
Meridian 1

Traffic measurement

Formats and output

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Introduction

The Meridian 1 automatically collects data about peg counts, usages, failures to match, and other activities that occur during operation. These measurements are stored in the system and are output on the hour or half-hour. By examining traffic data from different times of the day and year, system administrators can monitor system performance, identify potential congestion problems, and plan future growth.

System measurements are available for six different categories: networks, services, dial tone delay, processor load, lines, and junctor groups. With these statistics, a system manager can balance the load across the system and can meet or exceed the grade of service.

The audience for this document includes maintenance technicians, system operators, and system managers who want detailed information on types of calls, call completion rates, call failures, waiting periods, and other vital data.

Related documents

Program loading instructions and system messages are provided in *X11 input/output guide* .

If your system is equipped with the Meridian Manager Traffic Reporting option, available only with X11 release 17 and earlier, please refer to *Meridian Manager Traffic Reporting* for detailed information on programming traffic measurements.

Release 20 technical changes

This section describes technical changes to traffic measurement facilities provided in X11 release 20.

Attendant Blocking of DN (ABDN)

With ABDN equipped, each fulfilled ABDN attempt (DN rung) will increment the peg-count register under the Semi-Automatic Camp-on feature.

Attendant Break-In (BKI)

With BKI equipped, each break-in will increment the peg-count register under the Busy Verify feature.

Attendant and Network Remote Call Forward

With Attendant and Network Remote Call Forward equipped, each press of the RFW key will increment the peg-count register under feature number 77 in the TFC005 feature key usage report.

Semi-Automatic Camp-on

The count in this register can be incremented by the ABDN feature.

Busy Verify

The count in this register can be incremented by the BKI feature.

Traffic overview

This section provides information on how traffic data is accumulated, processed, and output. It also provides important information on how to interpret the traffic reports.

The system accumulates traffic data during normal call processing. This data is processed to provide regularly scheduled reports. Typical traffic measurements include the following:

Peg count A peg count is a count of an event, like call completion.

Failure to match (FTM) A failure to match is a count of the number of times an idle network path could not be found between two connection points.

Usage The usage of a resource such as a trunk or a conference is the time measurement, in 100 call seconds (CCS), of how long the resource has been busy. The usage time is normally calculated when the resource becomes idle.

Established path An established path is a path between two terminals when both are talking to each other. Outgoing calls are not considered established until the end-of-dialing timers have expired, as set in the software. Incoming calls are not established until answer supervision is returned.

Service loop A service loop is either a tone and digit switch loop or a multifrequency (MF) sender loop.

Network loop Provides path switching and control for stations and trunks connected to it.

The traffic data is accumulated for many of the system resources, such as lines, trunks, and network loops. The data is processed on a scheduled basis and output in various reports. The Traffic Control overlay (LD 02) is used to set the traffic options.

The traffic reporting system saves system-generated traffic reports in a Traffic Log File rather than in the History File.

Traffic Control program (LD 02)

LD 02 is used to:

- set traffic report schedules and options
- set the type of reports to be generated
- set system date, time, and daily time adjustment
- set or query the system identification (ID)
- set thresholds
- reset the system clock when daylight savings time begins and ends
- print or perform threshold tests on the last reports

The Traffic Control commands are provided at the end of this document and in the *X11 input/output guide* .

Report schedules

The traffic reports can be output:

- on selected days of the week during a defined period of the year, specified by start day and end day
- for any defined period of the day (from 8 a.m. to 5 p.m., for example)
- every hour or half hour as follows:
 - hourly, on the hour
 - hourly, on the half hour
 - half-hourly, on the hour and half hour

Customer reports can have different schedules.

Time and date

The time of day and date of the system can be queried and adjusted manually. Manual adjustment is required after a sysload.

To compensate for tolerances in the system clock, the time of day can be automatically adjusted during the midnight routines.

The time of day and date of the system can also be adjusted automatically. With the Network Time Synchronization feature equipped, a node will be able to obtain proper clock updates automatically from a Master node (clock) over the ISDN. (For further information, refer to Network Time Synchronization feature.)

Note: Since the traffic measurement schedule and midnight routines reference the time-of-day clock, these programs can be inadvertently triggered by time adjustment. For example, adjusting the time from 11:05 to 10:55 results in the output of traffic data when the system clock reads 11:00, provided output is scheduled.

System identification

The system ID is required when the system is controlled from a central administration center. The system ID identifies the system from which the traffic measurements originate. Each system is identified by a unique 1- to 4-digit number that is output as part of the traffic data.

The system ID is assigned to the system when the traffic measurement schedules and options are defined. It is input the first time traffic schedules are defined. When traffic schedules or options are changed, the system ID number need not be redefined. The system ID can also be changed using the Configuration Record program (LD 17).

Types of traffic reports

The following traffic reports are available:

- System reports
- Customer reports
- Customer network reports
- Threshold reports
- Traffic report on selected terminals

System reports

System reports are identified by the prefix TFS. The three-digit code following the prefix identifies the type of report.

TFS001—networks

TFS002—service loops

TFS003—dial tone delay

TFS004—processor load

TFS005—selected terminals

TFS007—juncture group

TFS008—Command Status Links and Application Module Links

TFS009—D-channel

TFS010—ISDN GF Transport

TFS011—Multi-purpose Integrated Services Digital Network (ISDN) Signaling Processor traffic

TFS012—Multi-purpose ISDN Signaling Processor D-channel (DCH) management

TFS014—ISDN BRI trunk DSL system report

TFS013—Multi-purpose ISDN Signaling Processor messages

TFS015—Meridian Packet Handler (MPH)

Customer reports

Customer reports are identified by the prefix TFC. The three-digit code following the prefix identifies the type of report.

TFC001—networks

TFC002—trunks

TFC003—customer console measurements

TFC004—individual console measurements

TFC005—feature key usage

TFC006—Radio Paging

TFC007—Call Park

TFC008—messaging and auxiliary processor links

TFC009—Network Attendant Service

TFC010—ISPC link establishment

TFC111—useage of broadcasting routes

Customer network reports

Customer network measurements are identified by the prefix TFN. The three-digit code following the measurement identifies the type of report.

TFN001—route lists measurement

TFN002—Network Class of Service measurements

TFN003—incoming trunk group measurements

Threshold reports

Various traffic thresholds can be defined to monitor system performance. When a threshold is reached, a warning message is output. For example, a threshold for attendants' average speed of answer can be defined. If this value is exceeded in a report period, then a TFC103 warning message is output. In addition, the two attendant console reports (TFC003 and TFC004) are generated, even if they are disabled. Threshold warnings may indicate the need for additional resources, such as more attendants.

The following system or customer thresholds can be defined. For each threshold there is an equivalent traffic report.

- TFS101**—dial tone speed
- TFS102**—loop traffic
- TFS103**—juncture group traffic
- TFS104**—superloop traffic
- TFC101**—incoming matching loss
- TFC102**—outgoing matching loss
- TFC103**—average Speed of Answer
- TFC104**—percent All Trunks Busy
- TFC105**—percent OHQ overflow
- TFN101**—off hook queue overflow threshold

Traffic report on selected terminals

Selected lines and trunks can be defined for special traffic measurement. In addition to the normal traffic measurements, additional peg counts and usage measurements are made for this set of terminals. Lines and trunks to be included in this set are given the Individual Traffic Measurement (ITM) class of service in the Traffic Control program. Attendants cannot be given the ITM class of service.

Traffic collection

The Meridian 1 has five traffic data collection stages: accumulate, hold, print, control, and output.

Accumulate

When the Meridian 1 takes any measured action, the associated counters are updated. Traffic information is automatically accumulated as the events take place, regardless of schedules or thresholds. When the measurements are transferred to the holding register, the accumulating register returns to zero for the next tracking period.

Note: Measurements totaling less than 50 call seconds are recorded as 0 CCS.

Hold

According to your defined schedules, traffic information is transferred from the accumulating registers to the holding registers. Each accumulating register has an associated holding register.

You can view or print data in the holding registers whenever you like. The information remains in the holding register until the next scheduled transfer.

Some measurements have thresholds. When the information is transferred into the holding register, the thresholds are checked. If the thresholds are exceeded, a message is printed.

Print

Once data is in the holding registers, you can print it whenever you desire before the next scheduled transfer. Additionally, in LD 02, you can access the holding registers and print any aspect of the traffic measurement information. Traffic data can only be printed when it is in the holding register.

Note: Depending on the type and amount of information, you may require a high-speed printer.

Control

Traffic measurement variables (such as options and schedules) are accessed in LD 02. See *X11 input/output guide* for complete information.

Output

Traffic information is output according to your schedules defined in LD 02. When data is being printed at the teletype (TTY), the output rate depends on the system time available. Information can be printed all at once, or it can be printed at intervals. Data output begins when the information enters the holding registers, and it ends before the next scheduled transfer.

Factors affecting traffic data

Any change in the system, such as a sysload or under- or over-use of facilities, can cause discrepancies in the data collected. In most cases, warning messages alert the user that the data may have been corrupt.

Sysload and initialization

A sysload or system initialization causes traffic data in the accumulating and holding registers to be lost. After sysload, any changes to traffic schedules, traffic options, or threshold levels made since the last Equipment Data Dump must be redefined using LD 02. After a sysload, two traffic report periods are required to produce a real-time usage count.

After an initialization, a TFS301 message precedes traffic reports output. The message warns that the initialization has corrupted the traffic data because the data was not collected over the entire hour or half hour. Ignore the first traffic reports after an initialization.

A TFS302 message warns that the traffic schedule was changed during the last hour or half hour. Traffic reports following this message may be invalid if the change involved periods not previously scheduled or report types not previously enabled.

Connections with high usage

To report connections with excessive CCS, two warning messages are provided. TFS401 is printed when the CCS is greater than or equal to 36 CCS, but less than 50 CCS. TFS402 is printed for CCS greater than or equal to 50.

When a network path is held for longer than 1 hour (36 CCS), the accumulated usage can have a detrimental effect on hourly traffic studies. High-usage connections can result from:

- data terminal connections
- loop start trunks that fail to provide suitable supervision
- long conversations
- call processing faults
- telephone problems

Small quantities

Peg counts and usage measurements for a small number of calls should not be used to analyze traffic data. Traffic measurements are not accurate for small samples.

Traffic information is accumulated in units of 2 seconds and is converted to CCS when printed. The CCS amounts are rounded to the nearest thousandth, so usage of less than 50 CCS is printed as 0 CCS.

Matching timeslots

Meridian 1 switching is accomplished through network groups and loops. A half-network group contains 16 network loops. A full-network group contains 32 network loops. A network loop has 32 timeslots: 30 are used to establish a network connection, 1 is for signaling and control, and 1 is reserved for future use. A timeslot is considered busy if it is in actual use or is reserved by the central processing unit (CPU) for future use.

In L, VL, LE, VLE, XL, A, M, MS, and S machines, timeslots are grouped into matching pairs so that each timeslot can be used with only one other timeslot on the same or different network loop. Thus, a matching pair of timeslots is idle only if both timeslots are idle. For a network connection between different groups, the matching timeslots are idle in at least one of the four junctors between the two network groups.

The N, XN, ST, STE, RT, NT, XT, 21, 21E, 51,51C, 61,61C, 71, 81 and 81C systems do not require matching timeslots. Any timeslot in the network loop can be used.

Measurement verification

A number of cross-reference checks can verify the traffic data. Sometimes a path is reserved but never actually used, or is used but is neither a tone and digit loop connection, nor a part of a completed call under the definition of a TFC001 report, so the checks given here contain a tolerance. For example, with ring no answer, a path is reserved between the two terminals, but not used.

TFS001 and TFC001

In these cases, TFS001 usage accumulates as the timeslots involved are considered occupied; however, no usage accumulates in either TFC001 or TFS002 reports.

The sum of TFS001 usages on all terminal loops, minus the sum of TFS001 usages on tone and digit loops should equal twice the sum of all TFC001 usages for all customers ± 25 percent.

TFC001 and TFC002

For each customer the following figures should be within ± 2 percent:

- Outgoing usage plus tandem usage in TFC001 should equal the outgoing trunk usages for all groups in TFC002.
- Outgoing peg count plus tandem peg count in TFC001 should equal the sum of all outgoing trunk peg counts, less Recorded Announcement Trunk peg counts, for all groups in TFC002.
- Incoming usage plus tandem usage in TFC001 should equal the sum of all incoming trunk usages for all groups in TFC002.
- Incoming peg count plus tandem peg count in TFC001 should equal the sum of all incoming trunk peg counts for all groups in TFC002.

TFS001 and TFS002

The following figures should be within ± 15 percent:

- The sum of loop failure to match over all Tone and Digit Switch (TDS) loops in TFS001 should equal the sum of failure to match over all services except Digitone Receiver and conference loops in TFS002.
- The sum of loop usage over all TDS loops in TFS001 should equal the sum of service usage over all services except Digitone Receiver and conference in TFS002.
- The sum of loop peg count over all TDS loops in TFS001 should equal the sum of service peg count over all services except Digitone receiver and conference in TFS002.

The following figures should be within ± 2 percent:

- The sum of loop failure to match over all conference loops in TFS001 should equal the conference failure to match in TFS002.
- The sum of loop usage over all conference loops in TFS001 should equal the conference service usage in TFS002.
- The sum of loop peg count over all conference loops in TFS001 should equal the conference service peg count in TFS002.

System traffic reports

This section describes the system traffic measurements and reports. Peg count and thresholds are always given as a five-digit number. Usage (accumulated CCS) and console measurements are given as seven-digit numbers.

TFS000 traffic print program entry

TFS000 is output to indicate the start of the reports.

TFS001 networks

The TFS001 report measures four types of network loops, which appear on the report as TERM (lines, trunks, consoles), TDS (Tone and Digit Switch), MFS (Multifrequency Sender), and CONF (conference service). Six columns of data indicate intraloop and loop measurements. The first three measurements, which show intraloop data, are valid only for terminal loops. TDS, MFS, and CONF loop values are always zero as they do not use intraloop measurements. The six columns are as follows:

- FTM (failure to match) increments when an intraloop connection cannot be made because all timeslots are busy.
- CCS shows the total time (in hundreds of call seconds) that two timeslots are busy in the same loop.
- PC (peg count) increments when an intraloop connection becomes idle.
- Loop FTM increments for the total loop when a connection between two terminals cannot be made.
- Loop CCS shows the total time that timeslots were busy for a loop.
- Loop PC indicates the total number of times that a connection was idled for the loop.

TFS001 may count incomplete or unsuccessful calls as well as successful ones. TFS001 does not count calls that use End to End Signaling (EES). The sections on “Terminal loop measurements” below, “Conference loop measurements” on page 18, and “Service loops” on page 19 describe this information in greater detail. See Figure 1 for TFS001 report format.

Intraloop and loop FTM should be zeros. Any failure to match indicates a load balance problem. The call seconds should not exceed 3500, and all terminal loops should have similar CCS counts (within 100 CCS of one another). Total loop blockage should be less than 1 percent, although blockage on an individual loop may exceed 1 percent.

To solve blockage and load problems, redistribute terminals and CCS over loops. Overloaded loops should not get new traffic, and it may be desirable to add a shelf or a loop (if the average loop CCS exceeds 660).

Terminal loop measurements

This section gives a detailed description of each field in each report.

Loop number

The loop number that is being measured.

Loop type

The type of network being measured (Phantom loop, terminal loop, TDS or MFS Sender loop, or conference loop).

Intraloop failure to match (FTM)

When two terminals on the same loop fail to match, loop FTM increments twice (once for each terminal) and intraloop FTM increments once. Intraloop FTMs indicate whether blockage occurred on a single loop or among many loops. Lessening traffic can ease most intraloop and interloop FTMs.

For DTI loops, the FTM increments only once.

Intraloop usage

When two points on the same loop connect, call usage is added twice to loop usage (once per timeslot) and once to the intraloop usage.

Intraloop peg count

If two connection points on the same network loop are idled, the loop peg count increments twice, once for each terminal, and the intraloop peg count increments once. These measurements plus the interloop measurements show the actual system loop usage.

Loop FTM

The loop FTM increments when the following conditions occur:

- A terminal to terminal connection is blocked. In this case, the loop FTM of both network loops increments.
- A terminal or Digitone Receiver (DTR) to service loop path is blocked. An FTM is counted on both the service loop and the terminal loop. No call can generate more than two FTMs.
- A single-line telephone to DTR path is blocked. An FTM is counted on both the DTR loop and the terminal loop. For any one call, at most one pair of FTMs per blocked idle DTR can occur. After the first pass at all DTRs, further attempts to find an idle DTR and a path to it (the system tries again automatically) are not counted as additional loop FTMs.
- A terminal loop to conference loop connection is blocked when any party tries to form a new conference or to add a new conferee to an existing conference.

Loop usage

The loop usage gives the total time that loop timeslots were busy. This measurement reflects the switch condition. Switches with less than 200 to 300 CCS on enhanced network loops (QPC414) or 800 to 900 CCS on superloops are considered low-usage switches. Average use ranges from 300 to 500 CCS for enhanced network loops (QPC414) and from 1200 to 2000 CCS for superloops. High-usage switches have 500 to 600 CCS on enhanced network loops (QPC414) and 2000 to 2800 CCS on superloops.

The maximum supported loop CCS for local equipment is 660 for network loops (QPC414) and 3500 for superloops (NT8D04). For Remote Peripheral Equipment (RPE) loops, the maximum is 435 CCS.

A report whose loop CCS is greater than 1080 CCS for network loops or 4320 CCS for superloops is invalid.

Loop peg count

This measurement increments when an established path between two terminals becomes idle. Idling the paths between the terminals and DTMF or DTR loops does not increase the terminal loop peg count. Idling the paths does accumulate peg counts on the service loops.

Conference loop measurements

Other measurements apply to conference calls.

Intraloop peg count, usage, and FTM

Since all calls to a conference loop are from another loop, the intraloop measurements are always zero.

Loop FTM

The conference loop FTM increments in two cases:

- No conference loop is available for a new conference. In this case, all conference loops of the system have been checked, and the FTM counts against the last conference loop checked. Conference loops are not used in any order so the last one checked is not always the same.
- A new conferee cannot be added to an existing conference.

Loop usage

This measurement gives the total time that timeslots in this loop were marked as busy and unavailable for other use. Conference loop usage can vary greatly. Conference loops are selected randomly and are evenly distributed throughout the system.

Loop peg count

This shows the total number of people involved on a given conference loop. The loop peg count increments when an established path between the connection point and the conference loop is idle. The connection point's loop peg count is not incremented. Each person involved in the conference requires a path between the telephone and the conference loop.

