MicroStation **j**
The Foundation for
Enterprise Engineering Modeling

MICROSTATION GEOGRAPHICS®

MicroStation/J® Geoengineering Configuration

Enterprise Engineering Modeling

MicroStation/J promotes enterprise engineering productivity by bringing about the convergence of enterprise IT technology, engineering applications, and computer-aided design (modeling). This new category of engineering products is called Enterprise Engineering Modeling (EEM).

The "engineering" in EEM refers to the Engineering Configurations, which add to the functionality of MicroStation/J for a variety of different uses. The Engineering Configuration for geoengineering is MicroStation GeoGraphics.

EEM brings increased productivity, reduced cost, and improved time control throughout the life cycle of your projects.

MicroStation GeoGraphics is both a geoengineering application and a foundation for discipline-specific applications. By configuring MicroStation® for a geoengineering use, it significantly increases user productivity and offers a more natural and easy-to-use environment for users in geoengineering than MicroStation alone. With MicroStation GeoGraphics and MicroStation/J, independent software developers can take advantage of high-level functionality to increase application performance and reduce development time. MicroStation GeoGraphics also facilitates migration to component-based modeling.

MicroStation GeoGraphics is a fully integrated CAD/GIS solution with sophisticated raster and vector functionality, created for engineers and application developers. It extends MicroStation's industry-standard data capture and editing tools with a solid database interface and powerful spatial analysis functionality.

MicroStation GeoGraphics integrates seamlessly with MicroStation /J, and provides tools to input, manage, analyze, and visualize geographical information within MicroStation. Most mapping projects require some level of customization, that is why MicroStation GeoGraphics is designed to be an application development platform, as well as an end-user product. Its open design provides a wide range of mapping functions that enable users to extend functionality and create custom applications on multiple hardware and operating systems.

Geoengineering: The Convergence of Computer-Aided Design and GIS

MicroStation is an industry standard for creating, managing, and manipulating graphical data deployed in a wide variety
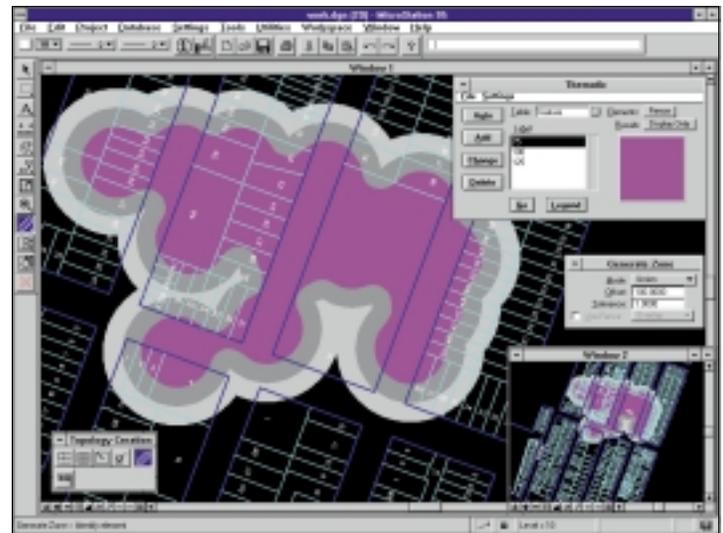
MicroStation GeoGraphics brings a broad range of mapping and spatial analysis tools to MicroStation, delivering a powerful, extensible, and easy-to-use GIS/mapping environment.

