

NO. 5 CROSSBAR PRIVATE NETWORK SWITCHING PERFORMANCE MEASUREMENT PLAN

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NOTICE

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1. GENERAL

1.01 This Plan addresses switching performance measurements for No. 5 Crossbar Systems. It is limited to those offices dedicated to private switched networks (CCSA, AUTOVON).

1.02 The measured components and the performance indicators included in this Plan are those for which network maintenance, administrative, and engineering forces are primarily responsible. These components and indicators are sufficiently sensitive to reflect changes in switching performance quality caused by maintenance, administration, and provisioning conditions.

1.03 Generally, the switching performance of a particular office is related to how well the network maintenance, network administration, and network design team is managed and how effectively they work together. One would expect that periodic short term situations may occur due to conditions beyond the control of the team (e.g., extreme weather conditions, other acts of nature, severe equipment or facility failures external to the particular switching machine) that would adversely affect service. The continuing performance levels are the responsibility of the team.

1.04 The weighting of the components and categories is necessarily judgmental; however, the following were the considerations applied:

- (a) Impact of failure on customer,
- (b) Relative magnitude of investment in the portion of switching machine being measured,
- (c) Relative magnitude of effort to maintain and administer,
- (d) Impact on revenue.

1.05 Since the level of performance of the marker group is the result of equipment maintenance, equipment administration, and provisioning, the results under the Plan are to a great extent a consequence of the management effort. The degree of cooperation, joint effort, and acceptance of joint responsibility will be evident in the result obtained.

2. OUTLINE

2.01 This plan is structured to measure overall CCSA switching performance as it affects the customer. Therefore, the most pertinent avail-

able aspects have been included as measured components are then combined into three categories. The three categories combine to form the switching index.

2.02 The three categories are:

- (a) Machine Access
- (b) Machine Switching
- (c) Billing

The components of (a), (b), and (c) are technical measurements designed to measure different aspects of service within the broad category.

2.03 In addition to the measured components upon which the index is based, the Plan also calls for recording certain measurement items entitled "performance indicators". These performance indicators are included for one or more of the following four reasons:

- (a) Indicators that assist in analyzing the cause of poor service as shown by a measurement component.
- (b) Indicators that measure aspects of service failure beyond the scope of the measurement components.
- (c) Indicators which are not universally available in all entities or in all data gathering systems, but which may in the future with increasing availability become measured components.
- (d) Indicators which identify potential service failure.

2.04 The Plan includes two types of results reports; a detailed results report for use as the marker group report; and a results summary for use of upper levels of management. It is not the intent of this Plan to designate at which level of management the detailed results report should stop. One would expect that severity of service problems and styles of management would decide. The detailed report is designed for single office (marker group) reporting and should be limited to that use. The management summary is to be used to consolidate two or more single entity reports to any management level desired and for any time period of one to twelve months. In addition to the above mentioned reports, the "SSS" (Special Service System) will be utilized to display switching results by CCSA network based on "C" record inputs.

2.05 The summary report and the "SSS" reports employ a results banding technique in which performance levels are grouped into four bands for each component of the Plan and for the overall index.

Meaning

Band A-98 — 100 Excellent (or super excellent) performance attainable only by very good work under very favorable conditions. For certain components this may be at or close to uneconomical operating levels.

Band B-96 — 97.9 Fully satisfactory and economical performance range.

Band C-90 — 95.9 Fair to mediocre performance.

Band D-Less than 90 Ranging from weak to definitely unsatisfactory performance.

The summary form provides for the entry of trend data for Band D in terms of actual results for a single office, or the number and percent of total office within the echelon which have experienced Band D performance within each component and/or the overall index.

2.06 The two page summary report also provides upper management with two additional summaries:

(a) The number of marker groups which are beyond the threshold level in each performance indicator.

(b) A listing of offices experiencing Band D during the period covered by the report. A specific entry is required for each Band D office for each monthly report period. That entry will show the name of the office, the number of times in the previous twelve monthly report periods that this office has experienced Band D performance, and the index level of each Band D component for the report period.

3. LIMITATIONS

3.01 The Plan is fundamental in nature and intended to provide a general measurement of improving or deteriorating service. It is not intended to be and should not be regarded as a personnel evaluation plan or a panacea for improving performance in switching environments. Proper application of this Plan will assist management in identifying engineering, administration, and maintenance problems. Correction of these

problems can only be accomplished through intelligent management action.

3.02 Although some machine switching and billing functions are included in the component descriptions, there is no intent to provide complete descriptions of No. 5XB system operation. Full description is included in Section 958-110-100, No. 5XB General Descriptive Information, in Division D of the Traffic Facilities Practices, and the No. 5 Crossbar Circuit Descriptions.

3.03 This Plan calls for the use of measured components and performance indicators. These items have been selected to serve several purposes. Some will be useful to local managers in predicting and/or in analyzing potential and actual areas of service to service-effecting problems other than in the measured office. Still others will reflect problems affecting A.M.A. data. Some of these indicators have direct impact upon the quality of customer service; others are indirectly related. All of the numerous indicators necessary to provide complete and detailed analysis of switching performance quality have not been included. Those selected are considered among the most important. They were carefully selected as those which require constant monitoring and management attention.

3.04 There are many other indicators useful to managers in the detection of adverse service conditions or trends. They should be used in addition to those contained in the Plan in the continuing identification and analysis of potential and actual trouble spots within the office.

3.05 Other indicators which are less representative of direct service effects, yet are related to the troubles, problems, or conditions affecting service are available and must be used. These other indicators may sometimes prove to be more important than the indicators of the Plan. If these supplemental indicators are neglected, managers may not be aware of impending service deterioration until results worsen. The proper approach is to be sensitive to these other indicators.

3.06 The following is a list of items not directly measured by the Plan. These items are certainly indicative of the service provided by the measured marker group and require constant attention. The list is not all inclusive.

(a) Total Trouble Recorder records;

- (b) Automatic Monitor failures;
- (c) Failure to make second trial attempts after first trial failure;
- (d) Traffic Controller functions;
- (e) Incoming reorders;
- (f) Dial Tone Marker failures;
- (g) Major alarms;
- (h) Test Frame utilization;
- (i) Performance of connecting PBX's, CTX's, etc.;
- (j) AIOD performance;
- (k) Cleanliness of the office;
- (l) Preventive Maintenance backlog;
- (m) Percent of engineered capacity;
- (n) Class of service balance;
- (o) Data validation;
- (p) Proper use of administrative and maintenance methods and procedures.

3.07 Although the administrative data requirements of this Plan are restricted to busy hour periods, it is strongly recommended that network administrative personnel exercise judgment in obtaining and analyzing other hours and, where warranted, total day periods.

3.08 This Plan will be modified as more precise measurements of switching performance become available and improved data gathering techniques become standard.

3.09 It would be beneficial to utilize an automated system for the accumulation of daily busy hour statistics required in the evaluation of load sensitive components. Offices equipped with EADAS could utilize the hourly report available to the Dial Administrator.

4. OBJECTIVE

4.01 This Plan is designed to provide a measurement of the quality of customer service provided by a No. 5XB marker group. It is also designed to reflect the quality of the administrative, maintenance, and design/provisioning efforts which relate to the measured service quality.

4.02 In each of the three major categories — Machine Access, Machine Switching and Billing — both measured components and performance indicators have been included. The measurements provide sufficiently sensitive reflections of the quality of service to the using customer. Performance indicators are designed to assist administrative, maintenance, and engineering personnel charged with responsibility for that service quality, in predicting and/or in analyzing areas of service concern related to switching machine performance and, when required, in developing joint programs for corrective action.

4.03 Generally, the performance of a No. 5XB marker group is related to the quality of the administrative, maintenance, and engineering efforts brought jointly to bear on that marker group. This plan is designed to measure the service quality resulting from those efforts and to indicate the necessity of joint involvement by personnel charged with the different primary functional responsibilities.

5. INTERPRETATION AND USE OF RESULTS

5.01 The measured components of the Plan represent actual failures of the machine to properly complete a call or to provide accurate billing information. The performance indicators represent conditions which may seriously impact upon the machine's ability to perform its switching and billing functions satisfactorily.

5.02 The measured components and performance indicators in this Plan are of several different types. Some measurements are obtained from machine counts of failures caused by equipment malfunction. This type of measurement represents a lost call and usually is followed by an attemp by the customer to reinitiate. Since regeneration also affects load-sensitive functions of the switching machine, the items of this type are critically indexed. Another type of measurement addresses blockage and delay experienced on equipment items which are engineered on a probability basis. With this type, it is expected and economic that a certain level of machine counts will be observed. The index levels and observation periods are designed to reflect this expected level of event occurrences. The customer trouble report category reflects central office, customer line, and facility conditions that caused the customer to report a service failure.

5.03 Switching performance, as measured by

this Plan, is strongly dependent on the control of equipment failure rates, the availability of equipment for service, the administration of the available equipment, and the quality of work.

5.04 Index levels obtained through the use of this Plan are not comparable to index levels in other types of switching machines under other measurement plans. The index tables used in this Plan are based on a scientific sample of No. 5XB offices throughout the System. Therefore the service provided by a given No. 5XB office can only be compared to other No. 5XB offices.

5.05 Performance indicator threshold levels have been established at a point considered to be generally valid on a broad basis throughout the System. There may be instances where this level is inappropriate for a particular marker group. In those instances, more stringent thresholds may be established for local management purposes. However, for System reporting of results, the threshold levels contained in the Plan should be used.

5.06 Management should pay particular attention to the trend of office results in the various components and performance indicators of the Plan. Improvement in the performance of any one item should be directly related to the corrective action taken. This point is significant not only in evaluating the performance of an office but also in evaluating a particular course of action as being worth the required effort and cost in view of the improvement in results obtained. Worsening results indicate the need for a stepped-up pace or different tack in pursuing corrective action.

5.07 Objectives should be established in such a manner that they are meaningful to and attainable by the managers involved in accomplishing these goals. For this reason, managers responsible for the maintenance, administration, and provisioning should be involved in the setting of objectives. An understanding of the interrelationship of the various functions in attaining overall satisfactory service levels is essential. The Plan is designed to foster this understanding.

5.08 While it may be argued that responsibility for the measured components of this Plan should be assigned to functional groups or individuals who can exclusively control their performance, examination of the causes of any component failure reveals that such sterile isolation is impossible. It is the intent of this Plan that the interdependency of service on functional group contribution be recognized. In other words, the network

maintenance and network administration and network design/provisioning functional groups are equally responsible and should be held equally accountable for analysis and for concerted corrective action.

5.09 The use of this measurement Plan is not an adequate substitute for intelligent management. Continuous diagnostic analysis must be employed to assure problem correction prior to service deterioration.

6. GENERAL INSTRUCTIONS

6.01 The report month to be used for this Plan will be from the 23rd of the month preceding the report month through the 22nd of the report month, (e.g., the February report month begins January 23rd and ends February 22nd.

6.02 Most of the data required for this Plan is obtained from administrative and maintenance registers. Actual peg counts or mechanized data printouts shall be used. Expanded figures calculated from sample peg count data are not permitted. The expected error in using an expanded sample is more than is considered allowable for this Plan. However, reconstructed data as prescribed in GL 77-01-123 is permitted.

6.03 All register readings needed for this Plan shall be taken in as short a time as possible. Interruptions in the job of reading registers shall be avoided. This requirement is intended to minimize distortion of results due to mismatch of data which are related in performance ratios to one another.

6.04 It is important that readings of both maintenance and administrative registers be taken as near as possible to the beginning of the report month. Where these are read by different forces, a coordinated effort is required.

6.05 If the final day (22nd) of the report month falls on a day when a person qualified to read and record the registers is not scheduled to work in the office, these readings shall be taken at the time calculated to most closely approximate the report month. In no case shall the deviation be greater than plus or minus three calendar days from midnight of the first day of the report month. Thus, a period of six days is available within which register readings may be obtained.

6.06 Register readings taken at the beginning of one month shall be used for the end of

the previous report month. There shall be no break in the register data between consecutive reporting periods.

6.07 Registers used in this Plan shall not be prevented from operating normally, and readings of such registers shall not be adjusted or changed either electrically or mechanically. When a register or its associated circuit used in the Plan fails to operate properly, the condition shall be repaired promptly and an entry shall be made in the "remarks" space of Form E-6420AA for that report period, such as "LR reg. replace."

6.08 Performance for those components and indicators which measure trouble conditions and customer reaction will be measured 24 hours a day for every day of the year. For those components and indicators which are design related and load sensitive, individually determined busy hour data will be reported in accordance with the material included in Part 7, Description of Components.

6.09 Procedures for determining and changing busy hour periods shall be in accord with instructions of the traffic data collection system in use by your company.

6.10 Equipment is or can be arranged so that marker first and second trial failure plant registers do not score when a marker is made busy at the master test or office test frame and a test call is placed. Although it is possible to score plant registers while conducting maintenance operations, the effort that would be required to validate test deductions is substantial. While it is recognized that register scores due to test calls may affect the results of a small marker group, it does not justify test deductions for the majority of central offices involved in the Plan. An explanatory note in the "remarks" space of Form E-6420AA (Fig. 1) shall be made for those marker groups where test calls may have adversely influenced the results. The register scores resulting from test calls shall not be discounted except as outlined in this section.

6.11 Deductions may be made when testing register circuits for audit purposes. Details of the audit must be signed by the auditor and attached to Form E-6420AA.

6.12 An exception to the "no-discounts" rule is applicable to failures on tests made in connection with the installation, modification, or

rearrangement of central office equipment by installation forces (Western Electric Company or equivalent) when the following conditions are met:

- (a) The testing is in connection with work being performed as covered by a specific authorization (e.g., MOP, routine order or estimate, etc).
- (b) The failures registered as a result of the testing are not service affecting.
- (c) The validity of the test is documented by having written certification attested to by the Central Office Supervisor, the Dial Administrator, and the Western Electric Company Supervisor. Form E-6429 (Fig. 3) will be submitted with the associated Form E-6420AA.

6.13 Rules for the inclusion (or exclusion) of administrative data, for the treatment of holiday data, and for the documentation of out-of-order conditions are as stated in the traffic data collection system in use by your company.

6.14 The measured components for which data is obtained from administrative registers require a minimum of fifteen days' valid busy hour data for each report month.

6.15 The following rules will apply when data is lost from maintenance registers which measure components or indicators 24 hours per day.

- (a) If a failure count or base data count is lost for a certain time period (e.g., transverter second trials did not score for two days), the base data or failure count used to calculate that component or indicator must be excluded for the same time period.
- (b) If the time period of lost data for a component or indicator exceeds eight calendar days during the report period, the component or indicator will be considered NA.
- (c) Data obtained from data gathering systems must contain valid date for 85 percent of the 1/2 hour data blocks during the measured month for any component or indicator.

6.16 If due to malfunction or error, results data for a measured component or a performance indicator are not available for the report period, "NA" shall be entered in the Performance columns of Form E-6420AA. NA is considered Band D or soft spot performance and will be reported as such on the marker group report and Form E-6420BA (Fig. 2).

6.17 The notations "NE" (Not Equipped) or "NP" (Not Provided) shall be entered in the (1) Performance and (2) Soft Spot or Band columns of Form E-6420AA if the component is not applicable to the measured marker group due to design limitations. "NE" or "NP" is *not* considered Band D or soft spot performance. *Ex.* "NE" will be entered for all AMA related categories in AUTOVON Switchers.

6.18 All register readings taken by maintenance personnel shall be recorded on Form E-4744, Register Readings or equivalent. Forms for the recording of administrative register readings shall be developed and prepared as locally required. Forms to be used for the compilation of register reading data and for the computation of applicable percentages and component indices shall also be developed and prepared locally except as prescribed in the detailed instructions.

6.19 Because of the importance of both measured components and performance indicators to the valid evaluation of the service rendered by the measured office, the District Manager must assume responsibility for the validity and integrity of the data reported.

6.20 All forms both standard and locally developed, used in the preparation of results data reported on Forms E-6420AA and E-6420BA shall be retained for at least one year. It is recommended that a retention system similar to that described in Section 218-001-010, No.5XB Switching Systems Controlled Maintenance Plan, be used. All forms records, trouble tickets, and administrative data sheets should be filed in the appropriate month's folder and retained until the results report for the same month of the following year replaces them.

6.21 Each marker group will prepare one report (Form E-6420AA) monthly from the first full calendar month after cutover and thereafter.

6.22 Form E-6420BA has been provided for use by each Area, Division, District or Office for purposes of combining results of multiple switching machines within a common vertical organizational structure. This form is provided for vertical lines of organization for tracking overall switching performance within a management entity.

6.23 Use of Form E-6420BA will be as required by local instruction.

6.24 Each marker group will prepare a "C" record in accordance with instruction in BSP 309-200-006 for input to the Special Service System (SSS).

6.25 Forms may be ordered on a regular requisition from your local Western Electric Service Center.

7. DESCRIPTION OF COMPONENTS

7.01 This part of the Plan describes the performance indicators and measured components to be reported on Form E-6420AA. Included are brief descriptions of the components, the sources of the data to be gathered, the computation methods to be employed in preparing data for reporting at the marker group level, and the applicable time periods for which data is to be gathered and summarized. Sections will also include references to report forms and to detailed reference material which may serve to further describe data gathering equipment.

PERFORMANCE INDICATORS

A. Machine Access

All Originating Registers Busy

7.02 All Originating Registers Busy is an indicator of switching performance which can be used as a predictor of poor dial tone speed service, as a tool in analyzing poor service, as an aid in determining ineffective dial tone marker utilization, and in determining shortages of originating registers due to inadequate or excessive maintenance outage. All originating register busy registers are scored when a dial tone marker finds all originating registers in a group busy.

7.03 The monthly results are computed as follows:

- (a) Enter the month's total of all originating register busy scorings for all types of originating registers for the busy hour in column A for Form E-6420AA.
- (b) Enter the month's Dial Tone Marker peg count scorings for the busy hour in column D.
- (c) Divide column A by column D and enter the result, expressed as a percent in column E [(A/D x 100 = E)].

Dial Tone Matching Loss

7.04 Dial Tone Matching Loss, sometimes referred to as dial tone second failure to match, is an indicator which can assist in predicting and/or analyzing poor dial tone speed service. Excessive dial tone matching loss may be indicative of excessive loading of line link frame horizontal groups, or of poor balance in the assignment of originating registers to trunk link frames. Dial tone matching loss (DT2FTM) registers are scored by the dial tone markers when the marker is unable, on a second trial, to establish a channel between a line equipment and an available originating register.

