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DMS-10 Family

600-Series Generics

Input/Output System

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Contents

Section 1: Introduction

Scope and purpose of this publication

This Nortel technical publication (NTP) contains a description of the DMS-10 input/output (I/O) system, which is used for performing data modification, maintenance, and operational measurement tasks. The purpose of this publication is to describe the functions, capabilities, components, and operation of the I/O system.

This publication also presents information on I/O system operation for Cluster configurations. Cluster configurations include Host Switching Office/Satellite Switching Office (HSO/SSO) configurations, consisting of an HSO and up to 16 SSOs, and Large Cluster Controller/Satellite Switching Office (LCC/SSO) configurations, consisting of an LCC and up to 16 SSOs. Cluster configurations allow centralized administration, billing, and maintenance for several offices at the host office, either an HSO or an LCC. Consequently, Cluster I/O system operation differs from that of a stand-alone DMS-10 switch.

Organization

This NTP comprises the following sections:

- Introduction
- System description
- System operation
- Operations Support Systems
- Index

Section 2 describes the major components of the I/O system, including storage media, overlay programs, and interactive terminals. Section 3 presents general user instructions as well as information on system operation relative to specific input tasks. Section 4 presents information on I/O system operation for Operations Support Systems (OSS) and for OSSs used with cluster configurations. These include the Engineering and Data Acquisition System (EADAS), the Switching Control Center System (SCCS), and the Predictor interface for Line Insulation Test (LIT) equipment.

Section 2: System description

Introduction

The DMS-10 switch is a stored-program, computer-controlled Digital Switching system. It responds to input signals (for example, line switch changes and digits dialed) according to instructions stored in memory. These instructions are organized into programs to provide an orderly response to the input signals. In order to respond correctly to these signals, the programs are in turn supplied stored data describing the physical makeup of the DMS-10 system directory numbers, line and trunk characteristics, and other information appropriate to the installed DMS-10 switch.

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2.1 Archiving Log Files
To archive the log files, the user will need to connect to the DMS-10 and perform an ftp transfer of the files to their PC. PASS already has these capabilities built in. They select the site from the Site Database and connect. This can be either through a RAS or straight IP connection. By selecting .Retrieve. from the LogView menu, the program will connect to the DMS-10 via ftp. It will use the same IP, username, and password that are used by PASS to patch the site. The user will be presented with a dialog that will allow them to walk the log file directories on the DMS-10. From there they can choose to download a single file, multiple files, or an entire directory.

The root directory to store the log files can be set by the user. Under the root directory, a subdirectory will be created based on the site name. The directory structure will then mimic that of the DMS-10.s log directory. The site name is taken from the PASS site database and is the one connected to at the time of retrieval.

To help automate the archiving process, an auto update feature can be used to pull all remote files that are not currently on the local PC (or mapped drive). This option can be invoked from the command line. This will allow the archiving to be performed automatically using the Windows Scheduler that comes with the Windows Operating System.

2.2 Viewing Log Files
Once the log files are available on the PC, the user can select and view it. The log files are stored in an encrypted format. The viewer will decrypt and display the log using a Windows GUI front end. You will be able to limit the view to a specific TTY, or all TTY.s. By default, the output from the debug channels will not be shown, but will be available as an option. The file will be read only. No editing capabilities will be provided.
A .Save As Text. option will allow importing into a text editor of choice.

2.3 Searching Log Files
There will be two kinds of searches provided. Find and Find in Files. Find will search the currently loaded document. It will give the user the ability to search up or down in the file. Find in Files will allow the user to search all the documents that are stored on the local machine. Options will be to Search all sites or a specific site, search all files, or a specific date range of files. User will be given the option to limit the search to a specific TTY. Results will display a list of logs found that match the search criteria and allow the user to select a file to view.

System functions

The data describing the physical makeup of the DMS-10 switch require frequent updating to keep them current with changes to the system configuration. A major function of the input/output (I/O) system is to provide a mechanism for modifying these data. In addition, the I/O system is used to perform automatic and interactive maintenance activities and to obtain operational measurements.

System capabilities

The I/O system contains a set of resident programs allowing the control unit to communicate with various I/O devices. All messages to and from the control unit are routed through the I/O system, providing a consistent set of rules for communicating with the DMS-10 switch.

The I/O system provides:

- access security through the use of passwords
- routing of various classes of messages to different terminals
- arbitration between input and output
- remote monitoring of transactions at any terminal
- multiple terminal and tape unit operation
- access to the DMS-10 switch data and programs
- message forwarding to other terminals
- message editing
- time and date functions

- communications between a Host Switching Office (HSO) and its Satellite Switching Offices (SSO)
- communications between a Large Cluster Controller (LCC) and its Satellite Switching Offices (SSO)
- access to Input/Output Interface (IOI) system features
- communications with IOI system buses

System configuration

The I/O system consists of the following:

- solid state memory
- disk drives
- terminals, printers, etc.
- nine-track Magnetic Tape Units or Billing Media Converters or both, for Automatic Message Accounting (AMA) billing
- circuitry to interface I/O devices to the DMS-10 control unit, including Magnetic Tape Interface, Input/Output Interface, Serial Data Interface (SDI), Data Link Controller (DLC), LAN/CPU Interface (LCI), and Dual Integrated Modem packs
- IOI shelf, if required, for magneto-optical drive
- GPIO shelf to house general-purpose I/O packs such as DLC, Magnetic Tape Interface, SDI packs, and magneto-optical drive

Terminals

The Serial Data Interface (SDI) pack (NT3T09), Dual SDI pack (NT3T80), and Dual Integrated Modem pack (NT3T93) provide communication ports between interactive terminal equipment and the DMS-10 switch. The SDI packs data transmission rates are specified by means of DIP switches on the pack. The Dual Integrated Modem pack automatically adjusts its transmission rate. The SDI packs transmit data by means of a programming plug to describe the types of terminal equipment with which the DMS-10 switch can interface (for example, modem, RS-232C port, or 20-mA current loop). The Dual Integrated Modem pack contains two Bell 212A-compatible modems, which interface to RS-232C ports. Further details on the SDI or Dual Integrated Modem packs can be found in the NTPs entitled *Equipment Identification* (297-3601-150) and *DIP Switch Settings for Printed Circuit Packs* (297-3601-316).

Terminal characteristics

Depending on the type of pack that interfaces with the terminals, different characteristics are supported:

SDI pack (NT3T09)

Interface:	RS-232C
Code:	ASCII
Speed:	110, 300, 1200, 2400, 4800 baud
Loop Current:	20 mA

Dual SDI pack (NT3T80)

Interface:	RS-232C
Code:	ASCII
Speed:	110, 150, 300, 600, 1200, 2400, 4800, 9600 baud (see note)
Loop Current:	20 mA

Dual Integrated Modem pack (NT3T93)

Interface:	RS-232C
Code:	ASCII
Speed:	300, 1200 baud
Loop Current:	not supported

Note: *Although the DMS-10 switch supports 9600-baud terminals, sustained input at that character rate is not recommended. Therefore, the 9600-baud rate is only recommended for terminal use involving human input; the baud rate for terminal use involving computer-generated input should not exceed 4800 baud.*

Terminals can be operated locally or remotely through modems. Dial up capability can be provided for the remote maintenance terminals. This provision is operative regardless of the status of the dedicated link to the office maintenance terminal.

ASCII character compliance

In support of the DMS-10 Telnet Interface feature, input and output of ASCII characters has been made compliant with standard ASCII. This changes the upper bit (bit 7) for each character byte from 1 to 0 for output to serial TTY ports. This may require video display terminal or terminal emulator setting changes in order for the terminal to function as a DMS-10 TTY. Further details on the SDI packs can be found in the NTP entitled *DIP Switch Settings for Printed Circuit Packs* (297-3601-316).

Terminal classification

The I/O system permits the classification of terminals by function. A terminal may be assigned to handle any function or combination of functions such as maintenance, traffic reporting, or data modification. Terminal classifications are established in the system Configuration Record using Overlay CNFG (LOGU prompting sequence). Refer to the NTP entitled *Data Modification Manual* (297-3601-311) for details on classifying terminals.

Note: *In an LCC or an office configured as an HSO, only one terminal can be classified to handle traffic. That terminal may not perform any input functions.*

Terminal assignment

Terminals are assigned in the DMS-10 switch as logical units. The DMS-10 switch can operate with a maximum of 31 logical units, which are designated by logical unit numbers (LUNOs) in the system Configuration Record using Overlay CNFG (LOGU prompting sequence). Refer to the NTP entitled *Data Modification Manual* (297-3601-311) for details on assigning a LUNO to a terminal.

LUNO assignment is restricted. LUNO 14 is not available in an LCC or an office configured as an HSO, and LUNOs 11, 12, 13, and 14 are not available in offices configured as SSOs.

Overlay programs

System functions implemented by overlays are those functions infrequently used and which allow relatively slow response. These include:

- updating of the office data by the operating company to reflect changes in the system configuration, including changes to directory numbers, trunking, and similar items
- testing to detect system troubles before they result in any deterioration of service to the subscriber (hardware and software diagnostics and audits)
- providing software aids for repair activities

Overlays may be requested by operating company personnel (that is, entering OVLY <*overlay mnemonic*>, followed by a carriage return), using an interactive terminal, or by the DMS-10 switch software, in free-running mode.

Interactive overlays are run by operating company personnel at maintenance terminals and require interactive exchange of information with the user, that is, the user inputs information in response to overlay prompts and the DMS-10 switch outputs messages and additional prompts in response to the user's input. Interactive overlay tasks include data modification and verification, maintenance testing, and operational measurements.

