Using MicroGDS 11

MicroGDS 11: February 2011

First image on page 2 courtesy of Jeff Radwell, Nigel Azis Ltd, London.

Email: info@microgds.co.uk
Web site: http://www.microgds.co.uk

Contents

Chapter 1

Introduction

About MicroGDS

Welcome to MicroGDS™ 11.

MicroGDS is a powerful, computer-aided design and draughting system that makes it easy to transfer your creative and imaginative ideas into two-dimensional and three-dimensional drawings and models.

MicroGDS is a registered trademark of Informatix Inc.

Informatix offer two MicroGDS products: MicroGDS Collaboration and MicroGDS Entry Level. Both products share a comprehensive set of features for meeting the needs of today's CAD users, including:

- the ability to draw to any scale using real-world measurements
- an extensive set of styles and drawing effects to make your drawings clear and attractive
- easy to use methods for creating and modifying data
- flexible and powerful tools for moving, editing, and deleting objects
- 3D geometry generation from 2D drawings
- the ability to work in multi-user mode so that a number of users can access the same project data simultaneously

- simple and effective techniques for exchanging data with other Windows software
- the ability to read and write data in other formats, including XML, DXF and DWG
- the ability to publish to numerous other formats, including PDF, PNG, and DWF
- extensive customization facilities

You can also use MicroGDS modelling with *Piranesi*™ to produce exhibition-quality drawings. Piranesi is a unique three-dimensional paint package that offers sophisticated painting techniques enabling you to express your ideas using a whole range of artistic effects.

Piranesi is a product of Informatix Inc. You can find the Piranesi homepage at www.piranesi.co.uk

It is recommended that you periodically check the Informatix website for new product information, updates, and free downloads. You can find the MicroGDS homepage at www.microgds.co.uk

MicroGDS Collaboration

MicroGDS Collaboration offers a full complement of features, including the capability to work in a multi-user environment. MicroGDS Collaboration also provides full 3D solid and surface modelling, plus a sophisticated, photo-realistic renderer.

This product is ideal for users who wish to generate high quality visualizations of 3D models, and work in both multi-user and single-user environments.

MicroGDS Entry Level

MicroGDS Entry Level offers similar features to MicroGDS Collaboration, but has a reduced set of 3D functions and rendering capabilities. This product is tailored for users who wish to work in both multi-user and single-user environments, but require only basic visualization capabilities.

The MicroGDS website

The MicroGDS website is your online technical resource centre. You can read the latest MicroGDS reviews, access all the product information, download applications and tools, and access the MicroGDS Gallery and User Forum. Visit the MicroGDS Gallery to view a range of example images created using MicroGDS. The User Forum lets you get in touch with other MicroGDS users around the world. Use it to share your thoughts, ask questions, provide answers, share images, and exchange tips and techniques. You can find the official MicroGDS website at www.microgds.co.uk

You can also access the website directly from MicroGDS by clicking MicroGDS Homepage on the MicroGDS Help menu.

It is recommended that you periodically check the MicroGDS website for new product information, updates, and free downloads.

Checking for updates

The MicroGDS version number is shown on the MicroGDS title bar. You can check the MicroGDS website online to see if there are updates to your copy of MicroGDS.

When an update or new version becomes available on the website, you can choose to download and install it.

To check for updates, click Check for Updates on the MicroGDS Help menu, then follow the instructions on the screen.

About this guide

This user guide presents selected concepts and procedures to enable you to begin working with MicroGDS. The guide includes information about creating and placing graphics, working with styles, working with other file formats, and customizing MicroGDS.

It also contains information on working in a multi-user environment and the advanced solid and rendering features in MicroGDS Collaboration.

Organization of this guide

The guide is arranged in two parts:

- Part One: Working with MicroGDS 11

  Explains the concepts and features that are applicable to both MicroGDS products. It also describes how to work in a multi-user environment.

- Part Two: Advanced 3D and rendering

  Describes the advanced solid and rendering features available in MicroGDS Collaboration.

Resources for learning MicroGDS

Informatix provides documentation and services for learning how to use MicroGDS and for solving problems.

MicroGDS documentation

The MicroGDS documentation consists of a user guide and a comprehensive online Help system. The user guide is provided in PDF format.

- What's new in MicroGDS 11

  This document provides information on new and enhanced features in MicroGDS 11. The document is provided in PDF format which you can find on the MicroGDS website at www.microgds.co.uk

- Using MicroGDS

  The user guide describes the fundamental concepts and how to use the features in MicroGDS.

  For full details of all the commands available in MicroGDS, refer to the online Help.

- MicroGDS Help

  MicroGDS provides extensive online Help. Details of every command and dialog box are included, along with procedures for completing each task.

Accessing online Help

To access the MicroGDS online Help system and use the full facilities of Microsoft HTML Help, Microsoft Internet Explorer must be installed on your computer.

▶ To use the online Help system

1 On the MicroGDS Help menu, click Help Topics.

  The main Help window is displayed, showing the topic *Overview of MicroGDS*.

2 Click the Contents, Index, Search, or Favorites tab to choose how you would like to navigate to the required help topic.

3 To display help on a topic, double-click the topic name.

▶ To display context-sensitive help

1 Press Shift+F1, or on the MicroGDS Help menu, click What’s This?

  A question mark is attached to the mouse pointer.

2 Click the command or toolbar button you want help on.

▶ To display help on the current command

- press F1, or click the Help button on a dialog box

Training courses

Informatix provides training courses that are designed to teach you how to plan and draw in MicroGDS. The courses are structured to cover basic foundation training, 3D, and advanced use. Please contact Informatix for more information.

Part One

Working with MicroGDS 11

Chapter 2

Exploring MicroGDS

Starting MicroGDS

▶ **To start MicroGDS**

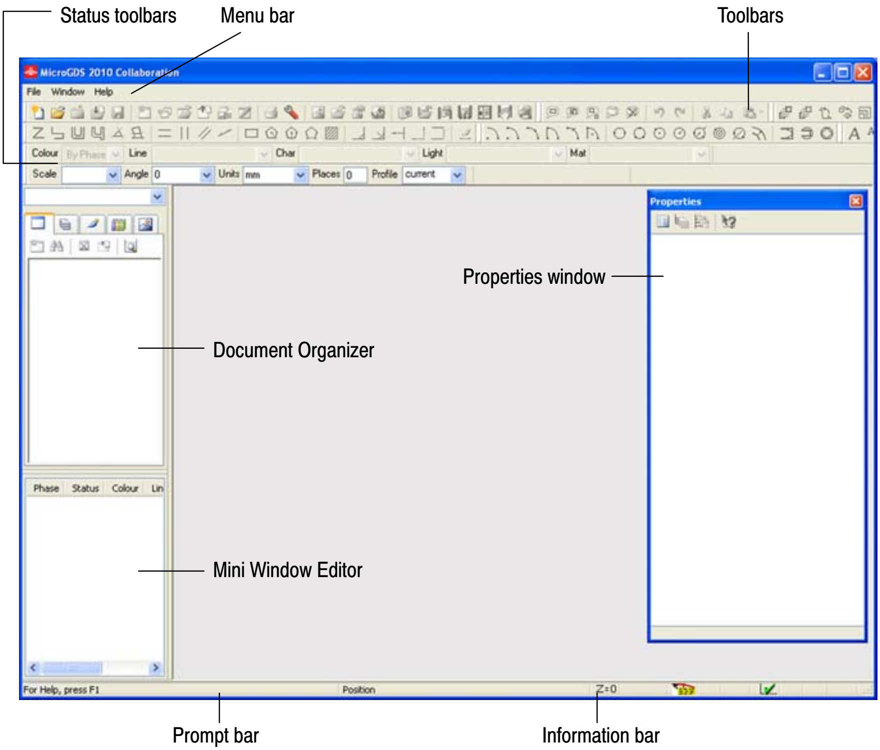
1 On the taskbar, click the Start button and point to Programs.

2 Point to the folder that contains MicroGDS, then click MicroGDS.

You can also start MicroGDS by double-clicking a MicroGDS desktop shortcut, or double-clicking one of the following MicroGDS file types:

- .MAN single-user document
- .MTF single-user template
- .STY style file
- .CV7 font file
- .CPJ multi-user project

The MicroGDS window



The layout of your window may be shown differently to the illustration, depending on the MicroGDS product and version you are using.

Not all menus and toolbar buttons are available until you create or open a document.

When you first use MicroGDS, the MicroGDS window displays:

- a menu bar
- a number of system toolbars
- the two status toolbars
- Document Organizer
- Mini Window Editor
- Properties window
- prompt bar
- information bar

You can switch toolbars and windows on and off using commands on the Window menu. The menu bar, prompt bar, and information bar are always displayed.

Profiles

As you work with MicroGDS, you will set up the MicroGDS window to best suit you. You can move windows around, dock and resize windows, customize toolbars and menus and so on. MicroGDS remembers all these settings and stores them in a *profile*. This means that when you next use MicroGDS, the layout will be exactly as you left it. By default, you use the ‘current’ profile. However, you can create additional profiles and choose which one to use from a list. For example, you might set up your toolbars to suit specific work environments, such as having separate 2D drawing and 3D design profiles and then switch between them.

When you exit MicroGDS, the window layout is always saved to the current profile. You can also save the layout to the loaded profile or to a new profile using the Profile commands available from the Window menu.

For more details about saving and loading profiles, see Chapter 17, *Customizing MicroGDS*.

Docking and resizing windows

In the illustration the Properties window is *undocked*, but the other items are *docked*. Docked items are placed in a side bar, at the top, bottom, left, or right of the window. To dock a window or toolbar, drag it to any side of the MicroGDS window, or double-click its border or title bar. To undock an item, drag it away from the side bar or double-click its border.

To move a window or toolbar to one side of the MicroGDS window without docking it, press Ctrl when you drag.

When any resizable windows, such as the Document Organizer or Mini Window Editor, are docked to the side of the MicroGDS window, a split bar appears which you can use to resize the docking area. In addition, when two of these windows are docked one above the other, a split bar appears which you can use to resize the windows.

The window positions and sizes are saved in the current profile.

Menu bar

At the top of the window is a standard Windows menu bar. The menu bar provides commands to create and edit documents in MicroGDS.

A number of right-click shortcut menus are also available with MicroGDS. Shortcut menus provide commands that apply specifically to the area in which you are working.

You can change a current key assignment or assign a new shortcut key to any MicroGDS menu command. For details, see Chapter 17, *Customizing MicroGDS*.

Toolbars

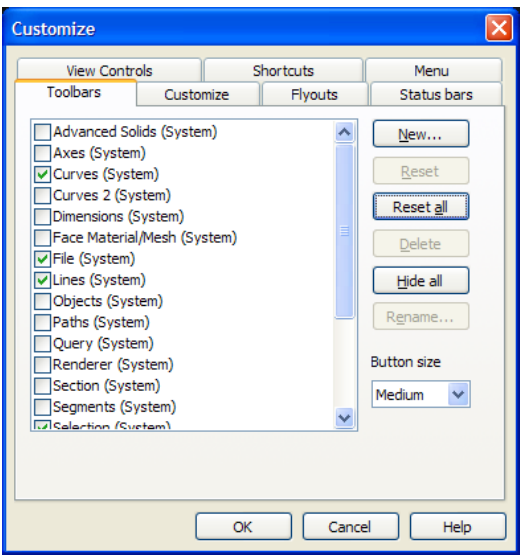
Toolbars contain buttons that give you quick access to menu commands and features.

You can use the status toolbars to change the settings for the current session and the selected graphics.

▶ To show and hide toolbars

1 Press Ctrl+T, or on the Window menu, click Profile, Customize.

The Customize dialog box is displayed:



The Toolbars tab is the first tab on the dialog box and so is automatically displayed.

2 For each toolbar that you want to show, select the corresponding check box. For each toolbar that you want to hide, clear the check box.

By default, toolbars are displayed horizontally. You can move the toolbars to different positions on your screen and you can change their orientation. Toolbars are saved in the current profile.

▶ To move a toolbar

- drag the toolbar by its gripper bar or by its border:

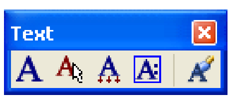
gripper bar

▶ To change the orientation of a toolbar

- press Shift when you drag the toolbar

Note that you cannot change the orientation of a status toolbar.

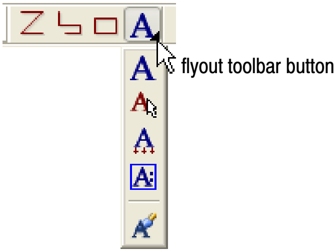
When you drag a toolbar away from the toolbar area or change its orientation, it is undocked and its title bar is shown. For example:



If you dock a toolbar to one side of the MicroGDS window, its orientation automatically changes to vertical or horizontal, as appropriate.

You can customize toolbars by adding or removing items. You can also create new toolbars and change the size of the buttons. In addition, you can create *flyout* toolbars that enable you to access all the commands on a toolbar, from a single button.

Flyout toolbars show a small triangle on the bottom right of the button, for example:



To select the command that the flyout button represents, click the button. To select a different command, press the mouse button on the flyout toolbar button, then drag to the appropriate command. The selected command becomes the flyout button on the toolbar.

Flyout toolbars provide a useful way of making many commands available, without using too much screen space. For details on how to create flyout toolbars, see Chapter 17, *Customizing MicroGDS*.

Status toolbars

The two status toolbars show information about the active window and about any currently selected graphics.

The default information displayed on Status bar 1 is:

Colour	the current colour; the default is ByPhase
Line	the current linestyle; the default is DEFAULT
Char	the current charstyle; the default is DEFAULT
Light	the current lightstyle; the default is NONE
Mat	the current material; the default is DEFAULT
File name	the path of the current document if the document has been saved, otherwise this is Document*n*

Justification	the justification buttons used for text; the default is left justification
x y z	the pressed buttons fix the corresponding coordinates The *x*, *y*, and *z* buttons are described in Chapter 5, *Entering positions*.

The default information displayed on Status bar 2 is:

Scale	the scale at which you are currently working; the default is 1:1
Angle	the set axes angle; the default is 0
Units	the units of measurement in which you are working; the default is millimetres (mm)
Places	the number of decimals places displayed; the default is 0
Profile	the name of the profile in use; the default is current
Layer	the name of the current layer
Object, instance, or assembly	the name of the current object, instance, or assembly
Selected graphics	the total number of selected graphics: objects or primitives

The appropriate settings shown on the status toolbars are used when you next create new graphics.

When you select graphics, the appropriate settings on the status toolbars are updated to reflect the properties of the selected graphics. For example, if you select a line primitive, the linestyle assigned to the primitive is displayed in the Line box.

If the selected graphics are all different, their status is not displayed and the appropriate box is blank. For example, if you select several line primitives which have different linestyles, the Line box is blank. When you deselect the graphics, the status returns to the previous value.

A box is also blank if its information is not appropriate. For example, if you select a line primitive, the Char box is blank since a line does not have a charstyle.

You can change a characteristic of the selected graphics by choosing the required value from the appropriate list, or in some cases, by typing the required value.

You can add and remove status toolbar items, but you cannot create flyout status toolbars with their contents. See Chapter 17, *Customizing MicroGDS* for details about customizing your toolbars.

Document Organizer

The Document Organizer provides a central point from where you can work with the data in your documents. It displays a series of tabs, each providing access to a specific type of data. For example, you can open and rename window definitions (and views) from the Window Definitions tab, and create and modify styles from the Styles tab.

The Document Organizer provides shortcuts to the equivalent menu commands. Although you can use the menus and toolbars for most operations in MicroGDS, it is expected that you will use the Document Organizer for all your document management tasks.

More details are given in *Using the Document Organizer* on page 29.

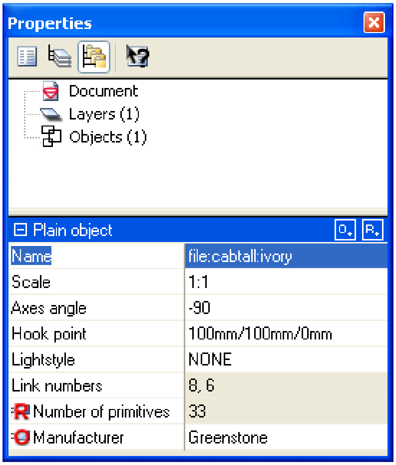
Mini Window Editor

The Mini Window Editor enables you to work with phases in the active window definition. The Mini Window Editor is a cut-down version of the full Window Editor, providing quick access to some of the frequently-used phase commands. You can, for example, use the Mini Window Editor to create a new layer or change the colour in which graphics in a phase are displayed.

The window editors are described in Chapter 4, *Using layers and phases*.

The Properties window

A particularly useful facility in MicroGDS is the Properties window. You can use the Properties window to view extensive details about the graphics currently selected. For example:



You can use the Properties window, for example, to see the colour and linestyle of a line primitive, the name of the object in which the primitive is stored, and the layer on which the object resides. You can also change the value of any editable property (properties that are read-only are shown shaded in the window).

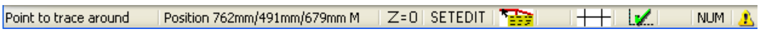
The buttons at the top of the window enable you view the information in different ways. You can also switch to *query* mode to view low-level primitive details, such as the radius of an arc, the length of a line, and the area of a circle.

The Properties window provides a central location from which to change the properties of your drawing elements. Although you can use the menu and toolbar equivalents to view and change the properties of the selection, it is expected that you will work with the Properties window active.

For more details, see Chapter 13, *Getting information*.

Hints, prompts, status, and positions

Many commands require you to enter positions. To help you, MicroGDS displays hints, prompts, the status of specific items, and coordinate positions at the bottom of the MicroGDS window. For example:



Information is shown from left-to-right about:

- the current command

  Shows a summary of the command under the mouse pointer or the action required to complete the next step in the command.

- the pointer position

  Shows the current pointer position—in the current units and decimal places—together with the nearest snapcode. This information is dynamically updated as you move the mouse pointer across a drawing. You can set your preferences to show only the last hit position if you prefer. For details about setting preferences, see page 22. For information about each individual preference, refer to Help.

- the status of the Z=0 facility

  The Z=0 button enables you to force graphics to be drawn on the XY plane. For details about using the Z=0 facility, refer to Help.

- the status of the SETEDIT facility

  The SETEDIT button enables you to set editing restrictions to temporarily exclude graphics from being edited. For more details, see Chapter 3, *Working with primitives and objects*.

- the status of hover highlighting

  The Hover Highlight button provides feedback about the graphics directly beneath the mouse pointer. Details are given in Chapter 3, *Working with primitives and objects*.

- an animation when drawing is in progress
- the status of the grid

  A grid can assist you when you are drawing and placing graphics. When a grid is defined, you can switch it on and off using the Grid button.

  More details about the grid are given in Chapter 5, *Entering positions*.

- the status of dynamic snap guides

  The Snap Guides button enables you to display dynamic snap guides when constructing or editing graphics. Details are given in Chapter 5, *Entering positions*.
- CAP if Caps Lock is on
- NUM if Num Lock is on
- whether there are any problems associated with an open document

  If there are problems associated with any open document, an exclamation mark on a yellow background is shown. You can use the exclamation mark button to display a Problems dialog box which you use to view and correct errors in open documents.

  More details about warnings and errors are given in the later section *Opening a document* on page 35 and also in relevant sections throughout the guide.

The prompt bar

For some MicroGDS commands, MicroGDS displays a prompt bar at the bottom-left of the window. The prompt bar is displayed, for example for you to enter the radius for a circle:

Whenever you are required to specify a position, you can display the prompt bar by typing coordinates instead of clicking in the window. The prompt bar appears as soon as you start typing.

By default, the prompt bar is fixed at the bottom of the MicroGDS window. You can choose to have a floating prompt bar which you can move to a convenient position on your screen.

▶ To float the prompt bar

1 On the File menu, click Preferences.

2 On the General tab, select the Floating prompt bar check box.

Using commands

In MicroGDS, you use commands to draw, view, and modify graphics. There are a number of ways you can access commands:

- you can access all commands from the menus

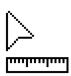
  Note that some commands are available only from the Document Organizer.
- you can access many commonly-used commands using the toolbars
- you can access some commands using buttons on the information bar
- you can access some commands using shortcut keys

  You can change the default shortcut assignments, and add or remove a shortcut for any MicroGDS command. For details, see Chapter 17, *Customizing MicroGDS*.

For example, to display the Window Editor, you can press F2, or on the File menu, click Window, Edit, or on the File toolbar, click the Window Editor button.

Command feedback

When you select a command, you often see a graphical representation of that command attached to the mouse pointer. For example, if you are measuring the distance between two points in a window, the following is shown:



For other commands, MicroGDS may require information from you. For example, when you construct a polygon, you are prompted to enter the number of sides.

Sometimes, you might need to *undo* a position during a command. For example, if you are drawing a series of lines and you make a mistake when specifying one of the points, you can undo the position. To undo a position, press Backspace.

When you use a command, it either:

- remains active ready for you to use again
- or ends automatically once you have completed the task

Where a command remains active, you can often change the command parameters before re-using the command. For example, if you construct an arc which has an angle of 45° and you now want to draw a second arc which has an angle of 90°, you can press Enter to redisplay the prompt bar and specify the new angle.

Note that some commands can be used while using another command. For example, you can start the Line command and begin drawing a line, use the Zoom Rectangle command to zoom to another area, and when the zoom completes you are back to the Line command.

To end an active command when you have finished, press Esc.

Repeating commands

For many commands, you can repeat the last command. For example, if you use Construct, Text to create and place a text primitive, you can use the repeat command facility to immediately create another text primitive.

▶ To repeat the last command

- press Enter

Undoing and redoing commands

You can undo commands that created, deleted, or modified graphics. MicroGDS undoes the most-recent first and works back. Similarly, you can reverse an undo.

▶ To undo a command

- press Ctrl+Z, or on the Edit menu, click Undo

▶ To redo a command

- press Ctrl+Y, or on the Edit menu, click Redo

You can undo and redo up to the undo buffer size set in your preferences. Note that you cannot undo commands you made before saving a document.

Setting preferences

You can customize MicroGDS by setting up a number of personal preferences. Initially, all preferences are preset to the default MicroGDS settings. You can modify settings using either the Preferences dialog box or the Preference Files Editor. The Preferences dialog box gives access only to your personal settings whereas the Preference Files Editor may let you modify settings at other levels. For example, you may be able to modify settings for all MicroGDS documents contained in a specified folder (if you have the relevant access permissions to the folder).

Note that any change to your personal settings is reflected in both editors.

All settings are saved to xml files, stored in the appropriate locations. You can see the location of a settings file in the Preference Files Editor. For more details about the Preference Files Editor, see Chapter 17, *Customizing MicroGDS*.

▶ To set your preferences

- on the File menu, click Preferences

You may find that not all your personal preferences are available to you. This is because a preference may be set as a *policy* a higher level. Where a policy is in place, it cannot be overridden at any lower level.

Changes to your preferences are saved only in memory. To save changes permanently, save your settings when you exit MicroGDS or save the settings file using the Preference Files Editor. Note that if you have any unsaved modified settings when you exit MicroGDS, you will be prompted to save the changes.

The preferences that you can set up are described in the relevant sections throughout this guide, and in the Help. Refer also to Chapter 17, *Customizing MicroGDS*.

MicroGDS documents

MicroGDS drawings are stored in documents. A document encompasses all the data for a drawing, that is, document windows, layers, graphics, and so on.

In MicroGDS, you can work in *single-user mode* or in multi-user projects. In single-user mode, each time you open or start a new document, a new window is opened in which you can store the graphics and related information (such as primitives, objects, and layers). Single-user documents are stored in .MAN files.

In a multi-user project, the graphical data is stored in separate files enabling several users to work on the data. For details, see Chapter 16, *Multi-user projects*.

In MicroGDS, graphical data is stored on a series of *layers*. Each layer can be considered as a transparent overlay. You can use layers to group related graphics together. If you do not create any layers, all the graphical data is held on a single default layer. The default layer, and any layers that you create, are automatically allocated a *phase*. A phase is a view onto the layer data, and enables you to choose the graphics that are to be included, the colour in which they are displayed, and the order in which they are to be printed. For more details, see Chapter 4, *Using layers and phases*.

To access the layer data in a document, you use a *window definition*. This provides a view onto the graphical data. In a single-user document, the first window created in a document is initially the *principal window*. This is the window that opens whenever you open the document. You can create as many window definitions as you require, and set any other window to be the principal window. Each window definition defines which layers are to be referenced in the view, which graphics are editable, visible, invisible, and hittable, the view extents, and the projection.

Every window definition has at least one *view* associated with it. One of these views is designated the default view for the window. Whenever you create a new window definition, a default view (named View1) is also created. You can create as many views onto a window definition as you require and, similar to a window definition, set any other view to be the default view of the window.

For more details, see *Working with window definitions* on page 38 and *Working with multiple views* on page 53.

Most graphics in a MicroGDS document have a *style* assigned. A style defines the appearance of a graphic. For example, a line primitive has a *linestyle* and a text primitives has a *charstyle*. Some graphics, such as inserted raster images, do not have a style assigned. Styles that you create in a document are saved in the MAN file. However, you can also share standard or common styles by using *style files*. For details about style files, see page 25.

You can also use graphics from other files in your documents. For example, you can insert a raster image from a raster file or link an object from another single-user document. In MicroGDS, you can set up *aliases* to reference the physical locations of files that you want to use in a document. For more details about aliases, see page 27.

Templates

A template is a document with custom-designed properties and content which you can use to create other documents. A template can contain anything that can be stored in a MAN file, such as graphics, styles, and window definitions. For example, you might create a template to define a drawing frame or one that includes a company's logo. Templates are simply single-user documents that you save with the extension .MTF. MicroGDS provides ready-made templates (a0.MTF through to a4.MTF) that you can use.

You may also find it useful to set up a template to reference style files (described next), or aliases which reference additional files that you can access.

When you base a new file on a template, the template's content is copied to the new document. Templates are used only when you create a new file; if the template is subsequently updated, existing documents based on the template are not updated.

If you want to make changes to a template (a .MTF file), you must open the file using the Open command on the MicroGDS File menu, or drag the template file into the MicroGDS window. If you double-click the file in Windows Explorer, a new document based on the template will be created.

If you often want the same graphics and styles to be available in new documents, you can set a default template to be used for all new, blank files.

You specify the location of your templates on the File Locations tab in your preferences. Then, when you choose to use a template, MicroGDS lists any templates that exist in the specified location. For details about setting your preferences, see Chapter 17, *Customizing MicroGDS*.

For more details about creating and using templates, refer to Help.

Style files

Documents can share styles by using style files. You can create and access the following types of style file:

Style file name	Style type
LINES.STY	linestyle
CHARS.STY	charstyle
LIGHTS.STY	lightstyle
MATLS.STY	material
ATTRS.STY	mnemonic definition
SCHEMAS.STY	schema definition

Only style definitions are saved in a style file. If you create graphics to help you define the styles, they are discarded when you save and close the style file.

For single-user documents, you can access style files by specifying their location on the *style search path*. For more details, see the following section *Styles and single-user documents*.

For multi-user projects, the location of style files is set in the project database. For more details, see *Styles and multi-user projects* on page 27.

You can also access any style files that exist in the location for styles and fonts, defined in your file location preferences. Any style files that exist in the specified location are made available to all your documents (single-user documents and projects). Note that although the style files in this location are made available, it is the location in which any are installed with MicroGDS. If you wish to place your own style files in this location, first ensure that a style file of its type does not already exist. If you do store files in this location, be sure to move them before your MicroGDS installation is updated or repaired, otherwise they may be lost.

▶ To specify style files in your file location preferences

1. On the File menu, click Preferences.
2. Click the File Locations tab.
3. In the Styles & Fonts box, specify the location in which global style files (and MicroGDS font files) are located.

   By default, the location is set to the Fonts folder in your MicroGDS installation directory.

   Note that your CAD manager can set policies to restrict any of your preference settings. If the Styles & Fonts box is greyed out, this indicates that a policy is in place and you cannot change the set location.

   Any changes to your preferences are saved only in memory. To save changes permanently, save your settings when you exit MicroGDS.

Styles and single-user documents

When you create or modify a style in a single-user document, the style is saved in the MAN file. These styles are called *local* styles. However, you can also access styles in external style files. To do this, you specify the folder in which the STY files are located on the style search path.

▶ To set the locations of style files on the style search path

1. On the File menu, click Style Search Path.
2. In the Edit Search Path dialog box, define the locations of the styles files (.STY) that are to be referenced by the current document.

   The order in which the search paths are listed is important because if a style name of the same type appears in more than one style file, MicroGDS uses the first style that it finds.

If changes are later made to any of the styles in a style file, those changes are reflected in all documents that reference the file.

If you modify a style from a style file, it becomes a local style in the current document and is saved in the MAN file. Styles saved in a document take precedence over styles of the same name in a style file.

For more details about creating and using style files, refer to Help.

Styles and multi-user projects

In multi-user projects, all styles are stored in external style files which are defined in the project database.

If you modify a style from a style file, it becomes a local style and is saved in the first location on the project's style search path. For details about creating multi-user projects, see Chapter 16, *Multi-user projects*.

Aliases

An alias is a name given to a folder so that the path to that folder does not have to be specified in full. This is similar to using Windows shortcuts. Mapping a location to an alias is useful when files are moved in the filing system.

In a single-user document, aliases can be used to reference the locations of:

- object libraries

  Object libraries are MicroGDS MAN files that contain objects you can insert or link to the current document. For details about objects, see Chapter 3, *Working with primitives and objects*.
- raster images

  Raster images are image files that you can insert into the current document. For details about raster files, see Chapter 15, *Working with different file formats*.
- reference documents

  Reference documents are MicroGDS documents that contain window definitions that can be used in *photos* in the current document. For details about photos, see Chapter 3, *Working with primitives and objects*.
- renderer files

  Renderer files can be used by materials, lights, and rendering environments in MicroGDS Collaboration. For details about rendering, see Part Two: *Advanced 3D and rendering*.

Aliases are defined using the Aliases command on the File menu and are stored in the current document.

Aliases are also used to define the locations for layer and window definition files, and are set up in the project database. For details, see Chapter 16, *Multi-user projects*.

▶ To set up aliases (in a single-user document)

1 On the File menu, click Aliases.

2 In the Aliases dialog box, define the alias definitions for the current document:

- to add a new alias, click Add
- to change an existing alias, click Edit
- to remove an alias, click Remove

When you add or change an alias, the Alias Editor is displayed.

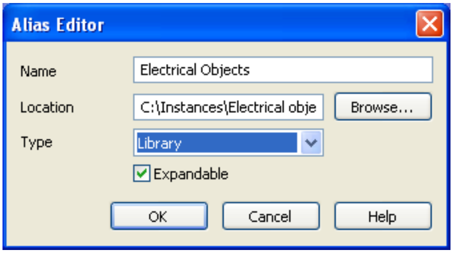
3 In the Name box, type the alias name you want to use.

4 In the Location box, specify the physical location to which the alias refers.

Note that if you map an alias to a network drive, the assignments will only work for all users who use the same standardised mapping of drive letters to disks. If you do not use a standardised network mapping system, you should specify the full network pathname when you set up alias names.

5 From the Type list, select the alias type you require.

For example:



6 To allow an alias name to be expanded which will give access to any subfolders below, select the Expandable check box.

7 Click OK to close the Alias Editor, and again to close the Aliases dialog box.

When you have set up aliases for object libraries and raster images, you can access the data from the Document Organizer (described next).

You can view the contents of raster and library alias locations in Windows Explorer by right-clicking over the folder and clicking 'Explore folder' on the shortcut menu.

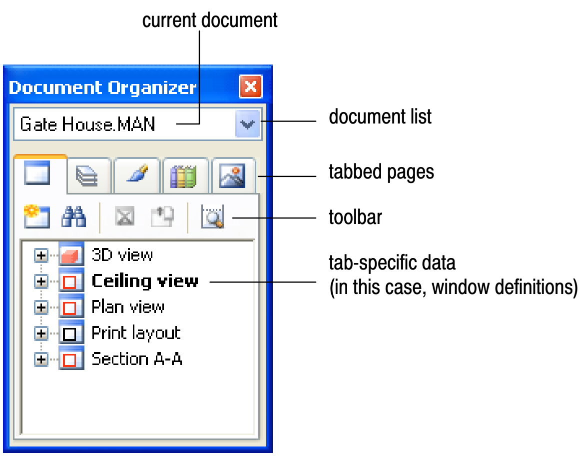
More details about setting up and using aliases are given in Help.

Using the Document Organizer

Use the Document Organizer to work with the data relating to documents that you have open. For example, you can open and rename window definitions in a document, create and modify styles, and copy and rename layers. The Document Organizer also provides access to files in any aliased file locations.

▶ To open and close the Document Organizer

- press F4, or on the Window menu, click Document Organizer



When you open a document, it becomes the *current document* in the Document Organizer and its name is displayed in the document list.

If you open more than one document, you can switch between them using the document list. This enables you to view, share, and work with data in any number of documents.

The first time you open the Document Organizer in the current session, the Window Definitions tab is displayed. This shows a list of the window definitions in the document. In a single-user document, the name of the principal window is shown in bold. (This is the window that MicroGDS opens each time you open the document.)

In a multi-user project, the name of the default window alias is shown in bold. This is the default location in which new window definitions in the project are saved. For details, see Chapter 16, *Multi-user projects*.

The Document Organizer has five tabs. Each tab provides a toolbar and a shortcut menu for commands specific to the type of data:

- the Window Definitions tab

  Includes commands to work with window definitions and saved views. For example, you can open, rename, find, and export window definitions and show, copy, rename, and delete views. For details, see *Working with window definitions* on page 38 and *Working with multiple views* on page 53.
- the Layers tab

  Includes commands to copy, rename, find, and export layers. For details, see Chapter 4, *Using layers and phases*.
- the Styles tab

  Includes commands to create, modify, and change styles. For details, see the individual styles chapters (Chapters 7 and 8, and Chapters 10 and 11).
- the Library Files tab

  Includes commands to preview and insert objects from aliased MAN file libraries. For details about objects, see Chapter 3, *Working with primitives and objects*.
- the Raster Files tab

  Includes commands to preview and insert raster images from aliased raster files. For details about raster images, see Chapter 15, *Working with different file formats*.

The Window Definitions and Layers tabs list the windows and layers currently available in the document, in alphabetical order.

The Styles tab shows the style categories; there is one category for each style. When you open a style category, a list of locations in which style files exist is displayed. The first location is the current MAN file; all new styles are saved in the MAN file. The path for each location defined in the style search path is then displayed. At the end of the list, the path set for styles and fonts (in your file location preferences) is shown, provided that a style file for the displayed category exists. Setting up the style search path is described on page 25.

If you have set up aliases for object libraries and raster files, the Library Files tab and the Raster Files tab list each aliased location.

To display the items available in a style category, or from a library or raster alias, you must open it.

▶ **To open a style category or alias location**

- double-click the name, or click the plus sign (+) to its left

Whenever a list of items is displayed in the Document Organizer, you can preview an item.

▶ **To preview an item in the Document Organizer**

1 Click the appropriate tab.

2 Select an item.

3 Click , or on the shortcut menu, click Toggle Preview.

To close the preview area, select the command again.

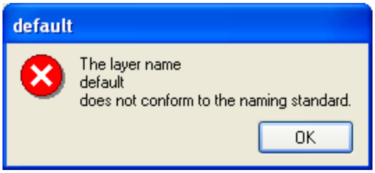
Remember that you can also view the contents of raster and library alias locations by right-clicking over the alias folder and clicking ‘Explore folder’ on the shortcut menu.

The facilities available from the Document Organizer are described in the relevant sections in this guide. For more details, refer to Help.

Using name assistants

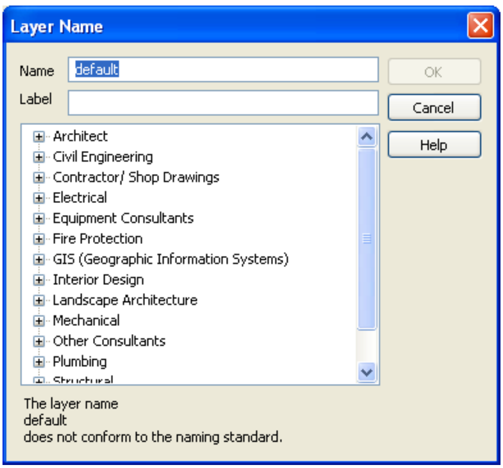
Your system administrator may set up special naming standards for layers and objects at your site, using *name assistant*s. Name assistants define the naming standards for layers and objects and can be set up to suggest or enforce the names.

If you begin to draw immediately, MicroGDS usually creates an object and a layer using the default names. However, if the name assistants are in force, and the default object and layer names do not conform to the naming standards, the following message appears:



MicroGDS then opens the Layer Name or New Object dialog box as appropriate, for you to specify a name that conforms to the naming standards. The dialog box shows a tree-like structure of naming conventions.

For example:

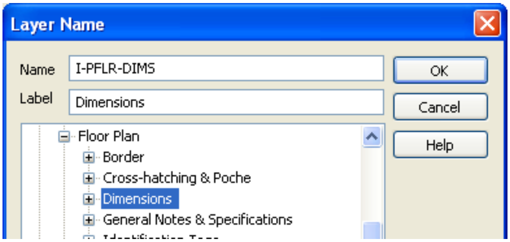


Note that when you create a layer in a multi-user project, an additional box is displayed at the bottom of the Layer Name dialog box. For details, see Chapter 16, *Multi-user projects*.

