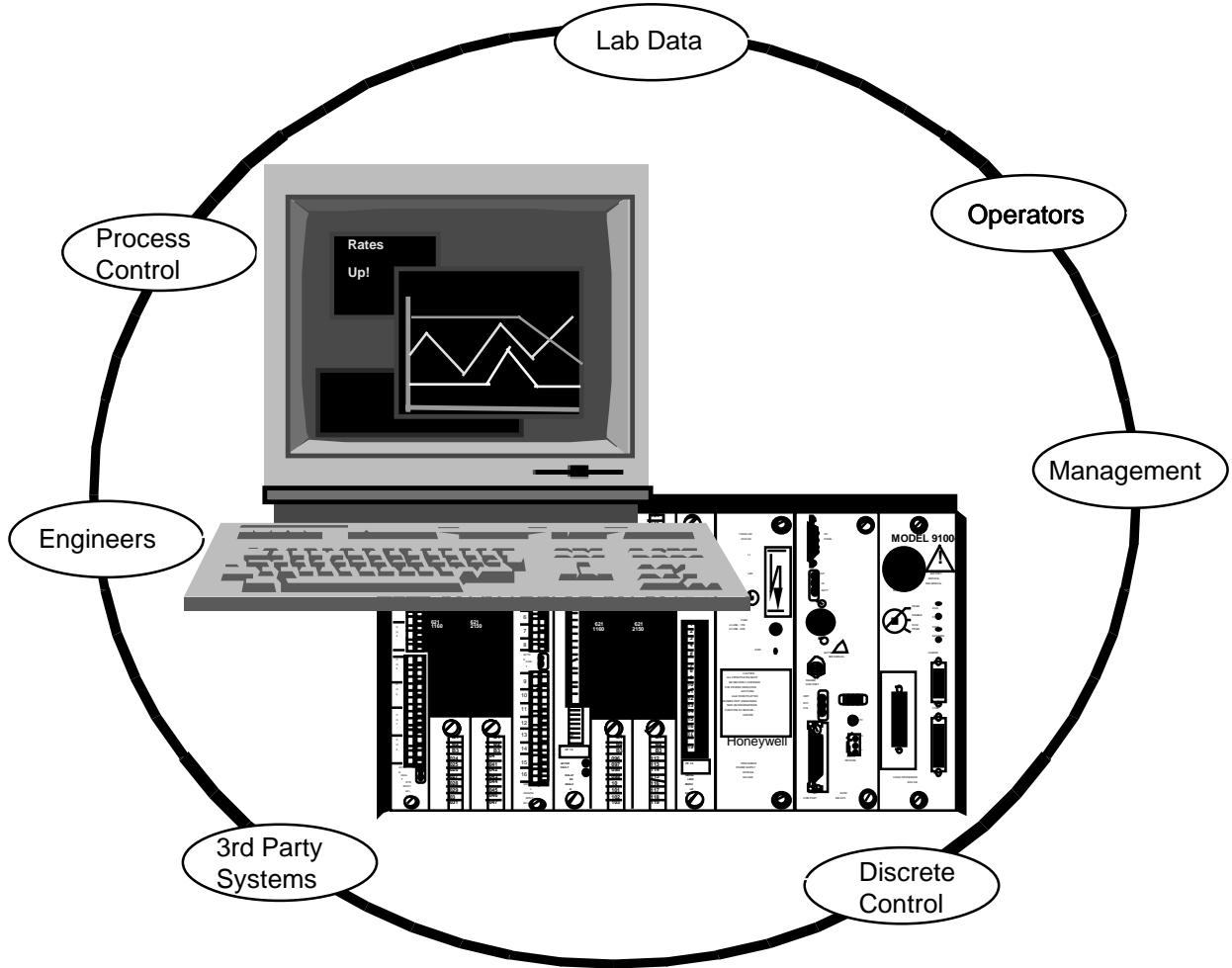


# Integrated PlantScape Vista/S9000 Controller System Specification and Technical Data

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# Integrated PlantScape Vista/ S9000 Controller System

# Specification and Technical Data

## Introduction

Honeywell's integrated PlantScape Vista/S9000 Controller System combines our field-proven Supervisory Control and Networking package PlantScape Vista with our equally reliable and proven integrated loop and logic controller S9000. This combination gives you a tightly

integrated control solution that provides the ultimate flexibility in designing, configuring, monitoring and controlling your process.

The integration is based on a client-server architecture using an Ethernet TCP/IP communications link as shown in Figure 1. The modular architecture means you can

easily expand the system if needed. The PlantScape Vista server maintains a single integrated real-time database for the system. This means the current process data is readily accessible throughout the network.

PlantScape Vista and the S9000 Controller still retain their unique features and functions.

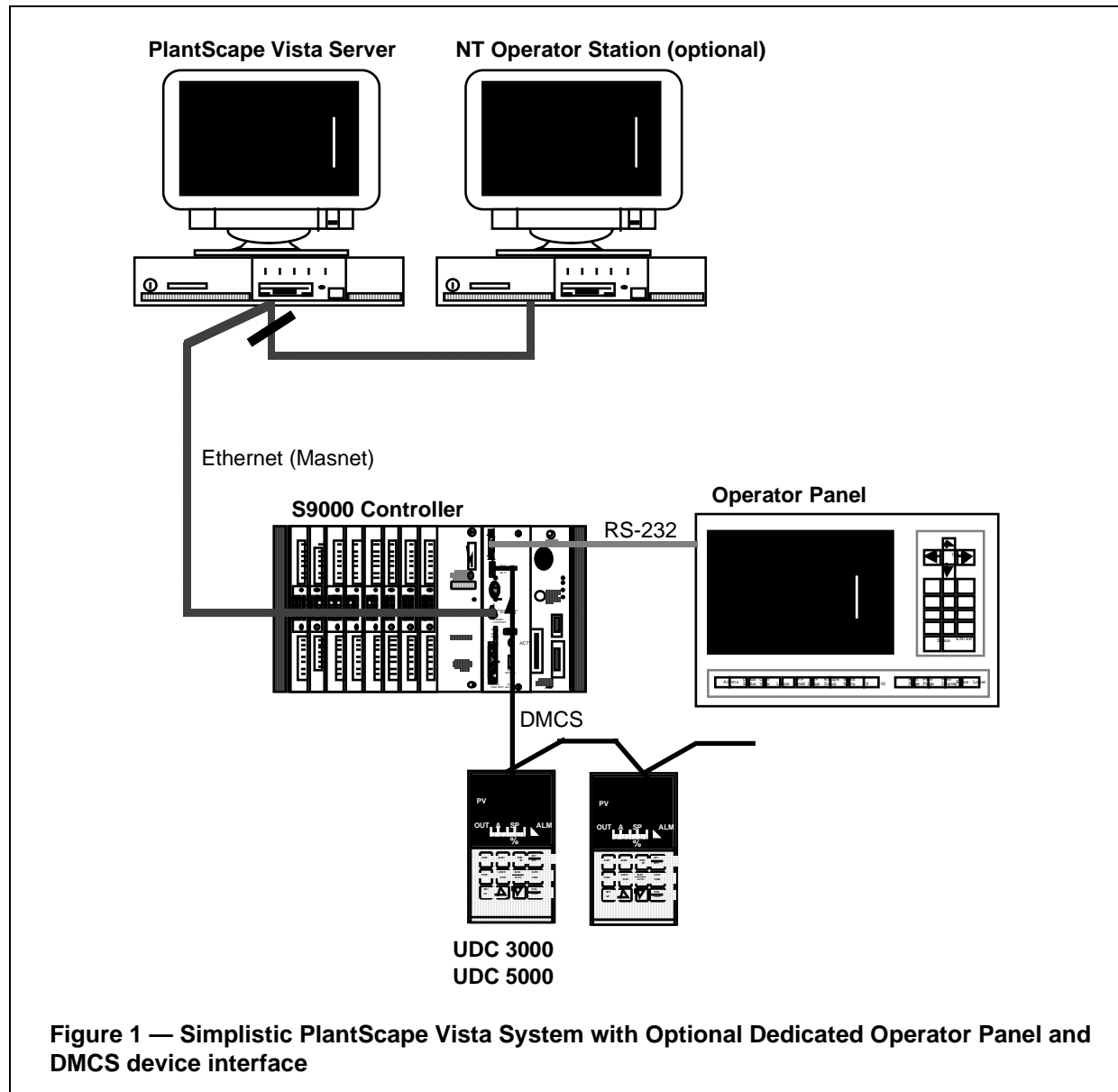


Figure 1 — Simplistic PlantScape Vista System with Optional Dedicated Operator Panel and DMCS device interface

## PlantScape Vista Features

- Familiar windowed human interface design. See Figure 2.
- Fits varying sizes and types of operations from 20 to 10,000 points per server.
- Real-time data acquisition from a wide variety of process-connected devices.
- Integrates with third-party applications.
- Powerful alarm management.
- Extensive historization and trending capabilities.
- Flexible standard or customized report generation.
- Industry standard local and wide area networking.
- Secure data integration.

The System Menu for the standard Station human interface application is shown in Figure 2.

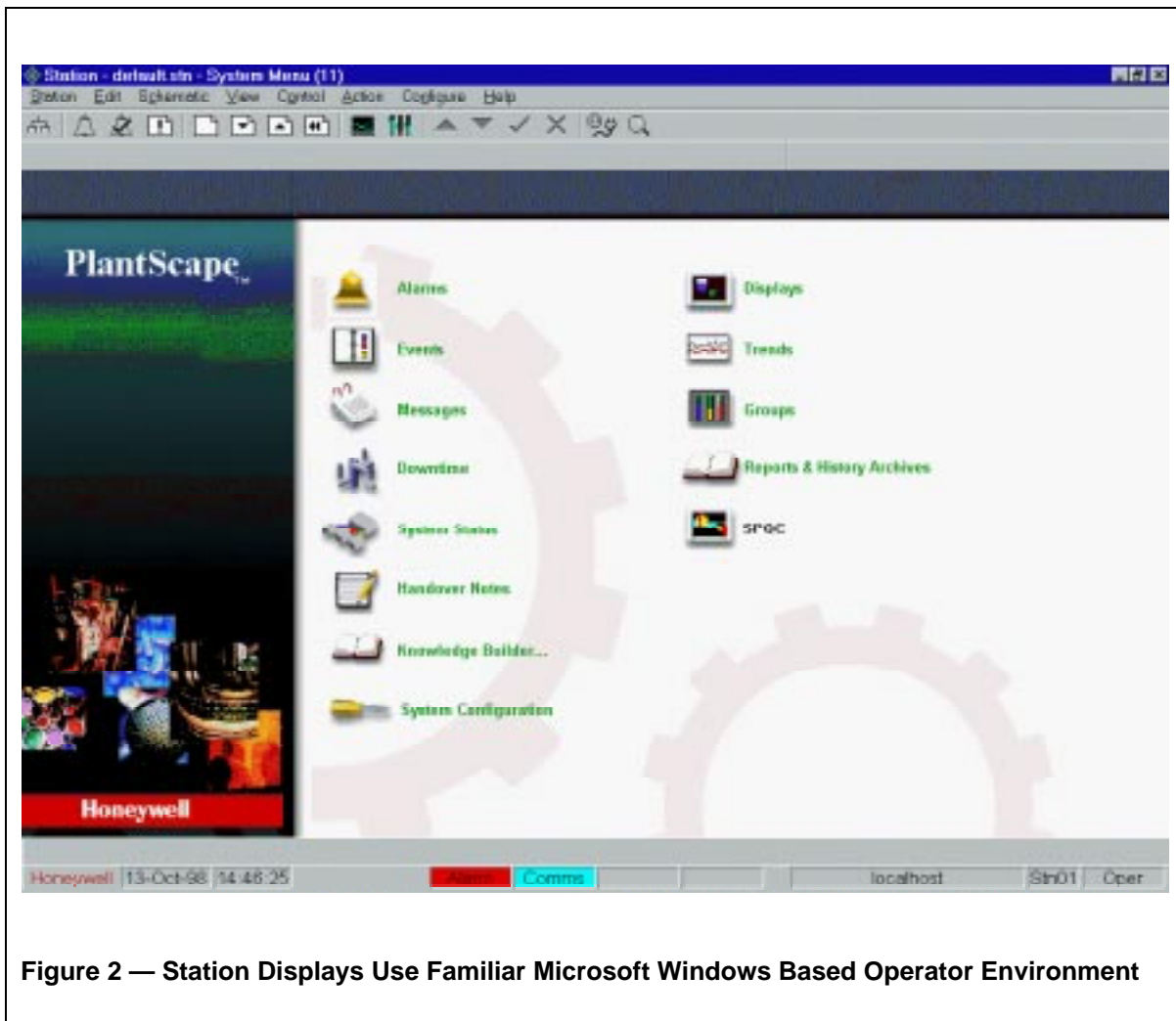
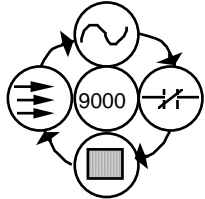
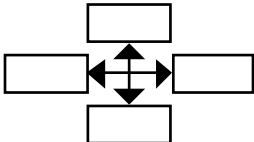
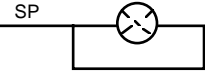
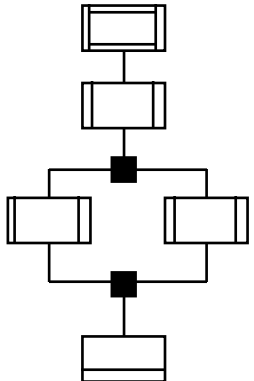
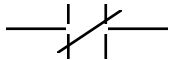
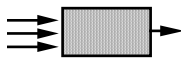
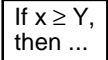


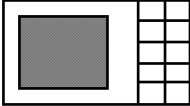
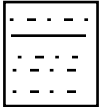
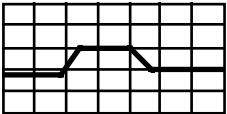



Figure 2 — Station Displays Use Familiar Microsoft Windows Based Operator Environment

**S9000 Features**

<p><b>Integrated Control</b></p> 	<p>The S9000 integrates loop, logic and sequential control. Real-time data is shared. For example, Sequential Control Chart (SCC) can read the status of a ladder logic contact and, if true, change the setpoint of a Continuous Control Chart (CCC) PID loop.</p>
<p><b>Partitioned Architecture</b></p> 	<p>The S9000 features independent logic and loop processors for fast and accurate control response.</p>
<p><b>Loop Control</b></p> 	<p>The loop processor in the S9000 Controller provides PID control loop capability. PID control blocks let you graphically build single and cascade control loop strategies with the Continuous Control Chart. Adaptive autotune is available with all 32 loops to help optimize control.</p>
<p><b>Sequence Control</b></p> 	<p>Integrated within the loop processor is the sequence control. Sequential Control Charts organize batch or other sequential operations. Sequential control strategies are designed using a simple flow chart approach.</p>
<p><b>Logic Control</b></p> 	<p>The logic processor in the S9000 Controller provides high-speed logic capabilities such as contacts, latches, sequencer, timer and counter. Configuration software includes relay ladder programming using familiar logic elements. Ladder type control blocks let you interface logic functions with loop control functions in the Continuous Control Chart configuration.</p>
<p><b>Inputs/Outputs (I/O)</b></p> 	<p>A Controller can handle from 256 to 960 I/O, depending on the model.</p>
<p><b>Auxiliary Functions</b></p> 	<p>Numerous Math, Calculations, and Boolean type control blocks let you include analog decision making and other special functions in your control strategy configuration.</p>

<p style="text-align: center;"><b>Alarms</b></p> 	<p>Each PID control block includes two configurable alarms, and alarm type control blocks let you configure high, low, deviation, and rate of change monitoring.</p>
<p style="text-align: center;"><b>Configuration Software</b></p> 	<p>The keys to the S9000's operation are its CCC and SCC configuration applications. The configuration software includes all the tools you need to build your customized control strategy. This software is factory installed in the WIPS.</p>
<p style="text-align: center;"><b>Operator Interface</b></p> 	<ul style="list-style-type: none"> <li>• The optional Operator Panel is the local operator interface from which an operator can monitor and control selected operations through preconfigured displays.</li> <li>• The WIPS is required to configure the S9000 Controller and integrate the configuration with SCAN. It serves as the centralized, enhanced operator interface in conjunction with or in place of the Operator Panel.</li> </ul>
<p style="text-align: center;"><b>Recipe Control</b></p> 	<p>Recipes allow an operator to quickly substitute a preconfigured set of control parameters and/or setpoint programs for the S9000 execution.</p>
<p style="text-align: center;"><b>Setpoint Programming</b></p> 	<p>Setpoint Programmer control blocks let you execute ramp/soak setpoint programs jointly with PID control blocks. You create the ramp/soak programs using a fill-in-the-blanks method of programming that is also provided in the configuration software.</p>
<p style="text-align: center;"><b>Communications</b></p> 	<p>The S9000 Controller has communication links to the Operator Panel, Ethernet network, and optional standalone Honeywell devices.</p> <p>All Controllers can now communicate with each other on Peer Data Net, a proprietary peer-to-peer data network.</p>

## S9000 Functions

### Loop, Sequence, and Logic Control

S9000 Controllers provide loop control, sequence control, logic control, data acquisition, and communications. They are shop-hardened for common industrial environments and can be mounted flush in a panel or a 19-inch, relay rack. See Figure 3.

