SWITCHING SYSTEMS MANAGEMENT
NO. 2 ELECTRONIC SWITCHING SYSTEMS
DIAL TONE SPEED (DTS)

CONTENTS PAGE

1. GENERAL

1.01 This section covers Dial Tone Speed (DTS) in the No. 2 Electronic Switching System (ESS). Because this is an important service and engineering item, the network administrator should be knowledgeable about the DTST program and the uses of data obtained from it.

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

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

1.04 Dial tone is considered to be delayed when it is not returned within 3 seconds after the customer goes off-hook. This component is expressed in terms of percentage of calls delayed over 3 seconds (% over 3 seconds) for which there are the following engineering service objectives:

DIAL TONE SPEED OVER 3 SECONDS	BUSY HOUR SERVICE OBJECTIVE
Average Busy Season	Not over 1.5%
Highest Annually Recurring Day	Not over 20.0%

1.05 When dial central office equipment is properly provided, dial tone delay generally does not constitute a problem. However, there may be times when unusual circumstances cause a serious deterioration of dial tone speed. This may occur other than during the usual busy hour of a business day and does require the immediate attention of the network administrator.

2. DESCRIPTION OF OPERATION

2.01 The No. 2 ESS uses a DTST program to measure the grade of dial tone service that its customer receives. This is done in other systems by measuring the time required to provide dial tone to system-originated test calls. These test calls are performed at a rate of one test every 4 seconds, or exactly 900 tests per hour. The ratio of test failures to total tests performed determines the dial tone grade of service. A DTST is considered to have failed if the time to provide dial tone exceeds 3 seconds. Five failures out of eight tests are an indication that the system is experiencing a traffic overload condition.

2.02 The DTST for the No. 2 ESS has several advantages over the foregoing testing methods. The No. 2 ESS DTST measures the grade of dial tone service to actual customer requests rather than system-originated test calls. This makes it a more accurate measurement of the dial tone grade of service. Since the system is not generating calls, but only monitoring system procedures for an actual call, no network or plant measurement counters are affected by the DTST. This type of DTST can measure dial tone delay to any class of service, to any type of line that needs dial tone, and from anywhere in the network.

2.03 The DTST program for the No. 2 ESS consists of three parts: the Recognition Time Test (RTT), the Connection Time Test (CTT), and the Elapsed Time Test (ETT).

A. Recognition Time Test (RTT)

2.04 The RTT measures the time it takes the system to recognize a line origination and to interpret that origination as a request for dial tone.

2.05 Every 4 seconds, the RTT program (a) records the time, (b) calls the RTT start time of an imaginary origination, and (c) sets a flag for the line scanning program which processes the results from the wired logic scanner. When the scanner completes scanning the last scanner group in the office, the scanner program detects the DTST flag and enters terminal equipment number zero in the line origination hopper. The input monitor processes the ***origination*** and the transient call record program translates this terminal equipment number as a DTST point. Control is passed to the DTST program which records the time of entry into the progress mark and calculates the elapsed time since the start of the test. This elapsed time is the Recognition Time (RT) of the system at this period in time. The RTT has thus measured the scan time and the input monitor processing time. During this procedure, a base level DTST program is monitoring the elapsed time of the RTT. When the elapsed time reaches 3 seconds and the DTST test point (terminal equipment number zero) has not reached the transient call record, the test is is stopped and the RT is set to 3 seconds. This insures that the DTST will fail at this period in time.

B. Connection Time Test (CTT)

2.06 The CTT measures the time required by the system to select and connect the necessary equipment to provide dial tone to a customer request. This is done by tracing an actual customer call through the call processing stages until the customer receives dial tone or until the elapsed time exceeds 3 seconds. The call to be monitored can be any legitimate request for dial tone. This includes calls from individual lines, 2-party lines, PBX, hotel/motel PBX, etc.

2.07 The call processing programs perform several functions in attempting to provide dial tone service to a customer request. After an originating translation is completed, the call processing program selects an Originating Register (OR), a Customer Digit Receiver (CDR), and a network path from the customer to the customer digit receiver; finally, the program loads a Peripheral Order Buffer (POB) with the necessary information for the network connection to be made. When the connection is made, dial tone has been provided to the customer and the system is ready to receive digits. The CTT program measures the time to perform these functions by monitoring the call until dial tone is returned to the subscriber. The elapsed time is the CT. If the customer has not received dial tone within 3 seconds, the program times out and sets the CTT to 3 seconds.

2.08 The call processing programs could fail at several locations. To insure a reliable CT measurement, the traced call is monitored for any of these features. If the call is returned to the line scanner because of a failure to select an originating register, a customer digit receiver, or a network path, the CT is set to 3 seconds. If an attempt to connect the customer digit receiver to the customer fails, the CT is set to the elapsed time from the start of the CTT to the time of the connection failure. This is done because 90 percent of the failures at this point are due to the customer's going on-hook before receiving dial tone. The system could have provided dial tone within the 3-second limit if the customer had stayed off-hook. Therefore, the test should be considered as a regular test and the elapsed time calculated.

C. Elapsed Time Test

2.09 Every RTT and CTT saves the test results in a DTST data area for later analysis. Three seconds after the start of a DTST, the ETT program sums the RT and CT and tests for a 3-second failure. Traffic counts are made of the total number of tests and the number of dial tone delays by customer receiver type (DP or TT).

