000-2377 CDC NOS/BE 2400-2777 CDC NOS/VE 3000-3377 SUPERLINK/MVS 3400-3777 VMS 4000-4377 AEGIS (Apollo) 4400-4777 UNIX 5000-5377 DIPS 5400-5777 MULTICS 6000-6377 UNIVAC 6400-6777 Honeywell 7000-7377 AOS (Data General) 7400-7777 Reserved for CRI 170000-177777 User-specified The common fields are further defined as follows: 0 Not used 1 Origin node ID 2 Origin group ID 3 Origin user ID 4 Origin password

† Valid only if FC=PJ

Field	Word	Bits	Description
FT† (continued)			101 Destination node ID 102 Destination group ID 103 Destination user ID 104 Destination password 105-200 Reserved common 201-377 'Defined Other'; fields not necessarily applicable to all stations but also not station-specific: 201 Output queue 202 Output class 203 bin/room/box 204 Subsystem/router 205 Priority 206-377 To be defined as needed by CRI
FL†	2	16-31	Indicates the length of the FTEXT field in bytes
FLAGS†	2	32-39	Further modifies the FT field. The leftmost byte indicates the following: 200 Read-only field 100 Inactive field 40 Modified field 20 EBCDIC field 10 Binary field
		40-47	Reserved
FTEXT†	3-*n*	0-63	Word-aligned text field of length FL. The FTEXT for FT=1-377 (common fields) is ASCII. The format of the remaining FTEXT fields is up to the station defining the field.

† Valid only if FC=PJ

APPENDIX SECTION

UNICOS STATION CALL PROCESSOR (USCP) A

This appendix describes the UNICOS Station Call Processor (USCP) implementation of the SCP protocol. USCP handles communications at the Cray mainframe. Although not strictly a protocol description, this appendix is intended to help users in an existing COS environment migrate to the Cray operating system UNICOS by making only minimal changes to the front-end station.

A.1 USCP CONFIGURATIONS

USCP is implemented as a UNICOS daemon that communicates with the stations through the NSC HYPERchannel or a CRI front-end interface. Figure A-1 shows the USCP configurations for a Cray computer system operating under UNICOS. Figure A-2 shows the USCP configurations for CRAY-1 and CRAY X-MP computer systems operating in a guest operating system (GOS) environment. Figure A-3 shows the USCP program flow.