If you are using name assistants and the tree structure is not shown, either the appropriate configuration file has not been set up or the name of the layer on which you are creating the new object does not conform to the naming standards.

To expand a name category, double-click the name. Each time you select a name, MicroGDS adds a component to the displayed name in the Name box.

For example:



The listed descriptions and the corresponding layer names are defined in the configuration file.

You specify the names and locations of the configuration files and their applicability on the Name Assistants tab in your preferences. Details on how a system administrator can set up the name assistants is given in Chapter 17, *Customizing MicroGDS*.

Working with documents

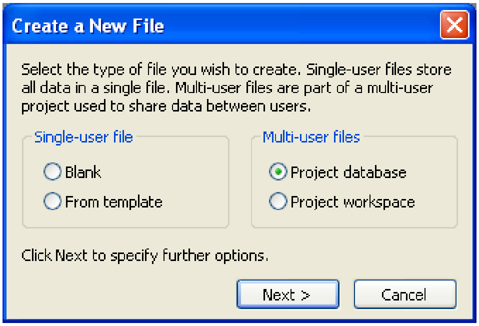
This section describes how to create, open, save, and close a single-user document.

For details about how to work with multi-user project files, see Chapter 16, *Multi-user projects*.

Creating a new document

▶ To create a new document

1 On the File menu, click New.
MicroGDS displays the Create a New File dialog box:



2 Do one of the following:

- to create a new blank document, or a document based on a default template, select Blank and click OK
- to create a document based on a template, select From template, then click Next

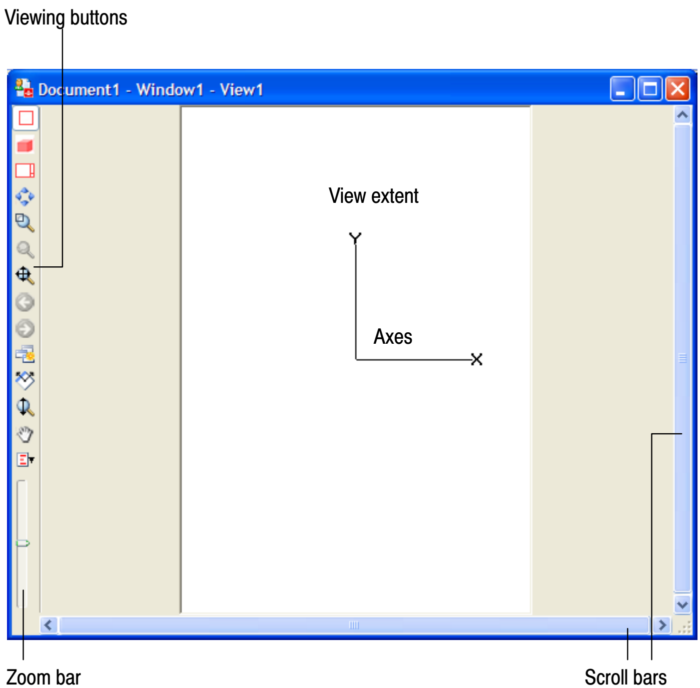
  Use the displayed dialog box to locate the template (a .MTF file), and click Open.

  The initial location that MicroGDS should look for template files can be set in your File Locations preferences.

You can also create a new document based on a template by double-clicking a template file in Windows Explorer. (Do not drag a template file into the MicroGDS window unless you want to open the template file.)

A new window opens in the MicroGDS window. Each new window is numbered sequentially from 1 within the current document (and in the current session).

For example:



The window items are described in *Working with windows* on page 41.

When you create a single-user document, MicroGDS creates a window definition (the principal window) and a default view onto the window. The principal window opens and the default view is shown each time you open the document. You can create additional window definitions and saved views as required. For details, see *Working with window definitions* on page 38 and *Working with multiple views* on page 53.

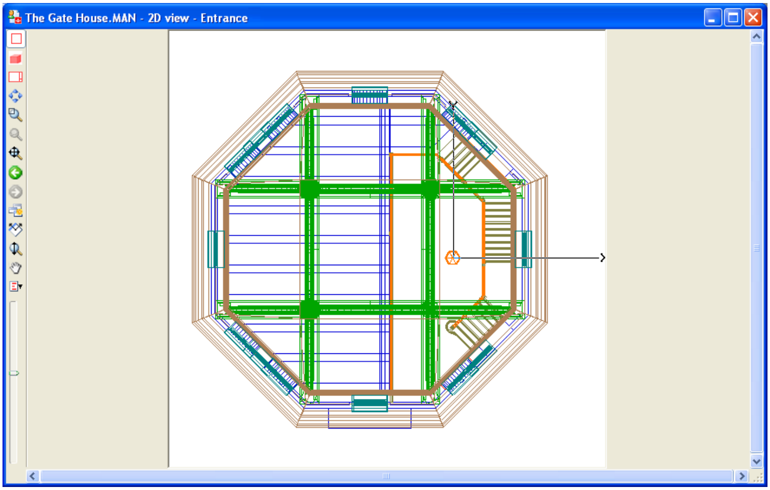
Opening a document

To open a document

- on the File menu, click Open, and select the document to open
- or, double-click the .MAN file in Windows Explorer
- or, drag the .MAN file from Windows Explorer into the MicroGDS window

When the document has loaded, the default view in the principal window definition opens.

For example:



You can open other MicroGDS documents, such as style files, in the same way.

You can also open files of other formats, for example, DXF files. For details, see Chapter 15, *Working with different file formats*.

By default, if MicroGDS detects any errors with the document, a Problems dialog box opens giving details about the error. For example, an error might indicate that the document contains a link to another document or file for which MicroGDS cannot find the source or that fonts used in the document are not installed on the current machine. The Problems dialog box provides facilities to view and correct the detected errors. More details are given in the section relevant to the type of data to which a problem has been found.

Whenever there are unsolved problems in an open document, a yellow warning triangle is shown on the information bar. You can double-click the button to open the Problems dialog box.

Lock files and backup files

When you open a .MAN file, MicroGDS creates a parallel lock file in the filing system. The lock file has the extension .MA#. Lock files ensure that only one person can edit the document at one time. The lock file is removed when the document is closed enabling another person to open it for editing. While a document is locked, other users can open the document as read-only.

If you have the Backup option set, on the General tab of your preferences, and you have made changes to the document since it was last saved, MicroGDS creates a backup file with the extension .MA$. When the document is next saved, the backup file is removed.

If a document is not closed correctly, for example, if MicroGDS stops responding, the lock file and the backup file (if it exists) remain in the filing system. When you next open the document, MicroGDS prompts you to first unlock the file. If you unlock the file and a backup file exists that is more recent than the file at the time it was closed, MicroGDS displays a second message prompting you to save the file.

If you close the backup file and then open the original file, you cannot re-open the backup file.

Template files and style files are locked and backed up in the same way.

If the Backup option is not set, a backup file does not exist and any unsaved changes to a file are lost.

Saving a document

As you work on a document, you can save the document using either the same name, or a different name.

▶ To save your document

- press Ctrl+S, or on the File menu, click Save MAN File

  This command reflects the type of document you are saving. For example, if you are saving a STY file, the command shows Save STY File.

  If you have not yet saved the document, a Windows Save As dialog box is displayed. In the Save As dialog box:

  a) ensure that the Save as type box shows MicroGDS File (*.MAN)

  b) specify the name and location for the document

     If you do not include the .MAN extension, MicroGDS adds it automatically.

  c) Click Save.

To save a document to another MicroGDS format, select the appropriate file type in the Save as type box. You can also export window definitions to other formats, for example, DXF. For details, see Chapter 15, *Working with different file formats*.

Closing a document

▶ To close your document

- on the File menu, click Close MAN File

  This command reflects the type of document you are closing. For example, if you are closing a STY file, the command shows Close STY File.

If the document has not yet been saved, you are prompted to save or discard it. If you choose to save the document, MicroGDS displays a Windows Save As dialog box. Save the document as described in the previous section.

If the document has unsaved changes, you are prompted to save or discard them.

Working with window definitions

Each window definition you open or create is opened in a new window. You can store multiple window definitions in a single document. This enables you to work with different parts of a document, and also share data throughout a document.

For each window definition that you create, MicroGDS also creates an initial, default view. You can create additional views and move easily from one to another. For more details, see *Working with multiple views* on page 53.

This section describes some of the basic, window definition tasks. For full details, refer to the appropriate chapters in this guide and also refer to Help.

Creating window definitions

▶ To create a window definition

1 On the Document Organizer, click the Window Definitions tab:

Window Definitions tab

2 Click the New Window toolbar button 

Alternatively, use the Window, New command on the File menu.

The window definition opens in a new window. The window title shows Window*n* – View*n*, where:

- Window*n* is the next sequential window definition number within the current document
- View*n* is the next sequential view number within for the current window definition

If you do not change the names, MicroGDS stores the window definition and view with the generated names when you save the document. Details about renaming window definitions and views are given later.

When you create a window definition in a multi-user project, you must save the window to a file. For details, see Chapter 16, *Multi-user projects*.

Opening window definitions

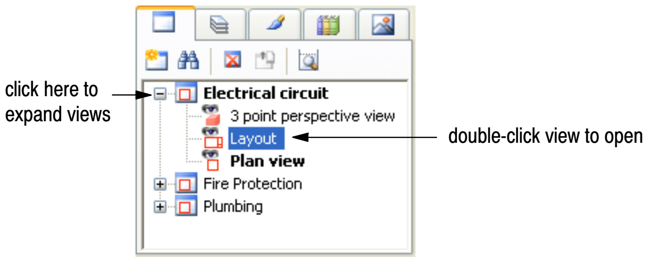
▶ To open a window definition

- in the Document Organizer, double-click the name of the window definition to open

  The default view of the window definition opens in the MicroGDS window.

  If a window definition has multiple saved views, you can open a different view by clicking the plus sign to the left of the window definition name and then double-clicking one of the displayed view names.

  For example:



Note that the view icons depict the type of view they store. For more details, see *Working with views* on page 45.

You can use the Find facility in the Document Organizer to search the document for specific window definitions. You can use wildcards to find window definitions that have similar names. For details, refer to Help.

You can also open the default view in a window definition from the File menu:

1 On the File menu, click Window, Open.

  MicroGDS displays the Open Windows dialog box.

2 Double-click the name of the window definition to open.

Changing the principal window

▶ To change the principal window in a single-user document

1 In the Document Organizer, select the name of the window definition that you want to set as the principal window.

2 Right-click to display the shortcut menu, and select Set as Principal.

The name of the window definition is shown in bold, to indicate that it is now the principal window.

This command is not applicable with multi-user projects.

Renaming window definitions

▶ To rename a window definition

1 In the Document Organizer, select the window definition you want to rename and press F2.

2 Enter the new name and press Enter.

You can group window definitions in a MAN file into categories, by typing the name in a particular format. This will show the windows in a document in a tree structure in the Document Organizer. For details, refer to Help.

Closing window definitions

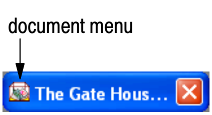
▶ To close a window definition

- on the File menu, click Window, Close

  If you have unsaved changes in the window definition, you are not prompted to save them. The changes will be saved when you save the document.

If the window definition is the last view onto the document, the window is closed but the document remains open. MicroGDS creates a placeholder window for the document, which appears minimized at the bottom of the MicroGDS window. This enables you to work with the document later in the current session.

The name of the document represented by the placeholder window is shown in its title bar. For example:



You can reopen recently-used windows in the document, using the window's document menu. You can close the document by clicking  on the placeholder window or using the Close MAN File command on the File menu.

Note that if you close a window definition in a multi-user project to which you have unsaved changes, you are prompted to save the changes. This is because window definitions in a project are saved in separate files.

Working with windows

When you create or open a document, MicroGDS opens a new window. The rectangle inside a window is where you produce your drawing. This rectangle is the *view extent* and is a view onto the *drawing sheet*. By default, the *axes* are shown in the centre of the window. MicroGDS uses the axes to draw and place graphics. Further details about the axes, the view extent, and the drawing sheet are given in the next section.

When you have drawn graphics, as you move the mouse pointer around the view extent you will notice the following:

- if you have *hover highlighting* switched on, any editable primitive or object beneath the mouse pointer is highlighted, and information relating to the graphics is shown in an *InfoTip*

  For more details about hover highlighting, see Chapter 3, *Working with primitives and objects*.

- if you have *snap guides* switched on, MicroGDS creates temporary construction lines that you can use to help position and align graphics precisely

  For more details about snap guides, see Chapter 5, *Entering positions*.

- the pointer constantly changes to identify the type and location of the nearest snap point (if you have the 'Dynamic pointer position' check box selected in your preferences)

  MicroGDS provides *snapcodes* to enable you to snap exactly to any given point in a window. This ensures accuracy in drawing, selecting, moving, and placing graphics. For details about the snapcodes, see Chapter 5, *Entering positions*.

You can create multiple windows, each showing a different view of the same window definition or showing different window definitions. To the left of each window are the *viewing buttons* for moving around the view, and the zoom bar. These are described later in *Working with views* on page 45.

The drawing sheet

The current view extent is simply a view onto the drawing sheet. You can think of the drawing sheet as a sheet of paper on a drawing board. You can draw on any part of the sheet—you do not have to use the entire drawing sheet.

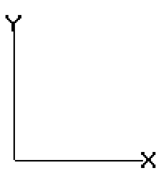
You can change the view extent to see different parts of a drawing, and you can enlarge or reduce the extent. For more details, see *Working with views* on page 45.

When you start to draw, you choose a scale. You do not have to print at this scale—you can choose to make your graphics fill as much or as little of whatever size paper you have in your printer or plotter. When you print a 2D or 3D view, MicroGDS prints only what is in view in the view extent, so if you want to print the entire contents of the window, you must ensure that it is completely in view. For a print-layout view, MicroGDS always prints the whole of the paper.

Note that the sheet has a fixed-paper size of 100,000 km square, at a scale of 1:1.

About the axes

By default, in the centre of the view extent are the *axes*. The axes provide a powerful drawing aid when you draw and place graphics.



If the axes are within the view extent, by default the axes are always displayed on the screen, but they are never printed. Each window has its own set of axes but only the axes in the current view of a window are shown.

Positions on the sheet are measured in relation to the origin of the current axes—using the X, Y, and Z coordinates. Coordinates are shown, and given, in the order X, Y, Z. The coordinates are shown to the right of the prompt bar. MicroGDS shows either the coordinates the dynamic pointer position or the last point input, depending on your preferences.

You can change the position of the axes and their rotation as you work. You can save a window's axes so that you can restore it at any time. You can also choose to hide or show the axes on your screen.

For more details, see Chapter 6, *Using the axes*.

The drawing origin

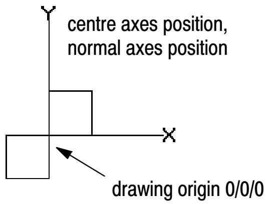
By default, the position at the centre of the drawing sheet is called the *drawing origin*. The point is 0 on the X, Y, and Z axes and is the position on your drawing sheet that you use as a point of reference.

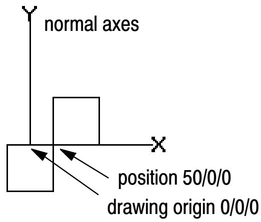
When you create a new, blank document, the normal axes' position has the axes' origin at the drawing origin. If you create a document from a template in which the drawing origin has been changed, the axes are set at the centre of the drawing sheet and not at the position set by the drawing origin.

You can change the location of the drawing origin, using the Document Properties command. You might want to do this, for example, to measure positions from the bottom, left-hand corner of a plan, rather than from the centre. You can then move the axes' origin to the drawing origin using the Axes Normal command.

Note that the Axes Centre command always resets the axes to the centre of the drawing sheet.

In the following example, the drawing origin in the first illustration is set at the default position, that is at the centre of the drawing sheet at coordinates 0/0/0. This is currently the centre axes' and the normal axes' position. In the second illustration, the drawing origin has been moved in a negative X direction. The drawing origin coordinates are measured from the centre axes position, relative to the new drawing origin. Therefore, the drawing origin is set to 50/0/0.





▶ To change the drawing origin

1 On the Set menu, click Axes, Centre to set the axes to the centre of the drawing sheet.

The drawing origin is specified as the position from the centre of the drawing sheet relative to the new drawing origin.

2 On the File menu, click Document Properties.

3 In the Document Properties dialog box, enter the X, Y, and Z coordinates for the new drawing origin, relative to the centre axes, then click OK.

Coordinates are always displayed relative to the current axes and its origin, even if you change the drawing origin.

▶ To position the axes at the drawing origin

- on the Set menu, click Axes, Normal

For more details about coordinates and axes, refer to Chapter 5, *Entering positions* and Chapter 6, *Using the axes* respectively.

The scale and size of graphics

You can draw at any scale you like and in any measurement units; both scale and units can be set on the status toolbar or by using commands on the Set menu.

▶ To set the axes scale

- in the Scale box on the status toolbar, type or select the scale you require
- or, on the Set menu, click Axes, Scale and enter the scale you require in the prompt bar

When you specify a scale, MicroGDS uses a scales file to determine the scales that are available. You specify the scales file to be used in your preferences. If you type a scale that corresponds to a value in the list, then that element is selected. For details about creating a scales file, see Chapter 17, *Customizing MicroGDS*.

When you have set the scale, all new graphics are drawn at this scale until you change it. The scale of existing graphics is not changed.

▶ **To set the units of measurement**

- in the Units box on the status toolbar, select the units you require; in the Places box, type the number of decimal places
- or, on the Set menu, click Units, enter the units you require in the prompt bar and then enter the number of decimal places you require

The number of decimal places does not affect the accuracy to which you draw, only the precision to which dimensions and numbers are displayed in MicroGDS.

For more details about inputting positions, see Chapter 5, *Entering positions*.

Working with views

A view comprises a number of settings including the extent of the window definition that is visible and the window *quality settings* used to display the graphics.

The window quality settings determine how graphics are to be displayed. You can set the window quality using the Quality command on the View menu. For details, refer to Help.

In MicroGDS, there are three view types that you can switch between:

- 2D view

  2D is the default view of a window definition. The extent of the view is in the XY plane.
- 3D view

  A 3D view extent is defined by the eye position and the look-at point. This determines the (pyramid-shaped) cone of view, with the apex of the cone at the eye position. For more details, see Chapter 9, *Working in 3D*.

- print layout view

  Print layout view is specifically for setting up how the physical page will be printed. A print layout view stores the paper size, orientation, and margins. The extent of the view is in the XY plane.

  In general, a print layout view behaves similar to a 2D view.

▶ To switch between views

- on the View menu or on the View toolbar, click the view type you require:

   2D view

   3D view

   print layout view

You can also switch between views using the viewing buttons which are on the left of each window. These are described later in this chapter.

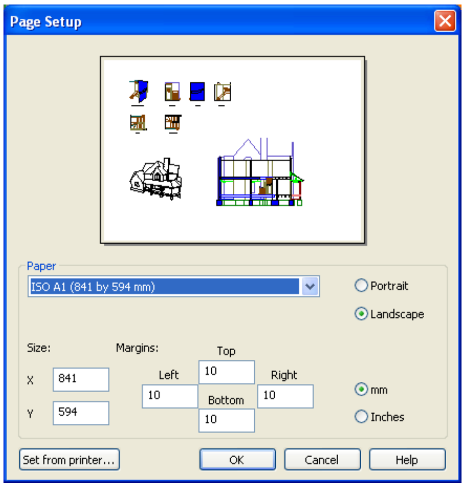
Switching to 3D view

When you switch to 3D for the first time, a default 3D perspective view is shown.

When you subsequently switch to 3D, a view with the previous 3D parameters is shown.

Switching to print layout view

When you switch to print layout for the first time, MicroGDS displays the Page Setup dialog box for you to set your paper size requirements. For example:



The name of the paper displayed in the Paper box defines the orientation, paper size, and margins of the current paper. MicroGDS uses a paper sizes file to determine the paper definitions available to you. A sample file called ‘paper sizes.csv’ is installed to your MicroGDS Programs folder and is automatically referenced in your File Location preferences. For details about editing or creating a paper sizes file, see Chapter 17, *Customizing MicroGDS*.

You can select any paper available to you. You can also change any of the displayed settings, for example, you can increase the margins to add more white space around your graphics.

When you subsequently select print layout, MicroGDS uses the paper definition that you set up. The paper definition is saved with the window when you save the document. To change the assigned paper size at a later date, use the Window, Page Setup command on the File menu, or click the Page Setup button on the Window Editor. The Window Editor is described in Chapter 4, *Using layers and phases*.

Changing the view extent

When you work with a document, you will constantly need to change the extent to see different parts of the view in the window definition. In MicroGDS, you can move around a view, and you can zoom in and out to enlarge or reduce the extent.

Each time you change a view, MicroGDS records the new parameters and updates the *view parameters*.

There are a number of ways in which you can view different parts of a window definition. For example, you can use:

- the zoom commands and the zoom bar
- the scroll bars
- the viewing buttons
- the Navigate window
- commands on the View menu

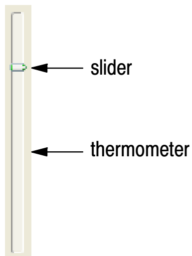
You can also view and manually change the parameters using the View Parameters command on the Window menu. More details about the view parameters are given in Chapter 9, *Working in 3D*.

If you are using a wheel mouse, you can zoom in and zoom out of the current window by rotating the wheel, and pan the window by pressing the wheel whilst moving the mouse.

The zoom bar, scroll bars, and the viewing buttons are known collectively as the *view controls*. You can choose which view controls you want to be made available on your windows. For details, see *Setting the view controls* on page 53.

Using the zoom bar

Use the zoom bar to zoom in and out of the window about the current view centre. By default, the zoom bar is situated on the left side of the window, below the viewing buttons.



To zoom out, click above the slider; to zoom in, click below the slider. Or drag the slider in the required direction.

- in a 2D view

  Dragging the slider to the top of the zoom bar zooms out 100 times, and dragging it to the bottom zooms in 100 times. The slider automatically returns to the centre of the zoom bar when you release it.

- in a print layout view

  The zoom bar behaves in an absolute manner, relative to the selected paper size. Note that you cannot zoom out beyond the selected paper size.

You can also zoom in and out using the viewing buttons, and the Zoom commands on the View menu.

Using the scroll bars

You can pan around a window definition using the scroll bars. The vertical scroll bar is on the right of the window and the horizontal scroll bar is at the bottom.

The scroll box indicates the extent of the graphics shown in the window as a proportion of the total extent of all graphics. When all graphics are shown, the scroll box fills the entire scrolling area; no background is visible.

In a 2D view, you can scroll the view almost without limit; in a print layout view, you can scroll only to the extent of the selected paper.

For details about navigating in 3D views, see Chapter 9, *Working in 3D*.

Using the viewing buttons

You can use the viewing buttons, at the left of each window, to change the view. You can select different viewing buttons to display on 2D (including print layout) and 3D views using the View Controls tab on the Customize dialog box. To open the Customize dialog box, click Profile, Customize on the Window menu.

The default buttons on a 2D window are:

 switches to 2D view

 switches to 3D view

 switches to print layout view

 expands the view extent to fill the window (not available with a print layout view)

 zooms in to a rectangular area that you specify

 zooms to show the selected graphics as large as possible

 zooms to show all the graphics as large as possible.

In print layout view, shows only graphics that are within the paper extent.

 switches back to the previous view

 switches forward to the next view

 creates a new window with a view extent that you specify

 aligns the view with the current XY axes (not available with a print layout view)

 creates a new window with a view extent that you specify

 advances to and retreats from a point

 sets the drawing style in which to draw intelligent objects

These and other commands, such as changing the graphical quality of the window, are also available through the View menu. All commands to change the view in a window are also available from the View toolbar.

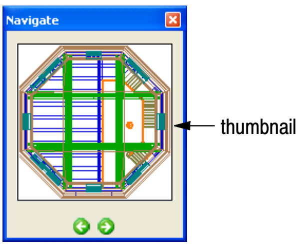
The default buttons on a 3D window are described in Chapter 9, *Working in 3D*. More details about choosing view controls are given in *Setting the view controls* on page 53.

When you change the view, you can use the Next View and Previous View commands to move forwards and backwards between views. This enables you, for example, to concentrate on a specific part of the window and to see the results instantly by returning to the previous view.

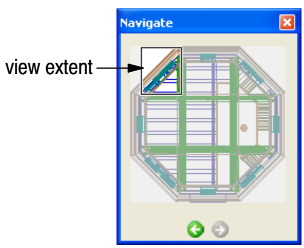
Using the Navigate window

When you have a 2D or print layout view, the Navigate window enables you to zoom, nudge, pan, and move around using a thumbnail view. A thumbnail shows a small picture that you can use to navigate the default view in the associated window definition. A thumbnail is not available in a 3D view.

For example:



If the view is zoomed in on a specific part of the default view, the view extent is highlighted in the thumbnail and the area outside is shaded in the Navigate window.



▶ To display the Navigate window

1 Ensure that the window whose contents you want to view in the Navigate window is the active window.

2 On the Window menu, click Navigate.

When the Navigate window is open, the thumbnail is immediately updated whenever you make a different window definition active.

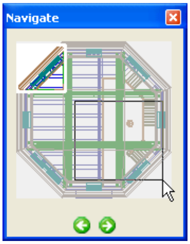
You can select the viewing buttons to display on the Navigate window on the View Controls tab of the Customize dialog box. For more details, see the next section *Setting the view controls*.

▶ To specify the view extent

- using the right mouse button, drag the mouse pointer across the required extent

  As you drag, a rectangular outline is drawn to indicate the new view extent.

  For example:

  When you release the mouse button, the view extent is updated.

  The view extent of a print layout view cannot be larger than the paper extent.

▶ To pan the view extent

- using the left mouse button, drag the rectangle in the thumbnail to move the position of the view extent

  Or, click at the new centre of the view.

Setting the view controls

You can show and hide the zoom bar, the individual viewing buttons, and the scroll bars. By default, a subset of viewing buttons are visible on each graphics window and on each Navigate window. You can also choose a different set of buttons for 2D (including print layout) and 3D views, and change the orientation of the view controls.

▶ **To set the view controls**

1 On the Window menu, click Profile, Customize.

2 On the Customize dialog box, click the View Controls tab.

3 Switch the zoom control options on and off by selecting the check boxes.

4 To set the orientation of the controls, select Horizontal or Vertical.

5 Click OK.

Working with multiple views

Each window definition has a default view. This is created automatically whenever a new window definition is created. You can create additional new views, rename a saved view, and change the default view. You can also save and recall views.

Creating new views

You can view different parts of the same window definition at the same time. For example, you may want to create a new view from a view which has a rotated axes. Or, you may want to have two views zoomed into different parts of a window—one shown in 2D and the other shown in 3D. You do this by creating a new view of the window.

When you create a new view, it is not a new window definition but simply another view onto the active window. Any changes you make to the graphics in one view are reflected in any other views.

▶ **To create a saved view**

1 Open the window definition in which to create a new saved view.

2 Set up the view extent that you want to save.

3 On the View menu, click Save View As.

4 In the View Name dialog box, specify the name for the view and click OK

   The view is added to the list of views, beneath the appropriate window definition on the Document Organizer.

Note that you can also use the View Parameters dialog box to create new saved views.

Showing saved views

▶ To show a saved view

1 In the Document Organizer, click the plus sign to the left of the window definition whose views you want to list.

2 Double-click the name of the view to show.

Changing the default view

▶ To change the default view of a window definition

1 In the Document Organizer, expand the window definition whose views you want to modify.

2 Right-click over the name of the view to set as the default view, and select Set as Default.

   The name of the view is shown in bold, to indicate that it is now the default view.

Renaming saved views

▶ To rename a saved view

1 In the Document Organizer, expand the window definition whose views you want to modify.

2 Select the view you want to rename and press F2.

3 Enter the new name and press Enter.

Saving and recalling views

When you open an existing document, by default MicroGDS displays a default 2D view of the principal window based on your current printer settings. For example, if your printer is set to A4 portrait, the view of the window is displayed in portrait view. Note that the size of the view is slightly smaller than the paper size to allow for the margins.

If you are working on a specific part of a drawing that contains many graphics, you may find it useful to save the view so that you can quickly return to it later. Then, when you next open the window definition for which you have a view saved, MicroGDS displays the saved view instead of the default view. You can also recall the saved view at any time.

Note that saving a document does not save the current view; you must explicitly save the view you require.

Saving views can also be useful if you embed a MicroGDS document in another application such as Word. You can save the view at the same extent as the embedded document. Then, when you double-click the embedded document, it is opened in MicroGDS at the same extent as it appears in the application. For details about embedding and linking data, see Chapter 15, *Working with different file formats*.

▶ **To save the current view**

- on the View menu, click Save *viewname*

Once you have saved a view, you can restore it later. You might want to do this, for example, if you change the extent of the view.

▶ **To restore a saved view**

- on the View menu, click Restore *viewname*

Exiting MicroGDS

▶ **To exit MicroGDS**

1 On the File menu, click Exit.

   If you have made changes to your preferences, you are prompted to save your personal settings.

2 Click Yes or No to save or abandon the changes, as required.

   If you have any unsaved changes to your documents, MicroGDS prompts you to save them before exiting.

Chapter 3

Working with primitives and objects

Primitives and objects

All the graphics you see in a drawing consist of *primitives* and *objects*. A primitive is a basic graphic item, such as a line or a block of text. An object is a collection of graphics, which can be primitives or objects.

Primitives

A primitive is a graphical element drawn using a single command. Primitives are the *building blocks* of a drawing. There are several types of primitive:

- line primitives

  Line primitives include multi-segments lines, arcs, circles, rectangles and so on. Details on line primitives are given in *Line primitives* described next.

- text primitives

  Text primitives can be created in MicroGDS or can be imported text. Details on text primitives are given in Chapter 8, *Working with text.*

- OLE photo primitives

  OLE primitives (Object Linking and Embedding) include Adobe Acrobat and Microsoft Office documents and graphic images saved as bitmaps. Details on OLE primitives are given in Chapter 15, *Working with different file formats.*
- window photo primitives

  A window photo primitive is a *snapshot* of the graphics in one window that is displayed in another window. Details on photo primitives are given on page 59.
- raster primitives

  Raster primitives are images inserted into a drawing. Details on raster primitives are given in Chapter 15, *Working with different file formats.*
- clump primitives

  Clump primitives are *made of* a material, and can also have a different material allocated to each face. Details on clump primitives are given in Chapter 9, *Working in 3D*.

Primitives are grouped together into objects; one primitive can be part of only one object.

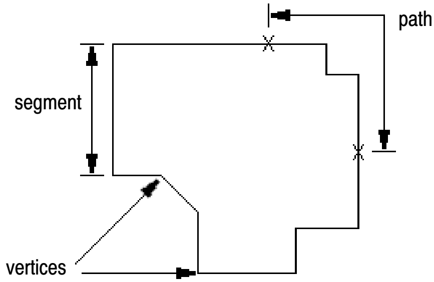
Line primitives

Line primitives are made up of vertices and segments:

- a vertex is a point where two line segments join (for example, a corner), or the point at the start and the end of a line
- a segment is a line between two vertices; it can be straight or curved

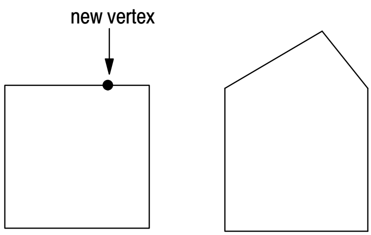
A number of MicroGDS commands work on *paths*. A path is a distance along a line primitive between any two selected points (these do not need to be vertex points). For example, you can delete a path or change the linestyle of a path.

For example:



All line primitives have at least two vertices, one at the start and one at the end. A line primitive that consists of a single segment has two vertices, and a line primitive that consists of two segments has three vertices. The start and end vertices of a closed primitive are at the same position. A rectangle, for example, has five vertices, one on each corner, and an end vertex at the same position as the start vertex.

When you draw a line primitive, MicroGDS adds vertices between segments on the line. You can also add a new vertex to an existing line. For example, the following rectangle (a closed-line primitive) has five vertices. By adding another vertex, you can change the shape of the graphic as shown in the example below:

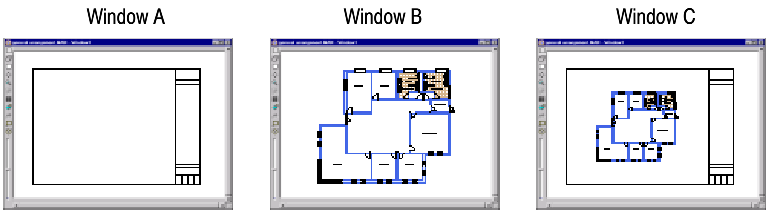


For details about adding, moving, and deleting vertices, refer to Help.

Window photo primitives

A window photo primitive is a *snapshot* of the graphics in one window definition (the *source* window), that is displayed in another window definition (the *destination* window). The photo can reference a window in the same document or in a different document.

Window photo primitives are useful for composing plot compositions. For example, if window definition A contains a frame, and window definition B a building plan, you can construct photos of them both and combine them in window definition C.



Typically, you would use a print layout view for plot compositions. In a print layout view, the size of the view corresponds to the size of chosen paper. For details about print layout views, see Chapter 2, *Exploring MicroGDS*.

Note that the contents of a window photo primitive are not shown in 3D views.

When you insert a photo into a window definition, the location of the original window from which it was taken is saved with it. Whenever the original window definition is updated, MicroGDS updates the contents of the photo. If the source window and target windows are in different documents, you can set up a reference alias to point to the source document's location. Then, if the source document is moved to a different location, you need only change the path of the alias. For details about setting up aliases, see Chapter 2, *Exploring MicroGDS*.

If you open a document in which the source of a referenced photo cannot be found, MicroGDS reports the error condition to the Problems dialog box.

To re-establish the link, you must correct the name and location of the document and/or window that contains the original graphics:

- if the location of the source file is aliased, you can edit the alias path

  You can edit the alias path using the Problems dialog box or the Aliases command on the File menu.

  Note that you can only edit the path of an alias in a single-user document. Reference aliases in a multi-user project are set up in the project database. For details, see Chapter 16, *Multi-user projects*.

- if the location of the file is not aliased, or you do not want to change the alias path, you can edit the photo path

  You can edit the photo path using the Problems dialog box, the Properties window, or the Photo, Edit Path command on the Alter menu.

Note that you can use the Many Paths command on the Edit menu to update the paths of multiple missing linked graphics.

You can move, scale, and rotate a window photo primitive by manipulating the photo border. You can also also assign a linestyle to the photo border or change its shape using many of the primitive editing commands. For example, you can move vertices to make an oblique shape or use the Fillet command to round-off the photo corners. You can even swap the border with that of another line primitive.

You can also snap onto the individual graphics within a photo primitive. For example, you might want to align a specific item in the photo with an existing graphic in the window, or measure the distance between two points in a photo.

If you want to edit any of the graphics in a window photo primitive, without changing the original graphics, you can *burn in* the photo. This converts the photo primitive to graphics in your document which you can then edit locally.

Full details on working with window photos are given in Help.

Objects

An object is a collection of graphics. In MicroGDS, there are several types of object:

- a *plain* object stores a collection of primitives
- an *instance* object does not contain graphics of its own, but has a link to the original object in the document in which it is stored
- an *intelligent object* is created from graphics and *attribute* data or just attribute data

  An attribute is non-graphical information that can be attached to graphics, such as height, colour, or cost.
- an *assembly object* contains only other objects; assembly objects can contain plain objects, instance objects, intelligent objects, and other assembly objects

Each object has a name and can be treated as a single item that you can edit, move, and so on. The commands that you can use, however, depend on the type of object with which you are working.

When you construct primitives, they are automatically included in the current plain object. By default, the current object is called no:name until you create a new object. The name of the current object is shown on the status toolbar.

You can change the default object name to something more meaningful using your preferences, if you prefer. For details, see Chapter 17, *Customizing MicroGDS*.

Selecting primitives and objects

Many MicroGDS commands require you to select graphics. For example, if you want to move, copy, or alter an item, you must first select it.

Before you select graphics, you must choose to select them as primitives or as objects. If you select the graphics as primitives, you can edit the individual primitives or a number of primitives from different objects. If you select the graphics as objects, you edit all the primitives within the whole object.

When you select a primitive or an object, the graphics change colour. You can choose the colour in which to show selected graphics in your preferences.

You can use the Set Edit command to define a filter to restrict editing to particular primitives. For details, see *Restricting editing* on page 91.

▶ To set primitive selection mode

- press F9, or on the Edit menu, click Select Primitives

▶ To set object selection mode

- press F10, or on the Edit menu, click Select Objects

The way in which you select items depends on the ‘Explorer-like selection and drag-and-drop’ option in your preferences. If this option is selected, then the Windows behaviour is used; if the option is cleared, then the default MicroGDS behaviour is used.

The following assumes that you are using the default MicroGDS behaviour; if you are using the Explorer-like behaviour, refer to Help for the equivalent details.

▶ To select graphics

1 Click the item using the appropriate *snapcode*:

- if you are selecting primitives, only the primitive you click is selected
- if you are selecting objects, the primitive you click and all other primitives within the same object are selected

  If you select an assembly object, all objects within the assembly are selected.

