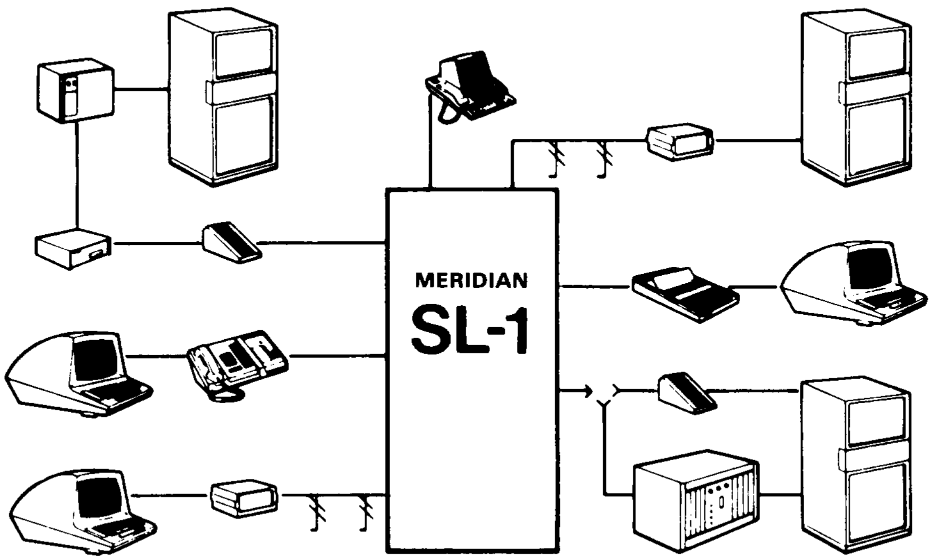
Meridian SL-1 Traffic



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Student materials 071

Introduction To

Meridian SL-1 Traffic

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Release 2
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NOTICE:

Use the following information for issues regarding this course.

When calling or writing refer to the title of the course **(MERIDIAN SL-1 TRAFFIC)** and the particular page number(s).

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Module 1
Introduction

MODULE ONE

INTRODUCTION

WELCOME

In this course you will explore how the Meridian SL-1 reports traffic information and what that information means to you. Traffic is the amount of time that a given circuit is in use over a period of time. The Meridian SL-1 provides traffic information in the form of detailed reports to aid you in maximizing the efficiency of your system.

Course Objective

By the end of this course, given several representative traffic reports, you should be able to identify any information on the reports that indicates possible areas of less than ideal switch operation. You should also be able to select, from a list of recommended procedures, the procedure to rectify the possible problem. Eighty percent accuracy will be required for both parts of the course objective.

Module Objective

By the end of this module you will be able to discuss the course length, course content, and the procedures to follow through the course. You will also be able to discuss Practice Exercises, Self Checks, and the overall Course Objective. There is no Self Check for this module.

Course Length

This course is designed to be self-paced, therefore the length of the course depends on you. If you devote all of your working day to its completion it should take you approximately 4 days to complete. This assumes that you have a proper environment in which to work on this course. You should also read the material at a pace that best suits your ability to learn.

This course is designed with the understanding that you have either taken Northern Telecom's Basic Telephony course or have equivalent experience. A familiarity with the Meridian SL-1 line of switches (PBXs) is also assumed. Both of those prerequisites will provide you with the third assumption, a familiarity with the terms that Northern Telecom uses in describing Meridian SL-1 components and features.

Course Content

This course is divided into six modules.

Module One - The introduction to the course, this module!

Module Two - Traffic terms and definitions.

This is the module where the terms and definitions used in traffic reporting are detailed. (NOTE: Use this module if there is a term that you don't understand or to check the meaning in the context of the lesson.)

Module Three - Introduction to Reports.

In this module the traffic reports for the Meridian SL-1 will be overviewed. The commands to request the system to print reports are also covered.

Module Four - System Reports.

In this module each system traffic report is broken down into its component parts. Each report is described in detail along with its parameters, both good and bad.

Module Five - Customer Reports.

In this module each customer traffic report is broken down into its component parts. Each report is described in detail along with its parameters, both good and bad.

Module Six - Thresholds/Warning Messages.

The first part of this module details the methods of setting and interpreting various traffic parameter thresholds. The second part of this module will be a brief overview of warning message types and their location on the traffic reports.

Practice Exercises

Practice Exercises are included in modules 2-6 to aid you in gaining a better understanding of the material presented in this course. The exercises vary from simple calculations, true-false, to fill-in-the-blank.

If you have any difficulty with an exercise, review the material in the module and try the exercise again. If all else fails check the answer(s) to the exercise(s). The Practice Exercises are not tests so take your time and complete all of them.

Self Checks

There is a Self Check at the end of each module and a final Self Check at the end of the course. The Self Check is your method of testing your progress.

The Self Checks are one of several types; true-false, multiple choice, fill-in-the blank, or matching. As our course objective states, you are expected to get 8Ø% of the Self Check questions correct. If you miss more, you should review the material to insure that you have a firm understanding of the information.

REFERENCE

The traffic measurement NTP 553-2ØØ1-45Ø is provided at the end of this course to help you in answering questions in the modules and for additional traffic information.

Locate the NTP in the APPENDIX and briefly look at the Table of Contents to familiarize yourself with the organization of the reference. Return here when you have reviewed the Table of Contents.

Materials needed to complete this course:

- The NTP in the Appendix
- A small calculator

Module One Conclusion

Well that's it for the Introduction Module. We hope that you will find this course useful and informative. If there are any important topics that were not covered please contact your Northern Telecom Representative for further information on that topic.

Module 2

Traffic Terms and Definitions

MODULE 2

TRAFFIC TERMS AND DEFINITIONS

Module Overview

In this module you are going to review some terms and their definitions that pertain to Meridian SL-1 Traffic. Some of the terms may be new and you should review them in more detail to become familiar with them. Other terms you will probably already know. These terms you may want to skim over quickly just to refresh yourself on their meaning. The terms are listed alphabetically so you may refer back to this module for definitions during the course.

Module Objective

Upon completion of Module 2, you will be given 10 incomplete traffic analysis statements. You will be required, using correct traffic terms to complete at least 80% of the statements.

DEFINITIONS/TERMS

BALANCING

The distribution of traffic within the architecture of the switch, such that switch operation is optimized. To balance a switch it is often necessary to make changes in equipment layout. Balancing is necessary to insure that the required grade of service is maintained.

BLOCKAGE

The inability of the calling party to be connected to the called party due to a lack of (a) an idle trunk circuit, or (b) an idle network speech path between any two terminals. Both types of blockage may occur in the same switching system, yet they are mutually exclusive. Before a trunk circuit may be accessed, a speech path must be available. In other words, the busy or idle status of a group of trunks is irrelevant if there is no available speech path to make an outgoing call. The probability that a call will be blocked by either event is expressed as a decimal fraction, and usually means the busy hour probability. The probability for the overall connection is equal to the sum of the individual probabilities at each switching stage. One busy per 100 attempts is shown "P.01", where "P" stands for probability of blockage. Blockage in reference to speech path availability in the Meridian SL-1 is often referred to as "matching loss"; however, the meaning is the same.

(USE THE MERIDIAN SL-1 TRAFFIC DISTRIBUTION CHART ON PAGE 2-9 TO HELP YOU WITH THE DEFINITIONS THAT FOLLOW.)

CCS

The unit in which amounts of telephone traffic are measured. On the printed reports the CCS is usually referred to as "usage".

CALCULATING CCS:
One CCS = one hundred call seconds of usage.
There is a maximum of 36 CCS in one hour.

(60 seconds/minute) x (60 minutes/hour) = 3600 seconds/hour

$$\frac{3600 \text{ seconds/hour}}{100} = 36 \text{ CCS/hour}$$

To convert minutes to CCS:

$$\frac{\text{minutes} \times 60 \text{ seconds}}{100} = \text{CCS}$$

*** PRACTICE EXERCISE ***

Now you try a quick CCS calculation.

How many CCS are there in 12 minutes? ______________.

*** ANSWER ***

12 minutes x 60 seconds/minute = 720 seconds

$$\frac{720 \text{ seconds}}{100} = 7.2 \text{ CCS}$$

LINE CCS (Station CCS)

Average amount of traffic generated by stations connected to the PBX.

LINE CCS = Incoming Terminating CCS + Originating Outgoing CCS + Terminating Intra-Office CCS + Originating Intra-Office CCS.

TRUNK CCS

Average amount of Line CCS generated on incoming and outgoing trunks. (Note: This traffic is included in the Line CCS figure.)

CONNECTION POINT

Any point to and from which a network path is possible.

FAILURE TO MATCH (FTM)

A count of the number of times an idle network path could not be found between two connection points.

*** PRACTICE EXERCISE ***

Circle the correct answer.

The method used to measure calls connected is known as a connection point.

1. TRUE   2. FALSE

*** ANSWER ***

2. FALSE

GRADE OF SERVICE

The percentage of calls completed. This indicator is the inverse of blocking which is the amount of calls blocked.

HOLDING TIME

The average length of a connection between two terminals.

INTERLOOP

Path between 2 connection points located in different loops.

INTRALOOP

Path between 2 connection points located in the same loop.

LINE

A station connected to the PBX.

LOAD

Total amount of traffic, expressed in CCS, that is generated by lines, trunks, attendant consoles, and/or Digitone Receivers in a specified section of the system or in the total system.

PEG COUNT (PC)

The count of the number of times a particular event occurs.

TERMINAL

Can be either a trunk, station, attendant or DTR. These are the points from which traffic is generated.

TRAFFIC

The amount of time (CCS, hundred call seconds) that a given circuit is in use over a period of time.

TRUNK

A telephone communications channel between two switching centers.

- PBX to Central Office (CO, FX, or WATS trunks)
- PBX to another PBX (Tie trunk)
- PBX to external equipment/devices (paging trunk, dictation trunk, etc.)

TRUNK GROUP

A group of identical trunks connecting a PBX to a specific location.

MODULE 2 SELF CHECK

Complete the statement(s) below by writing the correct answer(s) in the space(s) provided.

When you are done compare your answers to the answer sheet on the next page.

1. A count of the number of times an idle network path could not be found between two connection points would be called ______ ______________________________.

2. Any point to and from which a network path is possible is called a __________________________.

3. A ________________ is a group of identical trunks connecting a PBX to a specific location.

4. Trunk CCS is the average amount of line CCS that is generated on ____________________ and ______________trunks.

5. A ____________ is the total amount of traffic expressed in CCS, that is generated by lines, trunks, attendant consoles, and/or Digitone Receivers.

6. A ____________ is a telephone communications channel between two switching centers.

7. The probability of a call being blocked by busy trunks, expressed as a decimal fraction, and usually meaning the busy hour probability would be called ____________________.

8. A __________ is the number of times a particular event occurs.

9. Traffic is the amount of _____ that a given circuit is in _______ over a period of time.

10. Blockage is the inability of the calling party to be connected to the called party due to a lack of (a) an ______ trunk circuit or (b) an idle network ___________ between any two terminals.

MODULE 2 SELF CHECK ANSWER SHEET

1. A count of the number of times an idle network path could not be found between two connection points would be called FAILURE TO MATCH.

2. Any point to and from which a network path is possible is called a CONNECTION POINT.

3. A TRUNK GROUP is a group of identical trunks connecting a PBX to a specific location.

4. Trunk CCS is the average amount of line CCS that is generated on INCOMING and OUTGOING trunks.

5. A LOAD is the total amount of traffic expressed in CCS, that is generated by lines, trunks, attendant consoles, and/or Digitone Receivers.

6. A TRUNK is a telephone communications channel between two switching centers.

7. The probability of a call being blocked by busy trunks, expressed as a decimal fraction, and usually meaning the busy hour probability would be called BLOCKAGE.

8. A PEG COUNT is the number of times a particular event occurs.

9. Traffic is the amount of TIME that a given circuit is in USE over a period of time.

10. Blockage is the inability of the calling party to be connected to the called party due to a lack of (a) an IDLE trunk circuit or (b) an idle network speech path between any two terminals.

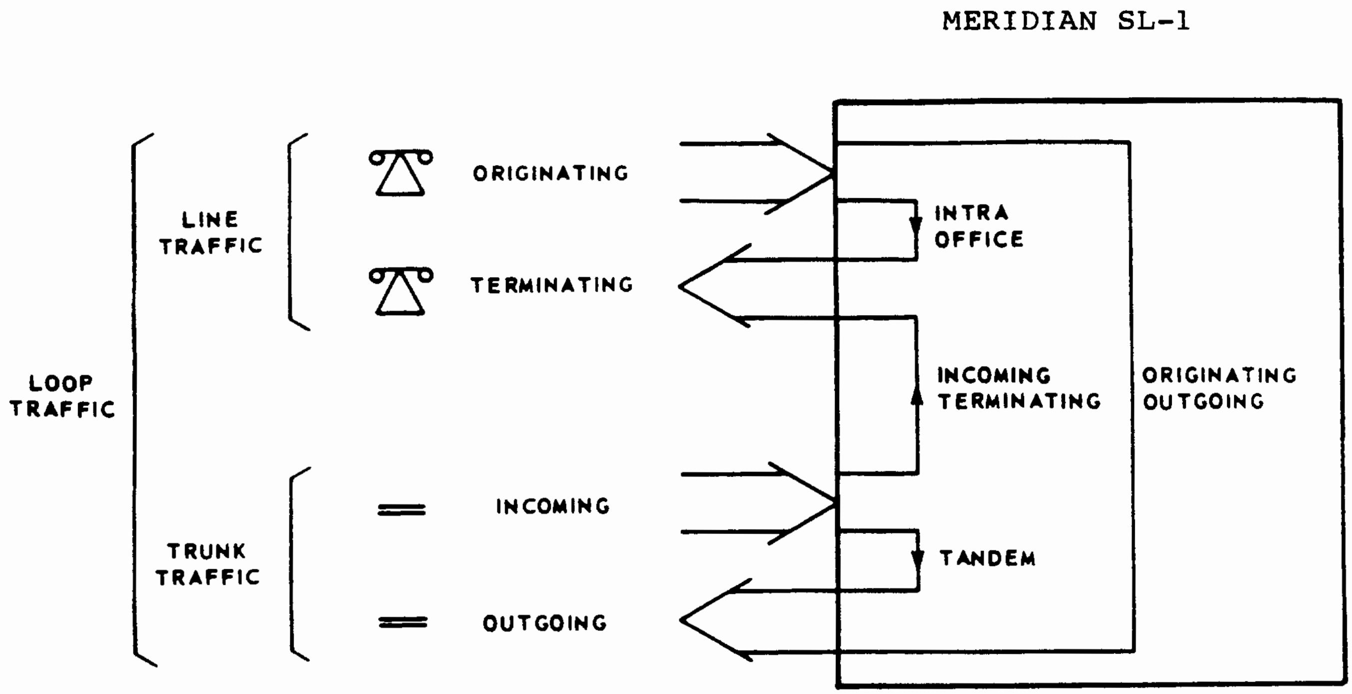
MODULE 2 SUMMARY

In this module a lot of traffic terms and definitions were covered to help prepare you for the modules that follow. Do not be concerned if you can't remember all of them because you can refer to this module whenever you like.

Below is a very brief chart containing some of the terms that will help you in the modules that follow. Review that chart and continue on to module 3 when you feel comfortable.

TRAFFIC TERM	BASIC DEFINITION
CCS	Unit of measurement for telephone traffic.
PEG COUNT	Number of times a particular event occurs.
INTRALOOP	Path between 2 connection points located in the same loop.
TRUNK	Communications channel between two switching centers.
FTM	A count of the number of times an idle path could not be found between two connection points.
TRAFFIC	Traffic is the amount of time that a given circuit is in use over a period of time.

MERIDIAN SL-1 TRAFFIC DISTRIBUTION



Module 3

Introduction to Reports

8. COMMUNICATING WITH SYSTEM

8.01 The Traffic Control overlay program (Program 02) is used when any of the following tasks are to be performed:

- Query system ID, system time-of-day, traffic schedules, traffic options or threshold levels
- Set system ID
- Set system time-of-day
- Change system or customer traffic measurement schedules
- Change traffic options
- Change threshold levels
- Access traffic data in the holding registers.

ACCESSING THE SYSTEM

8.02 All inputs to the system are made via the teletypewriter (TTY). When the Traffic Control program is loaded, the appropriate commands are input. Should an error or invalid data be input, the system returns an error message (Table 8-C). When the task has been completed, the Traffic Control program must be aborted and a background overlay program loaded. Maintenance personnel should be notified when the system fails to provide the correct responses.

COMMANDS

8.03 There are four types of commands, each type identified by the command's first letter. The command types are:

(a) **T Commands.** Used to query schedules, etc. When these commands are input the system automatically outputs a response, i.e., RETURN does not need to be depressed.

(b) **S Commands.** Used to set schedules, etc. These commands are in three parts: an S command name input by the user; a response output by the system; and a second input by the user. When the S command is input, the system responds automatically with the data asked for and then outputs a double dash (--). If the data is to be changed, the change is keyed in immediately following this prompt. If no changes are necessary, the user depresses the RETURN key.

(c) **C Commands.** Used to remove or clear an option. The format is similar to that of the corresponding S command.

(d) **I Commands.** Used to access data in the holding register. The data is output immediately.

8.04 Note the following points:

(a) The data fields are separated by a space. No other delimiter is necessary and no space is needed following a command name.

(b) The last parameter of the line may be followed by a carriage return which acts as a delimiter as well as terminating the command.

(c) A period (.) prompt indicates that the system is ready to receive a new command from the teletypewriter.

(d) A double dash (--) prompt is output after an S or C command and indicates that the system is now ready to receive data.

(e) An asterisk (*) in the command definition indicates that the carriage return should be depressed.

(f) In this practice, the commands input by the user are written in upper case and the system responses are written in lower case.

(g) Table 8-C gives a listing of error messages that can be output while using the Traffic Control program.

Abbreviations

8.05 The following abbreviations are used to define the various data fields within a traffic measurement command.

sh = start hour
eh = end hour
sd = start day
ed = end day
sm = start month
em = end month
so = schedule options
tc = threshold codes
tv = threshold values.

TRAFFIC MEASUREMENT SCHEDULES

8.06 Traffic measurement schedules can be set independently for system and customer measurements. The schedule options are:

0 - No traffic scheduled

1 - Hourly, on the hour

2 - Hourly, on the half-hour

3 - Half-hourly, on the hour and half-hour.

8.07 A schedule period runs from the start hour of the start day to the end hour of the end day, only on the days of the week specified.

8.08 The start day, the start month, the end day and the end month are numerical representations of the date. For example, August 17 is entered as 17 8. The days of the week are specified as follows:

1 = Sunday

2 = Monday

3 = Tuesday

4 = Wednesday

5 = Thursday

6 = Friday

7 = Saturday.

8.09 The start hour and stop hour codes are 1 or 2-digit numbers based on the 24 h clock (i.e., 1:00 p.m. is entered as 13). No half-hour start or stop hours are possible. Data is output at all scheduled times within the time period including the start and stop hours.

8.10 Query System Traffic Measurement Schedule. The input command structure used to query the system traffic measurement schedule is:

TSHS (sd) (sm) (ed) (em)
(sh) (eh) (so)
(d)

Example:

.TSHS 25 4 16 7
12 21 2
2 3 4 5 6
.

8.11 Set System Traffic Measurement Schedule. The input command format used to set the system traffic measurement schedule is:

SSHS (sd) (sm) (ed) (em) -- (SD) (SM) (ED) EM)
(sh) (eh) (so) -- (SH) (EH) (SO)
(d) -- (D)

Note: To clear the schedule enter 0.

Example:

.SSHS 25 4 16 7 -- 1 10 1 12
12 21 2 -- 0 23 1
2 3 4 5 6 -- 1 7
.

8.12 Query Customer Traffic Measurement Schedule. The format of the command used to query a customer schedule is:

TSHC (CUSTOMER) (sd) (sm) (ed) (em)
(sh) (eh) (so)
(d)

Example:

.TSHC 0 16 7 12 5
12 21 2
2 3 4
.

8.13 Set Customer Traffic Measurement Schedule. The format of the command to set a customer schedule is:

SSHC (CUSTOMER) (sd) (sm) (ed) (em) -- (SD) (SM) (ED) (EM)
(sh) (eh) (so) -- (SH) (EH) (SO)
(d) -- (D)

Note: To clear the schedule enter 0.

Example:

```
.SSHC 0 16 7 14 5 -- 1 6 12 6
12 21 3 -- 0 23 3
2 3 4 5 6 -- 1
.
```

TRAFFIC MEASUREMENT OPTIONS

8.14 System Measurement Options. The system measurement options are:

Option 1 - Networks (per loop)

Option 2 - Services

Option 3 - Dial Tone Delay

Option 4 - Processor Load

Option 5 - Lines

Option 7 - Junctor Group Traffic.

8.15 Customer Measurement Options. The customer measurement options are:

Option 1 - Networks (per customer)

Option 2 - Trunks

Option 3 - Queue

Option 4 - Attendant Console

Option 5 - Features

Option 6 - ARSQ/RGA (not applicable in X11)

Option 8 - Integrated Messaging System and Integrated Voice Messaging System.

Note: If no options are currently set, NIL is output by the system. If option 5 is to be set for a customer then the customer must be defined via command SCFT.

8.16 Network Measurement Options. The network measurement options (set on a customer basis) are:

Option 1 - Route List Measurements

Option 2 - Network Class-of-Service Measurements

Option 3 - Incoming Trunk Group Measurements.

8.17 Query System Traffic Measurement Options. The format of this command is:

TOPS (options)

Example:

.TOPS 3 5

.

8.18 Set System Traffic Measurement Options. The format for this command is:

SOPS (options) -- (OPTIONS)

Example:

.SOPS 3 5 -- 2

.

8.19 Clear System Traffic Measurement Options. The format for this command is:

COPS (options) -- (OPTIONS)

Example:

.COPS 2 3 5 -- 3

.

8.20 Query Customer Traffic Measurement Options. The input format for this command is:

TOPC (CUSTOMER) (options)

Example:

.TOPC 0 4 5

.

8.21 Set Customer Traffic Measurement Options. The input format for this command is:

SOPC (CUSTOMER) (options) -- (OPTIONS)

Example:

.SOPC 0 4 5 -- 1

.

8.22 Clear Customer Traffic Measurement Options. The input format for this command is:

COPC (CUSTOMER) (options) -- (OPTIONS)*

Example:

.COPC 0 1 4 5 -- 4 5

.

8.23 Set Customer Network Traffic Options. The input command structure used to set the network traffic options is as follows:

SOPN (CUSTOMER) (options) -- (OPTIONS)

Example:

.SOPN 0 2 -- 1

.

8.24 Query Customer Network Traffic Options. Use the following command to query the network traffic options:

TOPN (CUSTOMER) (options)

Example:

.TOPN 0 1 2

.

8.25 Clear Customer Network Traffic Options. Use this command to clear the network traffic options:

COPN (CUSTOMER) (options) -- (OPTIONS)

Example:

.COPN 0 1 2 -- 1

.

THRESHOLDS

8.26 Threshold levels can be queried or set for the system or for each customer. The system thresholds with their respective codes and ranges of values are given in Table 8-A. The customer thresholds with their respective codes and ranges of values are given in Table 8-B.

Table 8-A
SYSTEM THRESHOLDS

CODE	MEASUREMENT	RANGE
1	Dial Tone Speed	00.0% to 99.9%
2	Loop Traffic	000 to 999 CCS
3	Junctor Group Traffic	0000 to 9999 CCS

Table 8-B
CUSTOMER THRESHOLDS

CODE	MEASUREMENT	RANGE
1	Incoming Matching Loss	00.0% to 99.9%
2	Outgoing Matching Loss	00.0% to 99.9%
3	Average Speed of Answer	00.0 to 99.9 s
4	Percent All Trunks Busy	00.0% to 99.9%
5	Percent OHQ Overflow	00.0% to 99.9%

8.27 Query System Threshold Level. The input format for this command is:

TTHS (TC) (tv)

Example:

.TTHS 1 015
.

8.28 Set System Threshold Value. The format for this command is:

STHS (TC) (tv) -- (TV)

Example:

.STHS 1 020 -- 015
.

8.29 Query Customer Threshold Value. This command format is:

TTHC (CUSTOMER) (TC) (tv)

Example:

.TTHC 0 2 10.
.

8.30 Set Customer Threshold Value. The command format is:

STHC (CUSTOMER) (TC) (tv) -- (TV)

Example:

.STHC 0 2 10 -- 12
.

LINE TRAFFIC TERMINALS

8.31 These commands are used to query and change the Individual Traffic Measurement (ITM) class-of-service for given Terminal Numbers (TN). SL-1, 500/2500-type or trunk terminals can have this class-of-service. Terminals with ITM set are included in the groups for which Line Traffic Measurements ae recorded.

8.32 Query Line Traffic TN. The format for this command is:

```
TITM
(tn)
(tn)
(tn)
etc.
```

> **Note:** If only the loop number is printed, it means that all equipped terminals have ITM set. If only the loop and shelf numbers only are printed, it means that all equipped terminals on the specified shelf have ITM set. If the loop, shelf and card numbers are printed, it means that all equipped terminals on the specified card have ITM set.

Example:

```
.TITM
SHELF 04 0
LOOP  05
TN    11 3 4 1
CARD  13 2 1
TN    15 1 2 0
```

8.33 Set Line Traffic TNs. The format for this command is:

```
SITM
(tn)
(tn)
(tn)
etc.
-- (TN)
-- (TN)
-- (TN)
-- *
```

> **Note 1:** If only the loop number is entered and RETURN is depressed, it requests that all equipped TNs on the specified loop have ITM set.

> **Note 2:** If only the loop and shelf numbers are entered and RETURN is depressed, it requests that all equipped TNs on the specified shelf have ITM set.

> **Note 3:** If the loop, shelf and card numbers are entered and RETURN is depressed, it requests that all equipped TNs on the specified card have ITM set.

> **Note 4:** If the loop, shelf, card and unit numbers are entered, it requests that the given terminal has ITM set.

> **Note 5:** If ALL is entered, this sets ITM for all equipped TNs in the entire system.

MODULE THREE

INTRODUCTION TO REPORTS

Module Overview

Module 3 introduces you to the types of traffic reports available from the Meridian SL-1. You will also learn how to request that the system print the reports you need.

Module Objective

Upon completion of Module 3 you will be given a scenario of traffic report data being generated and a list of traffic reports needed. You will be required to write the commands that would generate the traffic reports needed with 80% accuracy.

Traffic reports are documents printed by the Meridian SL-1 that contain information about the system's operation during the specified time period. The information contained in these reports allows you to determine whether or not the system is meeting the service requirements of the customer. This information (also called data or report data) can be used to decide upon an action that will correct the problem and improve the switch's operation.

There are three major types of reports. They are:

1. System Measurement Outputs
   Provide information at a system level.

2. Customer Measurement Outputs
   Provide information at the customer level.

3. Threshold Violation Outputs
   Provide information when certain preset operational levels are exceeded.

By requesting various combinations of System, Customer, or Threshold Violation Outputs you are able to obtain information about the switch's operation and performance. This information assists you in deciding if the switch is meeting the expected level of operation.

Whenever a traffic study is performed it is recommended it be:

- o A minimum of 5 days.
  Anything shorter than this would not provide a broad enough base of data from which to judge the switch's operation.

- o A maximum of 2Ø days.
  Anything longer than this would not provide any additional increase in base averages of the data to be gathered.

- o Conducted during the three busiest months (not necessarily consecutive) of the year for a given customer. This is called the busy season, and will provide more accurate information for properly engineering the switch.

SYSTEM MEASUREMENT OUTPUTS

This group of reports gives you information about the performance of certain operations at a system level. System reports are designated by a three letter prefix, TFS. The three digit code that follows the prefix designates the specific report. The system reports available are:

- o TFSØØ1 - Networks

  Probably the most important report, TFSØØ1 identifies CCS, peg counts (PC) and failures to match (FTM) on a loop-by-loop basis.

- o TFSØØ2 - Services

  This report provides a breakdown of the FTMs, CCS and PCs for Tone and Digit Switch loops in TFSØØ1, as well as other services.

- o TFSØØ3 - Dial Tone Delay

  Delays in receiving dial tone can be an indication of a problem in the system. TFSØØ3 identifies all requests for dial tone that had to wait longer than 3 seconds and/or longer than 1Ø seconds before tone was provided, it also provides a peg count of the total number of seconds of delay suffered by all calls, for delays lasting one or more seconds.

*** PRACTICE EXERCISE ***

Fill in the blank.

What system report would gather FTM on a loop-by-loop basis?

____

*** ANSWER ***

What system report would gather FTMs on a loop-by-loop basis?
TFSØØ1 - NETWORKS

- TFSØØ4 - Processor Load

  The Central Processing Unit (CPU) in any switch has a certain amount of time within which to perform its tasks. TFSØØ4 provides information used to calculate the actual percentage of the total time available used to process calls, as well as information regarding the number of call attempts made and the status of the CPU as it performs it's tasks.

- TFSØØ5 - Lines

  This report provides a means of measuring individual line and/or trunk CCS. These measurements can be used as an administrative tool to determine traffic levels of various departments or groups.

- TFSØØ7 - Junctor Group Traffic

  The TFSØØ7 report provides FTM,CCS, and peg count information about calls between network groups in a multi-group switch.

*** PRACTICE EXERCISE ***

Circle the correct answer.

Which report would you use to determine traffic levels of various departments or groups?

A. TFSØØ5 - Lines
B. TFSØØ4 - Processor Load
C. TFSØØ7 - Junctor Group Traffic

*** ANSWER ***

Which report would you use to determine traffic levels of various departments or groups?

A. TFSØØ5 - Lines

Examples of these reports can be found in Section 3 of the NTP. System Reports will be covered in detail in Module 4.

Just as System Reports detail the system's operation at the system level, Customer Reports provide information about the system's operation as it pertains to individual customers.

Customer Reports are designated by a three letter prefix, TFC. The three digit code that follows the prefix designates the specific report. The customer reports available are:

o TFCØØ1 - Networks

This report details incoming, outgoing, intra-customer, and tandem traffic by customer. All CCS, PCs, and FTMs on this report peg on a per call basis as opposed to a per time slot basis on TFSØØ1.

o TFCØØ2 - Trunks

Data on this report details incoming and outgoing CCS and PCs for each trunk group. It also provides information about trunk status and amount of blockage on each route.

o TFCØØ3 - Queue

Information on how calls are processed as they enter the system via the attendant queue is detailed on this report. This information is usually used in conjunction with TFCØØ4.

o TFCØØ4 - Console

Individual console status and call processing information is presented on this report. This information is usually used in conjunction with TFSØØ3.

*** PRACTICE EXERCISE ***

Fill in the blank.

The ______________ report provides FTM data on a per call basis for all incoming, outgoing, intra-customer, and tandem calls.

*** ANSWER ***

The TFCØØ1 report provides FTM data on a per call basis for all incoming, outgoing, intra-customer, and tandem calls.

o TFCØØ5 - Features

Feature usage for SL-1 sets only is available from TFCØØ5. However, usage can only be monitored on one customer at a time due to system information storage limitations. The information presented represents all customers in the system, regardless of customer assignment.

- TFCØØ6 - ARS and Ring Again (not applicable with X11)

  This report provides information concerning the number of calls processed through the ARS Priority Queuing and Ring Again features, as well as time spent in the RGA queue. Measurements apply only to station-to-trunk calls, especially where Ring Again is concerned. ARS is replaced by BARS/NARS in Generic X11. Therefore, TFCØØ6 report information is neither collected nor printed on X11 systems.

- TFCØØ7 - System Park (XØ7), Call Park (X11,X37)

  On Generic XØ7 the TFCØØ7 report provides statistics related to the usage of the system park feature, including number of calls parked, wait time on park numbers, and system park number overflows.

  For Generic X11 and X37 TFCØØ7 provides information about the usage of both system wide and individual station call park features, including all of the information in generic XØ7 plus counts for the number of times a call recalls from a system or station park number.

- TFCØØ8 - Integrated Messaging System

  Traffic measurement data related to number of calls processed in the message Attendant queue, and usage of the various elements of the IMS (Integrated Messaging System) features.

*** PRACTICE EXERCISE ***

Fill in the blank

What report would you use to check the usage of a customer's SL-1 station features?

____

*** ANSWER ***

What report would you use to check the usage of a customer's SL-1 station features?

TFCØØ5 - Features

Three additional customer traffic measurement outputs can be obtained if the Meridian SL-1 is equipped with the Network Traffic (NTRF) feature of generic X11 features. The reports available are:

- TFNØØ1 - Routing Measurements
  This measurement provides data related to route utilization. The measurements 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 are available at Meridian SL-1 Nodes and Main switches.

- TFNØØ2 - Network Class-Of-Service (NCOS)
  This measurement provides data for each defined NCOS group (Ø to 15) to indicate the grade of service, in terms of blocking and queuing delay, being provided by the system.

- TFNØØ3 - Incoming Trunk Group
  This measurement provides an indication of the incremental traffic that was imposed on incoming trunk groups by the network queuing features. Data are provided for each incoming or 2-way trunk group that is offered OHQ, CCBQ or CBQCM. These measurements are available at Meridian SL-1 Nodes and Main Switches.

Refer to the NTP in the Appendix for more information on Customer Traffic reports. Customer reports will be detailed in Module 5.

THRESHOLD VIOLATION OUTPUTS

Thresholds in the Meridian SL-1 are levels that can be preset to provide printed data only when certain defined measurements reach a specified level. These thresholds may also be used to bypass other traffic reports unless the set level is exceeded.

Thresholds are covered in Module 6.

There is one output that we haven't discussed yet. That is TFSØØØ. This is not actually a report in the sense that a report tells you about the system's operation. TFSØØØ is a date and time stamp that is printed every time any other report or group of reports is to be printed. This provides a way of determining when the report print outs occurred. This is very important when you are looking for a day or time that a particular event occurred. This output can be suppressed through a special command in overlay 2.

Example of a TFSØØØ output:

```
279 TFSØØØ
13   Ø8    1985
14   ØØ    Ø3
```

This chart will give you an idea of what each part of this output indicates.

Line #1	279 Switch ID	TFSØØØ OUTPUT INDICATOR	
Line #2	13 day	Ø8 month	1985 year
Line #3	14 (2:ØØ pm) hour	ØØ minutes	Ø3 seconds

Remember that this output will be extremely helpful in locating information for particular times and dates.

TRAFFIC MEASUREMENT PROCESS

Turn to NTP Section 450, pages 2-2 through 2-5, and read paragraphs 2.11 through 2.27 for information on the overall procedure for collecting and printing traffic measurements.

* Return here when you have finished reading.

NTP Section 450, Section 8 contains more detailed information on setting the parameters for printing traffic reports. The appropriate items will be referenced in the text as they become appropriate.

REPORT SCHEDULING AND OPTIONS

There are two basic report selection criteria you must respond to in order to obtain traffic data. They are:

1. Traffic Measurement Schedules

   These selections allow you to tell the system when to start and when to stop accumulating data. There is a separate schedule for both system traffic reports and customer traffic reports.

2. Traffic Measurement Options

   These "options" allow you to select which of the system or customer reports you want printed. A separate command is used for both system and customer reports.

*** PRACTICE EXCERCISE ***

Use the NTP pages 8-1 - 8-6 to answer the following questions.

1. What overlay program would you use to change system or customer traffic measurement schedules?

2. List the four types of commands used when communicating with the system.

3. List the parts of an "S" command.

4. Match the symbol in column A to the correct definition in column B.

COLUMN A	COLUMN B
--	____ Carriage return should be depressed.
.	____ Indicates system is ready to receive a new command from the TTY.
*	
#	____ Prompt indicating that the system is ready to receive data.

*** ANSWER ***

1. What overlay program would you use to change system or customer traffic measurement schedules? **OVERLAY Ø2**

2. List the four types of commands used when communicating with the system. **T, S, C, I**

3. List the parts of an "S" command.

   S command name input by the user, a response output by the system and a second input by the user.

4. Match the symbol in column A to the correct definition in column B.

COLUMN A	COLUMN B
--	* Carriage return should be depressed.
.	. Indicates system is ready to receive a new command from the TTY.
*	-- Prompt indicating the system is ready to receive data.
#	

INTERPRETING TRAFFIC ABBREVIATIONS AND COMMAND INPUTS

Of course if you enter a "T" command the system is going to print out some information that you'll need to interpret. Our next topic will be the interpretation of that information.

First we deal with schedules. In order to interpret the schedule information, you need some understanding of the abbreviations that are associated with commands used to define various data fields.

Abbreviations

sh = start hour	sm = start month
eh = end hour	em = end month
sd = start day	so = schedule options
ed = end day	d = days of the week

The start and end hours (sh & eh) are expressed in 24 hour time.
Example: 1 = 1:ØØ AM, 1Ø= 1Ø:ØØ AM, 14 = 2:ØØ PM (12 noon + 2), 23 = 11:ØØ PM (12 noon + 11).

The start day, end day, start month and end month are expressed as numbers. The 17th of August would be 17 8 (day followed by month).

Days (d) are:

1 = Sunday	5 = Thursday
2 = Monday	6 = Friday
3 = Tuesday	7 = Saturday
4 = Wednesday	

*** PRACTICE EXERCISE ***

Fill in the blank(s).

1. What would the 'sh' look like if you needed it to be set for 4:ØØ PM?

   ____

2. What would the 'sd' and 'sm' look like if you needed a report for July 19th?

   ____

*** ANSWER ***

1. What would the 'sh' look like if you needed it to be set for 4:ØØ PM?

   16

2. What would the 'sd' and 'sm' look like if you needed a report for July 19th?

   19 7

INTERPRETING TRAFFIC ABBREVIATIONS AND COMMAND INPUTS (cont.)

When reports are requested you have the option of having them printed at various time intervals. The time intervals and their associated option numbers that may be entered for schedule options (so) are:

Ø - No traffic scheduled.
1 - Print reports hourly, on the hour.
2 - Print reports hourly, on the half hour.
3 - Print reports half-hourly, on the hour and half hour.

QUERYING SYSTEM TRAFFIC SCHEDULES

The command "TSHS" is used to query the schedule for system traffic reports.

The following are explanations of the format for responses to this command. CAPITAL letters are typed by you. The small letters refer to the abbreviations discussed on the prior page.

NOTE: The small letters are fields which require input data to obtain particular information. These letters do not appear on the screen or teletype. They appear on the NTP for a format guide.

System Traffic Measurement Schedule

```
TSHS  (sd)  (sm)  (ed)  (em)
(sh)  (eh)  (so)
(d)
```

Example of a screen/teletype display:

```
TSHS  25 4 16 7
12 21 2
2 3 4 5 6
```

In this example, System Traffic Measurement Reports will be generated from April 25 (25 4) to July 16 (16 7). Data is gathered from noon (12) until 9:ØØ PM (21). Reports are to be printed hourly, on the half-hour (2), Monday through Friday (2 3 4 5 6).

*** PRACTICE EXERCISE ***

Fill in the blank(s)

If line two of the example above looked like: 13 18 3

This would indicate that data is gathered from ____________ until ________________ and the reports are to be printed ________________ ___________________.

*** ANSWER ***

This would indicate that data is gathered from 1:ØØ PM until 6:ØØ PM and the reports are to be printed HALF HOURLY, ON THE HOUR AND HALF HOUR.

CHANGING THE SYSTEM TRAFFIC SCHEDULES

Setting up the system traffic schedules is just as easy as asking the system to tell you what the current schedule is. To set the schedule you change the command prefix "T" to an "S" -- "Set the schedule - "SSHS".

