ADMINISTRATIVE PROCESSOR
TRAFFIC AND PERFORMANCE MEASUREMENTS
LOCAL AREA DATA TRANSPORT NETWORK (LADT)
NETWORK ADMINISTRATION

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1. GENERAL

1.01 This section provides Network Administration with the traffic and performance measurements maintained by the Administrative Processor (AP) of the Local Area Data Transport (LADT) network. These measurements are provided for the Data Subscriber Interface (DSI) on both a system (all DSIs) and a per DSI basis, as well as measurements on the AP. A comprehensive listing of the measurement labels and details on report formatting and availability are also provided.

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

1.03 The title for each figure includes a number(s) in parentheses which identifies the paragraph(s) in which the figure is referenced.

1.04 The terms and specifications provided in this document are relative to LADT Generic 1, Release 1A. Any references to the No. 1 Packet Switching System (No. 1 PSS) packet switch relate to Version 2.0, Release 2.0.

1.05 The LADT network provides for data transmission between local subscribers and data service vendors. The components for service offerings similar to LADT may have different names but perform like functions. This document is generally based on the LADT network configuration implemented in the Florida area, which employs AT&T Technologies products.

1.06 Components of the network are the DSIs, the AP, and the packet switch. The DSIs and the AP are specifically designed for the LADT network while the packet switch employed is from the No. 1 PSS. It is for this reason that the DSI and AP measurements are administered separately from the packet switch.

2. DATA COLLECTION

2.01 The LADT system provides data on the activity and performance of the DSIs. Data reflecting the amount of activity on the DSI are referred to as traffic measurements. The data measuring the DSI performance are called error measurements. Additionally, a separate group of measurements is provided for the AP system performance by way of a 24-hour plant report. The AP measurements will be further defined in the Part 6 of this section.

2.02 The DSI activity and performance are measured by a set of counters that are maintained and controlled by the DSI microprocessor. At 5-minute intervals, these data are sent in the form of a packet through the packet switch to the AP for processing. The DSI originates a virtual call (VC) to the AP by using the logical network address (LNA) of the AP. Since each DSI has its own 56 kb/s data link to the packet switch, and the AP can handle 32 calls at the same time, this transmission occurs from each DSI simultaneously. Figure 1 illustrates the transmission from the DSI to the AP, via a logical channel for the 56 kb/s Digital Data System (DDS) data link from the DSI to the packet switch and one for the 9.6 kb/s data link from the packet switch to the AP.

2.03 When the data packets arrive at the AP, the data are partitioned into two separate sets. One set of data pertains to traffic measurements, and the other set pertains to error measurements.

SOURCE FILES

A. Definition

2.04 At regular intervals, traffic and error measurements are collected and written into their individual files. Traffic measurements are data that reflect the operational status of the DSI, customer activity, and load for the previous 5-minute period. Data such as the number of working (in service) access ports, the average number of calls from these ports, and the number of packets transmitted are all classified as traffic measurements.

2.05 Error measurements can be defined as those counts that, under normal call processing conditions, should be zero. These data reflect data switching errors and failures that are internal to the DSI. Data switching errors are errors that have **not** resulted from customer actions and/or exception conditions. For example, the number of times a subscriber entered an incorrect destination address (data terminal number) would **not** be an error measurement, as customer action caused the failure. This would be a traffic measurement. However, the number of frames received by a DSI from the packet switch that contained a cyclic redundancy check (CRC) error, would be considered a data switching error, and thereby classified as an error measurement. A count of the number of sanity timer interrupts is an example of internal DSI failures classified as an error measurement at the AP.

B. File Creation

2.06 The traffic and error source files contain the raw data that are used to furnish the automatic and on-demand printed reports. Although data are collected for each 5-minute DSI transmission, both types of measurements are not always written into their respective source files. Traffic data are written for each operational DSI. However, error measurements are only written for those operational DSIs for which the value of at least one error measurement is greater than zero. This coincides with the definition of error data, which should be zero during normal DSI operations.

2.07 The traffic and error source files are initially created from the 5-minute data transmitted by the DSI. As the data are gathered over longer periods of time, additional files are created. These files, which accumulate the 5-minute data, provide measurements for 30-minute and 24-hour time frames for each type of source file. A 30-minute source file is the equivalent of six 5-minute files added together. A source file for a 24-hour time period is an accumulation of forty-eight 30-minute source files.

2.08 In addition to the traffic and error source files, a DMERT (Duplex Multi-Environment Real Time Operating System) plant measurements file is created every 24 hours at midnight. This file contains a set of AP performance counters and a set of differences representing the increase in the counters over the previous 24-hour period. These measurements are the basis of the 24-Hour Plant Measurements Report.

C. File Removal

2.09 Source files, or raw data, only exist for as long as is necessary for use by the system. Since data users may have periodic requirements for data inquiry, an understanding of the retention periods is necessary.

2.10 Five-minute traffic and error source files provide the data not only for the 5-minute reports, but are also accumulated to form the 30-minute reports. These files are kept for a period of a full half-hour. Every 5 minutes, the creation of new files is matched by the deletion of 5-minute files from the previous 30 minutes. For example, a 5-minute traffic source file is created at 13:05 hours, and contains measurements of events that occurred from 13:00 to 13:05. This file will exist in DMERT with a complete file name that includes not only the 5-minute traffic label, but also time identifiers that represent the month, day, hour, and minute for which the data are accumulated. These data are then saved and merged with five more 5-minute files created between 13:05 and 13:30. At 13:30, a 30-minute traffic source file is created. When the next 5-minute file is created at 13:35, the file created at 13:05 is deleted.

2.11 Thirty-minute source files are saved using the same basic pattern as the 5-minute files. Initially, the 30-minute files provide the raw data for the 30-minute reports. These files are also accumulated at midnight (0000 hours) to create the 24-hour traffic and error source files. Each 30-minute file is kept for a full (rolling) 24 hours before automatically being removed from the system.

2.12 The 24-hour source files exist for a full 24 hours before being removed from the system. These files include the traffic and error files, as well as the source file for the 24-hour plant measurements. The 24-hour files provide the raw data for the three 24-hour reports, and are removed once new daily (24 hour) files exist.

3. REPORT GENERATION

TRAFFIC AND ERROR REPORTS

A. Description

3.01 Traffic and error reports provided by the LADT system are designed to be adaptable to meet user requirements in terms of automatic reporting and report content. Periodic reports (those designed to automatically generate) can be disabled for any of the three time periods (5-minute, 30-minute, and 24-hour) for traffic and/or error reports. This disabling feature causes the system to refrain from printing the specified reports, and yet has no impact on the data collection and file accumulation processes. Additionally, all possible traffic and error reports (a combined total of 20) contain only those selected data measurements specified by the user. Both of these features are controlled by the contents of the "traffic" and "errors" recent change data bases. These data bases are manipulated through interaction with the recent change Office Data Integrity (ODIN) subsystem report forms.

3.02 In conjunction with the administration of reports, threshold specifications are provided for both traffic and error measurements. Thresholds are used to provide notification to a data user that an individual traffic and/or error measurement has exceeded a maximum or failed a minimum specified limit. These thresholds are indicated on either of the two available threshold forms for each type of measurement data. Although thresholds can be placed on any measurement labels, it is advantageous to place them on those measurements which appear on periodic reports that have been disabled. This will provide the user with notification of any measurement(s) that has exceeded or failed a limit, without requiring the constant printing of the entire report(s).

3.03 These features can be enacted by using the appropriate input commands as specified in the LADT Recent Change Input/Output Manual. Additionally, all reports can be requested on a demand basis, using the appropriate inquiry command. These types of demand reports will only be honored by the system for the period of time that the related source file exists. Table A provides some key variables on traffic and error measurement reporting.

B. Traffic and Error Report Forms

3.04 Traffic and error reports contain data measurements for those measurement labels that have been specified in the respective report form. These forms consist of 10 format tables for each type of measurement (traffic or error), for a total of 20 format tables. Each of the format tables can contain any or all of the measurements for its related data type. Error labels cannot appear on traffic tables, nor can traffic labels appear on those specified for errors.

3.05 The report format tables are provided to allow the user control of the report contents. Ten format tables are allotted for each type of measurement as follows:

(a) *Periodic Reports:* Three tables are provided for periodic reports. The abbreviated name for these tables are "5P", "30P", and "24P", representing the automatic generation of reports for the 5-minute, 30-minute, and 24-hour accumulation periods.

(b) *On-Demand Reports:* Three tables are provided for on-demand reports. The abbreviated table names for these reports are "5Ø", "30Ø", and "24Ø", where Ø is an alpha character and the abbreviated names represent the time accumulation periods. The reports are generated only when requested by the user. These three format tables are the default tables for on-demand reporting. The term "default" refers to the implied format when a report is manually requested and the desired format is not specified in the command.

(c) *Special Reports:* In addition to the periodic and on-demand reports, four special report formats are available for traffic measurements and four for error measurements. The purpose of the special report formats is to provide the user with additional methods in which to group the data. For example, all usage measurements could be grouped together on a single special format table and only this data printed when the report(s) is requested. The abbreviated report names for the special report formats are F1, F2, F3, and F4. These names have no time reference, as they can be retrieved for any reporting period by specifying the format table desired. On-demand requests for special report formats can override the default report format tables specified in (b).

C. Administration of Report Forms

3.06 Each of the report format tables equates to one report form. Should the data user desire the use of all 10 reports for traffic measurements and all 10 for error measurements, all 20 forms would require completion. These forms should be completed manually first for expediency, and then updated in recent change. Prior to the actual update execution of the recent change activity, the update should be verified for accuracy.

3.07 Each report form has four sections or pages. The first section deals primarily with the descriptive and control information for the report. It is also the only section of the report that contains measurement labels for overall system measurements. The remaining three sections provide adequate space for the reporting of any or all other measurements that are provided on a per DSI basis. There is no provision for reporting certain measurements for one DSI and other measurements for another. The administration of the network encompasses the performance monitoring of all DSIs on the network; there is no need to segregate certain measurements for particular DSIs. Figure 2 provides an example of the four sections of a Traffic Report Form, and Fig. 3 provides an example of a completed report form. The four sections of an error report form are the same as the Traffic Report Form, with the exception of the word "Error" in the title, as shown in Fig. 4. Figure 5 provides a sample of a completed Error Report Form.

3.08 Section 1 of each form contains six major fields, five of which are user input:

(a) *FORMAT TABLE:* This field is the key field and identifies the name of the format table being defined. The name may either be the abbreviated name of the periodic, on-demand, or special report format as defined in paragraph 3.05 or may be the full name as provided in Table B.

(b) *DESCR:* This field provides a brief description of the retrieved format table and is a READ ONLY field.

(c) *REPORT SWITCH:* This field is used for periodic reports **only.** It is the switch or flag designator which indicates to the system whether the report is to be printed or not. The three values for this report enabling designator are:

- ON (report always printed)

- COND (report printed when threshold violated)
- OFF (report never printed.)

(d) *SECTION 1 SWITCH:* This field can be used to change the printed volume of a report without changing all the report labels. Each section (Sections 1 through 4) has its own SECTION SWITCH. This switch or flag is provided to allow for the printing of individual sections or all sections of the report. The printing of any periodic, on-demand, or special report is contingent upon the setting of the SECTION SWITCH. The appropriate values for this field are:

(1) *ON:* The section is always printed if the REPORT SWITCH is ON

(2) *OFF:* The section is never printed, regardless of the status of the REPORT SWITCH.

It should be noted that if a report switch is set on COND (conditional) so that measurements will only print if the threshold (s) has been violated, the section switch which contains the thresholded measurement(s) must be set to ON. Otherwise, the measurement(s) will not print even if its threshold has been violated.

(e) *HEADING:* This field can contain from zero to 60 characters as an added definition to the REPORT SECTION. This heading will print exactly as defined within the field whenever the section of the report is printed.

(f) _____ *MEASUREMENT LABELS:* This field contains up to 24 areas for the measurement labels of **traffic** or **error** data. The first section of all report forms always requires only the system measurements. Additionally, only traffic measurements may be identified on traffic forms, and error messages on error forms. All labels must be typed as they are defined in the system (see Part 4); no abbreviations are allowed. The measurement labels will appear on the report in the order in which they are presented within the section. Duplicate labels within the report form are allowed, as long as they coincide with other previously specified rules.

3.09 The remaining three sections of each of the report forms contain the SECTION SWITCH designator (ON or OFF), the HEADING field (variable), and 24 opportunities for the identification of measurement labels on a per DSI basis. The rules applying to the three fields within these remaining three sections are the same as specified in the preceding paragraph.

3.10 Given the format of the report forms, the amount of data provided for the periodic, on-demand, and special reports may be more than can be adequately administered. If full advantage were taken of all available formats, the amount of measurements that would be generated on an automatic or on-demand basis would be:

- 288 for periodic or on-demand reports
- 384 for special reports.

With the extensive amount of data available, thresholding certain measurements can be a viable tool in the data administration process.

THRESHOLD REPORTS

A. Application

3.11 Threshold application is a method by which certain key measurements are reported when a particular value is either exceeded or missed. The measurements selected are usually the most important ones, indicating the DSI performance degradation. These measurements may normally be suppressed on a periodic report, by indicating COND in the REPORT SWITCH portion of the report form. This will disable the report(s) from being printed except for those DSIs which have violated the threshold during the reporting period. Some 5-minute periodic reports could be candidates for this type of data monitoring.

B. Threshold Forms

3.12 Thresholds are set by the use of a thresholds form. Like the report forms, these forms must also be updated in the recent change data base. Two threshold forms are provided for traffic measurements, and two are provided for error measurements. A single thresholds form can relate to 5-minute data or 30-minute data and can contain up to 12 measurement labels, each with its own maximum or minimum limit. The measurement labels specified may either be system measurements, those measurements provided on a per DSI basis, or a combination of both. If a system measurement violates a threshold, the entire first section of the traffic or error report form (up to the 24 measurements specified) will also be printed.

3.13 Sample Traffic and the Error Thresholds forms are provided in Fig. 6. The forms are similar in nature, but require measurement labels specifically designated for the individual data type. The seven fields of a thresholds form are:

(a) *THRESHOLDS TABLE:* This field is a key field and must contain a system table name. A listing of full table names for each measurement type is provided in Table C. The abbreviated table names to be used for both traffic and error threshold forms are:

- 5 (for 5-minute reporting periods)
- 30 (for 30-minute reporting periods).

(b) *DESCRIPTION:* This field provides a short description of the retrieved table. It is a READ ONLY field.

(c) *CATG:* This field identifies the categories of the specified measurement labels. The allowed values are SYS for system measurements and DSI for measurements provided on a per DSI basis. Each category designation must coincide with its specified measurement label.

(d) *MEASUREMENT LABEL:* This field requires the exact identification of each measurement label as described in Part 4 of this section. The label specified must coincide with the category specified in the previous field.

(e) *TYPE:* This field defines the type of threshold checking that is to be done on the measurement data. The allowed values for this field are MAX (maximum) or MIN (minimum). If MAX is specified, a measured value exceeding the limit for any DSI will trigger the threshold violation to be reported. If MIN is specified, any DSI with a measured value equal to or below the limit will cause the threshold violation to be reported.

(f) *LIMIT:* This field defines the actual threshold value associated with a particular data measurement. The allowed values are 0 through 2000000.

3.14 A separate thresholds form is provided for each measurement type (traffic and error). If thresholds are set for the 5-minute and 30-minute reporting periods, then a total of 24 possible thresholds could be generated for each type of measurement. Samples of completed Traffic Thresholds and Error Thresholds Forms are provided in Fig. 7.

PLANT MEASUREMENTS REPORT

3.15 The Plant Measurements Report is a single daily report provided by the Plant Measurements source file. This file is created every 24 hours at midnight. The Plant Measurements source file contains a set of DMERT performance counters and a set of differences. The set of differences represents the increase in the counters over the previous 24 hour period. These differences form the basis of the 24 Hour Plant Measurements Report. This report also includes counts of the number of AP audits executed and failed.

3.16 In addition to the uniqueness in the data collection process, this report cannot be administered on a recent change basis. The format of this report is fixed, and the automatic report generation cannot be disabled. However, the report can also be retrieved on a demand basis, using the **OP:PLANT** command as specified in the LADT Recent Change Input/Output (I/O) Manual.

MESSAGE PERMISSIONS AND CLASSES

3.17 The I/O messages available for use at the remote AP workstation (via the Network Administration AP I/O channel) are based upon the message permissions provided in the Program Document Standard (PDS) shell. Any messages, or commands, that are not specifically designated for Network Administration are not allowed. The allowable commands are specified in Table D. For Traffic and Error Report and Threshold Forms, all commands are allowable for the review, update, delete, and insert data base modes.

