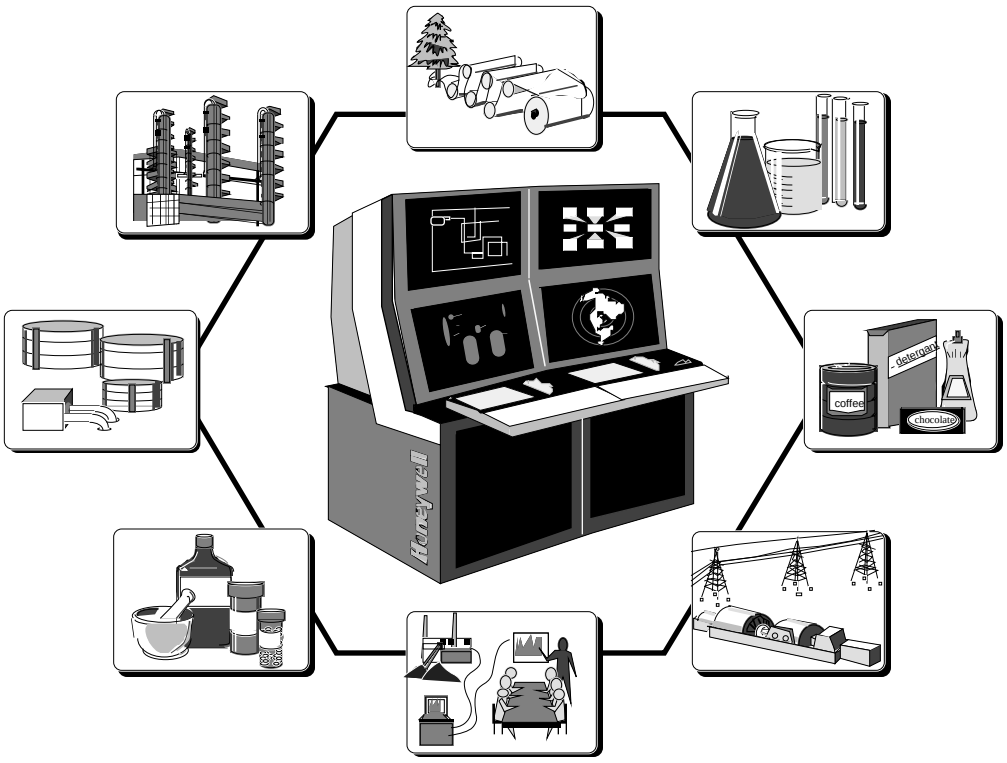
Honeywell

Personal Computer Network Manager/Relational History Server Specification and Technical Data

PCNM/RHS 3.0
NM03-522
11/96



TotalPlant

Personal Computer Network Manager

Specification and Technical Data Sheet

Table of Contents

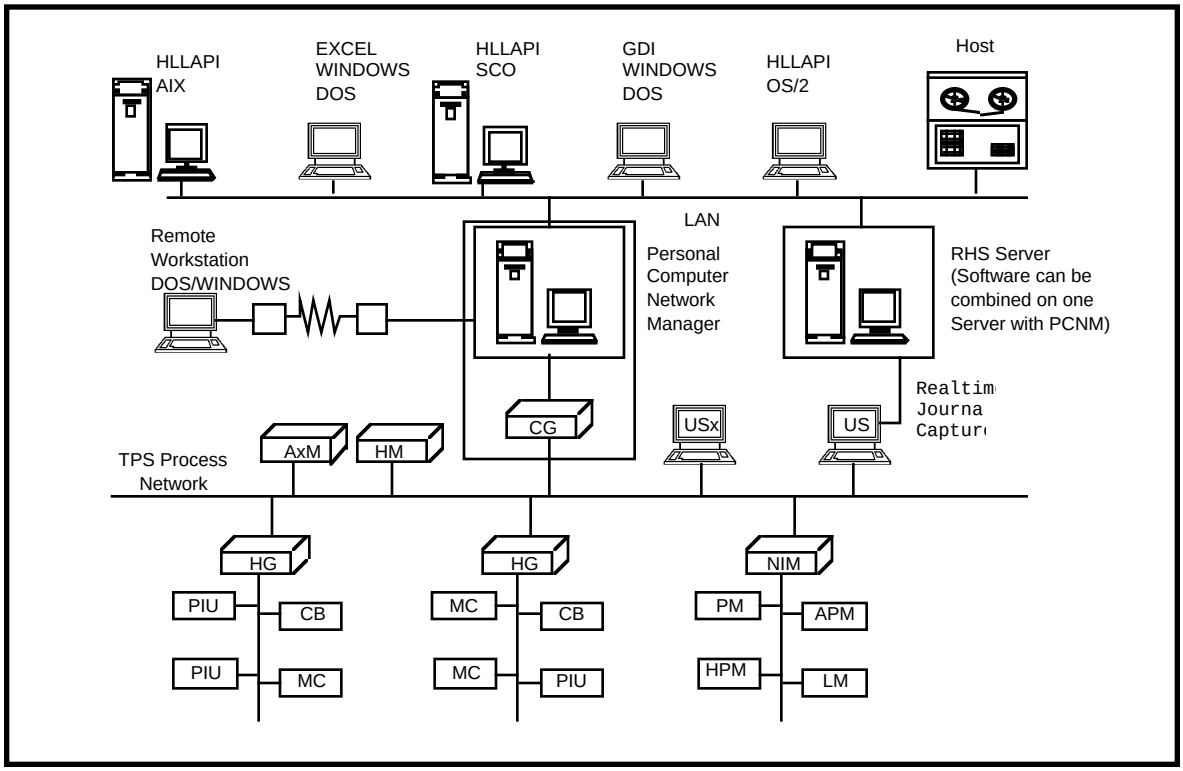


Figure 1 — TotalPlant Solution (TPS) System with PCNM, RHS, and LAN

Functional Summary

PCNM Software

Provides an industry standard data access mechanism (SQL queries) to **TotalPlant** Solution (TPS) system LCN data stored in the PCNM.

