

C. Test Results: Electronic Communications Trouble Administration (ECTA) Normal Volume Performance Test (M&R-3)

1.0 Description

The ECTA Normal Volume Performance test evaluated the current release of BellSouth's ECTA Gateway for Maintenance and Repair trouble report processing under projected year-end 2001 (YE01) normal load conditions. The objectives of the test were to determine the effect of YE01 load conditions on the viability of functionality in the current version of the ECTA Gateway and this gateway's response times. This test was conducted by submitting the projected volume of ECTA transactions against resale and UNE test bed accounts and analyzing ECTA Gateway responses to these transactions¹.

2.0 Methodology

This section summarizes the test methodology.

2.1 Business Process Description

See Section VII, "Maintenance & Repair Overview" for a description of BellSouth's ECTA Gateway² and CLEC interface options.

2.2 Scenarios

The breakdown of the ECTA transactions submitted for this test is shown below in Table VII-3.5. These transactions were submitted against a test bed comprised of 20 UNE lines and nine resale lines.

2.3 Test Targets & Measures

The test target was the maintenance and repair process for resale and UNEs via the ECTA Gateway under normal load conditions. Sub-processes, functions, and evaluation criteria are summarized in the following table. The last column "Test Cross-Reference" indicates where the particular measures are addressed in section 3.1 "Results & Analysis."

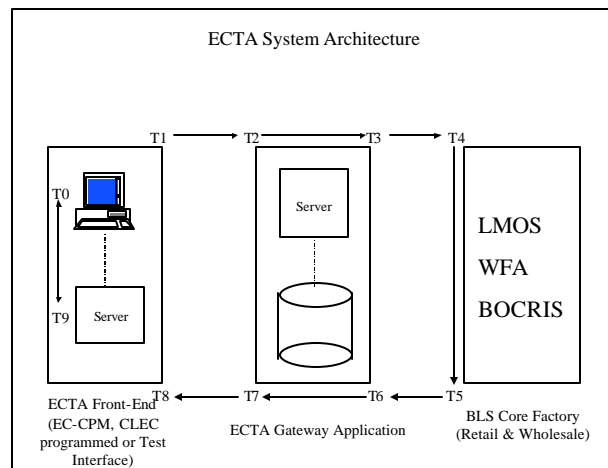
¹ See Section VII, "M & R Overview" for details on the Maintenance and Repair test bed.

² A new release of BellSouth's ECTA was implemented in May 2000 that enhanced the middleware that captures data from WFA for complex trouble tickets. Based on KCI's understanding of the changes implemented, obtained through documentation review, it is KCI's opinion that these changes to the interface would not affect the results of this evaluation.

Table VII-3.1: Test Target Cross-Reference

Sub-Process	Function	Evaluation Criteria	Test Cross-Reference
Trouble Reports	Create trouble report	Correctness of Response Timeliness of Response	M&R-3-1-1 M&R-3-2-1
	Request trouble ticket status	Correctness of Response Timeliness of Response	M&R-3-1-2 M&R-3-2-2
	Add trouble information	Correctness of Response Timeliness of Response	M&R-3-1-3 M&R-3-2-3
	Modify trouble report	Correctness of Response Timeliness of Response	M&R-3-1-4 M&R-3-2-4
	Cancel trouble report	Correctness of Response Timeliness of Response	M&R-3-1-5 M&R-3-2-5

Figure VII-3.1 below shows KCI's representation of the discrete time intervals associated with processing a transaction through the ECTA Gateway.

Figure VII-3.1: Time Intervals Associated with Transaction Processing

Time T1T8 is a function of the combined responsiveness of all Maintenance and Repair (M&R) systems (CLEC interface to the ECTA Gateway, ECTA Gateway, and BellSouth Core Factory) and the connectivity between them. The purpose of M&R-3 is to test only the ECTA Gateway; therefore, performance time for this test has been defined as time T2T7, the interval from receipt of an instruction by the ECTA Gateway to the issuance of a response from ECTA, and not T1T8. Time T9T0 was not included as a part of this evaluation because this time depends on the connectivity option and the interface selected by BellSouth's CLEC customers. CLECs can use various methods to connect to the BellSouth gateway.