7.05 The monthly results are computed as follows:

- (a) Enter the month's dial tone matching loss (DT2FTM) scorings for the busy hour in column A of Form E-6420AA.
- (b) Enter the month's dial tone marker peg count scorings for the busy hour in column D.
- (c) Divide column A by column D and enter the result, expressed as a percent, in column E $[(A/D \times 100 = E)]$.

B. Machine Switching**Marker First Trial Failure**

7.06 Completing (combined) marker first trial failure is an indicator of machine switching performance which should be used by maintenance personnel as a predictor of marker second trial failures. Marker first trial failure registers are scored when the marker fails on its first attempt to complete a required function.

7.07 The monthly results are computed as follows:

- (a) Enter the month's total completing (combined) marker first trial failure (CMTR, MTR) in column A of Form E-6420AA.
- (b) Enter deductions authorized by Form E-6429 in column B.
- (c) Subtract column B from column A and enter the result in column C.
- (d) Enter the month's total completing (combined, completing function) marker peg count, in terms of 10,000 in column D.
- (e) Divide column C by column D and enter the result in column E $[(A-B)/D = E]$.

Outsender Group Overflows

7.08 Outsender group overflows are included as a performance indicator to assist administrative and provisioning personnel in anticipating and/or analyzing service problems related to excessive office overflows. Administrative registers, provided for each outsender group, are scored each time a marker fails to find an idle sender in an outsender group when attempting to establish an originating, through-switched, or terminating LLP call. Because of the alternate route capability in No. 5XB offices, outsender group overflows do not necessarily result in blocked calls. When a call is blocked, both the outsender group overflow and the office overflow register will be scored. Outsender group overflow registers will assist in identifying provisioning, maintenance, and trunk group assignment problems.

7.09 The monthly results are computed as follows:

- (a) Enter the month's total outsender group overflows for all types of senders for the busy hour in column A of Form E-6420AA.
- (b) Enter the month's total outgoing sender group peg count for the busy hour in column D.
- (c) Divide column A by column D and enter the result, expressed as a percent in column E $[(A/D \times 100 = E)]$.

Originating Matching Loss

7.10 Originating matching loss, sometimes referred to as originating second failure to match, occurs when a completing or combined marker is unable to establish a channel between a line equipment and an available trunk on other than terminating class calls. Registrations of OML do not necessarily mean lost calls due to alternate route capabilities. In those cases where a call is blocked on a final route attempt, both the originating matching loss and office overflow registers will be scored. Use of the originating matching loss scorings in analyzing office overflow problems will assist network personnel in identifying problem causes.

7.11 The monthly results are computed as follows:

- (a) Enter the month's originating matching loss scorings for the busy hour in column A of Form E-6420AA.

(b) Enter the difference between the month's busy hour completing (combined) marker peg count and the month's busy hour total incoming peg count in column D.

(c) Divide column A by column D and enter the result, expressed as a percent in column E [(A/D x 100 = E)].

Trunk Outage

7.12 Switching machine out of service time for all intermachine trunks, access lines and auxiliary lines should be logged on Form E-4255 (Trunk Outage Log), or local equivalent. Trunk outage, expressed as a percent is the average normal business day outage hours per trunk per month. Abbreviated business day outage hours are to be used in those offices that qualify. (Ref. Paragraph 7.23).

7.13 The monthly results are computed as follows:

(a) Enter the month's total number of out of service hours for all intermachine trunks, access lines, and auxiliary lines in column A of Form E-6420AA.

(b) Multiply the total number of intermachine trunks, access lines and auxiliary lines by the number of business days for the report period. Multiply this result by the number of reportable hours per business day to determine the months total reportable hours. Enter the months total reportable hours in column D of Form E-6420AA.

(c) Divide column A by column D and enter the result, expressed as a percent in column E [(A/D x 100 = E)].

Overflow Percent (Final Trunk Group Overflow/Final Trunk Group Peg Count)

7.14 The indicator is a measure of the quality of a customers network. As such, it is designed to assist administrative and maintenance personnel in evaluating the customers overall network service. Performance in this category is directly dependant on circuit provision as authorized by the customer. Operations and Business Services should jointly determine the thresholds to be set for each customer based on the customers expressed grade of service requirements. Applies only to On-Network Intermachine Final Trunk Groups.

Customers should be listed individually in space provided on Form E-6420AA as follows:

— Enter total overflows for all final trunk groups for each customer.

— Enter total peg count for all final trunk groups for each customer.

— Divide overflow column by peg count column and enter the result, expressed as a percent in the performance column (Overflow/Peg Count x 100 = Performance)

7.15 The monthly results are computed as follows:

(a) Enter the total of individual customers "Overflow of Final Trunk Groups" for the busy hour in column A of Form E-6420AA.

(b) Enter the total of individual customers "Peg Count of Final Trunk Groups" for the busy hour in column D of form E-6420AA.

(c) Divide column A by column D and enter the result, expressed as a percent in column E [(A/D x 100 = E)].

Load Balance

7.16 The loading of customer lines into a No. 5XB marker group can have a distinct impact upon the quality of service rendered. The total traffic load carried by line link frame horizontal groups and the balanced application of that load bear upon the quality of dial tone, originating and incoming service provided. The Load Balance Index Plan will be the measurement provided to indicate trends, identify superior performances, and point up opportunities for improvement in load balance administration of central office line equipment. Division A of the Dial Facilities Management Practice contains instruction regarding load balance indexing, Division H outlines load balance procedures. Procedures outlined in Section 12 of this practice have been included to assist most offices in their load balance determination.

7.17 Enter the monthly load balance index as reflected on Form E-6402, Load Balance Index (traffic unit report) in column E of Form E-6420AA.

Equipment Outage

7.18 Switching equipment is provided to carry an estimated number of calls in the busy hours of the busy season at objective levels of service. When equipment is removed from service

the capacity available to handle traffic is reduced. As the call load reaches and exceeds the capacity of the reduced amount of equipment, calls are blocked or delayed.

7.19 Blocked calls are service failures which require the customer or operator to dial again. This causes an increase in attempts per call and aggravates the condition of overload. Calls which are delayed increase the holding time of other items of switching equipment or trunks. This further decreases the call-carrying capacity of this other equipment. The result is more blocked calls.

7.20 While it is true that a certain busy hour may be said to be the busy hour for given items of equipment, the call load on that equipment during other hours may be almost as great. This is especially true in the "side busy hours" which are those hours just preceding and following the designated busy hour. Because of this variation in the load which is carried by the various items of equipment, it is generally not possible for maintenance forces to be certain that removing equipment outage during the normal business day will affect service even though this may not be true for a given outage. Accordingly, equipment outage is included as a performance indicator.

7.21 Some marker groups have spare marker capacity which allows the extensive cross connection work required in large network rehomings and routing revisions to be performed in an orderly manner. The central office may request a letter from his Traffic Engineer stating the number of markers that were required to handle the average busy hour for the ten high days. This letter will determine the number of markers required to handle service satisfactorily. Out of service time for all markers exceeding the number specified in this letter need not be carried for index purposes. This request to Engineering should always be made in November to cover the following calendar year. This condition applies only to Completing Markers and should not apply for any other common equipment. If a machine has excess capacity in other common equipment, the Traffic Engineer is expected to make the necessary judgements as to the expiration of this surplus equipment. A copy of the Engineers letter should be filed with the index for each month to which it applies.

7.22 Only outage of major components of common control equipment will be included as an equipment outage performance indicator. This includes all markers, registers, senders, transverters,

recorders, translators, pre-translators and miscellaneous trunk circuits.

7.23 For the purpose of determining outage time, only those outages occurring during the hours of the normal Business day (N.B.D.) shall be counted. The normal business day is defined as follows:

- (a) Regular N.B.D. includes the period from 9:00 a.m. to 10:00 p.m. local time on weekdays (excluding Saturdays and Sundays).
- (b) Abbreviated N.B.D. includes the period from 9:00 a.m. to 6:00 p.m. local time on weekdays (excluding Saturdays and Sundays).

Outages occurring on weekdays, which are also Telephone Company recognized holidays, are excluded from measurement under the outage Plan.

7.24 The purpose of the abbreviated N.B.D. is to allow trunk or equipment outage without penalty during a known period of prolonged light traffic. This generally occurs in a marker group which is mainly serving a business community that terminates its activities around 5:30 p.m. each day.

7.25 The abbreviated N.B.D. may be assigned to a marker group when the conditions described below have been met and on written approval of the Area Operations or State General Plant Supervisor (or equivalent). This approval shall be reviewed annually during the month of November to cover the following calendar year. A copy of the letter authorizing the abbreviated N.B.D. shall be retained in the associated central office for one year to make it available for audit purposes.

7.26 In order to establish an abbreviated N.B.D. for a No. 5XB marker group, a study shall be made by the Traffic Department or Traffic Engineer of total day completing marker peg count for a period of at least ten consecutive normal business days. The abbreviated N.B.D. may be used only when at least 80 percent of the total day completing marker peg count occurs during the period from 9:00 a.m. to 6:00 p.m. on the normal business day sample. Before a request for such a study is made, it is recommended that the Operations Department determine from their readings of peg count registers that the abbreviated normal business day may apply. The details of these data are to be included in the letter signed by the General Plant or Area Operations Supervisor (or equivalent)

authorizing a switching entity to be classified as one using an abbreviated N.B.D.

7.27 The outage control Form (E-4256) described in Section 201-114-001 will be used for keeping accurate records of equipment removed from service so the amount and duration of equipment outage is held to a minimum. This form shows the duration, the specific item of plant affected, and the serial number of the trouble ticket which would show the details of the outage.

7.28 The monthly results are computed as follows:

- (a) Enter the month's total of measured equipment NBD (or ABD) outage hours in column A of Form E-6420AA.
- (b) Enter the total number of markers, registers, senders, transverters, recorders, translators, pretranslators and miscellaneous trunk circuits in Column D.
- (c) Divide column A by column D and enter the outage hours per equipment component in column E.

C. Billing

Bulk Billed Free

7.29 In the event of a transverter second trial failure, the CCSA customer is given a re-order signal if the call is off network to a toll point requiring detailed billing. If the call which failed on a second trial is to a nontoll point (bulk billed), or on network the customer is given the call free. In this case a second register, bulk billed free (BBF), is also scored by the transverter. A significant loss of billing data for the customers internal cost allocation may occur if a high volume of calls are allowed to complete on this basis. For this reason bulk billed free registrations are included as a performance indicator and should be monitored to detect problems.

7.30 The monthly results are computed as follows:

- (a) Enter the month's total bulk billed free registrations in column A of Form E-6420AA.
- (b) Enter deductions authorized by Form E-6429 in column B.

- (c) Subtract column B from column A and enter the net failures in column C.
- (d) Enter the month's total transverter peg count in terms of 10,000 in column D.
- (e) Divide column C by column D and enter the resultant in column E $[(A-B)/D = E]$.

Percent Single Time Line Entries

7.31 The equipment and billing accuracy control (EBAC) AMA tape analysis provides a method of determining the number of times a disconnect entry failed to be recorded on the tape. This could be indicative of busy common control equipment when a trunk is ready to disconnect or a failure in the trunk itself. A failure to record a disconnect entry results in loss of revenue.

7.32 The monthly results are computed as follows:

- (a) Enter the month's total single time line entries from the EBAC report in column A of Form E-6420AA.
- (b) Enter the total calls from the EBAC report in column D.
- (c) Divide column A by column D and enter the result, expressed as a percent, in column E $[(A/D \times 100 = E)]$.

Transverter First Trial Failure

7.33 Transverter first trial failures are included as a performance indicator to provide maintenance personnel with a means of detecting and predicting ineffective attempts due to transverter second trial failures. LAMA, CAMA, and ANI transverter TTR registrations are included in this indicator.

7.34 The monthly results are computed as follows:

- (a) Enter the month's total transverter first trial failures (TTR) in column A or Form E-6420AA.
- (b) Enter authorized deductions from Form E-6429 in column B.
- (c) Subtract column B from column A and enter the net failures in column C.

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(d) Enter the month's total transverter peg count (TVPC), in terms of 10,000 in column D.

(e) Divide column C by column D and enter the result in column E $[(A-B)/D = E]$.

MEASURED COMPONENTS

A. Machine Access

Dial Tone Speed

7.35 Automatic dial tone speed measuring equipment is used to determine the incidents of dial tone delays over three seconds. The primary purpose of the dial tone speed equipment is to provide overall dial tone speed data for the marker group and separate data for each type of originating register (where more than one type is provided). These data are used to evaluate customer service and are directly related to the design provisioning, and loading of No. 5XB common equipment in the dial tone switching path.

7.36 This switcher performance measurement plan follows closely the detailed descriptions of automatic dial tone speed equipment for use in No. 5XB offices that are included in TSOP (Traffic Service Observing Practice) Division F, Section 2B, Item 2, and Section 951-901-100. This plan however, allows for utilization of machine busy hour in machines where Dial Tone Speed Busy Hour is not determined separately. Procedures for assignment of test lines to automatic dial tone speed equipment are contained in TSOP, Division F, Section 2B, Item 3.

7.37 Dial tone speed results will be compiled on Form E-4372 as instructed in Section 11 of this practice.

7.38 Enter the months total adjusted index points earned in column M. Component index need not be completed in this form (item 28).

**B. Machine Switching
Stuck Senders**

7.39 No. 5XB offices are equipped with senders which are used to transmit call-steering and/or billing information, as required. Several different types of sender circuits are provided according to the needs of the particular central offices to which the No. 5XB office connects.

7.40 When a sender is unable to successfully transmit the call-steering information within the period its timing circuit allows, the sender "times out" causing a condition referred to as a stuck sender. The calling customer receives a re-order signal and is required to make his call again. In addition, as an option, the stuck sender register is scored in trunk guard test failures. These occur during light traffic operation when the marker remains connected to the sender long enough to see the result of a trunk guard test. When the test fails, the marker routes the call to reorder. During heavy traffic, when the marker does not wait for trunk test, this failure causes a stuck sender.

7.41 The different types of No. 5XB sender circuits measured in this component are multifrequency (MF), dial pulse (DP) and line link pulsing (LLP).

7.42 Intermarker group (IMG), centralized automatic message accounting (CAMA), frequency shift pulsing (FSP), and coin zone dialing (CZ) senders are not included in this measurement.

7.43 The monthly results are computed as follows:

- (a) Enter the month's total stuck sender registrations in column H of Form E-6420AA.
- (b) Enter deductions authorized by Form E-6429 in column J.
- (c) Subtract column J from column H and enter the net failures in column K.
- (d) Enter the month's total sender peg count, in terms of 10,000 in column L.
- (e) Divide column K by column L and enter the result in column M $[(H-J)/L = M]$.

Marker Second Trial Failures

7.44 Completing markers control connections within the office on such functions as outgoing calls, incoming calls, intraoffice calls, tandem switching calls, and certain kinds of special calls. When a completing marker encounters trouble, it should briefly connect to the trouble recorder in order to produce a punched card record of the failure, operate its first trial failure plant register (CMTR), signal the connector which is handling the service request to "try again," and then dis-

connect. The connector immediately offers the demand to the completing markers. A different completing marker is preferred on this attempt and this marker is "told" that the call is a second trial. If this marker fails, it briefly connects to the trouble recorder in order to produce a punched card record of the failure, operates the second trial failure plant register (CMST), causes the customer who originated the call to receive re-order signal, and then disconnects. The customer or operator is forced to place the call again.

7.45 The monthly results are computed as follows:

- (a) Enter the month's total completing marker second trial failures in column H of Form E-6420AA.
- (b) Enter deductions authorized on Form E-6429 in column J.
- (c) Subtract column J from column H and enter the net failures in column K.
- (d) Enter the month's total completing marker peg count, terms of 10,000 in column L.
- (e) Divide column K by column L and enter the result in column M $[(H-J)/L = M]$.

Office Overflow

7.46 Office overflow registers are scored by completing or combined markers when an originating call is routed to a combination tone trunk from which an overflow signal (120 IPM) will be returned, and will also score when all tone and common overflow trunks are busy. In addition to calls routed to combination tone (busy tone and overflow) trunks, these registers will be scored when, on the final route, all outsenders are busy, all trunks are busy, or when an originating matching loss occurs. Scorings on these registers will show customer calls which are ineffective.

7.47 Because of the alternate routing capability of No. 5XB switching equipment, out-sender group overflows, originating matching losses and trunk group overflows will only result in an overflow to the customer on final route attempts. Network management analysis of office overflow problems will require analysis of the individual portions. For this reason, out-sender group overflows, originating matching loss and final trunk group overflows have been included as performance

indicators in this Plan.

7.48 The monthly results are computed as follows:

- (a) Enter the month's total office overflow scorings minus CCSA final trunk group overflows for the busy hour in column H of Form E-6420AA (originated traffic only).
- (b) Enter the month's total originating peg count for the busy hour in column L.
- (c) Divide column H by column L and enter the result, expressed as a percent, in column M $[(H/L \times 100 = M)]$.

Link Release

7.49 Incoming trunks to a No. 5XB office must be connected through an incoming register link to an incoming register. The incoming register receives, counts, and stores the call-steering information. When an incoming trunk fails to get connected properly to an incoming register, a link release failure results. Link release (LR) registers are provided in offices with wire spring markers as well as marker groups with flat spring markers that have been modified to add the register. The LR register is scored by the marker whenever a link release failure occurs. The originating customer or operator must dial again.

7.50 The rate of occurrence of link release failures is an important measurement of the incoming service to No. 5XB offices and is therefore included as a measured component of the Plan.

7.51 The monthly results are computed as follows:

- (a) If all markers are equipped with LR registers, enter the month's total LR scorings in column H of Form F-6420AA.
- (b) If some markers are equipped with LR registers, divide the total LR scorings by the number of equipped markers, then multiply by the total number of markers and enter the result in column H.

- (c) Enter deductions authorized by Form E-6429 in column J. If applicable, the deductions must be inflated as in (b) above.
- (d) Subtract column J from column H and enter the net failures in column K.
- (e) Enter the month's total incoming register peg count, in terms of 10,000, in column L.
- (f) Divide column K by column L and enter the result in column M $[(H-J)/L = M]$.

Incoming Matching Loss

7.52 Incoming matching loss is a measured component reflecting the number of incoming calls which are not completed because of the inability of the completing or combined markers to find a channel between an incoming (or 2-way) trunk and an idle called line. Calls encountering an incoming matching loss are ineffective and the calling customer receives an overflow. Incoming matching loss registers do not score on intraoffice calls. In No. 5XB offices with some paired and some nonpaired line link frames, two loading divisions exist. Each loading division must be measured separately for both peg count and incoming matching loss.

