Implementation of a Performance Tracking System for a Wide Area Network Provider's Frame Relay Services Group

by

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(ABSTRACT)

The current system employed by the Wide Area Network Provider's Frame Relay Services group for tracking and improving the performance of the Frame Relay Trouble Ticket Resolution Group ("TTRG") lacks a comprehensive long term approach that involves and informs personnel of the TTRG. The existing system tracks twenty one indices for the Frame Relay group, of which only two apply directly to the TTRG sub-group. Because of the complexity and added importance of the TTRG, management should reconsider developing at least six more TTRG specific performance indicators (eight total) to better define the group's performance

With the current tracking system, scores are not readily displayed and benchmark performance values are not obvious to the TTRG nor are they utilized for comparing current levels of performance to past levels. Performance is based on the score of each individual indicator. A collective performance score, based on the weighted score of each index, is not used. A single goal is set for each index, but the time frame to accomplish them is not apparent to the TTRG. There is no distinction between short, medium, or long term goals. Lastly, the Clear Code chart used to define the resolution of a trouble ticket lacks organization and consistency and the format of the codes is insufficient to properly identify the fix to the level of granularity requested by management.

The approach taken for this report attempts to alleviate the above short comings. First, a new long term based performance tracking and scoring methodology was identified. Secondly, the TTRG's trouble shooting process for their Fractional T1 Frame Relay access card was flow charted in detail. Next, a criteria list for better defining an index's importance to the process and the TTRG was developed. From the Fractional T1 flow analysis and the criteria list, eight new performance indices were defined. Of the eight performance indices, four were selected for study. Data collected for the four indices was applied to the recommended performance tracking and scoring methodology. Lastly, improvement procedures and programs were implement to increase the accuracy of the collected data and clarify the readability of the trouble ticket.

The report's findings and recommendations are the following:

1. Identified a methodology that takes a comprehensive long term approach to performance tracking and process improvement and can be implemented with minimum effort and disruption.
2. Identified eight new performance indices that better define the TTRG's overall performance. Of the eight indices, three were tracked and evaluated. Because of its importance to management, a fourth indirectly related index was also tracked.
3. New Clear Code format, chart and numbers.
4. Detailed flow chart of the Fract-T1 trouble shooting process.
5. Benchmark values for the Collective MTTR, Clear Code, TTRG Proactiveness, and 25 Minute Proactiveness indices.
6. Improvement in the Clear Code and TTRG Proactiveness indices.
7. Improvement in the accuracy of the performance data.
8. Error rates of the data for the Clear Code and Proactiveness indicators.
9. The importance of "being proactive" in identifying a power outage at the customers premise.
10. The importance of an automated data collection system in gathering the data and improving it's accuracy.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION AND BACKGROUND

1.1 Background

The competitive nature of the global economy today demands high quality reliable products and services. This statement increasingly applies to the digital data communications industry and especially the US data communications industry, where the competition is very strong. According to Vertical Systems Group of Dedham, Mass., there are 20 separate Frame Relay networks operating in the US, including all the major inter-exchange carriers (AT&T, MCI, Sprint, WilTel, Cable & Wireless) and the seven regional Bell companies (Bell Atlantic, US West, Bell South, etc.) [CHOC94]. Competition in the US will be even greater when Congress passes pending legislation that opens both the long-distance and the local voice/data telecommunication markets to free competition. With this legislation, inter-exchange carriers will be able to significantly lower their local access fees (currently dictated by the Baby Bells) and directly pass these savings onto the consumer. Similarly, cost saving opportunities will also exist for the regional Bell companies. Internationally, the story is slightly different. Although not as popular as in the US and Canada, Frame Relay in Europe, Australia, Hong Kong and Japan is gaining ground on services such as Integrated Services Digital Network ("ISDN") and Private line. Currently, Frame Relay is being offered in their respective regions of the world by a number of large foreign telecommunications companies (e.g., British Telecom, France Telecom, Deutsche Bundespost and Nippon Telephone and Telegraph). British Telecom goes as far as offering international Frame Relay service among a number of former British colonies (e.g., Hong Kong, Singapore, Australia) as well as North America. The service provider studied for this report has only recently begun offering Frame Relay in Europe and the Pacific Basin. Their overseas customer base is small in comparison to their US customer base, however, it is suspected to grow steadily as Frame Relay's popularity grows and as overseas companies need to connect to companies in the US and Canada. Frame Relay's growing popularity in the US and Canada coupled with the level of service being offered there will have a direct affect on its popularity and competition worldwide, especially if US digital data service providers can establish a strong foreign market.

In the Wide Area Network ("WAN") business sector of the digital data communications market, companies are abandoning expensive private line solutions and slow restrictive services (e.g. X.25) in favor of higher speeds and more versatile digital services, such as Frame Relay, Switched Multi-Megabit Data Service ("SMDS"), and Asynchronous Transfer Mode ("ATM"). The push of companies to up-grade their long-haul data networks can be viewed as a natural progression brought on by sophisticated software applications and the need to interconnect remote sites, move greater amounts of data, and lower operating costs. In the past year or two, Frame Relay has been able to successfully establish a foot hold in North America by satisfying the above needs. It's success is in it's versatility (e.g., the capability to encapsulate many different routing protocols) , conformity (e.g., internationally defined and accepted by the Comite Consultatif International Telegraphique et Telephonique and the American National Standards Institute), and ease of use. Frame Relay provides the user with a WAN protocol that can be easily integrated with their existing Local Area Network("LAN") or mainframe environment. It's design allows the LAN administrator to reliably connect their dispersed LANs via single links to a shared public network verses multiple links of a private network. Through it's well defined encapsulation routine, Frame Relay is capable of transporting data of many different routing protocols such as, TCP/IP, IPX (Novell proprietary), SNA (IBM proprietary) and AppleTalk (Apple proprietary).

The growth in terms of the number of users in the US Frame Relay market alone has been estimated at 250% annually since 1994. Vertical Systems Group's new market report, "Frame Relay Industry Analysis: Statistical Update Q3-94", predicts big increases in Frame Relay revenues for both services and equipment. "We think there will be a tremendous lift in revenue this year (1994) and the next because the first wave of mass users are moving onto the network" said Rick Malone, a principal with Vertical Systems Group [MALO94]. In 1993, US Frame Relay users totaled 590. Vertical estimates that number will grow to more than 8,200 by the end of 1997. Such user growth predictions coincide with a survey outlined in the August 1994 issue of Data Communication, that a growing number of network managers (approximately 35.3% of the 445 surveyed) consider Frame Relay on their wish list (see Figure 1.1) for digital data services and have immediate plans to implement a Frame Relay network within the next 12 months [JOHN94]. With respect to revenue growth, Vertical reported that the worldwide market for Frame Relay services totaled $80 million in 1993 and projects the market to increase to

$751 million in 1995 and by 1997 will top $2 billion. This represents a compounded annual growth rate of 125 percent. Offerings by US Frame Relay providers represent approximately 70 percent of the global market, and they have seen their revenues more than tripled, from $57 million to $176 million today [COCH94]. Such a lucrative market warrants the utmost attention of management in capturing and retaining market share. To accomplish this, the service provider will need an aggressive sales force, a network that is reliable, and a customer service group that is knowledgeable, efficient, and effective.

What may not have been foreseen by the service provider, is the growing demand of the customer for a comprehensive data communication solution for their data communication needs. No longer is it sufficient to supply a reliable network. Today's customers are demanding high quality service programs (e.g., equipment leasing and maintenance, WAN network designing, technical assistance, outage resolution and data/video/voice solutions) and customer service in addition to a reliable network. With that said, it is strategically important in today's business environment to view network performance, knowledge services and customer service equally and as key factors depicting the success of a service provider's data network. Being able to "score" one's performance in these three categories is critical to better answering the question of "How well are we doing?"

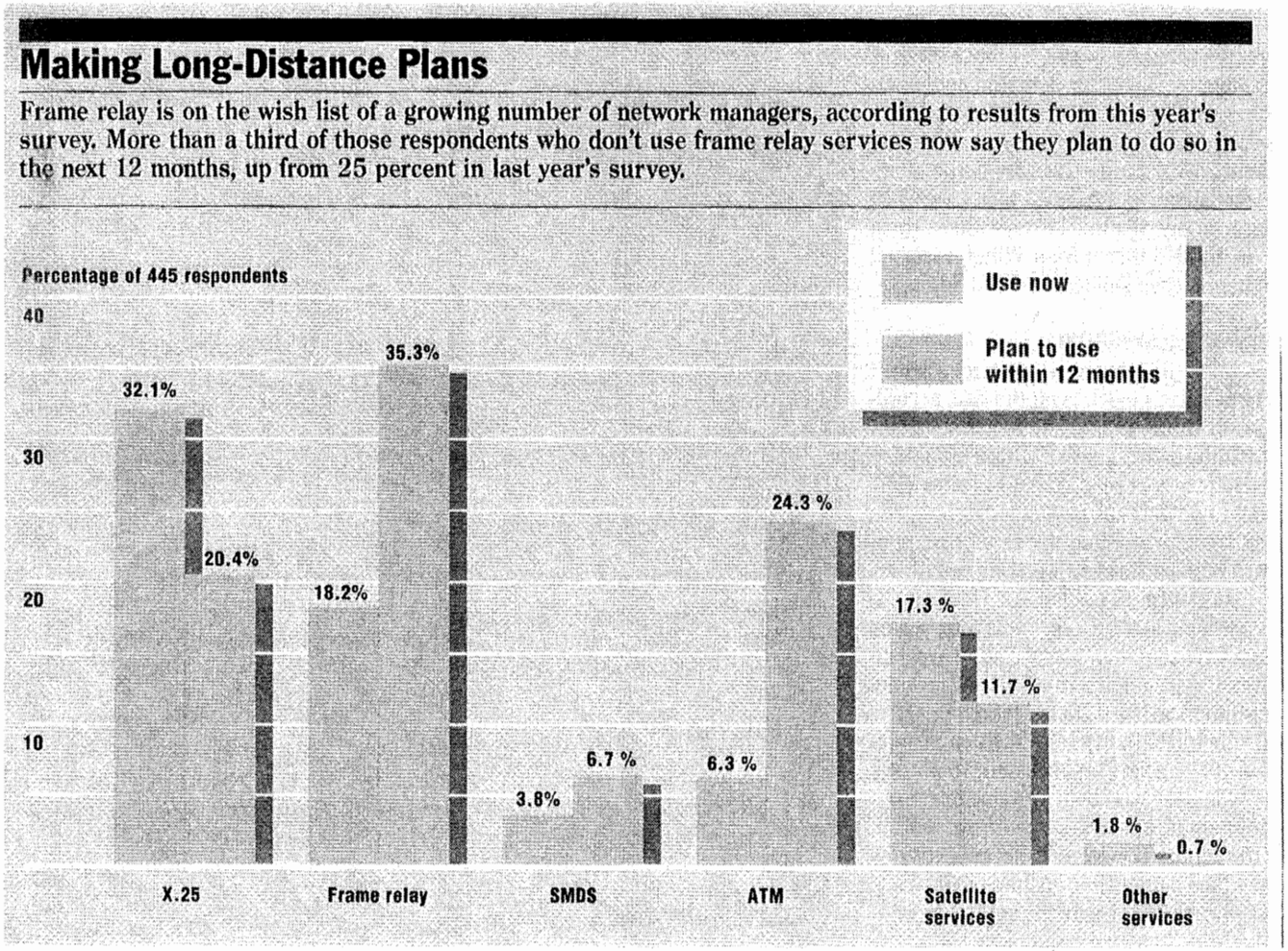

Figure 1.1 Frame Relay Survey, Non-User's Wish List of WAN Services

This report develops a Systems Engineering Process Control and Improvement frame work for use by the Provider's Frame Relay group. An outline of the frame work is described in Section 1.5. The frame work is specifically tailored to (1) flow charting the Frame Relay outage resolution process used by a US Telecommunications Digital Data Service Provider and (2) developing, measuring and tracking performance indices. The purpose of flow charting is to assist the investigator in describing the outage resolution process and in identifying points or steps in the process for elimination, stream lining, computer intervention/automation and performance measuring. The purpose of defining, measuring and tracking performance indices is to quantify how well the Frame Relay Trouble Ticket Resolution Group ("TTRG") is doing. This report focuses on the service provider's Customer Service group and its increasingly important role in working with the customer to resolve technical problems and service outages. In particular, this report will address a sub-group of the Customer Service super-group, namely the TTRG, which is responsible for resolving Frame Relay service outages. Network reliability is not addressed.

An outline of the performance scoring methodology employed for this report can be found in Figure 1.2. For a detailed description of the methodology, the reader is referred to "Managing with Productivity Indexing" by Northern Telecom [FLOW88]. In short, the Northern Telecom methodology describes how the user selects, defines, measures, scores and tracks performance, productivity or quality indicators. Selecting what the scoring system tracks (i.e., Productivity, Performance, Quality or Cost) is left to the investigator or the design team. The question of "How well are we doing?" also requires knowing what can be measured and improved upon. This in turn requires knowing all the processes that make-up the system being investigated. To describe these processes clearly, each step needs to be precisely defined and flow charted. By reviewing the completed flow charts, the investigator can identify critical areas for performance measuring, performance tracking and process improvements. The Functional Flow methodology outlined in Chapter 4 of System Engineering and Analysis [BLAN81] will be used to flow chart the Frame Relay Trouble Ticket Resolution process.

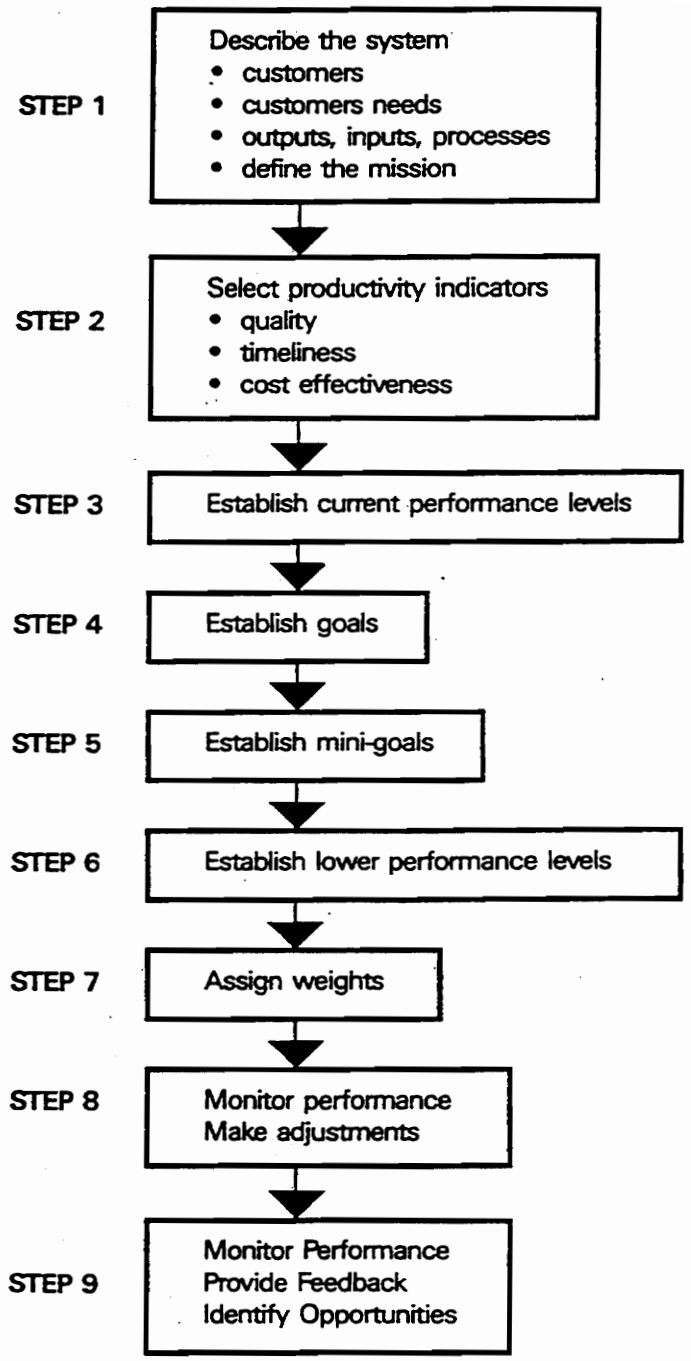

Figure 1.2 Outline of the Performance Tracking and Scoring Methodology Used

Four performance indices were defined, measured and tracked. To assist in answering the question, "What indices best describe a group's performance?", a list of criteria (see Section 1.5) were created to compare and weigh the indices against. Those indices that met five of the seven criteria were considered valid performance indicators and worthy of consideration. Details on how the TTRG Performance indices were defined and what criteria lead to their validity and final selection is addressed in Chapter 3.

1.2 Project Motivation

Upon starting this report there was a number of short comings with the current system being used by the Frame Relay group for tracking the performance of the TTRG. An attempt to correct these flaws by offering a better performance indices tracking system was the bases for the motivation of this report. These flaws where the following. First, of the performance indices that upper management tracked, only 2 applied directly to the TTRG's performance (i.e., Percent Closed As No Trouble Found and Proactive Notification as Percent of Total Inquiries). All other indices applied indirectly to the TTRG. The methodology employed [FLOW88], recommends tracking no fewer than three and at most seven indices that apply directly to the group being investigated. Secondly, the performance of the TTRG was calculated for each index, thus creating many separated scores. On the contrary, the Northern Telecom methodology recommends evaluating a group's performance based on a single score that incorporates each index through a weighting scheme chosen by the investigator. Thirdly, indices are being tracked and performance calculated without the processes having been flow charted to any significant degree. This may result in important indices being overlooked or misrepresented. The methodology outline in "Systems Engineering and Analysis" [BLAN81] recommends conducting a functional flow analysis on the system/process being investigated. The objective of such an analysis is to identify system/subsystem functions and the actions and resources to accomplish these functions. The lack of involvement by upper management in promoting the importance and use of performance tracking is causing all involved to lose sight of what performance tracking is suppose to accomplish. Performance tracking should promote motivation, process improvement, innovation, job satisfaction and performance recognition. An attempt to better educate all players of the performance tracking process was another motivation for this report. Lastly, competition,

network reliability and customer service are the driving forces in today's WAN market. Being able to "score" one's performance in the latter two categories is critical to better answering the question of "How well are we doing?" The methodology addressed herein offers a mechanism to accomplish this.

1.3 Research Objectives and Goals

The following are the goals of this report. Their final definition are the results of an iterative process that began when the investigation started.

1. Define the WAN Provider's Frame Relay Trouble Ticket Resolution ("TTR") process with regards to outages related to the Frame Relay switch's Fractional T1 card. A detailed flow diagram of the resolution process will be constructed. The flow charts will illustrate actions that must be performed and decisions that must be made to properly "investigate" a Fractional T1 card outage. Greater detail of the flow process will be provided for the TTRG only.

2. Identify indices of the TTR process that (1) best satisfy the TTRG Performance Index Criteria List and (2) are located in key areas of the process.

3. Collect four months worth of data on selected indices.

4. Apply the collected data to the Northern Telecom's performance tracking methodology and (1) establish benchmark performance levels for each index, (2) generate scores for each index in addition to a weighted overall score, (3) track the TRRG's performance in an organized, readable, and understandable manor and (4) define short, medium and long term performance goals for the TTRG.

1.4 Assumptions

Fract-T1 Process

Since 95% of the WAN provider's customers access frame relay via the Fract-T1 card, only the outage resolution process associated with the switch's Fract-T1 card was investigated. In addition, future upgrades to the network will include replacing existing Fract-T1 cards with an upgraded version. The new Fract-T1 card will have larger onboard resources and improved performance. This will increase the number of access circuits per card by 40% to 60%, further raising the percentage of customers accessing the frame relay network via the Fract-T1 card. It is safe to assume that trouble shooting the new Fract-T1 cards will differ very little from the current version and that the results of this paper can be directly applied.

Data Collection Time Frame

The performance tracking and scoring methodology used stipulates that at least three months worth of data is needed to best define a group's current level of performance.

Using the Northern Telecom Methodology to Measuring Performance vs. Productivity

Although the Northern Telecom methodology describes the process for measuring productivity, it is equally fitting to use it to measure performance.

Benchmarking

Having gathered the recommended three months of data, an average performance value is calculated and assigned to the score of 3 (see Figure 4.9a) on the performance tracking chart. This average value represents a benchmark for the performance indicator from which future performance levels can be compared.

25 Minute Proactive Grace Period

Current procedures direct the Proactive group to wait 15 minutes from the time a circuit outage is detected (displayed at the Proactive monitoring screen) before opening a trouble ticket. The reason for this grace period is the following:

1. To allow network anomalies to clear
2. To allow power to restore to the site or the customer time to conduct configuration changes and/or system upgrades without concern of the WAN provider opening a

trouble ticket and potentially prolonging (via. physical trouble testing) the outage of the circuit

While the grace period is being honor, the Proactive group gathers information on the circuit and calls the customer to inquire about the outage. If the circuit recovers within the 15 minute grace period a TT is not opened and the outage is not recorded. Observations, backed by a preliminary survey, discovered that the time from when an outage was detected to when a trouble ticket was open took approximately 30 minutes (i.e., 15 minute grace period plus 10 minutes opening the ticket). This being the case, the 15 Minute Proactive index was discarded for a more realist indicator, the 25 Minute Proactive index.

The Collective MTTR Index

Ideally, the Collective MTTR index should be as low as possible. However, marketing strategies, system complexity, existing resources, and current technologies dictate a Collective MTTR value closer to 2 1/3 hours. At present, the WAN provider's long term goal for the Collective MTTR index is 2 hours. This index represents the time accrued from when the trouble ticket is opened to when it is closed. Management does not include the 25 minute grace period discussed above in it's calculation of the Collective MTTR. The reason for this is unknown. Since, observations indicate a grace period closer to 30 minutes, to not include this value in the Collective MTTR calculation is misleading to both the customer, WAN personnel and management. Given the Collective MTTR goal of 2 hours, a 30 minute grace period represents 20% of the total outage time. A very significant amount. Another misgiving in using this index is that it does not directly related to the TTRG and is more an indictor of performance at the Data Services and corporate level (i.e., strategic level). As it's name depicts, the Collective MTTR index represents a value contributed by those groups having worked the trouble ticket, the TTRG being one of three or more groups.

Defining the Weights Used in the Scoring Methodology

Upper management was not consulted in defining the weighting values used, even though Northern Telecom's methodology encourages management participation. The reason for this was that management's involvement (in defining the weighting values) would have no baring on assuring that the goals of this report were successfully accomplished. Although not directly consulted, management's concerns were not completely ignored. Because the

Collective MTTR index is considered an important performance indicator by management, arrangements were made to the weighting scheme to reflect this. The Collective MTTR index was given a weighting value (i.e., 0.40) twice as large as any one of the other three indicators. The remaining three indices were given weights (i.e. 0.20) equal to each other. This was done to eliminate the influence of any one of the three equally weighted indices over the other two and to simplify the final analysis.

Selection of Indices

Management's muted interest and a lack of resources limited the number of indices studied to four. The selection of an index for study is based on the following assumptions:

1. Does the index satisfy five of the seven criteria found in Table 1.1 of Section 1.6. No one criteria was considered more important than the other six.
2. Is the index located at a critical point in the process.
3. Does the index directly relate to TTRG and reflect it's responsibility.

1.5 System Definition

Illustrated in Figure 1.3 is the Trouble Ticket Resolution system. Only the portion of the TTR process associated with the TTRG and the Proactive Group was addressed in this report. Other groups and organizations that have a stake in the TTR process (see Figure 1.3) were not studied. New trouble tickets flow into the TTRG via the customer or the Proactive group. The TTRG takes ownership of the Trouble Ticket ("TT") and begins the investigation to identify and resolve the outage. The TTRG closes a TT only when the fault is fixed, the circuit is functioning correctly and the customer is satisfied. Chronic issues are passed to the 2nd Level TTRG for resolution. The TTRG interfaces directly with all groups involved except the Local Telecommunications companies (i.e., Bell South, Bell Atlantic, etc.). By defining and flow charting the process coupled with developing a performance index criteria list, TTRG performance indices can be identified. With the performance indices identified, data collection can begin. From the data, performance scores and benchmarks are generated and tracked. Finally, process improvement programs are initiated to improve the group's performance score or assist in controlling the process.

1.6 Methodology Used

Three methodologies were employed. The first, outlines a flow charting technique that could be applied to the TTR process and from which new performance indices could be identified. The second, defines a system for developing, scoring and tracking performance indices. And the third, defines procedures and processes to improve the accuracy of the data and the TTRG's performance. Together they define the bases for a Systems Engineering Process Control and Improvement frame work. The complete frame work would consist of the following ten steps:

1. Definition of Need
2. Define and flow chart the TTR process
3. Identify steps of the process that can be eliminated, stream lined or automated
4. Define a performance index criteria list to direct and substantiate the index selection process
5. Identify points in the process for performance index measuring and analyzing

6. Develop a performance index scoring and tracking system
7. Collect and analyze the data, define data error rates
8. Define and implement process improvement actions
9. Identify and weigh costs
10. Track performance

The frame work follows the system life cycle outlined in "Systems Engineering and Analysis"[BLAN81].

Methodology 1

The Functional Flow methodology outlined in "Systems Engineering and Analysis"[BLAN81] was applied to the TTR process, specifically, outages involving the service provider's Fractional-T1 ("Fract-T1") card. The purpose for using this methodology is four fold. First, to illustrate in an organized and logical manor the many actions and decisions performed during the TTR process. Second, to identify points in the process that are critical to solving the outage. Third, to identify points and variable(s) in the process that define useful performance indices for measurement and analysis. And fourth, to identify points in the process that may be eliminated or redefined to better stream line and improve the process. Results of the functional flow analysis were: (1) functional flow diagrams detailing the Fract-T1 outage resolution process (2) the identification and selection of new indices that better define the TTRG's overall performance, and (3) the identification of processes that can be improved by stream lining or by implementing new procedures.

Methodology 2

The performance tracking methodology outlined by Northern Telecom was used as an guide to define, score and track performance indices. Indices were selected by asking the following question; "Does the performance index satisfy four of the seven criteria found in Table 1.1?" Equal importance was applied to all seven criteria. Immediate benefits of the Northern Telecom's performance tracking system were; (1) an easy to understand tracking system, (2) a scoring system that can incorporate the scores of many performance indices into one weighted score with the ability to tailor the score using a weighting scheme that retains the relative importance of one index to another, and (3) a tracking system that displays a group's performance over many scoring periods.

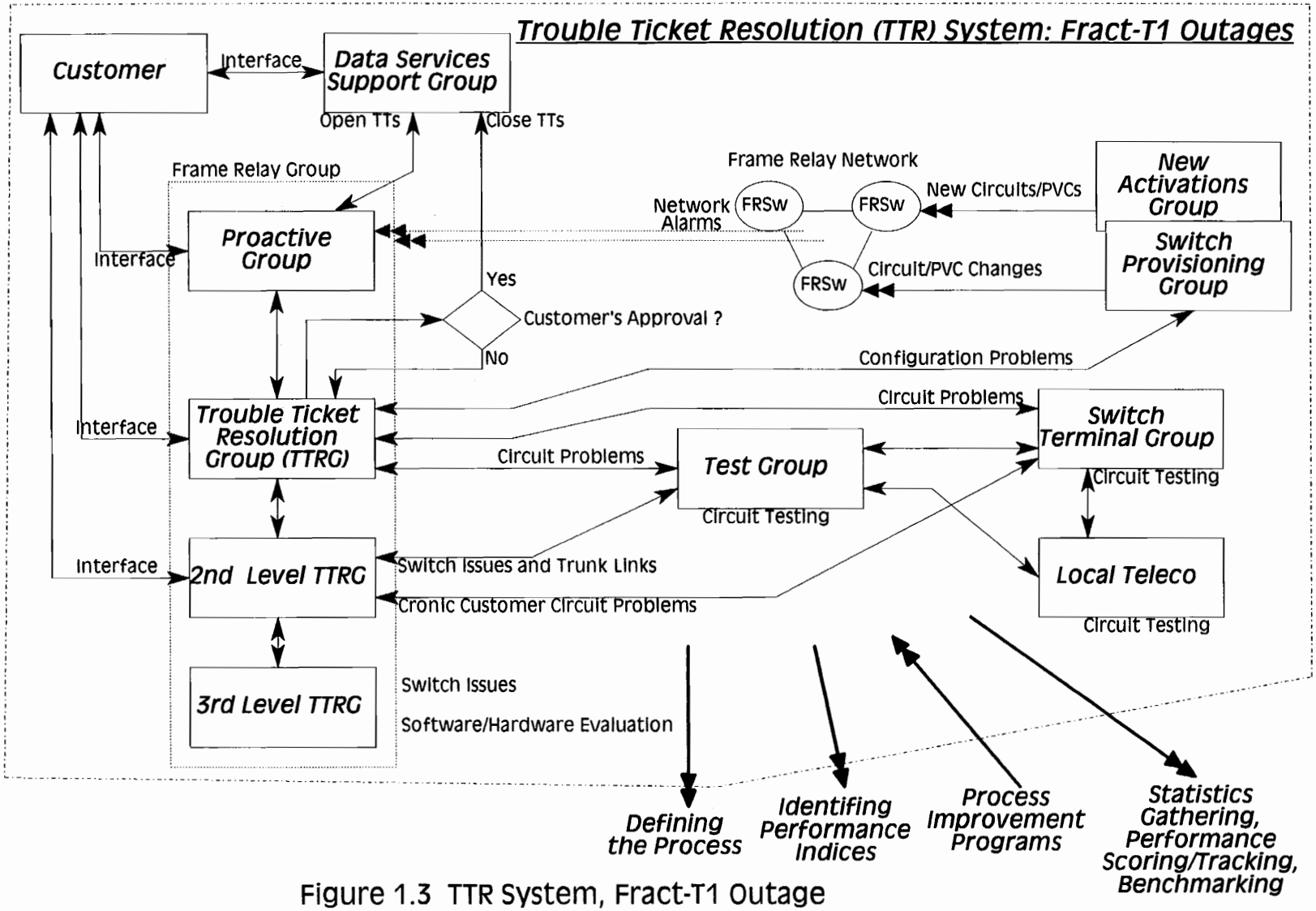

Figure 1.3 TTR System, Fract-T1 Outage

Table 1.1 TTRG Performance Index Criteria List

Criteria Number and Definition

1. Represents a measure the *customer*[1] values
2. Represents a measure that produces quality goods and services beneficial to the customer
3. Has upper management's approval and commitment
4. Facilitates collecting data
5. Best represents the performance of the TTRG
6. Facilitates calculating the error associated with the collected data
7. Represents a critical point/step in the process

Methodology 3

Once the indices are defined and the tracking system is in place a third methodology is needed to develop, implement and oversee process improvement programs. The third methodology should outline how to develop new processes and/or procedures that will improve the scores of the performance indices and raise the groups overall performance. Improvement can be measured in two ways; (1) by bettering the previous score or (2) by retaining a "good" score over time. The former implies constant improvement the later, performance retention. Both are desirable. Both can be tracked using the above tracking system. Due to the limited scope of this report the importance of this methodology will not be fully address

The following four TTRG performance indices were tracked for this investigation.

1. Clear Code Index
2. Collective MTTR Index
3. TTRG Proactiveness Index
4. 25 Minute Proactive Index

Data collected on the performance indices was used to construct a Performance Tracking Chart. The Performance Tracking Chart assisted in; (1) tracking the TTRG's performance for 16 weeks, (2) identifying a performance level for bench marking purposes, (3) establishing short, medium and long term goals, and (4) tabulating a performance score

[1]The term "customer" in the context of this report is viewed as either the company which has purchased Frame Relay WAN services from the WAN provider or as an internal group that interfaces directly with the TTRG.

based on the a weighted average of the indices. Approximately four months worth of performance data was collected for use.

1.7 Challenges and Concerns

Flow Charting the Process

The functional flow charts discussed in Chapter 2 and illustrated in Appendix A of this report describe the TTRG's current methods for trouble shooting a Fract-T1 outage. They were constructed based on the functional flow analysis methodology described in Chapter 4 of "Systems Engineering and Analysis"[BLAN81]. Flow charting the process proved to be a very tedious and time consuming task. If undertaken, it should not be approached lightly. Ample time and resources are needed if ones results are to be comprehensive.

Gathering and Ensuring Accurate Data

Gathering data for the Clear Code, TTRG Proactiveness and Collective MTTR indices was not difficult. It required running a batch file that retrieves the data and presents it in a "raw" form. With the help of a spread sheet program, such as Microsoft Excel and customized macros, the data can be organized into an usable form rather easily. Four months worth of data was collected. The data collected for each of the three indices occurred within the same time frame(i.e., late August to early December 1994).

For the 25 Minute Proactive index, the data had to be recorded manually since no automated mechanisms where available at the time of the investigation. Because of the manpower required to do so, only 6 weeks worth of data was gathered. Data collected for the 25 Minute Proactive index occurred during a different time frame (i.e., mid February to mid March 1995) than the other three indices. This posed a potential problem since the Northern Telecom performance tracking methodology dictates that the data for the indices must be collected at the same time.

The results of an investigation conducted at the beginning of this study determined that a significant percentage (i.e., approximately 20% to 40%) of the TTRG Proactiveness and the Clear Code data were consistently in error. To alleviate the problem, every TT was double checked and all inconsistencies were corrected. It is estimated that the double

checking lower the error rate to within 5%. Fortunately, for the Collective MTTR data set, the question of data integrity was not an issue since the data is record automatically and in real time by computer. For the purpose of this study the accuracy of the MTTR data set is considered very high. With regards to the 25 Minute Proactive induce, the manor in which it's data was collected should have induced errors. By what amount is unknown. One can only speculate, conservatively, that it is no higher than 20%. Unfortunately, there is no way to double check the 25 Minute Proactive data. This is because the events from which the data was recorded are not saved but are lost in time.

Process Improvement Programs

Working with the TTRG management, a number of improvement programs were devised and implemented. The programs are aimed at altering the operating procedures of the group to improve the accuracy of the performance data collected and to improve the management of a ticket. A detailed description can be found in Section 3.1. A list of these programs are as follows:

1. Trouble Ticket Ownership and Clear Concise Comments
2. Marking a Trouble Ticket - Proactively Opened vs. Customer Opened
3. Resolution Line and Fix Code
4. Standardized Clear Codes and Clear Code Chart
5. Data Accuracy Improvements

2 FRAME RELAY TROUBLE TICKET RESOLUTION PROCESS

2.1 Process Overview

This chapter will describe the trouble shooting process that is currently employed by a US Frame Relay service provider to resolve a frame relay circuit outage. This process is call the Frame Relay Trouble Ticket Resolution process ("TTR"). In short, the process involves an outage, reporting of the outage by either the customer or the service provider, the creation of an outage trouble ticket, the ensuing investigation to identify and resolve the outage, and finally the closing of the trouble ticket. Since a large majority (approximately 95%) of the service provider's customers access frame relay through a port on the Fract-T1 card, the resolution process presented in this chapter will be limited to solving only Fract-T1 related outages. Contained in Appendix A, is the functional flow analysis of the Fract-T1 trouble shooting process. In addition, Chapter 2 will describe the Trouble Ticket Tracking System ("TTTS") employed by the service provider. This system allows the WAN provider the ability to open, track, document, and close trouble tickets.

2.2 Frame Relay Trouble Ticket

A Frame Relay trouble ticket is an official request by either the customer or the WAN provider to investigate a Frame Relay circuit that has been identified as "Down" or not functioning correctly. The request generates an unique trouble ticket that resides in the Trouble Ticket Tracking System until it is closed by the customer. The purpose of a trouble ticket is the following:

1. Document an outage as perceived by the person/group reporting the TT
2. Document the fix that resolve the outage and returned the circuit to service
3. Chronologically document the actions that ensued to confirm and solve the outage or disprove the outage and affirm the circuits physical "Up" state
4. Track the TT as it moves among the different groups working to resolve the problem
5. Document the time required to resolve the outage in terms of "WAN-Caused" and "Customer-Caused" outage times.

A TT, as implemented by the Frame Relay WAN Provider is made up of three separate sections; the Header, the Action & Location Log, and the Event Log (see Figure 2.1). Within each section are a number of "pages" that contain information fields unique to the TT.

An example of a TT as implemented by the WAN provider is shown in Figures 2.2a-2.2e. The Header (Figure 2.2a) is made of many attributes that, collectively, distinguish a TT from all other trouble tickets. The Header's attributes are fixed length fields requiring data of a certain type or length. Some of the more important attributes are; Circuit ID, Customer Name, Customer Point-of-Contact, Point-of-Contact Phone Number, Report Source, and Date Opened. For this report the *Report Source* attribute was collected and used for the TTRG Proactive Index. Referring the reader to Figure 2.2b, for this particular TT the *Report Source* attribute was set to "CUS" which indicates that the ticket was opened by the customer and not the WAN provider.

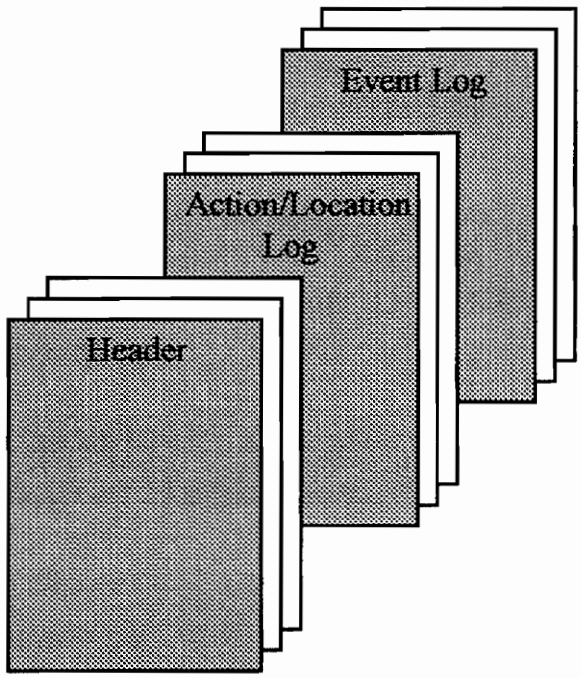

Figure 2.1 Frame Relay Trouble Ticket

A trouble ticket's Action & Location section (Figure 2.2c-2.2e) is a time stamped running log that shows the TT's current status as well as where the ticket had been and who had worked it. The time stamp is very useful in answering questions such as: "At what time was the TT passed to Group A?" and "After the TT arrived at Group A, at what time did an trouble shooter assign him/her self to the TT and begin working it?" These are important questions to ask if Group A is interested in determining the average "pick up" time for a TT. The average pick up time could be used indirectly as a indicator of the work load. For example, if the number of technicians and the average time to work a ticket are kept constant while the number of opened TTs are allowed to increase, a TT on the average will sit longer in the queue before being assigned and worked. Thus, there is a positive relationship between greater time in the queue (pick-up time) and increased work load.

Part of the Action & Location log is the Clear Code column. Located in the center of every Action & Location page (Figure 2.2d), the Clear Code column is either filled out manually by the trouble shooter or automatically by the tracking system. As is depicted in Figure 2.2d, the clear code column will vary depending upon what group worked the problem and the technician's perception of the fix. Note the 000 clear code used in Figures 2.2c and 2.2d. This code was added automatically by the tracking system when the TT's allotted time in the Customer-Caused-Outage Time bucket expired. Note the 747A clear code used in Figure 2.2e to close the TT. Referencing the Clear Code chart (see Figure 4.3), 747A indicates that the cause or rather the fix of the outage was a reboot of the customers router. Upon closing a TT, the Data Services Support group ("DSSG") repeats the clear code used by the TTRG. All previously suggested clear codes are ignored by the DSSG. The TTRG can only recommend closing a TT. Only the DSSG with the customer's permission has the authority to close a TT.

The trouble ticket's main body, the Event Log , is a series of freeform text pages (Figure 2.2f). Within these pages is kept a chronological log of the actions taken by individuals to investigate and solve the outage. Time stamping and ensign marking (far right five columns) is performed automatically by the TTTS as each comment is added. The Log is extremely useful in determining the sequence of events that transpired during an investigation. The added time stamps assist the reader further in determining when critical events happened and how one event may have influenced the results of another event.

Only personnel from those groups actively participating in the trouble shooting process have direct access to the ticket to add new or edit existing comments. All other non-participating groups are restricted to a read-only type of access. In an attempt to resolving the outage, a TT may be passed to a number of groups before the cause is found. The normal sequence of events is the following:

1. Data Services Support Group creates a TT and passes it to the Trouble Ticket Resolution Group
2. TTRG performs an initial investigation and forwards the TT to Test Group for physical line testing.
3. The Test Group tests the physical portion of the circuit.
4. The Test Group may require assistance from the Local Teleco, in which case the TT is forwarded to the Local Teleco.
5. The Test Group may also require assistance from the frame relay switch terminal site, in which case the TT is forwarded to the switch terminal site.
6. After the physical testing is done, the TT will be referred back from the Test Group to the TTRG for follow-up with the customer.
7. It is possible that the outage may not be a physical problem but a logical routing problem in the frame relay switch(s). In this case, the TT will be referred to the TTRG 2nd Level Group or the TTRG Switch Provisioning Group for resolution.

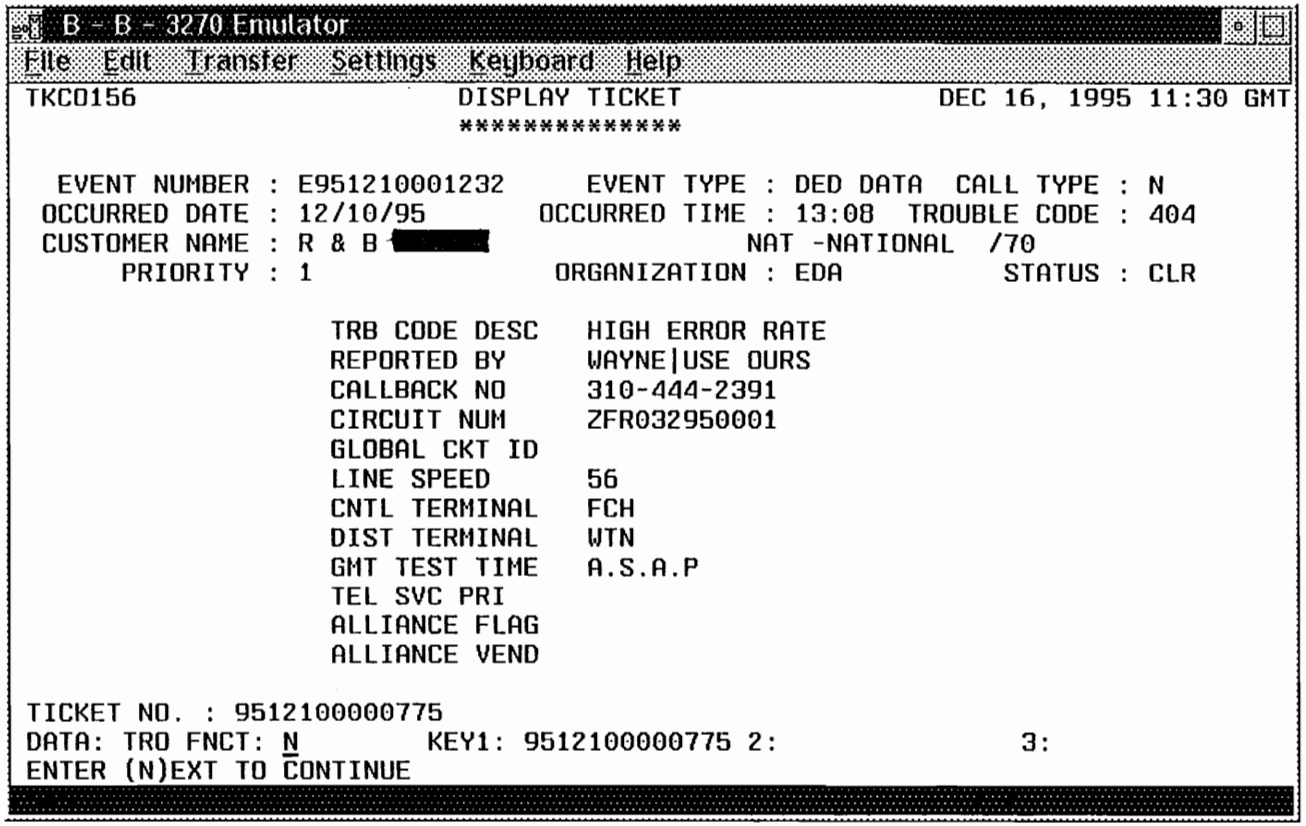

Figure 2.2a First Page of a Trouble Ticket's Header

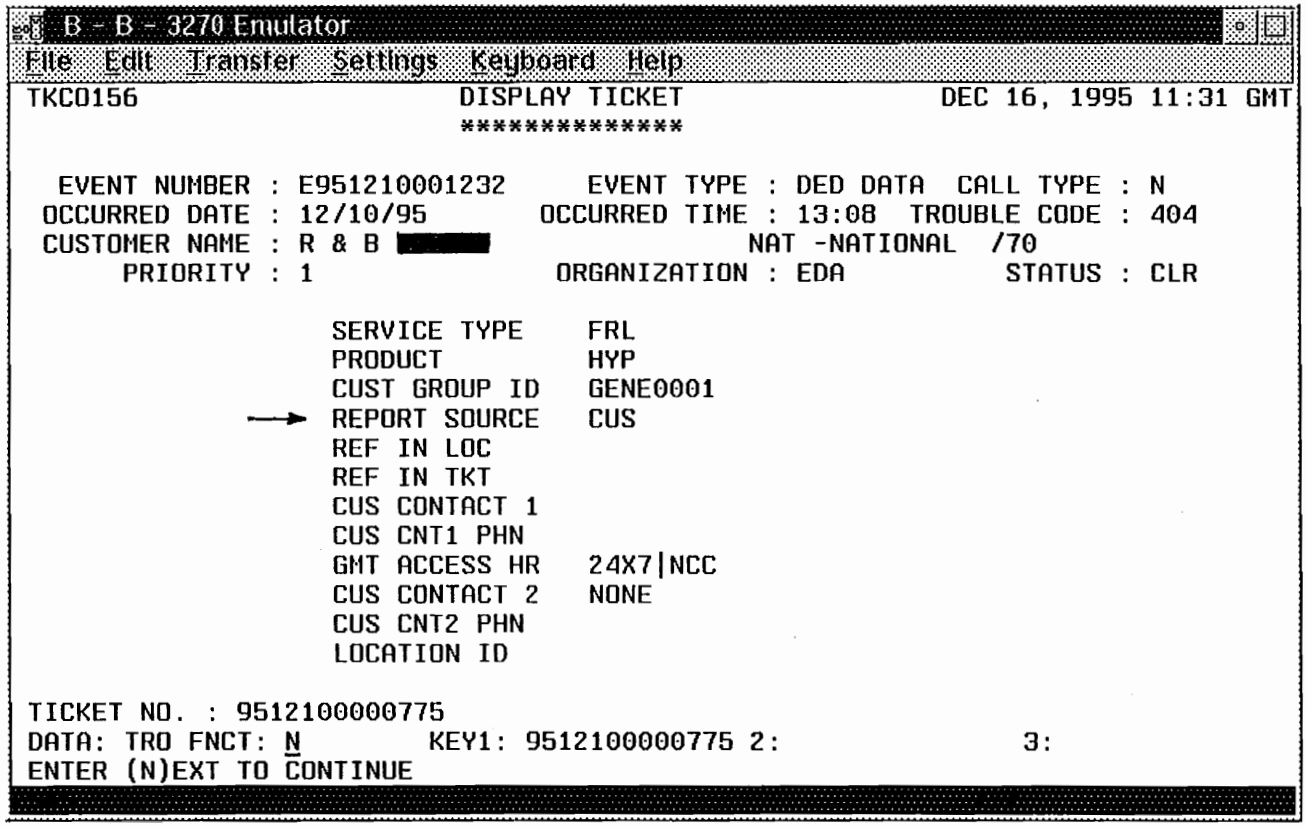

Figure 2.2b Second Page of a Trouble Ticket's Header

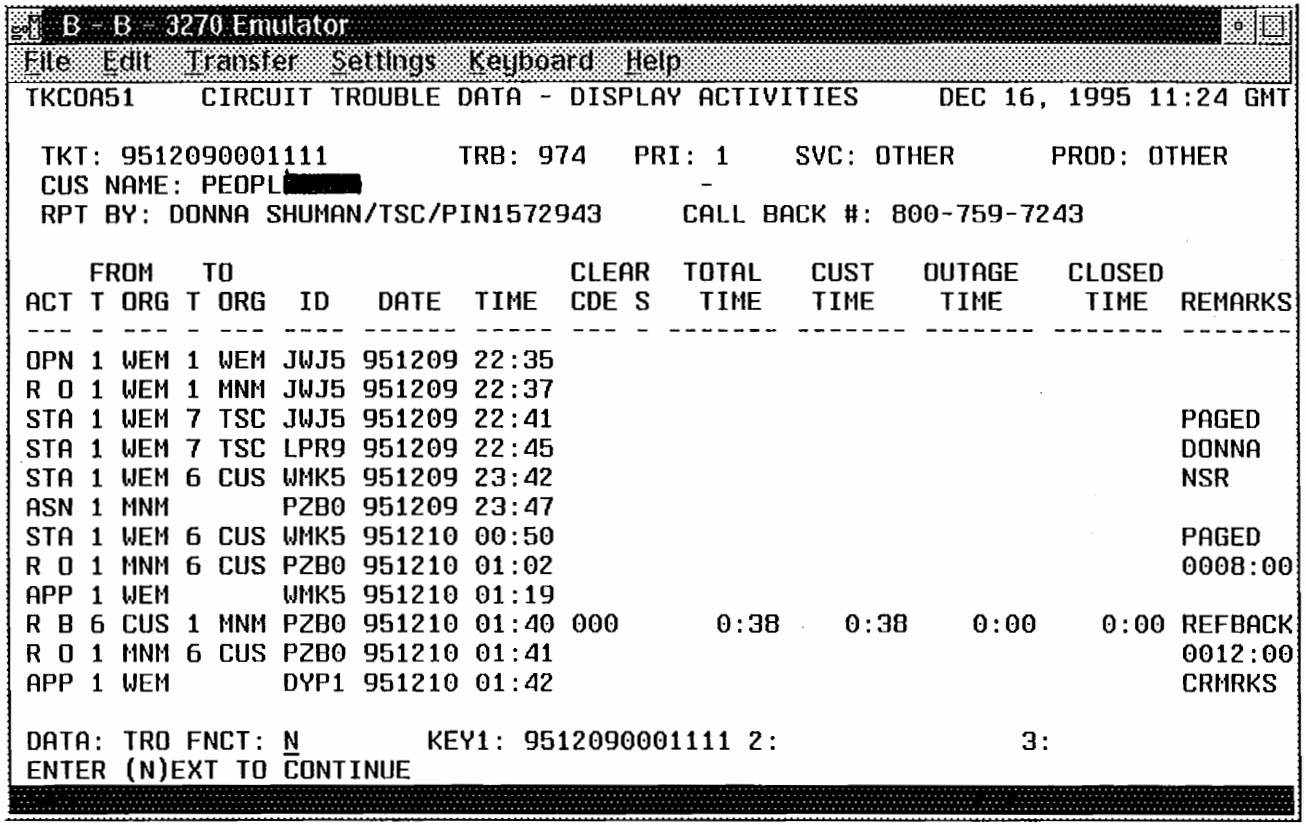

Figure 2.2c First Page of a Trouble Ticket's Action/Location Log

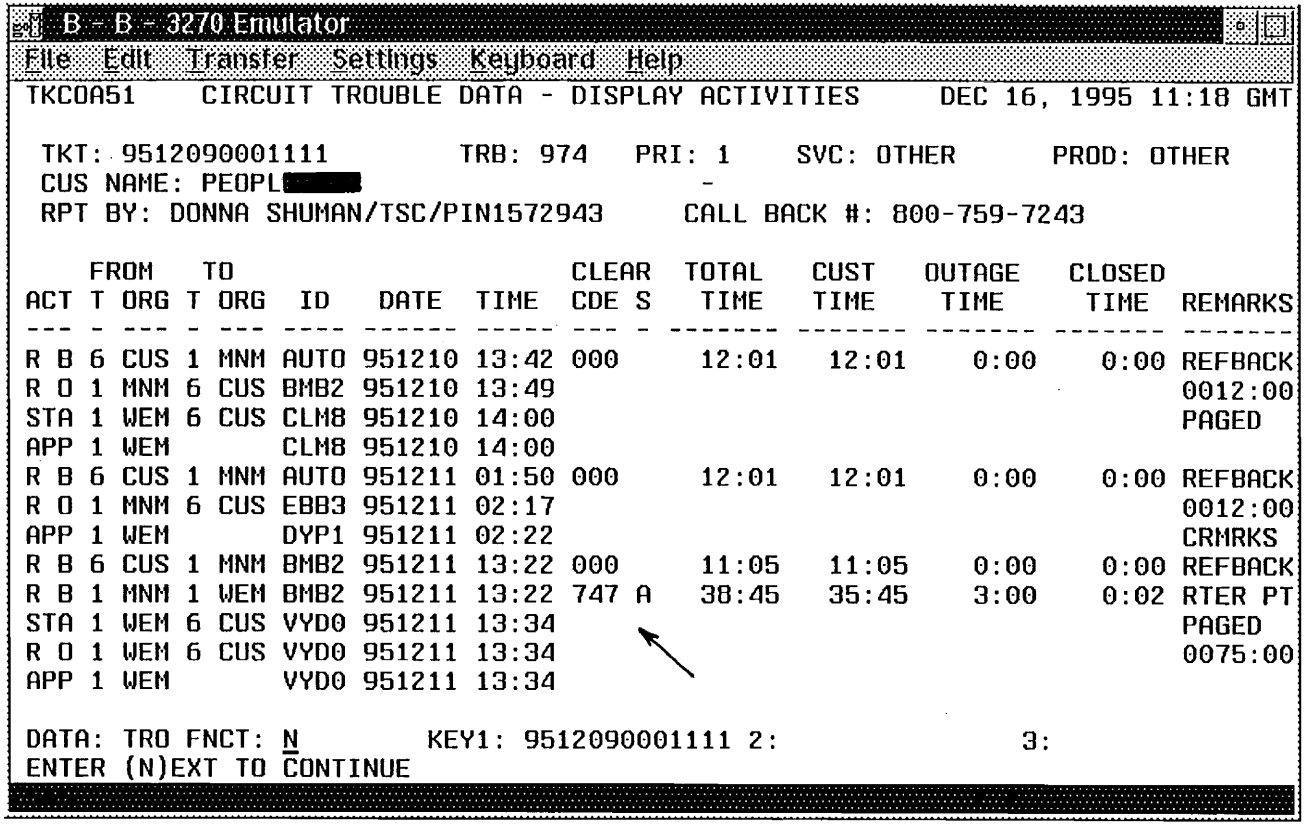

Figure 2.2d Nth Page of a Trouble Ticket's Action/Location Log

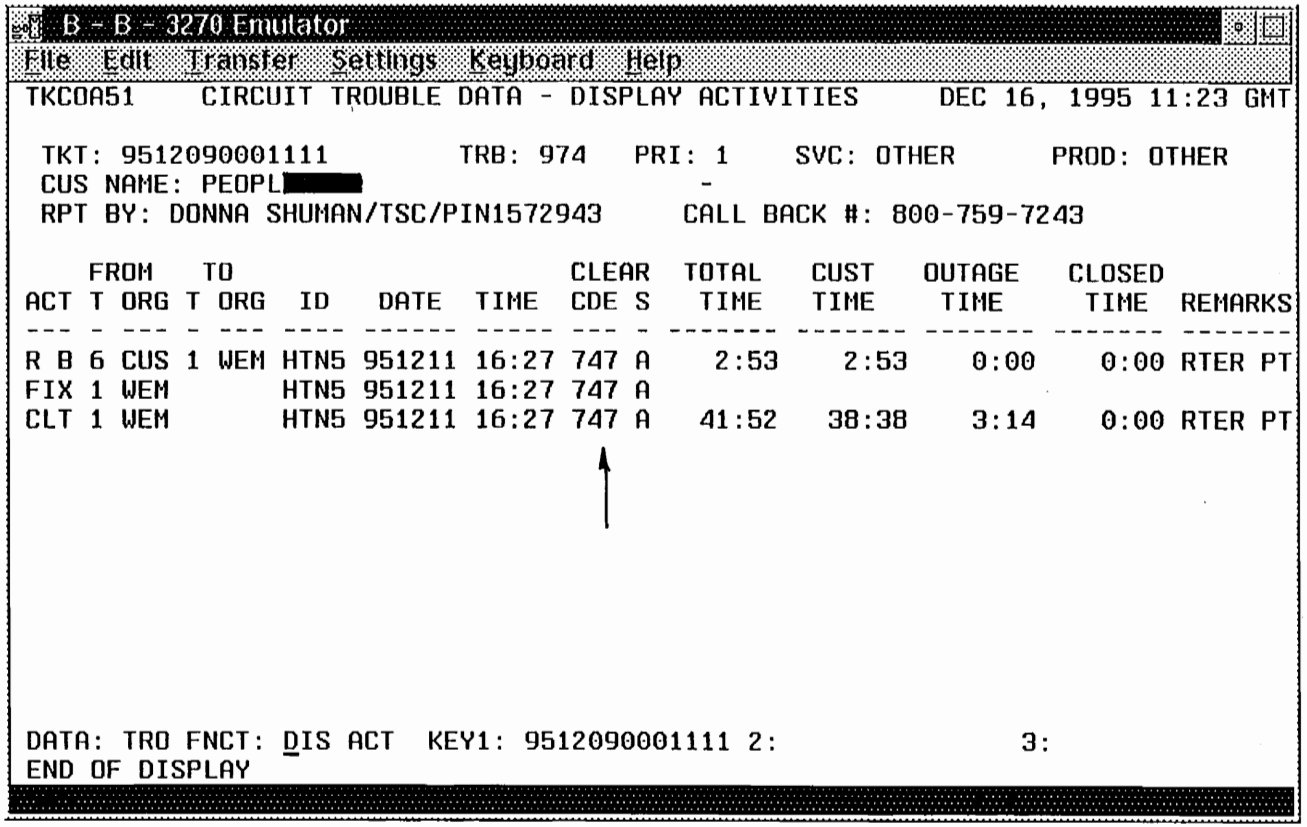

Figure 2.2e Last Page of a Trouble Ticket's Action/Location Log

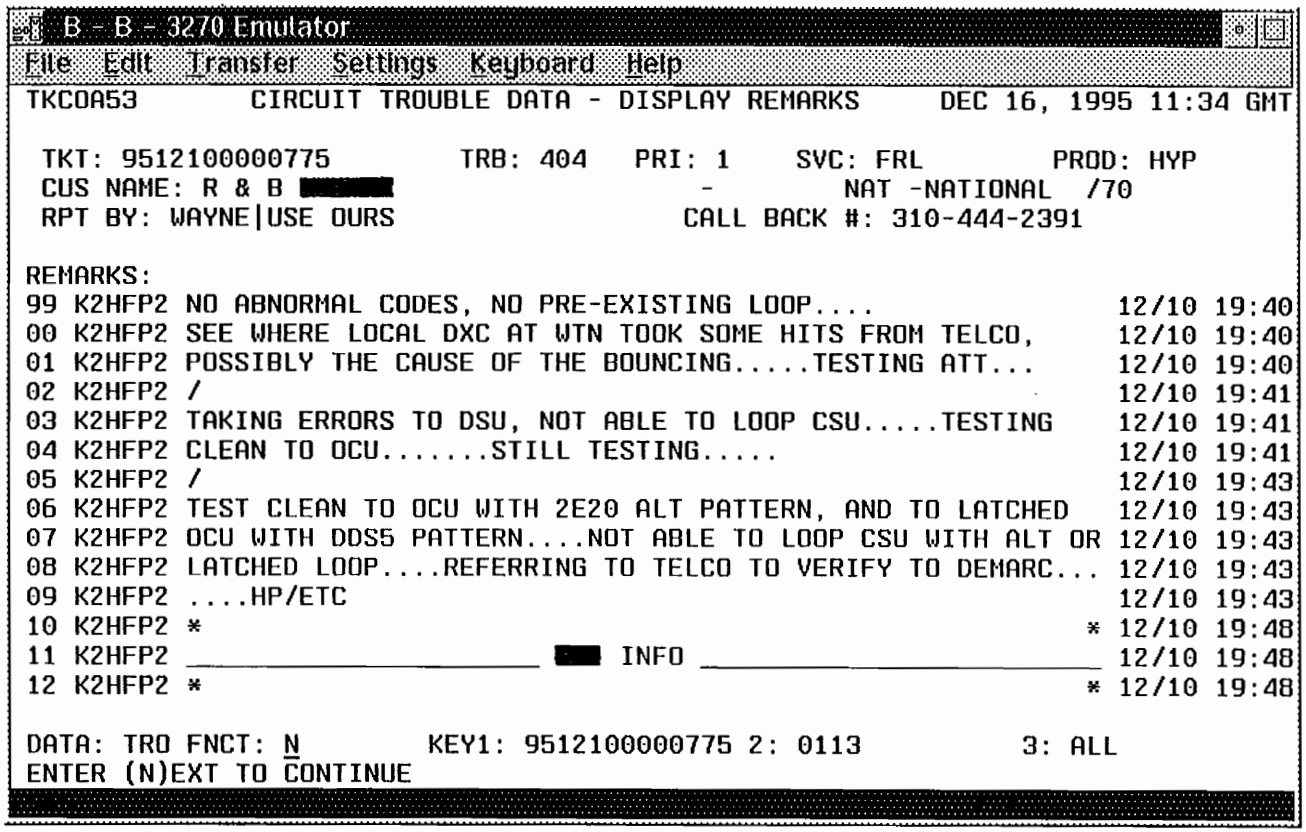

Figure 2.2f Nth Page of a Trouble Ticket's Event Log

2.2.1 Opening a TT

Upon creating a trouble ticket the trouble shooting process begins. The TTRG, customer, and the customer's WAN provider technical representative have the authority to open a TT. The customer can open a TT by either calling the DSSG or by calling the TTRG. If the customer calls the TTRG, the outage information given by the customer will be verified first by the TTRG before being relayed to the DSSG to generate a TT. All trouble tickets are categorized into two types: Proactive and Non-Proactive. If a TT is opened by the customer before the TTRG, it is considered Non-Proactive. If a TT is opened by the TTRG before the customer, it is considered Proactive. To identify a Proactive TT, the "Report Source" attribute should be set to the name of the service provider (e.g., WAN) and the beginning of the trouble ticket should have verbiage clearly indicating that the ticket is proactive (e.g., "proactive ticket open by the TTRG"). To identify a Non-Proactive TT , the "Report Source" attribute should be set to "CUS" (i.e., customer) plus the ticket's opening remarks should clearly indicate it as being non-proactive. Figures 2.3a and 2.3b is an example of a Non-Proactive TT (i.e., Report Source = CUS and opening remarks are non-proactive in nature) while Figures 2.4a and 2.4b is an example of a Proactive TT. Even though the Report Source attribute is showing "CUS" (see Figure 2.4a), it is clearly a proactive ticket because remarks at the beginning of the ticket indicate that the ticket was opened proactively. In situations like this the TT's dialog takes precedence.

2.2.2 Closing a TT

While the TTRG and Data Services Support personnel may recommend a ticket for closure, only the customer has the authority to close a TT. Once closed, the contents of a TT are frozen whereby existing information can neither be deleted nor changed but new information may be added.

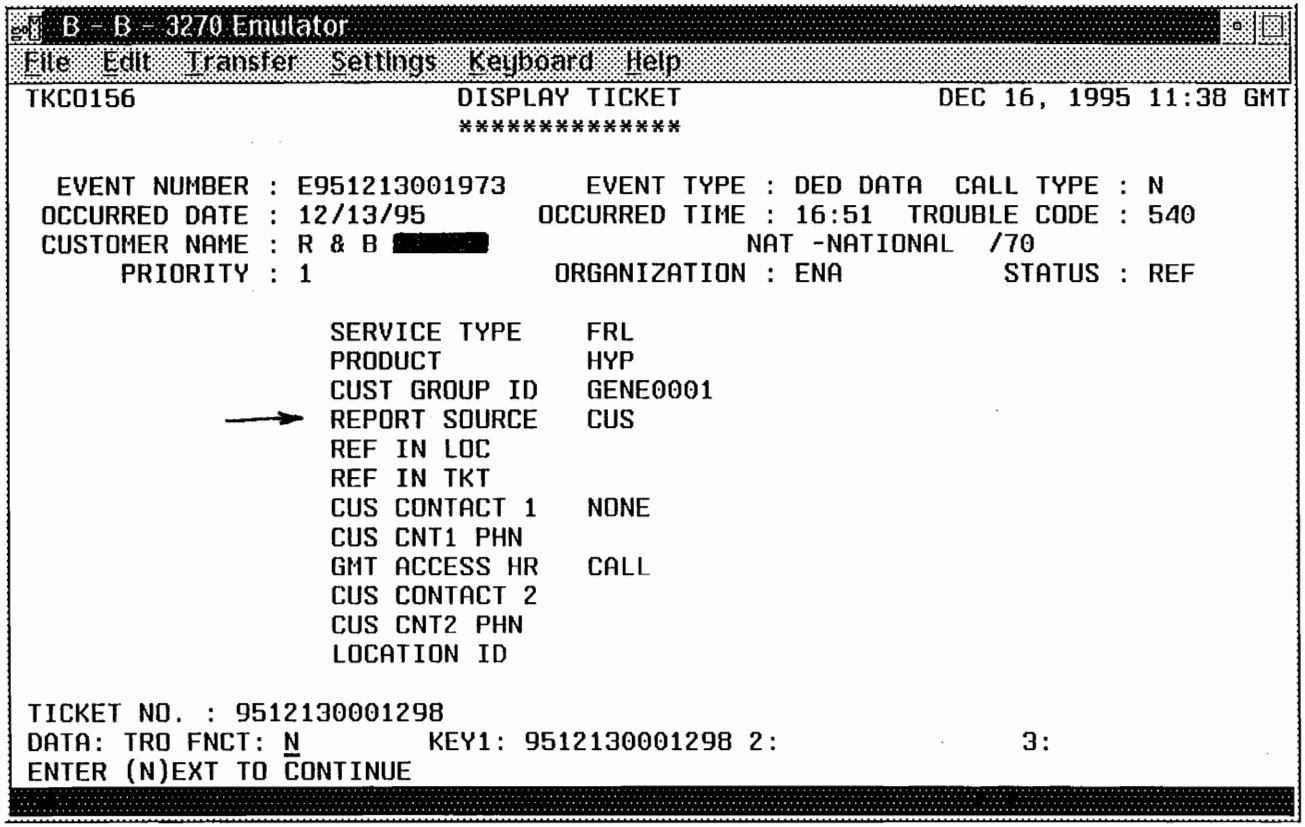

Figure 2.3a Customer Opened Ticket - Header Page

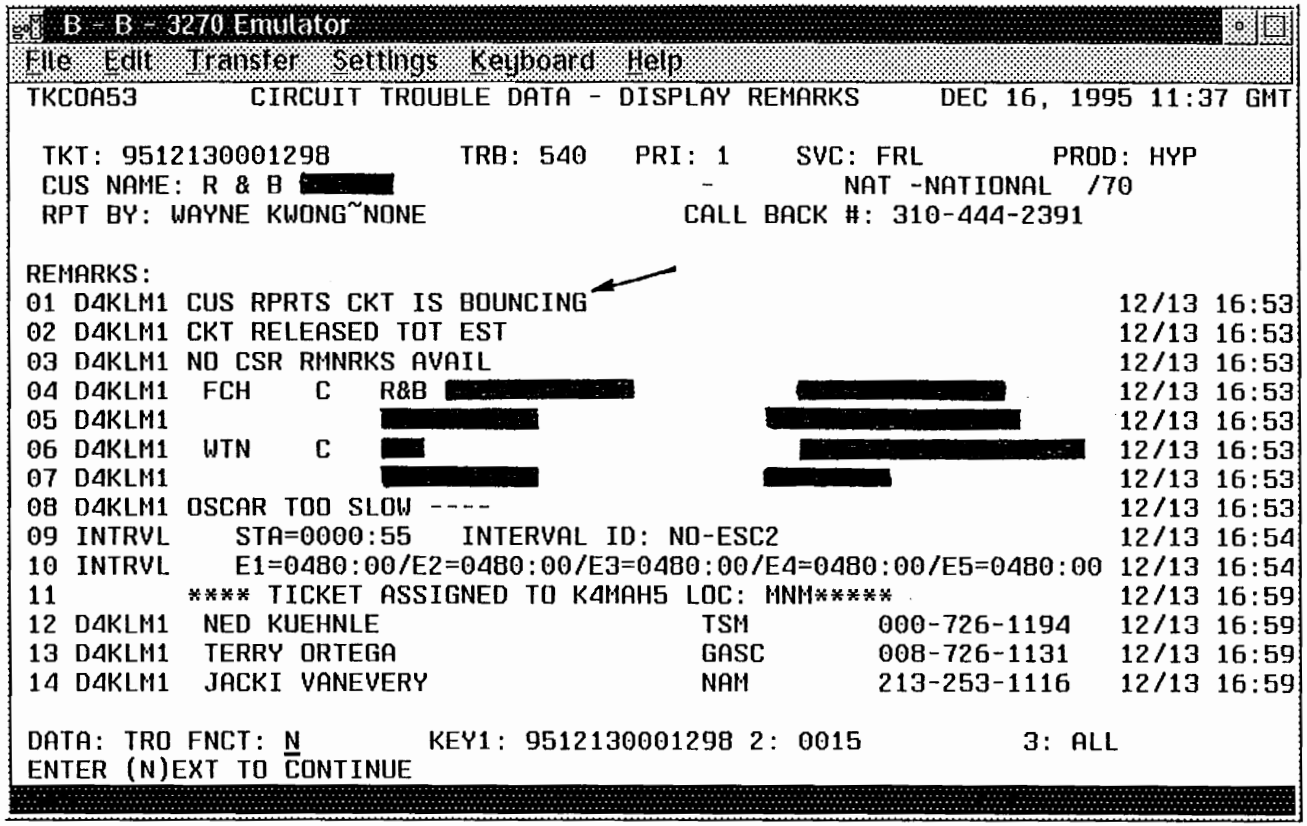

Figure 2.3b Customer Opened Ticket - Event Log Page

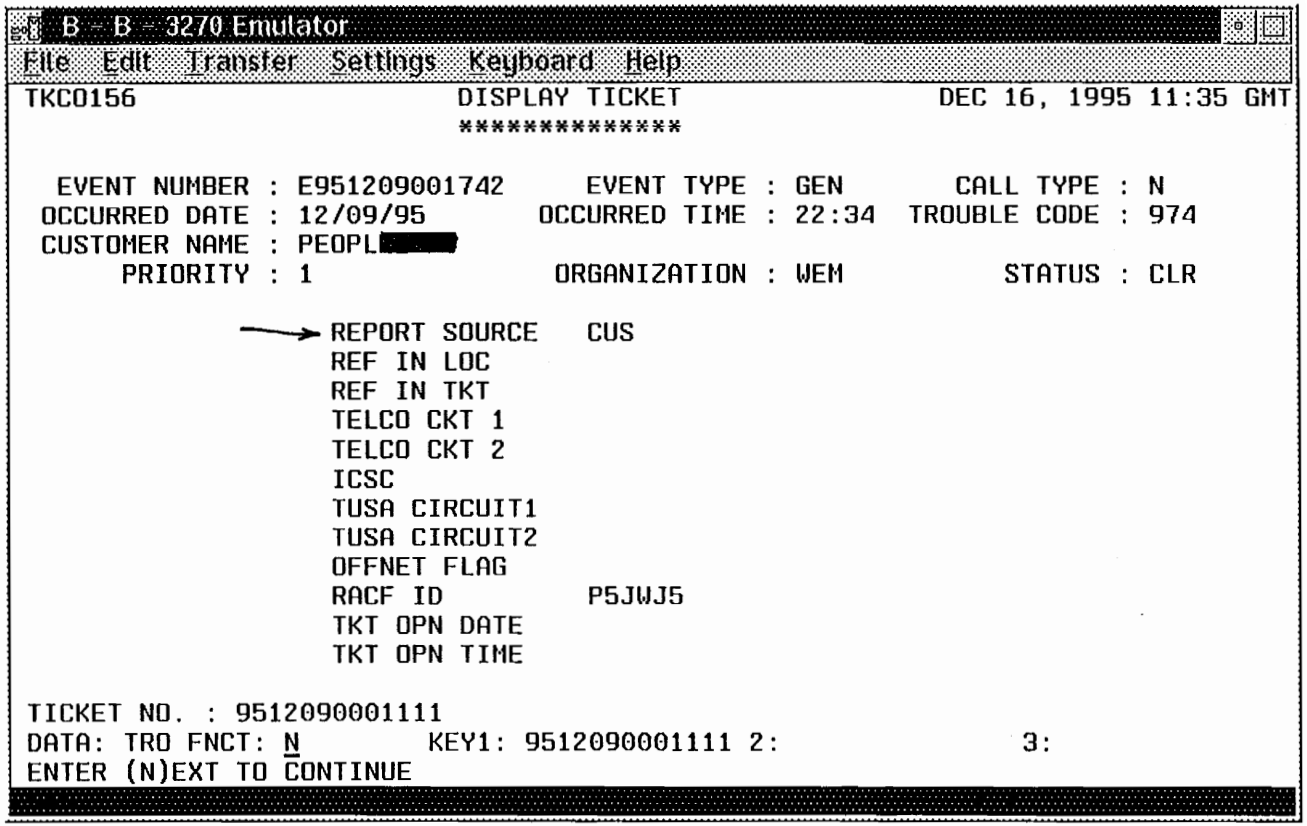

Figure 2.4a WAN Opened Ticket - Header Page

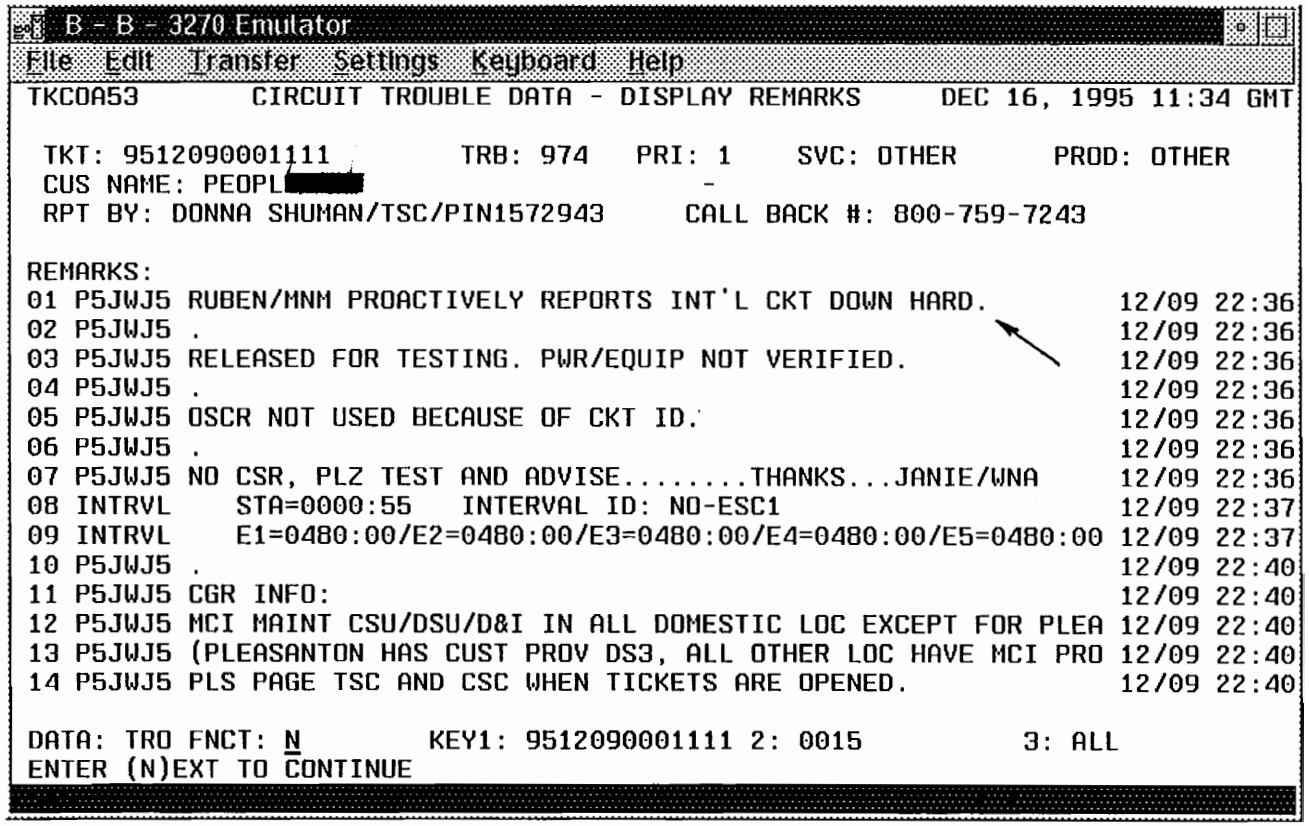

Figure 2.4b WAN Opened Ticket - Event Log Page

2.3 Trouble Ticket Tracking System ("TTTS")

The TTTS is a mainframe based application that can be accessed by multiple users simultaneously. It provides the capability to open, escalate, and close a trouble ticket and for real time management of these tickets via an assigning and timing mechanism and a chronological event log. Some of the more important factors of the TTTS have been provided below.

1. The TTTS provides the capability to open, escalate, and close a trouble ticket.
2. The TTTS provides a medium where information important to trouble shooting the outage is made accessible. Information such as: circuit information, customer contact, path through the network, passed trouble tickets on the same circuit ID, etc. Information can be added, changed and deleted. However, there are some restrictions on deleting information.
3. The TTTS provides the capability to track a TT's progression by keeping a chronological log of events and actions taken during the trouble shooting process.
4. The TTTS allows the capability to review opened and closed TTs. Six months worth of closed TTs are available for immediate access. Tickets older than six months are stored on back-up systems and can be access by issuing a job request. The TTTS also provides the capability to list all TT open on a circuit ID or by customer name.
5. The TTTS provides the capability to issue a specific job request that pulls data (e.g., attributes of a TT) from closed tickets. The job requests can be tailored specifically to the users needs and are currently being used for statistical data gathering.

A technician accesses the TTTS by establishing a session from their workstations. Multiple sessions can be established if more than one "working window" is needed. With a session, the technician has the ability to edit only those TTs that have been referred to his/hers group's domain but can view all other TTs created in the TTTS. The following is a list of editing commands frequently used: displaying or editing attributes in the Header, adding and editing comments in the Event Log, displaying the Event Log, displaying the Action Log, referring a TT "out" to another group, referring a TT "back" to the group that referred it out , moving a TT into and out of the Customer-Caused-Outage bucket, assigning ones self to a TT, and querying the TTTS database by customer or circuit ID for opened or closed TTs. The TTTS retains six months worth of TT for immediate access.

TTs older than six months can be access by initiating a "job" request via the mainframe's stored data retrieval application.

2.3.1 The TTTS Bucket

The term *bucket* represents an virtual place within the TTTS software where a TT can be placed. There are two bucket types; WAN-Caused-Outage and Customer-Caused-Outage. A definition of these terms follows:

- Customer-Caused-Outage bucket: Trouble tickets are placed in this bucket under the assumption that the outage is caused by the customer's actions or faulty equipment or the Test group has tested "good" (which implies the WAN provider's equipment is operating correctly) to the furthermost point that the WAN provider and Local Teleco have responsibility for.
- WAN-Caused-Outage bucket: Trouble tickets are placed in this bucket if the Test Group's results indicate a problem with either the WAN provider's or Local Teleco's switching equipment or cabling, or if the Test group is unable to test to the furthermost point that the WAN provider and Local Teleco have responsibility for.

From the time a TT is opened, it will reside in either one of the two bucket types mentioned. Groups actively involved in the trouble shooting process have the capability to move a TT among the two bucket types. Tickets remain in a group's WAN-Caused-Outage bucket if the cause of the outage remains unknown and if the service provider's and Local Teleco's furthermost equipment has not been tested. Movement of a TT out of the WAN-Caused-Outage bucket can only occur when the outage has been resolved or is known to be associated with the customer's equipment or actions. Tickets are moved to a group's domain to establish responsibility and solicit the group's expertise in solving the outage. Once a TT is in a group's domain, only personnel from that group have the authority to move the ticket among the two bucket types. While in a group's domain, the ticket can be moved at any time between that group's WAN-Caused-Outage bucket and the Customer-Caused-Outage bucket as long as all requirements are met. When a TT is moved from one group's domain to another, the TT is automatically placed in the recipients WAN-Caused-Outage bucket by the TTTS.

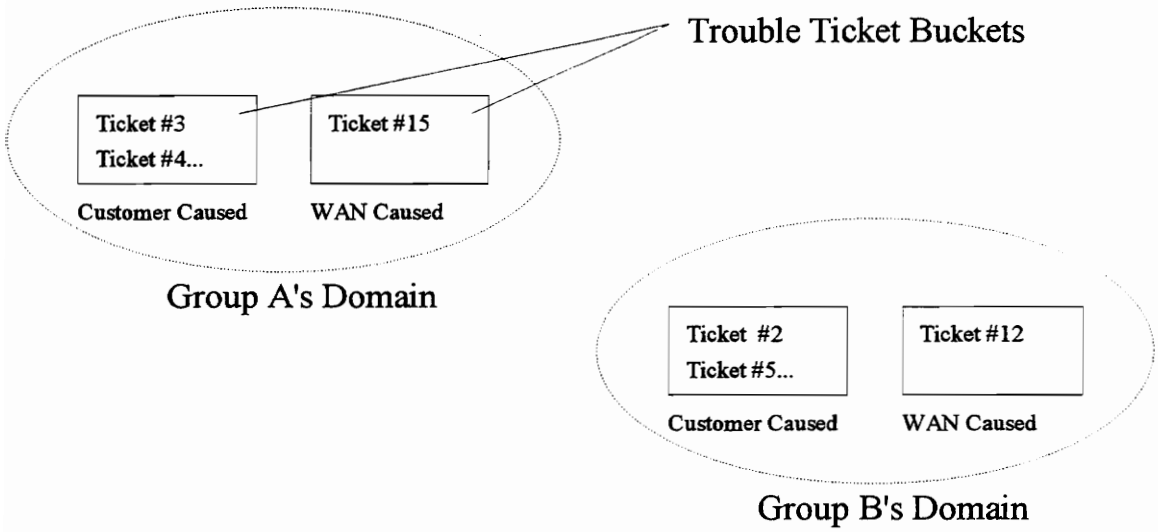

Figure 2.5 Trouble Ticket Bucket Types and Group Domains

2.3.2 The TTTS Timers

Every TT has two *timers* that are automatically managed and updated by the TTTS. The timers resemble and function very much like a stopwatch. One timer clocks the time a TT spends in the WAN-Caused-Outage bucket, while the other timer clocks the time a TT spends in the Customer-Caused-Outage bucket. The WAN-Caused-Outage timer starts clocking when a TT is opened. This timer will continue to clock until the TT is placed in the Customer-Caused-Outage bucket. Timers can be stopped and started by moving the TT from one bucket and placing it into another bucket. Upon closing a TT, both timers are stopped and their values are recorded and added as attributes to the TT. The Customer-Caused-Outage timer represents a collective sum. The WAN-Caused-Outage timer also represents a collective sum but is unique in that it is capable of clocking each group's contribution to the timer's total. Unfortunately, the data identifying each group's addition to the timer's total is not readily accessible and requires manually reviewing the ticket's Action Log, a very time consuming and paper heavy process. Automating the process will allow a more detail study of how each group contributes to the WAN-Caused Outage-timer and whether their specific MTTR value improves, worsens or remains unchanged over time. As a side note, the TT's timers could also be used to discern how much time was used identifying, investigating, and correcting the outage and/or monitoring the circuit for stability.

The WAN-Caused-Outage timer was collected automatically and used to define a ticket's Time-To-Repair. After collecting the data for a period of one week, it was summed and an average calculated. The resulting value equates to a trouble ticket's Mean-Time-To-Repair for that specific week of operation. It was this average value that was used to define the WAN Provider MTTR index.

Because of the complexities involved, trouble shooting a ticket can become so convoluted at times that it is unclear what the true fix was or who/what was at fault. It is possible that an outage, having claimed to be a customer equipment problem, was in fact, upon closer review of the TT's log, a WAN provider's problem. In situations like these, the time spent by the TT in the Customer-Caused-Outage bucket should have been time spent in the WAN-Caused-Outage bucket. Subsequently, both timers are incorrect and the MTTR indices are misrepresented and misleading. It is equally possible that this situation can

happen in reverse, where time was attributed to the WAN-Caused-Outage timer and not the Customer-Caused-Outage timer. Situations like these introduce error and skew the MTTR results. Given the current ticket tracking system, calculating this error would be a difficult task. Based on the advise given by W. Bruce Crew in his article No-Nonsense Guide to Measuring Productivity [CHEW88], increasing accuracy is not worth the additional effort and cost to acquire it. Thus, the error induced to the MTTR indices by the previously mentioned circumstance will not be address in this report.

2.4 Internal and External Group Involvement And Responsibilities

2.4.1 TTRG Internal Groups

The TTRG is comprised of five sub-groups: the Proactive group, 1st Level Trouble Shooting group, 2nd Level Engineering Group, 3rd Level Engineering Group, and the Switch Provisioning group. Since approximately 96% of the TTs opened are resolved by the Proactive and 1st Level Trouble Shooting group, this report will concentrate on these two groups only. A brief description of the responsibilities of the other TTRG sub-groups have been provider to assist the reader in understanding the interplay among the various groups. The reader is referred to Figure 2.6 for a visual description of how each group interacts with the other.

TTRG Proactive Group

The Proactive group has the responsibility of overseeing the WAN Circuit Status Alarm workstation(s) and opening a TT when an alarm is posted indicating that a circuit is experiencing an outage. A 15 minute grace period is honored before a trouble ticket is open. The grace period allows for network anomalies and for the proactive technician to contact the customer (i.e., 10 minute quick call) and determine if the outage is caused by power lost to the site, faulty equipment at the site, or planned equipment maintenance by the customer. If the Proactive group is unable to associate the outage to the customer's actions or equipment or to the lost of power at the site then a TT will be opened. The TTRG is also responsible for proactively monitoring the status of the frame relay switches and their internal cards (Fract-T1, Full-T1, FDDI, and Trunk cards), the back bone switches and their internal cards, and the back bone digital modems for failures and to

open a TT if a failure occurs. If resources are available, the Proactive group will assist the 1st Level Trouble Shooting group where ever possible.

TTRG 1st Level Trouble Shooting Group

This group has the sole responsibility of ensuring that every TT is investigated and tested correctly and upon returning to service (i.e., having verify the fix by noting the circuit's Up status), functions properly for 24 hours at the customer's satisfaction before being closed. Additional responsibilities of this group include; performing both a physical layer and frame relay logical layer investigation, reviewing the Test group's test results, assisting the Test group during testing, interfacing with the customer, provisioning the switch of PVC discrepancies, arranging dispatches for equipment located at the customer's premise but owned/maintained by the service provider (i.e., Service Provider Provided Equipment - SPE), and working with the 2nd level groups on trunk or switch card outages.

The TTRG is responsible for arranging a technician dispatch to test through and prove that the SPE is functioning correctly or replace the SPE if found faulty. The decision to arrange for a dispatch is a combined effort between the customer, the Test group and the TTRG. The customer's insistence for a dispatch takes precedence over the Test group or the TTRG, and arrangement for the dispatch is to begin immediately. The TTRG will provide customer point-of-contact and site information for the dispatch technician. The TTRG is responsible for correcting any minior (e.g., configuring no more than 2 PVCs and correcting CIR and LMI settings) provisioning mistakes found in the switch. The TTRG is also responsible for trouble shooting the back bone trunk lines. The 2nd Level Engineering group will be notified of all trunk outages and will be solicited for assistance if the 1st Level group's trouble shooting efforts have not corrected the problem within 30 minutes.

TTRG 2nd Level Engineering Group

The TTRG 2nd level engineering group consists of higher skilled engineers who manage the day to day operation of the Frame Relay WAN. This includes managing and configuring the switch, monitoring and tracking switch performance and capacity, monitoring and tracking switch-to-switch trunk line performance, conducting switch upgrades, and assisting the 1st Level Trouble Shooting group. This group will also assists in trouble shooting those circuits that continually experience errors and outages. This

group has the capability, via a protocol analyzer, to monitor a circuit, capture both it's transmit and receive packets and decipher their contents. Any large discrepancies found between what is provisioned on the Frame Relay switch and what is found in the provisioning database are handled by this group.