When a conferee leaves a conference, a peg is made only on the conference loop. The overall effect is:

- one peg per added conferee on its terminal loop
- one peg per conferee, including the controller, on the conference loop
- one peg per added conferee on the controller's terminal loop

For example, a six-party conference will give five pegs on the terminal loop peg count, six on the conference loop, and five on the controller's terminal loop.

End to End Signaling Interworking does not use the conference loop, reducing traffic measurement on this loop.

Service loops

Service loops include TDS and MF senders.

Since all calls to a service loop are from another loop, the intraloop measurements are always zero.

Loop FTM

When you cannot find a path for either a tone or an outpulsing to a terminal loop or service loop, then loop FTM counts on the last service loop checked. Further attempts to provide the service to the same terminal are not counted.

Within a given network group, service loops are checked in a fixed order. In normal operation, switches on the first TDS loop, which accumulates the peg and usage traffic, show high usage and those on a second loop that accumulates all loop FTM counts show low usage.

Loop usage

Loop usage gives the total time that timeslots of this loop are marked busy and unavailable for other use.

Loop peg count

This count increments whenever a path to the TDS loop becomes idle.

Figure 1
TFS001 networks

| Format | | | | | | | |
|--|-----------|---------------|---------------|---------------------|----------------|----------------|----------------------|
| System ID | TFS001 | | | | | | |
| Loop number | Loop type | Intraloop FTM | Intraloop CCS | Intraloop peg count | Total loop FTM | Total loop CCS | Total loop peg count |
| Example | | | | | | | |
| 200 | TFS001 | | | | | | |
| 004 | TERM | 00000 | 0000142 | 00161 | 00001 | 0002056 | 01652 S |
| 008 | TERM | 00000 | 0000184 | 00180 | 00001 | 0002500 | 01725 S |
| 012 | TDMS | 00000 | 0000000 | 00000 | 00013 | 0000031 | 01496 |
| 013 | CONF | 00000 | 0000000 | 00000 | 00000 | 0000010 | 00006 |
| 014 | TERM | 00000 | 0000085 | 00060 | 00006 | 0000544 | 00287 |
| 015 | TERM | 00003 | 0000064 | 00039 | 00014 | 0000372 | 00284 |
| <p>Note 1: Superloops are identified by an "S" at the end of the line. Superloops exist in multiples of four (4, 8, 12, 16, etc.). For example, if superloop 4 exists, loops 5, 6, and 7 do not.</p> <p>Note 2: Determine the grade of service provided within the listed loop, and determine the total loop traffic by dividing the FTM by the peg count.</p> | | | | | | | |

TFS002 service loops

The TFS002 report measures the following service loops: CONF, DTR, TDS, MFS, and tone detectors. The report output differs according to the type of service. Each type of service has its own report line. Three-digit numbers identify each service:

- 000 Dial Tone
- 001 Busy Tone
- 002 Overflow Tone
- 003 Ringback Tone
- 004 Tone Ringing Meridian 1 Sets
- 005 Miscellaneous Tone
- 006 Outpulsers
- 007 Spare
- 008 Digitone Receiver
- 009 Conference
- 010 MF Tone for Automatic Number Identification (ANI)
- 011 Meridian 1 Tone Detector
- 012 Multi-Frequency Compelled (MFC) Trunk Signalling
- 013 SOCOTEL Multi-Frequency Signalling
- 014 Dial Tone Detection
- 015 Multi-Frequency Receiver
- 016 EES TDS usage (X11 Release 19 and later)
- 017 EES conference usage (X11 Release 19 and later)
- 018 MFK5, Spanish KD3 Signalling
- 019 MFK6, Spanish KD3 Signalling

See Figure 2 for TFS002 report format.

Service failure to match (FTM)

When no path can be found between a terminal and any service loop, the FTM for that service increments. Repeated attempts to obtain a path for a service (dial tone, overflow tone, or outpulse) count as a single service FTM.

The response to the FTM varies, depending on the type of request:

- A queue forms for requests for Digitone Receivers, dial tone, overflow tone, and outpulsing connections. The system periodically searches for a network path.
- The system abandons requests for tones other than dial tone and overflow tone.
- Conference connections are replaced by overflow tone; console tone and the buzzing tone are not provided by the TDS.

Service usage

Service usage indicates the total time that the path to the service loop was busy. Peg counts for dial tone, busy tone, overflow tone, ringback tone, ringing tone, and miscellaneous tone appear per timeslot, not per call. Outpulsers accumulate usage for the duration of time spent outpulsing. The trunk circuit card, rather than the TDS card, performs the actual outpulsing.

Service request peg count

This measurement increments whenever a path between a terminal and a service loop becomes idle. The report identifies the service with a three-digit number. If the type of service is unknown, the miscellaneous tone peg count increments.

An outpulse is pegged once for the duration of outpulsing. Each outpulsed digit is not counted.

Conference measurements

TFS002 service number 9 represents the sum of all conference measurements on a per conferee basis. For example, a three-party conference for 200 seconds counts three times with usage equal to 6 CCS.

Digitone Receiver (DTR) measurements

DTR measurements reflect service failures, usage, and requests.

Service FTM

This count increments when the system cannot find a path between the originating party and an idle DTR. It does not increment in the case where idle DTRs cannot be used because of network blocking, and a subsequent idle DTR is successfully used for the call.

If the system cannot provide dial tone through a DTR, but the path between the originating party and the DTR is available, the DTR FTM increments. When the system makes repeated attempts to find a path to an idle receiver, any attempt after the first does not increment the FTM.

Service usage

This gives the time that the path between the DTR and the originating party was busy. It accumulates when that path is made idle.

Service request peg count

This count, which shows the number of DTR uses, increments when a path between a DTR and a single-line telephone, or a direct inward dial (DID) or tie trunk (receiving DTMF from the central office) is idle. The Meridian 1 does not provide dial tone to 2500-type telephones until an idle DTR and network path are available. Since requests for dial tone are queued if the TDS is not available, the count reflects the number of unavailable TDS timeslots as well as DTR use. The following formula determines grade of service:

$$\text{FTM} \div (\text{peg count} + \text{FTM})$$

Tone detector service

Tone detector statistics indicate service failures, usage, and requests.

Service FTM

This count increments when no path is available between an idle tone detector and a trunk.

Service usage

This count increments when the path between the tone detector and the originator is busy.

Service request peg count

This count increments when the path between the tone detector and the trunk is idled. The count reflects the total number of times the tone detectors are used.

Figure 2
TFS002 service loops

| Format | | | |
|----------------|-------------|---------------|---------------------------|
| System ID | TFS002 | | |
| Service number | Service FTM | Service usage | Service request peg count |
| Example | | | |
| 200 | TFS002 | | |
| 000 | 00002 | 0000023 | 01650 |
| 001 | 00000 | 0000003 | 00099 |
| 002 | 00002 | 0000008 | 00321 |
| 003 | 00002 | 0000057 | 00951 |
| 004 | 00000 | 0000010 | 00168 |
| 005 | 00000 | 0000005 | 00068 |
| 006 | 00003 | 0000044 | 00376 |
| 007 | 00000 | 0000000 | 00000 |
| 008 | 00013 | 0000076 | 01471 |
| 009 | 00000 | 0000013 | 00069 |
| 010 | 00000 | 0000002 | 00012 |
| 011 | 00000 | 0000000 | 00000 |
| 012 | 00000 | 0000002 | 00022 |
| 013 | 00000 | 0000001 | 00003 |
| 014 | 00000 | 0000000 | 00000 |
| 015 | 00000 | 0000000 | 00000 |
| 016 | 00000 | 0000000 | 00000 |
| 017 | 00000 | 0000000 | 00000 |
| 018 | 00000 | 0000000 | 00000 |
| 019 | 00000 | 0000000 | 00000 |

TFS003 dial tone delay

TFS003 measurements show the number of times users waited for dial tone for longer than 1 second. Three columns indicate the number of times a user waited longer than 3 seconds for a dial tone, the number of times a user waited longer than 10 seconds for a dial tone, and the total delay time in seconds of all calls that waited longer than 1 second. Dial tone delay should occur in no more than 1.5 percent of calls. See Figure 3 for TFS003 report format.

These counts include both successful and aborted connections. A call that is delayed for longer than 10 seconds increments both the three-second and the ten second counters. Dial tone delay can be caused by insufficient DTRs, network blockage, heavy CPU demands, or hardware faults.

Figure 3
TFS003 dial tone delay

| Format | | |
|----------------|--------------|-----------------|
| System ID | TFS003 | |
| Delay | Delay | Total delays |
| > 3 seconds | > 10 seconds | < or = 1 second |
| Example | | |
| 200 | TFS003 | |
| 00003 | 00001 | 0040 |

TFS004 processor load

The processor load report indicates the load on the system by showing the peg count for CPU functions: idle cycle count (ICC), total CPU attempts (CA), load peak peg, input/output buffer overflow, and call register overflow. See Figure 4 for TFS004 report format.

The more real time the switch uses, the slower call processing functions operate. For this reason, it is a good idea to check this report regularly (twice a year or whenever new features are added) to make sure the system is not overloaded. The idle cycle count should be a minimum of 1 million cycles.

Parameters applicable to all releases

Reported measurements

- idle cycle count
- CPU attempts
- load peak peg count
- high priority input buffer (HPIB) overflow peg count
- low priority input buffer (LPIB) overflow peg count
- 500/2500 output buffer (OB) overflow peg count
- SL-1 OB overflow peg count
- CR overflow peg count

Idle cycle count

The idle cycle count provides a measure of the real-time capacity used for call processing. If no higher priority call processing or I/O activity requires attention, the idle cycle count is incremented.

As the load increases, the idle cycle count decreases. As the load decreases, the idle cycle count increases.

The higher priority tasks include:

- input messages (including timing marks)
- 128 ms timing tasks (high-priority or low-priority)

- ring/queue activity
- teletype (TTY) input

Total CPU call attempts

This increments once for each of the following:

- dial tone request
- incoming trunk seizure
- call originating from the attendant
- attempt by the attendant to extend a call

Load peak peg

The load peak peg count is the number of times the CPU could not process a high priority task within 128 ms. The CPU continues to perform and complete the tasks, in order of priority, until all the tasks are completed.

I/O buffer overloads

I/O buffer overload measures the number of times that signaling or output signals have been lost due to buffer overflow. Each peg count indicates a lost call. The buffers involved are the high-priority input buffers, the low-priority input buffers, and the 500/2500 and Meridian 1 output buffers. If any I/O buffer overflow count is not zero, it indicates an extreme traffic load, a hardware fault, or the given buffer is not being fully used. Refer to *Meridian 1 system engineering* (553-3001-151) for recommended buffer sizes.

Call register (CR) overflow

Call register overflow counts the number of times call processing software fails to find an idle call register. Each peg represents either a lost Call Detail Recording (CDR) record, a lost call, or an uncompleted feature. When a call or feature requires a call register and none is available, a call register transfers from the CDR queue to the call or feature. In this way, calls and features are given higher priority than CDR records. Refer to *Meridian 1 capacity engineering* (553-3001-149) for call register provisioning guidelines.

Call capacity related parameters with X11 Release 18 through Release 23

Reported measurements

- the rated call capacity of the system
- the percentage of real time used for the current hour
- the highest percentage of real time used for the last 24 hours
- the hour of the highest real-time usage during the last 24 hours
- the number of eliminated measurements made during the last 24 hours

Measurements are collected over the most recent 24 hours, unless a sysload or initialization occurred during that period. Although errors are inevitable, more than six invalid points per 24 hours indicate that the numbers produced are not valid. (After a sysload or initialization, asterisks print for the first 23 hours because of insufficient data collection.)

Rated Call Capacity

Rated Call Capacity (RCC), determined over the most recent 24 hours, is a function of the idle cycle count and the number of call attempts, assuming a linear relationship between those factors. RCC represents the maximum level at which the CPU can operate and still maintain a high grade of service.

The RCC assumes 30% peakedness during busy hours, i.e. the maximum traffic within the busy hour is 30% higher than the average busy hour traffic level. Slight RCC variations are normal. A change greater than 5 percent indicates a possible shift in the fundamental nature of the call load.

Maximum of Real Time Used

Maximum of Real Time Used (Max RTU) shows the maximum load on the system during the previous 24 hours using the following formula:

$$\text{Max RTU} = \text{Maximum number of call attempts/RCC.}$$

Percent of Real Time Used

Percent of Real Time Used (Percent of RTU) shows the load level of the system for the current hour or half hour using the following formula:

$$\text{Percent of RTU} = 100 \times \text{Current number of call attempts/RCC.}$$

Most systems can operate at 100% real time utilization while providing a high grade of service, assuming 30% peakedness, although some highly featured sites experience link delays slightly earlier.

Hour of Maximum Real Time Used

Hour of Maximum Real Time Used (Hour of Max RTU) shows the time that the maximum load occurred, which is the busiest hour of the previous 24 hours. (Hours begin only on the hour, not on the half hour.)

Exception peg count

Every measurement that contains information not related to call processing activity impairs the relationship between idle cycle counts and number of call attempts, reducing the accuracy of calculations. Exception peg count indicates the number of times the idle cycle count or CPU attempt count deviates from the expected values over 24 hours. Up to three exceptions in 24 hours is normal because of activities like midnight routines, service changes, and broadcast messages. If the number is greater than six, the RCC is invalid. If the number continues to be high, a detailed traffic analysis is required.

Call capacity related parameters with X11 release 24 and onwards

Reported measurements

- the rated call capacity of the system
- the percentage of call capacity used for the current hour
- the maximum percentage of call capacity used during the sampled period
- the day (day of the month) and hour of the maximum percentage call capacity usage during the sampled period
- the number of eliminated measurements during the sampled period

Let the switch be running for N hours after the most recent sysload or initialization. Also, let the sampled period be W hours. W is the minimum of N and 168, where 168 is the number of hours in a week. The sample period is typically one week or 168 hours.

Measurements are stored and analysed over the most recent W hours. Note that data collection can begin on the hour or on the half hour. An observation (data point) is recorded every single hour. An observation is the ICC value and the corresponding CA value. After a sysload or initialization, asterisks are printed for the first 23 hours because of insufficient data collection. That is, if the value of N is less than 24, asterisks are printed in the above five fields of the TFS004 output. Analysis is performed after 24 hours of data collection.

Linear regression line analysis is used in the computation, assuming that (ICC, CA) pairs for different hours of the data window lie approximately on a straight line.

Noisy points typically occur when the processor is performing non-call processing tasks including management, reporting, or midnight routines. The analysis eliminates noisy points up to *ceiling* ($W/8$) data points, where *ceiling* (x) is a mathematical function denoting the smallest integer not less than x . Therefore, if W is equal to 70, up to 9 data points can be eliminated. However, if W is equal to 168, up to 21 data points can be eliminated.

The algorithm outputs the value of RCC, only when certain constraints are met. The coefficient of determination is a measure of the goodness of fit of the data points to a straight line. Numerical results are printed when either of the following two conditions are met:

- coefficient of determination is larger than or equal to 0.75
- coefficient of determination is larger than or equal to 0.55 and the ratio CA/ RCC is less than or equal to 0.1

If these conditions are not met ‘****’ is printed in the fields.

Rated Call Capacity

Rated Call Capacity (RCC), determined over the most recent W hours, is a function of the idle cycle count and the number of call attempts, for every hour. As mentioned earlier, W is the minimum of N and 168, and N is the number of hours since sysload or initialization. RCC represents the maximum level at which the CPU can operate and still maintain a high grade of service.

Valid RCC computations are performed for values of W greater than 23. That is computations are performed when more than a days (24 hours) worth of data is available.

The RCC assumes 30% peakedness during busy hours, i.e. the maximum traffic peak within the busy hour is 30% higher than the average traffic level for that hour. Slight RCC variations are normal.

Percent of Call Capacity Used

Percent of Call Capacity Used (Percent of CCU) is an indicator of the load level of the system for the current hour using the following formula:

$$\text{Percent of CCU} = 100 \times \text{Current number of call attempts} / \text{RCC}.$$

Maximum of Call Capacity Used

Maximum of Call Capacity Used (Max CCU) shows the maximum value of CCU during the previous W hours using the following formula:

$$\text{Max CCU} = \text{Maximum value of CCU over the past W hours}.$$

Day and Hour of Maximum Call Capacity Used

Day (day of the month) and hour of Maximum Call Capacity Used shows the day and hour at which the maximum value of CCU occurred, which is the busiest hour of the previous W hours. Its format is DDHH. The day of the month is DD, and HH is the hour. For example, if the date of the traffic report is May 15, 1998 (which reports the past 7 days) and the hour of maximum CCU is 1214, then the heaviest call processing load was experienced on May 12 at 14:00 (or 2:00 p.m.). If the date of the traffic report is May 2, 1998 (which reports the past 7 days) and the hour or maximum CCU is 2711, then the heaviest call processing load occurred on April 27, 1998 at 11:00 a.m.

Exception peg count

Every measurement that contains information not related to call processing activity impairs the relationship between idle cycle counts and number of call attempts, reducing the accuracy of calculations. Exception peg count indicates the number of points not considered (eliminated) in the analysis. Its largest value is *ceiling* (W/8).

Line Load Control (LLC)

Line Load Control (LLC) is a manually activated feature associated with optional feature package 105 that denies calls from designated stations. LLC can be set to OFF (no LLC), or to F, S, or T to block the first group of calls (F), first and second groups (S), or first, second, and third groups (T). Blocked group members cannot originate internal or trunk calls.

LD 02 defines blocking probability for LLC levels. The TFS004 report prints the blocking counts only when optional feature package 105 is equipped.

Refer to *Software Feature Guide* for more information on LLC level definition and activation.

Manual calculation of Real-time load

This manual calculation should only be used if RCC and Percent of CCU are not available since it is a less accurate approximation of the algorithm used to compute the Call Capacity Report values.

- Collect TFS004 for a minimum of 12 hours.
- Find the maximum idle cycle (IICC) and corresponding number of Call Attempts (ICA) over the hour when the switch processes almost no calls (the most non-busy hour).
- find the minimum idle cycle (BICC) and corresponding number of Call Attempts (BCA) during the busiest hour.

The RCC can be estimated using the following formula:

$$RCC = 0.7 * (BCA - BICC * (ICA - BCA) / (IICC - BICC))$$

Where the factor 0.7 accounts for the processing overhead of the system and the 30% peakedness which is assumed.