7.53 The monthly results are computed as follows:

- (a) Enter the total month's incoming matching loss scorings for the busy hour in column H of Form E-6420AA.
- (b) Enter the total month's incoming peg count for the busy hour in column L.
- (c) Divide column H by column L and enter the result, expressed as a percent, in column M $[(H/L \times 100 = M)]$.

C. Billing

Transverter Second Trial Failure

7.54 When a noncoin No. 5XB customer dials a call requiring machine billing, the necessary information is passed from the No. 5XB switching equipment to a device called a "transverter"

which is part of the automatic message accounting (AMA) system. The transverter controls the perforation of a paper tape record of all calls requiring billing. Up to three separate entries are put on the tape for completed calls. The first, called the "initial entry," consists of several lines which, on detail billed calls, identify the calling customer, called telephone, the billing index, and other required information. When the called telephone answers, an entry is put on tape which identifies the call and records the time conversation started. When the call is completed, another entry is put on the tape which identifies the call and records the time the call ended. The transverter uses a memory device called a translator frame, a trunk identifying device called a call identity indexer, and a tape perforator called an AMA recorder, in order to perform the machine billing functions in the office.

7.55 There are three types of transverter available for No. 5XB offices. They are local automatic message accounting (LAMA), centralized automatic message accounting (CAMA), and automatic number identification (ANI). The three different transverters obtain the calling line directory number in different ways. The LAMA transverter obtains the calling line directory number from the AMA translator located in the same office. The CAMA transverter obtains the calling line directory number from the CAMA sender. The CAMA sender receives the number from either a CAMA operator who keys the number after receiving it from a query to the calling customer, or from the outgoing sender in the ANI office where the calling customer is served. The ANI transverter also obtains the calling line directory number from an AMA translator located in the same office as the ANI transverter.

7.56 If a transverter fails on a call, it causes a trouble recorder card to be produced, scores its first trial failure plant register (TTR), and disconnects from the equipment serving the call. The serving equipment immediately resubmits the demand to the group of transverters as a second attempt and is "told" that this call is a second trial. If this attempt fails, the transverter produces a trouble card record of the failure and scores the second trial failure plant register (TST). Since a CCSA customer pays a flat rate for his network, the call is allowed to complete. Transverter first trial failures do not affect the call, but do provide an early warning of impending second trial failure problems. Therefore, they are a performance indicator in the Plan. Transverter second trial failures, which affect the customers internal cost allocation,

are a measured component of the Plan.

NOTE: In CCI6 (Call Class Index Six) equipped offices traffic entering the public message network will be blocked on second trial attempts since these calls are billed separately from the flat rate service. CCI6 provides the CCSA switcher with the ability to record message billing data for calls originated on a CCSA network and destined for the completion on the public message network.

7.57 The monthly results are computed as follows:

- (a) Enter the month's total transverter second trial failures in column H of Form E-6420AA.
- (b) Enter the total deductions authorized by Form E-6429 in column J.
- (c) Subtract column J from column H and enter the net failures in column K.
- (d) Enter the total transverter peg count (TVPC), in terms of 10,000, in column L.
- (e) Divide column K by column L and enter the result in column M $[H-J]/L = M$.

AMA Recorder Failures

7.58 AMA recorders produce the punched paper tape record of calls for which customers are to be billed. An initial entry failures causes a transverter second trial. When an AMA record fails to record the subsequent transactions properly on the AMA tape, it scores the AMA recorder trouble record register (RTR) and connects to the trouble recorder to produce a trouble record of the equipment used and information associated with the call in progress. When AMA recorders fail, there is no second trial and the call is completed. Detail information, incorrectly punched on the tape, may or may not be in such condition as to be billed properly. Record failures may cause stoppages to occur in the accounting center billing process or may be the cause of lost revenue.

7.61 The monthly results are computed as follows:

- (a) Enter the month's total AMA recorder failures in column H of Form E-6420AA.

- (b) Enter deductions as authorized by Form E-6429 in column J.
- (c) Subtract column J from column H and enter the net failures in column K.
- (d) Enter the month's total AMA recorder peg count, in terms of 10,000, in column L.
- (e) Divide column K by column L and enter the result in column M $[H-J]/L = M$.

8. PREPARATION OF FORM E-6420AA

8.01 This plan includes results data prepared by both administrative and maintenance personnel; therefore, it is recommended that Form E-6420AA be prepared jointly and that all developed input data be retained in one location as described in Part 6. Organizational structures or geographic locations may dictate alternative methods of report preparation. If so, Form E-6420AA should be used to transmit the maintenance or administrative data to a locally arranged report preparation point.

8.02 All decimal figures recorded in the performance columns of Form E-6420AA shall be rounded to two places after the decimal point.

8.03 The following subparagraphs define the column headings for the performance indicators section Form E-6420AA.

- (a) *Column A – Failures:* Entries in this column will include register scorings of the number of times an event or failure occurred within the defined time frame during the report period, the numbers of reports, and the amounts of outage experienced during the period.
- (b) *Column B – Deductions:* Entries in this column will include only those nonservice affecting deductions permitted in accordance with the instructions included in Part 6 and 7 of this Plan.
- (c) *Column C – Net Failures:* Entries in this column are the result of subtracting the deductions in column B from the failures recorded in column A.
- (d) *Column D – Base Data:* Entries in this column will include the data which is

used as the divisor to determine performance ratios or percentages.

(e) *Column E – Performance:* Entries in this column will be the ratios or percentages developed by dividing data entries in column A or C by the base data in column D. “NA,” “NE,” or “NP” will be entered when applicable, according to the instructions in Part 6 of this plan.

(f) *Column F – Threshold Level:* Entries in this column will be obtained from the threshold level table included in Part 10.

(g) *Column G – Softspot:* A check mark (✓) will be entered in this column when the indicator performance is worse than the threshold level, or the data is “NA” for the report period. “NE” will be entered when the office is not equipped with the indicator. “NP” will be entered when the indicator was not provided.

8.04 The following subparagraphs define the column headings for the measured components section of Form E-6420AA.

(a) *Column H – Failures:* Entries in this column will include register scorings of the number of times an event or failure occurred within the defined time frame during the report period, the number of observed failures, and the number of reports.

(b) *Column J – Deductions:* Entries in this column will include only those nonservice affecting deductions permitted in accordance with the instructions included in Parts 6 and 7 of this Plan.

(c) *Column K – Net Failures:* Entries in this column are the net result of subtracting the deductions in column J from the failures recorded in column H.

(d) *Column L – Base Data:* Entries in this column will include the data which is used as the divisor to determine performance ratios or percentages.

(e) *Column M – Performance:* Entries in this column will be the ratios of percentages developed by dividing data entries in column H or K by base data entries in column L. “NA,” “NE,” “NE”, or “NP” will be entered when applicable according to the instructions in Part

6 of this Plan.

(f) *Column N – Component Index:* Entries in this column will be obtained from the appropriate index table for the measured item.

(g) *Column P – Index Points:* Entries in this column will be obtained from the appropriate index table in Part 10.

(h) *Column R – Band:* Entries in this column will be the appropriate Band (A, B, C, or D) for each component index.

Band A – 98 – 100

Band B – 96 – 97.99

Band C – 90 – 95.99

Band D – less than 90

8.05 All lines on Form E-6420AA are defined in the description of components section or are self-explanatory except the following:

(a) *Line 13:* Enter the total number of performance indicators applicable to the measured marker group (including NAs) in column E. Enter the total number of soft spots () in column G.

(b) *Line 22 – Total Points:* Enter the total points in column P.

(c) *Line 23 – Maximum Available Points:* Enter the maximum points attainable by the measured marker group. Enter the total maximum points of all components for which results are measured. Exclude NE, NP, and NA components.

(d) *Line 24 – Total Index:* Divide line 22 by line 23 and enter the result expressed as a percent ($L22/L23 \times 100 = L24$) rounded to two decimal places.

9. PREPARATION OF FORM E-6420BA

9.01 Form E-6420BA is a 2-page summary report. It will provide all management echelons with a summary of the switching performance of the No. 5XB offices within their area of responsibility.

9.02 The form provides four summaries of results information:

- (a) The number and percent of offices by index band in each measured component.
- (b) The trend of Band D offices in each measured component.
- (c) The number of offices beyond threshold in each performance indicator.
- (d) Actual results of offices in each Band D measured component.

Load Balance	94.00
Equipment Outage	1.00
Billing	
Bulk Billed Free	4.00
Percent Single Time Line Entries	.19
Transverter First Trial Failures	31.00

9.03 All data recorded on Form E-6420BA (except percentage calculations) are taken directly from the represented E-6420AA reports. Percents should be rounded to one decimal place.

9.04 A dash (—) or no entry should be made in the Band D Trends section of Form E-6420BA, if all offices exceeded Band D performance during the applicable preceding report period.

9.05 The form serves three purposes. Attachments are provided as examples to follow when preparing Form E-6420BA for each of the purposes:

- (a) Multioffice, single month — Attachment 1
- (b) Multimonth, single office — Attachment 2
- (c) Multioffice, multimonth — Attachment 3

10. INDEX TABLES

10.01 This part of the Plan contains performance indicator threshold levels and measured component index tables to be used to complete the monthly E-6420AA form.

THRESHOLD LEVELS

Machine Access	Threshold
All Originating Register Busy	5.00
Dial Tone Matching Loss	
Non-Paired LLF	1.50
Paired LLF	8.00
Machine Switching	
Marker First Trial Failures	40.00
Outsender Group Overflows	1.50
Originating Matching Loss	.90
Trunk Outage	1.50
Overflow Percent RO/PC	DNA

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DIAL TONE SPEED

PERFORMANCE FROM	TO	COMP. INDEX	INDEX POINTS	PERFORMANCE FROM	TO	COMP. INDEX	INDEX POINTS
35.00	- 34.98	100.00	10.00	29.33	- 29.27	72.00	7.20
34.97	- 34.79	99.50	9.95	29.26	- 29.19	71.00	7.10
34.78	- 34.61	99.00	9.90	29.18	- 29.12	70.00	7.00
34.60	- 34.42	98.50	9.85	29.11	- 29.05	69.00	6.90
34.41	- 34.24	98.00	9.80	29.04	- 28.98	68.00	6.80
34.23	- 34.06	97.50	9.75	28.97	- 28.92	67.00	6.70
34.05	- 33.88	97.00	9.70	28.91	- 28.85	66.00	6.60
33.87	- 33.70	96.50	9.65	28.84	- 28.79	65.00	6.50
33.69	- 33.52	96.00	9.60	28.78	- 28.72	64.00	6.40
33.51	- 33.35	95.50	9.55	28.71	- 28.66	63.00	6.30
33.34	- 33.17	95.00	9.50	28.65	- 28.60	62.00	6.20
33.16	- 32.99	94.50	9.45	28.59	- 28.54	61.00	6.10
32.98	- 32.82	94.00	9.40	28.53	- 28.48	60.00	6.00
32.81	- 32.65	93.50	9.35	28.47	- 28.42	59.00	5.90
32.64	- 32.47	93.00	9.30	28.41	- 28.37	58.00	5.80
32.46	- 32.30	92.50	9.25	28.36	- 28.31	57.00	5.70
32.29	- 32.13	92.00	9.20	28.30	- 28.26	56.00	5.60
32.12	- 31.96	91.50	9.15	28.25	- 28.20	55.00	5.50
31.95	- 31.79	91.00	9.10	28.19	- 28.15	54.00	5.40
31.78	- 31.63	90.50	9.05	28.14	- 28.10	53.00	5.30
31.62	- 31.46	90.00	9.00	28.09	- 28.04	52.00	5.20
31.45	- 31.31	89.50	8.95	28.03	- 27.99	51.00	5.10
31.30	- 31.19	89.00	8.90	27.98	- 27.94	50.00	5.00
31.18	- 31.08	88.50	8.85	27.93	- 27.84	48.00	4.80
31.07	- 30.98	88.00	8.80	27.83	- 27.73	46.00	4.60
30.97	- 30.89	87.50	8.75	27.72	- 27.62	44.00	4.40
30.88	- 30.80	87.00	8.70	27.61	- 27.51	42.00	4.20
30.79	- 30.72	86.50	8.65	27.50	- 27.40	40.00	4.00
30.71	- 30.65	86.00	8.60	27.39	- 27.28	38.00	3.80
30.64	- 30.58	85.50	8.55	27.27	- 27.16	36.00	3.60
30.57	- 30.51	85.00	8.50	27.15	- 27.03	34.00	3.40
30.50	- 30.44	84.50	8.45	27.02	- 26.90	32.00	3.20
30.43	- 30.38	84.00	8.40	26.89	- 26.76	30.00	3.00
30.37	- 30.32	83.50	8.35	26.75	- 26.61	28.00	2.80
30.31	- 30.26	83.00	8.30	26.60	- 26.46	26.00	2.60
30.25	- 30.21	82.50	8.25	26.45	- 26.30	24.00	2.40
30.20	- 30.15	82.00	8.20	26.29	- 26.12	22.00	2.20
30.14	- 30.10	81.50	8.15	26.11	- 25.93	20.00	2.00
30.09	- 30.05	81.00	8.10	25.92	- 25.73	18.00	1.80
30.04	- 29.99	80.50	8.05	25.72	- 25.50	16.00	1.60
29.98	- 29.95	80.00	8.00	25.49	- 25.23	14.00	1.40
29.94	- 29.85	79.00	7.90	25.22	- 24.90	12.00	1.20
29.84	- 29.76	78.00	7.80	24.89	- 24.42	10.00	1.00
29.75	- 29.67	77.00	7.70	24.41	- 23.75	8.00	0.80
29.66	- 29.58	76.00	7.60	23.74	- 23.06	6.00	0.60
29.57	- 29.50	75.00	7.50	23.05	- 22.36	4.00	0.40
29.49	- 29.42	74.00	7.40	22.35	- 21.64	2.00	0.20
29.41	- 29.34	73.00	7.30	BELOW	21.64	0.00	0.00

Measured Component Index Table

STUCK SENDERS

PERFORMANCE		COMP.	INDEX	PERFORMANCE		COMP.	INDEX
FROM	TO	INDEX	POINTS	FROM	TO	INDEX	POINTS
0.00 - 0.62		100.00	20.00	23.70 - 24.00		72.00	14.40
0.63 - 1.34		99.50	19.90	24.01 - 24.29		71.00	14.20
1.35 - 2.06		99.00	19.80	24.30 - 24.59		70.00	14.00
2.07 - 2.78		98.50	19.70	24.60 - 24.87		69.00	13.80
2.79 - 3.50		98.00	19.60	24.88 - 25.15		68.00	13.60
3.51 - 4.22		97.50	19.50	25.16 - 25.42		67.00	13.40
4.23 - 4.94		97.00	19.40	25.43 - 25.69		66.00	13.20
4.95 - 5.66		96.50	19.30	25.70 - 25.95		65.00	13.00
5.67 - 6.38		96.00	19.20	25.96 - 26.20		64.00	12.80
6.39 - 7.10		95.50	19.10	26.21 - 26.45		63.00	12.60
7.11 - 7.82		95.00	19.00	26.46 - 26.70		62.00	12.40
7.83 - 8.54		94.50	18.90	26.71 - 26.94		61.00	12.20
8.55 - 9.25		94.00	18.80	26.95 - 27.18		60.00	12.00
9.26 - 9.97		93.50	18.70	27.19 - 27.42		59.00	11.80
9.98 - 10.69		93.00	18.60	27.43 - 27.65		58.00	11.60
10.70 - 11.41		92.50	18.50	27.66 - 27.87		57.00	11.40
11.42 - 12.13		92.00	18.40	27.88 - 28.10		56.00	11.20
12.14 - 12.85		91.50	18.30	28.11 - 28.32		55.00	11.00
12.86 - 13.56		91.00	18.20	28.33 - 28.54		54.00	10.80
13.57 - 14.28		90.50	18.10	28.55 - 28.75		53.00	10.60
14.29 - 15.00		90.00	18.00	28.76 - 28.96		52.00	10.40
15.01 - 15.63		89.50	17.90	28.97 - 29.17		51.00	10.20
15.64 - 16.16		89.00	17.80	29.18 - 29.38		50.00	10.00
16.17 - 16.61		88.50	17.70	29.39 - 29.80		48.00	9.60
16.62 - 17.02		88.00	17.60	29.81 - 30.22		46.00	9.20
17.03 - 17.39		87.50	17.50	30.23 - 30.66		44.00	8.80
17.40 - 17.74		87.00	17.40	30.67 - 31.11		42.00	8.40
17.75 - 18.07		86.50	17.30	31.12 - 31.58		40.00	8.00
18.08 - 18.37		86.00	17.20	31.59 - 32.06		38.00	7.60
18.38 - 18.66		85.50	17.10	32.07 - 32.56		36.00	7.20
18.67 - 18.94		85.00	17.00	32.57 - 33.07		34.00	6.80
18.95 - 19.21		84.50	16.90	33.08 - 33.61		32.00	6.40
19.22 - 19.46		84.00	16.80	33.62 - 34.17		30.00	6.00
19.47 - 19.71		83.50	16.70	34.18 - 34.76		28.00	5.60
19.72 - 19.95		83.00	16.60	34.77 - 35.39		26.00	5.20
19.96 - 20.18		82.50	16.50	35.40 - 36.05		24.00	4.80
20.19 - 20.40		82.00	16.40	36.06 - 36.75		22.00	4.40
20.41 - 20.62		81.50	16.30	36.76 - 37.52		20.00	4.00
20.63 - 20.83		81.00	16.20	37.53 - 38.36		18.00	3.60
20.84 - 21.04		80.50	16.10	38.37 - 39.30		16.00	3.20
21.05 - 21.24		80.00	16.00	39.31 - 40.39		14.00	2.80
21.25 - 21.63		79.00	15.80	40.40 - 41.74		12.00	2.40
21.64 - 22.01		78.00	15.60	41.75 - 43.76		10.00	2.00
22.02 - 22.37		77.00	15.40	43.77 - 46.63		8.00	1.60
22.38 - 22.71		76.00	15.20	46.64 - 49.51		6.00	1.20
22.72 - 23.05		75.00	15.00	49.52 - 52.38		4.00	0.80
23.06 - 23.37		74.00	14.80	52.39 - 55.26		2.00	0.40
23.38 - 23.69		73.00	14.60	ABOVE 55.26		0.00	0.00

