



Testing Mission Critical Applications

MCP 4011

UNITE 2012

Who is MGS, Inc.

- Software Engineering, Product Development and Professional Services firm founded in 1986
- We solve business problems with: Products, Professional Services, and Software Engineering Services on ClearPath MCP, Windows, and UNIX platforms.



MGS Professional Services

- IT Management and Planning
- Capacity Planning and Management
- Consulting and Technical Services including Performance Management and Hardware-Software-Network Integration
- Application Development Services including Java/J2EE development and platform re-hosting
- Training Services
- Testing Consultation

MGS Expertise

- Principals average over 30 years industry experience
- Junior staff - minimum 5 years experience
- 50% of experience is Unisys MCP systems
- Remainder is PC and Servers: Windows™, C, Java, Delphi
- Expanded expertise on Windows and UNIX
- Staff and expertise expand as business needs dictate

MGS Software Products

- MGSWeb Web Services Software
- SightLine™ Performance Analyzer, Capacity Manager & Workload Analyzer for ClearPath MCP
- C.A.T.T. And CATTSecured Term. Emulation
- HVFAX High Volume Facsimile Delivery System
- File Manager for ClearPath MCP (FMA)
- DELIVER Data Delivery Facility
- RETRIEVE
- CheckOutXP and CheckOutPC PC monitors

MGS' interest in testing

- As a product developer and maintainer, testing is key to minimizing bugs, improving customer satisfaction, and controlling maintenance and customer support costs
- As a software engineering team, testing insures delivery of a correct and reliable solution, and customer satisfaction
- As a professional services provider, we support clients in Integration and Functional Quality Testing (IFQT) and Independent Validation and Verification (IV&V)
- It makes good business sense

Why test programs and systems?

- To insure that services will be provided to end users as effectively and efficiently and with as little disruption to their work flow as possible?
- To prove that the program logic is correct?
- For regulatory compliance and to minimize legal liability?
- Because we were told to do so?

Why isn't testing usually done well?

- Testing is usually complex and often difficult - on-line environments are particularly complex to test
- Testing is not fun like designing and programming
- Even when we test everything there are still problems in production (frustrating to testers)
- Management pressure to implement NOW!
- Lack of structure and organization

Testing is a survival requirement.

- Rigorous, reproducible, regression testing coupled with thorough functional testing is the best way to insure program changes are correct and nothing was broken in the change process.
- Otherwise code gets debugged in production with end users bearing a high cost in lost productivity.

What do we need?

- ◆ Test Strategy
- ◆ Test Plans
- ◆ Test Budget
- ◆ Test Staff
- ◆ Test Tools

Structure, Organization, Commitment

Test Strategy

- ☞ Test Types/Levels
- ☞ Roles and Responsibilities
- ☞ Test Requirements
- ☞ Risk Assessment
- ☞ Testing Tools
- ☞ Regression Test Approach
- ☞ Test Management Structure
 - Test Scheduling
 - Test Priorities
 - Test Status Collections and Reporting
 - Test Records Maintenance
- ☞ Requirements Traceability Matrix
- ☞ Test Summary Reporting

IEEE 829 Test Plan Structure

- Introduction
- Test items
- Features to be tested
- Features not to be tested
- Approach
- Item pass/fail criteria
- Suspension criteria and resumption requirements
- Test deliverable
- Testing tasks
- Environmental needs
- Responsibilities
- Staffing and training needs
- Schedule
- Risks and contingencies
- Approvals

Ideal Testing Structure

- Unit Test
 - ◆ Programmer tests functionality (White Box Test)
 - ◆ Objective is to test all code paths (find 75% of bugs)
- Integration Test
 - ◆ Development Test Team tests functionality of interacting programs and platforms
 - ◆ Regression Test to verify code not broken
- System/QA Test
 - ◆ Independent Test Team tests all functionality and boundary conditions (Black Box Test)
 - ◆ Prove SYSTEM performs to user requirements/expectations

Testing Challenges

- Creating the test environment [on-line most difficult] - transactions and databases.
- Maintaining the test environment
 - ◆ Updating / restoring databases and supporting applications
 - ◆ Modifying, updating, and creating test transactions
- Executing end-to-end testing
- Analyzing test results
 - ◆ screen outputs
 - ◆ database, file, and report changes

Testing Cycle – Application Changes

1. Establish original test environment (DB, transactions, etc)
2. Run Baseline test and save the results
3. Restore the original environment
4. Run test on modified program(s) and save results
5. Analyze and compare the results (techniques differ with objectives: regression test, conversion, new functionality, new application)
6. Document and report test results
7. Correct program logic or configuration
8. Repeat starting at step 3 until correct results achieved

MGS Testing Opportunities

- Infrastructure Software – MGSWeb
 - ◆ Requires multi-platform testbed
 - ◆ Custom test tools
- System Monitoring Software – SightLine
 - ◆ Requires single and multi-platform testbeds
 - ◆ Custom test tools

More Testing Opportunities

- Utility Software – DELIVER, RETRIEVE, FMA, C.A.T.T.
 - ◆ Need multiple platform test bed
 - ◆ Need custom test data and programs
- Encryption software – CATTSecured
 - ◆ Need multiple platforms
 - ◆ Need custom test programs and data

Application Testing Opportunities

- Message Control System change to COMS
 - Year 2000 Changes Validation
 - Application Regression Testing
 - New Application Testing
 - System Update Testing
- NEEDED BETTER TEST TOOLS**

MGS Application Testing Objectives

- Automate Testing of On-Line Transaction Processing Programs at the Host system
- Automate On-Line Test Result Evaluation
- Validate Output File and Report Contents
- Validate Database Update Results
- Generate Screen Edit Test Transactions
- Provide External Test Drivers and End-Point Monitors as needed

Requirements for Automated Testing

- Test database(s) - subset of production data
- Test transactions - on-line from COMS TTRAIL, batch from input file copies
- Ability to view and modify transactions and to create transactions
- Capability to initiate and monitor a non-interfering test
- Ability to review results using automated tools
- Capability to reproduce test runs

Proof of Correctness System (PCS)

- Local Terminal Emulator (LTE) facility for on-line testing and screen results evaluation
- PCS COMPARE facility for file update validation
- Edit Test Generator for editing logic stress testing