BENTLEY
Engineering the future together

of automated mapping projects. GIS provides a technology that supports spatially based analysis used in decision-making, planning, and problem solving. GIS combines spatial and non-graphical attributes with tools that allow users to explore the relationships inherent in intelligent spatial data. Although CAD and GIS regularly deal with the same types of information, the supporting technologies are often separate and incompatible.
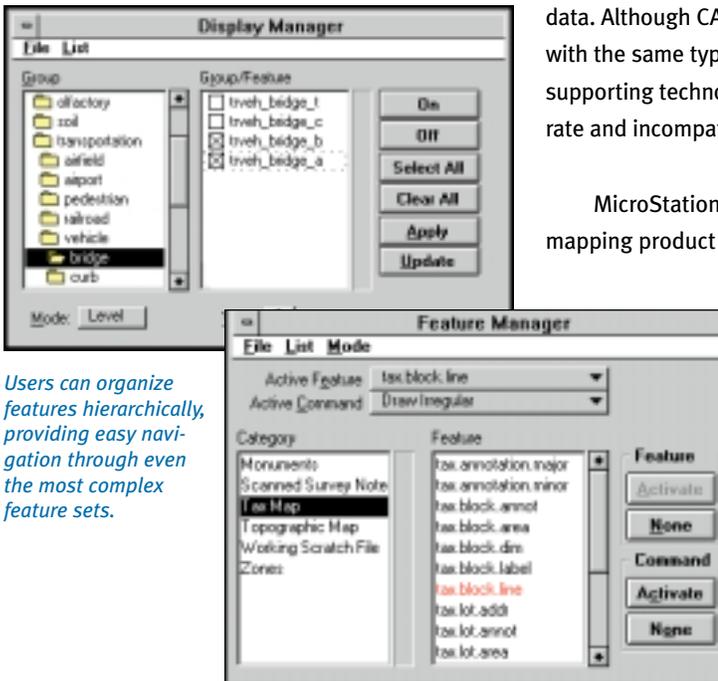
MicroStation GeoGraphics, the first mapping product created by the developers of MicroStation, brings together the best elements of CAD and GIS with no compromises in power or flexibility. In the same way that MicroStation extends computer-aided design into an integrated engineering platform, MicroStation GeoGraphics transforms MicroStation into a comprehensive GIS environment. MicroStation GeoGraphics allows users to integrate engineering and mapping applications on a single platform that emphasizes workgroup computing, inter-operability, and data consistency across multiple hardware platforms and operating systems. MicroStation GeoGraphics compliments MicroStation with spatial analysis functionality, enhanced database capabilities, and more.

Feature-Based Mapping— Beyond Layers

At the core of MicroStation GeoGraphics is its feature-based design that allows users to interact with data in terms that are familiar to them. A feature is the combination of an element's logical name, graphical symbology, database attribution, and methods as defined by the user. These methods, or operations, define the means by which features are created, modified, and manipulated, and can consist of any combination of MicroStation command key-ins, MicroStation BASIC scripts, MicroStation Development Language (MDL®) programs, or Java. Access to features is handled through the Feature Manager tools, which provide a concise and intuitive interface for users to interact with features. This allows users to focus on the task at hand, rather than on the detailed mechanics of data entry and manipulation. The result is improved data consistency and higher productivity.

Feature-based design transcends the limitations of levels by allowing many distinct features to exist on one design levels. Feature-based display management provides users with an intuitive way to control which features are displayed. Features can also be resymbolized at display time, without regard to their basic graphical definitions. Using the MicroStation GeoGraphics Feature Group utility, users can define different hierarchical organizations for features, which provide easy navigation of large, complex feature sets. When different features are coincident (for example, where a county boundary and corporate limit overlap), a single physical representation can be linked to multiple logical feature definitions, thus reducing data duplication.

Integrated Map Management

The MicroStation GeoGraphics map management system insulates users from the physical organization of map data by providing point-and-click access to project maps. With the help of a key map, an

Users can organize features hierarchically, providing easy navigation through even the most complex feature sets.

MicroStation GeoGraphics is a powerful geoengineering application and forms the foundation for discipline-specific applications.

active spatial index, and a tile management system, users can rapidly find and retrieve individual maps. This allows users to navigate large, complicated map sets without needing to know the details of underlying file organization. The Seamless Mapping option in MicroStation GeoGraphics will attach and detach project maps according to the view display. The Map Manager is also integrated with MicroStation® Image Manager™ to provide management of designs and images from one interface.

Interactive topology clean-up and validation tools enable users to quickly identify and correct geometric problems.

With MicroStation GeoGraphics and MicroStation/J, independent software developers can take advantage of high-level functionality to increase application performance and reduce development time.

