TPC Benchmark™ C
Full Disclosure Report

InfoSERVER® 5020

using
Microsoft® SQL Server 6.5™
and
Microsoft® Windows NT® 4.0

First Edition

Submitted for Review
June 30, 1997

June 30,1997

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Benchmark results are highly dependent upon workload, specific application requirements, and system design and implementation. Relative system performance will vary as a result for these and other factors. Therefore, TPC Benchmark C should not be used as a substitute for a specific customer application benchmark when critical capacity planning and/or product evaluation decisions are contemplated.

All performance data contained in his report were obtained in a rigorously controlled environment. Results obtained in other operating environments may vary significantly. Itautec Philco S.A. does not warrant or represent that a user can or will achieve similar performance expressed in transactions per minute (tpmC) or normalized price/performance ($/tpmC). No warranty of system performance or price/performance is expressed or implied in this report.

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Abstract

Overview

This report documents the methodology and results of the TPC Benchmark™ C test conducted on the Itautec Philco S.A. InfoSERVER 5020. The tests were conducted by Itautec Philco S.A.

The tests were run in a client/server configuration using six HiQ 133MHz Pentium® Personal Computers as clients. The operating system used for the benchmark was Microsoft NT Server 4.0 for both server and clients. The database was the Microsoft SQL Server v. 6.5.SP3.

All tests were done in compliance with Revision 3.3 of the Transaction Processing Council's TPC Benchmark™ C Standard Specification. Two standard TPC Benchmark ™ C metrics, transactions per minute (tpmC) and price per tpmC ($/tpmC) are reported and referred to in this document. The results from the tests are summarized below.

Hardware	Software	Total System Cost	tpmC	R$/tpmC	Availability Date
Itautec InfoSERVER 5020	Microsoft Windows NT 4.0 Microsoft SQL Server 6.5 SP3	R$ 829,918	7,573.00	109.58	HW: March 1, 1997 SW: March 31, 1997

AUDITOR

The results of the benchmark and test methodology used to produce the results were audited by Tom Sawyer and Richard Gimarc of Performance Metrics and have fully met the TPC−C rev 3.3 specifications.

Additional copies of this Full Disclosure Report can be obtained from either the Transaction Processing Performance Council or Itautec Philco S.A. at the following addresses:

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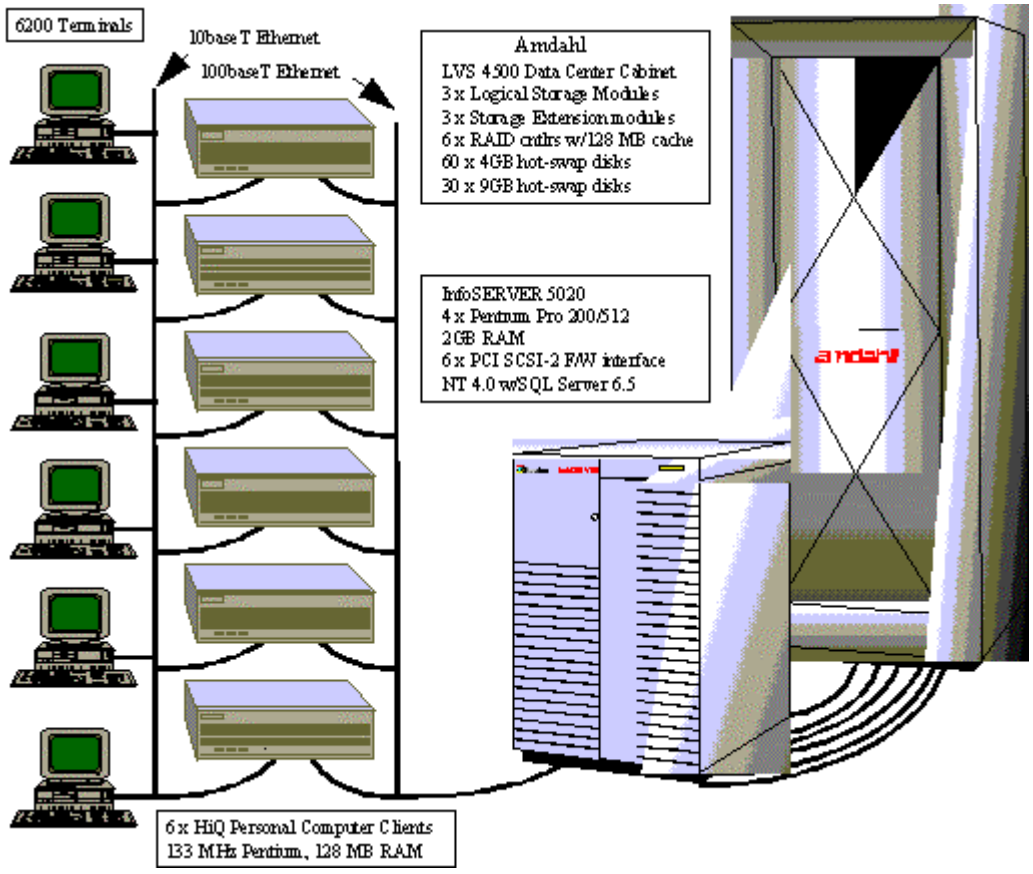
Itautec Philco S.A.	InfoSERVER® 5020 (C/S)		TPC-C Rev 3.3 Report Date: June 30, 1997
Total System Cost	TPC-C Throughput	Price/Performance	Availability Date
R$ 829.918	7.573 tpmC	109,58 R$/tpmC	March 31, 1997

Processors	Database Manager	Operating System	Other Software	Number of Users
4 200MHz Pentium® Pro Processors	Microsoft SQL Server 6.5 SP 3 (246)	Microsoft Windows NT 4.0	Microsoft Internet Information Server Microsoft Visual C++	6.200



System Component	Server		Clients	
Processors	4	Pentium® Pro Processor 200MHz	1	Pentium® 133MHz
Cache		512KB		256KB
Memory		2048MB		128MB
Disk Controllers	7	4 Adaptec 2944UW 1 Adaptec 3944UW 2 Adaptec AIC−7880	1	Adaptec 2940UW
Disk Drives	36 61	9 GB 4 GB	1	2 GB
Total Storage	97	568 GB	1	2 GB
Other	1	CD−ROM / Tape Unit	1	CD−ROM

Itautec Philco S.A.	InfoSERVER 5020 Client/Server					TPC-C REV 3.3 EXECUTIVE SUMMARY Report Date: June, 30 1997	
Description	Part Number	Third Party		Unit Price	Qty	Extended Price	5 yr. Maint. Price
Server Hardware							
InfoSERVER 5020 D1.4+CD4x+Keyboard+Mouse	81890		1	R$15.355	1	15.355	4.498
CPU PPro 200MHz/512KB Upgrade Kit	82337		1	R$2.297	4	9.188	1.615
InfoSERVER 5020 CPU Board	82349		1	R$1.836	1	1.836	323
128MB SIMM w/Parity Memory Kit	87514		1	R$1.977	16	31.632	5.559
Intel EtherExpress PRO 100B PCI	87507		1	R$173	1	173	41
SCSI-2 AHA-2944UW Differential Adapter	87508		1	R$726	4	2.904	680
SCSI-2 AHA-3944UW Differential Adapter	87509		1	R$1.134	1	1.134	266
Monitor 15"	80884		1	R$479	1	479	159
SVGA Adapter	78510		1	R$115	1	115	27
Tape Backup	86371		1	R$1.338	1	1.338	235
4GB hot-swappable disks	84463		1	R$1.869	1	1.869	328
9GB hot-swappable disks	85339		1	R$3.226	6	19.356	3.402
SUB-TOTAL						85.379	17.133
Server Software							
Windows NT Server 4.0 Port CD 5 Client	81607		1	R$910	1	910	1.380
Windows NT Client 4.0 MOLP A	81617		1	R$33	5	165	220
SQL Server 6.5 Eng Int CD 10 Client	81852		1	R$2.255	1	2.255	3.673
SQL Internet Connector 6.5 MLP	87510		1	R$3.342	1	3.342	0
Microsoft Software Support (One Year)	82621		1	R$0	5	0	6.386
SUB-TOTAL						6.672	11.659
Storage							
LVS 4500 Logical Storage Module	4500-001-8120	Amdahl	2	R$0	3	0	51.840
288 MB Intelligent Memory	4500-001-7383	Amdahl	2	R$20.360	3	61.080	0
Data Center Cabinet	4500-001-7371	Amdahl	2	R$5.045	1	5.045	0
Storage Expansion Module	4500-001-7410	Amdahl	2	R$3.737	3	11.211	12.960
SCSI Host Interface Cable (10 ft)	4500-001-8432	Amdahl	2	R$138	6	828	0
UPS	EXIDE-UPS2D-6450	Amdahl	2	R$3.987	1	3.987	997
9 GB hot-swappable Disk Drives (20 count)	4500-001-7989	Amdahl	2	R$120.833	1	120.833	0
9 GB hot-swap Extension Disks	4500-001-7944	Amdahl	2	R$4.448	10	44.480	0
4 GB hot-swappable Disk Drives (20 count)	4500-001-7405	Amdahl	2	R$76.659	2	153.318	0
4 GB hot-swap Extension Disks	4500-001-7444	Amdahl	2	R$2.321	20	46.420	0
SUB-TOTAL						447.202	65.797
Client Hardware							
1P 133 MHz Pentium		HiQ	3	R$4.428	8	35.424	8.301
2 GB disk							
128 MB memory							
PRO 100B 10/100 baseT NIC (2)							
8X CD-ROM							
SVGA Adapter							
Keyboard/mouse/15" monitor							
SUB-TOTAL						35.424	8.301
Client Software							
Windows NT Server 4.0 MOLP A	81614		1	R$695	6	4.170	3.987
Windows NT Client 4.0 MOLP A	81617		1	R$33	60	1.980	2.640
SQL Server Pgmr Toolkit	81608		1	R$566	1	566	698
Visual C++ V 4.0	87511		1	R$566	1	566	698
SUB-TOTAL						7.282	8.023
User Connectivity							
3Com SSII Dual Speed 100/10 Hub 12-port	87128		1	R$1.371	3	4.113	482
3Com Entry Hub 24-port	87512		1	R$416	285	118.560	13.891
SUB-TOTAL						122.673	14.373
TOTAL						R$704.632	R$125.286

Notes:
Price sources: 1=Itautec Philco 2=Amdahl 3=HiQ Computer Systems

Audited by Tom Sawyer and Richard Gimarc of Performance Metrics, Inc.

Five-Year Cost of Ownership:	R$829.918
tpmC Rating:	7.573
R$/tpmC:	109,58

Values in Real, the official currency in Brazil (symbol = R$).
Values following numeric convention in Brazil: a period separates thousands (1.000 = one thousand), a comma separates the decimal fraction (1,000 = one)

Prices used in TPC benchmarks reflect the actual prices a customer would pay for a one-time purchase of the stated components. Individually negotiated discounts are not permitted. Special prices based on assumptions about past or future purchases are not permitted. All discounts reflect standard pricing policies for the listed components. For complete details, see the pricing sections of the TPC benchmark specifications.
If you find that the stated prices are not available according to these terms, please inform the TPC at pricing@tpc.org.

MQTh, computed Maximum Qualified Throughput			7,573.00 tpmC
% throughput difference, reported & reproducibility runs			0.4%
Response Times (90th percentile | Average | Maximum) in seconds			
– Neworder	1.2	0.7	6.6
– Payment	1.1	0.6	3.5
– Order Status	1.8	1.3	7.2
– Delivery (interactive portion)	0.3	0.3	0.8
– Delivery (deferred portion)	1.4	1.2	14.4
– Stock–Level	3.6	2.4	8.5
– Menu	0.3	0.2	0.9
Response time delay added for menu delay			0.1
Response time delay added for response time delay			0.1
Transaction Mix, in percent of total transactions			
– New–Order			44.7 %
– Payment			43.1 %
– Order–Status			4.1 %
– Delivery			4.1 %
– Stock–Level			4.1 %

Keying/Think Times (in seconds),	Min		Average		Max	
– New–Order	18.0	0	18.0	12.1	18.1	120.8
– Payment	3.0	0	3.0	12.1	3.0	120.7
– Order–Status	2.0	0	2.0	10.2	2.0	100.7
– Delivery	2.0	0	2.0	5.1	2.0	50.7
– Stock–Level	2.0	0	2.0	5.1	2.0	44.8

Test Duration	
– Ramp–up time	25 minutes
– Measurement interval	30 minutes
– Number of checkpoints	1
– Checkpoint interval	30 minutes
– Number of transactions (all types) completed in measurement interval	508,268

(and all other numerical quantities required in the Full Disclosure Report)

Document Structure

The contents of this report are determined by the TPC Benchmark C Standard Specification Revision 3.3, written and approved by the Transaction Processing Performance Council (TPC). The format of this report is based on this specification. Most sections of this report begins with the revelant specification requirements printed in *italic type*, immediately followed by the detail in plain type of how Itautec Philco S.A. complied with the specification. Where extensive listings are required (such as listing of code), a note is included which references an appendix containing the listing.

Benchmark Overview

TPC Benchmark™ C (TPC−C) is an OLTP workload. It is a mixture of read−only and update intensive transactions that simulate the activities found in complex OLTP application environments. It does so by exercising a breadth of system components associated with such environments, which are characterized by:

- The simultaneous execution of multiple transaction types that span a breadth of complexity
- On−line and deferred transaction execution modes
- Multiple on−line terminalsessions
- Moderate system and application execution time
- Significant disk input/output
- Transaction integrity (ACID properties)
- Non−uniform distribution of data access through primary and secondary keys
- Databases consisting of many tables with a wide variety of sizes, attributes, and relationships
- Contention on data access and update

The performance metric reported by TPC−C is a "business throughput", measuring the number of orders processed per minute. Multiple transactions are used to simulate the business activity of processing an order, and each transaction is subject to a response time constraint.

The performance metric for this benchmark is expressed in transactions−per−minute−C (tpmC). To be compliant with the TPC−C standard, all references to tpmC results must include the tpmC rate, the associated price−per−tpmC, and the availability date of the priced configuration.

Although these specifications express implementation in terms of a relational data model with conventional locking scheme, the database may be implemented using any commercially available database management system (DBMS), database server, file system, or other data repository that provides a functionally equivalent implementation. The terms "table", "row", and "column" are used in this document only as examples of logical data structures.

TPC−C uses terminology and metrics that are similar to other benchmarks, originated by the TPC or others. Such similarity in terminology does not in any way imply that TPC−C results are comparable to other benchmarks. The only benchmark results comparable to TPC−C are other TPC−C results conformant with the same revision.

Despite the fact that this benchmark offers a rich environment that emulates many OLTP applications, this benchmark does not reflect the entire range of OLTP requirements. In addition, the extent to which a customer can achieve the results reported by a vendor is highly dependent on how closely TPC−C approximates the customer application. The relative performance of systems derived from this benchmark

does not necessarily hold for other workloads or environments. Extrapolations to any other environment are not recommended.

Benchmark results are highly dependent upon workload, specific application requirements, and systems design and implementation. Relative system performance will vary as a result of these and other factors. Therefore, TPC−C should not be used as a substitute for a specific customer application benchmarking when critical capacity planning and/or product evaluation decisions are contemplated.

System Overview

The hardware configuration used in this TPC−C test is the Itautec Philco S.A. InfoSERVER 5020. The test configuration was built with 2GB of memory, various Adaptec controllers, Amdahl Large Volume Storage (LVS) 4500 RAID controllers, a combination of 4GB and 9GB disk drives, and Intel Pro100B Smart Network adapter cards. The operating system used was Microsoft Windows NT 4.0 Server, and Microsoft SQL Server 6.5 SP3 was used as the database engine.

The InfoSERVER 5020 baseboard is based on the Intel 82450GX chipset and contains 2 processor boards that can hold up to 4 Pentium Pro Processors (200MHz with 512KB L2 cache). The system has 10 I/O slots based on dual−peer PCI bus; 6 of the slots are PCI, 4 are EISA and none is shared. The benchmark configuration used 2GB of RAM, consisting of 16 128MB SIMMs on the memory board. The InfoSERVER 5020 incorporates I2O ready BIOS. This means that as intelligent I/O devices become available, the system can take advantage of their performance benefits. This system has 2 integrated Ultra/Wide SCSI−3 controllers (based on Adaptec AIC−7880) and offers a peak transfer rate of 40 MB/s each. In a standard configurations, one Ultra/Wide SCSI−3 controller can be cabled to the hard drive backplane, and the other can be cabled to the CD−ROM and removable media bays.

The Amdahl LVS 4500 RAID disk system was configured in a Data Center cabinet and loaded with 90 hot−pluggable disks. The LVS 4500 storage sub−system utilized 3 Logical Storage Modules (LSM), each configured with 288 MB of Intelligent Memory for the RAID controllers and cache. Each LSM was configured with 2 active controllers in non−mirrored mode, with 128 MB of cache (with integral battery backup) per controller. The Amdahl LVS 4500 controllers can host Ultra Wide SCSI−3 connections, although the benchmark environment described here utilized SCSI−2 Fast/Wide differential connections. Each LSM was configured with one Storage Expansion cabinet, and the total allocation of disks per dual−controller LSM was 30 disks.

The system also used an Intel Pro100B PCI network adapter card. This network interface card (NIC) supplied a 100Base T network interface to the 6 HiQ Personal Computer clients. Each of the clients had one 133MHz Pentium® processor, 128MB of Memory, one 2GB SCSI hard disk and 2 Intel Pro100B network adapter cards. One of the cards interfaced with the InfoSERVER 5020 server at 100baseT speed, while the other card interfaced to the users (e.g., the RTE systems) at 10baseT speed.

All components of the benchmark configuration were configured in a manner appropriate to customer production environments, i.e., the system used full−function drivers and software. The exception is that operating system components unused during the benchmark were disabled (see Appendix C).

General Items

Test Sponsor

A statement identifying the sponsor of the Benchmark and any other companies who have participated.

Itautec Philco S.A. is the sponsor of this TPC Benchmark™ C.

Application Code and Definition Statements

The application program must be disclosed. This includes, but is not limited to, the code implementing the five transactions and the terminal input/output functions.

The section entitled Clause 1 − Logical Database Design Related Items contains a brief discussion of the database design. The database definition statements, distribution across disk drives, loading scripts, and tables are provided in Appendix B − Database Design.

The program that implements the TPC Benchmark C translation and collects appropriate transaction statistics is referred to as the Remote Terminal Emulator (RTE) or Driver program. The Driver program is discussed in Section 7.0. The source code for this driver program is provided in Appendix A − Application Source Code.

Parameter Settings

Settings must be provided for all customer-tunable parameters and options which have been changed from the defaults found in actual products, including but not limited to:

- Database options
- Recovery/commit options
- Consistency/locking options
- System parameters, application parameters, and configuration parameters.

This requirement can be satisfied by providing a full listing of all parameters and options.

Appendix C contains the database and operating system parameters used in this benchmark. Appendix D contains the hardware configuration details.

Configuration Diagrams

Diagrams of both the measured and priced systems must be provided, accompanied by a description of the differences.

Figure 1−1 and 1−2 respectively show the measured and priced full client/server configurations. The differences between the measured and priced configurations are highlighted below.

There were 15 9GB drives for the data and 4 for the log on the measured configuration, and 30 for data and 6 for the log on the priced configuration.

The measurement configuration utilized a 16−port 10/100baseT switch to connect the RTE machines to the clients. The switch was configured as 10baseT, half−duplex. There was no gain in performance while using the switch, demonstrated by inserting a single 10baseT Ethernet hub into one RTE−to−Client connection: the individually recorded response times were statistically identical between switch and hub connections.

The Client machines were benchmarked with 4GB disk drives, but 2GB drives were priced. There is no performance advantage inherent in Client disk capabilities.

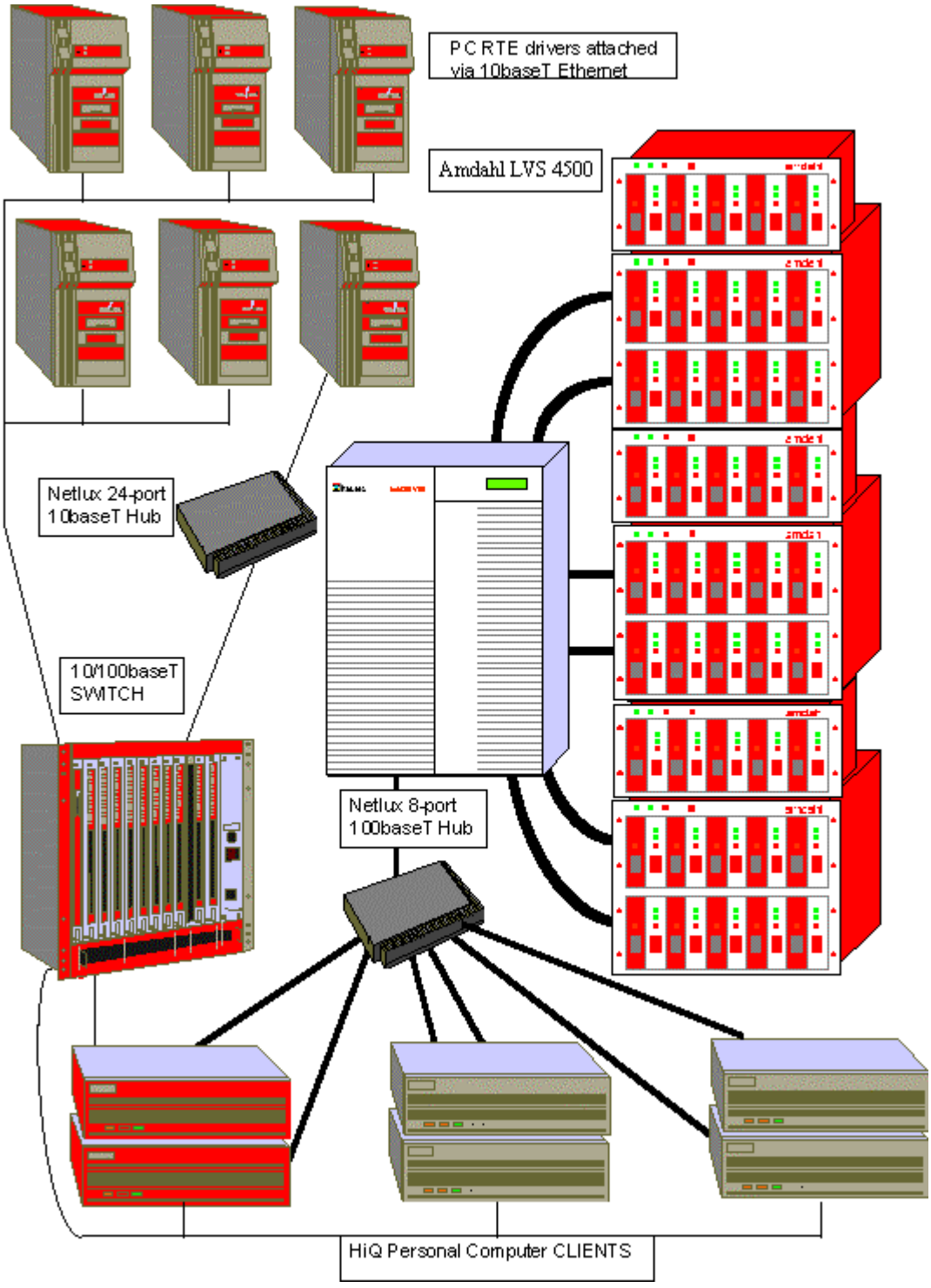


Figure 1: Measured Configuration

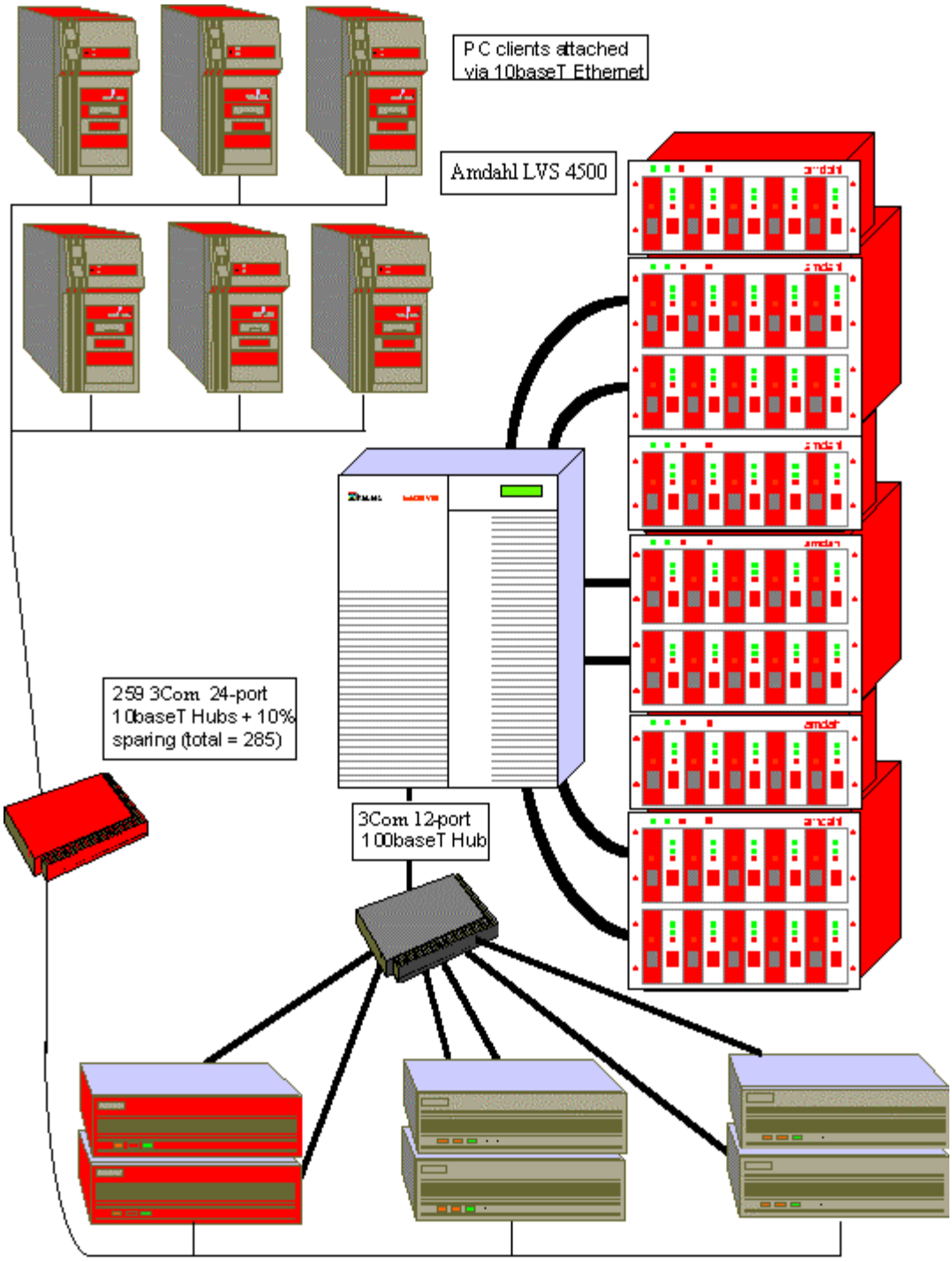


Figure 2: Priced Configuration

Clause 1 — Logical Database Design Related Items

Table Definitions

Listings must be provided for all table definition statements and all other statements used to set-up the database (from Clause 8.1.2.1).

Appendix B contains the code used to define and load the database tables.

Physical Organization of the Database

The physical organization of tables and indices within the database must be disclosed (Clause 8.1.2.2)

The measured configuration used ninety−six (96) SCSI−2 Fast/Wide disk drives. Ninety of the drives were installed in the Amdahl LVS 4500 Data Center Cabinet, of which there were fifteen (15) 9GB drives and seventy−five (75) 4GB drives. The remaining six (6) drives were installed in the InfoSERVER 5020 server and were used as LOG files (6) and the operating system filesystem.

The 90 drives in the LVS 4500 were configured as six groups of 15 disks each, all of them RAID 0 device groups. Each group of 15 drives was connected to the InfoSERVER 5020 server via a dedicated SCSI−2 Fast/Wide differential connection.

Insert and Delete Operations

It must be ascertained that insert and/or delete operations to any of the tables can occur concurrently with the TPC-C transaction mix. Furthermore, any restriction in the SUT database implementation that precludes inserts beyond the cardinality limits defined in Clause 1.4.11 must be disclosed. This includes the maximum number of rows that can be inserted and the maximum key value for these new rows (Clause 8.1.2.3)

Insert and delete functionality was fully operational during the benchmark.

Horizontal and Vertical Partitioning

While there are few restrictions placed upon horizontal or vertical partitioning of tables and rows in the TPC-C benchmark (see Clause 1.6), any such partitioning must be disclosed (Clause 8.1.2.4).

Partitioning was not used in this benchmark.

Replication

Replication of tables, if used, must be disclosed (see Clause 1.4.6) (from Clause 8.1.2.5)

Replication was not used in this benchmark.

Table Attributes

Additional and/or duplicated attributes in any table must be disclosed along with a statement on the impact on performance (see Clause 1.4.7) (Clause 8.1.2.6).

No additional attributes were used in this benchmark.

Clause 2 — Transaction and Terminal Profiles Related Items

Random Number Generation

The method of verification for the random number generation must be described (Clause 8.1.3.1)

The random number generation was performed internal to the Microsoft BenchCraft RTE program, which was audited independently.

Screen Layout

The actual layouts of the terminal input/output screens must be disclosed (Clause 8.1.3.2).

The screen layouts are based on those in Clauses 2.4.3, 2.5.3, 2.6.3, 2.7.3, and 2.8.3 of the TPC−C Standard Specification. There are some differences due to the fact this is a WEB client implementation.

Terminal Verification

The method used to verify that the emulated terminals provide all the features described in Clause 2.2.2.4 must be explained. Although not specifically priced, the type and model of the terminals used for the demonstration in 8.1.3.3 must be disclosed and commercially available (including supporting software and maintenance). (Clause 8.1.3.3)

The terminal features were verified by allowing the auditor to manually execute each of the five transaction types using Microsoft Internet Explorer version 3.0.

Intelligent Terminals

Any usage of presentation managers or intelligent terminals must be explained. (Clause 8.1.3.4).
Comment 1: The intent of this clause is to describe any special manipulations performed by a local terminal or workstation to off-load work from the SUT. This includes, but is not limited to, screen presentations, message bundling, and local storage of TPC-C rows.
Comment 2: This disclosure also requires that all data manipulation functions performed by the local terminal to provide navigational aids for transaction(s) must also be described. Within this disclosure, the purpose of such additional function(s) must be explained.

Application code involved in the manipulation of data was run on the client. Screen manipulation commands were downloaded to the WEB browser, which handled input and output presentation graphics. A listing of this code is included in Appendix A. Microsoft Internet Information Service® assisted in the processing and presentation of this data.

Transaction Profiles

The percentage of home and remote order-lines in the New-Order transactions must be disclosed (Clause 8.1.3.5). The percentage of New-Order transactions that rolled-back as a result of an unused item number must be disclosed (Clause 8.1.3.6). The number of items per orders entered by New-Order transactions must be disclosed (Clause 8.1.3.7). The percentage of home and remote Payment transactions must be disclosed (Clause 8.1.3.8). The percentage of Payment and Order-Status transactions that used non-primary key (C_LAST) access to the database must be disclosed (Clause 8.1.3.9). The percentage of Delivery transactions that were skipped as a result of an insufficient number of rows in the NEW_ORDER table must be disclosed.

Table 1: Transaction Statistics

Transaction	Function	Value
New Order	Home Warehouse Items	98.99%
	Remote Warehouse Items	1.01%
	Rolled Back Transactions	1.01%
	Average Lines Per Order	10
Payment	Home Warehouse	85.02%
	Remote Warehouse	14.98%
	Non-Primary Key Access	60.07%
Order Status	Non-Primary Key Access	60.09%
Delivery	Skipped Transactions	0

Transaction Mix

The mix (i.e., percentages) or transaction types seen by the SUT must be disclosed (Clause 8.1.3.11).

Table 2: Transaction Mix

Transaction	Percentage
New Order	44.70%
Payment	43.10%
Order Status	4.07%
Delivery	4.05%
Stock Level	4.08%

Deferred Delivery Mechanism

The queueing mechanism used to defer the execution of the Delivery transaction must be disclosed (Clause 8.1.3.12).

The client application processes submitted delivery transactions to named pipe delivery server software running on the client machines. There was a single delivery server with multiple execution threads running on each client machine. These delivery servers were responsible for processing deliveries queued to the named pipe and submitting them to the database server.

The source code is listed in Appendix A.

Clause 3 — Transaction and System Properties Related Items

ACID Tests

The results of the ACID tests must be disclosed along with a description of how the ACID requirements were met. This includes disclosing which case was followed for the execution of Isolation Test 7 (Clause 8.1.4.1).

All ACID property tests were successful. The executions are described below.

Atomicity

The system under test must guarantee that the database transactions are atomic; the system will either perform all individual operations on the data or will assure that no partially completed operations leave any effects on the data.

Completed Transactions

A row was selected in a script from the warehouse, district and customer tables, and the balances noted. A payment transaction was started with the same warehouse, district and customer identifiers and a known amount. The payment transaction was committed and the rows were verified to contain correctly updated balances.

Aborted Transactions

A row was selected in a script from the warehouse, district and customer tables, and the balances noted. A payment transaction was started with the same warehouse, district and customer identifiers and a known amount. The payment transaction was rolled back and the rows were verified to contain the original balances.

Consistency

Consistency is the property of the application that requires any execution of a database transaction to take the database from one consistent state to another, assuming that the database is initially in a consistent state.

Consistency conditions One through Four were tested using a shell script to issue queries to the database. The results of the queries verified that the database was consistent for all four tests. A run was executed under full load lasting over ten (10) minutes and included a checkpoint. The shell script was executed again. The result of the same queries verified that the database remained consistent after the run.

Isolation

Sufficient conditions must be enabled at either the system or application level to ensure the required isolation defined in Clause 3.4.1 is obtained.

Isolation tests One through Seven were executed using shell scripts to issue queries to the database. Each script included timestamps to demonstrate the concurrency of operations. The results of the queries were captured to files. The auditor verified the captured files. This demonstrated the required isolation had been met.

In addition, the phantom tests and the stock level tests were executed and verified.

For Isolation test seven, case A was followed.

Durability

The tested system must guarantee durability: the ability to preserve the effects of committed transactions and insure database consistency after recovery from any one of the failures listed in Clause 3.5.3.

Durable Media Failure

Durability from media failure was demonstrated on a 10 warehouse database for the loss of Data and Log and the fully scaled database for the Instantaneous Interruption and Loss of Memory. The standard driving mechanism was used to generate the transaction load of 100 users for the Loss of Data and Log and 6200 users for the Instantaneous Interruption and Loss of Memory.

Loss of Data and Log

The loss of data and log tests were performed on a 10 warehouse system. To demonstrate recovery from a permanent failure of durable medium containing TPC−C tables, the following steps were executed:

1. A 10 warehouse database was built in a manner similar to the full size database.
2. A backup was taken of the database using Microsoft SQL Server facilities.
3. A sum of d_next_o_id was taken and noted.
4. 100 users were logged into the database and proceeded to run transactions.
5. Removed one disk drive from a disk array containing the transaction log.
6. NT reported that part of a mirrored pair was not responding.
7. SQL Server reported no errors and continued running normally
8. Continued to run for 2 min.
9. Removed one disk drive from a disk array containing database files.
10. SQL Server reported errors and transactions failed.
11. SQL Server was restarted and a dump of the transaction log was taken.
12. The tpcc database was dropped.
13. The system was shut down and the removed disk drive was replaced and the partition reformatted.
14. The 10 warehouse database was recreated.
15. The 10 warehouse database was restored from backup.
16. The saved transaction log was loaded and transactions rolled forward.
17. A sum of d_next_o_id was taken and noted.
18. The number of transactions reported in the database and in the RTE log was compared.

Instantaneous Interruption and Loss of Memory

Because loss of power erases the contents of memory, the instantaneous interruption and the loss of memory tests were combined into a single test. This test was executed on a fully scaled database of 620 warehouses under a full load of 6200 users. The following steps were executed:

1. A sum of D_NEXT_O_ID was taken and noted.
2. 6200 users were logged into the database and proceeded to run transactions.
3. System power was terminated.
4. System power was reapplied and NT restarted.
5. SQL Server was started and recovery occured automatically.
6. A new sum of D_NEXT_O_ID was taken and noted.
7. The number of transactions reported in the database and in the RTE log was compared.

Clause 4 — Scaling and Database Population Related Items

Table Cardinality

The cardinality (e.g., the number of rows) of each , as it existed at the start of the benchmark run (see Clause 4.2) must be disclosed. If the database was over-scaled and inactive rows of the WAREHOUSE table were deleted (see Clause 4.2.2), the cardinality of the WAREHOUSE table as initially configured and the number of rows deleted must be disclosed (Clause 8.1.5.1).

The database was originally built with 650 warehouses. Thirty (30) rows were removed from the benchmark WAREHOUSE table prior to the run per Clause 4.2.2 of the TPC−C version 3.2 specification.

Table 3: Table Cardinality

Table	Cardinality as Benchmarked
Warehouse	620
District	6,500
Customer	19,500,000
History	19,500,000
Orders	19,500,000
New Order	5,850,000
Order Line	195,004,080
Stock	65,000,000
Item	100,000
Deleted Warehouses	30

Constant Values

The following values were used as constant value inputs to the NURand function for this benchmark.

Table 4: Constant Values

Function	Constant C Value
C_LAST (Build)	123
C_LAST (Run)	233

Data Distribution

The distribution of tables and logs across all media must be explicitly depicted for the tested and priced systems (Clause 8.1.5.2).

Table 5 : Data Distribution

Controller	Drives	Partition	size	Use
LVS1	15 x 9GB	E:	14,000MB	Misc_seg
		F:	18,000MB	Ol_seg
LVS2	15 x 4GB	G:	8,000MB	Cs_seg
LVS3	15 x 4GB	H:	8,000MB	Cs_seg
LVS4	15 x 4GB	I:	8,000MB	Cs_seg
LVS5	15 x 4GB	J:	8,000MB	Cs_seg
LVS6	15 x 4GB	K:	8,000MB	Cs_seg
		Y:	127,000MB	Backup
Adaptec	4GB	C:	4,000MB	OS
	9GB		8,600MB	Log_seg
	9GB	(mirror)	8,600MB	Log_seg
	9GB		8,600MB	Log_seg
	9GB	(mirror)	8,600MB	Log_seg
	4GB		4,000MB	Log_seg
	4GB	(mirror)	4,000MB	Log_seg

Clause 8.1.5.3: A statement must be provided that describes:

1. The data model implemented by the DBMS (e.g., relational, network, hierarchical)

2. The database interface (e.g., embedded, call level) and access language (e.g., SQL, DL/1, COBOL read/write) used to implement the TPC-C transactions. If more than one interface/access language is used to implement TPC-C, each interface/access language must be described and a list of which interface/access language is used with which transaction type must be disclosed.

Microsoft SQL Server v6.50.246 is a relational DBMS.

The interface used was Microsoft SQL Server stored procedures accessed with Remote Procedure Calls embedded in C code.

Partition Mapping

The mapping of database partitions/replications must be explicitly described.
Comment: The intent is to provide sufficient detail about partitioning and replication to allow independent reconstruction of the test database.

The database was not replicated.

180 Day Space Calculation

Details of the 180 day space computations along with proof that the database is configured to sustain 8 hours of growth for the dynamic tables (Order, Order-Line, and History) must be disclosed (see Clause 4.2.3) (Clause 8.1.5.5).

We calculated the 180 day space in the following manner:

1. The free space on the log file was queried using DBCC checktable(syslogs).
2. Transactions were run against the database with a full load of users.
3. The free space was again queried using DBCC checktable(syslogs).
4. The space used was calculated as the difference between the first and second query.
5. The number of NEW−ORDERS was verified from an RTE report covering the entire run.
6. The space used was divided by the number of NEW−ORDERS giving a space−used per NEW−ORDER transaction.
7. The space used per transaction was multiplied by the measured tpmC rate times 480 minutes.

The results of the above steps yielded a requirement of 21.16 GB (including mirror) to sustain the log for 8 hours. Space available on the transaction log volume was 34.4 GB (including mirror), indicating that enough storage was configured to sustain 8 hours of growth.

The same methodology was used to compute growth requirements for dynamic tables Order, Order−Line and History.

The details of the 180−day space requirements are shown in Appendix D.

Clause 5 — Performance Metrics and Response Time Related Items

Measured tpmC

Measured tpmC must be reported. (8.1.6.1)

Measured tpmC	7,573,00
Price per tpmC	$ 109.58 Real / tpmC

Response Times

Ninetieth percentile, maximum, and average response times must be reported for all transactions types as well as for the Menu response time (Clause 8.1.6.2).

Table 6: Transaction Response Times

Transaction	Average	Maximum	90%
New Order	0.71	6.58	1.20
Payment	0.57	3.45	1.10
Order Status	1.26	7.19	1.80
Interactive Delivery	0.27	0.75	0.30
Deferred Delivery	1.19	14.35	1.37
Stock Level	2.41	8.49	3.60
Menu	0.19	0.88	0.32

Think Times & Key Times

The minimum, average, and maximum keying and think times must be reported for each transaction type (Clause 8.1.6.3).

Table 7: Transaction Key Times

Transaction	Average	Minimum	Maximum
New Order	18.02	18.02	18.07
Payment	3.03	3.02	3.07
Order Status	2.03	2.02	2.07
Delivery	2.03	2.02	2.05
Stock Level	2.03	2.02	2.08

Table 8: Transaction Think Times

Transaction	Average	Minimum	Maximum
New Order	12.09	0	120.80
Payment	12.06	0	120.70
Order Status	5.11	0	50.70
Delivery	5.06	0	44.76
Stock Level	10.17	0	100.70

Response Time Distribution Curves

Response Time frequency distribution curves (see Clause 5.6.1) must be reported for each transaction type. (Clause 8.1.6.4)

Figure 3: New Order Response Time Distribution

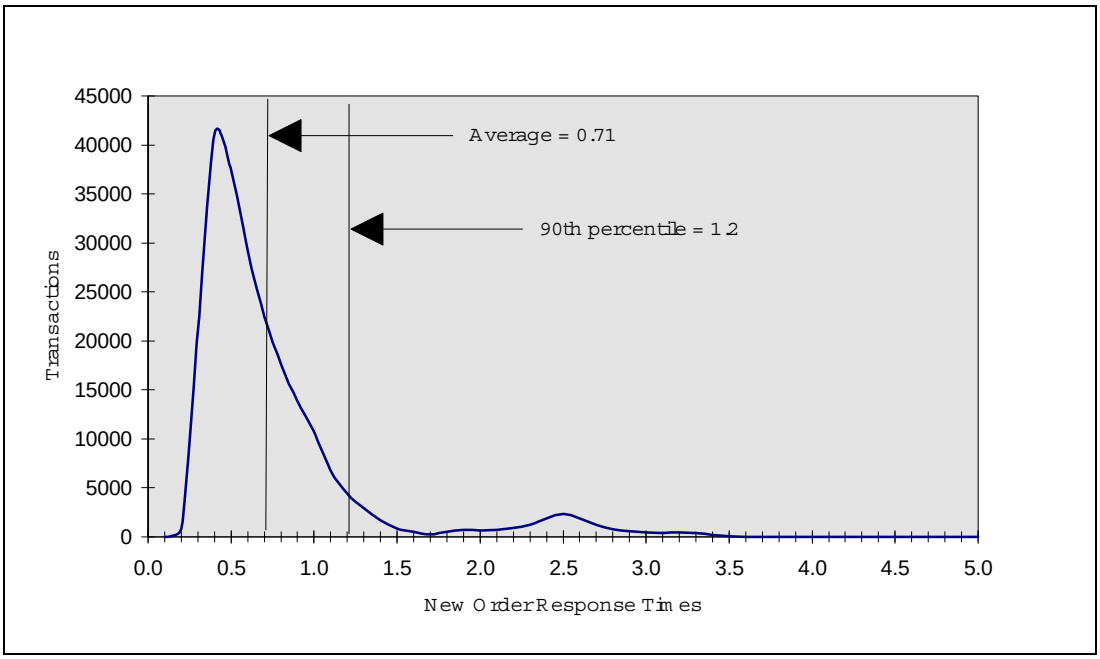


Figure 4: Payment Response Time Distribution

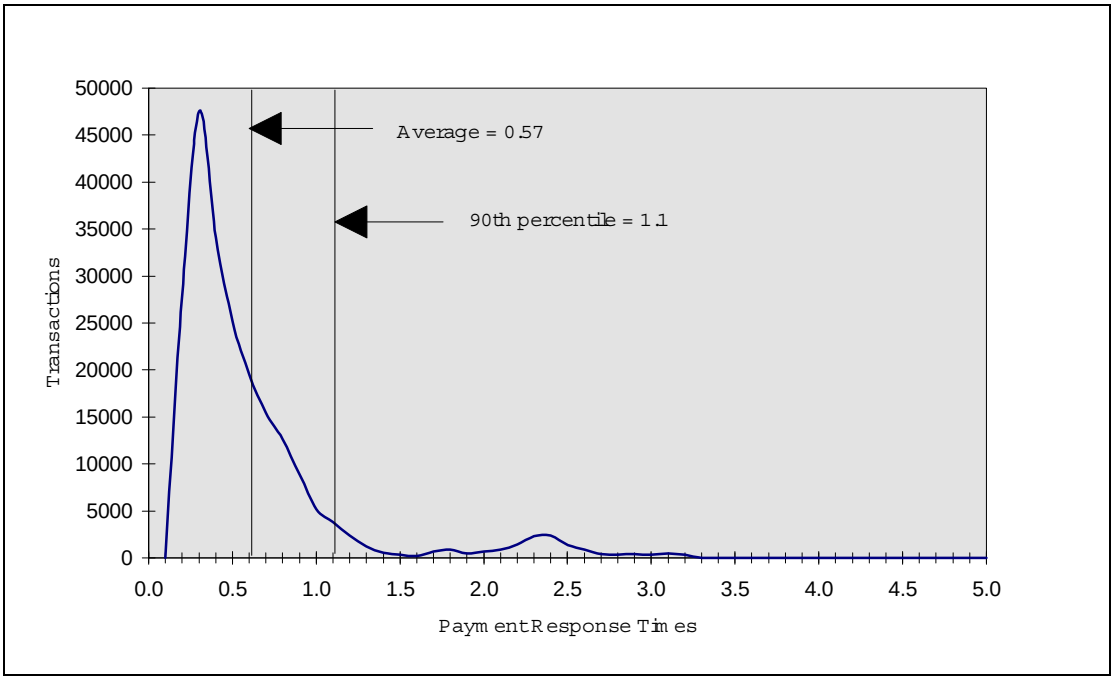


Figure 5: Order Status Response Time Distribution

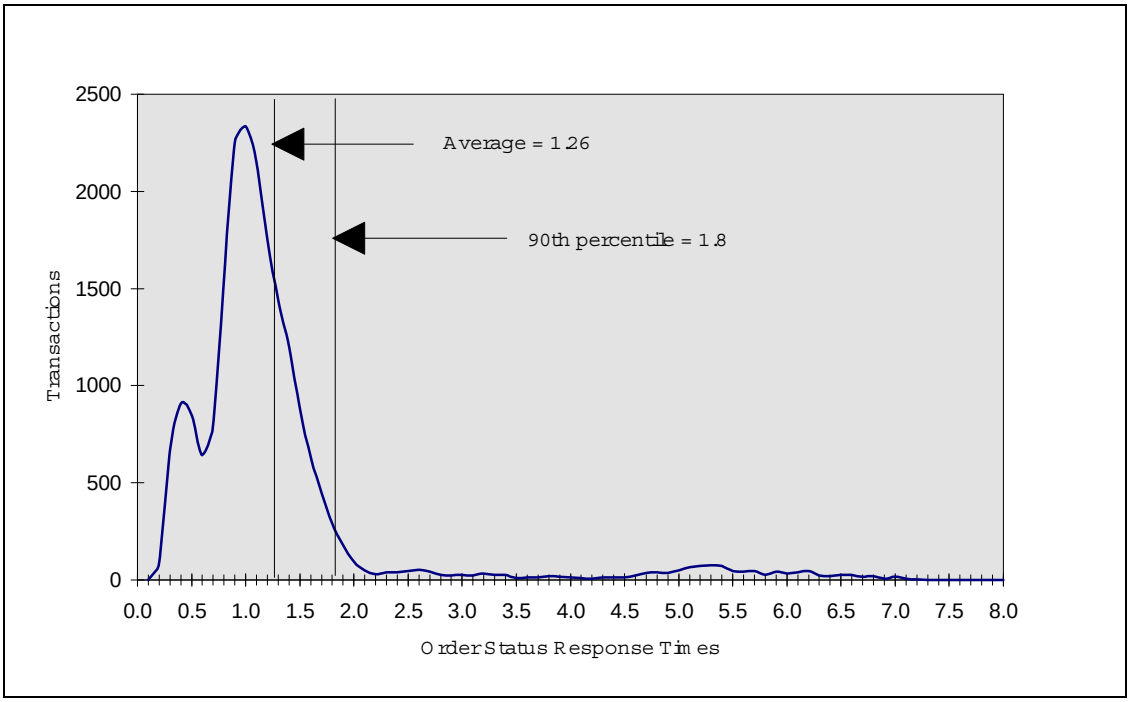


Figure 6: Delivery Response Time Distribution

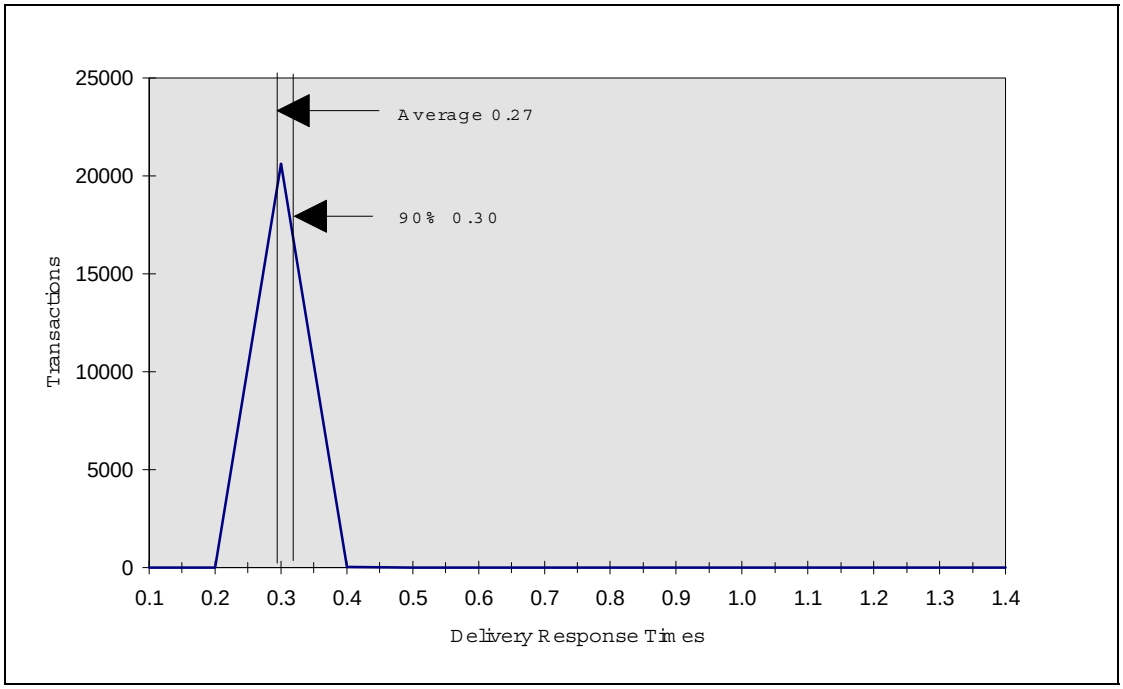
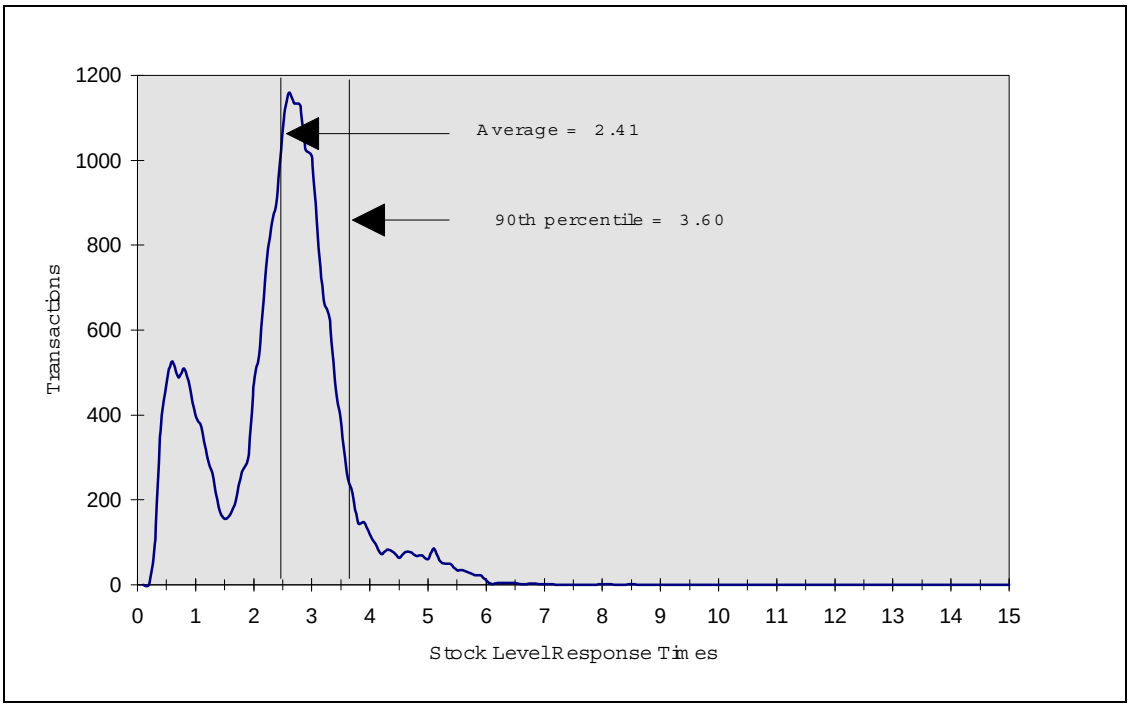