Loop functions include concurrent control of multiple loops, a comprehensive set of auxiliary control algorithms that support and/or modify control actions, and links that connect all elements of the strategy including logic control functions.

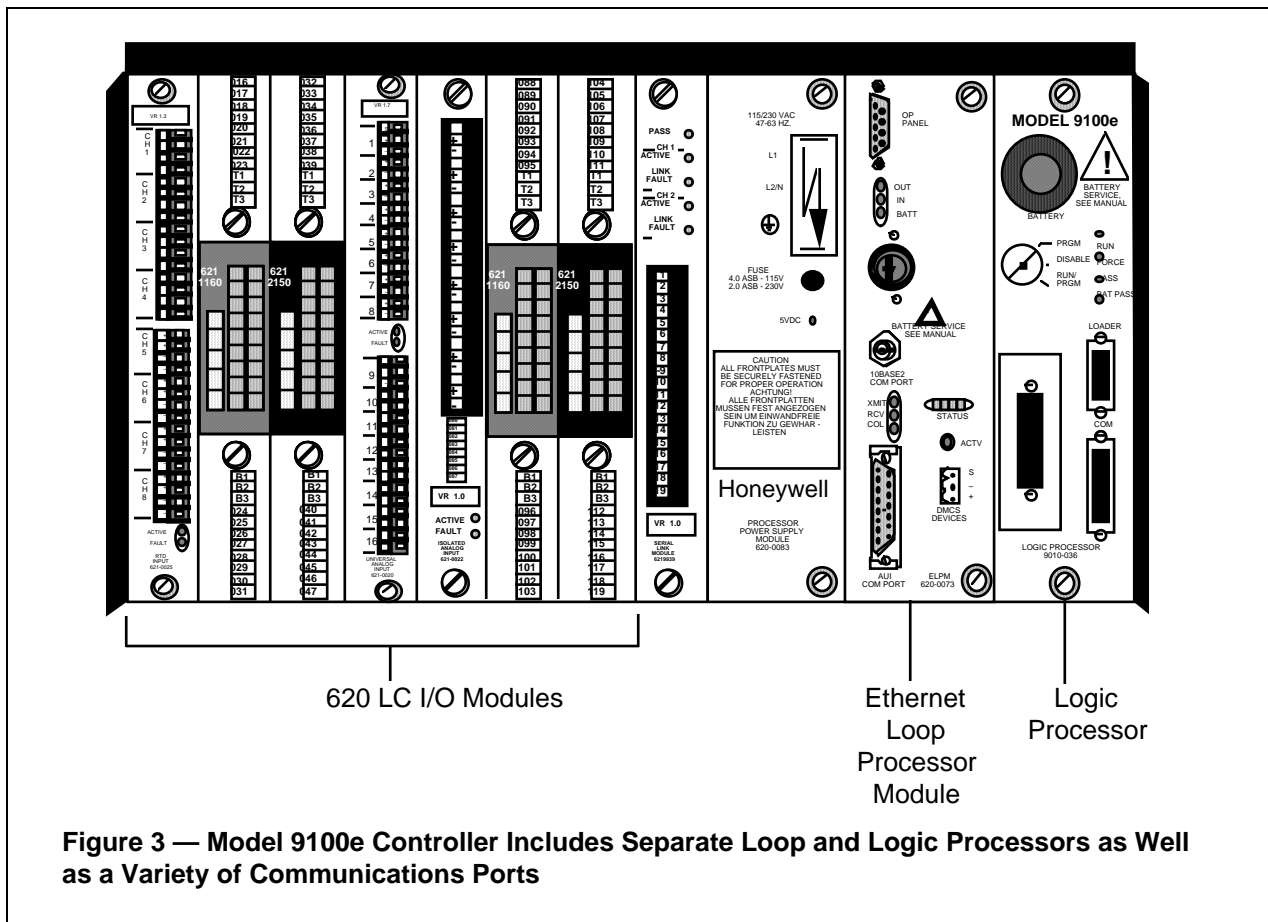
Integrated within the loop processor is the sequence control. Sequential Control Charts feature a "flow chart" approach modeled after sequential function charts. They are made up of Basic Process Operations (BPOs) which you define.

Logic functions include familiar relay ladder elements such as contacts, latches, sequencers, timers, and counters. Ladder type control blocks let you interface logic functions with loop functions in the Continuous Control Chart.

The controller can handle up to 32 PID loops and 256 to 960 I/O. Its logic memory capacity varies from small for Model

9000e to medium for Model 9100e (Figure 3), and to large for Model 9200e to meet varying application requirements. It uses the same flexible I/O as the 620 Logic Controllers. You can locate process I/O locally or remotely through a serial I/O link. Remote I/O allows shorter process wiring runs which can greatly reduce your overall wiring costs.

The S9000 has communication links to the optional Operator Panel through an RS-232C link and optional standalone Honeywell devices through a Distributed Manufacturing Control System (DMCS) link. Depending on the controller, a link to other systems is also possible.



### Controller Configuration

The optional NT Operator Station runs both the PlantScape Vista Station and the S9000 Configuration Software. You can now complete the PlantScape Vista hardware and point build functions in conjunction with the S9000 Controller configuration. This means you don't have to rebuild hardware and point files through the PlantScape Vista configuration applications.

As shown in Figure 4, the CCC provides the software equivalent of a multiple-page drawing, which graphically represents your process or control strategy on paper. You simply select and place control blocks on the screen and connect them using a soft-wiring technique.

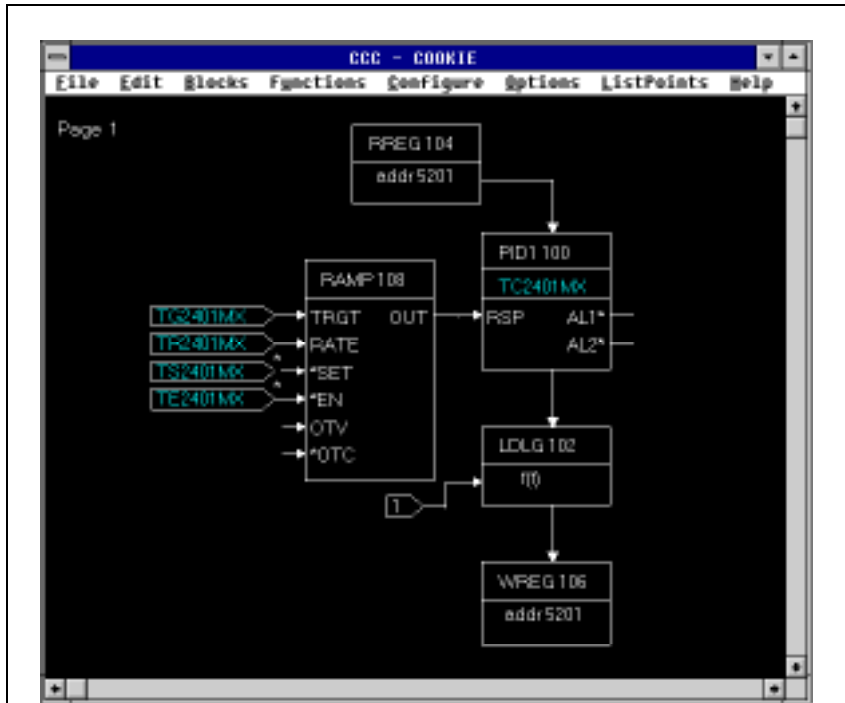


Figure 4 — Typical Loop Control Strategy Built in Continuous Control Chart for S9000 Controller

Control blocks resemble the familiar SAMA-style control blocks used to represent instrument-like functions graphically on hard-copy drawings. There are over 50 blocks to choose from. Their functions vary from PID control to reading and writing digital points in the relay ladder logic.

As shown in Figure 5, the SCC features the same type of configuration interface as the CCC. You select and place BPOs and steps on the screen and soft-wire them together. You can change your loop and logic parameters or modes based on time or events that occur in your application.

The ladder logic portion of the software lets you program the logic using familiar elements for coils, contacts, etc. It automatically changes function key assignments for straight-forward construction of individual rungs.

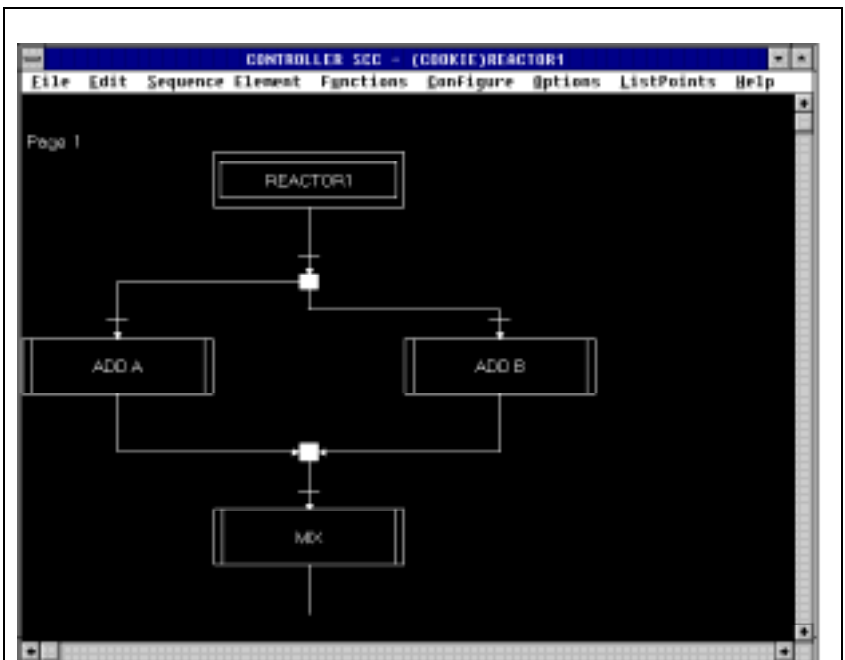


Figure 5 — Typical Sequence Application Configured in Sequential Control Chart for S9000 Controller



## PlantScope Vista Functions

### Networking and Data Gathering

The modular architecture of the PlantScope Vista system provides an extremely cost-effective, scalable system allowing configurations ranging from small single node systems to multi-server integrated systems and redundant configurations.

The PlantScope Vista system is based around a client-server architecture. A high-performance, real-time database is maintained by the server. It pro-

vides real-time information to local or network-based clients such as Operator Stations, or other applications such as spreadsheets or relational databases.

High availability architectures using redundant database servers and duplicated local area networks may be provided for additional PlantScope Vista system security.

PlantScope Vista tightly integrates S9000 data and functions with its operation.

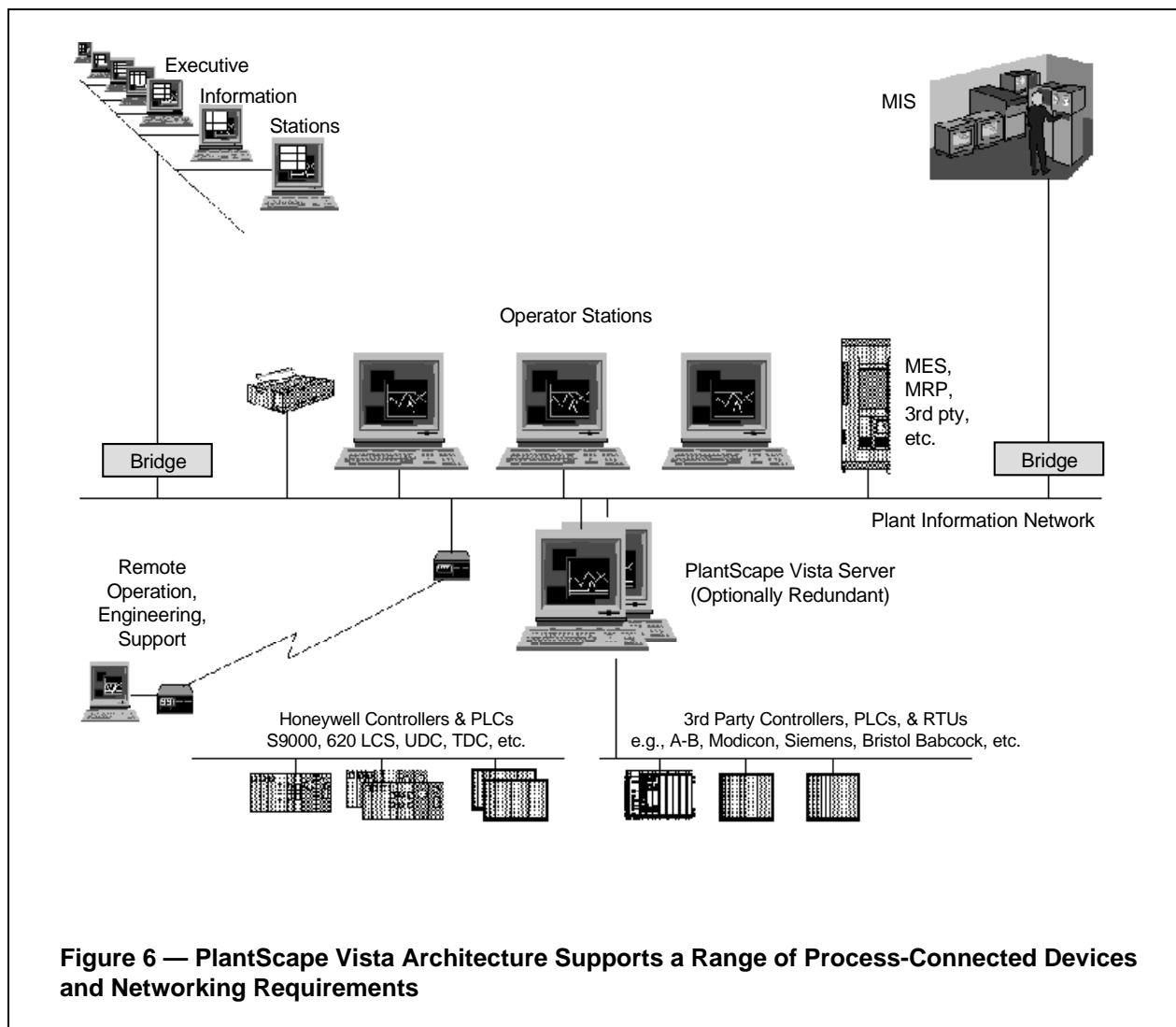
It also accepts input from a variety of third party Programmable Logic Controllers and Remote Terminal Units including:

- Allen-Bradley,
- Modicon, and
- Bristol Babcock.

Once acquired, data is available throughout the network for monitoring, controlling, historization, reporting, and custom applications.

The flexible networking architecture of PlantScope Vista supports both local and remote Operator Stations and process devices.

A variety of standard TCP/IP network topologies may be used depending on requirements ranging from local high-speed Ethernet LANs to Wide Area Networks as illustrated in Figure 6.