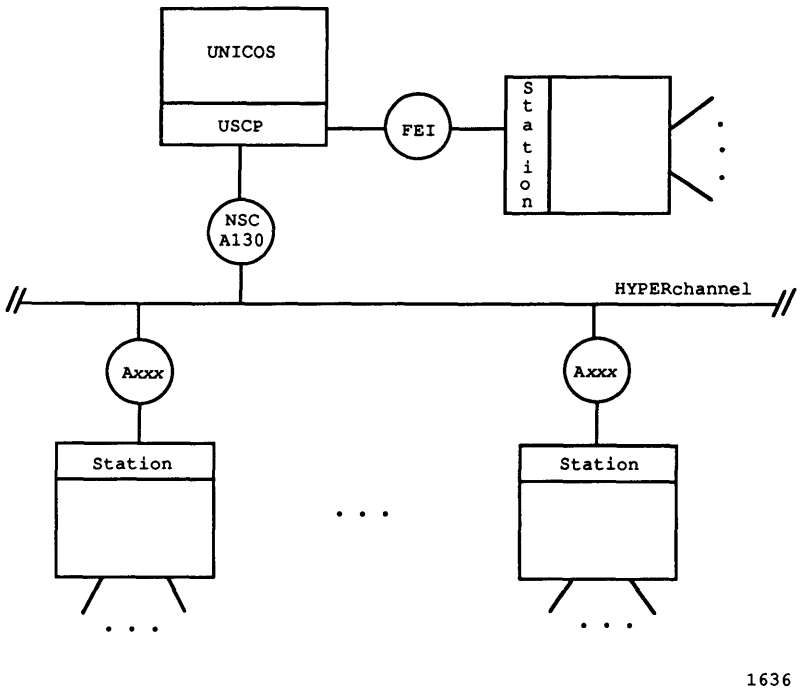


Figure A-1. USCP Configuration under UNICOS

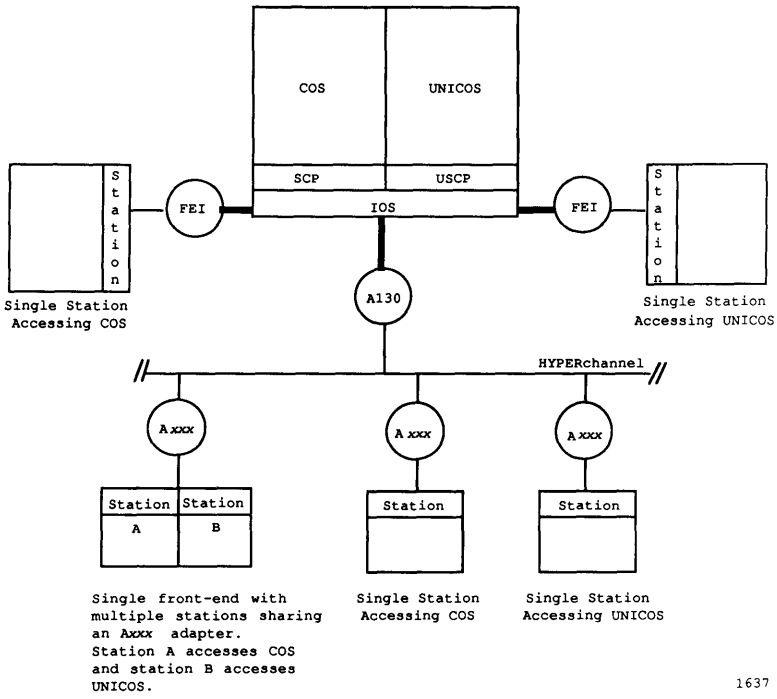


Figure A-2. USCP Configuration under GOS

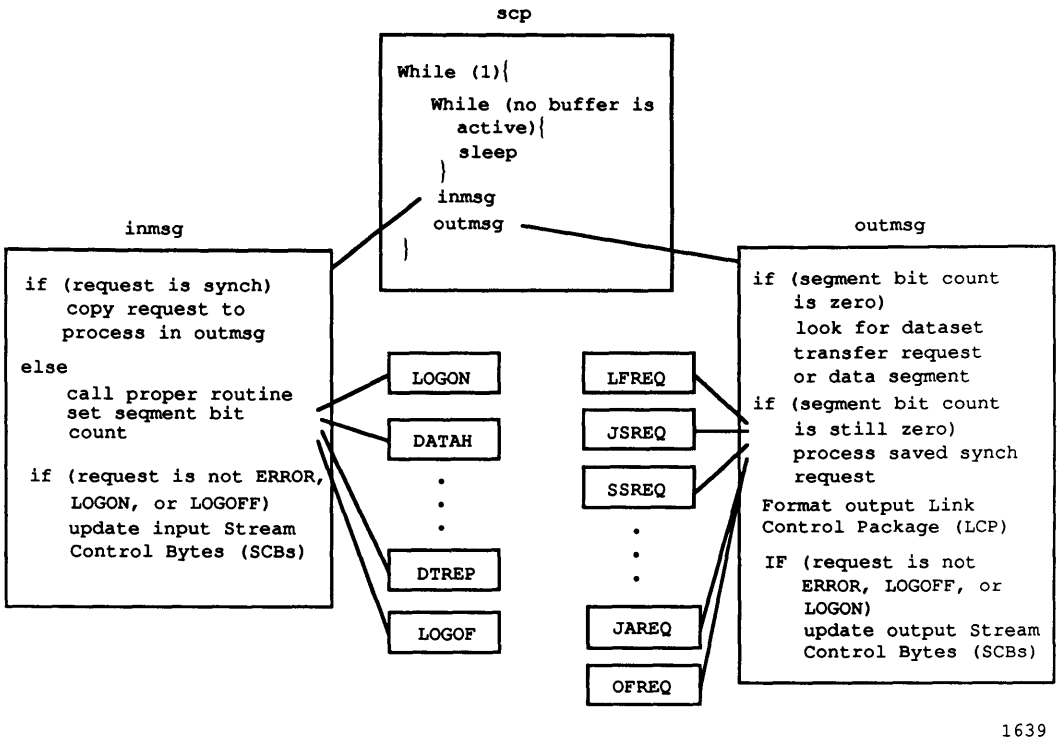


Figure A-3. USCP Program Flow

A.2 USCP FUNCTIONS

The USCP protocol provides the following functions:

- Dataset staging (file transfer)
- Interactive access
- Job submission and return
- User status, control commands, and job displays

Unlike SCP, USCP does not currently support the system operator commands and displays, or station messages. System operator commands and displays are controlled through the system console operator or a privileged interactive user.

A.3 USCP MESSAGE CODES

The USCP message codes are as follows:

Code	Description
001	Logon
003	Logoff
004	Start
006	Dataset header
007	Dataset segment
011	Control
012	Message error
013	Dataset transfer request
014	Dataset transfer reply
015	Enter logfile request
016	Enter logfile reply
021	Job status request
022	System status request
024	Link status request
026	Operator function request†
031	Job status reply
032	System status reply
034	Link status reply
036	Operator function reply†
040	Diagnostic echo request
041	Diagnostic echo reply
042	Interactive request
043	Interactive reply

† Does not support all function codes; see subsection A.9 for a description of the currently supported commands.

Code	Description
044	Statclass request
045	Statclass reply
056	Dataset status request†
057	Dataset status reply†
060	Job information request
061	Job information reply
062	Stream status request
063	Stream status reply

See section 4 for a complete discussion of these message codes.

A.4 INTERACTIVE SUPPORT

USCP interfaces to UNICOS without requiring modifications to UNICOS. All the network protocols share the same pool of pseudo terminals (pty). A pseudo terminal is a coupled pty/tty. The pty side is the master and the terminal connector (tty) side is the slave. The process that opens the pty side owns the pseudo terminal. The tty side appears and acts like a normal tty device, so a UNICOS process can open, close, read, or write it as if it were a tty device.

When a station logs on under SCP protocol, the STYP field of the Logon segment indicates if the station has interactive capabilities. Figure A-4 shows the interactive access connections.

When USCP is initialized, the Interactive User Table (IUT) is generated to support up to INUMPTY interactive users. (INUMPTY is a parameter that is set during system configuration.) This table is common to all stations. Each entry in the table contains a circular buffer for the data from the pty and other user information such as the name of the originating station and the pty/tty that is being used.

When USCP receives an interactive request segment from a station, each terminal message of the request is processed. Then the interactive reply segment is built and returned to the station.

† Deferred implementation

If the terminal message is an interactive logon request, the IUT is searched to see if it is a reconnect request. If the logon request is for a new user, an entry in the IUT is allocated. All ptys are tried until USCP finds one that it can open. Then a process is spawned to open the tty side, initialize the standard input (stdin), standard output (stdout), and standard error (stderr) files, and execute the login program. The login program writes a login prompt to the tty, and USCP passes data between the station and the pty (see figure A-4).

Data from the station is deblocked and sent to the pty as a string of characters. If this data is not in transparent mode, a new-line character is appended to the string. No station changes are necessary for up-line data sent to USCP. Data from the pty is put in a UNICOS data terminal message (message type 014) and sent to the station. The 014 message is added to the SCP protocol to handle down-line data sent from USCP to the station; therefore, a station modification is required.

When a station sends a segment or reads data from the pty, the other ptys are polled to see if the corresponding tty is waiting for data from the pty. If the corresponding tty is waiting for data, the pseudo terminal driver signals USCP. USCP then sends a Prompt special function to the station. Before sending this prompt, the pty/tty is checked to see if it is in ECHO mode. If the pty/tty is not in ECHO mode (for instance, when requesting a password), a flag (NOE) is set in the prompt terminal message. The station software ensures that user entries at the terminal are not displayed. The NOE flag is not part of the SCP protocol; therefore, a station modification is required.

The Logoff modifiers Hold, Quit, and Continue are described in the COS Operational Procedures Reference Manual. If the user logs off with Hold or Continue, the pty remains allocated and waits for the user to log on again. If the station logs off or relogs, all the corresponding sessions are logged off with Hold so that users can eventually reconnect their processes. If the user logs off with Quit, a kill signal is sent to the corresponding process. After an acknowledgment is returned indicating that the process is dead, the IUT entry is cleaned up, the pty is closed, and an interactive Logoff terminal message is sent to the station. The Logoff terminal message can be sent as soon as an interactive poll is received. If a process dies, a Kill special function terminal message is sent to the station. If the user receives an Attention or Abort special function, an interrupt signal (sigint) or a quit signal (sigquit) is sent to the process through the pty/tty.

