PN. ACB-464
9548E

Over The Counter Exchange of India (OTCEI)
Testing the ASSETS 8.0 Trading System
Test Results and recommendations

Financial Institutions Reforms and Expansion (FIRE) Project

August 18, 1997

Financial Institutions Reform and Expansion (FIRE) Project
US Agency for International Development (USAID/India)
Contract #386-0531-C-00-5010-00
Project #386-0531-3-30069

Price Waterhouse LLP
1616 North Fort Myer Drive
Arlington, VA 22209
Tel (703) 741-1000
Fax (703) 741-1616

Table of Contents

I.	Executive Summary	1
II.	Testing Methodology	3
III.	Observations of Function Test	6
	A. Day 1 - June 24	6
	B. Day 2 - June 25	13
	C. Day 3 - June 26	16
	D. Day 4 - June 27	25
	E. Day 5 - June 30	27
	F. Day 6 - July 1	36
IV.	Observations	45
	A. Training Sessions - June 26 & 27	45
	B. Operating Systems - 30 June, 1997	47
V.	Interim Recommendations	48
VI.	Cautions, Concerns and Limitations	53
VII.	Recommendations	54

I Executive Summary

The Over The Counter Exchange of India (OTCEI) has decided to trade certain scrips on a "Permitted" securities[1] basis. OTCEI modified its existing quote driven trading system to enable automated trading of Permitted securities on an order driven basis. OTCEI asked Price Waterhouse LLP (PW) to assist in testing the new software (Assets version 8.0) under the Financial Institutions Reform and Expansion (FIRE) Project funded by the US Agency for International Development (USAID). This document is a report of the results of that effort.

Per the agreement of technical assistance between OTCEI and PW, PW's technical review of Assets had the three objectives:

1. Determine whether this new version of the Assets software can be safely implemented;
2. Identify the potential limitations of the software in meeting OTCEI's projected trading volumes; and
3. Make recommendations of how that software might be improved.

PW arranged for Mr. Bill Gorman, an expert in exchange trading, clearing and settlement systems to work with OTCEI staff in conducting this review. Mr. Gorman was assisted by PW/India staff members who were also made available for work on this assignment under the FIRE Project. The project began on June 23, 1997.

Our basic conclusions regarding the three objectives were as follows:

1. We believe that the software, as currently structured, cannot be safely implemented at this time. We believe the software must undergo significant change before it can meet OTCEI's stated objectives and volume targets. The software could be implemented without making those changes but this would place extraordinary pressure and stress on key members of OTCEI technical staff.
2. The major limitation preventing the system from meeting projected trading volumes is its software structure. We believe that the Assets system cannot meet OTCEI's projected trading volumes unless its basic query-based architecture is changed to a broadcast-based architecture.
3. We believe that several changes are needed before Assets can enable OTCEI members to effectively compete with the automated trading systems provided by BSE, NSE and some of the other Indian stock exchanges.

The team did not find any software problems so egregious as to preclude start-up on the projected start-up date of July 3. Mr. Gorman and PW/FIRE nonetheless strongly recommended that implementation be postponed pending further testing and investigation.

[1] 100 securities, with large trading volumes, that currently trade on BSE, NSE and other exchanges, but which were not permitted to trade on OTCEI. These securities will now trade on OTCEI, but the companies will not be listed on the exchange.

The rationale for this recommendation is quite simple. The product is not ready. It is missing features generally found in automated trading systems. While we have found no major glitches, we have uncovered several problems that require further investigation and resolution. We believe the software is missing features that OTCEI members will need if they are to effectively compete with other markets that trade the same securities.

When these conclusions were first reached, the PW FIRE team had a series of discussions with the OTCEI Management Team. Due to the shortness of time, PW issued an interim assessment of the Assets 8.0 system.

Subsequent to the issuance of the Interim assessment, OTCEI decided that it would abandon further development of its Assets software. The main reasons were:

1. concern about capacity,
2. insufficient technical staff to complete the project in a reasonable manner,
3. a lack of a dynamic update facility for key displays and,
4. a general perception by brokers participating in the training sessions that the system was inferior to the BSE and NSE automated trading systems.

OTCEI then evaluated various alternatives. The most compelling issue was a need for very rapid implementation. As a result, OTCEI decided to implement the Vector (a CMC product) automated trading system. OTCEI's primary reasons for taking this step are:

1. CMC was willing to contractually commit to an extremely fast implementation,
2. Vector is in operation in several exchanges in India and meets OTCEI's basic requirements,
3. Vector has the full range of functions that OTCEI needs to be competitive with other Indian stock exchanges,
4. CMC has an experienced support team capable of providing OTCEI with timely maintenance.

OTCEI asked the PW/FIRE team for recommendations regarding Vector. The team responded that the main issue that must be addressed before finalizing on Vector is the issue of capacity.

We strongly recommend(ed) that 'Volume /Stress' tests be conducted on the Vector system in the presence of OTCEI staff and that OTCEI get written guarantees of software scalability from CMC. These tests should take into cognizance OTCEI's projected transaction volumes.

CMC conducted certain stress tests for OTCEI. The PW/FIRE team was not in attendance. CMC have also agreed to provide contractual commitments regarding system scalability.

Since OTCEI has decided to abandon the Assets 8.0 system, the PW/Fire team did not conduct any further tests of that system.

II Testing Methodology

This is a project to test the Over The Counter Exchange of India's (OTCEI) new Assets 8.0 screen-based trading system. These tests will be limited to testing the changes made for the trading of Permitted securities. It appears that no changes have been made to the Listed segment. Therefore only perfunctory testing will be performed on that segment.

The following types of tests are contemplated:

Tests conducted by the Developers

Since OTCEI staff are preparing for acceptance testing, it is presumed that these tests (Unit, Systems Integration and Operations) have been completed and the results verified. The test results should be reviewed to ensure adherence to specifications.

Unit Test

This is a programming level test to ensure the various software modules perform according to system specifications.

Systems Integration Test

This is a test to ensure that the various software modules fit together as an integrated whole and that those modules work together without interference.

Operations Test

This is a test to ensure that the system's operators understand the system and can run it without assistance from the development staff.

User Acceptance Tests

These tests are conducted by the user department rather than by the developers. The software is frozen (no change are permitted during testing) and turned over the operations department to run the system with the user department actually conducting the tests. Any problems or errors encountered are recorded on special forms prepared for the purpose. Full details of the results encountered must be supplied so that the developers can efficiently diagnose any problems. If problems are encountered, the software is returned to the developers with the test logs and associated problem reports for further testing and problem resolution. This is an iterative process which continues until the system is accepted by the User department.

Function Tests

This is a series of tests which verifies that each function described in the system specifications performs as specified. The tests will be conducted in the following fashion. At the start, the system clocks for the trader workstations will be coordinated. The clocks will made continuously available on each workstation. If possible, the system should be set to log every transaction at each stage of processing. This log would be used to investigate /diagnose any problems encountered.

Each person participating in the test will attempt to execute every function (e.g. order entry, order cancellation, enquiry, Market Watch, etc.) identified in the User Manual. As the test

proceeds those personnel will maintain a written record of their activities. Whenever a problem is encountered, the person conducting the test will record the details of the transaction they were attempting to enter, the time (from the system clock), their observations and any other information they believe pertinent. If development personnel are available at that moment, they should be asked to make their own observations.

Initially these function tests will be concentrated on the workstation functions. In subsequent tests, the back-end computer's processing and data base and will be checked for accuracy and completeness.

Workstation Operating System Tests

The purpose of these tests is to ensure that the workstation's operating system (Windows 3.1) does not and cannot interfere with the trading system. Persons conversant with Windows will attempt to perform various system functions and to violate the system and to cause the system to crash. As with all tests, a written log and a system log will be maintained.

Jointly Conducted Tests

These tests will be conducted jointly with the development department.

Communications Tests

These tests are to analyze how effectively the Assets system can function in a satellite communications (VSAT) environment. Systems using satellite communications must compensate for transmission delays. These are just under one-half second per hop due to the distance the signal must travel.

Volume Stress Tests

These are tests designed to determine how the system performs under high volume conditions. If the system reaches OTCEI's targets, transaction volumes will be enormous. A number of projections of trade volumes have been made. The moderate projections anticipate around 25,000 trades per day at the end of year one growing to 100,000 trades per day at the end of year five. Because the initial volumes will be light and OTCEI are anxious to start on the third of July or as soon as possible thereafter, these tests will be conducted later (after implementation).

Fall-Back Recovery Tests

These are two different types of test. The first is designed to demonstrate that should some unforeseen event occur that caused serious disruption to the existing system, OTCEI technical staff can restore service using the previous version of Assets software. The second test is to determine the overall resilience of the system and its behavior during instances of hardware or electrical failure.

Assets 8.0 Testing Procedure

The following procedures will be used in the testing of Assets 8.0

Testing of functions of Assets 8.0

The functions and features of Assets 8.0 should be tested based on the guidelines mentioned below.

Order Entry

Enter experimental cases in the system with:

- different combination of inputs with valid data
- different combination of inputs with valid and invalid data

Please log each case separately prior to committing the case to the system. Also log the system results.

Order Modification/ Deletion

Attempt to modify and delete cases in the system for:

- fields that are allowed to be modified
- fields that should not be allowed to be modified
- entries that should/ should not be allowed to be modified

Please log each case separately prior to committing the case to the system. Also log the system results.

View Market Order Book/ Consolidated Order Book/ Own Order Book/ Trades & Trades Ticker & Best Bid & Offer Ticker

View these screens/ tickers. Verify where applicable whether details of orders entered by your counter are correctly displayed.

Log any issues identified (including doubtful issues that may require re-confirmation/ further investigation).

Document Printing

Print the documents after committing each case entered and verify the output. Also verify the result of the system for duplicate/ triplicate printing.

Log any issues identified (including doubtful issues that may require re-confirmation/ further investigation).

Please log any observations that you think may help in improving the user friendliness of the system

III. Observations of Function Test

A. Day 1 – June 24

Background

These tests are the first of a series of tests designed to verify that ASSETS 8.0 functions perform properly and in accordance with system specifications and OTCEI rules. Prior to beginning these tests, we received a short (about one hour) explanation of the system and how to use it.

At present, only limited documentation (a 23 page document entitled *Permitted Securities*) is available. As a result personnel conducting the tests have a limited understanding of the system. Thus, they may conclude that a function does not exist because it is not documented or that a function is not performing properly simply because it is not described in the documentation and appears to function differently than expected.

The current Trading Rules concentrate on Listed Securities. The *Business Rules for Trading in Permitted Securities* is almost entirely devoted to post-trade (e.g. settlement, registration, etc.) matters. Nonetheless, the system documentation and Business Rules documents form the primary arbiter of correct functionality.

Day 1 Tests

Two PCs were set up in the OTCEI Conference Room for use in the tests. Some difficulty was encountered in installing the software on the test machines. Addendum 1 contains a print-out of the transaction log for this test and screen-prints illustrating our findings.

1. At present, the current state of the ASSETS 8.0 set-up procedure is such that only experienced personnel with knowledge of the OTCEI system and network are able to perform the set-up task. The first installations will be performed by OTCEI technical staff and, at the remote sites, by the VSAT vendor's engineers. As soon as possible, the set-up procedure should be automated. Initially diskettes could be used. Ultimately, software installation should be fully automated and delivery and set-up of new software effected via downloading over the OTCEI network.
2. The system permitted the logging in from two different workstations using the same log-in ID 'SBI'. This should not be permitted.
3. The second terminal (with the same ID) appeared to partially hang up (an hourglass icon appeared and remained continuously) when we logged in but allowed us to preview mail, print mail and to commit orders.
4. During the review, we rebooted both machines. We then logged in via the workstation which had partially hung up earlier. Following that, we tried to log-in via the first workstation but could not as a SU (super user) ID and password had not been entered. Once the SU ID password was entered, we were able to execute transactions from both workstations. This SU sign-on was not necessary during the earlier sign-ons.
5. We tried to process orders using the 'Order Entry' module. When we entered an order, we received a 'Mailbox' but it did not contain the new order number. When we clicked OK, we received a message that the transaction was successful and that transaction ID 91 was generated. When we next reviewed the Mailbox, we received a message saying that

transaction ID 91 was deactivated (refer Addendum 1).

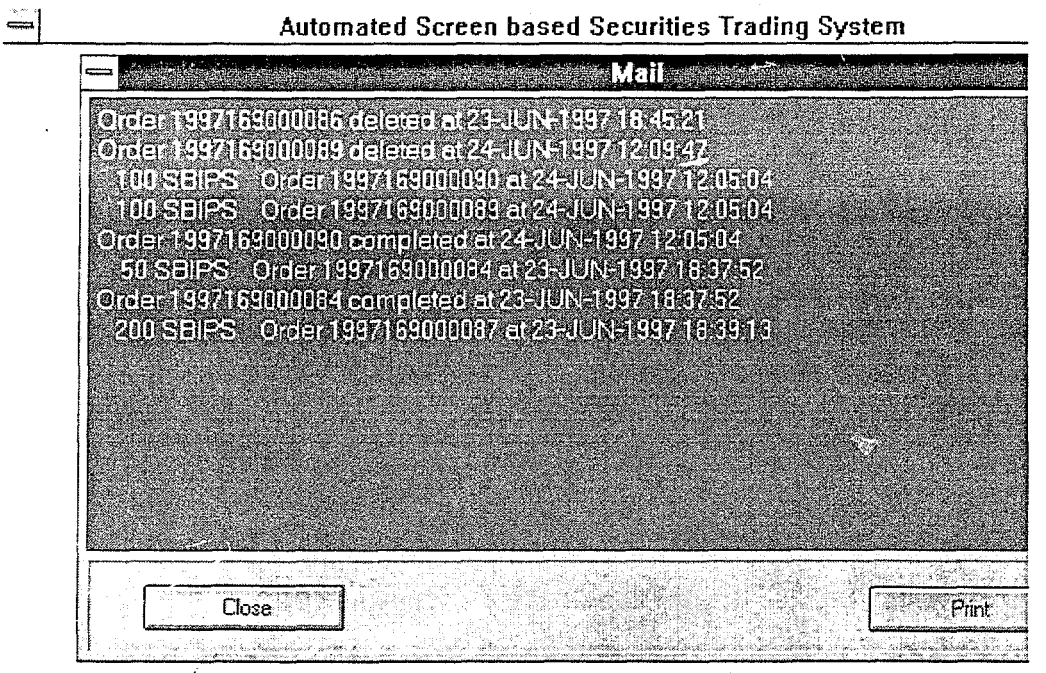
6. As soon as we committed transaction ID 91, the order entry module box reappeared on the screen with the quantity changed to 1. This allowed us to commit a second order for the same security. When we again clicked OK, the system loop repeated itself (assigning Ids and generating de-activated messages).
7. We also noticed that the system did not appear to be generating transaction Ids in sequence. The periodic skipping of Ids may have been caused by another group entering transactions during our test sessions.
8. The system is directing the Transaction Successful messages to the printer by default.
9. When we invoked the Update Mail module, we received an Information Box with the message "Illegal Function Call". When we clicked the OK button, the ASSETS software exited from the system leaving only the Windows Program Manager running (refer Addendum 1).
10. In order entry, the Investor Name and address is absent. Only the Investor Code is used. Is this purposeful?
11. Transaction ID 130 was a buy transaction (for SBI 50) that was not de-activated yet it was not shown in the updated 'Market Watch' list. However we were able to sell SBI 50 at market. When this was done, a Transaction Successful message was flashed on the screen with Order # 132.
12. The Help system is not working. When Help was invoked, we received a message stating "cannot find Help file".
13. The Mutual Fund option is not working. When invoked, the system asks for the path to Mutualfund.exe and NDS.EXE respectively.
14. The menu function 'Windows, Cascade, Tile' does not appear to work properly (i.e. in a standard Windows format).
15. In selecting Options, we discover the software is labeled version 7.0. We should have been, and believe we were, using version 8.0
16. Tool/Market Status – The index is always 0.
17. The Market Watch screen does not appear to be dynamically updated at all times.
18. The Market Watch shows only the best prices. When selecting the Consolidated Order Book or Market Order Book from the Market Watch screen, the full book does not appear, only the Users own orders appear.

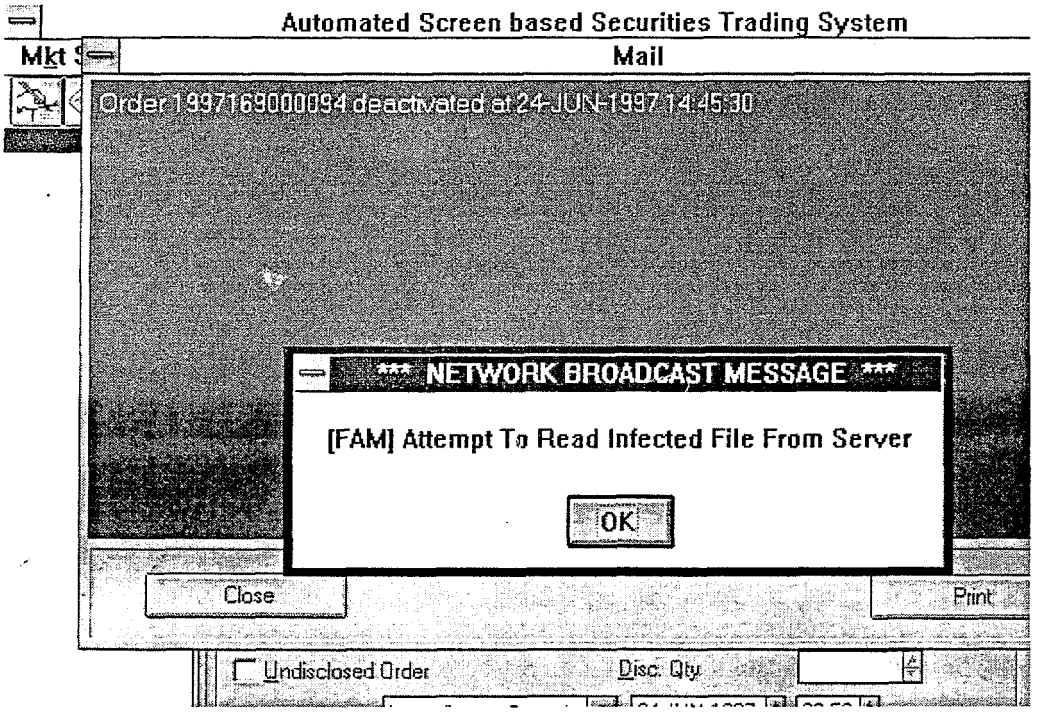
Addendum 1 – Transaction Log and screen prints