**Figure 6 — PlantScope Vista Architecture Supports a Range of Process-Connected Devices and Networking Requirements**

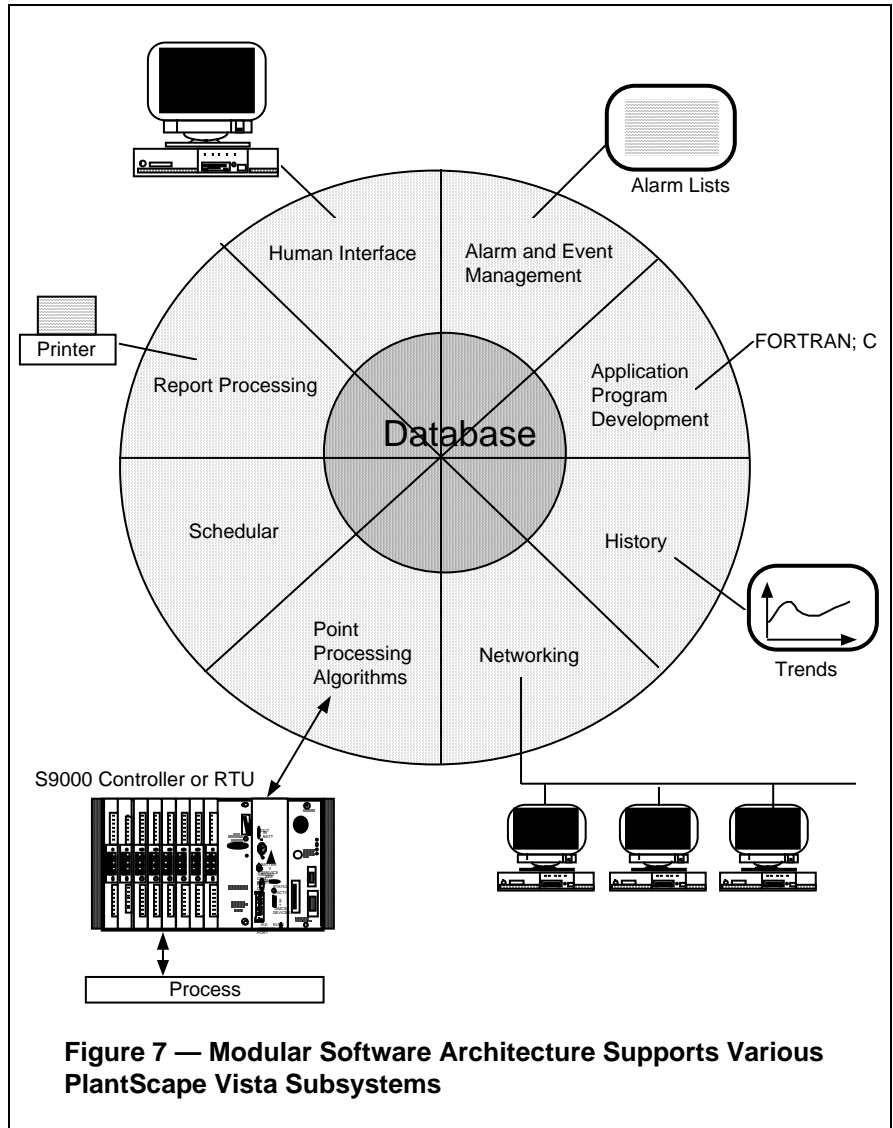
### Software Architecture

The PlantScape Vista server software executes under the control of the Windows NT or SCO UNIX operating system. Industry standards such as Ethernet, SQL, TCP/IP, NFS, and X Window are used extensively to provide an integrated, open system for Supervisory Control.

PlantScape Vista uses a modular software architecture as shown in Figure 7. The server maintains a real-time database of the current condition of the process. The various PlantScape Vista subsystems access the real-time database through a common, consistent set of services. Where integration of other applications is required, an Application Interface Library provides a standard supported interface for access by local and network clients. This integrated solution results from a single system served by one database.

The one database structure avoids the duplicate effort to create control and display points for each operating center. The system database (control and display) is built and modified when you create or modify your control program. The risks associated with creating and verifying separate databases is eliminated, increasing system security. And, maintenance effort is also reduced because you only modify one database as your needs change.

The PlantScape Vista operator station use the Microsoft Windows environment allowing the PlantScape Vista system to easily integrate with existing computing platforms.



**Figure 7 — Modular Software Architecture Supports Various PlantScape Vista Subsystems**

The PlantScape Vista System uses the Microsoft Windows environment to accommodate the S9000 Configuration Software.

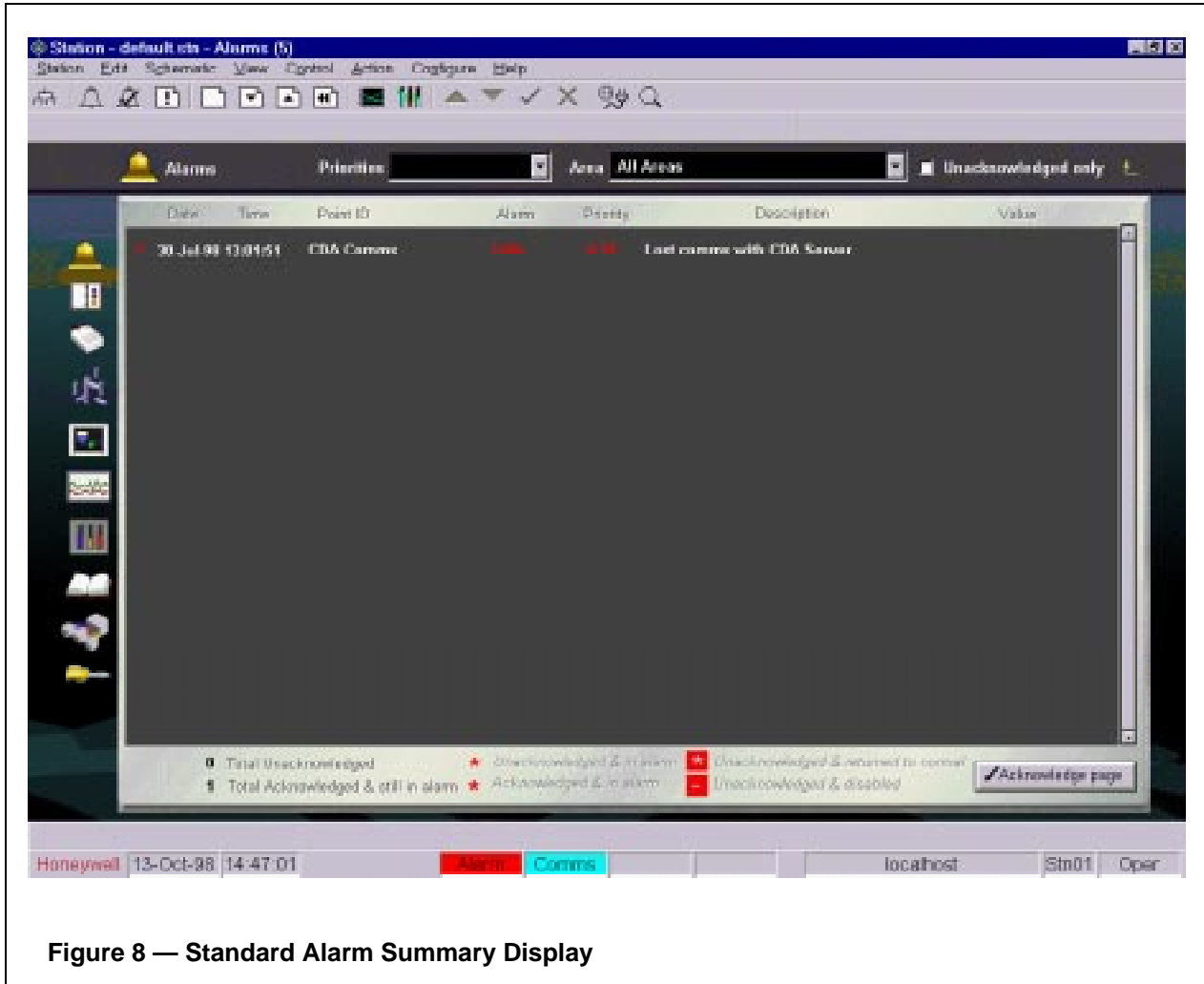
### Alarm Management

The comprehensive alarm management facilities of PlantScape Vista ensure that operators receive timely notification of process upsets or abnormal conditions.

Notification of alarm conditions is done through dedicated system alarm annunciators on the operator's screen and by audible alarm.

Each point in the PlantScape Vista database—whether measured or derived—may be configured for various alarm conditions. Up to four of the alarm conditions may be assigned to each point, each with their own prioritization. The alarm types include PV High, PV Low, PV High High, PV Low Low, Deviation High, Deviation Low, Rate of Change, Transmitter High and Transmitter Low.

Four levels of alarm priority are available: Journal, Low, High, and Urgent. All alarms and return-to-normal conditions are logged in the system Alarm/



**Figure 8 — Standard Alarm Summary Display**

Event journal for later retrieval; e.g., Alarm/Event or Batch reports. In addition, all Low, High, and Urgent alarms are automatically entered in the Alarm Summary display shown in Figure 8 and may be filtered by priority, if necessary, to allow the operator to deal with the highest priority alarms first, leaving less important alarms for later.

In addition to the Alarm Summary display, a dedicated Alarm Zone on each screen indicates the most recent (or oldest, if preferred), highest priority unacknowledged alarm in the system.

Therefore, no matter what screen the operator is currently viewing, the most important

alarm will not be obscured from view. The “Associated Display” capabilities allow linking of a user-defined display to each point, thus providing the operator with instant access to detailed information on the alarm location and recommended actions.

### **Historization**

The PlantScape Vista Real-Time Database maintains an extensive historical record of process and derived data. History is collected in various intervals ranging from 1 second to 24 hours as snapshot or averaged data - See Figure 9. In addition, alarm/event information and operator

changes are automatically recorded in the Alarm/Event Journal for later retrieval via the

Event Summary Display or Alarm/Event Reports. Once collected, historical data is available for use by Trend

Facilities, Custom Schematics, Report Generator, Application Programs, Spreadsheets, and network-based applications.

Historical data may be archived to off-line media such as Optical Disc or Streamer Tape. Once archived, the historical data may be easily recalled via the PlantScape Vista Trending facilities.

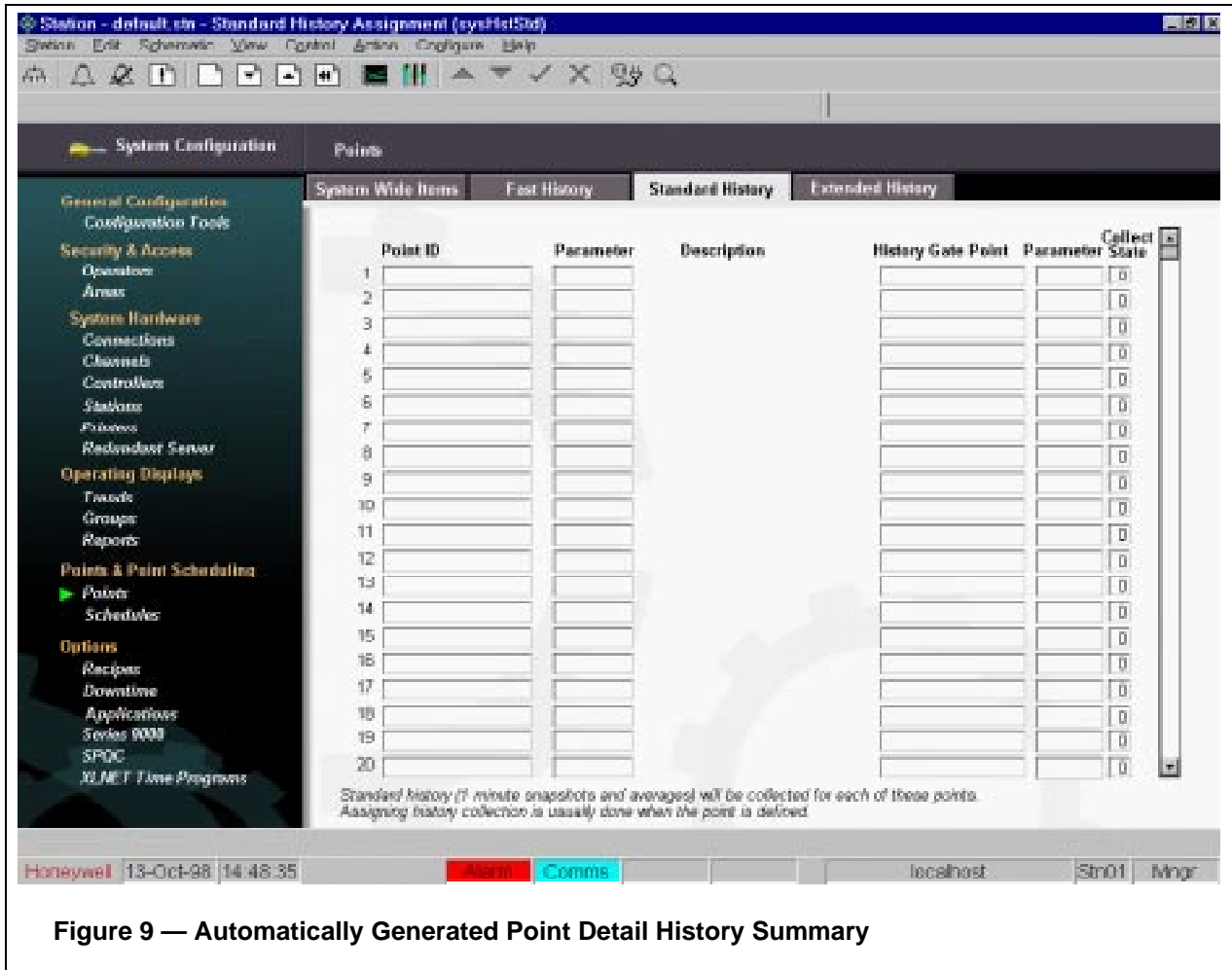


Figure 9 — Automatically Generated Point Detail History Summary

### Trending

PlantScape Vista provides extremely flexible and powerful trending capabilities to allow timely, accurate analysis of historical process and derived data.

Historical Data may be trended in a number of different formats including:

- Single (bar graph)
- Dual (bar graph)
- Triple (bar graph)
- Multiplot (line graph)
- Multirange (line graph) (as shown in Figure 10)
- X Y Plot (point plot)
- Numeric (tabular)

In addition, Trend objects may be included in user-configured custom graphics to allow

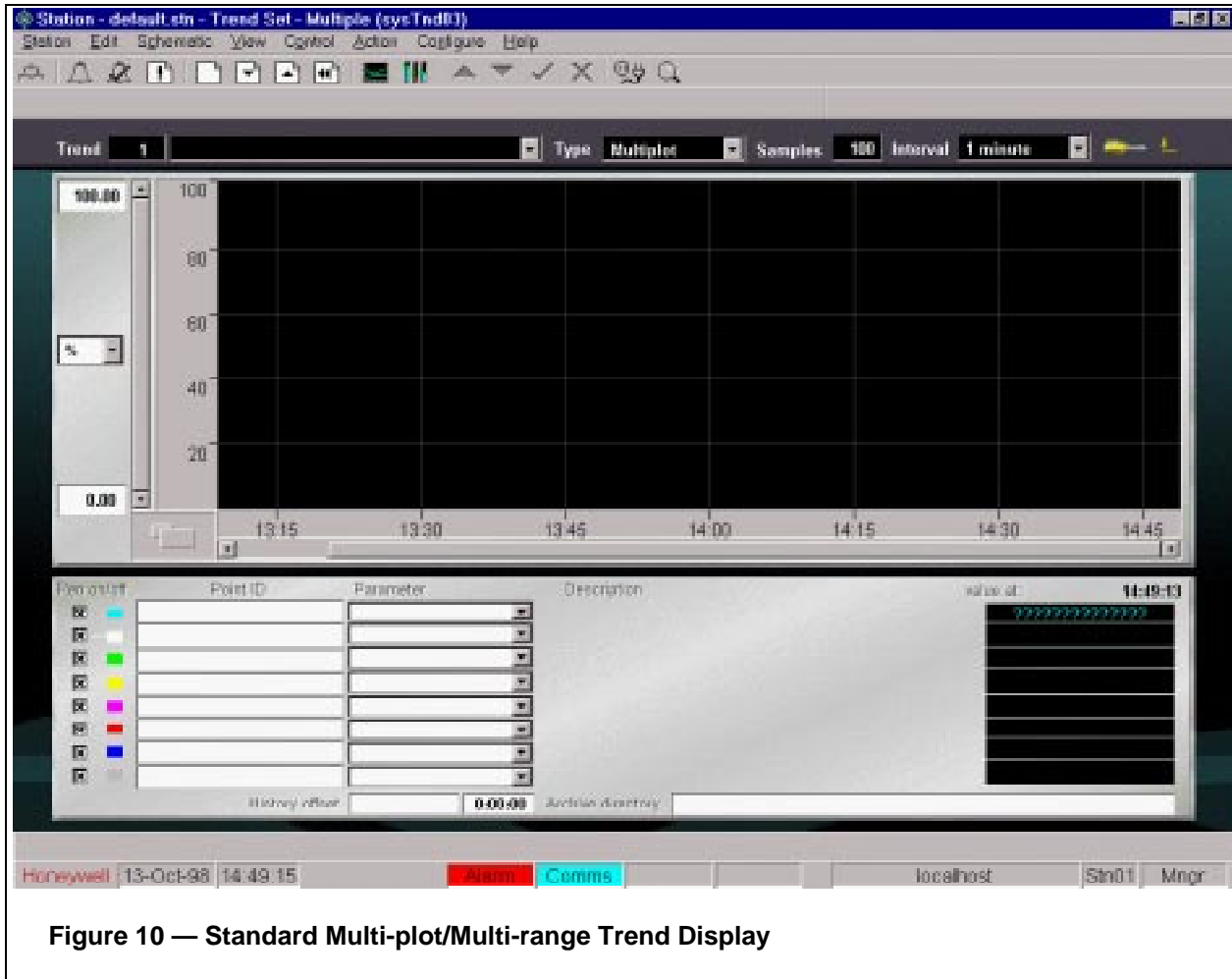
flexible access to historical data.

Standard trending capabilities include configurable sample densities (up to 999 samples per trend), up to eight scanned parameters per trend, scrolling, zooming, hairline readout, per pen enable/disable, and percent or Engineering Unit scaling.