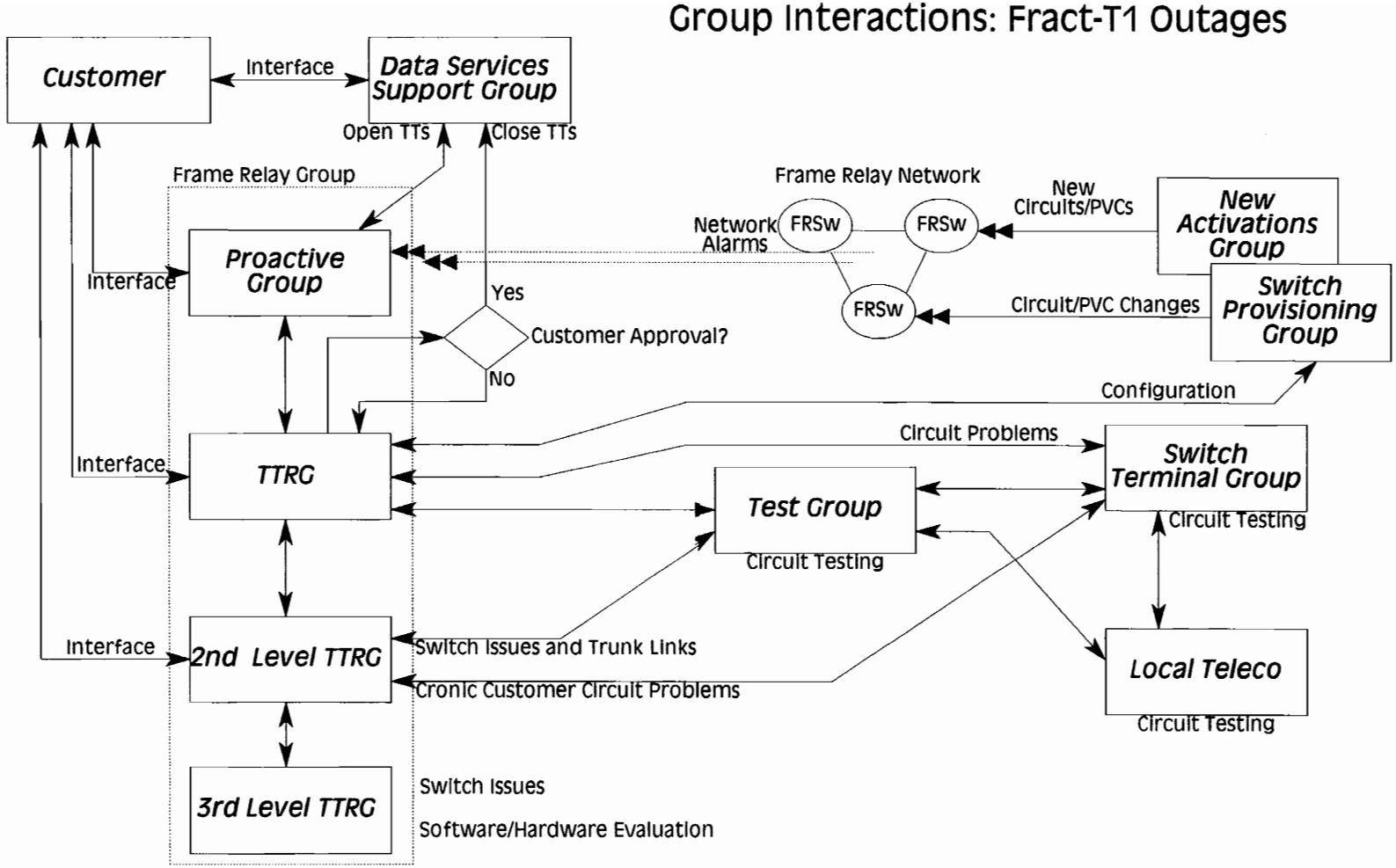

Figure 2.6 Group Interaction Flow Chart

TTRG 3rd Level Engineering Group

This group will be involved when all means to correct an outage have failed and/or the cause of the outage remains a mystery. This groups is directly involved when a switch crashes or when one of its internal cards are down and efforts to revive it are unsuccessful.

Switch Provisioning Group

This group is responsible for provisioning all new circuits and new PVCs. They are responsible for ensuring that the provisioning database correctly reflects what is provisioned in the switches. The Switch Provisioning group is also responsible for ensuring that the switch is configured correctly when working with the New Activation and Applications group to activate new circuits.

2.4.2 External Groups

Test Group

The Test group works in concert with the TTRG and officially drives to resolution all circuit problems detected in-house and externally. The Test group is responsible for testing the physical portion of a frame relay circuit beginning from a point closest to the frame relay switch up to and including the customer's digital modem (i.e., if configured for remote loop testing). This includes the physical portion owned and maintained by the Local Teleco provider. If the cause of the outage is isolated to Teleco's portion of the circuit, the Test group will contact the Local Teleco provider and solicits their involvement. Before returning a TT to the TTRG, the Test group verifies any fixes through additional testing. If the Test group is unable to test to the customer's location because they are unable to "loop" the digital modem, an attempt to loop and test to the next loopable piece of equipment, keeping the furthest from the frame relay switch as possible, will be made. With the testing completed, the Test group returns the TT to the TTRG where they will update the customer on the test results and if needed, request assistance from the customer in providing a test loop at their digital modem (i.e., furthest point) for additional testing.

Switch Terminal Groups

The Switch Terminal Groups are responsible for fixing problems isolated to their site by the Test group. These groups will work directly with Test group to ensure that the fault is

corrected. The Switch Terminal groups may at times be call upon (during busy periods) to provide the physical testing normally performed by the Test group. In this circumstance the Switch Terminal group will assume the responsibilities outline for the Test group.

Local Teleco Provider

The Local Teleco Provider is responsible for fixing problems isolated to their portion of the circuit. This includes dispatching a technician if the problem can not be fixed through normal trouble shooting methods.

New-Activation Group

The New-Activation group is responsible for turning-up a circuit for the first time. This includes ensuring that the circuit has been ordered, configured, and tested properly. This group will also ensure that the customer is able to establish a frame relay connection and retain the connection for at least 2 days without incidence as well as "use" the circuit the way the customer intended.

2.5 Trouble Ticket Resolution Process

Provided in the Section 2.5 is a descriptions of the Frame Relay trouble shooting process currently employed by a major WAN service provider. Where additional detail is need of the process the reader is referred to Appendix A.

To solve a frame relay outage requires knowing the status of the many entities (see Figure 2.7) that define the frame relay WAN and the user's equipment connected to it. Seven of these entities are as follows:

1. Access switch's physical and logical routing software operation
2. Operation of the customer's entry ports on the Access switches (logical in nature)
3. Operation of a PVC(s) at both the ingress and the egress switch (logical in nature)
4. Backbone switch's physical and logical operation
5. Backbone trunk lines (wiring and transmission equipment)
6. Physical wiring and the associated transmission equipment from the WAN provider through the Local Teleco to the customer's digital modem

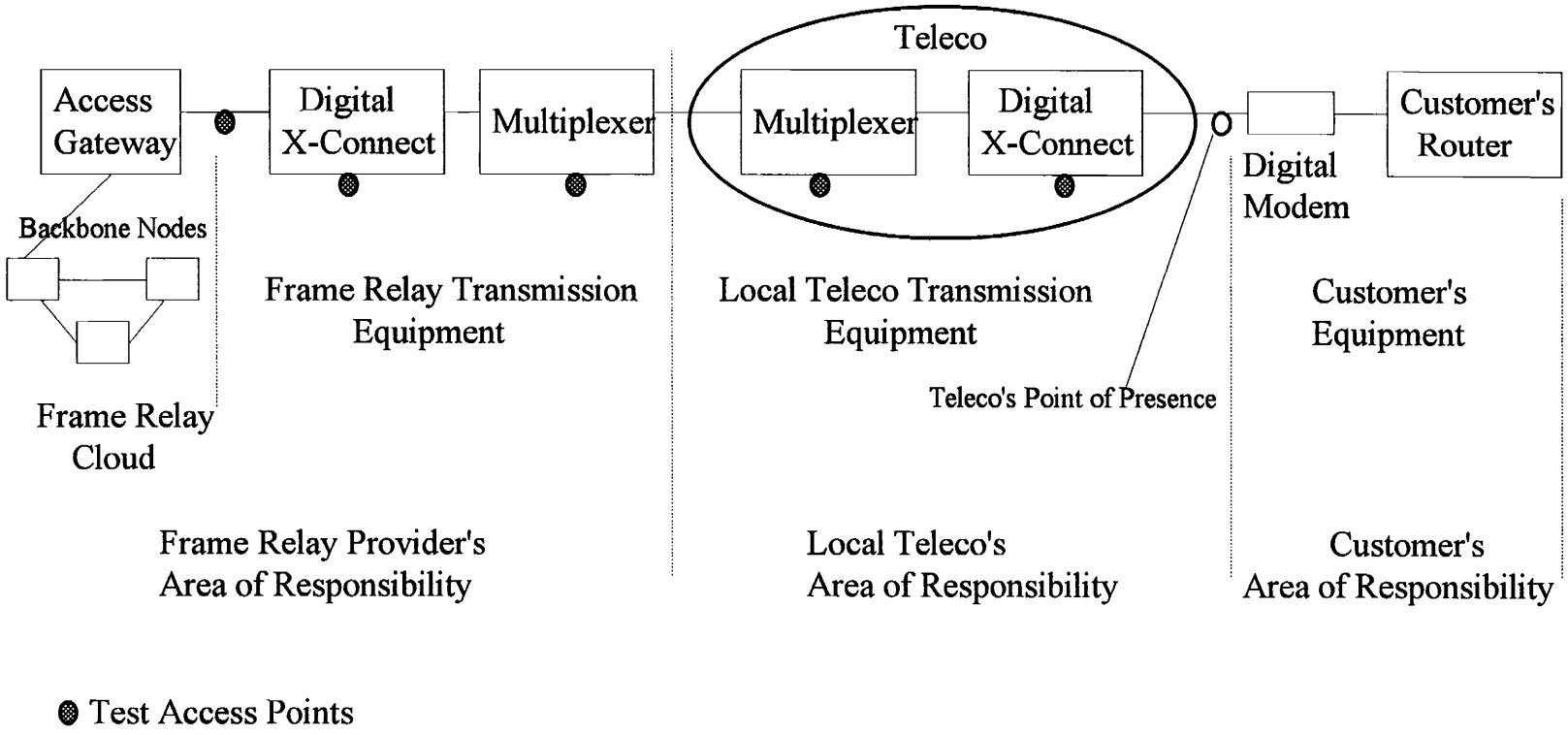

Figure 2.7 Equipment Layout Between the Frame Relay Provider and the Customer

7. Customer's router and associated equipment such as the digital modem or multiplexer or their software application(s)

Shown in Table 2.1 is the percentage of frame relay outages caused by any one entity and as defined by the clear code assigned to the TT by the trouble shooter.

Table 2.1 Cause of Fract-T1 Outages per Month

	Percent Of Total Monthly Tickets Issued				
Entity Attributed to the Outage	Aug	Sept	Oct	Nov	Dec '94
WAN Provider Related					
Frame Relay Access/Backbone Switch	10.79	17.52	16.49	11.45	11.07
Frame Relay Transmission Equipment	19.22	10.49	9.60	8.51	15.05
Equipment Leased by the Customer	0.20	0.12	0.23	0.00	0.68
Local Teleco Equipment Related	9.61	12.63	10.74	12.85	12.61
Customer Equipment Related	31.65	37.43	36.96	36.18	38.77
Cause Unknown/No Problem Found	28.49	21.81	23.62	31.32	24.79

Some customers prefer to lease the router and/or digital modem from the WAN provider. Outages isolated to leased equipment are included under the "Equipment Leased by the Customer" category. The very small values associated with this category is due to the relatively small number of customers that participate in the leased equipment program.

The Frame Relay Access/Backbone Switch category includes problems associated with the access switch's physical/logical operation, the backbone switch's physical/logical operation and the backbone trunk lines. Although Table 2.1 does not explicitly show outages caused by the backbone trunk lines or the backbone switches, closer analysis of the TT clear codes revealed that approximately 3% of the TTs opened were backbone related with the remaining percentage associated with the access switch. The rare occurrence of an outage caused by the backbone switch/trunk lines statistically allows the 1st level trouble shooter to initially ignore it as the cause of the outage (unless informed by the 2nd level TTRG). Only after the investigation has stalled will the TTRG shift their focus to the backbone switch and it's associated trunk lines.

From Table 2.1 it is clear that a majority (+50%) of the outages can be contributed to two categories, the Cause Unknown/No Trouble Found and Customer Equipment Related. The remaining three categories (Frame Relay Access Switch, WAN Transmission Equipment and Local Teleco Equipment) are divided relatively evenly at 15% each (+-5%). On average 36% of the trouble tickets opened can be attributed to the customer's equipment or lost of power at the customer's site. This being the case, it becomes very important in the trouble shooting process to determine as quickly as possible the status of the customer's equipment and whether the site has power.

2.5.1 Trouble Shooting a Trouble Ticket

After the DSSG opens a TT it is immediately passed to the TTRG to begin the trouble shooting process. Once a TT arrives into the TTRG's WAN-Caused-Outage bucket, the next available TTRG technician will assume "ownership" of the TT by assigning him/her self to the TT via the ticket's Action/Location log. Having assumed ownership, the trouble shooter will quickly inspect the ticket (see Figures 2.10a, b and c) to determine which of the following Category Types it matches:

1. New TT - Proactive: a TT opened by the TTRG
2. New TT- Non-Proactive: a TT opened by the customer
3. Old TT - Type 1: a TT returned off" Customer-Caused-Outage Time
4. Old TT - Type 2: a TT referred by the DSSG
5. Old TT - Type 3: a TT returned from the Test and/or Switch Terminal group(s)
6. RFO : a TT with a Reason-For-Outage ("RFO) request

Once a TT has been categorized in one of the above six profiles the technician begins trouble shooting the ticket in a manor specific to that category.

Since approximately 36% of the TTs opened are customer equipment related, answering the following questions early into the trouble shooting process will save resources and help decrease the MTTR index.

1. Does the customer's site have power?
2. If the site has power, are both the router and digital modem transmitting?
3. Is the router's transmit and receive counters incrementing?
4. What is the router's error statistics showing? Are they clocking CRC, line transitions and/or missed "keep alive" errors?

5. What is being posted in the router's event log

Because a majority of the frame relay customers do not allow the TTRG direct access to their routers, the trouble shooter is dependent on the customer to provide the answers to the above five questions. Referring to the customer for answers can at times can be difficult. For example, the customer's point man may be indisposed, not well trained or unable to access the router or the router may not display some of the statistical counters mentioned above. On the other hand, there are companies that are better trained and organized and can quickly answer the above questions if asked. However, they are the exception rather than the norm. In addition, the better router manufacturers offer products that can supply the user with a wealth of information on the status of their frame relay port. Obtaining this information and applying it to the trouble shooting process is always a challenge. It requires a customer that has a good understanding and working knowledge of frame relay and their router and out-of-band access to the router. Out-of Band access allows the network manager to remotely access the router even while their frame relay link is down. It consists of a standard phone link to a modem connected to the router. Through the modem link, the network manager can determine:

1. If the router's receive/transmit counters are incrementing
2. If the router's statistic counters are clocking receive/transmit errors
3. If the router lost power completely(i.e., establishing a modem connection indicates that the router has power)
4. If the router loss power temporarily
5. If the router rebooted recently
6. If the router is configured correctly
7. Whether there are postings in the router's event log related to the outage
8. If the router's routing table is corrupted or in error

2.5.2 New TT - Proactive

The TTRG proactive technician will be informed of all circuit outages by the switch's fault monitoring software. When a circuit goes down the switch will issue a warning that appears on the Proactive Monitoring workstation. The proactive technician will wait 15 minutes to see if the circuit recovers on it own. The grace period allows for network anomalies and for the proactive technician to contact the customer and inquire about

power lost to the site or the maintenance work on their equipment. If the circuit recovers within the 15 minute grace period a TT will not be opened. If the outage continues pass the 15 minute mark the proactive technician will begin the TT opening process. Observations have revealed that the ticket opening process takes approximately 10 minutes to complete. A majority of this time is used to verify that the circuit does not have an existing TT opened on it and to clear old alarms from the Proactive Monitoring workstation that have restored. Time is also spent in verifying whether the circuit is active, a new turn up or a test circuit. A flow diagram of the proactive trouble ticket opening process (See Figures 2.8 and 2.9) is provided. A summary of the process is as follows:

1. Call the customer and inquire about the outage
2. Verifying the outage by querying the access port on the switch
3. Reset the customer's access port in an attempt to restore the circuit to service[2]
4. Using the TTTS, double check for an opened TT under the same circuit ID
5. Locate the circuit and customer contact information
6. Call Data Services Support to open a proactive TT

An important aspect of trouble shooting a proactive outage is verifying whether the customer's equipment has power before a TT is opened and tested. In doing so, the TTRG will conserve scarce resources and manpower. In addition, quick calls to the customer about an outage helps to further improve the proactive monitoring image of the WAN provider. Analysis of the collected data revealed that TTs closed as "customer power related" account for approximately 6.63% of all tickets opened (See Figure 2.11). Further analysis indicated that 75.40% of the power related TTs opened were by the proactive monitoring group, further iterating the importance of the proactive group in identifying for the customer when a site of theirs losses power. To address the above concerns in light of the data, management reiterated the importance of calling the customer for all proactive outages before opening a TT. On a related note. A significant percentage of the TTs opened (approx. 20-30%) are closed as "No Trouble Found, Tested

[2]From late 1994 to mid 1995 a bug in the Frame Relay switch software would not let a customer's circuit recover from an outage. Operating procedures at the time call for the trouble shooter to issue an access port reset to bring the link up. Recent fixes in the newest version of software installed on the switches has alleviated this problem. In question now is a similar problem, except now the circuit must be down for 5+ hours before a reset of the access port is needed.

Clean or Outage Cleared While Checking". It is possible that a significant percentage of these unknown tickets are power related, which, if true could push the percent of power related TTs to a level that demands even greater attention.

After the DSSG opens a TT it is immediately passed to the TTRG to begin the trouble shooting process. Upon arrival, a 1st level trouble shooter will assign his/her self to the TT and "cut and paste" circuit information from the Frame Relay Customer Database (See Appendix A Section 0). Next, the event log is reviewed to determine if the ticket is proactive and for comments added by the DSSG or the customer. For non-proactive tickets, the reader is referred to Section 2.5.2 for detail. If the TT is proactive, the trouble shooter will doubled check the circuit's status and further sub-categories the ticket (See Appendix A Section 1.0) as one of the following Problems Types:

1. Up, Cleared On Its Own - frame relay circuit is up between the WAN switch and the customer's router. Not seeing errors of any kind, however, the circuit did take a "hit" per the switch event log. The outage cleared on its own.
2. Down with Errors - frame relay circuit is down between the WAN switch and the customer's router. Seeing error frames and the circuit is not bouncing per the switch's event log.
3. Down Hard - frame relay circuit is down between the WAN switch and the customer's router and the switch's receive-data and error counters are not incrementing.
4. Bouncing - frame relay circuit between the WAN switch may be up or down. The switch's event log indicates that the circuit has toggled from being up to being down numerous times. This is referred to as a "Bouncing" circuit. Errors may or may not be seen.

0.1 TTRG's Proactive Group Initial Investigation Before Opening a Frame Relay TT

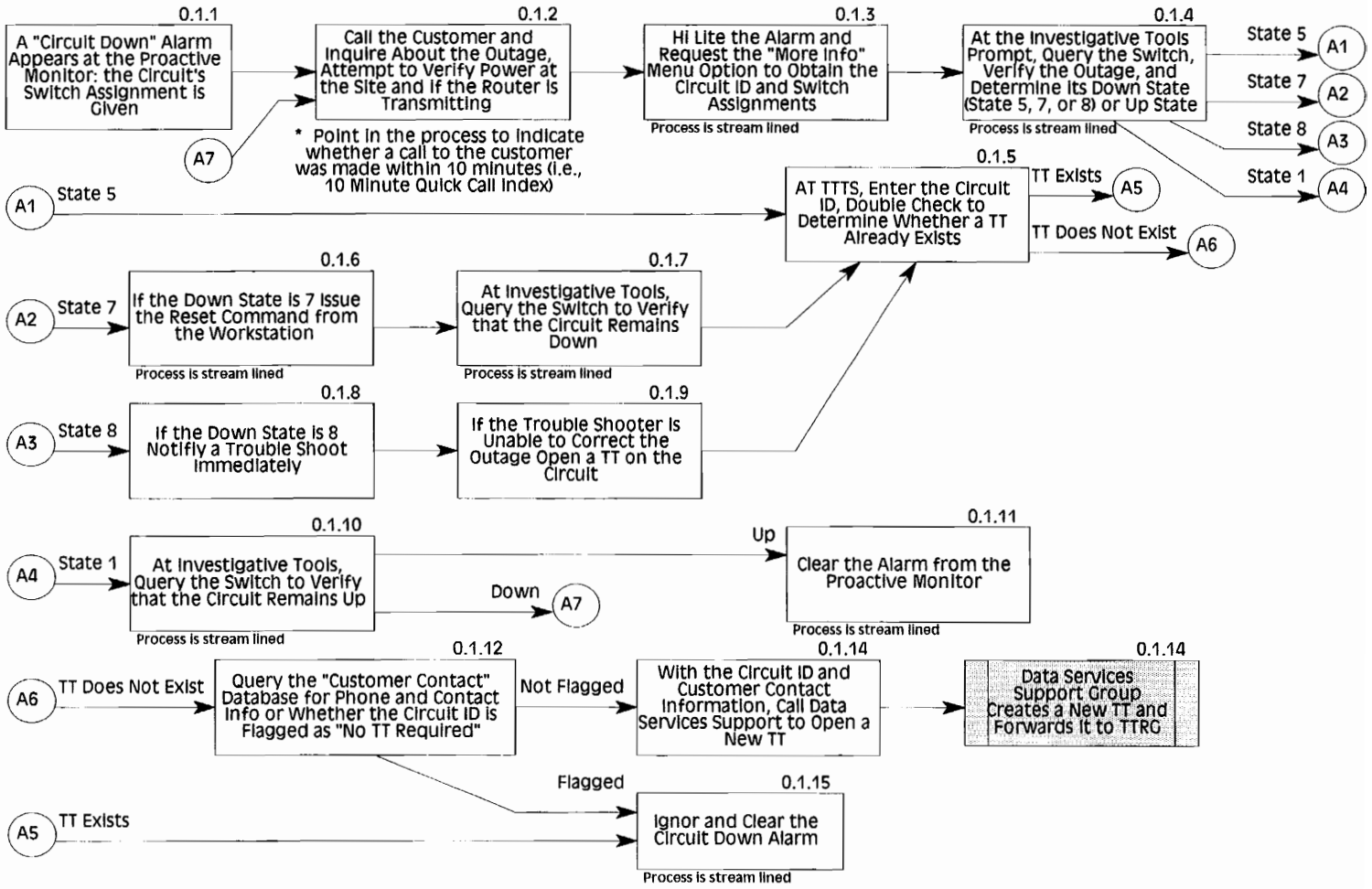

Figure 2.8 TTRG's Initial Investigation of a Posted Outage on the Proactive Monitoring Screen

0.2 Data Support Opening a TT to Investigate an Outage

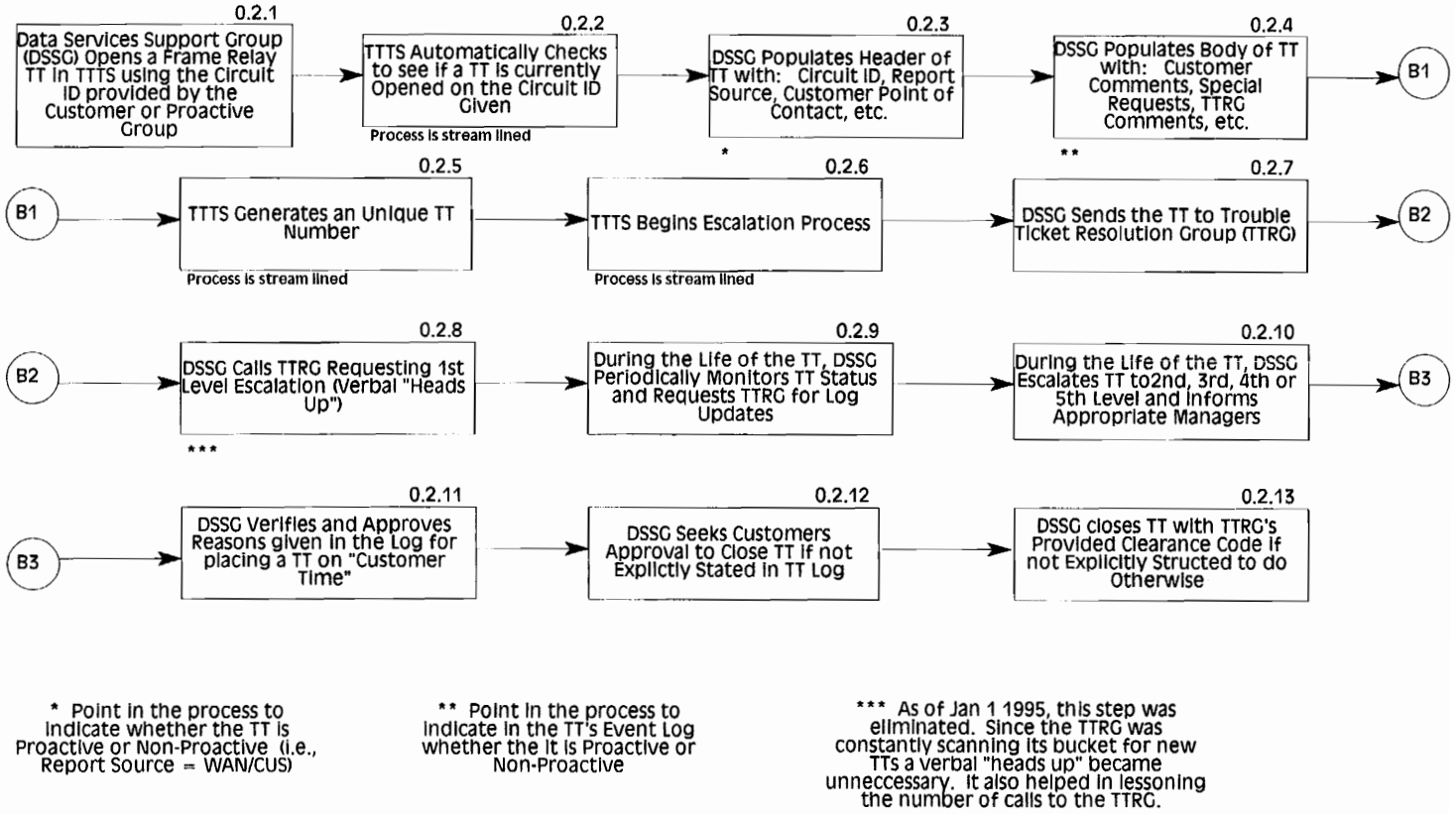

Figure 2.9 Opening of a Trouble Ticket by the Data Services Support Group

SECTION 0

0.3 Identifing the Trouble Ticket Type as It Arrives in the TTRG's Bucket

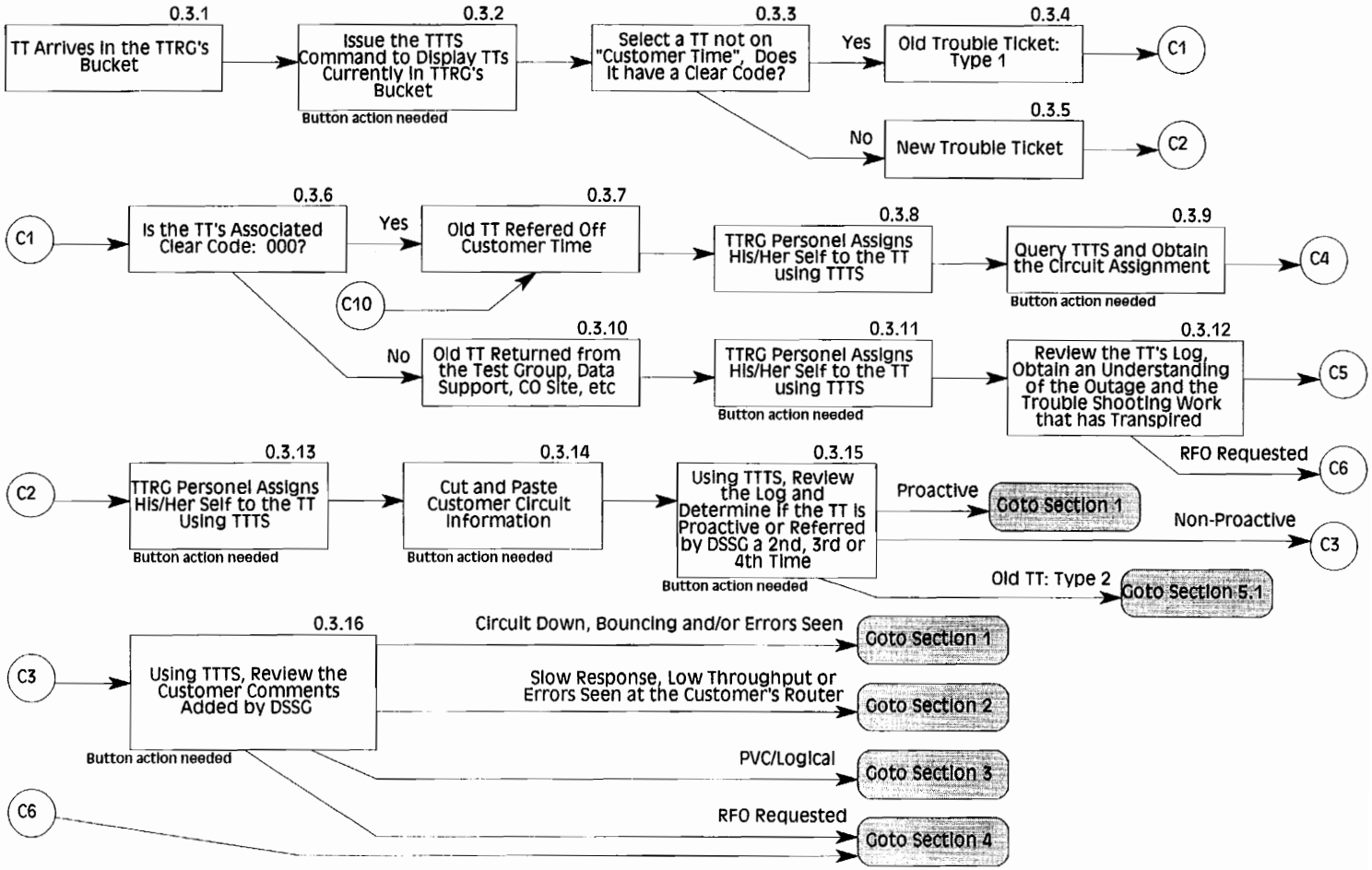

Figure 2.10a Indentifing the Trouble Ticket Type, Having Newly Arrived in TTRG's Bucket

0.3 Identifing the Trouble Ticket Type as it Arrives in the TTRG's Bucket Con't

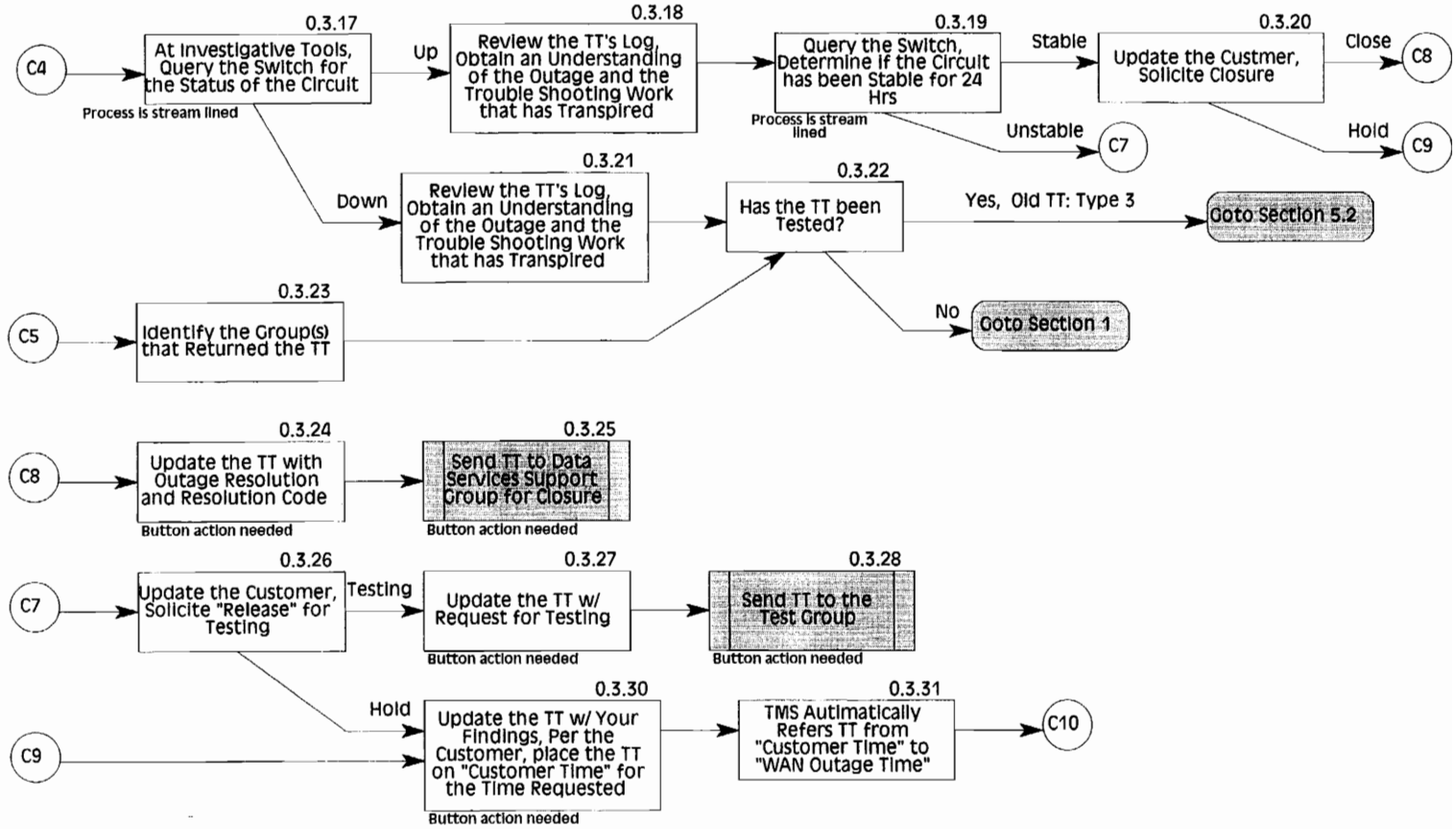

Figure 2.10b Indentifing the Trouble Ticket Type, Having Newly Arrived in TTRG's Bucket

0.3.14 Cut and Paste Customer Circuit Information

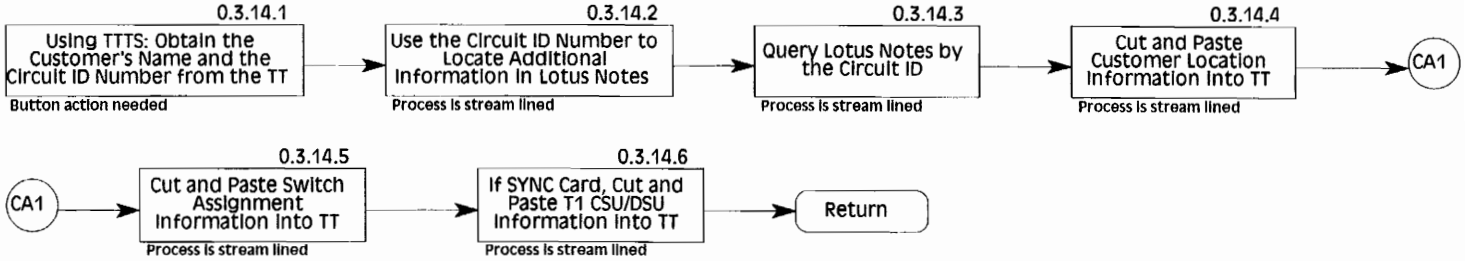

Figure 2.10c Indentifing the Trouble Ticket Type, Having Newly Arrived in TTRG's Bucket

Percent of Power Related Trouble Tickets Opened Proactively (Customer Prem and Local Teleco)								
Week		Week Of:	No TTs Proactive	No. TTs Power Related	% Proactive	Total TTs Closed	% TTs Power Related	
1		Aug 14 to Aug 20	11	12	91.67%	273	4.40%	
2		Aug 21 to Aug 27	8	12	66.67%	226	5.31%	
3		Aug 28 to Sept 3		Data was not available				
4		Sept 4 to Sept 10	3	6	50.00%	227	2.64%	
5		Sept 11 to Sept 17	12	14	85.71%	298	4.70%	
6		Sept 18 to Sept 24	7	10	70.00%	256	3.91%	
7		Sept 25 to Oct 1	14	18	77.78%	284	6.34%	
8		Oct 2 to Oct 8	12	25	48.00%	244	10.25%	
9		Oct 9 to Oct 15	11	16	68.75%	285	5.61%	
10		Oct 16 to Oct 22	16	21	76.19%	283	7.42%	
11		Oct 23 to Oct 29	18	22	81.82%	337	6.53%	
12		Oct 31 to Nov 5	22	24	91.67%	306	7.84%	
13		Nov 6 to Nov 12	13	18	72.22%	294	6.12%	
14		Nov 13 to Nov 19	19	22	86.36%	263	8.37%	
15		Nov 20 to Nov 26	16	19	84.21%	204	9.31%	
16		Nov 27 to Dec 2	32	40	80.00%	375	10.67%	
					75.40%	Percent of Power Related TTs Opened Proactively	6.63%	Percent of TTs Power Related

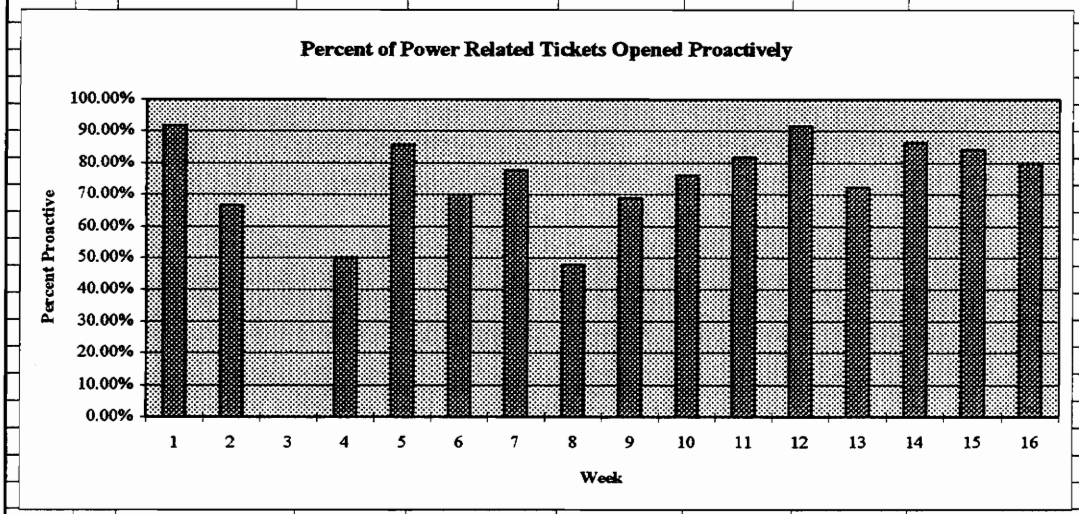

Figure 2.11 Percent of Power Related Tickets Opened Proactively

2.5.2.1 Up, Cleared on Its Own (See Appendix A Section 1.2)

For the situation where the outage cleared on its own, the trouble shooter will attempt to notify the customer and either place the TT in the Customer-Caused-Outage Time bucket for 24 hours for stability or refer the TT back (notifying the customer of doing so) to DSSG for closure. After the 24 hour time period has expired the trouble shooter will again check the circuit's status and switch statistics to judge the circuit performance during the stability period. The customer will be updated on the results of the 24 hour stability period. If the switch's statistics or event log do not indicate a problem, the TT will be recommended for closure. If the switch's statistics and event log indicate a problem the customer will be informed of the circuit's condition and solicited for testing.

2.5.2.2 Down Circuit with Errors (See Appendix A Section 1.6b)

If the status of the circuit is down, not bouncing and it's error counters are incrementing the trouble shooter will immediately solicit the TT for testing until the problem is found or for no more than one hour. The following three situations may occur as a result of the Test group's investigation. (1) If test results indicate that the circuit is "clean" and the errors continue, the customer will be updated and requested to double check the performance of their equipment. The TTRG will continue to interface with the customer and provide additional testing if requested or deemed necessary until the circuit is operational. The TT will be closed only when the customer is satisfied with the performance of the circuit. (2) If test results indicate that the circuit is "clean" and the error stopped incrementing, the TT will be recommended for a 24 hour holding period to ensure stability. After the holding period has expired the trouble shooter will check the circuit's status and review the statistics to judge it's performance. The customer will be updated on the results of the holding period. If the circuit's statistics do not indicate a problem, the TT will be recommended for closure. (3) If test results indicate that the errors are WAN/Local Teleco related, the TT will remain under the Test group's control until the problem is fixed and the errors stopped. To ensure that the errors have stopped and the circuit returns to service the Test center will contact the TTRG for verification. Once fixed, the customer will be updated on the results of investigation and the TT will be recommended for closure.

2.5.2.3 Down Circuit (See Appendix A Sections 1.6a, 1.7, 1.8, 1.12 and 1.13)

All physical problems will be further sub-categorized in the following manner:

1. Down Hard - State 5
2. Down Bad - State 7
3. Down Hard Not Present - State 8

The physical problem sub-categories dictate the type of investigation required of the 1st Level Group and testing required of the Test Group to properly trouble shoot the outage. For example, if a frame relay circuit is identified as Down Bad - State 7, the fix is usually a port reset at the switch or if the Down Bad - State 7 persists, the TT is sent to the Test group for stress testing for at least 30 minutes. In comparison, if a frame relay circuit is identified as Down Hard - State 5 the ticket is sent to the Test group for a simple five minute continuity test that should identify line disconnects and other rather obvious problems. The Down Hard Not Present - State 8 indicates that the T1 signaling between the switch and the adjacent DS0 Level Digital Cross-Connect has been lost. Verification of the T1 signaling loss can be performed by querying the switch for other frame relay circuits riding the same T1. If other circuits are found in the State 8 condition, than the loss of the T1 signaling has been verified. Next, the Central Office site where the switch is located is contacted and a technician requested to inspect the DS0 Level Digital Cross-Connect for malfunction. It is also possible that the State 8 problem may be caused by a bad Fract-T1 card in the switch. If the investigation by the switch terminal technician is inconclusive, the TT will be escalated to the TTRG's 2nd Level Engineer group for resolution. The TTRG will continue to hold the TT in their WAN-Caused-Outage bucket until the TTRG 2nd level engineering group resolves the Down Hard Not Present - State 8 problem and restores service.

2.5.2.4 Bouncing Circuit (see Appendix A Sections 1.3 - 1.5 and 1.9 - 1.11)

When the Frame Relay connection between the switch and the customer's router toggles from being "Up" (i.e., available and active) to "Down" (i.e., unavailable and inactive) repeatedly, the circuit is categorized as a "Bouncer". By logging in the switch and reviewing its event log the trouble shooter is able to categorize a bouncing circuit as either:

1. Constant Bouncing or,

2. Intermittent Bouncing

The trouble shooter continues their trouble shooting process by following the flow diagrams outlined in Appendix A Section 1.3-1.5 and 1.9-1.11. Referring to the flow charts, the outage is further sub-categorized in the following manor:

Constant bouncing plus:

a. Transmit and receiving, numerous CRC, short frame and/or sequencing errors
b. Transmit and receiving, no CRC or short frame errors

Intermittently bouncing plus:

a. Transmit and receiving, numerous CRC, short frame and/or sequencing errors
b. Transmit and receiving, no CRC or short frame errors

For TTs defined as bouncing-intermittently, a call to the customer is in order to eliminate causes related to power or customer maintenance. Of the errors seen, if a large majority are CRC errors then the cause is likely a noisy line and extended testing is required to pin point the source. If a large majority are short frame errors, experience tells us that the cause is likely a bad Teleco repeater, channel-bank card, or digital modem, or the digital cross-connects are configured incorrectly. It is also possible that other equipment, besides that mentioned, along the circuit's patch may be the cause. In either situation, extensive test is required to root out the cause. If the circuit is bouncing and no errors (CRC, short or sequence) are seen, the cause of the bouncing may be the customer's router/sync port, a bad digital modem causing "clear to send" transitions or a bad local loop. Next, the trouble shooter updates the TT with their findings. Before forwarding the TT to the Test group, a call to the customer is needed to solicit the release of the circuit for testing and to determine if their router's error (CRC, bad frame) counters are incrementing. If the router's error counters are incrementing, the cause of the bouncing is likely a bad line toward the customer. If not, the customer's router or digital modem may be the culprit. If the customer approves testing, the TT is forwarded to the Test group with a request to stress test per the customer's start and duration times. If testing has not been granted, the trouble shooter either solicits the TT for closure or holds it in Customer-Caused-Outage Time for 24 hours or for the duration requested by the customer. After the holding period has expired, the trouble shooter checks the circuit's status and switch statistics to judge the it's performance. The customer is updated on the results of the holding period. If the switch statistics do not indicate a problem, the TT is recommended for closure.

2.5.3 New TT - Non-Proactive (see Appendix A Sections 1.3-1.5 and 1.9-1.11)

Trouble tickets opened by the customer are considered to be Non-Proactive. The trouble shooter begins their investigation by reading the ticket's opening remarks entered by DSSG for the customer. These remarks usually hold a subtle clue that can assist in solving the outage faster. There are five categories that a TT opened by the customer falls under:

1. Circuit is down
2. Circuit is bouncing
3. Errors seen at the customer's router statistics
4. Experiencing slow response and/or low throughput, and
5. PVCs are missing or not functioning incorrectly

For all non-proactive TTs, an initial investigation is conducted in an attempt to verify or dispute the customer's claim.

The customer may open a low priority TT to determine the cause of a short outage (to short to warrant a proactive TT). Tickets such as these are grouped under the Request For Outage ("RFO") category. By definition, RFO tickets are low priority TTs and are worked only when all higher priority TTs (reported outages) have been addressed.

2.5.3.1 Down Circuit (see Appendix A Sections 1)

The customer's perception of an outage can be very different from that of the WAN trouble shooter. On occasions, a non-proactive TT reported as DOWN may in fact be technically UP. The trouble shooter is referred to Appendix A Section 1 for guidance. After an initial inspection of the circuit, the problem may be logical in nature at either the frame relay switch, customer's router, LAN server or workstation.

Having conducted an initial review and determined that the circuit is physically up, no errors are seen, and it has not nor is it currently bouncing (per the switch event log), the trouble shooter begins a more detailed inspection (see Appendix A Sections 2) to determine if the outage is a logical problem at the frame relay switch. If the logical investigation is inconclusive, a call to the customer is fitting to get a better understanding of the customer's perception of the outage. If after discussing the issue with the customer

the problem can not be pin pointed to their equipment, solicit the TT for 2nd Level help, closure, or a 24 hour monitoring period. If during the discussion with the customer, he or she indicates that one or more PVCs are functioning incorrectly or that the throughput is poor, the trouble shooter will begin investigating the outage as a WAN PVC (see Appendix A Sections 3) or low throughput problem (see Sections 2.5.3.4 and 2.5.3.5). If all indications point to the customer's router configuration, application, or 3rd level routing protocol problem, the trouble shooter will continue to assist, where ever possible, in identifying the problem. A 2nd level engineer will be solicited for additional assistance if the 1st level trouble shooter deems it necessary or the customer's makes a formal request.

Having verified that the circuit is physically down, the trouble shooter begins further categorizing the outage in the same manor as if it where a new proactive ticket (see Section 2.5.2) with one exception, a Far End Circuit problem. In the case of a Far End Circuit problem, the trouble shooter follows the processes shown in Appendix A Section 1.2.26. For Far End Circuit problems, the trouble shooter informs the customer that the problem is not with the circuit ID that the current TT was opened under but with the circuit ID at the far end. Next, the TT is referred back for closure and a new TT is opened on the far end circuit ID. When the new TT arrives the issue is worked as a new proactive ticket.

2.5.3.2 Bouncing Circuit (see Appendix A Sections 1.9 - 1.11)

Having verified that the circuit is bouncing, the trouble shooter follows the flow processes illustrated in Appendix A Section 1.9 - 1.11. Bouncing circuits can be a whole host of problems ranging from faulty/temperamental equipment to bad cabling at either the service provider's or the customer's location. If the bouncing is intermittent it is best to have the circuit stress tested for a substantial amount of time (depending on the bouncing interval) to ensure that the problem occurs during the testing. If the bouncing is fairly constant, at most, two hours of stress testing is needed to determine the cause.

2.5.3.3 Errors Seen at the Customer's Router Statistics

A trouble ticket open by the customer indicating that receive errors are seen at their router's statistic counters is worked as a standard proactive TT if found down or bouncing (see Section 2.5.2). If the circuit is found up (see Appendix A Section 2.3), an "OK" from the customer along with a test release time and duration is needed before the TT can be sent to the Test group for stress testing. Findings by the trouble shooter along with the customer's claim of clocking errors are to be added to the TT's event log before being sent to the Test group.

2.5.3.4 Slow Performance/Low Throughput Problem (see Appendix A Section 2)

The trouble shooter begins their investigation by following the flow processes spelled out in Appendix A Section 2. The trouble shooter further sub-categorizes the outage as either:

1. Errored and/or bouncing circuit (see Appendix A Section 1)
2. Malfunctioning, missing or misconfigured PVC (see Appendix A Section 3)
3. Packet loss or packet dropped problem (see Appendix A Section 2.1)
4. Switch routing problem (see Appendix A Section 2.2)
5. Switch Rx and Tx buffer problem (see Appendix A Section 2.2)

For errored/bouncing circuit problems, the TT is passed to the Test group for analyses. For switch routing and lost packet problems, the trouble shooter follows the steps outlined in Appendix A Sections 2 before passing the TT to the 2nd level TTRG. The 1st level trouble shooter will continue to work closely with the 2nd level engineer assigned to the TT until the problem has been resolved. For PVC problems, the 1st level trouble shooter will attempt to correct the problem by rebuilding the faulty PVC (See Appendix A Section 3). If proven unsuccessful, the TT is passed to the 2nd level TTRG. Having investigated all avenues in an attempt to isolate the outage as a logical WAN problem and found nothing, the trouble shooter contacts the customer and begins investigating the outage as a customer related problem. If needed or requested by the customer, the TT may be passed to the 2nd level TTRG for further assistance.

2.5.3.5 PVC Problem (see Appendix A Section 3)

The initial investigation follows the flow processes spelled out in Appendix A Section 3. If the circuit is found down the TT is worked per Appendix A Section 1. Having ensured that the circuit is not physically down, bouncing or clocking errors the trouble shooter can begin investigating the TT as a PVC functioning problem (See Appendix A Section 3). The trouble shooter further sub-categorizes the outage as one of the following:

1. Missing PVC
2. Misconfigured PVC
3. Malfunctioning PVC.

If the problem is with no more than 2 PVCs then the 1st level TTRG will attempt to correct the problem. If the problem is with three or more PVCs it usually indicates a more serious problem and the TT is passed to the 2nd level TTRG.

2.5.4 Old Trouble Ticket

An old TT is a ticket that has been referred back to the TTRG's WAN-Caused-Outage bucket from it's own Customer-Caused-Outage bucket, the Test group, or the DSSG's. An old TT should not to be confused with a new TT, the later being a TT that has been referred to TTRG for the first time by the DSSG starting the trouble shooting process. A easy way to spot an old TT is to view the TTTS Action Log and see if it has a clear code assigned to it. A ticket can not be referred back to the group from hence it came without a clear code. This also applies to when a TT is referred off Customer-Caused-Outage Time automatically by the TTTS. Trouble shooting an old TT depends heavily on what has and has not taken place, thus all old TTs should be reviewed very carefully.

Observations during the time of this report revealed that many of the TTs being referred back from the DSSG (after having been tested earlier) have not gotten the customer involved in the trouble shooting process. Getting the customers involved early is paramount to solving the problem quicker.

2.5.4.1 Type 1 - Returned Off Customer-Caused-Outage Time (see Appendix A Section 0)

When the Customer-Caused-Outage timer expires the TTTS will automatically refer the TT out of the Customer-Caused-Outage bucket and into the WAN-Caused-Outage bucket. When this occurs the TTTS uses the clear code of 000. A trouble shooter can quickly identify a Type 1 TT by viewing the TTTS Action Log and noting those tickets having a clear code of 000.

After identifying the ticket as an Old Type 1 TT, the 1st Level TTRG trouble shooter will review the TT's log to familiarize them selves with what has and has not been done to resolve the outage. The TT should be clearly documented as to why it was initially placed in Customer-Caused-Outage bucket. It may be for monitoring purposes and if so, "cut and paste" the necessary information in the TT and place it back in the Customer-Caused-Outage bucket until the next monitoring point.

If the TT is not for monitoring, the status of the circuit needs to be determined. If the circuit is physically up, not bouncing and it's error statistics are not incrementing a call to the customer is in order to determine if the circuit is functioning to their stratification and if the TT can be closed. Work with the customer to determine if the problem is a logical issue with the frame relay switch, WAN backbone, the customer's router or their application software (see Appendix A Section 2 and 3 for more detail). If the circuit is physically down, up and clocking errors, or bouncing, the investigator will determine if the circuit has been tested by the Test group? If tested, the TT will be re-categorized as an Old Type 3 ticket and investigated as outline in Section 2.5.4.3. Review the TT further to determine if the customer is actively involved (i.e., double checking their equipment and power to the site for the source of the outage). Contact the customer to determine if the outage is deliberate (i.e., customer performing testing and/or maintenance) and if not, have the customer inspect their router and its frame relay port. Ensure that the customer's router is transmitting. A down circuit, referred off the Customer-Caused-Outage bucket and having not been tested, should be investigated as a normal outage if not instructed otherwise by the customer.

2.5.4.2 Old Type 2 - Referred by the Data Services Support Group
(see Appendix A Section 5.1)

Trouble Tickets having been referred out to the TTRG a second, third or more times needs to be reviewed very carefully. The purpose of the TT may have changed from solving an earlier outage to solving a new outage or to perform monitoring. After identifying the ticket as an Old Type 2 TT, the 1st Level investigator will review the TT's log to familiarize them selves with what has and has not been done to resolve the outage. The TT should be clearly documented as to why it was sent to the DSSG for closure and subsequently referred back to the TTRG. It may be Up and back for monitoring purposes. If so, "cut and paste" the necessary information and place the TT in the Customer-Caused-Outage bucket until the next monitoring point.

If the TT is not for monitoring and the circuit is up, it's error statistics are not incrementing, and not bouncing, work with the customer to determine if the problem is a logical issue in the WAN or with the customer's router or application software(see Appendix A Section 2 and 3 for more detail). If the circuit is physically down, up plus clocking errors, or bouncing, the investigator will determine if the circuit has been tested by the Test group. If tested before, the TT will be re-categorized as an Old Type 3 ticket and investigated as outline in Section 2.5.4.3. If possible, ensure that the customer is actively involved (i.e., double checking their equipment and power at the site for the source of the outage) before sending the TT to the Test group. Most of all, ensure that the customer's router is transmitting. As defined by the frame relay protocol, a circuit will not become active unless the customer's router initiates and retains the "keep alive" conversation with the WAN switch.

2.5.4.3 Old Type 3 - Returned from the Test Group Or Switch Terminal Group
(see Appendix A Section 5.2)

When trouble shooting an old TT returned from either the Test group or Switch Terminal, it is important to identify what transpired during the tickets stay at these groups. Was the testing successful? Was the circuit tested to the digital modem at the customer's site, to a point at the Local Teleco site or to a point at the Wan provider's site? Where alarms found on the WAN provider's transmission equipment? Were errors seen while testing to

the customer's digital modem. These and a host of other questions, some in certain combinations that compliment the other, need answering before the trouble shooter can confidently say that the cause of the problem is not with the frame relay WAN. It is equally important to determine how many times the TT has been tested. For those TTs that have been tested more than twice, a 2nd level engineer may be requested for assistance. For those TT that have been tested once, the TT should be read very carefully to determine whether the testing was successful and to the furthest point possible. The customer's involvement is critical before and especially after the circuit is tested for the first time. Identifying what the customer's router is doing, seeing and receiving will assist in solving the other end of this two end problem.

2.5.5 Test Results

Transmission equipment verification to the customer's digital modem is accomplished by running standardized tests and observing the results. If the test results indicate a problem with the service provider's equipment, the equipment will be re-configured, reset or replaced. If the test results do not indicated a problem with the service provider's equipment, than it is assumed that the customer's equipment is at fault. The Test group always provides a summary of their investigation and testing performed. This includes the findings and/or fixes at both the Switch Terminal and Local Teleco group.

After the TT has been tested, the Test group (with the help of the WAN provider's Switch Terminal group and the Local Teleco when needed) will be able to categorize their results in the following manor:

1. Problem Identified
   - Implement a fix and solved the problem
   - Source of the problem associated to customer's equipment
   - Circuit Tested Clean and the Circuit Immediately Recovers
2. Unable to Identify a Problem, the Circuit Tested Clean and Remains Down

Upon conclusion of the transmission equipment tests, the customer is updated by the TTRG of the test results and requested to verify the circuit's performance if the circuit is up or check the operation of their equipment if the circuit remains down.

2.5.5.1 Problem Found, Fix Provided

For the situation where the problem was found through testing perform by the Test group, they will ensure that a fix is implemented promptly, and verified through additional testing. Before the TT is returned to the TTRG, the TTRG, working with the Test group, ensures data continuity from the frame relay switch to the digital modem at the customer's location. If the circuit recovers, the TT is updated and sent back to the TTRG. The TTRG will notify the customer of the circuit's up status and asked the customer to verified the operation of the circuit. If approved by the customer, the TT is returned to the DSSG for closure.

If the circuit does not recover, the problem is assumed to be with the customer's equipment. With the TT back in TTRG's domain, the customer is updated on the test results, the fix and the current down status of the circuit. Next, the TTRG requests the customer to check their equipment to ensure that it is functioning properly. To verify whether the customer's router and digital modem are transmitting, the trouble shooter, from the Investigative Tools prompt, can issue a command to view the transmit, receive and error counters at the customer's access port on the switch. If the access port's receive data and error counters are not incrementing the problem is with the customer's router not sending data. If the error counters are incrementing and the customer insists that their equipment is running properly, the TT should be re-tested to double check the Test groups earlier findings and fixes. If the receive counter is incrementing and the error and transmit counters are not, the switch access port may be "asleep". A reset is needed to reinitialize the port.

2.5.5.2 Outage Associated with the Customer's Equipment

The Test group's results indicate that errors are seen while testing to the customer digital modem. A common fix that works some of the time is to power cycle the digital modem. If power cycling the digital modem does not stop the errors then instruct the customer to replace the existing digital modem with a new one. If errors are still seen with the new digital modem, the problem may be a bad cable between the customer's router and digital modem, a bad cable from the digital modem to the Local Teleco wall jack, or the transmission line from the customer's site to the Local Teleco site is bad. To disprove the

transmission line requires dispatching a WAN technician to the customer site for testing. Test results of the dispatch will indicate whether the transmission line, customer digital modem or connecting cables are faulty.

2.5.5.3 Tested Good, Circuit Immediately Recovers

It is not uncommon to see a circuit recover immediately after the Test group removes their test loop at the digital modem. Symptoms before testing indicate that the circuit is down and no receive(errored or nor errored) is seen from the customer's router. Why the router or digital modem initially stopped transmitting and begin retransmitting after a test loop is removed is unknown. Upon receiving such a TT, the trouble shooter verifies the circuit's up status, adds their findings and attempts to notify the customer before returning the TT to the DSSG for closure.

2.5.5.4 Cause of the Outage is Unknown, Tested Good

For test results indicating that the "circuit tested good and the cause of the outage is unknown" and the circuit remains down, the TT is re-categorized as a Customer Related Problem and placed in the Customer-Caused-Outage bucket. The TTRG will request the customer to check their equipment to ensure that it is functioning properly. To verify whether the customer's router and digital modem are transmitting, the trouble shooter, from the investigative tools prompt, can issue a command to view the transmit, receive and error counters at the customer's access port on the switch. If the access port's receive and error counters are not incrementing, the problem is with the customer's router not sending data. If the error counters are incrementing and the customer insists that their equipment is running properly, the TT should be re-tested to double check the Test group's earlier efforts. If the receive counter is incrementing and the error and transmit counters are not, the switch access port may be "asleep" or the management interface (AnnexeD/LMI) set incorrectly. Issue the reset command to reinitialize the port and verify the management interface setting at the switch and with the customer.

2.6 Closing Remarks

Chapter 2 described the structure of a Frame Relay TT, it's attributes, and it's importance in keeping a chronological log of the actions taken to resolve the outage. Next, important factors of the Trouble Ticket Tracking System were explained. Factors such as the TTS's ability to "pull " statistical data, manage the movement of TTs among the different groups, and manage timers to track outage times. Lastly, the TTR was covered from the opening of a TT to the investigation, test, stability monitoring and resolution. Trouble shooting both physical and logical type outages were also explained.

3 QUALITY MANAGEMENT AND PERFORMANCE INDICES

This chapter outlines the Process Control and Improvement program used in this report. Discussed, is the manor in which the performance indices are defined and utilized to calculate an "overall" performance indicator [FLOW88]. Briefly mentioned is the influence of cost on selecting indices, gathering the data, and managing the system.

3.1 Quality Management Program

Quality management, as initially conceived in the early 1940s, relied on well defined concepts such as zero defects, inter-group coordination, statistical quality control, and cost of quality. Although the primary teachers of Quality Management were American, the general acceptance and use of their ideas in the US was limited to only the most creative and innovative companies like IBM, Hewlett Packard, Xerox, and AT&T. In Japan, the situation was just the opposite, the use of Quality Management programs was wide spread. The situation in the US changed with the increase in foreign competition and their high quality products in the early 1980s. Interest among top US executives in quality management rose, and in particularly, a new approach that expressed quality as a powerful competitive weapon. For the first time top US managers began linking quality with profitability, defined it from the customer's point of view, insisted on constant control and improvement programs, and required its inclusion in the strategic planning process [GARV88]. These ideas prove invaluable to those companies that were able to successfully implement them.

However, studies have revealed that, for too many companies, the push for quality can be as badly misguided as it is well-intended. Quality can be popular with managers and their consultants, but as at many companies, it can devolve into a exercise that proves meaningless to the customer. And quality that means little to the customers does not produce payoffs in improved sales, profits, or market share. In the end it is wasted effort and expense [GREI94]. This is why in defining a Quality Management program the utmost care and diligence is needed.

3.1.1 Process Control and Improvement Program

For the purpose of this report one element of the Quality Management program will be addressed, namely, the Process Control and Improvement Program. The Process Control and Improvement program holds the responsibility of defining performance indices, setting short and long term performance goals, defining and implementing control and improvement programs to meet performance goals, and implementing a system to analyze and present the data in a clear and concise manner. In short, the Process Control and Improvement program is a positive feedback loop with the intent to improve performance. It involves addressing the following sequence of steps [JURA80]:

1. Defining the system processes and the flow of information
2. Choosing entities to measure and control
3. Defining a performance index and unit of measure of the entities chosen
4. Defining short, medium and long term performance goals
5. Measuring performance and defining a base level of performance (benchmarking)
6. Comparing and analyzing the difference between actual performance and the goals
7. Taking actions to improve performance

The above seven steps are universal in that they can be applied to any control program with the intent to track and improve performance and productivity

Performance Index Management System

An integral part of the Process Control and Improvement Program is the system responsible for defining, collecting, analyzing and presenting the data. Such a system needs to be well defined. It should allow data to be collected in the least costly manner while ensuring a respectable degree of accuracy. It should spells out an useful guide line for defining indices and present the data in such a manner that those involved understand and agree with the intent of it's results. The methodology described in "Managing with Productivity Indexing" [FLOW88] is such a system in part. It represents the index definition, scoring, presentation and tracking portion of the Performance Index Management System. To satisfy the data collection and analysis part of the Performance Index Management System, existing data collection methods were utilized. These methods (excluding the manual method used to collect data for the 25 Minute Proactive index) were retained because management considered them the least costly. A more

detailed discussion of the data collection and analysis portion of the Performance Index Management System can be found in Section 4.

Process Control and Improvement System

Five improvement programs were implemented. Collectively, they worked on bettering the readability of the TT, standardizing the use of the clear codes, and increasing the accuracy of the data set. The affect of the improvement programs on the TTRG was a steady improvement of the Clear Code and the TTRG Proactiveness index scores (see Section 4.0) and in improving the accuracy of their respective data set. With respect to the Collective MTTR index, the improvement programs had no noticeable positive affect. For the 25 Minute Proactiveness index, the second improvement program appears to have had a positive affect in bettering its score, however, because of the small size of the data set one can only speculate.

A description of the improvement programs implemented are as follows:

Trouble Ticket Ownership and Clear Concise Comments

This program stressed the importance of following-up on a worked TT to ensure that it receives the proper attention and expertise and not simply forgotten. Because the TTRG is a 7 by 24 hours by 365 days a year operation, it is very common that a TT may be left for the next shift and/or worked by more than one trouble shooter. Thus, it becomes very important that the initial trouble shooter check-up on its status. To assist the trouble shooter in accomplishing this, booklets were created whereby critical information about the trouble ticket can be jotted down. The trouble shooter only needs to review his/hers notes to refresh their memory. The importance of inputting clear, short and concise comments in the ticket was also stressed. Comments entered in this manor helps the next trouble shooter to quickly discern what has happened and what may be need to solve the problem. Concise comments are also import to verify the fix code or if management needs to review the ticket to determine what did or did not happened or what was or was not entered into the ticket.

Marking a Trouble Ticket - Proactively Opened vs. Customer Opened

This program stressed the importance of ensuring that TTs called in by the Proactive Monitoring group are opened under the "proactive" category (e.g., WAN) verses the "customer" category (e.g., CUS). This requires the proactive personnel to; (1) inform the Data Support Services personnel that the TT is proactive , (2) request a clear easy to read one line remark in the TT's log indicating so , and (3) ensure that the proactive attribute of the TT is set to "WAN". This will help future readers to quickly determine who opened the TT.

Resolution Line and Fix Code

This program stressed the importance of ensuring that the resolution of the outage is documented in the TT. Before closing a TT, the trouble shooter is responsible for reviewing the TT, discerning the cause and fix of the outage, and documenting his/hers findings clearly. To assist the trouble shooter in performing this task correctly, standardized resolution/fix codes were organized into a chart and placed at each workstation.

Standardized Clear Codes and Clear Code Chart

This program stressed the importance of ensuring that the clear codes used by the TTRG to describe a fix to an outage were well defined and standardized. Codes were developed from a "guide line" list of codes provided by the service provider's Data Services Branch. The new codes incorporate a fourth character (i.e., alpha) which allows greater granularity in describing the fix. A Clear Code chart was developed to organize the new clear codes into a easy to read reference chart. The chart was placed at each work station to promote its use.

Data Accuracy Improvements

This program stressed the importance of ensuring that the error rate of the data used in this report was kept low. This was accomplished by reviewing every TT and correcting any inconsistencies. High error rates were more of a concern for the Clear Code, TTRG Proactiveness, and the 25 Minute Proactiveness indices. It is recommended that until the indices' long term goals are meet and sustained for a minimum of 6 months, the TT reviewing process (i.e., for identifying errors and correcting the data set) should not be halted.

3.1.2 Price of Performance Improvement

Although the cost in gathering the data and generating the performance matrix was not addressed, it is important to mention its importance in the quality management process.

Quality (or Performance) improvement programs based solely on defect reduction, quicker cycle times, and continual improvement are short sited in that they do not address the customer's primary concerns nor the views held by a growing number of "neo" quality enthuses: that quality programs should be evaluated against their subsequent financial impact. That is why a growing number of companies and quality managers are starting to rethink the quality notion. Today's rallying cry is "Return On Quality" or ROQ [GREI94]. This new paradigm abandons the narrow statistical bench-marks cherished by some TQM advocates. Instead, ROQ managers are ensuring that the quality they are offering yield sensible payoffs and is the quality their customers want. The school of thought behind the ROQ notion can be summaries as the following: "If we're not going to make money off of it and/or the customer does not consider it a necessary concern of theirs, we're not going to do it". Everything from the installation of new technology to process improvement programs are now held up against an array of financial yardsticks, such as potential sales gains, market share gains, and return on capital. For example, to win approval from AT&T's top management, proponents of any new quality initiative must first demonstrate that the effort will yield at least a 30% drop in defects and a 10% return on investment. Based on these standards and past experience, AT&T has found that when customer perceive improved quality, it shows up in better financial results three months later [GREI94]. ROQ envisionaries stress developing quality programs that add value to aspects of a service most admired by the customer. For example, in Federal Express' sorting operation, speed over accuracy was stressed. Workers met schedules, but the number of misdirected packages soured as they scrambled to meet dead lines. The problem was that FedEx was not asking it's customers the right questions. By asking broader questions about how it can improve service, it discovered that clients were less concern with "on time delivery" (delivering on the promised time of the promised day) as with "same day delivery" (delivering on the day promised but not the time promised). FedEx calculated that redirecting each package cost it approximately $50 plus the unknown cost of irritated customer and lost future business. Now, FedEx has lessened the sorting problem by investing $100 million in new routing equipment [GREI94].

3.2 Multifactor Performance Tracking System

Four performance indices were identified. The indices chosen were defined without the customer's participation (e.g., inputs from a survey or questionnaire), rather, they were defined around criteria thought to be important to both the customer and the Frame Relay group.

When creating a performance index the design team or individual should adhered to the following four rules: (1) the index should be well defined, (2) simple to calculate, (3) simple to understand by the people who use them and (4) valued by the work force, management and the customer. One of the goals in defining an index is to influence behavior of the work force in a positive direction. The simpler the index the better the work force will understand it's purpose and meaning. If the indices are difficult to understand, it is likely that they will not effect the decisions and actions of the work force in a positive way. For each group, their performance indices should be limited to no fewer than three and no greater than seven that they believe captures the essence of their mission and the customer's most pressing concerns [CREW88]. A multifactor view of the TTRG's performance is employed to better define it's "true" performance. The use of a single performance index limits management's view to one specific factor. By utilizing several single-factor measures, managers can employ a broader scorecard to answer the question, "How are we doing overall?" verses "How are we doing per factor A?".

3.2.1 Multifactor Performance Matrix

Within Northern Telecom, some divisions include their managers and workers in the design process of the performance tracking system from the beginning to the end. This better educates the users and establishes their stake in seeing the process succeed. A brief description of how the multifactor performance matrix is constructed, follows. It closely tracks the steps outlined Figure 3.1. For a more detailed description of how the multifactor performance measuring matrix works, the reader is referred to Managing with Productivity Indexing [FLOW88].

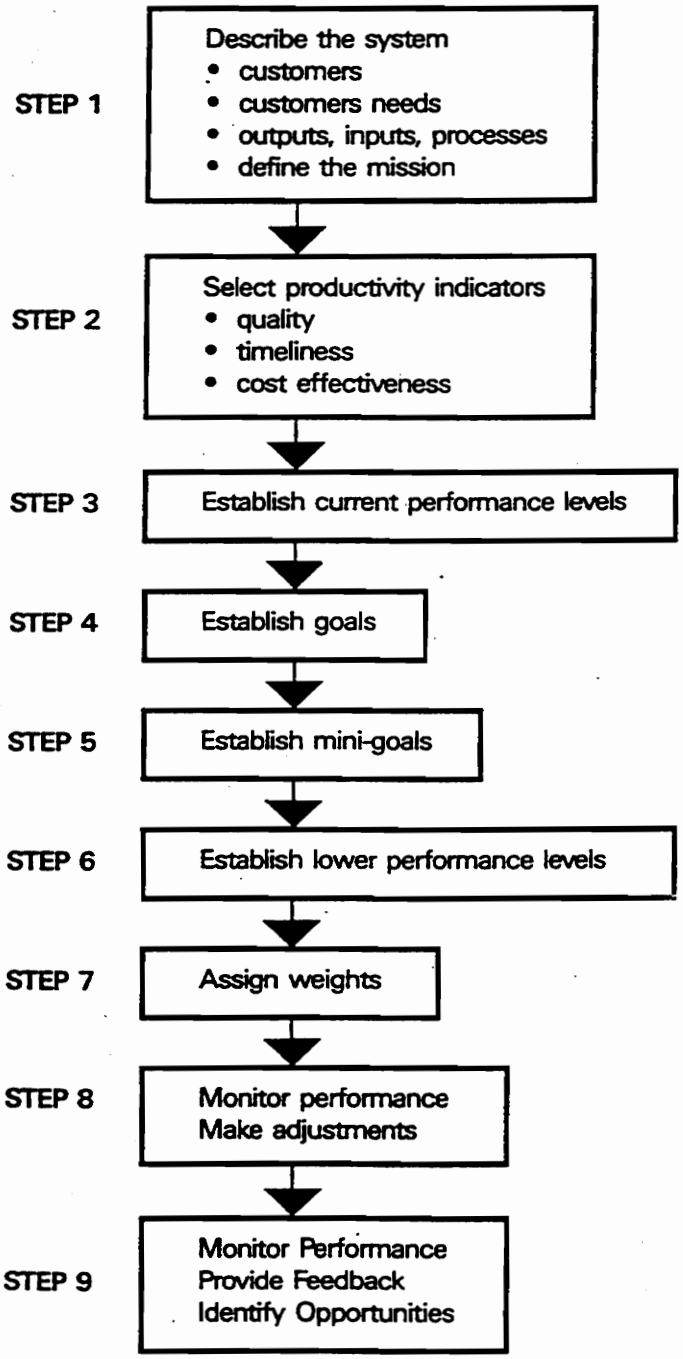

Figure 3.1 Performance/Productivity Indexing Check List

Having identified the indices a department/group plans to measure, the design team determines their current level of performance for each index. This usually requires three months worth of data. If the data is not available, an estimate of the group's current performance level will suffice until such time that three months worth of data has been collected. Next, the team creates short and long term performance goals for each index. The goals should be obtainable in a set time frame, usually one to two years. This time frame is also the term for the completed matrix. The performance improvement goals will help to keep all involved focused and motivated. Current performance levels are entered in the matrix at the level corresponding to the score of 3. Long term goals are entered in the matrix at the level corresponding to the score of 10. Short term goals are represented by levels 4 through 9 and characterize progress toward the final goal. Scores of 0, 1 and 2 allows the chart to account for periods of poor performance. Finally, the design team assigns percent weights to the indices to reflect their relative importance, with their sum adding to 100%. By combining each index's score a single multifactor performance score is produced. The resulting score measures progress over time towards agreed on goals in a way that everyone can understand. Monitor performance for up to three months and make any necessary changes to the weighting scheme, long term goals, current performance levels or the number of indices (i.e., adding new and deleting unimportant ones). After all adjustments have been made, the make-up of the matrix must not change. This ensures that comparisons between future recordings are meaningful. Upon the conclusion of each monitoring period the data is tallied and the results plotted. Although this approach is not analytically perfect and the weighting scheme is subjective, it is simple, understandable, and likely the least disruptive to conduct.

When embarking on a performance tracking system cost is an area that many companies fail to appreciate. The general rule of thumb to follow is: higher accuracy undoubtedly incurs a higher cost. Recent research has shown that increased accuracy is not worth the additional cost. Care must be taken and the pros and cons weighed before attempting to improve the accuracy of an index's data [CREW88].

When planning to track performance indices, it is import to distinguish between indices defined for the "customer" and those defined internally for a department or group. The former are paramount to the customer and describe the WAN Provider's accomplishments in meeting the customer's concerns on service and product quality. The later are more

import to the service provider or its internal group(s) and are used to track their performance. Although indices defined for internal use may lend assistance to improving customer service and product quality, their primary intention is to satisfy the immediate needs of upper management. For example, tracking the Clear Code index provides a means to generate "cause of outage" statistics - a requirement stipulated by management to trend outages and network performance.

3.2.2 Benchmarks

One of the goals of this report is to establish benchmarks for the four TTRG indices being investigated. The benchmark values listed below are based on a average score calculated for the four month period beginning August 1994 and ending December 1994. Management and the TTRG now have a measuring stick with which to compare future performance levels to.

Table 3.1 Four Month Benchmark Value

Index	4 Month Average Value
Collective MTTR	2:19 hrs
Clear Code	20.6%
TTRG Proactiveness	52.3%
25 Minute Proactiveness	32.5%[3]

[3]This benchmark is based on six weeks of data and not the recommended three to four months worth.

3.3 Performance Index Definition and Meaning

After a closer study of the Trouble Shooting Flow process the following eleven indices were identified (See Figure 3.2). Of the eleven indices, eight indices apply directly to the TTRG. Their position in the outage resolution process is critical in defining useful indices valued by the TTRG and management. Since the customer is the real benefactor, improvements in one, some, or all of the performance indices translates directly into added value to the WAN service, market share retention, and possible market share gains. Of the eleven indices only four were tracked for this report. They are as follows:

1. Clear Code Index
2. Collective MTTR Index
3. TTRG Proactiveness Index
4. 25 Minute Proactive Index

3.3.1 Proactive Indices

The WAN provider studied for this report markets it's Frame Relay service with the guaranteed that if an outage occurs a TT will be opened and a phone call made within 25 minutes. Although, not all customers demand proactive monitoring on this level, those that do rely heavily on the WAN provider to be their eyes. The "quickness" with which the WAN provider responses to a outage defines it's proactiveness and it's quality of service. A call or "heads up" to the customer within the recognized grace period can go a long way in improving the customer's positive perception of the service. Also, the "quick call" to the customer can be at times very effective, because once notified, the customer may be able to quickly discern the cause of the outage (i.e., power outage, maintenance, etc.) and correct it. Thus, the quick call has the potential of lessening a customer's average down time. Furthermore, a call to the customer can prevent undo work for the WAN provider in situations such as a power outage or scheduled equipment maintenance.

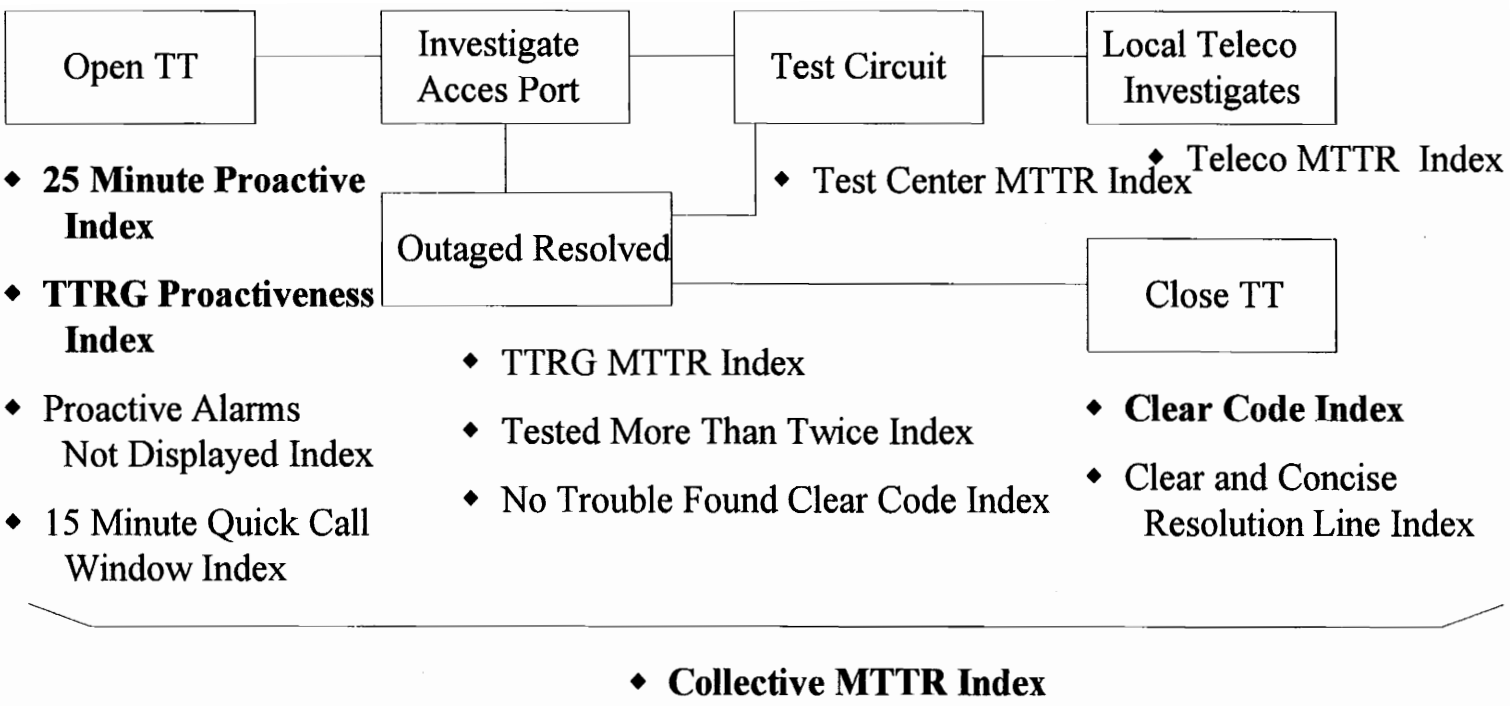

Figure 3.2 Where Performance Indices Lie in the Outage Resolution Process

Proactive monitoring becomes extremely critical to customers that run time sensitive applications like credit card validation systems or similar real-time data systems. For Example, if a frame relay link used for credit card validations drops, purchases may be delayed or processed at a slower rate (via. a less sophisticated backup link) which translates into longer lines at the check out counter, customer frustration, and lost revenues. Recognizing this, proactive monitoring should be viewed as the corner stone to any WAN management center.

In conducting this report, it was determined that the job of being proactive encompasses four key points:

1. Was the outage displayed on the Proactive Monitoring Workstation?
2. After verifying an outage, how soon was the customer notified (phone call, page, voice mail)?
3. Was a TT opened proactively on a verified outage?
4. If a TT was opened proactively, was it opened within the 25 minute grace period?

These four factors collectively describe the WAN Provider's proactive performance. To track the TTRG's performance for factors three and four above, two indices where created and defined as the following:

$$\text{TTRG Proactiveness} = \frac{\text{No. of Trouble Tickets Open Proactively}}{\text{Total No. of Trouble Tickets Opened}^{4}}$$

$$\text{25 Minute Proactive} = \frac{\text{No. of Proactive TTs Opened Within the 25 Minute Window}}{\text{No. of Trouble Tickets Open Proactively}}$$

The remaining two proactive factors were not addressed in this report, because collecting the data was a manual process and at the time of this study there were no resources available to do so. However, for completeness their definitions have been included.

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[4]The sum comprising the "Total Number of Trouble Tickets Opened" includes those TTs open by the customer and closed as customer operating/equipment problem. Such an outage may not be considered a "true" outage since neither the WAN Provider nor the Local Teleco was found at fault. If "customer caused" TTs were removed from the calculation the TTRG Proactiveness index value would be noticeably higher.

$$\text{Alarms Not Displayed} = \frac{\text{No. of Outages Not Displayed or Displayed Incorrectly}}{\text{Per 100 Trouble Tickets Opened}}$$

$$\text{15 Minute "Quick Call" Window} = \frac{\text{No. of Proactive TTs Opened Where the Customer was Notified Within a 15 Minute Window}}{\text{No. of Trouble Tickets Opened Proactively}}$$

The above four indices were included because each satisfies five of the criteria spelled out in the TTRG Performance Index Criteria List, Table 1.1 of Section 1.6.

Data for the TTRG Proactiveness index were collected automatically by running a data gathering routine on the TT Tracking System. Routines were run weekly between the months of August and December 1994. For the 25 Minute Proactive index, data had to be recorded manually since there were no mechanisms in place to record the information automatically. This prove to be quite difficult and very time consuming. Adding to the difficulty was management's reluctance to assist. Management held the opinion that "if it can not be automated it is not worth pursuing and a waste of effort and expense". But, to establish performance baselines that truly represent existing performance levels, data must be initially collected. The true limpness test of whether a performance index is worth the added work and associated expense is if the improvements made can yield performance and financial gains along the lines spelled out in Section 3.1.2. If substantial gains can be realized, than the added effort was worth the added work. Management can then concentrate on developing an automated data collection system to replace the manual system.

3.3.2 Clear Code Index

The Clear Code index measures how well both the TTRG and Data Support personnel fill out the "clear code" field in the Action Log of a TT when referring the TT back to the Data Services Support group (performed by TTRG) and when officially closing the TT (performed by DSSG). To track their collective performance, the following index was created and defined:

$$\text{Clear Code} = \frac{\text{No. of Trouble Tickets Closed With Incorrect Clear Codes}}{\text{Total No. of Trouble Tickets Closed}}$$

The Clear Code index was included because it satisfies criteria 1 through 7 outlined in the TTRG Performance Index Criteria List, Table 1.1 of Section 1.6. Management uses these codes to track the cause of a trouble ticket. From the clear codes, statistical reports are generated weekly for upper management. For example, from the TTs closed for the week of November 12th to the 18th the following report was generated:

WAN Transmission Problem	7.97%
WAN Switch Problem	15.14%
Equipment Leased by the Customer from the WAN Provider	0.00%
Customer Equipment Problem	32.27%
No Trouble Found	32.67%
Local Teleco Problem	11.95%

Figure 4.3 (page 95) is a chart of the clear codes uses to reference a fix. This chart was specifically developed for the TTRG to standardize the meaning and use of the codes. When the cause of the outage has been determined, the TT is updated with a resolution line and a clear code best representing the fix.

3.3.3 Mean Time To Repair Indices

A trouble ticket's Mean Time to Repair ("MTTR") index represents the time required by the WAN provider to investigate and resolve a given outage. It can be viewed in two very distinct ways; (1) a ticket's MTTR can be calculated based on the collective efforts of all the groups involved in fixing the outage, or (2) a ticket's MTTR can be calculated based on each group's contribution and effort to solving the outage. From the point of view of the customer and the WAN provider's Marketing group the Collective MTTR is the most important. From the point of view of the TTRG's management their group's MTTR is the most importance.

The Collective MTTR was chosen because it is highly valued by upper management as well as satisfying criteria 1, 3-6 and 7 outlined in the TTRG Performance Index Criteria List, Table 1.1 of Section 1.6. Data for the Collective MTTR index was collected automatically by the TTTS in a raw form. Next, the TTRG's statistical group massages the data into an usable form. Finally, the data is manually reviewed and those TTs having a clear code indicting a BAD TT, New Turn-Up, or Duplicate TT are removed from the data set before calculating the Collective MTTR index.

$$\text{Collective MTTR} = \frac{\text{Sum of : WAN Caused Outage Times per Trouble Ticket}}{\text{Total No. of Trouble Tickets Opened}}$$

The following three MTTR indices are not addressed in this report but for completeness their definitions have been included. The following three MTTR indices were included because they satisfy criteria 1, 3, 5, 6 and 7 outlined in the TTRG Performance Index Criteria List, Table 1.1 of Section 1.6. The TTRG MTTR represents the amount of outage time accrued while the TT was in the TTRG's bucket being investigated. Similarly, the Test Center and Local Teleco MTTR represents the amount of outage time accrued while the TT was in their respective buckets. Collecting the data for these indices requires reviewing each TT's Action Log Sheet manually and determining what amount of the outage time was contributed by each group involved. The TTTS assists by calculating the amount of time spent in the "Customer Caused" and the "WAN Caused" outage buckets per group and posting these times in the TT's Action Log Sheet. However, the TTTS does not summarize the outage times on a per group bases (i.e., Group A's MTTR) when the TT is closed. To summarize the outage time on a per group bases, the TT must be reviewed manually to obtain the necessary data. At approximately 300 TTs per month, the work required to accomplish this was beyond the scope of this project. To minimize the work load, a random sample of the data set (10% - 25%) could be selected and an analyses conducted monthly. By tracking the TTRG, Test Center and Local Teleco MTTR, all involved can gain a better understanding of each group's performance level and how their performance detracts from or benefits the Collective MTTR value.

$$\text{TTRG MTTR} = \frac{\text{WAN Caused Outage Time Attributed by the TTRG}}{\text{Total No. of Trouble Tickets Opened}}$$

Test Center MTTR = WAN Caused Outage Time Attributed by Test Group
Total No. of Trouble Tickets Opened

Local Teleco MTTR = WAN Caused Outage Time Attributed by the Local Teleco
Total No. of Trouble Tickets Opened

3.3.4 Miscellaneous Indices

The following two indices are not included in this study but have been added to further define the TTRG's mission in providing quality service to the customer.

The Tested More Than Twice Index tracks the number of tickets that were referred to the testing group more than two times. Ideally, very few TTs should be tested more than twice. If this index proves to be considerably high, management may want to investigate as to the reason why.

Tested More Than Twice = No. of TTs Tested More Than Twice
Per 100 Trouble Tickets

The Resolution Line index tracks the number of tickets that where sent back for closure from the TTRG without a clear and consist description of the resolution and a corresponding clear code in the TT's event log. Ideally, this index should be in the high 90 percentile, however, DSSG has been known in the pass to "pull" trouble tickets from the TTRG's bucket for closure and not include a resolution line or a proper clear code.

Resolution Line = No. of TTs Without a Resolution Line
Total No. of Trouble Tickets Opened

3.4 Closing Remarks

Discussed were two important elements of the Process Control and Improvement Program, namely the Performance Index Management System and the Process Control and Improvement System. Their importance in developing a comprehensive Process Control and Improvement Program is paramount. Five improvement plans implemented during the time frame of this report were described and their impact on the four indices addressed.

The effort required to gather data plays a dominate roll in whether an index is to be tracked. If the data gathering system is automated, effort is minimized and the index becomes very attractive. If the gathering system is manual, the effort required may be beyond the resources of the group, effectively placing the index out of reach. Management must weigh the benefits of tracking performance with the added effort and come to a reasonable balance (i.e., Section 3.1.2). However, management must not ignore critical indices on the availability of resources alone.

Eleven indices were described and their location within the process defined. However, time and resources limited the number of indices studied to four. Of the four indices tracked, two showed improvement (i.e., Clear Code and TTRG Proactiveness). The Collective MTTR index worsened slightly, while the 25 Minute Proactiveness index lack enough data for a proper analysis. It is important to note that during the time frame of this report the Frame Relay network grew at a rate of approximately 39.95% (see Chart 4.2) while manpower of the TTRG grew at 6.25% (see Chart 4.2). The poor performance of the Collective MTTR index may be attributed to the lack of manpower in the TTRG to handle the increase in TTs, abnormally high network problems, or high outage time contributions by the Test ,Switch Terminal or Local Teleco groups. Further analysis is needed to pin point the exact cause of the Collective MTTR index's poor performance.

4 DATA ANALYSIS AND COLLECTION METHODOLOGY

This chapter describe the methodology by which the data for this report was collected and analyzed. The data set used is found in Appendix B, Parts 1 and 2. Part 2 of Appendix B is the 25 Minute Proactiveness index data set.

4.1 Ensuring Data Accuracy and Preventive Measures

Upon starting this project, accurate data was a high concern. After collecting two weeks worth of data, a preliminary accuracy analysis was performed to identify error rates. Results indicated that a significant percentage, between 15%-40%, of the Clear Code and TTRG Proactiveness data was in error. Corrective actions were implemented for both the Clear Code and TTRG Proactiveness indices in an attempt to lesson their error rates. They resulted in correcting the error data and lowering the error rates to an estimated 5%. The error rate associated with the Collective MTTR data set is estimated to be less than 1%, since the data is calculated and collected automatically by the Trouble Ticket Tracking System ("TTTS"). In contras, the data for the 25 Minute Proactiveness index was recorded manually. It's error rate is speculated at less than 10%. The system that generated the 25 Minute Proactiveness data lacked the capability to store the data or produce hard copies, thus, the data could not be doubled checked for errors.