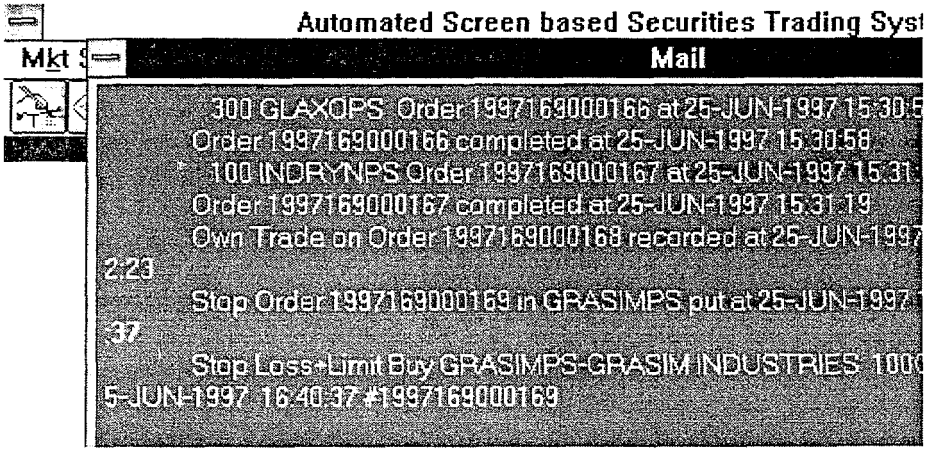
```
Order 1997169000086 deleted at 23-JUN-1997 18:45:21
_Order 1997169000089 deleted at 24-JUN-1997 12:09:47
_   100 SBIPS     Order 1997169000090 at 24-JUN-1997 12:05:04
_   100 SBIPS     Order 1997169000089 at 24-JUN-1997 12:05:04
_Order 1997169000090 completed at 24-JUN-1997 12:05:04
_    50 SBIPS     Order 1997169000084 at 23-JUN-1997 18:37:52
_Order 1997169000084 completed at 23-JUN-1997 18:37:52
_   200 SBIPS     Order 1997169000087 at 23-JUN-1997 18:39:13
_
_Order 1997169000086 deleted at 23-JUN-1997 18:45:21
_Order 1997169000089 deleted at 24-JUN-1997 12:09:47
_   100 SBIPS     Order 1997169000090 at 24-JUN-1997 12:05:04
_   100 SBIPS     Order 1997169000089 at 24-JUN-1997 12:05:04
_Order 1997169000090 completed at 24-JUN-1997 12:05:04
_    50 SBIPS     Order 1997169000084 at 23-JUN-1997 18:37:52
_Order 1997169000084 completed at 23-JUN-1997 18:37:52
_   200 SBIPS     Order 1997169000087 at 23-JUN-1997 18:39:13
_
_Order 1997169000086 deleted at 23-JUN-1997 18:45:21
_Order 1997169000089 deleted at 24-JUN-1997 12:09:47
_   100 SBIPS     Order 1997169000090 at 24-JUN-1997 12:05:04
_   100 SBIPS     Order 1997169000089 at 24-JUN-1997 12:05:04
_Order 1997169000090 completed at 24-JUN-1997 12:05:04
_    50 SBIPS     Order 1997169000084 at 23-JUN-1997 18:37:52
_Order 1997169000084 completed at 23-JUN-1997 18:37:52
_   200 SBIPS     Order 1997169000087 at 23-JUN-1997 18:39:13
_
_Order 1997169000086 deleted at 23-JUN-1997 18:45:21
_Order 1997169000089 deleted at 24-JUN-1997 12:09:47
_   100 SBIPS     Order 1997169000090 at 24-JUN-1997 12:05:04
_   100 SBIPS     Order 1997169000089 at 24-JUN-1997 12:05:04
_Order 1997169000090 completed at 24-JUN-1997 12:05:04
_
_Market Buy AKSHA1PD-ICICI AKSHAY OP.I  100@0.00 at 24-JUN-1997_
14:20:34_#1997169000091_Order 1997169000089 deleted at 24-JUN-1997 12:09:47
_Order 1997169000091 deactivated at 24-JUN-1997 14:20:35
_
_Market Buy AKSHA1PD-ICICI AKSHAY OP.I  1@0.00 at 24-JUN-1997_
14:24:59_#1997169000092_Order 1997169000092 deactivated at 24-JUN-1997
14:24:59
_
_Market Buy AKSHA1PD-ICICI AKSHAY OP.I  1@0.00 at 24-JUN-1997_
14:25:56_#1997169000093_Order 1997169000093 deactivated at 24-JUN-1997
14:25:56
_
_Market Buy AKSHA1PD-ICICI AKSHAY OP.I  1@0.00 at 24-JUN-1997_
14:45:30_#1997169000094_Order 1997169000094 deactivated at 24-JUN-1997
14:45:30
_
_Market Buy AKSHA1PD-ICICI AKSHAY OP.I  1@0.00 at 24-JUN-1997_
14:47:12_#1997169000096_Order 1997169000096 deactivated at 24-JUN-1997
14:47:12
_
_Market Buy AKSHA1PD-ICICI AKSHAY OP.I  1@0.00 at 24-JUN-1997_
15:18:34_#1997169000109_Order 1997169000109 deactivated at 24-JUN-1997
```

```
15:18:35
-
_Market Buy AKSHA1PD-ICICI AKSHAY OP.I  1@0.00 at 24-JUN-1997_
15:22:46_#1997169000110_Order 1997169000110 deactivated at 24-JUN-1997
15:22:46
-
_Market Buy AKSHA1PD-ICICI AKSHAY OP.I  1@0.00 at 24-JUN-1997_
15:33:21_#1997169000111_Order 1997169000111 deactivated at 24-JUN-1997
15:33:22
_Market Buy AKSHA1PD-ICICI AKSHAY OP.I  1@0.00 at 24-JUN-1997_
15:34:11_#1997169000112_Order 1997169000112 deactivated at 24-JUN-1997
15:34:11
_Market Buy ALAMINPS-ALKYL AMINES LIMITED  50@0.00 at 24-JUN-1997_
15:34:52_#1997169000113_Order 1997169000113 deactivated at 24-JUN-1997
15:34:52
_Market Buy ALAMINPS-ALKYL AMINES LIMITED  50@0.00 at 24-JUN-1997_
15:35:19_#1997169000114_Order 1997169000114 deactivated at 24-JUN-1997
15:35:19
_Market Buy RELIANPS-RELIANCE INDUSTRIES  50@0.00 at 24-JUN-1997_
15:48:35_#1997169000115_Order 1997169000115 deactivated at 24-JUN-1997
15:48:35
_Market Buy RELIANPS-RELIANCE INDUSTRIES  50@0.00 at 24-JUN-1997_
15:49:23_#1997169000116_Order 1997169000116 deactivated at 24-JUN-1997
15:49:23
_Market Buy RELIANPS-RELIANCE INDUSTRIES  50@0.00 at 24-JUN-1997_
15:49:39_#1997169000117_Order 1997169000117 deactivated at 24-JUN-1997
15:49:39
_Market Buy RELIANPS-RELIANCE INDUSTRIES  50@0.00 at 24-JUN-1997_
15:57:05_#1997169000118_Order 1997169000118 deactivated at 24-JUN-1997
15:57:06
_Market Buy RELIANPS-RELIANCE INDUSTRIES  50@0.00 at 24-JUN-1997_
16:01:30_#1997169000119_Order 1997169000119 deactivated at 24-JUN-1997
16:01:31
_Market Sell RELIANPS-RELIANCE INDUSTRIES  50@0.00 at 24-JUN-1997_
16:01:53_#1997169000120_Order 1997169000120 deactivated at 24-JUN-1997
16:01:53
_Market Buy RELIANPS-RELIANCE INDUSTRIES  50@0.00 at 24-JUN-1997_
16:02:31_#1997169000121_Order 1997169000121 deactivated at 24-JUN-1997
16:02:31
_Limit Buy RELIANPS-RELIANCE INDUSTRIES  50@189.00 at 24-JUN-1997_
16:04:37_#1997169000122_Own Trade on Order 1997169000122 recorded at 24-
JUN-1997 16:04:37
_Limit Sell RELIANPS-RELIANCE INDUSTRIES  50@189.00 at 24-JUN-1997_
16:04:51_#1997169000123_Error in Neg. Order 1997169000123,fails LTP
check24-JUN-1997 16:04:51
_Limit Sell RELIANPS-RELIANCE INDUSTRIES  50@189.00 at 24-JUN-1997_
16:05:09_#1997169000124_Error in Neg. Order 1997169000124,fails LTP
check24-JUN-1997 16:05:09
_Limit Buy RELIANPS-RELIANCE INDUSTRIES  50@189.00 at 24-JUN-1997_
16:05:26_#1997169000125_Own Trade on Order 1997169000125 recorded at 24-
JUN-1997 16:05:26
_Limit Buy RELIANPS-RELIANCE INDUSTRIES  50@189.00 at 24-JUN-1997_
16:05:38_#1997169000126_Order 1997169000086 deleted at 23-JUN-1997 18:45:21
_Order 1997169000089 deleted at 24-JUN-1997 12:09:47
_    100 SBIPS    Order 1997169000090 at 24-JUN-1997 12:05:04
_    100 SBIPS    Order 1997169000089 at 24-JUN-1997 12:05:04
_Order 1997169000090 completed at 24-JUN-1997 12:05:04
```

```
_     50 SBIPS    Order 1997169000084 at 23-JUN-1997 18:37:52
_Order 1997169000084 completed at 23-JUN-1997 18:37:52
_    200 SBIPS    Order 1997169000087 at 23-JUN-1997 18:39:13
_Order 1997169000115 deactivated at 24-JUN-1997 15:48:35
_Order 1997169000116 deactivated at 24-JUN-1997 15:49:23
_Order 1997169000117 deactivated at 24-JUN-1997 15:49:39
_Order 1997169000118 deactivated at 24-JUN-1997 15:57:06
_Order 1997169000119 deactivated at 24-JUN-1997 16:01:31
_Order 1997169000120 deactivated at 24-JUN-1997 16:01:53
_Order 1997169000121 deactivated at 24-JUN-1997 16:02:31
_Own Trade on Order 1997169000122 recorded at 24-JUN-1997 16:04:37
_Error in Neg. Order 1997169000123,fails LTP check24-JUN-1997 16:04:51
_Error in Neg. Order 1997169000124,fails LTP check24-JUN-1997 16:05:09
_Own Trade on Order 1997169000125 recorded at 24-JUN-1997 16:05:26
_Own Trade on Order 1997169000126 recorded at 24-JUN-1997 16:05:38
_Own Trade on Order 1997169000126 recorded at 24-JUN-1997 16:05:38
_Order 1997169000127 deactivated at 24-JUN-1997 16:07:11
_Order 1997169000128 deactivated at 24-JUN-1997 16:07:34
_Market Buy SBIPS-STATE BANK OF INDIA  50@0.00 at 24-JUN-1997_
16:29:59_#1997169000129_Order 1997169000129 deactivated at 24-JUN-1997
16:29:59
_Market Buy SBIPS-STATE BANK OF INDIA  50@0.00 at 24-JUN-1997_
16:30:42_#1997169000130_Order 1997169000130 deactivated at 24-JUN-1997
16:30:42
_Market Buy SBIPS-STATE BANK OF INDIA  100@0.00 at 24-JUN-1997_
16:33:54_#1997169000131_Order 1997169000131 deactivated at 24-JUN-1997
16:33:54
_Market Sell SBIPS  50@0.00 at 24-JUN-1997_ 16:39:43_#1997169000132_
Order 1997169000132 deactivated at 24-JUN-1997 16:39:43
_Market Buy SBIPS-STATE BANK OF INDIA  200@0.00 at 24-JUN-1997_
16:51:42_#1997169000133_Order 1997169000133 deactivated at 24-JUN-1997
16:51:42
_Market Buy SBIPS-STATE BANK OF INDIA  50@0.00 at 24-JUN-1997_
16:51:59_#1997169000134_Order 1997169000134 deactivated at 24-JUN-1997
16:51:59
_
```


Automated Screen based Securities Trading System
Mail
Order 1997169000086 deleted at 23-JUN-1997 18:45:21
Order 1997169000089 deleted at 24-JUN-1997 12:09:47
100 SBIPS Order 1997169000090 at 24-JUN-1997 12:05:04
100 SBIPS Order 1997169000089 at 24-JUN-1997 12:05:04
Order 1997169000090 completed at 24-JUN-1997 12:05:04
50 SBIPS Order 1997169000084 at 23-JUN-1997 18:37:52
Order 1997169000084 completed at 23-JUN-1997 18:37:52
200 SBIPS Order 1997169000087 at 23-JUN-1997 18:39:13
Close
Print


Automated Screen based Securities Trading System
Mkt
Mail
Order 1997169000094 deactivated at 24-JUN-1997 14:45:30
*** NETWORK BROADCAST MESSAGE ***
[FAM] Attempt To Read Infected File From Server
OK
Close
Print
Undisclosed Order
Disc. Qty


Automated Screen based Securities Trading Syst
Mkt
Mail
300 GLAXOPS Order 1997169000166 at 25-JUN-1997 15:30:5
Order 1997169000166 completed at 25-JUN-1997 15:30:58
100 INDRYNPS Order 1997169000167 at 25-JUN-1997 15:31:
Order 1997169000167 completed at 25-JUN-1997 15:31:19
Own Trade on Order 1997169000168 recorded at 25-JUN-199
2:23
Stop Order 1997169000169 in GRASIMPS put at 25-JUN-1997
:37
Stop Loss+Limit Buy GRASIMPS-GRASIM INDUSTRIES 100
5-JUN-1997 16:40:37 #1997169000169

B. Day 2 – June 25

BACKGROUND

This test was constrained due to limited availability of workstations. One broker workstation was not available until 12:00 because a hardware set-up had not been performed. The second machine was not available as it was being used for setting up other machines (OTCEI were setting up six other workstations in its large conference room for use by brokers at start-up).

Day 2 Tests

1. Scrip Code: We saw news flashing for Glaxo but could not find the name Glaxo in the Scrip Code List (refer to screen 3 day 1, Addendum 1).
2. We received a message dialog box highlighting a deal done in Glaxo at 15:30 and also for Indrynps at 15:31. None of these transactions were entered or executed by us.
3. The Scrip Code field is cryptic and conversions used in coding are not very user friendly (e.g. for GIC Mutual Fund, the code is GR91CBPS).
4. Both Brokerage fields (absolute and percentage) in the Order Entry form accept any numeric value. A reasonableness check should be performed by the system. The Business Rules must be checked for the percentages that may be charged by brokers. The software should reject any transactions which violated the limits imposed by the Business Rules.
5. Scrip Code and other fields can be left blank. The error message appears only when the OK button is clicked.
6. Total Quantity field, on selecting a "scrip" by default shows marketable lot but any figure can be entered in this field.
7. The Time field can be set to any time. This field should be limited to trading hours.
8. After clicking 'Own Trade', we were unable to switch to 'Single Trade' without disabling Own Trade.
9. After inputting all order details and clicking OK, a Mailbox appears but it did not show the transaction that was just entered. After closing the Mailbox, a Dialog Box was flashed saying transaction ID ...168 was successful (buy 100 Grasim @ 280). Following this, the Message Box did not show us that the order was recorded but we were able to see that order in the Market Order Book and the Consolidated Order Book.
10. The same key is used as a short-cut for two different functions. For example, Alt +:
    - T: Time Validity and Single Trade;
    - S: Scrip Code and Stop Loss Code;
    - M: Limit Price and Minimum fill Quantity; and
    - U: Undisclosed Order and Buy.

Addendum – Transaction Log

```
50 SBIPS    Order 1997169000084 at 23-JUN-1997 18:37:52
_Order 1997169000084 completed at 23-JUN-1997 18:37:52
_   200 SBIPS    Order 1997169000087 at 23-JUN-1997 18:39:13
_Order 1997169000086 deleted at 23-JUN-1997 18:45:21
_   100 SBIPS    Order 1997169000090 at 24-JUN-1997 12:05:04
_   100 SBIPS    Order 1997169000089 at 24-JUN-1997 12:05:04
_Order 1997169000090 completed at 24-JUN-1997 12:05:04
_Order 1997169000089 deleted at 24-JUN-1997 12:09:47
_Order 1997169000091 deactivated at 24-JUN-1997 14:20:35
_Order 1997169000092 deactivated at 24-JUN-1997 14:24:59
_Order 1997169000093 deactivated at 24-JUN-1997 14:25:56
_Order 1997169000094 deactivated at 24-JUN-1997 14:45:30
_Order 1997169000096 deactivated at 24-JUN-1997 14:47:12
_Order 1997169000109 deactivated at 24-JUN-1997 15:18:35
_Order 1997169000110 deactivated at 24-JUN-1997 15:22:46
_Order 1997169000111 deactivated at 24-JUN-1997 15:33:22
_Order 1997169000112 deactivated at 24-JUN-1997 15:34:11
_Order 1997169000113 deactivated at 24-JUN-1997 15:34:52
_Order 1997169000114 deactivated at 24-JUN-1997 15:35:19
_Order 1997169000115 deactivated at 24-JUN-1997 15:48:35
_____Order 1997169000115 deactivated at 24-JUN-1997 15:48:35
_Order 1997169000116 deactivated at 24-JUN-1997 15:49:23
_Order 1997169000117 deactivated at 24-JUN-1997 15:49:39
_Order 1997169000118 deactivated at 24-JUN-1997 15:57:06
_Order 1997169000119 deactivated at 24-JUN-1997 16:01:31
_Order 1997169000120 deactivated at 24-JUN-1997 16:01:53
_Order 1997169000121 deactivated at 24-JUN-1997 16:02:31
_Own Trade on Order 1997169000122 recorded at 24-JUN-1997 16:04:37
_Error in Neg. Order 1997169000123,fails LTP check24-JUN-1997
16:04:51     _Error in Neg. Order 1997169000124,fails LTP check24-
JUN-1997 16:05:09     _Own Trade on Order 1997169000125 recorded at
24-JUN-1997 16:05:26          _Own Trade on Order 1997169000126
recorded at 24-JUN-1997 16:05:38          _Order 1997169000127
deactivated at 24-JUN-1997 16:07:11                    _Order
1997169000128 deactivated at 24-JUN-1997 16:07:34
_Order 1997169000129 deactivated at 24-JUN-1997 16:29:59
_Order 1997169000130 deactivated at 24-JUN-1997 16:30:42
_Order 1997169000131 deactivated at 24-JUN-1997 16:33:54
_Order 1997169000132 deactivated at 24-JUN-1997 16:39:43
_Order 1997169000133 deactivated at 24-JUN-1997 16:51:42
_Order 1997169000134 deactivated at 24-JUN-1997 16:51:59
_____Limit Buy GRASIMPS-GRASIM INDUSTRIES  100@280.00 at 25-JUN-1997_
15:52:23_#1997169000168
_Order 1997169000134 deactivated at 24-JUN-1997 16:51:59
_   100 RELIANPS Order 1997169000136 at 25-JUN-1997 11:48:27
_Order 1997169000136 completed at 25-JUN-1997 11:48:27
_Order 1997169000139 deactivated at 25-JUN-1997 12:30:38
_   200 RELIANPS Order 1997169000140 at 25-JUN-1997 12:33:08
_   200 RELIANPS Order 1997169000141 at 25-JUN-1997 12:33:08
_Order 1997169000142 deactivated at 25-JUN-1997 12:35:36
_Order 1997169000140 deleted at 25-JUN-1997 12:54:48
_Order 1997169000143 deleted at 25-JUN-1997 12:55:44
_Order 1997169000144 deleted at 25-JUN-1997 12:56:50
_   100 RELIANPS Order 1997169000145 at 25-JUN-1997 12:57:53
_   100 RELIANPS Order 1997169000146 at 25-JUN-1997 12:57:53
_Order 1997169000145 completed at 25-JUN-1997 12:57:53
```

```
_Order 1997169000147 deactivated at 25-JUN-1997 13:36:33
_    300 GLAXOPS  Order 1997169000166 at 25-JUN-1997 15:30:58
_Order 1997169000166 completed at 25-JUN-1997 15:30:58
_    100 INDRYNPS Order 1997169000167 at 25-JUN-1997 15:31:19
_Order 1997169000167 completed at 25-JUN-1997 15:31:19
_Own Trade on Order 1997169000168 recorded at 25-JUN-1997 15:52:23
_____Stop Order 1997169000169 in GRASIMPS put at 25-JUN-1997 16:40:37
_____Stop Loss+Limit Buy GRASIMPS-GRASIM INDUSTRIES  100@0.00 at 25-
JUN-1997_ 16:40:37_#1997169000169_Market Buy ABBPS-ASEA BROWN BOVERI
50@0.00 at 25-JUN-1997_ 16:55:14_#1997169000170_Order 1997169000170
deactivated at 25-JUN-1997 16:55:14
_____Market Buy ABBPS-ASEA BROWN BOVERI  50@0.00 at 25-JUN-1997_
16:57:56_#1997169000171_Order 1997169000171 deactivated at 25-JUN-
1997 16:57:57
_____Limit Buy ABBPS-ASEA BROWN BOVERI  100@800.00 at 25-JUN-1997_
17:02:54_#1997169000172_
```

Observations of Function Test 1 – Day 3 – June 26

Background

Two workstations were used. Only one ID was available initially (this was used on both workstations). Around 14:30 we received additional sign-on Ids. Reference screen prints are shown in Addendum1.

Day 2 Tests

1. As soon as we logged into **Assets 8 (Test)**, the "Market Watch Window" displayed Reliance scrip with following buy and sell orders

   Buy 100 @ 281.25 and Sell 200 @ 281.25 with a open price @ 189/-.

   All of the orders that we processed yesterday i.e. on day 2 (25/06/97) were "Good Till Day" . The system should have cancelled these orders at the end of the day 2 and should not have displayed them as live orders today i.e. day 3 (26/06/97).

   This confirms that :

   - The system is not cancelling the "Good Till Day " orders the next day.
   - No market surveillance is available.(i.e. the band width for the scrip is not set).
   - The deal displayed was not struck even though the buy and sell orders were available at the same price. (However we could not verify the reference numbers of these orders and hence could not confirm whether these are single trade orders).

   Ref : Mess13.bmp & Mess14.bmp

2. We later placed an order for Buy 50 Reliance @ 282/- .The order was successfully placed generating ID number 1997169000184. However while updating the Market Watch Window, the application system removed the entire quantity available from the market watch window (i.e. buy 100 @ 281.25 and sell 200 @ 281.25) and replaced it with this order of Buy 50 @ 282/-.

   This confirms that the system is not updating the Market Watch Window correctly.

3. The scrip ABBPS was available for sell 100 qty. @ 601.05 in the Market Watch Window. We further placed an order for sell 50 qty. of ABBPS @ 600.00.

   The system displayed a message that the order was successful. Further the Market Watch Window should have replaced this order as the best sell order. However the Market Watch Window did not display this scrip at all.

   Ref : Mess16.bmp & Mess17.bmp

4. The application system is not calculating the turnover properly. Further it is not calculating the index at all.

   Ref : Mess18.bmp & Mess19.bmp

5. The Market Watch Window was blank before we processed the following order.

   Buy 50 ABBPS @ 280.

   After this order was placed successfully, the Market Watch Window displayed the following results. Buy 50 ABBPS @ 280 and **Sell 50 ABBPS @ 600.**

   Ref : Mess20.bmp & Mess21.bmp

6. The following orders were successfully placed by us.

   Buy 5 ACCPS @ 107/-

   Buy 5 ACCPS @ 5/-

   When we placed the orders successfully, the **open price** was updated to 1050/- from 1027/-.

   Ref : Mess22.bmp, Mess23.bmp & Mess24.bmp & Mess17.bmp

   Id: 1997169000194, 1997169000195

7. The Market Order Book showed the following orders for ACC were in the system.

The Buy Orders		**The Sell Orders**	
Qty	Rate	Qty	Rate
5	1050	5	15000
5	1027	5	100000
10	1020	10	
10	1000		
5	100		
35			

   a. We sold 5 @ 1000/- but the deal was **not** struck ***though*** this was the best sell available in the system. We sold 15 @ 500, this deal was struck appropriately.

8. The system would not allow us to sell a scrip at **market price**. The system flashed a message "Transaction successful", although the mail box gave us the message "Order is deactivated" and the price of the order is 0.00.

   As this order was an **immediate** type order and the match was available in the Market Watch Window, the deal should have been struck. We failed to understand why the order was deactivated.

   Ref : 1997169000216, 1997169000219

9. In the modify order module, help for order number is not available and the user need to remember /have record of the 13 digit order number for inputting it.

10. The Market Order Book Displayed the following orders were live in the system.

The Buy Orders		**The Sell Orders**	
Qty	Rate	Qty	Rate
5	8000	5	15000
5	1050	5	100000*
5	1027	10	
10	1020		
10	1000		
5	100		
35			

* We modified order #1997169000203 changing the price from Rs. 100000 to Rs 6000. For this change order #1997169000203 was deleted and a new order was created by the system #1997169000221.

The Market Order Book then displayed following status.

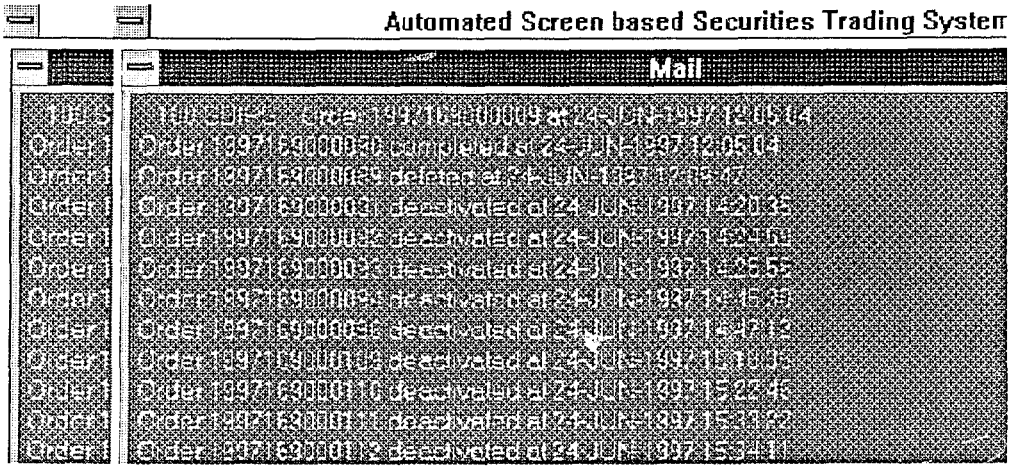
The Buy Orders		**The Sell Orders**	
Qty	Rate	Qty	Rate
5	**8000**	**5**	**6000**
5	1050	5	15000
5	1027	10	
10	1020		
10	1000		
5	100		
35			

This became the best sell order in the system but it was not matched by the system and the deal was not struck.