PlantScape Vista's flexible trend configuration allows trends to be modified on-line as necessary by simply selecting the point and parameter in the database to be trended. Any of the available history collection intervals in the Historical Database may be used as a basis for the trend allowing trending of data from 1 second to 24 hours.

Archived data is also available for seamless concurrent trending, with on-line history to allow easy comparison of current and past data. This is particularly useful for "best batch" verses "current batch" comparisons, allowing operators to immediately recognize deviations in process behavior and take corrective action as required.

Real-time trending occurs automatically for parameters which are included in a trend, but for which no history is being collected.



**Figure 10 — Standard Multi-plot/Multi-range Trend Display**

### Reporting

PlantScope Vista provides comprehensive reporting facilities with Standard Reports that are easily configured using fill in the blanks forms. The report types included in the base system are:

- Alarm/Event Query - list alarms and events
- Operator Trail - list actions for a particular operator
- Point Trail - list events for one or more points
- Alarm Duration - calculate the duration for selected alarms

- Archive - archive history files which may be stored on off-line media for later retrieval and trending
- Point Attribute - report on database status, e.g., points off scan, alarms inhibited, etc.
- Point Cross Reference - assists in database management functions.

See the standard Report Index display in Figure 11.

Reports may be generated on demand by the operator via dedicated pushbuttons on the keyboard or targets on custom-built displays, or on a periodic or event basis. Report output may be directed to the operator's console or any of the configured Report Printers on the system. In addition, report data is also written to the PlantScope Vista hard disk.

Each report may be configured to activate an application upon its completion, allowing advanced post processing or inter-system transfer.

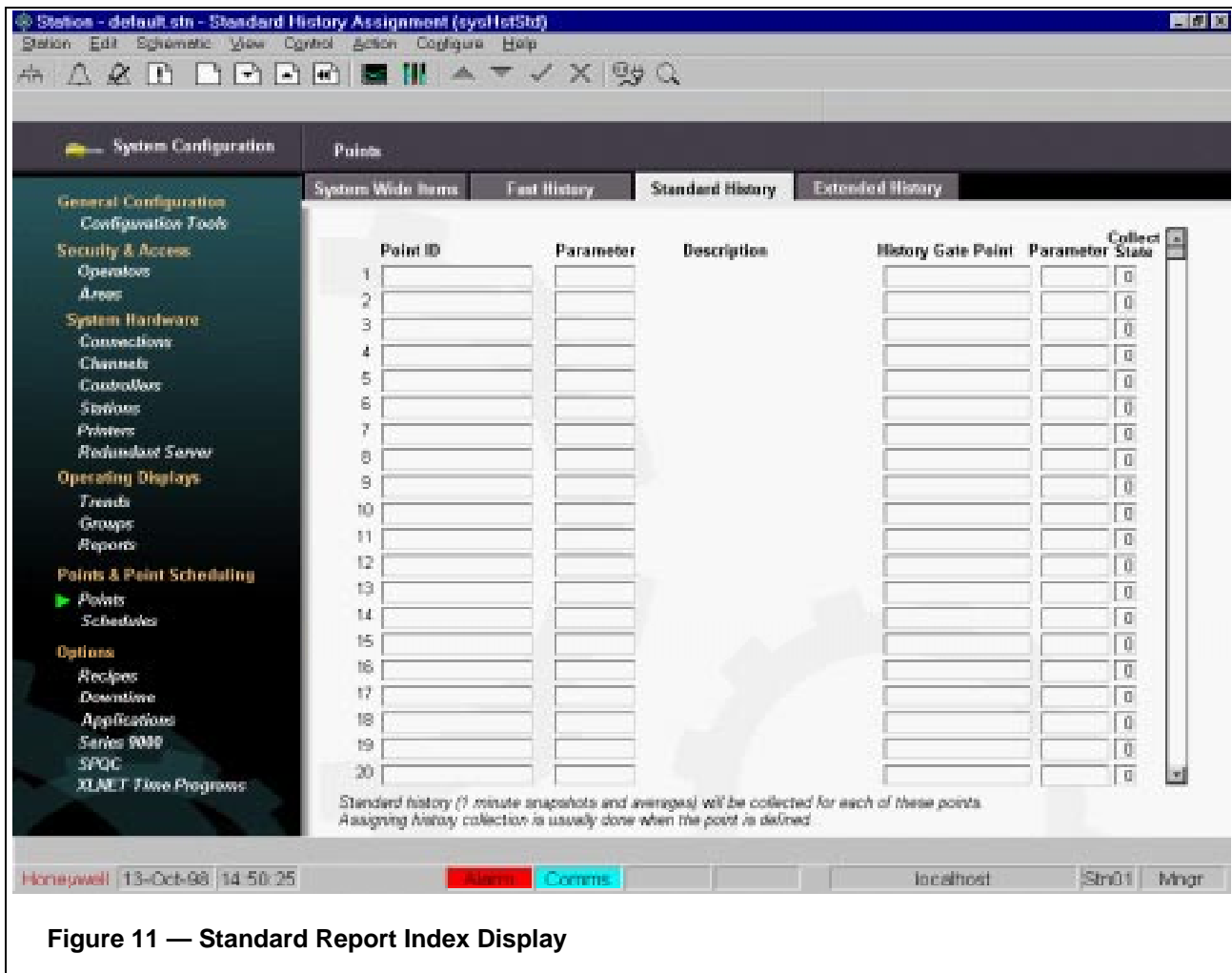


Figure 11 — Standard Report Index Display

### Algorithms

PlantScope Vista provides a powerful range of standard processing algorithms which may be attached to data items in the real-time database. Algorithms may be activated either periodically or upon occurrence of an event.

Periodic algorithms include:

- Arithmetic Calculations
- Production Totalizing
- Equipment Run Hours
- Boolean Calculations
- Integration
- Piecewise linearization
- Logging of maximum and minimums

Event-driven algorithms include:

- Report, Task, or Display Request
- Group Point Control
- Area or Group Alarm Inhibit
- Composite Hierarchical Point Alarming

### Application Enablers

PlantScope Vista provides a number of powerful application enablers to provide configurable (rather than programmatic) facilities to support individual application requirements.

Application implementation time is greatly reduced, providing extremely cost-effective automation.

### Recipe Management

PlantScope Vista Recipe Management provides facilities to create recipes and download them to nominated process units. Each recipe may have up to thirty items, with recipes chained together to form larger recipes, if required.

Recipe items may be used to set ingredient targets, set alarm limits, set timers, and place equipment into correct operating state. Items may be individually enabled for scaling.

### Batch Management

PlantScape Vista Batch Supervisor provides a comprehensive batch control package including Recipe Management, Production Scheduling, Inventory Management, Batch Control, Batch History, and Batch Archiving.

### Custom Applications Builder

If required, specialized applications may be easily integrated into the PlantScape Vista system using the Application Interface Library. This toolkit provides a library of subroutines for either C or FORTRAN, providing a stable application interface to the PlantScape Vista Real-Time Database.

User-definable database segments may be used to hold application data which may then be displayed by the standard

Display Builder or accessed by the reporting subsystem.

### SPQC

The SPQC option provides powerful statistical processing capabilities for real-time data collected by the system.

Facilities include on-line generation of control charts for X-Bar (see Figure 12) and R-Bar, Histograms and Sigma trends, Shewart's calculations for UCL and LCL and on-line statistical alarming.

### Fast History

Demanding applications requiring capture of historical data down to 1 second intervals may be easily accommodated with the PlantScape Vista Fast History Collection option.

Historical Data captured is available for display using the standard PlantScape Vista trending facilities and Display Builder.

### Downtime/ Slowback Analysis

Downtime Analysis may be used to detect, record, and code any equipment breakdowns or process delays to provide plant downtime analysis. A list of all current

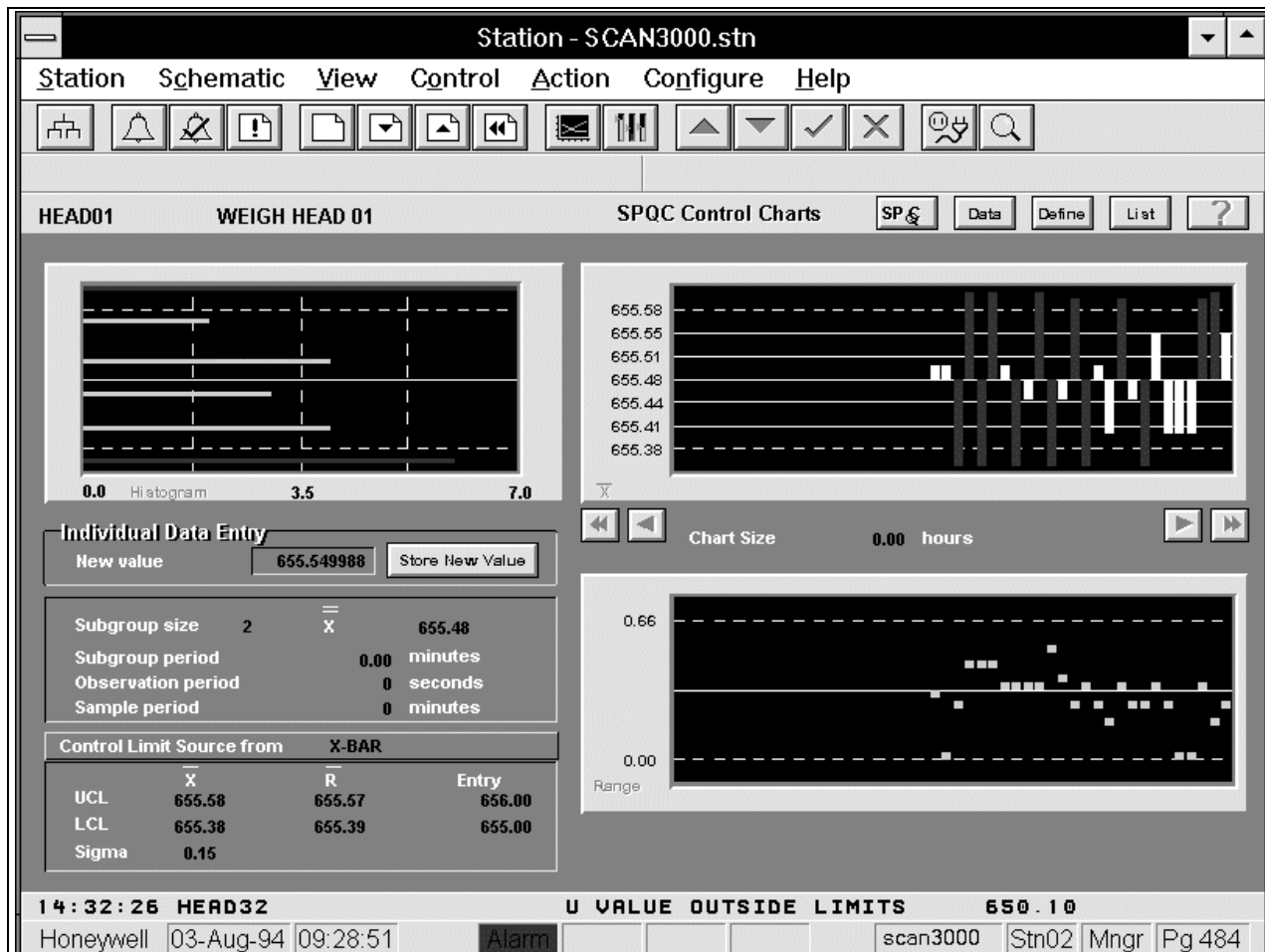


Figure 12 — PlantScape Vista SPQC Control Chart Display

downtime events is maintained as well as the history of previous downtime events with each assigned a category and a reason code.

Downtime reports may be printed on demand or periodically showing downtime duration sorted by categories and reasons.

### **Point Control Scheduler**

The Scheduler option allows point control to be automatically scheduled to occur at a specified time. This may occur on a one shot basis, at a pre-determined interval, or on specific days.

### **Free Format Report**

The Free Format Report option provides a configurable reporting tool for customized reports.

The Free Format Report generator has access to the PlantScape Vista real-time/historical database providing complete flexibility in the configuration of reports.

The Free Format Report generator also allows calculations to be performed on either real-time or historical data including statistical calculation such as mean and standard deviation, and maximum/minimum value determination. The report output may be customized as necessary to provide the required format.

### **SQL Integration**

The RDB SQL Real-Time Populator option provides a configurable tool to transfer data using SQL commands between the PlantScape Vista database and a local or remote SQL server in a relational

database. Supported SQL servers include SYBASE.

### **Network Enablers**

The PlantScape Vista open networking architecture allows easy integration of process data into other network-based applications to provide real-time and historic data access where and when it is required.

Comprehensive facilities are available to support any requirement, allowing close integration of process data with other systems through configurable interfaces.

### **Network Server**

The Network Server is the cornerstone of PlantScape Vista network access. The Network Server executes on each PlantScape Vista Server node to provide extremely efficient, real-time access to the PlantScape Vista database for network-based applications such as the Network DDE, Network Node Interface, and Network API options.

### **Network DDE**

Microsoft Windows 3.0/3.1 based applications which support the Windows Dynamic Data Exchange facility (e.g., Microsoft Excel Spreadsheets) may obtain real-time data from the PlantScape Vista system using the Network DDE for Windows option - See Figure 13 for a typical display.

Used in conjunction with the Network Server facilities of PlantScape Vista, this option provides adhoc access to data in one or more PlantScape Vista Databases, providing a powerful data consolidation and reporting tool.

Applications executing on other network-connected platforms may easily access PlantScape Vista real-time data over the network using the Network Application Program Interface (API).

The API provides high-level subroutine calls in C to allow read/write access to PlantScape Vista data in a networked environment. Data exchange between the host computer and the PlantScape Vista database is transparent to the application resulting in significant reductions in time required for application integration.

Commonly used functions available include:

- Point/Parameter read/write access
- Point List read/write access
- Historical Data Extraction
- Task Requests
- User File Access

### **Network Node Interface**

Where multiple PlantScape Vista systems require integration, the Network Node Interface allows high-performance exchange of data between PlantScape Vista nodes in peer-to-peer or hierarchical local and wide area networks.

### **Rotary Connected Stations**

Rotary connection permits any number of operator stations on a network to share a pre-configured number of connections to a PlantScape Vista system. This allows a large number of users on a PC network to graphically access production data on a part time basis.



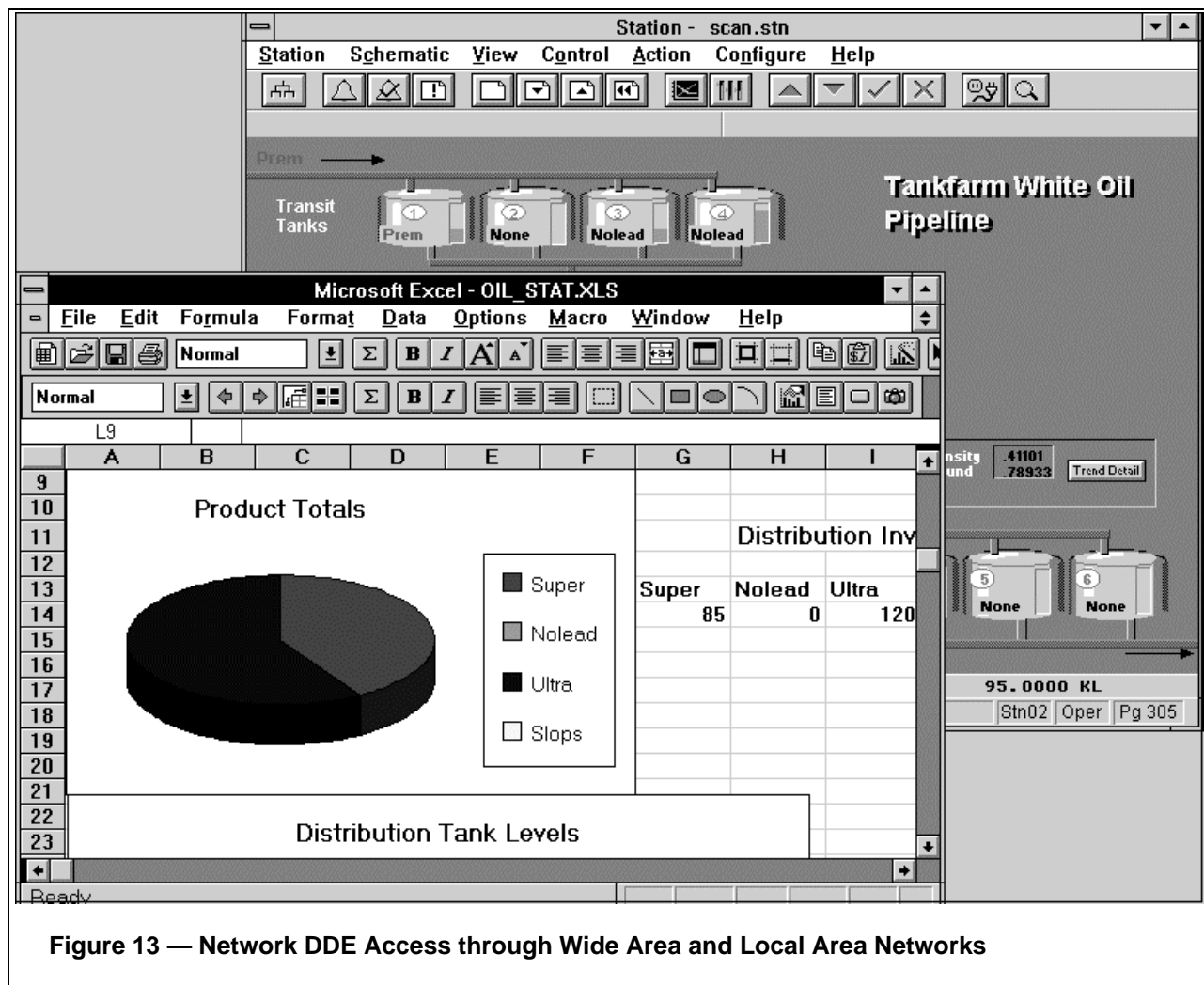


Figure 13 — Network DDE Access through Wide Area and Local Area Networks

### Device Interfaces

While PlantScope Vista is tightly integrated with our S9000 Controller, it also supports a wide variety of interfaces to other Honeywell and Third Party equipment to provide a complete Honeywell **TotalPlant** solution.