2.10 Further details on DTST operations are covered in Program Description PD-2H116-01.

3. TRAFFIC MEASUREMENT SCHEDULES FOR DTST

3.01 These are four separate traffic measurement schedules which can be used for DTST results in the No. 2 ESS machine. These include Q, H, C, and LSM schedules. The Q schedule contains fixed measurements which cannot be changed. The LSM schedule contains the same measurements as the Q schedule, except that it contains measurements for the current quarter hour, whereas the Q schedule contains measurements for the previous quarter hour. The H and C schedules are variable in that the measurements desired in these schedules must be assigned in translations.

A. Q Schedule

3.02 The Q schedule consists of 14 load service measurements collected over the previous quarter hour. These include DTS tests, line and trunk originations, incoming call measurements, and four counts of central processor and program activity.

3.03 The Q schedule will be printed each 15 minutes on a clock quarter hour if scheduled in the traffic work table or if one of the following conditions exists:

(a) The number of DTSTs during the last quarter hour was not equal to 225.

(b) The number of DTST failures in the last quarter hour exceeded 4.

(c) The system is in (or indicates that it should be implementing) dynamic service protection.

(d) The system is in an overload condition.

3.04 In addition to the above conditions, the Q schedule registers will be printed whenever transient call store records are cleared and reinitialized. This print, identified as Load Service Measurement (LSM), will contain data collected over the current quarter hour to the time of the printout.

3.05 A description of the Q and LSM measurements which relate to DTS may be found in Table A.

B. H and C Schedules

3.06 Measurements on the H and C schedules are collected continuously. They are recycled to zero as the measurements are printed in response to a scheduled print request for the appropriate schedule. A manual request to print the schedule will not zero the registers. Thus, to obtain

measurements for a given hour, a print request must be scheduled in the traffic work table for the beginning and the end of the collection period. The printout occurring at the end of the collection period, for example, then contains exactly one hour of data. By proper entry into the traffic work table, the H and (or) C schedules can be collected over any multiple of 15 minutes up to a full week. Since the H schedule is normally the office busy hour schedule, three entries (HA, HB, and HC) are provided in the traffic work table for scheduling the printing of the H schedule. Only one entry is provided for the C schedule. The measurements on the H and C schedules are separated into eight sections. Four of these sections can appear on either schedule. Items printed on the C and H schedules are specified by the operating company. The Office Totals section shows the DTST results.

3.07 Schedule C is an hourly schedule of measurements that will normally be made throughout the day. Each measurement period during the day must start at the same quarter hour. This would include various trunk group busy hours.

3.08 Schedule H differs from Schedule C in that hourly counts can be scheduled for one, two, and three different collection periods per day and for as many hours as desired per period. These collection periods may be scheduled for any nonoverlapping quarter hour. For example, (a) the first period might be collected on the clock hour, as from 9 AM to 11 AM; (b) the second period might be collected on the half hour, as from 11:30 PM to 12:30 PM; and (c) the third period might be collected on the three-quarter hour, as from 2:45 PM to 3:45 PM. Only one pattern of hours can be specified for each collection period. This schedule is usually used for component busy hour engineered equipment.

3.09 The measurement schedules may be assigned or canceled during appropriate inputted messages to the system via the teletypewriter. No single measurement can simultaneously appear on both schedules.

3.10 A description of the H- and C-schedule measurements which relate to DTS may be found in Table B.

3.11 For information on scheduling measurements and printouts, refer to Bell System Practices Section 232-120-301 and the Translation Guide, TG-2H, Division 4.

4. DIAL TONE SPEED MEASUREMENT—DAYS

Days to be Included

4.01 Valid DTS data for five business days each week (generally Monday through Friday) should be included in the DTS component of the Dial Line Index. In some locations, Saturday may be one of the busy days. Saturday may be used in place of a normal business day provided it is consistently one of the five high days.

4.02 All business days of the month are to be reported and included in the Dial Line Index, regardless of the service conditions. Such conditions may exist due to civil disturbances, curfews, storms, floods, impaired dial facilities, Western Electric installation activities, etc.

Days to be Excluded

4.03 The days to be excluded are those whenever the DTS program fails to function properly during the busy hour; for example, whenever the call store memory is temporarily erased.

4.04 Holidays celebrated on a nationwide basis, in general, do not carry traffic representative of the average business day and may be excluded from the Dial Line Index. For example, Christmas Eve evening data is highly unrepresentative and would not be included. Special days proclaimed as a holiday may be excluded only if they are observed as a holiday on a nationwide basis. Some holidays (such as Lincoln's Birthday, Veterans Day, Columbus Day, and Good Friday) may well be equal to or greater than a representative business day. If one of these holidays falls on a weekday or is celebrated on a Monday or Friday, these days may be included in the Dial Line Index, if locally desired. Refer to Traffic Service Observing Practices Division F, Section 2B for more information.

5. DIAL TONE SPEED BUSY HOUR SELECTION

5.01 Dial tone delay data must be measured during the actual busy hour to measure dial service quality accurately. The Network Administration group must determine that the busy hour has been correctly established. They must also be alert for

shifts in the busy hour due to changes in calling characteristics.