In MicroGDS, you use snapcodes to snap exactly to points on existing graphics. As you move the pointer around, you see snapcodes displayed beneath the mouse pointer. For more details, see Chapter 5, *Entering positions*.

If multiple items lie within the snap radius of the mouse pointer, you can cycle through the graphics by pressing Spacebar. When the item you want to select is highlighted, click the mouse button or type the displayed snapcode.

Note that you can change the key that is assigned to cycle through, using your preferences.

2 To add to the selection, press Shift and click each item.

To deselect an item, press Shift and click the item.

You can select and deselect all graphics in a window. If you are selecting primitives, all primitives will be selected, and if you are selecting objects, all objects will be selected.

▶ To select all graphics

- press F7, or on the Edit menu, click Select All

▶ To deselect all graphics

- press F8, or on the Edit menu, click Deselect All

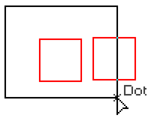
When in selection mode, you can select adjacent items by enclosing them in a box.

▶ To define the box

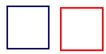
- click at the start of the box and then click at the opposite corner of the box

You can deselect items and add to the selection by pressing Shift when you define the box.

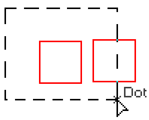
To include all graphics that cross the boundary of the enclosing rectangle, press Tab before giving the second position. When you press Tab, the bounding rectangle changes to a dotted line. For example:



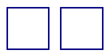
enclosing box, Tab not pressed



one primitive selected



enclosing box, Tab not pressed



two primitives selected

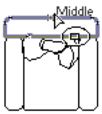
Another way to select graphics is to use the Fence command on the Edit menu to draw a fence. The graphics that are selected by the fence depend upon the selection mode, that is, whether you are selecting primitives or objects.

For more details on the select commands, refer to Help.

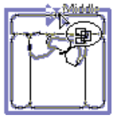
Highlighting primitives and objects

By default, as you move the mouse over a drawing, graphics are automatically highlighted. This provides constant feedback on your drawing, and gives a clear indication of complex structures. Graphics are highlighted only if the command you are using is able to operate on them.

In select primitive mode, the primitive beneath the mouse pointer is highlighted. In select object mode, the primitives within the object and the extent of the object beneath the pointer are highlighted. The object *hook point* is also shown (as a butterfly shape) if it is within the view extent. The hook point can be thought of as the ‘handle’ of the object, and is described further on page 68.

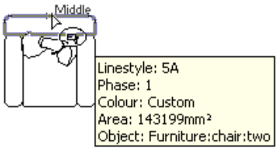


Select primitive mode

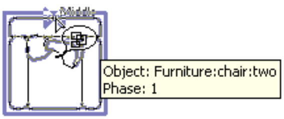


Select object mode

If you continue to hover over a graphic, an InfoTip is shown giving details about the highlighted primitive or object:



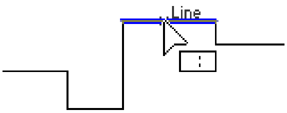
Select primitive mode



Select object mode

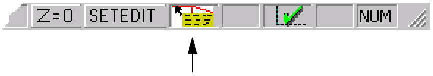
The details in the InfoTip depend on the type of graphic that is highlighted. For details about the type of information displayed, refer to Help.

When a command is in progress, the graphic feedback reflects what is required and highlights only items on which the command can operate. For example, if you are moving a line segment, only the line segment currently beneath the mouse pointer is highlighted:



When MicroGDS highlights an item, you can press Spacebar to move through any other items that are within the snap radius. For example, if you want to alter a line primitive but the primitive is obscured by other primitives, use Spacebar to cycle through the graphics until the primitive you want to alter is highlighted.

You can choose the level of hover highlighting you require using the Hover Highlight button on the information bar, at the bottom-right of the MicroGDS window:



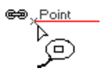
Hover Highlight button

You can choose from:

- highlight graphics and show InfoTips
- highlight graphics only
- do not highlight graphics or show InfoTips
- show InfoTips only

Note that you can customize InfoTips using your Snapping preferences.

When the mouse pointer is over an object or primitive in selection mode, to which a URL attribute has been assigned a link icon is shown to the left of the mouse pointer:



This indicates that a hyperlink exists which you can open. For details about assigning attributes, see Chapter 14, *Working with attributes and schemas*.

Viewing properties for graphics

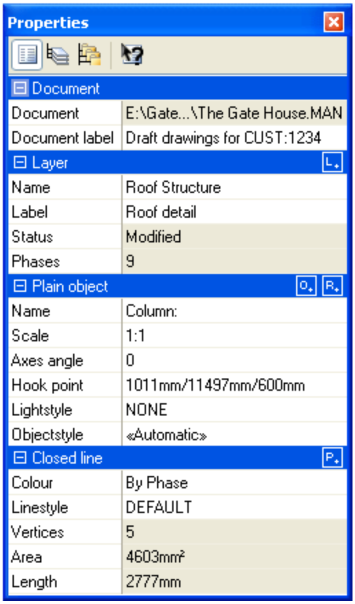
You can use the Properties window to see details about selected graphics. The information available depends on whether you select graphics as primitives or as objects. For example, in primitive mode, the details include the number of vertices, the colour, and the linestyle assigned to the primitive.

▶ To see details about a graphic

1. In primitive or object mode, select the graphic whose details you want to view.
2. If the Properties window is not currently displayed, press Ctrl+Q, or on the Window menu, click Properties.

The first time you open the Properties window, the ‘Details display’ is shown. This gives details about the document, layer, object, and primitive (if in primitive mode) for the selection.

For example:



You can use the buttons at the top of the window to view details for the selection in different ways. If you save your settings when you exit MicroGDS, MicroGDS remembers the last view selected in the Properties window.

For more details about viewing the properties of graphics, see Chapter 13, *Getting information*.

Drawing primitives

As soon as you start to draw a primitive, it is included in the current object and placed on the current layer.

To draw a primitive, you select the type of primitive you want to create using the toolbars or menu commands, and then draw the graphic. For example, to draw a line, you select the Construct Line command and then specify the start and end points of the line.

Line primitives are drawn using the current *linestyle*. Linestyles define the appearance of a line and are made up of one or more *strokes*. A stroke can define the line thickness, the fill, or the pattern in which lines are drawn. The name of the current linestyle is shown in the Line box on the status toolbar. For more details, see Chapter 7, *Working with linestyles*.

Text primitives are drawn using the current *charstyle*. Charstyles define the font, size, and style in which text is drawn. A charstyle also defines any spacing around the text. The name of the current charstyle is shown in the Char box on the status toolbar. For more details, see Chapter 8, *Working with text*.

The commands for drawing graphics are on the Construct menu. Full details on constructing graphics are given in Help.

Creating objects

To group primitives into a new object, you usually create the object before you draw the primitives. However, you can also move existing graphics into a new object.

When you create a new object, you are prompted for the object's name and its *hook* point. The hook point can be thought of as the 'handle' of the object and can be used, for example, to pick up and place the object at an exact point in the window. It is also used in other commands that work on objects.

Note that new objects are created on the current layer, therefore you should first set the layer on which you want to create the object. For details, see Chapter 4, *Using layers and phases*.

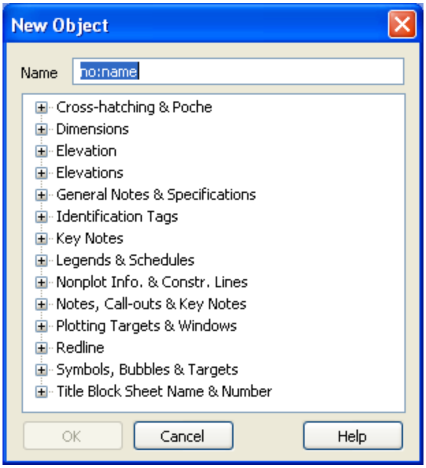
▶ To create an object

1 If you want to move existing graphics into a new object, select the graphics.

2 Do one of the following:

- to create a new empty object, on the Object menu, click New
- to create a new object from the selected graphics, on the Object menu, click New from Selection

The New Object dialog box is displayed. For example:



3 In the Name box, type the name of the object.

MicroGDS provides the current object name as the default.

The name must conform to the standard naming rules, described in the next section.

If you are using a name assistant, you can select the object name from the Object list. If you are not using the name assistant, the list is empty.

You are now required to enter a position for the object's hook point.

4 To set the hook point at the origin of the current axes, press Esc. Otherwise, click a point in the window.

The new object is created on the current layer.

Note that you can change the location of the hook point using the Hook command on the Object menu. For details, refer to Help.

You can also check that you have positioned the hook point correctly, by hovering over the object (in select object mode), where you will see the hook point. Alternatively, you can use the Axes, Reset command on the Set menu. For details about the axes and objects, see Chapter 6, *Using the axes*.

Object scale and axes

When you create an object, the current scale and current axes rotation are saved with it. In this way, an object has its own internal scale and its own axes, whose origin is located at the object's hook point.

Note that you can move an object and change its axes rotation using the Object Reposition command. For details, refer to Help.

Take care when placing objects that have a different scale from that of the set axes scale. For example, if you copy an object with a scale of 1:50 from a window, and paste it into a window where the current scale is 1:100, it would appear at half the size.

Note that you can change the scale of an object at any time using the Scale command on the Object menu. For details about axes and scales, see Chapter 6, *Using the axes*.

Rules for naming objects

You should structure object names in a meaningful way so that you can use *filters*. Filters enable you to manipulate graphics in different ways. For example, they enable you to restrict editing to only those objects whose names contain certain characters. For more details, see *Filtering object names* on page 72.

Rules for naming objects are:

- an object name can contain up to 256 characters and can include spaces and certain punctuation marks

  For a list of all valid characters that you can use in an object name, refer to Help.

- object names can be separated into up to six *facets* (sections)

  For example, the object name no:name has two facets: 'no' is one facet, and 'name' is the other.

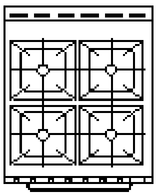
  If you are creating an intelligent object using the predefined BIM components provided with MicroGDS, the first facet of the object name must conform to one of the predefined names. For more details, see *Using BIM intelligent objects* on page 81.

- each facet is separated by a colon (:)

  You can use semicolons instead of colons. For example, if it is easier, you can type internal;wall;plaster rather than internal:wall:plaster. MicroGDS automatically converts the semi-colons to colons.

  Invalid characters are converted to colons.
- object names with only one facet can have between one and 255 characters, and must end with a colon
- object names are case sensitive, so ‘rad:1000’ and ‘RAD:1000’ are two different objects

When you name objects, try to give them clear, descriptive names. For example, the following object is a gas cooker:



The name for this object might be:

I:Kitchen:Cooker:Gas:Free

where:

I	indicates that the object is part of the interior detail
Kitchen	indicates that the object is located in the kitchen
Cooker	indicates that the object is a cooker
Gas	indicates that the cooker is gas sourced
Free	indicates that the cooker is freestanding

If your system administrator has set up special naming standards for layers and objects for your site and these are enforced, when you create an object or a layer, MicroGDS displays a dialog box showing a tree-like structure of naming conventions. This enables you to create names by selecting facets from the list. For more details about name assistants, see Chapter 2, *Exploring MicroGDS*.

Note that the object naming conventions are not displayed unless the current layer name conforms to the layer naming conventions.

You may want to rename existing objects from time to time. For example, you may want to change the name of an object that you have copied from another document. MicroGDS provides commands for renaming a single object or a number of objects. These are described in MicroGDS Help.

Filtering object names

Using a comprehensive naming structure for objects makes it easy to set filters (using wildcards) when you set up an *inclusion list*. You use an inclusion list when you want to define the graphics which:

- can or cannot be edited in a document, using the Set Edit command

  For details about using the Set Edit command, see *Restricting editing* on page 91.
- are to be displayed in a phase, using an inclusion list in the Window Editor

  For details about setting up an inclusion list in the Window Editor, see Chapter 4, *Using layers and phases*.

You use the asterisk as the wildcard character to match facets in object names, as follows:

*	means match this single facet
**	means match the remainder of the object name

You can also use the question-mark (?) to match any single character of an object name.

For example:

Object name	**Wildcard**	**Match**
kerb:	kerb:**	✓
kerb:paving		✓
kerb:paving:dropped		✓
external:kerb		✗
kerb:	kerb:*	✓
kerb:paving		✓
kerb:paving:dropped		✗
kerb:	kerb:*:dropped	✗
kerb:dropped		✗

Object name	**Wildcard**	**Match**
kerb:paving:dropped		✓
kerb:	**:paving	✗
kerb:paving		✓
kerb:paving:dropped		✗
kerb:	kerb:?	✗
kerb:A		✓
kerb:B		✓
kerb:paving		✗

You can also reverse the sense of the action using an Exclude rule. For example:

Exclude kerb:**

will match everything except objects with kerb as their first facet.

You can also use advanced filters to specify which primitives and objects can or cannot be edited, and will or will not be displayed, using *attributes*. For details, see Chapter 14, *Working with attributes and schemas*.

Inserting objects

You can insert objects from one single-user document into another document. This enables you to build up libraries of objects that you can re-use at any time.

You can also link objects from other single-user documents to your current document. A linked object is known as an *instance object*. An instance object does not contain graphics of its own in the current document, instead, it has a link to the original object in the document in which it is stored. You can create libraries of standard objects, and these objects can then be linked to a number of different documents as instance objects, to ensure that the objects in the documents are all the same.

Note that you can insert or link only to top-level objects, you cannot insert an object that is part of an assembly object.

If you are inserting or linking several objects in a document, you can set up *aliases* to map the physical location of the files containing the objects to an arbitrary name. If the files are later moved to a different location, you need only change the pathname in the aliases table.

Note that if you want to use aliases, you should define the aliases before you insert or link the objects to the document. For details about setting up aliases, see Chapter 2, *Exploring MicroGDS*.

When you insert an object or an instance object, styles may be copied to the target document if they are needed. If style names of the same type already exist in the document, those are used instead.

Inserting objects using the Document Organizer

When you set up aliases for object libraries, the library aliases are shown on the Library tab in the Document Organizer. This enables you to insert library objects directly from the aliased locations.

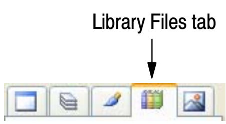
You can also insert objects from aliased and non-aliased libraries, using the Object menu. For details, see MicroGDS Help.

▶ To insert an object from an aliased library

1 If the Document Organizer is not displayed, press F4, or on the Window menu, click Document Organizer.

2 Ensure that the appropriate document is the current document in the Document Organizer.

3 Click the Library Files tab:



A list of each aliased object library file is displayed.

If you have not defined any aliases for object libraries, you can either define the alias before you continue, or you can insert an object using the Object menu.

4 Double-click the library MAN file that contains the object to insert.

The layers in the library are listed.

5 Double-click the layer that contains the object to insert.

The objects in the library are listed.

You can preview an object by selecting its name. If the preview is not currently visible, click 

6 To insert the selected object into the active window:

- to copy the object directly into the window, on the shortcut menu, click Insert Object
- to create an instance object, on the shortcut menu, click Insert Instance

MicroGDS prompts you to specify the position for the library object, or to press Enter if you want to change the object size or orientation.

For details about transforming objects, refer to Help.

For details about specifying positions, see Chapter 5, *Entering positions*.

Note that you can also insert an object by dragging it into the window definition. You can then move it to the required position and, if necessary, use the Transform commands on the Alter menu to rotate, enlarge or reduce, mirror, and stretch the graphics.

You can also use the shortcut menu in the Document Organizer on a library file or a layer to open the Object Insert dialog box, with the selected item as a filter. For more details about inserting objects, refer to Help.

Working with instance objects

When you insert an instance object into a document, you can view the physical file location of the object in the Properties window.

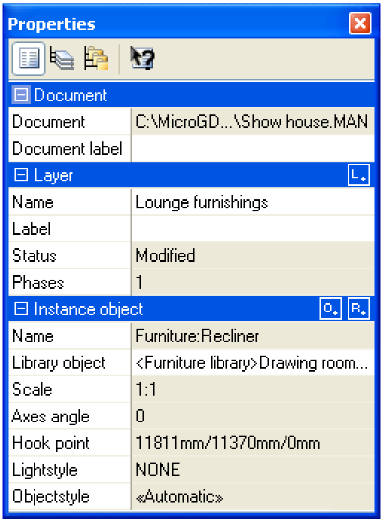
▶ To display the file location of an instance object

1 Press Ctrl+Q, or on the Window menu, click Properties.

2 Select the instance object to query.

The Properties window displays details about the library object, including the name and location of the file in which the object is stored and the name of the object.

For example:

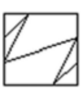


You can see more details about the instance object in an InfoTip, by hovering over the Library object property.

If you selected the instance object in primitive mode, the Properties window also shows the names of any styles, for example, the linestyle or charstyle assigned to the primitive you clicked on in the instance object. Note that the original styles may be copied to the target document if they did not already exist.

Instance objects are read-only. You can change the size and the scale, and move, copy, paste, and delete an instance object, but you cannot change any of its individual primitives or add new primitives to the object. Note that you must be in select object mode (F10) to manipulate an instance object. If you delete an instance object, only the instance in the current document is deleted.

If you open a document that contains an instance object that cannot be found, for example, because the file has been moved to a different location, MicroGDS displays the following symbol in its place:



To re-establish the link, you must correct the name and/or location of the MAN file that contains the original object:

- if the location of the file is aliased, you can edit the alias path

  You can edit the alias path using the Problems dialog box or the Aliases command on the File menu.

  Note that you can only edit the path of an alias in a single-user document. Library aliases in a multi-user project are set up in the project database. For details, see Chapter 16, *Multi-user projects*.
- if the location of the file is not aliased, or you do not want to change the alias path, you can edit the instance object path

  You can edit the instance object path using the Problems dialog box, the Properties window, or the Instance, Edit Path command on the Object menu.

Note that you can use the Many Paths command on the Edit menu to update the paths of multiple missing instance objects.

For more details on these commands, refer to Help.

If you want to make changes to the original object, for example, to alter a primitive, you can open the file that contains the original object.

▶ To edit the original object

1. On the Object menu, click Instance, Open.
2. Click the instance object whose MAN file you want to open.

Alternatively, double-click the instance object to open the MAN file to which the object is linked.

The window definition of the document containing the original object opens in a new window. The extent of the window is set to the extent of the original object.

If changes are made to the original object, all instances of that object are also changed. However, if the original object is changed and saved while you are working with a document that references it, you will need to update the document to see the changes.

▶ To update instance objects

- on the Object menu, click Instance, Update

If you want to edit an instance object, without changing the original object, you can *burn in* the object. You can then modify the object, or any of its primitives.

▶ **To burn in an instance object**

1 Press F10, or on the Edit menu, click Select Objects.

2 Select the instance object to burn in.

3 On the Object menu, click Instance, Burn In.

Any changes made to the original object will no longer be reflected in the converted object.

Using assembly objects

An assembly object is a collection of objects that can be used and manipulated as a group. You can insert, scale, and rotate an assembly object in a drawing. You can open an assembly object to access its individual objects, modify them, and then close the assembly to work with it once again as a group.

For example, suppose you are designing a dining room layout, you might arrange table and chair objects into an assembly, which you could then move about as a group.

Assembly objects can contain plain objects, instance objects, intelligent objects, and other assembly objects. An assembly object can also be instanced.

You can create libraries of standard assembly objects, which can then be referenced by a number of different documents as instance assembly objects. This will ensure that the graphics in the documents are all the same. If the source assembly is edited, the instance assembly objects can all be updated to make the changes visible.

Note that when you insert an object from a library, you can insert only top-level objects, you cannot insert an object that is part of an assembly object. As a consequence, if you insert an object as an instance object and you later move the object into an assembly, the link will be broken.

Each assembly object has a name, hook point, scale, and rotation associated with it. An assembly object, and all objects it contains, exist on a single layer.

Creating assembly objects

To group objects into a new assembly object, you can either:

- create the assembly object and then create the objects it will store
- or, move existing objects into a new assembly object

The procedure for creating new assembly objects is similar to creating new objects, described on page 68. This procedure is summarised below; for full details refer to Help.

▶ To create an assembly object

1 If you want to move existing graphics into a new object, select the graphics.

2 Do one of the following:

- to create a new empty assembly object, on the Object menu, click Assembly, New
- to create a new assembly object from the selected objects, on the Object menu, click Assembly, New from Selection

The New Assembly dialog box is displayed. This dialog box is the same as the New Object box, except for its title.

3 In the Name box, type the name of the assembly object.

The name must conform to the standard naming rules. For details, see *Rules for naming objects* on page 70.

If you are using a name assistant, you can select the assembly object name from the Object list. If you are not using the name assistant, the list is empty.

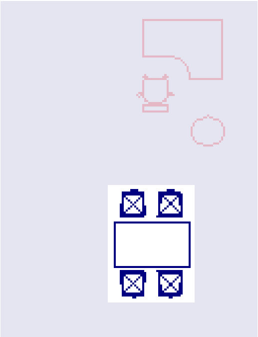
You are now required to enter a position for the assembly object's hook point.

4 To set the hook point at the origin of the current axes, press Esc. Otherwise, click a point in the window.

The new assembly object is created on the current layer and is opened for editing.

If the assembly object is empty, its extents are initially set to the view extent; any visible graphics outside the extent are shown faded to indicate that they cannot currently be edited. If the assembly object contains graphics, its extent is set to the boundaries of the objects it contains.

For example:



You can now create new objects which will be stored in the assembly object. If you immediately begin drawing without creating a new object, the primitives are automatically included in a new plain object.

When you have finished working with an assembly object, you can close it.

▶ To close an assembly object

- double-click outside the boundary of the assembly object
- or, on the Object menu, click Assembly, Close

▶ To open an assembly object

- in Select Object mode (F10), double-click the assembly object
- or, on the Object menu, click Assembly, Open

Dissolving an assembly object

Sometimes, you might want to move the contents of an assembly object up one level to its parent assembly or layer. You can do this easily, by dissolving the assembly.

▶ To dissolve an assembly object

1. Press F10, or on the Edit menu, click Select Objects.
2. Select the assembly object that you want to dissolve.
3. On the Object menu, click Assembly, Dissolve.

   Any selected assemblies are moved to their parent assembly, or to the layer if no parent assembly exists. The empty assembly objects are deleted.

Using BIM intelligent objects

In MicroGDS, a BIM (Building Information Modelling) intelligent object is modelled parametrically from MicroGDS data. This is typically achieved from line primitives and attribute data, or just attribute data. The attributes are referenced in Object-level *schemas*. The schema defines which objects a set of attributes are intended to be used with. Each schema defines an *objectstyle* which describes the properties of an intelligent object.

For example, a wall can be modelled as plan linework which defines its centreline, together with a height, and a style which defines the layers of the wall (for example, brick, cavity, and plaster). Individual properties of the wall style, such as the thickness of the layers, can then be overridden on an individual basis using the Properties window.

MicroGDS provides a set of predefined BIM (Building Information Modelling) components, such as walls, doors, and windows. New components will become available. It is recommended that you periodically check the Informatix website for updates.

The basic procedure for creating an intelligent drawing is:

1 Set the style search path of your document to reference the components that make the intelligent objects and drawings available.

2 Set the drawing style to one of the BIM drawing styles.

3 Create a new object and name it using one of the predefined BIM object names.

4 Set the objectstyle to the name of the schema that defines the behaviour of the object.

5 For walls and slabs, draw ordinary line graphics to represent the reference line of the wall or slab.

6 Modify the attribute values to tailor the objects to your drawing.

You can customize the BIM environment in various ways, such as by creating your own objectstyles or changing the mnemonic definitions that describe the behaviour of a particular intelligent object. You can also define your own BIM components. For more details, see Chapter 17, *Customizing MicroGDS*.

Setting the document intelligence

To enable the construction and drawing of BIM intelligent objects, you must tell the MicroGDS document that you are going to be using intelligent objects in your drawing. You can immediately tell if a document can use intelligent objects by looking at the drawing style. If the only entry shows <<Automatic>> then the document is not enabled for intelligent objects. To enable the document, you add an entry to the Style Search Path that points to the location of the BIM application data:

<*MICROGDS_COMMON_APPDATA>BIM

This is the default location set up during the MicroGDS installation. Note that by using this system format, you will not need to update the path for each of your MicroGDS documents if the installation procedure changes the location of the data in a future release; it will be done automatically.

If you define your own intelligent objects, you need to reference the relevant path to your own files on the style search path. For details, see Chapter 17, *Customizing MicroGDS*.

Now several new entries appear on the drawing styles list. These determine the the level of detail to show for the graphics in the current view.

Setting the drawing style

When you work with a document that contains intelligent objects, you choose a drawing style. Each drawing style is defined by a Window-level schema. The schema contains attributes and a reference to a predefined .NET assembly that determine the appearance of the view. (The .NET assembly is responsible for the display of MicroGDS BIM objects in the current view, in the selected drawing style.)

▶ To set the drawing style

1 On the viewing buttons or on the View toolbar, click 

2 Select the drawing style to set from the list.

MicroGDS provides the following drawing styles:

- Ceiling: shows a mirrored orthographic, bottom view of the solid model of the building. Similar to ‘Detail’, this drawing type using a clip plane and section styles to generate the required drawing.

  Note that clip planes and section styles are described in Chapter 9, *Working in 3D*.
- Detail: shows an orthographic, top view of the solid model of the building; this drawing type uses a clip plane and section styles to generate the required drawing.
- Elevation: shows a horizontal, orthographic view of the solid model of the building.
- GA (General Arrangement): shows a 2D view which draws the building using linestyle and masking techniques. For large buildings, you will probably want to use this drawing style for most interaction as it is the fastest to draw.
- Perspective: shows a general purpose 3D view of the solid model of the building.

In the 3D viewing styles, the reference line is not normally visible, but becomes visible when the object (and no other object) is selected.

In documents that are not enabled for intelligent objects, the drawing style is set to «Automatic»

Note that additional drawing styles may be created by application developers.

In addition to setting the appropriate type of view, the drawing style also selects a suitable representation of certain building components. For example, doors are shown open in a Detail view but closed in an Elevation view.

Tip: To view the graphics in an intelligent drawing in different drawing styles, create additional saved views for any other drawing types and switch between them. For details about saving views, see Chapter 2, *Exploring MicroGDS*.

Creating a BIM intelligent object

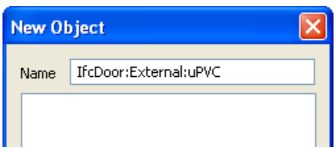
The process for creating a MicroGDS BIM intelligent object is identical to that for creating a plain MicroGDS object (described on page 68). However, the first facet of the object name must be defined in the intelligent object style that you want to use.

To use a style that is provided with MicroGDS, the first facet must be one of the following:

For a wall object:	IfcWallStandardCase
For a door object:	IfcDoor
For a window object:	IfcWindow
For a slab object:	IfcSlab

The case and name must be identical to that shown.

Additional facets may be used to distinguish between different objects of the same type. For example:



It is this first facet that tells MicroGDS which properties will apply to the object.

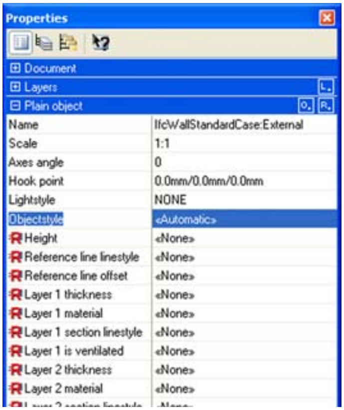
After you place the new object's hook point, the Properties window is populated with all the parameters for the object type.

You now define the objectstyle which will set the default attribute values for the type of construction you choose.

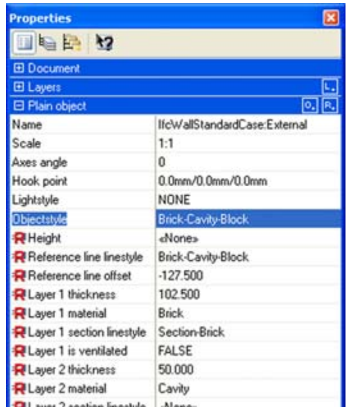
Defining the objectstyle for a BIM intelligent object

Each objectstyle of a BIM intelligent object is defined by an Object-level schema. The schemas contain attributes appropriate to the type of intelligent object. A BIM wall object, for example, currently has two objectstyles: Block and Brick-Cavity-Block. The two wall objectstyles each have a subset of the wall properties. These schemas are automatically associated with an object which has a corresponding object name. The association is then made using an Objectstyle property in the Properties window.

For example:



Default attributes and initial values for all IfcWallStandardCase objects



Default values for Brick-Cavity-Block objectstyles

▶ To set the Objectstyle

- click the the Objectstyle value, then click and select from the list

Drawing the reference line for an intelligent object

For MicroGDS BIM wall and slab objects, you need to draw the graphics to define the reference line of the object.

- for a slab object, draw the outline of the slab

  This must be a closed-line polygon, for example, to represent a floor slab.

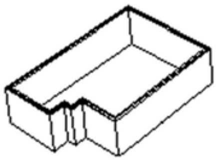
- for a wall object, draw the centreline of the wall

  This could be a single line for a garden wall or a closed-line polygon for a building.

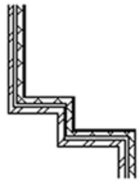
Note that when MicroGDS draws an intelligent object, curved surfaces are facetted when they are extruded. You specify the number of facets to use. The higher the number, the smoother the surface. For more details, see Chapter 9, *Working in 3D*.

Tip: You can use the Z=0 button to force graphics to be drawn on the XY plane, for example, if you are creating a floor slab. For details about using the Z=0 facility, refer to Help.

When you have drawn the primitive, the graphics are drawn in the selected drawing style. For example:

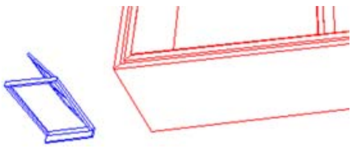


wall in Perspective drawing style

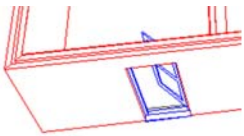


wall section in Detail drawing style

You do not draw any graphics for window and door objects. These are drawn intelligently according the attribute data values. However, when you create a window or door, set the object hook point at the position on the drawing at which to place the bottom left corner of the window or door. Then, to associate the window or door with an existing intelligent wall object, move the window onto the wall.



wall object and floating door



wall object and associated door

The depth of the window or door automatically adjusts to match the wall thickness and a hole is made in the wall to accommodate it.

Note that snapping onto the wall when you initially create the window or door object will not establish the connection between the two objects. This is because the window or door only becomes intelligent when its objectstyle has been set.

Modifying the properties of a BIM intelligent object

When you add a BIM intelligent object to a drawing, its attributes and values (defined by its objectstyle) are added to the Properties window. You can modify the default values to suit your drawing's environment. For example, you can change the operation type of a door, that is, whether it is a single or double swing door or whether it opens to the left or right. You might also want to change the overall door width and height and change the panel thicknesses. You do this by editing the attribute values in the Properties window.

Depending on the type of attribute, you can:

- type the new value in the box
- select a value from a list of predefined choices
- or edit the value in a dialog box

Any entry that you modify is shown in bold in the Properties window.

If you find that you are frequently using a particular set of attribute values, you can set these up as a new objectstyle. For details, see see Chapter 17, *Customizing MicroGDS*.

For full details about editing attribute values, see Chapter 14, *Working with attributes and schemas*.

Note that you can use the standard editing commands to modify the reference line of a BIM intelligent object. For example, you can use the Move Line Segment command to extend a wall area.

Moving and copying graphics

You can move or copy selected graphics:

- from their current positions to new positions in the same document
- from one object to another within the same document or to another document
- from one layer to another within the same document or to another document

You can move and copy graphics as primitives or as objects. If you want to move or copy objects from an assembly object or paste objects into an assembly, you must first open it for editing. For details, see page 80.

Note also that you can move and copy instance objects as a whole, but you cannot move or copy individual items within the instance.

You can also move an object and change its axes rotation using the Object Reposition command. For details, refer to Help.

The way in which you move and copy items depends on the 'Explorer-like selection and drag-and-drop' option in your preferences. The following assumes that you are using the default MicroGDS behaviour; if you are using the Explorer-like behaviour, refer to Help for the equivalent details. (Note that if you are using Explorer-like behaviour, a shortcut menu is available which provides Cut, Copy, Paste, and Delete commands.)

The procedures given describe just some of the moving and copying operations. For more details on these, and all other move and copy operations, refer to Help.

Moving and copying primitives and objects

You can move or copy selected primitives or objects from one position to another.

▶ To move or copy primitives or objects

1 On the Edit menu, click Select Primitives or Select Objects, as required.

2 Click the first graphic to move or copy.

3 Press Shift and click each subsequent graphic to move or copy.

4 Do one of the following:

- to move the selected graphics, press Shift+Ctrl and drag the graphics outline to the new location
- to copy the selected graphics, press Ctrl and drag the graphics outline to the new location

As soon as you have dragged the graphics away from their original position, you can release the keys and mouse buttons.

5 To place the graphics at the new position, click the mouse button.

You can also use the Alter Move command and the Construct Repeat command to move and copy selected graphics. For details, refer to Help.

Moving and copying primitives between objects

You can move or copy primitives from one object to another. You can also move or copy a primitive to an object that is on another layer or even another document.

Below are just two methods you can use to move or copy graphics. For full details, refer to Help.

▶ **To move primitives from one object to another**

1 Press F9, or on the Edit menu, click Select Primitives.

2 Select the primitive to move.

3 On the Object menu, click Get.

4 Select the object in which to move the primitive.

To retain the original primitives, press Ctrl when you click the object to which to move the item.

▶ **To copy primitives into a new object**

1 Press F9, or on the Edit menu, click Select Primitives.

2 Select the primitives to copy to the object.

3 Press Ctrl+C, or on the Edit menu, click Copy.

4 On the Object menu, click New, then create the new object.

For details, refer to *Creating objects* on page 68.

5 Press Ctrl+V, or on the Edit menu, click Paste.

6 To test that all of the primitives are now one object:

a) Press F10, or on the Edit menu, click Select Objects.

b) Click one of the primitives in the new object.

When you snap onto one of the primitives, all of the primitives in the object change colour, which means that they are all one object.

You can use the New from Selection command on the Object menu to move primitives (or objects) into a new object.

Cutting and deleting graphics

You can cut and delete graphics from your current document. Cut graphics are copied to the Clipboard. You can retrieve a cut graphic by pasting from the Clipboard or by undoing the Cut command. Deleted graphics are not copied to the Clipboard and can only be retrieved by undoing the command.

You can cut and delete graphics as primitives or as objects. If you want to cut or delete objects from an assembly object or paste objects into an assembly, you must first open it for editing. For details, see page 80.

Note also that you can cut or delete an instance object as a whole, but you cannot cut or delete any of its individual primitives.

When you cut or copy graphics to the Clipboard, MicroGDS stores the location of the graphics relative to the current axes' origin, and this is used when you paste a graphic back into a window. If you move the axes before you paste graphics back into the window, the graphics are pasted back at the position, scale, and rotation relative to the current axes origin.

▶ **To cut selected graphics to the Clipboard**

- press Ctrl+X, or on the Edit menu, click Cut

▶ **To paste graphics that have been cut or copied**

- press Ctrl+V, or on the Edit menu, click Paste

▶ **To delete selected graphics**

- press Delete, or on the Edit menu, click Delete

▶ **To retrieve deleted graphics**

- press Ctrl+Z, or on the Edit menu, click Undo

Note that if you are using Explorer-like behaviour, a shortcut menu is available which provides Cut, Copy, Paste, and Delete commands.

Replacing objects globally

Another way in which you might want to edit objects is to globally replace all occurrences of one object in a window for another.

For example, you might have started a floor layout with a simple object representing a door, which you later change to one showing more detail.

▶ **To replace all occurrences of one object with another one**

1. Ensure that the replacement object's hook point, and the hook point of each object being replaced, are in the appropriate positions.

   The replacement object will be placed by its hook point at the hook point of each replaced object.

   For details on moving an object's hook point, refer to Help.

2. Press F10, or on the Edit menu, click Select Objects.

3. Select the replacement object with which you will replace the existing objects.

4 On the Set menu, click Axes, Reset, then click the replacement object.

   The axes origin is moved to the hook point of this object.

5 With the replacement object selected, on the Edit menu, click Copy (or Cut) to copy the replacement object to the Clipboard.

6 Select the objects to be replaced.

   If there are a lot of different objects in the window, use Set Edit to limit editing to just the objects that are to be replaced, and use the Select All command on the Edit menu. For details about using Set Edit, see *Restricting editing* on page 91.

7 On the Object menu, click Replace.

All the selected objects in the window definition are replaced with the object on the Clipboard.

You can also replace primitives within objects, and superimpose objects and primitives. For details, refer to Help.

Altering graphics

MicroGDS provides many commands for altering graphics. For example, you can move a vertex, delete or move a line segment, alter a path, and so on. Most of the commands that you use to change the appearance of graphics are on the Alter menu.

An instance object does not contain any graphics of its own in the current document, therefore you cannot alter the appearance of any primitives it contains. However, you can use the Transform commands to rotate, enlarge, mirror, and stretch an instance object as a whole. For further details, refer to Help.

For details on all the commands that you can use to alter selected graphics, refer to Help.

Restricting editing

The Set Edit command allows you to temporarily exclude primitives and objects from being edited, or to restrict editing to specific primitives or objects. It also enables you to restrict editing to graphics that use particular linestyles, charstyles, materials, and colours.