RTU and RTA parameters with X11 Release 18 through Release 23

The Percent of RTU corresponding to BCA can be determined using the following formula:

$$\text{Percent of RTU} = BCA / RCC * 100$$

If the Percent of RTU is less than 100%, the Percent of Real Time Available (RTA) can be determined using the following formula:

$$\text{Percent of RTA} = 100 - \text{Percent of RTU}$$

CCU and CCA parameters with X11 Release 24 and onwards

The Percent of CCU corresponding to BCA can be determined using the following formula:

$$\text{Percent of CCU} = BCA / RCC * 100$$

If the Percent of CCU is less than 100%, the Percent of Call Capacity Available (CCA) can be determined using the following formula:

$$\text{Percent of CCA} = 100 - \text{Percent of CCU}$$

Note: The maximum idle cycle count is a function of the system configuration, software release, and package list. In case of software upgrades or changes to the hardware configuration, including additions of trunks or lines, the maximum idle cycle count should be recalculated. It is recommended that the maximum idle cycle count be recalculated for every traffic study.

Refer to Table 1 and Table 2.

Table 1
Parameters with X11 Release 18 through Release 23

| Format | | | |
|--|-------------------------------------|-------|-----------------------|
| System ID | TFS004 | | |
| Idle cycle count | CPU attempts | | Load peak peg count |
| HPIB overflow peg count | LPIB overflow peg count | | |
| 500/2500 OB overflow peg count | SL-1 OB overflow peg count | | |
| CR overflow peg count | | | |
| Rated Call Capacity (Note) | Maximum Real Time Used (RTU) (Note) | | Percent of RTU (Note) |
| Number of eliminated observations (Note) | Hour of Max RTU (Note) | | |
| LLC1 blocked calls | LLC2 blocked calls | | LLC3 blocked calls |
| Example | | | |
| 0377 | TFS004 | | |
| 020906195 | | 03042 | 00000 |
| 00000 | | 00000 | |
| 00000 | | 00000 | |
| 00000 | | | |
| 16829 | | 00023 | 00018 |
| 00001 | | 00016 | |
| 00000 | | 00000 | 00000 |
| Note: Asterisks appear in these fields when the information is insufficient to generate the report. | | | |

Table 2
Parameters with X11 release 24 and onwards

| Format | | | |
|--|--|-------|---------------------|
| System ID | TFS004 | | |
| Idle cycle count | CPU attempts | | Load peak peg count |
| HPIB overflow peg count | LPIB overflow peg count | | |
| 500/2500 OB overflow peg count | SL-1 OB overflow peg count | | |
| CR overflow peg count | | | |
| Rated Call Capacity (Note) | Maximum CCU (Note) | | % of CCU (Note) |
| Number of eliminated observations (Note) | Day of the month and hour of Max CCU (format: DDHH) (Note) | | |
| LLC1 blocked calls | LLC2 blocked calls | | LLC3 blocked calls |
| Example | | | |
| 0377 | TFS004 | | |
| 020906195 | | 03042 | 00000 |
| 00000 | | 00000 | |
| 00000 | | 00000 | |
| 00000 | | | |
| 16829 | | 00023 | 00018 |
| 00001 | | 1316 | |
| 00000 | | 00000 | 00000 |
| Note: Asterisks appear in these fields when the information is insufficient to generate the report. | | | |

Real-time load

The real-time load includes a minimum idle cycle count and a maximum idle cycle count.

- Take the minimum idle cycle count over 1 hour when the switch is not processing any calls. Background programs, as defined in the configuration record, should be removed from the configuration record for the duration of the measurement period, all users should be logged out, and there should be no TTY activity.

Note: In an ideal situation, the switch processes no calls during the 1 hour measurement period. However, you can make a fairly accurate minimum idle cycle count if the number of calls processed does not exceed 3 percent of calls processed during a busy hour.

- Record the maximum idle cycle count during a busy hour of each day (normal call processing, background programs running) in a moderately busy season for two weeks. The average of these daily numbers is the maximum cycle count.

The Percent of Real Time Used (%RTU) can be determined with the following formula:

$$\% \text{ RTU} = [(HICC - LICC) \div HICC] \times 100$$

Where:

HICC = minimum idle cycle count (high idle cycle count)

LICC = maximum idle cycle count (low idle cycle count)

To calculate the Percent of Real Time Remaining (%RTR), use the following formula:

$$\% \text{ RTR} = [(LICC \div HICC) - (1 - 2500 \div 3600)] \times 100$$

The figure of 2500 is the factor representing average busy season busy hour (ABSBH, with high day grade of service: 20 percent of calls having tone delay greater than three seconds). This figure is derived by computing 91 percent of total capacity, which is 3600 seconds an hour ($3600 \times 0.91=3276$), and assuming that number is 1.3 times as high as the ABSBH ($3276 \div 1.3$ is approximately 2500).

Manual calculation of Real-time load

This manual calculation should only be used if RCC and Percent of RTU are not available since it is a less accurate approximation of the algorithm used to compute the Call Capacity Report values.

- Collect TFS004 for a minimum of 12 hours.
- Find the maximum idle cycle (IICC) and corresponding number of Call Attempts (ICA) over the hour when the switch processes almost no calls (the most non-busy hour).
- find the minimum idle cycle (BICC) and corresponding number of Call Attempts (BCA) during the busiest hour of the day.

The RCC can be estimated using the following formula:

$$RCC = 0.7 * (BCA - BICC * (ICA - BCA) / (IICC - BICC))$$

Where:

0.7 = accounts for the processing overhead of the system and the 30% peakedness which is assumed.

The Percent of Real Time Used can be determined using the following formula:

$$\%RTU = BCA / RCC * 100$$

If the %RTU is less than 100%, the Percent of Real Time Available can be determined using the following formula:

$$\%RTA = 100 - \%RTU$$

Note: The maximum idle cycle count is a function of the system configuration, software Release, and package list. In case of software upgrades or changes to the hardware configuration, including additions of trunks or lines, the maximum idle cycle count should be recalculated. It is recommended that the maximum idle cycle count be recalculated for every traffic study.

Line Load Control (LLC)

Line Load Control (LLC) is a manually activated feature associated with optional feature package 105 that denies calls from designated stations. LLC can be set to OFF (no LLC), or to F, S, or T to block the first group of calls (F), first and second groups (S), or first, second, and third groups (T). Blocked group members cannot originate internal or trunk calls.

LD 02 defines blocking probability for LLC levels. The TFS004 report prints the blocking counts only when optional feature package 105 is equipped.

Refer to *Software Feature Guide* for more information on LLC level definition and activation.

Figure 4
TFS004 processor load

| Format | | |
|--|-------------------------------------|-----------------------|
| System ID | TFS004 | |
| Idle cycle count | CPU attempts | Load peak peg count |
| HPIB overflow peg count | LPIB overflow peg count | |
| 500/2500 OB overflow peg count | SL-1 OB overflow peg count | |
| CR overflow peg count | | |
| Rated Call Capacity (Note) | Maximum Real Time Used (RTU) (Note) | Percent of RTU (Note) |
| Number of eliminated observations (Note) | Hour of Max RTU (Note) | |
| LLC1 blocked calls | LLC2 blocked calls | LLC3 blocked calls |
| Example | | |
| 0377 | TFS004 | |
| 020906195 | 03042 | 00000 |
| 00000 | 00000 | |
| 00000 | 00000 | |
| 00000 | | |
| 16829 | 00023 | 00018 |
| 00001 | 00016 | |
| 00000 | 00000 | 00000 |
| Note: Asterisks appear in these fields when the information is insufficient to generate the report. | | |

Call Capacity Report Enhancement

The Call Capacity Report Enhancement (CCRE) feature improves the stability and accuracy of Meridian 1 traffic reports. The enhancements include:

- data collection will be based on 7 24-hour days
- real-time calculation improvements

The Call Capacity Report Enhancement feature does not require user operation changes. Meridian 1 traffic reports will contain the same number of fields in the same format as the current TFS004 report with the exception of a change to the field corresponding to the time of Maximum Call Capacity Used.

TFS005 measurement on selected terminals

The TFS005 measurements evaluate groups of phone lines, trunks, or both within a terminal loop. (See Figure 5.) These measurements, available for terminals assigned the Individual Traffic Measurement (ITM) class of service by the Traffic Control program (LD 02), help analyze traffic by department or group.

The TFS005 report shows loop numbers, total CCS for terminals assigned an ITM COS, and line peg count.

Line usage

This is the total usage for all calls in a loop. View individual terminals to determine their usage. Totals are related to those in TFS001, although the correlation is imprecise.

Line peg count

When an established path involving a non-trunk terminal with ITM becomes idle, the line peg count increments for the terminal's loop. If both terminals in an established path have ITM, then two line peg counts are added. In addition, when an established path between a terminal and a conference loop becomes idle and the terminal has ITM, the line peg count increments for the terminal's loop.

For all trunks, the peg count increments when the trunk becomes idle if, at any time since the trunk was seized, it was involved in an established connection.

Figure 5
TFS005 lines

| Format | | |
|----------------|------------|----------------|
| System ID | TFS005 | |
| Loop number | Line usage | Line peg count |
| Example | | |
| 200 | TFS005 | |
| 00 | 0000144 | 00066 |
| 01 | 0000213 | 00179 |
| 02 | 0000232 | 00144 |
| 03 | 00000244 | 00130 |
| 05 | 00000289 | 00124 |
| 08 | 00000218 | 00158 |
| 10 | 00000229 | 00154 |

TFS007 junctor measurements

Each network group has two network shelves and 32 consecutively numbered loops. Junctors link network groups together. The TFS007 report displays measurements related to the paths that connect different network groups, involving an intergroup junctor. Measurements indicate the FTMs for each junctor, the junctor usage in CCS, and a peg count of network group connections.

Each network group must be connected to all the other network groups. The two-digit junctor number that appears in the first column of the report signifies which two groups are connected:

- network group 0 contains loops 0 to 31
- network group 1 contains loops 32 to 63
- network group 2 contains loops 64 to 95
- network group 3 contains loops 96 to 127
- network group 4 contains loops 128 to 159

For example, junctor 02 connects network group 0 (loops 0 to 31) and network group 2 (64 to 95).

See Figure 6 for TFS007 report format.

Figure 6
TFS007 junctors

| Format | | | |
|----------------|-------------|---------------|-------------------|
| System ID | TFS007 | | |
| Junctor group | Junctor FTM | Junctor usage | Junctor peg count |
| Example | | | |
| 222 | TFS007 | | |
| 01 | 00001 | 0001642 | 01554 |
| 02 | 00001 | 0001696 | 01852 |
| 12 | 00002 | 0001712 | 01518 |

Junctor FTM

The junctor FTM counts failures to establish a connection between network groups. The junctor FTM increments the peg count at the originating loop, the junctor group, and the terminating loop. Blockage in a junctor group should not exceed 1 percent. Determine junctor blockage with the following formula:

$$\text{Junctor FTM} \div (\text{junctor peg count} + \text{FTM}) \times 100$$

Junctor usage

This measurement gives the total time in CCS that timeslots of the junctor group were busy and unavailable for other use. Low usage is around 500 CCS per group; high usage is around 1700 CCS. Two-group network systems usually have higher usage than larger systems because fewer connections are available.

If junctor loads are unbalanced, it may be desirable to redesign network groups. Departments with a high level of intercommunication should be in the same network group, separated on different loops. Outgoing trunks on a given route should be spread across groups. DTRs should also be spread across groups.

Junctor peg count

The junctor peg count shows completed calls between network groups. Connections to tone and digit loops do not affect the peg count. The junctor peg count increments when the connections between network groups become idle.

TFS008 Command Status Link and Application Module Link measurements

TFS008 gives traffic statistics related to Command Status Link (CSL) and Application Module Link (AML). The CSL handler tracks every incoming and outgoing message for each CSL message type. The counts appear on the traffic report and are kept by the CSL handler whether or not a traffic report is scheduled. The traffic report can be configured via LD 02 to appear every hour on the hour or half hour. See Figure 7 for the report format and the legend that follows the figure.

Figure 7
TFS008 CSL and AML measurements (Part 1 of 2)

| Format | | | | | | | | | | |
|------------|------------------------------------|---------------------------------------|--------------------------------------|----------------------------|-------------------------------|-------------------------------|-----------------------------|-----------------------------|-------------------------------|-----------------------------|
| System- ID | TFS008 | | | | | | | | | |
| SYSTEM | | | iqsys ovlf | oqsys ovlf | syscr unavl | avgiq sys | avgiq call | avgiq admin | | |
| CSL | | | | | | | | | | |
| csl# | vasid | fails | link stop | down time | avgoq size | iochr ovfl | eobf miss | eobf prem | inval prior | inval lngh |
| OMSG | cas uts calans icc dta | crs tnmn calds ias disreq | pci confm usm itc disres | ans data ceq init | dis audit cab isis | dnp cts ftr iei | digit dsi mon icss | tmg timstp iqs sfn | tst query its conreq | mwi ovd iss conres |
| IMSG | con opr calans cdd | incl gts calds conreq | rls tnmn setftr conres | offh alm mon dta | rdy confm iqr disreq | nrdy data itr disres | msi audit isr | msb rtsc isi | conf timstp iei | mwi query icsr |
| PRI | pri1 | pri2 | pri3 | pri4 | | | | | | |
| TRAF | aaaa | bbbb | cccc | dddd | eeee | | | | | |
| FLOW | ffff | gggg | hhhh | iiii | jjjj | kkkk | | | | |
| PACKETS | | output | input | | | | | | | |

Figure 7
TFS008 CSL and AML measurements (Part 2 of 2)

| Example | | | | | | | | | | |
|----------------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0111 | TFS008 | | | | | | | | | |
| SYSTEM | | 00004 | 00000 | 00003 | 00360 | 00001 | 00456 | | | |
| CSL | | | | | | | | | | |
| CSL01 | 00010 | 00021 | 00032 | 00043 | 00054 | 00001 | 00026 | 00089 | 0033 | 0022 |
| OMSG | 00001 | 00002 | 00003 | 00004 | 00005 | 00006 | 00007 | 00008 | 00009 | 00010 |
| | 00010 | 00014 | 00028 | 00040 | 00034 | 00025 | 00067 | 00016 | 00028 | 00001 |
| | 00009 | 00157 | 00021 | 00000 | 00065 | 00000 | 00000 | 00000 | 00000 | 00000 |
| | 00000 | 00000 | 00000 | 00099 | 00000 | 00000 | 00000 | 00000 | 00001 | 00000 |
| | 00005 | 00000 | 00000 | | | | | | | |
| IMSG | 00004 | 00003 | 00005 | 00006 | 00043 | 00002 | 00006 | 00009 | 00019 | 00007 |
| | 00010 | 00014 | 00028 | 00040 | 00034 | 00025 | 00067 | 00016 | 00028 | 00001 |
| | 00009 | 00157 | 00000 | 00000 | 00000 | 00000 | 00000 | 00000 | 00000 | 00000 |
| | 00000 | 00000 | 00001 | 00005 | 00000 | 00000 | | | | |
| PRI | | 00632 | 00078 | 00400 | 00067 | | | | | |
| TRAF | 00000 | 00000 | 00000 | 00000 | 00000 | | | | | |
| FLOW | 00000 | 00000 | 00000 | 00000 | 00000 | 00000 | | | | |
| PACKETS | | 00020 | 00012 | | | | | | | |

Legend for TFS008 report

SYSTEM

| | |
|-------------|---|
| iqsys ovfl | input queue overflow |
| oqsys ovfl | output queue overflow |
| syscr unavl | system resource not available |
| avgiq sys | average input queue size for system messages |
| avgiq call | average input queue size for call processing messages |
| avgiq admin | average input queue size for administration messages |

CSL

| | |
|-------------|--|
| csl# | Command Status Link (CSL) port number |
| vasid | value-added server ID associated with this link |
| fails | number of CSL output failures |
| link stop | number of times the link stopped |
| down time | link down time in seconds |
| avgoq size | average output queue size |
| iochr ovfl | number of times IOCHAR TTY buffer overflowed |
| eobf miss | number of packets with End of Block flag missing |
| eobf prem | number of packets with End of Block flag premature |
| inval prior | number of packets with invalid priority |
| inval lngth | number of packets with invalid length |

OMSG/IMSG—outgoing/incoming message types

| | |
|--------|-----------------------------------|
| alm | alarm indication |
| ans | call answered |
| audit | software audit |
| cab | call abandons queue |
| calans | call answer |
| calds | call disconnect |
| cas | channel assignment |
| cdd | control display digits |
| ceq | call enters queue |
| con | call connect |
| conf | conference request |
| confm | confirmation |
| conreq | network layer connect request |
| conres | network layer connect response |
| crs | call connection request |
| cts | change terminal status |
| data | administration data block |
| digit | dialed digits |
| dis | call disconnect |
| disreq | network layer disconnect request |
| disres | network layer disconnect response |

| | |
|------|--|
| dnp | DN update |
| dsi | device state information |
| dta | network layer data |
| fr | |
| gts | get terminal status |
| ias | the number of statistics messages |
| icc | the number of incoming call indication messages |
| icsr | the number of check/change call detail recording (CDN) state requests |
| icss | the number of check/change call detail recording (CDN) state response messages |
| iei | the number of error indications sent (output messages [OMSG]) |
| iei | the number of error indications (input messages [IMSG]) |
| incl | incoming call accepted |
| init | the number of Meridian 1 initialization indication messages |
| iqr | the number of queue requests |
| iqs | the number of queue request response messages |
| isi | the number of start up / shut down indications |
| isis | the number of start up / shut down indication response messages |
| isr | the number of statistics requests |
| iss | the number of statistics response messages |
| itc | the number of treatment completed messages |
| itr | the number of treatment requests |
| its | the number of treatment response messages |
| mon | monitor |
| msb | make set busy |
| msi | make set in service |
| mwi | message waiting indication change |
| nrdy | not ready |
| offh | off hook |
| opr | operator revert |

| | |
|--------|---|
| ovd | override |
| pci | present call |
| query | query |
| rdy | ready |
| rls | call disconnect request |
| rtsc | request terminal status change |
| setftr | set feature message |
| sfn | set feature notification |
| timstp | timestamp |
| tmg | telset message |
| tnmn | TN maintenance mode |
| tst | telset status message |
| usm | unsolicited status message |
| uts | update terminal status |
| PRI | number of messages of priority 1 to 4 (excluding polling messages) |
| TRAF | |
| aaaa | average MSDL AML incoming usage |
| bbbb | peak MSDL AML incoming usage |
| cccc | average MSDL AML outgoing usage |
| dddd | peak MSDL AML outgoing usage |
| eeee | time since last query traffic on MSDL card |
| FLOW | <p>To prevent any application from tying up buffer resources due to its abnormal conditions or misbehavior, a flow control mechanism is defined in the Meridian 1 and at the card level. This flow control mechanism only applies to the normal interface (receive and transmit ring buffers, not the expedited interface).</p> <p>This flow control mechanism is based on a common “window” mechanism. The basic concept is that the number of outstanding messages that are associated with a Socket ID in the transmit or receive ring cannot exceed a predefined number, “application threshold”. Note that the mechanism is based on the number of messages per application rather than the number of buffers per application.</p> |

| | |
|---------|---|
| ffff | first flow control hit starts a 128ms timer to allow one more try |
| gggg | second flow control hit requests the sending of OK_TO_SEDN_REQ message via a logged SSD message to MSDL loadware. Start the 128ms timer |
| hhhh | third flow control hit asks the data socket to be resynchronized by MSDL loadware. Start the 128ms timer |
| iiii | fourth flow control hit starts a 128ms timer such that the link will be forced to disable after time out. |
| jjjj | number of times outgoing ssd is lost or is not sent on time (MSDL only) |
| kkkk | number of times AML is reset (MSDL only) |
| PACKETS | number of incoming and outgoing packets |

TFS009 D-channel

TFS009 reports traffic activity for D-channels. Eight fields report activity on the Multi-purpose Serial Data Link (MSDL) D-channel. Nine fields report activity associated with the QSIG Path Replacement feature introduced with X11 Release 23.