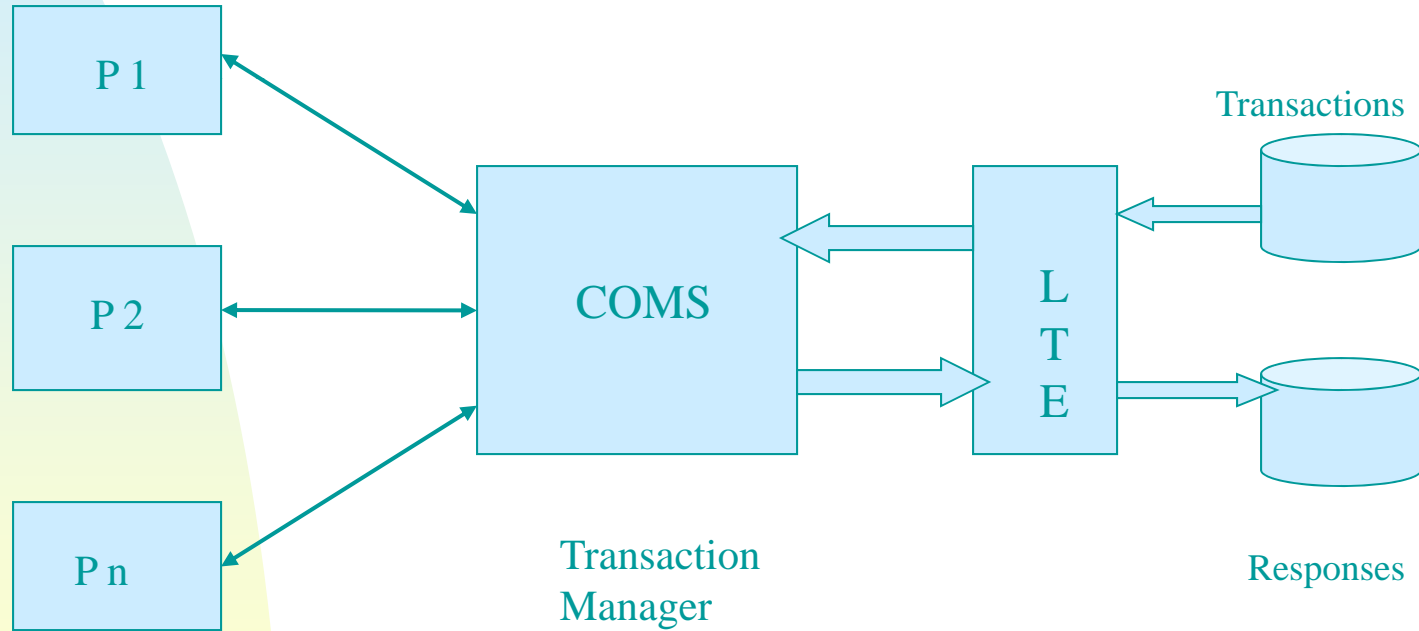
ALL MCP BASED

PCS Local Terminal Emulator

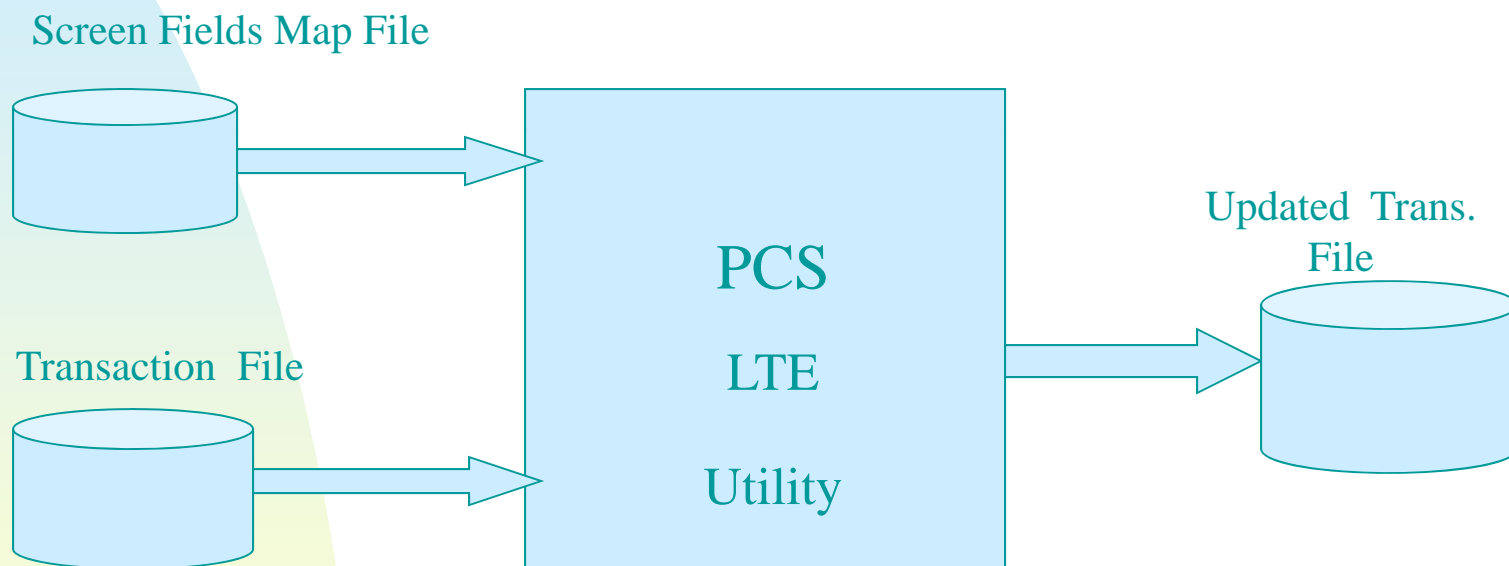
- Transaction Capture
- Transaction Modification
- Transaction Creation
- Transaction Replay
- Response Capture
- Result Comparison (LTE COMPARE)
- Tests run interactively or in Batch mode - including Result Comparison