3.18 Each report, whether traffic or error, periodic or on demand, has a unique message class. The message class defines a specific set of devices to which the reports or messages are routed. The destinations of all messages of a class are defined in the DMERT mapfile. Any changes to this mapfile are made through the use of the DMERT 1.0 input message **RTE:** Table E provides a listing of the LADT message classes and their associated output message types.

4. NETWORK OPERATIONS AND DATA MEASUREMENTS

4.01 Traffic and error measurements for the LADT network are provided for system totals (all operational DSIs) and on an individual DSI basis. In many instances these counts may be further subdivided by when, (during the course of the call), the measured activity occurs on the network. For example, one set of traffic measurements provides a count of the number of ports in service on both a system and a per DSI basis. These counts refer to access line availability to enable local subscribers to originate a call. Likewise, counts are provided for activities that occurr at the other end of the network. For example, a system total error count is provided for the number of traffic data packets expected but not received by the AP from all DSIs.

4.02 The combined available traffic and error measurements will be described in this document in two separate categories:

- Call Origination
- Call Processing.

4.03 These categories do not relate to the actual data presentation from an internal network standpoint, nor do they reflect stipulations for report table formats. Instead, they serve to provide a correlation between the LADT network operation and its measurements.

CALL ORIGINATION

A. Access Line Description

4.04 Local subscribers to the LADT network are those network users who desire to place a call to the data base of an information service vendor. Dependent on the type of facility provided, a subscriber may have an access line that terminates directly on a DSI, or may be switched through to a DSI via a local central office multiline hunt group (MLHG).

4.05 Subscriber access lines that terminate directly on a DSI are called direct access lines. These types of facilities use data SLC* carrier system devices at the customer premise and at the DSI in order to establish a direct physical data link. These devices allow the local subscriber use of the voice service and the data service simultaneously, by separating the two transmissions at the central office. Voice is passed to the local central office switching equipment while the data is passed to a termination on a DSI data SLC carrier system device. Direct access service is only available to those subscribers whose local telephone service is provided by a central office in which a DSI is installed. Figure 8 shows a direct access configuration, with a dedicated 4.8 kb/s data link between the subscriber's terminal and the DSI.

*Trademark of AT&T Technologies, Inc.

4.06 Dial-up access is provided for those subscribers who desire it, whose local telephone service is not provided by a central office equipped with a DSI, or whose facilities do not meet the existing restrictions for direct access. In the case of dial-up service, the subscriber originates an LADT call using both the voice telephone service and a data terminal. The call is switched via a MLHG and terminates at a dial-up port on a DSI. If the central office to which the customer subscribes does not have a DSI installed, the call is routed over an interoffice trunk to a central office that does have a DSI installed. Figure 9 provides a sample configuration of these two types of dial-up access.

B. The LADT Service Request

4.07 A call origination occurs when a local subscriber makes an initial bid for service. For dial-up service, the subscriber dials a 7-digit number assigned to the MLHG. The call is routed over the local switching network and terminated at a DSI dial-up port. For direct access service, a customer need only turn the data terminal on to initiate a bid for service. The call terminates directly at the DSI data SLC carrier system port assigned to the access line.

4.08 The DSI answers the bid for service by requesting the destination address of the service vendor. This address is referred to as the Data Terminal Number (DTN) or the Logical Network Address (LNA), and is assigned at the time of service provisioning for the service vendor(s). The purpose of the DTN is to provide a termination identification for the routing of the call(s).

C. Call Origination Measurements

4.09 Traffic measurements are provided for counts relating to an LADT network call origination. These measurements are provided on both a system total and a per DSI basis. A system total measurement provides a count for the measured item for all operational DSIs associated with the AP. Counts measured on a per DSI basis are individual measurements of the single, operational DSI.

4.10 The DSIs are scanned at 10-second intervals. Traffic counts are reported in five basic categories of measurements, based on the 10-second cycles:

(a) *TOTALS:* The data value reported as a total for the DSI is a total count over the previous 5-minute period. The values reported for longer time periods, ie, 30 minutes or 24 hours, represent the accumulation of the appropriate number of 5-minute totals for that period. For example, assume that from 12:00 to 12:05 hours all local subscribers for a single DSI incorrectly entered the DTN(s) of the service vendor(s) 17 times. The call processing measurement for the total invalid destinations (TOTAL-INVAL-DEST) measurement would have a data value of 17 for that 5-minute period. If the next 5-minute periods had data values of 6, 21, 14, 9, and 11, respectively, then the total value for the 30-minute period would be 78.

(b) *AVERAGE FOR 5 MINUTES:* For the 5-minute reporting period, this is a count of the total. For longer reporting periods (30 minutes or 24 hours), the count is the average of the 5-minute totals. For example, an average for the 30-minute reporting period is the average of six 5-minute totals. Using the same data values as provided for the TOTALS example, but applying them to a measurement that is based on an average count, such as the total average calls (TOTAL-AVG-CALLS), the average for the 30-minute period is 13.

(c) *AVERAGE OF 10 SECOND SAMPLES:* For all reporting periods, the value reported is the average of the samples that the DSI takes every 10 seconds. This unit of measurement is specifically identified as 10-second data in the measurement label definition. The average number of free packet buffers (AVG-FREE-PKT-BUFF) at the DSI is an example of this type of measurement. If, for a 5-minute period, the data values were 36 for 13 of the 10-second samples and 48 for the other seventeen 10-second samples (30 samples for a 5-minute period), then the average would be 43.

(d) *MAXIMUM VALUE:* Data samples are taken at the DSI every 10 seconds. For the 5-minute reporting period, the maximum value is the one highest value of all the 10-second samples taken over that 5-minute period. In the case of the maximum output queue (MAX-OUT-QUEUE) traffic measurement, a data value of 27 on a 5-minute report would indicate that the highest value of all thirty 10-second intervals is 27. For longer reporting periods (30 minutes and 24 hours), the data reported is the one highest value of all the 5-minute reported high values. This is referred to as the maximum of the individual DSI maxima.

(e) *USAGE:* All usage measurements are taken at 10-second scan intervals at the DSI. Usage measurements are reported in terms of CCS. This requires conversion of the 10-second data. The totals of all 10-second scans (reported only at 5-minute intervals) are converted to CCS by multiplying the CCS by a factor specific to each reporting period:

- 5-minute period = factor of 1.2
- 30-minute period (accumulation of six 5 minute periods) = factor of 0.2
- 24-hour period (accumulation of forty-eight 30 minute periods) = factor of .0042.

(f) *STATE TIME:* The state time reported is the average time in seconds that an entity is in a particular state. For example, a port that is placed out of service by the DSI is said to be in an OOS state. A chart of the measured states and their definitions is provided in Table F.

4.11 Some traffic measurements are provided in sets, where separate data values are counted for dial-up ports, data SLC carrier system ports (identified in the actual label as DSLC), and a total for both types of ports. Most of these measurements relate to the number of ports in various states of service. Measurements are also provided on call volumes, such as usage and the average number of calls, and subscriber errors, such as an invalid destination address.

4.12 Table G provides a complete listing of all traffic measurements that relate to subscriber originations. The first column of the table identifies the key measurement for a set of measurement labels. The second column of the table identifies the measurement labels as they must be defined on the traffic format tables. The labels are itemized for cross-reference purposes. The third column provides a brief description of the data associated with the label. The fourth and fifth columns identify whether the measurement is provided for the system, or whether it is provided for the individual DSIs. An indicator in both the fourth and fifth columns means that the measurement is provided for both.

4.13 Table H is provided as a cross-reference for all traffic measurement labels itemized in Tables G and I (refer to paragraph 4.38 for specifics of Table I). The labels are listed in Table H, in alphabetical order. The item numbers provided as cross-references to Table G, are for items 1 through 29.

CALL PROCESSING

A. Overview

4.14 The DSI is used in the LADT network to provide a means by which subscribers are connected to a remote service vendor data base. The entire LADT network is composed of DSIs, a packet switch, an AP, and subscriber and service vendor access lines. Figure 10 provides a view of the overall network, with local subscribers terminating on a DSI via a 1.2 kb/s dial-up data link or a 4.8 kb/s direct access data link. The DSI is, in turn, connected to a packet switch via a single 56 kb/s data link. The packet switch has a 9.6 kb/s data communications link to the AP, and also provides for the direct terminations of the 9.6 or 56 kb/s service vendor access lines. Calls are transmitted through the network via a virtual circuit over a logical channel. A virtual circuit may be a virtual call (VC), or, as an option for the service vendor, may be a permanent virtual circuit (PVC).

4.15 The DSI, through its call processing system, establishes a path to the packet switch when a service request from a local subscriber is made. The call processing system, which contains the data communication software, performs the data transport functions of the DSI by:

- Managing the transmission and reception of data on subscriber access lines
- Managing the transmission and reception of data on the access link to the packet switch
- Managing the establishment of VCs.

4.16 When a DSI detects a service request, it sends a prompt to the user, requesting the destination address of the service vendor. This address, referred to as the DTN, is used in order to set up a VC from the DSI through the packet switch to the service vendor. A VC, using the X.25 communications protocol, is the establishment of a logical channel on a demand or as needed basis. The logical channels are provided so that the single DSI to packet switch data link can support a number of simultaneous VCs (a maximum of 511 logical channels are available for a 56 kb/s access line).

4.17 Once a VC is established, all data received from a customer terminal is sent over the X.25 logical path in a manner transparent to the DSI. When a request to tear down this path is made, the transparency is eliminated. LADT calls can be terminated by the local subscriber, the service vendor, or the internal LADT network. A subscriber can tear down the path by disconnecting the physical link to the DSI (call hang-up). The service vendor may tear down the virtual circuit (VC or PVC) between the vendor and the packet switch. The internal LADT network will automatically terminate the call if it incurs unrecoverable software or hardware errors.

B. The X.25 Interface

4.18 The X.25 interface is a set of international communications rules used in packet switching. This interface has been modified to provide standard link access procedures (LAPB) that are used in the LADT communications between subscribers and service vendors. The X.25 interface supports three identifiable levels of protocol as shown in Fig. 11:

- Physical (level 1)
- Link (level 2)
- Packet (level 3).

4.19 The physical level of the X.25 interface is the lowest level of communications. This level provides a set of basic functions that activate, maintain, and deactivate the physical link between the DSI and the packet switch (and the packet switch to service vendor data link).

4.20 The link level is responsible for the transfer of data packets from level 3 to the physical level for actual transmission over the physical link between the DSI and the packet switch. The link level, which is software only, provides the control functions such as link initialization, link flow control, link assurance, and link error control. These are accomplished in a step-by-step handling of the data packet received from the packet level (level 3):

(1) When a data packet is to be transmitted over the LADT network, the level 3 protocol transfers the data packet(s) to the level 2 protocol.

(2) The level 2 system software converts the data packet to a frame by attaching an address and a control field in front of the data packet stream. The address field identifies the frame as either a command or a response. The control field contains transmit and receive sequence numbers which are used by the level 2 to insure that the frames cross the DSI to packet switch interface error free. This

control field also contains an identifier which defines each frame as one of the following:

- Numbered information (I) frame
- Numbered supervisory (S) frame
- Unnumbered (U) control frame.

(3) A flag byte is then added at the beginning of the frame. This byte identifies where the frame begins.

(4) The XPC chip in the DSI microprocessor adds a cyclic redundancy check (CRC) word to the bottom of the frame for error detection purposes.

(5) Another flag byte is added to the end of the frame to identify where the frame ends. If more than one frame is being sent at the same time, only one flag byte will be placed between the two frames; there will not be a beginning and an ending flag.

(6) The frame is then passed to level 1 for actual transmission.

A sample of the data packet to a frame transition is provided in Fig. 12. Figure 13 provides the overall structure of a level 2 frame.

4.21 The level 3 protocol is the highest protocol level. This level supports VC service features by the association and connection of logical channels on access lines. It also transfers the user data from these access lines to and from the level 2 protocol into uniform blocks of data call packets and provides flow control for the transfer of the data. When an LADT subscriber requests a message to be sent to the service vendor (via the DSI), the message is stored in one of the main memory buffers within the DSI. The level 3 protocol performs the following procedures in order to support its network responsibilities:

(1) The level 3 determines the number of words that are to be transmitted in the message and identifies the address of the main memory buffer which contains the data.

(2) Routines within the packet level packetize the data by attaching a packet descriptor word and two packet header words in front of the packet. The packet descriptor word contains the number of bytes that are to be included in this packet and also contains a flag field which identifies the packet as either a data or a control packet. The packet header words provide logical channel and sequence information. The first word contains the logical channel group number (LCGN) and a general format identifier (GFI). The second word of the packet header contains the logical channel number, two sequence numbers, and two bits. The sequence numbers support the flow control function of level 3 by identifying two distinct events (these numbers are not the same as the sequence number in the level 2 protocol):

- **P(R):** The packet receiver sequence number for the next expected data packet.
- **P(S):** The packet send sequence number for the current packet being transmitted. An M bit is provided as an indication of whether the packet being sent is the last packet or not. The M bit for the first and all intermediate packets is set to 1. The last packet of the message has an M bit that is set to zero. All packets with an M bit of 1 must use up all 256 bytes of each packet; these packets must be complete. The last packet, or if the message is fully contained in only one packet, may be less than 256 bytes in length. A sample of the basic packet header is provided in Fig. 14.

(3) Flow control procedures are provided separately for each direction of data transmission. These procedures use the packet sequence numbers (rolling digits 0 through 7) contained in the packet header and a predefined number which specifies the number of packets authorized to be transmitted or received at one time. Together, this information is called a transmission window. The standard window size for a VC is two packets for each direction of transmission.

(4) Each time a packet is received at level 3, a P(R) sequence number is incremented by one, and inserted into the next packet that is to be transmitted. This number informs the far end that all packets up to but **not** including this number have been received. For example, when the first packet is received, the P(R) number is moved up to 1, indicating that only 1 packet (packet 0) has been received. When a second data packet is received, the P(R) number is moved up to 2, indicating that only packets 0 and 1 have been received.

(5) At the beginning of the transmission sequence, the standard window size will contain two packets. Because these packets are in the transmission window, they may be transmitted. Each time a packet is transmitted, the sequence number P(S) will also be incremented by one, and the next packet in line to be transmitted will move into the transmission window. The first packet sent will have a P(S) number of zero. The second packet sent will have a P(S) number of 1. Any packet that is not in the transmission window is not available for transmission. Additionally, if a P(S) number in a received data packet does not contain a valid P(R) number (a difference of 1 value), a procedure error will occur and error recovery procedures are initiated.

C. DSI Call Processing

4.22 The DSI consists of two line group subunits and a processor complex subunit: Each line group has a maximum of 128 terminations, when fully equipped with dial-up line cards (32 line cards multiplied by 4 ports per card). Although line group 0 has line card 0 reserved for test access terminations (as opposed to subscriber terminations), each line group has 64 available data time slots to the processor complex. These time slots are maintained by the group distributor circuit (GDC) installed in each line group. The processor complex subunit contains a microprocessor, the DSI memory buffers, a direct memory access (DMA) processor, control and clock circuitry, and the Digital Data System (DDS) interface to the 56 kb/s data link to the packet switch. Figure 15 illustrates the internal flow through the DSI subunits, for the subscriber's initial service request, the setup of a VC, and as an interface through which data are transferred to and from subscriber lines.

Initial Service Request

4.23 A VC setup to the No. 1 PSS packet switch is required when a subscriber requests LADT service via the customer terminal. The call setup is basically the same for both direct access and dial-up subscribers. However, there is an initial difference for the dial-up subscribers because the dial-up ports are shared resources. When a dial-up modem goes off-hook, the DSI must insure that the port is actually in use. This is accomplished by the DSI requiring the DDD call to request service from the LADT network by establishing a link access procedure (LAPB). A customer data link (CDL) status unit performs timing on the interval between the off-hook and the LAPB establishment. If the interval exceeds a stated limit, the CDL demands that the dial-up line control unit disconnect the subscriber. The CDL also determines status of each line, and takes appropriate action when the line state affects the VC that is active on that line.

4.24 A service request is indicated when a terminal sends the LAPB frame to the DSI. Once this frame is received, a call process is created to handle the call. The Direct Memory Access (DMA) processor attempts to allocate a virtual circuit record (VCR) for the call. The VCR is used to store all administrative information about a call for billing, traffic, and error analysis. If a VCR cannot be allocated, the LAPB procedures ignore the service request, and an unnumbered acknowledgement frame is **not** sent to the terminal. This failure to allocate a VCR means that no additional calls can be handled by the DSI. An error message is sent to the maintenance system recovery software.