Figure 8
TFS009 D-channel report format

| | | | | |
|------------------|---------|---------|------------------|-------|
| System ID | TFS009 | | | |
| DCH x | | | | |
| aaaa | | | nnnn | |
| bbbb | | | oooo | |
| cccc | | | pppp | |
| dddd | | | qqqq | |
| eeee | | | rrrr | |
| fff | | | ssss | |
| gggg | | | | |
| hhhh | | | tttt | |
| iiii | | | | |
| jjjj | | | uuuu | |
| yyyy | | | | |
| kkkk (MSDL only) | | | vvvv (MSDL only) | |
| llll (MSDL only) | | | wwww (MSDL only) | |
| mmmm (MSDL only) | | | xxxx (MSDL only) | |
| tat1 (MSDL only) | | | tat2 (MSDL only) | |
| DIV_NB | DIV_NEW | DIV_OLD | | |
| CNG_NB | CNG_NEW | CNG_OLD | | |
| CON_NB | CON_NEW | CON_OLD | | |
| FLOW | FLOWa | FLOWb | FLOWc | FLOWd |

Legend for TFS009 report**SYSTEM**

| | |
|------|---|
| aaaa | number of all incoming messages received on the D-channel |
| bbbb | number of all incoming call processing messages received on the D-channel |
| cccc | number of all incoming management messages received on the D-channel |
| dddd | number of all incoming maintenance messages received on the D-channel |
| eeee | average number of incoming bytes per message |
| ffff | accumulated real time a D-channel was busy transferring incoming messages in half-millisecond units (Divide the reported number by 2 for a result in milliseconds. For example: divide a reported number of 200 by 2 for a result of 100 milliseconds.) |
| gggg | running average of the number of requests queued in request output message buffer |
| hhhh | number of times when no request output message buffer was available |
| iiii | number of PRA layer-3 protocol errors since the last traffic report |
| jjjj | number of times the D-channel was down |
| yyyy | number of established call-independent connections |
| kkkk | average incoming link usage (given as a percentage of the link capacity) |
| llll | average outgoing link usage (given as a percentage of the link capacity) |
| mmmm | number of connected calls |
| tatl | total number of anti-tromboning operations attempted since the D-channel traffic was last cleared Number of optimization requests with the diversion trigger |
| nnnn | number of all outgoing messages sent on the D-channel |
| oooo | number of all outgoing call processing messages sent on the D-channel |
| pppp | number of all outgoing management messages sent on the D-channel |
| qqqq | number of all outgoing maintenance messages sent on the D-channel |
| rrrr | average number of outgoing bytes per message |

| | |
|---------|---|
| ssss | accumulated real time a D-channel was busy transferring outgoing messages in half-millisecond units (Divide the reported number by 2 for a result in milliseconds. For example: divide a reported number of 200 by 2 for a result of 100 milliseconds.) |
| tttt | number of times a message with no End of Message (EOM) mark was received |
| uuuu | accumulated real time the D-channel was down since the last report in units of 2 seconds. For example, if the value is 10, the down time is 20 seconds |
| vvvv | peak incoming link usage (given as a percentage of the link capacity) over a 5-second period |
| wwww | peak outgoing link usage (given as a percentage of the link capacity) over a 5-second period |
| xxxx | time (in seconds) since the MSDL D-channel traffic was last cleared |
| tat2 | total number of successful anti-tromboning operations since the D-channel traffic was last cleared |
| CNG_NB | Number of optimization requests with the congestion trigger |
| CNG_NEW | Number of optimization successful with the congestion trigger: a new path is used |
| CNG_OLD | Number of optimization successful with the congestion trigger but the old path has been retained |
| CON_NB | Number of optimization requests with the connected trigger |
| CON_NEW | Number of optimization successful with the connected number trigger: a new path is used |
| CON_OLD | Number of optimization successful with the connected number trigger but the old path has been retained |
| DIV_NB | Number of optimization requests with the diversion trigger |
| DIV_NEW | Number of optimization successful with the diversion trigger: a new path is used |
| DIV_OLD | Number of optimization successful with the diversion trigger but the old path has been retained |

| | |
|-------|---|
| FLOW | <p>To prevent any application from tying up buffer resources due to its abnormal conditions or misbehavior, a flow control mechanism is defined in the Meridian 1 and at the card level. This flow control mechanism only applies to the normal interface (receive and transmit ring buffers, not the expedited interface).</p> <p>This flow control mechanism is based on a common “window” mechanism. The basic concept is that the number of outstanding messages that are associated with a Socket ID in the transmit or receive ring cannot exceed a predefined number, “application threshold”. Note that the mechanism is based on the number of messages per application rather than the number of buffers per application.</p> |
| FLOWa | first flow control hit starts a 128ms timer to allow one more try |
| FLOWb | second flow control hit requests the sending of OK_TO_SEDN_REQ message via a logged SSD message to MSDL loadware. Start the 128ms timer |
| FLOWc | third flow control hit asks the data socket to be resynchronized by MSDL loadware. Start the 128ms timer |
| FLOWd | fourth flow control hit starts a 128ms timer such that the link will be forced to disable after time out. |

TFS010 ISDN GF Transport

The GF/SS call register overflow counts the number of times supplementary services or the ISDN transport are not able to find an idle call register. This peg count provides information to the field engineer for determining whether the number of call registers configured for the system needs to be increased.

| | |
|--|--------|
| Format | |
| System ID | TFS010 |
| GF/SS call register overflow peg count | |
| Example | |
| 200 | TFS010 |
| 00000 | |

TFS011 Multi-purpose ISDN Signaling Processor traffic

The Multi-purpose ISDN Signaling Processor (MISP) card is used for ISDN Basic Rate Interface (BRI) activities. The MISP traffic report shows the call processing activities of all Digital Subscriber Loops (DSLs) associated with each MISP in the system and indicates the type of BRI traffic such as voice, data, or packet data.

Beginning with X11 Release 19, this report contains Basic Rate Signaling Concentrator (BRSC) information if the MISP serves BRSCs. It contains the following types of information for each MISP in the system. MISP information in the four D-channel parameters shows totals for the line cards that the MISP serves directly. BRSC information shows D-channel traffic data collected at the BRSC. .

Figure 9
TFS011 Multi-purpose ISDN Signaling Processor traffic

| Format | | | | | | |
|------------------|-----------------|-------------|--------------------|---------------------------------|------------------------|-------------------------------------|
| System ID TFS011 | | | | | | |
| MISP and BRSC ID | | | | | | |
| Attempted calls | Completed calls | Call length | MISP/BRSC messages | Terminal messages for MISP/BRSC | MISP/BRSC data packets | Terminal data packets for MISP/BRSC |
| Example | | | | | | |
| 0111 TFS011 | | | | | | |
| MISP002 | | | | | | |
| 00020 | 00006 | 00019 | 00080 | 00040 | 00000 | 00006 |
| MISP004 | | | | | | |
| 00030 | 00001 | 00030 | 00125 | 00060 | 00180 | 00012 |
| BRSC | | | | | | |
| 24 0 15 | | | | | | |
| | | | 005110 | 001020 | 003600 | 000200 |

Attempted calls (MISP only)

Number of attempted calls, including all successfully completed calls and incomplete attempted calls.

Completed calls (MISP only)

Number of successfully completed calls for the reported period.

Call length (MISP only)

Average length of a successfully completed call in seconds.

MISP/BRSC messages

Number of signaling messages sent by the MISP, the BRSC, or both to the terminals on the D-channels.

Terminal messages

Number of signaling messages sent by the terminals to the MISP, the BRSC, or both on the D-channels.

MISP/BRSC data packets

Number of D-channel data packets sent by the MISP, the BRSC, or both to the terminals.

If the MISP is configured with BRSCs, a separate report prints for each BRSC.

Terminal data packets

Number of D-channel data packets sent by the terminals to the MISP, the BRSC, or both.

In the sample report in Figure 9, an MISP004 serves a BRSC

TFS012 Multi-purpose ISDN Signaling Processor D-channel

The Multi-purpose ISDN Signaling Processor (MISP) card is used for ISDN Basic Rate Interface (BRI) activities. The MISP D-channel management messages check for communication problems between the MISP and the terminals. The report contains the traffic management activity for each DSL based on the exchange of signaling messages between the MISP and the terminals over the D-channels.

Beginning with X11 Release 19, this report contains MISP and BRSC information for MISPs that serve BRSCs. In TFS012, the report indicates the total for line cards that the MISP serves directly. BRSC information shows D-channel data collected at the BRSC.

| Format | | | | | |
|------------------------|-------------------|---------------------------|----------------------|---------------------|----------------|
| System ID TFS012 | | | | | |
| MISP/ BRSC ID | | | | | |
| MISP/ BRSC links | Terminal links | MISP/ BRSC messages | Terminal messages | Incomplete calls | Link errors |
| Example | | | | | |
| 0111 TFS012 | | | | | |
| MISP | 002 | | | | |
| 00010 | 00015 | 00010 | 00016 | 00011 | 00002 |
| MISP | 004 | | | | |
| 00001 | 00008 | 00016 | 00009 | 00017 | 00001 |
| BRSC | 24 0 15 | | | | |
| 000004 | 000012 | 000021 | 000089 | 000061 | 00021 |

MISP/BRSC links

Number of MISP/BRSC-initiated link initializations.

Terminal links

Number of terminal-initiated link initializations.

MISP/BRSC messages

Number of management messages sent from the MISP, the BRSC, or both to terminals.

Terminal messages

Number of management messages sent from terminals to the MISP, the BRSC, or both.

Incomplete calls

Number of times the links associated with D-channels were not able to complete calls.

Link errors

Number of management data link errors.

If the MISP is configured with BRSCs, a separate report prints for each BRSC.

The following example shows an MISP004 serving a BRSC.

TFS013 Multi-purpose ISDN Signaling Processor messages

The Multi-purpose ISDN Signaling Processor (MISP) card is used for ISDN Basic Rate Interface (BRI) activities. The MISP messages report shows the total number of call processing, maintenance, and management messages sent through each MISP in the system grouped by message size. Maintenance technicians analyze these totals to determine if messages are within the specified lengths.

Beginning with X11 Release 19, this report includes BRSC information for MISPs that serve BRSCs. The MISP information shows totals for the line cards that the MISP serves directly. BRSC data reflects D-channel information collected at the BRSC.

The report has three columns, as defined below:

1–10 bytes

Total number of messages from 1 to 10 bytes long.

11–20 bytes

Total number of messages from 11 to 20 bytes long.

Greater than 20

Total number of messages more than 20 bytes long.

A sample report appears below. If the MISP is configured with BRSCs, a separate report prints for each BRSC.

| Format | | |
|------------------|-------------|-------|
| System ID TFS013 | | |
| MISP/BRSC ID | | |
| 1–10 bytes | 11–20 bytes | > 20 |
| Example | | |
| 0111 TFS013 | | |
| MISP: 002 | | |
| 00060 | 00000 | 00000 |
| MISP: 004 | | |
| 00012 | 00004 | 00000 |
| BRSC: 024 0 15 | | |
| 00004 | 00002 | 00000 |

TFS014 ISDN BRI trunk DSL system report

The ISDN BRI trunk DSL system traffic report (TFS014), dedicated to ISDN BRI trunk DSLs, provides traffic measurement similar to the one provided by the ISDN PRI system traffic report. The report contains the following information for each MISP in the system.

| Format | |
|--|--|
| System ID | TFS014 |
| MISP ID | |
| Total number of outgoing maintenance messages | Total number of incoming maintenance messages |
| Total number of outgoing administration messages | Total number of incoming administration messages |
| Total number of outgoing protocol messages | |
| Total number of Layer 3 protocol messages | |
| Total number of Layer 2 protocol messages | |
| Total number of Layer 1 protocol errors | |
| Total number of connected calls | |

TFS015 Meridian Packet Handler traffic report

Beginning with X11 Release 19, the Meridian Packet Handler (MPH) report provides specific information about incoming and outgoing calls and data packets. This report is particularly useful for analyzing the flow of data over network links.

The report has ten columns as described below:

- aa:** The loop number of the Meridian Packet Handler.
- bb:** The link interface type (MCU, PRI, BCH, BRIL, BRSC); up to four characters (to determine which link interface type is listed in bb, STAT the interface using STIF in LD 32: the interface and timeslot appear).
- cc:** The timeslot number of the link on the MPH loop; four digits.
- dd:** Number of initializations of layer 2 link(s); up to five digits.
- ee:** Number of attempted incoming calls; up to five digits.
- ff:** Number of completed incoming calls; up to five digits.
- gg:** Number of attempted outgoing calls; up to five digits.
- hh:** Average length in seconds of a data call; up to five digits.
- ii:** Number of incoming data packets; up to ten digits.
- jj:** Number of outgoing data packets; up to ten digits.

A sample report appears below. The exact field sizes could not be reproduced. In the actual report, the ii and jj columns wrap to the second line.

| Format | | | | | | | | | |
|----------------|--------|------|-------|-------|-------|-------|-------|-------|-------|
| System ID | TFS015 | | | | | | | | |
| aa | bb | cc | dd | ee | ff | gg | hh | ii | jj |
| Example | | | | | | | | | |
| 0111 | TFS015 | | | | | | | | |
| MPH002 | | | | | | | | | |
| MCU | 0006 | 0019 | 00040 | 00040 | 00006 | 00001 | 00360 | 00780 | 00568 |

TFS101 dial tone speed threshold

The dial tone speed threshold indicates the maximum acceptable percentage (in units of 0.1 percent) of calls with dial tone delay longer than 3 seconds. The report compares this threshold figure to the actual percentage of calls with dial tone delay. It is also output when a threshold violation occurs on TFS002.

| Format | |
|-------------------------|-----------|
| System ID | TFS101 |
| Percent dial tone delay | Threshold |
| Example | |
| 200 | TFS101 |
| 00017 | 00015 |

TFS102 loop traffic threshold

This threshold, which applies to all loops, shows loop usage in CCS per measurement period. Also output when a threshold violation occurs in TFS001 are network FTMs.

| Format | | |
|----------------|------------|-----------|
| System ID | TFS102 | |
| Loop number | Loop usage | Threshold |
| Example | | |
| 220 | TFS102 | |
| 01 | 0000550 | 00450 |

TFS103 junctor traffic threshold

This threshold, expressed in CCS, highlights junctor usage per measurement period. When the junctor traffic threshold is exceeded, TFS007 junctor traffic prints. The threshold is the same for all junctor groups and cannot be set individually.

| Format | | |
|----------------|---------------|-----------|
| System ID | TFS105 | |
| Junctor group | Junctor usage | Threshold |
| Example | | |
| 222 | TFS105 | |
| 13 | 0002341 | 0002000 |

TFS301 initialization

A TFS301 message precedes traffic data output after an initialization. This message warns that some traffic data has been lost due to the initialization, and that the report is incomplete.

TFS302 traffic schedule changed

A TFS302 message warns that the traffic schedule was changed during the interval covered by the traffic report. Traffic report data may be invalid if the change covered dates or hours not previously scheduled or options not previously set.

TFS303 traffic measured over one hour

A TFS303 message indicates that traffic report data accumulated for more than one hour and is therefore inaccurate. For example, if reporting is scheduled to stop at 18:00 and restart at 08:00, the 08:00 report contains all data between 18:00 and 08:00 (14 hours). For an accurate report of the 08:00 to 09:00 hour, schedule reports to begin at 7:00.

TFS401 36 CCS terminals

A TFS401 message, which prints when a call disconnects, identifies connections held for more than 36 CCS but fewer than 50 CCS (between approximately 60 and 83 minutes). Although the regular traffic data measurements include the traffic data for these lengthy connections, a data analyst may decide that these calls represent abnormal usage and choose to exclude the data from statistical calculations.

TFS402 50 CCS terminals

A TFS402 message identifies connections, including data connections, that were held for 50 CCS or longer. The traffic data for these connections is not included in regular traffic measurements (pegs and usage). If network blockage occurs even though usage does not exceed recommended maximum CCS, long calls may trigger the TFS402 message. Be sure that terminals used for long connections are evenly distributed on your network loops. If no apparent reason for the message exists, the problem may be faulty hardware.

| Format | | | | |
|----------------|-----|--------------|--------------|------|
| TFS402 | CCS | TN1 | TN2 | TYPE |
| Example | | | | |
| TFS402 | 64 | 002 01 09 10 | 039 07 05 01 | 11 |

Legend

CCS gives the connection usage CCS.

TN1 and TN2 identify the terminal numbers. TFS001, TFS002, TFS005, TFS007, TFC001, and TFC002 figures can be corrected for previous hours because loops are involved.

TYPE identifies how the network path was used.

- 0 dial tone
- 1 busy tone
- 2 overflow tone
- 3 ringback tone
- 4 tone ringing
- 5 miscellaneous tones
- 6 outputting
- 7 unknown use of a TDS
- 8 Digitone receiver
- 9 incoming trunk speech path
- 10 outgoing trunk speech path
- 11 intra-customer speech path
- 12 random trunk speech path
- 13 reserved path not used

TFS411 36 CCS peg count

TFS411 counts the connections held longer than 36 CCS but less than 50 CCS that have disconnected since the last reporting period. It also includes the total usage (CCS) on the connections if no online device is available to print TFS401 or TFS402 measurements. The TFS411 and TFS412 messages appear between threshold violations and system violations, and between system traffic measurements and customer traffic measurements. Consistently long connections may indicate lengthy data calls, hung timeslots, or hardware faults.