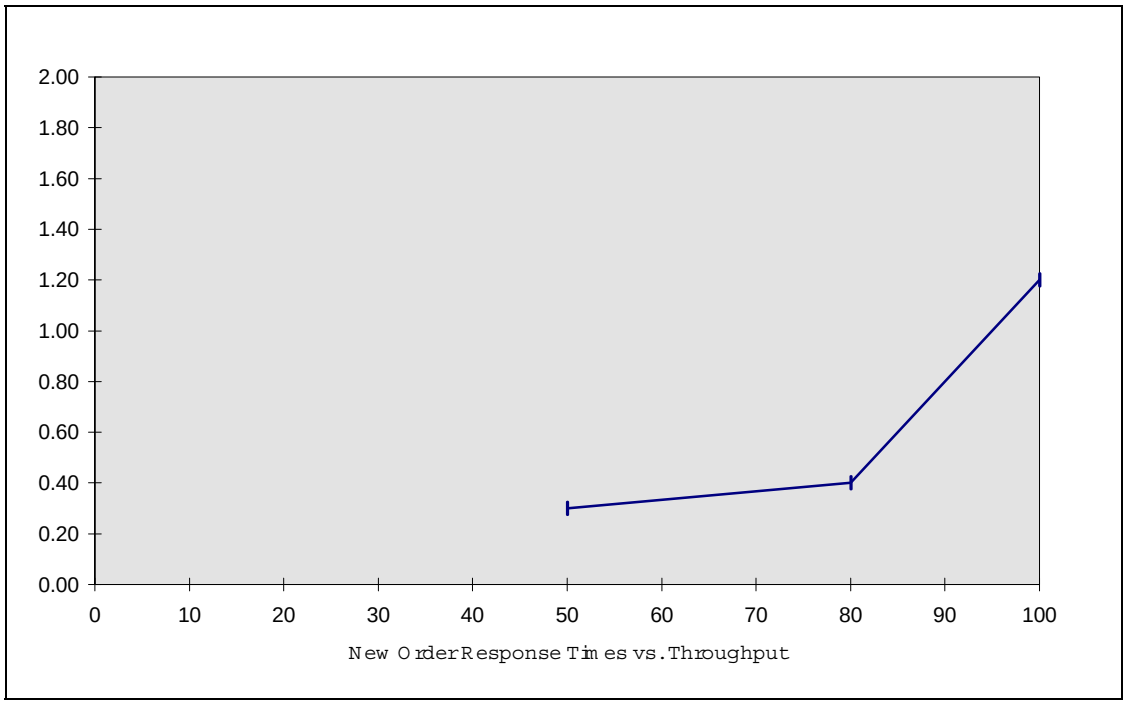
Figure 7: Stock Level Response Time Distribution



New-Order Response Time vs. Throughput Graph

The performance curve for response times versus throughput (see Clause 5.6.2) must be reported for the New-Order transaction. (Clause 8.1.6.5)

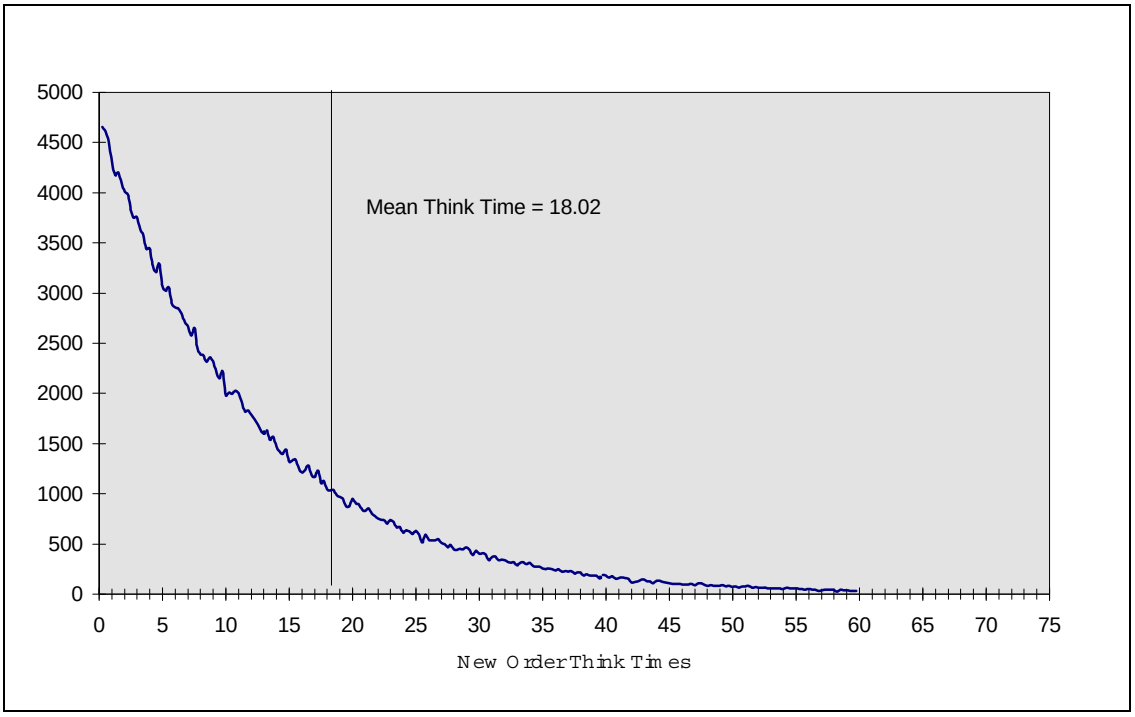
Figure 8: New Order Response Time vs. Throughput



New-Order Think Time Distribution Graph

Think time frequency distribution curves (see Clause 5.6.3) must be reported for the New-Order transaction (Clause 8.1.6.6).

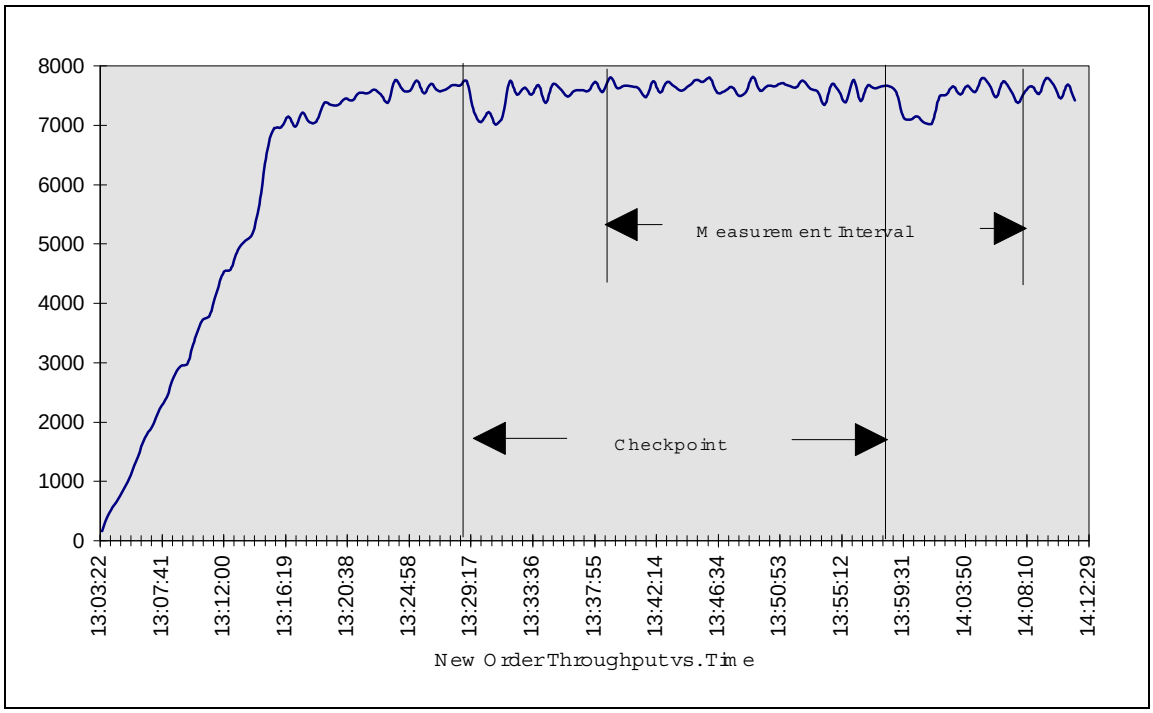
Figure 9: New Order Think Time Distribution



Steady-State Graph

A graph of throughput versus elapsed time (see Clause 5.6.5) must be reported for the New-Order transaction (Clause 8.1.6.8).

Figure 10: New Order Throughput vs. Time



Steady-State Methodology

The method used to determine that the SUT had reached a steady state prior to commencing the measurement interval (see Clause 5.5) must be described (Clause 8.1.6.9).

Steady state was determined using real time monitor utilities from both the operating system and the RTE. Steady state was further confirmed by the throughput data collected during the run and subsequently graphed in Figure 10.

Work Performed During Steady State

A description of how the work normally performed during a sustained test (for example, checkpointing, writing redo/undo log records, etc) actually occurred during the measurement interval must be reported (Clause 8.1.6.10).

The RTE generated the required input data to choose a transaction from the menu. This data was timestamped. The response for the transaction was verified and timestamped in the RTE log files.

The RTE generated the required input data for the chosen transaction. It waited to complete the minimum required key time before transmitting the input screen. The transmission was timestamped. The return of the screen with the required response data was timestamped. The difference between these two timestamps was the response time for that transaction and was logged in the RTE log.

The RTE then waited the required think time interval before repeating the process starting at selecting another transaction from the menu.

The RTE transmissions were sent to application processes running on the client machines through Ethernet LANs. These client application processes handled all screen I/O as well as all requests to the database on the server. The applications communicated with the database server over another Ethernet LAN using Microsoft SQL Server DBLIB library and RPC calls.

To perform checkpoints at specific intervals, we set SQL Server *recovery interval* to the maximum allowable value and wrote a script to schedule multiple checkpoints at specific intervals. By setting the TRACE FLAG #3502, SQL Server logged the checkpoint beginning and ending time in the ERRORLOG file. The script included a wait time between each checkpoint equal to the measurement interval which was 30 minutes. The checkpoint script was started manually after the RTE had all users logged in and sending transactions.

At each checkpoint, Microsoft SQL Server wrote to disk all memory pages that had been updated but not yet physically written to disk. Upon completion of the checkpoint, Microsoft SQL Server wrote a special record to the recovery log to indicate that all disk operations had been satisfied to this point. The positioning of the checkpoint was verified to be clear of the guard zones and is depicted on the graph in Figure 10.

Reproducibility Methodology

A description of the method used to determine the reproducibility of the measurement results must be reported (Clause 8.1.6.11).

The duration of total time for the measurement(s) was sufficient to include three checkpoints, each thirty minutes apart from checkpoint completion to checkpoint start. The stated throughput of the TPC−C benchmark, 7,573 tpmC, was obtained from the first half of the total running time. The reproducible portion was obtained from the second half of the total running time (e.g., it straddled the third and last checkpoint). The reported throughput was matched within 0.4%.

Measurement Interval

The measurement interval was 30 minutes.

Transaction Mix

The method of regulating the transaction mix (e.g., card decks or weighted random distribution) must be described. If weighted distribution is used and the RTE adjusts the weights associated with each transaction type, the maximum adjustments to the weight from the initial value must be disclosed (Clause 8.1.6.13).

The RTE was given a weighted random distribution which was not adjusted during the run.

The percentage of the total mix for each transaction type must be disclosed (Clause 8.1.6.14).

Table 9: Transaction Mix

Transaction	Percentage
New Order	44.7
Payment	43.1
Order Status	4.08
Delivery	4.07
Stock Level	4.05

Checkpoints

The initial checkpoint was started 26 minutes after the start of the ramp−up. The second checkpoint was started 30 minutes after the 1st checkpoint had completed. The checkpoint in the measurement interval lasted 2 minutes, 22 seconds. The measurement interval contains the second checkpoint, and is clear of the guard zones.

Clause 6 — SUT, Driver, and Communication Definition Related Items

RTE Parameters

The RTE input parameters, code fragments, functions, etc, used to generate each transaction input field must be disclosed (Clause 8.1.7.1).
Comment: The intent is to demonstrate the RTE was configured to generate transaction input data as specified in Clause 2.

The RTE used was the Microsoft BenchCraft RTE System. The input parameters are listed in Appendix C – Tunable Parameters.

Emulated Components

It must be demonstrated that the functionality and performance of the components being emulated in the Driver System are equivalent to that of the priced system. The results of the test described in Clause 6.6.3.4 must be disclosed (Clause 8.1.7.2).

No components were emulated.

Benchmarked and Targeted System Configuration Diagrams

A complete functional diagram of both the benchmark configuration and the configuration of the proposed (target) system must be disclosed. A detailed list of all software and hardware functionality being performed on the Driver System, and its interface to the SUT must be disclosed (see Clause 6.6.3.6) (Clause 8.1.7.3).

The driver system performed the data generation and input functions of the priced display device. It also captured the input and output data and timestamps for post-processing of the reported metrics. No other functionality was included on the driver system.

Figures 1 & 2 of this report contain detailed diagrams of both the benchmark configuration and the priced configuration, and the associated text summarizes the differences between the two.

Network Configuration

The network configurations of both the tested services and the proposed (target) services which are being represented and a thorough explanation of exactly which parts of the proposed configuration are being replaced with the Driver System must be disclosed (see Clause 6.6.4). (Clause 8.1.7.4)

All components of the priced configuration were operational during the benchmark. A high-speed switch was configured into the RTE-to-Client network topology to simplify connectivity. The switch was configured as 10baseT, half-duplex, which is the network capacity of the priced (and tested) 10baseT hub.

Network Bandwidth

The network bandwidth(s) used in the tested/priced configuration must be disclose. (Clause 8.1.7.5).

The network bandwidth for priced and tested configurations was identical. The RTE-to-Client connections used 10baseT Ethernet, while the Client-to-Server connection used 100baseT Ethernet.

Operator Intervention

If the configuration requires operator intervention (see Clause 6.6.6), the mechanism and the frequency of this intervention must be disclosed (Clause 8.1.7.6).

This configuration does not require any operator intervention to sustain eight hours of the reported throughput.

Clause 7 — Pricing Related Items

Hardware and Software List

The details of the hardware and software are reported in the front of this report as part of the executive summary. All third party quotations are included at the end of this report as Appendix E.

Availability Date

Hardware Availability Date: March 1, 1997
Software Availability Date: March 31, 1997

Measured TpmC

Maximum Qualified Throughput: 7,573.00 TpmC
Price Performance Metric: $ 109,58 Real per TpmC

Country Specific Pricing

This system is priced for Brazil, where the official currency is the Real (symbol R$).

Usage Pricing

The component pricing based on usage is shown below:

- Ten (10) Microsoft Windows NT 4.0 Server licenses
- One (1) Microsoft SQL Server v.6.50 (Includes 10 Client Access Licenses).
- One (1) Microsoft Internet Connector License
- One (1) Microsoft SQL Server Programmers Toolkit
- One (1) Microsoft Visual C++ version 4.2

System Pricing

The details of the hardware and software are reported in the front of this report as part of the executive summary. All third party quotations are included at the end of this report as Appendix E.

Clause 9 — Audit Related Items

Auditor

This TPC-C benchmark has been audited by Tom Sawyer and Richard Gimarc of Performance Metrics.

Availability of the Full Disclosure Report

Requests for this TPC Benchmark C Full Disclosure Report should be sent to:

Transaction Processing Performance Council
c/o Shanley Public Relations
777 North First Street, Suite 6000
San Jose, CA 95112-6311, USA

or:

Itautec Philco S.A.
Av. Dr. Hugo Beolchi 900
Sao Paulo, SP 04310-030, Brazil
Phone: (011) 5584-3154, fax (011) 5584-3717
Attn: Mauricio Bonini

Auditor Attestation Letter

Mr. Mauricio Bonini
General Manager
Itautec Philco S.A.
Av. Dr. Hugo Beolchi 900
Sao Paulo, SP 04310−030 Brazil

June 21, 1997

I have verified remotely the TPC Benchmark™ C for the following configuration:

Platform: Itautec InfoSERVER 5020
Database Manager: Microsoft SQL Server 6.5
Operating System: Microsoft Windows NT Server 4.0

CPUs	Memory	Disks	New Order Response Time @ 90%	tpmC
Server: Itautec InfoSERVER 5020				
4 Pentium Pro @ 200 MHz	Main: 2 GB L2 Cache: 512 KB	75 @ 4.3 GB 15 @ 9 GB	1.2 sec	7,583.00
6 Clients: HiQ Personal Computer				
1 Pentium @ 133 MHz	Main: 128 MB L2 Cache: 256 KB	1 @ 2 GB	n.a.	n.a.

In my opinion, these performance results were produced in compliance with the TPC Benchmark C Standard Specification, Revision 3.3.

The following attributes of the benchmark were given special attention:

- The transactions were correctly implemented, including error detection.
- The database files were properly sized and populated.
- The database was properly scaled with 620 warehouses.
- The ACID properties were met, including phantom protection.
- Input data was generated according to the specified percentages.
- Eight hours of mirrored log space was preseent on the tested system.
- The data for the 180−day space calculation was verified.
- Fifteen 9 GB disks were substituted for 4.3 GB disks in the priced configuration. The substituted disks contained stripes of the same tables on fifteen 9 GB disks in the tested configuration.
- The steady state portion of the test was 30 minutes.

- One checkpoint was taken during the steady state portion of the test.
- Checkpoints were verified to be clear of the guard zones.
- System pricing was checked for major components and maintenance.
- Third party quotes were verified for compliance.

Additional Audit Notes:

The benchmark was executed on an Amdahl EnVista Frontline Server. All active components on the Amdahl EnVista Frontline Server and the Itautec InfoSERVER 5020 are identical.

Regards,

Richard L. Gimarc
Auditor

Appendix A – Application Source Code

Microsoft WEB Client

Makefile

```
!IF "$(CFG)" == ""
CFG=Debug
!MESSAGE No configuration specified.  Defaulting to Debug
!ENDIF

!IF "$(SQL_LOC)" == ""
SQL_LOC=C:\MSSQL\DBLIB
!MESSAGE No SQL_LOC specified.  Defaulting to C:\MSSQL\DBLIB
!ENDIF

!IF "$(CFG)" != "Release" && "$(CFG)" != "Debug"
!MESSAGE Invalid configuration "$(CFG)" specified.
!MESSAGE You can specify a configuration when running NMAKE on this makefile
!MESSAGE by defining the macro CFG on the command line.  For example:
!MESSAGE
!MESSAGE NMAKE CFG="Debug"
!MESSAGE
!MESSAGE Possible choices for configuration are:
!MESSAGE
!MESSAGE "Release"
!MESSAGE "Debug"
!MESSAGE
!ERROR An invalid configuration is specified.
!ENDIF

OUTDIR        = .
SRCDIR        = .\Src
OBJDIR        = .\Objs
OUTDIR        = .\Bin
DBLIB         = $(SQL_LOC)
DBLIBINC      = $(DBLIB)\INCLUDE
DBLIBDIR      = $(DBLIB)\LIB

!IF "$(CFG)" != "Debug"
LDEBUG      =
CDEBUG      =
LDEBUG_RG   =
CDEBUG_RG   =
DEBUG       =
FLAGS       = /D "WIN32" /D "_WINDOWS"
OPT         = /Ot
!ELSE
LDEBUG      = /debug /pdb:$(OBJDIR)\tpcc.pdb
CDEBUG      = /Zi /Yd /Fd$(OBJDIR)\tpcc.pdb
LDEBUG_RG   = /debug /pdb:$(OBJDIR)\install.pdb
CDEBUG_RG   = /Zi /Yd /Fd$(OBJDIR)\install.pdb
FLAGS       = /D "_DEBUG" /D "WIN32" /D "_WINDOWS"
OPT         = /Od
!ENDIF

LINK32_LIBS     = user32.lib msacm32.lib advapi32.lib $(DBLIBDIR)\ntwdblib.lib
LINK32_OBJS     = "$(OBJDIR)\tpcc.obj" "$(OBJDIR)\tpcc.res"
LINK32_DEF      = "$(SRCDIR)\tpcc.def"
LINK32_FLAGS    = /nologo /subsystem:windows /dll /incremental:no $(LDEBUG) /def:"$(LINK32_DEF)" /out:"$(OBJDIR)\tpcc.dll"

LINK32_LIBS_RG  = user32.lib gdi32.lib advapi32.lib version.lib comctl32.lib
LINK32_OBJS_RG  = "$(OBJDIR)\install.obj" "$(OBJDIR)\install.res"
LINK32_FLAGS_RG = /nologo /subsystem:windows /incremental:no $(LDEBUG_RG) /out:$(OUTDIR)\install.exe

ALL:    $(OBJDIR)\. $(OUTDIR)\. $(OUTDIR)\install.exe

$(OBJDIR)\.:
                if not exist $(OBJDIR) md $(OBJDIR)

$(OUTDIR)\.:
                if not exist $(OUTDIR) md $(OUTDIR)

"$(OBJDIR)\tpcc.obj":   "$(SRCDIR)\tpcc.c" "$(SRCDIR)\tpcc.h"
                cl.exe /nologo /MT /W3 $(CDEBUG) $(OPT) /I $(DBLIBINC) $(FLAGS) /Fo$(OBJDIR)\tpcc.obj /c "$(SRCDIR)\tpcc.c"

$(OBJDIR)\tpcc.res:     $(SRCDIR)\tpcc.rc
                rc.exe /l 0x409 /fo $(OBJDIR)\tpcc.res $(FLAGS) $(SRCDIR)\tpcc.rc

$(OBJDIR)\tpcc.dll:     $(LINK32_OBJS) $(LINK32_DEF)
                link.exe   $(LINK32_FLAGS) $(LINK32_OBJS) $(LINK32_LIBS)
```

```
$(OBJDIR)\delisrv.exe:  $(SRCDIR)\delisrv.c $(SRCDIR)\delisrv.h
        cl.exe /nologo /MT /W3 $(CDEBUG) $(OPT) /I $(DBLIBINC) $(FLAGS) /Fo$(OBJDIR)\delisrv.obj $(SRCDIR)\delisrv.c /link /out:$(OBJDIR)\delisrv.exe
$(DBLIBDIR)\ntwdblib.lib msacm32.lib advapi32.lib

$(OBJDIR)\install.res:  $(SRCDIR)\install.rc $(OBJDIR)\tpcc.dll $(OBJDIR)\delisrv.exe
        rc.exe /l 0x409 /fo$(OBJDIR)\install.res /i $(OBJDIR) /i $(SRCDIR) $(FLAGS) $(SRCDIR)\install.rc

$(OBJDIR)\install.obj:  $(SRCDIR)\install.c $(OBJDIR)\tpcc.dll $(OBJDIR)\delisrv.exe $(OBJDIR)\install.res
        cl -W3 $(CDEBUG_RG) /Fo$(OBJDIR)\install.obj /c $(SRCDIR)\install.c

$(OUTDIR)\install.exe:    $(OBJDIR)\install.obj $(OBJDIR)\install.res
        link.exe @<<
  $(LINK32_FLAGS_RG) $(LINK32_OBJS_RG) $(LINK32_LIBS_RG)
<<
```

Delisrv.h

```
/*      FILE:                   DELISRV.H
 *                                      Microsoft TPC-C KitVer. 3.00.000
 *                                      Audited 08/23/96, By Francois Raab
 *
 *                                      Copyright Microsoft, 1996
 *
 *      PURPOSE:    Header file for delivery service executable
 *      Author:                 Philip Durr
 *                                      philipdu@Microsoft.com
 */

#define AVAILABLE               0                                       //queue array element available
#define WRITE_LOCKED    1                                       //queue array element is being written to
#define READ_LOCKED             2                                       //queue array element is begin read
#define     INUSE                       4                                       //queue array element has
information stored in it

#define     CTRL_C                      3                                       //<Ctrl> C, exit key code

#define DEFCLPACKSIZE                                       4096        //default DB Library SQL Connection pack size

#define     ERR_SUCCESS                                             0           //Success, no error.
#define ERR_CANNOT_CREATE_THREAD                1000        //Cannot create thread.
#define ERR_DBGETDATA_FAILED                    1001        //Get data failed.
#define     ERR_REGISTRY_NOT_SETUP                  1002        //Registry not setup for tpcc.
#define     ERR_CANNOT_ACCESS_DELIVERY_FN   1003        //Cannot access ReadDelivery cache.
#define     ERR_CANNOT_ACCESS_REGISTRY      1004        //Cannot access registry key TPCC.
#define     ERR_CANNOT_CREATE_RESULTS_FILE  1005        //Cannot create results file.
#define     ERR_CANNOT_OPEN_PIPE                    1006        //Cannot open delivery pipe.
#define     ERR_READ_PIPE                               1007        //Error reading pipe
#define     ERR_INSUFFICIENT_MEMORY                 1008        //insufficient memory

typedef struct _DELIVERY_TRANSACTION
{
        SYSTEMTIME          queue;                  //time delivery transaction queued
        short               w_id;                   //delivery warehouse
        short               o_carrier_id;   //carrier id
} DELIVERY_TRANSACTION;

typedef DELIVERY_TRANSACTION *LPDELIVERY_TRANSACTION;       //pointer to delivery transaction queue

typedef struct _DELIVERY_PACKET
{
        BOOL                bInUse;                 //entry current in use
        OVERLAPPED          ov;                     //pipe io overlapped structure
        DELIVERY_TRANSACTION    trans;              //delivery transaction information
} DELIVERY_PACKET, *LPDELIVERY_PACKET;

typedef struct _SERRORMSG
{
        int                 iError;                 //error mesage id
        char        szMsg[80];          //error message
} SERRORMSG;

//delivery transaction structure
typedef struct DELIVERY
{
        short               w_id;                   //warehouse id
        short               o_carrier_id;   //carrier id
        int                 spid;                   //db library spid
        long                o_id[10];           //returned delivery transaction ids
        DBPROCESS *dbproc;              //db library DBPROCESS pointer
        SYSTEMTIME          queue;                  //delivery transaction queue time
        SYSTEMTIME          trans_end;          //delivery transaction finished time
} DELIVERY;

typedef DELIVERY *LPDELIVERY;       //pointer to delivery structure

//function prototypes
void                    main(int argc, char *argv[]);
static      void        cls(void);
```

```
static    int                   RunDelivery(void);
static    void          QuitStatus(void);
static    void          AnimateWait1(void);
static    void          AnimateWait(void);
static    int                   Init(void);
static    void          Restore(void);
static    void          ErrorMessage(int iError);
static    BOOL          GetParameters(int argc, char *argv[]);
static    void          PrintParameters(void);
static    void          PrintHeader(void);
static    int                   ReadRegistrySettings(void);
static    void          CheckKey(void *ptr);
static    void          DeliveryHandler( void *ptr );
static    void          DeliveryThread( void *ptr );
static    int                   err_handler(DBPROCESS *dbproc, int severity, int dberr, int oserr, char *dberrstr, char *oserrstr);
static    int                   msg_handler(DBPROCESS *dbproc, DBINT msgno, int msgstate, int severity, char *msgtext);
static    BOOL          SQLOpenConnection(DBPROCESS **dbproc, char *server, char *database, char *user, char *password, int *spid);
static    void          WriteLog(LPDELIVERY pDelivery);
static    void          CalculateElapsedTime(int *pElapsed, LPSYSTEMTIME lpBegin, LPSYSTEMTIME lpEnd);
static    int                   SQLDelivery(DELIVERY *pDelivery);
static    BOOL          SQLDetectDeadlock(DBPROCESS *dbproc);
static    BOOL          ReadDeliveryInfo(short *w_id, short *o_carrier_id);
static    BOOL          PostDeliveryInfo(short w_id, short o_carrier_id);
static    int                   OpenLogFile(void);
```

Httpext.h

```
/********
*
*  Copyright (c) 1995  Process Software Corporation
*
*  Copyright (c) 1995  Microsoft Corporation
*
*
*  Module Name  : HttpExt.h
*
*  Abstract :
*
*     This module contains  the structure definitions and prototypes for the
*     version 1.0 HTTP Server Extension interface.
*
******************/

#ifndef _HTTPEXT_H_
#define _HTTPEXT_H_

#include <windows.h>

#ifdef __cplusplus
extern "C" {
#endif

#define   HSE_VERSION_MAJOR         1     // major version of this spec
#define   HSE_VERSION_MINOR         0     // minor version of this spec
#define   HSE_LOG_BUFFER_LEN        80
#define   HSE_MAX_EXT_DLL_NAME_LEN  256

typedef   LPVOID  HCONN;

// the following are the status codes returned by the Extension DLL

#define   HSE_STATUS_SUCCESS                  1
#define   HSE_STATUS_SUCCESS_AND_KEEP_CONN    2
#define   HSE_STATUS_PENDING                  3
#define   HSE_STATUS_ERROR                    4

// The following are the values to request services with the ServerSupportFunction.
//  Values from 0 to 1000 are reserved for future versions of the interface

#define   HSE_REQ_BASE                        0
#define   HSE_REQ_SEND_URL_REDIRECT_RESP      ( HSE_REQ_BASE + 1 )
#define   HSE_REQ_SEND_URL                    ( HSE_REQ_BASE + 2 )
#define   HSE_REQ_SEND_RESPONSE_HEADER        ( HSE_REQ_BASE + 3 )
#define   HSE_REQ_DONE_WITH_SESSION           ( HSE_REQ_BASE + 4 )
#define   HSE_REQ_END_RESERVED                1000

//
//  These are Microsoft specific extensions
//

#define   HSE_REQ_MAP_URL_TO_PATH             (HSE_REQ_END_RESERVED+1)
#define   HSE_REQ_GET_SSPI_INFO               (HSE_REQ_END_RESERVED+2)


//
// passed to GetExtensionVersion
//
```

```
typedef struct   _HSE_VERSION_INFO {

   DWORD  dwExtensionVersion;
   CHAR   lpszExtensionDesc[HSE_MAX_EXT_DLL_NAME_LEN];

} HSE_VERSION_INFO, *LPHSE_VERSION_INFO;

//
// passed to extension procedure on a new request
//
typedef struct _EXTENSION_CONTROL_BLOCK {

   DWORD     cbSize;               // size of this struct.
   DWORD     dwVersion;            // version info of this spec
   HCONN     ConnID;               // Context number not to be modified!
   DWORD     dwHttpStatusCode;     // HTTP Status code
   CHAR      lpszLogData[HSE_LOG_BUFFER_LEN];// null terminated log info specific to this Extension DLL

   LPSTR     lpszMethod;           // REQUEST_METHOD
   LPSTR     lpszQueryString;      // QUERY_STRING
   LPSTR     lpszPathInfo;         // PATH_INFO
   LPSTR     lpszPathTranslated;   // PATH_TRANSLATED

   DWORD     cbTotalBytes;         // Total bytes indicated from client
   DWORD     cbAvailable;          // Available number of bytes
   LPBYTE    lpbData;              // pointer to cbAvailable bytes

   LPSTR     lpszContentType;      // Content type of client data

   BOOL (WINAPI * GetServerVariable) ( HCONN      hConn,
                           LPSTR      lpszVariableName,

                                                                  LPVOID     lpvBuffer,
                           LPDWORD    lpdwSize );

   BOOL (WINAPI * WriteClient)  ( HCONN      ConnID,
                        LPVOID     Buffer,
                        LPDWORD    lpdwBytes,
                        DWORD      dwReserved );

   BOOL (WINAPI * ReadClient)  ( HCONN      ConnID,
                       LPVOID     lpvBuffer,
                       LPDWORD    lpdwSize );

   BOOL (WINAPI * ServerSupportFunction)( HCONN      hConn,
                             DWORD      dwHSERRequest,
                             LPVOID     lpvBuffer,
                             LPDWORD    lpdwSize,
                             LPDWORD    lpdwDataType );

} EXTENSION_CONTROL_BLOCK, *LPEXTENSION_CONTROL_BLOCK;

//
//  these are the prototypes that must be exported from the extension DLL
//

BOOL  WINAPI   GetExtensionVersion( HSE_VERSION_INFO  *pVer );
DWORD WINAPI   HttpExtensionProc(  EXTENSION_CONTROL_BLOCK *pECB );

// the following type declarations is for the server side

typedef BOOL  (WINAPI * PFN_GETEXTENSIONVERSION)( HSE_VERSION_INFO  *pVer );
typedef DWORD (WINAPI * PFN_HTTPEXTENSIONPROC )( EXTENSION_CONTROL_BLOCK *pECB );

#ifdef __cplusplus
}
#endif

#endif  // end definition _HTTPEXT_H_
```

Resource.h

```
//{{NO_DEPENDENCIES}}
// Microsoft Developer Studio generated include file.
// Used by TPCC.rc
//

// Next default values for new objects
//
#ifdef APSTUDIO_INVOKED
#ifndef APSTUDIO_READONLY_SYMBOLS
#define _APS_NEXT_RESOURCE_VALUE        101
#define _APS_NEXT_COMMAND_VALUE         40001
#define _APS_NEXT_CONTROL_VALUE         1000
#define _APS_NEXT_SYMED_VALUE           101
#endif
#endif
```

Tpcc.h

```
/*      FILE:                   TPCC.H
 *                                      Microsoft TPC-C Kit Ver. 3.00.000
 *                                      Audited 08/23/96, By Francois Raab
 *
 *                                      Copyright Microsoft, 1996
 *
 *      PURPOSE:    Header file for ISAPI TPCC.DLL, defines structures and functions used in the isapi tpcc.dll.
 *      Author:                 Philip Durr
 *                                      philipdu@Microsoft.com
 */

//VERSION RESOURCE DEFINES
#define _APS_NEXT_RESOURCE_VALUE                                101
#define _APS_NEXT_COMMAND_VALUE                                         40001
#define _APS_NEXT_CONTROL_VALUE                                 1000
#define _APS_NEXT_SYMED_VALUE                                   101

#define     ERR_TYPE_WEBDLL                                                     1
#define     ERR_TYPE_SQL                                                        2
#define     ERR_TYPE_DBLIB                                                      3

#define     ERR_SUCCESS                                                                 1000        //"Success, no
error.
#define     ERR_COMMAND_UNDEFINED                                       1001        //"Command undefined.
#define     ERR_NOT_IMPLEMENTED_YET                                     1002        //"Not Implemented Yet.
#define     ERR_CANNOT_INIT_TERMINAL                        1003        //"Cannot initialize client connection.
#define     ERR_OUT_OF_MEMORY                                           1004        //"insufficient memory.
#define     ERR_NEW_ORDER_NOT_PROCESSED                     1005        //"Cannot process new Order form.
#define     ERR_PAYMENT_NOT_PROCESSED                       1006        //"Cannot process payment form.
#define     ERR_NO_SERVER_SPECIFIED                                     1007        //"No Server name specified.
#define     ERR_ORDER_STATUS_NOT_PROCESSED                  1008        //"Cannot process order status form.
#define     ERR_W_ID_INVALID                                            1009        //"Invalid Warehouse ID.
#define     ERR_CAN_NOT_SET_MAX_CONNECTIONS                 1010        //"Insufficient memory to allocate # connections.
#define     ERR_NOSUCH_CUSTOMER                                                 1011        //"No such customer.
#define     ERR_D_ID_INVALID                                            1012        //"Invalid District ID Must be 1 to 10.
#define     ERR_MAX_CONNECT_PARAM                                       1013        //"Max client connections exceeded, run
install to increase.
#define     ERR_INVALID_SYNC_CONNECTION                     1014        //"Invalid Terminal Sync ID.
#define     ERR_INVALID_TERMID                                          1015        //"Invalid Terminal ID.
#define     ERR_PAYMENT_INVALID_CUSTOMER            1016        //"Payment Form, No such Customer.
#define     ERR_SQL_OPEN_CONNECTION                                     1017        //"SQLOpenConnection API Failed.
#define     ERR_STOCKLEVEL_MISSING_THRESHOLD_KEY    1018        //"Stock Level missing Threshold key "TT*".
#define     ERR_STOCKLEVEL_THRESHOLD_INVALID        1019        //"Stock Level Threshold invalid data type range = 1 - 99.
#define     ERR_STOCKLEVEL_THRESHOLD_RANGE                  1020        //"Stock Level Threshold out of range, range must be 1 - 99.
#define     ERR_STOCKLEVEL_NOT_PROCESSED            1021        //"Stock Level not processed.
#define     ERR_NEWORDER_FORM_MISSING_DID                   1022        //"New Order missing District key "DID*".
#define     ERR_NEWORDER_DISTRICT_INVALID           1023        //"New Order District ID Invalid range 1 - 10.
#define     ERR_NEWORDER_DISTRICT_RANGE                     1024        //"New Order District ID out of Range. Range = 1 - 10.
#define     ERR_NEWORDER_CUSTOMER_KEY                       1025        //"New Order missing Customer key "CID*".
#define     ERR_NEWORDER_CUSTOMER_INVALID                   1026        //"New Order customer id invalid data type, range = 1 to
3000.
#define     ERR_NEWORDER_CUSTOMER_RANGE                                 1027        //"New Order customer id out of range,
range = 1 to 3000.
#define     ERR_NEWORDER_MISSING_IID_KEY            1028        //"New Order missing Item Id key "IID*".
#define     ERR_NEWORDER_ITEM_BLANK_LINES                   1029        //"New Order blank order lines all orders must be
continuous.
#define     ERR_NEWORDER_ITEMID_INVALID                     1030        //"New Order Item Id is wrong data type, must be numeric.
#define     ERR_NEWORDER_MISSING_SUPPW_KEY                  1031        //"New Order missing Supp_W key "SP##*".
#define     ERR_NEWORDER_SUPPW_INVALID                      1032        //"New Order Supp_W invalid data type must be numeric.
#define     ERR_NEWORDER_MISSING_QTY_KEY            1033        //"New Order Missing Qty key "Qty##*".
#define     ERR_NEWORDER_QTY_INVALID                        1034        //"New Order Qty invalid must be numeric range 1 - 99.
#define     ERR_NEWORDER_SUPPW_RANGE                        1035        //"New Order Supp_W value out of range range = 1 - Max
Warehouses.
#define     ERR_NEWORDER_ITEMID_RANGE                       1036        //"New Order Item Id is out of range. Range = 1 to 999999.
#define     ERR_NEWORDER_QTY_RANGE                                      1037        //"New Order Qty is out of range. Range = 1
to 99.
#define     ERR_PAYMENT_DISTRICT_INVALID            1038        //"Payment District ID is invalid must be 1 - 10.
#define     ERR_NEWORDER_SUPPW_WITHOUT_ITEMID       1039        //"New Order Supp_W field entered without a corrisponding Item_Id.
#define     ERR_NEWORDER_QTY_WITHOUT_ITEMID                 1040        //"New Order Qty entered without a corrisponding Item_Id.
#define     ERR_NEWORDER_NOITEMS_ENTERED                    1041        //"New Order Blank Items between items, items must be
continuous.
#define     ERR_PAYMENT_MISSING_DID_KEY                     1042        //"Payment missing District Key "DID*".
#define     ERR_PAYMENT_DISTRICT_RANGE                      1043        //"Payment District Out of range, range = 1 - 10.
#define     ERR_PAYMENT_MISSING_CID_KEY                     1044        //"Payment missing Customer Key "CID*".
#define     ERR_PAYMENT_CUSTOMER_INVALID            1045        //"Payment Customer data type invalid, must be numeric.
#define     ERR_PAYMENT_MISSING_CLT                                     1046        //"Payment missing Customer Last Name
Key "CLT*".
#define     ERR_PAYMENT_LAST_NAME_TO_LONG                   1047        //"Payment Customer last name longer than 16 characters.
#define     ERR_PAYMENT_CUSTOMER_RANGE                      1048        //"Payment Customer ID out of range, must be 1 to 3000.
#define     ERR_PAYMENT_CID_AND_CLT                                     1049        //"Payment Customer ID and Last Name
entered must be one or other.
#define     ERR_PAYMENT_MISSING_CDI_KEY                     1050        //"Payment missing Customer district key "CDI*".
#define     ERR_PAYMENT_CDI_INVALID                                     1051        //"Payment Customer district invalid must
be numeric.
#define     ERR_PAYMENT_CDI_RANGE                                       1052        //"Payment Customer district out of range
must be 1 - 10.
#define     ERR_PAYMENT_MISSING_CWI_KEY                     1053        //"Payment missing Customer Warehouse key "CWI*".
```

```
#define	ERR_PAYMENT_CWI_INVALID	1054	//"Payment Customer Warehouse invalid must be numeric.
#define	ERR_PAYMENT_CWI_RANGE	1055	//"Payment Customer Warehouse out of range, 1 to Max Warehouses.
#define	ERR_PAYMENT_MISSING_HAM_KEY	1056	//"Payment missing Amount key "HAM*".
#define	ERR_PAYMENT_HAM_INVALID	1057	//"Payment Amount invalid data type must be numeric.
#define	ERR_PAYMENT_HAM_RANGE	1058	//"Payment Amount out of range, 0 − 9999.99.
#define	ERR_ORDERSTATUS_MISSING_DID_KEY	1059	//"Order Status missing District key "DID*".
#define	ERR_ORDERSTATUS_DID_INVALID	1060	//"Order Status District invalid, value must be numeric 1 − 10.
#define	ERR_ORDERSTATUS_DID_RANGE	1061	//"Order Status District out of range must be 1 − 10.
#define	ERR_ORDERSTATUS_MISSING_CID_KEY	1062	//"Order Status missing Customer key "CID*".
#define	ERR_ORDERSTATUS_MISSING_CLT_KEY	1063	//"Order Status missing Customer Last Name key "CLT*".
#define	ERR_ORDERSTATUS_CLT_RANGE	1064	//"Order Status Customer last name longer than 16 characters.
#define	ERR_ORDERSTATUS_CID_INVALID	1065	//"Order Status Customer ID invalid, range must be numeric 1 − 3000.
#define	ERR_ORDERSTATUS_CID_RANGE	1066	//"Order Status Customer ID out of range must be 1 − 3000.
#define	ERR_ORDERSTATUS_CID_AND_CLT	1067	//"Order Status Customer ID and LastName entered must be only one."
#define	ERR_DELIVERY_MISSING_OCD_KEY	1068	//"Delivery missing Carrier ID key \"OCD*\".
#define	ERR_DELIVERY_CARRIER_INVALID	1069	//"Delivery Carrier ID invalid must be numeric 1 − 10.
#define	ERR_DELIVERY_CARRIER_ID_RANGE	1070	//"Delivery Carrier ID out of range must be 1 − 10.
#define ERR_PAYMENT_MISSING_CLT_KEY	1071	//"Payment missing Customer Last Name key "CLT*".

//note that the welcome form must be processed first as terminal ids assigned here, once the
//terminal id is assigned then the forms can be processed in any order.
#define WELCOME_FORM	1	//beginning form no term id assigned, form id
#define MAIN_MENU_FORM	2	//term id assigned main menu form id
#define NEW_ORDER_FORM	3	//new order form id
#define PAYMENT_FORM	4	//payment form id
#define DELIVERY_FORM	5	//delivery form id
#define ORDER_STATUS_FORM	6	//order status id
#define STOCK_LEVEL_FORM	7	//stock level form id

//This macro is used to prevent the compiler error unused formal parameter
#define UNUSEDPARAM(x) (x = x)

//This structure is used for posting delivery transactions
typedef struct _DELIVERY_TRANSACTION
{
	SYSTEMTIME	queue;	//time delivery transaction queued
	short	w_id;	//delivery warehouse
	short	o_carrier_id;	//carrier id
} DELIVERY_TRANSACTION;

//error message structure used in ErrorMessage API
typedef struct _SERRORMSG
{
	int	iError;	//error id of message
	char	szMsg[80];	//message to sent to browser
} SERRORMSG;

//This structure defines the data necessary to keep distinct for each terminal or client connection.
typedef struct _CLIENTDATA
{
	int	inUse;	//in use flag allows client entries to be reused
	int	w_id;	//warehouse id assigned at welcome form
	int	d_id;	//district id assigned at welcome form

	DBPROCESS *dbproc;	//dblib connection pointer
	int	spid;	//spid assigned from dblib
	int	iSyncId;	//syncronization id
	int	iTickCount;	//time of last access;
	int	iTermId;	//terminal id of http stream connection

	char	szBuffer[4096];	//form buffer each HTML form is built for a client in here

	NEW_ORDER_DATA	newOrderData;	//new order form data
	PAYMENT_DATA	paymentData;	//payment form data
	ORDER_STATUS_DATA	orderStatusData;	//order status form data
	DELIVERY_DATA	deliveryData;	//delivery form data
	STOCK_LEVEL_DATA	stockLevelData;	//stock level form data
} CLIENTDATA;

typedef CLIENTDATA *PCLIENTDATA;	//pointer to client structure

//This structure is used to define the operational interface for terminal id support
typedef struct _TERM
{
	int	iAvailable;	//total allocated terminal array entries
	int	iNext;	//next available terminal array element
	int	iMasterSyncId;	//syncronization id
```

```
        BOOL            bInit;                                                          //structure has been initialized
flag
        CLIENTDATA      *pClientData;                                                   //pointer to allocated client data
        void            (*Init)(void);                                                  //API to initialize this structure
        int                     (*Allocate)(void);                                      //API to allocate a new terminal entry array
id returned
        void            (*Restore)(void);                                               //API to free terminal data
        int                     (*Add)(EXTENSION_CONTROL_BLOCK *pECB, char *pQueryString);      //API to add a terminal id to
array, this context will

        //be passed from the browser to the tpcc.dll in the

        //TERMID= key in the HTTP string.
        void            (*Delete)(EXTENSION_CONTROL_BLOCK *pECB, int id);               //API to free resources used by a terminal array entry
} TERM;

typedef TERM *PTERM;                                                                    //pointer to terminal structure type

#ifdef USE_ODBC
        typedef struct _DBPROCESS
        {
                HDBC                                    hdbc;
                HSTMT                                   hstmt;
                int                                             spid;
                int                                             iTermId;
                int                                             iSyncId;
                BOOL                                    bDeadlock;
                EXTENSION_CONTROL_BLOCK         *pECB;
        } DBPROCESS, *PDBPROCESS;
#else
        //this structure allows the EXTENSION CONTROL BLOCK to be passed to the msg and error handlers.
        typedef struct _ECBINFO
        {
                int                                             iTermId;        //terminal id
                int                                             iSyncId;        //browser sync id
                BOOL                                    bDeadlock;      //deadlock condition flag
                BOOL                                    bFailed;        //cleared before sql transaction, set in err handlers if an error
occurs
                EXTENSION_CONTROL_BLOCK *pECB;                  //inetsrv current connection structure information
        } ECBINFO, *PECBINFO;
#endif

//function prototypes
BOOL APIENTRY DllMain(HANDLE hModule, DWORD ul_reason_for_call, LPVOID lpReserved);
static void DeliveryDisconnect(void *ptr);
static BOOL IsValidTermId(int TermId);
BOOL ProcessQueryString(EXTENSION_CONTROL_BLOCK *pECB, int *pCmd, int *pFormId, int *pTermId, int *pSyncId);
void NewOrderForm(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId);
void PaymentForm(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId);
void DeliveryForm(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId);
void OrderStatusForm(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId);
void StockLevelForm(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId);
void Exitcmd(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId);
void SubmitCmd(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId);
void BeginCmd(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId);
void ProcessCmd(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId);
void ClearCmd(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId);
void MenuCmd(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId);
static void WriteZString(EXTENSION_CONTROL_BLOCK *pECB, char *szStr);
static void h_printf(EXTENSION_CONTROL_BLOCK *pECB, char *format, ...);
void ErrorMessage(EXTENSION_CONTROL_BLOCK *pECB, int iError, int iErrorType, char *szMsg, int iTermId, int iSyncId);
static BOOL GetKeyValue(char *pQueryString, char *pKey, char *pValue, int iMax);
static void TermInit(void);
int err_handler(DBPROCESS *dbproc, int severity, int dberr, int oserr, char *dberrstr, char *oserrstr);
int msg_handler(DBPROCESS *dbproc, DBINT msgno, int msgstate, int severity, char *msgtext);
static void TermRestore(void);
static int TermAllocate(void);
static int TermAdd(EXTENSION_CONTROL_BLOCK *pECB, char *pQueryString);
static void TermDelete(EXTENSION_CONTROL_BLOCK *pECB, int id);
BOOL Init(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId, char *szServer, char *szUser, char *szPassword, char *szDatabase);
static BOOL Close(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId);
static BOOL SQLOpenConnection(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId, DBPROCESS **dbproc, char *server, char *database, char *user, char
*password, char *app, int *spid);
static BOOL SQLCloseConnection(EXTENSION_CONTROL_BLOCK *pECB, DBPROCESS *dbproc);
static BOOL SQLStockLevel(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId, DBPROCESS *dbproc, STOCK_LEVEL_DATA *pStockLevel, short
deadlock_retry);
static int SQLNewOrder(EXTENSION_CONTROL_BLOCK          *pECB, int iTermId, int iSyncId, DBPROCESS *dbproc, NEW_ORDER_DATA  *pNewOrder, short
deadlock_retry);
static int SQLPayment(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId, DBPROCESS *dbproc, PAYMENT_DATA *pPayment, short deadlock_retry);
static int SQLOrderStatus(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId, DBPROCESS *dbproc, ORDER_STATUS_DATA *pOrderStatus, short
deadlock_retry);
BOOL SQLDetectDeadlock(DBPROCESS *dbproc);
static void FormatString(char *szDest, char *szPic, char *szSrc);
static char *MakeStockLevelForm(int iTermId, int iSyncId, BOOL bInput);
static char *MakeMainMenuForm(int iTermId, int iSyncId);
static char *MakeWelcomeForm(void);
static char *MakeNewOrderForm(int iTermId, int iSyncId, BOOL bInput, BOOL bValid);
static char *MakePaymentForm(int iTermId, int iSyncId, BOOL bInput);
static char *MakeOrderStatusForm(int iTermId, int iSyncId, BOOL bInput);
static char *MakeDeliveryForm(int iTermId, int iSyncId, BOOL bInput);
```

```
static void UtilStrCpy(char * pDest, char * pSrc, int n);
static void ProcessNewOrderForm(EXTENSION_CONTROL_BLOCK     *pECB, int iTermId, int iSyncId);
static void ProcessPaymentForm(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId);
static void ProcessOrderStatusForm(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId);
static void ProcessDeliveryForm(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId);
static void ProcessStockLevelForm(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId);
static int GetNewOrderData(LPSTR lpszQueryString, NEW_ORDER_DATA *pNewOrderData);
static int GetPaymentData(LPSTR lpszQueryString, PAYMENT_DATA *pPaymentData);
static int GetOrderStatusData(LPSTR lpszQueryString, ORDER_STATUS_DATA *pOrderStatusData);
static BOOL ReadRegistrySettings(void);
static BOOL PostDeliveryInfo(short w_id, short o_carrier_id);
static BOOL IsNumeric(char *ptr);
static int ODBCError(DBPROCESS *dbproc);
static void FormatHTMLString(char *szBuff, char *szStr, int iLen);
```

