

HEWLETT-PACKARD

Product Number 30391A



TurboIMAGE/XL

For the 900 Series of HP 3000 Systems

Network Model DBMS

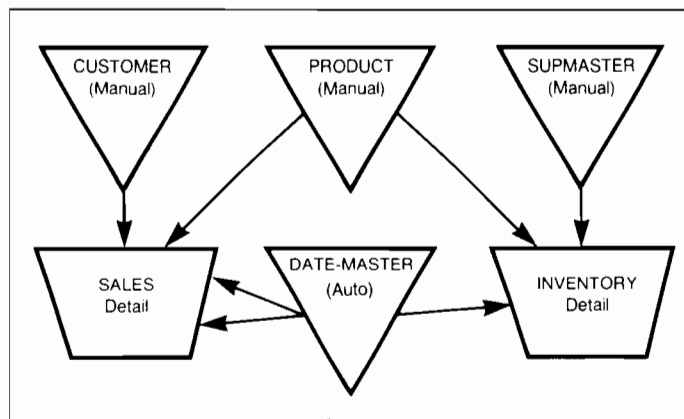
TurboIMAGE/XL continues in the DATAPRO award-winning tradition of IMAGE/3000 and TurboIMAGE/V database management systems (DBMS) designed for use with the HP 3000 computer family. TurboIMAGE/XL offers Native Mode operation of TurboIMAGE with compatible functionality and Native Mode performance. The database architecture is a two-level network model structure with owner/member data set relationships. This general purpose database system is included with the Fundamental Operating Software (FOS) on pre-configured 900 Series HP 3000 computer systems.

TurboIMAGE offers the capabilities to describe data structures, define data relationships, and create databases. A high level language interface is provided for access and maintenance of the data within the database. This interface supports applications written in COBOL, RPG, Pascal, SPL, FORTRAN, BASIC, and Transact.

TurboIMAGE allows data to be related logically between data sets. This linking minimizes data redundancy and facilitates fast information retrieval. In addition, a two-level security facility (at the data set and data item level) protects the database against unauthorized access.

Since locking is controllable from the database level to the data entry level, applications and/or interactive users may share the database concurrently. With NS/3000 networking products, programs are able to access databases remotely. Remote access allows a user on one HP 3000 to access a TurboIMAGE database on another HP 3000 computer.

Performance enhancements have been incorporated into TurboIMAGE that will support a wide range of database needs including applications requiring a large and high-performance database as well as applications with database requirements less demanding. The TurboIMAGE database management system provides the basis for developing information systems tailored to today's corporate, industrial, and educational needs.



Simplified TurboIMAGE Network Structure

Terminology

The brief glossary that follows will clarify and provide familiarity with common database terms which will be used.

Data item — smallest accessible unit of data, may consist of a field or a logically contiguous group of fields.

Data entry — groups of data items composing a record.

Data set — a collection of data entries where each entry contains values for the same data items.

Privacy — ability to restrict access to information.

Security — controlling feature to allocate privacy restriction at the data set and data item level.

Transaction — a logical unit of work defined by the programmer for the purpose of logging and recovery.

Concurrency — the ability to allow users (either batch and/or interactive) to share data in the database simultaneously.

Intrinsic — a library routine callable from application programs to perform specific functions.

Transaction Manager — part of the MPE XL file system that provides automatic concurrency control and recovery of disc data in the event of failure.

	Account	Last Name	First Name	Initial	Street Address	City	State	Zip	Credit Rating
Data Item Value	12345678	Mider	James	L	1645 Marshall Avenue	Glendale	Az	85301	
Data Entries	95430301	Brighton	Abigail	S	72 E Hampton Drive	Carmel	Ca	93921	
	54777833	Graziano	Isabel	M	113 Shasta Lane	Santa Clara	Ca	95050	

Data Items and Data Entries within a Data Set

Key TurboIMAGE Features

- Logically related files can be handled as a single entity (a database), relieving the application of low-level details.
- Network structure allows fast access to complex relationships among data.
- TurboIMAGE intrinsics callable from COBOL, RPG, Pascal, SPL, FORTRAN, BASIC, and Transact provide a high-level programmatic interface.
- Files within a database may stand alone or be logically linked together, allowing flexible data storage.
- Serial, direct, calculated, and chained access methods are available, to provide flexible choices for data retrieval.
- Access to multiple databases allows you to logically associate the data while maintaining database independence.
- Deleted record space is automatically reused to enhance efficient access.
- Concurrent interactive and/or batch access allows multiple users to access data simultaneously.
- Privacy and security allows the control to restrict certain information from unauthorized users. Two-level security at the data set and data item levels, defines subsets of the database providing customizable access to data.
- Transaction Manager guarantees the physical integrity of the database in the event of a system failure.
- Roll-back recovery guarantees the logical and physical integrity of the database in the event of a soft crash.
- Roll-forward recovery guarantees the logical and physical integrity in the event of a hard crash.
- Changelog Facility provides a logical link to new log files. It automatically switches to the new log files on disc or tape when the current log file becomes full.
- User defined locking strategy, at database, data set, and data entry level allows optimum concurrency level control.