- Integrates data from external systems (e.g., laboratory data) with LCN data in the same database.
- Provides automatic and demand update of the PCNM real-time database for LCN data values.
- Allows building of custom displays using the integrated GUI application - GDI.
- Provides standard Honeywell displays and tools for the analysis of LCN real-time and history data.
- Provides High Level Language subroutines that permit user application programs access to real-time and history data from the LCN.
- Supports Ethernet or IBM Token Ring networks and remote access.
- Supports multiple PCNMs per Local Area Network.
- Automatic time synchro-nization with LCN time.
- Provides Data Access Control and Security to the PCNM database.
- Utilize system events to trigger applications over the PCNM Network

RHS Software

Available as an option to PCNM, Relational History Server permits the creation of history tables within a SQL Server environment.

- Software runs on PCNM Server or standalone RHS Server.
- Automatic collection of data from sources such as LCN History Modules, the LCN (for real-time values), and PCNM Servers.
- Storage and accumulation of the collected data in a Relational Database for easy and secure data retrieval by user workstations.
- Ability to log alarms and journals to Relational tables including: Operator Changes, Process Alarms, Operator Messages, System Maintenance Messages, System Status Changes, and System Error Messages.
- Automatic archiving of the accumulated information to an ASCII file based on user-specified intervals.
- Reloading of previously archived data to the Relational Database for replay.
- RHS can access data from multiple PCNM Servers.

System Overview

This document describes the system architecture and features of the Personal Computer Network Manager (PCNM) and the PCNM Relational History Software (RHS). The PCNM system functions as a TPS module that integrates a Local Area Network (LAN) with the TPS Local Control Network (LCN) (see Figure 1). The RHS, an optional subsystem, runs on the PCNM Server or a separate RHS Server. It supports automatic collection, accumulation, and archiving of history data.

The PCNM system incorporates Microsoft Windows NT server which supports a wide array of network connectivity options. It allows Personal Computers connected to a Local Area Network to access real-time and history data from the LCN. LCN data is retrieved through the TPS Computer Gateway (CG) and stored in the PCNM Server real-time database. Data can also be collected in the RHS historical database from where it can be archived. Communication between the CG and the PCNM Server is based on the standard HDLC LAPB protocol.

Using Microsoft NT SQL Server, an industry standard SQL (Structured Query Language) database engine, the PCNM and RHS systems offer a flexible and secure platform for the sharing of LCN and other subsystem data in a PC Network environment. Data stored in the PCNM databases can be accessed easily using SQL commands, third party PC software packages, user application programs, or the PCNM Graphics Display Interface. Data access is controlled to prevent unauthorized access to the PCNM databases.

The PCNM's client-server architecture makes it possible for multiple "front–ends" (PC databases, custom graphics, spreadsheets, etc.) to access the same NT SQL Server database at the same time and yet provide a

high level of data security and improved performance.

User-provided PC workstations access PCNM configuration services through the Microsoft Windows for Workgroups 3.11, Windows 95, or Windows NT 3.51 environment. PCNM workstation utilities, supplied by Honeywell, provide users with interactive access to the PCNM/RHS servers for data configuration, history table definition (RHS and combined systems), query tools to review data and table viewing (RHS and combined systems) (see Figure 2).

One of these workstation utilities, Graphics Display Interface (GDI), is a powerful graphics application platform for custom displays. It is fully integrated with the PCNM and provides the user with easy access to the PCNM/RHS Server and LCN data. GDI includes the standard HTP trending application which provides users with a mechanism to define up to twelve (12) trend pens for the displaying of data from the LCN, PCNM database, History Module or data files.

The PCNM supports both Ethernet and IBM Token Ring networks. Leveraging the advanced interconnectivity features of the MS Windows NT server and SQL server for NT, PCNM workstations can be configured to operate under Novell TCP/IP, MS TCP/IP and NETBEUI network protocols. Connectivity to Oracle systems, DB2, etc. can be achieved by using existing third party gateways.

Remote workstation access to PCNM is supported with the addition of serial, asynchronous modems at both the PCNM Server and workstation. Remote access permission to PCNM is set by the administrator, using the Remote Access Administration Utility. Security is further enhanced with different levels of call-backs, managed by the network administrator, on an account-by-account basis.