Free-running overlays survey system integrity. The overlays run automatically, as requested by the system, and require no interactive dialog with the user. Output from the free-running overlays is printed on a terminal. Most maintenance overlays, such as the Control Equipment Diagnostic (CED) and Input/Output Diagnostic (IOD), may be executed in the free-running mode.

Overlay programs requested by the DMS-10 switch are classified as follows:

- *background*, run when the requests for all other overlays have been satisfied
- *scheduled*, run when there are no higher priority requests pending; aborted, scheduled programs are rescheduled
- *high priority*, run when a fault is detected and the system requires a fast response. If an overlay is running a scheduled or background program, that program is aborted and the high priority request is then satisfied. If the overlay is a manually-requested program in that program's overlay group, the system forwards a message to the user that the program is being aborted.

An overlay supervisor program arbitrates between the various requests for overlay execution. Contention for the use of an overlay area arises when a request is forwarded to the I/O system while an incompatible overlay is in use. The overlay supervisor prioritizes requests and grants program access.

Should contention arise due to a manual request, a message is forwarded to the requesting user's terminal to indicate which program is running and who initiated it. Upon receipt of the message, the requesting user may override the program that is running, regardless of its priority level. The user of the aborted program is notified that the program has been aborted. When a system-requested program is aborted, the system reschedules the program to run after the higher priority program is done.

In Generics 501 and 502, depending on compatibility, multiple DMOs can run simultaneously from different I/O ports. The compatibility of each overlay request is checked against a list of active overlays. The overlay supervisor assigns a First timeslice to an overlay request that has passed a compatibility check. Maintenance overlays always receive a normal timeslice. Each overlay to receive a timeslice is marked accordingly and the next active, unmarked overlay is selected to receive a timeslice.

Overlays are memory resident. The number of administration overlays that can run simultaneously over different IO ports is limited by compatibility. Depending on the active administration overlay's compatibility, the number of possible simultaneous active overlays could vary from one to more than ten. Table 2-A lists administration overlay incompatibilities. For each overlay listed in the left column, the possible overlays that cannot be simultaneously active are listed in the right column. Unlike administration overlays, only one maintenance overlay can run at a time. An overlay supervisor manages the loading and timeslicing of overlays. Since the overlays are memory-resident, the supervisor's task does not require storage media retrieval functionality.

Table 2-A:
Administrative Multiple Overlay Incompatibility

Overlay	Incompatible Overlays
AIN	AIN, AREA, DN, HUNT, ISDN, QTRN, SNET, TG, THGP, TRNS
ALRM	ALRM, CNFG, CPK, LAN, NET, SNET
AMA	AMA. CNFG
AREA	AIN, AREA, DN, EQA, HUNT, ISDN, ODQ, QTRN, ROUT, TG, THGP, TRK, TRNS
BERT	BERT, HUNT, OMC, SNET
CCTB	CCTB, DN, ISDN, MBS**,** ODQ, THGP
CLI	CLI
CNFG	ALRM, AMA, CNFG, CPK, DN, HUNT, ISDN, NET, LAN, ODQ, ROUT, SNET, TRK, TRNS
CPK	ALRM, CNFG, CPK, DN, HUNT, LAN, NET, ODQ, OMC, SNET, TG, TRK
DN	AIN, AREA, CCTB, CNFG, CPK, DN, EQA, HUNT, ISDN, NET, MBS, ODQ, OMC, QTRN, ROUT, SNET, TG, THGP, TRK, TRNS
EMUL	EMUL
EQA	AREA, DN, EQA, HUNT, ISDN, ODQ, QTRN, THGP, TRNS
HUNT	AIN, AREA, BERT, CNFG, CPK, DN, EQA, HUNT, ISDN, MBS, NET, ODQ, OMC, QTRN, THGP, TRNS
ISDN	AIN, AREA, CCTB, CNFG, DN, EQA, HUNT, ISDN, LAN, MBS, ODQ, OMC, QTRN, ROUT, SNET, TG, THGP, TRK, TRNS
LAN	ALRM. CNFG, CPK, ISDN, LAN, NET, SNET
MBS	CCTB, DN, HUNT, ISDN, MBS, OMC, QTRN, SNET, TG, TRK
NET	ALRM, CNFG, CPK, DN, HUNT, LAN, NET, ODQ, OMC, SNET, TG, TRK
ODQ	AIN, AREA, CNFG, CPK, DN, EQA, HUNT, ISDN, MBS, NET, ODQ, QTRN, ROUT, SNET, TG, THGP, TRK, TRNS
OMC	BERT, CPK, DN, HUNT, ISDN, MBS, NET, OMC, QTRN, ROUT, TG, TRNS, TRK
QTRN	AIN. AREA, DN, EQA, HUNT, ISDN, MBS, OMC, ODQ, QTRN, ROUT, SNET, TG, THGP, TRK, TRNS

Table 2-A: (Continued) **Administrative Multiple Overlay Incompatibility**	
Overlay	**Incompatible Overlays**
ROUT	AREA, CNFG, DN, ISDN, ODQ, OMC, QTRN, ROUT, SNET, TG, THGP, TRK
SNET	AIN, ALRM, BERT, CNFG, CPK, DN, ISDN, LAN, MBS, NET, ODQ, QTRN, ROUT, SNET, TG, THGP, TRK, TRNS
TG	AIN, AREA, CPK, DN, ISDN, MBS, NET, ODQ, OMC, QTRN, ROUT, SNET, TG, THGP, TRK, TRNS
THGP	AIN, AREA, CCTB, DN, EQA, HUNT, ISDN, ODQ, QTRN, ROUT, SNET, TG, THGP, TRK, TRNS
TRK	AREA, CNFG, CPK, DN, ISDN, MBS, NET, ODQ, OMC, QTRN, ROUT, SNET, TG, THGP, TRK, TRNS
TRNS	AIN, AREA, DN, CNFG, EQA, HUNT, ISDN, ODQ, OMC, QTRN, SNET, TG, THGP, TRK, TRNS

In Generic 503 and later 500-Series releases, many of the administrative overlay compatibity restrictions have been removed. This permits an increase in the number of possible simultaneous active overlays. Not only can different overlays be loaded at the same time, but the same overlay can be loaded multiple times from different I/O ports. This allows high usage overlays to be accessed at anytime without the inconvenience of having to wait for another user to finish their DMO activity. Table 2-B lists the administration overlay compatibilities for Generic 503 and later 500-Series releases.

Table 2-B: **Administrative Multiple Overlay Incompatibility (Generic 503 and later 500-Series releases)**	
Overlay	**Incompatible Overlays**
ISDN	AIN, AREA, CCTB, CNFG, DN, EQA, HUNT, ISDN, LAN, MBS, ODQ, OMC, PRI, QTRN, ROUT, SNET, SURV, TG, THGP, TRK, TRNS, UPDT
AIN, AREA, CCTB, CNFG, DN, EQA, HUNT, LAN, MBS, ODQ, OMC, PRI, QTRN, ROUT, SNET, SURV, TG, THGP, TRK, TRNS, UPDT	ISDN
CCTB, UPDT	CCTB, ISDN, UPDT
All other administrative overlays	None.

Section 3: System operation

Introduction

The input/output (I/O) system is used in making changes to the system data, querying the system data, and conducting maintenance tasks. General user instructions on I/O system operation are discussed below.

For detailed procedures to be followed when performing specific tasks, refer to the NTP covering those tasks, for example, *Data Modification Manual* (297-3601-311), *Operational Measurements* (297-3601-456), or *Maintenance and Test Manual* (297-3601-511).

Implementing a task

Using the I/O system to perform a task requires three steps:

- logging in
- executing the task
- logging out

In general, the three steps are sequential and follow a defined protocol. That is, successive substeps are permitted only if correct responses are provided to preceding machine messages. (Failure to observe the correct protocol results in error messages being printed.)

Logging in

Logging in consists of responding to the "!" prompt. Logging in is permitted if the previous user of the terminal has logged out. A user account can also be logged in using the LOGI command at the # prompt. Logging in consists of:

- indicating to the machine that you wish to log in by typing in the appropriate input command (LOGI),
- if the forced login indicator (FLGI) is set for the teletype in the CNFG-LOGU prompting sequence, providing a user account name (USER>) and password (PSWD>)
- providing your TTY class password (PASS?)

Passwords are required to gain access to the DMS-10 switch through an interactive terminal. Attempts to access the system through the use of an unauthorized password result in the user's being blocked. Password classes and the tasks allowed by those classes are presented in Table 3-A.

Executing a task

Executing a task consists of:

- requesting the appropriate overlay program (that is, entering OVLY <*overlay mnemonic*>, followed by a carriage return)
- responding to the messages output from the overlay

Table 3-A:
Password classes

Password classes	Typical tasks allowed
All	All tasks
Administrative	Administrative tasks such as setting time and data and changing passwords
Maintenance	Maintenance tasks
Data Modification	Data modification tasks
Traffic	Traffic measurement
Debug	Debug tasks (installer programming aid)
Line Insulation Testing	Line insulation testing tasks
Emergency Input/Output	Emergency input/output, and all tasks

The successful transfer of an overlay to the overlay area takes place only if the user has logged in using an authorized password. When the overlay has been loaded into the resident memory overlay area, an output message is forwarded to the user's terminal indicating that it is ready for use. The user then responds to prompts or inputs commands that are pertinent to the specific task to be accomplished. Refer to the NTP covering the specific task to be completed, for example, *Data Modification Manual* (297-3601-311), *Operational Measurements* (297-3601-456), or *Maintenance and Test Manual* (297-3601-511).