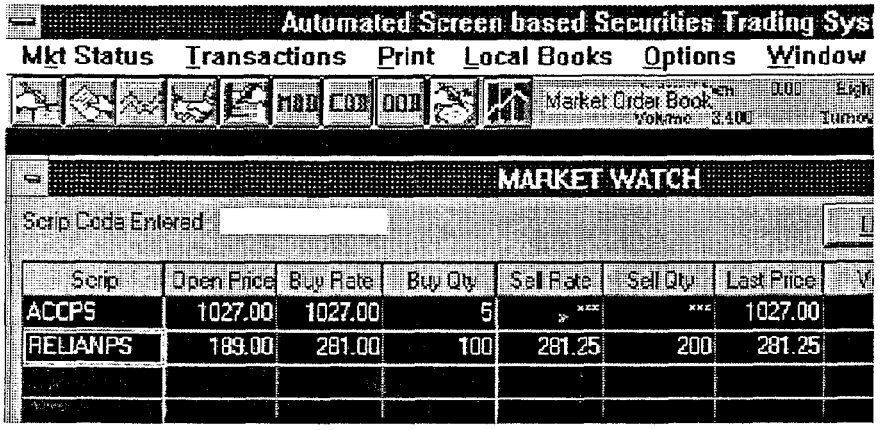
11. After pressing F3 / F4, it appears that (Buy Order and Sell Order):

- The number of scrips that the Market Watch Window can display differs in different user logins
- The space utilized by different 'pop up' screens which the broker may use together would differ; therefore each broker may experience different levels of difficulty / ease in using (viewing) these windows (simultaneously)

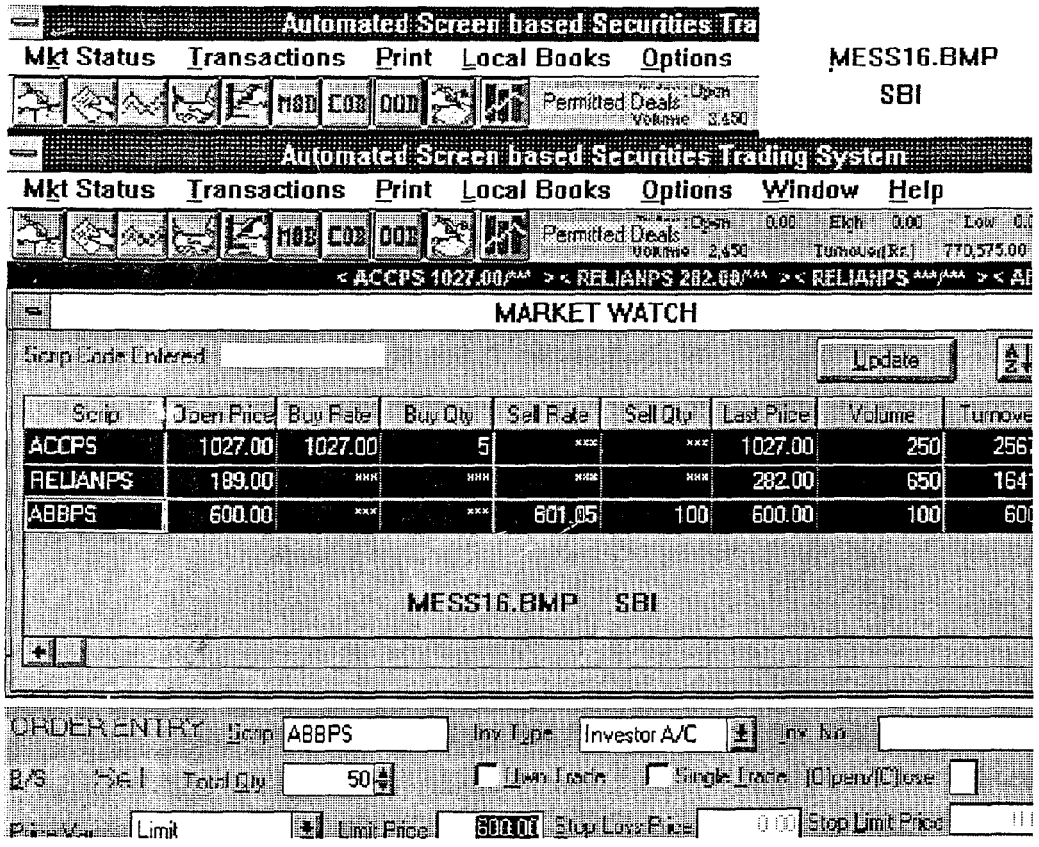
Addendum 1 – Referenced Screen Prints

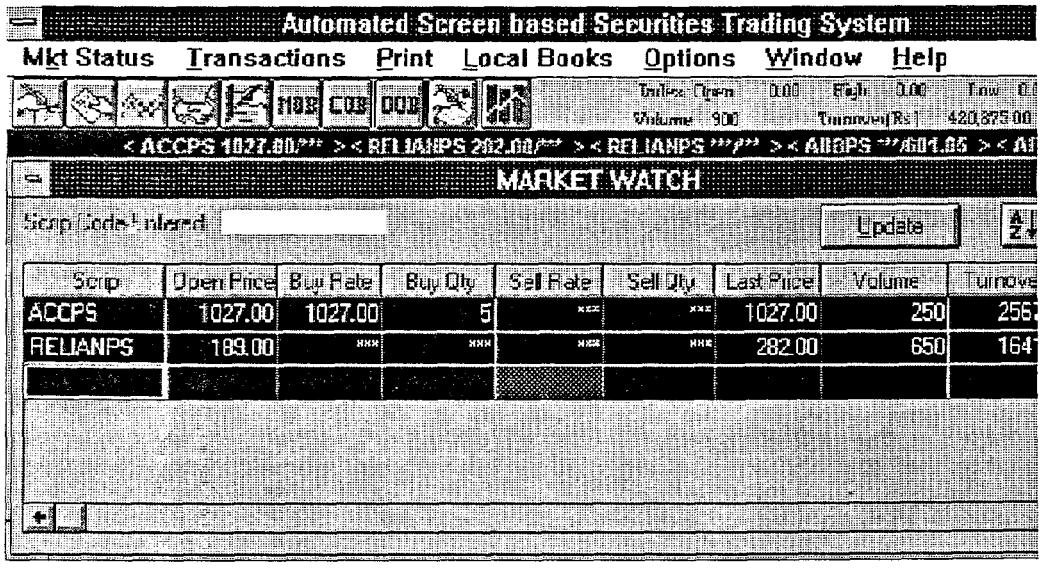


MESS13.BMP SBI

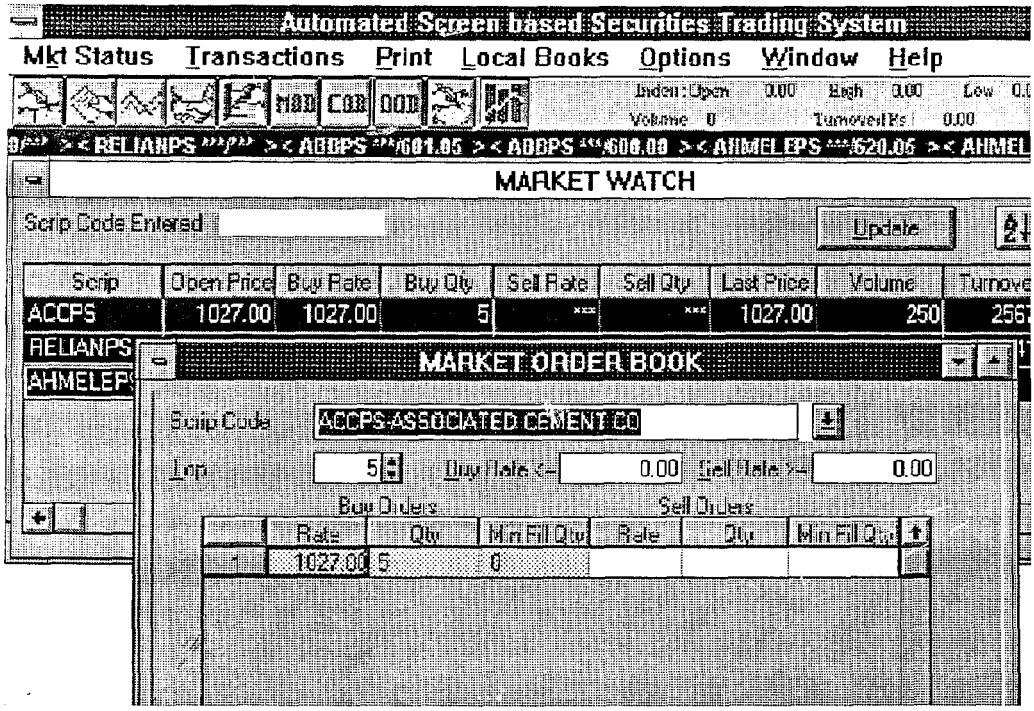


MESS14.BMP SBI

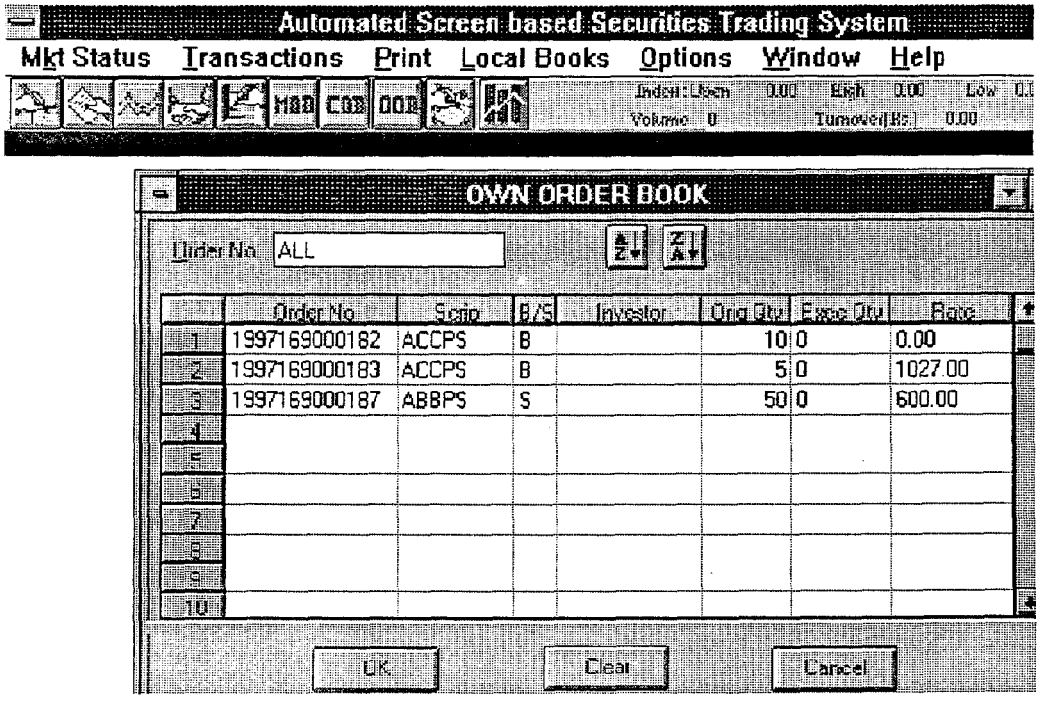




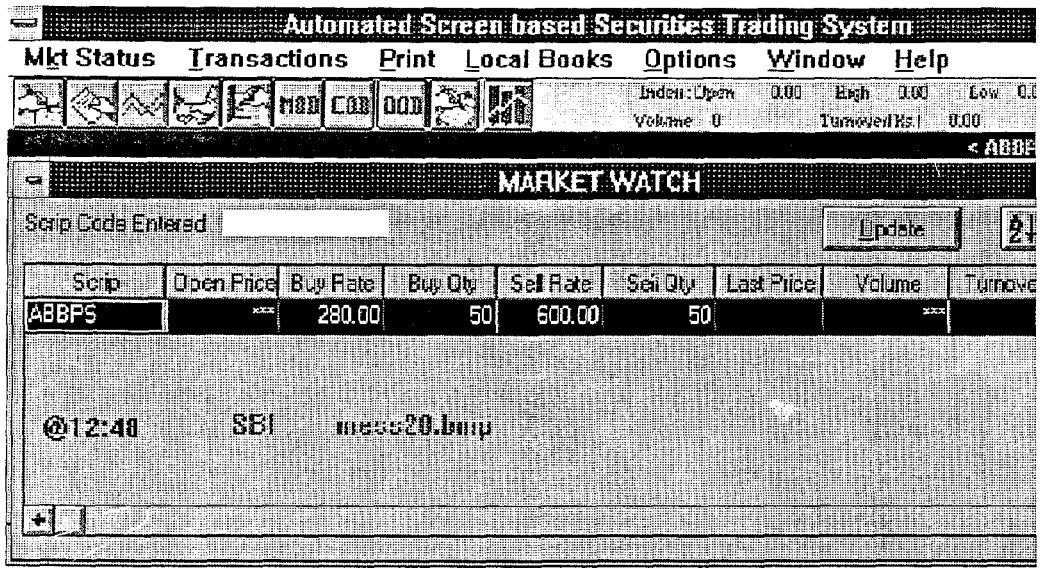
MESS17.BMP SBI

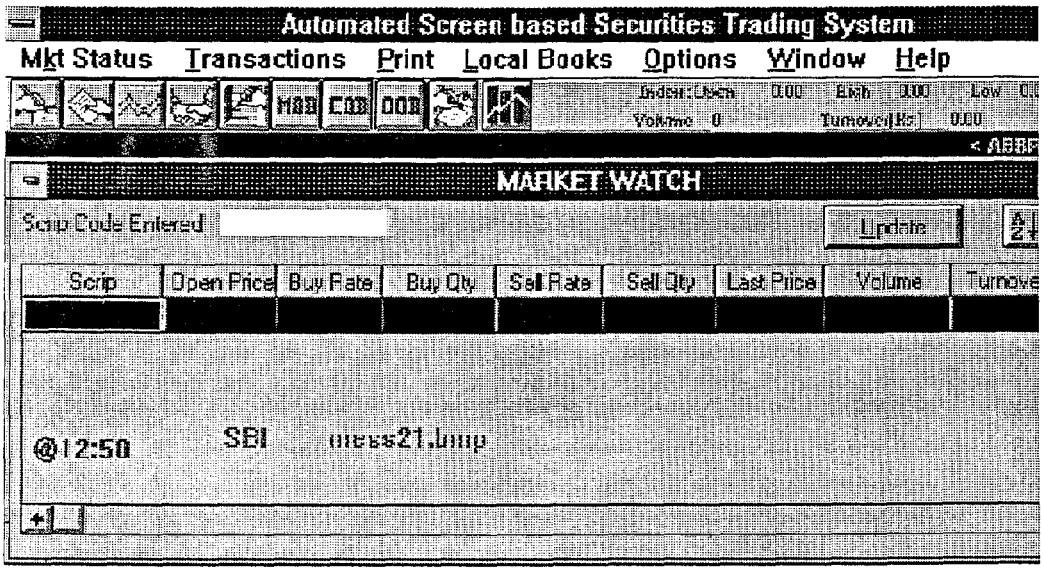


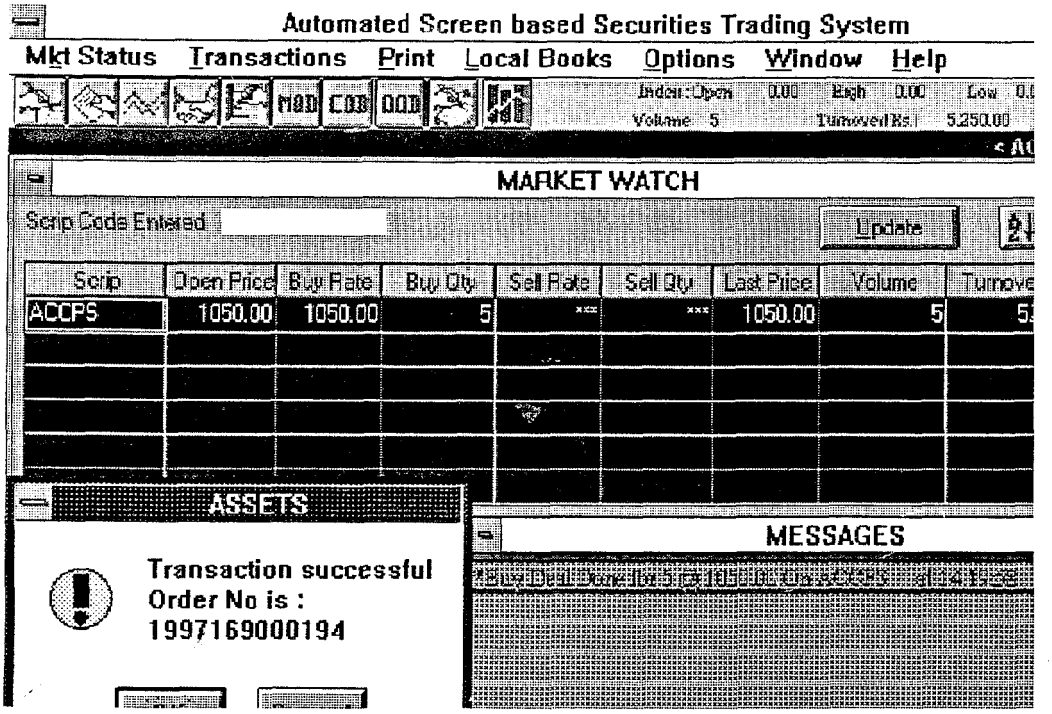
MESS18.BMP SBI



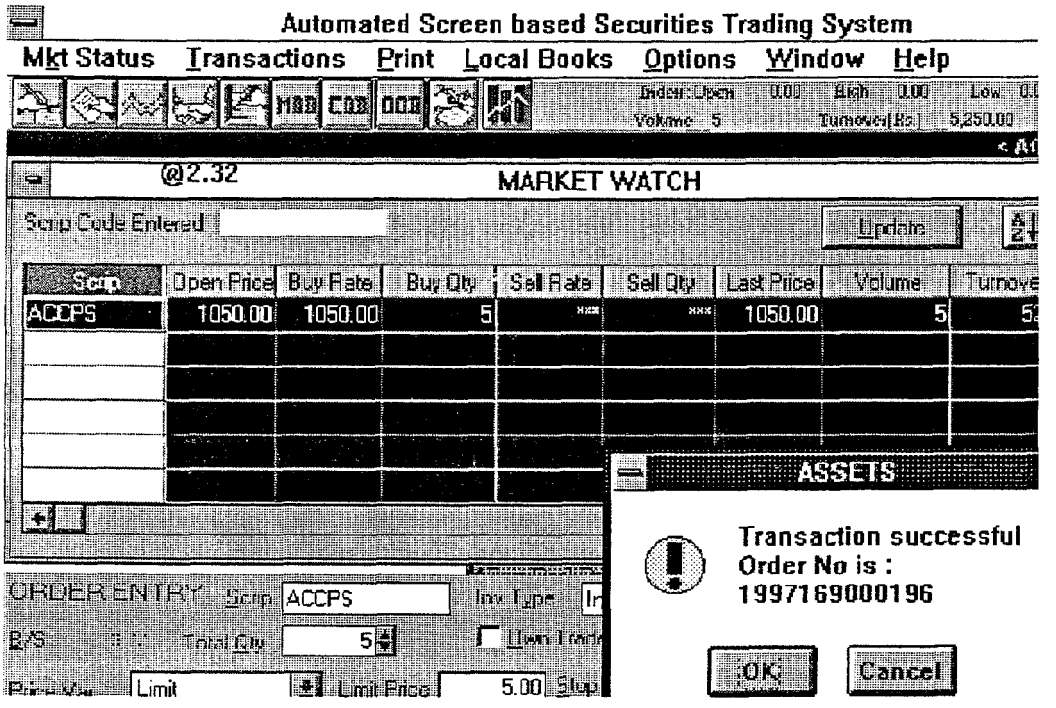
mess19.bmp SBI


Automated Screen based Securities Trading System
Mkt Status
Transactions
Print
Local Books
Options
Window
Help
MARKET WATCH
Scrip Code Entered
Update
Scrip
Open Price
Buy Rate
Buy Qty
Sell Rate
Sell Qty
Last Price
Volume
ABBPS
280.00
50
600.00
50
@12:48
SBI
mess20.bmp

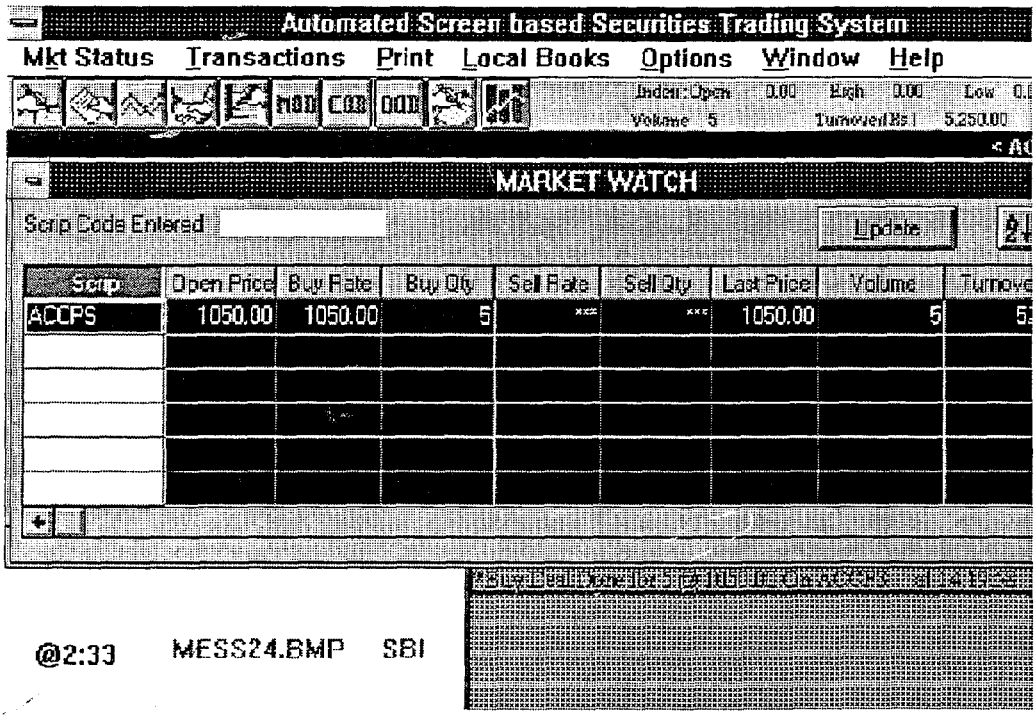

Automated Screen based Securities Trading System
Mkt Status
Transactions
Print
Local Books
Options
Window
Help
MARKET WATCH
Scrip Code Entered
Update
Scrip
Open Price
Buy Rate
Buy Qty
Sell Rate
Sell Qty
Last Price
Volume
@12:50
SBI
mess21.bmp



SBI MESS22.BMP



MESS23.BMP SBI


Automated Screen based Securities Trading System
Mkt Status
Transactions
Print
Local Books
Options
Window
Help
MARKET WATCH
Scrip Code Entered
Update
Scrip
Open Price
Buy Rate
Buy Qty
Sell Rate
Sell Qty
Last Price
Volume
ACCPS
1050.00
1050.00
5
1050.00
5
@2:33
MESS24.BMP
SBI

D. Day 4 – June 27

1. The system generates a 13 digit transaction number for each order entered into the system. This order number includes Julian date which is not user friendly. A mechanism for translating the date to the Gregorian calendar should be provided. In addition, OTCEI members should be provided a way to translate the transaction number to their internal order number. **Ref: Figure 1**
2. The help file does not provide any information on Permitted Securities trading. For example, stop loss, open /closed order, system /user password set up, trade confirmation slips, etc. is not available in the help file.