5.02 For purposes of computing the DTS component, the ***busy hour*** is defined as that time-consistent hour having the greatest average business day percentage dial tone delay over 3 seconds. The busy hour may start on the hour, half hour, or quarter hour (10 AM to 11 AM, 10:30 AM to 11:30 AM, or 9:45 AM to 10:45 AM, etc).

5.03 Each year, prior to the busy season period, the busy hour is selected from DTS data obtained during the previous busy season period. The busy hour selected from these data is retained for the duration of the current busy season period unless results show another time-consistent clock hour having an average business day percentage dial tone delay over 3 seconds that exceeds the designated busy hour results by at least 0.5 percent for each of two consecutive service observing months. If this occurs, the hour with the higher percentage dial tone delay over 3 seconds is designated as the new busy hour commencing no later than the second month; it is generally retained for the remainder of that busy season period.

Example:

	Dial Tone Delay Over 3 Seconds	
	December	January
9 AM to 10 AM (Previously designated BH)	1.1%	2.0%
7:30 PM to 8:30 PM	1.6%	2.7%
Difference	0.5%	0.7%

(Starting in January, report 7:30 PM to 8:30 PM.)

(a) Whenever the busy hour is not readily apparent or a shift in busy hour is expected, data for the 2 or 3 busiest or pertinent hours should be accumulated each day during the current busy season to accurately forecast the hour to be used for the next busy season. A study of half hours for one or two representative weeks should be made to determine these 2 or 3 hours. Ordinarily the study would be made early in the busy season period.

(1) When a pronounced busy hour is indicated and data are accumulated for a single hour, a second study is made during a later month when traffic loads normally are higher. If at that time several hours are close, studies need to be continued for a longer period, as in the preceding paragraph.

(b) A record should be made by the following notations on Form E-4372 (Part 8, Fig. 2) when a service observing busy hour is changed:

(1) Show the clock period and service results for the previously designated busy hour.

(2) Indicate dates of verification studies.

(c) It is highly important that official DTS measurement results not be shifted to a new hour without appropriate ***validated*** data.

(1) Recognition should be given to maintenance outages, abnormal equipment operating conditions affecting service results; to area transfers, new tariff offerings, or other factors affecting traffic characteristics; and to pertinent Customer trouble reports.

(2) When the hour of highest dial tone delay does not substantially coincide with the hour of maximum CCS usage for that type of equipment, the reason(s) should be investigated and documented.

(d) The selection of the service observing busy hour by the Network Administration group should be coordinated with the Traffic Facilities and Network Maintenance forces.

5.04 In a No. 2 ESS office which is 100 percent dial pulse or 100 percent TOUCH-TONE®, the DTS busy hour is selected for the entity as a whole. A No. 2 ESS office with both dial pulse and TOUCH-TONE receivers may have a separate DTS busy hour for each.

6. METHOD OF OBTAINING DAILY WEIGHTED PERCENTAGE DIAL TONE SPEED FOR AN ENTITY

6.01 The weighting factors developed each month for computing the daily weighted DTS results are based on originating calls taken during the busy hour for two to five days each month. If practical, these weighting factors may be used for weighting the current service observing month's DTS results; however, the factors may be used for weighting the dial tone speed results in the

month immediately following the study. Once it has been determined how the factors are to be applied (current service observing month or the first month following), the procedure should remain consistent. Factors shall not be used, in any case, for computing DTS results beyond the first month following the current service observing month.

6.02 Separate DTS results are to be obtained by the type of customer digit receiver, and results are weighted daily. If an office is 100 percent TOUCH-TONE or dial pulse, weighting is not required.

(a) ***Weighting Factors:*** The weight assigned to dial pulse and TOUCH-TONE service is based on the total receiver peg count. It is the percentage of each type of the total receiver peg count of the entity being weighted.

(b) ***Examples*** (No. 2 Entity-Dial Pulse and TOUCH-TONE Receiver):

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(1) Determine the weighting factors as follows:

Type of Receiver	Receiver Busy Hour		% of Total (Shown as Factor)
	Time	Peg Count	
DP	9:15 AM — 10:15 AM	3592	0.573
TT	10:45 AM — 11:45 AM	2674	0.427
Total		6266	1.000

(2) Calculate the weighted percentage DTS by the type of receiver as follows:

Type of Receiver	No. of Studies (Receiver Busy Hour)	(1) % DTS Over 3 Seconds (Receiver Busy Hour)	(2) Factor	(1X2) Weighted % DTS
DP	726	1.3	0.573	0.74
TT	532	0.9	0.427	0.38
Total	1258		1.000	1.10

7. COMPUTING DIAL TONE SPEED RESULTS AT ENTITY LEVEL

7.01 ***For 22 Business Days Measured in Observing Month:***

Step 1: Separately, for each business day measured, read the entity weighted busy hour percentage dial tone delay over 3 seconds directly into the Dial Tone Speed—BH Index Table (Fig. 1) to determine the dial tone speed index points earned for each day. Express the result to two decimal places.

Step 2: Total the daily index points earned (as obtained in Step 1) for the 22 days measured. Express the result to one decimal place. The sum of the daily points earned is to be used in computing the entity Dial Line Index.