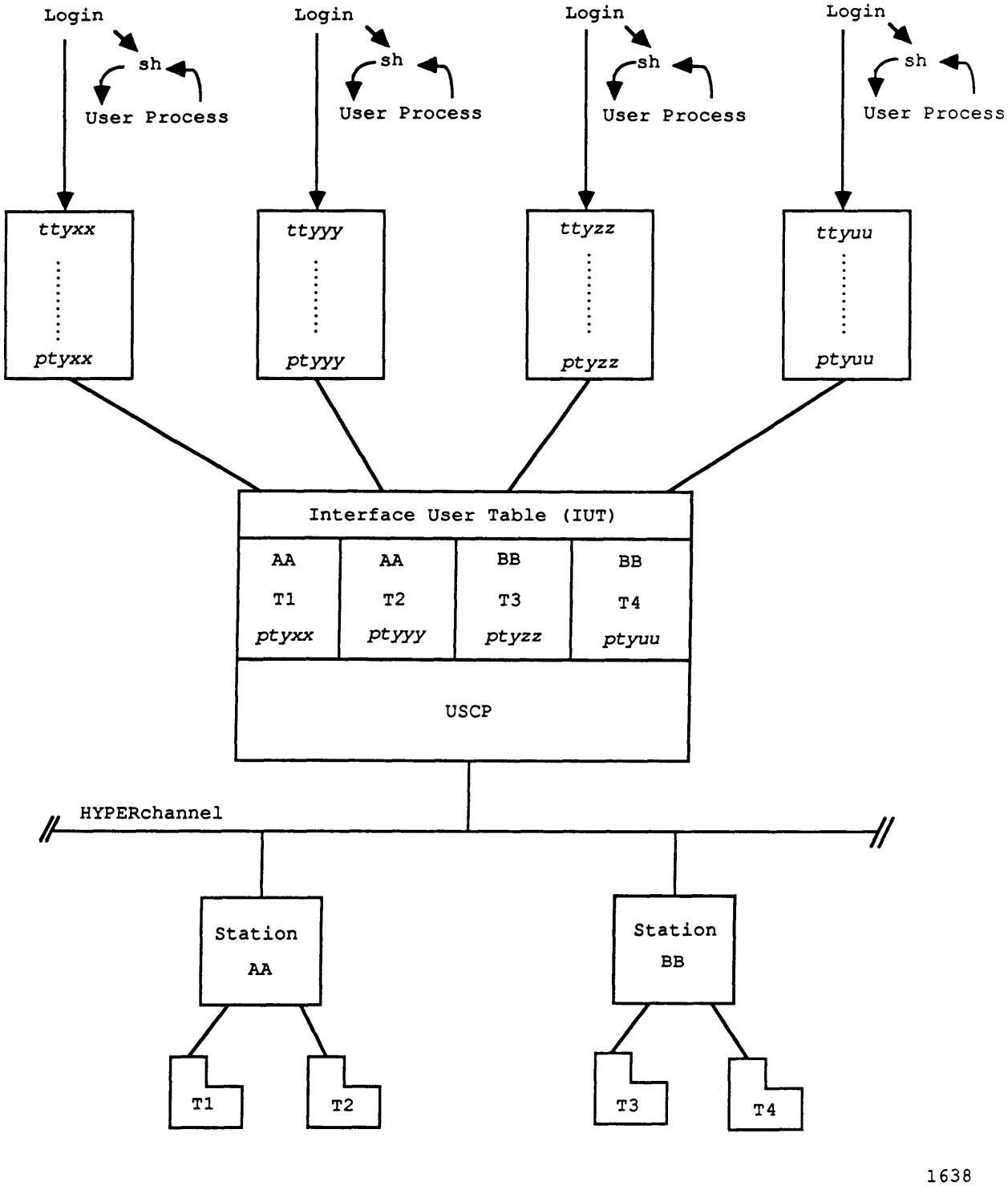


Figure A-4. Interactive Access Connections

A.5 INTERACTIVE STATION SLOTS

When a user logs on interactively, the station slot is optionally included in the interactive Logon request. USCP writes the station slot to a file within the /scp/int_slots directory. The file name is the number of the tty. The file contains the name of the originating station, the length of the slot, the Logon text, and the slot. The file is created even if no slot is present and is deleted when the user logs off.

When the user issues a command requesting access to the slot (such as acquire, dispose, or fetch), the command process determines if the request is interactive or batch. If the request is interactive, the command process gets the the requested user's tty number and uses it to access the appropriate file in the int_slots directory. The command process uses the saved interactive Logon text to fill appropriate fields in the Dataset Header, as follows: user name (UN) fills originating jobname (OJB), user number (US) fills user number (USR), and terminal ID (TID) fills terminal ID (TID). If a slot exists, it is appended to the Dataset Header.

A.6 FILE TRANSFER

UNICOS supports the following COS file transfer functions (which are common to the SCP/station environment): fetch, acquire, dispose, and save. The fetch, acquire, and dispose functions are called as follows:

fetch *localpath* [-n*filename*] [-i*tid*] [-u*user*] [-m*mf*] [-t*text*] [-d*dc*] [-f*fm*]

acquire *localpath* [-n*filename*] [-i*tid*] [-u*user*] [-m*mf*] [-t*text*] [-d*dc*] [-f*fm*]

dispose *localpath* [-n*filename*] [-i*tid*] [-u*user*] [-m*mf*] [-t*text*] [-f*fm*] [-d*dc*] [-*special forms*]

Argument	Description
localpath	Path name for the Cray computer system and, if *filename* is not specified, it is either a file source (when used with fetch and acquire) or a file destination (when used with dispose) on the front end. This argument is required.
filename	Dataset header permanent dataset name
tid	User's terminal ID for the front end

Argument	Description
user	User ID
mf	Mainframe ID of the front end station that performs the transfer
text	Front-end specific text information
dc	Disposition code (default=PR)
fm	Data format (default=CB)
special forms	Information for the front-end system

Use the *man*(1) command to display additional information on the following commands: acquire, dispose, fetch, scpqsub, scpreroute, uscpintro. The *man*(1) command has the following format:

```
% man command
```

The fetch, acquire, and dispose programs execute in the same way. Each program does the following:

- Creates a request file
- Issues a read on the response pipe and waits for USCP to act on the request
- Deletes the scp/output.stat_id entry and exits when USCP writes a completion response to the pipe. The completion response can be one of the following: y (yes), n (no), or p (postpone).

The acquire program can execute in an alternate manner. When acquire searches for and finds a requested file, the program terminates normally and returns control to the user.

USCP periodically scans the scp/output.stat_id directory for work. When it finds a fetch or acquire request, USCP opens the indicated response pipe and, with the specified path name and dataset header, invokes and executes the file transfer between the station and UNICOS. On completion, USCP notifies the requesting process through the response pipe. Figure A-5 shows the file transfer process.

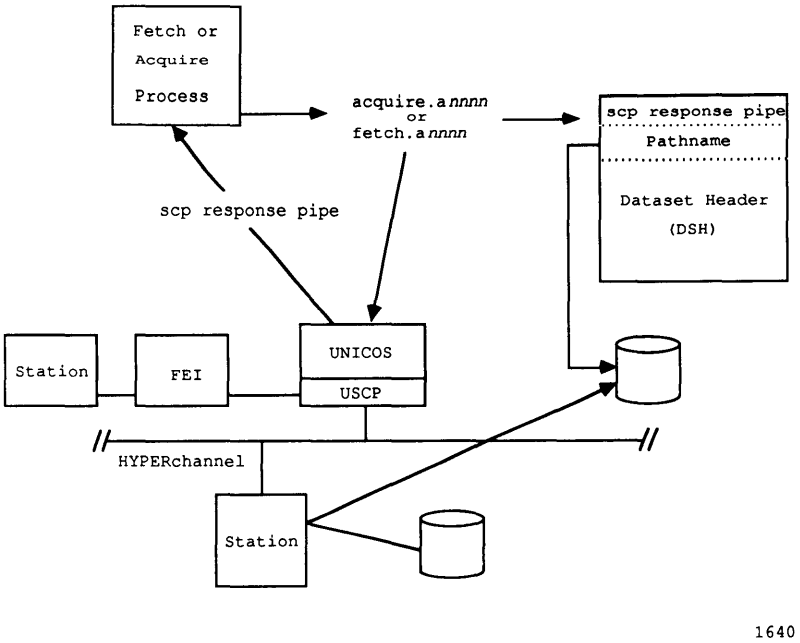


Figure A-5. File Transfer Process

A dispose request differs in that the specified path name points to an existing UNICOS file that is to be transferred to the station. USCP searches the scp/output.stat_id directory for files to dispose when an idle stream exists for a specific station.

