DIGITAL TRANSMISSION SURVEILLANCE SYSTEM
CENTRAL PROCESSOR OPERATION AND DATA-BASE MANAGEMENT
DIGITAL DATA SYSTEM

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1. GENERAL

1.01 This section describes the central processor operation and data-base management at the minicomputer center.

1.02 Whenever this section is reissued, the reason(s) for reissue will be given in this paragraph.

1.03 The central processor or minicomputer controls the communications for the Digital Transmission Surveillance System (DTSS). The DTSS provides monitoring capability on DS-1 facilities used in the Digital Data System (DDS) between digital serving areas (T1DM to T1DM). The minicomputer also processes data necessary to produce real-time exception and administrative reports on the facilities monitored, which enables detection of troubles. The minicomputer communicates by sending and receiving data messages to and from different surveillance units (SUs) equipped with microprocessors. The SUs are located in specific T1DM bays throughout the network. The SUs collect data (sync failure errors) on facilities and transmit a data message to the minicomputer after being polled.

1.04 The DTSS provides the capability to pinpoint a customer's circuit trouble to a facility by detecting errors and providing notification within a minute on a given facility. In addition, facility troubles can be identified and fixed prior to customer complaints, thereby providing better DATAPHONE* digital service. The administrative reports are used for analysis to identify facilities with recurrent troubles.

1.05 The responsibilities of the personnel at the minicomputer are documented in Section 314-984-101.

2. PHYSICAL DESCRIPTION OF MINICOMPUTER CENTER

2.01 A brief description of the required hardware and peripheral devices manufactured by Digital Equipment Corporation (Fig. 1) is as follows:

(a) One PDP† 11/70 minicomputer, or equivalent, for the central collection and processing of data. It presently has a 256K memory. Four standard size PDP 11 cabinets (each 72 inches high by 21 inches wide by 30 inches deep) should be allocated for multiplexer, processor memory, and tape drive (allow an additional space of about 30 inches for front and back drawer access).

(b) Two models RWP06 disk drive and controller with a 170 megabyte capacity, or equivalent. This is used for program and data storage of recent data (up to 7 days). A disk cabinet (47 inches high by 32.5 inches wide by 32 inches deep) should be allocated.

(c) One model LP11 high-speed printer (45 inches high by 33 inches wide by 22 inches deep), or equivalent, capable of 300 lines per minute and used for supplementary program listings.

(d) One model LA36 writer II system console (33.2 inches high by 27.5 inches wide by 24 inches

*Registered trademark of AT&T

†Registered trademark of Digital Equipment Corporation.

deep), or equivalent, for communicating and interfacing with the system.

(e) One model TWU16 tape drive and controller, or equivalent, capable of 1600 bits per inch per 9 tracks. Used for long-term (over 7 days) program and data storage.

(f) One model FP11 floating point unit for data processing.

(g) Multiplexers and demultiplexers and a DV-11 communications preprocessor, or equivalent, for 20 synchronous lines or ports and 12 asynchronous lines.

(h) One Electronic Industries Association (EIA) level control unit to interface with the 64-kb/s multiplex channels (not available as a Digital Equipment Corporation product).

2.02 Additional detailed information on the physical aspects of the peripheral devices can be obtained from the documents of the manufacturer.

ENVIRONMENTAL REQUIREMENTS

2.03 The minicomputer center requires an operating environment with sufficient cooling to dissipate 33,000 BTU/HR, temperature operating limits between 60 and 90 degrees Fahrenheit, and relative humidity limits between 30 and 80 percent.

POWER REQUIREMENTS

2.04 The power requirements for the equipment manufactured by Digital Equipment Corporation and located at the minicomputer center are as follows:

(a) Multiplexer cabinet: 120 volt 30 amps, one phase; 1 NEMA L5-30r receptacle

(b) Processor cabinet: 120 volt 30 amps, three phase Y; 1 NEMA L21-30r receptacle

(c) Memory cabinet: Same requirement as processor cabinet

(d) Tape drive cabinet: Same requirements as multiplexer cabinet

(e) Disk cabinet: 240/416 volt 20 amps, three phase Y; a receptacle to fit a Hubbell* 231A plug

(f) System console: 115 volt 5.5 amps

(g) Line printer: 115 volts 5 amps.

*Registered trademark of Harvey Hubbell Incorporated

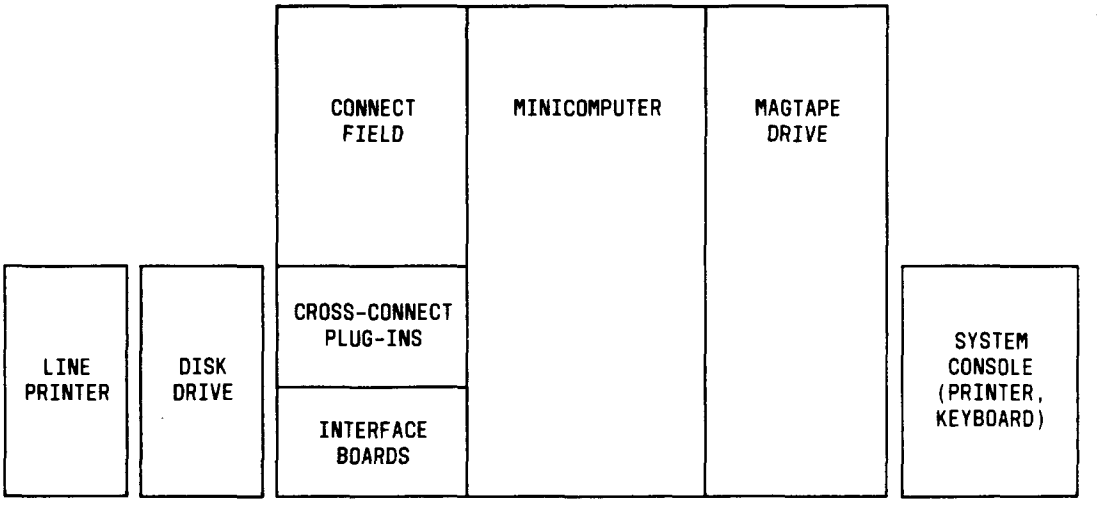

Fig. 1—Physical Layout of Minicomputer Center

3. MINICOMPUTER CENTER

FUNCTIONAL DESCRIPTION

3.01 The minicomputer center (Fig. 2) is the central data collector and processor for DTSS. A data message from a synchronous line at the minicomputer is multiplexed in the EIA level converter unit to 64 kb/s and is then transmitted via cable to the DSX-0B. From there, additional cabling connects to a T1DM bay which contains a level one SU. The data message is demultiplexed at the SU and is broadcast (transmitted) to all lower level SUs (eg, level 2, 3, 4, or 5) on that communications line. The SU contains multimicroprocessors for processing data. The SU operation is documented in Section 314-984-100.

3.02 The SU data messages (responses from polling) are transmitted over an 8-kb/s communications line to a level 1 SU, where multiplexing of the data message takes place. Multiplexing is used because of the distance between the minicomputer and the SU in the DDS central office. Demultiplexing of the 64-kb/s returned data messages occurs at the EIA level converter unit, where up to 20 synchronous lines are available for communications with the minicomputer.

3.03 The 12 asynchronous lines access up to 12 multipoint analog data circuits using data set 202T-type for the distribution of DTSS reports. The offices and centers receiving the DTSS reports have responsibilities for DDS facility troubleshooting and maintenance. The DTSS reports are generated automatically and are printed on DATASPEED* 40/3 receive-only printers (132-column, tractor-feed, addressable).

3.04 The synchronous communications lines or channels are provided on the T1DM facilities in the DDS. The 8-kb/s communications channel (also a synchronous line) is derived from the DS-1 signal by using the previously unused 191st bit of the 193-bit frame (sync byte for T1DM). The 191st bit as used in DTSS provides a free 8-kb/s channel. Access to this channel is enabled by a combination of the following:

(a) The T1DM bay wiring modification on older bay lists 1, 2, and 3. Newer bay lists 4, 5, and 6 have the modifications for DTSS factory wired.

(b) Additional access circuitry in HL16B circuit packs for each facility.

(c) Strapping the cross-connect field of the SU [circuit pack (CP) HL95].