New Ticket Documentation Procedures

Because of the high error rates found with the Clear Code and TTRG Proactiveness attributes, it was necessary to review every TT. In doing so, if the clear code used did not match a code found in the TTRG Clear Code chart the TT was suspected as being in error and targeted for review. Inconsistencies found between the Clear Code attribute and comments in the TT's event log were corrected by changing the attribute to agree with the event log. TTs with clear codes matching codes in the TTRG Clear Code chart were assumed error free (see Section 4.2 for more detail on the assumptions used) and passed over.

TTs with an incorrect TTRG Proactiveness attribute (Report Source) could not be identified by simple inspection. Instead, every TT had to be reviewed. Inconsistencies found were corrected by changing the attribute to agree with the TT's event log. If comments in the event log were inconclusive the attribute was left unchanged.

The process of reviewing a TT's event log for errors was a very tedious and time consuming task, requiring approximately 4.5 - 5 hours of an engineer's time to review approximately 300 tickets each week. In an attempt to lesson the review time needed, two new ticket handling procedures were implemented. The first new procedure called for a resolution line to be added by the trouble shooter to the event log before a TT is sent to the DSSG for closure. The resolution line would contain a brief description of the fix and it's corresponding clear code. The second new procedure instructed the Proactive group, when opening a new TT, to inform the DSSG that the TT should be categorized as a proactive ticket (report source = WAN) and to include a one line statement at the top of the event log indicating so . Shortly after implementing these two simple procedures, reviewing a TT became much easier and resulted in lowering the time required to do so by approximately 2 hours per every 300 tickets or a 45% deduction in time.

Data Accuracy

Both the TTRG and DSSG played key roles in ensuring accurate data. Data for both the Reported Source and Clear Code attributes are inputted by the Data Services Support Group at critical points in a TT's life. The former during the birth of a TT and the later upon closing a TT. The TTRG holds the responsibility of verbally indicating to the DSSG that the newly requested TT is proactive. The DSSG holds the responsibility of setting the Reported Source attribute to WAN upon opening a proactive TT. The TTRG also holds the responsibility of returning every TT with a clear code that accurately represents the fix to the problem. This includes a clear and concise resolution line. The DSSG also holds the responsibility for duplicating the clear code provided by TTRG upon closing the ticket. Only if instructed otherwise by the customer, the TTRG or the customer's WAN representative, can the DSSG use a clear code different from that recommended by the TTRG. Early into this study, there were numerous occurrences when, upon receiving an "OK" from the customer to close a TT, the DSSG would "pull" the TT from the TTRG's domain without allowing a trouble shooter to enter a resolution line or a clear code. Subsequently, the TT is likely to be closed with an incorrect clear code. The "pulling" of

TTs lessened considerably as the end of the study period neared and as the TTRG's complaints increased.

Since the DSSG is a organization the TTRG does not have direct control over, ensuring accurate data presented a problem. In an attempt to alleviate this problem, two new operating procedures were implemented.

1. To formally inform and/or direct the Data Services Support Group to pay greater attention when "filling out" the Reported Source and Clear Code columns, and
2. To double check every TT by reviewing the event log and entering the correct information

Both options were implemented early into the investigation. Only option 2 ensured reliable data but required additional work. Option 1, if successful would eliminate the need of option 2.

Option 1 had better results in lowering the error rate of the Clear Code index verses the TTRG Proactiveness index. Up to the end of the collection period, the Clear Code index's error rate continued to lessen even as the number of TTs opened per week steady increased (See Figure 4.1). The immediate benefit was less time spent reviewing TTs for incorrect clear codes. The long term benefit (if the error rate could be kept at a low value), would be the elimination of the clear code double checking procedure and the resulting savings in time, money and resources.

Option 1 had a notably different affect on the TTRG Proactiveness index. It's error rate did not increase nor remain constant, but rather worsened (See Figure 4.2) during the collection period. Although the TTRG has the ability to change the Reported Source attribute if found incorrect, to do so, in it's view, would be a duplication of effort. In addition, the TTRG viewed the changing of the Report Source attribute as not part of their standard operating procedures nor was it seriously pushed by management as so. One possible cause of the Reported Source's consistently high rate may be attributed to not getting the word out about the importance of the attribute. Another may be the way the ticket opening system operates. Sources at the DSSG indicated that when a new TT is opened, the TTTS uses CUS as the default value for the Reported Source attribute. Having not been prompt by TTTS for input for the Reported Source attribute, the unknowing DSSG personnel simply accepts the default value and continues on.

Initially when the new clear codes were implemented, discerning the specific fix of the TT improved drastically. With the new clear codes, management could quickly scan the data set and distinguish between a Fract-T1, Full-T1 and Backbone card fault. The immediate benefit was a faster and more accurate view of the WAN-Caused outages and a more exact representation of the network's overall performance. Before the clear codes were reorganized, a fault with the frame relay switch was designated by a single clear code number making it near impossible without reading the TT to discern the specific cause of the outage. With the new clear code number scheme, the event log of the TT need not be read. For example, a code of 175 A would represent a frame relay switch crash, 175 B would represent a faulty Fract-T1 card, and 175 I would represent a bad frame relay switch power supply.

Error Rates

Error rates for both the Clear Code and TTRG Proactiveness indices were calculated by reviewing the TT and comparing it's clear code and reported source attributes with comments posted in the TT's event log. If either attribute did not agree with comments in the event log then the attribute is consider invalid and an error is clocked. Error rates for the Clear Code and the TTRG Proactiveness indices were calculated weekly. Figures 4.1 and 4.2 depict the error rates calculated for the Clear Code and TTRG Proactiveness indices. The Clear Code average error rate (20.6%) represents mistakes made by both the TTRG and DSSG when entering the attribute into the TT. Note the steady decline of the error rate for the Clear Code index. The primary reason for the improvement can be attributed to the new "resolution line" procedure and personnel at the DSSG becoming familiar with the new clear code format. Improvements of the Clear Code index continued up to the last week the data was collected. Observations made of TTs with an incorrect clear code revealed the DSSG, on occasions, ignoring the TTRG suggested clear code for their own.

The TTRG Proactiveness average error rate (45.4%) represents mistakes made by DSSG when entering the Reported Source attribute into the TT. Note the steady worsening of the TTRG Proactiveness error rate. The cause of it's decline can be attributed to the following: (1) DSSG personnel were poorly informed as to the importance of the Reported Source attribute (the attribute used to define the TTRG Proactiveness index)

and (2) the automated ticketing system, used by the DSSG to open TTs, populates the Reported Source attribute with CUS (customer) as it's default setting. Few DSSG personnel bother to change the attribute to read WAN, however, a majority do add comments to the TT's event log indicating that the ticket was opened proactively.

Error rates for both the Clear Code and TTRG Proactiveness indices are present in Table 4.1. A TT was found in error if the targeted attribute did not agree with comments found in the TT's event log. These values represent an average for the period from mid August to early December.

Table 4.1 Error Rates for the Clear Code and TTRG Proactiveness Indices

Index	Calculated Average Error Rate
Clear Code	20.6%
TTRG Proactiveness	45.4%

Monitoring the Performance of the DSSG

The primary reason for gathering statistical error data on the Reported Source and Clear Code attributes is to establish accuracy standards for data being passed from the DSSG to the TTRG. If the DSSG can sustain these standards from week to week, then the TTRG could eliminate the need to double check a TT for errors. The ultimate goal is to reach an error level consistent over time and acceptable to the TTRG. The DSSG could also use the error statistical data as a benchmark for their own performance tracking system.

Clear Code Error Rate

Week	Week Of:	No. of TTs with Incorrect Clear Codes	Total TTs Closed		Total TTs Closed		TTs Closed Percentage Incorrect		TTs Closed Percentage Incorrect	
1	Aug 14 to Aug 20	59	273				21.6%			
2	Aug 21 to Aug 27	62	226				27.4%			
3	Aug 28 to Sept 3	Data was not Available			4 Week Running		Data was not Available		4 Week Running	
4	Sept 4 to Sept 10	49	227		Average >>	242	21.6%		Average >>	23.5%
5	Sept 11 to Sept 17	68	298				22.8%			
6	Sept 18 to Sept 24	64	256				25.0%			
7	Sept 25 to Oct 1	73	284		4 Week Running		25.7%		4 Week Running	
8	Oct 2 to Oct 8	51	244		Average >>	271	20.9%		Average >>	23.6%
9	Oct 9 to Oct 15	65	285				22.8%			
10	Oct 16 to Oct 22	88	283				31.1%			
11	Oct 23 to Oct 29	44	337		4 Week Running		13.1%		4 Week Running	
12	Oct 31 to Nov 5	62	306		Average >>	303	20.3%		Average >>	21.8%
13	Nov 6 to Nov 12	48	294				16.3%			
14	Nov 13 to Nov 19	38	263				14.4%			
15	Nov 20 to Nov 26	34	204		4 Week Running		16.7%		4 Week Running	
16	Nov 27 to Dec 2	37	375		Average >>	284	9.9%		Average >>	14.3%
	Average Score >>	56	277				20.6%	<< Average (4 Month Benchmark value)		

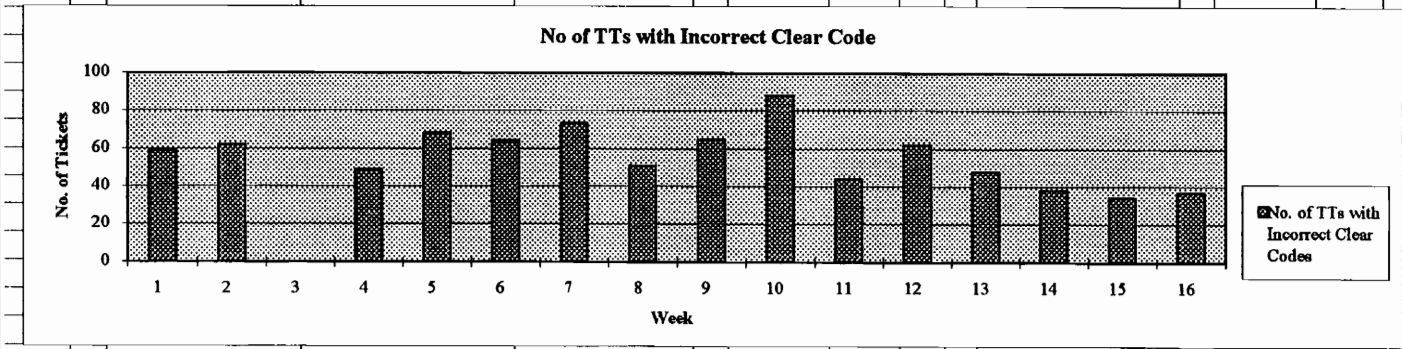

Figure 4.1 Clear Code Error Performance

Proactiveness Error Rate

Week	Week Of:	No. of Proactive TTs Opened by WAN Provider Reported by DSSG	No. of Proactive TTs Open by WAN Provider Calculated by TTRG	Percent of WAN Opened TTs Reported Incorrectly by DSSG		
1	Aug 14 to Aug 20	110	160	31.3%		
2	Aug 21 to Aug 27	73	99	26.3%		
3	Aug 28 to Sept 3	Data was not available		Data was not available	4 Week Running	
4	Sept 4 to Sept 10	70	110	36.4%	Average >>	31.3%
5	Sept 11 to Sept 17	79	160	50.6%		
6	Sept 18 to Sept 24	73	125	41.6%		
7	Sept 25 to Oct 1	75	139	46.0%	4 Week Running	
8	Oct 2 to Oct 8	62	116	46.6%	Average >>	46.2%
9	Oct 9 to Oct 15	43	127	66.1%		
10	Oct 16 to Oct 22	89	164	45.7%		
11	Oct 23 to Oct 29	87	165	47.3%	4 Week Running	
12	Oct 31 to Nov 5	95	181	47.5%	Average >>	51.7%
13	Nov 6 to Nov 12	90	161	44.1%		
14	Nov 13 to Nov 19	60	127	52.8%		
15	Nov 20 to Nov 26	64	127	49.6%	4 Week Running	
16	Nov 27 to Dec 2	112	219	48.9%	Average >>	48.8%
				45.4%	<< Average (4 Month Benchmark Value)	

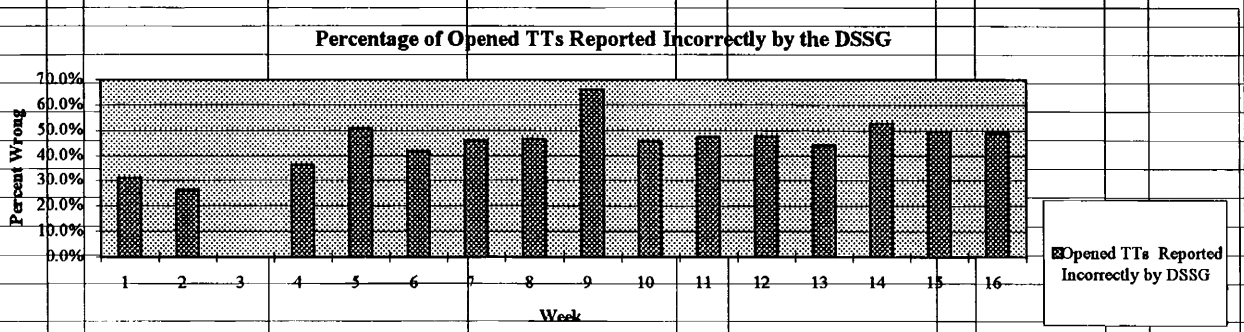

Figure 4.2 Proactiveness Error Performance

4.2 Clear Codes

The purpose of the clear code is to categorize the many possible fixes to an outage. Old codes were little more than a three digit number and lacked the flexibility for describing an outage in any detail. New codes, developed for this report, where based on the old codes, but incorporated an additional fourth character, an alpha character. The primary benefit of the alpha character is that it allows greater granularity in describing the fix of an outage. For example, if the fix was found to be associated with the customer's digital modem (i.e., CSU), the numeric code used in the past was 745 - CSU Problem. By adding the letters A, B, and C the fix can be described in greater detail:

745A - Bad/Replaced CSU

745B - Hung, Frozen or Looped CSU

745C - Powered Cycled CSU

As a side note. It may be important to track outages caused by human error verses outages caused by an equipment/software failure. With the four character clear code scheme, human errors could be tracked by using an unique alpha character (e.g., Z). For example, a mistake by a technician while working on a Digital Cross Connect (DXC) resulting in an outage could be categorized by the 134Z code verse a 134A (i.e., DXC equipment failure).

To determine whether the clear code used was the correct one, the following four assumptions were used: (1). If the code used can be found on the TTRG Clear Code chart (Figure 4.3) in its entirely (both the alpha and numeric portions) then the ticket is counted as having the correct clear code. The basis behind this assumption is: the trouble shooter, being closely involved with resolving the outage, will enter the correct code 100% of the time and that DSSG successfully repeated the code upon closing the TT. (2). If only the code's numeric designator can be found on the TTRG Clear Code chart then the ticket is counted as having the correct clear code. The basis behind this assumption is: the trouble shooter enter the correct clear code (both the alpha and numeric portions) but DSSG, upon closing the ticket, entered only the numeric portion leaving off the alpha portion. If the exact clear code is needed, it can be found near the bottom of the TT's event log where a "resolution line" should exist stating the cause of the outage and the corresponding alpha numeric clear code used. (3). If the code used can not be found on the TTRG Clear Code chart then the Data Services Branch Clear Code chart is consulted

(see Figure 4.4). If found on this chart, the tickets is reviewed to determine if the resolution line agrees w/ the clear code. If it does, the clear code is considered valid. If not, the clear code is considered invalid. (4). If the code used can not be found on the TTRG nor the Data Services Branch Clear Code charts or the code does not represent the fix as stated in the event log then the clear code is considered invalid. Review of the ticket's event log should identify the intended clear code.

Interesting enough, when the new clear codes where first implemented the DSSG's cooperation was slow coming. A large part of their reluctance was due in part to ignorance. A majority of the blame lies with the TTRG management and their cavalier approach to informing the DSSG of the new clear codes and why they were being used. The primary responsibility of informing the DSSG fell on the TTRG personnel. They were instructed by management to verbally pass on the new clear code information during their phone encounters with the DSSG. As the word of the new clear codes circulated DSSG's performance improved(see Figure 4.1).

Clear Code Chart

For the purpose of this report, the clear codes used by the TTRG were redefined and incorporated into an easy-to-read chart (see Figure 4.3). The chart was placed at each work station and proved instrumental in standardizing and promoting its use. The chart's codes are based on codes found in Figure 4.4, which is a "guide line" chart issued by the service provider's Data Services Branch of which the TTRG and other data services groups fall under. The TTRG Clear Code chart is organized by owner (WAN, Local Teleco, International Teleco, Customer) and equipment type (Fiber, Digital Cross Connects, Router, etc.). The hundreds position of the clear code designator, represents the owner of the equipment. For example, 151B is owned by the WAN provider, 751B is owned by the customer. The tens and ones position represent the equipment type. For example, 51 represents a Multiplexer (MUX). The alpha character identifies in greater detail what specific piece or type of equipment failed. In particular, the B of the clear code 151B represents a 1-3 Multiplexer verses an 151A (see Figure 4.3) which represents an Inverse Multiplexer - two different pieces of equipment with two different functions and two different levels of importance in the WAN. The benefit of this numbering scheme is that it allows management the mechanism and flexibility to track outage fixes in greater detail.

FRAME RELAY CLEARANCE CODES					
WAN Switch Issues	***US***	***Internatl***	***Bad Troubles Tickets***		
Terminal Power Outage	166 A	666 A	MCI Bad TT - Wrong Circuit/Duplicate	102 A	
Switch HW/SW Problems			Append TT-B to TT-A	103A	
Schedule Maint.	109 A	609 A	New Circuit - Install / Turn-Up	104 A	
HW			CUS Bad TT - Wrong Circuit/Duplicate	702 A	
Switch Crash	175 A	675 A			
Fract-T1 Card Replaced	175 B	675 B	***No Trouble Found***		
Full t1 Card Replaced	175 C	675 C	Cleared While Checking, No Testing	190 A	
Backbone Card Replaced	175 D	675 D	Nothing Found, Tested Clean	193 A	
FDDI Card Replaced	175 E	675 E	Customer Suspected, Cleared While Checking	790 A	
DXI Card Replaced	175 F	675 F			
Ethernet Card Replaced	175 G	675 G	***RFO Issues***		
Processor Card Replaced	175 H	675 H	Verified Hit, Cause Unknown	192 A	
Power Supply Replaced	175 I	675 I	Verified Hit, Cause Known	192 B	
Bad / Loose Cable	175 J	675 J	Nothing Found	192 C	
SW					
MI Configured Incorrect	176 A	676 A	***Telco Equipment Issues***		
PVC Errored, Rebuilt, Missing	176 B	676 B	**Smart Jack Problems**		
Routing Problems (OSPF, FDDI)	176 C	676 C	Bad / Looped	355 A	
Port Reset/Sleepy	181A	681A	**CO Power Outage**	366 A	
Slot Reset	177 B	677 B	**Transmission Problems**		
Switch Reboot	177 C	677 C	AMI / B8ZS Mismatch	310 A	
			CO Internal Wiring, X-Conct	314 A	
WAN Transmission Issues	***US***	***Internatl***	Fiber Cut / Outage	316 A	
CSU/DSU or NIU Problems			Fiber System/Equip Rx Tx Failure	316 B	
CSU Card (Reset, Reconfig, Looped)	149 A	649 A	Cable Pair (Metallic, X-Conct, Cut)	318 A	
DSU Card (Reset, Reconfig, Looped)	149 B		Repeater / Line Conditioner	318 B	
CSU Replaced	149 C	649 B	Channel Bank (OCU, Slic Card, X-Conct)	331 A	
DSU Replaced	149 D		DXC (1/0, 3/1 Card, X-Conct)	334 A	
Terminal Power Outage	166 B	666 B	Mux (M 1/3 Card)	351 A	
Transmission Problems			Bad Timing	356 A	
AMI / B8ZS Mismatch	110 A	610 A			
Internal Wiring (Loose, Crossed)	114 A	614 A	***Customer Equipment Issues***		
Fiber Cut / Outage	116 A	616 A	**CSU/DSU or NIU Problems**		
Fiber System/Equip Rx Tx Failure	116 B	616 B	Bad CSU/DSU or RJ-45 Cable	749 A	
Cable Pair (Metallic, X-Conct, Cut)	118 A	618 A	Hung / Looped CSU/DSU	749 B	
Repeater / Line Conditioner	118 B	618 B	Power Cycled CSU/DSU	749 C	
DXC (1/0, 3/1 Card, X-Conct)	134 A	634 A	**Site Power Outage**	766 A	
Bad IDNX	141 A	641 A	**Router, Bridge, FRAD Problems**		
I-Mux (DL-3800)	151 A	651 A	Custmr Prem Internal Wiring	715 A	
Mux (M 1/3 Card, DL-3000)	151 B	651 B	Testing / Maintenance	709 A	
Bad Timing	156 A	656 A	Reboot / Reset	747 A	
Bad ESFMU	157 A	657 A	Bad Card, Cable, Miscl Hardware	747 B	
Telzon Block	159 A	659 A	Config. Problems (PVCs, LMI, Routing)	748 A	
			Application and LAN Issues	748 B	
WAN Provided Equipment			**Transmission Problems**		
CSU/DSU or NIU Problems			Channel Bank	731 A	
Bad CSU/DSU or RJ-45 Cable	249 A		MUX	751 A	
Hung / Looped CSU/DSU	249 B				
Power Cycled CSU/DSU	249 C				
Site Power Outage	266 A				
Router, Bridge, FRAD Problems					
Custmr Prem Internal Wiring	215 A				
Reboot / Reset	247 A				
Bad Card, Cable, Miscl Hardware	247 B				
Config. Problems (PVCs, LMI, Routing)	248 A				
Application and LAN Issues	248 B				
Transmission Problems					
Channel Bank (Card, X-Conct)	231 A				

Figure 4.3 Clear Code Chart

PURPOSE OF CLEARANCE CODES

To provide an accurate Reason For Outage (RFO) for ongoing root cause analysis of CSM data to reduce customer service inquires.

LOCATION OF OUTAGE

0 Administrative
1 [redacted] Domestic
2 [redacted] Provided CPE (Includes Co-location)
3 Local Exchange Carrier (LEC)
4 Competitive Access Provider (CAP)
5 Other Common Carrier (OCC)
6 Foreign PTT
7 Customer/Vendor
8 [redacted] International

REASON FOR OUTAGE (RFO)

ADMINISTRATIVE

X00 R B CUS/RTN/CNR
X01 MIS-Referred Ticket
X02 Incomplete Ticket
X03 Appended/Duplicate Ticket
X04 Circuit Order Activity
X05 Non-Chronic(For TRB = 980-Chronic Inquiry Only)
X06 Human Error
X07 Monitor Complete
X08 Technical Assist (NO OUTAGE)
X09 Scheduled Maintenance

TRANSMISSION

X10 AMI/B8ZS Mismatch
X11 Bad Levels
X12 Cable Connector (U-Link Bridge Clip/Amphenol)
X13 Cross Connect/Electronic
X14 Cross Connect/Wire
X15 Inside Wire/Extended Demarc
X16 Fiber Cut/Damaged
X17 Metallic Cable-Cut/Damaged
X18 Metallic Cable-RPTR/Conditioning/Bad Pair
X19 Customer Maintained Loop
X20 Protection Switch
X21 Radio-Fading
X22 Radio-Hardware
X23 Satellite-Uplink
X24 Satellite-Downlink
X25 Satellite-Weather/Solar Activity

EQUIPMENT

X30 Power Supply
X31 Channel Bank-Channel Card
X32 Channel Bank-Common Card
X33 Channel Bank-Software/Optioning
X34 DXC-Common Cards
X35 DXC-Matrix
X36 DXC-NPC/DC Card
X37 DXC-Software/Optioning
X38 Echo Cancellor-Hardware
X39 Echo Cancellor-Software/Optioning
X40 End User Equipment
X41 IDNX-Common Card
X42 IDNX-Port Card
X43 IDNX-Software/Optioning
X44 Jack-Defective/Dirty
X45 Bridge/Concentrator
X46 Router- Common Card
X47 Router-Port Card
X48 Router-Software/Optioning
X49 Modem-CSU/DSU/Hardware
X50 Modem-Software/Optioning
X51 Mux-Hardware
X52 Mux-Software/Optioning
X53 Lightwave-Hardware
X54 Lightwave-Software/Optioning
X55 Station Package/Smartjack
X56 Timing
X57 Monitoring Unit (ESFMU/DS3MU)
X58 DTE Cabling
X59 Other Equipment

POWER/ENVIRONMENTAL

X65 Facility Power Plant
X66 Commercial Power
X67 Fire
X68 Grounding
X69 HVAC
X70 Natural Disaster
X71 Fuse
X72 Generator

SWITCH/DAP/STP

X75 Switch-Common Card
X76 Switch-Matrix
X77 Switch-Port Card
X78 Database/Translation Error
X79 New Load Feature
X80 Operating Load Corrupted

SWITCH/DAP/STP (Cont.)

X81 Hung State/Sleepy Port
X82 All Trunks Busy
X83 ANI/Auth Code File
X84 Route Guide

MICELLANEOUS

X85 Other

NO TROUBLE FOUND/CAME CLEAR

X90 Cleared While Checking (Problem Seen)
X91 No Record Of Call On Completed Search
X92 Hit Seen/Unable To Isolate
X93 No Trouble Found Test Ok

LOCAL USE

X96 SPEC-1
X97 SPEC-2
X98 SPEC-3
X99 SPEC-4

CLEARANCE SUPPLEMENT CODE

The Clearance Supplement Code may be locally defined, except M which is reserved to identify Major Outages. This field is limited to one alpha, numeric or punctuation character that can be generated from the keyboard. It may be used as required by an organization or as directed by management. It is entered in the field immediately following the 3-digit CLR Code.

Ordering Information

This document is stocked at the [redacted]
may be obtained through the Material Transfer System (MTS).
Documents may be ordered by accessing the MTS database and entering the order directly. When ordering, answer all the prompts, including the following required information:

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CHARGE TO SITE: RCSATX
SHIP TO SITE: [enter your site code]
MPN: (MCIT 094 365 6501
ITEM: 04000002084
DESCRIPTION: Customer Service Manger Clearance Codes
PROJECT CODE: 009160
CHARGE DEPT: 1015

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Figure 4.4 Data Services Branch Clear Code Chart

4.3 Data Set

Structuring of the Raw Data into an Usable Form

Already in place were mechanisms for collecting data for the Clear Code, Collective MTTR and TTRG Proactiveness indices. At the end of each week, a batch routine is run on the TTTS to gather the data on the TTs closed during the week. The batch routine gathers the data in a raw form. The raw data is then passed through a spread sheet macro to condition and structure the data in a format that is usable. The resulting data set is then stored on floppy and a hard copy is made for use in the Error Checking stage. Table 4.2 is an example of the data set after the spread sheet macro has been run. The six column types in Table 4.2 are only a few of the many attributes a TT has. Only columns 4, 5 and 6 were used for the report. Not shown in Table 4.2, are the customers names and circuit ID number. They were purposely left out for proprietary reasons.

The data found in column 4 of Table 4.2 is used in calculating the TTRG Proactiveness index, The term "Reported Source" refers to the entity that opened the TT; CUS being the customer and WAN being the Wide Area Network Provider. The data found in column 5 of Table 4.2 is used to define the Collective MTTR index. The data found in column 6 of Table 4.2 is used to define the Clear Code index. The complete data set used in this report can be found in Appendix B.

Table 4.2 Example Data Set: Post Spread Sheet Macro

Trouble Ticket No.	Circuit ID Number	Customer	Reported Source	WAN Outage Time	Clear Code
9409010002256			CUS	00:04	274B
9408280000051			WAN	08:28	277A
9409010001484			CUS	03:01	315 A
9408300001109			CUS	05:00	318 A
9408250002767			WAN	04:41	343B
9408250002767			WAN	04:41	343B
9408080002335			CUS	00:48	674B
9408310002355			CUS	00:13	677C
9408250001430			CUS	03:41	774A

4.4 Data Analysis

The Data Services Branch Clear Code chart changed during the time frame of this report. This explains why there are clear codes in the data set (see Appendix B) that are not found in Figures 4.3 and 4.4. Figures 4.3 and 4.4 represent the current versions of the clear code charts being used.

Part 1 of Appendix B was used to generate performance charts for the Clear Code, TTRG Proactiveness, and the MTTR indices. Part 2 of Appendix B was used to generate the performance chart for the 25 Minute Proactive index. Every TT was reviewed to improve the accuracy of the Clear Code and Report Source attribute. Inconsistencies found were noted in columns five and six of Appendix B. Data for the error analysis of Section 4.1 was obtained by reviewing columns five and six.

Clear Code Statistical Data

Figure 4.5 was developed from the data set of Appendix B Part 1. The near, mid and long term goals were developed in concert with management and thought to be obtainable by their associated dates.

Week 10 appears to have the highest error rate of 31.1%, or 22% higher then the next highest value of 27.4%. The cause of the high error value is unknown and may simply represent a slack period. Not until week 11 did the effect of the new clear codes and the new resolution line procedures begin to improve the clear code error rate significantly. The reason(s) for the slow turn-around is likely attributed to management's muted involvement in informing and reiterating to the DSSG the importance of accurate Clear Codes. Another, is the lack of direct influence over the DSSG. And still another may be the increase in the number of TTs closed (i.e., approximately 18%).

Weeks 1 2 3 4 Weeks 13 14 15 16
(275 + 266 + 206 + 222) / 4 = 242 compared to (294 + 264 + 208 + 375) / 4 = 285

Clear Code Statistical Data

Week	Week Of:	No. of TTs with Incorrect Clear Code	Total TTs Closed	Percent Wrong			
1	Aug 14 to Aug 20	59	273	21.6%			
2	Aug 21 to Aug 27	62	226	27.4%		<< New Clear Codes and Resolution Procedures	
3	Aug 28 to Sept 3	Data not available		Data not available		Implemented Aug 22 1994	
4	Sept 4 to Sept 10	49	227	21.6%	23.5%	< 4 Week Running	
5	Sept 11 to Sept 17	68	298	22.8%		Average	
6	Sept 18 to Sept 24	64	256	25.0%			
7	Sept 25 to Oct 1	73	284	25.7%			
8	Oct 2 to Oct 8	51	244	20.9%	23.6%	< 4 Week Running	
9	Oct 9 to Oct 15	65	285	22.8%		Average	
10	Oct 16 to Oct 22	88	283	31.1%			
11	Oct 23 to Oct 29	44	337	13.1%			
12	Oct 31 to Nov 5	62	306	20.3%	21.8%	< 4 Week Running	Near Term Goal: 20% by Nov 94
13	Nov 6 to Nov 12	48	294	16.3%		Average	Mid Term Goal: 10% by Dec 94
14	Nov 13 to Nov 19	38	263	14.4%			Long Term Goal: 6% by Aug 95
15	Nov 20 to Nov 26	34	204	16.7%			
16	Nov 27 to Dec 2	37	375	9.9%	14.3%	< 4 Week Running	
						Average	
				20.6% << Average (4 Month Benchmark Value)			

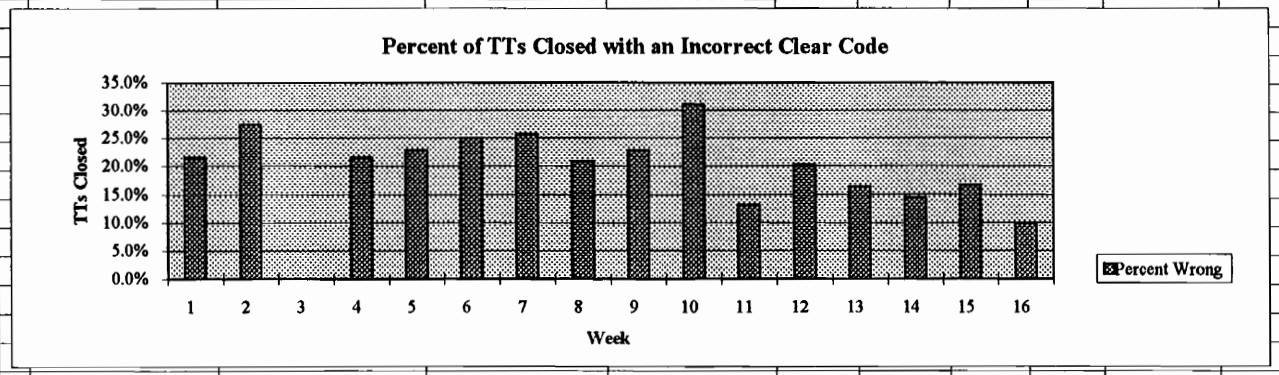


Figure 4.5 Clear Code Performance Chart

The steady increase of TTs with errors does not necessarily indicate a worsening network, but rather, it may indicate growth of the network in new frame relay circuits. Comparing the number of WAN-Caused outages per every 100 active circuits in August verses December should help to better describe the network's overall performance compared with it's growth. By mid October the 20% short term goal had been met and sustained for six consecutive weeks. By Week 16 the mid term goal of 10% was met for the first time with a score of 9.9%. Meeting ones goals is only half the battle, the other more difficult half is maintaining and/or improving ones level of performance from week to week. A process is not considered in "control" unless performance levels can be held and/or improved over time.

Proactiveness Statistical Data

Figures 4.6a - b were developed from the data set of Appendix B Part 1. The graph of Figure 4.6a contains a comparison between proactiveness as reported by the DSSG verses proactiveness as calculated by the TTRG. The phrase "Calculated by TTRG" implies that the data set was reviewed and inconsistencies found with the Reported Source attribute were corrected. Proactiveness, as calculated by the TTRG and not as reported by the DSSG, represents the true level of performance by the WAN provider. Figures 4.6a and 4.6b track the performance of the DSSG in filling out the Reported Source attribute. This data could also be used by the DSSG in establishing and monitoring their own performance index.

The TTRG's performance in being proactive averages at about 52%. A majority of the scores fall above the 50% range. If a running four-week average is calculated, the last four-week average reveals a slightly higher level of performance (i.e., 55.2%) as compared to the previous four-week averages (i.e., 51.4%, 50.3% and 52.2%). The small increase is most likely contributed to improvements made to the Proactive Monitoring system in the form of: automatic clearing of a reported outage from the monitoring screen by the system when the circuit recovers on its own. Prior to this improvement, the proactive monitoring person had to check the status of the circuit and if it was up he/she had to clear the alarm from the system manually. Performance improvements may be limited by the TT Opening system. Currently, the TT Opening system is not integrated with the Outage Detection system. This leaves the job of gathering the circuit data and correlating the two systems to the proactive monitoring person (TTRG).

Throughout the 16 week period, there was one person dedicated to performing the proactive monitoring job during the day and evening shifts. During the night shift, the proactive monitoring job was performed by one person, however, that person was also responsible for trouble shooting tickets. Those TTs which are (1) opened by the customer and found to be the customer's fault (i.e., Customer-Opened, Customer-Caused) were not removed from the data set in calculating the TTRG's proactiveness performance. There removal should given a more accurate depiction of the TTRG's proactiveness performance.

The DSSG consistently missed represented the true performance of the TTRG in the being proactive. On average, the DSSG opens 41.5% of the TTs with an incorrect Reported Source attribute. The phrase "Total TTs Opened", found at the head of column 6 of the table contained in Figure 4.6a, represents not the number of TTs opened for the week but the number of TTs closed for the week. The term "Opened" and not "Closed" is used because the Report Source attribute is filled out when the TT is opened and not when it is closed. Figure 4.6b illustrates the percentage of incorrect TTs opened as non-proactive. The cause of the DSSG's worsening performance is not clear. Even if the number of TTs opened per week increases, this should not lead to a higher error percentage. DSSG's poor performance may be attributed to the way the TT opening system works. Because the TT opening system uses a default value of CUS for the Reported Source attribute instead of prompting the DSSG personnel for the value, the DSSG personnel is more likely to over look it. Only well informed and/or experienced personnel would remember to enter the correct attribute.

TTRG Proactiveness Statistical Data

Week		Week Of	No. of Proactive TTs Opened by WAN Provider and Reported by DSSG	No. of Proactive TTs Open by WAN Provider and Calculated by TTRG	No. of TTs Opened by the Customer Calculated by TTRG	Total TTs Opened	% Opened by the WAN Provider	4 Week Running Average	% of Opened TTs Reported Incorrectly by DSSG
1		Aug 14 to Aug 20	110	160	113	273	58.6%		31.3%
2		Aug 21 to Aug 27	73	99	127	226	43.8%		26.3%
3		Aug 28 to Sept 3		Data was not available		Data was not available			
4		Sept 4 to Sept 10	70	110	117	227	48.5%	50.3%	36.4%
5		Sept 11 to Sept 17	79	160	138	298	53.7%		50.6%
6		Sept 18 to Sept 24	73	125	131	256	48.8%		41.6%
7		Sept 25 to Oct 1	75	139	145	284	48.9%		46.0%
8		Oct 2 to Oct 8	62	116	128	244	47.5%	49.8%	46.6%
9		Oct 9 to Oct 15	43	127	158	285	44.6%		66.1%
10		Oct 16 to Oct 22	89	164	119	283	58.0%		45.7%
11		Oct 23 to Oct 29	87	165	172	337	49.0%		47.3%
12		Oct 30 to Nov 5	95	181	125	306	59.2%	52.7%	47.5%
13		Nov 6 to Nov 12	90	161	133	294	54.8%		44.1%
14		Nov 13 to Nov 19	60	127	136	263	48.3%		52.8%
15		Nov 20 to Nov 26	64	127	77	204	62.3%		49.6%
16		Nov 27 to Dec 2	112	219	156	375	58.4%	55.9%	48.9%
		Totals:	1182	2180	1975	4155	52.3%	<< Average (4 Month Benchmark Value)	

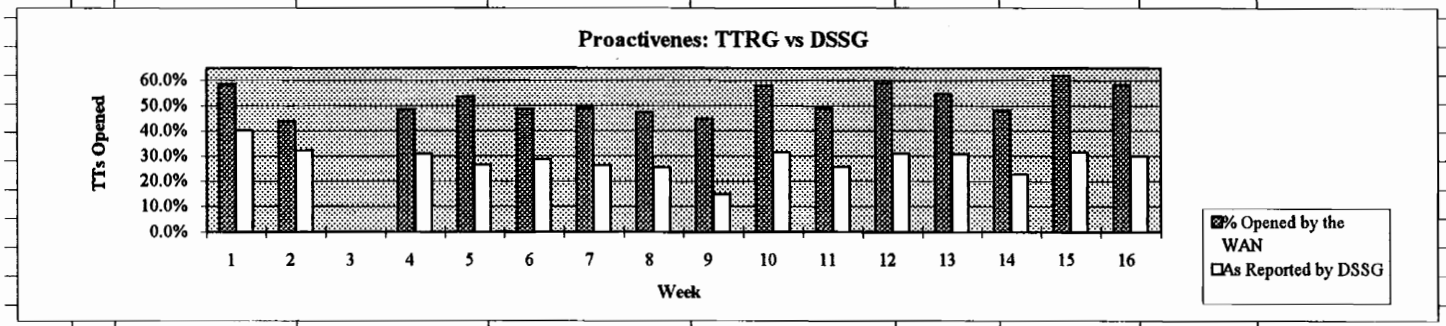
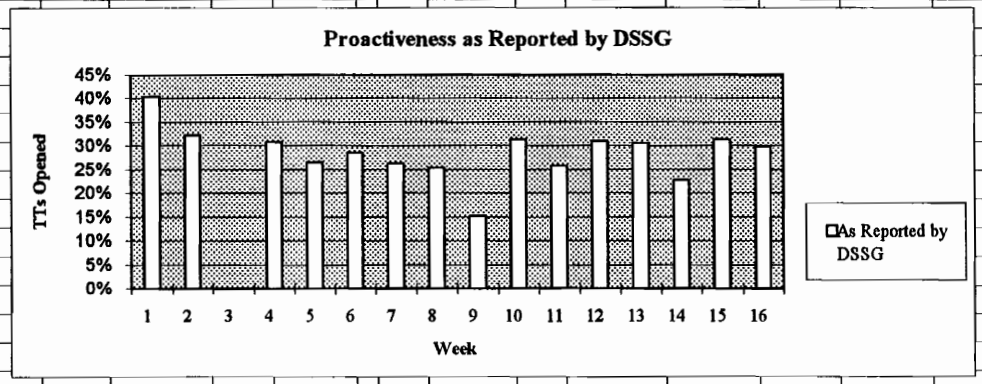


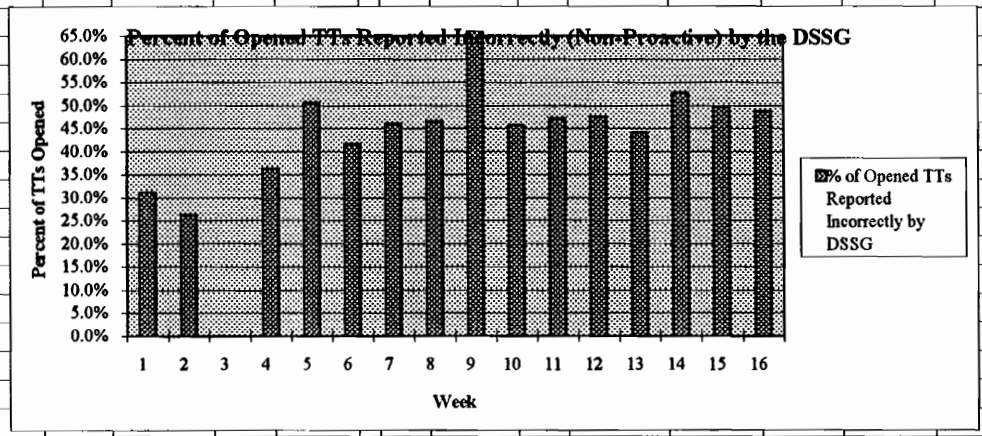
Figure 4.6a TTRG Proactiveness Level of Performance

DSSG Proactiveness Performance Data

Week	Proactiveness As Reported by DSSG
1	40%
2	32%
3	Data was not available
4	31%
5	27%
6	29%
7	26%
8	25%
9	15%
10	31%
11	26%
12	31%
13	31%
14	23%
15	31%
16	30%



TTRG Proactiveness Level of Performance as Reported by the DSSG



On the average, the DSSG opened 66.5 trouble tickets in error which equates to 41.5% of all trouble tickets opend.

Figure 4.6b Percent of Error TTs Reported Incorrectly by the DSSG as Non-Proactive

MTTR Statistical Data

The data set for the Collective MTTR index can be found in Appendix B Part 1. It's accuracy is consider high since the data was collected automatically by the TT tracking system. The MTTR values found in the third and fourth columns of Figure 4.7 were gotten from the TTRG's Statistical Data gathering group. The data set found in Part 1 of Appendix B is the same data set used by the TTRG Statistics group in calculating the MTTR values. The assumptions the TTRG Statistics employed in analyzing the data are the following:

1. Bad/Duplicate TTs were ignored (i.e., clear code = 702A, 602A and 102A)
2. New Circuit/Install/Turn-Up TTs were ignored (i.e., clear code = 104A and 704A)
3. All TTs appended to another TT (i.e., clear code = 103A)
4: TTs where the clear code is incorrect and the resolution is unknown were categorized as No Trouble Found and given a clear code of either 190A, 193A or 790A.

The Mean Time To Repair is an important factor for the Frame Relay service provider. It is one of the key factors in describing the performance of the Frame Relay TTRG and the Test center and to a lesser extent the performance of other participating groups. As currently define, the MTTR represents "the time required to return a circuit to full service" or as implemented, the time accrued from when the TT was opened to when it was closed. The Collective MTTR value is pulled from the TT's WAN-Caused-Outage attribute. There some concerns with the validity of the MTTR data. During busy periods TTs are neglected and the WAN-Caused-Outage time suffers and guidelines for when a TT should be placed on Customer-Caused-Outage time are at times not followed. Theoretically, every TT has a true WAN-Caused-Outage and Customer-Caused-Outage time. Unfortunately, to determine these values the TT's log must be reviewed after it has been closed using strict guide lines spelling out when it is valid to place a TT on Customer-Caused-Outage time. Even then, the event log may be incomplete. To conduct such a program would be a very time consuming and costly endeavor, when considering the number of TTs (approximately 350 to 400) now opened per month. In addition, the MTTR value does not include the elapse (or "dead time") time from when the outage started to when a TT was open. This is very important, because if the field data (see Appendix B Part 2) for the 25 Minute Proactive index is taken into account, the MTTR value would increase by an average of 30 minutes. A significant increase (i.e., 21%) when the Collective MTTR goal of the Frame Relay provider is 2 hours. The error and

uncertainty involved in obtaining an accurate MTTR illustrates that perhaps this performance index may not be as important as other performance indices. Taking this approach, a lower weighting value for the Collective MTTR score may be justified.

The Collective MTTR values gathered during the study period have been plotted for each week (see Figure 4.7). To assist in smoothing out the peaks and valleys of the data, a four week "running average" calculation of the data was added. From the "running average" calculation, it is clear that the Collective MTTR has worsened over time by approximately 14 minutes to a level of 2 hours and 18 minutes. Using the Linear Regression[4] technique to obtain a "best fit" line ($Y = mX + b$) of the data, the slope of the line calculated to be positive (i.e., $m = .021$ $b = 2.02$) further indicating an overall increase in the MTTR score from August 1994 to December 1994.

The impact of the improvement programs outline in Section 3.1.1 had little to no affect on improving the Collective MTTR score. However, because the improvement programs improved the readability of the TT and standardized the use of the clear codes the accuracy of the raw data for calculating the MTTR index has improved. What is seen as a worsening MTTR score from August 1994 to December 1994 may in fact be the results of higher accuracy in the raw data.

[4]Linear Regression analysis was performed on a Hewlett Packaged 11C calculator using the lease squares method

Collective Mean Time To Repair (MTTR) Statisical Data

Week	Week Of:	Average MTTR (hr:min)	Average MTTR (hr)			hr:min
1	Aug 14 to Aug 20	2:28	2.47			
2	Aug 21 to Aug 27	1:37	1.61			
3	Aug 28 to Sept 3	Data not available			4 Week Running	
4	Sept 4 to Sept 10	2:01	2.02		Average =	2:02
5	Sept 11 to Sept 17	2:11	2.18			
6	Sept 18 to Sept 24	2:02	2.03			
7	Sept 25 to Oct 1	2:02	2.03		4 Week Running	
8	Oct 2 to Oct 8	2:05	2.08		Average =	2:05
9	Oct 9 to Oct 15	2:04	2.07			
10	Oct 16 to Oct 22	2:22	2.37			
11	Oct 23 to Oct 29	2:25	2.42		4 Week Running	
12	Oct 31 to Nov 5	2:21	2.35		Average =	2:18
13	Nov 6 to Nov 12	2:53	2.88			
14	Nov 13 to Nov 19	2:04	2.07			
15	Nov 20 to Nov 26	2:00	2.00		4 Week Running	
16	Nov 27 to Dec 2	2:15	2.25		Average =	2:18
			2.19	<= Average (4 Month Benchmark Value)		

Hewlett Packard 11C calculator
Linear Regression analysis using the lease squares method to calculate:
Slope = 0.021
Y-Intercept = 2.02

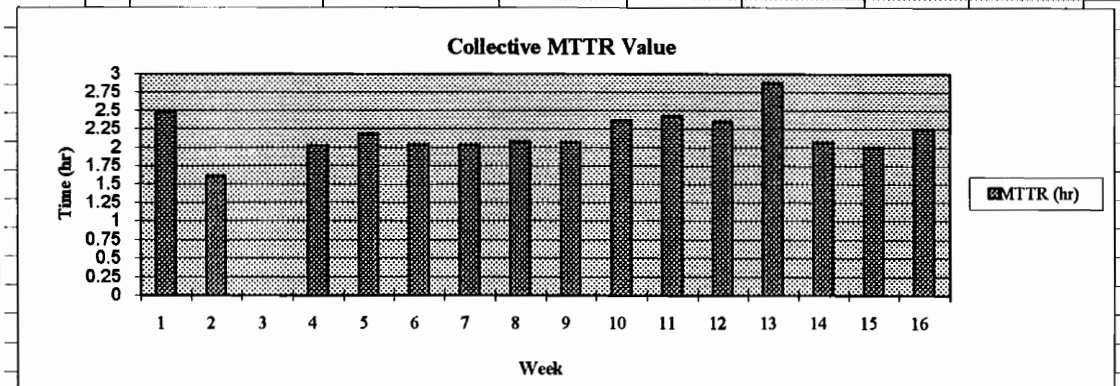


Figure 4.7 MTTR Performance Chart

25 Minute Proactive Statistical Data

Because of the manor in which data was collected for the 25 Minute Proactive index, its accuracy remains questionable. The data set includes samples taken during the day (most active) and during the evening (moderately active). It does not include the night shift, a time when the network is the least active. The data set for the 25 Minute Proactive index can be found in Appendix B Part 2. Figure 4.8 illustrates the performance rate at which the Proactive group opened TTs within a 25 minute time frame. Not all the TTs opened during the day and afternoon shifts were recorded. At the time that this data was collected the TTRG averaged approximately 320 tickets per week or 46 tickets per day.

The long term goal set by management stated that no fewer than 60% of all proactive TTs opened should fall within the "TT opening time frame". From Figure 4.8, one can see a gradual improvement in the index (i.e., 3 week average). The reason for the low performance can be contributed to two things. The first being the number of people performing the proactive job. At the time the data was collect there was only one proactive person. Observations made of the Proactive monitoring processes have determined that it takes on the average 25 minutes (grace period + 10 minutes) to open one proactive TT. Ideally, one person being proactive can open approximately 20 tickets in an eight hour day. If for example, four circuits go down at about the same time (which is not an uncommon occurrence), by the time the proactive person honors the grace and opens the third TT it is already 45 minutes into the outage and by the fourth ticket, 55 minutes. If the current outage monitoring and TT opening systems are to used, then to improve and sustain the 25 Minute Proactiveness index at the 60% mark would require two full time proactive people during both the day and evening shifts. During the night shift the grace time can be made longer if a large number of the installed frame relay circuits are non-critical to the customer at night. The second contributor is that the monitoring system and the TT opening system do not interact with one another. If a outage is reported by the monitoring system the proactive person is unable to quickly discern whether a TT has already been opened. Instead, the trouble shooter has to obtain the circuit ID from the proactive monitoring system and enter it into the TT tacking system. Although it is a fairly simple process it is distracting and takes time none the less. An ideal system would automatically scan the TTTS for open TTs. If a TT is not found the monitoring system would notify the operator that a TT is needed or better yet

automatically opens a TT in the DSSG's bucket. Management is currently investigating how the monitoring system can best integrated with the TTTS.

TTRG Performance Tracking Charts

The Northern Telecom methodology was applied to construct the charts found in Figures 4.9a to 4.9p. For each index the TTRG's "average"[5] level of operation was associated with the score level of 3. The intermediate performance levels 4 to 9 can be thought of as mini goals. The score of 10 can be viewed as the long term goal of the group. Selection of the time frame for the long term goal is important. Enough time should be given so that new improvement procedures and process have time to take effect. The group's vision should be on the long term goal, and it's immediate emphasis should be on achieving and retaining the mid term goals. Remember, the long term goal represents perfection or utopia and should be viewed as something to strive for, but, not necessarily to obtain. Scores of 2, 1 and 0 account for the occasional slack periods or disruption in the group (i.e., loss of personnel). A linear scale is used to create the score levels. That is, the numerical distance from between each score level is the same.

Since the goal is to create a single performance score from all the indices, each indicator is given a weighted numerical value that represents relative importance as defined by management or the design team. Because the Collective MTTR indicator is valued higher by management, it was given a weight (i.e., .40) twice as large as the other three. The remaining three performance factors were given weights equal to each another (i.e., .20). With this weight scheme, no one index dominates the resulting score. The sum of all the weights should equal one. Deciding the relative importance of the indicators and assigning a representative weight is an important step in the design process. A consensus is required. The relative importance among indicators will dictate how resources are used to better the group's performance in one area verses another.

[5]The performance levels used in Figures 2.9a to 2.9p for the scoring position of 3 were derived from past data (in considering the Collective MTTR index) and from what was perceived (gut feeling) at the time to be the TTRGs average level of performance (in considering the other three indices).

25 Minute Proactive Statisical Data

Week	Week Of:	Noof Proactive Trouble Tickets	No of TTs Opened Within the 25 Minute Grace Period	Percent Opened in 25 Minutes		
1	Feb 13 to Feb 19	31	10	32.3%		
2	Feb 20 to Feb 26	16	4	25.0%	3 Week Running	
3	Feb 27 to Mar 5	41	7	17.1%	Average >	25%
4	Mar 6 to Mar 12	40	17	42.5%		
5	Mar 13 to Mar 19	47	16	34.0%	3 Week Running	
6	Mar 20 to Mar 26	57	25	43.9%	Average >	40%
				32.5%	<< Average (6 Week Benchmark Value)	

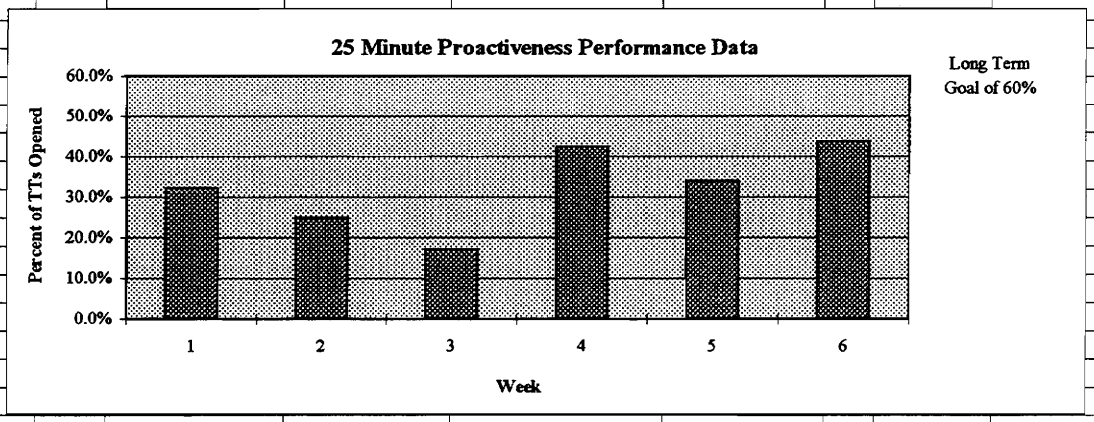


Figure 4.8 25 Minute Proactiveness Performance Chart

At the end of each monitoring period, the data is gathered and the results plotted. Corresponding performance scores are enter and the resultant multi-indicator score calculated. Over time, the multi-indicator score is tracked and only a consistent movement of the score in a positive fashion represents improvement in the group's performance . Scores which consistently "bounce" from high to low over long periods indicate that the system is unstable. Small "bounces" couple with steady improvement in the overall score represents a system more in control than out of control. A steady positive progression, such that the running average is constantly improving, with little variation among the overall score is an ideal situation and indicates that the system is in control.

TTRG Performance Tracking Chart

Frame Relay Trouble Ticket Resolution Group (TTRG) Week: 1

No. of TTs With Incorrect Clear Code / Total TTs Closed	TTs Opened Proactively / Total TTs Opened	Collective MTTR	No. of TTs Opened Within 25 Minutes / Total TTs Opened	
21.6%	58.6%	2:28	32.5%	<< Weekly Performance Level
0 to 6	70+	0:00 to 1:38	90+	10 << Long Term Goal
7 to 9	67 to 69	1:39 to 1:44	81 to 89	9
10 to 12	64 to 66	1:45 to 1:50	72 to 80	8
13 to 15	61 to 63	1:51 to 1:56	63 to 71	7
16 to 18	58 to 60	1:57 to 2:02	54 to 62	6
19 to 21	55 to 57	2:03 to 2:08	45 to 53	5
22 to 24	51 to 54	2:09 to 2:14	36 to 44	4
25 to 27	48 to 50	2:15 to 2:20	27 to 35	3 << Current Level of Operation **
28 to 30	45 to 47	2:21 to 2:26	18 to 26	2
31 to 33	42 to 44	2:27 to 2:32	9 to 17	1
34+	41-	2:33 +	0 to 8	0
5	6	1	3	<< Score
0.2	0.2	0.4	0.2	<< Weight
1	1.2	0.4	0.6	Computed Value > 3.2
2	2	4	2	<< Target Scores
				Target Value >> 10.0

Scores

Week	Wt. Score
1	3.2
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	

** (Avg of Weeks 1, 2, & 3)

Note: In computing the weighted performance value, it is important that the data for each index is collected during the same time period. For this chart, the average value of the 25 Minute Proactiveness is used since the data collected for this index was at a different time then the other indices.

Figure 4.9a TTRG Performance Tracking Chart: Week 1

TTRG Performance Tracking Chart

Frame Relay Trouble Ticket Resolution Group (TTRG) Week: 2

No. of TTs With Incorrect Clear Code / Total TTs Closed	TTs Opened Proactively / Total TTs Opened	Collective MTTR	No. of TTs Opened Within 25 Minutes / Total TTs Opened	
27.4%	43.8%	1:37	32.5%	<< Weekly Performance Level
0 to 6	70+	0:00 to 1:38	90+	10 << Long Term Goal
7 to 9	67 to 69	1:39 to 1:44	81 to 89	9
10 to 12	64 to 66	1:45 to 1:50	72 to 80	8
13 to 15	61 to 63	1:51 to 1:56	63 to 71	7
16 to 18	58 to 60	1:57 to 2:02	54 to 62	6
19 to 21	55 to 57	2:03 to 2:08	45 to 53	5
22 to 24	51 to 54	2:09 to 2:14	36 to 44	4
25 to 27	48 to 50	2:15 to 2:20	27 to 35	3 << Current Level of Operation **
28 to 30	45 to 47	2:21 to 2:26	18 to 26	2
31 to 33	42 to 44	2:27 to 2:32	9 to 17	1
34+	41-	2:33 +	0 to 8	0
3	1	10	3	<< Score
0.2	0.2	0.4	0.2	<< Weight
0.6	0.2	4	0.6	Computed Value > 5.4
2	2	4	2	<< Target Scores
				Target Value >> 10.0

Scores

Week	Wt. Score
1	3.2
2	5.4
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	

** (Avg of Weeks 1, 2, & 3)

Note: In computing the weighted performance value, it is important that the data for each index is collected during the same time period. For this chart, the average value of the 25 Minute Proactiveness is used since the data collected for this index was at a different time then the other indices.

Figure 4.9b TTRG Performance Tracking Chart: Week 2

TTRG Performance Tracking Chart

Frame Relay Trouble Ticket Resolution Group (TTRG) Week: 3

No. of TTs With Incorrect Clear Code / Total TTs Closed	TTs Opened Proactively / Total TTs Opened	Collective MTTR	No. of TTs Opened Within 25 Minutes / Total TTs Opened	
N/A	N/A	N/A	32.5%	<< Weekly Performance Level
0 to 6	70+	0:00 to 1:38	90+	10 << Long Term Goal
7 to 9	67 to 69	1:39 to 1:44	81 to 89	9
10 to 12	64 to 66	1:45 to 1:50	72 to 80	8
13 to 15	61 to 63	1:51 to 1:56	63 to 71	7
16 to 18	58 to 60	1:57 to 2:02	54 to 62	6
19 to 21	55 to 57	2:03 to 2:08	45 to 53	5
22 to 24	51 to 54	2:09 to 2:14	36 to 44	4
25 to 27	48 to 50	2:15 to 2:20	27 to 35	3 << Current Level of Operation **
28 to 30	45 to 47	2:21 to 2:26	18 to 26	2
31 to 33	42 to 44	2:27 to 2:32	9 to 17	1
34+	41-	2:33 +	0 to 8	0
0	0	0	3	<< Score
0.2	0.2	0.4	0.2	<< Weight
0	0	0	0.6	Computed Value > 0.6
2	2	4	2	<< Target Scores
				Target Value >> 10.0

Scores

Week	Wt. Score	
1	3.2	
2	5.8	
3	N/A	***
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		

** (Avg of Weeks 1, 2, & 3)

*** **Data was not available**

Note: In computing the weighted performance value, it is important that the data for each index is collected during the same time period. For this chart, the average value of the 25 Minute Proactiveness is used since the data collected for this index was at a different time then the other indices.

Figure 4.9c TTRG Performance Tracking Chart: Week 3

TTRG Performance Tracking Chart

Frame Relay Trouble Ticket Resolution Group (TTRG) Week: 4

No. of TTs With Incorrect Clear Code / Total TTs Closed	TTs Opened Proactively / Total TTs Opened	Collective MTTR	No. of TTs Opened Within 25 Minutes / Total TTs Opened	Scores	
21.6%	48.5%	2:01	32.5%		<< Weekly Performance Level
0 to 6	70+	0:00 to 1:38	90+	10	<< Long Term Goal
7 to 9	67 to 69	1:39 to 1:44	81 to 89	9	
10 to 12	64 to 66	1:45 to 1:50	72 to 80	8	
13 to 15	61 to 63	1:51 to 1:56	63 to 71	7	
16 to 18	58 to 60	1:57 to 2:02	54 to 62	6	
19 to 21	55 to 57	2:03 to 2:08	45 to 53	5	
22 to 24	51 to 54	2:09 to 2:14	36 to 44	4	
25 to 27	48 to 50	2:15 to 2:20	27 to 35	3	<< Current Level of Operation **
28 to 30	45 to 47	2:21 to 2:26	18 to 26	2	
31 to 33	42 to 44	2:27 to 2:32	9 to 17	1	
34+	41-	2:33 +	0 to 8	0	
5	3	6	3		<< Score
0.2	0.2	0.4	0.2		<< Weight
1	0.6	2.4	0.6		Computed Value > 4.6
2	2	4	2		<< Target Scores
					Target Value >> 10.0

Week	Wt. Score
1	0.32
2	5.4
3	N/A
4	4.6
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	

** (Avg of Weeks 1, 2, & 3)

Note: In computing the weighted performance value, it is important that the data for each index is collected during the same time period. For this chart, the average value of the 25 Minute Proactiveness is used since the data collected for this index was at a different time then the other indices.

Figure 4.9d TTRG Performance Tracking Chart: Week 4

TTRG Performance Tracking Chart

Frame Relay Trouble Ticket Resolution Group (TTRG) Week: 5

No. of TTs With Incorrect Clear Code / Total TTs Closed	TTs Opened Proactively / Total TTs Opened	Collective MTTR	No. of TTs Opened Within 25 Minutes / Total TTs Opened	Scores	
22.8%	53.7%	2:11	32.0%	<< Weekly Performance Level	
0 to 6	70+	0:00 to 1:38	90+	10	<< Long Term Goal
7 to 9	67 to 69	1:39 to 1:44	81 to 89	9	
10 to 12	64 to 66	1:45 to 1:50	72 to 80	8	
13 to 15	61 to 63	1:51 to 1:56	63 to 71	7	
16 to 18	58 to 60	1:57 to 2:02	54 to 62	6	
19 to 21	55 to 57	2:03 to 2:08	45 to 53	5	
22 to 24	51 to 54	2:09 to 2:14	36 to 44	4	
25 to 27	48 to 50	2:15 to 2:20	27 to 35	3	<< Current Level of Operation **
28 to 30	45 to 47	2:21 to 2:26	18 to 26	2	
31 to 33	42 to 44	2:27 to 2:32	9 to 17	1	
34+	41-	2:33 +	0 to 8	0	
4	4	4	3	<< Score	
0.2	0.2	0.4	0.2	<< Weight	
0.8	0.8	1.6	0.6	Computed Value >	3.8
2	2	4	2	<< Target Scores	
				Target Value >>	10.0

Week	Wt. Score
1	3.2
2	5.4
3	N/A
4	4.6
5	3.8
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	

** (Avg of Weeks 1, 2, & 3)

Note: In computing the weighted performance value, it is important that the data for each index is collected during the same time period. For this chart, the average value of the 25 Minute Proactiveness is used since the data collected for this index was at a different time then the other indices.

Figure 4.9e TTRG Performance Tracking Chart: Week 5

TTRG Performance Tracking Chart

Frame Relay Trouble Ticket Resolution Group (TTRG) Week: 6

No. of TTs With Incorrect Clear Code / Total TTs Closed	TTs Opened Proactively / Total TTs Opened	Collective MTTR	No. of TTs Opened Within 25 Minutes / Total TTs Opened	
25.0%	48.8%	2:02	32.5%	<< Weekly Performance Level
			Scores	
0 to 6	70+	0:00 to 1:38	90+	10 << Long Term Goal
7 to 9	67 to 69	1:39 to 1:44	81 to 89	9
10 to 12	64 to 66	1:45 to 1:50	72 to 80	8
13 to 15	61 to 63	1:51 to 1:56	63 to 71	7
16 to 18	58 to 60	1:57 to 2:02	54 to 62	6
19 to 21	55 to 57	2:03 to 2:08	45 to 53	5
22 to 24	51 to 54	2:09 to 2:14	36 to 44	4
25 to 27	48 to 50	2:15 to 2:20	27 to 35	3 << Current Level of Operation **
28 to 30	45 to 47	2:21 to 2:26	18 to 26	2
31 to 33	42 to 44	2:27 to 2:32	9 to 17	1
34+	41-	2:33 +	0 to 8	0
3	3	6	3	<< Score
0.2	0.2	0.4	0.2	<< Weight
0.6	0.6	2.4	0.6	Computed Value > 4.2
2	2	4	2	<< Target Scores
				Target Value >> 10.0

Week	Wt. Score
1	3.2
2	5.4
3	N/A
4	4.6
5	3.8
6	4.2
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	

** (Avg of Weeks 1, 2, & 3)

Note: In computing the weighted performance value, it is important that the data for each index is collected during the same time period. For this chart, the average value of the 25 Minute Proactiveness is used since the data collected for this index was at a different time then the other indices.

Figure 4.9f TTRG Performance Tracking Chart: Week 6

TTRG Performance Tracking Chart

Frame Relay Trouble Ticket Resolution Group (TTRG) Week: 7

No. of TTs With Incorrect Clear Code / Total TTs Closed	TTs Opened Proactively / Total TTs Opened	Collective MTTR	No. of TTs Opened Within 25 Minutes / Total TTs Opened	
25.7%	48.9%	2:02	32.5%	<< Weekly Performance Level
				Scores
0 to 6	70+	0:00 to 1:38	90+	10 << Long Term Goal
7 to 9	67 to 69	1:39 to 1:44	81 to 89	9
10 to 12	64 to 66	1:45 to 1:50	72 to 80	8
13 to 15	61 to 63	1:51 to 1:56	63 to 71	7
16 to 18	58 to 60	1:57 to 2:02	54 to 62	6
19 to 21	55 to 57	2:03 to 2:08	45 to 53	5
22 to 24	51 to 54	2:09 to 2:14	36 to 44	4
25 to 27	48 to 50	2:15 to 2:20	27 to 35	3 << Current Level of Operation **
28 to 30	45 to 47	2:21 to 2:26	18 to 26	2
31 to 33	42 to 44	2:27 to 2:32	9 to 17	1
34+	41-	2:33 +	0 to 8	0
3	3	6	3	<< Score
0.2	0.2	0.4	0.2	<< Weight
0.6	0.6	2.4	0.6	Computed Value > 4.2
2	2	4	2	<< Target Scores
				Target Value >> 10.0

Week	Wt. Score
1	3.2
2	5.4
3	N/A
4	4.6
5	3.8
6	4.2
7	4.2
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
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** (Avg of Weeks 1, 2, & 3)

Note: In computing the weighted performance value, it is important that the data for each index is collected during the same time period. For this chart, the average value of the 25 Minute Proactiveness is used since the data collected for this index was at a different time then the other indices.

Figure 4.9g TTRG Performance Tracking Chart: Week 7

TTRG Performance Tracking Chart

Frame Relay Trouble Ticket Resolution Group (TTRG) Week: 8

No. of TTs With Incorrect Clear Code / Total TTs Closed	TTs Opened Proactively / Total TTs Opened	Collective MTTR	No. of TTs Opened Within 25 Minutes / Total TTs Opened	
20.9%	47.5%	2:05	32.5%	<< Weekly Performance Level
0 to 6	70+	0:00 to 1:38	90+	10 << Long Term Goal
7 to 9	67 to 69	1:39 to 1:44	81 to 89	9
10 to 12	64 to 66	1:45 to 1:50	72 to 80	8
13 to 15	61 to 63	1:51 to 1:56	63 to 71	7
16 to 18	58 to 60	1:57 to 2:02	54 to 62	6
19 to 21	55 to 57	2:03 to 2:08	45 to 53	5
22 to 24	51 to 54	2:09 to 2:14	36 to 44	4
25 to 27	48 to 50	2:15 to 2:20	27 to 35	3 << Current Level of Operation **
28 to 30	45 to 47	2:21 to 2:26	18 to 26	2
31 to 33	42 to 44	2:27 to 2:32	9 to 17	1
34+	41-	2:33 +	0 to 8	0
				Scores
5	2	5	3	<< Score
0.2	0.2	0.4	0.2	<< Weight
1	0.4	2	0.6	Computed Value > 4
2	2	4	2	<< Target Scores
				Target Value >> 10.0

Week	Wt. Score
1	3.2
2	5.4
3	N/A
4	4.6
5	3.8
6	4.2
7	4.2
8	4.0
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
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25	
26	

** (Avg of Weeks 1, 2, & 3)

Note: In computing the weighted performance value, it is important that the data for each index is collected during the same time period. For this chart, the average value of the 25 Minute Proactiveness is used since the data collected for this index was at a different time then the other indices.

Figure 4.9h TTRG Performance Tracking Chart: Week 8

TTRG Performance Tracking Chart

Frame Relay Trouble Ticket Resolution Group (TTRG) Week: 9

No. of TTs With Incorrect Clear Code / Total TTs Closed	TTs Opened Proactively / Total TTs Opened	Collective MTTR	No. of TTs Opened Within 25 Minutes / Total TTs Opened	
22.8%	44.6%	2:04	32.5%	<< Weekly Performance Level
				Scores
0 to 6	70+	0:00 to 1:38	90+	10 << Long Term Goal
7 to 9	67 to 69	1:39 to 1:44	81 to 89	9
10 to 12	64 to 66	1:45 to 1:50	72 to 80	8
13 to 15	61 to 63	1:51 to 1:56	63 to 71	7
16 to 18	58 to 60	1:57 to 2:02	54 to 62	6
19 to 21	55 to 57	2:03 to 2:08	45 to 53	5
22 to 24	51 to 54	2:09 to 2:14	36 to 44	4
25 to 27	48 to 50	2:15 to 2:20	27 to 35	3 << Current Level of Operation **
28 to 30	45 to 47	2:21 to 2:26	18 to 26	2
31 to 33	42 to 44	2:27 to 2:32	9 to 17	1
34+	41-	2:33 +	0 to 8	0
4	1	5	3	<< Score
0.2	0.2	0.4	0.2	<< Weight
0.8	0.2	2	0.6	Computed Value > 3.6
2	2	4	2	<< Target Scores
				Target Value >> 10.0

Week	Wt. Score
1	3.2
2	5.4
3	N/A
4	4.6
5	3.8
6	4.2
7	4.2
8	4.0
9	3.6
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	

** (Avg of Weeks 1, 2, & 3)

Note: In computing the weighted performance value, it is important that the data for each index is collected during the same time period. For this chart, the average value of the 25 Minute Proactiveness is used since the data collected for this index was at a different time then the other indices.

Figure 4.9i TTRG Performance Tracking Chart: Week 9

TTRG Performance Tracking Chart

Frame Relay Trouble Ticket Resolution Group (TTRG) Week: 10

No. of TTs With Incorrect Clear Code / Total TTs Closed	TTs Opened Proactively / Total TTs Opened	Collective MTTR	No. of TTs Opened Within 25 Minutes / Total TTs Opened	Scores	
31.1%	58.0%	2:22	32.5%		<< Weekly Performance Level
0 to 6	70+	0:00 to 1:38	90+	10	<< Long Term Goal
7 to 9	67 to 69	1:39 to 1:44	81 to 89	9	
10 to 12	64 to 66	1:45 to 1:50	72 to 80	8	
13 to 15	61 to 63	1:51 to 1:56	63 to 71	7	
16 to 18	58 to 60	1:57 to 2:02	54 to 62	6	
19 to 21	55 to 57	2:03 to 2:08	45 to 53	5	
22 to 24	51 to 54	2:09 to 2:14	36 to 44	4	
25 to 27	48 to 50	2:15 to 2:20	27 to 35	3	<< Current Level of Operation **
28 to 30	45 to 47	2:21 to 2:26	18 to 26	2	
31 to 33	42 to 44	2:27 to 2:32	9 to 17	1	
34+	41-	2:33 +	0 to 8	0	
1	6	2	3		<< Score
0.2	0.2	0.4	0.2		<< Weight
0.2	1.2	0.8	0.6		Computed Value > 2.8
2	2	4	2		<< Target Scores
					Target Value >> 10.0

Week	Wt. Score
1	3.2
2	5.4
3	N/A
4	4.6
5	3.8
6	4.2
7	4.2
8	4.0
9	3.6
10	2.8
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	

** (Avg of Weeks 1, 2, & 3)

Note: In computing the weighted performance value, it is important that the data for each index is collected during the same time period. For this chart, the average value of the 25 Minute Proactiveness is used since the data collected for this index was at a different time then the other indices.

Figure 4.9j TTRG Performance Tracking Chart: Week 10

TTRG Performance Tracking Chart

Frame Relay Trouble Ticket Resolution Group (TTRG) Week: 11

No. of TTs With Incorrect Clear Code / Total TTs Closed	TTs Opened Proactively / Total TTs Opened	Collective MTTR	No. of TTs Opened Within 25 Minutes / Total TTs Opened		
13.1%	49.0%	2:25	32.5%	<< Weekly Performance Level	
				Scores	
0 to 6	70+	0:00 to 1:38	90+	10	<< Long Term Goal
7 to 9	67 to 69	1:39 to 1:44	81 to 89	9	
10 to 12	64 to 66	1:45 to 1:50	72 to 80	8	
13 to 15	61 to 63	1:51 to 1:56	63 to 71	7	
16 to 18	58 to 60	1:57 to 2:02	54 to 62	6	
19 to 21	55 to 57	2:03 to 2:08	45 to 53	5	
22 to 24	51 to 54	2:09 to 2:14	36 to 44	4	
25 to 27	48 to 50	2:15 to 2:20	27 to 35	3	<< Current Level of
28 to 30	45 to 47	2:21 to 2:26	18 to 26	2	Operation **
31 to 33	42 to 44	2:27 to 2:32	9 to 17	1	
34+	41-	2:33 +	0 to 8	0	
7	3	2	3	<< Score	
0.2	0.2	0.4	0.2	<< Weight	
1.4	0.6	0.8	0.6	Computed Value >	3.4
2	2	4	2	<< Target Scores	
				Target Value >>	10.0

Week	Wt. Score
1	3.2
2	5.4
3	N/A
4	4.6
5	3.8
6	4.2
7	4.2
8	4.0
9	3.6
10	2.8
11	3.4
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	

** (Avg of Weeks 1, 2, & 3)

Note: In computing the weighted performance value, it is important that the data for each index is collected during the same time period. For this chart, the average value of the 25 Minute Proactiveness is used since the data collected for this index was at a different time then the other indices.

Figure 4.9k TTRG Performance Tracking Chart: Week 11

TTRG Performance Tracking Chart

Frame Relay Trouble Ticket Resolution Group (TTRG) Week: 12

No. of TTs With Incorrect Clear Code / Total TTs Closed	TTs Opened Proactively / Total TTs Opened	Collective MTTR	No. of TTs Opened Within 25 Minutes / Total TTs Opened	Scores	
20.3%	59.2%	2:21	32.5%	<< Weekly Performance Level	
0 to 6	70+	0:00 to 1:38	90+	10	<< Long Term Goal
7 to 9	67 to 69	1:39 to 1:44	81 to 89	9	
10 to 12	64 to 66	1:45 to 1:50	72 to 80	8	
13 to 15	61 to 63	1:51 to 1:56	63 to 71	7	
16 to 18	58 to 60	1:57 to 2:02	54 to 62	6	
19 to 21	55 to 57	2:03 to 2:08	45 to 53	5	
22 to 24	51 to 54	2:09 to 2:14	36 to 44	4	
25 to 27	48 to 50	2:15 to 2:20	27 to 35	3	<< Current Level of Operation **
28 to 30	45 to 47	2:21 to 2:26	18 to 26	2	
31 to 33	42 to 44	2:27 to 2:32	9 to 17	1	
34+	41-	2:33 +	0 to 8	0	
5	6	2	3	<< Score	
0.2	0.2	0.4	0.2	<< Weight	
1	1.2	0.8	0.6	Computed Value > 3.6	
2	2	4	2	<< Target Scores	
				Target Value >> 10.0	

Week	Wt. Score
1	3.2
2	5.4
3	N/A
4	4.6
5	3.8
6	4.2
7	4.2
8	4.0
9	3.6
10	2.8
11	3.4
12	3.6
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	

** (Avg of Weeks 1, 2, & 3)

Note: In computing the weighted performance value, it is important that the data for each index is collected during the same time period. For this chart, the average value of the 25 Minute Proactiveness is used since the data collected for this index was at a different time then the other indices.

Figure 4.9l TTRG Performance Tracking Chart: Week 12

TTRG Performance Tracking Chart

Frame Relay Trouble Ticket Resolution Group (TTRG) Week: 13

No. of TTs With Incorrect Clear Code / Total TTs Closed	TTs Opened Proactively / Total TTs Opened	Collective MTTR	No. of TTs Opened Within 25 Minutes / Total TTs Opened	Scores	
16.3%	54.8%	2:53	32.5%		<< Weekly Performance Level
0 to 6	70+	0:00 to 1:38	90+	10	<< Long Term Goal
7 to 9	67 to 69	1:39 to 1:44	81 to 89	9	
10 to 12	64 to 66	1:45 to 1:50	72 to 80	8	
13 to 15	61 to 63	1:51 to 1:56	63 to 71	7	
16 to 18	58 to 60	1:57 to 2:02	54 to 62	6	
19 to 21	55 to 57	2:03 to 2:08	45 to 53	5	
22 to 24	51 to 54	2:09 to 2:14	36 to 44	4	
25 to 27	48 to 50	2:15 to 2:20	27 to 35	3	<< Current Level of Operation **
28 to 30	45 to 47	2:21 to 2:26	18 to 26	2	
31 to 33	42 to 44	2:27 to 2:32	9 to 17	1	
34+	41-	2:33 +	0 to 8	0	
6	4	0	3		<< Score
0.2	0.2	0.4	0.2		<< Weight
1.2	0.8	0	0.6		Computed Value > 2.6
2	2	4	2		<< Target Scores
					Target Value >> 10.0

Week	Wt. Score
1	3.2
2	5.4
3	N/A
4	4.6
5	3.8
6	4.2
7	4.2
8	4.0
9	3.6
10	2.8
11	3.4
12	3.6
13	2.6
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	

** (Avg of Weeks 1, 2, & 3)

Note: In computing the weighted performance value, it is important that the data for each index is collected during the same time period. For this chart, the average value of the 25 Minute Proactiveness is used since the data collected for this index was at a different time then the other indices.

Figure 4.9m TTRG Performance Tracking Chart: Week 13

TTRG Performance Tracking Chart

Frame Relay Trouble Ticket Resolution Group (TTRG) Week: 14

No. of TTs With Incorrect Clear Code / Total TTs Closed	TTs Opened Proactively / Total TTs Opened	Collective MTTR	No. of TTs Opened Within 25 Minutes / Total TTs Opened	Scores	
14.4%	48.3%	2:04	32.5%	<< Weekly Performance Level	
0 to 6	70+	0:00 to 1:38	90+	10	<< Long Term Goal
7 to 9	67 to 69	1:39 to 1:44	81 to 89	9	
10 to 12	64 to 66	1:45 to 1:50	72 to 80	8	
13 to 15	61 to 63	1:51 to 1:56	63 to 71	7	
16 to 18	58 to 60	1:57 to 2:02	54 to 62	6	
19 to 21	55 to 57	2:03 to 2:08	45 to 53	5	
22 to 24	51 to 54	2:09 to 2:14	36 to 44	4	
25 to 27	48 to 50	2:15 to 2:20	27 to 35	3	<< Current Level of Operation **
28 to 30	45 to 47	2:21 to 2:26	18 to 26	2	
31 to 33	42 to 44	2:27 to 2:32	9 to 17	1	
34+	41-	2:33 +	0 to 8	0	
7	3	5	3	<< Score	
0.2	0.2	0.4	0.2	<< Weight	
1.4	0.6	2	0.6	Computed Value > 4.6	
2	2	4	2	<< Target Scores	
				Target Value >> 10.0	

Week	Wt. Score
1	3.2
2	5.4
3	N/A
4	4.6
5	3.8
6	4.2
7	4.2
8	4.0
9	3.6
10	2.8
11	3.4
12	3.6
13	2.6
14	4.6
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	

** (Avg of Weeks 1, 2, & 3)

Note: In computing the weighted performance value, it is important that the data for each index is collected during the same time period. For this chart, the average value of the 25 Minute Proactiveness is used since the data collected for this index was at a different time then the other indices.

Figure 4.9n TTRG Performance Tracking Chart: Week 14

TTRG Performance Tracking Chart

Frame Relay Trouble Ticket Resolution Group (TTRG) Week: 15

No. of TTs With Incorrect Clear Code / Total TTs Closed	TTs Opened Proactively / Total TTs Opened	Collective MTTR	No. of TTs Opened Within 25 Minutes / Total TTs Opened	Scores	
16.7%	62.3%	2:00	32.5%		<< Weekly Performance Level
0 to 6	70+	0:00 to 1:38	90+	10	<< Long Term Goal
7 to 9	67 to 69	1:39 to 1:44	81 to 89	9	
10 to 12	64 to 66	1:45 to 1:50	72 to 80	8	
13 to 15	61 to 63	1:51 to 1:56	63 to 71	7	
16 to 18	58 to 60	1:57 to 2:02	54 to 62	6	
19 to 21	55 to 57	2:03 to 2:08	45 to 53	5	
22 to 24	51 to 54	2:09 to 2:14	36 to 44	4	
25 to 27	48 to 50	2:15 to 2:20	27 to 35	3	<< Current Level of Operation **
28 to 30	45 to 47	2:21 to 2:26	18 to 26	2	
31 to 33	42 to 44	2:27 to 2:32	9 to 17	1	
34+	41-	2:33 +	0 to 8	0	
6	7	6	3		<< Score
0.2	0.2	0.4	0.2		<< Weight
1.2	1.4	2.4	0.6		Computed Value > 5.6
2	2	4	2		<< Target Scores
					Target Value >> 10.0

Week	Wt. Score
1	3.2
2	5.4
3	N/A
4	4.6
5	3.8
6	4.2
7	4.2
8	4.0
9	3.6
10	2.8
11	3.4
12	3.6
13	2.6
14	4.6
15	5.6
16	
17	
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22	
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24	
25	
26	

** (Avg of Weeks 1, 2, & 3)

Note: In computing the weighted performance value, it is important that the data for each index is collected during the same time period. For this chart, the average value of the 25 Minute Proactiveness is used since the data collected for this index was at a different time then the other indices.

Figure 4.9o TTRG Performance Tracking Chart: Week 15

TTRG Performance Tracking Chart

Frame Relay Trouble Ticket Resolution Group (TTRG) Week: 16

No. of TTs With Incorrect Clear Code / Total TTs Closed	TTs Opened Proactively / Total TTs Opened	Collective MTTR	No. of TTs Opened Within 25 Minutes / Total TTs Opened		Scores
9.9%	58.4%	2:15	32.5%	<< Weekly Performance Level	
0 to 6	70+	0:00 to 1:38	90+		10
7 to 9	67 to 69	1:39 to 1:44	81 to 89		9
10 to 12	64 to 66	1:45 to 1:50	72 to 80		8
13 to 15	61 to 63	1:51 to 1:56	63 to 71		7
16 to 18	58 to 60	1:57 to 2:02	54 to 62		6
19 to 21	55 to 57	2:03 to 2:08	45 to 53		5
22 to 24	51 to 54	2:09 to 2:14	36 to 44		4
25 to 27	48 to 50	2:15 to 2:20	27 to 35		3
28 to 30	45 to 47	2:21 to 2:26	18 to 26		2
31 to 33	42 to 44	2:27 to 2:32	9 to 17		1
34+	41-	2:33 +	0 to 8		0
9	6	3	3	<< Score	
0.2	0.2	0.4	0.2	<< Weight	
1.8	1.2	1.2	0.6	Computed Value > 4.8	
2	2	4	2	<< Target Scores	
				Target Value >> 10.0	

<< Long Term Goal

<< Current Level of Operation **

Week	Wt. Score
1	3.2
2	5.4
3	N/A
4	4.6
5	3.8
6	4.2
7	4.2
8	4.0
9	3.6
10	2.8
11	3.4
12	3.6
13	2.6
14	4.6
15	5.6
16	4.8
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	

** (Avg of Weeks 1, 2, & 3)

Note: In computing the weighted performance value, it is important that the data for each index is collected during the same time period. For this chart, the average value of the 25 Minute Proactiveness is used since the data collected for this index was at a different time then the other indices.

Figure 4.9p TTRG Performance Tracking Chart: Week 16

TTRG Weighted Performance Score

Week	Week Of:	Weighted Performance Score		
1	Aug 14 to Aug 20	3.2		
2	Aug 21 to Aug 27	5.4		
3	Aug 28 to Sept 3	0.0	4 Week Running	
4	Sept 4 to Sept 10	4.6	Average =	4.4
5	Sept 11 to Sept 17	3.8		
6	Sept 18 to Sept 24	4.2		
7	Sept 25 to Oct 1	4.2	4 Week Running	
8	Oct 2 to Oct 8	4.0	Average =	4.1
9	Oct 9 to Oct 15	3.6		
10	Oct 16 to Oct 22	2.8		
11	Oct 23 to Oct 29	3.4	4 Week Running	
12	Oct 31 to Nov 5	3.6	Average =	3.4
13	Nov 6 to Nov 12	2.6		
14	Nov 13 to Nov 19	4.6		
15	Nov 20 to Nov 26	5.6	4 Week Running	
16	Nov 27 to Dec 2	4.8	Average =	4.4
	Average Score >>	4.0		

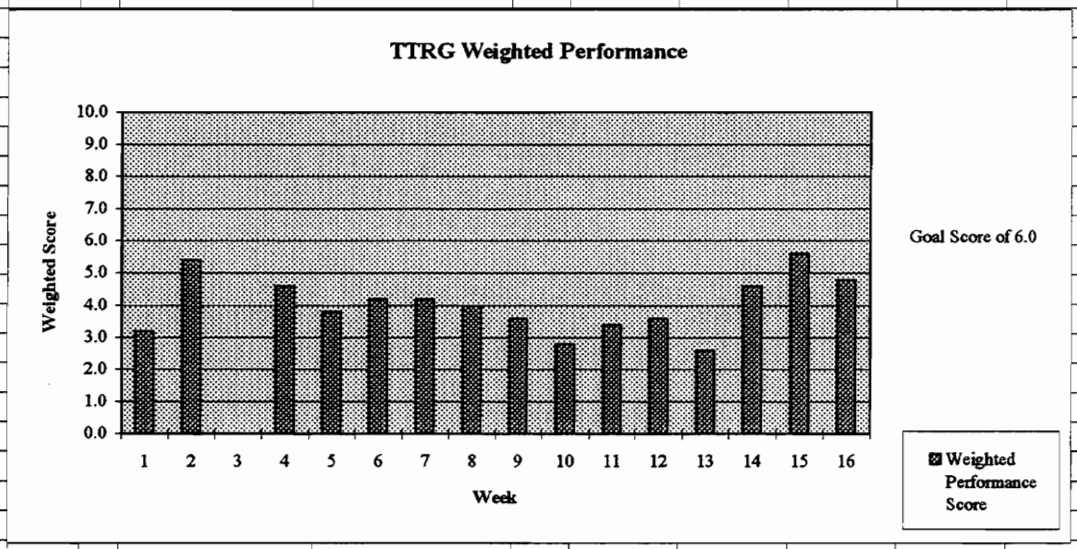

Figure 4.10 TTRG Weighted Performance Score

Scores calculated by the TTRG Performance Tracking Charts were gather and plotted for each week (see Figure 4.10). From Figure 4.10, there is no indication that the overall performance of the TTRG had improved from mid August to early December. On the contrary, Figure 4.10 indicates an unstable system whereby the group's score falls and raises weekly with no consistent trend to a positive score. On two occasions the overall score of the TTRG nearly met the long term goal of 6.0, only to drop below 5.0 the following weeks. With both the Clear Code and Proactiveness indices showing a steady improvement and the 25 Minute Proactiveness index constant, the MTTR indicator appears to be the cause of the overall lack of improvement.

The instability could be caused by any number of factors. One cause may be the change in the ratio of circuits-per-trouble shooter. Data supplied by the TTRG's Statistics group indicated that the number of personnel in the TTRG grew at approximately 6.25% while the number of new frame relay circuits grew by 47.63% (see Table 4.3). This represents a growth rate in the circuits-per-trouble shooter ratio of 38.95% (i.e., (47.63% - 6.25%) / 6.25%). Inevitably, an increase in new circuits will cause an increase in outages which must be serviced by a relatively smaller trouble shooting group. Yet another cause of the instability may be the poor performance of the network equipment, abnormally high fiber outages, holidays, new personnel, new switch software loads or new hardware. Events that may cause disturbances in the performance scores should be documented for comparison purposes.

Table 4.3 Trouble Shooter and Circuit Levels for the Frame Relay Group

Date	Trouble Shooters (TS)	No. of Active Circuits (Cr)	Cr/TS Ratio[6]
1 August 1994	16	4052	253.25 to 1
1 December 1994	17	5982	351.88 to 1
Growth in the Cr/TS Ratio:	38.95%		

As the network grows, a means is needed to compare the network's "status" in the past to it's "status" in the present. That is to say, in order to compare performance scores in the present to ones in the past, the circuit-per-trouble shooter ratio in the present should be the same as in the past (baring nothing else has changed such as personnel skill level, new

[6]The data was taken from an internal document of the WAN Provider.

procedures, better tools, etc.). Doing so ensures that apples are compared to apples and not oranges. Yet, what if the a new tool or new procedure is implemented such that it allows each trouble shooter to handle more TTs. Under this scenario, the circuit-per-trouble shooter ratio has risen to a new level and the network to a new "status". Then, a reassessment of the network's "status" in addition to the circuit-per-trouble shooter ratio is need to identify new "past-equivalent" levels.