PCS Local Terminal Emulator

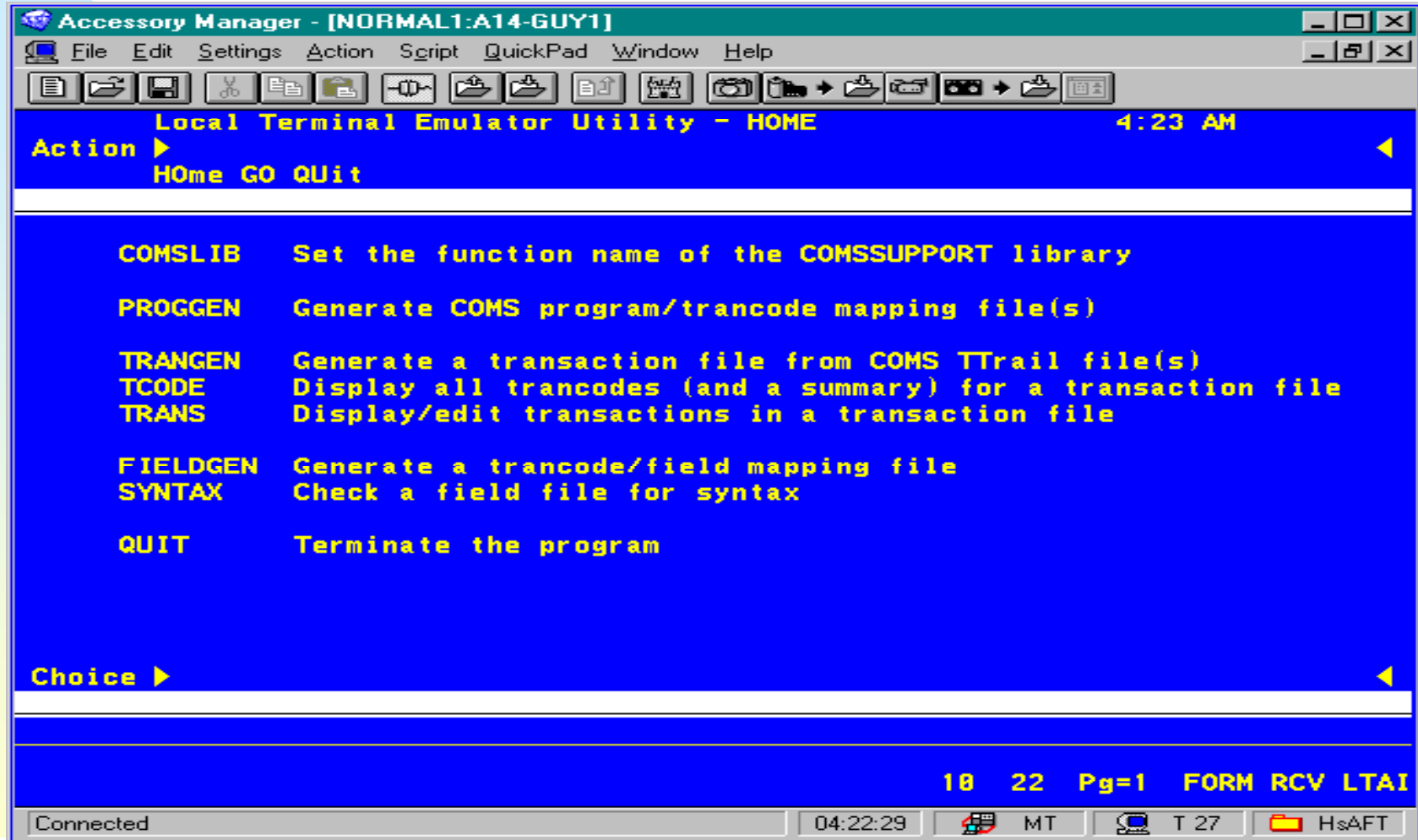
On-Line Programs under test



PCS LTE Utility



PCS LTE Utility Functions



The screenshot shows a window titled "Accessory Manager - [NORMAL1:A14-GUY1]" with a menu bar (File, Edit, Settings, Action, Script, QuickPad, Window, Help) and a toolbar. The main area is a terminal emulator with a blue background and yellow text. The title bar of the terminal reads "Local Terminal Emulator Utility - HOME" and the time is "4:23 AM". The terminal displays a menu of actions:

```
Local Terminal Emulator Utility - HOME          4:23 AM
Action ▶
Home GO QUIT

COMSLIB  Set the function name of the COMSSUPPORT library
PROGGEN  Generate COMS program/trancode mapping file(s)
TRANGEN  Generate a transaction file from COMS TTrail file(s)
TCODE    Display all transcodes (and a summary) for a transaction file
TRANS    Display/edit transactions in a transaction file

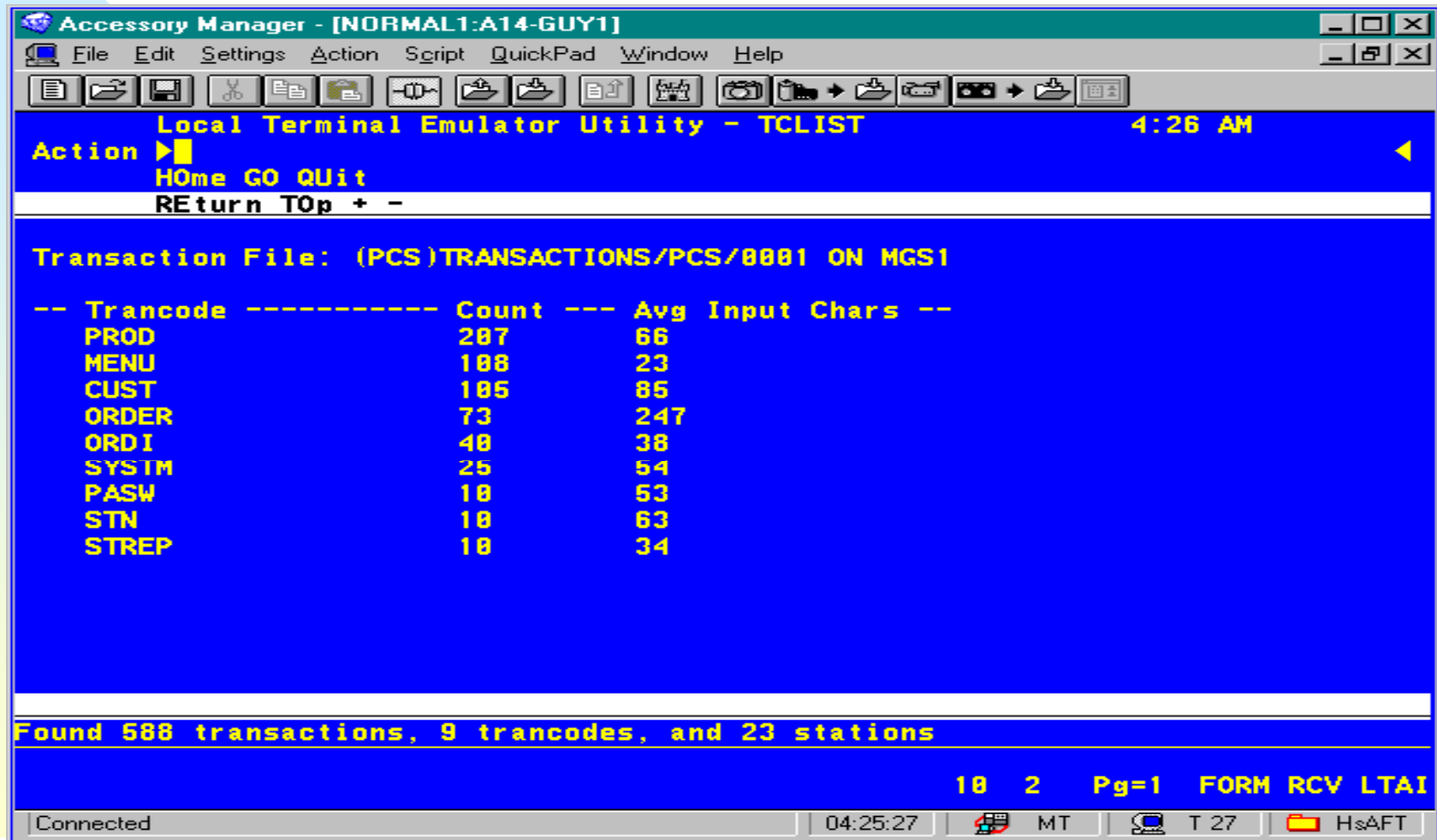
FIELDGEN Generate a tranocode/field mapping file
SYNTAX   Check a field file for syntax

QUIT     Terminate the program

Choice ▶
```

At the bottom of the terminal, it shows "18 22 Pg=1 FORM RCV LTAI". The status bar at the bottom of the window indicates "Connected", "04:22:29", "MT", "T 27", and "HsAFT".