Measured Component Index Table

MARKER 2ND TRIAL FAILURES

PERFORMANCE		COMP.	INDEX	PERFORMANCE		COMP.	INDEX
FROM	TO	INDEX	POINTS	FROM	TO	INDEX	POINTS
0.00 -	1.36	100.00	20.00	13.46 -	13.62	72.00	14.40
1.37 -	1.74	99.50	19.90	13.63 -	13.77	71.00	14.20
1.75 -	2.12	99.00	19.80	13.78 -	13.92	70.00	14.00
2.13 -	2.50	98.50	19.70	13.93 -	14.07	69.00	13.80
2.51 -	2.87	98.00	19.60	14.08 -	14.22	68.00	13.60
2.88 -	3.25	97.50	19.50	14.23 -	14.36	67.00	13.40
3.26 -	3.63	97.00	19.40	14.37 -	14.50	66.00	13.20
3.64 -	4.01	96.50	19.30	14.51 -	14.64	65.00	13.00
4.02 -	4.39	96.00	19.20	14.65 -	14.77	64.00	12.80
4.40 -	4.76	95.50	19.10	14.78 -	14.90	63.00	12.60
4.77 -	5.14	95.00	19.00	14.91 -	15.03	62.00	12.40
5.15 -	5.52	94.50	18.90	15.04 -	15.16	61.00	12.20
5.53 -	5.89	94.00	18.80	15.17 -	15.29	60.00	12.00
5.90 -	6.27	93.50	18.70	15.30 -	15.41	59.00	11.80
6.28 -	6.65	93.00	18.60	15.42 -	15.53	58.00	11.60
6.66 -	7.02	92.50	18.50	15.54 -	15.65	57.00	11.40
7.03 -	7.40	92.00	18.40	15.66 -	15.77	56.00	11.20
7.41 -	7.77	91.50	18.30	15.78 -	15.88	55.00	11.00
7.78 -	8.15	91.00	18.20	15.89 -	16.00	54.00	10.80
8.16 -	8.52	90.50	18.10	16.01 -	16.11	53.00	10.60
8.53 -	8.90	90.00	18.00	16.12 -	16.22	52.00	10.40
8.91 -	9.23	89.50	17.90	16.23 -	16.33	51.00	10.20
9.24 -	9.51	89.00	17.80	16.34 -	16.44	50.00	10.00
9.52 -	9.74	88.50	17.70	16.45 -	16.66	48.00	9.60
9.75 -	9.96	88.00	17.60	16.67 -	16.88	46.00	9.20
9.97 -	10.15	87.50	17.50	16.89 -	17.11	44.00	8.80
10.16 -	10.34	87.00	17.40	17.12 -	17.35	42.00	8.40
10.35 -	10.51	86.50	17.30	17.36 -	17.59	40.00	8.00
10.52 -	10.67	86.00	17.20	17.60 -	17.85	38.00	7.60
10.68 -	10.82	85.50	17.10	17.86 -	18.11	36.00	7.20
10.83 -	10.97	85.00	17.00	18.12 -	18.38	34.00	6.80
10.98 -	11.10	84.50	16.90	18.39 -	18.66	32.00	6.40
11.11 -	11.24	84.00	16.80	18.67 -	18.96	30.00	6.00
11.25 -	11.37	83.50	16.70	18.97 -	19.26	28.00	5.60
11.38 -	11.49	83.00	16.60	19.27 -	19.59	26.00	5.20
11.50 -	11.61	82.50	16.50	19.60 -	19.94	24.00	4.80
11.62 -	11.73	82.00	16.40	19.95 -	20.31	22.00	4.40
11.74 -	11.85	81.50	16.30	20.32 -	20.71	20.00	4.00
11.86 -	11.96	81.00	16.20	20.72 -	21.15	18.00	3.60
11.97 -	12.07	80.50	16.10	21.16 -	21.64	16.00	3.20
12.08 -	12.17	80.00	16.00	21.65 -	22.21	14.00	2.80
12.18 -	12.38	79.00	15.80	22.22 -	22.92	12.00	2.40
12.39 -	12.57	78.00	15.60	22.93 -	23.98	10.00	2.00
12.58 -	12.76	77.00	15.40	23.99 -	25.48	8.00	1.60
12.77 -	12.94	76.00	15.20	25.49 -	26.99	6.00	1.20
12.95 -	13.12	75.00	15.00	27.00 -	28.49	4.00	0.80
13.13 -	13.29	74.00	14.80	28.50 -	30.01	2.00	0.40
13.30 -	13.45	73.00	14.60	ABOVE	30.01	0.00	0.00

Measured Component Index Table

OFFICE OVERFLOW

PERFORMANCE		COMP.	INDEX	PERFORMANCE		COMP.	INDEX
FROM	TO	INDEX	POINTS	FROM	TO	INDEX	POINTS
0.00 -	0.05	100.00	10.00	4.78 -	4.83	72.00	7.20
0.06 -	0.21	99.50	9.95	4.84 -	4.89	71.00	7.10
0.22 -	0.37	99.00	9.90	4.90 -	4.95	70.00	7.00
0.38 -	0.53	98.50	9.85	4.96 -	5.01	69.00	6.90
0.54 -	0.69	98.00	9.80	5.02 -	5.07	68.00	6.80
0.70 -	0.85	97.50	9.75	5.08 -	5.13	67.00	6.70
0.86 -	1.00	97.00	9.70	5.14 -	5.18	66.00	6.60
1.01 -	1.15	96.50	9.65	5.19 -	5.24	65.00	6.50
1.16 -	1.30	96.00	9.60	5.25 -	5.29	64.00	6.40
1.31 -	1.45	95.50	9.55	5.30 -	5.34	63.00	6.30
1.46 -	1.60	95.00	9.50	5.35 -	5.39	62.00	6.20
1.61 -	1.75	94.50	9.45	5.40 -	5.44	61.00	6.10
1.76 -	1.89	94.00	9.40	5.45 -	5.49	60.00	6.00
1.90 -	2.03	93.50	9.35	5.50 -	5.54	59.00	5.90
2.04 -	2.17	93.00	9.30	5.55 -	5.59	58.00	5.80
2.18 -	2.32	92.50	9.25	5.60 -	5.64	57.00	5.70
2.33 -	2.45	92.00	9.20	5.65 -	5.68	56.00	5.60
2.46 -	2.59	91.50	9.15	5.69 -	5.73	55.00	5.50
2.60 -	2.73	91.00	9.10	5.74 -	5.77	54.00	5.40
2.74 -	2.87	90.50	9.05	5.78 -	5.82	53.00	5.30
2.88 -	3.00	90.00	9.00	5.83 -	5.86	52.00	5.20
3.01 -	3.12	89.50	8.95	5.87 -	5.91	51.00	5.10
3.13 -	3.22	89.00	8.90	5.92 -	5.95	50.00	5.00
3.23 -	3.31	88.50	8.85	5.96 -	6.04	48.00	4.80
3.32 -	3.40	88.00	8.80	6.05 -	6.13	46.00	4.60
3.41 -	3.47	87.50	8.75	6.14 -	6.22	44.00	4.40
3.48 -	3.54	87.00	8.70	6.23 -	6.31	42.00	4.20
3.55 -	3.61	86.50	8.65	6.32 -	6.41	40.00	4.00
3.62 -	3.67	86.00	8.60	6.42 -	6.51	38.00	3.80
3.68 -	3.73	85.50	8.55	6.52 -	6.61	36.00	3.60
3.74 -	3.79	85.00	8.50	6.62 -	6.72	34.00	3.40
3.80 -	3.84	84.50	8.45	6.73 -	6.83	32.00	3.20
3.85 -	3.89	84.00	8.40	6.84 -	6.95	30.00	3.00
3.90 -	3.94	83.50	8.35	6.96 -	7.07	28.00	2.80
3.95 -	3.99	83.00	8.30	7.08 -	7.20	26.00	2.60
4.00 -	4.04	82.50	8.25	7.21 -	7.33	24.00	2.40
4.05 -	4.09	82.00	8.20	7.34 -	7.48	22.00	2.20
4.10 -	4.13	81.50	8.15	7.49 -	7.64	20.00	2.00
4.14 -	4.18	81.00	8.10	7.65 -	7.81	18.00	1.80
4.19 -	4.22	80.50	8.05	7.82 -	8.01	16.00	1.60
4.23 -	4.26	80.00	8.00	8.02 -	8.23	14.00	1.40
4.27 -	4.34	79.00	7.90	8.24 -	8.50	12.00	1.20
4.35 -	4.42	78.00	7.80	8.51 -	8.90	10.00	1.00
4.43 -	4.49	77.00	7.70	8.91 -	9.45	8.00	0.80
4.50 -	4.57	76.00	7.60	9.46 -	10.01	6.00	0.60
4.58 -	4.63	75.00	7.50	10.02 -	10.60	4.00	0.40
4.64 -	4.70	74.00	7.40	10.61 -	11.21	2.00	0.20
4.71 -	4.77	73.00	7.30	ABOVE	11.21	0.00	0.00

Measured Component Index Table

LINK RELEASE

PERFORMANCE		COMP.	INDEX	PERFORMANCE		COMP.	INDEX
FROM	TO	INDEX	POINTS	FROM	TO	INDEX	POINTS
0.00 -	0.00	100.00	10.00	8.83 -	8.94	72.00	7.20
0.01 -	0.28	99.50	9.95	8.95 -	9.05	71.00	7.10
0.29 -	0.55	99.00	9.90	9.06 -	9.16	70.00	7.00
0.56 -	0.82	98.50	9.85	9.17 -	9.27	69.00	6.90
0.83 -	1.10	98.00	9.80	9.28 -	9.38	68.00	6.80
1.11 -	1.38	97.50	9.75	9.39 -	9.48	67.00	6.70
1.39 -	1.65	97.00	9.70	9.49 -	9.59	66.00	6.60
1.66 -	1.93	96.50	9.65	9.60 -	9.69	65.00	6.50
1.94 -	2.20	96.00	9.60	9.70 -	9.78	64.00	6.40
2.21 -	2.47	95.50	9.55	9.79 -	9.88	63.00	6.30
2.48 -	2.75	95.00	9.50	9.89 -	9.97	62.00	6.20
2.76 -	3.02	94.50	9.45	9.98 -	10.07	61.00	6.10
3.03 -	3.30	94.00	9.40	10.08 -	10.16	60.00	6.00
3.31 -	3.57	93.50	9.35	10.17 -	10.25	59.00	5.90
3.58 -	3.85	93.00	9.30	10.26 -	10.34	58.00	5.80
3.86 -	4.12	92.50	9.25	10.35 -	10.42	57.00	5.70
4.13 -	4.40	92.00	9.20	10.43 -	10.51	56.00	5.60
4.41 -	4.67	91.50	9.15	10.52 -	10.59	55.00	5.50
4.68 -	4.95	91.00	9.10	10.60 -	10.68	54.00	5.40
4.96 -	5.22	90.50	9.05	10.69 -	10.76	53.00	5.30
5.23 -	5.50	90.00	9.00	10.77 -	10.84	52.00	5.20
5.51 -	5.74	89.50	8.95	10.85 -	10.92	51.00	5.10
5.75 -	5.94	89.00	8.90	10.93 -	11.00	50.00	5.00
5.95 -	6.12	88.50	8.85	11.01 -	11.16	48.00	4.80
6.13 -	6.27	88.00	8.80	11.17 -	11.32	46.00	4.60
6.28 -	6.42	87.50	8.75	11.33 -	11.49	44.00	4.40
6.43 -	6.55	87.00	8.70	11.50 -	11.66	42.00	4.20
6.56 -	6.67	86.50	8.65	11.67 -	11.84	40.00	4.00
6.68 -	6.79	86.00	8.60	11.85 -	12.02	38.00	3.80
6.80 -	6.90	85.50	8.55	12.03 -	12.21	36.00	3.60
6.91 -	7.01	85.00	8.50	12.22 -	12.41	34.00	3.40
7.02 -	7.11	84.50	8.45	12.42 -	12.62	32.00	3.20
7.12 -	7.21	84.00	8.40	12.63 -	12.83	30.00	3.00
7.22 -	7.30	83.50	8.35	12.84 -	13.06	28.00	2.80
7.31 -	7.39	83.00	8.30	13.07 -	13.29	26.00	2.60
7.40 -	7.48	82.50	8.25	13.30 -	13.55	24.00	2.40
7.49 -	7.57	82.00	8.20	13.56 -	13.82	22.00	2.20
7.58 -	7.65	81.50	8.15	13.83 -	14.11	20.00	2.00
7.66 -	7.73	81.00	8.10	14.12 -	14.43	18.00	1.80
7.74 -	7.81	80.50	8.05	14.44 -	14.79	16.00	1.60
7.82 -	7.89	80.00	8.00	14.80 -	15.21	14.00	1.40
7.90 -	8.04	79.00	7.90	15.22 -	15.72	12.00	1.20
8.05 -	8.18	78.00	7.80	15.73 -	16.50	10.00	1.00
8.19 -	8.32	77.00	7.70	16.51 -	17.60	8.00	0.80
8.33 -	8.45	76.00	7.60	17.61 -	18.70	6.00	0.60
8.46 -	8.58	75.00	7.50	18.71 -	19.80	4.00	0.40
8.59 -	8.70	74.00	7.40	19.81 -	20.90	2.00	0.20
8.71 -	8.82	73.00	7.30	ABOVE	20.90	0.00	0.00

Measured Component Index Table

INCOMING MATCHING LOSS

PERFORMANCE		COMP.	INDEX	PERFORMANCE		COMP.	INDEX
FROM	TO	INDEX	POINTS	FROM	TO	INDEX	POINTS
0.00 -	1.70	100.00	10.00	3.44 -	3.45	72.00	7.20
1.71 -	1.82	99.50	9.95	3.46 -	3.48	71.00	7.10
1.83 -	1.92	99.00	9.90	3.49 -	3.50	70.00	7.00
1.93 -	2.00	98.50	9.85	3.51 -	3.52	69.00	6.90
2.01 -	2.07	98.00	9.80	3.53 -	3.55	68.00	6.80
2.08 -	2.14	97.50	9.75	3.56 -	3.57	67.00	6.70
2.15 -	2.20	97.00	9.70	3.58 -	3.59	66.00	6.60
2.21 -	2.26	96.50	9.65	3.60 -	3.61	65.00	6.50
2.27 -	2.31	96.00	9.60	3.62 -	3.63	64.00	6.40
2.32 -	2.36	95.50	9.55	3.64 -	3.66	63.00	6.30
2.37 -	2.41	95.00	9.50	3.67 -	3.68	62.00	6.20
2.42 -	2.45	94.50	9.45	3.69 -	3.70	61.00	6.10
2.46 -	2.50	94.00	9.40	3.71 -	3.72	60.00	6.00
2.51 -	2.54	93.50	9.35	3.73 -	3.74	59.00	5.90
2.55 -	2.58	93.00	9.30	3.75 -	3.75	58.00	5.80
2.59 -	2.62	92.50	9.25	3.76 -	3.77	57.00	5.70
2.63 -	2.66	92.00	9.20	3.78 -	3.79	56.00	5.60
2.67 -	2.69	91.50	9.15	3.80 -	3.81	55.00	5.50
2.70 -	2.73	91.00	9.10	3.82 -	3.83	54.00	5.40
2.74 -	2.77	90.50	9.05	3.84 -	3.85	53.00	5.30
2.78 -	2.80	90.00	9.00	3.86 -	3.87	52.00	5.20
2.81 -	2.83	89.50	8.95	3.88 -	3.88	51.00	5.10
2.84 -	2.86	89.00	8.90	3.89 -	3.90	50.00	5.00
2.87 -	2.89	88.50	8.85	3.91 -	3.93	48.00	4.80
2.90 -	2.92	88.00	8.80	3.94 -	3.97	46.00	4.60
2.93 -	2.94	87.50	8.75	3.98 -	4.01	44.00	4.40
2.95 -	2.97	87.00	8.70	4.02 -	4.05	42.00	4.20
2.98 -	2.99	86.50	8.65	4.06 -	4.08	40.00	4.00
3.00 -	3.01	86.00	8.60	4.09 -	4.12	38.00	3.80
3.02 -	3.03	85.50	8.55	4.13 -	4.17	36.00	3.60
3.04 -	3.05	85.00	8.50	4.18 -	4.21	34.00	3.40
3.06 -	3.07	84.50	8.45	4.22 -	4.25	32.00	3.20
3.08 -	3.09	84.00	8.40	4.26 -	4.30	30.00	3.00
3.10 -	3.11	83.50	8.35	4.31 -	4.35	28.00	2.80
3.12 -	3.13	83.00	8.30	4.36 -	4.40	26.00	2.60
3.14 -	3.15	82.50	8.25	4.41 -	4.45	24.00	2.40
3.16 -	3.16	82.00	8.20	4.46 -	4.51	22.00	2.20
3.17 -	3.18	81.50	8.15	4.52 -	4.57	20.00	2.00
3.19 -	3.20	81.00	8.10	4.58 -	4.64	18.00	1.80
3.21 -	3.21	80.50	8.05	4.65 -	4.71	16.00	1.60
3.22 -	3.23	80.00	8.00	4.72 -	4.79	14.00	1.40
3.24 -	3.26	79.00	7.90	4.80 -	4.88	12.00	1.20
3.27 -	3.29	78.00	7.80	4.89 -	5.00	10.00	1.00
3.30 -	3.32	77.00	7.70	5.01 -	5.14	8.00	0.80
3.33 -	3.35	76.00	7.60	5.15 -	5.30	6.00	0.60
3.36 -	3.38	75.00	7.50	5.31 -	5.49	4.00	0.40
3.39 -	3.40	74.00	7.40	5.50 -	5.73	2.00	0.20
3.41 -	3.43	73.00	7.30	ABOVE	5.73	0.00	0.00