The format is even the same. The only difference is that after the system displays each line of the current values a "--" prompt is displayed and the system waits for your input.

Example: When you enter SSHS("Set the ScHedule for the System") the system printout looks like this:

SSHS 25 4 16 7 --

The "--" tells you that the system is expecting some input from you. The format for inputting changes is in the same order as the displayed information. Note: CAPITAL letters indicate where you type, small letters indicate where the system types.

When changing any field in one or more lines, all fields in that line must be entered, even those that are not to be changed. If no changes are to be made to any line, enter a carriage return to go to the next line or end the command.

Example:

```
SSHS (sd) (sm) (ed) (em) -- (SD) (SM) (ED) (EM)
(sh) (eh) (so) -- (SH) (EH) (SO)
(d) -- (D)
```

Let's take a look at another example.

```
SSHS 25 4 16 7 -- 30 3 18 10
12 21 2 -- 10 20 1
2 3 4 5 6 -- 1 7
```

*** PRACTICE EXERCISE ***

In this example, the start date and month were changed from April 25 (25 4) to March 30 (30 3). The end date was changed from July 16 (16 7) to October 18 (18 10). See if you can determine what other changes were made on the second and third lines.

Line 2 ____

____

Line 3 ____

____

*** ANSWER ***

Line 2 The start hour is changed from noon (12) to 10:00 AM (10). The end hour is changed from 9:00 PM (21) to 8:00 PM (20). The report printing time is changed from hourly on the half hour (2) to hourly on the hour (1).

Line 3 The days of the week that the reports are to be run changed from Monday through Friday (2 3 4 5 6) to Saturday and Sunday (1 7).

QUERYING AND CHANGING THE CUSTOMER TRAFFIC SCHEDULES

Requesting and setting schedules for individual customer traffic is the same as requesting and setting the schedule for system traffic. The differences are:

1. Change the command suffix from an "S" to a "C". Example: TSHS becomes TSHC, SSHS becomes SSHC.

2. Include the customer number. Example: SSHC 0 tells the system that you want to "Set the ScHedule for Customer 0".

All other entries are the same.

Let's see what command would be entered to check on the current schedule for customer 2. In other words we want the system to "Tell me the ScHedule for Customer 2".

The command would be:

TSHC 2

The following is the structure of the command to set a schedule for customer traffic. Note: (CUSTOMER) indicates where the customer number is entered. Also note that the space bar must be pressed rather than a carriage return after the customer number is entered in order to change the current settings for the first line. Carriage returns are entered at the end of each line whether data is entered or not.

```
SSHC (CUSTOMER) (sd) (sm) (ed) (em) -- (SD) (SM) (ED) (EM)
(sh) (eh) (so) -- (SH) (EH) (SO)
(d) -- (D)
```

*** PRACTICE EXERCISE ***

The suffix and adding a customer number are the only differences when requesting and setting schedules for individual customers.

1. TRUE 2. FALSE

*** ANSWER ***

1. TRUE

CLEARING SYSTEM AND CUSTOMER TRAFFIC SCHEDULES

There is no separate command for clearing system or customer schedules that are already set. However, to stop traffic from printing out, one or more of the following steps may be taken.

1. The easiest way to clear traffic is to set both system and customer schedules for schedule option Ø, which means no traffic is to be output.

2. Another method for stopping traffic from printing out is to set the dates for both system and customer schedules to a past date. However, these dates will then be valid 365 days later.

3. A third method for stopping traffic printouts does not change any schedules. Instead, ask the maintenance craftsperson to change the Meridian SL-1's configuration record so that traffic is not automatically output to any TTY. By doing this, an active schedule may be maintained year-round, yet valid reports may be obtained only when requested by using the "T" commands to invoke them. However, as a result, you should be aware that certain warning messages (TFS401 and TFS402) will not be output at all. (These messages will be discussed in module 6.)

CHANGING, SETTING, AND CLEARING SYSTEM AND CUSTOMER OPTIONS

At the start of this module we listed the reports that can be run. There were System Reports and Customer Reports.

These reports are selected by telling the system the option number you want. The option numbers are:

System Reports

Option 1 - Networks (Per loop)
Option 2 - Services
Option 3 - Dial Tone Delay
Option 4 - Processor Load
Option 5 - Lines
Option 7 - Junctor Group Traffic

Customer Reports

Option 1 - Networks (per customer)
Option 2 - Trunks
Option 3 - Queue
Option 4 - Attendant Console
Option 5 - Features
Option 6 - ARSQ/RGA (not applicable in X11)
Option 7 - Call Park
Option 8 - Integrated Messaging System (IMS)/Integrated Voice Messaging System (IVMS).

Network reports

Option 1 - Route List Measurements
Option 2 - Network Class-of Service Measurements
Option 3 - Incoming Trunk Group Measurements

To query the options to be printed, the "TOPS" command format is used. The suffixes "S" or "C" are the same as those used in the schedule commands. The suffix "N" is used in place of the suffix "C" to obtain network traffic measurement options, in conjunction with the proper customer number.

To set additional options to be printed, the "SOPS" command is used. The suffixes "S", "C", and "N" are the same as those used above in querying options. Note, however, that this command only allows you to add additional options to those already set. Not typing in a preset option is not the same as clearing it. (Options typed in response to this command that are already set will not be repeated.)

To clear any undesired options, the "COPS" command is used. The suffixes "S", "C", and "N" are the same as those used above in querying or setting options. Options entered in response to this command will be deleted from the list of options to be printed.

Sample input: ("Tell me the Options for System reports").

TOPS 3 5

Explanation:

This means that System Option 3 (Dial Tone Delay) and System Option 5 (Lines) are currently selected. When reports are run, based on the system schedule, the only system reports that will be printed are the Dial Tone Delay and the Lines reports, unless threshold violations cause other reports to be printed.

*** PRACTICE EXERCISE ***

1. What would be the command if you wanted to set the options for customer 1?

____

____

2. What would be the command for customer Ø if you wanted to set a network option for incoming trunk group measurements?

____

____

*** ANSWER ***

1. If you answered SOPC 1 "Set the OPtions for Customer number" you have a good understanding of how to decide on the command you want. If you didn't get this question right, you should review this module before continuing with this course.

2. .SOPN Ø 3 Is the correct answer. For more information see the NTP in the Appendix.

REQUESTING REPORTS MANUALLY

Any of the data in the holding reqisters may be accessed at any time since the last scheduled traffic output, up until the next scheduled traffic output. There are separate commands for system and customer options.

In addition, the current time and date may be requested from the Meridian SL-1, also in overlay program 2. This should be done before any traffic measurements are envoked, as the time and date stamp is only output automatically by the system at the time of the next scheduled output. Data without a time and date stamp may otherwise be meaningless when conducting a traffic study.

QUERYING TIME AND DATE

The command used to queury the time and date is "TTAD". The system will output the time as set in the system real time clock. If the output is all zeroes or an invalid date and time the clock may be set to the correct time in this overlay program. The correct time and date must always be reset after a system reload.

The command format is:

.TTAD (Day of week) (date) (month) (year) (hour) (minutes) (seconds)

Example of querying time and date:

.TTAD MON 19 Ø8 1985 15 32 49

The date is August 19, 1985, and the time is 3:32:49 P.M. The hour is always expressed in military time, i.e., the 24-hour clock.

SETTING TIME AND DATE

The command used to set time and date is "STAD".

When setting the time and date, the day of the week is not entered, as the system calculates this automatically. The year may be entered as either a 4-digit number or a 2-digit number, representing years between 1976 and 2Ø75. (See NTP, page 8-9, paragraphs 8.35 through 8.36 for more information.) All other fields are entered as two-digit fields:

The command format is:

```
.STAD (date) (month) (year) (hour) (minutes) (seconds)
```

Example of setting time and date:

```
.STAD 19 8 85 15 32 49
```

The date is August 19. 1985, and the time is 3:32:49 P.M., using the 24-hour clock.

REQUESTING SYSTEM AND CUSTOMER TRAFFIC DATA

The commands used to invoke system and customer traffic reports are the "I" commands. Refer to NTP page 8-1Ø, paragraphs 8.4Ø through 8.44 for more information. The command for requesting system traffic reports is "INVS", followed by the option codes for the desired traffic reports. When this command is entered, the long connection messages TFS411 and TFS412 may also be output, if apporpriate. (These messages are discussed in module 6.)

Example of request for system traffic reports:

```
.INVS 1 2 3 4 5
```

The above example requests the Meridian SL-1 to output system options 1, 2, 3, 4, and 5.

The command used to invoke customer traffic reports is "INVC", followed by the desired customer number and the option codes for the desired traffic reports. When this command is entered, the long connection messages TFS411 and TFS412 may also be output, if appropriate.

Example of request for customer traffic reports:

```
.INVC Ø 2 3 4
```

The above example requests the Meridian SL-1 to print customer options 2, 3, and 4 for customer Ø.

> Note: When entering the customer number, press the space bar instead of a carriage return after the customer number, and then enter the desired option codes. Pressing the carriage return after the customer number will result in an error code.

The network traffic measurement options require a different command. To invoke these reports, use the command "INVN", followed by the customer number, and the desired option codes.

Example of request for network traffic reports:

```
.INVN 1 1 2 3
```

The above example requests the system to print the network traffic reports for customer 1, option codes 1, 2, and 3.

> Note: Enter the customer number followed by a space in the same manner as above for customer options.

MODULE 3 SELF CHECK PART 1

This self check has two parts. Part 1 is on this page and part 2 is on page 3-17. Using the scenario below write the information in the spaces provided by the sample CRT screen so you can obtain the reports requested by your boss.

Read the following scenario.

SCENARIO:

Your switch is currently generating system services and customer network reports for customer Ø. The schedules indicate that they are set up to run Monday through Friday, 12 noon to 9:ØØ PM and hourly on the half hour, from April 25 through June 16.

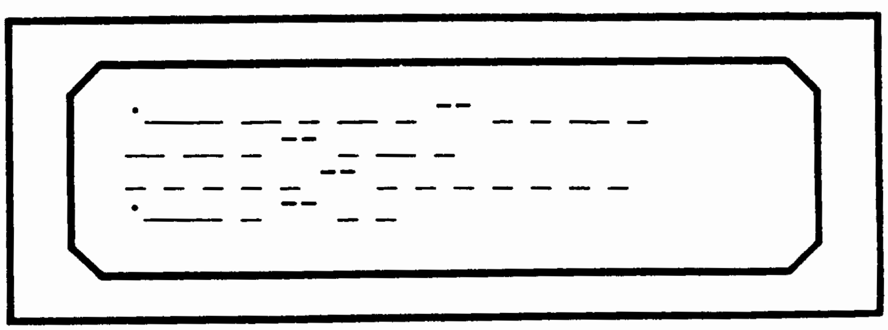
Your boss sends you the following memo:

> I want you to change schedules and options so that reports are generated on traffic accumulated during the entire month of August. The reports I need are System Network, Dial Tone Delay, Trunks, Queue, and Attendant Console. I would like the reports to be run from 6AM to 6PM, hourly on the hour and from Sunday through Saturday.
>
> Thank you

Part 1. USE THE SAMPLE CRT SCREEN FOR SYSTEM SCHEDULE(S).

Remember to write the commands in the spaces provided on the sample CRT screen below.

System response indicated by (--).
Areas for input indicated by _ for 1 number and __ for a two digit number. EXAMPLE: 1 -- 34



When you complete this part turn to the self check answer sheet on the next page.

MODULE 3 SELF-CHECK ANSWER SHEET

PART 1 SYSTEM SCHEDULE ANSWERS.

```
.SSHS 25 4 16 7 -- 1 8 31 8
12 21 2 -- 6 18 1
2 3 4 5 6 -- 1 2 3 4 5 6 7
.SOPS 2 -- 1 3
```

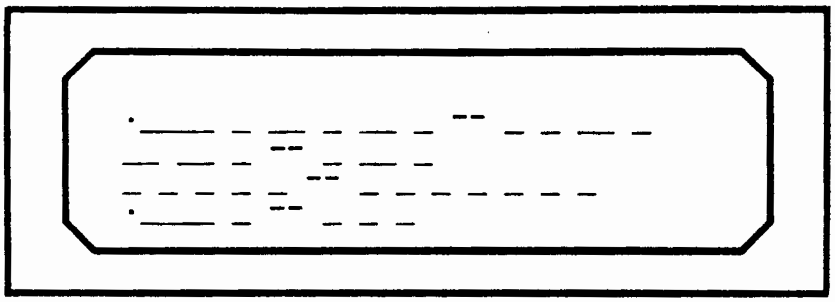
If you had any problems or some of your answers did not match, you should review this module and look at the example in Part 3 of the NTP.

Turn to the next page to complete part 2 of this self check.

MODULE 3 SELF CHECK PART 2

Part 2. Use the sample CRT screen for (Customer Schedules).
(NOTE: Refer back to page 3-16 to get the data you need.)

Remember to write the commands in the spaces provided by the sample CRT screen below.



When you complete this part turn to the self check answer sheet on the next page.

PART 2 CUSTOMER SCHEDULE ANSWERS

```
.SSHC Ø 25 4 16 7 -- 1 8 31 8
12 21 2 -- 6 18 1
2 3 4 5 6 -- 1 2 3 4 5 6 7
.SOPC Ø -- 2 3 4
```

If you had any problems or some of your answers did not match, you should review this module and look at the examples in Part 4 of the NTP.

SUMMARY

There are three major types of reports. They are:

1. System Measurement Outputs
   Provide information at a system level.

2. Customer Measurement Outputs
   Provide information at the customer level.

3. Threshold Violation Outputs
   Provide information when certain preset operational levels are exceeded.

There are six System Reports that you may select to be run.

- o TFS001 - Networks
- o TFS002 - Services
- o TFS003 - Dial Tone Delay
- o TFS004 - Processor Load
- o TFS005 - Lines
- o TFS007 - Junctor Group Traffic

There are eleven selectable Customer Reports.

- o TFC001 - Networks
- o TFC002 - Trunk
- o TFC003 - Queue
- o TFC004 - Console
- o TFC005 - Features
- o TFC006 - ARS and Ring Again
- o TFC007 - System Park
- o TFC008 - Integrated Messaging System
- o TFN001 - Routing Measurements
- o TFN002 - Network Class of Service
- o TFN003 - Incoming Trunk Group

Commands are used to schedule the times and select the reports to be printed.

The four types of commands for both system and customer traffic reports are:

"T"	Used to query schedules or options.
"S"	Used to set schedules or add options.
"C"	Used to remove options.
"I"	Used to access data in the holding registers.

More information on these commands can be found in section eight of the NTP in the Appendix.

The report information in this module will be helpful to you when you start interpreting the System and Customer Reports in the modules that follow.

Additional information on the subjects covered in this module can be found in the NTP contained in the Appendix.

Module 4
System Reports

MODULE FOUR

SYSTEM REPORTS

Module Overview

Module 4 provides an in-depth look at the System Reports mentioned in Module 3. The report descriptions, data available, and data interpretation will be detailed.

Module Objective

Given several system reports, you should be able to identify any information on the reports that identify possible areas of less than ideal switch operation. You should then be able to select from a list the recommended procedure to rectify the possible problem.

SYSTEM REPORTS

The first system report you will review is the **TFSØØ1-NETWORKS.** This report contains information on loop usage (CCS), failures to match (FTM), and peg count (PC), which are provided on a loop-by-loop basis in this report. One line of output is provided for each loop in the system.

EXAMPLE TFS ØØ1 NETWORKS REPORT

2ØØ TFSØØ1

ØØ	TERM	ØØØØØ	ØØØØØØ6	ØØØØ4	ØØØØØ	ØØØØØ64	ØØØ56
Ø1	TERM	ØØØØØ	ØØØØØ35	ØØØ22	ØØØØØ	ØØØØ123	ØØØ86
Ø2	TERM	ØØØØØ	ØØØØØ31	ØØØ2Ø	ØØØØØ	ØØØØ126	ØØØ75
Ø5	CONF	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØØØ	ØØØØØ
Ø7	TDS	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØØØ	ØØØØØ
Ø8	TERM	ØØØØØ	ØØØØØ19	ØØØ11	ØØØØØ	ØØØØ143	ØØØ98
Ø9	TERM	ØØØØ1	ØØØØØ89	ØØØ66	ØØØØ2	ØØØØ194	ØØ149
13	TERM	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØ25	ØØØØ6
15	TDS	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØ31	Ø1496

You are going to review each part of this report to insure that you understand it entirely. Before you get started it is important for you to know that the areas being reviewed on the reports will be **highlighted.**

The number 200 is called the System Identification number, and is used to identify what system generated the report. The number is helpful when trying to locate a report that is generated with several others.

200 TFS001

00	TERM	00000	0000006	00004	00000	0000064	00056
01	TERM	00000	0000035	00022	00000	0000123	00086
02	TERM	00000	0000031	00020	00000	0000126	00075
05	CONF	00000	0000000	00000	00000	0000000	00000
07	TDS	00000	0000000	00000	00000	0000000	00000
08	TERM	00000	0000019	00011	00000	0000143	00098
09	TERM	00001	0000089	00066	00002	0000194	00149
13	TERM	00000	0000000	00000	00000	0000025	00006
15	TDS	00000	0000000	00000	00000	0000031	01496

TFS001 indicates what report you are reviewing.
This number is helpful when you are trying to locate a particular report in a long list of reports. This number changes, depending on the report.

200 **TFS001**

00	TERM	00000	0000006	00004	00000	0000064	00056
01	TERM	00000	0000035	00022	00000	0000123	00086
02	TERM	00000	0000031	00020	00000	0000126	00075
05	CONF	00000	0000000	00000	00000	0000000	00000
07	TDS	00000	0000000	00000	00000	0000000	00000
08	TERM	00000	0000019	00011	00000	0000143	00098
09	TERM	00001	0000089	00066	00002	0000194	00149
13	TERM	00000	0000000	00000	00000	0000025	00006
15	TDS	00000	0000000	00000	00000	0000031	01496

This column is called LOOP NUMBERS.
These numbers indicate what loop number is assigned to the system. The loop numbers can range from Ø-159.

200 TFS001

ØØ	TERM	ØØØØØ	ØØØØØØ6	ØØØØ4	ØØØØØ	ØØØØØ64	ØØØ56
Ø1	TERM	ØØØØØ	ØØØØØ35	ØØØ22	ØØØØØ	ØØØØ123	ØØØ86
Ø2	TERM	ØØØØØ	ØØØØØ31	ØØØ2Ø	ØØØØØ	ØØØØ126	ØØØ75
Ø5	CONF	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØØØ	ØØØØØ
Ø7	TDS	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØØØ	ØØØØØ
Ø8	TERM	ØØØØØ	ØØØØØ19	ØØØ11	ØØØØØ	ØØØØ143	ØØØ98
Ø9	TERM	ØØØØ1	ØØØØØ89	ØØØ66	ØØØØ2	ØØØØ194	ØØ149
13	TERM	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØ25	ØØØØ6
15	TDS	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØ31	Ø1496

This column is called LOOP TYPES .
The three loops indicated in this report are:

- TERM(inal): A loop containing lines, trunks, etc.
- TDS: (Tone & Digit Switch) A loop providing tones and outpulsing for outgoing trunks. Also known as service loop.
- CONF(erence): A conference loop.

200 TFS001

ØØ	**TERM**	ØØØØØ	ØØØØØØ6	ØØØØ4	ØØØØØ	ØØØØØ64	ØØØ56
Ø1	**TERM**	ØØØØØ	ØØØØØ35	ØØØ22	ØØØØØ	ØØØØ123	ØØØ86
Ø2	**TERM**	ØØØØØ	ØØØØØ31	ØØØ2Ø	ØØØØØ	ØØØØ126	ØØØ75
Ø5	**CONF**	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØØØ	ØØØØØ
Ø7	**TDS**	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØØØ	ØØØØØ
Ø8	**TERM**	ØØØØØ	ØØØØØ19	ØØØ11	ØØØØØ	ØØØØ143	ØØØ98
Ø9	**TERM**	ØØØØ1	ØØØØØ89	ØØØ66	ØØØØ2	ØØØØ194	ØØ149
13	**TERM**	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØ25	ØØØØ6
15	**TDS**	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØ31	Ø1496

There is also an MF(sender) loop not indicated in this report. This loop provides multifrequency outpulsing. This loop is present only if you have Automatic Number Identification equipment software.

*** PRACTICE EXERCISE ***

Using the report below fill in the blank(s) for the following question(s):

279 TFSØØ1

ØØ	TERM	ØØØØØ	ØØØ1382	ØØ297	ØØØØØ	ØØØ9782	Ø3Ø33
Ø3	TERM	ØØØØØ	ØØØ1562	Ø1Ø84	ØØØØØ	ØØ13486	Ø7748
Ø6	CONF	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØ14	ØØØØ9
Ø7	TDS	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØØ2	ØØØØØ
Ø8	TERM	ØØØØØ	ØØØ555Ø	Ø399Ø	ØØØØØ	ØØ244Ø4	14221
14	CONF	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØØ5	ØØØØ9
15	TDS	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØ2598	4Ø77Ø

1. What is the system ID number? ____________________.
2. What is the report number? ____________________.
3. What is the loop type for loop Ø6? ________________.

*** ANSWER ***

1. What is the system ID number? 279
2. What is the report number? TFSØØ1
3. What is the loop type for loop Ø6? CONF

If you had any problems with this exercise you should review the first part of this module.

This column is called INTRALOOP FTM (within the same loop). An intraloop FTM is incremented when a connection cannot be made between two terminals in the same loop, because all time slots for that loop are busy.
It is only incremented once in this column although there were two terminals involved. There are no INTRA FTM measurements for TDS, MFS or conference loops; therefore, they should always be zero.

200 TFS001

00	TERM	**00000**	0000006	00004	00000	0000064	00056
01	TERM	**00000**	0000035	00022	00000	0000123	00086
02	TERM	**00000**	0000031	00020	00000	0000126	00075
05	CONF	**00000**	0000000	00000	00000	0000000	00000
07	TDS	**00000**	0000000	00000	00000	0000000	00000
08	TERM	**00000**	0000019	00011	00000	0000143	00098
09	TERM	**00001**	0000089	00066	00002	0000194	00149
13	TERM	**00000**	0000000	00000	00000	0000025	00006
15	TDS	**00000**	0000000	00000	00000	0000031	01496

This column is called INTRALOOP CCS . This is the total time two time slots on the same call on that loop were busy. The usage for the call is added once to the INTRALOOP CCS.

200 TFS001

00	TERM	00000	**0000006**	00004	00000	0000064	00056
01	TERM	00000	**0000035**	00022	00000	0000123	00086
02	TERM	00000	**0000031**	00020	00000	0000126	00075
05	CONF	00000	**0000000**	00000	00000	0000000	00000
07	TDS	00000	**0000000**	00000	00000	0000000	00000
08	TERM	00000	**0000019**	00011	00000	0000143	00098
09	TERM	00001	**0000089**	00066	00002	0000194	00149
13	TERM	00000	**0000000**	00000	00000	0000025	00006
15	TDS	00000	**0000000**	00000	00000	0000031	01496

This column is called INTRALOOP PEG COUNT.
Intra peg count is incremented only one time for a connection that is idled between two terminals on the same loop.
Therefore, we can see that all INTRA measurements peg on a per call basis, even though two terminals were involved.

200 TFS001

00	TERM	00000	0000006	**00004**	00000	0000064	00056
01	TERM	00000	0000035	**00022**	00000	0000123	00086
02	TERM	00000	0000031	**00020**	00000	0000126	00075
05	CONF	00000	0000000	**00000**	00000	0000000	00000
07	TDS	00000	0000000	**00000**	00000	0000000	00000
08	TERM	00000	0000019	**00011**	00000	0000143	00098
09	TERM	00001	0000089	**00066**	00002	0000194	00149
13	TERM	00000	0000000	**00000**	00000	0000025	00006
15	TDS	00000	0000000	**00000**	00000	0000031	01496

EXAMPLE

A call between 2 phones on the same loop lasted for 15 minutes (9CCS).

INTRA CCS = 9　　　　INTRA PC = 1

*** PRACTICE EXERCISE ***

Fill In The Blank

1. The total time two time slots on a loop are busy on the same call is incremented in the __________ column.

2. What is incremented only one time for a connection that is idled between two terminals on the same loop? ____________

3. If you needed to find out how many times a connection could not be made between two terminals in the same loop you would check the _________________ column.

*** ANSWER ***

1. The total time two time slots on a loop are busy on the same call is incremented in the INTRALOOP CCS column.

2. What is incremented only one time for a connection that is idled between two terminals on the same loop? INTRALOOP PEG COUNT

3. If you needed to find out how many times a connection could not be made between two terminals in the same loop you would check the INTRALOOP FTM column.

If you had any problems with this exercise you should review the appropriate parts of this module and/or refer to part 3 of the NTP in the Appendix.

This column is called LOOP FTM .

200 TFS001

00	TERM	00000	0000006	00004	**00000**	0000064	00056
01	TERM	00000	0000035	00022	**00000**	0000123	00086
02	TERM	00000	0000031	00020	**00000**	0000126	00075
05	CONF	00000	0000000	00000	**00000**	0000000	00000
07	TDS	00000	0000000	00000	**00000**	0000000	00000
08	TERM	00000	0000019	00011	**00000**	0000143	00098
09	TERM	00001	0000089	00066	**00002**	0000194	00149
13	TERM	00000	0000000	00000	**00000**	0000025	00006
15	TDS	00000	0000000	00000	**00000**	0000031	01496

The loop FTM column is used when you want to find information about TERMINAL LOOP FTMs, SERVICE LOOP FTMs and CONFERENCE LOOP FTMs. The following page explains some things that the loop FTM will indicate:

- A TERMINAL LOOP FTM is incremented when:

    1. A connection cannot be made between two terminals on that loop or between a terminal on that loop and a terminal on another loop. The LOOP FTM of one or both terminal loops will be incremented either once or twice, depending on whether it was an intraloop or an interloop connection. An intraloop connection will result in 2 loop FTM's on that loop, an interloop connection will result in one loop FTM on each of the loops involved.

    2. A connection cannot be made between a terminal or DTR and a SERVICE LOOP (for dial tone or outpulsing). The LOOP FTM of both the terminal loop and the service loop will be incremented once.

    3. A connection cannot be made between a 2500 type set and a DTR. The loop FTM of one or both loops will be incremented once for each terminal.
    The system will automatically try a second time to find an idle DTR, if the second attempt is blocked LOOP FTM will not be incremented again.

    4. A terminal cannot form a new Conference or add a new party to an existing conference.

- A SERVICE LOOP FTM is incremented once when a connection cannot be made to provide dial tone or outpulsing. Note that all appropriate loops are searched while trying to make a connection. If no connection can be made, the last service loop that was looked at by the system is incremented.

- A CONFERENCE LOOP FTM is incremented once when:

    1. A conference loop cannot be found to establish a new conference.

    2. A new party cannot be added to an existing conference.

Note: In the first circumstance, ALL conference loops of the system will have been looked at and the measurement will accumulate against the last conference loop to be looked at. The order in which conference loops are used is not fixed and, therefore, the last one to be looked at is not always the same one.

This column is called LOOP CCS .

200 TFS001

00	TERM	00000	0000006	00004	00000	**0000064**	00056
01	TERM	00000	0000035	00022	00000	**0000123**	00086
02	TERM	00000	0000031	00020	00000	**0000126**	00075
05	CONF	00000	0000000	00000	00000	**0000000**	00000
07	TDS	00000	0000000	00000	00000	**0000000**	00000
08	TERM	00000	0000019	00011	00000	**0000143**	00098
09	TERM	00001	0000089	00066	00002	**0000194**	00149
13	TERM	00000	0000000	00000	00000	**0000025**	00006
15	TDS	00000	0000000	00000	00000	**0000031**	01496

Loop measurements include any type of connections involving terminals on that loop, whether intraloop or interloop. Loop measurements are incremented once for each time slot per connection.

Since an intraloop connection involves two time slots on the same loop, any failures to match, usage, and/or peg counts accumulated for an intraloop connection are doubled in loop measurements. Connections between one loop and another increment FTM, CCS, and peg count once for each loop involved. The amount of interloop measurements on any loop can be determined using the following formula:

Loop (FTM, CCS, or PC) - 2 X Intraloop (FTM, CCS, or PC) =
Interloop (FTM, CCS, or PC)

The intraloop peg count plus the interloop peg count will show the actual number of different connections on that loop. (This can also be calculated by subtracting the intraloop peg count from the loop peg count).

This column is called LOOP PC (peg count).

200 TFS001

00	TERM	00000	0000006	00004	00000	0000064	**00056**
01	TERM	00000	0000035	00022	00000	0000123	**00086**
02	TERM	00000	0000031	00020	00000	0000126	**00075**
05	CONF	00000	0000000	00000	00000	0000000	**00000**
07	TDS	00000	0000000	00000	00000	0000000	**00000**
08	TERM	00000	0000019	00011	00000	0000143	**00098**
09	TERM	00001	0000089	00066	00002	0000194	**00149**
13	TERM	00000	0000000	00000	00000	0000025	**00006**
15	TDS	00000	0000000	00000	00000	0000031	**01496**

This column indicates the following:

- Each time an established path between two terminals is made idle the terminal loop peg count is incremented.
- Each time a busy path to the service loop is made idle the service loop peg count is incremented.
- Each time a path is idled between a terminal and a conference loop the conference loop peg count is incremented and the terminal's loop is incremented.

* PRACTICE EXERCISE *

Fill In The Blank

1. Which column would you check to find the amount of usage on a particular loop? _______________________.

2. What column would you check if a connection couldn't be made between any two terminals? ______________________________.

3. Which column would you check to find information on the times a busy path to the service loop was made idle? ___________________.

*** ANSWER ***

1. Which column would you check to find the amount of usage on a particular loop? LOOP CCS

2. What column would you check if a connection couldn't be made between any two terminals? LOOP FTM

3. Which column would you check to find information on the times a busy path to the service loop was made idle? SERVICE LOOP PC

If you had any problems with this exercise you should review the appropriate parts of this module before continuing.

Since the beginning of this module you have been reviewing the columns of the TFSØØ1 report. The module will now go into detail and explain the contents and relationships of the data in these columns. Before you begin, it is important to say that this is probably the single most important report in an entire traffic study because it provides an indication of how well a system is load balanced.

In order to determine whether a system is load balanced, one must understand what the term means. We know that traffic is generated by stations, trunks, attendant consoles, and Digitone receivers. This represents the load on a given system. The distribution of this traffic within the architecture of the Meridian SL-1 constitutes the system balance. Load balance is important because it has a great deal to do with the grade of service in the Meridian SL-1. The grade of service indicates the percentage of calls that are lost due to network blockage.

Network blockage, indicated by FTM's in the traffic reports, occurs when the Meridian SL-1 is unable to complete a call due to a lack of idle matching time slots between two terminals or a service loop. Blockage exists because of the basic time-division multiplex design of the Meridian SL-1. With 3Ø time slots per loop for voice and data traffic and a possible 16Ø terminals per loop, terminals must be distributed carefully so that contention for time slots is minimized. The object of load balancing is to provide the most efficient service at the least possible cost and level of inconvenience (blockage) to the customer.

Theoretically, each loop in the Meridian SL-1 can carry 1080 CCS of traffic. This is calculated by multiplying 30 time slots by 36 CCS, the maximum amount of traffic that can be carried by each in one hour. However, with all time slots in a loop busy 100% of the time, there would be 100% blockage for any other user in that loop wishing to make a call, assuming that there were more than 30 terminals in that loop. (Any Meridian SL-1 may be made non-blocking by assigning no more than 28 terminals per loop.) In addition, in generics prior to X11, time slots could only be used in certain combinations, (i.e., matched pairs). In generic X11, any idle time slot may be paired with any other idle time slot. In both cases, however, the CCS capacity per loop has been derated, in order to provide an acceptable grade for service for loops with more than 30 terminals. The developers of the Meridian SL-1 determined that a maximum of 600 CCS per loop (for pre-X11 software), and 660 CCS (for X11 software) for a system with 12 loops would provide a grade of service of no more than 1% blockage throughout the system. This is the grade of service to which all Meridian SL-1's should be engineered to provide.

With 30 times slots per loop, any Meridian SL-1 can accommodate 30 simultaneous calls, if all stations concerned are on different loops. However, with all users on the same loop, the number of simultaneous calls is reduced to 15. As a result, the probability of intraloop blockage occurring is higher than the probabiltiy of interloop blockage. That is why a greater percentage of intraloop blockage than interloop blockage is allowed. Intraloop blockage can be minimized by assigning stations that talk to each other frequently to different loops.

Although this module will not go into the procedures for load balancing a system, it should be noted that a well-balanced system will show usage evenly-distributed over all network groups and loops within the system, whether it consists of five network groups or two network loops. Because the Meridian SL-1 <u>is</u> traffic-sensitive, it will perform more efficiently with the same amount of equipment when it <u>is</u> balanced than when it is unbalanced. In particular, the smaller the system, or the higher the percentage of traffic capacity used in any system, the more critical becomes the load balance, as there are not as many time slots available. However, many switches have quite a range of latitude and will provide a good grade of service under less-than-ideal conditions.

A Meridian SL-1 may be said to be unbalanced when there are large numbers of trunks in the same route concentrated on a few loops, with some loops having no trunks in that route; or when there are one or more loops with a high number of high-usage stations and trunks located on them, and other loops with a low number of stations and few, if any, trunks: or when there are several loops with three or four shelves in a system which also has one or more loops with only one shelf. In such cases, often simply spreading trunks out over all loops, or moving a shelf from a three-shelf loop to a one-shelf loop, will significantly reduce blockage and improve service.

The following data that will be reviewed may vary depending on the size of the system, traffic etc. You will be reviewing what is considered ideal data for a balanced system, which may or may not be the case in all situations. For less than ideal data indications, you will review possible options to insure that a system does perform to meet the needs of the user.

Following you will see what is meant by ideal data and an example of ideal data on a well-balanced system report.

Ideal data may include:

- o All zeros in the INTRALOOP FTM column.
- o All zeros in the INTERLOOP FTM column.
- o Loop CCS 600 or below (660 for generic X11). Approximately no more than 100 CCS difference between loops.

Again you should be reminded that this is what is considered ideal. Many switches will operate quite well under less-than-ideal conditions.

Example of Well-Balanced System

259 TFS001

00	TERM	00000	0000015	00014	00000	0000218	00167
01	TERM	00000	0000028	00009	00000	0000264	00179
02	TERM	00000	0000011	00011	00000	0000206	00180
06	CONF	00000	0000000	00000	00000	0000000	00003
07	TDS	00000	0000000	00000	00000	0000000	00000
08	TERM	00000	0000021	00026	00000	0000304	00272
09	TERM	00000	0000023	00035	00000	0000266	00296
10	TERM	00000	0000004	00004	00000	0000222	00174
14	CONF	00000	0000000	00000	00000	0000006	00006
15	TDS	00000	0000000	00000	00000	0000085	01813
		B **			B *	A *	

This example is considered well balanced because:
(The asterisks (*) are used for clarification.)

o A * The highest loop (304) and the lowest loop (206) are only 98 CCS apart for terminal loops.

o B ** No intra FTMs.

o B * No loop FTMs.

This is a short example of a well balanced system. Again you should be reminded that there are many variations in these numbers that would still be considered a well balanced system.

Look at the example of a poorly balanced system.

Example of Poorly-Balanced System

Ø2Ø TFSØØ1

ØØ	TERM	ØØØØØ	ØØØØØ16	ØØØ19	ØØØ16	ØØØØ512	ØØ317
Ø1	TERM	ØØØØØ	ØØØØØ19	ØØØ13	ØØØØ6	ØØØØ366	ØØ245
Ø2	TERM	ØØØØ2	ØØØØØ19	ØØØ17	ØØØ39	ØØØØ592	ØØ355
Ø3	TERM	ØØØØØ	ØØØØØØ9	ØØØØ6	ØØØ17	ØØØØ374	ØØ226
Ø4	TERM	ØØØØØ	ØØØØØ22	ØØØ18	ØØØ16	ØØØØ564	ØØ292
Ø5	TERM	ØØØØØ	ØØØØØ12	ØØØ2Ø	ØØØ11	ØØØØ399	ØØ279
Ø6	CONF	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØ24	ØØØ72
Ø7	TDS	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØ33	ØØØØØØ2	ØØØ36
Ø8	TERM	ØØØØ9	ØØØØØ43	ØØØ37	ØØØ75	ØØØØ7ØØ	ØØ44Ø
Ø9	TERM	ØØØØ1	ØØØØØØ9	ØØØ18	ØØØ32	ØØØØ5Ø2	ØØ353
1Ø	TERM	ØØØØØ	ØØØØØ17	ØØØ21	ØØØ18	ØØØØ578	ØØ344
11	TERM	ØØØ33	ØØØØØ3Ø	ØØØ17	ØØ264	ØØØØ785	ØØ461
12	TERM	ØØØ11	ØØØØØ24	ØØØ18	ØØØ79	ØØØØ746	ØØ4Ø4
13	TERM	ØØØØ5	ØØØØØ39	ØØØ22	ØØØ6Ø	ØØØØ695	ØØ416
14	CONF	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØØ7	ØØØ66
15	TDS	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØ348	Ø6Ø88

Can you locate the data that makes this a poorly balanced system? The reason(s) this is considered a poorly balanced system will be reviewed:

- o Several loops are carrying usage exceeding 6ØØ CCS.
- o There are loop failures to match indicating network blockage.
- o The highest loop (785) and the lowest loop (366) exceed the recommended 1ØØ CCS difference.

Corrective action required to reduce blockage in this system and improve the load balance would be to remove high-usage stations and trunks from loops with high CCS and redistribute them evenly over loops with low CCS.

*** PRACTICE EXERCISE ***

Fill in the Blank.

1. FTM column(s) should generally be all ____________________.

2. A well balanced system has a loop CCS difference of less than ____________________.

*** ANSWER ***

1. FTM column(s) should generally be all <u>zeros Ø</u>.

2. A well balanced system has a loop CCS difference of less than <u>1ØØ.</u>

Before continuing with a review of the data there is something you should remember. For any system, the total system blockage, as well as the total loop blockage on any loop, should not exceed 1%. Where it does, there may be a problem, either in the distribution of trunks and stations, or the community of interest between stations. (Stations that talk to each other frequently are said to share the same community of interest.)

The total system blockage and the total loop blockage are based on the intraloop and interloop measurements you learned about earlier. These figures are used in calculating network blockage percentages for both individual loops and the entire system. Since total loop blockage represents the combined average of intraloop and interloop blockage, the recommended maximum blockage levels for intraloop and interloop calls will be a range of blockage levels <u>up to</u> 4% for intraloop blockage and <u>up to</u> 1% for interloop Blockage. This will result in an average total blockage of approximately 1% for individual loops or the entire system.

To calculate intra and interloop blockage for each loop use the following formula:

(NOTE: You must calculate interloop measurements before using the formula below to obtain intra/interloop blockage.)

$$\frac{\text{(Intra/Interloop) FTM}}{\text{(Intra/Interloop)PC + (Intra/Interloop)FTM}} \times 100 = \%\ \text{Blockage}$$

The example on the next 2 page(s) demonstrates how to calculate interloop measurements and then use that data to calculate intra/ interloop blockage for each loop using the report below.