4.5 Closing Remarks

Both the Clear Code and Proactiveness index's scores improved during the study period. Their improvement is likely attributed to the five process improvement programs. The 25 Minute Proactiveness index data set was incomplete due to difficulties in collecting the data, thus, an assessment of it's score is inconclusive. The Collective MTTR index score appears to have worsened during the study period. The cause is only speculative. However, one reason may be the growth of new circuits out pacing the growth of trouble shooters to service them (see Table 4.1). Yet another reasons may be that certain TTs with very high MTTR values (i.e., far from the rest of the data) are distorting the collective score. A simple solution would be to drop the perpetrators from the data set. The rational is that some uncontrollable event makes the values "non-typical". The decision to discard extreme data points should be well thought out, because, to do so is an easy solution to what may be a crucial problem. With the weighting scheme applied, the collective performance of the TTRG worsened. The influence of the Collective MTTR's index weight over the collective performance score is obvious.

The benefit of a multi-factor performance indexing methodology is it's organization, simplicity and versatility as a tools for tracking performance. The approach allows management to view a group's performance based on an array of specifically chosen factors verse one individual factor. It's weighting scheme allows management the ability to quantitatively stress one factors importance over another. Results are easily understood and management can quickly discern where resource for improvement are needed.

5 CONCLUSIONS

This report offers an alternative solution to the Performance Tracking System implemented at the Frame Relay Trouble Ticket Resolution Group. The report's findings identifies and outlines a performance tracking methodology that takes a comprehensive long term approach, uses weighted scoring and actively involves personnel with a direct stake in it's success. Because of it's simplicity, implementing the system would require minimum effort. Some training of the TTRG personnel on the methodology will be needed.

5.1 Major Findings

1. The Northern Telecom Performance Tracking and Scoring system offers a clear and concise methodology that is easy to understand and implement. It's simplicity and organization minimizes confusion, while, it's goals and results promote user involvement. Finally, it's versatility can accommodate change readily.

2. Eight new performance indices that directly relate to the TTRG system were identified. Collectively, they address the primary responsibilities of the TTRG and are a good representation of it's overall performance.

3. By recognizing the limitations of the resolution (i.e., clear) codes provided by the Data Services Division, a new robust TT resolution/fix coding scheme was developed. The new coding scheme was defined with the intention to satisfy the Frame Relay group's resolution granularity requirement and statistical gathering needs. Accompanying the new coding scheme was the creation of a working clear code reference chart for use by the TTRG. The chart proved instrumental in promoting the use of the new codes. The new resolution codes coupled with the "resolution line and fix code" improvement program were decisive in improving the accuracy of the clear code statistical data and in significantly lessening the time required to review a TT.

4. The flow chart of Appendix A represents that portion of the Fract-T1 trouble shooting process that is well define and thought out. It is sometimes referred to as the "science of trouble shooting". Critical points in the process were identified for possible performance monitoring and/or process stream lining. The other aspect of trouble shooting, the "art of trouble shooting", is for the most part not addressed in Appendix A. Skills for this aspect of trouble shooting tend to be found among the more experienced personnel (i.e., 2nd and 3rd Level) of the Frame Relay group and are a combination of the investigator's own intuitions and past experiences.

5. Benchmark values of 2.19 hours, 20.6%, 52.3%, and 32.5% were calculated for the Collective MTTR, Clear Code, TTRG Proactiveness and 25 Minute Proactiveness indices respectively. These values represent an average score for the period that the data was collected. The validity of the 25 Minute Proactiveness benchmark score is questionable since the data set used was not the recommended (Northern Telecom Methodology) three-to-four months worth.

6. Over the course of this investigation the performance of the TTRG in the Clear Code and TTRG Proactiveness indices steadily improved. This improvement occurred during a period where the growth of new circuits (47.63%) out ran the growth of trouble shooters (6.25%) in the TTRG by nearly eight fold. By December 1995, the circuit-per-troubleshooter ratio (or potential work load) had increased by 38.95%, from 253 to 352 circuits per trouble shooter. It is not entirely clear why the TTRG's performance improved. It may have been that the collective skill level of the group increased, or that the network's reliability improved or even that the new improvement programs/procedures worked. The network's performance during the study period was not investigated. However, all of 1994 and the first half of 1995 saw switch software upgrades that were less than smooth resulting in problems with the operational integrity of the switch and it's cards. Because, very few new people were hired during the months of August to December, it is safe to assumed that the collective skill level of the TTRG steadily increased. Finally, it is fair to say that the collective affect of the improvement programs on the TTRG's performance was more positive than negative. This is evident by the improvement of such indices as the Clear Code and TTRG Proactiveness.

7. The accuracy of the data collected was of primary concern. Procedures were defined and implemented to increase the data's accuracy. The results of these actions were three fold: (1) the number of errors in the data sets were significantly lowered, (2) the creditability of conclusions derived from the data set was raised, and (3) error rates for the Clear Code and TTRG Proactiveness indices were quantified.

8. Error rates for both the Clear Code and TTRG Proactiveness indices were identified (see Table 4.1). The steady improvement of the error rate for the Clear Code index can be attributed to the "resolution line and fix code" improvement procedures. It is suspected that the worsening of the TTRG Proactiveness error rate is related to DSSG personnel being poorly informed as to the importance of the Reported Source attribute (the attribute used to define the TTRG Proactiveness index) and the default settings of the ticketing system

9. Analysis of the collected data revealed that power related tickets account for approximately 6.63% of TTs opened. Further analysis indicated that 75.40% of the TTs closed as a customer power related problem were opened by the proactive monitoring group. These results reinforce the importance of the proactive group in identifying for the customer when their site losses power.

10. The importance of an automated data collection system on data accuracy should not be disregarded. Management should consider implementing an automated data collection system if data accuracy can be improved with equal or less effort. Tracking a performance index should not be postponed simply because an automated data collection system is not available. Management may have to forego the collection system in the interim and invest the extra manpower if the performance index is important enough (i.e., 25 Minute Proactive index).

11. There are a number of concerns with using the Collective MTTR as a TTRG performance indicator. The first and the most obvious reason is that it does not apply directly to the TTRG. The TTRG and at least two other groups contribute to the Collective MTTR's value. Secondly, the Collective MTTR is not an accurate value, but rather an interpretation. Guidelines do exist as to when a TT should be placed on Customer-Caused-Outage time. However, observations revealed that during busy periods

TTs do get neglected and the WAN-Caused-Outage time suffers. On the other hand, because the MTTR is highly watched, some technicians knowingly place the TT on Customer-Caused-Outage to "help" lower the MTTR. Thirdly, management does not include the grace time (i.e., time spent waiting for the circuit to recover prior to opening a TT) in it's calculation of the Collective MTTR. With the grace period averaging 30 minutes or 20% of the MTTR goal, to not include this time in the Collective MTTR calculation is misleading to the customer, WAN personnel, and management. The error and uncertainty involved in obtaining an accurate MTTR value illustrates that perhaps this performance index may not be as important as other performance indices. Taking this approach, a lower weighting value for the Collective MTTR score may be justified.

5.2 Recommended Future Study

1. The approach taken in this report could easily be expanded to include an analysis of the Full-T1 and Backbone type trouble tickets.

2. By addressing cost and cost related factors, this report could be further expanded to include an analysis of Productivity.

3. Finally, the Test, Data Services Support, 2nd Level TTRG groups could use the approach outlined in this report to measure, track and score their own performance.

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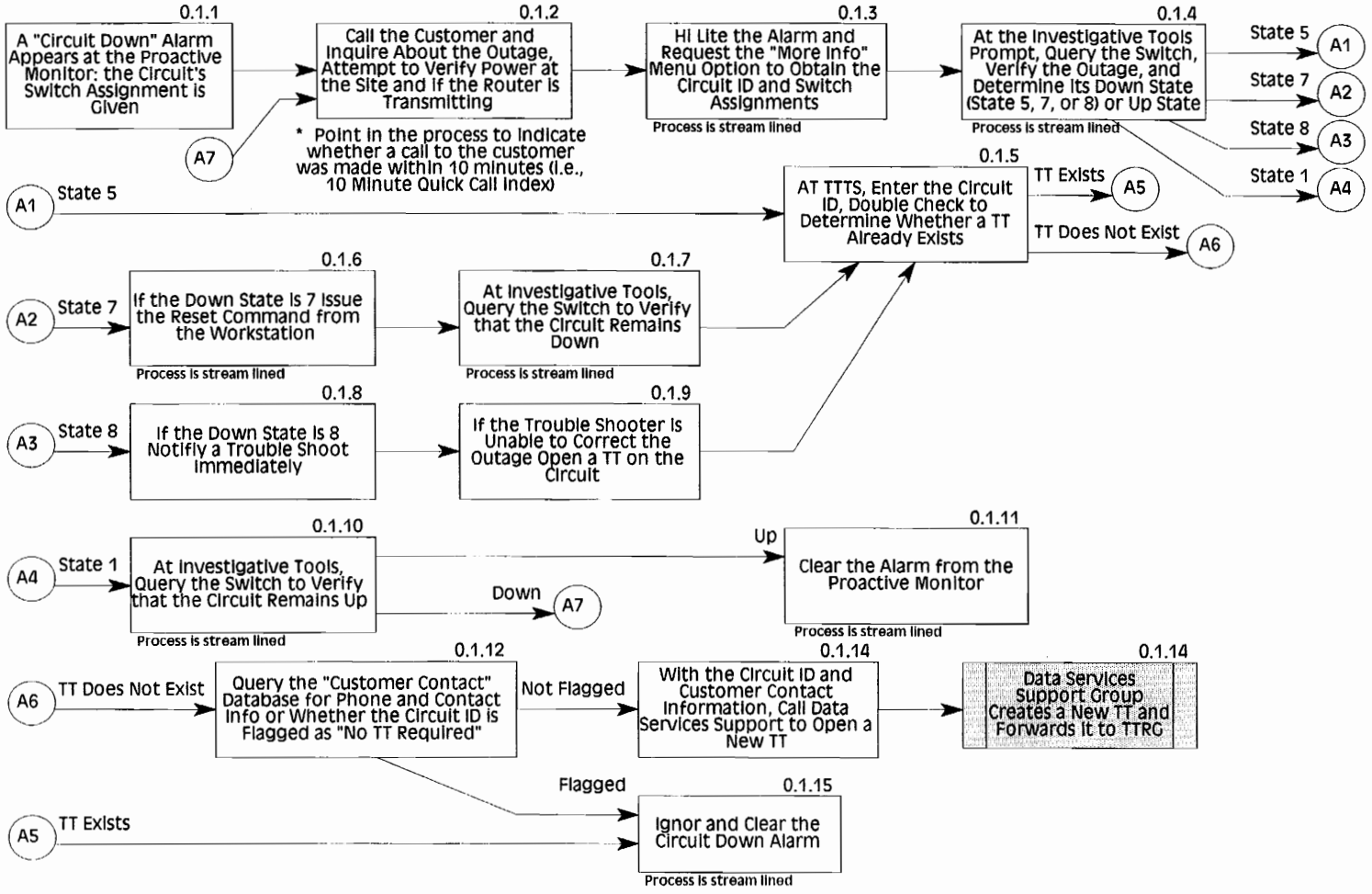
APPENDIX A

Functional Flow Analysis of the Fractional T1 Outage Resolution Process

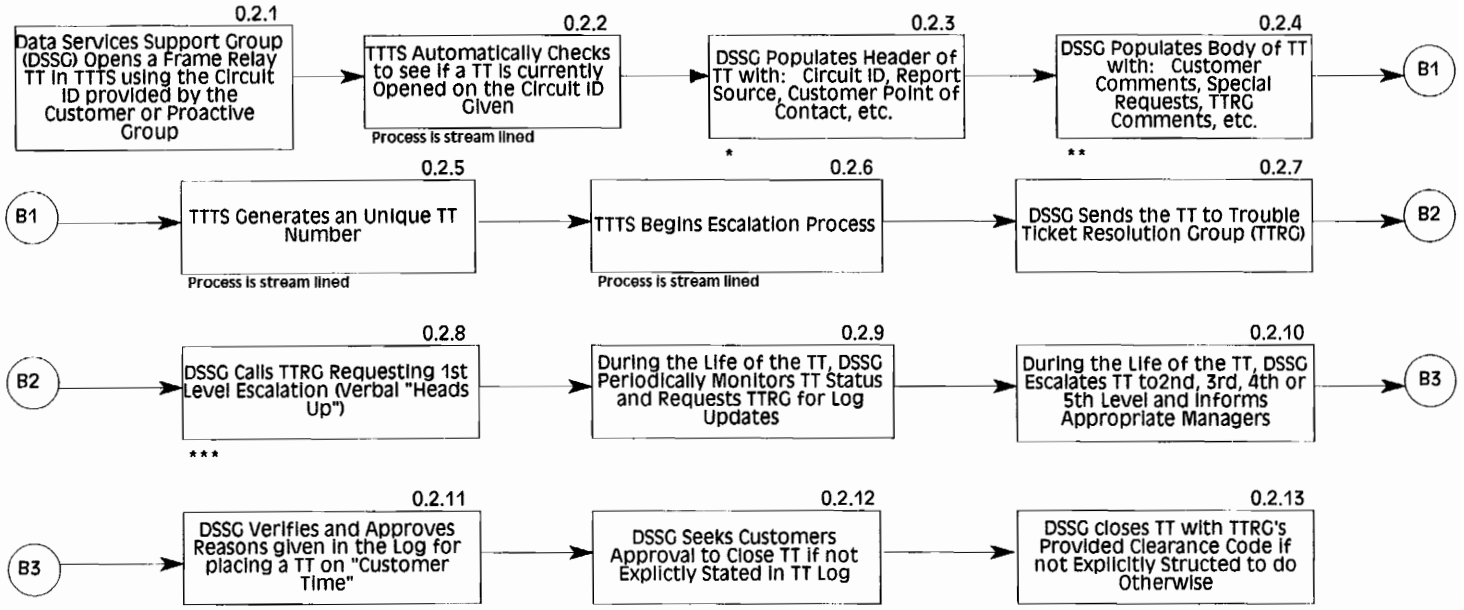
SECTION 0

0.1 TTRG's Proactive Group Initial Investigation Before Opening a Frame Relay TT



SECTION 0

0.2 Data Support Opening a TT to Investigate an Outage



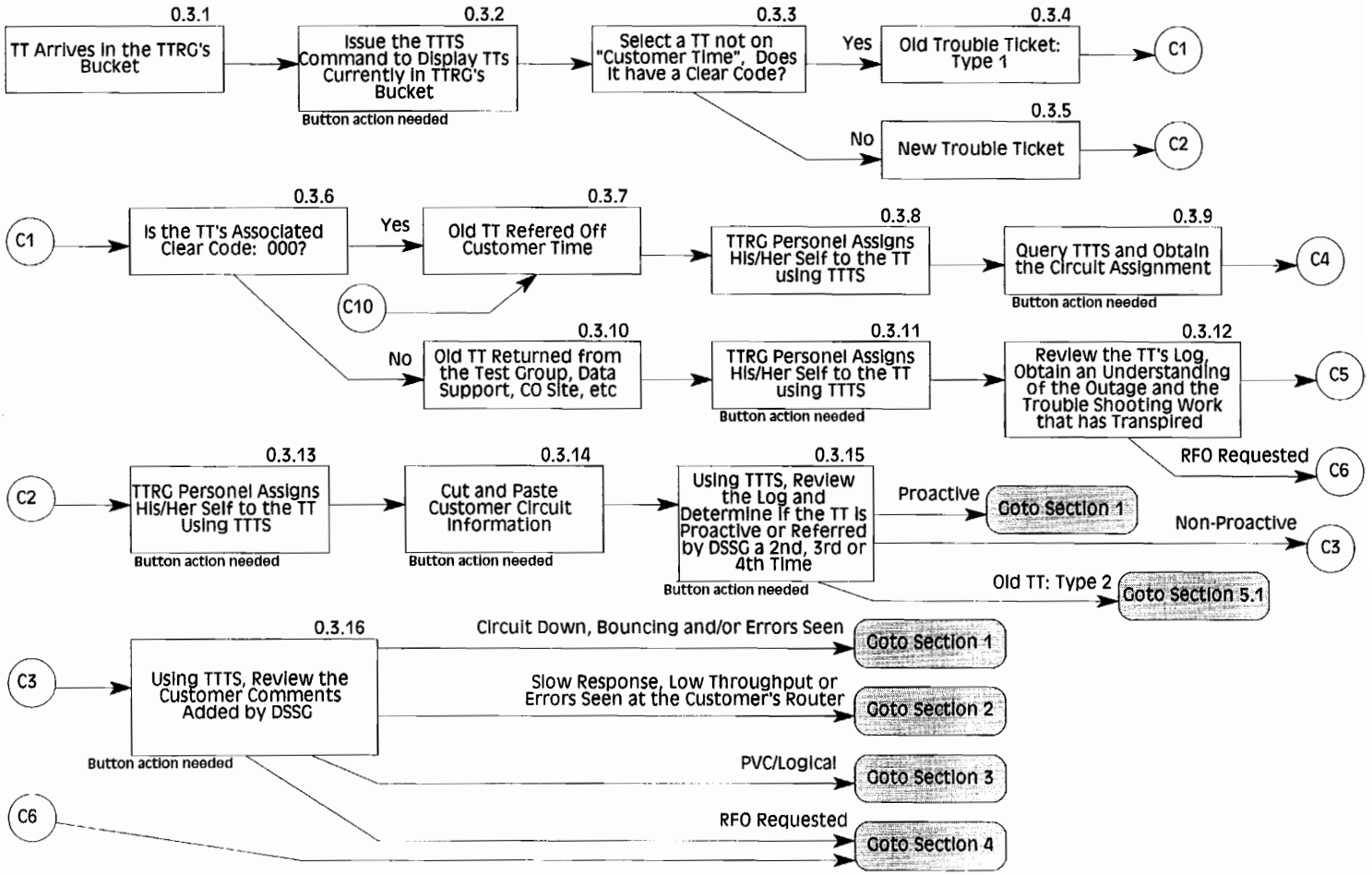
* Point in the process to indicate whether the TT is Proactive or Non-Proactive (i.e., Report Source = WAN/CUS)

** Point in the process to indicate in the TT's Event Log whether the it is Proactive or Non-Proactive

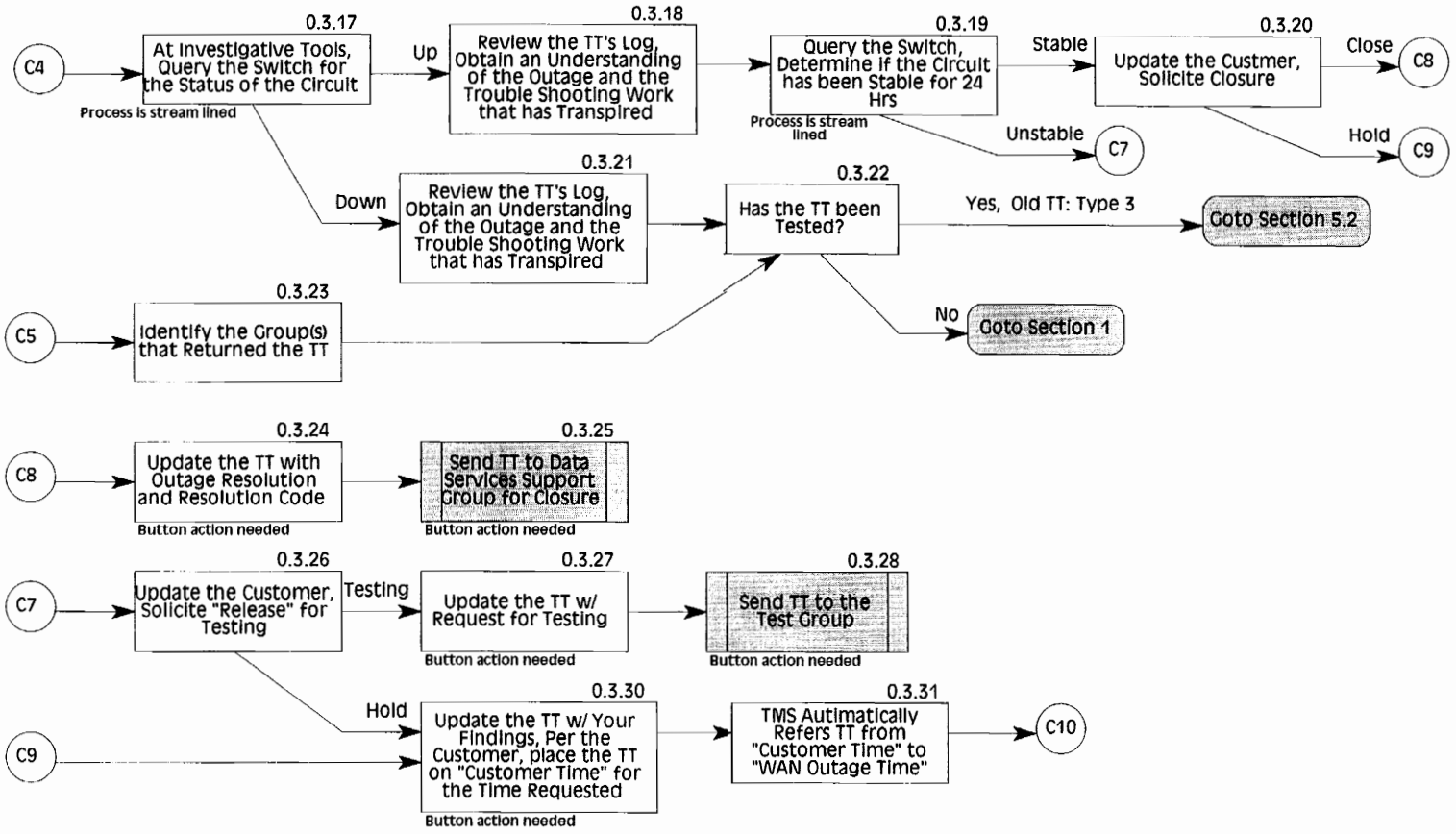
*** As of Jan 1 1995, this step was eliminated. Since the TTRG was constantly scanning its bucket for new TTs a verbal "heads up" became unneccessary. It also helped in lessoning the number of calls to the TTRG.

SECTION 0

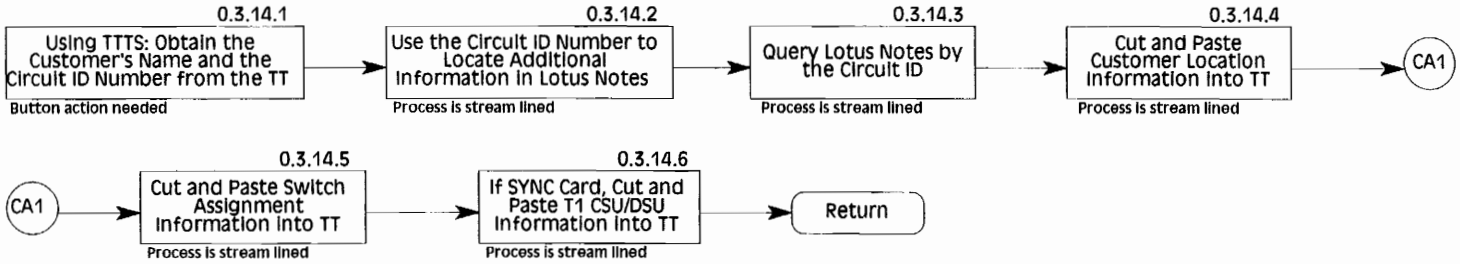
0.3 Identifing the Trouble Ticket Type as It Arrives in the TTRG's Bucket



0.3 Identifing the Trouble Ticket Type as It Arrives in the TTRG's Bucket Con't

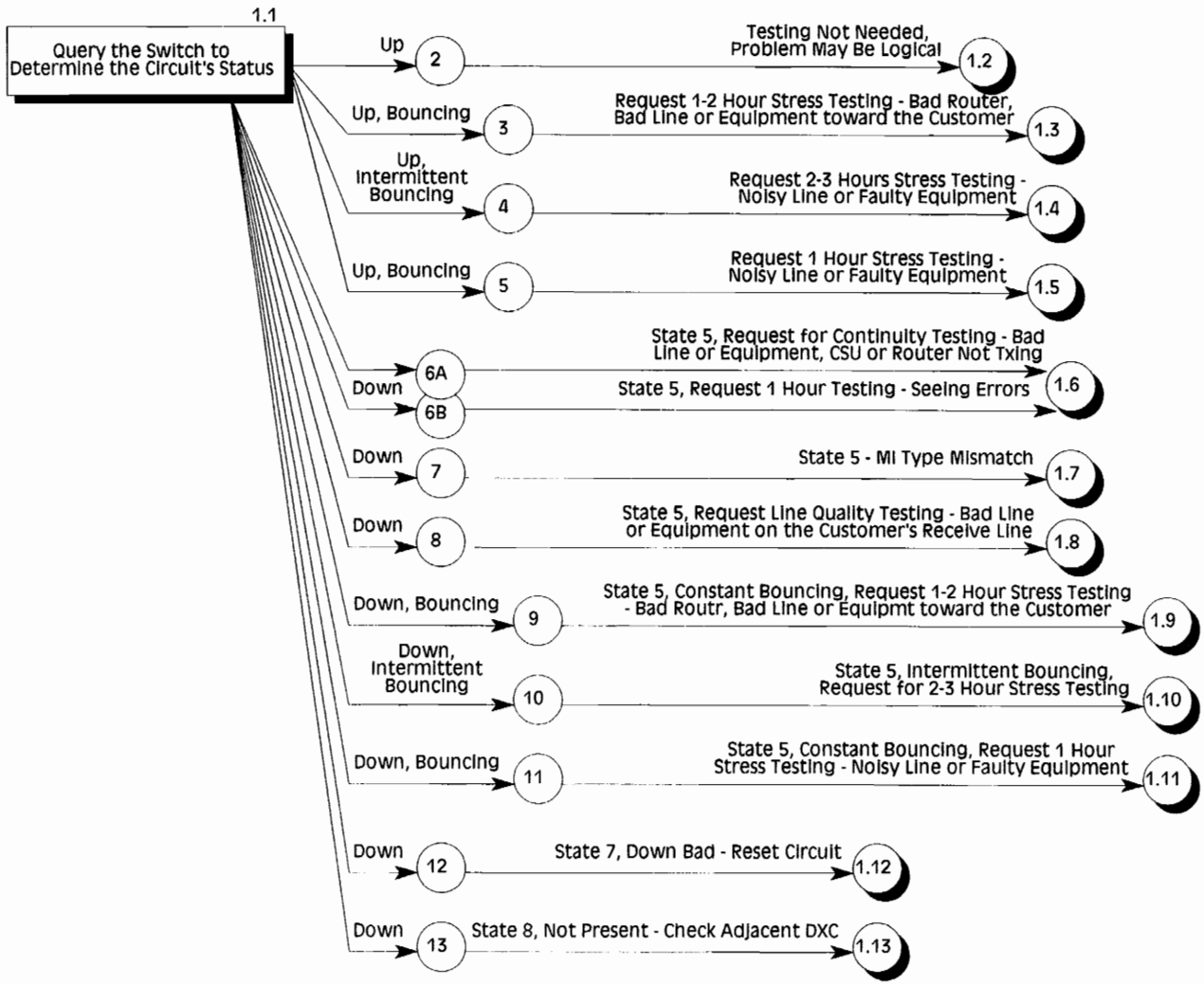


0.3.14 Cut and Paste Customer Circuit Information



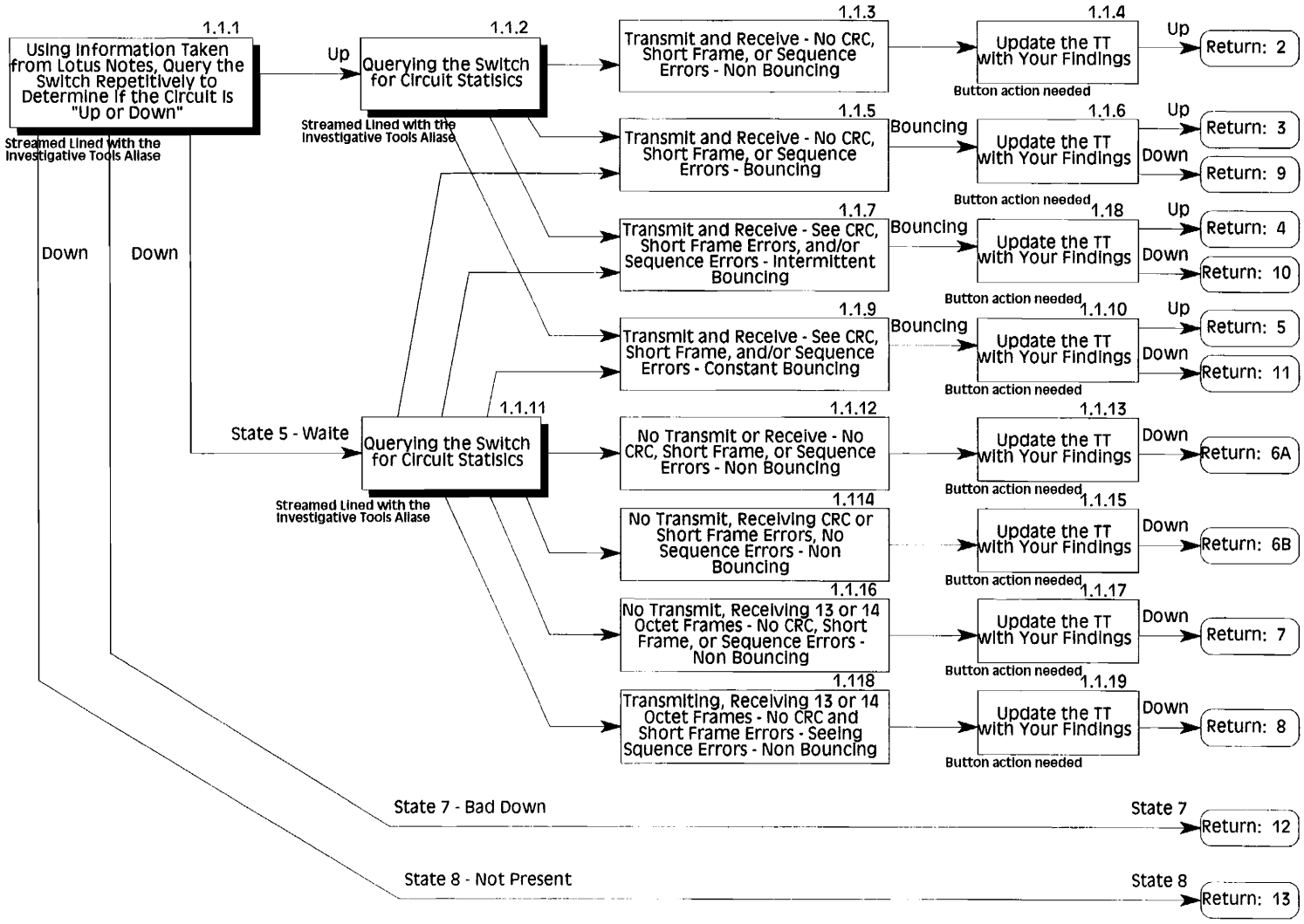
SECTION 1

1.0 New Trouble Ticket: Fract T1 Initial Investigation

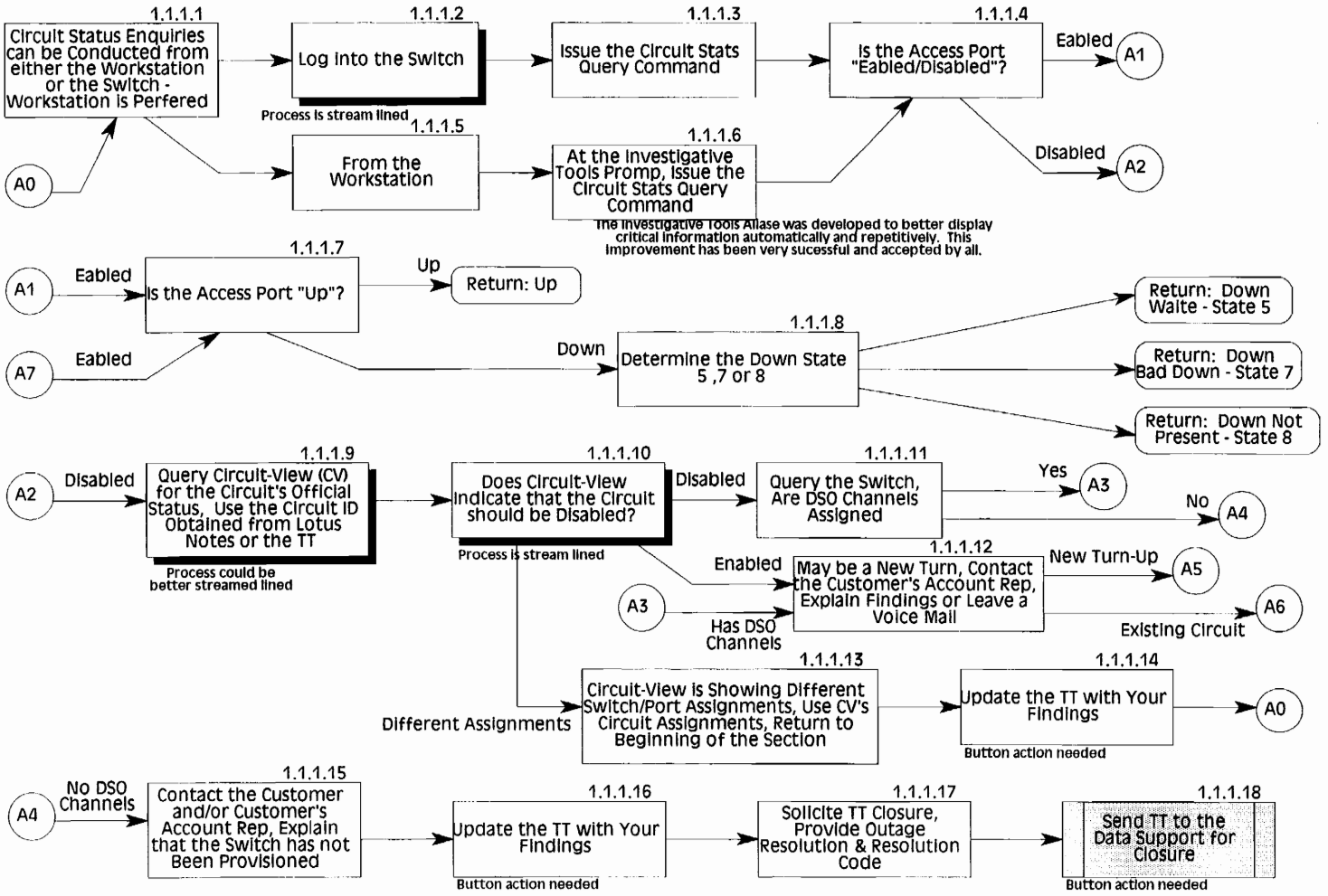


SECTION 1

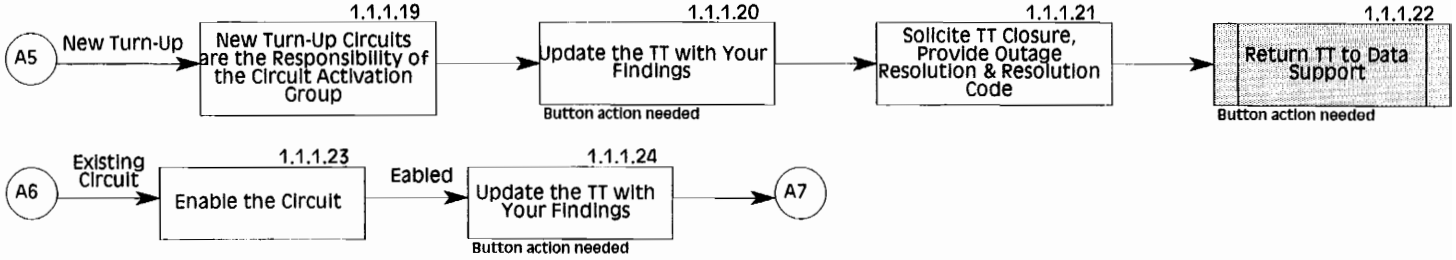
1.1 Fract T1 Card Initial Investigation



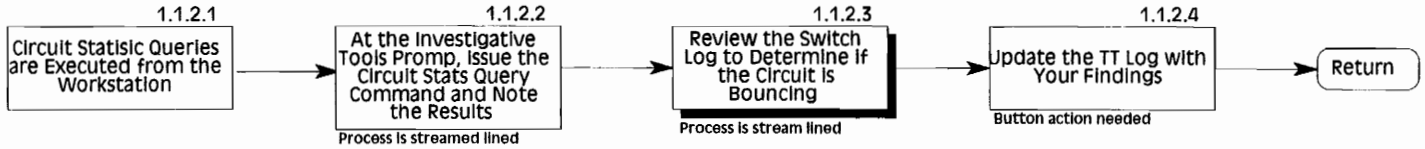
1.1.1 Circuit Status: Up or Down, Enabled or Disabled



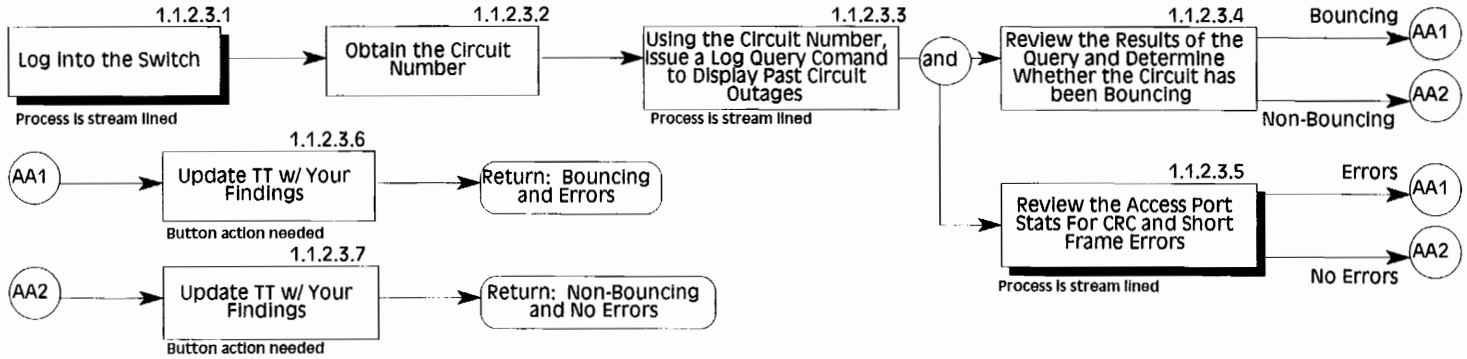
1.1.1 Circuit Status: Up or Down, Enabled or Disabled Con't



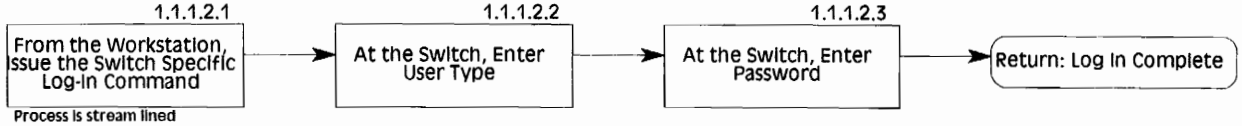
1.1.2, .11 Checking the Circuit Statisics at the Switch



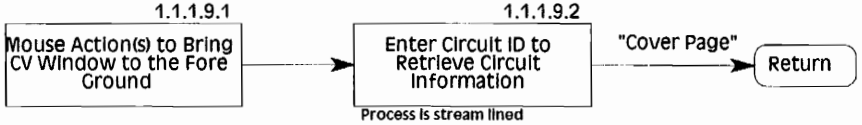
1.1.2.3 Bouncing Circuit Investigation



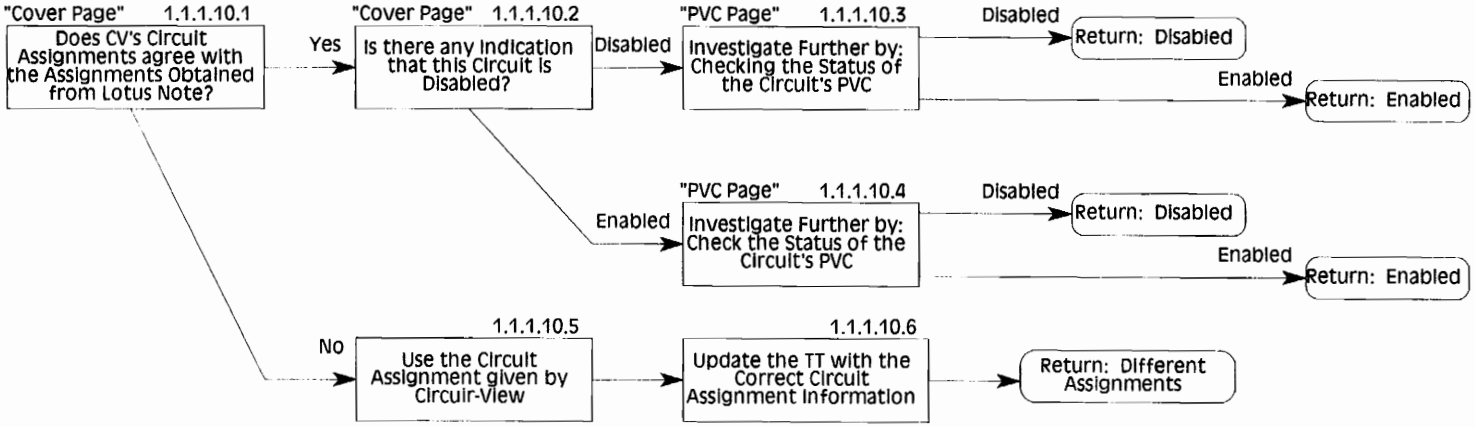
1.1.1.2 & 1.1.2.3.1 Switch Log In



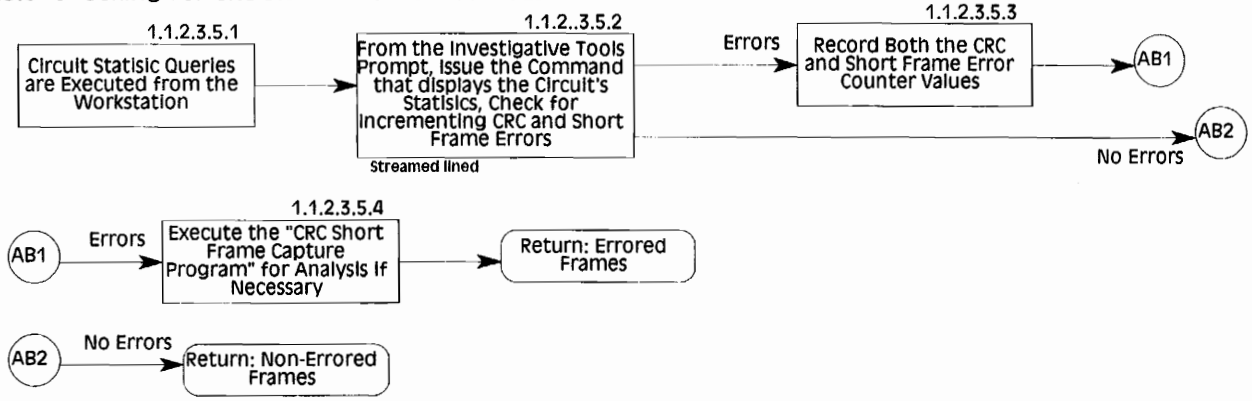
1.1.1.9 Circuit-View (CV) Query



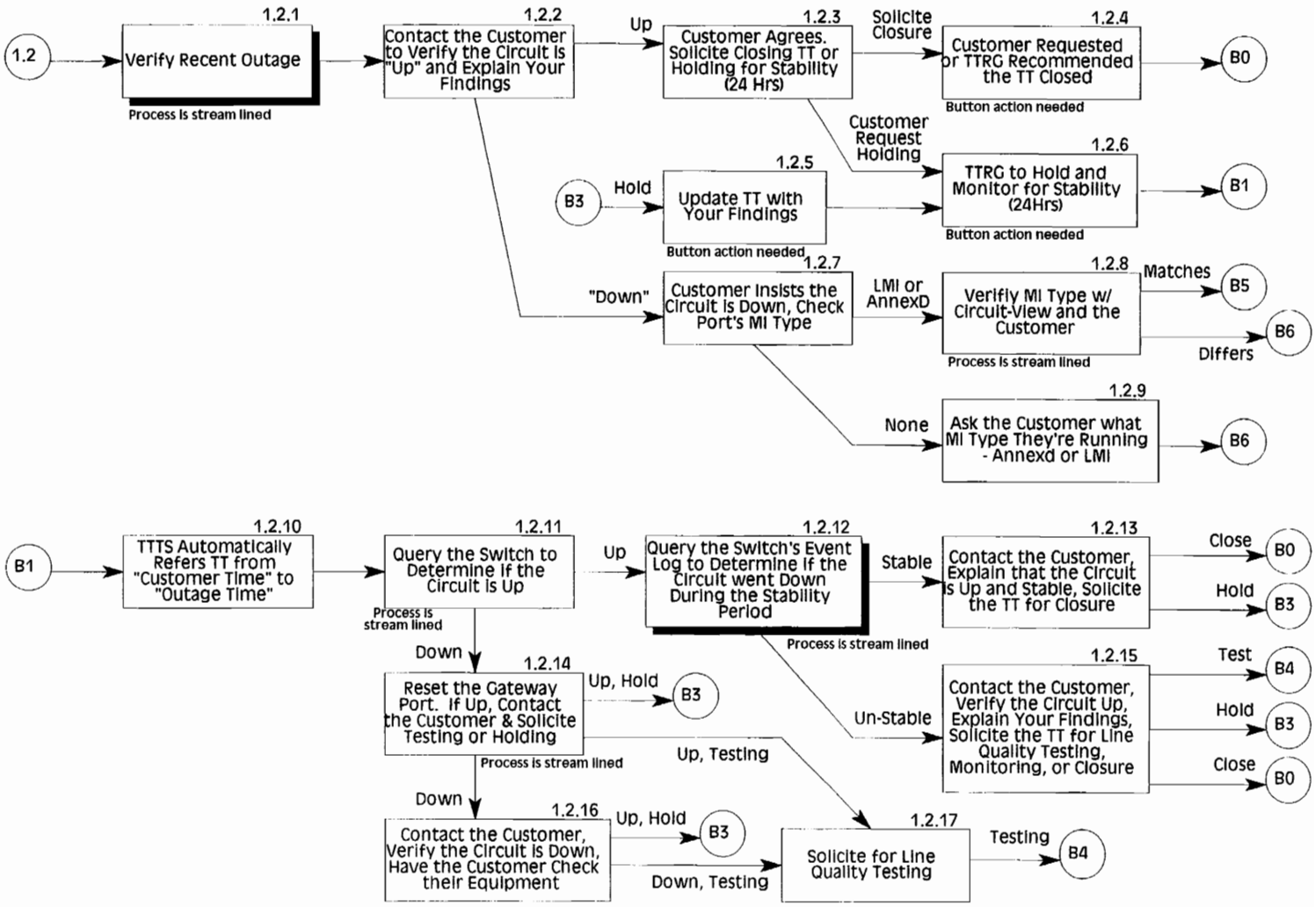
1.1.1.10 Circuit-View Query to Determine Whether a Circuit is Enabled or Disabled



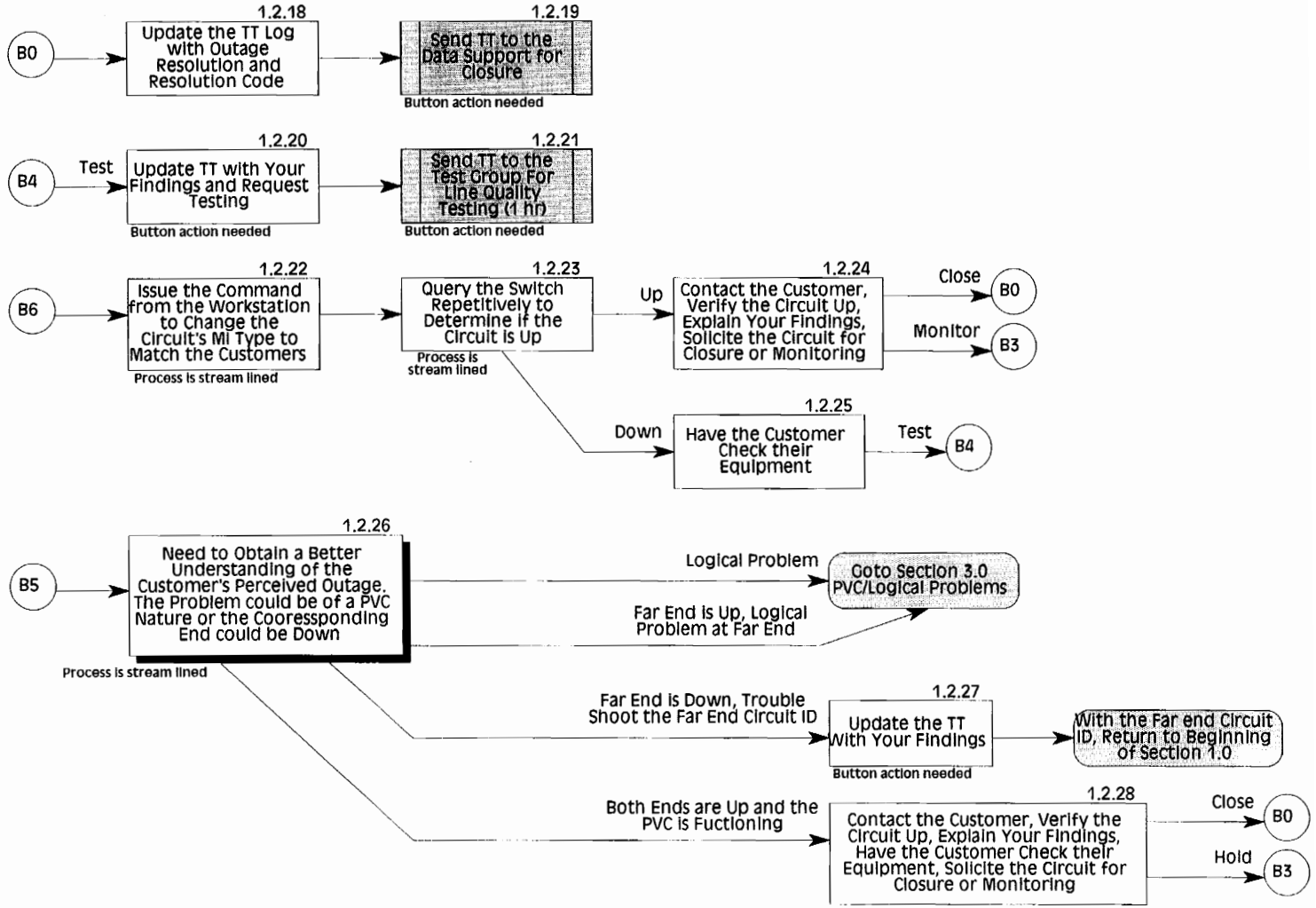
1.1.2.3.5 Checking for CRC and Short Frames Errors



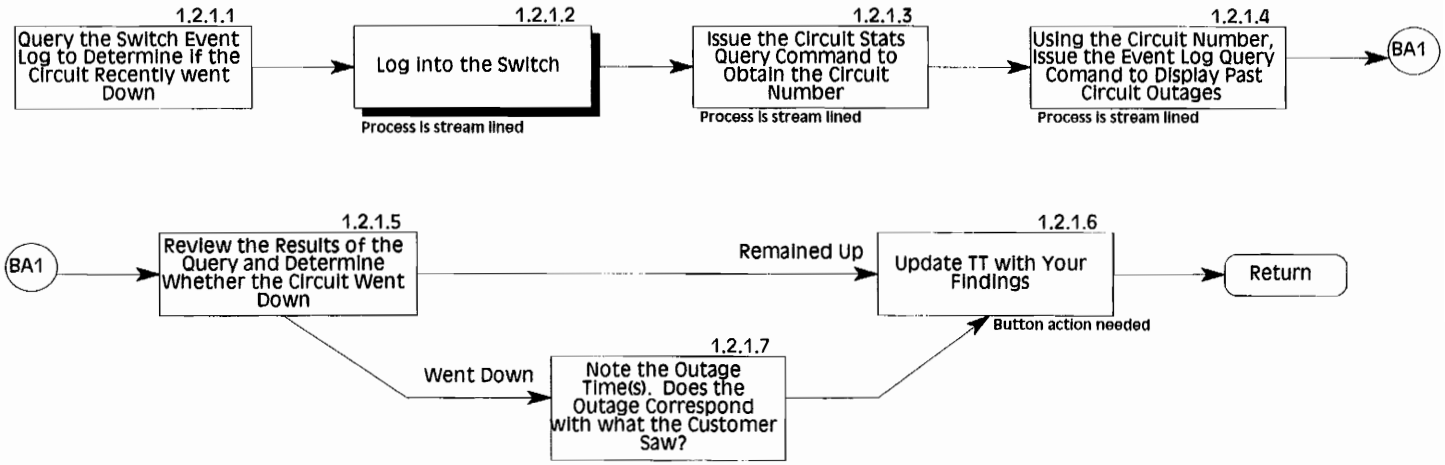
1.2 New Trouble Ticket - Circuit Up, No Errors & Non-Bouncing



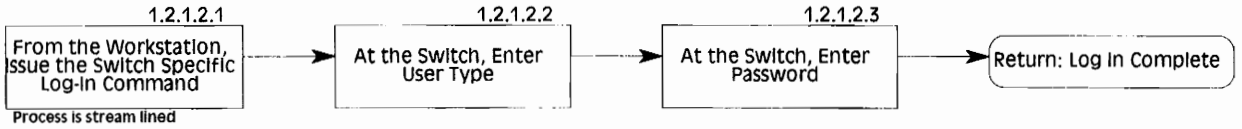
1.2 New Trouble Ticket - Circuit Up, No Errors & Non-Bouncing Con't



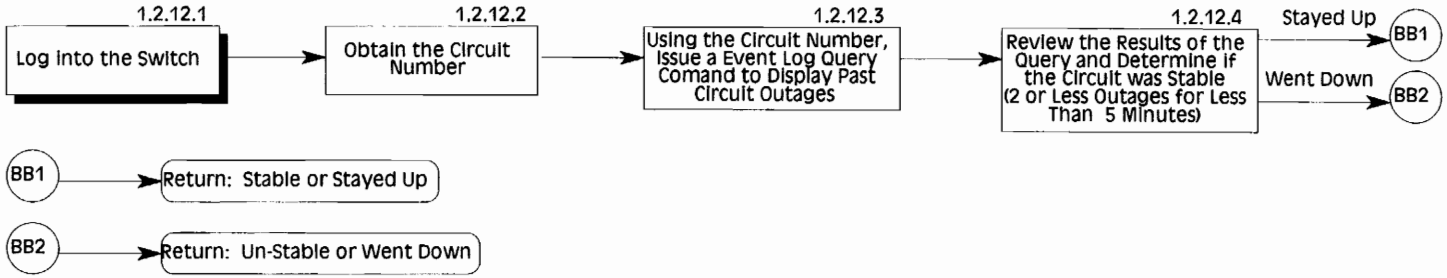
1.2.1 Verify a Reported Outage



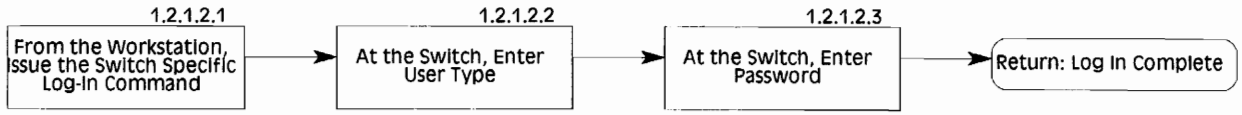
1.2.1.2 Switch Log In



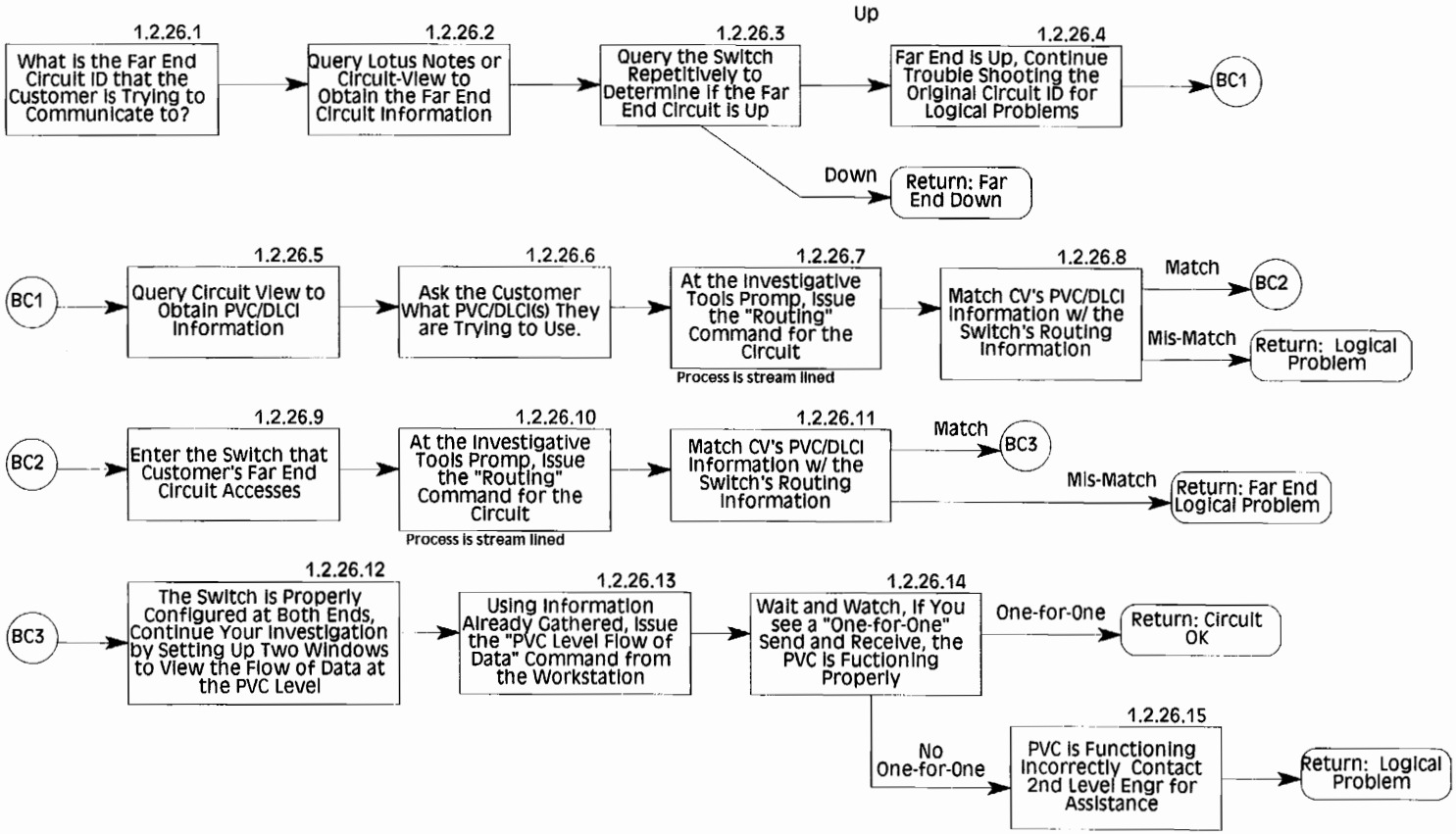
1.2.12 Circuit Stability Check



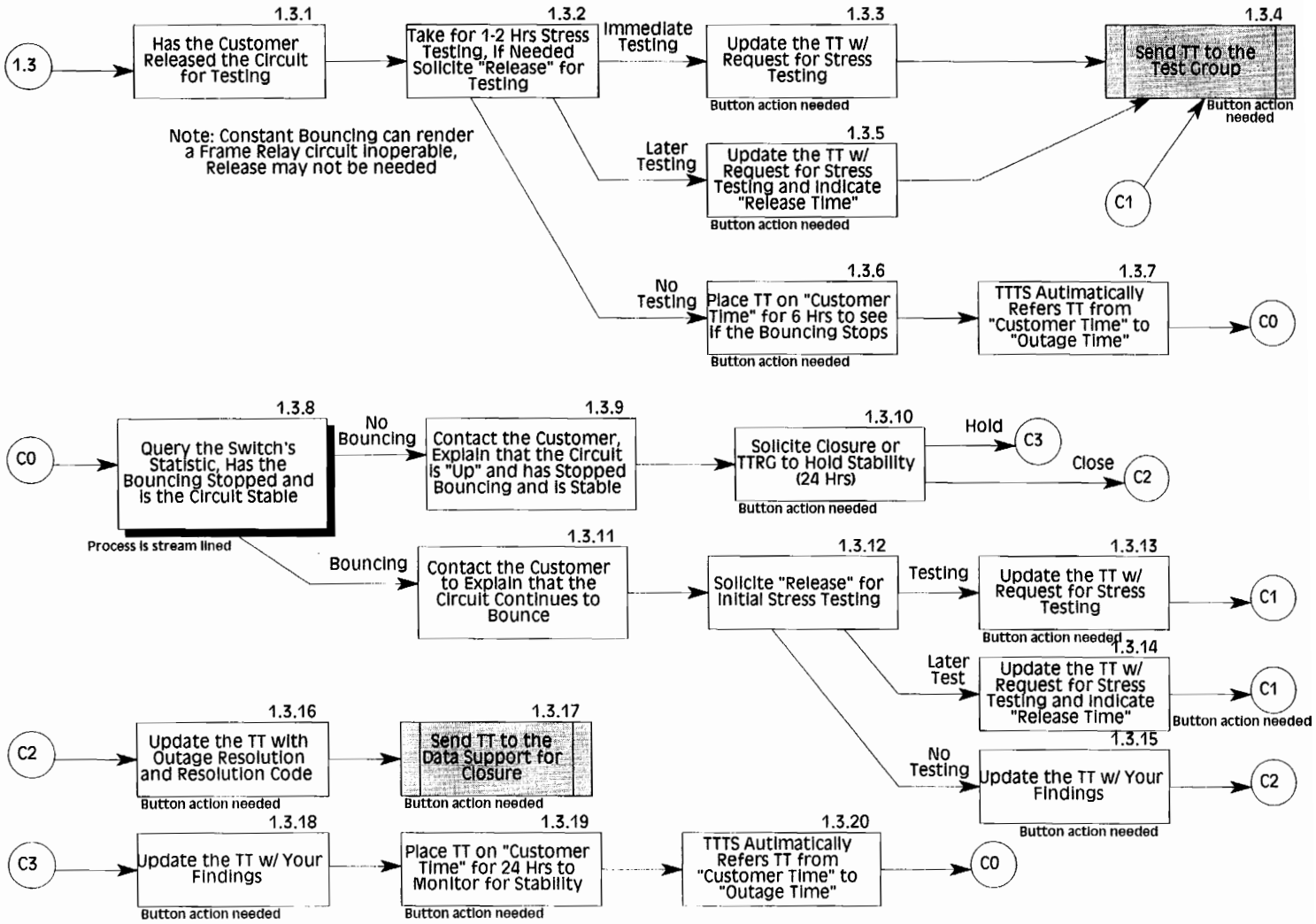
1.2.12.1 Switch Log In



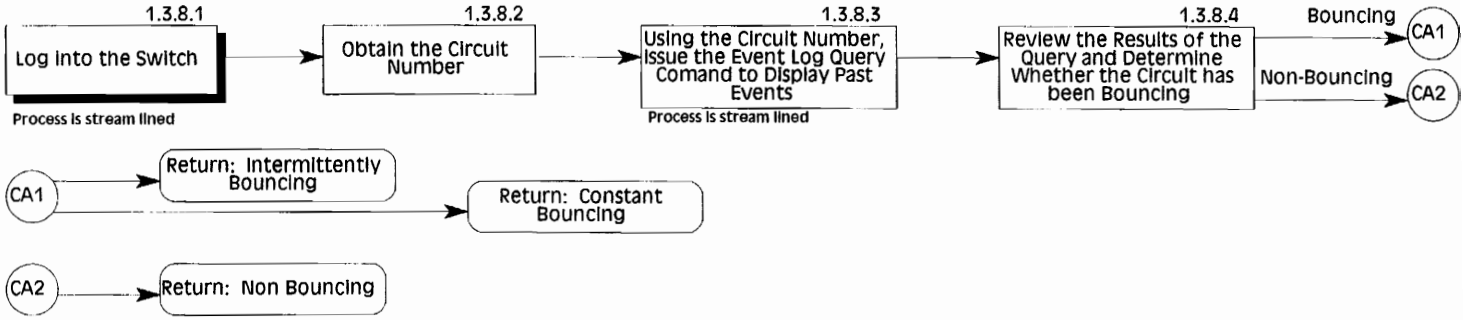
1.2.26 Trouble Shooting for a Possible Logical Problem



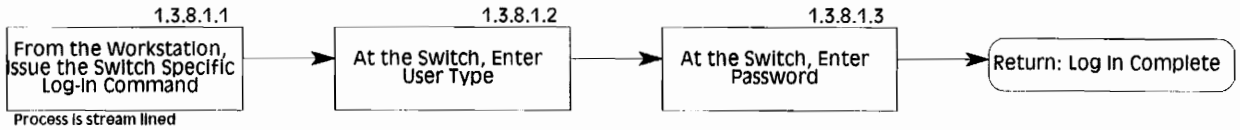
1.3 New Trouble Ticket - Circuit Up, No Errors & Constantly Bouncing



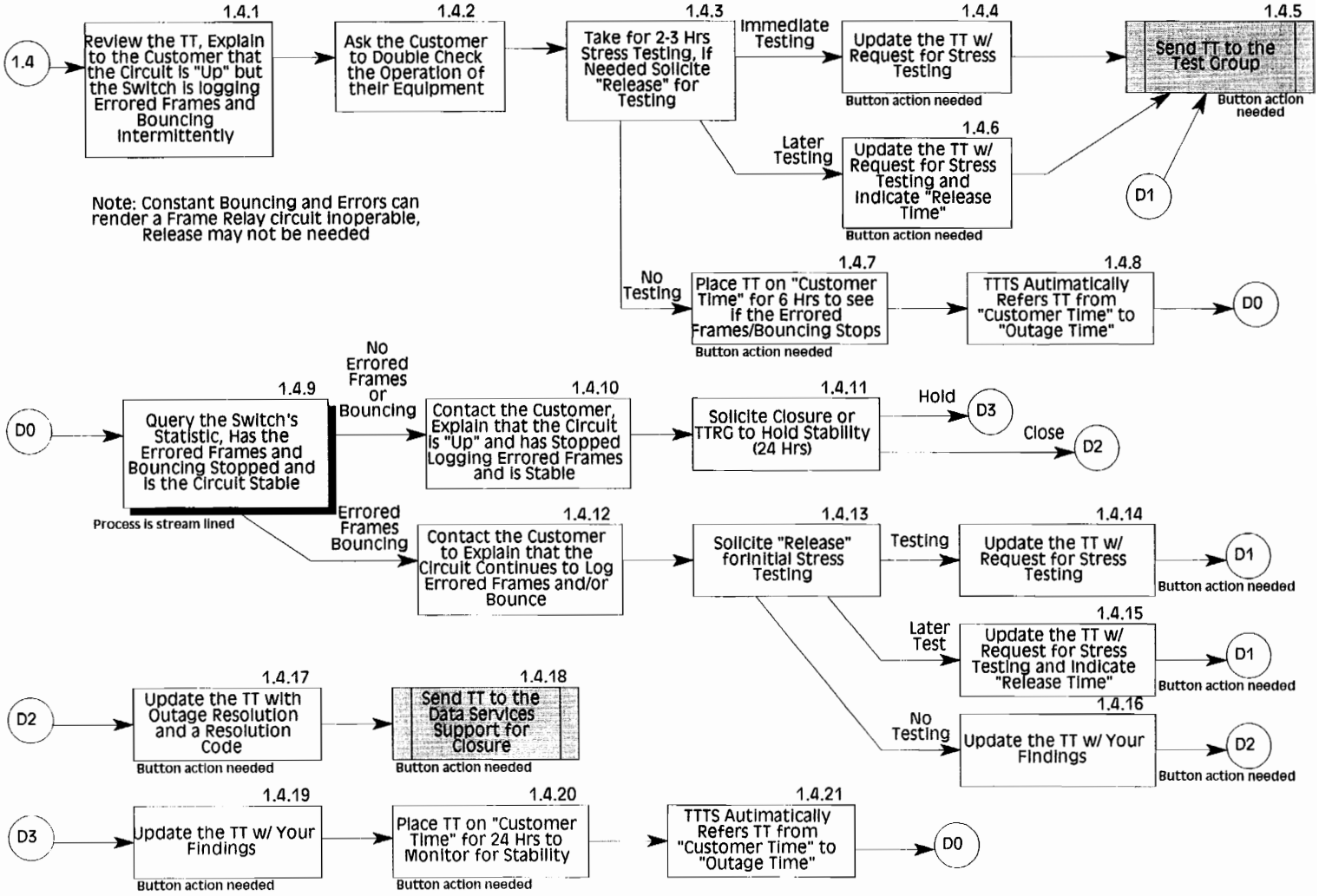
1.3.8 Bouncing Circuit Investigation



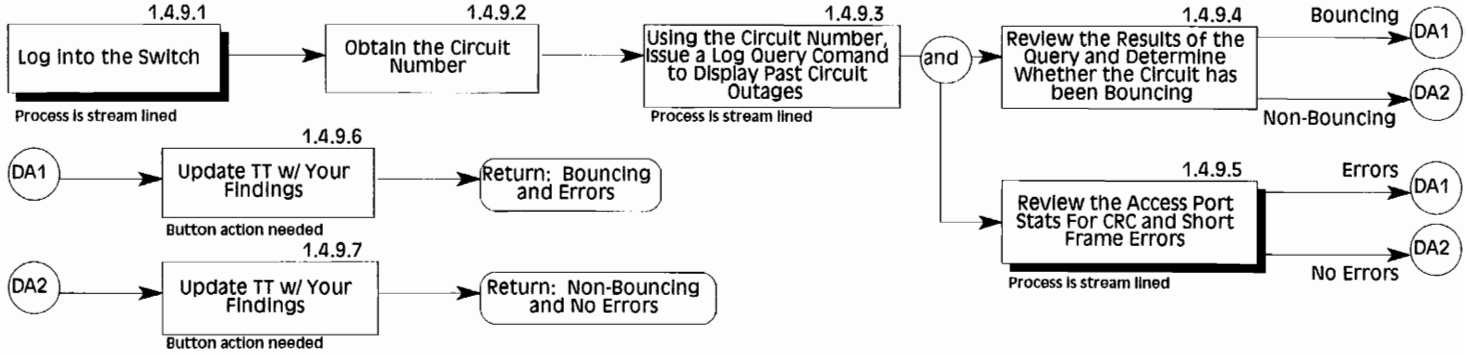
1.3.8.1 Switch Log In



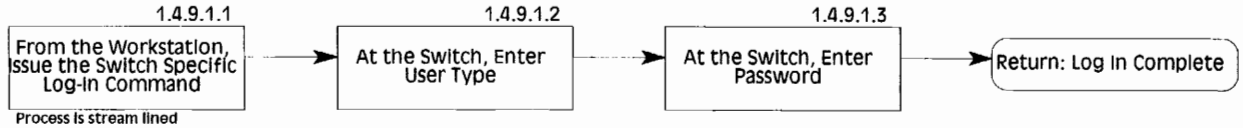
1.4 New Trouble Ticket - Circuit Up, Errored Frames and Intermittent Bouncing



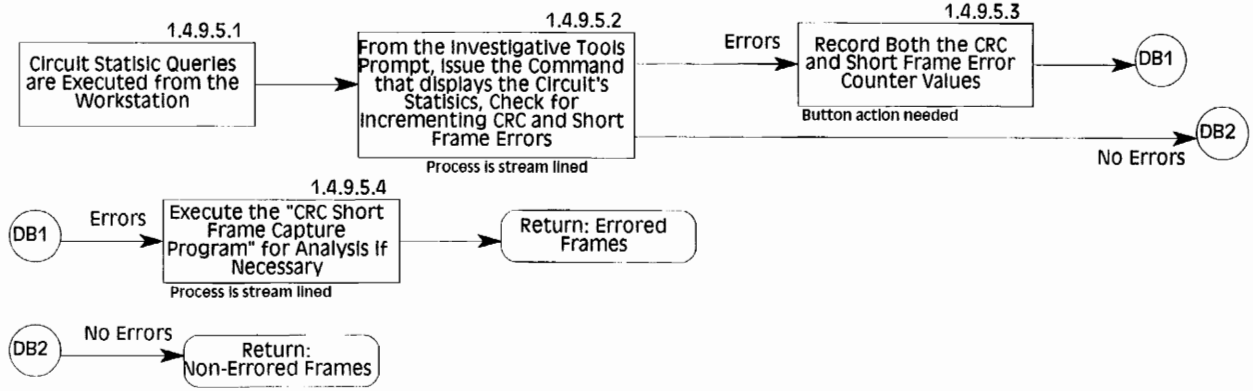
1.4.9 Bouncing Circuit Investigation



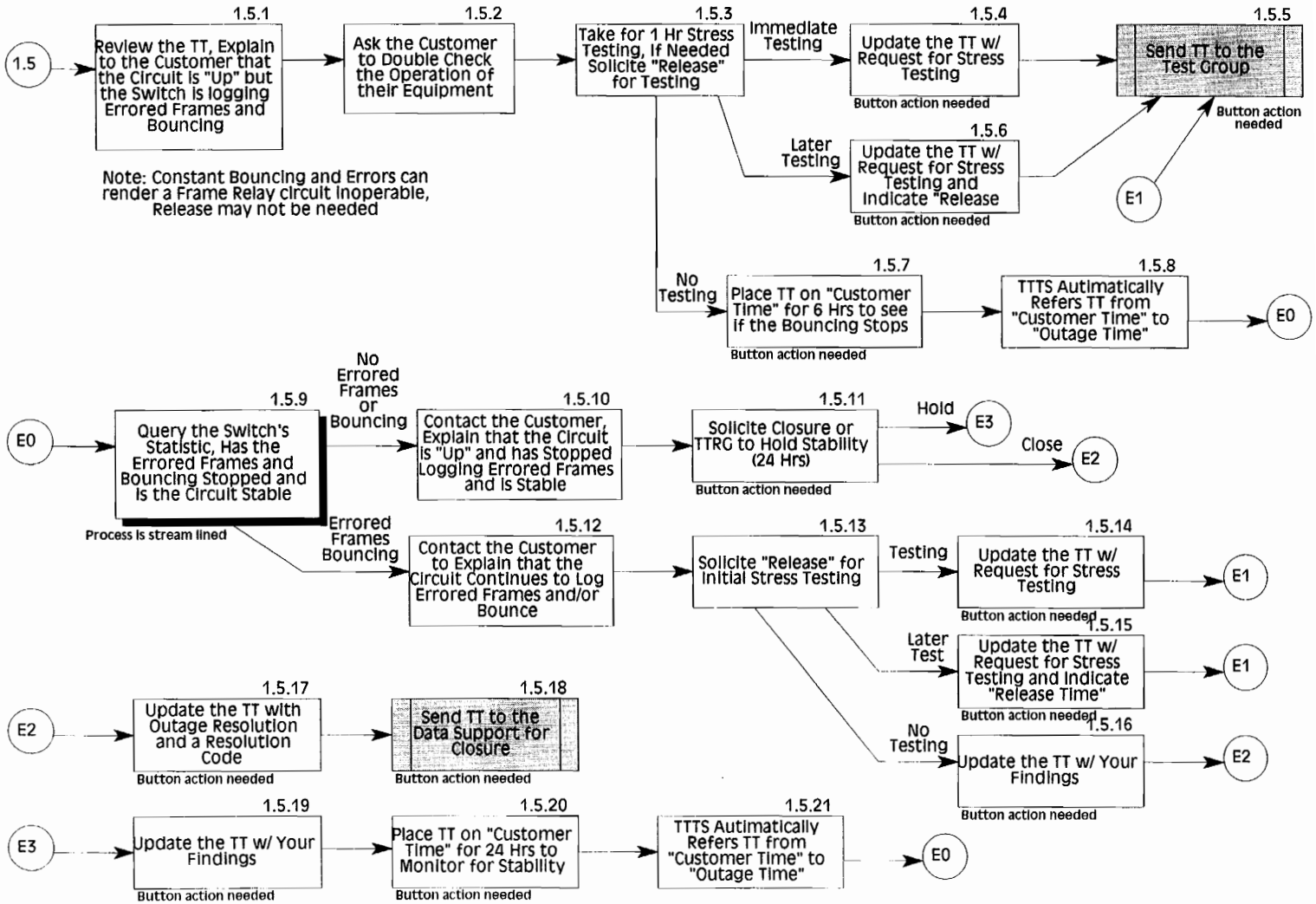
1.4.9.1 Switch Log In



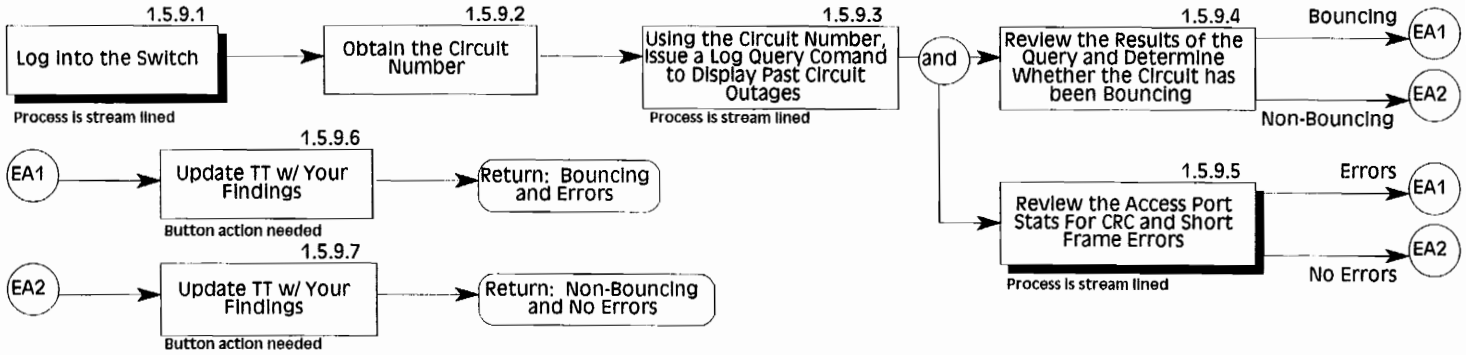
1.4.9.5 Checking for CRC and Short Frames Errors



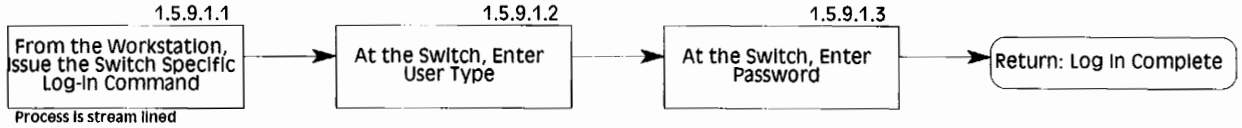
1.5 New Trouble Ticket - Circuit Up, Errored Frames & Bouncing



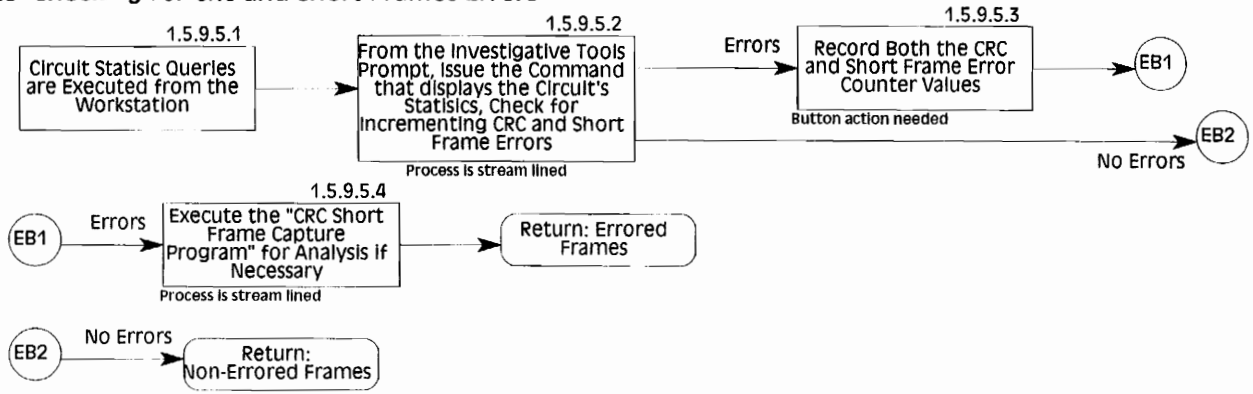
1.5.9 Bouncing Circuit Investigation



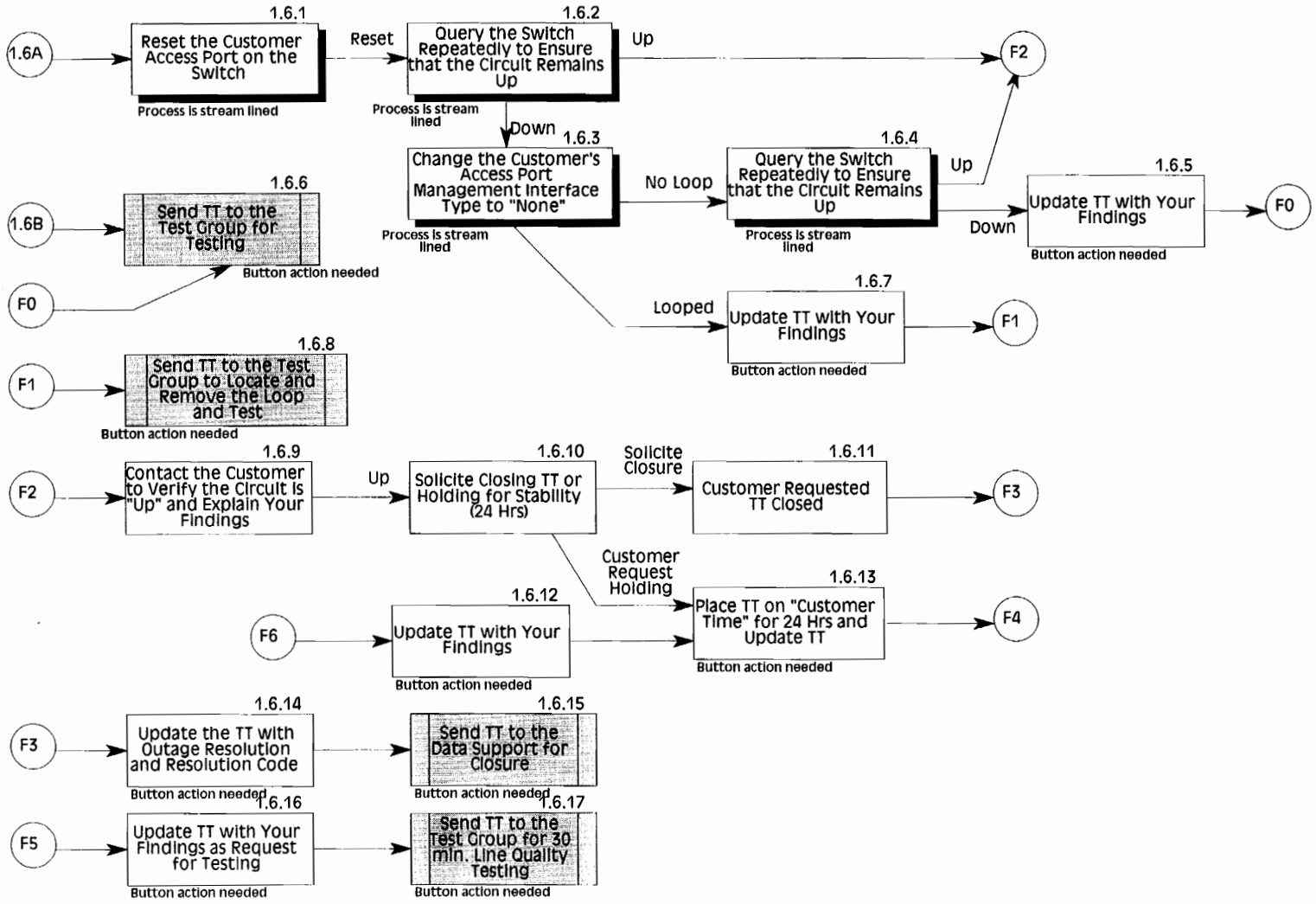
1.5.9.1 Switch Log In



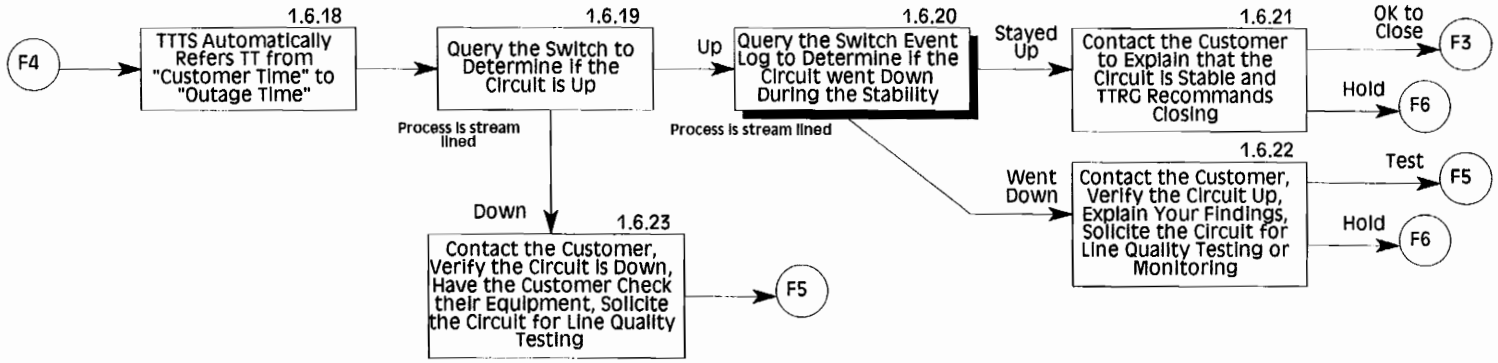
1.5.9.5 Checking for CRC and Short Frames Errors



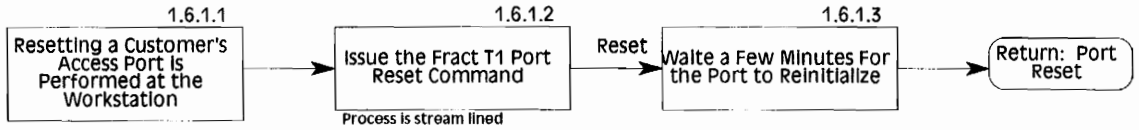
1.6 New Trouble Ticket - Circuit Down, No Errors, No Receive and Non-Bouncing



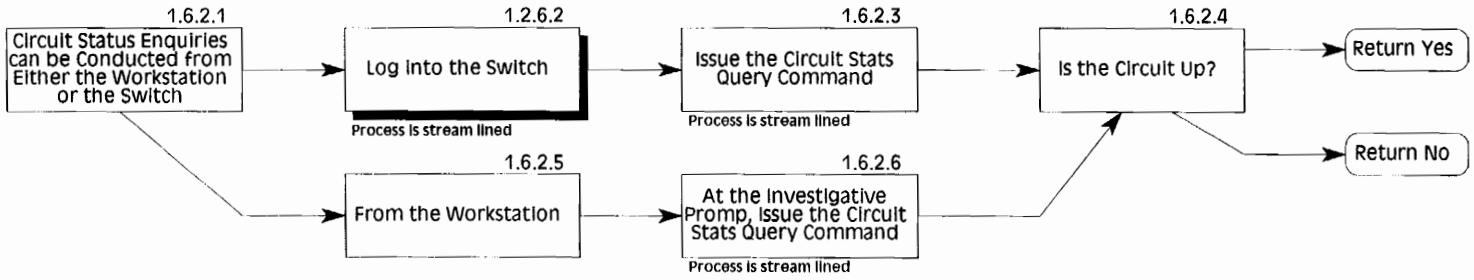
1.6 New Trouble Ticket - Circuit Down, No Errors, No Receive and Non-Bouncing Con't



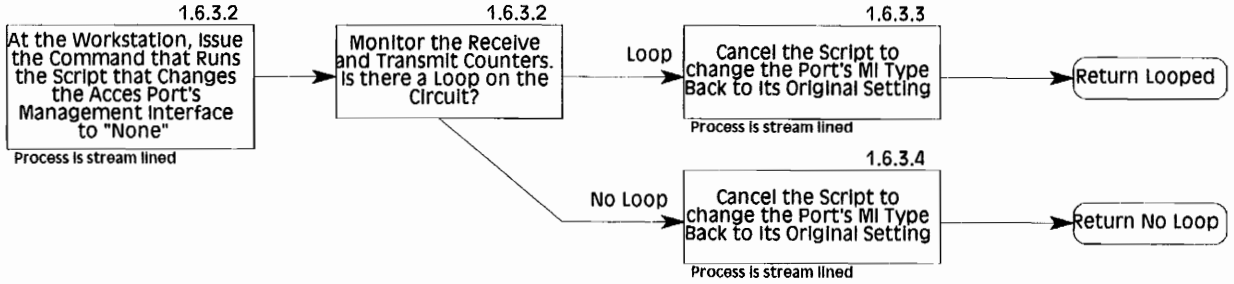
1.6.1 Resetting a Fractional T1 Port



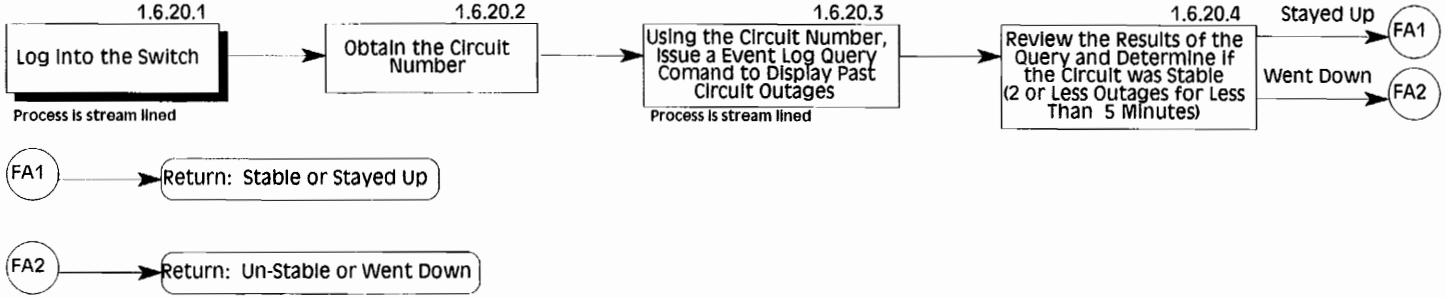
1.6.2 & .4 Repeated Query of the Switch



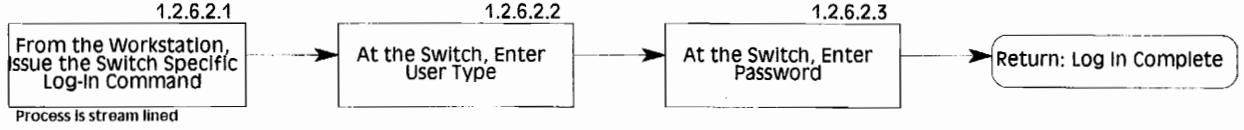
1.6.3 Changing the Management Interface (MI) Type to "None"