Note that style editing restrictions apply to primitives. Consequently, you can select an object only if all its primitives are individually selectable.

You can restrict editing to:

- specifically-named objects or all objects except those of a specified name
- line primitives that use (or do not use) a certain linestyle
  For details, see Chapter 7, *Working with linestyles*.
- text primitives that use (or do not use) a certain charstyle
  For details, see Chapter 8, *Working with text*.
- 3D clumps that use (or do not use) a certain material
  For details, see Chapter 11, *Working with materials*.
- primitives that are assigned or are not assigned a certain colour
  For details, see *Changing the colour of graphics* on page 94.

Furthermore, you can combine these options, making the Set Edit command an extremely powerful facility.

▶ To restrict editing of objects

1 Press F3, or on the Set menu, click Edit.

   You can also use the SETEDIT button on the information bar (at the bottom right of the MicroGDS window) to set restrictions:

   - if SETEDIT is not currently enabled, click the button
     If SETEDIT is enabled, a single click of the button toggles the current editing restrictions on and off.
   - if SETEDIT is currently enabled, double-click the button

   The Set Edit Filter Editor is displayed.

2 To define your object restrictions, do one or more of the following:

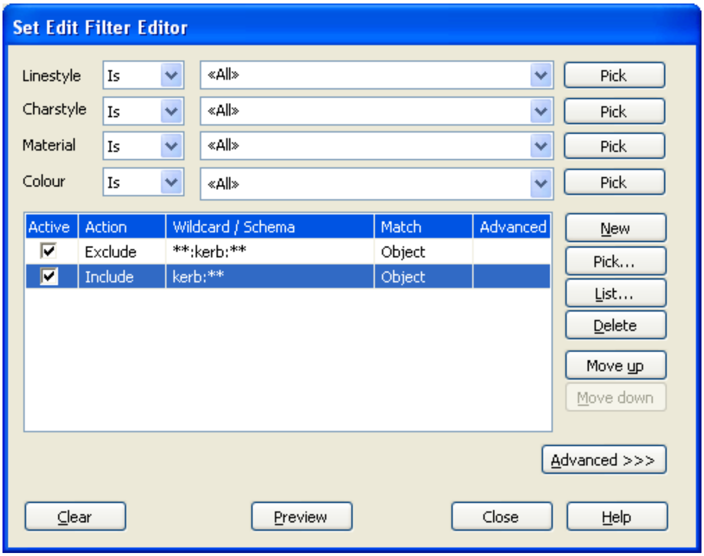
   - click the New button to add a new rule, then type the object name in the Wildcard/Schema box
   - click the Pick button and click an item (object or primitive, depending on the selection mode) in the window definition
   - click the List button to browse to the object name using a list

   For details on object naming conventions and use of wildcards, see *Rules for naming objects* on page 70.

3 To specify the action of a rule, select Include or Exclude from the Action list.

4 Select the types of objects to which the rule applies from the Match list.

For example, to restrict editing to objects whose names begins with kerb, but to exclude objects with kerb as any facet other than the first, you would specify the following:



Ensure that you enter Exclude rules at the start of the list, before any inclusion rules.

You can toggle rules on and off using the check box under the Active column.

You can also apply advanced filters to specify which primitives and objects can or cannot be edited, using *attributes*. A brief introduction to attributes is given later in this chapter. For details about assigning attributes to graphics, and filtering graphics using attribute values, see Chapter 14, *Working with attributes and schemas*. You can also refer to Help.

5 To only allow editing of primitives using a specific linestyle, charstyle, material, or colour, select the style or colour from the appropriate list.

- select «All» to apply the rule to all graphics of the corresponding type
- select «Undefined» to apply the rule to graphics whose style is missing

  For example, styles may be missing from files imported from other modelling systems.

Alternatively, click Pick and click a primitive to which the style or colour is assigned.

To allow editing of all primitives, except those drawn in the specified style or colour, select ‘Is not’ from the appropriate list. Note that, when primitive colour is set to «All», you cannot set Colour ‘Is not’ (as this would exclude all primitives from editing).

As you set up the filter rules, you can test the result at any time by clicking Preview. Only objects that meet the criteria are highlighted.

6 Click Close.

When you have set up your restrictions, the SETEDIT button on the information bar is pressed in and the text changes colour:

You can toggle the editing restrictions on and off by clicking the button.

MicroGDS will not let you select any primitives which do not comply to the restrictions you have set.

Remember to clear the edit restriction when you have made the changes you require.

Changing the colour of graphics

By default, graphics are drawn using the colour defined for the phase in which they are referenced. The default colours for phases are set in your document properties (available from the File menu). You can change the default colour for any phase to one of your choice, using the Mini Window Editor or the full Window Editor. For details, see Chapter 4, *Using layers and phases*.

You can override the phase colour for individual graphics using the Set Colour command.

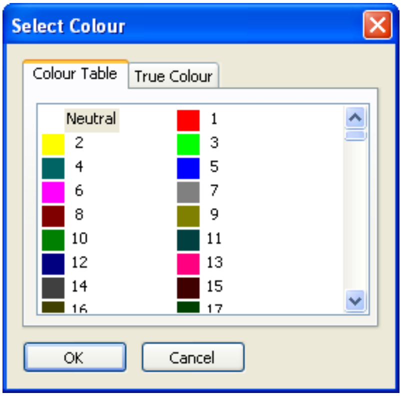
▶ To change the colour of existing graphics

1 Select the graphics whose colour you want to change.

2 From the Colour list on a status toolbar, select an existing colour or choose a new colour.

If you want to assign a colour that is not available in the list, click the ‘Select colour’ entry.

MicroGDS displays the Select Colour dialog box. For example:



You can choose a colour from the document’s colour table or define a new, custom colour.

If you are defining a custom colour on the True Colour tab, you can specify a level of transparency using the Alpha slider. For details about specifying a custom colour using the True Colour spectrum, refer to Help.

3 Specify the colour you require and click OK.

The colour assigned to the selected primitive is shown in the Colour box on the status toolbar.

- When you select a primitive for which no explicit colour is assigned, the Colour box shows ByPhase:

- When you select a primitive that has an explicit colour, the colour and colour number are displayed in the Colour box:

If the primitive has a custom colour assigned (specified by using the True Colour tab on the Select Colour dialog box), the colour and the red, green, blue, and alpha values are displayed in the Colour box:

- If the selected graphics have different colours assigned, the Colour box is blank:

The colour assigned to selected primitives is also shown in the Properties window. Note that primitives of different colours show «Mixed» in the Colour property line.

You can also set colours for individual linestyle strokes and charstyles. For example, you might have a linestyle that has a red border, and a green fill, or a charstyle that uses a blue font.

To use the colours set in the linestyles and charstyles of the graphics used in a phase, select the ‘Use style colours’ check box in the Window Editor. Otherwise, MicroGDS draws the graphics using the phase colour.

For details about creating and modifying linestyles, see Chapter 7, *Working with linestyles*. For details about creating and modifying charstyles, see Chapter 8, *Working with text*.

▶ To reset all graphics to their phase colours

1 On the Edit menu, click Select All.

2 From the Colour list on the status toolbar, select ByPhase.

Any explicit colours set in the styles are honoured, provided that the ‘Use style colours’ check box is selected in the Window Editor.

Using attributes

You can assign *attributes* to graphics. Attributes are non-graphical information about the item. For example, an attribute might provide information about the cost of an object, its colour, details of its supplier, and so on. You can then export this information to other Windows applications such as spreadsheets and databases, where it can be used to produce reports such as parts lists, costings, and maintenance reports.

In addition to assigning attribute values, you can also:

- calculate attributes for primitives and objects
- retrieve information from external databases

You do not assign attributes to calculated and external attributes, the values are calculated on request.

You can use an attribute as a filter in an inclusion list. For example, you could define a filter to show only those objects which have a floor area greater than 20 metres in one phase, and only those objects which have a lesser floor space in another phase.

You can also use attributes in text primitives, as secondary annotation. For example, if you were refurbishing an office, you could reference an external attribute to retrieve employees names and telephone numbers and assign them to the office desks.

For details about assigning attributes and filtering graphics using attributes, see Chapter 14, *Working with attributes and schemas*.

Details about secondary annotation are given in Chapter 8, *Working with text.*

Producing object reports

MicroGDS provides two facilities for producing reports about objects:

- Object List: produces a list of all the objects in the active window definition, together with the number of times they appear in each phase
- Object Schedule: generates a report that lists all the objects in the active window definition, together with other information requested such as any associated attributes

For details about the Object List and Object Schedule facilities, see Chapter 13, *Getting information*. For complete details, refer to Help.

Chapter 4

Using layers and phases

Layers

MicroGDS enables you to divide your drawings into logical and manageable portions by using *layers*. All the graphical data (primitives and objects) in a document are drawn on layers. You can regard layers as transparent overlays, with different parts of the drawing produced on each overlay.

For example, if you were producing an cinema complex, you might structure the drawing on the following layers:

- layers 1 – 10: the architectural detail
- layers 11 – 25: seating arena and foyer
- layers 26 – 30: wiring detail
- layers 31 – 34: lighting and projection
- layers 35 – 36: sprinkler system

If you create a new document and immediately begin drawing, MicroGDS creates a layer for you, with the name ‘default’. You can rename this layer or create a new layer to use.

You can also change the default layer name that is used for each new window definition if you do not explicitly create a layer, in your preferences.

In a single-user document, layers are stored in the MAN file. There is virtually no limit to the number of layers you can create.

In a multi-user project, the graphics on each layer are stored in separate files (.LYR files). For details about multi-user projects, see *Layers and phases in multi-user projects* on page 120.

Phases

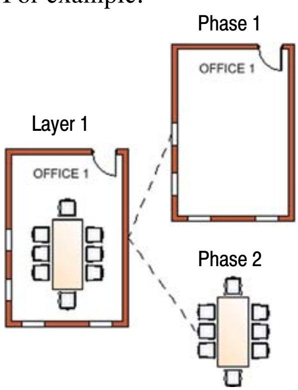
When you create a new layer, MicroGDS automatically creates a phase. A phase determines which graphics from the layer are drawn and how they are drawn.

The phase defines:

- whether the graphics are editable, hittable, visible, or invisible (known as the editing status)
- which graphics on the layer are to be included in the phase
- the colour in which graphics are shown
- any overrides, such as a specific linestyle or a fading value to *dim down* graphics
- the name of the layer to which the phase is linked

To specify which graphics stored on the layer are to be displayed in each phase, you can use an *inclusion list*.

For example:



You can use phases in this way to make editing easier. For example, you can show different graphics on the same layer in different colours. Or, you can choose which graphics in a phase are editable and which are hittable.

The current layer

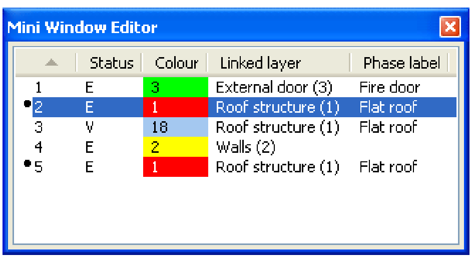
All new graphics are drawn on the current layer. If you open an existing window definition and immediately select a construct command, MicroGDS automatically makes the layer referenced by the last editable phase the current layer, and draws the graphics on that layer. If the window definition does not reference any layers, MicroGDS usually creates a layer using the default name. If the name assistants are in force, you may be prompted to specify a valid layer name. The new layer is made the current layer.

For details about using the layer name assistant, see Chapter 2, *Exploring MicroGDS*.

By default, the name of the current layer is shown on a status toolbar. For example:

You can customize your status toolbars to hide layer names. For details, see Chapter 17, *Customizing MicroGDS*.

All editable phases that reference the current layer are shown checked in the Mini Window Editor. For example:



In the above example, phases 2, 3, and 5 all reference the current layer 'Roof structure'. This is indicated by each phase having the same layer link number, in this case (1). However, because only phases 2 and 5 are editable, only these phases are checked.

For details about layer link numbers, see *Phases list* on page 104. For details about the editing status, see the section *Changing the editing status of a phase* on page 106.

To help you identify which graphics are included in a phase, MicroGDS assigns a default drawing colour to each phase. You can change the colour of individual primitives and objects on any layer, or change the default phase colour to one of your choice. For details, see *Changing the colour of a phase* on page 107.

You will often want to work on different layers to add, delete, and modify graphics held on other layers. To do this, you need to switch to a different layer.

▶ **To switch between different layers**

- in the Mini Window Editor, double-click a phase that is linked to the layer you want to make current

  If the phase was not editable, MicroGDS automatically changes its editing status to Editable.
- or, in the window definition click a graphic which is in an editable phase that is linked to the layer you want to make current

You can also switch between layers using the full Window Editor, described next.

Working with layers and phases

Although you can perform many tasks with the Mini Window Editor, you can also use the main Window Editor to manage the layers and phases in a window. For example, you can use either the Mini Window Editor or the Window Editor to create layers and phases. But if you also want to add a description to a layer, define style overrides for a phase, or set a phase to be screen only, you can perform all these tasks with the Window Editor.

▶ **To display the Window Editor**

1. Select the window definition whose layers and phases you want to modify.
2. Press F2, or on the File menu, click Window, Edit.

   The Window Editor is displayed.

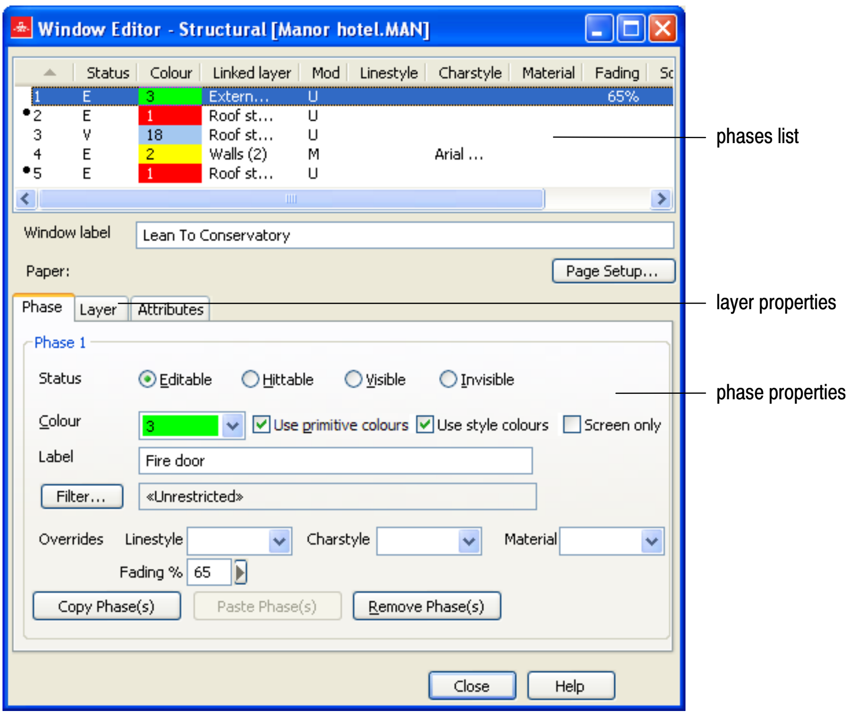
   To display the layer and phase properties for more than one window definition, select the next required window definition and then press F2.

   MicroGDS opens a new Window Editor for each subsequent window definition.

You can reposition or resize the Window Editor as required. When you next display the Window Editor, MicroGDS remembers its last position and size.

A number of shortcut menus are available when you work with the Window Editor. To see a shortcut menu, click the appropriate item with the right mouse button.

Using the Window Editor



The name of the window definition (and document) to which the Window Editor refers is shown in the title bar.

The Window Editor has three main areas: a phases list, window and paper details area, and three tabs: Phase, Layer, and Attributes.

Phases list

The phases list is at the top of the Window Editor. It shows all phases that are referenced in the window definition. A bullet to the left of a phase means that the layer it references is the current layer. If no layer is current, no phases are marked.

The information shown for each phase is:

- the number of the phase; phases are numbered sequentially starting from 1

  The phase number determines the order in which the graphics are drawn and printed.
- the editing status of the phase (E, H, V, or I)
- the colour and colour number (or colour value, for a user-defined colour) of the phase
- the name and the *link number* of the layer to which the phase is linked

  The link number can be used to distinguish between layers that have the same name.

  Each layer in a multi-user project is stored in a separate layer file. The link number is used to link the appropriate layer file to the window definition.
- the modification status of the layer (shows M if modifications have been made to the layer but not yet saved, or U if the layer is unmodified)

  If you are working on a multi-user project, there are two additional statuses. For details, see *Changing ownership of a layer* on page 123.
- the names of any overriding linestyle, charstyle, and material set for the phase
- the percentage of any fading used to *dim down* the graphics on a phase
- whether or not the phase is shown only on the screen, and not printed
- the phase label (not visible in the above illustration), if one exists

Phases can be sorted by different columns by clicking the required column header. Clicking the column a second time will reverse the order. The column on which phases are sorted shows an up or down pointing arrow, depending on the sort direction.

The Window label box below the phases list enables you to add a description of the associated window definition.

If you have set up a paper definition for use with a print layout view, the paper size is shown below the Window label box. If you want to assign or change the paper size, click the Page Setup button and define the paper definition using the Page Setup dialog box. For details about assigning a paper size for a print layout view, see Chapter 2, *Exploring MicroGDS*.

Phases, layers, and attributes

The Phase and Layer tabs enable you to work with the phases and labels used in the related window definition. The Attributes tab enables you to set up window-level attributes which apply to the entire window definition.

Working with phases

To work with the phases in the Window Editor, click the Phase tab.

Remember that many of the actions described in this section can also be performed using shortcut menus in the Mini Window Editor.

Selecting phases

To change the properties of a phase, such as its editing status, the colour, or description, you first select the phase.

▶ To select a phase

- in the phases list, select the phase whose properties you want to change

  You can use the Windows multi-select facilities to select multiple phases.

▶ **To select all phases**

- in the phases list, on the shortcut menu, click Select All

When you select multiple phases, the values for one or more properties may become blank or appear unavailable. This indicates that the phases have different values for those properties. If you change one of these values, all selected phases assume the new value.

Reordering phases

The order in which the phases are numbered determine which graphics are drawn over the top of other graphics (phase 1 is drawn first). You can change the position of a phase in the sequence, thereby changing the order in which graphics are overlaid.

▶ **To reorder the phases**

- in the phases list, drag the phase up or down the list

▶ **To move a phase to the top or bottom**

- select the phase to move and, on the shortcut menu, click Move to Top or Move to Bottom

Note that if you have changed the sort order, for example, to sort by the 'Linked layer' name, this changes only the sort order in the phases list; phases are always drawn in numeric order.

If you are using mask (or opaque) linestyles, take care when reordering phases. Unless the phases are correctly ordered, you might not be able to see graphics which are referenced in different phases. For details about creating and using mask linestyles, see Chapter 7, *Working with linestyles*.

Changing the editing status of a phase

Each phase determines the editing status of the graphics on the layer with which it is associated. The editing status can be one of the following:

- Editable (E)

  You can edit and hit existing graphics, and create new graphics.

- Hittable (H)

  You can hit existing graphics, but you cannot edit them or create new graphics.

- Visible (V)

  You can see existing graphics, but you cannot hit or edit them, or create new graphics.
- Invisible (I)

  You cannot see, edit, or hit existing graphics, or create new graphics.

▶ **To change the editing status of a phase**

1 In the phases list, point to the phase whose status you want to change.

2 On the shortcut menu under the Status column, click the editing status you require.

Alternatively, click the Status button you require on the Phase tab.

Tip: to change the editing status of a phase to Editable and make its layer current, double-click the phase in the list.

Changing the colour of a phase

MicroGDS automatically assigns a colour for the graphics in each phase. The default colours for phases are set in the document properties. The colour allocations are saved when you save a document, therefore, you can have different colour allocations for each document. You can also copy the colour allocations of a document to and from the document defaults, which are used for all new documents. For details about changing the default colour allocations, see Chapter 17, *Customizing MicroGDS*.

If you have the Colour list on a status toolbar, the colour assigned to the graphics in the current phase is shown in the box. Unless you change the colour of individual graphics, the Colour box shows ByPhase. This indicates that MicroGDS is using the phase colour for new graphics.

All graphics in the phase are drawn in the phase colour (unless you change the colour of individual items using the Colour list). If you change the colour of an individual graphic, the colour (and its number or value) is shown in place of ByPhase.

▶ To change the colour of a phase

1 In the phases list, point to the phase whose colour you want to change.

2 On the shortcut menu under the Colour column, select an existing colour or choose a new colour in which you want the graphics to be displayed.

   To assign a colour that is not available from the list, click the ‘Select colour’ entry. Then, select your colour using the Select Colour dialog box. For details about using the Select Colour dialog box, see Chapter 3, *Working with primitives and objects*.

Alternatively, select the Colour you require on the Phase tab.

Respecting primitive colours

You can set colours for individual graphics. By default, graphics are shown in their set colours. Graphics that have not been set explicit colours are shown in their phase colours.

▶ To use the colours set for individual graphics

1 In the phases list, select the phase that uses set colours for individual graphics.

2 On the Phase tab, select the Use primitive colours check box.

   The graphics are drawn in their set colours, and not in the phase colour.

Respecting style colours

You can set colours for individual linestyle strokes and charstyles. For example, you might have a linestyle that has a red border, and a green fill, or a charstyle that uses a blue font.

▶ To use the colours set in the linestyle or charstyle

1 In the phases list, select the phase that uses styles with the embedded colours you want to retain.

2 On the Phase tab, select the Use style colours check box.

   The styles are drawn in their embedded colours, and not in the phase colour.

For details about creating and modifying linestyles, see Chapter 7, *Working with linestyles*. For details about creating and modifying charstyles, see Chapter 8, *Working with text*.

Note that if you select both ‘Use style colours’ and ‘Use primitive colours’, any set colours for individual primitives are used.

Showing a phase on screen only

Occasionally, you may want to show the graphics in a phase only on the screen. MicroGDS enables you to display graphics on screen, but will hide them when you:

- print a window definition in which the phase is referenced
- include a photo of a window definition in which the phase is referenced in another window definition
- publish a window definition in which the phase is referenced

Details about each of these procedures is given in the corresponding chapters in this guide. Refer also to Help.

▶ To mark a phase for screen display only

1 In the phases list, select the phase whose graphics you want to display only on screen.

2 On the Phase tab, select the Screen only check box.

  Note that graphics are also not shown in the thumbnail picture in the Navigate window (for 2D views) or the window preview in the Document Organizer.

Filtering graphics in a phase

By default, all graphics on a layer are included in all phases that are linked to the layer. This is indicated by «Unrestricted» shown on the Phase tab of the Window Editor.

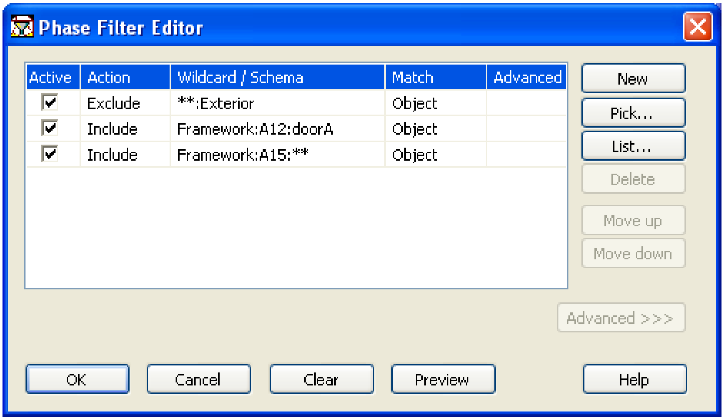
You can use a phase filter to include and exclude specific graphics on a layer. For example, you might want to include the electrical circuits in a phase, but do not want to show the actual wiring detail.

▶ To set up a phase filter

1 In the phases list, select the phase whose phase filter you want to edit.

2 On the Phase tab, click Filter.

The Phase Filter Editor is displayed, for example:



The default phase filter is simply ** (under the Wildcard/Schema column). This means, include all graphics stored on the layer linked to this phase.

3 Edit the phase filter as appropriate and click OK.

You set up a phase filter in much the same way as when restricting graphics from editing. This is described in Chapter 3, *Working with primitives and objects*.

It is important to remember however that you must specify any Exclude rules at the start of the list, before any Include rules.

For example, if you specify:

Exclude A:DR
**

all objects are included except A:DR.

However, if you want to exclude all objects that match a particular wildcard EXCEPT for some specific objects, you must specify the exceptions before the Exclude statement.

For example:

Include ARCH:DOOR**
Include ARCH:WINDOW**
Exclude ARCH**
**

excludes all objects with the first facet ARCH, except for objects with the first facets ARCH:DOOR and ARCH:WINDOW.

You can also use advanced filters to specify which primitives and objects will or will not be included in a phase, using *attributes*. For details about assigning attributes to graphics, and filtering graphics using attribute values, see Chapter 14, *Working with attributes and schemas*. You can also refer to Help.

Once you have set up a phase filter, you can copy it to other phases if required.

▶ **To copy a phase filter**

1 In the phases list, select the phase whose filter you want to copy.

2 On the Phase tab, click Copy Phase(s).

3 In the phases list, select the phase in which to copy the filter rules.

4 On the shortcut menu, click Paste Phase Filter.

Note that this command copies a phase filter from a single phase. If you copy multiple phases, the command is unavailable.

Setting global overrides for a phase

Usually, graphics are drawn and printed using the style definitions that are assigned to the graphics. For example, a line primitive uses a linestyle definition and a text primitive uses a charstyle definition.

You can specify a series of overrides to temporarily display or print the graphics in a different way.

Setting linestyle, charstyle, and material overrides

Normally you choose a style per primitive, so that graphics in a phase may be drawn using a mixture of linestyles, charstyles, and materials. However, you can override this and display all line primitives in a phase in a single linestyle, all text in a single charstyle, and all clumps in a single material.

You might want to do this, for example, if you are printing an early draft of a drawing using a printer that does not have all of the fonts that are used in the drawing.

▶ **To override the linestyle, charstyle, or material for a phase**

1 In the phases list, select the phase for which you want to set the overrides.

2 On the Phase tab, select the styles you want the phase to use from the linestyle, charstyle, or material lists.

For details about linestyles, charstyles, and materials, see chapters 7, 8, and 11 respectively.

Setting fading overrides

You can use a fading override to *dim down* the graphics on a phase. You might want to fade the graphics on one phase to help emphasize the graphics on another phase.

A fading value affects all graphics in the phase, including raster files and graphics that are assigned a primitive colour, using the Set Colour command.

▶ **To override the fading value for a phase**

1 In the phases list, select the phase for which you want to set the fade override.

2 On the Phase tab, specify the fading percentage for the strength in which you want the graphics to be drawn and printed.

   100% draws the graphics in full colour; 0% makes the graphics invisible. Intermediate values will be semi-transparent.

Copying phases

You can create more than one phase to link to a layer. You can then specify which objects on the layer you want to be included in each phase.

▶ **To copy a phase**

1 In the phases list, select the phase to copy.

2 On the Phase tab, click Copy Phase(s).

3 Click the position in the phases list at which to paste the phase, then click Paste Phase(s).

   The new phase is assigned the next phase number, but it has the same link number as the original phase. This indicates that both phases are linked to the same referenced layer.

You can also copy a phase from one window definition to another by copying the phase from one Window Editor and pasting it into another.

Removing a phase

Removing a phase from a document does not delete the layer graphics. It simply removes the link to the layer, in the window definition.

▶ **To remove a phase**

1 In the phases list, select the phase to remove.

2 On the Phase tab, click Remove Phase(s).

If you remove all phases that are linked to a layer, you can create a new phase that references the layer's data by copying the layer in the Document Organizer into the Window Editor. For details, see *Adding layer graphics to a window definition* on page 117.

Adding a description to a phase

You can add a description to a phase. You could, for example, make a note about the objects you have included in the phase.

▶ **To create or change the current phase's label**

1 In the phases list, select the phase for which you want to add a description.

2 On the Phase tab, type the description in the Label box.

Working with layers and phases

To work with the layers in the Window Editor, click the Layer tab.

Remember that many of the actions described in this section can also be performed using shortcut menus in the Mini Window Editor.

Creating layers and phases

To divide your drawing into layers, you must first create the new layers and phases.

▶ To create a new layer and phase

1 In the phases list, click the phase above which the new phase will be positioned.

2 On the Layer tab, click New Layer & Phase.

The Layer Name dialog box is displayed.

If you are using a layer name assistant, a list of layer categories is displayed in the box. If you are not using the name assistant, the box is empty. For details about using the layer name assistant, see Chapter 2, *Exploring MicroGDS*.

3 In the Name box, specify the name for the new layer, following the rules described in the next section *Naming layers*.

4 If you want to add a description of the layer, in the Label box, type a description (using up to 127 characters), and then click OK.

Note that if you are transferring data to a system using DXF/DWG files, layer names will be converted to a format required by DXF/DWG. You can force the exported layer name to a preferred name by entering it in a special format in the Label box. For details, refer to Help.

When you create a new layer, the associated phase is given the next phase number in the sequence (from 1), and is added to the phases list in the Window Editor. The phase is also assigned the next phase colour.

5 If you want to change the editing status, or the colour in which the graphics will be shown in the phase, make your changes as required.

A phase can have one of four editing restrictions. These are described earlier in *Changing the editing status of a phase* on page 106.

Changing the colour of a phase is described in *Changing the colour of a phase* on page 107.

You can also create new layers and phases using a shortcut menu in the Window Editor and the Mini Window Editor.

You can rename an existing layer description using:

- the Rename Layer button on the Window Editor
- the Document Organizer
- and the Properties window

For details about the Properties window, see Chapter 13, *Getting information*.

If you are using a layer name assistant, a layer description may have been added to the layer name assistant configuration file. If a label does exist, it is automatically displayed in the Label box. For more details, see Chapter 17, *Customizing MicroGDS*.

Naming layers

When you create or rename a layer, you should use a descriptive name. For example, 'architecture details' is far more meaningful than something like 'top layer'.

Rules for naming layers are:

- a layer name can contain up to 256 characters
- names can include spaces, except at the beginning or end of the name
- layer names are case sensitive, so 'lighting' and 'LIGHTING' are two different layers

By default, layer names in a document do not have to be unique. You can, however, force names to be unique, or request a warning if you name a layer using the same name as one that already exists. You set the applicability of unique names in your preferences. For details, refer to Help.

Previewing layers

Every layer that is created is saved in the document. You can list all the layers in a document by clicking the Layers tab on the Document Organizer.

You can also preview the graphics stored on any individual layer.

▶ To preview a layer

1 If the Document Organizer is not currently displayed, press F4, or on the Window menu, click Document Organizer.

2 On the Document Organizer, click the Layers tab:

3 Select a layer to preview.

4 If the preview area is not currently visible, click , or on the shortcut menu, click Toggle Preview.

All graphics are shown as two-dimensional images.

When the preview area is visible, the Preview button appears pressed in. To close the preview area, click the button again.

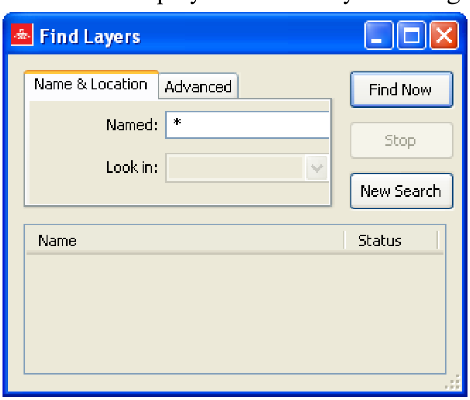
Finding layers

The Document Organizer can help you to locate layers that you cannot find because, for example, the window definition that referenced the layers has been deleted.

▶ To find layers in a document

1 On the Document Organizer, click the Layers tab.

2 On the Layers tab, click 
MicroGDS displays the Find Layers dialog box. For example:



If you are working with a project the dialog box displays an additional field called Location to display the path of any layers found.

3 Specify your search requirements and click Find Now:

- in the Named box on the Name & Location tab, specify the name of the layer

  You can use wildcards to match characters in the name. Layer names are not case sensitive. For example, S* matches all layers with names that begin with ‘S’ or ‘s’, followed by any number of characters, including none.

  Note that the Look in box can be used only to search for layers in specific aliases, in a multi-user project.

- to find layers by the assigned layer label, click the Advanced tab and specify the layer label

  You can also search for only those layers that are not referenced by any window definitions, by selecting the ‘Unreferenced layers only’ check box.

MicroGDS searches the document and lists any layers that match your search criteria in the Results box. For more details about finding layers, refer to Help.

Adding layer graphics to a window definition

You can add the graphics on an existing layer to any window definition in the same document. To do this, you create a new phase from the layer, and then reference that phase in the required window.

▶ To add layer graphics to a window

1 In the Document Organizer, ensure that the document from which you want to copy a layer is the current document.

2 Click the Layers tab and then select the layers whose data you want to copy to a window definition.

3 On the shortcut menu, click Copy.

MicroGDS copies the selected layers.

4 Ensure that the window definition in which you want to create the phase is the active window.

5 Under the Linked layer column in the Window Editor (or in the Mini Window Editor), on the shortcut menu, click Paste Phases.

MicroGDS pastes a phase for each layer that you copied into the window editor.

You can also create a new phase from a layer, by dragging the layer from the Document Organizer into either of the window editors. For more details, refer to Help.

Duplicating a layer

You can duplicate the data of an existing layer by cloning it. This may be useful if you want to try changing the graphics, but you want to keep the original layer graphics unchanged.

▶ To clone an existing layer

1 From the phases list in the Window Editor, select the phase that references the layer you want to clone.

2 Click Clone Layer(s).

The Clone Layers dialog box is displayed.

3 Do one of the following, and then click OK:

- to add a new phase to refer to the cloned layer, select this option
- to change the existing phase to refer to the cloned layer, select this option

If you are using a name assistant, MicroGDS displays the Layer Name dialog box for you to specify the name. The name must comply with the MicroGDS naming rules.

If you added a new phase to reference the cloned layer, MicroGDS adds a new phase to the Window Editor.

If you changed the existing phase to refer to the cloned layer, MicroGDS replaces the existing phase by the new phase in the Window Editor.

Deleting a layer

When you delete layers in a single-user drawing, the graphics on that layer are deleted from disk when you save the file. All phases that reference the layer are also deleted.

Note that if you want to delete layers from multi-user projects, you must use the MicroGDS Project Administrator utility. For more information, refer to the online Help for the Project Administrator (if the Project Administrator utility is available to you).

▶ **To delete a layer**

1. In the Document Organizer, ensure that the document from which you want to delete the layer is the current document.
2. Click the Layers tab and then select the layers that you want to delete.
3. Press Delete, or on the shortcut menu, click Delete.
4. To confirm the deletion, click Yes at the prompt.

Moving and copying objects between layers

Although objects are created on the current layer, you can move and copy selected graphics from one layer to another—within the same document or to another document.

▶ **To move objects to another layer**

1. Press F10, or on the Edit menu, click Select Objects.
2. Select the objects to move.
3. On the Object menu, click Get.
4. Select the layer to move the objects to by clicking an object already on that layer.

▶ **To copy objects to a layer in a different MAN file**

1. In the source MAN file, press F10, or on the Edit menu, click Select Objects.

   To copy all objects on a layer, make all other layers not editable and then press F7 or click Select All on the Edit menu.
2. To copy the objects to the Clipboard, press Ctrl+C, or on the Edit menu, click Copy.

3 In the destination MAN file, make the layer you want the objects to be copied to, the current layer.

  Ensure that a phase that is linked to the layer is editable.

4 To paste the objects onto the layer, press Ctrl+V, or on the Edit menu, click Paste.

Layers and phases in multi-user projects

Each layer in a multi-user project is stored in a separate layer file (a .LYR file) and is referenced by the window definitions. When you open a window definition, MicroGDS reads the list of layer names and looks for the graphics that appear on those layers in the layer files. A window definition can best be described as a set of filters on the graphical data held in the .LYR files.

In the same way that each layer in a single-user document has a unique link number, each layer file in a project also has a unique layer link number. In a project, the layer link number is also used for the file name of the layer. For example, if you create a new layer called ‘Foundations’, MicroGDS assigns it the next available layer link number, for example, link number 78. Consequently, the file name on disk is 78.LYR. It is important that you do not change the name of the layer file (.LYR) in the Windows Explorer. If you do change the name and you open a window definition that references the layer, an error message is displayed.

The layer link numbers in a project can be used when multi-user project files are shared over remote sites. The project manager can allocate layer link number ranges to each site, using the Project Administrator. The Project Administrator is available from the MicroGDS Program menu. For details on how to use the Project Administrator, refer to the utility’s online Help.

Each time a new layer is created, it is added to the project database. Details about all the layers in the project database are recorded in the Document Organizer. Other users can access the layers using the Document Organizer and can copy or link a layer directly to a window definition.

Because a layer can be referenced by more than one window definition, more than one user can open a layer at one time. To prevent more than one user editing the same layer at the same time, when a user opens a layer or creates a new one, they take ownership of that layer and MicroGDS locks the file. This means that one user can edit the file and other users can open it and snap onto the graphics, but cannot edit it at that time. When the owner has finished editing a layer, they can disown the layer which then enables another user to take ownership. This is described further in the later section *Changing ownership of a layer* on page 123.

Note that there is virtually no limit to the number of layers you can create in a multi-user project.