Building Clean, Accurate Data

MicroStation GeoGraphics provides a suite of geometric cleanup and validation tools that enable users to quickly identify and fix geometric problems. This helps to ensure data consistency so that analytical operations produce accurate results. Included are tools for finding and fixing duplicate and similar linework, endpoint gaps, intersections, dangling lines, and fragments based on user-defined tolerances. These interactive tools provide users with immediate feedback about errors and problems at the time of data entry, without loss of view context. All cleanup tools are tied into MicroStation's Undo capability so that any cleanup operation can be "rolled back" when tolerance settings produce undesirable results. Specialized geometric visualization tools allow for fast identification of topological problems.

Making Maps More Intelligent

MicroStation GeoGraphics provides a range of tools that not only add intelligence to existing data, but expose the intelligence that often already exists. Adding feature intelligence to CAD maps is made easy with feature-association tools that allow users to apply feature definitions to all elements in a file in one pass. Text-driven database tools provide the ability to build associations between text elements and new or existing database information. MicroStation GeoGraphics can calculate and store measurements of map features including the area and perimeter dimensions. Users can also bring a wide variety of data into MicroStation GeoGraphics using import tools for IGES, DXF, DWG, and CGM.

Point and Click Database Management

The interactive Visual SQL Query Manager helps users create, edit and store sophisticated database queries and database forms. Query results in Dataset mode can be saved directly into ASCII format or added to a selection set that can be acted on with other functionality such as creating zones. The database forms include query, update, review, delete, detach and locate functionality. MicroStation's database connectivity tools, including its ODBC capabilities, enable users to create and manage links between map features and non-graphical attributes that can be stored in a variety of databases, including Microsoft Access (ODBC), Microsoft SQL Server (ODBC), Oracle, Sybase and Informix (RIS)

Spatial Analysis and On-Demand Topology

Overlay operations such as polygon intersection or union allow users to dis-
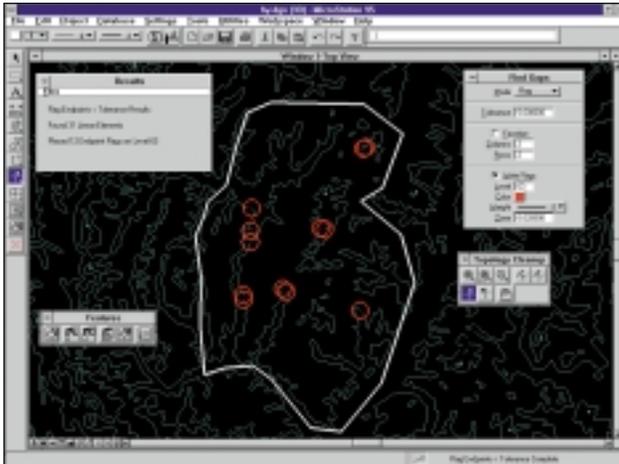
MicroStation GeoGraphics is a fully integrated CAD/GIS solution with sophisticated raster and vector functionality, created for engineers and application developers.

cover the spatial relationships between layers of data. Many systems use a specialized encoding of spatial relationships between objects known as topology. Most systems store topological relationships as a part of their persistent data model that needs to be recalculated when changes are made. As an alternative to storing topology, MicroStation GeoGraphics' spatial engine computes topological relationships on the fly, which means this data is never outdated. These on-demand topology tools allow users to create virtual topology layers containing point, line, and polygon data. These topological layers are used to perform spatial operations, such as intersections, unions, and adjacency, that can be filtered using standard SQL query criteria. MicroStation GeoGraphics' zone-creation tools can help users to examine the spatial relationships between map features.

Unlocking the Power of Images

Through its integration with Image Manager, MicroStation GeoGraphics provides access to a wide range of image data including aerial photographs, satellite imagery, and scanned maps and drawings. This high-performance image engine supports the display of bitonal, gray scale, and continuous tone images that can supplement vector maps and provide a background for "heads-up" feature digitizing. MicroStation GeoGraphics' image-exchange utilities allow users to import and export image data in TIFF, CIT, and COT format. Plotting of image data to a wide range of output devices is also supported.