PCS LTE Utility TCODE Function



The screenshot shows a terminal window titled "Accessory Manager - [NORMAL1:A14-GUY1]". The window contains a menu bar with "File", "Edit", "Settings", "Action", "Script", "QuickPad", "Window", and "Help". Below the menu bar is a toolbar with various icons. The main content area is blue with yellow text. It displays the title "Local Terminal Emulator Utility - TCLIST" and the time "4:26 AM". The prompt "Action" is followed by a cursor. Below the prompt are the options "Home GO QUIT" and "REturn TOp + -". The main content area displays the following text:

```
Transaction File: (PCS)TRANSACTIONS/PCS/8881 ON MGS1
```

Trancode	Count	Avg Input Chars
PROD	287	66
MENU	188	23
CUST	185	85
ORDER	73	247
ORDI	48	38
SYSTM	25	54
PASW	18	53
STN	18	63
STREP	18	34

Found 588 transactions, 9 trancodes, and 23 stations

18 2 Pg=1 FORM RCV LTAI

Connected 04:25:27 MT T 27 HsAFT

PCS LTE Utility Transaction View

Accessory Manager - [NORMAL1:A14-GUY1]

File Edit Settings Action Script QuickPad Window Help

Local Terminal Emulator Utility - TLIST 4:16 AM

Action ▶MO
Home GO QUIT

REturn FInd CReate MOdify DElete UNdo TOp + -

Transaction File: (PCS)TRANSACTIONS/PCS/8881 ON MGS1

Key	Timestamp	Length	Text
7	04/24/1998 13:28:16	149	ORDERT000008APR24989804 81123456
13	05/28/1998 13:23:59	569	ORDERT000008APR24989804 81123456
19	05/28/1998 14:26:02	149	ORDERT000008APR24989804 81123456
21	05/29/1998 13:47:24	569	ORDERT000008APR24989804 81123456
X 27	05/29/1998 13:47:26	149	ORDERT000008APR24989804 81123456
34	06/11/1998 12:02:04	149	ORDERT000008APR24989804 81123456
41	06/11/1998 14:07:05	149	ORDERT000008APR24989804 81123456
49	06/11/1998 15:01:59	149	ORDERT000008APR24989804 81123456
57	06/11/1998 15:06:16	149	ORDERT000008APR24989804 81123456
65	06/11/1998 15:33:54	149	ORDERT000008APR24989804 81123456
73	06/11/1998 15:56:59	149	ORDERT000008APR24989804 81123456
81	06/11/1998 16:03:51	149	ORDERT000008APR24989804 81123456
89	06/12/1998 15:14:20	149	ORDERT000008APR24989804 81123456
97	06/12/1998 15:27:18	149	ORDERT000008APR24989804 81123456

3 14 Pg=1 FORM LOC LTAI

Connected 04:15:17 MT T 27 HsAFT



PCS LTE Transaction Modification

Accessory Manager - [NORMAL1:A14-GUY1]

File Edit Settings Action Script QuickPad Window Help

Trancode ORDER, Key 27 Page 1 of 1

ORDER ISPEC ▶ ORDER◀
ORDERGLB-SOURCE ▶ T◀
ORDERTRANNO ▶ 888888◀
ORDERINPUT-DATE ▶ APR2498◀
ORDERACTMTH ▶ 9884◀

ORDERCUSTNO	ORDERPRODNO	ORDERQTY	ORDERSHIPDT
▶ 01◀	▶ 1234567898◀	▶ 018◀	▶ 123198◀
▶ 1◀	▶ 9876543218◀	▶ 028◀	▶ 113898◀
▶ 02◀	▶ 1234567898◀	▶ 038◀	▶ 018199◀
▶ 02◀	▶ 9876543218◀	▶ 048◀	▶ 018188◀
▶ 08◀	▶ 9999988888◀	▶ 999◀	▶ 038188◀

ORDERMAINMEN ▶ ◀

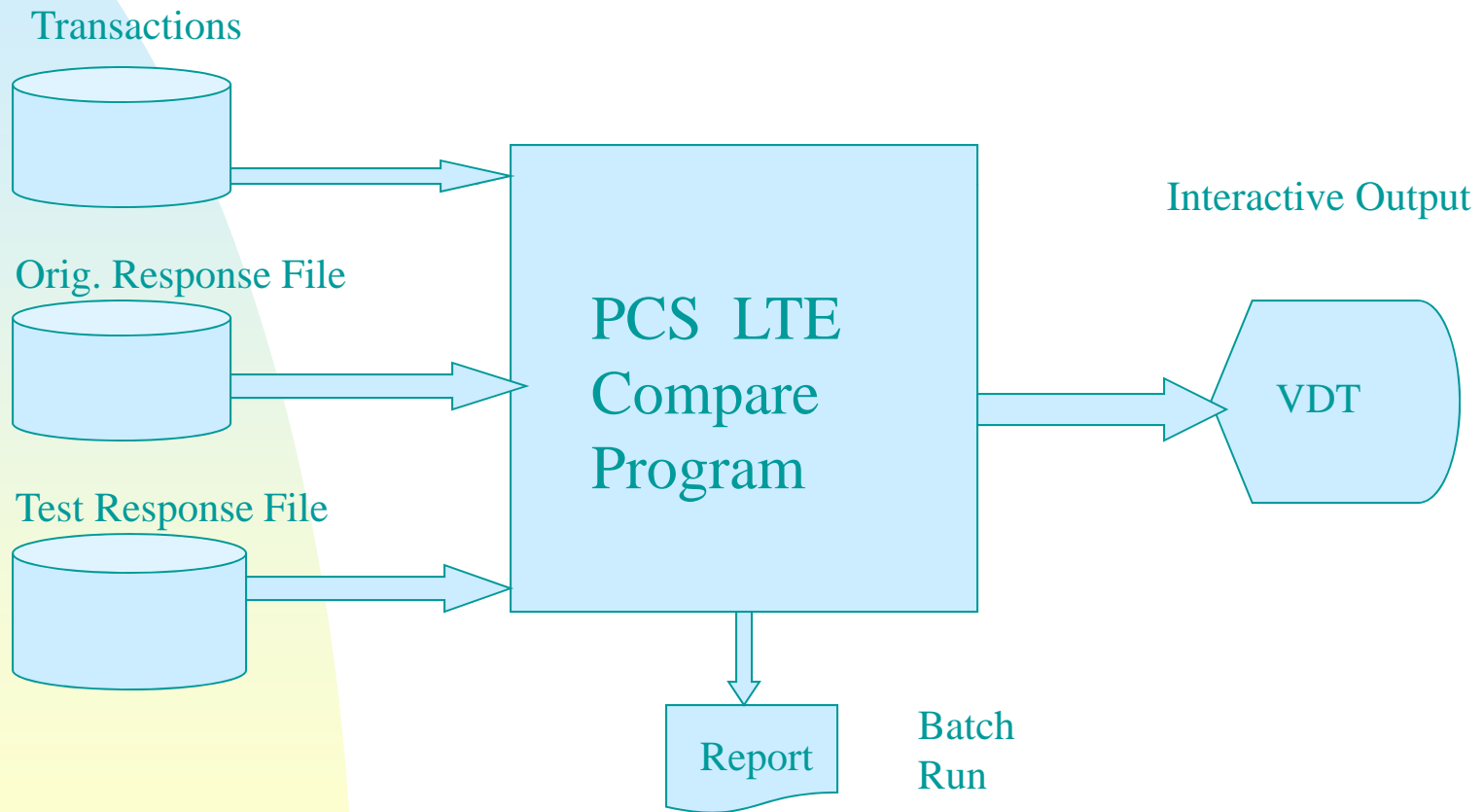
XMT to modify transaction, SPCFY to abort