If a user wishes to override an existing overlay to load a second, more urgently needed overlay, the abort command (****) can be entered to terminate the first overlay. Unless the Multiple Overlay Access System is configured, when one user is working with an overlay, a second user cannot load an incompatible overlay. Should a second user request the use of an overlay, the I/O system outputs a message indicating that the overlay is incompatible.

MOAS overlay arbitration

The Multiple Overlay Access System (MOAS) allows multiple compatible overlays from an administrative overlay group and one overlay from a maintenance overlay group to run at a time. Not only can different overlays be loaded at the same time, but the same overlay can be loaded multiple times from different Input/Output (I/O) ports.

Logging out

Logging out after a task has been completed is advisable. Logging out consists of responding to a system prompt (#) with the logout command (LOGO).

Note: *If a dialup port is being used and has been disconnected without logging out, the system will automatically log out the terminal after 1 min.*

Terminal operation

Terminal operation in conjunction with the I/O system can be divided into two categories: the input mode and the output mode. Characters may be input to the terminal through the teletype keyboard only when in the input mode. Characters may be output to the teletype by the DMS-10 switch only when in the output mode.

More than one terminal can connect to the I/O system at a time.

Input mode

The input mode has the following characteristics:

- All input characters are echoed back to the teletype.
- Input characters are stored in an input buffer on a character-by-character basis.
- Input characters are scanned for an input termination character.
- An input line is processed upon receipt of an input termination character.
- An input mode is terminated upon receipt of an input termination character.
- An input mode will be switched to output mode if left idle for 1 min and output is pending.

Output mode

The output mode has the following characteristics:

- All input characters except interrupt characters are ignored.
- Characters are not echoed back to the teletype.
- Three different types of output messages are possible: free-running (alarms, time, etc.), responses to inputs, and system requests for inputs (prompts).

- A teletype will remain in the output mode until a prompt is issued or until an interrupt character sequence is entered.

Remote monitoring

The I/O system makes it possible for one terminal to monitor the transactions taking place at another terminal. The monitor (MON) command is used to activate remote monitoring and to select the terminal that is to be monitored. (See section entitled “Commands.”)

When monitoring is requested, the I/O system places the terminal that issued the command into the output mode. The I/O system then repeats at the monitoring terminal all transactions that take place at the monitored terminal. In addition, the I/O system forwards all messages to the monitoring terminal that are normally routed to that terminal. This activity continues until the monitoring terminal issues the abort command (****) or four octothorps (####).

On a maintenance terminal using a Switching Control Center System (SCCS) format, the SCCS terminal automatically monitors all maintenance terminal units that are assigned any of the same output message classes as the SCCS.

Input operations

Interactive overlays proceed on the basis of the successful exchange of information between the user and the overlay program. With some of these overlays a specific prompt is provided by the overlay and the user in turn provides the desired response(s). With others, a specific command is required and must be input by the user before a response is provided.

Prompts

Prompts are generally used in interactive overlays involving data modification orders (DMOs) and operational measurements (OPMs). With these overlays, prompts are printed out by the I/O system to indicate to the user that a particular response is required.

With overlays for DMOs and OPMs, the response to a particular prompt may involve several options from which users can choose, depending on their needs. For a complete listing of DMO and OPM overlays, and the prompts and responses found in them, refer to the NTPs entitled *Data Modification Manual* (297-3601-311) and *Operational Measurements* (297-3601-456).

Some prompts that are printed by the i/o system involve general system operation and do not require responses from a particular overlay. For each of these prompts, there is an anticipated response. For example, when the password is the required response, the system prompts the user by displaying “pass?”. Table 3-B lists system prompts and provides the explanation and typical response for each.

Table 3-B:
I/O system prompts

Prompt	Explanation/Response
!	Request for log in. Response to proceed with log in is: LOGI
#	Request for system task. Refer to the resident commands in NTP 297-3601-506, *Maintenance Diagnostic Input Manual.*
>	General prompt used in interactive overlays. Response depends on the overlay selected.
Others	Special prompts peculiar to overlays. Response depends on the overlay selected.

Note: *To prevent excessive idle time, the time between prompt and response is monitored. If this time period exceeds 1 min, the machine enters the output mode and outputs any messages it has for the user.*

Commands

Commands are generally used in interactive overlays involving maintenance diagnostics. With these overlays, commands are input by the user to request that a particular activity be accomplished (for example, that a particular component be tested) and the response is printed out by the I/O system.

With diagnostic overlays, several commands may apply to any one component or one command can be used to manipulate several types of components. For example, users may be able to busy, test, or return to service a component, or they may be able to use the test command with several types of components. For a complete listing of diagnostic overlays, and the commands found in them, refer to the NTP entitled *Maintenance Diagnostic Input Manual* (297-3601-506).

Some commands are used to manipulate the system without loading a particular overlay. These commands are kept resident in the DMS-10 switch. For a complete description of resident commands, refer to NTP 297-3601-506, *Maintenance Diagnostic Input Manual*.

Mnemonics and symbols

Input messages are entered through an interactive terminal by using mnemonics and symbols. Mnemonics generally represent fixed information. Symbols are used to indicate variable information.

Mnemonics

A mnemonic consists of a two-, three-, or four-character alphanumeric term. In DMO overlays, for example, “QUE” in response to a designated prompt, specifies that a query be conducted. When multiple mnemonics are entered on the same line, they must be separated by one or more spaces. Two examples are illustrated below-one for input involving DMOs and the second for input involving diagnostics.

Example 1: QUE IFAC ALL

Example 2: TEST CNF ALL

In the first example QUE is the mnemonic for query; IFAC, the mnemonic for interface packs; and ALL, the mnemonic for all packs of the type noted. In the second example, TEST is the mnemonic for test; CNF, the mnemonic for conference packs; and ALL, the mnemonic for all packs of the type noted.

Symbols

Italics are used to represent statements involving variables. A major example is the use of variables to denote the physical address of a component. The following notations illustrate physical address:

PE *b s p u* PE bay (*b*), shelf (*s*), pack (*p*), pack unit (*u*) location.

SCE *b s p u* SCE bay (b), shelf (*s*), pack (*p*), pack unit (*u*) location.

LCE *b s lsg l* LCE bay (*b*), shelf (*s*), line subgroup (*lsg*), and line pack unit (*l*) location.

Example: PE 1 2 2 4

In addition to the symbols used within particular overlays, special input symbols are used with other variables. Table 3-C lists symbols used in a dialog applications as special input characters.

Table 3-C:
Special input symbols

Character	Use
@	Deletes last input character in input buffer. A backspace character does the same thing.
<CR>	Carriage return, used to end a line.
[	Delete previous input on the current line.
One or more spaces	Separate words.
²	As a prefix, indicates a hexadecimal number (for example, ●7A0F).
B.	As a prefix, indicates a binary number (for example, B.11110101).
####	Aborts the current command. Can be entered in either input or output mode and leaves terminal in input mode.
****	Aborts the currently active overlay. Can be entered with in either input or output mode and leaves terminal in input mode.
!!!!	Clears all TTY output buffers and aborts the current command.
%%%%	Clears interrupting TTY's output buffers and aborts the current command.
&&&&	Interrupts output.

Table 3-C: (Continued) **Special input symbols**	
Character	**Use**
?	Help request that causes system to display acceptable inputs for prompts within overlays.

Input editing

The editing capability of the I/O system permits the editing of input messages prior to requesting an overlay to act on them. The I/O system contains a temporary store that permits an input message to be assembled before it is forwarded to an overlay for execution. Typing a carriage return at the end of the line causes the I/O system to forward the message in its temporary store to the destination program for appropriate action. This permits the user to edit the input message. Edit functions are:

- deletion of the last character stored in the input buffer by pressing the "@" key or the "backspace" key on the terminal
- deletion of the line stored in the input buffer by typing in "[" on the terminal

Incorrect input

When an incorrect input (incorrect form) has been detected by a program, it rejects the input and responds by repeating the prompt or printing an error message.

If the user is uncertain about what are valid inputs to system prompts or what are valid options for diagnostic commands within an overlay, a "?" can be typed as a request for help. When this is done, any prompt or command within an overlay will display a list of acceptable options.

Input/output arbitration

To permit user verification of the information entered through the keyboard, the I/O system echoes all input characters. That is, each character is routed from the keyboard of the I/O system back to the printer for display. The echoed characters and program-generated output messages must be separated to avoid garbled information. The I/O system prevents garbling by operating in either the input or the output mode. In the input mode, the I/O system echoes input characters for verification and stores output messages in a buffer for later output. In the output mode, the I/O system:

- does not echo input characters
- ignores invalid input requests
- outputs any messages accumulated in the output buffer

A user can enter the output mode from the input mode by pressing the carriage return key (CR) at the end of a line. Also, the system switches to the output mode when more than 1 min has elapsed since the last character had been input. A user can enter the input mode from the output mode by typing four octothorps (####) as the abort command.

The abort commands for aborting the overlay or the last command entered use system characters and are passed directly to the I/O system for processing.

Output operations

Output messages are generated during an interactive terminal session to provide the information requested by a particular input command, to prompt the user for an appropriate response, or to provide a coded message concerning validity of input. In addition, output messages are generated automatically or in response to free-running overlays to inform or alert operating company personnel about the operational status of the switch. These message are explained in the Output Message Manual (OMM), which is generated for each software generic release for the DMS-10 switch.