Map Creation

Users can create a wide variety of maps using the comprehensive set of data-driven thematic tools. These tools use database attribution to control element resymbolization and area filling and patterning. Also included are functions for automatic data classification and legend generation. MicroStation GeoGraphics has a rich set of annotation tools that create text labels from database information. User-defined settings control the specification and positioning of map labels.

It is in map creation that the underlying capabilities of MicroStation become evident. Its precision graphics environment gives users control over many advanced features, including publication-quality fonts, user-defined line styles, and custom symbol (cell) libraries. These features, combined with MicroStation's plotting capabilities (including plot resymbolization, feature prioritization, plot previewing, and combined raster/vector plotting), provide the user with all the tools necessary to create high-quality maps.

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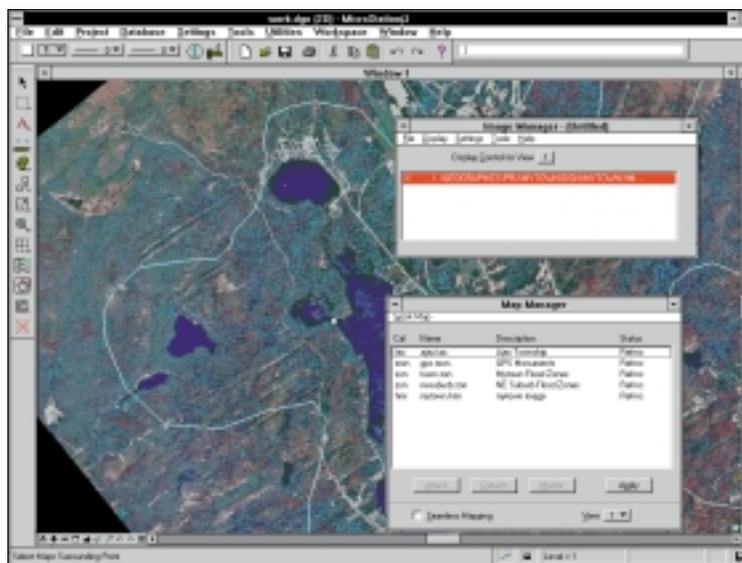
Image data can be used to supplement vector maps or provide a background for "heads-up" feature digitizing.

*MicroStation GeoGraphics
integrates seamlessly with
MicroStation /J, and provides
tools to input, manage,
analyze, and visualize
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Customization—The Key to High Productivity

Since MicroStation GeoGraphics is a general-purpose GIS toolbox, customization and extensibility are core philosophies that drive its design. MicroStation GeoGraphics has a range of customization tools accessible to users of all skill levels. Workspaces and toolboxes allow users to rapidly customize the mapping environment to meet their requirements, focusing the work environment on a specific task or project phase.

MicroStation BASIC, a full implementation of the language with extensions to all major MicroStation functions, can be used to combine different MicroStation GeoGraphics' tools into workflow-specific applications. The MicroStation BASIC macro record facility provides a simple, effective way to create BASIC scripts by simply recording the steps involved in a repetitive process. This feature allows users to write productivity programs without BASIC programming experience. These recorded programs can be replayed at the click of a representative icon. The comprehensive development environment includes an editor, debugger, compiler, and dialog builder.

MicroStation also supports OLE Automation. MicroStation GeoGraphics can expose its functionality to other OLE-driven applications through the use of a development environment such as Microsoft Visual Basic. This means that MicroStation GeoGraphics' functions can be driven from OLE-Automation controllers such as Microsoft Excel spreadsheets or Microsoft Access databases.