TFS412 50 CCS peg count

TFS412 provides a peg count of the number of connections that were held for 50 CCS or longer that have disconnected since the last reporting period. It also includes the total usage (CCS) on the connections. The TFS411 and TFS412 messages appear between threshold violations and system violations, and between system traffic measurements and customer traffic measurements. If these figures indicate a potential problem, turn on the traffic TTY and examine the TFS401 and TFS402 messages for more information. Consistently long connections may indicate lengthy data calls, hung timeslots, or hardware faults.

TFS501 and 502 audit messages

The Audit program (LD 44) outputs TFS501 and TFS502 when it releases hung timeslots. (A disconnected call does not necessarily result in a released timeslot.)

TFS501 identifies the loop number and the number of timeslots recovered. TFS502 identifies the junctor group number and the number of timeslots recovered. Data analysts should consider these warning messages when examining traffic statistics for the indicated loops.

Customer traffic reports

LD 02 defines the different report schedules and options available for each customer.

TFC001 networks

TFC001 describes traffic details for each customer group defined in LD 15 on a per call (not timeslot) basis, showing failures to match (FTMs), usage (CCR), peg count, partial dial counts, and abandoned call counts. See Figure 10 for the TFC001 report format.

The measurements in TFC001 total half those in TFS001, as TFC001 measurements increment for established calls only.

The maximum blockage for incoming, outgoing, and tandem calls on your system should be 1 percent. Intracustomer blockage should not be more than 4 percent. Determine the grade of service with this formula:

$$\text{FTM} \div (\text{peg count} + \text{FTM}) \times 100$$

Incoming FTM

The incoming FTM increments if a call is blocked (a stage of the call cannot be completed) between the time that an incoming call is recognized and the time that the trunk is idled.

For example, if a call cannot be presented to an idle attendant because of blocking, then an incoming FTM increments. If the call is successfully presented to an attendant, but the attendant cannot extend the call to an idle terminal because of blocking, then an incoming FTM increments. The incoming FTM increments once per incoming call regardless of the type of blocking or combination of blocking.

Incoming usage

When an established path between any terminal and an incoming trunk is idled, the incoming usage accumulates.

Incoming peg count

When a seized incoming trunk that had an established connection with a terminal (other than another trunk) is idled, the incoming peg count increments.

Outgoing FTM

If a path to an idle outgoing trunk is not found because no timeslot was available, the outgoing FTM increments. A call can increment the outgoing FTM only once. Further attempts to secure a trunk, for example, Ring Again, do not increment the FTM.

Outgoing usage

When an established path that includes an outgoing trunk is idled, the outgoing usage accumulates.

Outgoing peg count

When a trunk is seized for an outgoing call and establishes a connection with a nontrunk terminal, the outgoing peg count increments after the trunk is idled.

Intracustomer FTM

This measurement increments when a timeslot is not available between a customer's two nontrunk terminals.

Intracustomer usage

When a path is idled, this number increments to show the total calls between two terminals within a single customer.

Multi-User Login

A traffic file displays and stores system reports and user reports for the Multi-User Login feature.

Intracustomer peg count

The intracustomer peg count increments when an established path between two of a customer's nontrunk terminals is idled.

Tandem FTM

If a timeslot is not available for a path between two trunks, tandem FTM increments. If two attempts to find a path between the originating trunk and an idle outgoing trunk fail, one tandem FTM is pegged.

Tandem usage

When an established path between two trunks becomes idle, tandem usage accumulates.

Tandem peg count

The tandem peg count increments when an established connection between two trunks is idled. Since a tandem call does not increment either incoming or outgoing peg counts, tandem measurements must be added once to both the incoming and outgoing measurements to obtain total incoming and outgoing FTM and peg counts.

Permanent signal

The permanent signal increments when a Meridian 1 or Meridian Digital Telephone goes off hook but does not begin dialing within 30 seconds after receiving the dial tone.

The permanent signal increments when a 2500 telephone goes off hook but does not begin dialing within 15 seconds after receiving the dial tone.

Abandon

The abandon count increments when a terminal goes on hook before completely dialing a directory number or trunk access code and number. Abandon does not increment when a trunk has been seized, and the number has been partially outpulsed. It also increments when a 2500 set goes off hook, but does not begin dialing within 15 seconds of receiving a dial tone.

Partial dial

Partial dial increments when a 2500 telephone goes on hook before completely dialing a directory number or trunk access code.

Figure 10
TFC001 networks

| Format | | | |
|-------------------|-------------------|-------------------------|-------|
| System ID | TFC001 | | |
| Customer number | | | |
| Incoming FTM | Incoming CCS | Incoming peg count | |
| Outgoing FTM | Outgoing CCS | Outgoing peg count | |
| Intracustomer FTM | Intracustomer CCS | Intracustomer peg count | |
| Tandem FTM | Tandem CCS | Tandem peg count | |
| Permanent signal | Abandon | Partial dial | |
| Example | | | |
| 200 | TFC001 | | |
| 000 | | | |
| 00001 | | 0001985 | 01143 |
| 00002 | | 0002909 | 01732 |
| 00003 | | 0000339 | 00047 |
| 00000 | | 0000046 | 00062 |
| 00001 | | 00004 | 00002 |

TFC002 trunks

Each trunk group generates a TFC002 report that displays trunk usage. The TFC002 report always prints when an All Trunks Busy (ATB) condition occurs during the reported period. ATB and overflow indicate that additional trunks may be needed. See Figure 12 for the TFC002 report format.

To determine grade of service, use the following formula:

$$\begin{aligned} \text{Outgoing CCS} \div \text{Number trunks working} &= \text{CCS per trunk} \\ (\text{CCS per trunk} \div 36) \times 100 &= \text{grade of service} \end{aligned}$$

Trunk traffic report options

The following modifications to trunk traffic reporting have been implemented in X11 release 21 to improve the accuracy of TFC002 traffic reports. The options are selected in the Configuration Data Block. Each option can be enabled or disabled (the default condition).

Traffic Period Option This option allows a customer to enhance their TFC002 reports to accumulate trunk usage data every traffic period instead of accumulating usage only after a call disconnects. Therefore, with this option enabled, trunk usage accumulates at the end of a traffic period even while a call is still established. This option enables the CCS associated with lengthy calls to be reported in each traffic report interval through the call duration. The peg count is reported at disconnect time.

If this option is disabled, trunk usage will add its entire duration into the traffic period in which the disconnect occurs. If the duration is longer than the 36 CCS (CCS = 100 call seconds), but less than 50 CCS, a TFS401 message is output. However, that duration is still accumulated and included in the traffic reports. If the duration is longer than or equal to 50 CCS, a TFS4032 message is output. This duration is not accumulated, and is excluded from the traffic reports.

Trunk Seizure Option This option provides the ability to start accumulating statistics upon trunk seizure, rather than when the call is established.

If this option is disabled, Meridian 1 traffic statistics begin accumulating when a call is established.

Meridian 1 determines that the call is established when one of the following occurs:

- The End-of-Dialing (EOD) timer times out after the last digit is dialed
- The octothorpe (#) is dialed
- Answer supervision is received

In some situations, customers could not match Meridian 1 traffic reports with their carrier reports, because many carriers start accumulating statistics when a trunk is seized.

Operating parameters

The peg count occurs even if a call is not established.

If the duration of a call is less than two to four seconds, then the peg count is not accumulated. This functionality only applies when the trunk seizure option is enabled.

Feature interactions

Automatic Call Distribution (ACD) A trunk call to an ACD DN will only be considered established once this call is answered. It is not considered established while this call is waiting in the ACD queue. Therefore, at the end of a traffic period, if a trunk call is in the ACD queue, the Traffic Period Option will not accumulate the duration for this call.

Note that when the duration is accumulated at disconnect or at the end of a traffic period after this call is answered, the total duration including the time the call was in the ACD queue is accumulated. This total duration may be longer than a single traffic period due to the time in the ACD queue and a TFS401, TFS402, or TFS403 message may be output.

Music Trunks The Trunk Seizure Option is not supported on this type of trunk.

Recorded Announcement (RAN) Trunks The Trunk Seizure Option is not supported on this type of trunk.

Traffic Monitor The Traffic Monitor feature outputs certain traffic data approximately every minute.

The trunk usage and peg count output by the Traffic Monitor feature can be enhanced by enabling the Trunk Seizure Option. The accumulated duration and peg count of a call will begin at trunk seizure time instead of at the time the call was established.

The Traffic Monitor output that starts during the same time that the regular traffic report starts is impacted if the Traffic Period Option is enabled. With this option enabled, the duration of all currently established calls is accumulated at the end of the traffic period. Therefore, this additional duration is also accumulated in the next minute's traffic monitor output. For example, the Traffic Monitor feature and the Traffic Period Option are both enabled. Regular traffic reports are output every half hour. The difference in the accumulated duration from 10:29 to 10:30 may increase dramatically due to the additional durations accumulated for currently established calls at the end of this traffic period.

Feature implementation

LD 17—Both options can be enabled or disabled on a system-wide basis using this overlay.

| | | |
|-------|----------|---|
| REQ | CHG | Change |
| TYPE | CFN | Configuration data block |
| ... | | |
| PARM | (NO) YES | (Do not) change system parameters. |
| ... | | |
| - TPO | (NO) YES | Trunk Period Option Enter YES to enable, NO to disable, and <CR> to keep the current value. |
| - TSO | (NO) YES | Trunk Seizure Option Enter YES to enable, NO to disable, and <CR> to keep the current value. |

If the Trunk Seizure Option is enabled, four fields are added to the trunk usage traffic report. The new fields are highlighted with bold lettering in Figure 12.

Figure 11
TFC002 trunks with Trunk Seizure Option (X11 release 21 and greater)

| | |
|---------------------------------|--|
| Format | |
| System ID | TFC002 |
| Customer number | |
| Route number | Trunk type |
| Trunks equipped | Trunks working |
| Incoming usage @ seizure | Incoming peg count @ release of seizure |
| Outgoing usage @ seizure | Outgoing peg count @ release of seizure |
| Outgoing overflow | All Trunks Busy |
| Toll peg count | All Trunks Busy for non-priority users |
| Incoming ISA peg count | Outgoing ISA peg count |

Trunk types

TFC002 includes usage, peg count, overflow, ATB, and toll peg count for these trunk types:

| | |
|------|---|
| ADM | Data port interfacing with Data Line Card |
| AIOD | Automatic Identification of Outgoing Dialing |
| CAA | Common Control Switch Arrangement with ANI |
| CAMA | Centralized Automatic Message Accounting |
| CCSA | Common Control Switch Arrangement |
| CO | Central Office |
| DICT | Dictation |
| DID | Direct Inward Dialing |
| FX | Foreign Exchange |
| FGDT | Feature Group D |
| ISA | Integrated Services Access (X11 release 16 and later) |
| MDM | Modem interfacing with 500-type line card |
| MUS | Music |
| PAGE | Paging |
| RAN | Recorded Announcement |
| RCD | Emergency Recorder |
| RLTM | Release Link Main |
| RLTR | Release Link Remote |
| TIE | Tie trunks |
| WATS | WATS lines |

Integrated Services Access (ISA) trunks

Two types of routes are configured for ISA trunks: ISA master routes and ISA service routes. ISA master routes are eligible for the full traffic report; the service routes only contain data for the incoming ISA peg count and outgoing ISA peg count fields. No other traffic is tracked for ISA service routes. See Figure 12 for an example of the report containing ISA fields and also *ISDN Primary Rate Interface description and administration (553-2901-100)* for more information on ISA trunks.

Trunks equipped

Trunks equipped are the number of trunks working in the route.

Trunks working

The number of trunks enabled in the route appears in this column.

Incoming ISA peg count

A path that is eligible for the two following fields, incoming trunk usage and incoming trunk peg count, increments for the ISA service route and for the ISA master route. See *ISDN Primary Rate Interface description and administration* (553-2901-100) for more information.

Incoming trunk usage

Incoming trunk usage shows CCS for each trunk and may exceed 36 CCS an hour since it includes the entire time the connection was established. A connection spanning more than one period appears in the report for the period in which it ended. This may result in an understatement of CCS reported for some periods.

If the Trunk Seizure Option is alienabilities new fields for the trunk usage traffic report depend on when the trunk is seized, not when the trunk is established. Therefore, anytime a trunk becomes busy, duration will be accumulated in the new trunk usage traffic report field.

Incoming trunk peg count

The incoming trunk peg count increments when a trunk assigned to the customer becomes idle.

If the Trunk Seizure Option is enabled, the new fields for the trunk peg count traffic report will also apply to all calls that seize the trunk. Therefore, whether this call is established or not, as long as the call seizes the trunk, this call is pegged in the new trunk peg count traffic report field.

Outgoing ISA peg count

A path that is eligible for the two following fields, outgoing trunk usage and outgoing trunk peg count, increments for the ISA service route and for the ISA master route. See *ISDN Primary Rate Interface description and administration* (553-2901-100) for more information.

Outgoing trunk usage

Outgoing trunk usage increments in CCS when a trunk assigned to the customer becomes idle.

Outgoing trunk peg count

The outgoing trunk peg count increments when a trunk assigned to the customer becomes idle.

Outgoing trunk overflow

Outgoing trunk overflow increments when no idle enabled trunk is available to respond to a trunk request, even if the request searches other routes for an idle trunk or the caller initiates Ring Again. If a trunk is idle and enabled but timeslots are not available, then outgoing trunk overflow does not increment. Use the following formula to determine route blockage:

$$\text{Overflow peg count} \div (\text{outgoing peg count} + \text{overflow peg count}) \times 100$$

The maximum desired blockage for a central office trunk is 1 percent, and average holding time should be approximately 2 to 3 minutes. The maximum desired blockage for most other trunks is 2–5 percent, with an average holding time of 4 to 5 minutes. Average trunk use is 20 CCS; 25 CCS is high trunk usage.

Outgoing trunk connections are not considered complete until the end-of-dialing (EOD) timer expires after the last digit is dialed. Connections shorter than the EOD timer do not accumulate traffic data as complete connections. End of dialing can be forced by pressing the pound sign (#) to override the timer.

If an outgoing trunk call disconnects before the EOD timer expires, TFS001 usage accumulates. TFS001 peg count, TFC001, and TFC002 do not increment.

All Trunks Busy

All Trunks Busy (ATB) increments when all trunks in a group (with more than one trunk) are busy. A high ATB combined with high overflow indicates system blockage. High ATB and low overflow reflect efficient system use. To calculate the percentage of calls seizing the last available trunk, use the following formula:

$$\text{All trunks busy} \div (\text{outgoing peg count} + \text{outgoing overflow peg count}) \times 100$$

To determine blockage based on the overflow, use this formula:

$$\text{Overflow peg count} \div (\text{outgoing peg count} + \text{overflow peg count}) \times 100$$

Toll peg count

Toll peg count for CO and FX routes increments when the first or second meaningful digit dialed after the access code is either a "0" or a "1." (Use the NATL and TDIG prompts in LD 16 to define other digits as toll digits.) A meaningful digit is one that is not absorbed by either the Meridian 1 or by the connecting CO. Even if the call is abandoned after the first meaningful digit, the toll peg count increments, possibly resulting in a toll peg count that exceeds the actual number of completed calls. Determine the percentage of toll calls by using the following formula:

$$\text{Toll peg count} \div \text{outgoing peg count} \times 100$$

A high percentage of toll calls reflects a need to evaluate alternative routing or trunk use.

Incoming Integrated Services Access (ISA) peg count

Beginning with X11 release 16, the incoming ISA peg count increments for the trunk group when an incoming ISA trunk assigned to the customer becomes idle.

Outgoing ISA peg count

Beginning with X11 release 16, the outgoing ISA peg count increments for the trunk group when an outgoing trunk assigned to the customer becomes idle.

Figure 12
TFC002 trunks with ISA service routes (X11 release 16 and greater)

| Format | |
|---|--|
| System ID | TFC002 |
| Customer number | |
| Route number | Trunk type |
| Trunks equipped | Trunks working |
| Incoming usage | Incoming peg count |
| Outgoing usage | Outgoing peg count |
| Outgoing overflow | All Trunks Busy |
| Toll peg count | All Trunks Busy for non-priority users |
| Incoming ISA peg count | Outgoing ISA peg count |
| Example | |
| 200 | TFC002 |
| 007 | |
| 004 | ISA |
| 00008 | 00007 |
| 0000088 | 00046 |
| 0000114 | 00052 |
| 00001 | 00002 |
| 00006 | 00001 |
| 00000 | 00000 |
| Note: ISA master routes do not include incoming ISA peg count and outgoing ISA peg count in the traffic reports. | |

TFC003 customer console queue measurements

TFC003 examines the treatment of calls in customer queues: speed of response, number of calls delayed, number of calls abandoned, average wait time of delayed calls, and average wait time of abandoned calls. Timing measurements accumulate in 2 second units and appear in .01 second units. The fewer the calls in the sample (fewer than ten), the less reliable the data. See Figure 13 for TFC003 report format.

Systems with the Centralized Attendant Service (CAS) remote feature also receive TFC003 measurements for Release Link Trunk (RLT) for both local and remote attendants. Refer to *Centralized Attendant Service description and engineering* (553-2681-100).

Average speed of answer

Average speed of answer shows how long (in 0.1 seconds) a delayed call waits in the attendant queue. Attendant response time indicates how long the attendant takes to answer the call after it has been presented to a loop key on the console. Determine average answer speed with the following formula:

$$\frac{[(\text{calls delayed} \times \text{avg time in queue}) \div \text{total calls}] + \text{avg attendant response}}$$

Example

Peg count in queue = 2

Average time in queue = 3 seconds

Average attendant response = 2.4 seconds

Total calls = 9

Average speed of answer = $[(2 \times 3) \div 9] + 2.4 = 3.1$ seconds

The percentage of the total calls (including incoming calls, dial “0” calls, and recalls) that enter the attendant queue is not recorded, preventing analysis of the correlation between average speed of answer, average attendant response, and average time in queue.

Average attendant response

Average attendant response is the average time (in 0.1 seconds) that elapses between a call being presented to an attendant console and the attendant answering it. If the attendant answers a different call via Incoming Call Identification (ICI) keys, time accumulates as if the call answered were the one first presented.