Output messages are either printed out or displayed on a cathode ray tube (CRT) at the interactive terminal. Each output message begins on a separate line. The time of day is printed as an output message once every 15 minutes throughout the day.

Sequence numbers and time stamps

Sequence numbers and time stamps are appended to maintenance-class messages. Sequence numbers, from 000 to 999, show the order in which the messages were generated, which may differ from the order, according to relative priority, in which the messages were displayed. For example, alarm messages have the highest priority and, thus, will be displayed before non-alarm messages. Time stamps provide the hour, minute, and second that messages were generated.

Output format

The output message format is structured to permit easy visual separation of alarm and non-alarm messages. The general format of output messages is as follows:

```
ALMST <BEL> MSGID DEV TYPE / DEV LOC / MESSAGE
DATA
      SEQ HHMMSS
```

where:

- ALMST and <BEL> are provided only for alarm messages. ALMST (*, **, or ***) specifies the alarm status of the output message as *minor* (*), *major* (**), or *catastrophic* (***). <BEL> indicates an audible alarm.

- MSGID is a six- or seven-character code always appearing as a prefix to an output message and indicating the message content. The code consists of three alphabetic characters, to identify the functional category of the message, followed by three or four numeric characters, identifying the specific meaning of the message relative to the function. For example, DED822 indicates that the message is related to information in the Digital Equipment Diagnostic (DED).
- DEV TYPE (DEVICE TYPE) identifies the type of equipment involved (optional).
- DEV LOC (DEVICE LOCATION) identifies the physical location of the equipment (optional).
- MESSAGE DATA provides additional information.
- SEQ specifies the sequence number, from 000 to 999, of the maintenance-class message.
- HHMMSS specifies the time, in hours (HH), minutes (MM), and seconds (SS), when the maintenance class message was generated.

For example:

```
  AFD001  PELP  (NT4T05)  CE 1 4 14 1
  #054 125352

**ALM031 MAJ SET IOD
  #055 125407

**IOI032 0
  #056 125407
```

Note: *Alarm messages begin at the left edge of the printout. Non-alarm messages are not prefixed with asterisks and are always indented, thus making alarm messages more noticeable.*

Output message overload

Because all terminal outputs are buffered by the I/O system, it is possible to overload the output message capability under certain conditions. When this happens, a message may be lost or partially discarded. In such cases, an alarm indication is raised by the I/O system to indicate the lost messages. Partially discarded messages are denoted by periods appearing at the end of each incomplete message.

The priority of each incoming message received when the buffer is full is examined. If the priority of an incoming message is higher than any existing message, the lower priority message is overwritten by the new, higher priority message. Thus, catastrophic alarms having the highest priority will always be printed.

Output messages for cluster configurations

In cluster configurations, all alarm output messages are routed through the DLCs to the HSO or LCC. At the HSO or LCC, each message is queued for output according to its relative priority. Sequence numbers in maintenance-class alarms reflect the order that the messages were generated at the originating switch.

Output messages received from another switch are prefixed with an office identification (OFID) field, which identifies the originating switch. SCCS TTY messages are prefixed with a two-digit OFID: HSO messages are prefixed with *16*; SSO messages are prefixed with the number of the SSO (for example, messages from SSO #2 would be prefixed with *02*). For other cluster TTYs, messages are prefixed with a six-character OFID: at the HSO, messages from an SSO are prefixed with *SSOXXX* (*XXX* represents the SSO number); an HSO message being printed on an SSO's TTY (as a result of the Tandem Alarm Feature) is prefixed with *HSO016*.

Sequence numbers and time stamps for clusters

For cluster configurations, two time stamps are generated for each SSO maintenance-class message, each in the format *HHMMSS*. One time stamp indicates when the message was generated at the SSO, while the other time stamp indicates when the message was received at the host. The sequence numbers reflect the order that the messages were generated at the originating switch. The following is an example of output messages that might appear at a host TTY.

```
**DLC405 CD 1 5 07 (DLNK 9 0)
  #296 121407

**ALM031 MAJ SET DLC
  #297 121407

  SSO012 AFD002 MLIP (NT4T05) CD 1 4 15 02
  #077 074558 074559

  SSO012 AFD002 PELP (NT4T05) CE 1 4 15 02
  #078 074558 074559
```

Note: *The sequence numbers on the SSO messages do not correspond to sequence numbers on the host messages.*

Output message overload for clusters

When part of a message is lost due to a DLC or TTY buffer overflow, either ". . . .", "????", or "----" will be appended to the message. For example:

```
<MSG TEXT> .... <EOM>
```

indicates that text was lost due to a TTY buffer overflow either in the originating or destination switch;

```
<MSG TEXT> <EOL> ???? <EOM>
```

indicates that text was lost due to a DLC buffer overflow in the originating switch (this may occur for a message longer than 112 characters, unless the SSO is equipped with the SSO TTY Message Expansion feature which extends the message up through 4 DLC buffers, increasing the character limit to 448);

```
<MSG TEXT> ---- <EOM>
```

indicates that text was lost because the last part of a multiple DLC buffer message (used for the SSO TTY Message Expansion feature) was not received by the HSO.

Message class selection

Output messages generated as a result of a free-running program are routed to specific destinations by using the message (MSG) classification. Table 3-D shows how to use the message select commands.

Maintenance messages

Maintenance personnel are sometimes divided into outside plant and inside plant groups. Two different maintenance terminal classifications exist for the routing of these messages to appropriate maintenance personnel. Messages pertinent to outside plant personnel can be assigned through data input to be printed only at a maintenance terminal designated as a Remote Service Bureau (RSB) terminal. These terminals and the messages they receive are classified as "RSB"; inside plant maintenance terminals and messages are classified as "MTC."

If a Central Office does not have a maintenance terminal with the RSB classification, then all maintenance messages will be routed to the MTC terminal. See the NTP entitled *Data Modification Manual* (297-3601-311, Overlay CNFG, LOGU prompting sequence) for information on assigning maintenance terminal classifications.

Table 3-D: **Message class select commands**	
Input/Output	**Meaning**
# QUE CLAS <CR>	What are the message classes assigned to this terminal?
CLAS DMO MTCE	The message classes assigned to this terminal are data modification and maintenance.
# CSEL DMO <CR>	Output messages appropriate to data modification.
# QUE CSEL <CR>	What message classes have been selected?
CSEL DMO	The message class selected is data modification.
# CSEL <CR>	Output all messages appropriate to this terminal.
CSEL DMO MTCE	The message classes selected are data modification and maintenance.

Message routing

Messages generated as a result of an interactive (manually loaded) program are generally routed to the terminal involved in the interactive session. Messages generated as a result of a free-running (automatically loaded) program are generally routed to specific destinations by defining user (USER) message classes. These message classes are assigned as output classes using Overlay CNFG, and messages are routed to the terminals assigned to those classes. Terminals are assigned output message classes using Overlay CNFG. Typical output message classes are:

- Data modification (DMO)
- Debug (DEBG)
- Line Insulation Testing (LIT)
- Maintenance (MTC) for inside plant messages
- Remote Service Bureau (RSB) for outside plant messages
- Traffic (TRAF)

Except for alarm messages, the routing of messages to a terminal can be temporarily altered by selecting a subset of the output message classes assigned to the terminal. In this way, a user can exclude messages not directly related to the task being performed. Alarm messages are always output to a terminal.

Messages can be forwarded from one terminal to another through the use of the MSG command, permitting inter-terminal communication between users. (See section entitled “Commands.”) When a user receives a message while in the overlay area, the user must exit the overlay and send a return message within a specified time interval. The time is allotted (nominally 60 s) in the “Time-of-Day Timer” located in the overlay program supervisor. The response must be sent within this interval in order to regain control of the overlay area.

Note: *In cluster applications, the SSO can designate which classes of messages are to be transmitted from the SSO to the HSO or LCC. This is done using the Host Message Class (HMCL) feature, which is configured through the HMCL prompting sequence of Overlay CNFG.*

Sample printouts

Examples of a local terminal session, and a remote monitoring terminal session, and a Line Insulation Testing (LIT) session are presented below. These examples apply to terminals that are used with a standalone DMS-10 switch. For samples of printouts from terminal sessions involving cluster configurations and/or interfaces to EADAS or SCCS, refer to Section 5 of this publication.

Local terminal printout

Figure 3-1 illustrates a sample session for a local terminal. A general explanation follows the figure.

Figure 3-1: Sample terminal session

<CR>
!LOGI<CR>
PASS?
LOGI DMO MTC TRAF

#STAT IOI<CR>
IOI IDLEBUSA ACTV
BUSA HCD IDLE
BUSB HCD

#DSBL IOI<CR>
IOI DSBLBUSA ACTV
BUSA HCD DSBL
BUSB HCD

#ENBL IOI<CR>
IOI IDLEBUSA ACTV
BUSA HCD IDLE
BUSB HCD

#STAT IOI<CR>
IOI IDLEBUSA ACTV
BUSA HCD IDLE
BUSB HCD

#DATE<CR>
TIME MON 00:30:31 08/13/90

#DATE MON 08 13 91<CR>
TIME MON 00:30:31 08/13/91

#MSG<CR>
MSG FROM TTY0

#OVLY<CR>
OVLY000 IDLE (NED RSDT)
BUSA ACTV

#OVLY<CR>
OVLY000 BUSY: TTY 00 PGM
NED BUSA ACTV

#####<CR>
LOGO<CR>
!