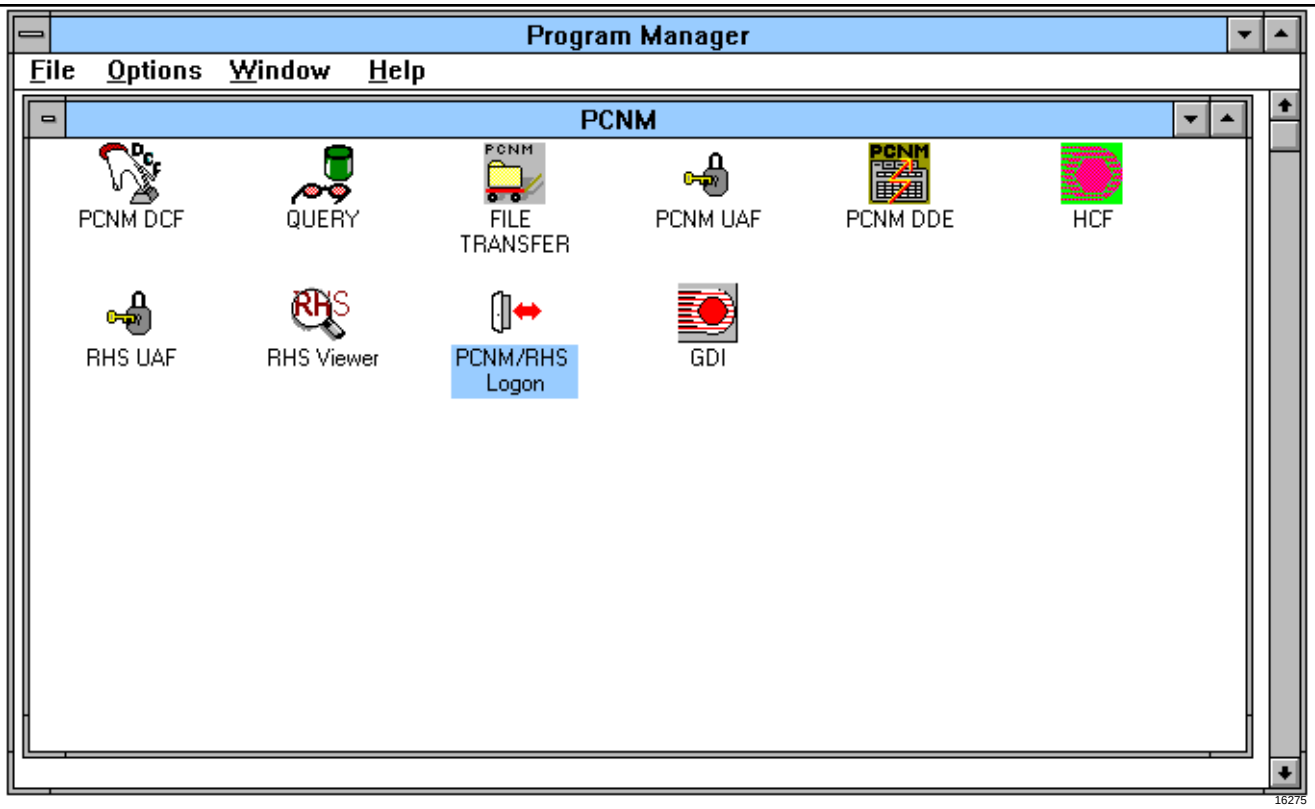


Figure 2 — PCNM User Access Panel

PCNM Functional Description

Data Sources

Client workstations connected to the PCNM Server through a Local Area Network can access the following types of data:

Real-Time Data

The PCNM real-time database stores snapshots of LCN and external subsystem real-time data values. Real-time LCN data can be updated automatically by one of the three user-configurable periodic schedulers. The user has the option of updating infrequently used data only on demand. Data stored in the PCNM real-time database can be accessed easily using both Honeywell provided tools and third party SQL server "front–end" products. Database access control, with audit trails on unauthorized access to the database, is provided by the PCNM Server.

The real-time database can store a maximum of 25,000 LCN floating point parameters with a maximum assignment of 8000 LCN floating point parameters per scheduler. The storage capacity for LCN ASCII string will be lower than the floating point parameters.

LCN History Data

History data from TPS History Modules can be retrieved through PCNM and optionally stored in the RHS's SQL Server Relational Database. The accumulated data can be retrieved at user workstations for detailed analysis with tools such as SQL report writers and spreadsheets.

Subsystem Data

The PCNM real-time database allows the storage of data from both LCN and external subsystems. Non-process data from laboratory systems, inventory control subsystems, etc., can be integrated with LCN data in the same database. Using GDI, both LCN and subsystem data can be displayed, trended, compared, and analyzed within the same display.

Data Access Mechanisms

Graphics Display Interface (GDI)

The PCNM Graphics Display Interface (GDI) is a powerful windows-based graphics package that enables the user to create sophisticated, interactive displays and applications. A **TOOL PALETTE** is provided with the GUI Editor to enhance the ease of building process graphics. Simple graphics animation can be built using point and click options *(more sophisticated process animation simulations can also be built through inherent GDI functions*). The GUI Application Manager supports easy navigation and maintenance through the different modules in the application. The GDI supports variants, target-like functions, as well as a wide range of built-in functions for data and graphics manipulation. A standard Honeywell display (HTP), built using the GDI, is provided with the PCNM. This display allows the user to retrieve and plot history data, trend real-time process values, and analyze previously saved history and trend data.

HLLAPI Subroutines

User program access to the PCNM Server and LCN data is supported by a library of High Level Language Application Program Interface (HLLAPI) subroutines. With release 3.0 of PCNM, HLLAPI's support Windows NT, DOS, and the WIN 16 in addition to MS Pascal and MS FORTRAN. In addition, PCNM also supports UNIX HLLAPI options for AIX and SCO.

Other Access Mechanisms

The user can write custom applications that use the SQL Server SQL language library to access the PCNM real-time database directly. In addition, many "front–end" products, such as Paradox, MS ACCESS, Lotus 1-2-3, MS Visual Basic, etc., provide transparent links to the PCNM SQL Server database. Since SQL Server is ODBC compatible (Microsoft's Open Database Connectivity Standard), third party products that support this capability can also be used to access PCNM.

Figure 3 shows the data flow within the PCNM environment.