200 TFS001

00	TERM	00000	0000004	00004	00016	0000361	00211
01	TERM	00000	0000001	00002	00004	0000278	00150
02	TERM	00000	0000014	00010	00025	0000358	00242
03	TERM	00000	0000009	00009	00010	0000316	00175
04	TERM	00000	0000014	00008	00018	0000391	00202
05	TERM	00000	0000016	00005	00012	0000351	00172
06	CONF	00000	0000000	00000	00000	0000002	00036
07	TDS	00000	0000000	00000	00018	0000001	00021
08	TERM	00043	0000013	00013	00232	0000592	00324
09	TERM	00000	0000010	00008	00009	0000385	00241
10	TERM	00000	0000010	00018	00019	0000482	00316
11	TERM	00017	0000013	00009	00142	0000593	00291
12	TERM	00000	0000037	00013	00017	0000481	00301
13	TERM	00000	0000020	00019	00022	0000500	00289
14	CONF	00000	0000000	00000	00000	0000001	00038
15	TDS	00000	0000000	00000	00000	0000250	04581

(LOOP FTM,CCS or PC) - 2 X INTRALOOP(FTM,CCS or PC)=INTERLOOP (FTM,CCS or PC)

LOOP Ø   INTERLOOP CALCULATIONS:

FTM: 16 - 2 X Ø = 16 INTERLOOP FTM

CCS: 361 - 2 X 4 = 353 INTERLOOP CCS

PC: 211 - 2 X 4 = 2Ø3 INTERLOOP PC

LOOP 8   INTERLOOP CALCULATIONS:

FTM: 232 - 2 X 43 = 146 INTERLOOP FTM

CCS: 592 - 2 X 13 = 566 INTERLOOP CCS

PC: 324 - 2 X 13 = 298 INTERLOOP PC

Now that we have the interloop calculations for loops Ø & 8 we can use the formula for calculating intra/interloop blockage for each of these loops.

LOOP Ø   BLOCKAGE PER LOOP

INTRALOOP:

$$\frac{0}{4 + 0} \times 100 = 0\% \text{ BLOCKAGE}$$

INTERLOOP:

$$\frac{16}{203 + 16} \times 100 = 7.3\% \text{ BLOCKAGE}$$

LOOP 8   BLOCKAGE PER LOOP

INTRALOOP:

$$\frac{43}{13 + 43} \times 100 = 76.8\% \text{ BLOCKAGE}$$

INTERLOOP:

$$\frac{146}{298 + 146} \times 100 = 32.9\% \text{ BLOCKAGE}$$

Do you understand how to use the formula for calculating intra/interloop blockage for each loop? If you don't go back and review.

*** PRACTICE EXERCISE ***

Use the report below to calculate the percent of intra/interloop blockage for loops Ø2 and 11.

2ØØ TFSØØ1

ØØ	TERM	ØØØØØ	ØØØØØØ4	ØØØØ4	ØØØ16	ØØØØ361	ØØ211
Ø1	TERM	ØØØØØ	ØØØØØØ1	ØØØØ2	ØØØØ4	ØØØØ278	ØØ15Ø
Ø2	TERM	ØØØØØ	ØØØØØ14	ØØØ1Ø	ØØØ25	ØØØØ358	ØØ242
Ø3	TERM	ØØØØØ	ØØØØØØ9	ØØØØ9	ØØØ1Ø	ØØØØ316	ØØ175
Ø4	TERM	ØØØØØ	ØØØØØ14	ØØØØ8	ØØØ18	ØØØØ391	ØØ2Ø2
Ø5	TERM	ØØØØØ	ØØØØØ16	ØØØØ5	ØØØ12	ØØØØ351	ØØ172
Ø6	CONF	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØØ2	ØØØ36
Ø7	TDS	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØ18	ØØØØØØ1	ØØØ21
Ø8	TERM	ØØØ43	ØØØØØ13	ØØØ13	ØØ232	ØØØØ592	ØØ324
Ø9	TERM	ØØØØØ	ØØØØØ1Ø	ØØØØ8	ØØØØ9	ØØØØ385	ØØ241
1Ø	TERM	ØØØØØ	ØØØØØ1Ø	ØØØ18	ØØØ19	ØØØØ482	ØØ316
11	TERM	ØØØ17	ØØØØØ13	ØØØØ9	ØØ142	ØØØØ593	ØØ291
12	TERM	ØØØØØ	ØØØØØ37	ØØØ13	ØØØ17	ØØØØ481	ØØ3Ø1
13	TERM	ØØØØØ	ØØØØØ2Ø	ØØØ19	ØØØ22	ØØØØ5ØØ	ØØ289
14	CONF	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØØ1	ØØØ38
15	TDS	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØ25Ø	Ø4581

*** ANSWER ***

LOOP 2 INTERLOOP CALCULATIONS:

FTM: 25 - 2 x 0 = 25 INTERLOOP FTM

CCS: 358 - 2 x 14 = 330 INTERLOOP CCS

PC: 242 - 2 x 10 = 222 INTERLOOP PC

LOOP 11 INTERLOOP CALCULATIONS:

FTM: 142 - 2 x 17 = 108 INTERLOOP FTM

CCS: 593 - 2 x 13 = 567 INTERLOOP CCS

PC: 291 - 2 x 9 = 273 INTERLOOP PC

LOOP 02 BLOCKAGE:

INTRA:

$$\frac{0}{10 + 0} \times 100 = 0\%\ \text{BLOCKAGE}$$

INTER:

$$\frac{25}{222 + 25} \times 100 = 10.1\%\ \text{BLOCKAGE}$$

LOOP 11 BLOCKAGE:

INTRA:

$$\frac{17}{9 + 17} \times 100 = 65.3\%\ \text{BLOCKAGE}$$

INTER:

$$\frac{108}{273 + 108} \times 100 = 28.3\ \%\ \text{BLOCKAGE}$$

As you can see the interloop blockage for loops 8 & 11 exceeds the recommended 1% blockage and the intraloop blockage for loop 11 exceeds the recommended 4%.

Now that we have reviewed how to calculate inter/intraloop blockage you may want to check the total loop blockage for each loop to insure the total loop blockage does not exceed the recommended 1%. The formula below is used to calculate total loop blockage.

$$\frac{(\text{INTRALOOP FTM} + \text{INTERLOOP FTM})}{\text{INTRALOOP FTM} + \text{INTRALOOP PC} + \text{INTERLOOP FTM} + \text{INTERLOOP PC}} \times 100 = \%\ \text{BLOCKAGE}$$

The example below demonstrates how to calculate total loop blockage.

200 TFS001

00	TERM	00000	0000004	00004	00016	0000361	00211
01	TERM	00000	0000001	00002	00004	0000278	00150
02	TERM	00000	0000014	00010	00025	0000358	00242
03	TERM	00000	0000009	00009	00010	0000316	00175
04	TERM	00000	0000014	00008	00018	0000391	00202
05	TERM	00000	0000016	00005	00012	0000351	00172
06	CONF	00000	0000000	00000	00000	0000002	00036
07	TDS	00000	0000000	00000	00018	0000001	00021
08	TERM	00043	0000013	00013	00232	0000592	00324
09	TERM	00000	0000010	00008	00009	0000385	00241
10	TERM	00000	0000010	00018	00019	0000482	00316
11	TERM	00017	0000013	00009	00142	0000593	00291
12	TERM	00000	0000037	00013	00017	0000481	00301
13	TERM	00000	0000020	00019	00022	0000500	00289
14	CONF	00000	0000000	00000	00000	0000001	00038
15	TDS	00000	0000000	00000	00000	0000250	04581

LOOP 0 BLOCKAGE

$$\frac{0 + 16}{0+4+16+203} \times 100 = 7.2\%$$

LOOP 8 BLOCKAGE

$$\frac{43 + 146}{43+13+146+298} \times 100 = 37.8\%$$

As you can see from this particular report the blockage for both loops exceeded the recommended 1%. This is usually an indication that some rebalancing may be required.

*** PRACTICE EXERCISE ***

Use the report below to calculate the total loop blockage for loops 2 and 11.

200 TFS001

00	TERM	00000	0000004	00004	00016	0000361	00211
01	TERM	00000	0000001	00002	00004	0000278	00150
02	TERM	00000	0000014	00010	00025	0000358	00242
03	TERM	00000	0000009	00009	00010	0000316	00175
04	TERM	00000	0000014	00008	00018	0000391	00202
05	TERM	00000	0000016	00005	00012	0000351	00172
06	CONF	00000	0000000	00000	00000	0000002	00036
07	TDS	00000	0000000	00000	00018	0000001	00021
08	TERM	00043	0000013	00013	00232	0000592	00324
09	TERM	00000	0000010	00008	00009	0000385	00241
10	TERM	00000	0000010	00018	00019	0000482	00316
11	TERM	00017	0000013	00009	00142	0000593	00291
12	TERM	00000	0000037	00013	00017	0000481	00301
13	TERM	00000	0000020	00019	00022	0000500	00289
14	CONF	00000	0000000	00000	00000	0000001	00038
15	TDS	00000	0000000	00000	00000	0000250	04581

*** ANSWER ***

LOOP 02 BLOCKAGE

$$\frac{0+25}{0+10+25+222} \times 100 = 9.7\%$$

LOOP 11 BLOCKAGE

$$\frac{17 + 108}{17+9+108+273} \times 100 = 30.7\%$$

As you can see from this particular report the blockage for both loops exceeded the recommended 1%. This information would be used in re-evaluating the distribution of stations and trunks in this system.

It's time for a short review.

- o INTRA FTM - Ideally these columns should be all zeros. The presence of failures to match <u>almost</u> always indicates some kind of load balance problem, whether usage on the loops exceeds the recommended CCS capacity or not.

- o LOOP FTM - If a loop appears to have high usage, check to see if there are any FTMs for the loop in question. High usage is not necessarily a problem unless it is accompanied by failure(s) to match.

- o LOOP BLOCKAGE - The blockage on individual loop(s) may exceed the 1% recommended and still not exceed the 1% total system blockage which will be covered next.

If you have any questions please review the previous information before moving on.

To determine if the total system blockage exceeds the recommended 1% you would follow the steps below to calculate the total intra/interloop blockage, and then plug these figures into another formula for total system blockage.

STEP 1:

$$\frac{\text{SUM OF INTRALOOP FTM's FOR ALL LOOPS}}{\text{SUM OF INTRALOOP FTM's + SUM OF INTRALOOP PC FOR ALL LOOPS}}$$

= TOTAL INTRALOOP BLOCKAGE (TO THREE DECIMAL PLACES)

STEP 2:

$$\frac{\text{SUM OF INTERLOOP FTM's FOR ALL LOOPS}}{\text{SUM OF INTERLOOP FTM's + SUM OF INTERLOOP PC FOR ALL LOOPS (EVEN THOSE WITHOUT FTMS)}}$$

= TOTAL INTERLOOP BLOCKAGE (TO THREE DECIMAL PLACES)

STEP 3:

$$\frac{1}{L} \times \underset{\text{as calculated above}}{(\text{INTRALOOP BLOCKAGE})} + \frac{L-1}{L} \times \underset{\text{as calculated above}}{(\text{INTERLOOP BLOCKAGE})} \times 100$$

= % TOTAL SYSTEM BLOCKAGE

WHERE:
L = TOTAL NUMBER OF TERMINAL LOOPS

EXAMPLE: TOTAL SYSTEM BLOCKAGE CALCULATION(S)

259 TFSØØ1

ØØ	TERM	ØØØØØ	ØØØØØ16	ØØØ16	ØØØØ1	ØØØØ372	ØØ262
Ø1	TERM	ØØØØØ	ØØØØØØ5	ØØØØ8	ØØØØØ	ØØØØ262	ØØ169
Ø2	TERM	ØØØØØ	ØØØØØØ6	ØØØØ7	ØØØØ4	ØØØØ319	ØØ22Ø
Ø3	TERM	ØØØØØ	ØØØØØØ9	ØØØØ8	ØØØØ2	ØØØØ288	ØØ167
Ø4	TERM	ØØØØØ	ØØØØØØ4	ØØØØ5	ØØØØ3	ØØØØ336	ØØ2Ø6
Ø5	TERM	ØØØØØ	ØØØØØØ8	ØØØØ8	ØØØØ2	ØØØØ276	ØØ161
Ø6	CONF	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØ41	ØØØ54
Ø7	TDS	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØ5	ØØØØØØØ	ØØØØ3
Ø8	TERM	ØØØ1Ø	ØØØØØ53	ØØØ33	ØØØ56	ØØØØ59Ø	ØØ311
Ø9	TERM	ØØØØØ	ØØØØØ18	ØØØ25	ØØØØ3	ØØØØ387	ØØ318
1Ø	TERM	ØØØØØ	ØØØØØ15	ØØØ18	ØØØØ6	ØØØØ493	ØØ3Ø7
11	TERM	ØØØØØ	ØØØØØ4Ø	ØØØ23	ØØØØ7	ØØØØ677	ØØ34Ø
12	TERM	ØØØØØ	ØØØØØ27	ØØØ22	ØØØØ6	ØØØØ541	ØØ285
13	TERM	ØØØØØ	ØØØØØ43	ØØØ18	ØØØØ1	ØØØØ642	ØØ284
14	CONF	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØØ8	ØØØ54
15	TDS	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØ273	Ø4738

STEP 1:

$$\frac{10}{10+16+8+7+8+5+8+33+25+18+23+22+18} = .0497$$ TOTAL INTRALOOP BLOCKAGE

STEP 2:

$$\frac{1+4+2+3+2+36+3+6+7+6+1}{71+230+206+151+196+145+245+268+271+294+241+248} = .0276$$ TOTAL INTER-LOOP BLOCKAGE

STEP 3:

$$\left(\frac{1}{12} \times .0497 + \frac{12-1}{12} \times .0276\right) \times 100 = 2.54\ \%$$ TOTAL SYSTEM BLOCKAGE

As you can see the total system blockage exceeds the recommended 1% blockage. This indicates that the system may need rebalancing, depending on the current configuration.

THINGS TO REMEMBER WHEN INDICATIONS OF BLOCKAGE ARE PRESENT:

- o May require redistribution of terminals and CCS over the loops.

- o Depending on the configuration of the switch, you may want to insure that no additional traffic is added to certain loops, or that additional equipment is added in such a manner as to maintain or improve system balance. In many cases, moving several high-usage stations and/or trunks from loops with high CCS to loops with lower usage is all that is necessary.

- o If the distribution of traffic is unsatisfactory, the steps required to improve it may range anywhere from a complete rebalancing of the system and/or the addition of a loop or shelf; or the redistribution of all trunks, attendants and DTR's; or the shifting of trunks within the existing framework.

- o Decisions to add loops or shelves should not be made hastily. There should be a genuine need for this equipment. To determine the number of loops required, divide the total network usage (sum of loop CCS for all terminal loops) by the number of loops equiped. If the resulting CCS per loop exceeds 6ØØ CCS, for pre-X11 machines and 66Ø CCS for X11 machines an additional loop can be justified. If not, the system should be able to handle the traffic with the number of loops equipped, although additional shelves may be required.

Up to this point a lot of information has been covered. It is suggested that you review this information before moving on to the practice exercise on the next page.

*** PRACTICE EXERCISE ***

Use the report below to answer the questions that follow.

259 TFS001

00	TERM	00000	0000006	00007	00000	0000353	00220
01	TERM	00000	0000014	00008	00000	0000331	00189
02	TERM	00000	0000011	00014	00000	0000330	00262
03	TERM	00000	0000029	00011	00000	0000364	00194
04	TERM	00000	0000019	00010	00000	0000311	00201
05	TERM	00000	0000007	00007	00000	0000281	00167
06	CONF	00000	0000000	00000	00000	0000004	00042
07	TDS	00000	0000000	00000	00000	0000000	00002
08	TERM	00000	0000067	00031	00000	0000601	00344
09	TERM	00000	0000014	00014	00000	0000365	00185
10	TERM	00000	0000020	00014	00000	0000321	00216
11	TERM	00000	0000074	00025	00012	0000627	00362
12	TERM	00000	0000056	00026	00000	0000537	00311
13	TERM	00000	0000028	00014	00000	0000471	00257
14	CONF	00000	0000000	00000	00000	0000064	00039
15	TDS	00000	0000000	00000	00000	0000268	04273

1. What loop(s) have a CCS higher than the recommended amount?

2. What is the total loop blockage for loop 11 ? ______________

3. What is the total system blockage?

   ____

4. Since the total loop blockage for loop 11 is above the recommended 1%, what step(s) might you take to resolve the problem?

   CIRCLE THE CORRECT ANSWER(S)

   A. Add trunks and phones to the system to balance it out.
   B. Move phones/trunks from loop 11 to loops 4 & 5.
   C. Add an additional loop to the system to balance it out.
   D. Move phones/trunks from loop 11 to loop 8.

*** ANSWER ***

1. What loop(s) have a CCS higher than the recomended amount?
   8 , 11

2. What is the total loop blockage for loop 11?
   3.43 %

3. What is the total system blockage?
   Ø.429 %

If some of your answers do not agree with questions 1-3 you should go back and review the formulas.

4. Since the total loop blockage for loop 11 is above the 1% what step(s) might you take to resolve the problem?

   CIRCLE THE CORRECT ANSWER(S)

   A. Add trunks and phones to the system to balance it out.

   B. Move phones/trunks from loop 11 to loops 4 & 5.

   C. Add an additional loop to the system to balance it out.

   D. Move phones/trunks from loop 11 to loop 8.

Answer A is incorrect because adding trunks and phones will not resolve this particular problem.

Answer C is incorrect because the average CCS per loop is 4Ø7 which is less than the recommended 6ØØ CCS, indicating that the loops are not being totally utilized.

Answer D is incorrect because loop 8 already exceeds the recommended 6ØØ CCS.

Answer B was correct because those loops are not being fully utilized which allows you to redistribute phones/trunks.

SUMMARY OF TFSØØ1 NETWORK REPORT

- Indicates roughly how well the system is balanced.
- Provides information on a loop by loop basis.
- Ideally data in the INTRA AND INTER FTM columns should be all zeros.
- Ideally each loop CCS should be below 6ØØ CCS or 66Ø CCS for generic X11.
- Ideally there should be no more than 1ØØ CCS difference between loops.
- Ideally the system should always be within 1% blockage.
- If the total system blockage exceeds the recommended 1% the system may need to be rebalanced or additional equipment added.
- FTMs almost always indicate some kind of load balance problem, whether usage on the loops exceeds the recommended CCS capacity or not.

This concludes the review of the TFSØØ1 network report. If any information covered up to this point is unclear please take the time to review before continuing. The reports that will be reviewed from now on will be occasionally related back to this report. The system reports that follow will be related to specific data, requested by the individual performing the traffic analysis.

The second report you will review is the TFSØØ2-SERVICES. This report measures FTM, USAGE, AND PEG COUNTS on the services provided by the system. Those services include all the functions of the tone and digit switch (TDS), the conference loops, digitone receivers, MF tones (FOR ANI), and tone detectors. This report is usually used in conjunction with TFSØØ1 measurements of TDS, CONF, and MF Sender loops.

EXAMPLE TFSØØ2 SERVICES REPORT

2ØØ TFSØØ2

ØØ	ØØØØØ	ØØØØØØ5	ØØ317
Ø1	ØØØØØ	ØØØØØØ1	ØØØ27
Ø2	ØØØØØ	ØØØØØØ1	ØØØØ4
Ø3	ØØØØØ	ØØØØØ13	ØØ154
Ø4	ØØØØØ	ØØØØØØ7	ØØØ91
Ø5	ØØØØØ	ØØØØØØØ	ØØØØØ
Ø6	ØØØØØ	ØØØØØØ4	ØØ898
Ø7	ØØØØØ	ØØØØØØ1	ØØØØ5
Ø8	ØØØØØ	ØØØØØØØ	ØØØØØ
Ø9	ØØØØØ	ØØØØØ25	ØØØØ6
1Ø	ØØØØØ	ØØØØØØØ	ØØØØØ
11	ØØØØØ	ØØØØØØØ	ØØØØØ

You are going to review each part of this report to insure that you understand it entirely. As indicated on the previous report the areas being reviewed will be **highlighted.**

NOTE: Remember that the switch ID and the report number will be included on all reports.

In the example above the switch ID is # 2ØØ and the report # is TFSØØ2.

This column is called SERVICE NUMBERS.
These numbers indicate the services provided by this system.
Turn to page 3-5 Section 3.28 in the NTP and review the service number(s) and their descriptions.

200 TFS002

00	00000	0000005	00317
01	00000	0000001	00027
02	00000	0000001	00004
03	00000	0000013	00154
04	00000	0000007	00091
05	00000	0000000	00000
06	00000	0000004	00898
07	00000	0000001	00005
08	00000	0000000	00000
09	00000	0000025	00006
10	00000	0000000	00000
11	00000	0000000	00000

*** PRACTICE EXERCISE ***

Using the NTP page 3-5 Section 3.28 answer the following question(s).

1. What service number in the report above indicates tone ringing (SL-1 Sets)? ______________________

2. The service number 06 in the report above indicates what service? ___________________________

*** ANSWER ***

1. What service number in the report above indicates tone ringing (SL-1 Sets)? 04

2. The service number 06 in the report above indicates what service? Outpulsers

This column is called SERVICE FTM .
These numbers are incremented each time a path cannot be found between a terminal and the service loop. Only the first attempt is counted although the system may make subsequent attempts on the same request for service.

200 TFS002

00	**00000**	0000005	00317
01	**00000**	0000001	00027
02	**00000**	0000001	00004
03	**00000**	0000013	00154
04	**00000**	0000007	00091
05	**00000**	0000000	00000
06	**00000**	0000004	00898
07	**00000**	0000000	00000
08	**00000**	0000000	00000
09	**00000**	0000025	00006

The following also applies to this report:

o Service FTM for services 0-7 is a total of all TDS FTM's in TFS001.

o Digitone receiver FTM is incremented when a path cannot be found between the originating party and an IDLE DTR. This service is not associated with the tone and digit switch in regards to these measurements.

o The conference measurement is a total of all the CONF FTMs in TFS001.

o The MF Sender measurements is a total of all the MFSD FTMs in TFS001.

o A tone detector FTM is incremented when a path cannot be found between an IDLE TONE DETECTOR and a trunk.

This column it called SERVICE USAGE.
These numbers indicate the time that a path to the service loop was busy for the associated service (dialtone, busy tone, etc). It does not necessarily reflect the duration of the service applied, because some paths are reserved before they are actually used and are not idled until the system is certain that the path is no longer needed.

200 TFS002

00	00000	**0000005**	00317
01	00000	**0000001**	00027
02	00000	**0000001**	00004
03	00000	**0000013**	00154
04	00000	**0000007**	00091
05	00000	**0000000**	00000
06	00000	**0000004**	00898
07	00000	**0000001**	00005
08	00000	**0000000**	00000
09	00000	**0000025**	00006
10	00000	**0000000**	00000
11	00000	**0000000**	00000

The following also applies to this report:

- Service Usage for services 0-7 is a total of all TDS loop usage in TFS001.
- For all services, this column is incremented when a path is idled.
- The conference measurement is a total of all of the CONF usage in TFS001.
- MF Sender Usage is a total of all MF Sender loop CCS in TFS001.

This column is called SERVICE PEG COUNT.
These numbers indicate a count of the times each service was used
It increments when the path between the terminal and service loop
is idled.

200 TFS002

00	00000	0000005	**00317**
01	00000	0000001	**00027**
02	00000	0000001	**00004**
03	00000	0000013	**00154**
04	00000	0000007	**00091**
05	00000	0000000	**00000**
06	00000	0000004	**00898**
07	00000	0000001	**00005**
08	00000	0000000	**00000**
09	00000	0000025	**00006**
10	00000	0000000	**00000**
11	00000	0000000	**00000**

This column also indicates the following:

- An outpulser is incremented for each call (outgoing or tandem) that at least starts to outpulse digits.
- If the system is unable to determine which specific service (tone) was provided, it will assume miscellaneous tone and peg miscellaneous tone.
- Each service peg count measurement is incremented when a path is idled.
- The peg count for DTR is incremented when a path between a DTR and a terminal is idled.
- Service peg counts for services 0-7 are a total of all TDS loop peg counts in TFS001.
- The CONF peg count is a total of all conference loops in TFS001.
- The SL-1 tone detector (TD) is incremented when a path between the TD and a trunk is disconnected (i.e, a count of the actual times that tone detectors are used).

*** PRACTICE EXERCISE***

Fill in the blank.

1. What columns increment when the path between a terminal and service loops is idled? ______________________

2. What column indicates the time that a path to the service loop was busy? ______________

3. What column would you check to find out how many times a path could not be found between a terminal and the service loops?

   ____

*** ANSWER ***

1. What columns increment when the path between a terminal and service loops is idled? <u>SERVICE USAGE and SERVICE PEG COUNT.</u>

2. What column indicates the time that a path to the service loop was busy? <u>SERVICE USAGE</u>

3. What column would you check to find out how many times a path could not be found between a terminal and the service loops? <u>SERVICE FTM</u>

If you had any problems with this exercise you should review the appropriate part(s) of this module before continuing.

You have reviewed all of the headings in the TFSØØ2 - Service Reports. Now you will review the formula(s) used to interpret the data in the TFSØØ2 report and its relationship to the data in the TFSØØ1- Network Report.

All of the data that you will review in this report may vary depending on the size of the system, traffic, etc. You will review what is considered to be ideal data for this report.

Services Ø-6 in this section represent a breakdown of the total failures to match, CCS, and peg counts on the tone and digit switch loops in TFSØØ1, according to the various types of services that are provided.

Service number 7 is a spare, and will always be zero.

Service number 8 represents Digitone receiver FTM's, CCS, and peg counts, which are not included in the totals for the TDS loop in TFSØØ1. Digitone receivers are required in systems that are equipped with touch-tone phones and/or DID or tie trunks that have a Digitone class-of-service. Trunks with this designation usually receive DTMF (dual tone multiple frequency, or touch-tone) signals from the serving central office. The Digitone receiver's purpose is to receive dialed digits from touch-tone sets or DTN trunks, and convert them into digital symbols. They are also involved in providing dial tone to touch-tone sets, although, for any type of set in the Meridian Sl-1, the actual tone itself comes from the tone and digit switch. However, the Meridian SL-1 will not provide dial tone to a 25ØØ-type set until it has an idle Digitone receiver and a network path to it from the tone and digit switch. For this reason, Digitone receivers may be closely linked to dial tone delay, if any, in a system.

In order to gain any insight from this data, you need to know how many receivers are equipped. Use this data in the following formula to obtain the average CCS per DTR:

$$\frac{\text{DTR CCS}}{\text{No. of DTR's}} = \text{Average CCS per DTR}$$

A median value for this figure is 10 CCS per Digitone receiver. Typically, smaller systems will average less (around 2-5 CCS) and larger systems will average more (often 20 CCS or more). This figure should not be interpreted as a maximum value for CCS/DTR. More importantly, you should be aware that, as usage on the DTR's increases, the greater becomes the probability of dial tone delay occurring, due to lack of an idle receiver.

NOTE: You must know how many receivers are equipped before you can use the formula for calculating CCS per DTR.

EXAMPLE: Average CCS per DTR
This example is based on the system being equipped with 11 Digitone Receivers.

```
104   TFS002

00       00000  0000028     02003
01       00000  0000003     00087
02       00003  0000009     00204
03       00003  0000076     00762
04       00000  0000048     00526
05       00000  0000004     00039
06       00002  0000083     00979
07       00000  0000000     00000
08       00018  0000112     02040
09       00000  0000004     00074
```

$$\frac{112}{11} = 10.2 \quad \text{AVERAGE CCS per DTR}$$

Any requests for dial tone from a 25ØØ-type set which cannot be served immediately due to lack of an idle receiver, are queued until one becomes available, assuming that all network paths are available. When all required network paths between a DTR and a station or a TDS loop (or both) are not available, blockage occurs, just as with any other terminal. DTR failures to match will never peg because all Digitone receivers are busy. Instead, a failure to match peg count here means that the system had an idle DTR, but could not find a speech path to it. The blockage, therefore, is due to either high traffic on the TDS loops and/or the terminal loops, or poor distribution of receivers, rather than excessive usage on the DTR's. The amount of blockage can be calculated as follows:

$$\frac{\text{DTR FTM}}{\text{DTR PEG COUNT + FTM}} \times 1ØØ = \text{\% BLOCKAGE}$$

The same procedure may be used to calculate the percent blockage on any other service in TFSØØ2.

Blockage higher than 1% on the DTR's or any other service may be accompanied by dial tone dely or other symptoms. Like loop FTM's in TFSØØ1, blockage on the service measurements may indicate an unbalanced system.

* PRACTICE EXERCISE *

Calculate the percentage of blockage using the report below.

1Ø4 TFSØØ2

ØØ	ØØØØØ	ØØØØØ33	Ø2181
Ø1	ØØØØØ	ØØØØØØ4	ØØ1Ø2
Ø2	ØØØØ3	ØØØØØØ7	ØØ1Ø9
Ø3	ØØØØ2	ØØØØ1Ø5	Ø1123
Ø4	ØØØØØ	ØØØØØ57	ØØ718
Ø5	ØØØØØ	ØØØØØØ8	ØØØ6Ø
Ø6	ØØØØ4	ØØØØØ82	ØØ94Ø
Ø7	ØØØØØ	ØØØØØØØ	ØØØØØ
Ø8	ØØØØ6	ØØØØ157	Ø2Ø73
Ø9	ØØØØØ	ØØØØØØ3	ØØ111

*** ANSWER ***

$$\frac{6}{2073 + 6} \times 100 = 0.3 \text{ \% BLOCKAGE}$$

Another useful measurement that can be calculated here is the average holding time per use of a service . This is calculated as follows using the Digitone receiver measurements as an example.

$$\frac{\text{DTR CCS}}{\text{DTR PEG COUNT}} \times 100 = \text{AVERAGE HOLDING TIME IN SECONDS}$$

For many systems, the DTR holding time will fall between 5 and 8 seconds. This is another example of a characteristic of the end user, which depends on such things as average number of digits dialed, numbering plan, etc. Values outside of this range, however, do not indicate a problem in the system and should not be interpreted that way.

EXAMPLE: DTR HOLDING TIME

104 TFS002

00	00000	0000032	01967
01	00000	0000003	00082
02	00000	0000008	00090
03	00003	0000092	01022
04	00000	0000062	00741
05	00000	0000005	00039
06	00000	0000071	00800
07	00000	0000000	00000
08	00002	0000103	01833
09	00000	0000049	00108

$$\frac{103}{1833} \times 100 = 5.61 \text{ seconds}$$

*** PRACTICE EXERCISE ***

Calculate the DTR holding time using the report below.

104 TFS002

00	00000	0000033	02181
01	00000	0000004	00102
02	00003	0000007	00109
03	00002	0000105	01123
04	00000	0000057	00718
05	00000	0000008	00060
06	00004	0000082	00940
07	00000	0000000	00000
08	00006	0000157	02073
09	00000	0000003	00111

*** ANSWER ***

$$\frac{157}{2073} \times 100 = 7.6 \text{ SECONDS DTR HOLDING TIME}$$

Summary of TFSØØ2 services report:

- o Services Ø - 6 represent a breakdown of total FTM's, CCS, and PEG COUNTS on the tone and digit switch loops in TFSØØ1, according to the various types of services that are provided.

- o Service 7 is a spare, and will always be zero.

- o Service number 8 represents Digitone receiver FTM's, CCS, and PEG COUNTS, which are not included in the totals for the TDS loop in TFSØØ1.

- o Service number 9 represents the sum of all conference measurements in TFSØØ1.

- o Service number 1Ø represents the sum of all MF Sender measurements in TFSØØ1.

- o Blockage on any service should not exceed 1 %.

- o Average DTR holding time is typically between 5 and 8 seconds, but may be any value.

This concludes the review of the TFSØØ2 service report. The next report, TFSØØ3, will deal primarily with dial tone delay. In reviewing this report data will be used from the TFSØØ2 report. If you feel that you understand the information in this section continue on to the next section. If any of the information was unclear it is recommended, that you review this section before continuing on to the next section.

The third system report you will be reviewing is the TFS003- DIAL TONE DELAY . This report represents the total number of requests for dial tone for which the user had to wait longer than three seconds and/or longer than ten seconds before actually receiving dial tone, as well as the total seconds of delay suffered by all requests for dial tone.

EXAMPLE TFS003-DIAL TONE DELAY REPORT

200 TFS003

00003   00001   0040

The areas being reviewed will be **highlighted.**
Remember the location of the system ID (200) and the report number (TFS003).

This column is called DELAY >3s (Greater than 3 seconds). This is a count of the number of calls for which dial tone was delayed for greater than 3 seconds but less than 10 seconds.

200 TFS003

00003   00001   0040

This column is called DELAY >10s (Greater than 10 seconds) . This is a count of the number of calls that waited more than 10 seconds before receiving dial tone. Delays >10s increment both the >3s and the >10s columns.

200 TFS003

00003   **00001**   0040

This column is called TOTAL DELAYS > or = 1s (greater than or equal to 1 second). This is the actual total delay time in seconds of all calls that encountered dial tone of at least 1 second.

200 TFS003

00003   00001   **0040**

If you understand the information that has been reviewed continue on to the practice exercise. If you do not understand the information, review before continuing to the next section.

*** PRACTICE EXERCISE ***

Fill in the blank.

1. The delay time of all calls that encounter a delayed dial tone of at least 1 second can be found in the __________ column.

2. What column would you check if you wanted to find the number of calls that waited more than 10 seconds before receiving dial tone? __________

*** ANSWER ***

1. The delay time of all calls that encounter a delayed dial tone of at least 1 second can be found in the TOTAL DELAYS column.

2. What column would you check if you wanted to find the number of calls that waited more than 10 seconds before receiving dial tone? DELAY >10s

You have reviewed all of the headings in the TFSØØ3-DIAL TONE DELAY report. You will now review the relationships of the data in these columns to each other and the DIAL TONE PC in the TFSØØ2 report. All of the data that is reviewed in this report may vary depending on the size of the system, traffic, etc. You will review what is considered unacceptable operation and possible action that may be taken to resolve the operating problem.

Ideal data may include the following:

- o All zeros in the >3s delay column. If not, no more than 1.5% dial tone delay greater than 3 seconds.
- o All zeros in the > 1Øs delay column.
- o All zeroes in the total delays column.

You are now going to review the data and <u>recommended</u> action(s) to take when data <u>is not</u> within the recommended limits.

2ØØ TFSØØ3

ØØØØ3 ØØØØ1 ØØ4Ø

First you would check to see if the dial tone delay greater than 3 seconds, if any, is at or below the recommended 1.5% using the formula below.

$$\frac{\text{Peg Count of delay (greater than three seconds)}}{\text{Dial tone Peg Count from TFSØØ2 for the same hour}} \times 1ØØ = \text{\% dial tone delay}$$

Dial tone delay in a system can occur under many conditions, the most common being:

- o Insufficient Digitone receivers
- o Network blockage as indicated by TFSØØ1
- o Heavy demands on the CPU (calling patterns) as indicated by TFSØØ4
- o Hardware faults (TDS loops, terminal loops, or DTRs)

Dial tone delay can occur in any system for any of the above reasons. In cases where all Digitone receivers are busy, for example, requests for dial tone from touch-tone sets or from trunks with a Digitone (DTN) class of service are queued in the CPU. Since Digitone receivers are required only for touch-tone sets, however, the number of DTR's equipped is not applicable in cases where SL-1 sets are experiencing dial tone delay. In that case, one of the other possible causes listed above must be investigated. All requests for dial tone will be served, however, either when a Digitone receiver becomes available, or when a speech path can be established, if the station user remains off-hook (barring any telephone set or other hardware malfunctions).

It should also be noted that DID or tie trunks that have a DTN class of service can cause unnecessary usage on the Digitone recievers, if the serving central office is not actually sending DTMF signals to the Meridian SL-1. When these trunks carry the DTN COS, the CPU will automatically access a Digitone receiver, rendering it busy, only to drop it if the CPU perceives dial pulse signals instead of DTMF signals coming from the central office. In some cases, the number of DID and/or tie trunks involved may have a significant effect on dial tone speed to touch-tone sets.

Example of dial tone delay with no peg counts

```
427   TFS003
  00000      00000      00016
```

This is an example of dial tone delay showing the total seconds of delay only for delays of one to three seconds duration. In cases where there are no peg counts at all, the total seconds of delay represents an unknown number of dial tone delays between one and three seconds. These delays, as well as delays greater than three seconds, may be due to periods of heavy demands on the processor (that is, uneven calling patterns), especially if they occur during hours when the idle cycle count reaches a low. This is not to be misconstrued as a real time problem, because they can be seen in almost any system at one time or another.

Example of dial tone delay with peg counts.

```
427   TFS003
  00001      00000      00011
```

This is an example of dial tone delay showing a peg count for delay greater than three seconds, but not necessarily greater than ten seconds. The percentage of dial tone delay is calculated as follows, using the dial tone peg count from the TFS002 report for the divisor during the same hour.

$$\frac{1}{1650} \times 100 = 0.06\%$$

The possible causes of dial tone delay listed above indicate the areas that you would need to check to resolve this type of problem. Where there is a significant amount of delay (greater than 1.5%), the source of the delays may not be clear, especially in systems that have a significant amount of traffic and a heavily-loaded processor. Sometimes taking steps to correct network blockage where present, will reduce or eliminate other problems also, such as this.

<u>* PRACTICE EXERCISE *</u>

Use the report and data to answer the question(s).

DATA: Dial tone PC from TFSØØ2 is <u>2ØØ3</u> .

```
177 TFSØØ3
  ØØØØ2        ØØØØØ       ØØØ13
```

1. What is the total percentage of dial tone delay for the system indicated in the report?

2. Is the system in the report within the 1.5% objective?

   YES OR NO

3. What possible causes might you suspect if dial tone delays were present?

*** ANSWER ***

1. What is the total dial tone delay for the system indicated in the report?

$$\frac{2}{2003} \times 100 = .09\%$$

2. Is the system in the report within the 1.5% objective?

   <u>YES</u> OR NO

   Yes, because we indicated that anything below 1.5% is acceptable.

3. What possible causes might you suspect if dial tone delays were present?

   - o Insufficient Digitone receivers
   - o Network blockage
   - o Heavy demands on the CPU (calling patterns) as indicated by TFS004
   - o Hardware faults

If you had any problems with this practice exercise it is suggested that you review before continuing on to new information.

SUMMARY OF TFS003 DIAL TONE DELAY REPORT:

- Measures the delay time encountered when requesting dial tone.
- Measures delays greater than 3 seconds.
- Measures delays greater than 10 seconds.
- Ideally the >3s delay column should be all zeros.
- Ideally the >10s delay column should be all zeros.
- Dial tone delay, if present, should not exceed 1.5% of all requests for dial tone.
- Possible causes of any dial tone delay:
  - Insufficient Digitone receivers
  - Network blockage
  - Heavy demands on the CPU
  - Hardware faults (TDS, loops, terminal loops, or DTRs)

This concludes the review of TFS003. It is recommended that you review any of the information that is unclear before continuing. The next report TFS004 will deal primarily with processor load.

The fourth system report you will be reviewing is the TFSØØ4-Processor Load . This report measures activities associated with the CPU. To understand the signifcance of these measurements, one must understand that the CPU has priorities it must follow in regard to its call processing functions. The measurements in TFSØØ4 relate to these priorities by indicating the status of the CPU as it performs its various tasks.

EXAMPLE TFSØØ4-PROCESSOR LOAD REPORT

```
200 TFS004

1474233   00446   00001
  00000   00000
  00000   00000
  00000
```

The CPU priorities in the L and VL differ slightly from those in the LE and VLE.