When to Use TurboIMAGE — When to Use HPSQL/XL

The network data model of TurboIMAGE and the relational data model of HPSQL/XL both have their place in meeting your business needs. HPSQL/XL is HP's relational DBMS as part of ALLBASE.

TurboIMAGE is well suited for high-volume inquiry and update transaction oriented applications. Characteristic of such applications is that they will be using predefined and stable database structures in a repetitive manner. Performance considerations and detailed tuning facilities are typically more important than high-level access to the data. The procedural TurboIMAGE DBMS allows the programmer to specify exactly how the data is to be accessed. While this requires more query preplanning, it allows the sophisticated programmer the granularity of control necessary to attain optimum performance in throughput for response-time critical applications.

Applications may be developed in less time with HPSQL than with TurboIMAGE. With HPSQL, the programmer must specify only what data is required, not how to access it. Therefore in applications where programmer productivity is important and speed of data access is non-critical, HPSQL should be considered strongly.

TurboIMAGE Components

TurboIMAGE consists of three components:

Data Definition Language. A free-format data definition language (DDL) is provided with TurboIMAGE. Through the DDL, the data base administrator defines the database by describing the items (symbolic name, data type, and length), security, data sets, data set relationships, and size. This database description file is called the *schema*. The schema is then used by a utility that creates the database structure including the data set file space.

Data Manipulation Language. A set of high-level, callable TurboIMAGE intrinsics comprise the data manipulation language (DML). These intrinsics support programmatic access to or maintenance of the data within the TurboIMAGE database. By supplying information such as the database name, the data set name, and the type of access desired, the data base manipulation language locates the data and performs the requested function. The application program simply "calls" the desired intrinsic. The TurboIMAGE DML includes the following intrinsics:

DBOPEN initiates access to a database.

DBCLOSE terminates access to a database or a data set, or rewinds a data set.

DBLOCK temporarily provides exclusive control of a database, one or more data sets, or one or more data entries.

DBUNLOCK relinquishes the locks acquired by all previous calls to DBLOCK.

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DBBEGIN designates the beginning of a logical TurboIMAGE transaction.

DBEND designates the end of a TurboIMAGE transaction.

DBMEMO writes a user-informational message to the TurboIMAGE log file.

DBFIND prepares for chained access to data entries.

DBGET retrieves data entries from a data set.

DBPUT adds new data entries to a data set.

DBUPDATE modifies existing data entries.

DBDELETE deletes data entries from a data set.

DBINFO returns information about the database currently being accessed.

DBCONTROL enables or disables the option to defer output.

DBERROR moves error message to a buffer specified by the calling program.

DBEXPLAIN prints message on the \$STDLIST device.

Database Utilities. Stand-alone utility programs aid in the creation of data sets and the maintenance of a database. These utilities may be run in batch or interactive mode.

DBUTIL is a general purpose utility that performs several different maintenance and administrative functions. Some of the functions of DBUTIL include:

- Allocate and initialize disc space for a database.
- Re-initialize all the data sets of a database.
- Purge the root file and all of the data sets within the database.
- Activate/deactivate the database for Remote Database Access.
- Enable/disable the database for logging and Roll-forward recovery.
- Enable/disable the database for Roll-back recovery.
- Reassign database passwords.
- Display the status of locks currently obtained.
- Move TurboIMAGE file from one device to another.
- Change file system security for TurboIMAGE database files.

DBSTORE transfers a physical copy of a database to magnetic tape or serial disc.

DBRESTOR copies a database from magnetic tape or serial disc back to disc.

DBUNLOAD produces a logical copy (data only) of a database on magnetic tape or serial disc.

DBLOAD loads data from a magnetic tape or serial disc (created with DBUNLOAD) into an existing empty database on disc.