4.25 If a VC is allocated, the LAPB notifies call control that a subscriber desires service. The LAPB also sends an unnumbered acknowledgement frame back to the customer terminal. An internal pointer is then provided to the LAPB protocol to identify where the information (I) frames from the customer are to be routed. During VC setup, the pointer directs the I-frames to call control. After the call setup phase is complete, call control changes the pointer to direct these frames to the X.25 level 3 unit.

Virtual Call Setup

4.26 The call control feature within the DSI call processing transmits and receives I frames until the VC is established. The following steps are involved in the basic setup of a VC:

(1) Call control checks the available congestion information to determine whether or not the DSI can accept additional service requests. If the DSI cannot, call control will peg the service blocking counter and send information back to the customer's terminal that indicates a service request denial and the reason why. Call control then asks the LAPB protocol to terminate the protocol on the customer's line, and waits to receive a confirmation from the LAPB. If the service request in question is the last call on the dial-up access lines, call control will request an immediate disconnect.

(2) If the DSI can accept additional calls, the service request is accepted, and call control enters the address-signaling state. A prompt is returned to the terminal requesting the destination address. Call

control checks the destination address to insure that it meets the LADT numbering plan format. If the address does not meet the format specifications, call control will disregard the address and send another prompt. Although there is no limit to the number of retries a customer can make, each invalid address is tracked by call control.

(3) If the destination address is valid, the call control again checks for congestion. If there is no congestion, call control is updated to a call-setup-in-progress state. A call setup request is then transmitted to the X.25 level 3 unit, with the address of the packet buffer used to create an X.25 call request packet. Call control then checks to see if the X.25 level 3 can initiate a call request packet to the packet switch. If a call request packet cannot be initiated, an error indication and reason are sent back to the call control. If the X.25 level 3 unit can initiate a call request packet, the packet is transmitted to the packet switch.

(4) The next determination to be made is whether or not a call connect packet has been received back from the packet switch. If the X.25 level 3 does not receive a call connect packet back, a VC cannot be established. The call control sends a message back to the customer terminal indicating that a call setup has been denied and provides an indication to the LAPB protocol to disconnect. Call setup can be denied if the packet switch sends a clear indication packet to the DSI, if the No. 1 PSS access link is down, or if the X.25 interface for all virtual circuits is not in a packet level ready state (R1). Additionally, if, after the maximum number of call request packet transmissions have occurred, a call connect packet response has still not been received from the packet switch, the VC setup attempt is denied.

(5) If a call connect packet is received from the packet switch, a successful indication is passed to call control along with the actual call connect packet. Call control then verifies whether or not the X.25 negotiable parameters are acceptable for the call. An example of a negotiable parameter is the size of data packets. The standard default packet size is 128 octets; however, this size may be negotiable up to 256 octets. If the parameters are not acceptable, call control will so inform the customer and release all system resources associated with the call.

(6) If the negotiable parameters are acceptable, a message is sent to the customer terminal indicating that the VC connection is established and transmission of messages may begin. After receiving this indication from call control, the customer responds with an acknowledgement. Call control then moves the direction pointer to the X.25 level 3 unit for data delivery.

4.27 Once a VC is set up between the DSI and the packet switch, data can be transmitted and received by the local subscriber. These data are transferred in modules called information (I) frames via the established logical channel. The I frames are processed and passed to the X.25 level 3 unit. The X.25 level 3 unit is a subprogram of the level 3 (packet) X.25 protocol, which separately monitors the level 3 interface. Its functions are to set up the X.25 VC to the packet switch; to tear down the VC upon request; and to transmit, receive and route the data over the VC. During the data transfer state, this unit also:

(a) Detects congestion on an individual VC and exerts flow control procedures

(b) Informs the call control software when the VC must be torn down. This can be due to hardware, software, or requests from the packet switch

(c) Provides data acknowledgements and VC resets. A reset may be initiated by a subscriber, the DSI, the packet switch, or the far-end service vendor. A reset results in returning access procedures to a known state, such as a VC reinitialization. The VC will not be terminated, but the DSI must discard all customer data associated with that VC. This means that all packet buffers that were previously in possession of the X.25 level 3 unit for this VC are deallocated. However, those packet buffers that were already passed to the XPC interface unit for transmission to the packet switch are not affected by the reset.

4.28 The XPC interface unit provides an interface with the XPC chip. The XPC chip, located within the DSI main processor, performs the standard link access procedures (LAPB) for level 2 of the X.25 communications protocol. It is this chip that adds the CRC word at the bottom of an information frame for error detection purposes. The XPC interface unit is responsible for:

- Managing output packet queues to the XPC
- Managing packet reception of those packets which are to be stored in main memory buffers

by the XPC.

4.29 Packet reception is controlled by the XPC interface unit through the allocation of free (available) buffers in the DSI main memory. When no buffers are available, a critical error indication is given. Packet transmission is also completed under the direction of the XPC interface unit. All packets are queued for transmission in order to provide a reasonable data flow and sequencing checks. If the DSI to packet switch access line is down, the packets are not queued and an error indication is provided.

D. LADT Call Terminations

4.30 Within the LADT network, there are three possible candidates that have the capability to request the termination of a call, thereby requiring a tear down of the VC established between the DSI and the packet switch:

- The subscriber
- The remote service vendor
- The network itself.

4.31 The subscriber call termination may be initiated through a normal call completion or by the customer's line going idle. In both cases, the call disconnect portion of call control is responsible for notifying the X.25 level 3 unit to tear down the VC. Once call control receives confirmation that the call has been torn down, it sends the billing and traffic measurements to the appropriate subsystem.

4.32 The service vendor may also initiate a call termination. In this case, the vendor has cleared a virtual circuit (a VC or a PVC) that extends from the packet switch to the vendor's terminal. The clearing of this circuit may be accomplished on a call completion basis, by a failure of the virtual circuit, or by a verbal request to unconditionally remove the physical vendor-to-packet switch access line from service. Although the logical channel used from the packet switch to the service vendor has no direct correlation to the DSI-to-packet switch (and thereby subscriber-to-packet switch) channel, a relationship does exist. If the virtual circuit on which the vendor was receiving messages is removed, data from the subscriber cannot pass through the packet switch. If the call control receives an indication that the service vendor's virtual circuit has been cleared, a disconnect is forced on the customer channel. Billing and traffic measurements are forwarded to the appropriate subsystem once a disconnect confirmation is received. However, the possibility of a new call setup does exist, so call control allocates a new VCR and initializes it.

4.33 In an attempt to set up the new call, call control checks for congestion. It then performs the following functions based on the congestion status:

(1) If there is no congestion, call control requests a call setup. If the setup is successful, call control notifies the customer terminal and requests a new destination address. The remainder of the call is processed in the normal manner. If the call setup is not successful, call control releases the new VCR and pegs a traffic counter indicating that a setup failed.

(2) If there is congestion, call control requests a call setup for the purpose of notifying the customer of the congestion. If this call setup is successful, and acknowledgement from the terminal received, the call is disconnected and a traffic counter is scored to indicate congestion. If a call setup cannot be made to transmit a congestion message to the subscriber, call control scores a traffic counter indicating that there was congestion and that the setup failed. In both cases, call control releases the VCR.

4.34 When a VC is terminated due to a network-originated request as the result of an error, the procedures for call tear down are the same. Once a disconnect confirmation is received, call control will send the billing and traffic information to the appropriate subsystem. It then allocates a new VCR and requests a call setup. If the setup is successful, a failure message is sent to the customer terminal. When acknowledgement is received, the call is torn down, the VCR is released, and an error counter is pegged. If the call setup is not successful, the VCR is released and call control also pegs the error counter.

E. Call Processing Measurements

4.35 Traffic and error measurements are provided for counts relating to LADT call processing. These measurements are provided on both a system total and a per DSI basis. A system total measurement provides a count for the measured item for all operational DSIs associated with the AP. Counts measured on a per DSI basis are the individual measurements of the single, operational DSI.

4.36 The DSIs are scanned at 10-second intervals. The measurements for traffic data are reported in five different categories, as previously described in paragraph 4.10. Error measurement data are only provided on a total basis for the 5-minute reporting period. Like traffic measurements, the data reported for longer time intervals are an accumulation of the 5-minute data. However, error measurements for the 30-minute and 24-hour time frames are totals only of the six 5-minute periods or forty-eight 30-minute periods, respectively. The variables provided for traffic measurements also include averages and maximum values.

4.37 Some of the traffic and error measurements are provided in sets, where separate data values are counted for dial-up ports, data SLC carrier system ports, and totals for both ports. For example, a total count of the number of logical channel setups is a traffic measurement provided on both a total port basis as well as separate counts for each type of port. Likewise, the error measurement for the total number of frame rejects sent is reported for dial-up terminals, data SLC carrier system terminals, and a total for all terminals.

4.38 Table I provides a complete listing of all traffic measurements which have significance to the processing of LADT calls, rather than subscriber access as provided in Table G. Table I is set up in five columns. The first column identifies the key measurement for a set of measurement labels. The second column provides measurement labels exactly as they are to be defined on the traffic format tables. These labels are itemized for cross-reference purposes. The third column provides a brief description of the data associated with the label. The fourth and fifth columns of Table I identify those measurements which are provided on a system and/or an individual DSI basis. An indicator in both columns means that the measurement is provided for both.

4.39 The Table I measurement labels are itemized in conjunction with the Table G labels, since both tables relate to traffic measurements. Therefore, the labels identified in the second column of Table I are itemized from item 30 through item 61. These items can be cross-referenced with Table H, which provides a listing of all traffic measurements in alphabetical order (refer to paragraph 4.13).

4.40 All available error measurements are identified in Table J, since all of these measurements relate to call processing. The format of Table J is the same as for Table I. However, the measurement labels in the second column are itemized 1 through 40.

4.41 Table K is provided as a cross-reference for all error measurements that are listed in Table J. These measurements are listed in alphabetical order, with corresponding item numbers indicated in the column to the right of the label.

4.42 Most call processing measurements can be identified by the descriptions provided in Tables I and J. One group of measurements that cannot readily be defined are those error measurements that relate to the DSI overload controls 1 and 2. The measurement labels DSI-CNT-OVRLD-1 and -2 provide counts of the total number of times the DSI invokes level 1 or level 2 overload controls. Measurement labels identified as DSI-TIME-OVRLD-1 and -2 provide counts of the total time in tenths of seconds that a DSI is in the particular level of overload control. Each level of overload control is activated and cleared by preset values. These values are set by administrative personnel via an update to the DSI Equipment Form located within the LADT recent change data base.

4.43 Table L provides activation, repercussion, and clearance arguments for these overload controls, and identifies the DSI Equipment Form fields that control the activation and clearance for each. Recommended values for these preset factors are provided in the table, within the parentheses; these values should be adjusted to meet the local system performance. A sample DSI Equipment Form is provided in Fig. 16. (Refer to Section 255-025-021 or the LADT Recent Change Input/Output Manual for additional information on the DSI Equipment Form.)

5. TRAFFIC AND ERROR REPORT OUTPUT

5.01 Traffic and error reports can be automatically generated or retrieved on a demand basis. These reports are provided as dictated in the report format tables by the network administrator. The automatic reports may be produced for all report sections for all reporting periods (5 minutes, 30 minutes, and 24 hours), or may be produced on as little as a conditional basis for the selected threshold measurement(s). The deciding factor(s) for automatic report generation is the report switch and/or the section switch.

5.02 The number and type of measurements appearing on each report is also under the control of the network administrator. All measurements may be reported on each of the automatic, on-demand, and special reports, or the amount and type of measurements may be contoured to provide only the most significant details.

FORMAT DESCRIPTION

5.03 The format of the report output is similar for both traffic and error measurements. The first line of the report always contains the date, the data ending time, and the title of the report. The remainder of the report is based on those variables identified in the format table. For example, if a 5-minute periodic error report table has measurement labels in all four sections (one for system measurements and three for DSI measurements), and the report switch and all section switches were turned on, all sections of the report would be generated every 5 minutes.

5.04 The Section 1 system measurements for a specific report are always printed first. The measurement labels are printed in the order in which they are presented on the format table(s). Each section is then printed in consecutive order, based on the section switch status. Measurement labels as specified are listed in a columnar format on the left side of the report. Each section of individual DSI measurements (Sections 2 through 4) has the data for the measurements labels printed in a columnar format to the right of the labels. Each data column contains a heading that identifies the data for a specific operational DSI, by DSI number. The DSI number represents its place within the LADT system, and corresponds to the number allotted to it via the recent change DSI Equipment Form. A sample of the LADT report output format for a 5-minute periodic error report is provided in Fig. 17.

5.05 A malfunction within the data collection and/or data retention process may cause traffic and error reports to contain incomplete data values. For 5-minute reports, the implication is that an active DSI did not send its data for that 5-minute period. For longer reporting periods (30 minutes and 24 hours), one or more source files used to accumulate data for the longer period source file does not exist. Any report that contains incomplete data does provide an indication to the user that the condition exists.

5.06 For traffic reports that contain imcomplete data values for the DSI, an asterisk (*) is printed as a suffix to the DSI identification number. This number is part of the DSI header that identifies the individual data columns for each active DSI. In addition, data values for all system counts are also suffixed by an asterisk, since incomplete data for one DSI will affect the total system counts. These invalid data flags are indicated as suffixes on traffic reports for all affected reporting periods.

5.07 For error reports that contain incomplete data values for a DSI, the user is notified by an asterisk (*). This invalid data flag is printed as a suffix to the report header when the error report is printed. Any periodic report that contains incomplete data is flagged with the asterisk.

6. AP DESCRIPTION AND MEASUREMENTS

DESCRIPTION

6.01 The AP is a duplicated 3B20 processor that is configured similarly to the No. 1 PSS packet switch. However, the software of the AP is implemented entirely at the user level of the DMERT.

6.02 The AP has only one physical link to the entire LADT network. This link is provided by a 9.6 kb/s interface between the AP and the packet switch. This interface must be compatible with the packet switch, and must support the X.25 communications protocol described in Part 4 of this section.

6.03 Although the AP is connected to the packet switch, it does not administer any of the packet switch functions. Instead it provides support to the DSIs. The AP has network management responsibilities, and performs functions relating to administration and maintenance. These processes require more storage and processing than is available in either the DSI or the packet switch. In addition, the AP provides recent change capabilities for craft input. These activities are subsequently downloaded to the DSI for updating.

6.04 The AP routinely collects billing and traffic data. These data are forwarded from the DSI to the AP over a VC through the packet switch. If the AP to packet switch link fails, or the AP fails by itself, the DSI will hold the billing records until the link (or AP) is restored or until its holding capacity is reached. Once the holding capacity is reached, the DSI will discard the billing records until the AP-packet switch link is restored. DSI dial-up billing records would be the first to be discarded, so that the data SLC carrier system records, which generate revenues, can be saved. The AP also maintains its own set of billing records. These records include data for both dial-up and direct access calls.

DATA MEASUREMENTS

6.05 Traffic data received from the DSIs are formatted and retained by the AP. The report output for this data is transmitted to the AP recent change terminal. Measurements are also taken by the AP for its own status, initializations, and alarms and diagnostics programs.

6.06 Every 24 hours, at midnight, a DMERT Plant Measurements source file is created for the AP performance measurements. The output of this file is the 24 Hour Plant Measurements Report. This report cannot be administered like the traffic and error reports for the DSIs. The report generation to the AP recent change terminal is automatic and cannot be suppressed. Also, measurements appearing on the report cannot be altered.

6.07 The data which appears on the 24-hour report stems from a set of counters that represent the increase in the data over the previous 24-hour period. The report is formatted in three basic columns, with each column providing measurements for certain processing levels, as well as the number of critical, major, and minor alarms. A sample of the 24 Hour Plant Measurements Report is provided in Fig. 18.