Measured Component Index Table

TRANSVERTER 2ND TRIAL FAILURES

PERFORMANCE		COMP.	INDEX	PERFORMANCE		COMP.	INDEX
FROM	TO	INDEX	POINTS	FROM	TO	INDEX	POINTS
0.00 -	0.10	100.00	10.00	25.60 -	25.93	72.00	7.20
0.11 -	0.90	99.50	9.95	25.94 -	26.26	71.00	7.10
0.91 -	1.69	99.00	9.90	26.27 -	26.58	70.00	7.00
1.70 -	2.49	98.50	9.85	26.59 -	26.90	69.00	6.90
2.50 -	3.28	98.00	9.80	26.91 -	27.20	68.00	6.80
3.29 -	4.08	97.50	9.75	27.21 -	27.50	67.00	6.70
4.09 -	4.87	97.00	9.70	27.51 -	27.80	66.00	6.60
4.88 -	5.66	96.50	9.65	27.81 -	28.09	65.00	6.50
5.67 -	6.46	96.00	9.60	28.10 -	28.37	64.00	6.40
6.47 -	7.25	95.50	9.55	28.38 -	28.65	63.00	6.30
7.26 -	8.05	95.00	9.50	28.66 -	28.92	62.00	6.20
8.06 -	8.84	94.50	9.45	28.93 -	29.19	61.00	6.10
8.85 -	9.64	94.00	9.40	29.20 -	29.45	60.00	6.00
9.65 -	10.43	93.50	9.35	29.46 -	29.71	59.00	5.90
10.44 -	11.23	93.00	9.30	29.72 -	29.96	58.00	5.80
11.24 -	12.02	92.50	9.25	29.97 -	30.22	57.00	5.70
12.03 -	12.81	92.00	9.20	30.23 -	30.46	56.00	5.60
12.82 -	13.61	91.50	9.15	30.47 -	30.71	55.00	5.50
13.62 -	14.40	91.00	9.10	30.72 -	30.95	54.00	5.40
14.41 -	15.20	90.50	9.05	30.96 -	31.19	53.00	5.30
15.21 -	15.99	90.00	9.00	31.20 -	31.42	52.00	5.20
16.00 -	16.69	89.50	8.95	31.43 -	31.65	51.00	5.10
16.70 -	17.27	89.00	8.90	31.66 -	31.88	50.00	5.00
17.28 -	17.77	88.50	8.85	31.89 -	32.34	48.00	4.80
17.78 -	18.22	88.00	8.80	32.35 -	32.81	46.00	4.60
18.23 -	18.64	87.50	8.75	32.82 -	33.30	44.00	4.40
18.65 -	19.02	87.00	8.70	33.31 -	33.80	42.00	4.20
19.03 -	19.38	86.50	8.65	33.81 -	34.31	40.00	4.00
19.39 -	19.72	86.00	8.60	34.32 -	34.84	38.00	3.80
19.73 -	20.04	85.50	8.55	34.85 -	35.39	36.00	3.60
20.05 -	20.35	85.00	8.50	35.40 -	35.96	34.00	3.40
20.36 -	20.64	84.50	8.45	35.97 -	36.56	32.00	3.20
20.65 -	20.92	84.00	8.40	36.57 -	37.18	30.00	3.00
20.93 -	21.20	83.50	8.35	37.19 -	37.83	28.00	2.80
21.21 -	21.46	83.00	8.30	37.84 -	38.52	26.00	2.60
21.47 -	21.72	82.50	8.25	38.53 -	39.25	24.00	2.40
21.73 -	21.96	82.00	8.20	39.26 -	40.03	22.00	2.20
21.97 -	22.20	81.50	8.15	40.04 -	40.87	20.00	2.00
22.21 -	22.44	81.00	8.10	40.88 -	41.80	18.00	1.80
22.45 -	22.67	80.50	8.05	41.81 -	42.84	16.00	1.60
22.68 -	22.89	80.00	8.00	42.85 -	44.04	14.00	1.40
22.90 -	23.32	79.00	7.90	44.05 -	45.54	12.00	1.20
23.33 -	23.73	78.00	7.80	45.55 -	47.77	10.00	1.00
23.74 -	24.13	77.00	7.70	47.78 -	50.95	8.00	0.80
24.14 -	24.51	76.00	7.60	50.96 -	54.12	6.00	0.60
24.52 -	24.88	75.00	7.50	54.13 -	57.30	4.00	0.40
24.89 -	25.24	74.00	7.40	57.31 -	60.48	2.00	0.20
25.25 -	25.59	73.00	7.30	ABOVE	60.48	0.00	0.00

Measured Component Index Table

AMA RECORDER FAILURES

PERFORMANCE		COMP.	INDEX	PERFORMANCE		COMP.	INDEX
FROM	TO	INDEX	POINTS	FROM	TO	INDEX	POINTS
0.00	- 0.10	100.00	10.00	7.81	- 7.90	72.00	7.20
0.11	- 0.34	99.50	9.95	7.91	- 8.00	71.00	7.10
0.35	- 0.58	99.00	9.90	8.01	- 8.10	70.00	7.00
0.59	- 0.82	98.50	9.85	8.11	- 8.19	69.00	6.90
0.83	- 1.06	98.00	9.80	8.20	- 8.29	68.00	6.80
1.07	- 1.30	97.50	9.75	8.30	- 8.38	67.00	6.70
1.31	- 1.54	97.00	9.70	8.39	- 8.47	66.00	6.60
1.55	- 1.78	96.50	9.65	8.48	- 8.55	65.00	6.50
1.79	- 2.02	96.00	9.60	8.56	- 8.64	64.00	6.40
2.03	- 2.26	95.50	9.55	8.65	- 8.72	63.00	6.30
2.27	- 2.50	95.00	9.50	8.73	- 8.80	62.00	6.20
2.51	- 2.74	94.50	9.45	8.81	- 8.88	61.00	6.10
2.75	- 2.98	94.00	9.40	8.89	- 8.96	60.00	6.00
2.99	- 3.22	93.50	9.35	8.97	- 9.04	59.00	5.90
3.23	- 3.46	93.00	9.30	9.05	- 9.12	58.00	5.80
3.47	- 3.70	92.50	9.25	9.13	- 9.20	57.00	5.70
3.71	- 3.94	92.00	9.20	9.21	- 9.27	56.00	5.60
3.95	- 4.18	91.50	9.15	9.28	- 9.34	55.00	5.50
4.19	- 4.42	91.00	9.10	9.35	- 9.42	54.00	5.40
4.43	- 4.66	90.50	9.05	9.43	- 9.49	53.00	5.30
4.67	- 4.90	90.00	9.00	9.50	- 9.56	52.00	5.20
4.91	- 5.11	89.50	8.95	9.57	- 9.63	51.00	5.10
5.12	- 5.29	89.00	8.90	9.64	- 9.70	50.00	5.00
5.30	- 5.44	88.50	8.85	9.71	- 9.84	48.00	4.80
5.45	- 5.57	88.00	8.80	9.85	- 9.98	46.00	4.60
5.58	- 5.70	87.50	8.75	9.99	- 10.13	44.00	4.40
5.71	- 5.81	87.00	8.70	10.14	- 10.28	42.00	4.20
5.82	- 5.92	86.50	8.65	10.29	- 10.43	40.00	4.00
5.93	- 6.03	86.00	8.60	10.44	- 10.59	38.00	3.80
6.04	- 6.12	85.50	8.55	10.60	- 10.76	36.00	3.60
6.13	- 6.22	85.00	8.50	10.77	- 10.93	34.00	3.40
6.23	- 6.30	84.50	8.45	10.94	- 11.11	32.00	3.20
6.31	- 6.39	84.00	8.40	11.12	- 11.30	30.00	3.00
6.40	- 6.47	83.50	8.35	11.31	- 11.49	28.00	2.80
6.48	- 6.55	83.00	8.30	11.50	- 11.70	26.00	2.60
6.56	- 6.63	82.50	8.25	11.71	- 11.92	24.00	2.40
6.64	- 6.70	82.00	8.20	11.93	- 12.16	22.00	2.20
6.71	- 6.78	81.50	8.15	12.17	- 12.41	20.00	2.00
6.79	- 6.85	81.00	8.10	12.42	- 12.69	18.00	1.80
6.86	- 6.92	80.50	8.05	12.70	- 13.01	16.00	1.60
6.93	- 6.98	80.00	8.00	13.02	- 13.37	14.00	1.40
6.99	- 7.11	79.00	7.90	13.38	- 13.82	12.00	1.20
7.12	- 7.24	78.00	7.80	13.83	- 14.50	10.00	1.00
7.25	- 7.36	77.00	7.70	14.51	- 15.46	8.00	0.80
7.37	- 7.47	76.00	7.60	15.47	- 16.42	6.00	0.60
7.48	- 7.59	75.00	7.50	16.43	- 17.38	4.00	0.40
7.60	- 7.69	74.00	7.40	17.39	- 18.34	2.00	0.20
7.70	- 7.80	73.00	7.30	ABOVE	18.34	0.00	0.00

Measured Component Index Table

**NO. 5XB PRIVATE
NETWORK SWITCHING PERFORMANCE
MEASUREMENT PLAN**

E-6420AA

Performance Indicators

		A	B	C	D		E	F	G	
		Indicator	Failures	Deductions	Net Failures	Base		Performance	Threshold Level	Soft Spot
						Item	Data			
1	Machine Access	All Orig Regs Busy				DTM-PC				1
2		Dial Tone Match Loss				BSY-HR				2
3	Machine Switching	Marker ITF				CMPC				3
4		Outsender Grp Ofi				OSG-PC				4
5		Orig Matching Loss				Busy Hr				5
6		Trunk Outage				INC-PC				6
7		Overflow % Ofi/PC				Orig Hrs				7
8		Load Balance				Tot Hrs				8
9	Equip Outage				Ofi/PC				9	
10	Billing	Bulk Billed Free				Orig Hrs				10
11		Sgl Tm Ln Entries				Tot Eq				11
12		Transverter ITF				TVPC				12
						TVPC				12
13							Total No. Of Indicators		Total No. Soft Spot	13

Individual Customers	Overflow Of Final Trunk Groups	Peg Count Of Final Trunk Groups	Performance	Threshold Level	Soft Spot
A					
B					
C					
D					
E					
F					

Measured Components

		H	J	K	L		M	N	P	R
Component	Max Points	Failures	Deduction	Net Failures	Calculation Base		Performance	Component Index	Index Points	Band
					Item	Data				
Machine Access										
14	Dial Tone Speed	10								14
Machine Switching										
15	Stuck Senders	20				SDR-PC				15
16	Marker 2TF	20				CMPC				16
17	Office Ofi	10				Orig PC				17
18	Link Release	10				Busy Hr				18
19	Inc Match Loss	10				INC-PC				19
Billing										
20	Transverter 2TF	10				TV-PC				20
21	AMA Rcd Fails	10				REC-PC				21

Remarks

22		Total Pts		22
23		Max Avail Pts		23
24		Total Index		24

S		T		U		V	
25	Prepared By	Office/MG		Division		Company	
26	Checked By	District		Area		Period	

Fig 1 — FORM E-6620AA

**NO. 5XB PRIVATE
NETWORK SWITCHING PERFORMANCE
MEASUREMENT PLAN**

E-6420BA
(1)

		A	B	C	D	E	F	G	H
		Measured Component	Weight	No. of Offices	Tot. No. of Ofc. Month Reports	Number and % of Office Month Reports by Index Band			
						A 98- 100	B 96- 97.9	C 90- 95.9	D <90
1	M A C C. h.c.	Dial	10						
2		Tone Speed		% of Total					
3	S	Stuck	20						
4		Senders		% of Total					
5	M w	Completing	20						
6		Marker 2nd T.F.		% of Total					
7	a i c t h i n i n g	Office	10						
8		Overflow		% of Total					
9	e n g	Link	10						
10		Release		% of Total					
11	B i l l i n g	Incoming	10						
12		Matching Loss		% of Total					
13	B i l l i n g	Transverter	10						
14		2nd T.F.		% of Total					
15	B i l l i n g	AMA Recorder	10						
16		Failure		% of Total					
17	Total		100						
18	Index			% of Total					

Band D Trends

		J	K	L											
		Measured Component		Preceding Periods											
				1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th
19	M A C C. h.c.	Dial	Number												
20		Tone Speed	%												
21	S	Stuck	Number												
22		Senders	%												
23	M w	Completing	Number												
24		Marker 2nd T.F.	%												
25	a i c t h i n i n g	Office	Number												
26		Overflow	%												
27	e n g	Link	Number												
28		Release	%												
29	B i l l i n g	Incoming	Number												
30		Matching Loss	%												
31	B i l l i n g	Transverter	Number												
32		2nd TF	%												
33	B i l l i n g	AMA Recorder	Number												
34		Failure	%												
35	Total		Number												
36	Index		%												

M	N	P	R	S	T
Office	District	Division	Area	Company	Report Period

Fig. 2 - Form E-6420BA (Sheet 1 of 2)

11. PREPARATION OF FORM E-4372 – BUSY HOUR DIAL TONE SPEED

General

11.01 Form E-4372 "Busy Hour Dial Tone Speed" is provided for computing daily busy hour dial tone speed results for an entity.

frame, or type of receiver) that is measured separately on the dial tone speed machine(s) provided the entity.

11.02 The preparation of Form E-4372 will generally be the responsibility of the Dial Administration Group.

(b) Time: Enter the busy hour for each class and type.

11.03 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.

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

11.07 *Items 2, 6, 10 and 14 – Number of Tests:*

Instructions for Use of Form E-4372

(a) Enter the number of dial tone speed tests obtained during the busy hour, separately, for each class and type. This is the number of registrations recorded on the test register of the dial tone speed measuring equipment.

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

(b) Enter the code NA in this item whenever dial tone speed delay registrations are not available for a particular class and type.

(a) Report Month: Enter the report month and year for which the dial tone speed data are reported.

11.08 *Items 3, 7, 11 and 15 – Number Over 3 Seconds:*

(b) Entity: Identify the entity for which dial tone speed data are reported.

(a) Enter for each day, the number of delays registered during the busy hour, separately, for each class and type. This is the number of registrations recorded on the delay registers of the dial tone speed measuring equipment.

(c) Type of Central Office Equipment: Enter No. 5 Crossbar."

(b) Enter the code NA in this item whenever dial tone speed delay registrations are not available for a particular class and type.

(d) Type of DTS Equipment: Enter the type of dial tone speed equipment (modified, unmodified or synchronous timer) provided the entity.

11.09 *Items 4, 8, 12 and 16 – Percent Over 3 Seconds:* Separately, for each class and type, calculate the percent that the delay registrations are of the total number of tests made during the busy hour (item 3 divided by item 2; 7 by 6; 11 by 10; and 15 by 14). Multiply the quotient by 100 and express the result to one decimal place.

(e) Page of : Enter the page number and the total number of pages for the office.

11.05 *Item 1 – Date Business Days:* Enter the date of each business day. Days on which dial tone speed measurements are to be included on Form E-4372 are covered in 6.14; days to be excluded are covered in 6.15; 6.16 and 6.17.

(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 class and type.

11.06 *Items 2 through 17:* Form E-4372 is designed for entering dial tone speed data for a single entity. The form provides for reporting a maximum of four separately measured classes of service.

(b) Line Designated TOTAL: Total the percentage figures, separately, for each class and type, for the month.

(a) Space is provided for identifying each class and type (class of service, class of

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

11.10 *Items 5, 9, 13 and 17 – Weighted Percent Over 3 Seconds:* Enter for each day, the weighted percent dial tone speed over three seconds, for each class and type. Multiply the "% Over 3 Seconds" in items 4, 8, 12, and 16 by the corresponding class and type 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 class and type.

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

11.11 *Item 18 – Number of Tests – Total Class Busy Hours:*

(a) Enter for each day, the total number of dial tone speed test. This is the sum of entries recorded in items 2, 6, 10 and 14.

(b) Enter the code NA in item 18 whenever dial tone speed results are not available for one (or more) class and type, as indicated by the code NA in any of items 2 through 17.

11.12 *Item 19 – Unusable Days (✓) – Total Class Busy Hours:* Enter a check mark (✓) in this item under the conditions described in (a) and (b) following:

(a) Entities measured by modified or synchronous timer dial tone speed equipment:

(1) Whenever the code NA has been entered in item 18.

(2) Whenever the total number of dial tone speed tests made during the busy hour for the entire entity, (item 18) deviates from the number of calculated dial tone speed tests expected for the entity, (item 25).

(b) Entities measured by unmodified dial tone speed equipment: Whenever the code NA has been entered in item 18.

(c) Line Designated TOTAL: Total for the month, the number of check marks entered

in item 19.

11.13 *Item 20 – Daily Weighted Percent Over 3 Seconds – Total Class Busy Hours:*

(a) Enter for each day, the daily weighted percent dial tone speed for the entire entity. Report the result to one decimal place. This is the sum of entries recorded in items 5, 9, 13, and 17.

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

11.14 *Item 21 – Accumulated Weighted Percent Over 3 Seconds – Total Class Busy Hours:*

For each day, enter the accumulated weighted percent dial tone speed over three seconds. Add the "Daily Wtd. % Over 3 Seconds" in item 20 to the previous day's accumulated weighted percent over three 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.

11.15 *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 dial tone speed component.

(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 tables. Enter the corresponding points earned in item 22. Report the result to two decimal places.

Note: The Dial Line Index table is contained in Figure 4.

(b) Item 23 – Points Earned – Cumulative: For each measured day, enter the accumulated dial tone speed index points earned. Add the "daily" points earned in item 22 to the previous day's accumulated dial tone speed 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.

11.16 *Item 24 – Weighting Factors:* Weighting factors are used to weight dial tone speed results for an entity having more than one class and type. Compute a weighting factor for each “class and type” that is separately measured on the dial tone speed machine(s), used for an entity.

(a) Class: Identify each separately measured “class and type” in the entity. These should correspond with the headings shown in “class and type” at the top of the form.

(b) Average Class Busy Hour Peg Count: Enter the average class busy hour peg count (DT-TT, DP) registrations corresponding to the class and type entered in (a). Enter the total number of “average registrations” for the entity on the line designated TOTAL.

(c) Factor: Compute the weighting factor for each class and type. Divide the “registrations” of each class and 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.

11.17 *Item 25 – Calculated Dial Tone Speed Tests:* For each entity, calculate the number of dial tone speed tests that can be expected for the busy hour for the entity.

(a) Number of Expected Tests: Enter the calculated number of dial tone speed tests that can be expected for the busy hour for the entity.

(b) Allowable Deviation: Multiply the number of calculated dial tone speed tests expected by 3.0% (8.0% in manual environment). Apply this figure as follows:

Max. —: Enter in this space the maximum number of dial tone speed tests allowable for the entity. Add the “figure” (3.0% or 8.0%) to the number of calculated dial tone speed tests expected.

Min. —: Enter in this space the minimum number of dial tone speed tests allowable for the entity. Subtract the “figure” (3.0% or 8.0%) from the number of calculated dial tone speed tests expected.

