FORSCOM SECURITY MONITOR (FSM)
COMPUTER PROGRAM DEVELOPMENT SPECIFICATION
(TYPE B5)

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ACCAT GUARD technology during IOC and to assess potential enhancements to this system, it is desirable to evaluate these concepts in an operational exercise.

The primary purpose of the FORSCOM GUARD experiment is to provide an IOC test bed for GUARD to test the effectiveness of GUARD as a major security application in an operational environment. The major operational exercise will be PROUD SPIRIT. Although the test will be conducted in a benign system-high environment, the experiment will be structured to simulate the "potentially threatening" environment of allowing the availability to non-Top Secret WES sites.

Presently, the MLS ACCAT GUARD system has completed its GENSER phase testing. Based on the GENSER test phase the following new GUARD requirements have been identified:

a. An "automatic" downgrade mechanism for reducing the workload of the Security Watch Officer (SWO).

b. A special "low-to-high" filtering mechanism for limiting low user capabilities on the system.

The first new requirement allows the GUARD, in a trusted manner, to perform automatic downgrade operations for certain recognizable high side outputs. Presently with ACCAT GUARD all high-to-low data must be screened by the SWO. This new feature will reduce the workload of the SWO and also improve the overall responsiveness of the system.
SECTION 1

SCOPE

1.1 IDENTIFICATION

This document sets forth design and implementation requirements for the Initial Operational Capability (IOC) phase of the GUARD project. The IOC phase of GUARD will operate under the UNIX Operating System, which shall ultimately consist of the Kernelized Secure Operating System (KSOS) security kernel and the UNIX emulation package. This IOC phase of GUARD software will operate under a version of Western Electric UNIX (Baseline 6.0) enhanced to provide both a more KSOS-like environment and operate with the special IOC testbed interfaces.

1.2 FUNCTIONAL SUMMARY

The FORSCOM WMCCS environment has been chosen for the GUARD IOC test site. This environment is ideal for experimenting further with the GUARD technology. It is desired to experiment with the GUARD technology at FORSCOM in order to determine whether FORSCOM could connect its present and future WES sites without jeopardizing security thus eliminating the efforts and associated costs of upgrading these sites to Top Secret, the system high operation. Therefore, to determine the true value of the
The second requirement is for security considerations. The purpose of the filtering mechanism is to confine the low user's activity on the high side of GUARD. It is believed that with the incorporation of the automatic downgrade mechanism, it will be necessary to restrict the low user from performing certain operations. This is particularly true for GUARD's IOC phase at FORSCOM, where the user is provided an interactive environment.

The following outcome of the GUARD IOC experiment will provide excellent data as to the true effectiveness of a downgrade mechanism for solving MLS problems in essentially non-MLS systems.

1.2.1 ACCAT GUARD

The ACCAT GUARD system allows the controlled "writing down" of information from a high security level network computer host to that of a lower security level network computer host. The "writing down" operation of the system is controlled completely by a Security Watch Officer (SWO). Since the ACCAT GUARD will become one of the first applications to be placed under the Kernelized Secure Operating System (KSOS) (currently under development), it will be a verifiably secure system. In particular, the "writing down" mechanism has been formally specified and will be implemented using the Modula programming language, a language which lends itself to formal code proofs.
Functionally, the ACCAT GUARD (see Figure 1-1) provides a transactional-like interface to its user set. ACCAT GUARD users reside on distant hosts connected to the ARPANET. One user set resides on a host with a high security level and the other user set resides on a host with a lower security level. The users communicate to each other and other hosts through GUARD using standard ARPANET messages (referred to in GUARD as transactions). Three basic transactions are supported by the ACCAT GUARD.

a. Messages from a low/high user to a high/low user.

b. Canonical queries from a low/high user to a high/low host.

c. English queries from a low/high user to a high/low host.

Messages are standard ARPANET mail, canonical queries are queries which are in the proper syntactic form for direct processing by the recipient host, and English queries are queries which must be manually translated by GUARD personnel into canonical queries prior to submission to the recipient host.

Communication security is guaranteed by the COMSEC approved Private-Line-Interfaces (PLI) connecting the hosts to the ARPANET. The PLI's provide encryption/decryption of information flowing from/to the hosts. The connectivity of a low host to a high host is only possible through the ACCAT GUARD. GUARD has two PLI connections to the ARPANET, one compatible with the high host PLI and the other compatible with the low host PLI (Figure 1-1).
Figure 1-1. MLS ACCAT GUARD Configuration
1.2.2 FORSCOM Security Monitor (FSM) GUARD

The FORSCOM Security Monitor (FSM) GUARD (to be called FSM from here on) will be a further extension of the technology of the existing ACCAT GUARD and be based on the actual software currently comprising this system. The FSM system, however, requires some alterations to the current ACCAT GUARD system. These are as follows:

a. The FSM system will interface a set of low security level users to a high security level host (see Figure 1-2).

b. The "communication unit" of the FSM is not transaction oriented, but instead is highly interactive.

c. Based on GENSER phase testing, the FSM requires that certain low level user inputs be filtered prior to submission to the high level host.

d. Based on GENSER phase testing, the FSM will employ a special "recognition mechanism" which will allow the automatic screening for certain system level prompts to the low security level user.

Since the FSM exercise will be operating in a benign environment, the standard UNIX version of the ACCAT GUARD (GENSER version) can be used as a software baseline for this new system.
Figure 1-2. FORSCOM Security Monitor (FSM) Configuration
Based on GENSER phase testing, it has become advisable that a special automatic screening mechanism be added to the current GUARD system. Although the initial test of this technology will only simulate the "writing down" of information from a high security level to a lower security level, the basic architecture and design of this mechanism must be carefully analyzed to ensure that future implementations under KSOS can be verified to operate correctly.

The basic operation of the FSM system is as follows. As depicted in Figure 1-2, the FORSCOM WWMCCS system, the FSM and the Screener are located in a Top Secret system high area. (The Screener is the FSM counterpart to the ACCAT GUARD's Security Watch Officer.) The FORSCOM WWMCCS system and the FSM are directly connected and the low security users are connected to the FSM only. Therefore, the multi-level secure situation exists only in the FSM processor. When a low security level user logs onto the FORSCOM system, they are in reality logging onto the FSM system which in turn logs the user onto the FORSCOM system. Note, the FORSCOM system software is not cognizant of the fact that the FSM system is between it and the low security users. Therefore, the FSM system must have complete knowledge of what the user is entering into the system. This is required for two reasons:

a. In order for FSM to properly filter what the user is entering, the filtering must be accomplished within the context of what the user is doing in the FORSCOM system.
b. In order for FSM to properly recognize certain system responses for automatic screening sequences, FSM must again do this within the context of what the user is doing in the FORSCOM system.

A pre-established set of FORSCOM system level prompts will be recognized by the FSM system and sent directly to the low security level user without Screener intervention. All variable data (e.g., teleconferencing messages) must go through the standard screening mechanism.
SECTION 2

APPLICABLE DOCUMENTS

Following is a list of documents relevant to this computer program development specification.

2.1 GOVERNMENT DOCUMENTS


g. IBM, "FORSCOM Computer Security Concept Experiment Notebook", April 1980.

2.2 NON-GOVERNMENT DOCUMENTS

SECTION 3

REQUIREMENTS

The FORSCOM Security Monitor (FSM) system shall provide for the secure transfer of information from the FORSCOM WWMCCS system running at Top Secret system high to a set of WWMCCS Entry System (WES) users of a Lower classification level. Special facilities provided by FSM will be controlled downgrading of information from FORSCOM WWMCCS to the WES sites, both manual and automatic, low user command filtering, extensive audit trail capabilities, and mechanisms to monitor and alter the FSM environment.

In order to accomplish the above FSM functions two FSM personnel types must be provided: the FSM Screener and the Environment Manager (EM). The Screener is responsible for insuring manually that information being downgraded (i.e., "written down") to low security level WES site users does not contain sensitive information of a higher classification. The Screeners perform their function via a Cathode Ray Tube (CRT) terminal which interfaces with FSM "trusted software." The trusted software will potentially be formally verified to guarantee that it does indeed operate correctly in accomplishing the downgrade. This special software guarantees that information is written down to the "Low side" of FSM only if the Screener has viewed all the information and has approved and confir-
med a downgrade. The EM is responsible for a variety of tasks; the reas-
assigning of low WES site users to a specific Screener, the monitoring of
low WES site user activity, the establishment of special test/exercise
parameters for automatic/manual screening, and the control of the FSM
audit trail. The EM accomplishes his role via a terminal and untrusted
software (albeit, some of the current functionality required for the
exercise/experiment is potentially security relevant. However, these
mechanisms would be removed in an operational environment).

Automatic screening and low user filtering will be accomplished with
trusted software which interacts in concert with the Screener trusted
software. Automatic screening is performed on those FORSCOM WWMCCS sys-
tem outputs which are exactly recognized within the context of the
user/system dialogue. Those system outputs which are not recognizable
(i.e., termed "variable data") must be screened manually by an assigned
Screener. Low WES site user filtering is accomplished by the same set of
trusted software which performs automatic screening. For this situation
the low user's input is restricted to a subset of the total FORSCOM
WWMCCS capability.

The FSM functionality described above will be accomplished by a set of
computer programs and data structures. The remainder of this section
will describe these in detail.
3.1 PROGRAM IDENTIFICATION

A program is defined by the algorithms it requires and the data structures (i.e., the program "states") required by the algorithms. The specification and subsequent implementation of these algorithms is by the use of computer programs. These programs when activated are called processes. FSM is specified and implemented by a set of concurrent processes which operate over a set of data structures representing the current state of FSM. The remainder of this section presents and specifies in detail all FSM programs, data structures, and their interaction.

3.1.1 Functional Areas

This subsection describes the basic functional areas which comprise the software of the FORSCOM Security Monitor (FSM). As discussed above, FSM will be implemented via a set of concurrent processes and a set of data structures which represent the state of FSM. Some processes will be invoked by user action (i.e., the Screener, the EM, or a low WES site user) while others may exist at all times performing required system functions. The data structures will be comprised of non-volatile disk files and volatile message queues. The precise specification of the states of these data structures in relation to the interaction of the processes constitutes the total algorithm of FSM operation. This section deals with the classes of FSM programs and descriptions of FSM data structures. Before discussing these in detail an overview of information flow in FSM will be given.

3-3
The overall information flow of FSM is shown in Figure 3-1. Here FSM programs are represented as executing processes (indicated as ellipses). Each program name is contained within the ellipse. The arrowed lines connecting processes indicate the direction of information flow, where in some cases the information flow is bi-directional (i.e., arrow heads on both ends). The FSM environment is divided into a high security domain and a low security domain. Note, except for the FSM Guardian Program (FSMGP), all FSM programs operate in the high security domain of FSM. FSMGP operates in both domains and has been given the privilege of violating, in a controlled manner, the *-property of the DoD security model (i.e., FSMGP can write information to a lower security level). Consequently, FSMGP must be trusted software. FSM personnel are depicted at the top of Figure 3-1 and interface through the high security domain of FSM. This implies that they must be physically located in an area that is cleared Top Secret "system high". The WES site users are physically located at a site with a lower security classification. The FORSCOM WWMCCS complex is depicted at the bottom of Figure 3-1 and is also connected to the high security domain of FSM.

In order to illustrate the overall information flow in FSM a simple scenario is described below.
Figure 3-1. Basic FSM Process and Information Flow
For this scenario let's assume that one or more Screeners are currently logged on to the FSM system. Now a low WES site user wishes to access the FORSCOM WWMCCS system. The WES user logs onto the FSM via his terminal. The FSMGP is responsible for interfacing with the user (i.e., there will be a separate copy of FSMGP for each user interfacing to FSM). FSMGP requests a Screener assignment from the FSM Assignment Daemon (FASSD) and allows the WES user to continue until a Screener is needed. Since Screeners are currently logged onto FSM one is available for assignment. Upon receiving the request from FSMGP, FASSD reviews the set of FSM Screeners that are currently logged onto FSM. Based on their current load (i.e., other WES users may be logged onto FSM) and their logon time, FASSD makes the appropriate Screener assignment. The Screener assignment is then passed back to FSMGP by FASSD. Following logon to FSM, FSMGP logs the user on to the FORSCOM WWMCCS complex. This is accomplished by establishing a connection to WWMCCS via the Remote Network Process Emulator (RNPE). Following successful logon to WWMCCS, the WES user and WWMCCS continue with their dialogue, with FSM as a somewhat invisible intermediary. However, FSMGP is busily performing many internal tasks, one of which is auditing specific events. This is accomplished by writing out the audit event and required data which is periodically moved to the FSM audit trail by the FSM Audit Daemon (FAD). FAD is always present in the FSM environment and is responsible for recording other processes' audit events into the FSM audit trail. During the user/WWMCCS dialogue, FSMGP is constantly monitoring all data the user enters and all data the WWMCCS host is writing back to the user. If
the user inadvertently enters illegal command sequences (those which are either syntactically incorrect or are privileged and hence not available to the low user) FSMGP will inform the user of the error and not send the input to the WWMCCS system. This is the "filtering" mechanism of FSMGP. For WWMCCS system output, FSMGP determines if the data is recognizable (termed "fixed") or unrecognizable (termed "variable"). If the data is recognizable and the user's current screen mode permits it, FSMGP writes the information to the WES user's terminal. This is the "automatic screening" mechanism of FSMGP. If the data is not recognizable or if the user's current screen mode requires Screener intervention, FSMGP notifies the Screener Trusted Process (SCTP) that manual screening is required (remember, FASSD had assigned a Screener to this specific WES user). SCTP notifies the Screener (note, each Screener logged on to FSM has a separate copy of SCTP) of the "downgrade" request. The variable data from WWMCCS is then viewed, a screen at a time, for potential high level sensitive information. The Screener will screen all data and then make a decision whether to "downgrade" the information. Let's assume for this scenario, the Screener accepts the data. SCTP then asks the Screener to confirm his decision and following confirmation, notifies FSMGP that the data can be written down to the low user. FSMGP also audits this event which is then recorded into the FSM audit trail by FAD. The above sequence is the "manual screening" mechanism provided by FSM. This set of operations is continued until the WES user logs off FSM. FSMGP notifies FASSD of the logoff and then exits.
As a final comment on the overall information flow of FSM, EM can also peruse the FSM Audit Trail via the Audit Trail Display Program (ATDP). This program is called via the EMP as directed by the EM.

3.1.1.1 Programs. The FSM system consists of several different programs which are divided into two classes: transient programs and daemon programs. A transient program is normally brought into existence (i.e., becoming a process) via some external event. Following satisfaction of this event the process usually exits, hence the name "transient". Daemon programs are those programs which are usually brought into existence when the system is brought up and remain active as a process until the system is brought down. Also, daemons usually perform functions which are not tied directly to some external event (although almost always related indirectly to some external event) and appear "invisible", hence the name "daemon".

3.1.1.1.1 FSM Programs. Following is a list of FSM programs, each accompanied with a short description of its function.

a. FSM Guardian Program (FSMGP)

The FSM Guardian Program (FSMGP) interfaces directly with a Low WES site user and is responsible for monitoring all information flowing from the WES user to the Top Secret WWMCCS system and vice versa. FSMGP contains the WES user "filtering" and "automatic screening" mechanisms of FSM. FSMGP operates over a set of extensive data structures
representing the user/system dialogue set for a WES user.

b. Screener Trusted Program (SCTP)

The Screener Trusted Program (SCTP) interfaces directly with a FSM Screener. The SCTP provides a verifiably secure mechanism by which a Screener can review information coming from the FORSCOM WWMCCS complex and accept/reject it for writing down to the low security level user. The process provides a "manual" screening facility for FSM.

c. FSM Assignment Daemon (FASSD)

The FSM Assignment Daemon (FASSD) is responsible for making initial Screener assignments to WES users. It also maintains overall FSM logon/logoff information in the Global Logon File (GLF).

d. FSM Audit Daemon (FAD)

The FSM Audit Daemon (FAD) operates invisibly within the FSM environment. It is responsible for maintaining the current FSM audit trail. It receives audit requests from the other processes of FSM and records these events onto the current FSM Audit Trail.
e. Environment Manager Program (EMP)

The Environment Manager Program (EMP) interfaces directly with the FSM Environment Manager (EM), performing specific tasks as directed by the EM. These tasks include reassigning FSM Screeners to WES site users, monitoring and modifying WES user environment parameters, and monitoring WES user activity profiles.

f. Audit Trail Display Program (ATDP)

The Audit Trail Display Program (ATDP) interfaces with the FSM Environment Manager (EM). This program allows the EM to selectively display portions of the FSM Audit Trail. Also, ATDP provides an audit trail maintenance facility by which the EM can save current FSM Audit Trails into other "time stamped" files.

g. Remote Network Processor Emulator (RNPE)

The Remote Network Processor Emulator (RNPE) is responsible for communicating with the FORSCOM WWMCCS complex. It emulates (by multiplexing/de-multiplexing WES users) a set of users interfacing to the WWMCCS complex.
Global Functions. This section provides descriptions of the global functions implemented for the FSM. Functions are defined in the literal sense as in the C language, hence are not programs but are actual functions which are compiled with the individual programs requiring their services. The global functions are described below.

Audit Function (GFAUDIT). To facilitate the logging of audit events, a global audit function is called by all event generators. The passed argument list is variable except that the first argument is always the one-byte event code (FEVENT). GFAUDIT processes its arguments and constructs an audit request file in the audit queue. It returns to the event generator when this is done. Note: The event generator does not wait for the event to be logged, only entered into the audit queue.

Input Parameters - Inputs to GFAUDIT consist of the passed arguments. With the exception of the first argument (which is always the audit event code, FEVENT), the argument list is of variable length and format. See Table 3-1 for the calling sequences to GFAUDIT, which are dependent upon the event code; see also Appendix D for detailed event definitions. These arguments are passed to GFAUDIT by any one of the four event generators (EMP, FASSD, FSMGP or SCTP):

a. FEVENT — The audit event code.

This one-byte quantity ranges from 01 to 19 and indicates which event occurred. It is used by GFAUDIT to process the remaining arguments passed to it.
b. **SUBSYS** -- The current WWMCCS subsystem code.

This one-byte quantity ranges from 1 to 8 and indicates the WWMCCS subsystem currently in use. A value of zero indicates all subsystems. See Table 3-2 for the subsystem names and their values.

c. **SRCFLG** -- Text Source Flag

This flag indicates if the audit text pointer (TP) is a character pointer into a buffer (0) or if it is a character pointer to a filename (1) which contains the text to audit.

d. **TP** -- The audit text pointer or filename where text can be found.

This character pointer is used to reference the beginning of the audit text (system output or user input). The event generator will set up this pointer and use a buffer for storage of the text. Alternatively, if there is a large amount of text the event generator will write a disk file instead of allocate in-core buffers. In this case, the SRCFLG will be set to one, not zero, as in the case of buffers. Upon return from GFAUDIT, the caller may de-allocate the buffer since the text is copied by GFAUDIT into the Audit Request File.
e. FAILEX -- The coded reason why user input was not sent.

This one-byte quantity ranges from 1 to 2 and indicates the reason why user input was not sent to WWMCCS by FSMGP. A value of 1 indicates no match was made with the user input, while a value of 2 indicates a match was made but the input was disallowed. This value is only used in Event 02 (User Input Not Sent).

f. SCRID -- The FSM user ID of the Screener

This one-byte quantity is identical, in concept, to the UNIX user ID and serves to uniquely identify the Screener involved in this event.

g. STATUS -- The status of the subsystem initiation

This one-byte quantity indicates success (1) or failure (0) when a user attempts to initiate a WWMCCS subsystem. Note: Logon is not considered a valid WWMCCS subsystem in this context. This argument is only used in Event 11 (User Initiated WWMCCS Subsystem).

h. USERID -- The FSM user ID of the WES user

Identical to the SCRID argument, except that it identifies the WES user involved in the event. A value of -1 indicates all users.
i. USRTTY -- The WES user's UNIX terminal identifier

This one-byte quantity identifies the user terminal involved with this event. It is the last character of the user's UNIX terminal name ("/dev/tty?").

j. SCRTTY -- The Screener's UNIX terminal identifier

This one-byte value is identical to the USRTTY argument, with the exception that it identifies the Screener terminal involved in this event.

k. SCMODE -- The current screen mode

This one-byte quantity indicates whether no (0), normal (1) or all (2) screening is now in effect. It is only passed for Event 14 (Screen Mode Modified).

l. RATE -- The bandwidth threshold for messages

This one-byte quantity indicates the number of messages which may be automatically downgraded without Screener intervention. It must be a positive integer in the range of one to 127.

m. EMID -- The FSM user ID of the Environment Manager

This one-byte quantity is identical to the SCRID and USERID arguments, with the exception that it identifies the Environment Manager involved in this event.
n. EMTTY — The EM's UNIX terminal identifier

This one-byte quantity is identical to the USRTTY and SCRTTY arguments, with the exception that it identifies the EM terminal involved in this event.

Output Parameters — None.

Operation — GFAUDIT assumes that the first argument passed to it is the one-byte event code (FEVENT). It uses this event code as a switch to decode the remaining arguments. After the arguments are extracted, GFAUDIT must obtain additional event data, such as the DTG of the event and its size. GFAUDIT then constructs an Audit Request filename from the event DTG, the process ID of the event generator (EMP, FASSD, FSMGP or SCTP) and a random character. This file is created in the Audit Request Queue and the event record is written as record one. If there is also text to audit (implies passing the TP and SRCFLG arguments), GFAUDIT copies the text into the second and possibly additional records. The text is copied "as is". It is null-terminated. GFAUDIT then closes the Audit Request File and returns control to the calling process.
Table 3-1. GFAUDIT Calling Sequences

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Calling Sequence</th>
<th>Caller</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>User Input Sent to WWMCCS</td>
<td>gfaudit(01, userid, usrty, srcflg, tp)</td>
<td>FSMGP</td>
</tr>
<tr>
<td>02</td>
<td>User Input not Sent to WWMCCS</td>
<td>gfaudit(02, userid, usrty, subsys, fail, srcflg, tp)</td>
<td>FSMGP</td>
</tr>
<tr>
<td>03</td>
<td>System Output Sent to User</td>
<td>gfaudit(03, userid, usrty, srcflg, tp)</td>
<td>FSMGP</td>
</tr>
<tr>
<td>04</td>
<td>System Output not Sent to User</td>
<td>gfaudit(04, userid, usrty, subsys, srcflg, tp)</td>
<td>FSMGP</td>
</tr>
<tr>
<td>05</td>
<td>System Output Accepted by Screener</td>
<td>gfaudit(05, userid, usrty, subsys, scrid, scrtty, srcflg, tp)</td>
<td>FSMGP</td>
</tr>
<tr>
<td>06</td>
<td>System Output Rejected by Screener</td>
<td>gfaudit(06, userid, usrty, subsys, scrid, scrtty, srcflg, tp)</td>
<td>FSMGP</td>
</tr>
<tr>
<td>07</td>
<td>Screener Logged onto FSM</td>
<td>gfaudit(07, scrid, scrtty)</td>
<td>FASSD</td>
</tr>
<tr>
<td>08</td>
<td>Screener Logged off FSM</td>
<td>gfaudit(08, scrid, scrtty)</td>
<td>FASSD</td>
</tr>
<tr>
<td>09</td>
<td>WES User Logged onto FSM</td>
<td>gfaudit(09, userid, usrty)</td>
<td>FSMGP</td>
</tr>
<tr>
<td>10</td>
<td>WES User Logged off FSM</td>
<td>gfaudit(10, userid, usrty)</td>
<td>FSMGP</td>
</tr>
<tr>
<td>11</td>
<td>User Initiated WWMCCS Subsystem</td>
<td>gfaudit(11, userid, usrty, subsys, status)</td>
<td>FSMGP</td>
</tr>
<tr>
<td>12</td>
<td>User Assigned to Screener</td>
<td>gfaudit(12, userid, usrty, scrid, scrtty)</td>
<td>FASSD</td>
</tr>
<tr>
<td>13</td>
<td>User Input Simulated</td>
<td>gfaudit(13, userid, usrty, subsys, scrid, scrtty, srcflg, tp)</td>
<td>FSMGP</td>
</tr>
<tr>
<td>14</td>
<td>Screen Mode Modified</td>
<td>gfaudit(14, subsys, userid, smode)</td>
<td>EMP,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>FSMGP</td>
</tr>
<tr>
<td>15</td>
<td>Bandwidth Threshold Modified</td>
<td>gfaudit(15, userid, rate)</td>
<td>EMP</td>
</tr>
<tr>
<td>16</td>
<td>EM Logged onto FSM</td>
<td>gfaudit(16, emid, emtty)</td>
<td>EMP</td>
</tr>
<tr>
<td>17</td>
<td>EM Logged off FSM</td>
<td>gfaudit(17, emid, emtty)</td>
<td>EMP</td>
</tr>
<tr>
<td>18</td>
<td>System Output Received by FSMGP</td>
<td>gfaudit(18, userid, usrty, subsys, srcflg, tp)</td>
<td>FSMGP</td>
</tr>
<tr>
<td>19</td>
<td>Downgrade Request Review Begun</td>
<td>gfaudit(19, scrid, scrtty, subsys)</td>
<td>SCTP</td>
</tr>
</tbody>
</table>

3 - 16
3.1.1.1.2.2 **Date Conversion Function (GFDTGTOA).** Input Parameters - GFDTGTOA requires a pointer to a buffer to store the converted ASCII time.

Output Parameters - GFDTGTOA outputs a pointer to the null character that terminates the converted ASCII string.

Operation - GFDTGTOA provides a common means for other processes to obtain a null-terminated ASCII string of the current Date-Time Group. GFDTGTOA uses a UNIX function to obtain the current date and then converts that to an ASCII string of the form MMDDHHmmss (Month, Day, Hours, minutes, seconds).

3.1.1.1.2.3 **String Match Function (GFEQUAL).** Input Parameters - pointers to two null-terminated strings to be tested for equality.

Output Parameters - GFEQUAL outputs a value of 1 if the strings are equal, zero otherwise.

Operation - GFEQUAL does a character-by-character comparison of the two strings until a mismatch occurs or the end of one is reached.

3.1.1.1.2.4 **Error Function (GFERROR).** Input Parameters - GFERROR requires one input parameter - an error/message number. GFERROR will accept any number of variable length null-terminated ASCII strings following the error/message number.
Output Parameters - None.

Operation - GFERROR provides a common means for the output of errors/messages to a user and system errors/messages to the system console. The first input parameter is an error/message number which specifies the error/message to be output. This number represents a canned message. If the number is greater than 500, then the error/message will be output to the system console and, in addition, if it is a system error and the standard output (file descriptor 1) is a terminal, a standard message will be output to the user indicating that a system error has occurred. Any further parameters will be inserted into the error/message at points where asterisks are encountered. Note: If GFERROR encounters a system error itself, it will output that error instead of the one with which it was called.

If the error is not a system error, the error message number indicates the appropriate error description item in GFEDES (error description file) which in turn contains pointers to the canned message text contained in GFEMES. Any character strings also provided as input parameters will be inserted in the canned message at points where asterisks are encountered. After printing the message to the user's terminal (or the system console for a system error/message), GFERROR returns to the calling function.

GFERROR uses library functions GFLOCK and GFUNLOCK to lock and unlock the system console in order to output system errors/messages. For this reason, it is mandatory that the calling program not have the system console locked when calling GFERROR.
GFERROR also uses two internal functions. These are:

a. gfout - internal function which outputs a string.

b. gfia - internal function which converts integer to ASCII.
   Input is an integer, output is a pointer to a null-terminated string in a fixed buffer (max of 9 characters).

### 3.1.1.2.5 Obtain User's Logon Name (GFGETNAME)

**Input Parameters**

UNIX user ID.

**Output Parameters**

GFGETNAME returns a pointer to the user's logon name or to the strings "none" or "unknown", depending upon the user ID passed.

**Operation**

GFGETNAME opens the UNIX password file and searches for the passed user ID. If found, GFGETNAME returns a pointer to the user's logon name. Otherwise, GFGETNAME returns a pointer to the string "unknown". If no user ID is passed to GFGETNAME, it returns a pointer to the string "none".

### 3.1.1.2.6 File Copy Function (GFILECOPY)

**Input Parameters**

GFFILECOPY requires three input parameters:

a. A flag with the following values:
   - 0 - Create destination file.
   - 1 - Append data to existing destination file.

b. Pathname of source file.

c. Pathname of destination file.
Output Parameters - GFILECOPY returns a null if the copy was successful, or a positive system error number (with which to call GFERROH) if unsuccessful.

Operation - GFILECOPY provides a mechanism for the copying of one file to another. The first input parameter is a flag which specifies whether the destination file is to be created or not. If the flag is set, the destination file is assumed to exist, and if it cannot be opened, GFILECOPY will return with an error (Open error). The second input parameter is the pathname of the source file, and the third input parameter is the pathname of the destination file. GFILECOPY first attempts to open the source file. If unsuccessful, then it returns an open error to the calling function. Otherwise, GFILECOPY attempts to open/create the destination file, depending on the value of the input flag. If the action is unsuccessful, GFILECOPY returns an open/create error to the calling process. If append is indicated, GFILECOPY seeks to the end of the destination file before beginning the copy. It then reads blocks of data from the source file and writes them to the destination file until the End-Of-File (EOF) of the source file is reached. If a read or write error is encountered at any time, GFILECOPY returns that error to the calling function. Otherwise, after a successful copy, both files are closed and GFILECOPY returns a successful value to the calling function.

3.1.1.1.2.7 Integer to ASCII Function (GFITOS). Input Parameters - an integer to be converted to an ASCII string.

Output Parameters - GFITOS returns a pointer to the beginning of the
ASCII string.

Operation - GFITOS allocates space for the ASCII string and then uses a modulo operation to fill the buffer from the end to the beginning. If the input integer was less than zero, GFITOS prepends a minus sign character to the ASCII string.

3.1.1.1.2.8 Lock Function (GFLOCK). Input Parameters - GFLOCK requires one input parameter - a pathname of the file to be locked.

Output Parameters - None.

Operation - GFLOCK provides a common means for the locking of data files which must be updated by more than one process. GFLOCK first builds a "lock-file" pathname by concatenating the string "-lock" to the supplied pathname. GFLOCK then attempts to create the lock-file with a read-only mode. If the file already exists, an error status is received. GFLOCK then sleeps for one second and then attempts the create again. Eventually, the create is successful and GFLOCK returns to the calling function. At this point, the file is "locked-out" from other read-for-update attempts. Of course, this assumes the cooperation of other processes which update this file to call GFLOCK prior to such updates. The file can now be updated, and after the update is complete it is mandatory that the calling process call the GFUNLOCK function to "unlock" the file. Note: The user ID of the calling process must not be that of the superuser since, in that case, the create is always successful even if the file does already exist.
3.1.1.2.9 Leading Zero Integer to ASCII Conversion Function (GFLZITOA). Input Parameters - GFLZITOA requires three parameters:

a. Number of digits to convert to a string.

b. Integer value to convert.

c. A pointer to a user supplied buffer to place the converted string in.

Output Parameters - None.

Operation - GFLZITOA first converts the integer to an ASCII string, using the same technique as does GFITOS. It then checks the leading characters of the ASCII string and if they are blank, GFLZITOA converts them to character zeroes. Finally, the ASCII string is stored character-by-character beginning at the buffer location given by the third argument.

3.1.1.2.10 List Match Function (GFMATCHLIST). Input Parameters - a pointer to an array of strings and a pointer to a string to match to the array.

Output Parameters - GFMATCHLIST returns the index of the array string matched, if found. Otherwise it returns a -1 for no match or a -2 if a match was made to more than one array string.

Operation - GFMATCHLIST first makes certain both array and search string are lower case, and then searches the input array for any occurrences of the input string. If only one exact match is made, the index of the
matched array string is returned. Otherwise a -1 is returned if no match is found or a -2 is returned if multiple array strings matched the input string.

3.1.1.1.2.11 String Match Function (GFNEQUAL). Input Parameters - GFNEQUAL requires three input parameters:

a. Length of match.
b. Pointer to a string to match.
c. Pointer to a second string to match with.

Output Parameters - GFNEQUAL returns a 1 if both strings are equivalent for the amount of characters specified, otherwise a zero is returned.

Operation - GFNEQUAL compares the two strings character-by-character until a mismatch is detected or the specified number of bytes have been checked, whichever occurs first.

3.1.1.1.2.12 Read IPC Function (GFRIPC). Input Parameters - GFRIPC requires three input parameters:

a. A file descriptor for the port.
b. A pointer to a user supplied buffer in which to store an IPC message.
c. A flag with the following value:
   0 - Block on port read.
   1 - Poll on port read.
Block on port read, but return EOF if all writers die.

Output Parameters - GFRIPC returns the number of bytes in the current IPC message, 0 for EOF, or -1 if a read error has occurred.

Operation - GFRIPC provides a common means for the reading of ports. The first input parameter is a file descriptor which the user obtained from a successful port call. The second input parameter is the location of a buffer into which the input IPC message will be placed. The third input parameter is a flag with three values. The value of zero (0) indicates that the caller wishes to block on port reads, i.e., does not want GFRIPC to return until a message has been read. The value of one (1) indicates that the caller does not want to block on reads, but wants GFRIPC to return EOF if there is no data available. The value of two (2) indicates that the caller wishes to block on port reads, but does want GFRIPC to return EOF if all of its writers have died. GFRIPC returns one of three values. A count is returned if an IPC message has been read. An EOF (0) is returned if the user has indicated that polling is desired and there is no data, or if the user has indicated that partial blocking is desired and all writers have died. A minus one (-1) is returned if GFRIPC encounters a read error from the port.

GFRIPC uses the alloc and free system calls in order to buffer up IPC messages from more than one writer.
GFRIPC first checks if polling is wanted, and if so performs an EMPTY call on the supplied file descriptor. If no data is available, GFRIPC returns a no data value to the calling function. Otherwise, it reads on the supplied file descriptor. If a system error occurs (read error), a read error value is returned to the calling function. If an End-Of-File (EOF) is encountered (all writers have died) and partial blocking was requested, a no data value is returned to the calling function. Otherwise, GFRIPC reads an IPC header. If this is the first block for this message (indicated by the Process ID (PID) in the header), then GFRIPC allocates enough core for an entire message. If this is not the first segment of a message, then GFRIPC searches for the start of the message in already allocated core. It then reads the block of data into the allocated core. If this is the end of a message, then GFRIPC moves the entire message into the user supplied buffer, deallocates the core and returns the number of characters in the message to the calling function. Otherwise, it reads again on the port for another message segment.

3.1.1.1.2.13 Compute String Size Function (GFSIZE). Input Parameters - a pointer to a null-terminated string whose size is to be computed.

Output Parameters - the number of characters in the string.

Operation - GFSIZE steps through the string counting characters until it finds a null character. It then returns the character count to the caller. Note: the terminating null byte is not included in the count.
3.1.1.2.14 String Copy Function (GFSTRCOPY). Input Parameters - a pointer to a null-terminated string to be copied and a pointer to a buffer in which to place the copy.

Output Parameters - a pointer to the terminating null byte in the destination buffer.

Operation - GFSTRCOPY copies the input string character-by-character into the destination buffer until it reaches the terminating null character in the source string.

3.1.1.2.15 Unlock Function (GFUNLOCK). Input Parameters - GFUNLOCK requires one input parameter - a pathname of the file to be unlocked.

Output Parameters - None.

Operation - GFUNLOCK provides a common means for the unlocking of data files which must be updated by more than one process. GFUNLOCK first builds a "lock-file" pathname by concatenating the string "-lock" to the supplied pathname. GFUNLOCK then unlinks the lock-file, thus allowing another process to create it and hence gaining control of the file. Of course, failure of a process to call GFUNLOCK after successfully locking out a file with GFLOCK would eventually bring the FSM to a halt.

3.1.1.2.16 Write IPC Function (GFWIPC). Input Parameters - GFWIPC requires three input parameters. It will accept a variable number of other parameters as specified below.
a. A flag specifying interpretation of the second parameter:
   U - second parameter is a pathname of a port to open for write,
   1 - second parameter is a file descriptor of a port already opened.

b. Pathname of a port, or a file descriptor depending on the value of the first parameter.

c. IPC message type as defined in the FSM global data.

d. Optional parameters, in the following order if present: User ID, Bandwidth rate, Screen Mode, Subsystem index, user security classification, pathname of a downgrade file, pathname of a context file.

Output Parameters - GFWIPC returns the status of the write: 0 - successful, positive error number with which to call GFERROR if write was unsuccessful.

Operation - GFWIPC provides a common means for writing to ports. The first input parameter is a flag which tells GFWIPC whether the second parameter is a pathname of a port to open or a file descriptor of an already opened port. The second input parameter is then either a file descriptor or a port pathname. The third input parameter is an IPC message type which will be stored in the IPC port message structure. Any other parameters are data to be stored in the IPC port message structure.
GFWIPC sets up the IPC message in the structure according to the input parameters which have been passed. If a pathname was input, then GFWIPC opens the port. If the open is unsuccessful, an open error is returned to the calling function. Otherwise, GFWIPC writes the IPC message to the opened port. If a write error occurs, then GFWIPC returns a write error to the calling function. If a pathname was input, GFWIPC closes the port. It then returns to the calling function with a successful value.

3.1.1.2 Data Structures. The state of FSM is contained in a set of data structures which can be divided into two types:

a. non-volatile disk files

b. volatile message queues (i.e., ports)

Disk files are used to contain that information which must be saved through continuous day-in and day-out operations of FSM. Audit trail information is a good example of information contained in disk files. In addition other system oriented information must be maintained in disk files in order for FSM to operate correctly; i.e., predefined data which represents the user/WWMCCS dialogue contexts. Volatile data is that data which is not needed in FSM for long periods of time; message queues for inter-process communication (IPC) are good examples of volatile data. All message queues will be implemented in FSM via the port data structure. Ports provide sophisticated First-In, First-Out (FIFO) queues for efficient inter-process communication between processes. In addition, ports allow inter-process communication across different process fami-
lies, hence allow transient/daemon process communication.

Figure 3-2 illustrates the entire FSM directory/data structure hierarchy. Before describing this structure the notational conventions used in this figure will be defined.

a. Rectangles represent files or directories with the file/directory name appearing on top. The name is followed by "(d)" if it represents a UNIX directory, and "(f)" if it is a disk file.

b. Disk files entered in a directory have their names inside the rectangle representing their presence.

c. Circles represent ports, with the port name appearing inside the circle.

d. UNIX C-structure names appear in capital letters (e.g., GPROF).

e. Special lock-files are denoted as dashed-line entries in directories (e.g., gaud-lock).

f. Symbolic names are employed to depict multiple occurrences of a name. For example "user-1" through "user-n" is used to depict different FSM WES users.
Figure 3-2. FSM Directory/File Hierarchy
To determine the entire UNIX pathname of any given data structure, each directory-to-directory/file/port must be concatenated together. For example, the pathname for the profile file of WES user-i is "/fsm/usr/user-i/gprof". Similarly, the absolute pathname for the Assignment Daemon (FASSD) input port is "/fsm/port/faport".

Before going into the detailed descriptions of the individual data structures depicted in Figure 3-2 a general overview will be given on the entire directory/data structure hierarchy.

All directory/data structures originate directly or indirectly from the UNIX "root" directory, termed "/". FSM will have its own directory with the absolute pathname of "/fsm". It contains system level data structure entries and other related directories. System level data structures are the user logon file ("/fsm/gLf") which contains information on all FSM personnel and WES users currently logged onto FSM; the system level environment file ("/fsm/genv") which contains information currently representing system-wide FSM environment values; the user/system dialog context structures for teletypewriter ("/fsm/gcont.tty", "/fsm/ghdel.tty" and "/fsm/gtext.tty") and VIP ("/fsm/gcont.vip", "/fsm/ghdel.vip" and "/fsm/gtext.vip") terminals which control the automatic output screening and input filtering mechanisms of FSM; the error description file ("/fsm/gedes") which contains a pointer to the first character of an error message text and number of characters in the message (used by GFER-ROR); the error messages themselves ("/fsm/gemes"); and finally, the global terminal file ("/fsm/gttys") which is used by the FSMGTTY program to
start up a Guardian Process for specified WES terminals.

The FSM directory contains three directories relevant to data structures: the low user directory ("/fsm/usr"), the FSM audit trail directory ("/fsm/fsat") and the IPC port directory ("/fsm/port"). The user directory contains entries to individual directories for each WES user logged on to FSM. Individual directories exist regardless of whether the user is logged on or not. For user-i, the directory "/fsm/usr/user-i" would contain four data structure references; the user profile file ("/fsm/usr/user-i/gprof"), the user environment file ("/fsm/usr/user-i/genv"), the downgrade file ("/fsm/usr/user-i/gdown") and the user downgrade context information file ("/fsm/usr/user-i/ginfo"). The FSM audit trail directory, "/fsm/fsat", contains the entire FSM audit trail environment. This directory resides on a separate file system to ensure the security of the generated audit trail, since it will contain Top Secret data. The directory contains one directory and two classes of audit trail events/texts, and one lock-file. The primary audit file data structure is "/fsm/fsat/raud" which contains information describing the current state of the FSM audit trail. Directory "/fsm/fsat/auditq" is used by FSM processes for registering audit trail events. For example, the FSM Guardian Program (FSMGP) in auditing an event would insert an entry into this directory using the current Date-Time Group (DTG), its process identifier (PID) and a random character as a file name. This combination ensures uniqueness within the directory "/fsm/fsat/auditq". Data structure "/fsm/fsat/current.e" and "/fsm/fsat/current.t" contain the event and text information respectively of the current audit trail.
Similarly, data structure entries "/fsm/fsat/dtg.ei" and "/fsm/fsat/dtg.ti" contain previously saved audit trails and are identified by a unique DTG. Finally, the lock-file, "/fsm/fsat/gaud-lock" is used when the audit trail file is being updated (i.e., the file "/fsm/fsat/gaud").