7.02 ***For 15 through 21, 23, or 24 Business Days Measured in Observing Month:*** The Dial Tone Speed Index Table is based on daily points obtainable for a 22-business-day month. This means that if DTS results are available for 15 through 21 days, the points obtainable for the

month will be something less than the points allocated to the DTS component. Conversely, if 23 or 24 days are measured, the points obtainable would exceed the points allotted. In these cases, a DTS adjustment factor is applied to the sum of the daily points earned for the measured days to increase (or decrease) the total points earned to the equivalent of the maximum monthly points possible.

Step 1: Determine the sum of the daily points earned for the number of days measured, reported to two decimal places.

Step 2: Multiply the sum of the total points earned by the appropriate DTS adjustment factor. Express the result as a percentage, rounded to one decimal place.

Note: The earned points reported should never exceed the maximum points allocated to the DTS component.

7.03 ***For Less Than 15 Days Measured in Observing Month:*** If less than 15 days are measured in any month, the DTS component is to be omitted from the Dial Line Index, and official dial line results.

7.04 ***Dial Tone Speed Component Index:*** The Dial Tone Speed Component Index is obtained by dividing the total points earned for the month by the maximum points available and multiplying the result by 100.

8. PREPARATION OF FORM E-4372—BUSY HOUR DIAL TONE SPEED

A. General

8.01 Form E-4372, ***Busy Hour Dial Tone Speed,*** is provided for computing daily busy hour DTS results for an entity (Fig. 2). For local reproduction purposes, a full size form is provided on an unnumbered page at the end of this section.

8.02 The preparation of Form E-4372 will generally be the responsibility of the Network Administration group. A duplicate copy shall be forwarded to the service observing group.

8.03 The term ***item*** as used in the subsequent instructions refers to the column number, or block number, of the corresponding item on the ***Busy Hour Dial Tone Speed*** Form E-4372. Only items which relate to the No. 2 ESS will be discussed herein.

B. Instructions for Use of Form E-4372

8.04 ***Items — Top of Form E-4372:*** Space has been provided for entering the following information:

(a) ***Report Month:*** Enter the service observing month and year for which the DTS data is reported.

(b) ***Page — of —:*** Enter the page number and the total number of pages for the office.

(c) ***Entity:*** Identify the entity for which DTS data is reported.

(d) ***Type of Central Office Equipment:*** Enter the type of dial central office equipment provided the entity. For No. 2 ESS, the term DTST Program will suffice.

8.05 ***Item 1 — Date Business Days:*** Enter the date of each business day. Days on which DTS measurements are to be included in the Dial Line Index are covered in 4.01 and 4.02; days to be excluded are covered in 4.03 and 4.04.

8.06 ***Items 2 through 9:*** Form E-4372 is designed for entering DTS data for a single entity. The form provides for reporting a maximum of four separately measured classes of service. However, for the No. 2 ESS, only two types of service (DP and TT) are available.

(a) ***Class and Type:*** Space is provided for identifying each measured class and type.

(b) ***Time:*** Enter the DTS busy hour for each type, whether the selected busy hour is the same or a different hour for each type. Rules for determining the DTS busy hour for each type of dial central office equipment are outlined in Part 5.

(c) ***Factor:*** Enter the weighting factor for each type as determined in item 24.

8.07 ***Items 2 and 6 — Number of Tests:*** Enter the number of DTS tests obtained

during the DTS busy hour separately for each type. This is the number of registrations recorded on the test register of the traffic schedule.

8.08 ***Items 3 and 7 — Number Over 3 Seconds:***

(a) Enter for each day the number of delays registered during the DTS busy hour separately for each type. This is the number of registrations recorded on the delay registers of the traffic schedule.

(b) Enter the code NA in this item whenever DTS delay registrations are not available.

8.09 ***Items 4 and 8 — Percentage Over 3 Seconds:*** Separately for each type, calculate the delay registrations percentage of the total number of tests made during the DTS busy hour (item 3 divided by item 2; and 7 divided by 6). Multiply the quotient by 100 and express the result to one decimal place.

(a) Enter the code NA in this item whenever a code NA has been entered under ***No. Tests*** and/or ***No. Over 3 Seconds*** for a particular type.

(b) Line Designated ***Total***: Total the percentage figures separately for each type for the month.

(c) Line Designated ***Average***: Divide the ***Total*** as determined in (b) by the number of days used in arriving at the total.

8.10 ***Items 5 and 9 — Weighted Percentage Over 3 Seconds:*** Enter for each day the weighted percentage DTS over 3 seconds for each type. Multiply the ***% Over 3 Seconds*** in items 4 and 8 by the corresponding weighting factors. Express the result to one decimal place.

(a) Enter the code NA in this item whenever the code NA has been entered in the item ***% Over 3 Seconds*** for a particular type.

(b) Enter the code NA in this item whenever a check mark (✓) has been entered in item 19.

8.11 ***Item 18 — Number of Tests — Total Class Busy Hours:***

(a) Enter for each day the total number of DTS tests. This is the sum of entries recorded in items 2 and 6.

(b) Enter the code NA in item 18 whenever DTS results are not available for one (or more) type, as indicated by the code NA in any of items 2 through 9.

8.12 ***Item 20 — Daily Weighted Percent Over 3 Seconds — Total Class Busy Hours:***

(a) Enter for each day, the daily weighted percent DTS for the entire entity. Report the result to one decimal place. This is the sum of entries recorded in items 5 and 9.