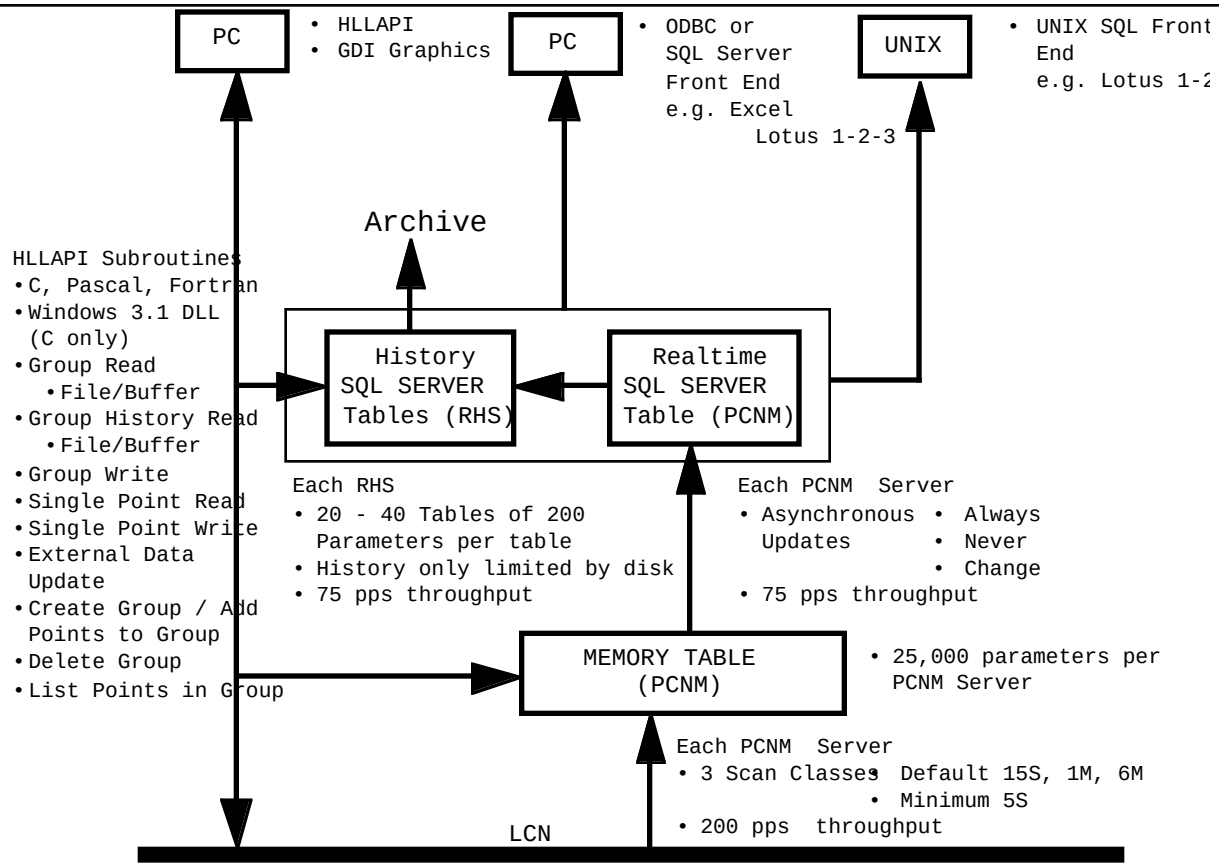


Figure 3 — PCNM Data Flow

PCNM Workstation Utilities - Data Configuration and Analysis

The PCNM contains a series of client workstation utilities that provide users with the functionality required to configure the PCNM database, query the database, transfer files with the LCN, establish a DDE-link between PCNM and another windows application, and configure event triggers for application programs. The workstation utilities can operate under Windows for Workgroups 3.11, Windows 95, or Windows NT 3.51 Workstation. The following table provides an overview of the PCNM workstation utilities.

PCNM DCF	 PCNM DCF	Through the Data Configuration Facility (DCF) the user specifies the point parameters to be stored in the PCNM Server database, the update frequency for each point parameter, as well as other required attributes. To maximize system performance, a change limit for each point parameter can be defined. An update of a value in the SQL database occurs when the change limit value is exceeded. The user can define a list of point parameters to be accessed by a group name. These data groups are also defined through the DCF. Configuration updates to the PCNM database can be performed with system interruption.
Query	 QUERY	The Query program provides users with a facility to examine the configuration of, and current point values in, a PCNM Server. The Query program application window is subdivided into separate working tabs to allow users to separately define queries for PCNM points, groups, and points in groups.
PCNM DDE	 PCNM DDE	The PCNM DDE program provides a point-and-click interface to the capabilities of the HLLAPI subroutines. With this application users can read data from a PCNM Server, or the LCN directly, and write data to a PCNM Server or the LCN. In addition, PCNM DDE can also act as a DDE server to other applications running on your PC.
File Transfer	 FILE TRANSFER	The File Transfer program provides users with a mechanism to transfer text files to and from an HM. The system administrator can control this transfer function by restricting user-access through the assignment of PCNM resources.
EAP		The Event Activated Process (EAP) program enables users to configure their application programs, across the PCNM network, for activation in response to events or triggers. These user application programs are known as Event Activated Processes, or EAPs.
WCF		The Workstation Configuration Facility (WCF) allows users to configure their workstations to interact more effectively with the PCNM/RHS System. This configuration facility provides users with the ability to specify PCNM and RHS servers that they will connect to, specify default parameters for the HCF program, define point parameters for the DCF auto-point generation and specify valid characters for the EAP configuration program.

RHS Functional Description - Optional Addition to PCNM

Relational History Server, currently available as an option to PCNM, provides users with the ability to store a large volume of LCN data in relational tables for off-line access and analysis. Inherent tools that are provided with RHS allow for the development of custom table population schemes. These schemes can include periodic collection of data, collection triggers that are activated through process events (*start/stop of a batch process*), custom scripts that define conditions for data collection and storage (*store data only if point values have changed by a specified amount between successive scans*), and also a combination of triggers and scripts. These same collection tools can also be applied to develop custom archiving schemes for data in the tables. Figure 4 depicts the basic structure of a History Data table.

Event triggers and collection scripts provide users with the ability to control the collection of data. An additional RHS feature, the Destination Table, gives users the power to manipulate the collected data before storing the data in their tables. This data manipulation can include averaging collection data over a specified number of samples and storing the average in the history table, or it can be more complex utilizing the scripting language to develop a storage script. The storage script can be a simple comparison or summation of point values, or it can be a complex algorithm that rearranges the collected data into a meaningful, function-oriented table.