2 13 Pg=1 FORM LOC LTAI

Connected 04:19:24 MT T 27 HsAFT



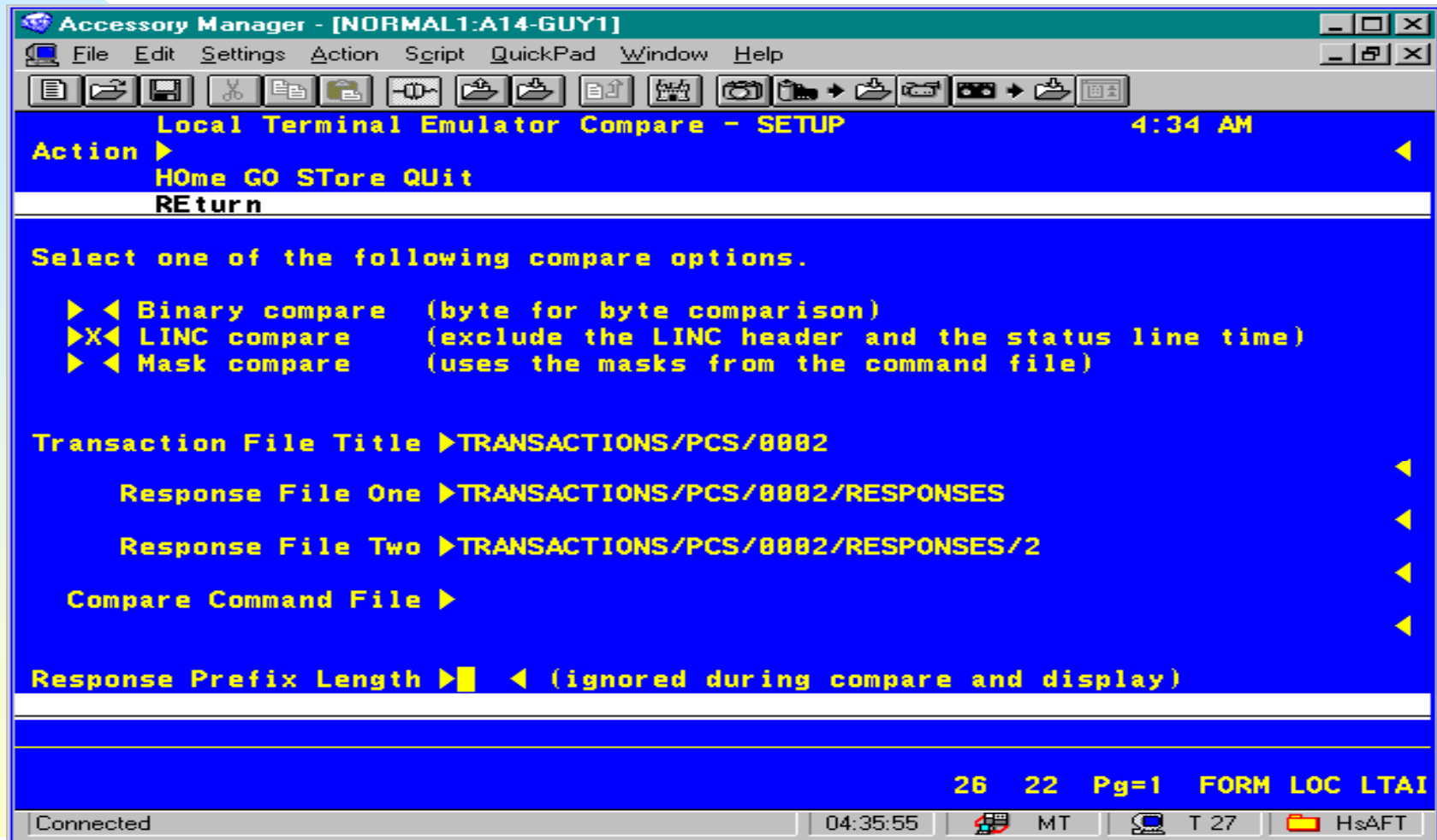
PCS LTE Compare



PCS LTE Compare Interactive Output

- Show only error results
 - ◆ Show the transaction
 - ◆ Show the screen results (write to page 1 and page 2)
 - ☞ Toggle pages to see differences
 - ◆ Show the status line results (write to page 1 and 2)
 - ☞ Toggle pages to see differences
- Show statistics of results file comparison
- Create an optional ErrorFile for future review
- Batch execution as part of a test package permits saving files & results for future review