Trans.h

```
/*      FILE:                   TRANS.H
 *                                      Microsoft TPC-C Kit Ver. 3.00.000
 *                                      Audited 08/23/96        By Francois Raab
 *      PURPOSE:    Header file for ISAPI TPCC.DLL, defines structures and functions used in the isapi tpcc.dll.
 *
 *                                      Copyright Microsoft inc. 1996, All Rights Reserved
 *
 *      Author:                 PhilipDu, from tpcc.h by DamienL
 *                                      DamienL@Microsoft.com
 *                                      philipdu@Microsoft.com
 */

#ifndef _INC_TRANS

        #define _INC_TRANS

        #ifdef USE_ODBC
                #ifndef TIMESTAMP_STRUCT
                        #include <sqltypes.h>
                #endif
        #else
                #ifndef _INC_SQLFRONT
                        #include <sqlfront.h>
                #endif
        #endif

        #ifndef DBINT
                typedef long DBINT;
        #endif

        #define     DEFCLPACKSIZE                                   4096
        #define     DEADLOCKWAIT                                    10

        // String length constants
        #define SERVER_NAME_LEN         20
        #define DATABASE_NAME_LEN       20
        #define USER_NAME_LEN           20
        #define PASSWORD_LEN            20
        #define TABLE_NAME_LEN          20
        #define I_DATA_LEN              50
        #define I_NAME_LEN              24
        #define BRAND_LEN               1
        #define LAST_NAME_LEN           16
        #define W_NAME_LEN              10
        #define ADDRESS_LEN             20
        #define STATE_LEN               2
        #define ZIP_LEN                 9
        #define S_DIST_LEN              24
        #define S_DATA_LEN              50
        #define D_NAME_LEN              10
        #define FIRST_NAME_LEN          16
        #define MIDDLE_NAME_LEN         2
        #define PHONE_LEN               16
        #define DATETIME_LEN            30
        #define CREDIT_LEN              2
        #define C_DATA_LEN              250
        #define H_DATA_LEN              24
        #define DIST_INFO_LEN           24
        #define MAX_OL_NEW_ORDER_ITEMS  15
        #define MAX_OL_ORDER_STATUS_ITEMS 15
        #define STATUS_LEN              25
        #define OL_DIST_INFO_LEN                        24

        // transaction structures

        typedef struct
        {
                short                                   ol_supply_w_id;
                long                                    ol_i_id;
                char                                    ol_i_name[I_NAME_LEN+1];
                short                                   ol_quantity;
```

```
        char                                    ol_brand_generic[BRAND_LEN+1];
        double                                  ol_i_price;
        double                                  ol_amount;
        short                                   ol_stock;
        short                                   num_warehouses;
} OL_NEW_ORDER_DATA;

typedef struct
{
        short           w_id;
        short           d_id;
        long            c_id;
        short           o_ol_cnt;
        char            c_last[LAST_NAME_LEN+1];
        char            c_credit[CREDIT_LEN+1];
        double          c_discount;
        double          w_tax;
        double          d_tax;
        long                                    o_id;
        short                                   o_commit_flag;
#ifdef USE_ODBC
        TIMESTAMP_STRUCT        o_entry_d;
#else
        DBDATEREC               o_entry_d;
#endif
        short           o_all_local;
        double          total_amount;
        long            num_deadlocks;
        char                                    execution_status[STATUS_LEN];
        OL_NEW_ORDER_DATA ol[MAX_OL_NEW_ORDER_ITEMS];
} NEW_ORDER_DATA;

typedef struct
{
        short                                   w_id;
        short                                   d_id;
        long                                    c_id;
        short                                   c_d_id;
        short                                   c_w_id;
        double                                  h_amount;
#ifdef USE_ODBC
        TIMESTAMP_STRUCT        h_date;
#else
        DBDATEREC                       h_date;
#endif
        char                                    w_street_1[ADDRESS_LEN+1];
        char                                    w_street_2[ADDRESS_LEN+1];
        char                                    w_city[ADDRESS_LEN+1];
        char                                    w_state[STATE_LEN+1];
        char                                    w_zip[ZIP_LEN+1];
        char                                    d_street_1[ADDRESS_LEN+1];
        char                                    d_street_2[ADDRESS_LEN+1];
        char                                    d_city[ADDRESS_LEN+1];
        char                                    d_state[STATE_LEN+1];
        char                                d_zip[ZIP_LEN+1];
        char                                    c_first[FIRST_NAME_LEN+1];
        char                                    c_middle[MIDDLE_NAME_LEN + 1];
        char                            c_last[LAST_NAME_LEN+1];
        char                                    c_street_1[ADDRESS_LEN+1];
        char                                    c_street_2[ADDRESS_LEN+1];
        char                                    c_city[ADDRESS_LEN+1];
        char                                    c_state[STATE_LEN+1];
        char                                    c_zip[ZIP_LEN+1];
        char                                    c_phone[PHONE_LEN+1];
#ifdef USE_ODBC
        TIMESTAMP_STRUCT        c_since;
#else
        DBDATEREC                               c_since;
#endif
        char                                    c_credit[CREDIT_LEN+1];
        double                                  c_credit_lim;
        double                                  c_discount;
        double                                  c_balance;
        char                                    c_data[200+1];
        long                                    num_deadlocks;
        char                                            execution_status[STATUS_LEN];
} PAYMENT_DATA;

typedef struct
{
        long                                    ol_i_id;
        short                                   ol_supply_w_id;
        short                                   ol_quantity;
        double                                  ol_amount;
#ifdef USE_ODBC
        TIMESTAMP_STRUCT        ol_delivery_d;
#else
        DBDATEREC                               ol_delivery_d;
#endif
} OL_ORDER_STATUS_DATA;
```

```
typedef struct
{
        short           w_id;
        short           d_id;
        long            c_id;
        char            c_first[FIRST_NAME_LEN+1];
        char            c_middle[MIDDLE_NAME_LEN+1];
        char            c_last[LAST_NAME_LEN+1];
        double           c_balance;
        long            o_id;
#ifdef USE_ODBC
        TIMESTAMP_STRUCT        o_entry_d;
#else
        DBDATEREC         o_entry_d;
#endif
        short           o_carrier_id;
        OL_ORDER_STATUS_DATA OlOrderStatusData[MAX_OL_ORDER_STATUS_ITEMS];
        short           o_ol_cnt;
        long            num_deadlocks;
        char                                    execution_status[STATUS_LEN];
} ORDER_STATUS_DATA;

typedef struct
{
        long                                                    o_id;
} DEL_ITEM;

typedef struct
{
        short                   w_id;
        short                   o_carrier_id;
        SYSTEMTIME                      queue_time;
        long                    num_deadlocks;
        DEL_ITEM                        DelItems[10];
        char                    execution_status[STATUS_LEN];
} DELIVERY_DATA;

typedef struct
{
        short                                                   w_id;
        short                                                   d_id;
        short                                                   thresh_hold;
        long                                                    low_stock;
        long                                                    num_deadlocks;
        char                                                    execution_status[STATUS_LEN];
} STOCK_LEVEL_DATA;

#endif
```

Delisrv.c

```
/*      FILE:           DELISRV.C
 *                              Microsoft TPC-C Kit Ver. 3.00.000
 *                              Audited 08/23/96, By Francois Raab
 *
 *                              Copyright Microsoft, 1996
 *
 *      PURPOSE:    Delivery TPC-C transaction executable
 *      Author:         Philip Durr
 *                              philipdu@Microsoft.com
 */

#include <windows.h>
#include <process.h>
#include <stdio.h>
#include <stdarg.h>
#include <malloc.h>
#include <stdlib.h>
#include <string.h>
#include <time.h>
#include <sys\timeb.h>
#include  <io.h>
#include <conio.h>
#include <ctype.h>

#define DBNTWIN32
#include <sqlfront.h>
#include <sqldb.h>

#include "delisrv.h"

char                                    szServer[32];                   //SQL server name
char                                    szDatabase[32];                         //tpcc database name
char                                    szUser[32];                             //user name
char                                    szPassword[32];                         //user password
int                                             iNumThreads             = 4;    //number of threads to create
```

```
int                                                     iDelayMs                = 1000;         //delay between delivery
queue checks
int                                                     iDeadlockRetry          = 3;            //number of read check
retries.
int                                                     iQSlotts                = 3000;         //delivery transaction queues

FILE                                            *fpLog;                                                 //pointer to log
file
CRITICAL_SECTION                WriteLogCriticalSection;        //critical section for delivery write log
CRITICAL_SECTION                DeliveryCriticalSection;        //critical section for delivery transactions cache
static          LPTSTR                          lpszPipeName = TEXT("\\\\.\\pipe\\DELISRV");            //delivery pipe name

HANDLE                                          hPipe                   = INVALID_HANDLE_VALUE;         //delivery pipe handle
HANDLE                                          hComPort        = INVALID_HANDLE_VALUE;         //delivery pipe completion port handle.

BOOL                                            bDone;
                //delivery executable termination request flag
BOOL                                            bFlush;
                //Flush delivery log info when written.

LPDELIVERY_PACKET               pDeliveryCache;

int                                                     versionMS = 3;
                //delivery executable version number.
int                                                     versionMM = 0;
                //formatted as MS.MM.LS, 1.00.005
int                                                     versionLS = 2;

/* FUNCTION: int main(int argc, char *argv[])
 *
 * PURPOSE: This function is the beginning execution point for the delivery executable.
 *
 * ARGUMENTS:           int                     argc            number of command line arguments passed to delivery
 *                                              char            *argv[]         array of command line argument pointers
 *
 * RETURNS:             None
 *
 * COMMENTS:            None
 *
 */

void main(int argc, char *argv[])
{
                int             iError;

                if ( GetParameters(argc, argv) )
                {
                                PrintParameters();
                                return;
                }

                if ( (iError=Init()) )
                {
                                ErrorMessage(iError);
                                Restore();
                                return;
                }

                if ( (iError = RunDelivery()) != ERR_SUCCESS )
                                ErrorMessage(iError);

                Restore();

                return;
}

/* FUNCTION: void cls(void)
 *
 * PURPOSE: This function clears the console window
 *
 * ARGUMENTS:           None
 *
 * RETURNS:             None
 *
 * COMMENTS:            None
 *
 */

static void cls(void)
{
                HANDLE          hConsole;
                COORD           coordScreen = { 0, 0 };                                 //here's where we'll home the cursor
                DWORD           cCharsWritten;
                CONSOLE_SCREEN_BUFFER_INFO      csbi;                           //to get buffer info
                DWORD                                                                   dwConSize;      //number of character cells in the current buffer

                hConsole = GetStdHandle(STD_OUTPUT_HANDLE);

                //get the number of character cells in the current buffer
```

```
		GetConsoleScreenBufferInfo( hConsole, &csbi );
		dwConSize = csbi.dwSize.X * csbi.dwSize.Y;

		//fill the entire screen with blanks
		FillConsoleOutputCharacter( hConsole, (TCHAR) ' ', dwConSize, coordScreen, &cCharsWritten );
		GetConsoleScreenBufferInfo( hConsole, &csbi );

		//now set the buffer's attributes accordingly
		FillConsoleOutputAttribute( hConsole, csbi.wAttributes,dwConSize, coordScreen, &cCharsWritten );

		//put the cursor at (0, 0)
		SetConsoleCursorPosition( hConsole, coordScreen );

		return;
}

/* FUNCTION: int RunDelivery(void)
 *
 * PURPOSE:  This function executes the main delivery executable loop.
 *
 * ARGUMENTS:		None
 *
 * RETURNS:		int		ERR_CANNOT_OPEN_PIPE			cannot open named pipe
 *							ERR_CANNOT_CREATE_THREAD	cannot create required threads
 *							ERR_SUCCESS				successfull no
error
 *
 *
 * COMMENTS:		None
 *
 */

static int RunDelivery(void)
{
		SECURITY_ATTRIBUTES	sa;
		int				i;

		cls();

		PrintHeader();

		printf("\n<Starting Delivery Service with %d Threads.>\n", iNumThreads);
		printf("\nPress <Ctrl>C to exit.\n");

		bDone = FALSE;
		_beginthread( CheckKey, 0, NULL );

		printf("\nWaiting for delivery pipe: ");

		while( !bDone )
		{
			AnimateWait1();
			if ( WaitNamedPipe(lpszPipeName, NMPWAIT_USE_DEFAULT_WAIT) )
			{
				sa.nLength			= sizeof(sa);
				sa.lpSecurityDescriptor	= NULL;
				sa.bInheritHandle		= TRUE;

				hPipe = CreateFile(lpszPipeName, GENERIC_READ | GENERIC_WRITE, FILE_SHARE_READ | FILE_SHARE_WRITE, NULL,
OPEN_EXISTING,
					FILE_FLAG_OVERLAPPED, NULL);
				if ( hPipe  == INVALID_HANDLE_VALUE )
					return ERR_CANNOT_OPEN_PIPE;
				hComPort = CreateIoCompletionPort(hPipe, NULL, 0, 256);
				break;
			}
			Sleep(100);
		}

		if ( !bDone )
		{
			if ( _beginthread( DeliveryHandler, 0, NULL ) == -1 )
				return ERR_CANNOT_CREATE_THREAD;

			for(i=0; i<iNumThreads; i++)
			{
				if ( _beginthread( DeliveryThread, 0, NULL ) == -1 )
					return ERR_CANNOT_CREATE_THREAD;
			}

			printf(" \nRunning : ");

			while( !bDone )
				AnimateWait();
		}

		return ERR_SUCCESS;
}

/* FUNCTION: void AnimateWait1(void)
```

```
 *
 * PURPOSE: This function provides a visual indicator that the delivery executable is waiting for
 *                                      the delivery pipe to appear.
 *
 * ARGUMENTS:           None
 *
 * RETURNS:             None
 *
 * COMMENTS:            None
 *
 */

static void AnimateWait1(void)
{
        const static char szStr[] = "+–|*";
        static char *ptr = (char *)szStr;

        printf("%c\x8", *ptr);
        ptr = (*(ptr+1)) ? ptr + 1 : (char *)szStr;
        Sleep(100);

        return;
}

/* FUNCTION: void AnimateWait(void)
 *
 * PURPOSE: This function provides a visual indicator that the delivery executable is waiting for
 *                                      and processing transactions.
 *
 * ARGUMENTS:           None
 *
 * RETURNS:             None
 *
 * COMMENTS:            None
 *
 */

static void AnimateWait(void)
{
        const static char szStr[] = "/–\\|/–\\|";
        static char *ptr = (char *)szStr;

        printf("%c\x8", *ptr);
        ptr = (*(ptr+1)) ? ptr + 1 : (char *)szStr;
        Sleep(100);

        return;
}


/* FUNCTION: int Init(void)
 *
 * PURPOSE: This function prepares the delivery executable for processing.
 *
 * ARGUMENTS:           None
 *
 * RETURNS:             int             iError                  Error code if unsuccessfull
 *                                                              ERR_SUCCESS             No error successfull code
 *
 *
 * COMMENTS:            None
 *
 */

static int Init(void)
{
        int             iError;

        InitializeCriticalSection(&WriteLogCriticalSection);
        InitializeCriticalSection(&DeliveryCriticalSection);

        fpLog           = NULL;

        if ( !(pDeliveryCache = malloc(sizeof(DELIVERY_PACKET) * iQSlotts)) )
                return ERR_INSUFFICIENT_MEMORY;

        memset(pDeliveryCache, 0, sizeof(DELIVERY_PACKET) * iQSlotts);

        if ( (iError = ReadRegistrySettings()) )
                return iError;

        if ( (iError=OpenLogFile()) )
                return iError;

        //initialize db library for use
        dbinit();

        // install Db Library error and message handlers
        dbmsghandle((DBMSGHANDLE_PROC)msg_handler);
        dberrhandle((DBERRHANDLE_PROC)err_handler);
```

```
		return ERR_SUCCESS;
}

/* FUNCTION: void Restore(void)
 *
 * PURPOSE:  This function cleans up allocated objects to allow for termination of the
 *                                      delivery executable.
 *
 * ARGUMENTS:           None
 *
 * RETURNS:             None
 *
 * COMMENTS:            None
 *
 */

static void Restore(void)
{
		int             iret, l, d;

		DeleteCriticalSection(&WriteLogCriticalSection);
		DeleteCriticalSection(&DeliveryCriticalSection);

		l = 1;
		iret = WriteFile(hPipe, &l, 1, &d, NULL);

		if ( hPipe  != INVALID_HANDLE_VALUE )
			iret = CloseHandle(hPipe);

		if ( fpLog )
			fclose(fpLog);

		fpLog = NULL;

		dbexit();

		return;
}

/* FUNCTION: void ErrorMessage(int iError)
 *
 * PURPOSE:  This function displays an error message in the delivery executable's console window.
 *
 * ARGUMENTS:           int                     iError          error id to be displayed
 *
 * RETURNS:             None
 *
 * COMMENTS:            None
 *
 */

static void ErrorMessage(int iError)
{
		int i;

		static SERRORMSG errorMsgs[] =
		{
			{       ERR_SUCCESS,                                                    "Success, no
error."                                                                 },
			{       ERR_CANNOT_CREATE_THREAD,               "Cannot create thread."
                                                                },
			{       ERR_DBGETDATA_FAILED,                           "Get data failed."
                                                                },
			{       ERR_REGISTRY_NOT_SETUP,                         "Registry not setup for tpcc."
                                },
			{       ERR_CANNOT_ACCESS_DELIVERY_FN,  "Cannot access ReadDelivery cache."
                                },
			{       ERR_CANNOT_ACCESS_REGISTRY,     "Cannot access registry key TPCC."
                                },
			{       ERR_CANNOT_CREATE_RESULTS_FILE,  "Cannot create results file."
                                },
			{       ERR_CANNOT_OPEN_PIPE,                           "Cannot open delivery pipe."
                                },
			{       ERR_READ_PIPE,                                                  "Reading
Delivery Pipe."                                                         },
			{       ERR_INSUFFICIENT_MEMORY,        "Insufficient memory."
                                                                },
			{       0,
		""
		}
		};

		for(i=0; errorMsgs[i].szMsg[0]; i++)
		{
			if ( iError == errorMsgs[i].iError )
			{
				printf("'\nError(%d): %s", iError, errorMsgs[i].szMsg);
				if ( fpLog )
				{
```

```
                                        EnterCriticalSection(&WriteLogCriticalSection);
                                        fprintf(fpLog, "*Error(%d): %s\r\n", iError, errorMsgs[i].szMsg);
                                        if ( bFlush )
                                                fflush(fpLog);
                                        LeaveCriticalSection(&WriteLogCriticalSection);
                                }
                                return;
                        }
                }

                printf("Error(%d): Unknown Error.");
                EnterCriticalSection(&WriteLogCriticalSection);
                fprintf(fpLog, "*Error(%d): Unknown Error.\r\n", iError);
                if ( bFlush )
                        fflush(fpLog);
                LeaveCriticalSection(&WriteLogCriticalSection);

                return;
}

/* FUNCTION: BOOL GetParameters(int argc, char *argv[])
 *
 * PURPOSE:  This function parses the command line passed in to the delivery executable, initializing
 *                      and filling in global variable parameters.
 *
 * ARGUMENTS:           int             argc            number of command line arguments passed to delivery
 *                      char            *argv[]         array of command line argument pointers
 *
 * RETURNS:             BOOL            FALSE           parameter read successfull
 *                                                              TRUE            user has requested parameter information screen be displayed.
 *
 * COMMENTS:            None
 *
 */

static BOOL GetParameters(int argc, char *argv[])
{
                int i;


                szServer[0]             = 0;
                szPassword[0] = 0;
                bFlush                  = FALSE;
                strcpy(szDatabase, "tpcc");
                strcpy(szUser, "sa");

                for(i=0; i<argc; i++)
                {
                        if ( argv[i][0] == '-' || argv[i][0] == '/' )
                        {
                                switch(argv[i][1])
                                {
                                        case 'S':
                                        case 's':
                                                strcpy(szServer, argv[i]+2);
                                                break;
                                        case 'D':
                                        case 'd':
                                                strcpy(szDatabase, argv[i]+2);
                                                break;
                                        case 'U':
                                        case 'u':
                                                strcpy(szUser, argv[i]+2);
                                                break;
                                        case 'P':
                                        case 'p':
                                                strcpy(szPassword, argv[i]+2);
                                                break;
                                        case 'F':
                                        case 'f':
                                                bFlush = TRUE;          //turn on delilog flush when written.
                                                break;
                                        case '?':
                                                return TRUE;
                                }
                        }
                }
                return FALSE;
}

/* FUNCTION: void PrintParameters(void)
 *
 * PURPOSE:  This function displays the supported command line flags.
 *
 * ARGUMENTS:           None
 *
 * RETURNS:             None
 *
 * COMMENTS:            None
 *
```

```
 */

static void PrintParameters(void)
{
		PrintHeader();
		printf("DELISRV:\n\n");
		printf("Parameter                                   Default\n");
		printf("-------------------------------------------------------------------------------\n");
		printf("-S Server                                    \n");
		printf("-D Database                                 tpcc   \n");
		printf("-U Username                                  sa     \n");
		printf("-P Password                                     \n");
		printf("-F Flush output to delilog file when written.              OFF    \n");
		printf("-? This help screen\n\n");
		printf("Note:  Command line switches are NOT case sensitive.\n");

		return;
}

/* FUNCTION: void PrintHeader(void)
 *
 * PURPOSE:  This function displays the delivery executable's banner information.
 *
 * ARGUMENTS:		None
 *
 * RETURNS:		None
 *
 * COMMENTS:		None
 *
 */

static void PrintHeader(void)
{
		printf("*************************************************\n");
		printf("*                                               *\n");
		printf("*  Microsoft SQL Server 6.5                     *\n");
		printf("*                                               *\n");
		printf("*  HTML TPC-C BENCHMARK KIT: Delivery Server    *\n");
		printf("*  Version %d.%2.2d.%3.3d                       *\n", versionMS, versionMM, versionLS);
		printf("*                                               *\n");
		printf("*************************************************\n\n");

		return;
}

/* FUNCTION: int ReadRegistrySettings(void)
 *
 * PURPOSE:  This function reads the system registry filling in required key parameters.
 *
 * ARGUMENTS:		None
 *
 * RETURNS:		int		ERR_REGISTRY_NOT_SETUP			registry not setup tpcc.exe needs to be run
 *
		to setup registry.
 *                                                      ERR_SUCCESS                                                     Reqistry read
Successfull, no error
 *
 *
 * COMMENTS:		None
 */

static int ReadRegistrySettings(void)
{
		HKEY		hKey;
		DWORD		size;
		DWORD		type;
		char		szTmp[256];

		if ( RegOpenKeyEx(HKEY_LOCAL_MACHINE, "SOFTWARE\\Microsoft\\TPCC", 0, KEY_READ, &hKey) != ERROR_SUCCESS )
			return ERR_REGISTRY_NOT_SETUP;

		size = sizeof(szTmp);

		iNumThreads = 4;
		if ( RegQueryValueEx(hKey, "NumberOfDeliveryThreads", 0, &type, szTmp, &size) == ERROR_SUCCESS )
			iNumThreads = atoi(szTmp);
			if ( !iNumThreads )
				iNumThreads = 4;

		iDelayMs = 1000;
		if ( RegQueryValueEx(hKey, "BackoffDelay", 0, &type, szTmp, &size) == ERROR_SUCCESS )
			iDelayMs = atoi(szTmp);
			if ( !iDelayMs )
				iDelayMs = 1000;

		iDeadlockRetry = 3;
		if ( RegQueryValueEx(hKey, "DeadlockRetry", 0, &type, szTmp, &size) == ERROR_SUCCESS )
			iDeadlockRetry = atoi(szTmp);
		if ( !iDeadlockRetry )
			iDeadlockRetry = 3;
```

```
		iQSlotts = 3000;
		size = sizeof(szTmp);
		if ( RegQueryValueEx(hKey, "QueueSlotts", 0, &type, szTmp, &size) == ERROR_SUCCESS )
			iQSlotts = atoi(szTmp);
			if ( !iQSlotts )
				iQSlotts = 3000;

		RegCloseKey(hKey);

		return ERR_SUCCESS;
}

/* FUNCTION: void CheckKey(void *ptr)
 *
 * PURPOSE:  This function checks for a key press on the delivery executable's console. If the
 *			key press is a Ctrl C then the execution termination flag variable bDone is set to
 *			TRUE which will start the termination of the delivery executable.
 *
 * ARGUMENTS:		void		*ptr		dummy argument passed in though thread manager, unused NULL.
 *
 * RETURNS:		None
 *
 * COMMENTS:		None
 *
 */

static void CheckKey(void *ptr)
{
		while( _getch() != CTRL_C)
			;
		bDone = TRUE;

		return;
}

/* FUNCTION: void DeliveryHandler( void *ptr )
 *
 * PURPOSE:  This function is executed in it's own thread what it does is to check for delivery
 *			postings in the delivery named pipe. If any are present then it pulls them off and
 *			places them in the next available delivery queue array element.
 *
 * ARGUMENTS:		void		*ptr		dummy argument passed in though thread manager, unused NULL.
 *
 * RETURNS:		None
 *
 * COMMENTS:		None
 *
 */

static void DeliveryHandler( void *ptr )
{
		int		i;
		int		size;
		int		iError;

		while( !bDone )
		{
			for(i=0; i<iQSlotts; i++)
			{
				if ( !pDeliveryCache[i].bInUse )
					break;
			}
			if ( i < iQSlotts )
			{
				EnterCriticalSection(&DeliveryCriticalSection);
				pDeliveryCache[i].bInUse = TRUE;
				LeaveCriticalSection(&DeliveryCriticalSection);
			}
			else
			{
				EnterCriticalSection(&DeliveryCriticalSection);
				if ( !(pDeliveryCache = (LPDELIVERY_PACKET)realloc(pDeliveryCache, sizeof(DELIVERY_PACKET) * (iQSlotts+512))) )
				{
					ErrorMessage(ERR_INSUFFICIENT_MEMORY);
					LeaveCriticalSection(&DeliveryCriticalSection);
					return;
				}
				for(i=iQSlotts; i<iQSlotts+512; i++)
					pDeliveryCache[i].bInUse = FALSE;
				i = iQSlotts;
				pDeliveryCache[i].bInUse = TRUE;
				LeaveCriticalSection(&DeliveryCriticalSection);
			}

			pDeliveryCache[i].ov.Offset			= i;
			pDeliveryCache[i].ov.Internal		= 0;
			pDeliveryCache[i].ov.InternalHigh	= 0;
			pDeliveryCache[i].ov.OffsetHigh		= 1;
			pDeliveryCache[i].ov.hEvent			= NULL;
```

```
                        while( !bDone )
                        {
                                if ( ReadFile(hPipe, &pDeliveryCache[i].trans, sizeof(DELIVERY_TRANSACTION), &size, &pDeliveryCache[i].ov) )
                                        break;
                                if ( bDone )
                                        break;
                                iError = GetLastError();
                                if ( iError == ERROR_IO_PENDING )
                                {
                                        while( pDeliveryCache[i].ov.OffsetHigh )
                                                Sleep(10);
                                        break;
                                }
                                else
                                {
                                        ErrorMessage(ERR_READ_PIPE);
                                        return;
                                }
                        }
                        Sleep(1);
                }

                return;
}

/* FUNCTION: void DeliveryThread( void *ptr )
 *
 * PURPOSE:  This function is executed inside the delivery threads. The queue array
 *                      is continuously check and if any array elements are in use then the
 *                      array entry is read, cleared and this function processes it.
 *
 * ARGUMENTS:           void            *ptr            dummy argument passed in though thread manager, unused NULL.
 *
 * RETURNS:             None
 *
 * COMMENTS:            The registry key HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\TPCC
 *                      value NumberOfDeliveryThreads controls how many of these
 *                      functions are running. The HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\TPCC
 *                      value BackoffDelay controls the amount of time this function waits
 *                      between checks of the delivery queue.
 *
 */

static void DeliveryThread( void *ptr )
{
                int                                             size;
                int                                             key;
                LPOVERLAPPED            pov;
                DELIVERY                delivery;
                int                                             iError;

                if ( SQLOpenConnection(&delivery.dbproc, szServer, szDatabase, szUser, szPassword, &delivery.spid) )
                        return;         //error posting tbd

                //while delisrv running i.e. user has not requested termination
                while( !bDone )
                {
                        if ( GetQueuedCompletionStatus(hComPort, &size, &key, &pov, (DWORD)-1) )
                        {
                                pov->OffsetHigh = 0;            //clear to notify delivery handler ok to read another entry.
                                //some delivery to do so process it
                                memcpy(&delivery.queue, &pDeliveryCache[pov->Offset].trans.queue, sizeof(SYSTEMTIME));
                                delivery.w_id                           = pDeliveryCache[pov->Offset].trans.w_id;
                                delivery.o_carrier_id           = pDeliveryCache[pov->Offset].trans.o_carrier_id;

                                if ( (iError=SQLDelivery(&delivery)) )
                                {
                                        ErrorMessage(iError);
                                        printf("Running : ");
                                        continue;
                                }

                                //update log
                                WriteLog(&delivery);

                                EnterCriticalSection(&DeliveryCriticalSection);
                                pDeliveryCache[pov->Offset].bInUse = FALSE;
                                LeaveCriticalSection(&DeliveryCriticalSection);
                        }
                }

                return;
}

/* FUNCTION: static int err_handler(DBPROCESS *dbproc, int severity, int dberr, int oserr, char *dberrstr, char *oserrstr)
 *
 * PURPOSE:  This function handles DB-Library errors
 *
 * ARGUMENTS:           DBPROCESS               *dbproc                                 DBPROCESS id pointer
```

```
 *                                              int                                     severity                        severity of error
 *                                              int                                     dberr                                   error id
 *                                              int                                     oserr                                   operating
system specific error code
 *                                              char                            *dberrstr               printable error description of dberr
 *                                              char                            *oserrstr               printable error description of oserr
 *
 * RETURNS:             int                                     INT_CONTINUE            continue if error is SQLETIME else INT_CANCEL action
 *
 * COMMENTS:            None
 *
 */

static int err_handler(DBPROCESS *dbproc, int severity, int dberr, int oserr, char *dberrstr, char *oserrstr)
{
        if (oserr != DBNOERR)
                printf("(%d) %s", oserr, oserrstr);

        if ((dbproc == NULL) || (DBDEAD(dbproc)))
                ExitThread((unsigned long)-1);

        return INT_CONTINUE;
}

/* FUNCTION: static int msg_handler(DBPROCESS *dbproc, DBINT msgno, int msgstate, int severity, char *msgtext)
 *
 * PURPOSE:  This function handles DB-Library SQL Server error messages
 *
 * ARGUMENTS:           DBPROCESS               *dbproc                 DBPROCESS id pointer
 *                                              DBINT                   msgno                   message number
 *                                              int                                     msgstate                message state
 *                                              int                                     severity                message severity
 *                                              char                            *msgtext                printable message description
 *
 * RETURNS:             int                                     INT_CONTINUE            continue if error is SQLETIME else INT_CANCEL action
 *                                                                                     INT_CANCEL                      cancel
operation
 *
 * COMMENTS:            This function also sets the dead lock dbproc variable if necessary.
 *
 */

static int msg_handler(DBPROCESS *dbproc, DBINT msgno, int msgstate, int severity, char *msgtext)
{
   if ( (msgno == 5701) || (msgno == 2528) || (msgno == 5703) || (msgno == 6006) )
                return INT_CONTINUE;

   // deadlock message
   if (msgno == 1205)
   {
                // set the deadlock indicator
                if (dbgetuserdata(dbproc) != NULL)
                *((BOOL *) dbgetuserdata(dbproc)) = TRUE;
                else
                printf("\nError, dbgetuserdata returned NULL.\n");

                return INT_CONTINUE;

   }

        if (msgno == 0)
                return INT_CONTINUE;
        else
                printf("SQL Server Message (%ld) : %s\n", msgno, msgtext);
        return INT_CANCEL;
}

/* FUNCTION: BOOL SQLOpenConnection(DBPROCESS **dbproc, char *server, char *database, char *user, char *password, int *spid)
 *
 * PURPOSE:  This function opens the sql connection for use.
 *
 * ARGUMENTS:           DBPROCESS               **dbproc        pointer to returned DBPROCESS
 *                                              char                            *server                 SQL server name
 *                                              char                            *database       SQL server database
 *                                              char                            *user                   user name
 *                                              char                            *password       user password
 *                                              int                                     *spid                   pointer to returned spid
 *
 * RETURNS:             BOOL            FALSE   if successfull
 *                                                                                     TRUE            if an error occurs
 *
 * COMMENTS:            None
 *
 */

static BOOL SQLOpenConnection(DBPROCESS **dbproc, char *server, char *database, char *user, char *password, int *spid)
{
        LOGINREC   *login;

        login = dblogin();
```

```
	DBSETLUSER(login, user);
	DBSETLPWD(login,  password);

	DBSETLPACKET(login, (USHORT)DEFCLPACKSIZE);

	if ((*dbproc = dbopen(login, server )) == NULL)
		return TRUE;

	// Use the the right database
	dbuse(*dbproc, database);

	dbsetuserdata(*dbproc, malloc(sizeof(BOOL)));
	*((BOOL *)dbgetuserdata(*dbproc)) = FALSE;

	dbcmd(*dbproc, "select @@spid");

	dbsqlexec(*dbproc);
	while (dbresults(*dbproc) != NO_MORE_RESULTS)
	{
		dbbind(*dbproc, 1, SMALLBIND, (DBINT) 0, (BYTE *) spid);
		while (dbnextrow(*dbproc) != NO_MORE_ROWS);
	}
	dbcmd(*dbproc, "set nocount on");

	dbsqlexec(*dbproc);
	while (dbresults(*dbproc) != NO_MORE_RESULTS)
		while (dbnextrow(*dbproc) != NO_MORE_ROWS);

	return FALSE;
}


//queue time, end time, elapsed time, w_id, o_carrier_id, o_id1, ... o_id10
/* FUNCTION: void WriteLog(LPDELIVERY pDelivery)
 *
 * PURPOSE:  This function writes the delivery results to the delivery log file.
 *
 * ARGUMENTS:		LPDELIVERY		pDelivery	Pointer to delivery information.
 *
 * RETURNS:		None
 *
 * COMMENTS:		None
 *
 */

static void WriteLog(LPDELIVERY pDelivery)
{
	int elapsed;

	CalculateElapsedTime(&elapsed, &pDelivery->queue, &pDelivery->trans_end);

	EnterCriticalSection(&WriteLogCriticalSection);

	fprintf(fpLog, "%2.2d/%2.2d/%2.2d,%2.2d:%2.2d:%2.2d:%3.3d,%2.2d:%2.2d:%2.2d:%3.3d,%d,%d,%d,%d,%d,%d,%d,%d,%d,%d,%d,%d\r\n",
		pDelivery->trans_end.wYear - 1900, pDelivery->trans_end.wMonth, pDelivery->trans_end.wDay,
		pDelivery->queue.wHour, pDelivery->queue.wMinute, pDelivery->queue.wSecond, pDelivery->queue.wMilliseconds,
		pDelivery->trans_end.wHour, pDelivery->trans_end.wMinute, pDelivery->trans_end.wSecond, pDelivery->trans_end.wMilliseconds,
		elapsed,
		pDelivery->w_id, pDelivery->o_carrier_id,
		pDelivery->o_id[0], pDelivery->o_id[1], pDelivery->o_id[2], pDelivery->o_id[3],
		pDelivery->o_id[4], pDelivery->o_id[5], pDelivery->o_id[6], pDelivery->o_id[7],
		pDelivery->o_id[8], pDelivery->o_id[9] );

	if ( bFlush )
		fflush(fpLog);

	LeaveCriticalSection(&WriteLogCriticalSection);

	return;
}

/* FUNCTION: void CalculateElapsedTime(int *pElapsed, LPSYSTEMTIME lpBegin, LPSYSTEMTIME lpEnd)
 *
 * PURPOSE:  This function calculates the elapsed time a delivery transaction took.
 *
 * ARGUMENTS:		int				*pElapsed	pointer to int variable to receive calculated elapsed
 *										time in
milliseconds.
 *			LPSYSTEMTIME	lpBegin		Pointer to system time structure containing
 *										transaction
beginning time.
 *			LPSYSTEMTIME	lpEnd		Pointer to system time structure containing
 *										transaction
ending time.
 * RETURNS:		None
 *
 * COMMENTS:		None
 *
 */
```

```
static void CalculateElapsedTime(int *pElapsed, LPSYSTEMTIME lpBegin, LPSYSTEMTIME lpEnd)
{
	int		beginSeconds;
	int		endSeconds;


	beginSeconds = (lpBegin->wHour * 3600000) + (lpBegin->wMinute * 60000) + (lpBegin->wSecond * 1000) + lpBegin->wMilliseconds;
	endSeconds = (lpEnd->wHour * 3600000) + (lpEnd->wMinute * 60000) + (lpEnd->wSecond * 1000) + lpEnd->wMilliseconds;
	*pElapsed = endSeconds - beginSeconds;

	//check for day boundry, this will function for 24 hour period however it will not work over 48 hours.
	if ( *pElapsed < 0 )
		*pElapsed = *pElapsed + (24 * 60 * 60 * 1000);

	return;
}

/* FUNCTION: int SQLDelivery(DELIVERY *pDelivery)
 *
 * PURPOSE:  This function processes the delivery transaction.
 *
 * ARGUMENTS:		DELIVERY		*pDelivery		Pointer to delivery transaction structure
 *
 * RETURNS:		int		ERR_DBGETDATA_FAILED		Delivery get data operation failed.
 *					ERR_SUCCESS		Delivery successfull, no error
 *
 *
 * COMMENTS:		None
 *
 */

static int SQLDelivery(DELIVERY *pDelivery)
{
	RETCODE	rc;
	int		i;
	int		deadlock_count;
	BYTE	*pData;

	deadlock_count = 0;


	// Start new delivery
	while ( TRUE )
	{
		if (dbrpcinit(pDelivery->dbproc, "tpcc_delivery", 0) == SUCCEED)
		{
			dbrpcparam(pDelivery->dbproc, NULL, 0, SQLINT2, -1, -1, (BYTE *)&pDelivery->w_id);
			dbrpcparam(pDelivery->dbproc, NULL, 0, SQLINT1, -1, -1, (BYTE *) &pDelivery->o_carrier_id);

			if (dbrpcexec(pDelivery->dbproc) == SUCCEED)
			{
				while (((rc = dbresults(pDelivery->dbproc)) != NO_MORE_RESULTS) && (rc != FAIL))
				{
					while (((rc = dbnextrow(pDelivery->dbproc)) != NO_MORE_ROWS) && (rc != FAIL))
					{
						for (i=0;i<10;i++)
						{
							if(pData=dbdata(pDelivery->dbproc, i+1)
								pDelivery->o_id[i] = *((DBINT *)pData);
							else
								pDelivery->o_id[i] = 0;
						}
					}
				}
			}
		}
		if ( !SQLDetectDeadlock(pDelivery->dbproc) )
			break;
		deadlock_count++;
		Sleep(10 * deadlock_count);
	}
	GetLocalTime(&pDelivery->trans_end);

	return ERR_SUCCESS;
}

/* FUNCTION: BOOL SQLDetectDeadlock(DBPROCESS *dbproc)
 *
 * PURPOSE:  This function is used to check for deadlock conditions.
 *
 * ARGUMENTS:		DBPROCESS		*dbproc		DBPROCESS to check
 *
 * RETURNS:		BOOL		FALSE		No lock condition present
 *					TRUE		Lock condition detected
 *
 * COMMENTS:		None
 *
 */
```

```
static BOOL SQLDetectDeadlock(DBPROCESS *dbproc)
{
        if (*((BOOL *) dbgetuserdata(dbproc)) == TRUE)
  {
                *((BOOL *) dbgetuserdata(dbproc)) = FALSE;
                return TRUE;
        }
        return FALSE;
}

/* FUNCTION: int OpenLogFile(void)
 *
 * PURPOSE:  This function opens the delivery log file for use.
 *
 * ARGUMENTS:        None
 *
 * RETURNS:          int     ERR_REGISTRY_NOT_SETUP                  Registry not setup.
 *                           ERR_CANNOT_CREATE_RESULTS_FILE          Cannot create results log file.
 *                           ERR_SUCCESS
        Log file successfully opened
 *
 *
 * COMMENTS:         None
 *
 */

static int OpenLogFile(void)
{
        HKEY    hKey;
        BOOL    bRc;
        BYTE    szTmp[256];
        char    szKey[256];
        char    szLogPath[256];
        DWORD   size;
        DWORD   sv;
        int             len;
        char    *ptr;

        szLogPath[0] =  0;
        bRc = TRUE;
        if ( RegOpenKeyEx(HKEY_LOCAL_MACHINE, "SYSTEM\\CurrentControlSet\\Services\\W3SVC\\Parameters\\Virtual Roots", 0, KEY_ALL_ACCESS, &hKey)
== ERROR_SUCCESS )
        {
                sv = sizeof(szKey);
                size = sizeof(szTmp);

                if ( RegEnumValue(hKey, 0, szKey, &sv, NULL, NULL, szTmp, &size) == ERROR_SUCCESS )
                {
                        strcpy(szLogPath, szTmp);
                        bRc = FALSE;
                }
                RegCloseKey(hKey);
        }

        if ( bRc )
                return ERR_REGISTRY_NOT_SETUP;

        if ( (ptr = strchr(szLogPath, ',')) )
                *ptr = 0;

        len = strlen(szLogPath);
        if ( szLogPath[len-1] != '\\' )
        {
                szLogPath[len] = '\\';
                szLogPath[len+1] = 0;
        }
        strcat(szLogPath, "delilog.");

        fpLog = fopen(szLogPath, "ab");

        if ( !fpLog )
                return ERR_CANNOT_CREATE_RESULTS_FILE;

        return ERR_SUCCESS;
}
```