The layer name assistant in multi-user projects

The name assistants enable you to create layers and objects whose names conform to the naming standards in use at your site. Layers and objects have separate configuration files. For information on using object name assistants see Chapter 2, *Exploring MicroGDS*.

The layer name configuration file determines the names to be used for new layers. For multi-user projects, this file can also define the location in which a layer of a particular name should be located.

Any rule in the layer name assistant configuration file can have an alias added to it. When an entry is selected from the top-level names in the Layer Name dialog box, if there is a relevant alias attached and that alias is defined in the project, that alias is selected in the alias location of the dialog box.

To attach an alias to a rule in the file, add the alias in parentheses to the end of the expansion text. For example:

```
ELEC–(Lighting)|Electrical
```

specifies that the alias name Lighting will be selected in the Layer Name dialog box when a new layer starts with ELEC-.

You can also override a previously specified alias for a specific expansion only. For example:

```
ELEC–|ALARM~(Security)|Alarm installation
```

overrides the alias set for the top-level entry for this specific expansion only.

Creating new layers

When you create a new layer in a multi-user project, you can select the layer alias in which to save the new layer.

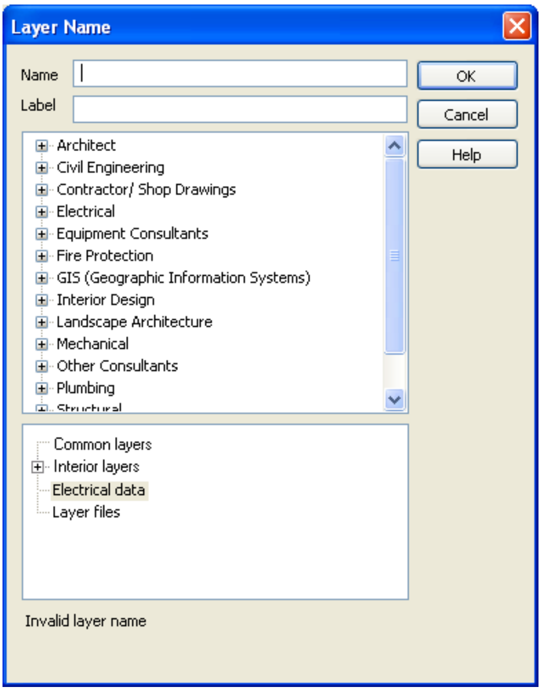
Note that aliases are defined in the project database. For details about creating a project database, see Chapter 16, *Multi-user projects*.

▶ To create a new layer in a multi-user project

1 Press F2, or on the File menu, or click Window, Edit.

2 In the Window Editor, click the Layer tab and then click New Phase & Layer.

The Layer Name dialog box is displayed, for example:



If you are using a layer name assistant, a list of layer categories is displayed in the top list box. If you are not using the name assistant, this box is empty.

3 Specify the name for the new layer.

By default, all new layers are saved in the location defined by the default layer alias set for the workspace. However, if you are using a layer name assistant the layer name configuration file may define the preferred location to which a layer of a particular name should be created. For more details, see the previous section, *The layer name assistant in multi-user projects*.

4 Select the alias that defines the location in which you want to save the layer from the list at the bottom of the dialog box.

Note that you can override the default alias for new layers for the current work session using the Alias Overrides command. For details about overriding the default aliases, see Chapter 16, *Multi-user projects*.

5 Click OK.

Creating a new layer automatically creates a phase to refer to the newly created layer.

Changing ownership of a layer

You can edit layers only if you 'own' them. When you create a new layer, or when you are the first person to open a layer for editing (an editing status of Editable), you are given ownership of the layer. Other users can open the layer as Hittable or Visible, but cannot edit it.

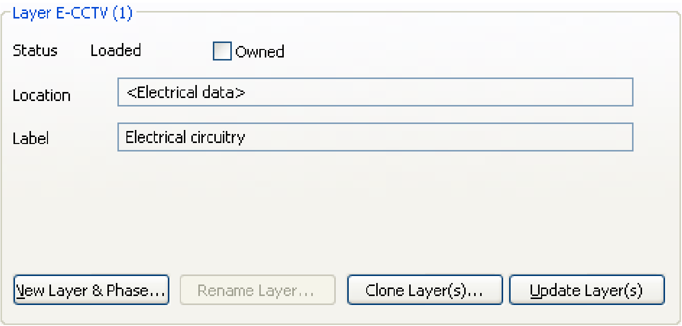
When you save changes to a layer that you are editing, other users can update to see the changes.

▶ **To see recent changes made by the owner**

1 The current owner must first save the window definition that references the layer.

2 Once the window definition has been saved, in the Phases list in the Window Editor, select a phase that references the layer whose changes you want to see.

3 On the Layer tab, click Update Layer(s):



The most up-to-date version of the layer is now available. Any edits that have been saved by other users are displayed.

▶ To change the ownership of a layer

1 The current owner must disown the layer by:

a) selecting a phase that references the layer, and then

b) clearing the Owned check box on the Layer tab

If changes have been made to the layer that have not yet been saved, MicroGDS prompts whether to save the changes or discard them.

2 Another user can then take ownership of the layer by:

a) selecting a phase that references the layer, and then

b) selecting the Owned check box

The ownership of other phases that reference the layer is also changed.

You can also own and disown a layer using the shortcut menu in the Mini Window Editor.

When you disown a layer, the editing status of any editable phases that reference the layer is changed to hittable. Another user can then take ownership of the layer for editing.

Note that when you close a project workspace, all layers are automatically disowned.

Deleting a layer

You cannot delete layers from a multi-user project using MicroGDS. The project manager can delete duplicate and unused layers using the Project Administrator.

The Project Administrator is available from the MicroGDS Program menu. For details on how to use the Project Administrator, refer to the utility’s online Help.

Chapter

5

Entering positions

Specifying positions

Many commands in MicroGDS require you to enter a position. You can specify the position by using a snapcode to snap to existing graphics or snap in free space, or by typing coordinates.

If you make a mistake when specifying a position, you can often use Backspace to cancel the position.

MicroGDS provides the following drawing aids which you will find useful when locating a position.

- snap guides which are drawn automatically for you to snap to
- a grid which you can use to help lay out your drawing
- the *x*, *y*, *z* buttons which you can use to fix a coordinate
- a current position from which you can measure relative coordinates

By default, the position of the mouse pointer is shown in the Position box at the bottom of the MicroGDS window.

This shows that the current position is 664mm along the X axis, 859mm along the Y axis, and 0mm along the Z axis. The D represents the Dot snapcode. The coordinates and snapcode are dynamically updated as you move the mouse.

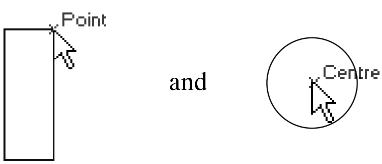
You can change your preferences to show the last hit position instead. For details about changing your preferences, see Chapter 17, *Customizing MicroGDS*.

Note that unless you snap to a graphic that has a Z coordinate, or you explicitly type a Z coordinate, the previous Z coordinate is used. If no graphics in the window have a Z coordinate, you can omit the Z value as it will always be 0.

Using snapcodes

Snapcodes enable you to snap exactly to points on the graphics. This ensures accuracy in drawing, selecting, moving, and placing primitives and objects.

As you move the pointer around, you see snapcodes displayed at their appropriate positions as the pointer passes over them. For example:



MicroGDS tries to anticipate what you are trying to snap to based on the command you are using and the position of the mouse pointer. You can accept the suggested snapcode by clicking the mouse button or choose a different one by typing an explicit snapcode.

When MicroGDS looks for a snapcode to show, a default distance is used which determines how far away from the mouse pointer to look. Usually, this distance will be suitable. You can, however, specify your own hit-radius value, using your preferences.

When there are no graphics to snap to at the pointer position, the Dot snapcode is shown. The coordinates of a Dot snapcode will have an X coordinate, a Y coordinate, and a Z value of 0. If you draw graphics using a Dot snapcode, the graphics will always have a Z value of 0. This is because the Dot snapcode always snaps to the *XY plane*. The XY plane is the default view—looking across the XY plane, with the X axis running left-to-right, and the Y axis running bottom-to-top.

▶ To use a snapcode

- click the mouse button when you see the snapcode displayed
- or, type the initial letter for the snapcode you want

If multiple items lie within the snap radius of the mouse pointer, you can cycle through the graphics by pressing Spacebar. When the item you want to select is highlighted, click the mouse button or type the displayed snapcode.

By default, snapcodes are displayed using the whole word. You can set your preferences to have snapcodes shown using just their single letter reference.

The table below shows the snapcodes with their single-letter reference, highlighted in bold:

Axes	parallel to the current X or Y axes
Box	one of nine justification points around a text box (corners, midpoints, and centre)
Centre	centre of curvature of arc or circle
Dot	position of mouse pointer (when there are no underlying editable or hittable graphics)
End	end of a line
Face	surface of a clump
Grid	points on a grid
Inside	centre of gravity of a 2D shape or centre of the 3D clump face
Line	nearest point on a line
Middle	middle of the nearest line segment
Normal	position on the nearest line to create a ninety degree angle
Origin	origin (hook point) of the nearest object
Point	vertex of a line, or the intersection of two lines
Tangent	position on the nearest line to create a tangent
Vertex	vertex of a line

Note that snapcodes A, O, T, and V are never shown at the mouse pointer; you must always type the initial letter to use them. Note also that G is shown only when the grid is enabled, but is always available when a grid has been defined by typing the initial letter.

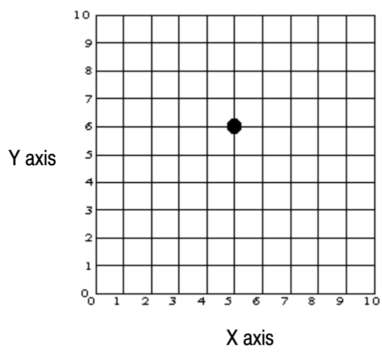
Snapcodes are displayed with an initial uppercase letter. When you type a snapcode, you can type it in uppercase or lowercase.

If you type a snapcode that is not applicable to the current graphics, MicroGDS displays a warning. For example, if you hover over a line segment of a rectangle and you use the Centre snapcode, instead of the Inside snapcode to snap to the centre of the rectangle, MicroGDS displays the message: 'Cannot get centre of straight line'. You can choose to switch off snapcode error messages in your preferences.

Using coordinates

To give exact positions when you are drawing or moving graphics, you can use coordinates.

The principle of coordinates is the same as that used for map references, where a point is represented by two numbers indicating its position along an X axis and a Y axis. The following grid shows this principle.



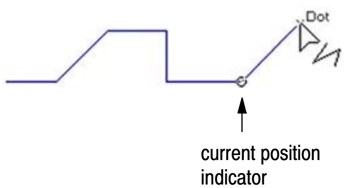
Horizontal measurements are along the *X axis*, and vertical measurements are along the *Y axis*. In this case, measurements along both axes start from the bottom left of the grid and are incremented in the *positive directions* (that is, right along the X axis, and up along the Y axis). The bottom left-hand corner is therefore 0/0/0, known as the origin. The last position of the coordinate (that is, /0) is the Z position. The Z axis runs vertically through the XY plane at the origin.

The spot shown in the example above, is 5 units along the X axis, 6 units along the Y axis, and 0 along the Z axis. In MicroGDS, this point is referred to as 5/6/0 or 5,6,0 (depending on your list separator setting). These are the coordinates of this position.

When you draw and place graphics, it is often useful to move or rotate the axes. You can change the position, scale, and orientation of the axes as required, For details, see Chapter 6, *Using the axes*.

The current position

MicroGDS marks the last hit position in the document window by a small circle. This is called the *current position*. For example:



It is from this position that relative coordinates are measured. Each time you specify a new position, the current position and circle marker move accordingly.

You can change the current position without specifying a position simply by hovering over a point where one of the following snapcodes is shown:

- Centre
- End
- Inside
- Middle
- Box
- Point

Then, when you use a relative coordinate, the position is interpreted as an offset from the current position. For more details, refer to MicroGDS Help.

Setting the units of measurement

When you type in coordinates, if you do not specify units of measurement MicroGDS uses the current set units as shown on the status toolbar. For example:

If you want to enter the coordinates in different units from the set units, you simply enter the correct symbol for the units when you type in the numbers. MicroGDS automatically converts the coordinates to the current set units to draw the item accurately.

For example, you may be drawing an office work area in metres and you want to add a desktop for which you only have the imperial measurements. You could type the desktop's imperial dimensions, followed by the feet symbol (`'`) and MicroGDS would convert the dimensions for you.

The types of units you can use, with examples, are:

mm (for millimetres)	1.2mm
cm (for centimetres)	1.2cm
Inches	1.2″
m (for metres)	0.23m
km (for kilometres)	1.34km
Feet	2.3′
Feet+Inch	2′6.5″
Imperial	2′6 1/2″
Miles	0.23miles
Ken	3.4ken
Shaku	15shaku
Sun	1.4sun
Bu	15bu
Nautical Miles	1.5nmi

You can combine different units, for example `5"/2'` specifies the X coordinate in inches and the Y coordinate in feet.

In addition to setting the type of units you want to work in, you also set the number of decimal places used for measurements. This does not affect the accuracy to which you draw, only the precision to which dimensions are displayed. If you are working in Imperial units, this is the fractional unit. For example, if you want measurements to be displayed to an accuracy of sixteenths of an inch, set decimal places to 16.

Note that each type of measurement unit has a maximum number of decimal places that you can set. The maximum number of decimal places you can set per measurement is given in a table in Help.

If you save the axes for a window definition, the current units and decimal places are also saved. When you open a window definition, its axes are loaded from the window's stored values. You can recall a window's axes which will also restore the units and decimal places. For details about saving and recalling a window's axes, see Chapter 6, *Using the axes*.

MicroGDS stores the coordinates of graphics as double-precision, floating-point numbers. The accuracy of this storage is 1/10,000mm over a space of ±50,000km. So, if you set the scale to 1:1 and are using mm as the set units, the smallest value that you can enter (and that MicroGDS can display) accurately, is 0.0001mm. If you set a scale of 1:50 and are using miles as the set units, the smallest value is 0.000000001 miles.

You can specify the type of units and number of decimal places on the status toolbar or by using the Units command on the Set menu.

▶ To set the units of measurement and decimal places

1. On the Set menu, click Units.
2. At the prompt bar, type the units you require.
3. At the prompt bar, type the number of decimal places you require.

When you set the units, those units are also used, by default, for new dimensions, measurements, lengths, and coordinate positions, unless you change them.

Note that the number of decimal places specified does not affect the number of decimal places for angles. The decimal places for angles are set on the General tab of your preferences. For more details, refer to Help.

Entering coordinates

You can use coordinates whenever MicroGDS requires you to give a position. To enter the position, just start typing the coordinates. As soon as you begin typing, MicroGDS displays the Position prompt bar for you to enter the coordinates.

For example:

When you have typed the coordinates, press Enter or click ✓

There are two types of coordinates you can use:

- Cartesian coordinates
- Polar coordinates

Both Cartesian and Polar coordinates can be *absolute* or *relative*:

- absolute coordinates are measured relative to the current axes

  By default, the set axes have their origin at the centre of the drawing sheet. You can move the axes, and therefore the origin for measuring absolute coordinates, to anywhere on the drawing sheet.
- relative coordinates are measured relative to the current position

  The current position is marked by a small circle. This position is the base point from which relative coordinates are measured.

You enter coordinates in the order X, Y, Z. If you omit a coordinate, MicroGDS uses the last value specified for that coordinate. If you omit the Z coordinate and no Z coordinate has been specified, the Z coordinate is 0.

In MicroGDS, you can use in-line equations when you enter coordinates. MicroGDS solves the equation to calculate the required position. When you enter in-line equations, you must enclose the equation in brackets. Note that there must be no spaces between an arithmetic operator and the coordinate.

For example, to draw a line which has a total length of two existing graphics, you could add the two X dimensions of the graphics together by typing:

(42.5+65.23)/20

MicroGDS solves the equation to calculate the precise length for the line. For a summary of the in-line equations you can use, refer to Help.

Cartesian coordinates

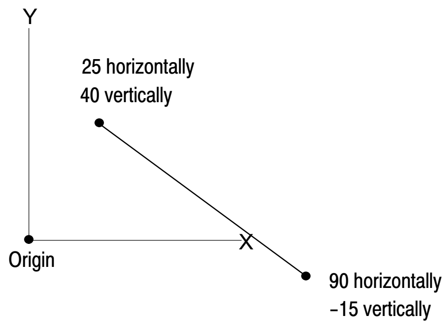
Cartesian coordinates are defined by a distance horizontally and a distance vertically.

Absolute and relative Cartesian coordinates must be separated by a slash (/) or by the list-separator character (often a comma) specified in your Windows Regional Settings.

Any point can be given in absolute coordinates, relative coordinates, or a mixture of both.

Absolute Cartesian coordinates

Absolute Cartesian coordinates are measured from the set axes' origin. For example, a line drawn from 25mm/40mm to 90mm/–15mm appears as:



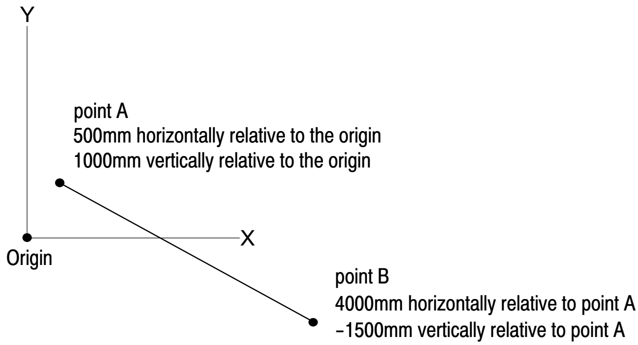
Type absolute coordinates in the format:

- *X*/*Y*/*Z* or *X*,*Y*,*Z*

  For example, 120/20/20 or 120,20,20

Relative Cartesian coordinates

Relative Cartesian coordinates are measured relative to the current position. For example, if you were to draw a line from x=500, y=1000 to x=4500, y=–1500, you might give the first position in absolute coordinates, at 500/1000. Then, to specify the other end of the line, you could enter the position relative to the current position (indicated by the small circle), r4000/r–2500:



Type relative coordinates in the format:

- **r***X*/**r***Y*/**r***Z* or **r***X*,**r***Y*,**r***Z*

  For example, r120/20/20 or r120,20,20

or:

- @*X*/*Y*/*Z* or @*X*,*Y*,*Z*

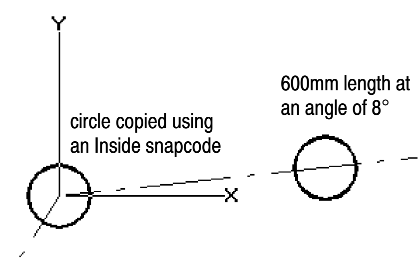
  For example, @120/20/20 or @120,20,20

Polar coordinates

Polar coordinates are defined by a distance and an *angle*. An angle is either an angle value or a bearing (a direction). Angles are measured from the X axis, where normal X has a rotation of 0° (with a bearing of East). Angular units are described in detail in Help.

Absolute Polar coordinates

Absolute Polar coordinates are measured from the set axes' origin. For example, to copy a circle 600mm along a construction line where the angle of the construction line is 8° to the X axis, you could enter 600<8:



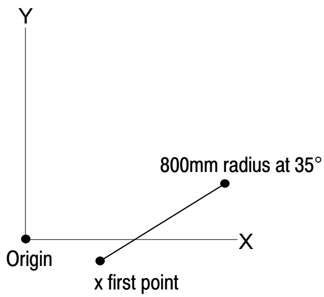
Type absolute Polar coordinates in the format:

- *distance* **<** *angle/Z*

  For example, 850<45/0

Relative Polar coordinates

Relative Polar coordinates are measured relative to the last position. For example, you could draw a line of length 800 at an angle of 35° to the X axis:



Type relative Polar coordinates in the format:

- **r***distance* **<** *angle*/**r***Z*

  For example, r330<90/r0

or:

- *@distance* **<** *angle/Z*

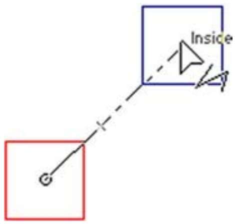
  For example, @330<90/0

Constraining distances

You can specify the next position to be measured from the current position, by typing the distance.

When you type a distance, the next position is constrained in all directions from the current position. As you move the mouse pointer outside the radius of the distance, a ghost chain line is drawn to the current mouse position.

For example, you may want to draw a line 1000 units from the centre of a rectangle, at an angle which intersects the centre of a second rectangle. To do this, start the line command and click in the centre of the first rectangle, then type a distance of 1000 and click in the centre of the second rectangle:



Using shortcuts

If you want to use the same value for X, Y or Z as the previous position, you can omit that coordinate when you specify the new position. For example, //50 means use the same X and Y values as the previous position, and a value of 50 for Z.

If you enter an X and Y coordinate, the previous Z position (or zero if no Z position has been specified) is used. So, /20 means use the same X value as the previous position, a value of 20 for Y, and the same Z value as the previous position. A single slash (/) character means use the same X, Y, and Z values as the previous position.

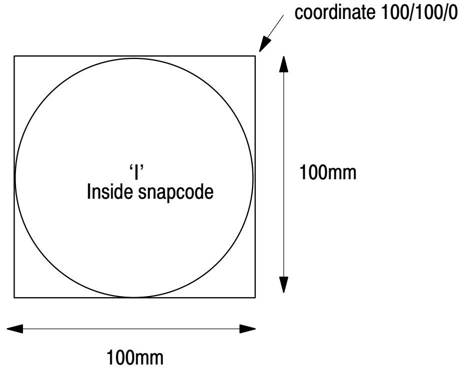
Note that you must use '/' (not ',') to specify the same value as a previous position.

Combining snapcodes with coordinates

You can combine a snapcode with a coordinate. This enables you to specify a coordinate (or an approximate coordinate) and use a snapcode to snap exactly to a given point on the graphics.

To combine a coordinate and a snapcode, you simply type the single-letter snapcode reference. MicroGDS finds the nearest graphic component to the given coordinate. You can use any snapcode that is appropriate to the graphic with which you are working.

For example, to place a 50mm radius circle in the centre of a 100mm by 100mm rectangle, you can use an I (Inside) snapcode:



Type the coordinate and snapcode in the format:

- *coordinate snapcode*

  For example, 100/100/0 i

You must leave a space between the number and the snapcode.

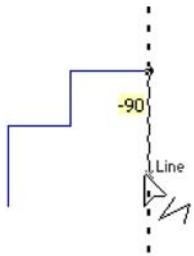
Examples of valid coordinates

50m/75m	absolute Cartesian coordinates in metres
r50/r50/r100	relative Cartesian coordinates in the current set units
r50/100	relative Cartesian coordinates in X, absolute in Y in the current set units
10/5/8	absolute Cartesian coordinates in the current set units
@75,60	relative Cartesian coordinates in the current set units
35m<30,15	absolute Polar coordinates, distance in metres, height in current set units
@250<30	relative Polar coordinates in the current set units
550,225,100	absolute Cartesian coordinates in the current set units
5″,2′	absolute Cartesian coordinates, X in inches, Y in feet

Using snap guides

Snap guides are temporary construction lines that are automatically created for you by MicroGDS. You can use snap guides to help position and align graphics more precisely. Snap guides are displayed whenever you are prompted for a position in a command.

For example:



A set of default snap guides is created at the point of the last snap. They are shown whenever the mouse pointer is within the snap radius. A label indicating the origin of the snap guide is also shown.

You can remove the default angles or define additional angles, using your Snapping preferences. You can also choose whether or not to show snap guides in the Z direction.

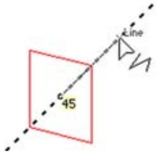
Note that the angles are measured relative to the current axes.

By default, the snap guides are drawn as thin, black dashes. You can change the colour, width, and pattern in which snap guides are displayed in your preferences.

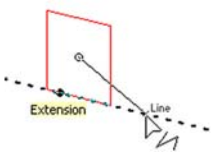
MicroGDS also creates snap guides at the angles and intersections of existing graphics, simply by hovering the mouse pointer over an appropriate position. For example, if you hover over a point, the default set of snap guides are shown. If you hover over a line, Extension or Parallel snap guides are shown through the current position.

If you hover over a snap guide, MicroGDS shows details of its origin in an label. This shows:

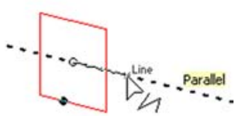
- an angle, if the snap guide was generated from an angle in your preferences



- Extension, if the snap guide is the infinite extension of an existing line

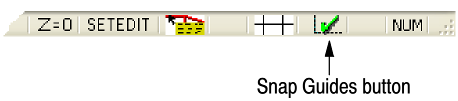


- or Parallel, if the guide was created parallel to an existing line



Note that if snap guides are coincident (for example, an extension and 45° angle), a label is given only for the first guide to be added.

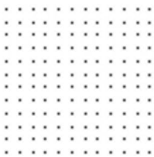
You can switch snap guides on and off, using the Snap Guides button on the Information bar:

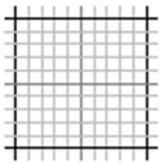


Using a grid

You can use a grid to help you draw and align graphics. You can display the grid or set it to invisible, using the Grid command on the Set menu.

When visible, you can choose the spacing of the grid, and specify whether to display it as dots or as graph paper.

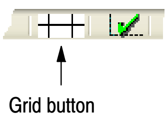




When the grid is visible as graph paper, you can choose a colour for the lines, and also vary the thicknesses of the lines by specifying a change in boldness at set line intervals.

When a grid is defined, the grid is always active, even when invisible. This means that you can always snap to it using the Grid snapcode. You can choose to automatically snap to the grid point nearest the mouse pointer when drawing in free space or only snap to the grid using a G snapcode.

When a grid is defined, you can also show and hide the grid by clicking the Grid button on the information bar:



Note that if you save a window's axes and you have a grid defined, the x and y grid spacing is also saved. For details about saving and restoring a window's axes, see see Chapter 6, *Using the axes*.

For more details about using a grid, refer to MicroGDS Help.

Fixing a position

You can fix the X, Y, or Z (or a combination of them) coordinates so that the next point you pick uses the fixed X, Y, or Z position. You can do this using the ***x y z*** status toolbar buttons:

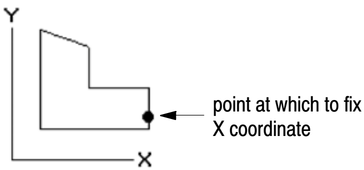
You can use these buttons when you are prompted to give a position. When you click on a status toolbar button, it remains pressed until you specify the corresponding coordinate. When you specify the position, the status toolbar button changes colour to show that the coordinate is fixed. When you specify the next position, the button reverts to its normal state and the coordinate is no longer fixed.

Note that, as an alternative, you can press the X, Y, and Z keys on your keyboard.

The following example shows how you can position the centre of a circle at the intersecting coordinates of an existing graphic, where the intersecting coordinates are not known.

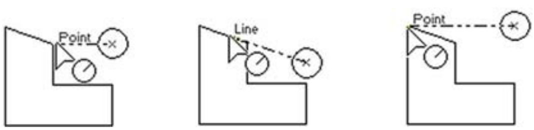
1 Click 

2 To fix the X coordinate, click anywhere on the far right line:



The button changes colour to show that it is fixed.

As you move the mouse pointer away from the fixed X coordinate, a ghost chain line is drawn from the centre of the attached circle to the intersection of the current mouse position. For example:



3 To indicate the Y and Z coordinates, click the appropriate point on the top line.

You can fix any combination of coordinates you require.

You can also force all graphics to be drawn on the XY plane, using the Z=0 button on the information bar. When the button is switched on, MicroGDS also switches on the fix Z button (on the status toolbar) and then switches it off again when you end Z=0 mode. For details about using the Z=0 facility, refer to Help.

Chapter 6

Using the axes

About the axes

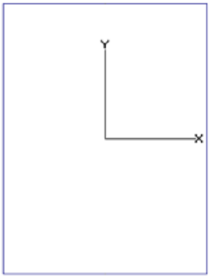
MicroGDS uses *axes* to draw and place graphics. Coordinates are measured from the *origin* of the axes, that is, 0,0,0. Some commands use the rotation of the axis (also called the angle) to place graphics.

Each window definition has its own set of axes; these are used for all views within the corresponding window definition. You can save a window's axes so that you can restore them at any time. For details, see the later section *Saving and restoring a window's axes.*

By default, the axes are set with:

- the origin at the centre of the drawing space
- the X axis horizontal in 2D view (a rotation of 0°), the Y axis vertical, (and the Z axis coming out the screen)
- a scale of 1:1

For example:



MicroGDS does not show the Z axis in a 2D view if it points directly up the world Z axis, out of the paper.

If you have moved or rotated the axes, or changed the axes' scale, you can reset them to their 'normal' position. For details, see the later section *Repositioning the axes*.

You can choose to hide the axes, but note that the axes are never printed even when they are shown.

You can draw lines that will always be parallel to either the X, Y, or Z axis by using the Construct Oline command (orthogonal). This is the same as using the A (Axes) snapcode with the Construct Line command.

Where any part of a graphic lies on the same coordinate as the axes, the associated part of the axes may change colour.

Note that you can also display a grid, for which you specify the grid spacing, to further assist you when drawing and placing graphics. For details, refer to Help.

Showing and hiding the axes

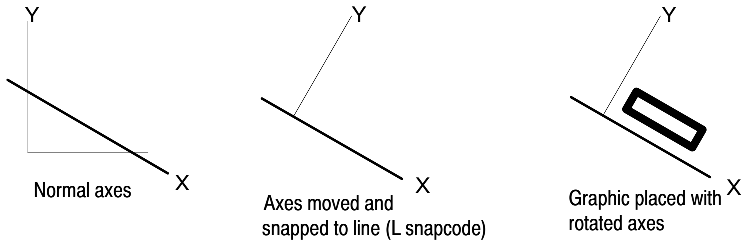
The axes are often useful to have on screen as they can help you when you are drawing and placing graphics. At times, however, you may prefer to work with the axes switched off.

▶ To hide or show the axes

- on the Set menu, click Axes, Show

Moving and rotating the axes

It is often useful to move or rotate the axes. For example, you may want to carry out a series of constructions and measurements at a specific angle to the horizontal.



Text is always drawn parallel to the X axis. You can change the alignment of existing text using the Alter Align command. For details, refer to Help.

▶ To move and rotate the axes

1 On the Set menu, click Axes, Move.

A set of axes are attached to the pointer.

2 To specify the new origin:

- click on the drawing at the required position
- or, type the coordinates of the position, relative to the existing axes
- or, if you are working in 3D you can press Tab to use the orientation of a 3D clump face, and then click on the face at the required position

  For details about working in 3D, see Chapter 9, *Working in 3D*.

MicroGDS now prompts you to specify the position of the X, Y, and Z axes, in turn. In each case, you can:

- cycle through the possible axes, in the order X, Y, Z, –X, –Y, and –Z by pressing Tab
- cycle through the possible axes in reverse order, by pressing Shift+Tab
- retain the current rotations, by pressing Esc

3 Specify the position of the axes.

The axes are moved and the rotation is shown in the Angle box on the status toolbar.

If you know the exact angle you require, a quicker way to rotate the axes is to specify the angle of the X axis (relative to its normal position) using the Angle box on the status toolbar:

This is the angle through which the X axis will be rotated from the normal position (horizontal on the screen). A positive angle usually indicates an anti-clockwise rotation. However, you can change this on the General tab of the Preferences dialog box. For details about changing your preferences, see Chapter 17, *Customizing MicroGDS*.

When you rotate the axes, MicroGDS uses an angles file to determine the strings and corresponding angles. You specify the angles file to be used in your preferences. For details about creating an angles file, see Chapter 17, *Customizing MicroGDS*.

You can also use the Axes Spin commands to rotate the axes. Using Axes Spin Z is similar to typing in the Angle box—the axes are rotated in the XY plane, about the Z axis. However, when you use the spin commands, the angle you specify is measured from the current position. Note that if you spin the axes about the X or Y axis, the Angle box displays Skew to indicate the rotation in three dimensions.

For more details, refer to the Axes commands in Help.

Note that when you are working in 3D, it is often useful to rotate the axes to a particular orientation before you construct 3D graphics (or before you copy a 3D graphic to the Clipboard). For details about working in 3D, see Chapter 9, *Working in 3D*.

Repositioning the axes

In addition to simply moving the axes as described above, you can reposition the axes in a number of ways. This section describes how to reset the axes to normal, and how to centre the axes.

For details on the commands you can use to change the position, the origin, and the rotation of the axes, refer to Help.

Note that you can also move an object and change its axes rotation using the Object Reposition command. For details, refer to Help.

▶ To set the axes and scale to normal

- on the Set menu, click Axes, Normal

  This resets the axes to the drawing origin and sets the scale to 1:1.

  If you have not moved the drawing origin, the axes are set to their normal position. For more details about the drawing origin, see Chapter 2, *Exploring MicroGDS*.

▶ To centre the axes on the drawing sheet

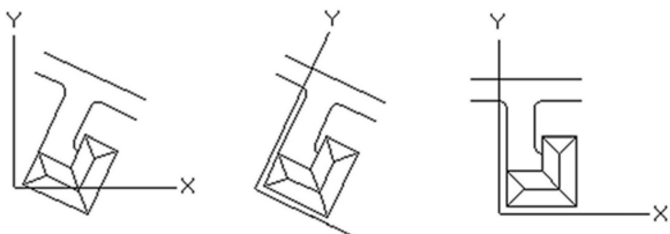
- on the Set menu, click Axes, Centre

  This resets the axes to the centre of the drawing sheet, but leaves the scale as you have set it.

Rotating the view

You can rotate the view to align all the graphics in the window to the XY plane. This enables you, for example, to work more easily with graphics drawn at different angles. This is the equivalent of actually turning the paper around to look at a different angle of the drawing.

When you have finished, you can revert the view to its real-world orientation. For example:



original view rotated axes view aligned to XY axes

▶ To rotate the view

1 Set the angle at which to rotate the view.

  The angle of the XY axes define the orientation for the view.

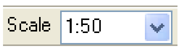
2 On the View menu, click Align to Set XY Axes.

Axes scale

In MicroGDS, you can draw at full size (that is, 1:1), or you can use different scales for different objects just as you would if you were drawing on a piece of paper. For example, you may want to draw an office cubicle at a scale of 1:50 on one layer, and then draw a particular work area, for example, the desk space at 1:10 on another layer. You simply set the scale before drawing the first object and then change the scale before drawing the next object.

Changing the scale

New graphics are drawn at the current scale. The current axes' scale is shown on the status toolbar:



You can change the current scale at any time. When you change the scale, any new objects are drawn at that scale until you change it again. Existing graphics are left unchanged. This means that you can have different objects, at different scales, together in one document.

▶ To change the scale of the axes

- in the Scale box on the status toolbar, type or select the scale from the list

Or:

1 On the Set menu, click Axes, Scale.

2 Enter the scale you require at the Axes scale prompt.

When you specify a scale, MicroGDS uses a scales file to determine the strings and corresponding scales. You specify the scales file to be used in your preferences. For details about creating a scales file, see Chapter 17, *Customizing MicroGDS*.

When you are drawing, you input real-world dimensions. MicroGDS converts the dimensions and draws to the set scale. For example, to draw a desk of 1800mm x 800mm, you would construct a rectangle, giving its dimensions as 1800 and 800, no matter what the current set scale is.

More information about objects and their scale and rotation is provided in the following section.

Saving and restoring a window's axes

Each window definition in a document has its own set of axes. By default, this is the normal axes. If you move, rotate or change the axes' scale, you can save the axes for the window. You can then restore the window's saved axes later.

▶ **To save a window's axes**

- on the View menu, click Save Window Axes

Note that a window definition stores the following values:

- the axes origin, rotation and scale
- the units and decimal places
- the x and y grid spacing

The axes are saved in memory. To save the window axes in the window definition, you must save the document.

▶ **To restore a window's saved axes**

- on the View menu, click Restore Window Axes

If you are using a grid, the grid location and orientation are reset to align to the restored axes.

Axes and objects

Each object has its own internal axes' scale and rotation. When you create an object, you set the hook point for that individual object. The hook point is the 'handle' of the object which you can use to pick up and place the object. It also defines the origin of the object's internal axes.

When you create an object, the current scale and rotation of the axes are saved along with the new object. If you subsequently rotate or scale the object, its internal axes are also rotated and scaled. The current axes are unaffected.

The following drawing of an articulated lorry consists of two objects: one object is the cab, and the other object is the trailer. The objects were drawn as shown in Figure 1, and then the cab was rotated as shown in Figure 2. The cab will have its axes saved as shown in the second figure.

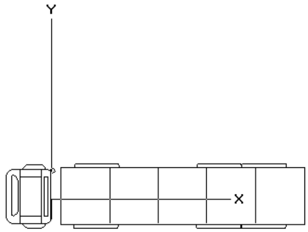


Figure 1

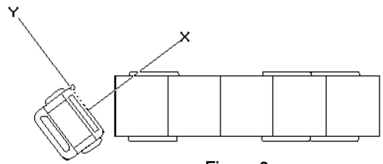


Figure 2

If you later want to modify an object, you may want to set the current axes to be the same as the object's axes.

You can use the Query window to obtain the scale of an object's axes and its angle. For details, see Chapter 13, *Getting information*.