Calculation Procedure

The timing device of the D.T. Speed machine makes tests at precise 4 second intervals. Theoretically, the machine makes 900 tests per hour. The actual number however depends on both the number of test lines and the number of “Dwell” terminals and is independent of the number of delays. The expected number of hourly registrations must be computed and will only change when test line assignments have changed.

Example:

$$\begin{array}{r}
 75 \text{ test lines} \\
 + \quad 2 \text{ dwell terminals} \\
 \hline
 = 77 \text{ test and dwell terms} \\
 \times 4 \text{ seconds/test} \\
 \hline
 = 308 \text{ seconds/cycle} \\
 \quad 3600 \text{ seconds/hour} \\
 \quad \underline{308} \\
 = 11.69 \text{ cycles/hour} \\
 \times 75 \text{ test lines} \\
 \hline
 877 \text{ calculated tests/hour}
 \end{array}$$

If the number of tests exceeds plus or minus 3% of calculated tests, that day’s data is considered unusable. Therefore, for this example, the actual number of tests must be between 851 and 903.

11.18 *Item 26 – Adjustment Factor – Total Month:* Enter the “Adjustment Factor” corresponding to the total number of days dial tone speed data are reported and indexed for the total report period. This factor is obtained from the Dial Line Index Table included in Figure 4.

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

11.10 *Items 5, 9, 13 and 17 – Weighted Percent Over 3 Seconds:* Enter for each day, the weighted percent dial tone speed over three seconds, for each class and type. Multiple the "% Over 3 Seconds" in items 4, 8, 12, and 16 by the corresponding class and type 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 class and type.

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

11.11 *Item 18 – Number of Tests – Total Class Busy Hours:*

(a) Enter for each day, the total number of dial tone speed test. This is the sum of entries recorded in items 2, 6, 10 and 14.

(b) Enter the code NA in item 18 whenever dial tone speed results are not available for one (or more) class and type, as indicated by the code NA in any of items 2 through 17.

11.12 *Item 19 – Unusable Days (✓) – Total Class Busy Hours:* Enter a check mark (✓) in this item under the conditions described in (a) and (b) following:

(a) Entities measured by modified or synchronous timer dial tone speed equipment:

(1) Whenever the code NA has been entered in item 18.

(2) Whenever the total number of dial tone speed tests made during the busy hour for the entire entity, (item 18) deviates from the number of calculated dial tone speed tests expected for the entity, (item 25).

(b) Entities measured by unmodified dial tone speed equipment: Whenever the code NA has been entered in item 18.

(c) Line Designated TOTAL: Total for the month, the number of check marks entered

in item 19.

11.13 *Item 20 – Daily Weighted Percent Over 3 Seconds – Total Class Busy Hours:*

(a) Enter for each day, the daily weighted percent dial tone speed for the entire entity. Report the result to one decimal place. This is the sum of entries recorded in items 5, 9, 13, and 17.

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

11.14 *Item 21 – Accumulated Weighted Percent Over 3 Seconds – Total Class Busy Hours:*

For each day, enter the accumulated weighted percent dial tone speed over three seconds. Add the "Daily Wtd. % Over 3 Seconds" in item 20 to the previous day's accumulated weighted percent over three 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.

11.15 *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 dial tone speed component.

(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 tables. Enter the corresponding points earned in item 22. Report the result to two decimal places.

Note: The Dial Line Index table is contained in Figure 4.

(b) Item 23 – Points Earned – Cumulative: For each measured day, enter the accumulated dial tone speed index points earned. Add the "daily" points earned in item 22 to the previous day's accumulated dial tone speed 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.

11.16 Item 24 — Weighting Factors: Weighting factors are used to weight dial tone speed results for an entity having more than one class and type. Compute a weighting factor for each "class and type" that is separately measured on the dial tone speed machine(s), used for an entity.

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

(b) **Average Class Busy Hour Peg Count:** Enter the average class busy hour peg count (DT-TT, DP) registrations corresponding to the class and type entered in (a). Enter the total number of "average registrations" for the entity on the line designated TOTAL.

(c) **Factor:** Compute the weighting factor for each class and type. Divide the "registrations" of each class and 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.

11.17 Item 25 — Calculated Dial Tone Speed Tests: For each entity, calculate the number of dial tone speed tests that can be expected for the busy hour for the entity.

(a) **Number of Expected Tests:** Enter the calculated number of dial tone speed tests that can be expected for the busy hour for the entity.

(b) **Allowable Deviation:** Multiply the number of calculated dial tone speed tests expected by 3.0% (8.0% in manual environment). Apply this figure as follows:

Max. —: Enter in this space the maximum number of dial tone speed tests allowable for the entity. Add the "figure" (3.0% or 8.0%) to the number of calculated dial tone speed tests expected.

Min. —: Enter in this space the minimum number of dial tone speed tests allowable for the entity. Subtract the "figure" (3.0% or 8.0%) from the number of calculated dial tone speed tests expected.

Calculation Procedure

The timing device of the D.T. Speed machine makes tests at precise 4 second intervals. Theoretically, the machine makes 900 tests per hour. The actual number however depends on both the number of test lines and the number of "Dwell" terminals and is independent of the number of delays. The expected number of hourly registrations must be computed and will only change when test line assignments have changed.

Example:

$$\begin{array}{r}
 75 \text{ test lines} \\
 + \quad 2 \text{ dwell terminals} \\
 \hline
 = 77 \text{ test and dwell terms} \\
 \times 4 \text{ seconds/test} \\
 \hline
 = 308 \text{ seconds/cycle} \\
 \quad 3600 \text{ seconds/hour} \\
 \quad \underline{308} \\
 = 11.69 \text{ cycles/hour} \\
 \times 75 \text{ test lines} \\
 \hline
 877 \text{ calculated tests/hour}
 \end{array}$$

If the number of tests exceeds plus or minus 3% of calculated tests, that day's data is considered unusable. Therefore, for this example, the actual number of tests must be between 851 and 903.

11.18 Item 26 — Adjustment Factor — Total Month: Enter the "Adjustment Factor" corresponding to the total number of days dial tone speed data are reported and indexed for the total report period. This factor is obtained from the Dial Line Index Table included in Figure 4.

DIAL LINE INDEX TABLE
Dial Tone Speed – BH

Perf.	Points
.0–1.1	1.59
1.2–1.4	1.57
1.5–1.6	1.56
1.7–1.8	1.54
1.9–2.0	1.53
2.1	1.51
2.2	1.49
2.3	1.48
2.4	1.46
2.5	1.45
2.6	1.43
2.7–3.0	1.40
3.1–3.4	1.35
3.5–3.8	1.30
3.9–4.2	1.24
4.3–4.7	1.18
4.8–5.2	1.11
5.3–4.7	1.03
5.8–6.2	.95
6.3–6.8	.87
6.9–7.5	.80
7.6–8.4	.64
8.5–9.4	.48
9.5–10.5	.32
10.6–15.0	.16
Over 15.0	.00

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.-1.000	15 DA.-1.467

11.19 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.

11.20 Item 28 – Component Index – Total Month
Item 29 – Weakspot (✓) – Total Month
Item 30 – ESS – Number Blocked Dial Tone-Busy Hour: These items need not be completed for purposes of this Service Result Plan.

11.21 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; for example, a brief, clear, explanation of an “out-of-order” condition. It would not be sufficient to merely enter the code “OD” (out of order) in the Notes space.

Fig. 4

B. Method of Obtaining Weighted Percent Dial Tone Speed for an Entity

General

11.22 The weighting factors developed each month for computing the weighted dial tone speed results are based on originating calls taken during the busy hour, for all of the measured days of the report month. In order to track dial tone speed results, the Dial Administrator should calculate weighted percent on a daily basis.

11.23 *No. 5 Crossbar Offices 100% Dial Pulse or 100% Touch Tone:* No weighting is required since all classes of service are mixed on the line link frame.

11.24 *For No. 5 Crossbar Offices Having Some Paired and Some Nonpaired Line Link Frames:* There may be occasions when engineering of administrative requirements necessitate assignment of test lines to separate arcs on the dial tone speed machine. In these cases, add the total number of registration tests and the total number of delays for both arcs. To procure a combined percent dial tone speed for both the paired and the nonpaired line link frames, divide the total number of delays by the total number of test registrations. No weighting is required.

11.25 *No. 5 Crossbar Offices With More Than One Group of Originating Registers:* Separate dial tone speed results may be obtained and weighted daily.

(a) **Weighting Factors:** The weight assigned to each group is based on originating register per count, and is the percentage that the calls in each group are of the total of the entity being weighted. These weighting factors shall be based on originating register peg count taken during the busy hour.

(b) For No. 5 crossbar offices, DP and TT equipment, having some paired and some nonpaired line links frames, there may be occasions when engineering or administrative requirements necessitate assignment of test lines to separate arcs on the dial tone speed machine. In these cases, no attempt should be made to weight and results by type of line links frame. To procure a weighted percent dial tone speed for an office, determine the total number of tests registrations and the total number of delays by type of equipment (Touch-Tone and dial pulse) for both the paired and nonpaired line links frames and compute a weighted percent dial tone speed for the office in accordance with B.04(c).

(c) *Example:* No. 5 Crossbar Entity — DP and TT Equipment

(1) Developing weighting factors:

<u>Class of Service</u>	<u>Time (BH)</u>	<u>Orig. Reg. Peg Count</u>	<u>Wtg. Factor</u>
Dial Pulse	10:30 A.M. to 11:30 A.M.	9,642	.821
Touch-Tone	10:30 A.M. to 11:30 A.M.	<u>2,106</u>	<u>.179</u>
Total		11,748	1.000

(2) Computing weighted percent dial tone speed:

<u>Class of Service</u>	<u>No. Test Reg.</u>	<u>No. Tests Over 3 Seconds</u>	<u>%DTS Over 3 Seconds</u>	<u>Wtg. Factor</u>	<u>Wtd. % DTS Over 3 Seconds</u>
Dial Pulse	783	14	1.8	.821	1.5
Touch-Tone	<u>117</u>	<u>7</u>	<u>6.0</u>	<u>.179</u>	<u>1.1</u>
Total	900			1.000	2.6

Weighted % DTS over 3 seconds - BH = 2.6%

12. LOAD BALANCE DETERMINATION

DESCRIPTION

12.01 The first process involved with the calculation of a load balance index is to apply statistical formulas to the load unit usage data and establish scores for each unit. This procedure requires the selection of quality control limits (based upon average holding time (AHT) and percent of capacity) and the application of these limits to the raw CCS data. The method used to select QCLs and develop scores is outlined as follows:

DEFINITION OF TERMS

12.02 Definition of a *traffic unit* is the same as the definition of a *dial entity*. The term traffic unit is used to conform with common language location identification practice, Bell System Practice 795-100-100. An example of traffic units is as follows:

No. 5 Crossbar: A group of lines using a common marker group.

12.03 A *load unit* is defined as that component of line originating equipment arranged for usage measurements and for which individual scores are to be computed. Examples of load units are horizontal groups (No. 5 Crossbar).

12.04 A general definition of a *loading division* is a group of load units of the same type of dial equipment, designed to be loaded similarly by both usage and classes of service and not requiring telephone number changes to effect line load balance within the loading division. Where equipment features, such as TOUCH-TONE®, prevent similar loading and assigning due to equipment design, the operating telephone company (OTC) has the option of further breakdowns by loading divisions. Uniformity of justification for creating more loading divisions should be maintained within an OTC. Care should be taken that the establishment of additional loading divisions does not create undetectable imbalances in other equipment components. Creation of more than one loading division requires administration for proper loading between divisions.

12.05 A *study* is the period of time scheduled to measure and score the usage to determine load balance by quality control techniques.

12.06 The *class busy hour* (CBH) is the time consistent hour during which a loading division has the highest average hundred called seconds (CCS) usage measured for five days during the same week. The hour may start and end on the clock hour, half-hour, or quarter-hour.

12.07 A *side hour* is an amount of time equal to one hour that is time consistent and adjacent to the CBH. It may be on one side or both sides of the CBH in order to provide the highest possible CCS for the side hour, but must not be divided into time periods of less than one quarter of an hour. For example, if the CBH is 9:00 to 10:00 am, the side hour could be 8:00 to 9:00 am, 10:00 to 11:00 am, 8:15 to 9:00 am and 10:00 to 10:15 am, etc.

12.08 *Session busy hours* (SBHs) are comprised of the CBH and the side hour.

12.09 *Completion date* of added or changed load units will be the date they are available for service.

(a) When *advance completion* of one or more load units on a single addition or change is necessary, the completion date will be the date that the *last* unit is available for service.

(b) When *segmental completion* is scheduled, each segment will be treated as a separate addition or change.

Note: Segmental completion may only be applicable in certain companies.

12.10 The index plan covers offices equipped with either electromechanical or electronic equipment, assigned either by manual mechanized procedures, whether or not service observing is provided, unless three or fewer load units are in service.

12.11 A *loading division* is indexed in this plan when the average usage of its measured load units equals or exceeds **30 percent** of their engineered capacity.

12.12 *Traffic units* are indexed in this plan when one or more loading divisions satisfy the 30 percent rule.

12.13 When *load units* are *added* to a present loading division, the operating telephone company (OTC) will have the following options.

- (a) Indexing the addition as a separate loading division for a maximum of *six months* after the completion date or
- (b) Including the new load units with the present loading division.

12.14 If part of a loading division is planned for *removal* or *rearrangement*, the OTC will have the option of indexing that part as a separate loading division. Indexing as a separate loading division will begin when *assignment rules* are changed for the involved load units.

12.15 An entire traffic unit may be removed from service in a dial-to-dial replacement. Advance planning in such a case may include an embargo on all new connect service orders for the unit to be retired if there are other traffic units in the wire center. Load balance studies and LBI calculations should be continued even though all line movement is out of the traffic unit and the load is decreasing.

12.16 Quality control limits (see 12.25) and the Load Balance Index Table are more liberal as load decreases. Traffic units scheduled for retirement will continue to be covered by the plan as long as they serve working main stations. However, they will not be indexed and will be classified NI (not indexed) when they no longer satisfy the 30 percent rule.

REPORTING PERIODS

12.17 All months are to be reported but only one week of data per month for three months is used for the index.

12.18 One week per month will be utilized for the computation of an LBI. This is not intended to restrict quantities of studies for load balance purposes. Additional studies are encouraged and may be scheduled by the administrator during any week of the month. However, the week chosen for index reporting must be the *last valid study week* of the month.

12.19 Studies for index computation should be conducted a minimum of *two weeks apart* (one intervening week) in order to:

- (a) Allow time for review
- (b) Take corrective action
- (c) Look at an entity over approximately twelve equally distributed periods.

12.20 The two week rule may not be broken except in extreme cases where data are unavailable, ie, where the last week of a month is the index week it is acceptable to use the first week of the following month if, and only if, all subsequent data for that period are invalid or lost.

12.21 *Five days* of usage per week will be scheduled for each study.

12.22 Each study selected for an LBI computation must be scheduled for *ten hours* and coincide with the busy season *session busy hour* (SBH) determined by loading division. Although variations are permitted to account for minor data collection or processing problems, the QCL for ten hours must always be used. The variation limits are as follows:

256 to 370 SCANS — WHICH IS APPROXIMATELY 7.1 to 10.3 HOURS

12.23 *Busy hour* studies are taken periodically to determine busy hours for engineering and administration purposes. After the busy hour has been determined, side hours and balance periods may be easily selected.

12.24 It is recommended that those side hours immediately adjoining the busy hour (as found by usage measurements on line groups) be reviewed first. The hours on either side of the busy hour in most cases will be close to the busy hour in CCS and will have the same general traffic characteristics as the busy hour. Where the usage in these side hours are at least *90 percent of the busy hour load* during the busy season, they should be used with the busy hour for balancing purposes. Out of the busy season, the side hour must have at least *80 percent of the busy hour load*.

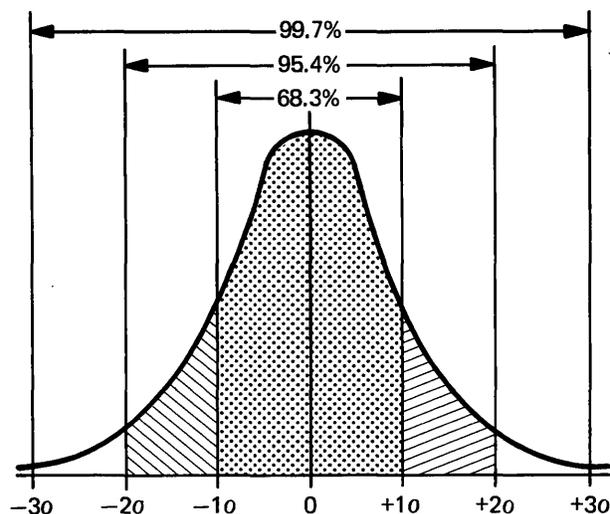
A. Quality Control Limits (QCL)

12.25 The quality control technique is a practical way of taking advantage of mathematics in order to create a uniform approach to load balance procedures. This technique indicates reliably whether fluctuations in load data might be the result of chance or are probably the result of differences in traffic unit performance, and consequently indicate whether or not some action should be taken. A successful quality control plan requires limits to be used that will satisfactorily and accurately indicate a true imbalance.

12.26 The two primary causes for variation of individual load unit usage from the average of a number of horizontal groups in the same loading/division are *chance* and *imbalance*. Chance variations result from the random calling patterns of customer telephone usage. The size of chance variations depends upon certain measurable office characteristics: average holding time (AHT) of calls, percent loading of the division, and number of customers. The general rule is, the larger the sample measured, the smaller the chance variation relative to the size of the sample. Each of the aforementioned characteristics affects the size of samples observed in load studies.

12.27 It can be demonstrated that group variations due to chance in a reasonably balanced loading division will follow the normal distribution pattern, which is a bell-shaped distribution about the mean (average). This normal distribution can be described by stipulating a mean value and the measure of dispersion of group loads around that value. The measure of dispersion, adjusted for the number of hours of data, is commonly called the *standard deviation*. Office trends will not be a factor since each group is related to the average of all groups every time a record is taken. An area representing one standard deviation from the mean in a normal distribution may be expected to include 68.3 percent of all the group measurements; two standard deviations 95.4 percent of all measurements; and three standard deviations 99.7 percent of all measurements, as illustrated in the distribution curve below:

Normal Distribution . . .