Machine printouts are shown in bold type in this figure. The end of a user input line is indicated by <CR>. A <CR> entered after the prompts ! or # causes the I/O system to exit the input mode and enter the output mode. The input mode can be reentered by typing #### within 10 seconds. The password is not echoed, but a <CR> is required at the end of the password.

In the sample printouts, the user has indicated the wish to log in by entering four octothorps (####) within 10 s. The I/O system causes the prompt ! to be printed, requesting the user to log in.

The user responds with LOGI followed by <CR>. The I/O system displays the prompt PASS?, requesting the password and returning to the input mode.

The user then responds with the password, followed by <CR>. Note that passwords are not echoed. The system returns with LOGI and a statement of task classes appropriate to the authorized password. The system then reverts to the input mode to await further input.

Each entry following the system prompt # illustrates a task requested by the user. The information following each system command indicates the machine response.

At the end of the task, the user successfully logs out by:

- reentering the input mode with the #### command
- responding to prompt # with the system command LOGO

The I/O system indicates that it is ready for logging in by printing the prompt *!* at the end of the session. Typing *<CR>* after this prompt causes the system to enter the output mode.

Remote monitoring session

Figure 3-2 represents a remote monitoring session. The request to monitor the transactions at Terminal 2 is indicated by the MON 2 command. All messages originating from the monitored terminal are preceded by a period. Four asterisks at the end of a session, not preceded by a period, are a request to abort remote monitoring. All other messages are repeats of information that was printed at Terminal 2.

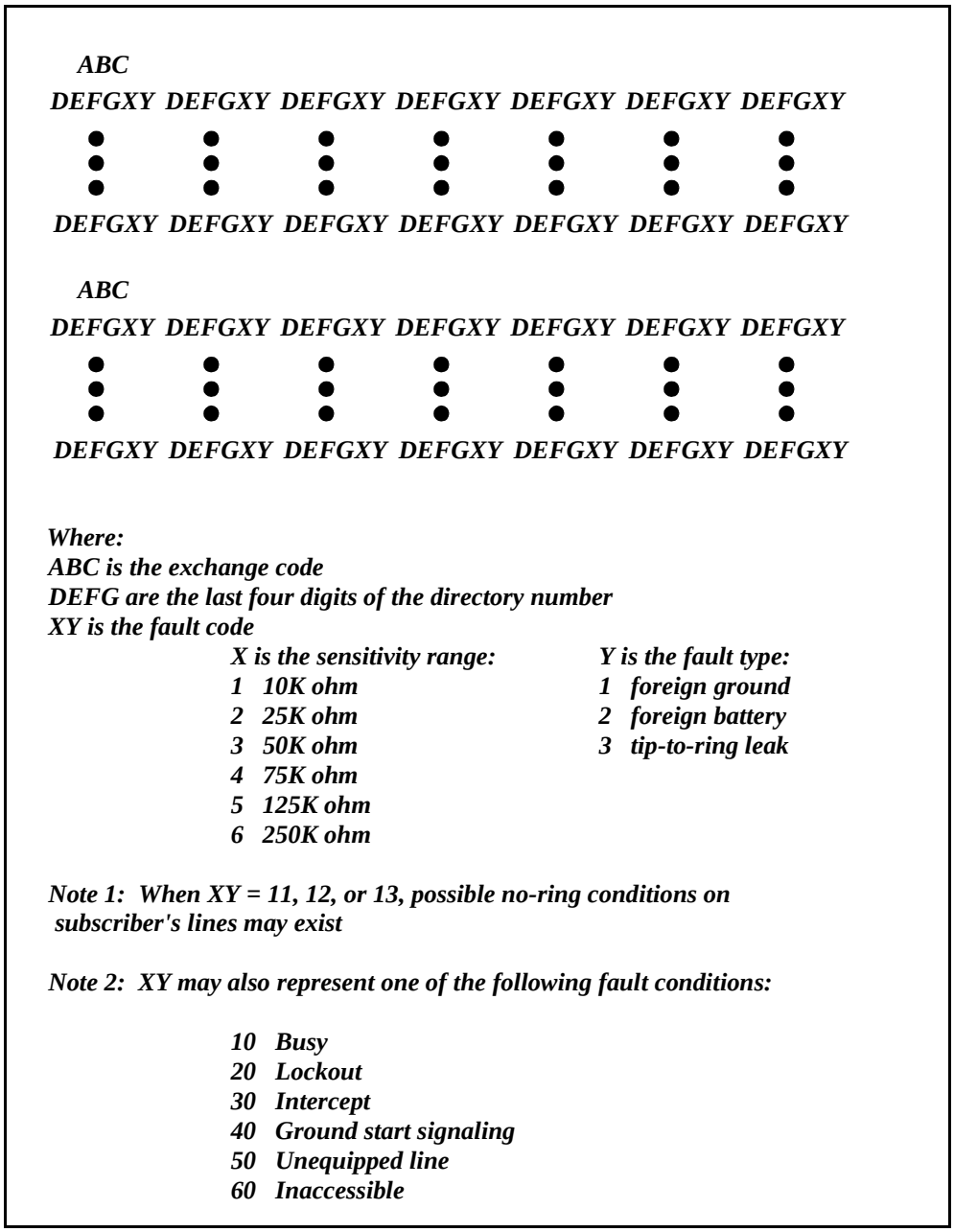
Figure 3-2: Sample remote monitoring session

```
#MON 2
.OVLY ROUT
REQ
.NEW ROUT 32
ALT
.33
TYPE
.AMR
TG
.22
OPR
.NOPR
COS
.NONE
DEL
.0
****
```

LIT Session.

LIT data are formatted on a printout in one to seven columns, as shown in Figure 3-3. For an explanation of the data provided in the printout, refer to the NTP entitled *Maintenance Diagnostic Input Manual* (297-3601-506), which provides the diagnostic used to implement the LIT feature in software.

Figure 3-3: Sample printout for LIT session



Emergency I/O (EIO)

Feature operation

This feature enables operating company personnel to interrupt a terminal that is generating an unusually large number of output messages due to an abnormal system condition. After EIO has been activated, the terminal operates only in the *interactive* state, that is, the state in which operating company personnel can work within an overlay or can issue Debug commands. The feature may operate simultaneously on as many terminals as are configured in the office. EIO activation is protected by a password set up by the telco.

After a terminal is in the EIO mode, *classed* messages, for example, alarms and maintenance messages, are discarded; only interactive, time, and EIO warning messages are output. These messages are saved in special EIO buffers set up using Overlay CNFG (BUFF) in NTP 297-3601-311, *Data Modification Manual*. A minor EIO alarm is automatically asserted when an EIO activation occurs and remains set as long as any terminal is in the EIO mode. A warning message is output at the terminal every 15 minutes as a reminder that EIO is activated and that classed messages are being discarded.

Activation of EIO is allowed either before or after a login is performed and when the terminal is in either the input or output mode. For offices in a cluster configuration, EIO can be activated at a satellite virtual terminal from the host. After the EIO activation command is issued, a message indicating the status of the activation is output. Because there is no guarantee that the status message will be output when I/O channel is flooded with messages, the maintenance display on the Central Processor circuit pack (NT3T65) displays a hex code also representing the state of the activation attempt: E10 indicates a successful activation; E11 indicates an invalid password was entered. Operating company personnel can also determine the status of the EIO activation through the resident command, STAT EIO. Following EIO deactivation, the terminal returns to the state, either pre-login or post-login, in which it operated prior to the EIO activation.

Activating and deactivating EIO

To activate EIO when not logged in, operating company personnel enter:

```
((((
```
(when the TTY is in output mode)

The system then prompts operating company personnel for the correct password.

To activate EIO when logged in, operating company personnel enter:

```
((((
```
(when the TTY is in output mode)

or

```
ACT EIO
```
(when the TTY is in input mode)

```
The system then prompts operating company
personnel for the correct password.
```

To deactivate EIO, operating company personnel enter:

`DACT EIO` (when the TTY is in input mode)

or

`))))` (when the TTY is in output mode)

or

`LOGO <cr>`

The terminal is placed back in the state in which it operated prior to the EIO activation.

EIO operation in the cluster configuration

In order for EIO to work properly in the cluster configuration, the SSO must be able to access buffers in the SSO in order to send messages to the HSO and the HSO must be able to access buffers in the HSO in order to send messages to the SSO.

If the SSO has already been accessed, operating company personnel may activate EIO at the SSO by entering:

`ACT EIO` (when the TTY is in input mode)

or

`((((` (when the TTY is in output mode)

and then entering the password for the SSO.

After EIO has been activated at the SSO, EIO will be automatically activated at the accessing HSO TTY.

To deactivate EIO, operating company personnel enter:

`DACT EIO` (when the TTY is in the input mode)

or

`))))` (when the TTY is in the output mode)

EIO at the accessing HSO TTY must be deactivated manually, following the *ACC HSO* command.

The SCCS terminal is the TTY of the HSO. To activate EIO at the SCCS, operating company personnel enter:

```
16 ACT EIO  <cr>
```

or

```
16 ((((  <cr>
```

To activate EIO in the particular satellite office experiencing difficulties, operating company personnel enter:

nn `ACT EIO  <cr>`

or

nn `((((  <cr>`

where, *nn* is the number of the office (0-15 for SSOs; 16 for the HSO).

After EIO has been activated at the SSO, EIO will be automatically activated at the accessing SCCS TTY.