L and VL CPU functions, in order of priority, are:

1. High priority timing list
2. Input messages from high and low priority buffers
3. 128 millisecond timing tasks
4. Two-second ringing queue
5. TTY input

6a. Attendant queue
6b. Tone waiting queue
6c. Dialing queue
6d. Ring again queue
6e. Camp-on queue
6f. Overlay program
6g. Lamp audit
6h. Traffic output

Each of the six categories is looked at to determine if there is something to do to that category. The highest priority is known as the "top of the loop". The five highest priorities are looked at first, one at a time, in the order shown. If any category requires attention, the CPU attends to it, then goes back to the top of the loop instead of continuing to the next category. In this way, the number one priority is looked at most often.

If the first five priorities do not require attention, one idle cycle count is pegged, and the CPU can proceed to priority six. This category consists of eight areas, all of which have equal priority. When the CPU gets to priority six, it will look at only one of the eight areas in the order shown, before returning to the top of the loop.

Most call processing tasks are completed within one or more time intervals of 128 milliseconds. When the CPU has more work to do in any of the categories 1,2, or 3 than it can complete within one 128 millisecond period, one load peak peg count will be pegged. However the CPU will continue to clear those tasks, one at a time, until all tasks have been performed within one category, before returning to the top of the loop, regardless of how many 128 millisecond time periods were required to complete the work.

When processing input messages in category 2, the CPU sorts all such messages according to their priority. Messages in the high priority input buffers (from card position one, or terminals wih the high priority class of service) are attended to immediately. Messages from the low priority input buffers (from terminals with the low priority class of service) are queued in their appropriate area in category six. The areas in category six are the items that will suffer delays if demands on the CPU are heavy enough to keep it constantly processing items in categories 1-5.

LE and VLE functions, in order of priority, are:

1. High priority timing list
2. Input messages from high and low priority buffers
3. 128 millisecond timing tasks
4. Two-second ringing queue
5. TTY input

6a. Dial tone/originations

6b. Two-second timing tasks (includes calls in dialing state)

7a. Attendant queue

7b. Tone waiting queue

7c. AIOD queue

7d. Print queue

7e. Ring again queue

7f. Camp-on queue

7g. Overlay queue

7h. Lamp audit

7i. Traffic output

In the LE and VLE machines, the dial tone queue and dialing queues have been moved up out of the lower priority category that they occupy in the L and VL machines. These functions are now placed immediately following character input from a TTY (step 5). If there are no tasks to perform in any of steps 1-5, one idle cycle count will be pegged, and the CPU will proceed to step 6. When it gets to this point, the CPU first scans the dial tone queue for work, performs it, then returns to the top of the loop before scanning the two-second timing (dialing queue) functions for work.

Input messages in category 2 are sorted in a manner similar to the L and VL. Messages in the high priority input buffers will be attended to immediately. However, messages from (from card position one or terminals with a high priority class of service) low priority stations will be assigned to the appropriate queue in step 6, rather than the lowest priority step, as in the L & VL machines. Therefore, it can be seen that dial tone delay in an LE or VLE is less likely to occur due to heavy demands on the processor than in an L or VL.

The idle cycle peg count, number of CPU attempts, and load peak peg counts all serve to indicate the load on the processor. The idle cycle peg count will decrease and the other two measurements will increase, as the load on the CPU increases. All other measurements in TFSØØ4 (which represent various types of buffers) are normally zero. If any of these should peg consistently, the given buffer is underengineered, and more memory should be allocated to that item. Extreme traffic loads may also cause these measurements to increment.

The areas being reviewed will be **highlighted.**
Remember the location of the system ID (2ØØ) and the report number (TFSØØ4).

This column is called IDLE CYCLE COUNT.
This measurement indicates the load on the CPU. A high idle cycle count indicates a low load on the the CPU and vice-versa.

2ØØ TFSØØ4

1474233	ØØ446	ØØØØ1
ØØØØØ	ØØØØØ	
ØØØØØ	ØØØØØ	
ØØØØØ		

This column is called <u>CPU ATTEMPTS</u> .
This is incremented one time for each of the following:

1. Dial tone request
2. Incoming trunk seizure
3. Attendant origination to initiate a call
4. Each attempt the attendant makes to extend a call

2ØØ TFSØØ4

1474233   **ØØ446**   ØØØØ1
ØØØØØ   ØØØØØ
ØØØØØ   ØØØØØ
ØØØØØ

This column is called <u>LOAD PEAK PEG</u> .
This is incremented once each time the CPU has more work than it can perform in one 128 millisecond time period, in any of the following categories:

1. High-Priority timing list
2. Input messages
3. 128ms timing tasks

2ØØ TFSØØ4

1474233   ØØ446   **ØØØØ1**
ØØØØØ   ØØØØØ
ØØØØØ   ØØØØØ
ØØØØØ

This column is called <u>HIGH-PRIORITY INPUT BUFFER OVERFLOW PEG (HPIB).</u> These are counts of the number of times incoming signaling messages from terminals in card slot 1 or terminals with a high priority class of serivce have been lost due to buffer overflow.

2ØØ TFSØØ4

1474233   ØØ446   ØØØØ1
ØØØØØ   ØØØØØ
ØØØØØ   ØØØØØ
ØØØØØ

PRACTICE EXERCISE

1. When the CPU has more work to do in categories 1,2 or 3 than it can complete within one 128 millisecond period what count will be pegged?

2. The HPIB indicates lost data due to overflow.

   TRUE OR FALSE

*** ANSWER ***

1. LOAD PEAK PEG COUNT

2. TRUE

If you had any problem with this exercise it is recommended that you review the material before continuing on to new material.

This column is called <u>LOW PRIORITY INPUT BUFFER OVERFLOW PEG (LPIB).</u> These are counts of the number of times that incoming signaling messages from low priority stations or trunks in all other card slots have been lost due to buffer overflow.

```
200 TFS004

1474233   00446   00001
  00000   **00000**
  00000   00000
  00000
```

This column is called <u>500/2500 OUTPUT BUFFER OVERFLOW PEG.</u> These are counts of the number of times that output signals to 500/2500 sets have been lost due to buffer overflow.

```
200 TFS004

1474233   00446   00001
  00000   00000
  **00000**   00000
  00000
```

This column is called <u>SL-1 OUTPUT BUFFER OVERFLOW PEG.</u> These are counts of the number of times that output signals to SL-1 sets have been lost due to buffer overflow.

```
200 TFS004

1474233   00446   00001
  00000   00000
  00000   **00000**
  00000
```

This column is called CALL REGISTER OVERFLOW PEG. This is a count of the number of times call processing software failed to find an idle call register. Each peg represents either a lost CDR (Call Detail Recording) record, a lost call, or an incomplete feature.

```
200 TFS004

1474233   00446   00001
  00000   00000
  00000   00000
  00000
```

More information can be found on the report in the NTP on pages 3-8 and 3-9. If you understand the material up to this point continue on to the practice exercise.

***PRACTICE EXERCISE ***

1. What does the call register overflow peg represent?

2. Input and Output buffer overflow pegs indicate the number of times that __________ and __________ signaling messages have been lost due to buffer overflow.

*** ANSWER ***

1. What does the call register overflow peg represent?

   A. Lost CDR (Call Detail Recording) record
   B. Lost call or an incomplete feature

2. Input and output buffer overflow pegs indicate the number of times that incoming and outgoing signaling messages have been lost due to buffer overflow.

You have reviewed all of the headings in the TFSØØ4-PROCESSOR LOAD report. You will now review some of the data within these headings.

TAKE A LOOK AT THE REPORT:

```
200 TFSØØ4

1474233   ØØ446   ØØØØ1
  ØØØØØ   ØØØØØ
  ØØØØØ   ØØØØØ
  ØØØØØ
```

Ideal data for this report may include:

- o Zeros in all overflow columns.
- o A load peg peak count that is lower than your CPU attempts.

If a buffer overflow peg count indicates a number other than zero it could mean one of the following:

- o Extreme traffic level (TRAFFIC LOAD).
- o Hardware fault.
- o The given buffer is under-engineered.

Usually the lower the idle cycle count is, the higher the peg counts of CPU attempts and load peak peg counts. This reflects the varying traffice levels in the system during the course of a day.

Of the above measurements, the idle cycle peg count is probably the most important. It can be used to indicate how much of the Meridian SL-1's real time capacity is being used for call processing. In any Meridian SL-1, the maximum amount of time available in one hour to carry out its tasks is 3600 seconds. However, not all of this time is available for call processing. In addition to call processing, the CPU has additional tasks to perform in order to maintain system integrity. These overhead functions occupy a portion of the 3600 seconds of real time available -- approximately 30%. As a result, the amount of real time that is allocated to call processing is derated to approximately 2500 seconds (70%) for post-cut systems. Therefore, the maximum amount of total real time capacity that can be used for call processing in any Meridian SL-1 is 70%, not 100%. As the idle cycle peg count represents 3600 seconds, not 2500 seconds, it can be seen that the minimum value for this figure (below which degradation of service will occur) will be 70% of the high idle cycle count for that machine (which is described below).

To calculate the percent real time used for call processing, two figures will be required: a low idle cycle count and a high idle cycle count. The high idle cycle count is the maximum value for this figure, and will vary from one machine to the next. Its value depends on machine type, generic, and even software options equipped. It will normally occur at some point within a 24-hour period, and should be collected when there is little or no traffic on the system, no TTY activity, and no background program in effect. Few machines will ever peg the same value twice; however, many machines <u>will</u> settle down on a plateau, where the first four digits will be the same in two or more hours. Data from such time periods will be the most representative value for each machine. (Note: The traffic schedule should be set at 1-hour intervals.)

The low idle cycle count should be taken during the average busy season (the three highest calling months for that customer). It will be most accurate when a background program is scheduled and there is normal TTY activity. Use these figures in the following formula:

FORMULA FOR CALCULATING CPU REAL TIME USED:

$$3600 \times \frac{\text{HIGH IDLE CYCLE COUNT} - \text{LOW IDLE CYCLE COUNT}}{\text{HIGH IDLE CYCLE COUNT}}$$

$$= \text{TOTAL SECONDS OF REAL TIME USED}$$

TO CONVERT TO A PERCENTAGE:

$$\frac{\text{TOTAL SECONDS OF REAL TIME USED} \times 100}{3600} = \text{\% REAL TIME USED}$$

Since the idle cycle peg count represents 3600 seconds, of which 30% is allowed for overhead, not all of the remaining capacity can be used for call processing. To determine the amount of real time capacity remaining that is allocated to call process, use the following formula:

$$\frac{\text{LOW IDLE CYCLE COUNT}}{\text{HIGH IDLE CYCLE COUNT}} - \left(1 - \frac{2500}{3600}\right) \times 100 = \text{\% REAL TIME REMAINING *}$$

Number of seconds of real time remaining will be the percent real time remaining times 3600 seconds.

* NOTE: This formula differs slightly from that given in NTP Section 450, as the NTP version is inaccurate.

If you had any problems understanding this information please review the information and take a look at the NTP in the Appendix.

*** PRACTICE EXERCISE ***

1. If an overflow column has a number other than zero this might indicate what?

*** ANSWER ***

1. If an overflow column has a number other than zero this might indicate what?

    - o Extreme traffic level (TRAFFIC LOAD).
    - o Hardware fault.
    - o The given buffer is under-engineered.

It should be noted that no action is required from the CPU unless someone goes off-hook, on-hook, or reprograms a feature. In other words, the CPU is no longer involved in a call once it has been established. It is only when a change of state occurs in the system that processing is required form the CPU. As a result, a system whose traffic load consists primarily of a fairly low number of calls with long holding times will use a low percentage of its real time capacity, but a high percentage of its traffic capacity. On the other hand, a system whose traffic load consists primarily of a high volume of calls with fairly short holding times will use a high percentage of its real time capacity, but a low percentage of its traffic capacity. This will hold true for any Meridian SL-1, regardless of its type. Therefore, a customer's calling characteristics have a great deal to do with the amount of processing capacity his switch will use.

Other factors that can cause the CPU to use a high percentage of real time include:

1. A significant amount of network blockage.

2. Hardware faults.

3. Lost time slots.

4. All stations or trunks classified as high priority.

5. Constant TTY use.

6. Constant traffic report output (such as every half hour in a high-traffic system).

7. Severely undertrunked, high-usage routes.

In the case of items 1 and 7 above, the CPU makes two attempts to find an idle time slot, or to find an idle trunk on an outgoing call, before abandoning the attempt. An unbalanced system, or a severly underengineered route, therefore, will create unnecessary work for the CPU. In such cases, corrective action (such as rebalancing the switch or adding the proper number of trunks to handle the demand), should be taken before any CPU upgrade is considered. Often this can make a significant reduction in the CPU's work load.

A suprisingly-common user reaction can also be the source of unnecessary real time usage. Almost everyone has, at some time, hung the handset up and gone off-hook again upon encountering no dial tone when going off-hook. The rationale is that a second try will produce dial tone faster. Contrary to popular belief, this behavior only serves to further delay the desired result. As mentioned previously, all requests for dial tone are queued in the Meridian SL-1, and the user will normally receive dial tone eventually just by remaining off-hook. By going on-hook and off-hook again, the user creates two more changes of state to add to the CPU's work load. As you can see, if this is repeated throughout a large system, the effects on the CPU's response time can be significant.

Generally speaking, the more real time a system is using, the slower it will operate. Symptoms of this include slow dial tone, slow lamp changes, slow call completion; even wrong numbers reached or calls simply lost. Corrective action should include investigation into the possible causes listed above, and elimination of as many as are feasible. In some cases the only resolution may be to upgrade the CPU to a faster processor (L to LE, VLE to XL, etc.).

SUMMARY OF TFS004 PROCESSOR LOAD REPORT:

- CPU attempts are incremented one time for each of the following:
  - Dial tone request.
  - Incoming trunk seizure.
  - Attendant origination to initiate a call.
  - Each attempt the attendant makes to extend a call.

- The idle cycle peg count, number of CPU attempts, and load peak peg counts all serve to indicate the load on the processor.

SUMMARY OF TFSØØ4 PROCESSOR LOAD REPORT: (continued)

- The idle cycle peg count will decrease and the other two measurements will increase, as the load on the CPU increases.

- Idle cycle count indicates how much of a system's real time capacity is being used for call processing.

- A customers calling characteristics can have a great deal of impact on the amount of real time used.

This concludes the review of TFSØØ4. It is recommended that you review any of the information that is unclear before continuing. The next report TFSØØ5 will deal primarily with the individual measurement of terminals (except attendant console).

The fifth system report you will be reviewing is the TFSØØ5-LINES. This report is associated with individual measurement of terminals. The traffic software has a provision for assigning specific terminals an ITM class of service for individual traffic measurements. Usage and peg counts can be accumulated for a group of lines and/or trunks within a terminal loop. The conditions under which the TFSØØ5 measurements peg are the same as those for the TFCØØ1 peg counts. The ITM COS cannot be set for attendants or Digitone receivers; therefore, these terminals will not be included in this section.

EXAMPLE TFSØØ5 - LINES REPORT

2ØØ TFSØØ5

ØØ	ØØØØØ34	ØØØ45
Ø1	ØØØØØ12	ØØØØ9
Ø2	ØØØØØ54	ØØØ12
Ø8	ØØØØ121	ØØ1Ø1
Ø9	ØØØØØ21	ØØØ19
13	ØØØØØØØ	ØØØØØ

The areas being reviewed will be **highlighted.**

This column is called LOOP NUMBER .
This is the same loop number column that was reviewed in the TFSØØ1-Network Report. The loops can range from Ø-159. This is an indication of what loops are in the system.

2ØØ TFSØØ5

ØØ	ØØØØØ34	ØØØ45
Ø1	ØØØØØ12	ØØØØ9
Ø2	ØØØØØ54	ØØØ12
Ø8	ØØØØ121	ØØ1Ø1
Ø9	ØØØØØ21	ØØØ19
13	ØØØØØØØ	ØØØØØ

This column is called LINE USAGE.
This is the total usage of all terminals assigned ITM COS in the specified loop. It increments when a connection involving a terminal with the ITM COS is idled.

200 TFS005

00	**0000034**	00045
01	**0000012**	00009
02	**0000054**	00012
08	**0000121**	00101
09	**0000021**	00019
13	**0000000**	00000

This column is called LINE PEG COUNT.
This PC measurement is incremented as follows:

- o Once when an established path involving a station with ITM COS is idled.
- o Twice if both parties have ITM COS, one for each terminal.
- o Once if the ITM COS party was in a conference call.

It increments when a connection involving a terminal with the ITM COS is idled.

200 TFS005

00	0000034	**00045**
01	0000012	**00009**
02	0000054	**00012**
08	0000121	**00101**
09	0000021	**00019**
13	0000000	**00000**

If you understand the information covered up to this point continue on to the practice exercise.

*** PRACTICE EXERCISE ***

Fill in the blanks.

1. What column would you check to find the number of times that an established path involving a terminal with ITM COS was idled? ________________.

2. What column would you check to find the total CCS for a terminal or group of terminals with the ITM class of service? ______________________.

*** ANSWER ***

1. What column would you check to find the number of times that an established path involving a terminal with ITM COS was idled? <u>LINE PEG COUNT</u>

2. What column would you check to find the CCS for a terminal or group of terminals with the ITM class of service? <u>LINE USAGE</u>

If you had any problems with the practice exercise it is recommended that you review the appropriate part(s) of this module and section 3-10 in the NTP before continuing.

You have reviewed all of the headings in the TFS005-LINES report. You will now review the relationship of the data in these columns to each other. All of the data that you will review in this report may vary depending on the size of the system, traffic, etc.

As indicated earlier, this report provides a means of measuring individual lines and/or trunks, as well as groups of these terminals. These measurements can be used as an administrative tool in determining traffic levels of various departments or groups in any system; or on data terminals equipped with ADM's; or ACD agents, in other systems. They can also be used to determine what portion of total loop traffic consists of traffic from such groups; or, in the case of a group of trunks with ITM COS set, what percentage of loop traffic is trunk traffic from those trunks. This may be useful in cases where an overloaded loop is suspected.

To identify terminals which are to be included in this section, the Individual Traffic measurement class of service must be set for each terminal to be included. This is done through overlay program 2, and the NTP in the appendix. If no terminals are assigned the ITM COS, the data in TFS005 will be all zeros even though the option is scheduled.

It is important to remember that the measurements are accumulated on a per-loop basis. That is, usage and peg counts in TFS005 represent all terminals on a loop that have the ITM class of service. Individual lines on the same loop cannot be separated, unless studied one at a time. However, an approximation of the actual CCS and peg counts per terminal for a group of terminals on the same loop can be obtained by calculating the average CCS and peg count per TN. This requres a count of the total number of TN's that have the ITM COS on that loop. Use the following formulas:

To calculate average CCS per TN for individual terminals:

$$\frac{\text{TFS005 CCS/LOOP}}{\text{NO. OF TN'S WITH ITM COS ON THAT LOOP}} = \text{CCS PER TN}$$

To calculate average peg count per TN for individual terminals:

$$\frac{\text{TFS005 PEG COUNT/LOOP}}{\text{NO. OF TN'S WITH ITM COS ON THAT LOOP}} = \text{PEG COUNT PER TN}$$

Traffic measurements in TFSØØ5 will not correspond to loop measurements in TFSØØ1, nor are they intended to. The differences in the two sets of measurements are due to the difference in the way the measurements are pegged in each section. (SEE THE NTP IN THE APPENDIX FOR DEFINITIONS OF MEASUREMENTS). As you learned earlier, TFSØØ1 loop measurements peg on a per-time-slot basis, and the intraloop measurements peg on a per-call basis. However, TFSØØ5 measurements peg on a per-terminal basis, which is different from either of the other two. In other words, the Meridian SL-1 is looking at the ITM COS status of the terminal when deciding whether to increment these measurements, rather than the time slots involved in the call, or the location of each terminal involved. It will only peg once for a call if only one terminal on that call has ITM COS, but it will peg twice for a call in which both terminals have the ITM COS. In either case, the terminals involved may either be on the same loop, or on different loops. Therefore, no precise correlation between TFSØØ5 and TFSØØ1 measurements can be made. One may determine roughly what percent of total traffic on a loop is made up of the terminals on that loop with the ITM class of service, as shown below.

$$\frac{\text{TFSØØ5 LOOP CCS}}{\text{TFSØØ1 LOOP CCS}} \text{ (For each loop) X 1ØØ} = \text{\% of total traffic from terminals with ITM COS}$$

EXAMPLE:

The following example used the two reports below:

$$\frac{34}{64} \text{ X 1ØØ} = 53\%$$

2ØØ TFSØØ5

ØØ	ØØØØØ34	ØØØ45
Ø1	ØØØØØ12	ØØØØ9
Ø2	ØØØØØ54	ØØØ12
Ø8	ØØØØ121	ØØ1Ø1
Ø9	ØØØØØ21	ØØØ19
13	ØØØØØØØ	ØØØØØ

200 TFS001

00	TERM	00000	0000006	00004	00000	0000064	00056
01	TERM	00000	0000035	00022	00000	0000123	00086
02	TERM	00000	0000031	00020	00000	0000126	00075
05	CONF	00000	0000000	00000	00000	0000000	00000
07	TDS	00000	0000000	00000	00000	0000000	00000
08	TERM	00000	0000019	00011	00000	0000143	00098
09	TERM	00001	0000089	00066	00002	0000194	00149
13	TERM	00000	0000000	00000	00000	0000025	00006
15	TDS	00000	0000000	00000	00000	0000031	01496

The following formula is used to calculate the average holding time of calls on each loop:

FORMULA:

$$\frac{\text{CCS}}{\text{PEG COUNT}} = \frac{\text{XXX}}{0.6} = \text{HOLDING TIME IN MINUTES.}$$

Example of calculating average holding time per loop:

200 TFSØØ5

ØØ	ØØØØØ34	ØØØ45
Ø1	ØØØØØ12	ØØØØ9
Ø2	ØØØØØ54	ØØØ12
Ø8	ØØØØ121	ØØ1Ø1
Ø9	ØØØØØ21	ØØØ19
13	ØØØØØØØ	ØØØØØ

200 TFSØØ1

ØØ	TERM	ØØØØØ	ØØØØØØ6	ØØØØ4	ØØØØØ	ØØØØØ64	ØØØ56
Ø1	TERM	ØØØØØ	ØØØØØ35	ØØØ22	ØØØØØ	ØØØØ123	ØØØ86
Ø2	TERM	ØØØØØ	ØØØØØ31	ØØØ2Ø	ØØØØØ	ØØØØ126	ØØØ75
Ø5	CONF	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØØØ	ØØØØØ
Ø7	TDS	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØØØ	ØØØØØ
Ø8	TERM	ØØØØØ	ØØØØØ19	ØØØ11	ØØØØØ	ØØØØ143	ØØØ98
Ø9	TERM	ØØØØ1	ØØØØØ89	ØØØ66	ØØØØ2	ØØØØ194	ØØ149
13	TERM	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØ25	ØØØØ6
15	TDS	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØ31	Ø1496

o First you would locate loop ØØ line usage on the TFSØØ5 report.
The number is 34 CCS.

o Second you would locate loop ØØ line PC on the TFSØØ5 report.
The number is 45.

Then you perform the calculation.

$$\frac{\frac{34}{45} = 0.755}{0.6} = 1.25 \text{ Minutes average holding time for loop } 0.$$

The associated loop measurements for the same system are shown on the TFSØØ1 report above. Note the difference between these measurements and the line measurements in TFSØØ5.

You can perform this calculation on all loops to determine the average holding time per loop.

*** PRACTICE EXERCISE ***

Use the following reports to fill in the blanks.

200 TFS005

00	0000034	00045
01	0000017	00009
02	0000028	00012
08	0000059	00101
09	0000033	00019
13	0000000	00000

200 TFS001

00	TERM	00000	0000006	00004	00000	0000064	00056
01	TERM	00000	0000035	00022	00000	0000130	00086
02	TERM	00000	0000031	00020	00000	0000126	00075
05	CONF	00000	0000000	00000	00000	0000000	00000
07	TDS	00000	0000000	00000	00000	0000000	00000
08	TERM	00000	0000019	00011	00000	0000143	00098
09	TERM	00001	0000089	00066	00002	0000194	00149
13	TERM	00000	0000000	00000	00000	0000025	00006
15	TDS	00000	0000000	00000	00000	0000031	01496

TFS005 TFS001

1. Loop 01 line CCS ________ Loop 01 CCS ___________
2. Loop 09 line CCS ________ Loop 09 CCS ___________
3. How many CCS were <u>not</u> generated by terminals with ITM COS set in loop 01? _________
4. How many CCS were <u>not</u> generated by terminals with ITM COS set in loop 02? _________

*** ANSWER ***

1. Loop 01 line CCS <u>17</u> Loop 01 CCS <u>130</u>
2. Loop 09 line CCS <u>33</u> Loop 09 CCS <u>194</u>
3. How many CCS were <u>not</u> generated by terminals with ITM COS set in loop 01? <u>113</u>
4. How many CCS were <u>not</u> generated by terminals with ITM COS set in loop 02? <u>98</u>

SUMMARY TFSØØ5 LINES REPORT:

- The report indicates the total usage of all terminals assigned ITM COS in a specified loop.

- Can be used to determine roughly what portion of total loop traffic is made up of terminals with ITM COS.

- Measurements are accumulated on a per-terminal basis, and reported on a per loop basis.

- Measurements in TFSØØ5 will not exactly correspond to loop measurements in TFSØØ1, nor are they intended to.

- Overlay 2 must be used to set the Individual Traffic measurement class of service. Otherwise, no data will be obtained.

This concludes the review of TFSØØ5. It is recommended that you review any of the information that is unclear before continuing. The next report TFSØØ7 will deal primarily with the measurements, between two connection points that are in different network groups.

The sixth system report you will be reviewing is the TFSØØ7-JUNCTOR GROUP TRAFFIC. This report measures the usage, peg counts, and FTMs between two connection points that are in different network groups. Junctors are no more than a link between the network groups. Junctors are arranged in groups, with a junctor group consisting of two sets of two one-way junctors. Each junctor in a group has 3Ø time slots for traffic; therefore, each junctor group has a total of 12Ø time slots.

EXAMPLE TFSØØ7-JUNCTOR GROUP TRAFFIC

222 TFSØØ7

Ø1	ØØØØ1	ØØØ2344	Ø1667
Ø2	ØØØØØ	ØØØ2122	Ø1322
12	ØØØØ2	ØØØ1993	ØØ922

The areas being reviewed will be **highlighted.**

This column is called JUNCTOR GROUP.
These two digit numbers identify a junctor group connecting two network groups. The number represents the junctor going from network group X to network group Y.

EXAMPLE:

Junctor Group Ø2 is the junctor group between Network Group Ø and Network Group 2.

222 TFSØØ7

Ø1	ØØØØ1	ØØØ2344	Ø1667
Ø2	ØØØØØ	ØØØ2122	Ø1322
12	ØØØØ2	ØØØ1993	ØØ922

This column is called JUNCTOR FTM.
These numbers are incremented when a connection cannot be made between two terminals in different groups, and the attempt has qualified for a loop FTM in TFS001.

222 TFS007

01	**00001**	0002344	01667
02	**00000**	0002122	01322
12	**00002**	0001993	00922

This column is called JUNCTOR USAGE.
These numbers indicate the total time that time slots between specified network groups were busy. The measurement is incremented when a path is idled.

222 TFS007

01	00001	**0002344**	01667
02	00000	**0002122**	01322
12	00002	**0001993**	00922

This column is called JUNCTOR PC.
These numbers are incremented when an established path between two network groups is idled and meets the qualifications of a loop PC in TFS001.

222 TFS007

01	00001	0002344	**01667**
02	00000	0002122	**01322**
12	00002	0001993	**00922**

*** PRACTICE EXERCISE ***

Fill in the blank.

1. The total time that a time slot between specified network groups is busy could be found in what column? ______________

2. What column would you check if a connection between 2 terminals in different groups could not be made? ___________

3. Use the junctor group number (12) to answer the following.

   This junctor group number represents the junctor going from network group ___ to network group ____.

*** ANSWER ***

1. The total time that a time slot between specified network groups is busy could be found in what column? JUNCTOR USAGE

2. What column would you check if a connection between 2 terminals in different groups could not be made? JUNCTOR FTM

3. Use the junctor group number (12) to answer the following.

   This junctor group number represents the junctor going from network group 1 to network group 2.

You have reviewed all of the headings in the TFSØØ7-JUNCTORS REPORT. You will now review the relationships of the data in these columns to each other.

All of the data that you will review in this report may vary depending on the size of the system, traffic, etc. You will review what is considered to be ideal data for this report. You will also review what is considered less than ideal data, and some possible actions you may take to insure that this system is performing within the user's guidelines.

The following items apply to two-network group systems:

- Two-network group systems generally, though not always, show higher traffic than systems with three or more groups. This is because the four junctors in the group are the only connection between all terminals in the system.
- A low junctor usage is approximately 5ØØ CCS or less.
- A high junctor usage is approximately 17ØØ CCS. Systems of this size showing usage over 1ØØØ CCS may have a load balance problem.
- Well-balanced systems may average between 5ØØ-1ØØØ CCS.
- No more than 1% blockage on a junctor group.

The following items apply to any multi-group system:

- The maximum CCS per junctor group is 2000 CCS.

- No more than 1% blockage on a junctor group.

- A well balanced system will show usage on all junctor groups to be about the same. Unfortunately, many times there will be systems with one or two junctor groups showing much higher usage than the others, indicating either a high community of interest between stations in the network groups involved, or poor distribution of trunks, or both.

- For any size system, it is desirable to keep junctor traffic to a minimum. One reason for this is because all three elements in a network-group-to-network-group connection (i.e., the originating loop, the junctors, and the terminating loop) must have the same pair of matching time slots available, in order for a connection to be possible.

- Three-network group or larger systems generally show a low level of traffic on the junctors, ranging from approximately 300 - 600 CCS. This is because traffic in these systems is spread out over more network groups, not concentrated in two.

- The best way to minimize junctor traffic is to insure that the system is well-balanced, with traffic evenly distributed among network groups, taking into consideration community of interest among stations. Stations that talk to each other frequently (i.e, have a high community of interest) should be located on different loops within the same network group.

Blockage on the junctors is usually due to high usage on the terminal loops, rather than on the junctors, due to the greater number of time slots in the junctor groups. To calculate the percent blockage for a junctor group, use the following formula:

$$\frac{\text{JUNCTOR FTM}}{\text{JUNCTOR PEG COUNT + FTM}} \text{ X } 1ØØ = \qquad \text{\% Blockage}$$

Work through one of these formulas.

222 TFSØØ7

Ø1	ØØØØ1	ØØØ2344	Ø1667
Ø2	ØØØØØ	ØØØ2122	Ø1322
12	ØØØØ2	ØØØ1993	ØØ922

JUNCTOR GROUP Ø1 Blockage $\frac{1}{1667 + 1}$ X 1ØØ = .Ø6% Blockage

As you can see this particular junctor group is within the 1% blockage we mentioned earlier.

*** PRACTICE EXERCISE ***

1. Blockage on the junctors is usually due to high usage on the __________ loops.

2. Using the report below calculate the percent of blockage for junctor group 12.

222 TFSØØ7

Ø1	ØØØØ1	ØØØ2344	Ø1667
Ø2	ØØØØØ	ØØØ2122	Ø1322
12	ØØØØ4	ØØØ1993	ØØ922

*** ANSWER ***

1. Blockage on the junctors is usually due to high usage on the <u>TERMINAL</u> loops.

2. Using the report below calculate the percent of blockage for junctor group 12.

$$\frac{4}{922+4} \quad X\ 100 = .43\%\ \text{Blockage}$$

If the answer for this question had been 4% blockage or greater what might you do to try and resolve the problem?

The best way to minimize junctor traffic is to insure that the system is well-balanced, with traffic evenly distributed among network groups, taking into consideration community of interest among stations.

If you had any problems with this practice exercise review before continuing.

SUMMARY TFSØØ7 JUNCTORS REPORT:

- In any size system, junctor traffic should be minimized to prevent blockage. Stations with a high community of interest should be located on different loops within the same network group.

- Indicates when a connection cannot be made between two terminals in different network groups.

- Indicates the total time that time slots between the specified network groups were busy.

- Indicates when an established path between two network groups is idled.

- A low junctor usage is approximately 5ØØ CCS. Depending on system size.

- A high junctor usage is approximately 17ØØ CCS. Depending on system size.

- Well balanced systems may average between 5ØØ-1ØØØ CCS.

- Junctor traffic may be used as an indication of how well traffic is distributed over the network groups.

- No more than 1% blockage on a junctor group.

- The same pair of matching time slots must be available on the originating loop, the junctor group, and the terminating loop in order for an inter-group connection to be completed.

- To calculate blockage use this formula:

$$\frac{\text{JUNCTOR FTM}}{\text{JUNCTOR PEG COUNT + FTM}} \times 100 = \%\ \text{Blockage}$$

This concludes the review of TFSØØ7. It is recommended that you review any of the information that is unclear before continuing.

MODULE FOUR SUMMARY:

- TFSØØ1 report measures: Loop CCS, FTMs, and Peg Counts on a loop by loop basis.

- TFSØØ2 report measures: FTM's,Usage, and Peg counts on services provided by the TDS loop.

- TFSØØ3 report measures: Number of calls encountering delay greater than 3 seconds and greater than 1Ø seconds, and total delay time encountered when requesting dial tone.

- TFSØØ4 report measures: CPU status and workload associated with its priorities.

- TFSØØ5 report measures: Usage and peg counts for terminals with ITM COS.

- TFSØØ7 report measures: Usage peg counts and FTMs between two connection points that are in different network groups.

This concludes the module on the system reports. The next module will be dealing with the specifics of customer reports. The format will be presented in the same manner. When you are ready, turn the page and complete the Self Check for this module.

SELF CHECK

This Self Check has two parts:

- o Part one requires you to analyze system traffic reports.
- o Part two requires you to select recommended action(s) you would take to resolve any problem(s) you found in the analysis of the reports in part one of this self check.

Part 1.

Analyze the traffic reports below as outlined in this module. Write the results of your analysis on the page that follows.

104 TFS001

00	TERM	00000	0000011	00012	00001	0000431	00286
01	TERM	00000	0000004	00008	00001	0000307	00146
02	TERM	00000	0000014	00016	00002	0000453	00288
03	TERM	00000	0000017	00007	00001	0000322	00144
04	TERM	00000	0000010	00018	00002	0000400	00266
05	TERM	00000	0000005	00004	00000	0000419	00200
06	CONF	00000	0000000	00000	00000	0000003	00057
07	TDS	00000	0000000	00000	00003	0000000	00009
08	TERM	00001	0000065	00027	00014	0000699	00342
09	TERM	00000	0000022	00014	00002	0000510	00248
10	TERM	00000	0000029	00029	00003	0000589	00314
11	TERM	00009	0000037	00025	00032	0000790	00380
12	TERM	00004	0000018	00019	00011	0000642	00314
13	TERM	00000	0000058	00015	00008	0000621	00312
14	CONF	00000	0000000	00000	00000	0000014	00060
15	TDS	00000	0000000	00000	00000	0000319	05072

104 TFS002

00	00000	0000029	01948
01	00000	0000007	00167
02	00000	0000003	00078
03	00000	0000125	01139
04	00000	0000071	00803
05	00000	0000012	00074
06	00002	0000073	00837
07	00000	0000000	00000
08	00000	0000103	01964
09	00000	0000017	00117
10	00000	0000000	00000

104 TFS003

00000	00000	00000

Write your analysis of the reports in the appropriate space provided.

PART 1 Continued

Your TFSØØ1 Analysis Results :

Your TFSØØ2 Analysis Results:

Your TFSØØ3 Analysis Results :

MODULE 4 SELF CHECK ANSWER

PART 1. The answers below are results based on the information reviewed in Module 4.

TFS001 ANALYSIS RESULTS :

Loop FTM's on loops 0,1,2,3,4,8,9,10,11,12 and 13.

High loop CCS on loops 8,11,12,13.

Highest loop CCS (790) and lowest loop CCS (307) has a difference of 483 CCS, exceeding the recommended 100 CCS difference.

LOOP 8 BLOCKAGE

INTRA	INTER	TOTAL LOOP
3.57% does not exceed 4%	4.% exceeds 1%	3.96% exceeds 1%

LOOP 11 BLOCKAGE

INTRA	INTER	TOTAL LOOP
26.4% exceeds 4%	4.06% exceeds 1%	6.08% exceeds 1%

LOOP 12 BLOCKAGE

INTRA	INTER	TOTAL LOOP
17.4% exceeds 4%	1.07% exceeds 1%	2.31% exceeds 1%

TOTAL SYSTEM BLOCKAGE

2.1% exceeds 1%

TFS002 ANALYSIS RESULTS :

Outpulse blockage = 0.24%

DTR holding time within a range of 5 - 8 seconds(5.24).

TFS003 ANALYSIS RESULTS :

No indication of dial tone delay.

MODULE 4 SELF CHECK ANSWER PART 2

PART 2. Use the traffic analysis results from the previous page to answer the following question(s).

1. Place a check mark by the action(s) you would take to resolve the problem(s) found in TFSØØ1.

RECOMMENDED ACTION

1. ___ Add equipment to the system and rebalance.

2. ___ Add another loop and rebalance the system.

3. ___ Distribute phone/trunks from loops 8 and 11 to loops 1 and 3.

4. ___ Add trunks/phones to balance the system.

2. Place a check mark by the action(s) you would take to resolve the problem(s) found in TFSØØ2.

RECOMMENDED ACTION

1. ___ Rebalance system.

2. ___ Add DTRs to the system

3. ___ NO ACTION REQUIRED

4. ___ Replace the faulty TDS circuit pack

MODULE 4 SELF CHECK ANSWER

PART 2.

1. Place a check mark by the action(s) you would take to resolve the problem(s) found in TFSØØ1.

RECOMMENDED ACTION

1. ___ Add equipment to the system and rebalance.

2. ___ Add another loop and rebalance the system.

3. _X_ Distribute phones/trunks from loops 8 and 11 to loops 1 and 3.

4. ___ Add trunks/phones to balance the system.

2. Place a check mark by the action(s) you would take to resolve the problem(s) found in TFSØØ2.

RECOMMENDED ACTION

1. ___ Rebalance system.

2. ___ Add DTRs to the system.

3. _X_ No action required.

4. ___ Replace the faulty TDS circuit pack.

This concludes the Self Check for module four. Continue on to module five if you understand the information presented in this module.

Module 5

Customer Reports

MODULE FIVE

CUSTOMER REPORTS

Module Overview

In this module you are going to learn about traffic reports that may be selected for a specific customer. Since a Meridian SL-1 switch may have several customers it is important to have access to data about each one individually.

The topics you'll cover are:

1. Individual report description - this section will give you an explanation of each customer report that you can request.
2. Report headings - these are not printed on the report and you will learn how to determine what data is under a specific heading.
3. Data discrimination - you will learn how to identify "normal" data from questionable data.
4. Corrective actions - you will learn what may be done to rectify identified problems.

Module Objective

Given several customer reports, you should be able to identify any information on the reports that indicates possible areas of less than ideal operation. You will then select from a list the recommended procedure to rectify the possible problem. Eighty percent accuracy is required for both parts of this objective.

CUSTOMER REPORTS

The first customer report you will review is the TFCØØ1 - CUSTOMER NETWORKS. This report details traffic within each customer group. It groups the traffic into incoming, outgoing, intra-customer, and tandem traffic and provides CCS, peg count, and FTM data on those calls for each customer. In addition, statistics for certain unsuccessful attempts are also provided. Peg is on a per call basis, rather than a per time slot basis as in the TFSØØ1 (System Report).