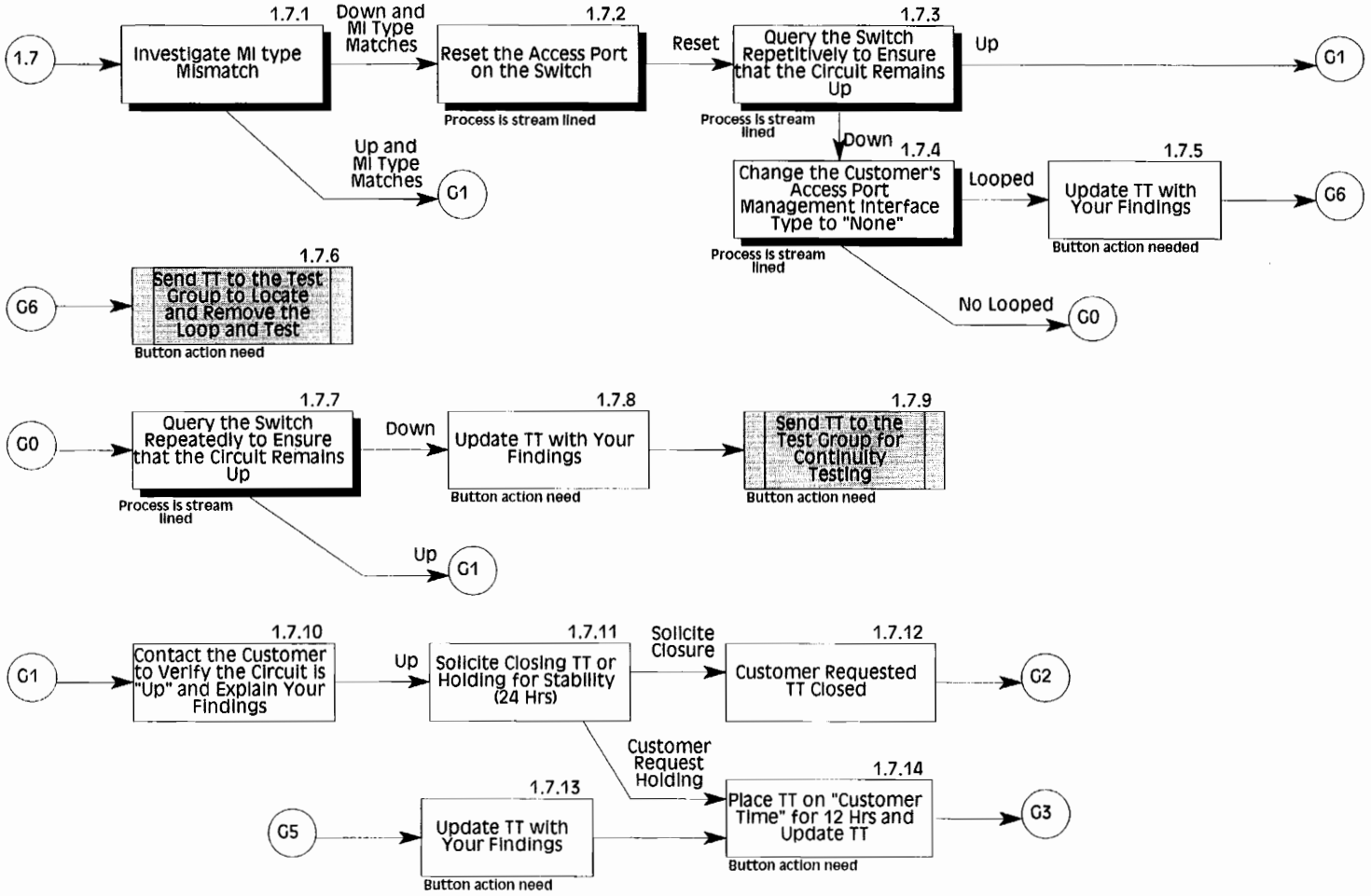
1.6.20 Circuit Stability Check



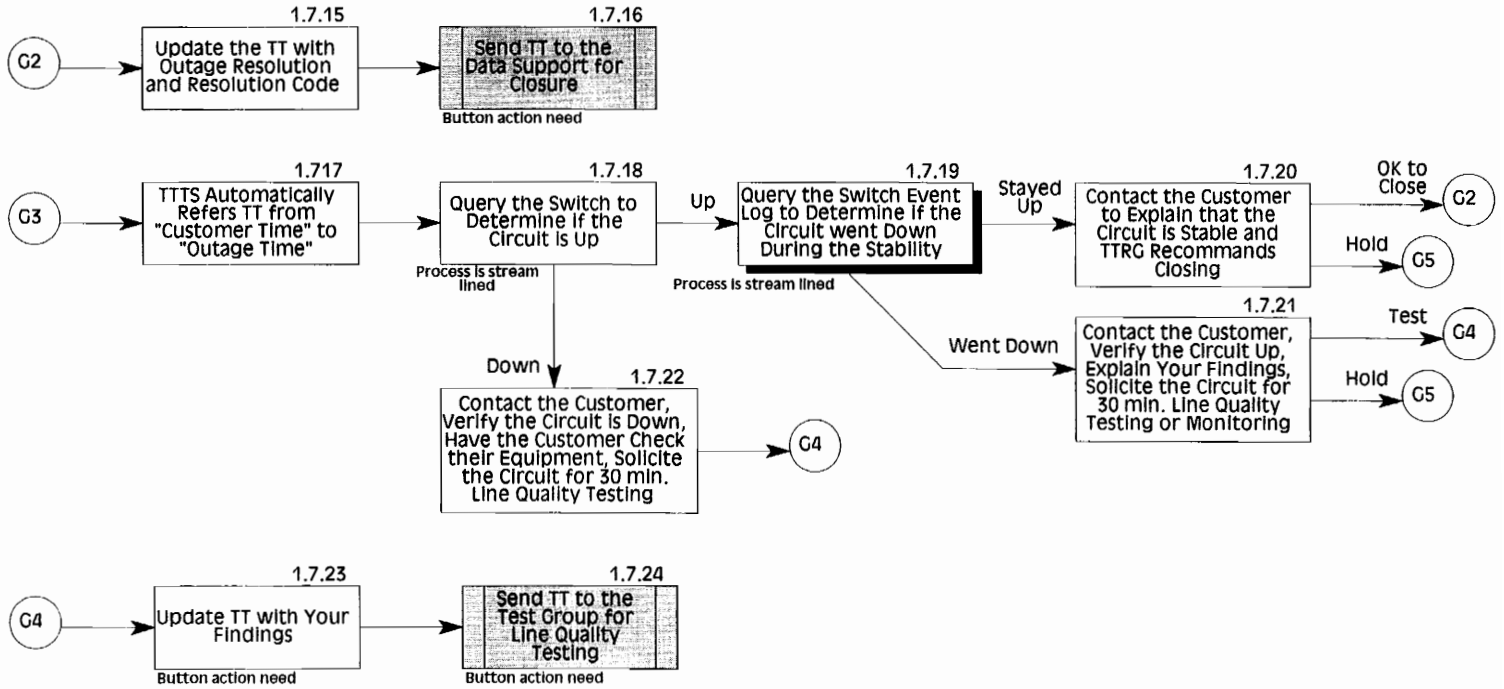
1.2.6.2 & 1.6.20.1 Switch Log In



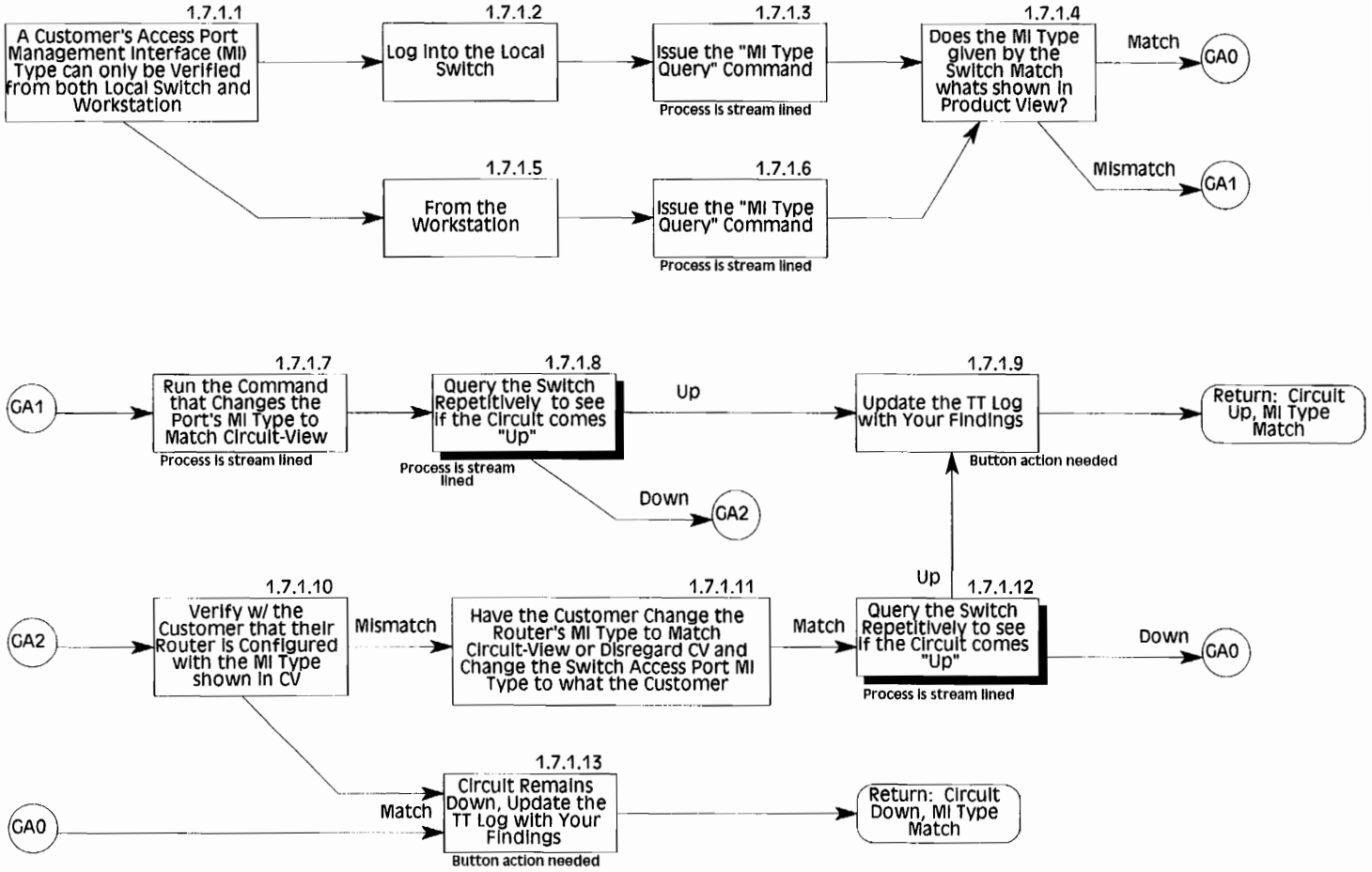
1.7 New Trouble Ticket - Circuit Down, No Errors, Receiving Data & Non-Bouncing



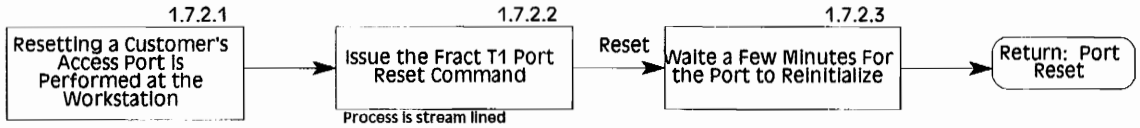
1.7 New Trouble Ticket - Circuit Down, No Errors, Receiving Data & Non-Bouncing Con't



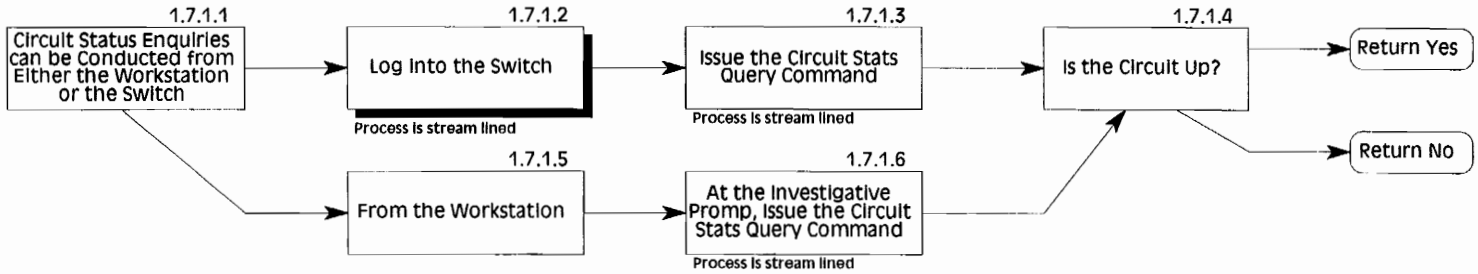
1.7.1 Management Information (MI) Type Verification, Circuit is Down



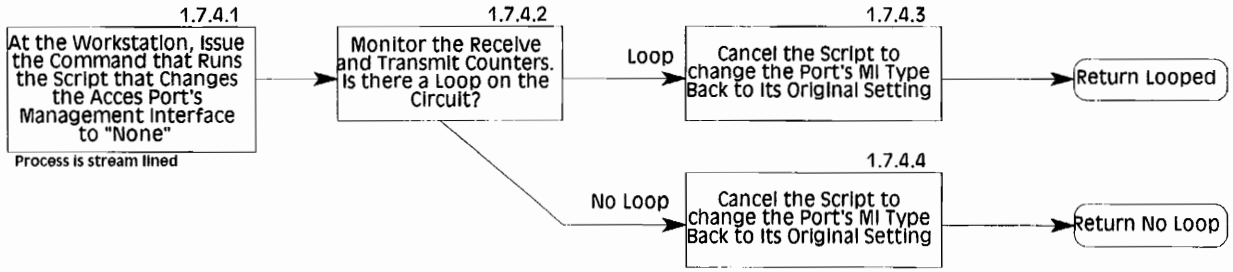
1.7.2 Resetting a Fractional T1 Port



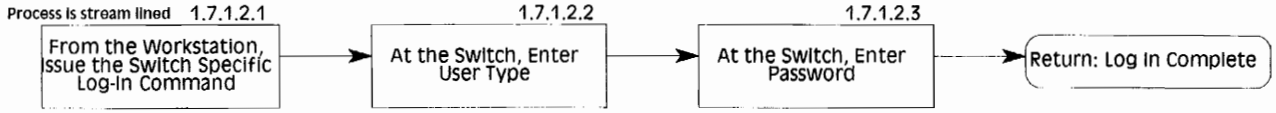
1.7.3 ,.7 & 1.7.1.8 Repeated Query of the Switch



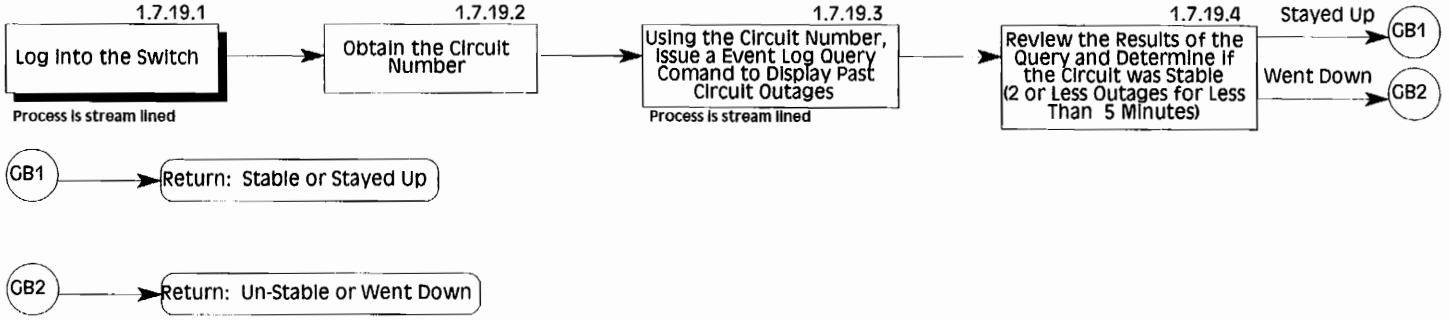
1.7.4 Changing the Management Interface (MI) Type to "None"



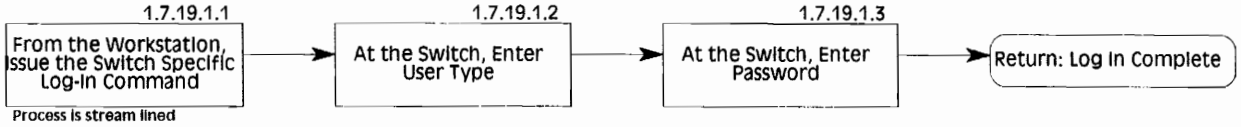
1.7.1.2 Switch Log



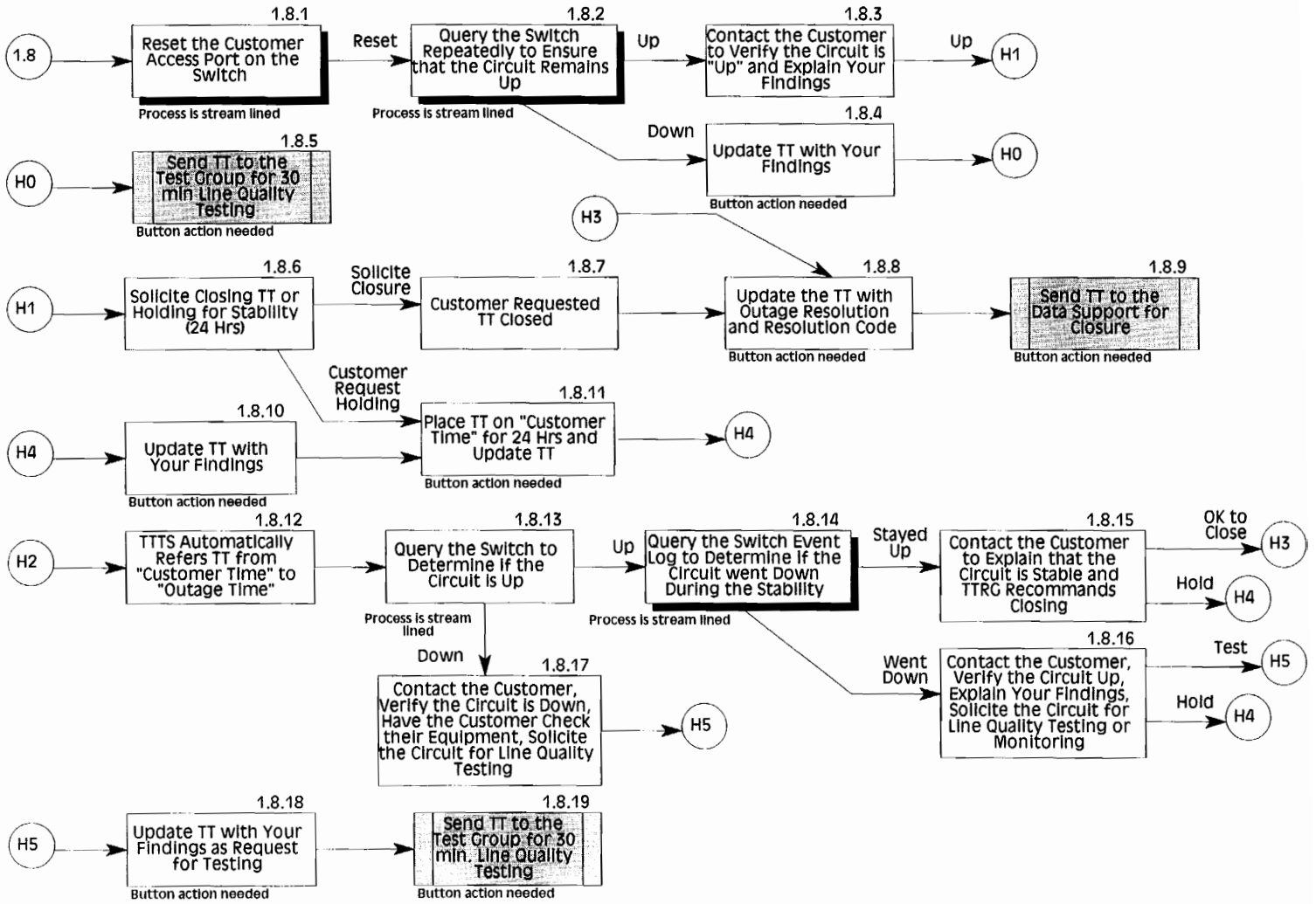
1.7.19 Circuit Stability Check



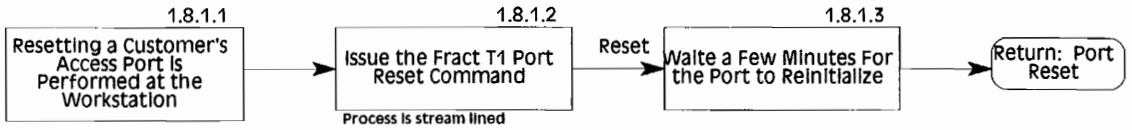
1.7.19.1 Switch Log In



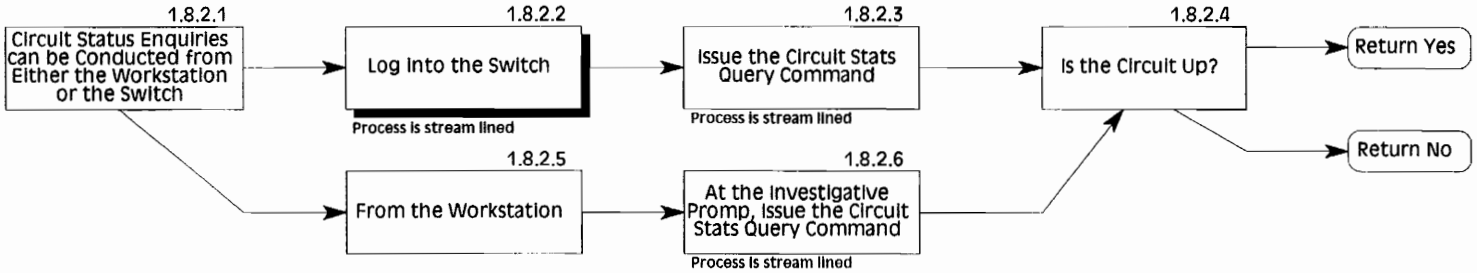
1.8 New Trouble Ticket - Circuit Down, No Errors, Receiving Data & Non-Bouncing



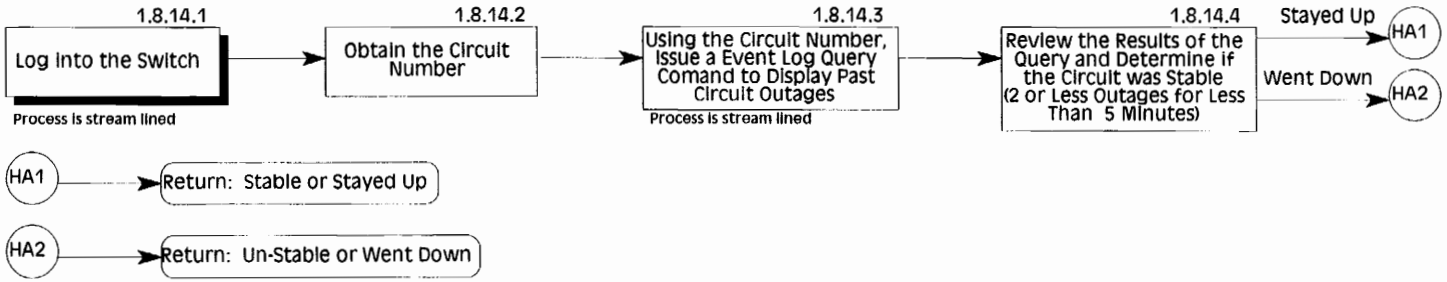
1.8.1 Resetting a Fractional T1 Port



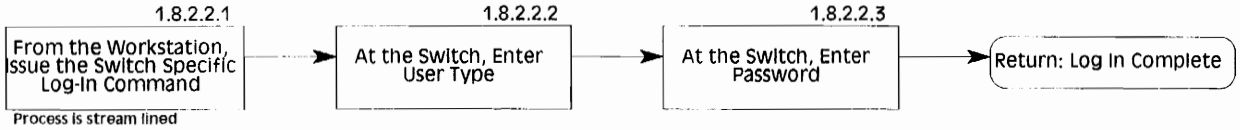
1.8.2 Repeated Query of the Switch



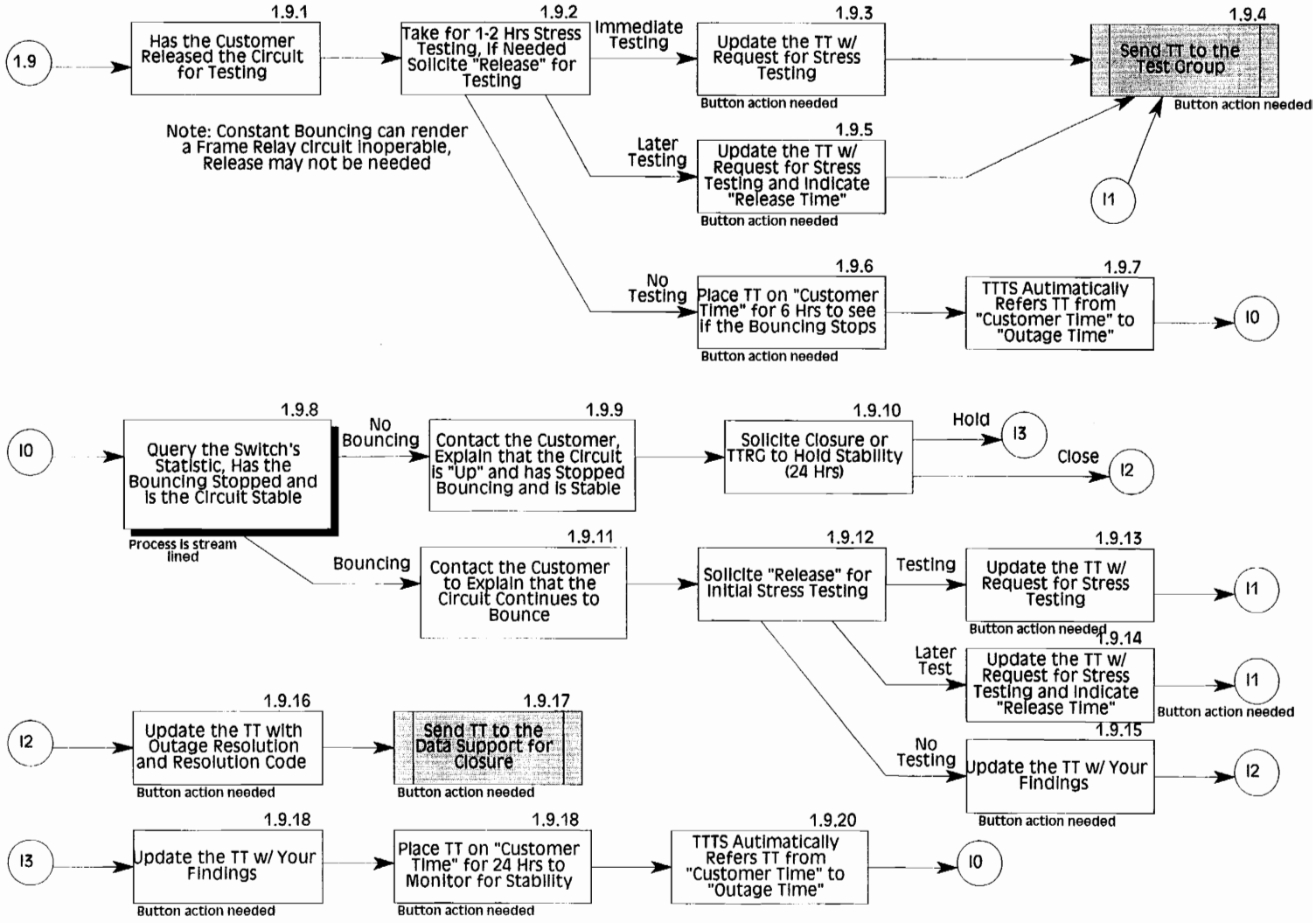
1.8.14 Circuit Stability Check



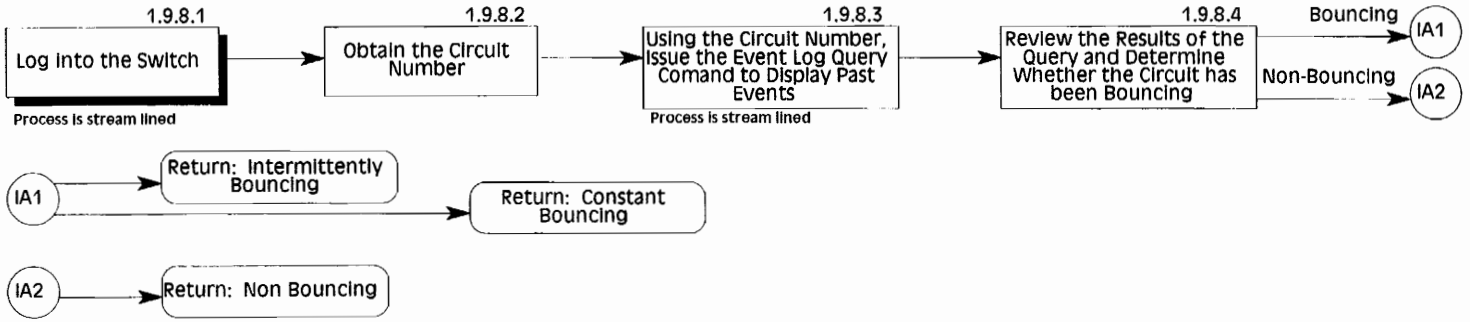
1.8.2.2 & .1.8.14.1 Switch Log In



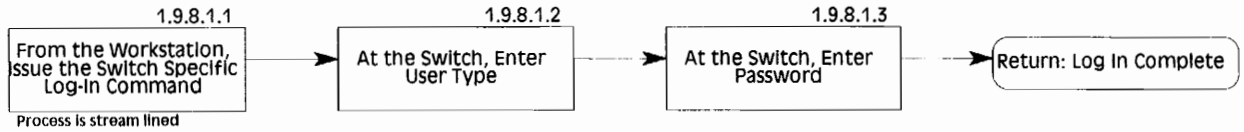
1.9 New Trouble Ticket - Circuit Down, No Errors & Bouncing



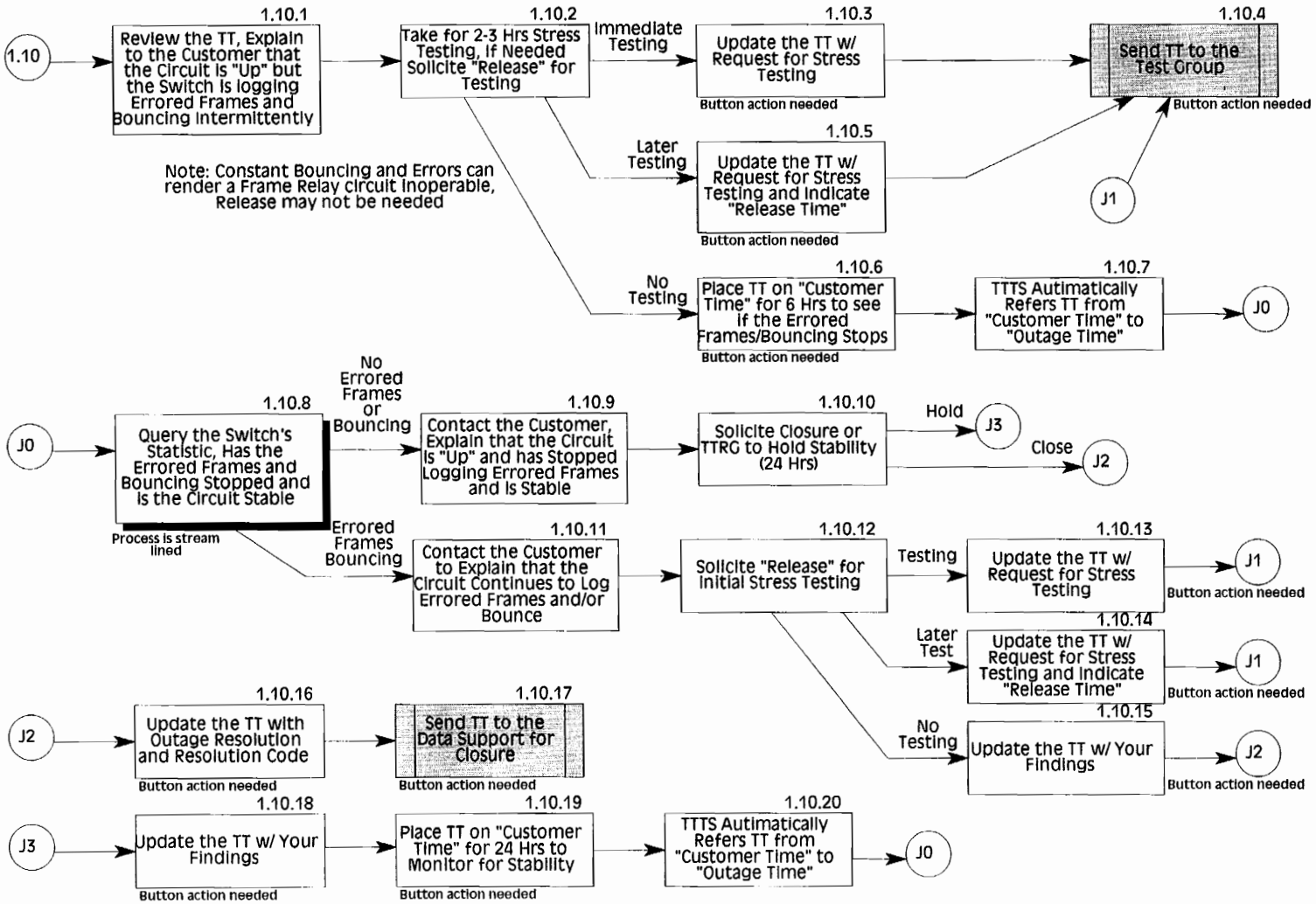
1.9.8 Bouncing Circuit Investigation



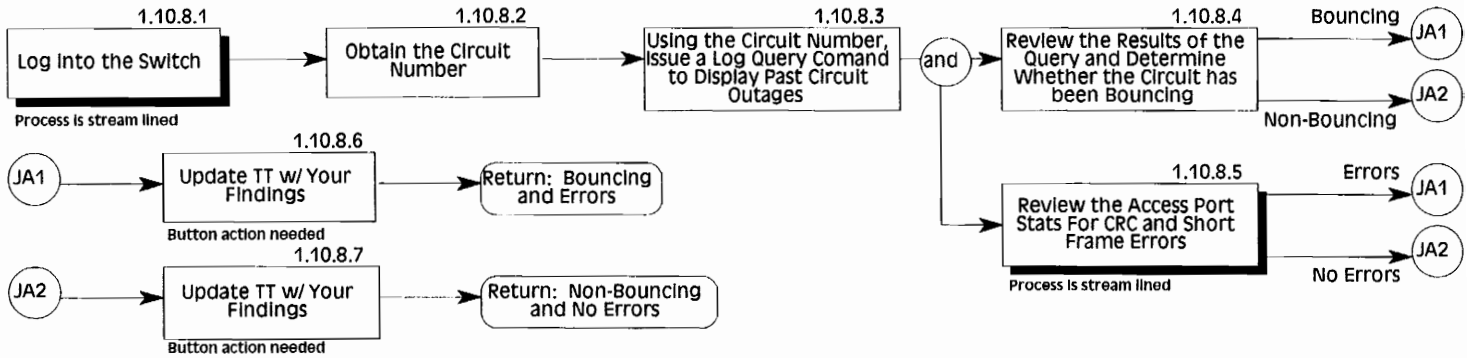
1.9.8.1 Switch Log In



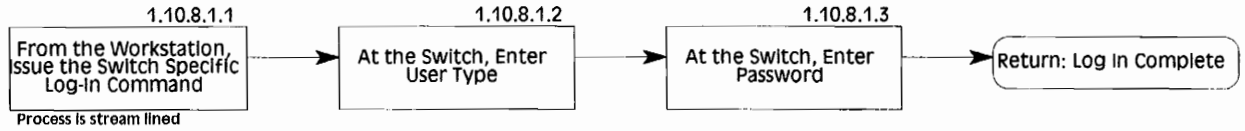
1.10 New Trouble Ticket - Circuit Down, Errored Frames and Intermittent Bouncing



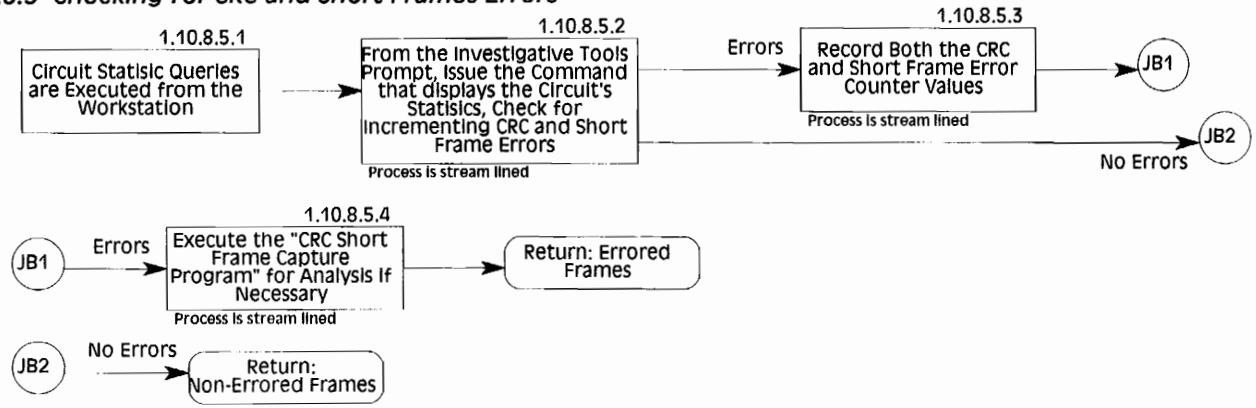
1.10.8 Bouncing Circuit Investigation



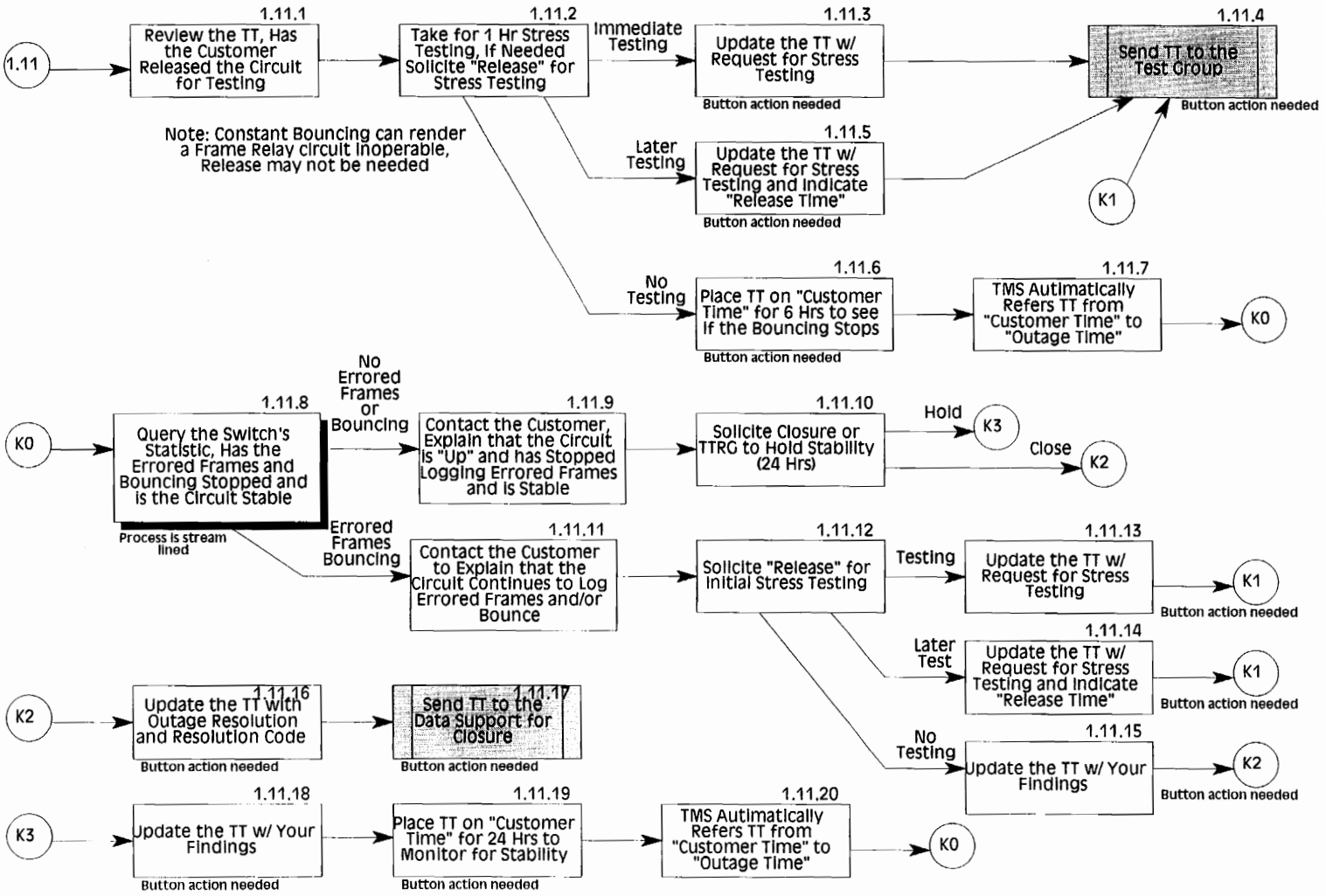
1.10.8.1 Switch Log In



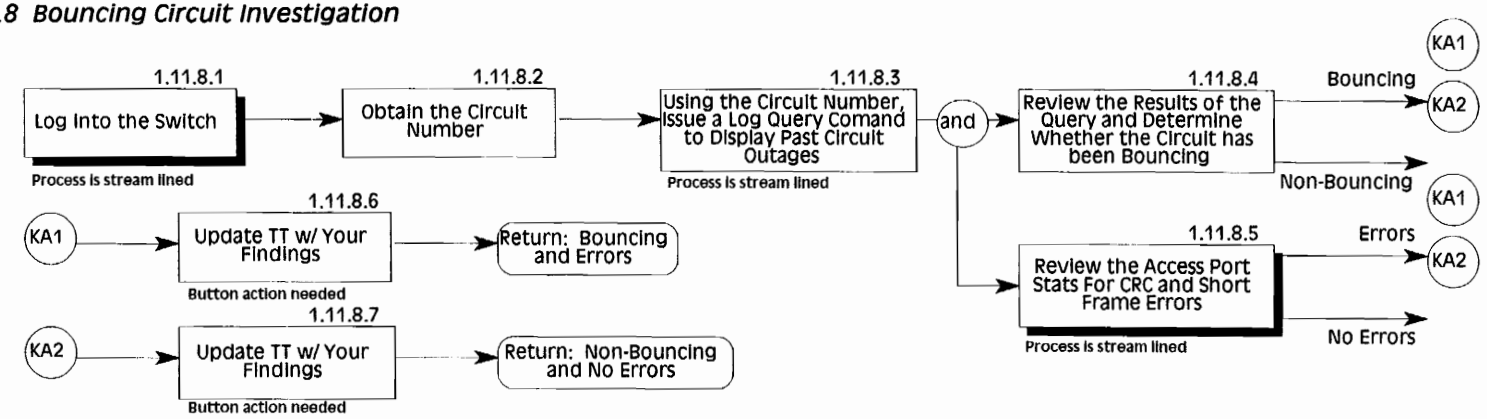
1.10.8.5 Checking for CRC and Short Frames Errors



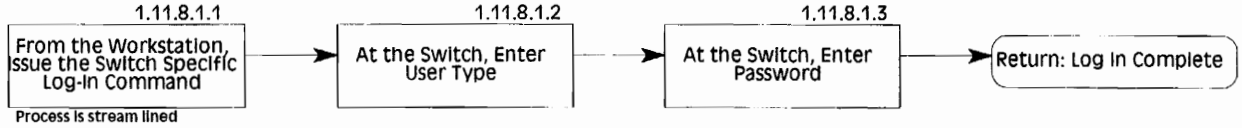
1.11 New Trouble Ticket - Circuit Down, Errored Frames & Bouncing



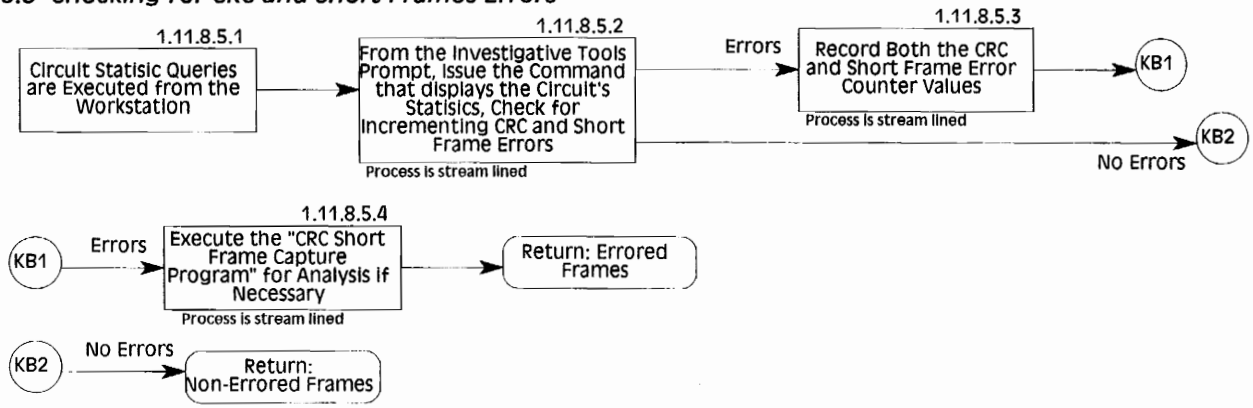
1.11.8 Bouncing Circuit Investigation



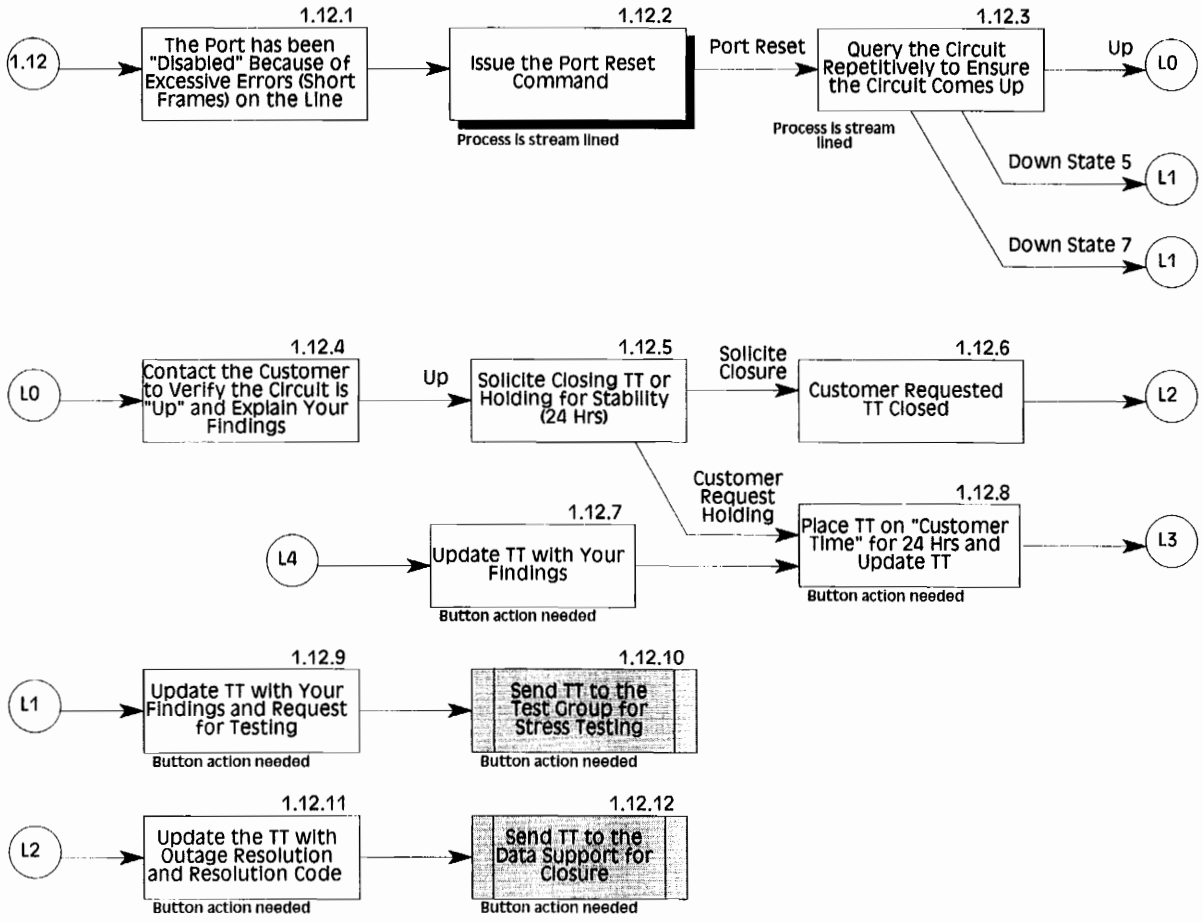
1.11.8.1 Switch Log In



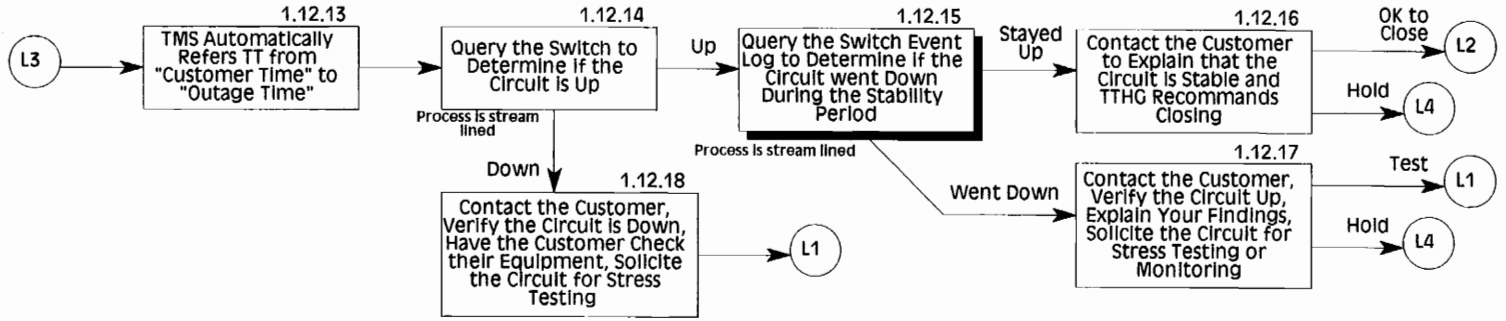
1.11.8.5 Checking for CRC and Short Frames Errors



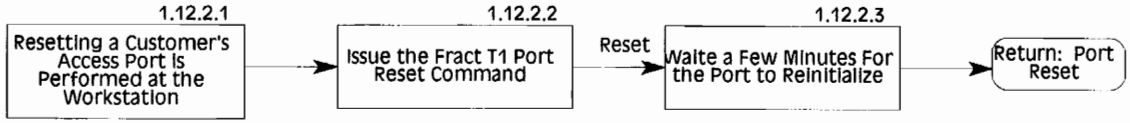
1.12 New Trouble Ticket - State 7 "Bad Down"



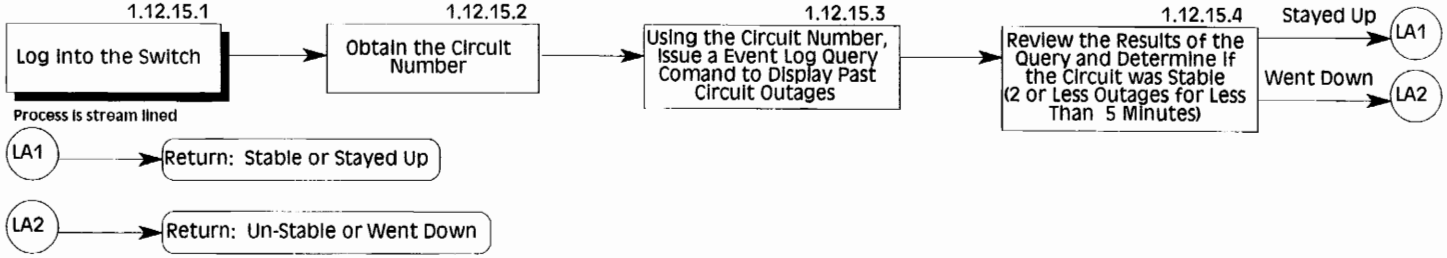
1.12 New Trouble Ticket - State 7 "Bad Down" Con't



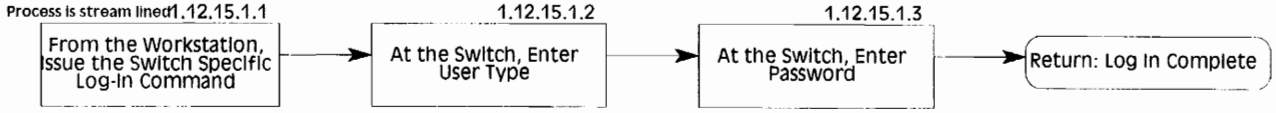
1.12.2 Resetting a Fractional T1 Port



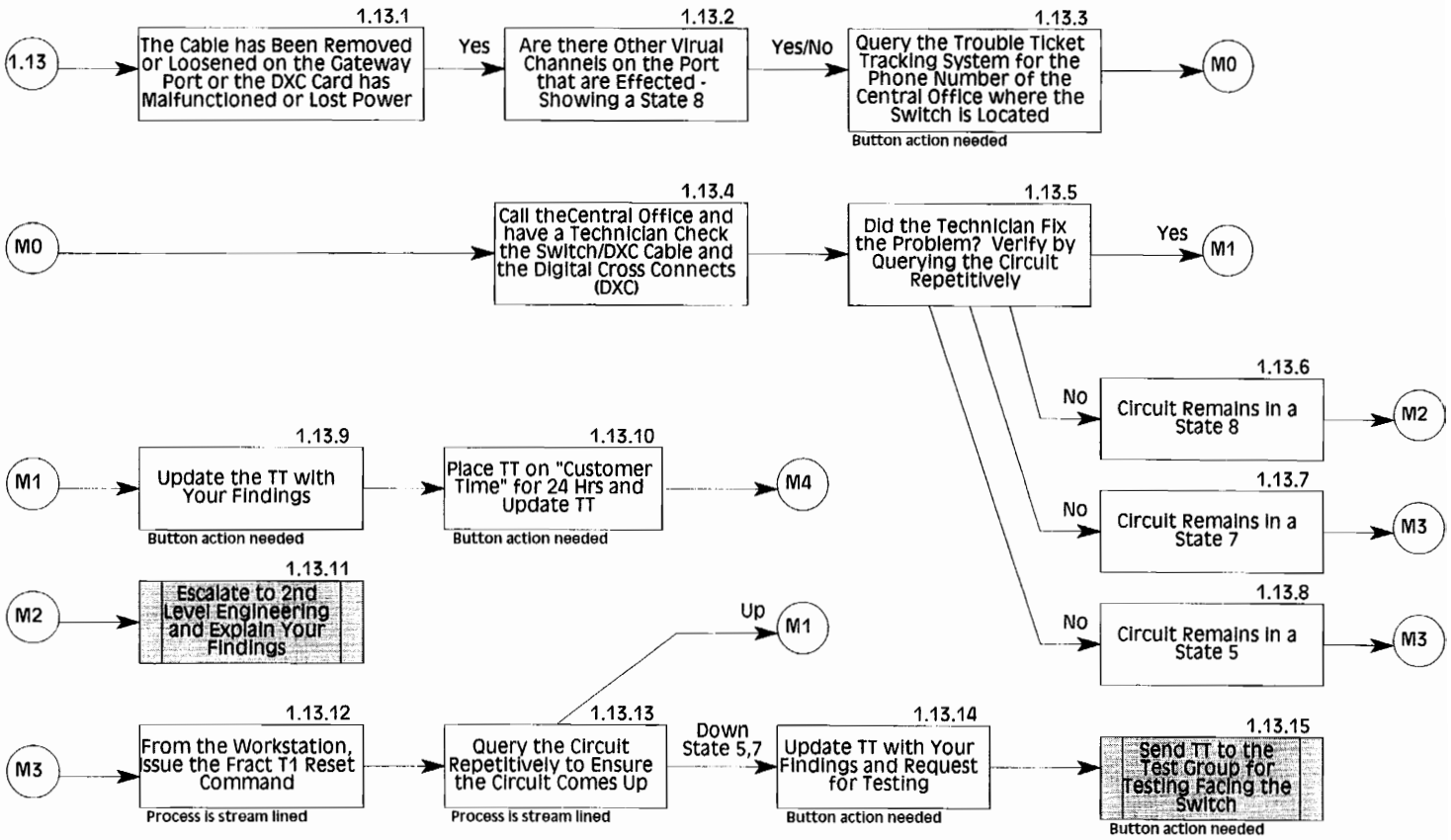
1.12.15 Circuit Stability Check



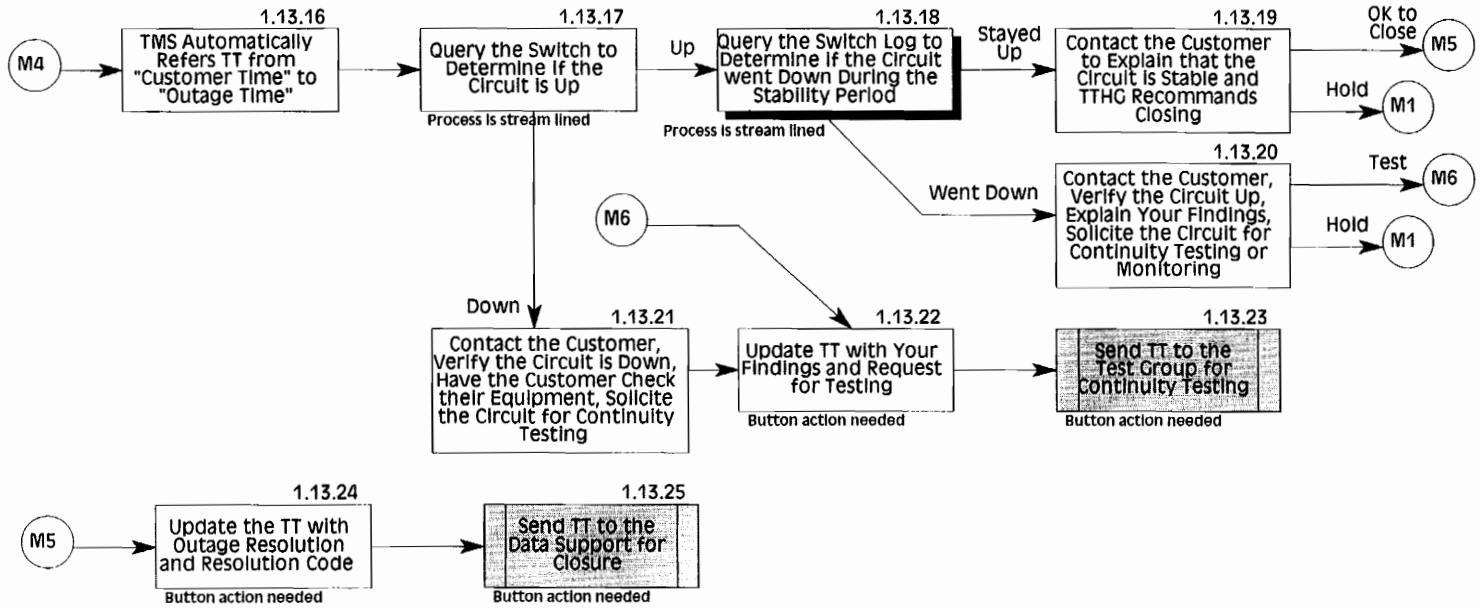
1.12.15.1 Switch Log In



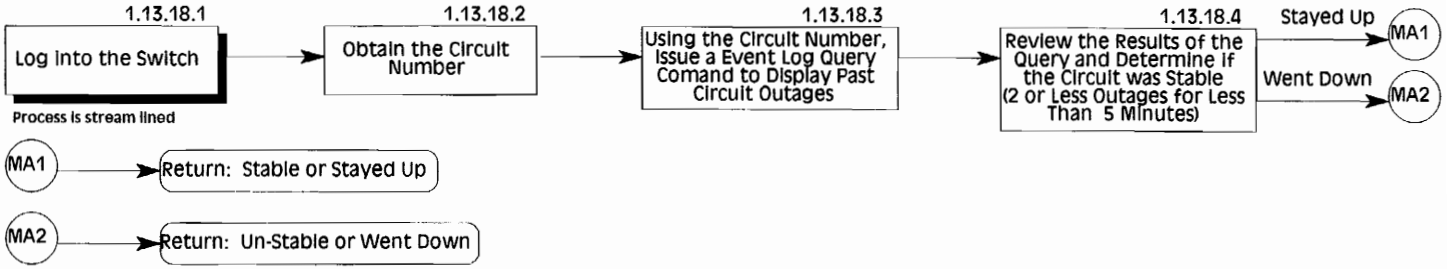
1.13 New Trouble Ticket - State 8 "Not Present"



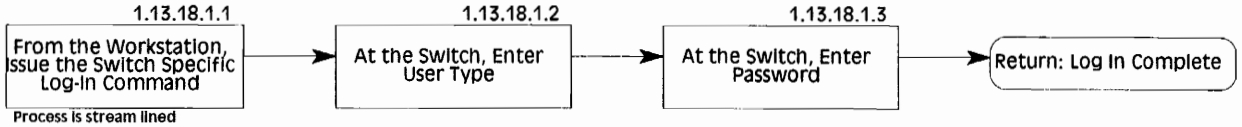
1.13 New Trouble Ticket - State 8 "Not Present" Con't



1.13.18 Circuit Stability Check

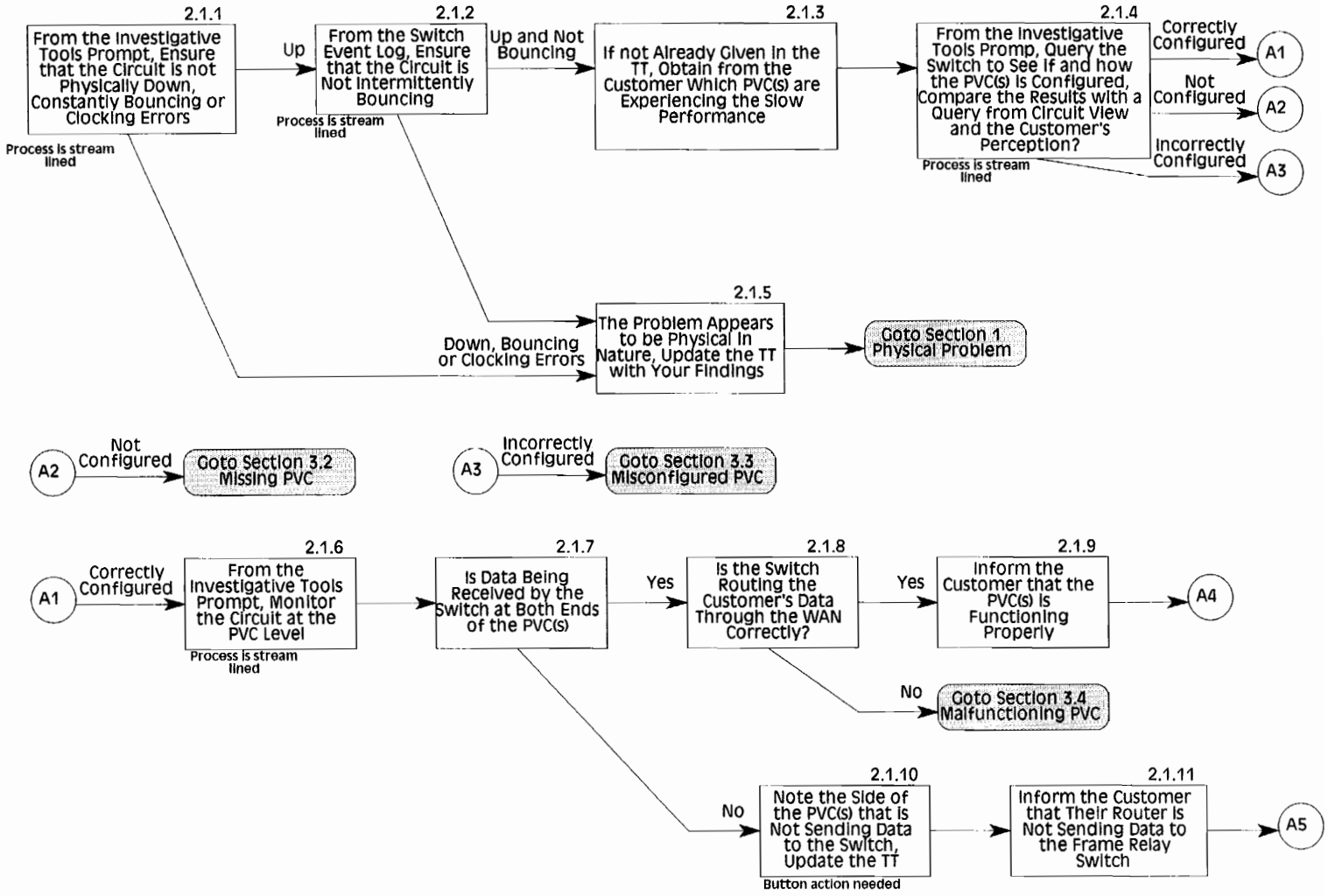


1.13.18.1 Switch Log

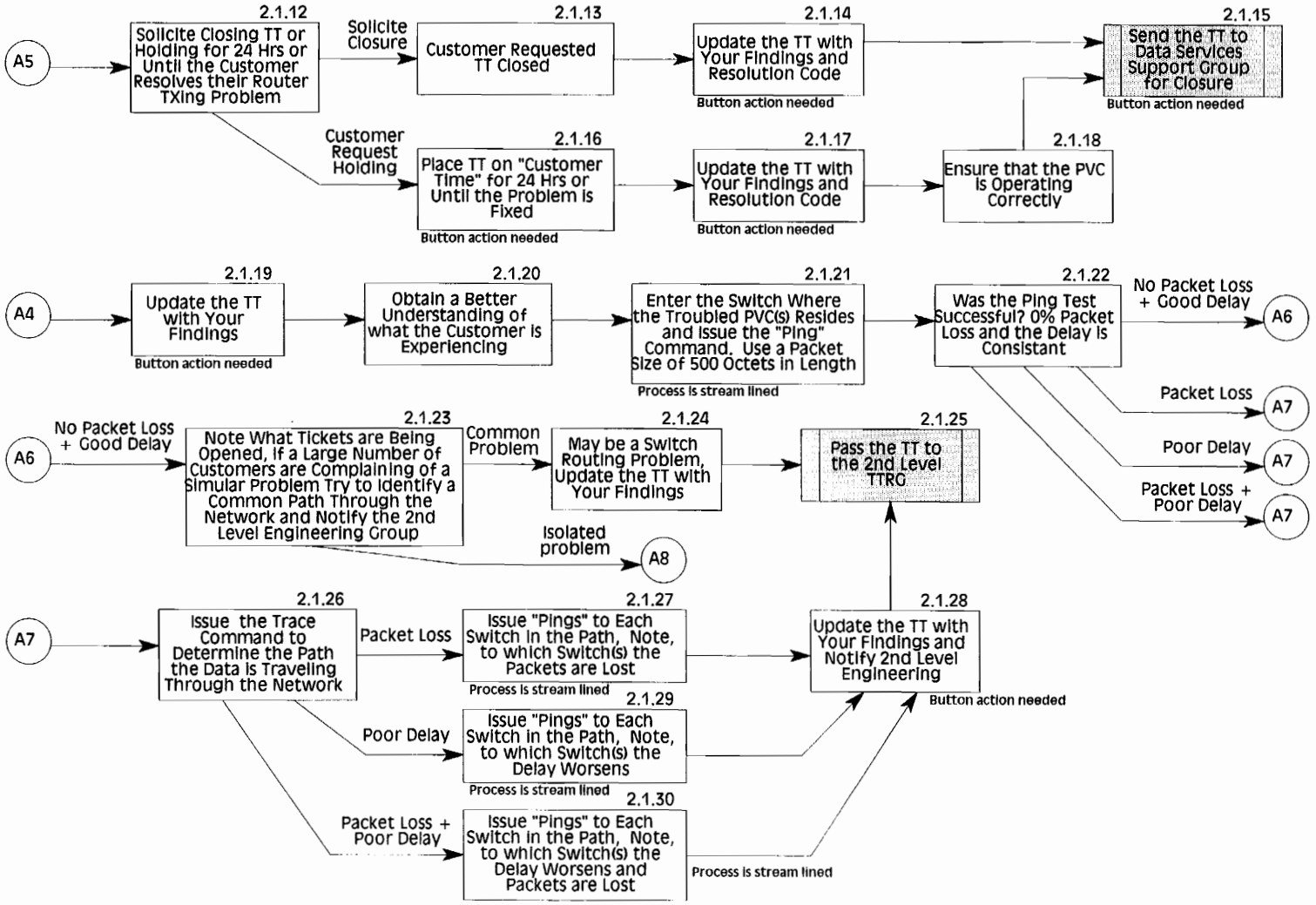


SECTION 2

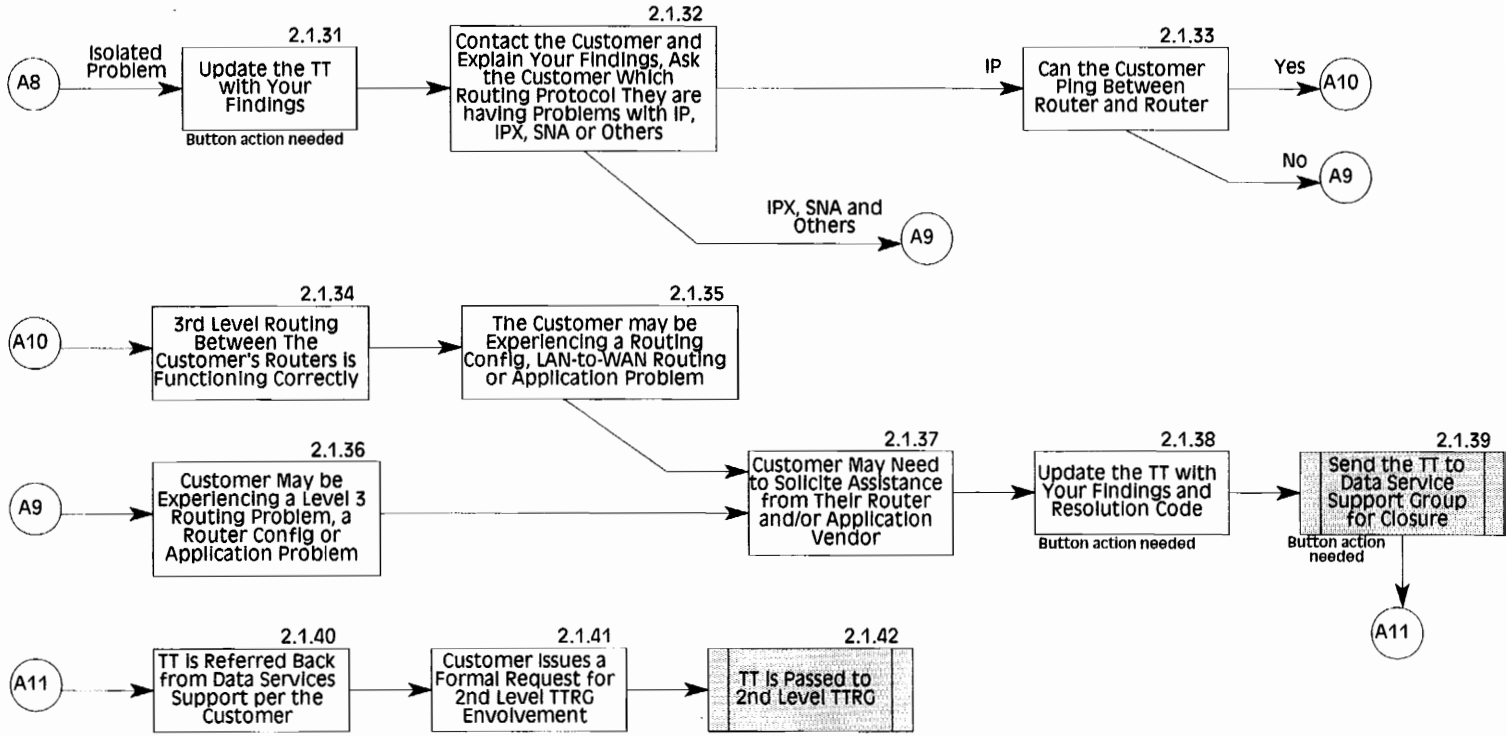
2.1 Slow Performance and Low Throughput Problems



2.1 Slow Performance and Low Throughput Problems Con't

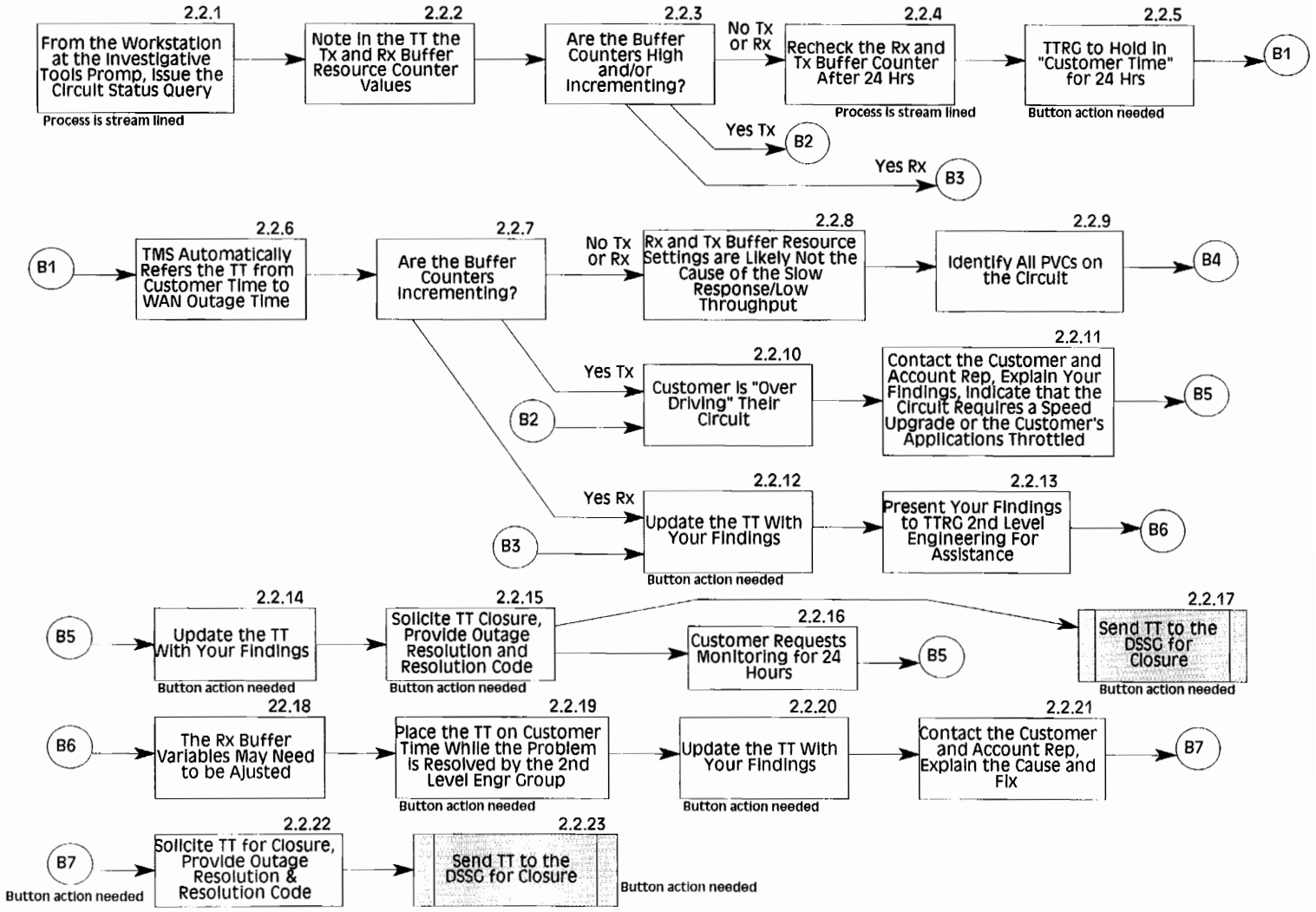


2.1 Slow Performance and Low Throughput Problems Con't

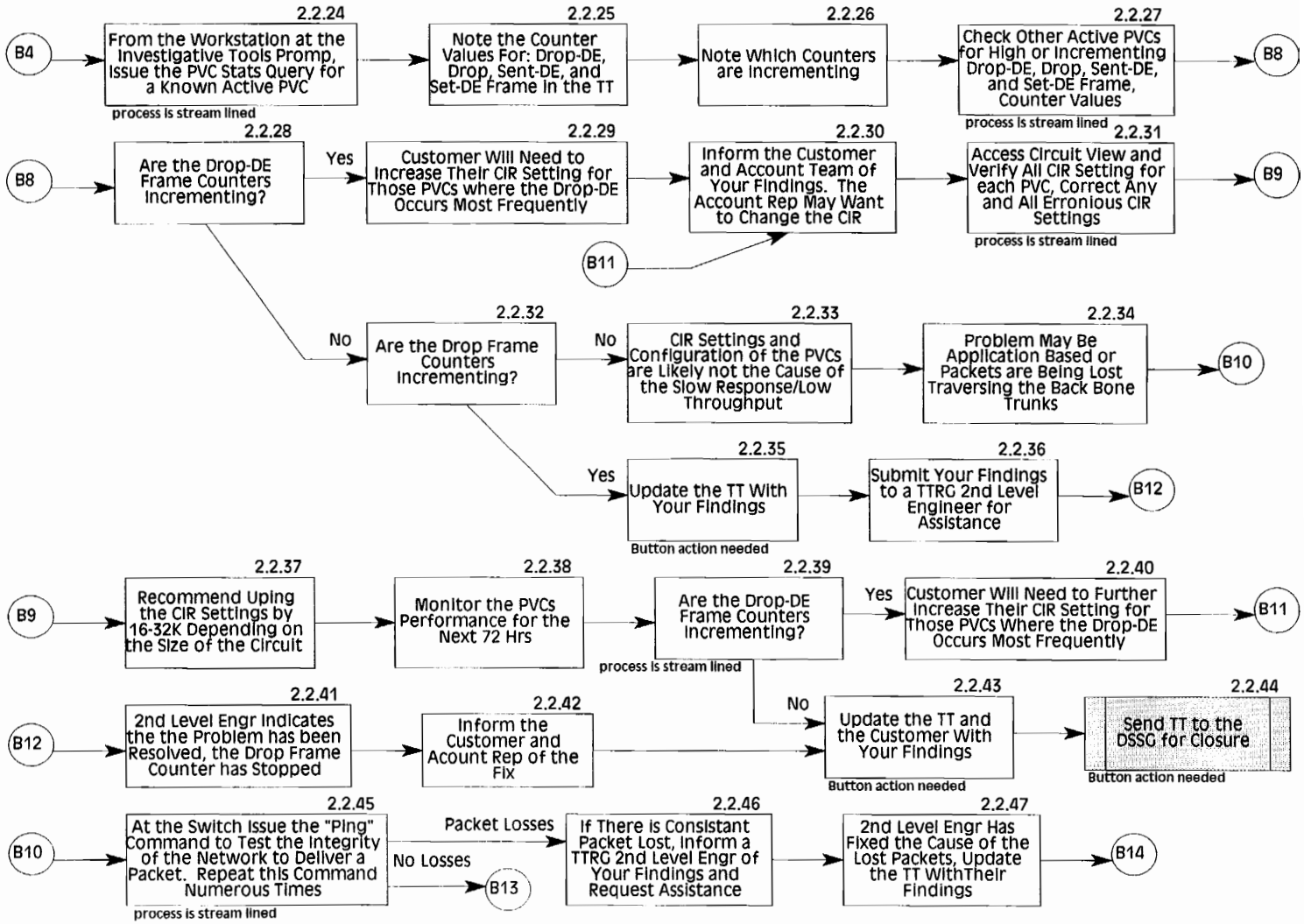


Note: 2nd Level TTRGs Envolvement is Predicated on the Customer Exhausting All Their Ideas to Solve the Problem and Have Gotten Their Router Vendor Envolved

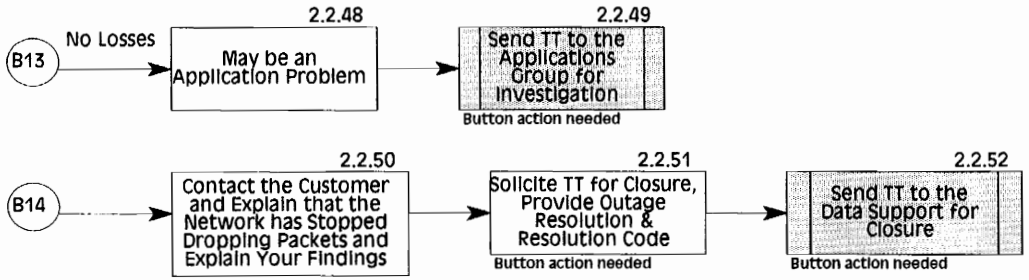
2.2 Slow Response/Low Throughput: Rx & Tx Buffers



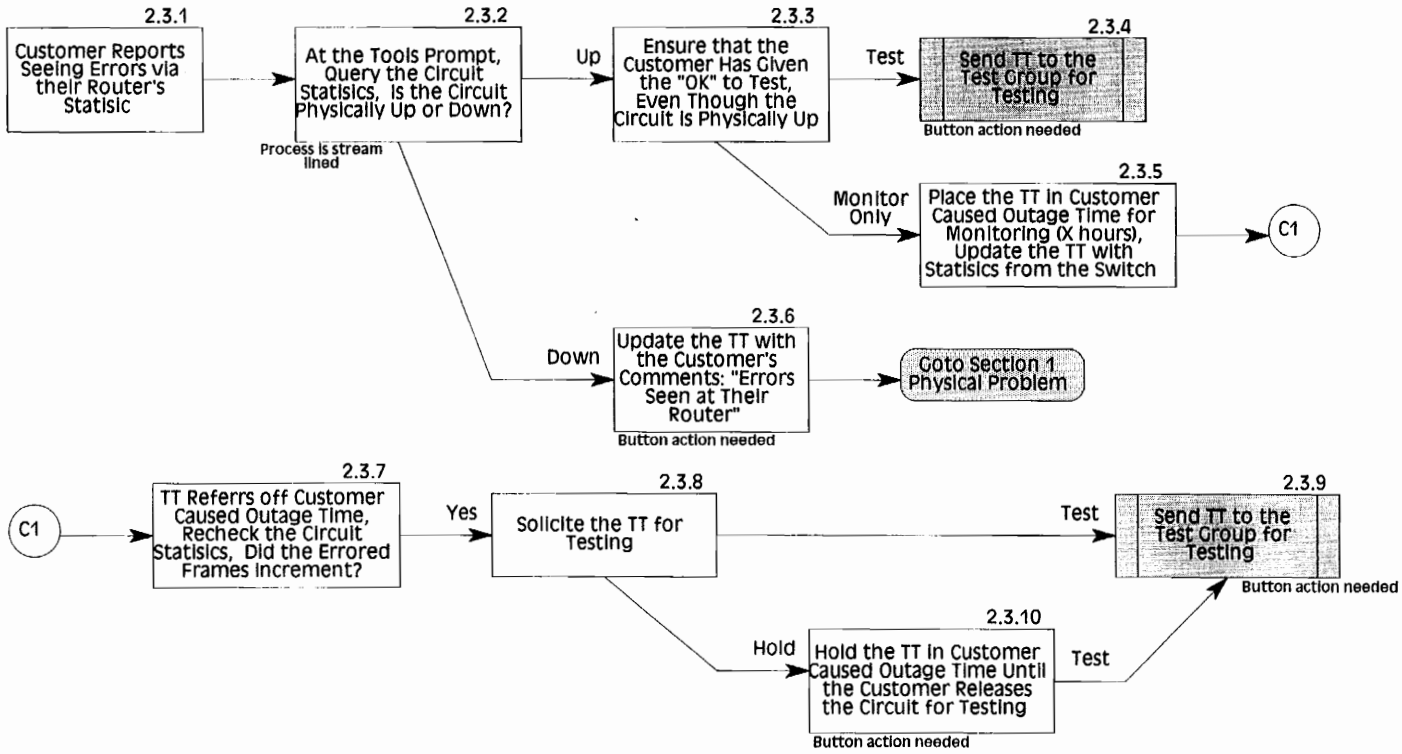
2.2 Slow Response/Low Throughput Con't: Backbone Integrity