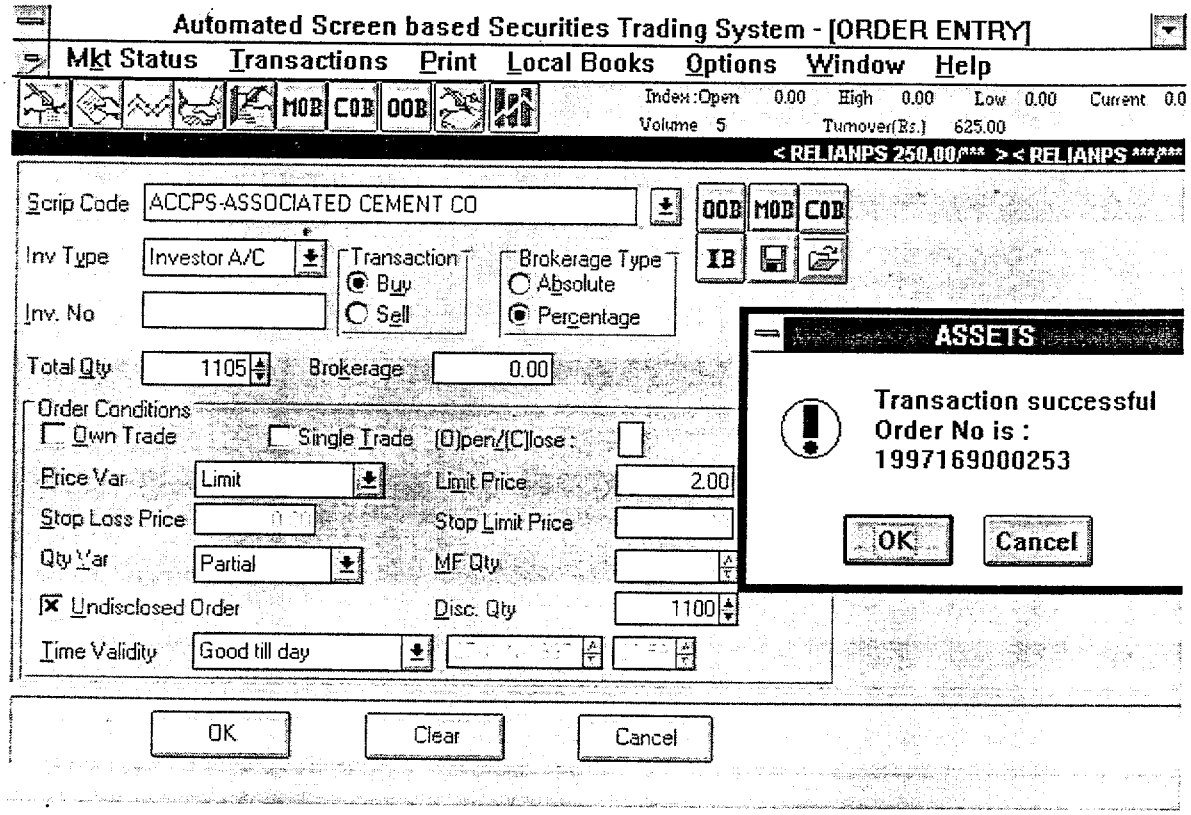
   The information available about permitted securities, password is just a two line text message that is meaningless to the users.
3. No end Of Day (EOD) and Start Of Day (SOD) procedures are defined in the application system that ensures printing of the critical reports, order slips etc. at the day end automatically.
4. The system does not allow the user to print successful orders or contracts for executed trades.
5. A mechanism for browsing Trade Nos. is not available in the system.
6. Further the **trade no** is not flashed by the system when the trade is done (we receive the message "deal is done".)
7. After placing the order successfully, the system flashes a dialog box with the message "Transaction Successful". It flashes the message "Deal is Done" when the order is executed.
   a) If the message "Transaction Successful" is taken to mean that the deal is successful by brokers(?); it may lead to confusion. Therefore the system should provide messages as "Order Successful" or Order Accepted. Further after executing the order the system should flash message as "Order executed **Or** Trade successful".
8. After placing three successful orders i.e. 1997169000249, 1997169000250, 1997169000251, the deals were updated properly in Market Watch Window. however these were not **own trades**.
   a) Later a buy transaction was committed with **own trade**. The transaction was successful and the order number got generated at 1997169000252. We received a message in the mail box that it 'is recorded'.
   b) Later the Market Watch Window didn't show any of the orders and the screen was blank. Also hot keys like F5 (For viewing Market Order Book) and F6 (For viewing consolidated Order Book) did not show any orders.
9. Password administration is weak. The minimum length of the password for the user IDs (it could be six) is not defined in the system. The system accepts obvious passwords (i.e. BMD for BMD login).
10. As soon as we login we need to click on Asset 7 group (we are testing Asset 8.0).
    a) Further in this window another icon is identified as Asset 8 (Test). Along with this

icon we have other icons which do not function. **e.g.** user rights, reports downloaded, software downloaded etc.

11. For an institutional investor order, entering Investor Number is compulsory. However the field level control does not make it mandatory at the time of entering the order data. A message is flashed only after the request for committing the order. That message instructs the broker to enter Investor number. To improve data entry efficiency, input controls should be established at the field level - the application system should not allow the user to proceed to the next field unless the field level input is complete.

12. We input a deal as "Good Till Cancelled" on 26/6/97 as close order, but today i.e. as on 27/06/97 the order was struck out by the system at day end and was not shown in the Market Order Book.

Figure 1 – Transaction Successful



E. Day 5 – June 30

NOTE: Within the following text, a plus sign (+) signifies a buy order and a minus sign (-) a sell order.

1. Viewing of market book positions such as Market Order Book (MOB), Consolidated Order Book (COB), Own Order Book (OOB) is not permitted by the application system outside trading hours.
2. At 10:15 AM while placing an order for ACC, the system took about 5 minutes to send the order (as reflected in example (i) below) and 3 minutes for subsequent orders(as reflected in example (ii) below).

   (Later we received a message that the order had been rejected)

Ref	**: pvl.3bmp**			
ι (i).	10:15:25	**(5mins)**	Order rejected	10:19:50
ιι (ii).	10:20:50	**(3 min)**	10:24:49 **(3 min)**	10:28:12 **(3 min)**
	10:23:49		10:27:48	10:31:11
	order		order	order
	rejected		rejected	rejected

3. **The stop loss Buy order** +100 ACC @ 282 was successfully placed by us but the message received by us in the mail box was that the order is put into the system @ 0.00 price. The order number generated was 1997169000518.

   Further, after processing another order to sell ACC 100 @ 282 (1997169000519), the stop loss order was not matched by the system.
4. The application system accepts orders irrespective of system time and option available for time validity i.e. the " Good Till Time /Date" option is not proper.

   E.g. when system time was 12:20:50 we could process the order 1997169000521 and 1997169000522 at 12:14 (this is "back time" transaction).
5. An order to Buy 5 ACC @ 281.50 was placed, but the market watch was not updated (although it was the best order). The Market Order Book (MOB) and Consolidated Order Book (COB) did not get updated. Neither did the own order book show it.

   Refer pvl4.bmp
6. Hot keys F5 & F6 do not show the Market Order Book (MOB) and Consolidated Order Book (COB) respectively from BMD login. It flashed a message that there were no buy and sell orders even though the JKS login showed a number of orders (with yellow band indicating that it was placed by the same counter).
   a) An order viz. Buy 5 ACC @ 281.50 with option (good till time 30/6/97 till 12:39) was accepted by the system and the order number (1997169000524) was generated by the system.
      i) This order was placed @ 12:38 and was shown in the Market Watch Window as the best order. But the order was not cancelled by the system after 12:39 and was

observed to be still open after 12:39.

b) When Market Watch Window displayed buy 5 ACC @ 281.50 as the best order, we placed another order (1997169000525) for +15 ACC @ 281.50.

Ref. pvl7.bmp

i) But the market watch window didn't update the results to 20 @ 281.50. Instead it replaced +5 @ 281.50 ***with*** 15 @ 281.50

c) We modified the order 1997169000525 (Buy 15 ACC @ 281.50) *from* 'good till cancelled' *to* 'immediate'. At the time of change there was no other sell order was available, **still** the order was not deactivated by the system & the Market Watch Window continued to show this order as a live order.

i) Subsequently we placed a new order that would match this order successfully. The deal was successful.

d) We successfully placed **a Stop loss order** for sale of 100 ACC @ 282 (1997169000527). Before we placed this order the Market Watch Window displayed the following order as the best sell order.

i) Sell 90 ACC @ 282. But the system didn't update the Market Watch Window for the order

ii) The Market Order Book displayed the following orders for ACC.

The Buy Orders		**The Sell Orders**	
Qty	Rate	Qty	Rate
40	281	90	282
35	281		
50	280		
125			

We sold 125 @ 279 as **single trade**.

iii) The order was successful and the order number generated was 1997169000536. Though the system didn't match with the available orders (this is correct), the order got deactivated.

iv) However, we should note that the system recognises single trade orders as 'complete and immediate' only, not otherwise. For example, this order cannot be "Good Till Day", "Good Till Cancelled" etc.

e) Later we tried to sell ACC 130 @ 279 as **Complete** quantity. The quantity was reflected in the MOB and the order was not executed by the system (this is correct). However the Market Watch Window didn't get updated with this order.

Ref : PVL11.BMP

7. It appears that Consolidated Order Book orders with the complete option are highlighted in yellow. Note: Counters' Own Orders are also highlighted in yellow in the Market Order Book.

Ref : PVL12.BMP

8. Subsequently, we placed order to buy 10 ACC @ 275 (1997169000538). With this we have the following live orders.

The quantity available for buy was		**The quantity available for sale was**	
Qty	Rate	Qty	Rate
40	281	90	282
35	281	130*	279
50	280		
10**	275		
135			

***complete order**

****order 1997169000538**

a) The deal was not struck (this is correct). Later we modified changed order 1997169000538 to a quantity to 5 instead of 10. Still the deal was not struck by the system (this is also correct).

b) However the system failed to strike the deal even when we changed the rate to 279 maintaining the quantity at 5. The deal should have struck since the order status was as follows:

The quantity available for buy was		**the quantity available for sale was**	
Qty	Rate	Qty	Rate
40	281	90	282
35	281	130	279
50	280		
5	279		
130			

Ref : PVL13.BMP

9. The Own Order Book (OOB) does not show a sell order for ACC (sell 90 @ 282/-) as pending order even though this order is live and had not been executed by the system. As evidence it is reflected in the MOB.

10. Later we placed an **complete** buy order for 130 quantity @ 280.50 (1997169000541). That deal was struck @ 279 with the **complete** sell order of 130 @ 279. This demonstrates that the system matches complete buy orders with only complete sale

orders.

Ref : PVL14.BMP

11. An order was successfully placed by us on 30/06/1997 as "Good Till Cancelled". However the system cancelled the same order on 01/07/1997.

Ref : PVL22.BMP

12. We successfully placed an buy order **viz.** Buy 5 ACC @ 282 as **own trade** (1997169000544).

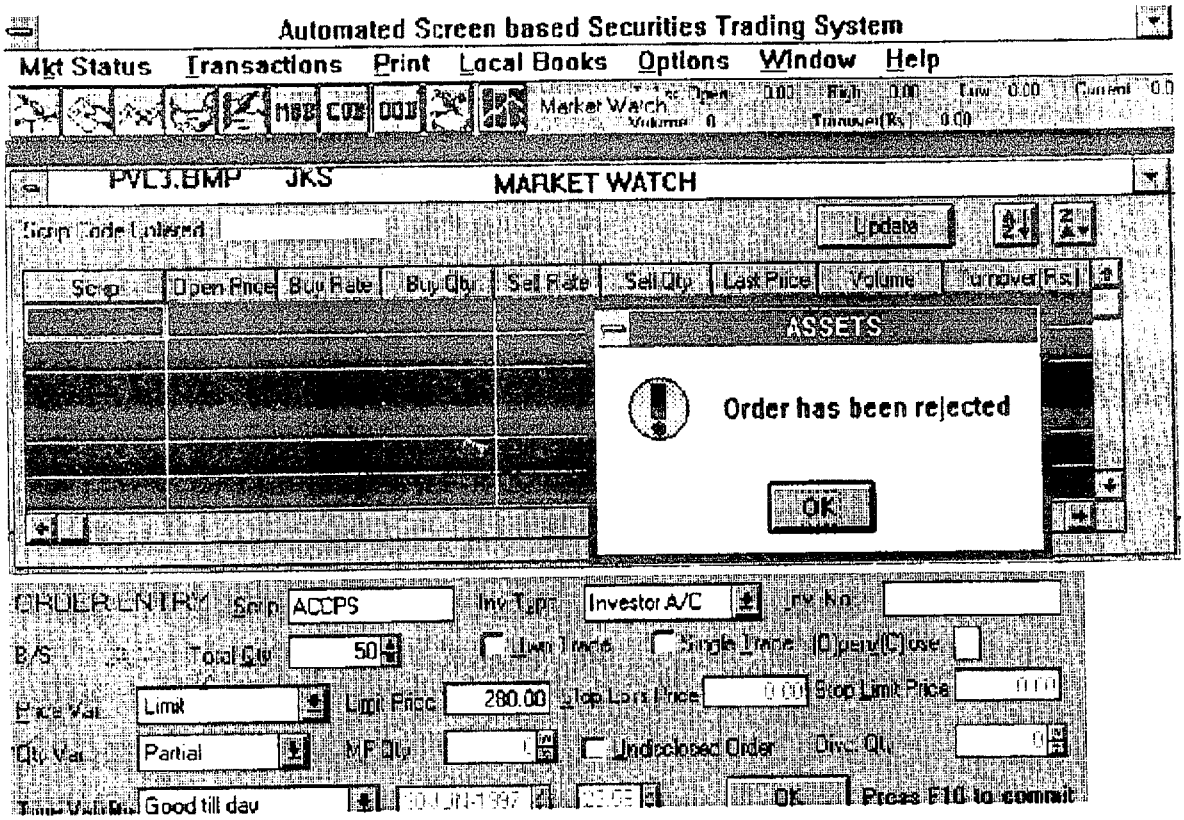
    a) At this time a seller was available in ACC at 90 quantity @ 282.

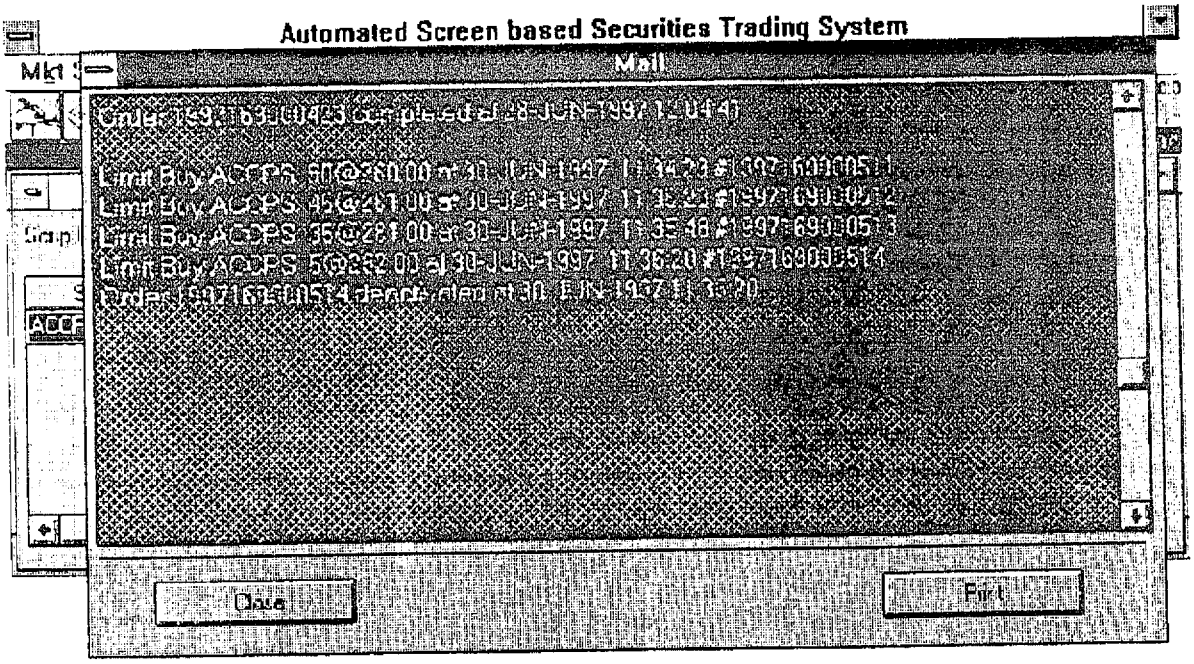
    b) The deal didn't strike

    c) The market watch was not updated

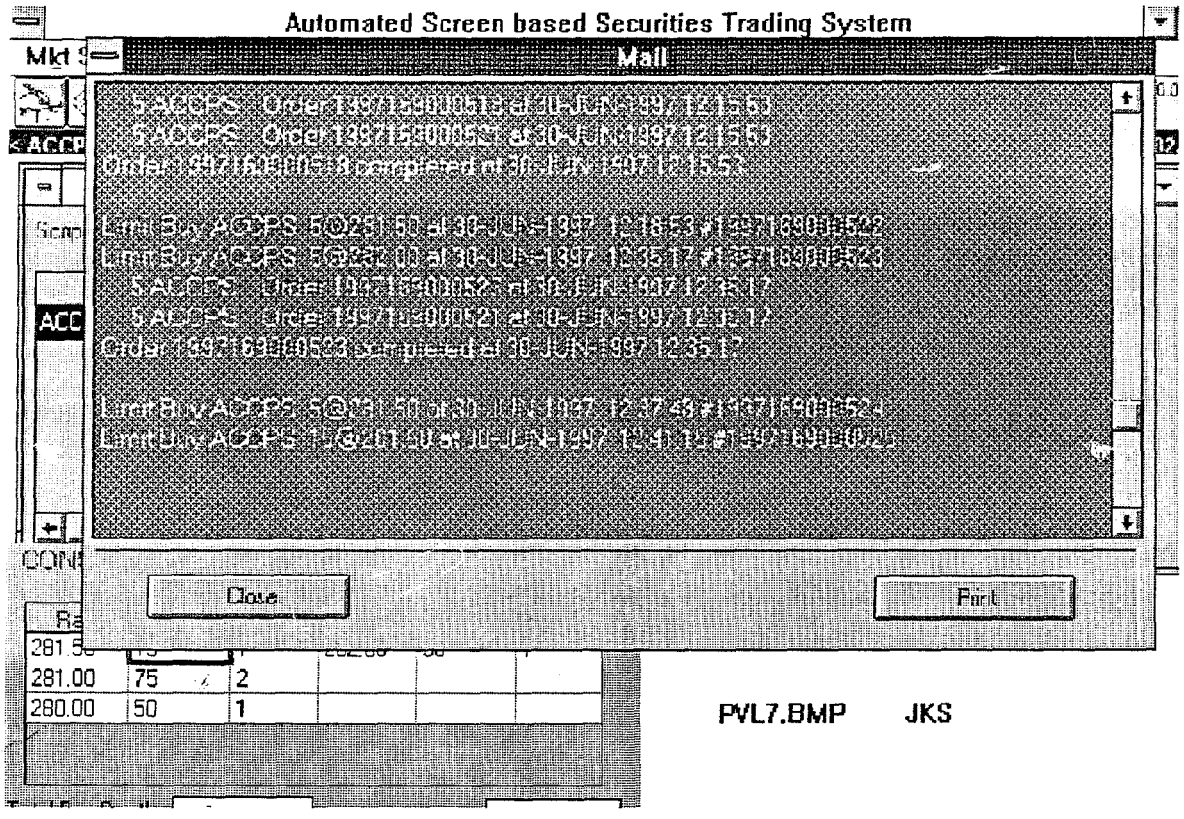
    d) We received a message saying error in order fails LPT check

Ref : PVL17.BMP, PVL18.BMP and PVL19.BMP

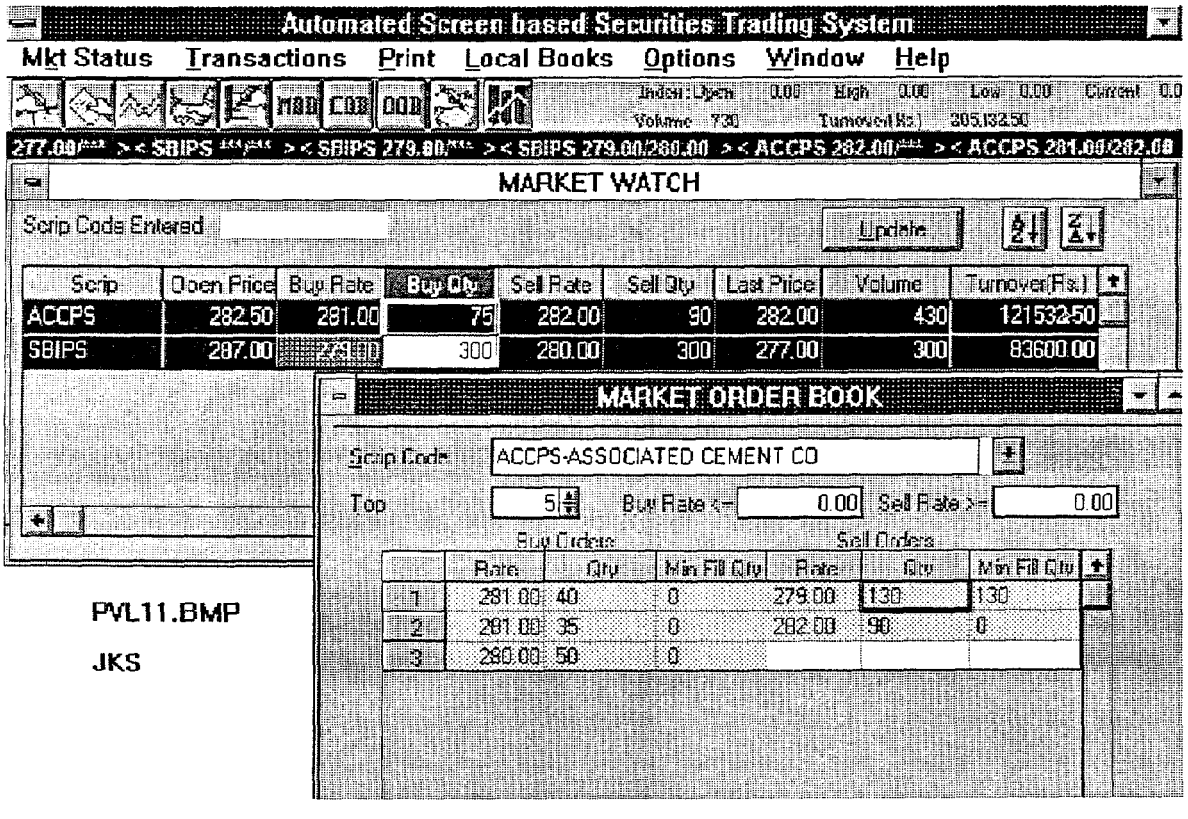

Automated Screen based Securities Trading System
Mkt Status
Transactions
Print
Local Books
Options
Window
Help
Market Watch
PVL3.BMP JKS
MARKET WATCH
Update
Scrip
Open Price
Buy Rate
Buy Qty
Sell Rate
Sell Qty
Last Price
Volume
Turnover Rs
ASSETS
Order has been rejected
OK
ORDER ENTRY
Scrip
ACCPS
Inv Type
Investor A/C
Inv No
B/S
Total Qty
50
Limit
Limit Price
280.00
Stop Limit Price
Partial
Undisclosed Order
Good till day
OK
Press F10 to commit


Automated Screen based Securities Trading System
Mail
Limit Buy ACCPS
Limit Buy ACCPS
Limit Buy ACCPS
Limit Buy ACCPS
Close
Print