Tpcc.c

```
/*      FILE:           TPCC.C
 *                      Microsoft TPC-C Kit Ver. 3.00.000
 *                      Audited 08/23/96        By Francois Raab
 *
 *                      Copyright Microsoft, 1996
 *
 *      PURPOSE:    Main module for TPCC.DLL which is an ISAPI service dll.
 *      Author:         Philip Durr
 *                      philipdu@Microsoft.com
```

```
*/

#include <windows.h>
#include <process.h>
#include <stdio.h>
#include <stdarg.h>
#include <malloc.h>
#include <stdlib.h>
#include <string.h>
#include <time.h>
#include <sys\timeb.h>
#include <io.h>

#define DBNTWIN32
#include <sqlfront.h>
#include <sqldb.h>

#include "trans.h"                                                              //tpckit transaction header contains definations of structures specific to
TPC−C
#include "httpext.h"                                                            //ISAPI DLL information header

#include "tpcc.h"                                                               //this dlls specific structure, value e.t. header.

char        szServer[32]    = { 0 };                    //global variables used with this DLL
char        szUser[32]                  = { 0 };
char        szPassword[32]              = { 0 };
char        szDatabase[32]              = "tpcc";
BOOL        bLog                                    = FALSE;
int                 iThreads                        = 5;
int                 iMaxWareHouses                  = 500;
int                 iDelayMs                        = 100;
short       iDeadlockRetry              = (short)3;
short       iMaxConnections = (short)25;

//allowable client command strings i.e. CMD=command
char *szCmds[] =
{
            "..NewOrder..", "..Payment..", "..Delivery..", "..Order−Status..", "..Stock−Level..", "..Exit..",
            "Submit", "Begin", "Process", "Menu", "Clear", ""
};


//defined command string functions, called via CMD=command http string from html client.

void (*DoCmd[])(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId) =
{
            NewOrderForm,
            PaymentForm,
            DeliveryForm,
            OrderStatusForm,
            StockLevelForm,
            Exitcmd,
            SubmitCmd,
            BeginCmd,
            ProcessCmd,
            MenuCmd,
            ClearCmd
};

//Terminal client id structure and interface defination
TERM        Term = { 0, 0, 0, FALSE, NULL, TermInit, TermAllocate, TermRestore, TermAdd, TermDelete };

//welcome to tpc−c html form buffer, this is first form client sees.
static char     *szWelcomeForm =            "<HTML>"
                                                                                                    "<HEAD><TITLE>Welcome To TPC−
C</TITLE></HEAD><BODY>"

                                                                                                    "Please Identify your Warehouse and District for this
session.<BR>"

                                                                                                    "<FORM ACTION=\"tpcc.dll\" METHOD=\"GET\">"
                                                                                                    "<INPUT TYPE=\"hidden\" NAME=\"STATUSID\"
VALUE=\"0\">"

                                                                                                    "<INPUT TYPE=\"hidden\" NAME=\"FORMID\"
VALUE=\"1\">"

                                                                                                    "<INPUT TYPE=\"hidden\" NAME=\"TERMID\"
VALUE=\"−2\">"

                                                                                                    "<INPUT TYPE=\"hidden\" NAME=\"SYNCID\"
VALUE=\"0\">"

                                                                                                    "Warehouse ID <INPUT NAME=\"w_id\" SIZE=4><BR>"
                                                                                                    "District ID <INPUT NAME=\"d_id\" SIZE=2><BR>"
                                                                                                    "<HR>"
                                                                                                    "<INPUT TYPE=\"submit\" NAME=\"CMD\"
VALUE=\"Submit\">"

                                                                                                    "</FORM><BODY>"
                                                                                                    "</HTML>";

static char     szTpccLogPath[256];         //path to html log file if logging turned on in registry.
static char szErrorLogPath[256];            //path to error log file.

static          CRITICAL_SECTION                    CriticalSection;
static          CRITICAL_SECTION                    ErrorLogCriticalSection;
```

```
static	LPTSTR                                                  lpszPipeName = TEXT("\\\\.\\pipe\\DELISRV");
static	HANDLE                                                  hDeliveryWrite          = INVALID_HANDLE_VALUE;
static	HANDLE                                                  hPipe                           = INVALID_HANDLE_VALUE;

static	EXTENSION_CONTROL_BLOCK	*gpECB;
static	int                                                             bTpccExit;      //exit delivery disconnect loop as dll exiting.

/* FUNCTION: BOOL APIENTRY DllMain(HANDLE hModule, DWORD ul_reason_for_call, LPVOID lpReserved)
 *
 * PURPOSE:  This function is the entry point for the DLL this implementation is baised on the
 *                                      fact that DLL_PROCESS_ATTACH is only called from the inet service once. Connections
 *                                      are sent to this function as thread attachments.
 *
 * ARGUMENTS:           HANDLE  hModule                                 module handle
 *                                              DWORD   ul_reason_for_call      reason for call
 *                                              LPVOID  lpReserved                      reserved for future use
 *
 * RETURNS:             BOOL    FALSE                                   errors occured in initialization
 *                                                                              TRUE                                                    DLL successfully initialized
 *
 * COMMENTS:            None
 *
 */

BOOL APIENTRY DllMain(HANDLE hModule, DWORD ul_reason_for_call, LPVOID lpReserved)
{
        int                                                             i;
        static SECURITY_ATTRIBUTES      sa;
        static PSECURITY_DESCRIPTOR pSD;

        switch( ul_reason_for_call )
        {
                case DLL_PROCESS_ATTACH:
                        if ( ReadRegistrySettings() )
                        {
                                MessageBox(NULL, "Cannot Find TPCC Key in registry (run install.exe).", "Init", MB_OK | MB_ICONSTOP);
                                return FALSE;
                        }

                        InitializeCriticalSection(&CriticalSection);
                        InitializeCriticalSection(&ErrorLogCriticalSection);

                        (*Term.Init)();
                        if ( !(*Term.Allocate)() )
                        {
                                MessageBox(NULL, "Error Trm.Allocate().", "Init", MB_OK | MB_ICONSTOP);
                                return FALSE;
                        }
                        for(i=Term.iNext; i<Term.iAvailable; i++)
                                Term.pClientData[i].inUse = 0;
                        Term.pClientData[0].inUse = 1;

                        // create a security descriptor that allows anyone to access the pipe...
                        pSD = (PSECURITY_DESCRIPTOR)malloc( SECURITY_DESCRIPTOR_MIN_LENGTH );
                        if ( pSD == NULL )
                        {
                                MessageBox(NULL, "Error malloc(SECURITY_DESCRIPTOR_MIN_LENGTH)", "Init", MB_OK | MB_ICONSTOP);
                                return FALSE;
                        }
                        if ( !InitializeSecurityDescriptor(pSD, SECURITY_DESCRIPTOR_REVISION) )
                        {
                                MessageBox(NULL, "Error InitializeSecurityDescriptor()", "Init", MB_OK | MB_ICONSTOP);
                                return FALSE;
                        }
                        // add a NULL disc. ACL to the security descriptor.
                        if ( !SetSecurityDescriptorDacl(pSD, TRUE, (PACL) NULL, FALSE) )
                        {
                                MessageBox(NULL, "Error SetSecurityDescriptorDacl().", "Init", MB_OK | MB_ICONSTOP);
                                return FALSE;
                        }

                        sa.nLength                                              = sizeof(sa);
                        sa.lpSecurityDescriptor         = pSD;
                        sa.bInheritHandle                               = TRUE;

                        // open delivery named pipe...
                        hPipe = CreateNamedPipe(lpszPipeName, FILE_FLAG_OVERLAPPED | PIPE_ACCESS_DUPLEX,
                                PIPE_TYPE_BYTE | PIPE_READMODE_BYTE | PIPE_NOWAIT,
                                1, 65535, 65535, 250, &sa);

                        if ( hPipe == INVALID_HANDLE_VALUE )
                        {
                                MessageBox(NULL, "Error CreateNamedPipe().", "Init", MB_OK | MB_ICONSTOP);
                                free(pSD);
                                return FALSE;
                        }

                        bTpccExit = FALSE;

                        if ( _beginthread( DeliveryDisconnect, 0, NULL ) == -1 )
```

```
                                        {
                                                MessageBox(NULL, "Error _beginthread()", "Init", MB_OK | MB_ICONSTOP);
                                                return FALSE;
                                        }

                                        #ifdef USE_ODBC
                                                if ( SQLAllocEnv(&henv) == SQL_ERROR )
                                                {
                                                        MessageBox(NULL, "Error SQLAllocEnv()", "Init", MB_OK | MB_ICONSTOP);
                                                        return FALSE;
                                                }
                                        #else
                                                dbinit();
                                                if ( dbgetmaxprocs() < iMaxConnections )
                                                {
                                                        if ( dbsetmaxprocs(iMaxConnections) == FAIL )
                                                        {
                                                                //set for fail error message when HttpExtensionProc() is called because
                                                                //at this point we don't have a pECB so no way to show error message.
                                                                iMaxConnections = -1;
                                                        }
                                                }
                                                // install error and message handlers
                                                dbmsghandle((DBMSGHANDLE_PROC)msg_handler);
                                                dberrhandle((DBERRHANDLE_PROC)err_handler);
                                        #endif
                                        break;
                                case DLL_THREAD_ATTACH:
                                        break;
                                case DLL_THREAD_DETACH:
                                        break;
                                case DLL_PROCESS_DETACH:
                                        if ( pSD )
                                                free( pSD );

                                        bTpccExit = TRUE;

                                        if ( hPipe )
                                                DisconnectNamedPipe(hPipe);

                                        if (hPipe != INVALID_HANDLE_VALUE )
                                                CloseHandle(hPipe);

                                        (*Term.Restore)();

                                        #ifdef USE_ODBC
                                                SQLFreeEnv(henv);
                                        Else
                                                dbexit();
                                        #endif

                                        DeleteCriticalSection(&CriticalSection);
                                        DeleteCriticalSection(&ErrorLogCriticalSection);

                                        break;
                }
                return TRUE;
}

/* FUNCTION: void DeliveryDisconnect(void *ptr)
 *
 * PURPOSE:  This function handles disconnecting the server side of the delivery pipe when the
 *                                      delivery handler application shuts down.
 *
 * ARGUMENTS:           void            *ptr            void pointer normally NULL passed from thread handler.
 *
 * RETURNS:             None
 *
 * COMMENTS:            This function runs as thread which allows the client pipe to disconnect by
 *                                      sending a byte back though the pipe to the server i.e. this DLL.
 */

static void DeliveryDisconnect(void *ptr)
{
                int                                                                                     l, d;
                SECURITY_ATTRIBUTES                     sa;
                PSECURITY_DESCRIPTORpSD;

                // create a security descriptor that allows anyone to access the pipe...
                pSD = (PSECURITY_DESCRIPTOR)malloc( SECURITY_DESCRIPTOR_MIN_LENGTH );
                InitializeSecurityDescriptor(pSD, SECURITY_DESCRIPTOR_REVISION);
                SetSecurityDescriptorDacl(pSD, TRUE, (PACL) NULL, FALSE);
                sa.nLength                                      = sizeof(sa);
                sa.lpSecurityDescriptor         = pSD;
                sa.bInheritHandle                       = TRUE;

                while( !bTpccExit )
                {
                        if ( hPipe && ReadFile(hPipe, &l, 1, &d, NULL) )
                        {
```

```
                                        DisconnectNamedPipe(hPipe);
                                        CloseHandle(hPipe);
                                        // open delivery named pipe...
                                        hPipe = CreateNamedPipe(lpszPipeName, FILE_FLAG_OVERLAPPED | PIPE_ACCESS_DUPLEX,
                                                PIPE_TYPE_BYTE | PIPE_READMODE_BYTE | PIPE_NOWAIT,
                                                1, 65535, 65535, 250, &sa);
                        }
                        Sleep( 2000 );  //check for delivery application exit once every 2 seconds.
                }

                free(pSD);

                return;
}

/* FUNCTION: BOOL WINAPI GetExtensionVersion(HSE_VERSION_INFO *pVer)
 *
 * PURPOSE:  This function is called by the inet service when the DLL is first loaded.
 *
 * ARGUMENTS:           HSE_VERSION_INFO        *pVer           passed in structure in which to place expected version number.
 *
 * RETURNS:             TRUE            inet service expected return value.
 *
 * COMMENTS:            None
 *
 */

BOOL WINAPI GetExtensionVersion(HSE_VERSION_INFO *pVer)
{

                pVer->dwExtensionVersion = MAKELONG(HSE_VERSION_MINOR, HSE_VERSION_MAJOR);
                lstrcpyn(pVer->lpszExtensionDesc, "TPC-C Server.", HSE_MAX_EXT_DLL_NAME_LEN);

                return TRUE;
}

/* FUNCTION: DWORD WINAPI HttpExtensionProc(EXTENSION_CONTROL_BLOCK *pECB)
 *
 * PURPOSE:  This function is the main entry point for the TPCC DLL. The internet service
 *                                      calls this function passing in the http string.
 *
 * ARGUMENTS:           EXTENSION_CONTROL_BLOCK         *pECB       structure pointer to passed in internet
 *
                service information.
 *
 * RETURNS:             DWORD       HSE_STATUS_SUCCESS                                                      connection can be dropped if error
 *                                                                      HSE_STATUS_SUCCESS_AND_KEEP_CONN        keep connect valid comment
sent
 *
 * COMMENTS:            None
 *
 */

DWORD WINAPI HttpExtensionProc(EXTENSION_CONTROL_BLOCK *pECB)
{
                int iCmd, FormId, TermId, iSyncId;
                FILE *fp;

                static BOOL bReadRegistry = FALSE;

                if ( iMaxConnections == -1 )
                {
                        ErrorMessage(pECB, ERR_CAN_NOT_SET_MAX_CONNECTIONS, ERR_TYPE_WEBDLL, NULL, -1, -1);
                        return HSE_STATUS_SUCCESS;
                }

                //if registry setting is for html logging then show http string passed in.
                if ( bLog )
                {
                        SYSTEMTIME              systemTime;

                        fp = fopen(szTpccLogPath, "ab");

                        GetLocalTime(&systemTime);

                        fprintf(fp, "* QUERY * %2.2d/%2.2d/%2.2d %2.2d:%2.2d:%2.2d\r\n\r\n%s\r\n\r\n",
                                systemTime.wYear, systemTime.wMonth, systemTime.wDay,
                                systemTime.wHour, systemTime.wMinute, systemTime.wSecond,
                                pECB->lpszQueryString);
                        fclose(fp);
                }


                //process http query
                if ( !ProcessQueryString(pECB, &iCmd, &FormId, &TermId, &iSyncId) )
                {
                        if ( TermId < 0 )
                                ErrorMessage(pECB, ERR_INVALID_TERMID, ERR_TYPE_WEBDLL, NULL, TermId, iSyncId);
                        else
                                ErrorMessage(pECB, ERR_COMMAND_UNDEFINED, ERR_TYPE_WEBDLL, NULL, TermId, iSyncId);
```

```
                return HSE_STATUS_SUCCESS_AND_KEEP_CONN;
        }

        if ( TermId != 0 )
        {
                if ( !IsValidTermId(TermId) )
                {
                        ErrorMessage(pECB, ERR_INVALID_TERMID, ERR_TYPE_WEBDLL, NULL, TermId, iSyncId);
                        return HSE_STATUS_SUCCESS_AND_KEEP_CONN;
                }

                //must have a valid syncid here since termid is valid
                if ( iSyncId < 1 || iSyncId != Term.pClientData[TermId].iSyncId )
                {
                        ErrorMessage(pECB, ERR_INVALID_SYNC_CONNECTION, ERR_TYPE_WEBDLL, NULL, TermId, iSyncId);
                        return HSE_STATUS_SUCCESS_AND_KEEP_CONN;
                }

        }

        //set use time
        Term.pClientData[TermId].iTickCount = GetTickCount();

        //go execute http: command
        (*DoCmd[iCmd])(pECB, FormId, TermId, iSyncId);

        //finish up and keep connection
        return HSE_STATUS_SUCCESS_AND_KEEP_CONN;
}

/* FUNCTION: static BOOL IsValidTermId(int TermId)
 *
 * PURPOSE:  This function checks to see of the passed in terminal id is valid.
 *
 * ARGUMENTS:           int                                     TermId                                  client terminal id
 *
 * RETURNS:             BOOL    FALSE                                                           Terminal ID Invalid
 *                                                              TRUE
        Terminal ID valid
 *
 * COMMENTS:            None
 *
 */

static BOOL IsValidTermId(int TermId)
{
        return (BOOL) ( TermId > 0 && TermId <= Term.iAvailable && Term.pClientData[TermId].inUse );
}

/* FUNCTION: BOOL ProcessQueryString(EXTENSION_CONTROL_BLOCK *pECB, int *pCmd, int *pFormId, int *pTermId, int *pSyncId)
 *
 * PURPOSE:  This function extracts the relevent information out of the http command passed in from
 *                                      the browser.
 *
 * ARGUMENTS:           EXTENSION_CONTROL_BLOCK         *pECB                   structure pointer to passed in internet
 *
        service information.
 *                                              int                                     *pCmd
        returned command id
 *                                              int                                     *pFormId                        returned active
form client browser is on
 *                                              int                                     *pTermId                        returned client
terminal id
 *
 * RETURNS:             BOOL    FALSE                                                           success
 *                                                              TRUE
        command passed in is invalid
 *
 * COMMENTS:            If this is the initial connection i.e. client is at welcome screen then
 *                                              there will not be a terminal id or current form id if this is the case
 *                                              then the pTermid and pFormid return values are undefined.
 */

BOOL ProcessQueryString(EXTENSION_CONTROL_BLOCK *pECB, int *pCmd, int *pFormId, int *pTermId, int *pSyncId)
{
        char *ptr;
        char szBuffer[25];
        char szTmp[25];
        char *dest = szBuffer;
        int i;


        if ( (ptr = strstr(pECB->lpszQueryString, "FORMID=")) )
                *pFormId = *(ptr+7) & 0x0F;

        if ( (ptr = strstr(pECB->lpszQueryString, "TERMID=")) )
        {
                *pTermId = atoi((ptr+7));
                if ( *pTermId == 0 )            //terminal id 0 used internally
                        *pTermId = -1;
```

```
                        if ( *pTermId == -2 )           //login screen
                                *pTermId = 0;
        }
        else
                        *pTermId = 0;

        if ( (ptr = strstr(pECB->lpszQueryString, "SYNCID=")) )
                        *pSyncId = atoi((ptr+7));
        else
                        *pSyncId = 0;

        if ( !(ptr = strstr(pECB->lpszQueryString, "CMD=")) )
        {
                        ptr = szBuffer;
                        if ( !stricmp(szBuffer, "Default") )
                                strcpy(szBuffer, "CMD=Begin");
                        switch( *pFormId )
                        {
                                case WELCOME_FORM:
                                        strcpy(szBuffer, "CMD=Submit");
                                        break;
                                case MAIN_MENU_FORM:
                                        strcpy(szBuffer, "CMD=NewOrder");
                                        break;
                                case NEW_ORDER_FORM:
                                case PAYMENT_FORM:
                                case DELIVERY_FORM:
                                case ORDER_STATUS_FORM:
                                case STOCK_LEVEL_FORM:
                                        if ( !(*pTermId) )
                                                return FALSE;
                                        if ( GetKeyValue(pECB->lpszQueryString, "PI*", szTmp, sizeof(szTmp)) )
                                                strcpy(szBuffer, "CMD=Process");
                                        else
                                        {
                                                strcpy(szBuffer, "CMD=");
                                                strcat(szBuffer, szCmds[*pFormId - NEW_ORDER_FORM]);
                                        }
                                        break;
                                default:
                                        return FALSE;
                        }
        }

        ptr += 4;

        while( *ptr && *ptr != '&' )
                        *dest++ = *ptr++;
        *dest = 0;

        for(i=0; szCmds[i][0]; i++)
        {
                        if ( !strcmp(szCmds[i], szBuffer) )
                        {
                                *pCmd = i;
                                return TRUE;
                        }
        }
        return FALSE;
}

/* FUNCTION: void NewOrderForm(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId)
 *
 * PURPOSE:  This function wraps the functionality needed for the TPC-C New Order Form.
 *
 * ARGUMENTS:           int                                                     iFormId         unused
 *                      int                                                     iTermId
        id of calling browser, i.e. TERMID= from http command line
 *                      EXTENSION_CONTROL_BLOCK     *pECB           structure pointer to passed in internet
 *
        service information.
 *
 * RETURNS:             None
 *
 * COMMENTS:            None
 *
 */

void NewOrderForm(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId)
{
        WriteZString(pECB, MakeNewOrderForm(iTermId, iSyncId, TRUE, FALSE));

        UNUSEDPARAM(iFormId);

        return;
}

/* FUNCTION: void PaymentForm(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId)
 *
 * PURPOSE:  This function wraps the functionality needed for the TPC-C Payment Form.
```

```
 *
 * ARGUMENTS:        int                                                     iFormId         unused
 *                   int                                                     iTermId
        id of calling browser, i.e. TERMID= from http command line
 *                   int                                                     iSyncId
        sync id of calling browser
 *                   EXTENSION_CONTROL_BLOCK     *pECB           structure pointer to passed in internet
 *
        service information.
 * RETURNS:          None
 *
 * COMMENTS:         None
 *
 */

void PaymentForm(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId)
{
        WriteZString(pECB, MakePaymentForm(iTermId, iSyncId, TRUE) );

        UNUSEDPARAM(iFormId);

}

/* FUNCTION: void DeliveryForm(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId)
 *
 * PURPOSE:  This function wraps the functionality needed for the TPC−C Delivery Form.
 *
 * ARGUMENTS:        int                                                     iFormId         unused
 *                   int                                                     iTermId
        id of calling browser, i.e. TERMID= from http command line
 *                   int                                                     iSyncId
        sync id of calling browser
 *                   EXTENSION_CONTROL_BLOCK     *pECB           structure pointer to passed in internet
 *
        service information.
 * RETURNS:          None
 *
 * COMMENTS:         None
 *
 */

void DeliveryForm(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId)
{
        WriteZString(pECB, MakeDeliveryForm(iTermId, iSyncId, TRUE) );

        UNUSEDPARAM(iFormId);
}

/* FUNCTION: void OrderStatusForm(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId)
 *
 * PURPOSE:  This function wraps the functionality needed for the TPC−C Order Status Form.
 *
 * ARGUMENTS:        int                                                     iFormId         unused
 *                   int                                                     iTermId
        id of calling browser, i.e. TERMID= from http command line
 *                   int                                                     iSyncId
        sync id of calling borwser
 *                   EXTENSION_CONTROL_BLOCK     *pECB           structure pointer to passed in internet
 *
        service information.
 * RETURNS:          None
 *
 * COMMENTS:         None
 *
 */

void OrderStatusForm(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId)
{
        WriteZString(pECB, MakeOrderStatusForm(iTermId, iSyncId, TRUE) );

        UNUSEDPARAM(iFormId);

}

/* FUNCTION: void StockLevelForm(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId)
 *
 * PURPOSE:  This function wraps the functionality needed for the TPC−C Stock Level Form.
 *
 * ARGUMENTS:        int                                                     iFormId         unused
 *                   int                                                     iTermId
        id of calling browser, i.e. TERMID= from http command line
 *                   int                                                     iSyncId
        sync id of calling browser
 *                   EXTENSION_CONTROL_BLOCK     *pECB           structure pointer to passed in internet
 *
        service information.
 * RETURNS:          None
 *
 * COMMENTS:         None
 *
```

```
 */

void StockLevelForm(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId)
{
        WriteZString(pECB, MakeStockLevelForm(iTermId, iSyncId, TRUE) );

        return;
}

/* FUNCTION: void Exitcmd(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId)
 *
 * PURPOSE:  This function removes a terminal id from use, the allocated structure however remains
 *                                      valid so the next request for a new client will not require a new memory allocation.
 *
 * ARGUMENTS:           int                                                     iFormId         unused
 *                                      int                                                     iTermId
        id of calling browser, i.e. TERMID= from http command line
 *                                      int                                                     iSyncId
        sync id of calling browser
 *                                      EXTENSION_CONTROL_BLOCK     *pECB       structure pointer to passed in internet
 *
        service information.
 * RETURNS:             None
 *
 * COMMENTS:            None
 *
 */

void Exitcmd(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId)
{
        (*Term.Delete)(pECB, iTermId);

        WriteZString(pECB, MakeWelcomeForm() );

        UNUSEDPARAM(iFormId);
        UNUSEDPARAM(iSyncId);

        return;
}

/* FUNCTION: void SubmitCmd(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId)
 *
 * PURPOSE:  This function allocated a new terminal id in the Term structure array.
 *
 * ARGUMENTS:           int                                                     iFormId         unused
 *                                      int                                                     iTermId
        id of calling browser, i.e. TERMID= from http command line
 *                                      int                                                     iSyncId
        sync id of calling browser
 *                                      EXTENSION_CONTROL_BLOCK     *pECB       structure pointer to passed in internet
 *
        service information.
 * RETURNS:             None
 *
 * COMMENTS:            A terminal id can be allocated but still be invalid if the requested warehouse number
 *                                      is outside the range specified in the registry. This then will force the client id
 *                                      to be invalid and an error message sent to the users browser.
 */

void SubmitCmd(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId)
{
        int             iCurrent;

        if ( (iCurrent = (*Term.Add)(pECB, pECB->lpszQueryString)) < 0 )
        {
                ErrorMessage(pECB, ERR_CANNOT_INIT_TERMINAL, ERR_TYPE_WEBDLL, NULL, iCurrent, iSyncId);
                return;
        }

        if ( Term.pClientData[iCurrent].w_id > iMaxWareHouses || Term.pClientData[iCurrent].w_id < 1 )
        {
                ErrorMessage(pECB, ERR_W_ID_INVALID, ERR_TYPE_WEBDLL, NULL, iCurrent, iSyncId);
                (*Term.Delete)(pECB, iCurrent);
                return;
        }
        if ( Term.pClientData[iCurrent].d_id < 1 || Term.pClientData[iCurrent].d_id > 10 )
        {
                ErrorMessage(pECB, ERR_D_ID_INVALID, ERR_TYPE_WEBDLL, NULL, iCurrent, iSyncId);
                (*Term.Delete)(pECB, iCurrent);
                return;
        }

        WriteZString(pECB, MakeMainMenuForm(iCurrent, Term.pClientData[iCurrent].iSyncId) );

        return;
}

/* FUNCTION: void BeginCmd(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId)
 *
 * PURPOSE:  This function is the first command executed. It is executed with the command
```

```
 *                                      CMD=Begin?Server=xxx from the http command line.
 *
 * ARGUMENTS:          int                                                                 iFormId          unused
 *                                      int                                                                 iTermId
                id of calling browser, i.e. TERMID= from http command line
 *                                      int                                                                 iSyncId
                sync id of calling browser
 *                                      EXTENSION_CONTROL_BLOCK     *pECB          structure pointer to passed in internet
 *
                service information.
 * RETURNS:           None
 *
 * COMMENTS:          SQL server must be specified, however the user and password parameters are optional.
 *                                      The complete command line is CMD=Begin&Server=server&User=sa&Psw=&. The & are used
 *                                      to separate parameters which is internet browser standard.
 */

void BeginCmd(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId)
{
        LPSTR pQueryString;

        pQueryString = pECB->lpszQueryString;

        if ( !GetKeyValue(pQueryString, "Server", szServer, sizeof(szServer)) )
        {
                ErrorMessage(pECB, ERR_NO_SERVER_SPECIFIED, ERR_TYPE_WEBDLL, NULL, iTermId, iSyncId);
                return;
        }

        if ( !GetKeyValue(pQueryString, "User", szUser, sizeof(szUser)) )
                strcpy(szUser, "sa");

        if ( !GetKeyValue(pQueryString, "Psw", szPassword, sizeof(szPassword)) )
                strcpy(szPassword, "");

        if ( !GetKeyValue(pQueryString, "Db", szDatabase, sizeof(szDatabase)) )
                strcpy(szDatabase, "tpcc");

        WriteZString(pECB, MakeWelcomeForm() );

        UNUSEDPARAM(iFormId);

        return;
}

/* FUNCTION: void ProcessCmd(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId)
 *
 * PURPOSE:  This function process the passed in http command
 *
 * ARGUMENTS:          int                                                                 iFormId          unused
 *                                      int                                                                 iTermId
                id of calling browser, i.e. TERMID= from http command line
 *                                      int                                                                 iSyncId
                sync id of calling browser
 *                                      EXTENSION_CONTROL_BLOCK     *pECB          structure pointer to passed in internet
 *
                service information.
 * RETURNS:           None
 *
 * COMMENTS:          None
 *
 */

void ProcessCmd(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId)
{
        switch( iFormId )
        {
                case WELCOME_FORM:
                        return;
                case MAIN_MENU_FORM:
                        return;
                case NEW_ORDER_FORM:
                        ProcessNewOrderForm(pECB, iTermId, iSyncId);
                        return;
                case PAYMENT_FORM:
                        ProcessPaymentForm(pECB, iTermId, iSyncId);
                        return;
                case DELIVERY_FORM:
                        ProcessDeliveryForm(pECB, iTermId, iSyncId);
                        return;
                case ORDER_STATUS_FORM:
                        ProcessOrderStatusForm(pECB, iTermId, iSyncId);
                        return;
                case STOCK_LEVEL_FORM:
                        ProcessStockLevelForm(pECB, iTermId, iSyncId);
                        return;
        }
}

/* FUNCTION: void ClearCmd(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId)
```

```
 *
 * PURPOSE:  This function frees all currently logged in terminal ids.
 *
 * ARGUMENTS:          int                                                   iFormId                 unused
 *                     int                                                   iTermId
          id of calling browser, i.e. TERMID= from http command line
 *                     int                                                   iSyncId
          sync id of calling browser
 *                     EXTENSION_CONTROL_BLOCK     *pECB                     structure pointer to passed in internet
 *
          service information.
 * RETURNS:            None
 *
 * COMMENTS:           Use this function with caution, it may cause unpredictable results
 *                     if existing browsers attempt to use the web client with out
 *                     beginning at the login screen for each client.
 */

void ClearCmd(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId)
{
          int i;

          EnterCriticalSection(&CriticalSection);

          for(i=0; i<Term.iAvailable; i++)
          {
                    if ( Term.pClientData[i].inUse )
                              (*Term.Delete)(pECB, i);
          }

          Term.iNext                  = 0;
          Term.iAvailable             = 0;
          Term.iMasterSyncId          = 1;

          if ( Term.pClientData )
                    free(Term.pClientData);
          Term.pClientData            = NULL;
          Term.bInit                  = FALSE;

          (*Term.Init)();
          if ( !(*Term.Allocate)() )
          {
                    ErrorMessage(pECB, ERR_MAX_CONNECT_PARAM, ERR_TYPE_WEBDLL, NULL, iTermId, iSyncId);
                    return;
          }
          for(i=Term.iNext; i<Term.iAvailable; i++)
                    Term.pClientData[i].inUse = 0;
          Term.pClientData[0].inUse = 1;

          LeaveCriticalSection(&CriticalSection);

          WriteZString(pECB, MakeWelcomeForm() );

          return;
}

/* FUNCTION: void MenuCmd(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId)
 *
 * PURPOSE:  This function causes an exit to the main menu
 *
 * ARGUMENTS:          int                                                   iFormId                 unused
 *                     int                                                   iTermId
          id of calling browser, i.e. TERMID= from http command line
 *                     int                                                   iSyncId
          sync id of calling browser
 *                     EXTENSION_CONTROL_BLOCK     *pECB                     structure pointer to passed in internet
 *
          service information.
 * RETURNS:            None
 *
 * COMMENTS:           None
 *
 */

void MenuCmd(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId, int iSyncId)
{
          WriteZString(pECB, MakeMainMenuForm(iTermId, iSyncId) );

          return;
}


/* FUNCTION: void WriteZString(EXTENSION_CONTROL_BLOCK *pECB, char *szStr)
 *
 * PURPOSE:  This function is the low level output function. It writes a string of text back to the
 *                     client browser.
 *
 * ARGUMENTS:          EXTENSION_CONTROL_BLOCK     *pECB     passed in structure pointer from inetsrv.
 *                     char                                  *szStr                  string to display in the client
browser.
```

```
 *
 * RETURNS:             None
 *
 * COMMENTS:            This function assumes that the string to written to the client browser has
 *                                      been formatted in an HTML manner.
 */

static void WriteZString(EXTENSION_CONTROL_BLOCK *pECB, char *szStr)
{
        FILE    *fp;
        int     lpbSize;
        int     iSize;
        char    szHeader[128];
        char    szHeader1[128];

        lpbSize = strlen(szStr)+1;

        if ( bLog )
        {
                SYSTEMTIME              systemTime;

                fp = fopen(szTpccLogPath, "ab");

                GetLocalTime(&systemTime);

                fprintf(fp, "* HTML PAGE * %2.2d/%2.2d/%2.2d %2.2d:%2.2d:%2.2d\r\n\r\n%s\r\n\r\n",
                        systemTime.wYear, systemTime.wMonth, systemTime.wDay,
                        systemTime.wHour, systemTime.wMinute, systemTime.wSecond,
                        szStr);

                fclose(fp);
        }

        iSize = sprintf(szHeader, "200 Ok");
        sprintf(szHeader1, "Connection: keep-alive\r\nContent-type: text/html\r\nContent-length: %d\r\n\r\n", lpbSize);

        (*pECB->ServerSupportFunction)(pECB->ConnID, HSE_REQ_SEND_RESPONSE_HEADER, szHeader, &iSize, (LPDWORD)szHeader1);
        (*pECB->WriteClient)(pECB->ConnID, szStr, &lpbSize0);


        return;
}

/* FUNCTION: void h_printf(EXTENSION_CONTROL_BLOCK *pECB, char *format, ...)
 *
 * PURPOSE:  This function forms a high level printf for an HTML browser
 *
 * ARGUMENTS:           EXTENSION_CONTROL_BLOCK         *pECB       passed in structure pointer from inetsrv.
 *                                              char                            *format                         printf style format string
 *                                              ...
        other arguments as required by printf style format string.
 *
 * RETURNS:             None
 *
 * COMMENTS:            This function is mainly used for developmental support.
 */

static void h_printf(EXTENSION_CONTROL_BLOCK *pECB, char *format, ...)
{
        int lpbSize;
        char szBuff[512];
        char szTmp[512];

        va_list marker;
        va_start( marker, format );
        vsprintf(szTmp, format, marker);
        va_end( marker );

        lpbSize = wsprintf(szBuff, "<html>%s</html>", szTmp) + 1;

        (*pECB->WriteClient)(pECB->ConnID, szBuff, &lpbSize, 0);

        return;
}

/* FUNCTION: void ErrorMessage(EXTENSION_CONTROL_BLOCK *pECB, int iError, int iErrorType, char *szMsg)
 *
 * PURPOSE:  This function displays an error message in the client browser.
 *
 * ARGUMENTS:           EXTENSION_CONTROL_BLOCK         *pECB       passed in structure pointer from inetsrv.
 *                                              int                             iError                          id of error
message
 *                                              int                             iErrorType              error type, ERR_TYPE_SQL,
ERR_TYPE_DBLIB, or ERR_TYPE_WEBDLL
 *                                              int                             iTermId                         terminal id
from browser
 *                                              int                             iSyncid                         sync id from
browser
 *                                              char *                          szMsg                           optional error message string
used with ERR_TYPE_SQL and
```

```
*
		ERR_TYPE_DBLIB
*
* RETURNS:		None
*
* COMMENTS:		If the error type is ERR_TYPE_WEBDLL the szmsg parameter may be NULL because it
*				is ignored. If the error type is ERR_TYPE_SQL or ERR_TYPE_DBLIB then the szMsg
*				parameter contains the text of the error message, so the szMsg parameter cannot
*				be NULL.
*
*/

void ErrorMessage(EXTENSION_CONTROL_BLOCK *pECB, int iError, int iErrorType, char *szMsg, int iTermId, int iSyncId)
{
		int i;

		static SERRORMSG errorMsgs[] =
		{
			{	ERR_SUCCESS,	"Success, no
error."
		},
			{	ERR_COMMAND_UNDEFINED,	"Command undefined."
				},
			{	ERR_NOT_IMPLEMENTED_YET,	"Not Implemented Yet."
				},
			{	ERR_CANNOT_INIT_TERMINAL,	"Cannot initialize client connection."
			},
			{	ERR_OUT_OF_MEMORY,	"insufficient memory."
				},
			{	ERR_NEW_ORDER_NOT_PROCESSED,	"Cannot process new Order form."
			},
			{	ERR_PAYMENT_NOT_PROCESSED,	"Cannot process payment form."
				},
			{	ERR_NO_SERVER_SPECIFIED,	"No Server name specified."
				},
			{	ERR_ORDER_STATUS_NOT_PROCESSED,	"Cannot process order status form."
			},
			{	ERR_W_ID_INVALID,	"Invalid Warehouse ID."
				},
			{	ERR_CAN_NOT_SET_MAX_CONNECTIONS,	"Insufficient memory to allocate # connections."
				},
			{	ERR_NOSUCH_CUSTOMER,	"No such customer."

		},
			{	ERR_D_ID_INVALID,	"Invalid District ID Must be 1
to 10."
			},
			{	ERR_MAX_CONNECT_PARAM,	"Max client connections
exceeded, run install to increase."
				},
			{	ERR_INVALID_SYNC_CONNECTION,	"Invalid Terminal Sync ID."
				},
			{	ERR_INVALID_TERMID,	"Invalid Terminal ID."
				},
			{	ERR_PAYMENT_INVALID_CUSTOMER,	"Payment Form, No such Customer."
			},
			{	ERR_SQL_OPEN_CONNECTION,	"SQLOpenConnection API Failed."
				},
			{	ERR_STOCKLEVEL_MISSING_THRESHOLD_KEY,	"Stock Level missing Threshold key \"TT*\"."
				},
			{	ERR_STOCKLEVEL_THRESHOLD_INVALID,	"Stock Level Threshold invalid data type range = 1 − 99."
			},
			{	ERR_STOCKLEVEL_THRESHOLD_RANGE,	"Stock Level Threshold out of range, range
must be 1 − 99."
				},
			{	ERR_STOCKLEVEL_NOT_PROCESSED,	"Stock Level not processed."
			},
			{	ERR_NEWORDER_FORM_MISSING_DID,	"New Order missing District key \"DID*\"."
					},
			{	ERR_NEWORDER_DISTRICT_INVALID,	"New Order District ID Invalid range 1 − 10."
				},
			{	ERR_NEWORDER_DISTRICT_RANGE,	"New Order District ID out of Range. Range = 1 − 10."
				},
			{	ERR_NEWORDER_CUSTOMER_KEY,	"New Order missing Customer key
\"CID*\"."
			},
			{	ERR_NEWORDER_CUSTOMER_INVALID,	"New Order customer id invalid data type,
range = 1 to 3000."
				},
			{	ERR_NEWORDER_CUSTOMER_RANGE,	"New Order customer id out of range, range
= 1 to 3000."
				},
			{	ERR_NEWORDER_MISSING_IID_KEY,	"New Order missing Item Id key \"IID*\"."
				},
			{	ERR_NEWORDER_ITEM_BLANK_LINES,	"New Order blank order lines all orders must
be continuous."
				},
			{	ERR_NEWORDER_ITEMID_INVALID,	"New Order Item Id is wrong data type, must be numeric."
			},
			{	ERR_NEWORDER_MISSING_SUPPW_KEY,	"New Order missing Supp_W key
\"SP##*\"."
			},
			{	ERR_NEWORDER_SUPPW_INVALID,	"New Order Supp_W invalid data type must
be numeric."
				},
			{	ERR_NEWORDER_MISSING_QTY_KEY,	"New Order Missing Qty key \"Qty##*\"."
			},
			{	ERR_NEWORDER_QTY_INVALID,	"New Order Qty invalid must be numeric
range 1 − 99."
				},
```

```
                {       ERR_NEWORDER_SUPPW_RANGE,                       "New Order Supp_W value out of range
range = 1 − Max Warehouses."    },
                {       ERR_NEWORDER_ITEMID_RANGE,                      "New Order Item Id is out of range. Range =
1 to 999999."   },
                {       ERR_NEWORDER_QTY_RANGE,                                 "New Order Qty is out of
range. Range = 1 to 99."                                        },
                {       ERR_PAYMENT_DISTRICT_INVALID,           "Payment District ID is invalid must be 1 − 10."
                        },
                {       ERR_NEWORDER_SUPPW_WITHOUT_ITEMID,      "New Order Supp_W field entered without a corrisponding
Item_Id."       },
                {       ERR_NEWORDER_QTY_WITHOUT_ITEMID,        "New Order Qty entered without a corrisponding Item_Id."
                },
                {       ERR_NEWORDER_NOITEMS_ENTERED,                   "New Order Blank Items between items,
items must be continuous."      },
                {       ERR_PAYMENT_MISSING_DID_KEY,            "Payment missing District Key \"DID*\"."
                        },
                {       ERR_PAYMENT_DISTRICT_RANGE,                     "Payment District Out of range, range = 1 −
10."
                        },
                {       ERR_PAYMENT_MISSING_CID_KEY,            "Payment missing Customer Key \"CID*\"."
                        },
                {       ERR_PAYMENT_CUSTOMER_INVALID,                   "Payment Customer data type invalid, must
be numeric."
                        },
                {       ERR_PAYMENT_MISSING_CLT,                        "Payment missing Customer Last Name Key
\"CLT*\"."
                        },
                {       ERR_PAYMENT_LAST_NAME_TO_LONG,                  "Payment Customer last name longer than
16 characters."
                        },
                {       ERR_PAYMENT_CUSTOMER_RANGE,                     "Payment Customer ID out of range, must
be 1 to 3000."
                        },
                {       ERR_PAYMENT_CID_AND_CLT,                        "Payment Customer ID and Last Name
entered must be one or other."  },
                {       ERR_PAYMENT_MISSING_CDI_KEY,            "Payment missing Customer district key \"CDI*\"."
                        },
                {       ERR_PAYMENT_CDI_INVALID,                        "Payment Customer district invalid must be
numeric."
                        },
                {       ERR_PAYMENT_CDI_RANGE,                                  "Payment Customer district
out of range must be 1 − 10."
                        },
                {       ERR_PAYMENT_MISSING_CWI_KEY,            "Payment missing Customer Warehouse key \"CWI*\"."
                        },
                {       ERR_PAYMENT_CWI_INVALID,                        "Payment Customer Warehouse invalid
must be numeric."
                        },
                {       ERR_PAYMENT_CWI_RANGE,                                  "Payment Customer
Warehouse out of range, 1 to Max Warehouses."   },
                {       ERR_PAYMENT_MISSING_HAM_KEY,            "Payment missing Amount key \"HAM*\"."
                                                                        },
                {       ERR_PAYMENT_HAM_INVALID,                        "Payment Amount invalid data type must be
numeric."
                        },
                {       ERR_PAYMENT_HAM_RANGE,                                  "Payment Amount out of
range, 0 − 9999.99."                                                    },
                {       ERR_ORDERSTATUS_MISSING_DID_KEY,        "Order Status missing District key \"DID*\"."
                        },
                {       ERR_ORDERSTATUS_DID_INVALID,            "Order Status District invalid, value must be numeric 1 −
10."            },
                {       ERR_ORDERSTATUS_DID_RANGE,                      "Order Status District out of range must be 1
− 10."
                        },
                {       ERR_ORDERSTATUS_MISSING_CID_KEY,        "Order Status missing Customer key \"CID*\"."
                        },
                {       ERR_ORDERSTATUS_MISSING_CLT_KEY,        "Order Status missing Customer Last Name key \"CLT*\"."
                        },
                {       ERR_ORDERSTATUS_CLT_RANGE,                      "Order Status Customer last name longer
than 16 characters."
                        },
                {       ERR_ORDERSTATUS_CID_INVALID,            "Order Status Customer ID invalid, range must be numeric
1 − 3000."      },
                {       ERR_ORDERSTATUS_CID_RANGE,                      "Order Status Customer ID out of range
must be 1 − 3000."
                        },
                {       ERR_ORDERSTATUS_CID_AND_CLT,            "Order Status Customer ID and LastName entered must be
only one."      },
                {       ERR_DELIVERY_MISSING_OCD_KEY,           "Delivery missing Carrier ID key \"OCD*\"."
                                                                        },
                {       ERR_DELIVERY_CARRIER_INVALID,           "Delivery Carrier ID invalid must be numeric 1 − 10."
                        },
                {       ERR_DELIVERY_CARRIER_ID_RANGE,                  "Delivery Carrier ID out of range must be 1 −
10."
                        },
                {       ERR_PAYMENT_MISSING_CLT_KEY,            "Payment missing Customer Last Name key \"CLT*\"."
                        },
                {       0,
        ""
                                                                        }
        };

        static char szNoMsg[] = "";
        char                    *szForm;

        if ( !szMsg  )
                szMsg = szNoMsg;

        if ( iTermId > 0 && IsValidTermId(iTermId) )
                szForm = Term.pClientData[iTermId].szBuffer; //if termid valid use common terminal static buffer.
        else
                szForm = Term.pClientData[0].szBuffer;      //else term id invalid so use common terminal static buffer.
        switch(iErrorType)
```

```
	{
		case ERR_TYPE_WEBDLL:
			for(i=0; errorMsgs[i].szMsg[0]; i++)
			{
				if ( iError == errorMsgs[i].iError )
					break;
			}
			if ( !errorMsgs[i].szMsg[0] )
				i = 1;
			strcpy(szForm, "<HTML><HEAD><TITLE>Welcome To TPC-C</TITLE></HEAD><BODY><FORM
ACTION=\"tpcc.dll\" METHOD=\"GET\">");
			wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"STATUSID\" VALUE=\"%d\">", iError);
			wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"TERMID\" VALUE=\"%d\">", iTermId);
			wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"SYNCID\" VALUE=\"%d\">", iSyncId);
			wsprintf(szForm+strlen(szForm), "Error: TPCCWEB(%d): %s", iError, errorMsgs[i].szMsg);
			strcat(szForm, "</FORM><BODY></HTML>");
			WriteZString(pECB, szForm);
			break;
		case ERR_TYPE_SQL:
			strcpy(szForm, "<HTML><HEAD><TITLE>Welcome To TPC-C</TITLE></HEAD><BODY><FORM
ACTION=\"tpcc.dll\" METHOD=\"GET\">");
			wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"STATUSID\" VALUE=\"%d\">", iError);
			wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"TERMID\" VALUE=\"%d\">", iTermId);
			wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"SYNCID\" VALUE=\"%d\">", iSyncId);
			wsprintf(szForm+strlen(szForm), "Error: SQLSVR(%d): %s", iError, szMsg);
			strcat(szForm, "</FORM><BODY></HTML>");
			WriteZString(pECB, szForm);
			break;
		case ERR_TYPE_DBLIB:
			strcpy(szForm, "<HTML><HEAD><TITLE>Welcome To TPC-C</TITLE></HEAD><BODY><FORM
ACTION=\"tpcc.dll\" METHOD=\"GET\">");
			wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"STATUSID\" VALUE=\"%d\">", iError);
			wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"TERMID\" VALUE=\"%d\">", iTermId);
			wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"SYNCID\" VALUE=\"%d\">", iSyncId);
			wsprintf(szForm+strlen(szForm), "Error: DBLIB(%d): %s", iError, szMsg);
			strcat(szForm, "</FORM><BODY></HTML>");
			WriteZString(pECB, szForm);
			break;
	}
	return;
}

/* FUNCTION: BOOL GetKeyValue(char *pQueryString, char *pKey, char *pValue, int iMax)
 *
 * PURPOSE:  This function parses a http formatted string for specific key values.
 *
 * ARGUMENTS:		char		*pQueryString		http string from client browser
 *			char		*pKey			key value to look for
 *			char		*pValue			character array into which to
place key's value
 *			int			iMax			maximum
length of key value array.
 *
 * RETURNS:		BOOL	FALSE	key value not found
 *				TRUE	key valud found
 *
 *
 * COMMENTS:		http keys are formatted either KEY=value& or KEY=value\0. This DLL formats
 *			TPC-C input fields in such a manner that the keys can be extracted in the
 *			above manner.
 */

static BOOL GetKeyValue(char *pQueryString, char *pKey, char *pValue, int iMax)
{
	char *ptr;


	if ( !(ptr=strstr(pQueryString, pKey)) )
		return FALSE;
	if ( !(ptr=strchr(ptr, '=')) )
		return FALSE;
	ptr++;
	iMax--;
	while( *ptr && *ptr != '&' && iMax)
	{
		*pValue++ = *ptr++;
		iMax--;
	}
	*pValue = 0;
	return TRUE;
}

/* FUNCTION: void TermInit(void)
 *
 * PURPOSE:  This function initializes the client ternimal structure it is called when the TPCC.DLL
 *			is first loaded by the inet service.
 *
 * ARGUMENTS:		none
 *
 * RETURNS:		None
```

```
 *
 * COMMENTS:            None
 *
 */

static void TermInit(void)
{
        if ( Term.bInit )
                return;
        Term.iNext                      = 0;
        Term.iMasterSyncId      = 1;

        Term.iAvailable                 = 0;
        Term.pClientData        = NULL;
        Term.bInit                      = TRUE;

        return;
}

#ifndef USE_ODBC
        /* FUNCTION: int err_handler(DBPROCESS *dbproc, int severity, int dberr, int oserr, char *dberrstr, char *oserrstr)
         *
         * PURPOSE:  This function handles DB-Library errors
         *
         * ARGUMENTS:           DBPROCESS       *dbproc                 DBPROCESS id pointer
         *                                      int                             severity                        severity of
error
         *                                      int                             dberr
        error id
         *                                      int                             oserr
        operating system specific error code
         *                                      char                    *dberrstr               printable error description of
dberr
         *                                      char                    *oserrstr               printable error description of
oserr
         *
         * RETURNS:             int                                     INT_CONTINUE    continue if error is SQLETIME else
INT_CANCEL action
         *
         * COMMENTS:            None
         *
         */


        int err_handler(DBPROCESS *dbproc, int severity, int dberr, int oserr, char *dberrstr, char *oserrstr)
        {
                PECBINFO                                        pEcbInfo;
                EXTENSION_CONTROL_BLOCK         *pECB;
                FILE                                                    *fp;
                SYSTEMTIME                                      systemTime;
                char                                                    szTmp[256];
                int                                                             iTermId;
                int                                                             iSyncId;

                pEcbInfo = NULL;

                if ((dbproc == NULL) || (DBDEAD(dbproc)))
                {
                        ErrorMessage(gpECB, -1, ERR_TYPE_DBLIB, "DBPROC is invalid.", iTermId, iSyncId);
                        return INT_CANCEL;
                }

                if ( !(pEcbInfo = (PECBINFO)dbgetuserdata(dbproc)) )
                {
                        pECB = gpECB;
                        iTermId = 0;
                        iSyncId = 0;
                }
                else
                {
                        pECB = pEcbInfo->pECB;
                        iTermId = pEcbInfo->iTermId;
                        iSyncId = pEcbInfo->iSyncId;
                }

                if ( pEcbInfo && pEcbInfo->bFailed )
                        return INT_CANCEL;

                if ( oserr != DBNOERR )
                {
                        ErrorMessage(pECB, oserr, ERR_TYPE_DBLIB, oserrstr, iTermId, iSyncId);

                        if ( pEcbInfo )
                                pEcbInfo->bFailed = TRUE;

                        GetLocalTime(&systemTime);
                        fp = fopen(szErrorLogPath, "ab");

                        EnterCriticalSection(&ErrorLogCriticalSection);
```

```
                        sprintf(szTmp, "Error: DBLIB(%d): %s", oserr, oserrstr);

                        fprintf(fp, "%2.2d/%2.2d/%2.2d %2.2d:%2.2d:%2.2d\r\n\r\n%s\r\n\r\n",
                                systemTime.wYear, systemTime.wMonth, systemTime.wDay,
                                systemTime.wHour, systemTime.wMinute, systemTime.wSecond,
                                szTmp);
                        LeaveCriticalSection(&ErrorLogCriticalSection);

                        fclose(fp);
                }


                return INT_CANCEL;
        }


        /* FUNCTION: int msg_handler(DBPROCESS *dbproc, DBINT msgno, int msgstate, int severity, char *msgtext)
         *
         * PURPOSE:  This function handles DB-Library SQL Server error messages
         *
         * ARGUMENTS:    DBPROCESS       *dbproc         DBPROCESS id pointer
         *               DBINT           msgno                   message
number
         *               int                     msgstate        message state
         *               int                     severity        message
severity
         *               char            *msgtext        printable message description
         *
         * RETURNS:      int             INT_CONTINUE    continue if error is SQLETIME else
INT_CANCEL action
         *                                               INT_CANCEL
        cancel operation
         *
         * COMMENTS:     This function also sets the dead lock dbproc variable if necessary.
         *
         */

        int msg_handler(DBPROCESS *dbproc, DBINT msgno, int msgstate, int severity, char *msgtext)
        {
                PECBINFO                        pEcbInfo;
                EXTENSION_CONTROL_BLOCK *pECB;
                FILE                            *fp;
                SYSTEMTIME                      systemTime;
                char                            szTmp[256];
                int                             iTermId;
                int                             iSyncId;

                if ( !(pEcbInfo = (PECBINFO)dbgetuserdata(dbproc)) )
                {
                        pECB = gpECB;
                        iTermId = 0;
                        iSyncId = 0;
                }
                else
                {
                        pECB = pEcbInfo->pECB;
                        iTermId = pEcbInfo->iTermId;
                        iSyncId = pEcbInfo->iSyncId;
                }


                if ( (msgno == 5701) || (msgno == 2528) || (msgno == 5703) || (msgno == 6006) )
                        return INT_CONTINUE;

                // deadlock message
                if (msgno == 1205)
                {
                        // set the deadlock indicator
                        if ( pEcbInfo )
                                pEcbInfo->bDeadlock = TRUE;
                        else
                                ErrorMessage(pECB, -1, ERR_TYPE_SQL,"Error, dbgetuserdata returned NULL.", iTermId, iSyncId);
                        return INT_CONTINUE;
                }
                if ( pEcbInfo && pEcbInfo->bFailed )
                        return INT_CANCEL;

                if (msgno == 0)
                        return INT_CONTINUE;
                else
                {
                        ErrorMessage(pECB, msgno, ERR_TYPE_SQL, msgtext, iTermId, iSyncId);

                        if ( pEcbInfo )
                                pEcbInfo->bFailed = TRUE;

                        GetLocalTime(&systemTime);
                        fp = fopen(szErrorLogPath, "ab");

                        EnterCriticalSection(&ErrorLogCriticalSection);
```

```
                                        sprintf(szTmp, "Error: SQLSVR(%d): %s", msgno, msgtext);
                                        fprintf(fp, "%2.2d/%2.2d/%2.2d %2.2d:%2.2d:%2.2d\r\n\r\n%s\r\n\r\n",
                                                systemTime.wYear, systemTime.wMonth, systemTime.wDay,
                                                systemTime.wHour, systemTime.wMinute, systemTime.wSecond,
                                                szTmp);
                                        LeaveCriticalSection(&ErrorLogCriticalSection);

                                        fclose(fp);
                                }

                                return INT_CANCEL;
                }
#endif

/* FUNCTION: void TermRestore(void)
 *
 * PURPOSE:  This function frees allocated resources associated with the terminal structure.
 *
 * ARGUMENTS:           none
 *
 * RETURNS:             None
 *
 * COMMENTS:            This function is called only with the inet service unloads the TPCC.DLL
 *
 */

static void TermRestore(void)
{
                Term.iNext                              = 0;
                Term.iAvailable                         = 0;
                Term.iMasterSyncId      = 0;
                if ( Term.pClientData )
                        free(Term.pClientData);
                Term.pClientData        = NULL;
                Term.bInit                              = FALSE;


                return;
}

/* FUNCTION: int TermAllocate(void)
 *
 * PURPOSE:  This function allocates more terminal array entries in the Term structure.
 *
 * ARGUMENTS:   None
 *
 * RETURNS:             int             TRUE or 1 if sucessfull
 *                                                 int             FALSE or 0 if terminal id cannot be allocated.
 *
 * COMMENTS:            None
 *
 */

static int TermAllocate(void)
{
                Term.iAvailable += 32;
                if ( !Term.pClientData )
                        Term.pClientData = (PCLIENTDATA)malloc(Term.iAvailable * sizeof(CLIENTDATA));
                else
                        Term.pClientData = (PCLIENTDATA)realloc(Term.pClientData, Term.iAvailable * sizeof(CLIENTDATA));
                return ( Term.pClientData ) ? 1 : 0;
}

/* FUNCTION: int TermAdd(EXTENSION_CONTROL_BLOCK *pECB, char *pQueryString)
 *
 * PURPOSE:  This function assigns a terminal id which is used to identify a client browser.
 *
 * ARGUMENTS:           EXTENSION_CONTROL_BLOCK         *pECB                                   passed in structure pointer from inetsrv.
 *                                                 char                                                    *pQueryString           http query
string passed to this DLL.
 *
 * RETURNS:             int                             assigned terminal id
 *                                                                 -1              cannot assign id error occured.
 *
 *
 * COMMENTS:            if the terminal id cannot be assigned it is because of insufficient memory or the
 *                                                 SQL connection cannot be allocated.
 *
 */

static int TermAdd(EXTENSION_CONTROL_BLOCK *pECB, char *pQueryString)
{
                char            szTmp[32];
                int                             i, iCurrent, iTotalConnections, iTickCount;

                EnterCriticalSection(&CriticalSection);

                for(i=0, iTotalConnections = 0; i<Term.iAvailable; i++)
                {
                        if ( Term.pClientData[i].inUse )
```

```
                                        iTotalConnections++;
                }

                if ( iTotalConnections >= iMaxConnections )
                {
                        for(iCurrent = 1, i=1, iTickCount = 0x7FFFFFFF; i<iMaxConnections; i++)
                        {
                                if ( iTickCount > Term.pClientData[i].iTickCount )
                                {
                                        iTickCount = Term.pClientData[i].iTickCount;
                                        iCurrent = i;
                                }
                        }
                }
                else
                {
                        for(i=0; i<Term.iAvailable; i++)
                        {
                                if ( !Term.pClientData[i].inUse )
                                        break;
                        }
                        iCurrent = i;
                }

                if ( i == Term.iAvailable )
                {
                        Term.iNext = Term.iAvailable;
                        if ( !(*Term.Allocate)() )
                                goto TermAddErr1;
                        for(i=Term.iNext; i<Term.iAvailable; i++)
                                Term.pClientData[i].inUse = 0;
                        iCurrent = Term.iNext;
                }

                Term.pClientData[iCurrent].inUse = 1;

                if ( !GetKeyValue(pQueryString, "w_id", szTmp, sizeof(szTmp)) )
                        goto TermAddErr1;

                Term.pClientData[iCurrent].w_id = (short)atoi(szTmp);

                if ( !GetKeyValue(pQueryString, "d_id", szTmp, sizeof(szTmp)) )
                        goto TermAddErr1;

                Term.pClientData[iCurrent].d_id = atoi(szTmp);

                Term.pClientData[iCurrent].iTickCount = GetTickCount();
                Term.pClientData[iCurrent].iSyncId = Term.iMasterSyncId++;

                if ( Init(pECB, iCurrent, Term.pClientData[iCurrent].iSyncId, szServer, szUser, szPassword, szDatabase) )
                {
                        (*Term.Delete)(pECB, iCurrent);
                        goto TermAddErr1;
                }

                LeaveCriticalSection(&CriticalSection);
                return iCurrent;

TermAddErr1:
                LeaveCriticalSection(&CriticalSection);
                return -1;      //terminal unsuccessfully added
}

/* FUNCTION: void TermDelete(EXTENSION_CONTROL_BLOCK *pECB, int id)
 *
 * PURPOSE:  This function makes a terminal entry in the Term array available for reuse.
 *
 * ARGUMENTS:           EXTENSION_CONTROL_BLOCK         *pECB       passed in structure pointer from inetsrv.
 *                                                      int                                                     id
                Terminal id of client exiting
 *
 * RETURNS:             None
 *
 * COMMENTS:            None
 *
 */

static void TermDelete(EXTENSION_CONTROL_BLOCK *pECB, int id)
{
                if ( id >= 0 && id < Term.iAvailable )
                {
                        Close(pECB, id, -1);
                        Term.pClientData[id].inUse = 0;
                }

                return;
}

/* FUNCTION: BOOL Init(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId, char *szServer, char *szUser, char *szPassword, char *szDatabase)
 *
```

```
 * PURPOSE:  This function initializes the sql connection for use.
 *
 * ARGUMENTS:          EXTENSION_CONTROL_BLOCK     *pECB                   passed in structure pointer from inetsrv.
 *                     int                                                                         iTermId
        id of browser client that this connection is for.
 *                     int                                                                         iSyncId
        sync id for this client session
 *                     char                                                        *szServer       sql server name
 *                     char                                                        *szUser                 user name
 *                     char                                                        *szPassword     user password
 *                     char                                                        *szDatabase     database to use
 *
 * RETURNS:            BOOL        FALSE       if successfull
 *                                                 TRUE        if an error occurs and connection cannot be established.
 *
 * COMMENTS:           None
 *
 */

BOOL Init(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId, char *szServer, char *szUser, char *szPassword, char *szDatabase)
{
        char        szApp[32];

        sprintf(szApp, "TPCC:%ld", (int)iTermId);

        Term.pClientData[iTermId].dbproc = NULL;

        if ( SQLOpenConnection(pECB, iTermId, iSyncId, &Term.pClientData[iTermId].dbproc, szServer, szDatabase, szUser, szPassword, szApp,
&Term.pClientData[iTermId].spid) )
        {
                ErrorMessage(pECB, ERR_SQL_OPEN_CONNECTION, ERR_TYPE_WEBDLL, NULL, iTermId, iSyncId);
                return TRUE;
        }
        return FALSE;
}

/* FUNCTION: BOOL Close(EXTENSION_CONTROL_BLOCK     *pECB, int iTermId, int iSyncId)
 *
 * PURPOSE:  This function closes the sql connection for use.
 *
 * ARGUMENTS:          EXTENSION_CONTROL_BLOCK     *pECB       passed in structure pointer from inetsrv.
 *                     int                                                         iTermId     id of browser
client that this connection is for.
 *                     int                                                         iSyncId     sync id of
client browser
 *
 * RETURNS:            BOOL        FALSE       if successfull
 *                                                 TRUE        if an error occurs and connection cannot be terminated.
 *
 * COMMENTS:           None
 *
 */

static BOOL Close(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId)
{
        PECBINFO    pEcbInfo;

        if (Term.pClientData[iTermId].dbproc != NULL)
        {
                if ( (pEcbInfo = (PECBINFO)dbgetuserdata(Term.pClientData[iTermId].dbproc)) )
                {
                        pEcbInfo->iTermId = -1;
                        pEcbInfo->iSyncId = -1;
                        free(pEcbInfo);             //free up user info
                }
                return SQLCloseConnection(pECB, Term.pClientData[iTermId].dbproc);
        }

        UNUSEDPARAM(iSyncId);
}

/* FUNCTION: BOOL SQLOpenConnection(EXTENSION_CONTROL_BLOCK     *pECB, int iTermId, int iSyncId, DBPROCESS **dbproc, char *server, char *database,
char *user, char *password, char *app, int *spid, long *pack_size)
 *
 * PURPOSE:  This function opens the sql connection for use.
 *
 * ARGUMENTS:          EXTENSION_CONTROL_BLOCK     *pECB       passed in structure pointer from inetsrv.
 *                     int                                                 iTermId             terminal id of browser
 *                     int                                                 iSyncId             sync id of browser
 *                     DBPROCESS                   **dbproc    pointer to returned DBPROCESS
 *                     char                                    *server             SQL server name
 *                     char                                    *database   SQL server database
 *                     char                                    *user               user name
 *                     char                                    *password   user password
 *                     char                                    *app                pointer to returned application array
 *                     int                                                 *spid               pointer to returned spid
 *                     long                                    *pack_size  pointer to returned default pack size
 *
 * RETURNS:            BOOL        FALSE       if successfull
 *                                                 TRUE        if an error occurs
```

```
*
* COMMENTS:             None
*
*/


#ifdef USE_ODBC
        static BOOL SQLOpenConnection(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId, DBPROCESS **dbproc, char *server, char *database,
char *user, char *password, char *app, int *spid, long *pack_size)
        {

                RETCODE     rc;
                char        buffer[30];

                *dbproc = (DBPROCESS *)malloc(sizeof(DBPROCESS));
                if ( !*dbproc )
                        return TRUE;

                //set pECB data into dbproc
                (*dbproc)->bDeadlock = FALSE;
                (*dbproc)->bFailed= FALSE;
                (*dbproc)->pECB = pECB;
                (*dbproc)->iTermId = iTermId;
                (*dbproc)->iSyncId = iSyncId;

                if ( SQLAllocConnect(henv, &(*dbproc)->hdbc) == SQL_ERROR )
                        return TRUE;

                if ( SQLSetConnectOption((*dbproc)->hdbc, SQL_PACKET_SIZE, pack_size) == SQL_ERROR )
                        return TRUE;

                rc = SQLConnect((*dbproc)->hdbc, server, SQL_NTS, user, SQL_NTS, password, SQL_NTS);
                if (rc != SQL_SUCCESS && rc != SQL_SUCCESS_WITH_INFO)
                        return TRUE;
                rc = SQLAllocStmt((*dbproc)->hdbc, &(*dbproc)->hstmt);
                if (rc == SQL_ERROR)
                        return TRUE;

                sprintf(buffer,"use %s", Client->database);

                rc = SQLExecDirect((*dbproc)->hstmt, buffer, SQL_NTS);
                if (rc != SQL_SUCCESS && rc != SQL_SUCCESS_WITH_INFO)
                        return TRUE;

                SQLFreeStmt((*dbproc)->hstmt, SQL_CLOSE);
                sprintf(buffer,"set nocount on");
                rc = SQLExecDirect((*dbproc)->hstmt, buffer, SQL_NTS);
                if (rc != SQL_SUCCESS && rc != SQL_SUCCESS_WITH_INFO)
                        return TRUE;
                SQLFreeStmt((*dbproc)->hstmt, SQL_CLOSE);

                sprintf(buffer,"select @@spid");

                rc = SQLExecDirect((*dbproc)->hstmt, buffer, SQL_NTS);
                if (rc != SQL_SUCCESS && rc != SQL_SUCCESS_WITH_INFO)
                        return TRUE;

                if ( SQLBindCol((*dbproc)->hstmt, 1, SQL_C_SSHORT, &(*dbproc)->spid, 0, NULL) == SQL_ERROR )
                        return TRUE;

                if ( SQLFetch((*dbproc)->hstmt) == SQL_ERROR )
                        return TRUE;

                SQLFreeStmt((*dbproc)->hstmt, SQL_CLOSE);

                return FALSE;
        }

#else

        static BOOL SQLOpenConnection(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId, DBPROCESS **dbproc, char *server, char *database,
char *user, char *password, char *app, int *spid)
        {
                LOGINREC    *login;
                PECBINFO    pEcbInfo;

                //set local msg proc for login record
                //attach pECB record

                //this is necessary as dblib provides no way to pass user data in a login structure. So until
                //there is an allocated dbproc we need to use a static which means that the login attempt must
                //be serialized.

                gpECB = pECB;

                login = dblogin();
                if ( !*user )
                        DBSETLUSER(login, "sa");
                else
                        DBSETLUSER(login, user);
```

```
                        DBSETLPWD(login,  password);
                        DBSETLHOST(login, app);

                        DBSETLPACKET(login, (unsigned short)DEFCLPACKSIZE);

                        if ((*dbproc = dbopen(login, server )) == NULL)
                                return TRUE;

                        //set pECB data into dbproc
                        pEcbInfo = (PECBINFO)malloc(sizeof(ECBINFO));
                        pEcbInfo->bDeadlock = FALSE;
                        pEcbInfo->pECB = pECB;
                        pEcbInfo->iTermId = iTermId;
                        pEcbInfo->iSyncId = iSyncId;
                        dbsetuserdata(*dbproc, pEcbInfo);


                        // Use the the right database
                        dbuse(*dbproc, database);

                        dbcmd(*dbproc, "select @@spid");

                        dbsqlexec(*dbproc);
                        while (dbresults(*dbproc) != NO_MORE_RESULTS)
                        {
                                dbbind(*dbproc, 1, SMALLBIND, (DBINT) 0, (BYTE *) spid);
                                while (dbnextrow(*dbproc) != NO_MORE_ROWS)
                                ;
                        }
                        dbcmd(*dbproc, "set nocount on");

                        dbsqlexec(*dbproc);
                        while (dbresults(*dbproc) != NO_MORE_RESULTS)
                        {
                                while (dbnextrow(*dbproc) != NO_MORE_ROWS)
                                ;
                        }

                        //rollback transaction on abort
                        dbcmd(*dbproc, "set XACT_ABORT ON");

                        dbsqlexec(*dbproc);
                        while (dbresults(*dbproc) != NO_MORE_RESULTS)
                        {
                                while (dbnextrow(*dbproc) != NO_MORE_ROWS)
                                ;
                        }

                        return FALSE;
                }

#endif

/* FUNCTION: BOOL SQLCloseConnection(EXTENSION_CONTROL_BLOCK *pECB, DBPROCESS *dbproc)
 *
 * PURPOSE:  This function closes the sql connection.
 *
 * ARGUMENTS:           EXTENSION_CONTROL_BLOCK         *pECB       passed in structure pointer from inetsrv.
 *                                      DBPROCESS                   *dbproc     pointer to DBPROCESS
 *
 * RETURNS:             BOOL        FALSE       if successfull
 *                                                                  TRUE        if an error occurs
 *
 * COMMENTS:            None
 *
 */

#ifdef USE_ODBC
                static BOOL SQLCloseConnection(EXTENSION_CONTROL_BLOCK *pECB, DBPROCESS *dbproc)
                {
                        if ( dbproc )
                        {
                                SQLFreeStmt(dbproc->hstmt, SQL_DROP);
                                SQLDisconnect(dbproc->hdbc);
                                SQLFreeConnect(dbproc->hdbc);
                                free(dbproc);
                                dbproc = NULL;
                        }
                        return FALSE;
                }
#else
                static BOOL SQLCloseConnection(EXTENSION_CONTROL_BLOCK *pECB, DBPROCESS *dbproc)
                {
                        if (dbclose(dbproc) == FAIL)
                                return TRUE;
                        return FALSE;
                }
#endif
```

```
/* FUNCTION: SQLStockLevel(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId, DBPROCESS *dbproc, STOCK_LEVEL_DATA *pStockLevel, short deadlock_retry)
 *
 * PURPOSE: This function handles the stock level transaction.
 *
 * ARGUMENTS:		EXTENSION_CONTROL_BLOCK	*pECB		passed in structure pointer from inetsrv.
 *			int			iTermId		terminal id of browser
 *			int			iSyncId		sync id of browser
 *			DBPROCESS		*dbproc		connection db process id
 *			STOCK_LEVEL_DATA	*pStockLevel	stock level input / output data structure
 *			short			deadlock_retry	retry count if deadlocked
 *
 * RETURNS:		BOOL	FALSE	if successfull
 *				TRUE	if deadlocked
 *
 * COMMENTS:		None
 *
 */

static BOOL SQLStockLevel(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId, DBPROCESS *dbproc, STOCK_LEVEL_DATA *pStockLevel, short deadlock_retry)
{
	int		tryit;
	RETCODE		rc;
	char		printbuf[25];
	BYTE		*pData;
	PECBINFO	pEcbInfo;

	//update pECB and bFailed flag
	if ( (pEcbInfo = (PECBINFO)dbgetuserdata(dbproc)) )
	{
		pEcbInfo->pECB = pECB;
		pEcbInfo->bFailed = FALSE;
		pEcbInfo->iTermId = iTermId;
		pEcbInfo->iSyncId = iSyncId;
	}

	pStockLevel->num_deadlocks = 0;

	for (tryit=0; tryit < deadlock_retry; tryit++)
	{
		if (dbrpcinit(dbproc, "tpcc_stocklevel", 0) == SUCCEED)
		{
			dbrpcparam(dbproc, NULL, 0, SQLINT2, -1, -1, (BYTE *) &pStockLevel->w_id);
			dbrpcparam(dbproc, NULL, 0, SQLINT1, -1, -1, (BYTE *) &pStockLevel->d_id);
			dbrpcparam(dbproc, NULL, 0, SQLINT2, -1, -1, (BYTE *) &pStockLevel->thresh_hold);

			if (dbrpcexec(dbproc) == SUCCEED)
			{
				while (((rc = dbresults(dbproc)) != NO_MORE_RESULTS) && (rc != FAIL))
				{
					if (DBROWS(dbproc))
					{
						while (((rc = dbnextrow(dbproc)) != NO_MORE_ROWS) && (rc != FAIL))
						{
							if(pData=dbdata(dbproc, 1))
								pStockLevel->low_stock = *((long *) pData);
						}
					}
				}
			}
		}
		if (SQLDetectDeadlock(dbproc))
		{
			pStockLevel->num_deadlocks++;
			sprintf(printbuf,"deadlock: retry: %d",pStockLevel->num_deadlocks);
			Sleep(10 * tryit);
		}
		else
		{
			strcpy(pStockLevel->execution_status, "Transaction commited.");
			return FALSE;
		}
	}

	// If we reached here, it means we quit after MAX_RETRY deadlocks
	strcpy(pStockLevel->execution_status, "Hit deadlock max. ");
	return TRUE;
}

/* FUNCTION: int SQLNewOrder(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId, int iTermId, int iSyncId, DBPROCESS *dbproc, NEW_ORDER_DATA *pNewOrder, short deadlock_retry)
 *
 * PURPOSE: This function handles the new order transaction.
 *
 * ARGUMENTS:		EXTENSION_CONTROL_BLOCK	*pECB		passed in structure pointer from inetsrv.
```

```
 *                                      int                                                     iTermId
                terminal id of browser
 *                                      int                                                     iSyncId
                sync id of browser
 *                                      DBPROCESS                       *dbproc                 connection db
process id
 *                                      NEW_ORDER_DATA                  *pNewOrder              pointer to new order structure
for input/output data
 *                                      short                                   deadlock_retry  retry count if
deadlocked
 *
 * RETURNS:             int             TRUE    transaction committed
 *                                              FALSE   item number not valid
 *                                              −1              deadlock max retry reached
 *
 *
 * COMMENTS:            None
 *
 */

static int SQLNewOrder(EXTENSION_CONTROL_BLOCK          *pECB, int iTermId, int iSyncId, DBPROCESS *dbproc, NEW_ORDER_DATA  *pNewOrder, short
deadlock_retry)
{
        RETCODE                         rc;
        int                             i;
        DBINT                           commit_flag;
        int                             tryit;
        char                            printbuf[25];
        char                            tmpbuf[30];
        DBDATETIME                      datetime;
        BYTE                            *pData;
        PECBINFO                pEcbInfo;

        if ( (pEcbInfo = (PECBINFO)dbgetuserdata(dbproc)) )
        {
                pEcbInfo−>pECB = pECB;
                pEcbInfo−>bFailed = FALSE;
                pEcbInfo−>iTermId = iTermId;
                pEcbInfo−>iSyncId = iSyncId;
        }

        pNewOrder−>num_deadlocks = 0;

        strcpy(tmpbuf, "tpcc_neworder");

        for (tryit=0; tryit < deadlock_retry; tryit++)
        {
                if (dbrpcinit(dbproc, tmpbuf, 0) == SUCCEED)
                {
                        dbrpcparam(dbproc, NULL, 0, SQLINT2, −1, −1, (BYTE *) &pNewOrder−>w_id);
                        dbrpcparam(dbproc, NULL, 0, SQLINT1, −1, −1, (BYTE *) &pNewOrder−>d_id);
                        dbrpcparam(dbproc, NULL, 0, SQLINT4, −1, −1, (BYTE*) &pNewOrder−>c_id);
                        dbrpcparam(dbproc, NULL, 0, SQLINT1, −1, −1, (BYTE *) &pNewOrder−>o_ol_cnt);
                        dbrpcparam(dbproc, NULL, 0, SQLINT1, −1, −1, (BYTE *) &pNewOrder−>o_all_local);

                        pNewOrder−>o_all_local =1;
                        for (i = 0; i < pNewOrder−>o_ol_cnt; i++)
                        {
                                if ( pNewOrder−>o_all_local && pNewOrder−>Ol[i].ol_supply_w_id != pNewOrder−>w_id )
                                        pNewOrder−>o_all_local = 0;
                                dbrpcparam(dbproc, NULL, 0, SQLINT4, −1, −1, (BYTE *) &pNewOrder−>Ol[i].ol_id);
                                dbrpcparam(dbproc, NULL, 0, SQLINT2, −1, −1, (BYTE *) &pNewOrder−>Ol[i].ol_supply_w_id);
                                dbrpcparam(dbproc, NULL, 0, SQLINT2, −1, −1, (BYTE *) &pNewOrder−>Ol[i].ol_quantity);
                        }

                        if (dbrpcexec(dbproc) == SUCCEED)
                        {
                                pNewOrder−>total_amount=0;

                                // Get resutls from order line
                                for (i = 0; i<pNewOrder−>o_ol_cnt; i++)
                                {
                                        if (((rc = dbresults(dbproc)) != NO_MORE_RESULTS) && (rc != FAIL))
                                        {
                                                if (DBROWS(dbproc) && (dbnumcols(dbproc) == 5))
                                                {
                                                        while (dbnextrow(dbproc) != NO_MORE_ROWS)
                                                        {
                                                                if(pData=dbdata(dbproc, 1))
                                                                        UtilStrCpy(pNewOrder−>Ol[i].ol_i_name,
pData, dbdatlen(dbproc, 1));
                                                                if(pData=dbdata(dbproc, 2))
                                                                        pNewOrder−>Ol[i].ol_stock =
(*(DBSMALLINT *) pData);
                                                                if(pData=dbdata(dbproc, 3))
                                                                        UtilStrCpy(pNewOrder−
>Ol[i].ol_brand_generic, pData, dbdatlen(dbproc, 3));
                                                                if(pData=dbdata(dbproc, 4))
                                                                        pNewOrder−>Ol[i].ol_i_price = (*(DBFLT8
*) pData);
```

```
if(pData=dbdata(dbproc, 5))
    pNewOrder->Ol[i].ol_amount = (*(DBFLT8
*) pData);

    pNewOrder->total_amount = pNewOrder->total_amount +
pNewOrder->Ol[i].ol_amount;
                }
            }
        }
    }
    while (((rc = dbresults(dbproc)) != NO_MORE_RESULTS) && (rc != FAIL))
    {
        if (DBROWS(dbproc) && (dbnumcols(dbproc) == 8))
        {
            while (((rc = dbnextrow(dbproc)) != NO_MORE_ROWS) && (rc != FAIL))
            {
                if(pData=dbdata(dbproc, 1))