12.28 The problem of isolating and evaluating chance variation may be resolved by utilizing procedures involving the standard deviation. In this way the size of a deviation from the mean may be used to judge whether that deviation may be due to chance or is most probably due to imbalance. As a basis for this judgment, quality control limits (QCLs) representing three standard deviations have been selected (this approach is arbitrary and is used by many industries to indicate items not meeting manufacturing tolerances). To see what this means, consider 1000 groups whose measured loads are averaged together. The mathematical analysis tells us that we may expect only three (the 0.3 percent outside the 99.7 percent) of those measurements to differ by chance from the mean by more than three standard deviations, ie, the QCL. In effect, we can assume that *all* deviations from the mean greater than the QCLs are due to imbalance. Choosing larger QCLs would increase this assurance; however, there will be a greater chance that some deviations that truly reflect imbalance will be ignored. These three standard deviations (3 sigma) limits are shown in the quality control limit charts of Fig. 1.

12.29 There are two steps in determining the appropriate QCL. The first step is to calculate the *percent of capacity* for the study period. This is accomplished by taking the actual average load and comparing it to the engineered

load. The QCL value derived from this computation makes allowance for the fact that group loads in a lightly loaded office can fluctuate more than those in a comparable heavily loaded office.

12.30 This computation is made by dividing the total actual average usage (in CCS) per load unit by the engineered load (in CCS) per load unit and multiplying the result by 100. Engineered line link frame (LLF) capacities may be found in Traffic Facilities Practices Division D, Section 8b(2), or obtained from the Network Design engineer. The answer will be the percentage of capacity at which the horizontal groups are operating for the given study period. This is done for each loading division; where only sample usage is read, usage must be calculated (see Part 3E for specific details with multiple loading divisions). The percentage is then used to determine the table from which the QCL will be selected for that loading division. There are eight of these tables to cover percentage loading ranges from 30 to over 96 percent. The calculation of the percentage of capacity for a study period is illustrated in the following example:

Office Parameters

LLFs Installed = 30 (300 Horizontal Group)
 TLFs Installed = 15
 Pattern = 36 X 9P

Step 1

LLF Capacity = 1140 CCS
 Horizontal Group Capacity = 114 CCS

ie, Engineered Load (EL) = 114 CCS

Step 2

Marker Total Channel P.C. (TCPC) = 11454
 Marker Sample Channel P.C. (SCPC) = 2907
 Sample Channel Usage (DGU) = SU = 6480

Total Office CCS = $\frac{TCPC}{SCPC}$ X Sample Usage

= T/S Ratio X SU

T/S Ratio = $\frac{11454}{2907}$ = 3.9

Total Office CCS = 3.9 X 6480
 = 25272 CCS

$$\begin{aligned} \text{Average Actual Load (AL)} &= \frac{\text{Total CCS}}{\text{No. of HG}} \\ &= \frac{25272}{300} \\ &= \underline{84} \text{ CCS} \end{aligned}$$

Step 3

$$\begin{aligned} \text{Percent of Capacity} &= \frac{AL}{EL} \times 100 \\ &= 84 \times 100 = 73.6 \end{aligned}$$

$$\begin{aligned} \text{Percent of Capacity} &= \frac{AL}{EL} \times 100 \\ &= \frac{84}{114} \times 100 = 73.6 \end{aligned}$$

73.6% rounded to the nearest whole number (integer) would be 74%.

12.31 QCL tables also require the use of average holding times (AHTs) of the calls creating usage on line equipment. Documentation of the AHT in a traffic unit is necessary for each balance study, by loading division if possible, to get the most accurate results.

12.32 Computation of AHT in seconds for a No. 5 crossbar office is as follows:

$$\text{AHT} = \frac{\text{Sample Channel Usage} \times 100}{\text{Sample Channel Peg Count}}$$

Example:

$$\begin{aligned} \text{AHT} &= \frac{6480}{2907} \times 100 \\ &= \underline{223} \text{ sec.} \end{aligned}$$

12.33 Following, is an example of selecting the QCL percent with the results in 12.30 and 12.32:

Step 1

Given 74 percent of capacity in 12.30, select the table in Fig. 1, entitled 66 percent to 75 percent.

Step 2

Given an 1140 CCS per LLF in 12.30, select the proper column, 1040-1159, of the table found in Step 1.

Step 3

Given a 223 second holding time from 12.32, select the proper range, 211-230 AHT.

Step 4

Where the line chosen in Step 3 intersects the column designated in Step 2, the QCL is found equal to 48 percent.

12.34 For 10-hour QCLs not represented by tables, the company staff may contact the AT&T Network Administration group.

12.35 The eight quality control limit tables in Fig. 1 were constructed using ten hours of data for a base. These tables are the only system tables allowed for computing the load balance index as described in Division A, Section 5b.

12.36 After computing the QCL as described in the preceding paragraphs, it is possible to establish CCS values for the +3 sigma points. It is also necessary to indicate load units that are approaching these limits. This is established by designating intermediate points at ± 1.5 sigma, as illustrated in the distribution curve below:

Example:

Assume average usage per load unit in a loading division is 200 CCS and the QCL is 44 percent.

$$200 \text{ CCS} \times .44 = 88 \text{ CCS}$$

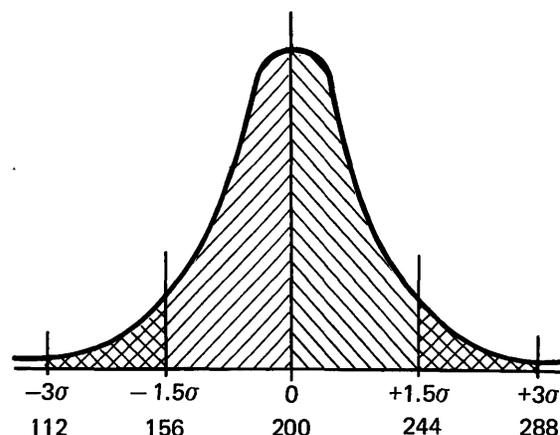
$$+ 3.0 \text{ S.D.} = 200 \text{ CCS} + 88 \text{ CCS} = 288 \text{ CCS}$$

$$- 3.0 \text{ S.D.} = 200 \text{ CCS} - 88 \text{ CCS} = 112 \text{ CCS}$$

$$+ 1.5 \text{ S.D.} = 200 \text{ CCS} + 44 \text{ CCS} = 244 \text{ CCS}$$

$$- 1.5 \text{ S.D.} = 200 \text{ CCS} - 44 \text{ CCS} = 156 \text{ CCS}$$

CCS Value . . .



12.37 The use of CCS values at the specified 3 and 1.5 sigma limits works well for one week data. Unfortunately, when a history is maintained to increase statistical reliability, the mathematics becomes too complicated to utilize on a manual basis. This deficiency is overcome with an alternate method being used, called the Score System.

B. Development of Scores

12.38 The Score System has been developed to simplify the mathematics required in the balancing of loading groups. The system substitutes a very simple number for a much larger number to enable subtractions and additions to be made quickly and simply. Numerical values are assigned to represent the extent each load unit has departed from the group average during a measurement period. In application, all groups exceeding the quality control limit on a weekly record are assumed to be out of balance. The other groups, however, also deviate to a lesser degree above and below the average.

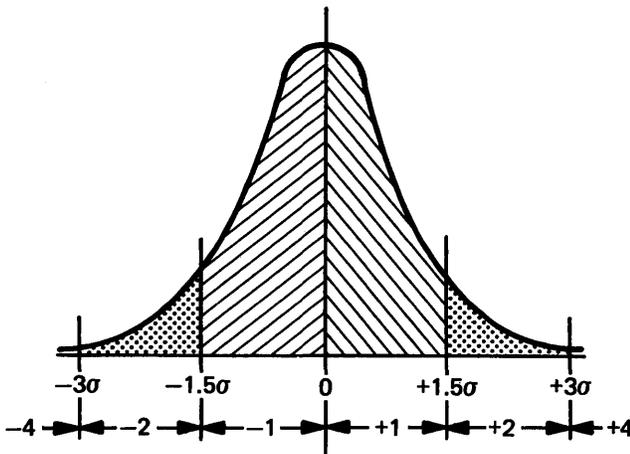
12.39 The procedure for deriving scores is to take the QCL percentage as determined from the preceding paragraphs and apply it as follows (see distribution curve below).

- (a) Each load unit with exactly average CCS is assigned a score of 0 (zero).
- (b) Each load unit deviating above or below average up to and including 1.5 standard deviations, half the QCL, is assigned a score of +1 or -1.

(c) Each load unit deviating above or below 1.5 standard deviations from the average and up to and including 3.0 standard deviations is assigned a score of +2 or -2.

(d) Each load unit deviating above or below 3.0 standard deviations from the average is assigned a score of +4 or -4. Note that four (4) is used rather than three (3) in order to accentuate this undesirable deviation.

Score Method . . .



Example:

Assume average usage per load unit in a loading division is 200 CCS and the QCL is 44 percent. 3.0 standard deviations is 44 percent and 1.5 standard deviations is 22 percent. Scores are computed as follows:

Load Unit CCS	Score
289 and higher	+4
245 thru 288	+2
201 thru 244	+1
200	0
156 thru 199	-1
112 thru 155	-2
111 and lower	-4

12.40 Next, *plus four (+4)* scores are highlighted for the past *three studies* in order to indicate all load units that are truly out of balance.

12.41 *Penalty points* are then applied to these

+4 scores for the three studies on a weighted basis in this manner:

- (a) Load units are assigned three (3) penalty points for a +4 score on the current reporting month's study.
- (b) Two (2) penalty points are applied to a +4 score on the preceding study.
- (c) One (1) penalty point is given for a +4 score on the next preceding study.

This can result in a maximum of six (6) penalty points per load unit.

12.42 Examples of the application of weighted penalty points are as follows:

	Nov.	Dec.	Jan.	Total
Load Unit A —Study Score	+4	+4	+4	-
—Penalty Points	1	2	3	6
Load Unit B —Study Score	-	-	+4	-
—Penalty Points	-	-	3	6#
Load Unit C —Study Score	+4	+1	+4	-
—Penalty Points	1	0	3	4
Load Unit D —Study Score	-1	+4	+2	-
—Penalty Points	0	2	0	2
Load Unit E —Study Score	+4	+1	-1	-
—Penalty Points	1	0	0	1
Load Unit F —Study Score	-2	+2	+4	-
—Penalty Points	0	0	0	1
Load Unit G —Study Score	+1	-1	+1	-
—Penalty Points	0	0	0	0
Load Unit H —Study Score	+4*	+2	+2	-
—Penalty Points	-	0	0	0

See 12.43

* Load Unit H was changed to a new loading division after the November index week and old scores were dropped.

12.43 The example of load unit B in 4.04, is in which the unit is being indexed for the first time during the month of January. This load unit is part of a loading division in service for five months and considered sufficiently loaded to be included with the rest of the loading divisions in the office. The use of penalty points for one month, January, could give misleading index results especially if the load condition remains the same over a three month period. Therefore, to eliminate this problem

and make the *start-up* index meaningful, one of two approaches may be taken. Either assume that the latest index month represents all three months or utilize actual data from the two previous months. The example shown in load unit B indicates the former approach.

12.44 The penalty points are accumulated for an entire loading division and a *penalty point fraction* is calculated. This fraction is computed by dividing the number of penalty points by the number of valid load units in that division. The performance is then located on a table (Fig. 2) that relates it to the *percent of engineered capacity* which is based on monthly values developed for QCL computations. A *loading division raw LBI* is found at the intersection of these two values.

12.45 In order to provide a more meaningful index, it is necessary to calculate a *weighted percent of engineered capacity* for the period during which that index is being prepared. This is accomplished in much the same manner as for development of penalty points and is required for both the traffic unit and loading divisions.

Example:

	DEC.	JAN.	FEB.	TOTAL
Percent of Capacity (Loading Division)	65	66	71	-
Weight	1	2	3	6
Total	65	132	213	410
Weighted % Capacity	-	-	-	68

Example:

	PENALTY POINTS	VALID LOAD UNITS	% Eng. CAPACITY
Loading Division I —	75	150	68
Loading Division II —	<u>100</u>	<u>150</u>	84
Traffic Unit	175	300	76

Penalty point fraction = $\frac{175}{300} = .58$

Traffic unit raw LBI = 93

12.46 Given a specific penalty point condition in an office and a weighted percent of capacity, a raw LBI can be developed as follows:

- Valid load units = 150
- Penalty points = 75
- Wtd. percent of capacity = 68

Penalty point fraction = $\frac{75}{150} = 0.5$

A raw LBI is then selected from Fig. 2. The penalty point fraction (0.5) is located within range of the line labeled 0.49 to 0.52. The percent capacity (68 percent) is located within range of the column headed 66 to 75. Where the line and column intersect, a raw LBI is found equal to 95.

12.47 The performance for a *traffic unit* is computed by dividing the total penalty points of all load units in that traffic unit by the total number of valid load units. A *traffic unit LBI* is obtained by reading its performance and percent of capacity into the table of Fig. 2.

12.48 To provide a high degree of equality of service to each and every customer, a reasonable level of balance is required. As the average usage moves toward the engineered capacity, the level of balance becomes more important in meeting objectives of maximum utilization of equipment and not having any customers receiving inferior service. A balanced traffic unit is also more economical to maintain as it approaches engineered capacity. With engineering intervals averaging approximately one to one and a half years, time becomes an important factor in improving poorly balanced traffic unit. A little corrective action done each month is better than being in a position of having to do a substantial amount in very short time. For these reasons, the LBI is designed to emphasize a minimum index that should be maintained in a traffic unit.

12.49 Indexes of 95 or below will indicate the necessity for further analysis of the load balance condition. Corrective action in the form of improved assignment procedures and/or line transfers will generally be required.

12.50 An index of 96 to 98 will indicate a satisfactory and economical operation. Of course, if a traffic unit is operating at or near engineered capacity and service results are not meeting objective levels, further improvements in load balance may contribute to improving service results. The quality of central office equipment engineering and maintenance are also important factors in attaining service results which meet objective levels.

HOT SPOT CORRECTION

12.51 The raw LBI developed above is a measure of the state of balance, based on statistical analysis of the spread of individual load unit loads relative to the average load unit load. It penalizes individual units whose loads are excessively high, compared to the average. It does not give any consideration to excessive overload conditions that may exist and that create a potential for appreciable blocking. As an incentive for reduction of the number of load units operating in severely overloaded conditions, and in the interests of improved customer service or better network administration, a hot spot correction is applied to the index. The hot spot correction lowers the index when there are load units whose measured loads are greater than their engineered capacities by more than a specified amount.

12.52 An easily implemented way to generate a hot spot correction is to establish for each system a *threshold value* of load that is selected as corresponding to a high probability of blocking. Then any load unit whose measured usage exceeds the threshold value will be assigned *hot spot penalty points*.

12.53 The Load Unit (Horizontal Group) Hot Spot Load Threshold has been set at 210 BHCCS.

12.54 Load unit CCS measurements are compared to the threshold value for the *past three index studies* in order to highlight hot spots.

12.55 *Hot spot penalty points* are then applied to hot spot load units on a weighted basis as follows.

- (a) Load units are assigned three (3) hot spot penalty points for hot spots on the current reporting month's study.
- (b) Two (2) penalty points are applied to a hot spot penalty points on the preceding study.
- (c) One (1) penalty point is given for a hot spot on the next preceding study.
- (d) Whenever a hot spot penalty point persists for two consecutive studies, an additional penalty point is assigned.
- (e) If a hot spot penalty points continues for the three consecutive study periods two additional penalty points are assigned.

This can result in a maximum of eight (8) hot spot penalty points per load unit. These are entirely separate from and do not affect any penalty points assigned to the same load unit for plus four scores.

12.56 Examples of the application of weighted hot spot penalty points are as follows:

	NOV.	DEC.	JAN.	TOTAL
Load Unit J — Hot Spots (*)	*	*	*	-
— Penalty Points	1 (1)	2 (1)	3	8
Load Unit K — Hot Spots	-	*	*	-
— Penalty Points	0	2 (1)	3	6
Load Unit L — Hot Spots	*	*	-	-
— Penalty Points	1 (1)	2	0	4
Load Unit M — Hot Spots	*	-	*	-
— Penalty Points	1	0	3	4
Load Unit N — Hot Spots	-	-	*	-
— Penalty Points	0	0	3	3

12.57 The penalty points are accumulated for an entire loading division and a *hot spot penalty point fraction* is calculated. This fraction is computed by dividing the number of penalty points by the number of measured load units in that division. The performance is then located on a table (Fig.3) that relates it to the *hot spot correction points*.

Example:

Given — Measured load units = 300
 — Hot spot penalty points = 25

$$\text{Hot spot penalty point fraction} = \frac{25}{300} = 0.08$$

Locate 0.08 in the table, Fig. 3, and read across to the hot spot correction points and read 3.

12.58 The hot spot correction points are then subtracted from the raw load balance index and the result in the load balance index.