(b) Enter the code NA in item 20 whenever a check mark (✓) has been entered in item 19.

8.13 ***Item 21 — Accumulated Weighted Percentage Over 3 Seconds — Total Class Busy Hours:*** For each day, enter the accumulated weighted percentage DTS over 3 seconds. Add the ***Daily Wtd. % Over 3 Seconds*** in item 20 to the previous day's accumulated weighted percentage over 3 seconds.

(a) Line Designated ***Total***: Enter the same figures as shown for the last day reported in item 21.

(b) Line Designated ***Average***: Divide the ***Total*** as determined in (a) by the number of days used in arriving at the total.

8.14 ***Items 22 and 23 — Points Earned — Total Class Busy Hours:*** Items 22 and 23 are used for entering ***daily*** and ***accumulated daily*** index points earned for the DTS component of the Dial Line Index. These items are used for ESS, crossbar and panel entities, and the TOUCH-TONE portion of step-by-step entities partially equipped with common equipment.

(a) ***Item 22 — Points Earned — Daily:*** For each measured day, read the ***Daily WTD. % Over 3 Seconds*** in item 20 directly in the ***Performance*** column of the

"Dial Tone Speed — BH" table (labeled Crossbar — ESS — Panel SXS TT) of the Dial Line Index Table (Fig. 1). Enter the corresponding points earned in item 22. Report the result to two decimal places.

(b) ***Item 23 — Points Earned — Cumulative:*** For each measured day, enter the accumulated DTS index points earned. Add the ***daily points earned*** in item 22 to the previous day's accumulated DTS points earned. Express the result to two decimal places.

(1) Line Designated ***Total:*** Enter the accumulated index points earned for all days reported in the total month. This is the same figure as shown for the last day, reported in item 23. Report the result to two decimal places. Enter the code NA whenever less than 15 days are measured in the observing month.

8.15 ***Item 24 — Weighting Factors:*** Weighting factors are used to weight DTS results for an entity having more than one type. Compute a weighting factor for each ***type*** separately measured for an entity.

(a) ***Type:*** Identify each separately measured ***type*** in the entity. These should correspond with the headings shown in the ***type*** at the top of the form.

(b) ***Average Type Busy Hour Peg Count:*** Enter the average type of busy hour peg count (DP-TT, DP) registrations corresponding to the type entered in (a). These counts should be based on studies taken for at least two to five business days each month in the class busy hour. Enter the total number of ***average registrations*** for the entity on the line designated ***Total.***

(c) ***Factor:*** Compute the weighting factor for each type. Divide the ***registrations*** of each type by the total of the class busy hour registrations for the entity. Report the weighting factor to three decimal places. The sum of the weighting factor must always equal 1.000.

8.16 ***Item 26 — Adjustment Factor — Total Month:*** Enter the ***Adjustment Factor*** corresponding to the total number of days that DTS data are reported and indexed for the total service observing month. This factor is obtained from the Dial Line Index Table.

8.17 ***Item 27 — Total Adjusted Index Points Earned — Total Month:*** Multiply the ***Points Earned Cumulative*** in item 23, line designated ***Total,*** by the conversion factor in item 26. Enter the result in item 27, reported to one decimal place.

8.18 ***Item 28 — Component Index — Total Month:*** Divide the ***Total Adjusted Index Points Earned*** reported in item 27 by the maximum DTS points attainable. Express the result as a whole number.

Note: Round the component index to the next higher number whenever the fraction is 0.5 or larger. For example, 97.49 is to be reported 97; 97.50 is to be reported 98.

8.19 ***Item 29 Weakspot (✓) — Total Month:*** Enter a check mark (✓) in item 29 whenever the Dial Tone Speed Component Index for the Entity, as reported in item 28, is 89 or lower.

8.20 ***Item 31 — Notes:*** Space is provided at the bottom of the form for entering a written explanation of any pertinent service item or unusual occurrence.

9. USE OF DTS RESULTS

A. Monitor Service Results

9.01 The DTST is one of the service indicators by which the network administrator may determine the grade of service the customer is receiving. It also acts as an indicator as to how well the office is functioning during an overload. Close analysis of the traffic schedules with DTS will enable the network administrator to closely monitor dial tone service results.

9.02 Dial tone overloads are defined from two points: an equipment overload and a network overload. An equipment overload occurs when the usage of the customer dial pulse receiver exceeds engineered capacity or designed capacity. A network overload occurs when the load is so heavy that service deteriorates in the form of excessive dial tone delays and/or matching loss. Since service is a major concern, a network administrator analyzes

the hour in which the customer is receiving the poorest service.

B. Criteria for Program to Start Dynamic Service Protection (DSP)

9.03 Dial tone delay is one measure of dial central office performance. The number of dial tone delays is one of the criteria used in determining the implementation of dynamic service protection (DSP). DSP is a feature designed to provide preferential service to certain lines during extended overloads on the switching system by preferentially giving dial tone access to those lines during high load conditions.

9.04 Unless DSP is denied, the system automatically administers DSP when an overload condition exists. An overload is determined by dial tone speed test (DTSTs) which are performed every 4 seconds. Every 100 seconds the traffic program checks the DTST for the number of failures in the last 16 tests performed. A DTST failure results when a random customer line selected by the traffic program for the DTST has failed to receive dial tone within 3 seconds. There are three conditions which determine the actions taken by the system as a result of these tests.