In addition, the choice of interface – EC-CPM or CLEC-developed – will also affect transaction timing³.

2.4 Data Sources

The data collected for the test are summarized in the table below.

Table VII-3.2: Data Sources for ECTA Normal Volume Performance Test

Document	File Name	Location in Work Papers	Source
<i>Joint Implementation Agreement for Electronic Communications Trouble Administration (ECTA) Gateway for Local Service</i> Version 10/07/98	CLEC_JIA.doc	M&R-2-A- 1	BLS
<i>American National Standard for Telecommunications – Operations, Administration, Maintenance and Provisioning (OAM&P) – Extension to Generic Network Information Model for Interfaces between Operations Systems across Jurisdictional Boundaries to Support Fault Management (Trouble Administration)</i> (ANSI T1.227-1995)	ANSI+T1[1].227-1995.pdf	M&R-2-A-2	American National Standards Institute
<i>American National Standard for Telecommunications – Operations, Administration, Maintenance and Provisioning (OAM&P) – Services for Interfaces between Operations Systems across Jurisdictional Boundaries to Support Fault Management (Trouble Administration)</i> (ANSI T1.228-1995)	ANSI+T1[1].228-1995+(R1999).pdf	M&R-2-A-3	American National Standards Institute
E-Mail Communication Re: BLS Volume Forecast	No Electronic Copy	M&R-3/4-A-1	BLS
Volume Results Files	volume results.zip	M&R-3/4-A-3	KCI

³ See Section VII, “M & R Overview” for a description of the ECTA interface options available to CLECs.

Document	File Name	Location in Work Papers	Source
Volume Transaction Sequence File	volume transaction sequence.zip	M&R-3 /4-A-4	KCI

2.4.1 Data Generation/Volumes

The following section summarizes the methodology used to derive the volumes for this evaluation.

BellSouth projects that by year-end 2001, CLECs will have 5.42 million BellSouth circuits in use⁴. The projected growth pattern of these circuits is shown below⁵:

Table VII-3.3: BellSouth Circuit Growth Forecast⁶ (Thousands of Circuits at Year-End)

Product Type	1998	1999	2000	2001
Full CLEC (LNP)	149	329	811	1,137
Resale	609	1,057	1,424	1,692
Unbundling	136	217	272	425
UNE Loop & Port	899	1,375	1,777	2,162
Total ⁷	1,791	2,978	4,285	5,417

For each of these circuit types, BellSouth has used the methodology depicted below to project troubles to be entered into the ECTA Gateway:

⁴ KCI attempted to reconcile BellSouth's forecast numbers against those submitted by BellSouth to KCI for Pre-Order and Order volume test. The forecast submitted for the ECTA evaluation was significantly higher. In addition, KCI requested forecast data from a CLEC user for in validation of the forecast. This CLEC did not provide KCI with a forecast of ECTA usage. Therefore, KCI has not independently verified these projections. However, it is highly unlikely that these volume projections will be reached or exceeded before the next release of ECTA.

⁵ The number of actual BellSouth CLEC LSRs in 1997 and 1998 totaled 1.89 million.

⁶ BellSouth ECTA volume forecast received by KCI on 10/20/99.

⁷ Totals may not add due to rounding.