▶ **To set the current axes to the object axes**

1 On the Set menu, click Axes, Reset.

2 Click on the object to set the axes to.

MicroGDS aligns the current axes rotation with the selected object, puts the origin of the axes at the object's hook point, and sets the scale to be that of the object.

If the object was the current object, it remains the current object. If the object was not the current object, this does not make it current.

Scale with measurements

MicroGDS provides commands for you to measure graphics. For example, you can measure:

- the distance between any two points
- the angle between two lines
- the radius of an arc or a circle

For some measure commands, such as measuring the angle between two lines, the scale is not important. An angle of 90° will be 90° at any scale.

For other commands, for example, when you measure the area of a graphic, the scale can be important. When you measure the area of a graphic, MicroGDS calculates and reports the area of the graphic at the set scale and at the object scale.

Note that when you measure graphics, MicroGDS displays the results in a Query Measurements dialog box if the Query dialogues check box is selected in your preferences. For details about setting your preferences, see Chapter 17, *Customizing MicroGDS*.

More details about the measure commands, and other facilities that you can use to access information about the graphics in your document, are given in Chapter 13, *Getting information*.

Using the axes with cut and copy

When you cut or copy graphics to the Clipboard, MicroGDS stores the location of the graphics relative to the current axes' origin, and this is used when you paste a graphic back into a window. This is important when you replace one object with another using the Object Replace command, or place one object on top of another using the Object Superimp command.

You can replace multiple copies of one object with another, and superimpose one object on top of multiple objects.

If you move the axes before you paste graphics back into the window, the graphics are pasted back at the position, scale, and rotation relative to the current axes origin.

▶ **The basic steps for replacing objects are**

1 Select the new object.

2 Copy it to the Clipboard (using the Edit Copy command).

3 Select the range of objects to be replaced.

4 Replace the objects with the new object (using Object Replace).

When you replace the old object, the new object is positioned so that the origin of the axes when it was copied to the Clipboard is placed at the point of the old object's hook point. To avoid having objects displaced, use the Set Axes, Reset command to reset the axes onto the new object before copying it to the Clipboard.

Replacing objects is described in Help and an example is also given in Chapter 3, *Working with primitives and objects*. For details about superimposing objects, refer to Help.

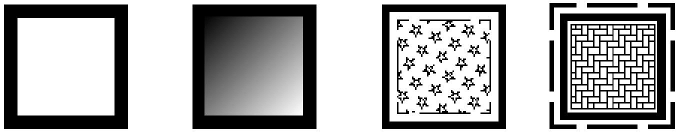
Chapter 7

Working with linestyles

Linestyles

All line primitives have a linestyle, which defines what the line looks like. A linestyle is made up of one or more *strokes*. Each stroke defines specific characteristics of the linestyle. For example, one stroke can define the line thickness, another can define the fill properties, and a third stroke could define an offset pattern.

For example:



one stroke linestyle | two stroke linestyle | multi-stroke linestyle, with a symbol fill | multi-stroke linestyle, with a hatch fill

MicroGDS provides a variety of built-in linestyles for you to use or modify. When you create a new document, two linestyles are always available: DEFAULT and BLANK.

- DEFAULT is a basic, standard linestyle which draws with a single-stroke line. It is shown as one pixel wide on the screen, and it will print in the thinnest line available to your printer (unless you select a different pen width when you print).
- BLANK is an invisible linestyle used by MicroGDS, for example, for the borders of raster images. You might use it, for example, to hide construction lines.

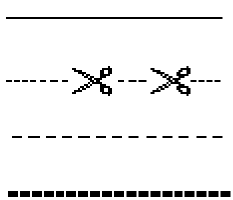
The DEFAULT and BLANK linestyles are stored separately from any linestyles and cannot be saved, deleted, or replaced.

The thickness of lines shown in the graphics window will vary according to how much the view is zoomed. Note that the thickness of lines is dependent on the co-ordinate space setting for the linestyle stroke, as described in *Defining strokes* on page 167.

You can add a style to a document by selecting a built-in MicroGDS style or by creating your own.

MicroGDS linestyles

MicroGDS provides a number of built-in linestyles, for example:



DEFAULT

SCISSOR

DASHA

14M

When you select a linestyle, MicroGDS shows you a sample of the selected linestyle. You can use a linestyle as it is, or you can modify it and save it for future use within the document.

Although MicroGDS linestyles are stored separately from your own and cannot be overwritten, you can, however, accidentally overwrite amended versions if you use the same name as that of a built-in linestyle. For example, if you select SCISSOR, change the symbol size and save it with the same name, your version of SCISSOR takes effect. If you later reselect SCISSOR from the built-in styles and save it to the same name, your version is overwritten and all graphics using this linestyle now use the characteristics defined in the MicroGDS version.

Accessing linestyles

For single-user documents, new linestyles are stored in the document. They are saved when you save the document.

You can also access linestyles from external style files (called LINES.STY). To do this, you specify the folders in which the LINES.STY files are located using the Style Search Path command on the File menu. You can add more than one folder to the style search path, but only one LINES.STY file can be stored in each location. If you modify and save a style from an external style file, it is saved in the document. For more details about style files, see Chapter 2, *Exploring MicroGDS*.

For multi-user projects, all linestyles are stored in external style files (LINES.STY). New linestyles are saved in the first LINES.STY location on the style search path. A linestyle is saved in the style file as soon as you save the style, even if you do not save the project.

You can access linestyles available to a document from the Document Organizer and also from the status toolbar.

▶ To access linestyles using the Document Organizer

1 On the Document Organizer, click the Styles tab:

2 Double-click the Linestyles category, or click the plus sign (+) to the left.

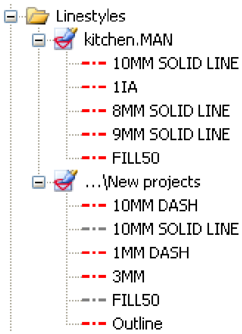
A list of all locations from where you can access linestyles is shown:

- for a single-user document, the name of the document with which you are working is shown first, followed by the path of each style file defined in the style search path if any
- for a multi-user project, the name of the first style file defined in the style search path for the project is shown first, followed by the path of each subsequent location defined in the project

If a LINES.STY file exists in the location defined for styles and fonts in your file location preferences, this location is shown last in the list. This enables you to reference a set of global style files that are available to all your documents. For more details, refer to Help.

3 To display a list of linestyles in a location, double-click the location or click the plus sign (+) to the left.

For example:



Linestyles are prefixed by an icon. The colour of the icon determines the availability of the style:

- linestyles that can be used in the document are prefixed by a red icon
- linestyles that are not currently available to the document are prefixed by a grey icon

  (A linestyle is unavailable if a linestyle of the same name already exists in a location higher in the style search path.)

4 To preview a linestyle, select the style and then, on the shortcut menu, click Toggle Preview.

▶ To access linestyles from the status toolbar

- on the Line box on the status toolbar, click the arrow

  All styles available to the current document are listed.

Adding a linestyle

You can add a new linestyle to a document by saving one from those available with MicroGDS or by creating your own.

When you add a linestyle, it immediately becomes current and any selected graphics are assigned that linestyle. Any new graphics you draw are also assigned the current linestyle.

Note that if you open a document in which there are missing linestyles, for example, if they have been deleted, MicroGDS reports the error conditions to the Problems dialog box. You can use the dialog box to correct the errors by:

- changing the styles and fonts folder
- editing the style search path
- adding new linestyles

This section describes how to add a new linestyle to your document. For details about the characteristics that make up a stroke, see *Defining strokes* on page 167.

▶ To add a linestyle using the Document Organizer

1 Click the Styles tab on the Document Organizer, and then double-click the Linestyles category.

2 Do one of the following:

   - to create a new linestyle based on DEFAULT, select the Linestyles category and then, on the shortcut menu, click New
   - to create a new linestyle based on an existing style, select the linestyle on which to base the new style from the required location and then, on the shortcut menu, click New based upon

   MicroGDS displays the Linestyle dialog box.

   The dialog box shows you a sample of the linestyle, and the characteristics of the first stroke in the linestyle. Each stroke is represented by a separate tab.

3 If you want to use or amend a linestyle other than the current one, do one of the following:

   - to base the linestyle on an existing style in the document, click ‘Document style’, and then select the linestyle on which to base the new style from the list
   - to base the linestyle on a built-in style, select ‘MicroGDS style’, and then select the linestyle on which to base the new style from the list

   You can use a built-in linestyle as it is, or you can modify it and save it with a different name.

   If you select a style from a list, all settings in the Linestyle dialog box are reset to those stored with the selected linestyle.

4 Specify the settings in the Linestyle dialog box, as required.

5 Check that the linestyle is what you require in the Sample box.

6 Save the linestyle:

- to save the linestyle with the existing name, as shown on the title bar, click Save
- to save the linestyle with a new name, click Save As, type the name in the Style Name dialog box and click OK

The name must comply with the MicroGDS naming rules, as described later in this section. You cannot use the name DEFAULT or BLANK.

The named linestyle is made current and its name is shown in the Line box on the status toolbar.

▶ To add a linestyle using commands

1 Deselect all graphics.

2 From the Line list on the status toolbar, select the linestyle on which you want to base your new linestyle.

3 On the Styles menu, click Linestyle Modify

4 Specify the settings in the Linestyle dialog box, as required.

5 Check that the linestyle is what you require in the Sample box.

6 Save the linestyle as described in step 6 in the previous procedure.

Rules for naming linestyles

- a linestyle name can contain up to 256 characters
- names can include spaces, except at the beginning or end of the name
- linestyle names are case sensitive, so ‘fill 100’ and ‘FILL 100’ are two different linestyles
- you cannot save to the name DEFAULT or BLANK

Changing the linestyle

When you add a linestyle, it immediately becomes current. To use another linestyle, you select it from those available with the document. When you change the linestyle, you can:

- change the current linestyle
- change the linestyle of selected graphics
- change the linestyle of all graphics using a specific linestyle
- override the linestyle of all graphics for a particular phase

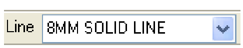
You can also change the linestyle of part of an existing primitive, using the Path, Linestyle command on the Alter menu. For details, see Help.

When you change to another linestyle or change the linestyle of an existing graphic, MicroGDS automatically refreshes the window so that you can see its effect.

If you are working with a complex drawing, redraws may take some time. You can speed up redraws by changing the *view quality* options. These determine how linestyles, text, and selected graphics are to be displayed. Note that the quality settings also affect the printed drawing. For details on setting the window quality, refer to Help.

Changing the current linestyle

The current linestyle is assigned to new line primitives that you draw. The name of the current linestyle is shown in the Line box on the status toolbar.



If you have selected several graphics that have different linestyles assigned, the Line box is blank.

Note that each time you click a line primitive, the current linestyle changes to that primitive's linestyle.

▶ To change the current linestyle

1 Select any graphics for which you want to change the linestyle.

2 Do one of the following:

- from the Linestyle list on the Properties window, select the linestyle
- from the Styles tab on the Document Organizer, select the linestyle and then click Set as current on the shortcut menu
- from the Line list on the status toolbar, select the linestyle
- on the Set menu, click Linestyle, type the name of the linestyle in the prompt bar and press Enter

  The linestyle name must match a linestyle that you have already added to the document.

Changing the linestyle of existing graphics

▶ To change the linestyle of existing graphics

1 Select any graphics for which you want to change the linestyle.

2 Select the replacement linestyle, as described in the previous section.

Changing the linestyle globally

MicroGDS makes it very easy to change the linestyle of a number of graphics drawn using one linestyle to another linestyle. You simply restrict editing to a specific linestyle.

▶ To change the linestyle globally

1 Press F3, or on the Set menu, click Edit.

You can also use the SETEDIT button on the information bar (at the bottom-right of the MicroGDS window) to set restrictions:

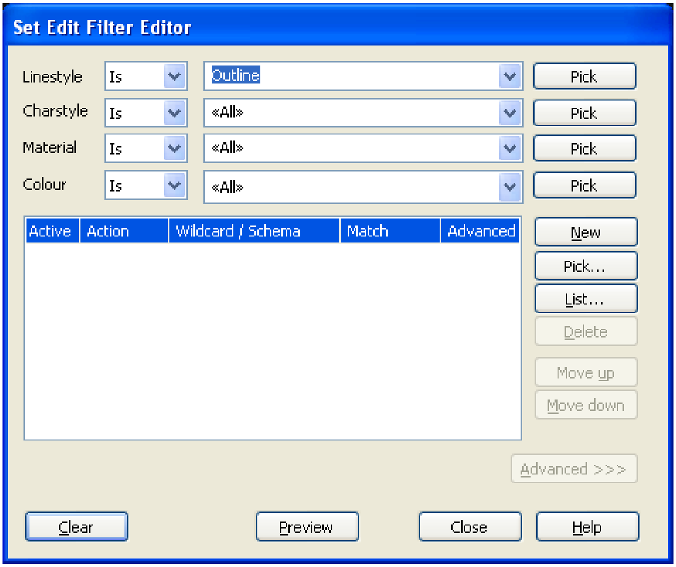
- if SETEDIT is not currently enabled, click the button

  If SETEDIT is enabled, a single click of the button toggles the current editing restrictions on and off
- if SETEDIT is currently enabled, double-click the button

The Set Edit Filter Editor is displayed.

2 From the Linestyle list, select the linestyle to which you wish to restrict editing.

Alternatively, click the Linestyle Pick button and click a line primitive to which the style is assigned.



3 Click Close.

When you have set up your restrictions, the SETEDIT button on the information bar is pressed in and the text changes colour. You can toggle the editing restrictions on and off by clicking the button.

4 Ensure that you are in Select Primitives mode by pressing F9, or on the Edit menu, click Select Primitives.

5 In your graphics window, select the relevant primitives; the status toolbar shows you the number of primitives selected and that they all use the same linestyle.

You cannot select any primitives that do not use the specified linestyle.

To select all primitives drawn in the linestyle, press F7, or on the Edit menu, click Select All.

6 Select the replacement linestyle as described in *Changing the current linestyle* on page 161.

Remember to clear the editing restriction when you have changed the linestyle.

Overriding the linestyles for a phase

Usually, you assign linestyles to individual primitives. This means that a phase can show primitives in many different linestyles. You can, however, force all line primitives within one phase to be displayed and printed in a single linestyle.

▶ **To override the linestyle for all graphics in a phase**

1 Press F2, or on the File menu, click Window, Edit.

2 From the phases list in the Window Editor, select the phase whose linestyles you want to override.

3 From the Linestyle Overrides list on the Phase tab, select the linestyle you wish the graphics in the phase to use.

   All line primitives within the selected phase are now drawn using the chosen linestyle. Note that although they appear on screen and print using the linestyle override, their original linestyles are unchanged and still appear in the Line box on the status toolbar.

   You can also see the name of the linestyle assigned to a line primitive in the InfoTip, if you have hover highlighting on the Information bar switched on. For details about hover highlighting, see Chapter 3, *Working with primitives and objects*.

   If you later remove the override, the primitives are drawn using their original assigned styles.

You would probably use this feature as a temporary override. To change the linestyle permanently, you would make the phase the only phase editable, then select all the graphics, and change the linestyle.

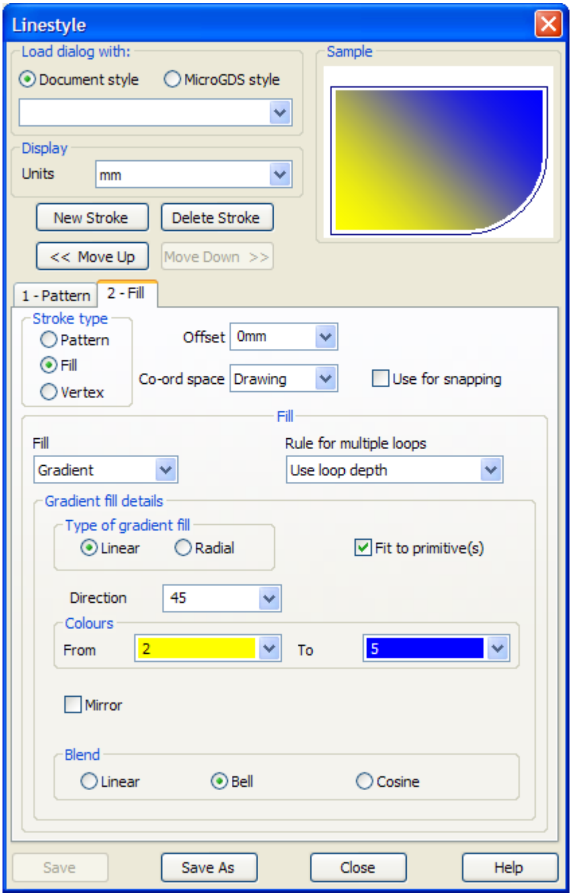
Using strokes

Linestyles are made up of one or more strokes. There are three types of stroke: pattern, fill, and vertex. Each linestyle can have up to 20 strokes.

For example, you might define two pattern strokes, each with a different line thickness and a different colour, to create an overlay effect.

You can use symbols in linestyles, for example, to fill the area of a closed-line primitive with a pattern. When you use symbols in linestyles, you select the symbol from a font. You can also create new fonts to define your own symbols. For more details, see *Using symbols in strokes* on page 166.

You use the Linestyle dialog box to add, delete, and reorder strokes in a linestyle. For example:



Creating new strokes

When you create a new stroke in a linestyle MicroGDS adds a new tab to the Linestyle dialog box for you to define the characteristics of the stroke. Each stroke tab is assigned the next sequential number; this number defines the order of the strokes in the linestyle.

▶ **To create a new stroke in a linestyle**

1 On the Linestyle dialog box, click the appropriate tab for the stroke on which to base the new stroke.

MicroGDS creates a new stroke that is a copy of the currently selected stroke.

2 Click New Stroke.

A new tab to define the stroke is added to the dialog box.

3 From the Stroke type box, select the type of stroke to define.

4 Define the characteristics for the stroke, as described in *Defining strokes* on page 167.

Reordering strokes

The order in which strokes are drawn may be important. For example, if one stroke defines a black fill and another stroke defines a white criss-cross hatch, you would need to place the black fill before the white hatch so that the hatch pattern is visible.

▶ **To reorder the strokes in a linestyle**

1 On the Linestyle dialog box, click the tab of the stroke to reorder.

2 Click << Move Up or Move Down >>, as required.

Deleting strokes

▶ **To delete a stroke from a linestyle**

1 On the Linestyle dialog box, click the tab of the stroke to delete.

2 Click Delete Stroke.

Using symbols in strokes

When you use symbols in a stroke, the set of symbols that is available depends on the selected font. MicroGDS supplies a large variety of fonts that you can use in your linestyles and charstyles. The folder in which MicroGDS looks for fonts is set in your File Location preferences. For details about setting your file location preferences, refer to Help.

If you want to use special characters or symbols in a linestyle that are not available in the supplied MicroGDS fonts, you can create your own fonts from graphics.

In MicroGDS, there are two types of font files: CV7 and CV6:

- CV7 fonts save many types of primitive as part of the font graphics. All linestyle properties, such as filled strokes, multiple colours, and thickened offsets are retained. Other graphics, such as text primitives, and raster primitives, are also saved.
- CV6 fonts save only line primitives as part of the font graphics. All linestyle properties and other graphics, such as text primitives are ignored.

A CV6 symbol is presented in a linestyle as having a font and a size.

A CV7 symbol is presented in a linestyle as having a font and a scale, however, it can also have a size. To specify a size, you assign the special MGDS_SymbolSize attribute to the symbol objects. For example, if you have a church symbol that has a base width (and MGDS_SymbolSize attribute) of 5mm, and you specify a size of 10mm in the Linestyle dialog box, the symbol is enlarged by a factor of 2.

For more details on fonts and creating MicroGDS CV6 and CV7 font files, refer to Help.

Defining strokes

When you add or modify a linestyle, MicroGDS displays the Linestyle dialog box (shown on page 165). The name of the current linestyle is shown in the title bar of the Linestyle dialog box. If you are creating a new linestyle or if there are no linestyles saved in the current document, the title bar does not show a linestyle name.

The top part of the dialog box contains:

- Document style and MicroGDS style options
- the linestyle name if you are basing the linestyle on an existing document style or on a MicroGDS linestyle
- the units in which to display and interpret measurements in the dialog box
- an example of the linestyle in the Sample box
- buttons to create, delete, and reorder strokes

Common stroke properties

Each type of stroke (Fill, Pattern, and Symbol) has a number of common properties. These define:

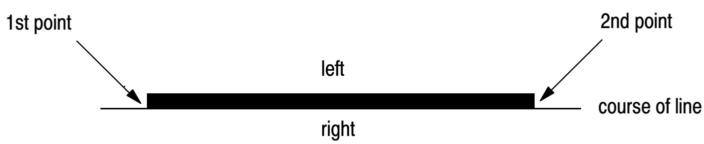
- an offset
- a colour
- a co-ord space
- whether to resolve snaps for this stroke

Stroke offset

When you draw a line, the line goes through the given positions. You can offset the drawn line to the left or right.

Use the Offset box to specify an offset to the left or right of the drawn line, in the display units. Enter a positive value to offset the stroke to the left, a negative value to offset the stroke to the right.

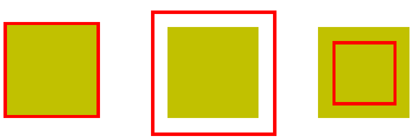
For example, the stroke for the line below has a positive offset and so is offset to the left of the line:



With offset lines, left and right is determined by the direction in which you draw the line.

When you use the Rectangle, Ellipse, or Circle commands, the graphics are drawn anti-clockwise. This means that a stroke with a negative offset is offset outside a rectangle or circle, and a stroke with a positive offset is offset inside.

For example:



Stroke colour

Note that the Colour option is not available with Raster and Gradient fill strokes. The colours for a Raster fill are defined in the raster image; the colours for a Gradient fill are defined by two colours which are specified in the Gradient area. For more details, see *Creating filled strokes* on page 176.

By default, MicroGDS draws graphics using the colour defined for the current phase.

You can use the colour list to specify the colour of a stroke:

- to use any colours defined in the stroke's components, select Neutral

  If you select Neutral, MicroGDS uses the colours embedded in the components that make up the stroke, if any. For example, if you use a symbol for a filled stroke and the symbol primitives were created in green, the fill symbol is drawn in green. However, if you select red in the Colour box, the fill symbol is drawn in red.
- to use an explicit colour for the stroke, select an existing colour from the list

  If you want to assign a colour that is not available in the list, click the 'Select colour' entry. Then, select your colour using the Select Colour dialog box. For details about using the Select Colour dialog box, see Chapter 3, *Working with primitives and objects*.

To use the colours in a linestyle, ensure that the Use style colours check box is selected in the Window Editor for the phase that uses the specified linestyle.

Note that if the primitive has an explicit colour set (using the Set Colour command), by default the primitive is drawn in the set colour and any stroke colours are ignored. To use the stroke colours in a linestyle, clear the Use primitive colours check box in the Window Editor.

For details about changing the colour of the graphics in a phase, see Chapter 4, *Using layers and phases*.

The co-ordinate space of a stroke

Use the Co-ord space options to control the way in which the stroke is drawn. Select the type of co-ordinate space to use:

- Object

  Use Object space if you want the linestyle graphics to move, rotate, and scale along with their object.

- Drawing

  Use Drawing space if you want the linestyle graphics to stay in proportion when you zoom in and out; the graphics are not tied to the object scale.
- Output

  Use Output space if you want the linestyle graphics to always be the same size, irrespective of scale and zoom.

  In a print layout view, any graphics that have linestyles assigned that use output space are drawn so that they are a scaled version of what will appear on the paper. For details about print layout views, see Chapter 2, *Exploring MicroGDS*.
- Version 6

  Use Version 6 only if you want the same results as in earlier MicroGDS releases.

For further details about co-ordinate space, and tips for choosing the right co-ordinate space, refer to Help.

Stroke snapping

Use the Use for snapping option to specify whether to resolve snaps for this stroke. When selected, snaps for patterned strokes are resolved at each edge of the thickened stroke. For other strokes types, snaps are resolved along their offset. All lines can be snapped along their base line (at offset zero). Note that the setting of this option is ignored for Output space styles, which are never snapped to.

Creating patterned strokes

Use a pattern stroke to create complex linestyles using combinations of dots, dashes, and symbols embedded in the line. You can also change the line thickness and specify the *phasing* for the pattern.

Stroke thickness

Use the Thickness box to specify the thickness of the stroke, in the display units. The stroke can also be offset (to the right or left) as specified in the Offset box.

Note that you can increase the width for unthickened lines when you print. For example, if you are using a high-resolution printer or if you intend to photocopy a drawing, this may help to ensure that the lines are visible. For details about printing a view, see Chapter 12, *Printing and plotting*.

When you specify a thickness, the value you give is a real-world value. When it is printed, the line will be drawn according to the type of co-ordinate space selected, as described earlier.

Patterns

You define your pattern, using the pattern buttons, in three parts: the start, middle and end. The start and end are drawn once per line primitive, and the middle pattern is repeated in between. If necessary, the middle can be stretched to fit the line.

Use the pattern buttons to build up your pattern:

 draws a line of a specified fixed length

 draws a space of a specified fixed length

 draws the specified character or symbol from the selected font

 draws a line of a variable length (Middle only)

 draws a space of a variable length (Middle only)

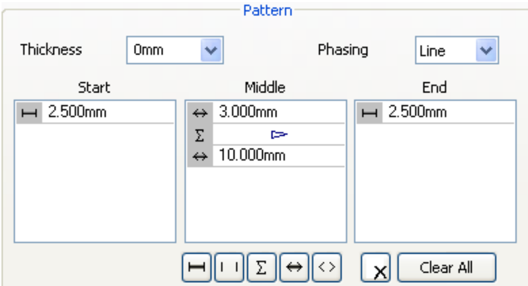
Lines and spaces of variable lengths are called *elastic* components. You can specify the length for elastic components, but they can be stretched to fit the line if necessary. The elastic components are varied according to the *phasing* of the linestyle, described in the following section.

▶ To define the start, middle, and end components

- drag the required pattern buttons into the appropriate list

  MicroGDS calculates the line using the start and end components of the pattern. Therefore, elastic lines and spaces can be used only in the middle of the pattern.

For example:



You can set the length for fixed and elastic length lines and spaces; the length of a symbol is regarded as zero. If you want to leave a gap in the pattern for the symbol, add spaces to either side of the symbol.

▶ To change the length for lines and spaces

1 Double-click the component and then select or type the length you require.

For elastic components, the value you enter defines the 'unstretched' length.

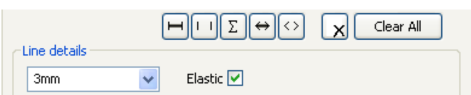
If you type the length in different units from the display units shown at the top of the dialog box, MicroGDS automatically converts the measurements to the display units to draw the line. For details on the types of units you can use, see Chapter 5, *Entering positions*.

2 To accept the new value, click ✓

▶ Alternatively

1 Click the line or space component whose length you want to change.

The Linestyle dialog box displays options for changing the properties of the component. For example:



2 To change the length, select from the list or type the length you require.

3 To change a fixed component to an elastic component, select the Elastic check box.

To change an elastic component to a fixed component, clear the Elastic check box.

▶ To change a symbol character

1 Double-click the symbol component and then select the character you require.

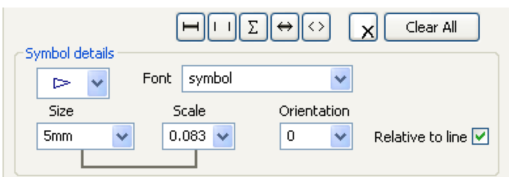
The characters available from the list are determined by the current font. If the symbol you require is not available in the current font, you can choose another font.

2 If the symbol you require is available in the current font, accept the new value by clicking ✓

▶ Alternatively

1 Click the symbol component whose details you want to change.

The Linestyle dialog box displays options for changing the properties of the symbol. For example:



2 To change the character, font, size, and orientation for the selected symbol, select the value you require from each of the boxes.

Note that the fonts that you can choose from depend on the font files available in your font path set in your File Location preferences.

- If you are editing the details of a MicroGDS CV6 font, type the size for the symbol or select from the list.
- If you are editing the details of a MicroGDS CV7 font, type the scale for the symbol or select from the list instead.

  Note that if a symbol size attribute is assigned to the symbol, a Size box is also shown, displaying the specified symbol size. (The Size and Scale boxes are interlinked, that is, if you change one value, the other changes accordingly.)

3 To draw the symbols at the specified orientation, relative to the line, select the Relative to line check box.

To draw the symbols at the specified orientation, relative to the chosen co-ordinate space, clear this check box. For details about the co-ordinate space settings, see *Defining strokes* on page 167.

For more information about the symbol details, refer to Help.

▶ To remove an individual component

- press Delete or drag the component out of the list

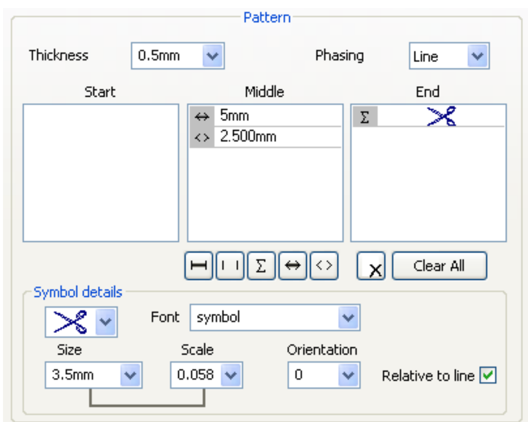
▶ To remove all components in a list

- drag  into the appropriate list

▶ To remove all components in all lists

- click Clear All

The following example shows how you would define a linestyle that repeats a pattern of fixed-length lines and fixed-length spaces throughout the line, and ends each line primitive with a scissors symbol:



If you draw an ellipse using this linestyle pattern, it appears as:

Phasing

Stroke patterns can include variable length, or *elastic*, components. You can specify the length for elastic components, but they can be stretched to fit the line if necessary. The elastic components are varied according to the *phasing* of the pattern. Phasing is commonly used to ensure that the vertices of a line primitive appear at a line, and not at a space in the pattern.

Note that elastic components are only applicable to the middle components in a pattern. Components that make up the pattern are described in the previous section.

There are five phasing options; select the phasing you require from the list:

- Select None for no phasing. The pattern starts at the start vertex of the line, and repeats to the end vertex. Elastic components are drawn at their defined lengths. The end of the line does not necessarily correspond with the end of a pattern repetition.
- Select Angle to restart the middle pattern at each *angular vertex* (where the two line segments that meet at the vertex are not tangential). Elastic components are stretched as necessary.
- Select Line to ensure that the start of the End pattern corresponds with the end of a Middle pattern repetition. Elastic components are stretched as necessary.

  Note that if the Middle pattern ends with a space, the last pattern repetition is forced to end at the last line or symbol in the pattern.
- Select Grid to line up the components of the pattern when they occur on parallel lines. You can use this option to line up the hatch pattern when you use the Construct Hatch command to create hatch lines.
- Select Vertex to restart the middle pattern at each vertex, where each segment is separately phased. Elastic components are stretched as necessary.

Creating filled strokes

Use a fill stroke to flood fill closed primitives. Fill has no effect on open primitives.

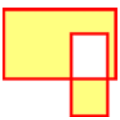
There are several fill types from which you can select:

- Brush
- Gradient
- Hatch
- Raster
- Symbol

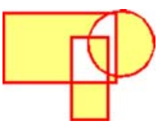
MicroGDS provides options for you to choose how to fill multiple, overlapping closed line primitives. You can specify that 'holes' are created where the primitives overlap, or that those areas should be filled in. These options apply only to primitives which are in the same object, and use the same filled linestyle and primitive colour.

You choose how to fill the primitives using the 'Rule for multiple loops' option on the Fill tab:

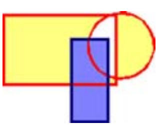
- Use loop depth
  Creates a hole wherever primitives overlap:

  If another primitive with the same fill attributes is overlaid, any part of the hole that it overlaps is filled, and any fill that it overlaps creates a hole:

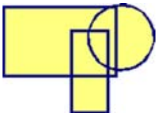
  If you explicitly change the colour of one of the primitives, any holes in the primitive are filled:

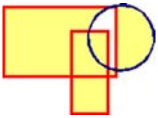
Furthermore, if strokes in a linestyle use offsets, each closed line primitive is offset independently before all the primitives are combined.

- Use loop sense

  Select this option to take account of the direction in which each line primitive is drawn. Overlapping primitives that are drawn in the same direction are simply overlaid. Holes are created only where overlapping primitives are drawn in opposite directions.



all lines are drawn in the same direction

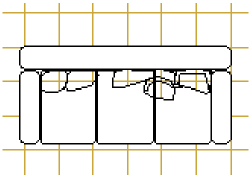


circle direction now reversed

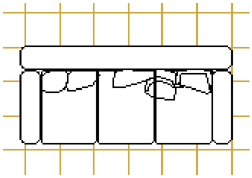
  For details about the direction in which primitives are drawn and how to reverse the direction, refer to Help.

- Independent loops
  This option draws each primitive independently, ignoring the direction in which the primitive was drawn. No holes are created.

The following illustration shows part of a floor plan, with a sofa placed on a tiled floor. The sofa uses an opaque, brush filled linestyle. Initially, the style is set to ‘Use loop depth’, which means that a hole is created wherever the sofa line primitives overlap:



Notice that the floor tiles are visible wherever the cushions overlap. One way to correct this is to use different linestyles for the sofa and cushions. A more efficient way is to simply change the rule for multiple loops option to 'Independent loops':



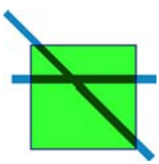
The Fill tab has options to control the ways in which colours are mixed at each pixel, to obtain the final result.

In this particular example, you could achieve the same result by reversing the line direction of overlapping primitives and using 'Loop sense'.

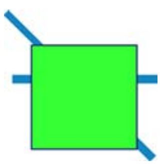
'Loop sense' creates holes only where overlapping primitives are drawn in opposite directions. This gives you more control over the appearance of each nested primitive. To create a hole, make sure that the outer and inner primitives are drawn in different directions. When you reverse the direction of a primitive, the area of the primitive is reported as negative. This enables you to calculate areas based on the positive and negative line directions.

For all fills except Gradient, you can choose to make a fill transparent or opaque (the default). To make the fill transparent, clear the Opaque check box. Gradient fills are always opaque (unless a colour includes an alpha value).

Transparent means that you will see any graphics that are drawn underneath, and opaque means that you will not:



transparent fill



opaque fill

Brush fills also provide a 'true transparency' option, where the colour builds up where primitives overlap. You will see this in the next section.

Note that some output devices do not support transparent fills.

For more details on the transparency options and the formulae for colour mixing, refer to Help.

▶ **To define a fill type for the stroke**

- from the Fill list, select the fill type you require

Brush fill

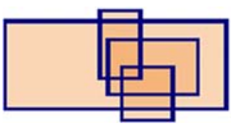
Select Brush to create a fill using a brush or pattern.

- select Percent fill and select the percentage fill from the list
- or, select Brush pattern and select the brush pattern from the list

  The listed brush patterns are compatible with all versions of MicroGDS.
- or, select Extended brush pattern and select the brush pattern from the list

  The listed brush patterns are compatible with MicroGDS version 8.0 and later.

For percentage fills, you can specify to use true transparency. True transparency ‘builds up’ the colour where primitives overlap:



This option is not available if the Opaque check box is selected.

Brush patterns always use Output co-ordinate space, and are never rotated or scaled. If you change the co-ordinate space, it has no effect on the pattern.

Note that some output devices cannot print solid fills and overlapping fills, therefore test your device before you use this feature.

Gradient fill

Select Gradient to create a fill that gradually changes from one colour to another.

You can define linear and radial Gradient fills:

- From the ‘Type of gradient fill’ options, select Linear to blend the fill linearly, or Radial to blend the fill radially.
- To fit the fill to the primitives to which the gradient linestyle is assigned, select the ‘Fit to primitive(s)’ check box. To fill a primitive by specifying the coordinate positions, clear this check box.
- Click the Colours boxes and select the colours you want for the graduated fill.

  Note that the colours you select are not affected by the phase colour or the current colour.
- Use the Blend options to define the fall-off:
  - Linear creates an even fall-off
  - Bell creates a fairly steep fall-off, based on a bell-shaped curve
  - Cosine creates a steep fall-off, using a cosine blend shape

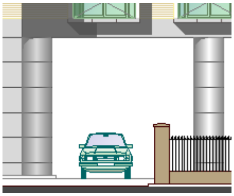
The remaining options reflect the type of gradient fill, and whether or not you have selected the ‘Fit to primitive(s)’ option.

Linear fill

If you select ‘Fit to primitive(s)’:

- Specify the angle for the graduated fill, by selecting from the Direction list or typing in the box.
- To mirror the gradient fill, from the mid-point of the extent of the primitive, select the Mirror check box.

  You might do this, for example, to create a shading effect for cylindrical columns:

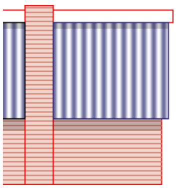
  If you do not select the Mirror check box, the extent of the primitive is filled with a single instance of the fill.

If you did not select 'Fit to primitive(s)':

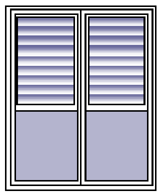
- In the From and To boxes, type the coordinates for the start and end of the fill, in the display units.