#### Honeywell 620 LC PLC

PlantScope Vista interfaces to 620 Logic Controllers via serial (optionally redundant) links to a CIM or via the high-speed Ethernet Interface Module (EIM).

#### Honeywell UDC Controllers

PlantScope Vista interfaces to UDC 3000/6000 controllers via RS-485. Up to 16 controllers

per link and a maximum of 8 links are supported per system. PlantScope Vista supports full on-line configuration and upline/downline load of UDC controllers to enable centralized configuration and configuration tracking.

#### Honeywell TDC3000<sup>x</sup> Data Hiway

PlantScope Vista interfaces to the TDC 3000<sup>x</sup> Data Hiway using the high-performance Hiway Bridge.

All of the TDC 3000<sup>x</sup> Data Hiway devices are supported including the Advanced Multi-function Controller, Basic Controller, Process Interface Unit, and Hiway Interface Modules.

PlantScope Vista is a Preferred Access Device on the Data Hiway and may coexist with other Preferred Access Devices such as Basic Operator Stations, Enhanced Operator Stations, 4500 and 45000 Computers, and Control Network Hiway Gateway devices. Where multiple Preferred Access Devices are connected to the Hiway, a Hiway Traffic Director is required to control access to the hiway.

The TDC Data Hiway Driver provides read/write capabilities to provide acquisition and control capabilities. The Report by Exception capabilities of the Data Hiway devices is utilized, where possible, to provide optimal system performance.

Configuration of TDC Data Hiway devices is easily achieved through the use of the PlantScape Vista Data Hiway Box Configurator facility. This allows point and click configuration of all Data Hiway devices, including Basic Controller, Extended Controller, Multifunction and Advanced Multifunction Controllers, Process Interface Unit, and Data Hiway Port providing a standalone capability for hiway-based systems without the need for any other hiway-based operator stations.

Hiway Boxes may be uploaded/downloaded from PlantScape Vista to assist in the management of the hiway. In addition, any discrepancies between the PlantScape Vista Box image and the actual Box image are clearly displayed and may be

optionally alarmed to assist in configuration management.

CL (Control Language) programs may also be developed and compiled on the PlantScape Vista and downloaded to Multifunction or Advanced Multifunction Controllers.

### Driver Toolkit

Where specialized interfaces to control devices such as RTUs, Flow Computers, PLCs Weigh Scales and other devices are required, which are not covered by the standard device interfaces, the User Scan Task Kit is available to allow rapid development of user implemented drivers. The toolkit provides complete templates for the development of new interfaces and protocols

allowing read/write access to external devices.

## PlantScape Vista Operator Interface

Once your process point data resides in the PlantScape Vista database, the preconfigured operating environment provides many standard displays and other functions for quickly and easily interacting with your process. The first page of a multiple page standard Point Detail display for an analog point is shown in Figure 14.

PlantScape Vista standard displays and functions include:

- Alarm summary displays.
- Event summary displays.
- Operating group displays.
- Trend displays.

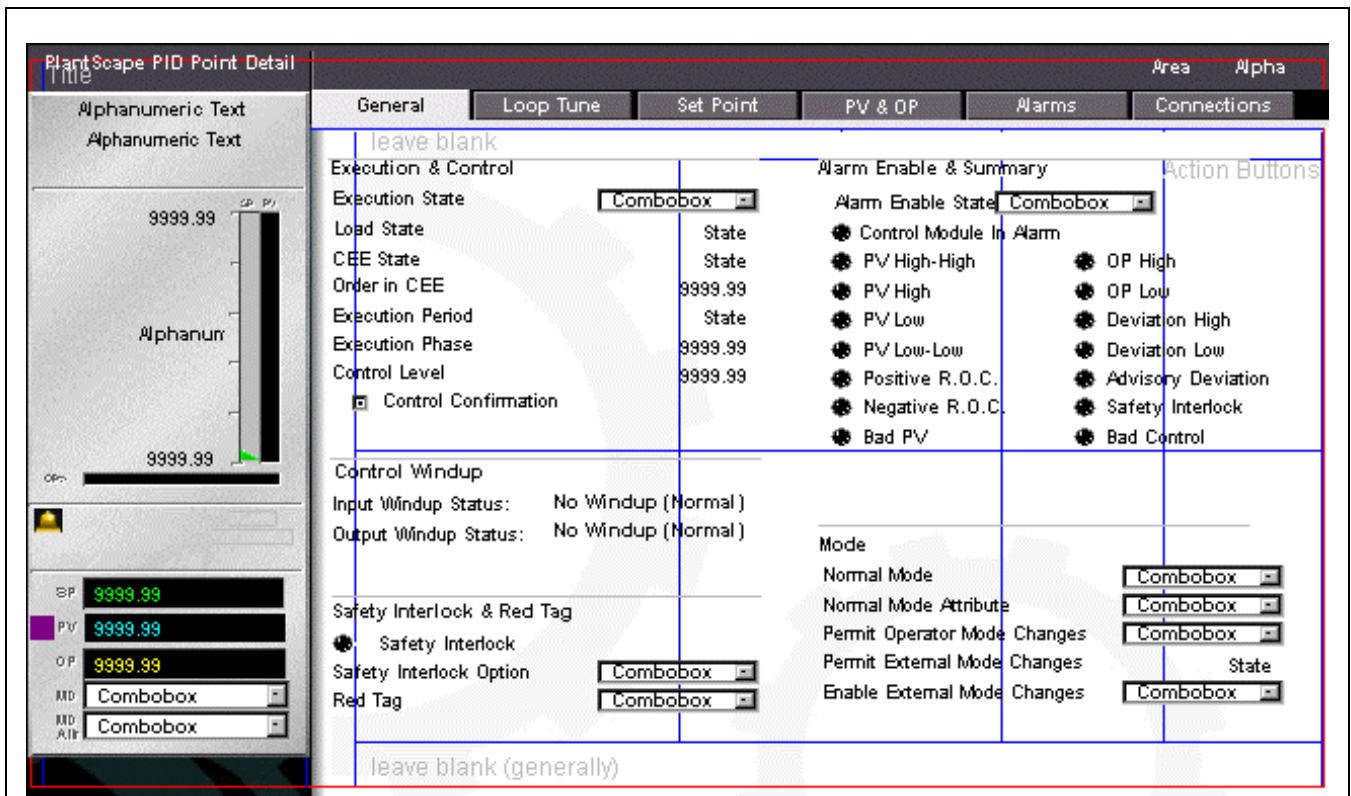


Figure 14 — Page 1 of a Multi-page Standard Point Detail Display for an Analog Point

- Loop tuning displays.
- Diagnostic displays.
- Display summary.
- Standard reports.
- Predefined composite points.
- Composite point detail displays.
- Point Processing algorithms.
- Preconfigured pushbuttons/ toolbar for all key functions.
- Pull-down and screen-based menus.
- Most recent/urgent alarm field on all displays.
- Standard status bar on all displays.

Extensive use of user configurable Pull Down Menus and Toolbars allow easy, intuitive navigation and fast access to key process data. In addition, Operator Stations may be configured with a variety of

hardware options such as the Honeywell Universal Station membrane keyboard, trackballs, and touchscreen, if desired.

Configurable window management facilities allow selection of either resizable windows or full screen lock depending on operational requirements.

Critical information is conveyed through the use of dedicated annunciators for Alarms, Controller and RTU Communication failures, Controller Sequence Messages, and Equipment Downtime/ Slowback conditions.

A dedicated Alarm Line is available to display the highest priority, most recent (or oldest) unacknowledged alarm at all times.

To enhance system security, PlantScape Vista provides configurable security levels, control levels, and area assignments. These may be configured for each individual operator or alternatively for each operator station. Up to six security levels limit operator access to PlantScape Vista functions. Up to 255 control levels limit operator control of individual items of plant and equipment.

Area assignments limit operator access to graphics, alarms and point data to their assigned areas providing effective plant partitioning. Individual operator profiles, including security levels, control levels, and area assignments are activated when operators sign on to the system.

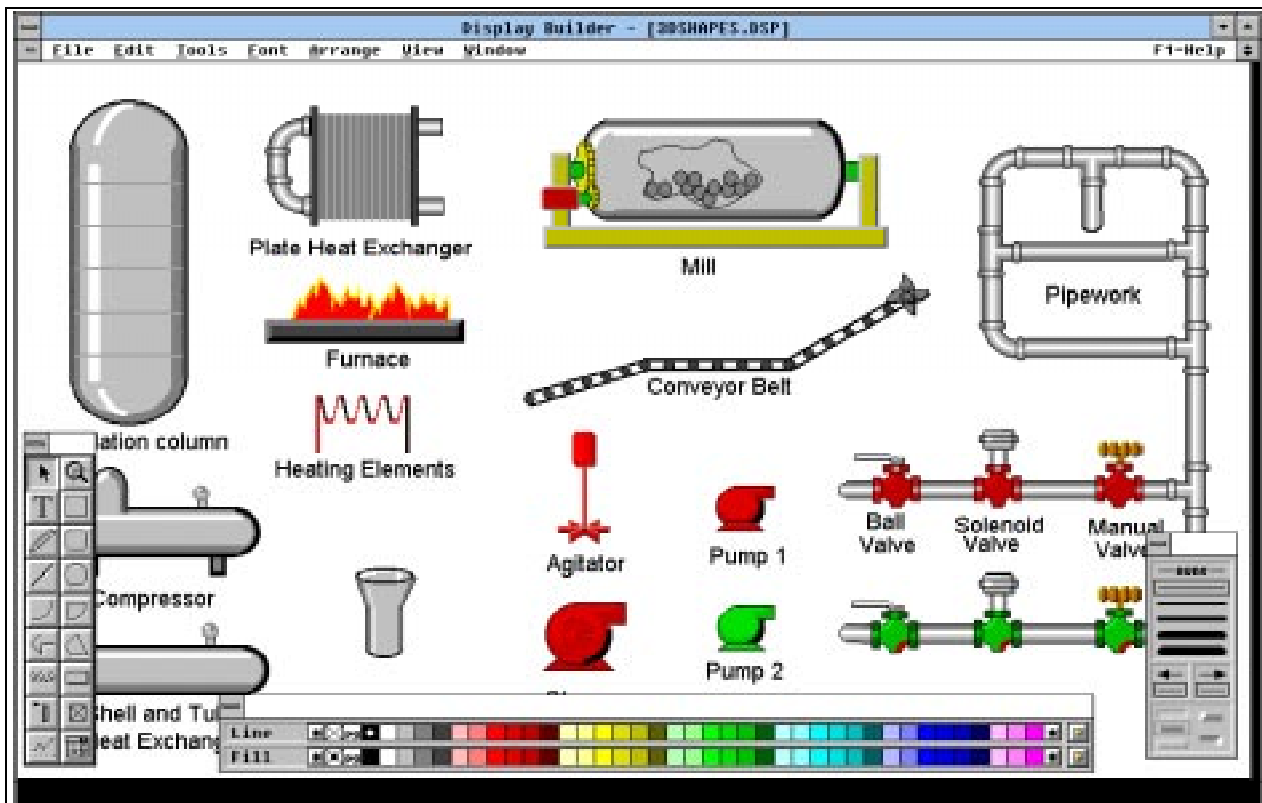


Figure 15 — PlantScape Vista Display Builder Tool Showing Object Library

### Display Builder

In addition to the standard displays, PlantScape Vista provides a powerful, object oriented, fully integrated custom display builder to allow development of application specific graphics in the Microsoft Windows 95 environment.

Process object and color palettes allow quick and easy creation of objects with or without 3D effects. A library of commonly used plant equipment such as vessels, piping, valves, tanks,

conveyors, etc., is supplied with the display builder to further speed graphic development as shown in Figure 15.

The Display Builder and Operator Interface have built-in support for the creation and display of "live video objects." A range of video overlay cards are supported which enable live video to be fully integrated into custom schematics. The position and size of each video object can be configured. Figure 16 shows a typical custom graphic schematic with an integrated live video window.

Integrated live video is a very powerful tool, providing operators with visual access to hazardous, remote, or out-of-reach areas. It may also be used to monitor environmental conditions or to ensure that staff are clear of certain areas prior to initiating dangerous operations.

Microsoft Windows Operator Stations may incorporate standard Windows help files, which enables complete on-line presentation of such information as training documents, maintenance manuals, etc.

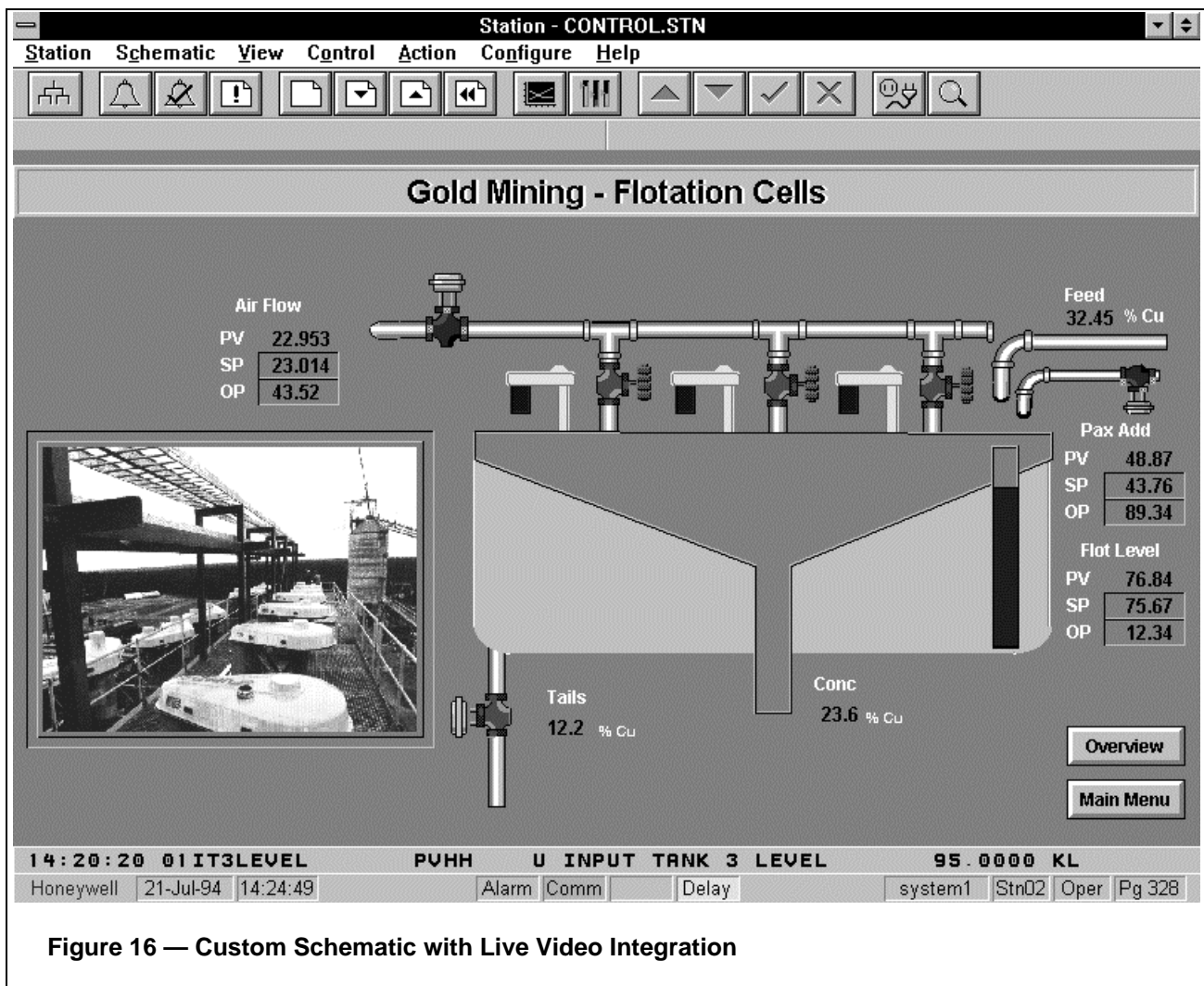


Figure 16 — Custom Schematic with Live Video Integration

## S9000 Operator Panel

An optional, industrially-hardened Operator Panel is available to provide low-cost dedicated local monitoring and controlling of the connected S9000 Controller. The Operator Panel features these standard preformatted displays.