The USCP daemon handles the save request as follows:

1. If the permanent dataset name begins with a /, USCP will use it as the complete UNICOS path name.

2. USCP scans the UNICOS password file to determine the user's home directory. If the permanent dataset name does not begin with a /, and the ID field is used to specify the user's UNICOS user ID, USCP appends the permanent dataset name to the home directory to determine the UNICOS path name.

A.7 UNICOS BATCH JOB PROCESSING

Batch job processing under UNICOS is based on the Network Queuing System (NQS). NQS allows you to submit, terminate, monitor, and control batch jobs that are submitted to the batch system. For more detailed NQS information, refer to NQSINTRO in the UNICOS User Commands Reference Manual.

Figure A-6 shows batch access under UNICOS for an interactive user connected to the network through a station.

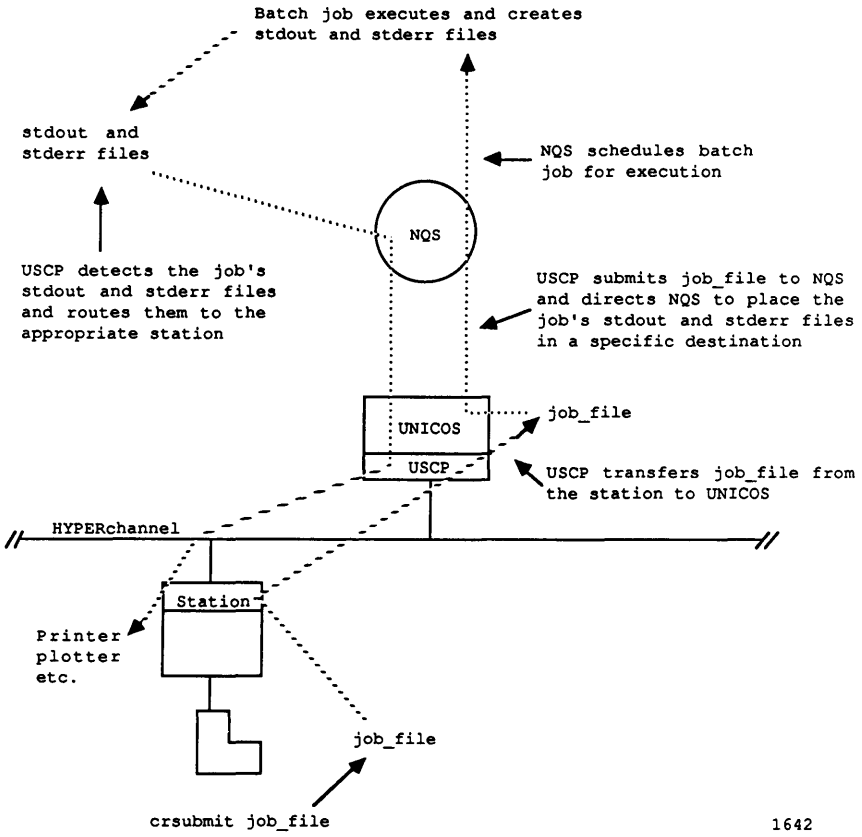


Figure A-6. Batch Connection for an Interactive User under UNICOS

Stations that support interactive access and batch-only stations can access UNICOS through a USCP interface to NQS. Stations can submit jobs, get status, and control batch jobs running under UNICOS in a similar manner as those running under COS.

Station users can prepare batch jobs on the front end and submit them to UNICOS for processing. USCP accepts the job dataset from the station and provides a transparent interface to NQS.

When the batch job is completed, NQS places the contents of the UNICOS stdout and stderr files in a USCP directory. USCP finds the job's output in this directory and transfers it to the appropriate front-end station. Batch station slots are fully supported. No station changes are required to support the job submission and job output return functions.

For example, if you maintain a UNICOS batch job file on the front-end station, you can execute the job with any of your available privileges.

Use the fetch command to move the job file to UNICOS and the qsub command to submit the job to NQS for processing. By default, NQS directs the batch job's stdout and stderr files to your directory. To route these files to the front end, use the dispose command with the appropriate disposition code for printing, plotting, and so on. Qstat and qdel can be used to provide job status information and to control the batch job.

The USCP interface to NQS requires that your job contain either your user identification record or a COS JOB card as the first record or records, followed by a mandatory ACCOUNT card.

The user identification record format is as follows:

#user=*logname* pw=*password*

logname and *password* are your UNICOS logname and password, respectively.

The COS JOB and ACCOUNT cards are interpreted as follows:

JOB card:

- JOB is verified
- JN is changed to the -r option of the qsub command
- MFL is changed to the -lM option on the qsub command
- T is changed to the -T option on the qsub command
- P is ignored
- US indicates the UNICOS logname
- OLM is ignored
- CL is changed to the -q option on the qsub command
- gn is ignored

ACCOUNT card:

- ACCOUNT is verified
- AC is the UNICOS account†
- APW is ignored
- NAPW is ignored
- US indicates the UNICOS logname
- UPW indicates the UNICOS password
- NUPW is ignored

Qsub options -e, -o, -re, and -ro are not available with the USCP interface. USCP can be configured to force the -eo option with all jobs. This option merges stdout and stderr.

Other qsub options are available as documented in the UNICOS User Commands Reference Manual. Figure A-7 shows the station/USCP/NQS interaction.