PVL4.BMP JKS

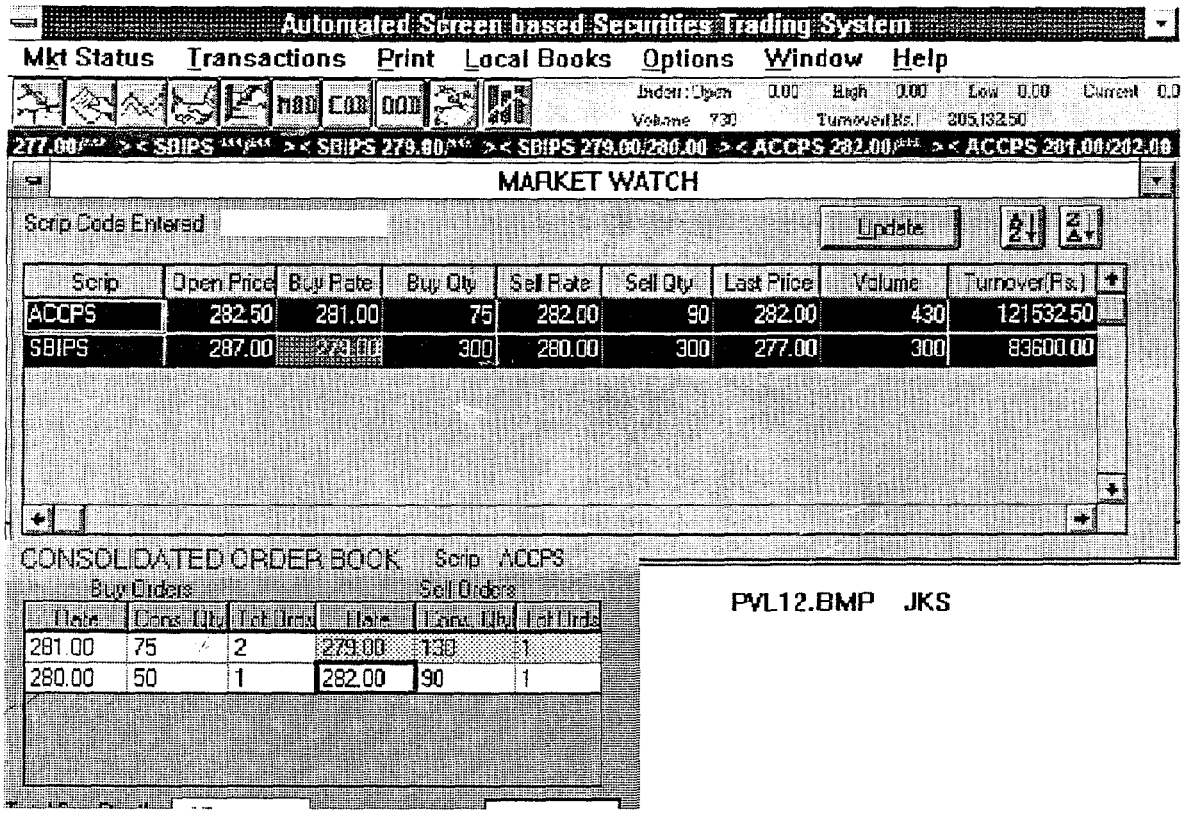


PVL7.BMP JKS

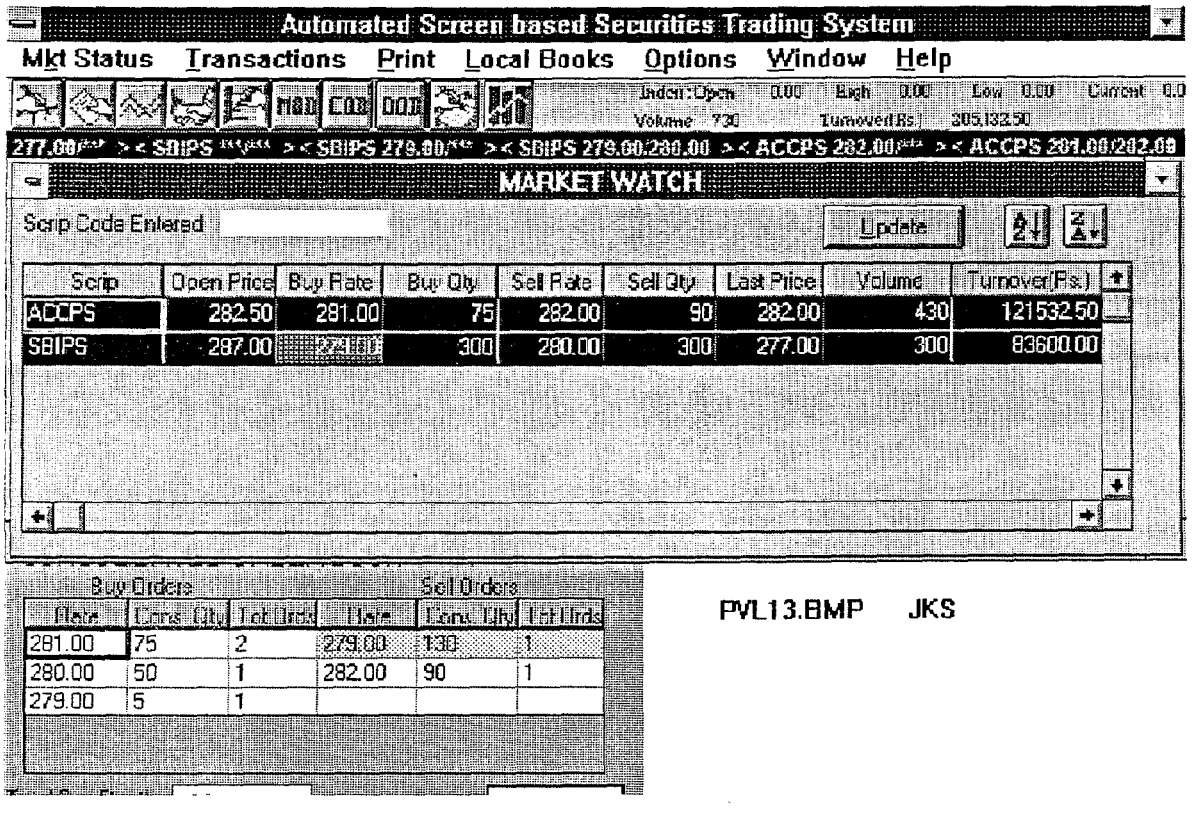


PVL11.BMP

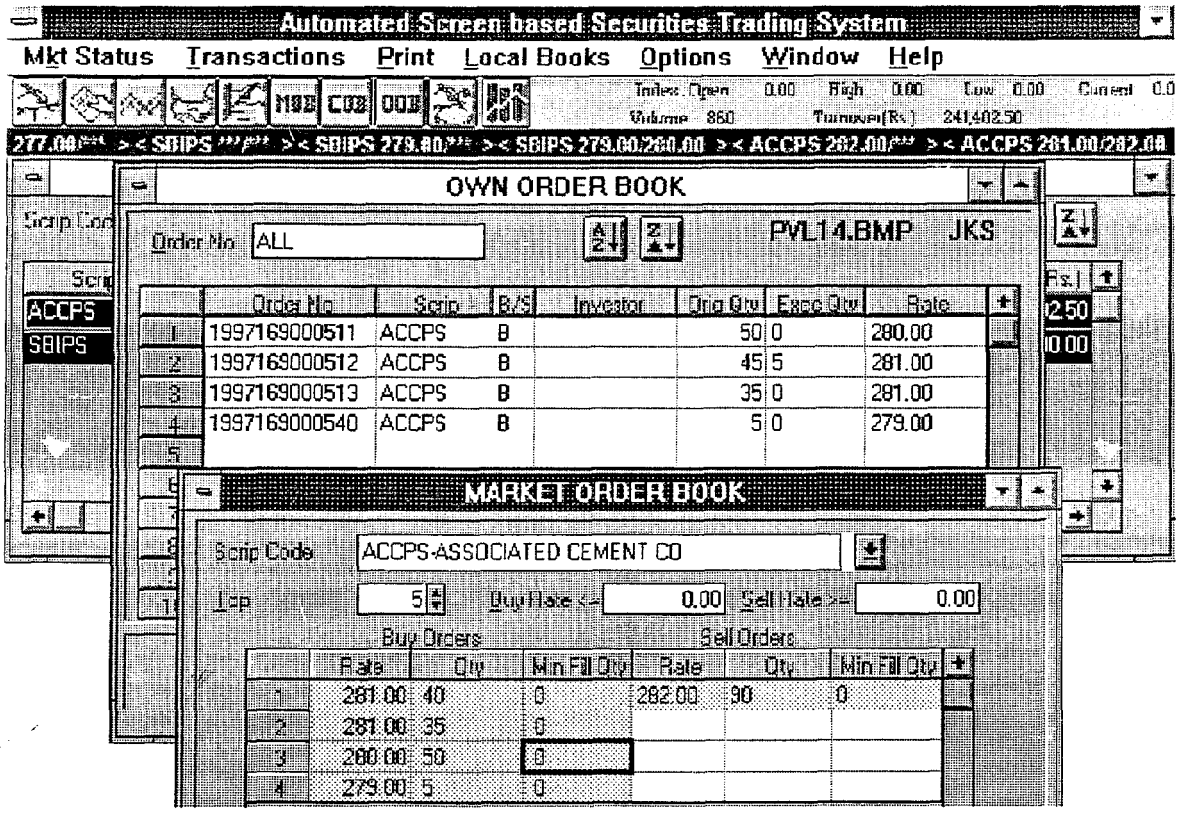
JKS

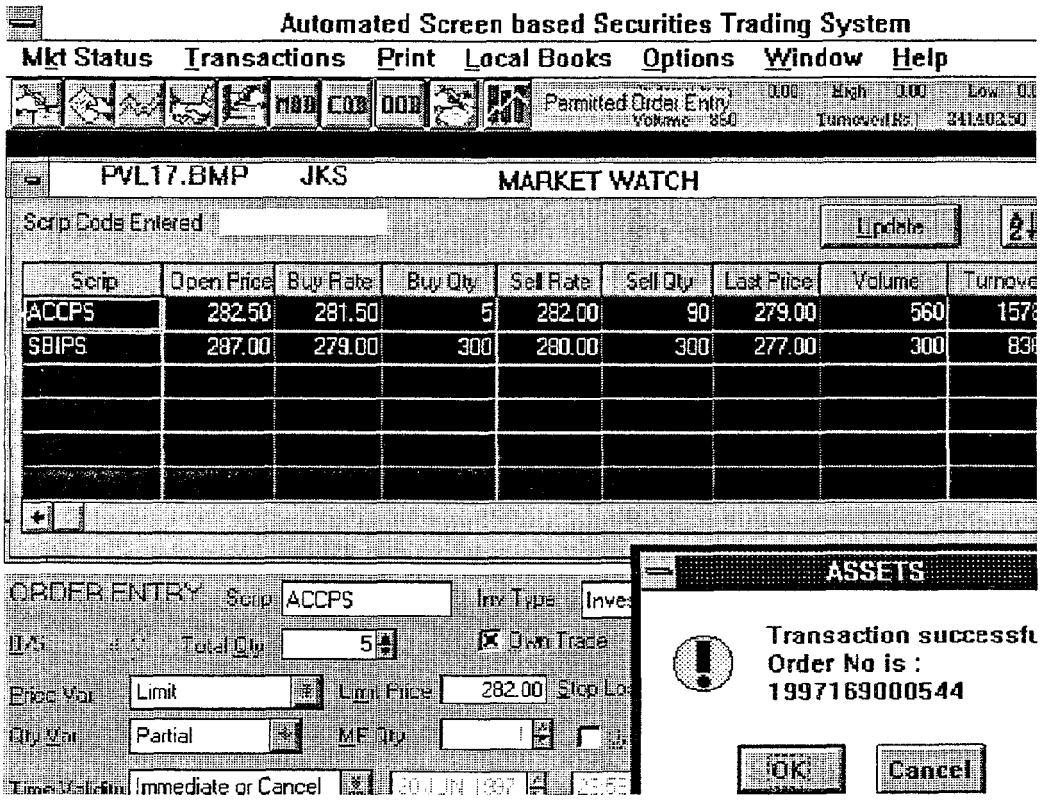


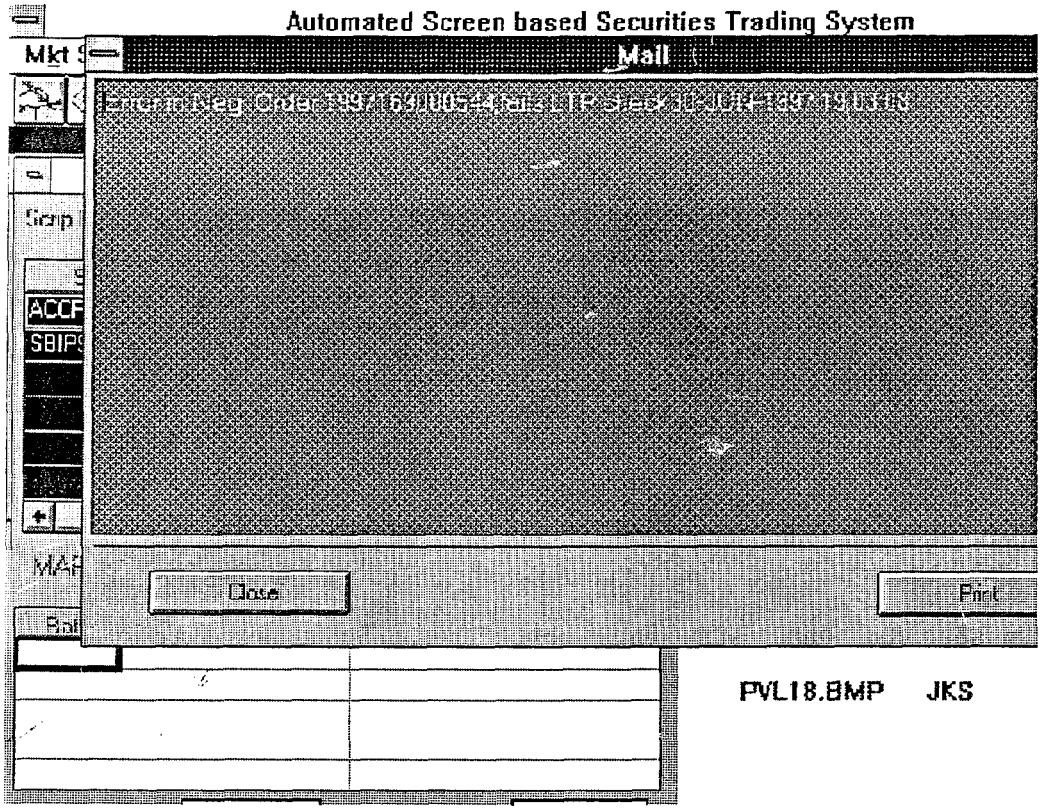
PVL12.BMP JKS



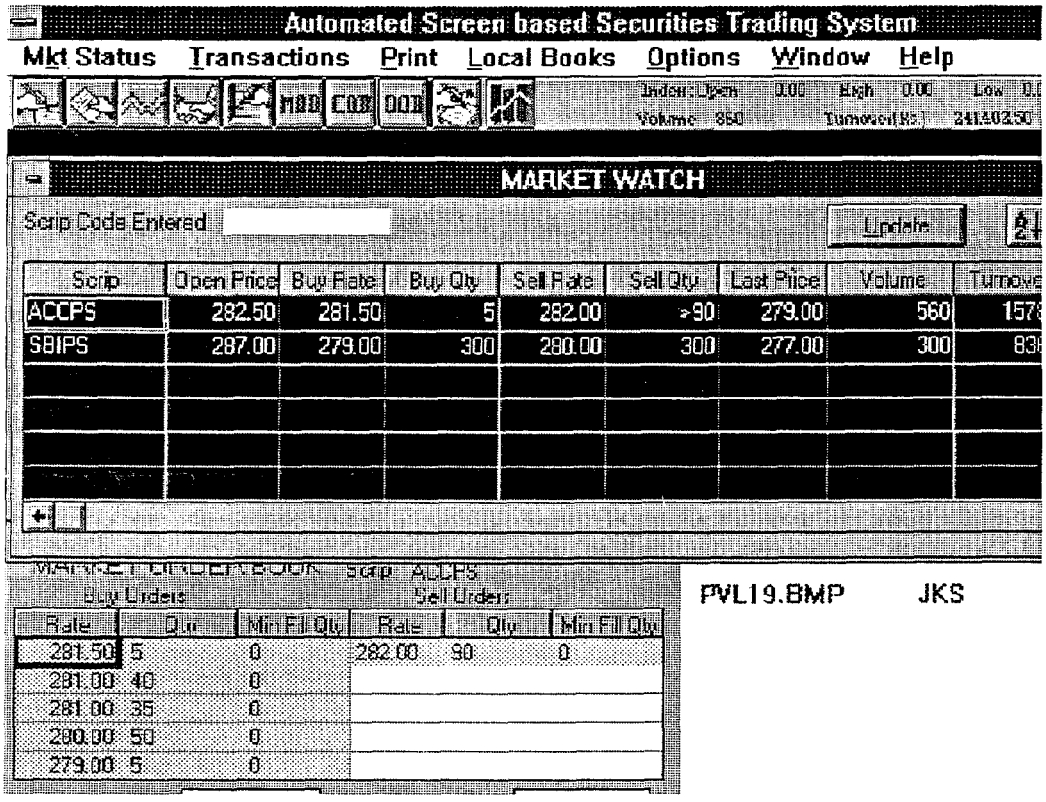
PVL13.BMP JKS


Automated Screen based Securities Trading System
Mkt Status Transactions Print Local Books Options Window Help
OWN ORDER BOOK
Order No ALL
PVL14.BMP JKS
Order No Scrip B/S Investor Orig Qty Exec Qty Rate
1997169000511 ACCPS B 50 0 280.00
1997169000512 ACCPS B 45 5 281.00
1997169000513 ACCPS B 35 0 281.00
1997169000540 ACCPS B 5 0 279.00
MARKET ORDER BOOK
Scrip Code ACCPS-ASSOCIATED CEMENT CO
Top 5
Buy Rate <= 0.00
Sell Rate >= 0.00
Buy Orders
Sell Orders
Rate Qty Min Fill Qty Rate Qty Min Fill Qty
281.00 40 0 282.00 90 0
281.00 35 0
280.00 50 0
279.00 5 0


Automated Screen based Securities Trading System
Mkt Status Transactions Print Local Books Options Window Help
Permitted Order Entry
PVL17.BMP JKS
MARKET WATCH
Scrip Code Entered
Update
Scrip Open Price Buy Rate Buy Qty Sell Rate Sell Qty Last Price Volume
ACCPS 282.50 281.50 5 282.00 90 279.00 560
SBIPS 287.00 279.00 300 280.00 300 277.00 300
ORDER ENTRY Scrip ACCPS
Total Qty 5
Own Trade
Limit
Limit Price 282.00
Partial
Immediate or Cancel
ASSETS
Transaction successfu
Order No is :
1997169000544
OK
Cancel



PVL18.BMP JKS



PVL19.BMP JKS

F. Day 6 – July 1

1. The Market Watch Window showed the best order available is Buy 5 ACC ltd. @ 281.50.

   Later we placed an order **viz.** Buy ACC # 5 @ 281.75.

   Though this order was successfully accepted by the system, the Market Watch Window was not updated with this order as the best order.

   Ref : PVL21.BMP JKS

2. The orders placed by us using JKS login yesterday i.e. 30/06/97 with the condition "Good till day" were observed to be valid when we logged into the **Assets 8** on 01/07/97.

   Ref : PVL20.BMP JKS

3. While the Market Watch Window showed the orders that were placed by us yesterday, the market order book (MOB) showed only today's order i.e. Buy 5 ACC @ 281.75 **(which was not updated in the market watch window).**

   Ref : PVL21.BMP JKS

4. The hot key F3 is provided by the system for brokers to place an order while viewing the Market Watch Window. But this buy /sell order window does not permit input of he brokerage amount /percentage.

5. We successfully placed an order viz. buy 150 ACC @ 285 and an ID got generated 1997169000546, but

   - The system did not update the Market Watch Window.
   - The seller was available in the market watch window for 90 quantity @ 282/-. But the deal was not struck even when the seller is available @ 282 and the buyer is available @ 285.

   Ref : PVL23.BMP JKS

1. The market watch window shows that buy /sell orders for SBIPS are live. However the hot key F5 says that "No orders are available for this scrip."

   Ref : PVL24.BMP JKS

2. Parameters for defining disclosed quantity are not clear. Even the relevant error messages are not clearly understandable ***such as*** 'Disclosed quantity is too less than the order quantity". (At this time the order quantity was 5000 and the disclosed quantity was 50).

   When we changed the quantity to 500 the order was accepted. (Here the disclosed quantity can still be considered as *too less*.)

   Ref : PVL25.BMP JKS

3. When we changed the disclosed quantity to 500 from 50, the order was accepted (1997169000547).

   - The mail got updated. (but the mail does not say that this is an undisclosed order).
   - The Market Watch Window was not updated. (This was the best buy order)
   - Seller was available at 282/- still the order was not executed.

- Further the MOB didn't get updated.

Ref : 1997169000547, PVL26.BMP and PVL27.BMP JKS

1. We were able to place orders in the system which will remain valid until the end of next century. However the Market Watch Window didn't get updated.

   Ref : 1997169000549, PVL28.BMP JKS

2. We successfully placed an order in the system with the date field blank (Here the option we selected was "Good till time /date")

   Ref : 1997169000550

3. We were unable to see how the system responds to buy /sell transactions when the order is placed with the time validity as valid till settlement. We were unable to verify the settlement period defined in the system.

4. We received a message that Reliance (order number **1997169000001**) was reactivated and completed at 14:45:40 Hrs (We could not see the original order as deactivated.)

   Later while we were processing an order to buy 50 SBIPS @ 280, we received the message 'Transaction successful' and the order number generated was **1997169000001** @ 15:22 Hrs **(which is the same as above transaction)**

   This is absolutely confusing.

   Ref : 1997169000001, PVL29.BMP and PVL30.BMP JKS

5. Later @ 15:28 the system took about 4 minutes to process an order. The Windows Hourglass sign was displayed and a message said the system was communicating with OTCEI. Later we received the message "Error in database". This slow response time was also observed while processing other orders.

   Ref : PVL31.BMP JKS

6. In the "Order Modify /Delete Module" the field available for input of order number does not have any help facilities. The user needs to remember /record the exact 13 digit order number. This is not user friendly.

7. The "Permitted Securities Trades Module" does not allow the user to view trades from the Central Trading Server (CTS) for more one day i.e. other than the system date.

8. Though the MOB allows the user to see the buy /sell market depth (i.e. the total quantity available in the market for trade), it does not allow the user to see more than 15 trades.

   Hence the MOB ***may*** not show proper market depth when the total number of orders available for a security exceeds 15 in number.

   However the Consolidated Order Book (COB) does not show the market depth accurately and the market depth keeps adjusting itself to the number of orders that the user would like to view using this option.