Support for Java

Extensions to MicroStation/J's Java DGN package provide access to all MicroStation GeoGraphics project data including category, feature, map and command information. The Feature instance class has been added for dealing with MicroStation elements as GeoGraphics features. Topology classes have been provided for building and intersecting topology layers. MicroStation GeoGraphics includes support for JDBC access to databases and a host of native Java 3rd party development tools for database forms.
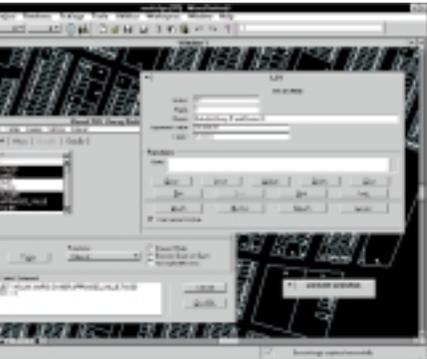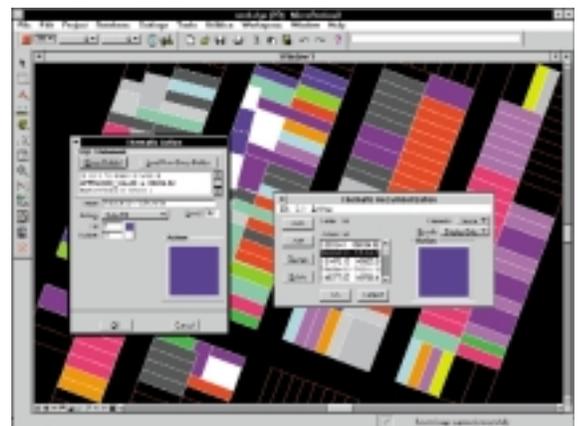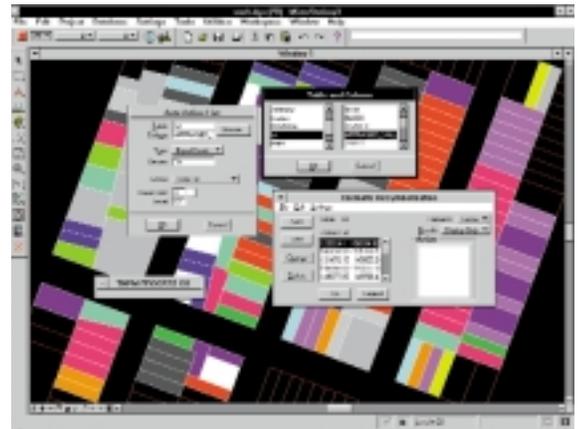

Thematic mapping functions provide database-driven resymbolization and annotation and include automated data classification tools.
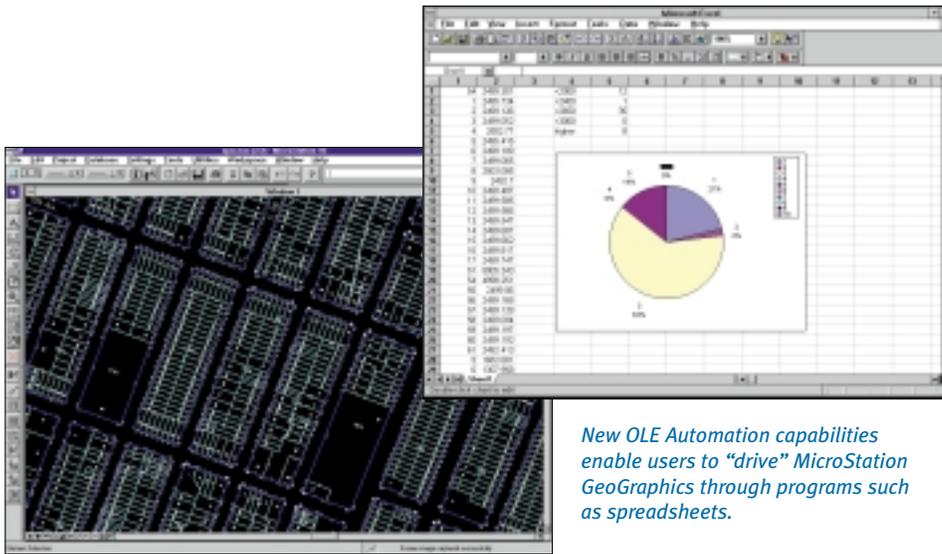
New OLE Automation capabilities enable users to "drive" MicroStation GeoGraphics through programs such as spreadsheets.

Feature Implementation Using Its Own Toolkit

MicroStation GeoGraphics comes with a full suite of MDL routines that give developers full access to the underlying graphics and spatial processing functions. Just as many parts of MicroStation are written in MDL, many MicroStation GeoGraphics features have been implemented using the functions in its toolkit.