7. ABBREVIATIONS AND ACRONYMS

7.01 Abbreviations and acronyms used in this section are defined below:

ABBREVIATION	ACRONYMN
AP	Administrative Processor
CDL	Customer Data Line
CRC	Cyclic Redundancy Check
DDD	Direct Distance Dialing
DDS	Digital Data System
DMA	Direct Memory Access
DMERT	Duplex Multi-Environment Real Time Operating System
DSI	Data Subscriber Interface
DTN	Data Terminal Number
GFI	General Format Identifier
LADT	Local Area Data Transport
LAPB	Link Access Procedure B (Standard)
LCGN	Logical Channel Group Number
LNA	Logical Network Address
MLHG	Multiline Hunt Group
OOS	Out of Service
PDS	Program Document Standard
P(R)	Packet Receive Sequence Number
P(S)	Packet Send Sequence Number
PSS	Packet Switching System
PVC	Permanent Virtual Circuit
VC	Virtual Call
VCR	Virtual Circuit Record

8. REFERENCES

8.01 The following sections can be used as references:

SECTION	TITLE
255-025-005	LADT General Description
255-025-020	LADT System Administration
255-025-021	Data Subscriber Interface
255-025-022	Data Terminal Numbers
255-025-023	Packet Switch Assignments
255-025-041	Packet Switch Measurements
255-093-010	Feature Document—No. 1 Packet Switching System Description

SECTION	TITLE
255-093-510	Feature Document—Data Subscriber Interface—LADT Network

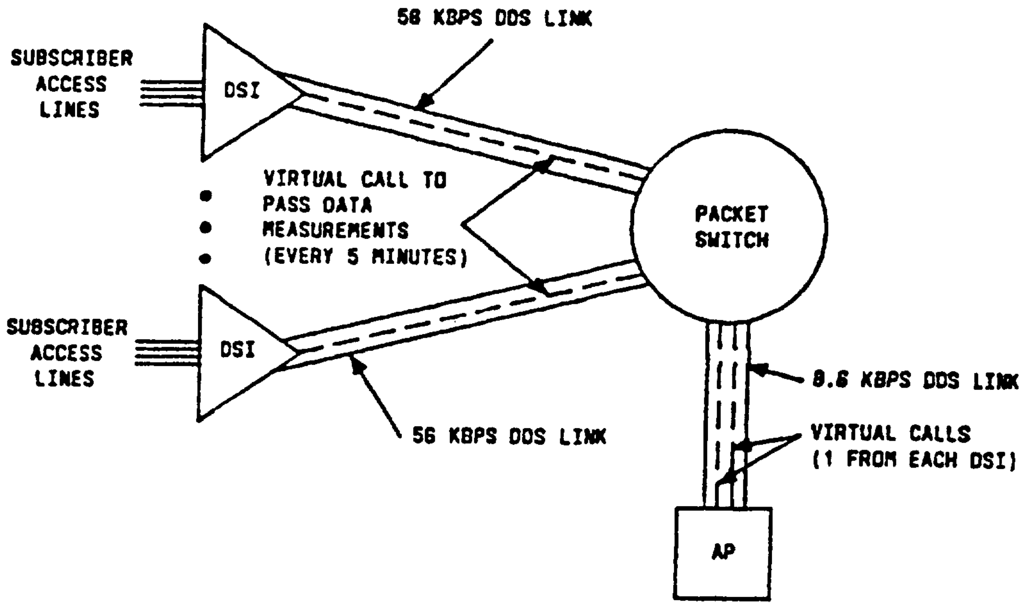


Fig. 1—Transmission of Data Measurements Through Packet Switch to AP (2.02)

PAGE 1 OF 4 TRAFFIC REPORT FORM

*1. FORMAT TABLE: ________ 2. DESCR: ________________________________

3. REPORT SWITCH: ____

4. SECTION 1 SWITCH: ____

5. HEADING: ____

6. SYSTEM TRAFFIC MEASUREMENT LABELS

[1] ____________________	[13] ____________________
[2] ____________________	[14] ____________________
[3] ____________________	[15] ____________________
[4] ____________________	[16] ____________________
[5] ____________________	[17] ____________________
[6] ____________________	[18] ____________________
[7] ____________________	[19] ____________________
[8] ____________________	[20] ____________________
[9] ____________________	[21] ____________________
[10] ____________________	[22] ____________________
[11] ____________________	[23] ____________________
[12] ____________________	[24] ____________________

PAGE 2-4 OF 4 TRAFFIC REPORT FORM
SECTION 2-4

11. SECTION 2-4 SWITCH: ____

12. HEADING: ____

13. DSI TRAFFIC MEASUREMENT LABELS

[1] ____________________	[13] ____________________
[2] ____________________	[14] ____________________
[3] ____________________	[15] ____________________
[4] ____________________	[16] ____________________
[5] ____________________	[17] ____________________
[6] ____________________	[18] ____________________
[7] ____________________	[19] ____________________
[8] ____________________	[20] ____________________
[9] ____________________	[21] ____________________
[10] ____________________	[22] ____________________
[11] ____________________	[23] ____________________
[12] ____________________	[24] ____________________

Fig. 2—Traffic Report Form (Sheet 1 of 2) (3.07)

PAGE 3-4 OF 4

TRAFFIC REPORT FORM
SECTION 3-4

11. SECTION 3-4 SWITCH: ____
12. HEADING: ______________________________

13. DSI TRAFFIC MEASUREMENT LABELS

[1] ____________	[13] ____________
[2] ____________	[14] ____________
[3] ____________	[15] ____________
[4] ____________	[16] ____________
[5] ____________	[17] ____________
[6] ____________	[18] ____________
[7] ____________	[19] ____________
[8] ____________	[20] ____________
[9] ____________	[21] ____________
[10] ____________	[22] ____________
[11] ____________	[23] ____________
[12] ____________	[24] ____________

PAGE 4-4 OF 4

TRAFFIC REPORT FORM
SECTION 4-4

11. SECTION 4-4 SWITCH: ____
12. HEADING: ______________________________

13. DSI TRAFFIC MEASUREMENT LABELS

[1] ____________	[13] ____________
[2] ____________	[14] ____________
[3] ____________	[15] ____________
[4] ____________	[16] ____________
[5] ____________	[17] ____________
[6] ____________	[18] ____________
[7] ____________	[19] ____________
[8] ____________	[20] ____________
[9] ____________	[21] ____________
[10] ____________	[22] ____________
[11] ____________	[23] ____________
[12] ____________	[24] ____________

Fig. 2—Traffic Report Form (Sheet 2 of 2) (3.07)

PAGE 1 OF 4 TRAFFIC REPORT FORM

*1. FORMAT TABLE: *30P* 2. DESCR: ______
3. REPORT SWITCH: *ON*

4. SECTION 1 SWITCH: *ON*
5. HEADING: *SYSTEM MEASUREMENTS*

6. SYSTEM TRAFFIC MEASUREMENT LABELS

[1]	*TOTAL-DSI-INS*	[13]	*DSLC-AVG-CALLS*
[2]	*TOTAL-PORTS-INS*	[14]	*MAX-CALLS-CONNECT*
[3]	*DIALUP-PORTS-INS*	[15]	
[4]	*DSLC-PORTS-INS*	[16]	
[5]	*TOTAL-LC-SETUPS*	[17]	
[6]	*DIALUP-LC-SETUPS*	[18]	
[7]	*DSLC-LC-SETUPS*	[19]	
[8]	*DIAL-UP-PORT-USAGE*	[20]	
[9]	*AVG-PS-OUT-QUEUE*	[21]	
[10]	*MAX-PS-OUT-QUEUE*	[22]	
[11]	*TOTAL-AVG-CALLS*	[23]	
[12]	*DIALUP-AVG-CALLS*	[24]	

PAGE 2-4 OF 4 TRAFFIC REPORT FORM
SECTION 2-4

11. SECTION 2-4 SWITCH: *ON*
12. HEADING: *CALL ORIGINATION MEASUREMENTS*

13. DSI TRAFFIC MEASUREMENT LABELS

[1]	*TOTAL-DSI-INS*	[13]	*DSLC-MBSY-USAGE*
[2]	*TOTAL-PORTS-INS*	[14]	*AVG-TIME-DLUP-MBY*
[3]	*DIALUP-PORTS-INS*	[15]	*AVG-TIME-DSLC-MBY*
[4]	*DSLC-PORTS-INS*	[16]	
[5]	*DIALUP-CALL-ANSWER*	[17]	
[6]	*DIALUP-CALL-TIMOUT*	[18]	
[7]	*DIALUP-PORT-USAGE*	[19]	
[8]	*TOTAL-TRANS-MBSY*	[20]	
[9]	*DIALUP-TRANS-MBSY*	[21]	
[10]	*DSLC-TRANS-MBSY*	[22]	
[11]	*TOTAL-MBSY-USAGE*	[23]	
[12]	*DIALUP-MBSY-USAGE*	[24]	

Fig. 3—Sample Completed Traffic Report Form (Sheet 1 of 2) (3.07)

PAGE 3-4 OF 4 TRAFFIC REPORT FORM
SECTION 3-4

11. SECTION 3-4 SWITCH: *ON*
12. HEADING: *CALL PROCESSING MEASUREMENTS*

13. DSI TRAFFIC MEASUREMENT LABELS

[1]	*TOTAL-AVG-CALLS*	[13]	
[2]	*DIALUP-AVG-CALLS*	[14]	
[3]	*DSLC-AVG-CALLS*	[15]	
[4]	*MAX-CALLS-CONNECT*	[16]	
[5]	*TOTAL-LC-SETUPS*	[17]	
[6]	*DIALUP-LC-SETUPS*	[18]	
[7]	*DSLC-LC-SETUPS*	[19]	
[8]	*TOTAL-DSI-PS-PKT*	[20]	
[9]	*DIALUP-DSI-PS-PKT*	[21]	
[10]	*DSLC-DSI-PS-PKT*	[22]	
[11]		[23]	
[12]		[24]	

PAGE 4-4 OF 4 TRAFFIC REPORT FORM
SECTION 4-4

11. SECTION 4-4 SWITCH: ____
12. HEADING: ____

13. DSI TRAFFIC MEASUREMENT LABELS

[1]		[13]	
[2]		[14]	
[3]		[15]	
[4]		[16]	
[5]		[17]	
[6]		[18]	
[7]		[19]	
[8]		[20]	
[9]		[21]	
[10]		[22]	
[11]		[23]	
[12]		[24]	

Fig. 3—Sample Completed Traffic Report Form (Sheet 2 of 2) (3.07)

PAGE 1 OF 4 ERROR REPORT FORM

*1. FORMAT TABLE: ________ 2. DESCR: ________________________________
3. REPORT SWITCH: ____

4. SECTION 1 SWITCH: ____
5. HEADING: ____

6. SYSTEM ERROR MEASUREMENT LABELS

[1] ____________________	[13] ____________________
[2] ____________________	[14] ____________________
[3] ____________________	[15] ____________________
[4] ____________________	[16] ____________________
[5] ____________________	[17] ____________________
[6] ____________________	[18] ____________________
[7] ____________________	[19] ____________________
[8] ____________________	[20] ____________________
[9] ____________________	[21] ____________________
[10] ____________________	[22] ____________________
[11] ____________________	[23] ____________________
[12] ____________________	[24] ____________________

PAGE 2-4 OF 4 ERROR REPORT FORM
SECTION 2-4

11. SECTION 2-4 SWITCH: ____
12. HEADING: ____

13. DSI ERROR MEASUREMENT LABELS

[1] ____________________	[13] ____________________
[2] ____________________	[14] ____________________
[3] ____________________	[15] ____________________
[4] ____________________	[16] ____________________
[5] ____________________	[17] ____________________
[6] ____________________	[18] ____________________
[7] ____________________	[19] ____________________
[8] ____________________	[20] ____________________
[9] ____________________	[21] ____________________
[10] ____________________	[22] ____________________
[11] ____________________	[23] ____________________
[12] ____________________	[24] ____________________

Fig. 4—Error Report Form (Sheet 1 of 2) (3.07)

PAGE 3-4 OF 4 ERROR REPORT FORM
SECTION 3-4

11. SECTION 3-4 SWITCH: ____
12. HEADING: ______________________________

13. DSI ERROR MEASUREMENT LABELS

[1] ____________	[13] ____________
[2] ____________	[14] ____________
[3] ____________	[15] ____________
[4] ____________	[16] ____________
[5] ____________	[17] ____________
[6] ____________	[18] ____________
[7] ____________	[19] ____________
[8] ____________	[20] ____________
[9] ____________	[21] ____________
[10] ____________	[22] ____________
[11] ____________	[23] ____________
[12] ____________	[24] ____________

PAGE 4-4 OF 4 ERROR REPORT FORM
SECTION 4-4

11. SECTION 4-4 SWITCH: ____
12. HEADING: ______________________________

13. DSI ERROR MEASUREMENT LABELS

[1] ____________	[13] ____________
[2] ____________	[14] ____________
[3] ____________	[15] ____________
[4] ____________	[16] ____________
[5] ____________	[17] ____________
[6] ____________	[18] ____________
[7] ____________	[19] ____________
[8] ____________	[20] ____________
[9] ____________	[21] ____________
[10] ____________	[22] ____________
[11] ____________	[23] ____________
[12] ____________	[24] ____________

Fig. 4—Error Report Form (Sheet 2 of 2) (3.08)

PAGE 1 OF 4 ERROR REPORT FORM

*1. FORMAT TABLE: *30P* 2. DESCR: ______
3. REPORT SWITCH: *ON*
4. SECTION 1 SWITCH: *ON*
5. HEADING: ______

6. SYSTEM ERROR MEASUREMENT LABELS

[1]	*AP-MISSING-PACKETS*	[13]	
[2]	*TOT-CALL-CLR-PS*	[14]	
[3]	*TOT-CALL-CLR-VEND*	[15]	
[4]	*TOT-CALL-CLR-NDSI*	[16]	
[5]		[17]	
[6]		[18]	
[7]		[19]	
[8]		[20]	
[9]		[21]	
[10]		[22]	
[11]		[23]	
[12]		[24]	

PAGE 2-4 OF 4 ERROR REPORT FORM
SECTION 2-4

11. SECTION 2-4 SWITCH: *ON*
12. HEADING: *CONGESTION AND OVERLOADS*

13. DSI ERROR MEASUREMENT LABELS

[1]	*BLOCKING-CONG-CRLS*	[13]	
[2]	*SERV-BLOCK-PSCONG*	[14]	
[3]	*SERV-BLOCK-PSSETUP*	[15]	
[4]	*SERV-BLOCK-VENDOR*	[16]	
[5]	*DSI-LCHAN-BLOCK*	[17]	
[6]	*DSI-CNT-OVRLD-1*	[18]	
[7]	*DSI-CNT-OVRLD-2*	[19]	
[8]	*DSI-TIME-OVRLD-1*	[20]	
[9]	*DSI-TIME-OVRLD-2*	[21]	
[10]		[22]	
[11]		[23]	
[12]		[24]	

Fig. 5—Sample Completed Error Report Form (Sheet 1 of 2) (3.07)

PAGE 3-4 OF 4 ERROR REPORT FORM
SECTION 3-4

11. SECTION 3-4 SWITCH: *ON*
12. HEADING: ______

13. DSI ERROR MEASUREMENT LABELS

[1]	*ALL-DSI-LC-INITS*	[13]	*ALL-DSI-REJ-COND*
[2]	*DU-DSI-LC-INITS*	[14]	*DU-DSI-REJ-COND*
[3]	*DSLC-DSI-LC-INITS*	[15]	*DSLC-DSI-REJ-COND*
[4]	*DSI-L3-RESETS*	[16]	*CALL-CLR-CUST*
[5]	*VENDOR-L3-RESETS*	[17]	*CALL-CLR-PS*
[6]	*DSI-TO-ALL-RTIFRM*	[18]	*CALL-CLR-VENDOR*
[7]	*DSI-TO-DU-RTIFRM*	[19]	*CALL-CLR-DSI-CONG*
[8]	*DSI-TO-DSLC-RTIFRM*	[20]	*TOT-CALL-CLR-PS*
[9]	*ALL-DSI-CRC-ERR*	[21]	*TOT-CALL-CLR-VENDOR*
[10]	*DU-DSI-CRC-ERR*	[22]	*TOT-CALL-CLR-NDSI*
[11]	*DSLC-DSI-CRC-ERR*	[23]	
[12]	*PS-DSI-CRC-ERR*	[24]	

PAGE 4-4 OF 4 ERROR REPORT FORM
SECTION 4-4

11. SECTION 4-4 SWITCH: *ON*
12. HEADING: *MAINTENANCE ERRORS*

13. DSI ERROR MEASUREMENT LABELS

[1]	*DSI-INIT-1*	[13]	
[2]	*DSI-INIT-2*	[14]	
[3]	*DSI-EXC-INTRR-HDW*	[15]	
[4]	*DSI-EXC-INTRR-STM*	[16]	
[5]	*DSI-ALARM-MINOR*	[17]	
[6]	*DSI-ALARM-MAJOR*	[18]	
[7]	*DSI-ALARM-CRIT*	[19]	
[8]	*DSI-AUDITS-FAIL*	[20]	
[9]		[21]	
[10]		[22]	
[11]		[23]	
[12]		[24]	

Fig. 5—Sample Completed Error Report Form (Sheet 2 of 2) (3.07)