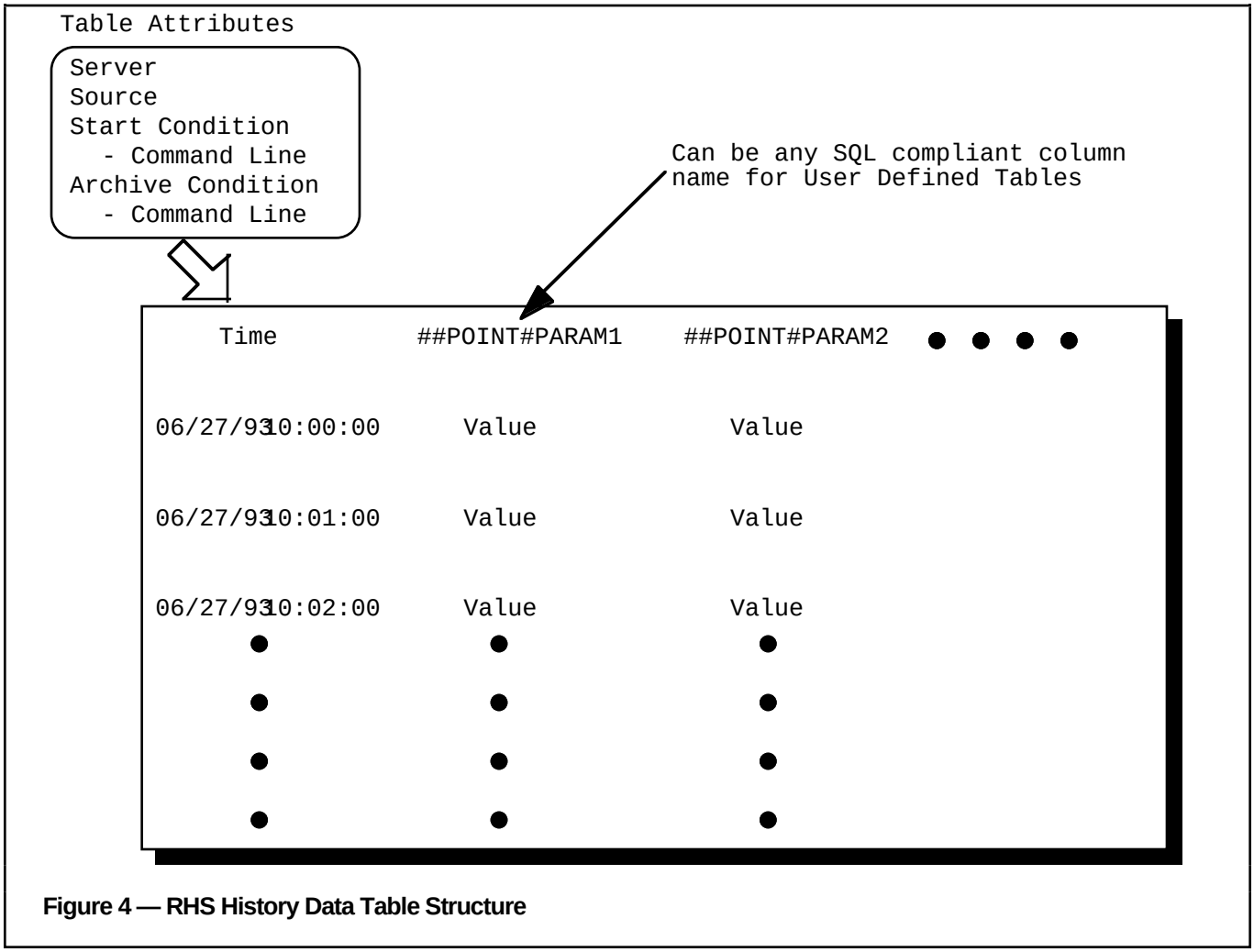


Figure 4 — RHS History Data Table Structure

At present, RHS is delivered with two workstation programs that support history table definition and configuration, and the viewing of table data. The table configuration program (History Configuration Facility) allows users to define the requirements for the history table. This definition includes specifying the collection source for the data (History Module, directly from the LCN, the PCNM database or user-defined program), defining the collection schema for the table, and determining archive requirements. The HCF program provides users with access to the collection and archiving tools.

The data-table viewing program (RHS Viewer) allows users to specify which tables on the RHS server they wish to view. In addition to providing a simple interface to the data, RHS Viewer supports the selection of a subset of table columns to be viewed and also the development of selection criteria for the data to be viewed. The selection criteria can be developed using a *selection tool* that supports the development of the criteria through a simple point-and-click interface. In addition to the ad-hoc development of the selection criteria, RHS Viewer supports the use of standard SQL queries to select the data for viewing.

One of the more powerful features of RHS Viewer is the ability to modify data in user tables with a complete audit trail of the changes. The audit trail, captured in a table on the server, records information (user name and date/time of change) related to modification of point values and the addition/deletion of points in the table. By default, tables do not support this feature—they must be specifically configured using the HCF to support data modification. This feature is particularly useful in plant situations where data must be manually verified or in situations where data is known to be in error (failed transmitter).

History data in RHS tables can be accessed from PCs connected to RHS via a network. The Microsoft SQL Server database, upon which RHS has been built, supports data access by third-party front-end that are ODBC-SQL Server compliant. Figure 5 depicts the RHS data flow.

RHS Customization

The capabilities of RHS can be extended by the use of User-Defined tables and the Command Line function.

With User-Defined tables, columns can be customized to any name, type, and size acceptable to SQL Server. The RHS does not populate the User-Defined table, so the user is responsible for collecting and storing the data into the table using an application program. The application program can be invoked by a Command Line expression.

Since SQL Server is ODBC compatible, third party tools which support this capability can also be used to update the User-Defined tables.

The History Tables can be customized to contain either user-defined data or transformed LCN point parameters.

Real-Time Journal Capture

The Real-Time Journal Capture (RTJC) Subsystem captures Journal messages from a Universal Station printer port and stores them into RHS User-Defined Tables. These tables are archived on a daily basis as a default.

The various Journal messages are parsed according to type. Each Journal message type is stored in its corresponding table. When the RTJC subsystem is installed, separate tables are created for the following journals:

- Operator Changes
- Process Alarms
- Operator Messages
- System Maintenance Messages
- System Status Changes
- System Error Messages

This allows the user to conduct sophisticated analysis such as relating the point values during a time period before and after the point goes to the alarm state.