PCS LTE Compare Setup



PCS LTE Compare Functions

```
Accessory Manager - [NORMAL1:A14-GUY1]
File Edit Settings Action Script QuickPad Window Help
Local Terminal Emulator Compare - HOME 4:38 AM
Action ▶
Home GO Store QUIT

SETUP Specify compare options and files
SHOW Display a specific transaction and response(s)
PRINT Print a specific transaction and response(s)
FIND Find and display/print transaction(s) and response(s)

TCODE List the trancodes from the transaction file
TRANS List all transactions (can be limited by trancode or station)
KEYS List the transaction key numbers from response file one

INTER Start an interactive LINC compare
BATCH Start a batch LINC compare

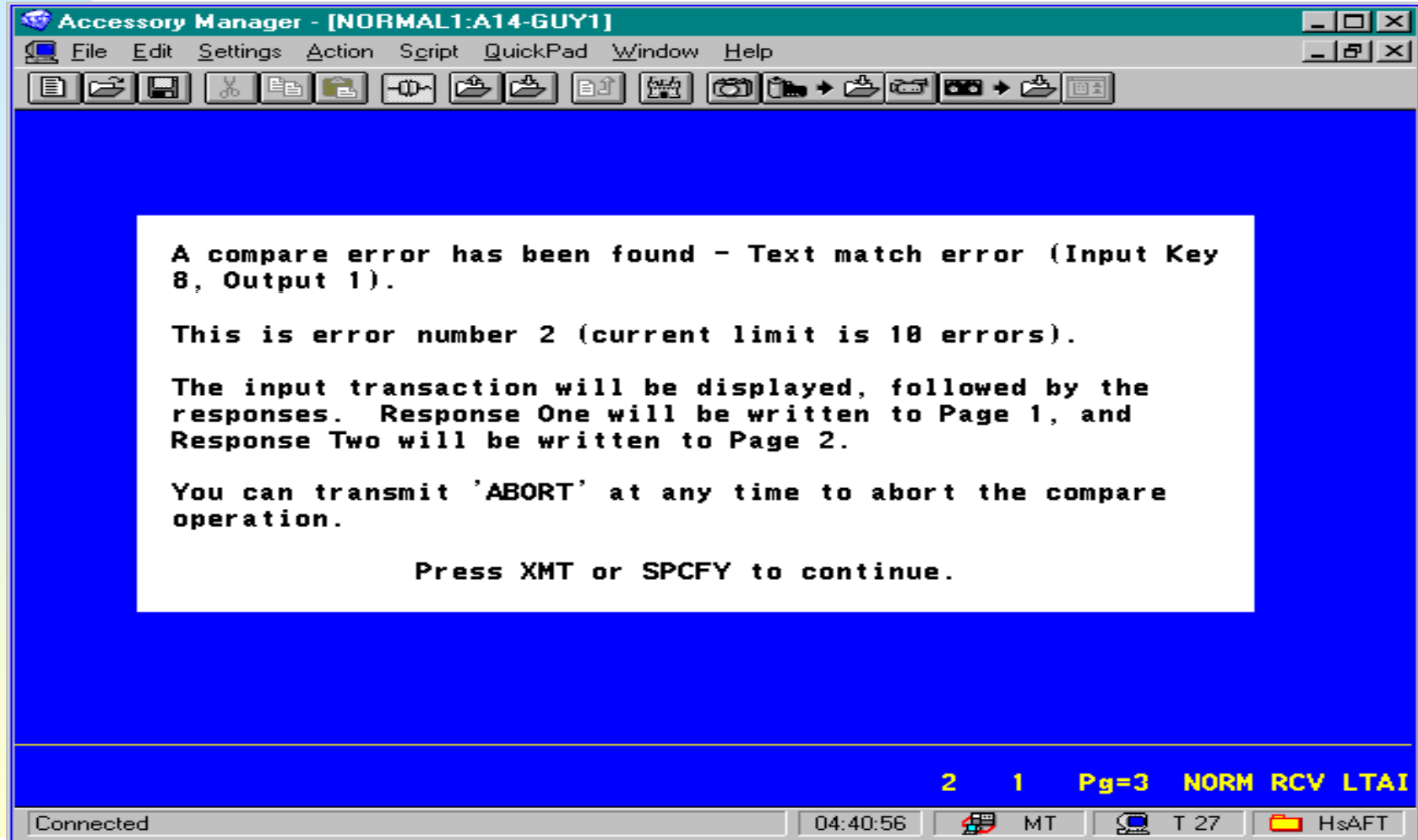
QUIT Exit the program

Choice ▶ INTER
```

15 22 Pg=1 FORM LOC LTAI

Connected 04:38:02 MT T 27 HsAFT

PCS LTE Compare Error Notice



The screenshot shows a window titled "Accessory Manager - [NORMAL1:A14-GUY1]". The menu bar includes File, Edit, Settings, Action, Script, QuickPad, Window, and Help. The toolbar contains various icons for file operations and system functions. The main display area has a blue background with a white text box containing the following error message:

A compare error has been found - Text match error (Input Key 8, Output 1).

This is error number 2 (current limit is 10 errors).

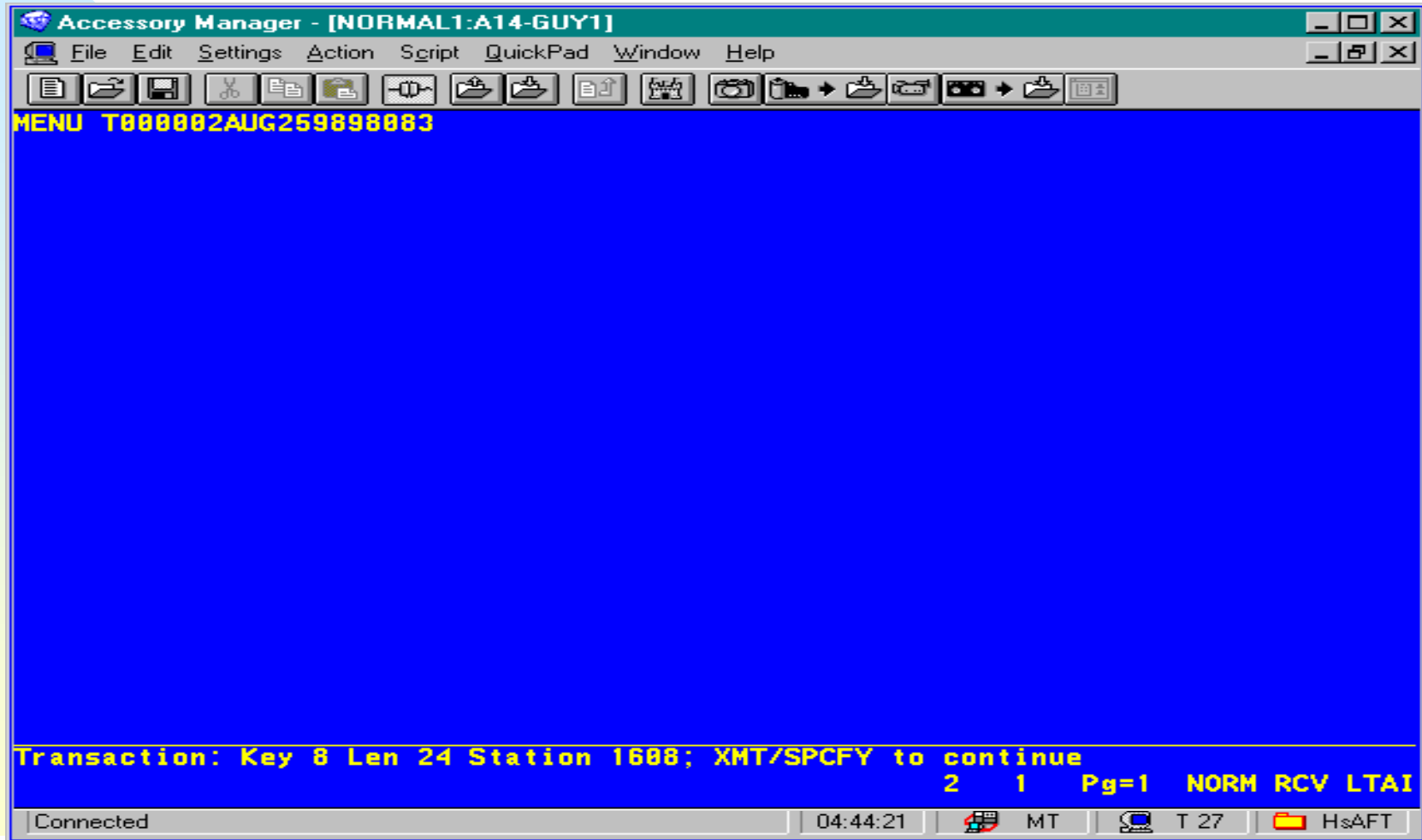
The input transaction will be displayed, followed by the responses. Response One will be written to Page 1, and Response Two will be written to Page 2.