<u>EXAMPLE TFCØØ1 CUSTOMER NETWORKS REPORT</u>

200 TFCØØ1

ØØ

ØØØØØ	ØØØØØ92	ØØØ72
ØØØØØ	ØØØØ114	ØØØ74
ØØØØØ	ØØØØØ63	ØØØ83
ØØØØØ	ØØØØØØ5	ØØØØ3
ØØØØ1	ØØØ16	ØØØØØ

Areas being reviewed on the reports will be **highlighted.** Remember that the location of the system ID (2ØØ) and the report number (TFCØØ1) are in the same place as the System reports.

This column is called INCOMING FTM.
If at any time between an incoming call being recognized by the system, and the time that the trunk is idled the call suffers blocking so that a given stage of the call cannot be completed, then incoming FTM is incremented. The FTM figure does not include blockage occurring between an incoming trunk and an outgoing trunk. It does, however, represent the total blockage suffered by all incoming trunks on trunk - to - station or trunk - to - attendant calls.

200 TFC001

00

00000	0000092	00072
00000	0000114	00074
00000	0000063	00083
00000	0000005	00003
00001	00016	00000

This column is called INCOMING CCS.
When an established path between any terminal and a trunk was originally incoming, the Incoming CCS is accumulated. However, this does not include usage on a connection between an incoming and an outgoing trunk (i.e. tandem connection). The usage figure represents the total usage for all incoming trunks on trunk - to - station or trunk - to - attendant calls.

200 TFC001

00

00000	**0000092**	00072
00000	0000114	00074
00000	0000063	00083
00000	0000005	00003
00001	00016	00000

This column is called INCOMING PC.
This count in incremented when a trunk is idled if:

a. The trunk was incoming when it was originally seized.

b. After the trunk was seized, it was involved in an established connection.

This count does not peg for connections between an incoming trunk and an outgoing trunk. However, it does represent the total peg count for all incoming trunks on trunk - to - station or trunk - to - attendant calls.

200 TFC001

00

00000	0000092	**00072**
00000	0000114	00074
00000	0000063	00083
00000	0000005	00003
00001	00016	00000

If you understand everything up to this point continue on to the practice exercise.

* PRACTICE EXERCISE *

1. What column would you check to find the CCS of all incoming trunks? ______________________

2. What column increments when an incoming call is blocked and cannot be completed? ______________________

*** ANSWER ***

1. What column would you check to find the CCS of all incoming trunks? INCOMING CCS

2. What column increments when an incoming call is blocked and cannot be completed? INCOMING FTM

If you had any problems with this exercise it is recommended that you review the material presented and/or the references in the Appendix.

This column is called OUTGOING FTM.

If a path to an idle outgoing trunk cannot be found due to network blocking then the Outgoing Failure to Match is incremented. The FTM figure does not include blockage occurring between an incoming trunk and and outgoing trunk. It does, however, represent the total blockage suffered by all outgoing trunks on trunk - to - station or trunk - to - attendant calls.

```
200   TFC001

00

00000          0000092        00072
00000          0000114        00074
00000          0000063        00083
00000          0000005        00003
00001            00016        00000
```

This column is called <u>OUTGOING CCS.</u>
When an established path is idled and one of the terminals is a trunk, then, if that trunk was outgoing when originally seized, the outgoing usage is accumulated. The usage figure does not include usage on a connection between an outgoing trunk and an incoming trunk. It does represent the total usage for all outgoing trunks on station - to - trunk or attendant - to - trunk calls.

2ØØ TFCØØ1

ØØ

ØØØØØ	ØØØØØ92	ØØØ72
ØØØØØ	**ØØØØ114**	ØØØ74
ØØØØØ	ØØØØØ63	ØØØ83
ØØØØØ	ØØØØØØ5	ØØØØ3
ØØØØ1	ØØØ16	ØØØØØ

This column is called <u>OUTGOING PC.</u>
This count is incremented when a trunk is idled if:

a. The trunk was outgoing when it was originally seized.

b. After the trunk was seized, it was involved in an established connection.

This figure does not represent connections between an incoming trunk and an outgoing trunk. It does, however, represent the total peg count for all outgoing trunks on station - to - trunk or attendant - to - trunk calls.

2ØØ TFCØØ1

ØØ

ØØØØØ	ØØØØØ92	ØØØ72
ØØØØØ	ØØØØ114	**ØØØ74**
ØØØØØ	ØØØØØ63	ØØØ83
ØØØØØ	ØØØØØØ5	ØØØØ3
ØØØØ1	ØØØ16	ØØØØØ

*** PRACTICE EXERCISE ***

1. The total CCS for all outgoing trunks would be found in what column? ______________

2. If a path to an idle outgoing trunk cannot be found it would be indicated in what column? ______________

*** ANSWER ***

1. The total CCS for all outgoing trunks would be found in what column? OUTGOING CCS

2. If a path to an idle outgoing trunk cannot be found it would be indicated in what column? OUTGOING FTM

If you understand all of the information up to this point continue.

This column is called INTRA-CUSTOMER FTM.
This count is incremented when a path cannot be found between two terminals, neither of which is a trunk. It represents the total blockage suffered by all station - to - station or station - to - attendant calls.

```
200   TFC001

00

00000          0000092        00072
00000          0000114        00074
00000          0000063        00083
00000          0000005        00003
00001            00016        00000
```

This column is called INTRA-CUSTOMER CCS.
It indicates the total usage of all calls that increment Intra-customer Peg Count.

200 TFC001

00

00000	0000092	00072
00000	0000114	00074
00000	**0000063**	00083
00000	0000005	00003
00001	00016	00000

This column is called INTRA-CUSTOMER PC.
When an established path between two terminals, neither of which is a trunk, is idled, this count will be incremented. This count represents the total peg count for all station - to - station or station - to - attendant calls.

200 TFC001

00

00000	0000092	00072
00000	0000114	00074
00000	0000063	**00083**
00000	0000005	00003
00001	00016	00000

If you understand all of the information up to this point continue to the practice exercise.

*** PRACTICE EXERCISE ***

1. What column indicates the total usage of all calls that increment the intra-customer peg count? ________________

2. What column would you check if two terminals (not trunks) have their established path idled? ________________

3. What column would indicate when a path between two terminals (not trunks) could not be found? ________________

*** ANSWER ***

1. What column indicates the total usage of all calls that increment the intra-customer peg count? INTRA-CUSTOMER CCS

2. What column would you check if two terminals (not trunks) have their established path idled? INTRA-CUSTOMER PC

3. What column would indicate when a path between two terminals (not trunks) could not be found? INTRA-CUSTOMER FTM

Refer to the NTP in the Appendix for additional information on the subjects covered up to this point.

This column is called TANDEM FTM.
If a path between two terminals, both of which are trunks, cannot be found due to network blocking, then Tandem FTM is incremented. Two attempts are made to find a path between the originating trunk and idle outgoing trunk. If both attempts fail, one Tandem FTM is counted. The FTM figure represents the total blockage suffered by all trunk - to - trunk connections. It is not included in either incoming or outgoing FTM measurements.

200 TFC001

00

00000	0000092	00072
00000	0000114	00074
00000	0000063	00083
00000	0000005	00003
00001	00016	00000

This column is called TANDEM CCS .
When an established path between two terminals, both of which are trunks, is idle then tandem usage is accumulated. The usage figure represents the total usage for all trunk - to - trunk calls. Tandem usage does not increment either incoming or outgoing usage.

200 TFC001

00

00000	0000092	00072
00000	0000114	00074
00000	0000063	00083
00000	**0000005**	00003
00001	00016	00000

This column is called TANDEM PC .
When an established connection between two terminals, both of which are trunks, is idled and both trunks are also to be idled, then this count is incremented. A tandem call does not increment either Incoming or Outgoing Peg Counts. Therefore, to calculate the total incoming and outgoing traffic, the tandem peg count must be added once to both the incoming and the outgoing peg counts. Likewise, add the tandem CCS and/or FTM's once to both the incoming and outgoing CCS and/or FTM's to find the total incoming and outgoing usage and/or FTM's.

200 TFC001

00

00000	0000092	00072
00000	0000114	00074
00000	0000063	00083
00000	0000005	**00003**
00001	00016	00000

If you understand all of the information up to this point continue on to the practice exercise on the next page.

*** PRACTICE EXERCISE ***

1. What column would you check if a path between two trunk type terminals cannot be found due to network blocking? ____________________

2. What columns are incremented when an established connection between two terminals, both of which are trunks, is idled and both trunks are also to be idled? ____________________

*** ANSWER ***

1. What column would you check if a path between two trunk type terminals cannot be found due to network blocking? TANDEM FTM

2. What columns are incremented when an established connection between two terminals, both of which are trunks, is idled and both trunks are also to be idled? TANDEM PC & TANDEM CCS .

If you understand all of the information up to this point continue.

This column is called PERMANENT SIGNAL.

This count is incremented when:

1. A terminal does not start to dial within 30 seconds of receiving dial tone.

2. A terminal, other than a trunk or attendant, does not continue dialing once it has started and is placed into the line-lockout condition.

```
200   TFC001

00

00000          0000092          00072
00000          0000114          00074
00000          0000063          00083
00000          0000005          00003
00001            00016          00000
```

This column is called ABANDON .
This count is incremented when a terminal, other than a trunk, goes on-hook and thus abandons the call before having completely dialed a directory number or a trunk access code. This count will not be incremented if a partial number has been outpulsed on a trunk route.

200 TFC001

00

00000	0000092	00072
00000	0000114	00074
00000	0000063	00083
00000	0000005	00003
00001	**00016**	00000

This column is called PARTIAL DIAL.
When a 2500 set does not complete dialing within 30 seconds this count will be incremented.

200 TFC001

00

00000	0000092	00072
00000	0000114	00074
00000	0000063	00083
00000	0000005	00003
00001	00016	**00000**

If you understand all of the information up to this point continue on to the practice exercise.

*** PRACTICE EXERCISE ***

1. What column indicates when a terminal goes on-hook and abandons the call before completely dialing a directory number? ________________

2. What column is incremented if a terminal does not start to dial within 3Ø seconds? ________________

3. What column is incremented when a 25ØØ set does not complete dialing within 3Ø seconds? ________________

*** ANSWER ***

1. What column indicates a terminal goes on-hook and abandons the call before completely dialing a directory number? ABANDON

2. What column is incremented if a terminal does not start to dial within 3Ø seconds? PERMANENT SIGNAL

3. What column is incremented when a 25ØØ set does not complete dialing within 3Ø seconds? PARTIAL DIAL

If you had any problems with this exercise it is recommended that you review before continuing.

From the beginning of this module you have been reviewing the columns of the TFC001 report. The module will now detail the data contained in these columns and their relationships.

All of the data that you will be reviewing may vary from system to system depending on traffic, size, etc.

First, take a look at what is considered to be ideal data for the TFC001 report.

Ideal data may include:

- Maximum blockage for incoming, outgoing, and tandem calls is 1%.
- Maximum blockage for intra-customer calls is 4%.

If you understand everything up to this point continue on to the practice exercise.

*** PRACTICE EXERCISE ***

1. Ideally how many FTMs should a report have? __________
2. What is the maximum blockage for intra-customer calls? _____
3. Maximum blockage for incoming calls is? __________

*** ANSWER ***

1. Ideally how many FTMs should a report have? (Ø) ZERO

2. What is the maximum blockage for intra-customer calls? 4%

3. Maximum blockage for incoming calls is? 1%

The recommended maximum blockage for incoming, outgoing and tandem calls is 1%, and for intracustomer calls it is 4%.

If you had any problems with this practice exercise it is recommended that you review before continuing.

All CCS, peg counts, and failures to match in this section peg on a per-call basis, rather than a per-time slot basis, as in TFSØØ1.

These measurements are incremented for only one of the two time slots involved and only for calls that reach the established state. An established path for incoming calls is defined as a connection in which answer supervision has been returned to the central office. An established path for outgoing calls is defined as a connection in which the Meridian SL-1's end - of - dialing timer has timed out, regardless of the fate of the call. Therefore, the outgoing peg count will include calls to a busy number or a ring - no - answer, as long as the EOD timer has timed out on those calls. Connections of the two types listed below are not included in the counts in TFCØØ1:

- o Connections to service loops
- o Connections to Digitone receivers

*** PRACTICE EXERCISE ***

Failures to match, PC, CCS peg on a per time slot basis for TFCØØ1.

TRUE or FALSE

*** ANSWER ***

Failures to match, PC, CCS peg on a per time slot basis for TFCØØ1.

TRUE or **FALSE**

Multiplying usage and peg count measurements by two and finding the sum for each will more or less approximate the sum of terminal loop usage and peg counts in TFSØØ1, although it will never equal it. This is because the measurements in the two sections do not peg for the same reasons or at the same times during the handling of a call. For example, the two connection - types listed above are not included in TFCØØ1, however they are included in TFSØØ1.

EXAMPLE:

A blocked call will peg one failure to match twice in TFSØØ1 -- once for each time slot involved -- but only once in TFCØØ1, depending on whether it was incoming, outgoing, intracustomer, or tandem.

Similarly, an incoming call to an attendant console that is blocked twice before it reaches its destination--once between the trunk and the console, and once between the console and the station -- will only show one failure to match in TFCØØ1. However, TFSØØ1 will show four loop failures to match for this call.

Failures to match between any terminal and the tone and digit switch or a Digitone receiver are not recorded in TFCØØ1, whereas they will be recorded in TFSØØ1.

The percentage of blockage on incoming, outgoing, intracustomer, and tandem calls can be determined from this section, using the formula:

$$\frac{\text{FTM}}{\text{Peg Count + FTM}} \times 1ØØ = \%\ \text{Blockage}$$

The example below demonstrates the use of the formula utilizing an actual report:

```
1Ø4   TFCØØ1
ØØ
   ØØØØ8    ØØØØ9Ø2     ØØ387
   ØØØ32    ØØØ1214     ØØ796
   ØØØ14    ØØØØ437     ØØ496
   ØØØØØ    ØØØØØ54     ØØØ24
   ØØØ16      ØØ132     ØØ124
```

INCOMING FTM

$$\frac{8}{387 + 8} \times 1ØØ = 2.Ø2\ \%\ \text{Blockage}$$

*** PRACTICE EXERCISE ***

Use the example report above to answer the following questions.

1. What is the % of blockage for outgoing calls?

2. What is the % of blockage for intracustomer calls?

3. What is the % of blockage for tandem calls?

*** ANSWER ***

1. % of blockage for outgoing calls is 3.9

$$\frac{32}{796 + 32} \times 100 = 3.9\ \%$$

2. % of blockage for intracustomer calls is 2.7

$$\frac{14}{496 + 14} \times 100 = 2.7\ \%$$

3. % of blockage for tandem calls is 0 %

$$\frac{0}{132 + 0} \times 100 = 0\ \%$$

Intra-office ratio for each customer can be calculated from this section. This is defined as the ratio of station-to-station traffic to total station traffic. The formula used is:

$$\frac{2 \text{ X Intracustomer CCS}}{\text{Incoming CCS + Outgoing CCS + (2 X Intracustomer CCS)}} =$$

EXAMPLE:

```
104   TFCØØ1
ØØ
   ØØØØ8    ØØØØ9Ø2    ØØ387
   ØØØ32    ØØØ1214    ØØ796
   ØØØ14    ØØØØ437    ØØ496
   ØØØØØ    ØØØØØ54    ØØØ24
   ØØØ16      ØØ132    ØØ124
```

$$\frac{2 \text{ X } 437}{9\text{Ø}2 + 1214 + (2 \text{ X } 437)} = \text{Ø}.292 \text{ (29 \%) Intra-office ratio}$$

*** PRACTICE EXERCISE ***

Use the report below to calculate the intra-office ratio for station to station traffic.

```
104   TFCØØ1
ØØ
   ØØØØØ    ØØØØ478    ØØ217
   ØØØØØ    ØØØØ821    ØØ569
   ØØØØØ    ØØØØ21Ø    ØØ255
   ØØØØØ    ØØØØØ53    ØØØ24
   ØØØØ2      ØØØ8Ø    ØØØ8Ø
```

*** ANSWER ***

$$\frac{2 \times 21Ø}{478 + 821 + (2 \times 21Ø)} = Ø.244\ (24\ \%)\ \text{Intra-office ratio}$$

Take a look at the TFCØØ1 report below.

200 TFCØØ1

ØØ

ØØØØØ	ØØØØØ92	ØØØ72
ØØØØØ	ØØØØ114	ØØØ74
ØØØØØ	ØØØØØ63	ØØØ83
ØØØØØ	ØØØØØØ5	ØØØØ3
ØØØØ1	ØØØ16	ØØØØØ

Using the report above you will review the steps that are recommended to be taken when looking at this report.

- o Check for FTMs

  NO FTMs stop

  If FTMs are present-continue

- o Use the formula to check blockage

  Is the blockage within the recommended percentage?

  YES, then you are ok.

  NO, then you might need to add equipment and/or re-balance.

Take a look at another report that does have some FTMs.

```
427   TFCØØ1
ØØ
  ØØØØ1        ØØØ3413        Ø2377
  ØØØØ1        ØØØ5124        Ø3199
  ØØØØØ        ØØØØ833        Ø1322
  ØØØØØ        ØØØØ358        ØØ213
  ØØØ59          ØØ6Ø3        ØØ332
```

What is the percent of blockage for INCOMING TRAFFIC? Use the formula.

$$\frac{1}{2377 + 1} \times 100 = 0.04\% \text{ Incoming Blockage}$$

Well it's within the recommended 1% blockage; therefore, this one is okay.

What is the percent of blockage for outgoing traffic? Again, use the formula.

$$\frac{1}{3199 + 1} \times 100 = 0.03\% \text{ Outgoing Blockage}$$

This one is also within the recommended 4% blockage; therefore, this one is also okay.

If you understand everything up to this point then continue on to the practice exercise.

*** PRACTICE EXERCISE ***

Using the report below answer the questions that follow.

```
427  TFCØØ1
ØØ
  ØØØØ2       ØØØ3413       Ø2377
  ØØØØØ       ØØØØ9ØØ       Ø1392
  ØØØØ1       ØØØ5137       Ø3212
  ØØØØØ       ØØØØ358       ØØ213
  ØØØ59         ØØ6Ø3       ØØ332
```

1. What is the percent of blockage for intra-customer traffic?

   ____

2. What is the percent of blockage for INCOMING TRAFFIC?

   ____

*** ANSWER ***

1. What is the percent of blockage for intra-customer traffic?
   .Ø3% blockage

$$\frac{1}{3212 + 1} \times 100 = 0.03$$

2. What is the percent of blockage for incoming traffic?
   .Ø8% blockage

$$\frac{2}{2377 + 2} \times 100 = 0.08$$

The TFCØØ1 data may also be used to indicate what percentage of total system traffic is incoming, outgoing, intracustomer, or tandem. The procedure is to find the sum of the incoming CCS, outgoing CCS, intracustomer CCS, and tandem CCS figures, then divide each of the above figures by the sum of all CCS values. This kind of information is useful in determining trunking needs, customer calling characteristics, or any other type of engineering need for which this information is required.

The formula is:

```
Incoming CCS (or Outgoing CCS, Intracustomer CCS, or Tandem CCS)
----------------------------------------------------------------
Incoming CCS + Outgoing CCS + Intracustomer CCS + Tandem CCS

                              X 1ØØ = % of Total System Traffic
```

Repeat for each type.

Another useful item that can be calculated from the TFCØØ1 data is the average holding time for each type of call. In combination with the percentage of total traffic for each type of call, this information, which also represents the customer's calling characteristics, can be used in the same manner as the percentages of each type of call, or to possible causes of other problems in the system (such as high real time usage).

The formula is:

```
      CCS               XXX
  -------------   =  ---------
    Peg Count           .Ø6     (to convert to minutes)
```

Repeat for each type of call - incoming, outgoing, intracustomer, and tandem.

EXAMPLE:

INCOMING CCS

200 TFC001

00

```
00000     0000092    00072
00000     0000114    00074           92
00000     0000063    00083    ----------------- X 100 = Incoming CCS
00000     0000005    00003    92 + 114 + 63 + 5         33.5% of total
00001       00016    00000                              system traffic
```

This data will vary according to the customer's method of operation and nature of business. However, for manyu customers, representative holding times for each type of call are as follows:

- o Incoming calls: 3 - 3.5 minutes.
- o Outgoing calls: 2 - 3 minutes.
- o Intracustomer calls: 30 seconds - 1.5 minutes.
- o Tandem calls: 4 - 5 minutes.

SUMMARY OF TFCØØ1 NETWORK REPORT :

- Details traffic within each customer group.
- All data is on a per call basis.
- Ideally 1% or less blockage for incoming, outgoing, and tandem calls.
- Ideally 4% or less blockage for intra-customer calls.
- Formula for calculating blockage:

$$\frac{\text{(TYPE) FTM}}{\text{(TYPE) PEG COUNT + (TYPE) FTM}} \times 100 = \text{\% Blockage}$$

- Blockage that is higher than recommended may require the addition of equipment and/or rebalancing.
- The intra-office ratio indicates the ratio of station - to - station traffic to total station traffic.
- The percentage of total system traffic represented by incoming, outgoing, intracustomer, and tandem calls and the average holding time of each may also be calculated.

This concludes the review of the TFCØØ1 NETWORK REPORT. If any information reviewed up to this point is unclear please take the time to review before continuing. The four customer reports that follow are related to specific customer data that will sometimes refer back to this report.

The second customer report you will review is the TFSØØ2 TRUNK TRAFFIC . This report consists of incoming and outgoing CCS, and peg counts for each trunk group, as well as other peg counts regarding the status of trunks in that route and the amount of blockage on that route.

EXAMPLE TFCØØ2 TRUNK TRAFFIC REPORT

```
2ØØ   TFCØØ2

Ø7

ØØ4   CO

ØØØØ8          ØØØØ7

ØØØØØ51        ØØØ43
ØØØØØØ4        ØØØØ4
  ØØØØØ        ØØØØØ
  ØØØØ6
```

This column is called GROUP NUMBER.
It indicates the number of the trunk group.

200 TFC002

07

004 CO

00008	00007
0000051	00043
0000004	00004
00000	00000
00006	

This column is called TRUNK TYPE.
Turn to page 4-3 in the NTP to see the 11 trunk types.

RETURN HERE AFTER YOU HAVE LOOKED AT THE NTP

200 TFC002

07

004 **CO**

00008	00007
0000051	00043
0000004	00004
00000	00000
00006	

This column is called <u>TRUNKS EQUIPPED.</u>
It gives the number of trunks configured in the route at the time of printing.

```
200   TFC002

07

004   CO

00008          00007

0000051        00043
0000004        00004
  00000        00000
  00006
```

If you understand the information up to this point continue on to the practice exercise.

*** PRACTICE EXERCISE ***

Using the example report, answer the questions below.

```
200   TFC002

07

004   CO

00008          00007

0000051        00043
0000004        00004
  00000        00000
  00006
```

1. What type of trunk does this report indicate? ______________

2. How many equipped trunks does this report indicate? ______________

*** ANSWER ***

1. What type of trunk does this report indicate? <u>(CO) CENTRAL OFFICE</u>

2. How many equipped trunks does this report indicate? <u>(8) eight</u>

If you had any problems with this exercise it is recommended that you review before continuing.

This column is called <u>TRUNKS WORKING.</u>
It indicates the number of working trunks at the time of printing.

```
200   TFC002

07

004   CO

00008           00007

0000051         00043
0000004         00004
  00000         00000
  00006
```

This column is called <u>INCOMING USAGE.</u>
It does not start accumulating until answer supervision is returned to the central office. It will not peg until the connection is idled.

```
200   TFC002

07

004   CO

00008           00007

0000051         00043
0000004         00004
  00000         00000
  00006
```

This column is called <u>INCOMING PC.</u>
It gives a peg count for each time an incoming trunk was seized in this group and resulted in an established call. Incoming PC does not peg until the call is idled.

```
200   TFC002

07

004   CO

00008           00007

0000051         00043
0000004         00004
  00000         00000
  00006
```

If you understand the information up to this point continue on to the practice exercise.

*** PRACTICE EXERCISE ***

Using the report below, answer the questions that follow.

```
200   TFC002

07

004   CO

00008           00007

0000051         00043
0000004         00004
  00000         00000
  00006
```

1. What is the peg count for the number of times incoming trunks were used in this route? ______________

2. What is the number of working trunks? ______________

3. The number "51" on the report is called? ______________

*** ANSWER ***

1. What is the peg count for the number of times incoming trunks were used in this route? (43) FORTY THREE

2. What is the number of working trunks? (7) SEVEN

3. The number "51" on the report is called? INCOMING USAGE

If you had any problems with this exercise it is recommended that you review before continuing.

This column is called OUTGOING USAGE.
This indicates the total time an outgoing trunk was involved in an established call. It begins to accumulate as soon as the end - of - dialing timer times out, regardless of whether the call is answered or not. It will not peg until the connection is idled.

200 TFC002

07

004 CO

00008	00007
0000051	00043
0000004	00004
00000	00000
00006	

This column is called OUTGOING PC.
It gives a peg count for each time an outgoing trunk in this group was seized and resulted in an established call. It will peg for all calls which completed dialing, regardless of the fate of the call, but will not peg until the connection is idled.

200 TFC002

07

004 CO

00008	00007
0000051	00043
0000004	**00004**
00000	00000
00006	

This column is called <u>OUTGOING OVERFLOW.</u>
It is a count of the number of call attempts over that route which were blocked due to an ATB condition.

```
200   TFC002

07

004   CO

00008          00007

0000051        00043
0000004        00004
  00000        00000
  00006
```

If you understand the information up to this point continue on to the practice exercise on the next page.

*** PRACTICE EXERCISE ***

Use the report to answer the questions.

```
200   TFC002

07

004   CO

00008          00007

0000051        00043
0000004        00004
  00000        00000
  00006
```

1. What is the outgoing peg count for the number of times trunks were used in this route? ______________

2. What is the CCS for outgoing trunk calls? ______________

3. The outgoing overflow column contains the number six (6)?

   TRUE   or   FALSE

*** ANSWER ***

1. What is the outgoing peg count for the number of times trunks were used in this route? (4) FOUR

2. What is the CCS for outgoing trunk calls? (4) FOUR

3. The outgoing overflow column contains the number six (6)?

TRUE or **FALSE**

If you said TRUE to question number three you probably were looking at the TOLL PC which contains the number 6. The overflow column contains the number Ø.

If you had any problems with this exercise it is recommended that you review before continuing.

This column is called ALL TRUNKS BUSY.
It is only valid for trunks with more than one equipped member; incremented whenever the last idle, enabled trunk is made busy.

```
200   TFC002

07

004   CO

00008           00007

0000051         00043
0000004         00004
  00000         00000
  00006
```

This column is called TOLL PC .
It is a count of the number of times a toll call was dialed on a CO or FEX route. ("Ø" or "1" is dialed as the first or second digit after the access code.) It will peg as soon as the first digit (after Ø, 1) is dialed even if the call was not completely dialed.

```
200   TFC002

07

004   CO

00008          00007

0000051        00043
0000004        00004
  00000        00000
  00006
```

*** PRACTICE EXERCISE ***

Use the report to answer the questions.

```
200   TFC002

07

004   CO

00008          00007

0000051        00043
0000004        00004
  00000        00000
  00008
```

1. What is the number in the all trunks busy column? __________

2. What is the toll PC on this report?

   ____

*** ANSWER ***

1. What is the number in the all trunks busy column? (Ø) ZERO.

2. What is the toll PC on this report? (8) EIGHT

If you had any problems with this exercise it is recommended that you reveiw before continuing.

The first part of the review of the TFCØØ2 report covered only the columns and what they were. Now the module will go into detail and explain the contents and relationships of the data in these columns.

All of the data that you will be reviewing may vary from system to system depending on traffic, size, etc.

Data in this section consists of incoming and outgoing CCS and peg counts for each trunk group, as well as information regarding the status of the trunks and the amount of blockage on each route. In this section, blockage on a group of trunks is the statistical probability that a call will be blocked, or unable to be completed, due to lack of an idle, enabled trunk.

First take a look at what is considered to be ideal data for the TFCØØ2 report.

Ideal data may include:

- o High ATB's and low overflows on outgoing or two-way routes.
- o Zero or low toll peg counts on CO and FEX routes.
- o Zero or low ATB's on DID or other incoming routes.

For most types of trunks, there is an industry-accepted standard grade of service to which most systems are engineered, which is known as the recommended maximum blockage. These values are:

TRUNK TYPE	RECOMMENDED MAX. BLOCKAGE
CO	1 %
DID, FEX, TIE, WATS	2 % - 5 %

Northern Telecom uses the above figures for the recommended maximum blockage for the above types of trunks.

NOTE: The type of trunks having a higher level of blockage are known as special service trunks, and are allowed that level of blockage due to their high cost.

There are several formulas developed by mathematicians regarding the nature of trunk traffic in a switching system; treatment of a blocked call; and the criteria for the grade of service. These may be used to determine the number of trunks required for the recommended grade of service on a given route. The most commonly used formulas are based on the Poisson, Erlang B, and Erlang C theories. The basic assumptions behind these theories are:

Poisson (Blocked Calls Held)

Calls that find no idle trunk remain in the system for the period that they would have occupied if they had been connected, and then leave the system. Time in the system is equal to the expected call duration.

Erlang B (Blocked Calls Cleared)

Calls which find no idle trunk are cleared immediately from the system. Time in the system is zero.

Erlang C (Blocked Calls Delayed)

Calls which find no idle trunk wait in a queue until a trunk is free and then are connected normally. Time in the system is equal to the waiting time plus the expected call duration.

For the Poisson and Erlang B formulas, the grade of service criteria is the percentage of calls blocked. This applies to systems in which there is no queuing for a trunk group. Switching systems that allow queuing deal with delayed rather than blocked calls, and the grade of service criteria becomes the ratio between the average queuing time and the average holding time per call. In a delay system, the traffic carried (i.e., the calls that are actually completed) equals the traffic offered (i.e., the total number of calls that need to be completed over that route). In non-queuing system, the traffic carried is equal to the total CCS carried by trunks in a given route, and the traffic offered may be calculated from the grade of service being provided by that route, using the formula:

$$\text{Traffic offered} = \frac{\text{Traffic carried}}{1 - \text{blockage (GOS)}}$$

The GOS is usually expressed as the probability of blockage, and written "P.XX", where XX is the percentage of blockage in decimal form. (The "P" stands for probability, not Poisson). In Meridian SL-1 traffic measurements, the overflow peg count may be used to calculate the blockage, and the sum of the incoming CCS and the outgoing CCS may be used to represent the traffic carried. These figures may be plugged into the formula above to determine the actual demand being offered to trunks in that route.

In the TFC002 report the overflow peg count indicates the total number of attempts to seize a trunk in that route after all trunks are made busy. This will peg only once, whether the system diverts the call to another route (through ARS/NARS/BARS) or the user activates Ring Again against that route. This peg count can be used to calculate the actual percentage of blockage for outgoing calls only on that route, using the formula:

$$\frac{\text{OVERFLOW PEG COUNT}}{\text{Outgoing Peg Count + Overflow Peg Count}} \times 100 = \text{\% Blockage}$$

The overflow peg count does not apply to incoming calls, as this information never reaches the Meridian SL-1. For incoming routes, overflow information must be obtained from the serving central office. However, it may be approximated by using the Poisson or Erlang B tables and the total CCS carried by that route.

Take a look at the report.

200 TFC002

07

004 CO

00008	00007
0000051	00043
0000004	00004
00008	00004
00006	

The report above will be used to calculate the percent of blockage using the formula previously mentioned. By doing this you will be able to see if the percent of blockage is above the recommended maximum of 1%.

$$\frac{8}{4 + 8} \quad X\ 100 = 66.6\ \%\ \text{Blockage}$$

This figure is blockage based on overflow. This type of comparison will help identify if there is a need to add more trunks. If the percentage of blockage is >1%, it is generally recommended that trunks be added.

REMEMBER:

Maximum Trunk Blockage:	Trunk Type	Maximum Blockage
	CO	1%
	DID, FEX, TIE, WATS	2% - 5%

*** PRACTICE EXERCISE ***

Use the report to answer the question.

```
200   TFC002

00

002   CO

  00008        00007


0000096        00022
0000030        00080
0000003        00001
  00000
```

1. What is the blockage based on overflow? _______________

*** ANSWER ***

1. What is the blockage based on overflow? 3.6%

$$\frac{3}{80 + 3} \times 100 = 3.6\%$$

When this number is >1% , adding trunks should be considered.

If you had any problems with this exercise it is recommended that you review before continuing.

Another useful figure that can be calculated from the traffic data is the CCS per trunk. This is the total CCS divided by the total number of trunks enabled (or equipped, if the same as number enabled).

```
TOTAL CCS  (INCOMING + OUTGOING CCS)
------------------------------------ = CCS Per Trunk
          Trunks enabled
```

As each trunk can conceivably carry a maximum of 36 CCS* each, this will give a rough estimate of the amount of usage a route receives. However, this should not be interpreted to mean that the total CCS capacity for a given route is 36 CCS times the number of trunks in the route. That would be the maximum CCS that a route could carry, representing 100 % blockage for anyone else attempting to use that route. The actual CCS capacity is derated, and comes from either the Poisson or Erlang B tables. It is the value of CCS which corresponds to the total number of trunks equipped and the recommended maximum blockage for the type of route (read from a Poisson or Erlang B table).

* It is possible for a trunk to accrue usage on the traffic printout greater than 36 CCS during one hour. This occurs because CCS and peg counts are not accumulated until the connection is idled. A connection that began in one time period and ended in another will cause the CCS for the second time period to be inflated by the amount of time used in the first time period, and consequently, the data for the first time period to be lower than was actually the case. A pattern of low-and-high CCS over a number of consecutive hours on a route with 1 or 2 members will indicate that this is happening.

EXAMPLE: CCS Per Trunk

```
02   WATT

  00006         00006

0000000         00000
0000131         00082
  00056         00028
  00000
```

$$\frac{131}{6} = 22 \text{ CCS Per Trunk}$$

This information is useful for load balancing purposes. Routes which average 25 CCS per trunk or higher may be considered "high-usage" trunks; routes which average 20-25 CCS per trunk may be considered to have "average" usage; and routes which average 20 CCS or lower may be considered to be "low-usage" trunks.

If you understand everything up to this point continue on to the practice exercise.

*** PRACTICE EXERCISE ***

Use the report to answer the question.

Ø2 WATT

ØØØØ5	ØØØØ5
ØØØØØØØ	ØØØØ5
ØØØØ145	ØØØ87
ØØØ62	ØØØ31
ØØØØØ	

1. Calculate the CCS per trunk. CCS per trunk = ________

*** ANSWER ***

1. Calculate the CCS per trunk. CCS per trunk = 29

$$\frac{145}{5} = 29 \text{ CCS per trunk}$$

If you had any problems with this exercise please review before continuing.

The CCS per trunk can be used in another formula to determine the percent utilization of a route, which is calculated as follows:

$$\frac{\text{CCS/Trunk}}{36} \times 1ØØ = \% \text{ Utilization}$$

Work through one of the formulas using the report below.

```
Ø2    WATT
                                          (CCS per trunk, previous formula)
  ØØØØ6        ØØØØ6        22     X 1ØØ = 61% Utilization
                           ----
                            36
ØØØØØØØ        ØØØØØ
ØØØØ131        ØØØ82
  ØØØ56        ØØØ28
  ØØØØØ
```

The higher the CCS per trunk, the more efficiently a route is being utilized. Removing trunks on routes that are over equipped will improve the utilization of the remaining trunks, as long as the traffic offered remains at the same level. If the amount of usage on a group increases as the number of available trunks increases, then adding trunks will increase the utilization. In most cases, larger trunk groups are more efficient than smaller routes, due to economy of scale.

If you understand everything up to this point continue on to the practice exercise.

*** PRACTICE EXERCISE ***

Use the report below and the CCS per trunk (29) calculation that you calculated before to answer the question that follows.

```
Ø2    WATT

  ØØØØ5        ØØØØ5

ØØØØØØØ        ØØØØØ
ØØØØ145        ØØØ87
  ØØØ62        ØØØ31
  ØØØØØ
```

1. What is the percent of utilization for this report?

*** ANSWER ***

1. What is the percent of utilization for this report?

$$\frac{29}{36} \times 100 = 81\% \text{ Utilization}$$

If you had any problem with this exercise it is recommended that you review before continuing.

Both incoming and outgoing trunks can also be monitored for utilization by observing the ATB peg count. The ATB peg count may often be seen to be considerably higher than the total peg count for a route, in which case it is to be disregarded. It is possible for this count to be higher than the total peg count, but not by more than a very small percentage. This can happen when a caller dials out on a trunk, then abandons the call before the EOD timer times out. If that trunk was the last idle, enabled trunk in the route, one ATB peg count will be incremented, but no trunk peg count will be pegged.

Before continuing complete the practice exercise.

*** PRACTICE EXERCISE ***

1. What is another way to monitor utilization of trunks?

*** ANSWER ***

1. What is another way to monitor utilization of trunks?

Monitor the (ATB) all trunks busy peg count .

You can use the ATB peg count to determine the % of calls seizing the last trunk. Now take a look at the formula used to calculate the percent of calls seizing the last trunk.

```
          ATB PEG COUNT
--------------------------------------- X 1ØØ = % of calls siezing
Incoming Peg Count + Outgoing Peg Count         last trunk
+ Overflow Peg Count
```

Now work through one of these formulas using the report below.

```
Ø2   WATT

  ØØØØ6         ØØØØ6

ØØØØØØØ         ØØØØØ
ØØØØ131         ØØØ82
  ØØØ56         ØØØ28
  ØØØØØ
```

$$\frac{28}{Ø + 82 + 56} \times 1ØØ = 2Ø.3 \text{ \% of calls seizing last trunk}$$

It should be noted that ATB's, overflows, and a high percentage of calls seizing the last trunk in the route are not necessarily bad in themselves. In fact, high ATB's and low overflows are actually to be desired on outgoing or two-way routes, as this indicates that the route is being used efficiently but is providing a good grade of service. Likewise, a high percentage of calls seizing the last trunk may indicate efficient use of trunks, depending on circumstances. If this occurs on a last choice route in an alternate routing situation (such as ARS/NARS/BARS), however, it could mean that a large number of calls are being blocked. High ATB's and high overflows almost always mean high blockage on a route.

*** PRACTICE EXERCISE ***

Use the report below to answer the question that follows.

Ø2 WATT

ØØØØ5	ØØØØ5
ØØØØØØØ	ØØØØØ
ØØØØ145	ØØØ87
ØØØ62	ØØØ31
ØØØØØ	

1. What is the percent of calls seizing the last trunk?
   (NOTE: Rememember to use the formula.)

*** ANSWER ***

1. What is the percent of calls seizing the last trunk?

$$\frac{31}{87 + 62} \times 100 = 21\%$$

If you understand everything up to this point then continue to the practice exercise.

*** PRACTICE EXERCISE ***

1. High blockage on a route might be indicated by what?

2. High ATBs and low overflow for outgoing or two-way routes indicate what?

*** ANSWER ***

1. High blockage on a route might be indicated by what?

   High ATBs and high overflow almost always mean high blockage on a route.

2. High ATBs and low overflow for outgoing or two-way routes indicate what?

   This indicates that the route is being used efficiently, and providing a good grade of service.

If you had any problems with this exercise it is recommended that you review before continuing.

Another part of the data that might be helpful when interpreting this report is the average holding time per call on each route. The greater the holding time per call, the fewer the calls that can be carried, and the higher the probability of blockage. Holding times will vary according to the customer's application and method of operation. For most normal 8 - 5 type businesses, however, the average holding times may look like this:

(NOTE: The figures below are representative of some customers, but not all.)