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† Deferred implementation

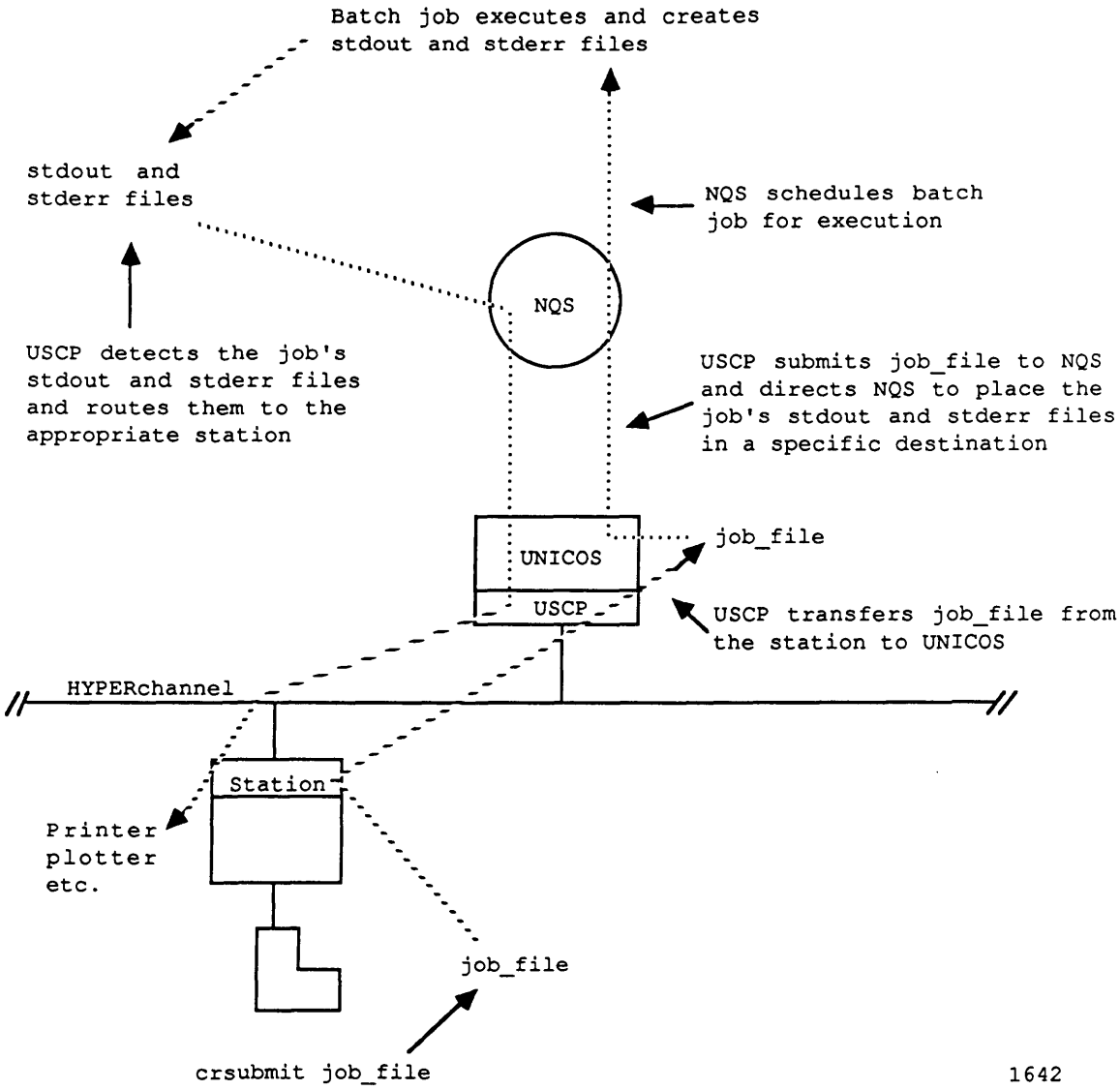


Figure A-7. Station/USCP/NQS Interaction

A.8 BATCH JOB STATUS

The following codes return job status information.

A.8.1 JOB STATUS

The batch Job Status Request (21) is supported. USCP uses the NQS qstat function to return the Job Status Reply (31) as follows:

- TID is from the request
- JN is from the request
- ST is one of the following:
  - Q (queued for execution)
  - X (executing)
- MSG is from the NQS qstat function and can be one of the following:
  - Running
  - Holding
  - Waiting
  - Queued
- OSID is from the dataset header
- JSQ is from the dataset header
- OTID is from the dataset header
- LOG is from the last record in the job's stderr file

A.8.2 DATASET STATUS†

The Dataset Status Request (56) is supported. USCP uses the NQS qstat function to return the Dataset Status Reply (57) as follows:

- If the permanent dataset name (PDN) begins with a /, the Dataset Status Reply function processes it as a complete path name and determines the existence of the specified file; otherwise, the Dataset Status Reply function uses the ID field to scan the password file for the user's home directory. It then appends the PDN to the path and determines the status of the requested dataset.

† Deferred implementation

- TID is from the request
- PDN is from the request
- ST is the dataset status
- ID (your UNICOS logname must be present if the PDN does not begin with a /)
- ED is not applicable
- OWN
- MSG is used in the same manner as under COS

A.8.3 ENTER LOGFILE REQUEST (015)

USCP uses the job's stderr file instead of the COS job's logfile, and it uses the USCP logfile as the system logfile. USCP attempts to make entries in the job's stderr file and the USCP logfile as indicated by the request.

A.8.4 STATCLASS

The Statclass Request (44) is supported. USCP uses the NQS qstat function to return the Statclass Reply (45). Each job class is a queue of type batch in NQS. USCP accesses qstat to get information on the job classes.

- Header:
  - TID is from the request
  - SNM is from NQS
  - JS is the sum of jobs in each queue
  - MJXT is the sum of all the limits of each queue
  - AJXT is not applicable
  - AJ is the sum of jobs running in each queue
  - NCL is the number of queues
  - NCW is not applicable
- Entry:
  - CNM is from the qstat queue name
  - OFF is the queue status from qstat
  - ACT is the number of jobs running in the queue
  - WTG is the sum of jobs waiting, queued, and holding in the queue
  - RES is not applicable
  - MAX is the limit of the queue

A.8.5 SYSTEM STATUS

The System Status Request (22) is supported. System Status Reply (32) is implemented as a function in USCP. The function can access qstat and examine USCP's queues. The reply fields are as follows.

- Header:
  - TID is from the request
  - JCSN is from NQS
  - ESR supported
- Executing queue (always from qstat):
  - TCPU is from qstat
  - OPR is not applicable
  - DC is from the dataset header
  - FID is from the dataset header
  - OTID is from the dataset header
  - DN is from the dataset header
  - ST is always x (executing)
  - JCN is from the qstat queue name
  - QF is the executing queue
  - PR is not applicable
  - TL is from qstat
  - FL is from qstat
  - JSQ is from the dataset header
  - EST is running
- Input queue (always from qstat):
  - TCPU is not applicable
  - OPR is not applicable
  - DC is from the dataset header
  - FID is from the dataset header
  - OTID is from the dataset header
  - DN is from the dataset header
  - ST is always q (queued for execution)
  - JCN is from the qstat queue name
  - QF is the input queue
  - PR is not applicable
  - TL is not applicable
  - FL is not applicable
  - JSQ is from the dataset header
  - EST is the qstat status and can be one of the following:
    - Waiting
    - Holding
    - Queued

- Output queue (from USCP's output queue):

  - TCPU is not applicable
  - OPR is not applicable
  - DC is from the dataset header
  - FID is from the dataset header
  - OTID is from the dataset header
  - DN is from the dataset header
  - ST is not applicable
  - JCN is not applicable
  - QF is the output queue
  - PR is not applicable
  - TL is not applicable
  - FL is not applicable
  - JSQ is from the dataset header
  - EST is not applicable

- Receiving queue (from USCP's receive queue):

  - TCPU is not applicable
  - OPR is not applicable
  - DC is from the dataset header
  - FID is from the dataset header
  - OTID is from the dataset header
  - DN is from the dataset header
  - ST is not applicable
  - JCN is not applicable
  - QF is the receiving queue
  - PR is not applicable
  - TL is not applicable
  - FL is not applicable
  - JSQ is from the dataset header
  - EST is not applicable

- Sending queue (from USCP's Stream Control Tables):

  - TCPU is not applicable
  - OPR is not applicable
  - DC is from the dataset header
  - FID is from the dataset header
  - OTID is from the dataset header
  - DN is from the dataset header
  - ST is not applicable
  - JCN is not applicable
  - QF is the sending queue
  - PR is not applicable
  - TL is not applicable
  - FL is not applicable
  - JSQ is from the dataset header
  - EST is not applicable

A.9 OPERATOR COMMANDS

The following operator commands are available under USCP: ENTER, DROP, ROUTE, KILL, STREAM, and LOGOFF.