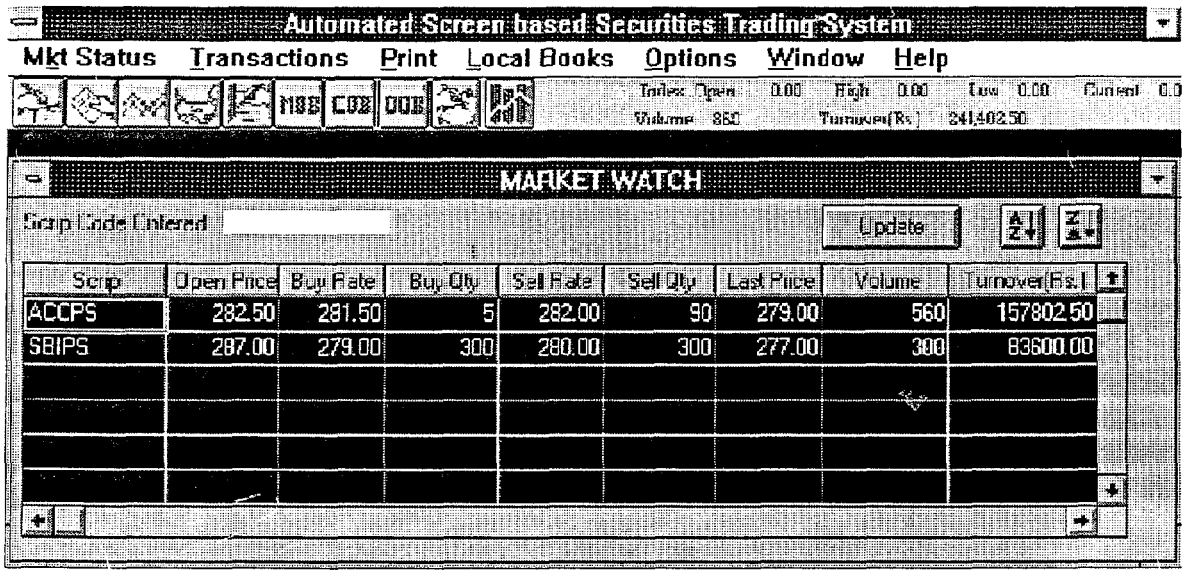
9. While we were modifying the order number 1997169000546, we could successfully modify the brokerage field to 11,11,111 digit level in percentage terms and the order retained the same number. The system took about 3 minutes to modify the order.

   Ref : PVL32.BMP JKS

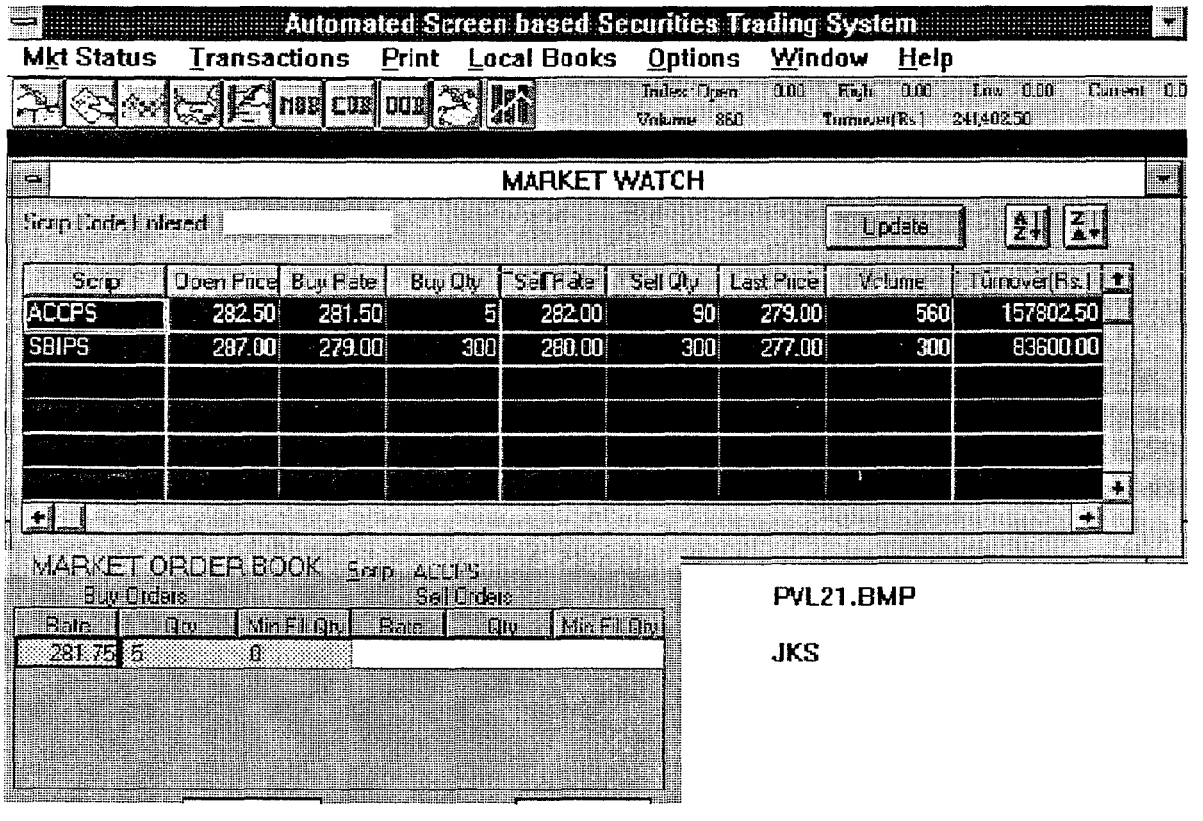
10. While we were modifying the order number 1997169000542, we got a message that

"could not establish link with OTCEI. Before this we didn't get any message that the counter is going to lose its link with OTCEI.

11. As soon as the user logs into the system asks the user whether update Scrips now ? Yes or No. we could not figure out the difference by selecting any of these options.

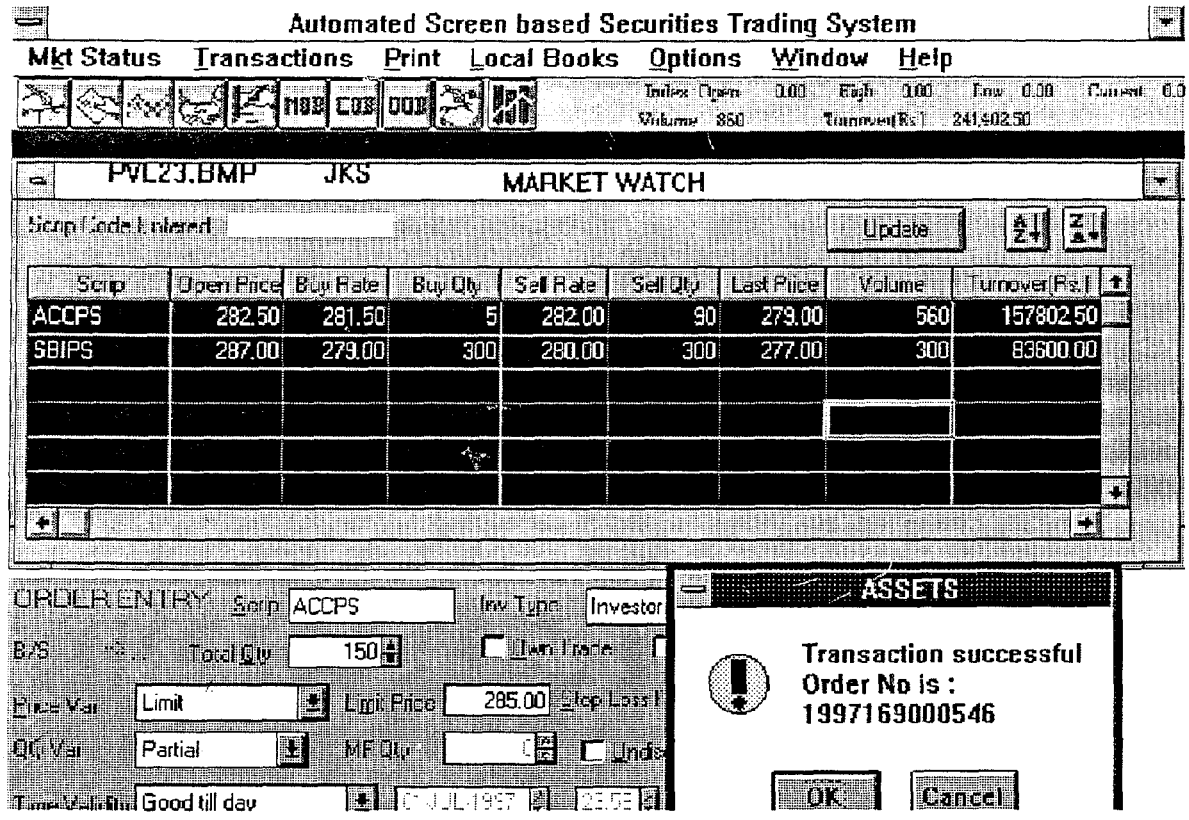


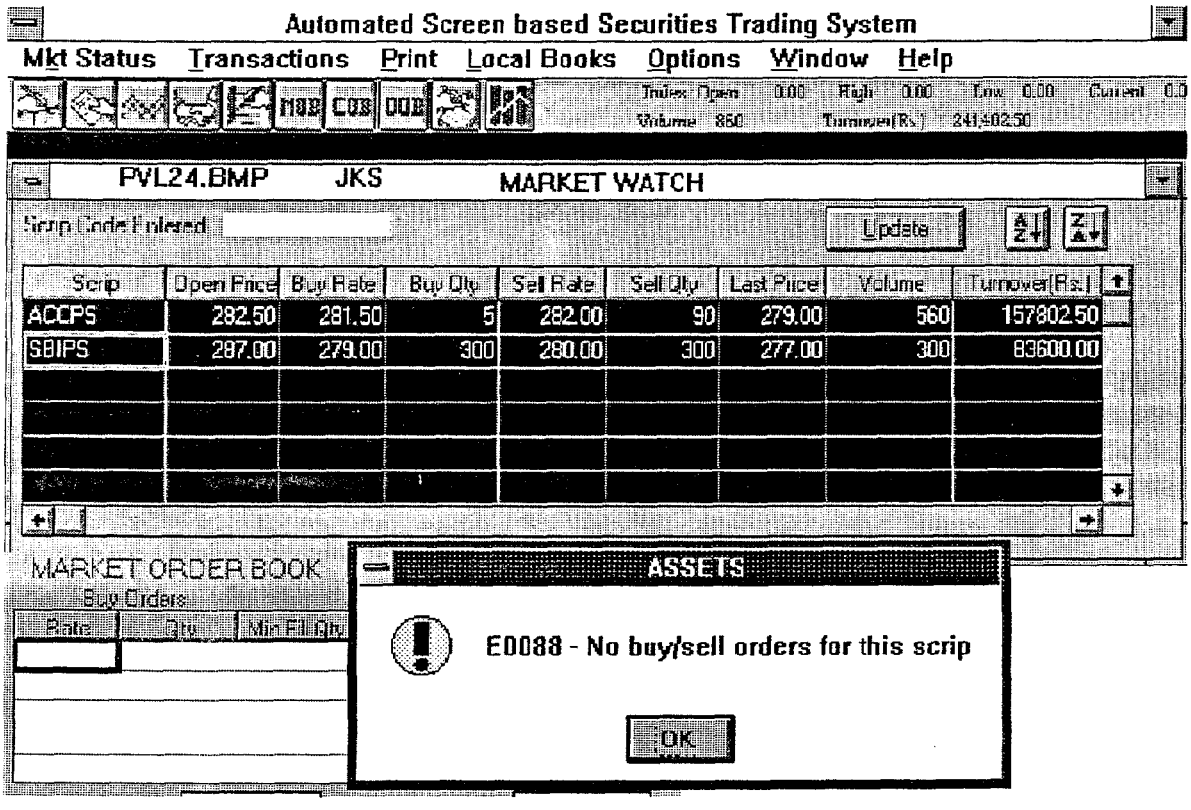
PVL20.BMP JKS

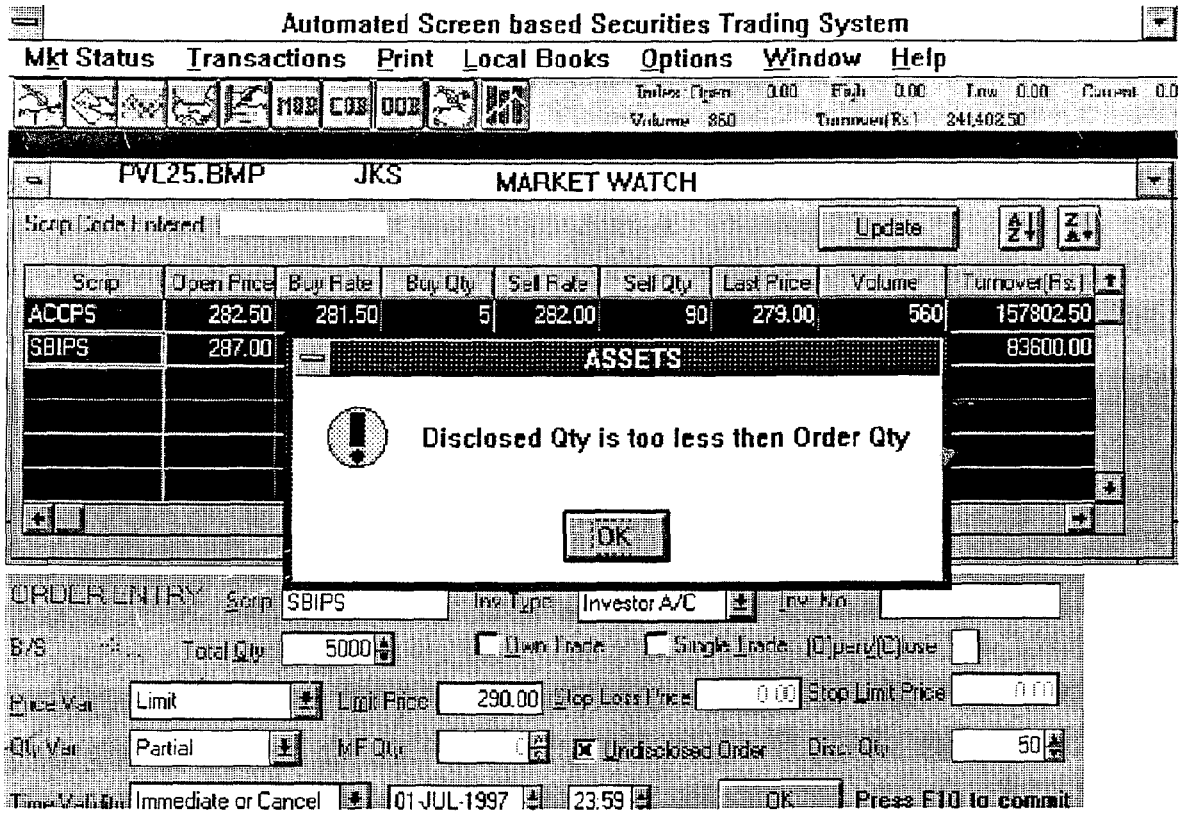


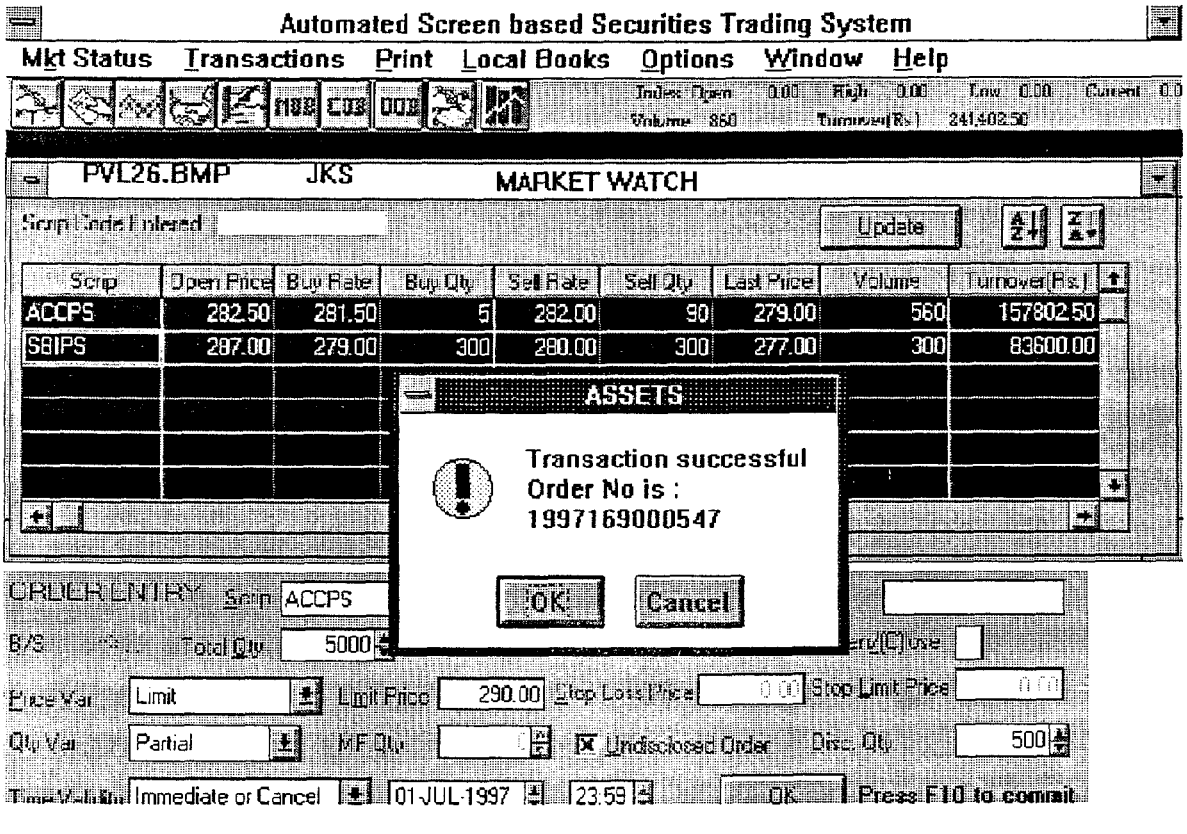
PVL21.BMP

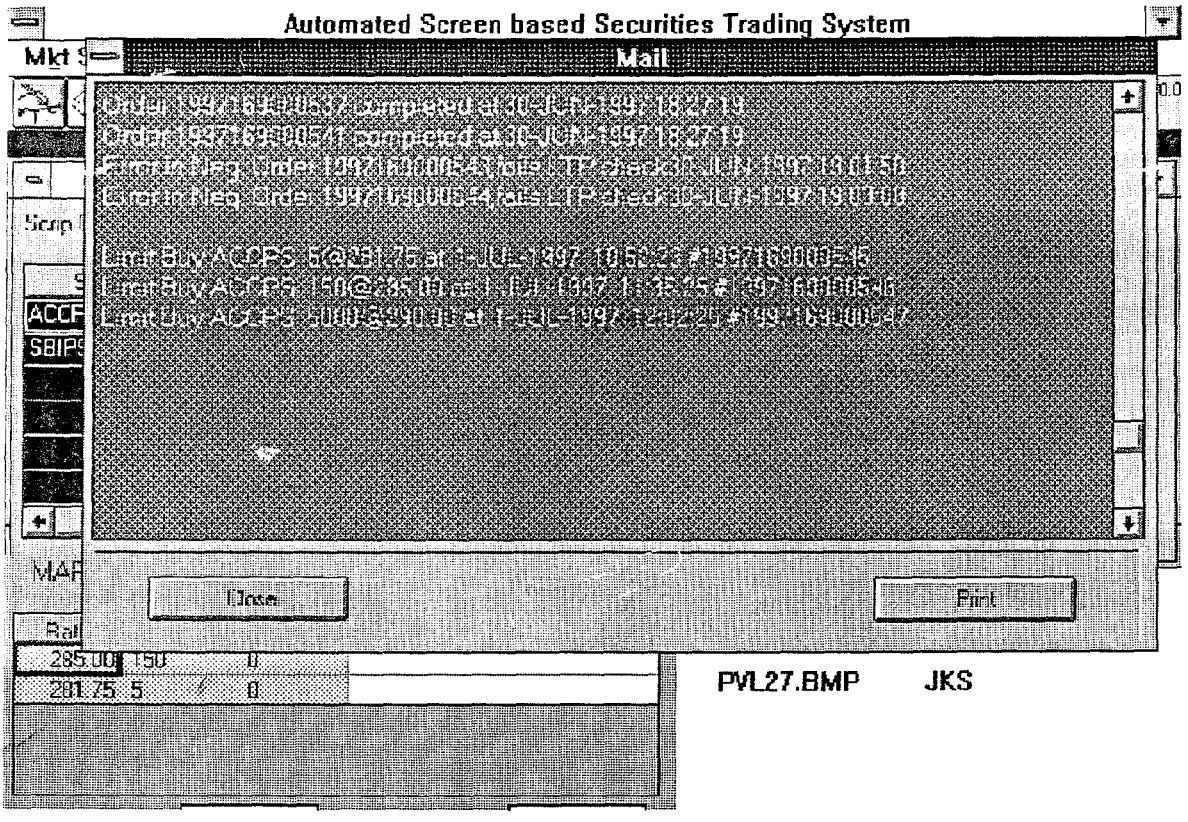
JKS

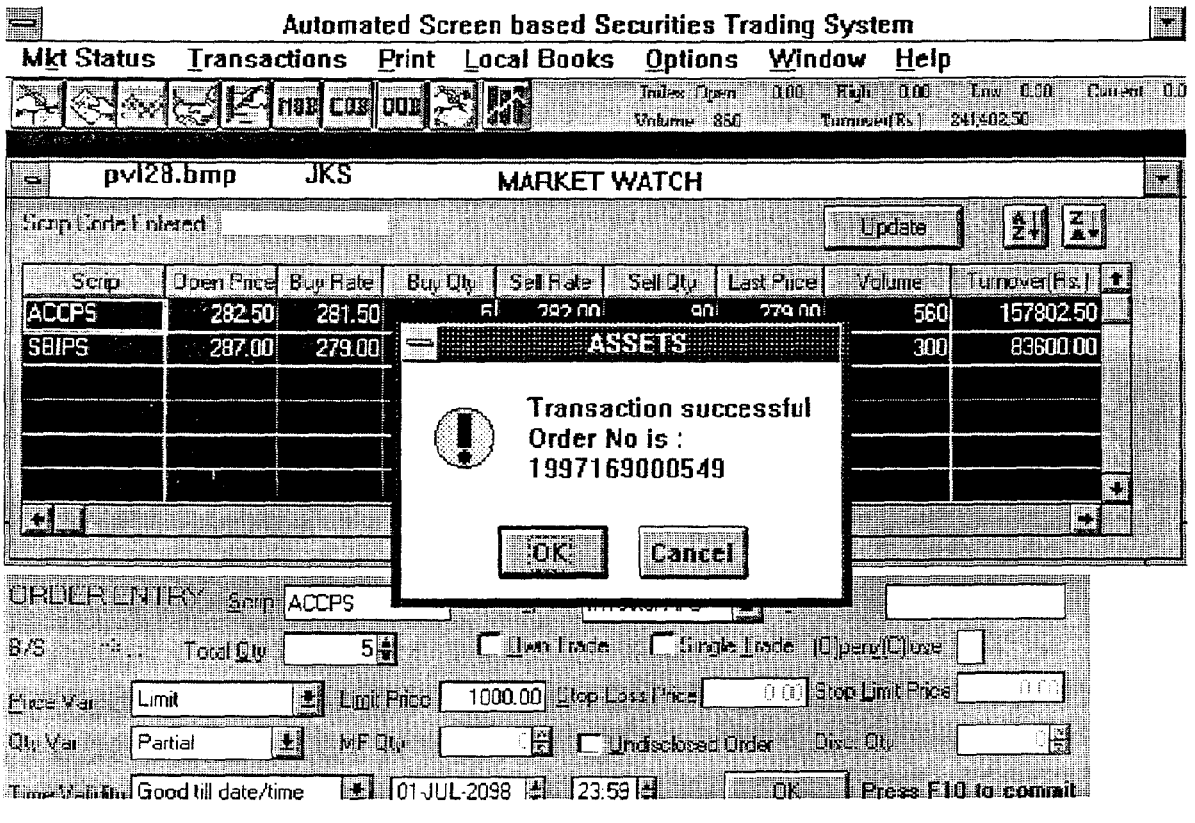

Automated Screen based Securities Trading System
Mkt Status
Transactions
Print
Local Books
Options
Window
Help
PVL23.BMP
JKS
MARKET WATCH
Update
Scrip
Open Price
Buy Rate
Buy Qty
Sell Rate
Sell Qty
Last Price
Volume
Turnover(Rs.)
ACCPS
282.50
281.50
5
282.00
90
279.00
560
157802.50
SBIPS
287.00
279.00
300
280.00
300
277.00
300
83600.00
ORDER ENTRY
Scrip
ACCPS
Inv Type
Investor
Total Qty
150
Limit
Limit Price
285.00
Partial
Good till day
ASSETS
Transaction successful
Order No is :
1997169000546
OK
Cancel