The last directory in the main FSM directory is the port directory ("/fsm/port"). This directory contains all FSM ports. FSM utilizes five basic ports, the FSM Assignment Daemon (FASSD) port ("/fsm/port/faport"), the FSM Screener assignment port ("/fsm/port/fsagn-i"), the Screener request port ("/fsm/port/screq-i"), Screener reply port ("/fsm/port/fsrly-i") and the Screener Logoff port ("/fsm/port/sclog-i"). The fsagn and fsrly ports exist for each logged on WES user, while the screq and sclog ports exist for each Screener that is logged on. These four portnames are constructed for uniqueness using the owner's FSM user ID (hence the "-i"). All ports only exist when the reading process is activated within FSM. Note, since FASSD is a daemon the faport is always present.

3.1.1.2.1 Disk File Descriptions. Each disk file that appears in Figure 3-2 will be described in detail in the following sections.

3.1.1.2.1.1 GCONT (Global Context File). This structure provides the information FSMGP needs to follow a user's progress through the various WWMCCS subsystems allowed in the restricted environment. It is tree-like in its structure, since any given item will reference several other items in the file. The file contains a series of CONTEXT items. A CONTEXT
item (termed "CONTEXT") represents all possible recognizable user inputs and/or system outputs at a branch of the input/output dialog tree.

Each CONTEXT item contains a HEADER item and one or more SUBCONTEXT items. A HEADER and SUBCONTEXT define a CONTEXT. See Figure 3-3 for a depiction of their relationship. The HEADER supplies information that is applicable to the entire CONTEXT while SUBCONTEXTs supply information relevant to a given user input or system output. The HEADER allows FSMGP to know when to stop accumulating system output or user input. It also provides default actions on error conditions. Figure 3-4 shows a HEADER item. A CONTEXT can have one or more SUBCONTEXTs, depending on the possible recognizable user inputs/system outputs at this stage of the user/system dialog. All SUBCONTEXTs, whether user input or system output are the same size. See Figure 3-5 for a SUBCONTEXT item description.

HEADER Field Descriptions

GPOPTR The pop-up context pointer points to a recovery CONTEXT item when FSMGP encounters an error condition or a user-entered break. Error conditions include a no match condition between current SUBCONTEXT items and system output, a time-out condition on system reads, and Screener rejection of system output. FSMGP usually performs some action (i.e. simulate user input) to resynchronize its processing with the next system output and then proceeds to the appropriate CONTEXT. GPOPTR points to this item, in general a higher level within a given WWMCCS subsystem.
Figure 3-3. Header and Subcontext Relationship
Figure 3-4. GCON Header Item
Figure 3-5. GCON Subcontext Item
GDLIMP  The delimiter set pointer points to a byte offset in the Halting Delimiter file at which the particular delimiter set for this CONTEXT resides. FSMGP reads user input or system output until one of these strings is matched.

GNSUBS  The number of subcontexts field specifies the number of SUBCONTEXTs comprising this CONTEXT. Since SUBCONTEXTs are of a fixed size, this value can be used in reading the complete CONTEXT for processing by FSMGP.

GCONFL  The header flags field contains various bit settings representing conditions of the CONTEXT as a whole, in contrast to states specific to individual SUBCONTEXTs. The following bit settings are used:

  BOTH  User Input and System Output (1). This bit, when set, signifies that either user input or system output can be expected next. When this bit is set, FSMGP must poll both the user and the system for the next data. Note: when this bit is set, the USR bit is ignored.

  USR  User input (1) / System Output (0). This bit signifies whether the CONTEXT represents user input or system output. It is only used when the BOTH bit is zero.

  RPT  Repeating CONTEXT (1) / Non-repeating CONTEXT (0). This bit signifies whether the CONTEXT requires multiple iterations of the FSMGP Read System Output (RSO) function in order to satisfy a single SUBCONTEXT.

  FIX  Fixed Repeating CONTEXT (1) / Variable Repeating CONTEXT
(0). Only applicable when the RPT bit is set to one. In either situation of this bit setting, multiple calls to the RSO function are required in order to satisfy this CONTEXT. For fixed CONTEXTs, FSMGP will call the Read System Output function repeatedly, doing a continuous match on the indicated search string specified by the single SUBCONTEXT. This will allow, for example, a simple delimiter string set for halting by the RSO function (probably line-by-line for some lengthy output; e.g., TCON skeletons). For variable CONTEXTs, FSMGP will accumulate the variable data until a match is made by one of the SUBCONTEXTs. This mechanism is applicable, for example, to TLCF message texts.

**AUD** Audit subsystem entry (1) / no audit required (0). This bit signifies that an audit trail event is required because the user just entered another WWMCCS subsystem. The subsystem entered is specified in field GSYSX (see below).

**GFUNX** This entry indexes a function in FSMGP which will generate the appropriate simulated user input required to place FSMGP (and the WES user) back to the "pop-up" level as specified in field GPPOPTR. Different sequences are required for different subsystems.

**GSYSX** This field specifies which subsystem the CONTEXT is concerned with. It will be filled with an index that identifies the subsystem name. See Table 3-2 for subsystem names and their values.
SUBCONTEXT Field Descriptions

GSTRP  This field is an offset into the GTEXT data structure which specifies the string to be searched against for this particular SUBCONTEXT. The SUB bit field in GSUBFL controls how this search is performed.

GNEXT  This field is an offset into GCONT specifying the next valid CONTEXT to transfer to if this SUBCONTEXT satisfies the given user input/system output.

GSFX  This field indexes a function in FSMGP and indicates that a special function is required to validate user input parameters or to modify system output.

GSUBFL  This field contains a set of bit flags which represent various conditions of this particular SUBCONTEXT. The following bits are defined:

FX  Fixed data (1) / Variable data (0). This bit in conjunction with the SUB bit indicates the type of match algorithm to use. Fixed data (whether user input or system output) has two cases: substring and no substring. Fixed, no substring matching is perhaps the easiest to comprehend since it involves a character-by-character comparison between the input data and the text string in GTEXT. Fixed, substring on the other hand utilizes two additional values (GSTART and GLENG) to define a window, or substring, within the GTEXT text string to match against. This window is compared against the input data and if a match occurs, the
GTEXT string is written to the user, not the input data. If this bit is not set (i.e. variable), again there are two cases to consider: substring and no substring. Variable, substring is very similar to fixed, substring with the exception that the text string in GTEXT is not further defined and is assumed to be the substring with which to match. Variable, no substring (otherwise known as a "null subcontext") is a wildcard and will match any input data. If the screen mode is normal, fixed data is a candidate for automatic screening by FSMGP, while variable data must be visually inspected by the Screener.

**SUB** Input data requires Substring match (1) / no substring match (0). Used in conjunction with the FX bit, see description given above.

**FUNC** This bit signifies that a special function is required (1) / function not required (0). Field GSFX contains the index of the special function if this bit is set.

**VAL** This bit signifies that a user’s matched input is invalid (1) / matched input is valid (0). This provides a finer granularity on the filtering of user input.

**USI** This bit signifies the subcontext as user input (1) / system output (0). It is used only if the BOTH bit flag in the CONTEXT header is set.

**BEG** This bit signifies that the halting delimiter for the subcontext is the beginning of the next subcontext (1) / the
end of the current subcontext (0). Since system output strings may terminate with unmatchable variable data, a given halting delimiter may apply to the beginning of the string expected next.

GSTART This field is a byte offset into a fixed system output at which to begin the subcontext match. This field is relevant for fixed, substring system outputs only.

GLENG This field specifies the length of the system output to be matched. It is used in conjunction with GSTART to make an exact match on the substring at the specified location within the system output. This field, like GSTART, is relevant for fixed, substring system outputs only.

3.1.1.2.1.2 GTEXT (Global Text File). This structure contains the actual text strings of user input and system output. These text strings are used by FSMGP when it is identifying the user/system context. When FSMGP has obtained a user input or system output, it must identify it to recognize the user's place in the particular WWMCCS subsystem. This is accomplished by comparing the system output or user input with a subcontext string. Strings in GTEXT are referenced by the GSTRP field in the SUBCONTEXT item. GTEXT is thus simply a concatenation of all possible user input/system output strings in one file, each terminated by a null character. When a particular SUBCONTEXT is checked to see if it matches a particular system output or user input, the SUBCONTEXT field GSTRP points to the appropriate string to match. FSMGP then obtains that string and makes a comparison.

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3.1.1.2.1.3 **GHDEL (Global HaltingDelimiter File).** This structure contains all the character strings required by FSMGP to determine when it has accumulated enough system output or user input to satisfy a particular CONTEXT. These delimiter strings are arranged in sets, since the SUBCONTEXTS of a given CONTEXT may be terminated differently. Each delimiter string in the file is terminated by a null character, and the final string in each set of delimiter strings is terminated by two null characters. This allows FSMGP to know when it has reached the end of a particular set.

FSMGP must read system output and user input, but in order for it to know when enough data has been read (and therefore to stop) it must be aware of the possible terminating sequences of any given CONTEXT. GHDEL provides this information. After a new CONTEXT is established by FSMGP (pointed to by the old one), it must read data (system or user) to find a match to one of the particular SUBCONTEXT strings in the current CONTEXT. A read will continue until one of the delimiter strings is found (or an error occurs). The particular string set that FSMGP searches against is pointed to by the GDLIMP field in the current CONTEXT's HEADER.

3.1.1.2.1.4 **GDOWN (Global Downgrade File).** This structure contains the text of the system output that is to be examined by the Screener. It is created by FSMGP and written to each time a downgrade is required. When a system output is recognized as requiring screening (either because it is variable data or because the current screen mode is set for all data to be screened), FSMGP sends an IPC message to SCTP requesting a down-
grade. In this message is the pathname of the user's GDOWN (uniquely identified by user) which SCTP displays to the Screener to accept or reject.

3.1.1.2.1.5 GINFO (Global Downgrade Context File). This structure contains the latest user/system interactions so that the Screener may make his downgrade decision in concert with the current user/system dialog. It contains recent user input and system output text strings in the order of their occurrence. Whenever a downgrade is required FSMGP writes the data from the Downgrade Context (GINFO) Buffer to this file. The Screener may peruse this file if he/she desires.

3.1.1.2.1.6 Global Logon File (GLF). The Global Logon File is established at system generation time and contains one record for each FSM user. The record contains user identification (in the form of FSM logon name) and bit-flags denoting if the user is a Screener, an EM or a WES user and if the user is currently logged on. A user's FSM user ID is obtained by noting the location of the user's record in the file. For example, the user described by record 14 has a FSM user ID of 14. In this way, the normal UNIX user ID is not used. Since the FSM user ID is a one-byte quantity, GLF must contain no more than 127 records (the zeroth record is not used). This file will be updated by the Guardian Process (FSMGP), FSM Assignment Daemon (FASSD), Environment Manager Process (EMP), Screener Trusted Process (SCTP) and by a stand-alone program USER (see Appendix E). In light of the number of potential writers, GLF has an associated lock file ('/fsm/glf-lock') which must be created prior
to writing. When a user logs onto the FSM, the user's process (whether EMP, SCTP or FSMGP) checks this file for a record containing the user's name. If there is no match found or a match is made and either the DEFINED bit is not set or the user-type bit (DHI-EM, DHI-SCR or DLO-USR) is not proper, the user cannot proceed and his process is terminated. If a record is found and all bit settings are correct, the user's process marks the record active by setting the DLOGDON bit to one. When a Screener or WES user logs off FSM, FASSD is notified and resets the user's terminal ID to zero and marks the record inactive by setting the DLOGDON bit to zero. EM logoff is taken care of by the EMP. Whenever FASSD makes a WES user/Screener assignment, the WES user's record is modified to contain the assigned Screener's FSM user ID. Finally, when the EM manually reassigns a WES user to a Screener, FASSD modifies GLF. EMP reads this file when processing its commands. See Figure 3-6 for a record layout of the GLF file. The corresponding fields are described below:

**LFLAG** A collection of bit flags that have the following meanings:

**DEFINED** This bit signifies that the user which this record describes is a valid FSM user. In this way, records are never removed from GLF (thus altering a user's FSM user ID), but are marked as not-DEFINED, when a user is deleted from FSM participation.
Figure 3-6. A GLF Record
DLOGDON This bit signifies that this user is currently logged onto FSM. During logon, this bit is checked and set by the user's process (EMP, SCTP or FSMGP). During logoff, FASSD resets the bit for WES users and screeners, while EMP resets it for the EM. Its purpose is to prevent users with the same name from being logged on simultaneously.

DHI-EM This bit indicates that this GLF record describes a "high-side" Environment Manager. Only one record should be marked as an EM.

DHI-SCR This bit indicates that this GLF record describes a "high-side" Screener.

DLO-USR This bit indicates that this GLF record describes a "low-side" WES user.

LUSRID The FSM user ID of this WES user's currently assigned Screener. If there is no Screener currently assigned, the field will be zero. This field is undefined (not used) for Screener and EM records.

LTTYID The UNIX identifier of the terminal this user is logged onto or zero if the user is not logged on.

LUSRNAME The eight-byte UNIX logon name of this Screener or EM; or the twelve-byte WWMCCS user ID of this WES user.
3.1.1.2.1.7 **Global Logon File Lock (GLF-LOCK).** Because FSMgp, FASSD, SCTP, EMP and USER all modify the Global Logon File (GLF), the standard lock mechanism is used during writes to GLF. The existence of the lock file indicates that a process is currently updating GLF. The lock file has no records, it is merely an entry in the /fsm directory so that its presence or absence may be easily checked.

3.1.1.2.1.8 **System Global Environment (GENV) File.** Established at FSM initialization is the System Global Environment File. When a WES user logs onto FSM, he is given a copy of the system default values. Subsequent changes in the environment can be made by either the EMP, at the behest of the EM, or by the FSMgp, following detection of bandwidth overflow. The file contains one record with values which indicate bandwidth threshold and subsystem screen modes. Updates occur when the EM, via the EMP, modifies system-wide or user-specific environment values. See Figure 3-7 for a GENV record layout. The corresponding fields are described below:

- **UANDW** The bandwidth threshold. Indicates number of messages per minute which are allowed to be automatically downgraded.
- **ACCSM** The ACCESS subsystem screen mode. A screen mode has one of three discrete values: OFF (no screening is done), NORMAL (FSMgp determines what system outputs need to be sent to the Screener for manual downgrading) or ALL (all output is manually screened).
- **LSTSM** The LIST subsystem screen mode. Screen mode can be OFF (0), NORMAL (1) or ALL (2).
<table>
<thead>
<tr>
<th>Word</th>
<th>BANDW</th>
<th>ACCSM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word 1</td>
<td>LSTSM</td>
<td>SIOSM</td>
</tr>
<tr>
<td>Word 2</td>
<td>TCNSM</td>
<td>TLCSM</td>
</tr>
<tr>
<td>Word 3</td>
<td>TSSSM</td>
<td>WDMSM</td>
</tr>
</tbody>
</table>

Figure 3-7. A GENV Record
SIOSM The SIOS subsystem screen mode. Screen mode can be OFF (0), NORMAL (1) or ALL (2).

TCNSM The TCON subsystem screen mode. Screen mode can be OFF (0), NORMAL (1) or ALL (2).

TLCSM The TLCF subsystem screen mode. Screen mode can be OFF (0), NORMAL (1) or ALL (2).

TSSSM The TSS subsystem screen mode. Screen mode can be OFF (0), NORMAL (1) or ALL (2).

WDM SM The WWDMS subsystem screen mode. Screen mode can be OFF (0), NORMAL (1) or ALL (2).

3.1.1.2.1.9 User Global Environment (GENV) File. Associated with every logged-on WES user is a GENV file which contains environment values for the specific user. The file is created when the user logs onto FSM. The user's FSMGP copies the system GENV into the user's GENV. The file is contained in the user's directory ("/fsm/usr/user-i"). The file is modified, when environment values change, by FSMGP. The format of the file follows the system GENV exactly (refer to Figure 3-7). FSMGP modifies this file when the EM makes environment changes pertinent to this WES user and when bandrate overflow has been detected. EMP reads this file when displaying a current WES user's environment to the EM.

3.1.1.2.1.10 Global Profile (GPROF) File. Associated with each WES user is a user profile file. This file is created and updated by the user's FSMGP. The file contains only one record which identifies the user (with FSM user ID and UNIX terminal ID), indicates the current WWMCCS subsys-
tem, user's status and the Date-Time Group (DTG) of the status. Status
in this sense refers to potential delays. There are six conditions that
can cause delay:

- waiting on user input
- waiting on system output
- waiting for Screener response
- waiting on polling text (user input or system output)
- waiting on Screener assignment
- waiting for RNPE connection

Each time the WES user's delay state changes, FSMGP updates the user's
GPROF file. This file is read by EMP whenever the EM requests a user
profile. See Figure 3-8 for a GPROF record.

Each record has the following fields:

PUSR The one-byte FSM user ID.

PTTY The UNIX terminal ID.

PSUB The WWMCCS subsystem in use at the time the status was recorded.

PSTAT The user's status. Values are 0 (waiting on user input), 1
(waiting on system output), 2 (waiting on Screener response), 3
(waiting on polling text), 4 (waiting on Screener assignment) and
5 (waiting on RNPE/Honeywell H6000 connection).

PDTG The four-byte DTG of the status.
<table>
<thead>
<tr>
<th>Word 0</th>
<th>Word 1</th>
<th>Word 2</th>
<th>Word 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUSR</td>
<td>PSUB</td>
<td></td>
<td>PDTG</td>
</tr>
<tr>
<td>PTTY</td>
<td>PSTAT</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 3-8. A GPROF Record
3.1.1.2.1.11 Global Audit Description (GAUD) File. In order for ATDP to know quickly what audit files are present, in addition to the total time range they cover, a file exists which contains all audit file-pairs (one entry per pair), including the current pair, their DTG of creation and DTG of last entry. Each time FAD logs an audit event in the current file-pair, it must also update the corresponding GAUD record with the new "last entry" DTG. Since the description record (in GAUD) for the current file-pair is always the last record in the file, FAD has no problem updating it.

The description file contains fixed-length sequential records; one record per audit file-pair. Each record follows this format:

**AUDFN** Audit file-pair name (14 bytes).

**CRET** Date-time group of creation (4 bytes).

**LMOD** Date-time group of last entry (4 bytes).

In addition to FAD, the description file is also updated by ATDP. When ATDP saves the current file-pair, it modifies the description record of the current file-pair by changing the filename from "current" to the DTG of the save. It also writes a new record with a filename of "current" and the DTG of creation. Notice, ATDP does NOT modify the DTG of last entry on the old current file. This data is only modified by FAD. Similarly, FAD never modifies the filename or the DTG of creation. Since both FAD and ATDP have write-access to this file, it must be locked before writing. See Figure 3-9 for a GAUD record.
Figure 3-9. A GAUD Record
3.1.1.2.1.12 **Audit File Lock (GAUD-LOCK).** As mentioned previously, to protect audit files from being simultaneously write-accessed, FSM employs a standard lock-for-writing mechanism. The mechanism involves requiring all writing processes to lock the file before writing and unlocking it after. The existence of the lock file signifies a process is currently updating an audit file. The two file sets which are of concern are the Current Audit File-Pair and the GAUD file. Both are updated by ATDP and FAD. The lock file has no records, it is merely an entry in the audit directory so that its presence or absence can be detected easily.

3.1.1.2.1.13 **Current Global Audit Event (GAEV) Files.** The Global Audit Event Files are pairs of sequential files which contain records of varying format and length. All audit events are written to the GAEV files. These events can be generated by any one of the four FSM processes: FSM Guardian Process (FSMGP), Environment Manager Process (EMP), Screener Trusted Process (SCTP) or FSM Assignment Daemon (FASSD). Audit events are actually audited (written to the GAEV files) by the FSM Audit Daemon (FAD). User-oriented formatting and display of GAEV records is performed by the Audit Trail Display Program (ATDP).
There are nineteen events logged by FAD:

<table>
<thead>
<tr>
<th>Event Code</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>User input sent to system (WWMCCS)</td>
</tr>
<tr>
<td>02</td>
<td>User input not sent to system</td>
</tr>
<tr>
<td>03</td>
<td>System output matched and sent to user</td>
</tr>
<tr>
<td>04</td>
<td>System output not matched</td>
</tr>
<tr>
<td>05</td>
<td>System output accepted by Screener</td>
</tr>
<tr>
<td>06</td>
<td>System output rejected by Screener</td>
</tr>
<tr>
<td>07</td>
<td>Screener logged onto FSM</td>
</tr>
<tr>
<td>08</td>
<td>Screener logged off FSM</td>
</tr>
<tr>
<td>09</td>
<td>User logged onto FSM</td>
</tr>
<tr>
<td>10</td>
<td>User logged off FSM</td>
</tr>
<tr>
<td>11</td>
<td>User initiated a WWMCCS subsystem</td>
</tr>
<tr>
<td>12</td>
<td>User assigned to Screener</td>
</tr>
<tr>
<td>13</td>
<td>User input simulated (resynch)</td>
</tr>
<tr>
<td>14</td>
<td>Screen mode modified</td>
</tr>
<tr>
<td>15</td>
<td>Bandwidth threshold modified</td>
</tr>
<tr>
<td>16</td>
<td>EM logged onto FSM</td>
</tr>
<tr>
<td>17</td>
<td>EM logged off FSM</td>
</tr>
<tr>
<td>18</td>
<td>System output received from WWMCCS</td>
</tr>
<tr>
<td>19</td>
<td>Screener begins downgrade request</td>
</tr>
</tbody>
</table>

The GAEV file-pair consist of two files: the Event file and the Text file. Every audit event causes a record to be written to the Event file. Additionally, some audit events will write ASCII strings to the Text file.
file. All auditable user input and system output will be written to the Text file with the appropriate offset and length entered with the corresponding Event file record. For example, consider audit event 01 (User input sent to system). This event causes a record to be written in the Event file containing useful data (user ID, DTG and so on), as well as the offset in the Text file where the user input can be found and its length. The motivation behind two files, as opposed to one, stems from the potential size of user inputs and system outputs; as well as the fact that not all audit events have text to audit.

All of the following event records are written to the Event file. Also, the following descriptions pertain only to the Event file, NOT the Text file. Records in the Text file are format-less; that is, they are variable-length ASCII strings.

Each audit event record contains a fixed-size header block followed by a variable Length Event Description. Figure 3-10 illustrates an audit event record.

The header is the same for all audit events and contains these fields:

FEVENT  The Event Code (01-19).
FEVSIZ  The number of bytes in the Event Description. NOTE: This does not include the size of the header.
FEVTIM  The Date-Time Group (DTG) of this event in standard UNIX two integer (four bytes) format.

Figure 3-11 is an Event file Record Header Description.
| HEADER |
| EVENT DESCRIPTION |

Figure 3-10. An Audit Event Record (written to Event File)
<table>
<thead>
<tr>
<th>Word 0</th>
<th>FEVENT</th>
<th>FEVSIZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Word 2</td>
<td></td>
<td>FEVTIM</td>
</tr>
</tbody>
</table>

Figure 3-11. An Event File Record Header Description
The following paragraphs provide a description of the content and format of the audit event record for each of the nineteen events recorded in the GAEV files.

EVENT 01 (User input sent to system)

FSMGP will generate this audit event whenever the FSM has recognized and allowed user input to be sent to a WWMCCS subsystem. The user input will be copied to the Text file with the text file offset and text length entered in the Event file. Figure 3-12 is an Event 01 record description to be written to the Event file.

Field Descriptions

USERID The one byte FSM user ID.
USRTTY The UNIX identifier of the terminal from which the input was sent.
SUBSYS The current WWMCCS subsystem in use. See Table 3-2 for the OFFSET The byte offset from the beginning of the Text file where the user input is written.
LENGTH The byte length of the user input.
<table>
<thead>
<tr>
<th>Word</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>FEVENT</td>
</tr>
<tr>
<td>1</td>
<td>FEVTIM</td>
</tr>
<tr>
<td>2</td>
<td>USERID</td>
</tr>
<tr>
<td>3</td>
<td>USRTTY</td>
</tr>
<tr>
<td>4</td>
<td>SUBSYS</td>
</tr>
<tr>
<td>5</td>
<td>OFFSET</td>
</tr>
<tr>
<td>6</td>
<td>LENGTH</td>
</tr>
</tbody>
</table>

Figure 3-12. Description of Event 01, 03, 04, 13 and 18 Records
Table 3-2. WWMCCS Subsystems and their FSM codes

<table>
<thead>
<tr>
<th>Subsystem Code</th>
<th>WWMCCS Subsystem</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>ALL subsystems</td>
</tr>
<tr>
<td>1</td>
<td>ACCESS</td>
</tr>
<tr>
<td>2</td>
<td>LIST</td>
</tr>
<tr>
<td>3</td>
<td>SIOS (Standard Input/Output System)</td>
</tr>
<tr>
<td>4</td>
<td>TCON (Transaction Constructor)</td>
</tr>
<tr>
<td>5</td>
<td>TLCF (Teleconferencing)</td>
</tr>
<tr>
<td>6</td>
<td>TSS (Timesharing System)</td>
</tr>
<tr>
<td>7</td>
<td>WWDMS (World-Wide Data Management System)</td>
</tr>
<tr>
<td>8</td>
<td>Logon</td>
</tr>
</tbody>
</table>

EVENT 02 (User input not sent to system)

Whenever FSMGP cannot recognize the user input or the user attempts to use a privileged WWMCCS facility that is not allowed, FSMGP will generate this audit event. The user input will be written to the Text file. Figure 3-13 is an Event 02 record description to be written to the Event file.

Field Descriptions

USERID The one byte FSM user ID.
<table>
<thead>
<tr>
<th>Word 0</th>
<th>FEVENT</th>
<th>FEVSIZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word 1</td>
<td>FEVTIM</td>
<td></td>
</tr>
<tr>
<td>Word 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Word 3</td>
<td>USERID</td>
<td>USRTTY</td>
</tr>
<tr>
<td>Word 4</td>
<td>SUBSYS</td>
<td>FAILEX</td>
</tr>
<tr>
<td>Word 5</td>
<td>OFFSET</td>
<td></td>
</tr>
<tr>
<td>Word 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Word 7</td>
<td>LENGTH</td>
<td></td>
</tr>
<tr>
<td>Word 8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 3-13. Description of Event 02 Record
USRTTY  The UNIX identifier of the terminal from which the input was sent.

SUBSYS  The current WWMCCS subsystem in use. Refer to Table 3-2 for code explanations.

FAILEX  The coded reason why the input was not sent. Codes are: 1=No match (unrecognizable input) and 2=Match but disallowed.

OFFSET  The byte offset from the beginning of the Text file where the user input can be found.

LENGTH  The byte length of the user input.

EVENT 03 (System output matched and sent to user)

Whenever system output is matched (recognized) by the FSMGP and sent to the user, thereby bypassing the Screener, FSMGP generates this audit event. The system output is written to the Text file. Refer to Figure 3-12 for an Event 03 record description to be written to the Event file.

Field Descriptions

USERID  The one byte FSM user ID.

USRTTY  The UNIX identifier of the terminal to which the output was sent.

SUBSYS  The current WWMCCS subsystem in use. Refer to Table 3-2 for code explanations.

OFFSET  The byte offset from the beginning of the Text file where the system output was written.

LENGTH  The byte length of the system output.
EVENT 04 (System output not matched)

In the course of a system-user dialogue, whenever the system responds with unrecognizable output, FSMGP will generate this audit event. The system output will be written to the Text file. Refer to Figure 3-12 for an Event 04 record description to be written to the Event file.

Field Descriptions

USERID  The one byte FSM user ID.
USRTTY  The UNIX identifier of the terminal to which the output would have been sent.
SUBSYS  The current WWMCCS subsystem in use. Refer to Table 3-2 for code explanations.
OFFSET  The byte offset from the beginning of the Text file where the system output was written.
LENGTH  The byte length of the system output.

EVENT 05 (System output accepted by the Screener)

When a WWMCCS subsystem returns output which must be visually inspected by a Screener for downgrading and the output was accepted for downgrading, FSMGP generates this audit event. The accepted system output is written to the Text file. See Figure 3-14 for an Event 05 record description to be written to the Event file.
Figure 3-14. Description of an Event 05 and 06 Records
Field Descriptions

USERID  The one byte FSM user ID.

USRTTY  The UNIX identifier of the terminal to which the accepted output was sent.

SUBSYS  The current WWMCCS subsystem in use. Refer to Table 3-2 for code explanations.

SCRID  The one byte FSM user ID of the Screener.

OFFSET  The byte offset from the beginning of the Text file where the system output is written.

LENGTH  The byte length of the accepted system output.

EVENT 06 (System output rejected by Screener)

In this case, a WWMCCS subsystem output was visually inspected by a Screener and the downgrade request was refused. FSMGP will be notified of the downgrade rejection and will then generate this audit event. The rejected system output is written to the Text file. Refer to Figure 3-14 for an Event 06 record description to be written to the Event file.

Field Descriptions

USERID  The one byte FSM user ID.

USRTTY  The UNIX identifier of the terminal to which the output was to be sent.

SUBSYS  The current WWMCCS subsystem in use. Refer to Table 3-2 for code explanations.
SCRID  The one byte FSM user ID of the Screener.
OFFSET  The byte offset from the beginning of the Text file where the rejected system output is written.
LENGTH  The byte length of the rejected system output.

EVENT 07 (Screener logon to FSM)

Whenever a Screener logs onto the FSM (through a new instance of SCTP), SCTP will generate this audit event. See Figure 3-15 for an Event 07 record description to be written to the Event file.

Field Descriptions

SCRID  The one byte FSM user ID of the Screener.
SCRTTY  The UNIX identifier of the Screener terminal logging on.

EVENT 08 (Screener logoff of FSM)

When a Screener logs off of the FSM, FASSD will generate this audit event. Refer to Figure 3-15 for an Event 08 record description to be written to the Event file.

Field Descriptions

SCHID  The one byte FSM user ID of the Screener.
SCRTTY  The UNIX identifier of the Screener terminal logging off.
<table>
<thead>
<tr>
<th>Word 0</th>
<th>FEVENT</th>
<th>FEVSIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Word 2</td>
<td></td>
<td>FEVTIM</td>
</tr>
<tr>
<td>Word 3</td>
<td>SCRID</td>
<td>SCRTTY</td>
</tr>
</tbody>
</table>

**Figure 3-15. Description of Event 07 and 08 Records**
EVENT 09 (User Logon to FSM)

When a WES user begins a terminal session (which includes logon sequence) FSMGP will generate this audit event. See Figure 3-16 for an Event 09 record description to be written to the Event file.

Field Descriptions

USERID The one byte FSM user ID.
USRTTY The UNIX identifier of the user terminal logging on.

NOTE: A user who fails the initial logon sequence may not have any audit events generated.

EVENT 10 (User Logoff of FSM)

When a WES user ends a terminal session, FASSD will generate this audit event. This event involves two cases: explicit user logoff and user logoff due to error conditions. Refer to Figure 3-16 for an Event 10 record description to be written to the Event file.

Field Descriptions

USERID The one byte FSM user ID.
USRTTY The UNIX identifier of the terminal logging off.
Word 0 | FEVENT | FEVSIZ
---|---|---
Word 1 | FEVTIM |  
Word 2 | USERID | USRTTY

Figure 3-16. Description of Event 09 and 10 Records

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EVENT 11 (User initiates a WWMCCS subsystem)

When a user initiates a WWMCCS subsystem, FSMGP will generate this audit event. A WWMCCS subsystem can be initiated in response to the "SYSTEM ?" prompt or at other less well-defined times. For instance, if the user is currently using the TCON subsystem, he can invoke the LIST subsystem at any time. **NOTE:** Logon is not considered a valid WWMCCS subsystem for this event. See Figure 3-17 for an Event 11 record description to be written to the Event file.

Field Descriptions

USERID  The one byte FSM user ID.

USRTTY  The UNIX identifier of the terminal initiating a WWMCCS subsystem.

SUBSYS  The initiated subsystem code. Refer to Table 3-2 for code explanations.

STATUS  The status of the initiation attempt (0=Failure, 1=Success). **Note:** If STATUS=0, SUBSYS will be undefined.
<table>
<thead>
<tr>
<th>Word 0</th>
<th>FEVENT</th>
<th>FEVSIZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word 1</td>
<td>FEVTIM</td>
<td></td>
</tr>
<tr>
<td>Word 2</td>
<td>USERID</td>
<td>USRTTY</td>
</tr>
<tr>
<td>Word 4</td>
<td>SUBSYS</td>
<td>STATUS</td>
</tr>
</tbody>
</table>

Figure 3-17. Description of Event 11 Record
EVENT 12 (User assigned to Screener)

Whenever the FASSD makes an initial WES user/Screener assignment or the EM (via the EMP) reassigns a WES user to a Screener, FASSD generates this audit event. See Figure 3-18 for an Event 12 record description to be written to the Event file.

Field Descriptions

USERID    The one byte FSM user ID of the assigned user.
USRTTY    The UNIX identifier of the assigned user terminal.
SCRID     The one byte FSM user ID of the assigned Screener.
SCRTTY    The UNIX identifier of the assigned Screener terminal.
### Figure 3-18. Description of Event 12 Record

<table>
<thead>
<tr>
<th>Word 0</th>
<th>FEVENT</th>
<th>FEVSIZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Word 2</td>
<td></td>
<td>FEVTIM</td>
</tr>
<tr>
<td>Word 3</td>
<td>USERID</td>
<td>USRTTY</td>
</tr>
<tr>
<td>Word 4</td>
<td>SCRID</td>
<td>SCRTTY</td>
</tr>
</tbody>
</table>
EVENT 13 (User input simulated)

When the FSMGP receives system output that is unrecognizable, FSMGP will simulate user input to the WWMCCS subsystem in use in order for FSMGP to keep from getting lost in the context tables. This usually involves "popping up" to the next higher level within WWMCCS. This could terminate the current subsystem (thus, returning the user to the "SYSTEM?" prompt) or return to a well-defined point within the current subsystem (e.g. the "NEXT?" prompt in TCON). The simulated user input is written to the Text file. Refer to Figure 3-12 for an Event 13 record description to be written to the Event file.

Field Descriptions

USERID The one byte FSM user ID.

USRTTY The UNIX identifier of the terminal from which input is being simulated.

SUBSYS The current WWMCCS subsystem in use. Refer to Table 3-2 for code explanations.

OFFSET The byte offset from the beginning of the Text file where the simulated user input is written.

LENGTH The byte length of the simulated user input.

EVENT 14 (Screen mode modified)

When the EM (via the EMP) modifies the downgrade screening mode, EMP generates this audit event; or if a WES user's FSMGP detects that the user's

3 - 76
bandwidth threshold has been exceeded, FSMGP modifies the user's screen mode (to ALL) and generates this event. Screen mode may be set to any one of three values:

NONE No output is inspected by the Screener.
NORMAL Only output FSMGP cannot match is inspected by the Screener.
ALL All output is inspected by the Screener.

Additionally, the screen mode may be set for a user, for a subsystem or for a user/subsystem. See Figure 3-19 for an Event 14 record description to be written to the Event file.

Field Descriptions

USERID The one byte FSM user ID. If ALL users are affected, this value will be set to -1.

USRTTY The UNIX identifier of the user's terminal. This value is undefined if USERID is -1.

SUBSYS The WWMCCS subsystem(s) for which the screen mode was modified. Refer to Table 3-2 for code explanations. The logon subsystem is not affected by the screening mode.

SCMODE The new screen mode (0=NONE, 1=NORMAL and 2=ALL).
Figure 3-19. Description of Event 14 Record

<table>
<thead>
<tr>
<th>Word 0</th>
<th>FEVENT</th>
<th>FEVSIZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Word 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Word 3</td>
<td>USERID</td>
<td>USRTTY</td>
</tr>
<tr>
<td>Word 4</td>
<td>SUBSYS</td>
<td>SCMODE</td>
</tr>
</tbody>
</table>
EVENT 15 (Bandwidth Threshold modified)

When the EM (via the EMP) modifies the bandwidth threshold for a user, EMP generates this audit event. The bandwidth threshold is defined as the number of messages allowed to be automatically downgraded for a user each minute. If the bandwidth threshold is surpassed, screen mode is automatically modified to ALL for the particular user (by FSMGP). See Figure 3-20 for an Event 15 record to be written to the Event file.

Field Descriptions

USERID  The one byte FSM user ID. If ALL users are affected, this value will be -1.

RATE  The number of messages per minute which may automatically bypass the Screener. The rate must be a positive integer in the range of one to 127.

EVENT 16 (EM logon to FSM)

When the EM logs onto FSM, EMP generates this audit event. See Figure 3-21 for an Event 16 record to be written to the Event file.

Field Descriptions

EMID  The one byte FSM user ID of the Environment Manager.

EMTTY  The UNIX identifier of the EM's terminal.
<table>
<thead>
<tr>
<th>Word 0</th>
<th>FEVENT</th>
<th>FEVSIZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word 1</td>
<td></td>
<td>FEVTIM</td>
</tr>
<tr>
<td>Word 2</td>
<td>USERID</td>
<td></td>
</tr>
<tr>
<td>Word 3</td>
<td>RATE</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3-20. Description of Event 15 Record
EVENT 17 (EM Logoff of FSM)

When the EM logs off of FSM, EMP generates this audit event. See Figure 3-21 for an Event 17 record to be written to the Event file.

Field Descriptions

EMID The one byte FSM user ID of the Environment Manager.
EMTTY The UNIX identifier of the EM's terminal.

EVENT 18 (System output received by FSMGP)

when FSMGP receives a system output from WWMCCS, via the RNPE, and has matched a halting delimiter (the output may or may not subsequently match a SUBCONTEXT), this event is generated. The system output received is written to the Text file. Refer to Figure 3-12 for an Event 18 record description.

Field Descriptions

USERID The one byte FSM user ID of the user.
USRTTY The UNIX identifier of the user's terminal.
SUBSYS The current WWMCCS subsystem in use. Refer to Table 3-2 for code explanations.
OFFSET The byte offset from the beginning of the Text file where the system output can be found.
LENGTH The byte length of the user input.
<table>
<thead>
<tr>
<th>Word 0</th>
<th>FEVENT</th>
<th>FEVSIZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word 1</td>
<td>FEVTIM</td>
<td></td>
</tr>
<tr>
<td>Word 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Word 3</td>
<td>EMID</td>
<td>EMTTY</td>
</tr>
</tbody>
</table>

Figure 3-21. Description of Event 16 and 17 Records
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A
EVENT 19 (Downgrade request received by Screener)

When the Screener begins reviewing a downgrade request from a WES user this event is generated by SCTP. The time of this event in conjunction with the time of the subsequent event 05 (accept) or 06 (reject) yields the time needed by the Screener to make his decision. See Figure 3-22 for an Event 19 record description.

Field Descriptions

SCRID The one byte FSM user ID of the Screener.

SCRTTY The UNIX identifier of the Screener's terminal.

SUBSYS The current WWMCCS subsystem in use. Refer to Table 3-2 for code explanations.

USERID The one byte FSM user ID of the WES user requesting the downgrade.

3.1.1.2.1.14 Current Audit Text File. When audit events are logged which contain audit text (system output or user input), the text is written in the current audit text file. It has no format. Text is written to the file, by being appended, as ASCII strings. The starting location (OFFSET) and LENGTH of each event's text is recorded with the corresponding event record in the current GAEV file.
Figure 3-22. Description of Event 19 Record
3.1.1.2.1.15 Saved Global Audit Environment (GAEV) Files. ATDP can save the current audit file-pair and initialize a new pair. Once a file-pair has been saved, it can be accessed only by ATDP and only for reading. Therefore, saved audit files (i.e. non-current) need no corresponding lock files. A saved audit file-pair is renamed to the DTG of the save operation. For example, saving a current file-pair on April 2 at 12:05:30 has the effect of renaming the current Event file from "current.e" to "0402120530.e" and the current Text file from "current.t" to "0402120530.t". The new current file-pair exists with the same name as before but now with zero length. NOTE: Do not confuse the saved DTG with the DTG of the last-entered audit event. Records in the saved Event files have formats as described above in the Global Audit Event (GAEV) file description. Records in the saved Text files are format-less.

3.1.1.2.1.16 Saved Audit Text Files. Saved audit text files have no format. They contain ASCII strings which were audit text. Associated with each saved text file is a saved GAEV file.