TRAFFIC THRESHOLDS FORM

*1. THRESHOLD TABLE: ________

2. DESCRIPTION: ____

3. TRAFFIC THRESHOLDS

	4.CATG	5.MEASUREMENT LABEL	6.TYPE	7.LIMIT
[1]	___	________________	___	____________
[2]	___	________________	___	____________
[3]	___	________________	___	____________
[4]	___	________________	___	____________
[5]	___	________________	___	____________
[6]	___	________________	___	____________
[7]	___	________________	___	____________
[8]	___	________________	___	____________
[9]	___	________________	___	____________
[10]	___	________________	___	____________
[11]	___	________________	___	____________
[12]	___	________________	___	____________

ERROR THRESHOLDS FORM

*1. THRESHOLD TABLE: ________

2. DESCRIPTION: ____

3. ERROR THRESHOLDS

	4.CATG	5.MEASUREMENT LABEL	6.TYPE	7.LIMIT
[1]	___	________________	___	____________
[2]	___	________________	___	____________
[3]	___	________________	___	____________
[4]	___	________________	___	____________
[5]	___	________________	___	____________
[6]	___	________________	___	____________
[7]	___	________________	___	____________
[8]	___	________________	___	____________
[9]	___	________________	___	____________
[10]	___	________________	___	____________
[11]	___	________________	___	____________
[12]	___	________________	___	____________

Fig. 6—Traffic and Error Thresholds Forms (3.13)

TRAFFIC THRESHOLDS FORM

*1. THRESHOLD TABLE: 5

2. DESCRIPTION: ______

3. TRAFFIC THRESHOLDS

	4.CATG	5.MEASUREMENT LABEL	6.TYPE	7.LIMIT
[1]	DSI	AVG-FREE-PKT-BUFF	MIN	31
[2]	DSI	OUT-QUEUE-LENGTH	MAX	8
[3]				
[4]				
[5]				
[6]				
[7]				
[8]				
[9]				
[10]				
[11]				
[12]				

ERROR THRESHOLDS FORM

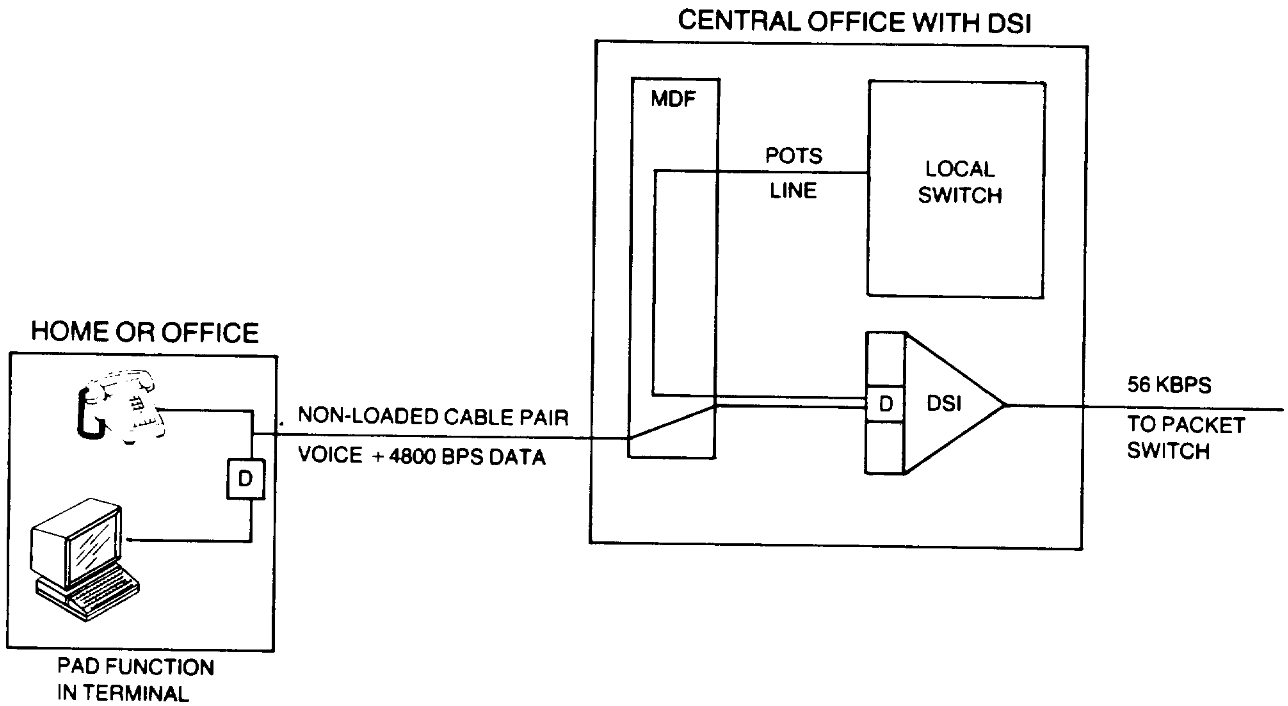
*1. THRESHOLD TABLE: 5

2. DESCRIPTION: ______

3. ERROR THRESHOLDS

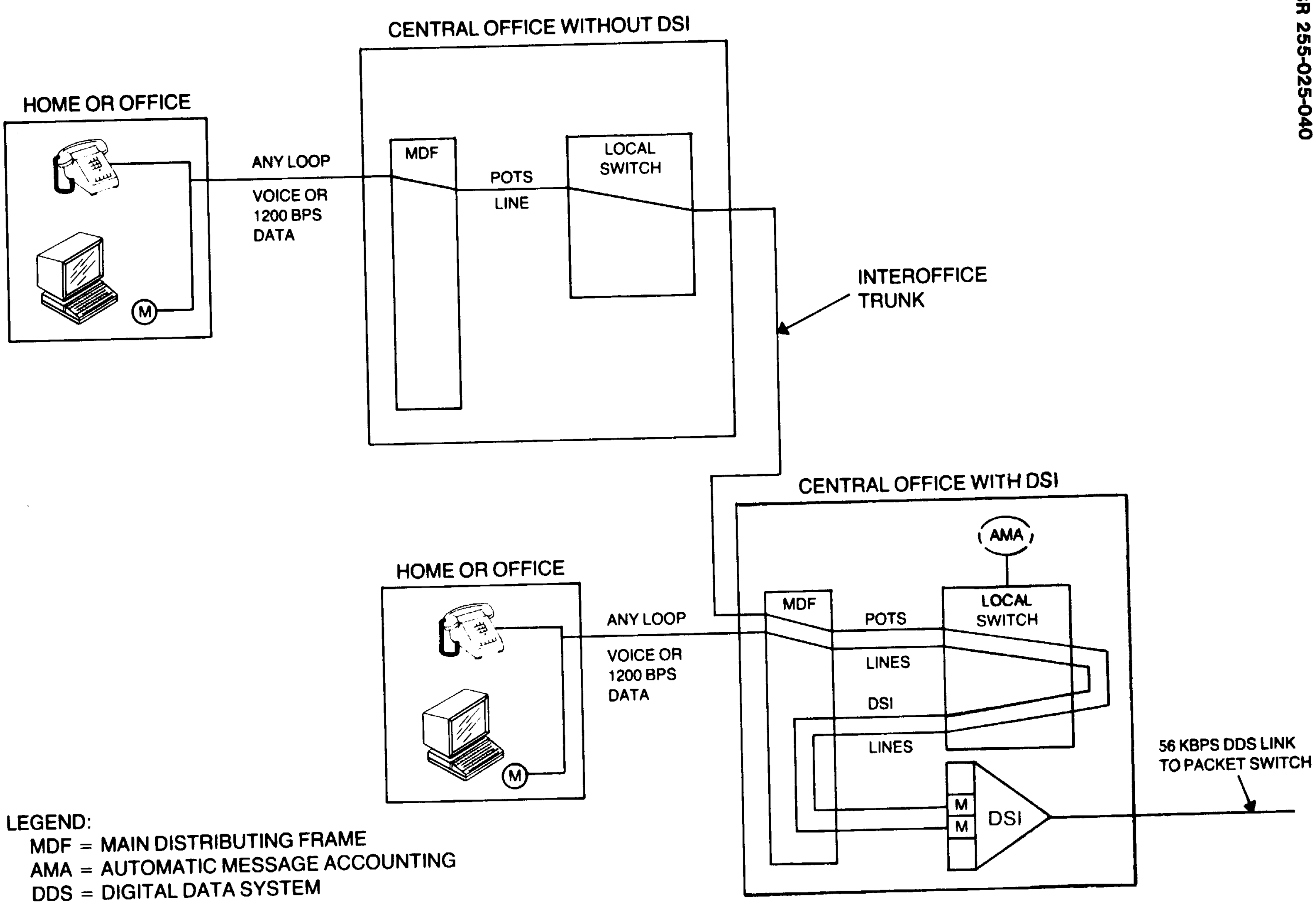
	4.CATG	5.MEASUREMENT LABEL	6.TYPE	7.LIMIT
[1]	DSI	DSI-CNT-OVRLD-1	MAX	0
[2]	DSI	DSI-CNT-OVRLD-2	MAX	0
[3]	DSI	DIS-TIME-OVRLD-1	MAX	0
[4]	DSI	DSI-TIME-OVRLD-2	MAX	0
[5]				
[6]				
[7]				
[8]				
[9]				
[10]				
[11]				
[12]				

Fig. 7—Sample Completed Traffic and Error Thresholds Forms (3.14)



LEGEND:
D = DATA SLC CARRIER SYSTEM DEVICE
MDF = MAIN DISTRIBUTING FRAME

Fig. 8—LADT Direct Access to the DSI (4.05)



LEGEND:
MDF = MAIN DISTRIBUTING FRAME
AMA = AUTOMATIC MESSAGE ACCOUNTING
DDS = DIGITAL DATA SYSTEM
M = MODEM

Fig. 9—LADT Dial-Up Access to the DSI (4.06)

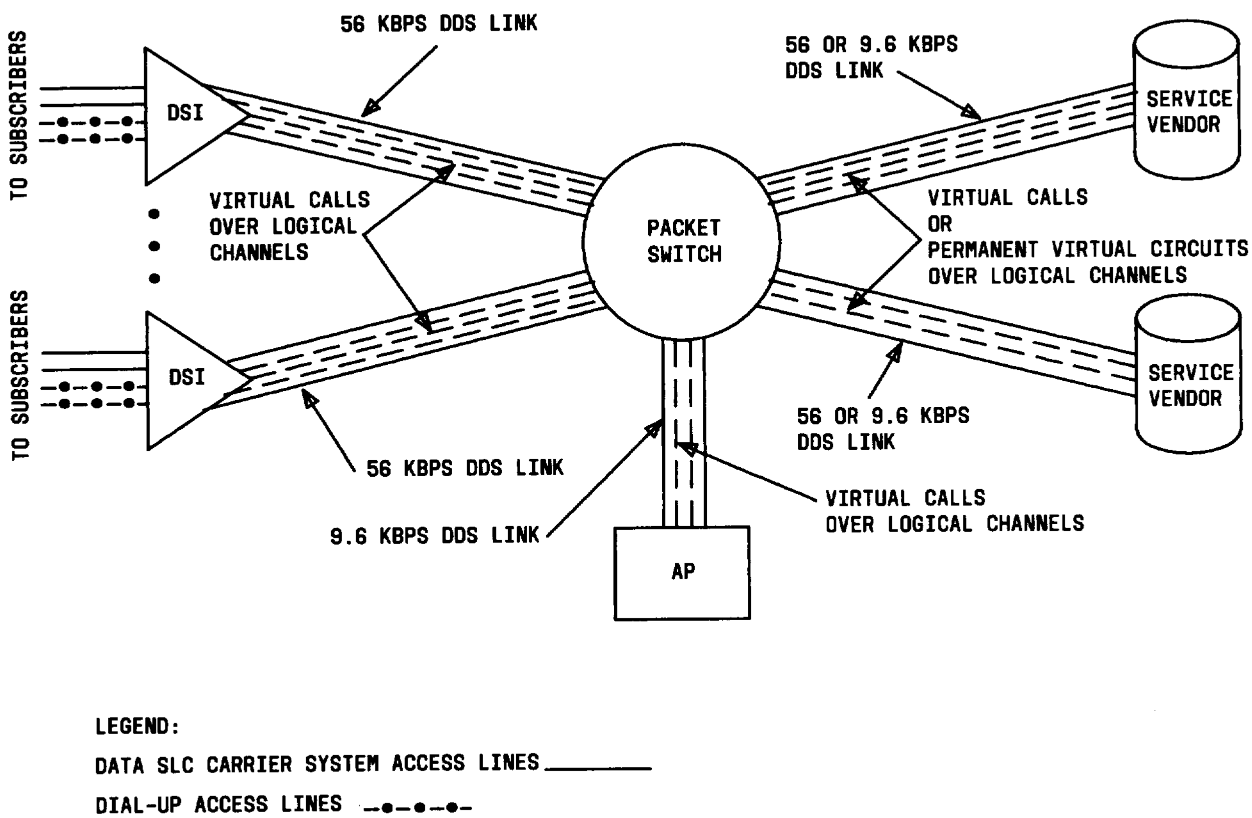


Fig. 10—LADT Network with Virtual Circuits (4.14)

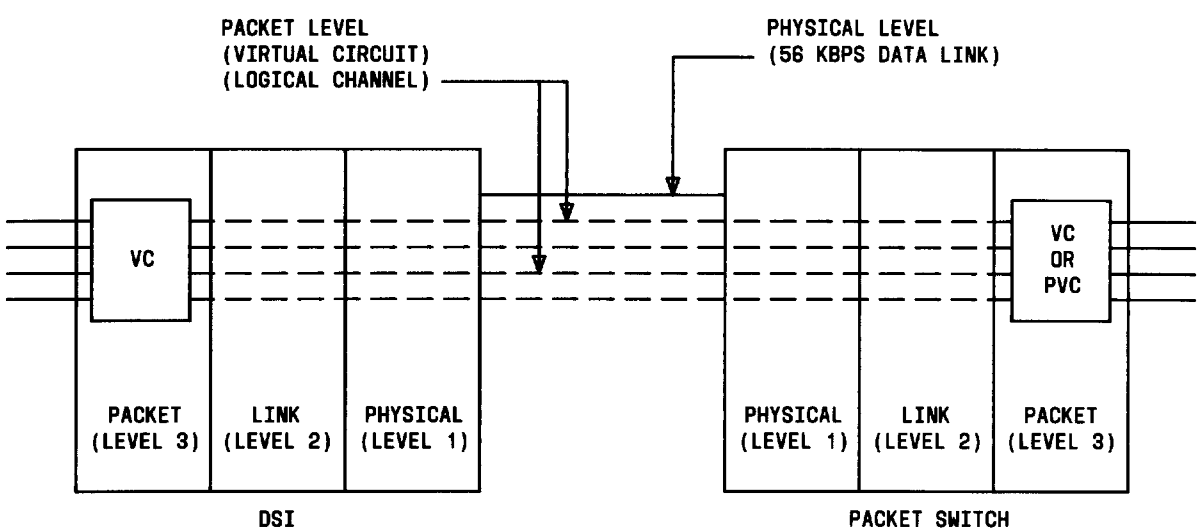


Fig. 11—X.25 Protocol Levels (4.18)

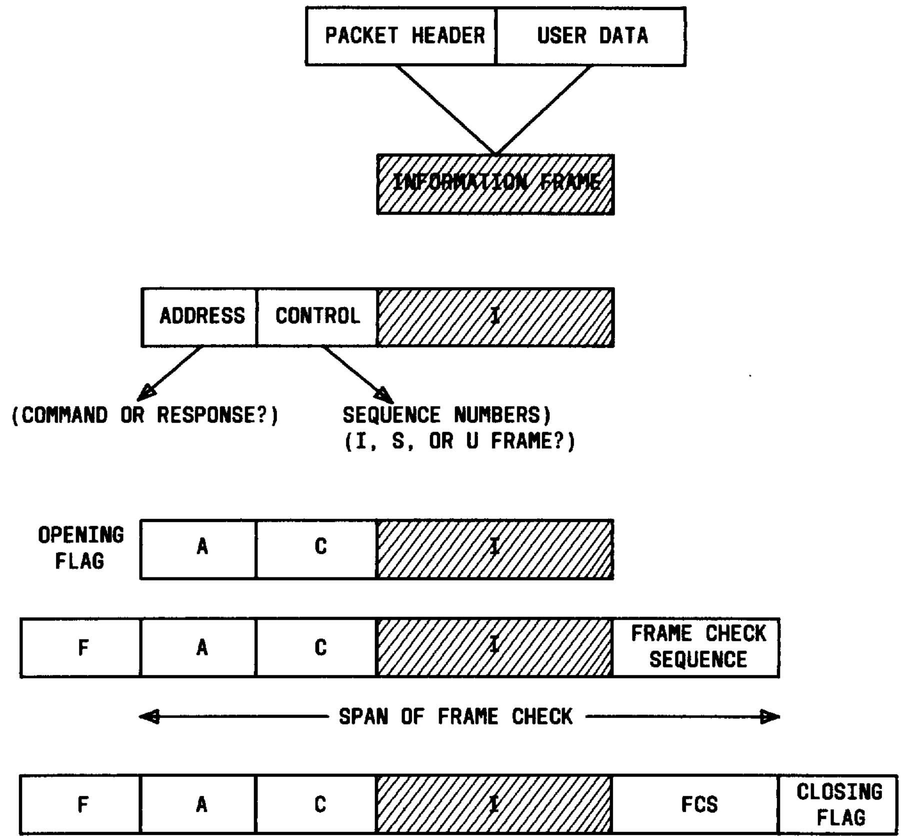


Fig. 12—Data Packet to Frame Transmission (4.20)