  If you want a vertical fill, set the X coordinates to be the same, or the Y coordinates for a horizontal fill.
- If you want to mirror repeat the gradient fill, select the 'Mirror repeat' check box.

  The first example below uses a mirror-repeat gradient fill to simulate profiled roof sheeting; the second example uses gradient fill without a mirror repeat to represent louvered window shutters:



mirror repeat fill



no mirror repeat

Radial fill

If you select 'Fit to primitive(s)' with a radial fade, there are no additional options to those described earlier.

If you did not select 'Fit to primitive(s)':

- In the From and To boxes, type the coordinates for the start and end of the fill, in the display units

  The From point is the centre of the fill and the To point is a point on the circumference.

Hatch fill

Select Hatch to create a fill using a hatch pattern.

- to create a cross–hatch pattern, select the Cross hatch check box

By default, the hatching is drawn in the DEFAULT linestyle. You can use any linestyle that exists in the document.

- to use a different linestyle, select the linestyle from the list

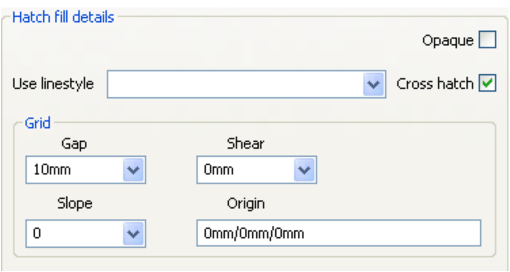
Note that only middle pattern strokes in the specified linestyle are used for the hatching. Fill and vertex strokes are ignored. The pattern is drawn as if its phasing were set to Grid. For details about phasing, see page 175.

Note also that there can be a conflict of co-ordinate spaces between the pattern stroke, and the strokes of the hatch linestyle. In these cases, the hatch style will be drawn in the 'lower' space, where the spaces rank in the order Object, Drawing, Output (from high to low). Consequentially, if you are designing a linestyle for use in hatching strokes in different spaces, Object space is the most likely to give the desired results.

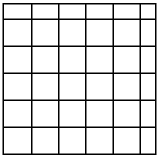
Use the Grid settings to define the grid along which the hatching lines will be drawn:

gap	specifies the gap between the rows of hatching
shear	specifies the distance by which the hatched rows are to be offset from one another This affects the way in which any pattern elements line up.
slope	specifies the angle at which the hatched lines are to be drawn
origin	specifies the coordinates for the origin of the hatched grid; the coordinates are interpreted in the selected co-ordinate space

For example:



If you draw a rectangle using this hatch fill, it appears as:



Raster fill

Select Raster to create a fill using a raster image. You might use a raster fill, for example, to show wall textures or flooring. For example:

- In the File name box, type the full path of the raster file or click the Browse button to select the file.

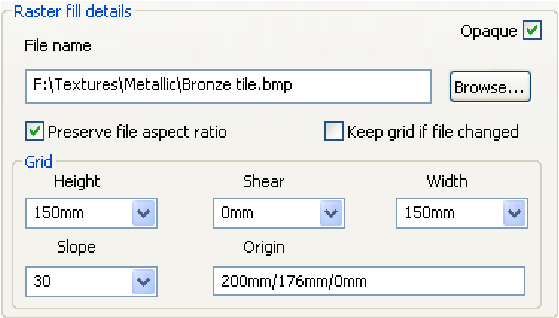
  You can use any type of raster file that can be imported into MicroGDS. For details, see Chapter 15, *Working with different file formats*.
- To maintain the aspect ratio of the raster file, select the ‘Preserve file aspect ratio’ check box.

  Clear the check box to draw the raster image at the size specified by the Height (Y size) and Width (X size) boxes.
- To retain the specified Height and Width settings if a different raster file is later selected, select the ‘Keep grid if file changed’ check box.

Use the Grid settings to define the grid for placing the raster image:

height	specifies the height of the raster image tile
shear	specifies the distance by which the rows of raster images are to be offset from one another
width	specifies the width of the raster image tile
slope	specifies the angle at which the raster image is to be drawn
origin	specifies the coordinates for the origin of the grid; the coordinates are interpreted in the selected co-ordinate space

For example:



where a single instance of the raster image is:

If you draw a rectangle using this raster image with the above settings, it appears as:

Symbol fill

Select Symbol to create a fill using symbols from a MicroGDS font.

- From the Symbol list, select the symbol you require. The set of symbols that is available depends on the selected font. To change the font, select the font you require from the Font list.
- To specify the size for the symbol:
  - if you are editing the details of a MicroGDS CV6 font, type the size for the symbol or select from the list
  - if you are editing the details of a MicroGDS CV7 font, type the scale for the symbol or select from the list

  Note that if a symbol size attribute is assigned to the symbol, a Size box is also shown, displaying the specified symbol size. (The Size and Scale boxes are interlinked, that is, if you change one value, the other changes accordingly.)

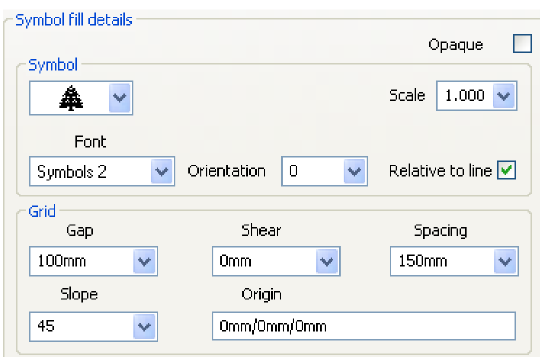
- To draw the symbols at a specified angle, in the Orientation box, type the angle for the symbol or select it from the list.
- To draw the symbols at the given orientation, relative to the line of symbols as defined by the grid slope, select the Relative to line check box.

  Clear the check box to draw the symbols at the given orientation, relative to the co-ordinate space.

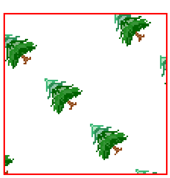
Use the Grid settings to define the grid for placing symbols:

gap	specifies the gap between each row of symbols
shear	specifies the offset between the left edge of a symbol on one row and the left edge of a symbol on the next row
spacing	specifies the spacing between each column of symbols
slope	specifies the angle at which the rows are to be drawn
origin	specifies the coordinates for the origin of the grid; the coordinates are interpreted in the selected co-ordinate space

For example:

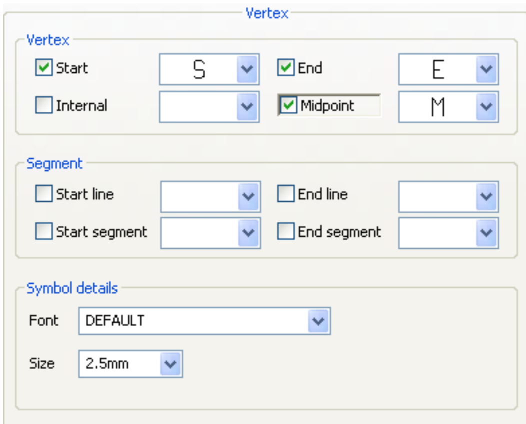


If you draw a rectangle using this symbol fill, it appears as:

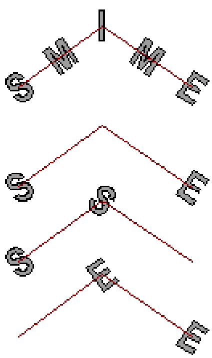


Creating vertex strokes

Use a vertex stroke to mark various points on a vertex, line, and/or segment. For example, to mark the start, end, and mid-point of every segment of a primitive, you could define the symbols as shown:



The following examples illustrate various combinations of marking vertex and segment points:



Vertex: Start, End, Internal, and Midpoint points

Segment: Start line and End line points

Segment: Start segment points

Segment: End segment points

Symbol details

You can change the font for individual vertex and segment points. The set of symbols that is available depends on the selected font.

▶ **To change the font for vertex or segment point**

- under Vertex or Segment, select the check box for the appropriate point

  MicroGDS indents the vertex or segment point to indicate that it is the currently active property.
- from the Font list, select the font you require
- to specify the size for the symbol:
  - If you are editing the details of a MicroGDS CV6 font, type the size for the symbol or select from the list.
  - If you are editing the details of a MicroGDS CV7 font, type the scale for the symbol or select from the list, instead.

  Note that if a symbol size attribute is assigned to the symbol, a Size box is also shown, displaying the specified symbol size. (The Size and Scale boxes are interlinked, that is, if you change one value, the other changes accordingly.)

Drawing order of primitives

You draw objects on layers, and you use phases to reference the layers. The order in which MicroGDS draws the graphics on a layer is defined by the phase order in the Window Editor. For details, see Chapter 4, *Using layers and phases*.

Generally, objects are drawn in a phase in the order the objects are created. However, MicroGDS draws the primitives within an object in a particular order. This order is important, particularly with filled, closed-line primitives. The order in which primitives in an object are drawn is:

- all closed-line primitives that have any type of filled stroke are drawn first

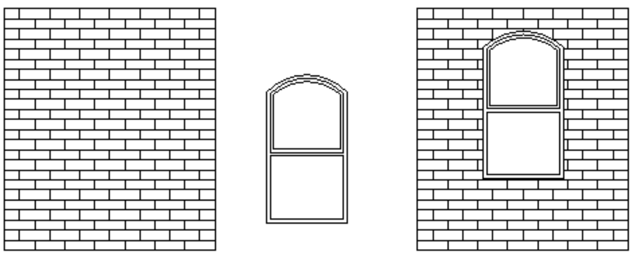
  Within the filled primitives, all graphics that are assigned the same linestyle, and colour, are filled together (with the strokes being drawn in the order in which they are defined).
- all non-filled strokes are then drawn, in their defined stroke order
- finally, all other graphics in the object are drawn

For details about filled linestyles, see page 176.

Using linestyles as a mask

You can use a filled linestyle to mask out parts of a drawing. You define a mask linestyle by setting a brush of 0% and a fill of opaque (so that graphics underneath are covered by the background colour).

For example, you could use a mask linestyle if you are inserting windows into a wall elevation. You can draw the wall in a hatched linestyle—to represent the brickwork—and then create a new object, and reference it in a different phase (or on a different layer), for a window. If you then create the background rectangle of the window in a mask linestyle (and the detail in a normal, visible linestyle), it masks over the brickwork detail wherever you place it on the wall.



phase 1: wall phase 2: window window masks over brickwork

For this to draw correctly, you will need to ensure that the phase in which the wall is referenced is drawn first, the window background rectangle is drawn next (because it is a filled linestyle) and the window detail is drawn last.

Primitives drawn with mask linestyles will not mask:

- other primitives in the same object
- items on layers placed on top of the masked-object layer

Phases are drawn and printed in the order in which they are listed in the Window Editor. Each phase is drawn on top of the previous phase. You may need to reorder the phases if you want to mask out items on other layers. For details, see Chapter 4, *Using layers and phases*.

Modifying an existing linestyle

With the exception of DEFAULT and BLANK, you can modify any linestyle that is available to the document.

▶ To modify a linestyle using the Document Organizer

1 In the Document Organizer, ensure that the appropriate document is the current document.

2 On the Styles tab, locate the linestyle that you want to modify.

3 Double-click the linestyle name, or on the shortcut menu, click Edit.

This command is unavailable for any linestyle where a linestyle of the same name exists in a location higher in the style search path.

If you want to edit a linestyle referenced in a style file, you can open the style file for editing, using the shortcut menu.

MicroGDS displays the Linestyle dialog box.

4 Modify the characteristics as required.

5 To save the linestyle, do one of the following:

- to keep the same linestyle name, click Save

  If you retain the linestyle name, all line primitives that use the linestyle are immediately updated.

- to save the linestyle with a new name, click Save As, type the name in the Style Name dialog box and click OK

If you modify a linestyle from an external style file, MicroGDS creates a new local linestyle with the name you specify.

For more details about style files, see Chapter 2, *Exploring MicroGDS*.

If you save a linestyle to a name that exists in an external style file, the icon for the external linestyle changes colour in the Document Organizer. This indicates that a local style of the same name now exists. For more details, see *Accessing linestyles* on page 157.

▶ **To modify a linestyle using commands**

1. From the Line list on the status toolbar, select the linestyle to modify.

   Alternatively, select a primitive that uses the style you want to modify.

2. On the Styles menu, click Linestyle Modify.
3. Modify the linestyle and then save the linestyle, as described in step 5 in the previous procedure.

Deleting a linestyle

You can delete linestyles that are no longer required. You cannot retrieve deleted linestyles.

If you select a graphic whose style has been deleted, the Line box on the status toolbar is empty. You can see the name of the assigned linestyle in the InfoTip, if you have hover highlighting on the Information bar switched on. You can also see the name in the Properties window (Ctrl+Q).

If you later create another linestyle with the same name as the deleted linestyle, it is used by the graphics to which the style was originally assigned (if you have not assigned a different linestyle in the meantime).

You cannot delete the DEFAULT or BLANK linestyle.

▶ **To delete a linestyle**

1. In the Document Organizer, ensure that the appropriate document is the current document.
2. On the Styles tab, select the linestyle that you want to delete.

   You can delete multiple linestyles (or multiple styles of any type), using Windows multi-select facilities.

3. Press Delete, or on the shortcut menu, click Delete.
4. To confirm the deletion, click Yes at the prompt.

Chapter 8

Working with text

Text primitives

All text primitives have a charstyle (character style), which defines what the text looks like. A charstyle determines the height and width of the text, the spacing and margins around the text, and the font that is used.

For example:

Windows font

MicroGDS font

user-created font: linestyle with a transparent, percentage fill

user-created font: linestyle with a symbol fill

MicroGDS provides a variety of built-in charstyles for you to use or modify. When you create a new document, there is only one available charstyle, DEFAULT. This uses a MicroGDS font that draws text in a text box that has a height of 5mm.

The DEFAULT charstyle is stored separately from any charstyles you create and cannot be saved, deleted, or replaced.

Note that you specify the size for a charstyle using real-world measurements. The size of the text shown in the window will vary according to how much the view is zoomed. The size of text is independent of the current axes scale, and the scale of the object.

You can add a charstyle to a document by selecting a built-in MicroGDS style or by creating your own. When you create your own charstyles, you can use either a Windows font or a MicroGDS font. You can also create new fonts that you can then use to create or modify charstyles. For details about creating your own fonts, refer to Help.

MicroGDS charstyles

MicroGDS provides a number of built-in charstyles, for example:

Default

30A

PEU35

PARC18

When you select a charstyle, MicroGDS shows you a sample of the selected charstyle. You can use a charstyle as it is, or you can modify it and save it for future use within the document.

Although MicroGDS charstyles are stored separately from your own and cannot be overwritten, you can, however, accidentally overwrite amended versions if you use the same name as that of a built-in charstyle. For example, if you select AR25, change the font height and save it with the same name, your version of AR25 takes effect. If you later reselect AR25 from the built-in styles and save it to the same name, your version is overwritten and all text boxes using this charstyle now use the characteristics defined in the MicroGDS version.

Accessing charstyles

For single-user documents, new charstyles are stored in the document. They are saved when you save the document.

You can also access charstyles from external style files (called CHARS.STY). To do this, you specify the folders in which the CHARS.STY files are located using the Style Search Path command on the File menu. You can add more than one folder to the style search path, but only one CHARS.STY file can be stored in each location. If you modify and save a style from an external style file, it is saved in the document. For more details about style files, see Chapter 2, *Exploring MicroGDS*.

For multi-user projects, all charstyles are stored in external style files (CHARS.STY). New charstyles are saved in the first CHARS.STY location on the style search path. A charstyle is saved in the style file as soon as you save the style, even if you do not save project.

You can access charstyles available to a document from the Document Organizer and also from the status toolbar.

▶ To access charstyles using the Document Organizer

1 On the Document Organizer, click the Styles tab:

2 Double-click the Charstyles category, or click the plus sign (+) to the left.

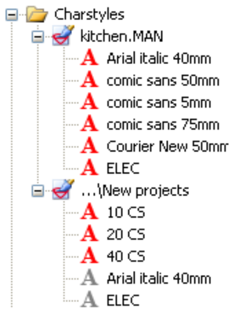
A list of all locations from where you can access charstyles is shown:

- for a single-user document, the name of the document with which you are working is shown first, followed by the path of each style file defined in the style search path if any
- for a multi-user project, the name of the first style file defined in the style search path for the project is shown first, followed by the path of each subsequent location defined in the project

If a CHARS.STY file exists in the location defined for styles and fonts in your file location preferences, this location is shown last in the list. This enables you to reference a set of global style files that are available to all your documents. For more details, refer to Help.

3 To display a list of charstyles in a location, double-click the location or click the plus sign (+) to the left.

For example:



Charstyles are prefixed by an icon. The colour of the icon determines the availability of the style:

- charstyles that can be used in the document are prefixed by a red icon
- charstyles that are not currently available to the document are prefixed by a grey icon

  (A charstyle is unavailable if a charstyle of the same name already exists in a location higher in the style search path.)

4 To preview a charstyle, select the style and then, on the shortcut menu, click Toggle Preview.

▶ To access charstyles from the status toolbar

- on the Char box on the status toolbar, click the arrow

All styles available to the current document are listed.

Adding a charstyle

You can add a new charstyle to a document by saving one from those available with MicroGDS or by creating your own.

When you add a charstyle, it immediately becomes current and any selected text changes to use that charstyle. Any new text you create also uses this charstyle.

Note that if you open a document in which there are missing charstyles, for example, if they have been deleted, MicroGDS reports the error conditions to the Problems dialog box. You can use the dialog box to correct the errors by:

- changing the styles and fonts folder
- editing the style search path
- adding new charstyles

This section tells you how to add a new charstyle to your document. For details about each of the charstyle characteristics, see *Charstyle properties* on page 201.

▶ **To add a charstyle using the Document Organizer**

1 Click the Styles tab on the Document Organizer, and then double-click the Charstyles category.

2 Do one of the following:

   - to create a new charstyle based on DEFAULT, select the Charstyles category and then, on the shortcut menu, click New
   - to create a new charstyle based on an existing style, select the charstyle on which to base the new style from the required location and then, on the shortcut menu, click New based upon

   The Charstyle dialog box shows the characteristics of the current charstyle.

3 If you want to use or amend a charstyle other than the current one, do one of the following:

   - to base the charstyle on an existing style in the document, click ‘Document style’, and then select the charstyle on which to base the new style from the list

- to base the charstyle on a built-in style, select ‘MicroGDS style’, and then select the charstyle on which to base the new style from the list

  If you select a style from a list, all settings in the Charstyle dialog box are reset to those stored with the selected charstyle.

4. Specify the settings in the Charstyle dialog box, as required.
5. Check that the charstyle is what you require in the Sample box.
6. Save the charstyle:
   - to save the charstyle with the existing name, as shown on the title bar, click Save
   - to save the charstyle with a new name, click Save As, type the name in the Style Name dialog box and click OK

   The name must comply with the MicroGDS naming rules, as described in the next section. You cannot save a charstyle with the name DEFAULT.

The named charstyle is made current and its name is shown in the Char box on the status toolbar.

▶ To add a charstyle using commands

1. From the Char list on the status toolbar, select the charstyle on which you want to base your new charstyle.
2. On the Styles menu, click Charstyle Modify.

   MicroGDS displays the Charstyle dialog box.
3. Specify the settings in the Charstyle dialog box, as required.
4. Check that the charstyle is what you require in the Sample box.
5. Save the charstyle as described in step 6 in the previous procedure.

Rules for naming charstyles

- a charstyle name can contain up to 256 characters
- names can include spaces, except at the beginning or end of the name
- charstyle names are case sensitive, so ‘courier8’ and ‘Courier8’ are two different charstyles
- you cannot save to the name DEFAULT

Changing the charstyle

When you add a charstyle, it immediately becomes current. To use another charstyle, you select it from those available with the document. When you change the charstyle, you can:

- change the current charstyle
- change the charstyle of selected text primitives
- change the charstyle of all text primitives using a specific charstyle
- override the charstyle of all text primitives for a particular phase

When you change to another charstyle or change the charstyle of existing text, MicroGDS automatically refreshes the window so that you can see its effect.

If you are working with a complex drawing, redraws may take some time. You can speed up redraws by changing the *view quality* options. These determine how linestyles, text, and selected graphics are to be displayed. Note that the quality settings also affect the printed drawing. For details on setting the view quality, refer to Help.

Changing the current charstyle

The current charstyle is assigned to new text that you draw. The name of the current charstyle is shown in the Char box on the status toolbar.

If you have selected several text primitives that have different charstyles assigned, the Char box is blank.

Note that each time you click a text primitive, the current charstyle changes to that primitive's charstyle.

▶ To change the current charstyle

1 Select any text for which you want to change the charstyle.

2 Do one of the following:

- from the Charstyle list on the Properties window, select the charstyle
- from the Styles tab on the Document Organizer, select the charstyle and then click Set as current on the shortcut menu

- from the Char list on the status toolbar, select the charstyle
- on the Set menu, click Charstyle, type the name of the charstyle in the prompt bar and press ENTER

  The charstyle name must match a charstyle that you have already added to the document.

Note that if you have enlarged, reduced, or stretched the text, and you want to retain the size, ensure that you reapply the charstyle using the Properties window. If you reapply the charstyle using any other method, the text returns to the size set in the charstyle definition. For details about enlarging and stretching graphics, refer to Help.

Changing the charstyle of existing text

▶ To change the charstyle of existing text

1 Select any text for which you want to change the charstyle.

2 Select the replacement charstyle, as described in the previous section.

Changing the charstyle globally

MicroGDS makes it very easy to change the charstyle of a number of text primitives drawn using one charstyle to another charstyle. You simply restrict editing to a specific charstyle.

▶ To change the charstyle globally

1 Press F3 or on the Set menu, click Edit.

  You can also use the SETEDIT button on the information bar (at the bottom-right corner of the MicroGDS window) to set restrictions:

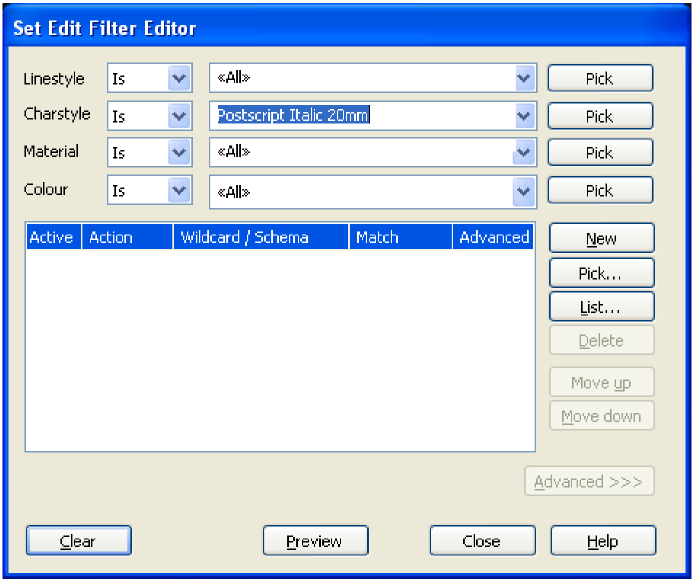
  - if SETEDIT is not currently enabled, click the button

    If SETEDIT is enabled, a single click of the button toggles the current editing restrictions on and off
  - if SETEDIT is currently enabled, double-click the button

  The Set Edit Filter Editor is displayed.

2 From the Charstyle list, select the charstyle to which you wish to restrict editing.

  Alternatively, click the Charstyle Pick button and click a text primitive to which the style is assigned.



3 Click Close.

When you have set up your restrictions, the SETEDIT button on the information bar is pressed in and the text changes colour. You can toggle the editing restrictions on and off by clicking the SETEDIT button.

4 Ensure that you are in Select Primitives mode by pressing F9, or on the Edit menu, click Select Primitives.

5 In your graphics window, select the relevant text primitives; the status toolbar shows you the number of primitives selected and that they all use the same charstyle.

You cannot select any text primitives that do not use the specified charstyle.

To select all primitives drawn in the charstyle, press F7, or on the Edit menu, click Select All.

6 Select the replacement charstyle, as described on page 197.

Remember to clear the editing restriction when you have changed the charstyle.

Overriding the charstyles for a phase

Usually, you assign charstyles to individual text primitives. This means that a phase can show text primitives in many different charstyles. You can, however, force all text primitives within one phase to be displayed and printed in a single charstyle.

▶ To override the charstyle for all graphics in a phase

1. Press F2, or on the File menu, click Window, Edit.
2. From the phases list in the Window Editor, select the phase whose charstyles you want to override.
3. From the Charstyle Overrides list on the Phase tab, select the charstyle you wish the graphics in the phase to use.

   All text primitives within the selected phase are now drawn using the chosen charstyle. Note that although they appear on screen and print using the charstyle override, their original charstyles are unchanged and still appear in the Char box on the status toolbar.

   You can also see the name of the charstyle assigned to a text primitive using the Properties window (Ctrl+Q). For details about the Properties window, see Chapter 13, *Getting information.*

   If you later remove the override, the primitives are drawn using their original assigned charstyles.

You would probably use this feature only as a temporary override. To change the charstyle permanently, you would make the phase the only phase editable, then select all the graphics, and change the charstyle.

Charstyle properties

When you add or modify a charstyle, MicroGDS displays the Charstyle dialog box. For example:

The name of the currently specified charstyle is shown in the title bar. If you are creating a new charstyle or if there are no charstyles saved in the current document, the title bar of the dialog box does not show a charstyle name.

The dialog box shows:

- the charstyle name if you are basing the charstyle on an existing document style or on a MicroGDS style
- an example of the charstyle in the Sample box

- whether this style uses a MicroGDS font or a Windows font, and the name of the font

  If the charstyle uses a Windows font that is not available, for example, because it is not installed on this machine, the name of the substitute font used by MicroGDS is shown.
- the colour for the font
- the units in which to display and interpret measurements in the dialog box
- the size, spacing, and margins for the font
- the type of outline and any linestyle for the outline, if used

Note that if you type any measurement in different units to the display units shown at the top of the dialog box, MicroGDS automatically converts the measurements to the display units to draw the text. For details on the types of units you can use, see Chapter 5, *Entering positions*.

Font

The font is the style in which the characters are drawn, for example:

Arial Bold Italic 11pt

`Courier New Regular 14pt`

✯❏■❏▼▮❐❄ ✳❏❐▼▲ ☞✐❐▼

Fonts can be scaled, rotated, and drawn in perspective.

To choose a font on which to base your new charstyle, click Windows or MicroGDS.

- Windows

  Any TrueType font (including OpenType) that is available on your computer can be used.

  When you click Windows, a Windows Font dialog box is displayed listing the TrueType fonts (including OpenType) that are available on your computer. Use this dialog box to choose a font and style for the new charstyle (**bold**, *italic*, and so on). You can also choose the size of the font, in points. If you prefer, you can specify the height and width of the font, in the display units, on the Charstyle dialog box.

Note that when you select a font, MicroGDS resets various settings on the Charstyle dialog box based on the point size of the selected font. Therefore, select the font before you change the individual parameters.

- MicroGDS

  MicroGDS fonts are normal graphics that have been drawn using MicroGDS. Some examples are:

  CAD Vector Font 1

  CAD Vector Font 2

  When you click MicroGDS, the MicroGDS Font dialog box is displayed listing the fonts that are available. Use this dialog box to choose a font for the new charstyle.

  You set the path in which to look for MicroGDS fonts using the Preferences dialog box. For details about setting your preferences, see Chapter 17, *Customizing MicroGDS*.

  In MicroGDS, there are two types of MicroGDS font files: CV7 and CV6:

  — CV7 fonts save many types of primitive as part of the font graphics. All linestyle properties, such as filled strokes, multiple colours, and thickened offsets are retained.

    Other graphics, such as text primitives, and raster primitives, are also saved. Note that you cannot, however, use instance objects, photo primitives, or OLE objects.

  — CV6 fonts save only line primitives as part of the font graphics. All linestyle properties and other graphics, such as text primitives are ignored.

  Although MicroGDS supplies a number of font files, you can also create your own. When you create a new font, you can define the font to be proportional by assigning a special attribute to the character objects. For a MicroGDS CV7 font, you can also define the size of the character objects

Full more details on fonts and creating MicroGDS CV6 and CV7 font files, refer to Help.

Size

Use the Height box to specify the height of the text box in which a single-line text block is placed. The height you specify is the height of the font including the top and bottom padding (the total padding for a CV6 font is calculated to half the font height). For example:

The padding for TrueType fonts will vary, but is usually approximately 20% of the font height.

The set scale and object scale do not affect the size of text. For example, a 5mm text block is always printed in a surrounding 5mm text box, whatever the axes' or object scale.

Use the Width box to define the width of the text box. A width of 0 means that MicroGDS will pick a default width based on the height of the text box.

When you specify a size for a charstyle, the values you give are real-world values.

Colour

Use the Colour box to specify the colour of the charstyle:

- to use any colours defined in the compiled font, select Neutral

  If you select Neutral, MicroGDS uses the colours embedded in the font, if any. For example, if you use a CV7 font that was created in multiple colours, the charstyle is drawn in multiple colours. However, if you select red in the Colour box, all characters in the font are drawn in red.
- to use an explicit colour for the font, select an existing colour from the list

  If you want to assign a colour that is not available from the list, click the 'Select colour' entry. Then, select your colour using the Select Colour dialog box. For details about using the Select Colour dialog box, see Chapter 3, *Working with primitives and objects*.

By default, MicroGDS draws graphics using the colour defined for the current phase.

To use the colours of a font, ensure that the Use style colours check box is selected in the Window Editor for the phase that uses the specified charstyle.

Note that if the text primitive has an explicit colour set (using the Set Colour command), by default the primitive is drawn in the set colour and any font colours are ignored.

Note that if the primitive has an explicit colour set (using the Set Colour command), by default the primitive is drawn in the set colour and any font colours are ignored. To use the font colours in a charstyle, clear the Use primitive colours check box in the Window Editor.

For details about changing the colour of the graphics in a phase, see Chapter 4, *Using layers and phases*.

Spacing

Use the Character box to specify the spacing between each character of text.

Use the Line box to specify the spacing between each horizontal or vertical line in a multiple-line text block. For example:

default spacing

character and line spacing 2.5mm

Note that if you are constructing vertical text, you may want to set a higher value for the inter-line spacing.

Margins

Use the Margins boxes to specify the additional spacing around the text. For example:

default margins

all margins 2.5mm

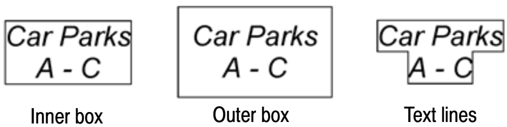
Note that when you select a Windows font, the left and right margins are set to allow for overhangs in the font's lettering.

Outline

Use the Outline options to specify whether or not to draw an outline around the text. Select:

- None if you do not want to outline the text
- Inner box to draw an outline inside the margins
- Outer box to draw an outline outside the margins
- Text lines to draw an outline around the boundary of the text characters, inside the margins

For example:



If you select an outline option, choose the linestyle for the outline from the list.

Modifying an existing charstyle

With the exception of DEFAULT, you can modify any existing charstyle that is available to the document.

▶ **To modify a charstyle using the Document Organizer**

1. In the Document Organizer, ensure that the appropriate document is the current document.
2. On the Styles tab, locate the charstyle that you want to modify.
3. Double-click the charstyle name, or on the shortcut menu, click Edit.

   This command is unavailable for any charstyle where a charstyle of the same name exists in a location higher in the style search path.

   MicroGDS displays the Charstyle dialog box.
4. Modify the characteristics as required.

5 To save the charstyle, do one of the following:

- to keep the same charstyle name, click Save

  If you retain the charstyle name, all line primitives that use the charstyle are immediately updated.

- to save the charstyle with a new name, click Save As, type the name in the Style Name dialog box and click OK

If you modify a charstyle from an external style file, MicroGDS creates a new local charstyle with the name you specify.

For more details about style files, see Chapter 2, *Exploring MicroGDS*.

If you save a charstyle to a name that exists in an external style file, the icon for the external charstyle changes colour in the Document Organizer. This indicates that a local style of the same name now exists. For more details, see *Accessing charstyles* on page 193.

▶ **To modify a charstyle using commands**

1 Deselect all graphics.

2 From the Char list on the status toolbar, select the charstyle to modify.

Alternatively, select a primitive that uses the style you want to modify.

3 On the Styles menu, click Charstyle Modify.

4 Modify the charstyle and then save the charstyle, as described in step 5 in the previous procedure.

Deleting a charstyle

You can delete charstyles that are no longer required. You cannot retrieve deleted charstyles.

If you select a text primitive whose style has been deleted, the Char box on the status toolbar is empty. You can see the name of the assigned charstyle in the InfoTip, if you have hover highlighting on the Information bar switched on. You can also see the name in the Properties window (Ctrl+Q).

If you later create another charstyle with the same name as the deleted charstyle, it is used by the graphics to which the style was originally assigned (if you have not assigned a different charstyle in the meantime).

You cannot delete the DEFAULT charstyle.

▶ **To delete a charstyle**

1. In the Document Organizer, ensure that the appropriate document is the current document.
2. On the Styles tab, select the charstyle that you want to delete.

   You can delete multiple charstyles (or multiple styles of any type), using Windows multi-select facilities.
3. Press Delete, or on the shortcut menu, click Delete.
4. To confirm the deletion, click Yes at the prompt.

Creating and editing text

Text is drawn on the current layer, aligned with the current X axis, in the current object. It has a charstyle, justification point, a direction, and, optionally a wrap width, *point* behaviour, and a linestyle for text-box decoration, all of which you can choose when you create the text primitive.

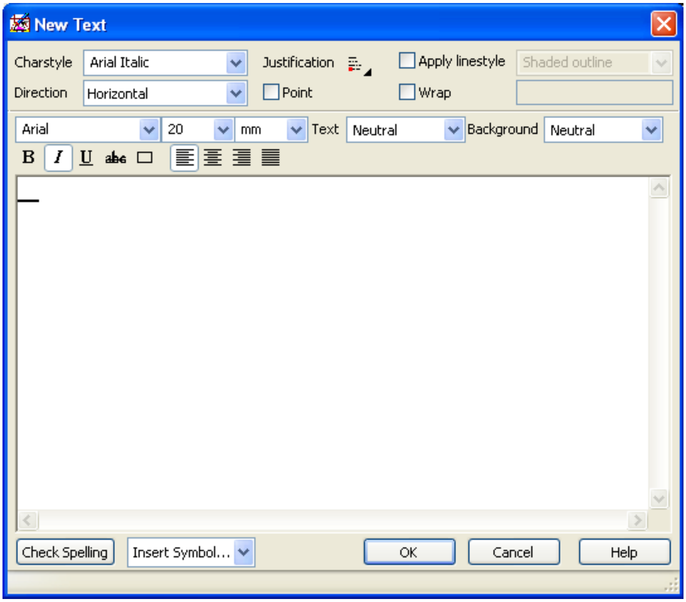
Creating text

You create text in your document by typing the text in the New Text dialog box.

▶ **To create a text primitive**

1. On the Construct menu, click Text.

   The New Text dialog box is displayed, for example:



The options on the top row of the New and Edit Text dialog boxes affect the entire text block. The options below enable you to override properties for individual text characters.

2 From the Charstyle list, select the charstyle for the new text.

3 Press the mouse button over the current Justification button, and click the button for the alignment you require.

For more details about justification, see *Justifying text* on page 213.

4 If you want to enclose the text block in a box, select the Apply linestyle check box and then select the linestyle you wish to use from the list.

If you want to enclose only part of the text in a box (in the default linestyle), you can use the box formatting button, described below.

5 Select the required direction option.

By default, text is displayed horizontally in rows. To display the text vertically in columns, select ‘Vertical, left to right’ or ‘Vertical, right to left’ from the list.

6 If you want to specify that only the justification point of the text primitive is hittable, select the Point check box.

This option has the effect of making the text primitive behave like a 'point' symbol. You might do this, for example, if you wanted to use a suitable vector character symbolising the point, such as an electrical outlet symbol.

7 By default, text is drawn on a single line, only wrapping to the next line when a carriage return is encountered.

If you want to automatically wrap multiple lines to the width of the New Text dialog box, select the Wrap check box. Note that you can resize the dialog box as required.

If you prefer to wrap multiple lines to a fixed width, select the Wrap check box and type the width in the set units in the box. Note that the width includes the left and right margins set in the assigned charstyle.

You can also change the width of an existing text block using the Text, Width command on the Alter menu.

8 You can change the following properties for selected text or new text:

- Font: for charstyles that use a Windows font, you can select a new font from the list
- Size: to change the size of the text, select from the list or type the size in the displayed units
- Units: to change the unit of measurement, select from the list
- Text and Background colours: to change the font colour or the background colour, select from the colour lists:
  - — to use the default colours, select Neutral
  - — to use an explicit colour, select the colour from the document's colour table or define a new, custom colour
- Formatting: you can apply Box formatting to text

  For charstyles that use a Windows font, you can also apply bold, italic, underline, and strikethrough in any combination.

  If you select text that already has formatting applied, clicking the corresponding button removes the formatting.

- Text alignment: to change the alignment, click the appropriate button

  You can choose from Left, Centre, Right, and Justify, respectively.

9 Type the text in the text box.

- You can use commands on the shortcut menu to cut and copy data from other Windows-based programs, and paste into this text box.
- To include a character not on your keyboard, such as a trademark symbol or special mathematical character, click the Insert Symbol box. Then either select a recently used symbol from the list or click Insert Symbol to insert a new symbol.