3.1.1.2.1.17 Audit Request Files. After an audit event has been generated by one of the four primary FSM processes, GFAUDIT is called by the generating process and passed pertinent event data items. It processes its arguments and writes a file containing an audit request into the audit queue. The audit request file contains all known event data that is needed by FAD to log the audit event into the current audit files. The file has a name composed of the Date-Time Group (DTG) of the audit event, the process ID of the event generator (one of FSMGP, EMP, SCTP or
FASSD) and a random alphanumerical character. This format guarantees unique filenames in the queue. Specifically, the filename format is:

`MMDDhhmmsspppr`

where,

- **MM** is the month (01-12)
- **DD** is the day (01-31)
- **hh** is the hour (00-23)
- **mm** is the minute (00-59)
- **ss** is the second (00-59)
- **ppp** is the process ID of the event generator (000-999)
- *r* is a random alphanumerical character

The audit request file written by GFAUDIT is composed of one or more records. The first record of every file will follow the format of the audit event it represents. These follow the formats described above in the Global Audit Event (GAEV) file description. If the particular event also contains text, in the form of system output or user input, there will be a second and possibly additional records which contain the text. The text has no format; that is, it is composed of ASCII strings and is guaranteed to be terminated by a UNIX null byte ('\0').

All audit request files are written into an audit request queue by the global audit function GFAUDIT. Audit request files are processed (the events are logged) by the audit daemon FAD. The audit request queue is implemented as a directory entry in the main audit directory "(/fsm/fsat)".
The queue pathname is "/fsm/fsat/auditq".

An empty audit queue directory (i.e. no files) signifies that there are no pending audit requests. Similarly, n files signifies n pending audit requests. Audit requests are handled in a strict First-in, First-out (FIFO) basis and are unlinked by FAD as the specified event is recorded in the current audit files.

3.1.1.2.1.18 Lock-File sclog-i. This lock-file provides a means for SCTP to inform assigned FSMGPs that a Screener is logging off or has logged off. This prevents downgrade requests from being sent to logged-off Screeners. Prior to requesting a downgrade, FSMGP checks for the presence of this lock-file. If the lock-file is not present, the downgrade request is sent to the assigned Screener. If the port exists, the downgrade request is deferred until a new Screener is assigned. In the latter case, the user is also notified that no Screener is available. The lock-file name consists of the characters "sclog" followed by the Screener's FSM user ID as a five character string with leading zeroes.

3.1.1.2.2 Port Descriptions. The inter-process communication (IPC) ports used by FSM are for the use of FSMGP, FASSD, EMP and SCTP. Ports are used to pass IPC messages indicating various events applicable to FSM, such as Screener assignments, Screener logon/logoff notifications, environment changes, and so on. Following are descriptions of the individual ports implemented in FSM and corresponding message formats.
3.1.1.2.2.1 Port Message Descriptions. The FSM port messages will consist of structured data, both binary and ASCII. See Table 3-3 for a summary of the message types. Figure 3-23 describes the actual structure of the message.

Field Descriptions

GMTYP One byte Message Type.

GUID One byte FSM user ID.

GECNG A one byte environmental change value (bypass rate or screen mode); or a second FSM user ID.

GSSI One byte subsystem index (refer to Table 3-2 for code explanations).

GCLAS Integer security classification code.

GDPTH Pathname of a downgrade file.

GCPTH Pathname of a context file.
<table>
<thead>
<tr>
<th>Word 0</th>
<th>GMTYP</th>
<th>GUID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word 1</td>
<td>GECNG</td>
<td>GSSI</td>
</tr>
<tr>
<td>Word 2</td>
<td>GCLAS</td>
<td></td>
</tr>
<tr>
<td>Word 3</td>
<td>GDPTH</td>
<td></td>
</tr>
<tr>
<td>Word 15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Word 16</td>
<td>GCPTH</td>
<td></td>
</tr>
<tr>
<td>Word 28</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 3-23. Description of IPC Messages
Table 3-3. Summary of IPC Messages

General Format:

<mtyp>[<uid>][<ecng>][<ssinx>][<sc><dgfn><ctxfn>]

where:

* Items enclosed in [] are optional.

* "mtyp" represents the IPC message type (byte).

* "uid" represents a user ID (byte).

* "ecng" represents an environment change, a bypass rate change (number of messages per minute), a screen mode change (0 - none, 1 - normal, 2 - all); or a second user ID (all values one byte).

* "ssinx" represents a subsystem index for a screen mode change (byte).

0 - All subsystems

1 - ACCESS

2 - LIST

3 - SIOS

4 - TLCF

3 - 90
5 - TLCF
6 - TSS
7 - WWOMS
8 - logon

* "sc" represents the security classification of the user (byte).
  1 - unclassified
  2 - confidential
  3 - official use only
  4 - secret working papers
  5 - secret

* "dgfn" represents the pathname of a file to be downgraded.

* "ctxfn" represents the pathname of a context file associated with a downgrade file.

IPC Message Types are:

UAREQ <uid><ecng> User assignment request.

UALGO <uid> User logoff notification.

SCASS <uid><ecng> Screener assigned.
3.1.1.2.2.2 Port faport. This port provides a means for a FSMGP to request a Screener assignment for a newly logged on WES user. FSMGP writes a UAREQ message to FASSD. FASSD writes a reply (SCASS or SCNAV) on the appropriate fsagn-i port. SCTP also uses the faport to notify FASSD of Screener logons/logoffs (DRRDY/DRLGO). Finally, EMP utilizes this port to notify FASSD of Screener reassignments (SCCNG).

3.1.1.2.2.3 Port fsagn-i. This port provides a means for FASSD and EMP to communicate with an FSMGP. The port name consists of the characters "fsagn" followed by the WES user's FSM ID as a five character string with leading zeros. FASSD writes messages SCASS and SCNAV on this port to one or more of the currently running FSMGPs. Messages SCASS and SCNAV are
replies to the request message UA REQ which FASSD reads from its input port faport. Messages BRCNG and SMCNG can be written at any time on this port by the EMP.

3.1.1.2.2.4 Port screq-i. This port provides a means for a FSMGP to request a downgrade (DGREQ). The port name consists of the characters "screq" followed by the Screener's user ID as a five character string with leading zeroes. The FSMGP writes a DGREQ message to the appropriate SCTP using this port. The SCTP will write a reply message (DGACC, DGREJ or DRLGO) on the appropriate fsrLy-i port.

3.1.1.2.2.5 Port fsrLy-i. This port provides a means for a SCTP to communicate with a FSMGP. The port name consists of the characters "fsrLy" followed by the WES user's FSM ID as a five character string with leading zeroes. The SCTP writes messages DGACC, DGREJ and DRLGO on this port to the appropriate FSMGP. These are reply messages to a DGREQ message which the SCTP read from its input port screq-i.

3.1.2 Process/Data Structure Interfaces

To this point we have described FSM's data structures in great detail but have only given a simplistic view of how they are manipulated by FSM processes. In this subsection we now describe how and when processes access FSM data structures and/or communicate using them (from a data structure viewpoint). For particulars of data access from the process view, see Section 3.2. The descriptions presented below refer to Figures 3-24 and 3-25, disk files and ports, respectively.
Figure 3-25. FSM Process/Port Flow
3.1.2.1 Disk File Interfaces. All FSM disk file data structures will be described with respect to process manipulation. These disk files are:

a. Context Data (GCONT)
b. Context Text Data (GTEXT)
c. Context Halting Delimiter Data (GHDEL)
d. User Profile Data (GPROF)
e. System Environment Data (GENV)
f. User Environment Data (GENV)
g. User Logon File (GLF)
h. Downgrade File (GDOWN)
i. Downgrade Context Information File (GINFO)
j. Audit Request Data
k. Audit File (GAUD)
l. Audit Event Data (GAEV)
m. Audit Text Data
n. Screener Lock-File (sclog-i)
3.1.2.1.1 Context Data (GCONT). FSM Context Data (GCONT) is manipulated by only one FSM process type, the FSM Guardian Program (FSMGP). This data structure contains the entire user/WWMCCS dialogue context and controls all automatic/manual screening and filtering decisions. It is read-only and is used to control the referencing of its related data structures, the Context Text Data (GTEXT) and the Context Halting Delimiter Data (GHDEL). Since this data structure is read-only it does not need to be locked during FSM operation.

3.1.2.1.2 Context Text Data (GTEXT). FSM Context Text Data (GTEXT) is manipulated by only one FSM process type, FSMGP. This data structure contains the textual data of the user/WWMCCS dialogue context and is pointed to by appropriate entries in GCONT. Since this data structure is read-only it does not require locking sequences.

3.1.2.1.3 Context Halting Delimiter Data (GHDEL). FSM Context Halting Delimiter Data (GHDEL) is referenced by only one FSM process type, FSMGP. This data structure contains halting delimiter strings utilized by FSMGP in recognizing user/system data sequences. As with its related data structures GCONT and GTEXT, this data structure does not require locking sequences.

3.1.2.1.4 User Profile Data (GPROF). The User Profile Data (GPROF) structure is created by FSMGP for each WES user logged onto FSM. GPROF contains the current state the WES user is in during his dialogue with WWMCCS. GPROF is updated by FSMGP each time the WES user enters another profile state. The Environment Manager Program (EMP) reads GPROF when
the Environment Manager (EM) wishes to view the profile of some WES user logged onto FSM.

3.1.2.1.5 System Environment Data (GENV). The Environment Data (system) (GENV) structure is created when the FSM is initiated and contains a set of default environment values. The Environment Manager Program (EMP), under direction of the EM, updates this data structure to reflect new system-wide environment values. EMP also displays GENV to the EM. FSMGP utilizes the system GENV to establish initial local environment values for its local user (it is used to build the user level GENV).

3.1.2.1.6 User Environment Data (GENV). The Environment Data (user) Structure is created by FSMGP when a WES user logs onto FSM. FSMGP uses the system GENV data structure to initialize the user's local GENV. As FSMGP receives new environment values from EMP, it updates the user's GENV accordingly.

3.1.2.1.7 Global Logon File (GLF). The Global Logon File (GLF) exists when FSM is initiated and is updated by the FSM Guardian Process (FSMGP), FSM Assignment Daemon (FASSD), Screener Trusted Process (SCTP), Environment Manager Process (EMP) and a stand-alone maintenance program, USER (see Appendix E). When a WES user logs onto FSM, FSMGP updates GLF to reflect that fact. SCTP operates similarly when a Screener logs on. FASSD modifies GLF when WES users or Screeners log off. When an EM logs on or off, EMP modifies GLF. Additionally, FASSD modifies GLF when an assignment is made and when an EM-directed reassignment occurs. USER modifies GLF whenever it is directed to do so.
3.1.2.1.8 **Downgrade File (GDOWN).** The Downgrade File (GDOWN) is created by the FSM Guardian Program (FSMGP) when a user logs onto FSM. This data structure contains WWMCCS output for manual screening by the FSM Screener assigned to the WES user. Therefore the Screener Trusted Process (SCTP) must read GDOWN.

3.1.2.1.9 **Downgrade Context File (GINFO).** The Downgrade Context File (GINFO) is created by FSMGP when a WES user logs onto FSM. This data structure contains dialogue context data used by the FSM Screener in making a decision as to the sensitivity of the downgrade data (i.e., GDOWN). Under Screener control, SCTP reads GINFO, displaying a screen at a time to the Screener.

3.1.2.1.10 **Audit Request Data.** Audit Request Data is created as separate event/text file entries by four FSM processes: the FSM Guardian Program (FSMGP), the Environment Manager Program (EMP), the Screener Trusted Program (SCTP) and the FSM Assignment Daemon (FASSD). FSMGP builds event/text entries for many different audit events, such as entering new WWMCCS subsystems, inputting commands, and so on. EMP creates audit event entries when the EM alters the environment. SCTP audits Screener Logon and whenever a downgrade request is accepted for inspection. FASSD creates audit events when a WES user or Screener logs off of FSM or a WES user/Screener assignment is made. The FSM Audit Daemon (FAD) is responsible for updating the current FSM Audit Trail with these audit request data. FAD deletes the request data after it is recorded in the current audit trail.
3.1.2.1.11 Audit File (GAUD). The Audit File (GAUD) exists when FSM is initiated and is updated by the Audit Trail Display Program (ATDP) under direction of the EM. GAUD reflects the current and old (saved) audit trail events/texts. When the EM desires to save the current audit trail, EMP updates GAUD to reflect the saved event/text pair. FAD also updates GAUD to reflect information concerning the current audit trail event/text pair. Since both ATDP and FAD update GAUD, it requires a lock sequence.

3.1.2.1.12 Audit Trail Event Data (GAEV) Structure. The Audit Trail Event Data (GAEV) Structure is created by the FSM Audit Daemon (FAD) and contains current audit trail events. EMP, under direction of the EM, can display this data in concert with its text file counterpart. When the EM wishes to save the current audit trail event/text pair, EMP creates another copy of these data structures and recreates the current GAEV to zero length. Although both ATDP and FAD have write access to the current GAEV, a lock sequence prevents an update conflict.

3.1.2.1.13 Audit Trail Text Data Structure. The Audit Trail Text Data Structure is handled identically as GAEV. It is created by FAD and is displayed by ATDP. ATDP also deletes the current version of this data structure when the EM commands it to be saved.

3.1.2.1.14 Screener Lock-File (sclog-i). The sclog-i lock-file is created when an active Screener is logging off. Its presence indicates that the owner (Screener) is unavailable for any further downgrade requests. Prior to sending his assigned Screener a downgrade request IPC message, FSMGP checks for the existence of this port (the "-i" is the
Screener's FSM ID and uniquely identifies the file). If it is present, FSMGP must defer its downgrade request until another Screener is assigned. Otherwise, the downgrade request can be made as usual.

5.1.2.2 Port Interfaces. Figure 3-25 illustrates the FSM port/process interface. Ports are used in FSM as FIFO message queues and provide an efficient mechanism for inter-process communication (IPC). FSM ports are:

a. FSM Assignment Daemon (faport) Port

b. Screener Assignment (fsagn-i) Port

c. Screener Request (screq-i) Port

d. Screener Reply (fsrly-i) Port

Following is a description of these ports with respect to their utilization by FSM processes.

5.1.2.2.1 FSM Assignment Daemon (faport) Port. The faport port is created by the FSM Assignment Daemon (FASSD) and is utilized by existing FSM Guardian Processes (FSMGP) for requesting WES user/Screener assignments, Screener Trusted Processes (SCTP) for Screener Logons/Logoffs, and Environment Manager Process (EMP) for reassignment requests.
3.1.2.2 Screener Assignment (fsagn-i) Port. The fsagn-i port is created by FSMGP when it is invoked by a WES user. This port is written to by FASSD to pass WES user/Screener assignments and by EMP to indicate new environment values for the WES user. This port type exists for each WES user logged onto FSM and therefore utilizes the user's identifier in its name (i.e., "-i" means the "ith" WES user user ID). Port fsagn-i is deleted from FSM when the WES user logs off of FSM and FSMGP exits.

3.1.2.2.3 Screener Request (screq-i) Port. The screq-i port is created by the Screener Trusted Process (SCTP) and is written to by an assigned FSMGP for Screener requests. Since a FSM Screener can service more than one WES user, potentially many FSMGPs will be writing on any individual screq-i port. Note here, since more than one Screener can be logged onto FSM, the Screener's user ID is used in the port name (i.e., "-i" represents the "ith" Screener user ID). This port is deleted from the system when the Screener logs off of FSM and SCTP exits.

3.1.2.2.4 Screener Reply (fsrly-i) Port. The fsrly-i port is created by FSMGP and is written to by an assigned SCTP. In this situation, since a WES user can only have one Screener assigned to him at any one time, only one SCTP will be writing on this port. SCTP uses this port to inform the FSMGP of the Screener's downgrade decision (i.e., accept/reject) or of Screener logoff. This port is deleted from the system when the WES user logs off of FSM and FSMGP exits.
3.2 DETAILED FUNCTIONAL REQUIREMENTS

This section provides descriptions of the programs comprising the FORSCOM Security Monitor (FSM). Each program description is organized as follows. A short general description is followed by a list of the FSM global data used. Then, if applicable, a list of pertinent local data contained in the program is provided. A general process flow details the major paths the program traverses in accomplishing its task(s), with references to global and local data as well as major functions. The descriptions of major functions, if any, used in the general process flow discussion complete the program description.

The FSM programs described include:

a. FORSCOM Security Monitor Guardian Program (FSMGP)

b. Screener Trusted Program (SCTP)

c. FSM Assignment Daemon (FASSD)

d. FSM Audit Daemon (FAD)

e. Environment Manager Program (EMP)
f. Audit Trail Display Program (ATDP)

Notice, the Remote Network Processor Emulator (RNPE) is not described since it is furnished by a subcontractor and its internal operations are unknown.

3.2.1 FORSCOM Security Monitor Guardian Program (FSMGP)

The FORSCOM Security Monitor Guardian Program (FSMGP) is responsible for following user/system interactions in the restricted WWMCCS environment. It must know exactly where a user is in any given subsystem so that downgrade decisions can be made. Any given user input can be identified only in the context of what system output preceded it and what is to follow it. Conversely, any given system output can be understood only in terms of what has happened before and what the possible future events are. To do this tracking FSMGP must rely on a disk file, the context file, which contains all user inputs and system outputs, linked together in a tree-like structure. FSMGP is thus table driven, and its processing depends heavily on the information contained in the context file.

3.2.1.1 Global Data Usage. FSMGP uses the following global data files:

- **GCONT**: Context items and associated subcontexts.
- **GHDEL**: Context halting delimiter strings.
- **GTEXT**: Context text strings.
- **GENV**: System environment values.
- **GINFO**: Downgrade context information buffer.
3.2.1.2 Local Data Usage. FSMGP uses the following pertinent local data:

- **IB**: Working input buffer.

3.2.1.3 General Process Flow. The FORSCOM Security Monitor Guardian Process (FSMGP) is activated when its parent process, FSMGTty, receives user input from the terminal keyboard. FSMGP follows the standard WWMCCS TSS and TLCF logon procedures in the LOGON function which also establishes initial conditions. FSMGP receives the terminal identification as an argument and following local validation of the low-side WES user's WWMCCS userid, communicates to the FSM Assignment Daemon (FASSD), via an Inter-Process Communication (IPC) message on the port faport, requesting that a Screener be assigned to this user. FASSD communicates to FSMGP via the port fsagn, which is read only by the FSMGP for this user (the portname has a user identifier appended to it making it unique for this FSMGP). If there is no Screener available, the user is allowed to proceed until one is needed. Otherwise the Screener identification, user identification and terminal identification are written to the Global Logon File (GLF), using a lock mechanism. FSMGP then reads the system default Environment Values file (GENV) to determine the current default screen mode and bandwidth. This information is then written to the user's copy of the GENV, created by LOGON, so that FSMGP can update these values if the Environment Manager decides to change them. An audit event
is then passed to the Audit Function, GFAUDIT, indicating that a user has logged onto FSM. LOGON also creates the user Profile file (GPROF), Downgrade file (GDOWN) and the Downgrade Context file (GINFO).

LOGON processing then continues as if for a normal logon to WWMCCS TSS or TLCF systems. Upon successful completion of the logon sequence an event is passed to GFAUDIT recording that fact.

FSMGP then enters the main loop of its processing which continues until the user logs off. Since the loop is iterated each time a user input or a system output occurs, a new context must be established with each iteration. This is accomplished by reading the context file GCONT at the point established by the last context. The current context, with header and a variable amount of subcontexts, is copied into a buffer local to FSMGP so that quick access can be made to the information. Processing then takes alternate paths depending on whether the current context is system output or user input.

If it is a user context a loop is entered which reads inputs from the user until a match is made to one of the subcontext strings in the current context. Before FSMGP reads user input the GPROF file is updated to reflect that fact. If no match is found, an error message

*** UNRECOGNIZABLE OR DISALLOWED INPUT -- PLEASE TRY AGAIN ***

is issued to the user, the previous system output is re-written to the terminal, an audit event is recorded indicating invalid user input and the user is expected to enter new input. If a match is made the particular subcontext is checked for the presence of a special function. Special
functions for user subcontexts perform command syntax verification. If a special function is present it is executed. If the user's syntax was incorrect, it is treated the same as if it was invalid input (see above). If no error is detected the loop is exited and the user input is moved to the GINFO buffer, a local buffer to FSMGP that is continually written in a circular fashion enabling the most current user/system interactions to be saved. FSMGP then writes the matched user input to the system, audits that fact and establishes a new context in preparation for the system response.

If the current context is a set of expected system outputs, the System Output Match (SOM) function is called. This function updates GPROF to reflect the fact that FSMGP is waiting for system output, and reads system output from the Remote Network Processor Emulator (RNPE), comparing it to the set of subcontexts in the current context. If a match is found, the system output is written to the user's Downgrade file (GDOWN), which eventually is written to the user (if the system output is fixed), or the Screener (if the system output is variable) for downgrading. System output may be repeating or nonrepeating, which simply serves to indicate the size of a particular expected system output. Contexts of the repeating type are expected to be large, as in the case of TCON skeletons or TLCF messages, and oftentimes there is only one subcontext item. If the context indicates that the expected system output is repeating, SOM may make repeated reads to acquire the entire system output text. If the current context is variable repeating (e.g. TCON skeleton with data or a TLCF message), SOM accumulates system output line-by-line. If the
current context is fixed repeating (e.g. TCON skeleton without data), SOM acquires the entire system output matching each character until the terminating delimiter sequence is encountered.

If the current context is nonrepeating, system outputs are expected to be smaller and there may be more than one subcontext item. In this case SOM loops for the number of subcontexts or until a match is found to the current system output. If no match is found to the system output, SOM returns that fact.

If SOM returns with no match to a system output FSMGP audits the no match condition. Then a special function is executed which sends a simulated user input to the system to get FSMGP back in synchronization. This sending of simulated user input is known as a "pop-up". The special function used is indexed by the current context and performs a specific action depending on the particular place FSMGP is in the current subsystem. The current context also contains a pointer to the next context in the event that SOM returns no match. This resynchronization event is audited and FSMGP continues execution at the next context.

If SOM finds a match to the system output FSMGP must then decide whether or not it is to be sent to the Screener. System output may or may not be automatically screened by FSMGP. This depends on the current screen mode and bandwidth. FSMGP determines these values by first checking the port fsagn to see if the EM has changed either of these values. If so, the user's Environmental Values file (GENV) is updated. FSMGP switches on the screen mode value.
If the current screen mode is for no messages to be sent to the Screener, the system output contained in the GDOWN file is sent to the user's terminal. FSMGP then audits that fact, establishes a new context, and repeats its main execution loop.

If the current screen mode is for all messages to be sent to the Screener, the user's GPROF is updated to show that FSMGP is waiting for the Screener's decision, and a message is sent to SCTP via its port screq, requesting a downgrade. This message contains the name of the user's GDOWN, as well as the name of the user's GINFO. FSMGP then waits for the Screener's reply on the fsrly port, which contains the accept/reject decision. If the Screener accepts the system output, an audit event of that fact is recorded, the system output is sent to the user, a new context is established and FSMGP continues at the top of its main processing loop. If the Screener rejects the system output, an audit event is recorded, an error message is sent to the user, and the special function that resynchronizes FSMGP is executed.

If the current screen mode is for normal and the matched subcontext indicates that the current system output is fixed, the bandwidth rate is checked. This is accomplished in the CBR function, which computes a rate for the number of automatically screened messages that have occurred in a specific amount of time. If this bandwidth has been exceeded, the user's screen mode is automatically changed to "all", and his GENV is updated to reflect that fact. The system output is then sent to the Screener, and processing continues as above. If the bandwidth rate was not exceeded,
the system output is written to the user, an audit event is recorded, and processing continues in the main loop with a new context. Finally, if the current system output is variable, it is sent to the Screener and processing continues as above.

When the user terminates his session with WWMCCS, the LOGOFF function is called to terminate the program's execution. This function is invoked as a special function when the user enters a terminating sequence (e.g. bye) at an appropriate point. LOGOFF sends a logoff notification to FASSD, via the faport, so that FASSD may change GLF accordingly.

3.2.1.4 Major Functions.

LOGON
The LOGON function is responsible for establishing FSMGP initial conditions and for tracking a user's progress through the WWMCCS TLCF and TSS logon procedures. LOGON writes an IPC to the FASSD, via the port faport, requesting that a Screener be assigned to the FSMGP's user. LOGON receives FASSD's reply on the port fsagn, and allows the user to continue until a Screener is necessary. (At that time, if there is no Screener available, the user is given the option of waiting for a Screener assignment (and subsequent downgrade decision) or logging off.) If a Screener has been assigned, this information, as well as the user's terminal identification, is written to GLF — a Global Logon File with records for each valid user. Since this file is written to by every FSMGP during a user logon, a lock mechanism must be used. LOGON then reads the system default Environment Values file (GENV) to determine the
system-wide current screen mode and bandwidth rate. This information is then written to the user's copy of GENV. The user's GENV is maintained by FSMGP and is updated when it is discovered that the Environment Manager has changed one of these values. LOGON then calls the the global function GFAUDIT so that an audit event indicating that the user has logged on to WWMCCS can be recorded in the audit file. LOGON then processes a user's logon to WWMCCS TLCF or TSS systems in the normal fashion with two exceptions. The user's response to the "IDENT?" question is used to look-up this user's User Master Catalog (UMC) designation. All subsequent references to user-owned files, regardless of the WWMCCS subsystem involved, must be preceded by this UMC. Also, the response "zzz" to the system query "CLASSIFICATION OF YOUR OUTPUT?" is substituted for the user's response so that the paging and classification headers are not displayed by the system. LOGON also creates the user's copy of the Environment Values file (GENV), the user's Profile file (GPROF), the Downgrade file that is sent to the Screener (GDOWN), and the Downgrade Context file that the Screener may peruse during a downgrade (GINFO).

UIM
The User Input Match function (UIM) searches the subcontexts of the current context for a match to the user input that it reads upon its invocation. UIM loops for the number of subcontexts. If a match is found to the user's input the loop is exited. If a null subcontext is encountered it is saved so that it may be returned as a default match. Only one null subcontext per context set is allowed. A matched user input is moved to the Downgrade Context Buffer (GINFO), as well as
returned to FSMGP so that it can be written to the system. If no match is found, this fact is returned to FSMGP. FSMGP then issues an error message to the user and calls UIM again.

WTP

The Write to Profile function, WTP, updates the user's GPROF whenever FSMGP is waiting for the next user input, system output or Screener action. Additionally, during logon only, WTP is called to record the fact that FSMGP is waiting for an RNPE connection. Under normal circumstances, this event will occur once for a very short duration. WTP is called when a user input match search is made (by UIM), when a system output match search is made (by SOM), or when a downgrade request is made to the Screener (by STS). GPROF is created for the user by LOGON upon invocation of FSMGP. WTP opens GPROF, writes the index of the appropriate event (passed to it by FSMGP) as well as the current subsystem index (also passed to it by FSMGP) and current DTG. WTP then closes GPROF and exits.

WCB

The Write Context Buffer function, WCB, maintains the Downgrade Context Buffer (GINFO) in preparation for its eventual transferrence to the GINFO file for the Screener's perusal during a downgrade. All user inputs and system outputs are moved to GINFO by WCB, but GINFO is written to the GINFO file only when a downgrade request occurs, thus ensuring that the most current information is in the file. WCB maintains GINFO in a wrap around fashion, moving data to GINFO until the end of the buffer is
reached, and then overwriting old data at the beginning of the buffer. When data is written to the GINFO file from GINFO, the start of transferrence in GINFO is that point at which data was last moved into GINFO.

SOM

The System Output Match function (SOM) searches the current context for a match to the current system output. System output contexts may be fixed or variable depending on whether or not the system output that matches them is to be sent to the Screener. System output contexts may also be repeating or non-repeating, which provides an indication of expected system output size. Repeating contexts are used when larger system output is expected (e.g. TLCF messages or TCON skeletons). When a system output is matched to a subcontext, the output is written to GDOWN, and SOM returns a match found condition. If no match is made, SOM returns that fact to FSMGP.

Repeating contexts will contain only one subcontext. If the current context is variable repeating SOM looks for the terminating sequence (from the place in the GHDEL file pointed to by the context) in the system output returned by the Read System Output function (RSO). If the terminating sequence is not found, the searched data is written to GDOWN and another call to RSO is made. This sequence of events is continued until a match is made or a read error occurs, either of which is returned to FSMGP.
If the current context is fixed repeating RSO is called and the system output is matched character-for-character to the subcontext until its end or until the system output is exhausted. In the latter case the system output is written to GDOWN and more system output is read and the process continues. In the former SOM writes to GDOWN and returns that a match has been found.

If the current context is non-repeating there may be several subcontexts to compare against the current system output, and SOM loops for the number of subcontexts. Also, one of the subcontexts could be null, which indicates that any system output is to be accepted. If a fixed subcontext is encountered in the loop SOM attempts an exact match. If a match is found, it is written to GDOWN and SOM exits. If not, the search continues. If a subcontext is encountered that is null, it is saved as a default match. If a subcontext is encountered that is variable, a substring match is attempted on the system output. If a match is found, GDOWN is written and SOM returns to FSMGP. Otherwise the search continues.

At the end of the loop the presence of a null subcontext is determined. If so, a match to the system output is assumed and it is written to GDOWN and SOM returns. If no null subcontext was flagged SOM returns a no match condition.

RSO

The Read System Output (RSO) function is responsible for reading WWMCCS system outputs through the Remote Network Processor Emulator (RNPE).
This function must initiate reads from WWMCCS and buffer them so that SOM can attempt a subcontext match. RSO must therefore stop reading when one of the delimiter strings is encountered or a time-out has occurred. The RSO function maintains a local buffer, the input buffer (IB), in which it puts data from RNPE. HSO is passed the delimiter set by SOM (i.e. a pointer to it) so that it may search for these characters in IB. RSO begins searching in IB where it last left off from a previous invocation. RSO searches the buffer until a match is found to one of the delimiter strings or until the end of the system output in IB is encountered. If this is the first invocation of RSO the end of the system output will be found at the outset so that an initial read will occur. The read may result in normal completion with the number of characters read returned, an I/O error from RNPE or a time-out error. RSO returns to SOM when either error condition results. After a read, RSO’s buffer pointers are updated and an end of read marker is placed in the buffer indicating the end of the system output, and the search is continued. If a match is found to one of the delimiter strings, pointers to the beginning and end of the system output are returned to SOM.

CES
The Check Environment Set function (CES) determines current values for the Screener identification, bandwidth rate and screen mode. Screener identification is used in communicating with SCTP when a downgrade request is made by FSMGP. Since a Screener is not permanently assigned to any given user (the Screener may log off or be reassigned by an EM), FSMGP must know the assigned Screener before a request is made. Bandwidth
rate determines the rate at which messages are allowed to be automatically screened. If this rate is exceeded, FSMGP must change its user's screen mode to 'all', which requires all messages to be screened by the Screener. Screen mode is checked by FSMGP to help it decide whether or not a particular system output is to go to the Screener.

CES must first examine the port fsagn (uniquely identified by the user's identification appended to the port name) to see if the Screener assignment, the bandwidth rate, or the screen mode has been changed. If there is data on the port, the appropriate local FSMGP variables are updated. In addition, if one of the changes involves an environmental value (screen mode or bandwidth), the user's GENV is opened, updated to reflect the change(s), and closed. If there is no data on the port, CES must read the current environment values from GENV and set the appropriate local variables. In either case, CES returns to FSMGP.

STS

The Send to Screener function sends a downgrade request to the Screener and takes appropriate action depending on the Screener's decision. The function actually encompasses several logical tasks, but has common entry from several places in FSMGP. If the screen mode mandates all system output must be screened, or if the screen mode is normal and a particular system output is tagged as variable by its matching subcontext, or if the screen mode is normal and the system output is fixed but the bandwidth has been exceeded, the STS function is executed.
When a downgrade is to go to the Screener, STS writes the information in the local buffer GINFO to the GINFO file. GINFO is the downgrade context buffer and is updated with each user input and system output. The GINFO file allows the Screener to view the downgrade material in context to the current user/system interactions. STS then sends a request message to SCTP via the port screq. This port is uniquely identified to SCTP (so it knows where to send the reply) by STS appending the Screener's identifier to the port name. This message contains the name of the user's GDOWN, which is a text file of the information to be downgraded, and the name of the user's GINFO. STS then waits for a reply to the downgrade request. This reply is delivered on the port fsrly, uniquely identified by appending the user's identifier to the port name. If the Screener accepted the material, STS calls the global function GFAUDIT to record that fact on the audit file GFAUDIT. STS then writes the information in GDOWN to the user and returns to FSMGP.

If the Screener rejected the downgrade material, STS audits that fact and sends a message to the user stating the decision. STS must then establish a new context to proceed. This is accomplished by calling a special function that is pointed to by the current context. Since the particular point in the current subsystem is implicit in the current context, the function that it points to will know the appropriate action to take to "pop-up" FSMGP to a level from which to proceed safely. The current context also contains a pointer to another context appropriate to the special function. Therefore STS sets a new context and calls the special function. This function must send an appropriate simulated user
input to the WWMCCS system to resynchronize FSMGP. This is accomplished by sending a canned message to the current WWMCCS subsystem via RNPE. The special function then records the fact that simulated user input has been sent with a call to GFAUDIT.

CBR
The Check Bandwidth Rate function determines a dynamic rate of messages automatically screened by FSMGP and compares it to the current setting of the FSM-wide rate. If the dynamic rate is greater than or equal to the set rate, FSMGP returns this fact to FSMGP which must then change the screen mode of its user to "all". If the dynamic rate is less than the set rate, CBR returns this fact to FSMGP and no special action need be taken.

CBR calculates the dynamic rate by keeping track of the time the last system output was sent to the user (the last invocation of CBR), and the number of system outputs automatically bypassed to date. If the time the last system output was sent to the user was sufficiently long ago (defined by some default time set at FSM initiation), a rate is calculated by dividing the number of system outputs that have been automatically screened by the amount of time. If this rate is greater than the system-wide set rate, CBR returns that value, otherwise CBR returns nothing. In either case CBR must reinitialize its counters before returning. If the time was not sufficiently long ago to calculate a rate, no counters are changed and CBR returns nothing. On its initial invocation, CBR establishes its counters and returns nothing.
LOGOFF

The LOGOFF function performs clean-up activities when the user logs off the WWMCCS system. It must make sure that the assignment daemon knows about the logoff. LOGOFF is invoked when the user indicates he is logging off, for example entering 'bye'. When this occurs, a pointer in the context with the user's input will direct FSMGP to execute LOGOFF. LOGOFF communicates with FASSD over its port FAPORT, informing it that the user has logged off.

3.2.2 Screener Trusted Program (SCTP)

The Screener Trusted Program (SCTP) interfaces directly with the FSM Screener when the Screener logs onto FSM. SCTP is responsible for displaying downgrade information to the Screener in order for the Screener to determine if the information to be written down to the low security domain of FSM contains sensitive high security level data. This information is presented to the Screener one screen at a time. Any time during this data review sequence the Screener can reject the data for downgrading. However, the entire downgrade file must be displayed to the Screener before he can accept it for downgrade. An additional downgrade context information file is also available to the Screener in order to assist in determining if the downgrade information contains sensitive data. This downgrade context file contains two screen fulls of information reflecting the user/system dialogue just prior to the downgrade data. This data can be perused by the Screener following the inspection of the downgrade information. During the perusal of the downgrade
context file, the Screener can accept/reject the downgrade request.

3.2.2.1 Global Data Usage. SCTP utilizes the following FSM global data structures in performing its function:

GLF  SCTP updates the logon file (GLF) when a Screener logs onto FSM.
GDOWN  SCTP reads in the downgrade file (GDOWN) and displays its contents to the Screener for review.
GINFO  SCTP reads in the downgrade context information file (GINFO) and displays its contents to the Screener for review.

Audit Requests  SCTP builds audit trail requests whenever the Screener logs onto FSM and when the Screener begins reviewing a downgrade request.

3.2.2.2 Local Data Usage. SCTP uses no pertinent local data structures.

3.2.2.3 General Processing Flow. The Screener Trusted Program (SCTP) is invoked when a FSM Screener logs onto FSM. There is a separate copy of SCTP for each Screener logged onto FSM. As soon as SCTP is initiated it locks, opens and reads in the Global Logon File (GLF), updates its contents reflecting the Screener logon, writes GLF out, then closes and unlocks the file. SCTP audits the Screener logon event via the global function GFAUDIT.

Following Screener registration into GLF, SCTP creates its screening request port based on the Screener's user ID. This port will be utilized in receiving screening requests from the zero or more FSM Guardian Processes assigned to this Screener.
Next SCTP checks the screening request port for possible screen requests. If requests are not present then SCTP outputs to the Screener a set of prompts stating that there are no pending screening requests and he may log out if he wishes. Then SCTP checks for both Screener logout requests or potential screening requests. If neither event occurs for some predetermined time SCTP again outputs no screening request/logout prompts to the Screener. This sequence continues indefinitely until either the Screener logs out or a screening request appears.

If the Screener logs out, SCTP deregisters the Screener from GLF by writing a message to FASSD via its port (faport).

If a screening request is present then SCTP notifies the Screener with the prompt options to continue with the screen request or logout. Assuming the Screener decides to continue with the screen request, SCTP then reads in the downgrade file (GDOWN) indicated in the request port message and displays the first page to the Screener. Following this page of data are one of two possible prompts: If this is not the only page of data then SCTP prompts the Screener with a reject/continue option; if this is the first and last page of downgrade information, SCTP prompts the Screener with accept/reject/continue options. For the first situation, the Screener continues screening the downgrade information by continuing for each subsequent page. Following complete display of the downgrade file, the Screener has the option of viewing a downgrade context information file (GINFO). This is accomplished by continuing past the downgrade file. For each page of context data, SCTP prompts the
Screener with an accept/reject/continue option. If the Screener continues through and past the context information file, SCTP will cycle back to the downgrade file, ad infinitum.

During the above sequence the Screener will eventually either accept the downgrade or reject it. If the Screener accepts the downgrade request SCTP requests that he confirm his action. If the Screener does not confirm the accept, SCTP continues displaying information at the point where it left off. If the Screener does confirm the accept action, SCTP notifies the appropriate FSMGP through the screening reply port (fsrly-i). Then SCTP notifies the Screener that the confirmation has been acted upon and continues at the beginning of its cycle looking for another screening request.

If the Screener decides to reject the downgrade, SCTP requests that he confirm the rejection. If the Screener does not confirm the rejection, SCTP continues displaying data. If the Screener confirms the rejection, SCTP notifies the appropriate FSMGP of the rejection through the screening reply port (fsrly-i). Then SCTP notifies the Screener that the rejection has been acted upon and then proceeds to obtain another screening request.

3.2.2.4 Major Functions. Following are a set of salient functions important to SCTP operation.

SCUGLF

The Update GLF function is responsible for processing the Global Logon
File (GLF). This function operates on an input parameter specifying the Screener's logon name. It locks GLF (using global function GFLOCK). The Screener's GLF record is sought and, if found, is checked to see if this Screener is currently logged on. If so, the Screener is informed and his SCTP terminates. If the found record indicates an inactive record (not logged-on), SCTP marks it active and updates GLF with it (the file is still write-locked). If no GLF record is found for this Screener, he is informed and his SCTP terminates. The GLF file is unlocked following this sequence, regardless of the outcome of the logon.

SCPROMPT
The Screener Prompt Function is responsible for determining the appropriate user prompt based on the current state of SCTP. Prior to outputting the next appropriate prompt, SCPROMPT flushes the Screener's terminal input in order to remove superfluous characters that the Screener may have entered. Then SCPROMPT determines the prompt on the following SCTP states. If the current SCTP state is proceed, then valid prompts are "Logout (l)" or "continue (<CR>)"; if the current state is continue, then valid prompts are "continue (<CR>)" and "accept (a)" and "reject (r)". If the Screener has not seen all downgrade information and the state is continue, then "continue (<CR>)" and "reject (r)" are valid prompts. If the state is accept, then "confirm-yes" and "confirm-no" are valid prompts. If the state is reject, then "confirm-yes" and "confirm-no" are valid prompts.
3.2.3 FSM Assignment Daemon (FASSD)

The FSM Assignment Daemon (FASSD) is responsible for automatic WES user/Screener assignments within the FSM. The Environment Manager (EM), via the EMP, can manually reassign users and Screeners as desired. However, since the EMP is not always expected to be running, FASSD makes all initial assignments as WES users and Screeners log on and off.

3.2.3.1 Global Data Usage. FASSD uses the following global data structures:

- GLF: FSM global logon file.
- GAEV: Current audit event files.
- FSAGN-i: FSMGP assignment reply port.
- FAPORT: FASSD assignment request port.

3.2.3.2 Local Data Usage. FASSD uses no pertinent local data structures.

3.2.3.3 General Process Flow. FASSD is a daemon which is initiated at FSM system startup. FASSD reads its input port, faport, for an IPC message and blocks on it if empty. If there is at least one port message in faport, FASSD reads the message and checks the message type.

IPC messages from EMP can only be WES user/Screener reassignments (SCCNG) followed by the WES user ID and Screener ID to reassign. FASSD reads the Global Logon File (GLF) searching for the WES user ID. When the user's record is found, the Screener ID for this WES user is changed to reflect
the new Screener that the EM reassigned. The record is updated in GLF (after GLF is locked) and FASSD generates an audit event indicating a WES user/Screener assignment has taken place. FASSD checks its port for more messages and if none, blocks.