Calls delayed peg count

This peg count increments whenever a call is removed from the attendant queue. A call that is removed from and then returned to the queue (because a second call was selected using an ICI) increments the measurement only once as if the first call had remained in the queue throughout. Calls abandoned at any point do not increment this count. To determine the percentage of delayed calls, use the following formula:

$$\text{Calls delayed peg count} \div (\text{internal calls} + \text{external calls peg count}) \times 100$$

Average time in queue

The total amount of time (in 0.1 seconds) that calls spend in the attendant queue is divided by the number of calls placed into that queue. If a call is presented to the attendant but a different call is selected using the ICI keys, the time accumulated adjusts so that the ICI call appears to have been presented first.

Abandoned calls peg count

This measurement increments whenever a call leaves the attendant queue without being answered. To determine the percentage of calls abandoned, use the following formula:

$$\text{Abandoned calls} \div (\text{internal} + \text{external console calls} + \text{abandoned calls}) \times 100$$

Average wait time of abandoned calls

This is the average time in tenths of seconds that a call waited before disconnecting.

Figure 13
TFC003 customer console measurements

| Format | |
|---------------------------|--------------------------------------|
| System ID | TFC003 |
| Customer number | |
| Average speed of answer | Average attendant response |
| Calls delayed peg count | Average time in queue |
| Abandoned calls peg count | Average wait time of abandoned calls |

| Example | |
|----------------|--------|
| 200 | TFC003 |
| 003 | |
| 00107 | 00048 |
| 00289 | 00079 |
| 00015 | 00192 |

TFC004 individual console measurements

These measurements examine calls by attendant, providing the total number of calls handled by each attendant console, the calculated work time per call, and the total amount of time that the console was attended. A call that is answered by an attendant, extended to an internal DN, and recalled to an attendant, appears as a new call in these measurements. See Figure 14 for the TFC004 report format.

Compare the figures in TFC004 with those in TFC003 to determine whether any problems originate with equipment or with attendants.

Peg count of internal calls handled by attendant

This measurement increments when an internal call disconnects from the console. This includes calls originated by the attendant, internal calls to the attendant (dial "0"), attendant accessing paging, and recalls from camped on or ring no answer calls. Any internal call increments this peg count when it is removed from the console, whether or not it has been extended.

The peg count for internal calls handled by the attendant plus the count for external calls handled by the attendant equals the total calls the attendant handles.

Total time spent servicing internal requests

This is the total time, in CCS, that an attendant handles active internal or outgoing calls originating in the system. (The system records the CCS after the call is removed from the console or held on the console. A held call that is reactivated accrues additional CCS.)

Peg count of external calls handled by attendant

This peg count includes calls to a Listed Directory Number (LDN) in a direct inward dial (DID) system, and CO, WATS, and Foreign Exchange (FX) trunks that terminate on the console as well as busy DID calls that hunt to the attendant. Any internal call increments this peg count whenever it is removed from the console, whether or not it is extended.

If a call comes in, and the attendant extends it to a telephone, it is pegged as an external call. If that same call recalls back to the attendant, it is pegged again as an internal call.

Total time spent servicing external requests

This is the total time, in CCS, that an attendant has active incoming calls on the console. Time accumulates when the call is removed from the console or is held on the console. A call on hold accumulates more time after it is reactivated.

Total time console is attended

This is the total time, in CCS, that the console is not in Night Service or Position Busy. Calls that originate or complete when the console is in Night Service or Position Busy do not appear in this figure.

Total time spent servicing calls

This is the total time, in CCS, that each attendant spends servicing internal (including those originated by the attendant) and external call requests, with a peg count and work time. The total time spent servicing calls may not equal the sum of the total time spent servicing internal and external requests because of approximations.

The total time a console is in use plus the total time the console is in Night Service or Position Busy is equal to the total available time.

Number of times all attendant loops are busy

This measurement increments when all loop keys on the attendant console are busy.

Attendant Alternative Answering (AAA) peg count

This measurement, available beginning with X11 release 15, indicates the total number of attempts to forward a call to AAA. For a complete discussion of AAA, see *Software Feature Guide*.

Successful AAA termination peg count

The termination peg count, available beginning with X11 release 15, indicates the total number of successful terminations to an AAA position. For a complete discussion of AAA, see *Software Feature Guide*.

Calculate attendant performance

Use the following formulas to determine attendant performance.

Total number of calls handled by the attendant

All console internal peg count + all consoles external peg count + abandoned call peg count in TFC003

Average number of calls per attendant

All attendants' total number of calls ÷ number of attendants

Percentage of delayed calls

Delayed calls peg count in TFC003 ÷ (internal peg count + external peg count for each console) × 100

Percentage of abandoned calls

(Abandoned call peg count from TFC003 ÷ total number of calls handled by all attendants) × 100

Average work time per call for all attendants

Total work time for all attendants ÷ (all attendants' internal + external peg counts) × 100

Percentage of manned time for all attendants

Total manned time for every attendant ÷ (36 × number of attendants manned) × 100

Figure 14
TFC004 individual console measurements

| Format | |
|---|--|
| System ID | TFC004 |
| Customer number | |
| Attendant number | |
| Peg count of internal calls handled by an attendant | Total time spent servicing internal requests |
| Peg count of external calls handled by an attendant | Total time spent servicing external requests |
| Total time a console is attended | Total time spent servicing calls |
| Number of times all attendant loops are busy | |
| Total AAA attempt peg count | Successful AAA termination peg count |
| Example | |
| 200 | TFC004 |
| 000 | |
| 001 | |
| 00076 | 0000011 |
| 00167 | 0000017 |
| 000036 | 0000029 |
| 00000 | |
| 00005 | 0000003 |
| 002 | |
| 00057 | 0000012 |
| 00066 | 0000021 |
| 000036 | 0000033 |
| 00000 | |
| 00004 | 0000003 |

TFC005 feature key usage

This report looks at patterns of customer usage: which features are activated from multi-line telephone sets (excluding 500/2500 sets) or attendant consoles and the call selection procedures. Feature key usage does not include programming changes (for example, changing a call forward directory number). See Figure 15 for TFC005 report format.

Figure 15
TFC005 feature key usage

| Format | |
|-----------------|-----------|
| System ID | TFC005 |
| Customer number | |
| Feature number | Peg count |
| Example | |
| 200 | TFC005 |
| 000 | |
| 000 | 00012 |
| 001 | 00002 |
| 002 | 00003 |
| 003 | 00015 |
| ... | ... |
| 049 | 00000 |

Each member of a conference causes an increment to the count. For example, a five-party conference pegs three times, once for each conferee added to the original two parties.

A peg count appears for each feature per specified customer. Each feature has its own output line, identified by number. (See Figure 16.)

Figure 16
X11 release 19 TFC005 feature key numbers

| Number | Feature | Number | Feature |
|--------|----------------------|---------|--------------------------------|
| 000 | Auto Dial | 020 | Message Waiting Indicator |
| 001 | Call Forward | 021 | Message Indication |
| 002 | Call Pickup | 022 | Message Cancellation |
| 003 | Call Transfer | 023 | Message Center INCALLS |
| 004 | Call Waiting | 024 | Attendant Overflow |
| 005 | 3-Party Conference | 025 | Group Call |
| 006 | 6-Party Conference | 026 | Auto Answerback |
| 007 | Manual Signaling | 027 | See Note |
| 008 | Override | 028 | See Note |
| 009 | Privacy Release | 029 | Call Park |
| 010 | Private Line Service | 030 | Stored Number Redial |
| 011 | Ring Again | 031 | Last Number Redial |
| 012 | Speed Call | 032 | Malicious Call Trace |
| 013 | Voice Call | 033 | Enhanced Hot Line |
| 014 | Volume Control | 034 | Group Pickup |
| 015 | Busy Verify | 035 | DN Pickup |
| 016 | Barge-in | 036 | Attendant End-to-End Signaling |
| 017 | Call Selection | 037 | Internal Call Forward |
| 018 | Attendant Recall | 038 | End-to-End Signaling |
| 019 | Dial Intercom | 039-045 | See Note |

Note: Feature numbers 27, 28, and 39-45 are reserved. The peg counts for these is always zero.

Figure 17
X11 release 20 and later TFC005 feature key numbers

| Number | Feature | Number | Feature |
|--------|---------------------------|--------|--------------------------------------|
| 000 | Auto Dial | 025 | Group Call |
| 001 | Call Forward | 026 | Auto Answerback |
| 002 | Call Pickup | 027 | Trunk-Mail Access Restriction (R-22) |
| 003 | Call Transfer | 028 | Trunk to Trunk Connection (R-22) |
| 004 | Call Waiting | 029 | Call Park |
| 005 | 3-Party Conference | 030 | Stored Number Redial |
| 006 | 6-Party Conference | 031 | Last Number Redial |
| 007 | Manual Signaling | 032 | Malicious Call Trace |
| 008 | Override | 033 | Enhanced Hot Line |
| 009 | Privacy Release | 034 | Group Pickup |
| 010 | Private Line Service | 035 | DN Pickup |
| 011 | Ring Again | 036 | Attendant End-to-End Signaling |
| 012 | Speed Call | 037 | Attendant Break In |
| 013 | Voice Call | 038 | Attendant Break In Busy Verify |
| 014 | Volume Control | 039 | Semi-automatic Camp On |
| 015 | Busy Verify | 040 | Series Call Activation |
| 016 | Barge-in | 041 | Ringing Change |
| 017 | Call Selection | 042 | See Note |
| 018 | Attendant Recall | 043 | End-to-End Signaling |
| 019 | Dial Intercom | 044 | Internal Call Forward |
| 020 | Message Waiting Indicator | 045 | Attendant Remote Call Forward |
| 021 | Message Indication | 046 | BRI Call Forward |
| 022 | Message Cancellation | 047 | Network Intercom (R-21) |
| 023 | Message Center INCALLS | 048 | See Note |
| 024 | Attendant Overflow | 049 | See Note |

Note: Feature numbers 42, 48 and 49 are reserved. The peg count for these is always zero.

TFC006 Radio Paging

These measurements give the number of calls processed by Radio Paging. Figure 18 shows the TFC006 report format. Figure 19 explains the contents of each field in the report.

Figure 18
TFC006 radio paging report format

| | | | | | | | |
|-----------------|--------|--------|------|------|------|-------------------------------------|------------------|
| System ID | | TFC006 | | | | | |
| Customer Number | | | | | | | |
| RPA | SYS bb | cccc | dddd | eeee | ffff | % Paging count | |
| | | gggg | hhhh | iiii | jjjj | % Selectio n, auto/ manual | |
| | | kkkk | llll | mmmm | nnnn | oooo | % Mode counts |
| | | pppp | qqqq | rrrr | ssss | % Average time | |
| | | tttt | uuuu | vvvv | | % RAN | |

Figure 19
TFC006 radio paging report fields

| Field | Measurement |
|--------------|--|
| bb | RPA system number |
| cccc | Request peg count |
| dddd | Request being blocked peg count |
| eeee | Request abandoned by caller |
| ffff | Preselection peg count |
| gggg | Postselection peg count |
| hhhh | Auto mode peg count |
| iiii | Manual mode peg count |
| jjjj | Diversion peg count |
| kkkk | Paging mode 1 peg count |
| llll | Paging mode 2 peg count |
| mmmm | Paging mode 3 peg count |
| nnnn | Paging mode 4 peg count |
| oooo | Paging mode 5 peg count |
| pppp | Paging time out (TATECO only) |
| qqqq | Average answer time (in 2 sec. units) |
| rrrr | Recall count |
| ssss | Average time in using paging trunk (in 2 sec. units) |
| tttt | RAN request count |
| uuuu | RAN request fail count |
| vvvv | Average RAN connect time (in 2 sec. units) |

Radio Paging measurements

The Radio Paging measurements count each time a call is made with the preselection method, the postselection method, or the paging time limit (paging timeout).

Parallel Radio Paging measurements

Paging Recall counts increments whenever an attempted paging call returns to the attendant.

Average answer time count is the average time that the paged calls are in queue before being answered.

Serial Radio Paging measurements

Automatic mode counts increments each time an automatic serial paging call is attempted.

Manual mode counts increments each time a manual serial paging call is attempted.

TFC007 Call Park

Traffic measurement data accumulates for the following Call Park items. See Figure 20 for TFC007 report format.

System Park peg count

This count identifies the number of calls parked to a System Park DN.

System Park overflow peg count

This count identifies the number of calls that could not be parked because a System Park DN was not available.

Station Park peg count

This count identifies the number of calls parked to a Station Park DN.

Parked call access peg count

This count identifies the number of parked calls successfully accessed.

Park recall peg count

This count identifies the number of parked calls that were recalled after the Call Park Recall Timer expired (defined in LD 50).

Average wait time in Call Park

This value (expressed in units of 0.1 second) reflects the average time that parked calls waited before access.

Figure 20
TFC007 call park

| Format | | | | | |
|-----------------------|--------------------------------|------------------------|------------------------------|------------------------------|--------------------------------------|
| System ID | TFC007 | | | | |
| Customer number | | | | | |
| System Park peg count | System Park overflow peg count | Station Park peg count | parked call access peg count | parked call recall peg count | average wait time in park in seconds |
| Example | | | | | |
| 0001 | TFC007 | | | | |
| 000 | | | | | |
| 00004 | 00000 | 00000 | 00003 | 00001 | 00360 |

TFC008 messaging and Auxiliary Processor links

This report provides traffic data on messaging and Auxiliary Processor links. See Figure 21 for TFC008 report format and the applicable legend.

Auxiliary Processor Link (APL)

This section of the report shows the APL number and its statistics. The information about the APL includes the following:

- output queue overflow (Meridian 1 to APL)
- input queue overflow (APL to Meridian 1)
- average output queue size
- average input queue size
- total time (in seconds) the APL was not operating
- total time (in seconds) input message call register was unavailable
- total 4-second timeouts
- total negative acknowledgments
- total out of synchronization characters received from the Meridian 1

Output message traffic

This information indicates the type and number of messages the Meridian 1 sends to the APL.

Input message traffic

This information concerns the type and number of messages the APL sends the Meridian 1.

Message attendant queue

This section describes the Automatic Call Distribution DN (ACD DN) assigned to the queue, showing the ACD DN assigned as well as operation information.

- Command Status Link (CSL) Value Added Server ID (VAS ID)
- APL number
- total calls in the message attendant queue
- total direct calls to the message attendant
- total indirect calls to the message attendant
- total abandoned calls to the message attendant
- average time calls waited before abandoning
- average delay (time spent waiting for calls ÷ number of calls answered)
- direct call processing time each message attendant spent handling answered calls to the ACD DN
- post call processing time each message attendant was in Not Ready

Telephone set status

This part of the report gives information regarding the telephone usage. The information it provides includes the following:

- ACD DN
- Value Added Server ID (VAS ID)
- total telephone status calls
- total calls accessing Special Prefix (SPRE) codes
- total call forward access calls
- total key access calls
- total unsuccessful messaging calls

Telephone messaging

This section of the report provides information about telephone messaging. The information provided includes the following:

- ACD DN
- Value Added Server ID (VAS ID)
- APL number
- total calls in the message attendant queue
- total telephone status calls
- total successful telephone status calls
- total abandoned calls
- total unsuccessful telephone status calls
- average telephone message processing time (in seconds)
- total telephones requesting the message attendant

Figure 21
TFC008 messaging and Auxiliary Processor links

| Format | | | | | | | | | | |
|-----------------|--------------|--------------|----------------|----------------|--------------|------------|-------|-------------|---------------|-------|
| System ID | | TFC008 | | | | | | | | |
| Customer number | | | | | | | | | | |
| APL | | | | | | | | | | |
| apl# | outq ovfl | inpq ovfl | avgoq size | avgiq size | down time | icr uav | to | nak | char synch | |
| omsg | cas | crs | pci | ans | dis | dnp | digit | tmg | tst | mwi |
| | uts | tnmn | confm | data | audit | cts | dsi | timstp | query | ovd |
| | calans | calds | usm | ceq | cab | setftr | mon | iqs | its | iss |
| | icc | ias | itc | init | isis | iei | icss | sfn | | |
| imsg | con | incl | rls | offh | rdy | nrdy | msi | msb | conf | mwi |
| | opr | gts | tnmn | alm | confm | data | audit | rtsc | tmstp | query |
| | calans | calds | setftr | mon | iqr | itr | isr | isi | iei | icsr |
| PACKET | | | xxxxx | | | | | | | |
| MAQ | | | | | | | | | | |
| acddn | vasid | apl# | qlngth | drct | indrt | abn | avgwt | | avgdly | dcp |
| TST | | | | | | | | | | |
| acddn | vasid | apl# | total calls | spre | cfw | ust | fail | | | |
| TMG | | | | | | | | | | |
| acddn | vasid | apl# | qlngth | total calls | succ | abn | fail | avg time | rqst | |

Legend for TFC008 report

| | |
|------------|--|
| abn | total number of abandoned calls |
| acd dn | Automatic Call Distribution (ACD) Directory Number (DN) |
| APL | Auxiliary Processor Link |
| apl# | Auxiliary Processor Link (APL) number, if used |
| avg dly | the average delay equals total waiting time for all calls divided by the number of calls answered on this ACD DN (abandoned calls are not included in total) |
| avg time | average telephone messaging processing time in seconds |
| avgwt | average time (in seconds) that calls waited before being abandoned |
| avgiq size | average input queue size |
| avgog size | average output queue size |
| cfw | total number of call forward access calls |
| char synch | input characters from processor to Meridian 1 out of synchronization |
| dcp | direct call processing time is the average time (in seconds) that each message attendant spent handling answered calls to this ACD DN |
| down time | total APL down time in seconds |
| drct | total number of direct calls to the message attendant or Voice Mail System (VMS) processor queue |
| fail | total number of unsuccessful telephone messaging or status calls |
| icr uav | input message call register unavailable |
| imsg | input message traffic count (by message type) |
| indrt | total number of indirect calls |
| inpq ovfl | input queue overflow (processor to Meridian 1) |
| MAQ | Message Attendant Queue |
| nak | total number of negative acknowledgments |
| ocr uav | output message call register unavailable |
| omsg | output message traffic count (by message type) |
| outq ovfl | output queue overflow (Meridian 1 to processor) |
| packet | output packet message count from Meridian 1 to auxiliary processor |

| | |
|-------------|---|
| pcp | post call processing is the average time (in seconds) that each message attendant or VMS processor was “not ready” per answered call to this ACD DN |
| qlngth | total number of calls in the message attendant queue or VMS processor queue |
| rqst | total number of telephone messaging calls that requested the message attendant |
| spre | total number of special prefix access calls |
| succ | total number of successful telephone messaging calls |
| TMG | Telephone Messaging |
| to | total 4-second timeout count |
| total calls | the total number of telephone status calls |
| TST | Telephone Set Status |
| ust | total number of user key access calls |
| vas id | the VAS ID of the associated link, if using Command Status Link (CSL) |