2.2 Slow Response/Low Throughput Con't

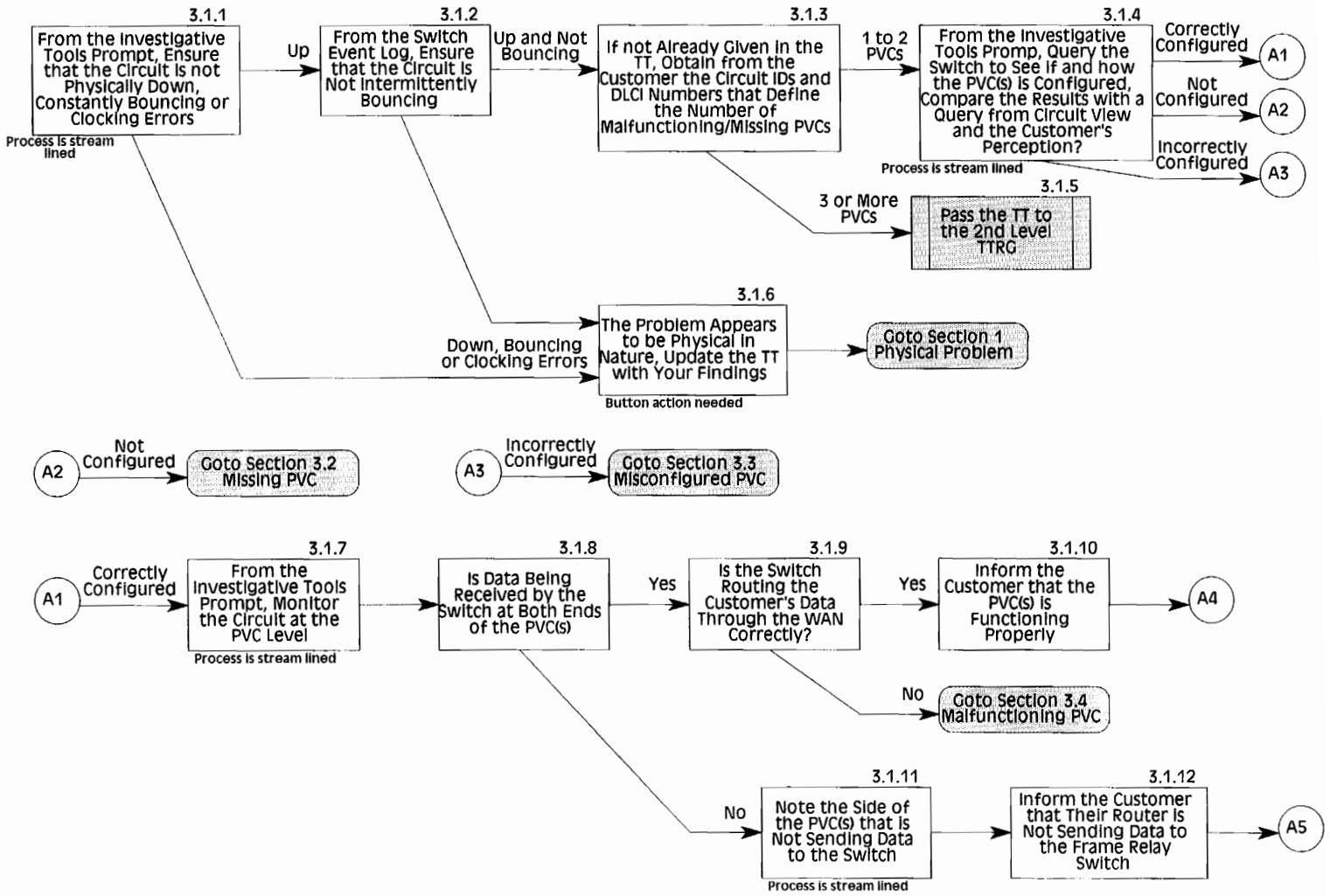


2.3 Customer is Seeing Errors at Their Router's Statisics

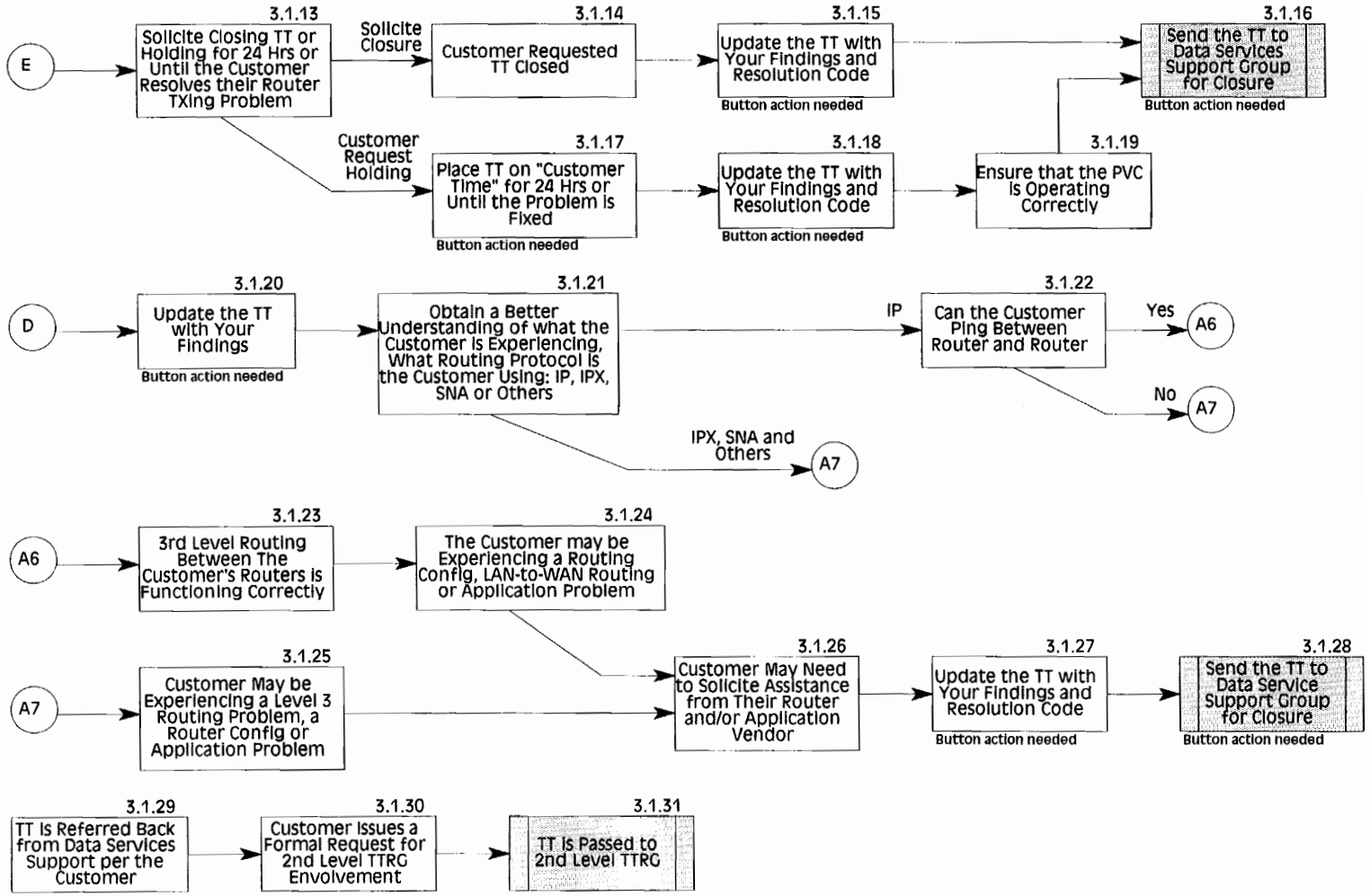


SECTION 3

3.1 PVC Problems

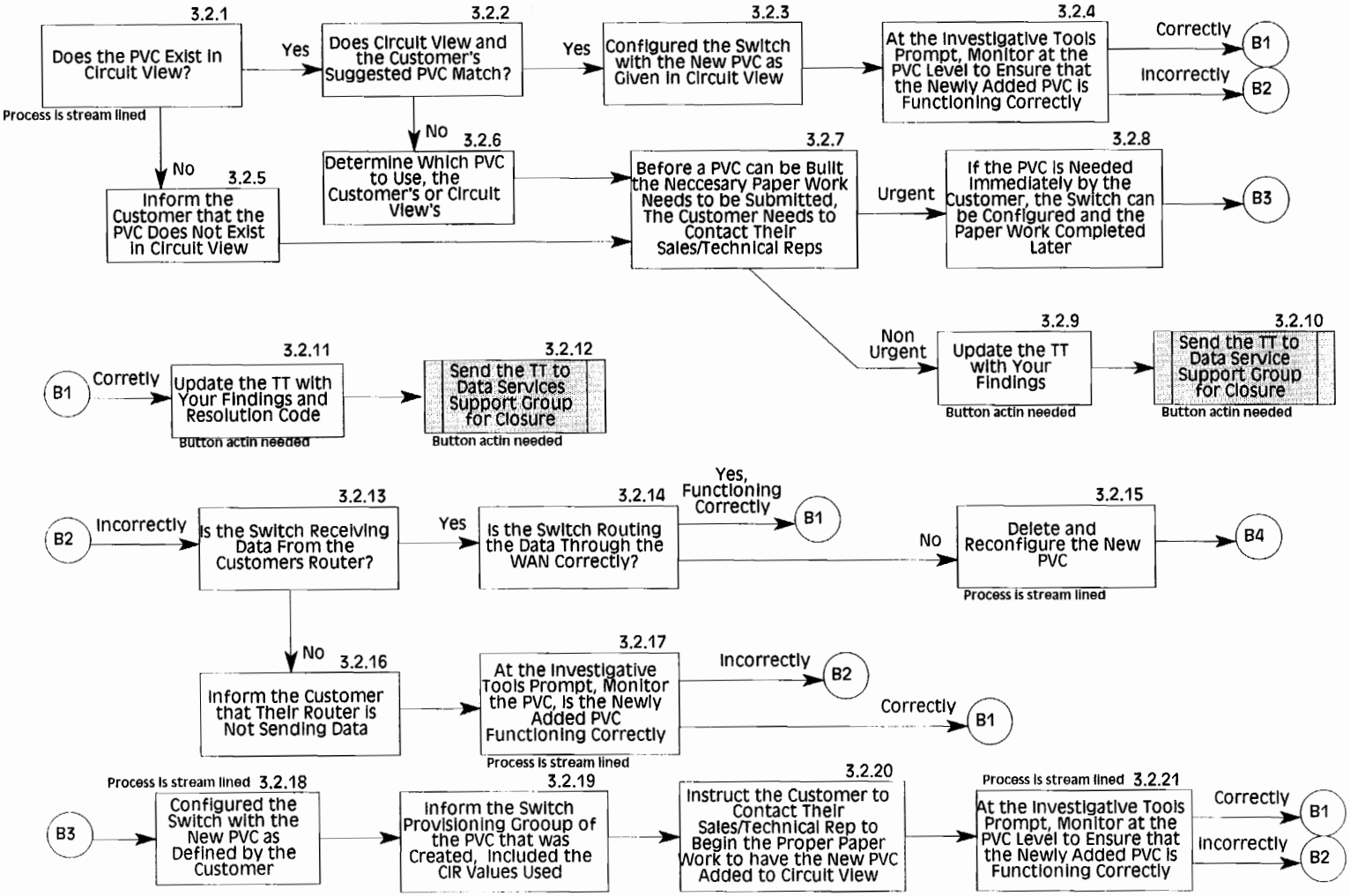


3.1 PVC Problems Con't

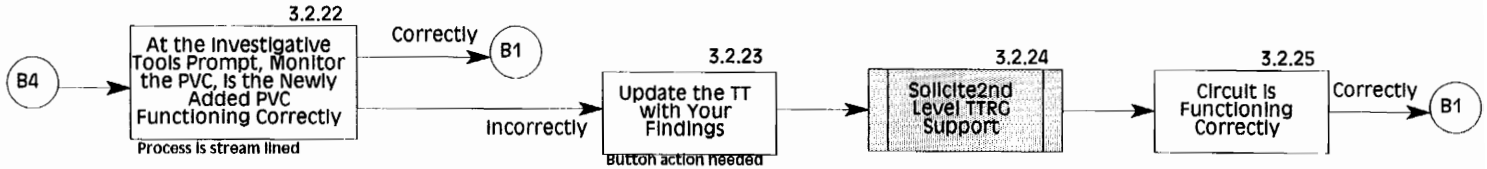


Note: 2nd Level TTRGs Envolvement is Predicated on the Customer Exhausting All Their Ideas to Solve the Problem and Have Gotten Their Router Vendor Envolved

3.2 Missing PVC(s)

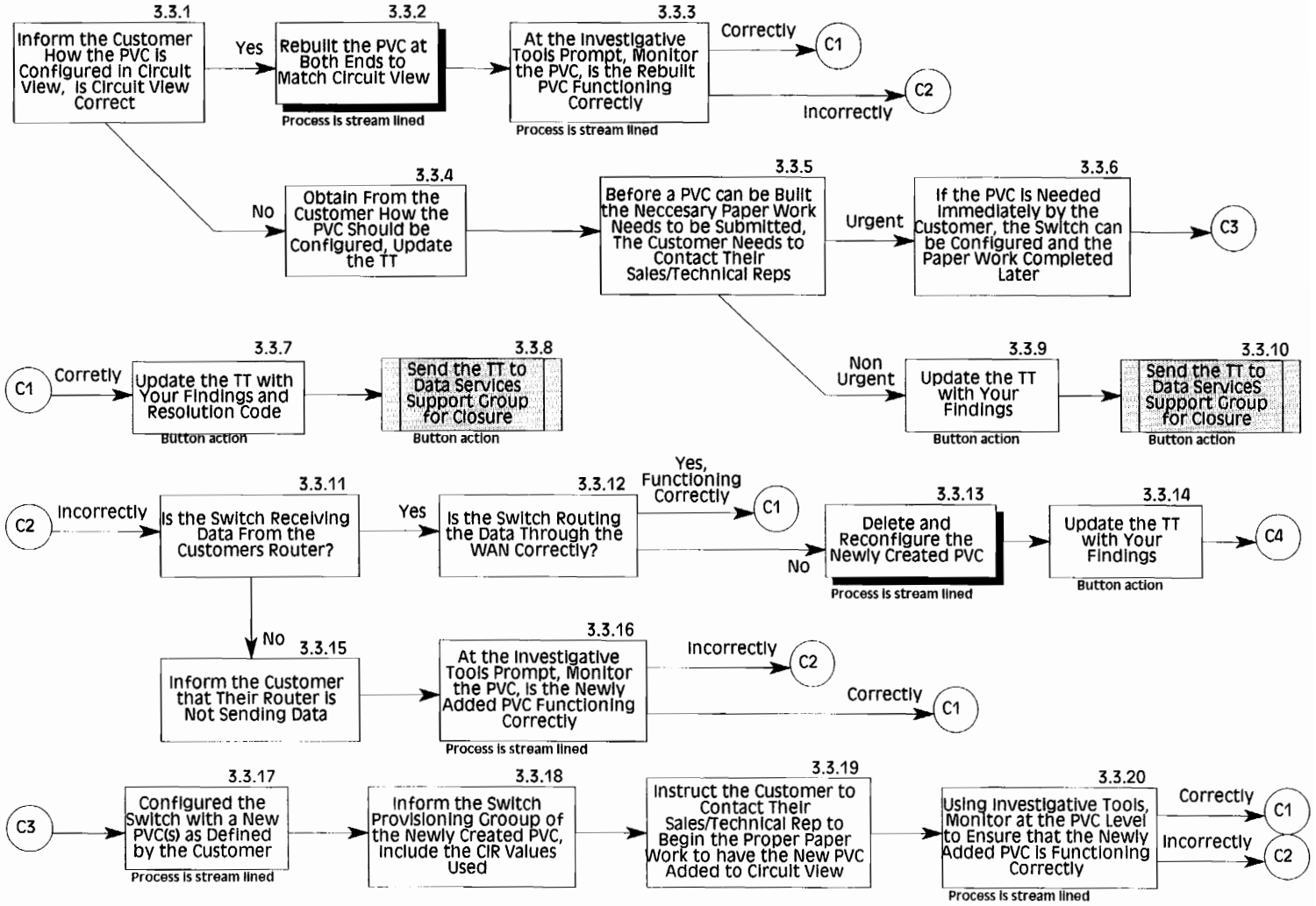


3.2 Missing PVC(s) Con't



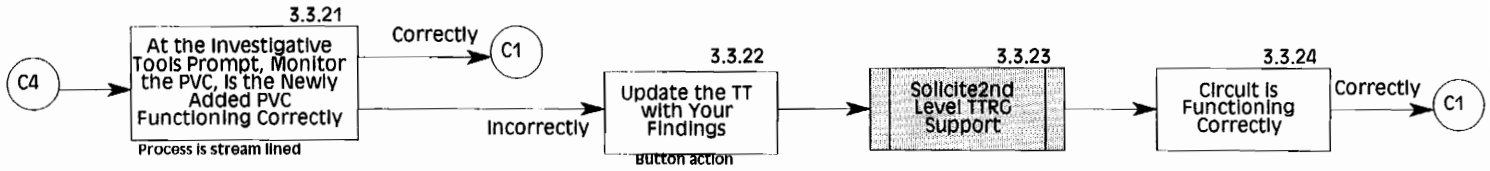
Note: If a PVC is added to the switch but is not shown in Circuit View the trouble shooter is to update the Switch Provisioning Group of their actions

3.3 Misconfigured PVC(s)



Section 3

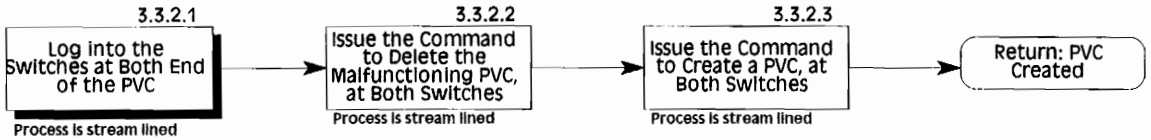
3.3 Misconfigured PVC(s)



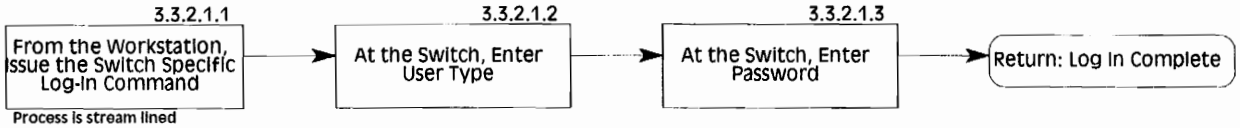
Note: If a PVC is added to the switch but is not shown in Circuit View the trouble shooter is to update the Switch Provisioning Group of their actions

SECTION 3

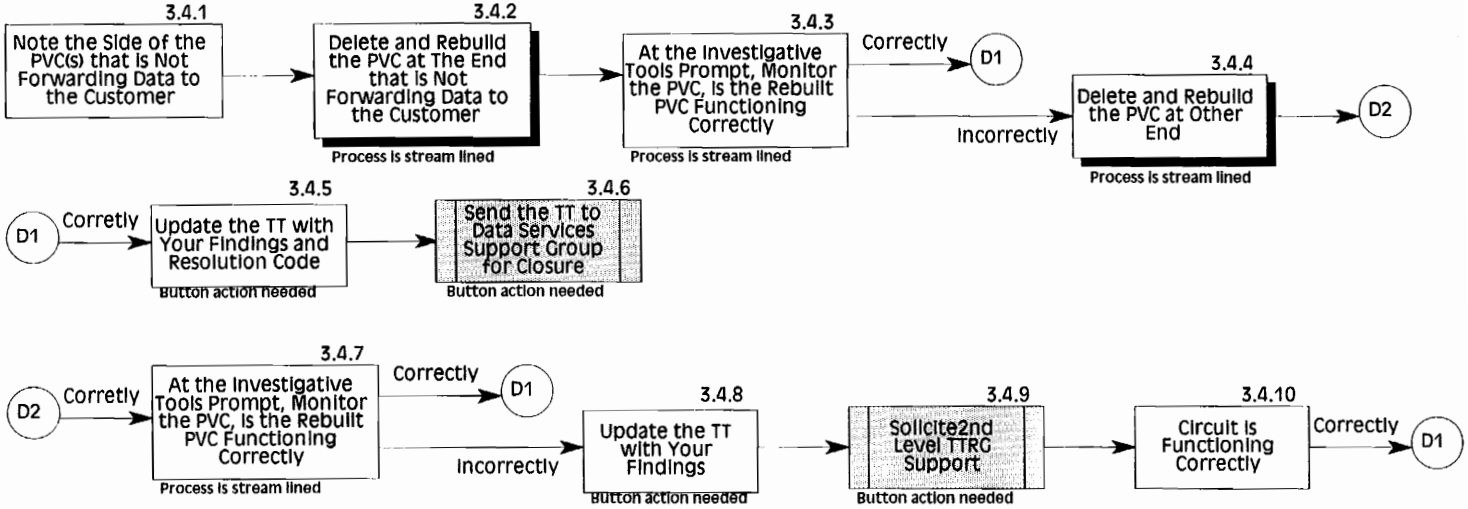
3.3.2 & 3.3.13 Rebuilting/Creating a PVC



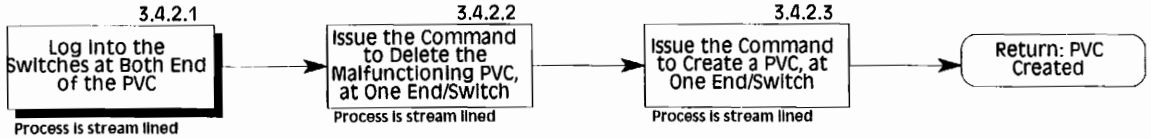
3.3.2.1 Switch Log In



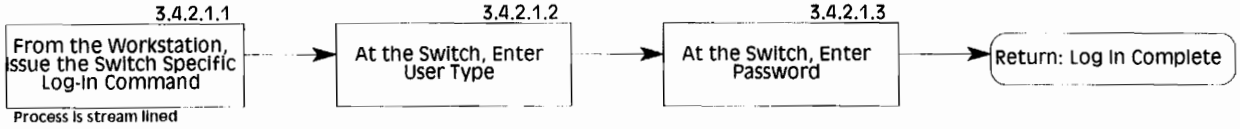
3.4 Malfunctioning PVC(s)



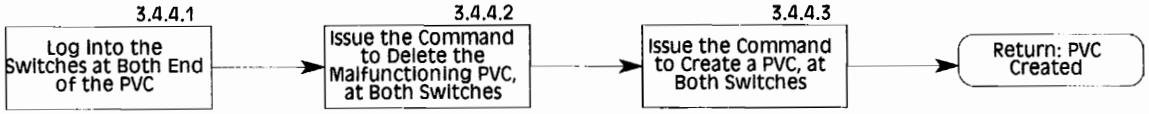
3.4.2 Rebuilting/Creating a PVC



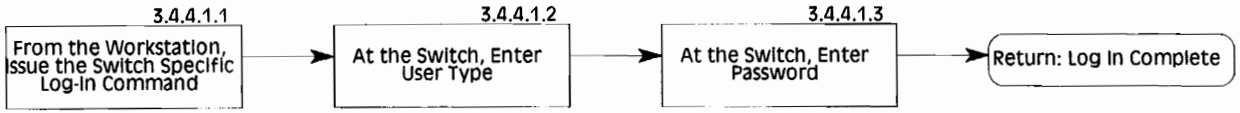
3.4.2.1 Switch Log In



3.4.4 Rebuilting/Creating a PVC

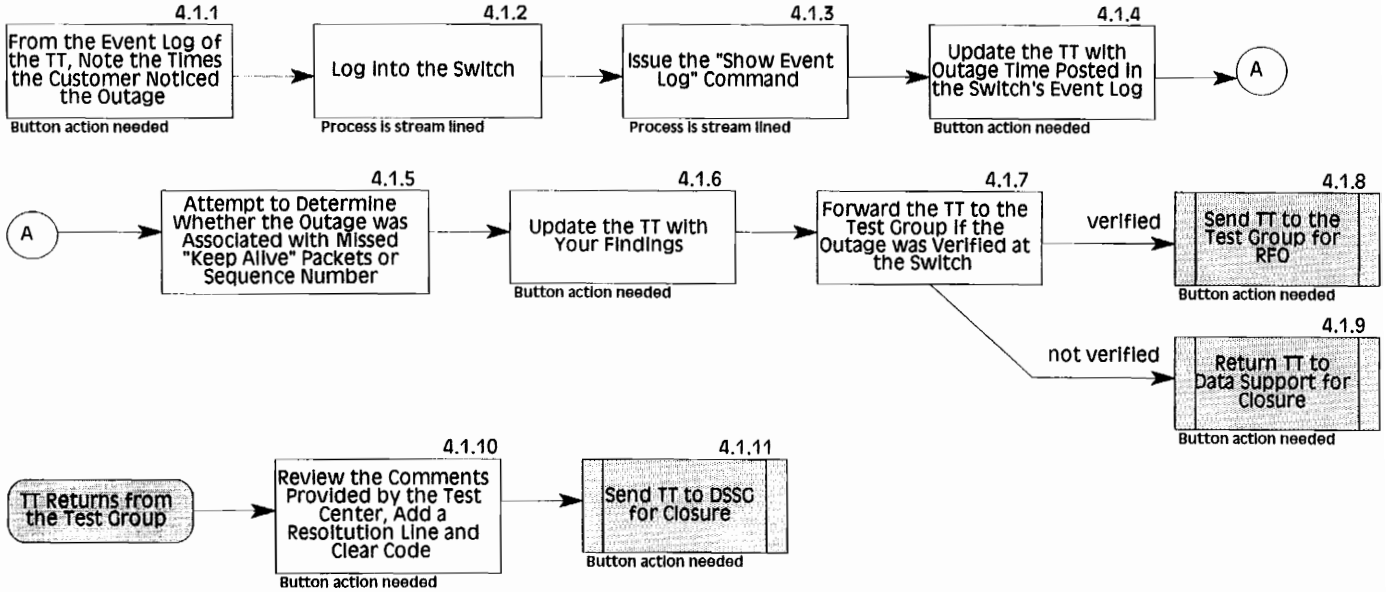


3.4.4.1 Switch Log In



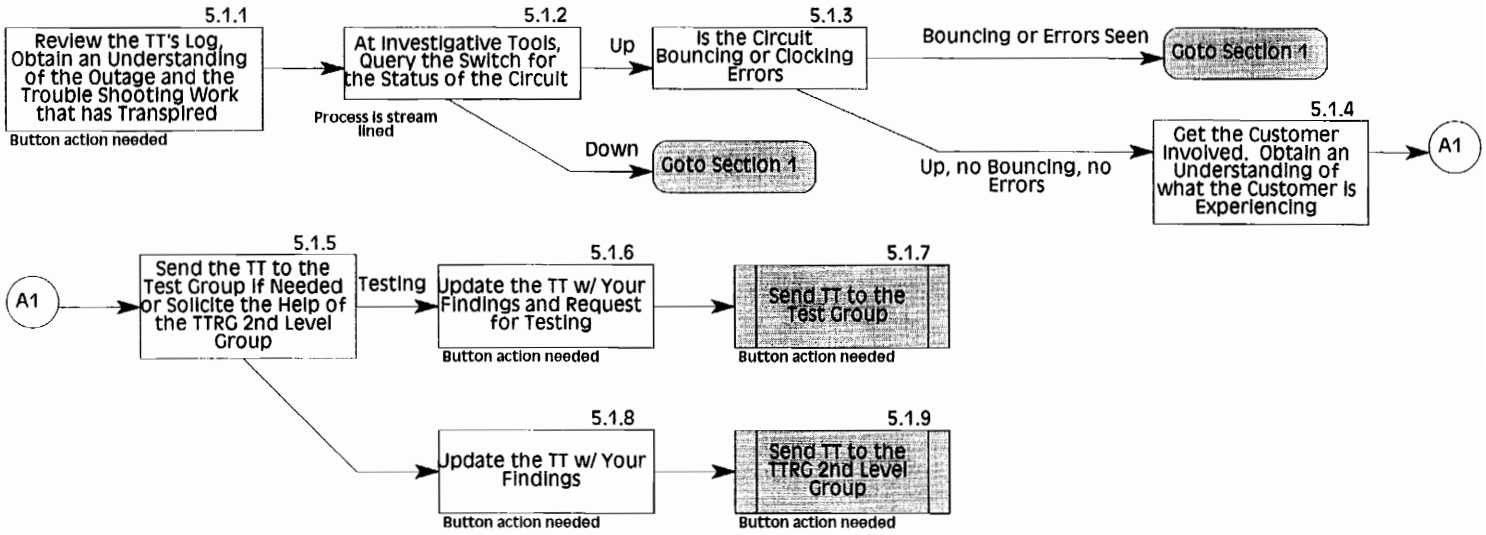
SECTION 4

4.1 Request For Outage

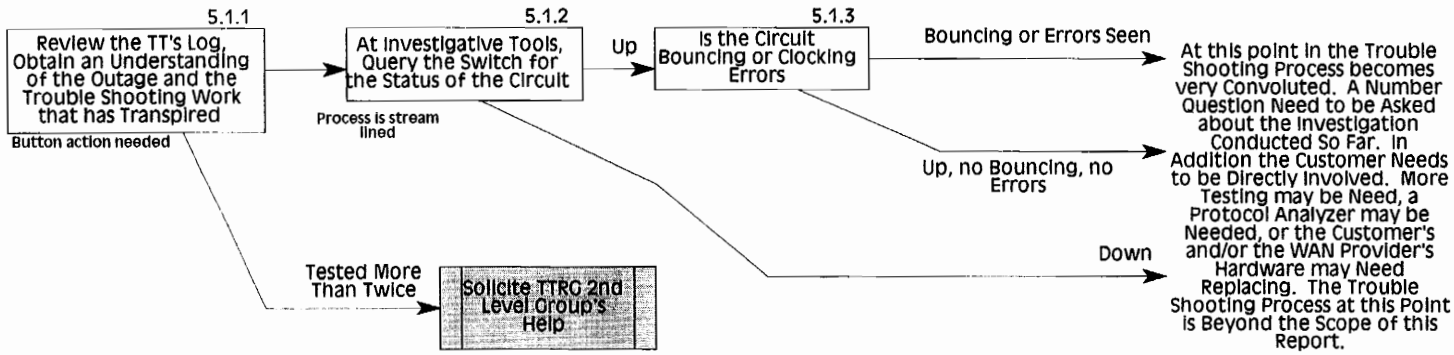


SECTION 5

5.1 Old Trouble Ticket: Type 2



5.2 Old Trouble Ticket: Type 3



APPENDIX B

The Data Set

Part 1

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940804000 0710	CUS	726	00:44	WAN	
940804000 1167	WAN	150	30:24		
940808000 2361	CUS	150	00:28		
940808000 2489	WAN	250	00:58		150
940809000 0901	CUS	745	01:56		
940809000 1028	CUS	713	07:33		744R
940809000 1747	CUS	315	03:20		
940809000 2175	CUS	731	01:17		
940810000 0356	CUS	144	02:28		
940810000 0535	WAN	102	00:58		
940810000 0728	WAN	773	01:18		744R
940810000 0955	WAN	137	03:27		744R
940810000 0958	WAN	137	03:11		744R
940810000 1473	CUS	104	02:50		
940810000 2792	CUS	100	02:06	WAN	190
940811000 0648	CUS	767P	01:31		768
940811000 1061	CUS	333	02:11	WAN	
940811000 1128	WAN	737	01:58		744
940811000 1609	CUS	000	01:13	WAN	790
940811000 2127	CUS	108	00:47		790
940812000 0040	WAN	145C	02:24		
940812000 0086	WAN	171	08:16		
940812000 0681	CUS	193	01:48		
940812000 0682	CUS	144	01:30		
940812000 0711	CUS	708	01:42		790
940812000 0720	CUS	108	01:34		790
940812000 0779	CUS	171R	00:22		
940812000 0812	CUS	793	00:17		
940812000 0928	WAN	315	14:36		
940812000 1180	WAN	737	02:31		744
940812000 1326	WAN	108	02:12		190
940812000 1751	CUS	000	00:10		790
940812000 1850	CUS	193	00:12		
940812000 2165	CUS	750	05:34		744R
940812000 2239	WAN	744R	03:10		
940812000 2378	WAN	7373	01:28		737
940812000 2596	CUS	108	00:40		171
940812000 2681	WAN	726	01:39		
940813000 0002	CUS	744 (R)	01:44	WAN	
940813000 0007	WAN	737	03:04		
940813000 0046	WAN	108	02:05		745
940813000 0461	WAN	790	00:37		
940813000 0475	WAN	737	01:41		
940813000 0539	WAN	750	00:31		
940813000 0651	WAN	000	01:31		790
940813000 0684	WAN	190	03:41		
940813000 0692	WAN	108	02:29		768
940813000 1040	CUS	744 (R)	00:51	WAN	
940813000 1242	WAN	108	00:55		744R
940813000 1275	WAN	150	00:02		
940813000 1306	ACT	308	07:04	WAN	768
940813000 1311	WAN	308	07:01		768
940813000 1327	WAN	737	03:29		
940813000 1378	CUS	726	05:47		
940814000 0009	WAN	768	01:06		
940814000 0022	WAN	750	00:40		
940814000 0079	WAN	144H	01:21		
940814000 0080	CUS	108	03:08		144H
940814000 0138	CUS	126	00:27		
940814000 0143	WAN	102	00:01		
940814000 0149	WAN	117	13:12		
940814000 0158	CUS	108	00:03		102
940814000 0161	WAN	114	03:16		115
940815000 2726	WAN	315	02:18		
940815000 2746	WAN	108	02:05		315
940815000 2772	CUS	108	00:08		704
940816000 2222	CUS	108	00:11		190
940816000 0027	CUS	190	01:06	WAN	
940816000 0029	WAN	750	01:14		
940816000 0058	WAN	104	01:01		
940816000 0141	WAN	193	01:00		
940816000 0173	WAN	745	01:22		
940816000 0233	WAN	118	00:36		190
940816000 0296	CUS	190	01:10	WAN	
940816000 0451	CUS	108	00:47		702
940816000 0493	WAN	146M	02:28		
940816000 0503	WAN	108	00:38		102
940816000 0511	CUS	113	01:43		115
940816000 0527	WAN	145T	01:14		
940816000 0528	WAN	145T	02:00		
940816000 0530	WAN	145T	01:22		
940816000 0534	CUS	790	03:52		
940816000 0619	WAN	744R	01:34		
940816000 0710	CUS	762	04:16		
940816000 0723	CUS	190	01:25		
940816000 0725	CUS	750	01:18		
940816000 0854	CUS	750	00:22		
940816000 0989	CUS	750	04:34		
940816000 1168	WAN	737	01:02		
940816000 1175	CUS	737	00:59	WAN	
940816000 1533	CUS	850	01:26		
940816000 1611	CUS	108	01:19	WAN	768
940816000 1641	CUS	745	00:17		
940816000 1741	CUS	135	01:26		
940816000 1868	CUS	145	01:49		
940816000 1874	WAN	193	03:20		
940816000 1948	CUS	765	01:19	WAN	
940816000 2156	CUS	737	01:30		
940816000 2222	CUS	108	0:11		190
940816000 2266	CUS	193	00:05		
940816000 2311	WAN	108	01:24		102
940816000 2382	ACT	737	00:08	WAN	
940816000 2517	CUS	744R	00:27		
940816000 2654	CUS	844C	00:23		
940816000 2721	WAN	218	04:54		193
940816000 2868	CUS	637	01:54		
940817000 0089	CUS	190	09:34		
940817000 0093	WAN	744 (R)	00:00		
940817000 0158	WAN	768	00:40		
940817000 0198	WAN	193	00:29		
940817000 0202	WAN	744R	00:34		
940817000 0299	CUS	744 (R)	00:05		
940817000 0300	CUS	104	01:13		
940817000 0523	CUS	193	01:06		
940817000 0530	CUS	108	00:18	WAN	102
940817000 0578	CUS	102	00:18		
940817000 0596	WAN	190	01:45		
940817000 0644	WAN	000	00:07		102
940817000 1087	CUS	744 (R)	01:21	WAN	
940817000 1160	WAN	190	01:16		
940817000 1167	CUS	737	01:04		
940817000 1389	WAN	110	01:21		
940817000 1420	CUS	744 (R)	00:51		
940817000 1447	CUS	108	02:13		744R
940817000 1494	WAN	768	02:52		
940817000 1758	WAN	738	03:37		
940817000 1916	CUS	193	01:47		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940814000 0174	WAN	000	00:03		
940814000 0224	CUS	135	02:48	WAN	
940814000 0235	WAN	117	10:53		
940814000 0236	WAN	726	00:53		
940814000 0245	WAN	193	00:31		
940814000 0248	CUS	150	00:49		
940814000 0249	CUS	108	00:41	WAN	102
940814000 0251	CUS	768	00:44	WAN	
940814000 0253	CUS	135	00:27	WAN	
940814000 0264	CUS	146	00:15	WAN	
940814000 0265	CUS	737	03:11	WAN	
940814000 0270	WAN	190	00:09		
940814000 0276	WAN	146	00:10		
940814000 0284	CUS	108	00:20	WAN	102
940814000 0285	WAN	744 (R)	06:37		
940814000 0286	CUS	126	00:14		
940814000 0291	CUS	135	00:30		
940814000 0293	WAN	126	00:22		
940814000 0294	WAN	193	00:41		
940814000 0306	WAN	745	00:58		
940814000 0307	CUS	744 (R)	00:08	WAN	
940814000 0312	CUS	768	00:30	WAN	
940814000 0324	CUS	324	01:25		
940814000 0330	CUS	124	01:25	WAN	
940814000 0343	CUS	767T	00:01	WAN	
940814000 0353	WAN	150	01:05		
940814000 0377	CUS	190	00:24		
940814000 0383	CUS	135	00:36	WAN	
940814000 0418	CUS	135M	00:51	WAN	
940814000 0443	CUS	350	06:13		
940814000 0455	CUS	108	00:10		702
940814000 0460	CUS	767	01:51	WAN	
940814000 0467	CUS	108	02:37	WAN	744R
940814000 0495	CUS	193	00:03		
940814000 0504	CUS	744 (R)	02:55		
940814000 0659	CUS	193	01:23		
940814000 0717	CUS	116M	01:04		
940814000 0733	CUS	190	00:08		116M
940814000 0777	CUS	002	00:54		102
940814000 0779	CUS	726	00:29		
940814000 0820	CUS	193	01:53		
940814000 0973	CUS	135	01:23	WAN	
940814000 0977	CUS	190	03:05	WAN	
940814000 0980	WAN	103	00:04		
940814000 0986	WAN	135	01:11		
940814000 1158	WAN	190	00:56		
940815000 0060	CUS	750	00:52	WAN	
940815000 0264	WAN	193	00:56		
940815000 0289	CUS	144H	00:57	WAN	
940815000 0329	CUS	0000	00:01	WAN	
940815000 0344	CUS	193	00:33		
940815000 0370	WAN	193	00:36		
940815000 0400	CUS	738	01:46		744R
940815000 0721	CUS	331	08:01		
940815000 0732	CUS	193	01:32		
940815000 0768	CUS	190	01:06		
940815000 0967	CUS	171R	00:52		
940815000 1291	CUS	744 (R)	01:51		
940815000 1326	CUS	171	01:40		
940815000 1440	WAN	114	03:38		
940815000 1548	CUS	193	03:33		
940815000 1668	CUS	100	00:06		702
940815000 1687	CUS	193	04:43		
940815000 1821	CUS	000	00:01		702

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940817000 2025	CUS	193	01:22		
940817000 2515	WAN	744R	02:45		
940817000 2994	WAN	193	06:33		
940818000 0050	WAN	193	00:33		
940818000 0058	WAN	744R	02:42		
940818000 0131	WAN	190	00:26		
940818000 0329	WAN	744	00:57		
940818000 0349	CUS	193	00:26		
940818000 0442	CUS	350	02:24		
940818000 0446	WAN	102	00:03		
940818000 0504	CUS	326	01:29		
940818000 0535	WAN	744R	01:02		
940818000 0778	WAN	146	00:34		
940818000 0798	CUS	193	04:07		
940818000 0835	WAN	704	01:03		
940818000 1054	CUS	190	00:20		
940818000 1141	WAN	715	02:00		
940818000 1644	CUS	871	01:45		193
940818000 1654	ACT	720C	00:15	CUS	
940818000 1707	CUS	737	01:14		
940818000 1734	WAN	150	02:25		
940818000 1835	CUS	350	11:31	WAN	
940818000 1934	WAN	145T	00:00		
940818000 2176	CUS	316M	02:45		
940818000 2570	CUS	744 (R)	01:17		
940818000 2584	WAN	193	01:42		
940818000 2677	WAN	715	02:06		
940818000 2752	CUS	750	02:19		
940818000 2786	WAN	773	02:45		774
940818000 2838	CUS	350	04:41		
940818000 2921	CUS	193	01:14	WAN	
940818000 2931	CUS	319	09:26	WAN	
940818000 2969	CUS	331	04:16	WAN	
940818000 2995	WAN	103	00:42		
940819000 0041	CUS	821V	00:03		
940819000 0208	CUS	331	02:30	WAN	
940819000 0306	CUS	774R	01:33	WAN	
940819000 0412	CUS	737	00:44	WAN	
940819000 0442	WAN	117	00:47		
940819000 0606	CUS	744R	00:37	WAN	
940819000 0898	CUS	127	00:52		193
940819000 0914	CUS	127	00:48		193
940819000 1024	CUS	350	01:05		
940819000 1107	CUS	390	00:59		
940819000 1165	WAN	193	01:30		
940819000 1167	CUS	726	00:23	WAN	
940819000 1289	CUS	190	00:21		
940819000 1503	WAN	103	00:09		
940819000 1573	ACT	750	03:22	CUS	
940819000 1597	WAN	115	01:42		
940819000 1701	WAN	331	03:37		
940819000 1804	WAN	745	01:17		
940819000 2065	CUS	193	01:51		
940819000 2069	CUS	744 (R)	03:32	WAN	
940819000 2076	CUS	700	01:49		744R
940819000 2077	CUS	744 (R)	03:31	WAN	
940819000 2091	CUS	744 (R)	03:29	WAN	
940819000 2098	CUS	171R	01:19	WAN	
940819000 2157	CUS	193	01:15		
940819000 2170	CUS	193	01:48		
940819000 2241	CUS	190	00:12		
940819000 2343	WAN	768	01:06		
940819000 2383	WAN	737	01:57		
940820000 0028	WAN	192	00:03		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940815000 2007	CUS	413	04:02		134
940815000 2044	WAN	193	01:56		
940815000 2055	CUS	190	01:51		
940815000 2087	CUS	790	04:44		
940815000 2124	CUS	193	02:46		
940815000 2169	CUS	714	02:49		
940815000 2173	CUS	193	03:37		
940815000 2366	CUS	102	00:41		
940815000 2586	WAN	103	00:42		
940815000 2665	WAN	790	01:01		
940815000 2691	WAN	134	01:37		
940815000 2719	TER	731	00:08	CUS	
940815000 2722	WAN	118	00:00		102

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940820000 0098	CUS	171	00:35		
940820000 0163	WAN	135	01:01		
940820000 0732	CUS	108	01:17	WAN	768
940820000 0904	CUS	708	00:09	WAN	702
940820000 0983	CUS	744R	00:20		
940820000 1044	WAN	110	01:01		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940816000 2204	WAN	000	00:16	CUS	744A
940826000 2098	CUS	000	02:26		116A
940826000 3923	WAN	000	02:01	CUS	702A
940826000 4548	CUS	000	00:15		702A
940827000 1007	CUS	100	00:00	WAN	102A
940822000 2828	CUS	102 (A)	00:07		
940826000 0657	CUS	102 (A)	00:15		
940826000 2201	CUS	102 (A)	00:23		
940823000 0670	CUS	103	00:23		102A
940822000 1054	WAN	104 (A)	00:17		
940822000 2669	WAN	104 (A)	01:04		
940823000 3074	CUS	104	02:10	WAN	102A
940825000 0473	WAN	104	01:05		190A
940827000 1166	CUS	104 (A)	00:03	WAN	
940817000 2802	CUS	108	00:18		190A
940819000 1624	CUS	108	00:08		726A
940822000 1550	WAN	108	01:43		702A
940823000 0569	WAN	108	00:25		190A
940823000 1108	CUS	108	01:03		702A
940823000 1228	WAN	108	01:42		190A
940824000 2148	CUS	108	00:05		790A
940824000 2661	WAN	108	01:26	CUS	190A
940825000 0622	CUS	108	00:26	WAN	177A
940826000 4375	CUS	108	05:57		
940826000 4579	WAN	108	04:40		116A
940826000 4590	WAN	108	04:36		116A
940826000 2086	CUS	116 (A)	05:08		
940826000 2760	WAN	116 (A)	04:31		
940826000 2770	CUS	116 (A)	01:06		
940826000 2923	CUS	116 (A)	04:41		
940826000 2935	CUS	116 (A)	05:02		
940826000 3830	CUS	116 (A)	00:18		
940826000 4223	CUS	116 (A)	00:05		
940826000 2884	CUS	116A	04:37		
940826000 3639	WAN	116A	02:21		
940826000 2007	CUS	116M	04:50		
940826000 2181	CUS	116M	01:16		
940826000 2282	CUS	116M	02:29		
940826000 2346	CUS	116M	00:34		
940826000 2353	CUS	116M	01:58		
940826000 2373	CUS	116M	00:17		
940826000 2476	CUS	116M	00:36		
940826000 2485	CUS	116M	00:24		
940826000 2492	CUS	116M	00:16		
940826000 2638	CUS	116M	00:20		
940826000 2657	CUS	116M	01:42		
940826000 2657	CUS	116M	01:42		
940826000 2695	CUS	116M	00:26		
940826000 2712	CUS	116M	00:26		
940826000 2928	CUS	116M	01:31		
940826000 2936	CUS	116M	04:48		
940826000 3028	CUS	116M	03:08		
940826000 3071	CUS	116M	03:03		
940826000 3080	CUS	116M	00:13		
940826000 3101	CUS	116M	02:59		
940826000 3129	CUS	116M	02:55		
940826000 4201	CUS	116M	00:09		
940826000 4220	WAN	116M	00:09		
940821000 0251	CUS	117	00:10	WAN	146B
940821000 0252	WAN	117	01:01		146B
940823000 0669	CUS	117	02:50	WAN	177A
940823000 1706	CUS	117B	00:08		
940819000 2347	CUS	118	00:10		109A
940825000 1482	CUS	118	01:59		133A

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940822000 1806	CUS	192A	01:15		
940818000 2373	CUS	193 (A)	01:27		
940821000 0060	WAN	193 (A)	00:28		
940821000 0064	WAN	193 (A)	02:32		
940821000 0748	CUS	193 (A)	00:28		
940822000 0191	WAN	193 (A)	02:04		
940822000 0440	WAN	193 (A)	04:36		
940823000 1377	CUS	193 (A)	02:30	WAN	
940824000 1349	CUS	193 (A)	01:02		
940824000 1375	CUS	193 (A)	02:18		
940824000 2742	CUS	193	01:05		744C
940826000 0608	CUS	193 (A)	00:12		
940827000 0404	CUS	193 (A)	01:04		
940821000 0566	CUS	193A	00:38	WAN	
940827000 0795	WAN	193A	01:33		
940823000 0508	WAN	310 (A)	04:50		
940826000 1470	WAN	315 (A)	08:37		
940826000 2549	CUS	316 (A)	00:07		
940822000 1646	WAN	320A	06:02		
940819000 2290	WAN	331 (A)	04:07		
940821000 0921	CUS	331 (A)	03:29		
940822000 1843	CUS	331 (A)	06:43		
940823000 1397	CUS	331 (A)	08:23		
940825000 0547	CUS	331 (A)	03:46	WAN	
940825000 2676	CUS	331 (A)	05:13		
940826000 0574	CUS	331 (A)	03:12		
940824000 2009	CUS	331A	09:21		
940821000 0513	WAN	343	05:07		333A
940823000 2136	CUS	343 (B)	03:52		
940824000 1330	CUS	343B	01:14		
940827000 0432	CUS	343B	01:50	WAN	190A
940824000 2436	WAN	350 (A)	13:20		
940825000 1809	CUS	350	03:07		150
940824000 1340	WAN	393A	01:55		320A
940825000 0553	WAN	413	02:53		320A
940823000 0658	CUS	644	02:24		144A
940823000 2377	WAN	715	02:07		790A
940824000 1908	CUS	715	08:45		
940826000 3162	CUS	718	00:48		702A
940825000 1715	CUS	719	01:22	WAN	
940821000 0381	CUS	726 (A)	00:19	WAN	
940821000 0484	CUS	726 (A)	00:49	WAN	
940823000 0765	CUS	726	00:32		744D
940827000 1317	WAN	726 (A)	00:10		
940820000 0201	WAN	726A	00:22		
940822000 1727	WAN	726A	00:10		
940823000 3023	CUS	726A	00:05	WAN	
940825000 0864	CUS	726A	03:42		
940825000 0896	CUS	726A	03:44		
940825000 1689	CUS	726A	01:08		
940819000 0048	WAN	737	01:12		744C
940820000 1087	CUS	737	00:31	WAN	744C
940821000 0938	WAN	737	01:36		745B
940822000 0057	WAN	737	00:46		744C
940822000 1552	WAN	737	02:18		726A
940823000 1082	WAN	737	02:00		726A
940825000 1807	WAN	737	03:01		744D
940825000 1812	WAN	743	03:03		744D
940825000 1304	CUS	744	13:42		343A
940821000 0313	CUS	744 (A)	00:35		
940822000 0126	WAN	744 (B)	00:26		
940822000 1256	CUS	744 (A)	03:50		
940822000 1997	CUS	744 (B)	00:17		
940822000 2008	CUS	744 (B)	00:18		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940826000 2716	CUS	118	03:40		146B
940826000 3773	CUS	119	00:29		
940826000 0867	CUS	127	00:38		
940823000 2792	CUS	133 (A)	02:21		
940822000 1945	WAN	133A	01:40		
940822000 2745	CUS	133A	02:36		
940821000 0011	WAN	135	00:34		133A
940826000 0455	CUS	143	00:43		177A
940819000 2134	CUS	144 (H)	00:38		
940823000 0597	CUS	144 (H)	02:52		
940823000 0631	CUS	144 (H)	02:24	WAN	
940823000 0737	CUS	144 (H)	01:35		
940823000 0766	CUS	144 (H)	01:29		
940823000 0787	CUS	144 (H)	01:23	WAN	
940823000 0800	CUS	144 (H)	01:17	WAN	
940823000 0929	CUS	144 (H)	00:40		
940823000 0996	CUS	144 (H)	00:22		
940823000 1022	CUS	144 (H)	00:10		
940823000 0439	CUS	144 (H)	00:38		
940823000 1216	WAN	144A	00:20		
940826000 0463	WAN	145 (D)	01:08	CUS	
940819000 0004	WAN	146	00:00		150A
940822000 0295	CUS	146 (D)	02:43		
940827000 1341	WAN	146	00:20		116A
940821000 0247	WAN	146B	00:09		
940827000 1356	WAN	146M	00:18		116A
940822000 2721	WAN	150	02:23		145A
940822000 2403	CUS	171C	01:18		
940824000 0783	CUS	171C	01:00		
940824000 1906	WAN	171C	01:26		
940823000 0022	CUS	173	00:16		702A
940821000 0503	WAN	174	00:27		171A
940827000 1122	WAN	177 (C)	01:14	CUS	
940825000 0728	CUS	177B	00:10		
940825000 2493	CUS	177B	02:14		
940826000 0406	CUS	177B	01:36		
940826000 1353	CUS	177B	00:24		
940825000 0038	CUS	177C	00:08	WAN	
940825000 0063	WAN	177C	00:03		146B
940820000 0322	CUS	190 (A)	00:10	WAN	
940820000 0734	CUS	190 (A)	00:12	WAN	
940820000 0869	CUS	190 (A)	01:42	WAN	
940821000 0388	CUS	190 (A)	01:02	WAN	
940821000 0451	WAN	190 (A)	01:22		
940824000 1446	CUS	190 (A)	00:18		
940824000 2665	WAN	190 (A)	01:09		
940825000 0016	WAN	190 (A)	03:50		
940825000 0682	CUS	190	03:30		144D
940825000 0852	CUS	190 (A)	00:25		
940822000 2583	CUS	190A	01:02		
940825000 2747	CUS	192 (A)	04:12		
940825000 2749	CUS	192 (A)	04:12		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940822000 2186	CUS	744 (B)	05:37		
940823000 0096	WAN	744 (B)	01:21		
940823000 0482	WAN	744 (D)	01:02		
940825000 2625	WAN	744A	02:23		
940823000 1600	WAN	744B	02:23		
940817000 2452	CUS	744B	5:31		
940819000 2040	WAN	744B	03:49		
940824000 0427	WAN	744B	00:49		
940818000 2600	CUS	744B	09:04		
940820000 0564	WAN	745 (A)	01:11		
940820000 0805	CUS	745 (A)	01:46		
940820000 1178	CUS	745 (A)	01:12		
940821000 0275	CUS	745 (A)	00:29		
940827000 0588	WAN	745A	00:52		
940820000 0763	WAN	745A	02:56		
940821000 0905	CUS	745A	02:27		
940821000 0950	WAN	745B	03:07		
940820000 1211	WAN	745B	04:35		
940824000 0133	WAN	745B	01:03		
940827000 1010	CUS	745B	02:18		
940818000 2973	WAN	750	00:46		790A
940819000 0477	CUS	750	00:36	WAN	103A
940821000 0550	CUS	750	02:07	WAN	771A
940821000 0591	CUS	750	00:53		771A
940823000 0907	CUS	750	00:15		744P
940826000 0024	WAN	767A	01:48		745B
940816000 2603	CUS	767A	02:17		
940822000 1773	CUS	767A	01:17		
940822000 2387	CUS	767A	00:53		
940823000 2012	WAN	767A	00:36		
940823000 2027	WAN	767A	00:31		
940825000 2562	CUS	767P	01:36	WAN	
940821000 0357	WAN	768 (A)	00:35		
940821000 0747	WAN	768 (A)	01:10		
940821000 0825	WAN	768 (A)	00:55		
940822000 0038	WAN	768 (A)	01:21		
940826000 0566	WAN	768 (A)	00:05		
940818000 2057	WAN	770	03:24		744B
940826000 4508	CUS	771A	02:08		
940819000 0055	CUS	774 (A)	00:57		
940824000 2659	CUS	790 (A)	00:50		
940820000 1169	WAN	790 (A)	02:47		
940823000 0895	CUS	790 (A)	00:16		
940825000 2647	CUS	790 (A)	00:23		
940825000 1548	CUS	790A	02:03		
940822000 0406	CUS	871I	00:17		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940906000 0839	CUS	101	00:09		
940908000 2689	CUS	101	00:26		726A
940908000 2698	CUS	101	00:19		726A
940908000 2657	CUS	102 (A)	00:02	WAN	
940908000 2735	CUS	102 (A)	00:08		
940907000 3522	WAN	102A	08:28		
940907000 3347	WAN	103	00:15		102A
940907000 3882	WAN	103	00:11		102A
940909000 0072	WAN	103	02:46		102A
940909000 0499	CUS	103	00:08		102A
940906000 0542	CUS	104 (A)	00:56		
940906000 1081	WAN	104 (A)	00:11		
940908000 0183	WAN	104 (A)	00:53		
940902000 1299	CUS	104A	09:52		
940831000 1103	CUS	108	48:24		
940905000 0390	CUS	108	01:28	WAN	177A
940906000 1977	CUS	108	00:56		190A
940907000 2869	CUS	108	04:19		190A
940907000 3391	CUS	108	02:58		190A
940909000 0394	WAN	108	02:33		
940910000 0628	WAN	108	00:51		190A
940907000 2140	CUS	114 (A)	04:19		
940907000 0508	WAN	114 (A)	04:55		
940907000 0518	WAN	116 (A)	05:15		
940907000 0530	WAN	116 (A)	05:14		
940907000 1524	CUS	116 (A)	01:27		
940907000 1649	CUS	116 (A)	00:42		
940907000 1716	CUS	116 (A)	03:14		
940907000 2434	WAN	116 (A)	01:21		
940907000 2807	WAN	116 (A)	00:21		
940907000 3234	CUS	116 (A)	00:26		
940907000 3894	CUS	116 (A)	00:12		
940905000 0338	CUS	116A	00:16		
940907000 1042	CUS	116A	02:37		
940907000 2026	CUS	116A	00:43		
940907000 2320	CUS	116A	04:35		
940908000 0331	WAN	116A	00:49		
940907000 1020	CUS	116M	01:27		
940907000 1345	CUS	116M	00:19		
940907000 1974	CUS	116M	01:14		
940907000 2829	WAN	116M	01:34		
940907000 2933	WAN	116M	00:23		
940907000 2956	WAN	116M	01:05		
940907000 2961	WAN	116M	00:18		
940907000 3047	CUS	116M	00:25		
940907000 3197	WAN	116M	00:36		
940907000 3268	CUS	116M	00:14		
940907000 3695	WAN	116M	01:10		
940907000 3788	CUS	116M	00:15		
940908000 0056	WAN	116M	00:20		
940907000 3627	WAN	116M	00:15		
940905000 0606	WAN	116M	00:45		
940906000 0320	CUS	118	00:50		102A
940906000 2360	CUS	118	00:11		
940908000 2734	CUS	118	04:02		
940905000 0373	CUS	127	02:44		
940906000 2061	CUS	127	04:26		
940907000 3774	WAN	133 (A)	01:10		
940906000 2053	WAN	135	01:16		
940906000 2067	WAN	135	01:12		
940908000 1149	CUS	144	02:45		718
940908000 1792	WAN	144	01:56		
940908000 1854	WAN	144	03:32		
940908000 1405	CUS	146 (A)	01:07		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940905000 0187	WAN	193A	01:58		131A
940907000 0615	CUS	193A	01:02		
940902000 0334	WAN	244	04:05		744B
940906000 0354	CUS	245	01:01		745B
940901000 1044	CUS	245A	04:24		
940910000 0414	CUS	245B	03:42	WAN	
940906000 0063	CUS	268A	01:23		768A
940902000 0052	CUS	274B	02:16	WAN	768A
940902000 1016	CUS	274B	01:08		190A
940902000 1062	CUS	274B	02:22		190A
940905000 0006	CUS	274B	00:40	WAN	190A
940910000 0958	CUS	274B	00:47		190A
940904000 0659	CUS	277	01:49		177C
940906000 0223	WAN	277A	00:34		
940909000 0081	WAN	315	06:01		
940909000 0990	CUS	315	03:05		
940909000 1227	WAN	315	02:25		
940905000 0152	WAN	316A	04:47	CUS	
940907000 0167	CUS	316A	02:45	WAN	
940909000 0346	CUS	316A	00:17		
940904000 0355	WAN	316M	07:33		
940905000 0138	CUS	317M	05:16	WAN	
940905000 0143	CUS	317M	05:00	WAN	
940909000 2558	WAN	319A	02:10		
940908000 0092	CUS	320	07:09	WAN	
940906000 0128	WAN	331 (A	05:54		
940907000 0404	CUS	331 (A	02:11	WAN	
940908000 1346	CUS	331 (A	05:56		
940908000 1791	CUS	331 (A	06:24		
940825000 1736	CUS	331A	01:10		
940906000 2164	WAN	331A	04:54		
940909000 1334	WAN	331A	04:45	CUS	
940909000 1631	WAN	331A	02:43		
940901000 2073	CUS	333A	01:36		
940907000 3252	CUS	346	05:06		331A
940905000 0159	WAN	346M	04:30		
940908000 1931	WAN	350 (A	03:32		
940905000 0162	WAN	368A	02:05		346M
940902000 2005	CUS	374A	02:54		744A
940905000 0472	WAN	415	03:23		315
940901000 1538	CUS	453	02:11		353A
940908000 2654	CUS	549	05:25		353A
940902000 1052	CUS	677A	02:17		
940908000 0823	CUS	700	00:32	WAN	702A
940907000 0478	CUS	702 (A	00:08		
940908000 2520	CUS	702 (A	00:20		
940909000 1529	CUS	702 (A	00:00		
940909000 0762	CUS	708	03:13		774A
940904000 0448	CUS	718	00:31		702A
940908000 1409	CUS	718	02:35		745B
940907000 0183	WAN	726 (A	00:32		
940907000 0280	WAN	726A	00:56		
940909000 2576	CUS	726A	00:31	WAN	
940909000 2578	CUS	726A	01:01		
940904000 0335	CUS	731A	03:21		
940901000 2537	CUS	737	03:45	WAN	
940905000 0019	WAN	737	01:32		
940905000 0032	CUS	737	00:38	WAN	726A
940906000 1828	CUS	737	00:16		
940906000 2234	WAN	737	01:50		
940903000 0336	WAN	744 (?	02:11		
940905000 0217	CUS	744 (?	00:09	WAN	
940907000 3839	CUS	744 (?	00:14		
940902000 2147	CUS	744A	00:45		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940908000 1418	CUS	146 (A)	00:54		
940901000 1438	WAN	146A	10:13		
940908000 1277	CUS	146B	03:05		
940909000 0557	CUS	146B	01:43		
940908000 1412	CUS	146M	01:05		
940908000 1423	CUS	146M	01:04		
940908000 1430	CUS	146M	01:02		
940908000 1453	CUS	146M	01:09		
940901000 0718	CUS	171 (D)	01:50		
940902000 2610	CUS	171 (A)	02:58		
940906000 0503	CUS	171 (D)	02:06		
940906000 0504	CUS	171 (D)	01:13		
940906000 0559	CUS	171 (D)	00:45		
940908000 0613	CUS	171 (B)	02:04		
940908000 0803	CUS	171 (C)	00:14		
940908000 1490	CUS	171C	01:06		
940906000 0343	CUS	171D	01:48		
940906000 0426	CUS	171D	00:13		
940906000 0569	CUS	171D	00:45		
940906000 0211	CUS	171 (C)	01:25		
940906000 2266	CUS	177	00:40	WAN	190A
940907000 0815	CUS	177 (A)	00:27		
940908000 1734	CUS	177A	00:14		726A
940904000 0435	CUS	177B	06:27	WAN	
940906000 0212	WAN	177B	00:47		
940906000 0727	CUS	177B	00:12		
940906000 1992	CUS	177B	02:06	WAN	744C
940906000 0538	CUS	177C	00:36		
940906000 0676	CUS	177C	00:03		
940904000 0249	CUS	190 (A)	00:01	WAN	
940905000 0268	WAN	190 (A)	00:31		
940907000 3827	CUS	190 (A)	00:07	WAN	
940909000 1915	WAN	190 (A)	03:10		
940910000 0885	WAN	190 (A)	00:29		
940910000 0918	CUS	190 (A)	00:21	WAN	
940906000 0518	CUS	190A	01:40		
940909000 0239	WAN	190A	00:40		177A
940902000 2566	CUS	192B	02:52		
940901000 1763	WAN	193 (A)	02:08		
940903000 0158	CUS	193 (A)	02:08		
940903000 0162	CUS	193 (A)	00:46		
940905000 0034	CUS	193 (A)	01:30	WAN	
940905000 0584	WAN	193 (A)	00:05		
940906000 0138	WAN	193 (A)	00:35		
940906000 0302	CUS	193 (A)	00:08		
940906000 0411	WAN	193 (A)	01:40		
940907000 0118	CUS	193 (A)	01:12	WAN	
940907000 0441	CUS	193 (A)	00:16		
940907000 2550	CUS	193 (A)	03:03		
940907000 3005	CUS	193 (A)	04:13		
940907000 3207	CUS	193 (A)	02:23		
940901000 2239	CUS	193A	01:25		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940907000 0409	WAN	744A	03:40		
940908000 0604	CUS	744A	00:33		
940908000 1649	CUS	744A	01:49		
940983000 0668	CUS	744B	06:32		
940901000 0916	CUS	744B	01:38	WAN	
940905000 0323	WAN	744B	00:30		
940907000 0274	WAN	744B	01:40		
940907000 0384	CUS	744B	0:45	WAN	
940825000 1897	CUS	744C	05:21		
940907000 3577	WAN	744C	02:12		
940906000 0852	CUS	744D	00:33		
940906000 0883	CUS	744D	00:30		
940906000 0892	CUS	744D	00:29		
940831000 0384	WAN	745 (B	07:22		
940903000 0291	CUS	745 (B	03:15	WAN	
940904000 0031	CUS	745 (B	04:12	WAN	
940904000 0224	WAN	745 (B	00:46		
940905000 0621	CUS	745 (B	01:19		
940907000 1598	CUS	745 (B	01:42		
940902000 0441	WAN	745B	00:29		
940904000 0340	CUS	745B	01:32	WAN	
940905000 0401	CUS	745B	00:48		190A
940906000 1649	CUS	745B	01:43		
940906000 2109	CUS	745B	02:53	WAN	
940908000 0433	WAN	745B	01:27		
940910000 0416	CUS	745B	01:06	WAN	
940910000 0539	WAN	745B	00:32		
940910000 0567	WAN	745B	03:01	CUS	
940903000 0323	CUS	745C	00:40	WAN	
940830000 2550	CUS	750	02:19	WAN	
940904000 0027	WAN	750	02:11	CUS	768A
940904000 0255	CUS	750	01:01	WAN	744C
940904000 0284	CUS	750	00:56	WAN	744C
940905000 0310	CUS	750	00:30	WAN	744A
940906000 1257	CUS	750	03:32	WAN	744C
940907000 2191	CUS	750	09:25	WAN	133A
940908000 0680	CUS	750	03:43		726A
940909000 0127	WAN	750	00:07		104A
940909000 0770	WAN	768 (A	01:25		
940909000 2547	CUS	768 (A	00:24	WAN	
940905000 0295	CUS	768A	01:49		
940904000 0241	CUS	774 (A	01:41	WAN	193A
940812000 2250	CUS	774A	00:29		
940903000 0040	CUS	790 (A	00:06	WAN	
940903000 0378	WAN	790 (A	01:07		
940909000 1867	CUS	790A	00:30		
940902000 0721	WAN	907	01:54		709A

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940912000 0296	CUS	000	02:18	WAN	116A
940913000 1687	CUS	000	01:48		745B
340913000 2259	CUS	000	00:48		744B
940917000 0813	WAN	002	00:06		102A
940915000 0028	CUS	100	01:52		702A
940916000 0834	CUS	100	00:15		704A
940912000 0423	CUS	101	00:01		702A
940915000 0897	CUS	101	00:01		702A
940915000 2742	WAN	101	00:06		702A
940911000 0961	WAN	102 (A)	00:19		
940912000 0632	CUS	102 (A)	00:44		
940914000 2500	CUS	102 (A)	00:10		
940915000 0093	CUS	102 (A)	01:35		
940915000 0122	WAN	102 (A)	00:14		
940911000 0672	CUS	102A	00:10	WAN	
940911000 0243	WAN	103 (A)	04:43		
940913000 0061	CUS	103 (A)	00:12	WAN	102A
940913000 1038	CUS	103 (A)	02:38		102A
940913000 2274	CUS	103 (A)	00:01		
940915000 2063	WAN	103 (A)	01:41		102A
940907000 1155	WAN	104 (A)	15:52		
940909000 0094	WAN	104 (A)	02:50		
940909000 2155	WAN	104 (A)	01:06		
940912000 1098	CUS	104 (A)	01:29	WAN	
940913000 0974	CUS	104 (A)	00:51	WAN	
940913000 0975	WAN	104 (A)	00:28		
940914000 0562	WAN	104 (A)	01:18		
940916000 1289	CUS	104 (A)	00:11	WAN	
940916000 2500	CUS	104 (A)	01:46		
940907000 3905	CUS	108	01:59	WAN	102A
940908000 1813	CUS	108	02:17		744C
940909000 1825	WAN	108	02:12		193A
940910000 1039	WAN	108	00:07		102A
940911000 0601	CUS	108	02:45	WAN	190A
940912000 0434	CUS	108	00:23		190A
940912000 1503	CUS	108	00:12		702A
940914000 0310	CUS	108	00:20		190A
940914000 1268	CUS	108	00:08		102A
940914000 3031	CUS	108	00:49		745C
940914000 3258	CUS	108	00:38		190A
940914000 3288	CUS	108	00:11		190A
940915000 0847	CUS	108	00:20		171D
940915000 1387	CUS	108	00:12		774A
940916000 0091	WAN	108	01:48		190A
940916000 0426	CUS	108	00:08		190A
940916000 1355	CUS	108	01:11		190A
940916000 1503	CUS	108	00:06		190A
940916000 2006	WAN	108	00:45		104A
940911000 0907	CUS	110	02:13		
940916000 1068	WAN	110	04:30		310A
940914000 3294	WAN	113	09:08		
940908000 2644	CUS	114 (A)	02:10		
940914000 3296	WAN	115	05:43		
940907000 3460	WAN	116 (A)	07:38		
940912000 0323	CUS	116 (A)	02:27		
940912000 1849	CUS	116A	01:06		
940912000 1899	CUS	116M	02:00		
940915000 2346	CUS	117M	06:50		
940910000 0417	CUS	118	01:01	WAN	104A
940911000 0587	CUS	118	00:20		102A
940912000 2808	WAN	118	00:13	CUS	102A
940913000 2509	CUS	118	00:23		745B
940914000 2309	CUS	118	07:12		745B
940914000 2321	CUS	118	07:41		146B

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940912000 0648	CUS	193 (A)	01:12		
940912000 2847	WAN	193 (A)	00:54		
940912000 2872	WAN	193 (A)	02:38		
940913000 2525	CUS	193 (A)	00:32		
940913000 2527	CUS	193 (A)	01:00		
940914000 0519	WAN	193 (A)	00:33		
940915000 2711	CUS	193 (A)	00:06	WAN	
940911000 0922	WAN	193A	00:41		
940913000 0943	CUS	193A	00:47	WAN	
940913000 1033	CUS	193A	02:59		
940912000 0927	ACT	193L	01:58	WAN	
940915000 0006	CUS	244A	03:16		
940909000 1616	CUS	245B	02:20		
940911000 0603	CUS	245B	05:20	WAN	
940911000 0690	CUS	245B	00:31	WAN	
940911000 0863	CUS	245B	01:57	WAN	
940912000 2532	CUS	245B	02:52	WAN	
940913000 2350	CUS	268	06:42		
940914000 0081	CUS	274A	00:31		
940915000 1559	CUS	277A	00:28		
940915000 0555	WAN	308	00:26		190A
940911000 0643	CUS	310 (A)	01:02	WAN	
940914000 2985	CUS	310A	04:55		
940916000 0123	CUS	310A	02:04		
940911000 0299	CUS	314 (A)	02:20	WAN	
940909000 0627	CUS	315	12:08		
940912000 1013	CUS	315	03:53	WAN	
940914000 1921	CUS	316M	00:48		
940916000 0657	CUS	318	04:17	WAN	
940912000 1540	CUS	320	08:14		
940911000 0335	WAN	331 (A)	02:06		
940912000 1658	CUS	331 (A)	08:06		
940914000 2228	CUS	331 (A)	05:40		
940915000 0937	WAN	331 (A)	02:21		
940914000 1477	WAN	331A	02:28		
940916000 0305	WAN	331A	03:14		
940912000 1149	CUS	333	03:51	WAN	
940914000 1870	CUS	346 (A)	04:05		
940916000 0098	CUS	346 (A)	00:18	WAN	
940913000 2265	CUS	350	02:59		346A
940914000 2103	CUS	350 (A)	01:20	WAN	
940914000 2180	WAN	350 (A)	00:48		
940914000 2193	CUS	350 (A)	00:50	WAN	
940917000 0100	WAN	350 (A)	02:05		
940914000 1896	CUS	350M	01:21	WAN	
940913000 2398	ACT	366S	04:58	WAN	
940914000 2028	WAN	367	01:51		
940914000 1902	CUS	368 (A)	00:50		
940911000 0513	CUS	368A	06:41		
940912000 2763	CUS	393	06:27		
940910000 0071	CUS	453	04:16		
940910000 0492	CUS	453	05:11	WAN	
940915000 2429	CUS	618	00:49	WAN	
940912000 1429	CUS	700	00:18		790A
940912000 1431	CUS	700	00:32		790A
940914000 0504	CUS	700	00:17		702A
940911000 0757	WAN	702 (A)	04:21		
940912000 0403	CUS	702 (A)	00:33		
940913000 0905	CUS	702 (A)	00:04		
940913000 0168	WAN	708	01:27		704A
940913000 2529	CUS	708	00:50	WAN	704A
940915000 1231	CUS	708	01:14	WAN	726A
940916000 0448	WAN	708	04:17		726A
940909000 2190	CUS	718	00:47		702A

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940915000 2735	CUS	118	00:00	WAN	790A
940911000 0249	CUS	126 (A)	02:00	WAN	
940911000 0471	WAN	126 (A)	00:20		
940911000 0486	WAN	126 (A)	00:36		
940911000 0834	CUS	133A	08:01		
940912000 0291	CUS	133A	03:56		
940913000 2228	CUS	133A	01:27	WAN	
940916000 2515	CUS	133A	07:55	WAN	
940911000 0150	CUS	135	01:51	WAN	
940910000 0570	CUS	144	00:15		190A
940910000 0587	CUS	144	00:10		190A
940912000 0358	CUS	144	00:59	WAN	744A
940915000 1039	CUS	144D	00:33		
940913000 1452	WAN	144H	00:06		
940909000 2304	WAN	145	06:24		
940912000 1913	CUS	146 (?)	00:56		
940914000 0362	WAN	146 (B)	02:48		
940914000 0383	WAN	146 (B)	01:10		
940911000 0145	CUS	146B	04:35	WAN	
940914000 0379	CUS	146B	02:18	WAN	
940914000 0389	WAN	146B	01:20		
940914000 0431	CUS	146B	00:31		
940915000 1626	ACT	146B	02:56	WAN	
940917000 0231	CUS	146B	01:00	WAN	
940906000 0350	WAN	150	07:18		
940912000 1946	CUS	150	01:29	WAN	
940914000 1685	WAN	150	07:51		
940908000 1526	CUS	171 (?)	02:34		
940912000 1312	CUS	171 (?)	01:25		
940913000 2463	WAN	171 (?)	00:56		
940915000 0861	CUS	171 (?)	00:27		
940915000 0872	CUS	171 (?)	00:22		
940915000 0877	CUS	171 (?)	00:21		
940915000 2235	CUS	171A	00:17		
940912000 1183	CUS	171C	00:58		
940913000 2821	WAN	171C	00:54		
940912000 1342	CUS	171D	00:21		
940912000 1349	CUS	171D	01:15		
940912000 1372	CUS	171D	01:32		
940912000 1657	CUS	171D	00:18		
940915000 0791	CUS	171D	00:20		
940915000 0807	CUS	171D	00:14		
940915000 0895	CUS	171D	00:08		
940915000 0936	CUS	171D	00:06		
940915000 0951	CUS	171D	00:03		
940915000 0956	CUS	171D	00:04		
940915000 0967	CUS	171D	00:04		
940915000 0970	CUS	171D	00:14		
940915000 0979	CUS	171D	00:15		
940915000 0981	CUS	171D	00:19		
940915000 0999	CUS	171D	00:11		
940915000 1000	CUS	171D	00:17		
940915000 1104	CUS	171D	00:05		
940915000 1303	CUS	171D	01:29		
940915000 2270	CUS	174A	02:57	WAN	
940916000 0401	CUS	177A	00:39	WAN	
940907000 2822	CUS	177B	00:06		
940911000 0638	CUS	177B	00:30		
940912000 0382	CUS	177B	00:34	WAN	
940912000 0591	CUS	177B	00:38		
940915000 0881	CUS	177B	00:12		
940916000 2414	CUS	177B	00:26		
940912000 1316	CUS	177D	00:44		
940912000 1327	CUS	177D	01:02		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940911000 1000	CUS	718	00:30		702A
940913000 0995	CUS	718	00:21		702A
940913000 1503	CUS	718	00:06		702A
940913000 1541	CUS	718	00:10		702A
940908000 0588	CUS	726A	00:32		
940912000 1324	CUS	726A	04:05		
940913000 2024	CUS	726A	00:14		
940916000 1892	WAN	726A	00:56		
940916000 1363	CUS	731A	02:12		
940909000 0855	CUS	737	04:55		774A
940905000 0277	CUS	744 (?)	00:53	WAN	
940909000 1238	CUS	744 (?)	02:51		
940911000 0363	CUS	744 (?)	00:35	WAN	
940914000 3041	CUS	744 (?)	00:34	WAN	
940909000 0074	CUS	744B	01:09	WAN	
940909000 2570	WAN	744B	00:56		
940910000 0008	WAN	744B	03:19		
940910000 0475	WAN	744B	05:49		
940910000 0700	CUS	744B	01:33	WAN	
940911000 0104	WAN	744B	01:04		
940911000 0295	CUS	744B	00:59	WAN	
940911000 0918	WAN	744B	00:27		
940912000 2414	CUS	744B	01:58	WAN	
940913000 2939	CUS	744B	02:37	WAN	
940907000 3331	WAN	744C	07:31		
940909000 2589	WAN	744C	01:16		
940910000 0092	WAN	744C	02:03		
940911000 0339	WAN	744C	02:01		
940912000 0430	CUS	744C	00:33		
940913000 2299	CUS	744C	03:01	WAN	
940913000 2472	WAN	744C	05:22		
940914000 0354	CUS	744C	00:54		
940916000 0182	CUS	744C	00:46	WAN	
940910000 0830	WAN	744D	02:08		
940911000 0415	CUS	744D	00:48	WAN	
940911000 0309	CUS	744N	02:57	WAN	
940829000 0833	CUS	745 (?)	16:25		
940909000 0936	CUS	745 (?)	04:02		
940911000 0585	CUS	745 (?)	06:16		
940912000 0021	WAN	745 (?)	00:56		
940909000 1975	CUS	745A	03:26		
940911000 0357	CUS	745B	05:12		
940911000 0371	CUS	745B	00:42	WAN	
940911000 0583	WAN	745B	05:06		
940911000 0949	CUS	745B	03:01	WAN	
940912000 0032	WAN	745B	00:47		
940912000 0469	CUS	745B	01:04		
940912EAM 0001	WAN	745B	02:11		
940915000 2720	WAN	745B	03:19		
940910000 0036	WAN	745C	01:34		
940917000 0236	CUS	745C	04:27	WAN	
940906000 1257	CUS	750	02:45		319A
940912000 1923	CUS	750	00:44	WAN	790A
940913000 2702	CUS	750	00:19		774A
940913000 2944	CUS	750	01:33	WAN	190A
940914000 1613	CUS	750	02:02	WAN	102A
940914000 1655	WAN	750	01:58		102A
940914000 1665	WAN	750	01:57		102A
940914000 1669	WAN	750	01:56		102A
940914000 3225	CUS	750	01:47		766A
940911000 0974	CUS	768 (A)	05:48		
940912000 0025	CUS	768 (A)	01:05	WAN	
940914000 0021	CUS	768 (A)	02:49	WAN	
940914000 2685	WAN	768 (A)	01:32		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940912000 1330	CUS	177D	00:54		
940912000 1341	CUS	177D	00:47		
940912000 1410	CUS	177D	00:54	WAN	
940911000 0284	WAN	190 (A)	00:03		
940912000 1433	CUS	190 (A)	02:05		
940912000 2095	CUS	190 (A)	00:17	WAN	
940913000 0280	CUS	190 (A)	00:19	WAN	
940913000 1008	WAN	190 (A)	03:50		790A
940913000 2003	CUS	190 (A)	01:52		
940914000 2665	CUS	190 (A)	00:15	WAN	
940915000 0168	WAN	190 (A)	05:04		
940917000 0376	WAN	190 (A)	00:46		
940909000 2580	CUS	190A	00:45	WAN	
940912000 0334	CUS	190A	00:35	WAN	
940912000 1640	CUS	190A	00:39		
940913000 0074	CUS	190A	00:04	WAN	
940915000 0511	WAN	190A	00:12		
940912000 2580	CUS	192 (A)	01:20	WAN	
940913000 2080	CUS	192A	01:20		
940831000 0978	CUS	193 (A)	02:55		
940909000 0771	CUS	193 (A)	01:43		
940910000 1042	WAN	193 (A)	02:32		
940912000 0034	WAN	193 (A)	02:30		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940915000 0232	CUS	768 (A)	03:21	WAN	
940916000 0109	CUS	768 (A)	00:15	WAN	
940916000 2546	WAN	768 (A)	01:05		
940917000 0151	WAN	768 (A)	02:04		
940917000 0612	WAN	768 (A)	00:47		
940912000 0084	CUS	768A	01:17	WAN	
940912000 0398	WAN	768A	00:51		
940912000 0763	CUS	768A	00:25	WAN	
940915000 2766	CUS	768A	01:22	WAN	
940912000 0377	CUS	771 (A)	00:12	WAN	
940913000 1954	CUS	771A	00:08		
940916000 1458	CUS	771A	01:43		
940913000 2136	CUS	790A	00:12		
940911000 0013	CUS	790A	00:13	WAN	
940912000 0294	CUS	790A	01:05	WAN	
940912000 1407	CUS	790A	00:54	WAN	
940913000 2098	CUS	790A	01:07		
940913000 2928	WAN	790A	00:04		
940912000 1334	CUS	999	01:38		702A

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940919000 2745	WAN	000	01:09		316A
940919000 0294	CUS	101	02:01		102A
940922000 0480	CUS	101	00:07		102A
940921000 1353	CUS	102	00:27		
940922000 3182	CUS	102	00:12		702A
940924000 0785	CUS	102	00:12		702A
940923000 2755	CUS	103	01:17	WAN	
940918000 0433	WAN	103	00:11		
940919000 0276	WAN	103	00:57		
940919000 1961	CUS	103	02:01		
940919000 2380	CUS	103	00:54		
940920000 0329	CUS	103	01:14	WAN	
940921000 0071	WAN	103	00:47		
940919000 1452	WAN	103	00:39		
940923000 2452	CUS	103	00:07		702A
940921000 0416	WAN	104	05:18		
940923000 0570	WAN	104	02:14		146B
940920000 2779	WAN	104	00:12		
940916000 2513	CUS	104	01:01	WAN	
940924000 0061	CUS	104	00:22	WAN	
940916000 1696	CUS	104	00:31		
940919000 1601	WAN	104A	00:06		
940922000 0807	CUS	104A	01:29		
940919000 1703	WAN	104A	01:34	CUS	
940923000 1875	CUS	104A	01:36	WAN	
940923000 2466	WAN	104A	00:35		
940919000 0837	CUS	104A	01:05		
940916000 2314	CUS	108	00:24		744C
940919000 1464	CUS	108	02:27		177C
940919000 2830	CUS	108	01:07		
940919000 3183	CUS	108	03:01	WAN	
940922000 0226	WAN	108	00:04		102A
940919000 0660	WAN	108	01:30	CUS	193A
940919000 1489	CUS	108	00:43		190A
940916000 0285	WAN	1119	00:50	CUS	119A
940923000 0589	CUS	113	02:00	WAN	119A
940919000 2016	WAN	113	10:14	CUS	133A
940914000 2200	CUS	113A	03:54		744B
940923000 0836	CUS	114	02:52		190A
940919000 2867	CUS	117	01:05		
940922000 0566	CUS	117A	00:29	WAN	
940923000 0841	CUS	117C	00:51		177C
940915000 2311	CUS	117C	00:52		177C
940922000 0603	WAN	117M	00:28		
940924000 0355	CUS	118	00:47	WAN	102A
940919000 1415	CUS	118	00:13		102A
940923000 1383	WAN	118	00:34	CUS	102A
940920000 2109	WAN	118	02:29		102A
940919000 0353	WAN	118	00:00	CUS	146A
940918000 0214	WAN	126	01:21		
940916000 1902	CUS	144H	09:02		
940916000 1902	CUS	114H	09:02		
940920000 1855	WAN	145B	02:10		145C
940924000 0572	CUS	146	01:57	WAN	
940923000 0581	CUS	146	01:58	WAN	
940915000 2377	CUS	150	00:37		177A
940922000 0541	WAN	168M	00:29		
940919000 1986	WAN	171	01:27		
940921000 0074	CUS	171	01:31	WAN	
940920000 0694	CUS	171	00:35		
940921000 0432	CUS	171A	00:28		
940916000 0315	CUS	171C	03:03	WAN	
940916000 0318	CUS	171C	02:57	WAN	

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940919000 0468	CUS	2770	00:03	WAN	
940915000 0688	CUS	277A	03:14		777A
940914000 1149	WAN	312	04:37		
940916000 1296	CUS	313	03:14		
940919000 2232	CUS	314	05:32		333A
940921000 1602	CUS	316	01:13		
940919000 2228	CUS	316M	00:27		
940919000 2090	CUS	316M	09:47		
940922000 0114	CUS	320	03:00	WAN	
940921000 1620	CUS	320	04:22		
940922000 0485	CUS	320	07:15		
940917000 0464	CUS	320A	08:56		
940917000 0523	CUS	320A	01:17		790A
940919000 3067	CUS	331	03:15	WAN	
940918000 0041	CUS	331	03:59	WAN	
940919000 2330	CUS	331	05:56		
940923000 0537	CUS	331	04:11		
940920000 1693	CUS	331	02:39		
940922000 0266	WAN	331	03:59		
940922000 0822	CUS	331A	07:15	WAN	
940922000 1697	CUS	332	03:16		333A
940920000 2664	CUS	333	02:19		
940916000 1555	CUS	345	07:29		343A
940920000 1118	CUS	346	02:08		
940910000 0188	CUS	346	17:33	WAN	320A
940920000 1751	WAN	346	06:42		
940920000 1399	WAN	346	01:14		
940920000 1124	CUS	346	02:05		
940920000 2636	WAN	350	04:59		320A
940921000 1212	WAN	350A	05:02		319A
940923000 0034	CUS	368	03:15	WAN	
940924000 0024	CUS	368A	00:29		
940924000 0045	CUS	368A	00:21		
940920000 2639	CUS	390	04:00		
940923000 1771	WAN	390	03:17		
940924000 0591	WAN	390	02:00		
940922000 2573	CUS	602	00:04		702A
940915000 1142	CUS	674A	01:31		
940920000 0111	CUS	702	03:33		
940923000 1455	CUS	702	00:18		
940923000 0197	WAN	704	01:27		104A
940916000 0050	CUS	704	02:59		104A
940922000 1705	CUS	704	00:53	WAN	726A
940914000 0543	CUS	708	02:42		190A
940922000 0623	WAN	713	02:57		193A
940923000 0767	CUS	718	01:59		193A
940923000 0088	CUS	726	00:22	WAN	
940919000 1965	WAN	726	02:28		
940918000 0708	CUS	726A	01:09	WAN	
940921000 0436	WAN	726A	00:51		
940920000 0419	CUS	726A	01:20		
940922000 3256	WAN	726A	03:12		
940921000 2048	CUS	7373	00:20		744D
940920000 0467	WAN	744	03:35		
940918000 0717	CUS	744	01:20		
940923000 2103	CUS	744	01:36		
940923000 0955	CUS	744	00:02		
940920000 2391	WAN	744A	02:22		
940923000 0775	CUS	744A	00:14		
940923000 0827	CUS	744A	00:13		
940923000 0789	CUS	744A	00:06		
940923000 0846	CUS	744A	00:11		
940923000 0868	CUS	744A	00:06		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940922000 0255	WAN	171C	04:02		
940919000 1471	CUS	171C	00:21		
940922000 0208	WAN	171C	01:22		
940922000 0507	WAN	177B	01:23	CUS	
940922000 0369	WAN	177B	00:55		
940915000 0108	CUS	177B	00:37		
940917000 0904	WAN	177B	02:26		
940915000 2329	CUS	177C	08:41		
940920000 1781	CUS	177B	00:14		
940921000 1854	CUS	177B	00:14		
940918000 0177	CUS	177B	00:39	WAN	
940921000 0352	CUS	177C	03:05		
940919000 1600	CUS	177C	00:04		
940919000 1797	CUS	177C	00:10	WAN	
940919000 1617	CUS	177C	00:08		
940919000 1559	CUS	177C	00:09	WAN	
940919000 1368	CUS	177C	00:38		
940915000 0916	WAN	177D	03:47		
940920000 2139	CUS	190	00:06		
940920000 2141	CUS	190	00:24		
940922000 1868	CUS	190	00:10		
940924000 0643	CUS	190	00:00	WAN	
940919000 3137	CUS	190	01:38	WAN	
940918000 0513	CUS	190	01:23	WAN	
940918000 0431	WAN	190	00:07		
940922000 1873	CUS	190	00:08		
940924000 0058	CUS	190	02:42	WAN	
940916000 1759	CUS	190	00:26		
940922000 1874	CUS	190	01:50		
940916000 0116	WAN	190	01:18		
940920000 2168	CUS	190	00:22		
940920000 1321	CUS	190	01:26		
940916000 0927	CUS	190	00:13		
940916000 1201	CUS	190A	00:16	WAN	
940924000 0977	CUS	190A	01:41		
940914000 0283	WAN	192	13:56		744C
940922000 1417	CUS	193	01:12		726A
940923000 0622	WAN	193	02:13		
940920000 0575	WAN	193	02:15		
940920000 0273	CUS	193	01:29	WAN	
940916000 0321	CUS	193	01:59		
940918000 0021	CUS	193	00:06		
940921000 0802	WAN	193	01:45		
940924000 1040	WAN	193A	01:07		
940915000 0074	CUS	193A	02:19	WAN	
940919000 1130	CUS	193A	00:10		
940916000 1457	WAN	193A	04:27		
940916000 1634	CUS	193A	00:13		
940917000 0268	CUS	193A	00:31		
940921000 0305	WAN	193A	01:07		
940920000 2254	WAN	193A	02:15		
940919000 3116	WAN	193A	00:12		
940914000 3255	ACT	193X	02:29	WAN	
940923000 2683	CUS	244A	00:07		
940919000 0153	WAN	245	01:11		745B
940922000 2911	CUS	245	00:46	WAN	745B
940923000 1878	CUS	245B	02:02		745B
940922000 2908	WAN	245B	01:28		745B
940923000 2538	WAN	245B	03:34		745B
940922000 3194	CUS	245B	01:51		745B
940923000 0146	WAN	268A	00:03		
940923000 1487	CUS	274C	00:17		774C