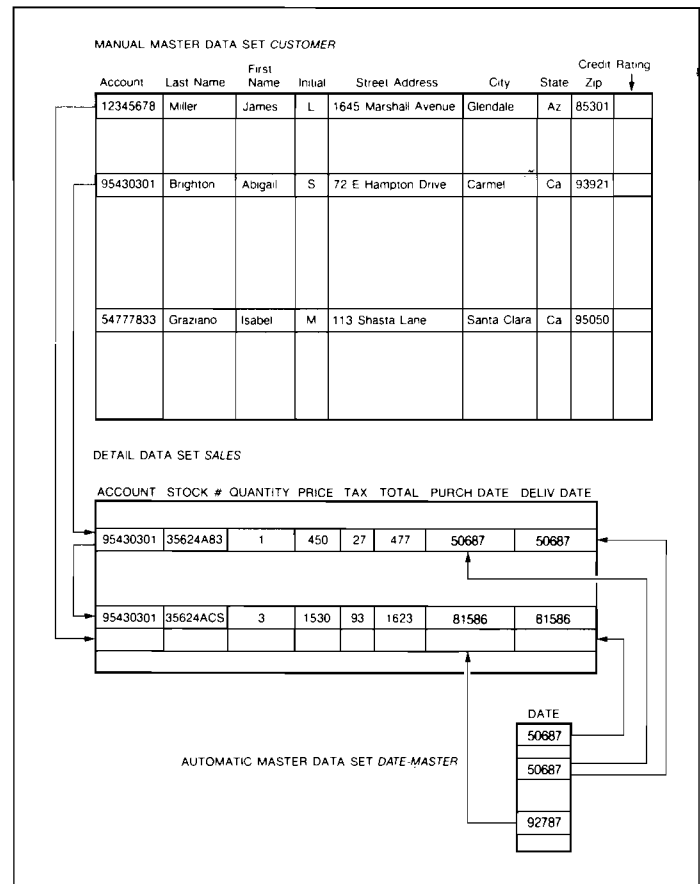
DBRECOV reads the log file to recover a database in the event of a system failure, with roll-back or roll-forward recovery.

Data Types

TurboIMAGE supports signed binary integer (single and double word), unsigned integer, binary, real, double precision real, ASCII character strings, packed decimal, and zoned decimal data types.

Data Set Types

TurboIMAGE supports two types of data sets, master and detail. Master data sets are used to keep information relating to a unique entity; for example, information describing a customer. They allow for rapid retrieval of a data entry, since one of the items in the entry is a search item (a key). A search item serves as an index into detail data sets. Through the search item, a master data set may be linked to up to 16 detail data sets. Detail data sets are used to record information about related events; for example, all of the purchases made by a particular customer. A detail data set may be defined with up to 16 search items and therefore be linked to a maximum of 16 master data sets. Items in detail data sets with identical key values are maintained in an internal linked-list called a chain. TurboIMAGE/XL will allow a chain length to be equal to the number of data entries in its respective data set.



Master and Detail Data Set Relationships

In addition to data sets that are linked together, TurboIMAGE allows both Master and Detail data sets to "stand-alone". This means that there are no links to other data sets within the database. Calculated access is possible with a stand-alone master data set. TurboIMAGE will allow up to 199 data sets to be defined within a single database. These data sets may be in any combination of master/detail relationships.

Access

TurboIMAGE supports serial (chronological), direct, calculated (hashed), and chained access. Access to data entries in a master data set may be hashed (based on the key value of the data entry), or serially read (forward or backward). Access to a data entry in a detail data set is usually through a particular key using an argument value (e.g., name = SMITH). This type of access is called chained. Chained access may be done in either read-previous or read-next modes. It is also possible to access data in a detail data set via direct (by relative record number) or serial (forward or backward) modes. Access methods may be chosen to suit the particular application or subroutine.

Security Facility

Logical views are maintained within TurboIMAGE. The logical view security is implemented through a class-type privacy and security scheme. The database administrator associates a password with each user class to be defined in the database. The user classes are then granted "read" or "read-and-write" access to any or all of the data items and data sets. End users must supply their password when accessing the database. That password will provide end users access to their logical view of the data base. TurboIMAGE allows up to 63 defined passwords within a single database.

Database Integrity

Database Locking

Locking is possible on three levels: the database, data set, and data entries (by locking the value of a data item). TurboIMAGE will allow mixed levels of locking where one user may request a lock on a data set while a second user may request a lock on a data entry. Locking at the data entry level will provide the most concurrency. Locking may be done unconditionally where the application waits for a successful lock, or conditionally where the application can perform other things while a lock is held by other applications.

Recovery

TurboIMAGE/XL recovery options have been modified to operate most effectively with the MPE XL operating system. TurboIMAGE/XL also offers three methods of recovery: Intrinsic Level Recovery (ILR), Roll-forward recovery, and Roll-back recovery. With Intrinsic Level Recovery, TurboIMAGE ensures the physical integrity of the database. TurboIMAGE intrinsics that alter the data in the database are logged to the Transaction Manager (XM) log file (see MPE XL Operating System data sheet). Once the intrinsic completes the XM log file is written to disc. If a hardware failure occurs before the intrinsic completes, the MPE XL operating system will back out the interrupted intrinsic during system start-up.