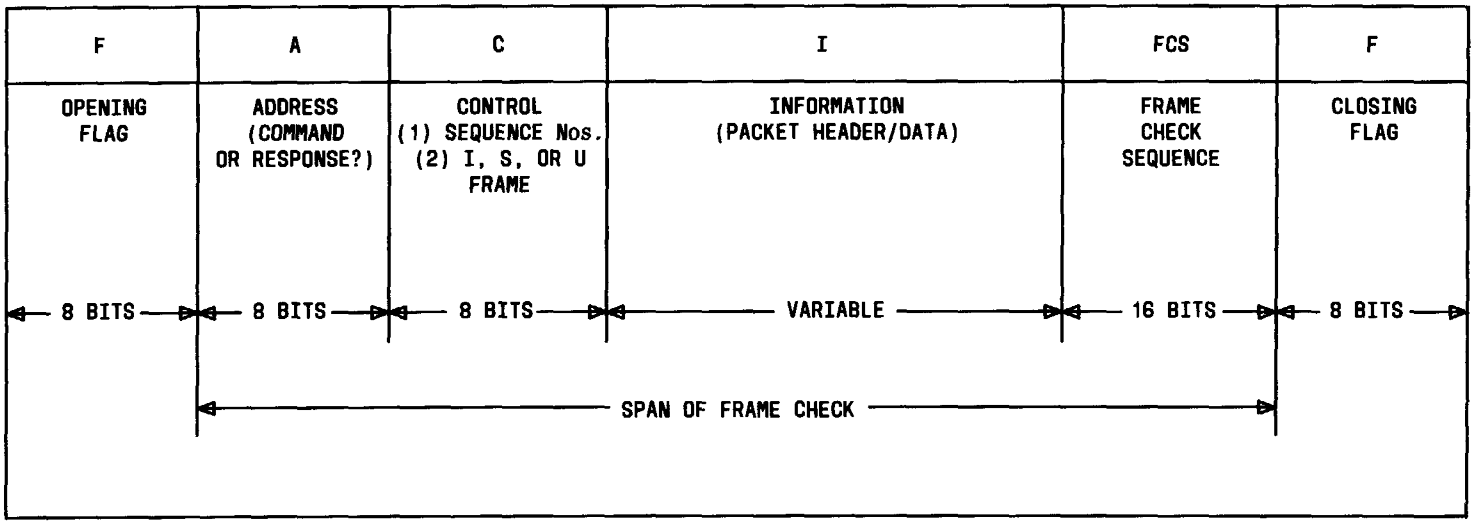


Fig. 13—Overall Frame Structure (4.20)

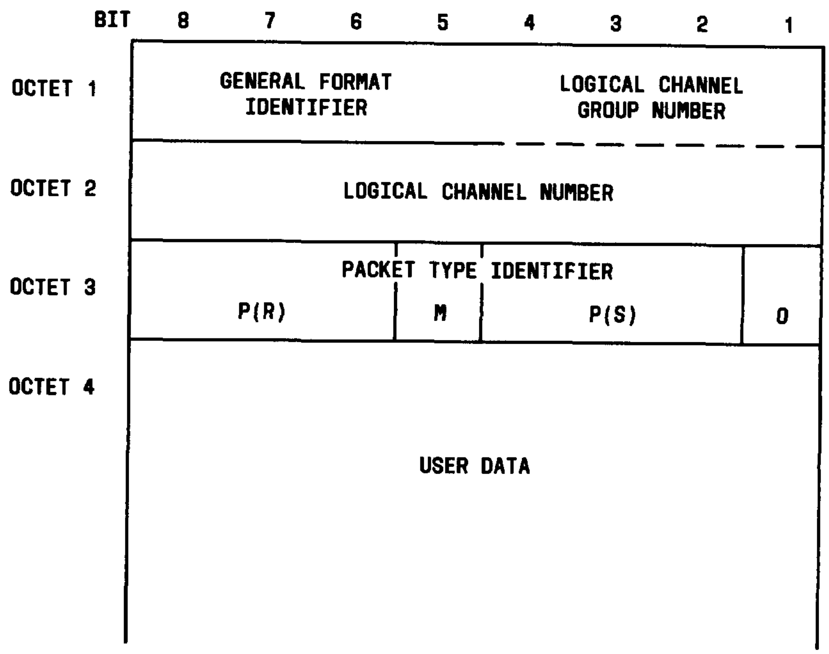


Fig. 14—Basic Packet Header (4.21)

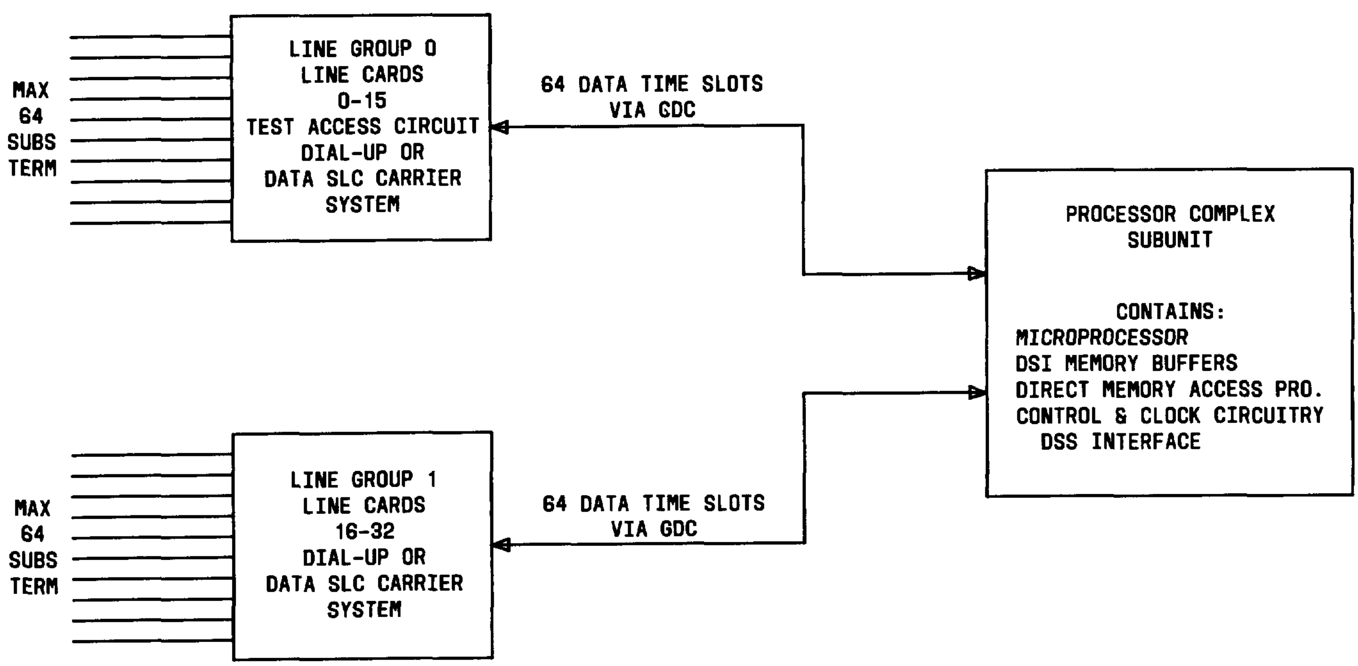


Fig. 15—Internal Flow through DSI Components (4.22)

```
PAGE 1 OF 2                     DSI EQUIPMENT FORM

*1. DSI:                      2. DSI STATUS: __          3. UPD TYPE: ____
 4. SERVING REGION: __        5. SERVING AREA: __        6. DSI EPN: ____
 7. DIALUP EPN: ___           8. DSI ISSUE: _            9. ALPHA ISSUE: _
10. CLK SOURCE: ___          11. TIMEZONE: _            12. DST TIME: __

13. GROUP 0 STATUS: __               14. GROUP 1 STATUS: __

15. RTN EXERC: __:__       18. DGN RMV LIM: __       19. AUDIT MSG LIN: __

21. L3 HIGH Q       22. L2 LOW Q       23. LAPC HIGH Q       24. LAPC LOW Q
    ____                ____               ____                  ____
    ____                ____               ____                  ____
    ____                ____               ____                  ____

                                                             31. BILL PER
25. HI PKT THR: ____         26. HI PKY HYST: ____               __:__
27. LOW PKT THR: ____        28. LOW PKT HYST: ____              __:__
29. PS QUE THR: ____         30. PS QUE HYST: ____               __:__
                                                                 __:__
```

Fig. 16—DSI Equipment Form (4.43)

Jun 3 22:30:00 1983 30 MIN PERIODIC DSI TRAFFIC REPORT

TRAFFIC REPORT SECTION 1 - SYSTEM MEASUREMENTS

TOTAL-DSI-INS	3	TOTAL-PORTS-INS	181
DIALUP-PORTS-INS	160	DSLC-PORTS-INS	21
TOTAL-LC-SETUPS	2	DIALUP-LC-SETUPS	2
DSLC-LC-SETUPS	0	DIAL-UP-PORT-USAGE	74
AVG-PS-OUT-QUEUE	0	MAX-PS-OUT-QUEUE	0
TOTAL-AVG-CALLS	2	DIALUP-AVG-CALLS	2
DSLC-AVG-CALLS	0	MAX-CALLS-CONNECT	4

TRAFFIC REPORT SECTION 2 - DSI MEASUREMENTS

	DSI:1	DSI:2	DSI:17
TOTAL-PORTS-INS	76	76	29
DIALUP-PORTS-INS	76	76	8
DSLC-PORTS-INS	0	0	21
DIALUP-PORT-USAGE	1	73	
DIALUP-MBSY-USAGE	0	0	
DSLC-MBSY USAGE	0	0	0
TOTAL-MBSY-USAGE	0	0	0
DIALUP-CALL-ANSWER	1	1	0
DIALUP-CALL-TIMOUT	0	0	0
DIALUP-OOS-USAGE	0	36	0
DSLC-OOS-USAGE	0	0	0
TOTAL-OOS-USAGE	0	36	0
DIALUP-TRANS-MBSY	0	0	0
DSLC-TRANS-MBSY	0	0	0
TOTAL-TRANS-MBSY	0	0	0
DIALUP-TRANS-OOS	0	0	0
DSLC-TRANS-OSS	0	0	0
TOTAL-TRANS-OOS	0	0	0
DIALUP-LC-SETUPS	1	1	0
DSLC-LC-SETUPS	0	0	0
TOTAL-LC-SETUPS	1	1	0
DIALUP-DSI-CT-FRM	12	719	0
DSLC-DSI-CT-FRM	0	0	0
TOTAL-DSI-CT-FRM	12	719	0

Fig. 17—Sample Report Output (Sheet 1 of 2) (5.04)

TRAFFIC REPORT SECTION 3 – DSI MEASUREMENTS

	DSI:1	DSI:2	DSI:17
DIALUP-CT-DSI-FRM	12	718	0
DSLC-CT-DSI-FRM	0	0	0
TOTAL-CT-DSI-FRM	12	718	0
DIALUP-DSI-CT-IFR	9	430	0
DSLC-DSI-CT-IFR	0	0	0
TOTAL-DSI-CT-IFR	9	430	0
DIALUP-CT-DSI-IFR	2	199	0
TOTAL-CT-DSI-OCT	32	3984	0
DIALUP-DEST-SELECT	1	1	0
DSLC-DEST-SELECT	0	0	0
TOTAL-DEST-SELECT	1	1	0
DIALUP-INVAL-DEST	0	0	0
DSLC-INVAL-DEST	0	0	0
TOTAL-INVAL-DEST	0	0	0
DIALUP-DSI-PS-PKT	10	604	0
DSLC-DSI-PS-PKT	0	0	0
TOTAL-DSI-PS-PKT	10	604	0

TRAFFIC REPORT SECTION 4 – DSI MEASURMENTS

	DSI:1	DSI:2	DSI:17
DIALUP-PS-DSI-PKT	9	627	0
DSLC-PS-DSI-PKT	0	0	0
TOTAL-PS-DSI-PKT	9	627	0
TOTAL-DSI-AP-PKT	38	38	37
TOTAL-AP-DSI-PKT	30	30	30
DIALUP-AVG-CALLS	0	2	0
DSLC-AVG-CALLS	0	0	0
TOTAL-AVG-CALLS	0	2	0
MAX-VIRT-CALLS	1	3	0
CPU-SCHED-CYCLES	60366	56521	61309
AVG-FREE-PKT-BUFF	206	205	185
OUT-QUEUE-LENGTH	0	0	0
MAX-OUT-QUEUE	0	0	0
DSI-AUDITS-EXC	667	663	680
AVG-TIME-DSLC-MBY	0	0	0
AVG-TIME-DLUP-MBY	0	0	0
AVG-TIME-DSLC-OOS	0	0	0
AVG-TIME-DLUP-OOS	0	0	0

END OF REPORT

Fig. 17—Sample Report Output (Sheet 2 of 2) (5.04)

```
PLANT MEASUREMENTS STARTED

CRIT-ALARMS        Ø    MAJ-ALARMS        Ø    MIN-ALARMS        Ø
DMERT-AUD-ATMP     4    DMERT-AUD-FAIL    Ø    LEV-1-SFT-INIT    Ø
LEV-2-SFT-INIT     Ø    LEV-3-SFT-INIT    Ø    LEV-4-SFT-INIT    Ø
LEV-1-HRD-INIT     Ø    LEV-2-HRD-INIT    Ø    LEV-3-HRD-INIT    Ø
LEV-4-HRD-INIT     Ø    LEV-1-MAN-INIT    Ø    LEV-2-MAN-INIT    Ø
LEV-3-MAN-INIT     Ø    LEV-4-MAN-INIT    Ø    LEV-Ø-PRC-INTR    Ø
LEV-1-PRC-INTR     Ø    LEV-2-PRC-INTR    Ø

UNIT  UNIT  TRANS  AUTO-DGN  TIME  FAULT  TIME  MAN-REQ  TIME  FRC  TIME
NAME  NUM   ERRS     OOS     SEC    OOS   SEC     OOS    SEC   ACT   SEC

PLANT MEASUREMENTS COMPLETED
```

Fig. 18—24-Hour Plant Measurements Report (6.07)

TABLE A

REPORT FEATURES TRAffiC AND ERROR REPORTS

FEATURE	REPORT		
	5 MINUTE	30 MINUTE	24 HOUR
1. There are separate reports for traffic measurements versus error measurements.	Yes	Yes	Yes
2. Data are accumulated for "X TIME" source files.	30 Minutes (6 intervals accumulated)	24 Hours (48 intervals accumulated)	None —No Other reports available
3. Source files (raw data) for exist for "X" time after their creation.	30 Minutes	24 Hours	24 Hours
4. Any or all measurements for the report type (traffic or error) may be included in the report.	Yes	Yes	Yes
5. Periodic reports should normally be disabled.	Yes	Discretion of the Receiver of the Report	No
6. Threshold conditions may, when option specified, enable the printing of periodic reports for those DSIs that experience at least one preset threshold.	Yes	Yes	NA — Report should be enabled
7. All DSI ERROR measurements must be contained in the report for the time period.	Not Required	Not Required	Yes