(a) If the number of failures is less than seven, the DTST program will do one of two things. If DSP ***is not*** functioning at this time, the program does nothing. If DSP ***is*** functioning, the program will then stop DSP and set appropriate bits to point a DSP NORMAL message on the Network Administration (traffic) and Maintenance TTYs. The program will also extinguish the DSP lamp (amber) on the maintenance center control and display panel, and a spurt minor alarm will be given.

(b) If the number of failures is seven, eight, or nine, the program will not change the status of DSP. If DSP ***is*** functioning, it continues; if it ***is not*** functioning, the program does not activate it.

(c) If the number of failures is greater than nine, the program will attempt to activate DSP. If DSP ***is*** already operative, no further action is taken. If DSP ***is not*** functioning, a check is made to determine if DSP has been allowed. If it is denied, a DSP DENIED message is printed on the Network Administration and Maintenance TTYs and the major alarm is activated. If DSP is allowed and not previously active, the program will activate DSP, light the DSP lamp (amber) on the maintenance panel, activate the major alarm, and output a DSP ACTIVE message on the Network Administration and Maintenance TTYs.

9.05 The DSP check is made continuously 24 hours per day and cannot be turned off. However, the telephone company has the capability to either allow or deny the system to activate DSP. For further information on DSP, refer to DFMP, Division H, Section 10d(1).

10. SUPPLEMENTARY INFORMATION

10.01 Additional information on the No. 2 ESS DTS can be found in the following documents:

(a) No. 2 ESS Translation Guide, TG-2H, Division 10

(b) Input Manual, IM-2H200-01

(c) Output Manual, OH-2H200-01

(d) Bell System Practices, Section 232-120-301, Traffic and Plant Measurements

(e) Dial Facilities Management Practices

(1) Division H, Section 10d(1), Operational Features, Dynamic Service Protection

(2) Division H, Section 10i, Traffic Measurements

(f) Traffic Service Observing Practices, Division F, Section 2B

(g) Program Description PD-2H116-01

DIAL LINE INDEX TABLE

Comp. Index	Equipment Irregularities				NC or Reorder				Dial Tone Speed – BH				Incoming Match. Loss – BH		Comp. Index
	Crossbar ESS		Step-by-Step Panel		Crossbar ESS		Step-by-Step Panel		Crossbar – ESS Panel – SxS (TT)		Step-by-Step Dial Pulse		Crossbar ESS		
	Perf.	Points	Perf.	Points	Perf.	Points	Perf.	Points	Perf.	Points	Perf.	Points	Perf.	Points	
100	.0	25.0	.0	30.0	.0– .2	25.0	.0– .3	35.0	.0–1.1	1.59	.0– 1.2	35.0	.0– 1.7	15.0	100
99	.1	24.8	.1	29.7	.3– .4	24.8	.4– .5	34.7	1.2–1.4	1.57	1.3– 1.4	34.7	1.8– 1.9	14.9	99
98	.2	24.5	.2	29.4	.5– .6	24.5	.6	34.3	1.5–1.6	1.56	1.5– 1.6	34.3	2.0– 2.1	14.7	98
97	.3	24.3	.3	29.1	.7	24.3	.7	34.0	1.7–1.8	1.54	1.7	34.0	2.2	14.6	97
96	.4	24.0	.4	28.8	.8	24.0	.8	33.6	1.9–2.0	1.53	1.8	33.6	2.3	14.4	96
95	.5	23.8	.5	28.5	.9	23.8	.9	33.3	2.1	1.51	1.9	33.3	2.4	14.3	95
94	.6	23.5	.6	28.2	1.0	23.5	1.0	32.9	2.2	1.49	2.0	32.9	2.5	14.1	94
93	.7	23.3	.7	27.9	–	–	–	–	2.3	1.48	2.1	32.6	2.6	14.0	93
92	–	–	–	–	1.1	23.0	1.1	32.2	2.4	1.46	2.2	32.2	2.7	13.8	92
91	.8	22.8	.8	27.3	–	–	–	–	2.5	1.45	–	–	–	–	91
90	.9	22.5	.9	27.0	1.2	22.5	1.2	31.5	2.6	1.43	2.3	31.5	2.8	13.5	90
88	1.0	22.0	1.0	26.4	1.3	22.0	1.3	30.8	2.7–3.0	1.40	2.4– 2.5	30.8	2.9– 3.0	13.2	88
85	1.1	21.3	1.1	25.5	1.4	21.3	1.4	29.8	3.1–3.4	1.35	2.6– 2.7	29.8	3.1– 3.2	12.8	85
82	1.2	20.5	1.2	24.6	1.5–1.6	20.5	1.5–1.6	28.7	3.5–3.8	1.30	2.8– 2.9	28.7	3.3– 3.4	12.3	82
78	1.3	19.5	1.3	23.4	1.7	19.5	1.7	27.3	3.9–4.2	1.24	3.0– 3.2	27.3	3.5– 3.6	11.7	78
74	1.4	18.5	1.4	22.2	1.8	18.5	1.8	25.9	4.3–4.7	1.18	3.3– 3.6	25.9	3.7– 3.8	11.1	74
70	1.5	17.5	1.5	21.0	1.9	17.5	1.9	24.5	4.8–5.2	1.11	3.7– 4.0	24.5	3.9– 4.0	10.5	70
65	1.6	16.3	1.6	19.5	2.0	16.3	2.0	22.8	5.3–5.7	1.03	4.1– 4.5	22.8	4.1– 4.2	9.8	65
60	1.7	15.0	1.7	18.0	2.1	15.0	2.1	21.0	5.8–6.2	.95	4.6– 5.0	21.0	4.3– 4.5	9.0	60
55	1.8	13.8	1.8	16.5	2.2	13.8	2.2	19.3	6.3–6.8	.87	5.1– 6.0	19.3	4.6– 5.0	8.3	55
50	1.9	12.5	1.9	15.0	2.3–2.4	12.5	2.3–2.4	17.5	6.9–7.5	.80	6.1– 7.0	17.5	5.1– 6.0	7.5	50
40	2.0	10.0	2.0	12.0	2.5–2.6	10.0	2.5–2.6	14.0	7.6–8.4	.64	7.1– 9.0	14.0	6.1– 7.0	6.0	40
30	2.1–2.2	7.5	2.1–2.2	9.0	2.7–2.8	7.5	2.7–2.8	10.5	8.5–9.4	.48	9.1–12.0	10.5	7.1– 8.0	4.5	30
20	2.3–2.4	5.5	2.3–2.4	6.0	2.9–3.3	5.5	2.9–3.2	7.0	9.5–10.5	.32	12.1–16.0	7.0	8.1–10.0	3.0	20
10	2.5–3.4	2.5	2.5–3.4	3.0	3.4–4.1	2.5	3.3–4.1	3.5	10.6–15.0	.16	16.1–20.0	3.5	10.1–12.0	1.5	10
0	Over 3.4	0.0	Over 3.4	0.0	Over 4.1	0.0	Over 4.1	0.0	Over 15.0	.00	Over 20.0	0.0	Over 12.0	0.0	0