Roll-forward recovery ensures the logical and physical integrity of the database. TurboIMAGE uses MPE's user logging to log transactions automatically to a tape or disc log file. This log file is transaction oriented as opposed to the intrinsic oriented log file used by ILR. In the event of a hardware or software failure, the recovery system reads the log file and re-executes those transactions which were successfully completed, after the back-up database has been restored.

Roll-back recovery ensures the logical and physical integrity of the database. As with Roll-forward, TurboIMAGE transactions are logged automatically to a tape or disc log file. The user log file and the database must reside in the same volume set. In the event of a hardware or software failure, the recovery system will "roll-back" any incomplete transactions. Roll-back recovery utilizes ILR, to provide database integrity.

Restructuring

DBLOAD and DBUNLOAD utilities provide for restructuring databases in a number of ways, including:

- Changing data item name or data set name
 - Increasing or decreasing data set capacities
 - Adding or removing data items at the end of a data entry
 - Changing data set relationships
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Accessing the Database

A TurboIMAGE database can be accessed in the following ways:

- From COBOL, FORTRAN, and BASIC through a "CALL" statement to the TurboIMAGE intrinsics.
- From RPG through the chain and read statements after the database has been declared in the file specifications section.
- From SPL and Pascal through intrinsic calls to TurboIMAGE.
- From the QUERY language function.
- From the Transact interface function.

QUERY/V Inquiry Facility

QUERY/V is an inquiry facility designed for use by application programmers, database designers, and database administrators. Application programmers and database designers can use QUERY as a tool to validate the database structure before coding has begun. Using the query commands, the programmer can perform module and system testing against the database structure. In addition, QUERY can be used as a way to enter data into a database structure in order to test the logic of the application program.

A database administrator or database designer can use QUERY as a tool for maintaining TurboIMAGE/XL databases. The ADD, DELETE, and REPLACE commands, designed for this purpose, allow data item value modification without writing programs. For additional information on QUERY, refer to the QUERY/V data sheet.

Remote Database Access

NS/3000 permits manipulation of a TurboIMAGE database residing on a remote system. The same security provisions apply to remote access as apply to local access. The user must log on to the system(s) and provide passwords to TurboIMAGE.

To isolate both the user and the application program, TurboIMAGE allows the database administrator to create a directory called a database-access file. This access file defines the location of the database and the authorized users. Only the administrator need be concerned with actual locations; TurboIMAGE and NS/3000 handle the rest. This flexibility allows the administrator to relocate databases without affecting the users' operating procedures or changing any application programs.

TurboIMAGE Specifications

- Data item names per database: 1023
- Data items per data entry: 255
- Data sets per database: 199
- Detail data sets per master set: 16
- Master data sets per detail set: 16
- Search items (keys) per detail data set: 16
- Maximum entry size: 4096 bytes
- Entries per data set: 2 billion (with an assumed blocking factor of 255)
- Entries per chain: 2 billion
- Characters per database name: 6
- Characters per password: 8
- Characters per data set name: 16
- Characters per data item name: 16

TurboIMAGE Compatibility

The availability of TurboIMAGE in native mode allows customers the option to maintain a single version of application source code. The applications could then run on MPE XL based systems as well as on MPE V based systems. This provides full native mode performance without modification to existing application programs or databases. IMAGE applications may therefore be developed which share a common source code across the entire HP 3000 computer family.

IMAGE is also available on the HP 1000 family and selected models of the HP 9000 family. Although very similar in nature, their external specifications and internal storage format is different. The reference manuals for the individual IMAGE products indicate the features and specifications supported by the particular IMAGE model. It is possible to move data from one computer to another, if the differences between the IMAGE databases are taken into consideration in the design phase.

System Environment

TurboIMAGE/XL is supported on the 900 Series of HP 3000 systems.

Ordering Information

The right to use TurboIMAGE/XL on an HP 3000 computer is available according to the terms and conditions of the Hewlett-Packard Software Purchase Agreement.

Software

TurboIMAGE/XL is included in the Fundamental Operating Software on the 900 Series of HP 3000 systems.

Documentation

Part Number	Document Description
30391-90001	TurboIMAGE/XL Reference Manual
32215-90042	QUERY/V Reference Manual

Customer Training

A one week class on TurboIMAGE and QUERY/V is available through the local sales office. The course includes instruction and labs. Training is provided on:

- Creating a TurboIMAGE database using the Data Definition Language
- Practice with the Data Manipulation Language
- Using QUERY against a TurboIMAGE database

Contact the local sales office for a course outline and schedule.