TABLE B

FORMAT TABLE NAMES TRAffIC AND ERROR REPORT FORMS

TRAFFIC FORMAT TABLE NAMES

FULL NAME	ABBREV	NORMALLY USED FOR
TPTSTPTRF	5P	5-minute periodic traffic report
TPTMPTRF	30P	30-minute periodic traffic report
TPTDPTRF	24P	24-hour periodic traffic report
TPTSOTRF	5Ø	5-minute on-demand traffic report
TPTMOTRF	30Ø	30-minute on-demand traffic report
TPTDOTRF	24Ø	24-hour on-demand traffic report
TPT10TRF	F1	Traffic report special format #1
TPT20TRF	F2	Traffic report special format #2
TPT30TRF	F3	Traffic report special format #3
TPT40TRF	F4	Traffic report special format #4

ERROR FORMAT TABLE NAMES

FULL NAME	ABBREV	NORMALLY USED FOR
TPMSPMRF	5P	5-minute periodic error report
TPMMPMRF	30P	30-minute periodic error report
TPMDPMRF	24P	24-hour periodic error report
TPMSOMRF	5Ø	5-minute on-demand error report
TPMMOMRF	30Ø	30-minute on-demand error report
TPMDOMRF	24Ø	24-hour on-demand error report
TOM10MRF	F1	Error report special format #1
TPM20MRF	F2	Error report special format #2
TPM30MRF	F3	Error report special format #3
TPM40MRF	F4	Error report special format #4

TABLE C

THRESHOLD TABLE NAMES TRAffiC AND ERROR THRESHOLD FORMS

TRAFFIC THRESHOLD TABLE NAMES

FULL NAME	ABBREV	TABLE CONTAINS
TPTSTHLD	5	5-minute traffic thresholds
TPTMTHLD	30	30-minute traffic thresholds

ERROR THRESHOLD TABLE NAMES

FULL NAME	ABBREV	TABLE CONTAINS
TPMSTHLD	5	5-minute error thresholds
TPMMTHLD	30	30-minute error thresholds

TABLE D

NETWORK ADMINISTRATION MESSAGE PERMISSIONS

INPUT MESSAGE	OUTPUT MESSAGE	NAC USE
RCACT:LADT	RCACT-LADT	To initiate a recent change session.
OP:TRAFFIC	OP-TRAFFIC	To print 5-minute, 30-minute, and 24-hour traffic reports.
OP:ERRMEAS	OP-ERRMEAS	To print 5-minute, 30-minute, and 24-hour error reports.
OP:PLANT	OP-PLANT	To print 24-hour plant measurements report.
INQ:LN	INQ-LN	To determine status of a DSI customer data line.
INQ:LG	INQ-LG	To determine status of a DSI customer line group.
REPT:DSI	REPT-DSIST	To verify DSI state.
	OP-DSIST	**ALARM**
RCACT:LADT	REPT-RC	Reports recent change failures. **ALARM**
Internally triggered	REPT TMPS	Reports measurement problems **ALARM**
Internally triggered	REPT THRHLD	Reports threshold crossings (traffic and error). **ALARM**
None	REPT-DOWNLOAD	Reports trouble with generic download of a DSI. **ALARM**
Internally triggered	REPT-EA	Reports initialization of a DSI or out of service of a customer line. **ALARM**

TABLE E

LADT MESSAGE CLASSES

LADT MESSAGE CLASS	LADT OUTPUT MESSAGE TYPES
36	TPMS 5-minute periodic traffic report.
37	TPMS 30-minute periodic traffic report.
38	TPMS 24-hour periodic traffic report.
39	TPMS 5-minute on-demand traffic report.
40	TPMS 30-minute on-demand traffic report.
41	TPMS 24-hour on-demand traffic report.
42	TPMS 5-minute periodic error report.
43	TPMS 30-minute periodic error report.
44	TPMS 24-hour periodic error report.
45	TPMS 5-minute on-demand error report.
46	TPMS 30-minute on-demand error report.
47	TPMS 24-hour on-demand error report.
48	TPMS periodic plant measurement report.
49	TPMS on-demand plant measurements report.
85	TPMS nonfatal error output class.
86	TPMS automatically generated messages.
87	TPMS craft command response.
88	TPMS traffic threshold messages.
89	TPMS error threshold messages.

TABLE F

EQUIPMENT STATES

STATUS	DEFINITION
INS	The in-service (INS) state means that the equipment is available for service. When referring to dial-up or direct access (data SLC carrier system) ports, this means that the port and its associated line number, line card, line group and the DSI are also "in-service." If any of the associations are not in service, the port cannot function as an in-serivce access line.
OOS	An equipped port goes into an out-of-service (OOS) state when, through craft input to recent change, the line is manually removed from service. If any equipment associated with the port (e.g., line card, line group, and/or DSI) is manually removed from service, it will create a domino effect; the port will also be placed in an OOS state. A port (line) can also be placed in an OOS state automatically by DSI error analysis, if a perline internal error condition is detected by the DSI.
MBSY	The maintenance busy (MBSY) state is effected on a port when a manual or automatic diagnostic is executed on the line. In the case of a manual diagnostic, the port is first moved to an OOS state. Then, while diagnostics are running, the port is in a MBSY state. Once diagnostics are completed, the port is either restored, or moved back to an OOS state. The DSI also automatically runs routine exercises on all idle lines. The time these routines are to run is specified by craft via the RTN EXERC field of the DSI Equipment Form (see Fig. 16). If a time is specified in this field, diagnostics are automatically run on each idle line. During the running of the diagnostics, the lines (ports) that are idle are placed ina MBSY state. Any lines that fail the diagnostics are subsequently placed in an OOS state, and remain as such until manual (craft) intervention. Any lines that pass the diagnostics are automatically restored to service (INS state).

TABLE G

TRAffiC MEASUREMENTS LADT CALL ORIGINATION

MEASUREMENT	MEASUREMENT LABEL	DEFINITION	SYSTEM	DSI
PORTS IN SERVICE	1. TOTAL-DSI-INS	The number of DSIs in service at the end of the reporting period.	X	
	2. TOTAL-PORTS-INS	The total number of ports in service for all DSIs or for a DSI at the end of the reporting period.	X	X
	3. DIALUP-PORTS-INS	The total number of dial-up ports in service for all DSIs or for a DSI at the end of the reporting period.	X	X
	4. DSLC-PORTS-INS	The total number of data SLC carrier system ports in service for all DSIs or for a DSI at the end of the reporting period.	X	X
DDS CALLS	5. DIALUP-CALL-ANSWER	The total number of DDD calls answered on dial-up ports via the MLHG.		X
	6. DIALUP-CALL-TIMOUT	The total number of DDD calls from dial-up ports to a DSI that time out without establishing data link protocol.		X
DIAL-UP	7. DIALUP-PORT-USAGE	The usage, stated in terms of CCS, of all dial-up ports over all DSIs or over a DSI.	X	X
PORTS TO MBSY	8. TOTAL-TRANS-MBSY	The total port transitions to a maintenance busy state.		X
	9. DIALUP-TRANS-MBSY	The number of dial-up port transitions to a maintenance busy state.		X
	10. DSLC-TRANS-MBSY	The number of data SLC carrier system port transitions to a maintenance busy state.		X

TABLE G

TRAffiC MEASUREMENTS LADT CALL ORIGINATION

MEASUREMENT	MEASUREMENT LABEL	DEFINITION	SYSTEM	DSI
MBSY CCS	11. TOTAL-MBSY-USAGE	The total maintenance busy CCS.		X
	12. DIALUP-MBSY-USAGE	The maintenance busy CCS of all dial-up ports.		X
	13. DSLC-MBSY-USAGE	The maintenance busy CCS of all data SLC carrier system ports.		X
MBSY TIME	14. AVG-TIME-DLUP-MBY	The average number of seconds that a dial-up port is in a maintenance busy state.		X
	15. AVG-TIME-DSLC-MBY	The average number of seconds that a data SLC carrier system port is in a maintenance busy state.		X
PORTS TO OOS	16. TOTAL-TRANS-OOS	The total port transitions to an out-of-service state.		X
	17. DIALUP-TRANS-OOS	The number of dial-up port transitions to an out-of-service state.		X
	18. DSLC-TRANS-OOS	The number of data SLC carrier system port transitions to an out-of-service state.		X
OOS CCS	19. TOTAL-OOS-USAGE	The total out-of-service CCS.		X
	20. DIALUP-OOS-USAGE	The out-of-service CCS of dial-up ports.		X
	21. DSLC-OOS-USAGE	The out-of-service CCS of data SLC carrier system ports		X
OOS TIME	22. AVG-TIME-DLUP-OOS	The average number of seconds that a dial-up port is in an out-of-service state.		X
	23. AVG-TIME-DSLC-OOS	The average number of seconds that a data SLC carrier system port is in an out-of-service state.		X

TABLE G

TRAffIC MEASUREMENTS LADT CALL ORIGINATION

MEASUREMENT	MEASUREMENT LABEL	DEFINITION	SYSTEM	DSI
SUBSCRIBER DESTINATION SELECTIONS	24. TOTAL-DEST-SELECT	The number of times a destination selection process (DTN) is entered by all ports of a DSI.		X
	25. DIALUP-DEST-SELECT	The number of times a destination selection process (DTN) is entered by dial-up ports of a DSI.		X
	26. DSLC-DEST-SELECT	The number of times a destination selection process (DTN) is entered by data SLC carrier system ports of a DSI.		X
INVALID SUBSCRIBER DESTINATION SELECTIONS	27. TOTAL-INVAL-DEST	The number of times an invalid address (DTN) is entered in the destination selection process of all ports of a DSI.		X
	28. DIALUP-INVAL-DEST	The number of times an invalid address (DTN) is entered in the destination selection process of dial-up ports of a DSI.		X
	29. DSLC-INVAL-DEST	The number of times an invalid address (DTN) is entered in the destination selection process of data SLC carrier system ports of a DSI.		X

TABLE H

CROSS-REFERENCE FOR TRAffiC MEASUREMENTS

MEASUREMENT LABEL	ITEM NUMBER
AVG-FREE-PKT-BUFF	45
AVG-PS-OUT-QUEUE	47
AVG-TIME-DLUP-MBY	14
AVG-TIME-DLUP-OOS	22
AVG-TIME-DSLC-MBY	15
AVG-TIME DSLC-OOS	23
CPU-SCHED-CYCLES	68
DIALUP-AVG-CALLS	31
DIALUP-CALL-ANSWER	5
DIALUP-CALL-TIMEOUT	6
DIALUP-CT-DSI-FRM	51
DIALUP-CT-DSI-IFR	57
DIALUP-CT-DSI-OCT	63
DIALUP-DEST-SELECT	25
DIALUP-DSI-CT-FRM	54
DIALUP-DSI-CT-IFR	60
DIALUP-DSI-CT-OCT	66
DIALUP-DSI-PS-PKT	38
DIALUP-INVAL-DEST	28
DIALUP-LC-SETUPS	35
DIALUP-MBSY-USAGE	12
DIALUP-OSS-USAGE	20
DIALUP-PORTS-INS	3
DIALUP-PORT-USAGE	7
DIALUP-PS-DSI-PKT	41
DIALUP-TRANS-MBSY	9
DIALUP-TRANS-OOS	17
DSI-AUDITS	69
DSLC-AVG-CALLS	32
DSLC-CT-DSI-FRM	52
DSLC-CT-DSI-IFR	53
DSLC-CT-DSI-OCT	64
DSLC-DEST-SELECT	26
DSLC-DSI-CT-FRM	55
DSLC-DSI-CT-IFR	61
DSLC-DSI-CT-OCT	67
DSLC-DSI-PS-PKT	39
DSLC-INVAL-DEST	29
DSLC-LC-SETUPS	36
DSLC-MBSY-USAGE	13
DSLC-OOS-USAGE	21
DSLC-PORTS-INS	4
DSLC-PS-DSI-PKT	42

TABLE H

CROSS-REFERENCE FOR TRAffIC MEASUREMENTS

MEASUREMENT LABEL	ITEM NUMBER
DSLC-TRANS-MBSY	10
DSLC-TRANS-OOS	18
MAX-CALLS-CONNECT	33
MAX-OUT-QUEUE	48
MAX-PS-OUT-QUEUE	49
OUT-QUEUE-LENGTH	46
TOTAL-AP-DSI-PKT	44
TOTAL-AVG-CALLS	30
TOTAL-CT-DSI-FRM	50
TOTAL-CT-DSI-IFR	56
TOTAL-CT-DSI-OCT	62
TOTAL-DEST-SELECT	24
TOTAL-DSI-AP-PKT	43
TOTAL-DSI-CT-FRM	53
TOTAL-DSI-CT-IFR	59
TOTAL-DSI-CT-OCT	65
TOTAL-DSI-INS	1
TOTAL-DSI-PS-PKT	37
TOTAL-INVAL-DEST	27
TOTAL-LC-SETUPS	34
TOTAL-MBSY-USAGE	11
TOTAL-OOS-USAGE	19
TOTAL-PORTS-INS	2
TOTAL-PS-DSI-PKT	40
TOTAL-TRANS-MBSY	8
TOTAL-TRANS-OOS	16

TABLE I

TRAffiC MEASUREMENTS LADT CALL PROCESSING

MEASUREMENT	MEASUREMENT LABEL	DEFINITION	SYSTEM	PER DSI
VIRTUAL CALL VOLUMES	30. TOTAL-AVG-CALLS	The sum of the average number of dial-up and data SLC carrier system virtual calls connected from all ports for all DSIs or on an individual DSI basis. The calls are in a data transfer state; a call accept packet has been received.	X	X
	31. DIALUP-AVG-CALLS	The average number of virtual calls connected from dial-up ports for all DSIs or an individual DSI basis. The calls are in a data transfer state; a call accept packet has been received.	X	X
	32. DSLC-AVG-CALLS	The average number of virtual calls connected from data SLC carrier system ports for all DSIs or on an individual DSI basis. The calls are in a data transfer state; a call accept packet has been received.	X	X
	33. MAX-CALLS-CONNECT	The maximum number of virtual calls connected from all DSIs or on an individual DSI basis at the end of all 10-second intervals collected. These calls are in a data transfer state; a call accept packet has been received. For reporting periods longer than 5 minutes, it is the maximum of the 5-minute maxima.	X	X
LOGICAL CHANNEL	34. TOTAL-LC-SETUPS	The total number of logical channel setups over all DSIs, as determined by the number of initial request commands received from terminals and acknowledged by UA frame. Will count multiple origination requests (seizures) that may be made during one dial-up call.	X	X

TABLE I

TRAffIC MEASUREMENTS LADT CALL PROCESSING

MEASUREMENT	MEASUREMENT LABEL	DEFINITION	SYSTEM	PER DSI
LOGICAL CHANNEL (Contd)				
	35. DIALUP-LC-SETUPS	The total number of logical channel setups by dial-up ports over all DSIs, as determined by the number of initial request commands received from terminals and acknowledged by UA frame. Will count multiple origination requests (seizures) that may be made during one dialup call.	X	X
	36. DSLC-LC-SETUPS	The total number of logical channel setups by data SLC carrier system ports over all DSIs.	X	X
DSI TO PACKET SWITCH PACKETS	37. TOTAL-DSI-PS-PKT	The total number of packets transmitted from a DSI to the packet switch for all DSI ports.		X
	38. DIALUP-DSI-PS-PKT	The total number of packets transmitted from a DSI to the packet switch for dial-up ports.		X
	39. DSLC-DSI-PS-PKT	The total number of packets transmitted from a DSI to the packet switch for data SLC carrier system ports.		X
PACKET SWITCH TO DSI PACKETS	40. TOTAL-PS-DSI-PKT	The total number of packets transmitted to a DSI from the packet switch for all DSI ports.		X
	41. DIALUP-PS-DSI-PKT	The total number of packets transmitted to a DSI from the packet switch for dial-up ports.		X
	42. DSLC-PS-DSI-PKT	The total number of packets transmitted to a DSI from the packet switch for data SLC carrier system ports.		X

TABLE I

TRAffiC MEASUREMENTS LADT CALL PROCESSING

MEASUREMENT	MEASUREMENT LABEL	DEFINITION	SYSTEM	PER DSI
DSI/AP PACKET EXCHANGE	43. TOTAL-DSI-AP-PKT	The total number of packets transmitted from a DSI to the LADT AP. These are data and control packets.		X
	44. TOTAL-AP-DSI-PKT	The total number of packets transmitted to a DSI from the LADT AP. These are data and control packets		X
DSI PACKET AVAILABILITY	45. AVG-FREE-PKT-BUFF	The average number of free (available) packet buffers at the DSI. The value is the average of 10-second scans at the DSI.		X
AVERAGE QUEUE LENGTH TO PACKET SWITCH	46. OUT-QUEUE-LENGTH	The average number of buffers assigned to output queues going to the packet switch. The value is the average of 10-second scans at the DSI.		X
	47. AVG-PS-OUT-QUEUE	The average number of buffers assigned to output queues to the packet switch. The value is the sum of the averages over all DSIs.	X	
HIGHEST QUEUE LENGTH TO PACKET SWITCH	48. MAX-OUT-QUEUE	Maximum number of packet buffers assigned to output queues to the packet switch. The value is the maximum of 10-second scans for the 5-minute reporting period. For longer period reporting, the value is the maxima of the 5-minute maxima.		X
	49. MAX-PS-OUT-QUEUE	The maximum number of buffers assigned to output queues to the packet switch by a DSI.	X	