To deactivate EIO at the satellite office, operating company personnel enter:

nn `DACT EIO  <cr>`

Section 4: Operations Support Systems

SCCS-teletype

The Switching Control Center System (SCCS) is an Operations Support System (OSS) that is used to monitor and control the status and performance of a DMS-10 switch from a remote location by interfacing a remote maintenance terminal (MTTY) at the Switching Control Center (SCC) to the DMS-10 switch. This interface allows the operating company to centralize DMS-10 switch surveillance and maintenance operations at the SCC.

When the SCCS is used in conjunction with cluster configurations, the Host Switching Office (HSO) or Large Cluster Controller (LCC) interfaces with the SCCS by way of the remote MTTY, and the Satellite Switching Offices (SSOs) interface with the host office (HSO or LCC) by way of Data Link Controller (DLC) data links. In this arrangement, the SSOs are not directly linked to the SCCS; consequently, the number of teletypes required to provide SSO information to the SCC is kept to a minimum.

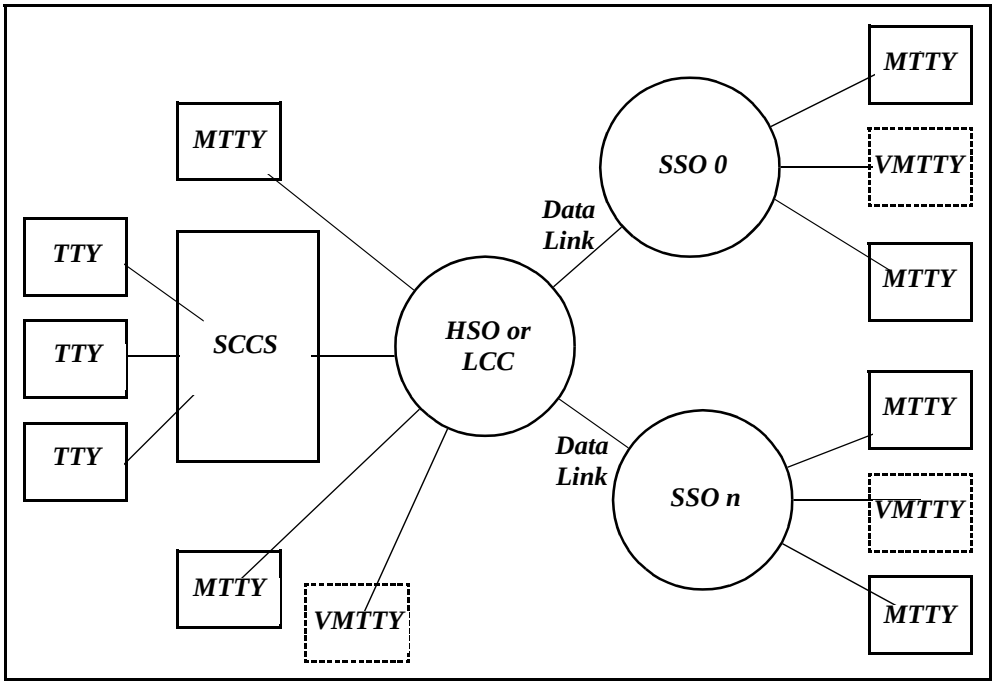
In cluster configurations, as with the stand-alone DMS-10 switch, input messages and system responses from a local MTTY are echoed at all of the local MTTYs as well as at the remote MTTY. Additionally, messages and responses at the remote MTTY are echoed at the local MTTYs. All alarm and maintenance output messages are directed to both the local and remote MTTYs.

Terminals

The MTTY terminal at the SCC provides the same input/output (I/O) messaging and monitoring functions as an MTTY found locally at the DMS-10 switch.

In cluster applications, the SCCS can have several terminals connected by way of a host office (HSO or LCC) over a single TTY link. The SCCS can thus communicate with several DMS-10 switches concurrently by using “virtual” teletypes (VTTYs) (see Figure 4-1). VTTYs require no physical hardware and consist of all the software structures necessary to support TTY I/O. Each SSO can have up to four VTTYs, each of which is associated with a logical unit (11, 12, 13, or 14). The host office (HSO or LCC) has one VMTTY, associated with logical unit 14. VTTYs cannot be assigned or deleted in Overlay CNFG.

Figure 4-1: MTTY configuration in a DMS-10 cluster



Input

All messages input at the local MTTY as well as the system's responses are transmitted to the remote MTTY. Likewise, all messages input at the remote MTTY and the system's responses are echoed at the local MTTY.

When information is input at the SCCS MTTY in a cluster application, it is directed to a given VMTTY by prefixing each input line with header information that identifies the appropriate office.

The office identification (OFID) number found in the <Control Option> field of all output messages is used for this purpose.

Input messages

The format for a typical SCCS input message in a cluster application is as follows:

: <Control Option> <SP> <Input Line> <EOM> <Error Msg>

where:

: is the prompt generated by the switching system for SCCS.

<Control Option> is the OFID number assigned to the office (0-15 for SSOs, 16 for the host office (HSO or LCC)).

<Input Line>	is the line input to the DMS-10 switch.
<EOM>	is the end-of-message sequence.
<Error Msg>	is the error message generated by the DMS-10 switch (if applicable).

Once the <CR> is pressed, the host office (HSO or LCC) software routes the input to the appropriate VMTTY based on the OFID number. The input is processed as if it were entered on a local MTTY, and the output is in turn echoed back to the SCCS.

Input arbitration

In order for simultaneous operations in a cluster application to occur through one MTTY channel at the SCCS, the following guidelines for input mode, error messages, and output mode must be observed:

The MTTY is in the input mode only when the ":" prompt is displayed. Other prompts are output messages indicating that the VMTTY is ready for input. For example:

```
16 REQ <EOM>
```

indicates that Switch 16 (the host office (HSO or LCC)) is ready for input and that input can be entered at the next occurrence of ":".

Any input from the MTTY resulting in an error condition will be followed by an error message, any outstanding output messages, and a ":" prompt. The error message indicates the status of the input. For example:

```
A1   STAT   TTY  <EOM>
```

Some errors occur when the remote MTTY is attempting to communicate with the HSO, LCC, or SSOs. These messages may appear in the following format, where XX is an identification number for the office (0-16). Note that all messages will be followed by a system prompt ":" on the following line.

XX IOSXXX UNAV - DLC links to the requested SSO are not connected.

XX IOSXXX BUSYV - MTTY is not ready for input (that is, in output mode).

IOSXXX DEST - Input message was not prefixed with a valid office identification number.

Output messages

The format for output messages printed on the local MTTY (at the SSO in cluster configuration) is as follows:

** <BEL> MSGID DEVICE TYPE DEVICE LOCATION MESSAGE DATA

where:

** <BEL> specifies the alarm status of the output message as minor (*), major (**), or catastrophic (*C). A blank indicates a nonalarmmessage. BEL indicates that an audible alarm has been activated. The first character position from the left margin is for the alarmcondition. The alarm message test starts in Position 6.

MSGID is a six-character code identifying the message type. The code consists of three alphabetic characters representing the particular function involved, followed by three numericcharacters representing the particular message appropriateto the function. MSGID codes are defined in the Output Message Manual.

DEVICE TYPE is the type of equipment involved.

DEVICE LOCATION is the physical location of the equipment.

MESSAGE DATA is the output message.

The format for all output data printed at the SCCS in a cluster configuration is as follows:

<Alarm Level> <Control Option> <SP> <SP> <Sort Field> <MSG DATA> <EOM>

where:

<Alarm Level> is a two-character alarm indication (printed in Column 1).

<Control Option> is the OFID number assigned to the reporting office (printed in Columns 3 and 4). The numbers 0-15 are used as SSO numbers; the number 16 is used for the host office (HSO or LCC).

<Sort Field> is a six-character message identification (printed in Column 6).

<MSG DATA> The OFID field also appears here within the first 50 characters printed.

<EOM> is the end-of-message sequence

In report-type messages (that is, queries), every line of output is followed by <CR> <LF> except the last line, which is followed by <LF> <LF> <EM>

where:

<CR> is a carriage return.

<LF> is a line feed.

<EM> is an end-of-message character.

During output of cluster messages to the SCCS MTTY, a multiple-line message is not interrupted by messages of equal or lower priority. When interrupted by a message of higher priority, the currently active message is terminated with an <EOM> notation and the higher priority message is output. A time is also maintained to ensure that an improperly terminated message does not cause a buffer overload. Upon termination of the higher priority message, the remainder of the interrupted message is output. Note that this process, along with the MTTY echo feature, may cause the output at one teletype to be delayed because output of an equal priority is being printed at a different teletype.

Interrupts

When the SCCS MTTY is in the input mode, the output mode can be entered in three ways: (1) upon termination of an input line, (2) by inputting a blank or null line, or (3) by a timeout. The output mode that occurs upon termination of an input line is temporary, and the SCCS MTTY channel returns to the input mode after all pending output messages have been printed. The second method, entering a blank or null line, places the SCCS MTTY channel into the output mode until it is manually returned to the input mode. The third method, a timeout, occurs when output messages are pending. The system will time out to allow the SCCS MTTY channel to output the messages, and the SCCS MTTY channel remains in the output mode until manually returned to the input mode.

When the SCCS MTTY is in the output mode, the input mode can be entered by typing in four “plus” symbols (++++) or any similar notation representing an interrupt sequence. When this occurs, the output in progress (if any) is terminated with an <EOM>, and the “:” prompt is printed on the SCCS MTTY. When the SCCS MTTY returns to the output mode, printing of the interrupted messages resumes at the point of interruption.