                    pNewOrder->w_tax = (*(DBFLT8 *) pData);

                if(pData=dbdata(dbproc, 2))

                    pNewOrder->d_tax = (*(DBFLT8 *) pData);

                if(pData=dbdata(dbproc, 3))
                    pNewOrder->o_id = (*(DBINT *) pData);
                if(pData=dbdata(dbproc, 4))
                    UtilStrCpy(pNewOrder->c_last, pData, dbdatlen(dbproc,
4));
                if(pData=dbdata(dbproc, 5))
                    pNewOrder->c_discount = (*(DBFLT8 *) pData);

                if(pData=dbdata(dbproc, 6))
                    UtilStrCpy(pNewOrder->c_credit, pData, dbdatlen(dbproc,
6));
                if(pData=dbdata(dbproc, 7))
                {
                    datetime = *((DBDATETIME *) pData);
                    dbdatecrack(dbproc, &pNewOrder->o_entry_d,
&datetime);
                }
                if(pData=dbdata(dbproc, 8))commit_flag = (*(DBTINYINT *) pData);
            }
        }
    }
    }
}
if (SQLDetectDeadlock(dbproc))
{
    pNewOrder->num_deadlocks++;
    sprintf(printbuf,"deadlock: retry: %d",pNewOrder->num_deadlocks);
    Sleep(DEADLOCKWAIT*tryit);
}
else
{
    if (commit_flag == 1)
    {
        pNewOrder->total_amount = pNewOrder->total_amount * ((1 + pNewOrder->w_tax + pNewOrder->d_tax) * (1 -
pNewOrder->c_discount));

        strcpy(pNewOrder->execution_status,"Transaction commited.");

        return TRUE;
    }
    else
    {
        strcpy(pNewOrder->execution_status,"Item number is not valid.");
        return FALSE;
    }
}
}

// If we reached here, it means we quit after MAX_RETRY deadlocks
strcpy(pNewOrder->execution_status,"Hit deadlock max.  ");

return -1;      //      "deadlock max retry reached!"
}

/* FUNCTION: int SQLPayment(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId, DBPROCESS *dbproc, PAYMENT_DATA *pPayment, short
deadlock_retry)
```

```
 *
 * PURPOSE:  This function handles the payment transaction.
 *
 * ARGUMENTS:          EXTENSION_CONTROL_BLOCK     *pECB                   passed in structure pointer from inetsrv.
 *                     int                                                 iTermId
          terminal id of browser
 *                     int                                                 iSyncId
          sync id of browser
 *                     DBPROCESS                   *dbproc                 connection db
process id
 *                     PAYMENT_DATA                *pPayment               pointer to payment
input/output data structure
 *                     short                                   deadlock_retry          deadlock retry
count
 *
 * RETURNS:            int         TRUE            success
 *                                 −1              max deadlocked reached
 *
 * COMMENTS:           None
 *
 */

static int SQLPayment(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId, DBPROCESS *dbproc, PAYMENT_DATA *pPayment, short deadlock_retry)
{
          RETCODE             rc;
          int                 tryit;
          char                printbuf[26];
          BOOL                by_name;
          DBDATETIME          datetime;
          BYTE                *pData;
          PECBINFO  pEcbInfo;

          if ( (pEcbInfo = (PECBINFO)dbgetuserdata(dbproc)) )
          {
                    pEcbInfo−>pECB = pECB;
                    pEcbInfo−>bFailed = FALSE;
                    pEcbInfo−>iTermId = iTermId;
                    pEcbInfo−>iSyncId = iSyncId;
          }

          pPayment−>num_deadlocks = 0;

          if (pPayment−>c_id == 0)
                    by_name = TRUE;
          else
                    by_name = FALSE;

          for (tryit=0; tryit < deadlock_retry; tryit++)
          {
                    if (dbrpcinit(dbproc, "tpcc_payment", 0) == SUCCEED)
                    {
                              dbrpcparam(dbproc, NULL, 0, SQLINT2, −1, −1, (BYTE *) &pPayment−>w_id);
                              dbrpcparam(dbproc, NULL, 0, SQLINT2, −1, −1, (BYTE *) &pPayment−>c_w_id);
                              dbrpcparam(dbproc, NULL, 0, SQLFLT8, −1, −1, (BYTE *) &pPayment−>h_amount);
                              dbrpcparam(dbproc, NULL, 0, SQLINT1, −1, −1, (BYTE *) &pPayment−>d_id);
                              dbrpcparam(dbproc, NULL, 0, SQLINT1, −1, −1, (BYTE *) &pPayment−>c_d_id);
                              dbrpcparam(dbproc, NULL, 0, SQLINT4, −1, −1, (BYTE *) &pPayment−>c_id);
                              if (pPayment−>c_id == 0)
                              {
                                        dbrpcparam(dbproc, NULL, 0, SQLCHAR, −1, strlen(pPayment−>c_last), pPayment−>c_last);
                              }
                    }
                    if (dbrpcexec(dbproc) == SUCCEED)
                    {
                              while (((rc = dbresults(dbproc)) != NO_MORE_RESULTS) && (rc != FAIL))
                              {
                                        if (DBROWS(dbproc) && (dbnumcols(dbproc) == 27))
                                        {
                                                  while (((rc = dbnextrow(dbproc)) != NO_MORE_ROWS) && (rc != FAIL))
                                                  {
                                                            if(pData=dbdata(dbproc, 1))
                                                                      pPayment−>c_id = *((DBINT *) pData);
                                                            if(pData=dbdata(dbproc, 2))
                                                                      UtilStrCpy(pPayment−>c_last, pData, dbdatlen(dbproc, 2));
                                                            if(pData=dbdata(dbproc, 3))
                                                            {
                                                                      datetime = *((DBDATETIME *) pData);
                                                                      dbdatecrack(dbproc, &pPayment−>h_date, &datetime);
                                                            }
                                                            if(pData=dbdata(dbproc, 4))
                                                                      UtilStrCpy(pPayment−>w_street_1, pData, dbdatlen(dbproc, 4));
                                                            if(pData=dbdata(dbproc, 5))
                                                                      UtilStrCpy(pPayment−>w_street_2, pData, dbdatlen(dbproc, 5));
                                                            if(pData=dbdata(dbproc, 6))
                                                                      UtilStrCpy(pPayment−>w_city, pData, dbdatlen(dbproc, 6));
                                                            if(pData=dbdata(dbproc, 7))
                                                                      UtilStrCpy(pPayment−>w_state, pData, dbdatlen(dbproc, 7));
                                                            if(pData=dbdata(dbproc, 8))
                                                                      UtilStrCpy(pPayment−>w_zip, pData, dbdatlen(dbproc, 8));
                                                            if(pData=dbdata(dbproc, 9))
```

```
                                                                        UtilStrCpy(pPayment->d_street_1, pData, dbdatlen(dbproc, 9));
                                                                if(pData=dbdata(dbproc, 10))
                                                                        UtilStrCpy(pPayment->d_street_2, pData, dbdatlen(dbproc, 10));
                                                                if(pData=dbdata(dbproc, 11))
                                                                        UtilStrCpy(pPayment->d_city, pData, dbdatlen(dbproc, 11));
                                                                if(pData=dbdata(dbproc, 12))
                                                                        UtilStrCpy(pPayment->d_state, pData, dbdatlen(dbproc, 12));
                                                                if(pData=dbdata(dbproc, 13))
                                                                        UtilStrCpy(pPayment->d_zip, pData, dbdatlen(dbproc, 13));
                                                                if(pData=dbdata(dbproc, 14))
                                                                        UtilStrCpy(pPayment->c_first, pData, dbdatlen(dbproc, 14));
                                                                if(pData=dbdata(dbproc, 15))
                                                                        UtilStrCpy(pPayment->c_middle, pData, dbdatlen(dbproc, 15));
                                                                if(pData=dbdata(dbproc, 16))
                                                                        UtilStrCpy(pPayment->c_street_1, pData, dbdatlen(dbproc, 16));
                                                                if(pData=dbdata(dbproc, 17))
                                                                        UtilStrCpy(pPayment->c_street_2, pData, dbdatlen(dbproc, 17));
                                                                if(pData=dbdata(dbproc, 18))
                                                                        UtilStrCpy(pPayment->c_city, pData, dbdatlen(dbproc, 18));
                                                                if(pData=dbdata(dbproc, 19))
                                                                        UtilStrCpy(pPayment->c_state, pData, dbdatlen(dbproc,19));
                                                                if(pData=dbdata(dbproc, 20))
                                                                        UtilStrCpy(pPayment->c_zip, pData, dbdatlen(dbproc, 20));
                                                                if(pData=dbdata(dbproc, 21))
                                                                        UtilStrCpy(pPayment->c_phone, pData, dbdatlen(dbproc, 21));
                                                                if(pData=dbdata(dbproc, 22))
                                                                {
                                                                        datetime = *((DBDATETIME *) pData);
                                                                        dbdatecrack(dbproc, &pPayment->c_since, &datetime);
                                                                }
                                                                if(pData=dbdata(dbproc, 23))
                                                                        UtilStrCpy(pPayment->c_credit, pData, dbdatlen(dbproc, 23));
                                                                if(pData=dbdata(dbproc, 24))
                                                                        pPayment->c_credit_lim = (*(DBFLT8 *) pData);
                                                                if(pData=dbdata(dbproc, 25))
                                                                        pPayment->c_discount = (*(DBFLT8 *) pData);
                                                                if(pData=dbdata(dbproc, 26))
                                                                        pPayment->c_balance = (*(DBFLT8 *) pData);
                                                                if(pData=dbdata(dbproc, 27))
                                                                        UtilStrCpy(pPayment->c_data, pData, dbdatlen(dbproc, 27));
                                                        }
                                                }
                                        }
                                }
                                if (SQLDetectDeadlock(dbproc))
                                {
                                        pPayment->num_deadlocks++;
                                        sprintf(printbuf,"deadlock: retry: %d",pPayment->num_deadlocks);
                                        Sleep(DEADLOCKWAIT*tryit);
                                }
                                else
                                {
                                        if ( pPayment->c_id == 0 )
                                        {
                                                strcpy(pPayment->execution_status,"Invalid Customer id,name.");
                                                return 0;
                                        }
                                        else
                                                strcpy(pPayment->execution_status,"Transaction commited.");
                                        return TRUE;
                                }
                        }
                        // If we reached here, it means we quit after MAX_RETRY deadlocks
                        strcpy(pPayment->execution_status,"Hit deadlock max.  ");
                        return -1; //"deadlock max retry reached!"
}


/* FUNCTION: int SQLOrderStatus(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId, DBPROCESS *dbproc, ORDER_STATUS_DATA *pOrderStatus,
short deadlock_retry)
 *
 * PURPOSE:  This function processes the Order Status transaction.
 *
 * ARGUMENTS:           EXTENSION_CONTROL_BLOCK     *pECB                   passed in structure pointer from inetsrv.
 *                      int                                                 iTermId
                terminal id of browser
 *                      int                                                 iSyncId
                sync id of browser
 *                      DBPROCESS                   *dbproc                 connection db
process id
 *                      ORDER_STATUS_DATA           *pOrderStatus pointer to Order Status data input/output structure
 *                      short                                   deadlock_retry      deadlock retry
count
 *
 * RETURNS:             int         -1              max deadlock reached
 *                                  0               No orders found for customer
 *                                  1               Transaction successfull
 *
 * COMMENTS:            None
 *
```

```
*/

static int SQLOrderStatus(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId, DBPROCESS *dbproc, ORDER_STATUS_DATA *pOrderStatus, short
deadlock_retry)
{
	RETCODE		rc;
	int			tryit;
	int			i;
	char		printbuf[25];
	BOOL		by_name;
	DBDATETIME	datetime;
	BYTE		*pData;
	PECBINFO	pEcbInfo;

	if ( (pEcbInfo = (PECBINFO)dbgetuserdata(dbproc)) )
	{
		pEcbInfo->pECB = pECB;
		pEcbInfo->bFailed = FALSE;
		pEcbInfo->iTermId = iTermId;
		pEcbInfo->iSyncId = iSyncId;
	}

	pOrderStatus->num_deadlocks = 0;
	if (pOrderStatus->c_id == 0)
		by_name = TRUE;
	else
		by_name = FALSE;

	for (tryit=0; tryit < deadlock_retry; tryit++)
	{
		if (dbrpcinit(dbproc, "tpcc_orderstatus", 0) == SUCCEED)
		{
			dbrpcparam(dbproc, NULL, 0, SQLINT2, -1, -1, (BYTE *) &pOrderStatus->w_id);
			dbrpcparam(dbproc, NULL, 0, SQLINT1, -1, -1, (BYTE *) &pOrderStatus->d_id);
			dbrpcparam(dbproc, NULL, 0, SQLINT4, -1, -1, (BYTE *) &pOrderStatus->c_id);
			if (pOrderStatus->c_id == 0)
			{
				dbrpcparam(dbproc, NULL, 0, SQLCHAR, -1, strlen(pOrderStatus->c_last), pOrderStatus->c_last);
			}
		}
		if (dbrpcexec(dbproc) == SUCCEED)
		{
			while (((rc = dbresults(dbproc)) != NO_MORE_RESULTS) && (rc != FAIL))
			{
				if (DBROWS(dbproc) && (dbnumcols(dbproc) == 5))
				{
					i=0;
					while (((rc = dbnextrow(dbproc)) != NO_MORE_ROWS) && (rc != FAIL))
					{
						if(pData=dbdata(dbproc, 1))
							pOrderStatus->OlOrderStatusData[i].ol_supply_w_id = (*(DBSMALLINT
*) pData);
						if(pData=dbdata(dbproc, 2))
							pOrderStatus->OlOrderStatusData[i].ol_i_id = (*(DBINT *) pData);
						if(pData=dbdata(dbproc, 3))
							pOrderStatus->OlOrderStatusData[i].ol_quantity = (*(DBSMALLINT *)
pData);
						if(pData=dbdata(dbproc, 4))
							pOrderStatus->OlOrderStatusData[i].ol_amount = (*(DBFLT8 *) pData);
						if(pData=dbdata(dbproc, 5))
						{
							datetime = *((DBDATETIME *) pData);
							dbdatecrack(dbproc, &pOrderStatus->OlOrderStatusData[i].ol_delivery_d,
&datetime);
						}
						i++;
					}
					pOrderStatus->o_ol_cnt = i;
				}
				else if (DBROWS(dbproc) && (dbnumcols(dbproc) == 8))
				{
					while (((rc = dbnextrow(dbproc)) != NO_MORE_ROWS) && (rc != FAIL))
					{
						if(pData=dbdata(dbproc, 1))
							pOrderStatus->c_id = (*(DBINT *) pData);
						if(pData=dbdata(dbproc, 2))
							UtilStrCpy(pOrderStatus->c_last, pData, dbdatlen(dbproc,2));
						if(pData=dbdata(dbproc, 3))
							UtilStrCpy(pOrderStatus->c_first, pData, dbdatlen(dbproc,3));
						if(pData=dbdata(dbproc, 4))
							UtilStrCpy(pOrderStatus->c_middle, pData, dbdatlen(dbproc, 4));
						if(pData=dbdata(dbproc, 5))
						{
							datetime = *((DBDATETIME *) pData);
							dbdatecrack(dbproc, &pOrderStatus->o_entry_d, &datetime);
						}
						if(pData=dbdata(dbproc, 6))
							pOrderStatus->o_carrier_id = (*(DBSMALLINT *) pData);
						if(pData=dbdata(dbproc, 7))
							pOrderStatus->c_balance = (*(DBFLT8 *) pData);
```

```
                                                                        if(pData=dbdata(dbproc, 8))
                                                                                pOrderStatus->o_id = (*(DBINT *) pData);
                                                                }
                                                        }
                                                        if (i==0)
                                                                return 0; //"No orders found for customer"
                                                }
                                        }
                                        if (SQLDetectDeadlock(dbproc))
                                        {
                                                pOrderStatus->num_deadlocks++;
                                                sprintf(printbuf,"deadlock: retry: %d",pOrderStatus->num_deadlocks);
                                                Sleep(DEADLOCKWAIT*tryit);
                                        }
                                        else
                                        {
                                                if (pOrderStatus->c_id == 0 && pOrderStatus->c_last[0] == 0)
                                                        strcpy(pOrderStatus->execution_status,"Invalid Customer id,name.");
                                                else
                                                        strcpy(pOrderStatus->execution_status,"Transaction commited.");
                                                return 1;
                                        }
                                }
                                // If we reached here, it means we quit after MAX_RETRY deadlocks
                                strcpy(pOrderStatus->execution_status,"Hit deadlock max.  ");
                                return -1; //"deadlock maxretry reached!"
}

/* FUNCTION: BOOL SQLDetectDeadlock(DBPROCESS *dbproc)
 *
 * PURPOSE:  This function checks to see if a sql server deadlock condition exists.
 *
 * ARGUMENTS:           DBPROCESS                       *dbproc                         connection db process id to check
 *
 * RETURNS:             BOOL    FALSE                   no deadlock detected
 *                                                              TRUE                    deadlock condition exists
 *
 * COMMENTS:            None
 *
 */

BOOL SQLDetectDeadlock(DBPROCESS *dbproc)
{
                PECBINFO    pEcbInfo;

                if ( (pEcbInfo = (PECBINFO)dbgetuserdata(dbproc)) )
                {
                        if ( pEcbInfo->bDeadlock )
                        {
                                pEcbInfo->bDeadlock = FALSE;
                                return TRUE;
                        }
                }
                return FALSE;
}

/* FUNCTION: void FormatString(char *szDest, char *szPic, char *szSrc)
 *
 * PURPOSE:  This function formats a character string for inclusion in the
 *                                      HTML formatted page being constructed.
 *
 * ARGUMENTS:           char                    *szDest     Destination buffer where formatted string is to be placed
 *                                              char                    *szPic      picture string which describes how character value is to be
 *                                                                                                              formatted.
 *                                              char                    *szSrc      character string value.
 *
 * RETURNS:             None
 *
 * COMMENTS:            This functions is used to format TPC-C phone and zip value strings.
 *
 */

static void FormatString(char *szDest, char *szPic, char *szSrc)
{
                while( *szPic )
                {
                        if ( *szPic == 'X' )
                        {
                                if ( *szSrc )
                                        *szDest++ = *szSrc++;
                                else
                                        *szDest++ = ' ';
                        }
                        else
                                *szDest++ = *szPic;
                        szPic++;
                }
                *szDest = 0;

                return;
```

```
}

/* FUNCTION: char *MakeStockLevelForm(int iTermId, int iSyncId, BOOL bInput)
 *
 * PURPOSE:  This function constructs the Stock Level HTML page.
 *
 * ARGUMENTS:          int                                 iTermId     client browser terminal id
 *                     int                                 iSyncId     client browser sync id
 *                     BOOL                                bInput      TRUE if form is being constructed for input else FALSE
 *
 * RETURNS:            char *                        A pointer to buffer inside client structure where HTML form is built.
 *
 * COMMENTS:           The internal client buffer is created when the terminal id is assigned and should not
 *                     be freed except when the client terminal id is no longer needed.
 */

static char *MakeStockLevelForm(int iTermId, int iSyncId, BOOL bInput)
{
        char        *szForm;

        szForm = (char *)Term.pClientData[iTermId].szBuffer;

        Term.pClientData[iTermId].stockLevelData.w_id                = (short)Term.pClientData[iTermId].w_id;
        Term.pClientData[iTermId].stockLevelData.d_id                = (short)Term.pClientData[iTermId].d_id;
        Term.pClientData[iTermId].stockLevelData.num_deadlocks       = 0;

        strcpy(szForm, "<HTML><HEAD><TITLE>TPC-C Stock Level</TITLE></HEAD>");
        strcat(szForm, "<FORM ACTION=\"tpcc.dll\" METHOD=\"GET\">");
        if ( bInput )
                strcat(szForm, "<INPUT TYPE=\"hidden\" NAME=\"PI*\" VALUE=\"\">");
        strcat(szForm, "<INPUT TYPE=\"hidden\" NAME=\"STATUSID\" VALUE=\"0\">");
        wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"FORMID\" VALUE=\"%d\">", STOCK_LEVEL_FORM);
        wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"TERMID\" VALUE=\"%d\">", iTermId);
        wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"SYNCID\" VALUE=\"%d\">", iSyncId);
        strcat(szForm, "<PRE>                    Stock-Level<BR>");
        wsprintf(szForm+strlen(szForm), "Warehouse: %4.4d   District: %2.2d<BR><BR>", Term.pClientData[iTermId].stockLevelData.w_id,
Term.pClientData[iTermId].stockLevelData.d_id);
        if ( bInput )
        {
                strcat(szForm, "Stock Level Threshold: <INPUT NAME=\"TT*\" SIZE=2><BR><BR>"
                                                        "low stock:   <BR><HR>"
                                                        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Process\">"
                                                        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Menu\">" );
        }
        else
        {
                wsprintf(szForm+strlen(szForm), "Stock Level Threshold: %2.2d<BR><BR>", Term.pClientData[iTermId].stockLevelData.thresh_hold);

                wsprintf(szForm+strlen(szForm), "low stock: %3.3d</PRE><BR><HR>", Term.pClientData[iTermId].stockLevelData.low_stock);
                strcat(szForm, "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..NewOrder..\">"
                                                        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Payment..\">"
                                                        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Delivery..\">"
                                                        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Order-Status..\">"
                                                        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Stock-Level..\">"
                                                        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Exit..\">" );
        }

        strcat(szForm, "</FORM></HTML>");

        return szForm;
}

/* FUNCTION: char *MakeMainMenuForm(int iTermId, int iSyncId)
 *
 * PURPOSE:  This function
 *
 * ARGUMENTS:          int                                 iTermId     client browser terminal id
 *                     int                                 iSyncId     client browser sync id
 *
 * RETURNS:            char *                        A pointer to buffer inside client structure where HTML form is built.
 *
 * COMMENTS:           The internal client buffer is created when the terminal id is assigned and should not
 *                     be freed except when the client terminal id is no longer needed.
 */

static char *MakeMainMenuForm(int iTermId, int iSyncId)
{
        char        *szForm;

        szForm = (char *)Term.pClientData[iTermId].szBuffer;

        strcpy(szForm,          "<HTML><HEAD><TITLE>TPC-C Main Menu</TITLE></HEAD><BODY>"
                                                        "Select Desired Transaction.<BR><HR>"
                                                        "<FORM ACTION=\"tpcc.dll\" METHOD=\"GET\">");
        strcat(szForm, "<INPUT TYPE=\"hidden\" NAME=\"STATUSID\" VALUE=\"0\">");
        wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"TERMID\" VALUE=\"%d\">", iTermId);
        wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"SYNCID\" VALUE=\"%d\">", iSyncId);
        wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"FORMID\" VALUE=\"%d\">", MAIN_MENU_FORM);
        strcat(szForm,          "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..NewOrder..\">"
                                                        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Payment..\">"
```

```
                                                "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Delivery..\">"
                                                "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Order-Status..\">"
                                                "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Stock-Level..\">"
                                                "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Exit..\">"
                                                "</FORM>"
                                                "</HTML>" );

        return szForm;
}

/* FUNCTION: char *MakeWelcomeForm(void)
 *
 * PURPOSE:  This function
 *
 * ARGUMENTS:   None
 *
 * RETURNS:             char *                  A pointer to the static HTML welcome form.
 *
 * COMMENTS:            The welcome form is static.
 */

static char *MakeWelcomeForm(void)
{
        return szWelcomeForm;
}

/* FUNCTION: char *MakeNewOrderForm(int iTermId, BOOL bInput, BOOL bValid)
 *
 * PURPOSE:  This function
 *
 * ARGUMENTS:           int                             iTermId     client browser terminal id
 *                              int                                 iSyncId     client browser sync id
 *                              BOOL                        bInput      TRUE if form is being constructed for input else FALSE
 *                              BOOL                        bValid      TRUE if NeworderData valid, ELSE FALSE effects output
only
 *
 * RETURNS:             char *                  A pointer to buffer inside client structure where HTML form is built.
 *
 * COMMENTS:            The internal client buffer is created when the terminal id is assigned and should not
 *                              be freed except when the client terminal id is no longer needed.
 */

static char *MakeNewOrderForm(int iTermId, int iSyncId, BOOL bInput, BOOL bValid)
{
        char            *szForm;
        char            szName[146];
        char            szCredit[14];
        int                     i;

        szForm = (char *)Term.pClientData[iTermId].szBuffer;

        Term.pClientData[iTermId].newOrderData.w_id = Term.pClientData[iTermId].w_id;

        strcpy(szForm,          "<HTML>"
                                                "<HEAD><TITLE>TPC-C New Order</TITLE></HEAD><BODY>"
                                                "<FORM ACTION=\"tpcc.dll\" METHOD=\"GET\">" );

        if ( bInput )
                strcat(szForm, "<INPUT TYPE=\"hidden\" NAME=\"PI*\" VALUE=\"\">");

        strcat(szForm, "<INPUT TYPE=\"hidden\" NAME=\"STATUSID\" VALUE=\"0\">");
        wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"FORMID\" VALUE=\"%d\">", NEW_ORDER_FORM);
        wsprintf(szForm+strlen(szForm),         "<INPUT TYPE=\"hidden\" NAME=\"TERMID\" VALUE=\"%d\">", iTermId);
        wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"SYNCID\" VALUE=\"%d\">", iSyncId);
        strcat(szForm, "<PRE>                   New Order<BR>");

        if ( bInput )
        {
                wsprintf(szForm+strlen(szForm), "Warehouse: %4.4d   District: <INPUT NAME=\"DID*\" SIZE=1>                  Date:<BR>",
Term.pClientData[iTermId].newOrderData.w_id);
                strcat(szForm, "Customer:  <INPUT NAME=\"CID*\" SIZE=4>   Name:              Credit:     %Disc:<BR>"
                                                "Order Number:          Number of Lines:        W_tax:      D_tax:<BR><BR>"
                                                " Supp_W  Item_Id  Item Name             Qty  Stock  B/G  Price    Amount<BR>"
                                                " <INPUT NAME=\"SP00*\" SIZE=4>  <INPUT NAME=\"IID00*\" SIZE=6>
<INPUT NAME=\"Qty00*\" SIZE=1><BR>"
                                                " <INPUT NAME=\"SP01*\" SIZE=4>  <INPUT NAME=\"IID01*\" SIZE=6>
<INPUT NAME=\"Qty01*\" SIZE=1><BR>"
                                                " <INPUT NAME=\"SP02*\" SIZE=4>  <INPUT NAME=\"IID02*\" SIZE=6>
<INPUT NAME=\"Qty02*\" SIZE=1><BR>"
                                                " <INPUT NAME=\"SP03*\" SIZE=4>  <INPUT NAME=\"IID03*\" SIZE=6>
<INPUT NAME=\"Qty03*\" SIZE=1><BR>"
                                                " <INPUT NAME=\"SP04*\" SIZE=4>  <INPUT NAME=\"IID04*\" SIZE=6>
<INPUT NAME=\"Qty04*\" SIZE=1><BR>"
                                                " <INPUT NAME=\"SP05*\" SIZE=4>  <INPUT NAME=\"IID05*\" SIZE=6>
<INPUT NAME=\"Qty05*\" SIZE=1><BR>"
                                                " <INPUT NAME=\"SP06*\" SIZE=4>  <INPUT NAME=\"IID06*\" SIZE=6>
<INPUT NAME=\"Qty06*\" SIZE=1><BR>"
                                                " <INPUT NAME=\"SP07*\" SIZE=4>  <INPUT NAME=\"IID07*\" SIZE=6>
<INPUT NAME=\"Qty07*\" SIZE=1><BR>"
```

```
                                                                    " <INPUT NAME=\"SP08*\" SIZE=4>  <INPUT NAME=\"IID08*\" SIZE=6>
<INPUT NAME=\"Qty08*\" SIZE=1><BR>"
                                                                    " <INPUT NAME=\"SP09*\" SIZE=4>  <INPUT NAME=\"IID09*\" SIZE=6>
<INPUT NAME=\"Qty09*\" SIZE=1><BR>"
                                                                    " <INPUT NAME=\"SP10*\" SIZE=4>  <INPUT NAME=\"IID10*\" SIZE=6>
<INPUT NAME=\"Qty10*\" SIZE=1><BR>"
                                                                    " <INPUT NAME=\"SP11*\" SIZE=4>  <INPUT NAME=\"IID11*\" SIZE=6>
<INPUT NAME=\"Qty11*\" SIZE=1><BR>"
                                                                    " <INPUT NAME=\"SP12*\" SIZE=4>  <INPUT NAME=\"IID12*\" SIZE=6>
<INPUT NAME=\"Qty12*\" SIZE=1><BR>"
                                                                    " <INPUT NAME=\"SP13*\" SIZE=4>  <INPUT NAME=\"IID13*\" SIZE=6>
<INPUT NAME=\"Qty13*\" SIZE=1><BR>"
                                                                    " <INPUT NAME=\"SP14*\" SIZE=4>  <INPUT NAME=\"IID14*\" SIZE=6>
<INPUT NAME=\"Qty14*\" SIZE=1><BR>"
                                                                    "Execution Status:                              Total:<BR><HR>"
                                                                    "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Process\">"
                                                                    "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Menu\">"
                                                                    "</FORM>"
                                                                    "</HTML>" );

        }
        else
        {
                if ( bValid )
                {
                        wsprintf(szForm+strlen(szForm), "Warehouse: %4.4d   District: %2.2d                  Date: %2.2d−%2.2d−%4.4d %2.2d:%2.2d:%2.2d
<BR>",
                                Term.pClientData[iTermId].newOrderData.w_id,
                                Term.pClientData[iTermId].newOrderData.d_id,
                                Term.pClientData[iTermId].newOrderData.o_entry_d.day,
                                Term.pClientData[iTermId].newOrderData.o_entry_d.month,
                                Term.pClientData[iTermId].newOrderData.o_entry_d.year,
                                Term.pClientData[iTermId].newOrderData.o_entry_d.hour,
                                Term.pClientData[iTermId].newOrderData.o_entry_d.minute,
                                Term.pClientData[iTermId].newOrderData.o_entry_d.second);
                }
                else
                {
                        wsprintf(szForm+strlen(szForm), "Warehouse: %4.4d   District: %2.2d                  Date:<BR>",
                                Term.pClientData[iTermId].newOrderData.w_id,
                                Term.pClientData[iTermId].newOrderData.d_id);
                }

                FormatHTMLString(szName, Term.pClientData[iTermId].newOrderData.c_last, 16),
                FormatHTMLString(szCredit, Term.pClientData[iTermId].newOrderData.c_credit, 2);

                wsprintf(szForm+strlen(szForm), "Customer:  %4.4d   Name: %s   Credit: %s   ",
                        Term.pClientData[iTermId].newOrderData.c_id, szName, szCredit);


                if ( bValid )
                {
                        sprintf(szForm+strlen(szForm), "%%Disc: %5.2f           <BR>", Term.pClientData[iTermId].newOrderData.c_discount);
                        sprintf(szForm+strlen(szForm), "Order Number: %8.8d  Number of Lines: %2.2d       W_tax: %5.2f   D_tax: %5.2f  <BR><BR>",
                                Term.pClientData[iTermId].newOrderData.o_id,
                                Term.pClientData[iTermId].newOrderData.o_ol_cnt,
                                Term.pClientData[iTermId].newOrderData.w_tax,
                                Term.pClientData[iTermId].newOrderData.d_tax);

                        strcat(szForm, " Supp_W  Item_Id  Item Name              Qty  Stock  B/G  Price    Amount<BR>");
                        for(i=0; i<Term.pClientData[iTermId].newOrderData.o_ol_cnt; i++)
                        {
                                FormatHTMLString(szName, Term.pClientData[iTermId].newOrderData.Ol[i].ol_i_name, 24);

                                sprintf(szForm+strlen(szForm), "  %4.4d   %6.6d   %s  %2.2d    %3.3d    %1.1s   $%6.2f  $%7.2f  <BR>",
                                        Term.pClientData[iTermId].newOrderData.Ol[i].ol_supply_w_id,
                                        Term.pClientData[iTermId].newOrderData.Ol[i].ol_i_id,
                                        szName,
                                        Term.pClientData[iTermId].newOrderData.Ol[i].ol_quantity,
                                        Term.pClientData[iTermId].newOrderData.Ol[i].ol_stock,
                                        Term.pClientData[iTermId].newOrderData.Ol[i].ol_brand_generic,
                                        Term.pClientData[iTermId].newOrderData.Ol[i].ol_i_price,
                                        Term.pClientData[iTermId].newOrderData.Ol[i].ol_amount );
                        }
                }
                else
                {
                        strcat(szForm, "%Disc:<BR>");
                        sprintf(szForm+strlen(szForm), "Order Number: %8.8d  Number of Lines:          W_tax:       D_tax:<BR><BR>",
                                Term.pClientData[iTermId].newOrderData.o_id);

                        strcat(szForm, " Supp_W  Item_Id  Item Name              Qty  Stock  B/G  Price    Amount<BR>");

                        i = 0;
                }
                for(; i<15; i++)
                        strcat(szForm, "<BR>");

                if ( bValid )
                {
```

```
                                        sprintf(szForm+strlen(szForm), "Execution Status: %24.24s              Total:  $%8.2f  ",
                                                Term.pClientData[iTermId].newOrderData.execution_status,
                                                Term.pClientData[iTermId].newOrderData.total_amount);
                        }
                        else
                        {
                                        sprintf(szForm+strlen(szForm), "Execution Status: %24.24s              Total:",
                                                Term.pClientData[iTermId].newOrderData.execution_status);
                        }

                        strcat(szForm, "</PRE><HR><BR>"
                                                                        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..NewOrder..\">"
                                                                        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Payment..\">"
                                                                        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Delivery..\">"
                                                                        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Order−Status..\">"
                                                                        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Stock−Level..\">"
                                                                        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Exit..\">" );
                        strcat(szForm, "</FORM></HTML>");
        }

        return szForm;

}

/* FUNCTION: char *MakePaymentForm(int iTermId, int iSyncId, BOOL bInput)
 *
 * PURPOSE:  This function
 *
 * ARGUMENTS:           int                                     iTermId         client browser terminal id
 *                                      int                                             iSyncId         client browser sync id
 *                                      BOOL                                    bInput          TRUE if form is being constructed for input else FALSE
 *
 * RETURNS:             char *                          A pointer to buffer inside client structure where HTML form is built.
 *
 * COMMENTS:            The internal client buffer is created when the terminal id is assigned and should not
 *                                      be freed except when the client terminal id is no longer needed.
 */

static char *MakePaymentForm(int iTermId, int iSyncId, BOOL bInput)
{
        char            *szForm;
        char            *ptr;
        char            szTmp[64];
        char            szW_Zip[26];
        char            szD_Zip[26];
        char            szC_Zip[26];
        char            szC_Phone[26];
        char            szTmpStr1[122];
        char            szTmpStr2[122];
        char            szTmpStr3[122];
        char            szTmpStr4[122];
        int                     i;
        int                     l;
        char            *szZipPic = "XXXXX−XXXX";

        szForm = (char *)Term.pClientData[iTermId].szBuffer;

        Term.pClientData[iTermId].paymentData.w_id = Term.pClientData[iTermId].w_id;

        strcpy(szForm,          "<HTML><HEAD><TITLE>TPC−C Payment</TITLE></HEAD><BODY>"
                                                "<FORM ACTION=\"tpcc.dll\" METHOD=\"GET\">");
        if ( bInput )
                strcat(szForm, "<INPUT TYPE=\"hidden\" NAME=\"PI*\" VALUE=\"\">");

        strcat(szForm, "<INPUT TYPE=\"hidden\" NAME=\"STATUSID\" VALUE=\"0\">");
        wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"FORMID\" VALUE=\"%d\">", PAYMENT_FORM);
        wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"TERMID\" VALUE=\"%d\">", iTermId);
        wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"SYNCID\" VALUE=\"%d\">", iSyncId);

        strcat(szForm, "<PRE>                   Payment<BR>");

        if ( bInput )
                strcat(szForm, "Date:<BR><BR>" );
        else
        {
                wsprintf(szForm+strlen(szForm), "Date: %2.2d−%2.2d−%4.4d %2.2d:%2.2d:%2.2d <BR><BR>",
                        Term.pClientData[iTermId].paymentData.h_date.day,
                        Term.pClientData[iTermId].paymentData.h_date.month,
                        Term.pClientData[iTermId].paymentData.h_date.year,
                        Term.pClientData[iTermId].paymentData.h_date.hour,
                        Term.pClientData[iTermId].paymentData.h_date.minute,
                        Term.pClientData[iTermId].paymentData.h_date.second);
        }
        wsprintf(szForm+strlen(szForm), "Warehouse: %4.4d", Term.pClientData[iTermId].paymentData.w_id);

        if ( bInput )
        {
                strcat(szForm, "                District: <INPUT NAME=\"DID*\" SIZE=1><BR><BR><BR><BR><BR>"
                                                                "Customer: <INPUT NAME=\"CID*\" SIZE=4>"
                                                                "Cust−Warehouse: <INPUT NAME=\"CWI*\" SIZE=4>  "
```

```
                                                                "Cust-District: <INPUT NAME=\"CDI*\" SIZE=1><BR>"
                                                                "Name:          <INPUT NAME=\"CLT*\" SIZE=16>          Since:<BR>"
                                                                "                                Credit:<BR>"
                                                                "                                Disc:<BR>"
                                                                "                                Phone:<BR><BR>"
                                                                "Amount Paid:      $<INPUT NAME=\"HAM*\" SIZE=7>      New Cust Balance:<BR>"
                                                                "Credit Limit:<BR><BR>Cust-Data: <BR><BR><BR><BR></PRE><HR>"
                                                                "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Process\"><INPUT
TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Menu\">"
                                                                "</BODY></FORM></HTML>" );
        }
        else
        {
                sprintf(szForm+strlen(szForm),          "          District: %2.2d<BR>",
                        Term.pClientData[iTermId].paymentData.d_id);

                FormatHTMLString(szTmpStr1, Term.pClientData[iTermId].paymentData.w_street_1, 20);
                FormatHTMLString(szTmpStr2, Term.pClientData[iTermId].paymentData.d_street_1, 20);

                sprintf(szForm+strlen(szForm),"%s          %s<BR>", szTmpStr1, szTmpStr2);

                FormatHTMLString(szTmpStr1, Term.pClientData[iTermId].paymentData.w_street_2, 20);
                FormatHTMLString(szTmpStr2, Term.pClientData[iTermId].paymentData.d_street_2, 20);

                sprintf(szForm+strlen(szForm),"%s          %s<BR>", szTmpStr1, szTmpStr2);

                FormatString(szW_Zip, szZipPic, Term.pClientData[iTermId].paymentData.w_zip);
                FormatString(szD_Zip, szZipPic, Term.pClientData[iTermId].paymentData.d_zip);

                FormatHTMLString(szTmpStr1, Term.pClientData[iTermId].paymentData.w_city, 20);
                FormatHTMLString(szTmpStr2, Term.pClientData[iTermId].paymentData.w_state, 2);
                FormatHTMLString(szTmpStr3, Term.pClientData[iTermId].paymentData.d_city, 20);
                FormatHTMLString(szTmpStr4, Term.pClientData[iTermId].paymentData.d_state, 2);

                wsprintf(szForm+strlen(szForm), "%s %s %10.10s      %s %s %10.10s<BR><BR>",
                        szTmpStr1, szTmpStr2, szW_Zip, szTmpStr3, szTmpStr4, szD_Zip );

                wsprintf(szForm+strlen(szForm), "Customer: %4.4d  Cust-Warehouse: %4.4d  Cust-District: %2.2d<BR>",
                        Term.pClientData[iTermId].paymentData.c_id,
                        Term.pClientData[iTermId].paymentData.c_w_id,
                        Term.pClientData[iTermId].paymentData.c_d_id);

                FormatHTMLString(szTmpStr1, Term.pClientData[iTermId].paymentData.c_first, 16);
                FormatHTMLString(szTmpStr2, Term.pClientData[iTermId].paymentData.c_middle, 2);
                FormatHTMLString(szTmpStr3, Term.pClientData[iTermId].paymentData.c_last, 16);

                wsprintf(szForm+strlen(szForm), "Name:   %s %s %s    Since:  %2.2d-%2.2d-%4.4d<BR>",
                        szTmpStr1, szTmpStr2, szTmpStr3,
                        Term.pClientData[iTermId].paymentData.c_since.day,
                        Term.pClientData[iTermId].paymentData.c_since.month,
                        Term.pClientData[iTermId].paymentData.c_since.year);

                FormatHTMLString(szTmpStr1, Term.pClientData[iTermId].paymentData.c_street_1, 20);
                FormatHTMLString(szTmpStr2, Term.pClientData[iTermId].paymentData.c_credit, 2);

    wsprintf(szForm+strlen(szForm), "       %s          Credit: %s<BR>", szTmpStr1, szTmpStr2);

                FormatHTMLString(szTmpStr1, Term.pClientData[iTermId].paymentData.d_street_2, 20);
    sprintf(szForm+strlen(szForm), "       %s          %%Disc:  %5.2f<BR>",
                        szTmpStr1, Term.pClientData[iTermId].paymentData.c_discount);

                FormatString(szC_Zip, szZipPic, Term.pClientData[iTermId].paymentData.c_zip);
                FormatString(szC_Phone, "XXXXXX-XXX-XXX-XXXX", Term.pClientData[iTermId].paymentData.c_phone);

                FormatHTMLString(szTmpStr1, Term.pClientData[iTermId].paymentData.c_city, 20);
                FormatHTMLString(szTmpStr2, Term.pClientData[iTermId].paymentData.c_state, 2);

                wsprintf(szForm+strlen(szForm), "       %s %s %10.10s      Phone:  %-19.19s<BR><BR>",
                        szTmpStr1, szTmpStr2, szC_Zip, szC_Phone );

                sprintf(szForm+strlen(szForm), "Amount Paid:      $%7.2f      New Cust Balance: $%14.2f<BR>",
                        Term.pClientData[iTermId].paymentData.h_amount,
                        Term.pClientData[iTermId].paymentData.c_balance);

                sprintf(szForm+strlen(szForm), "Credit Limit:   $%13.2f<BR><BR>",
                        Term.pClientData[iTermId].paymentData.c_credit_lim);

                ptr = Term.pClientData[iTermId].paymentData.c_credit;
                if ( *ptr == 'B' && *(ptr+1) == 'C' )
                {
                        ptr = Term.pClientData[iTermId].paymentData.c_data;
                        l = strlen( ptr ) / 50;
                        for(i=0; i<4; i++, ptr += 50)
                        {
                                if ( i <= l )
                                        UtilStrCpy(szTmp, ptr, 50);
                                else
                                        szTmp[0] = 0;
                                if ( !i )
                                {
```

```
                                        FormatHTMLString(szTmpStr1, szTmp, 50);
                                        wsprintf(szForm+strlen(szForm), "Cust−Data: %s<BR>", szTmpStr1);
                                }
                                else
                                {
                                        FormatHTMLString(szTmpStr1, szTmp, 50);
                                        wsprintf(szForm+strlen(szForm), "          %s<BR>", szTmpStr1);
                                }
                        }
                }
                else
                        strcat(szForm, "Cust−Data: <BR><BR><BR><BR>");

                strcat(szForm, "</PRE><HR><BR>"
                                                "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..NewOrder..\">"
                                                "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Payment..\">"
                                                "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Delivery..\">"
                                                "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Order−Status..\">"
                                                "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Stock−Level..\">"
                                                "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Exit..\">"
                                                "</BODY></FORM></HTML>");
        }

        return szForm;
}

/* FUNCTION: char *MakeOrderStatusForm(int iTermId, int iSyncId, BOOL bInput)
 *
 * PURPOSE:  This function
 *
 * ARGUMENTS:           int                             iTermId         client browser terminal id
 *                              int                                     iSyncId         client browser sync id
 *                              BOOL                            bInput          TRUE if form is being constructed for input else FALSE
 *
 * RETURNS:             char *                  A pointer to buffer inside client structure where HTML form is built.
 *
 * COMMENTS:            The internal client buffer is created when the terminal id is assigned and should not
 *                              be freed except when the client terminal id is no longer needed.
 */

static char *MakeOrderStatusForm(int iTermId, int iSyncId, BOOL bInput)
{
        char            *szForm;
        char            c_first[98];
        char            c_middle[14];
        char            c_last[98];
        int                     i;

        szForm = (char *)Term.pClientData[iTermId].szBuffer;

        Term.pClientData[iTermId].orderStatusData.w_id = Term.pClientData[iTermId].w_id;

        strcpy(szForm,          "<HTML><HEAD><TITLE>TPC−C Order−Status</TITLE></HEAD><BODY>"
                                        "<FORM ACTION=\"tpcc.dll\" METHOD=\"GET\">");

        if ( bInput )
                strcat(szForm, "<INPUT TYPE=\"hidden\" NAME=\"PI*\" VALUE=\"\">");

        strcat(szForm, "<INPUT TYPE=\"hidden\" NAME=\"STATUSID\" VALUE=\"0\">");
        wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"FORMID\" VALUE=\"%d\">", ORDER_STATUS_FORM);
        wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"TERMID\" VALUE=\"%d\">", iTermId);
        wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"SYNCID\" VALUE=\"%d\">", iSyncId);

        strcat(szForm, "<PRE>                   Order−Status<BR>" );
        wsprintf(szForm+strlen(szForm), "Warehouse: %4.4d   ", Term.pClientData[iTermId].orderStatusData.w_id);

        if ( bInput )
        {
                strcat(szForm, "District: <INPUT NAME=\"DID*\" SIZE=1><BR>"
                                                "Customer: <INPUT NAME=\"CID*\" SIZE=4>   Name:          <INPUT
NAME=\"CLT*\" SIZE=23><BR>"
                                                "Cust−Balance:<BR><BR>"
                                                "Order−Number:          Entry−Date:             Carrier−Number:<BR>"
                                                "Supply−W    Item−Id    Qty    Amount    Delivery−Date<BR></PRE>"
                                                "<HR><INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Process\"><INPUT
TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Menu\">"
                                                "</BODY></FORM></HTML>" );
        }
        else
        {
                wsprintf(szForm+strlen(szForm), "District: %2.2d<BR>", Term.pClientData[iTermId].orderStatusData.d_id);

                FormatHTMLString(c_first, Term.pClientData[iTermId].orderStatusData.c_first, 16);
                FormatHTMLString(c_middle, Term.pClientData[iTermId].orderStatusData.c_middle, 2);
                FormatHTMLString(c_last, Term.pClientData[iTermId].orderStatusData.c_last, 16);

                wsprintf(szForm+strlen(szForm), "Customer: %4.4d   Name: %s %s %s<BR>",
                        Term.pClientData[iTermId].orderStatusData.c_id, c_first, c_middle, c_last);

                sprintf(szForm+strlen(szForm), "Cust−Balance: $%9.2f<BR><BR>",
```

```
                        Term.pClientData[iTermId].orderStatusData.c_balance);

                wsprintf(szForm+strlen(szForm), "Order−Number: %8.8d   Entry−Date: %2.2d−%2.2d−%4.4d %2.2d:%2.2d:%2.2d   Carrier−Number: %2.2d<BR>",
                        Term.pClientData[iTermId].orderStatusData.o_id,
                        Term.pClientData[iTermId].orderStatusData.o_entry_d.day,
                        Term.pClientData[iTermId].orderStatusData.o_entry_d.month,
                        Term.pClientData[iTermId].orderStatusData.o_entry_d.year,
                        Term.pClientData[iTermId].orderStatusData.o_entry_d.hour,
                        Term.pClientData[iTermId].orderStatusData.o_entry_d.minute,
                        Term.pClientData[iTermId].orderStatusData.o_entry_d.second,
                        Term.pClientData[iTermId].orderStatusData.o_carrier_id);
                strcat(szForm+strlen(szForm), "Supply−W    Item−Id  Qty    Amount     Delivery−Date<BR>");

                for(i=0; i<Term.pClientData[iTermId].orderStatusData.o_ol_cnt; i++)
                {
                        sprintf(szForm+strlen(szForm), "  %4.4d      %6.6d    %2.2d    $%8.2f      %2.2d−%2.2d−%4.4d<BR>",
                                Term.pClientData[iTermId].orderStatusData.OlOrderStatusData[i].ol_supply_w_id,
                                Term.pClientData[iTermId].orderStatusData.OlOrderStatusData[i].ol_i_id,
                                Term.pClientData[iTermId].orderStatusData.OlOrderStatusData[i].ol_quantity,
                                Term.pClientData[iTermId].orderStatusData.OlOrderStatusData[i].ol_amount,
                                Term.pClientData[iTermId].orderStatusData.OlOrderStatusData[i].ol_delivery_d.day,
                                Term.pClientData[iTermId].orderStatusData.OlOrderStatusData[i].ol_delivery_d.month,
                                Term.pClientData[iTermId].orderStatusData.OlOrderStatusData[i].ol_delivery_d.year);
                }

                strcat(szForm, "<BR></PRE><HR><INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..NewOrder..\">"
                                                        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Payment..\">"
                                                        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Delivery..\">"
                                                        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Order−Status..\">"
                                                        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Stock−Level..\">"
                                                        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Exit..\">"
                                                        "</BODY></FORM></HTML>" );
        }

        return szForm;
}

/* FUNCTION: char *MakeDeliveryForm(int iTermId, int iSyncId, BOOL bInput)
 *
 * PURPOSE:  This function
 *
 * ARGUMENTS:           int                                     iTermId         client browser terminal id
 *                      int                                                     iSyncId         client browser sync id
 *                      BOOL                                    bInput          TRUE if form is being constructed for input else FALSE
 *
 * RETURNS:             char *                          A pointer to buffer inside client structure where HTML form is built.
 *
 * COMMENTS:            The internal client buffer is created when the terminal id is assigned and should not
 *                      be freed except when the client terminal id is no longer needed.
 */

static char *MakeDeliveryForm(int iTermId, int iSyncId, BOOL bInput)
{
        char            *szForm;

        szForm = (char *)Term.pClientData[iTermId].szBuffer;

        Term.pClientData[iTermId].deliveryData.w_id = Term.pClientData[iTermId].w_id;

        strcpy( szForm,         "<HTML><HEAD><TITLE>TPC−C Delivery</TITLE></HEAD><BODY>"
                                                "<FORM ACTION=\"tpcc.dll\" METHOD=\"GET\">");

        if ( bInput )
                strcat(szForm, "<INPUT TYPE=\"hidden\" NAME=\"PI*\" VALUE=\"\">");

        strcat(szForm, "<INPUT TYPE=\"hidden\" NAME=\"STATUSID\" VALUE=\"0\">");
        wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"FORMID\" VALUE=\"%d\">", DELIVERY_FORM);
        wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"TERMID\" VALUE=\"%d\">", iTermId);
        wsprintf(szForm+strlen(szForm), "<INPUT TYPE=\"hidden\" NAME=\"SYNCID\" VALUE=\"%d\">", iSyncId);

        strcat(szForm, "<PRE>                   Delivery<BR>" );

        wsprintf(szForm+strlen(szForm), "Warehouse: %4.4d<BR><BR>", Term.pClientData[iTermId].deliveryData.w_id);

        if ( bInput )
                strcat( szForm, "Carrier Number: <INPUT NAME=\"OCD*\" SIZE=1><BR><BR>");
        else
        {
                wsprintf(szForm+strlen(szForm), "Carrier Number: %2.2d<BR><BR>",
                        Term.pClientData[iTermId].deliveryData.o_carrier_id);
        }
        if ( bInput )
        {
                strcat( szForm, "Execution Status:<BR></PRE>"
                                                        "<HR><INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Process\">"
                                                        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Menu\">" );
        }
        else
        {
                wsprintf(szForm+strlen(szForm), "Execution Status: %25.25s<BR></PRE>",
```

```
                                        Term.pClientData[iTermId].deliveryData.execution_status);

                        strcat(szForm, "<HR><INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..NewOrder..\">"
                                                                "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Payment..\">"
                                                                "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Delivery..\">"
                                                                "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Order−Status..\">"
                                                                "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Stock−Level..\">"
                                                                "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Exit..\">" );
        }

        strcat( szForm,         "</BODY></FORM></HTML>" );

        return szForm;
}

/* FUNCTION: void UtilStrCpy(char * pDest, char * pSrc, int n)
 *
 * PURPOSE:  This function copies n characters from string pSrc to pDst and places a
 *                      null character at the end of the destination string.
 *
 * ARGUMENTS:       char                    *pDest      destination string pointer
 *                                  char                    *pSrc       source string pointer
 *                                  int                     n           number of characters to copy
 *
 * RETURNS:         None
 *
 * COMMENTS:        Unlike strncpy this function ensures that the result string is
 *                                  always null terminated.
 *
 */

static void UtilStrCpy(char * pDest, char * pSrc, int n)
{
   strncpy(pDest, pSrc, n);
   pDest[n] = '\0';

        return;
}

/* FUNCTION: void ProcessNewOrderForm(EXTENSION_CONTROL_BLOCK      *pECB, int iTermId, int iSyncId)
 *
 * PURPOSE:  This function gets and validates the input data from the new order form
 *                      filling in the required input variables. it then calls the SQLNewOrder
 *                      transaction, constructs the output form and writes it back to client
 *                      browser.
 *
 * ARGUMENTS:       EXTENSION_CONTROL_BLOCK      *pECB       passed in structure pointer from inetsrv.
 *                                  int                                                 iTermId     client browser
terminal id
 *                                  int                                                 iSyncId client browser sync
id
 *
 * RETURNS:         None
 *
 * COMMENTS:        None
 *
 */

static void ProcessNewOrderForm(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId)
{
        int                             iRc;
        int                             iError;
        PECBINFO    pEcbInfo;

        memset(&Term.pClientData[iTermId].newOrderData, 0, sizeof(NEW_ORDER_DATA));

        Term.pClientData[iTermId].newOrderData.w_id = Term.pClientData[iTermId].w_id;

        if ( (iError=GetNewOrderData(pECB−>lpszQueryString, &Term.pClientData[iTermId].newOrderData)) != ERR_SUCCESS )
        {
                ErrorMessage(pECB, iError, ERR_TYPE_WEBDLL, NULL, iTermId, iSyncId);
                return;
        }

        iRc = SQLNewOrder(pECB, iTermId, iSyncId, Term.pClientData[iTermId].dbproc, &Term.pClientData[iTermId].newOrderData, iDeadlockRetry);

        if ( (pEcbInfo = (PECBINFO)dbgetuserdata(Term.pClientData[iTermId].dbproc)) )
        {
                if ( pEcbInfo−>bFailed )
                        return;
        }

        if ( iRc < 0 )
                ErrorMessage(pECB, ERR_NEW_ORDER_NOT_PROCESSED, ERR_TYPE_WEBDLL, NULL, iTermId, iSyncId);
        else
                WriteZString(pECB, MakeNewOrderForm(iTermId, iSyncId, FALSE, (BOOL)iRc) );

        return;
}
```

```
/* FUNCTION: void ProcessPaymentForm(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId)
 *
 * PURPOSE:  This function gets and validates the input data from the payment form
 *                                      filling in the required input variables. It then calls the SQLPayment
 *                                      transaction, constructs the output form and writes it back to client
 *                                      browser.
 *
 * ARGUMENTS:           EXTENSION_CONTROL_BLOCK         *pECB       passed in structure pointer from inetsrv.
 *                                                      int                                                     iTermId         client browser
terminal id
 *                                                      int                                                     iSyncId client browser sync
id
 *
 * RETURNS:             None
 *
 * COMMENTS:            None
 *
 */

static void ProcessPaymentForm(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId)
{
        int                                     iRc;
        int                                     iError;
        PECBINFO    pEcbInfo;

        memset(&Term.pClientData[iTermId].paymentData, 0, sizeof(PAYMENT_DATA));

        Term.pClientData[iTermId].paymentData.w_id = Term.pClientData[iTermId].w_id;

        if ( (iError=GetPaymentData(pECB->lpszQueryString, &Term.pClientData[iTermId].paymentData)) != ERR_SUCCESS )
        {
                ErrorMessage(pECB, iError, ERR_TYPE_WEBDLL, NULL, iTermId, iSyncId);
                return;
        }

        iRc = SQLPayment(pECB, iTermId, iSyncId, Term.pClientData[iTermId].dbproc, &Term.pClientData[iTermId].paymentData, iDeadlockRetry);

        if ( (pEcbInfo = (PECBINFO)dbgetuserdata(Term.pClientData[iTermId].dbproc)) )
        {
                if ( pEcbInfo->bFailed )
                        return;
        }

        if ( iRc == 0 )
                ErrorMessage(pECB, ERR_PAYMENT_INVALID_CUSTOMER, ERR_TYPE_WEBDLL, NULL, iTermId, iSyncId);
        else if ( iRc < 0 )
                ErrorMessage(pECB, ERR_PAYMENT_NOT_PROCESSED, ERR_TYPE_WEBDLL, NULL, iTermId, iSyncId);
        else
                WriteZString(pECB, MakePaymentForm(iTermId, iSyncId, FALSE) );

        return;
}

/* FUNCTION: void ProcessOrderStatusForm(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId)
 *
 * PURPOSE:  This function gets and validates the input data from the Order Status
 *                                      form filling in the required input variables. It then calls the
 *                                      SQLOrderStatus transaction, constructs the output form and writes it
 *                                      back to client browser.
 *
 * ARGUMENTS:           EXTENSION_CONTROL_BLOCK         *pECB       passed in structure pointer from inetsrv.
 *                                                      int                                                     iTermId         client browser
terminal id
 *                                                      int                                                     iSyncId client browser sync
id
 *
 * RETURNS:             None
 *
 * COMMENTS:            None
 *
 */

static void ProcessOrderStatusForm(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId)
{
        int                                     iRc;
        int                                     iError;
        PECBINFO    pEcbInfo;

        memset(&Term.pClientData[iTermId].orderStatusData, 0, sizeof(ORDER_STATUS_DATA));

        Term.pClientData[iTermId].orderStatusData.w_id = Term.pClientData[iTermId].w_id;

        if ( (iError=GetOrderStatusData(pECB->lpszQueryString, &Term.pClientData[iTermId].orderStatusData)) != ERR_SUCCESS )
        {
                ErrorMessage(pECB, iError, ERR_TYPE_WEBDLL, NULL, iTermId, iSyncId);
                return;
        }

        iRc = SQLOrderStatus(pECB, iTermId, iSyncId, Term.pClientData[iTermId].dbproc, &Term.pClientData[iTermId].orderStatusData, iDeadlockRetry);
        if ( (pEcbInfo = (PECBINFO)dbgetuserdata(Term.pClientData[iTermId].dbproc)) )
```

```
	{
		if ( pEcbInfo->bFailed )
			return;
	}

	if ( iRc == 0 )
		ErrorMessage(pECB, ERR_NOSUCH_CUSTOMER, ERR_TYPE_WEBDLL, NULL, iTermId, iSyncId);
	else if ( iRc < 0 )
		ErrorMessage(pECB, ERR_ORDER_STATUS_NOT_PROCESSED, ERR_TYPE_WEBDLL, NULL, iTermId, iSyncId);
	else
		WriteZString(pECB, MakeOrderStatusForm(iTermId, iSyncId, FALSE) );

	return;
}

/* FUNCTION: void ProcessDeliveryForm(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId)
 *
 * PURPOSE:  This function gets and validates the input data from the delivery form
 *		filling in the required input variables. It then calls the PostDeliveryInfo
 *		Api, The client is then informed that the transaction has been posted.
 *
 * ARGUMENTS:	EXTENSION_CONTROL_BLOCK	*pECB	passed in structure pointer from inetsrv.
 *		int		iTermId	client browser terminal id
 *		int		iSyncId	clinet browser sync id
 *
 * RETURNS:	None
 *
 * COMMENTS:	None
 *
 */

static void ProcessDeliveryForm(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId)
{
	char	szTmp[26];

	memset(&Term.pClientData[iTermId].deliveryData, 0, sizeof(DELIVERY_DATA));

	Term.pClientData[iTermId].deliveryData.w_id = Term.pClientData[iTermId].w_id;

	if ( !GetKeyValue(pECB->lpszQueryString, "OCD*", szTmp, sizeof(szTmp)) )
	{
		ErrorMessage(pECB, ERR_DELIVERY_MISSING_OCD_KEY, ERR_TYPE_WEBDLL, NULL, iTermId, iSyncId);
		return;
	}

	if ( !IsNumeric(szTmp) )
	{
		ErrorMessage(pECB, ERR_DELIVERY_CARRIER_INVALID, ERR_TYPE_WEBDLL, NULL, iTermId, iSyncId);
		return;
	}

	Term.pClientData[iTermId].deliveryData.o_carrier_id	= atoi(szTmp);


	if ( Term.pClientData[iTermId].deliveryData.o_carrier_id > 10 || Term.pClientData[iTermId].deliveryData.o_carrier_id < 1 )
	{
		ErrorMessage(pECB, ERR_DELIVERY_CARRIER_ID_RANGE, ERR_TYPE_WEBDLL, NULL, iTermId, iSyncId);
		return;
	}

	//post delivery info
	if ( PostDeliveryInfo(Term.pClientData[iTermId].deliveryData.w_id, Term.pClientData[iTermId].deliveryData.o_carrier_id) )
		strcpy(Term.pClientData[iTermId].deliveryData.execution_status, "Delivery Post Failed");
	else
		strcpy(Term.pClientData[iTermId].deliveryData.execution_status, "Delivery has been queued.");

	WriteZString(pECB, MakeDeliveryForm(iTermId, iSyncId, FALSE) );

	return;
}

/* FUNCTION: void ProcessStockLevelForm(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId)
 *
 * PURPOSE:  This function gets and validates the input data from the Stock Level
 *		form filling in the required input variables. It then calls the
 *		SQLStockLevel transaction, constructs the output form and writes it
 *		back to client browser.
 *
 * ARGUMENTS:	EXTENSION_CONTROL_BLOCK	*pECB	passed in structure pointer from inetsrv.
 *		int		iTermId	client browser terminal id
 *		int		iSyncId	client browser sync id
 *
 * RETURNS:	None
 *
 * COMMENTS:	None
 *
```

```
 */

static void ProcessStockLevelForm(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, int iSyncId)
{
	char		szTmp[26];
	BOOL		bRc;
	PECBINFO	pEcbInfo;

	memset(&Term.pClientData[iTermId].stockLevelData, 0, sizeof(STOCK_LEVEL_DATA));

	Term.pClientData[iTermId].stockLevelData.w_id = Term.pClientData[iTermId].w_id;
	Term.pClientData[iTermId].stockLevelData.d_id = Term.pClientData[iTermId].d_id;

	if ( !GetKeyValue(pECB->lpszQueryString, "TT*", szTmp, sizeof(szTmp)) )
	{
		ErrorMessage(pECB, ERR_STOCKLEVEL_MISSING_THRESHOLD_KEY, ERR_TYPE_WEBDLL, NULL, iTermId, iSyncId);
		return;
	}

	if ( !IsNumeric(szTmp) )
	{
		ErrorMessage(pECB, ERR_STOCKLEVEL_THRESHOLD_INVALID, ERR_TYPE_WEBDLL, NULL, iTermId, iSyncId);
		return;
	}

	Term.pClientData[iTermId].stockLevelData.thresh_hold = atoi(szTmp);

	if ( Term.pClientData[iTermId].stockLevelData.thresh_hold >= 100 || Term.pClientData[iTermId].stockLevelData.thresh_hold < 0 )
	{
		ErrorMessage(pECB, ERR_STOCKLEVEL_THRESHOLD_RANGE, ERR_TYPE_WEBDLL, NULL, iTermId, iSyncId);
		return;
	}

	bRc = SQLStockLevel(pECB, iTermId, iSyncId, Term.pClientData[iTermId].dbproc, &Term.pClientData[iTermId].stockLevelData, iDeadlockRetry);

	if ( (pEcbInfo = (PECBINFO)dbgetuserdata(Term.pClientData[iTermId].dbproc)) )
	{
		if ( pEcbInfo->bFailed )
			return;
	}

	if ( bRc )
		ErrorMessage(pECB, ERR_STOCKLEVEL_NOT_PROCESSED, ERR_TYPE_WEBDLL, NULL, iTermId, iSyncId);
	else
		WriteZString(pECB, MakeStockLevelForm(iTermId, iSyncId, FALSE) );

	return;
}

/* FUNCTION: int GetNewOrderData(LPSTR lpszQueryString, NEW_ORDER_DATA *pNewOrderData)
 *
 * PURPOSE:  This function extracts and validates the new order form data from an http command string.
 *
 * ARGUMENTS:		LPSTR		lpszQueryString		client browser http command string
 *			NEW_ORDER_DATA	*pNewOrderData		pointer to new order data structure
 *
 * RETURNS:		int		error code
indicating reason for failure
 *			ERR_SUCCESS
	new order input data successfully parsed
 *
 *
 * COMMENTS:		None
 *
 */

static int GetNewOrderData(LPSTR lpszQueryString, NEW_ORDER_DATA *pNewOrderData)
{
	char	szTmp[26];
	char	szKey[26];
	int		i;
	short	items;
	BOOL	bCheck;

	if ( !GetKeyValue(lpszQueryString, "DID*", szTmp, sizeof(szTmp)) )
		return ERR_NEWORDER_FORM_MISSING_DID;

	if ( !IsNumeric(szTmp) )
		return ERR_NEWORDER_DISTRICT_INVALID;

	pNewOrderData->d_id = atoi(szTmp);

	if ( !GetKeyValue(lpszQueryString, "CID*", szTmp, sizeof(szTmp)) )
		return ERR_NEWORDER_CUSTOMER_KEY;

	if ( !IsNumeric(szTmp) )
		return ERR_NEWORDER_CUSTOMER_INVALID;
	pNewOrderData->c_id = atoi(szTmp);

	bCheck = FALSE;
```

```
		for(i=0, items=0; i<15; i++)
		{
			wsprintf(szKey, "IID%2.2d*", i);
			if ( !GetKeyValue(lpszQueryString, szKey, szTmp, sizeof(szTmp)) )
				return ERR_NEWORDER_MISSING_IID_KEY;
			if ( szTmp[0] )
			{
				//if blank lines between item ids
				if ( bCheck )
					return ERR_NEWORDER_ITEM_BLANK_LINES;
				if ( !IsNumeric(szTmp) )
					return ERR_NEWORDER_ITEMID_INVALID;
				pNewOrderData->Ol[i].ol_i_id = atoi(szTmp);

				wsprintf(szKey, "SP%2.2d*", i);
				if ( !GetKeyValue(lpszQueryString, szKey, szTmp, sizeof(szTmp)) )
					return ERR_NEWORDER_MISSING_SUPPW_KEY;
				if ( !IsNumeric(szTmp) )
					return ERR_NEWORDER_SUPPW_INVALID;
				pNewOrderData->Ol[i].ol_supply_w_id = (short)atoi(szTmp);

				wsprintf(szKey, "Qty%2.2d*", i);
				if ( !GetKeyValue(lpszQueryString, szKey, szTmp, sizeof(szTmp)) )
					return ERR_NEWORDER_MISSING_QTY_KEY;

				if ( !IsNumeric(szTmp) )
					return ERR_NEWORDER_QTY_INVALID;

				pNewOrderData->Ol[i].ol_quantity = atoi(szTmp);
				items++;

				if ( pNewOrderData->Ol[i].ol_i_id >= 1000000 || pNewOrderData->Ol[i].ol_i_id < 1 )
					return ERR_NEWORDER_ITEMID_RANGE;
				if ( pNewOrderData->Ol[i].ol_quantity >= 100 || pNewOrderData->Ol[i].ol_quantity < 1 )
					return ERR_NEWORDER_QTY_RANGE;
			}
			else
			{
				wsprintf(szKey, "SP%2.2d*", i);
				if ( !GetKeyValue(lpszQueryString, szKey, szTmp, sizeof(szTmp)) )
					return ERR_NEWORDER_MISSING_QTY_KEY;

				if ( szTmp[0] )
					return ERR_NEWORDER_SUPPW_WITHOUT_ITEMID;

				wsprintf(szKey, "Qty%2.2d*", i);
				if ( !GetKeyValue(lpszQueryString, szKey, szTmp, sizeof(szTmp)) )
					return ERR_NEWORDER_MISSING_QTY_KEY;

				if ( szTmp[0] )
					return ERR_NEWORDER_QTY_WITHOUT_ITEMID;

				bCheck = TRUE;
			}
		}
		if ( items == 0 )
			return ERR_NEWORDER_NOITEMS_ENTERED;

		pNewOrderData->o_ol_cnt = items;

		return ERR_SUCCESS;
}

/* FUNCTION: int GetPaymentData(LPSTR lpszQueryString, PAYMENT_DATA *pPaymentData)
 *
 * PURPOSE:  This function extracts and validates the payment form data from an http command string.
 *
 * ARGUMENTS:		LPSTR		lpszQueryString		client browser http command string
 *			PAYMENT_DATA	*pPaymentData		pointer to payment data structure
 *
 * RETURNS:		int		error code
indicating reason for failure
 *			ERR_SUCCESS
		all input data successfully parsed
 *
 * COMMENTS:		None
 *
 */

static int GetPaymentData(LPSTR lpszQueryString, PAYMENT_DATA *pPaymentData)
{
		char		szTmp[26];
		char		*ptr;

		if ( !GetKeyValue(lpszQueryString, "DID*", szTmp, sizeof(szTmp)) )
			return ERR_PAYMENT_MISSING_DID_KEY;
		if ( !IsNumeric(szTmp) )
			return ERR_PAYMENT_DISTRICT_INVALID;
		pPaymentData->d_id = atoi(szTmp);
```

```
	if ( !GetKeyValue(lpszQueryString, "CID*", szTmp, sizeof(szTmp)) )
		return ERR_PAYMENT_MISSING_CID_KEY;

	if ( szTmp[0] && !IsNumeric(szTmp) )
		return ERR_PAYMENT_CUSTOMER_INVALID;


	pPaymentData->c_id = atoi(szTmp);

	if ( szTmp[0] == 0 )
	{
		if ( !GetKeyValue(lpszQueryString, "CLT*", szTmp, sizeof(szTmp)) )
			return ERR_PAYMENT_MISSING_CLT;
		_strupr( szTmp );

		strcpy(pPaymentData->c_last, szTmp);
		if ( strlen(pPaymentData->c_last) > 16 )
			return ERR_PAYMENT_LAST_NAME_TO_LONG;
	}
	else
	{
		if ( !GetKeyValue(lpszQueryString, "CLT*", szTmp, sizeof(szTmp)) )
			return ERR_PAYMENT_MISSING_CLT_KEY;
		if ( szTmp[0] )
			return ERR_PAYMENT_CID_AND_CLT;
	}

	if ( !GetKeyValue(lpszQueryString, "CDI*", szTmp, sizeof(szTmp)) )
		return ERR_PAYMENT_MISSING_CDI_KEY;
	if ( !IsNumeric(szTmp) )
		return ERR_PAYMENT_CDI_INVALID;
	pPaymentData->c_d_id = atoi(szTmp);

	if ( !GetKeyValue(lpszQueryString, "CWI*", szTmp, sizeof(szTmp)) )
		return ERR_PAYMENT_MISSING_CWI_KEY;

	if ( !IsNumeric(szTmp) )
		return ERR_PAYMENT_CWI_INVALID;

	pPaymentData->c_w_id = atoi(szTmp);


	if ( !GetKeyValue(lpszQueryString, "HAM*", szTmp, sizeof(szTmp)) )
		return ERR_PAYMENT_MISSING_HAM_KEY;

	ptr = szTmp;

	while( *ptr )
	{
		if ( *ptr == '.' )
		{
			ptr++;
			if ( !*ptr )
				break;
			if ( *ptr < '0' || *ptr > '9' )
				return ERR_PAYMENT_HAM_INVALID;
			ptr++;
			if ( !*ptr )
				break;
			if ( *ptr < '0' || *ptr > '9' )
				return ERR_PAYMENT_HAM_INVALID;
			if ( !*ptr )
				return ERR_PAYMENT_HAM_INVALID;
		}
		else if ( *ptr < '0' || *ptr > '9' )
				return ERR_PAYMENT_HAM_INVALID;
		ptr++;
	}

	pPaymentData->h_amount = atof(szTmp);
	if ( pPaymentData->h_amount >= 10000.00 || pPaymentData->h_amount < 0 )
		return ERR_PAYMENT_HAM_RANGE;

	return ERR_SUCCESS;
}

/* FUNCTION: int GetOrderStatusData(LPSTR lpszQueryString, ORDER_STATUS_DATA *pOrderStatusData)
 *
 * PURPOSE:  This function extracts and validates the payment form data from an http command string.
 *
 * ARGUMENTS:		LPSTR			lpszQueryString		client browser http command string
 *			ORDER_STATUS_DATA	*pOrderStatusData	pointer to order status data structure
 *
 * RETURNS:		int					error code
indicating reason for failure
 *			ERR_SUCCESS
		successfully parsed all required input data
 *
 * COMMENTS:		None
 *
```

```
 */
static int GetOrderStatusData(LPSTR lpszQueryString, ORDER_STATUS_DATA *pOrderStatusData)
{
	char		szTmp[26];

	if ( !GetKeyValue(lpszQueryString, "DID*", szTmp, sizeof(szTmp)) )
		return ERR_ORDERSTATUS_MISSING_DID_KEY;
	if ( !IsNumeric(szTmp) )
		return ERR_ORDERSTATUS_DID_INVALID;
	pOrderStatusData->d_id = atoi(szTmp);

	if ( !GetKeyValue(lpszQueryString, "CID*", szTmp, sizeof(szTmp)) )
		return ERR_ORDERSTATUS_MISSING_CID_KEY;

	if ( szTmp[0] == 0 )
	{
		pOrderStatusData->c_id = 0;
		if ( !GetKeyValue(lpszQueryString, "CLT*", szTmp, sizeof(szTmp)) )
			return ERR_ORDERSTATUS_MISSING_CLT_KEY;
		_strupr( szTmp );
		strcpy(pOrderStatusData->c_last, szTmp);
		if ( strlen(pOrderStatusData->c_last) > 16 )
			return ERR_ORDERSTATUS_CLT_RANGE;
	}
	else
	{
		if ( !IsNumeric(szTmp) )
			return ERR_ORDERSTATUS_CID_INVALID;
		pOrderStatusData->c_id = atoi(szTmp);
		if ( !GetKeyValue(lpszQueryString, "CLT*", szTmp, sizeof(szTmp)) )
			return ERR_ORDERSTATUS_MISSING_CLT_KEY;
		if ( szTmp[0] )
			return ERR_ORDERSTATUS_CID_AND_CLT;
	}

	return ERR_SUCCESS;
}

/* FUNCTION: BOOL ReadRegistrySettings(void)
 *
 * PURPOSE:  This function reads the NT registry for startup parameters. There parameters are
 *			under the TPCC key.
 *
 * ARGUMENTS:   None
 *
 * RETURNS:		None
 *
 * COMMENTS:		This function also sets up required operation variables to their default value
 *				so if registry is not setup the default values will be used.
 *
 */

static BOOL ReadRegistrySettings(void)
{
	HKEY	hKey;
	DWORD	size;
	DWORD	type;
	char	szTmp[256];

	bLog				= FALSE;
	iMaxWareHouses		= 500;
	iThreads			= 5;
	iDelayMs			= 100;
	iDeadlockRetry		= (short)3;
	strcpy(szTpccLogPath, "tpcclog.");


	if ( RegOpenKeyEx(HKEY_LOCAL_MACHINE, "SOFTWARE\\Microsoft\\TPCC", 0, KEY_READ, &hKey) != ERROR_SUCCESS )
		return TRUE;
	size = sizeof(szTmp);

	if ( RegQueryValueEx(hKey, "PATH", 0, &type, szTmp, &size) == ERROR_SUCCESS )
	{
		strcpy(szTpccLogPath, szTmp);
		strcat(szTpccLogPath, "tpcclog.");
		strcpy(szErrorLogPath, szTmp);
		strcat(szErrorLogPath, "tpccerr.");
	}

	size = sizeof(szTmp);
	if ( RegQueryValueEx(hKey, "LOG", 0, &type, szTmp, &size) == ERROR_SUCCESS )
	{
		if ( !stricmp(szTmp, "ON") )
			bLog = TRUE;
	}

	size = sizeof(szTmp);
	if ( RegQueryValueEx(hKey, "MaximumWarehouses", 0, &type, szTmp, &size) == ERROR_SUCCESS )
	{
		iMaxWareHouses = atoi(szTmp);
```

```
                        if ( iMaxWareHouses == 0 )
                                iMaxWareHouses = 500;
        }

        size = sizeof(szTmp);
        if ( RegQueryValueEx(hKey, "NumberOfDeliveryThreads", 0, &type, szTmp, &size) == ERROR_SUCCESS )
                iThreads = atoi(szTmp);
        if ( !iThreads )
                iThreads = 5;

        size = sizeof(szTmp);
        if ( RegQueryValueEx(hKey, "BackoffDelay", 0, &type, szTmp, &size) == ERROR_SUCCESS )
                iDelayMs = atoi(szTmp);
                if ( !iDelayMs )
                        iDelayMs = 100;

        size = sizeof(szTmp);
        if ( RegQueryValueEx(hKey, "DeadlockRetry", 0, &type, szTmp, &size) == ERROR_SUCCESS )
                iDeadlockRetry = (short)atoi(szTmp);
                if ( !iDeadlockRetry )
                        iDeadlockRetry = (short)3;

        size = sizeof(szTmp);
        if ( RegQueryValueEx(hKey, "MaxConnections", 0, &type, szTmp, &size) == ERROR_SUCCESS )
                iMaxConnections = (short)atoi(szTmp);
                if ( !iMaxConnections )
                        iMaxConnections = (short)25;

        RegCloseKey(hKey);

        return FALSE;

}

/* FUNCTION: BOOL PostDeliveryInfo(short w_id, short o_carrier_id)
 *
 * PURPOSE:  This function writes the delivery information to the delivery pipe. The information is
 *                      sent as a long.
 *
 * ARGUMENTS:           short                   w_id                    warehouse id
 *                                      short                   o_carrier_id    carrier id
 *
 * RETURNS:             BOOL    FALSE   delivery information posted successfully
 *                                                              TRUE    error cannot post delivery info
 *
 * COMMENTS:            The pipe is initially created with 16K buffer size this should allow for
 *                                      up to 4096 deliveries to be queued before an overflow condition would
 *                                      occur. The only reason that an overflow would occur is if the delivery
 *                                      application stopped listening while deliveries were being posted.
 *
 */

static BOOL PostDeliveryInfo(short w_id, short o_carrier_id)
{
        DELIVERY_TRANSACTION    deliveryTransaction;
        int                                                     d;
        int                                                     i;

        GetLocalTime(&deliveryTransaction.queue);

        deliveryTransaction.w_id                        =       w_id;
        deliveryTransaction.o_carrier_id        =       o_carrier_id;

        for(i=0; i<4; i++)
        {
                if ( WriteFile(hPipe, &deliveryTransaction, sizeof(deliveryTransaction), &d, NULL) )
                        return FALSE;

                if ( GetLastError() != ERROR_PIPE_BUSY )        //ERROR_PIPE_LISTENING
                        return TRUE;
        }

        return TRUE;
}

/* FUNCTION: BOOL IsNumeric(char *ptr)
 *
 * PURPOSE:  This function determines if a string is numeric. It fails if any characters other
 *                      than numeric and null terminator are present.
 *
 * ARGUMENTS:           char                    *ptr    pointer to string to check.
 *
 * RETURNS:             BOOL    FALSE   if string is not all numeric
 *                                                              TRUE    if string contains only numeric characters i.e. '0' – '9'
 *
 * COMMENTS:            None
 *
 */

static BOOL IsNumeric(char *ptr)
```

```
{
        if ( *ptr == 0 )
                return FALSE;

        while( *ptr && isdigit(*ptr) )
                ptr++;
        return ( !*ptr );
}

#ifdef USE_ODBC
        /* FUNCTION: static int ODBCError(DBPROCESS *dbproc)
         *
         * PURPOSE:  This function Handles the processing of errors from ODBC APIs
         *
         * ARGUMENTS:            PDBPROCESS
         *
         * RETURNS:              BOOL        FALSE       if string is not all numeric
         *                                                                   TRUE        if string contains only numeric characters i.e. '0' – '9'
         *
         * COMMENTS:             None
         *
         */

        static int ODBCError(DBPROCESS *dbproc)
        {
                RETCODE    rc;
                SDWORD     lNativeError;
                BOOL                bError;
                char       szState[6];
                char       szMsg[SQL_MAX_MESSAGE_LENGTH];
                char                timebuf[128];
                char                datebuf[128];

                pdbproc->deadlock_detected = TRUE;
                bError = FALSE;

                while( SQLError(dbproc->henv,
                                                        dbproc->hdbc,
                                                        dbproc->hstmt,
                                                        szState,
                                                        &lNativeError,
                                                        szMsg,
                                                        sizeof(szMsg),
                                                        NULL) != SQL_NO_DATA_FOUND )
                {
                        if (lNativeError == 1205)
                                dbproc->deadlock_detected = TRUE;
                        else
                        {
                                _strtime(timebuf);
                                _strdate(datebuf);

                                h_printf(dbproc->pECB, "%s %s : ODBC Error:  State=%s, Error=%ld, %s\n", datebuf, timebuf, szState, lNativeError,
szMsg);
                                bError = TRUE;
                        }
                }
                if ( bError )
                        return -1;
                return dbproc->deadlock_detected;
        }
#endif

/* FUNCTION: void FormatHTMLString(char *szBuff, int iLen, char *szStr)
 *
 * PURPOSE:  This function Handles translation of HTML specific character field data
 *                      when an HTML output form is generated.
 *
 * ARGUMENTS:           char        *szBuff     Returned string information
 *                                              char        *szStr      input string to be formatted.
 *                                              int                     iLen        Length of returned string
 *
 * RETURNS:             none
 *
 * COMMENTS:            The length paramter is the absolute length of the returned string in
 *                                              HTML characters. For example the input string > would be returned as
 *                                              &gt; which would be counted as 1 character.If the number of input
 *                                              characters is less than the iLen parameter spaces are appended to
 *                                              the end of the string to ensure that at least iLen characters are
 *                                              returned in the szBuff parameter.
 *
 */

static void FormatHTMLString(char *szBuff, char *szStr, int iLen)
{
        while( iLen && *szStr )
        {
                switch( *szStr )
                {
                        case '>':
```

```
                                        *szBuff++ = '&';
                                        *szBuff++ = 'g';
                                        *szBuff++ = 't';
                                        *szBuff++ = ';';
                                        szStr++;
                                        break;
                                case '<':
                                        *szBuff++ = '&';
                                        *szBuff++ = 'l';
                                        *szBuff++ = 't';
                                        *szBuff++ = ';';
                                        szStr++;
                                        break;
                                case '&':
                                        *szBuff++ = '&';
                                        *szBuff++ = 'a';
                                        *szBuff++ = 'm';
                                        *szBuff++ = 'p';
                                        *szBuff++ = ';';
                                        szStr++;
                                        break;
                                case \'"':
                                        *szBuff++ = '&';
                                        *szBuff++ = 'q';
                                        *szBuff++ = 'u';
                                        *szBuff++ = 'o';
                                        *szBuff++ = 't';
                                        *szBuff++ = ';';
                                        szStr++;
                                        break;
                                default:
                                        *szBuff++ = *szStr++;
                                        break;
                        }
                        iLen--;
                }
                while( iLen-- )
                        *szBuff++ = ' ';

                *szBuff = 0;

                return;
}
```