- Alarms
- Digital Status
- Overview
- Loops
- Loop Detail
- Setpoint Program Operate
- Setpoint Program Setup
- Setpoint Program Detail
- Recipe
- Recipe Detail
- Maintenance Menu
- Text Information

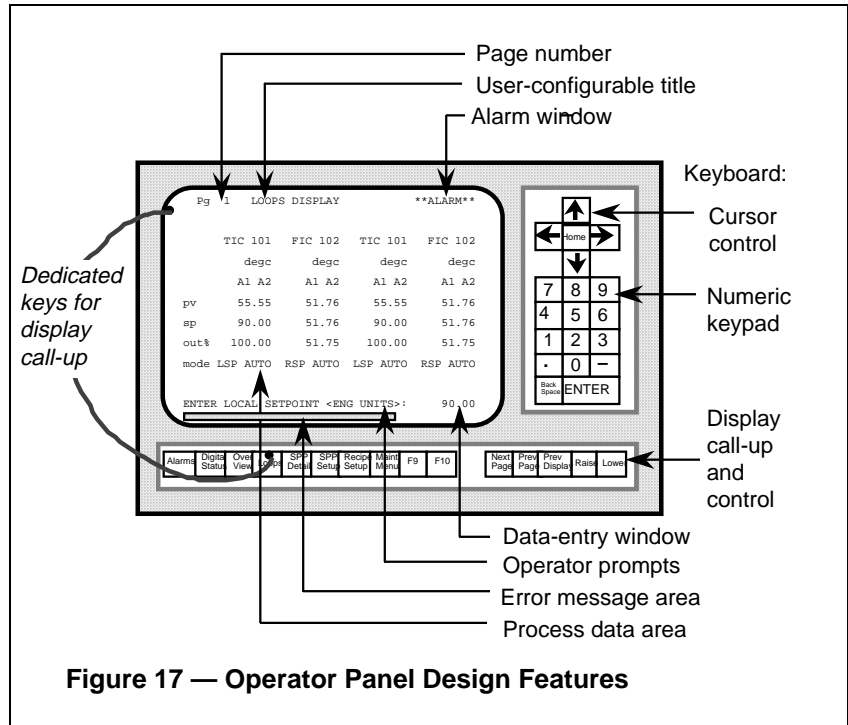


Figure 17 — Operator Panel Design Features

The following table shows some sample displays and describes the data that you can configure in them.

<p><b>Alarms</b></p> <p>Provides the functional equivalent of an annunciator panel. Format features include:</p> <ul style="list-style-type: none"> <li>• Up to 28 point names per page.</li> <li>• Up to 10 pages.</li> <li>• Alarm status indication. <ul style="list-style-type: none"> <li>Blinking = active, unacknowledged.</li> <li>Reverse video = active, acknowledged.</li> <li>Normal = not active.</li> </ul> </li> <li>• Acknowledgement of alarms per page.</li> </ul> <p>When <b>**ALARM**</b> message appears in another display, you only have to press the [<b>ALARMS</b>] key to call up the alarms display, and a press of the [<b>PREV DISP</b>] key will return you to the previous display.</p>	
<p><b>Digital Status</b></p> <p>Provides the functional equivalent of pilot lights on a panel. Format features include:</p> <ul style="list-style-type: none"> <li>• Up to 28 point names per page.</li> <li>• Up to 10 pages.</li> <li>• Digital status indication. (Point names of digitals in ON state are reverse video.)</li> </ul>	

**Overview**

Provides the functional equivalent of a complement of thumbwheels, selector switches, and LED displays. Format features include:

- Up to 7 Analog or Digital point names per page which an operator can edit.
- Up to 14 Digital point names per page.
- Up to 10 pages.
- Shown current values of parameters.
- Digital status indication. (Point names of digitals in ON state are reverse video.)

```

Pg 2 OVERVIEW GROUP 3 **ALARM**

TI-803 200.00 degF TAH-803 PAH-901
LEAKTEST 10953 TYPE98 TAH-804 PAH-902
ZI-803 12.5 MA TAH-805 PAH-903
HI ZONE3 1.00 TYPE99 TAH-806 PAH-904
LOW H2O 1.00 TYPE99 TAH-807 PAH-905
DIF PUMP 1.00 TYPE99 TAH-808 PAH-906
HI ZONE4 1 00 TYPE99 TAH-809 PAH-907

ENTER VALUE IN ENG UNITS: 1.00
    
```

**Loops**

Provides the functional equivalent of a set of stand-alone PID loop controller faceplates. Format features include:

- Up to 4 point names per page.
- Up to 10 pages.
- Shows current values of PV, SP Out, Mode.
- Operators can edit SP, Out and Mode values.
- Calls up the Loop Detail Display.

```

Pg 1 LOOPS DISPLAY **ALARM**

TIC 101 FIC 101 TIC 102 FIC 102
degc gals degc gals
A1 A2 A1 A2 A1 A2 A1 A2
pv 55.55 51.76 55.55 51.76
sp 90.00 51.76 90.00 51.76
out% 100.00 51.75 100.00 51.75
mode LSP AUTO RSP AUTO LSP AUTO RSP AUTO

ENTER LOCAL SETPOINT <ENG UNITS>: 90.00
    
```

**Loop Detail**

Provides additional data for loop selected loops display. Operators can view and edit these parameters:

- Tuning constants (gain, rate, reset).
- Autotuning status.
- Set point limits.
- Process variable limits.
- Output limits
- Alarm set points.

```

Pg 1 TIC 101 Loop Detail **ALARM**

gain 12.00 at type SP ONLY
rate-min 0.20 sp step 10.00
rset-min 0.10 at state DISABLED
sp hilim 70.00 at status INACTIVE
sp lolim 5.00 pend ovrđ NOT AVAIL
pv hilim 100.0 init tune NOT AVAIL
pv lolim 0.00 more on next page

ENTER GAIN (.1 TO 1000): 12.00
    
```

**Maintenance Menu**

Provides easy access to service related displays as well as the means to restrict access to detail displays.

```

Pg 1 MAINTENANCE MENU **ALARM**

function function

1 TEXT DISPLAY 2 LOOP STATUS
3 OPERATOR ACCESS 4 LOGIC STATUS
5 ENGINEER ACCESS 6 BLOCK STATUS
7 TERMINAL TYPE 8 COMM STATUS
9 I/O STATUS 10 MESSAGE DISPLAY

PRESS HOME FOR COLOR OR MONOCHROME:COLOR
    
```

---

## Documentation

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PlantScape Vista/S9000 documentation provides information to install, configure, and operate a PlantScape Vista System. The documentation set is a combination of PlantScape Vista and S9000 documentation which includes:

- Operator's Manuals
- Configuration Manuals
- Display Building Manual
- PlantScape Vista Release & Installation Notes
- Station Release & Installation Notes
- PlantScape Vista System Release & Installation Notes
- S9000 Configuration Software Tour Guide

Documentation for PlantScape Vista options includes:

- Application Programming Manual
- Network Options Manual
- Batch Supervisor for PC Operator's Manual, Configuration Manual Release & Installation Notes
- SPQC User's Guide

## Specifications

### PlantScape Vista Standard Database Capacities

Parameter	Quantity	Parameter	Quantity
Composite Points	300, 1000, 2000, 5000, 10000	Reports	200
Operator Stations	10	Point Control Schedules	1000
Printers	15	Operator Profiles	400
Comms. Channels	90	Recipes	500
RTUs	100	Concurrent Alarms	500
Algorithm Blocks	6000	Concurrent Events	10000
Custom Displays	500	Concurrent Downtime Events	500
Animation Shapes	500	Concurrent CL Messages	500
Std. Trend Displays	1000	User Written Applications	80
Std. Group Displays	2000	User Application Files	150
Areas	250		

### PlantScape Vista History Collection Parameters

History Type	Intervals	Maximum Parameters Collected
Fast	1 or 5 second snapshot	100
Standard	1 minute snapshot	10000
	6 minute average	10000
	1 hour average	10000
	8 hour average	10000
	24 hour average	10000
Extended/Production	1 hour snapshot	200
	8 hour snapshot	200
	24 hour snapshot	200

### MZ-NTPC02 PlantScape Vista Performance Server Specifications

<b>Operating System</b>	Windows NT Workstation 4.0
<b>General</b>	
<b>Microprocessor Type</b>	Intel® Pentium® II microprocessor with MMX™ technology
<b>Microprocessor Speed</b>	300 MHz
<b>Internal Cache</b>	32 KB (16-KB data cache, 16-KB instruction cache)
<b>L2 Cache Memory</b>	512-KB pipeline burst, 4-way set-associative, write-back SRAM
<b>Math Coprocessor</b>	Internal to the microprocessor
<b>Microprocessor Slot</b>	1



System Information	
System Chip Set	Intel 82440LX PCI/AGP
Data Bus Width	64 bits
Address Bus Width	32 bits
DMA Channels	8
Interrupt Levels	15
Flash EPROM (BIOS)	2 Mb
System Clock	66 MHz (matches external processor speed)
Expansion Bus	
Bus Type	PCI (2.1-compliant) and ISA
Bus Speeds	PCI: 33 MHz ISA: 8.33 MHz
Expansion-Card Connectors	<i>Mini tower chassis:</i> 3 PCI (2 available—1 taken by SCSI adapter), 2 PCI/ISA shared, 2 ISA
NIC	Integrated on system board 3Com® PCI 3C905 network controller, operating at 10 or 100 Mbps
Memory	
Architecture	72-bit (ECC), noninterleaved
DIMM Sockets	3 (1 taken by base memory)
DIMM Capacities	32-, 64-, and 128-MB ECC SDRAM
Shipped RAM	128 MB ECC SDRAM
Maximum RAM	384 MB
BIOS Address	F0000h
Drives	<p>4 GB SCSI Hard Drive 49 GB Mini-Cartridge SCSI Tape Drive 12/24 SCSI CD-ROM</p> <p><i>Mini tower chassis:</i></p> <ul style="list-style-type: none"> <li>• <b>Externally accessible bays:</b> (3) 5.25-inch bays for diskette, tape, or CD-ROM drives; (1) 3.5-inch bay for a diskette drive NOTE: 1 externally accessible bay available</li> <li>• <b>Internally accessible bays:</b> (2) 3.5 inch bays: one for a 1-inch high hard-disk drive and one for a 1.6-inch high hard-disk drive NOTE: 1-inch high bay occupied by hard drive.</li> </ul>

<b>Ports</b>	<p><i>Externally accessible:</i></p> <ul style="list-style-type: none"> <li>• <b>Serial (DTE):</b> (2) 9-pin connectors (16550-compatible)</li> <li>• <b>Parallel:</b> 25-hole connector (bidirectional)</li> <li>• <b>Video:</b> 15-hole connector</li> <li>• <b>NIC:</b> RJ45 connector</li> <li>• <b>PS/2-style keyboard:</b> 6-pin mini-DIN</li> <li>• <b>PS/2-compatible mouse:</b> 6-pin mini-DIN</li> <li>• <b>USB:</b> 2 USB-compliant connectors</li> <li>• <b>Audio line-in:</b> miniature audio jack</li> <li>• <b>Audio line-out:</b> miniature audio jack (amplified source)</li> <li>• <b>Microphone:</b> miniature audio jack</li> <li>• <b>SCSI</b> NOTE: This port is unusable due to combination of wide and narrow SCSI devices connected internally.</li> </ul> <p><i>Internally accessible:</i></p> <ul style="list-style-type: none"> <li>• <b>SCSI</b> for hard drive, CD-ROM, 4/8 GB Mini-cartridge tape drive</li> <li>• <b>Diskette drive:</b> 34-pin connector</li> </ul>
<b>Audio</b>	
<b>Model</b>	Crystal Semiconductor
<b>Chip Set</b>	CS4236
<b>Jacks</b>	<p><i>Audio line-in:</i> (1) miniature audio jack  <i>Audio line-out:</i> (1) miniature audio jack (amplified)  <i>Microphone:</i> (1) miniature audio jack</p>
<b>Video</b>	
<b>Video Type</b>	ATI 3D Rage Pro AGP controller
<b>Video Memory</b>	4-MB standard SGRAM
<b>Maximum Resolution</b>	1600 x 1200 pixels with 256 colors
<b>Power</b>	
<b>DC Power Supply</b>	<i>Mini tower chassis:</i> 200 W
<b>Power Supply Heat Dissipation</b>	<i>Mini tower chassis:</i> 913 BUT/hr (nominal)
<b>Power Supply Voltage</b>	90 to 135 V at 60 Hz 180 to 265 V at 50 Hz
<b>Backup Battery</b>	3-V CR2032 coin cell
<b>Physical</b>	
<b>Weight</b>	<i>Mini tower chassis:</i> 14.3 kg (33.0 lb) or more, depending on options installed
<b>Height</b>	<i>Mini tower chassis:</i> 44.4 cm (17.5 inches)
<b>Width</b>	<i>Mini tower chassis:</i> 20.6 cm (8.1 inches)
<b>Depth</b>	<i>Mini tower chassis:</i> 43.7 cm (17.2 inches)

<b>Environmental</b>	
<b>Temperature</b>	<p><i>Operating:</i> 10 to 35°C (50 to 95°F)  <i>Storage:</i> -40 to 65°C (-40 to 149°F)  <i>Relative humidity:</i> 8 to 80% (noncondensing)</p>
<b>Maximum Vibration</b>	<p><i>Operating:</i> 0.25 G at 3 to 200 Hz at 1 octave/min.  <i>Storage:</i> 0.5 G at 3 to 200 Hz at 1 octave/min.</p>
<b>Maximum Shock</b>	<p><i>Operating:</i> Left side (for mini tower orientation) and bottom (for low-profile and midsize orientation) half-sine pulse with a change in velocity of 20 inches/sec (50.8 cm/sec).  <i>Storage:</i> 27-G faired square wave with a velocity change of 200 inches/sec (508 cm/sec)</p>
<b>Altitude</b>	<p><i>Operating:</i> -16 to 3048 m* (-50 to 10,000 ft)  <i>Storage:</i> -16 to 10,600 m (-50 to 35,000 ft)</p> <p><i>*The maximum operating temperature of 35°C (95°F) is for altitudes below 914.6 m (30000 ft). Above 914.6 m (30000 ft) the maximum operating temperature is reduced.</i></p>
<b>Regulatory Notices</b>	<ul style="list-style-type: none"> <li>• FCC (U.S. only): Class A<sup>1</sup>, Class B<sup>2</sup></li> <li>• IC Notice (Canada only): Class B</li> <li>• CE Notice: Class B</li> <li>• DMI 3.0-compliant</li> <li>• APM 1.1-compliant</li> <li>• FCC ID: Class B</li> <li>• EN 55022 (Czech Republic only): Category B</li> <li>• VCCI Notice (Japan only): Class 1, Class 2</li> <li>• Korean Regulatory Notice: Class A, Class B</li> <li>• NOM 024 Information (Mexico only)</li> <li>• Polish Center for Testing and Certification</li> </ul> <p><sup>1</sup>For the mini tower chassis when networked  <sup>2</sup>For the mini tower chassis when in stand-alone mode</p>

**MZ-NTPC03 PlantScape Vista Operator Station Specifications and  
MZ-NTPC04 PlantScape SCADA/PlantScape Vista Mini-Server Specifications**

**NOTE: MZ-NTPC03 and MZ-NTPC04 are identical except that MZ-NTPC04 includes a 100 MB ZIP Drive, and MZ-NTPC04 does NOT.**