The ENTER command takes the following required arguments: *jsq* and *id*[*tid*]. When the ENTER command is issued, the appropriate fields are modified in the dataset header and station slot file. If the file is in the output queue and its ID is changed, it is moved to the new ID's output queue, along with any associated output files.

The DROP command takes the following argument: *jsq*. When the DROP command is issued, the qdel command sends a sigterm signal and the available output is returned to the user.

The ROUTE command takes the following arguments: *oid* and *nid*. When the ROUTE command is issued, the files in the output queue for the old ID are moved to the output queue for the new ID. Files in the executing queue have changes made to the appropriate fields in the dataset header and station slot files. Changes are also made to files in transit.

The KILL command takes the following argument: *jsq*. When the KILL command is issued, the qdel command sends a sigkill signal. Only the stderr is returned to the user.

The STREAM command takes the following arguments: *id*, *ni*, *no*, and *na*. This command is used to update stream variables for the station.

The LOGOFF command is used to log off all interactive users from a specified front end.

A.10 USCP RESTRICTIONS

USCP supports all appropriate fields in the station reply messages. If the COS and UNICOS information is not equivalent or comparable, 0's or ASCII nulls are returned. If an unsupported USCP message is received, the Message Error (12) message is returned with MSC set to 250_8. The unsupported USCP messages are as follows:

```
ENTER,jsq,PRIORITY,pri
ENTER,jsq,TIME,tl
CHANNEL,chan[,ordinal],OFF
DEVICE,device,OFF
FLUSH,device
ENTER,jsq,CLASS,jcl
LIMIT[,n]
SWITCH,jsq,ssw,ON
SWITCH,jsq,ssw,OFF
```

```
OPERATOR,id,tid,pq,[,npw]
DEVICE,device,PRIVATE
DEVICE,device,PUBLIC
RESUME,ALL
RECOVER
RELEASE,jsq
RERUN,jsq
RESUME,jsq
SUSPEND,ALL
SUSPEND,jsq
SHUTDOWN
CHANNEL,chan[,ordinal],ON
DEVICE,device,ON
CLASS, [ALL,jcn], [ON,OFF]
```

The job sequence number is used to identify jobs and input and output files. USCP maintains job sequence numbers and maps them to the NQS sequence numbers. All station commands and displays refer to the SCP-maintained job sequence numbers.

The following SCP Message Codes are not supported:

Code	Description
17	Unsolicited Operator Message
20	Unsolicited Operator Reply
25	Mass storage status request
27	Debug function request
35	Mass storage status reply
37	Debug function reply
46	Station message request†
47	Station message reply†
50	Tape configuration request†
51	Tape configuration reply†
52	Tape job status request†
53	Tape job status reply†
54	Configure request
55	Configure reply
64	Generic resource status request
65	Generic resource status reply
100	Swap Space Status Request
101	Swap Space Status Reply

† Deferred implementation

A.11 REQUIRED STATION CHANGES

To use USCP under UNICOS, some changes must be made to the interactive protocol. The USCP interactive capability is implemented by Interactive Request (42), for communication from one front end to the Cray mainframe, and by Interactive Reply (43), for communication from the Cray mainframe to the front end.

The terminal message header contains control and data information. The message fields are as follows:

Field	Word	Bits	Description
PN	0	0-11	Process number
MN	0	12-15	Message number
ST	0	16-19	Terminal state
EC	0	20-23	Error code
MT	0	24-31	Message type
SF	0	32-35	Special function
MODE	0	36	Terminal mode
CHN	0	37	Chain flag
GDU	0	38	Graphic data unbuffered
NOE	0	39	No Echo flag
UB	0	45-47	Unused byte count
WC	0	52-63	Word count

The fields PN, MN, ST, EC, and WC operate as described section 4. The front end sends data in COS blocked format (MT=4) but the Cray mainframe does not send data from UNICOS processes in blocked format; instead it sends data in a format called UNICOS data (MT=14).

All special function (SF) subtypes are supported, as follows:

Code	Description
1	Abort generates a sigquit signal
2	Status generates the UNICOS command ps - le
3	Attention generates a signit signal
4	Prompt is issued when needed
5	Kill is issued when the corresponding process is dead

Logoff with Quit, Continue, and Hold are supported as described in section 4. The MODE and CHN flags are not currently supported. The GDU flag is not yet implemented but will be used with the UNICOS data message type (MT=14) to specify transparent data.

The NOE flag is used with the prompt special function to indicate to the station that the data entered by the user at the terminal must not be echoed to the terminal. This is useful for password processing.

The UB field is used only when UNICOS data is being sent from the Cray mainframe to the front end. It contains the count of unused bytes in the last word of the data segment. This is similar to the unused bit count field in COS blocked format.

A.12 ADDITIONAL MESSAGE TYPE (MT=14)

The COS message type MT=4 (blocked data) cannot be implemented on data sent by USCP because UNICOS uses partial record format for some I/O processes. The Cray mainframe sends data in a format called UNICOS data (MT=14).

Example 1 shows a C program with the first printf statement requesting the user's name, but the cursor remains on the current line because the printf statement does not contain the character '/n' (ASCII new-line). Under the COS blocked data format, the prompt could not be sent to the front end because the entire record (the prompt and the name) is not input. However, the user on the front end does not know to enter his or her name, so the blocking (and hence the transfer) is not completed.

Example 1:

```
main ( )
char name (10):
printf("Enter your name,please:");
read name;
printf("/nThank you/n");
return (0);
```

Example 2 shows a record that is being composed of three partial outputs. USCP implementation depends on asynchronous reads of the pty, so the first asynch read will catch the output of variable 1, the next read will catch the output of variable 2, and the last read will catch the output of variable 3. If COS blocked format were used in the protocol, the result would be three lines of output instead of one.

Example 2:

```
main ( )
printf (""%d",var1)
.
.some calculations
.
printf (""%d",var2)
.
.some calculations
.
printf (""%d/n",var3)
return (0);
```

The previous examples show that a partial write can be part of a larger amount to be output (example 2) or an end in itself (example 1). No single scheme for handling partial records will work in COS format.

(MT=14) is a new message type that was implemented to support the UNICOS data format (refer to examples 3 and 4). When the USCP process reads a pty, it immediately sends the data to the front-end station as a string of characters. The front-end station must break out the control characters to appropriately display the string. The control characters are the new-line (/n) character (12 octal) and the tab (11 octal).