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940923000 0861	CUS	744A	00:09		
940923000 0898	CUS	744A	00:06		
940923000 0877	CUS	744A	00:03		
940923000 0925	CUS	744A	00:04		
940905000 0522	WAN	744B	00:36	CUS	
940920000 0108	WAN	744B	00:29		
940922000 2923	WAN	744B	01:18		
940920000 2832	CUS	744B	00:15		
940915000 1459	WAN	744B	00:48		
940918000 0698	CUS	744B	04:21		
940923000 0462	WAN	744B	00:29		
940919000 0099	WAN	744B	00:42		
940918000 0276	CUS	744C	01:24	WAN	
940922000 0091	CUS	744C	02:06	WAN	
940921000 0921	CUS	744C	01:50		
940920000 2715	CUS	744D	00:11		
940920000 2758	CUS	744D	00:10		
940922000 0089	CUS	745	02:55	WAN	
940923000 0352	WAN	745	01:52		
940918000 0154	WAN	745	00:03		
940922000 2002	WAN	745	07:08		
940922000 1399	CUS	745	01:28		
940922000 2246	CUS	745	00:09	WAN	
940919000 3074	CUS	745A	02:07		
940918000 0343	WAN	745B	02:38		
940922000 1865	CUS	745B	02:15		190A
940920000 0184	CUS	745B	00:22	WAN	190A
940918000 0527	CUS	745B	00:27	WAN	
940920000 0771	CUS	745B	00:56		
940918000 0638	CUS	745C	00:15		
940916000 0007	WAN	745C	01:40		
940913000 2664	WAN	745C	02:57		
940920000 0426	CUS	750	07:11	WAN	726A
940919000 1234	WAN	750	02:23		745C
940923000 0067	CUS	750	01:39		745C
940923000 0338	WAN	750	00:06		726A
940921000 0066	CUS	750	00:06		744D
940917000 0830	WAN	750	02:51		774A
940921000 1114	CUS	750	00:19		702A
940923000 0244	CUS	750	00:32		193A
940923000 0184	CUS	750	01:11	WAN	193A
940920000 0063	CUS	750	00:41	WAN	104A
940921000 2229	CUS	750	00:32	WAN	726A
940921000 1291	CUS	768	00:13		
940920000 0460	CUS	768	02:35	WAN	
940918000 0630	WAN	768	00:53		
940918000 0261	WAN	768	00:21		
940922000 0120	CUS	768	00:43	WAN	
940923000 0521	CUS	768	00:34	WAN	
940920000 0555	CUS	768	00:57		
940924000 0808	CUS	768	00:21		
940918000 0330	WAN	768A	02:56		
940919000 0472	CUS	768A	00:13		
940917000 0409	WAN	768A	02:10		
940918000 0823	WAN	771A	01:33		
940923000 0590	WAN	774	03:34	CUS	
940923000 2555	WAN	774A	01:39		
940918000 0106	WAN	774A	00:51	CUS	
940915000 2718	ACT	774A	00:05	WAN	
940918000 0640	CUS	774A	03:16	WAN	
940921000 2286	CUS	774D	08:02	WAN	
940922000 1766	CUS	790	04:15		
940923000 2369	CUS	790	01:25		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940919000 2822	WAN	790A	01:47	CUS	
940923000 0991	CUS	790A	00:23		
940919000 1817	CUS	790A	00:15		
940922000 2291	WAN	790A	00:20	CUS	
940920000 2710	WAN	790A	00:29		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940928000 1402	CUS	000	00:08		768A
940924000 0777	CUS	000	00:17		790A
940930000 1966	CUS	000	00:07		702A
940926000 0804	CUS	000	00:10		702A
940929000 0487	CUS	102	00:01		
940927000 2557	CUS	102	00:22		
940925000 0271	CUS	102	00:05		
940928000 1694	CUS	102	00:10		
940921000 2646	WAN	102A	04:34	CUS	
940926000 0393	CUS	103	00:10		
940930000 2762	WAN	103	00:18		
940928000 2926	WAN	103	00:03		
940930000 2911	CUS	103	00:19	WAN	
940926000 1620	CUS	103	07:22	WAN	177B
940929000 2415	WAN	104	10:27	CUS	
940927000 2363	CUS	104	00:19		
940927000 2366	CUS	104	00:18		
940927000 0692	CUS	104	00:35	WAN	
940927000 0457	WAN	104	01:14		
940927000 0334	CUS	104	00:50	WAN	
940925000 0856	CUS	104	05:06	WAN	
940925000 0318	CUS	104	00:45		
940925000 0350	WAN	104	00:44		
940927000 2994	WAN	104	00:02	CUS	
940927000 2457	WAN	104	00:07		
940926000 2621	CUS	104	01:34		
940923000 2477	CUS	104	01:25		
941001000 0536	CUS	104A	01:07	WAN	
940925000 0347	CUS	104A	00:23	WAN	
940928000 1303	CUS	104A	00:09		
940929000 3108	CUS	104A	01:49		
940930000 1184	CUS	104A	00:18		
940923000 2447	CUS	104A	01:01		
940929000 1210	CUS	104B	00:09		
940929000 0372	WAN	106	01:01		102A
940928000 2298	CUS	108	00:05		
940925000 0329	CUS	108	00:49		
940926000 2269	CUS	108	02:05		193A
940928000 2532	WAN	108	00:03		193A
940928000 3025	CUS	108	02:43		190A
940928000 0932	WAN	108	00:37		102A
940912000 1846	CUS	108	06:38		
940926000 0346	WAN	108	01:09		744C
940926000 2561	CUS	108	01:24		726A
940930000 0146	CUS	114	00:59	WAN	
940927000 2703	WAN	115	00:48		
940930000 0608	CUS	116A	00:41	WAN	
940924000 1440	WAN	116A	02:33	CUS	
940930000 0611	CUS	116A	00:39	WAN	
940929000 0504	CUS	117	00:42	WAN	
940930000 2788	CUS	117A	00:21		177A
940928000 2115	WAN	117A	00:20		177A
940926000 0973	CUS	118	00:09		190A
940927000 1826	CSC	118	02:53		102A
940926000 1207	WAN	118	00:40		
940927000 1907	WAN	119A	01:08		
940929000 2938	CUS	119A	07:27	WAN	
940928000 2541	CUS	119A	05:01	WAN	319A
940925000 0096	CUS	126A	00:21		726A
940930000 0496	CUS	126A	02:18		
940927000 0303	CUS	133A	00:56		
940929000 1222	CUS	135	01:03		133A
940925000 0182	WAN	137	00:42		
940928000 2839	CUS	144	02:04		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940929000 1410	WAN	193A	01:43		
940930000 0795	CUS	193A	01:05		
940930000 0350	ACT	193A	00:19	WAN	
940927000 2101	CUS	210	05:47		
940925000 0065	CUS	245	04:33		368A
940926000 0031	CUS	245	01:20	WAN	
940925000 0936	CUS	245B	01:12	WAN	193A
940925000 0395	WAN	245B	03:10		745B
940924000 0906	WAN	245B	01:18		745B
940930000 0093	CUS	245B	00:59		745B
940924000 1233	CUS	245B	01:44	WAN	245B
940927000 0019	CUS	245B	01:25	WAN	102A
940927000 0085	CUS	245B	02:30		193A
940926000 0657	WAN	245B	06:59		319A
940925000 0700	CUS	245B	00:56		790A
940925000 0301	WAN	274	01:24		193A
940926000 0380	CUS	277	05:18		177A
940927000 2549	CUS	277	02:58		
940928000 2651	WAN	277A	01:46		
940929000 0327	WAN	277A	01:04		
940920000 1280	CUS	277A	01:47		
940926000 1373	CUS	310	11:12		
940928000 2754	CUS	313	02:52	WAN	
940929000 0026	CUS	313	00:54	WAN	
940928000 2763	CUS	314	02:49	WAN	
940929000 0685	WAN	314	00:16		
940929000 0881	WAN	314	00:17		
940928000 3121	CUS	314	02:20	WAN	333A
940929000 0728	WAN	314	00:19	CUS	
941001000 0585	WAN	315	06:45		
940927000 0423	CUS	317	13:17	WAN	
940927000 1027	CUS	318	04:33		331A
940927000 2078	CUS	319	04:23		
940928000 3136	CUS	319	09:00		
940930000 1685	WAN	319A	03:03		
940929000 2231	CUS	319A	05:03		
940925000 0842	CUS	331	01:31		
940930000 1471	CUS	331A	03:12		
940928000 2699	CUS	331A	03:07		
940929000 3102	CUS	331A	16:41		
940929000 0007	WAN	331A	02:09		
940926000 1557	CUS	345	02:18		745A
940930000 0157	CUS	346A	00:12		326A
940929000 0671	CUS	349	03:27	WAN	
940929000 0987	CUS	350	09:36		319A
940960000 0031	WAN	350	04:55		
940928000 1742	CUS	350A	05:54		
940924000 1253	CUS	368	00:22	WAN	768A
940926000 0237	WAN	368	01:19		768A
940930000 0141	CUS	368A	01:06		
940930000 2068	CUS	368A	07:17	WAN	
940930000 0102	WAN	368M	00:20		
940923000 1921	ACT	3900	02:39	WAN	190A
940926000 2095	CUS	392	03:41		192A
940927000 0673	CUS	700	01:53		790A
940926000 0373	CUS	700	00:05		190A
940923000 0561	CUS	702	00:48		
940926000 2027	CUS	702	00:29		
940927000 1018	CUS	702A	01:26		
940928000 1278	CUS	702A	00:53		
940928000 2392	CUS	702A	00:50		
940921000 2212	CUS	715	03:36		726A
940927000 0053	WAN	721	01:14		726A
940924000 0164	WAN	726	01:39		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940930000 0080	WAN	144H	00:30		
940929000 0634	CUS	145	05:48		190A
940926000 1568	CUS	145	06:44		
940924ESB 0006	WAN	145B	03:43		
940924000 1445	CUS	146	01:45		
940924000 1439	CUS	146	02:35		
940924000 1441	CUS	146B	02:28		
940926000 2891	CUS	146B	07:05		
940923000 0091	WAN	147	01:22		159A
940925000 0299	NMC	150	04:59	WAN	133A
940930000 0025	CUS	150	02:45	WAN	146A
940928000 1397	WAN	150	04:07		190A
941001000 0885	WAN	159	02:23		
940926000 0169	WAN	168A	00:50		
940926000 1277	CUS	171	00:32		
940926000 0440	CUS	171C	04:04		
940930000 2551	CUS	171C	01:14		
940927000 1223	CUS	171C	01:06		
940925000 0441	WAN	177	02:31		
940930000 0099	CUS	177	00:18		
940928000 2974	WAN	177	00:05		
940926000 1250	CUS	177	00:55		
940930000 1204	WAN	177	00:21		
941001000 0031	CUS	177A	02:29		
940930000 0991	CUS	177A	00:14		
940929000 1306	CUS	177A	00:19		
940928000 2533	WAN	177A	02:12	CUS	
940928000 0771	CUS	177A	00:10		
940925WDA 0004	CUS	177A	00:08	WAN	
940929000 0419	WAN	177A	01:12		
940929000 0491	CUS	177B	02:54		
940926000 1818	CUS	177B	00:11		
940925000 0320	CUS	177B	01:17	WAN	
940925000 0691	CUS	177C	01:49		
940925000 0308	WAN	177D	01:12		
940926000 0871	CUS	177D	01:04		
940926000 1183	CUS	177D	00:09		
940925000 0150	WAN	177D	01:33		
940925000 0290	CUS	177D	00:09	WAN	
940925000 0325	CUS	177D	00:19	WAN	
940928000 0124	CUS	190	00:46		
940927000 2468	CUS	190	00:27	WAN	
940926000 0374	CUS	190	01:09	WAN	
940927000 0905	WAN	190	02:00		
940927000 0082	CUS	190	01:50	WAN	
940926000 2788	CUS	190	00:10	WAN	
940922000 2315	CUS	190	00:15		
940928000 2941	WAN	190	02:18		
940926000 2918	CUS	190	01:13	WAN	
940925000 0689	CUS	190	00:07		744A
941001000 1230	WAN	190A	00:00	CUS	
940927000 2739	CUS	190A	01:27		
940926000 0377	CUS	190A	00:04	WAN	
940930000 1155	CUS	190A	00:07		
941001000 1250	CUS	190A	00:54		
940930000 2486	CUS	190A	00:14		
940926000 0795	CUS	190A	01:14		
940925000 0348	CUS	190A	02:21	WAN	
940928000 0057	CUS	190A	01:07	WAN	
940926000 0124	CUS	190A	00:52		
940930000 0379	CUS	192	00:04	WAN	
940925000 0321	CUS	192	01:10	WAN	
940925000 0402	CUS	192A	00:44		
941001000 0312	CUS	192A	00:11		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940926000 2089	CUS	726	00:49		
940924000 1492	WAN	726A	00:00		
940927000 1870	WAN	726A	00:00		
940930000 2574	WAN	726A	00:00		
940928000 2865	WAN	726A	00:09		
940930000 0753	CUS	726A	00:05	WAN	
940929000 1616	WAN	726A	01:19		
940930000 2326	WAN	726A	02:29		
940929000 0140	WAN	726A	00:06		
940929000 2163	CUS	726A	02:07	WAN	
940927000 0025	WAN	726A	04:41		
940927000 0077	WAN	726A	01:10		
940926000 0358	CUS	726A	00:03	WAN	
940929000 0359	WAN	737	00:53		190A
940926000 0023	CUS	737	01:23	WAN	745B
940928000 1994	WAN	737	03:48		744C
940928000 3020	CUS	737	02:08		744D
940923000 1800	CUS	737	02:20	WAN	193A
940926000 0315	CUS	744	02:20		
940924000 1100	CUS	744	01:59	WAN	
940929000 0466	CUS	744	01:11		
940921000 1274	WAN	744	03:27		
940929000 1919	CUS	744	02:45		
940925000 0344	WAN	744	02:15		
940925000 0279	CUS	744	01:29		
940919000 1953	CUS	744A	12:47		
940928000 0383	CUS	744A	02:17		
940928000 0389	CUS	744A	01:50		
940924000 1099	WAN	744B	01:56		
940930000 1996	WAN	744B	02:01		
940921000 0815	WAN	744C	01:21		744A
940923000 0815	CUS	744C	05:49		
940926000 1264	CUS	744C	02:06		
940928000 2613	CUS	744C	07:50	WAN	319A
940930000 0276	CUS	744C	06:11	WAN	
941001000 0708	WAN	744C	04:34		319A
940928000 0397	CUS	744C	00:57	WAN	
940927000 3218	CUS	745	01:56	WAN	
941001000 1174	WAN	745	00:36		
940927000 1963	CUS	745	01:44		
940926000 1825	CUS	745	04:10		
940924000 0084	CUS	745A	02:31	WAN	
940930000 0019	CUS	745B	02:08	WAN	146B
940928000 1084	WAN	745B	01:05		
940927000 0352	WAN	745B	03:29		
940928000 2077	WAN	745C	02:07	CUS	
940926000 0068	WAN	750	01:09		177A
940925000 0323	CUS	750	00:07		177C
940925000 0330	CUS	750	00:16		177C
940925000 0336	CUS	750	00:05		177C
940927000 0473	CUS	750	00:07	WAN	744B
940925000 0338	CUS	750	00:04		177C
940926000 0050	CUS	750	00:34	WAN	768A
941001000 0565	CUS	750	12:36		744C
940925000 0327	CUS	750	00:12		177C
940925000 0339	CUS	750	00:03		177C
940925000 0332	CUS	750	00:13		177C
940925000 0280	CUS	750	00:45		177C
940924000 0690	CUS	766	01:33		
940930000 0247	CUS	768	01:30	WAN	
940927000 0168	CUS	768	00:49	WAN	
940922000 3062	WAN	768	01:15		
940924000 0462	WAN	768	00:35		
940924000 1372	CUS	768	04:05	WAN	745B

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940926000 0857	CUS	193	01:35		
940930000 2755	CUS	193	00:07		
940928000 2071	CUS	193	02:40		
940922000 1833	CUS	193	01:06		
940930000 1622	CUS	193	01:59		
940928000 1862	CUS	193	00:06		
940929000 2041	CUS	193	00:11		
940924000 0691	CUS	193	01:43		
940928000 1751	CUS	193	03:58		
940927000 1190	WAN	193	01:07		
940924000 1488	CUS	193	00:38		
940930000 2390	CUS	193	01:31	WAN	
940926000 0188	CUS	193	01:05	WAN	
940926000 1213	CUS	193	00:56		
940929000 2679	CUS	193	01:12		
940925000 0211	CUS	193	00:36		
940929000 1042	CUS	193	01:56		
940920000 2047	CUS	193	00:05		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
940930000 0105	WAN	768	02:29		
940930000 0027	WAN	768	02:17		
940924000 0100	CUS	768	02:39	WAN	
940927000 0418	CUS	768	01:01	WAN	
940929000 1535	CUS	768A	00:17		
940929000 1536	CUS	768A	00:17		
940926000 0070	WAN	768A	00:22		
940925000 0462	CUS	768A	00:10		
941001000 0349	WAN	768A	02:44		
940925000 0541	CUS	771	00:21		
940926000 0835	CUS	771A	03:37		
940927000 0438	WAN	773	01:08		190A
940924000 1414	WAN	790A	00:39	CUS	
940930000 0749	CUS	790A	00:27		
940925000 0516	WAN	790A	01:07		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94100 5 000 0580	CUS	0	00:32		768A
94100 5 000 1319	CUS	0	04:15		316A
94100 3 000 2485	CUS	0	01:42		726A
94100 1 000 0328	WAN	0	00:54		744A
94100 6 000 1246	CUS	0	00:19		177A
94100 5 000 0219	CUS	0	01:45	WAN	790A
94093 0 000 0713	CUS	100	02:40		331A
94100 6 000 1209	CUS	101	00:06	WAN	190A
94092 7 000 3310	CUS	101	00:29	WAN	104A
94093 0 000 0022	CUS	102	01:32	WAN	
94100 4 000 0531	CUS	102	00:01		702A
94100 6 000 0001	CUS	102	02:10	WAN	
94100 1 000 0873	WAN	103	03:53		177A
94100 8 000 0956	CUS	103	00:17		102A
94093 0 000 2916	CUS	103	00:04	WAN	102A
94100 6 000 1435	CUS	103	00:09	WAN	102A
94100 6 000 1581	CUS	108	00:50		193A
94100 3 000 2817	CUS	108	00:27		790A
94100 5 000 0756	CUS	108	00:07		177A
94100 5 000 0346	CUS	108	00:42		702A
94100 3 000 0513	CUS	108	00:02		702A
94100 4 000 2490	CUS	108	01:20	WAN	190A
94100 2 EN/ 0022	CUS	108	03:06	WAN	331A
94100 3 000 0895	CUS	108	00:10		702A
94092 1 000 1205	CUS	108	00:06		192A
94100 1 000 1198	CUS	113	03:51		146A
94100 5 000 2734	CUS	121	00:49	WAN	704A
94100 2 EN/ 0016	WAN	133	00:39		
94100 4 000 3029	CUS	133	01:31	WAN	
94092 9 000 1253	CUS	134	04:00		
94100 3 000 0446	CUS	144	00:25		
94100 7 000 1039	CUS	171	00:17		
94100 6 000 0959	CUS	172	01:05	WAN	146B
94100 2 000 0343	WAN	173	08:07		146B
94092 6 000 0866	WAN	177	02:21		
94100 4 000 1967	CUS	177	00:08		
94100 3 000 1590	CUS	177	00:27		
94100 6 000 0815	CUS	190	00:12	WAN	
94100 4 000 0323	CUS	190	01:19	WAN	
94100 8 000 0522	WAN	190	00:32		
94100 4 000 2877	CUS	190	02:18		
94100 3 000 0008	CUS	190	01:05	WAN	
94100 4 000 1293	CUS	190	01:12		744A
94100 4 000 2624	CUS	190	01:20		
94100 3 000 2153	WAN	190	04:23		
94100 5 000 1365	CUS	192	02:18		
94100 4 000 2260	CUS	192	00:20		
94100 4 000 0547	CUS	193	00:41		
94100 6 000 0096	WAN	193	00:05		
94100 6 000 0097	WAN	193	00:10		
94093 0 000 2165	CUS	193	00:11		
94100 1 000 0368	WAN	193	00:18		
94100 6 000 0039	WAN	193	00:07	CUS	
94100 8 000 1528	CUS	193	01:18	WAN	
94092 7 000 2877	CUS	193	04:13	WAN	
94100 6 000 2911	CUS	193	02:05	WAN	
94100 8 000 0036	CUS	306	00:49	WAN	104A
94100 6 000 2319	CUS	310	07:50		
94100 4 000 2974	CUS	320	07:11		
94100 5 000 0531	WAN	326	03:07		
94100 1 000 0114	WAN	331	03:12		
94100 1 000 1312	CUS	331	07:41		
94100 6 000 2946	CUS	331	03:30	WAN	
94100 8 000 0070	CUS	334	03:16		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94100 4 000 0523	CUS	790	00:43		
94100 4 000 0535	CUS	790	00:22		
94100 4 000 0509	CUS	790	00:51		
94100 4 000 0538	CUS	790	00:19		
94100 4 000 0454	CUS	790	00:36		
94093 0 000 2281	CUS	790	00:13		
94100 3 000 0650	WAN	102A	00:08		
94100 6 000 3186	WAN	104A	02:01		
94100 3 000 2642	CUS	104A	00:11		
94092 7 000 2935	CUS	104A	01:48		
94100 4 000 0401	WAN	110A	05:14		
94100 5 000 1896	CUS	113A	04:03		133A
94100 8 000 0709	WAN	119A	04:42		
94100 3 000 2224	WAN	126A	03:36		
94100 5 000 0257	CUS	130A	02:38	WAN	726A
94093 0 000 2689	WAN	133A	05:47		
94100 6 000 2111	WAN	133A	01:43		
94100 4 000 3117	CUS	133A	02:29		
94100 3 000 1161	CUS	133A	01:16		
94100 4 000 0554	CUS	133A	01:58	WAN	
94092 2 000 2453	WAN	145A	06:28		
94100 4 000 2728	WAN	146A	03:32		
94100 2 000 0386	CUS	146B	02:46		
94100 6 000 0353	WAN	146B	00:37		
94100 7 000 0993	CUS	171C	00:15		
94100 8 000 1228	CUS	171C	00:28		
94100 4 000 2821	CUS	171D	00:10		
94100 4 000 2977	CUS	171D	01:14	WAN	
94100 4 000 2996	CUS	171D	01:08		
94100 4 000 3155	CUS	171D	02:27	WAN	
94100 4 000 2797	CUS	171D	01:26		
94100 5 000 0766	CUS	177A	00:10		
94100 7 000 0575	CUS	177A	00:09		
94100 3 000 0626	CUS	177A	00:46		
94100 7 000 0920	CUS	177A	00:14		
94100 5 000 0002	WAN	177A	06:49		
94100 4 000 0862	CUS	177A	00:20		
94100 8 000 0697	WAN	177A	00:59		
94100 8 000 0992	CUS	177A	00:12		
94092 8 000 2640	CUS	177A	00:33		
94092 6 000 1284	CUS	177A+	00:46		
94100 4 000 2770	CUS	190A	01:00	WAN	
94100 5 000 2138	WAN	190A	00:05		
94100 2 000 0873	CUS	190A	02:07	WAN	
94100 3 000 0398	CUS	190A	00:06		
94100 4 000 2778	CUS	190A	01:36		
94100 7 000 0496	WAN	190A	01:08		
94100 6 000 0059	WAN	190A	00:11		
94100 5 000 0106	WAN	190A	02:09		
94100 7 000 1238	WAN	190A	00:11		
94100 8 000 0743	CUS	190A	00:48		
94100 3 000 0850	CUS	190A	01:02		
94100 5 000 0573	CUS	192A	00:19		
94093 0 000 2385	CUS	192B	02:02	WAN	
94100 7 000 2669	CSC	193A	00:41		
94100 2 000 0502	CUS	193A	08:18		319A
94092 9 000 2856	CUS	193A	03:15		
94100 4 000 2731	CSC	193Z	00:40		
94100 2 000 0366	WAN	244A	00:57		
94100 7 000 2132	WAN	245A	02:28		
94100 8 000 0395	WAN	245B	00:58		
94100 1 000 1447	CUS	316A	01:32		
94100 5 000 1316	CUS	316A	04:16		
94100 5 000 1078	CUS	319A	11:26		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94100 7 000 0373	CUS	346	03:46	WAN	
94100 3 000 2480	CUS	354	12:22		333A
94100 5 000 2174	CUS	368	02:41	WAN	
94100 6 000 1203	CUS	368	00:59		
94100 4 000 0424	CUS	390	06:35		190A
94100 4 000 2497	CUS	702	00:45		
94100 3 000 2092	CUS	702	04:49		
94100 3 000 0396	CUS	708	00:04	WAN	190A
94100 7 000 0309	WAN	708	01:39		193A
94100 6 000 0033	WAN	715	02:13		
94100 3 000 1499	CUS	726	02:06		
94100 6 000 2647	WAN	726	00:48		
94100 4 000 3021	CUS	726	04:38		
94100 5 000 1299	CUS	737	01:12		704A
94100 2 000 0550	CUS	737	04:01	WAN	774A
94100 5 000 2455	CUS	737	01:16		133A
94100 4 000 2162	CUS	743	01:51		
94100 3 000 0027	CUS	744	04:37	WAN	
94100 8 000 0101	CUS	744	03:43	WAN	
94100 2 000 0747	CUS	744	02:16		768A
94100 2 000 0769	WAN	744	02:10		768A
94100 2 000 0748	CUS	744	02:15		768A
94100 2 000 0771	WAN	744	02:08		768A
94100 6 000 2662	CUS	744	03:01	WAN	
94100 1 000 1071	CUS	744	03:58		
94100 7 000 1638	CUS	744	00:10	WAN	
94100 7 000 0480	CUS	744	02:27	WAN	
94100 6 000 2832	CUS	744	01:14	WAN	
94100 6 000 1030	CUS	744	01:13		
94100 6 000 1548	CUS	745	01:00		
94100 5 000 0207	CUS	745	01:23	WAN	
94100 6 000 2493	WAN	745	03:18		
94093 0 000 0240	CUS	745	00:52		
94100 7 000 0011	CUS	745	00:35		744A
94100 3 000 0844	CUS	745	04:22		
94100 4 000 1548	WAN	745	00:49		
94100 3 000 0010	CUS	750	01:13	WAN	744C
94100 5 000 2685	CUS	750	00:08		
94100 5 000 2684	CUS	750	00:07		
94100 7 000 2521	CUS	750	00:27	WAN	726A
94100 2 000 0434	WAN	750	01:51		744B
94100 3 000 1180	CUS	750	02:40		744B
94100 3 000 1194	CUS	750	02:51		744B
94100 1 000 0563	CUS	760	01:10		768A
94100 3 000 0473	CUS	760	00:12		768A
94100 8 000 0816	CUS	768	01:17		
94100 5 000 0101	CUS	768	02:42	WAN	
94100 5 000 0544	CUS	768	02:07		
94100 7 000 2854	WAN	768	00:12		
94100 4 000 2383	CUS	768	03:43	WAN	
94100 3 000 2060	CUS	768	07:19		
94100 4 000 0528	CUS	768	00:53		
94100 4 000 1790	WAN	768	00:09		
94100 6 000 0658	WAN	768	00:59		
94100 8 000 0953	CUS	768	00:08		
94100 3 000 2691	CUS	768	05:54		
94093 0 000 2182	CUS	774	00:06		
94093 0 000 2194	CUS	774	00:12		
94093 0 000 2155	CUS	774	00:17		
94093 0 000 2202	CUS	774	00:05		
94100 1 000 0814	WAN	790	00:04		
94100 4 000 0542	CUS	790	00:15		
94100 3 000 0932	CUS	790	00:49		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94100 7 000 2051	CUS	319A	04:02		
94100 7 000 0404	WAN	319A	06:40		
94100 1 000 1345	CUS	331A	05:29		
94100 5 000 2656	CUS	343A	03:39		
94100 3 000 0002	CUS	343A	28:16		
94100 4 000 2298	CUS	343A	05:48	WAN	
94100 5 000 2511	CUS	350A	03:17		
94100 3 000 0215	WAN	368A	02:58		
94100 2 000 0823	WAN	726A	03:30		
94100 7 000 0256	CUS	726A	00:28	WAN	
94100 4 000 2782	CUS	726A	00:11	WAN	
94100 6 000 2497	WAN	726A	03:49		
94100 4 000 0020	WAN	726A	02:05		
94100 6 000 2096	CUS	726A	00:37		
94100 7 000 2249	CUS	726A	00:16	WAN	
94100 6 000 3111	CUS	744A	00:21		
94100 7 000 0064	CUS	744A	00:19	WAN	
94100 9 000 0865	CUS	744A	01:07		
94100 4 000 2783	CUS	744A	08:26		
94100 5 000 0329	CUS	744B	02:30	WAN	
94100 5 000 0346	WAN	744B	01:23		
94100 1 000 0694	WAN	744B	00:40		
94100 4 000 3009	CUS	744B	01:25		
94100 6 000 1972	CUS	744C	02:04		
94100 5 000 2797	ACT	744C	00:44	WAN	
94100 4 000 2346	CUS	744C	00:08		
94093 0 000 2792	CUS	744C	05:20		
94100 2 000 0403	WAN	744C	01:39		
94092 9 000 1028	CUS	744C	00:18		
94100 2 WD, 0044	WAN	744C	01:15		
94100 3 000 1348	CUS	744C	00:18	WAN	
94100 6 000 0794	CUS	744C	01:54		
94100 3 000 2747	CUS	744C	00:18		
94100 6 000 1397	CUS	744D	00:20		
94100 6 000 2573	WAN	745B	00:06		
94100 3 000 2407	CUS	745B	04:28		
94093 0 000 2746	WAN	745B	03:34		
94100 2 000 0233	WAN	745B	01:00		
94100 4 000 1191	CUS	745B	00:14		
94100 3 000 2353	CUS	745B	02:33		
94100 7 000 0558	WAN	745B	01:36		
94100 4 000 3170	CUS	745B	00:39		
94100 1 000 0922	CUS	745B	00:51	WAN	
94100 1 000 1104	WAN	768A	01:23		
94100 5 000 0411	WAN	768A	03:09		
94100 4 000 0146	CUS	768A	01:23	WAN	
94100 3 000 0053	CUS	768A	00:45	WAN	
94100 4 000 0507	CUS	768A	00:45		
94100 8 000 0352	CUS	768A	01:12		
94100 7 000 1122	WAN	768A	00:34		
94093 0 000 2208	CUS	774A	00:03		
94100 5 000 1104	CUS	774A	04:24		
94100 4 000 2399	CUS	790A	00:54		
94100 3 000 2112	CUS	790A	00:07		
94100 3 000 0791	CUS	790A	01:28		
94092 9 000 0588	WAN	790A	02:21		
94100 8 000 0982	WAN	790A	00:06		
94100 8 000 1064	CUS	790A	01:06	WAN	
94100 1 000 0619	WAN	790A	00:16		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94100 5 000 2361	CUS	000	00:46		744C
94101 1 000 1462	CUS	000	00:36		177B
94101 2 000 1468	CUS	000	01:22		192A
94101 3 000 0666	CUS	000	01:49		193A
94101 2 000 0291	CUS	000	01:08	WAN	744B
94100 9 000 1171	WAN	000	02:17		768A
94100 9 000 0711	CUS	000	10:44	WAN	190A
94101 0 000 0430	CUS	000	00:00	WAN	190A
94101 2 000 2969	CUS	100	00:56	WAN	102A
94101 0 000 1003	CUS	100	00:13		702A
94101 2 000 2093	CUS	102	00:12		
94101 3 000 0276	WAN	102	00:03		
94100 9 000 0783	WAN	103	00:06		102A
94101 0 000 0488	CUS	103	00:03		702A
94101 4 000 0121	CUS	104	01:38	WAN	
94101 4 000 0111	CUS	104	01:22	WAN	
94101 4 000 0108	WAN	104	01:39		
94101 5 000 0095	CUS	104	00:29	WAN	
94100 4 000 2551	CUS	108	10:49	WAN	744C
94101 4 000 0187	CUS	108	00:08		702A
94101 4 000 0178	CUS	108	01:18		177A
94101 1 000 1228	CUS	108	02:19	WAN	133A
94100 7 000 2014	CUS	108	00:36		190A
94101 4 000 2004	CUS	108	00:53		177A
94101 0 000 2569	CUS	108	00:01		702A
94101 0 000 2592	CUS	108	00:32		702A
94101 0 000 0104	CUS	108	00:21		177A
94101 3 000 0629	WAN	108	03:17		144B
94101 1 000 1730	CUS	117	00:46		177A
94101 1 000 0632	CUS	117	00:40		790A
94100 9 000 0907	WAN	118	00:15		102A
94101 3 000 1504	WAN	119	08:03		
94101 1 000 0457	CUS	123	01:14		
94101 1 000 0460	CUS	123	01:18		
94101 1 000 1326	CUS	123	00:15		
94101 2 000 0722	CUS	124	00:13		
94100 9 000 0256	CUS	126	00:50	WAN	
94101 5 000 0493	WAN	126	01:19		
94101 4 000 2702	WAN	127	00:43		102A
94101 3 000 0208	CUS	149	00:55		
94101 3 000 0256	CUS	149	00:55		
94101 3 000 0216	CUS	149	00:44		
94101 3 000 0264	CUS	149	00:33		
94101 3 000 0260	CUS	149	00:34		
94101 3 000 0219	CUS	149	01:05		
94101 3 000 0252	CUS	149	00:38		
94101 3 000 0222	CUS	149	00:41		
94101 3 000 0267	CUS	149	00:30		
94101 3 000 0159	CUS	149	01:28		
94100 9 000 0315	WAN	150	01:18		133A
94101 0 000 1547	CUS	150	04:01		177A
94101 1 000 0196	CUS	152	03:25	WAN	193A
94100 5 000 0107	WAN	167	02:43		790A
94101 0 000 0996	CUS	171	00:05		
94101 3 000 2409	CUS	177	00:12		
94101 1 000 1515	CUS	177	00:28		
94101 1 000 0420	CUS	177	00:17	WAN	
94100 8 000 0372	CUS	177	01:56	WAN	
94101 1 000 1439	CUS	177	00:38		
94101 3 000 3277	CUS	177	02:06	WAN	
94101 2 000 2310	CUS	177	05:00		
94101 1 000 1495	CUS	177	00:23		731A
94101 1 000 2138	WAN	190	00:38		
94101 0 000 0499	CUS	190	00:30		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94101 3 000 0576	WAN	1932	0:52		744B
94100 9 000 0799	WAN	102A	2:11		
94101 0 000 0098	ACT	103A	2:47		
94100 8 000 0154	CUS	104A	3:18	WAN	177B
94101 2 000 2744	CUS	117B	0:32		
94100 9 000 0630	CUS	126A	4:29	WAN	
94101 3 000 0883	CUS	146A	0:21	WAN	
94101 3 000 0755	CUS	146B	0:55		104A
94101 0 000 2658	CUS	171B	0:08		
94101 2 000 1466	CUS	171C	2:27		
94100 9 000 0989	CUS	171C	2:42	WAN	
94101 3 000 1526	CUS	171C	0:17		
94101 2 000 2247	WAN	171C	0:18		
94101 0 000 1596	CUS	171C	1:10		
94101 3 000 0262	CUS	171D	0:43		
94101 3 000 0176	CUS	171D	1:08		
94101 3 000 0181	CUS	171D	1:06		
94101 3 000 0186	CUS	171D	1:30		
94101 3 000 0162	CUS	171D	1:10		
94101 3 000 0202	CUS	171D	0:58		
94101 3 000 0855	CUS	171D	2:55		
94101 3 000 0266	CUS	171D	0:38		
94101 3 000 0185	CUS	171D	1:15		
94101 3 000 0194	CUS	171D	1:25		
94101 3 000 0255	CUS	171D	0:23		
94101 3 000 0257	CUS	171D	0:44		
94101 3 000 0268	CUS	171D	0:44		
94101 3 000 0184	CUS	171D	1:14		
94101 3 000 0175	CUS	171D	1:17		
94101 3 000 0204	CUS	171D	0:53		
94101 3 000 0195	CUS	171D	1:24		
94101 3 000 0201	CUS	171D	1:36		
94101 1 000 0951	CUS	177A	0:30		
94101 3 000 3184	CUS	177A	0:31		
94101 3 000 2452	CUS	177A	2:46		
94101 4 000 0905	CUS	177A	0:50	WAN	
94101 3 000 2297	CUS	177A	0:14		
94101 4 000 0341	CUS	177B	0:57		
94101 0 000 1563	CUS	177B	0:42		
94101 0 000 1575	CUS	177B	0:43		
94101 0 000 1581	CUS	177B	0:39		
94101 0 000 1646	CUS	177B	0:22		
94101 0 000 1625	CUS	177B	0:33		
94101 2 000 2710	CUS	177B	0:45		
94101 1 000 1464	CUS	177B	0:34		
94101 1 000 1488	CUS	177B	0:29		
94101 1 000 1311	CUS	177B	1:07	WAN	
94101 1 000 1332	CUS	177B	1:05	WAN	
94101 0 000 1669	CUS	177B	0:14		
94101 0 000 1593	CUS	177B	0:34		
94101 0 000 1578	CUS	177B	0:48		
94101 2 000 2717	CUS	177B	0:51		
94101 0 000 1570	CUS	177B	0:38		
94101 0 000 1681	CUS	177C	0:09		
94101 2 000 2901	CUS	190A	0:07		
94100 9 000 0270	CUS	190A	0:47	WAN	
94101 3 000 2098	CUS	190A	1:39		
94101 0 000 2031	CUS	190A	0:08		
94101 4 000 0676	CUS	190A	0:47	WAN	
94101 4 000 1118	CUS	190A	0:10	WAN	
94101 4 000 1128	CUS	190A	0:05		
94100 8 000 1597	CUS	190A	0:16	WAN	
94100 8 000 1448	CUS	190A	0:56	WAN	
94101 3 000 0837	WAN	190Z	1:47		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94101 2 000 2892	CUS	190	00:10	WAN	
94101 0 000 0013	CUS	190	01:23	WAN	
94100 9 000 0272	WAN	190	00:43		
94101 2 000 0294	CUS	190	02:34	WAN	
94101 0 000 1558	CUS	190	00:55		
94100 7 000 0366	WAN	190	09:32		790A
94101 1 000 1927	CUS	192	00:50		133A
94101 0 000 2393	WAN	192	00:24		726A
94101 1 000 0465	CUS	193	01:57	WAN	
94101 3 000 0604	CUS	193	01:58	WAN	133A
94101 2 000 0910	CUS	193	01:59		
94101 0 000 2024	WAN	193	04:19		
94101 2 000 1309	CUS	193	04:32		
94101 3 000 1963	CUS	193	02:31		333A
94101 0 000 1350	CUS	193	02:09		
94101 3 000 0483	CUS	193	01:20		177A
94101 2 000 2301	CUS	193	01:40		
94101 3 000 2267	CUS	193	00:50		
94101 4 000 0604	CUS	193	00:17	WAN	726A
94101 0 000 2008	CUS	193	09:09		350A
94101 0 000 2579	CUS	193	01:46		
94101 7 000 0962	CUS	193	01:40	WAN	177A
94101 2 000 2032	CUS	193	00:27		
94100 9 000 0488	CUS	193	04:18	WAN	745B
94101 1 000 2880	CUS	193	00:32	WAN	
94101 3 000 2686	WAN	193	02:13		
94101 3 000 1422	CUS	193	01:46	WAN	
94101 0 000 0413	CUS	231	01:49		
94101 4 000 0334	CUS	274	00:15	WAN	102A
94101 4 000 1095	CUS	316	01:04		
94101 0 000 2372	CUS	319	01:43	WAN	744C
94100 9 000 0622	CUS	320	04:17		319A
94101 3 000 2030	WAN	331	06:27		
94100 7 000 2553	CUS	331	14:50		
94101 3 000 1652	WAN	343	02:57		
94101 1 000 0832	CUS	350	10:38		744B
94100 9 000 0522	CUS	350	08:11	WAN	
94101 1 000 1233	CUS	350	01:08		326A
94101 1 000 1246	CUS	350	01:45		326A
94101 1 000 1828	CUS	353	01:26	WAN	
94101 3 000 1239	CUS	373	03:54	WAN	
94101 5 000 0607	WAN	526	01:00		
94101 2 000 0717	CUS	700	00:13		702A
94101 1 000 1327	CUS	702	00:11		
94101 3 000 0535	CUS	702	00:22		
94101 1 000 0095	CUS	702	00:49		
94100 8 000 1445	CUS	702	02:40		
94101 3 000 0261	CUS	708	00:37		190A
94101 0 000 1859	WAN	713	03:50		744C
94100 5 000 1615	CUS	715	11:36		315A
94101 3 000 0575	WAN	737	00:55		744B
94101 0 000 1274	CUS	737	00:05	WAN	790A
94093 0 000 0230	WAN	744	01:01		726A
94101 3 000 1132	CUS	744	00:26		
94100 6 000 2418	CUS	744	01:25		704A
94100 9 000 0244	CUS	744	02:09	WAN	
94101 3 000 1145	CUS	744	00:23		
94101 3 000 1142	CUS	744	00:24		
94101 4 000 1772	CUS	744	01:35		
94101 3 000 1104	CUS	744	00:30		
94101 3 000 1162	CUS	744	00:19		
94100 8 000 1381	CUS	745	01:39		
94101 0 000 1728	CUS	745	22:14		
94101 0 000 0121	WAN	745	01:36		
94101 3 000 2672	WAN	192A	1:30		
94101 0 000 2384	CUS	193A	2:04		
94100 6 000 0139	WAN	193A	1:50		
94100 9 000 0990	CUS	193A	2:52	WAN	
94100 9 000 0202	WAN	193A	1:01	WAN	
94100 8 000 0948	CUS	193A	2:17	WAN	
94101 3 000 0482	CUS	193A	0:56	WAN	
94100 9 000 0154	CUS	193A	1:12	WAN	
94101 4 000 0301	CUS	193A	0:28	WAN	
94101 2 000 1002	WAN	193A	0:32		
94101 0 000 0039	CUS	224A	9:07		244A
94100 9 000 0071	CUS	231A	4:54	WAN	
94100 6 000 0076	WAN	231A	4:28		
94100 9 000 0213	CUS	244A	5:02	WAN	
94101 3 000 2114	CUS	244A	0:24		
94101 2 000 2055	CUS	245B	1:38	WAN	
94101 0 000 0786	CUS	274A	6:38		
94101 0 000 1624	CUS	274B	0:24		
94100 9 000 0556	WAN	310A	14:02		
94101 1 000 0252	CUS	316A	13:49	WAN	
94101 4 000 0783	CUS	316A	2:42		
94101 2 000 1480	CUS	319A	4:29		
94101 1 000 0839	CUS	319A	4:22		
94101 0 000 2492	WAN	319A	10:48		
94101 4 000 2958	CUS	331A	10:52		
94101 3 000 1580	WAN	331A	3:51		
94100 9 000 0594	CUS	333A	9:30		
94101 3 000 0766	CUS	343B	1:21		
94100 9 000 0392	CUS	346A	1:51	WAN	
94100 6 000 1796	ACT	350X	25:20	WAN	320A
94101 2 000 0656	CUS	368A	1:18		
94101 3 000 0258	CUS	702A	0:14		
94101 2 000 1179	CUS	702A	0:21		
94101 0 000 1034	CUS	702A	0:09		
94100 6 000 2892	CUS	726A	1:50		
94101 4 000 2722	CUS	726A	0:03	WAN	
94101 3 000 2000	CUS	726A	1:42	WAN	
94100 9 000 0780	WAN	726A	1:45		
94101 0 000 0222	CUS	726A	1:50	WAN	
94101 5 000 0569	CUS	726A	0:22	WAN	
94092 8 000 2893	WAN	726A	2:20		
94100 8 000 0107	CUS	726A	1:31	WAN	
94101 4 000 0525	CUS	731A	1:34	WAN	
94100 8 000 1063	CUS	744A	2:56	WAN	
94101 0 000 0640	CUS	744B	1:39	WAN	
94100 8 000 1412	CUS	744B	0:12	WAN	
94101 4 000 1498	CUS	744C	1:51		
94092 8 000 0777	CUS	744C	1:09		
94101 3 000 3245	CUS	744C	2:41		
94101 4 000 1511	WAN	744C	6:05		
94100 9 WD 0009	CUS	744C	9:10		
94101 1 000 3097	CUS	744C	4:03	WAN	
94101 2 000 0719	CUS	744D	1:06		
94100 8 000 1390	CUS	744D	6:26	WAN	
94101 3 000 2649	ACT	745A	6:26	WAN	
94101 1 000 2376	WAN	745B	10:53		
94100 9 000 0707	CUS	745B	5:50		
94101 5 000 0966	CUS	745B	1:04	WAN	
94100 9 000 1045	CUS	764A	9:44	WAN	768A
94100 9 000 1028	CUS	768A	3:41	WAN	
94100 9 000 0703	CUS	768A	1:23		
94101 0 000 0118	CUS	768A	0:13		
94100 8 000 0125	CUS	768A	16:17	WAN	
94101 3 000 1518	CUS	768A	0:07		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94101 3 000 2365	CUS	745	01:45	WAN	
94101 3 000 2373	CUS	745	01:50	WAN	
94101 2 000 0571	CUS	746	01:20	WAN	
94101 3 000 1819	CUS	750	02:46		744B
94101 1 000 3200	WAN	750	00:43		746A
94101 5 000 0911	WAN	750	01:28		768A
94100 8 000 1538	WAN	768	03:39		
94101 3 000 2072	CUS	768	00:20	WAN	
94101 0 000 0165	CUS	768	01:02	WAN	
94100 7 000 2914	CUS	768	02:20	WAN	
94101 3 000 0682	CUS	768	01:16	WAN	
94101 1 000 0567	CUS	773	02:03	WAN	747B
94101 2 000 1086	CUS	774	02:04	WAN	744C
94101 0 000 1817	CUS	790	02:34		
94101 4 000 1879	CUS	790	00:14		
94100 9 000 0394	CUS	790	01:04	WAN	
94101 0 000 0089	CUS	790	01:08	WAN	
94100 9 000 0353	CUS	802	00:19		
94101 4 000 0260	CUS	802	00:25	WAN	

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94101 2 000 1960	CUS	768A	2:25		
94101 2 000 0452	CUS	768A	3:26	WAN	
94101 4 000 1565	CUS	768A	1:34		
94101 3 000 1342	WAN	774A	1:56		
94101 3 000 1348	WAN	774A	1:54		
94100 7 000 1949	CUS	774A	0:48		
94101 0 000 1388	CUS	774A	1:13		
94100 8 000 0817	CUS	790A	1:59		
94100 0 000 1253	CUS	790A	0:07		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94101 4 000 2488	CUS	000	04:46		150A
94101 5 000 1045	CUS	000	00:08		192A
94101 5 000 0260	WAN	000	02:30		745B
94101 7 000 0437	CUS	000	01:22		702A
94101 8 000 1897	CUS	000	02:39		744C
94101 8 000 1487	CUS	000	01:37		744A
94102 0 000 3454	CUS	000	01:23	WAN	102A
94102 0 000 2414	WAN	000	01:40		744B
94101 4 000 2975	CUS	100	01:13	WAN	102A
94102 0 000 1139	CUS	100	00:10		177A
94102 0 000 1142	CUS	100	00:11		177A
94101 9 000 1944	CUS	100	00:35		190A
94101 7 000 2526	CUS	101	00:24	WAN	102A
94102 1 000 0518	CUS	102	00:12		
94101 7 000 1132	CUS	102	02:34		702A
94102 0 000 1380	CUS	103	02:39		702A
94101 8 000 2454	CUS	104	00:13	WAN	
94101 1 000 0480	CUS	104	04:05	WAN	
94102 1 000 1194	CUS	104	02:16	WAN	
94101 9 000 1453	CUS	104	00:14		
94101 8 000 3206	WAN	104	00:11		
94101 9 000 2659	CUS	108	00:21		790A
94101 5 000 0024	WAN	108	03:00	CUS	190A
94101 8 000 0754	CUS	108	01:12		190A
94102 1 000 0096	CUS	108	00:37	WAN	104A
94102 1 000 0106	CUS	108	00:27	WAN	104A
94102 1 000 0111	CUS	108	00:23	WAN	104A
94102 1 000 0549	WAN	108	01:34		745B
94101 1 000 1731	CUS	108	00:47		
94101 9 000 0089	WAN	108	00:09		102A
94101 7 000 3180	WAN	108	00:27		726A
94102 0 000 1382	CUS	108	01:43		744C
94102 0 000 1514	CUS	108	03:04		702A
94101 9 000 1481	CUS	108	02:49		704A
94102 1 000 0034	CUS	108	00:05	WAN	726A
94102 1 000 0062	CUS	108	00:47	WAN	104A
94102 0 000 3298	CUS	108	00:19		768A
94101 8 000 2179	CUS	108	00:01	WAN	102A
94101 3 000 1281	CUS	108	04:00		745B
94102 1 000 0145	CUS	110	01:01		
94102 0 000 2589	WAN	113	02:07		
94101 8 000 1115	WAN	115	05:07	CUS	133A
94101 9 000 1510	WAN	117	00:37		
94102 0 000 1454	CUS	117	03:05		
94101 7 000 0397	CUS	117	00:14	WAN	
94101 7 000 0392	WAN	117	00:46		
94102 2 WD. 0024	WAN	118	05:41		102A
94102 0 000 0162	CUS	118	00:09		702A
94102 0 000 0161	CUS	118	00:09		702A
94101 8 000 1252	CUS	118	00:06		702A
94102 2 000 1124	WAN	118	00:14		102A
94102 2 000 1122	WAN	118	00:09		102A
94101 7 000 3371	CUS	118	00:40		702A
94102 1 000 0472	CUS	118	00:00		702A
94102 2 000 1127	WAN	118	00:10		102A
94101 6 000 0309	CUS	118	00:08		702A
94102 2 000 1130	WAN	118	00:07		102A
94102 0 000 2326	CUS	119	00:59	WAN	744C
94101 6 000 0326	CUS	126	00:32	WAN	
94101 6 000 0315	CUS	126	02:23		
94101 7 000 1652	CUS	126	01:04		
94101 8 000 0005	CUS	133	01:39		
94101 7 000 2641	CUS	134	03:50	WAN	133A
94101 7 000 0332	CUS	135	01:42		133A

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94102 1 000 0673	CUS	750	02:13	WAN	
94102 1 000 2646	CUS	750	03:13		790A
94101 8 000 1344	CUS	750	01:26	WAN	790A
94101 5 000 0697	CUS	768	00:31	WAN	
94101 5 000 0691	CUS	768	00:36	WAN	
94101 5 000 0701	CUS	768	00:19	WAN	
94101 9 000 0905	CUS	768	00:10	WAN	
94101 5 000 0833	CUS	768	02:24	WAN	
94101 5 000 0941	WAN	768	00:12		
94101 8 000 0832	WAN	768	02:31		
94101 5 000 1079	WAN	768	01:11		
94102 2 000 0987	CUS	768	00:43	WAN	
94101 9 000 1950	WAN	768	02:20		
94101 8 000 2809	CUS	768	00:16	WAN	
94101 7 000 0286	CUS	768	00:19		726A
94101 8 000 2833	CUS	790	02:21	WAN	
94102 1 000 0094	CUS	792	00:32	WAN	102A
94102 1 000 0137	WAN	102A	00:06		
94102 1 000 0051	CUS	102A	00:10	WAN	
94101 9 000 1225	CSC	104A	04:12	WAN	
94101 9 000 0192	CUS	104A	00:13		
94101 8 000 1730	CUS	104A	02:58		
94102 0 000 2627	CUS	104A	00:12	WAN	
94102 0 000 3237	WAN	104A	00:22		
94101 6 000 1121	CUS	117A	00:10		177A
94102 1 000 0592	CUS	133A	01:57	WAN	
94101 7 000 2682	CUS	133A	02:54	WAN	
94101 7 000 3384	WAN	145B	11:39		
94101 7 000 0459	CUS	146A	01:33		
94101 9 000 1504	WAN	146B	02:06		
94102 0 000 1318	CUS	146B	01:17		
94102 0 000 0592	CUS	146M	00:29		
94101 8 000 1248	CUS	171C	01:09		
94101 2 000 2758	CUS	171C	07:00	WAN	
94101 3 000 2742	CUS	171D	02:02	WAN	
94101 7 000 0502	CUS	174A	02:24		
94101 6 000 2067	CUS	174B	02:34		
94102 1 000 0524	WAN	177A	00:05		
94101 8 000 2310	WAN	177A	00:45		
94102 1 000 0850	CUS	177A	05:46		
94101 7 000 0657	CUS	177A	00:38		
94101 5 000 0400	WAN	177A	01:11		
94101 4 000 2338	CUS	177A	01:07		
94102 0 000 1529	CUS	177A	00:12		
94101 6 000 0345	CUS	177A	00:17		
94101 8 000 3074	WAN	177A	01:12	CUS	
94101 7 000 2206	CUS	177A	00:28		
94101 9 000 2232	CUS	177A	00:20		
94101 8 000 2866	CUS	177A	00:13		
94101 3 000 0051	CUS	177B	07:07	WAN	
94101 8 000 1859	CUS	190A	00:30		
94101 3 000 0962	CUS	190A	02:11		
94101 6 000 0645	WAN	190A	00:13		
94101 8 000 2303	CUS	190A	00:51		
94101 8 000 2468	CUS	190A	00:15		
94101 8 000 1387	WAN	190A	04:49		
94101 9 000 3058	CUS	190A	01:02	WAN	
94102 0 000 2675	CUS	190A	00:12		
94101 3 000 2261	CUS	190A	01:02		
94101 7 000 3334	CUS	190A	01:27	WAN	
94101 4 000 0780	CUS	192A	00:53		
94102 1 000 3554	CUS	192A	07:49		
94101 5 000 0757	CUS	192B	01:41		790A
94101 4 000 0500	WAN	193A	01:01		190A

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94102 1 000 0545	WAN	135	01:48	WAN	133A
94101 8 000 1497	CUS	146	09:34		
94101 6 000 0524	CUS	146	02:02		116A
94102 0 000 0582	CUS	146	00:45		168B
94102 2 000 0092	CUS	146	00:47		
94102 0 000 3168	WAN	147	03:59		133A
94102 2 000 0908	WAN	150	02:37		790A
94102 1 000 0449	CUS	174	06:09		
94101 3 000 0062	CUS	190	04:08	WAN	
94101 8 000 0017	CUS	190	02:18		
94101 6 000 0654	WAN	190	05:49		
94101 7 000 2262	CUS	190	01:55		
94101 8 000 0781	WAN	190	02:14		
94101 3 000 2495	CUS	190	02:47		
94102 1 000 0066	CUS	190	01:32	WAN	
94101 8 000 2147	WAN	190	02:28		745B
94101 9 000 0342	CUS	192	02:14	WAN	
94102 0 000 2479	CUS	192	00:40		
94102 2 ENA 0010	CUS	192	02:16		702A
94101 2 000 0114	CUS	192	01:02	WAN	
94101 6 000 0322	WAN	193	02:07		
94101 5 000 0894	CUS	193	04:21		744B
94101 7 000 3355	WAN	193	02:25		
94102 2 000 1011	CUS	193	00:25	WAN	
94102 1 000 2488	WAN	193	01:52		
94101 1 000 2259	CUS	193	02:59		
94101 9 000 0067	CUS	193	00:17	WAN	
94101 8 000 2135	CUS	193	02:22		
94101 4 000 0602	WAN	193	02:39		
94101 7 000 0664	WAN	231	03:07		
94101 6 000 0454	CUS	308	24:16		350A
94101 6 000 0511	CUS	314	11:35	WAN	333A
94101 7 000 0405	WAN	316	01:15		
94102 0 000 2129	WAN	318	01:51		
94101 7 000 0804	CUS	319	04:14		
94102 0 000 1963	WAN	320	09:51		
94102 0 000 3458	WAN	320	02:33		
94102 2 000 0808	WAN	323	01:23		
94102 2 000 0592	WAN	331	03:55		
94102 0 000 2615	CUS	331	05:14		
94101 5 000 0861	CUS	350	03:03	WAN	
94101 7 000 2577	CUS	350	00:25	WAN	744B
94102 2 000 0581	WAN	390	01:00		
94101 5 000 0665	CUS	700	08:28		744A
94101 8 000 2970	WAN	700	00:02		702A
94102 0 000 3149	WAN	700	00:15		726A
94101 9 000 3143	WAN	702	01:09		
94101 7 000 0614	CUS	702	00:32		
94102 7 000 3294	CUS	708	03:05	WAN	744A
94101 7 000 0378	CUS	708	02:35		790A
94101 7 000 1246	CUS	708	00:52		744A
94101 7 000 0578	CUS	713	06:17		
94101 7 000 0585	CUS	713	06:25	WAN	
94101 9 000 1841	CUS	715	00:10		702A
94101 5 000 1364	CUS	726	00:49	WAN	
94101 9 000 0078	CUS	726	01:24	WAN	
94101 9 000 0401	CUS	737	01:23	WAN	726A
94102 0 000 0940	CUS	737	00:49	WAN	768A
94101 6 000 0506	CUS	737	02:03	WAN	744B
94101 4 000 2973	WAN	738	03:02		102A
94101 8 000 0888	CUS	744	00:51		774A
94101 7 000 3080	CUS	744	01:14	WAN	
94101 7 000 1751	CUS	744	05:47		
94100 7 000 0022	WAN	744	05:27		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94101 9 000 2473	WAN	193A	03:20		
94102 0 000 1945	CUS	193A	01:06		
94101 8 000 1162	WAN	193A	03:39		
94101 8 000 1828	CUS	193A	00:35		
94102 1 000 0029	CUS	193A	01:26	WAN	
94102 1 000 1615	WAN	245B	02:01		
94102 0 000 3128	CUS	245B	04:10		
94101 5 000 1222	WAN	277A	01:05		
94101 7 000 1128	CUS	316M	00:16	WAN	
94101 8 000 1800	CUS	319A	04:19	WAN	
94101 8 000 0183	WAN	333A	04:56		
94102 1 000 0469	CUS	333A	05:04		
94102 0 000 3096	CUS	343B	01:15		
94102 0 000 1445	CUS	346A	01:29		
94102 0 000 0532	WAN	346A	02:14		146A
94102 0 000 0573	CUS	346M	01:54		146A
94101 8 000 0958	WAN	368M	01:45		
94101 7 000 0287	CUS	426A	00:25		726A
94101 9 000 0324	CUS	702A	11:43	CUS	
94101 7 000 3262	CUS	702A	00:11		
94101 8 000 1238	CUS	702Z	00:09		
94102 0 000 3277	CUS	726A	00:23		
94101 9 000 0047	WAN	726A	01:01		
94101 9 000 0085	WAN	726A	02:42		
94101 9 000 0062	CUS	726A	00:59	WAN	
94101 9 000 0069	CUS	726A	00:52	WAN	
94101 6 000 0546	CUS	726A	00:16	WAN	
94101 7 000 0295	WAN	726A	00:14		
94101 9 000 0063	CUS	726A	00:36	WAN	
94102 1 000 3229	WAN	726A	01:02		
94101 9 000 0613	CUS	726A	00:30	WAN	
94101 7 000 3324	CUS	744A	02:20	WAN	
94101 1 000 3044	CUS	744A	02:47		
94101 9 000 2832	WAN	744A	00:47		
94101 9 ESE 0008	WAN	744B	00:28		
94102 0 000 3391	WAN	744B	03:09		
94102 1 000 1051	CUS	744B	00:12		
94102 1 000 1743	WAN	744B	00:44		
94101 9 000 0770	WAN	744B	00:45		
94102 1 000 0190	CUS	744C	00:25	WAN	
94102 1 000 0483	CUS	744C	01:39		
94101 4 000 2895	WAN	744C	12:28		
94101 9 000 2558	CUS	744C	01:57	WAN	
94101 8 000 2854	CUS	744C	02:51	WAN	
94102 0 000 3178	WAN	744C	00:41		
94101 5 000 1338	WAN	744C	05:37		
94101 3 000 0676	CUS	744C	01:40		
94102 0 000 2488	CUS	744D	00:24		
94101 3 000 1076	CUS	745A	09:09		
94101 6 000 0630	CUS	745B	00:51		
94101 6 000 0791	WAN	745B	07:41		
94102 0 000 3401	WAN	745B	00:58		
94101 5 000 1130	WAN	745B	06:09		
94101 8 000 0678	WAN	745B	01:18		
94101 4 000 2671	WAN	745B	03:36		
94102 0 000 2746	CUS	745B	10:07		
94101 5 000 0846	WAN	745B	03:07		
94102 0 000 2532	WAN	745B	01:22		
94101 7 000 0337	CUS	745C	10:21	WAN	
94101 9 000 1300	WAN	745C	00:45		
94101 4 000 1422	CUS	745C	02:24	WAN	
94101 6 000 0473	CUS	768A	01:13	WAN	
94101 7 000 1418	CUS	768A	01:02		
94102 0 000 0644	CUS	768A	00:36	WAN	

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94101 3 000 0310	WAN	744	02:49		
94101 3 000 0209	CUS	744	01:36		
94102 1 000 1084	CUS	745	02:20		
94102 0 000 3331	WAN	745	02:01		
94102 2 000 0780	CUS	745	01:48	WAN	
94101 5 000 1073	WAN	745	01:19		
94101 3 000 3246	CUS	745	03:40	WAN	
94101 7 000 3189	WAN	745	03:03		
94101 4 000 2927	CUS	745	03:09	WAN	
94101 8 000 2898	WAN	745	01:03		
94101 7 000 0047	CUS	745	09:40		744B
94101 5 000 0450	WAN	745	08:41		745B
94101 9 000 0577	CUS	750	02:15	WAN	102A
94101 8 000 0013	CUS	750	00:37		744A
94101 7 000 3259	CUS	750	00:30		726A
94101 9 000 0141	CUS	750	01:36		744B
94101 7 000 2112	CUS	750	02:28		790A
94101 6 000 0068	CUS	750	16:59		744A

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94102 0 000 0643	CUS	768A	00:37		
94102 0 000 2102	WAN	768A	01:15		
94101 5 000 1276	WAN	768A	00:40		
94101 7 000 0310	CUS	768A	01:21		
94102 0 000 1951	WAN	768A	01:29		
94102 1 000 1299	WAN	774A	01:10		
94101 8 000 0685	CUS	790A	01:45		
94101 6 000 0891	WAN	790A	02:14		
94101 8 000 1871	CUS	790A	00:27		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94101 4 000 1362	CUS	000	07:19		745B
94012 4 000 2861	CUS	000	04:20		177C
94012 9 000 1447	CUS	000	00:59	WAN	190A
94012 3 000 0659	WAN	000	01:35		190A
94101 7 000 1382	CUS	000	02:59		774A
94102 7 000 1917	CUS	000	00:28		703A
94102 4 000 4536	CUS	100	00:13		704A
94102 3 000 0276	CUS	108	01:49		744B
94102 6 000 2678	CUS	108	00:37		703A
94102 9 000 1252	CUS	108	00:02	WAN	102A
94102 7 000 1320	CUS	108	00:20		102A
94102 7 000 1300	CUS	108	00:15		102A
94102 5 000 2380	CUS	108	02:27	WAN	102A
94102 4 000 2836	CUS	108	04:35		190A
94102 1 000 1042	CUS	108	02:56		104A
94102 5 000 0064	WAN	108	00:01		190A
94102 2 ESB 0003	WAN	108	07:04		745A
94102 6 000 2239	CUS	113	01:03		
94102 4 000 3134	CUS	116	00:08		
94102 7 000 2071	WAN	116	00:17	WAN	
94102 7 000 2101	WAN	116	00:15		
94102 4 000 2744	CUS	116	10:15		177C
94102 7 000 2123	WAN	116	00:18		
94102 7 000 1537	CUS	116	00:38		
94102 7 000 1592	CUS	116	00:47		
94102 7 000 1772	CUS	116	00:20		
94102 7 000 1774	WAN	116	00:32		
94102 7 000 1809	WAN	116	00:33		
94102 7 000 1578	CUS	116	00:48		
94102 7 000 1713	CUS	116	00:24		
94102 4 000 1053	CUS	118	00:08		702A
94102 6 000 3465	CUS	118	01:20	WAN	
94102 7 000 2780	CUS	126	02:01	WAN	726A
94102 6 000 2165	CUS	130	00:07		703A
94102 3 WN. 0024	CUS	131	01:15	WAN	
94102 6 000 1803	CUS	133	03:48	WAN	
94102 3 000 0392	CUS	134	03:04	WAN	133A
94102 3 000 0393	CUS	134	02:51	WAN	133A
94102 9 000 0140	CUS	134	01:40		133A
94102 4 000 2739	CUS	144	03:40		177C
94102 7 000 3168	CUS	150	02:27	WAN	174A
94102 8 000 1597	WAN	174	02:14		
94102 7 000 0846	CUS	177	00:07		
94102 8 000 1738	CUS	177	00:16		
94102 1 000 2089	CUS	177	00:22		
94102 4 000 3187	CUS	177	01:24		
94102 4 000 0568	CUS	177	00:12		
94102 4 000 3242	CUS	177	01:31		
94102 4 000 3297	CUS	177	02:30		
94102 2 000 1128	CUS	182	02:00	WAN	190A
94102 6 000 1514	CUS	190	01:03		
94102 6 000 1601	CUS	190	03:29		
94102 5 000 0327	CUS	190	00:05	WAN	
94102 3 000 0720	WAN	190	00:43		
94102 4 000 2750	CUS	190	04:39		
94102 3 000 0444	WAN	190	05:36		
94102 5 000 2785	CUS	190	00:06		
94102 5 000 0655	CUS	190	00:19	WAN	
94102 8 000 0533	WAN	190	02:05		
94102 3 000 0374	WAN	190	02:45		
94102 9 000 1510	CUS	190	02:19	WAN	
94102 4 000 3547	CUS	190	02:40		
94102 3 000 0382	CUS	190	03:29	WAN	
94102 4 000 3646	WAN	190	03:11		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94102 7 000 1500	WAN	116M	00:28		
94102 7 000 1932	CUS	116M	00:34		
94102 7 000 1944	CUS	116M	00:30		
94102 7 000 1923	WAN	116M	00:32	CUS	
94102 7 000 1896	CUS	116M	00:33		
94102 7 000 1963	CUS	116M	00:36		
94102 3 000 0743	CUS	116M	00:09		
94102 4 000 1576	CUS	116M	00:10		
94102 4 000 3493	CUS	117C	01:09		
94102 9 000 0333	CUS	133A	01:01		
94102 0 000 1734	CUS	133A	05:41		
94102 7 000 3532	WAN	133A	01:22		
94102 9 000 0379	WAN	133A	01:31		
94102 9 000 0375	WAN	133A	02:00		
94102 9 000 0490	CUS	133A	00:22	WAN	
94102 9 000 0492	WAN	133A	01:02		
94102 9 000 0512	CUS	133A	00:44	WAN	
94102 9 000 0337	WAN	133A	00:49		
94102 1 000 1435	WAN	133A	04:21		
94102 5 000 2549	CUS	133A	03:47		
94102 9 000 0536	CUS	133A	00:32	WAN	
94102 4 000 3415	CUS	144C	01:13		
94102 6 000 3266	WAN	145C	00:00		
94102 8 000 2191	CUS	168A	03:41	WAN	
94102 3 000 0135	CUS	171A	02:12		
94102 6 000 0219	CUS	171C	00:21		
94102 4 000 0665	CUS	171C	02:42		
94102 7 000 0619	CUS	171C	11:23		
94102 7 000 1771	CUS	171C	01:38		
94102 7 000 0253	WAN	171D	01:11		
94102 0 000 2809	CUS	174A	00:39		
94102 7 000 3570	WAN	174A	01:14		
94102 9 000 1004	WAN	174A	00:00		
94102 9 000 1280	CUS	174A	00:13		
94102 6 000 1754	CUS	174A	00:33		
94102 7 000 3631	CUS	174A	00:52	WAN	
94102 7 000 3192	CUS	174A	01:59	WAN	
94102 6 000 1831	CUS	177A	00:11		
94102 2 000 1165	WAN	177A	02:19		
94102 4 000 1697	CUS	177A	00:17		
94102 5 000 0951	CUS	177A	00:09		
94102 4 000 0733	WAN	177A	01:12		
94102 8 000 0263	CUS	177A	01:29	WAN	
94102 9 000 0346	CUS	177A	00:16		
94102 9 000 0212	CUS	177B	00:33		
94102 6 000 1259	WAN	177C	00:00		
94102 4 000 3317	WAN	177C	10:30		
94102 4 000 2887	CUS	177C	01:55		
94102 4 000 3393	CUS	177C	01:23		
94102 4 000 2843	CUS	177C	01:58	WAN	
94102 4 000 1851	CUS	177C	00:45		
94102 6 000 0905	CUS	177C	01:35		
94102 4 000 3203	CUS	177C	01:31		
94102 4 000 3169	CUS	177C	01:27		
94102 4 000 3104	CUS	177C	01:26		
94102 4 000 3132	CUS	177C	01:04		
94102 4 000 3113	CUS	177C	01:28		
94102 4 000 3542	CUS	177C	00:59		
94102 4 000 2721	CUS	177C	10:17		
94102 4 000 3796	CUS	177C	00:17		
94102 4 000 3302	CUS	177C	01:25		
94102 4 000 3478	CUS	177C	01:01		
94102 4 000 3172	CUS	177C	01:36		
94102 4 000 3251	CUS	177C	01:30		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94102 4 000 0381	WAN	190	00:31		
94102 8 000 0076	WAN	192	02:25		
94102 1 000 1887	CUS	192	02:50		
94102 2 000 0932	CUS	192	06:48		
94102 1 000 0513	CUS	192	03:40	WAN	
94102 8 000 0679	CUS	192	01:27	WAN	
94102 4 000 0268	WAN	192	00:42		
94102 8 000 0606	CUS	192	00:41	WAN	
94102 9 000 1742	CUS	192	00:18		
94102 5 000 0532	CUS	193	00:30		
94102 2 000 1023	CUS	193	00:47		
94102 6 000 2699	CUS	193	01:55		
94102 2 000 1195	WAN	193	01:41		
94102 6 000 1399	WAN	193	01:33	CUS	
94102 5 000 0666	CUS	193	00:29	WAN	
94102 2 000 0800	WAN	193	01:26		
94102 7 000 0251	CUS	193	02:22	WAN	
94102 4 000 3371	WAN	193	03:49		
94102 5 000 1591	CUS	193	02:09		
94102 4 000 2223	WAN	193	01:03		
94102 7 000 1903	CUS	193	01:46		
94102 5 000 1758	CUS	193	02:44		
94102 5 000 1365	CUS	231	05:54		
94102 7 000 2072	CUS	304	06:42		704A
94102 6 000 1355	WAN	315	02:37		
94102 7 000 1926	CUS	316	00:31		
94102 6 000 1955	CUS	318	02:39	WAN	304A
94102 8 000 2580	CUS	318	04:42		304A
94102 7 000 2846	CUS	318	05:17	WAN	304A
94102 6 000 3196	CUS	331	03:38		
94102 4 000 2156	CUS	331	10:06		
94102 5 000 1377	CUS	331	04:53		
94102 9 000 1536	CUS	333	02:53		
94102 2 000 1166	CUS	343	11:54		
94102 2 000 1202	WAN	343	11:00		
94102 8 000 1416	WAN	350	04:16		331A
94102 5 000 3313	WAN	350	02:31		
94102 5 000 2644	CUS	700	00:04		102A
94102 6 000 2169	CUS	718	00:41		702A
94102 7 000 1372	CUS	718	24:51	WAN	744C
94102 7 000 3226	CUS	721	02:07		174A
94102 8 000 0104	CSC	726	00:05	WAN	
94102 6 000 3142	CUS	726	04:42		
94102 0 000 0492	WAN	726	09:58		
94102 6 000 3526	CUS	726	04:16	WAN	
94102 1 000 1837	CUS	744	04:49		
94102 5 000 1312	CUS	744	06:43		
94102 5 000 1347	CUS	744	04:38		
94102 6 000 2627	CUS	744	03:08		
94102 5 000 0660	WAN	744	01:32		
94102 3 000 0138	CUS	744	01:19	WAN	
94102 5 000 0799	CUS	744	01:47	WAN	
94102 7 000 3557	WAN	744	00:13		
94102 7 000 3768	WAN	745	02:22		
94102 8 000 0749	CUS	745	00:56		
94102 4 000 0533	WAN	745	04:01		
94102 3 000 0332	CUS	745	02:10	WAN	
94102 0 000 3455	CUS	745	01:57	WAN	
94102 5 000 3292	CUS	745	01:01		
94102 2 000 0895	CUS	745	03:44	WAN	
94102 2 000 0253	CUS	745	01:24	WAN	
94102 6 000 0225	CUS	750	00:01		744C
94102 6 000 2554	CUS	750	00:52	WAN	
94102 7 000 3310	CUS	750	05:43		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94102 4 000 3266	CUS	177C	01:30		
94102 4 000 3286	CUS	177C	00:36		
94102 4 000 3274	CUS	177C	01:28		
94102 4 000 3517	CUS	177C	00:57		
94102 4 000 3500	CUS	177C	00:59		
94102 4 000 3753	CUS	177C	00:31		
94102 4 000 3824	CUS	177C	00:16		
94102 4 000 3509	CUS	177C	00:55		
94102 6 000 1125	CUS	177C	00:25		
94102 4 000 3267	WAN	177D	01:53		
94102 4 000 3705	CUS	177D	00:51		
94102 5 000 0001	WAN	190A	01:46		
94102 7 000 2005	CUS	190A	03:24		
94102 3 000 0389	CUS	190A	04:07	WAN	
94102 5 000 2617	CUS	190A	00:11		
94102 3 000 0020	WAN	190A	02:59		
94102 4 000 2789	CUS	190A	11:03		
94102 5 000 2894	CUS	190A	01:03		
94102 8 000 1272	CUS	190A	01:26		
94102 2 000 0821	CUS	190A	00:52	WAN	
94102 4 000 4977	CUS	190A	00:15		
94102 3 000 0685	CUS	190A	00:27	WAN	
94102 1 000 0501	CUS	190A	02:41	WAN	
94102 4 000 5057	CUS	190A	04:26		
94102 5 000 2989	CUS	190A	00:05	WAN	
94102 5 000 1205	CUS	190A	00:28		
94102 6 000 0555	CUS	190A	00:41	WAN	
94102 6 000 0559	CUS	190A	00:17	WAN	
94102 5 000 0976	CUS	190A	00:09		
94102 1 000 1760	WAN	192A	10:29		
94102 7 000 2329	CUS	192A	01:55		
94102 8 000 0699	CUS	192A	00:06	WAN	
94102 7 000 0001	WAN	192A	00:07		
94102 6 000 2173	CUS	192A	00:35		
94102 6 000 2804	CUS	192A	00:53		
94102 5 000 1242	CUS	192A	04:29		
94102 7 000 0645	WAN	192A	00:44		
94102 7 000 2674	WAN	193A	01:14		
94102 5 000 1171	CUS	193A	03:43		
94102 6 000 0654	WAN	231A	08:16		
94102 5 000 0032	WAN	245A	01:33		
94102 6 000 2396	CUS	245A	17:18		
94102 5 000 0750	CUS	3+9A	02:53	WAN	
94102 2 000 0746	WAN	277A	02:33		
94102 4 000 0619	CUS	310A	00:18	WAN	
94102 3 000 0283	CUS	316A	03:34		
94102 5 000 2762	CUS	316A	05:59	WAN	
94102 4 000 0295	WAN	319A	04:22	WAN	
94102 8 000 2260	CUS	319A	01:10	WAN	
94102 5 000 1703	CUS	331A	07:47		
94102 8 000 1192	CUS	331A	04:28		
94102 6 000 2713	CUS	331A	02:15		
94102 1 000 3003	CUS	331A	05:44		
94102 4 000 0551	CUS	333A	03:14		
94102 5 000 2284	CUS	350A	06:55		
94102 4 000 3472	WAN	368A	09:05		
94102 4 000 4477	CUS	677A	00:10		
94102 4 000 0031	CUS	702A	00:31		
94102 3 000 0198	CUS	726A	00:48	WAN	
94102 4 000 5067	CUS	726A	00:29	WAN	
94102 9 000 1264	WAN	726A	01:17		
94102 7 000 1536	WAN	726A	01:27		
94102 7 000 2257	WAN	726A	00:46		
94102 6 000 2843	CUS	726A	00:42		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94102 4 000 3378	CUS	750	01:47		790A
94102 2 000 0503	CUS	750	01:38	WAN	
94102 4 000 3949	CUS	750	09:46		
94102 1 000 3113	CUS	750	06:18	WAN	790A
94102 6 000 2051	WAN	750	01:59		745B
94102 7 000 0678	WAN	750	01:24	CUS	744C
94102 0 000 1132	CUS	768	03:30	WAN	
94102 5 000 0275	CUS	768	05:46		
94102 6 000 0020	WAN	768	02:16		
94102 6 000 3316	WAN	768	00:58		
94102 3 000 0030	WAN	768	05:24		
94102 4 000 0064	CUS	768	05:30	WAN	
94102 2 000 1102	CUS	768	03:07		
94102 5 000 0266	CUS	768	05:48	WAN	
94102 8 000 0251	CUS	768	01:57	WAN	
94102 3 000 0257	CUS	768	00:37	WAN	
94102 4 000 5203	CUS	768	02:54	WAN	
94102 1 000 3043	CUS	768	03:09		
94102 5 000 2758	CUS	774	03:12	WAN	
94102 6 000 2400	CUS	790	00:14		
94102 5 000 3314	CUS	790	00:45	WAN	
94102 1 000 2529	WAN	790	02:18		
94102 7 000 1282	CUS	912	04:41		
94102 6 000 0885	CUS	931	00:43		745A
94102 8 000 0615	CUS	1334	00:06	WAN	133A
94102 4 000 0626	WAN	110A	00:10		
94102 9 000 0376	WAN	113M	01:05		133A
94102 4 000 1409	WAN	116A	02:09		
94102 7 000 1690	WAN	116M	00:36		
94102 4 000 1234	CUS	116M	03:59		
94102 4 000 3175	WAN	116M	07:51		
94102 7 000 1839	WAN	116M	00:22		
94102 7 000 1837	CUS	116M	00:23		
94102 7 000 1866	CUS	116M	00:19		
94102 7 000 1977	CUS	116M	00:28		
94102 7 000 1855	CUS	116M	00:22		
94102 7 000 1525	CUS	116M	00:48		
94102 7 000 2135	CUS	116M	00:17		
94102 7 000 1739	WAN	116M	00:54		
94102 7 000 1996	WAN	116M	00:26		
94102 7 000 1946	WAN	116M	00:28		
94102 7 000 1508	CUS	116M	00:48		
94102 7 000 1470	WAN	116M	00:48		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94102 4 000 4937	WAN	744A	01:48		
94102 8 000 2505	WAN	744B	01:38		
94102 7 000 0714	CUS	744B	01:04		
94102 1 000 1173	CUS	744B	00:09		
94102 1 000 1154	CUS	744B	00:09		
94102 9 000 0704	WAN	744B	00:34		
94102 1 000 1138	CUS	744B	00:11		
94102 1 000 3164	CUS	744B	05:13		
94102 7 000 3795	CUS	744B	01:59	WAN	
94102 7 000 0165	CUS	744B	01:47	WAN	
94102 4 000 3284	CUS	744B	02:30		
94102 9 000 0292	WAN	744C	01:44		
94102 7 000 2359	CUS	744C	00:41		
94102 1 000 2260	CUS	744C	05:19		
94102 4 000 4623	CUS	744C	10:15		
94102 4 000 4824	WAN	744C	00:09		
94102 7 000 3754	CUS	745A	00:11	WAN	
94102 9 000 1512	CUS	745B	02:19		
94102 4 000 0386	WAN	745B	00:58		
94102 6 000 2616	CUS	745B	00:11		
94102 9 000 1545	CUS	745B	02:18	WAN	
94102 7 000 1927	CUS	745B	05:03		
94102 3 000 0599	WAN	745C	02:24		
94102 9 000 1515	WAN	745G	02:08		
94102 6 000 2799	CUS	768A	00:27	WAN	
94102 6 000 1755	CUS	768A	02:54		
94102 4 000 0069	CUS	768A	04:49	WAN	
94102 3 000 0199	WAN	768A	00:32		
94102 4 000 0060	CUS	768A	04:51	WAN	
94102 4 000 0044	WAN	768A	01:06		
94102 5 000 2544	CUS	768A	03:37	WAN	
94102 6 000 0240	CUS	768A	02:18	WAN	
94102 7 000 1080	CUS	768A	00:35	WAN	
94102 8 000 1291	WAN	768A	03:28		
94102 7 000 1528	CUS	774A	01:06		
94102 4 000 3860	CUS	774D	00:29		
94102 5 000 2109	ACT	774D	00:18	WAN	
94102 4 000 3038	CUS	790A	00:24		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
941018 000 1250	CUS	000	06:02		193A
941028 000 2436	WAN	000	06:29		790A
941029 000 1527	CUS	000	02:25		744B
941101 000 0067	CUS	000	02:13	WAN	768A
941101 000 1471	CUS	000	01:08		790A
941030 000 0329	CUS	000	01:59	WAN	190A
941031 000 0974	CUS	000	00:20		190A
941031 000 0317	WAN	100	02:22		190A
941031 000 0314	WAN	100	01:24		745A
941105 000 0773	CUS	100	00:06		702A
941102 000 0365	CUS	101	00:54	WAN	102A
941104 000 1077	CUS	101	00:03		102A
941031 000 2709	CUS	102	00:01		
941102 000 0458	CUS	102	00:05	WAN	
941101 000 1022	CUS	103	00:02		
941101 000 1066	CUS	103	00:04		
941101 000 1011	CUS	103	00:05		
941101 000 1053	CUS	103	00:07		
941101 000 1040	CUS	103	00:12		
941101 000 0046	WAN	103	00:39		
941101 000 1130	CUS	103	00:10		
941103 000 0136	WAN	103	00:10		
941103 000 0177	CUS	103	00:06	WAN	
941104 000 2349	CUS	103	00:02		
941102 000 0154	CUS	103	00:12		
941104 000 1559	CUS	103	00:15		
941104 000 1535	CUS	103	00:17		
941104 000 1871	CUS	103	00:05		
941019 000 2834	WAN	103	05:43		
941103 000 2959	CUS	103	00:15		
941103 000 2938	CUS	103	00:23		
941103 000 2947	CUS	103	00:23		
941030 000 0334	WAN	104	01:13		102A
941021 000 2424	WAN	104	01:26		102A
941029 000 1657	WAN	104	03:01		
941105 000 0238	CUS	104	01:52	WAN	
941102 000 2039	CUS	104	00:55	WAN	744C
941101 000 2496	WAN	104	01:33		
941103 000 1225	CUS	104	03:49		
941031 000 0159	CUS	104	01:25		171C
941028 000 2232	CUS	108	01:33		190A
941029 000 1680	CUS	108	05:19	WAN	190A
941103 000 2064	CUS	108	00:16		702A
941031 000 2301	WAN	108	02:04		102A
941104 000 1878	CUS	108	00:12		190A
941029 000 0736	CUS	108	05:09	WAN	790A
941105 000 0303	CUS	108	00:33		702A
941103 000 1106	CUS	108	03:10		245B
941029 000 0210	CUS	108	00:36	WAN	790A
941029 000 0215	CUS	108	00:37	WAN	190A
941101 000 3325	CUS	117	01:16		146B
941103 000 2038	CUS	117	01:02	WAN	
941102 000 0128	CUS	118	01:47	WAN	102A
941105 000 0428	WAN	118	00:05		102A
941105 000 0604	WAN	126	00:28		
941104 000 1402	CUS	135	00:38		
941031 000 2690	WAN	144	01:10		190A
941101 000 3553	WAN	144	00:58		
941030 WD. 0023	CUS	144	11:25		
941103 000 1202	WAN	145	01:20		
941102 000 0461	WAN	146	03:40		
941103 000 1204	CUS	146	00:46		
941031 000 0534	CUS	171	04:11		
941101 000 1225	CUS	171	00:00		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
941029 000 0013	WAN	744	01:49		
941101 000 0884	CUS	745	01:27	WAN	
941031 000 0893		745	00:16	WAN	
941031 000 2670	CUS	745	02:38		
941101 000 1286	CUS	745	06:10		
941030 000 0294	CUS	745	05:34	WAN	
941102 000 0298	WAN	750	01:23		
941029 000 1589	CUS	750	01:53	WAN	
941029 000 0653	CUS	750	13:30		177A
941103 000 0183	WAN	750	00:51		744C
941102 000 0262	CUS	750	06:58	WAN	745A
941031 000 2026	CUS	750	02:08	WAN	702A
941030 WD/ 0007	WAN	750	10:41	CUS	193A
941031 000 0385	WAN	750	01:57		768A
941102 000 3724	WAN	750	00:14		726A
941028 000 0704	CUS	767	03:23	WAN	768A
941102 000 0285	CUS	768	02:06	WAN	
941104 000 1431	CUS	768	00:50		
941104 000 1257	CUS	768	03:56	WAN	
941030 000 0271	CUS	768	00:06	WAN	
941101 000 0711	CUS	768	00:40	WAN	
941029 000 1507	CUS	768	02:46	WAN	
941029 000 0394	WAN	768	00:39		
941102 000 0415	WAN	768	01:39		
941101 000 0654	WAN	768	01:01		
941103 000 0009	CUS	768	02:04	WAN	
941101 000 0482	CUS	790	01:45		768A
941101 000 0750	CUS	100A	00:33	WAN	102A
941031 000 1766	CUS	102A	00:35		
941105 000 0894	CUS	103A	00:08		
941103 000 2450	CUS	104A	01:58	WAN	
941031 000 2847	CUS	104A	01:00		
941028 000 2666	CUS	104A	02:10	WAN	
941105 000 0122	WAN	104A	00:13		
941105 000 0126	WAN	104A	00:13		
941105 000 0117	CUS	104A	00:16	WAN	
941029 000 0384	CUS	133A	01:18		
941029 000 0554	WAN	133A	32:20		
941103 000 1093	WAN	133A	01:03		
941103 000 1071	CUS	133A	02:03		
941030 000 0697	WAN	133A	13:56		
941031 000 2752	WAN	145A	05:57		
941101 000 3589	WAN	146A	01:18		
941101 000 3557	WAN	146A	01:22		
941103 000 3019	CUS	146B	01:35		
941029 000 1029	CUS	146B	04:45	WAN	
941103 000 1049	CUS	146M	01:28		
941102 000 0117	WAN	146M	01:34		
941102 000 0146	WAN	146M	01:08		
941101 000 2674	CUS	150A	02:01	WAN	190A
941031 000 1212	CUS	171A	03:28		
941101 000 3408	CUS	171C	00:44		
941103 000 0513	CUS	174A	02:42		
941101 000 0077	CUS	177A	01:42	WAN	
941101 000 2379	CUS	177A	00:22		
941102 000 0632	CUS	177A	00:41	WAN	
941030 WEI 0042	WAN	177A	03:10		
941101 000 1963	WAN	177A	03:50		
941031 000 1006	CUS	177A	00:20		
941103 000 0155	CUS	177A	01:06	WAN	
941031 000 1961	CUS	177A	00:41		
941104 000 0130	CUS	177A	00:12		
941031 000 2452	CUS	190A	00:03	WAN	
941101 000 3093	CUS	190A	00:06		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
941104 000 2646	WAN	172	00:00		
941102 000 1996	CUS	177	01:12		
941101 000 1514	CUS	177	00:56		
941031 000 0090	CUS	190	00:08		
941104 000 1177	CUS	190	00:23	WAN	
941102 000 0045	CUS	190	03:31	WAN	
941103 000 1215	CUS	190	00:36		
941101 000 1636	CUS	190	05:14		
941029 000 0205	CUS	190	01:11	WAN	
941029 000 1599	WAN	192	01:27		
941104 000 1874	CUS	192	00:12		
941029 000 0624	WAN	192	00:51		
941102 000 0130	CUS	193	02:43	WAN	
941031 000 0865	CUS	193	04:23		
941027 000 3209	CSC	193	02:33	WAN	
941102 000 1411	WAN	193	00:40		
941030 000 0494	WAN	193	01:47		
941101 000 2395	CUS	193	02:01		
941103 000 3203	WAN	193	01:13		
941031 000 0987	WAN	193	02:05		
941102 000 0024	WAN	193	00:03		
941102 000 2009	CUS	193	00:13		
941104 000 3209	CUS	193	00:05	WAN	
941031 000 0390	CUS	193	00:54	WAN	
941031 000 1425	CUS	193	01:42		
941031 000 0094	CUS	193	02:41		
941030 WEI 0021	WAN	193	10:14		
941029 000 0197	CUS	193	00:47	WAN	
941101 000 3169	CUS	231	10:30		
941103 000 0125	CUS	277	01:58	WAN	
941104 000 3321	CUS	310	02:16	WAN	
941104 000 3324	WAN	310	03:02		
941104 000 3324	WAN	310	03:02		
941006 000 2807	CUS	314	26:06		744A
941102 000 2495	CUS	315	06:55	WAN	319A
941101 000 3414	CUS	315	03:11		319A
941101 000 1520	CUS	316	00:29	WAN	
941101 000 1382	WAN	316	00:20		
941029 000 1772	WAN	317	03:06		
941030 000 0698	CUS	320	08:31	WAN	
941102 000 0141	CUS	331	09:28	WAN	
941031 000 1350	CUS	331	03:54		
941031 000 0255	CUS	331	02:35	WAN	
941102 000 1639	CUS	346	11:49		
941101 000 0432	WAN	346	01:04		
941101 000 2264	CUS	350	02:03	WAN	190A
941105 000 0804	CUS	350	00:44		190A
941030 000 0088	CUS	368	14:01	WAN	
941030 000 0120	CUS	368	09:21		
941105 000 0855	WAN	376	05:56		333A
941030 000 0357	CUS	390	02:13	WAN	
941104 000 0319	WAN	390	01:04		
941031 000 0324	CUS	393	07:20	WAN	
941031 000 1366	CUS	526	01:52		126A
941102 000 0373	WAN	650	00:05		
941102 000 0287	CUS	650	01:33	WAN	
941105 000 0468	WAN	700	00:10		702A
941031 000 0045	CUS	700	00:05	WAN	702A
941104 000 0254	WAN	702	03:17		
941102 000 0939	CUS	702	00:56		
941102 000 2758	CUS	702	00:38		
941031 000 0615	CUS	702	00:53		
941101 000 3652	WAN	708	05:45		744B
941030 000 0556	CUS	708	00:39	WAN	104A

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
941103 000 1083	CUS	190A	00:20		
941031 000 1221	CUS	190A	02:26		
941103 000 0552	CUS	190A	00:12		
941031 000 1158	CUS	190A	00:13		
941031 000 1157	CUS	190A	00:14		
941102 000 0460	CUS	190A	03:51	WAN	
941103 000 0217	CUS	192A	00:42	WAN	
941102 000 2949	WAN	192A	01:54		
941102 000 2215	CUS	192A	02:38		
941102 000 0039	CUS	192A	00:30	WAN	
941102 000 0032	CUS	192A	04:27	WAN	
941031 000 0307	CUS	192A	02:30		
941031 000 0209	CUS	192A	00:30		
941101 000 1895	WAN	192A	04:09		
941101 000 1350	CUS	192B	00:34		
941103 000 0219	CUS	193A	03:25		
941103 000 0220	WAN	193A	00:04		
941102 000 2192	CUS	193A	01:37		
941103 000 1061	CUS	193A	00:37		
941104 000 0827	WAN	193A	00:56		
941101 000 2306	CUS	193A	00:56	WAN	
941101 000 1835	CUS	193A	00:42		
941031 000 0100	CUS	193A	01:38		
941030 000 0027	CUS	231A	07:48	WAN	
941029 000 1702	CUS	244A	01:06		
941027 000 0090	WAN	244A	10:21		
941027 000 0090	WAN	244A	10:21		
941026 000 2962	WAN	244C	09:28		
941101 000 1194	CUS	274B	02:36		
941028 000 2319	CUS	274B	02:17	WAN	
941031 000 2378	CUS	274C	05:33		
941031 000 1295	CUS	316A	01:40	WAN	
941104 000 3280	WAN	316A	02:58		
941028 000 2544	CUS	319A	11:31		
941102 000 3113	WAN	319A	08:33		
941031 000 0236	WAN	319A	06:33		
941101 000 0659	WAN	331A	03:51		
941104 000 0301	CUS	331A	05:01	WAN	
941102 000 1126	CUS	331A	05:46	WAN	
941103 000 0287	CUS	331A	02:02	WAN	
941104 000 0638	WAN	333A	02:19		
941102 000 1314	WAN	333A	01:28		
941030 000 0373	WAN	392B	01:30		
941102 000 3158	WAN	516M	00:21		102A
941031 000 2080	CUS	677A	02:00		
941104 000 0737	CUS	677A	00:57		
941103 000 1126	CUS	702A	00:21		
941030 000 0203	CUS	726A	00:24	WAN	
941031 000 2600	CUS	726A	02:27	WAN	
941029 000 0968	WAN	726A	22:09		
941031 000 1203	CUS	744A	01:21		
941021 000 1795	WAN	744A	09:52		
941102 000 1281	CUS	744B	04:42	WAN	
941101 000 2523	WAN	744B	00:45		
941103 000 2589	CUS	744B	03:35	WAN	
941101 000 0547	WAN	744C	00:41		
941029 000 1279	CUS	744C	01:24	WAN	
941025 000 0154	WAN	744C	04:05		
941031 000 2711	CUS	744C	00:38	WAN	
941102 000 2882	WAN	744C	01:35		
941101 000 1861	CUS	744D	00:31		
941104 000 2754	CUS	744D	00:28		
941102 000 3513	WAN	745B	01:27		
941102 000 2238	CUS	745B	02:10	WAN	