Table VII-3.4: BellSouth Trouble Calculations

Line Type	Calculation	December '01 Troubles
Full CLEC (LNP)	$LIS_{Full\ CLEC\ (LNP)} * TPL * LNP * TAF * ECT$	128
Resale	$LIS_{Resale} * TPL * TAF * ECT$	1,269
Unbundling	$LIS_{Unbundling} * TPL * (LNP + UNE) * TAF * ECT$	207
UNE Loop & Port	$LIS_{UNE\ Loop\ \&\ Port} * TPL * TAF * ECT$	1,622
Total		3,226

Where:

LIS_X Total Lines in Service (where subscript “X” denotes Line Type)

TPL Percent of Lines with a Trouble Per Month (3%)

LNP Percent of Troubles Relating to LNP (15%)

UNE Percent of Troubles Relating to UNE Loops (50%)

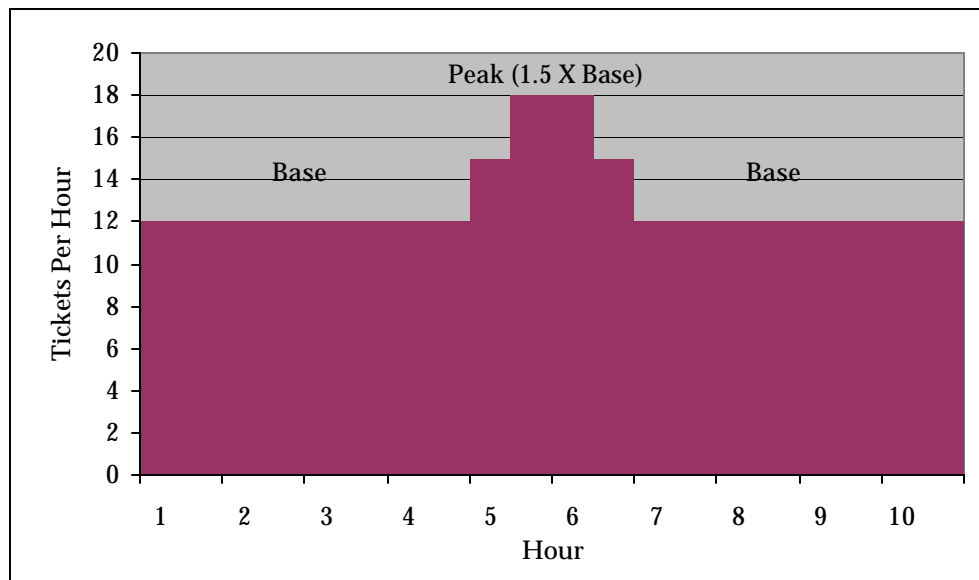
TAF Percent of POTS Reports through TAFI (50%)

ECT Percent of Customers Owned by ECTA Users (5%)

These calculations are based on BellSouth’s assumption that ECTA users will lease 5% of the number of lines that TAFI users lease. Therefore, the calculations first project TAFI volumes and then derive ECTA volumes from those.

Using the data provided by BellSouth, KCI assumed that 90% of trouble reports would occur on the 22 weekdays during an average month. Applying this logic, the 3,226 troubles projected for December '01 will translate to 132 troubles per weekday ($3,226 * 0.90 \div 22$). Assuming that a given weekday can be divided into nine non-peak hours and one peak hour (where the peak hour volume is 1.5 times the non-peak hour volume), and that volumes build up and ramp down during the period surrounding the daily peak, the projected non-peak, hourly volume would be 12 ($132 \div 10.75$) trouble tickets⁸. Figure VII-3.2 below shows the projected distribution of trouble reports over a day.

⁸ The projected daily load (represented graphically in Figure VII-3.2) is equal to the sum the following time segments and their corresponding time multiples: 4 hours of average non-peak volume, 0.5 hours of average non-peak volume multiplied by 1.25, 1 hour of average non-peak volume multiplied by 1.5, 0.5 hours of average non-peak volume multiplied by 1.25, and 4 hours of average non-peak volume. This can be expressed mathematically by the equation “ $132 = 4X + (0.5)(1.25) X + 1.5X + (0.5)(1.25) X + 4X$ ” where X is the average non-peak hour volume of trouble reports and 132 is the total number of trouble reports in a day. Solving for X, produces “ $X = 132 \div 10.75$ ” or “ $X=12$ ”. As BellSouth does not keep statistics on ECTA transactions, KCI used this methodology to simulate a day containing both normal and peak periods.