RHS Data Collection

Data values collected by the RHS are stored into user-configured relational database tables, called History Data tables (including User-Defined tables). Each History Data table has the time stamp as the first column, with the rest of the columns being the point parameter names of the

members. History Data table members are point parameter values unless the user customizes the table.

Data Sources

The RHS can collect data from any of the following sources:

History data from the LCN History Module*:* Snapshots and averages (Hourly, Daily, Shift and User) are available. With averages, the additional values of Status, Maximum, and Minimum may be read. When using User averages, the type of User average must be specified. Floating point, ordinal, and integer data types are supported.

Real-time values directly from the LCN*:* Floating point, ordinal, integer and ASCII data types are supported.

PCNM Server data: Floating point, ordinal, integer and ASCII data types are supported.

LCN Array data directly from the LCN*:* Floating point, ordinal, integer and ASCII data types are supported.

User -defined data for User - Defined Tables*:* Any data type acceptable to SQL Server is supported.

The PCNM Server is the channel through which the RHS collects its data. Each RHS can access multiple PCNM Servers, and therefore multiple LCNs. While the RHS supports data collection from multiple data sources and multiple PCNM Servers, each History Data table can have only one data source.

Data Time Stamps

The first column of a History Data table is the time stamp column. The times stored in the table are associated with the data values collected. The times recorded in the table for data collected from the LCN History Module are the history module time stamps returned with the data. The times recorded in the table for real-time snapshot values from the LCN are the times those values are returned to the PCNM Server.

The times recorded in the table for data retrieved from the PCNM Server are the current PCNM Server times. The PCNM Server time is synchronized with the attached LCN system time every 24 hours. The time recorded in a User-Defined table is entered automatically by the SQL Server at the time when a record is inserted into the table.

Collection/Archive Triggers

The initiation of data collection or archiving is triggered when the condition specified for that action is met. During the definition of the history data table, the user can specify the triggers for both data collection and data archiving.

The following triggers are supported:

Periodic*:* This is used to initiate data collection and archiving on a periodic basis. A Start Time is used in conjunction with the Periodic trigger so that the user can specify exactly when an action should take place. This allows the user to pace actions so that bottlenecks are avoided.

Event*:* This trigger is available for controlling when to collect and terminate data collection and for starting automatic archiving. The user can use an Advance Control Interface Data Point (ACIDP) event, a User-Defined condition, or a combination of both to start and to terminate data collection. The user also has the option to specify a termination condition or an Elapsed Time so data collects just for the time period stated. All ACIDPs have to be defined on the LCN.

Number of Samples*:* This trigger is available only for starting automatic archiving.

All triggers have a Command Line option that is executed every time a condition is met. This feature allows the user to access custom applications after the specified action (data collection or archiving) is performed.

Archiving

Archiving is either triggered automatically or initiated manually by the user. The automatic archiving trigger is specified when the user configures the History Data table. If the Archive trigger condition is met and the table is in an ACTIVE state, the RHS automatically copies the data in that table to an ASCII file. The column names as well as the current trigger definitions are stored in the archive file. Data values are stored in Comma Separated Values (CSV)

format. This format is compatible with many third party application programs such as Lotus 1-2-3 and Microsoft Excel.

The automatically archived data is written to a file on the RHS with the same name as the History Data table. The RHS server can be configured to archive files in one of three manners: write to a single file that is overwritten on each archive, write to a new file (same name as the history table but different extension—up to 999 distinct files can be written), or append the data to the end of an existing file. The user can select whether to archive all the data in a table or only part of the data by specifying the number of records to retain. The records retained are always the most recent. After information is copied to the archived data file, the RHS deletes the "non-retained" archived data in the table to allow room for new data.

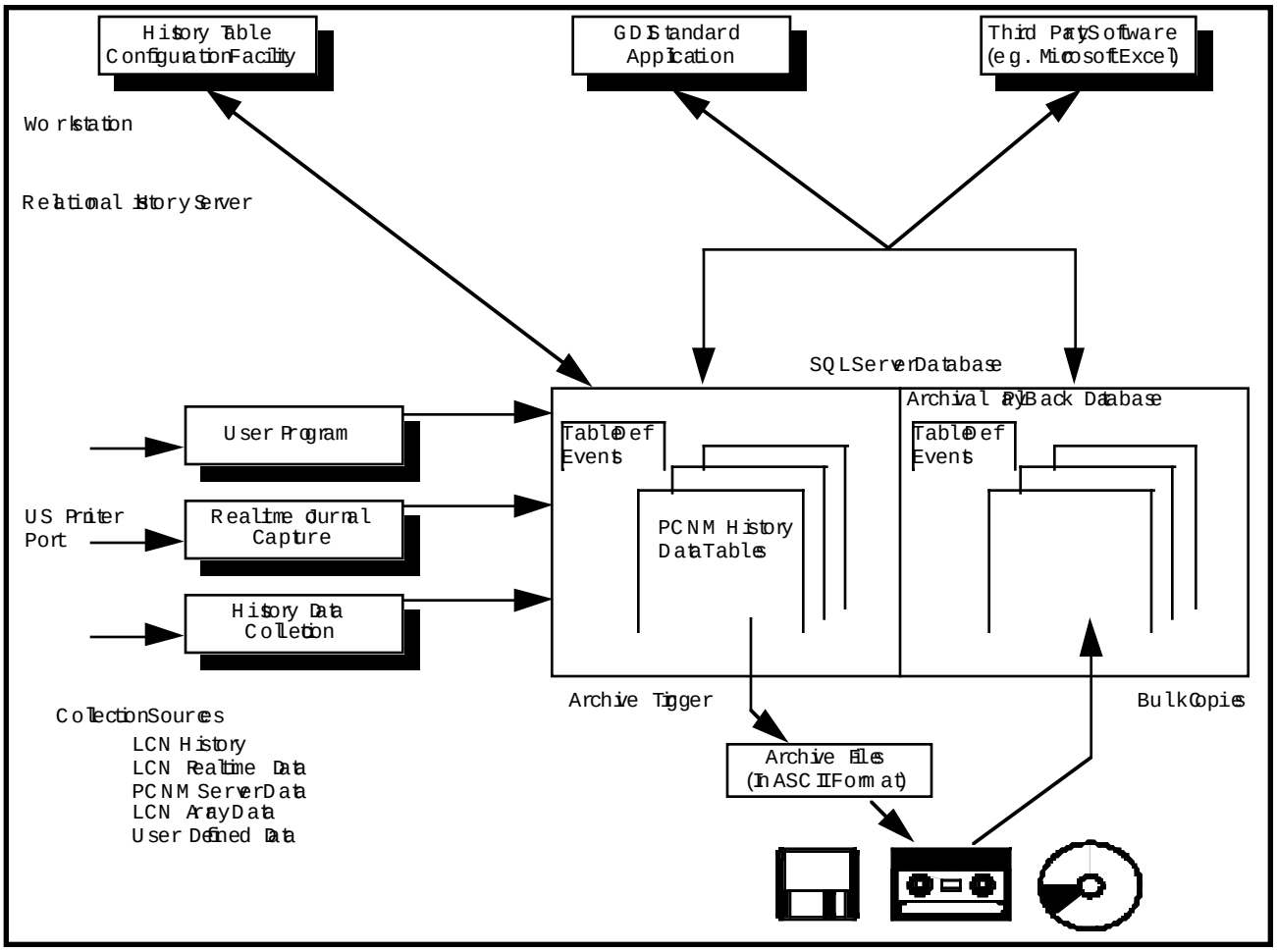
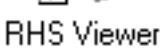