You can transmit 'ABORT' at any time to abort the compare operation.

Press XMT or SPCFY to continue.

At the bottom right of the window, the status "2 1 Pg=3 NORM RCV LTAI" is displayed. The system tray at the bottom shows "Connected", "04:40:56", "MT", "T 27", and "HsAFT".

PCS LTE Compare Error Transaction



PCS LTE Compare Result 1

Accessory Manager - [NORMAL1:A14-GUY1]

File Edit Settings Action Script QuickPad Window Help

◆ORDERT888882AJG2698◆9888◆ PCS TESTING SYSTEM

CUSTOMER	ORDER ENTRY SCREEN	PRODUCT	QUANTITY	SHIP DATE
▲ 8◀		▶	▲ 8◀	▲ 8◀
▲ 8◀		▶	▲ 8◀	▲ 8◀
▲ 8◀		▶	▲ 8◀	▲ 8◀
▲ 8◀		▶	▲ 8◀	▲ 8◀
▲ 8◀		▶	▲ 8◀	▲ 8◀
▲ 8◀		▶	▲ 8◀	▲ 8◀
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▲ 8◀		▶	▲ 8◀	▲ 8◀
▲ 8◀		▶	▲ 8◀	▲ 8◀
▲ 8◀		▶	▲ 8◀	▲ 8◀
▲ 8◀		▶	▲ 8◀	▲ 8◀
▲ 8◀		▶	▲ 8◀	▲ 8◀

RETURN TO MAIN MENU ? ▶ ◀ ET▶@◀

Response: Key 8 Output 1 Page 1; XMT/SPCFY to continue

56 1 Pg=1 NORM LOC LTAI

Connected 04:51:09 MT T 27 HsAFT



PCS LTE Compare Result 2

Accessory Manager - [NORMAL1:A14-GUY1]

File Edit Settings Action Script QuickPad Window Help

◆ORDERT888882SEP1898◆9889 PCS TESTING SYSTEM

CUSTOMER	ORDER ENTRY SCREEN	PRODUCT	QUANTITY	SHIP DATE
▲ 1	1	▶1111111111	▲ 1	▲998381
▲ 2	2	▶2222222222	▲ 2	▲981238
▲ 8			▲ 8	▲ 8
▲ 8			▲ 8	▲ 8
▲ 8			▲ 8	▲ 8
▲ 8			▲ 8	▲ 8
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▲ 8			▲ 8	▲ 8
▲ 8			▲ 8	▲ 8
▲ 8			▲ 8	▲ 8

RETURN TO MAIN MENU ? ▶ ◀ ET>>@◀

Response: Key 8 Output 1 Page 1; XMT/SPCFY to continue

71 6 Pg=2 NORM LOC LTAI

Connected 04:52:24 MT T 27 HsAFT



PCS LTE Compare Summary

```
Accessory Manager - [NORMAL1:A14-GUY1]
File Edit Settings Action Script QuickPad Window Help
-----
Local Terminal Emulator Compare - REPORT 4:56 AM
Action ▶
Home GO Store QUIT
REturn TCode

----- Totals -----
Responses Processed: 8
Responses Excluded: 8
Responses Matched: 28
Compare Errors: 2

----- Response File One - Response File Two -----
Total Responses: 28 28
Highest Key: 28 28
Unmatched Responses: 8 8

Compare completed

18 2 Pg=1 FORM RCV LTAI
Connected 04:55:24 MT T 27 HsAFT
```