Webclnt.c

```
/*              FILE:                   WEBCNCT.C
 *
 *                                              Microsoft TPC-C Kit Ver. 3.00.000
 *
 *                                              Copyright Microsoft, 1996
 *
 *              PURPOSE:        Example application that connects a specified number of clients to
 *                                              the WEB client TPCC.DLL.
 *
 *              REQUIREMENTS:           Requires VC++ Version 4.2 for the wininet internet library.
 *
 *              Author:                 Philip Durr
 *                                              philipdu@Microsoft.com
 */

#include <windows.h>
#include <stdio.h>
#include <stdlib.h>
#include <memory.h>
#include <malloc.h>
#include <conio.h>
#include <wininet.h>

char szCmd1[256];
char szCmd2[256];
char szCmd3[256];

int versionMS = 3;
int versionMM = 0;
int versionLS = 2;

int                             main(int argc, char *argv[]);
void                    paktc(void);
int                             Login(HINTERNET         hInternet, int *pTermId, int *pSyncId);
int                             Logout(HINTERNET hInternet, int iTermId, int iSyncId);
int                             ReadUrlPage(HINTERNET hInternet, char *szUrl, char **ppBuffer, int *piTotalBytes);
static BOOL     GetParameters(int argc, char *argv[]);
static void     PrintParameters(void);
static void     PrintHeader(void);

int                     iTotalConnections;
```

```
int                     iTermId[8192];
int                     iSyncId[8192];
char        szInetServer[256];
char        szSqlServer[256];

/* FUNCTION: int main(int argc, char *argv[])
 *
 * PURPOSE:  This function is the beginning execution point for the webcnct executable.
 *
 * ARGUMENTS:          int             argc        number of command line arguments passed to delivery
 *                                     char        *argv[]     array of command line argument pointers
 *
 * RETURNS:            None
 *
 * COMMENTS:           None
 *
 */

int main(int argc, char *argv[])
{
        HINTERNET  hInternet;
        int                                     iRc;
        int                                     i;

        PrintHeader();
        if ( GetParameters(argc, argv) )
        {
                PrintParameters();
                return 0;
        }

        sprintf(szCmd1, "http://%s/tpcc.dll?CMD=Begin&Server=%s&", szInetServer, szSqlServer);
        sprintf(szCmd2, "http://%s/tpcc.dll?FORMID=1&w_id=1&d_id=6&CMD=Submit", szInetServer);
        sprintf(szCmd3, "http://%s/tpcc.dll?STATUSID=0&FORMID=2&TERMID=%%d&SYNCID=%%d&CMD=..Exit..", szInetServer);

        printf("About to attempt %d connections.\n", iTotalConnections);
        printf("On Internet Server %s.\n", szInetServer);
        printf("On SQL Server %s.\n", szSqlServer);

        paktc();

        if ( !(hInternet = InternetOpen("Web Test Connections", INTERNET_OPEN_TYPE_DIRECT, NULL, NULL, 0)) )
        {
                printf("Error cannot open internet connection, GetLastError() = %d\n",
                        GetLastError());
                return 0;
        }

        for(i=0; i<iTotalConnections; i++)
        {
                if ( (iRc = Login(hInternet, &iTermId[i], &iSyncId[i])) )
                {
                        printf("Error = %d\n", iRc);
                        goto main_exit;
                }
                printf("Login() TermID = %d SyncId = %d\n", iTermId[i], iSyncId[i]);
        }

        printf("All %d Connections made.\n", iTotalConnections);
        paktc();

        for(i=0; i<iTotalConnections; i++)
        {
                printf("Logout() TermID = %d SyncID = %d\n", iTermId[i], iSyncId[i]);
                if ( (iRc = Logout(hInternet, iTermId[i], iSyncId[i])) )
                {
                        printf("Error = %d\n", iRc);
                        goto main_exit;
                }
        }

main_exit:

        InternetCloseHandle(hInternet);

        return 0;
}

/* FUNCTION: void paktc(void)
 *
 * PURPOSE:  This function displays a message on the console and waits for the user to press a key.
 *
 * ARGUMENTS:          none
 *
 * RETURNS:            None
 *
 * COMMENTS:           None
 *
 */
```

```
void paktc(void)
{
        printf("Press any Key to Continue.");
        getch();
}

/* FUNCTION: int Login(HINTERNET hInternet, int *pTermId, int *pSyncId)
 *
 * PURPOSE:  This function logs the specified number of clients into the IIS TPCC.DLL client.
 *
 * ARGUMENTS:        HINTERNET  hInternet          internet handle return from InternetOpen()
 *                   int        *pTermId           terminal id array
 *                   int        *pSyncId           sync id array
 *
 * RETURNS:          0 if successfull or error code if an error occurs.
 *
 * COMMENTS:         The TermID and SyncID returned are provieded to the logout function
 *                   on exit or logout.
 *
 */

int Login(HINTERNET     hInternet, int *pTermId, int *pSyncId)
{
        int             iRc;
        int             iPageSize;
        char            *ptr;
        char            *pBuffer;
        static char *szKeyTermId = "NAME=\"TERMID\" VALUE=\"";
        static char *szKeySyncId = "NAME=\"SYNCID\" VALUE=\"";

        if ( (iRc = ReadUrlPage(hInternet, szCmd1, &pBuffer, NULL)) )
        {
                printf("ERROR: %s\n", pBuffer);
                return iRc;
        }
        free(pBuffer);

        if ( (iRc = ReadUrlPage(hInternet, szCmd2, &pBuffer, &iPageSize)) )
        {
                printf("ERROR: %s\n", pBuffer);
                return iRc;
        }
        ptr = strstr(pBuffer, szKeyTermId);
        if ( ptr )
        {
                ptr += strlen(szKeyTermId);
                *pTermId = atoi(ptr);

                ptr = strstr(pBuffer, szKeySyncId);
                if ( ptr )
                {
                        ptr += strlen(szKeySyncId);
                        *pSyncId = atoi(ptr);
                        free(pBuffer);
                        return 0;
                }
        }
        free(pBuffer);
        return -1;
}

/* FUNCTION: int Logout(HINTERNET hInternet, int iTermId, int iSyncId)
 *
 * PURPOSE:  This function logs the number of clients logged into the IIS TPCC.DLL client out.
 *
 * ARGUMENTS:        HINTERNET  hInternet    internet handle return from InternetOpen()
 *                   int        iTermId      terminal id array, provided from Login API.
 *                   int        iSyncId      sync id array, provided from Login API.
 *
 * RETURNS:          0 if successfull or error code if an error occurs.
 *
 * COMMENTS:         None
 *
 */

int Logout(HINTERNET hInternet, int iTermId, int iSyncId)
{
        char    *pBuffer;
        char    szTmp[256];
        int             iRc;

        sprintf(szTmp, szCmd3, iTermId, iSyncId);

        iRc = ReadUrlPage(hInternet, szTmp, &pBuffer, NULL);
        free(pBuffer);

        return iRc;
}
```

```
/* FUNCTION: int ReadUrlPage(HINTERNET hInternet, char *szUrl, char **ppBuffer, int *piTotalBytes)
 *
 * PURPOSE:  This function logs the number of clients logged into the IIS TPCC.DLL client out.
 *
 * ARGUMENTS:          HINTERNET  hInternet      internet handle return from InternetOpen()
 *                                                char                *szUrl              URL string passed to the internet service
 *                                                char                **ppBuffer    pointer to dynamically allocated buffer containing
 *                                                                                                                the result HTML page read
from the URL.
 *                                                int                 *piTotalBytes size of the returned HTML page in bytes.
 *
 * RETURNS:            0 if successfull or error code if an error occurs.
 *
 * COMMENTS:           The caller is responsible for freeing the returned buffer.
 *
 */

int ReadUrlPage(HINTERNET hInternet, char *szUrl, char **ppBuffer, int *piTotalBytes)
{
        HINTERNET  hUrl;
        BOOL                bOk;
        int                 bytesRead;
        int                 iBuffSize;
        int                 iCurrentByte;
        char                szTmp[512];


        *ppBuffer = (char *)malloc(512);
        iBuffSize = 512;
        iCurrentByte = 0;
        **ppBuffer = 0;
        if ( piTotalBytes )
                *piTotalBytes = 0;

        hUrl = InternetOpenUrl(hInternet, szUrl, NULL, 0, INTERNET_FLAG_RELOAD, 0);
        if ( !hUrl )
        {
                return GetLastError();
        }
        do
        {
                bOk = InternetReadFile(hUrl, szTmp, sizeof(szTmp), &bytesRead);
                if ( !bOk )
                        break;
                if ( (iBuffSize − iCurrentByte) <= bytesRead )
                {
                        iBuffSize += (((bytesRead/512)+1)*512);
                        *ppBuffer = realloc(*ppBuffer, iBuffSize );
                        if ( !(*ppBuffer) )
                        {
                                InternetCloseHandle(hUrl);
                                return −2;
                        }

                }
                memcpy(((*ppBuffer)+iCurrentByte), szTmp, bytesRead);
                iCurrentByte += bytesRead;
        } while( bOk && (bytesRead != 0 ) );

        InternetCloseHandle(hUrl);

        if ( !bOk )
                return GetLastError();

        if ( piTotalBytes )
                *piTotalBytes = iCurrentByte;

        return 0;
}

/* FUNCTION: BOOL GetParameters(int argc, char *argv[])
 *
 * PURPOSE:  This function parses the command line passed in to the delivery executable, initializing
 *                                 and filling in global variable parameters.
 *
 * ARGUMENTS:          int                 argc        number of command line arguments passed to delivery
 *                                         char        *argv[]     array of command line argument pointers
 *
 * RETURNS:            BOOL        FALSE   parameter read successfull
 *                                                         TRUE        user has requested parameter information screen be displayed.
 *
 * COMMENTS:           None
 *
 */

static BOOL GetParameters(int argc, char *argv[])
{
        int i;

        szSqlServer[0] = 0;
```

```
	szInetServer[0] = 0;
	iTotalConnections = 100;

	for(i=0; i<argc; i++)
	{
		if ( argv[i][0] == '-' || argv[i][0] == '/' )
		{
			switch(argv[i][1])
			{
				case 'S':
				case 's':
					strcpy(szSqlServer, argv[i]+2);
					break;
				case 'I':
				case 'i':
					strcpy(szInetServer, argv[i]+2);
					break;
				case 'C':
				case 'c':
					if ( !(iTotalConnections = atoi(argv[i]+2)) )
						iTotalConnections = 100;
					break;
				case '?':
					return TRUE;
			}
		}
	}
	if ( !szInetServer[0] )
		return TRUE;

	return FALSE;
}

/* FUNCTION: void PrintParameters(void)
 *
 * PURPOSE:  This function displays the supported command line flags.
 *
 * ARGUMENTS:		None
 *
 * RETURNS:		None
 *
 * COMMENTS:		None
 *
 */

static void PrintParameters(void)
{
	printf("WEBTEST:\n");
	printf("Parameter                                    Default\n");
	printf("-------------------------------------------------------------------------------\n");
	printf("-S SQL Server for test run.                  local  \n");
	printf("-I Internet server for test run.(Required)       none   \n");
	printf("-C Total connections for test run.             100    \n");
	printf("-? This help screen\n\n");
	printf("Note:  Command line switches are NOT case sensitive.\n");

	return;
}

/* FUNCTION: void PrintHeader(void)
 *
 * PURPOSE:  This function displays the delivery executable's banner information.
 *
 * ARGUMENTS:		None
 *
 * RETURNS:		None
 *
 * COMMENTS:		None
 *
 */

static void PrintHeader(void)
{
	printf("*****************************************************\n");
	printf("*                                   *\n");
	printf("*  Microsoft SQL Server 6.5                 *\n");
	printf("*                                   *\n");
	printf("*  HTML TPC-C BENCHMARK KIT: Web Connect Utility *\n");
	printf("*  Version %d.%2.2d.%3.3d                        *\n", versionMS, versionMM, versionLS);
	printf("*                                   *\n");
	printf("*****************************************************\n\n");

	return;
}
```