All of the abort commands (that is, ****, ####) supported by the I/O system for the DMS-10 switch are supported by the MTTY channel used in the SCCS interface to the cluster. However, the abort commands must be prefixed by the appropriate site identification number.

Restrictions

When SCCS is used with the cluster configuration, the following restrictions apply:

Because of the VTTY concept, host office (HSO or LCC) MTTY(s) cannot use the TTY access commands. Use of these commands results in the interleaving of messages at the SCCS.

Application of the VTTY concept reduces the number of available logical units by one.

All MTTYs in the cluster except the SCCS MTTY communicate only with the switch with which they are physically connected. The OFID number used in SCCS applications is therefore not required in these instances.

Because SYSLOAD messages print to TTY Port 7 in SCCS format, the SCCS MTTY channel should be connected to Port 7 of the SDI pack in the DMS-10 switch.

SCCS-telemetry

SCCS telemetry allows the alarm and status indicator panels and system recovery control switches located at the SCC to be used to remotely monitor and control the status and performance of the DMS-10 switch. The alarms and controls located in the Alarm and Ringing Module of the DMS-10 switch, as well as status indicators on various components, interface (via cables) to a Digital Alarm Scanner (DAS). In turn, the DAS, which is collocated with the DMS-10 switch, acts as the telemetry interface between the DMS-10 switch and the status indicators and control switches located at the SCC. For a complete description of SCCS telemetry, refer to the NTPs entitled *General Description* (297-3601-100) and *General Maintenance Information* (297-3601-500).

All alarms registered at the SCC are classified as either “critical” or “status” alarms. Other selected conditions, such as central office battery discharging and carrier group failures, are also monitored by the DMS-10 switch and reported to the SCC. For a complete listing of critical indicators, see the NTP entitled *General Maintenance Information* (297-3601-500).

Data between the DMS-10 switch and the DAS is exchanged through both a discrete interface (alarm indications transmitted by way of a contact closure for each indicator) and a serial data interface (alarm information transmitted through an RS-232C data link). Data between the DAS and the SCC is exchanged through a modem-connected telemetry link.

The DAS is also equipped with alarm leads that are used to report DAS alarms, which are reported visually and audibly to both the DMS-10 switch and to the remote MTTY. Alarm output messages are generated at the DMS-10 switch and in turn echoed to the remote MTTY. A typical output messages is as follows:

```
* ALM021  MIN  <site>  DASF

See the NTP entitled General Maintenance
Information (297-3601-500) for an explanation of
DAS alarms.
```

In the cluster configuration, telemetry capabilities are centralized in the LCC, or in one DMS-10 switch, the HSO. When the SCC is used with the cluster, outside plant requirements are substantially reduced, because only one telemetry link is needed from the host office (HSO or LCC) to the SCC. That is, the SCCS is interfaced through a single physical port to the host office (HSO or LCC). Telemetry and MTTY data links, however, are needed to interface the SSOs to the host office (HSO or LCC).

In the cluster configuration, two methods exist for implementing the physical links for the telemetry and the MTTY channels: analog links and digital links.

The DMS-10 switch is interfaced to a 1200-baud telemetry channel through the DAS. The DAS, which has discrete control and scan points and a serial data link to the DMS-10 switch, scans discrete points and the serial data port and passes information to the SCC. The SCC in turn issues commands to the DMS-10 switch through the DAS and discrete points or through the serial link.

When analog data links are implemented, the telemetry data and the cluster data are transmitted across analog facilities. Telemetry data are routed to a 1200-baud modem, then to the SCC. The 1200-baud modems used are RS-232C compatible inputs, and transmission lines must be voice-grade telephone lines conforming to Bell Standard 3002. The cluster data link consists of a pair of 1200-, 2400-, 4800-, or 9600-baud data links. The 1200-, 2400-, 4800-, or 9600-baud modems are also RS-232C compatible and conform to Bell Standard 208A.

MTTY information is transmitted from the host office (HSO or LCC) to the SCC through a single 1200-baud dedicated four-wire link to the DMU, which provides a dialup backup link for input. DMU output is run through a 1200-baud modem, converted to RS-232C format, and transmitted to the DMS-10 switch by way of a Serial Data Interface (SDI) port. MTTY data to/from the host office (HSO or LCC) to/from the SSO is received and routed through the DLC in the respective office.

The DAS requires some specialized handling for MTTY input. For example, a "control m" is used to denote the CD in SSO 1. Thus, the SCCS must send a command message in the following format:

```
<SSO#> <SP> <CNTRL> <SP> <CHAR>
```

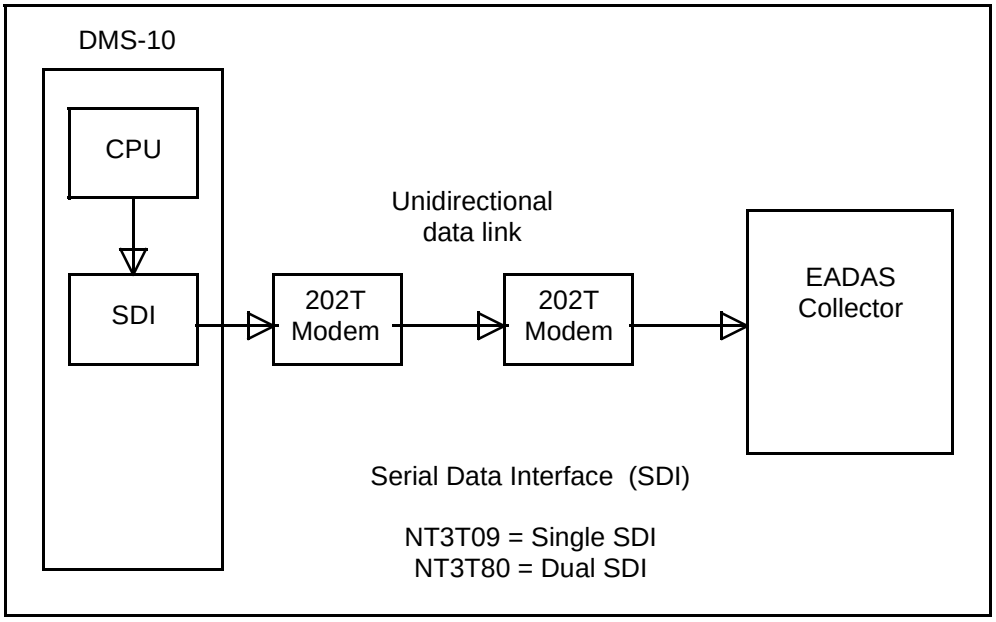
This input stream is transmitted through the MTTY channel to the host office (HSO or LCC), which examines the stream and sends the appropriate control character to the SSO's DLC. The SSO's DLC in turn relays the received control character, by way of the unused port of the DLC, through a 1200-baud modem, to the DMU. The relayed control character is transmitted from the DMU through another modem to the CD that, upon receipt of the control character, takes the appropriate actions.

Implementation of digital data links is functionally equivalent to that of analog links with modems. However, the digital link uses one channel of a DS-1 link to transmit both the telemetry and the Cluster data between the HSOs or LCCs and the SSOs, with a second DS-1 link serving as a backup. The DCM-DAS telemetry link emulates the signaling and protocol between the DAS and a modem (1200-baud, RS-232C compatible).

EADAS

The No.1A Engineering and Administration Data Acquisition System (EADAS) is a centralized Operations Support System (OSS) used to collect traffic and performance measurements from several switching systems by way of unidirectional, dedicated data links. In applications with the DMS-10 switch, these measurement data are formatted and transmitted to EADAS over a dedicated data link using a teletype and a Serial Data Interface (SDI) (see Figure 4-2). At EADAS, the data are processed, generated as nearly real-time reports, and relayed to network terminals in operations centers.

Figure 4-2: Block diagram - EADAS interface, single office



Measurements acquired and relayed to EADAS include standard traffic and performance data as well as maintenance and validity data. The measurement data are collected over fixed intervals of either 30 or 60 min (type A) or 24 hr (type D) and printed out following the collection interval. The 30-min collection interval begins on the half-hour or hour and ends 30 min later. The 60-min collection interval begins on the hour and ends 60 min later. The 24-hr collection interval begins at 2 a.m. and ends 24 hr later. At the end of a defined collection interval, measurement data are grouped, classified as data messages according to the collection interval (that is, 30- or 60-min or 24-hr), formatted using ASCII-encoded characters, and transmitted to EADAS over the dedicated data link.

EADAS measurements are acquired in the DMS-10 switch as part of operational measurement (OPM) blocks provided by the OPM System. For a complete discussion of OPM blocks and OPM printouts, see the NTP entitled *Operational Measurements* (297-3601-456).