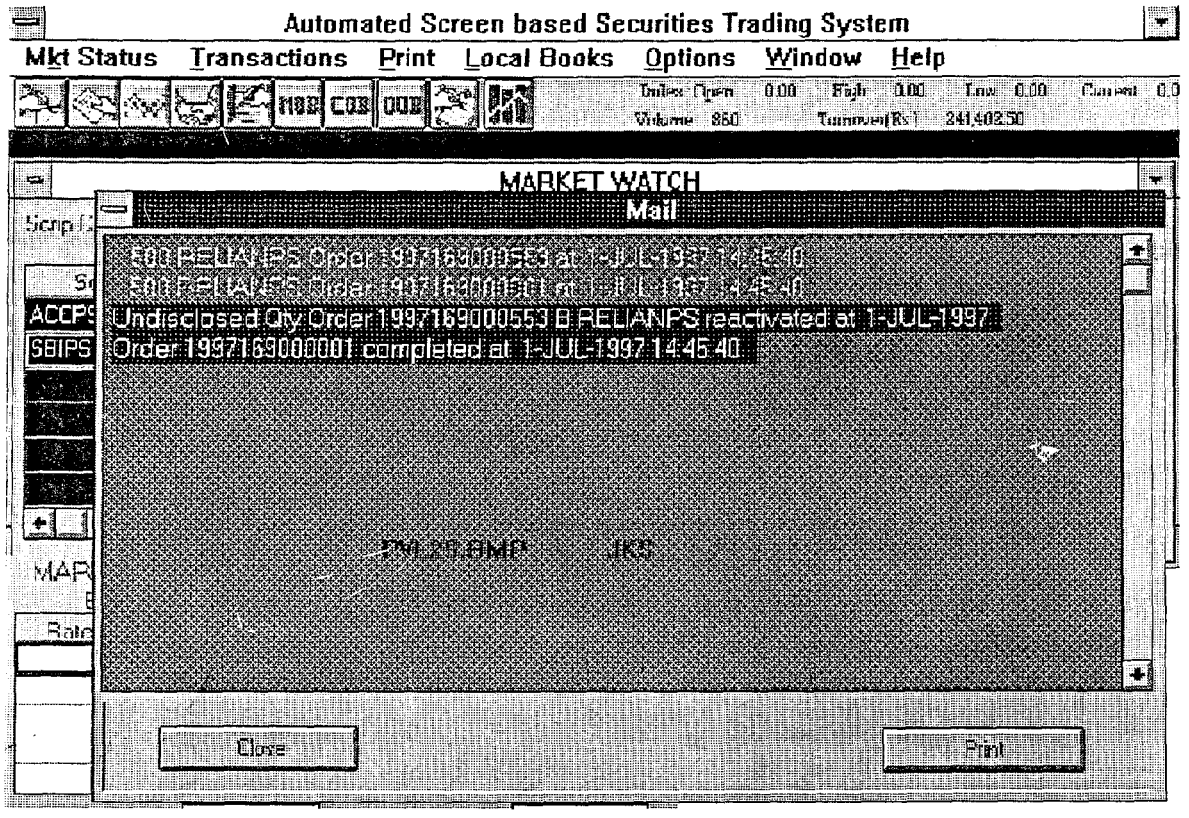

Automated Screen based Securities Trading System
Mkt Status
Transactions
Print
Local Books
Options
Window
Help
PVL24.BMP
JKS
MARKET WATCH
Update
Scrip
Open Price
Buy Rate
Buy Qty
Sell Rate
Sell Qty
Last Price
Volume
Turnover(Rs.)
ACCPS
282.50
281.50
5
282.00
90
279.00
560
157802.50
SBIPS
287.00
279.00
300
280.00
300
277.00
300
83600.00
MARKET ORDER BOOK
Buy Orders
Rate
Qty
ASSETS
E0088 - No buy/sell orders for this scrip
OK

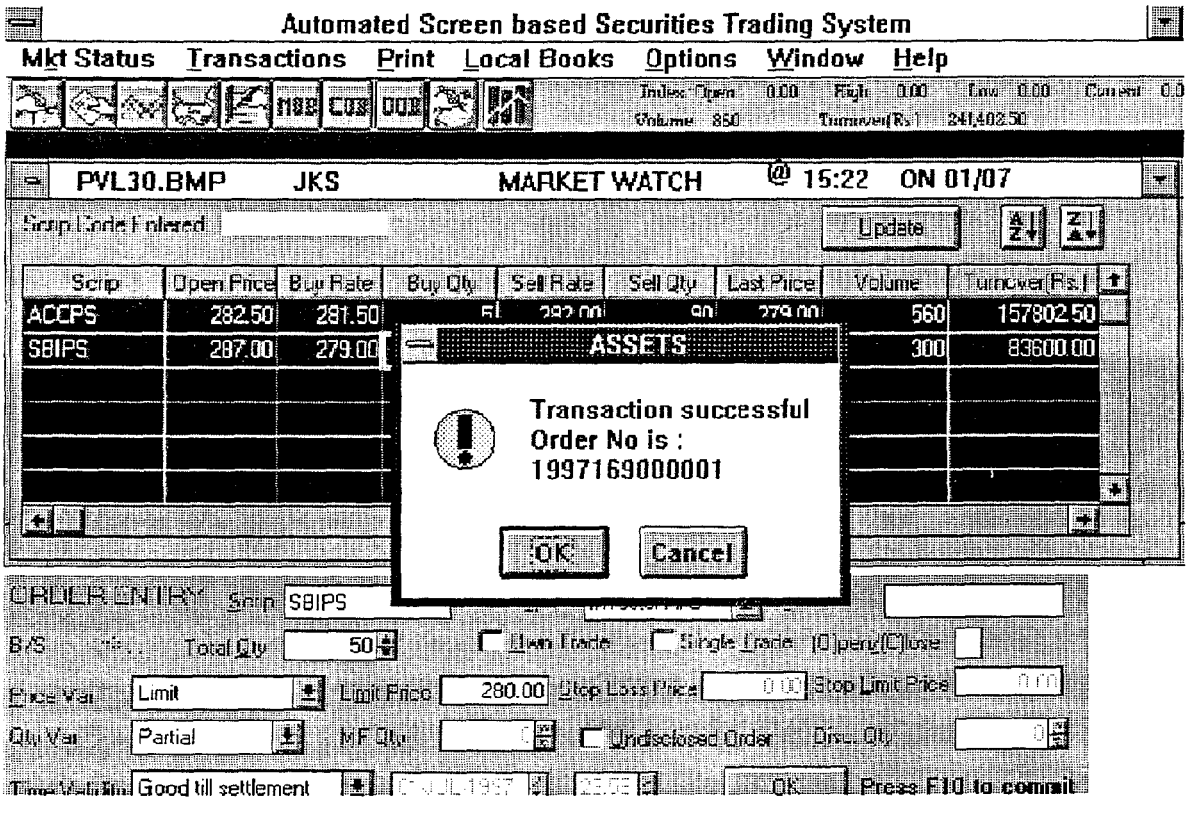

Automated Screen based Securities Trading System
Mkt Status
Transactions
Print
Local Books
Options
Window
Help
PVL25.BMP
JKS
MARKET WATCH
Update
Scrip
Open Price
Buy Rate
Buy Qty
Sell Rate
Sell Qty
Last Price
Volume
Turnover(Rs.)
ACCPS
282.50
281.50
5
282.00
90
279.00
560
157802.50
SBIPS
287.00
83600.00
ASSETS
Disclosed Qty is too less then Order Qty
OK
ORDER ENTRY
Scrip
SBIPS
Inv Type
Investor A/C
B/S
Total Qty
5000
Own Trade
Single Trade
Price Var
Limit
Limit Price
290.00
Stop Loss Price
Stop Limit Price
Qty Var
Partial
MF Qty
Undisclosed Order
Disc. Qty
50
Immediate or Cancel
01-JUL-1997
23:59
OK
Press F10 to commit

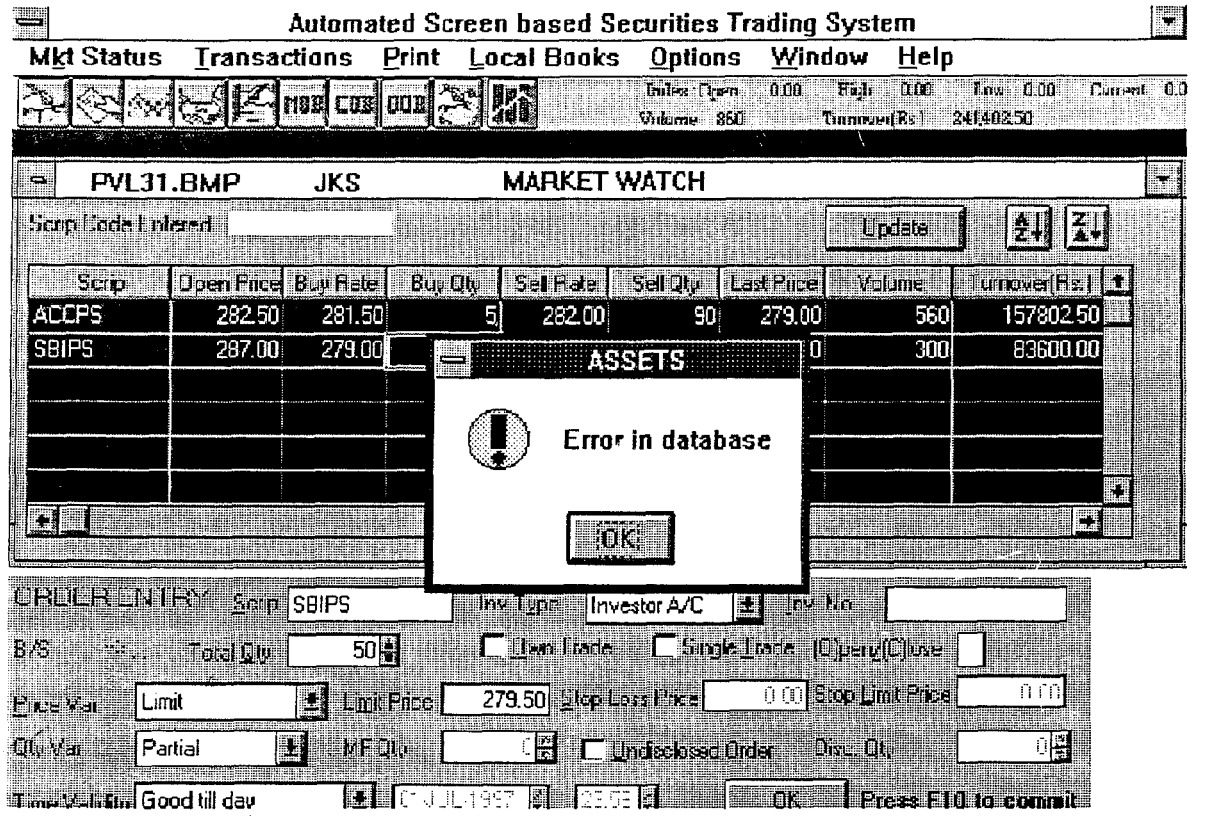

Automated Screen based Securities Trading System
Mkt Status
Transactions
Print
Local Books
Options
Window
Help
PVL26.BMP
JKS
MARKET WATCH
Update
Scrip
Open Price
Buy Rate
Buy Qty
Sell Rate
Sell Qty
Last Price
Volume
Turnover(Rs.)
ACCPS
282.50
281.50
5
282.00
90
279.00
560
157802.50
SBIPS
287.00
279.00
300
280.00
300
277.00
300
83600.00
ASSETS
Transaction successful
Order No is :
1997169000547
OK
Cancel
ORDER ENTRY
Scrip
ACCPS
B/S
Total Qty
5000
Price Var
Limit
Limit Price
290.00
Stop Loss Price
Stop Limit Price
Qty Var
Partial
MF Qty
Undisclosed Order
Disc. Qty
500
Immediate or Cancel
01-JUL-1997
23:59
OK
Press F10 to commit

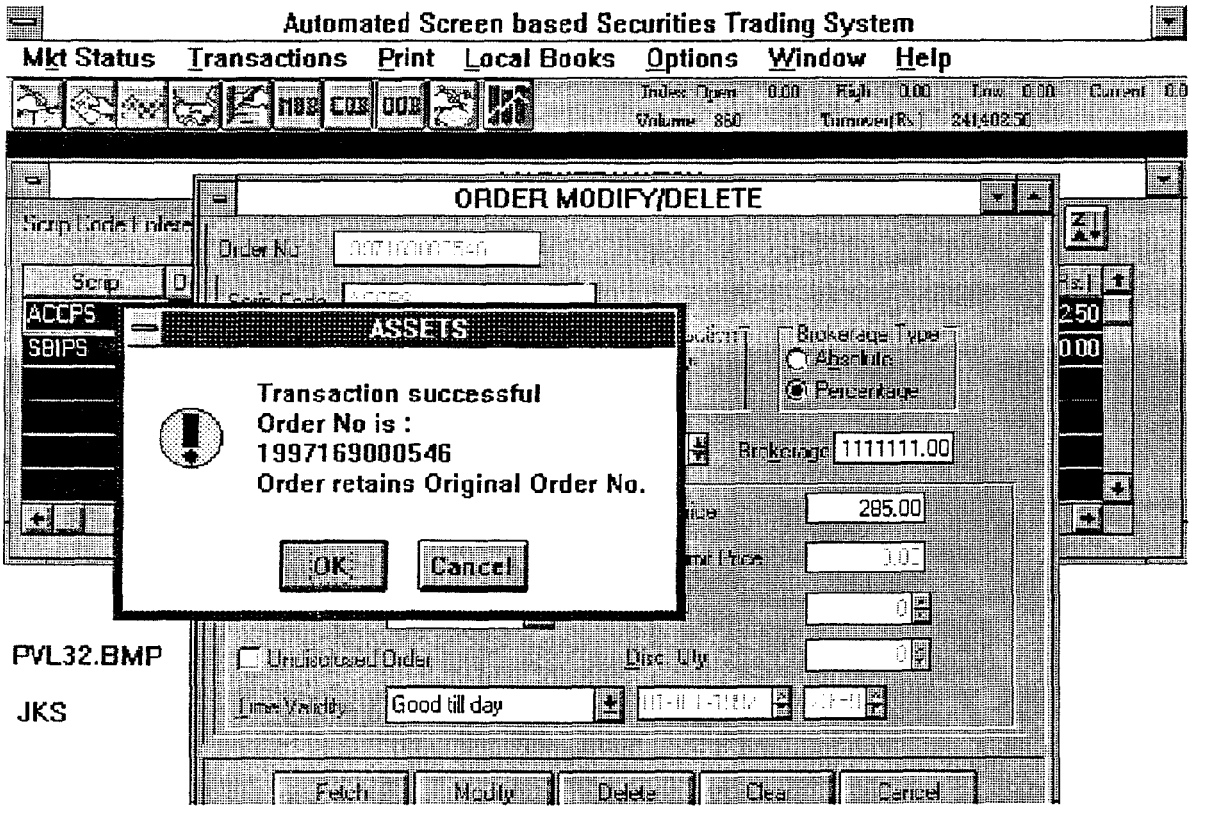

Automated Screen based Securities Trading System
Mkt
Mail
Close
Print
PVL27.BMP JKS


Automated Screen based Securities Trading System
Mkt Status Transactions Print Local Books Options Window Help
pvl28.bmp JKS
MARKET WATCH
Update
Scrip Open Price Buy Rate Buy Qty Sell Rate Sell Qty Last Price Volume Turnover(Rs.)
ACCPS 282.50 281.50 560 157802.50
SBIPS 287.00 279.00 300 83600.00
ASSETS
Transaction successful
Order No is :
1997169000549
OK
Cancel
ORDER ENTRY
Scrip ACCPS
Total Qty 5
Limit
Limit Price 1000.00
Partial
Good till date/time
01-JUL-2098
23:59
OK
Press F10 to commit


Automated Screen based Securities Trading System
Mkt Status
Transactions
Print
Local Books
Options
Window
Help
MARKET WATCH
Mail
Undisclosed Qty Order 1997169000553 B RELIANPS reactivated at 1-JUL-1997
Order 1997169000001 completed at 1-JUL-1997 14:45:40
Close
Print


Automated Screen based Securities Trading System
Mkt Status
Transactions
Print
Local Books
Options
Window
Help
PVL30.BMP
JKS
MARKET WATCH
@ 15:22
ON 01/07
Update
Scrip
Open Price
Buy Rate
Buy Qty
Sell Rate
Sell Qty
Last Price
Volume
Turnover Rs.
ACCPS
282.50
281.50
560
157802.50
SBIPS
287.00
279.00
300
83600.00
ASSETS
Transaction successful
Order No is :
1997169000001
OK
Cancel
ORDER ENTRY
Scrip
SBIPS
B/S
Total Qty
50
Limit
Limit Price
280.00
Partial
Undisclosed Order
Good till settlement
OK
Press F10 to commit


Automated Screen based Securities Trading System
Mkt Status
Transactions
Print
Local Books
Options
Window
Help
PVL31.BMP
JKS
MARKET WATCH
Update
Scrip
Open Price
Buy Rate
Buy Qty
Sell Rate
Sell Qty
Last Price
Volume
Turnover(Rs.)
ACCPS
282.50
281.50
5
282.00
90
279.00
560
157802.50
SBIPS
287.00
279.00
300
83600.00
ASSETS
Error in database
OK
ORDER ENTRY
Scrip
SBIPS
Inv Type
Investor A/C
Inv No
B/S
Total Qty
50
Own Trade
Single Trade
(O)pen/(C)lose
Price Var
Limit
Limit Price
279.50
Stop Loss Price
Stop Limit Price
Qty Var
Partial
MF Qty
Undisclosed Order
Disc. Qty
Good till day
OK
Press F10 to commit


Automated Screen based Securities Trading System
Mkt Status
Transactions
Print
Local Books
Options
Window
Help
ORDER MODIFY/DELETE
Scrip
Order No
ACCPS
SBIPS
ASSETS
Transaction successful
Order No is :
1997169000546
Order retains Original Order No.
OK
Cancel
Brokerage Type
Absolute
Percentage
Brokerage
1111111.00
285.00
Undisclosed Order
Disc Qty
Time Validity
Good till day
Fetch
Modify
Delete
Clear
Cancel
PVL32.BMP
JKS

IV. Observations

A. Training Sessions – June 26 & 27

Background

Certain OTCEI members participated in mock trading sessions as part of their training and preparation for system implementation. Eight PC broker workstations were set-up (June 27 & 28) in the OTCEI Conference Room for these sessions. Around 10 to 12 member firms participated. This document contains our observations concerning those tests and comments received from a participating broker (representing one of OTCEI's largest member firm).

Viewing Market Depth and Breadth

A key dealer member complained that with the system, they, the member firm ". . . do not know what (trend) is going on." More specifically, the firm's brokers cannot easily view market depth or and that the system does not supply any information on market breadth.

Actually Market depth can be seen via the Market Order Book and Consolidated Order Book. These can be invoked by a pressing a single function key when the Market Watch screen is active (more keystrokes are required when other displays are active). The crucial factor is that order book displays are not dynamically updated. In an active trading environment, such as has been experienced with the top 5 listed Indian companies since the advent of automated trading, knowing market depth is an absolute must.

The complaint that brokers cannot readily view market depth may be a occasioned by a lack of understanding of the system's features. It is also a criticism of its clumsiness and lack of a dynamic book display. Further exploration of this issue is needed.

Brokers who have Reuters and/or BOLT and NEAT workstations are able to view market breadth. However OTCEI members who do not have this access will be flying partially blind. Most investors read the stock tables on the day after they have made a purchase or sale transaction. If after reading the newspapers, the investor concludes that he or she would have received a better price on the BSE or NSE (and that his OTCEI broker did not know this fact), it will be difficult for the broker to retain the client.

Need for BSE and NSE market data

If the OTCEI system for permitted securities is to be successful, the BSE and NSE best bids and offers and last sale data must be provided. Otherwise brokers who participate only in the OTCEI market will be at a disadvantage.

To address the issue of market breadth, we suggest that OTCEI provide its brokers with BSE and NSE prices on a real-time basis. This is a technically simple task. The difficulty, if any, will be in gaining access to the data (i.e. will BSE and NSE allow OTCEI to rebroadcast those data) and addressing related legal issues, if any.

Order Entry Complexity

Another concern registered by participating brokers is the amount of keying required to enter an order. One broker suggested we compare the order entry process in BOLT to the procedures required in the OTCEI system. BOLT system is simpler, involves fewer key strokes and requires entry of only 5 fields, one of which is implied (Buy /Sell) in requesting

an order entry template.

Cryptic Messages

The information and error messages provided by the Assets system is very cryptic. At times it is difficult to understand the precise meaning of the messages.

No Help file

Only the Listed Securities module provides on-line Help support. The system does not provide any Help for the Permitted Securities features of Assets.

Investor Number

One large broker has complained about the method used to identify the buying and selling clients. He notes that OTCEI's Investor Number differs from that used by BSE and NSE (ideally the same numbers should be used). He stated that this difference forces him to maintain two account numbers for each client and that if he is to use the client number on OTCEI orders, he must first register the client with OTCEI. Registering his 10,000 accounts in advance is impractical but if he does not register those accounts, he cannot use the account number to aid in identifying his orders.

A number of brokers complain about being required to provide the Investor Number for Institutional trades at the time of order entry. They note that Institutional Investors often wait until after trading has been completed to decide on which of their accounts are allocated which trades.

Calculation of Brokerage

ASSETS will not process an order unless the Brokerage field has been entered. Many brokers charge different rates of brokerage for different clients or categories of client. When a broker has a large number of clients, it is difficult for the broker to know what should be entered into this field. The process of checking and entering this field can seriously slow trading. Most brokers keep this information on their Back Office systems. In general, those brokers would prefer to provide this information via a downloaded file or some other automated technique.

Slow Processing

A number of brokers have complained about the ASSETS system's slow pace. They complain that order entry is slow and that the system sometimes appears sluggish. One broker felt that the system should enable him to enter ten orders in one minute. While this may be an exaggeration, in general brokers feel they must respond very rapidly to fast changing market conditions.

Unexplained Log-out

Brokers participating in the test noted that they had on occasion experienced an unexplained log-out from the system. This would be unacceptable during normal trading hours.