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
941031 000 0319	WAN	708	01:36		726A
941031 000 1299	CUS	713	04:49	WAN	
941105 000 1386	CUS	715	03:46		
941104 000 1114	CUS	718	01:21		726A
941103 000 0242	WAN	718	00:54		146B
941103 000 0241	WAN	718	00:58		146B
941028 000 0669	WAN	731	14:13		
941025 000 1738	CUS	731	04:19		
941104 000 1736	WAN	737	02:19	CUS	774A
941029 000 0385	WAN	737	09:24		133A
941031 000 0679	CUS	737	03:44		744A
941102 000 0663	CUS	737	01:57	WAN	744B
941104 000 0574	CUS	737	02:46		744B
941031 000 1330	CUS	737	01:47		193A
941031 000 2386	CUS	737	00:49		744B
941103 000 2115	CUS	738	04:35		745A
941028 000 1882	CUS	744	05:46		
941101 000 1627	CUS	744	02:05		
941103 000 1254	CUS	744	02:17		
941102 000 0124	CUS	744	02:28	WAN	
941030 WD. 0024	CUS	744	10:53	WAN	
941029 000 1612	CUS	744	02:41		
941104 000 3306	WAN	744	02:45		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
941027 000 1916	WAN	745B	09:42		
941103 000 0534	CUS	745B	00:30		
941101 000 3602	CUS	745B	01:07		
941030 000 0350	WAN	745B	02:07		
941103 000 3184	CUS	745B	01:24		
941030 WN/ 0038	WAN	745C	02:20		
941104 000 1218	CUS	768A	00:48	WAN	
941105 000 1145	CUS	768A	05:15	WAN	
941105 000 0753	WAN	768A	01:36		
941104 000 0279	WAN	768A	02:28		
941105 000 0977	WAN	768A	00:49		
941104 000 1175	CUS	768A	00:39	WAN	
941102 000 0690	WAN	768A	00:47		
941103 000 1390	CUS	768A	00:48	WAN	
941104 000 0839	CUS	768A	00:50	WAN	
941104 000 0208	WAN	768A	03:06		
941031 000 0886	CUS	768A	00:52		
941103 000 0209	WAN	774A	00:55		
941104 000 2046	CUS	790A	00:12		
941104 000 2080	CUS	790A	00:15		
941101 000 2990	CUS	790A	01:29		
941101 000 3361	WAN	790A	00:00		
941101 000 0766	CUS	790A	02:44	WAN	
941101 000 1641	CUS	790A	02:30		
941104 000 1527	CUS	790A	00:09		
941031 000 0955	CUS	790A	06:54		774A
941105 000 1394	WAN	792A	02:07		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94110 7 000 0102	WAN	000	02:37		193A
94110 9 000 1068	CUS	000	00:00	WAN	102A
94110 9 000 2934	CUS	000	00:35		190A
94110 9 000 0098	CUS	000	10:05		350A
94110 9 000 3208	CUS	000	00:20		144A
94110 5 000 0005	CUS	000	09:44		790A
94110 8 000 1110	CUS	000	00:40		177A
94111 1 000 2582	CUS	000	01:00		731A
94110 9 000 0911	WAN	000	00:00		146B
94110 2 000 3609	WAN	000	00:00		744C
94110 7 000 0385	WAN	000	01:10		193A
94110 5 000 0065	CUS	000	02:11		193A
94110 5 000 0566	WAN	000	07:28		245A
94110 6 000 0360	CUS	000	00:43	WAN	745B
94110 7 000 1010	CUS	102	00:24		
94111 0 000 3093	CUS	102	00:09	WAN	
94110 8 000 4320	WAN	102	02:27		
94110 9 000 3292	WAN	102	00:07		
94110 9 000 3257	WAN	102	00:13		
94110 9 000 1934	CUS	103	00:06		
94110 9 000 1943	CUS	103	00:09		
94110 9 000 1796	CUS	103	00:29		
94110 9 000 1783	CUS	103	00:31		
94110 9 000 1775	CUS	103	00:35		
94110 9 000 1764	CUS	103	00:39		
94110 9 000 1752	CUS	103	00:43		
94110 9 000 1740	CUS	103	00:54		
94110 9 000 1729	CUS	103	00:57		
94110 9 000 0036	CUS	103	01:37	WAN	
94111 0 000 0876	CUS	103	00:06		
94110 7 000 0530	CUS	103	00:04	WAN	
94110 7 000 2132	CUS	103	01:35		
94110 7 000 0886	CUS	103	00:54		
94110 7 000 0290	WAN	103	01:12		
94110 8 000 4387	CUS	103	00:03		
94111 0 000 2293	CUS	104	00:09		
94110 9 000 3656	CUS	104	02:48		
94110 7 000 1692	CUS	104	01:56	WAN	
94111 1 000 1282	CUS	104	00:37		
94111 1 000 1292	CUS	104	00:40		
94110 9 000 1970	CUS	104	00:31		
94111 2 000 0135	WAN	104	00:13		
94110 8 000 3853	CUS	104	02:46	WAN	
94110 7 000 0381	WAN	107	00:30		102A
94111 0 000 0972	CUS	108	00:07		102A
94110 9 000 1802	CUS	108	00:28		103A
94110 9 000 1020	CUS	108	04:56		774A
94110 9 000 0870	CUS	108	00:06	WAN	193A
94110 8 000 1008	CUS	108	00:13		190A
94110 3 000 1305	CUS	108	01:16		190A
94110 8 000 3352	WAN	108	00:23	CUS	103A
94110 5 000 0017	WAN	108	08:06		133A
94110 7 000 2946	WAN	108	01:44		744C
94110 8 000 3910	CUS	110	06:27	WAN	
94110 8 000 2285	WAN	116	02:58		
94110 8 000 4117	CUS	118	00:15	WAN	192A
94111 1 000 0643	WAN	125	00:11		146A
94110 6 000 0303	CUS	126	00:35	WAN	
94111 0 000 0738	CUS	126	01:18		
94110 6 000 0321	CUS	126	00:28		
94110 6 000 0496	CUS	126	02:13	WAN	
94110 6 000 0346	WAN	126	02:42		
94111 1 000 0647	WAN	126	00:08		146A+J84
94111 0 000 0775	WAN	126	00:07		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94110 6 000 0030	CUS	750	03:07	WAN	
94110 9 000 1640	CUS	750	01:07		744C
94110 7 000 3275	CUS	750	01:16	WAN	744A
94110 7 000 0111	WAN	750	01:40		744C
94111 0 000 2282	CUS	750	03:52		726A
94110 7 000 0310	WAN	762	02:09		744C
94110 8 000 0405	CUS	762	02:05	WAN	744C
94111 0 000 0794	WAN	768	01:14		
94110 6 000 1096	WAN	768	00:47		
94110 8 000 0558	CUS	768	01:54	WAN	
94111 0 000 0714	CUS	768	00:31		
94111 0 000 0889	CUS	768	00:41		
94110 7 000 0407	CUS	768	00:15	WAN	
94111 0 000 2316	CUS	774	00:05		
94110 4 000 1565	CUS	774	00:13		
94110 4 000 1897	CUS	774	02:28		
94110 9 000 1241	CUS	790	00:21		
94102 8 000 0805	CUS	792	01:28	WAN	
94110 7 000 2214	CUS	803	00:38		190A
94110 9 000 1004	CUS	102A	00:10		
94110 6 000 0154	CUS	102A	01:47		
94111 0 000 0533	CUS	110A	06:18	WAN	
94110 8 000 3881	WAN	116A	04:05		
94110 8 000 3161	WAN	116A	00:00		
94110 9 000 1933	CUS	119A	01:20	WAN	
94110 9 000 1910	CUS	119A	01:24	WAN	
94110 9 000 0693	WAN	126A	00:45		
94111 0 000 0830	WAN	133A	03:28		
94110 9 000 0407	CUS	133A	01:27	WAN	
94111 0 000 1256	CUS	133A	01:47		
94110 9 000 0783	CUS	133A	02:08	WAN	
94110 7 000 1622	CUS	133A	01:47		
94111 0 000 1786	CUS	133A	00:49	WAN	
94110 7 000 3090	CUS	133A	05:33		
94110 9 000 0710	CUS	135A	02:04	WAN	
94110 8 000 0963	CUS	144H	00:42		
94110 8 000 0949	CUS	144H	00:45		
94110 8 000 0956	CUS	144H	00:46		
94110 8 000 0944	CUS	144H	00:49		
94110 8 000 0939	CUS	144H	00:52		
94110 8 000 0933	CUS	144H	00:56		
94110 8 000 4131	CUS	146B	04:07	WAN	
94102 0 000 2049	WAN	150A	11:59		
94110 5 000 1072	WAN	168A	00:31		
94110 3 000 3204	WAN	171A	00:17		
94111 1 000 1341	CUS	171C	00:38		
94111 1 000 1351	CUS	171C	00:39		
94111 1 000 1118	CUS	171C	00:42		
94110 9 000 0058	WAN	177A	00:14		
94110 8 000 1407	CUS	177A	00:11		
94110 6 000 0128	CUS	177A	00:05		
94110 6 000 0122	CUS	177A	00:10		
94110 6 000 0125	CUS	177A	00:13		
94110 6 000 0118	CUS	177A	00:00		
94110 8 000 1041	CUS	177A	00:20		
94110 8 000 1034	CUS	177A	00:22		
94110 8 000 1021	CUS	177A	00:26		
94110 8 000 1016	CUS	177A	00:27		
94110 8 000 1028	CUS	177A	00:27		
94110 9 000 3492	CUS	177A	00:10		
94111 0 000 3114	WAN	177A	00:29		
94110 7 000 1566	CUS	177A	00:11		
94110 9 000 3243	CUS	177A	01:31		
94110 9 000 2724	CUS	177A	02:00		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94111 0 000 0774	WAN	126	00:08		
94111 0 000 0762	WAN	126	00:56		
94110 6 000 0342	WAN	126	01:42		
94110 6 000 0499	CUS	126	01:27		
94110 8 000 4102	WAN	133	07:57		
94110 6 000 0035	CUS	133	01:53	WAN	
94111 0 000 2131	CUS	134	05:36		133A
94111 2 000 0592	CUS	135	01:53	WAN	133A
94110 9 000 2965	WAN	144	00:41		171D
94110 7 000 1725	WAN	145	01:52		193A
94110 8 000 0858	CUS	146	01:18		193A
94110 9 000 2410	CUS	150	00:10		192A
94110 8 000 1329	CUS	171	03:14		
94110 4 000 1970	CUS	171	01:49		
94110 7 000 0820	CUS	174	02:16	WAN	
94110 4 000 3071	CUS	177	01:19		
94110 9 000 3103	WAN	177	02:22		
94111 0 000 1492	CUS	177	00:27		
94111 0 000 2431	WAN	177	00:12		
94111 1 000 2555	CUS	190	02:59		
94111 1 000 0173	CUS	190	02:02	WAN	
94110 6 000 0137	CUS	190	03:49	WAN	
94110 8 000 4476	CUS	190	00:33	WAN	
94111 0 000 1825	CUS	190	03:23		
94111 2 000 0719	CUS	190	00:10	WAN	
94111 1 000 1883	CUS	192	00:34		
94111 0 000 1135	CUS	192	00:08		
94110 8 000 3638	CUS	192	02:25		
94110 9 000 3009	CSC	192	00:07		
94110 9 000 3230	CUS	192	02:18		
94110 5 000 1013	WAN	193	01:58		
94111 1 000 0183	WAN	193	04:41		
94110 8 000 4277	WAN	193	00:03		
94111 2 000 1271	CUS	193	00:53	WAN	
94110 7 000 2522	WAN	193	01:03		
94110 8 000 4381	CUS	193	00:10		
94110 3 000 0237	CUS	193	03:41	WAN	
94110 7 000 3045	WAN	193	01:37		
94110 8 000 1703	CUS	208	00:47		
94110 5 000 1037	WAN	231	02:30		
94103 0 000 0613	CUS	245	07:04		
94111 0 000 0485	CUS	245	01:07	WAN	
94110 7 000 2693	CUS	316	09:57		
94110 4 000 3358	CUS	320	02:28		
94110 6 000 1214	WAN	331	02:45		
94110 8 000 0897	CUS	333	00:45	WAN	
94110 7 000 1755	CUS	333	00:38	WAN	
94110 7 000 1744	CUS	333	00:44	WAN	
94110 7 000 1737	CUS	333	00:47	WAN	
94110 7 000 1698	CUS	333	00:54	WAN	
94110 3 000 2214	CUS	343	09:21		
94111 1 000 0212	WAN	353	04:18	CUS	
94110 7 000 1948	CUS	366	05:32		
94110 7 000 0327	WAN	368	00:21		
94110 7 000 0343	WAN	368	00:24		
94110 7 000 0349	CUS	368	00:25	WAN	
94110 7 000 0344	WAN	368	00:27		
94110 7 000 0339	CUS	368	00:29	WAN	
94110 7 000 2799	CUS	368	01:03	WAN	
94110 6 000 0603	WAN	390	08:58		
94110 4 000 1556	CUS	414	04:53		133A
94110 7 000 2424	WAN	516	01:36		316A
94110 7 000 2119	CUS	517	01:12		317A
94110 6 000 0692	CUS	702	00:07		
94110 3 000 0702	CUS	177B	00:59		
94111 0 000 2938	CUS	177B	00:14		
94110 7 000 0879	WAN	177C	00:47		
94110 4 000 3064	CUS	190A	04:26	WAN	
94110 9 000 0243	WAN	190A	03:50		
94110 8 000 1505	CUS	190A	02:28	WAN	
94110 7 000 0539	CUS	190A	00:14		
94110 5 000 0433	WAN	190A	01:17		
94110 8 000 1880	CUS	190A	00:34		
94110 5 000 0261	CUS	190A	02:24	WAN	
94110 7 000 0691	WAN	190A	00:04		
94110 6 000 0480	WAN	190A	00:50		
94110 8 000 0515	WAN	190A+	00:13		
94110 8 000 4100	WAN	192A	01:10		
94110 9 000 1072	WAN	192A	03:50		
94110 8 000 0174	CUS	192A	01:45	WAN	
94110 9 000 0100	WAN	192A	02:02		
94110 9 000 0097	CUS	192A	00:06		
94110 9 000 1025	CUS	192A	04:21	WAN	
94110 4 000 2098	CUS	192A	05:08	WAN	
94111 0 000 1335	CUS	192A	00:46		
94110 7 000 2821	WAN	193A	00:00		
94110 6 000 0905	CUS	193A	01:13	WAN	
94110 9 000 3058	CUS	193A	02:30		
94110 9 000 0745	CUS	245B	00:30	WAN	
94110 8 000 3869	CUS	245B	08:08	WAN	
94110 8 000 3513	CUS	277A	01:11	WAN	
94110 8 000 3749	CUS	277A	00:39		
94110 7 000 2416	CUS	310A	06:22		
94111 1 000 0595	WAN	319A	00:08		
94110 9 000 0442	WAN	320A	06:34		
94110 8 000 0916	CUS	333A	00:24	WAN	
94110 8 000 0868	WAN	333A	02:16		
94110 8 000 1050	CUS	343A	08:41		
94110 7 000 1828	CUS	346A	07:20		
94111 1 000 3039	CUS	726A	00:20	WAN	
94110 7 000 3326	CUS	726A	00:06		
94110 7 000 2783	CUS	726A	00:04	WAN	
94111 1 000 0498	CUS	726A	02:18	WAN	
94110 7 000 3147	WAN	726A	00:07		
94110 7 000 3150	WAN	726A	00:08		
94110 6 000 0224	WAN	726A	02:35		
94110 8 000 4167	CUS	726A	00:17	WAN	
94110 4 000 2863	CUS	744B	01:02		
94110 7 000 2978	CUS	744C	02:59	WAN	
94110 7 000 2940	WAN	744D	03:05		
94110 4 000 2832	WAN	745A	00:00		
94110 6 000 0808	WAN	745A	02:59		
94110 4 000 3239	CUS	745B	02:57	WAN	
94110 9 000 2416	CUS	745B	01:00		
94110 7 000 1825	CUS	745B	02:29	WAN	
94110 4 000 3399	CUS	745B	04:02		
94110 8 000 0909	CUS	745B	01:11		
94110 9 000 1706	CUS	745B	01:12		
94111 0 000 2962	WAN	745B	02:26		
94110 6 000 1093	WAN	745B	04:32		
94111 0 000 0914	CUS	745B	01:01	WAN	
94111 2 000 1052	WAN	745B	02:55		
94110 6 000 0604	CUS	768A	01:26	WAN	
94110 6 000 0723	WAN	768A	00:46		
94111 0 000 2535	WAN	768A	00:43		
94111 0 000 1991	CUS	768A	00:03		
94111 0 000 2730	CUS	768A	00:13	WAN	
94111 0 000 0571	WAN	768A	00:34		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94111 1 000 2898	CUS	702	03:11		
94110 8 000 4146	CUS	704	04:00		
94110 9 000 0926	CUS	704	01:08		
94111 1 000 2288	CUS	708	00:04		750A
94110 8 000 1879	WAN	708	01:21		310A
94110 4 000 3100	CUS	718	03:03	WAN	726A
94111 1 000 0102	WAN	726	02:05		
94111 2 000 1040	CUS	726	03:38	WAN	
94110 7 000 0264	CUS	726	07:57		
94111 1 000 2037	CUS	726	01:38		
94110 8 000 4026	CUS	737	02:45		
94110 7 000 2489	WAN	738	01:18		744C
94110 5 000 1429	CUS	744	01:14		
94110 6 000 0784	CUS	744	01:16	WAN	
94110 5 000 0763	WAN	744	00:51		
94110 8 000 0240	CUS	744	04:36		
94110 4 000 1239	CUS	745	06:46		
94110 6 000 0602	WAN	745	05:48		
94111 2 000 1278	WAN	745	02:47		
94111 0 000 0656	WAN	745	00:37		
94110 9 000 2391	CUS	750	00:59		
94111 0 000 0498	CUS	750	00:21		744C
94110 5 000 0558	CUS	750	02:18	WAN	

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94111 0 000 0358	WAN	768A	01:02		
94111 0 000 2986	CUS	768A	01:03		
94110 9 000 3073	WAN	768A	03:31		
94110 6 000 1221	CUS	768A	01:18		
94110 8 000 4177	CUS	768A	01:17	WAN	
94110 8 000 4163	CSC	768A	04:44	WAN	
94110 8 000 4379	WAN	774A	06:32		
94110 9 000 0869	CUS	774A	01:11		
94111 0 000 1598	WAN	790A	00:42		
94110 7 000 3208	CUS	790A	00:55		
94110 8 000 0873	WAN	790A	00:39		
94111 1 000 0390	WAN	790A	00:25		
94110 7 000 3207	WAN	790A	01:04		
94110 6 000 0401	WAN	790A	02:19		
94111 1 000 0813	WAN	792A	01:19		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94111 1 000 2026	CUS	000	01:20		190A
94111 1 000 3019	WAN	000	01:27		177A
94111 4 000 1946	CUS	000	09:27		319A
94111 7 000 0745	WAN	000	01:49		193A
94111 6 000 0440	CUS	000	00:35		744A
94111 5 000 0778	CUS	000	01:22	WAN	744B
94111 5 000 1324	CUS	108	01:14		171C
94111 5 000 1186	CUS	108	00:04		171C
94110 9 000 2622	CUS	108	04:03		250A
94111 8 000 3165	CUS	108	01:09		190A
94111 2 000 0057	CUS	108	04:06	WAN	319A
94111 6 000 3065	CUS	108	03:25		171C
94111 4 000 0577	CUS	108	00:11		104A
94111 7 000 2005	CUS	108	00:24		104A
94111 6 000 2974	CUS	108	00:01		104A
94111 7 000 1687	CUS	108	00:13		104A
94111 6 000 3486	WAN	110	01:47	CUS	
94111 8 000 2595	CUS	114	01:07		133A
94111 7 000 0275	CUS	114	01:52		150A
94111 8 000 1001	CUS	118	01:05	WAN	102A
94111 7 000 0263	WAN	118	00:47		
94111 5 000 1196	CUS	118	00:05		104A
94111 5 000 1177	CUS	118	00:05		104A
94111 4 000 0579	CUS	118	00:56	WAN	102A
94111 5 000 0718	CUS	118	06:50		133A
94111 3 000 0631	CUS	126	01:20		
94111 3 000 0495	WAN	126	00:53	CUS	
94111 6 000 0650	WAN	126	02:06		
94111 5 000 2720	CSC	133	04:14	WAN	
94111 4 000 1265	CUS	135	03:53		133A
94111 3 000 0512	WAN	135	01:17		133A
94111 7 000 1330	CUS	144	00:09		
94111 5 000 1036	CUS	146	02:56		
94111 5 000 0818	CUS	150	00:29		
94111 5 000 2645	CUS	171	02:37		
94111 4 000 0376	CUS	171	01:55	WAN	
94111 5 000 2987	CUS	177	00:05		
94111 9 000 0370	CUS	177	01:05		
94111 7 000 3314	WAN	190	00:00		
94111 8 000 2940	CUS	190	02:27		
94111 9 000 0921	CUS	190	00:03		
94111 5 000 1994	CUS	190	00:30		
94111 3 000 0463	CUS	190	00:36	WAN	
94111 5 000 2468	CUS	190	01:24	WAN	
94111 2 000 1017	WAN	190	01:31		
94111 4 000 2130	CUS	190	00:01		
94111 7 000 3197	WAN	192	02:04		
94111 8 000 3299	CUS	192	00:15	WAN	
94111 6 000 0750	CUS	192	00:17		
94111 6 000 2801	CUS	192	06:10	WAN	346A
94111 8 000 0681	CUS	193	01:10		
94111 8 000 2423	CUS	193	00:27		
94111 8 000 2276	CUS	193	02:09		
94111 4 000 0110	CUS	193	01:16		
94111 7 000 2571	CUS	193	02:02		
94111 3 000 1292	CUS	193	00:25		
94111 8 000 0597	CUS	193	00:49		
94111 7 000 0335	WAN	193	00:05		
94111 8 000 0796	WAN	193	00:36		
94111 7 000 2760	CUS	193	00:17		
94111 4 000 2628	WAN	193	00:46		
94111 3 000 1567	CUS	193	00:08		
94111 7 000 3113	CUS	193	00:37		
94111 3 000 0071	CUS	193	00:22	WAN	
94111 8 000 1547	CUS	117B	01:50		177B
94111 6 000 0799	CUS	126A	04:37		
94111 3 000 0450	WAN	126A	00:21		
94111 3 000 0678	CUS	126A	00:28		
94111 7 000 0883	CUS	133A	01:15	WAN	
94111 4 000 2049	CUS	133A	03:16	WAN	
94111 6 000 0703	CUS	133A	06:02	WAN	
94111 7 000 2261	CUS	144H	00:13	WAN	
94111 9 000 0393	CUS	144H	00:38	WAN	
94111 9 000 0388	CUS	144H	00:48	WAN	
94111 9 000 0407	CUS	144H	00:44	WAN	
94111 7 000 0943	WAN	168B	02:55		
94111 5 000 0233	CUS	171A	00:47		
94111 9 000 1169	CUS	171C	02:13	WAN	
94111 4 000 1296	CUS	171C	00:39		
94111 0 000 1773	CSC	171C	01:15	WAN	
94111 4 000 1288	CUS	171C	00:42	WAN	
94111 6 000 1155	CUS	174A	00:44		
94111 7 000 0944	CUS	174Q	00:57		
94111 6 000 0485	CUS	177A	00:38		
94111 9 000 1229	CUS	177A	00:17		
94111 5 000 0918	CUS	177A	00:09		
94111 3 000 0768	CUS	177A	00:16	WAN	
94111 4 000 1533	CUS	177A	00:17		
94111 6 000 2505	CUS	177A	00:38		
94111 9 000 1710	CUS	177A	00:25	WAN	
94111 7 000 3084	CUS	177A	00:39		
94111 4 000 2034	CUS	177A	00:11		
94111 4 000 1999	CUS	177B	00:53	WAN	
94111 8 000 1759	CUS	177B	00:36		
94111 8 000 0522	WAN	177B	01:57		
94111 8 000 0514	WAN	177B	03:05		
94111 8 000 1153	CUS	177B	01:54		
94111 6 000 2356	CUS	177B	02:08		
94111 8 000 1691	CUS	177B	03:21		
94111 8 000 0476	WAN	177B	01:47		
94111 3 000 0585	CUS	177B	00:27	WAN	
94111 8 000 0788	CUS	190A	01:22	WAN	
94111 4 000 1231	CUS	190A	02:11	WAN	
94111 5 000 1155	CUS	190A	01:54		
94111 9 000 0903	WAN	190A	02:28		
94111 8 000 1993	CUS	190A	01:42	WAN	
94111 5 000 0549	CUS	190A	00:50	WAN	
94111 5 000 2822	CUS	190A	00:26		
94111 3 000 0091	WAN	190A	00:47		
94111 8 000 0831	CUS	190A	01:10		
94111 3 000 0939	CUS	190A	02:04	WAN	
94111 3 000 0943	CUS	190A	02:04	WAN	
94111 7 000 1216	CUS	190A	00:19		
94111 4 000 3114	WAN	190A	00:51		
94111 8 000 2858	CUS	190Z	00:50		
94111 8 000 3023	WAN	192A	00:55		
94111 6 000 0105	CUS	192A	00:05	WAN	
94111 8 000 2331	WAN	192A	00:01		102A
94111 8 000 2804	CUS	192A	00:08		
94111 8 000 3321	CUS	192A	00:10	WAN	768A
94111 5 000 2278	CUS	192A	02:01		
94111 5 000 1821	CUS	192A	01:49	WAN	
94111 5 000 0261	WAN	192A	00:12		
94111 7 000 0278	CUS	192A	00:06	WAN	
94111 6 000 0140	CUS	192A	00:05		
94111 5 000 0739	WAN	192A	01:23		
94111 1 000 1613	CUS	192A	02:36		
94111 8 000 3282	WAN	193A	00:18		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94111 6 000 0751	CUS	193	00:33		
94111 8 000 2027	CUS	315	04:45		350A
94111 5 000 1077	CUS	318	00:17		104A
94111 5 000 1150	CUS	318	00:08		104A
94111 5 000 1102	CUS	318	00:11		104A
94111 1 000 1147	WAN	320	13:02	WAN	
94111 3 000 1418	WAN	331	02:37		
94111 2 000 1652	CUS	331	04:06		
94111 4 000 0416	CUS	342	09:00	WAN	
94111 6 000 2726	CUS	346	03:08		
94111 6 000 2813	CUS	346	02:50		
94111 6 000 1710	CUS	349	14:13		
94111 7 000 1004	CUS	350	03:44		
94111 3 000 0222	CUS	350	06:52	WAN	
94111 8 000 0411	CUS	350	04:48	WAN	
94111 7 000 0257	CUS	353	04:41		
94111 9 000 0668	WAN	357	05:59		
94111 9 000 0666	WAN	357	05:58		
94111 4 000 0650	CUS	450	06:54	WAN	343A
94111 5 000 0359	CUS	702	00:13		
94111 3 000 1002	CUS	704	01:27	WAN	
94111 8 000 0855	CUS	704	01:56		
94111 7 000 2198	CUS	708	00:20		
94111 2 000 1154	CUS	708	02:49	WAN	
94111 7 000 1353	CUS	708	00:06		
94111 8 000 2312	CSC	715	07:09	CUS	319A
94111 6 000 3769	CUS	718	01:09	WAN	702A
94111 4 000 2444	CUS	718	02:12	WAN	726A
94111 6 000 0052	WAN	726	00:25		
94111 8 000 1502	CUS	726	00:07	WAN	
94111 6 000 1539	CUS	744	02:03		
94111 3 000 0310	WAN	744	01:43		
94111 1 000 2444	CUS	744	04:26		
94111 0 000 2419	CSC	744	04:00	WAN	
94110 5 000 1310	CUS	744	02:13	WAN	
94111 6 000 3592	CUS	744	00:11	WAN	
94111 5 000 2559	CUS	745	06:08		
94111 9 000 0175	CUS	745	03:02	WAN	
94111 3 000 0414	CUS	745	00:31	WAN	
94111 3 000 0183	CUS	750	00:55		
94111 5 000 0243	WAN	750	00:28		
94111 3 000 1151	CUS	750	03:19	WAN	
94111 6 000 3726	CUS	750	00:23		
94111 5 000 3275	CUS	750	00:06		
94111 5 000 3287	CUS	750	00:10		
94111 9 000 0135	CUS	750	00:35	WAN	745B
94111 3 000 0076	CUS	768	01:16	WAN	
94111 6 000 2892	CUS	768	01:19	WAN	
94111 3 000 0085	WAN	768	00:36		
94111 9 000 0490	CUS	768	00:34	WAN	
94111 6 000 2494	CUS	768	00:25	WAN	
94111 2 000 0076	WAN	768	00:48		
94111 2 000 1633	WAN	768	00:32		
94111 1 000 3000	CUS	768	01:26	WAN	
94111 3 000 0776	CUS	768	00:48	WAN	
94111 2 000 1789	CUS	768	00:53	WAN	
94111 4 000 1179	CUS	768	02:05	WAN	
94111 9 000 0853	CUS	790	01:58	WAN	
94111 7 000 1468	CUS	790	02:45		
94111 9 000 1186	CUS	790	00:12		
94111 4 000 2456	CUS	790	00:08		
94111 6 000 0756	CUS	790	00:17		
94111 6 000 2883	CUS	790	00:09		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94111 7 000 0254	CUS	193A	01:46		
94111 2 000 1035	WAN	193A	02:26		
94111 8 000 0416	CUS	193A	00:32		
94111 5 000 2394	CUS	244A	03:05		
94111 7 000 1745	CUS	274C	00:14		
94111 9 000 1376	WAN	310A	01:54		
94111 6 000 0784	WAN	315A	11:31		
94111 7 000 0900	CUS	315A	05:14		
94111 6 000 0204	WAN	316A	03:24		
94111 6 000 2994	CUS	331A	04:13		
94111 5 000 0316	WAN	331A	04:55		
94111 3 000 0545	CUS	333A	04:18	WAN	
94111 6 000 0560	WAN	333A	04:29		
94111 8 000 2606	CUS	334A	07:41		
94111 5 000 1454	WAN	343A	08:49		
94111 5 000 1726	CUS	346A	02:55	WAN	
94111 8 000 0366	WAN	702A	00:02		
94111 4 000 1627	CUS	702A	00:24		
94111 1 000 2107	CUS	702A	03:13	WAN	
94111 8 000 0583	CUS	716M	00:42		
94111 9 000 0819	WAN	726A	01:20		
94111 2 000 1485	WAN	726A	00:48		
94111 7 000 0203	CUS	726A	00:07		
94111 8 000 2437	CUS	726A	00:05	WAN	
94111 8 000 0180	WAN	726A	00:12		
94111 7 000 1890	CUS	726A	00:22		
94111 7 000 2092	CUS	731A	03:58	WAN	
94111 4 000 3379	CUS	744A	00:36		
94111 6 000 1613	CUS	744A	00:17		
94111 4 000 3346	WAN	744B	00:48		
94111 8 000 1959	CUS	744B	03:12	WAN	
94111 7 000 0170	CUS	744B	00:35	WAN	
94111 1 000 1777	WAN	744B	01:56		
94111 5 000 0431	CUS	744B	00:49		
94111 2 000 1243	WAN	744C	05:16		
94111 8 000 2455	CUS	744C	00:17		
94111 7 000 0754	WAN	744C	00:02		
94111 9 000 1270	WAN	744C	02:41		
94111 7 000 2183	CUS	744C	09:02	WAN	
94111 4 000 2789	CUS	744D	00:10	WAN	
94111 4 000 1307	CUS	744D	00:50		
94111 6 000 3692	WAN	745A	03:29	CUS	
94111 5 000 2689	CUS	745A	06:28	WAN	
94111 3 000 1361	WAN	745A	00:51		
94111 4 000 2898	WAN	745B	00:36		
94111 2 000 1118	WAN	745C	04:00		
94111 6 000 1885	CUS	745C	01:26		
94111 5 000 0239	WAN	750A	11:03		
94111 6 000 0824	WAN	768A	04:02		
94111 3 000 0040	CUS	768A	00:35	WAN	
94111 6 000 0534	WAN	768A	01:12		
94111 8 000 2072	CUS	768A	02:06		
94111 8 000 2076	CUS	768A	00:42	WAN	
94111 6 000 3666	CUS	768A	00:57	WAN	
94111 6 000 3469	CUS	768A	01:01		
94111 6 000 3396	CUS	768A	01:05	WAN	
94111 5 000 0861	CUS	768A	00:44		
94111 9 000 0537	WAN	768A	00:22		
94111 7 000 1878	CUS	768A	01:04	WAN	
94111 8 000 0008	WAN	771A	00:00		
94111 9 000 0713	CUS	774A	00:37		
94111 4 000 2658	CUS	774A	00:09		
94111 9 000 0714	CUS	774A	01:00		
94111 4 000 1350	CUS	777B	01:02		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94111 4 000 0652	CUS	790A	04:36		
94111 5 000 0881	CUS	790A	01:29	WAN	
94111 4 000 1790	CUS	790A	00:22		
94111 6 000 1727	WAN	790A	00:06		
94111 7 000 0146	WAN	790A	02:22		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94112 2 000 1067	CUS	000	01:12		744D
94111 8 000 2608	CUS	000	00:12		190A
94112 0 000 0455	CUS	000	00:25	WAN	190A
94111 0 000 3212	WAN	000	01:48		646B
94111 8 000 1697	CUS	000	03:04		190A
94112 1 000 2466	WAN	102	00:02		
94112 0 000 0894	WAN	102	00:26		
94112 2 000 0256	WAN	102	02:18		
94112 3 000 2905	CUS	102	00:05	WAN	
94112 3 000 2017	WAN	104	01:38		
94112 3 000 1339	CUS	104	01:44		
94112 3 000 2029	WAN	104	01:26		
94111 5 000 1140	CUS	108	09:38		346A
94112 1 000 0614	CUS	108	00:37		744A
94112 2 000 1041	CUS	108	00:16		102A
94111 9 000 1125	CUS	108	03:03	WAN	104A
94112 1 000 2381	WAN	108	02:09		104A
94111 6 000 3690	WAN	108	05:44		102A
94112 0 000 0246	CUS	108	02:01	WAN	190A
94112 1 000 0780	CUS	114	03:41	WAN	
94112 2 000 1213	WAN	114	00:00		
94112 3 000 2022	CUS	126	01:22		
94112 2 000 1783	WAN	143	00:00		
94112 1 000 1150	CUS	144	00:31		
94111 6 000 2542	CUS	145	03:32		
94111 6 000 0814	WAN	174	02:11		
94112 2 000 1709	CUS	174	01:17		
94112 2 000 2854	CUS	177	00:12		
94112 1 000 1363	CUS	177	00:23		
94111 0 000 1600	CUS	190	05:30		
94112 0 000 0259	WAN	190	02:12		
94112 1 000 0483	CUS	190	04:17		
94112 1 000 2399	WAN	190	00:34		
94112 3 000 0325	CUS	190	00:16	WAN	
94111 5 000 1329	CUS	190	70:59	WAN	
94111 9 000 0932	CUS	190	03:40		
94112 0 000 0327	CUS	190	00:46	WAN	
94112 4 000 1390	WAN	190	00:21		
94112 2 000 0954	CUS	192	01:07		
94112 1 000 0304	WAN	192	00:32		
94112 0 000 0820	WAN	192	00:28		
94112 2 000 0091	CUS	193	00:23	WAN	
94112 1 000 2373	CUS	193	00:10		
94112 1 000 1140	CUS	193	01:04	WAN	
94112 2 000 2235	CUS	193	02:09	WAN	
94111 7 000 0739	CUS	193	00:52	WAN	
94112 1 000 0893	CUS	193	01:22		
94112 2 000 0150	CUS	193	00:44		
94112 1 000 0247	WAN	193	01:23		
94112 0 000 0425	CUS	193	00:08	WAN	
94112 3 000 2288	WAN	193	00:00		
94112 5 000 1428	CUS	193	00:09		
94112 1 000 2998	CUS	193	01:34	WAN	
94112 1 000 0365	WAN	193	01:33		
94112 0 000 0589	CUS	193	00:41		
94112 0 000 0485	CUS	193	00:04	WAN	
94112 4 000 1064	CUS	245	13:16	WAN	
94111 9 000 1349	WAN	310	02:08		
94112 1 000 0526	CUS	315	03:42		319A
94112 1 000 2677	CUS	315	04:37		319A
94112 1 000 2377	CUS	316	01:47		
94111 9 000 0598	WAN	320	06:13		
94111 8 000 0200	CUS	331	03:44	WAN	
94112 3 000 0156	CUS	331	06:40	WAN	

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94111 8 000 1925	CUS	745	09:02	WAN	
94111 1 000 2039	CUS	745	03:14		
94112 2 000 0187	CUS	750	00:12		193A
94112 1 000 3028	CUS	750	01:52	WAN	190A
94111 9 000 1561	CUS	750	01:48		
94112 2 000 2626	CUS	750	02:00		744B
94111 6 000 1572	CUS	753	03:28	WAN	331A
94112 4 000 0170	CUS	768	01:59	WAN	
94112 0 000 0193	WAN	768	00:36		
94112 3 000 2001	CUS	768	02:02	WAN	
94112 1 000 0382	CUS	768	05:19	WAN	
94112 1 000 2993	CUS	768	03:39		
94112 2 000 0292	CUS	768	00:39	WAN	
94112 0 000 0520	CUS	768	04:49	WAN	
94112 1 000 0023	WAN	768	00:51		
94112 3 000 0290	WAN	790	00:04		
94112 4 000 0753	WAN	802	00:07		790A
94112 5 000 0073	WAN	102A	00:04		
94112 1 000 1594	CUS	104A	02:05		
94112 1 000 1747	WAN	110A	03:53		
94112 2 000 0272	CUS	133A	02:07	WAN	
94111 7 000 0101	CUS	135A	01:32	WAN	
94112 1 000 1127	WAN	144I	00:00		
94112 1 000 0018	CUS	145A	00:49	WAN	
94112 0 000 0920	WAN	145B	00:00		
94112 1 000 1003	WAN	145B	00:00		
94111 7 000 0704	WAN	146B	02:00		
94112 2 000 0730	WAN	146B	01:16		
94112 3 000 0745	WAN	146B	00:43		
94112 1 000 2335	CUS	171C	04:39	WAN	
94112 3 000 0181	CUS	171C	01:06	WAN	
94112 3 000 0162	CUS	171C	01:21		
94112 2 000 1186	CUS	177A	00:16		
94112 1 000 2084	CUS	177A	00:12	WAN	
94112 1 000 1126	CUS	177A	01:16		
94111 8 000 0538	WAN	177B	00:00		
94112 1 000 3079	CUS	190A	01:25	WAN	
94112 2 000 0620	CUS	190A	00:53	WAN	
94112 2 000 1058	WAN	190A	03:15		
94112 1 000 1180	CUS	190A	00:42		
94111 4 000 0680	CUS	190A	04:07		
94112 1 000 0134	WAN	190A	00:00		
94112 2 000 2760	WAN	190A	00:00		
94112 2 000 2061	WAN	190A	01:09		
94112 3 000 0209	CUS	190A	01:14		
94112 1 000 1155	CUS	190A	00:53		
94112 5 000 0683	WAN	190A	00:43		
94111 8 000 0585	CUS	190A	00:49		
94112 2 000 0767	WAN	192A	00:27		
94112 3 000 0285	WAN	193A	03:05		
94112 6 000 0165	CUS	193A	00:05		
94112 6 000 0160	CUS	193A	00:16	WAN	
94112 5 000 1002	CUS	193A	00:35	WAN	
94112 2 000 0035	WAN	193A	01:21		
94112 3 000 3080	CUS	193A	00:16	WAN	
94111 6 000 2887	CUS	193A	03:39		
94112 3 000 2419	CSC	193A	00:14	WAN	
94112 3 000 2429	CUS	193A	00:18		
94112 1 000 0021	WAN	193A	00:54		
94112 1 000 1167	CUS	244A	00:28		
94112 1 000 0424	WAN	316A	01:19		
94112 2 000 3407	CUS	319A	02:31		
94112 2 000 3156	CUS	320A	03:06		
94112 1 000 2578	CUS	320A	04:53		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94112 3 000 0404	CUS	331	03:26	WAN	
94112 3 000 2725	CUS	332	04:36		
94112 1 000 0529	CUS	346	02:37	WAN	
94112 6 000 0477	CUS	346	03:03	WAN	
94112 0 000 0483	WAN	346	01:54		
94112 3 000 0465	CUS	350	00:18	WAN	
94112 1 000 0290	CUS	350	00:57	WAN	745C
94112 3 000 0659	WAN	350	02:17		331A
94112 0 000 0785	CUS	367	03:54	WAN	
94112 1 000 0213	WAN	390	00:45		
94112 5 000 0985	WAN	392	01:21		
94112 5 000 0978	WAN	392	01:24		
94112 5 000 0975	WAN	392	01:32		
94111 9 000 0992	WAN	677	06:08		
94112 1 000 2893	CUS	702	00:29		
94112 0 000 0298	CUS	708	00:12		790A
94112 0 000 0290	CUS	708	00:13		790A
94112 0 000 0284	CUS	708	00:14		790A
94112 0 000 0295	CUS	708	00:15		790A
94112 0 000 0297	CUS	708	00:16		790A
94112 0 000 0282	CUS	708	00:18		790A
94112 0 000 0291	CUS	708	00:20		790A
94112 2 000 0301	CUS	708	00:49		790A
94112 1 000 1975	CUS	715	03:55		
94112 1 000 1741	CUS	718	00:02		702A
94111 9 000 1230	CUS	718	02:55	WAN	744B
94112 5 000 1274	WAN	720	06:35		
94112 3 000 1559	WAN	726	00:53		
94111 8 000 1459	CUS	726	02:12	WAN	
94112 3 000 1838	CUS	737	00:08		192A
94112 0 000 0508	WAN	737	00:14		744C
94111 8 000 3077	CUS	737	03:00	WAN	744C
94112 1 000 1998	CUS	744	00:12		
94112 0 000 0443	CUS	744	01:14	WAN	
94112 0 000 0410	CUS	744	01:52	WAN	
94111 9 000 1552	CUS	744	00:51	WAN	

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94110 8 000 1453	WAN	320A	03:59		
94111 9 000 0197	CUS	331A	09:21	WAN	
94111 9 000 1634	WAN	346A	04:51		
94112 3 000 2728	CUS	346A	00:49		
94112 2 000 0145	WAN	392A	09:06		
94112 3 000 2370	CUS	726A	00:29		
94112 4 000 1190	CUS	726A	00:30	WAN	
94112 3 000 2354	CUS	744A	00:12		
94112 3 000 2316	CUS	744A	00:14		
94112 1 000 2604	CUS	744A	02:08	WAN	
94112 0 000 0918	CUS	744A	00:48	WAN	
94111 8 000 0036	CUS	744B	00:57		
94112 0 000 0287	CUS	744B	00:18		
94112 0 000 0286	CUS	744B	00:50		
94112 2 000 0838	WAN	744B	02:54		
94112 3 000 0775	WAN	744B	01:19		
94112 3 000 1448	CUS	744C	01:03		
94112 1 000 1404	CUS	744C	00:32		
94111 7 000 2086	CUS	744C	00:28		
94112 1 000 1981	CUS	744C	00:22		
94112 2 000 3388	WAN	744C	00:32		
94112 1 000 0155	CUS	745A	09:06		
94112 3 000 0170	CUS	745B	02:20	WAN	
94112 2 000 1082	CUS	745B	00:44		
94111 8 000 1392	CUS	745C	03:02		
94112 1 000 0442	CUS	768A	04:23		
94112 0 000 0658	CUS	768A	00:23		
94111 7 000 3325	WAN	768A	02:26		
94112 1 000 0432	WAN	768A	07:56		
94111 9 000 1409	CUS	768A	02:16	WAN	
94112 5 000 0132	CUS	768A	00:25	WAN	
94112 3 000 0037	CUS	768A	03:53	WAN	
94112 0 000 0345	WAN	768A	02:49		
94111 9 000 0188	CUS	768A	04:16	WAN	
94112 0 000 0199	CUS	768A	01:24	WAN	
94112 6 000 0364	CUS	768A	00:38	WAN	
94112 3 000 0035	CUS	774A	01:16	WAN	
94112 3 000 2780	CUS	790A	00:24	WAN	
94112 1 000 0267	WAN	790A	00:00		
94112 1 000 0631	CUS	790A	00:06		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94111 7 000 1877	CUS	000	03:05		774A
94120 2 000 2518	CUS	000	03:22		350A
94113 0 000 4455	CUS	000	01:13	WAN	116A
94112 8 000 0387	WAN	000	01:08		731A
94120 3 000 0101	WAN	000	00:00		102A
94120 2 000 1687	CUS	000	00:14		102A
94120 1 000 0310	WAN	000	00:00		144B
94112 3 000 2685	WAN	000	02:43		745B
94120 2 000 1336	CUS	100	00:55		702A
94120 1 000 1520	CUS	100	01:22		171C
94112 9 000 2638	WAN	102	01:08		
94120 1 000 3218	CUS	102	00:00		
94113 0 000 5222	CUS	102	00:32		
94112 8 000 0816	CUS	103	02:22		
94120 2 000 0973	CUS	103	00:55	WAN	
94120 2 000 0970	CUS	103	00:04	WAN	
94113 0 000 0936	CUS	103	00:49		
94120 1 000 2958	CUS	103	00:15		
94112 9 000 2538	CUS	103	00:14		
94120 1 000 2969	CUS	103	00:31		
94120 2 000 1055	CUS	103	00:12		
94120 2 000 1057	CUS	103	00:30		
94113 0 000 4607	CUS	104	01:45		
94120 1 000 3205	CUS	104	00:36		
94120 1 000 2995	CUS	104	00:32		
94120 1 000 1995	CUS	104	00:10	WAN	
94120 1 000 1084	WAN	104	00:36		
94120 1 000 1073	WAN	104	00:42		
94120 1 000 0244	WAN	104	00:30		
94120 1 000 1064	WAN	104	00:51		
94120 1 000 0173	WAN	104	01:26		
94112 9 000 2700	CUS	104	00:11	WAN	
94112 8 000 1163	CUS	104	00:10	WAN	
94112 7 000 0080	WAN	108	00:21		102A
94113 0 000 4513	CUS	108	01:18	WAN	177A
94112 7 000 0307	WAN	108	01:29		790A
94112 9 000 2687	CUS	108	00:08	WAN	104A
94112 8 000 2937	CUS	108	01:12	WAN	102A
94111 8 000 0735	CUS	108	11:34		726A
94111 6 000 1064	WAN	108	00:48		768A
94111 0 000 4060	WAN	108	11:29		171A
94120 1 000 0709	WAN	115	03:45		150A
94120 1 000 0791	CUS	115	03:55		315A
94113 0 000 4219	CUS	116	02:11		
94120 2 000 0874	WAN	118	06:15		146B
94112 9 000 0914	CUS	118	00:11		102A
94120 2 000 0229	CUS	118	00:13		102A
94120 3 000 1066	WAN	133	02:58		
94120 1 000 1419	CUS	133	02:02	WAN	
94120 1 000 1440	CUS	133	02:02	WAN	
94120 1 000 1449	CUS	133	02:03	WAN	
94113 0 000 3438	CUS	134	03:13		133A
94112 9 000 0694	CUS	135	00:18		133A
94120 2 000 1831	CUS	145	04:48	WAN	
94120 1 000 0958	CUS	146	02:13	WAN	
94113 0 000 3988	CUS	146	02:45	WAN	
94113 0 000 4604	CUS	146	01:04		
94113 0 000 3323	CUS	150	06:06		
94113 0 000 3803	CUS	150	08:46		
94113 0 000 3734	CUS	150	08:54		
94113 0 000 3260	CUS	150	03:44		
94110 7 000 0751	CUS	156	11:44		
94112 7 000 0027	WAN	168	05:32		
94112 9 000 2477	CUS	171	00:13	WAN	

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94113 0 000 4426	CUS	116M	01:52		
94113 0 000 2293	CUS	116M	00:30	WAN	
94113 0 000 3053	CUS	116M	01:16	WAN	
94113 0 000 4523	CUS	116M	01:03		
94113 0 000 2204	WAN	116M	02:40		
94113 0 000 4234	CUS	116M	00:35	WAN	
94113 0 000 4614	CUS	116M	00:48		
94113 0 000 4341	WAN	116M	02:17		
94113 0 000 2950	CUS	116M	02:09	WAN	
94113 0 000 1726	CUS	116M	00:15		
94113 0 000 4462	CUS	116M	01:35		
94113 0 000 4187	CUS	116M	01:49		
94113 0 000 4172	CUS	116M	01:54		
94113 0 000 2278	CUS	116M	03:26		
94113 0 000 2568	CUS	116M	01:07		
94113 0 000 2268	CUS	116M	00:59		
94113 0 000 2281	CUS	116M	03:26		
94113 0 000 2013	CUS	116M	03:41		
94113 0 000 2996	CUS	116M	00:24	WAN	
94113 0 000 2883	CUS	116M	00:26	WAN	
94113 0 000 2856	CUS	116M	01:54	WAN	
94113 0 000 4937	CUS	116M	02:06	WAN	
94113 0 000 2408	CSC	116M	00:42	CUS	
94113 0 000 4687	CUS	116M	00:46		
94113 0 000 2818	CUS	116M	02:28		
94113 0 000 4774	CUS	116M	00:44		
94113 0 000 4001	CUS	116M	02:12		
94113 0 000 1939	CUS	116M	02:25		
94112 9 000 1100	CUS	117A	00:16		
94120 1 000 0738	CUS	123A	00:24	WAN	
94113 0 000 1745	CUS	133A	04:23		
94120 2 000 2549	WAN	133A	10:31		
94120 1 000 1896	CUS	133A	02:35		
94112 3 000 2091	WAN	133A	01:29		
94112 8 000 2945	CUS	134A	06:02		
94113 0 000 4125	CUS	144H	00:14	WAN	
94112 7 000 0092	WAN	144H	00:00		
94120 2 000 0660	CUS	145C	04:37	WAN	
94120 1 000 0880	WAN	146A	09:05		
94113 0 000 4069	WAN	146A	02:33		
94112 7 000 0218	WAN	146A	00:08		
94112 9 000 0738	CUS	146M	00:19		
94113 0 000 3489	CUS	150A	07:51		
94113 0 000 3797	CUS	150A	05:22	WAN	
94113 0 000 3785	CUS	150A	05:43	WAN	
94113 0 000 3740	CUS	150A	08:56	WAN	
94113 0 000 3755	CUS	150A	08:54	WAN	
94113 0 000 3516	CUS	150A	05:54		
94112 7 000 0799	WAN	159A	01:58		
94112 9 000 1236	CUS	171A	01:54		
94112 9 000 0565	CUS	171A	00:46	WAN	
94120 1 000 1516	CUS	171C	01:03		
94120 1 000 3125	CUS	171D	00:34		
94120 1 000 3046	CUS	174A	02:03	WAN	
94111 1 000 2189	WAN	174A	03:51		
94112 6 000 0753	WAN	177A	01:47		
94120 3 000 1051	CUS	177A	00:21		
94113 0 000 4553	WAN	177A	00:07		
94113 0 000 4352	CUS	177A	00:59		
94120 2 000 1974	CUS	177A	01:23	WAN	
94113 0 000 0938	WAN	177A	00:29		
94112 9 000 3000	CUS	177A	00:10		
94113 0 000 4534	WAN	177A	00:14		
94120 1 000 0891	WAN	177A	03:20		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94113 0 000 1341	CUS	171	01:31		
94113 0 000 5463	CUS	177	00:18		
94120 2 000 2730	CUS	177	00:14		
94112 9 000 1282	CUS	182	00:32		104A
94112 5 000 0130	CUS	190	00:05		
94113 0 000 3430	WAN	190	05:23		
94113 0 000 5334	WAN	190	00:09		
94112 9 000 0543	CUS	190	00:33		
94120 1 000 2705	WAN	190	00:36		
94120 1 000 3208	WAN	190	01:10		
94120 1 000 0152	WAN	190	00:18		
94120 1 000 1228	CUS	190	00:25		
94112 7 000 0669	CUS	190	01:14		
94112 9 000 1941	CUS	190	00:29		
94112 3 000 1631	CUS	192	04:51	WAN	
94112 8 000 0441	CUS	193	00:37		
94112 8 000 0867	CUS	193	01:02	WAN	
94112 4 000 0734	CUS	193	01:16		
94112 8 000 2948	CUS	193	00:11		
94120 1 000 2639	CUS	193	01:16	WAN	
94112 2 000 3506	CUS	193	01:57		
94112 9 000 0268	WAN	193	00:03		
94112 9 000 1053	CUS	193	00:17		
94112 9 000 0053	CUS	193	01:11	WAN	
94113 8 000 4691	CUS	193	00:45	WAN	
94112 0 000 2482	CUS	193	00:10		
94113 9 000 3470	CUS	193	01:05	WAN	
94112 9 000 1083	CUS	193	00:06		
94112 9 000 1497	CUS	215	03:59		715A+J19
94112 9 000 2123	CUS	302	00:01		
94112 8 000 0276	CUS	303	01:29	WAN	315A
94112 8 000 0272	CUS	303	01:35		315A
94112 6 000 1073	CUS	310	01:26	WAN	
94120 1 000 3225	CUS	315	00:30		
94112 8 000 2194	CUS	315	03:15		
94112 9 000 0715	CUS	316	01:04	WAN	
94112 9 000 0716	CUS	316	01:07	WAN	
94112 9 000 0720	CUS	316	01:36	WAN	
94112 9 000 0508	WAN	316	02:35		
94112 9 000 3154	WAN	316	01:02		
94112 9 000 0741	WAN	316	00:43		
94120 1 000 2267	CUS	317	02:26		
94120 2 000 3595	WAN	318	03:50		
94112 9 000 2048	CUS	320	04:06		
94112 9 000 0735	WAN	326	00:11		
94110 1 000 1763	CUS	331	03:33		
94112 8 000 2672	CUS	331	04:23		
94113 0 000 1487	WAN	335	01:50		
94112 7 000 0617	CUS	346	01:08	WAN	
94113 0 000 3677	WAN	346	03:21		
94112 8 000 1764	CUS	390	04:55		
94112 9 000 0771	WAN	392	03:07		
94112 5 000 0890	WAN	393	02:38		
94120 2 000 3429	WAN	700	00:19		726A
94120 2 000 1072	CUS	700	00:38		702A
94112 9 000 1211	CUS	700	02:51		731A
94120 2 000 2515	CUS	702	00:21		
94112 8 000 2497	CUS	702	00:24		
94112 8 000 2734	CUS	702	02:08	WAN	
94112 8 000 2506	CUS	702	00:34		
94120 3 000 0174	WAN	710	04:54		
94112 3 000 1861	CUS	718	02:54		768A
94113 0 000 0159	CUS	726	00:10		
94112 9 000 3229	CUS	726	01:37	WAN	

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94113 0 000 2674	CUS	177A	01:18	WAN	
94113 0 000 3777	WAN	177B	09:35		
94112 7 000 0593	CUS	190A	00:17	WAN	
94120 1 000 1776	CUS	190A	00:12		
94112 8 000 1810	CUS	190A	02:41		
94112 2 000 1039	CUS	190A	07:23		
94112 9 000 1502	CUS	190A	00:19		
94113 0 000 4058	CUS	190A	01:39	WAN	
94120 2 000 2513	CUS	190A	02:17		
94120 3 000 0976	CUS	190A	00:08	WAN	
94112 4 000 0095	WAN	190A	02:07		
94113 0 000 2976	CUS	190A	04:03	WAN	
94112 9 000 1390	CUS	190A	01:23	WAN	
94120 3 000 0600	WAN	192A	00:42		
94112 6 000 1163	CUS	192A	02:19	WAN	
94113 0 000 3611	WAN	192A	01:02		
94120 2 000 1222	CUS	193A	00:45		
94113 0 000 0222	CUS	193A	00:05	WAN	
94112 5 000 0489	CUS	193A	05:10	WAN	
94120 1 000 3166	CUS	193A	00:23		
94120 2 000 3572	WAN	193A	00:50		
94112 7 000 0310	CUS	193A	00:54	WAN	
94113 0 000 1321	WAN	193A	00:38		
94112 8 000 2932	WAN	193A	01:10		
94112 9 000 2743	WAN	193A	01:39		
94120 2 000 0247	WAN	193A	02:09		
94113 0 000 4075	CUS	193A	02:26	WAN	
94112 8 000 1887	CUS	193A	00:22		
94112 8 000 2520	WAN	277A	00:39		
94112 8 000 0270	CUS	315A	01:36	WAN	
94120 1 000 2008	ACT	316M	02:12	WAN	
94120 1 000 2004	ACT	316M	02:13	WAN	
94112 9 000 2478	CUS	316M	00:36	WAN	
94112 9 000 2469	CUS	316M	00:38	WAN	
94112 9 000 2456	CUS	316M	00:41	WAN	
94120 1 000 0933	CUS	319A	01:24	WAN	
94112 3 000 2440	CUS	319A	06:15		
94112 9 000 0167	CUS	319A	03:39		
94112 3 000 1535	CUS	320A	21:51		
94113 0 000 1064	WAN	331A	02:39		
94112 6 000 0166	CUS	331A	02:22	WAN	
94120 3 000 0961	WAN	346A	02:01		
94112 7 000 0922	WAN	346A	05:26		
94120 1 000 3298	WAN	350A	01:31		
94112 5 000 0605	WAN	350A	02:59		
94112 8 000 1684	CUS	702A	00:00		
94112 4 000 0142	WAN	726A	00:48		
94112 9 000 3017	CUS	726A	01:52		
94112 9 000 2795	CUS	726A	00:11		
94112 0 000 0822	WAN	726A	02:18		
94120 1 000 1878	CUS	726A	01:09		
94113 0 000 0548	WAN	726A	00:17		
94113 0 000 0767	CUS	726A	04:07	WAN	
94112 9 000 3197	CUS	726A	02:38	WAN	
94120 1 000 2908	WAN	726S	03:37		
94120 2 000 1191	CUS	744A	00:08	WAN	
94113 0 000 4670	CUS	744A	05:17	WAN	
94120 1 000 0294	WAN	744B	02:27		
94112 8 000 0515	CUS	744B	00:15	WAN	
94112 9 000 0568	WAN	744B	00:43		
94112 8 000 0579	CUS	744B	02:41		
94120 1 000 0083	WAN	744B	03:58		
94112 8 000 0164	CUS	744B	02:07	WAN	
94120 1 000 0749	CUS	744B	00:40		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94112 9 000 2403	CUS	731	03:47		
94113 0 000 5424	WAN	737	05:40		
94112 7 000 1027	CUS	737	04:09	WAN	
94113 0 000 0535	CUS	737	02:52	WAN	
94112 6 000 0842	WAN	744	01:02		
94120 1 000 2098	CUS	744	00:51	WAN	
94120 1 000 0042	CUS	744	00:33	WAN	
94112 8 000 0595	CUS	744	02:50		
94112 5 000 0826	CUS	744	00:28		
94112 9 000 1467	CUS	744	01:57	WAN	
94112 9 000 1477	CUS	744	02:28	WAN	
94112 8 000 2444	CUS	744	04:46		
94112 9 000 2433	CUS	744	02:12		
94112 9 000 2596	CUS	745	00:32		
94113 0 000 5089	CUS	745	03:59		
94112 7 000 0638	WAN	745	01:00		
94112 9 000 0990	CUS	745	01:20		
94112 7 000 0817	WAN	747	01:03		
94120 1 000 0229	WAN	750	02:11		
94112 5 000 0873	CUS	750	05:08	WAN	
94112 7 000 1036	WAN	750	00:08		
94120 2 000 3527	CUS	750	01:38		
94112 9 000 1829	CUS	750	00:39		768A
94112 8 000 0990	CUS	750	00:44		744B
94112 7 000 0789	CUS	768	05:13	WAN	
94112 8 000 0278	WAN	768	01:09		
94113 0 000 0213	WAN	768	00:45		
94112 7 000 0971	WAN	768	00:55		
94112 7 000 0894	CUS	768	01:05	WAN	
94112 8 000 0588	CUS	768	02:17		
94112 6 000 0095	WAN	768	03:50		
94120 3 000 1620	CUS	768	00:09		
94113 0 000 0592	CUS	768	00:28	WAN	
94120 2 000 3108	CUS	768	00:28	WAN	
94120 1 000 1619	CUS	768	01:21	WAN	
94113 0 000 5410	CUS	768	04:16	WAN	
94120 2 000 0226	WAN	768	01:18		
94112 9 000 2142	CUS	768	00:48	WAN	
94112 7 000 0800	WAN	768	00:40		
94112 7 000 0166	CUS	768	00:42	WAN	
94112 5 000 1534	WAN	768	00:43		
94113 0 000 5157	WAN	768	02:32		
94112 8 000 0583	CUS	774	03:18		
94112 9 000 2557	CUS	790	00:02	WAN	
94111 7 000 0182	WAN	790	01:11		
94120 2 000 0013	WAN	790	00:44		
94112 8 000 2944	CUS	803	03:36		
94120 3 000 1426	WAN	102A	00:00		
94112 4 000 0720	WAN	102A	04:32		
94113 0 000 0584	WAN	104A	01:53		
94112 9 000 1542	WAN	104A	00:00		
94112 4 000 0638	WAN	104A	01:44		
94113 0 000 5197	CUS	104A	00:54	WAN	
94112 8 000 1250	CUS	104A	00:25		
94112 9 000 2093	CUS	104A	00:46	WAN	
94113 0 000 3835	CUS	114J	07:06	WAN	144J
94113 0 000 2965	CUS	116A	00:13	WAN	
94113 0 000 3900	CUS	116A	00:00	WAN	
94113 0 000 3951	CUS	116A	00:00	WAN	
94112 9 000 2811	WAN	116A	02:55		
94113 0 000 2733	CUS	116A	00:14		
94113 0 000 2806	CUS	116A	00:19	WAN	
94113 0 000 3390	CUS	116M	02:34		
94113 0 000 4047	CUS	116M	02:09	WAN	

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94111 8 000 3183	WAN	744C	02:53		
94120 1 000 1054	CUS	744C	00:53		
94120 1 000 1087	CUS	744C	00:30		
94112 8 000 1017	CUS	744C	00:18		
94112 8 000 0982	CUS	744C	00:33		
94113 0 000 0708	WAN	744C	00:41		
94112 6 000 1091	WAN	744D	02:03		
94112 2 000 0097	CUS	744D	02:18	WAN	
94112 8 000 0414	CUS	744D	00:14		
94112 8 000 0416	CUS	744D	00:34		
94112 8 000 0412	CUS	744D	00:14		
94112 8 000 0408	CUS	744D	00:19		
94112 8 000 0410	CUS	744D	00:35		
94120 1 000 1548	CUS	744D	02:49		
94120 2 000 0980	CUS	744D	02:01	WAN	
94112 2 000 1778	CUS	745B	08:24		
94120 2 000 0780	CUS	745B	02:12	WAN	
94120 3 000 0596	WAN	745B	00:42		
94120 3 000 0583	WAN	745B	01:02		
94120 2 000 0259	CUS	745B	01:27	WAN	
94113 0 000 5451	WAN	768A	01:40		
94120 2 000 0647	WAN	768A	00:45		
94111 8 000 2517	CUS	768A	00:27	WAN	
94112 5 000 1388	WAN	768A	01:25		
94113 0 000 1197	CUS	768A	01:41		
94120 2 000 0207	WAN	768A	01:29		
94112 6 000 0481	WAN	768A	01:07		
94112 8 000 0330	WAN	768A	00:25		
94112 9 000 1355	CUS	768A	01:21		
94112 9 000 0530	WAN	768A	01:45		
94112 8 000 1733	CUS	768A	00:33		
94112 8 000 0381	WAN	768A	00:45		
94112 6 000 0724	WAN	768A	00:57		
94112 4 000 1416	CUS	768A	01:05	WAN	
94120 1 000 2974	CUS	768A	03:06		
94112 9 000 0830	WAN	768A	01:52		
94112 6 000 0985	WAN	768A	00:23		
94112 7 000 0834	WAN	768A	01:11		
94112 7 000 0935	WAN	768Z	02:16		
94112 9 000 1638	CUS	774A	00:13		
94120 2 000 0990	CUS	744C	01:03	WAN	
94112 8 000 0983	CUS	744C	05:58		
94112 8 000 1872	CUS	790A	01:32		
94112 8 000 0288	CUS	790A	01:03	WAN	
94112 4 000 1155	CUS	790A	01:07	WAN	
94113 0 000 4524	CUS	790A	04:24		
94113 0 000 1098	CUS	790A	00:36		177A
94112 9 000 0306	CUS	790A	01:16		
94113 0 000 1987	CUS	790A	08:34		
94120 1 000 3003	CUS	790A	00:57		
94120 1 000 2312	CUS	790A	02:48	WAN	

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code
94113 0 000 2299	CUS	116M	00:44		
94113 0 000 2769	CUS	116M	00:29		
94113 0 000 2724	CUS	116M	00:36		
94113 0 000 1780	CUS	116M	01:31		

Trouble Ticket No.	Reported Source	Clear Code	Outage Time	Corrected Reported Source	Corrected Clear Code

APPENDIX B

The Data Set

Part 2

25 Minute Proactive Statisics: Week 1

Date	Event	Time Down	Time Reported	Time Elapsed	Date	Event	Time Down	Time Reported	Time Elapsed
14-Feb-95	1	13:18	13:43	0:25	16-Feb-95	1	13:52	14:00	0:08
	2	14:20	14:26	0:06		2	13:46	14:20	0:34
	3	13:52	14:52	1:00		3	14:35	15:13	0:38
	4	14:13	15:02	0:49		4	15:30	16:00	0:30
	5	16:13	16:36	0:20		5	15:49	16:27	0:38
	6	17:10	18:03	0:53		6	16:00	16:48	0:48
	7	17:17	18:09	0:52		7	16:26	17:10	0:44
	8	17:26	18:15	0:49					
	9	17:27	18:26	1:00	17-Feb-95	1	14:20	16:01	1:44
	10	17:47	18:48	1:00		2	18:17	19:27	1:10
	11	19:56	20:19	0:23		3	19:58	20:24	0:26
						4	20:22	20:32	0:10
15-Feb-95	1	11:44	12:15	0:31					
	2	12:47	13:09	0:22	18-Feb-95	1	12:57	13:25	0:28
	3	13:25	13:50	0:25					
	4	13:36	14:00	0:24					
	5	13:52	14:39	0:47					
	6	16:56	17:17	0:21					
	7	17:00	17:28	0:28					
	8	17:25	17:54	0:29					

Number of Proactive Trouble Tickets Recorded:	31
Elapsed Times Less Than or Equal to 25 Mins:	10
Percent of the Trouble Tickets Opened within the 25 Minute Time Period:	32%
Average Elasped Time (Hr:Min):	0:37

25 Minute Proactive Statisics: Week 2

Date	Event	Time Down	Time Reported	Time Elapsed	Date	Event	Time Down	Time Reported	Time Elapsed
22-Feb-95	1	14:02	14:25	0:23	24-Feb-95	1	13:53	14:04	0:11
	2	15:27	15:55	0:28		2	13:27	14:24	0:57
	3	17:39	18:05	0:26		3	14:10	15:39	1:29
	4	17:49	18:20	0:31		4	15:30	15:45	0:15
	5	19:59	20:34	0:35		5	17:53	18:32	0:39
	6	20:05	20:59	0:54					
23-Feb-95	1	12:51	13:16	0:25					
	2	15:58	16:25	0:27					
	3	16:08	16:40	0:32					
	4	16:33	17:10	0:37					
	5	17:47	18:25	0:38					

Number of Proactive Trouble Tickets Recorded:	16
Elapsed Times Less Than or Equal to 25 Mins:	4
Percent of the Trouble Tickets Opened within the 25 Minute Time Period:	25%
Average Elasped Time (Hr:Min):	0:35

25 Minute Proactive Statisics: Week 3

Date	Event	Time Down	Time Reported	Time Elapsed	Date	Event	Time Down	Time Reported	Time Elapsed
26-Feb-95	1	13:27	15:20	1:53	3-Mar-95	1	12:25	12:56	0:29
	2	13:55	15:50	1:55		2	14:42	16:12	0:30
	3	15:08	16:09	1:01					
	4	16:13	17:22	1:09	4-Mar-95	1	12:47	13:23	0:36
	5	16:40	17:42	1:02		2	13:00	13:55	0:55
	6	17:15	18:00	0:45		3	13:22	14:40	1:18
	7	17:45	18:59	1:14		4	15:08	16:28	1:20
	8	19:02	19:32	0:30		5	15:25	16:38	1:13
	9	18:50	20:00	1:10		6	15:30	17:01	1:31
	10	19:58	20:06	0:08		7	15:31	17:25	1:54
	11	22:20	22:41	0:21		8	16:17	17:27	1:10
						9	16:11	18:30	2:19
28-Feb-95	1	14:36	15:00	0:24		10	17:56	18:45	0:49
	2	15:40	15:59	0:19		11	17:07	20:30	3:23
	3	16:10	16:40	0:30		12	18:04	20:37	2:33
	4	16:53	17:00	0:07		13	16:32	20:43	4:11
	5	16:12	17:05	0:53		14	19:14	20:50	1:36
	6	17:02	18:46	1:44		15	20:02	21:02	1:00
	7	17:56	19:18	1:22		16	20:44	21:15	0:59
1-Mar-95	1	13:13	13:21	0:08					
	2	14:27	14:47	0:20					
	3	14:11	15:45	1:34					
	4	14:56	15:49	0:53					
	5	15:09	16:09	1:00					

Number of Proactive Trouble Tickets Recorded:	41
Elapsed Times Less Than or Equal to 25 Mins:	7
Percent of the Trouble Tickets Opened within the 25 Minute Time Period:	17%
Average Elasped Time (Hr:Min):	1:10

25 Minute Proactive Statisics: Week 4

Date	Event	Time Down	Time Reported	Time Elapsed	Date	Event	Time Down	Time Reported	Time Elapsed
6-Mar-95	1	20:48	21:14	0:26	9-Mar-95	1	19:02	19:19	0:17
	2	20:52	21:40	0:48		2	19:12	19:36	0:24
7-Mar-95	1	12:22	12:43	0:21	10-Mar-95	1	11:27	12:20	0:53
	2	12:44	13:14	0:30		2	12:01	12:30	0:29
	3	12:57	13:34	0:37		3	12:10	13:46	0:56
	4	12:57	13:45	0:48		4	15:09	15:17	0:08
	5	13:55	14:20	0:25		5	15:15	15:27	0:12
	6	13:56	14:20	0:24		6	16:47	16:47	0:05
	7	14:45	14:51	0:06		7	16:37	16:37	0:43
	8	15:26	15:44	0:18		8	17:03	17:03	0:42
	9	16:38	17:14	0:36		9	21:42	22:08	0:26
	10	17:37	18:37	1:00		10	18:59	20:33	1:34
	11	20:35	20:45	0:10					
					11-Mar-95	1	12:05	14:00	1:55
8-Mar-95	1	12:39	12:58	0:19		2	12:05	14:00	1:55
	2	13:54	14:30	0:36		3	15:19	16:03	0:44
	3	13:52	15:20	0:28		4	15:44	16:28	0:44
	4	15:36	15:50	0:14		5	16:51	17:20	0:29
	5	16:21	16:41	0:20		6	18:10	18:30	0:20
	6	18:12	18:17	0:05		7	18:10	18:30	0:20
	7	18:38	19:05	0:27					
	8	21:37	22:14	0:37					

Number of Proactive Trouble Tickets Recorded:	40
Elapsed Times Less Than or Equal to 25 Mins:	17
Percent of the Trouble Tickets Opened within the 25 Minute Time Period:	43%
Average Elasped Time (Hr:Min):	0:34

25 Minute Proactive Statisics: Week 5

Date	Event	Time Down	Time Reported	Time Elapsed
13-Mar-95	1	13:04	13:35	0:31
	2	13:43	14:10	0:27
	3	14:17	14:37	0:20
	4	14:38	15:15	0:37
	5	15:26	15:50	0:24
	6	15:49	16:20	0:31
	7	18:21	19:00	0:39
	8	18:56	19:20	0:24
	9	19:30	20:00	0:30
	10	19:43	20:08	0:25
14-Mar-95	1	12:32	12:45	0:13
	2	13:06	14:20	1:14
	3	14:21	15:00	0:39
	4	14:29	15:25	0:56
	5	15:51	16:03	0:12
	6	15:53	16:07	0:14
	7	15:38	16:34	0:56
	8	18:21	19:10	0:49
	9	19:17	19:37	0:20
15-Mar-95	1	11:50	12:20	0:30
	2	12:12	12:35	0:23
	3	12:47	13:01	0:14
	4	12:12	13:10	0:58
	5	14:54	15:08	0:14
	6	15:35	16:28	0:53
	7	16:12	16:35	0:23
	8	15:48	16:47	0:59
	9	15:48	16:55	1:07
	10	16:34	17:11	0:37
	11	17:07	17:29	0:22
	12	19:54	20:07	0:13
16-Mar-95	1	14:01	15:18	1:17
	2	15:25	15:45	0:20
	3	15:38	16:30	0:52
	4	15:45	16:45	1:00
	5	16:12	16:54	0:42
	6	17:33	18:00	0:27
	7	17:58	18:20	0:22
	8	18:34	18:43	1:09
	9	19:30	19:46	0:26
18-Mar-95	1	13:04	14:16	1:12
	2	13:10	14:30	1:20
	3	16:25	17:39	1:14
	4	17:04	17:50	0:46
	5	18:20	18:44	0:24
	6	17:06	18:50	0:44
	7	17:46	19:15	1:29

Number of Proactive Trouble Tickets Recorded:	47
Elapsed Times Less Than or Equal to 25 Mins:	16
Percent of the Trouble Tickets Opened within the 25 Minute Time Period:	34%
Average Elasped Time (Hr:Min):	0:39

25 Minute Proactive Statisics: Week 6

Date	Event	Time Down	Time Reported	Time Elapsed
19-Mar-95	1	22:44	23:20	0:36
	2	0:29	0:52	0:23
	3	0:35	1:10	0:35
	4	0:39	1:26	0:47
	5	2:18	2:36	0:18
	6	3:10	3:26	0:16
20-Mar-95	1	13:37	13:55	0:18
	2	15:19	15:40	0:21
	3	15:23	15:45	0:22
	4	15:26	15:55	0:29
	5	15:38	16:40	1:02
	6	16:14	17:00	0:46
	7	16:27	17:15	0:48
	8	19:19	19:36	0:17
	9	19:32	19:51	0:19
	10	21:39	21:52	0:13
	11	19:49	20:30	0:40
21-Mar-95	1	13:06	13:25	0:19
	2	14:30	14:52	0:22
	53	15:16	15:50	0:34
	4	17:00	17:15	0:15
	5	17:26	17:33	0:07
	6	17:26	18:19	0:53
	7	17:27	18:37	1:10
	8	17:35	18:45	1:10
	9	17:37	19:00	1:23
	10	18:39	19:00	0:21
	11	17:44	19:22	2:22
	12	20:17	20:31	0:14
22-Mar-95	1	12:00	12:25	0:25
	2	14:19	14:45	0:26
	3	15:49	16:10	0:21
	4	16:15	16:27	0:22
	5	16:22	17:02	0:40
	6	18:08	18:34	0:26
	7	19:36	20:10	0:34
23-Mar-95	1	12:30	12:45	0:15
	2	12:34	13:05	0:31
	3	13:59	14:17	0:18
	4	14:11	14:38	0:27
	5	15:17	15:29	0:22
	6	16:50	17:10	0:20
	7	17:35	17:43	0:08
	8	17:15	18:21	1:06
	9	18:18	18:34	0:16
	10	18:57	19:30	0:33
	11	19:11	19:50	0:09

Number of Proactive Trouble Tickets Recorded:	57
Elapsed Times Less Than or Equal to 25 Mins:	25
Percent of the Trouble Tickets Opened within the 25 Minute Time Period:	44%
Average Elasped Time (Hr:Min):	0:26

APPENDIX C

Frame Relay Tutorial

Frame Relay Short Tutorial

Frame Relay is a level two protocol designed with the intent to interconnect LANs over long distances via a public WAN. It explicitly defines the protocol by which the user's router communicates with the service provider's Frame Relay gateway/switch. Because, frame relay is a protocol that does not distinguish between what type of data the user is trying to transport, it is happy routing IPX, TCP/IP, AppleTalk or EtherNet to mention just a few. Frame Relay is capable of excepting LAN data frames ranging from 5 to 4096 octets. These limits were set to satisfy the largest possible LAN packet (i.e., 4096 octets for Token Ring) as well as the smallest frame relay management packet. Once access to the frame relay cloud has been established through a Permanent Virtual Circuit ("PVC"), workstations on a LAN in New York can view workstations and servers on a LAN in Phoenix as if they were at the same physical location. The only difference being the added delay incurred by the distance traveled and the number of Frame Relay switches traversed. Since frame relay is a publicly shared network, the costs to operate and manage the network is shared by all. This results in cheaper access fees compared to a private line network.

The following discussion is provided to give the reader a better understanding of now frame relay works , where it lies in the scheme of LANs and WANs and how data is passed from a workstation on one LAN to a workstation on another LAN [SMIT93]. Referring the reader to Figure 1.1:

1. The user's data is passed down the OSI stack where at layer 3 it is given a destination address (i.e., LAN3.WS2). Next at OSI layer 2, the user's data is encapsulated in a ethernet header and trailer for transport across LAN1 to Router-2 (i.e., R2).

2. At R2, the LAN1 ethernet header and trailer is removed exposing the OSI layer 3 destination address. Router-1 compares the layer 3 destination address with addresses in it's routing table to determine where to route the packet. Having determined that the destination address is LAN3.WS2 and the means to get there is via PVC-20, the router encapsulates the data in a frame relay header and trailer and sends it down the frame relay access link to the gateway (i.e., GW1) and into the cloud.

Router 1's Routing Table

Workstation Addresses	Route to Destination
LAN3.WS1 to 15	Frame Relay via PVC-20 to PVC-15
LAN4.WS1 to 15	Frame Relay via PVC-21 to PVC-16
LAN2.WS1 to 15	Local - LAN2 Port
LAN1.WS1 to 15	Local - Ignore

Router 3's Routing Table

Workstation Addresses	Route to Destination
LAN3.WS1 to 15	Local - Ignore
LAN4.WS1 to 15	Frame Relay via PVC-16 to PVC-21
LAN2.WS1 to 15	Frame Relay via PVC-15 to PVC-20
LAN1.WS1 to 15	Frame Relay via PVC-15 to PVC-20

Router 4's Routing Table

Workstation Addresses	Route to Destination
LAN3.WS1 to 15	Frame Relay via PVC-16 to PVC-21
LAN4.WS1 to 15	Local - Ignore
LAN2.WS1 to 15	Frame Relay via PVC-15 to PVC-20
LAN1.WS1 to 15	Frame Relay via PVC-15 to PVC-20

3. At GW1, the PVC route address is gotten from the header of the received frame relay packets and compared against its routing table and routed accordingly. The details of how the service provider routes a frame relay packet within its cloud is unique to the provider and is of no concern to the user except that the packet be delivered non-corrupted and as quickly as possible. No where in the Frame Relay specification is it defined how the service provider will route the packet within its cloud. Frame Relay only defines the User-to-Provider interface and stipulates that the service provider will provided a best effort delivery system having a very low error rate. Before forwarding the packet into the cloud, GW1 will encapsulate the frame relay packet (for routing within the cloud only) and add the destination PVC address (i.e., PVC-15.GW2) to match the PVC built between itself and Gateway-2 (i.e., PVC-20.GW1 to PVC-15.GW2).

Gateway 1's Routing Table[1]

[1]For simplicity, only one customer's access to the service provider is shown. It is highly possible that more than one user will access the same gateway (the provider studied can allow 40+ users to access one gateway). Because frame relay allows each user to choose their own PVC number it is possible that two

Local PVC's	Route to Destination
Physical Line 1	
PVC-20	PVC-20.GW1 to PVC-15.GW2
PVC-21	PVC-21.GW1 to PVC-16.GW2
Physical Line 2	
PVC-xy ...	PVC-xy.GW1 to ....

4. Having travel through the frame relay cloud on virtual path PVC-20.GW1 to PVC-15.GW2, the user's data is received by Gateway-2 (i.e., GW2) and routed via it's routing table down the frame relay access link to Router-3 ("R3"). However, before forwarding the packet to R3, GW2 removes the source PVC address of 20 and places in its place the destination PVC address of 15 to match the PVC built between itself and R3. If this not done R3 would receive a frame relay packet with PVC = 20 and ignore it.

5. Upon receiving a Frame Relay packet from it's link with GW2, R3 checks the PVC address to ensure that it matches PVC addresses in its routing table. If the address is 15 or 16 the packet is accepted. If the PVC address is anything other than 15 the packet is dropped. Having accepted the packet, the router removes the frame relay header and trailer to read the layer 3 address. After determining that the packet is destined for WS2.LAN3, R3 encapsulates the data in a token ring header and sends it out it's LAN port.

6. Workstation LAN3.WS1, having received the data off its connection to LAN3, passes it up through the OSI stack to the application layer where it is acted upon.

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different users will have the same PVC number. The only means to distinguish one customer's PVC number from another is by noting which physical line from the customer the data traveled in on. Thus the physical connect from the user to the service provider plus the PVC number uniquely defines the user's data.

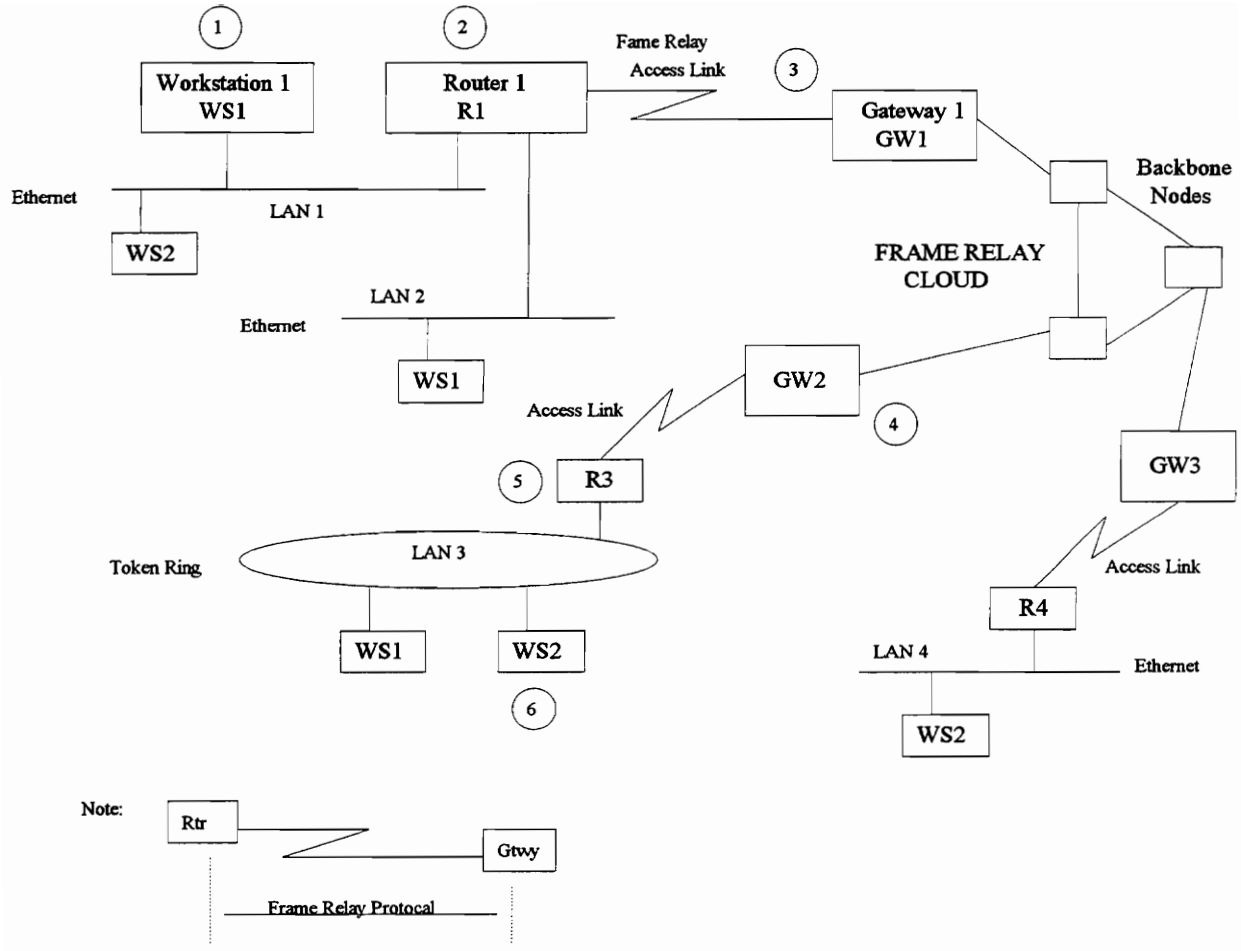

Figure C.1 Routing of Data Through the Frame Relay Network

Figure 1.2 attempts to illustrate how the OSI's many layers play-out in a Frame Relay connection between the user's LAN at one point, to the WAN in the middle and on to the user's LAN at the other end. Layer 2, the Data Link layer, is invoked every time a packet traverses a different network. Layer 3, the Network Layer, is invoked if the packet needs to be "router " to or between network(s) (e.g., LAN A to LAN B). Layers 4 to 7 of the OSI stack are left for end-to-end resolution of the data and resides in the users workstation or the application they are running.

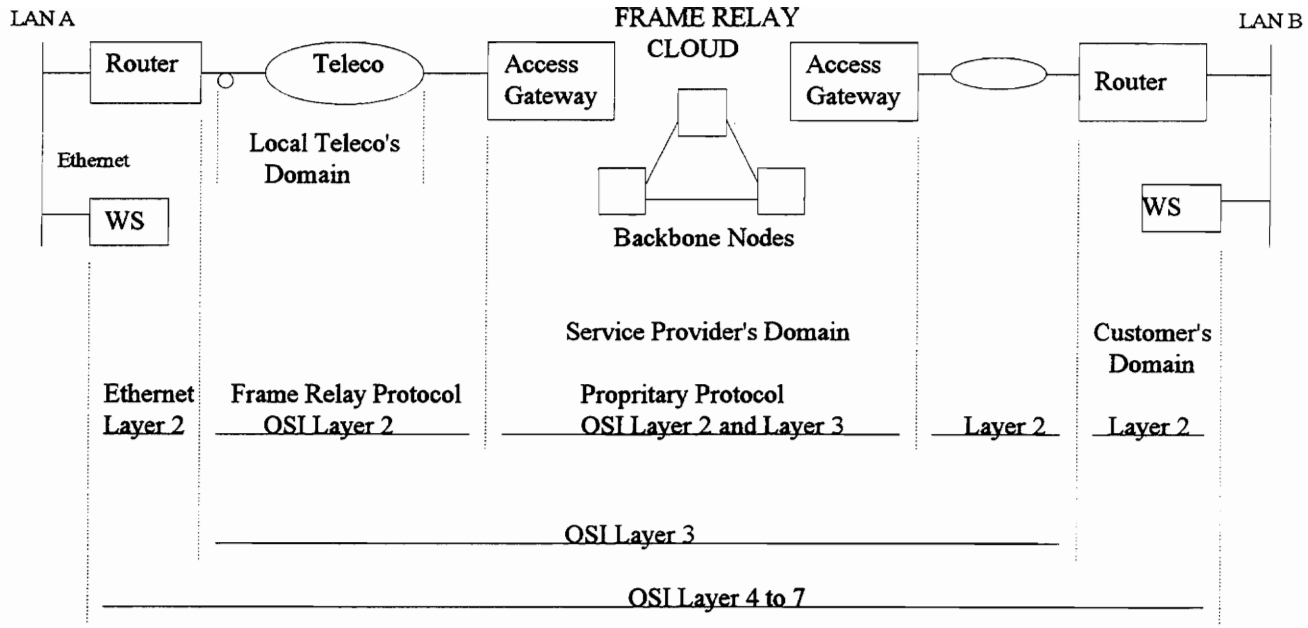

Figure C.2 Frame Relay and the OSI Layers

Figure 1.3 provides in simplistic diagram of the equipment involved and each group's area of responsibility. Although the service provider is responsible for resolving the outage, the assistance of the Local Teleco is required if the outage is perceived to be in it's area of responsibility. If the digital modem and/or router is owned by the customer, they are responsible for ensuring that the equipment has power and functions properly (i.e., digital modem is transmitting and optioned for remote testing, router is transmitting the frame relay "keep alive" packet).

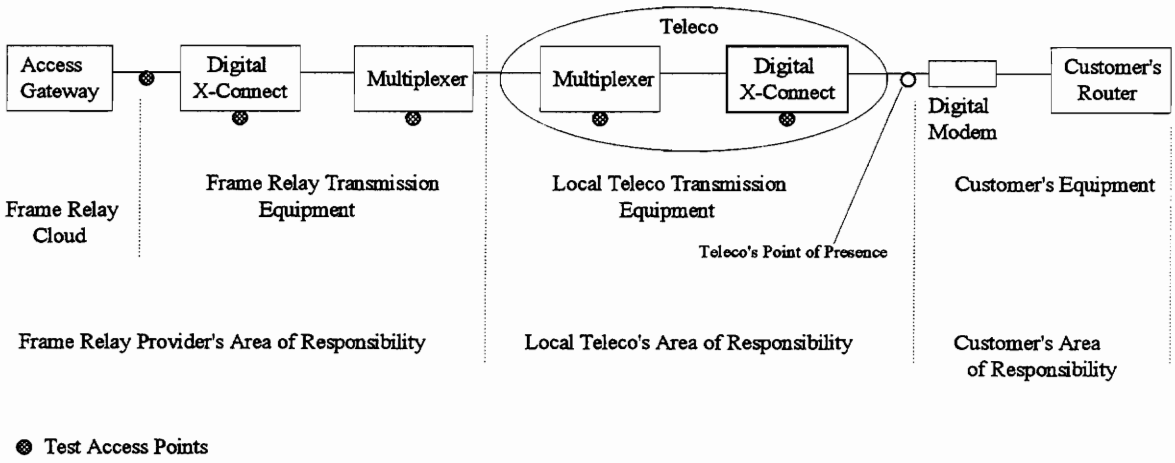

Figure C.3 Equipment Layout Between the Frame Relay Provider and the Customer