Appendix B – Database Design

Build

Createdb.sql

```
/* TPC-C Benchmark Kit                  */
/*                                      */
/* CREATEDB.SQL                         */
/*                                      */
/* This script is used to create the database   */


use master
go

if exists ( select name from sysdatabases where name = "tpcc" )
        drop database tpcc
go

create database tpcc on
                        bigdev1 = 1481,
                        bigdev2 = 1481,
                        bigdev3 = 1481,
                        bigdev4 = 1481,
                        bigdev5 = 1481,

                        bigdev5 = 1481,
                        bigdev1 = 1481,
                        bigdev2 = 1481,
                        bigdev3 = 1481,
                        bigdev4 = 1481,

                        bigdev4 = 1481,
                        bigdev5 = 1481,
                        bigdev1 = 1481,
                        bigdev2 = 1481,
                        bigdev3 = 1481,

                        bigdev3 = 1481,
                        bigdev4 = 1481,
                        bigdev5 = 1481,
                        bigdev1 = 1481,
                        bigdev2 = 1481,

                        bigdev2 = 1481,
                        bigdev3 = 1481,
                        bigdev4 = 1481,
                        bigdev5 = 1481,
                        bigdev1 = 1481,

                        ol1     = 17178,
                        misc1   = 13608

        log on tpcclog1 =  8670,
                        tpcclog2 = 8670
go
```

Diskinit.sql

```
/* TPC-C Benchmark Kit                          */
/*                                      */
/* DISKINIT.SQL                                 */
/*                                      */
/* This script is used create the database devices for a 500    */
/* warehouse database.                          */
/* NOTE! This version of DISKINIT.SQL assumes that you are using */
/* some form of NT partitioning. If you wish to use raw         */
/* partitions, YOU MUST SPECIFY A DRIVE LETTER ONLY for the     */
/* physname parm! Raw partitions will not accept a file name.   */
/* Also note that use of a drive letter only for the physname   */
/* parm will result in corruption of any normal NT partition!   */

use master
go

disk init name = "tpcclog1",
        physname = "X:",
        vdevno   = 2,
        size     = 4442112
go

disk init name = "tpcclog2",
        physname = "V:",
        vdevno   = 3,
        size     = 4442112
go

disk init name = "tpcclog3",
        physname = "W:",
        vdevno   = 4,
        size     = 2048000
go

/*
 *  Devices for Warehouse, District, Item, New_order, History, and Order tables
*/
disk init name = "misc1",
        physname = "E:",
        vdevno   = 5,
        size     = 6967296
go

/*
 * Devices for Order_line table
 */
disk init name = "ol1",
        physname = "F:",
        vdevno   = 6,
        size     = 8795136
go

/*
 * Devices for customer and stock tables
 */
disk init name = "bigdev1",
        physname = "G:",
        vdevno   = 7,
        size     = 4080640
go

disk init name = "bigdev2",
        physname = "H:",
        vdevno   = 8,
        size     = 4080640
go

disk init name = "bigdev3",
        physname = "I:",
        vdevno   = 9,
        size     = 4080640
go

disk init name = "bigdev4",
        physname = "J:",
        vdevno   = 10,
        size     = 4080640
go

disk init name = "bigdev5",
        physname = "K:",
        vdevno   = 11,
        size     = 4080640
go
```

Segment.sql

```
/* TPC-C Benchmark Kit                  */
/*                                      */
/* SEGMENT.SQL                          */
/*                                      */
/* This script is used to create the database segments  */


use tpcc
go

/* Drop all segments if needed  */

sp_dropsegment big_seg
go
sp_dropsegment ol_seg
go
sp_dropsegment misc_seg
```

```
go

/*  Create segment for Customer and Stock tables  */

exec sp_addsegment big_seg, bigdev1
exec sp_extendsegment big_seg, bigdev2
exec sp_extendsegment big_seg, bigdev3
exec sp_extendsegment big_seg, bigdev4
exec sp_extendsegment big_seg, bigdev5
go

/*  Create segment for Order−line table  */

exec sp_addsegment ol_seg, ol1
go

/*  create segment for warehouse, district, item, new−order, history, and Order
tables */

exec sp_addsegment misc_seg, misc1
go
```

Tables.sql

```
/*  TPC−C Benchmark Kit                          */
/*                                          */
/*  TABLES.SQL                              */
/*                                          */
/*  Creates TPC−C tables (seg)                   */


use tpcc
go

checkpoint
go


if exists ( select name from sysobjects where name = 'warehouse' )
        drop table warehouse
go

create table warehouse
(
        w_id
        smallint,
        w_name
        char(10),
        w_street_1                      char(20),
        w_street_2                      char(20),
        w_city
        char(20),
        w_state
        char(2),
        w_zip
        char(9),
        w_tax
        numeric(4,4),
        w_ytd
        numeric(12,2)
) on misc_seg
go


if exists ( select name from sysobjects where name = 'district' )
        drop table district
go

create table district
(
        d_id                                            tinyint,
        d_w_id
        smallint,
        d_name
        char(10),
        d_street_1                      char(20),
        d_street_2                      char(20),
        d_city
        char(20),
        d_state
        char(2),
        d_zip
        char(9),
        d_tax
        numeric(4,4),
        d_ytd
        numeric(12,2),
        d_next_o_id                     int
) on misc_seg
go


if exists ( select name from sysobjects where name = 'customer' )
        drop table customer
go

create table customer
(
        c_id                                            int,
        c_d_id                                          tinyint,
        c_w_id
        smallint,
        c_first
        char(16),
        c_middle                        char(2),
        c_last
        char(16),
        c_street_1                      char(20),
        c_street_2                      char(20),
        c_city
        char(20),
        c_state
        char(2),
        c_zip
        char(9),
        c_phone
        char(16),
        c_since
        datetime,
        c_credit                        char(2),
        c_credit_lim            numeric(12,2),
        c_discount                      numeric(4,4),
        c_balance                       numeric(12,2),
        c_ytd_payment                   numeric(12,2),
        c_payment_cnt                   smallint,
        c_delivery_cnt          smallint,
        c_data_1                        char(250),
        c_data_2                        char(250)
) on big_seg
go


if exists ( select name from sysobjects where name = 'history' )
        drop table history
go

create table history
(
        h_c_id                                          int,
        h_c_d_id                        tinyint,
        h_c_w_id                        smallint,
        h_d_id                                          tinyint,
        h_w_id
        smallint,
        h_date
        datetime,
        h_amount                        numeric(6,2),
        h_data
        char(24)
) on misc_seg
go


if exists ( select name from sysobjects where name = 'new_order' )
        drop table new_order
go

create table new_order
(
        no_o_id                                         int,
        no_d_id                                         tinyint,
        no_w_id
        smallint
) on misc_seg
go


if exists ( select name from sysobjects where name = 'orders' )
        drop table orders
go

create table orders
(
        o_id                                            int,
        o_d_id                                          tinyint,
        o_w_id
        smallint,
        o_c_id                                          int,
```

```
        o_entry_d                       datetime,
        o_carrier_id            tinyint,
        o_ol_cnt                        tinyint,
        o_all_local                     tinyint
) on misc_seg
go


if exists ( select name from sysobjects where name = 'order_line' )
        drop table order_line
go

create table order_line
(
        ol_o_id                                         int,
        ol_d_id                                         tinyint,
        ol_w_id
        smallint,
        ol_number                       tinyint,
        ol_i_id                                         int,
        ol_supply_w_id                  smallint,
        ol_delivery_d           datetime,
        ol_quantity                     smallint,
        ol_amount                       numeric(6,2),
        ol_dist_info            char(24)
) on ol_seg
go


if exists ( select name from sysobjects where name = 'item' )
        drop table item
go

create table item
(
        i_id                                            int,
        i_im_id                                         int,
        i_name
        char(24),
        i_price
        numeric(5,2),
        i_data
        char(50)
) on misc_seg
go


if exists ( select name from sysobjects where name = 'stock' )
        drop table stock
go

create table stock
(
        s_i_id                                          int,
        s_w_id
        smallint,
        s_quantity                      smallint,
        s_dist_01                       char(24),
        s_dist_02                       char(24),
        s_dist_03                       char(24),
        s_dist_04                       char(24),
        s_dist_05                       char(24),
        s_dist_06                       char(24),
        s_dist_07                       char(24),
        s_dist_08                       char(24),
        s_dist_09                       char(24),
        s_dist_10                       char(24),
        s_ytd                                           int,
        s_order_cnt                     smallint,
        s_remote_cnt            smallint,
        s_data
        char(50)
) on big_seg
go
```

Idxcuscl.sql

```
/* TPC-C Benchmark Kit                          */
/*                                      */
/* IDXCUSCL.SQL                         */
/*                                      */
/* Creates clustered index on customer (seg)            */


use tpcc
go


if exists ( select name from sysindexes where name = 'customer_c1' )
        drop index customer.customer_c1
go

select getdate()
go
create unique clustered index customer_c1 on customer(c_w_id, c_d_id, c_id)
        with sorted_data on big_seg
go
select getdate()
go
```

Idxcusnc.sql

```
/* TPC-C Benchmark Kit                          */
/*                                      */
/* IDXCUSNC.SQL                         */
/*                                      */
/* Creates non-clustered index on customer (seg)        */


use tpcc
go


if exists ( select name from sysindexes where  name = 'customer_nc1' )
        drop index customer.customer_nc1
go

select getdate()
go
create unique nonclustered index customer_nc1 on customer(c_w_id, c_d_id,
c_last, c_first, c_id)
        on big_seg
go
select getdate()
go
```

Idxdiscl.sql

```
/* TPC-C Benchmark Kit                          */
/*                                      */
/* IDXDISCL.SQL                         */
/*                                      */
/* Creates clustered index on district (seg)            */


use tpcc
go


if exists ( select name from sysindexes where name = 'district_c1' )
        drop index district.district_c1
go

select getdate()
go
create unique clustered index  district_c1 on district(d_w_id, d_id)
        with fillfactor=1 on misc_seg
go
select getdate()
go
```

Idxitmcl.sql

```
/* TPC-C Benchmark Kit                          */
/*                                      */
/* IDXITMCL.SQL                         */
/*                                      */
/* Creates clustered index on item (seg)                */


use tpcc
go


if exists ( select name from sysindexes where  name = 'item_c1' )
        drop index item.item_c1
go

select getdate()
go
create unique clustered index item_c1 on item(i_id)
        with sorted_data on misc_seg
go
select getdate()
```

```
go
```

Idxnodcl.sql

```
/*  TPC−C Benchmark Kit                                 */
/*                                                      */
/*  IDXNODCL.SQL                                        */
/*                                                      */
/*  Creates clustered index on new−order (seg)          */

use tpcc
go

if exists ( select name from sysindexes where  name = 'new_order_c1' )
        drop index new_order.new_order_c1
go

select getdate()
go
create unique clustered index new_order_c1 on new_order(no_w_id, no_d_id,
no_o_id)
        with sorted_data on misc_seg
go
select getdate()
go
```

Idxodlcl.sql

```
/*  TPC−C Benchmark Kit                                 */
/*                                                      */
/*  IDXODLCL.SQL                                        */
/*                                                      */
/*  Creates clustered index on order−line (seg)         */

use tpcc
go

if exists ( select name from sysindexes where  name = 'order_line_c1' )
        drop index order_line.order_line_c1
go

select getdate()
go
create unique clustered index order_line_c1 on order_line(ol_w_id, ol_d_id,
ol_o_id, ol_number)
        with sorted_data on ol_seg
go
select getdate()
go
```

Idxordcl.sql

```
/*  TPC−C Benchmark Kit                                 */
/*                                                      */
/*  IDXORDCL.SQL                                        */
/*                                                      */
/*  Creates clustered index on orders (seg)             */

use tpcc
go

if exists ( select name from sysindexes where  name = 'orders_c1' )
        drop index orders.orders_c1
go

select getdate()
go
create unique clustered index orders_c1 on orders(o_w_id, o_d_id, o_id)
        with sorted_data on misc_seg
go
select getdate()
go
```

Idxstkcl.sql

```
/*  TPC−C Benchmark Kit                                 */
/*                                                      */
/*  IDXSTKCL.SQL                                        */
/*                                                      */
/*  Creates clustered index on stock (seg)              */

use tpcc
go

if exists ( select name from sysindexes where  name = 'stock_c1' )
        drop index stock.stock_c1
go

select getdate()
go
create unique clustered index stock_c1 on stock(s_i_id, s_w_id)
        with sorted_data on big_seg
go
select getdate()
go
```

Idxwarcl.sql

```
/*  TPC−C Benchmark Kit                                 */
/*                                                      */
/*  IDXWARCL.SQL                                        */
/*                                                      */
/*  Creates clustered index on warehouse (seg)          */

use tpcc
go

if exists ( select name from sysindexes where name = 'warehouse_c1' )
        drop index warehouse.warehouse_c1
go

select getdate()
go
create unique clustered index warehouse_c1 on warehouse(w_id)
        with fillfactor=1 on misc_seg
go
select getdate()
go
```

Dbopt1.sql

```
/*  TPC−C Benchmark Kit                                 */
/*                                                      */
/*  DBOPT1.SQL                                          */
/*                                                      */
/*  Set database options for database load              */

use master
go

sp_dboption tpcc,'select into/bulkcopy',true
go

sp_dboption tpcc,'trunc. log on chkpt.',true
go

use tpcc
go

checkpoint
go

use tpcc_admin
go

sp_dboption tpcc,'trunc. log on chkpt.',true
go
```

Dbopt2.sql

```
/*  TPC−C Benchmark Kit                                 */
/*                                                      */
/*  DBOPT2.SQL                                          */
/*                                                      */
/*  Reset database options after database load          */

use master
go
```

```
sp_dboption tpcc,'select ',false
go

sp_dboption tpcc,'trunc. ',false
go

use tpcc
go

checkpoint
go
```

Pintable.sql

```
/* TPC−C Benchmark Kit                                          */
/*                                                              */
/* PINTABLE.SQL                                                 */
/*                                                              */
/* This script file is used to 'pin' certain tables in the data cache      */

use tpcc
go

exec sp_tableoption "district","pintable",true
exec sp_tableoption "warehouse","pintable",true
exec sp_tableoption "new_order","pintable",true
exec sp_tableoption "item","pintable",true
go
```

Tpccbcp.sql

```
/* TPC−C Benchmark Kit                                          */
/*                                                              */
/* TPCCBCP.SQL                                                  */
/*                                                              */
/* This script file sets the table lock option for bulk load               */


use tpcc
go

exec sp_tableoption "warehouse","table lock on bulk load",true
exec sp_tableoption "district","table lock on bulk load",true
exec sp_tableoption "stock","table lock on bulk load",true
exec sp_tableoption "item","table lock on bulk load",true
exec sp_tableoption "customer","table lock on bulk load",true
exec sp_tableoption "history","table lock on bulk load",true
exec sp_tableoption "orders","table lock on bulk load",true
exec sp_tableoption "order_line","table lock on bulk load",true
exec sp_tableoption "new_order","table lock on bulk load",true
go
```

Tpccirl.sql

```
/* TPC−C Benchmark Kit                                          */
/*                                                              */
/* TPCCIRL.SQL                                                  */
/*                                                              */
/* This script file sets the insert row lock option on selected tables     */


use tpcc
go

exec sp_tableoption "history","insert row lock",true
exec sp_tableoption "new_order","insert row lock",true
exec sp_tableoption "orders","insert row lock",true
exec sp_tableoption "order_line","insert row lock",true
go
```

Stored Procedures

Neword.sql

```
/* File:      NEWORD.SQL                                        */
/*            Microsoft TPC−C Kit Ver. 3.00.000                 */
/*            Audited 08/23/96, By Francois Raab                */
/*                                                              */
/*            Copyright Microsoft, 1996                         */
/*                                                              */
/* Purpose:   New−Order transaction for Microsoft TPC−C Benchmark Kit   */
/* Author:    Damien Lindauer                                   */
/*            damienl@Microsoft.com                             */


use tpcc
go

/* new−order transaction stored procedure */

if exists ( select name from sysobjects where name = "tpcc_neworder" )
        drop procedure tpcc_neworder
go

create proc tpcc_neworder
        @w_id           smallint,
        @d_id           tinyint,
        @c_id           int,
        @o_ol_cnt       tinyint,
        @o_all_local    tinyint,
        @i_id1  int = 0, @s_w_id1 smallint = 0, @ol_qty1 smallint = 0,
        @i_id2  int = 0, @s_w_id2 smallint = 0, @ol_qty2 smallint = 0,
        @i_id3  int = 0, @s_w_id3 smallint = 0, @ol_qty3 smallint = 0,
        @i_id4  int = 0, @s_w_id4 smallint = 0, @ol_qty4 smallint = 0,
        @i_id5  int = 0, @s_w_id5 smallint = 0, @ol_qty5 smallint = 0,
        @i_id6  int = 0, @s_w_id6 smallint = 0, @ol_qty6 smallint = 0,
        @i_id7  int = 0, @s_w_id7 smallint = 0, @ol_qty7 smallint = 0,
        @i_id8  int = 0, @s_w_id8 smallint = 0, @ol_qty8 smallint = 0,
        @i_id9  int = 0, @s_w_id9 smallint = 0, @ol_qty9 smallint = 0,
        @i_id10 int = 0, @s_w_id10 smallint = 0, @ol_qty10 smallint = 0,
        @i_id11 int = 0, @s_w_id11 smallint = 0, @ol_qty11 smallint = 0,
        @i_id12 int = 0, @s_w_id12 smallint = 0, @ol_qty12 smallint = 0,
        @i_id13 int = 0, @s_w_id13 smallint = 0, @ol_qty13 smallint = 0,
        @i_id14 int = 0, @s_w_id14 smallint = 0, @ol_qty14 smallint = 0,
        @i_id15 int = 0, @s_w_id15 smallint = 0, @ol_qty15 smallint = 0



as
declare @w_tax          numeric(4,4),
        @d_tax          numeric(4,4),
        @c_last         char(16),
        @c_credit       char(2),
        @c_discount     numeric(4,4),
        @i_price        numeric(5,2),
        @i_name         char(24),
        @i_data         char(50),
        @o_entry_d      datetime,
        @remote_flag    int,
        @s_quantity     smallint,
        @s_data         char(50),
        @s_dist         char(24),
                        @li_no          int,
                        @o_id                                   int,
                        @commit_flag    tinyint,
        @li_id          int,
        @li_s_w_id      smallint,
        @li_qty         smallint,
                        @ol_number              int,
                        @c_id_local             int

begin

        begin transaction n

   /* get order date */

   select @o_entry_d = getdate()

   /* get district tax and next availible order id and update */

   update district
        set @d_tax      = d_tax,
           @o_id        = d_next_o_id,
                        d_next_o_id = d_next_o_id + 1
           where d_w_id = @w_id and
                 d_id   = @d_id

        /*  process orderlines */

   select  @li_no = 0

        /*  set commit flag */
        select @commit_flag = 1

   while (@li_no < @o_ol_cnt)
        begin

      select @li_no = @li_no + 1

          /*  Set i_id, s_w_id, and qty for this lineitem */
```

```
                select @li_id = case @li_no
                    when 1 then @i_id1
                                        when 2 then @i_id2
                                        when 3 then @i_id3
                                        when 4 then @i_id4
                                        when 5 then @i_id5
                                        when 6 then @i_id6
                                        when 7 then @i_id7
                                        when 8 then @i_id8
                                        when 9 then @i_id9
                                        when 10 then @i_id10
                                        when 11 then @i_id11
                                        when 12 then @i_id12
                                        when 13 then @i_id13
                                        when 14 then @i_id14
                                        when 15 then @i_id15
                                        end

                                select      @li_s_w_id = case @li_no
                                        when 1 then @s_w_id1
                                        when 2 then @s_w_id2
                                        when 3 then @s_w_id3
                                        when 4 then @s_w_id4
                                        when 5 then @s_w_id5
                                        when 6 then @s_w_id6
                                        when 7 then @s_w_id7
                                        when 8 then @s_w_id8
                                        when 9 then @s_w_id9
                                        when 10 then @s_w_id10
                                        when 11 then @s_w_id11
                                        when 12 then @s_w_id12
                                        when 13 then @s_w_id13
                                        when 14 then @s_w_id14
                                        when 15 then @s_w_id15
                                        end

                                select      @li_qty = case  @li_no
                                        when 1 then @ol_qty1
                                        when 2 then @ol_qty2
                                        when 3 then @ol_qty3
                                        when 4 then @ol_qty4
                                        when 5 then @ol_qty5
                                        when 6 then @ol_qty6
                                        when 7 then @ol_qty7
                                        when 8 then @ol_qty8
                                        when 9 then @ol_qty9
                                        when 10 then @ol_qty10
                                        when 11 then @ol_qty11
                                        when 12 then @ol_qty12
                                        when 13 then @ol_qty13
                                        when 14 then @ol_qty14
                                        when 15 then @ol_qty15
                                        end

        /* get item data (no one updates item) */

        select @i_price = i_price,
             @i_name  = i_name,
             @i_data  = i_data
        from item (tablock holdlock)
                where i_id = @li_id

                /* if there actually is an item with this id, go to work */

                        if (@@rowcount > 0)
                        begin
          update stock set s_ytd       = s_ytd + @li_qty,
                @s_quantity  = s_quantity,
                s_quantity   = s_quantity − @li_qty +
                   case when (s_quantity − @li_qty < 10) then 91 else 0 end,
                s_order_cnt  = s_order_cnt + 1,
                s_remote_cnt = s_remote_cnt + case
                   when (@li_s_w_id = @w_id) then 0 else 1 end,
                @s_data      = s_data,
                @s_dist      = case @d_id
                                                        when 1  then
s_dist_01
                                                        when 2  then
s_dist_02
                                                        when 3  then
s_dist_03
                                                        when 4  then
s_dist_04
                                                        when 5  then
s_dist_05
                                                        when 6  then
s_dist_06
                                                        when 7  then
s_dist_07
                                                        when 8  then
s_dist_08
                                                        when 9  then
s_dist_09
                                                        when 10 then
s_dist_10
                                        end
                where s_i_id = @li_id and
                                                s_w_id = @li_s_w_id

                                        /* insert order_line data (using data
from item and stock) */

                insert into order_line values(@o_id,            /* from district update */
                                @d_id,                                  /* input param
*/
                                @w_id,          /* input param          */
                                @li_no,         /* orderline number     */
                                @li_id,         /* lineitem id          */
                                @li_s_w_id,     /* lineitem warehouse   */
                                "jan 1, 1900",  /* constant             */
                                @li_qty,        /* lineitem qty         */
                                @i_price * @li_qty, /* ol_amount            */
                                @s_dist)        /* from stock           */


                /* send line−item data to client */

                                        select @i_name,
                        @s_quantity,
                        b_g = case when ( (patindex("%ORIGINAL%",@i_data) > 0) and
                                        (patindex("%ORIGINAL%",@s_data) > 0) )
                            then "B" else "G" end,
                        @i_price,
                        @i_price * @li_qty

            end
            else
                                begin

                                        /*  no item found − triggers rollback condition */


                                                select "",0,"",0,0
                                                select @commit_flag = 0


                                end
                        end

          /* get customer last name, discount, and credit rating */

          select @c_last     = c_last,
               @c_discount = c_discount,
               @c_credit   = c_credit,
                                @c_id_local = c_id
          from customer holdlock
          where c_id   = @c_id and
              c_w_id = @w_id and
              c_d_id = @d_id

          /* insert fresh row into orders table */

          insert into orders values (@o_id,
                                                @d_id,
                                                        @w_id,
                                                        @c_id_local,
                                                       @o_entry_d,
                                                      0,
                                                       @o_ol_cnt,
                                                       @o_all_local)

                        /* insert corresponding row into new−order table */

                        insert into new_order values (@o_id,
                                                        @d_id,
                                                       @w_id)

                        /*  select warehouse tax */

                        select @w_tax = w_tax
                        from warehouse holdlock
                        where w_id = @w_id

                        if (@commit_flag = 1)

                                commit transaction n
                        else
                                /* all that work for nuthin!!! */
                                rollback transaction n
```

```
                /* return order data to client */
                select @w_tax,
                     @d_tax,
                                @o_id,
                                @c_last,
                                @c_discount,
                                @c_credit,
                                @o_entry_d,
                                @commit_flag

end

go
```