Example:

$$\begin{array}{r} \text{Raw load balance index} = 98 \\ \text{Hot spot correction} = - 3 \\ \hline \text{Load balance index} = \underline{95} \end{array}$$

LOAD BALANCE QUALITY CONTROL LIMITS																								(MARCH 1975)						
NO. 1 & 5 CROSSBAR																														
AVERAGE HOLDING TIME (SECS)		ACTUAL AVERAGE LOAD PERCENTAGE OF ENGINEERING LOAD																												
		66% TO 75%						76% TO 85%						86% TO 95%						96% AND UP										
		LLF CCS CAPACITY						LLF CCS CAPACITY						LLF CCS CAPACITY						LLF CCS CAPACITY										
		1460 - 1660	1300 - 1459	1160 - 1299	1040 - 1159	940 - 1039	860 - 939	780 - 859	1460 - 1660	1300 - 1459	1160 - 1299	1040 - 1159	940 - 1039	860 - 939	780 - 859	1460 - 1660	1300 - 1459	1160 - 1299	1040 - 1159	940 - 1039	860 - 939	780 - 859	1460 - 1660	1300 - 1459	1160 - 1299	1040 - 1159	940 - 1039	860 - 939	780 - 859	
0 - 70	21	22	24	25	26	28	29	20	21	22	23	25	26	27	18	20	21	22	23	24	25	18	19	20	21	22	23	24		
71 - 90	24	26	27	29	30	32	33	23	24	25	27	28	30	31	21	23	24	25	27	28	29	20	21	22	23	24	25	26	27	28
91 - 110	27	29	30	32	34	35	37	25	27	28	30	32	33	35	24	25	28	29	31	33	34	25	26	27	28	29	30	31	32	
111 - 130	29	31	33	35	37	39	41	28	29	31	33	35	36	38	26	28	29	31	33	34	36	26	28	29	31	33	34	35	36	
131 - 150	32	34	36	38	40	42	44	30	32	34	36	37	39	41	28	30	32	33	35	37	39	27	28	30	32	33	35	37	37	
151 - 170	34	36	38	41	43	45	47	32	34	36	38	40	42	44	30	32	34	36	38	40	41	29	30	32	34	36	38	39	39	
171 - 190	36	38	41	43	45	48	50	34	36	38	40	42	44	47	32	34	36	38	40	42	44	30	32	34	36	38	40	42	42	
191 - 210	38	40	43	45	48	50	52	36	38	40	42	45	47	49	34	36	38	40	42	44	46	32	34	36	38	40	42	44	44	
211 - 230	40	42	45	48	50	53	55	37	40	42	44	47	49	52	35	37	40	42	44	46	49	33	36	38	40	42	44	46	46	
231 - 250	42	44	47	50	52	55	57	39	41	44	46	49	51	54	37	39	41	44	46	48	51	35	37	39	42	44	46	48	48	
251 - 270	43	46	49	52	54	57	60	41	43	46	48	51	53	56	38	41	43	46	48	50	53	36	39	41	43	46	48	50	50	
271 - 290	45	48	51	54	57	59	62	42	45	47	50	53	55	58	40	42	45	47	50	52	55	38	40	42	45	47	50	52	52	
291 - 310	47	50	52	55	58	61	64	44	46	49	52	55	57	60	41	44	46	49	52	54	57	39	41	44	46	49	51	54	54	
311 - 330	48	51	54	57	60	63	66	45	48	51	54	57	59	62	42	45	48	51	53	56	59	40	43	45	48	51	53	56	56	
331 - 350	50	53	56	59	62	65	68	46	49	52	55	58	61	64	44	47	49	52	55	58	60	42	44	47	49	52	55	57	57	
351 - 370	51	54	57	61	64	67	70	48	51	54	57	60	63	66	45	48	51	54	57	59	62	43	45	48	51	54	56	59	59	
371 - 390	52	56	59	62	66	69	72	49	52	55	58	62	65	68	46	49	52	55	58	61	64	44	47	49	52	55	58	61	62	
391 - 410	54	57	61	64	68	71	74	50	54	57	60	63	66	69	47	50	53	57	60	63	65	45	48	49	51	54	57	59	62	
411 - 430	55	59	62	66	69	73	76	52	55	58	61	65	68	71	49	52	55	58	61	64	67	46	49	52	55	58	61	64	64	
431 - 450	56	60	64	67	71	74	78	53	56	59	63	66	69	73	50	53	56	59	62	66	69	47	50	53	56	59	62	65	65	
451 - 470	58	61	65	69	72	76	80	54	57	61	64	68	71	74	51	54	57	61	64	67	70	48	51	54	58	61	64	67	67	
471 - 490	59	63	66	70	74	78	81	55	59	62	66	69	73	76	52	55	59	62	65	68	72	49	52	56	59	62	65	68	68	

AVERAGE HOLDING TIME (SECS)		ACTUAL AVERAGE LOAD PERCENTAGE OF ENGINEERING LOAD																											
		30% TO 35%						36% TO 45%						46% TO 55%						56% TO 65%									
		LLF CCS CAPACITY						LLF CCS CAPACITY						LLF CCS CAPACITY						LLF CCS CAPACITY									
		1460 - 1660	1300 - 1459	1160 - 1299	1040 - 1159	940 - 1039	860 - 939	780 - 859	1460 - 1660	1300 - 1459	1160 - 1299	1040 - 1159	940 - 1039	860 - 939	780 - 859	1460 - 1660	1300 - 1459	1160 - 1299	1040 - 1159	940 - 1039	860 - 939	780 - 859	1460 - 1660	1300 - 1459	1160 - 1299	1040 - 1159	940 - 1039	860 - 939	780 - 859
0 - 70	32	34	36	38	40	42	44	28	29	31	33	35	36	42	38	40	42	44	46	48	23	24	25	27	28	30	31	31	
71 - 90	37	39	41	44	46	48	51	32	34	36	38	40	42	44	34	36	38	40	42	44	26	28	29	31	33	34	36	36	
91 - 110	41	44	46	49	51	54	57	36	38	40	42	45	47	49	32	34	36	38	40	42	44	29	31	33	35	37	38	40	40
111 - 130	45	48	51	53	56	59	62	39	41	44	46	49	51	54	35	37	39	42	44	46	48	32	34	36	38	40	42	44	44
131 - 150	48	51	55	58	61	64	67	42	45	47	50	53	55	58	38	40	42	45	47	50	52	34	37	39	41	43	45	47	47
151 - 170	52	55	58	62	65	68	71	45	48	51	53	56	59	62	40	43	45	48	51	53	55	37	39	41	44	46	48	51	51
171 - 190	55	58	62	65	69	72	76	48	51	54	57	60	63	66	43	45	48	51	54	56	59	39	41	44	46	49	51	54	54
191 - 210	58	62	65	69	73	76	80	50	53	57	60	63	66	69	45	48	51	54	56	59	62	41	44	46	49	52	54	57	57
211 - 230	61	65	68	72	76	80	84	53	56	59	63	66	69	72	47	50	53	56	59	62	65	43	46	49	51	54	57	59	59
231 - 250	63	67	71	75	80	83	87	55	58	62	65	69	72	76	49	52	55	59	62	65	68	45	48	51	54	56	59	62	62
251 - 270	66	70	74	79	83	87	91	57	61	64	68	72	75	78	51	54	58	61	64	67	70	47	49	52	55	58	61	64	65
271 - 290	68	73	77	81	86	90	94	59	63	67	71	75	78	82	53	57	60	63	67	70	73	49	52	55	58	61	64	67	67
291 - 310	71	75	80	84	89	93	98	61	65	69	73	77	81	85	55	59	62	66	69	72	76	50	53	57	60	63	66	69	69
311 - 330	73	78	82	87	92	96	*	63	67	71	76	80	84	88	57	60	64	68	71	75	78	52	55	58	62	65	68	72	72
331 - 350	75	80	85	90	95	99	*	65	70	74	78	82	86	90	59	62	66	70	74	77	81	53	57	60	64	67	70	74	74
351 - 370	78	82	87	92	97	*	*	67	72	76	80	84	88	93	60	64	68	72	76	79	83	54	58	62	66	69	73	76	76
371 - 390	80	85	90	95	*	*	*	69	74	78	82	87	91	95	62	66	70	74	78	82	85	57	60	64	67	71	75	78	78
391 - 410	82	87	92	97	*	*	*	71	75	80	85	89	93	98	64	68	72	76	80	84	88	58	62	65	69	73	76	80	80
411 - 430	84	89	94	*	*	*	*	73	77	82	87	91	96	*	65	69	73	78	82	86	90	59	63	67	71	75	78	82	82
431 - 450	86	91	97	*	*	*	*	74	79	84	89	93	98	*	67	71	75	79	84	88	92	61	65	69	73	76	80	84	84
451 - 470	88	93	99	*	*	*	*	76	81	86	91	96	*	*	68	72	77	81	86	90	94	62	66	70	74	78	82	86	86
471 - 490	90	95	*	*	*	*	*	78	83	88	93	98	*	*	70	74	78	83	87	92	96	64	68	72	76	80	84	88	88

* FOR QCL DATA IN THIS RANGE CONSULT WITH AT&T COMPANY STAFF

Fig. 1

RAW LOAD BALANCE INDEX TABLE								
PERFORMANCE (PENALTY POINT FRACTION)	ACTUAL AVERAGE LOAD PERCENTAGE OF ENGINEERED CAPACITY							
	96 AND UP	86 TO 95	76 TO 85	66 TO 75	56 TO 65	46 TO 55	36 TO 45	30 TO 35
.00 – .03 .04 – .08	100 99	100 99	100 99	100 99	100 99	100 99	100 99	100 99
.09 – .13 .14 – .19	98 97	98 97	98 97	98 97	98 97	98 97	98 97	98 97
.20 – .24 .25 – .29	96 95	96 96						
.30 – .34 .35 – .39	94 93	95 95	96 96	96 96	96 96	96 96	96 96	96 96
.40 – .44 .45 – .48	92 91	94 93	95 94	96 96	96 96	96 96	96 96	96 96
.49 – .52 .53 – .55	90 89	92 91	94 93	95 95	96 96	96 96	96 96	96 96
.56 – .58 .59 – .60	88 87	90 89	93 91	94 93	96 95	96 96	96 96	96 96
.61 – .63 .64 – .66	86 84	88 88	91 91	93 93	95 95	96 96	96 96	96 96
.67 – .69 .70 – .72	82 80	86 86	90 90	92 92	94 94	96 96	96 96	96 96
.73 – .75 .76 – .78	78 76	84 84	89 89	91 91	93 93	95 95	96 96	96 96
.79 – .81 .82 – .84	73 70	80 80	86 86	89 89	92 92	94 94	95 95	96 96
.85 – .87 .88 – .90	67 64	75 74	83 83	88 88	91 91	93 93	94 94	95 95
.91 – .94 .95 – .97	60 56	70 69	81 80	87 86	90 90	92 92	93 93	94 94
.98 – 1.00 1.01 – 1.03	52 48	65 62	77 73	81 80	87 86	90 90	92 92	93 93
1.04 – 1.06 1.07 – 1.09	44 40	58 54	70 67	79 77	85 84	89 89	90 90	92 92
1.10 – 1.13 1.14 – 1.17	36 32	50 46	64 61	75 72	82 81	87 86	90 90	91 91
1.18 – 1.21 1.22 – 1.25	28 24	41 35	56 52	68 63	80 77	85 84	88 87	90 90
1.26 – 1.30 1.31 – 1.39	20 16	31 25	46 39	61 56	75 72	82 81	86 85	90 89
1.40 – 1.51 1.52 – 1.69	12 8	20 12	33 23	50 35	65 54	73 70	82 81	87 86
1.70 – 1.89 1.90 & Up	4 0	8 4	15 8	23 14	46 28	64 50	77 72	85 83

Fig. 2 – Raw Load Balance Index Table

INDEX CORRECTION TABLE	
HOT SPOT PENALTY POINT FRACTION	HOT SPOT CORRECTION
.00- .01	0
.02- .03	1
.04- .06	2
.07- .11	3
.12- .19	4
.20- .31	5
.32- .49	6
.50- .74	7
.75-1.24	8
1.25-1.99	9
2.00 & Up	10

Fig. 3 – Index Correction Table

INSTRUCTIONS FOR PREPARING FORM E-6402

LOAD BALANCE INDEX

(TRAFFIC UNIT RECORD)

Company — Enter the name of the company.

Area — Enter the name of the area.

Division — Enter the name of the division.

District — Enter the name of the district.

Building — Enter the name of the building.

Office — Enter the name of the office.

Traffic Unit — Enter the identification of the traffic unit (BSP 795-100-100).

Eqpt. Type — Enter the equipment type serving the traffic unit — SXS, No. 1XB, No. 2 ESS, etc.

Year — Enter the year.

Column 1 — *Month*: Enter the service observing month for which the record is being made. There should be an entry on this form for each month of the year. Where a line is used for traffic unit total, enter total in this column.

Column 2 — *Number of Main Stations*: Enter the total number of working main stations for the traffic unit total *only*. This should be the monthly count for the month entered in column 1.

Column 3 — *Loading Division*: Enter the identification of the loading divisions in the traffic unit. Each loading division should be entered for each month. Dash this column for the traffic unit total.

Column 4 — *Load Units — Quantity Included*: Enter the total number of load units installed in each loading division. Total this column for the traffic unit total ex-

cept omit load units in loading divisions that are "NI" in columns 15 and 16. If the traffic unit total is 0, skip to column 15 and enter "NI" in columns 15 and 16.

Note: See 4.32 for explanation of NI.

Column 5 — *Load Units — Quantity Valid*: Enter the quantity of load units having valid data for the reporting month by loading division. Total this column for the traffic unit total except omit load units in loading divisions that are "NA" or "NI" in columns 15 and 16.

Note: See 4.32 for explanation of NA.

Column 6 — *Load Units — % of Quantity Included*: Enter the percent column 4 (column 5 divided by column 4 and multiplied by 100), rounded to one decimal point, by loading division and for the traffic unit total. If less than 75 percent, skip to column 15 and enter "NA" in columns 15 and 16.

Column 7 — *Total — Engineered Capacity (CCS)*: Enter the total engineered capacity CCS of the valid load units (column 5) for the load balance study period by loading divisions. Total this column for the traffic unit total except omit load units in loading divisions that are "NA" or "NI" in columns 15 and 16.

Column 8 — *Total — Actual Load (CCS)*: Enter the total CCS usage of the measured load units, for the reporting month's study, by loading division. Total this column for

the traffic unit total except omit load units in loading divisions that are "NA" or "NI" in columns 15 and 16.

Column 9 — *Total — Current % Capacity*: Enter the percent column 8 is of column 7 (column 8 divided by column 7 and multiplied by 100), rounded off to a whole number, by loading division and for the traffic unit total. If less than 30 percent, skip to column 15 and enter "NI" in column 15 and 16 if blank.

Column 10 — *Performance — Balance Penalty Points*: Enter the total penalty points by loading division. Total this column for the traffic unit total.

Column 11 — *Performance — Balance Fraction*: Enter the fraction column 10 is of column 5 (column 10 divided by column 5), rounded to two decimal points, by loading division and for the traffic unit total.

Column 12 — *Performance — Hot Spot Penalty Points*: Enter the total penalty points by loading division. Total this column for the traffic unit total.

Column 13 — *Performance — Hot Spot Fraction*: Enter the fraction column 12 is of column 5 (column 12 divided by column 5), rounded to two decimal points, by loading division and for the traffic unit total.

Column 14 — *Weighted % Capacity*: Enter the weighted percent capacity by loading division and for the traffic unit total by using the current % capacity for the latest and two previous months as follows:

Example:	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Jan.</u>	<u>Total</u>
% Capacity	80	85	NA	90	—
Weight	1	2	—	3	6
Total	80	170	—	270	520
% Capacity	(c)	(b)	(b)	(a)	(d)
Weight	—	—	—	—	87

For each loading division and the traffic unit:

- (a) Multiply the current month column 9 by 3.
- (b) Multiply the previous month column 9 by 2 and add to the value in (a) unless:
 - the previous month's column 4 is different from the current month.
 - Column 15 or 16 is "NA" or "NI", in which case use column 9 from the most recent NON-"NA" or "NI" month.
- (c) Add column 9 for the month prior to the month used in (b) unless:
 - that month's column 4 is different from the current month.
 - Column 15 or 16 is "NA" or "NI", in which case use column 9 from the most recent Non-"NA" or "NI" preceding month.
- (d) Divide sum obtained in (a), (b), and (c) by 6 unless (c) not added, then divide by 5, or if (b) not added divide by 4, or if (b) and (c) not added divide by 3.

Round off result to a whole number and enter in column 14. See example below:

Column 15 — *Raw Load Balance Index*: Enter the raw load balance index by loading division and for the traffic unit total. This is found by reading the *penalty point fraction* (column 11) and the weighted % capacity (column 14) into the raw load balance index table, Appendix 2. The proper row is selected by the penalty point fraction and the proper column by the weighted % capacity.

Column 16 — *Load Balance Index*: Enter the load balance index by loading division and for the traffic unit total. This is found by reading the *hot spot fraction* (column 13) into the index correction table, Figure 3 and subtracting the *hot spot correction* from the raw load balance index (column 15).

Column 17 — *Service Results*: Optional to operating telephone company — Enter
Column 18 ing telephone company — Enter
Column 19 and identify appropriate service results for the reporting month for the traffic unit total. If results are available by loading division, they may be shown.

Note: Where a traffic unit contains only one loading division, a line is not necessary for the traffic unit total.

**LOAD BALANCE INDEX
(TRAFFIC UNIT RECORD)**

**E-6402
(3-75)**

COMPANY: TEXAS BELL			DISTRICT: EAST						TRAFFIC UNIT: DLL STXMQ 279									
AREA: DALLAS			BUILDING: MESQUITE						EQPT. TYPE: SXS									
DIVISION: SOUTH DALLAS			OFFICE: 279						YEAR: 1974									
Month	No. of Main Stations	Load Div.	Load Units			Total			Performance				WTD % Cap.	Raw Load Bal. Index	Load Bal. Index	Service Results		
			Quan. Incl.	Quan. Valid	% of Quan. Valid	Eng. Load (CCS)	Act Load (CCS)	Current % Cap.	Balance		Hot Spots					DTS		
									Penalty Pts.	Frac.	Penalty Pts.	Frac.						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
SEP.		A	83	20	24.1	-	-	-	-	-	-	-	-	NA	NA		1.0	
		B	2	2	100.0	872	650	75	2	1.00	0	0	74	81	81		.2	
		C	1	1	100.0	296	272	92	0	0	0	0	91	100	100		.1	
TOTAL	15190	-	86	3	3.5	-	-	-	-	-	-	-	-	NA	NA		.9	
OCT.		A	83	81	97.6	23976	21668	90	11	.14	4	.05	89	97	95		.9	
		B	2	2	100.0	872	612	71	0	0	0	0	73	100	100		.4	
		C	1	1	100.0	296	235	80	0	0	0	0	86	100	100		.1	
TOTAL	15234	-	86	84	97.6	25144	22515	90	11	.13	4	.05	90	98	96		.8	
NOV.		A	83	83	100.0	24568	21466	88	10	.12	0	0	89	98	98		.7	
		B	2	2	100.0	872	673	78	3	1.50	0	0	75	50	50		.7	
		C	1	1	100.0	296	239	81	0	0	0	0	83	100	100		0	
TOTAL	15286	-	86	86	100.0	25736	22378	87	13	.15	0	0	89	97	97		.7	
DEC		A	83	80	96.4	23680	20019	85	12	.15	0	0	87	97	97		.6	
		B	2	2	100.0	872	618	71	2	1.00	0	0	73	81	81		.3	
		C	1	1	100.0	296	294	100	0	0	0	0	90	100	100		.9	
TOTAL	15357	-	86	83	96.5	24848	20931	84	14	.16	0	0	86	97	97		.6	

Traffic Unit Record (Form E-6402)

13. AUDIT PROCEDURES

13.01 To be furnished later.

8001-006