Figure VII-3.2: Distribution of Trouble Reports⁹

For each trouble report submitted to ECTA, several ECTA transactions, such as 'modify information,' 'view status,' 'status response,' and 'attribute value change notification' will occur. BellSouth estimates that each 'trouble ticket create' transaction will engender six to seven additional transactions on average¹⁰. These transactions could be CLEC-initiated, they could be responses to CLEC transactions, or they could be transactions initiated by BellSouth systems or personnel. Of these six to seven additional transactions, BellSouth estimates that 2.25 transactions will be initiated by CLECs (such as 'modify information,' 'add information,' or 'request status'), and the remaining transactions will be ECTA Gateway responses or BellSouth-initiated transactions¹¹. Table VII-3.5 shows the transaction distribution projected for a non-peak hour based on the BLS estimates above.

⁹ Testing took place between 2:00 P.M. and 12:00 A.M. on the first day of testing and between 9:00 A.M. and 7:00 P.M. on the second day.

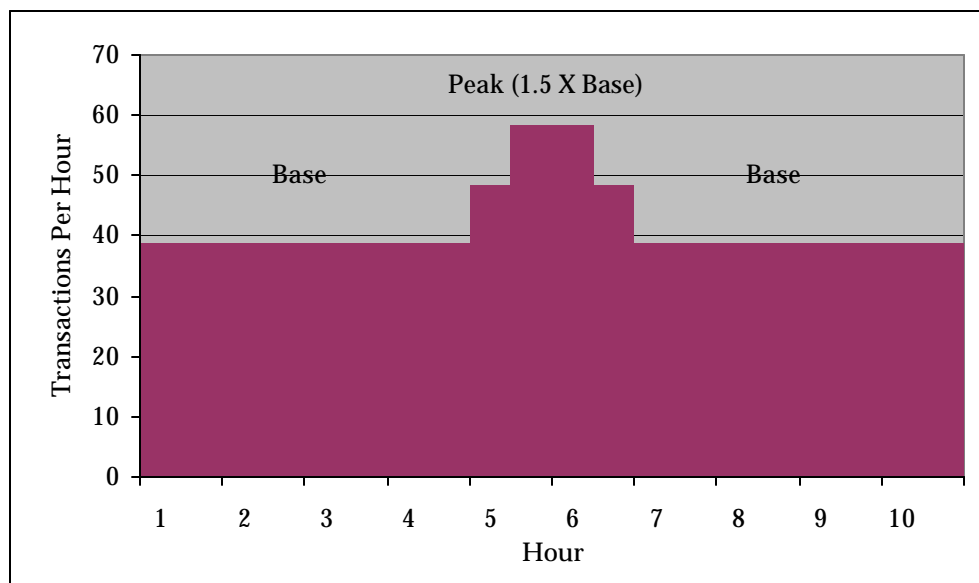
¹⁰ Each trouble ticket will involve a 'trouble ticket create' and a 'trouble ticket cancel' or 'attribute value change' involved with a clear and a close. In addition, most will also involve an 'attribute value change' from a screening notification from the agent. As BellSouth does not keep statistics on usage of the ECTA Gateway, KCI could not independently verify these estimates.