MDL provides a complete development environment that lets applications take full advantage of the power of MicroStation GeoGraphics. MicroStation
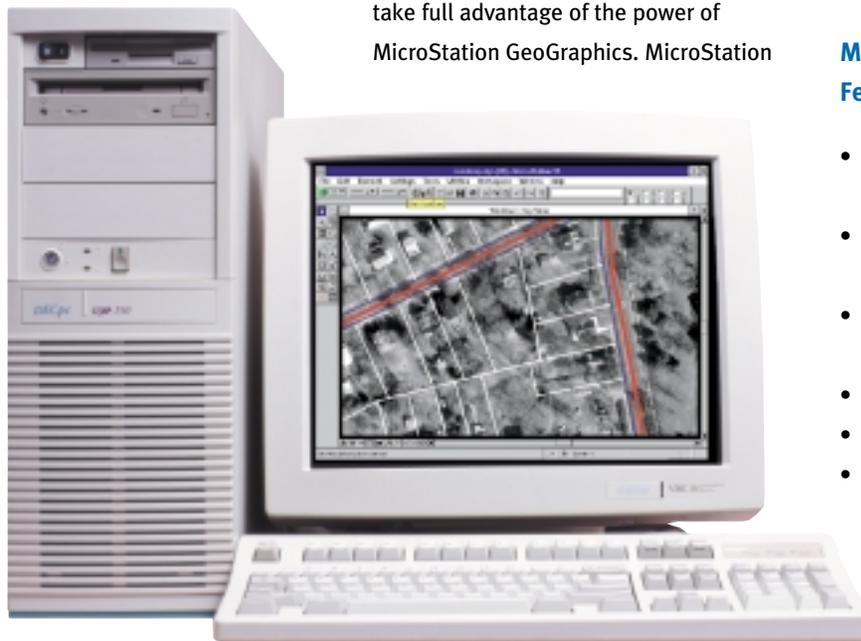
GeoGraphics provides developers with a cohesive application architecture to ensure that programs written using the toolkit will share a consistent foundation, resulting in better cross-application compatibility.

Responding to Industry Needs

Engineering and departments responsible for planning and analysis have employed separate technologies to accomplish similar and complimentary functions far too long. The lack of integrated CAD and GIS tools is to blame. Too often has the lack of integrated, user-specific applications and software availability enterprise-wide kept GIS an isolated technology. Too often has the cost of GIS software capable of managing corporate-wide requirements and point solutions cost too much. Bentley has developed a GIS solution that addresses these issues. One need only consider the underlying features of MicroStation GeoGraphics to see that our GIS offering has been designed with what users and the industry requires to expand GIS utilization.

MicroStation GeoGraphics Features Summary:

- Seamlessly integrates CAD/GIS into geoengineering
- Binary interoperability available on multiple platforms
- Optimal application-development environment and tools
- Integrated raster and vector GIS
- Point-and-click interface
- Optional feature-based versus layer-based file management
  - Advanced database management and interface

Open System Architecture

Databases
Oracle
Sybase
Informix
Access
ODBC
SQL Server

Multi-platform
Windows® 95
Windows NT®
DEC Alpha NT
SUN Solaris
HP/UX
SGI

Integrated
MicroStation® GeoCoordinator™
MicroStation® GeoExchange®
MicroStation Image Manager
MicroStation® Descartes™
ModelServer Discovery™

MicroStation GeoGraphics
INTEROPERABLE
MicroStation

Data Formats
DGN
IGES
DXF
DWG
CGM
MGE
TIF
CIT/COT

Tools
MicroStation Development Language (MDL)
MicroStation BASIC
Windows OLE/DDE
User Commands
Visual Basic
Java
C/C++
SQL

MicroStation GeoGraphics allows users to integrate engineering and mapping applications on a single platform that emphasizes workgroup computing, interoperability, and data consistency across multiple hardware platforms and operating systems.