IPC messages originating from SCTP can either be Screener Logon (DRRDY) or Screener Logoff (DRLGO), followed by the Screener ID and (for DRRDY messages only) the Screener's UNIX terminal ID. If the port message is DRRDY, FASSD may make WES user/Screener assignments if this is the only Screener currently logged onto FSM. If the port message is DRLGO, FASSD searches the GLF for a record with the FSM ID the same as the passed Screener ID and marks the record inactive. Then, FASSD searches GLF looking for active WES users which are assigned to this Screener. If there are any, FASSD uses its assignment algorithm to reassign WES users to other Screeners. If there are no other Screeners available, FASSD sends a port message to the FSMGP of each WES user denoting that no Screeners are available (SCNAV). FASSD generates an audit event when the Screener Logs off and whenever a WES user/Screener assignment occurs.

IPC messages from FSMGP can be either User Logon (UAREQ) or User Logoff (UALGO) followed by the user ID and terminal ID. Similar to SCTP message types, FASSD searches GLF for a user ID that matches the passed user ID. In the UAREQ case, FASSD assigns the WES user to a logged-on Screener, if any. FASSD notifies FSMGP of the assignment by sending a Screener Assigned (SCASS) message and the assigned Screener's ID to the FSMGP's port, fsagn-i. If no Screener is available, FASSD sends the SCNAV message to
this port. An audit event is generated if an assignment occurs. In the UALGO case, FASSD marks the WES user's GLF record inactive. FASSD generates an audit event indicating that the WES user has logged off of FSM.

3.2.3.3.1 Specification of Assignment Algorithm. Four cases need to be considered with the assignment algorithm:

1. Screener Logs On

2. Screener Logs Off

3. User Logs On

4. User Logs Off

3.2.3.3.1.1 Screener Logs On. FASSD makes no assignment changes in this case. Even though there may be a heavy load on another Screener, no users are automatically assigned to the new Screener, in the interest of user/Screener stability. The new Screener will be the prime candidate for future assignments however.

3.2.3.3.1.2 Screener Logs Off. This is the most serious case since it is likely that at least one WES user, and possibly more, will need reassignment. If no other Screeners are available, the port message No Screeners Available (SCNAV) is sent to each FSMGP's fsagn-i port. FSMGP allows the user to proceed until a Screener is needed, at which time the
user has the option of logging off or waiting for either a Screener assignment or screen mode change (via the EMP) to occur.

If other Screeners are available, FASSD chooses the Screener with the smallest current load (fewest users assigned) to reassign the user to. This step may be repeated multiple times in order to reassign all WES users who were assigned to the logged-off Screener. Each time, the Screener with the smallest current load is chosen. In the case of ties (multiple Screeners with the same load), FASSD chooses the Screener who most recently logged on. This is done because the most recently logged-on Screener will probably remain logged-on longer than the other Screener(s). This scheme requires that FASSD record the Screener logon DTG in a local data structure (following a DRRDY port message from a SCTP).

3.2.3.3.1.3 User Logs On. Similar to the previous case, FASSD chooses the Screener with the smallest current load to assign the WES user to. Ties are resolved as stated above. This case will require at most one assignment. As before, there may be no Screeners available.

3.2.3.3.1.4 User Logs Off. FASSD makes no assignment changes when a WES user logs off. The reasoning follows that discussed in "Screener Logs On". The EM may manually reassign users and Screeners; however, in the light of user/Screener stability, FASSD makes no assignments.
3.2.4 FSM Audit Daemon (FAD)

FAD logs audit events in the current audit files based on requests in the audit queue. Audit requests are processed on a strict FIFO scheme. Audit request files are opened, processed and unlinked as the audit event specified is actually logged in the audit files.

3.2.4.1 Global Data Used. The following global data is used by FAD:

- Audit Request Files: Contains audit events to log.
- AUDITQ Directory: contains all audit request files.
- Current Audit File-Pair: Contains logged audit events.
- GAUD: Audit description file.
- GAUD-LOCK: Write-lock mechanism for audit files.

3.2.4.2 Local Data Used. FAD uses the UNIX file status buffer returned by the "stat" call.

3.2.4.3 General Process Flow. Due to the large volume of audit events, FAD is implemented as a daemon, rather than a callable process or function. As such, it has no input or output parameters. All data that FAD uses in logging an audit event is either contained in the audit request file(s) or is obtained by FAD. FAD will sleep for 30 seconds, wake up and examine its queue, "/fsm/fsat/auditq", for pending requests. If there are no file entries in the Audit Queue directory, FAD returns to the sleep state and repeats this process again upon waking. If there are pending audit requests, FAD must find their filenames and Date-Time Group (DTG) of last modification. The filenames and DTGs of last modification
are entered in a list and are sorted on the DTG using the UNIX qsort function. The filename with the least recent last modification (the oldest file) appears first in the list, followed by the second oldest file and so on.

FAD locks the audit files (GAUD) for writing by calling GFLOCK. Then, it opens the current audit file-pair and the next oldest audit request file. FAD increments the pointer into its sorted filename list, so on the next pass it will pick up the next oldest file. After reading the event record and saving it, FAD reads the text record(s), if any, and copies them byte-by-byte to the current Text file; remembering the beginning location of the text (OFFSET) and keeping a count of the number of bytes transferred. FAD sets up the event record, updates it (with OFFSET and LENGTH) if necessary, and writes it to the current Event file. The event has now been logged, so FAD closes the current audit file-pair. FAD signifies successful event logging by closing and unlinking the audit request file just processed from the audit queue.

FAD must update the Audit Description (GAUD) file, as well, with the new "last entry" DTG for the current audit file-pair. FAD opens GAUD (the audit files are still write-locked), locates the last record in the file and reads it into a small buffer. The DTG of last entry is updated and the record is written back to the GAUD file. FAD closes and unlocks the audit files for writing by calling GFUNLOCK.

If there are any files left in the sorted list, FAD repeats the sequence described above until there are no files left in the list. Then, FAD
re-examines the audit queue and if there are any files, continues as described above. Otherwise, FAD will sleep before repeating this entire process.

3.2.5 Environment Manager Program (EMP)

The Environment Manager Program (EMP) permits monitoring and alteration of the FSM operating environment. EMP performs manual WES user/Screener assignments, profiles WES user's status and modifies FSM screen modes and bandwidth thresholds. The EMP is run by the Environment Manager (EM).

3.2.5.1 Global Data Usage. EMP uses the following global data:

- **GENV** System (default) and user's environment files.
- **GLF** FSM global logon file.
- **GPROF** User profile file.

3.2.5.2 Local Data Usage. The following local data is used by EMP:

1. ** Screener list** - a variable-length list whose entries each contain a one-byte Screener ID and an eight-byte Screener logon name.

2. **User list** - a variable-length list whose entries each contain a one-byte user ID, a one-byte Screener ID (who the user is currently assigned to) and a twelve-byte WWMCCS user ID.
3.2.5.3 General Process Flow. When invoked by the EM, EMP checks the Global Logon File (GLF) to verify the logon name that was entered and to ensure that the EM is not currently logged on. Only one EMP can exist at any given time, and therefore only one EM record can be defined in GLF. If the EM name is valid and not logged on, EMP marks the record as active and updates GLF (after locking it for writing). Then, the EMP help file is displayed which briefly describes available EMP commands. Following this display, the EM is placed at the EMP's command level, signified by an asterisk on the EM's terminal. EMP commands are valid at this point. See Appendix B for detailed command information.

If the assignments command is entered, the EMP prints the current list of user/Screener assignments. This is done by reading each Global Logon File (GLF) record and checking the Logged Bit Flag (DLOGDON) for logged-on users. Records of users that are not logged onto FSM are not considered. For each active (logged-on) record, EMP also checks whether this user is a WES user or a Screener. If the active record indicates a WES user, the FSM user ID, user's WWMCCS user ID and the Screener ID are stored in the user list. If the active record indicates a Screener, the Screener ID and the Screener's logon name are stored in the Screener list. After all GLF records have been read, EMP checks each record in the Screener list. The Screener ID of each record in the Screener list is compared with each Screener ID in the user list. When a match is found (there may be more than one), the Screener user logon name from the Screener list is printed on the EM's terminal, followed by the user's logon name from the user list. Each record in the user list is compared
with records in the Screener list. For each Screener list record, if a match occurs a flag is set. After all user list records have been compared with a Screener list record, the flag is checked. If it was never set, the Screener associated with this Screener list record is not assigned to any users. This information is important for future EM-directed WES user/Screener reassignments, hence the Screener's user logon name from the Screener list is printed on the terminal followed by the string "- none assigned -". When the Screener list is exhausted, EMP returns to command level.

If the EM enters the display command at EMP command level, EMP prints out current system/user environment values. Display entered without arguments causes the current system environment values to be listed, followed by the current environment values of every logged-on WES user. If optional names follow the display command, they must be names of logged-on WES users or the keyword "SYSTEM". This causes EMP to only display those user's status. If no arguments followed the command name, EMP reads the system Global Environment (GENV) file and displays the bandwidth threshold and the WWMCCS subsystem screen modes. Additionally, EMP reads each GLF record and keeps counts of the number of logged-on WES users and Screeners. This information is printed out on the terminal. Following the system display, each GLF record is read. For each logged-on WES user, the user ID is used to form a filename of the form "/fsm/usr/user-i/genv". This file contains the user's current environment values. EMP reads it and displays the information on the EM's terminal. When all GLF records have been read, EMP returns to the command
level. If optional names follow the display command, each name is compared with the string "SYSTEM". If a match occurs, the procedure described above for displaying system environment values is performed. If the name does not match "SYSTEM", then each logged-on WES GLF record is checked with the user name. If there is no match for a name, EMP warns the EM and requests a replacement user name. If there is none, EMP continues with the next name following the display command, otherwise, it repeats the process for the replacement user name. Each name is processed identically in sequential fashion. The WES user's GENV file is read and the contents formatted for display. When there are no more names remaining, EMP returns to the command level. The display command has a limit of five user names and if this number is exceeded, EMP prints a message and ignores the remaining names.

If the history command is entered at the command level, EMP fork/executes the Audit Trail Display Program (ATDP). This command enables the EM to view previous audit events. The audit event information may aid the EM in making a FSM environment change. When the EM terminates ATDP (by using the quit command), EMP returns to the command level. See Appendix D for detailed ATDP command formats.

If the modify command is entered at the command level, EMP parses and saves any optional arguments. The modify command has both long and short command forms and depending upon which is used, various displays and prompts appear. In the case of no command arguments, EMP prints a menu of valid modification actions and then prompts the EM for the action
desired. The selected action then causes a new menu to be displayed and the EM is prompted to enter the new environment value(s). When finished with this modification action, the EM is returned to the initial menu which details modification actions. This was done so that the EM can modify multiple values with one modify command. If command arguments are present, they are parsed syntactically and errors cause EMP to re-prompt for the bad value(s). When the modification has been made, in this case, the EM is returned to the command level. This is an important distinction between the long and short command forms. The short form enables multiple changes to be made with a single modify command, with the EM being prompted from menus. The long form validates the command arguments, modifies the desired value(s) and returns to the command level. Except for this external distinction, the two command forms operate identically. If the system-wide environment values are modified, EMP writes the new values in the system Global Environment (GENV) file. The values in this file are given to each WES user at logon. To alter currently logged-on user's values, a port message (BRCNG or SMCNG) is sent to each FSMGP noting that an environment value has changed and indicating the new value(s). System-wide values that can change include bandwidth threshold and subsystem screening status. Notice, EMP does not update each WES user's GENV file. Following the system-wide change, EMP generates an audit event which details the change and new values. If a specific user's environment values are modified, EMP writes a port message to the user's FSMGP, via the fsagn-i port, noting the change and new value(s). User environment values, like system-wide values, which can be
altered are bandwidth threshold and subsystem screening modes. Again, the EMP does not alter the WES user's GENV file. EMP generates an audit event which details the change and new values. The final type of modification that can occur is WES user/Screener reassignment. EMP verifies that both the WES user and Screener specified by the EM are logged onto FSM. If they are not, EMP messages and re-prompts for user names. If both names are valid and logged-on, EMP sends a port message (SCCNG), via the faport, to the FSM Assignment Daemon (FASSD) indicating the user ID and Screener ID to reassign. There is no communication between the user's FSMbP and EMP in this case. EMP returns to command level after the port message has been sent. Notice, EMP does not directly reassign WES users and Screeners and it does not generate an audit event.

If the profile command is entered at the command level, EMP displays the WES user's profile. Profile followed by no optional command arguments causes EMP to read the GLF and for each logged-on WES user, to form the filename "(/fsm/usr/user-i/gprof". This file contains the last wait condition for this user. Additionally, the file contains the WES user's terminal ID, WWMCCS subsystem and DTG of the wait. This information is displayed, one line per user, on the EM's terminal. When the GLF file has been exhausted, the EMP returns to command level. If optional command arguments follow the command, EMP checks the GLF for a match between each argument and GLF WES user names (if the argument is longer than one byte) or GLF terminal IDs (if the argument is a single byte). If no match is found, the EMP prints a warning message and the EM is prompted for a replacement name. If a match is found, the user ID of the GLF
A record is used to form the filename shown above and the file contents are formatted and displayed on the EM's terminal. As with the display command, there is a limit of five names following the command and remaining names are ignored with a message.

The final EMP command is one to terminate the program. Since EMP has no input ports and automatic WES user/Screener assignments are performed by the FSM Assignment Daemon (FASSD), the EMP does not always need to be running during FSM operation. If the EM enters the quit command, EMP exits. The EMP can be run at any future time the EM desires.

3.2.6 Audit Trail Display Program (ATDP)

ATDP performs all formatting and display of generated audit events. It also is used to prevent the current audit file-pair from growing to an unmanageable size. ATDP is invoked by using the HISTORY command in the Environment Manager Program (EMP).

3.2.6.1 Global Data Usage. The following global data is used by ATDP:

Current Audit File-Pair Contains logged audit events.
GAUD-LOCK Audit files lock mechanism.
Saved Audit File-Pair(s) Contains previously logged audit events.
GAUD Audit description file.
3.2.6.2 Local Data Usage. ATDP does not use any pertinent local data.

3.2.6.3 General Process Flow. After ATDP has prompted the EM for command input (signified by ATDP printing a ">") on the EM's terminal) and has read it, argument parsing begins. This is a major phase of ATDP since at least one command has several optional variables, with many variables also taking several optional arguments. The only restrictions on command input are argument ordering. See Appendix D for detailed command syntax and descriptions. The ATDP command name is always the first argument. In the LIST command, the flag variable is always second (if present), followed by the event-name (if present) and the time-range (if present). Several non-fatal errors may be detected during this parsing phase and if an unrecognizable argument is decoded, ATDP prompts for the value again after printing a warning message detailing the problem.

If the command to ATDP is END, ATDP write-locks the audit files by calling GFLOCK. This is necessary since ATDP renames the current audit file-pair and updates GAUD. ATDP renames the current audit file-pair from "current" to the DTG of the END operation. For example, ENDing the current audit file-pair on April 2 at 12:05:30 causes a rename from "current.e" to "0402120530.e" for the Event file and a rename from "current.t" to "0402120530.t" for the Text file to take place. ATDP then updates GAUD (audit files are still write-locked) to change the filename of the old current file to the new DTG and to create a new current record with the filename of current and the DTG of file creation. Then, ATDP unlocks the audit files by calling GFUNLOCK.
If the command is QUIT, ATDP exits back to the Environment Manager Process from which it was fork/executed.

If the command is LIST, ATDP checks the second argument for a flag value. If it is a flag argument, it must be preceeded by a "-". The flag indicates method and destination of the output. Methods include paging and no paging. Destinations include terminal and printer. If the second argument is preceeded by a "-" and the remaining character is not a valid flag argument, a warning message is printed and the flag is ignored.

ATDP checks the next argument, if any, for an event name keyword. If a valid event keyword is found, and there is no valid event type following it, ATDP prompts the user for a list of event types. Otherwise, ATDP decodes the event type and sets the appropriate internal flags. Event types include FSM user names, WWMCCS subsystem names and event codes. This argument serves to limit ATDP output to a selected subset.

ATDP checks the next argument(s), if any, and expects to find valid time ranges or time keywords. A time range is a numeric string indicating month, day, hour and minute or a time keyword. If the remaining argument(s) are not valid time ranges, a warning message is printed. ATDP also reprompts the user for the correct time range. Time ranges, like event types, serve to limit the output to a selected subset of events.

Once all arguments for LIST have been parsed, validated and internal program flags set, ATDP reads the GAUD file from the beginning, searching
for the first audit file-pair whose date of last modification is greater than the LIST start-time. By default, the start-time is midnight on the current day. Once a file has been found, ATDP opens it for read-only. Each event is read from the Event file and its FEVTIM (DTG of the event) is compared with the start- and end-times to list. If the record is within the specified time range, ATDP checks the event name condition(s), if any. By default, all event types are chosen. If the event record satisfies the event name condition(s), it is printed out. The event's text, if any, is read and written to the output destination in a byte-by-byte fashion. When the current event is done, ATDP reads the next Event file record. At end of file, ATDP gets the next audit file-pair in the GAUD file. ATDP stops looking for next event records (files) when the DTG of the event is greater than the end-time.
SECTION 4

QUALITY ASSURANCE

This section is not applicable to this document.
This section is not applicable to this document.
SECTION 6

NOTES

This section is not applicable to this document.
APPENDIX A

FSM CONTEXT TABLES

A.1 OVERVIEW

The low-level context tables which are used by the FORSCOM Security Monitor (FSM) are produced from high-level files created with the UNIX text editor, ed. A C program named Conbuild exists which makes the transformation from the human-oriented, high-level files to the machine-oriented, low-level files.

Using Conbuild offers many advantages in context table construction. All labels used are symbolic and thus do not require alteration if the file is changed. Non-printing ASCII characters can be easily entered and visually checked. In addition to generating correct low-level tables, Conbuild checks and verifies high-level values. Errors detected in the high-level tables can be quickly pinpointed and corrected.

Conbuild accepts three high-level files and produces three low-level files: context, halting delimiter and text. The formats of the high-level files are detailed below. The halting delimiter and text files make use of special symbols to visualize non-printing or hard to see characters. Special symbols are character strings preceeded and followed
by a vertical bar ("|"). Conbuild translates the special symbols into
the appropriate character sequence. Special symbols include:

| | one blank
|bell| terminal bell
|cr| carriage return
|ctl-A| control-A
|lf| line feed
|nl| new line (carriage return, line feed)
|| null byte

A.2 CONTEXT

The high-level context file follows this format:

Cs Cp Dh bf ss [pf] ![comment]
Ts Cn bf gs gl [sf] ![comment]

The first line of every context is the context header. The fields are:

1. Cs -- The context label

This symbolic label serves to identify this context. It can be used by other contexts (as a pop-up reference, following an abnormal match) and subcontexts (as a go-to context, following a match).

2. Cp -- Pop-up context

If, during normal context processing, an input is received from the user or system which cannot be matched in any of the
subcontexts, a "pop-up" is effected. This label serves to symbolically identify the context to process next, in the event of a pop-up.

3. Dh -- Halting delimiter set

The halting delimiter set is identified by this symbolic label. It is an offset into the halting delimiter file where the desired delimiter set can be found.

4. bf -- Context header bit flags

The header bit flags are positional and represent the following:

i. Source of next input

This bit flag can take the value "U" (user input), "S" (system output) or "B" (both). This flag identifies the location of the next input to process. In the degenerate case of both, polling is done and the first input received is processed.

ii. Length of next input

This bit flag can take the value "R" (repeating) or "N" (non-repeating). In the case of multi-line system outputs, such as bare TCON skeletons,
multiple reads will need to be performed to obtain the entire output. This occurs because the read function stops reading when a halting delimiter is encountered. One logical system output may contain many halting delimiters.

iii. Matching of next input

This bit flag can take the value "F" (fixed) or "V" (variable). The flag identifies the type of matching to be performed, during repeating reads only. This flag does not supersede the subcontext fixed/variable bit flag.

iv. Subsystem entry to audit

This bit flag can take the value "A" (audit) or "N" (no audit). The flag, if "A", causes an audit event to be generated that records the fact that a new WWMCCS subsystem was entered.

5. ss -- Subsystem name

This field contains the name of the WWMCCS subsystem which this context item pertains to. The field is used for audit purposes when the audit bit flag is set.
6. **pf** -- Pop-up function name

This optional field, if present, contains the name of a C function to execute which will simulate user input, so as to effect a pop-up to the pop-up context.

7. **!comment**

An exclamation mark followed by anything can appear at the end of any context header line. It is ignored by all programs. All comments are optional.

Each line of input following the context header is a subcontext item that is part of the context item. The fields are:

1. **Ts** -- Text string to match on

   This symbolic label identifies the text string to use when matching input. It is an offset in the text file of a null-terminated string.

2. **Cn** -- Next context if match made

   If this subcontext's text matched the input, use this symbolic label as the next context to process. It is an offset in the context file of a context item.
3. **bf -- Subcontext bit flags**

The subcontext bit flags are positional and represent the following:

i. **Type of matching to perform**

This bit flag can take the value "F" (fixed) or "V" (variable). The value determines the type of matching to perform on the input received. A fixed match compares the input against the text string byte-by-byte. A variable match compares the text string against the input, looking for a match anywhere.

ii. **All or partial match**

This bit flag can take the value "S" (substring) or "N" (no-substring). Used in combination with the previous bit flag, it denotes whether the entire input is to be matched against, or only part of it. Fixed no-substring requires that the input and the text string be of equivalent sizes, order and each byte matches (i.e. an exact match). Fixed substring requires that a small part of the text string match the input exactly. Following a match, the text string is used and not the input that was received. Variable no-
substring involves no matching and is otherwise termed a "null subcontext". This can be thought of as a "wildcard" and will match any input. Variable substring is similar to fixed substring, with the exception that the input is used, rather than the text string.

iii. Special function necessary

This bit flag can take the value "F" (function required) or "N" (no function required). This flag denotes whether the optional field "sf" will be present or not.

iv. Validity of input

This bit flag can take the value "V" (valid input) or "I" (invalid input). Following a match between the received input and the text string, this bit is checked and if not set, the input is not allowed to proceed due to its invalidity. This occurs in subsystems which have commands that FSMGP does not allow to be used. For example, the TCON OLD command is a valid WWMCCS input, but is not part of the subset of WWMCCS operations that FSM allows.
v. Source of input

This bit flag can take the value "U" (user input) or "S" (system output). In the event that the header bit flag was "Both", this bit flag identifies whether this subcontext pertains to the received input or not.

vi. Disposition of input following match

This bit flag can take the value "E" (end of current input) or "B" (beginning of next input). Its use is limited to variable substring matches and serves to identify whether the substring matched is part of the current input, to be downgraded, or is the beginning of the succeeding input. The flag will normally be "E", signifying that the substring matched is to be downgraded with the rest of the input received.

4. gs -- Start of fixed substring match

This field pertains only to fixed substring matches and in that event, gives an offset into the text string to use in matching. The length of the substring, since it is not null-terminated, is given by the next field, "gl".
5. **gl** -- Length of fixed substring match

This field pertains only to fixed substring matches and in that event, gives a length from the start of the substring to use in matching. In the event that the substring defined by these two fields is matched, the input received is discarded and the entire text string is used as the input.

6. **sf** -- Special function name

This optional field, if present, contains the name of a C function which can be to perform special actions in regard to the input received, following a successful match. Initially, this field only pertained to user input and was limited to validating complex user inputs so as to reduce the possible number of error messages received. Since that time, the concept has been generalized to include system output as well. The special function can implement any special actions that are not normally performed during the FSMGP's processing loop.

7. **!comment**

An exclamation mark followed by anything which appears at the end of a subcontext input line is regarded as a comment and is ignored by all programs. It is optional.
Context items, which include the single context header followed by zero or more subcontext items, are delimited from each other by a blank line.

A.3 HALTING DELIMITER

The halting delimiter file follows this format:

Ds d1\^d2^ ... di^^

or

Ds d1^ d2^ . . . di^^

Each halting delimiter set contains one or more halting delimiters. Halting delimiters are delimited from each other by a special character that is called a "pseudo-null". This character will be recognized as a metasymbol and translated to a null byte everywhere it is encountered. The pseudo-null character is a carret (^). This indirection is necessary due to the editor's inability to insert nulls in a file. Each halting delimiter set is doubly null-terminated.

The fields in a halting delimiter set are:

1. Ds -- The delimiter set label

   This symbolic label is used in the context file as a reference to a delimiter set.
2. **dj -- The halting delimiters**

Each halting delimiter is null terminated and can contain any meaningful characters that are legitimate halting delimiters. Typically, halting delimiters will be new-lines or carriage returns.

A halting delimiter set can be entered on a single line or on multiple lines, as desired. It is best NOT to split a halting delimiter across new-lines, however, it will be interpreted correctly. In the event multi-line input is used, following the new-line there must appear a tab. This serves to denote that the set is not yet terminated, as well as providing a visual mnemonic to that effect.

Halting delimiter sets are delimited from each other by a blank line.

A.4 **TEXT STRING**

The text string file follows a similar format to the halting delimiter file. The format is:

```
Ts ttttttt ... ttt*
```

or

```
Ts ttt
  ttt
  *
  *
  ttt*
```

A - 11
Each text string contains zero or more characters and is terminated by the "pseudo-null" character, as described above. Each text string requires a unique label and is delimited from other text strings by a blank line.

The fields are:

1. \textit{Ts} -- The text string label

   This symbolic label identifies the text string and is used in the context file. It must be unique.

2. \textit{t} -- The text string

   The text string must be null-terminated and can be entered on a single input line or on multiple lines. If using multi-line input, following a new-line there must be a tab. Similar to the halting delimiter file, this provides an indication that the text string is not terminated.

\textbf{A.5 SOURCE CONTEXT TABLES}

Following is a listing of the source context files for the teletypewriter and wang terminals which were used during the PROUD SPIRIT exercise.
A.5.1 Source Context File (GCONT)

The context file which follows has had its comments truncated to eighty columns in order to fit onto the page. All essential data is otherwise intact.

C1 C999 D1 SRVN LOGON outnup ! begin tty/wang logon
T2 C10 VSNVSE 0 0 ! "1316400" (line number)
T1 C10 VNNVSE 0 0 ! (anything else)

C10 C999 D20 SNVN LOGON outnup ! system prompts for subsystem
T10 C20 VSNVSE 0 0 ! "PROGRAM NAME -"

C20 C999 D40 UNFN LOGON outnup ! user enters subsystem
T20 C30 FNNVUE 0 0 ! "tss"
T21 C200 FNNVUE 0 0 ! "tlcf"

C30 C999 D30 SNFN LOGON outnup ! Begin TSS logon
T30 C40 FNNVUE 0 0 ! "TERMINAL"

C40 C999 D1 SNVN LOGON outnup ! system identifies terminal
T40 C50 VSFVSE 0 0 ! "nn" (terminal id)

C50 C999 D50 SNFN LOGON outnup ! system prompts for userid
T50 C60 FNNVSE 0 0 ! "USERID$PASSWORD ...
T51 C999 F1NFSE 0 0 locked ! "LOCKED" (terminal is locked)

C60 C70 D40 UNVN LOGON outnup ! user enters userid
T60 C60 VSNVUE 0 0 ! <uid>$<pw>/scc/sc [invalid]
T61 C90 VSFVUE 0 0 getuid ! <uid>$<pw>

C70 C999 D40 SRFN LOGON outnup ! system re-prompts for userid
T50 C80 FNNVSE 0 0 ! "USERID$PASSWORD ...

C80 C999 D40 UNVN LOGON outnup ! user enters userid (last chan
T60 C80 VSNVUE 0 0 ! <uid>$<pw>/scc/sc [invalid]
T61 C90 VSFVUE 0 0 getuid ! <uid>$<pw>

C90 C999 D1 SRFN TSS outnup ! system prompts for ident
T90 C100 FNNVSE 0 0 ! "IDENT?"

C100 C999 D40 UNVN TSS outnup ! user enters identifier
T100 C110 VSNVUE 0 0 ! <ident>

C110 C999 D110 SNFA TSS outnup ! system responds to ident
T110  C120  FNIVSE  0  0  ! "CLASSIFICATION OF YOUR OUTPUT?"
T111  C120  VSNVSE  0  0  ! "CLASSIFICATION OF YOUR OUTPUT?" +
T111  C120  FNIVSE  0  0  ! "classification of your output?" +
T90   C100  FNIVSE  0  0  ! "IDENT?" (previous one bad)

C120  C999  D40  UNFN  TSS  outnup  ! user enters output class
T121  C130  FNIVUE  0  0  getcls  ! uzz
T122  C130  FNIVUE  0  0  getcls  ! ufo
T123  C130  FNIVUE  0  0  getcls  ! czz
T124  C130  FNIVUE  0  0  getcls  ! szz
T125  C130  FNIVUE  0  0  getcls  ! swp

C130  C999  D130  SNFN  TSS  outnup  ! system responds to output class
T130  C140  FNIVSE  0  0  ! "CLASSIFICATION OF FILES ..."
T131  C140  FNIVSE  0  0  ! "classification of files ..."
T132  C110  FNIVSE  0  0  ! "ILLEGAL CLASSIFICATION CODE"
T133  C110  FNIVSE  0  0  ! "illegal classification code"

C140  C999  D40  UNFN  TSS  outnup  ! user enters file class
T121  C150  FNIVUE  0  0  ! uzz
T122  C150  FNIVUE  0  0  ! ufo
T123  C150  FNIVUE  0  0  ! czz
T124  C150  FNIVUE  0  0  ! szz
T125  C150  FNIVUE  0  0  ! swp

C150  C150  D150  SNVN  TSS  outnup  ! system responds to file class
T150  C160  FNIVSE  0  0  ! "SYSTEM?" (only)
T151  C160  FNIVSE  0  0  ! "SYSTEM?" (after pop-up)
T152  C160  VSNVSE  0  0  ! "SYSTEM?" (preceded by message)
T132  C130  FNIVSE  0  0  ! "ILLEGAL CLASSIFICATION CODE"
T133  C130  FNIVSE  0  0  ! "illegal classification code"

C160  C150  D40  UNVN  TSS  outnup  ! user enters TSS subsystem
T160  C100  FNIVUE  0  0  ! acce (ss)
T161  C100  FNIVUE  0  0  ! acces (s)
T162  C100  FNIVUE  0  0  ! access
T170  C7000  FNIVUE  0  0  ! list (with no arguments)
T163  C7000  VSNVSE  0  0  ! vumcl  ! list
T164  C6000  FNIVUE  0  0  ! sios
T165  C2000  FNIVUE  0  0  ! tcon
T166  C9000  FNIVUE  0  0  ! wwdm (s)
T167  C9000  FNIVUE  0  0  ! wwdms
T168  C990  FNIVUE  0  0  ! bye (logoff)
T171  C7000  FNIVUE  0  0  ! listl (with no arguments)
T169  C7000  VSNVSE  0  0  ! vumcl  ! listl
T172  C9020  FNIVUE  0  0  ! wwdm new
T173  C9020  FNIVUE  0  0  ! wwdms new
T174  C9020  FNIVUE  0  0  ! wwdms new
T175  C9020  FNIVUE  0  0  ! wwdms new

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A - 15
T1230 C1240 FNNVUE 0 0 ! read
T1231 C1240 FNNVUE 0 0 ! r (read)
T1232 C1240 FNNVUE 0 0 ! execute
T1233 C1240 FNNVUE 0 0 ! e (execute)
T1234 C1240 FNNVUE 0 0 ! write
T1235 C1240 FNNVUE 0 0 ! w (write)
T1236 C1240 FNNVUE 0 0 ! append
T1237 C1240 FNNVUE 0 0 ! a (append)
T1238 C1240 FNNVUE 0 0 ! modify
T1239 C1240 FNNVUE 0 0 ! m (modify)
T1023 C1240 FNNVUE 0 0 ! <carriage return>

C1240 C150 D1240 SNVN ACCESS outnup ! system prompts user for speci
T1240 C1250 FNNVSE 0 0 ! "SPECIFIC PERMISSIONS?"
T1051 C1220 VSNVSE 0 0 ! "ERR-..." (several types)

C1250 C150 D40 UNVN ACCESS outnup ! user inputs specific permissi
T1250 C1300 VSNVUE 0 0 ! read/
T1251 C1300 VSNVUE 0 0 ! r/ (read)
T1252 C1300 VSNVUE 0 0 ! write/
T1253 C1300 VSNVUE 0 0 ! w/ (write)
T1254 C1300 VSNVUE 0 0 ! append/
T1255 C1300 VSNVUE 0 0 ! a/ (append)
T1256 C1300 VSNVUE 0 0 ! execute/
T1257 C1300 VSNVUE 0 0 ! e/ (execute)
T1258 C1300 VSNVUE 0 0 ! modify/
T1259 C1300 VSNVUE 0 0 ! m/ (modify)
T1023 C1300 FNNVUE 0 0 ! <carriage return> (end specific permi

C1300 C150 D1300 SNFN ACCESS outnup ! response to above permissions
T1240 C1250 FNNVSE 0 0 ! "SPECIFIC PERMISSIONS?"
T1300 C1310 FNNVUE 0 0 ! "MORE?"
T1301 C1320 FNNVUE 0 0 ! "SUCCESSFUL."
T1302 C1240 FNNVSE 0 0 ! "ERR-PERMISSIONS ILLEGALLY STATED"
T1051 C1240 VSNVSE 0 0 ! "ERR-..." (several types)
T1303 C1010 VSNVSE 0 0 ! "REQUEST DENIED-"

C1310 C150 D40 UNVN ACCESS outnup ! user enters more names
T1040 C1300 VNNVUE 0 0 ! (anything)

C1320 C150 D581 SNFN ACCESS outnup ! system prompts for file name
T1320 C1060 FNNVSE 0 0 ! "FILE TO BE MODIFIED?"

C2000 C2004 D510 SNVA TCON outnup !tcon start1
T2002 C2010 FNNVSE 0 0 !<all>TCON VERSION 6.3, JUNE 1976<SP><C
T2020 C150 VSNVSE 0 0 !NO TEMPORARY FILE SPACE CODE

C2001 C2004 D501 SNFN TCON outnup !tcon first question
T2001 C2010 FNNVSE 0 0 !<all>FUNCTIONAL AREA?
C2003 C2004 D40 UNFN TCON outnup !user hits <nl>
T2100 C2001 FNNVUE 0 0 !<all><CR>

C2004 C2004 D509 SNVN TCON outnup !back to system or top
T150 C160 FNNVSE 0 0 !SYSTEM ?
T150 C160 VSNVSE 0 0 !SYSTEM ? preceded by message
T2000 C2003 FNNVSE 0 0 !TCON VERSION 6.3, JUNE 1976

C2010 C2004 D40 UNFN TCON outnup !user input functional area
T2030 C2020 FNNVUE 0 0 !<all>fs
T2040 C4020 FNNVUE 0 0 !<all>dem
T2100 C150 FNNVUE 0 0 !<all><CR>

C2015 C2015 D509 SNVN TCON outnup !back to system, top or type?
T150 C160 FNNVSE 0 0 !SYSTEM ?
T150 C160 VSNVSE 0 0 !SYSTEM ? preceded by message
T2000 C2016 FNNVSE 0 0 !TCON VERSION 6.3, JUNE 1976
T2201 C2070 FNNVSE 0 0 !<CR><NL> TRANSACTION TYPE ?<SP><SP>

C2016 C2015 D40 UNFN TCON outnup !user hits <nl>
T2100 C2017 FNNVUE 0 0 !<CR>

C2017 C2015 D501 SNFN TCON outnup !tcon first question
T2001 C2018 FNNVSE 0 0 !FUNCTIONAL AREA?

C2018 C2015 D40 UNFN TCON outnup !user input functional area
T2030 C2020 FNNVSE 0 0 !fs
T2040 C4020 FNNVUE 0 0 !dem
T2100 C150 FNNVUE 0 0 !<CR>

C2020 C2015 D520 SNFN TCON outnup !system asks for old or new
T2110 C2030 FNNVSE 0 0 !<C2010(t2030)>OLD OR NEW-
T2110 C2030 VSNVSE 0 0 !OLD OR NEW-
T2190 C2020 FNNVSE 0 0 !<C2030(t2140)>READY
T2200 C2070 FNNVSE 0 0 !<all><CR><NL><NL><CR><NL>TRANSACTION T
T2201 C2070 FNNVSE 0 0 !<all><CR><NL> TRANSACTION TYPE ?<SP>
T2120 C150 FNNVUE 0 0 !FUNCTIONAL AREA BUSY

C2030 C2015 D40 UNVN TCON outnup !user response to old or new
T2130 C2020 FNNVUE 0 0 !<all>new<CR>
T2140 C2020 FNNVUE 0 0 !<all>n<CR>
T2640 C3000 FNNVUE 0 0 !<all>old<CR>
T2645 C3000 FNNVUE 0 0 !<all>o<CR>
T2162 C2800 VSPVUE 0 0 vumc2 !<all>old <filename>
T2160 C2800 VSPVUE 0 0 vumc2 !<all>o <filename>
T2180 C2042 FNNVUE 0 0 !<all>same<CR>
T2181 C2042 FNNVUE 0 0 !<all>s<CR>
T2100 C150 FNNVUE 0 0 !<all><CR>

C2042 C2015 D530 SNFN TCON outnup !sys resp to same

A - 18
<ALL> YOU PRESENTLY DO NOT HAVE A CURRENT READY

OUTNUP !TCON START2

TCON VERSION 6.3, JUNE 1976

OUTNUP !NO TEMPORARY FILE SPACE CODE

OUTNUP !USER INPUT TRANSACTION TYPE

USER INPUT TRANSACTION TYPE

OUTNUP !USER INPUT TRANSACTION TYPE
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C3064  C3062  D40  UNVN  TCON  outnup  !user input filename
T2100  C3062  FNNVUE  0  0  !<all><CR>
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T2657  C3071  FNNVSE  0  0  !<c2733(t2290t2300)c3060(t2290t2320t234
T2658  C3071  VSNVSE  0  0  !<CR><NL>TRANSACTION xxxxxx NOT IN CURR FILE<SP>
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C4000  C4004  D510  SNVN  TCON  outnup  !tcon start3
T2002  C4010  FNNVSE  0  0  !<all>TCON VERSION 6.3, JUNE 1976
T2020  C150  VSNVSE  0  0  !NO TEMPORARY FILE SPACE CODE
C4001  C4004  D501  SNFN  TCON  outnup  !tcon first question
T2001  C4012  FNNVSE  0  0  !<all><CR>
C4003  C4004  D40  UNFN  TCON  outnup  !user hits <nl>
T2100  C4001  FNNVUE  0  0  !<all><CR>
C4004  C4004  D509  SNVN  TCON  outnup  !back to system, top or type?
T150  C160  FNNVSE  0  0  !SYSTEM ?
T150  C160  VSNVSE  0  0  !SYSTEM ? preceded by message
T2000  C4003  FNNVSE  0  0  !<c2800>TCON VERSION 6.3, JUNE 1976
T2201  C3060  FNNVSE  0  0  !<CR><NL> TRANSACTION TYPE ?<SP><SP>
C4010  C4004  D40  UNFN  TCON  outnup  !user input functional area
T2030  C2800  FNNVUE  0  0  !<all>fs
T2040  C4800  FNNVUE  0  0  !<all>dem
T2100  C150  FNNVUE  0  0  !<all><CR>
C4015  C4015  D509  SNVN  TCON  outnup  !back to system, top or type?
T150  C160  FNNVSE  0  0  !SYSTEM ?
T150  C160  VSNVSE  0  0  !SYSTEM ? preceded by message
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A - 27
UNFN TCON outnup !user hits <nl>

T2001 C6018 FNNVSE 0 0 !FUNCTIONAL AREA?