<b>Operating System</b>	Windows NT Workstation 4.0
<b>General</b>	
<b>Microprocessor Type</b>	Intel® Pentium® II microprocessor with MMX™ technology
<b>Microprocessor Speed</b>	233 MHz
<b>Internal Cache</b>	32 KB (16-KB data cache, 16-KB instruction cache)
<b>L2 Cache Memory</b>	512-KB pipeline burst, 4-way set-associative, write-back SRAM
<b>Math Coprocessor</b>	Internal to the microprocessor
<b>Microprocessor Slot</b>	1
<b>System Information</b>	
<b>System Chip Set</b>	Intel 82440LX PCI/AGP
<b>Data Bus Width</b>	64 bits
<b>Address Bus Width</b>	32 bits
<b>DMA Channels</b>	8
<b>Interrupt Levels</b>	15
<b>Flash EPROM (BIOS)</b>	2 Mb
<b>System Clock</b>	66 MHz (matches external processor speed)
<b>Expansion Bus</b>	
<b>Bus Type</b>	PCI (2.1-compliant) and ISA
<b>Bus Speeds</b>	<i>PCI</i> : 33 MHz <i>ISA</i> : 8.33 MHz
<b>Expansion-Card Connectors</b>	<i>Midsized chassis</i> : 2 PCI (1 available—1 taken by SCSI adapter), 1 PCI/ISA shared, 2 ISA
<b>NIC</b>	Integrated on system board 3Com® PCI 3C905 network controller, operating at 10 or 100 Mbps
<b>Memory</b>	
<b>Architecture</b>	72-bit (ECC), noninterleaved
<b>DIMM Sockets</b>	3 (1 taken by base memory)
<b>DIMM Capacities</b>	32-, 64-, and 128-MB ECC SDRAM
<b>Shipped RAM</b>	64 MB ECC SDRAM
<b>Maximum RAM</b>	384 MB (would require replacing 64 MB DIMM with 128 MB DIMM)
<b>BIOS Address</b>	F0000h

<b>Drives</b>	<p>4 GB SCSI Hard Drive</p> <p>100 MB SCSI ZIP Drive (Mini-Server only—option to upgrade to 4/8 GM Mini-Cartridge SCSI Tape Drive)</p> <p>12/24 SCSI CD-ROM</p> <p><i>Midsized chassis:</i></p> <ul style="list-style-type: none"> <li>• <b>Externally accessible bays:</b> (2) 5.25-inch bays for diskette, tape, or CD-ROM drives; (1) 3.5-inch bay for a diskette drive NOTE: All external bays occupied in Mini-Server, 1 available in Operator Station.</li> <li>• <b>Internally accessible bays:</b> (2) 3.5-inch bays: one for a 1-inch high hard-disk drive and one for a 1.6-inch high hard-disk drive NOTE: 1-inch high bay occupied by hard drive.</li> </ul>
<b>Ports</b>	<p><i>Externally accessible:</i></p> <ul style="list-style-type: none"> <li>• <b>Serial (DTE):</b> (2) 9-pin connectors (16550-compatible)</li> <li>• <b>Parallel:</b> 25-hole connector (bidirectional)</li> <li>• <b>Video:</b> 15-hole connector</li> <li>• <b>NIC:</b> RJ45 connector</li> <li>• <b>PS/2-style keyboard:</b> 6-pin mini-DIN</li> <li>• <b>PS/2-compatible mouse:</b> 6-pin mini-DIN</li> <li>• <b>USB:</b> 2 USB-compliant connectors</li> <li>• <b>Audio line-in:</b> miniature audio jack</li> <li>• <b>Audio line-out:</b> miniature audio jack (amplified source)</li> <li>• <b>Microphone:</b> miniature audio jack</li> <li>• <b>SCSI</b> NOTE: This port is unusable due to combination of wide and narrow SCSI devices connected internally.</li> </ul> <p><i>Internally accessible:</i></p> <ul style="list-style-type: none"> <li>• <b>SCSI</b> for hard drive, CD-ROM, ZIP (if fitted) and 4/8 GB Mini-cartridge tape drive (if fitted)</li> <li>• <b>Diskette drive:</b> 34-pin connector</li> </ul>
<b>Audio</b>	
<b>Model</b>	Crystal Semiconductor
<b>Chip Set</b>	CS4236
<b>Jacks</b>	<p><i>Audio line-in:</i> (1) miniature audio jack</p> <p><i>Audio line-out:</i> (1) miniature audio jack (amplified)</p> <p><i>Microphone:</i> (1) miniature audio jack</p>
<b>Video</b>	
<b>Video Type</b>	ATI 3D Rage Pro AGP controller
<b>Video Memory</b>	4-MB standard SGRAM
<b>Maximum Resolution</b>	1600 x 1200 pixels with 256 colors

<b>Power</b>	
<b>DC Power Supply</b>	<i>Midsized chassis: 200 W</i>
<b>Power Supply Heat Dissipation</b>	<i>Midsized chassis: 913 BUT/hr (nominal)</i>
<b>Power Supply Voltage</b>	90 to 135 V at 60 Hz 180 to 265 V at 50 Hz
<b>Backup Battery</b>	3-V CR2032 coin cell
<b>Physical</b>	
<b>Weight</b>	<i>Midsized chassis: 12.7 kg (28 lb)</i>
<b>Height</b>	<i>Midsized chassis: 16.5 cm (6.5 inches)</i>
<b>Width</b>	<i>Midsized chassis: 41.9 cm (16.5 inches)</i>
<b>Depth</b>	<i>Midsized chassis: 44.5 cm (17.5 inches)</i>
<b>Environmental</b>	
<b>Temperature</b>	<i>Operating: 10 to 35°C (50 to 95°F) Storage: -40 to 65°C (-40 to 149°F) Relative humidity: 8 to 80% (noncondensing)</i>
<b>Maximum Vibration</b>	<i>Operating: 0.25 G at 3 to 200 Hz at 1 octave/min. Storage: 0.5 G at 3 to 200 Hz at 1 octave/min.</i>
<b>Maximum Shock</b>	<i>Operating: Left side (for mini tower orientation) and bottom (for low-profile and midsized orientation) half-sine pulse with a change in velocity of 20 inches/sec (50.8 cm/sec). Storage: 27-G faired square wave with a velocity change of 200 inches/sec (508 cm/sec)</i>
<b>Altitude</b>	<i>Operating: -16 to 3048 m* (-50 to 10,000 ft) Storage: -16 to 10,600 m (-50 to 35,000 ft)  *The maximum operating temperature of 35°C (95°F) is for altitudes below 914.6 m (30000 ft). Above 914.6 m (30000 ft) the maximum operating temperature is reduced.</i>
<b>Regulatory Notices</b>	<ul style="list-style-type: none"> <li>• FCC (U.S. only): Class B</li> <li>• IC Notice (Canada only): Class B</li> <li>• CE Notice: Class B</li> <li>• DMI 3.0-compliant</li> <li>• APM 1.1-compliant</li> <li>• FCC ID: Class B</li> <li>• EN 55022 (Czech Republic only): Category B</li> <li>• VCCI Notice (Japan only): Class 1, Class 2</li> <li>• Korean Regulatory Notice: Class A, Class B</li> <li>• NOM 024 Information (Mexico only)</li> <li>• Polish Center for Testing and Certification</li> </ul>

## Specifications

### Summary of S9000 Controller Functions

Description	Model 9000e	Model 9100e	Model 9200e
<b>Loop Control</b>			
Loop Control Blocks	32	32	32
Control Blocks (See Control Block List)	250	250	250
Typical Cycle Time (8 loops)	0.5 sec/8 loops	0.5 sec/8 loops	0.5 sec/8 loops
<b>Sequence Control</b>			
Stored Sequences per Controller	32	32	32
Active Sequences per Controller	10	10	10
Simultaneous BPOs per Sequence	4	4	4
Elements per Controller (total of all Steps, Branches, Forks, BPOs, etc. )	700	700	700
Continuation Conditions per Step	8	8	8
Control Instructions per Step	12	12	12
Conditions and Instructions per Controller	3000	3000	3000
Calculation Statements per Controller	600	700	600
<b>Logic Control</b>			
Internal Coils	3840	1024	2048
Internal Registers	256	2048	4096
Timers/Counters	128	1024	2048
Sequencer Steps	1024	1024	1024
Ladder Logic Memory	2K	8K	32K
Logic Scan Rate (See Ladder Logic Instructions List)	2.5 ms/K	2.5 ms/K	2.5 ms/K
<b>Recipes</b>			
Stored Recipes per Controller	50	50	50
Ingredients per Recipe	50	50	50
<b>Setpoint Programs</b>			
Setpoint Program Control Blocks	8	8	8
Stored Programs	99	99	99
Events per Program	12	12	12
Segments per Program	98	98	98
Total Segments for All Programs	1000	1000	1000
<b>Inputs and Outputs</b>			
Total I/O (digital and analog)	256	640	960
Analog Inputs	96	96	96
<b>I/O and Option Slots</b>			
I/O Slots in Controller Rack	8	8	6
Supported I/O Expansion Racks (11 or 12 slots per rack)	1	3	5
Total I/O Slots (Controller + I/O Racks)	20	44	66
Option Slots	0	1	3
Options Modules (contact factory for information)	None	HIM CIM	HIM CIM

## Specifications

### Summary of Available Control Block Types in CCC for S9000 Controller

Category	Block Type	Description
Loops	PID1* PID2* PID3* AI AO WTUN UDC1  UDC2 UDC3 UAI UA16 RTD RTD8	Proportional, Integral, Derivative control loop Proportional, Integral, Derivative control loop (Cascade) Proportional, Integral, Derivative control loop (with interlocking) Analog Input Analog Output Write Tuning Constants Supervisory setpoint, monitoring of a UDC on the DMCS network Monitor analog input of a UDC on the DMCS network Auto/Manual station Universal Analog Input Use up to 16 UAI channels as analog inputs Resistance Temperature Detector Module Input Use up to 8 RTD channels as analog input*
SPP (Setpoint Programmer)/Recipe	SPP SPP2 SPEV  SYNC RCP RAMP	Setpoint Programmer (up to eight available) Setpoint Programmer (saves operator edits on-line) Setpoint Programmer Events (up to 12 events per block available) Setpoint Programmer Synchronization Loads a specified recipe Ramps to input target at specified rate
Ladder	RDIG RREG WDIG WREG PB TOT DEV RRG8 WRG8  RFP8  WFP8	Read Digital (contact value from Ladder Logic) Read Register (analog value from Ladder Logic) Write Digital (to Ladder Logic latch coil) Write Register (analog value to Ladder Logic Register) Pushbutton (momentary) Totalization using pulse input module Digital Device Interface Read up to 8 signed/unsigned registers in the logic processor Write an analog input value (X) to up to 8 signed/unsigned registers in the logic processor Read up to 8 IEEE Floating Point numbers from pairs of registers in the logic processor Write up to 8 IEEE Floating Point analog input (X) numbers to pairs of registers in the logic processor
Math	SCB SUB ADD MUL DIV	Scale and Bias; Out = AX + B Subtract; Out = X - Y Add; Out = X + Y Multiply; Out = (X * Y) Divide; Out = X/Y
Calculation	SQRT ABS CMPR MMA MSF	Square Root; Out = $\sqrt{X}$ Absolute Value; Out = $ X $ Compare; X:Y, Out = X > Y, or X = Y, or X < Y Min/Max/Avg/Sum/Standard Deviation Mass Flow; Out = Kg * sqrt [(dp * P)T]
Alarm/Signal	HMON LMON	High Monitor; if X > Y, Out = On Low Monitor; if X < Y, Out = On

\*All PID control blocks offer adaptive autotune.



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**Specifications**


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**Summary of Available Control Block Types in CCC for S9000 Controller, continued**

Category	Block Type	Description
Auxiliary	HLLM VLIM HSEL LSEL SW XFR LDLG FGEN RCON TAHD	High-Low Limiter Rate/Velocity Limit High Selector Low Selector Switch; Out = X input or Y input Bumpless Analog Transfer Switch Lead/Lag Function Generator Read Configuration Parameter Track and Hold
Boolean	NOT AND OR XOR LTCH TRIG	Logical Boolean Complement 2-Input AND Gate 2-Input OR Gate 2-Input Exclusive-OR Gate Bi-Stable Element (flip-flop) Triggered Pluse
Recorder	RCH WCH	Read Recorder Channels Recorder Pen Output

**Summary of Available Elements in SCC for S9000 Controller**

Element Type	SCC Portion	Description or Functions
<b>Begin Sequence</b>	Sequence	Identifies the beginning of a sequence <ul style="list-style-type: none"> <li>• Initialization instructions</li> <li>• Abnormal condition identification</li> <li>• Abnormal condition actions</li> <li>• Activate sequence identification</li> </ul>
<b>Basic Process Operation</b>	Sequence	Identifies a Basic Process Operation <ul style="list-style-type: none"> <li>• Continuation condition evaluated before entry</li> <li>• Consists of a BPO chart</li> </ul>
<b>Branched Basic Process Operation</b>	Sequence	Identifies a Basic Process Operation with 2 to 4 branches <ul style="list-style-type: none"> <li>• Continuation condition evaluated before entry</li> <li>• Consists of a BPO chart</li> </ul>
<b>Branch In</b>	Sequence	Channels multiple control flow inputs to a single output <ul style="list-style-type: none"> <li>• Multiple inputs</li> <li>• 1 output</li> </ul>
<b>Fork</b>	Sequence	Allows simultaneous execution of up to four BPOs in "parallel" <ul style="list-style-type: none"> <li>• Continuation conditions</li> <li>• 1 input</li> <li>• Up to 4 outputs</li> </ul>
<b>Join</b>	Sequence	Functionally opposite of a Fork <ul style="list-style-type: none"> <li>• Multiple inputs</li> <li>• 1 output</li> </ul>
<b>End Sequence</b>	Sequence	Identifies the end of a sequence <ul style="list-style-type: none"> <li>• Continuation conditions</li> <li>• No instructions</li> </ul>

## Specifications

### Summary of Available Elements in SCC for S9000 Controller, continued

Element Type	SCC Portion	Description or Functions
<b>Begin BPO</b>	BPO	Identifies the beginning of a BPO <ul style="list-style-type: none"> <li>• Entry instructions</li> <li>• Abnormal condition identification</li> <li>• Abnormal condition actions</li> <li>• Activate sequence identification</li> </ul>
<b>Step</b>	BPO	Performs all normal instructions <ul style="list-style-type: none"> <li>• Up to four continuation conditions evaluated before entry</li> <li>• Up to 12 instructions which can be executed upon entry, exit, timeout, and/or mode change</li> </ul>
<b>Branched Step</b>	BPO	Same as Step but with up to four outputs <ul style="list-style-type: none"> <li>• Logic control branches to one (and only one) of the four outputs</li> </ul>
<b>Branch-In</b>	BPO	Up to four inputs and one output
<b>End BPO</b>	BPO	Required final element of a BPO <ul style="list-style-type: none"> <li>• Continuation conditions evaluated before entry</li> </ul>

### Summary of S9000 Controller Logic Instructions

Instruction Type	Instruction
<b>Relay Logic</b>	Normally Open Contacts Normally Closed Contacts Transition On Contacts Transition Off Contacts Branch Output Retentive Output Latch Output Unlatch Output
<b>Timer and Counter</b>	ON Delay Timer (0.1 second, 1.0 second) OFF Delay Timer (0.1 second, 1.0 second) Retentive ON Delay Timer Up/Down Counter
<b>Skip</b>	Not Skip and Retain (NSKR) Not Skip and De-energizes (NSKD) End of Skip (EOS) Return to Beginning of program Jump Jump to Subroutine Subroutine Return to Subroutine
<b>Sequencer</b>	Sequencer Load Sequencer Unload Sequencer

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**Specifications**

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**Summary of S9000 Controller Logic Instructions, continued**

Instruction Type	Instruction
<b>Miscellaneous</b>	Input Status Scan (ISS) No Operation Matrix Instructions Conditional Data Handling Binary to BCD Conversion BCD to Binary Conversion
<b>Data Manipulation</b>	Bring In Send Out PUSH PULL Constant Indirect Bring In Indirect Send Out Floating Point Most Significant Register Floating Point Least Significant Register Floating Point Bring In Floating Point Send Out Bit Write Floating Point to Integer Conversion Integer to Floating Point Conversion
<b>Arithmetic</b>	Addition Subtraction Multiplication Division Equality Comparison Less-Than Comparison Test for Zero Floating Point Square Root

## Specifications

### Analog Input Module Data Summary

Parameter	Module Type		
	Universal Analog	Fast High Level Analog	Resistance Temperature Detector
<b>Inputs</b>	16 different (isolated)	8 differential (isolated)	8 isolated (2, 3, or 4-wire input) <sup>5</sup>
<b>Resolution</b>	15 bits	12 bits	14 bits
<b>Accuracy</b>	±0.05% full scale	±0.1% of span	±0.8°F or ±0.48°C
<b>Conversion Speed</b>	20 conversions/sec without burnout 16 conversions/sec with burnout	33 milliseconds for 8 inputs	20 conversions /s at 60 Hz
<b>Input Impedance</b>	10 megohms	Greater than 200K ohms	1 megohm (minimum)
<b>Input Voltage Range/RTD Type<sup>1</sup></b>	1 to 5V 0 to 5V 0 to 10 mV <sup>2</sup> 10 to 50 mV <sup>2</sup> Direct sensor <sup>*2,3</sup>	0 to 10V -10 to 10V 0 to 5V -5 to 5V 1 to 5V	IEC RTD platinum 100, 200, 500 ohms JIS RTD platinum 100 ohms BURNS RTD platinum 100, 200, 500 ohms GE RTD copper 10 ohms
<b>Input Current Range (use 1 to 5V range with external shunt)</b>	4 to 20 mA 0 to 20 mA <sup>4</sup>	4 to 20 mA 0 to 20 mA	Not Applicable
<b>Common Mode Voltage</b>	30V rms maximum continuous	30V rms maximum continuous	30V rms maximum continuous
<b>Temperature Coefficient</b>	0.004% per °C	0.006% per °C	0.004% per °C
<b>Point-to Ground and Point-to-Point isolation</b>	300V peak 300V peak	1000V peak 1000V peak	300V peak 300V peak

<sup>1</sup>See Resistance Temperature Detector Module Range Data table.