TABLE I

TRAffiC MEASUREMENTS LADT CALL PROCESSING

MEASUREMENT	MEASUREMENT LABEL	DEFINITION	SYSTEM	PER DSI
FRAMES SENT FROM SUBSCRIBERS TO DSI	50. TOTAL-CT-DSI-FRM	The total number of frames transmitted to the DSI from customer terminals.		X
	51. DIALUP-CT-DSI-FRM	The total number of frames transmitted to the DSI from dial-up customer terminals.		X
	52. DSLC-CT-DSI-FRM	The total number of frames transmitted to the DSI from data SLC carrier system customer terminals.		X
FRAMES SENT FROM DSI TO SUBSCRIBERS	53. TOTAL-DSI-CT-FRM	The total number of frames transmitted from the DSI to customer terminals.		X
	54. DIALUP-DSI-CT-FRM	The total number of frames transmitted from the DSI to dial-up customer terminals.		X
	55. DSLC-DSI-CT-FRM	The total number of frames transmitted from the DSI to data SLC carrier system customer terminals.		X
INFORMATION FRAMES FROM SUBSCRIBERS TO DSIs	56. TOTAL-CT-DSI-IFR	The total number of I frames transmitted to the DSI from customer terminals.		X
	57. DIALUP-CT-DSI-IFR	The total number of I frames transmitted to the DSI from dial-up customer terminals.		X
	58. DSLC-CT-DSI-IFR	The total number of I frames transmitted to the DSI from data SLC carrier system customer terminals.		X

TABLE I

TRAffiC MEASUREMENTS LADT CALL PROCESSING

MEASUREMENT	MEASUREMENT LABEL	DEFINITION	SYSTEM	PER DSI
INFORMATION FRAMES FROM DSI TO SUBSCIRBERS	59. TOTAL-DSI-CT-IFR	The total number of I frames transmitted from the DSI to customer terminals.		X
	60. DIALUP-DSI-CT-IFR	The total number of I frames transmitted from the DSI to dial-up customer terminals.		X
	61. DSLC-DSI-CT-IFR	The total number of I frames transmitted from the DSI to data SLC carrier system customer terminals.		X
OCTETS FROM SUBSCRIBERS TO DSI	62. TOTAL-CT-DSI-OCT	The total number of octets transmitted to the DSI from customer terminals. The number of octets is an integral number. A packet may be 128 or 256 octets in length, including the header. The conversion of a packet to a frame adds a maximum of 6 additional octets, if both beginning and ending flags are specified [each flag is 8 bits to 1 byte (octet)].		X
	63. DIALUP-CT-DSI-OCT	The total number of octets transmitted to the DSI from dial-up customer terminals. The number of octets is an integral number. A packet may be 128 or 256 octets in length, including the header. The conversion of packet to a frame adds a maximum of 6 additional octets, if both beginning and ending flags are specified [each flag is 8 bits or 1 byte (octet)].		X

TABLE I

TRAffiC MEASUREMENTS LADT CALL PROCESSING

MEASUREMENT	MEASUREMENT LABEL	DEFINITION	SYSTEM	PER DSI
OCTETS FROM SUBSCRIBERS TO DSI (Contd)	64. DSLC-CT-DSI-OCT	The total number of octets transmitted to the DSI from data SLC carrier system customer terminals. The number of octets is an integral number. A packet may be 128 or 256 octets in length, including the header. The conversion of a packet to a frame adds a maximum of 6 additional octets, if both beginning and ending flags are specified [each flag is 8 bits or 1 byte (octet)].		X
OCTETS FROM DSI TO SUBSCRIBERS	65. TOTAL-DSI-CT-OCT	The total number of octets transmitted from the DSI to customer terminals. The number of octets is anintegral number. A packet may be 128 or 256 octets in length, including the header. The conversion of a packet to a frame adds a maximum of 6 additional octets, if both beginning and ending flags are specified [each flag is 8 bits to 1 byte (octet)].		X
	66. DIALUP-DSI-CT-OCT	The total number of octets transmitted from the DSI to dial-up customer terminals. The number of octets is an integral number. A packet may be 128 or 256 octets in length, including the header. The conversion of a packet to a frame adds a maximum of 6 additional octets, if both beginning and ending flags are specified [each flag is 8 bits or 1 byte (octet)].		X

TABLE I

TRAffiC MEASUREMENTS LADT CALL PROCESSING

MEASUREMENT	MEASUREMENT LABEL	DEFINITION	SYSTEM	PER DSI
OCTETS FROM DSI TO SUBSCRIBERS (Contd)	67. DSLC-DSI-CT-OCT	The total number of octets transmitted from the DSI to data SLC carrier system terminals. The number of octets is an integral number. A packet may be 128 or 256 octets in length, including the header. The conversion of a packet to a frame adds a maximum of 6 additional octets, if both beginning and ending flags are specified [each flag is 8 bits or 1 byte (octet)].		X
PROCESSOR CYCLES	68. CPU-SCHED-CYCLES	The average number of processor scheduler cycles completed at the DSI over 5 minutes. These cycles relate to maintenance levels that are executed. The higher the traffic load on the system, the lower the number of cycles executed.		X
EXECUTED AUDITS	69. DSI-AUDITS-EXC	The number of DSI audits of all types that have been executed in the reporting period. Does not indicate internal audit failures, nor that, if low, there is a critical failure.		X

TABLE J

ERROR MEASUREMENTS

MEASUREMENT	MEASUREMENT LABEL	DEFINITION	SYSTEM	PER DSI
LOST PACKETS TO AP	1. AP-MISSING-PACKETS	The number of DSI to AP traffic data packets expected but not received by the AP. This value impacts data collected and accumulated for the reporting periods.	X	
BLOCKING	2. BLOCKING-CONG-CRLS	Total number of calls at any stage of setup that are blocked due to active DSI overload controls.		X
	3. SERV-BLOCK-PSCONG	Total number of virtual circuit requests denied because of packet switch congestion or blocking.These calls would have reached the packet switch, but the packet switch has denied them due to internal congestion or blocking.		X
	4. SERV-BLOCK-PSSETUP	Total number of virtual circuit requests denied because of the setup failure by the packet switch from the packet switch out to the service vendor. The number of logical channels available on a service vendor access line could create this type of blocking, or by the vendor line being out of order. Denial is determined by the destination address.		X
	5. SERV-BLOCK-VENDOR	Total number of virtual circuit requests denied by the service vendor. For example, a request from the service vendor to take down the access line will block the call before setup.		X

TABLE J

ERROR MEASUREMENTS

MEASUREMENT	MEASUREMENT LABEL	DEFINITION	SYSTEM	PER DSI
BLOCKING (Contd)	6. DSI-LCHAN-BLOCK	Total number of logical channel set-ups failing due to lack of DSI resources. The count does not include failures when the DSI is in an overload state. The count does include virtual circuit setups denied because the maximum number of virtual circuits (internal, not recent change) has been reached, or if, during call setup, no buffers are available.		X
LOGICAL CHANNEL INITIALIZATIONS	7. ALL-DSI-LC-INITS	Total number of logical channel initializations received from a terminal or sent to a terminal on logical channels in the data transfer state.		X
	8. DU-DSI-LC-INITS	Total number of logical channel initializations received from a dial-up terminal or sent to a dial-up terminal on logical channels in the data transfer state.		X
	9. DSLC-DSI-LC-INITS	Total number of logical channel initializations received from a data SLC carrier system terminal or sent to a data SLC carrier system terminal on logical channels in the data transfer state.		X
X.25 LEVEL 3 RESETS	10. DSI-L3-RESETS	Total number of DSI originated level 3 resets. The count does not include level 2 resets at the terminal to DSI interface.		X
	11. VENDOR-L3-RESETS	Total number of remotely generated level 3 resets by the service vendor.		X

TABLE J

ERROR MEASUREMENTS

MEASUREMENT	MEASUREMENT LABEL	DEFINITION	SYSTEM	PER DSI
RETRANSMIT INFORMATION	12. DSI-TO-ALL-RTIFRM	The total number of DSI to terminal retransmission of I frames.		X
	13. DSI-TO-DU-RTIFRM	The number of DSI to terminal retransmission of I frames for dial-up terminals.		X
	14. DSI-TO-DSLC-RTIFRM	The number of DSI to terminal retransmission of I frames for data SLC carrier system terminals.		X
CYCLIC REDUNDANCY CHECK ERROR	15. ALL-DSI-CRC-ERR	The total number of frames received having a CRC error.		X
	16. DU-DSI-CRC-ERR	The total number of frames received, from dial-up terinals, having a CRC error.		X
	17. DSLC-DSI-CRC-ERR	The total number of frames received, from data SLC carrier system terminals, having a CRC error.		X
	18. PS-DSI-CRC-ERR	Total number of frames received by a DSI from the packet switch, having a CRC error.		X
FRAME REJECTS	19. ALL-DSI-REJ-COND	Total number of frame rejects sent to a terminal.		X
	20. DU-DSI-REJ-COND	Total number of frame rejects sent to a dial-up terminal.		X
	21. DSLC-DSI-REJ-COND	Total number of frame rejects sent to a data SLC carrier system terminal.		X

TABLE J

ERROR MEASUREMENTS

MEASUREMENT	MEASUREMENT LABEL	DEFINITION	SYSTEM	PER DSI
CALLS CLEARED BY (DSI COUNTS)	22. CALL-CLR-CUST	Total number of established virtual calls cleared by a customer terminal.		X
	23. CALLS-CLR-PS	Total number of established virtual calls cleared by the packet switch.		X
	24. CALL-CLR-VENDOR	Total number of established virtual calls cleared by the service vendor.		X
	25. CALL-CLR-DSI-CONG	Total number of established virtual calls cleared by DSI congestion controls. This is currently not done and should be zero.		X
CALLS CLEARED BY...(SYSTEM COUNTS)	26. TOT-CALL-CLR-PS	The total number of calls over all DSIs cleared by the packet switch.	X	
	27. TOT-CALL-CLR-VEND	The total number of calls over all DSIs cleared by the service vendor.	X	
	28. TOT-CALL-CLR-NDSI	The total number of calls over all DSIs cleared by non-DSI facilities.	X	
OVERLOAD CONTROLS	29. DSI-CNT-OVRLD-1	Total number of times a DSI enters overload mode 1. (Refer to Table L for overload 1 definition.)		X
	30. DSI-CNT-OVRLD-2	Total number of times a DSI enters overload mode 2. (Refer to Table L for overload 2 definition.)		X

TABLE J

ERROR MEASUREMENTS

MEASUREMENT	MEASUREMENT LABEL	DEFINITION	SYSTEM	PER DSI
OVERLOAD CONTROLS (Contd)	31. DSI-TIME-OVRLD-1	Total time in tenths of seconds that a DSI is in overload mode 1.		X
	32. DSI-TIME-OVRLD-2	Total time in tenths of seconds that a DSI is in overload mode 2.		X
LEVEL INITIALIZATIONS	33. DSI-INIT-1	Total number of DSI level 1 initializations. A level 1 initialization replaces the current software operating system. It can be done manually or automatically and takes place over a short period of time (about 10 to 20 seconds).		X
	34. DSI-INIT-2	Total number of DSI level 2 initializations. This involves rebooting the system (power down, power up) and downloading an entirely new generic into the DSI operating system. Approximate time involved is 5 minutes.		X
INTERRUPTS	35. DSI-EXC-INTRR-HDW	Total number of exceptional hardware interrupts for a DSI.		X
	36. DSI-EXC-INTRR-STM	Total number of sanity timer interrupts for a DSI.		X
ALARMS	37. DSI-ALARM-MINOR	Total number of minor alarms generated by a DSI.		X
	38. DSI-ALARM-MAJOR	Total number of major alarms generated by a DSI.		X
	39. DSI-ALARM-CRIT	Total number of critical alarms generated by a DSI.		X
AUDIT FAILURES	40. DSI-AUDITS-FAIL	Total number of DSI audit failures. The count is the sum of failures of all types of DSI audits. This count does not provide specifics on which audits have failed.		X

TABLE K

CROSS-REFERENCE FOR ERROR MEASUREMENTS

MEASUREMENT LABEL	ITEM NUMBER
ALL-DSI-CRC-ERR	15
ALL-DSI-LC-INITS	7
ALL-DSI-REJ-COND	19
AP-MISSING-PACKETS	1
BLOCKING-CONG-CRLS	2
CALL-CLR-CUST	22
CALL-CLR-DSI-CONG	25
CALL-CLR-PS	23
CALL-CLR-VENDOR	24
DSI-ALARM-CRIT	39
DSI-ALARM-MAJOR	38
DSI-ALARM-MINOR	37
DSI-AUDITS-FAIL	40
DSI-CNT-OVRLD-1	29
DSI-CNT-OVRLD-2	30
DSI-EXC-INTRR-HDW	35
DSI-EXC-INTRR-STM	36
DSI-INIT-1	33
DSI-INIT-2	34
DSI-L3-RESETS	10
DSI-LCHAN-BLOCK	6
DSI-TIME-OVRLD-1	31
DSI-TIME-OVRLD-2	32
DSI-TO-ALL-RTIFRM	12
DSI-TO-DSLC-RTIFRM	14
DSI-TO-DU-RTIFRM	13
DSLC-DSI-CRC-ERR	17
DSLC-DSI-LC-INITS	9
DSLC-DSI-REJ-COND	21
DU-DSI-CRC-ERR	16
DU-DSI-LC-INITS	8
DU-DSI-REJ-COND	20
PS-DSI-CRC-ERR	18
SERV-BLOCK-PSCONG	3
SERV-BLOCK-PSSETUP	4
SERV-BLOCK-VENDOR	5
TOTAL-CALL-CLR-NDSI	28
TOTAL-CALL-CLR-PS	26
TOTAL-CALL-CLR-VEND	27
VENDOR-L3-RESETS	11

TABLE L

DSI OVERLOAD CONTROLS

<table>
<tr><th>STATUS</th><th>LEVEL 1</th><th>LEVEL 2</th></tr>
<tr><td>ACTIVATION:</td><td>Activated when either one of the following two measurements cross a present value:

1. The number of free packet buffers goes below the present value for the high packet threshold (HI PKT THR [21])

2. The length of the queue of packets going out to the packet switch exceeds the packet switch queue threshold (PS QUE THR [10]).</td><td>Activated when the number of free packet buffers goes below the low packet threshold (LO PKT THR [16])</td></tr>
<tr><td>REPERCUSSIONS:</td><td>If a DSI goes into overload state 1, then the following will occur:

1. All new call requests will be denied. Dial-up calls will get a busy signal, and data-SLC carrier system calls will get no answer.

2. Terminals with active calls will be flow controlled. No new requests for information from users will be honored.

3. Incoming packets from the packet switch destined for the customer terminals will still be processed. More than likely these packets are in response to a request made to the service vendor prior to the overload condition and will be handled.</td><td>If a DSI goes into overload state 2, then the following will occur:

1. All level 1 repercussions will be in effect.

2. The packet switch will be flow controlled. No incoming packets from the packet switch destined for the customer terminals will be processed.</td></tr>
</table>

TABLE L

DSI OVERLOAD CONTROLS

STATUS	LEVEL 1	LEVEL 2
CLEARANCE:	Overload controls are cleared when: 1. For the restoral of packet buffers, the total available number of buffers, exceeds the sum of the HI PKT THR plus the high packet hysteresis (HI PKT HYST [12]). The HI PKT HYST is a preset value that provides a margin for an extra number of buffers before the control is cleared. 2. For the restoral of normal packet output, the total number of packets that are in queue goes below the sum of the PS QUE THR minus the packet switch queue hysteresis (PS QUE HYST [5]). The PS QUE HYST is a preset value that provides a margin for a lesser number of packets to be in queue before the control is cleared.	Overload controls are cleared when the number of free packet buffers goes above the sum of the LO PKT THR plus the low packet hysteresis (LO PKT HYST [2]). The LO PKT HYST is a present value that provides a margin for an extra number of free buffers before the control is cleared.

Notes: The preset values described for the overload control activation and clearance are input into Recent Change via the DSI Equipment Form.

A hysteresis is provided for each measurement in order to prevent a DSI from constantly thrashing into and out of an overload condition.