- o CO Trunks: 2-3 minutes
- o WATS and other Special Service Trunks: 4-5 minutes

*** PRACTICE EXERCISE ***

1. What is the average holding time for CO Trunks seen for most customers ?

2. Blockage might be caused by what?

3. What is the average holding time for special service trunks seen for most customers?

*** ANSWER ***

1. What is the average holding time for CO Trunks seen for most customers ? 2-3 MINUTES

2. Blockage might be caused by what? A greater holding time per call

3. What is the average holding time for special service trunks seen for most customers? 4-5 MINUTES

If you had any problems with this exercise it is recommended that you review before continuing.

Now that you have reviewed the holding times for calls, take a look at the formula for calculating the average holding time per call.

Formula:

$$\frac{\text{INCOMING CCS + OUTGOING CCS}}{\text{INCOMING PEG COUNT + OUTGOING PEG COUNT}} = \text{XXX} \qquad \frac{\text{XXX}}{0.6} = \text{HOLDING TIME IN MINUTES}$$

EXAMPLE: Calculating holding time.

```
Ø2    WATT

  ØØØØ6          ØØØØ6


ØØØØØØØ          ØØØØØ       131
ØØØØ131          ØØØ82       --- = 1.597
  ØØØ56          ØØØ28        82     -----   = 2.7 minutes holding time
  ØØØØØ                               Ø.6
```

As you can see, the 2.7 holding time is shorter than the 4-5 minute holding time discussed earlier.

REMEMBER: Holding times are characteristics of each customer, not something that can be regulated.

If you understand everything up to this point continue on to the practice exercise.

*** PRACTICE EXERCISE ***

Use the report below to answer the question that follows.

```
Ø2    WATT

  ØØØØ5          ØØØØ5

ØØØØØØØ          ØØØØØ
ØØØØ145          ØØØ87
  ØØØ62          ØØØ31
  ØØØØØ
```

1. What is the average holding time per call? ______________

*** ANSWER ***

1. What is the average holding time per call? 2.8 MINUTES

```
145
---  =  1.666
 87     -----  =  2.8
         0.6
```

If you had any problems with this exercise it is recommended that you review before continuing.

Now let's take a look at the Toll PC Column.

A high number of toll calls relative to the total peg count may indicate that the customer needs more trunks in his first-choice routes; or may need to reevaluate his alternative routing scheme, if ARS/NARS/BARS is present; or consider adding this feature, if it is not.

```
02   CO

  00005          00005

0000000          00000
0000145          00087
  00062          00031
  00009
```

The toll peg count indicates the number of times a "1" or "0" was dialed, whether the call was actually completed or not. Therefore, it is possible for this peg count to be higher than the outgoing peg count for the route. The percentage of toll calls dialed can be calculated as follows:

$$\frac{\text{TOLL PEG COUNT}}{\text{OUTGOING PEG COUNT}} \times 100 = \%\ \text{TOLL CALLS}$$

Let's work through one of these formulas using the report above.

$$\frac{9}{87} \quad X\ 100 = 10.3\%\ \text{TOLL CALLS FOR THE REPORT ABOVE}$$

If you understand everything up to this point then continue on to the practice exercise.

*** PRACTICE EXERCISE ***

Use the report below to answer the questions that follow.

```
177   TFC002

00
00    CO
  00007           00007

0000000           00000
0000183           00117
  00000           00169
  00010
```

1. What is the percentage of toll calls for this report?

2. If the percentage of toll calls on this report had exceeded 25% it may indicate the need to do what ?

*** ANSWER ***

1. What is the percentage of toll calls for this report? 8.5%

$$\frac{10}{117} \times 100 = 8.5\ \%\ \text{TOLL CALLS}$$

If you came up with a different answer check the following and then try the calculation again:

$$\frac{\text{TOLL PC} = 10}{\text{OUTGOING PC} = 117} \times 100 = \%$$

2. If the percentage of toll calls on this report had exceeded 25% it might indicate the need to do what?

   Might require the addition of more trunks in the first-choice routes.

If you had any problems with this exercise it is recommended that you review before continuing.

SUMMARY OF TFC002 TRUNKS REPORT :

- o Data for each trunk group (Incoming & Outgoing CCS, PC)
- o Trunks Equipped
- o Trunks Enabled
- o Recommended maximum blockage of 1% for CO trunks
- o Recommended maximum blockage of 2-5% for DID, FEX, TIE, WATS Trunks
- o Trunk CCS of 25 or higher indicates a "high usage" route
- o Trunk CCS of 20-25 indicates "average usage" route
- o Trunk CCS less than 20 indicates "low usage" route
- o Higher CCS per trunk indicates an efficiently used route
- o Average holding times for CO trunks is generally 2-3 minutes
- o Average holding times for WATS and other special service trunks is generally 4-5 minutes

In general, the best indication of any required change in trunking for any route is the presence of ATB's and overflows. Where these peg counts are present, the recommendation to add trunks is generally valid; where these peg counts are intermittent or absent the recommendation to make no changes or even to possibly delete trunks is generally valid.

This concludes the review of the TFC002 Trunks Report. If any information reviewed up to this point is unclear please take the time to review before continuing. The next review will cover <u>two</u> customer reports, TFC003 and TFC004. Both of these reports are covered together due to their relationship. The TFC003 report pertains to the treatment of calls as they enter the system via the attendants; whereas, the TFC004 report pertains to individual attendants as they process calls. You will review the headings of both reports first and then review the data for each showing their relationships.

The third customer report you will review is the TFSØØ3 - QUEUE (ATTENDANT CONSOLE).

This report measures calls in the attendant queue, and represents the average of all calls that were handled by the attendants. Queue measurements cannot be broken down on an individual console basis.

NOTE: All timing measurements in this report are printed in tenths of a second. This time is provided as an average, so if the sample is small the accuracy suffers.

EXAMPLE TFCØØ3 QUEUE REPORT :

2ØØ TFCØØ3

Ø3

ØØØ92	ØØØ48
ØØØØ6	ØØ129
ØØØØ3	ØØ135

This column is called <u>CUSTOMER NUMBER.</u>
A number is assigned to individual customers in a single system.

```
200   TFCØØ3

Ø3

ØØØ92          ØØØ48
ØØØØ6          ØØ129
ØØØØ3          ØØ135
```

This column is called <u>AVG. SPEED OF ANSWER.</u>
This is the average amount of time that a call waited to be answered from the time it entered the system until the time it was answered. This includes any time spent in queue, as well as attendant response time. The average speed of answer is measured in tenths of a second.

```
  EXAMPLE:    ØØØ92
              -----  =  9.2 seconds
                1Ø
```

```
200   TFCØØ3

Ø3

ØØØ92          ØØØ48
ØØØØ6          ØØ129
ØØØØ3          ØØ135
```

This column is called AVG. ATTENDANT RESPONSE.
It indicates the average time elapsed between a call being presented to the console and that call being answered.
If the attendant answers a different call, via the ICI keys, the Meridian SL-1 acts as if the call answered was the first one presented (ie; the measurement still give a true indication of the attendant's response. The avg. attendant response is also measured in tenths of a second.

EXAMPLE: $\frac{00048}{10} = 4.8$ seconds

```
200   TFC003

03

00092          00048
00006          00129
00003          00135
```

If you understand everything up to this point continue on to the practice exercise.

* PRACTICE EXERCISE *

Use the report below to answer the questions that follow.

```
200    TFC003

03

00092          00048
00006          00129
00003          00135
```

1. What is the customer number for this report? ______________

2. What is the average attendant response time for this report? ______________

3. What is the average speed of answer for this report? ______________

*** ANSWER ***

1. What is the customer number for this report? (3) THREE

2. What is the average attendant response time for this report? 4.8 seconds

3. What is the average speed of answer for this report? 9.2 seconds

Remember that the average speed of answer and the average attendant response are measured in tenths of a second.

If you had any problems with this exercise it is recommended that you review before continuing.

This column is called PC OF CALLS DELAYED.
This count is incremented whenever a call is removed from the queue, i.e. answered by the attendant. Calls which abandon before being answered do not increment this count.

200 TFC003

03

00092	00048
00006	00129
00003	00135

This column is called AVG. TIME IN QUEUE. This is an average of the amount of time all calls spend waiting for an idle attendant. Calls which abandon before being answered do not increment this count. Average time in queue is measuered in tenths of a second.

Example: ØØ129

$$\frac{129}{1Ø} = 12.9 \text{ seconds}$$

200 TFC003

03

00092	00048
00006	**00129**
00003	00135

If you understand everything up to this point continue on to the practice exercise.

*** PRACTICE EXERCISE ***

Use the report below to answer the questions that follow.

200 TFC003

03

00092	00048
00006	00129
00003	00135

1. What is the avg. time in queue for this report? __________

2. What is the PC of calls delayed for this report? __________

*** ANSWER ***

1. What is the avg. time in queue for this report? 12.9 (seconds)

2. What is the PC of calls delayed for this report? (6) SIX

If you had any problems with this exercise it is recommended that you review before continuing.

This column is called PC OF ABANDONED CALLS.
It is a count of calls that abandoned or hung up before being answered by the attendant.

200 TFCØØ3

Ø3

ØØØ92	ØØØ48
ØØØØ6	ØØ129
ØØØØ3	ØØ135

This column is called AVG. WAIT TIME OF ABANDONED CALLS.
It indicates the average amount of time that abandoned calls waited before abandoning. Average wait time of abandoned calls is measured in tenths of a second.

EXAMPLE: ØØ135

$$\frac{135}{1\text{Ø}} = 13.5 \text{ seconds}$$

200 TFCØØ3

Ø3

ØØØ92	ØØØ48
ØØØØ6	ØØ129
ØØØØ3	**ØØ135**

*** PRACTICE EXERCISE ***

Use the report below to answer the questions that follow.

```
200    TFC003

03

00092        00048
00006        00129
00005        00156
```

1. What was the average amount of time the abandoned calls waited before abandoning? __________

2. How many calls were abandoned before being answered by the attendant? __________

*** ANSWER ***

1. What was the average amount of time the abandoned call waited before abandoning? 15.6 (seconds)

2. How many calls were abandoned before being answered by the attendant? (5) FIVE

If you had any problems with this exercise it is recommended that you review before continuing.

Now that you have reviewed all of the columns for the TFCØØ3 - Queue Report we will review the columns for the TFCØØ4 - Console Report. After you review these columns, the module will go into detail and explain the data and relationships of these two reports.

The fourth customer report you will review is the <u>TFCØØ4 - CONSOLE</u> .

<u>EXAMPLE TFCØØ4 CONSOLE REPORT</u>

```
200   TFC004

00

02

  00008         0000002
  00025         0000004
0000015         0000005
  00000
```

This column is called PC OF INTERNALLY ORIGINATED CALLS HANDLED BY ATTENDANT .

It should be noted that the peg count of internally originated calls include only those calls which were answered by the attendant. It includes all "dial Ø" calls to the attendant, as well as recalls from a station which did not answer. However, these calls come in on a different ICI key than the others, so that the attendant will know how to respond. It also includes calls originated by the attendant, and each time the attendant accesses the paging trunk. However, it does not include each attempt the attendant makes to extend a call.

200 TFC004

00

02

00008	0000002
00025	0000004
0000015	0000005
00000	

This column is called TOTAL TIME SPENT SERVICING INTERNAL REQUESTS .

It registers the amount of time, in CCS, an attendant has calls that originate within the Meridian SL-1 system. Calls active on the console, both internal and outgoing calls, are counted.

200 TFC004

00

02

00008	**0000002**
00025	0000004
0000015	0000005
00000	

This column is called PC OF EXTERNALLY ORIGINATED CALLS HANDLED BY ATTENDANT.

It counts the number of calls that originated outside the Meridian SL-1 which are answered by the attendant; incrementing when the attendant releases the call.

```
200   TFC004

00

02

  00008        0000002
  00025        0000004
0000015        0000005
  00000
```

If you understand everything up to this point continue on to the practice exercise.

*** PRACTICE EXERCISE ***

Use the report below to answer the following questions.

```
200   TFC004

00

02

  00005        0000002
  00030        0000004
0000015        0000005
  00000
```

1. How long did the console have calls active on the console that originated within the Meridian SL-1 system?

____

*** ANSWER ***

1. How long did the console have calls active on the console that originated within the Meridian SL-1 system?
2 (TWO) CCS.

This column is called <u>TOTAL TIME SPENT SERVICING EXTERNAL REQUESTS.</u>
It indicates, in CCS, the amount of time an attendant spends processing externally originated calls.

200 TFCØØ4

ØØ

Ø2

ØØØØ8	ØØØØØØ2
ØØØ25	**ØØØØØØ4**
ØØØØØ15	ØØØØØØ5
ØØØØØ	

This column is called <u>TOTAL TIME CONSOLE IS MANNED.</u>
It indicates the total time, in CCS, the console was not in "Position Busy" or "Night Service" in one time period. A call which is active on a console in position busy or night service will still accumulate processing time. Also, calls originated from a console in night service or position busy will accumulate processing time as well. Therefore, it is possible to have a total time spent servicing internal/external calls which is greater than the total time the console is manned.

200 TFCØØ4

ØØ

Ø2

ØØØØ8	ØØØØØØ2
ØØØ25	ØØØØØØ4
ØØØØØ15	ØØØØØØ5
ØØØØØ	

This column is called <u>TOTAL TIME SPENT SERVICING CALLS.</u> It is the sum of the time spent servicing both internal and external requests.

```
200   TFC004

00

02

 00008          0000002
 00025          0000004
0000015         0000005
 00000
```

This column is called <u>NUMBER OF TIMES ALL ATTENDANT LOOPS ARE BUSY</u> . This count is incremented whenever the last idle attendant loop key is busy. All loop keys must be busy simultaneously in order for this count to increment.

```
200   TFC004

00

02

 00008          0000002
 00025          0000004
0000015         0000005
 00000
```

If you understand everything up to this point continue on to the practice exercise.

*** PRACTICE EXERCISE ***

Use the report below to answer the questions that follow.

```
200   TFC004

00

02

 00008          0000002
 00025          0000005
0000015         0000007
 00000
```

1. What is the sum of the total time spent servicing internal/external requests? __________

2. How many times were all attendant loops busy? __________

3. What is the total CCS time that the console was not in 'Position Busy' or 'Night Service'? __________

*** ANSWER ***

1. What is the total time spent servicing internal/external requests? (7) SEVEN

2. How many times were all attendant loops busy? (0) ZERO

3. What is the total CCS time that the console was not in 'Position Busy' or 'Night Service'? (15) FIFTEEN

If you had any problems with this exercise it is recommended that you review before continuing.

As mentioned earlier the TFC003 and TFC004 are very closely related in that both are concerned with the attendant console measurements. As you review the data and relationships of these two reports the particular report being reviewed will be noted so that you will not become confused.

Queue and console measurements can be broken down into three general categories -- average attendants in non-DID systems, very efficient attendants in non-DID systems, and average attendants in DID systems. The distinctions are made because many times, operators in a DID system are answering questions or providing information to callers, or obtaining information from the caller so the call can be extended. Any type of attendant may take messages or provide information; however, these types of calls seem to be more prevalent in DID systems.

Take a look at the chart below. After you have reviewed the chart continue with the module. The specific parts of the chart and how the numbers were determined will be reviewed.

Satisfactory Average Busy Hour Data for Attendant Consoles in DID and non-DID Systems

		Very Efficient Attendant in non-DID Systems	Avg. Attendant in non-DID Systems	Avg. Attendant in DID systems
TFC003	Avg. Speed of Answer	8 sec.	10-12 sec.	12-15 sec.
TFC003	Att. Response Time	1-2 sec.	2-3 sec.	3-5 sec.
TFC003	Calls Delayed	25-35%	25-35%	25-35%
TFC003	Avg. Wait Time of Calls in Queue and Abandoned Calls	8-10 sec.	10-12 sec.	12-15 sec.
TFC003	Abandoned Calls	1-2%	1-2%	3-5%
TFC004	Total No. of Calls (per attdt.)	175-200	150-175	125-150
TFC004	% Time Manned (for all attdts. or per attdt.)	95-100%	>85%	>85%
TFC004	Work Time per Call (for all attdts. or per attdt.)	7-8 sec.	10-12 sec.	12-16 sec.

If you understand everything up to this point continue on to the practice exercise.

*** PRACTICE EXERCISE ***

Use the chart on the previous page to answer the following questions.

1. A very efficient attendant in a NON-DID system should have a response time of ______________.

2. The average speed of answer for an average attendant in NON-DID systems should be ______________.

3. What should be the percentage of abandoned calls for an average attendant in a DID system? ______________

4. The percentage of calls delayed for an average attendant in NON-DID systems should be ______________.

5. What would be the percentage of time manned for very efficient attendant(s)? ______________

*** ANSWER ***

1. A very efficient attendant in a NON-DID system should have a response time of <u>1-2 SECONDS</u> .

2. The average speed of answer for an average attendant in NON-DID systems should be <u>1Ø-12 SECONDS</u> .

3. What should be the percentage of abandoned calls for an average attendant in a DID system <u>3-5%</u> .

4. The percentage of calls delayed for an average attendant in NON-DID systems should be <u>25-35%</u> .

5. What would be the percentage of time manned for very efficient attendant(s)? <u>95-1ØØ%</u>

If you had any problems with this exercise we recommend you review before continuing.

First, let's review the average speed of answer listed on the previous chart. The average speed of answer takes into account such things as the wait time of calls in queue and the attendant response time. It is also based on the total number of calls that are answered and the percent of calls that go into queue.

Turn to Page 4-6 Section 4.32 in the NTP and review the forumla used for calculating the average speed of answer.

***RETURN HERE ONCE YOU HAVE REVIEWED THIS SECTION*.**

If you understand everything up to this point continue on to the practice exercise.

*** PRACTICE EXERCISE ***

Use page 4-6 Section 4.32 in the NTP and the report below to answer the following question.

999 TFCØØ3

ØØ

ØØ243	ØØØ22
ØØ347	ØØ263
ØØØ9Ø	ØØ338

1. What is the average speed of answer? ____________

*** ANSWER ***

1. What is the average speed of answer? 24.3 SECONDS

If you had any problems with this exercise it is recommended that you review before continuing.

Now let's take a look at the formulas used to aid in determining the console measurements:

1. Percentage of calls Delayed:

$$\frac{\text{Peg Count of calls Delayed}}{\text{Sum of Internal and External Calls for all consoles}} \times 100$$

2. Percentage of Abandoned Calls:

$$\frac{\text{Peg Count of Abandoned Calls}}{\text{Sum of Internal \& External calls for all consoles}} \times 100$$

3. Total Number of Calls:

   Sum of Internal & External Calls for all consoles; or sum of internal & external calls per console.

4. Percent of Time Manned:

$$\frac{\text{Total Time Manned (for all consoles or per console)}}{\begin{array}{c}\text{36 CCS x No. of Consoles In Service}\\ \text{(or 36 CCS per console)}\end{array}} \times 100$$

   For this measurement, only the number of consoles which recorded measurements was considered as consoles in service, regardless of how many are equipped.

5. Work Time per Call in seconds:

$$\frac{\text{Total Work Time (for all consoles or per console)}}{\begin{array}{c}\text{Sum of Internal \& External Calls for all consoles}\\ \text{or per console}\end{array}} \times 100$$

This may also be calculated for internal & external calls separately by dividing the processing (work) time for each by the total number of calls of each type.

Symptoms of poor attendant performance show up most commonly in the queue measurements; that is, the average speed of answer, percentages of delayed and abandoned calls, and the wait times of these calls. If any or all of these areas exceeds the levels specified in the above chart, the cause can usually be found in the console measurements. In TFCØØ4, compare the total number of calls, the percentage of time manned, and the work time per call to the values given above. If any one of these values exceeds the levels specified above, corrective action may be required. The majority of console-related problems can be traced back to one or or more of these sources.

A majority of studies have shown that the slowest speed of answer occurs when the volume of calls on the console is less than peak. When analyzing systems with a high speed of answer, you should look at the clock hours for that data to see whether the high data occurred in the off-peak hours (8-9, 12-1, or 4-5), or in the busy hours (early-to-mid-morning and mid-to-late afternoon). Compare the total number of calls received in the busy hours to that in the off-peak hours. If the high data occurred only in the off-peak hours and the difference in the number of calls is large, the high speed of answer may be due to a less-experienced relief operator, in which case it may be less significant. In addition, it would seem characteristic of human nature that operators will pace themselves according to workload. This should be kept in mind for any system where the objective speed of answer is exceeded only when traffic is light. If the high speed of answer occured in the busy hours, and the total number of calls received in the two time periods is similar, look for a cause of the problem in the rest of the data, that will be described later in this module.

Take a look at the example below calculating calls delayed:

```
999   TFCØØ3
ØØ
  ØØ243          ØØØ22
  ØØ347          ØØ263
  ØØØ9Ø          ØØ338

999   TFCØØ4
ØØ
Ø1
  ØØØ76         ØØØØØ11
  ØØ167         ØØØØØ17
ØØØØØ36         ØØØØØ29
  ØØØØØ
Ø2
  ØØØØ3         ØØØØØØ1
  ØØØØ4         ØØØØØØ1
ØØØØØØ1         ØØØØØØ1
  ØØØØØ
Ø3
  ØØØ5Ø         ØØØØØØ7
  ØØ123         ØØØØØ16
ØØØØØ34         ØØØØØ23
  ØØØØØ
```

$$\frac{347}{76 + 167 + 3 + 4 + 5\text{Ø} + 123} \times 1\text{ØØ} = 82\ \%$$

This example indicates an extremely high amount of delayed calls.

*** PRACTICE EXERCISE ***

Use the reports below to find out the percent of delayed calls.

1. Percent of delayed calls is ____________.

```
999  TFCØØ3
ØØ

  ØØ125          ØØØ22
  ØØØ35          ØØ112
  ØØØ1Ø          ØØ15Ø

999  TFCØØ4
ØØ
Ø1
  ØØØ93         ØØØØØ11
  ØØ213         ØØØØØ17
ØØØØØ36         ØØØØØ29
  ØØØØØ
Ø2
  ØØØ67         ØØØØØØ1
  ØØØ89         ØØØØØØ1
ØØØØØ36         ØØØØØØ1
  ØØØØØ
Ø3
  ØØØ45         ØØØØØØ7
  ØØØ86         ØØØØØ16
ØØØØØ36         ØØØØØ23
  ØØØØØ
```

*** ANSWER ***

1. Percent of delayed calls is 5.9%

$$\frac{35}{93+213+67+89+45+86} \times 100 = \%$$

Occasionally, there will be systems which have high wait times for calls in queue, and possibly high percentages of delayed and abandoned calls. It may be that the call waiting buzzer, which alerts the attendant that a call has been waiting in queue for X number of seconds, is set too high. This buzzer is also a variable -length timer, which is set through the customer data block. The customer should check and adjust the timing, if necessary. As calls should not have to wait more than 12 seconds to be answered, this timer should have a maximum of 12 seconds.

If you understand everything up to this point continue on to the practice exercise.

*** PRACTICE EXERCISE ***

1. List one way that you might be able to decrease the percentage of calls delayed.

*** ANSWER ***

1. Check and adjust the timing in the customer data block to have a maximum value of 12 seconds.

If you had any problems with this exercise it is recommended that you review before continuing.

There may be systems which show normal queue and console measurements, but whose incoming callers are complaining about poor service. This can occur in systems experiencing heavy matching losses. When an incoming call is blocked between the trunk and the attendant, the caller hears ringback tone and thinks he is ringing the attendant. However, the attendant will not know that the call is there until the system can establish a speech path between the two. When this occurs, the system recognizes the call and may then present it to the console, or put it in the attendant queue. However, the caller may have already been listening to ringback tone for 15 or 20 seconds, and may abandon before the attendant can answer. This synopsis of events can cause a high percentage of abandoned calls, but a fairly low wait time in queue. Usually, reducing blockage in the system by rebalancing the traffic carried across the loops will resolve this situation.

You may also see systems in which there are a high percentage of abandoned calls, but short wait times for these calls. This can occur in any system, but especially in universities, hospitals, or any system where the attendants have been instructed to select calls out of queue using the ICI keys. If the attendant has been told to select external calls over internal calls, the percentage of abandoned calls could be mostly made up of internal calls, and, therefore, may be acceptable to the customer.

Another scenario which can result in a high percentage of abandonded calls with short wait times may occur frequently in universities or any DID system. When a caller dials a DID number which rings no-answer in a system in which these calls "hunt" to the operator, the caller may realize that the called party is not there when the call rolls over. If he does not desire to speak with anyone else, he may hang up. If the call rolled over into the attendant queue, this will result in abandoned call with a very short wait time, typically 1 - 5 seconds. A large number of these calls will result in a high percentage of abandoned calls, which may be acceptable to the customer under these circumstances.

If you understand everything up to this point then continue to the practice exercise.

*** PRACTICE EXERCISE ***

1. Briefly explain two reasons why the percentage of abandoned calls could be higher than recommended.

2. If the high percentage of abandoned calls is external you really might not need to worry.

   TRUE OR FALSE

3. List one way that you might be able to decrease the percentage of abandonded calls?

*** ANSWER ***

1. Briefly explain two reasons why the percentage of abandoned calls could be higher than recommended.

   a. Incoming calls are blocked between the trunk and the attendant, the caller hears ring back tone and thinks he is ringing the attendant.

   b. Attendant is selecting external calls over internal calls, the percentage of abandoned calls is most likely made up of internal calls, which may be acceptable to the customer.

2. If the high percentage of abandoned calls is external you really might not need to worry.

   TRUE OR **FALSE**

   This is definitely FALSE because these are your main users. In a hospital, the reverse is generally true, as internal calls may be patients and therefore would have a higher priority than external calls.

3. List one way that you might be able to decrease the percentage of abandoned calls?

   1. Eliminate any network blockage by rebalancing unevenly loaded loops.

Now that you know some of the causes of a high percentage of abandoned calls, take a look at the example below:

```
999   TFC003
00
  00243         00022
  00347         00263
  00090         00338
```

$$\frac{90}{90 + 76 + 167 + 3 + 4 + 50 + 123} \times 100$$

= 17.5% of abandoned calls

```
999   TFC004
00
01
  00076        0000011
  00167        0000017
0000036        0000029
  00000
02
  00003        0000001
  00004        0000001
0000001        0000001
  00000
03
  00050        0000007
  00123        0000016
0000034        0000023
  00000
```

As you can see this is an extremely high percentage. We will discuss later some of the steps you can take to try and decrease this number.

If you understand everything up to this point continue on to the practice exercise.

*** PRACTICE EXERCISE ***

Use the report below to find the percent of abandoned calls.

1. Percent of abandoned calls is _______________.

```
999   TFCØØ3
ØØ
 ØØ125          ØØØ22
 ØØØ35          ØØ112
 ØØØ1Ø          ØØ15Ø

999   TFCØØ4
ØØ
Ø1
  ØØØ93         ØØØØØ11
  ØØ213         ØØØØØ17
ØØØØØ36         ØØØØØ29
  ØØØØØ
Ø2
  ØØØ67         ØØØØØØ1
  ØØØ89         ØØØØØØ1
ØØØØØ36         ØØØØØØ1
  ØØØØØ
Ø3
  ØØØ45         ØØØØØØ7
  ØØØ86         ØØØØØ16
ØØØØØ36         ØØØØØ23
  ØØØØØ
```

*** ANSWER ***

1. Percent of abandoned calls is 1.6% .

$$\frac{1\text{Ø}}{93+213+67+89+45+86+1\text{Ø}} \text{ X } 1\text{ØØ} = 1.6\%$$

If you had any problems with this exercise it is recommended that you review before continuing.

The next part of the module will demonstrate how to look for additional causes of problems revealed in the TFC003 data by examining the TFC004 data.

If the total number of calls is too high for one attendant, all or most queue measurements could possibly be excessive. This may be seen in any system where the average number of calls handled by each console (sum of internal and external for all consoles divided by number of consoles in service) is excessive. The customer should either attempt to reduce the number of calls coming to the attendants (if a large percent are internal, he should perhaps publish and keep an updated company directory); increase the amount of time the consoles are staffed (if there is more than one and they are not manned 100%); or consider adding an additional console (if none of the above is feasible). As a more costly possibility, the customer could consider providing DID service directly to specific departments or individuals.

*** PRACTICE EXERCISE ***

List at least 3 things that the customer could do to reduce excessive queue measurements due to a high number of calls coming in to the attendants.

*** ANSWER ***

List at least 3 things that the customer could do to reduce excessive queue measurements due to a high number of calls coming in to the attendants.

1. Attempt to reduce the amount of calls coming to the console.
2. Increase the amount of time the consoles are staffed.
3. Add another console.
4. Install DID service.

If you had any problems with this exercise it is recommended that you review before continuing.

Now you know that the number of calls per attendant affects the queue measurements. Take a look at the example formula for calculating average calls per console.

```
999  TFCØØ3
ØØ
  ØØ243          ØØØ22
  ØØ347          ØØ263
  ØØØ9Ø          ØØ338

999  TFCØØ4
ØØ
Ø1
  ØØØ76         ØØØØØ11    ATTENDANT  # 1    76+167   =  243 CALLS
  ØØ167         ØØØØØ17
ØØØØØ36         ØØØØØ29
  ØØØØØ
Ø2
  ØØØØ3         ØØØØØØ1
  ØØØØ4         ØØØØØØ1    ATTENDANT  # 2    3+4      =    7 CALLS
ØØØØØØ1         ØØØØØØ1
  ØØØØØ
Ø3
  ØØØ5Ø         ØØØØØØ7    ATTENDANT  # 3   5Ø+123    =  173 CALLS
  ØØ123         ØØØØØ16
ØØØØØ34         ØØØØØ23             TOTAL CALLS =  423
  ØØØØØ
```

$$\frac{423 \quad \text{TOTAL CALLS}}{3 \quad \text{CONSOLES}} = 141 \text{ Average Calls per Console}$$

If you understand everything up to this point continue to the practice exercise.

*** PRACTICE EXERCISE ***

1. Use the report below to find the average amount of calls per console. What is the average amount of calls per console?

   ____

```
000  TFC004

00
01

  00003        0000000
  00090        0000007
0000020        0000007
  00000

02

  00010        0000002
  00151        0000011
0000035        0000013
  00000

03

  00007        0000002
  00059        0000006
0000017        0000008
  00000
```

2. If you have a low number of calls per console you might want to reduce the amount of consoles in service.

   TRUE OR FALSE

*** ANSWER ***

1. What is the average amount of calls per console? 1Ø6.6

#1	3+9Ø	=	93
#2	1Ø+151	=	161
#3	7+59	=	66

TOTAL CALLS = 32Ø

$$\frac{320 \text{ TOTAL CALLS}}{3 \text{ Consoles}} = 106.6$$

2. If you have a low number of calls per console you might want to reduce the amount of consoles in-service.

TRUE OR FALSE

If you had any problems with this exercise please review before continuing.

The next topic to be reviewed will be the percent of time manned for all attendants or per attendant.

If the percentage of time manned is below the minimum of 85% for any system, you may see a high speed of answer, high percentages of delayed and abandoned calls, high wait times of calls in queue and abandoned calls, or all of these. When one or more consoles are staffed less than 85% of the hour (51 minutes), calls tend to stack up in queue, creating high queue wait times and large numbers of calls delayed. This in turn causes the average speed of answer to skyrocket. Increasing the percentage of time manned in the busy hours to at least 85% will decrease the number of calls that have to go into queue, as well as the time spent in queue, and, therefore, the average speed of answer.

There will be some cases where increasing the amount of time manned (if it is less than 85%) does not apply and is not necessary. This occurs in a system with two or more consoles, where one or more are open 85% - 1ØØ% of the time and the rest are open a very small percentage of time. In these cases, the percentage of time manned for all consoles will be deceptively low. If the primary consoles are open at least 85 % of the time and appear to be providing satisfactory services (low queue measurements, work time per call, etc.) it is not necessary that the time manned be increased. Of course, if the primary consoles are open less than 85% of the time and are not providing satisfactory service, then by all means this action should be taken. Ninety percent of all systems (with two or more consoles) that are experiencing problems show an insufficient amount of time manned, and the recommendation to increase the amount of time the consoles are manned is made more than any other recommendation. For some customers, this may mean providing relief operators to cover lunches, breaks, etc., instead of busying out the console, but the grade of service is guaranteed to improve.

Look at the example using the formula to determine the percent of time manned:

```
999  TFCØØ4
ØØ
Ø1                          1#  36  TOTAL =    71
  ØØØ76       ØØØØØ11                        ----   X 1ØØ = 65.7 % Manned
  ØØ167       ØØØØØ17                        36X3
ØØØØØ36       ØØØØØ29
  ØØØØØ                     2#   1
Ø2
  ØØØØ3       ØØØØØØ1
  ØØØØ4       ØØØØØØ1       3#  34
ØØØØØØ1       ØØØØØØ1
  ØØØØØ
Ø3
  ØØØ5Ø       ØØØØØØ7
  ØØ123       ØØØØØ16
ØØØØØ34       ØØØØØ23
  ØØØØØ
```

As you can see this is well below the 85% recommended. However, since one of the consoles was open for only 1 CCS, this may be an example of the situation described above, in which the two primary consoles could be providing excellent service. In that case, it would not be necessary to increase the amount of time that console number 2 is staffed.

*** PRACTICE EXERCISE ***

Use the report below to calculate the percent of time the consoles are manned. Consoles are manned ________ %.

```
000   TFC004

00
01

  00003        0000000
  00090        0000007
0000020        0000007
  00000

02

  00010        0000002
  00151        0000011
0000035        0000013
  00000

03

  00007        0000002
  00059        0000006
0000017        0000008
  00000
```

*** ANSWER ***

Consoles are manned 66.6 %

#1 20   #2 35   #3 17 $\frac{72}{26 \times 3}$

Notice the low percentage.
If the queue measurements for these consoles were high, to resolve this problem you might want to try the following:

- o Increase the time manned for all consoles during busy hours.
- o Provide relief operators to cover lunches, breaks, etc. instead of busying out the console.

The next section of data you will review is the work time per call for all attendants. If the work time per call is excessive the result is similar to a low percentage of time manned in that there is not an available console to which the Meridian SL-1 can direct a call.

This may be seen in any system, but particularly those with DID service or an Attendant Message Center. To reduce the queue measurements, the customer may want to consider adding the Attendant overflow feature (i.e. establish someone at an SL-1 set to serve as a message center in addition to the attendants); or motivate the attendants to spend less time on each call, if possible. To shed more light on the latter the customer may determine which type of calls (internal or external) are requiring more processing time by calculating the work time per call on both internal and external calls separately (as explained later). Often simply knowing the source of the time-consuming calls or the identity of the callers will determine whether unproductive conversation can be eliminated. If it is not posible to do either of these, the customer's only alternative is to open an additional console to cover peak traffic.

*** PRACTICE EXERCISE ***

1. List three possible solutions that would help lower the work time per call.

*** ANSWER ***

1. List three possible solutions that would help lower the work time per call.

    1. Add the Attendant Overflow feature, i.e., establish someone at an SL-1 set to serve as a message center in addition to the attendant.

    2. Motivate the attendant to spend less time on each call, if possible.

    3. Open an additional console during the busy hour.

Look at the example formula for calculating % work time per call.

```
ØØØ   TFCØØ4

ØØ
Ø1

  ØØØØ3         ØØØØØØØ
  ØØØ9Ø         ØØØØØØ7
ØØØØØ2Ø         ØØØØØØ7
  ØØØØØ

Ø2

  ØØØ1Ø         ØØØØØØ2
  ØØ151         ØØØØØ11
ØØØØØ35         ØØØØØ13
  ØØØØØ

Ø3

  ØØØØ7         ØØØØØØ2
  ØØØ59         ØØØØØØ6
ØØØØØ17         ØØØØØØ8
  ØØØØØ
```

$$\frac{\overset{\#1}{7} + \overset{\#2}{13} + \overset{\#3}{8}}{3+9Ø+1Ø+151+7+59} \times 1ØØ = 8.75 \text{ seconds}$$

As you can see this is a pretty good time per call. This may also be calculated on an individual basis, for comparison. Generally, the lower the work time per call, the more efficient the attendants will be.

*** PRACTICE EXERCISE ***

Use the report below to calculate the work time per call in seconds.

1. Work time per call is __________ seconds.

```
999  TFCØØ4
ØØ
Ø1
  ØØØ76        ØØØØØ11
  ØØ167        ØØØØØ17
ØØØØØ36        ØØØØØ29
  ØØØØØ
Ø2
  ØØØØ3        ØØØØØØ1
  ØØØØ4        ØØØØØØ1
ØØØØØØ1        ØØØØØØ1
  ØØØØØ
Ø3
  ØØØ5Ø        ØØØØØØ7
  ØØ123        ØØØØØ16
ØØØØØ34        ØØØØØ23
  ØØØØØ
```

*** ANSWER ***

1. Work time per call is 12.5 seconds.

$$\frac{29 + 1 + 23}{76+167+3+4+50+123} \times 100 = 12.5 \text{ seconds}$$

If you had any problems with this exercise it is recommended that you review before continuing.

To calculate the work time per call for internal calls & external calls separately, use the same formula, substituting the internal or external work time for total work time, and the internal or external calls for total calls.

Example:

a.) Internal work time per call:

```
#1    #2    #3
Ø  + 2  + 2         4
------------  =  --   X 1ØØ = 2Ø seconds
3  + 1Ø + 7        2Ø
```

b.) External work time per call:

```
 #1    #2    #3
  7 + 11 +  6         24
-------------    =   ---   X 1ØØ   = 8.Ø seconds
9Ø + 151 + 59        3ØØ
```

NOTE: The difference may be due to efficiency or to message-taking, etc.

If there is no blockage in the system, and the queue measurements show high percentages of delayed and abandoned calls with no other symptoms of trouble, the customer should investigate the attendant's method of operation and non call-processing activities for efficiency. Often the cause of a problem does not appear in the data, and the customer may simply need to consider a replacement.

SUMMARY OF TFCØØ3 & TFCØØ4 REPORTS :

TFCØØ3

- Indicates treatment of calls as they enter the system via the attendant queue.
- Indicates problems in the handling of calls, through five primary measurements: Speed of Answer, Calls Delayed, and Abandoned call, and Wait Times of Delayed and Abandoned calls.

TFCØØ4

- Provides more information related to the operation of the attendant console
- Indicates source of problems in the handling of calls, through three primary measurements: total calls, work time per call, and time manned.

This concludes the review of the TFCØØ3-TFCØØ4 reports. If any information that you have reviewed up to this point is unclear please take the time to review before continuing. The next review will cover the TFCØØ5 Features Report. This is a very short report which basically reports data concerning the number of times a specific feature is being used.

The fifth and final report you will review is the TFCØØ5-FEATURES . This report details the features used by a customer. Feature measurements differ widely from one customer to another. The difference in customer calling habits and system configuration prohibits comparisons of feature data.

EXAMPLE TFCØØ5 FEATURE REPORT

200 TFCØØ5

ØØ

ØØ	ØØØ12
Ø1	ØØØØ2
Ø2	ØØØØ3
Ø3	ØØØ15
Ø4	ØØØØ2
Ø5	ØØØØØ

etc.

This column is called FEATURE NUMBER.
These are the features that are activated by keys on either an SL-1 set or an attendant console. Turn to the NTP in the index page 4-1Ø Table 4-F to see the list of features.

NOTE: Features activated by code dialing on 5ØØ or 25ØØ sets are not included.

RETURN HERE WHEN YOU HAVE FINISHED REVIEWING THE FEATURES.

2ØØ TFCØØ5

ØØ

ØØ	ØØØ12
Ø1	ØØØØ2
Ø2	ØØØØ3
Ø3	ØØØ15
Ø4	ØØØØ2
Ø5	ØØØØØ

etc.