Figure 5 — RHS Data Flow

RHS Workstation Utilities - Table Configuration and Analysis

PCNM/RHS contains a series of client workstation utilities that provide users with the functionality required to configure all aspects of history tables, view the table data, and manipulate the table data (with full audit trail). The workstation utilities can operate under Windows for Workgroups 3.11, Windows 95, or Windows NT 3.51 Workstation. The following table provides an overview of the RHS workstation utilities.

HCF 	The History Configuration Facility (HCF) program allows the user to configure the RHS History tables. The HCF program provides the facility for the user to create, delete, and modify RHS tables, manually archive table data, and develop complex rules that govern the collection of data.
RHS Viewer  	The RHS Viewer is used to select and view the data in a History Table, filtering it according to criteria that you supply, and in some cases, change the table data. The data is displayed in a tabular format, from which it can be copied and used elsewhere.

Hardware Configuration

PCNM Components

The Personal Computer Network Manager package consists of the following:

- High performance Intel Pentium-based computer. Either a Dell's 5100/PXE-2 tower server computer running at 100 MHz, with 32 MB of RAM and 2 GB of hard disk, or a Dell's 5100GM desktop model PC running at 100 MHz, with 24 MB of RAM and 850 MB of hard disk. Both models are equipped with an internal modem and a CD-ROM drive.
- TPS Computer Gateway with the RS449 CLI board option.
- PCNM HDLC communications board. It connects directly to the Computer Gateway through an RS449/RS422 cable, and communicates with the Gateway using the standard HDLC LAPB protocol. The HDLC board is based on the IBM PC AT bus architecture, and utilizes dual DMA channels for more efficient data transfers.
- PCNM to CG communication cable.
- One Network communications card (Ethernet or IBM Token Ring).
- A set of PCNM Implementation documentation.
- Electronic media containing the PCNM Server and client workstation software.

Multiple PCNMs may be connected to one LAN.

RHS Components

The RHS package consists of the following:

- RTJC communication cable.
- 4/8 Gigabyte DAT (Digital tape) backup kit which includes a tape drive with an "Adaptec" model 1540CF controller.
- A set of RHS documentation.
- Electronic media containing the RHS and client workstation software.

If the PCNM RHS package is ordered as a separate Server, the following hardware is also included:

- High performance Intel Pentium-based computer. Dell's 5100/PXE-2 tower server computer running at 100 MHz, with 32 MB of RAM, 2 GB of hard disk, an internal modem and a CD-ROM. A SCSI Drive Array and additional hard disk storage (RAID subsystem) are optional.
- one Network communications card (Ethernet or IBM Token Ring).

RAID Subsystem (Optional Hardware for RHS Systems)

A RAID (Redundant Array of Inexpensive Disks) subsystem consists of a DSA controller card and an array of hard disk drives, is designed to support data integrity and redundancy for reliable data storage in the high performance RHS server. In a RAID subsystem, a series of physical drives is configured as a drive array (or a composite drive), the operating system "sees" just one drive, such as drive "c" or drive "d." The way data is distributed across the drive array is determined by the RAID configuration (or RAID Level) of the subsystem. The RAID subsystem also support for replacing failed hard-disk drives without turning off the computer system.

The optional RAID subsystem for RHS server supports a maximum of eight 2-GB hard disk drives, and the following RAID configurations:

RAID 1 (with even number of drives) - RAID 1 is **DISK MIRRORING**. Data is duplicated across two identical drives so that one is a mirror of the other. Mirroring offers complete redundancy for good fault tolerance and maximum data security. However, mirroring requires twice as many drives as the specified data capacity. Also, in mirroring configuration, for every disk write operation, the system must write the same data to both disks, this can degrade system performance.

RAID 5 (with a minimum of 3 drives) - RAID 5 is **DATA GUARDING**. It dedicates the equivalent capacity of one entire drive for storing parity information (redundancy check data) and the rest for drive capacity for ordinary data storage. Redundancy parity information and ordinary data are distributed across all drives in the array. RAID 5 allows the composite drive in RAID subsystem to continue to operate even after a drive failures, and data from the failed drive can be regenerated on the new drive after a failed drive has been replaced. The performance penalty in a RAID 5 configuration is not as severe a RAID 1 configuration. RAID 5 requires one more drive than the specified data capacity.