Multiple users on a common log-in ID

Five different users were logged into the system using the same ID.

Settlement Problems

One broker complained of the need to maintain three additional bank accounts (in addition to those needed for settling BSE and NSE trades) just for use in settling OTCEI trades.

B. Operating Systems - 30 June, 1997

1. The Assets Software executes on the broker's workstation using the Microsoft Windows 3.1© Operating System. Windows 3.1 is not a TCB (Trusted Computing Base) i.e. the users are not denied access to operating system parameters and anyone may make serious changes to the operating system. This can cause temporary / permanent disruptions. It also does not segregate memory accesses to different users during multi-user access to different users during multi-user access thereby causing allowing one user to interfere in the operations of another

   Recommendation: Windows NT Operating system, which is a TCB. Big brokerage houses are unlikely to trade on a system which is vulnerable to attacks by anyone.

2. The backend is a VAX VMS system with a query-based application. This has the chance of getting choked on very high volumes.

   Recommendation: Shift to a Broadcast based system where most of the queries can be handled locally and server communication need not get jammed by volume. This would speed up response times. A query-based system functioning under volume-related stress becomes slow in response and evokes impatient duplications of requests (there is a tendency for users to re-strike the enter key when there is no immediate response to their initial request.

3. Security needs to be strengthened at both ends of the leased lines by using routers which would query and verify predetermined IP addresses to check that authentic and authorized workstations are accessing the system at OTCEI. Unauthorized accesses at the broker's end must be controlled absolutely. The password maintenance of supervisor and VAX users should be highly controlled. A person knowing the user id and password on the VAX can make remote connections through the leased lines using software on the workstations and logging into the server at OTCEI.

   Recommendation: Operating system access should be restricted to system administration only at the broker's end. Again for that they would need to install Windows NT. More than one concurrent session of a single user-id on the VAX should be disallowed.

V. Interim Recommendation

Background

In response to lagging trade volumes and the need for new sources of business, OTCEI has decided to implement an automated trading system (Assets 8.0) for 'Permitted Securities'. Survival considerations demand immediate implementation. The purpose of this project was to assess the system's ability to handle anticipated trading volumes and its overall suitability.

In our initial tests of Assets, we found no major bugs in the software. We did however encounter a number of minor problems whose collective effect caused us to recommend a delay in implementation of Assets 8.0.

The cost of delay however, appears very high. OTCEI management feel they must act now. As a precautionary note they have been exploring alternative software. The need for immediate action makes full exploration of alternatives nearly impossible. During this time, CMC (an Indian software house) visited OTCEI and offered their Vector automated trading system which is in use in several exchanges in India. That system is considered (by OTCEI management) affordable and having the functions required of an exchange. In addition, CMC have stated they are willing to provide guarantees of capacity specified by OTCEI.

Other systems which can meet OTCEI's functional and capacity requirements are available on a commercial basis. The critical factor is time. To evaluate and choose one of those systems could take months, time that OTCEI does not have. While we would prefer a more orderly analysis and planning process, we appreciate OTCEI's need for immediate action. We therefore proposed the following accelerated approach to implementing an automated trading system for Permitted securities (we have included a decision chart as an addendum). To achieve the decisions needed, some educated guesses must be made.

Proposed Approach

1. Determine the suitability of the Assets 8.0 system. This task is described in the next section. This entails answering the following questions.
   a) Does the system provide the functions required by its members? If not, how difficult would it be to add those capabilities?
   b) Can ASSETS (with appropriate hardware upgrades) handle the projected volumes?
   c) Can OTCEI maintain and enhance the system?
2. If the answer to question #1 is yes, then determine the changes needed, make those changes and implement the ASSETS 8.0 system. Once the system has been implemented, the following support efforts should be initiated:
   a) Help Desk. It should identify errors that must be corrected. It should also serve as a center for collecting suggestions and requirements from OTCEI members.
   b) Hardware Planning.
   c) Capacity Planning.
3. If the answer to question # 1 is no or maybe, then alternatives must be explored. CMC's Vector system is the next most immediately available vehicle for trading Permitted Securities. Since Vector is in use at several Indian exchanges, it can be safely assumed that it provides most of the functions required by OTCEI members. Also, CMC have the

resources needed to properly enhance and maintain Vector. However, the issue of capacity is not so clear cut. Cost is another important factor as is the question of supporting Listed Securities trading. Therefore, the following questions must be asked;

a) Can Vector (with appropriate hardware) handle the projected trading volumes?
   i) What is Vector's projected capacity (e.g. numbers of trades, orders, enquiries, reports, etc. per trading day, hour and peak period)?
   ii) Has CMC conducted any volume or stress tests of Vector?
   iii) Will CMC provide performance guarantees? What level of guarantee?
   iv) What will be the cost of accommodating the projected volumes?
b) On what computer hardware does the Vector system run? And what hardware does CMC recommend?
c) How will the Listed market be supported? At what cost?

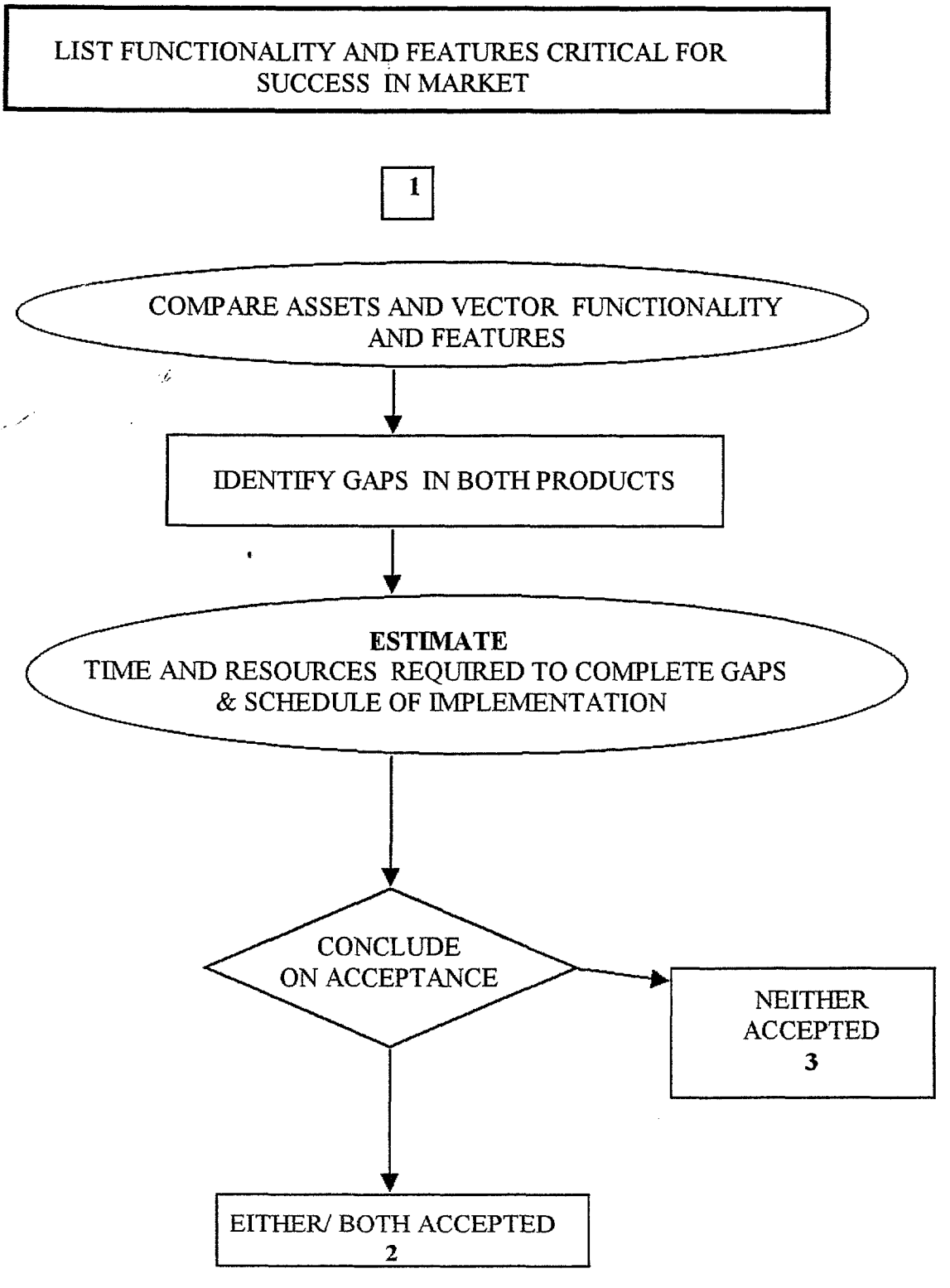
4. If Vector cannot provide the needed performance and guarantees at a reasonable cost, then other alternatives must be explored. This will necessitate examining other systems. We suggest that if this alternative becomes necessary, only systems with known large capacity be reviewed. Otherwise, this exercise could become extremely time consuming.
5. If Vector can provide the necessary solution and capacity, then the fastest solution would be to install Vector and gradually migrate Listed trading to that system. If Vector is chosen, then tasks noted in step 2 must still be performed.

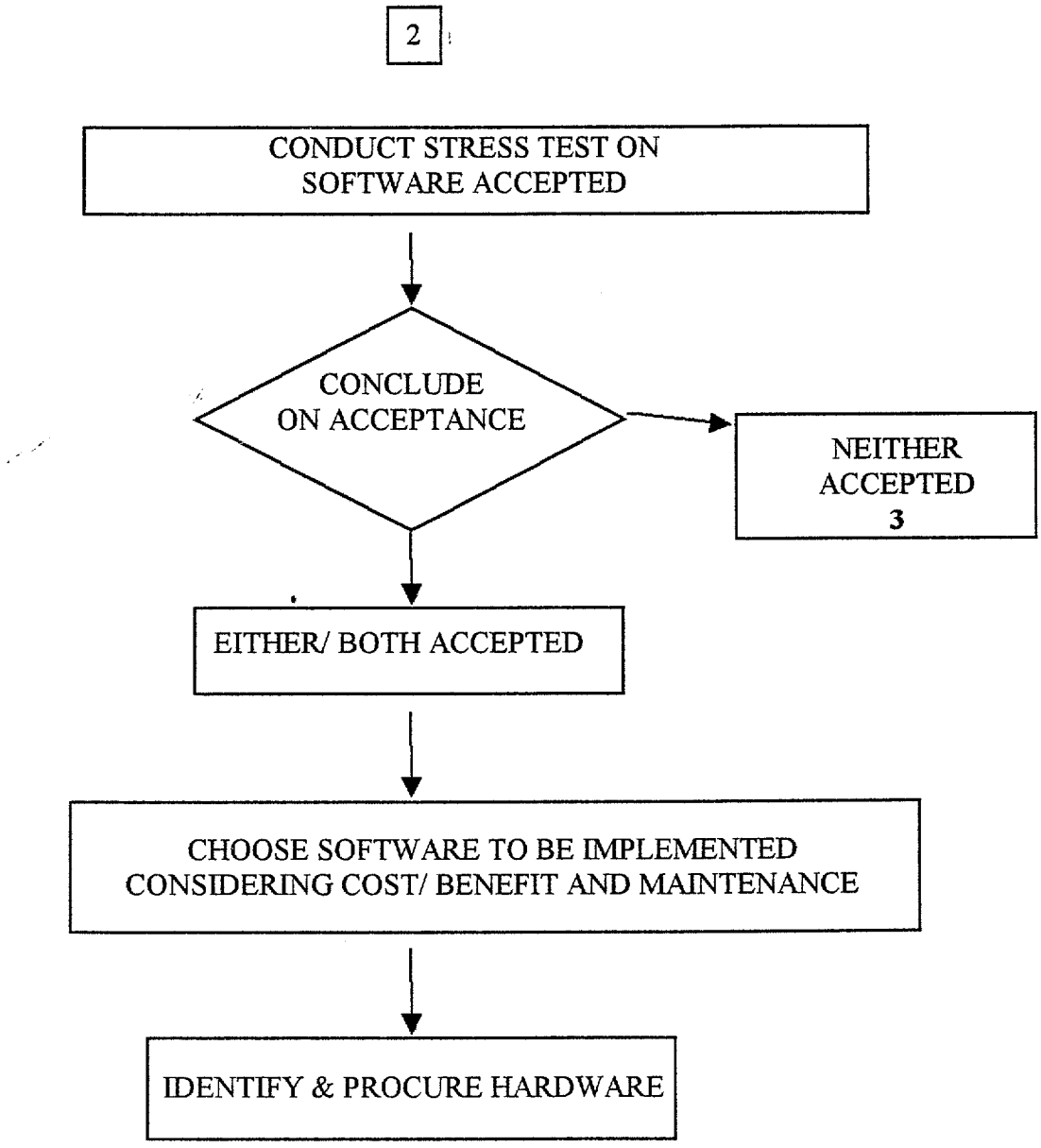
Breakdown of Analysis Task

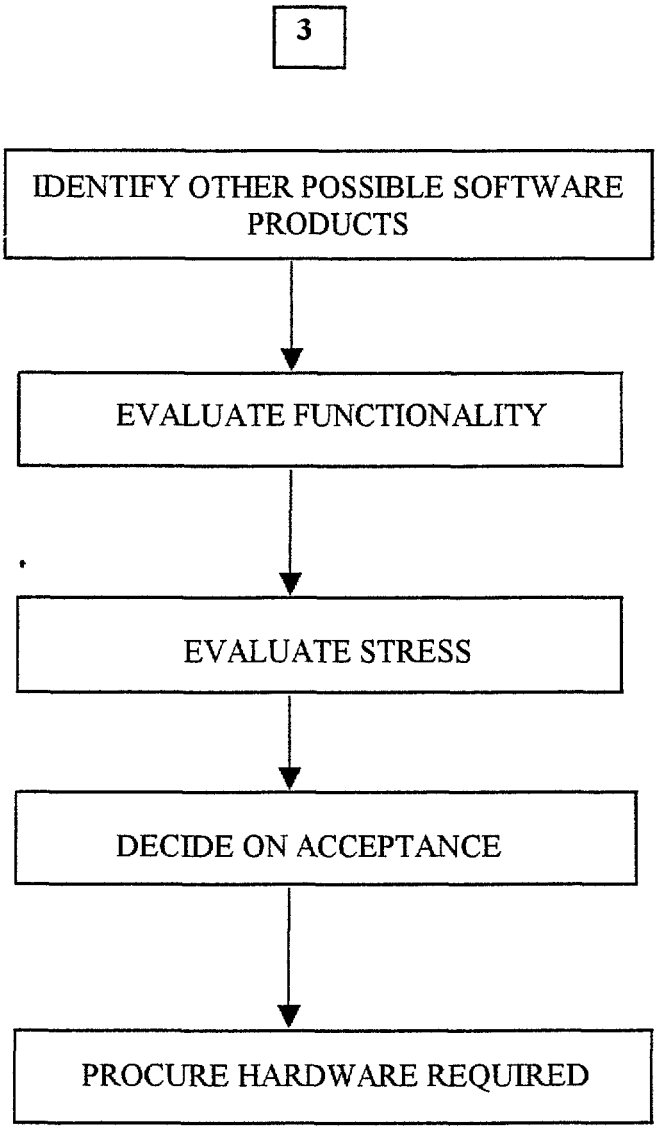
1. Determine Assets 8.0 suitability over the longer term
   a) Determine functional suitability
      i) List the functions needed to compete
      ii) Determine which of those functions exist and which must be added
      iii) Identify existing errors and discrepancies
      iv) Solicit the views of members who have participated in Assets testing and training
   b) Determine needed capacity
      i) Using existing assumptions of daily trade volumes, estimate the numbers and types of transactions the system will most likely encounter
   c) Estimate system capacity
      i) Analyze system architecture for potential bottlenecks
      ii) Analyze whether the existing query based architecture should be changed to a broadcast architecture
      iii) Conduct volume and stress tests
   d) Estimate effort (time and cost) required to perform the following tasks
      i) Correct reported errors and add new functions
      ii) Implement Windows NT on the member workstations

iii) Modify the system architecture to meet capacity requirements

e) Analyze staff requirements




2
CONDUCT STRESS TEST ON SOFTWARE ACCEPTED
CONCLUDE ON ACCEPTANCE
NEITHER ACCEPTED
3
EITHER/ BOTH ACCEPTED
CHOOSE SOFTWARE TO BE IMPLEMENTED CONSIDERING COST/ BENEFIT AND MAINTENANCE
IDENTIFY & PROCURE HARDWARE


3
IDENTIFY OTHER POSSIBLE SOFTWARE PRODUCTS
EVALUATE FUNCTIONALITY
EVALUATE STRESS
DECIDE ON ACCEPTANCE
PROCURE HARDWARE REQUIRED

VI. Cautions, Concerns and Limitations

During the course of our testing, OTCEI management asked the FIRE team what cautions, concerns and limitations were associated with implementing the Assets 8.0 trading system. This section contains our response to that request.

Limited Capacity

Because of the shortness of time available to undertake the review before OTCEI's proposed launch date of July 3, PW was unable to conduct any volume or stress tests. Nonetheless, our understanding of the software architecture of the Assets system leads us to the conclusion that it will be unable to handle the transaction volumes projected by OTCEI. The computer hardware is reasonably scaleable but that scalability carries a significant cost. Furthermore, the communications traffic would grow significantly with any increase in activity. We believe OTCEI would be unable to readily increase the system's capacity without a fundamental change in architecture (see Section VII Recommendations) from query-based to broadcast-based.

Dependence on a very small team

OTCEI is exceptionally dependent on a very small group of people for development and maintenance of the Assets system. Only one or two people are familiar with the overall system and its architecture. This fact coupled with the problem of very limited technical documentation exposes OTCEI to the risk of failure if those key people were unavailable at crucial times.

Lack of a dynamic book update feature

Users of the system can examine the open order book at any time. Unfortunately the book display is static. The user is unable to see changes in the book by any means other than making regular requests. If a broadcast-based architecture were used, the book display could be dynamically updated without any intervention on the part of the user.

Complex Transaction Entry

Assets is overly complex, especially in terms of the user interface. A number of the brokers who have used it during the traiining sessions have compared it unfavorably to the BOLT (Stock Exchange Mumbai trading system) and NEAT (National Stock Exchange's trading system). This attitude could be detrimental to the success of the Assets trading system.

VII. Recommendations

During the course of this project, OTCEI decided to use a commercially available trading system for its Permitted Securities trading rather than continue with the development of Assets 8.0. The following recommendations apply to both the Assets 8.0 or any other software system OTCEI chooses.

Replace the Windows 3.1© Operating System

Assets Software executes on the broker's workstation using the Microsoft Windows 3.1© Operating System. Windows 3.1 is not a TCB (Trusted Computing Base) i.e. the users are not denied access to operating system parameters and anyone may make serious changes to the operating system. This can cause temporary / permanent disruptions. In addition, Windows 3.1 does not segregate memory accesses to different users during multi-user access. This means that different users can interfere in each others operations.

We recommend that Windows NT, which is a TCB be used on the Assets workstations. We believe that large brokerage houses are unwilling to trade on a system that is vulnerable to attacks (whether accidental or purposeful) by anyone.

Broadcast architecture

The host (the main trading engine) system is a DEC VAX VMS© system with a query-based architecture. This has the chance of getting choked on very high volumes. This means that every query is processed by the host computer. A query-based system functioning under volume-related stress becomes slow in response and evokes impatient duplications of requests (there is a tendency for users to re-strike the enter key when there is no immediate response to their initial request.

We recommend that the system architecture be changed to a Broadcast base. With a broadcast-based architecture, key information (e.g. bids, offers, last sale prices) are broadcast to all workstations. Those devices maintain a data base of that information. When the workstation operator makes a query, it is handled locally. This reduces the load on the host computer. It also reduces the load on the communications lines reducing the likelihood of their being jammed by volume. This would speed up response times and improve overall performance.

System Security

Security must be strengthened at both ends of the leased lines by using routers that would query and verify each workstation's IP (unique identity) addresses to check that only authentic and authorized workstations are accessing the Assets system. Unauthorized accesses at the broker's end must be controlled absolutely. The password maintenance of supervisor and VAX users should be stringently controlled. A person knowing the user id and password on the VAX could make remote connections through the leased lines using software on the workstations and logging into the server at OTCEI.

We recommend that operating system access be restricted to system administrators at the broker's end. This requires installation of the Windows NT Operating System. More than one concurrent session of a single user-id on the VAX should be disallowed.

Business Rules

We suggest that the Business Rules for both the Listed Securities and Permitted Securities trading and settlement be made into an on-line file. The rules should be well indexed for ease of use. If the rules are maintained as an on-line file, members will always be assured of having a completely up-to-date set. It should not be necessary to distribute paper copies as OTCEI's members could print the rules directly from the on-line file.

Documentation

User Manual

Generally speaking, the Assets paper documentation is poorly written, poorly maintained and difficult to use. This is not unusual. Documentation is notoriously difficult to create and maintain. We recommend that OTCEI supply its "*User Manual*" as a standard Windows on-line Help file. We suggest that the paper manual be limited to a modest overview type document. All other documentation should be included in the on-line Help file. There are several advantages to this approach. On-line documentation can be prepared gradually and on an as needed basis. More importantly, users would be assured of having the latest documentation available.

On-Line Help File

We recommend that OTCEI create a separate Help facility for Permitted Securities. We suggest that the Help file be arranged alphabetically and made context sensitive.

Broker Training

Broker Training has been an ad hoc affair. One of the difficulties we observed during the training session was a lack of visibility to the presentations. This is because a large number of brokers had to crowd around a small screen to see the demonstration. We suggest that a video projector be attached to the demonstration trading system. An operator would enter the trades and other transactions while the trainer would provide an explanation of what was being done.

Following the demonstration, we suggest that a mock trading session be executed. During that session, knowledgeable people should be assigned to each terminal to assist the brokers in understanding how to use the system.

Another technique worth considering would be to create a training CD. This could take the form of a trading game. Brokers could use the game in the future to provide training for new staff members.

We would also suggest that the feedback process be made more formal. A number of

brokers made extensive comments during the trading sessions. Only a few of their comments appeared to have been recorded.

Change Existing Functions

Message Formats

The message formats are incomplete. An example of a trade message is as follows:

*Buy deal done for 1000@ 255 on **Error! Bookmark not defined.**

A broker receiving this report cannot easily identify the client for whom the trade was made. The older the order, the less likely the broker will have that information at his fingertips. This message should be changed to identify the broker's original order number.

Other messages are even more cryptic. We suggest that all messages carry information that will enable the receiving broker to readily identify all of the particulars associated with the reported transaction.

Transaction Number

The system generates a 13 digit transaction number for each order entered into the system. This order number includes Julian date. The number is a necessary part of the system. It is difficult to use however and is not particularly user friendly. A mechanism for translating the date to the Gregorian calendar should be provided. More importantly, OTCEI members should be given a way to translate the 13 digit transaction number to their internal order number.

New Functions

Global Cancel Facility

In a market undergoing severe stress, clients with open orders need a way of rapidly removing those orders. Brokers should therefore be provided a Global Cancel facility. That transaction should allow a broker to cancel all buy or all sell orders in a particular security.

Opening Auction

We recommend that OTCEI provide an Opening Auction. Prior to the opening, brokers would be able to examine the open order book and to enter new orders. At the Opening, the system would match those orders. The Opening Price would be set at that price where the largest number of shares would trade. If the same number of shares would trade at two or more prices, the system would select the price which was closest to the previous closing price.