This column is called <u>PEG COUNT (PC).</u>
A peg count is given for each feature for one specified customer.

200   TFC005

00

00	**00012**
01	**00002**
02	**00003**
03	**00015**
04	**00002**
05	**00000**
etc.	

*** PRACTICE EXERCISE ***

Use the report below to answer the questions that follow.

200   TFC005

00

00	00012
01	00002
02	00003
03	00015
04	00002
05	00000
etc.	

1. What are the feature numbers listed on this report? ________ ________________________

2. What is the peg count for the call transfer feature? ________

*** ANSWER ***

1. What are the feature numbers listed on this report? ________
   ØØ, Ø1, Ø2, Ø3, Ø4, Ø5

2. What is the peg count for the call transfer feature?
   (15) FIFTEEN

If you had any problems with this exercise it is recommended that you review before continuing.

Currently there are 3Ø features as indicated on Page 4-1Ø Table 4-F in the NTP for this report. These features will be enhanced as the software is enhanced.

Two of the most important measurements in this report are:

- o Peg Count for Ring Again
- o Peg Count for Call Selection

Peg count for ring again is important because:

- o The ring again peg count in this section pegs when this feature is activated against both stations (on a station-to-station call) and trunks (on a station-to-trunk call).

- o Use of the ring again feature on outgoing trunk calls will improve the utilization of these trunks. Although a breakdown of ring-again usage is not provided by this measurement (this is provided only in TFCØØ6, generics XØ5 and XØ9), this peg will provide at least an indication of any attempts to use this feature. TFCØØ6 measurements represent only ring again against trunks.

The peg count for call selection is important because:

- o The call selection peg count indicates the number of times that attendants selected a call out of queue using the incoming call indicator on the console. This may be used to provide additional insight into the attendant's method of operation. Although selecting a call out of queue (over the call that is ringing on the console) will not distort the measurements for attendant response time or wait time of calls in queue in TFCØØ3, it could account for a high number of abandoned calls or high wait times of abandoned calls in that section. The customer should be aware of these consequences if call selection is heavily used as part of his method of operation.

Note: The peg count for attendant recall in this section does not represent the automatic recall of an attendant - extended call to a busy or no-answer station. Those calls are included in the peg count of internally - originated calls in TFCØØ4, and do not peg separately anywhere in the traffic printout. The attendant recall feature associated with a key on an SL-1 set allows the user to include the attendant on an active call on his set by activating this key.

If you understand everything up to this point continue on to the practice exercise.

*** PRACTICE EXERCISE ***

1. Currently how many features are there for this report?

   ____

2. Name the two most important features for this report.

   ____________________ ____________________

3. Why is the peg count for ring again important?

   For additional information refer to the NTP in the appendix pages 4-9 - 4-11.

*** ANSWER ***

1. Presently how many features are there for this report?
   (3Ø) THIRTY

2. Name the two most important features for this report.

   Peg Count for Ring Again   Peg Count for Call Selections

3. Why is the peg count for ring again important?

   Use of the ring again feature on outgoing trunk calls will improve the utilization of these trunks .

If you had any problems with this exercise we recommend that you review before continuing.

SUMMARY OF TFCØØ5 FEATURES REPORT :

- o Details the features used by a customer.
- o Features are activated by the keys on an SL-1 set or the attendant console.
- o Currently there are 3Ø features.
- o Use of the ring again feature on outgoing trunk calls will improve the utilization of these trunks.
- o The call selection feature indicates if calls are being selected from the attendant queue.
- o The number of calls selected from queue can provide additional insight into the attendant's method of operation.

This concludes the review of TFCØØ5. It is recommended that you review any of the information that is unclear before continuing.

MODULE FIVE SELF CHECK

This self check has two parts:

- o Part one requires you to analyze customer traffic reports.
- o Part two requires you to select recommended action(s) you would take in resolving traffic problems found in part 1.

PART 1.

Analyze the traffic reports below as outlined in this module.

Write the results of your analysis on the pages that follow.

```
ØØ1   TFCØØ1
ØØ

  ØØØØØ     ØØØØ532     ØØ31Ø
  ØØØØØ     ØØØØ816     ØØ485
  ØØØØØ     ØØØØ9Ø7     Ø1Ø19
  ØØØØØ     ØØØØØØ5     ØØØØ6
  ØØØ14       ØØØØØ     ØØØØØ

ØØ1   TFCØØ2

ØØ
ØØ    CO

  ØØØ33        ØØØ33

ØØØØ353        ØØ2Ø3
ØØØØ221        ØØ137
  ØØØØØ        ØØØØØ
  ØØØ11

Ø1    WATT

  ØØØØ4        ØØØØ4

ØØØØØØØ        ØØØØØ
ØØØØØ32        ØØØ18
  ØØØØØ        ØØØØ4
  ØØØØØ
```

```
Ø2    FEX

  ØØØØ3            ØØØØ3

 ØØØØØØ2            ØØØØ1
 ØØØØØØ1            ØØØØ1
   ØØØØØ            ØØØØØ
   ØØØØØ


Ø4    FEX

  ØØØ11            ØØØ11

ØØØØ165            ØØØ67
ØØØØ239            ØØØ79
  ØØØ17            ØØØ87
  ØØØØ2

ØØ1   TFCØØ3

ØØ
  ØØØ5Ø            ØØØ2Ø
  ØØØ89            ØØØ97
  ØØØØ8            ØØ127

ØØ1   TFCØØ4

ØØ
Ø1

  ØØØØ3            ØØØØØØ1
  ØØ134            ØØØØØ12
ØØØØØ31            ØØØØØ13
  ØØØØØ

Ø2

  ØØØØ8            ØØØØØØ4
  ØØ125            ØØØØØ12
ØØØØØ33            ØØØØØ15
  ØØØØØ

Ø3

  ØØØØ1            ØØØØØØ1
  ØØØ16            ØØØØØØ2
ØØØØØØ5            ØØØØØØ3
  ØØØØØ
```

ØØ1 TFCØØ5

ØØ	
ØØ	ØØ2Ø2
Ø1	ØØØØØ
Ø2	ØØ16Ø
Ø3	ØØØØØ
Ø4	ØØØØ2
Ø5	ØØ1Ø6
Ø6	ØØØ19
Ø7	ØØØ37
Ø8	ØØØØØ
Ø9	ØØØØØ
1Ø	ØØØØ2
11	ØØØ24
12	ØØØØ3
13	ØØØØØ
14	ØØØ99
15	ØØØØ7
16	ØØØ16
17	ØØØ24
18	ØØØØØ
19	ØØØØØ
2Ø	ØØØØØ
21	ØØØØØ
22	ØØØØØ
23	ØØØØØ
24	ØØØØØ
25	ØØØØØ
26	ØØØØØ
27	ØØØØØ
28	ØØØØØ
29	ØØØØØ

Write your analysis of the reports in the appropriate space provided.

YOUR TFCØØ1 ANALYSIS RESULTS :

YOUR TFCØØ2 ANALYSIS RESULTS :

YOUR TFCØØ3 ANALYSIS RESULTS :

YOUR TFCØØ4 ANALYSIS RESULTS :

YOUR TFCØØ5 ANALYSIS RESULTS:

Turn the page for the answers.

PART 1.

TFCØØ1 ANALYSIS RESULTS :

1. Intra-office ratio:

$$\frac{2 \times 907}{532 + 816 + (2 \times 907)} \times 100 = 57\%$$

2. Incoming calls:

$$\frac{532}{310} = \frac{1.71}{0.6} = 2.8 \text{ minutes holding time}$$

3. Outgoing calls:

$$\frac{816}{485} = \frac{1.68}{0.6} = 2.8 \text{ minutes holding time}$$

4. Intracustomer calls:

$$\frac{907}{1019} = \frac{0.890}{0.6} = 1.5 \text{ minutes holding time}$$

5. Tandem calls:

$$\frac{5}{6} = \frac{0.83}{0.6} = 1.4 \text{ minutes holding time}$$

6. Percent of total traffic which is incoming:

$$\frac{532}{2260} = 24\%$$

Outgoing;

$$\frac{816}{2260} = 36\%$$

TFCØØ1 CONTINUED:

Intracustomer;

```
  9Ø7
 ---- = 4Ø%
 226Ø
```

Tandem;

```
   5
 ----  = .2%
 226Ø
```

TFCØØ2 ANALYSIS RESULTS :

GROUP ØØ

```
574
--- = 17.39 CCS PER TRUNK
 33
```

```
17
--   X 1ØØ = 47%  PERCENT UTILIZATION
36
```

```
   Ø
-------   X 1ØØ = Ø%  PERCENT OF CALLS SEIZING LAST TRUNK
137 + Ø
```

```
574            1.7
--- = 1.7      --- = 2.8 MINUTES HOLDING TIME
34Ø            Ø.6
```

```
   Ø
-------   X 1ØØ = Ø% BLOCKAGE BASED ON OVERFLOW
137 + Ø
```

```
 11
----   X 1ØØ = 8% TOLL CALLS
137
```

TFCØØ2 CONTINUED:

GROUP Ø1

```
32
-- = 8 CCS PER TRUNK
4

 8
--   X 1ØØ = 22 % UTILIZATION
36

 4
-- X 1ØØ = 22.2 % PERCENT OF CALLS SEIZING LAST TRUNK
18

32            1.7
-- = 1.7      ---    = 2.9 MINUTES HOLDING TIME
18            Ø.6

  Ø
------   X 1ØØ = Ø% BLOCKAGE BASED ON OVERFLOW
18 + Ø
```

Note: Toll peg count not applicable.

GROUP Ø2

```
3
- = 1 CCS PER TRUNK
3

 1
--   X 1ØØ = 3 % PERCENT UTILIZATION
36

  Ø
----- X 1ØØ = Ø % PERCENT OF CALLS SEIZING LAST TRUNK
1 + Ø

3           1.5
- = 1.5     ---    = 2.5 MINUTES HOLDING TIME
2           Ø.6

  Ø
-----   X 1ØØ = Ø% BLOCKAGE BASED ON OVERFLOW
1 + Ø

 Ø
---   X 1ØØ = Ø% TOLL CALLS
 1
```

GROUP 04

$$\frac{404}{11} = 36.7 \text{ CCS PER TRUNK}$$

$$\frac{36.7}{36} \times 100 = 101\ \% \text{ PERCENT UTILIZATION}$$

$$\frac{87}{79+17+67} \times 100 = 58.78\% \text{ PERCENT OF CALLS SEIZING LAST TRUNK}$$

$$\frac{404}{146} = 2.7 \qquad \frac{2.7}{0.6} = 4.6 \text{ MINUTES HOLDING TIME}$$

$$\frac{17}{79 + 17} \times 100 = 17.7\% \text{ BLOCKAGE BASED ON OVERFLOW}$$

$$\frac{2}{79} \times 100 = 2.5\% \text{ TOLL CALLS}$$

TFC003 ANALYSIS RESULTS :

- Average speed of answer = 5.0 Seconds
- Average attendant response time was 2.0 Seconds
- Wait time of calls in queue = 9.7 Seconds
- Wait time of abandoned calls = 12.7 Seconds

PART 1 CONTINUED

TFC004 ANALYSIS RESULTS :

TOTAL # OF CALLS HANDLED FOR THIS CUSTOMER:

$$3 + 134 + 8 + 125 + 1 + 16 = \frac{287}{3} = 96 \text{ CALLS PER CONSOLE}$$

PERCENTAGE OF DELAYED CALLS

$$\frac{89}{3 + 134 + 8 + 125 + 1 + 16} \times 100 = 31\ \%$$

PERCENTAGE OF ABANDONED CALLS

$$\frac{8}{295} \times 100 = 2.7\ \%$$

AVERAGE WORK TIME PER CALL FOR ALL CONSOLES:

$$\frac{13 + 15 + 3}{3 + 134 + 8 + 125 + 1 + 16} \times 100 = 10.8 \text{ seconds}$$

AVERAGE TIME MANNED FOR ALL CONSOLES:

$$\frac{31 + 33 + 5}{36 \times 3} \times 100 = 64\ \%$$

CONSOLE 01

TOTAL # OF CALLS: 3 + 134 = 137

PERCENTAGE OF TIME MANNED: $\frac{31}{36} \times 100 = 86\ \%$

WORK TIME PER CALL:

INTERNAL $\frac{1}{3} \times 100 = 33.3$ SECONDS

EXTERNAL $\frac{12}{134} \times 100 = 8.9$ SECONDS

ALL CALLS $\frac{13}{137} \times 100 = 9.4$ SECONDS

CONSOLE 02

TOTAL # OF CALLS: 8 + 125 = 133

PERCENTAGE OF TIME MANNED: $\frac{33}{36} \times 100 = 91.6$ %

WORK TIME PER CALL:

INTERNAL $\frac{4}{8} \times 100 = 50$ SECONDS

EXTERNAL $\frac{12}{125} \times 100 = 9.6$ SECONDS

ALL CALLS $\frac{15}{133} \times 100 = 11$ SECONDS

TFCØØ4 CONTINUED:

CONSOLE Ø3

TOTAL # OF CALLS: 1 + 16 = 17

PERCENTAGE OF TIME MANNED: $\frac{5}{36}$ X 1ØØ = 13.8 %

WORK TIME PER CALL:

INTERNAL $\frac{1}{1}$ X 1ØØ = 1ØØ SECONDS

EXTERNAL $\frac{2}{16}$ X 1ØØ = 12.5 SECONDS

ALL CALLS $\frac{3}{17}$ X 1ØØ = 17.6 SECONDS

TFCØØ5 ANALYSIS RESULTS

Ring again peg count = 24

Call selection peg count = 24

PART 2

Use the traffic analysis results from the previous pages to answer the following question(s).

1. Place an (X) by the action(s) you would take to resolve the problems found in TFCØØ1.

RECOMMENDED ACTION

1. _______ Reprimand users for using their telephones too much on station-to-station calls.

2. _______ Rebalance the system to eliminate blockage.

3. _______ No action required.

2. Place an (X) by the action(s) you would take to resolve the problem(s) found in TFCØØ2.

RECOMMENDED ACTION

ROUTE Ø:

1. _____ No action required.

2. _____ Add more trunks.

3. _____ Decrease the number of trunks.

ROUTE 1:

1. _____ No action required.

2. _____ Add more trunks.

3. _____ Decrease the number of trunks.

ROUTE 2:

1. _____ No action required.

2. _____ Add more trunks.

3. _____ Decrease the number of trunks.

ROUTE 4:

1. _____ No action required.

2. _____ Add more trunks.

3. _____ Decrease the number of trunks.

3. Place a check mark by the action(s) you would take to resolve the problem(s) found in TFCØØ3 and TFCØØ4.

RECOMMENDED ACTION

1. _____ No action required.
2. _____ Add the attendant overflow feature.
3. _____ Add more consoles.
4. _____ Increase the amount of time that the consoles are staffed.

4. Place a check mark by the action(s) you would take to resolve the problems found in TFCØØ5.

RECOMMENDED ACTION

1. _____ Remove all speed call lists since no one ever uses them.
2. _____ Commend users for making more efficient use of trunks by using the Ring Again feature.
3. _____ Reprimand users for using Volume Control too much.

PART 2 CONTINUED

*** ANSWER ***

1. Place an (X) by the action(s) you would take to resolve the problems found in TFCØØ1.

RECOMMENDED ACTION

1. _______ Reprimand users for using their telephones too much on station-to-station calls.

2. _______ Rebalance the system to eliminate blockage.

3. ___X___ No action required.

2. Place a check mark by the action(s) you would take to resolve the problem(s) found in TFCØØ2.

RECOMMENDED ACTION

ROUTE Ø:

1. ___X___ No action required.

2. _______ Add more trunks.

3. ___X___ Decrease the number of trunks.

ROUTE 1:

1. ___X___ No action required.

2. _______ Add more trunks.

3. _______ Decrease the number of trunks.

ROUTE 2:

1. ___X___ No action required.

2. _______ Add more trunks.

3. ___X___ Decrease the number of trunks.

ROUTE 4:

1. _______ No action required.

2. ___X___ Add more trunks.

3. _______ Decrease the number of trunks.

3. Place a check mark by the action(s) you would take to resolve the problem(s) found in TFCØØ3 & TFCØØ4.

RECOMMENDED ACTION

1. __X__ No action required.

2. _____ Add the attendant overflow feature.

3. _____ Add more consoles.

4. __X__ Increase the amount of time that the consoles are staffed.

Both one and four are correct depending on your particular requirements.

4. Place a check mark by the action(s) you would take to resolve the problems found in TFCØØ5.

RECOMMENDED ACTION

1. _____ Remove all speed call lists since no one ever uses them.

2. __X__ Commend users for making more efficient use of trunks by using the Ring Again feature.

3. _____ Reprimand users for using Volume Control too much.

This concludes the self check for module five. Continue on to module six if you understand the information presented in this module.

Module 6
Thresholds/Warning Messages

MODULE SIX
THRESHOLDS/WARNING MESSAGES

This module has **two** parts.

PART ONE OVERVIEW :

For many customers it is advantageous to know when certain operational parameters or levels have been exceeded. The thresholding capability of the Meridian SL-1 allows customers to set the desired levels so that the printouts only occur when the desired levels have been reached. In part 1 of this module you'll learn about.

1. Threshold level querying.
2. Threshold level setting.
3. Threshold Violation Outputs (the printed message).

PART ONE OBJECTIVE:

Given three threshold violation outputs and a copy of the NTP Section 450 determine with eighty percent accuracy:

What caused the threshold violation.

PART TWO OVERVIEW:

In this part of the module you are going to learn about the importance of warning messages, and why they appear on printouts.

PART TWO OBJECTIVE:

Given two warning messages you will be required to identify the following with 80 percent accuracy:

What the warning messages indicate.

Thresholds in the Meridian SL-1 are a means of telling the system you want to be notified if a certain event occurs. In most cases the event will be when a certain operational parameter is reached.

For example, you can request that the system print a threshold violation output when:

- o A certain percent of all trunks are busy.

- o Loop traffic exceeds a certain CCS value within a predefined time period.

When a preset threshold level has been exceeded, the Meridian SL-1 will output one or more traffic data blocks associated with the particular threshold. This data may then be examined for further insight into the cause of the problem. These traffic options will be output regardless of whether the option has been specifically scheduled, as long as an "active" schedule is maintained for either system or customer traffic or both. Under these conditions, however, there is no way to suppress the printing of these options when any one system or customer threshold is violated.

Threshold violation outputs are useful in two ways. For the customer who desires to run all traffic options year-round, they serve as flags (when set to some value) over and above the traffic data, which can be clarified by the associated traffic options. For the customer who does not want to see traffic information (unless there is a problem), they can serve as a means to suppress traffic printouts when the system is operating within the limits set by the thresholds. In this case, no options should be scheduled, but threshold values set and an "active" schedule maintained (for example, Jan. 1 - Dec. 31).

Threshold reports and any warning messages will be printed immediately after the time and date stamp and before all other reports on a printout. If you understand everything up to this point continue to the practice exercise.

*** PRACTICE EXERCISE ***

1. What is a threshold?

2. List two ways in which threshold violation outputs are useful.

*** ANSWER ***

1. What is a threshold?

   A means of telling the system you want to be notified if a certain operational parameter is reached.

2. List two ways in which threshold violation outputs are useful.

   1. They serve as flags over and above the traffic data.

   2. They can serve as a means to suppress traffic printouts when the system is operating within the limits set by the thresholds.

If you had any problems with this exercise it is recommended that you review before continuing.

The two categories of thresholds are:

<u>System Threshold Levels</u>

- o TFS1Ø1 DIAL TONE SPEED
- o TFS1Ø2 LOOP TRAFFIC
- o TFS1Ø5 JUNCTOR TRAFFIC

<u>Customer Threshold Levels</u>

- o TFC1Ø1 INCOMING MATCHING LOSS
- o TFC1Ø2 OUTGOING MATCHING LOSS
- o TFC1Ø3 AVERAGE SPEED OF ANSWER
- o TFC1Ø4 PERCENT ALL TRUNKS BUSY
- o TFN1Ø1 OHQ OVERFLOW

*** PRACTICE EXERCISE ***

1. List the <u>numbers</u> of the system level thresholds.

2. List the <u>numbers</u> of the customer level thresholds.

*** ANSWER ***

1. List the numbers of the system level thresholds.

   TFS101, TFS102, TFS105

   NOTE: The letter 'S' indicating a system threshold.

2. List the number of the customer level thresholds.

   TFC101, TFC102, TFC103, TFC104

   NOTE: The letters "C"and "N" are used for customer thresholds.

If you had a problem with this exercise it is recommended that you review before continuing.

The outputs that we will be reviewing are given only when threshold levels are exceeded. Not setting a threshold is equivalent to setting it to zero and will result in an exception report.

Turn to page 6-1 in the NTP and read sections 6.02 through 6.04 on the TFS101 dial tone speed threshold.

*** RETURN HERE WHEN YOU HAVE FINISHED READING ABOUT TFS101. ***

If you understand everything that you have read continue on to the practice exercise.

*** PRACTICE EXERCISE ***

Use the information below to answer the questions that follow. The following report was printed because the threshold was exceeded.

```
200  TFS101
 00019   00014
```

1. What is the threshold setting in this report? _____________.

2. What is the percent dial tone delay? _____________.

*** ANSWER ***

1. What is the threshold in this report? <u>1.4%</u>

2. What is the percent dial tone delay? <u>1.9%</u>

As you can see the dial tone delay exceeded the threshold by .5% causing the report to be printed. If you had any problems with this exercise it is recommended that you review before continuing.

Now that you have taken a look at the TFS1Ø1 dial tone speed threshold report turn to page 6-1 Section 6.Ø5-6.Ø7 in the NTP and read about the TFS1Ø2 loop traffic threshold.

*** RETURN HERE WHEN YOU HAVE FINISHED READING ABOUT TFS1Ø2. ***

If you understand everything that you read continue on to the practice exercise.

*** PRACTICE EXERCISE ***

Use the information below to answer the questions that follow.

The following report was printed because the threshold was exceeded.

```
220   TFS102
02    0000600    00550
```

1. What is the loop usage in this report? ____________

2. What is the threshold for this report? ____________

3. What loop exceeded the threshold? ____________

*** ANSWER ***

1. What is the loop usage in this report? <u>6ØØ CCS</u>

2. What is the threshold for this report? <u>55Ø CCS</u>

3. What loop exceeded the threshold? <u>Loop 2</u>

As you can see the loop usage exceeded the threshold by 5Ø CCS causing the report to be printed.

The next threshold that you will be reviewing is the last of the system thresholds. Turn to page 6-1 Sections 6.Ø8-6.1Ø in the NTP and read about the TFS1Ø5 Junctor Traffic Threshold.

*** RETUN HERE WHEN YOU HAVE FINISHED READING ABOUT TFS1Ø5. ***

If you understand everything that you have read continue on to the practice exercise.

*** PRACTICE EXERCISE ***

Use the information below to answer the questions that follow.

The following report was printed because the threshold was exceeded.

```
220   TFS1Ø5
12    ØØØ2138    ØØØ2ØØØ
```

1. When the junctor traffic threshold is exceeded what system report is also printed? ____________

2. What is the threshold for this report? ____________

3. What is the junctor usage for this report? ______________

4. What junctor group exceeded the threshold? _____________

*** ANSWER ***

1. When the junctor traffic threshold is exceeded what system report is also printed? TFSØØ7

2. What is the threshold for this report? 2ØØØ CCS

3. What is the junctor usage for this report? 2138 CCS

4. What junctor group exceeded the threshold? 12

As you can see the junctor usage CCS exceeded the threshold by 138 CCS causing the report to be printed.

If you had any problems with this exercise it is recommended that you review before continuing.

Now that you have reviewed all of the system threshold format(s), you will review the customer thresholds.

Turn to page 6-2 in the NTP and read Sections 6.11-6.13 on the TFC1Ø1 Incoming Matching Loss Threshold.

*** RETURN HERE WHEN YOU HAVE FINISHED READING ABOUT TFC1Ø1. ***

If you understand everything that you have read continue on to the practice exercise.

*** PRACTICE EXERCISE ***

Use the information below to answer the questions that follow.

The following report was printed because the threshold was exceeded.

```
200   TFC101
01
 00003    00000
```

1. What is the threshold set at in this report? ____________

2. What is the incoming matching loss? ____________

*** ANSWER ***

1. What is the threshold set at in this report? **Ø.%**

2. What is the incoming matching loss? **Ø.3%**

As you can see the incoming matching loss exceeded the threshold by Ø.3% causing the report to be printed.

If you had any problems with this exercise it is recommended that you review before continuing.

Turn to page 6-2 in the NTP and read Sections 6.14-6.16 on the TFC1Ø2 Outgoing Matching Loss.

*** RETURN HERE WHEN YOU HAVE FINISHED READING ABOUT TFC1Ø2. ***

If you understand everything that you have read continue on to the practice exercise.

*** PRACTICE EXERCISE ***

Use the information below to answer the questions that follow.
The following report was printed because the threshold was exceeded.

```
200   TFC102
 02
 00020      00015
```

1. What is the threshold set at in the report? ____________

2. What is the outgoing matching loss? ____________

*** ANSWER ***

1. What is the threshold set at in the report? <u>1.5%</u>

2. What is the outgoing matching loss? <u>2.Ø%</u>

As you can see the outgoing matching loss exceeded the threshold by Ø.5% causing the report to be printed.

If you had any problems with this exercise it is recommended that you review before continuing.

Turn to page 6-3 in the NTP and read Sections 6.17-6.19 on the TFC1Ø3 Average Speed of Answer.

*** RETURN HERE WHEN YOU HAVE FINISHED READING ABOUT TFC1Ø3. ***

If you understand everything that you have read continue to the practice exercise.

*** PRACTICE EXERCISE ***

Use the information below to answer the questions that follow. The following report was printed because the threshold was exceeded.

```
200     TFC1Ø3
 ØØ
 ØØ152      ØØ12Ø
```

1. What is the threshold set at in the report? ___________

2. What is the average speed of answer? ______________

*** ANSWER ***

1. What is the threshold set at in the report? 12.Ø seconds

2. What is the average speed of answer? 15.2 seconds

As you can see the average speed of answer exceeded the threshold by 3.2 seconds, causing the report to be printed.

If you had any problems with this exercise is is recommended that you review before continuing.

Turn to page 6-3 in the NTP and read Section 6.2Ø-6.22 on the TFC1Ø4 Percent All Trunks Busy.

*** RETURN HERE WHEN YOU HAVE FINISHED READING ABOUT TFC1Ø4 ***

If you understand everything that you read, continue on to the practice exercise.

*** PRACTICE EXERCISE ***

Use the information to answer the questions.
The following report was printed because the threshold was exceeded.

```
200    TFC1Ø4
Ø2
Ø4
 ØØØ18     ØØØ15
```

1. What is the threshold set at in the report? ____________

2. What is the percent of trunks busy? ___________

*** ANSWER ***

1. What is the threshold set at in the report? 1.5%

2. What is the percent of trunks busy? 1.8%

As you can see the percent of trunks busy exceeded the threshold by Ø.3% causing the report to be printed.

Another customer threshold is TFN1Ø1 even though it is identified "TFN".

EXAMPLE:

```
Ø855 TFN1Ø1

ØØØ
OHQT ØØ387     ØØØØØ
```

Ø855 is the system ID.

ØØØ is the customer number.

ØØ387 is the percentage (expressed in units of Ø.1%) of off-hook queue calls which timed out (overflowed) in the OHQ before an available trunk was found. This value represents the total number of OHQ overflows, divided by the total number of OHQ offers plus the OHQ overflows.

ØØØØØ is the threshold.

The OHQ overflow threshold measurement (TFN1Ø1) provides an indication that more than the expected number of users are timing out in the OHQ. This means that OHQ is offered and accepted, but a trunk does not become available before the service-changeable OHQ time limit expires. This could result from trunks being out of service, an incorrectly defined OHQ time limit, or temporary traffic overload.

Now that you have reviewed the threshold reports and their meaning you need to review the format of the input commands to set and query these reports.

Begin by reviewing module three in this text (REPORT SCHEDULING AND OPTIONS) and Section 8 (COMMUNICATING WITH THE SYSTEM) in the NTP in the Appendix. Since the communication process is the same only the areas that differ will be reviewed.

Remember you must be in overlay program (2) when communicating with the system.

The command "TTHS" is used to query system threshold levels, followed by the threshold code.

Example format for Query System Threshold Level:

Format: TTHS (TC) (tv)

Actual Input: TTHS 1 Ø15

The TTH S is entered by the user to indicate that it is a System threshold query.

The letters "TC" stand for Threshold Code. Turn to page 8-6 in the NTP and read Table 8A System T hreshold C odes

*** RETURN HERE WHEN YOU HAVE FINISHED READING. ***

One of the three system t hreshold c odes is entered in the 'TC' column depending on what measurement you desire. YOU DO NOT ENTER THE LETTERS "TC" . The letters 'TC' stand for t hreshold c ode.

The letters 'tv' stand for t hreshold v alue. This is the actual value (Range on chart) of the threshold being queried.

*** PRACTICE EXERCISE ***

1. What command would you enter if you desired to query a system threshold? __________

2. The letters 'TC' indicate what?

3. List the system threshold codes and what they measure.

4. What do the letters "tv" indicate in the system threshold query format?

*** ANSWER ***

1. What command would you enter if you desired to query a system threshold? <u>TTHS</u>

2. The letters 'TC' indicate what? <u>t</u> hreshold <u>c</u> ode

3. List the system threshold codes and what they measure? 1 Dial tone speed, 2 loop traffic, 3 junctor group traffic

4. What do the letters "tv" indicate in the system threshold query format?

   <u>The actual value (RANGE) of the threshold being queried</u> .

This concludes the review of the system threshold query format. The next topic you will review will be the format for setting system thresholds. Any of the thresholds may be set at whatever level is desired by the customer.

The command "STHS" is used to set system threshold levels, followed by the threshold code.

Example:

Format: STHS (TC) (tv) -- (TV)

Actual Input: STHS 1 Ø2Ø -- Ø15

You may have noticed already that most of the input for querying thresholds is identical to setting them. Only the differences in querying and setting the thresholds will be reviewed.

The threshold codes and values are the same as those used to Query the threshold (NTP page 8-6).

The large letters (TV) in the example below illustrate where you would enter the new threshold value that you want based on your particular grade of service expected. (See table 8-A page 8-6 in the NTP for codes and range of values.) The small letters (tv) illustrate the current threshold values output by the system.

STHS(TC)(tv) - - (TV) Example Input: STHS 1 Ø2Ø - - Ø15

The 1 is the threshold code, dial tone speed.
The Ø2Ø is the present threshold value.
The Ø15 is the new threshold value set.

*** PRACTICE EXERCISE ***

Use the example threshold to answer the questions that follow:

```
.STHS 2 Ø6Ø -- 1ØØ
.
```

1. What is the name of the threshold measurement being set?

2. What is the new threshold value?

*** ANSWER ***

1. What is the name of the threshold measurement being set?

   LOOP TRAFFIC

2. What is the new threshold value?

   1ØØ CCS

Although most thresholds may be set to any desired level, many thresholds have a recommended setting, which reflects the Northern Telecom grade of service. A list of such settings for the majority of systems is provided below:

THRESHOLD	RECOMMENDED SETTING	RECOMMENDED GRADE OF SERVICE MAXIMUM
TFS1Ø1-Dial Tone Speed	Ø15	1.5%
TFS1Ø2-Loop CCS	55Ø	66Ø CCS
TFS1Ø5-Junctors	1ØØØ CCS	2ØØØ CCS

*** PRACTICE EXERCISE ***

1. What is the recommended setting for t hreshold c ode number 2? ________________

2. What is the recommended setting for t hreshold c ode number 5? ________________

3. What is the recommended setting for t hreshold c ode number 1? ________________

*** ANSWER ***

1. What is the recommended setting for t hreshold c ode number 2? 55Ø

2. What is the recommended setting for t hreshold c ode number 5? 1ØØØ

3. What is the recommended setting for t hreshold c ode number 1? Ø15

Continue on to the next topic if you didn't have any problems with this exercise.

This concludes the review of input format command for system threshold query and system threshold setting.

The next review will cover the input format commands for customer threshold query and setting customer thresholds.

Most of the input formats will be primarily the same for both the system and the customer; therefore, the review will only go into detail on the difference of the two.

Begin by taking a look at the format used for a customer threshold query.

The command "TTHC" is used to queue customer threshold levels, followed by the customer number and the threshold code.

Example format for Query System Threshold Level:

Format: TTHC(Customer)(TC)(tv)

Actual Input: TTHC Ø 2 Ø1Ø

Note: When entering the customer number, press the space bar instead of a carriage return after the customer number. Pressing the carriage return key will result in an error code.

The TTH C command is entered by the user to indicate that it is a customer threshold query.

The "CUSTOMER" number is entered by the user to indicate to the system which customer is going to be queried.

The letters "TC" stand for Threshold Code. Turn to page 8-7 in the NTP and read Table 8-B Customer Thresholds.

RETURN HERE WHEN YOU HAVE FINISHED READING.

One of the five customer threshold codes are entered in the "TC" column depending on what measurement you desire.

The letters "tv" stand for threshold value. This is the actual value (Range on the chart page 8-7 table 8-B) of the threshold being queried.

*** PRACTICE EXERCISE ***

1. What command would you enter if you desired to query a <u>c</u> ustomer threshold? ________________

2. List the customer threshold codes and what they measure.

*** ANSWER ***

1. What command would you enter if you desired to query a <u>c</u> ustomer threshold? <u>TTHC</u>

2. List the customer threshold codes and what they measure.

   1 Incoming Matching Loss

   2 Outgoing Matching Loss

   3 Average Speed of Answer

   4 Percent All Trunks Busy

   5 Percent OHQ Overflow

This concludes the review of the customer threshold query format. The next topic will be the format for setting customer thresholds. The review will only include those areas that differ from the previous review of setting and querying thresholds.

The command "STHC" is used to set customer threshold levels, followed by the customer number and the threshold code.

Example setting a customer threshold:

Format: STHC (customer)(TC)(tv) -- (TV)

Actual Input: STHC Ø 2 Ø1Ø -- 12

Note: Enter a space after the customer number, instead of a carriage return.

You may have already noticed that most of the input for querying threshold is identical to setting them. Only the difference between querying and setting thresholds will be reviewed.

The customer number indicates which customer is being queried.

The threshold codes and values are the same as those used to Query a customer threshold. (NTP page 8-7).

STHC(Customer) (TC)(tv) -- (TV)

Example Input: STHC Ø 2 Ø1Ø -- 12

The Ø is the customer number
The 2 is the t hreshold c ode, outgoing matching loss
The 1Ø is the present t hreshold v alue
The 12 is the new T hreshold V alue set

*** PRACTICE EXERCISE ***

Use the example threshold to answer the questions that follow:

.STHC 3 4 Ø15 -- 5Ø

1. What is the name of the threshold measurement being set?

2. What is the new threshold value?

*** ANSWER ***

1. What is the name of the threshold measurement being set?

   Percent All Trunks Busy

2. What is the new threshold value?

   5%

Like system thresholds, customer thresholds may be set to any desired level.
A list of recommended settings for the majority of systems is provided below:

THRESHOLD	RECOMMENDED SETTING	RECOMMENDED GRADE OF SERVICE MAXIMUM
TFC1Ø1-Incoming Match Loss	Ø1Ø	1%
TFC1Ø2-Outgoing Match Loss	Ø1Ø	1%
TFC1Ø3-Attendant Speed of Answer	12Ø	12 secs.
TFC1Ø4-Percent of Calls Seizing Last Trunk	Ø5Ø	5%

If you have reviewed the chart continue on to the practice exercise.

*** PRACTICE EXERCISE ***

1. What is the recommended setting for threshold code number 1?
   ____

2. What is the recommended setting for threshold code number 2?
   ____

3. What is the recommended setting for threshold code number 3?
   ____

4. What is the recommended setting for threshold code number 4?
   ____

*** ANSWER ***

1. What is the recommended setting for threshold code number 1?
   Ø1Ø

2. What is the recommended setting for threshold code number 2?
   Ø1Ø

3. What is the recommended setting for threshold code number 3?
   12Ø

4. What is the recommended setting for threshold code number 4?
   Ø5Ø

System & customer threshold tests may also be performed manually at any time between outputs. The command used is an "I" command similar to that used to invoke traffic data manually. When this command is used, the Meridian SL-1 tests the data in the holding registers against the current system or customer threshold setting. If the traffic data passes the test (i.e, does not exceed the threshold setting), the system outputs the response "OK". If the traffic data exceeds the current threshold setting, the threshold violation in the format described above is output, along with the associated system or customer traffic options. (See NTP page 8-11, paragraphs 8.45 thru 8.47)

The command used to invoke system threshold tests is "ITHS", followed by the threshold code or codes desired.

Example of system threshold tests:

.ITHS 1 2

This test is for system threshold codes 1 and 2. The appropriate response would then be output by the system.

The command used to invoke customer threshold tests is "ITHC", followed by the customer number and threshold code or codes desired.

Example of customer threshold tests:

.ITHC Ø 1 3 5

This test is for customer number Ø, and customer threshold codes 1,3, and 5. The appropriate responses would then be output by the system.

SUMMARY THRESHOLDS:

- A threshold is a means of telling the system you want to be notified if a certain operational parameter is reached.
- Two categories of thresholds: Customer and System
- System thresholds include: Dial tone speed, loop traffic, and junctor traffic.
- Customer thresholds include: Incoming matching loss, outgoing matching loss, average speed of answer, percent all trunks busy, and percent off-hook queue overflow.
- Not setting a threshold is equivalent to setting it to zero.
- To find a threshold setting you could just query it.
- To change the actual threshold value you would set it.
- Threshold reports will be printed before any other traffic data.
- Threshold formats can be found in the NTP page 8-7.
- Threshold tests may be invoked manually between outputs.

This concludes the review on thresholds. For additional threshold information see pages 8-6 through 8-7 in the NTP.

In the second part of this module you will review warning messages, what the warning messages mean, and where they will be printed on the traffic reports.

What are warning messages? Well, they are just like any warning that you receive. They tell you to use caution in whatever you are doing. In this case you need to use caution in how you interpret the data on the traffic reports.

As you learned earlier, the Meridian SL-1 gathers data over a specified time period. You control this period by requesting the reports to be printed at certain times. However, while the system is gathering the data for you lots of things can happen, and probably will, this may cause the data to be corrupted one way or the other. The warning messages are intended to inform you about the corruption of data due to such things as; initialization, system reload, and a change to the traffic schedule. One or more warning messages may be output preceding the traffic measurement data.

Continue on to the practice exercise if you understand what has just been reviewed.

*** PRACTICE EXERCISE ***

1. For what are the warning messages intended?

*** ANSWER ***

1. For what are the warning messages intended?

   Inform you about corruption of report data .

Turn to page 2-5 in the NTP and read Sections 2.29, 2.30, and 2.31 on warning messages.

*** RETURN HERE WHEN YOU HAVE FINISHED READING ***

The TFS301 message indicates that an initialization has occurred at some time since the last traffic report. When this happens, the data in the accumulating registers is lost and the registers begin accumulating again from zero. Therefore, the data in the next traffic report will represent only a portion of the scheduled time interval with the results abnormally low. All data in the report will be affected, even though some may appear normal, and should be disregarded. If no more initializations occur, the data in the following hour will be valid.

*** PRACTICE EXERCISE ***

Use the NTP to answer this question.

1. What does the TFS301 warning message indicate?

*** ANSWER ***

1. What does the TFS301 warning message indicate?

   This message warns that data has been corrupted by an initialization and should be ignored .