Example 3:

```
main( )
printf ("line 1/n");
.
.
.
printf ("line 2/n");
```

Segment 1:

```
word 0 :(message header)
        PN/MN/ST/EC=0/MT=14/SF=0/MD/CH/UB=1,WC=1
word 1 : (data)
     line 1/n
```

Segment 2:

```
word 0 : (message header)
     PN/MN/ST/EC=C/MT=14/SF=0/MD/CH/UE=1,WC=1
word 1 : (data)
     line 2/n
```

Example 4:

```
main ( ) (
printf ("enter your name");
```

Segment 1:

```
word 0 : (message header)
         PN/MN/ST/EC=0/MT=14/SF=0/MD/CH/UB=1,WC=2
word 1 : (data)
         enter yo
word 2 : (data)
         ur name
```

Partial records can be larger than the station's segment size. The USCP protocol allows the entire record to be transmitted using multiple segments.

A.13 HYPERCHANNEL ACCESS IN A GOS ENVIRONMENT

In a GOS environment, COS and UNICOS share a HYPERchannel (see figure A-2). The IOS driver supports the message routing based on the logical path number. Path 0 is reserved for COS stations. The IOS NSC concentrator processes messages that are addressed to logical path 0. A second path *x* is reserved for stations that are logging onto UNICOS. USCP uses the NSC F-packet driver to perform I/O on path *x*.

In a USCP configuration under UNICOS, USCP allocates path 0 or 1 (or both) to service the front-end stations (see figure A-1).

USCP performs all error recovery for UNICOS stations. The USCP error recovery support may differ from that provided by the IOS NSC concentrator for the COS stations.

The NSC driver supports additional COS and UNICOS protocols on paths other than 0 and 1 via the NSC F-packet interface.

The following software changes are required to support station connections through the GOS IOS HYPERchannel:

Software	Change Required
COS	None
IOS	Change NSC F-packet driver to allow logical path 0 to be assigned; modify IOS station to allow it to log on to UNICOS.
UNICOS	None
USCP	Add capability that allows logical paths 1 and 0 to be assigned
Station	Add option that allows you to write to logical path 1 if communicating with UNICOS in a GOS environment

A.14 ACCOUNTING ENHANCEMENTS†

UNICOS and/or USCP provide appropriate accounting functions for the following:

- Job execution time
- CPU utilization by job or command

† Deferred implementation

- Disk resource utilization
- Data transfer activities

This allows customer billing of users and provides assistance in capacity and performance planning.

The main UNICOS accounting areas are as follows:

- Disk storage
- Command processing (CPU usage)
- Data transfer between the Cray mainframe and front-ends

These accounting areas are logged separately and then merged by system administration routines to form a complete "daily charges" file for the entire system. Disk storage information is stored by user ID through a UNICOS administration tool that is run periodically. CPU usage is logged by the kernel and stored by user ID. For batch jobs, NQS adds accounting information for CPU usage. Information for disk storage and CPU usage is processed and stored by routines that are internal to the UNICOS system. These routines are documented in the UNICOS System Administrator Guide for CRAY-2 Computer Systems and the UNICOS System Administrator Guide for CRAY X-MP and CRAY-1 Computer Systems.

USCP stores information for data transfers between a front-end station logged on through USCP and the Cray mainframe. The stored information is then placed in a general system accounting format, merged with the other UNICOS system accounting information, and added to the daily charges file.

SPC ERROR RECOVERY B

This appendix describes SCP error recovery procedures.

B.1 ELIMINATION OF ERROR LCP GENERATION

SCP running under the Cray operating system UNICOS (USCP) uses the logical path connection in the I/O subsystem. The IOS driver does not require a specific protocol and does not generate Error LCPs in the IOS.

The front-end station no longer receives the following Error LCPs: 251, 330, 331, 332, and 333. Additionally, SCP does not receive a 307 Error LCP from the IOS driver.

B.2 IOS ERROR RECOVERY

The following subsections describe how the IOS driver attempts to recover from an error.

B.2.1 READ OPERATIONS/INPUT LCPs

There is no error recovery. The driver waits for the front-end station to retransmit the LCP. Neither SCP nor the front-end is notified of the error condition.

B.2.2 WRITE OPERATIONS/OUTPUT LCPs

Each attempt to complete a write request consists of two retries separated by a short time delay. If both attempts are unsuccessful, the write request is requeued at the end of the write chain. Further attempts will be made after other write requests have had a chance to complete. A write request will return an error if the operation is not completed before the write timer expires. (The timer value is 60 seconds.)

NOTE

The driver will return an error immediately on any unrecoverable condition such as an attempt to send a message to a nonexistent adapter.

SCP is not notified of the output LCP error condition. It is the responsibility of the front-end station to detect the condition using a software time out.

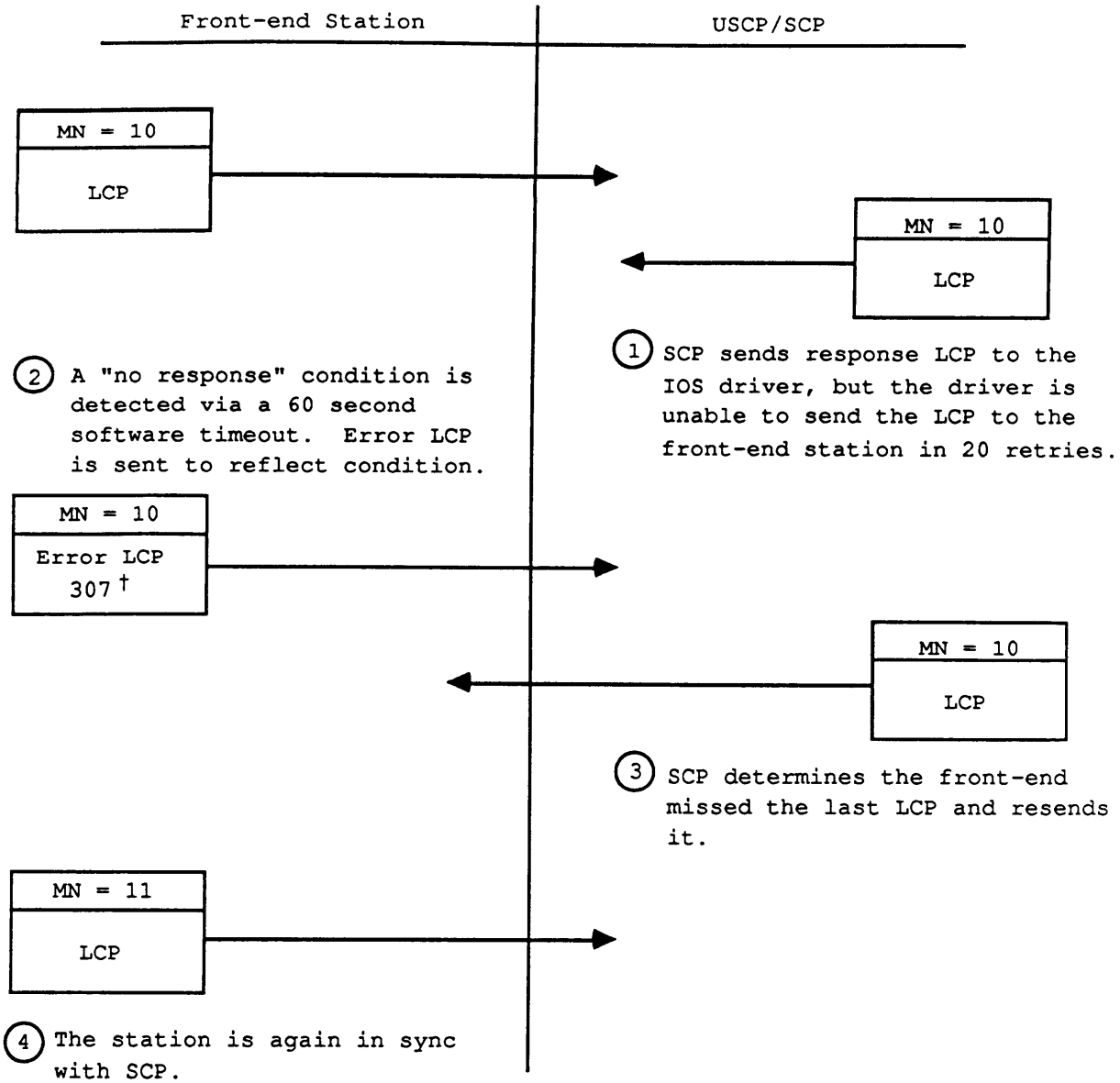
USCP is notified of the output LCP error condition. See appendix A for more information.