Licensing Scheme

Microsoft Software License

Under Microsoft's new licensing policy, "servers" and "clients" are licensed independently. The license fees for NT 3.51 server and SQL 4.21a server are included in the price of all PCNM/RHS 3.0 models. However, the ***users must purchase their own client licenses to access the NT and SQL servers*** incorporated in all PCNM/RHS products.

The "per-client" or "per-seat" licensing scheme is applied to NT 3.51 server, the users are required to pay an access fee (by purchasing a client license) for every client connected to the NT 3.51 server. For example, a user with 100 PCs which are connected to a LAN to access a NT 3.51 server, or to access it at some time in the future, would have to purchase 100 client licenses for that server.

The "concurrent" licensing scheme is applied to SQL 4.21a server, the users would be required to purchase client licenses only for the number of PCs that are currently accessing the SQL server.

For users with multi-server in the LAN, a client license for NT and SQL servers allows the client to access to any number of servers on the same network. Therefore, if a user has already acquired the client licenses for accessing other NT 3.51 and SQL 4.21a servers on the network, he would not need to purchase a new client license for the installation of the new PCNM/RHS 3.0 server(s) to the network.

PCNM/RHS 3.0 Server License

The "concurrent" licensing policy also applies to Honeywell's server software in PCNM 3.0 systems. Users that purchased a PCNM/RHS system with a certain number of "workstations" (1, 5, 20, or 64 users) will allow a certain number of clients to connect to the PCNM/RHS server(s) at a given time concurrently.

Licenses for PCNM/RHS Upgrades

The following client licenses are included in all systems upgraded from PCNM/RHS 2.x to PCNM/RHS 3.0:

- Same number of “workstation” licenses for accessing the PCNM/RHS server,
- Same number of “concurrent” client licenses for accessing the SQL 4.21a server,
- Same number of “per-client” client licenses for accessing the NT 3.51 server.

Due to the change of Microsoft licensing policy from "concurrent" (for LAN Manager in PCNM/RHS 2.x) to "per-client" (for NT 3.51 in PCNM/RHS 3.0), the users may be required to purchase additional client licenses for accessing the NT 3.51 server from their local representatives or dealers of Microsoft products.

Specifications

Server Hardware Platforms

System Type	PCNM Server Desktop Model (for 1 & 5 users only)	PCNM Server Tower Model (for 1,5,20,64 Users)	RHS Standalone	PCNM/RHS Combined System (1,5,20,64) (See Note Below)
DELL Model Name	5100/GM	PowerEdge 5100-2/XE	PowerEdge 5100-2/XE	PowerEdge 5100-2/XE
Computer Type	Desktop	Tower	Tower	Tower
Processor	100 MHz Pentium	100 MHz Pentium	100 MHz Pentium	100 MHz Pentium
Memory	24 MB	32 MB	32 MB	32 MB
Disk Drive	850 MB	2 GB	2 GB	2 GB
Removable Media	3 _" Diskette	3 _" Diskette	3 _" Diskette	3 _" Diskette
HDLC Card	Standard	Standard	N/A	Standard
Internal Modem	Standard	Standard	N/A	Standard
CD-ROM	Standard	Standard	Standard	Standard
Server Network Adapter for Ethernet Systems	3COM 3C509 Combo	3COM 3C509 Combo	3COM 3C509 Combo	3COM 3C509 Combo
Server Network Adapter for Token Ring Systems	IBM Token Ring 16/4	IBM Token Ring 16/4	IBM Token Ring 16/4	IBM Token Ring 16/4
4G DAT Tape Backup	N/A	N/A	Standard	Standard
Options:				
UPS	Available	Available	Available	Available
Optical Disk Drive	N/A	N/A	N/A	N/A
DELL SCSI2 Array	N/A	N/A	Available	Available

NOTE: A combined PCNM/RHS server will have 50% to 80% the performance, data throughput, and database capacity of a system with separated RHS and PCNM servers, depends on the applications.

Server Software Platform

Operating System	Microsoft Windows NT Server Version 3.51
RDBMS	Microsoft SQL Server for NT Version 4.21a

Recommended Workstation Configuration

Processor	INTEL 80486 (or above) Computer Systems
Storage	At least 12 Megabytes of Free Disk Space*
Memory	16 Megabytes
Network Adapter	For Ethernet Systems : 3COM 3C509 Combo Card For Token Ring Systems: 3COM Tokenlink Controller
Operating System	Microsoft Windows for Workgroup 3.11, Windows 95, or Windows NT workstation v3.51

PCNM to Computer Gateway Interface Cable

Cable Connections	PCNM Server to Computer Gateway
Cable Type	Shielded twisted pair
Signal Type	RS449 (RS422 for data & clock signals, and RS423 for modem handshake signals)
Connector (CG Side)	37-pin Male
Connector (Server Side)	25-pin Female
Cable Length	
Standard	20 meters
Maximum	400 meters
Other	In increments of 10 meters
Link Protocol	HDLC LAPB
Link Speed	Up to 75 kilobaud per second

RTJC Communication Cable

Cable Connections	PCNM/RHS Server to Honeywell Universal Station (Printer Port)
Cable Type	Shielded twisted pair
Signal Type	RS232C
Connector (Universal Station Side)	25-pin Male (for US with EPDG I/O board), or 9-pin Female (for US with EPDGC I/O board, and U^{X}S with TPDGC I/O board)
Connector (Server Side)	9-pin Female
Cable Length	20 meters

TDC 3000^{X} System Requirements

Computer Gateway Required	CG with RS449 CLI I/O board
LCN Software Supported	TDC 3000^{X} Release 410 or beyond (up to R500)

*This amount is required for full installation of PCNM workstation software. Actual disk space requirement may be less, depending on the software components installed.

Specifications (Continued)

Physical

	Tower Model	Desktop Model	Monitor
Height	19.5"	6"	14.6"
Width	11.5"	16.6"	14.33"
Depth	26"	17"	15.07"
Weight	70 lb	34 lb	27 lb

Power Requirements

Tower Server	530 W Max.
Desktop Server	145 W Max
Monitor	110 W Max.

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