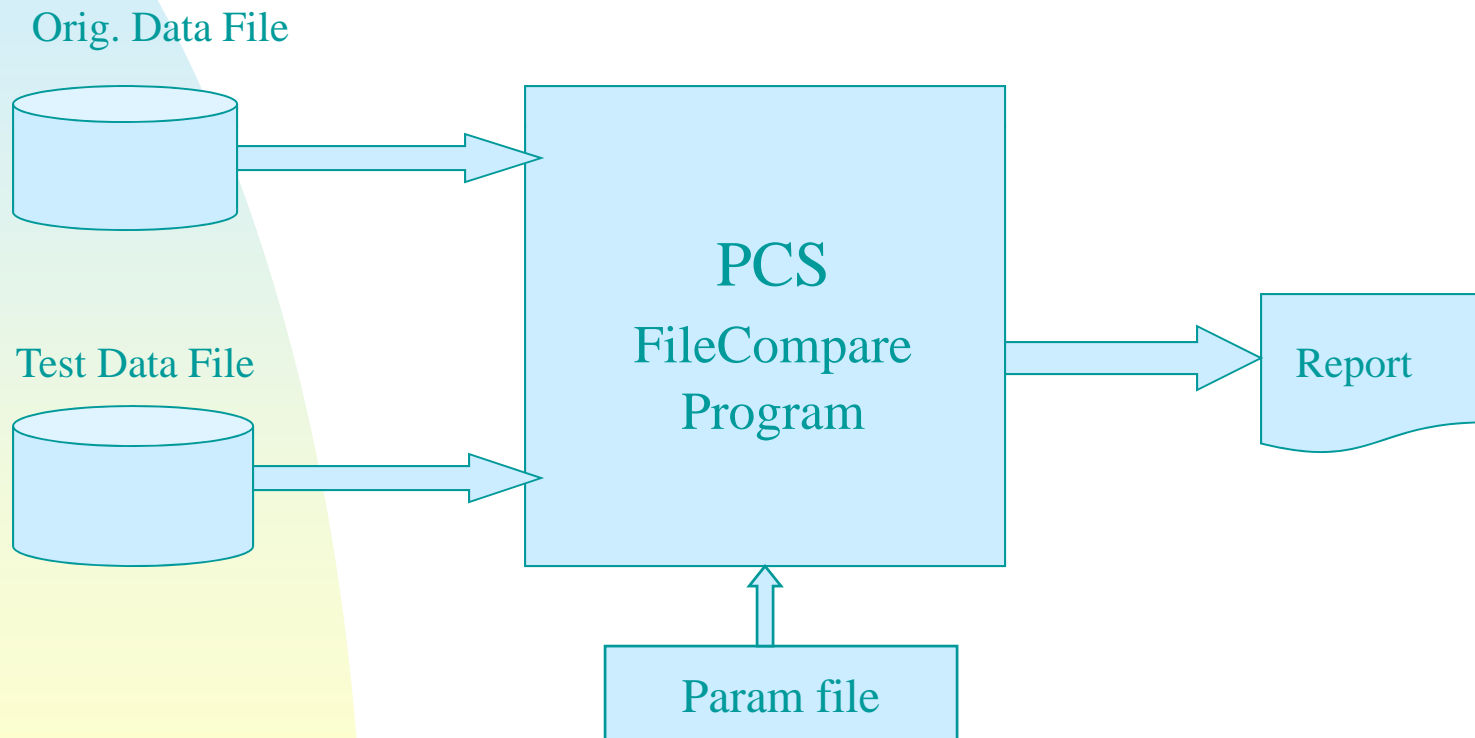
PCS COMPARE

- Provides data update validation
- Database Compare
- Data File Compare
- Printer File Compare
- Record Field Masking
- Date Field Masking

PCS DBCompare Program

- Generates programs to dump databases (updated structures only) to be compared
- Creates WFL to run the dump programs
- Creates WFL to run PCS/FileCompare to compare the dumped files

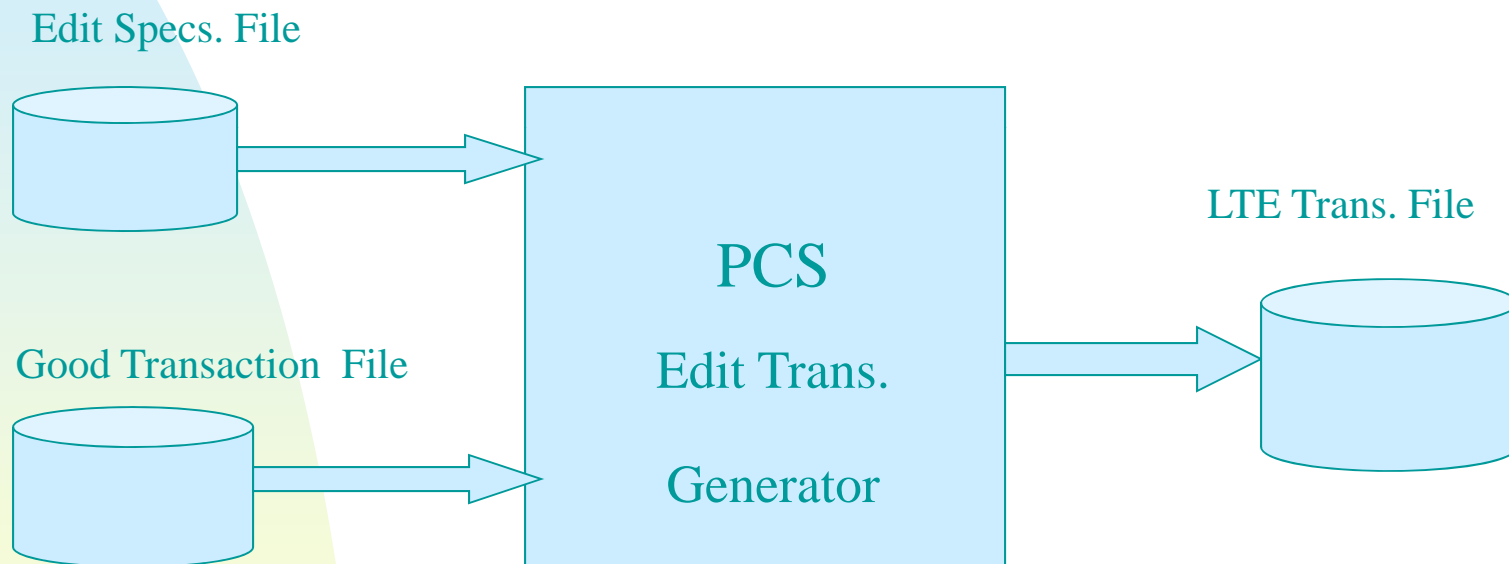
PCS Compare Facility



PCS Edit Transaction Generator

- Creates Error Transactions to stress test edit routines in on-line programs
 - ◆ Describe Input Field Edit Specifications
 - ◆ Generate LTE input transaction files
 - ◆ Run LTE and inspect Response File for errors
 - ◆ Can also generate English descriptions of field editing rules

PCS Edit Transaction Generator



PCS Features

- Rigorous, Reproducible Environment for on-line regression testing
 - ◆ Transaction Capture and Replay
 - ◆ Transaction Modification and Creation
 - ◆ Transaction Date Modifications for Year 2000 Testing
- Supports Organized Unit Testing
- Automated On-Line Results Comparison
- Data File and Database update validation
- Date Field Masking
- Screen Edit Logic Stress Testing

PCS Benefits

- More thorough testing
- Validated accurate test results
- Rigorous, reproducible tests possible
- Reduced time for thorough testing
- Reduced manpower costs to test
- More reliable information processing results

PCS Evolution

- Improved automation of on-line testing
- Additional flexibility in transaction capture
- Structuring for batch execution of on-line tests
- Organize test <packages> under PCSDATA directory structure
- Implementation of batch execution and results comparisons of on-line tests
- Ability for QA staff to save test <packages> and restore results for future developer review

Successful Test Program Keys

- Corporate Commitment
- Test Strategy
- Budget
- Formal Test Plans
- Test Tools
- Trained & Experienced Staff

QUESTIONS ???

Thank you for your attention. Are there any questions?

Contact Information

Guy Bonney

MGS, Inc.

10901 Trade Road

Suite B

Richmond, Virginia 23236

804-379-0230, Fax: 804-379-1299

www.mgsinc.com