3.05 The SUs in selected T1DM bays receive error performance data for each facility terminat-

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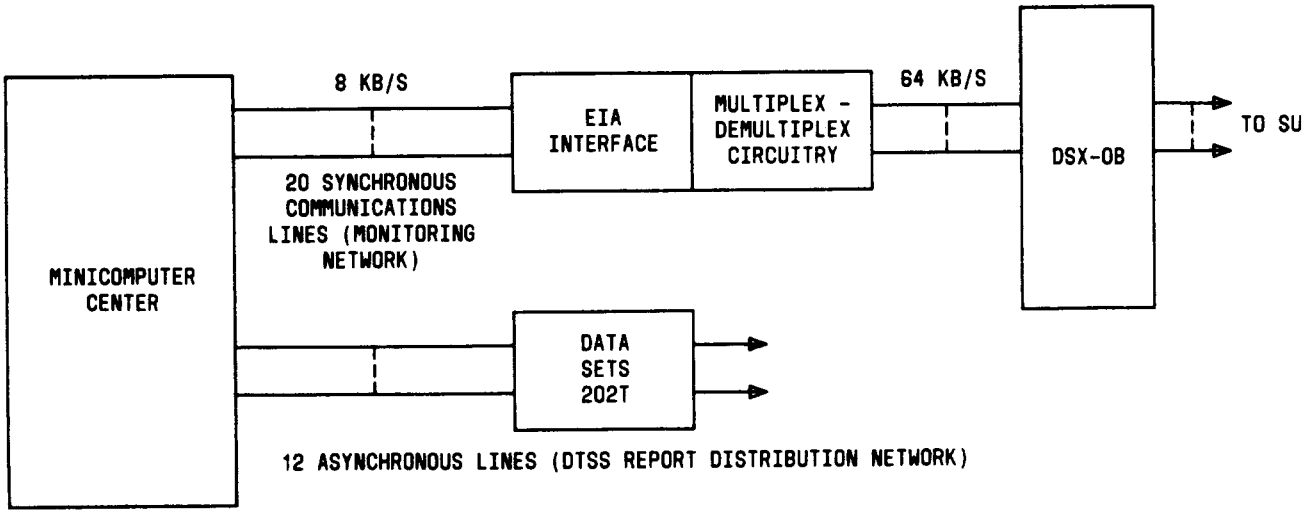

Fig. 2—Functional Layout of Minicomputer Center

ing in that bay. The error performance data can be due to an error in the sync byte or an error in the framing bit pattern (193rd bit) of the receiving direction. Normally, an SU monitors the performance data at the distant end of a T1DM facility. If there is no SU at the distant end, the HL16B CP at the distant end of the T1DM facility is optioned to loop back error performance data over the communications channel. Thus, an SU can monitor the receive direction of up to 11 T1DM facilities and also the distant end for the same facilities (transmit direction) when the distant end is optioned for loopback. When the minicomputer polls, an SU will respond with a facility error data message summarizing error counts for up to 22 facility-direction combinations (discussed later under Message Formats).

3.06 The minicomputer controls communications and initiates communications with the SUs. The SUs cannot initiate a message exchange. The communications channels are separated from each other because each channel uses a synchronous line. All SUs on a particular channel receive the polling data message from the minicomputer; only the SU with the proper network address will respond. Network addresses are unique in a given channel. Polling data messages are transmitted by the minicomputer every half second. The half second interval is required because of time constraints imposed by the address checking circuitry. Normally, the minicomputer will poll each SU on a given channel in turn (from level 1 to level 5). The time constraints do not apply between polls on separate channels, which means the minicomputer can simultaneously poll two or more SUs if they are on separate channels.

MESSAGE FORMATS

3.07 The Digital Data Communications Message Protocol (DDCMP) is used for network control in DTSS. The protocol uses ***numbered messages*** (Fig. 3) and ***control messages***. The messages are transmitted and received by either the minicomputer or an SU. A numbered message is exchanged whenever normal communications exist between the minicomputer and an SU. A control message is exchanged whenever trouble exists or information is received garbled.

A. Numbered Message

3.08 Figure 4 shows an example of a numbered message. Callouts refer to the different portions of the message and are used to associate with Fig. 3. The characters (numbers and alphabet letters) used in the format example represent hexadecimal characters; therefore, one pair of hex characters represents one byte or eight bits of data.

B. Control Message

3.09 Figure 5 shows the control message format. Callouts are used to refer to different portions of the message and to associate the example in Fig. 6.

3.10 Figure 7 shows examples of the seven types of control messages as transmitted by an SU. For equivalent messages from minicomputer, substitute 8 (final bit) where 4 is on third byte or substitute 9 where 5 is on third byte. For example: 05 02 81 RR 00 WWWW is a negative acknowledgement (NAK) with back check code (BCC) header error from minicomputer.

3.11 Figure 8 shows a ***typical message exchange*** between the minicomputer and an SU. This is only one possible operating mode or sequence.

4. GENERAL SOFTWARE DESCRIPTION

4.01 One method of describing the software of DTSS is to look at the information flow through the system (Fig. 9). Initially, the data base for the system is stored on a disk. The data base consists of tables for facilities, SU information, physical line assignments, etc. When the system is started up (initialization), the tables are read into memory for quick and easy access. Dynamic regions are created to accumulate data and to temporarily store received SU messages from the system until processed. Message exchange begins with initialization messages sent by the minicomputer and acknowlegements sent by each SU, in turn. Thereafter, the minicomputer will send polls to each SU, and the SU will respond with performance (facility errors) data messages. These are then processed and the results stored in accumulator arrays. Under the guidance of a clock (schedule), these arrays are checked every minute to see if the system thresholds on facility errors have been exceeded. When exceeded, a real-time exception report is generated. It is sent to printers located at offices and centers that have DDS facility maintenance responsibilities. The accumulator counts are recorded every 15 minutes on disk storage. These are

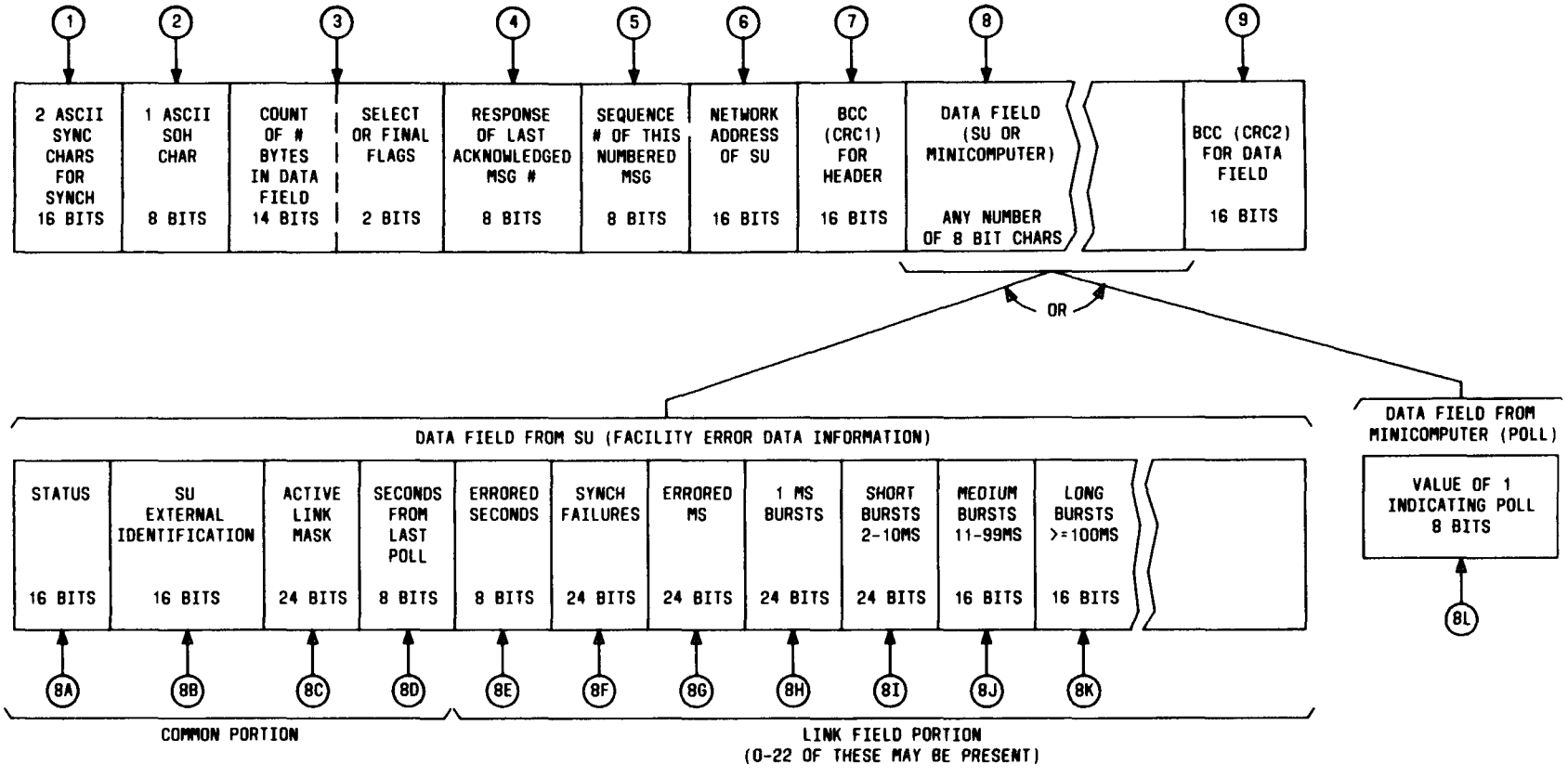

Fig. 3—Numbered Message Format

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EXAMPLE = 96969696 81 MMMM RR NN WWWW KKKK (Data portion) KKKK