B.3 ERROR LCP PROTOCOL ENHANCEMENTS

Enhancements to Error LCP protocol aid in recovery from a lost message problem (caused by a software time out). Figures B-1 and B-2 illustrate how these enhancements operate. Figure B-1 illustrates the recovery procedure when the IOS driver is unable to send a response LCP to the front-end station. Figure B-2 illustrates the recovery procedure when the IOS driver fails to receive an LCP sent by the front end. After transmitting an LCP, the front-end station should wait 60 seconds for a response from SCP. This allows for COS/IOS polling conditions, in addition to the time needed to execute 20 retries.

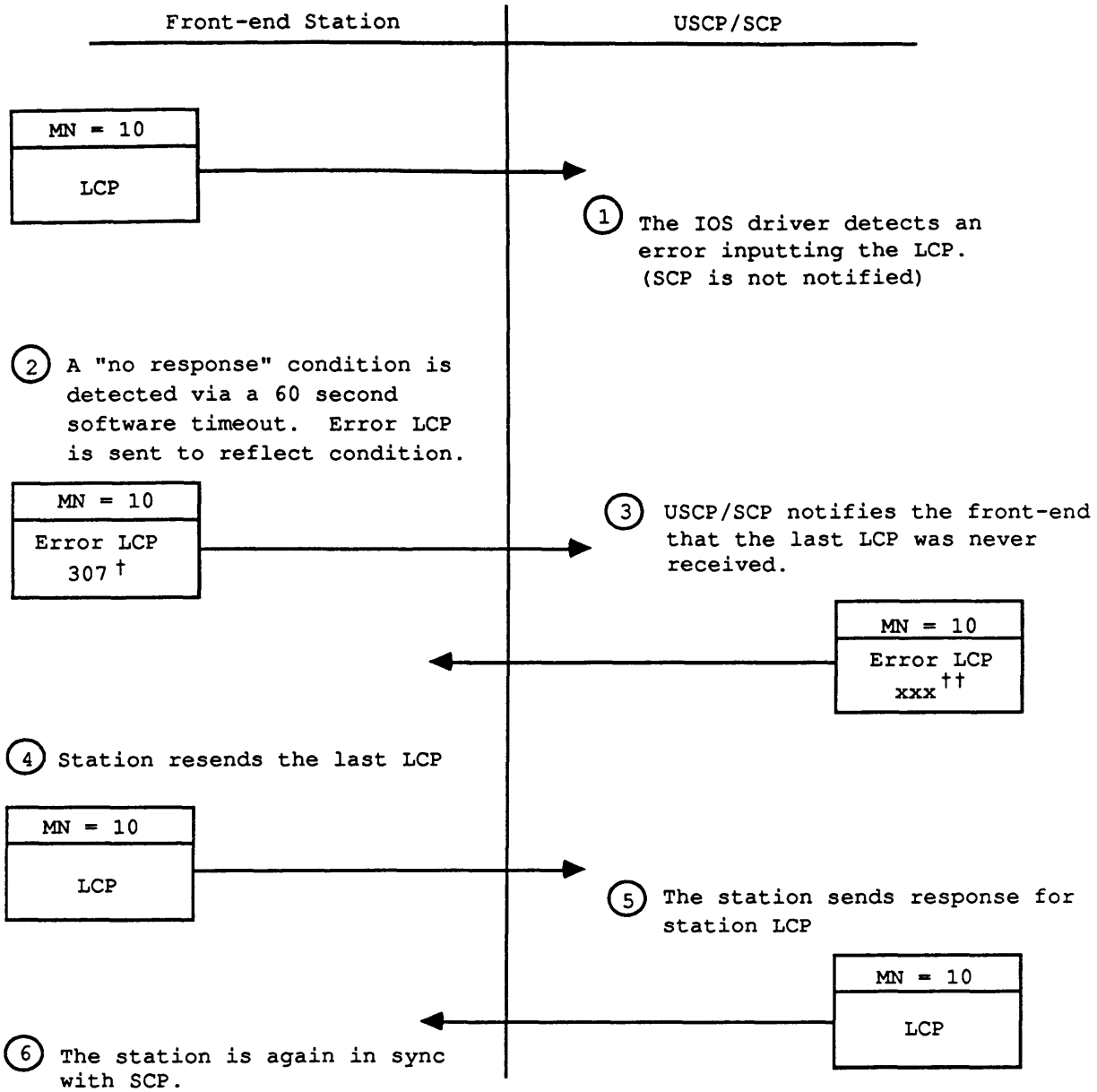
NOTE

Customer sites using a single NSC A71X adapter to support more than one remote station will experience stability problems. This results when a number of stations relog if they do not receive a response to an LCP within a specified amount of time (typically 30 seconds). Additionally, the IOS driver does not support link adapter error messages for protocols which are sensitive to lost messages (such as SCP).



† Error LCP code 307 = HYPERchannel error 1664

Figure B-1. Error Recovery Sequence, Case 1



† Error LCP code 307 = HYPERchannel error
†† Error LCP code xxx = SCP missed previous LCP

1665

Figure B-2. Error Recovery Sequence, Case 2

MNEMONICS USED IN TABLES C

The following list is an index of mnemonics for field names and codes for field values as used in tables in this manual. Different appearances of the same mnemonic do not necessarily denote the same meaning.

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