C4017 C4015 D501 SNFN TCON outnup !user input functional area

C4020 C4015 D520 SNFN TCON outnup !system asks for old or new

T2110 C4030 FNNVSE 0 0 !<c2010>OLD OR NEW-

C4030 C4015 D40 UNFN TCON outnup !user response to old or new

C4042 C4015 D530 SNFN TCON outnup !sys.resp to same

C4050 C4015 D510 SNFN TCON outnup !tcon start4

C4070 C4015 D40 UNVN TCON outnup !user input tran type

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T3310 C4342 FNNVUE 0 0 !<c4020(t2200)>as
T3320 C4342 FNNVUE 0 0 !am
T3330 C4342 FNNVUE 0 0 !av
T3340 C4342 FNNVUE 0 0 !ae
T3350 C4342 FNNVUE 0 0 !at
T3380 C4342 FNNVUE 0 0 !ma
T3390 C4342 FNNVUE 0 0 !mc
T3400 C4342 FNNVUE 0 0 !pl
T3410 C4342 FNNVUE 0 0 !pd
T3420 C4342 FNNVUE 0 0 !ol
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<td>!remov clearfiles</td>
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<tr>
<td>T2621</td>
<td>C4072</td>
<td>VSVNUE 0 0</td>
<td>!done&lt;CR&gt;</td>
</tr>
<tr>
<td>T2640</td>
<td>C4072</td>
<td>VSVNUE 0 0</td>
<td>!remove clearfiles</td>
</tr>
<tr>
<td>T2645</td>
<td>C4072</td>
<td>FNNVUE 0 0</td>
<td>!remove clearfiles</td>
</tr>
<tr>
<td>T2650</td>
<td>C4072</td>
<td>FNNVUE 0 0</td>
<td>!resave&lt;CR&gt;</td>
</tr>
<tr>
<td>T2651</td>
<td>C4072</td>
<td>FNNVUE 0 0</td>
<td>!resave&lt;CR&gt;</td>
</tr>
<tr>
<td>T2652</td>
<td>C4072</td>
<td>FNNVUE 0 0</td>
<td>!resave&lt;filename&gt;</td>
</tr>
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<td>T2660</td>
<td>C4072</td>
<td>VSVNUE 0 0</td>
<td>!resave&lt;CR&gt;</td>
</tr>
<tr>
<td>T2661</td>
<td>C4072</td>
<td>VSVNUE 0 0</td>
<td>!ready preceded by data/error</td>
</tr>
<tr>
<td>C4072</td>
<td>C4073</td>
<td>D1000 0 SNFN TCON outnup !sys resp after ready(List), retr</td>
<td></td>
</tr>
<tr>
<td>T2280</td>
<td>C4072</td>
<td>FNNVSE 0 0</td>
<td>!ready</td>
</tr>
<tr>
<td>T2281</td>
<td>C4072</td>
<td>VSNVSE 0 0</td>
<td>!ready preceded by data/error</td>
</tr>
<tr>
<td>C4074</td>
<td>C4072</td>
<td>D599 0 SNFN TCON outnup !sys resp after retr</td>
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<td>C4u75</td>
<td>C4072</td>
<td>D581 0 SNFN TCON outnup !file name for resave</td>
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<td>T2211</td>
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<tr>
<td>C4076</td>
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<td>D40 0 UNVN TCON outnup !user input file name</td>
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<td>C4072</td>
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<td>!&lt;CR&gt;</td>
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<td>C4072</td>
<td>VSNVSE 0 0</td>
<td>vumcl !filename</td>
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<td>C4077</td>
<td>C4072</td>
<td>D502 0 SNFN TCON outnup !sys resp to file name</td>
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<td>!&lt;CR&gt;&lt;NL&gt;&lt;ERR-FILE NAME &gt;8 CHARACTER</td>
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<td>T2202</td>
<td>C4070</td>
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<td>!&lt;CR&gt;&lt;NL&gt;&lt;TRANSACTION TYPE ?&lt;SP&gt;&lt;SP&gt;</td>
</tr>
<tr>
<td>C4080</td>
<td>C4341</td>
<td>D560 0 SRFN TCON outnup !hd skeleton</td>
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<tr>
<td>T3440</td>
<td>C4340</td>
<td>FNNVSE 0 0</td>
<td>!skeleton</td>
</tr>
<tr>
<td>C4085</td>
<td>C4341</td>
<td>D560 0 SRFN TCON outnup !as skeleton</td>
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<tr>
<td>T3450</td>
<td>C4340</td>
<td>FNNVSE 0 0</td>
<td>!skeleton</td>
</tr>
</tbody>
</table>

A - 29
C4090  C4341  D560  SRFN  TCON  outnup  !am skeleton
T3460  C4340  FNNVSE  0  0  !skeleton
C4110  C4341  D560  SRFN  TCON  outnup  !av skeleton
T3470  C4340  FNNVSE  0  0  !skeleton
C4130  C4341  D560  SRFN  TCON  outnup  !ae skeleton
T3480  C4340  FNNVSE  0  0  !skeleton
C4150  C4341  D560  SRFN  TCON  outnup  !at skeleton
T3490  C4340  FNNVSE  0  0  !skeleton
C4210  C4341  D560  SRFN  TCON  outnup  !ma skeleton
T3520  C4340  FNNVSE  0  0  !skeleton
C4230  C4341  D560  SRFN  TCON  outnup  !mc skeleton
T3530  C4340  FNNVSE  0  0  !skeleton
C4250  C4341  D560  SRFN  TCON  outnup  !pl skeleton
T3540  C4340  FNNVSE  0  0  !skeleton
C4270  C4341  D560  SRFN  TCON  outnup  !pd skeleton
T3550  C4340  FNNVSE  0  0  !skeleton
C4290  C4341  D560  SRFN  TCON  outnup  !ol skeleton
T3560  C4340  FNNVSE  0  0  !skeleton
C4310  C4341  D560  SRFN  TCON  outnup  !od skeleton
T3570  C4340  FNNVSE  0  0  !skeleton
C4340  C4341  D550  SRFN  TCON  outnup  !end of skeletons
T3070  C4700  FNNVSE  0  0  !END OF TRANSACTION
C4341  C4710  D560  SRVN  TCON  outnup  !remnants of skeleton after <br
T2050  C4341  VSNVSE  0  0  ![<c4710(t2050)>END OF TRANSACTION]
C4342  C4710  D560  SRVN  TCON  outnup  !variable skeleton
T3070  C4700  VSNVSE  0  0  ![<c4700(t3070)>END OF TRANSACTION]
C4700  C4710  D40  UNVN  TCON  outnup  !user skeleton data entry
T3030  C990  FNNVUE  0  0  ![<c4700(t3030)>byye]
T3040  C4800  FNNVUE  0  0  ![<c4342(donw with this skeleton)]
T2520  C150  FNNVUE  0  0  ![<c4360(t2050)>list]<CR>
T2610  C4380  FNNVUE  0  0  ![<c4360(t2050)>list]<CR>
T2612  C4380  FNNVUE  0  0  ![<c4360(t2050)>old]<CR>
T2640  C5020  FNNVUE  0  0  ![<c5071>resave]<CR>
T2550  C4710  FNNVUE  0  0  ![<c5071>remove clearfiles]
T2555  C4710  FNNVUE  0  0  ![<c5071>remval clearfiles]
T2560  C4710  FNNVUE  0  0  ![<c5071>removal clearfiles]
T2630  C4711  FNNVUE  0  0  ![<c5071>removal clearfiles]
INVALID COMMAND AT THIS LEVEL
!user enters tran type

!hd
!as
!am
!av
!ae
!pl
!pd
!ol
!od

!variable tran type

!OLD OR NEW-

!OLD OR NEW-

!READY

TRANSACTION TYPE ?

 TRANSACTION TYPE ?<SP><SP>

 TRANSACTION TYPE

!sys resp to same

YOU PRESENTLY DO NOT HAVE A CURRENT FI

!sys resp to old<CR>

!user input old filename

!user input old filename

!end of data saved msg

!user input tran type
<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>T3300</td>
<td>C5070 FNVUE 0 0 !&lt;c5050(t2201)&gt;hd</td>
</tr>
<tr>
<td>T3310</td>
<td>C5070 FNVUE 0 0 !&lt;c5050(t2201)&gt;as</td>
</tr>
<tr>
<td>T3320</td>
<td>C5070 FNVUE 0 0 !am</td>
</tr>
<tr>
<td>T3330</td>
<td>C5070 FNVUE 0 0 !av</td>
</tr>
<tr>
<td>T3340</td>
<td>C5070 FNVUE 0 0 !ae</td>
</tr>
<tr>
<td>T3350</td>
<td>C5070 FNVUE 0 0 !at</td>
</tr>
<tr>
<td>T3360</td>
<td>C5070 FNVUE 0 0 !ma</td>
</tr>
<tr>
<td>T3370</td>
<td>C5070 FNVUE 0 0 !mc</td>
</tr>
<tr>
<td>T3380</td>
<td>C5070 FNVUE 0 0 !pl</td>
</tr>
<tr>
<td>T3390</td>
<td>C5070 FNVUE 0 0 !pd</td>
</tr>
<tr>
<td>T3400</td>
<td>C5070 FNVUE 0 0 !ol</td>
</tr>
<tr>
<td>T3410</td>
<td>C5070 FNVUE 0 0 !od</td>
</tr>
<tr>
<td>T3420</td>
<td>C5070 FNVUE 0 0 !&lt;c5050(t2201)&gt;*</td>
</tr>
<tr>
<td>T3430</td>
<td>C5070 FNVUE 0 0 !bye</td>
</tr>
<tr>
<td>T3440</td>
<td>C5070 FNVUE 0 0 !&lt;CR&gt;</td>
</tr>
<tr>
<td>T3450</td>
<td>VSNVUE 0 0 !dele(te) &lt;transaction&gt;</td>
</tr>
<tr>
<td>T3460</td>
<td>FNVUE 0 0 !done&lt;CR&gt;</td>
</tr>
<tr>
<td>T3470</td>
<td>!list&lt;CR&gt;</td>
</tr>
<tr>
<td>T3480</td>
<td>VSFVUE 0 0 !list&lt;filename&gt;</td>
</tr>
<tr>
<td>T3490</td>
<td>!old&lt;CR&gt;</td>
</tr>
<tr>
<td>T3500</td>
<td>VSFVUE 0 0 !old &lt;filename&gt;</td>
</tr>
<tr>
<td>T3510</td>
<td>FNVUE 0 0 !remove clearfiles</td>
</tr>
<tr>
<td>T3520</td>
<td>FNVUE 0 0 !remov clearfiles</td>
</tr>
<tr>
<td>T3530</td>
<td>FNVUE 0 0 !resave&lt;CR&gt;</td>
</tr>
<tr>
<td>T3540</td>
<td>FNVUE 0 0 !resa&lt;CR&gt;</td>
</tr>
<tr>
<td>T3550</td>
<td>VSFVUE 0 0 !resave &lt;filename&gt;</td>
</tr>
<tr>
<td>T3560</td>
<td>VSFVUE 0 0 !resave &lt;filename&gt;</td>
</tr>
<tr>
<td>T3570</td>
<td>VSFVUE 0 0 !retr</td>
</tr>
<tr>
<td>T3580</td>
<td>VSFVUE 0 0 !sys resp to resave</td>
</tr>
<tr>
<td>T3590</td>
<td>VSFVUE 0 0 !sys resp after ready(list), retr</td>
</tr>
<tr>
<td>C5061</td>
<td>C5084 D506 SNVN TCON outnup !sys resp to list</td>
</tr>
<tr>
<td>T2280</td>
<td>C5062 FNVVE 0 0 !ready</td>
</tr>
<tr>
<td>T2281</td>
<td>C5062 VSNVSE 0 0 !ready preceded by data/error</td>
</tr>
<tr>
<td>C5062</td>
<td>C5062 D1000 SNFN TCON outnup !sys resp after ready(list), retr</td>
</tr>
<tr>
<td>T2201</td>
<td>C5060 FNVVE 0 0 !&lt;CR&gt;&lt;NL&gt; TRANSACTION TYPE ?&lt;SP&gt;&lt;SP&gt;</td>
</tr>
<tr>
<td>T2202</td>
<td>C5060 FNVVE 0 0 !&lt;CR&gt;&lt;NL&gt; TRANSACTION TYPE ?&lt;SP&gt;&lt;SP&gt; pre</td>
</tr>
<tr>
<td>C5063</td>
<td>C5062 D581 SNFN TCON outnup !sys resp to resave</td>
</tr>
<tr>
<td>T2211</td>
<td>C5064 UNVN TCON outnup !user input filename</td>
</tr>
<tr>
<td>C5064</td>
<td>C5062 D40 UNVN TCON outnup !user input filename</td>
</tr>
<tr>
<td>T2100</td>
<td>C5062 FNVVE 0 0 !&lt;CR&gt;</td>
</tr>
<tr>
<td>T2100</td>
<td>C5065 VNFVUE 0 0 vumc1 !&lt;all&gt;&lt;filename&gt;</td>
</tr>
<tr>
<td>C5065</td>
<td>C5062 D502 SNVN TCON outnup !sys resp to resave</td>
</tr>
<tr>
<td>T2202</td>
<td>C5060 VSNVSE 0 0 !&lt;CR&gt;&lt;NL&gt; TRANSACTION TYPE ?&lt;SP&gt;&lt;SP&gt; pre</td>
</tr>
</tbody>
</table>
A - 35
C6250  C150  D40  UNVN  SIOS  outnup  ! user enters wufi file
T6110  C6260  VNNVUE  0  0  ! <wufi file name>
T6035  C150  VNNVUE  0  0  ! <carriage return>

C6260  C150  D6260  SNFN  SIOS  outnup  ! sios response to wufi file
T6260  C6270  FNNVSE  0  0  ! "RECORDS WERE RETURNED"
T6261  C6020  FNNVSE  0  0  ! "NO DATA FOR THIS SYSTEM ID ..."
T2100  C6020  VSNVSE  0  0  ! error message

C6270  C150  D40  SNVN  SIOS  outnup  ! number of records returned
T6170  C6280  VSNVSE  0  0  ! "nnnnnn RECORDS"

C6280  C150  D6140  SNFN  SIOS  outnup  ! finish up normal return
T6280  C6020  FNNVSE  0  0  ! "WUFI RECORDS WERE CLEARED"

C6300  C150  D40  SRFN  SIOS  outnup  ! prompt for system id to use
T6300  C6310  FNNVSE  0  0  ! "SIOS CLEAR ROUTINE ..."

C6310  C150  D40  UNVN  SIOS  outnup  ! users enters system id
T6110  C6320  VNNVUE  0  0  ! <system id>
T6035  C150  VNNVUE  0  0  ! <carriage return>

C6320  C150  D6140  SNFN  SIOS  outnup  ! sios response to system id
T6140  C6330  FNNVSE  0  0  ! "WUFI FILE YOU WANT TO USE"

C6330  C150  D40  UNVN  SIOS  outnup  ! user enters wufi file
T6110  C6340  VNNVUE  0  0  ! <wufi file name>
T6035  C150  VNNVUE  0  0  ! <carriage return>

C6340  C150  D6340  SNFN  SIOS  outnup  ! sios response to wufi file
T6280  C6020  FNNVSE  0  0  ! "WUFI RECORDS WERE CLEARED"
T6340  C6020  FNNVSE  0  0  ! "NO DATA TO CLEAR"

C6400  C150  D40  SRFN  SIOS  outnup  ! prompt for system id
T6400  C6410  FNNVSE  0  0  ! "SIOS SEARCH ROUTINE ..."

C6410  C150  D40  UNVN  SIOS  outnup  ! user enters system id
T6110  C6420  VNNVUE  0  0  ! <system id>
T6035  C150  VNNVUE  0  0  ! <carriage return>

C6420  C150  D6140  SNFN  SIOS  outnup  ! sios response to system id
T6140  C6430  FNNVSE  0  0  ! "WUFI FILE YOU WANT TO USE"

C6430  C150  D40  UNVN  SIOS  outnup  ! user enters wufi file
T6110  C6440  VNNVUE  0  0  ! <wufi file name>
T6035  C150  VNNVUE  0  0  ! <carriage return>

C6440  C150  D6140  SNVN  SIOS  outnup  ! sios response to wufi file
T6440  C6450  VSNVSE  0  0  ! "nnnnnn BLOCKS OF DATA"
T6441  C6020  FNNVSE  0  0  ! "NO RECORDS FOUND"
<table>
<thead>
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<th>C150</th>
<th>D40</th>
<th>SNVN</th>
<th>SIOS</th>
<th>outnup</th>
<th>number of records involved</th>
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<tr>
<td>T6170</td>
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<table>
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<th>C150</th>
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<th>list output</th>
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<td>0</td>
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<th>0</th>
<th>&gt;&lt;NL&gt;illegal character</th>
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<td>T7002</td>
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<td>0</td>
<td>&gt;&lt;NL&gt;CURRENT FILE NOT DEFINED &lt;</td>
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<td>C160</td>
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<td>0</td>
<td>0</td>
<td>&gt;&lt;NL&gt;SYSTEM ? (preceded by anything</td>
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<th>C150</th>
<th>D20</th>
<th>SNFA</th>
<th>WWDS</th>
<th>outnup</th>
<th>&lt;pop&gt;WWDS entry point</th>
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<td>T2110</td>
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<td>&gt;&lt;ALL&gt;OLD OR NEW-</td>
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<th>C150</th>
<th>D60</th>
<th>UNFN</th>
<th>WWDS</th>
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<th>user resp to old/new</th>
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<th>C150</th>
<th>D9020</th>
<th>SNFN</th>
<th>WWDS</th>
<th>outnup</th>
<th>&lt;all&gt;system is ready</th>
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<tbody>
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<td>FNNVSE</td>
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<td>!&lt;ALL&gt;READY</td>
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<table>
<thead>
<tr>
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<th>C150</th>
<th>D9030</th>
<th>SNVN</th>
<th>WWDS</th>
<th>outnup</th>
<th>&lt;all&gt;WWDS prompt</th>
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<tbody>
<tr>
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<td>C9040</td>
<td>FNNVSE</td>
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<td>!&lt;c9020 c9210&gt;&lt;CR&gt;&lt;NL&gt;&lt;pop&gt;</td>
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<tr>
<td>T9030</td>
<td>C9040</td>
<td>FNNVSE</td>
<td>0</td>
<td>0</td>
<td>!&lt;c9160(pop)&gt;prompt preceded by error</td>
<td></td>
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<table>
<thead>
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<th>C150</th>
<th>D60</th>
<th>UNFN</th>
<th>WWDS</th>
<th>outnup</th>
<th>&lt;run commands</th>
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<tbody>
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<td>FNNVUE</td>
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<td>0</td>
<td>!&lt;c9030(t9030F)&gt;run mc76/exercise/equip</td>
<td></td>
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<tr>
<td>T9050</td>
<td>C9050</td>
<td>FNNVUE</td>
<td>0</td>
<td>0</td>
<td>!&lt;c9030(t9030F)&gt;run mc76/exercise/equip</td>
<td></td>
</tr>
<tr>
<td>T9060</td>
<td>C9050</td>
<td>FNNVUE</td>
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<td>0</td>
<td>!&lt;c9030(t9030F)&gt;run mc76/exercise/equip</td>
<td></td>
</tr>
<tr>
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<td>0</td>
<td>0</td>
<td>!&lt;c9030(t9030F)&gt;run mc76/exercise/equip</td>
<td></td>
</tr>
<tr>
<td>T9075</td>
<td>C9550</td>
<td>FNNVUE</td>
<td>0</td>
<td>0</td>
<td>!&lt;c9030(t9030F)&gt;run mc76/exercise/rptmo</td>
<td></td>
</tr>
<tr>
<td>T9080</td>
<td>C9550</td>
<td>FNNVUE</td>
<td>0</td>
<td>0</td>
<td>!&lt;c9030(t9030F)&gt;run mc76/exercise/rptm</td>
<td></td>
</tr>
<tr>
<td>T9090</td>
<td>C9300</td>
<td>FNNVUE</td>
<td>0</td>
<td>0</td>
<td>!&lt;c9210(t9030V)&gt;run mc76/exercise/acci</td>
<td></td>
</tr>
<tr>
<td>T9100</td>
<td>C9300</td>
<td>FNNVUE</td>
<td>0</td>
<td>0</td>
<td>!&lt;c9210(t9030V)&gt;runj mc76/exercise/acci</td>
<td></td>
</tr>
<tr>
<td>T9110</td>
<td>C9300</td>
<td>FNNVUE</td>
<td>0</td>
<td>0</td>
<td>!&lt;c9170(t9030V)&gt;run mc76/exercise/info</td>
<td></td>
</tr>
<tr>
<td>T9120</td>
<td>C9300</td>
<td>FNNVUE</td>
<td>0</td>
<td>0</td>
<td>!&lt;c9170(t9030V)&gt;runj mc76/exercise/info</td>
<td></td>
</tr>
<tr>
<td>T9130</td>
<td>C9300</td>
<td>FNNVUE</td>
<td>0</td>
<td>0</td>
<td>!&lt;c9160(t9030F)&gt;runj mc76/exercise/info</td>
<td></td>
</tr>
<tr>
<td>T9140</td>
<td>C9300</td>
<td>FNNVUE</td>
<td>0</td>
<td>0</td>
<td>!&lt;c9160(t9030F)&gt;runj mc76/exercise/info</td>
<td></td>
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<tr>
<td>T9150</td>
<td>C9300</td>
<td>FNNVUE</td>
<td>0</td>
<td>0</td>
<td>!&lt;c9030(t9030F)&gt;runj mc76/exercise/stren</td>
<td></td>
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<tr>
<td>T9160</td>
<td>C9300</td>
<td>FNNVUE</td>
<td>0</td>
<td>0</td>
<td>!&lt;c9030(t9030F)&gt;runj mc76/exercise/stren</td>
<td></td>
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<tr>
<td>T9170</td>
<td>C9300</td>
<td>FNNVUE</td>
<td>0</td>
<td>0</td>
<td>!&lt;c9030(t9030F)&gt;run j mc76/exercise/stre</td>
<td></td>
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<tr>
<td>T9180</td>
<td>C9300</td>
<td>FNNVUE</td>
<td>0</td>
<td>0</td>
<td>!&lt;c9030(t9030F)&gt;run j mc76/exercise/stre</td>
<td></td>
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<tr>
<td>T9190</td>
<td>C9300</td>
<td>FNNVUE</td>
<td>0</td>
<td>0</td>
<td>!&lt;c9030(t9030F)&gt;runj mc76/exercise/stre</td>
<td></td>
</tr>
<tr>
<td>T9200</td>
<td>C9300</td>
<td>FNNVUE</td>
<td>0</td>
<td>0</td>
<td>!&lt;c9030(t9030F)&gt;runj mc76/exercise/stre</td>
<td></td>
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<tr>
<td>T9210</td>
<td>C9300</td>
<td>FNNVUE</td>
<td>0</td>
<td>0</td>
<td>!&lt;c9030(t9030F)&gt;runj mc76/exercise/stre</td>
<td></td>
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<tr>
<td>T9220</td>
<td>C9300</td>
<td>FNNVUE</td>
<td>0</td>
<td>0</td>
<td>!&lt;c9030(t9030F)&gt;runj mc76/exercise/stre</td>
<td></td>
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<tr>
<td>T9230</td>
<td>C9300</td>
<td>FNNVUE</td>
<td>0</td>
<td>0</td>
<td>!&lt;c9030(t9030F)&gt;runj mc76/exercise/stre</td>
<td></td>
</tr>
<tr>
<td>T9240</td>
<td>C9550</td>
<td>FNNVUE</td>
<td>0</td>
<td>0</td>
<td>!&lt;c9030(t9030F)&gt;runj mc76/exercise/stre</td>
<td></td>
</tr>
<tr>
<td>T9250</td>
<td>C9550</td>
<td>FNNVUE</td>
<td>0</td>
<td>0</td>
<td>!&lt;c9030(t9030F)&gt;runj mc76/exercise/stre</td>
<td></td>
</tr>
<tr>
<td>T9260</td>
<td>C9550</td>
<td>FNNVUE</td>
<td>0</td>
<td>0</td>
<td>!&lt;c9030(t9030F)&gt;runj mc76/exercise/stre</td>
<td></td>
</tr>
<tr>
<td>T9270</td>
<td>C9300</td>
<td>FNNVUE</td>
<td>0</td>
<td>0</td>
<td>!&lt;c9030(t9030F)&gt;runj mc76/exercise/stre</td>
<td></td>
</tr>
</tbody>
</table>
T9280  C9300  FNNVUE  0  0  !runs mc76/exercise/dployhpa
T9290  C9300  FNNVUE  0  0  !runj mc76/exercise/dployhpa
T9300  C9300  FNNVUE  0  0  !run mc76/exercise/cinc
T9310  C9300  FNNVUE  0  0  !runs mc76/exercise/cinc
T9320  C9300  FNNVUE  0  0  !<c9030(t9030F)>runj mc76/exercise/cinc
T9330  C9300  FNNVUE  0  0  !run mc76/exercise/cinc
T9340  C9300  FNNVUE  0  0  !runj mc76/exercise/exdepLoy
T9350  C9300  FNNVUE  0  0  !runs mc76/exercise/exdepLoy
T9360  C9300  FNNVUE  0  0  !runj mc76/exercise/exdepLoy
T9370  C9300  FNNVUE  0  0  !runs mc76/exercise/trans
T9380  C9300  FNNVUE  0  0  !<c9030(t9030F)>runj mc76/exercise/trans
T9390  C9300  FNNVUE  0  0  !<c9030(t9030F)>runj mc76/exercise/rptor
T9400  C9300  FNNVUE  0  0  !runs mc76/exercise/rptor
T9410  C9300  FNNVUE  0  0  !runj mc76/exercise/rptor
T9420  C9300  FNNVUE  0  0  !run mc76/exercise/mboistol
T9430  C9300  FNNVUE  0  0  !runj mc76/exercise/mboistol
T9440  C9300  FNNVUE  0  0  !<c9030(t9030F)>runj mc76/exercise/mbco
T9320  C150  FNNVUE  0  0  !<c9030(t9030F)>bye
T2100  C9030  FNNVUE  0  0  !<CR>
C9050  C9030  D9040  SNFN  WWDSM  outnup  !compiler pass 1
T9500  C9051  FNNVSE  0  0  !<c9040(t9040 t9060)>CR><NL>
C9051  C9030  D560  SNFN  WWDSM  outnup  !compiler pass 2
T9501  C9052  FSNVSE  0  1  !<all><CR><NL>
C9052  C9030  D9045  SNFN  WWDSM  outnup  !1st question for EQUIP
T9520  C9070  FNNVSE  0  0  !<all>ENTER REQUIRED PARAMETER FOR 'OMN
C9070  C9030  D40  UNVN  WWDSM  outnup  !user enters cat file
T2100  C9080  VSNVUE  0  0  !<all>omni/<userid-prefix>/<filename>
C9080  C9030  D9060  SNVN  WWDSM  outnup  !query for fldname
T9530  C9090  FNNVSE  0  0  !<all>ENTER FLDNAME = LITERAL
T9530  C9090  VSNVSE  0  0  !ENTER FLDNAME = LITERAL
T9030  C9040  FNNVSE  0  0  !<CR><NL>*
T9030  C9040  VSNVSE  0  0  !prompt preceded by error
C9090  C9030  D40  UNVN  WWDSM  outnup  !user enters fieldname
T2100  C9100  VSNVUE  0  0  !<all>fieldname = "literal"
C9100  C9030  D9060  SNVN  WWDSM  outnup  !query for sort-key1
T9540  C9110  FNNVSE  0  0  !<c9090>ENTER SORT-KEY1
T9540  C9110  VSNVSE  0  0  !ENTER SORT-KEY1
T9030  C9040  FNNVSE  0  0  !<CR><NL>*
T9030  C9040  VSNVSE  0  0  !prompt preceded by error
C9110  C9030  D40  UNVN  WWDSM  outnup  !user enters sort-key1
T2100  C9120  VSNVUE  0  0  !<all>sort-key1

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C9120 C9030 D9060 SNVN WWDM outnup !query for sort-key2
T9550 C9130 FNNVSE 0 0 !<c9110>ENTER SORT-KEY2
T9550 C9130 VSNVSE 0 0 !ENTER SORT-KEY2
T9030 C9040 FNNVSE 0 0 !<CR><NL>*
T9030 C9040 VSNVSE 0 0 !prompt preceded by error
C9130 C9030 D40 UNVN WWDM outnup !user enters last arg
T9325 C9140 VNNVUE 0 0 !<c9120(t9550F) c9390(t9600F t9600V)>La
T9550 C9130 FNNVSE 0 0 !<ALL>ENTER SORT-KEY2
T9550 C9130 VSNVSE 0 0 !<ALL>ENTER SORT-KEY2
T9030 C9040 FNNVSE 0 0 !<CR><NL>*
T9030 C9040 VSNVSE 0 0 !prompt preceded by error
C9150 C9030 D40 UNVN WWDM outnup !user enters filename
T9325 C9160 VNNVUE 0 0 vumc1 !<c9140><filename>
C9160 C9160 D9050 SNVN WWDM !compiler pass 3
T9500 C9170 FNNVSE 0 0 !<all><CR><NL>
T9030 C9040 FNNVSE 0 0 !<all><CR><NL>*
T9030 C9040 VSNVSE 0 0 !prompt preceded by error
C9170 C9170 D9070 SNVN WWDM !run-id
T9501 C9170 FSNVSE 0 1 !<c9160(t9501F).<CR><NL>
T9700 C9180 FNNVSE 0 0 !<c9170(t9501F)>RUN-ID?
T9030 C9040 FNNVSE 0 0 !<CR><NL>*
T9030 C9040 VSNVSE 0 0 !prompt preceded by error
T2050 C9170 FNNVSE 0 0 !<c9160(t9500F)>CR<NL>
T9325 C9170 VNNVUE 0 0 !prompt preceded by error
C9180 C9030 D40 UNVN WWDM outnup !user enters run-id
T9325 C9190 VNNVUE 0 0 !<all><run-id>
C9190 C9030 D9080 SNVN WWDM outnup !ident?
T9710 C9200 FNNVSE 0 0 !<all><CR>IDENT?
T9750 C9170 FNNVSE 0 0 !<CR><NL>MUST BE 12 CHARACTERS OR LESS
T2100 C9030 VNNVSE 0 0 !<CR><NL>*
C9200 C9030 D40 UNVN WWDM outnup !user enters ident
T100 C9210 VSNVSE 0 0 !<all><ident>
C9210 C9211 D9120 SNVN WWDM !end of status
T9030 C9040 FNNVSE 0 0 !<CR><NL>*
T9030 C9040 VSNVSE 0 0 !<c9200 c9210(t10290)<CR><NL>* precede
T9030 C9040 VSNVSE 0 0 !<c9200>(ab)normal termination
T10290 C9210 VSNVSE 0 0 !<c9200>NOT IN SYSTEM
T10300 C9030 VSNVSE 0 0 !<c9200>INVOKED JOUT MANUALLY
T9800 C9230 VSNVSE 0 0 !<c9210(t10210)>JOUT INVOKED FOR SNUMB.
T2100 C9210 FNNVSE 0 0 !<carriage return> (only)
T9030  C9040  VSNVSE  0  0  !<CR><NL> preceded by data/error
T9780  C9270  FNNVSE  0  0  !please direct, release, or hold before
C9240  C9231  D40  UNFN  WWDM  outnup  !user inputs print
T9802  C9250  FNNVUE  0  0  !print $$
T9803  C9250  FNNVUE  0  0  !print $$
T10230  C9250  FNNVUE  0  0  !<all>print 74
T10240  C9250  FNNVUE  0  0  !print 74
C9250  C9231  D9058  SRVN  WWDM  outnup  !end of print
T10170  C9260  VSNVSE  0  0  !end of $$
T10250  C9260  VSNVSE  0  0  !end of 74
T10260  C9230  FSNVSE  2  13  !74 not found
C9260  C9231  D9064  SNFN  WWDM  outnup  !second function
T9801  C9270  FNNVSE  0  0  !function?
C9270  C9231  D40  UNVN  WWDM  outnup  !second func choices
T10180  C9030  FNNVUE  0  0  !hold
T10190  C9030  VSNVUE  0  0  !rele
T10200  C9030  FNNVUE  0  0  !direct ac
T10205  C9030  FNNVUE  0  0  !direct onl
C9300  C9030  D9040  SNFN  WWDM  outnup  !compiler pass 1
T9500  C9301  FNNVSE  0  0  !<c9040(t9110 t9140 t9440 t9200 t9230 t
C9301  C9030  D560  SNFN  WWDM  outnup  !compiler pass 2
T9501  C9302  FSNVSE  0  1  !<all>.<CR><NL>
C9302  C9030  D9045  SNFN  WWDM  outnup  !1st question for ACCIMOB, INFO
T9520  C9320  FNNVSE  0  0  !<all>ENTER REQUIRED PARAMETER FOR 'OMN
C9320  C9030  D40  UNVN  WWDM  outnup  !user enters cat file
T9325  C9330  VNNVUE  0  0  !<all>omni/<userid-prefix>/<filename>
C9330  C9030  D9060  SNVN  WWDM  outnup  !query for fieldname
T9530  C9340  FNNVSE  0  0  !<all>ENTER FLDNAME = LITERAL
T9530  C9340  VSNVSE  0  0  !ENTER FLDNAME = LITERAL
T9531  C9340  FNNVSE  0  0  !<all>ENTER FLDNAME = LITERAL
T9531  C9340  VSNVSE  0  0  !ENTER FLDNAME = LITERAL
T9030  C9040  FNNVUE  0  0  !<CR><NL>preceded by error
T9030  C9040  VSNVSE  0  0  !<CR><NL>preceded by error
C9340  C9030  D40  UNVN  WWDM  outnup  !user enters fieldname
T9325  C9350  VNNVUE  0  0  !<all>fieldname = "literal"
C9350  C9030  D9060  SNVN  WWDM  outnup  !query for sort-field1
T9580  C9360  FNNVSE  0  0  !<all>ENTER SORT-FLD1
T9580  C9360  VSNVSE  0  0  !<c9340>ENTER SORT-FLD1
T9030  C9040  FNNVUE  0  0  !<CR><NL>
<table>
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<tr>
<th>T9030</th>
<th>C9040</th>
<th>VSNVSE</th>
<th>0</th>
<th>0</th>
<th>!&lt;CR&gt;&lt;NL&gt;* preceded by error</th>
</tr>
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<td>C9360</td>
<td>C9030</td>
<td>D40</td>
<td>UNVN</td>
<td>WWDM</td>
<td>outnup !user enters sort-field1</td>
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<tr>
<td>T9325</td>
<td>C9370</td>
<td>VNNVUE</td>
<td>0</td>
<td>0</td>
<td>!&lt;all&gt;sort-field1</td>
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<tr>
<td>C9370</td>
<td>C9030</td>
<td>D9060</td>
<td>SNVN</td>
<td>WWDM</td>
<td>outnup !query for sort-field2</td>
</tr>
<tr>
<td>T9590</td>
<td>C9380</td>
<td>FNNVSE</td>
<td>0</td>
<td>0</td>
<td>!&lt;all&gt;ENTER SORT-FLD2</td>
</tr>
<tr>
<td>T9590</td>
<td>C9380</td>
<td>VSNVSE</td>
<td>0</td>
<td>0</td>
<td>!&lt;all&gt;ENTER SORT-FLD2</td>
</tr>
<tr>
<td>T9030</td>
<td>C9040</td>
<td>FNNVSE</td>
<td>0</td>
<td>0</td>
<td>!&lt;CR&gt;&lt;NL&gt;*</td>
</tr>
<tr>
<td>T9030</td>
<td>C9040</td>
<td>VSNVSE</td>
<td>0</td>
<td>0</td>
<td>!&lt;CR&gt;&lt;NL&gt;* preceded by error</td>
</tr>
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<td>C9380</td>
<td>C9030</td>
<td>D40</td>
<td>UNVN</td>
<td>WWDM</td>
<td>outnup !user enters sort-field2</td>
</tr>
</tbody>
</table>
| T9325 | C9390 | VNNVUE | 0  | 0  | !<CR><NL>*!
| C9390 | C9030 | D9060 | SNVN | WWDM | outnup !sort-field3 query |
| T9600 | C9130 | FNNVSE | 0  | 0  | !<all>ENTER SORT-FLD3 |
| T9600 | C9130 | VSNVSE | 0  | 0  | !<all>ENTER SORT-FLD3 |
| T9030 | C9040 | FNNVSE | 0  | 0  | !<CR><NL>*!
| T9030 | C9040 | VSNVSE | 0  | 0  | !<CR><NL>* preceded by error |
| C9550 | C9030 | D9040 | SNFN | WWDM | outnup !compiler pass 1 |
| T9500 | C9551 | FNNVSE | 0  | 0  | !<CR><NL>.
| C9551 | C9030 | D560 | SNFN | WWDM | outnup !compiler pass 2 |
| T9501 | C9552 | FSNVSE | 0  | 1  | !<CR><NL>.
| C9552 | C9030 | D9045 | SNFN | WWDM | outnup !1st question for RPTMOB, DEPLOY |
| T9570 | C9570 | FNNVSE | 0  | 0  | !ENTER PARAM FOR 'SBRPT' |
| C9570 | C9030 | D40 | UNVN | WWDM | outnup !user enters sbrpt |
| T2100 | C9580 | VSNVUE | 0  | 0  | !<all>"w..."
| C9580 | C9030 | D9060 | SNVN | WWDM | outnup !query for cat file |
| T9521 | C9590 | FNNVSE | 0  | 0  | !<all>ENTER PARAM FOR OMNI CATFILE |
| T9521 | C9590 | VSNVSE | 0  | 0  | !<all>ENTER PARAM FOR OMNI CATFILE |
| T9030 | C9040 | FNNVSE | 0  | 0  | !<CR><NL>*!
| T9030 | C9040 | VSNVSE | 0  | 0  | !<CR><NL>* preceded by error |
| C9590 | C9030 | D40 | UNVN | WWDM | outnup !user enters catfile name |
| T2100 | C9350 | VSNVUE | 0  | 0  | !<all>omni/<userid-prefix>/<filename> |
| C11000 | C999 | D11000 | SNVN | TLCF | outnup ! announce teleconferencing |
| T11000 | C11010 | VSNVSE | 0  | 0  | !"TELECONFERENCING AT ... " |
| T11001 | C280 | FNNVSE | 0  | 0  | !"ILLEGAL CLASSIFICATION CODE" |
| C11010 | C11010 | D11010 | SNFN | TLCF | outnup ! prompt user for conf action |
| T11010 | C11020 | FSNVSE | 122 | 31 | !"USER ASSISTANCE IS AVAILABLE ... " |
| C11020 | C11010 | D40 | UNFN | TLCF | outnup ! user enters conf action |
| T11020 | C11030 | FNNVUE | 0  | u | !j(oin) |

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T11021 C11030 FNNVUE 0 0 ! jo(in)
T11022 C11030 FNNVUE 0 0 ! jo(in)
T11023 C11030 FNNVUE 0 0 ! join
C11030 C11010 D11030 SNFN TLF outnup ! prompt user for conf name
T11030 C11040 FNNVSE 0 0 ! "NAME OF CONFERENCE YOU WISH TO JOIN?"
T11031 C999 VSFVSE 0 0 exit ! "LINE TERMINATED" (bad conf n
C11040 C11010 D40 UNFN TLF outnup ! user enters conf name
T11040 C11050 VNNVUE 0 0 ! <conference name>
C11050 C11030 D11050 SNFN TLF outnup ! prompt user for name
T11050 C11060 FNNVSE 0 0 ! "PARTICIPANT'S NAME?"
T11051 C11030 FNNVSE 0 0 ! "SORRY, THAT CONFERENCE IS NOT IN SES
C11060 C11010 D40 UNVN TLF outnup ! user enters name
T11060 C11070 VNNVUE 0 0 ! <name>
C11070 C11050 D11070 SNFN TLF outnup ! prompt user for password
T11070 C11080 FNNVSE 0 0 ! "PARTICIPANT'S PASSWORD ... "
T11071 C11050 FNNVSE 0 0 ! "SORRY, NAME GIVEN NOT RECOGNIZED"
T11072 C999 FNNVSE 0 0 ! "ACCESS DENIED"
C11080 C11010 D40 UNVN TLF outnup ! user enters password
T11080 C11090 VNNVUE 0 0 ! <participant password>
C11090 C11070 D11090 SNFN TLF outnup ! prompt user for host name
T11090 C11100 FNNVSE 0 0 ! "THE FOLLOWING QUESTIONS CONCERN ...
T11091 C11140 FNNVSE 0 0 ! "ACCESS GRANTED"
T11072 C999 FNNVSE 0 0 ! "ACCESS DENIED"
T11070 C11080 FNNVSE 0 0 ! "PARTICIPANTS PASSWORD ... "
C11100 C11010 D40 UNVN TLF outnup ! user enters host name
T11100 C11110 VNNVUE 0 0 ! <host name>
C11110 C11090 D11110 SNFN TLF outnup ! prompt user for ident
T11110 C11120 FNNVSE 0 0 ! "ENTER YOUR ACCOUNT NUMBER, ... "
T11111 C11120 FNNVSE 0 0 ! "ENTER YOUR ACCOUNT NUMBER, ... "
T12271 C11090 FNNVSE 0 0 !INVALID HOST NAME<SP><SP><SP>
C11120 C11010 D40 UNVN TLF outnup ! user enters ident
T11120 C11130 VSNVUE 0 0 ! <ident>
C11130 C11010 D11130 SNFN TLF outnup ! outcome of join
T11091 C11140 FNNVSE 0 0 ! "ACCESS GRANTED"
C11140 C11010 D11140 SNVN TLF outnup ! conf security classification
T11140 C11150 VSNVSE 0 0 ! "CONFERENCE SECURITY CLASSIFICATION .
C11150 C11010 D11140 SNVN TLF outnup ! message announcement status

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THERE ARE NO ANNOUNCEMENTS AT THIS TIME.

ANNOUNCEMENT MESSAGE NUMBERS ARE ...

LATEST MESSAGE NUMBER IS n

LAST MESSAGE SEEN WAS NUMBER n

LISTEN MODE ENTERED IN ...

Listen mode polling

Listen mode polling preceded by form feed

Listen mode polling preceded by message

(Any user input is accepted and ignored)

user enters command

user enters command preceded by form feed

user enters command preceded by message

message received

user last joined

user last left

ANY USER INPUT IS ACCEPTED AND IGNORED

COMMAND ?