Output messages (omsg):

| | |
|--------|-----------------------------|
| cas | Channel Assignment |
| crs | Connection Request Response |
| pci | Present Call |
| ans | Call Answered |
| dis | Disconnect |
| dnp | DN Update |
| digit | Key Message Digit |
| tmg | Telephone Message |
| tst | Telephone Status Message |
| mwi | Message Waiting Indication |
| uts | Update Terminal Status |
| tnmn | Terminal Maintenance |
| confm | Administration Confirmation |
| data | Data Message |
| audit | Audit Message |
| cts | Change Terminal Status |
| dsi | Device State Information |
| timstp | AML Time Stamp |

| | |
|------------------------|---|
| query | Server Query |
| ovd | Overload Warning |
| calans | Call Answer |
| calds | Call Disconnect |
| usm | Unsolicited Status Message |
| ceq | Call Enters Queue |
| cab | Call Abandons Queue |
| setftr | Feature Invocation Message |
| mon | Host Control Monitor of the Unsolicited Status Messages |
| iqs | Queue/Dequeue Request Response |
| its | Treatment Request Response |
| iss | ACD Statistics Request Response |
| icc | Incoming Call |
| ias | ACD Statistics |
| itc | Treatment Completed |
| init | Meridian 1/SL-1 Initialization |
| isis | Start Up/Shut Down Indication Response |
| iei | Error Indication |
| icss | Check CDN State Response |
| sfn | Set Feature Notification |
| Input Messages (imsg): | |
| con | Connection Request |
| incl | Incoming Call Accept |
| rls | Call Disconnected Request |
| offh | Off hook |
| rdy | Ready |
| nrdy | Not Ready |
| msi | In Service |
| msb | Make Set Busy |
| conf | Confirmation Message |
| mwi | Message Waiting Indication |
| opr | Operator Revert |
| gts | Get Terminal Status |

| | |
|--------|---|
| tnmn | Terminal Maintenance |
| alm | Alarm Message |
| confm | Administration Confirmation |
| data | Data Message |
| audit | Audit Message |
| rtsc | Report Terminal Status Change |
| tmsp | AML Time Stamp |
| query | Server Query |
| calans | Call Answer |
| calds | Call Disconnect |
| setftr | Feature Invocation Message |
| mon | Host Control Monitor of the Unsolicited Status Messages |
| iqr | Queue/Dequeue Request |
| itr | Treatment Request |
| isr | ACD Statistics Request |
| isi | Start Up/Shut Down Indication |
| iei | Error Indication |
| icsr | CDN Check Request |

TFC009 Network Attendant Service

The traffic data for the Network Attendant Service (NAS) describes attempts to route to NAS. See Figure 22 for TFC009 report format.

NAS TRY

This number indicates the number of attempts to route to the Network Attendant Service (NAS).

ALT

This number is the total number of attempts to route to NAS across alternate routes.

DB

This shows the number of drop back busys over the NAS alternate route.

$$ALT + DB = NAS\ TRY$$

Figure 22
TFC009 Network Attendant Service

| Format | | |
|-----------------|-------------|-----------|
| System ID | TFC009 | |
| Customer number | | |
| NAS TRY | | |
| | ALT1 | DB |
| Example | | |
| 0000 | TFC009 | |
| 087 | | |
| NAS TRY | 00048 | |
| | ALT1: 00004 | DB: 00000 |
| | ALT2: 00010 | DB: 00003 |
| | ALT3: 00025 | DB: 00000 |
| | ALT4: 00000 | DB: 00006 |

TFC101 incoming matching loss threshold

This threshold level shows the percentage of incoming calls (expressed in units of 0.1 percent) that encounter a failure to match (FTM). FTMs occur when a connection between an incoming trunk and the called line or attendant fails, or when an attendant does not complete a call because timeslots are unavailable (even if the call is eventually presented). A call counts as one incoming FTM regardless of the number of times that call completion attempts failed.

| | |
|-----------------|-----------|
| Format | |
| System ID | TFC101 |
| Customer number | |
| Incoming FTM | Threshold |
| Example | |
| 200 | TFC101 |
| 000 | |
| 0014 | 00010 |

The threshold figure represents the desired maximum percentage of FTMs in 0.1 percent.

The TFC101 triggers a TFS001 system measurement report to assist with analysis of the problem loop.

TFC102 outgoing matching loss threshold

This threshold is based on the percentage of outgoing calls (expressed in units of 0.1 percent) that encounter a failure to match when connecting to an outgoing trunk. A call counts as one outgoing FTM regardless of further failures to complete the call. TFC102 triggers a TFS001 network report.

| Format | |
|-----------------|-----------|
| System ID | TFC102 |
| Customer number | |
| Outgoing FTM | Threshold |
| Example | |
| 200 | TFC102 |
| 002 | |
| 00014 | 00010 |

The threshold figure represents the desired maximum percentage of FTMs in units of 0.1 percent.

TFC103 average speed of answer threshold

The speed of answer threshold is the minimum acceptable time, in units of 0.1 second, that calls wait to be answered by the attendant. The recommended setting is 00120, which translates to 12.0 seconds. TFC103 shows the actual average speed of answer. If the average speed exceeds the threshold, the TFC003 (queue) and TFC004 (console) reports print.

| Format | |
|-------------------------|-----------|
| System ID | TFC103 |
| Customer number | |
| Average speed of answer | Threshold |
| Example | |
| 200 | TFC103 |
| 000 | |
| 00152 | 000120 |

TFC104 percent all trunks busy threshold

This threshold level indicates the desired maximum percentage of time (in units of 0.1 percent) that all trunks in a trunk group should be busy. (Only trunk groups with more than one member are measured.) The recommended maximum is 00050, which is equivalent to 5 percent. TFC104 shows the actual percentage of time that all trunks are busy.

All calls except outgoing trunk calls are considered successful as soon as they are answered or established. Outgoing trunk calls are considered successful only when the end-of-dialing timer expires or a pound sign (#) is pressed to force an end of dialing. Calculate the threshold using the following formula:

$$\text{All trunks busy peg count} \div (\text{successful calls} + \text{overflows})$$

| | |
|-----------------|-----------|
| Format | |
| System ID | TFC104 |
| Customer number | |
| Trunk group | |
| All trunks busy | Threshold |
| Example | |
| 200 | TFC104 |
| 002 | |
| 004 | |
| 0014 | 00017 |

TFC105 ISPC links establishment report

The ISPC links establishment report provides a peg count of the number of ISPC links established by an Australian Central office for each Phantom loop for each trunk defined.

| Format | |
|-----------------|-----------|
| System ID | TFC105 |
| Customer number | |
| loop number | peg count |
| Example | |
| 200 | TFC105 |
| 003 | |
| 100 | 50 |
| 110 | 2 |

In the above example, the customer 3, on the system 200, has two phantom loops. The loop 100 had 50 ISPC links establishment and loop 110 had 2 ISPC link establishments.

TFC111 usage of Broadcasting routes

This report provides traffic data on the usage of broadcasting routes.

Trunk Type

This field identifies either Music (MUS) or Recorded Announcement (RAN) broadcast trunk types.

Successful Broadcast connections peg count

The number of successful broadcast connections to trunks associated with this route.

Average call duration

Average duration of broadcast connections for this route.

Average waiting time

Average waiting time (in seconds) between the RAN/MUS request and the moment RAN/MUS is given.

Maximum waiting time

Longest waiting time (in seconds) between the RAN/MUS request and the moment RAN/MUS is given.

Waiting time threshold peg count

Incremented each time this threshold (configured in the route data block) is exceeded (output as 0 if not applicable).

Number of waiting parties threshold peg count

Incremented each time this threshold (configured in the route data block) is exceeded (output as 0 if not applicable).

Broadcast connections peg count for the three lowest usage trunks

For each trunk of the broadcasting route, a peg count is incremented each time the trunk reaches its broadcast connections (64 for a music trunk) limit (depends on the value configured for the CONN prompt in the RAN route data block). Three lowest counters are output.

Note: The TFC002 report (trunks report) is not modified: a trunk with one or more connections will provide the same data as if only one connection was set up.

Figure 23
TFC111 usage of Broadcasting routes

| Format | | |
|--|----------------------------------|--|
| System ID | TFC111 | |
| Customer number | | |
| Route Number | Trunk Type | |
| Successful Broadcast connections peg count | Average call duration | Average waiting duration |
| Maximum waiting time | Waiting time threshold peg count | Number of waiting parties threshold peg count |
| Broadcast connections peg count for lowest usage trunk | | Broadcast connections peg count for next to next to lowest usage trunk |
| Example | | |
| 0200 | TFC111 | |
| 000 | | |
| 031 | RAN | |
| 00817 | 00006 | 00004 |
| 00007 | 00000 | 00000 |
| 00000 | 00000 | 00002 |

Customer network traffic reports

A Meridian 1 switch equipped with the Network Traffic (NTRF) feature provides network traffic measurements. The measurements relate to the features described in the following documents:

- *Basic and Network Alternate Route Selection description* (553-2751-100)
- *Network Queuing description* (553-2751-101)
- *Coordinated Dialing Plan description* (553-2751-102)

TFN001 route list measurements

A route list enumerates outgoing alternate trunk routes to a specific location. The maximum number of definable route lists is 64 with X11 release 15 or later, 32 with X11 releases 13 and 14.

The routing traffic measurements in TFN001 show how often a route list was accessed, which entries in the list were used, and whether the call was successful in completing a selection or connection. Routing traffic measurements, described below, are available at both node and main sites. See Figure 24 for TFN001 report format.

Note: Fields for features not equipped or activated always show zeros (0).

Route list measurements

A variety of measurements describe each route list.

Route list requests

This count increments each time the system selects a specific route list.

Route list requests served without delay

This measurement indicates the number of calls that did not encounter blockage or queuing. The count increments when a route list is selected, and a call is assigned to a trunk immediately. The count includes expensive route acceptances.

Expensive route acceptances

Callers can choose to route a call over an expensive route by choice after being informed of the additional cost by the Expensive Route Warning Tone (ERWT). The count increments after call completion.

Route list requests standard blocking

This measurement shows calls that could not access a route or a queue. The blocked call may be given an overflow tone or a recorded announcement, or be routed to the attendant. The count increments when one of the following occurs:

- the caller's Facility Restriction Level (FRL) is not sufficient to select any route choice
- no route choice is available, and the caller is only allowed Off Hook Queuing (OHQ) but too many calls are already queued
- the call times out in the Off Hook Queue
- blocking occurs and the system cannot select another route choice, and OHQ and Call Back Queuing (CBQ) are denied

Reuse count of on hold VNS trunks

This measurement identifies the total number of calls which successfully reused an established VNS trunk on a given route (outgoing and incoming calls).

Total time VNS trunks were idle

This measurement identifies the amount of time an established VNS trunk was available for re-use on a given route.

Route list entry use

This measurement is the number of calls successfully routed over each particular route list entry (trunk route). The count increments when one of the following occurs:

- an entry is selected without being offered OHQ or CBQ
- an entry is selected after OHQ or OHQ timeout
- an entry is selected to process a CBQ call back

Off Hook Queuing measurements (OHQ)

Each route list has associated OHQ traffic measurements.

OHQ calls

This measurement identifies the number of calls that attempted to use a route list entry when facilities were unavailable. The count increments each time a call is placed in the OHQ to await facilities, including calls from stations at a node, main, or conventional main and calls made using the Direct Inward System Access (DISA) feature.

Average time in OHQ

The queue handler records the time that the call is placed in the OHQ and the time that it is removed from the OHQ. The route list accumulates this elapsed time, in units of 0.1 seconds, only under one of these conditions:

- an entry becomes available
- the OHQ time limit expires and the call is removed from the OHQ
- the caller abandons a call while waiting in the OHQ

Quantity of calls abandoned while in OHQ

This measurement identifies the number of calls placed in the OHQ then disconnected by the caller or the OHQ timer. The count increments when a station at a node, main, or conventional main disconnects during the OHQ offer or while waiting in the OHQ.

Call Back Queuing measurements

Traffic measurements for Call Back Queuing (CBQ) are associated with each route list and identify the use of the feature.

CBQ calls

This measurement shows how many calls were offered CBQ, how many accepted the offer, and how many were placed in the CBQ. The count increments each time a call is placed in the CBQ.

Average time in CBQ

This measurement identifies the average time that calls remain in the CBQ. The measurement increments when a local station accepts the CBQ offer and places the call in the CBQ.

The queue handler stamps the time that a call is placed in the CBQ and the time that it is removed from the CBQ. The elapsed time, in units of 0.1 second, is added to the accumulating count for the route list.

Quantity of CBQ offerings

This measurement identifies the number of calls offered CBQ call backs, regardless of whether the CBQ call back was answered. The count increments when the caller is presented with the CBQ call back.

Quantity of CBQ user cancellations

This measurement identifies the number of times that a caller deactivates Ring Again to remove a call from the CBQ.

Remote Virtual Queuing measurements

If Remote Virtual Queuing (RVQ) is equipped and activated, RVQ traffic measurements appear in the TFN001 printout. Each route list has RVQ traffic measurements that identify feature use.

RVQ calls

This count increments each time the caller selects RVQ.

Average time in RVQ

This measurement tracks the elapsed time between a caller accepting the RVQ and the RVQ call placement.

The queue handler records the time that a call is placed in RVQ and the time that it is removed from RVQ, adding the elapsed time, in 0.1 seconds, to the route list's running total.

Quantity of RVQ offerings

This measurement identifies the number of RVQ calls offered RVQ call backs, regardless of whether the call back was answered. The count increments when the caller is presented with the RVQ call back.

Quantity of RVQ user cancellations

This measurement identifies the number of RVQ calls removed from the RVQ process after the user deactivates Ring Again.

Figure 24
TFN001 route list measurements (Part 1 of 2)

| Format | | | | | | | | |
|-----------------|----------------|---------------------------------|----------------------------|---------------------------------------|--------------------------------|---------------------------------|----------------------|----------------------|
| System ID | TFN001 | | | | | | | |
| Customer number | | | | | | | | |
| RLST xxx | route requests | route list served without delay | expensive route acceptance | route list requests standard blocking | reuse count on hold VNS trunks | total time VNS trunks were idle | | |
| RT | | route list entry use | route list entry use | route list entry use | route list entry use | route list entry use | route list entry use | route list entry use |
| | | TD calls | TD calls | TD calls | TD calls | TD calls | TD calls | TD calls |
| OHQ | OHQ calls | time in OHQ | abandoned calls | | | | | |
| CBQ | CBQ calls | average time in CBQ | CBQ offerings | | CBQ user cancel | | | |
| | RVQ | RVQ calls | average time in RVQ | RVQ offerings | RVQ user cancel | | | |

TFN002 Network Class of Service measurements

Traffic measurements for each defined Network Class of Service (NCOS) group indicate the grade of service, in terms of blocking and queuing delay. If a grade of service is not appropriate for users in a particular NCOS group, users can be reassigned to another NCOS group, the characteristics of the existing NCOS group can be redefined, or the routing parameters can be changed. See Figure 25 for the TFN002 report format.

Note: Fields for features not equipped or activated always show zeros (0).

Quantity of calls attempted

This measurement identifies the total number of network call attempts by users assigned to this NCOS group.

Routing requests served without delay

This measurement identifies the number of call attempts routed without encountering blockage or being offered queuing.

Expensive route acceptances

This count increments if a user allows a call to complete over an expensive facility.

Network call standard blocking

This measurement identifies the number of call attempts by NCOS user groups that could not be served because a route or queuing process was not available.

Calls refusing expensive routes

This measurement identifies the number of callers that received an Expensive Route Warning Tone (ERWT) and either abandoned the call or activated the Ring Again feature to place the call in the Call Back Queue.

Quantity of calls placed in OHQ

This measurement identifies the number of calls by NCOS groups that were offered Off Hook Queuing (OHQ) and accepted the offer.

Average time in OHQ

This measurement identifies the average duration, in 0.1 seconds, that calls remained in the OHQ. Calls that time out in the queue are included in the average.

Quantity of CBQ calls

This measurement identifies the number of calls that accepted CBQ.

Average time in CBQ

This measurement identifies the average time (in units of 0.1 second) that calls in this NCOS group waited in the CBQ for an available route. The measurement includes calls requesting a CBQ cancellation, calls completed, and calls initiating direct Ring Again against trunks.

Quantity of RVQ calls

This measurement identifies the number of calls accepting RVQ.

Average time in RVQ

This measurement identifies the average time (in units of 0.1 second) that calls in this NCOS group waited in RVQ for an available route. The measurement includes calls requesting RVQ cancellation, calls completed, and calls initiating direct Ring Again against trunks.

Note: Statistics for OHQ, CBQ, RVQ, or for all three print only when the features are equipped and activated.

Figure 25
TFN002 Network Class of Service measurements

| Format | | | | | | | |
|-----------------|--------------------------------|-----------------|---------------------------------------|-----------------------------|--------------------------------|-------------|---------------------------------|
| System ID | | TFN002 | | | | | |
| Customer number | | | | | | | |
| NCOS | network class of service group | calls attempted | routing requests served without delay | expensive route acceptances | network call standard blocking | not defined | calls refusing expensive routes |
| | OHQ | OHQ calls | average time in OHQ | | | | |
| | CBQ | CBQ calls | average time in CBQ | | | | |
| | RVQ | RVQ calls | average time in RVQ | | | | |
| Example | | | | | | | |
| 0423 | | TFN002 | | | | | |
| 00 | | | | | | | |
| NCOS | 000 | 00207 | 00197 | 00000 | 00001 | 00000 | 00000 |
| | OHQ | 00007 | 00237 | | | | |
| | CBQ | 00000 | 00000 | | | | |
| | RVQ | 00000 | 00000 | | | | |

TFN003 incoming trunk group measurements

These measurements provide an indication of the incremental traffic that network queuing features impose on incoming trunk groups. Data accumulates for each incoming or two-way trunk group offered Off Hook Queuing (OHQ), Coordinated Call Back Queuing (CCBQ), or Call Back Queuing to Conventional Mains (CBQCM). These measurements are available at both the node and main switches. See Figure 26 for TFN003 report format.

Quantity of calls placed in OHQ

This measurement identifies the number of incoming trunk calls placed in the OHQ for possible connection to another trunk group.

Average time in OHQ

This measurement reflects the average time (in units of 0.1 second) that calls waited in the OHQ for a trunk to become available. The average time includes calls removed from the OHQ by caller abandonment or removed from the queue after expiration of the OHQ time limit.