   (1)   96969696       = 4 sync characters (at least 2 are needed)
   (2)   81             = start of header character
   (3)   MMMM           = low order part of data portion character count
                                (byte 1)
                          + high order part of data portion character count
                                (byte 2)
                          + final bit if message is from SU
                                (next highest bit of byte 2 set)
                          or + select bit if message is from minicomputer
                                (highest bit of byte 2 set)
   (4)   RR             = number of last data message received
   (5)   NN             = number of this data message
   (6)   WWWW           = network address of SU involved
   (7)   KKKK           = two bytes of back check code (BCC) check for header
   (8)   (Data portion) = If message is a poll message from minicomputer, data portion is
                          01 in hex. If the data message is a message reporting on facility
                          errors from an SU, the data portion consists of a 8 byte common
                          data field followed by a variable number of 17 byte per link
                          fields (each link representing a facility), followed by BCC check
                          bytes.

                 Common field: XXXX IIII LLLLLL SS
         (8A)    XXXX     = two bytes of status (for change mode, SU overflow)
         (8B)    IIII     = external identification field
         (8C)    LLLLLL   = active link mask for facilities reporting errors
         (8D)    SS       = seconds from last poll

                 Per link field: XX XXXXXX XXXXXX XXXXXX XXXXXX XXXX XXXX
         (8E)    XX       = # errored seconds
         (8F)    XXXXXX   = # sync failures
         (8G)    XXXXXX   = # errored milliseconds (ms)
         (8H)    XXXXXX   = # 1 ms bursts
         (8I)    XXXXXX   = # short bursts (2-10 ms)
         (8J)    XXXX     = # medium bursts (11-99 ms)
         (8K)    XXXX     = # long bursts (100ms and up)

                          OR

         (8L)    01       = one byte indicating poll from minicomputer

   (9)   KKKK       = two bytes of BCC for data portion
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Fig. 4—Example of Numbered Message

used in creating administrative reports. The accumulator information is periodically dumped onto tape for storage and long-term analysis. The information from the accumulator is used to update weekly and monthly facility tables. These tables are then used to create administrative reports. These reports are sent to printers located in offices and centers that are responsible for overall DDS facility management. They help to identify recurring troubles.

4.02 Because of the addition of new facilities, new SUs, new 8-kb/s communications channels, etc, new information must be included in the tables stored on disks and in memory. The new information is inputted via a terminal; and when completed, notification is given to the system to reinitialize its tables. This reinitialization is normally done at the end of the next 15-minute period.

4.03 These functions are performed by the minicomputer software. The software consists of independent built programs called tasks. Tasks communicate with each other by means of global event flags. These flags allow data packets to be passed be-

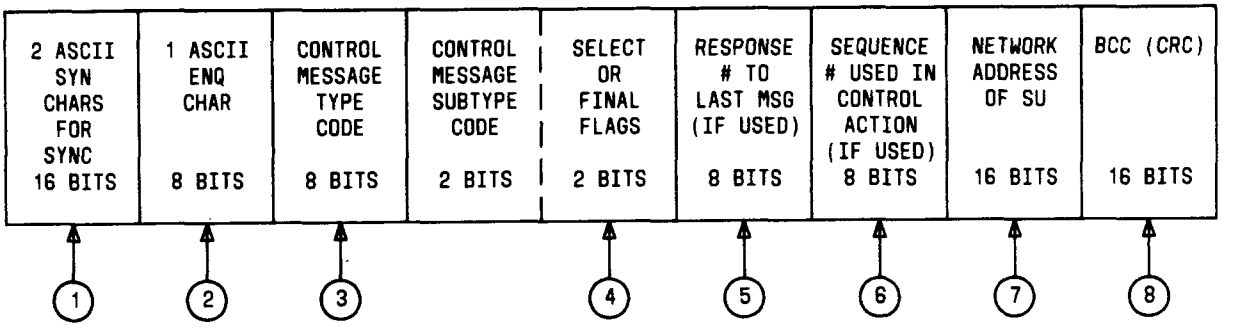

Fig. 5—Control Message Format

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EXAMPLE = 96969696 05 TT SS RR NN WWWW KKKK

    (1)   96969696 = 4 sync characters (at least 2 are needed)
    (2)   05       = enquiry character indicating this is a control message
    (3)   TT       = type of control message (01-07)
    (4)   SS       = subtype (for NAK messages) plus a or b:
                     a. final bit if message is from SU
                           (next highest bit of byte set)
                     b. select bit if message is from minicomputer
                           (highest bit of byte set)
    (5)   RR       = response field
    (6)   NN       = number field
    (7)   WWWW     = network address of SU involved
    (8)   KKKK     = two byte BCC check
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Fig. 6—Example of Control Message

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Control message types:          (As sent by a SU unless otherwise noted)
       05 01 14 RR 00 WWWW        ACK (acknowledge) message

       05 02 41 RR 00 WWWW     NAK (negative acknowledge) message for BCC header error
       05 02 42 RR 00 WWWW     NAK message for BCC data error
       05 02 43 RR 00 WWWW     NAK message for REP response
       05 02 48 RR 00 WWWW     NAK message for buffer unavailable
       05 02 50 RR 00 WWWW     NAK message for message too long
       05 02 51 RR 00 WWWW     NAK message for header format error

       05 03 40 00 NN WWWW     REP message (reply)
       05 04 40 00 NN WWWW     RES message (reset)
       05 05 40 RR 00 WWWW     RESAK message (reset acknowledge)
       05 06 80 00 NN WWWW     STRT message (start) only sent by minicomputer
       05 07 40 RR 00 WWWW     STACK message (start acknowledge)

For equivalent messages from minicomputer, substitute 8 (final bit) where
4 is on third byte or substitute 9 where 5 is on third byte.
For example: 05 02 81 RR 00 WWWW is a NAK with BCC header error from minicomputer.
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Fig. 7—Example of the Seven Types of Control Messages

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Start sequence:                                  Start from minicomputer
        05 06 80 00 NN WWWW KKKK                  STACK from SU
        05 07 40 RR NN WWWW KKKK

Poll sequence 1.
        81 01 80 RR NN WWWW KKKK                 poll from minicomputer
        81 MMMM RR NN WWWW KKKK (data portion)   KKKK data message
                                                 from SU where RR of SU message
                                                 = NN of poll

Poll sequence 2.                                 poll from minicomputer
        81 01 80 RR NN WWWW KKKK                 ACK from SU where RR of SU message
        05 01 40 RR 00 WWWW KKKK                     = NN of poll

Poll sequence 3.                                 poll from minicomputer
        81 01 80 RR NN WWWW KKKK                 NAK from SU where RR of SU message
        05 02 42 RR 00 WWWW KKKK                     is not equal to NN of poll

Reset sequence.                                  RES from minicomputer
        05 04 80 00 NN WWWW KKKK                 RESAK from SU where RR of RESAK
        05 05 40 RR 00 WWWW KKKK                 = NN of RES

Reply sequence 1.                                REP from minicomputer
        05 03 80 00 NN WWWW KKKK                 ACK from SU where RR of ACK
        05 01 40 RR 00 WWWW KKKK                 = NN of REP