Index Conversion Factors

Max. Points Possible For Items Indexed	Conversion Factor
85	1.176
65	1.538
50	2.000

Dial Tone Speed-C.I. Crossbar-ESS-Panel

To determine the Dial Tone Speed component index for the month, divide the points earned by 35.0 and multiply by 100.

Crossbar-ESS-Panel-SXS TT DTS Adjustment Factors

24 DA.- .917	19 DA.-1.158
23 DA.- .957	18 DA.-1.222
22 DA.-1.000	17 DA.-1.294
21 DA.-1.048	16 DA.-1.375
20 DA.-1.100	15 DA.-1.467

Fig. 1—Dial Line Index Table (7.01 and 8.14[a])

Form E–4372 (5–73)
Printed in U.S.A.

REPORT MONTH _____ 19___ **BUSY HOUR DIAL TONE SPEED** PAGE _____ OF _____

ENTITY _____ TYPE OF C.O. EQUIPMENT _____ TYPE OF DTS EQUIPMENT _____

DP. TT

CLASS AND TYPE	TIME		FACTOR		TIME		FACTOR		TIME		FACTOR		TIME		FACTOR		TOTAL CLASS BUSY HOURS						ESS
DATE BUS. DAYS	NO. TESTS	NO. OVER 3''	% OVER 3''	WTD % OVER 3''	NO. TESTS	NO. OVER 3''	% OVER 3''	WTD % OVER 3''	NO. TESTS	NO. OVER 3''	% OVER 3''	WTD % OVER 3''	NO. TESTS	NO. OVER 3''	% OVER 3''	WTD % OVER 3''	NO. TESTS	UNUS-ABLE DAYS (√)	DAILY WTD % OVER 3''	ACCUM. WTD % OVER 3''	ESS–CROSSBAR PANEL–SXS TT POINTS EARNED DAILY	ESS–CROSSBAR PANEL–SXS TT POINTS EARNED CUM.	NO. BLOCKED DT BH
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	30
TOT.																							
AVG.																							

WEIGHTING FACTORS 24		
CLASS	AVG. CLASS BH PEG COUNT	FACTOR
DP		XX
TT		XX
TOTAL		1.000

CALCULATED DIAL TONE SPEED TESTS 25

NO. EXPECTED TESTS: _____

ALLOWABLE DEVIATION:

MAX: _____ MIN: _____

31 NOTES:

TOTAL MONTH

ADJUSTMENT FACTOR	26
TOTAL ADJ. INDEX POINTS EARNED	27
COMPONENT INDEX	28
WEAKSPOT (√)	29

IF MORE THAN ONE PAGE IS USED SHOW TOTALS ON THE LAST PAGE

Fig. 2—Example of Form E-4372, "Busy Hour Dial Tone Speed" (8.01)

TABLE A

DTST MEASUREMENTS Q AND LSM SCHEDULES

EXAMPLE PRINTOUTS

```
15    TI   PR  Q     MON  1-26   0945-01  312   554
                1      2    3      4    5      6    7   8   9   10
               11     12   13     14    0      0    0   0   0    0
      END   PR  TRF   MON  1-26   0945-09  312   554

58    TI   PR  LSM   MON  1-26   0958-16  312   554
                1      2    3      4    5      6    7   8   9   10
               11     12   13     14    0      0    0   0   0    0
      END   PR  TRF   MON  1-26   0958-34  312   554
```