Quantity of incoming calls offered CCBQ or CBQCM

This measurement identifies the number of blocked incoming trunk calls that were offered a node-initiated call back. The measurement tracks users at an Electronic Switched Network (ESN) main (Coordinated Call Back Queuing) or conventional main (Call Back Queuing for Conventional Mains).

Quantity of calls accepting CCBQ or CBQCM

This measurement identifies the number of blocked incoming trunk calls that accepted a node-initiated call back. The measurement tracks users at an ESN main or conventional main.

Average time in CBQ

This measurement (in 0.1 seconds) reflects the average time that main or conventional main users remained in the CBQ at the ESN node for an available facility.

When a CCBQ call back is offered to a busy station at the main, the call is removed from the queue for 5 minutes, then reinserted in the same place in the queue. This process occurs only once. The additional queuing time is included in the computation of average time. The 5-minute suspension time is not included, and reinsertion into the queue does not count as an additional CBQ call.

When a conventional main station is too busy or fails to answer a CBQCM call back, the call is removed from the queue and reinserted into the queue as specified in the preceding paragraph.

Quantity of calls blocked in call back

This measurement identifies the number of node-initiated CBQ call backs (CCBQ or CBQCM) that could not be completed because an outgoing trunk group to the main or conventional main was not available.

Call back attempts no answer and cancellation

This measurement identifies the number of call back attempts that failed because the caller did not answer the call back. CBQ call backs to a main station that previously canceled CBQ are treated as unanswered call back attempts.

Quantity of incoming calls offered RVQ or RVQCM

This measurement identifies the number of blocked incoming trunk calls that were given the option of accepting a call back. Calls from an ISDN main (Remote Virtual Queuing) or conventional main (Remote Virtual Queuing for Conventional Mains) are included in this measurement.

Quantity of calls accepting RVQ or RVQCM

This measurement identifies the number of blocked incoming trunk calls that accepted an RVQ offer. The count includes RVQ acceptances by users at the ISDN main or conventional main.

Average time in RVQ

This measurement (in units of 0.1 second) reflects the average time that users at an ISDN main or conventional main remained in the RVQ at the ISDN node for a facility to become available.

Quantity of RVQ calls blocked in call back

This measurement identifies the number of node-initiated RVQ call backs (RVQ or RVQCM) that could not be completed because no outgoing trunk group to the ISDN main or conventional main was available.

RVQ call back attempts no answer and cancellation

This measurement identifies the number of call back attempts that failed because the caller did not respond. RVQ call backs to a station at an ISDN main that has previously canceled RVQ are treated as call back attempts not answered.

Note: Statistics for OHQ, CBQ, RVQ, or all three print out only when the features are equipped and activated.

Figure 26
TFN003 Incoming Trunk Group

| Format | | | | | | |
|-----------------|----------------------|---|----------------------------------|----------------------------------|-------------------------------------|---|
| System ID | | TFN003 | | | | |
| Customer number | | | | | | |
| TRKG | incoming trunk group | | | | | |
| | OHQ | calls placed in OHQ | average time in OHQ | | | |
| | CBQ | incoming calls offered CBQ, CCBQ, CBQCM | calls accepting CBQ, CCBQ, CBQCM | average time in CBQ, CCBQ, CBQCM | blocked CBQ, CCBQ, CBQCM call backs | call back attempts not answered or canceled |
| | RVQ | incoming calls offered RVQ, RVQCM | calls accepting RVQ, RVQCM | average time in RVQ, RVQCM | blocked RVQ, RVQCM call backs | call back attempts not answered or canceled |
| Example | | | | | | |
| 0423 | | TFN003 | | | | |
| 000 | | | | | | |
| TRKG | 003 | | | | | |
| | OHQ | 00006 | 00263 | | | |
| | CBQ | 00000 | 00000 | 00000 | 00000 | 00000 |
| | RVQ | 00000 | 00000 | 00000 | 00000 | 00000 |

TFN101 OHQ overflow threshold

This threshold measurement indicates that an abnormally large number of users are timing out in the OHQ because the OHQ time limit has expired (defined in LD 16) before a trunk is available. This overflow results from trunks being out of service, incorrectly defined OHQ time limits, or temporary traffic overload.

Off Hook Queuing Timer (OHQT)

The OHQT report (see Figure 27) shows the percentage of OHQ calls that timed out (overflowed) in the OHQ before an available trunk was found. This value (in units of 0.1 percent) represents the total number of OHQ overflow, divided by the total number of OHQ offers, plus the OHQ overflows. It also shows the threshold defined (in LD 16).

Figure 27
TFN101 OHQ overflow threshold

| | |
|--------------------------|-----------|
| Format | |
| System ID | TFN101 |
| Customer number | |
| OHQT timed out OHQ calls | threshold |
| Example | |
| 0423 | TFN101 |
| 000 | |
| 00333 | 00000 |

Traffic Control (LD 02)

This section discusses traffic commands and traffic measurements.

How to use traffic commands

LD 02 sets traffic options, system ID, and time and date. The following conventions help describe the traffic commands in this section.

- user entered data is shown in UPPER CASE
- system output data is shown in lower case
- a period (.) prompt indicates the system is ready to receive a new command
- a double dash (--) indicates the system is ready to receive data
- a <cr> means that the user should press the return key

Traffic report format

The beginning of a traffic report is labelled with the header message **TFS000** followed by the date and time.

The end of the traffic report is labelled with a footer message **TFS999**.

Be sure the traffic report shows both the header message and footer message. This is because messages and threshold violations are printed at the beginning of the report.

Some of the messages or threshold violations may instruct the user to ignore the report. For example, if the system initializes, the traffic registers are cleared out. If this occurs during the traffic report period, there is no point in using the data since it is not complete.

Setting and querying daylight savings information

Beginning with X11 release 19, the daylight savings time adjustment can be programmed so that it occurs automatically on the desired dates. (The system clock must have already been set.)

The daylight savings commands FWTM and BWTM set the date and time for the clock changes (FWTM = spring; BWTM = fall), SDST enables or disables the automatic change feature, and TDST queries the information using the following formats (variables shown in brackets):

FWTM <month> <week> <day> <hour>

BWTM <month> <week> <day> <hour>

SDST ON (OFF)

TDST

The month and day of week can be entered as numerics or abbreviations as shown below. The possible variable values (defaults in parentheses) are shown as follows:

month = 1–12 or JAN–DEC

where 1 = January and 12 = December; 4 or APR is FWTM default; 10 or OCT is BWTM default

week = 1–5, L

where 1 = the first week and L = the last week of the month
1 is FWTM default; L is BWTM default

day = (1)–7 or (SUN)–SAT

where 1 = Sunday; 7 = Saturday

hour = 0–(2)–23

where 0 = midnight and 23 = 11 p.m.

Examples of each command:

Set daylight savings time in the spring

FWTM 4 1 1 2

or

FWTM APR 1 SUN 2

Return to regular time in the fall

BWTM 10 4 1 2

Turn on the automatic feature

SDST ON

Query the settings

TDST

Daylight savings information set by these commands survives sysload.

Set traffic report schedules**Print current customer report schedule**

TSHC C sd sm ed em

sh eh so

d d ...

Print current system report schedule

TSHS sd sm ed em

sh eh so

d d ...

Set customer report schedule

SSHC C sd sm ed em -- SD SM ED EM

sh eh so -- SH EH SO

d d ...—D D ...<cr>

Set system report schedule

SSHS sd sm ed em -- SD SM ED EM

sh eh so -- SH EH SO

d d ...—D D ...<cr>

The following legend applies to format fields used when configuring the customer and system traffic report schedule. Possible variable values appear in parentheses:

C = customer number

D = day of the week:

1 = Sunday

2 = Monday

3 = Tuesday

4 = Wednesday

5 = Thursday

6 = Friday

7 = Saturday

ED = end day (1-31)

EH = end hour (0-23)

EM = end month (1-12)

SD = start day (1-31)

SH = start hour (0-23)

SM = start month (1-12)

SO = schedule options:

0 = no traffic scheduled

1 = hourly on the hour

2 = hourly on the half hour

3 = every half hour

Example

To set the system report schedule:

```
SSHS 25 4 16 7 -- 1 10 1 12
```

```
12 21 2 -- 0 23 3
```

```
2 3 4 5 6 -- 1 7<cr>
```

Meaning:

Old schedule

start time: April 25 at 12 noon

end time: July 16 at 9 P.M.

frequency: hourly on the half hour (SO = 2)

days of the week: Monday to Friday

New schedule

start time: October 1 at 12 midnight

end time: December 1 at 11 P.M.

frequency: every half hour (SO = 3)

days of the week: Saturday and Sunday

Note 1: To obtain traffic reports at the scheduled intervals, the output device must have prompt USER = TRF in LD 17. If TRF is not defined for any device, reports are still generated.

Note 2: Start and end times on the half hour are not supported—use full-hour only (23, not 23 30). Output every half hour is supported, however, using SO=3.

Set system ID

Each Meridian 1 system has a unique system ID number (SID) of up to four digits. The ID number can be printed or set by the following commands.

Print the current SID

TSID sid

Change the SID

SSID sid -- SID

System reports

Print the current report types

TOPS r r ...

Set one or more report types

SOPS r r ... -- R R ...<cr>

Clear one or more report types

COPS r r ... -- R R ...<cr>

R is traffic report type:

- 1 = networks
- 2 = service loops
- 3 = dial tone delay
- 4 = processor load
- 5 = measurement on selected terminals
- 7 = junctor group traffic
- 8 = CSL and AML links
- 9 = D-channel
- 10 = ISDN GF Transport
- 11 = MISP traffic
- 12 = MISP D-channel management
- 13 = MISP messaging
- 14 = ISDN BRI trunk DSL system report
- 15 = MPH traffic

To use the print command, enter a space (not a carriage return) after the customer number. If no reports are currently set, the system outputs NIL.

Set system thresholds

The system thresholds (TH) and range of values (TV) appear as percentages or CCS:

Print the current system thresholds

```
TTHS TH tv
```

Set the system thresholds

```
STHS TH tv -- TV
```

- 1 = dial tone speed (range 0.00% to 99.9%)
- 2 = loop traffic (range 000 to 999 CCS)
- 3 = junctor group traffic (range 0000 to 9999 CCS)
- 4 = superloop traffic (range 0000 to 9999 CCS)

Thresholds and range of values for customer appear as percentages or seconds.

Customer reports

Print the current report types

TOPC C r r ...

Set one or more report types

SOPC C r r ... -- R R ...<cr>

Clear one or more report types

COPC C r r ... -- R R ...<cr>

C = customer number

R is traffic report type:

1 = networks

2 = trunks

3 = customer console measurements

4 = individual console measurement

5 = feature key usage

6 = Radio Paging

7 = Call Park

8 = messaging and Auxiliary Processor links

9 = Network Attendant Service

10 = ISPC links establishment

11 = useage of broadcasting routes

To use the print command, enter a space (not a carriage return) after the customer number.

If no reports are set, the system outputs NIL. For report 5, see “Set customer for feature key usage measurement” on page 140.

Set customer thresholds

Print the current customer thresholds

TTHC C TH tv

Set the customer thresholds

STHC C TH tv -- TV

- 1 = incoming matching loss (TV range 00.0% to 99.9%)
- 2 = outgoing matching loss (TV range 00.0% to 99.9%)
- 3 = average Speed of Answer (TV range 00.0 to 99.9 seconds)
- 4 = percent All Trunks Busy (TV range 00.0% to 99.9%)
- 5 = percent OHQ overflow (TV range 00.0% to 99.9%)

Network reports

Print the current report types

TOPN C r r ...

Set one or more report types

SOPN C r r ... -- R R ...<cr>

Clear one or more report types

COPN C r r ... -- R R ...<cr>

C = customer number

R is traffic report type:

- 1 = route list measurements
- 2 = network class of service measurements
- 3 = incoming trunk group measurements

To use the print command, enter a space (not a carriage return) after the customer number.

If no reports are currently set, NIL is output by the system.

Set customer for feature key usage measurement

Print current customer being measured

TCFT c

Set the customer to be measured

SCFT c -- C

C refers to the customer number. Only one customer can have feature measurement set at a time.

Stop printing title, date, and time

Suppress the printing of the title (TFS000), date, and time in cases where traffic measurement is scheduled but no other data is printed by issuing the following command:

Stop printing

IDLT 0

Start printing

IDLT 1

0 = no title is printed unless further data is also printed

1 = the title is always printed

Set traffic measurement on selected terminals

These commands print, set and clear the Individual Traffic Measurement (ITM) class of service for specific terminals, trunks, and DTI channels in traffic report TFS005.

Note: Do not use these commands on superloops or octal density cards: NT8D02, NT8D03, NT8D09, NT8D14, or NT8D16.

Print the current TNs with ITM set

TITM

Example

| | |
|-------------|--|
| TITM | (prints current settings) |
| shelf 4 0 | (all units on loop 4 shelf 0 have ITM set) |
| loop 5 | (all units on loop 5 have ITM set) |
| tn 11 3 4 1 | (unit on TN 11 3 4 1 has ITM set) |
| card 13 2 1 | (all units on card 13 2 1 have ITM set) |
| chnl 15 21 | (loop 15 channel 21 has ITM set) |

Set ITM on terminals:

SITM

Example

```
SITM                (prints current settings)
shelf 4 1           (all units on loop 4 shelf 1 have ITM set)
loop 05             (all units on loop 5 have ITM set)
tn 11 3 4 1        (unit on TN 11 3 4 1 has ITM set)
card 13 1 1        (all units on card 13 2 1 have ITM set)
chnl 34 18         (loop 34 channel 18 has ITM set)
-- 7                (set ITM on all units on this loop)
-- 6 1             (set ITM on all units on this shelf, or on channel 1)
-- 8 1 1           (set ITM on all units on this card)
-- 8 1 1 1         (set ITM on this unit)
-- 34 18           (set ITM on loop 34 channel 18)
-- <cr>            (stop "--" prompt)
```

Clear line traffic TNs:

CITM

Example

```
CITM                (prints current settings)
shelf 4 1           (all units on loop 4 shelf 1 have ITM set)
loop 05             (all units on loop 5 have ITM set)
tn 11 3 4 1        (unit on TN 11 3 4 1 has ITM set)
card 13 1 1        (all units on card 13 2 1 have ITM set)
chnl 34 18         (loop 34 channel 18 has ITM set)
-- 4 1             (clear ITM on all units on this loop 4 shelf 1)
-- 5                (clear ITM on all units on this loop)
-- 11 3 4 1        (clear ITM on this unit)
-- 19 1 1          (clear ITM on all units on this card)
-- 34 18           (clear ITM on loop 34 channel 18)
-- <cr>            (stop "--" prompt)
```

Set blocking probability for Line Load Control (LLC)

Print current LLC level and blocking probability

TLLC

Set blocking probability

SCTL x aaa

Activate Line Load Control at level x

SLLC x

x = 1, 2, or 3 LLC level

aaa = blocking probability in%

Set time and date

Print the current time and date

TTAD day-of-week day month year hour minute second

Example

TTAD WED 24 11 1976 15 41 49

Set the time and date

STAD DAY MONTH YEAR HOUR MINUTE SECOND

Example

STAD 24 11 1976 15 41 49

All entries in the time-of-day output, except the year, are two-digit numbers. The year, which can be any year from 1901 to 2099 inclusive, is input as a full four-digit field (for any year between 1901 and 2099 inclusive) or in a two-digit short form (for years between 1976 and 2075).

Also see “Setting and querying daylight savings information” on page 132.

Set daily time adjustment

The time of day can be adjusted during the midnight routines to compensate for a fast or slow system clock.

Print the current adjustment

TDTA x y

Set the adjustment

SDTA x y -- X Y

x = 0 for negative increment

= 1 for positive increment

y = 0–60 second adjustment in increments of 100 ms

Set network time synchronization

A number of parameters can be adjusted for the Network Time Synchronization feature.

Print the current node status

TTSS

Set the node status

STSS <STATUS>

where <STATUS> may be:

(STDA) = stand-alone

MAST = Master

SLAV = Slave

Print the customer assigned to feature

TTSC

Set the customer assigned to feature

STSS C

where C may be:

(0) - 99 = Customer Number

Print the Local Virtual DN

TLDN

Set the Local Virtual DN

SLDN <DN>

where:

<DN> = Directory Number.

Print the Master/Backup Time Synchronization Number

TMDN

Set the Master/Backup Time Synchronization Number

SMDN <DN>

where:

<DN> = Directory Number.

Print Time Delta

TDEL

Set Time Delta

SDEL <SIGN><HR><MIN>

where:

<SIGN> is the time adjust factor direction indicator which may be:

0 = to indicate the Master switch is behind in time

1 = to indicate the Master switch is ahead in time.

<HR> = number of hours the time must be adjusted by 0 - 23.

<MIN> = number of minutes the time must be adjusted by 0 - 59.

Print Requesting Mode

TMOD

Set Requesting Mode

SMOD <MODE>

where <MODE> may be:

(BKGD) = Background

DVSC = Daily Service Routines

Print last reports

The last traffic reports can be printed or tested against threshold values. Data accumulating for the next reports is not accessible.

Print one or more of the last customer reports

INVC C R R ...

For printing the last customer report:

C = customer number

R is traffic report type:

1 = networks

2 = trunks

3 = customer console measurements

4 = individual console measurement

5 = feature key usage

6 = Radio Paging

7 = Call Park

8 = messaging and Auxiliary Processor links

9 = Network Attendant Service

Print one or more of the last network reports

INVN C R R ...

C = customer number

R is traffic report type:

1 = route list measurements

2 = network class of service measurements

3 = incoming trunk group measurements

Print one or more of last system reports

INVS R R ...

R is traffic report type:

- 1 = networks (per loop)
- 2 = services
- 3 = dial tone delay
- 4 = processor load
- 5 = selected terminals
- 7 = junctor group traffic
- 8 = CSL and AML links
- 9 = D-channel

Perform threshold tests on last reports**Perform threshold tests on customer reports**

ITHC C TH

C = customer number

TH = threshold type:

- 1 = incoming matching loss
- 2 = outgoing matching loss
- 3 = average Speed of Answer
- 4 = percent All Trunks Busy
- 5 = percent OHQ overflow

Perform threshold tests on system reports

ITHS TH

TH = threshold type:

- 1 = dial tone speed
- 2 = loop traffic
- 3 = junctor group traffic
- 4 = superloop traffic

Note: When a threshold test passes, “OK” is output.

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Traffic measurement

Formats and output

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