Reply sequence 2.                                REP from minicomputer
        05 03 80 00 NN WWWW KKKK                 NAK from SU where RR of NAK
        05 02 43 RR 00 WWWW KKKK                 is not equal to NN of REP
```

Fig. 8—Example of Typical Message Exchange

tween tasks by means of send data and receive data (RSX11M) system directives. Large amounts of data, such as the message arrays and accumulator arrays, are stored in dynamic regions. Each task maps itself into the appropriate region or regions using RSX11M memory management directives. Some tasks are activated at initialization. A task may be activated within a task by using request task directives. Other tasks may need to be blocked while other tasks are running. This is accomplished by using global event flags which indicate the state of critical tasks.

4.04 Each task performs a set of related functions. A logical grouping of these functions is called a ***process.*** A process must encompass one or more tasks. The software for DTSS has eight processes.

INITIALIZATION PROCESS

4.05 The initialization process consists of the STARTUP and ARYINI (array initialization) tasks and part of the DATGAT (data gathering) tasks. To begin the initalization process, the computer operator at the system console accesses a command file with commands to install DTSS tasks and to run the STARTUP task. STARTUP then activates ARYINI. ARYINI in turn activates DATGAT. DATGAT activates the scheduling task, CLOCK, and remains in the system to perform SU-minicomputer communications. This process consists of the following functions:

(a) Sets global event flags to indicate no critical tasks are running. When a task is running, the corresponding event flag is cleared for the duration of the task and set when the task has completed (STARTUP).

(b) Creates the dynamic memory regions for received SU messages and facility error accumulators (ARYINI).

(c) Reads facility identification information into the accumulator region from the facility table on disk (ARYINI).

(d) Creates line control, SU (microprocessor) control, and poll control tables from tables on disk (DATGAT).

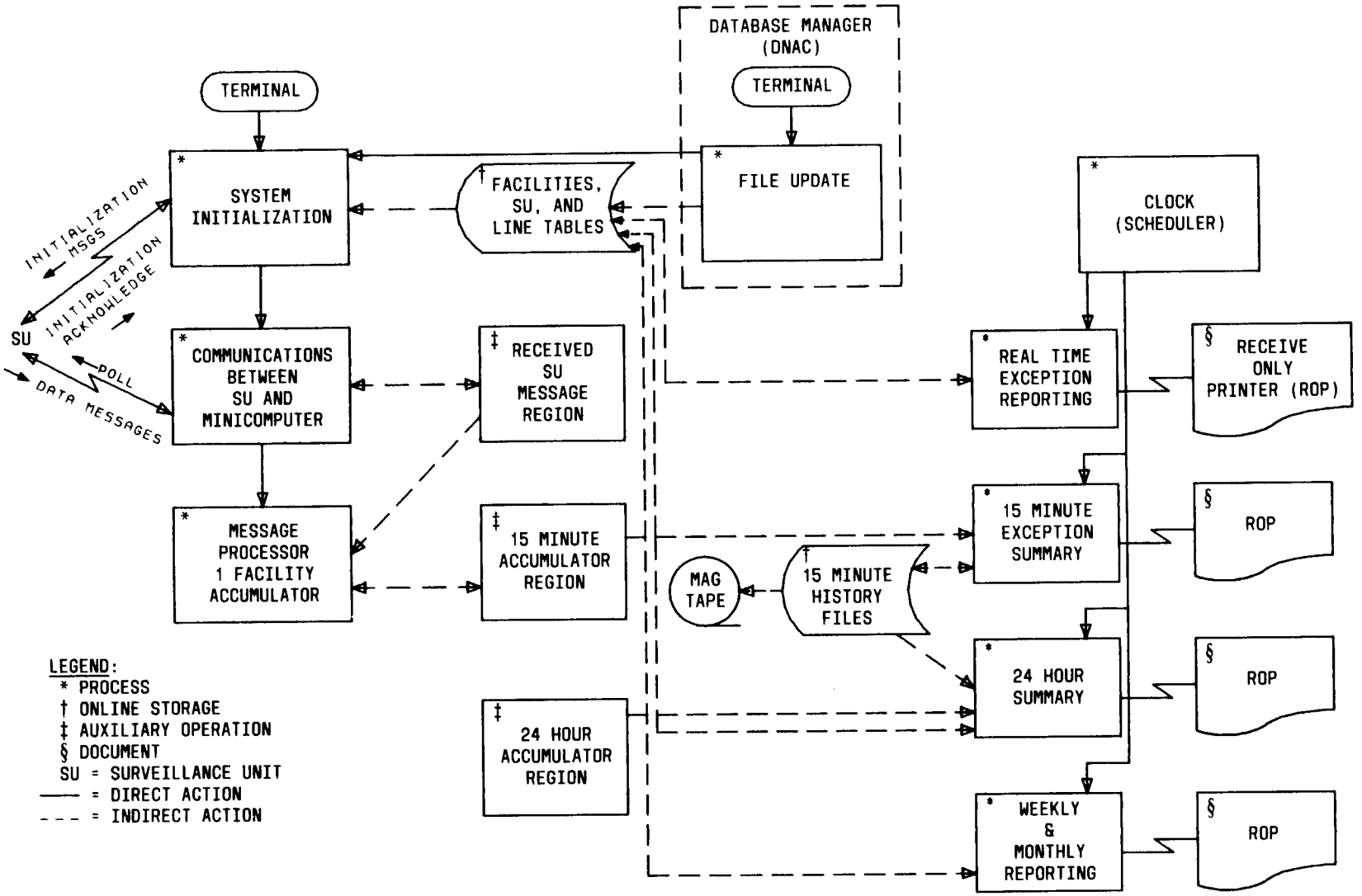

Fig. 9—Information Flow for DTSS

(e) Initializes lines (DATGAT).

(f) Sets up start messages as first messages to be sent to (DATGAT).

SU/MINICOMPUTER COMMUNICATIONS PROCESS

4.06 The SU/minicomputer communications process is contained basically within the DATGAT task. The minicomputer sends and receives a message from each SU in turn on a given channel. The message exchange on one communications channel is independent of the message exchange on another. Each communications channel corresponds to a separate synchronous communications line on the minicomputer. After initialization messages, DATGAT enters the data message exchange or data gathering mode. All messages between an SU and the minicomputer follow DDCMP standards with a few variations. The DDCMP provides for message synchronization and acknowledgement using message number counters and control messages. It also provides for bit error detection using a 16-bit cyclic redundancy check (CRC).

4.07 Each message sent to an SU contains its network address (Fig. 3) which is two bytes or 16 bits long, unlike standard DDCMP which uses a one byte address field. In messages received from an SU, the address field contains the network address of the SU instead of the minicomputer address. The field is used in this manner to allow the minicomputer to determine which SU it is communicating with. The SUs send messages only to the minicomputer. In addition to the network address of an SU, the minicomputer uses the communications line number to identify it.

4.08 Within DDCMP, there are two types of messages, numbered and unnumbered. The poll message from the minicomputer to an SU and the data message from an SU to the minicomputer reporting on facility errors are the numbered messages (also called the performance data message). The unnumbered messages are the control messages, used in starting communications (START, STACK) and in error recovery when there has been some error in reception or transmission. The initial message sent by the minicomputer to each SU is a START message, which directs it to initialize its message number counters. The proper response is a STACK (Start acknowledge) from the SU. Thereafter, the normal sequence would be a poll from the minicomputer, followed by a response (performance data message) from the polled SU. Each poll also acknowledges the message number of the previous data message received from that SU, and each data message acknowledges the message number of the last poll received. In this manner it is possible to determine if messages are lost; if so, either the minicomputer or the SU can send control messages that are used to determine which messages should be resent and to reset the message counters if necessary. Within each message are BCC check fields which are checked to determine if parts of the message have been garbled or lost. In addition, a time limit is set for the reception of a response from the HL95 to flag a no response situation. The minicomputer then proceeds to error recovery control messages on its next message exchange with that SU. Refer to paragraph 3.10 for a possible control message exchange or sequence.

4.09 The format of control messages and performance data messages are similar. Control messages are 7 bytes (8 bits per byte) in length (excluding sync bytes and 2 bytes for BCC check). Performance data messages have a 7 byte header (excluding sync bytes and 2 bytes for BCC header check) plus a variable number of bytes in the data portion (excluding 2 more bytes for BCC data check). Within the header is a field for the byte count of the data portion. In a poll from the minicomputer, the data portion is one byte containing the value 1. The data portion of the data message from the SU would be 8+17N bytes in length, where N is the number of facilities with errors since the last poll monitored by that SU. The 8-byte common field includes information pertaining to the SU, such as two status bytes, a two byte ID field, a three byte active link mask for identifying facilities with errors, and a one byte elapsed second count from the last poll. The 17-byte link fields give counts of error seconds and error bursts for facilities with errors. (See Fig. 3 and 4 for detailed message formats. For a detailed description of DDCMP, see "Specification for: DDCMP Digital Data Communications Message Protocol, Edition 3, 10-December-1974," by Digital Equipment Corporation.)

4.10 The functions of the SU/minicomputer communications process performed by the DATGAT task are as follows:

(a) Send out poll or control messages to each SU.

(b) Receive messages from each SU.

(c) If a data message has been received from an SU, set a flag in the received message region

for the MSGPRO (message processing) task and also send SU ID information in a separate data packet.

(d) Update status for each SU and its communications state, last message numbers received and transmitted counters, last message sent to it by the minicomputer.

(e) Update status of each line, last SU polled on it.

(f) Notify console of problems detected, such as line out of service.

PERFORMANCE DATA MESSAGE PROCESS

4.11 The processing of performance (facility error) data messages is done in the MSGPRO task. The task is mapped into two dynamic memory regions: the message region where it can access line buffers for messages received from SUs and the accumulator region where the error data for facilities is updated. The MSGPRO also receives a data packet from DATGAT with microprocessor control block information for each SU whose message is to be processed. Processing is done one message at a time. MSGPRO is activated during the initialization process, but remains in a wait state until a data packet appears in its queue indicating a data message is ready to be processed. The functions performed during message processing are as follows:

(a) Use data packet information to locate a particular buffer with a data message to be processed in the message region.

(b) Check status bytes in common field of message for indications of change button having been pushed or of an SU accumulator overflow.

(c) If change mode or overflow indication bits are set, compute for each facility in service and reporting errors on that SU the dotted error pattern check ratio, ie, sync failure count/count of elapsed seconds. These values are sent in one or more data packets to CONSOL task, which activates it (notifies console).

(d) Compute counts of elapsed seconds, 1 ms, short, medium, and long bursts, errored seconds, errored ms, and sync failures for each facility in service on that HL95 and update those facility accumulators. Also for each facility actually reporting errors, set change flag in accumulator array as an indicator to M01TSK, the real-time exception reporting task.

(e) Reset flag in message region to indicate to DATGAT that the data message has been processed so that additional messages can be sent out on the particular communications line.

4.12 The CONSOL task prints out on the system console the indicator for change button having been pushed or SU accumulator overflow (CB or OV), the dotted error pattern ratio, and the shelf number for the facility reporting errors. This information is useful during initial SU installation and strapping tests (Section 314-984-200).

SCHEDULER (CLOCK) TASK

4.13 The scheduling of all tasks is done by the CLOCK task. This task is activated at specific times of day or date. CLOCK task is activated during the initialization process by DATGAT, and every second it obtains the system time and date. It also checks the run schedule for the following tasks:

(a) M01TSK (minute real-time report)—every minute

(b) M15TSK—M15RPT (15-minute report and file creation)—every 15 minutes

(c) M01HDG (minute real-time report headings)—done at end of 15 minutes or when system first is initialized

(d) H24TSK—H24RPT—H24RP2 (24-hour array creation and reports)—every 24 hours

(e) DO7TSK—DO7RP2 (weekly reports)—at the end of a week

(f) MONTSK (monthly report)—at the end of a troubleshooting month.

4.14 Certain tasks are chained together so that one task activates the next before exiting. In addition, the data packet containing date and time information is passed to the task to be activated. Before M15TSK exits, it activates M15RPT. Before H24TSK exits, it activates H24RPT. Lastly, H24RPT activates H24RP2 before it exits. The checking is done in sequence, and with the exception of M01HDG, CLOCK

does not activate an additional task while the previously activated one is still running. Thus, for each such activated task, CLOCK generally does the following:

(a) Clears global event flag corresponding to the given task or group of tasks to indicate it is running.

(b) Sends data packet with binary and American Standard Code for Information Interchange (ASCII) versions of time and date.

(c) Requests activation of task.

(d) Waits for task or task group completion by checking for the global event flag to be set again.

SAVE HISTORICAL DATA PROCESS

4.15 On a continuous basis, the performance data (facility error) is saved on disk history and T1DM facility files. Updating occurs every 15 minutes and every 24 hours for the disk facility files. On the 15-minute files, the accumulators are saved for all facilities in service at that time. This provides counts of elapsed seconds, 1 ms, short, medium, and long error burst counts, error seconds, error ms, and sync failures, as well as facility identification (ID) information. The M15TSK performs this function and creates date files of the form MMDDYY.HST;* where MM is month, DD is day, YY is year, and * is version number for the day. The file for the first 15-minute period in a given day has version 1, and additional periods have successive version numbers. The M15TSK also updates the 24-hour accumulators (zeroed at midnight) in the T1DM facility file. Before it terminates, M15TSK activates M15RPT which reads the latest history file before creating the 15-minute exception report.

4.16 These 15-minute files are dumped to tape in the HISTORY task. The computer operator runs the task and specifies via terminal input which day's files are to be dumped. Depending on the file, a tape can contain a variable number of days' files. Normally, after the files are dumped to tape, the disk files are deleted. If it becomes necessary at a later time to copy the files back onto disk, the operator can run the HISTREAD (history file read) task.

4.17 Every 24 hours, within the H24RPT task, for each facility in service at the time, the day's elapsed second and errored second counts are added to the respective current weekly and monthly accumulators in the facility file. The weekly accumulators are cleared at the end of each Saturday for the weekly tasks DO7RP2. The monthly accumulators are cleared at the end of a troubleshooting month by MONTSK, the monthly task. In addition, flags are set in the facility file for those facilities which make the "10 worst" list for that month.

REPORT GENERATION PROCESS

4.18 Reports are automatically generated at 1-minute and 15-minute intervals if error thresholds are exceeded and at daily, weekly, and monthly intervals for all facilities in service. The tasks involved are M01HDG (minute real-time exception report heading), M01TSK (minute real-time exception report), M15RPT (15-minute exception summary report), H24TSK (24-hour array creation), H24RPT (24-hour summary report), H24RP2 (historical file report), DO7TSK (weekly summary report), DO7RP2 (weekly worst facilities report), and MONTSK (monthly performance ranking reports). The scheduling of these tasks is done through the scheduler, the CLOCK task, which also sends a data packet containing system date and time.

A. One-Minute Real-Time Exception Report Task

4.19 The 1-minute report task, M01TSK, is activated directly by CLOCK. The M01TSK maps into the 15-minute accumulator array in the dynamic accumulator memory region. It performs the following functions:

(a) Clears event flag for the 1-minute task. (This was done in CLOCK, but is also done here to allow for activation independent of time for testing purposes.)

(b) Checks a flag in the accumulator array for each facility in service, indicating whether any errors were detected since the previous minute; and if so, checks whether any error thresholds have been exceeded.

(c) Generates a 1-minute exception report if both of the above conditions are true. The facility office codes are sent via data packets to the OFCMG2 task. This task translates the codes and returns the information in different data packets. The time of day, facility information, status of the

15-minute accumulators for errored seconds, and 1 ms, short, medium, and long burst counts are written to the output tables. A set of TTYSPx (x = alpha character) tasks is activated to send the output tables to the various parts of the report network.

(d) If a report was generated, it resets the change flag for the errored facility. The MSGPRO task will set it again the next time error data for the given facility is received.

(e) Before exiting, it sets the event flag for the 1-minute task.

4.20 The headings for this report are generated at the beginning of each 15-minute period by the M01HDG task. It is activated by the CLOCK task.

B. Fifteen-Minute Exception Summary Task

4.21 The 15-minute report generation task, M15RPT, is activated by M15TSK (the task that writes the 15-minute history files to disk, updates the daily accumulators in the T1DM facility file, and clears the 15-minute accumulator region). The M15RPT does the following:

(a) Scans the dynamic region EXCREG created by M15TSK for facilities that have exceeded error thresholds.

(b) Generates a 15-minute exception summary if thresholds are exceeded. Office codes in the facility identification are sent to OFCMG2 task via a data packet, and a data packet is received with office name translation. The 15-minute accumulators for errored seconds and 1 ms, short, medium, and long burst counts are output to the report. Various sets of TTYSPx (x=alpha character) tasks are activated to actually send the output tables to the different parts of the report network.

(c) Before exiting, it sets global event flag for 15-minute group of tasks.

C. Daily Reports Tasks

4.22 The daily group of reporting tasks are activated at the end of the day. The activated tasks are the H24TSK (24-hour array creation), H24RPT (24-hour summary report), and the H24RP2 (24-hour worst facilities report). These tasks perform the following functions:

(a) Clear event flag for the 24-hour group of tasks (H24TSK). (This is also done in CLOCK, but doing it here allows activation of this task independent of time for testing purposes.)

(b) Create a dynamic region for the 24-hour accumulators (H24TSK).

(c) Read in the day's accumulated data from the T1DM facility file for each facility (H24TSK).

(d) Determine if a facility should be added or deleted from the historical file based on past and present performance, and mark the T1DM facility file accordingly.

(e) Generate a 24-hour summary report for all facilities and a historical file report for problem facilities based on the 24-hour accumulator array, and place them on the output files. Office codes in the facility identifications are sent to the OFCMG2 task via data packets. After translation to names, the information is returned in data packets. A set of TTYSPx (x=alpha character) tasks is activated to send the output files to various parts of the report network (H24RPT & H24RP2).

(f) Set the global event flag for the 24-hour group of tasks (H24RP2) before exiting.

4.23 The H24TSK task is activated by CLOCK. This task sends information on the newly created 24-hour accumulator region to the H24RPT task. The H24RPT maps into the region and generates the 24-hour reports. It also updates the longer term accumulators in the facility files (see Save Historical Data Process). Finally, the H24RPT task updates the accumulator region with performance data for creation of the historical file report, sends mapping information along with system date and time to H24RP2, and activates it before exiting. The H24RP2 then maps into the region and creates the historical file report.

D. Weekly Report Task

4.24 The DO7TSK task is activated by CLOCK at the end of each week. This task is generated after the daily report tasks are produced. The DO7TSK task provides a weekly summary of performances based on percentage error-free seconds for each facility in service at that time. Also, this task performs the following functions:

(a) Clears event flag for weekly task. (This is also done in CLOCK, but is done here to allow time independent task activation for testing purposes.)

(b) Reads for each facility, from the facility file, percentages of error-free seconds for the last 7 days.

(c) Generates a summary report with facility information onto output files. Facility codes from the facility files are converted to names through the OFCMG2 task. A set of TTYSPx (x= alpha character) tasks is activated which sends the output files to the various parts of the report network.

(d) Sets the event flag for weekly task before exiting.

E. Monthly Report Task

4.25 The MONTSK task is activated by CLOCK at the end of a troubleshooting month. Task generation occurs after the 24-hour reports and after the weekly report, if its the end of the week. This task performs the following functions:

(a) Clears event flag for monthly task. (This is also done in CLOCK, but doing it here allows date independent activation for testing purposes.)

(b) Reads, from the facility file on disk, facility identification information, elapsed seconds, and errored seconds accumulated over the month for each facility in service at that time.

(c) Computes percentage error-free seconds for each facility.

(d) Generates a set of monthly reports to output files. Facility office codes are translated to office names via the OFCMG2 task. A set of TTYSPx (x=alpha character) tasks is activated to send out the output files to the report network.

(e) Sets the event flag for monthly task before exiting.

4.26 The MONTSK task also clears the monthly accumulators on the facility files after the reports are generated.

F. Report Spooler Tasks

4.27 All the TTYSPx (x=alpha character) spooling tasks perform the same functions. Each task when activated sends one or more output files to a group of minicomputer asynchronous lines. A group of lines receives a common set of reports. The difference among the tasks is the particular grouping of lines. For example, the lines for the Centralized Test Center/Special Service Center subnetwork receive the reports when TTYSPA is activated. The individual report generating tasks, M01HDG, M01TSK, M15RPT, H24RPT, H24RP2, DO7TSK, DO7RP2, and MONTSK, send data packets to the spooling tasks. The data packets contain file name information for the file being sent to the spooling task. The spooling tasks perform the following functions:

(a) Initialize each line on that particular part of the network.

(b) Send data on output files to each line initialized successfully.

(c) Send a message to the console indicating line out of service if a problem occurs with sending.

(d) Delete each output file from disk after sending.

4.28 Each spooling task will remain active while there are data packets with file information on queue for it. The task will continue to send and delete output files until the queue is empty.

G. Office Name and Code Translation Task

4.29 The sole function of the OFCMG2 task is to translate office codes to office names and vice versa. Other tasks communicate with the OFCMG2 task through data packets which contain the value to be translated. The communication also indicates the direction of the translation. Only one translation at a time can be performed. During a translation, an event flag is cleared and is set when the translation is completed. The OFCMG2 task results are returned in another data packet. Other data packets requesting translations are queued up in the meantime, waiting until the flag is set again.

4.30 For maintenance on the office name file, the OFCLOAD, OFCBLD, OFCLST, and OFCNAME tasks are used. The OFCBLD just creates an initial empty office file. The OFCLOAD is used to add or change office names. The OFCLST and OFCNAME provide listings of the office file. The person in charge of data-base management activates these tasks when needed.

H. Other Administrative Tasks

4.31 In addition to the previously described tasks, there are other tasks which may be run for network administration purposes by the data-base manager at the Digital Network Administration Center (DNAC). The NOTALK task checks the last 15-minute file for the elasped time monitored by each SU. Every elapsed time less than a set threshold is listed on the terminal along with the elapsed time monitored. This task can be run on a demand basis or scheduled as often as every 15 minutes. The CHGBUT task allows the manager to shunt the SU sync failure rate data to a terminal instead of to the data base for a specific SU to do dotted pattern strapping tests. The SETDIG task enables changing the threshold for real-time exception reporting to 1-errored second for a specific digroup. The DIGCNT task provides a count of digroups in the system. The FAXLST task provides a listing of the digroups in the data base by the SU assignment and shelf number. The BROALL task (on a one-time basis) and the REMIND task (on a scheduled basis) are used to send information message files to all printers on the asynchronous report network. The BOLIST, RFLIST, and CTLIST tasks are used to resend output files to specific groups of printers, for example, test centers.

4.32 The ASYTST and XVTEST tasks are used to provide test messages for the DV11 lines of the minicomputer. The ASYTST task tests the asynchronous lines which are used for the report distribution network. The XVTEST task tests the synchronous lines which are the communication channels to the SUs. The ASYTST task can also be used to test individual report printers. Running both tasks checks the network component, whether the component is inside or outside (report printer) of the minicomputer.

4.33 In case of system problems, several tasks as follows can be run to update and/or restore files to the proper state. The RERH24 task updates and produces all of the reports normally done at midnight for a given day. The FIXDAY task reads all the history files for a specified day and uses the information to reproduce the day's accumulator counts on the facility file. The RUNNOW task is used to activate one of the tasks normally activated by the scheduler via the CLOCK task. The SETALL task sets all of the event flags associated with a task that was requested by the CLOCK task. The SETEVT is used to set a particular event flag. Normally, an event flag in the clear state indicates a critical task is running. This blocks other tasks from being run. The CLREVT task is used to clear a particular event flag. To help in analyzing the state of the system, dump routines are available. The TRFDMP task is a transaction file dump for update transactions. The FACDMP task is a facility file dump. The IDXDMP task is a facility index file dump. The FILDMP task is a dump of the SU, poll, and line control tables. The MTRFIL task creates a new transaction file. The FAXIDX task creates a new facility index from the facility file.

FILE AND TABLE UPDATE PROCESS

4.34 The file and table update process consists of two subprocesses: ***transaction file creation*** and ***transaction file read.*** The transaction file creation subprocess can be activated at any time at the request of the data-base manager. This subprocess consists primarily of the UPDATE task which allows the user to input data that indicates the changes to be made to the files and tables. The transaction file read subprocess can be activated at the end of the current 15-minute period. Activation occurs automatically if a global event flag for reinitialization was set during the transaction file creation subprocess. The transaction file read subprocess consists of the RTRANS task. This task allows for updating the disk files and internal memory tables and initializing whenever SUs or lines are added.

4.35 The UPDATE task is divided into three areas: facilities, SUs, and line numbers. Each input parameter for these areas has error checking.

(a) The ***facilities*** functions of the UPDATE task include:

(1) Adding new facilities. The information required is the facility number, A and Z office names, CDR1 and DMUR information, SU identification for each facility receive direction, SU message slot assignments for each direction, and control region for each direction.

(2) Moving a facility that is assigned to one SU to another SU. The information required is the facility identification and direction and the new SU identification and message slot number.

(3) Changing facility information. The information required is the facility identifica-

tion and the particular information to be changed, eg, DMUR information.

(4) Deleting facility. Only the facility identification information is required.

(b) The ***surveillance unit*** functions of the UPDATE task include:

(1) Adding a new SU to DTSS. The information required is the logical line number assignment for minicomputer communications and the SU network address.

(2) Moving an SU to another logical line number. Only the new minicomputer logical line number information is required.

(3) Changing SU information. The only information that might change is the SU network address.

(4) Deleting SU from DTSS. Only the SU network address information is required.

(c) The ***logical line number*** functions of the UPDATE task include:

(1) Adding new logical line. This is normally done when additional communications channels are added to the DTSS network configuration. The information required is the logical line number and the minicomputer physical line number assignment.

(2) Moving logical line. The information required is the logical line number and the new physical line number assignment.

(3) Deleting logical line. Only the logical line number information is required.

DATA-BASE MANAGEMENT

4.36 The data-base manager is located at the DNAC and uses a DATASPEED type terminal (cathode-ray tube/keyboard with associated printer) for interaction with the minicomputer. The primary responsibility of the data-base manager is to coordinate activities to update the data base at the minicomputer. The DNAC responsibilities are defined in Section 314-984-101.

4.37 The data base consists of accumulated data stored in tables and files at the minicomputer center. Tables are stored in the memory of the minicomputer for present calculations, whereas files are stored on disk for future calculation.