REGISTER	DESCRIPTION	COMMENT
Q1, LSM1	DTSTs performed on DP receivers	The type of test is determined by the type of receiver required for the last call traced by the DTST program
Q2, LSM2	DTSTs performed on TT receivers	
Q3, LSM3	DTSTs performed on DP receivers	A failure is a DTST that was greater than 3 seconds
Q4, LSM4	DTSTs failures on TT receivers	
Q5, LSM5	Total line originations	Line originations are independent of digits dialed and do not include DTSTs
Q6, LSM6	Total originating calls	Line origination plus at least one dialed digit
Q7, LSM7	Total trunk originations	Includes bylink, one-way incoming, and 2-way trunks

Note: No hardware origination is involved in DTST; therefore, the number of DTSTs does not have to be subtracted from the traffic or plant originating counters. The DTST is strictly a software test which runs continuously and cannot be stopped.

TABLE B

DTST MEASUREMENTS H OR C SCHEDULE

EXAMPLE PRINTOUT

00	TI	PR	H	MON	1-26	1100-01	312	554					
	TRK		1	2		3	4	5	1	2	3	4	5
			1	2		3	4	5	1	2	3	4	5
			1	2		3	4	5	1	2	3	4	5
	SIM		1	2		3	4	5	1	2	3	4	5
			1	2		3	4	5	1	2	3	4	5
			1	2		3	4	5	1	2	3	4	5
	MLH		1	2		3	4	5	1	2	3	4	5
			1	2		3	4	5	1	2	3	4	5
	OFT		1	2		3	4	5	6	7	8	9	10
			11	12		13	14	15	16	17	18	19	20
			21	22		23	24	25	26	27	28	29	30
			31	32		33	34	35	36	37	38	39	40
			41	42		43	44	45	46	47	48	49	50
	BYL		0	1		2	3	4	5	6	7	8	9
			10	11		12	13	14	15	0	0	0	0
	PRC		0	1		2	3	4	5	6	7	8	9
			10	11		12	13	14	15	16	17	18	19
			20	21		22	24	24	25	26	27	28	29
			30	31		32	33	34	35	36	37	38	0
	JCT		1	2		0	0	0	0	0	0	0	0
	A		1	2		3	4	0	0	0	0	0	0
	B		1	2		3	4	5	6	0	0	0	0
	C		1	2		3	4	5	6	7	8	0	0
	CTX		1	2		3	4	5	6	7	8	9	10
			11	12		13	14	15	16	17	18	19	20
	CTX		1	2		3	4	5	6	7	8	9	10
			11	12		13	14	15	16	17	18	19	20
END	PR		TRF	MON	1-26	1102-05	312	554					

OFFICE TOTAL MEASUREMENTS		
		OFT1 through OFT10 are updated every 15 minutes by the Q schedule registers.
OFT01	DP DTSTs performed	The register pegged is determined by the type of receiver required by the line translation for the last call traced by the DTST program, not the type of receiver actually used; ie, in an office with 100% TT receiver, a DP line will peg a DP count, even though a TT receiver was used (see *Note*).
OFT02	TT DTSTs performed	
OFT03	DP DTST failures	A failure is a DTST that was greater than 3 seconds (see *Note).*
OFT04	TT DTST failures	

Note: No hardware origination is involved in the DTSTs; therefore, the number of DTSTs does not have to be substracted from the traffic or plant originating counters. The DTST is strictly a software test which runs continuously and cannot be stopped.

REPORT MONTH_____ 19_____ **BUSY HOUR DIAL TONE SPEED** PAGE_____ OF_____

ENTITY_____ TYPE OF C.O. EQUIPMENT_____ TYPE OF DTS EQUIPMENT _____

CLASS AND TYPE	TIME		FACTOR		TIME		FACTOR		TIME		FACTOR		TIME		FACTOR		TOTAL CLASS BUSY HOURS						ESS
DATE BUS. DAYS	NO. TESTS	NO. OVER 3''	% OVER 3''	WTD % OVER 3''	NO. TESTS	NO. OVER 3''	% OVER 3''	WTD % OVER 3''	NO. TESTS	NO. OVER 3''	% OVER 3''	WTD % OVER 3''	NO. TESTS	NO. OVER 3''	% OVER 3''	WTD % OVER 3''	NO. TESTS	UNUS-ABLE DAYS (√)	DAILY WTD % OVER 3''	ACCUM. WTD % OVER 3''	ESS-CROSSBAR PANEL-SXS TT POINTS EARNED DAILY	ESS-CROSSBAR PANEL-SXS TT POINTS EARNED CUM.	NO. BLOCKED DT BH
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	30
TOT.																							
AVG.																							

WEIGHTING FACTORS 24

CLASS	AVG. CLASS BH PEG COUNT	FACTOR
TOTAL		1.000

CALCULATED DIAL TONE SPEED TESTS 25

NO. EXPECTED TESTS:_____

ALLOWABLE DEVIATION:

MAX:_____ MIN:_____

31 NOTES:

TOTAL MONTH

ADJUSTMENT FACTOR	26
TOTAL ADJ. INDEX POINTS EARNED	27
COMPONENT INDEX	28
WEAKSPOT (√)	29

IF MORE THAN ONE PAGE IS USED SHOW TOTALS ON THE LAST PAGE