COMMAND ? (preceded by form feed)

COMMAND ? (preceded by message)

user enters command

user enters command preceded by form feed

user enters command preceded by message

NO MESSAGES WAITING

MESSAGE NUMBER

NO MESSAGES WAITING

MESSAGE NUMBER

bulletin verb

bulletin message

COMMAND ?

communication

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<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Action</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>T12060</td>
<td>C12070 FSNVSE 0 92</td>
<td>&quot;ENTER ONE LINE PER PROMPT (-) ... &quot;</td>
<td></td>
</tr>
<tr>
<td>T12061</td>
<td>C12000 FSNVSE 0 34</td>
<td>&quot;INVALID COMMUNICATION ARGUMENT&quot;</td>
<td></td>
</tr>
<tr>
<td>C12070</td>
<td>C12000 D12070 SNVN TLF outnup</td>
<td>comm input prompt</td>
<td></td>
</tr>
<tr>
<td>T12070</td>
<td>C12080 FSNVSE 0 3</td>
<td>&quot;&quot;</td>
<td></td>
</tr>
<tr>
<td>T12071</td>
<td>C12000 FSNVSE 0 22</td>
<td>&quot;COMMUNICATION SENT&quot;</td>
<td></td>
</tr>
<tr>
<td>T12072</td>
<td>C12000 FSNVSE 0 34</td>
<td>&quot;COMMUNICATION REQUEST IGNORED&quot;</td>
<td></td>
</tr>
<tr>
<td>T12000</td>
<td>C12010 VSNVSE 0</td>
<td>&quot;COMMAND ?&quot; (preceded by msg)</td>
<td></td>
</tr>
<tr>
<td>C12080</td>
<td>C12000 D40 UNFN TLF outnup</td>
<td>user comm input</td>
<td></td>
</tr>
<tr>
<td>T11040</td>
<td>C12070 VNNVUE 0</td>
<td>&quot;COMMAND ?&quot; (preceded by msg)</td>
<td></td>
</tr>
<tr>
<td>C12100</td>
<td>C12000 D12100 SVN TLF outnup</td>
<td>definition output</td>
<td></td>
</tr>
<tr>
<td>T12100</td>
<td>C12010 FNNVSE 0</td>
<td>&quot;FLOOR RECORDING IS OFF&quot;</td>
<td></td>
</tr>
<tr>
<td>T12101</td>
<td>C12010 FNNVSE 0</td>
<td>&quot;FLOOR RECORDING IS ON&quot;</td>
<td></td>
</tr>
<tr>
<td>T12102</td>
<td>C12010 FNNVSE 0</td>
<td>&quot;CONFERENCE IS OPEN TO JOINING ... &quot;</td>
<td></td>
</tr>
<tr>
<td>T12103</td>
<td>C12010 FNNVSE 0</td>
<td>&quot;CONFERENCE IS CLOSED TO JOINING ... &quot;</td>
<td></td>
</tr>
<tr>
<td>T12104</td>
<td>C12010 FNNVSE 0</td>
<td>&quot;OPTION RESTRICTED TO INITIATING ... &quot;</td>
<td></td>
</tr>
<tr>
<td>T12105</td>
<td>C12010 FNNVSE 0</td>
<td>&quot;OPTION RESTRICTED TO CURRENT ... &quot;</td>
<td></td>
</tr>
<tr>
<td>T12106</td>
<td>C12010 FNNVSE 0</td>
<td>&quot;NO ALTERNATES HAVE BEEN ASSIGNED&quot;</td>
<td></td>
</tr>
<tr>
<td>T12107</td>
<td>C12110 VSNVSE 0</td>
<td>&quot;... CHANGE?&quot;</td>
<td></td>
</tr>
<tr>
<td>T12108</td>
<td>C12100 VSNVSE 0</td>
<td>&quot;... FILE INSERT LIMIT IS— ... &quot;</td>
<td></td>
</tr>
<tr>
<td>T12000</td>
<td>C12010 VSNVSE 0</td>
<td>&quot;COMMAND ?&quot; (preceded by anything)</td>
<td></td>
</tr>
<tr>
<td>T12110</td>
<td>C12000 D40 UNVN TLF outnup</td>
<td>user responds to definition p</td>
<td></td>
</tr>
<tr>
<td>T11040</td>
<td>C12120 VNNVUE 0</td>
<td>&quot;COMMAND ?&quot; (only)</td>
<td></td>
</tr>
<tr>
<td>C12120</td>
<td>C12000 D12120 SNVN TLF outnup</td>
<td>system response to user input</td>
<td></td>
</tr>
<tr>
<td>T12000</td>
<td>C12010 FNNVSE 0</td>
<td>&quot;COMMAND ?&quot; (only)</td>
<td></td>
</tr>
<tr>
<td>T12120</td>
<td>C12110 FSNVSE 0</td>
<td>&quot;HOST?&quot;</td>
<td></td>
</tr>
<tr>
<td>T12121</td>
<td>C12110 FSNVSE 0</td>
<td>&quot;$IDENT?&quot;</td>
<td></td>
</tr>
<tr>
<td>T12122</td>
<td>C12110 FSNVSE 0</td>
<td>&quot;NEW IDENT CARD NOT VALID AT THIS ... &quot;</td>
<td></td>
</tr>
<tr>
<td>T12000</td>
<td>C12010 VSNVSE 0</td>
<td>&quot;COMMAND ?&quot; (preceded by anything)</td>
<td></td>
</tr>
<tr>
<td>C12200</td>
<td>C12000 D12200 SNVN TLF outnup</td>
<td>floor response</td>
<td></td>
</tr>
<tr>
<td>T12200</td>
<td>C12210 FSNVSE 0</td>
<td>&quot;ENTER ONE LINE OF TEXT ... &quot;</td>
<td></td>
</tr>
<tr>
<td>T12201</td>
<td>C12000 FSNVSE 0</td>
<td>&quot;CHAIRMAN NOT PRESENT ... &quot;</td>
<td></td>
</tr>
<tr>
<td>T12202</td>
<td>C12000 FSNVSE 0</td>
<td>&quot;FLOOR INVALID COMMAND&quot;</td>
<td></td>
</tr>
<tr>
<td>T12203</td>
<td>C12010 VSNVSE 0</td>
<td>&quot;INVALID FLOOR COMMAND ... &quot;</td>
<td></td>
</tr>
<tr>
<td>T12000</td>
<td>C12010 VSNVSE 0</td>
<td>&quot;COMMAND ?&quot; (preceded by anything)</td>
<td></td>
</tr>
<tr>
<td>C12220</td>
<td>C12000 D40 UNVN TLF outnup</td>
<td>floor prompt for input</td>
<td></td>
</tr>
<tr>
<td>T12220</td>
<td>C12220 FSNVSE 0</td>
<td>&quot;(ENTER BREAK STATUS OR NULL ...)&quot;</td>
<td></td>
</tr>
<tr>
<td>T11040</td>
<td>C12230 VNNVUE 0</td>
<td>floor request input</td>
<td></td>
</tr>
<tr>
<td>C12230</td>
<td>C12000 D40 UNVN TLF outnup</td>
<td>floor request acknowledged</td>
<td></td>
</tr>
<tr>
<td>T12230</td>
<td>C12000 FSNVSE 0</td>
<td>&quot;CHAIRMAN'S APPROVAL ... &quot;</td>
<td></td>
</tr>
</tbody>
</table>

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C12240 C12000 D12240 SNFN TLCF outnup ! giveup response
T12240 C12000 FSNVSE 0 30 ! "COMMAND VALID FOR FLOOR ONLY"

C12250 C12000 D12250 SNVN TLCF outnup ! print response
T12250 C12000 FSNVSE 0 38 ! "PRINT REQUEST INCOMPLETE OR INVALID"
T12251 C12000 FSNVSE 0 26 ! "MESSAGE NUMBER TOO HIGH"
T12252 C12260 VSNVSE 0 0 ! "... CHANGE?"
T12000 C12010 VSNVSE 0 0 ! "COMMAND ?" (preceded by anything)

C12260 C12000 D40 UNVN TLCF outnup ! user enters info to prompt
T11040 C12270 VNNVUE 0 0 ! (any user input)
C12270 C12000 D12270 SNVN TLCF outnup ! print request prompts
T12270 C12260 FSNVSE 0 46 ! "ENTER HOST NAME FOR DELIVERY ..."
T12271 C12270 FSNVSE 0 22 ! "INVALID HOST NAME"
T12272 C12260 VSNVSE 0 0 ! "... CHANGE?"
T12273 C12260 VSNVSE 0 52 ! "ENTER YOUR ACCOUNT NUMBER, NAME ..."
T12274 C12260 FSNVSE 0 80 ! "IDENT INFORMATION NOT VALID ..."
T12000 C12010 VSNVSE 0 0 ! "COMMAND ?" (preceded by anything)

C12350 C12000 D12350 SNFN TLCF outnup ! quit
T12350 C999 FSNVSE 0 18 ! "QUIT SUCCESSFUL"

C12360 C12000 D12360 SNFN TLCF outnup ! review
T12360 C12000 FSNVSE 0 24 ! "INVALID REVIEW REQUEST"
T11600 C12050 FNNVSE 0 0 !<CR><NL><NP>

C12450 C12000 D12450 SRVN TLCF outnup ! status
T12050 C12010 VSNVSE 0 0 ! "COMMAND ?"
C12470 C12000 D12450 SRFN TLCF outnup ! ? output
T12470 C12010 FSNVSE 809 9 ! "THIS TERMINAL IS CURRENTLY ..."

C12500 C12000 D12500 SNFN TLCF outnup ! determine describe output
T12500 C12000 FSNVSE 5 14 ! ">>>ADD<<<"
T12501 C12610 FSNVSE 5 14 ! ">>>ADJOURN<<<"
T12502 C12620 FSNVSE 5 14 ! ">>>ANNNOUNCE<<<"
T12503 C12630 FSNVSE 5 14 ! ">>>BULLETIN<<<"
T12504 C12640 FSNVSE 5 14 ! ">>>CHAIR TO<<<"
T12505 C12650 FSNVSE 5 14 ! ">>>COMMUNICATION<<<"
T12506 C12660 FSNVSE 5 14 ! ">>>DEFINITION<<<"
T12507 C12670 FSNVSE 5 14 ! ">>>DELETE<<<"
T12508 C12680 FSNVSE 5 14 ! ">>>DESCRIBE<<<"
T12509 C12690 FSNVSE 5 14 ! ">>>ERASE<<<"
T12510 C12700 FSNVSE 5 14 ! ">>>FLOOR<<<"
T12511 C12710 FSNVSE 5 14 ! ">>>FORMAT<<<"
T12512 C12720 FSNVSE 5 14 ! ">>>GIVEUP<<<"
T12513 C12730 FSNVSE 5 14 ! ">>>INSERT<<<"
T12514 C12740 FSNVSE 5 14 ! ">>>KEYWORD<<<"
T12515 C12750 FSNVSE 5 14 ! ">>>LISTEN<<<"
T12516 C12760 FSNVSE 5 14 ! ">>>PDAC<<<"
T12517 C12770 FSNVSE 5 14 ! ">>>PRINT<<<"
T12518 C12780 FSNVSE 5 14 ! ">>>QUIT<<<"
T12519 C12790 FSNVSE 5 14 ! ">>>REVIEW<<<"
T12520 C12800 FSNVSE 5 14 ! ">>>STATUS<<<"
T12521 C12810 FSNVSE 5 14 ! ">>>TALK<<<"
T12522 C12820 FSNVSE 5 14 ! ">>>TERMINATE<<<"
T12523 C12830 FSNVSE 5 14 ! ">>>?<<<"
T12524 C12470 FSNVSE 5 14 ! "INVALID DESCRIBE ARGUMENT PASSED"

C12600 C12000 D12450 SRFN TLCF outnup ! add text
C12600 C12010 FSNVSE 471 9 ! "THIS VERB'S USAGE IS RESTRICTED ..."
C12610 C12000 D12450 SRFN TLCF outnup ! adjourn text
T12610 C12010 FSNVSE 454 9 ! "THIS VERB'S USAGE IS RESTRICTED ..."
C12620 C12000 D12450 SRFN TLCF outnup ! announce text
T12620 C12010 FSNVSE 589 9 ! "THIS VERB'S USAGE IS RESTRICTED ..."
C12630 C12000 D12450 SRFN TLCF outnup ! bulletin text
T12630 C12010 FSNVSE 240 9 ! "THIS VERB ALLOWS AN INDIVIDUAL ..."
C12640 C12000 D12450 SRFN TLCF outnup ! chair to text
T12640 C12010 FSNVSE 822 9 ! "THIS VERB'S USAGE IS RESTRICTED ..."
C12650 C12000 D12450 SRFN TLCF outnup ! communication text
T12650 C12010 FSNVSE 918 9 ! "THIS VERB WILL ALLOW INFORMAL ..."
C12660 C12000 D12450 SRFN TLCF outnup ! definition text
T12660 C12010 FSNVSE 2644 9 ! "THIS VERB DISPLAYS THE STATE ..."
C12670 C12000 D12450 SRFN TLCF outnup ! delete text
T12670 C12010 FSNVSE 360 9 ! "THIS COMMAND ALLOWS THE ..."
C12680 C12000 D12450 SRFN TLCF outnup ! describe text
T12680 C12010 FSNVSE 572 9 ! "THIS VERB IS USED TO OBTAIN ..."
C12690 C12000 D12450 SRFN TLCF outnup ! erase text
T12690 C12010 FSNVSE 289 9 ! "THIS COMMAND IS USED BY THE ..."
C12700 C12000 D12450 SRFN TLCF outnup ! floor text
T12700 C12010 FSNVSE 1311 9 ! "THE PURPOSE OF THE FLOOR ..."
C12710 C12000 D12450 SRFN TLCF outnup ! format text
T12710 C12010 FSNVSE 685 9 ! "THIS COMMAND IS USED BY THE ..."
C12720 C12000 D12450 SRFN TLCF outnup ! giveup text
T12720 C12010 FSNVSE 181 9 ! "THIS VERB ALLOWS A PARTICIPANT ..."
C12730 C12000 D12450 SRFN TLCF outnup ! insert text
<table>
<thead>
<tr>
<th>Line</th>
<th>Start</th>
<th>End</th>
<th>Action</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>T12730</td>
<td>C12010</td>
<td>FSNVSE 618</td>
<td>9</td>
<td>&quot;THIS IS A CHAIRMAN ONLY VERB ...&quot;</td>
</tr>
<tr>
<td>C12740</td>
<td>C12000</td>
<td>D12450</td>
<td>SRFN</td>
<td>TLF</td>
</tr>
<tr>
<td>T12740</td>
<td>C12010</td>
<td>FSNVSE 528</td>
<td>9</td>
<td>&quot;MESSAGES MAY BE ASSIGNED A ...&quot;</td>
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<td>C12750</td>
<td>C12000</td>
<td>D12450</td>
<td>SRFN</td>
<td>TLF</td>
</tr>
<tr>
<td>T12750</td>
<td>C12010</td>
<td>FSNVSE 328</td>
<td>9</td>
<td>&quot;TO RECEIVE CONFERENCE MESSAGES ...&quot;</td>
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<tr>
<td>C12760</td>
<td>C12000</td>
<td>D12450</td>
<td>SRFN</td>
<td>TLF</td>
</tr>
<tr>
<td>T12760</td>
<td>C12010</td>
<td>FSNVSE 561</td>
<td>9</td>
<td>&quot;THIS VERB OPENS A CONNECTION ...&quot;</td>
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<tr>
<td>C12770</td>
<td>C12000</td>
<td>D12450</td>
<td>SRFN</td>
<td>TLF</td>
</tr>
<tr>
<td>T12770</td>
<td>C12010</td>
<td>FSNVSE 1868</td>
<td>9</td>
<td>&quot;THIS VERB ALLOWS AN INDIVIDUAL ...&quot;</td>
</tr>
<tr>
<td>C12780</td>
<td>C12000</td>
<td>D12450</td>
<td>SRFN</td>
<td>TLF</td>
</tr>
<tr>
<td>T12780</td>
<td>C12010</td>
<td>FSNVSE 115</td>
<td>9</td>
<td>&quot;THIS VERB DISCONNECTS A ...&quot;</td>
</tr>
<tr>
<td>C12790</td>
<td>C12000</td>
<td>D12450</td>
<td>SRFN</td>
<td>TLF</td>
</tr>
<tr>
<td>T12790</td>
<td>C12010</td>
<td>FSNVSE 1265</td>
<td>9</td>
<td>&quot;THIS VERB ALLOWS A SELECTIVE ...&quot;</td>
</tr>
<tr>
<td>C12800</td>
<td>C12000</td>
<td>D12450</td>
<td>SRFN</td>
<td>TLF</td>
</tr>
<tr>
<td>T12800</td>
<td>C12010</td>
<td>FSNVSE 294</td>
<td>9</td>
<td>&quot;THIS VERB PRODUCES A REPORT ...&quot;</td>
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<tr>
<td>C12810</td>
<td>C12000</td>
<td>D12450</td>
<td>SRFN</td>
<td>TLF</td>
</tr>
<tr>
<td>T12810</td>
<td>C12010</td>
<td>FSNVSE 233</td>
<td>9</td>
<td>&quot;THIS VERB TRANSFERS A ...&quot;</td>
</tr>
<tr>
<td>C12820</td>
<td>C12000</td>
<td>D12450</td>
<td>SRFN</td>
<td>TLF</td>
</tr>
<tr>
<td>T12820</td>
<td>C12010</td>
<td>FSNVSE 422</td>
<td>9</td>
<td>&quot;THIS VERB'S USAGE IS RESTRICTED ...&quot;</td>
</tr>
<tr>
<td>C12830</td>
<td>C12000</td>
<td>D12450</td>
<td>SRFN</td>
<td>TLF</td>
</tr>
<tr>
<td>T12830</td>
<td>C12010</td>
<td>FSNVSE 173</td>
<td>9</td>
<td>&quot;THE QUESTION MARK IS USED ...&quot;</td>
</tr>
<tr>
<td>C13000</td>
<td>C13050</td>
<td>D13000</td>
<td>SNVN</td>
<td>TLF</td>
</tr>
<tr>
<td>T13000</td>
<td>C13010</td>
<td>VSNVSE 0</td>
<td>0</td>
<td>&quot;TALK MODE ENTERED IN ...&quot;</td>
</tr>
<tr>
<td>C13010</td>
<td>C13050</td>
<td>D13010</td>
<td>SNFN</td>
<td>TLF</td>
</tr>
<tr>
<td>T13010</td>
<td>C13050</td>
<td>FSNVSE 0</td>
<td>3</td>
<td>&quot;&gt;&quot; (talk mode prompt)</td>
</tr>
<tr>
<td>T13011</td>
<td>C13050</td>
<td>FSNVSE 0</td>
<td>3</td>
<td>&quot;-&quot; (alternate talk mode prompt)</td>
</tr>
<tr>
<td>T13012</td>
<td>C13020</td>
<td>FNNVSE 0</td>
<td>0</td>
<td>&lt;CR&gt;&lt;NL&gt;TO?</td>
</tr>
<tr>
<td>T13012</td>
<td>C13020</td>
<td>VSNVSE 0</td>
<td>0</td>
<td>&lt;CR&gt;&lt;NL&gt;TO?</td>
</tr>
<tr>
<td>T13013</td>
<td>C13020</td>
<td>FSNVSE 0</td>
<td>7</td>
<td>&quot;FROM?&quot;</td>
</tr>
<tr>
<td>T13014</td>
<td>C13020</td>
<td>FSNVSE 0</td>
<td>10</td>
<td>&quot;SUBJECT?&quot;</td>
</tr>
<tr>
<td>T13015</td>
<td>C13020</td>
<td>FSNVSE 0</td>
<td>8</td>
<td>&quot;CLASS?&quot;</td>
</tr>
<tr>
<td>T13016</td>
<td>C13020</td>
<td>FSNVSE 0</td>
<td>7</td>
<td>&quot;INFO?&quot;</td>
</tr>
<tr>
<td>T13017</td>
<td>C13020</td>
<td>FSNVSE 0</td>
<td>6</td>
<td>&quot;REF?&quot;</td>
</tr>
<tr>
<td>C13020</td>
<td>C13500</td>
<td>D40</td>
<td>UNVN</td>
<td>TLF</td>
</tr>
<tr>
<td>T11040</td>
<td>C13030</td>
<td>VNNVUE 0</td>
<td>0</td>
<td>(anything is valid)</td>
</tr>
<tr>
<td>C13030</td>
<td>C13500</td>
<td>D13010</td>
<td>SNFN</td>
<td>TLF</td>
</tr>
</tbody>
</table>
user enters talk mode command

$DESCRIBE<<

>>>$COMMAND<<<

$DELETE<<

$END<<<

$LIST<<<

$SELECT<<<

$SUBJECT<<<

$TALK<<

$INSERT<<<

INVALID DESCRIBE ARGUMENT PASSED

$describe text

THIS PARAMETER IS USED TO OBTAIN ...

$command text

THIS PARAMETER WILL CAUSE A ...

$delete text

THIS PARAMETER WILL CAUSE THE ...

$send text

THIS PARAMETER WILL CAUSE A ...

$List text

$LIST AS THE FIRST CHARACTERS ...
C13420  C13500  D13420  SNVN  TLCF  outnup  ! message number assigned
T13420  C13430  VSNVSE  0    0    "MESSAGE NUMBER ... "

C13430  C13500  D13430  SNFN  TLCF  outnup  ! return to talk mode
T13430  C13010  FNNVSE  0    0    "CONTINUING IN TALK MODE"

C13500  C13500  D13300  SNVN  TLCF  outnup  ! user entered a break
T13300  C13510  FNNVSE  0    0    <!CR><NL>MESSAGE DELETED BY PARTICIPANT
T13300  C13510  VSNVSE  0    0    <!CR><NL>MESSAGE DELETED BY PARTICIPANT
T12000  C12010  FSNVSE  0    9    "COMMAND ?" (command mode entered)
T11500  C11510  VSNVSE  0    0    "LISTEN MODE ENTERED IN ... "

C13510  C13500  D40  UNVN  TLCF  outnup  ! user enters carriage return
T11040  C11500  VNVUE  0    0    (anything)
A.5.2 Source Halting Delimiter File (GHDEL)

D1  \|"nl|"
D20 \|--
D30  |  |
D40  |cr|"
D50  ZMA|cr|"
      KED|cr|"
D110 ?|cr||nl|"
D130 ?|cr||nl|"
      Code"
D150 ?"
      Code"
D501 ?  "
D502 ?  "
      ERS"
D503 6  "
D504  L  "
D506 y|cr||nl|"
D509 6  "
      ?  "
      M ?"
D510 ?  "
      CODE"
D520 "
      DY"
      ?  "
      USY  "
D530 ?  "
      DY"
      FILE"
ERS"  
VED--"  
T CHARACTER"  
LONG"  
TION"  
E SAVE"  

? "  
DY"  
ERS"  
W--"  
E SAVE"  

|cr||nl|"  

|cr||nl|"  

|cr||nl|"INVALID COMMAND AT THIS LEVEL "  
|cr||nl|"TED "  

? "  
|cr||nl|"  
R |cr||nl|"LEVEL "  
R FILE "  

? "  

R FILE "  
R "  
E "  
R |cr||nl|"  

? "  

- "  

|nl||nl|"  
CP"  

|nl||nl|"  

|nl|"  
|cr|"  
| | |"  

? "  

A - 54
09050 .
  |cr|nl|**

09060 |cr|nl|=*
  |cr|nl|**

09061 *``
  ?``

09063 E|cr|nl|**

09064 ?``

09065 TEM``

09070 |cr|nl|*
  |cr|nl|``

09080 ?``
  LESS``
  |cr|cr|nl|``

09095 of 74``
  of $$``
  found``
  |cr|nl|``

09096 t|cr|nl|`
  *``

09097 -``

09100 ?``
  *``
  busy``
  found``

09120 |cr|nl|`
  |cr|nl|`
  |bell||bell||bell||bell||bell||bell|``
  TEM``
  ALLY``

011000 | ||cr|nl|`
  CODE``

011010 JOIN?``

011030 JOIN?
CP

D11050 NAME? "SESSION"
D11070 ZMA|cr|"NIZED" DENIED "
D11090 COPY "GRANTED " DENIED " ZMA|cr|"
D11110 NAME " CARD " CARD-- "
D11130 "
D11140 |cr|
D11180 |cr||nl|
D11190 CONFERENCE "
D11510 |cr||nl| CONFERENCE " |ff|"
D12000 COMMAND ?"
D12040 WAITING "MESSAGE NUMBER"
D12050 |cr||nl||ff| |cr||nl| COMMAND ?"
D12060 AGE "
ENT "
D12070 " SENT " IGNORED " COMMAND ?"
D12100 COMMAND ?" CHANGE? |cr||nl| LIMIT IS-- "

A - 57
FUNCTION. **

013300 PANT "
   |cr||nl|
MAND ??"

013320 TED ??

013330 yy |cr||nl|
COMMAND ??

013340 ENTERED |
   |cr||nl|>
   |cr||nl|-
   |cr|

013360 NAMES|cr||nl|
   |cr||nl|>
   |cr||nl|-

013400 |cr||nl|-

013410 |cr||nl|>
   MODE "
   ACCEPTED"

013420 |cr||nl|

013430 MODE "

013440 |cr||nl||ff|"
A.5.3 Source Text String File (GTEXT)

Long text string lines have been "wrapped around" onto the next line in order to fit onto the page. This wrapping is indicated by the characters "->" at the end of a line.

```
T1  ^
T2  |cr||nl|1316400|cr||nl|^*
T10 |cr||nl|PROGRAM NAME ->
T20  tss|cr|^*
T21  tlcf|cr|^*
T30  |cr||nl|TERMINAL ^
T40  |cr||nl|^*
T50  USERID$PASSWORD?|cr||nl||cr||nl|
  *%&<%#?**$%?AM+5*48#N&|#|cr|
  TX0GWBMEPVRMCBQNKMGAKZMA|cr|^*
T51  LOCKED|cr|^*
T60  /^*
T61  $^*
T90  |cr||nl|IDENT?|cr||nl|^*
T100 .^*
T110 |cr||nl|CLASSIFICATION OF YOUR OUTPUT?|cr||nl|^*
T111 |cr||nl|classification of your output?|cr||nl|^*
T120  zzz|cr|^*
T121  uzz|cr|^*
T122  ufo|cr|^*
T123  czz|cr|^*
```
CLASSIFICATION OF FILES YOU WILL CREATE?

ILLEGAL CLASSIFICATION CODE

SYSTEM ?

acce

acces

access

list

sios

tcon

wwdm

wwdms

bye

listl

listl

wwdm n

wwdms n

wwdm new

wwdms new

|cr||nl| LINE TERMINATED CP
FUNCTION?

CATALOG STRUCTURE TO WORKING LEVEL?

FILE TO BE MODIFIED?

NEW NAME?

NEW MAX SIZE IN LLINKS?

NEW PASSWORD?

MAX SIZE ILLEGALLY STATED?

GENERAL PERMISSIONS?

read

r

execute

e

write

w

append

a
SPECIFIC PERMISSIONS?

read/

write/

append/

a/

execute/

e/

modify/

m/

MORE?

SUCCESSFUL.

ERR-PERMISSIONS ILLEGALLY STATED

REQUEST DENIED

FILE TO BE MODIFIED?

TCOM VERSION 6.3, JUNE 1976

FUNCTIONAL AREA?

TCOM VERSION 6.3, JUNE 1976

FUNCTIONAL AREA?

NO TEMPORARY FILE SPACE CODE

fs

dem

|
T2060  0
T2061  1
T2062  2
T2063  3
T2064  4
T2065  5
T2066  6
T2067  7
T2068  8
T2069  9
T2100  \cr
T2110  \cr|\nl|OLD OR NEW--
T2120  \cr|\nl|FUNCTIONAL AREA BUSY
T2130  new|\cr
T2140  n|\cr
T2160  o
T2161  ol
T2162  old
T2180  same|\cr
T2181  s|\cr
T2190  \cr|\nl|READY
T2195  -- NONEXISTENT
T2196  ' DOES NOT EXIST—USE SAVE'
T2200  \cr|\nl|\nl|\cr|\nl|TRANSACTION TYPE ?
T2201  \cr|\nl| TRANSACTION TYPE ?

A - 64
T2202 |cr||nl|TRANSACTION TYPE?
T2205 |cr||nl||nl||cr||nl|INVALID TRANSACTION TYPE ON RETRIEVE
|cr||nl||cr||nl|ENTER TRANSACTION TYPE
T2210 |cr||nl|YOU PRESENTLY DO NOT HAVE A CURRENT FILE
T2211 |cr||nl|FILE NAME?
T2220 INCORRECT CAT/FILE DESCRIPTION
T2221 |cr||nl||nl|ERR-FILE NAME >8 CHARACTERS
T2222 |cr||nl|ERR-FILE NAME >8 CHARACTERS
T2223 IS NOT A LEGAL INPUT CHARACTER
T2224 IS AN ILLEGAL INPUT CHARACTER
T2225 TOO LONG
T2230 |cr||nl||nl||cr||nl|INVALID TRANSACTION TYPE - RETYPE -
T2240 NOT IN CURR FILE
T2250 |cr||nl|ILLEGAL PARAMETER
T2260 FILE PRESENTLY BUSY
T2270 |cr||nl|DATA SAVED-
T2280 |cr||nl||cr||nl||dc3||cr||nl|ready|cr||nl|
T2281 |cr||nl|ready|cr||nl|
T2290 a|cr|
T2300 a a|cr|
T2310 aa1|cr|
T2320 d|cr|
T2330 e|cr|
T2340 h|cr|
T2350 j|cr|
T2360 k|cr|
T2370  ka1|cr|*
T2380  l|cr|*
T2390  m|cr|*
T2400  n|cr|*
T2410  p|cr|*
T2420  r-1|cr|*
T2430  r-2|cr|*
T2440  r11|cr|*
T2450  r12|cr|*
T2460  aa4|cr|*
T2470  ka2|cr|*
T2480  t|cr|*
T2490  v|cr|*
T2500  x|cr|*
T2510  z a|cr|*
T2512  jsb|cr|*
T2514  j b|cr|*
T2516  n a|cr|*
T2518  n b|cr|*
T2519  xxx|cr|*
T2520  done|cr|*
T2540  dele"  
T2541  feed"  
T2542  next"  
T2543  nofe"
| T2544   | pass  |
| T2545   | rewi  |
| T2546   | skip  |
| T2547   | help  |
| T2548   | voca  |
| T2550   | remove clearfile|cr|  |
| T2555   | remov clearfile|cr|  |
| T2560   | remo clearfile|cr|  |
| T2580   | rese  |
| T2600   | retr  |
| T2610   | list|cr|  |
| T2611   | list  |
| T2612   | listl|cr|  |
| T2613   | listl |
| T2630   | resave|cr|  |
| T2631   | resa|cr|  |
| T2632   | resave |
| T2633   | resa  |
| T2640   | old|cr|  |
| T2645   | o|cr|  |
| T2890   | tnl|cr|  |
| T2891   | tn |
| T2910   | C  |
| T2940   | forward |
| T2941   | f  |
backward
b
get
g
test
\r
\r
\r
system
\r
\r
xmit
\r
\r
bye
\r
\r
data truncated
\r
invalid command at this level
end of transaction
more
\r
\r
\r
old file?
invalid command at this level
invalid transaction type - retype -
hd
as
am
av
| T2657 | TRANSACTION SEQUENCE NUMBER | \( |crl|n|l| \) |
|-------|-----------------------------|------------------|
| T2658 | TRANSACTION SEQUENCE NUMBER | \( |crl|n|l| \) |
| T2659 | ERROR MESSAGE | \( |crl|n|l| \) |
| T2660 | TRANSACTION SEQUENCE NUMBER | \( |crl|n|l| \) |

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| 03CE | E-CARD-TYPE|cr|nl| | | | |
| 04C---- | E-ORGUIC|cr|nl| | | | |
| 05CFS | E-RPTYP|cr|nl| | | | |
| 06C--- | E-RPTNR|cr|nl|cr||nl| |

| T2710 | cr|nl| cr|nl|TNC000010 TRANSACTION SEQUENCE NUMBER | cr|nl| DATA NAME | ERROR MESSAGE|cr||nl|
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| 02C- | H-SECURITY-CL|cr|nl| | | | |
| 03CH | H-CARD-TYPE|cr|nl| | | | |
| 04C-- | H-CARD-DAY|cr|nl| | | | |
| 05C-- | H-CARD-HR|cr|nl| | | | |
| 06C-- | H-CARD-MIN|cr|nl| | | | |
| 07CZ | H-ZULU|cr|nl| | | | |
| 08C--- | H-CARD-MONTH|cr|nl| | | | |
| 09C-- | H-CARD-YEAR|cr|nl| | | | |
| 10C- | H-REAL-EXERCISE|cr|nl| | | | |
| 11C---- | H-ORGUIC|cr|nl| | | | |
| 12CFS | H-RPTYP|cr|nl| | | | |
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| T2720 | cr|nl| | | | | |

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<tr>
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<tr>
<td>01E---</td>
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<tr>
<td>02E---</td>
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</tr>
<tr>
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<tr>
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<tr>
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<tr>
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<td>N-A-DISTR</td>
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<td>N-A-ORGUIC</td>
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<td>DATA</td>
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<td>ERROR MESSAGE</td>
</tr>
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<td>07C-</td>
<td>N-B-FRN</td>
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</tr>
<tr>
<td>08C-</td>
<td>N-B-RPTDES</td>
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</tr>
<tr>
<td>09C-</td>
<td>N-B-PLEAC</td>
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</tr>
<tr>
<td>10C-</td>
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<td>N-B-RSNL</td>
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<td>12C-</td>
<td>N-B-PUTCV</td>
<td>cr</td>
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<tr>
<td>13C-</td>
<td>N-B-POEGED</td>
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<td>14C-</td>
<td>N-B-PODEG</td>
<td>cr</td>
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<td>N-B-LAD</td>
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<td>17C-</td>
<td>N-B-RTMDIR</td>
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<td>N-B-GCMDCODE</td>
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<td>19C-</td>
<td>N-B-ORGUI</td>
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<td>20CFS</td>
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<td>21C-</td>
<td>N-B-RPTNR</td>
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**T3180**

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<tr>
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<tbody>
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<td>01C-</td>
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<td>KA1-EXLIM</td>
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<td>07C-</td>
<td>KA1-TRWRC1</td>
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<td>08C-</td>
<td>KA1-PSPER</td>
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<td>09C-</td>
<td>KA1-MSPER</td>
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<tr>
<td>10C-</td>
<td>KA1-APERT</td>
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<td>11C-</td>
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<td>12C-</td>
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<td>KA1-PERTL</td>
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<td>18C-</td>
<td>KA1-PERRS</td>
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<td>19C-</td>
<td>KA1-PERRE</td>
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A – 81
A - 82
T3480 |cr|nl|TN000010 TRANSACTION SEQUENCE NUMBER |cr|nl|
DATA NAME ERROR MESSAGE|cr|nl|
01[A-E VALIDATION|cr|nl|
02[C--- TRANSNUM|cr|nl|
03[C----- PIN|cr|nl|
04[C------- ULN|cr|nl|
05[C------- UIC|cr|nl|
06[C------- RTM|cr|nl|
07[C------- RTMEST|cr|nl|
08[C------- RSNLA|cr|nl|cr|nl|

T3490 |cr|nl|TN000010 TRANSACTION SEQUENCE NUMBER |cr|nl|
DATA NAME ERROR MESSAGE|cr|nl|
01[A-T TOA-PICKUP|cr|nl|
02[C--- TRANSNUM|cr|nl|
03[C----- PIN|cr|nl|
04[C------- ULN|cr|nl|
05[C------- UIC|cr|nl|
06[C------- RTMTOA|cr|nl|cr|nl|

T3500 |cr|nl|TN000010 TRANSACTION SEQUENCE NUMBER |cr|nl|
DATA NAME ERROR MESSAGE|cr|nl|
01[C-ED EMPLOY-DEPART|cr|nl|
02[C--- TRANSNUM|cr|nl|
03[C----- PIN|cr|nl|
04[C------- ULN|cr|nl|
05[C------- UIC|cr|nl|
06[C------- EMDD|cr|nl|cr|nl|

T3510 |cr|nl|TN000010 TRANSACTION SEQUENCE NUMBER |cr|nl|
DATA NAME ERROR MESSAGE|cr|nl|
01[C-A EMPLOY-ARRIVE|cr|nl|
02[C--- TRANSNUM|cr|nl|
03[C----- PIN|cr|nl|

A - 83
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
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</thead>
</table>
| T3520 | Transaction Sequence Number: 01C
| | Data Name: ULN, UIC, EMAD |
| | Error Message: cr|nl |
| | 01CMC: ARRIVE-MOBSTATION |
| | 02C: TRANSNUM |
| | 03C: UIC |
| | 04C: DTAMS |
| | 05C: PPA |

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
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</table>
| T3530 | Transaction Sequence Number: 01C
| | Data Name: ULN, UIC |
| | Error Message: cr|nl |
| | 01CMC: CHANGE-MOB-DATA |
| | 02C: TRANSNUM |
| | 03C: UIC |
| | 04C: MASTE |
| | 05C: MBSAD |
| | 06C: MBODD |
| | 07C: ACGEO |
| | 08C: MBCMD |

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
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</table>
| T3540 | Transaction Sequence Number: 01C
| | Data Name: ULN, UIC |
| | Error Message: cr|nl |
| | 01CPD: POE-LAST-DEPART |
| | 02C: TRANSNUM |
| | 03C: PIN |
| | 04C: ULN |
| | 05C: UIC |
| | 06C: POEDEPART |

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
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</table>
| T3550 | Transaction Sequence Number: 01C
| | Data Name: ULN, UIC |
| | Error Message: cr|nl |
| | 01CPD: POE-DEPART |
| | 02C: TRANSNUM |
| | 03C: PIN |
| | 04C: ULN |
| | 05C: UIC |
| | 06C: POEDEPART |
| | 07C: POECARRIER |

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| T3560 | Transaction Sequence Number: 01C
| | Data Name: ULN, UIC |
| | Error Message: cr|nl |
| | 01COL: ORIGIN-LAST-DEPART |

A - 84
In Li cr IDATA WAS MOVED

In Li cr SYSTEM ID IS INVALID ON WUFI

RECORDS

In Li cr SIOS RETURN ROUTINE
YOUR FILE YOU WANT TO USE

In Li cr RECORDS WERE RETURNED

In Li cr NO DATA FOR THIS SYSTEM ID
RECORDS WERE NOT RETURNED

In Li cr WUFI RECORDS WERE CLEARED

In Li cr SIOS CLEAR ROUTINE
SYSTEM ID YOU WANT TO USE

In Li cr NO DATA TO CLEAR

In Li cr SIOS SEARCH ROUTINE
SYSTEM ID YOU WANT TO USE

BLOCKS OF DATA

In Li cr NO RECORDS FOUND

ready

Illegal character

<52> CURRENT FILE NOT DEFINED

* run mc76/exercise/equip

run mc76/exercise/equip

runj mc76/exercise/equip

run mc76/exercise/rptmob

runs mc76/exercise/rptmob

runj mc76/exercise/rptmob

run mc76/exercise/accimob
T9100  runs mc76/exercise/accimob|cr|"  
T9110  runj mc76/exercise/accimob|cr|"  
T9120  run mc76/exercise/info|cr|"  
T9130  runs mc76/exercise/info|cr|"  
T9140  runj mc76/exercise/info|cr|"  
T9150  run mc76/exercise/strength|cr|"  
T9160  runs mc76/exercise/strength|cr|"  
T9170  runj mc76/exercise/strength|cr|"  
T9180  run mc76/exercise/ready|cr|"  
T9190  runs mc76/exercise/ready|cr|"  
T9200  runj mc76/exercise/ready|cr|"  
T9210  run mc76/exercise/pomcus|cr|"  
T9220  runs mc76/exercise/pomcus|cr|"  
T9230  runj mc76/exercise/pomcus|cr|"  
T9240  run mc76/exercise/deployrp|cr|"  
T9250  runs mc76/exercise/deployrp|cr|"  
T9260  runj mc76/exercise/deployrp|cr|"  
T9270  run mc76/exercise/dployhpa|cr|"  
T9280  runs mc76/exercise/dployhpa|cr|"  
T9290  runj mc76/exercise/dployhpa|cr|"  
T9300  run mc76/exercise/cinc|cr|"  
T9310  runs mc76/exercise/cinc|cr|"  
T9320  runj mc76/exercise/cinc|cr|"  
T9325  "  
T9330  run mc76/exercise/exdeploy|cr|"
T9340 runs mc76/exercise/exdeploy
T9350 runj mc76/exercise/exdeploy
T9360 run mc76/exercise/trans
T9370 runs mc76/exercise/trans
T9380 runj mc76/exercise/trans
T9390 run mc76/exercise/rptor
T9400 runs mc76/exercise/rptor
T9410 runj mc76/exercise/rptor
T9420 run mc76/exercise/mbcoistl
T9430 runs mc76/exercise/mbcoistl
T9440 runj mc76/exercise/mbcoistl
T9500 |cr||nl| .
T9501 .|cr||nl|
T9520 ENTER REQUIRED PARAMETER FOR 'OMNI-CATFILE'|cr||nl|= 
T9521 |cr||nl|ENTER REQUIRED PARAMETER FOR 'OMNI-CATFILE'|cr||nl|= 
T9530 |cr||nl|ENTER REQUIRED PARAMETER FOR 'WHERE-FLDNAME="LITERAL"'|cr||nl-> 
T9531 |cr||nl|ENTER REQUIRED PARAMETER FOR 'WHERE-FIELDNAME="LITERAL"'|cr||nl-> 
T9540 |cr||nl|ENTER REQUIRED PARAMETER FOR 'SORT-KEY1'|cr||nl|= 
T9550 |cr||nl|ENTER REQUIRED PARAMETER FOR 'SORT-KEY2'|cr||nl|= 
T9560 |cr||nl|ENTER REQUIRED PARAMETER FOR 'OUTPUT-CATFILE'|cr||nl|= 
T9570 ENTER REQUIRED PARAMETER FOR '"SBRPT"'|cr||nl|= 
T9580 |cr||nl|ENTER REQUIRED PARAMETER FOR 'SORT-FLD1-OR-BLANKS'|cr||nl|= 
T9590 |cr||nl|ENTER REQUIRED PARAMETER FOR 'SORT-FLD2-OR-BLANKS'|cr||nl|= 
T9600 |cr||nl|ENTER REQUIRED PARAMETER FOR 'SORT-FLD3-OR-BLANKS'|cr||nl|= 

A - 88
RUN-ID?