Payment.sql

```
/*  File:      PAYMENT.SQL                                  */
/*             Microsoft TPC−C Kit Ver. 3.00.000            */
/*             Audited 08/23/96, By Francois Raab           */
/*                                                          */
/*             Copyright Microsoft, 1996                    */
/*                                                          */
/*  Purpose:   Payment transaction for Microsoft TPC−C Benchmark Kit   */
/*  Author:    Damien Lindauer                              */
/*             damienl@Microsoft.com                        */


use tpcc
go

if exists (select name from sysobjects where name = "tpcc_payment" )
                drop procedure tpcc_payment
go

create proc tpcc_payment @w_id          smallint,
                                 @c_w_id        smallint,
                                 @h_amount      numeric(6,2),
                                 @d_id          tinyint,
                                 @c_d_id        tinyint,
                                 @c_id          int,
                                 @c_last        char(16) = ""



as
declare  @w_street_1     char(20),
        @w_street_2     char(20),
        @w_city         char(20),
        @w_state        char(2),
        @w_zip          char(9),
        @w_name         char(10),
        @d_street_1     char(20),
        @d_street_2     char(20),
        @d_city         char(20),
        @d_state        char(2),
        @d_zip          char(9),
        @d_name         char(10),
        @c_first        char(16),
        @c_middle       char(2),
        @c_street_1     char(20),
        @c_street_2     char(20),
        @c_city         char(20),
        @c_state        char(2),
        @c_zip          char(9),
        @c_phone        char(16),
        @c_since        datetime,
        @c_credit       char(2),
        @c_credit_lim   numeric(12,2),
        @c_balance      numeric(12,2),
        @c_discount     numeric(4,4),
        @data1          char(250),
        @data2          char(250),
        @c_data_1       char(250),
        @c_data_2       char(250),
        @datetime       datetime,
        @w_ytd          numeric(12,2),
        @d_ytd          numeric(12,2),
        @cnt            smallint,
        @val            smallint,
        @screen_data                char(200),
                                 @d_id_local    tinyint,
                                 @w_id_local    smallint,
                                 @c_id_local    int

select @screen_data = ""

begin tran p

                /* get payment date */

                select @datetime = getdate()

                if (@c_id = 0)
                begin
                        /* get customer id and info using last name */

                        select @cnt = count(*)
                        from customer holdlock
                        where c_last = @c_last and
                             c_w_id = @c_w_id and
                             c_d_id = @c_d_id


                        select @val = (@cnt + 1) / 2
                        set rowcount @val

                        select @c_id = c_id
                        from customer holdlock
                        where c_last = @c_last and
                             c_w_id = @c_w_id and
                             c_d_id = @c_d_id
                        order by c_w_id, c_d_id, c_last, c_first

                        set rowcount 0
                end

                /* get customer info and update balances */

                update customer set
                        @c_balance     = c_balance = c_balance −
@h_amount,
                        c_payment_cnt  = c_payment_cnt + 1,
                        c_ytd_payment  = c_ytd_payment + @h_amount,
                        @c_first       = c_first,
                        @c_middle      = c_middle,
                   @c_last       = c_last,
                   @c_street_1   = c_street_1,
                        @c_street_2    = c_street_2,
                        @c_city        = c_city,
                        @c_state       = c_state,
                        @c_zip         = c_zip,
                        @c_phone       = c_phone,
                        @c_credit      = c_credit,
                        @c_credit_lim  = c_credit_lim,
                        @c_discount    = c_discount,
                        @c_since       = c_since,
                        @data1         = c_data_1,
                        @data2         = c_data_2,
                        @c_id_local    = c_id
                where c_id   = @c_id and
                     c_w_id = @c_w_id and
                     c_d_id = @c_d_id

                /* if customer has bad credit get some more info */

                if (@c_credit = "BC")
                begin

                        /* compute new info */

                        select @c_data_2 = substring(@data1,209,42) +
                                                substring(@data2, 1,
208)
                        select @c_data_1 = convert(char(5),@c_id) +

convert(char(4),@c_d_id) +

convert(char(5),@c_w_id) +

convert(char(4),@d_id) +

convert(char(5),@w_id) +

convert(char(19),@h_amount) +

substring(@data1, 1, 208)

                        /* update customer info */

                        update customer set
                             c_data_1 = @c_data_1,
                                        c_data_2 = @c_data_2
                        where c_id   = @c_id and
                                        c_w_id = @c_w_id and
                             c_d_id = @c_d_id

                        select @screen_data = substring (@c_data_1,1,200)
```

```
        end


        /* get district data and update year-to-date */

        update district
                set d_ytd       = d_ytd + @h_amount,
                    @d_street_1 = d_street_1,
                    @d_street_2 = d_street_2,
                    @d_city     = d_city,
                    @d_state    = d_state,
                    @d_zip      = d_zip,
                    @d_name     = d_name,
                    @d_id_local = d_id
                where d_w_id = @w_id and
                    d_id   = @d_id

        /* get warehouse data and update year-to-date */

        update warehouse
        set w_ytd       = w_ytd + @h_amount,
                    @w_street_1 = w_street_1,
            @w_street_2 = w_street_2,
            @w_city     = w_city,
            @w_state    = w_state,
            @w_zip      = w_zip,
            @w_name     = w_name,
                    @w_id_local = w_id
        where w_id = @w_id

        /* create history record */

        insert into history values  (@c_id_local,
                                     @c_d_id,
                                     @c_w_id,
                                     @d_id_local,
                                     @w_id_local,
                                     @datetime,
                                     @h_amount,
                                     @w_name + "    " + @d_name)

commit tran p

/* return data to client */

select  @c_id,
                        @c_last,
                        @datetime,
                        @w_street_1,
                        @w_street_2,
                        @w_city,
                        @w_state,
                        @w_zip,
                        @d_street_1,
                        @d_street_2,
                        @d_city,
                        @d_state,
                        @d_zip,
                        @c_first,
                        @c_middle,
                        @c_street_1,
                        @c_street_2,
                        @c_city,
                        @c_state,
                        @c_zip,
                        @c_phone,
                        @c_since,
                        @c_credit,
                        @c_credit_lim,
                        @c_discount,
                        @c_balance,
                        @screen_data

go
```

Delivery.sql

```
/*  File:       DELIVERY.SQL                                */
/*              Microsoft TPC-C Kit Ver. 3.00.000           */
/*              Audited 08/23/96, By Francois Raab          */
/*                                                          */
/*              Copyright Microsoft, 1996                   */
/*                                                          */
/*  Purpose:    Delivery transaction for Microsoft TPC-C Benchmark Kit     */
/*  Author:     Damien Lindauer                             */
/*              damienl@Microsoft.com                       */

use tpcc
go

/* delivery transaction */

if exists (select name from sysobjects where name = "tpcc_delivery" )
                drop procedure tpcc_delivery
go

create proc tpcc_delivery                                       @w_id           smallint,


                                                                @o_carrier_id
smallint
as


declare @d_id tinyint,
        @o_id int,
        @c_id int,
        @total numeric(12,2),
        @oid1 int,
        @oid2 int,
        @oid3 int,
        @oid4 int,
        @oid5 int,
        @oid6 int,
        @oid7 int,
        @oid8 int,
        @oid9 int,
        @oid10 int

select @d_id = 0

begin tran d

    while (@d_id < 10)
    begin

        select @d_id  = @d_id + 1,
            @total = 0,
            @o_id  = 0

        select @o_id = min(no_o_id)
        from new_order holdlock
        where no_w_id = @w_id and
                                        no_d_id = @d_id

        if (@@rowcount <> 0)
        begin

            /* claim the order for this district */

            delete new_order
            where no_w_id = @w_id and
                                            no_d_id = @d_id and
                                                    no_o_id = @o_id

            /* set carrier_id on this order (and get customer id) */

            update orders
                                        set o_carrier_id = @o_carrier_id,
                @c_id       = o_c_id
            where o_w_id = @w_id and
                                            o_d_id = @d_id and
                                                    o_id   = @o_id

            /* set date in all lineitems for this order (and sum amounts) */

            update order_line
                                        set ol_delivery_d = getdate(),
                                @total      = @total + ol_amount
            where ol_w_id = @w_id and
                ol_d_id = @d_id and
                                                    ol_o_id = @o_id

            /* accummulate lineitem amounts for this order into customer */

                                        update customer
                                                set c_balance      = c_balance +
@total,
                                                    c_delivery_cnt = c_delivery_cnt +
1
            where c_w_id = @w_id and
                                            c_d_id = @d_id and
                                                    c_id   = @c_id

        end
```

```
      select @oid1 = case @d_id when  1  then @o_id else @oid1 end,
          @oid2 = case @d_id when  2  then @o_id else @oid2 end,
          @oid3 = case @d_id when  3  then @o_id else @oid3 end,
          @oid4 = case @d_id when  4  then @o_id else @oid4 end,
          @oid5 = case @d_id when  5  then @o_id else @oid5 end,
          @oid6 = case @d_id when  6  then @o_id else @oid6 end,
          @oid7 = case @d_id when  7  then @o_id else @oid7 end,
          @oid8 = case @d_id when  8  then @o_id else @oid8 end,
          @oid9 = case @d_id when  9  then @o_id else @oid9 end,
          @oid10 = case @d_id when 10 then @o_id else @oid10 end

   end

commit tran d

select @oid1,
      @oid2,
      @oid3,
      @oid4,
      @oid5,
      @oid6,
      @oid7,
      @oid8,
      @oid9,
      @oid10

go
```

Ordstat.sql

```
/*  File:      ORDSTAT.SQL                                  */
/*             Microsoft TPC-C Kit Ver. 3.00.000            */
/*             Audited 08/23/96, By Francois Raab           */
/*                                                          */
/*             Copyright Microsoft, 1996                    */
/*                                                          */
/*  Purpose:   Order-Status transaction for Microsoft TPC-C Benchmark Kit  */
/*  Author:    Damien Lindauer                              */
/*             damienl@Microsoft.com                        */


use tpcc
go

if exists ( select name from sysobjects where name = "tpcc_orderstatus" )
                drop procedure   tpcc_orderstatus
go

create proc tpcc_orderstatus @w_id                  smallint,
                             @d_id                  tinyint,


                             @c_id                  int,
                             @c_last        char(16) = ""


as

declare @c_balance                  numeric(12,2),
      @c_first              char(16),
      @c_middle                     char(2),
      @o_id                         int,
      @o_entry_d                    datetime,
      @o_carrier_id         smallint,
      @val                          smallint,
      @cnt                          smallint

begin tran o

            if (@c_id = 0)
                        begin
                        /* get customer id and info using last name */


                        select @cnt = count(*)
                        from customer holdlock
                        where c_last = @c_last and
                          c_w_id = @w_id and
                  c_d_id = @d_id

                        select @val = (@cnt + 1) / 2
                        set rowcount @val

                        select @c_id = c_id,
                                    @c_balance = c_balance,
                                    @c_first   = c_first,
                                    @c_last    = c_last,
                                    @c_middle  = c_middle
                        from customer holdlock
                        where c_last = @c_last and
                          c_w_id = @w_id and
                  c_d_id = @d_id
                        order by c_w_id, c_d_id, c_last, c_first

                        set rowcount 0
                        end

            else
                        begin

                        /*  get customer info if by id*/

                        select @c_balance = c_balance,
                              @c_first   = c_first,
                              @c_middle  = c_middle,
                              @c_last    = c_last
                        from customer holdlock
                        where c_id  = @c_id and
                            c_d_id = @d_id and
                            c_w_id = @w_id

                        select @cnt = @@rowcount

                        end

            /* if no such customer */
            if (@cnt = 0)
            begin
                        raiserror("Customer not found",18,1)
                        goto custnotfound
            end

            /*  get order info */

            select @o_id = o_id,
                              @o_entry_d    = o_entry_d,
                  @o_carrier_id = o_carrier_id
            from orders holdlock
            where o_c_id = @c_id and
      o_d_id = @d_id and
      o_w_id = @w_id

            /*  select order lines for the current order */

            select ol_supply_w_id,
              ol_i_id,
                  ol_quantity,
                  ol_amount,
                  ol_delivery_d
            from order_line holdlock
            where ol_o_id = @o_id and
                ol_d_id = @d_id and
                ol_w_id = @w_id

custnotfound:

commit tran o

/*  return data to client  */

select @c_id,
                  @c_last,
                  @c_first,
                  @c_middle,
                  @o_entry_d,
                  @o_carrier_id,
                  @c_balance,
                  @o_id

go
```

Stocklev.sql

```
/*  File:      STOCKLEV.SQL                                 */
/*             Microsoft TPC-C Kit Ver. 3.00.000            */
/*             Audited 08/23/96, By Francois Raab           */
/*                                                          */
/*             Copyright Microsoft, 1996                    */
/*                                                          */
/*  Purpose:   Stock-Level transaction for Microsoft TPC-C Benchmark Kit  */
/*  Author:    Damien Lindauer                              */
/*             damienl@Microsoft.com                        */


use tpcc
go
```

```
/* stock−level transaction stored procedure */

if exists (select name from sysobjects where name = "tpcc_stocklevel" )
                drop procedure tpcc_stocklevel
go

create proc tpcc_stocklevel    @w_id          smallint,
                               @d_id          tinyint,
                               @threshhold    smallint
as
declare @o_id_low int,
        @o_id_high int

   select @o_id_low  = (d_next_o_id − 20),
                        @o_id_high = (d_next_o_id − 1)
   from district
   where d_w_id = @w_id and
                                d_id   = @d_id

   select count(distinct(s_i_id))
                from  stock, order_line
   where ol_w_id    = @w_id and
                ol_d_id    = @d_id and
                ol_o_id between @o_id_low and @o_id_high and
        s_w_id     = ol_w_id and
                s_i_id     = ol_i_id and
                s_quantity <  @threshhold

go
```

Appendix C – Tuning Parameters

Microsoft Windows NT Server Tunable Parameters

Registry Changes

One Windows NT registry parameter on the InfoSERVER 5020 server was modified for this benchmark:

Key Name: SYSTEM\ControlSet001\Services\aic78xx\Parameters\Device
Class Name: <NO CLASS>
Last Write Time: 3/17/97 – 6:36 PM
Value 0
Name: NumberOfRequests
Type: REG_DWORD
Data: 0x30

This modification set the number of outstanding requests on the Adaptec AIC–78xx controllers to 48 (decimal).

Microsoft SQL Server version 6.5 Startup Parameters

Microsoft SQL Server was started with the following command line options

```
sqlservr -c -x -t1081 -t3502
```

where

-c	Start SQL Server independently of the Microsoft Windows NT Service Control Manager.
-x	Disable the keeping of CPU time and cache–hit ration statistics.
-t1081	Allow the index pages a second trip through cache before those pages are released.
-t3502	Prints a message to the log at the beginning and end of each checkpoint.

DBCC GAMINIT

The Global Allocation Map (GAM) was pre–populated using DBCC GAMINIT prior to starting the benchmark.

Microsoft Windows NT Server Configuration Parameters

The following services were disabled on the Server prior to benchmark execution:

- Computer Browser
- License Manager
- Messenger
- NT LM Security Provider
- Plug and Play
- TCP/IP NetBIOS Helper
- Spooler

Microsoft SQL Server 6.5 Configuration Parameters

name	minimum	maximum	config value	run value
affinity mask	0	2147483647	0	0
allow updates	0	1	0	0
backup buffer size	1	32	1	1
backup threads	0	32	5	5
cursor threshold	-1	2147483647	-1	-1
database size	2	10000	2	2
default language	0	9999	0	0
default sortorder id	0	255	50	50
fill factor	0	100	0	0
free buffers	20	524288	5000	5000
hash buckets	4999	265003	265003	265003
language in cache	3	100	3	3
LE threshold maximum	2	500000	200	200
LE threshold minimum	2	500000	20	20
LE threshold percent	1	100	0	0
locks	5000	2147483647	5000	5000
LogLRU buffers	0	2147483647	1500	1500
logwrite sleep (ms)	-1	500	0	0
max async IO	1	1024	32	32
max lazywrite IO	1	1024	24	24
max text repl size	0	2147483647	65536	65536
max worker threads	10	1024	100	100
media retention	0	365	0	0
memory	2800	1048576	870000	870000
nested triggers	0	1	1	1
network packet size	512	32767	3072	3072
open databases	5	32767	20	20
open objects	100	2147483647	500	500
priority boost	0	1	0	0
procedure cache	1	99	2	2
Protection cache size	1	8192	15	15
RA cache hit limit	1	255	4	4
RA cache miss limit	1	255	3	3
RA delay	0	500	15	15
RA pre-fetches	1	1000	3	3
RA slots per thread	1	255	5	5
RA worker threads	0	255	0	0
recovery flags	0	1	0	0
recovery interval	1	32767	32767	32767
remote access	0	1	0	0
remote conn timeout	-1	32767	10	10
remote login timeout	0	2147483647	5	5
remote proc trans	0	1	0	0
remote query timeout	0	2147483647	0	0
remote sites	0	256	0	0
resource timeout	5	2147483647	10	10
set working set size	0	1	0	0
show advanced options	0	1	1	1
SMP concurrency	-1	64	-1	-1
sort pages	64	511	64	64
spin counter	1	2147483647	10000	10000
tempdb in ram (MB)	0	2044	5	5
time slice	50	1000	100	100
user connections	5	32767	6350	6350
user options	0	4095	0	0

Microsoft SQL Server Stack Size

The default stack size of Microsoft SQL Server was changed using the EDITBIN utility. The EDITBIN utility ships with Microsoft Visual C++ V4.2. The command used was `editbin /stack:32768 sqlserver.exe`.

Disk Array Configuration Parameters

LUN	1	2	3	4	5	6
#Disks	15	15	15	15	15	15
RAID Level	0	0	0	0	0	0
Segment Size	4K	4K	4K	4K	4K	4K
Write Cache	enabled	enabled	enabled	enabled	enabled	enabled
Cache Mirror	disabled	disabled	disabled	disabled	disabled	disabled
Force Unit Access	on	on	on	on	on	on
Partitions	2	1	1	1	1	2

Force Unit Access is set in the LVS 4500 controllers to force Microsoft SQL Server 6.5 to utilize the caches in "write-to" mode. Cache mirroring is a reliability/failover feature of the LVS 4500 that is not utilized in the TPC benchmark.

Client Configuration Parameters

The Client system configurations were modified as described below.

Microsoft Windows NT Server Configuration Parameters

No NT parameters were changed on the client machines.

The following services were disabled on the client machines:

- Computer Browser
- FTP Publishing Service
- Gopher Publishing Service
- License Logging Service
- Messenger
- Net Logon
- NT LM Security Support Provider
- Plug and Play
- RPC Locator
- Schedule
- Spooler
- TCP/IP NetBIOS Helper
- UPS

RTE Parameters

Profile: 6200users
File Path:C:\rte\6200users.pro
Version: 1.0.0

Number of Engines: 6

Name: RTE1
Description: ACLIENT1
Directory: C:\rte\arte1.log
Machine: ARTE1
Parameter Set: plus-10
Index: 0
Seed: 57543
Configured Users: 1040
Pipe Name: DRIVER111826846
Connect Rate: 100
Start Rate: 0
CLIENT_NURAND: 233

Name: RTE2
Description: ACLIENT2
Directory: C:\rte\arte2.log
Machine: ARTE2
Parameter Set: plus-10
Index: 100000
Seed: 57543
Configured Users: 1040
Pipe Name: DRIVER211882295
Connect Rate: 100
Start Rate: 0
CLIENT_NURAND: 233

Name: RTE3
Description: ACLIENT3
Directory: C:\rte\arte3.log
Machine: ARTE3
Parameter Set: plus-10
Index: 200000
Seed: 57543
Configured Users: 1040
Pipe Name: DRIVER312000425
Connect Rate: 100
Start Rate: 0
CLIENT_NURAND: 233

Name: RTE4
Description: ACLIENT4
Directory: C:\rte\arte4.log
Machine: ARTE4
Parameter Set: plus-10

Index: 300000
Seed: 57543
Configured Users: 1040
Pipe Name: DRIVER412025752
Connect Rate: 100
Start Rate: 0
CLIENT_NURAND: 233

Name: RTE5
Description: ACLIENT5
Directory: C:\rte\arte5.log
Machine: ARTE5
Parameter Set: plus−10
Index: 400000
Seed: 57543
Configured Users: 1040
Pipe Name: DRIVER512105106
Connect Rate: 100
Start Rate: 0
CLIENT_NURAND: 233

Name: RTE6
Description: ACLIENT6
Directory: C:\rte\arte6.log
Machine: ARTE6
Parameter Set: plus−10
Index: 500000
Seed: 57543
Configured Users: 1000
Pipe Name: DRIVER613784941
Connect Rate: 100
Start Rate: 0
CLIENT_NURAND: 233

Number of Users: 6

Driver Engine: RTE1
IIS Server: ACLIENT1
SQL Server: ENVISTA
User: sa
Protocol: Html
w_id Range: 1 − 104
w_id Max Warehouse: 620
Scale: Normal
User Count: 1040
District id: 1
Scale Down: No

Driver Engine: RTE2
IIS Server: ACLIENT2
SQL Server: ENVISTA
User: sa
Protocol: Html
w_id Range: 105 − 208

w_id Max Warehouse: 620
Scale: Normal
User Count: 1040
District id: 1
Scale Down: No

Driver Engine: RTE3
IIS Server: ACLIENT3
SQL Server: ENVISTA
User: sa
Protocol: Html
w_id Range: 209 - 312
w_id Max Warehouse: 620
Scale: Normal
User Count: 1040
District id: 1
Scale Down: No

Driver Engine: RTE4
IIS Server: ACLIENT4
SQL Server: ENVISTA
User: sa
Protocol: Html
w_id Range: 313 - 416
w_id Max Warehouse: 620
Scale: Normal
User Count: 1040
District id: 1
Scale Down: No

Driver Engine: RTE5
IIS Server: ACLIENT5
SQL Server: ENVISTA
User: sa
Protocol: Html
w_id Range: 417 - 520
w_id Max Warehouse: 620
Scale: Normal
User Count: 1040
District id: 1
Scale Down: No

Driver Engine: RTE6
IIS Server: ACLIENT6
SQL Server: ENVISTA
User: sa
Protocol: Html
w_id Range: 521 - 620
w_id Max Warehouse: 620
Scale: Normal
User Count: 1000
District id: 1
Scale Down: No

RTE Pacing Sets

The following BenchCraft RTE pacing sets were used in the benchmark. The measured tpmC was established using pacing set PLUS−10.

PLUS 1

	Txn Weight	Think Time	Key Time	RT Delay	RT Fence	Menu Delay
New Order	44.72		12.98	18.02	0.10	5.00	0.10
Payment	43.08		12.97	3.03	0.10	5.00	0.10
Delivery	4.04		5.97	2.03	0.10	5.00	0.10
Stock Level	4.08		5.97	2.03	0.10	20.00	0.10
Order Status	4.08		10.97	2.03	0.10	5.00	0.10

PLUS 2

	Txn Weight	Think Time	Key Time	RT Delay	RT Fence	Menu Delay
New Order	44.72		13.98	18.02	0.10	5.00	0.10
Payment	43.08		13.97	3.03	0.10	5.00	0.10
Delivery	4.04		6.97	3.03	0.10	5.00	0.10
Stock Level	4.08		6.97	3.03	0.10	20.00	0.10
Order Status	4.08		11.97	3.03	0.10	5.00	0.10

~Default
Default Parameter Set

	Txn Weight	Think Time	Key Time	RT Delay	RT Fence	Menu Delay
New Order	44.72		12.00	18.02	0.10	5.00	0.10
Payment	43.08		12.00	3.03	0.10	5.00	0.10
Delivery	4.04		5.00	2.03	0.10	5.00	0.10
Stock Level	4.08		5.00	2.03	0.10	20.00	0.10
Order Status	4.08		10.00	2.03	0.10	5.00	0.10

2 X Defaults

	Txn Weight	Think Time	Key Time	RT Delay	RT Fence	Menu Delay
New Order	44.80		24.00	18.00	0.10	5.00	0.10
Payment	43.05		24.00	3.00	0.10	5.00	0.10
Delivery	4.05		10.00	2.00	0.10	5.00	0.10
Stock Level	4.05		10.00	2.00	0.10	20.00	0.10
Order Status	4.05		20.00	2.00	0.10	5.00	0.10

PLUS−10

	Txn Weight	Think Time	Key Time	RT Delay	RT Fence	Menu Delay
New Order	44.72		12.08	18.02	0.10	5.00	0.10
Payment	43.08		12.07	3.03	0.10	5.00	0.10
Delivery	4.04		5.07	2.03	0.10	5.00	0.10
Stock Level	4.08		5.07	2.03	0.10	20.00	0.10
Order Status	4.08		10.07	2.03	0.10	5.00	0.10

PLUS –05

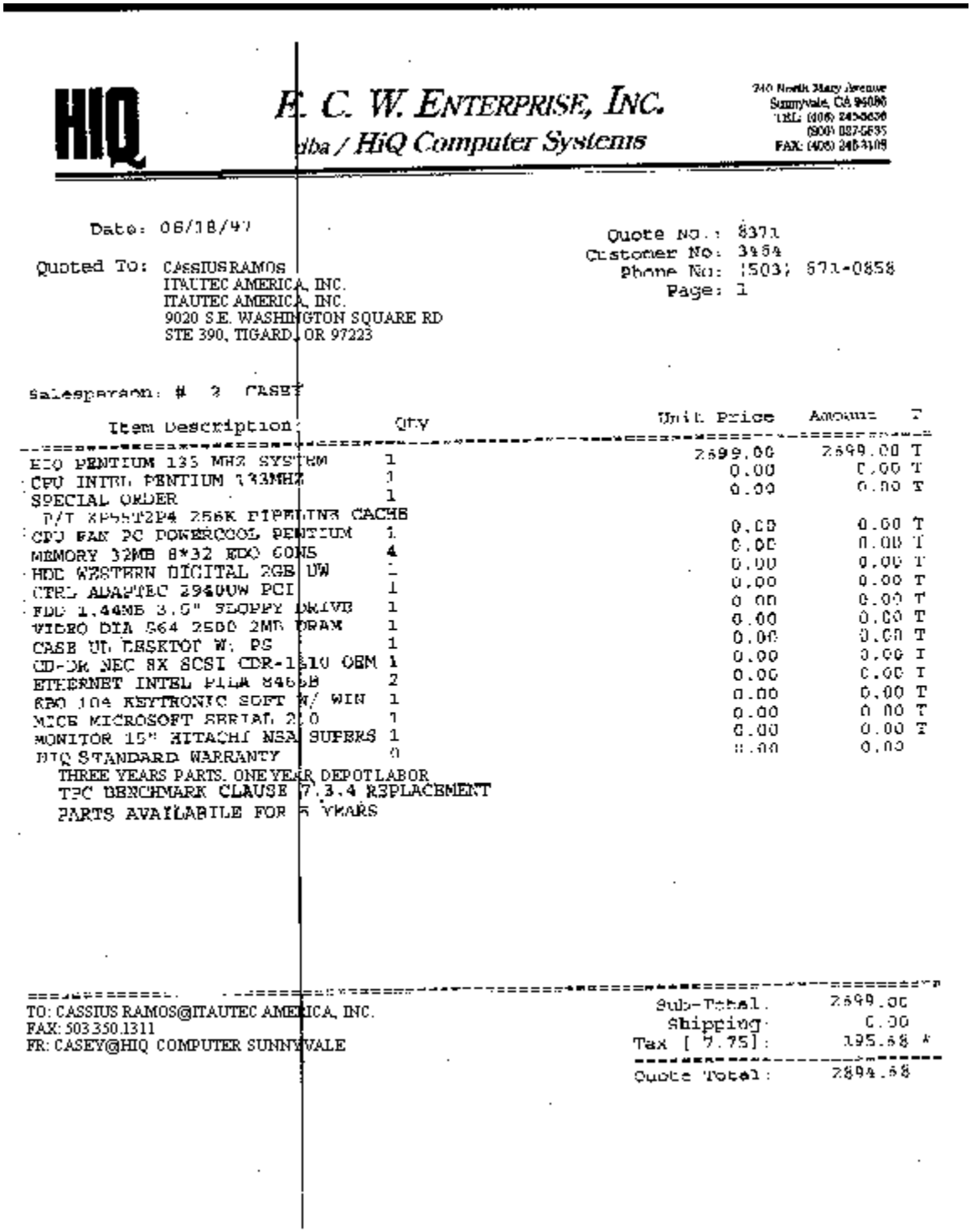
	Txn Weight	Think Time	Key Time	RT Delay	RT Fence	Menu Delay	
New Order	44.68	12.03	18.02	0.10	5.00	0.10	
Payment	43.08	12.02	3.03	0.10	5.00	0.10	
Delivery	4.08	5.02	2.03	0.10	5.00	0.10	
Stock Level	4.08	5.02	2.03	0.10	20.00	0.10	
Order Status	4.08	10.02	2.03	0.10	5.00	0.10	

Appendix D – Disk Storage

180 Day Space Calculations

Warehouses	620					
TpmC	7573					
Table	Rows	Data 1K pages	Index 1K pages	Extra 5%	Total with 5%	
Warehouse	620	1,300	10	66	1,376	
District	6,200	13,000	56	653	13,709	
Item	100,000	9,100	46	457	9,603	
Customer	18,600,000	13,002,600	1,009,188	700,589	14,712,377	
New_Order	5,580,000	65,000	398	3,270	68,668	
Stock	62,000,000	21,671,000	119,736	1,089,537	22,880,273	
History (Dynamic)	18,600,000	975,002	0		975,002	
Orders (Dynamic)	18,600,000	507,000	3,060		510,060	
Order_line (Dynamic)	195,004,080	10,839,880	70,856		10,910,736	
Total MB	318,490,900	47,083,882	1,203,350	1,794,572	50,081,804	
Loaded	48,287,232					
With 5%	50,081,804					
8 Hours						
Dabase Layout	# of Segs	Size in MB	Total Allocated	Tables		
Master	1	17	17			
Model	1	1	1			
Msdb	1	8	8		Allocated	Loaded + 5%
CS_Dev (big)	4	8,427	33,708	c,s	37,921	36,712
CS_Dev (small)	1	4,213	4,213			
Misc_dev (big)	4	1,404	5,616	w,d,l,no,h,o	6,318	1,541
Misc_dev (small)	1	702	702			
OL_dev	2	8,450	16,900	ol	16,900	10,655
Total Allocated					61,165	48,908
	MB					
Dynamic Space	12,395,798	Sum of Data + bitmap for Order, Order_Line and History				
Static Space	37,686,006	Sum of all data, index, bitmap (including the rootdbs) +5% – above dynamic space				
Free Space	12,551,156	Total space allocated to DBMS – dynamic and static				
Daily growth	2,422,538.79	(Dynamic space / (W * 62.5)) * tpmC				
Daily spread	8,917,348.11	Free space – 1.5 * Daily growth (zero if negative)				
	0	This can be reconfigured to eliminate daily spread, zero assumed				
180 day space (MB)	473,742,989	Static space + 180 * (daily growth + daily spread)				
180 day space (GB)	462,640					
8 hr log space (GB)	21.16	(excludes RAID–1)				
					8.36706543	
	Space Needed	Disk size (GB)	Disks Priced	GB		
180 day space	462,640	3.992	60	239.52		
		8.367	30	251.01		
				490.53		
Logical Logs (w/mirrors)	42.32	8.367	6	50.202		
OS, file sys, Swap	0.5					
Total	462682.4573					

Appendix E – Price Quotes



HIQ

F. C. W. ENTERPRISE, INC.
dba / HiQ Computer Systems

240 North Mary Avenue
Sunnyvale, CA 94086
TEL: (408) 245-8630
(800) 827-6835
FAX: (408) 245-4108

Date: 06/18/97

Quoted To: CASSIUS RAMOS
ITAUTEC AMERICA, INC.
ITAUTEC AMERICA, INC.
9020 S.E. WASHINGTON SQUARE RD
STE 390, TIGARD, OR 97223

Quote No.: 8371
Customer No: 3454
Phone No: (503) 671-0858
Page: 1

Salesperson: # 3 CASEY

Item Description	Qty	Unit Price	Amount	T
EIO PENTIUM 133 MHZ SYSTEM	1	2699.00	2699.00	T
CPU INTEL PENTIUM 133MHZ	1	0.00	0.00	T
SPECIAL ORDER	1	0.00	0.00	T
P/T XP55T2P4 256K PIPELINE CACHE				
CPU FAN PC POWERCOOL PENTIUM	1	0.00	0.00	T
MEMORY 32MB 8*32 EDO 60NS	4	0.00	0.00	T
HDD WESTERN DIGITAL 2GB UW	1	0.00	0.00	T
CTRL ADAPTEC 2940UW PCI	1	0.00	0.00	T
FDD 1.44MB 3.5" FLOPPY DRIVE	1	0.00	0.00	T
VIDEO DIA S64 2500 2MB DRAM	1	0.00	0.00	T
CASE UL DESKTOP W/ PS	1	0.00	0.00	T
CD-DR NEC 8X SCSI CDR-1810 OEM	1	0.00	0.00	T
ETHERNET INTEL PILA 8466B	2	0.00	0.00	T
KBD 104 KEYTRONIC SOFT W/ WIN	1	0.00	0.00	T
MICE MICROSOFT SERIAL 2.0	1	0.00	0.00	T
MONITOR 15" HITACHI NSA SUPERS	1	0.00	0.00	T
HIQ STANDARD WARRANTY	0	0.00	0.00	
THREE YEARS PARTS. ONE YEAR DEPOT LABOR				
TPC BENCHMARK CLAUSE 7.3.4 REPLACEMENT				
PARTS AVAILABILE FOR 5 YEARS				

TO: CASSIUS RAMOS@ITAUTEC AMERICA, INC.
FAX: 503 350 1311
FR: CASEY@HIQ COMPUTER SUNNYVALE

Sub-Total:	2699.00
Shipping:	0.00
Tax [7.75]:	195.68 *
Quote Total:	2894.68

X-Lotus-FromDomain: AMDAHL
From: Larry_Bazinett@notes.amdahl.com
To: leonardo@itautec-philco.com.br
Date: Mon, 2 Jun 1997 16:17:18 -0700
Subject: LVS Pricing from Amdahl

Dear Mr. Leonardo

Below please find the ordering information & internal list price information for AMDAHL's LVS Storage Product Line. The discount for ITAUTEC if buying product directly from Amdahl will be 37% off the list prices below. Prices are payable in $US and title transfers at the US freight forwarder. If you need additional assistance is learning how to configure the systems appropriately, please let me know.

Regards,

Larry Bazinett
Regional Director, Latin America
Amdahl

Host Bus Adapter (HBA)

4500-001-7370 Host Bus Adapter for Windows NT, Ultra TBD TBD
SCSI Support*

*The HBA for Windows NT is currently NOT available. The customer may order the Adaptec AHA-2944UW HBA locally. Or, you may order PRM NVISTA-SCSI-2691 "SCSI Adapter, Ultra Wide, Diff., PCI", refer to the EnVista
Server product information to order.

AMDAHL STORAGE PRODUCTS
LOGICAL VOLUME STORAGE (LVS) 4500

DURING 2Q97 ONLY, CUSTOMERS CAN ORDER THE FIBRE CHANNEL UPGRADE KIT AT NO
CHARGE IF THEY MEET THE FOLLOWING CRITERIA. The upgrade kit contains two
Fibre Availability Managers with fibre cable for the LVS4500 array.
For each program the customer must:
o Order one LVS4500 with 20-9GB drives and 96MB cache.
o Operate on either Solaris or NT platform.
Orders must be received during 2Q97 and installed during the calendar year1997. Installation fees will be waived during this promotion.
DURING 2Q97 ONLY, CUSTOMER CAN ORDER THE FIBRE HOST BUS ADAPTER PAIR AT NO
CHARGE IF THEY MEET THE CUSTOMER REQUIREMENTS LISTED ABOVE AND ALSO PURCHASE EITHER AN ENVISTA OR SUN SERVER.

```
Fibre Channel Upgrade Kit
--------------------------
4500-001-7466 Fibre Channel Upgrade Kit, 8M,50micron Fibre Cable  $0
4500-001-7467 Fibre Channel Upgrade Kit,12M,50micron Fibre Cable  $0
4500-001-7468  bre Channel Upgrade Kit,20M,50micron Fibre Cable   $0
Fibre Host Bus Adapter (HBA)
----------------------------
4500-001-7469  Fibre Host Bus Adapter Pair for NT                   $0
4500-001-7470  Fibre Host Bus Adapter Pair for Solaris              $0
**************************************************************************
***
***
FOLLOWING IS THE CURRENT PRM WITH PRICING FOR THE LVS4500.
--------------------------------------------------------------------------
---
-
                                                          Purchase
Premium
PRM Order Number    Feature Description                     List
--------------------------------------------------------------------------
INITIAL ORDER
--------------
LVS 4500 Logical Storage Module  (order one)  Note 1
-----------------------------------------------------
4500-001-8120    LVS 4500 Logical Storage Module              $0

Cabinet (order one)  Note 2
----------------------------
4500-001-7371    Data Center Cabinet (US/Canada) (220V only)  $4,945
4500-001-7373    Deskside Cabinet (US/Canada)                   $995

Power Cords for Deskside Cabinet (order one) Note 2
---------------------------------------------------
4500-001-8554    Power Cord for Deskside Cabinet (US/Japan)     $0
Intelligent Memory  (order one) Note 1
---------------------------------------
4500-001-7380    64 MB Intelligent Memory                       $0
4500-001-7381    96 MB Intelligent Memory                   $3,995
4500-001-7382   160 MB Intelligent Memory                  $10,995
4500-001-7383   288 MB Intelligent Memory                  $21,490

4.3-GB Disk Drives  Notes 1, 4
-------------------------------
4500-001-7390   5   4.3-GB Disk Drives (21.5 GB total)     $41,170
4500-001-7391   6   4.3-GB Disk Drives (25.8 GB total)     $43,620
4500-001-7392   7   4.3-GB Disk Drives (30.1 GB total)     $46,070
4500-001-7393   8   4.3-GB Disk Drives (34.4 GB total)     $48,520
4500-001-7394   9   4.3-GB Disk Drives (38.7 GB total)     $50,970
4500-001-7395   10  4.3-GB Disk Drives (43.0 GB total)     $53,420
4500-001-7396   11  4.3-GB Disk Drives (47.3 GB total)     $55,870
4500-001-7397   12  4.3-GB Disk Drives (51.6 GB total)     $58,320
4500-001-7398   13  4.3-GB Disk Drives (55.9 GB total)     $60,770
4500-001-7399   14  4.3-GB Disk Drives (60.2 GB total)     $63,220
4500-001-7400   15  4.3-GB Disk Drives (64.5 GB total)     $65,670
4500-001-7401   16  4.3-GB Disk Drives (68.8 GB total)     $68,120
4500-001-7402   17  4.3-GB Disk Drives (73.1 GB total)     $70,570
4500-001-7403   18  4.3-GB Disk Drives (77.4 GB total)     $73,020
4500-001-7404   19  4.3-GB Disk Drives (81.7 GB total)     $75,470
4500-001-7405   20  4.3-GB Disk Drives (86.0 GB total)     $77,920
```

```
9.1-GB Disk Drives  Notes 1, 4
--------------------------------
4500-001-7974    5   9.1-GB Disk Drives (45.9 GB total)      $52,395
4500-001-7975    6   9.1-GB Disk Drives (54.6 GB total)      $57,090
4500-001-7976    7   9.1-GB Disk Drives (63.7 GB total)      $61,785
4500-001-7977    8   9.1-GB Disk Drives (72.8 GB total)      $66,480
4500-001-7978    9   9.1-GB Disk Drives (81.9 GB total)      $71,175
4500-001-7979   10  9.1-GB Disk Drives (91.0 GB total)       $75,870
4500-001-7980   11  9.1-GB Disk Drives (100.1 GB total)      $80,565
4500-001-7981   12  9.1-GB Disk Drives (109.2 GB total)      $85,260
4500-001-7982   13  9.1-GB Disk Drives (118.3 GB total)      $89,955
4500-001-7983   14  9.1-GB Disk Drives (127.4 GB total)      $94,650
4500-001-7984   15  9.1-GB Disk Drives (136.5 GB total)      $99,345
4500-001-7985   16  9.1-GB Disk Drives (145.6 GB total)     $104,040
4500-001-7986   17  9.1-GB Disk Drives (154.7 GB total)     $108,735
4500-001-7987   18  9.1-GB Disk Drives (163.8 GB total)     $113,430
4500-001-7988   19  9.1-GB Disk Drives (172.9 GB total)     $118,125
4500-001-7989   20  9.1-GB Disk Drives (182.0 GB total)     $122,820

804-MB Solid-State Disk (SSD) Drive w/Backup Hard Disk (order one) Note
7
-------------------------------------------------------------------------
--
4500-001-7424    1  804-MB SSD Drive (804 MB total)          $56,280
4500-001-7425    2  804-MB SSD Drives (1608 MB total)       $112,560
4500-001-7426    3  804-MB SSD Drives (2412 MB total)       $168,840
4500-001-7427    4  804-MB SSD Drives (3216 MB total)       $225,120
4500-001-7428    5  804-MB SSD Drives (4020 MB total)       $281,400

Storage Expansion Module (required for more than 20 Disk Drives
during Initial Order) Notes 4, 5
-----------------------------------------------------------------
4500-001-7410    Storage Expansion Module                     $3,945
4.3-GB Disk Drive Add-ons for Storage Expansion Module during
Initial Order (maximum 10 per Storage Expansion Module) Notes 1, 4, 5
-----------------------------------------------------------------------
4500-001-7444    1  4.3-GB Disk Drive Increment Add-on        $2,450
                     for Expansion Module

9.1-GB Disk Drive Add-ons for Storage Expansion Module during
Initial Order (maximum 10 per Storage Expansion Module) Notes 1, 4, 5
-----------------------------------------------------------------------
4500-001-7944    1  9.1-GB Disk Drive Increment Add-on        $4,695
                     for Expansion Module
```

```
Host Bus Adapter (HBA)
----------------------
4500-001-7370    Host Bus Adapter for Windows NT, Ultra          TBD
                   SCSI Support*  Note 3
4500-001-7377    Ultra-SCSI Host Bus Adapter Card for          $1,355
                   Solaris Servers  Note 8
*The HBA for Windows NT is currently NOT available.  The customer may
order the Adaptec AHA-2944UW HBA locally.  Or, you may order PRM
NVISTA-SCSI-2691 "SCSI Adapter, Ultra Wide, Diff., PCI", refer to the
EnVista Server PRM to order.

A+LVS Configuration and Control Software (order minimum one)  Note 6
-------------------------------------------------------------------
4500-LVSNNT-0109   A+LVS/Net Direct Configuration and Control     $0
                     SW for Network NT, CD ROM
4500-LVSHSO-0109   A+LVS Configuration and Control Host-based     $0
                     SW for Sun Solaris 2.5, CD ROM
4500-LVSHNT-0109   A+LVS Configuration and Control Host-based     $0
                     SW for Intel Windows NT, CD ROM
4500-LVSHHP-0109   A+LVS Configuration and Control Host-based     $0
                     SW for HP UX,  CD ROM*
*This offering is currently NOT available.

SCSI Interface Cables for Host-Dependent Software (order one SCSI cable
per host attachment)
-------------------------------------------------------------------
-
4500-001-8430    SCSI Host Interface Cable (.4M/1Ft.)           $100
4500-001-8431    SCSI Host Interface Cable (1.5M/5Ft.)          $125
4500-001-8432    SCSI Host Interface Cable (3M/10Ft.)           $135
4500-001-8433    SCSI Host Interface Cable (8M/26Ft.)           $165
4500-001-8434    SCSI Host Interface Cable (12M/40Ft.)          $185


UPGRADES/ADD-ONS (Cannot be ordererd during Initial Order)
==========================================================
41xx to 4500 Model Upgrades   Note 9
-----------------------------------
4500-001-7475   4015 JBOD to LVS 4500 Model Upgrade          $35,861
4500-001-7476   4110 RAID LSM-DIFF to LVS 4500 Model         $35,865
                  Upgrade

Intelligent Memory Add-ons
--------------------------
4500-001-7450    64 MB to 96 MB Intelligent Memory Add-on       $3,995
4500-001-7451    64 MB to 160 MB Intelligent Memory Add-on     $10,995
4500-001-7452    64 MB to 288 MB Intelligent Memory Add-on     $21,490
4500-001-7453    96 MB to 160 MB Intelligent Memory Add-on      $7,000
4500-001-7454    96 MB to 288 MB Intelligent Memory Add-on     $17,495
4500-001-7455   160 MB to 288 MB Intelligent Memory Add-on     $10,495

Upgrade Storage Expansion Module (required if adding more than 20
Disk Drives to an Already Installed System)   Notes 4, 5
-------------------------------------------------------------------
4500-001-7460    Storage Expansion Module Add-on Notes 4,5      $3,945
```

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4.3-GB Disk Drive Add-ons (maximum 20 per LVS 4500 and 10 per Storage
Expansion Module)  Notes 1, 4 and 5
-------------------------------------------------------------------------
4500-001-7461    1  4.3-GB Disk Drive Increment Add-on          $2,450

9.1-GB Disk Drive Add-ons (maximum 20 per LVS 4500 and 10 per Storage
Expansion Module)  Notes 1, 4 and 5
-------------------------------------------------------------------------
4500-001-7464    1  9.1-GB Disk Drive Increment Add-on          $4,695

804-MB Solid-State Disk (SSD) Drive w/Backup Hard Disk Add-on Note 7
-----------------------------------------------------------------
4500-001-7462    1  804-MB SSD Drive Increment Add-on         $56,280


4.3-GB to 9.1-GB Disk Drive Upgrade
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4500-001-7471    4.3-GB to 9.1-GB Disk Drive Increment          $2,735
                 *Requires return of 4.3-GB Disk Drive(s)
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LVS 4500 NOTES
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NOTE 1
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The Initial Order MINIMUM configuration must include:
o  One LVS 4500 Logical Storage Module (contains two 4510 Availability
   (Managers)
o  One Data Center Cabinet or one Deskside Cabinet (required if no
   cabinet is currently at the customer site or if an existing cabinet
     is   fully populated)
o   64 MB Intelligent Memory
o   Minimum of  5 Disk Drives (either 4.3GB or 9.1GB) required for
system
operation
o  A+LVS Configuration and Control Software (either Network or Host
   Dependent)
The maximum Intelligent Memory allowed per LVS 4500 Logical Storage
Module is 288 MB. Only one optional Storage Expansion Module  and up to
a
maximum of 30 total 4.3-GB Disk Drives (20 per base; 10 per Storage
Expansion Module) are allowed per LVS 4500 Logical Storage Module.
NOTE 2
-------
The Cabinets (either Data Center or Deskside) can be populated as
follows:
1)  One Data Center Cabinet can house up to three (3) LVS 4500 Logical
Storage Modules (up to 60 Disk Drives) and three (3) Storage Expansion
Modules (up to 30 disk drives)
2)  OR,  one Data Center Cabinet can house up to four (4) LVS 4500
Logical
Storage Modules (up to 80 Disk Drives) and one Storage Expansion Module
(up
to 10 disk drives)
3)  The Deskside Cabinet can house one (1) LVS 4500 Logical Storage
Module.
Power cables for the Deskside Cabinet are required.  Order minimum one
cable per deskside cabinet.  Cables for countries other than those
specified require a Type II RPQ.
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NOTE 3
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Each host interface requires a Host Bus Adapter which is installed in
the
host server. Server manufacturers usually define the specific Host Bus
Adapter for use with external device attachment.  The currently
supported
HBAs include:
o  for Windows NT using an Ultra SCSI interface, order PRM 7370
o  for Solaris on a Sun SPARC or UltraSPARC 1062A, have the customer
order
a Native Sun Fast and Wide HBA locally.  NOTE:  Currently there is a 7-
week
lead-time for delivery from Sun, plan accordingly.

NOTE 4
--------
Extending the capacity of an existing RANK of Logical Unit Number (LUN)
requires planning.  Consult with your MSE before ordering additional
Disk
Drives.
NOTE 5
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To accommodate more than 20 disk drives in an LVS 4500 Logical Storage
Module, order one Optional Storage Expansion Module which can house up
to
10 disk drives (for a maximum of 30 disk drives per system).  Disk
drives
for the Optional Storage Expansion Module should be selected from the
"Disk
Drive Add-on" section.
NOTE 6
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A+LVS Configuration and Control software is required.  A+LVS Software is
available for Network-based and/or Host-based systems.  Select the
appropriate platform desired.  The LVS Configuration and Control
software
and the Host Interface Failover software are provided on a single CD ROM
and and includes the necessary technical documentation.  License
Agreement
for Amdahl Software Products (new customer) and a Schedule to the
License
Agreement   (all customers) for the A+LVS Configuration and Control
software is required.
NOTE 7
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The solid-state disk offers high performance packaged in a 3.5 inch disk
cannister along with a 2nd backup hard disk for non-volatile storage of
SSD
data.  There are no technical limits to the minimum/maximum number of
drives per system.  Orders above five (5) 804-MB SSD Drives require a
RPQ2.
Pertinent features are:
o  512 byte sector format, 804MB per drive
o  Requires 2 disk cannister slots
Software coreqs are:
o  LVS4500 firmware must be Release 2.04.02 or higher (orderable via
FCO)
o  Initially available for Solaris 2.x and NT platforms, contact Product
Marketing for other platform offerings
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NOTE 8
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The Ultra-SCSI Host Bus Adapter card provides for:
o  SUN 1062A compatible mode
o  Support for SCSI-2, SCSI-3 (20MB/sec) and Ultra-SCSI (40MB/sec) modes
o  15 SCSI target devices
o  32 LUN's per target (ext. LUN mode)
o  Solaris 2.3, 2.4, 2.5 and 2.5.1 O/S environments
Order 2 HBAs per LVS4500 for maximum connectivity.
NOTE 9
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Included in the model upgrade kit is a LVS 4500 chassis.  When ordering
this  upgrade, the customer must also order an LVS 4500 Cabinet (if
Deskside Cabinet is selected, they must also order a country-specific
power
cord), a minimum of 64MB Intelligent Memory, A+LVS Control Software,
cables
and any additional drives as required.  Customer Service will install
this
upgrade at no additional charge to ensure a smooth transition.  The
customer has the responsibility to backup and restore data.  All
deinstalled equipment must be returned to the Amdahl Corporation.
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