The following is an example of how and where this message may appear on a traffic report:

```
036 TFS000
25  11   1979
21  00   00

TFS301
```

The TFS3Ø2 message is significant when changes are made as to what options are to be printed. Because the accumulating registers for a particular traffic option do not re-zero themselves until that option is scheduled to be output, scheduling the printout of an option which was not output in the last traffic report will result in much larger numbers for that option in the first report after the change was made than would normally occur. Therefore, the data for that option only in that hour must be disregarded. Note that all other options in that hour's report would, however, be valid (assuming they had all been output in the previous report).

Schedule changes that involve when the data is to be printed may have a similar effect, but those are generally covered under the TFS3Ø3 message.

*** PRACTICE EXERCISE ***

Use the NTP to answer the question.

1. What does the TFS3Ø2 warning message indicate?

*** ANSWER ***

1. What does the TFS3Ø2 warning message indicate?

   This message warns that the traffic schedule was changed during the interval covered by the traffic measurement data, you may need to disregard this particular traffic data.

The following is an example of how and where this message may appear on a traffic report:

```
279  TFSØØØ
13  Ø8   1984
14  ØØ   Ø3

TFS3Ø2
```

The TFS3Ø3 message is similar to the TFS3Ø2 message in that the data following this message normally shows much larger numbers than would normally occur. However, all traffic options are affected. In defining what this message means, always remember that traffic reports are output at the end of a reporting period. However, the traffic schedule for accumulating reports must be scheduled for the beginning of the desired report period, in order to empty the holding registers and the accumulating registers, and re-zero the accumulating registers. (Note that all events take place simultaneously; that is, the holding registers are emptied of the last scheduled hour's data, at the same time that the data in the accumulating registers, and the accumulating registers are re-zeroed. The data from the accumulating registers is also output to the traffic TTY at the time of transfer to the holding registers, according to the traffic schedule). Therefore, in order to obtain valid data for an 8 - 5 study, the schedule must begin at 8:ØØ and end at 5:ØØ. The first report for such a schedule would be output at 8:ØØ, however, the first valid report will be output at 9:ØØ. The 8:ØØ report will show the message TFS3Ø3, and will represent all traffic data that was accumulated between the last hour that traffic was scheduled to be output in the previous calendar day i.e, 5:ØØ -- and the first hour that traffic was scheduled to be output the next calendar day - i.e, 8:ØØ. This data is invalid, as it represents 15 hours accumulation. (Note: In the above example, the data in the holding registers i.e, the 5:ØØ data will not change until 8:ØØ the next day. Therefore, it may be invoked any time before 8:ØØ A.M. and will represent valid 5:ØØ data from the previous day).

The significance of the above is that any change in when the traffic data is to be output may result in the TFS3Ø3 message appearing in the first report output after the change. Such changes would include changing past dates to present or future dates; changing the days of the week to be included in the study period, or changing the hours of the day to be reported.

*** PRACTICE EXERCISE ***

Use the NTP to answer the question.

1. What does the TFS3Ø3 warning message indicate?

*** ANSWER ***

1. What does the TFS3Ø3 warning message indicate?

   This message warns that the associated traffic measurement data was accumulated over a period greater than one hour .

The following is an example of how and where this message may appear on a traffic report:

```
279  TFSØØØ
13   Ø8   1984
14   ØØ   Ø3

TFS3Ø3
```

You will now review the output format and meaning of two more warning messages:

- o TFS4Ø1
- o TFS4Ø2

Turn to page 2-5 in the NTP Section 2.33 and read about these two reports.

*** RETURN HERE WHEN YOU HAVE FINISHED READING. ***

TFS4Ø1/4Ø2 messages differ from the other traffic record types in that they are transient in nature and are not stored, unless the customer is equipped with the History File option. Except in the latter case, they cannot be manually requested from the Meridian SL-1.

The only time these messages are printed out is when an established speech path, which has been held up for longer than 36 CCS, is finally disconnected. This may occur at any given moment of the day, even while the Meridian SL-1 is printing out other data (including traffic reports). Therefore, these messages will only be available to a terminal which is on-line at the time the long connection was disconnected.

The TFS4Ø1/4Ø2 messages are significant in that frequently they represent data calls with long holding times. As data applications become more and more a part of telecommunications, the impact of these high-traffic connections becomes significant.

Like all other Meridian SL-1 traffic measurements, these messages are not output until a connection is idled. Typically, a data connection which is set up at the beginning of the day (which may include voice also), and is held up for the entire day, will not be disconnected until the end of the day. Therefore, TFS4Ø2 messges may not be seen until the last hour of the day. However, the time slots involved in those connections were not available for use all day. Even though the usage is accumulated against the last hour, the long holding times effectively contributed to possible network blockage all day.

In the Meridian SL-1 connections of up to 83 minutes each (5Ø CCS) are included in the normal traffic statistics. However, connections of greater than 83 minutes are not, and it is these which have the most impact on grade of service being provided by a Meridian SL-1 as described above.

Since the TFS4Ø2 message gives the TN's of the terminals involved and the total CCS of the connection, it is possible to add the CCS per connection back into the affected traffic reports to determine the actual traffic load on the various system elements. The reports that would be affected include TFSØØ1 and TFSØØ7 (in multi-group switches) TFCØØ1, and TFCØØ2.

Simply determine the hour in which the message was output (the hour following the TFS4Ø2 message), divide the total CCS per connection by 36, count backwards that number of hours from the time output, and add 36 CCS (representing long connection CCS) per connection to each element in the affected traffic report (i.e., each loop, junction group, or route with one or more long connections). This will give a close approximation of the actual traffic load including these long connections. Long connection data should be added in once per terminal's loop to each of TFSØØ1 and TFSØØ7, and once per connection to each of TFCØØ1 and TFCØØ2. For the latter, the direction of usage (incoming, outgoing, or two-way) must be known, and may be determined from the corresponding route for each trunk TN.

Systems that show a great deal of TFS4Ø2 messages may show some network blockage, yet show low loop traffic on the terminal loops. Calculation of the actual load, as outlined above, may shed some light on the situation by revealing overloaded loops.

In any system, it is important that terminals with typically long holding times be distributed evenly over all loops, to minimize network blockage.

*** PRACTICE EXERCISE ***

1. What does the TFS4Ø1 warning message indicate?

2. What does the TFS4Ø2 warning message indicate?

*** ANSWER ***

1. What does the TFS4Ø1 warning message indicate?

   Identifies connections that were held for at least 36 CCS but less than 5Ø CCS. The message includes the measurements (pegs and usage) in the regular traffic data.

2. What does the TFS4Ø2 warning message indicate?

   Identifies connections that were held for 5Ø CCS or longer. The message does not include the measurements (pegs and usage) in the regular traffic data.

Now that you know what these warning messages mean you need to take a look at the format for these messages.

The format is as follows:

TFS4ØX CCS TN1 TN2 TYPE

The area(s) being reviewed will be **highlighted.**

The highlighted number identifies the message.

TFS4Ø **X** CCS TN1 TN2 TYPE

EXAMPLE: TFS4Ø1 or TFS4Ø2

This CCS gives the usage on the connection.

TFS4ØX **CCS** TN1 TN2 TYPE

*** PRACTRICE EXERCISE ***

Use the message format to answer the questions below.

TFS4Ø1 4Ø TN1 TN2 TYPE

1. What is the number of the warning message? __________

2. What is the CCS on the connection? __________

*** ANSWER ***

1. What is the number of the warning message? 4Ø1

2. What is the CCS on the connection? 4Ø

The TN1 and TN2 identify the terminal (Loop, Shelf, Card, Unit) involved in the connection.

TFS40X CCS **TN1 TN2** TYPE

EXAMPLE: TFS401 36 8 1 7 1 0 0 8 0 TYPE

*** PRACTICE EXERCISE ***

Use the message format to answer the questions below.

TFS40X CCS TN1 TN2 TYPE

1. What do the TN1 and TN2 indicate?

*** ANSWER ***

1. What do the TN1 and TN2 indicate?

   The teminals (Loop, Shelf, Card, Unit) involved in the connection.

The type is a number which identifies to what use the network path was put. Turn to page 2-6 in the NTP and review Table 2-A NETWORK PATHS USAGE IDENTIFICATION.

*** RETURN HERE WHEN YOU HAVE FINISHED ***

TFS40X CCS TN1 TN2 **TYPE**

Example: TFS40X CCS TN1 TN2 1

*** PRACTICE EXERCISE ***

Use the NETWORK DATA USAGE IDENTIFICATION TABLE in the NTP to answer the following?

1. What was the network path used for in the following warning message?

   TFS40X CCS TN1 TN2 0 ____________________________

2. What was the network path used for in the following warning message?

   TFS40X CCS TN1 TN2 7 ____________________________

*** ANSWER ***

1. What was the network path used for in the following warning message?

   TFS40X CCS TN1 TN2 0 <u>DIAL TONE</u>

2. What was the network path used for in the following warning message?

   TFS40X CCS TN1 TN2 7 <u>Unknown use of a TDS</u>

Continue on to the review of two more warning messages. These are the TFS411 and TFS412 messages.

Turn to page 2-6 in the NTP and read Section 2.35.

*** RETURN HERE WHEN YOU HAVE FINISHED READING ***

The TFS411/412 messages are actually a summarization of the TFS401/TFS402 messages that were output since the last traffic report. These messages are output for the benefit of those collecting traffic data remotely, or whose TTY is not on-line with the Meridian SL-1.

- TFS401 messages are compiled under TFS411 messages.

- TFS402 messages are compiled under TFS412 messages.

However, as stated in the NTP, not all the data given in the TFS401/402 messages is included in the TFS411/412 messages.

The TFS411/412 messages are always output together and normally appear (if one or the other is non-zero) immediately following all threshold violations and before the first scheduled system or customer option. However, they will also appear before any system or customer traffic data, or both, which is invoked manually.

These messages are significant in that they contribute a total count of the TFS401/402 messages which were output since the last traffic report, as well as a sum of the total CCS per connection for all of those connections. Since they are not output until after a long connection is idled, these messages, like TFS401/402 messages, may not be seen until the last hour of the day.

*** PRACTICE EXERCISE ***

Use the NTP Section 2.35 to answer the following questions.

1. What warning messages indicate connections with high holding times when the traffic TTY is not on line to receive messages? ____________________

*** ANSWER ***

1. What warning messages indicate connections with high holding times when the traffic TTY is not on line to receive messages? TFS411 TFS412

The actual output format for these two warning messages differs from that for TFS4Ø1 and TFS4Ø2 warning messages.

The following is an example of TFS411/412 reports:

```
Ø423 TFS411
                            For all TFS4Ø1 messages since last report.
  ØØØØ1  ØØØØØ43


Ø423 TFS412
  ØØØØ2  ØØØØ167            For all TFS4Ø2 messages since last report.
```

Breakdown of report(s):

The system ID on both reports.

```
Ø423 TFS411                              Ø423 TFS412
                                           ØØØØ2  ØØØØ167
  ØØØØ1  ØØØØØ43
```

The Total peg count on both reports.

```
Ø423 TFS411                              Ø423 TFS412
                                           ØØØØ2  ØØØØ167
  ØØØØ1  ØØØØØ43
```

The total CCS on both reports.

```
Ø423 TFS411                              Ø423 TFS412
                                           ØØØØ2  ØØØØ167
  ØØØØ1  ØØØØØ43
```

From the information given in the TFS411/412 messages, the average holding time per long connection can be calculated. This is useful if the TFS4Ø1/4Ø2 messages with the exact CCS per connection are not available. To calculate this, use the following formula:

```
Total CCS for all long connections (for either type)
----------------------------------------------------
Total number of long connections (for either type)
```

The results may be converted to minutes by dividing by Ø.6, or to hours by dividing by 36.

EXAMPLE:

```
Ø423 TFS411                 43 CCS
                            ------   = 43 CCS/connection =
  ØØØØ1   ØØØØØ43              1          72 minutes or 1.2 hours

Ø423 TFS412               167 CCS
  ØØØØ2   ØØØØ167         -------   = 83.5 CCS per connection =
                             2             139 minutes or 2.3 hours
```

SUMMARY WARNING MESSAGES:

Warning messages are the way the system informs you that a certain event has occurred during the accumulation of traffic data (initialization, system reload, etc.).

- o TFS3Ø1 - A warning that data has been corrupted by an intitalization and should be ignored.
- o TFS3Ø2 - A warning that the traffic schedule was changed during the interval covered by the traffic measurement data and may be invalid.
- o TFS3Ø3 - A warning that associated traffic measurement data was accumulated over a period greater than one hour, and the data should be disregarded.
- o TFS4Ø1 - A warning that identifies connections that are held for at least 36 CCS but less than 5Ø CCS.
- o TFS4Ø2 - A warning that identifies connections that are held for 5Ø CCS or longer.
- o TFS411 - A warning that summarizes connections that are held for at least 36 CCS but less than 5Ø CCS when the traffic TTY is not on-line to receive messages.
- o TFS412 - A warning that summarizes connections that are held for 5Ø CCS or longer when the traffic TTY is not on-line to receive messages.

This concludes part 2 of this module and the last part of this course. If you are unsure of any of the material that has been covered, review before continuing on to the selfcheck.

MODULE 6 SELF CHECK

The self check has two parts:

- o Part one requires you to identify:
  - o What caused the threshold(s) to be printed.

- o Part two requires you to identify:
  - o Warning messages

PART 1.

Use the reports below to answer the questions that follow.

```
Ø21    TFSØØØ
16     Ø9  1984
14     ØØ   ØØ

Ø21    TFS1Ø1
       ØØØØ5     ØØØØØ

Ø21    TFS1Ø2

ØØ     ØØØØ623   ØØ58Ø

Ø21    TFC1Ø3
ØØØ
       ØØ25Ø     ØØ12Ø
```

1. What caused the TFS1Ø1 threshold to be printed?

2. What caused the TFS1Ø2 threshold to be printed?

3. What caused the TFC1Ø3 threshold to be printed?

*** ANSWER ***

1. What caused the TFS1Ø1 threshold to be printed?

   The threshold was not set. .5% violation

2. What caused the TFS1Ø2 threshold to be printed?

   Threshold violated

```
 623
-58Ø
  43 CCS exceeded
```

3. What caused the TFC1Ø3 threshold to be printed?

```
Threshold violated.    25Ø
                      -12Ø
                       13Ø tenths of a second exceeded
```

PART 2.

Use the warning message below to answer the questions that follow.

```
Ø21   TFSØØØ
 23   1Ø  1984
 Ø8   ØØ  ØØ

TFS3Ø1

TFS4Ø1   39   ØØ1   ØØ   Ø3   Ø4   1Ø
```

1. What does the TFS3Ø1 warning message indicate?

2. What does the TFS4Ø1 warning message indicate?

*** ANSWER ***

1. What does the TFS3Ø1 warning message indicate?

   This message precedes traffic data that is output after a Meridian SL-1 initialization. The message warns that data has been corrupted by the initialization and should be ignored.

2. What does the TFS4Ø1 warning message indicate?

   Outgoing trunk connection was held for 39 CCS.

This concludes the self-check for module 6. Continue on to the final SelfCheck if you understand all of the information presented in this course.

Final Self Check

FINAL SELF CHECK

This self check has two parts:

- o Part one requires you to analyze traffic reports.
- o Part two requires you to select recommended action(s) you would take to resolve any problem(s) you found in the analysis of the reports in part one of this self check.

NOTE: Use the modules if you need help with this self-check. Do not spend too much time on any of the exercises.

Use the information and the traffic reports below to answer the questions on the following pages.

INFORMATION: The system that generated the following traffic reports contains 11 Digitone receivers.

The high idle cycle count for this system is 3,525,196.

104 TFSØØØ

13 1Ø 1986
15 ØØ Ø1

104 TFS411

ØØØØ2 ØØØØØ8Ø

104 TFS412

ØØØØØ ØØØØØØØ

104 TFSØØ1

ØØ	TERM	ØØØØØ	ØØØØØØ6	ØØØØ9	ØØØ1Ø	ØØØØ391	ØØ258
Ø1	TERM	ØØØØØ	ØØØØØØ1	ØØØØ3	ØØØØ2	ØØØØ296	ØØ141
Ø2	TERM	ØØØØØ	ØØØØØ12	ØØØ14	ØØØØ9	ØØØØ444	ØØ3Ø4
Ø3	TERM	ØØØØØ	ØØØØØØ2	ØØØØ3	ØØØØ6	ØØØØ375	ØØ161
Ø4	TERM	ØØØØØ	ØØØØØ23	ØØØØ6	ØØØØ9	ØØØØ486	ØØ236
Ø5	TERM	ØØØØØ	ØØØØØ1Ø	ØØØØ9	ØØØØ5	ØØØØ415	ØØ199
Ø6	CONF	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØØ4	ØØØ57
Ø7	TDS	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØ9	ØØØØØØ1	ØØØØ7
Ø8	TERM	ØØØØØ	ØØØØØ97	ØØØ33	ØØØ17	ØØØØ71Ø	ØØ349
Ø9	TERM	ØØØØØ	ØØØØØ16	ØØØ13	ØØØØ6	ØØØØ462	ØØ243
1Ø	TERM	ØØØØØ	ØØØØØ5Ø	ØØØ27	ØØØ13	ØØØØ5Ø1	ØØ334
11	TERM	ØØØ17	ØØØØØ18	ØØØ17	ØØ1Ø6	ØØØØ695	ØØ327
12	TERM	ØØØØØ	ØØØØØ32	ØØØ26	ØØØ12	ØØØØ661	ØØ361
13	TERM	ØØØØØ	ØØØØØ18	ØØØ12	ØØØ14	ØØØØ532	ØØ269
14	CONF	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØØØ3	ØØØ54
15	TDS	ØØØØØ	ØØØØØØØ	ØØØØØ	ØØØØØ	ØØØØ271	Ø4981

104 TFS002

00	00000	0000034	02107
01	00000	0000005	00105
02	00000	0000009	00149
03	00000	0000081	00938
04	00000	0000059	00720
05	00000	0000005	00041
06	00004	0000079	00928
07	00000	0000000	00000
08	00006	0000119	02047
09	00000	0000006	00111
10	00000	0000000	00000

104 TFS003

00000 00000 00002

104 TFS004

2208861 03293 00183
00000 00000
00000 00000
00000

104 TFS007

01	00000	0000790	00572
02	00005	0000656	00504
12	00000	0000767	00580

(Note: The TFC007 data does not relate to the TFS001 data in this example, as it is from a different system.

104 TFC001
00

00004	0000943	00382
00020	0001265	00720
00006	0000272	00385
00000	0000112	00032
00031	00188	00178

1Ø4 TFCØØ2
ØØ
ØØ CO

ØØØ35 ØØØ35

ØØØØØØØ ØØØØØ
ØØØØ562 ØØ384
ØØØØØ ØØØØØ
ØØØ46

Ø1 TIE

ØØØ41 ØØØ4Ø

ØØØØ4ØØ ØØ1Ø6
ØØØØ745 ØØ354
ØØØ74 ØØ1ØØ
ØØØØØ

Ø2 DID

ØØØ3Ø ØØØ3Ø

ØØØØ627 ØØ282
ØØØØØØØ ØØØØØ
ØØØØØ ØØØØØ
ØØØØØ

Ø3 TIE

ØØØØ3	ØØØØ3
ØØØØØØ6	ØØØØ8
ØØØØØØ1	ØØØØ3
ØØØØØ	ØØØ34
ØØØØØ	

Ø4 WATT

ØØØØ2	ØØØØ2
ØØØØØØØ	ØØØØ9
ØØØØØØ6	ØØØØ2
ØØØØØ	ØØØØØ
ØØØØØ	

Ø7 TIE

ØØØØ3	ØØØØ3
ØØØØØ22	ØØØ18
ØØØØØ63	ØØØØ9
ØØØ11	ØØØ28
ØØØØØ	

104 TFC003

00

00065	00040
00007	00151
00006	00090

104 TFC004

00

01

00013	0000005
00015	0000002
0000026	0000007
00000	

02

00014	0000004
00016	0000002
0000031	0000006
00000	

PART 1.

Write your analysis of the reports in the appropriate space provided.

<u>YOUR TFS411 ANALYSIS RESULTS</u> :

<u>YOUR TFS412 ANALYSIS RESULTS</u> :

<u>YOUR TFSØØ1 ANALYSIS RESULTS</u> :

YOUR TFSØØ1 ANALYSIS RESULTS CONTINUED :

YOUR TFSØØ1 ANALYSIS RESULTS CONTINUED :

YOUR TFSØØ2 ANALYSIS RESULTS :

YOUR TFSØØ3 ANALYSIS RESULTS :

YOUR TFSØØ4 ANALYSIS RESULTS :

YOUR TFSØØ7 ANALYSIS RESULTS :

YOUR TFCØØ1 ANALYSIS RESULTS :

YOUR TFCØØ2 ANALYSIS RESULTS :

YOUR TFCØØ3 ANALYSIS RESULTS :

YOUR TFCØØ4 ANALYSIS RESULTS :

Answers for part 1 are on the following pages.

TFS411 ANALYSIS RESULTS :

2 calls exceeded 36 CCS for a total connection time of 8Ø CCS. The average holding time per connection is 4Ø CCS, or 67 minutes, or 1.1 hours.

TFS412 ANALYSIS RESULTS :

No problem indicated.

TFSØØ1 ANALYSIS RESULTS :

INTERLOOP MEASUREMENTS PER LOOP

LOOP	FTM'S	CCS	PC
Ø	1Ø - 2 x Ø = 1Ø	391 - 2 x 6 = 379	258 - 2 x 9 = 24Ø
1	2 - 2 x Ø = 2	296 - 2 x 1 = 294	141 - 2 x 3 = 135
2	9 - 2 x Ø = 9	444 - 2 x 12 = 42Ø	3Ø4 - 2 x 14 = 276
3	6 - 2 x Ø = 6	375 - 2 x 2 = 371	161 - 2 x 3 = 155
4	9 - 2 x Ø = 9	486 - 2 x 23 = 44Ø	236 - 2 x 6 = 224
5	5 - 2 x Ø = 5	415 - 2 x 1Ø = 395	199 - 2 x 9 = 181
8	17 - 2 x Ø = 17	71Ø - 2 x 97 = 516	349 - 2 x 33 = 283
9	6 - 2 x Ø = 6	462 - 2 x 16 = 43Ø	243 - 2 x 13 = 217
1Ø	13 - 2 x Ø = 13	5Ø1 - 2 x 5Ø = 4Ø1	334 - 2 x 27 = 28Ø
11	14Ø - 2 x 17 = 1Ø6	695 - 2 x 18 = 659	327 - 2 x 17 = 293
12	12 - 2 x Ø = 12	661 - 2 x 32 = 597	361 - 2 x 26 = 3Ø9
13	14 - 2 x Ø = 14	532 - 2 x 18 = 496	269 - 2 x 12 = 245

TFS001 CONTINUED: INTRA/INTERLOOP BLOCKAGE PER LOOP

LOOP	INTRA	INTER
0	$\frac{0}{9 + 0} \times 100 = 0\ \%$	$\frac{10}{240 + 10} \times 100 = 4.\ \%$
1	$\frac{0}{3 + 0} \times 100 = 0\ \%$	$\frac{2}{135 + 2} \times 100 = 1.5\ \%$
2	$\frac{0}{14 + 0} \times 100 = 0\ \%$	$\frac{9}{276 + 9} \times 100 = 3.2\ \%$
3	$\frac{0}{3 + 0} \times 100 = 0\ \%$	$\frac{6}{155 + 6} \times 100 = 3.7\ \%$
4	$\frac{0}{6 + 0} \times 100 = 0\ \%$	$\frac{9}{224 + 9} \times 100 = 3.9\ \%$
5	$\frac{0}{9 + 0} \times 100 = 0\ \%$	$\frac{5}{181 + 5} \times 100 = 2.7\ \%$
8	$\frac{0}{33 + 0} \times 100 = 0\ \%$	$\frac{17}{283 + 17} \times 100 = 5.7\ \%$
9	$\frac{0}{13 + 0} \times 100 = 0\ \%$	$\frac{6}{217 + 6} \times 100 = 2.7\ \%$
10	$\frac{0}{27 + 0} \times 100 = 0\ \%$	$\frac{13}{280 + 13} \times 100 = 4.4\ \%$
11	$\frac{17}{17 + 17} \times 100 = 50.\ \%$	$\frac{106}{293 + 106} \times 100 = 26.6\ \%$
12	$\frac{0}{26 + 0} \times 100 = 0\ \%$	$\frac{12}{309 + 12} \times 100 = 3.7\ \%$
13	$\frac{0}{12 + 0} \times 100 = 0\ \%$	$\frac{14}{245 + 14} \times 100 = 5.4\ \%$

TFSØØ1 CONTINUED: TOTAL LOOP BLOCKAGE PER LOOP

LOOP	PERCENT BLOCKAGE
Ø	$\frac{Ø + 1Ø}{Ø + 9 + 1Ø + 24Ø} \times 1ØØ = 3.9$ %
1	$\frac{Ø + 2}{Ø + 3 + 2 + 135} \times 1ØØ = 1.4$ %
2	$\frac{Ø + 9}{Ø + 14 + 9 + 276} \times 1ØØ = 3.Ø$ %
3	$\frac{Ø + 6}{Ø + 3 + 6 + 155} \times 1ØØ = 3.7$ %
4	$\frac{Ø + 9}{Ø + 6 + 9 + 224} \times 1ØØ = 3.8$ %
5	$\frac{Ø + 5}{Ø + 9 + 5 + 181} \times 1ØØ = 2.6$ %
8	$\frac{Ø + 17}{Ø + 33 + 17 + 283} \times 1ØØ = 5.Ø$ %
9	$\frac{Ø + 6}{Ø + 13 + 6 + 217} \times 1ØØ = 2.5$ %
1Ø	$\frac{Ø + 13}{Ø + 27 + 13 + 28} \times 1ØØ = 4.Ø$ %
11	$\frac{17 + 1Ø6}{17 + 17 + 1Ø6 + 293} \times 1ØØ = 28.4$ %
12	$\frac{Ø + 12}{Ø + 26 + 12 + 3Ø9} \times 1ØØ = 3.5$ %
13	$\frac{Ø + 14}{Ø + 12 + 14 + 245} \times 1ØØ = 5.2$ %

TFSØØ1 CONTINUED

TOTAL SYSTEM BLOCKAGE

$$\frac{17}{17+9+3+14+3+6+9+33+13+27+26+12} = .\text{Ø}89 \text{ TOTAL INTRALOOP BLOCKAGE}$$

$$\frac{1\text{Ø}+2+9+6+9+5+17+6+13+1\text{Ø}6+12+14}{2\text{Ø}9+24\text{Ø}+135+276+155+224+181+283+217+28\text{Ø}+293+3\text{Ø}9+245} = .\text{Ø}68 \text{ TOTAL INTERLOOP BLOCKAGE}$$

$$\frac{1}{12} \times .\text{Ø}9\text{Ø} + \frac{12-1}{12} \times .\text{Ø}68 \times 1\text{ØØ} = 6.9\ \% \text{ TOTAL SYSTEM BLOCKAGE}$$

Loops 8, 11, and 12 exceeded 6ØØ CCS.

The difference between the lowest loop CCS (296) and the highest loop CCS (71Ø) exceeds 1ØØ CCS meaning that this system is unbalanced.

TFS002 ANALYSIS RESULTS:

AVERAGE CCS/PER DTR

$$\frac{119}{11} = 10.8$$

BLOCKAGE

$$\frac{6}{2047 + 6} \times 100 = 0.3\ \%$$

AVERAGE HOLDING TIME IN SECONDS

$$\frac{119}{2047} \times 100 = 5.8 \text{ SECONDS}$$

TFS003 ANALYSIS RESULTS :

Total Dial Tone delay for all calls equals 2 seconds.

TFS004 ANALYSIS RESULTS :

% REAL TIME USED:

$$\frac{3525196 - 2208861}{3525196} \text{ X } 3600 = 1{,}344 \text{ seconds used}$$

$$\frac{1344}{3600} \text{ X } 100 = 37\%$$

% REAL TIME REMAINING:

$$\frac{2208861}{3525196} - \left(1 - \frac{2500}{3600}\right) \text{X}100 = 32\%$$

$$.32 \text{ X } 3600 = 1{,}155 \text{ sec. remaining}$$

TFSØØ7 ANALYSIS RESULTS:

JUNCTOR GROUP Ø1:

$$\frac{0}{572 + 0} = 0\% \text{ BLOCKAGE}$$

JUNCTOR GROUP Ø2:

$$\frac{5}{504 + 5} = 1\% \text{ BLOCKAGE}$$

JUNCTOR GROUP 12:

$$\frac{0}{580 + 0} = 0\% \text{ BLOCKAGE}$$

Junctor traffic exceeds 5ØØ CCS per group

TFCØØ1 ANALYSIS RESULTS :

GRADE OF SERVICE

INCOMING; Percent of total traffic

943
---- = 36 %

2592

Blockage

$$\frac{4}{382 + 4} \times 100 = 1.\%$$

TFC001 ANALYSIS RESULTS CONTINUED:

GRADE OF SERVICE CONTINUED

```
                    Holding time

                    943
                    --- = 2.468
                    382   -----   = 4.1 minutes
                           0.6

OUTGOING;           Percent of total traffic

                    1265
                    ---- = 49 %
                    2592

                    Blockage

                       20
                    -------- x 100 = 2.7%
                    720 + 20

                    Holding time

                    1265
                    ----   = 1.756
                     720     -----   = 2.9 minutes
                              0.6

INTRACUSTOMER;      Percent of total traffic

                     272
                    ----   = 10%
                    2592

                    Blockage

                        6
                    -------- x 100 = 1.5%
                    385 + 6

                    Holding time

                    272
                    ---   = 0.706
                    385     -----   = 1.2 minutes
                             0.6
```

TFCØØ1 ANALYIS RESULTS CONTINUED:

GRADE OF SERVICE CONTINUED

TANDEM; **Percent of total traffic**

```
 112
----   = 4%
2592
```

Blockage

```
   Ø
------ x 1ØØ = Ø%
32 + Ø
```

Holding time

```
112
---   = 3.5
 32     ---   = 5.8 minutes
        Ø.6
```

INTRA-OFFICE RATIO (RATIO OF STATION-TO-STATION TRAFFIC TO TOTAL STATION TRAFFIC)

```
         2 X 272
----------------------   = Ø.197 (2Ø%) INTRA-OFFICE RATIO
943 + 1265 + (2 X 272)
```

TFCØØ2 ANALYSIS RESULTS :

ROUTE

Ø : Blockage: Ø %

CCS per trunk:

$$\frac{562}{35} = 16 \text{ CCS}$$

Holding time per call: (MINUTES)

$$\frac{562}{384} = \frac{1.463}{0.6} = 2.4 \text{ min.}$$

Ø1: Blockage:

$$\frac{74}{354 + 74} \times 100 = 17.3\%$$

CCS per trunk:

$$\frac{400 + 745}{40} = 28.6 \text{ CCS}$$

Holding time per call: (MINUTES)

$$\frac{1145}{460} = \frac{2.489}{0.6} = 4.1 \text{ min.}$$

TFCØØ2 ANALYSIS RESULTS CONTINUED:
ROUTE

Ø2 : Blockage: Ø% (actually non-applicable)

CCS per trunk: $\frac{627}{3\text{Ø}} = 21$ CCS

Holding time per call: (MINUTES) $\frac{627}{282} = \frac{2.223}{\text{Ø}.6} = 3.7$ min.

Ø3 : Blockage: Ø %

CCS per trunk: $\frac{6 + 1}{3} = 2$ CCS

Holding time per call: (MINUTES) $\frac{7}{11} = \frac{\text{Ø}.636}{\text{Ø}.6} = 1.\text{Ø}$ min.

Ø4: Blockage: Ø %

CCS per trunk: $\frac{6}{2} = 3$ CCS

Holding time per call: (MINUTES) $\frac{6}{2} = \frac{3}{\text{Ø}.6} = 5$ min.

Ø7: Blockage: $\frac{11}{9 + 11} \times 1\text{ØØ} = 55\%$

CCS per trunk: $\frac{22 + 63}{3} = 28.3$ CCS

Holding time per call: (MINUTES) $\frac{85}{27} = \frac{3.148}{\text{Ø}.6} = 5.2$ min.

TFCØØ3 ANALYSIS RESULTS:

Average speed of answer: $\frac{00065}{10} = 6.5$ seconds

Average time in queue: $\frac{151}{10} = 15.1$ seconds

Average attendant response: $\frac{00040}{10} = 4.0$ seconds

Average wait time abandoned calls: $\frac{90}{10} = 9.0$ seconds

TFCØØ4 ANALYSIS RESULTS:

BOTH CONSOLES:

Total calls 13+15+14+16 = 58 Avg. calls/console: $\frac{58}{2} = 29$

Total work time 7+6 = 13 CCS

Total time manned 26+31 = 57 CCS

% calls delayed $\frac{7}{58} = 12\ \%$

% abandoned calls $\frac{6}{58} = 10.3\%$

% time manned $\frac{57}{72} = 79\%$

TFCØØ4 ANALYSIS RESULTS CONTINUED:

Work time per call;

All calls $\dfrac{13}{58} = 22.4$ seconds

External $\dfrac{2+2}{15+16} = 12.9$ seconds

Internal $\dfrac{5+4}{13+14} = 33$ seconds

CONSOLE Ø1:

Time manned: $\dfrac{26}{36} \times 100 = 72.2$ %

Work time per call

All calls $\dfrac{7}{28} \times 100 = 25$ seconds

External $\dfrac{2}{15} \times 100 = 13$ seconds

Internal $\dfrac{5}{13} \times 100 = 38$ seconds

TFC004 ANALYSIS RESULTS CONTINUED:

CONSOLE 2

Time manned: $\frac{31}{36} \times 100 = 86.1\ \%$

Work time per call

All calls $\frac{6}{30} \times 100 = 20$ seconds

External $\frac{2}{16} \times 100 = 12.5$ seconds

Internal $\frac{4}{14} \times 100 = 29$ seconds

PART 2

Use the traffic analysis results from the previous pages to answer the following question(s).

1. Place a check mark by the action(s) you would take to resolve the problems found in TFS411 and TFS412.

RECOMMENDED ACTION

1. _____ Verify that all trunks are in good working order.
2. _____ Occassionally allow the system to complete audits in order to clear time slots that might be hung up.
3. _____ Reprimand the users with excessive conversation time.
4. _____ Add the CCS for each long connection back into the traffic reports.

2. Place a check mark by the action(s) you would take to resolve the problem(s) found in TFSØØ1.

RECOMMENDED ACTION

1. _____ Move some of the sign usage phones and trunks out of loop(s) 8, 11 and 12 to lower usage loops (Ø,1,3), to reduce blockage.
2. _____ Add more equipment to balance out the system.
3. _____ Remove shelves from the high-usage loops.
4. _____ No action required.

3. Place a check mark by the action(s) you would take to resolve the problem(s) found in TFSØØ2.

RECOMMENDED ACTION

1. _____ Remove excess DTRs.
2. _____ Install additional DTRs.
3. _____ Reduce blockage in the system before taking further action.
4. _____ Add another TDS loop.

4. Place a check mark by the action(s) you would take to resolve the problem(s) found in TFSØØ3.

RECOMMENDED ACTION

1. _____ Install additional DTR's
2. _____ Have users hang up and try again if they don't receive dial tone.
3. _____ Classify all DID and tie trunks as dial pulse (DIP) instead of Digitone (DTN).
4. _____ No action required.

5. Place a check mark by the action(s) you would take to resolve the problem(s) found in TFSØØ4.

RECOMMENDED ACTION

1. _____ No action required.
2. _____ Upgrade the CPU to a faster processor.
3. _____ Have the users talk longer on each call and make fewer calls.
4. _____ Classify all stations as low priority, but all trunks as high priority.

6. Place a check mark by the action(s) you would take to resolve the problem(s) found in TFS007.

RECOMMENDED ACTION

1. _____ Add another network group.
2. _____ Reduce junctor blockage by rebalancing traffic on high-usage loops in network groups 0 and 2.
3. _____ Put stations with the same community of interest on separate loops in network groups 1 and 3.
4. _____ Have users in network groups 0 and 1 make fewer calls.

7. Place a check mark by the action(s) you would take to resolve the problem(s) found in TFC004.

RECOMMENDED ACTION

1. _____ Install DID service.
2. _____ Add another console.
3. _____ No action required.
4. _____ Replace the attendants.

8. Place a check mark by the action(s) you would take to resolve the problem(s) found in TFC002.

RECOMMENDED ACTION

1. _____ Reduce the amount of time spent on outgoing WATS calls.
2. _____ Redistribute high-usage trunks evenly over the loops.
3. _____ Add more trunks to routes 1 and 7.
4. _____ No action required.

PART 2

*** ANSWERS ***

1. Place a check mark by the action(s) you would take to resolve the problems in TFS411 and TFS412.

RECOMMENDED ACTION

1. __X__ Verify that all trunks are in good working order.
2. _____ Occassionally allow the system to complete audits in order to clear time slots that might be hung up.
3. _____ Reprimand the users with excessive conversation time.
4. _____ Add the CCS for each long connection back into the traffic reports.

2. Place a check mark by the action(s) you would take to resolve the problem(s) found in TFSØØ1.

RECOMMENDED ACTION

1. __X__ Move some of the high usage phones and trunks out of loop(s) 8, 11 and 12 to lower usage loops (Ø,1,3), to reduce blockage.
2. _____ Add more equipment to balance out the system.
3. _____ Remove shelves from the high-usage loops.
4. _____ No action required.

3. Place a check mark by the action(s) you would take to resolve the problem(s) found in TFSØØ2.

RECOMMENDED ACTION

1. _____ Remove excess DTRs.

2. _____ Install additional DTRs.

3. __X__ Reduce blockage in the system before taking further action.

4. _____ Add another TDS loop.

4. Place a check mark by the action(s) you would take to resolve the problem(s) found in TFSØØ3.

RECOMMENDED ACTION

1. _____ Install additional DTR's.

2. _____ Have users hang up and try again if they don't receive dial tone.

3. _____ Classify all DID and tie trunks as dial pulse (DIP) instead of Digitone (DTN).

4. __X__ No action required.

5. Place a check mark by the action(s) you would take to resolve the problem(s) found in TFSØØ4.

RECOMMENDED ACTION

1. __X__ No action required.

2. _____ Upgrade the CPU to a faster processor.

3. _____ Have the users talk longer on each call and make fewer calls.

4. _____ Classify all stations as low priority, but all trunks as high priority.

6. Place a check mark by the action(s) you would take to resolve the problem(s) found in TFSØØ7.

RECOMMENDED ACTION

1. _____ Add another network group.
2. __X__ Reduce junctor blockage by rebalancing traffic on high-usage loops in network groups Ø and 2.
3. _____ Put stations with the same community of interest on separate loops in network groups 1 and 3.
4. _____ Have users in network groups Ø and 1 make fewer calls.

7. Place a check mark by the action(s) you would take to resolve the problem(s) found in TFCØØ4.

RECOMMENDED ACTION

1. _____ Install DID service.
2. _____ Add another console.
3. __X__ No action required.
4. _____ Replace the attendants.

8. Place a check mark by the action(s) you would take to resolve the problem(s) found in TFCØØ2.

RECOMMENDED ACTION

1. _____ Reduce the amount of time spent on outgoing WATS calls.
2. _____ Redistribute high-usage trunks evenly over the loops.
3. __X__ Add more trunks to routes 1 and 7.
4. _____ No action required.

Congratulations! This concludes the self-paced traffic course. Do not be alarmed if you cannot recall everything that was presented. This course material and the NTP will serve as a good reference when you are looking at your traffic reports.