4.38 Tables are used to translate an SU and channel to a physical T1DM route. Whenever there are changes in the SU channel assignment, such as by rewiring within a bay, these tables must be updated. Coordination between personnel at the DDS office and the DNAC is necessary to prevent interruption of data still being received from other offices. These tables are again updated whenever adding or deleting a T1DM system, adding T1DM bays, or adding or reassigning SUs in the DTSS network. Initially, these updates are made manually from the DNAC or from the minicomputer center. In the future, it may be possible to update the tables automatically using files from circuit layout (engineering).

4.39 The performance data from each polled SU is accumulated and processed according to a particular T1DM route for the current 15-minute period. The accumulated data consists of the following:

- The number of errored seconds
- The number of sync failures
- The number of short error bursts, 2 to 10 milliseconds
- The number of medium error bursts, 11 to 99 milliseconds
- The number of long error bursts, 100 and over 100 milliseconds
- The sum total of milliseconds in error
- The number of 1-millisecond bursts
- The number of total seconds monitored.

4.40 The accumulated data is written into a disk file for each 15-minute period. The disk file contains data for the last 24 hours and is further assorted into daily statistics for the last 7 days.

5. MINICOMPUTER MAINTENANCE

ROUTINE MAINTENANCE

5.01 The history files for the preceding week, up to and including Sunday, are to be dumped onto

tape every Monday unless other arrangements are made. The History program is used with entry of individual dates to be dumped. Depending on the number of facilities in the data base, one or more tapes will be needed. The DTSS should remain on-line during this time, so no downtime is incurred. The retention period for each tape is 1 year after the last date of data on the tape.

5.02 The BRU tape (RSX11M backup and restore utility) is created to back up all files to tape, once a week, normally in the evening when the system is less loaded. This will allow selected restoral of files within the DTSS system. It will also allow a complete restoral of files to a different disc on an RSX11M system with dual disc drives, should a problem with the disc occur at some future date. During the backup process, DTSS should remain on-line so no downtime is incurred. The retention period for each tape is 2 months from the creation of the tape.

5.03 The DSC tape (RSX11M disc save and compress utility) can be used to create backup tapes and restore to disc. On a one disc system, a stand-alone version must be booted into the system, thus DTSS would be down during the operation.

FILE RESTORAL OPERATIONS

5.04 If for any reason individual files are destroyed on the disc, the files can be restored onto the disc using the appropriate copy of BRU tapes.

5.05 If the system disc develops problems necessitating transferral of files to a different disc, a new disc should be formatted using a formatter such as Digital Equipment Corporation model XXDP. To locate all the bad blocks in the new disc, it should be run three times for three cases (all 0s, all 1s, and worst case), and a combined list of all bad blocks by cylinder, track, and sector should be made. The addresses of the bad blocks should be converted to logical block numbers. The RSX11M utility BAD tape should be run to list all the bad logical block numbers and combined with the previous list. The BAD tape is run in the manual mode to enter the entire list of bad blocks and search for additional bad blocks. Once this is done, a bad block descriptor file is created on the disc. For a 2-disc RSX11M system, a BAD tape may be run on-line if the system is operating with one disc and writing to the other disc. If running a BAD tape on a 1-disc system, the tape must be booted as a stand-alone. Next, the files must be restored to tape. This requires using a BRU tape with an RSX11M system with two disc drives. One disc drive is used for the running system, and the other drive is used in overwriting the disc using the BRU tapes. Another restore operation is possible by using the set of DSC tapes.

MINICOMPUTER PROBLEMS

A. Hardware

5.06 Any problems attributable to minicomputer hardware should be promptly referred to the appropriate hardware maintenance organization for repairs or replacement. For system crashes or hangups, referral is accomplished after obtaining relevant register counts and error light indications. Hardware problems include peripheral problems, such as jamming of the line printer, malfunction of tape drives, etc.

B. Software

5.07 Any problems with the running of the software should be referred to the software support group. This group may request dumps of executive locations and registers.

6. TROUBLESHOOTING DTSS

6.01 The following troubleshooting information assumes the minicomputer center is functioning properly. Any problems involving DTSS other than the minicomputer will most likely involve the participation of the technician at the DNAC. Such problems may include the SU(s) located in DDS office(s), the cabling from the minicomputer via the DSX-0B to the DDS office, the report distribution terminals located at the DNAC, Network Operations Center, Special Service Center/Centralized Test Center (SSC/CTCs), and Regional Facility Management Centers, and the connecting multipoint data circuits for report distribution.

6.02 Trouble indications on the DTSS may be observed by any technician involved in the use or operation of DTSS.

PATCH PANEL INDICATIONS

A. All SD Indicators Off

6.03 When DTSS is operating properly, the SD (send data) and RD (receive data) indicators

should flash in sequence at the polling rate. The polling rate is usually every second or half-second; check with the software group to be sure. For troubleshooting, the DNAC technician can provide the latest communications channel configuration, indicating the associated minicomputer port. If none of the SD indicators flash, the minicomputer may be hungup, halted, or crashed.

B. SD Indicator Off

6.04 The minicomputer is not sending messages to the SUs if the SD indicator is not flashing for a particular port/line. Determine how many indicators are not flashing and try to detect what is common between the ports/lines. For example, ports/lines numbered 0 to 15 are associated with a particular DV sync preprocessor, and ports/lines numbered 16 to 19 are associated with another DV.

C. SD Indicator Off and RD Indicator On

6.05 If the RD indicator is on while the SD indicator remains off, the information is being received at the minicomputer before a polling message has been sent. Normally, this should not happen and must be referred to the software support group.

D. SD and RD Indicators Off

6.06 If the SD and RD indicators are off and input/output (I/O) error messages have been printed (see printer indicators), the probable cause is the hardware associated with a DV11. The hardware refers to cabling and connections that are associated with the patch panel or distribution panel or a problem with the DV11s themselves.

E. SD Indicator Flashes and RD Indicator Off

6.07 If the SD indicator is flashing normally and the RD indicator is not flashing, the response message is not being received at the minicomputer. This may be due to a break in the communications channel caused by a facility outage or by an inoperative SU. Refer to the network configuration to determine the SU(s) on the communications channel and the associated facilities. Assist the DNAC as required to localize the problem. The DNAC will probably be aware of any facility outages. The network configuration lists the hierarchy of SUs from the lowest level SU (level 1) to the highest level SU (level 5). The DDS offices with SU(s) can be called to determine if any messages are being received by an SU (SU POLL indicator flashes). The DNAC can request tests of a suspected malfunctioning SU. A problem pertaining to several communications channels may be due to malfunctions in multiplexing/demultiplexing circuitry of SU(s), cabling between SU and minicomputer, or hardware associated with the minicomputer (including the EIA level converter). A diagram of the cabling between the minicomputer and the SU(s) is useful in determining what the common problem is between the affected channels.

F. SD Indicator Flashes and RD Indicator Flashes Intermittently

6.08 In this case where several SUs are on a communications channel, some of the SUs may be responding while the other SUs are not. The patch panel indication is the sequence of an SD indicator, an RD indicator, and one or more SD indicator flashes without a corresponding RD indicator flash. This indicates some failure on the communications channel or an SU malfunction. The NOTALK program indicates the SU(s) that is not responding. In some instances if the problem is due to an inoperative SU, reseating the unit will fix the problem. If a problem occurs on a lower level SU, the higher level SUs which branch off may appear to have problems, since all communications pass through the lower level SU.

LINE PRINTER INDICATIONS

A. Microprocessor Accumulator Overflow Message

6.09 An SU overflow message containing a flag is sent to the minicomputer whenever one of the following conditions occur. One condition is when the time period between the last poll of the minicomputer and an SU exceeds 256 seconds. The other condition is when the error counts are so high that error accumulators have overflowed. The minicomputer recognizes the flag and prints out a message at the line printer. The message format is as follows:

hh:mm:ss OV m=n

s1 s2 s3 ...

e1 e2 e3 ...

The hh:mm:ss is the time is hours, minutes, and seconds. The OV means overflow, the m means micro or SU, and the n stands for the SU number. If errors

occurred, the shelf number (s) and the sync error (e) rate are also listed.