<sup>2</sup>Requires software filtering to meet accuracy specification.

<sup>3</sup>See Universal Analog Input Module Range Data table.

<sup>4</sup>Eight 250 ohm shunt resistors supplied per module.

<sup>5</sup>4-wire, separate loop, dual connector hookup is not supported.

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**Specifications**


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**Universal Analog Input Module Range Data**

Probe Type		Range		Reference Accuracy		Temp. Stab. 59 to 131°F or 15 to 55°C
				72°F ±5°	22°C ±3°	
		°F	°C	±°F	±°C	±Degrees Error per 1° ΔT °F
<b>Thermocouples</b>	<b>B</b>	<b>105 to 3300</b>	<b>41 to 1815</b>			
		105 to 150	41 to 66	30.0	17.0	1.67
		150 to 500	66 to 260	20.0	11.0	1.67
		500 to 1000	260 to 538	4.0	2.2	0.39
		1000 to 3300	538 to 1815	1.7	1.0	0.18
	<b>E</b>	<b>-454 to 1832</b>	<b>-270 to 1000</b>			
		-454 to -202	-270 to -130	7.0	3.8	0.67
		-202 to 1832	-130 to 1000	1.0	0.5	0.33
	<b>J</b>	<b>0 to 1600</b>	<b>-18 to 871</b>	1.0	0.55	0.06
	<b>K</b>	<b>0 to 2400</b>	<b>-18 to 1316</b>	1.0	0.55	0.09
<b>Ni-Ni-Moly</b>	<b>32 to 2500</b>	<b>0 to 1371</b>				
	32 to 500 500 to 2500	0 to 260 260 to 1371	1.26 1.0	0.7 0.54	0.09 0.07	
<b>N*</b>	<b>0 to 2372</b>	<b>-18 to 1300</b>	1.0	0.55	0.09	
<b>R</b>	<b>0 to 3100</b>	<b>-18 to 1704</b>				
	0 to 500 500 to 3100	-18 to 260 260 to 1704	2.5 1.5	1.5 0.9	0.23 0.13	
<b>S</b>	<b>0 to 3100</b>	<b>-18 to 1704</b>				
	0 to 500 500 to 3100	-18 to 260 260 to 1704	2.5 1.5	1.5 0.9	0.23 0.13	
<b>T</b>	<b>-300 to 700</b>	<b>-184 to 371</b>	0.8	0.48	0.07	
<b>W5W26 (W)</b>	<b>0 to 4200</b>	<b>-18 to 2316</b>				
	0 to 600	-18 to 316	8.5	4.7	0.17	
	600 to 3600	316 to 1982	2.5	1.4	0.17	
	3600 to 4200	1982 to 2316	4.0	2.2	0.28	
<b>Carbon Potential**</b>	<b>ZrO<sub>2</sub> Probe</b>	measured carbon potential	<b>0 to 2.00%</b> 0.10 to 1.40% C	±0.02% carbon (natural gas enriching atmosphere)		
<b>Dewpoint***</b>	<b>ZrO<sub>2</sub> Probe</b>	<b>-50 to 100</b>	<b>-45 to 38</b>			
<b>% Oxygen</b>	<b>ZrO<sub>2</sub> Probe</b>	0 to 20% O <sub>2</sub> 20 to 40% O <sub>2</sub>		±0.5% O <sub>2</sub> ±1.0% O <sub>2</sub>		
<b>Honeywell RH Radiamatic</b>		<b>1400 to 3400</b>	<b>760 to 1871</b>			
		1400 to 2100	760 to 1149	4.2	2.3	0.17
		2100 to 3400	1149 to 1871	1.4	0.8	0.05

\*Nicrosil-Nisil or Omegalloy 14 AWG.

\*\*One ZrO<sub>2</sub> probe per module; probe can be Marathon Monitors, Corning, AACC, Furnace Control Corp., MacDhui, Barber Coleman, or Bricesco model.

\*\*\*Furnace Control Corp. probe - One per module.

**Specifications**

**Resistance Temperature Detector Module Range Data**

Type of Input Actuation	Range		Reference Accuracy		Temp. Stab. ±Degrees Error per 1° ΔT °F	0% Value In Ohms	100% Value In Ohms
			72°F ±5°	22°C ±3°			
	°F	°C	±°F	±°C			
IEC RTD - Platinum alpha = 0.00385 100 ohms 200 ohms 500 ohms	-300 to 900	-184 to 482	0.8	0.48	0.05	25.18 50.36 125.9	274.96 549.92 1374.80
JIS RTD - Platinum alpha = 0.003916 100 ohms	-300 to 900	-184 to 482	0.8	0.48	0.05	23.90	277.98
Burns RTD - Platinum alpha = 0.003902 100 ohms 200 ohms 500 ohms	-300 to 900	-184 to 482	0.8	0.48	0.05	23.86 47.72 119.20	277.37 554.74 1386.85
GE RTD - Copper alpha = 0.003856 10 ohms	-4 to 482	-20 to 250	2.00	1.11	0.12	8.26	18.68
Relative Humidity IEC RTD alpha = 0.00385 Dry/Wet Bulb	0 to 300	-18 to 149	0.3	0.2	0.02	93.03	156.90
Relative Humidity calculation done for temperatures in the 21 to 212°F (-6 to 100°C)							
Measured RH	Dry Bulb Range						
0 to <20	35 to 212	2 to 100	2%RH		0.11% RH/F		
20 to 100	35 to 40	2 to 4	2% RH		0.11% RH/F		
	>40 to 100	>4 to 38	1% RH		0.06% RH/F		
	100 to 212	38 to 100	1% RH		0.03% RH/F		

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**Specifications**


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**24 Vdc Input Module Data**

<b>Inputs</b>	16
<b>Voltage Range</b>	18 to 28V
<b>Current Range</b>	3 to 9 mA
<b>Switching Level:</b> Logic 1 Logic 0	18 Vdc 11 Vdc
<b>Allowable Leakage Current</b>	1.3 mA
<b>Input Delay</b> OFF to ON ON to OFF	2.4 ms $\pm$ 20% 17 mx $\pm$ 20%

**115 Vac Input Module Data**

<b>Inputs</b>	16
<b>Voltage Range</b>	90 to 140V
<b>Current Range</b>	6 to 24 mA
<b>Switching Level:</b> Logic 1 Logic 0	75 V 43 V
<b>Allowable Leakage Current</b>	1.5 mA
<b>Input Delay</b> OFF to ON ON to OFF	2.4 ms $\pm$ 20% 17 mx $\pm$ 20%

**Pulse Input Module Data**

<b>Inputs</b>	4
<b>Voltage Range</b>	4.7 to 9 Vdc 10 to 32 Vdc 32 to 60 Vdc
<b>Current (Typical)</b>	7 to 15 mA
<b>Maximum Input Frequency</b> Low (filtered) High (Unfiltered)	200 Hz 100 KHz
<b>Minimum Pulse Width</b> Filtered Unfiltered	2.5 ms $\pm$ 25% 5 $\mu$ sec
<b>Input Isolation</b>	2500 Vdc optical

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**Specifications**

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**230 Vac/Vdc Input Module Data**

<b>Inputs</b>	8
<b>Voltage Range</b>	195 to 250V
<b>Current Range</b>	4.5 to 10 mA (8.5 mA at 230V typical)
<b>Switching Level:</b> Logic 1 Logic 0	140 Vac/155 Vdc 63 Vac/90 Vdc
<b>Allowable Leakage Current</b> Vac Vdc	1 mA 1.5 mA
<b>Input Delay</b> OFF to ON ON to OFF	2.4 ms $\pm$ 20% (plus 0 to 0.5 cycles) 17 mx $\pm$ 20%

**Analog Output Module Data**

<b>Outputs</b>	4 non-isolated
<b>Resolution</b>	12 bits
<b>Module Power Requirements</b>	+5 Vdc, 285 mA -15 Vdc, 120 mA* + 15 Vdc, 85 mA* Plus 20 mA for each current output used.
<b>Output Ranges</b> Voltage Current	$\pm$ 10 Vdc $\pm$ 5 Vdc 0 to 10 Vdc 4 to 20 mA
<b>Load</b> Voltage Current	8K ohm minimum 0 to 600 ohm
<b>Accuracy</b>	0.15% of Full Scale Range at 25°C
<b>Temperature Control</b> Voltage Current	$\pm$ 0.006% of FSR per °C plus 3/4 LSB $\pm$ 0.03% of FSR per °C plus 3/4 LSB

\*Voltage outputs not loaded.



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**Specifications**


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**24 Vdc Output Module Data**

<b>Outputs</b>	16
<b>Voltage Range</b>	2A per circuit 5A per group of 4 12A per module
<b>Surge Current</b>	8A for 10 ms (non-repetitive)
<b>Field Power Requirement</b>	25 mA for each energized output
<b>Off State Leakage Current</b>	≤5 mA (typical)
<b>On State Voltage Drop</b>	≤2V at 2A
<b>Fusing</b>	1 per group of 4, 7A Fast-Blo

**115 Vac Output Modules Data**

<b>Outputs</b>	6 (isolated)	16
<b>Voltage Range</b>	90 to 140V	90 to 140V
<b>Maximum Current Range</b>	2A per circuit	2A per circuit 12A per module
<b>Surge Current</b>	10A, 1 cycle (non-repetitive)	8A, 1 cycle (non-repetitive)
<b>Off State Leakage Current</b>	≤5 mA (typical)	≤5 mA (typical)
<b>On State Voltage Drop</b>	≤2V at 2A	≤2V at 2A
<b>Fusing</b>	1 per circuit, 3A Fast-Blo	1 per circuit, 3A Fast-Blo

**230 Vac Output Module Data**

<b>Outputs</b>	8
<b>Voltage Range</b>	195 to 250V
<b>Maximum Current Range</b>	2A per circuit 6A per common 8A per module
<b>Surge Current</b>	8A, 1 cycle (non-repetitive)
<b>Off State Leakage Current</b>	≤5 mA (typical)
<b>On State Voltage Drop</b>	≤2V at 2A
<b>Fusing</b>	1 per circuit, 3A Fast-Blo

## Specifications

### S9000 Controller Environmental, Electrical, and Physical Ratings

Description	Model 9000e	Model 9100e	Model 9200e
<b>Power Requirements</b>			
Voltage, Vac	115 to 230* ±15%	115 to 230* ±15%	115 to 230* ±15%
Frequency, Hz	50/60	50/60	50/60
Power consumption, VA	95 to 110	110	110
<b>Battery Backup</b>	6 mo. minimum	6 mo. minimum	6 mo. minimum
<b>Communications</b>			
Ethernet port to network	2	2	2
RS-232 port to the Operator Panel	1	1	1
DMCS port to external Honeywell devices	1	1	1
<b>Ambient Temperature (Operative Limits)</b>			
°C	0 to 60	0 to 60	0 to 60
°F	32 to 140	32 to 140	32 to 140
<b>Relative Humidity</b>			
% (non-condensing)	5 to 95	5 to 95	5 to 95
<b>Vibration</b>			
Frequency, Hz	500	500	500
Acceleration, g	2	2	2
<b>Mechanical Shock</b>			
Acceleration, g	15	15	15
Duration, msec	11	11	11
<b>Dimensions</b>			
Height, inches (millimeters)	10.7 (272)	10.7 (272)	10.7 (272)
Width, inches (millimeters)	19 (483)	19 (483)	19 (483)
Depth, inches (millimeters)	7.5 (191)	7.5 (191)	7.5 (191)
<b>Mounting</b>	Panel or 19-inch rack mount	Panel or 19-inch rack mount	Panel or 19-inch rack mount
<b>Weight</b>			
Pounds	39.5	39.5	39.5
Kilograms	18	18	18

\*Field selectable.

## Specifications

### Summary of Operator Panel Design Features

Description	Monochrome	Color
<b>Hardware</b>  <div style="text-align: right; padding-right: 20px;">CRT Type</div> <div style="text-align: right; padding-right: 20px;">Flat Panel Type</div>	12-inch diagonal. 12 lines by 40 columns of double-spaced characters.	12-inch diagonal 12 lines by 40 columns of double-spaced characters.
	10.5-inch diagonal 25 or 30 lines of 80 characters 640 x 480 pixel resolution	10.5-inch diagonal 25 or 30 lines of 80 characters 640 x 480 pixel resolution
<b>Operator Interface</b>	Preformatted operator displays with up to 400 point names: <ul style="list-style-type: none"> <li>• Alarms</li> <li>• Digital Status</li> <li>• Overview</li> <li>• Loops</li> <li>• Loop Detail</li> <li>• Setpoint Program Operate</li> <li>• Setpoint Program Setup</li> <li>• Setpoint Program Detail</li> <li>• Recipe Setup</li> <li>• Recipe Detail</li> <li>• Text Information</li> </ul>	Preformatted operator displays with up to 400 point names: <ul style="list-style-type: none"> <li>• Alarms</li> <li>• Digital Status</li> <li>• Overview</li> <li>• Loops</li> <li>• Loop Detail</li> <li>• Setpoint Program Operate</li> <li>• Setpoint Program Setup</li> <li>• Setpoint Program Detail</li> <li>• Recipe Setup</li> <li>• Recipe Detail</li> <li>• Text Information</li> </ul>
<b>Communications</b>	One RS-232C port to the S9000 Controller.	One RS-232C port to the S9000 Controller.

## Specifications

### Operator Panel Environmental, Electrical, and Physical Ratings

Description	Monochrome	Color
<b>Power Requirements</b> Voltage, Vac Frequency, Hz Power consumption	90 to 250 Vac auto-ranging 50/60 45*	90 to 250 Vac auto-ranging 50/60 65*
<b>Ambient Temperature (Operative Limits)</b> CRT Type:            °C °F Flat Panel Type       °C °F	0 to 50 32 to 122 15 to 35 59 to 95	0 to 50 32 to 122 15 to 35 59 to 95
<b>Relative Humidity</b> % (non-condensing)	5 to 9	5 to 95
<b>Vibration</b> Frequency, Hz	5 to 10, 0.20 inches peak-to-peak 10 to 200, 1g peak-to-peak	5 to 10, 0.20 inches peak-to-peak 10 to 200, 1g peak-to-peak
<b>Mechanical Shock</b> Acceleration, g Duration, msec	5 10	5 10
<b>Magnetic Field</b>	0.1 oersted	0.1 oersted
<b>Dimensions</b> CRT Type       Height, inches (millimeters) Width, inches (millimeters) Depth, inches (millimeters) Flat Panel Type   Height, inches (millimeters) Width, inches (millimeters) Depth, inches (millimeters)	14 (356) 19 (483) 16.1 (412) 13 (330) 16.3 (413) 3.9 (100)	14 (356) 19 (483) 16.1 (412) 13 (330) 16.3 (413) 3.9 (100)
<b>Mounting</b>	Panel mount - NEMA 4/12 enclosure	Panel mount - NEMA 4/12 enclosure
<b>Weight</b> CRT Type                               Pounds Kilograms Flat Panel Type                               Pounds Kilograms	42 20 15.35 6.96	42 20 16.15 7.33

\*Maximum consumption for flat-panel type is 50 watts.

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## Specifications

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### S9000 Controller Options

<b>I/O Expansion Rack (Local or Remote)</b>	<p><i>Standard:</i> 12 input/output module slots and handles up to 3 analog I/O modules.</p> <p><i>Extended:</i> 11 input/output module slots and handles up to 8 analog I/O modules.</p> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-bottom: 5px;"><b>ATTENTION</b></div> Restrict use of UAIM and RTD modules in remote I/O racks to temperature loops and/or data acquisition. Contact Honeywell for details.
<b>External Devices</b>	<p>Up to 29 UDC 3000, UDC 5000, or UDC 6000 stand-alone loop controllers can be connected to the Controller. Note that a maximum of 32 loops can be configured in the the Continuous Control Chart. This includes all internal and external PID sources.</p> <p>Up to two DPR 1500 Multipoint Recorders or two DPR 3000 Multipoint Recorders can be connected to the Controller. Note that external device communications does not support a DPR 1500 and a DPR 3000 on the same network.</p>

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## Ordering Information

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For complete ordering information, request the Model Selection Guides listed below.

For more information, contact your nearest Honeywell Branch Office or call:

1-800-328-5111, extension 99

If you want data on...	Then, order...
Model 9000e Controller	51-51-16-34
I/O Expansion Rack	51-51-16-35
Model 9100e Controller	51-51-16-36
Model 9200e Controller	51-51-16-37
Operator Panel	51-51-16-41

*Specifications are subject to change without notice.*