MUST BE 12 CHARACTERS OR LESS

SNUMB NOT IN SYSTEM

LOOK, MORE, DELE, ABRT, QUIT?

SNUMB(S)

SNUMB?

SNUMB NOT IN TABLE

SNumb?

Look

more

dele

abrt

quit

please direct, release, or hold before exit

JOUT INVOKED FOR SNUMB

function?

print $$

print $$

end of $$

hold

rele

direct ac

direct onl

normal termination
print 74\cr`
print 74\cr`
end of 74``
|cr|nl|74 not found``
output not found``
output busy``
NOT IN SYSTEM``
INVOKE JOUT MANUALLY``.
|cr|nl|ff|cr|nl|TELECONFERENCING AT ``
|cr|nl|ILLEGAL CLASSIFICATION CODE``
|cr|nl|USER ASSISTANCE IS AVAILABLE IN TALK AND COMMAND MODES. |cr|nl|
|cr|nl|THE QUESTION MARK (?) WILL INTRODUCE YOU TO THIS FEATURE. |cr|nl|
|cr|nl|INITIATE, RECONVENE, OR JOIN?``
|cr|``
|cr|``
|cr|``
|cr|``
|cr|nl|NAME OF CONFERENCE YOU WISH TO JOIN?``
LINE TERMINATED``
``
|cr|nl|PARTICIPANT'S NAME? ``
|cr|nl|SORRY, THAT CONFERENCE IS NOT IN SESSION``
|cr|nl|PARTICIPANT'S PASSWORD? |cr|nl|
*%&<%>??#%?AM*5*48#N&#|cr|
TXOGWBMWEPVRMCBQNKMGAKZMA|cr|``
|cr|nl|SORRY, NAME GIVEN NOT RECOGNIZED``
|cr|nl|ACCESS DENIED ``
THE FOLLOWING QUESTIONS CONCERN TRANSCRIPT DELIVERY
ENTER HOST NAME FOR DELIVERY OF YOUR COPY

ENTER YOUR ACCOUNT NUMBER, NAME FOR IDENT CARD

ACCESS GRANTED

ENTER YOUR ACCOUNT NUMBER, NAME FOR IDENT CARD—

CONFERENCE SECURITY CLASSIFICATION CODE IS

THERE ARE NO ANNOUNCEMENTS AT THIS TIME

ANNOUNCEMENT MESSAGE NUMBERS ARE

LATEST MESSAGE NUMBER IS

LAST MESSAGE SEEN WAS NUMBER

LISTEN MODE ENTERED IN

HAS JOINED THE CONFERENCE

HAS LEFT THE CONFERENCE

LISTEN MODE ENTERED IN

LIST

COMMAND ?

COMMAND ?

bull

comm

defi

floo

give

list
T12016 prin^T12017 quit^T12018 rev^T12019 stat^T12020 talk^T12021 ?^T12022 desc^T12040 \texttt{\textbackslash cr\textbackslash nl}|NO MESSAGES WAITING^T12041 \texttt{\textbackslash cr\textbackslash nl}|MESSAGE NUMBER^T12050 COMMAND ?^T12060 \texttt{\textbackslash cr\textbackslash nl}|ENTER ONE LINE PER PROMPT (-), 13 LINES MAX \texttt{\textbackslash cr\textbackslash nl}|NULL INPUT OR ALL SPACES = END OF MESSAGE ^T12061 \texttt{\textbackslash cr\textbackslash nl}|INVALID COMMUNICATION ARGUMENT^T12070 \texttt{\textbackslash cr\textbackslash nl}^T12071 \texttt{\textbackslash cr\textbackslash nl}|COMMUNICATION SENT ^T12072 \texttt{\textbackslash cr\textbackslash nl}|COMMUNICATION REQUEST IGNORED ^T12080 \texttt{\textbackslash cr}^T12090 \texttt{\textbackslash cr\textbackslash nl}|FLOOR RECORDING IS OFF \texttt{\textbackslash cr\textbackslash nl}|COMMAND ?^T12091 \texttt{\textbackslash cr\textbackslash nl}|FLOOR RECORDING IS ON \texttt{\textbackslash cr\textbackslash nl}|COMMAND ?^T12100 \texttt{\textbackslash cr\textbackslash nl}|CONFERENCE IS OPEN TO JOINING PARTICIPANTS \texttt{\textbackslash cr\textbackslash nl}|COMMAND ?^T12101 \texttt{\textbackslash cr\textbackslash nl}|CONFERENCE IS CLOSED TO JOINING PARTICIPANTS \texttt{\textbackslash cr\textbackslash nl}|COMMAND ?^T12102 \texttt{\textbackslash cr\textbackslash nl}|OPTION RESTRICTED TO INITIATING CHAIRMAN \texttt{\textbackslash cr\textbackslash nl}|COMMAND ?^T12103 \texttt{\textbackslash cr\textbackslash nl}|OPTION RESTRICTED TO CURRENT CHAIRMAN \texttt{\textbackslash cr\textbackslash nl}|COMMAND ?
T12106  |cr||nl|NO ALTERNATES HAVE BEEN ASSIGNED|cr||nl|
COMMAND ?^
T12107  CHANGE? |cr||nl|^  
T12108  FILE INSERT LIMIT IS--  "  
T12120  |cr||nl|HOST?  |cr||nl|^  
T12121  |cr||nl|$IDENT?  |cr||nl|^  
T12122  |cr||nl|NEW IDENT CARD NOT VALID AT THIS HOST  |cr||nl|
CHANGE? |cr||nl|^  
T12200  |cr||nl|ENTER ONE LINE OF TEXT TO BE SENT WITH YOUR REQUEST^
T12201  |cr||nl|SORRY, CHAIRMAN NOT PRESENT TO GRANT FLOOR PRIVILEGE^
T12202  |cr||nl|FLOOR INVALID COMMAND^
T12203  |cr||nl|INVALID FLOOR COMMAND ARGUMENT--^
T12210  |cr||nl|ENTER BREAK STATUS OR NULL RESPONSE IF TEXT IS NOT DESIRED)^
T12230  |cr||nl|CHAIRMAN'S APPROVAL IS BEING REQUESTED, CONTINUE YOUR ACTIVITY Y^
T12240  |cr||nl|COMMAND VALID FOR FLOOR ONLY^
T12250  |cr||nl|PRINT REQUEST INCOMPLETE OR INVALID^
T12251  |cr||nl|MESSAGE NUMBER TOO HIGH^
T12252  CHANGE?^
T12270  |cr||nl|ENTER HOST NAME FOR DELIVERY OF YOUR COPY^
T12271  |cr||nl|INVALID HOST NAME^
T12272  |cr||nl|CHANGE?^
T12273  |cr||nl|ENTER YOUR ACCOUNT NUMBER, NAME FOR IDENT CARD  |cr||nl|^  
T12274  |cr||nl|IDENT INFORMATION NOT VALID AT THIS HOST|cr||nl|
DO YOU WISH TO CHANGE IT(YES OR NO)?^
T12350  |cr||nl|QUIT SUCCESSFUL^
T12360  |cr||nl|INVALID REVIEW REQUEST^

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T12470 |cr||nl||cr||nl|THIS TERMINAL IS CURRENTLY IN COMMAND MODE.|cr||nl||c->
|nl|
COMMAND MODE ALLOWS A PARTICIPANT TO ENTER OTHER MODES, TO|cr||nl|
OBTAIN CONFERENCE INFORMATION AND TO PERFORM SPECIFIC FUNCTIONS.|cr||nl|
A SPECIFIC COMMAND CAPABILITY IS ACQUIRED BY RESPONDING WITH A|cr||nl->
|COMMAND VERB TO THE PROMPT 'COMMAND?'. THE POSSIBLE RESPONSES|cr||nl|
ARE:|cr||nl||cr||nl|
ADD   ADJOURN   ANNOUNCE   BULLETIN   CHAIR TO|-->
|nl|
COMMUNICATION DEFINITION DELETE DESCRIBE ERASE|cr|->
|nl|
FLOOR  FORMAT  GIVEUP  INSERT  KEYWORD|c->
|nl|
LISTEN  PDAC  PRINT  QUIT  REVIEW|cr->
|nl|
STATUS  TALK  TERMINATE  ?|cr||nl||cr||nl|
AN EXPLANATION OF EACH VERB IS POSSIBLE BY RESPONDING|cr||nl|
'DESCRIPTION VERB'--WHERE VERB IS ANY VALID COMMAND MODE VERB.|cr||nl||c->
|nl|
EXAMPLE:|cr||nl|
COMMAND?DESCRIBE FLOOR|cr||nl|
|cr||nl||cr||nl|

T12500 |cr||nl||ff||cr||nl|>>>ADD<<< |cr||nl|`
T12501 |cr||nl||ff||cr||nl|>>>ADJOURN<<< |cr||nl|`
T12502 |cr||nl||ff||cr||nl|>>>ANNOUNCE<<< |cr||nl|`
T12503 |cr||nl||ff||cr||nl|>>>BULLETIN<<< |cr||nl|`
T12504 |cr||nl||ff||cr||nl|>>>CHAIR TO<<< |cr||nl|`
T12505 |cr||nl||ff||cr||nl|>>>COMMUNICATION<<< |cr||nl|`
T12506 |cr||nl||ff||cr||nl|>>>DEFINITION<<< |cr||nl|`
T12507 |cr||nl||ff||cr||nl|>>>DELETE<<< |cr||nl|`
T12508 |cr||nl||ff||cr||nl|>>>DESCRIBE<<< |cr||nl|`
T12509 |cr||nl||ff||cr||nl|>>>ERASE<<< |cr||nl|`
T12510 |cr||nl||ff||cr||nl|>>>FLOOR<<< |cr||nl|`
T12511 |cr||nl||ff||cr||nl|>>>FORMAT<<< |cr||nl|`
T12512 |cr||nl||ff||cr||nl|>>>GIVEUP<<< |cr||nl|`

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T12513 |cr|nl|ff|cr|nl|>INSERT<|cr|nl|
T12514 |cr|nl|ff|cr|nl|>KEYWORD<|cr|nl|
T12515 |cr|nl|ff|cr|nl|>LISTEN<|cr|nl|
T12516 |cr|nl|ff|cr|nl|>PDAC<|cr|nl|
T12517 |cr|nl|ff|cr|nl|>PRINT<|cr|nl|
T12518 |cr|nl|ff|cr|nl|>QUIT<|cr|nl|
T12519 |cr|nl|ff|cr|nl|>REVIEW<|cr|nl|
T12520 |cr|nl|ff|cr|nl|>STATUS<|cr|nl|
T12521 |cr|nl|ff|cr|nl|>TALK<|cr|nl|
T12522 |cr|nl|ff|cr|nl|>TERMINATE<|cr|nl|
T12523 |cr|nl|ff|cr|nl|> ? <|cr|nl|
T12524 |cr|nl|INVALID DESCRIBE ARGUMENT PASSED*

T12600 |cr|nl|THIS VERB'S USAGE IS RESTRICTED TO THE CURRENT CHAIRMAN AND A-
|cr|nl|
HIM TO ADD TO THE VALID PARTICIPANT LIST FOR THE CONFERENCE. IT|cr|nl|
ALSO ALLOWS HIM TO CORRECT/CHANGE THE USERID ASSOCIATED WITH ..|cr|nl|
PARTICULAR PARTICIPANT NAME. A PARTICIPANT NAME CANNOT BE CHANGED.|c->
The USERID AND PARTICIPANT NAME TO BE ADDED/CORRECTED MUST FOLLOW|cr|nl|
The VERB IN THE SAME FORMAT USED DURING CONFERENCE INITIATION|cr|nl|
EXAMPLE|cr|nl|cr|nl|
COMMAND?ADD USERID/PNAME|cr|nl|

T12610 |cr|nl|THIS VERB'S USAGE IS RESTRICTED TO THE CURRENT CHAIRMAN AND A-
|cr|nl|
HIM TO ADJOURN A CONFERENCE SESSION. AN ADJOURNED CONFERENCE CAN|cr|nl|
BE RECONVENED AT A LATER TIME. AN ADJOURNMENT WILL NOT TAKE PLACE|cr|nl|
IF THERE ARE ACTIVE PARTICIPANTS OTHER THAN THE CHAIRMAN STILL|cr|nl|C
CONNECTED TO THE CONFERENCE. NO PARTICIPANTS ARE PERMITTED TO JOIN|c->

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THE CURRENT SESSION OF THE CONFERENCE ONCE THE ADJOURN IS ENTERED.

Example command? ADJOURN

Command? ADJOURN?

This verb's usage is restricted to the current chairman and allows him to create a list of messages to be displayed to participants upon joining. The arguments for the verb are a list of up to 10 valid message numbers delimited by semicolons. If no arguments are found the announcement list is purged.

Example 1:
Command? ANNOUNCE 2;3;5

Example 2:
Command? ANNOUNCE

This verb allows an individual participant to see the next message queued to his terminal without entering listen mode. Only one message will be received per each bulletin request.

Example 1:
Command? BULLETIN

Example 2:
Command? BULLETIN

This verb's usage is restricted to the chairman (current or original). The current chairman may pass the chairmanship to another active participant. The original chairman can at any time retake the chairmanship he previously passed.

Example 1:
Command? CHAIR TO PARTICIPANT NAME

Example 2:
Command? CHAIR TO

Another function of this command is to allow a designated alternate.
TO ASSUME THE CHAIRMANSHIP. THIS MAY ONLY BE DONE IF THE CONFERENCE IS WITHOUT A CHAIRMAN AT THE TIME THE COMMAND IS INVOKED.

EXAMPLE 3

COMMAND? CHAIR TO

(THE DESIGNATED ALTERNATE WILL RECEIVE THE CHAIR IF IT IS VACANT.)

Command? Chair

This verb will allow informal message text to be sent to several or all active participants. It differs from a talk message in that the message is not written to the transcript and is delivered with priority. This means the recipient does not have to be in listen mode to receive the communication.

Example

Command? Communication $All

Enter text when prompt character appears (-),

Maximum input is 13 lines

Null input or all spaces indicates end of message

-THESE ARE EXAMPLES OF A GENERAL COMMUNICATION REQUEST

-CR-

This verb displays the state of several conference parameters. In some cases it allows the state to be changed. A request may be general or specific. A general request will display all information to which the user is entitled. A specific request will display the requested information, and prompt for change when change is possible.

Example

DEFINITION -- THOSE CONFERENCE PARAMETERS AVAILABLE FOR

DEFINITION SCC -- DISPLAYS CONFERENCE SECURITY CLASSIFICATION

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cr

ATION; CAN BE CHANGED BY THE CURRENT CHAIRMAN

DEFINITION ACCESS -- INFORMS AS TO WHETHER NEW PARTICIPANTS->
MAY JOIN; cr

DEFINITION FLOOR -- INFORMS AS TO WHETHER FLOOR RECORDING I-
S TAKING cr

PLACE; CAN BE CHANGED BY THE CURRENT CHAIRMAN

DEFINITION FILE -- DISPLAYS THE NAME OF THE TRANSCRIPT FILE->
|cr

DEFINITION ANNOUNCE -- DISPLAYS THE ANNOUNCEMENT MESSAGE|cr->
||nl|

NUMBERS; CAN BE CHANGED BY THE CURRENT CHAIRMAN USING|->
cr

COMMAND MODE VERB ANNOUNCE|cr||nl|

DEFINITION INSERT -- DISPLAYS CURRENT INSERT FILE LINE|cr||->

LIMIT; CAN BE CHANGED BY CURRENT CHAIRMAN USING|cr||nl->
|

COMMAND MODE VERB INSERT|cr||nl|

DEFINITION KEYWORD -- TELLS HOW MANY KEYWORDS ARE CURRENT|->
cr

LY ASSIGNED; CAN BE CHANGED BY THE CURRENT CHAIRMAN|cr->
||nl|

USING COMMAND MODE VERB KEYWORD|cr||nl|

DEFINITION CHAIR -- DISPLAYS TO THE INITIATING CHAIRMAN|cr|->

HIS PASSWORD AND PROMPTS HIM FOR CHANGE|cr||nl|

DEFINITION PARTICIPANT -- DISPLAYS TO THE CHAIRMAN THE|cr|->

CURRENT PARTICIPANT PASSWORD AND PROMPTS FOR CHANGE|cr->

DEFINITION LIST -- DISPLAYS A LIST OF ALL VALID PARTICI->

PANTS, FOR THE CURRENT CHAIRMAN IT ALSO DISPLAYS THE|c->

ASSOCIATED USERID; CAN BE CHANGED BY THE CURRENT|cr||nl

CHAIRMAN USING COMMAND MODE VERB ADD|cr||nl|

DEFINITION DELIVERY -- DISPLAYS USER TRANSCRIPT DELIVERY|cr->

INFORMATION PROVIDED DURING JOIN PROCESSING AND|cr||nl->

PROMPTS FOR CHANGE|cr||nl|

DEFINITION ALTERNATE -- DISPLAYS THE NAMES OF THOSE PARTI->
cr

cIPANTS WHO HAVE BEEN DESIGNATED AS ALTERNATE CHAIRMAN->
;|cr||nl|

CAN BE CHANGED BY THE CURRENT CHAIRMAN|cr||nl||cr||nl|
EXAMPLE|cr||nl|

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COMMAND?DEFINITION DELIVERY
DELIVERY INSTRUCTIONS FOR YOUR COPY OF TRANSCRIPT
HOST-HOST NAME
$IDENT-$IDENT INFORMATION
CHANGE?YES
HOST?HOST NAME
$IDENT-(NULL, WILL NOT CHANGE)

COMMAND ?

T12670 |cr|nl|THIS COMMAND ALLOWS THE CHAIRMAN TO REMOVE AN UNUSED PARTICIPANT NAME FROM THE LIST OF NAMES ACCEPTABLE TO THE CONFERENCE. A LIST OF UNUSED NAMES IS AVAILABLE BY INVOKING THE COMMAND WITHOUT AN ARGUMENT.

EXAMPLE 1
COMMAND?DELETE
(LIST OF UNUSED PARTICIPANT NAMES)
EXAMPLE 2
COMMAND?DELETE PARTICIPANTS

COMMAND ?

T12680 |cr|nl|THIS VERB IS USED TO OBTAIN AN EXPLANATION OF COMMAND MODE VERBS. TO RECEIVE AN EXPLANATION OF A VERB, THE VERB WOULD FOLLOW THE WORD 'DESCRIBE'. THE VERBS THAT CAN BE DESCRIBED ARE:

ADD  ADJOURN  ANOUNCE  BULLETIN  CHAIR TO
COMMUNICATION  DEFINITION  DELETE  DESCRIBE  ERASE
FLOOR  FORMAT  GIVEUP  INSERT  KEYWORD
LISTEN  PDAC  PRINT  QUIT  REVIEW
STATUS  TALK  TERMINATE
EXAMPLE
COMMAND?DESCRIBE FLOOR

COMMAND ?

T12690 |cr|nl|THIS COMMAND IS USED BY THE CHAIRMAN TO REMOVE THE TEXT OF A MESSAGE FROM THE CONFERENCE TRANSCRIPT. THE MESSAGE BANNER WILL BE RETAINED WITH A NOTE STATING THAT THE MESSAGE HAS BEEN DELETED. A MESSAGE BEING READ CANNOT BE ERASED.

EXAMPLE
COMMAND?ERASE 5
THE OPTIONS MAY BE CHANGED AT ANYTIME. THEY MAY BE CANCELLED BY USE OF THE ARGUMENT CANCEL. THE OPTIONS ARE:

CLASSIFICATION  DATE-TIME-GROUP FROM INFORMATION

REFERENCE  SUBJECT  TO

EXAMPLE 1
COMMAND?FORMAT TO;FROM;SUBJECT;SEND
EXAMPLE 2
COMMAND?FORMAT CANCEL

T12720  THIS VERB ALLOWS A PARTICIPANT TO RELINQUISH THE FLOOR PRIVILEGE. IT IS INVALID IF THE PARTICIPANT DOES NOT HAVE THE FLOOR.

EXAMPLE
COMMAND?GIVEUP

T12730  THIS IS A CHAIRMAN ONLY VERB. IT ALLOWS HIM TO CONTROL THE NUMBER OF LINES THAT CAN BE INSERTED INTO A MESSAGE FROM AN EXTERNAL FILE. THE LINES CAN BE RESTRICTED TO A VALUE BETWEEN 1 AND 600, OR ANY RESTRICTION CAN BE COMPLETELY ELIMINATED.

EXAMPLE 1
COMMAND?INSERT 10
EXAMPLE 2
COMMAND?INSERT ELIMINATE

NOTE: NO MORE THAN 600 FULL 80 CHARACTER LINES MAY MAKE UP A CON-ERENCE MESSAGE. IF THE AVERAGE LINE CHARACTER COUNT IS LESS THAN 80, THE MAXIMUM POSSIBLE LINES WOULD INCREASE. IT IS ONLY IN THESE CASES THAT ELIMINATING LINE COUNT HAS ANY MEANING.

T12740  MESSAGES MAY BE ASSIGNED A SUBJECT LINE WHEN THEY ARE BUILT. THE SUBJECT LINE PROVIDES FOR TOPIC ORIENTATION AND SELECTIVE REVIEWING.

TO CONTROL THE CONFERENCE SUBJECTS THE CHAIRMAN WOULD USE THE VERB 'KEYWORD' TO BUILD A VALID SUBJECT LIST. ONLY MESSAGES WHOSE SUBJECT LINE CONTAINS A WORD FROM THIS LIST WILL BE REVIEWABLE BY
SUBJECT: EXAMPLE

COMMAND?KEYWORD
ITEM?TANKS

THE SUBJECT WORD TO BE ADDED IS-TANKS

(YES OR NO)?YES

SUBJECT WORD ACCEPTED

|cr||nl|COMMAND ?

T12750 |cr||nl|TO RECEIVE CONFERENCE MESSAGES AND VIEW FLOOR ACTIVITY A PARTICIPANT MUST BE IN LISTEN MODE. THIS VERB TRANSFERS A PARTICIPANT FROM COMMAND MODE TO LISTEN MODE. IT IS INVALID IF THE PARTICIPANT HAS THE FLOOR.

EXAMPLE|cr||nl|

COMMAND?LISTEN

NOTE: IT IS NOT HONORED IF THE PARTICIPANT HAS THE FLOOR.

|cr||nl|COMMAND ?

T12760 |cr||nl|THIS VERB OPENS A CONNECTION TO A DIRECT ACCESS PROGRAM IN THE SAME HOST. THE VERB MUST BE FOLLOWED BY THE NAME OF THE DIRECT ACCESS PROGRAM TO BE CONNECTED TO. WHEN NECESSARY A PDAC CONNECTION CAN BE SUSPENDED. THIS IS ACCOMPLISHED BY USING 's' AS THE FIRST CHARACTERS Rupted FOR MESSAGES FROM THE CONFERENCE. THIS INTERRUPTION CAN BE PREVENTED BY USING 'n' AS THE FIRST CHARACTERS OF INPUT FROM THE TERMINAL. TO RESUME RECEIPT OF MESSAGES FROM THE CONFERENCE THE CHARACTERS 'p' WOULD BE USED.

EXAMPLE|cr||nl|

COMMAND?PDAC TSS

|cr||nl|COMMAND ?

T12770 |cr||nl|THIS VERB ALLOWS AN INDIVIDUAL TO REQUEST A PRINTED COPY OF SELECTED PORTIONS OF THE TRANSCRIPT DURING THE CONFERENCE. THE TRANSCRIPT MAY BE DIRECTED TO A REMOTE PRINTER OR BY DEFAULT BE DIRECTED TO THE SYSTEM PRINTER. SOME VALIDITY CHECKING OF THE ARGUMENTS IS DONE PRIOR TO SPAWNING THE PRINT JOB. IF AN ERROR IS FOUND THE

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PARTICIPANT WILL BE INFORMED AND THE REQUEST IGNORED. THE ARGUMENTS ARE:

- PRINT ALL -- ALL CONFERENCE MESSAGES WILL BE PRINTED
- PRINT ALL BY PARTICIPANT NAME -- ALL MESSAGES BY THE NAMED PARTICIPANT WILL BE PRINTED
- PRINT LAST XX -- THE MOST CURRENT XX MESSAGES WILL BE PRINTED
- PRINT LAST XX BY PARTICIPANT NAME -- THE MOST CURRENT XX MESSAGES BY THE NAMED PARTICIPANT WILL BE PRINTED
- PRINT N[X;N...] -- THE SPECIFIED MESSAGES WILL BE PRINTED
- THE LIST SHOULD NOT EXCEED 20 NUMBERS
- PRINT N-X -- MESSAGES 'N' THROUGH 'X' WILL BE PRINTED
- PRINT SUBJECT KEYWORD -- ALL MESSAGES WITH A SUBJECT LINE CONTAINING THE SPECIFIED KEYWORD WILL BE PRINTED
- PRINT FLOOR -- ALL FLOOR ACTIVITY WILL BE PRINTED
- PRINT FLOOR FROM HHMM TO HHMM ON DDMMYY -- ALL ACTIVITY RECORDED DURING THE TIME SPAN ON THE SPECIFIED DAY WILL BE PRINTED
- PRINT EVENTS -- RECORDED EVENTS WILL BE PRINTED
- PRINT MESSAGES -- CONFERENCE MESSAGES WILL BE PRINTED

TO DIRECT THE OUTPUT TO A REMOTE PRINTER THE PHRASE 'ON ID' WOULD FOLLOW THE REQUEST. 'ID' WOULD BE A VALID REMOTE PRINTER DESIGNATOR.

EXAMPLE 1: PRINT ALL ON AA
COMMAND?PRINT ALL ON AA
EXAMPLE 2: PRINT FLOOR ON 260CT80
COMMAND?PRINT FLOOR ON 260CT80

T12780: THIS VERB DISCONNECTS A PARTICIPANT FROM THE CONFERENCE PROGRAM
EXAMPLE: QUIT
COMMAND?QUIT
This verb allows a selective review of conference messages and floor activity. Selectivity is provided by the arguments that accompany the verb. These include:

- Review all -- all previous messages will be reviewed.
- Review all by participant name -- all messages by the named individual will be reviewed.
- Review last xx -- the most current xx messages will be reviewed.
- Review last xx by participant name -- the most current messages by the named individual will be reviewed.
- Review n-x -- messages 'n' through 'x' will be displayed.
- Review subject -- the list of available subjects for talk messages will be displayed.
- Review subject keyword -- all messages containing the specified keyword will be listed.
- Review floor -- all recorded floor activity will be reviewed.
- Review floor from hhmm to hhmm -- all floor activity recorded during the given time span will be reviewed.

This verb produces a report of the current conference status. The display includes conference name, start time and date, current chairman's name, host name, whether the floor is occupied, and a list of active participants and their mode. For example:

```
COMMAND?STATUS
```

This verb transfers a participant from command mode to talk mode.
TALK MODE IS THE STATE IN WHICH A PARTICIPANT CAN BUILD MESSAGES TO BE DELIVERED TO OTHER CONFERENCE PARTICIPANTS.

```
|cr||nl|command ?
```

T12820 |cr||nl| this verb's usage is restricted to the chairman and allows him to terminate a conference session. a terminated conference cannot be reconvened. termination will not take place if there are active participants other than the chairman still connected to the conference. no participants are permitted to join the conference once a terminate request is entered.

```
|cr||nl|command ?
```

T12830 |cr||nl| the question mark is used to obtain an explanation of the mode the participant is in. it works from command and talk modes.

```
|cr||nl|command ?
```

T13000 |cr||nl||ff||nl| talk mode entered in "
T13010 |cr||nl|>
T13011 |cr||nl|--
T13012 |cr||nl|to?
T13013 |cr||nl|from?
T13014 |cr||nl|subject?
T13015 |cr||nl|class?
T13016 |cr||nl|info?
T13017 |cr||nl|ref?
T13050 $desc"
$comm$
$dele$
$send$
$list$
$sele$
$subj$
$talk$

?|$c; |

|$cr||nl||ff||cr||nl|>$DESCRIBE<<<
|$cr||nl||ff||cr||nl|>

|$cr||nl||ff||cr||nl|>$COMMAND<<<
|$cr||nl||ff||cr||nl|>

|$cr||nl||ff||cr||nl|>$DELETE<<<
|$cr||nl||ff||cr||nl|>

|$cr||nl||ff||cr||nl|>$SEND<<<
|$cr||nl||ff||cr||nl|>

|$cr||nl||ff||cr||nl|>$LIST<<<
|$cr||nl||ff||cr||nl|>

|$cr||nl||ff||cr||nl|>$SELECT<<<
|$cr||nl||ff||cr||nl|>

|$cr||nl||ff||cr||nl|>$SUBJECT<<<
|$cr||nl||ff||cr||nl|>

|$cr||nl||ff||cr||nl|>$TALK<<<
|$cr||nl||ff||cr||nl|>

|$cr||nl||ff||cr||nl|>?

|$cr||nl||ff||cr||nl|>$INSERT<<<
|$cr||nl||ff||cr||nl|>

|$cr||nl||ff||cr||nl|>$INVALID DESCRIBE ARGUMENT PASSED

|$cr||nl|THIS PARAMETER IS USED TO OBTAIN AN EXPLANATION OF THE POSSIBLE TALK MODE VERBS. THE AVAILABLE VERBS ARE $COMMAND $DELETE $DESCRIBE $SEND $INSERT |->
|$cr||nl| $LIST $SELECT $SUBJECT $TALK ? |cr|->
|$nl||cr||nl| THE PARAMETER TO BE EXPLAINED WOULD FOLLOW $DESCRIBE. |cr||nl||cr|->
|$nl| EXAMPLE |cr||nl|
|$>DESCRIBE SEND |cr||nl|
T13120 |cr||nl|THIS PARAMETER WILL CAUSE A MESSAGE BEING BUILT TO BE ACCEPTED AS COMPLETE AND QUEUED FOR TRANSMISSION. THE PARTICIPANT WILL THEN BE TRANSFERRED TO COMMAND MODE. |cr||nl||cr||nl|

T13130 |cr||nl|THIS PARAMETER WILL CAUSE THE MESSAGE BEING ENTERED TO BE DELETED AND THE TERMINAL TRANSFERRED TO LISTEN MODE. |cr||nl|

T13140 |cr||nl|THIS PARAMETER WILL CAUSE A MESSAGE BEING ENTERED TO BE COMPLETE AS COMPLETE AND QUEUED FOR TRANSMISSION. THE MESSAGE WILL BE ASSIGNED A NUMBER AND STAMPED WITH THE AUTHOR'S NAME AND THE TIME AND DATE. THE PARTICIPANT WILL THEN BE TRANSFERRED TO LISTEN MODE. |cr||nl|

T13150 |cr||nl|$LIST AS THE FIRST CHARACTERS OF INPUT WILL CAUSE THE ENTIRE MESSAGE BEING BUILT, OR THE LAST SEVERAL LINES ENTERED IF THE $LIST IS FOLLOWING BY A NUMBER, TO BE LISTED. |cr||nl||cr||nl|

T13160 |cr||nl|THIS VERB ALLOWS A PARTICIPANT TO DIRECT HIS MESSAGE TO UP TO SPECIFIED RECIPIENTS. IF $SELECT IS NOT SPECIFIED THE MESSAGE IS DELIVERED TO ALL ACTIVE PARTICIPANTS. |cr||nl||cr||nl|

T13170 |cr||nl|THIS VERB ALLOWS A PARTICIPANT TO ASSIGN A SUBJECT LINE TO A MESSAGE. THE LINE SHOULD CONTAIN A WORD THAT IS IN THE SUBJECT LIST CREATED BY THE CONFERENCE CHAIRMAN IF THE MESSAGE IS TO BE REVIEWED BY SUBJECT, OTHERWISE NOT REQUIRED. |cr||nl||cr||nl|

T13180 |cr||nl|THIS PARAMETER WILL CAUSE A MESSAGE BEING BUILT TO BE ACCEPTED→
COMPLETE AND QUEUED FOR TRANSMISSION. THE PARTICIPANT WILL REMAIN IN TALK MODE, AND BE PROMPTED TO START ANOTHER MESSAGE.

EXAMPLE

>\$TALK\|\|nl\|^\$TALK\|\|nl\|"
PARAMETER '$DESCRIBE' FOLLOWED BY THE VERB TO BE EXPLAINED.

EXAMPLE

$DESCRIBE $INSERT

THE EXIT FROM TALK UPON COMPLETION OF A MESSAGE IS CONTROLLED BY THE USER. CONTROL IS BASED ON THE TALK MODE VERB USED TO END THE MESSAGE.

T13300 |<cr>|<nl>| MESSAGE DELETED BY PARTICIPANT |

T13320 |<cr>|<nl>| MESSAGE ACCEPTED |

T13340 |<cr>|<nl>| NO TEXT HAS BEEN ENTERED |

T13360 |<cr>|<nl>| ILLEGAL SELECT REQUEST DUE TO--NO PARTICIPANT NAMES |<cr>|<nl>| |

T13380 |<cr>|<nl>| |

T13381 |<cr>|<nl>| INVALID SUBJECT REQUEST--NO SUBJECT LINE |<cr>|<nl>| |

T13420 |<cr>|<nl>| MESSAGE NUMBER |

T13430 |<cr>|<nl>| |<ff>||<cr>|<nl>| CONTINUING IN TALK MODE |
APPENDIX B

ENVIRONMENT MANAGER PROCESS (EMP) USER INTERFACE

The Environment Manager Process (EMP) allows FSM personnel, the Environment Manager (EM), to monitor and change the FSM operating environment. The EM can observe a user's current status, reassign users to Screeners, and change FSM screen modes and bandwidth thresholds. The EM initiates EMP by logging on as a normal UNIX user. After logging on, the EM is initially presented with a help message informing him of the available commands. The EMP then signifies that it is ready to accept commands by printing a "*" on the terminal.

EMP provides the EM with seven commands. These commands allow the EM to make all necessary changes in the FSM environment. The commands are:

1. ASSIGNMENTS - Display a list of current logged on users and Screeners and the assignments of each.

2. DISPLAY - Display detailed user/system information.

3. HELP - Display a list of commands or detailed information about a specific command.

4. HISTORY - Invoke the ATDP program to view previous FSM events.
5. MODIFY - Change the current FSM operating environment.

6. PROFILE - Display the current status of logged on users.

7. QUIT - Terminate EMP and log off UNIX.

Descriptions of each command follow, including examples and syntax. Also, the syntax for the complete set of EMP commands is provided in Appendix A.

8.1 ASSIGNMENTS

The ASSIGNMENTS command provides the EM with a list of all current user/Screener assignments. It displays all current users and Screeners logged on, showing which Screener is assigned to which user. If a user currently has no Screener, ASSIGNMENTS displays "No Screener" for that user. If a Screener currently has no users, ASSIGNMENTS displays "- none assigned -" for that Screener. The command syntax is:

    a[ssignments] <nl>

where the letters enclosed in brackets "[]" are optional and <nl> represents a newline or carriage return. ASSIGNMENTS returns to the command level prompt ("*") after displaying the user/Screener assignments.
Following is an example of the output from the ASSIGNMENTS command.

CURRENT FSM USER/SCREENER ASSIGNMENTS  Mon Sep 15 14:56:28 1980

<table>
<thead>
<tr>
<th>Screener</th>
<th>User</th>
</tr>
</thead>
<tbody>
<tr>
<td>mees</td>
<td>af3gwbrglre</td>
</tr>
<tr>
<td>atlas</td>
<td>- none assigned -</td>
</tr>
<tr>
<td>mees</td>
<td>af3gwbrgmes</td>
</tr>
<tr>
<td>jones</td>
<td>af9gwglrmbm</td>
</tr>
<tr>
<td>jones</td>
<td>af3gwbrgslw</td>
</tr>
</tbody>
</table>

B.2 DISPLAY

The DISPLAY command gives the EM a detailed description of current FSM system state as well as the current states of any logged on users. At the system level, DISPLAY produces the current bandwidth rate, the screening status for each WWMCCS subsystem, the number of Screeners currently logged on, and the number of users currently logged on. At the user level, the DISPLAY command gives the user identification, the user's current terminal, the assigned Screener, the current bandwidth rate, and the screening status for each WWMCCS subsystem. The syntax for this command is:

```
display [ <userlist> ] <nl>
<userlist> := <user> | <user> <userlist>
<user> := system | <username>
<username> := a valid logged on WWMCCS user name
<nl> := a newline or carriage return
```

Arguments enclosed in brackets "[]" are optional. DISPLAY returns to the command prompt ("#") after displaying the requested information.
maximum of five arguments to the DISPLAY command is allowed.