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Table VII-3.5: Transactions Per Hour

Transaction Type	Transactions / Create	Transactions / Hour
Enter Trouble Report	1.00	12
Request Trouble Report Status	0.42	5
Add Trouble Information	0.42	5
Modify Trouble Administration Information	0.42	5
Cancel Trouble Report	1.00	12
Total	3.26	39

Figure VII-3.3 below shows how the test was conducted across time:

Figure VII-3.3: Transactions Per Hour¹²

During the initial normal volume test trial, the BellSouth Test Interface used by KCI to simulate a CLEC interface failed to consistently submit transactions to the ECTA Gateway. KCI and BellSouth Applied Technologies personnel investigated these errors and discovered that they were not caused by limitations or faults in the ECTA Gateway itself. Diagnostic testing showed that the Test Interface failed on 13% of ECTA transactions. To compensate, test volumes were increased by 15%. In the actual tests, Test Interface error levels did

¹² Testing took place between 2:00 P.M. and 12:00 A.M. on the first day of testing and between 9:00 A.M. and 7:00 P.M. on the second day.

not exceed 13% and therefore did not compromise the planned volume of test transactions. See Section VII, “M&R Overview” for a description of the Test Interface employed by KCI in this evaluation.

2.5 Evaluation Methods

The ECTA Normal Volume Performance Test evaluated the behavior and performance of the ECTA Gateway under “normal¹³” YE01 projected transaction load conditions. The test cycle was executed using UNIX test scripts capable of submitting large volumes of resale services and UNE trouble test cases in a manner consistent with ECTA’s forecasted daily usage patterns and transaction mix, including error conditions. The test was executed during two 10-hour periods by modeling expected, normal daily usage. Trouble transaction loads were distributed geographically across multiple Georgia Central Offices (COs) to reflect a realistic operating environment. The test bed utilized for this analysis included both UNE and resale lines.

The ECTA Normal Volume Performance Test evaluated each of the ECTA functional processes against two criteria: correctness of system responses and timeliness of system responses. The evaluation consisted of the following steps:

1. A Load Profile was developed outlining the timing between transactions as per BellSouth’s volume projections for YE01 (see section 2.4.1 for a detailed description).
2. The order and timing of each test transaction was outlined in two test sequence files, one for each 10-hour period. Each line in these files included the following:
 - Data to be entered into the ECTA Test Interface.
 - A line of UNIX test code to submit a transaction to the ECTA Test Interface.
3. Data input files and UNIX test scripts were developed from the test sequence files and uploaded to the BellSouth Test Interface system.
4. Each test script was executed to submit transactions to the ECTA Test Interface.
5. The ECTA Gateway system agent log and response messages to the ECTA Test Interface were analyzed to log transaction times and to verify expected

¹³ Normal is defined as the average projected volume for a given time period.

system responses¹⁴. Any exceptions or mismatched responses were flagged and investigated.

6. Data from Step 5 were compiled and mapped against the individual evaluation criteria.

2.6 Analysis Methods

The ECTA Normal Volume Performance Test included a checklist of evaluation criteria developed by KCI during the initial phase of the BellSouth - Georgia OSS Evaluation. These evaluation criteria, detailed in the *Master Test Plan*, provided the framework of norms, standards and guidelines for the ECTA Normal Volume Performance Test.

The data collected were analyzed employing the evaluation criteria referenced above.

3.0 Results Summary

This section identifies the evaluation criteria and test results.

3.1 Results & Analysis

The results of this test are presented in the table below. Definitions of evaluation criteria, possible results, and exceptions are provided in Section II.

Table VII-3.6: M&R-3 Evaluation Criteria and Results -- Presence of Functionality

Test Cross-Reference	Evaluation Criteria	Result	Comments
M&R-3-1-1	The user receives the correct response when entering a trouble ticket into ECTA.	Satisfied	The correct response was received on 304 of 309 transactions. On four transactions, an error was received indicating that the Loop Maintenance Operations System (LMOS) had assigned a trouble ticket ID that already existed in the ECTA Gateway database. These tickets, once created, were not accessible through the ECTA Gateway and had to be manually cancelled by BLS personnel. As a result of these errors, KCI issued

¹⁴ The ECTA Gateway automatically produces entries into the agent log as transactions occur. KCI monitored the agent log during testing and downloaded the test log for analysis directly from the ECTA server. The integrity of the ECTA agent log was verified in M&R-2: ECTA Functional Test.