Specifically, the EADAS measurements record:

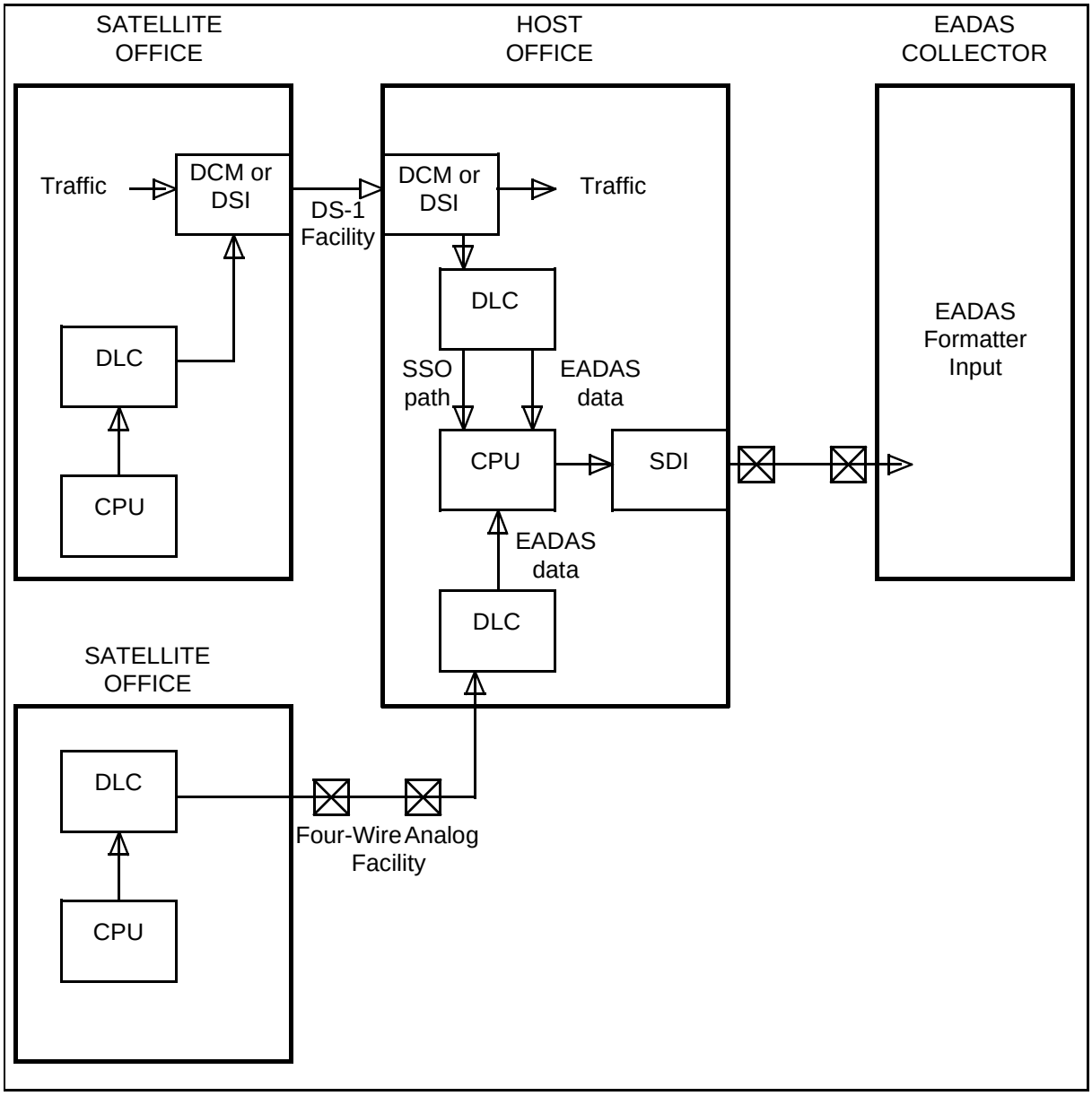
- network maintenance usage
- trunk maintenance usage
- receiver maintenance usage
- validity (reliability of data)
- idle system real-time usage

In the cluster configurations, a single data link is used to transmit all EADAS information from the cluster to EADAS by way of the host office (HSO or LCC) (see Figure 4-3). In this arrangement, each SSO transmits (not in sequence) its EADAS measurement printouts to the host, using a data link, for subsequent transmission to EADAS.

Each collection interval, the host prints and sends its measurements to EADAS. The printout for each SSO is generated locally at the SSO following the collection interval, if a local TTY is provided, and then transmitted to the host. The host subsequently transmits the SSO's data to the EADAS center.

Measurements for each SSO and for the host are transmitted by way of the host to EADAS over a single TTY port. In order for the EADAS to distinguish the printouts from one another, a control character is provided at the beginning of each message identifying the originating office. A front-end processor (FEP) attached to the EADAS can be used to demultiplex the messages according to the office of origination and route them to separate physical ports. For addition description of EADAS, refer to the NTP entitled *Operational Measurements* (297-3601-456).

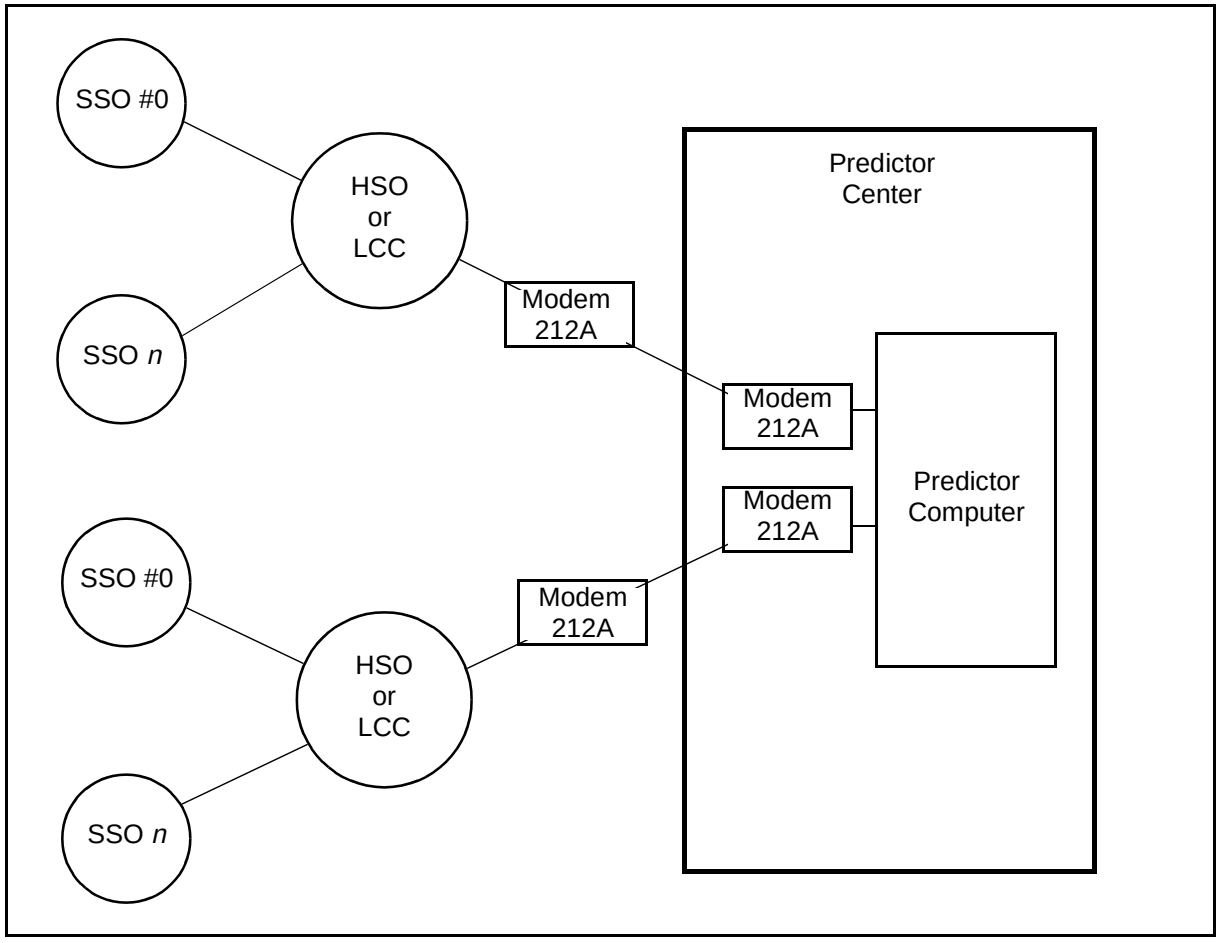
Figure 4-3: Block diagram - EADAS interface, SSO cluster



LIT predictor

The predictor interface is used with the Line Insulation Test (LIT) feature in cluster applications. In this arrangement, each SSO outputs LIT data to the host office (HSO or LCC) using the DLC data link. The data are transmitted to the predictor center in succession over a single TTY port provided at the host office (HSO or LCC), as illustrated in Figure 4-4.

Figure 4-4: LIT/predictor configuration in DMS-10 cluster



In a cluster configuration with LIT, the host office (HSO or LCC) has only one dedicated output class and one dialup LIT output class for backup. The SSO should have one dialup as backup.

LIT output uses ASCII-encoded characters that are transferred to the predictor center over a single TTY I/O port. The predictor is viewed by the host office (HSO or LCC) as a TTY connected to the system by way of a Serial Data Interface, and it is declared in the system using Overlay CNFG. For additional information on the hardware and software interface for Predictor, refer to the NTPs entitled *General Description* (297-3601-100) and *Data Modification Manual* (297-3601-311), respectively.

LIT data are output to the predictor in a first-in/first-out (FIFO) mode in the same format as LIT data for a stand-alone DMS-10 switch (see Section 3). Because each office's test cycle time is different (declared in Overlay CNFG), a start/stop handshake method is employed to transmit output from an SSO to the host office (HSO or LCC) when the SSO is ready. The host office (HSO or LCC) starts outputting the LIT data from one SSO to the Predictor and stop when the transmission is complete; the host office (HSO or LCC) then moves on to the next office. This approach keeps separate LIT outputs from interleaving.

Section 5: Index

DMS-10 Family

600-Series Generics

Input/Output System

NTP number: NTP 297-3601-300
Release: 07.01
For Generic 602.20
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