The DISPLAY command with no arguments causes reports on the system and all logged on users to appear. For example:

```
dis <nl>
```

might cause EMP to display:

```
CURRENT FSM ENVIRONMENT VALUES        Mon Sep 22 09:51:54 1980

System-wide:
  Bandwidth is 10 messages/minute
  Subsystem screening status:
    ACCESS is normal
    LIST is normal
    SIOS is normal
    TCON is normal
    TLCF is normal
    TSS is normal
    WWdms is normal
  Screeners logged on - 1
  Users logged on - 1

User:
  Username - af3gwbrgmes
  Terminal - 7
  Screener assigned - erickson
  Bandwidth is 5 messages/minute
  Subsystem screening status:
    ACCESS is normal
    LIST is none
    SIOS is normal
    TCON is none
    TLCF is normal
    TSS is all
    WWdms is normal

Had the EM input:
```
d sys <nl>
```
EMP would have displayed only the system portion of the above display. Alternatively, the EM could have asked for information on users. For example, if the EM inputs:

di af3gwbrgjd af8gwglmrmb af3gwglmjtc <nl>

EMP would output:

CURRENT FSM ENVIRONMENT VALUES Mon Sep 22 09:51:54 1980

User:
  Username - af3gwbrgjd
  Terminal - k
  Screener assigned - jones
  Bandwidth is 10 messages/minute
  Subsystem screening status:
    ACCESS is none
    LIST is none
    SIOS is normal
    TCON is normal
    TLCF is all
    TSS is none
    WWDMS is normal

User:
  Username - af8gwglmrmb
  Terminal - 1
  Screener assigned - jones
  Bandwidth is 1 messages/minute
  Subsystem screening status:
    ACCESS is none
    LIST is none
    SIOS is none
    TCON is none
    TLCF is none
    TSS is none
    WWDMS is none

User:
  Username - af3gwglmjtc
  Terminal - j
  Screener assigned - jones
  Bandwidth is 25 messages/minute
  Subsystem screening status:
Finally, the EM could have asked for users and system information, as in the example:

dis af3gwbrgrmb system af9gwglmslw <nl>

which would result in a display of the system information, af3gwbrgrmb's information, and finally the information on af9gwglmslw.

If the EM enters an invalid user name (not defined to FSM or not currently logged on) EMP outputs an appropriate message and reprompts for the information.

8.3 HELP

The HELP command displays information about all or each EMP command. The command syntax is:

```
help [<command-name-list>] <nl>
```

```
<command-name-list> ::= <command-name> | <command-name><command-name-list>
<command-name> ::= assignments | display | help | history | modify | profile | quit
<nl> ::= newline or return key
```

Syntax is shown in a modified BNF format. Optional arguments are shown in brackets "[]", and terminal tokens are shown between the characters "<>". The bar character "|" separates options.
The HELP command displays general information on all commands or the syntax for one or more specific commands. If the EM entered:

```
h <nl>
```

EMP would display:

This is a brief list of EMP commands. To get further information on a specific command, enter "help <command-name>" where the valid command names are "assignments, display, help, history, modify, profile, quit".

**ASSIGNMENTS** - List current user/Screener assignments.

**DISPLAY** - Display current screening and bandwidth data for system and all logged on users or specified data only.

**HELP** - Display this list of commands or information about one or more specified commands.

**HISTORY** - Call the Audit Trail Display Program to display audit data.

**MODIFY** - Modify specified system or user data.

**PROFILE** - Display current profile data for all or specified users.

**QUIT** - Terminate the Environment Manager's Program.

In another example, if the EM entered:

```
help display modify <nl>
```

EM would output:

**DISPLAY** - Display current screening and bandwidth data for system and all logged on users or specified data only.

Syntax is shown in a modified BNF format. Optional arguments are shown in brackets "[]", and terminal tokens are shown between the characters "<>". The bar character "|" separates options.

Syntax:

```
display [<disp-arg-list>] <nl>
```
MODIFY - Modify specified system or user data.

Syntax is shown in a modified BNF format. Optional arguments are shown in brackets "[ ]", and terminal tokens are shown between the characters "<>". The bar character "|" separates options.

Syntax:

modify [modify-arg] <nl>
   Where a menu will be presented with the various choices if no arguments are specified.


<mod-screen-arg> := screen <screen-mode>
<mod-band-arg> := bandwidth <bandwidth-rate>
<mod-sub-arg> := subsystem <subsystem-name> <screen-mode>
<mod-usystem-arg> := user <user-name> <screen-mode>
<mod-uband-arg> := ubandwidth <user-name> <bandwidth-rate>
<mod-usub-arg> := usubsystem <user-name> <subsystem-name> <screen-mode>
<mod-assgn-arg> := uassignments <user-name> <Screener-name>

<screen-mode> := all | normal | none | off
   Where none and off mean no screening.

<bandwidth-rate> := digit between the values 1 and 255 inclusively.
<subsystem-name> := tss | tlcf | wqms | tcon | sios | access | list
-user-name := valid user name known to FSM (WES user)
-Screener-name := valid user name known to FSM (Screener)

<nl> := newline or return key
B.4 HISTORY

The HISTORY command allows the EM to view previous FSM events that were audited. Its invocation activates the Audit Trail Display Program (ATDP). ATDP permits the display of any and all audit events. The syntax of the HISTORY command is:

```
history <nl>
```

where the letters in brackets "[ ]" are optional, and <nl> represents a newline or carriage return. A complete description of the options available for ATDP appears in Section 3. Control returns to EMP when the EM is finished with ATDP.

B.5 MODIFY

The MODIFY command is the most powerful of all EMP commands. Through it the EM can modify the FSM environment. Environment values that may be modified include:

1. system-wide screening
2. system-wide bandwidth threshold
3. subsystem screening
4. user screening
5. user subsystem screening
6. user bandwidth threshold

7. user/Screener assignments

Because of the complexity of this command, two forms are available. The long form accepts arguments and processes one MODIFY command at a time; it can be used by an EM familiar with EMP. The other, the short form, does not accept arguments and prompts the user for the necessary information. The initial prompt is a menu requesting the user to enter the number of the MODIFY command he/she desires. Further prompts are specific questions. This form of the MODIFY command continues until the user specifically exits from it.

B.5.1 Short Form Modify Command

The short form MODIFY command has the syntax:

```
m[odify] <nl>
```

where the letters enclosed in brackets "[]" are optional and <nl> represents a newline or carriage return. EMP responds with

```
MODIFY CURRENT FSM ENVIRONMENT VALUES Mon Sept 15 15:36:45 1980
```

Please enter the character which corresponds to the desired action

```
1 - modify system-wide screening
2 - modify system-wide bandwidth
3 - modify subsystem screening
4 - modify user screening
5 - modify user/subsystem screening
6 - modify user bandwidth
7 - modify user/Screener assignments
h - display this list of options
q or <cr> - terminate modifications
```
The EM enters the character at the "action?" prompt. An incorrect response, "22" for example, causes EMP to output: "22" is an invalid argument for this command.

8.5.1.1 Short Form Modify System-Wide Screening. If the EM wants to change system-wide screening he enters "1<nl>" in response to the "action?" menu prompt. EMP responds with:

    MODIFY System-Wide Screening    Mon Sep 15 15:37:21 1980

Set screening to all, none, or normal (q or <cr> to quit):

The EM may enter "all", "off", "none" or "normal" in response to this prompt, setting system-wide screening to all, none or normal respectively. The characters "off" may be used at any time a screen mode is requested and means the same as "none". The EM may also enter any part of the above strings as long as enough characters are provided to uniquely identify it. Entering "nor" for example causes EMP to respond:

    Current system-wide screening is now normal

The EM may also hit newline or return in response to the above prompt. In this case EMP says:

    System-wide screening not changed

Had the EM entered an incorrect response, for example "nominal", EMP indicates this fact and prompts for another user input:

    "nominal" is an invalid screen mode. Enter replacement or <cr>
If the EM enters an ambiguous screen mode, "no" for example, EMP says:

Input no is ambiguous. Enter replacement or <cr>

8.5.1.2 Short Form System-Wide Bandwidth. To change the system bandwidth threshold the EM enters "2<nl>" in response to the menu prompt. EMP will then output:

MODIFY System-wide Bandwidth Tue Sep 16 11:21:45 1980
Current system-wide bandwidth is 10 messages/minute.
Set it to (1-255) (q or <cr> to quit):

The EM may enter any integer within the specified range, "5" for example, and EMP will output:

Current system-wide bandwidth is now 5
An incorrect entry, "350" for example, will cause:
"350" is an invalid bandwidth rate. Enter replacement or <cr>
At this point the EM may enter a replacement value or return. If a return is entered, EMP says:
Bandwidth not changed
and returns to the menu prompt display.

8.5.1.3 Short Form Modify Subsystem Screening. Entry of "3" followed by <nl> at the menu prompt causes EMP to output:

MODIFY Subsystem Screening Tue Sep 16 11:32:36 1980
Subsystem Screening Status:
ACCESS is normal
LIST is none
SIOS is all
TCON is normal
TLCF is none
TSS is normal
WWDMS is normal

Enter the next subsystem name (q or <cr> to quit):

The EM may then enter any subsystem name (with enough characters to uniquely identify it). Entering q or <cr> causes EMP to return to the menu prompt. If the user enters "w" followed by <nl> (he wants to modify the screen mode for WWDMS), EMP responds with:

Set screening to all, none or normal (q or <cr> to quit):
If EM enters "a" followed by <nl> in response to this query, EMP outputs
Screening for WWDMS is now all
EMP then reprompts for another subsystem name.
The entry of an invalid or ambiguous system name or screen mode causes EMP to issue an appropriate message and reprompt for the information.

B.5.1.4 Short Form Modify User Screening. A "4" response followed by <nl> will cause EMP to enter the MODIFY user screening subcommand and output

MODIFY User Screening Tue Sep 16 11:40:29 1980

Enter the next user name whose overall screen mode you wish to modify <q or <cr> to quit):
EM then enters a user name, "af8gwbrgjdm" for example. EMP then asks for the screen mode:

Set screening to all, none or normal (q or <cr> to quit)
A correct response (enough characters to identify the string as one of "all", "none" or "normal"), "non" for example, causes EMP to display:

Current screening for af8gwbrqjdm is none
EMP then reprompts for another user name. The characters "all" may be input to change the screen modes for all currently logged on users.

The entry of an invalid username (unknown to FSM or not currently logged-on) causes a reprompt. An invalid or ambiguous screen mode causes an appropriate message and a reprompt.

8.5.1.5 Short Form Modify User Subsystem Screening. If the EM enters "5" followed by <nl> in response to the menu prompt, he/she can then change the screen modes of specified users for specified subsystems. EMP prompts with:

MODIFY User/Subsystem Screening Tue Sep 16 13:18:36 1980
Enter the next user name whose subsystem screen mode you wish to modify (q or <cr> to quit):
The EM then enters a valid user name, "af8gwbrqjre" for example. EMP then prompts for subsystem:

Enter the next subsystem name (q or <cr> to quit):
A valid unique subsystem entry (enough characters to identify the string as one of "all", "access", "list", "sios", "tcon", "tlcf", "tss" or "wwdms"), "tl" for example, causes EMP to output:

Set screening to all, none or normal (q or <cr> to quit):
A correct response (enough characters to identify the string as one of "all", "none" or "normal"), "a" for example, causes:
Please enter the character which corresponds to the desired action:

1 - modify system-wide screening
2 - modify system-wide bandwidth
3 - modify subsystem screening
4 - modify user screening
5 - modify user/subsystem screening
6 - modify user bandwidth
7 - modify user/Screener assignments

h - display this list of options
q or <cr> - terminate modifications

During normal operation, the EMP will continue to output data to the screen until it is full, and then request the EM to hit a newline key to get the next screen. The above options will be repeated each time the screen is cleared.

8.5.2 Long Form Modify Commands

The following sections describe each long form MODIFY command in detail.

In contrast to the short form, long form MODIFY commands do only the action specified. Repeat MODIFY commands are not allowed in the long form.

8.5.2.1 Long Form Modify System-Wide Screening. This subcommand changes the value of the system screen mode. Its effect is to change the screen mode for all subsystems as well as the screen modes for all logged on user's subsystems (and all users who subsequently log on to FSM). The syntax for this command is:

```
m[odify] s[c]reen <mode> <nl>
```

```
<mode> := a[ll] | non[e] | nor[mal] | o[ff]
```
Arguments enclosed in brackets "[ ]" are optional.

For example,

```
m scr none <nl>
```

would change the value of the screen mode of all subsystems for all logged on users so that no screening would occur. It would result in the message:

Current system-wide screening is now none

Had the EM entered "screen" incorrectly, EMP would output an appropriate message and return to the command level prompt. Had the EM entered an incorrect or ambiguous screen mode, EMP would output an appropriate message and reprompt.

8.5.2.2 Long Form Modify System-Wide Bandwidth Threshold. This subcommand changes the value of the system bandwidth threshold. Its effect is to change the threshold value for all users currently logged on to FSM (and all users who subsequently log on). The syntax for this command is:

```
m modify bandwidth <rate> <nl>
```

```
<rate> := positive integer between 1 and 255 inclusive.
<nl> := return or newline key
```

Arguments enclosed in brackets "[ ]" are optional.

If the EM enters

```
mod b 10 <nl>
```

for example, the command would result in changing the current system-wide bandwidth threshold to 10 and would output:

Current system-wide bandwidth is now 10
If the EM had entered an out-of-range bandwidth EMP would output an appropriate message and reprompt for another bandwidth value.

B.5.2.3 Long Form Modify Subsystem Screening. This subcommand changes individual subsystem screen modes. Its effect is to change the individual subsystem screen mode for all users currently logged onto FSM (and all users who subsequently log on). The syntax for this command is:

```
m[odify] su[bsystem] <subname> <mode> <nl>
```

```
```

```
<mode> := a[l]l | n[on] | n[or] | o[f]f
```

Arguments enclosed in brackets "[ ]" are optional.

An example of this command is:

```
m su tc a <nl>
```

This command would set the screen mode for tcon to all. EMP would output:

```
Screening for TCON is now all
```

If the EM had entered an incorrect or ambiguous subsystem name, or an incorrect or ambiguous screen mode, EMP would issue an appropriate message and reprompt.

B.5.2.4 Long Form Modify User Screening. This subcommand changes all subsystem screen modes for a single user. The syntax of the command is:

```
m[odify] us[e][r] <username> <mode> <nl>
```

```
<username> := a valid logged on WWMCCS username | a[l]l
```

```
<mode> := a[l]l | n[on] | n[or] | o[f]f
```

8 - 19
Arguments enclosed in brackets "[ ]" are optional.

An example of this command is:

```
modify user af3gwbrgrle all <nl>
```

This command would change the screen mode of all subsystems for user af3gwbrgrle to all. EMP would output:

```
Current screening for af3gwbrgrle is all
```

If the EM had entered an invalid username (not defined to FSM or not currently logged on) or an incorrect or ambiguous screen mode, EMP would output an appropriate message and reprompt for the information.

**8.5.2.5 Long Form Modify User Subsystem Screening.** This subcommand changes individual screen modes for a single user. The syntax of the command is:

```
m[odify] usu[bsystem] <username> <subname> <mode> <nl>
```

- **<username>** := a valid logged on WWMCCS username | a[ll]
- **<subname>** := ac[cess] | l[ist] | s[ios] | tl[cf] |
  := tc[on] | ts[s] | w[mdms] | a[ll]
- **<mode>** := a[ll] | non[e] | nor[mal] | o[ff]
- **<nl>** := return or newline key

Arguments enclosed in brackets "[ ]" are optional.

An example of this command is:

```
mod usub af8gwglmxyz lis non <nl>
```

This command would change af8gwglmxyz's list subsystem screen mode to none. EMP would output:
Current screening for af8gwlxyz using LIST is none

Had the EM entered an invalid username (not defined to FSM or not currently logged on), an incorrect or ambiguous subsystem name, or an incorrect or ambiguous screen mode, EMP would output an appropriate message and reprompt.

B.5.2.6 Long Form Modify User Bandwidth. This subcommand changes a bandwidth threshold value for a single user. The syntax of the command is:

```
m[odify] [ub]andwidth] <username> <rate> <nl>
```

- `<username>` := a valid Logged on WWMCCS username | all
- `<rate>` := a positive integer between 1 and 255 inclusive
- `<nl>` := return or newline key

Arguments enclosed in brackets "[ ]" are optional.

An example of this command is:

```
m ub af3gwbrgmes 2 <nl>
```

This command would change the bandwidth threshold for the user af3gwbrgmes to 2. EMP would output in response to this command:

```
Current bandwidth for af3gwbrgmes is now 2
```

If the EM enters an invalid username (not defined to FSM or not currently logged on), or an incorrect bandwidth threshold rate, EMP outputs an appropriate message and reprompts for the information.
B.5.2.7  Long Form Modify User/Screener Assignments. This subcommand changes a user's Screener. The syntax of the command is:

```
mtodifyuaassignments <username> <Screenername> <nl>
```

- `<username>` := a valid logged on WWMCCS username
- `<Screenername>` := a valid logged on Screener
- `<nl>` := return or newline key

Arguments enclosed in brackets "[ ]" are optional.

An example of this command is:
```
mod uas af3gwbrglre mees <nl>
```

This command would change af3gwbrglre's current Screener to be Mees. EMP would output a message indicating the change:

```
User af3gwbrglre is now assigned to Screener Mees
```

If the EM enters an invalid username or Screener name (not defined to FSM or not currently logged on) EMP issues an appropriate message and reprompts.

B.6  PROFILE

The PROFILE command displays the current status of any or all current FSM low-side users. There are six status types:

1. waiting on user input

2. waiting on system output
3. waiting on Screener response
4. waiting on user input/system output
5. waiting on Screener assignment
6. waiting to logon (connect to WWMCCS).

Waiting on user input means that the user's FSMGP is waiting for the WWMCCS user to enter data so that it may proceed. Waiting on system output means that the WWMCCS user's FSMGP is waiting for output from WWMCCS to proceed. Waiting for Screener response means that the user's FSMGP is waiting for a decision from a Screener before the system output can be sent to the user. Waiting on user input/system output means that the user's FSMGP is waiting for data from either WWMCCS or the user in order to proceed (e.g., LISTEN mode in TLCF). Waiting on Screener assignment means that the user is waiting to be assigned a Screener before he may proceed. Waiting to logon means that the user's FSMGP is waiting to connect to the WWMCCS via the Remote Network Processor Emulator (RNPE).

The command syntax is:

```
plprofie] [<userlist>] <nl>

<userlist> ::= <user> | <user> <userlist>

<user> ::= <termid> | <username>

<termid> ::= last character of valid FSM terminal

<username> ::= a valid logged on WWMCCS username

<nl> ::= a newline or return key
```

Arguments enclosed in brackets "[ ]" are optional. PROFILE returns to the
command prompt ("*") after displaying the status information.

The PROFILE command with no arguments causes profiles for all currently logged on WWMCCS users to be displayed. Each logged on user causes one record to be displayed with the user name, terminal ID, current subsystem status and DTG (date-time group) of the status to be displayed. For example:

```
pro af3gwbrgjdm <nl>
```

would cause EMP to output:

```
CURRENT FSM USER STATUS       Wed Sep 17 14:53:46 1980
User   Terminal  Subsystem    Waiting On     DTG of Status
af3gwbrgjdm 1    WWDMS     user input  Sep 17 14:30:22 1980
```

In another example, if the EM entered:

```
p af3gwbrgmes 5  af8gwglmlre <nl>
```

EMP might display:

```
CURRENT FSM USER STATUS       Wed Sep 17 15:13:07 1980
User   Terminal  Subsystem    Waiting On     DTG of Status
af3gwbrgmes 6    TSS      Screener assignment Sep 17 15:12:03 1980
af8gwbrgjdm 5     TLCF  system output   Sep 17 15:12:43 1980
af8gwbrglre f     TCON     user input       Sep 17 15:05:40 1980
```
If the EM enters an invalid username (not defined to FSM or not currently logged on) or an invalid terminal identifier (not currently in use) EMP outputs an appropriate message and prompts for the information.

8.7 QUIT

The QUIT command terminates EMP and logs the user off the system. Its syntax is:

   q[uit] <nl>

where the letters in brackets "[ ]" are optional, and <nl> is a newline or carriage return.
The decision to let users view system output is made by Screener personnel via the Screener Trusted Program (SCTP). Since SCTP must be verified, its interface with the Screener is minimal. All inputs are single letter responses to prompts, and SCTP operates in raw mode (no newline or return keystrokes are necessary). Therefore, no syntax is presented in this section. Rather, a scenario is presented in which all possible Screener actions are covered.

The Screener logs on to FSM in the normal UNIX fashion. If there are no downgrades pending, SCTP clears the screen and outputs:

*************** No Pending Downgrade Requests ***************

Enter L to logout :

This message remains on the screen until a downgrade is requested or the Screener types "L". When a downgrade request appears, SCTP clears the terminal screen and outputs:

*************** DOWNGRADE REQUESTED ***************
Enter <return> to proceed
l to logout :

This prompt is followed by three audible alarms (bells). When the Screener is ready to perform the downgrade he presses the terminal's "return" key. SCTP then outputs the first page of downgrade data followed by the prompt (on the bottom of the same screen):

"downgrade data"

****************** Downgrade File ******************

Classification is: OFFICIAL USE ONLY

Enter r for REJECT :
<return> to continue :

The Screener is not allowed to accept a downgrade request until the entire contents of the downgrade file has been displayed; the Screener can always reject a downgrade at any time during his perusal of the data. The above prompt is positioned at the bottom of each page (except the last page) of downgrade information. Notice that the classification of the user's output is displayed for the Screener. This information is obtained from the user's response to the "CLASSIFICATION OF YOUR OUTPUT?" query from WWMCCS. The user in this example responded "ufo". The following is a list of possible classification outputs displayed by SCTP:
1. if the user enters "uzz" SCTP displays "UNCLASSIFIED"

2. if the user enters "ufo" SCTP displays "OFFICIAL USE ONLY"

3. if the user enters "czz" SCTP displays "CONFIDENTIAL"

4. if the user enters "szz" SCTP displays "SECRET"

5. if the user enters "swp" SCTP displays "SECRET WORKING PAPERS"

When the last page of information is displayed SCTP outputs the following prompt:

"downgrade data"

***************  Downgrade File  ***************

Classification is: OFFICIAL USE ONLY

Enter r       for REJECT

a       for ACCEPT

<return> to continue :

SCTP will clear its Screener's input buffer before the output of each prompt. Thus, the Screener must wait for the data to be presented before replying. In addition, SCTP will not accept invalid responses. Should the Screener enter one, SCTP outputs "??" and waits for the next entry. This is true for all prompts.
For all downgrade requests, the Screener is given the option of viewing an additional context file. This file contains two screens of information just preceding the downgrade data. This file contains both ordered user input and system output. In some situations this additional data may aid the Screener in determining whether to accept or reject the downgrade request. If the Screener decides to view the context file (by depressing the "return" key) then SCTP outputs the first page of data from this file followed by the prompt

"context information data"

*************** Information File ***************

Enter r for REJECT
a for ACCEPT
<return> to continue

SCTP always displays downgrade and context data in a cyclic manner. That is, if the Screener always depressed the "return" key, SCTP would first display the downgrade data (one page at a time), and then the context file data (if present), and then cycle back to the downgrade data, and so on.

If the Screener decides to accept a downgrade request (after having viewed all downgrade data) he depresses "a". SCTP requires that the Screener confirm all accept/reject inputs and thus outputs
Confirm Downgrade

Enter y for CONFIRMATION
n for no :

If the Screener enters "n" (for no confirmation), SCTP outputs the next page of the current file (downgrade or context file), followed by the appropriate reject-accept-continue prompt. If the Screener enters "y" (confirming the downgrade request), SCTP outputs

Downgrade Accepted

and proceeds to the next downgrade request. If the Screener decides to reject the downgrade request, SCTP asks for confirmation

Confirm Rejection

Enter y for CONFIRMATION
n for no :

If the Screener confirms the rejection, SCTP responds with

Downgrade Rejected

and proceeds to the next downgrade request.

When a downgrade request comes as a result of the Environment Manager changing the screen mode to ALL, SCTP displays this fact in the downgrade file prompt:

C - 5
Classification is: SECRET

Enter r for REJECT
a for ACCEPT

<return> to continue :

If the screen mode had changed because the user exceeded his/her current bandwidth threshold, SCTP displays this in the downgrade file prompt:

Classification is: SECRET WORKING PAPERS

Enter r for REJECT
a for ACCEPT

<return> to continue :
APPENDIX D

AUDIT TRAIL DISPLAY PROGRAM (ATDP) USER INTERFACE

The Audit Trail Display Program (ATDP) displays FSM audit events to help analyze FSM activities. The program is invoked by the Environment Manager (EM) via the "history" command. (See Appendix D for more information on EM commands).

The FSM Audit Trail consists of a "current" file and saved files that were previously current. When a current file is saved (by using the END command), its name will be changed from 'current' to the date-time group (DTG) of the save. In this way the size of the current file may be limited to a manageable amount. In addition, if the EM saved the current file daily, a uniform audit database could be maintained. See the END command for more details.

ATDP commands include:

1. END - Save the current audit file and start a new one.

2. FILES - List all of the existing audit files.

3. HELP - Display a list of commands or information about one or more specified commands.
4. LIST - Display audited events with optional specifiers in ascending time order.

5. QUIT - Terminate the Audit Trail Display Program.

Additionally, unrecognizable input causes a message to be output and a return to the command level prompt.

When ATDP is invoked by the EM, it initially displays a help message informing the EM of the available commands. Then ATDP signifies that it is ready to accept commands by printing a "->" on the terminal. This informs the user that any of the commands listed above can be entered. This prompt distinguishes it from other EM commands, which prompt with an asterisk (*). The following sections describe each ATDP command in detail.

D.1 END

The END command saves the current audit file.

The command syntax is:

```
e[nd] <nl>
```

`<nl> ::= newline or return key`

The END command terminates the current audit file and saves it. The current file will be renamed with the DTG of the save. This command allows the audit files to be kept to reasonable sizes, allowing more efficient processing by the LIST command. To illustrate the renaming
property of END, assume that the current audit file is ENDED on April 2 at 12:05:30. The current audit file would be renamed to "0402120530" and the "current" file length would be reset to zero.

D.2 FILES

The FILES command lists all existing audit files.

The command syntax is:

```
files [<output-flag>] <nl>
<output-flag> ::= -t | -l | -p
-t = output to terminal with paging (default)
-l = output to terminal with no paging
-p = output to printer with no paging
<nl> ::= new line or return key
```

The FILES command displays in order all past audit files that have been saved by the END command. It displays each file's name, DTG of creation, date of last modification and size in 512 character blocks. In addition, FILES displays the above information on the "current" file. If the FILES command were entered as:

```
f <nl>
```

ATDP would output, for example:
The HELP command displays information about all or each ATDP command.

The command syntax is:

```
help [output-flag] [command-name-list] <nl>
```

```
<output-flag> := -t | -L | -p
```

```
-t = output to terminal with paging (default).
-L = output to terminal with no paging.
-p = output to printer with no paging.
```

```
<command-name-list> := <command-name> | <command-name> <command-name-list>
```

```
<command-name> := end | files | help | list | quit
```

```
<nl> := newline or return key
```

Syntax is shown in a modified BNF format. Optional arguments are shown in brackets "[]", and terminal tokens are shown between the characters "<>".

The bar character "|" separates options.
The HELP command displays general information on all commands or the syntax for one or more specific commands. If the EM entered:

```
    h <nl>
```

ATDP would display:

This is a brief list of ATDP commands. To get further information on a specific command, enter "help <command-name>" where the valid command names are "end, files, help, list, quit".

END - Save the current audit file and start a new one.
FILES - List all of the existing audit files.
HELP - Display this list of commands or information about one or more specified commands.
LIST - Display audited events with optional specifiers in ascending time order.
QUIT - Terminate the Audit Trail Display Program.

In another example, if the EM entered:

```
    help files <nl>
```

ATDP would output:

FILES - List all of the existing audit files.

Syntax is shown in a modified BNF format. Optional arguments are shown in brackets "[]", and terminal tokens are shown between the characters "<>". The bar character "|" separates options.

Syntax:

```
files [<output-flag>] <nl>

<output-flag> ::= -t | -l | -p
    -t = output to terminal with paging (default).
    -l = output to terminal with no paging.
    -p = output to printer with no paging.

<nl> ::= newline or return key
```
The LIST command prints all or specified FSM audit events.

The command syntax is:

```plaintext
list [<output-flag>] [<list-arg-list>] <nl>
```

**<output-flag>** :-t | -l | -p
- `-t` = output to terminal with paging (default).
- `-l` = output to terminal with no paging.
- `-p` = output to printer with no paging.

**<List-arg-List>** :-<List-arg> | <List-arg> <List-arg-List>

**<List-arg>** :-<user-arg> | <system-arg> | <event-arg> | <time-arg>

where each `<list-arg>` can only appear once.

**<user-arg>** :- user [<user-name-list>]

**<user-name-list>** :- <user-name> | <user-name> <user-name-list>

**<user-name>** :- valid user name known to FSM (manager, screener, WES u.

**<system-arg>** :- subsystem [<subsys-name-list>]

**<subsys-name-list>** :- <subsys-name> | <subsys-name> <subsys-name-list>

**<subsys-name>** :- tss | tlcf | wwdms | tcon | sios | access | list | log

**<event-arg>** :- event [<event-type-list>]

**<event-type-list>** :- <event-type> | <event-type> <event-type-list>

**<event-type>** :- 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19

1 = valid user input received
2 = invalid user input received
3 = system output sent to user
4 = system output not sent to user
5 = system output accepted by screener
6 = system output rejected by screener
7 = screener logged onto FSM
8 = screener logged off of FSM
9 = WES user logged onto FSM
10 = WES user logged off of FSM
11 = user initiated WWMCCS subsystem
12 = user assigned to screener
13 = user input simulated
14 = screen mode modified
15 = bandwidth threshold modified
16 = environment manager logged onto FSM
17 = environment manager logged off of FSM
18 = system output received from WWMCCS
19 = system output received by screener

<time-arg> := <start-time> | <end-time> | <start-time> <end-time>

<start-time> := start | <dtg>
<end-time> := end | <dtg>

where a <dtg> by itself will be interpreted as a <start-time>.

<dtg> := MMMDDhhmm[YY]

MMM = month (01 - 12)
DD = day of month (01 - 31)
hh = hour of day (00 - 23)
mm = minute of hour (00 - 59)
YY = year minus 1900 (00 - 99)
(defaulT time-range is current day)

<nl> := newline or return key

Syntax is shown in a modified BNF format. Optional arguments are shown in brackets "[ ]", and terminal tokens are shown between the characters "<>". The bar character "|" separates options.

LIST allows the user-oriented display of accumulated FSM audit events. Each event listed contains the following information:

1) time of the event
2) event description
3) event data items such as user name, terminal ID, etc.

When no arguments are entered with the command, LIST produces a listing of all events logged for the current day. Events of particular interest (such as WMMCCS subsystem usage or a specific user history) can also be selectively listed using an optional list argument. See below for sample LIST input and output.

The following arguments are known to LIST:

EVENT event-type(s) All audit events of the numeric type(s)
(see a detailed description of FSM audit events for the event codes and their
explanation). For instance, all "Valid user input received" events could be listed using an event-type of 1. If EVENT is used with no event-type, the user will be prompted for the desired event-type(s). Input can consist of multiple types.

SUBSYSTEM subsystem(s) Audit events pertaining to the particular WWMCCS subsystem(s) (i.e. TSS, TLCF, WWDMS, TCON, SIOS, ACCESS, LIST and LOGON) are listed.

USER user-name(s) Audit events involving the particular user(s) are listed.

The output of LIST may be further restricted to events within a specified time-range. The time-range arguments must be in one of the following forms:

START All events from the start of the FSM audit trail to the current time.

END All events for the current day.

START END All events from the start of the FSM audit trail to the current time.
time.

START MMDDhhmm[YY] ALL events from the start of the FSM audit trail to the specified month, day, hour, minute and year.

MMDDhhmm[YY] MMDDhhmm[YY] ALL events from the specified start-time to the specified end-time.

MMDDhhmm[YY] END All events from the specified month, hour, minute and year to the current time.

MMDDhhmm[YY] All events from the specified month, day, hour, minute and year to the current time.

If arguments are combined, LIST output can become very specific. The boolean property of the LIST command allows the EM to restrict the LIST output to precise events. For example:

list event 11 user af3gwbrgjdm sub sios <nl>

would list (for the current day) only the events in which the user af3gwbrgjdm entered the WWMCCS subsystem (event 11) SIOS. That is, LIST would search for audit events that were event 11 AND user af3gwbrgjdm AND subsystem SIOS. Had the ATDP user entered:

list event 15 user af3gwbrgjdm af8gwbrgrmb <nl>
LIST would search for audit events that were event 15 (bandwidth threshold modified) AND user af3gwbrgjdm OR event 15 AND user af8gwbrgrmb. In this way the ATDP user can display each event in which two users had their bandwidth thresholds modified (if any).

Sample LIST input follows:

a) list

This is the default form of LIST; i.e. all events for the current day (April 15) are displayed. This form of the command is equivalent to: list -t 04150000 end

b) list -p event 01

Send all "Valid user input received" (Event 01) audit events for the current day to the line printer.

c) list event start end

Please choose one or more of the following event types:

1 - Valid user input received
2 - Invalid user input received
3 - System output sent to user
4 - System output not sent to user
5 - System output accepted by screener
6 - System output rejected by screener
7 - Screener logged onto FSM
8 - Screener logged off of FSM
9 - WES user logged onto FSM
10 - WES user logged off of FSM
11 - User initiated WWMCCS subsystem
12 - User assigned to screener
13 - User input simulated
14 - Screen mode modified
15 - Bandwidth threshold modified
16 - Environment manager logged onto FSM
17 - Environment manager logged off of FSM
18 - System output received from WWMCCS
19 - System output received by screener

Event types? 7 8 9 10

Display on the terminal (with paging) the logging events Screener logon/logoff and User logon/logoff for the entire time-range the audit files cover. Notice, the user was presented with a menu of event-types and prompted for the events desired since none were entered.

d) list -l sub tlcf 04021200 04150830

Display on the terminal (without paging) all audit events concerned with the WWMCCS Teleconferencing (TLCF) subsystem between April 2nd at noon until April 15th at 8:30 am.

e) list user
   User name(s)? RAH MEES SCHELLER

Display on the terminal (with paging) all audit events concerned with the named users (RAH, MEES, SCHELLER) for the current day.

f) list -p start end
List all audit events on the printer. Every audited event would be printed out using this command.

Sample LIST output for each audit event is shown in Figure D-1.

Wed Sep 10 14:17:23 1980
Event: Valid user input received
User: af8gwbrgjdm
Terminal: k
Subsystem: LOGON
************ TEXT *******
U01
************ END OF TEXT *******

Wed Sep 10 15:17:19 1980
Event: Invalid user input received
User: af8gwbrgjdm
Terminal: k
Subsystem: TSS
Reason: No match.
************ TEXT *******
zzz
************ END OF TEXT *******

Wed Sep 10 14:17:37 1980
Event: System output sent to user
User: af8gwbrgjdm
Terminal: k
Subsystem: TSS
************ TEXT *******
CLASSIFICATION OF YOUR OUTPUT?
************ END OF TEXT *******

Fri Sep 12 12:43:38 1980
Event: System output not sent to user
User: af8gwbrgjdm
Terminal: 1
Subsystem: TSS
************ TEXT *******
CP DISCONNECT
************ END OF TEXT *******

Wed Sep 10 14:21:18 1980
Event: System output accepted by screener
User: af8gwbrgjdm
Terminal: k
Fri Sep 19 11:46:13 1980
Event: System output rejected by screener
User: af3gwbrgrah
Terminal: k
Subsystem: LIST
Screener: harvey

Wed Sep 10 14:18:22 1980
Event: Screener logged onto FSM
User: screener
Terminal: 7

Wed Sep 17 15:58:26 1980
Event: Screener logged off of FSM
User: harvey
Terminal: k

Wed Sep 10 14:17:34 1980
Event: WES user logged onto FSM
User: af8gwbrgjdm
Terminal: k

Wed Sep 10 08:16:33 1980
Event: WES user logged off of FSM
User: af8gwbrgjdm
Terminal: l

Wed Sep 10 14:17:36 1980
Event: User initiated WWMCCS subsystem
User: af8gwbrgjdm
Terminal: k
Subsystem: TSS

Wed Sep 10 14:18:26 1980
Event: User assigned to screener
User: af8gwbrgjdm
Terminal: k
Screener: screener
Terminal: 7
Figure D-1. Sample LIST output.
Notice several features of Figure D-1. First, each event has an English
description of the event as well as the event number. Second, each event
has the DTG of its recording. Finally, where applicable, the audit texts
are included.

It is also possible to restrict the ATDP output by requesting a combina-
tion of arguments. For example, if a user wanted certain events for a
given user he might input:

```
L user af3gwbrgjdm event 10 <nl>
```

which would display all events for the current day of type 10 for user
af3gwbrgjdm. ATDP might output:

```
List events between Tue Sep 23 08:00:00 1980 and Tue Sep 23 15:19:57 1980
Concerning users: af3gwbrgjdm
Concerning events: 10

Tue Sep 23 08:16:33 1980
  Event: WES user logged off of FSM
  User: af3gwbrgjdm
  Terminal:  
```

Notice that ATDP uses a Boolean algorithm to obtain the user's request.
That is, ATDP searches the audit files for events that involve user
'af8gwbrgjdm' AND are of type 10.

In another example, a user might want to restrict the event selection
further:
l user af8gwbrgjdm event 3 sub sios <nl>

ATDP might output:

List events between Tue Sep 23 08:00:00 1980 and Tue Sep 23 15:38:28 1980
Concerning users: af8gwbrgjdm
Concerning subsystems: sios
Concerning events: 3

Tue Sep 23 14:21:36 1980
Event: System output sent to user 3
User: af8gwbrgjdm
Terminal: k
Subsystem: SIOS
********** TEXT **********
SIOS ROUTINE
********** END OF TEXT **********

Finally, ATDP outputs an appropriate message when it cannot find the requested events. For example, if no events had been generated for September 23, and the EM entered:

l <nl>

ATDP would output:

List events between Tue Sep 23 00:00:00 1980 and Tue Sep 23 15:47:31 1980 with no specific search categories specified.

No audit records were found which satisfied the requirements.

0.5 QUIT
The QUIT command terminates ATDP processing.

The command syntax is:

```
q[uit] <nl>
<nl> := newline or return key
```

QUIT terminates ATDP and returns control to the Environment Manager Process.
APPENDIX E

GLOBAL LOGON FILE MODIFIER (USER) USER INTERFACE

The USER utility program adds and deletes users from the FSM environment. With it, WWMCCS users, Screeners and Environment Managers can be added and deleted, and a current list of users (all those listed above) can be displayed. The USER program is executed by issuing the command "user <nl>" at the command prompt. USER responds with the prompt:

Please choose the next action to be performed:
Type a to add a new WWMCCS user
Type s to add a new Screener
Type e to add a new Environment Manager
Type d to delete a WWMCCS user
Type t to delete a Screener or Environment Manager
Type l to list currently defined users
Type q to quit the UPDATE program

Option?

If the user wants to add a WWMCCS user, he/she enters "a" at the Option? prompt. USER then outputs:

Add a WWMCCS user
Please enter a user name with exactly 11 characters with the format:
af[389] [gx] [mw] [site code (3 chars)] [user initials (3 chars)]:

If the user enters "af3gwbrgrmb", USER responds with:

User af3gwbrgrmb is now a valid user name

USER then redisplays the command options and the prompt. If the user had entered a WWMCCS user name in the wrong format, USER outputs:

Invalid user name, must follow the following format:
af[389] [gx] [mw] [site code (3 chars)] [user initials (3 chars)]
and then redisplay the command options prompt. If the user had entered
too many characters, USER responds with:
Invalid user name, too many characters
and then redisplay the command options prompt. If the user attempted to
add an existing WWMCCS user (already defined to FSM), 'af3gwbrgjdm' for
example, USER outputs:
User af3gwbrgjdm is already a valid user name
If the WWMCCS user had previously been deleted (undefined to FSM), USER
outputs:
User af3gwbrgjdm is a previously used user name.
Do you wish this name to be reinstated?
A 'y' to this question results in:
User af3gwbrgjdm is now a valid user name
Any other response results in a redisplay of the command options prompt.

If the user wants to add a Screener, he/she would respond to the Option?
prompt with 's'. USER would respond with:
Add a Screener
Please enter a user name not exceeding 8 characters.
Hadh the user entered 'mees', for example, USER would respond with:
User mees is now a valid user name
Hadh the user entered a name already defined to FSM, or a name with too
many characters, USER would output an appropriate message and redisplay
the command options prompt.
If the user wanted to add an Environment Manager to FSM, he/she would enter "e" at the Option? prompt. This would result in:

Add an Environment Manager
Please enter a user name not exceeding 8 characters:

Had the user entered 'smyth', for example, USER would output:

User smyth is now a valid user name

However, only one Environment Manager may be defined to FSM at any one time. If there had already been an EM when the user tried to add one, USER would output:

Only one manager may be defined at a time, 'smyth' already exists

Deleting (undefining users to FSM) is as easy as adding them. To delete a WWMCCS user the user enters 'd'; to delete a Screener or Environment Manager, the user enters 't'. This results in:

Delete a WWMCCS user
Please enter a user name with exactly 11 characters with the format:

af [389] [gx] [mw] [site code (3 chars)] [user initials (3 chars)]:

for WWMCCS users and

Delete a Screener or Environment Manager
Please enter a user name not exceeding 8 characters:

for Screeners and EMs. Entering the correct names (they must exist to FSM), results in USER confirming the deletion. Entry errors (invalid format or trying to delete non-existent users) cause USER to issue an error and redisplay the command options prompt.

The user can also display the currently existing FSM users. This is done by entering 'l' at the Option? prompt. USER might display, for example:
Finally, to terminate the USER program, the user enters "q" at the Option? prompt. USER responds with:

    UPDATE program terminated
    Good-bye
APPENDIX F

FSMGTTY PROGRAM DESCRIPTION

FSMGTTY is a small program that sets up the WES user/Guard environment when the WES user initiates a terminal session. During FSM startup, FSMGTTY is executed and attempts to open each terminal that is connected to Guard (via the PDP 11/70). After setting terminal attributes to resemble normal WWMCCS terminals, FSMGTTY waits until the WES user enters data at the terminal keyboard. Once this occurs, FSMGTTY fork/executes a copy of itself which obtains current copies of the context tables and fork/executes the Guardian Process (FSMGP). In this way, little machine overhead is consumed while a terminal is not being used, due to FSMGTTY's small size.

FSMGTTY, when executed, changes the UNIX terminal attributes to resemble WWMCCS terminals. These changes involve changing the character delete and line erase characters, as well as mapping keyboard carriage returns into strict carriage returns (sans line feed). It also arranges to ignore potentially troublesome input, such as control-S, delete and other characters that have a special meaning to the UNIX operating system.

When a WES initiates a terminal session (by typing a carriage return or control-A from a tty terminal or "$*$log24" from a vip terminal), FSMGTTY locks the context files, preventing any changes from being made, and
makes copies of them for this user. This facilitates context table changes during normal FSM operation and assures that each WES user obtains the most current version of the context tables. When the copies have been made, the lock is removed and the Guardian Process is fork/executed. Following WES user logoff (either normally, or following a system error), FSMGP terminates and control returns to FSMGTTY. It will start the entire sequence again, beginning with changing the terminal attributes.

An external file (/fsm/gttys) contains terminal identifiers and all associated information that FSMGTTY needs. A copy of this file follows:

: FSM active terminals for low-side WES users. Format is:
: one character terminal type, 'v' = vip, 't' = tty/wang.
: Colon to separate fields, ':'.
: one character to be used for logging for this terminal.
: Colon to separate fields, ':'.
: UNIX pathname for terminal, E.g. /dev/tty8.
: Colon to separate fields, ':'.
: UNIX pathname for RNPE line, E.g. /dev/rnpe/300/8
:
: t:e:/dev/ttye:/dev/rnpe/300/e
: t:f:/dev/ttyf:/dev/rnpe/300/f
: t:g:/dev/ttyg:/dev/rnpe/300/g
: t:h:/dev/ttyh:/dev/rnpe/300/h
END
10-86
DTIC