- ODBC and OLE compliance
- Capacity to manage large databases effectively
- Industry-leading price/performance

About Bentley

Bentley Systems, Incorporated is a worldwide leader in aecXML-ready, project-oriented engineering software. The Bentley Continuum℠ is the company's project engineering strategy comprising products, services, and strategic affiliations. The company serves more than 300,000 professionals in building/plant engineering, geoengineering, and manufacturing engineering. With annual revenues of over $175 million, Bentley is the number two software provider in the worldwide architecture, engineering and construction (A/E/C) market, according to Daratech, and is the world's largest software company primarily dedicated to A/E/C.

Bentley's MicroStation® and ModelServer® engineering products are essential to successful projects at over 70 percent of the largest U.S. engineering firms, and the owners of their engineered assets. Bentley is the leader in project engineering, providing engineering information management through its ProjectBank™ technology and ProjectWise® products. Bentley software users create and operate the world's infrastructure, including landmark buildings, roadways, manufacturing facilities, and utility and telecommunications networks. The Bentley SELECT℠ subscription program now reaches more than 200,000 users.

More information about Bentley is available at www.bentley.com.

MicroStation GeoGraphics Technical Specifications

MicroStation GeoGraphics Version 7.0

PC System Requirements
- MicroStation/J
- Intel-compatible PCs running Microsoft Windows NT® or Windows® 95
- 16 MB minimum RAM; 24 MB recommended
- 100 MB hard disk
- Input device: Mouse or tablet
- Supported graphics card (256-color card recommended)
- A host of industry-standard output devices are supported
- DEC Alpha running Windows NT

MicroStation GeoGraphics Version 5.7

PC System Requirements
- MicroStation 95
- Intel-compatible PCs running Microsoft Windows NT or Windows 95
- 16 MB minimum RAM; 24 MB recommended
- 100 MB hard disk
- Input device: Mouse or tablet
- Supported graphics card (256-color card recommended)
- A host of industry-standard output devices are supported
- DEC Alpha running Windows NT

UNIX Workstation System Requirements
- Hewlett Packard 700/800 Series workstations running HP-UX 9.x or 10.x
- Sun SPARC workstations running Solaris 2.4 or later
- SGI Indigo Series workstations (MIPS R4000-/R5000-based) running IRIX 5.3 or later
- Memory: 24 MB minimum; 32 MB recommended
- Hard Disk: 200 MB minimum (typical installation: 60 MB, minimum: 15 MB)
- Input device: Mouse or tablet
- Output device: A host of industry-standard

devices are supported
- Video: X11 (R4 or R5) and dual screen graphics supported

Features

MicroStation GeoGraphics Project
- Category and feature structures
- Map Manager
- Display Manager
- Feature Manager

Project Administration
- Unified project administration interface
- Project Wizard
- Project Export–Import
- Support working directly with MGE projects

Map Management
- Simple way to access individual maps within a project
- Categorical map access
- Key map display
- Spatial map index
- Variety of map selection modes including point, fence, shape, view and all
- Image Manager for image integration

Map Creation Tools
- Topology Clean-up Tools–Duplicate, Similar, Fragments, Gaps, Dangles
- Topology Creation Tools–Shapes, Centroids, Merge Slivers
- GeoDefiner
- Create Zone

Thematic Resymbolization
- Create a wide variety of maps using comprehensive data-driven tools
- Control element resymbolization and area filling and patterning
- Automatic data classification and legend generation
- Annotation tools that create text labels from

database information
- Advanced classification schemes using thematic customization tools
- Manual creation of thematic classifications
- Rainbow display

Database Support
- Oracle
- Microsoft Access (ODBC)
- Sybase
- Informix (RIS)
- SQL Server (ODBC)

Visual SQL Query Manager
- Build customized database queries
- Interactive query definition tool
- Locate associated map features
- Custom database forms
- Dataset query results operations

Topology Analysis
- Query drive topo layer generation
- Polygon-to-polygon overlay
- Point-in-polygon overlay
- Line-in-polygon overlay
- Spatial join
- Zone generation
- Network Topology

Customization
- MicroStation Development Language (MDL) programming environment
- MicroStation BASIC development environment
- Support for OLE Automation
- Java

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For more information about the MicroStation and ModelServer families of EEM products and services, please contact Bentley.

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