6.10 An overflow message means that an SU is not being polled sufficiently, thus a communications problem. The problem may be due to the communications channel or the SU(s). If DATASCOPE* data communications test equipment is connected to monitor the channel, the messages between the minicomputer and the SU(s) can be verified. If the overflow message is recurring, DNAC should be notified so a request to test the SU(s) or to confirm the channel is on a bad facility can be made.

B. Elapsed Second Check Message

6.11 This message indicates which SU(s) has an elapsed second count less than a preset threshold and the count for each SU. The count is over the last 15-minute period. Elapsed seconds are obtained from each data message that is sent by an SU. Normally, the count is about 900 seconds (60 sec/min × 15 min). If an SU is not sending any data messages, the count is zero. If only a few messages are being received at the minicomputer, the count is something less than the threshold which is normally set at 720 seconds. The message format is as follows:

hh:mm:ss 15 min elapsed sec check

micros = m1 m2 m3 ...

secs = s1 s2 s3 ...

The hh:mm:ss is the time of the message followed by the title. The m is the microprocessor or SU number and the s is the second count.

6.12 If a group of SUs is listed in the message, DNAC will analyze the SU relationship using the network configuration map to check if all SUs use a common facility or if their messages pass through a common SU. DATASCOPE test equipment connected to a communications channel can identify a problem of a garbled message or a no message received. Remember, the patch panel indicates when messages are sent and received by the flashing SD and RD indicators.

6.13 If the elapsed second check message program is set to run automatically, it may be run from the printer as RUN[110,50]NOTALK. An SU is listed in the message only when it does not respond to the polls.

C. Exiting Messages of the RSX11M Program

6.14 The following system message is printed whenever any of the DTSS programs exit abnormally.

(task name) exiting due to error n
(+ text such as FCS-mm... rec# file name logical unit#)

The mm refers to an I/O error code which is explained in the RSX11M minireference.

6.15 If the program is DATGAT, MSGPRO, OFCMG2, or CLOCK, the system must be restarted whenever an exit message appears. For the remaining programs, the system continues to run, but there may be flags that are not set which will stop DTSS from proceeding further. The RUN[110,50] SETALL program will set all relevant event flags. The cause of the abnormal program termination may be due to a variety of reasons, such as bad blocks used for reading or writing files or a lack of dynamic pool space for input/output operations. The terminations may result from a hardware or software problem. In any case, the software support group should be notified.

D. DTSS Error Messages

6.16 The error messages involve the transmission and reception of messages on the 20 synchronous lines. These lines are the communications channel with SU(s). The error message format is:

logical line #
micro #
error code is n
iosb contains xxx (RSX11M i/o error code).

6.17 An error message may indicate a hardware problem in the DV11(s), in associated cabling to the patch panel, or in the distribution panel. Sometimes, loose connections are discovered and should be tightened. The DNAC and software support group should be aware of any problem. After correction of the problem, reboot the system.

SCOPE INDICATIONS

6.18 A scope, such as DATASCOPE test equipment, can be used to monitor messages on the

*Registered trademark of Spectron

synchronous and asynchronous lines. Table A lists the settings for the two types of lines.

6.19 The DATASCOPE test equipment is connected into the monitor slot at the patch panel for the selected line. Displayed on the DATASCOPE test equipment are message sequences between the SU and the minicomputer. The parts of the message sequence that are underlined represent what is sent by the SU. Those parts that are not underlined represent what is sent by the minicomputer. Normally, the minicomputer sends a poll and receives a data message or an ACK message from each SU on the line. If there are other types of messages, the problem may be the SU. The SU is identified by the network address field. This field indicates which SU sends and receives the particular messages. The messages should be in a readable text and may be outputted on remote printers.

A. Trouble Indications at a DTSS Report Location

No Reports Received

6.20 The report locations normally have a DATASPEED 40/3 read only printer, or equivalent, connected via a data set 202T-type to a full period multipoint circuit. All reports are initially distributed to the DNAC, SSC/CTC, Regional Facility Management Centers, and Network Operations Center—Facility Management. Normally, a location should receive a message on each DTSS dedicated printer at least every 15 minutes. If a printer has not received a message for a while, the report location will probably contact DNAC about the problem. The problem may be due to circuit, printer, or minicomputer.

CO Indicator Off

6.21 A circuit problem is indicated if the patch panel indicators appear correct, no messages are on the printer, and the minicomputer seems to be operating properly. At the report location, verify that the data set 202T-type indicators ON, MR, and CO are lighted. If the CO indicator is extinguished, a circuit problem exists and must be reported to DNAC. Other locations on the same multipoint circuit should be contacted to aid in localizing the problem or break point.

Local Test on Printer Fails

6.22 If the CO indicator is lighted, the problem may be the printer or the data set. First, make a local test on the printer; and if it fails, notify the responsible local maintenance group. If the local test passes, the RUN[110,73]ASYTST program should be

TABLE A

SCOPE SETTINGS

"DATASCOPE" EQUIPMENT SETTING	TYPE OF LINE	
	SYNCHRONOUS	ASYNCHRONOUS
SEND/RCV	FDX	SEND*
FRAMING	SYNC 8	ASYNC 8
DISPLAY	HEX	ASCII 8—Bit Characters (No Parity)
MARKER	OFF	OFF
LINE SPEED	MODEM	1800 Baud
FRAMING PATTERN	8532 Switches up, others down	—
SUPPRESS	MRK	MRK

* The FDX may be used if the answer back tone is to be checked.

run, which will provide an on-line test message via the minicomputer. The program requires the following inputs:

(a) Specify the line number (20 to 31) that corresponds to the correct data circuit.

(b) Indicate the speed (1800).

(c) Enter CDC for call directing code.

(d) Enter AB for answer back code for the particular location.

If the test message is not received at a report location, send a broadcast code and check with another report location to see if they received the test message. If the first location still does not receive the test message, DNAC should have DATASCOPE test equipment connected to observe any received data at that location. A technician may listen for data on the line if a monitor speaker is available. If data is on the line (verified by DATASCOPE test equipment or speaker) but the data is not being printed, notify the responsible local maintenance group. If data is not on the line, circuit trouble is indicated and should be reported to the private line maintenance group. If the data appears garbled on the DATASCOPE test equipment, the problem is possibly in the data set and should be reported to the responsible local maintenance group.

B. Trouble Indications at an SU Location

SU POLL Indicator Off

6.23 A DDS office may have one or more T1DM bays with each bay equipped with an SU for monitoring the facilities in that bay. The POLL indicator on an SU flashes each time a proper network address message is received from the minicomputer. If a technician at an office notices that the POLL indicator is not flashing, the problem should be reported to DNAC. At this point, the problem should be confirmed by observing the patch panel indications, line printer indications, and scope indications as described earlier in this part. If the DTSS system appears to be operating normally, DNAC should ask the SU location reporting trouble to reseat the SU. Sometimes, the reseating of an SU clears the trouble.

7. GLOSSARY OF TERMS

Accumulator Array: A temporary storage for data information for a certain time, eg, day.

Clock (Scheduler): The system clock checks the time of day and requests tasks which check accumulator arrays and generate and transmit as needed.

Data base: Data information is stored in tables or files that pertain to facilities, SU address, and physical line assignments. This information is stored on disks.

Data Packet: Specific data information that is passed between tasks.

File: Data information is stored on a particular item, such as SU network addresses. This information is usually stored on disk or magnetic tape.

Global Event Flag: In the RSX11M software, a means in which a task can recognize specific events. For example, some time initiated tasks clear associated flags during execution. Other tasks, upon completion, set flags for task synchronization to prevent simultaneous demand of a data base.

Initialize: Tables are read into memory for quick and easy access, eg, at start up or reinitialization.

Process: A logical grouping of a set of functions which may encompass one or more tasks.

Program: A set of instructions that performs computer operations.

Request Task Directives: Software which allows one task to request the running of another.

System Directives: RSX11M software which allows interaction between tasks, memory management, and input/output processing.

Table: A more specific kind of file. Tables are stored in memory instead of on disk or tape. This allows more frequent updates and use (write and read).

Task: An independent program.

Software: The instructions that make the hardware perform its operations.