Test Cross-Reference	Evaluation Criteria	Result	Comments
			<p>Exception 15. BLS responded to this exception by changing system maintenance parameters to more frequently purge old trouble report IDs from the ECTA Gateway database. KCI retesting verified that BLS had indeed changed the purge parameter. Given this, KCI concluded that the likelihood of similar problems occurring in the future had been reduced to acceptable levels. Exception 15 is closed. See Exception 15 for additional information on this issue.</p> <p>One other transaction was incomplete as the result of an internal error in the ECTA Gateway. This item is under investigation by BellSouth.</p>
M&R-3-1-2	The user receives the correct response when requesting the status of a trouble ticket using ECTA.	Satisfied	The correct response was received for 120 out of 120 request status transactions.
M&R-3-1-3	The user receives the correct response when adding trouble information to a trouble ticket using ECTA.	Satisfied	The correct response was received on 120 out of 120 add transactions.
M&R-3-1-4	The user receives the correct response when modifying trouble administration information using ECTA.	Satisfied	The correct response was received for 120 out of 120 modify transactions. 48 of the 120 transactions contained intentional errors. Correct error responses were received for these transactions as well.
M&R-3-1-5	The user receives the correct response when canceling a trouble ticket using ECTA.	Satisfied	<p>The correct response was received for 272 of 273 cancel transactions. One transaction failed because the ECTA Gateway incorrectly identified a ticket as canceled, and therefore could not process the true cancel request. This item is under investigation by BLS.</p>

Table VII-3.7: M&R-3 Evaluation Criteria and Results -- Timeliness of Response

Test Cross-Reference	Evaluation Criteria	Result	Comments
M&R-3-2-1	The response when entering a trouble report using ECTA is within published specifications ¹⁵ .	Satisfied	The MTTR ¹⁶ for 304 create requests was 16 seconds. Five responses were received in excess of 30 seconds. All responses were received within 180 seconds.
M&R-3-2-2	The response when requesting trouble report status using ECTA is within BLS published specifications ¹⁵ .	Satisfied	The MTTR for 120 status requests was less than 0.5 seconds. All responses were received within 30 seconds.
M&R-3-2-3	The response when adding trouble information using ECTA is within BLS published specifications ¹⁵ .	Satisfied	The MTTR for 120 add requests was seven seconds. All responses were received within 30 seconds.
M&R-3-2-4	The response when modifying trouble report administration information using ECTA is within BLS published specifications ¹⁵ .	Satisfied	The MTTR for 72 modify requests was seven seconds. The MTTR for 48 modify requests with intentional errors was less than 0.5 seconds. One response was received in excess of 30 seconds. All responses were received within 180 seconds.

¹⁵ BellSouth's *Joint Implementation Agreement (JIA) for Electronic Communications Trouble Administration (ECTA) Gateway for Local Service between CLEC and BellSouth*, Version 10/07/98 states "The end-to-end protocol target response time will be 30 seconds or less for 90% of the requests while handling 40 messages per minute. End to End [sic] maximum response time will not exceed 180 seconds." During this test, the maximum number of KCI messages per minute for any hour in the test was 12.3. KCI observed that there was no discernable difference in ECTA performance during the periods of highest message volume.

¹⁶ Mean Time To Response (MTTR) measures the average response time for all valid transactions. Individual response times are calculated as the difference between the time that the transaction is entered (time T2 in Figure VII-3.1) and the response comes back from the ECTA Gateway (time T7 in Figure VII-3.1).

Test Cross-Reference	Evaluation Criteria	Result	Comments
M&R-3-2-5	The user receives the correct response when canceling a trouble ticket using ECTA ¹⁵ .	Satisfied	The MTTR for 272 cancel requests was seven seconds. All responses were received within 30 seconds.