  When you insert a new symbol, MicroGDS displays the Microsoft Windows Character Map. To insert a symbol, select the symbol (so that it is drawn enlarged), and then either:

  — drag it to the appropriate position in your text

    A character is added to the Insert Symbol list when you drag a single character into the text box.

  — click Select in Character Map, then click Copy, and then paste the symbol into your text

    You can add multiple symbols to the Select box and copy them in one action.

  If you are not familiar with using the Character Map, click the Help button on the window.

You can also enter *secondary annotation* in a text block. Secondary annotation is a reference which calls up information such as attributes and displays it as text. For more details, see *Using secondary annotation* on page 215.

10 To check the spelling of the text, click the Check Spelling button.

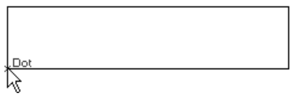
If any errors are found, MicroGDS displays suggestions for correcting them.

This facility requires Microsoft Word to be installed on your computer. The spelling checker automatically uses the default language, and any custom dictionaries, as set in Microsoft Word.

If a suitable version of Microsoft Word cannot be found on your computer, the Check Spelling button is not available.

11 Click OK.

The New Text dialog box closes and a text box is attached to the pointer. The text box is sized to accommodate the amount of text you entered. For example:



12 Place the text box in the window by clicking, or by typing in the snapcode or coordinates.

Editing text

You can edit existing text blocks, for example, to correct spelling mistakes, change the justification, change the font or size, or change the wording.

▶ To edit a text block

1 Do one of the following:
- double-click the text block you wish to edit, using a B (Box) snapcode
- or, on the Alter menu, click Text, Edit and then click on the text box you wish to edit, using a Box snapcode

The Edit Text dialog box is displayed with the contents of the selected text primitive.

Note that if you clicked somewhere other than on existing text, the New Text dialog box is displayed for you to create a new text primitive.

2 Edit the text as required and click OK to update the text in the box.

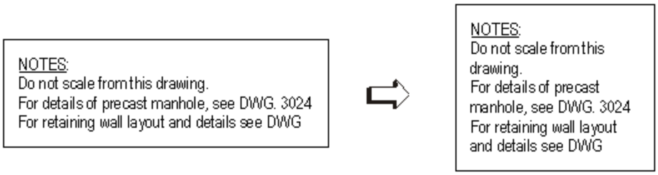
3 When you have finished editing text, press ESC to cancel the command.

You can also edit a number of properties of a text block using the Properties window (Ctrl+Q). For details about the Properties window, see Chapter 13, *Getting information.*

You can use the Curve, Cloud Text command on the Construct menu to draw a revision cloud around a text block. This may be useful to highlight changes you have made to text. For more details, refer to Help.

Changing the width of a text block

You can change the layout of a text block by changing its text wrapping.



You can wrap the text to:

- the width of the New/Edit Text dialog box
- a specific size, using the New/Edit Text dialog box or the Properties window

You can also use the Text Width command to change the width graphically:

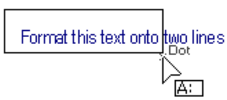
1 On the Alter menu, click Text, Width.

2 Specify the text justification point on the text primitive around which to format the text.

  A ghost rectangle is drawn around the text block.

3 Specify the position to indicate the new wrap point of the text block.

  When you move the mouse pointer, the ghost rectangle indicates the current width of the text block.



  The word wrapping, number of lines, and height of the text is adjusted to fit the new size.

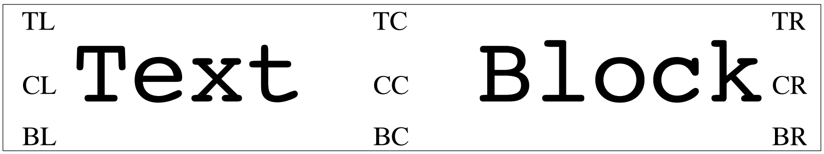
  The width includes the left and right margins specified in the charstyle's definition.

Justifying text

When you create new text, you place the text at the appropriate position in the window. Every text block has a justification point, and this is the point that is located at the on-screen position you choose. It also defines the alignment of the text.

There are nine possible justification points. These refer to points on an imaginary rectangle drawn around the block of text, not to individual letters or lines.

In the illustration below, ‘Text Block’ is the new text and the abbreviated-justification codes are shown at the associated points of the rectangle:



Top Left (T L)	Top Centre (T C)	Top Right (T R)
Centre Left (C L)	Centre Centre (C C)	Centre Right (C R)
Bottom Left (B L)	Bottom Centre (B C)	Bottom Right (B R)

When you type text in the New Text and Edit Text boxes, you select the justification setting you want to use.

▶ To set the justification for new and selected text

1. If required, select any text primitives for which you want to change the justification.
2. On the Set menu, click Justify.
3. In the prompt bar, type the justification you require.

   You need only type in the initial letters of the two words, with a space in between, (as shown in brackets above); you can use either uppercase or lowercase.

   If you do not type a space between the two letters, MicroGDS will not accept the entry and displays a message.
4. Press Enter.

You can also set the left, centre, and right horizontal alignments of lines in a text block using the three justification buttons on the status toolbar:

Greeking text

Greeking is the term used when text is no longer displayed on screen as text, each line of the text block being indicated by a straight line instead.

Greeking is useful, for example, when you are zoomed a long way out from your graphics, and text would be so small as to be illegible. The greeking level is the size of text in pixels down to which it will be displayed as text. You can set the level at which greeking occurs in your MicroGDS preferences. For details on changing your preferences, see Chapter 17, *Customizing MicroGDS*.

Using secondary annotation

You can place a reference in a text primitive so that you need not change the text of the primitive each time the value changes. This is called *secondary annotation*. For example, you might use secondary annotation to insert the scale of an object.

You can use attributes for the reference or one of the standard references provided by MicroGDS. For example, you might use a reference to insert the current date and time, or the scale of the object in which the text primitive resides.

An attribute is non-graphical information that you can attach to graphics in a document. Details about attributes is given in Chapter 14, *Working with attributes and schemas*.

You can choose to show the reference text itself rather than the reference value using your user preferences. For details about changing your preferences, see Chapter 17, *Customizing MicroGDS*.

MicroGDS automatically updates secondary annotation information whenever needed.

Using attributes

You can use a mnemonic definition to insert data in a text primitive, by specifying a mnemonic name.

To insert an attribute value as secondary annotation, type the mnemonic name in the appropriate position in the text using the following format:

^(*mnemonic name*)

The mnemonic picks up the value allocated to the object that contains the text primitive.

For example, the text:

Install a ^(manufacturer), ^(size), ^(colour) desk at this location

would use the values for manufacturer, size, and colour assigned to the current object, and so might read:

Install a Steelcase, 30x60, Brown desk at this location

For a computed or external mnemonic, the appropriate computed value is inserted in the text block. For example, the text:

The pipe length required here is ^(Pipe length)

might retrieve the length of all line primitives in an object, and so might read:

The pipe length required here is 20m

Note that if a mnemonic of the specified name exists at more than one level, you can prefix the name with the appropriate applicability.

Note also that if you open a document in which there are missing attributes referred to by text primitives, for example, if they have been deleted, MicroGDS reports the error conditions to the Problems dialog box. You can use the dialog box to correct the errors by editing editing the text.

Using standard references

To use one of the standard references provided with MicroGDS, type the reference in the appropriate position in the text using the following format:

^(*reference*)

For example:

Status as of: ^(Time)

might read:

Status as of: Tue April 06 13:43:56 2004

For a list of the standard references provided by MicroGDS, refer to Help.

Working with dimensions

You can add dimension text to the graphics in a document. For example, you can construct a dimension between two points, or construct a dimension for the radius of an arc or a circle.

When you add dimensions to existing graphics, MicroGDS creates new graphics for the dimensions. You can either create the new graphics in a new object, or in the object that is current at the time. You specify the object in which to create the new graphics using the Set Name command. For details about setting the object name for dimensions, refer to Help.

You can specify whether you want dimensions drawn at the object scale, or the scale set when you created the dimension, in the document defaults dialog box. For details about changing the document defaults, see Chapter 17, *Customizing MicroGDS*.

MicroGDS provides a number of commands for constructing dimensions. You use these commands by selecting Dimension on the Construct menu. An additional command, Show Units, enables you to choose whether or not the dimension text should display the units.

When you add dimension text, MicroGDS automatically sets the linestyle and charstyle to those specified on the Dimensions tab in your preferences. For details about changing your preferences, see Chapter 17, *Customizing MicroGDS*.

By default, linear dimensions (not angle, arc length, or radius) are created using *intelligent* text. This enables MicroGDS to update the result if the primitive being dimensioned is changed. You can set your preferences to create linear dimensions in plain text if you do not want dimensions to be recalculated at any time.

Intelligent dimension text is displayed as meaningful text in the window, but MicroGDS stores it as a formula. You can set your preferences to display the formulas of dimensions or their result in the window. For details, see Chapter 17, *Customizing MicroGDS*.

If you resize a graphic using Box Move or Fence Move on the Alter menu, the formula is recalculated and the dimension text is updated automatically. If the justification for the dimension text is set to bottom left, bottom centre, or bottom right, the dimension text is also repositioned with the dimension. You can move dimension text temporarily by selecting and dragging the text box in the usual way.

However, if you want to reposition dimension text permanently without it being moved by the Box Move and Fence Move commands, change its justification to any justification other than bottom left, bottom centre, or bottom right.

For full details about constructing dimensions, refer to Help.

Chapter 9

Working in 3D

Introduction

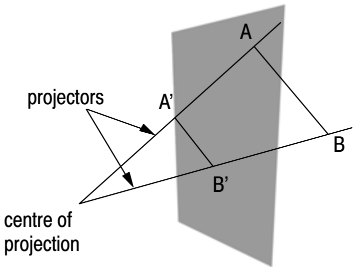
When you work in MicroGDS, by default you work in a 2D view. MicroGDS also enables you to work and view drawings in 3D. All data in MicroGDS is held as 3D data.

When you view a 3D object, the object must be projected onto a 2D plane, that is, your screen. MicroGDS uses planar geometric projections in which straight-line rays, called projectors, are drawn from a centre of projection, through the object, and onto the projection plane.

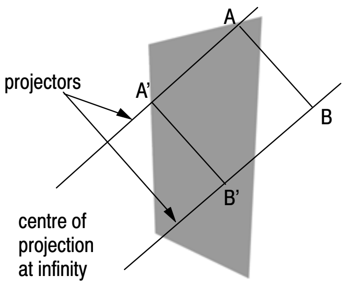
There are two types of planar geometric projection:

- perspective
- parallel

In *perspective projections*, the centre of projection is a fixed distance from the object.



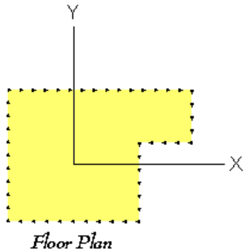
In *parallel projections*, the centre of projection is at infinity, which means that the projectors are parallel.



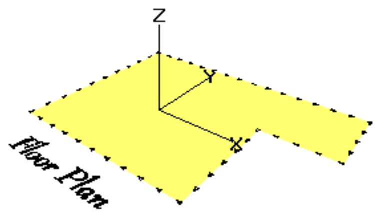
Projections are described in more detail later in this chapter.

Switching to a 3D view

You can switch the view between 2D, print layout, and 3D at any time. 2D and print layout objects appear flat in a 3D view. For example:



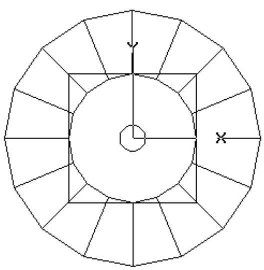
2D object in 2D view



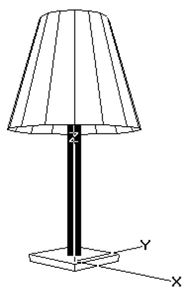
2D object in 3D view

You can display 3D graphics in different modes. The first time you view the graphics in a window definition in 3D, the graphics are shown in *wireline*. When you display 2D graphics in a 3D view, all strokes in a linestyle are shown in wireline mode. If you change the type of 3D mode, filled strokes may not be shown, depending upon the mode chosen. Types of 3D modes are discussed later in this chapter.

3D objects are viewed as if looking down the Z axis in a 2D view:



3D object in 2D view



3D object in 3D view

▶ **To switch to 3D**

- on the View menu, click 3D

When you view graphics in a document that is enabled for intelligent objects, you also use the drawing style modes to switch between predefined 2D and 3D views. For details about using intelligent objects in a document, see Chapter 3, *Working with primitives and objects*.

Drawing in 3D

It is not necessary to be in 3D view to draw 3D objects. When you draw a 3D object, you supply a Z coordinate in addition to the X and Y coordinates. Whenever you do not explicitly specify a Z coordinate, MicroGDS uses the last specified Z position. If no Z position has been given, the Z coordinate is zero (0).

Although you can draw 3D objects in a two dimensional view, you might find it difficult to visualise without seeing the object in 3D.

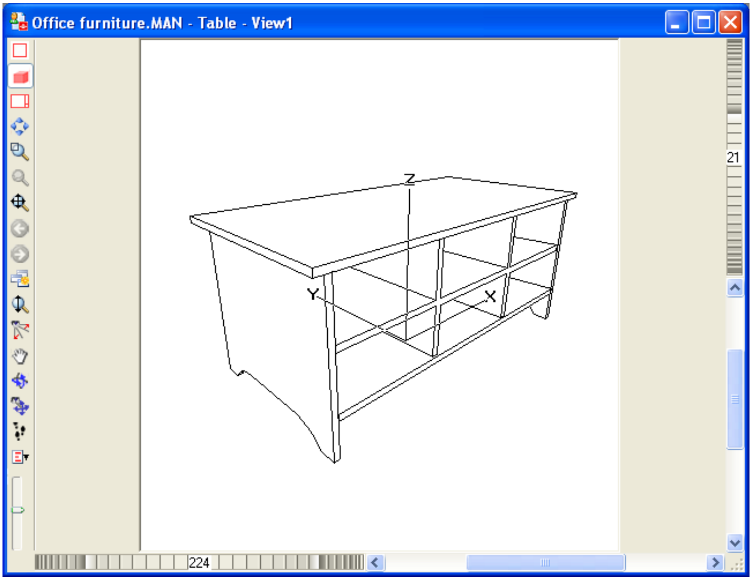
When you are working in a 3D view, you can use the Z axes snap guide to help locate a 3D position. MicroGDS generates a Z axis snap guide during many commands, through the current position and whenever you hover over an End, Point, Inside, Centre, or Middle snapcode. You switch the Z Axis option on and off using your Snapping preferences.

For more details about using snap guides, see Chapter 5, *Entering positions*.

The graphics window in 3D

When you switch to a 3D view, the graphics are drawn in the last 3D projection. The first time you view the graphics in a window definition in 3D, the *eye position* and *look-at* point are set up to show the extent of existing graphics, centred in the window.

The eye position is your position in space, and the look-at point is the point on the drawing at which you are looking. Together, these define the direction of viewing (your line of sight) across a scene. For example:



In the same way that each 2D view has a set of view controls, the window for each 3D view also has a set of view controls for moving around a 3D view.

By default, these are displayed to the left of each window. You can choose which view controls you want for your windows and their orientation, using the Customize dialog box. For details about customizing the view controls, see Chapter 17, *Customizing MicroGDS*.

Navigating 3D views

When you work in a 3D view, you will often want to change the direction in which you view a model and move around to see different parts of the window.

MicroGDS provides specific commands and controls for you to navigate 3D views that are in addition to those facilities for working with 2D views. These are covered briefly in the following sections. For full details, refer to Help.

The scroll bars and zoom bar in a 3D perspective view

In a 3D perspective view, the scroll bars and the zoom bar change their behaviour.

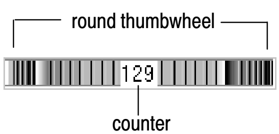
In a perspective view, the zoom slider advances or retreats along the line-of-sight. The slider range is scaled so that the middle position corresponds to the distance set by the Zoom Extents command. Moving up from the middle retreats from the scene and moving down advances into the scene.

The scroll bars slide the look-at point across the view. Dragging the scroll box to either end drags the look-at point from the centre to the edge of the view.

Note that in a 3D parallel view, the scroll bars and the zoom bar behave in the same way as for a 2D view. You can scroll the view almost without limit. For details about changing the projection, see page 228.

The 3D thumbwheels

MicroGDS provides two *thumbwheels* that you can use to change the line of sight, by swinging the eye position around the look-at point. The 3D round thumbwheel moves the eye position horizontally around the look-at point, and the 3D wheel thumbwheel moves vertically around the look-at point. The look-at point stays in the same place.



By default, the 3D thumbwheels are situated at the top right, and bottom left of the window definition, next to the scroll bars. You can show or hide the 3D thumbwheels using the Customize dialog box. For more details, see Chapter 17, *Customizing MicroGDS*.

The counters positioned in the centre of the thumbwheels show the current horizontal and vertical positions, relative to the Z axis.

▶ To move the eye position to a specific point

- drag the appropriate thumbwheel in the required direction

▶ **To move the eye position in steps**

- click the appropriate point on the thumbwheel

  Note that the size of the step depends on how far from the counter you click.

The viewing buttons

MicroGDS provides a number of viewing buttons that you use to zoom, pan, and change the view. You can select the viewing buttons to display on 2D (including print layout) and 3D views using the View Controls tab on the Customize dialog box.

The default buttons on a 3D window are:

 switches to 2D view

 switches to 3D view

 switches to print layout view

 expands the view extent to fill the window

 zooms in to a rectangular area that you specify

Note that in a 3D perspective view, you drag a frustum to indicate the view extent.

 zooms to show the selected graphics as large as possible

 zooms to show all the graphics as large as possible.

 switches back to the previous view

 switches forward to the next view

 creates a new window with a view extent that you specify

 advances to and retreats from a point

 changes the zoom angle and advances or retreats

 slides the eye ray or pans across the scene

 revolves the eye position about the look-at point

 pans and tilts the look-at point around a fixed eye position

 walks in and out of the scene

 sets the drawing style

The default buttons on a 2D window are described in Chapter 2, *Exploring MicroGDS*. More details about choosing view controls are given in Chapter 17, *Customizing MicroGDS*.

The nudge commands

MicroGDS also provides a set of *nudge commands* to enable you to move the view up, down, left, and right.

The effect of a nudge command depends on the active *nudge mode* and the current 3D projection. MicroGDS provides three nudge modes that you use to nudge a 3D view:

- 'Swing Round mode' swings around the model
- 'Walk Through mode' walks through the model
- 'Slide Past mode' slides past the model

▶ To nudge the view

1. On the View menu, click Alter View, Nudge, and then click the nudge mode you require.
2. On the viewing buttons or on the View toolbar, click the nudge direction button you require.

   Alternatively, on the View menu, click Alter View, Nudge, and then select the nudge direction.

For details on the nudge modes and each of the nudge commands, refer to Help.

By default, the view is nudged by a 5° angle or by a distance of 10%. You can change the amount in which the view swings or walks using the Nudge Parameters dialog box, available from the View menu (Alter View, Nudge, Parameters). For more details, refer to Help.

Note that you might want to assign shortcut keys to the nudge commands and use them as an alternative to the mouse-based navigation facilities. For details about assigning shortcut keys, see Chapter 17, *Customizing MicroGDS*.

Changing the view parameters

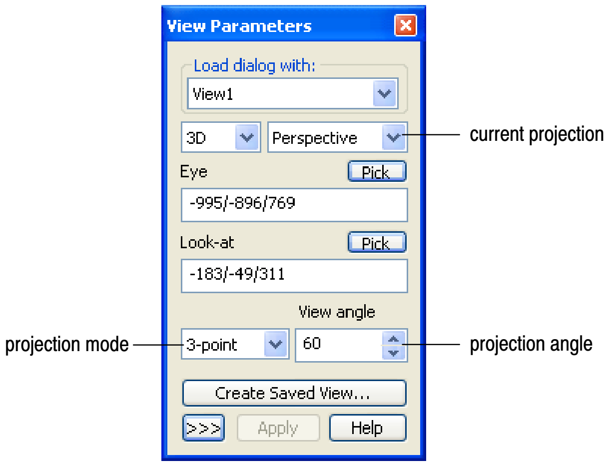
A MicroGDS document has a view which consists of 2D, print layout, and 3D parameters. A 2D view has an extent and a rotation from horizontal. A print layout view has only an extent. A 3D view is either parallel or perspective; these two views share the eye point and look-at point parameters.

When you switch between views, MicroGDS remembers the view parameters independently. You can use the View Parameters dialog box to display the projection and view parameters for the current view, and set new parameters.

▶ To display the View Parameters dialog box

- on the Window menu, click View Parameters

MicroGDS displays the view parameters for the current view, for example:



By default, the View Parameters dialog box is displayed in its shortened form, showing the parameters that you are most likely to be interested in. To expand the dialog box to see more parameters, click >>>. When the dialog box is expanded, you can shrink the dialog box by clicking <<<.

Use this dialog box to change the current projection and the line of sight, as described next, and any other parameters specific to the projection type. You can also create new saved views and recall and apply any existing saved view from the View Parameters dialog box. For full details on changing the view parameters and working with saved views, refer to Help.

Changing the projection

There are two types of projection used in MicroGDS: parallel projections, and perspective projections.

The first time you view a drawing in 3D, MicroGDS shows the graphics using a 3-point perspective projection with a zoom angle of 60°. In a 3-point perspective projection, lines that are parallel to each other but are not parallel to the projection plane (your screen) converge to a vanishing point.

If the set of parallel lines is itself parallel to an axis, the vanishing point is called a principal (or an axis) vanishing point. A 3-point perspective projection has three vanishing points, corresponding to the X, Y, and Z axes. The line of sight is defined by the eye position and look-at point. You can also specify 1-point or 2-point perspective projections.

With a perspective projection, you specify the angle subtended by the cone of vision at the eye position. The default angle of the cone is 60°, but you can specify any angle between 0.1° and 179.9° (depending on the number of decimal places for angles set in your preferences).

When you change the cone of vision, MicroGDS automatically includes all graphics in the perspective view. Therefore, this angle also determines the location of the eye position.

MicroGDS offers a range of standard parallel projections, such as Isometric and Orthographic. For details about these projections, refer to Help.

You can change the projection of a view using the View Parameters dialog box. You can also view and change the eye position, look-at point, and other parameters. Whenever you change the view, MicroGDS stores the current view in memory so that you can return to a previous or next view.

▶ **To change the projection in which the 3D view is drawn**

1 On the Window menu, click View Parameters.

2 From the Projection list, click the projection you require.

3 From the Projection mode list, click the mode you require.

With a perspective projection, you must specify the cone of vision from the eye. The angle defines the apex of the cone, at the eye position.

4 Click Apply.

Changing the line of sight

The line of sight is the line between your position in space (the eye position), and the point on the drawing at which you are looking (the look-at point).

You can change the eye position and the look-at point independently, or together, using the View Parameters dialog box.

▶ **To change the eye position and the look-at point independently**

1 On the Window menu, click View Parameters.

2 In the Eye or Look-at boxes, type the new coordinates in the current set units and set axes.

3 Click Apply.

▶ **To change the eye position and the look-at point together**

1 Click one of the Pick buttons in the View Parameters dialog box.

2 In the graphics window, press the mouse button at the position to identify the first value.

3 Move the mouse in the required direction, and then release the mouse button.

As you move the mouse, a line is dragged to indicate the line of sight.

4 At the position to identify the second value, click the mouse button.

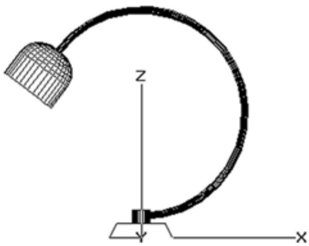
Setting a 3D view to the XY plane

When you work in a 3D view, you can change the view to the current XY plane while remaining in 3D view. This provides a flat view that can be useful, for example, for exact positioning, or if you want to see the top or side elevation of a shape.

▶ To set a 3D view to the XY plane

- on the View menu, click Axes XY Plane

  The view is set to the XY plane, in an orthographic parallel projection, and is zoomed to display all graphics.

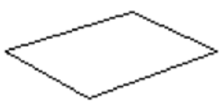


Note that the view direction is automatically set to Top, but in the example above, the Front view has been selected on the View Parameters dialog box.

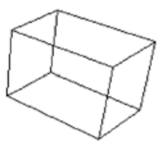
Working with clumps

A clump is a 3D primitive that comprises one or more joined faces.

One way to create clumps is from closed line primitives, where each closed line primitive becomes a face. For example:

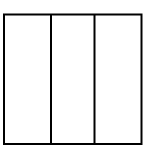


A clump with a single face

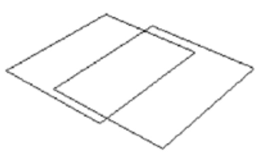


A clump with six faces

You can create clumps when you want to show one graphic in front, or on top, of another graphic. For example, if you drew two overlapping rectangles, the outlines of both line primitives are shown in 2D and 3D views as:

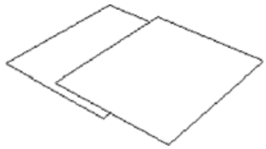


2D view

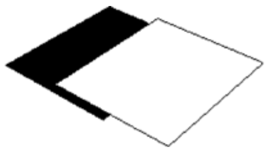


3D view

You can clump the graphics to create 3D graphics, and use the 3D Hide command so that hidden lines are not drawn:



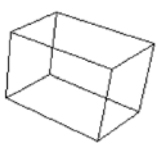
You can change the colour of a clump by applying a material. Materials are used when you use a 3D *shaded* view:



3D views are described further on page 241. For details about creating and using materials, see Chapter 11, *Working with materials*.

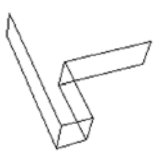
In MicroGDS, there are two types of clumps: *solid* clumps, and *mesh* clumps:

- solid clumps: When clump faces are joined to form a closed shape, the clump is solid. For example, to create a cube you must first draw six closed squares, one for each face of the cube. Each square must be drawn in the same direction as you look at the cube from the outside to ensure that the edges will match correctly. Then, when you select Clump Create, each coincident edge is joined to form the solid clump.



Solid clump

- mesh clumps: When clump faces do not join to form a closed shape, the clump is a mesh.



Mesh clump

Constructing clumps

You can use the Solid Construct commands to construct clumps, and the Solid Boolean, Slice command to slice through clumps.

The following subsections show some of the different types of clumps that you can construct. For full details about how to construct clumps and details about each of the clump commands, refer to Help.

If you have MicroGDS Collaboration, additional 3D solid commands are described in Part Two: *Advanced 3D and rendering*.

Changing the set facets

MicroGDS converts graphics to facets when you construct a clump with a curved surface. Facets are created when you extrude, displace, sweep, and revolve graphics.

For example, if you extrude a circle to form a cylinder, the extrusion has a number of faces. You specify the number of facets with the Set Facet command. The default is 32, but you can change this to anything between zero (which creates a solid clump with 2 faces) and 4906. Using a high number of facets results in a truer shape, but increases the time for redraws.

▶ To change the number of facets for new graphics

1 On the Set menu, click Facet.

2 In the prompt bar, type the number of facets and then press Enter.

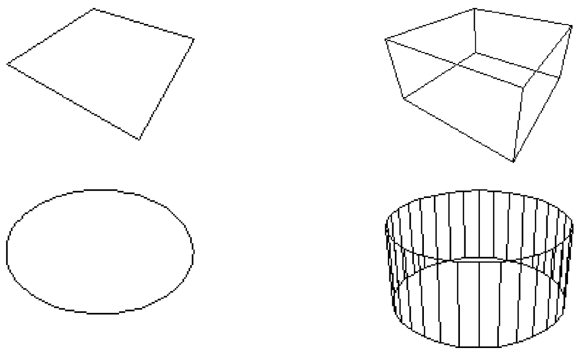
This number of facets will be used for new graphics; existing faceted graphics are not affected.

MicroGDS remembers the set facet value between MicroGDS sessions.

Extruding graphics

The Extrude command extrudes line primitives or objects. By default, the graphics are extruded parallel to the Z axis.

You can use the Extrude command, for example, to create a cube from a rectangle, or to create a cylinder from a circle:



You can also extrude graphics in any direction or taper graphics to any given point.

When you extrude graphics:

- each closed line primitive forms a solid clump
- each open line primitive forms a mesh clump
- if you extrude a curved primitive, it is facetted
- if you extrude multiple, closed line primitives that are nested, holes are created in the enclosing clump

The clumps are created in the current object. You can choose to replace or retain the original graphics.

When you extrude graphics, you specify two points to extrude between. For each point, you can snap to existing graphics or type in a 3D coordinate. MicroGDS uses only the Z coordinates of these two points.

The graphics must lie in the XY plane if you want to use the true shape of the graphics. If they do not, they are shadowed onto the XY plane before extrusion.

You can snap to the XY plane either when you specify the position to extrude from, or the position to extrude to. You cannot snap to the XY plane for both positions because both Z values are zero.

▶ To extrude graphics

1. Select the graphics to extrude.
2. On the Solid menu, click Construct, Extrude.
3. Specify the coordinates, or use a snapcode, for the position to extrude from.

   You can press TAB to toggle between extruding freely or constraining to the Z axis.

   If you want to taper the extrusion, press Enter and type the scale factor in the Extrude Scaling dialog box. MicroGDS calculates the tapering as a ratio between the start point and the scaling factor. For example, a scaling factor of 0 will join the vertices to a single point:

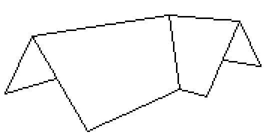
   

4. Specify the coordinates, or use a snapcode, for the position to extrude to.

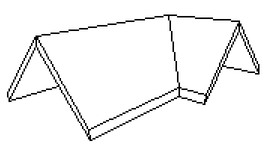
   To create a new graphic rather than modify the selected graphic, press Ctrl when you specify the position to extrude to.

Displacing graphics

The Displace command displaces line primitives or mesh clumps, and joins them up in the specified direction to form a surface or solid. For example:



Before displacing



After displacing

You can also extrude graphics parallel to the Z axis or taper graphics to any given point.

When you displace graphics:

- each closed line primitive or mesh primitive forms a solid clump
- each open line primitive forms a mesh clump
- if you displace a curved primitive, it is facetted
- if you displace multiple, closed line primitives that are nested, holes are created in the enclosing clump

The clumps are created in the current object. You can choose to replace or retain the original graphics.

When you displace graphics, you specify two points to extrude between. For each point, you can snap to existing graphics or type in a 3D coordinate. MicroGDS uses only the Z coordinates of these two points.

You can snap to the XY plane either when you specify the position to extrude from, or the position to extrude to. You cannot snap to the XY plane for both positions because both Z values are zero.

▶ To displace graphics

1. Select the graphics to displace.
2. On the Solid menu, click Construct, Displace.
3. Specify the coordinates, or use a snapcode, for the position to extrude from.

   You can press TAB to toggle between extruding freely or constraining to the Z axis.

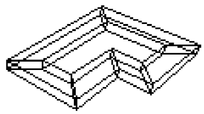
   If you want to taper the extrusion, press Enter and type the scale factor in the Extrude Scaling dialog box. MicroGDS calculates the tapering as a ratio between the start point and the scaling factor.
4. Specify the coordinates, or use a snapcode, for the position to extrude to.

   To create a new graphic rather than modify the selected graphic, press Ctrl when you specify the position to extrude to.

Sweeping graphics

You can construct a clump by sweeping line primitives along a path:

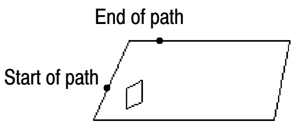
Before sweeping



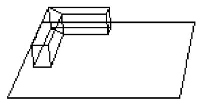
After sweeping

Note that if the path is not perpendicular to the plane of graphics, the graphics are first shadowed onto the plane that is normal to the path.

The graphics need not lie on the path:



Before sweeping



After sweeping path

When you sweep graphics:

- each closed line primitive forms a solid clump
- each open line primitive forms a mesh clump
- if you sweep a curved primitive, it is facetted
- if you sweep multiple, closed line primitives that are nested, holes are created in the enclosing clump

The clumps are created in the current object. The original graphics are always replaced by the new clumps.

▶ To sweep graphics

1 Select the graphics to sweep.

2 On the Solid menu, click Construct, Sweep.

3 Specify the coordinates, or use a snapcode, for the start of the path to sweep from.

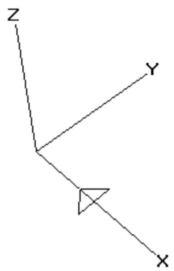
   If you want to taper the swept graphics, press ENTER and type the scaling factor in the Extrude Scaling dialog box.

4 Specify the coordinates, or use a snapcode, for the end of the path to sweep to.

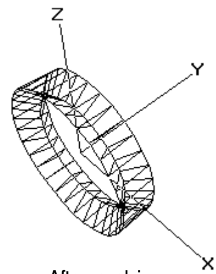
   To sweep along the entire path of the graphic, press Ctrl and click anywhere along the path.

Revolving graphics

MicroGDS enables you to construct a clump by revolving a graphic through 360° around the Y axis.



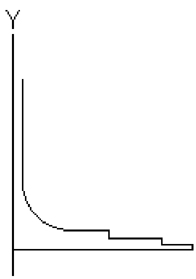
Before revolving



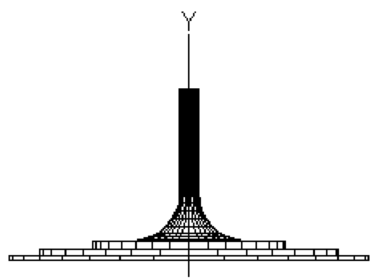
After revolving

There is an example at the end of this chapter that you can work through to create a 3D desk lamp. In the example, the lamp stem and base are converted to a clump by revolving the 2D primitive around the Y axis.

For example:



Before revolving



After revolving

The graphics to be revolved must not cross the Y axis.

If you want to use the true shape of the graphics, the graphics should lie in the XY plane. If they do not, they are shadowed onto the XY plane before they are revolved.

When you revolve graphics:

- each closed line primitive forms a solid clump
- each open line primitive forms a mesh clump

The surfaces are facetted so that the faces of the clumps can be created.

The clumps are created in the current object. You can choose to replace or retain the original graphics.

▶ To revolve graphics

1 Select the graphics to revolve.

The graphics must lie in the XY plane, and must not cross the Y axis.

2 On the Solid menu, click Construct, Complete Revolve.

To create a new graphic rather than modify the selected graphic, press Ctrl when you select the command.

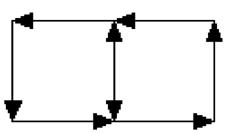
Creating clumps

MicroGDS offers a number of commands for you to work with clumps. You can:

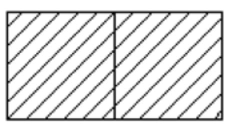
- clump existing graphics
- unclump existing clumps into constituent line primitives
- fragment existing clumps into constituent faces

You can assemble existing primitives and objects to form a single clump.

- if two closed line primitives have coincident edges, and the edges have opposite directions, they are joined to form a single clump

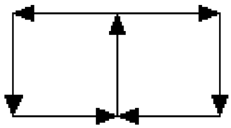


two closed line primitives; edges opposite directions

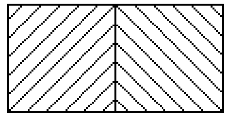


forms a single clump with two faces

if the edges have the same direction, the two primitives become two clumps each with one face



two closed line primitives;
edges same direction



forms two clumps, each with one face

- if three or more faces have coincident edges in opposite directions, the edges are joined in pairs

Clumps can only be created from closed line primitives; open line primitives are ignored.

Full details on creating clumps are given in Help.

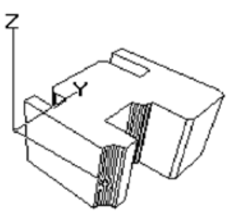
Co-planar Geometry

If your graphics use *co-planar* geometry, 3D views may be unpredictable. Co-planar geometry is where faces of two different clumps wholly or partly coincide. Where graphics use co-planar geometry, MicroGDS has no way of knowing which face should be in front of the other. This is particularly obvious when you have assigned materials to your graphics and you view the graphics in a 3D shaded view.

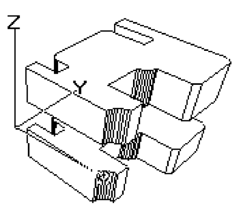
In some circumstances, you may be able to extrude or move one of the clumps so that they no longer coincide.

Slicing clumps

You can slice a clump along the XY plane. For example, you may want to slice a clump into two, and then separate the clumps to create an exploded view of the object.



Before slicing



After slicing

When you slice graphics:

- if the original clump was a solid clump, the cut surfaces are closed to make new solid clumps
- if the original clump was a mesh clump, the cut surfaces remain open to create two new mesh clumps

The clumps are created in the current object.

▶ **To slice a clump**

1 Set the axes so that the XY plane defines the slice that you want to make.

You can achieve this using the Set, Axes Spin X, Spin Y, and Spin Z commands, or Set, Axes Move. For details on how to use these commands, refer to Help.

2 Select the clump to slice.

3 On the Solid menu, click Boolean, Slice.

The clumps are sliced in the XY plane.

To create an exploded view, move one of the new clumps.

Smoothing clumps

You can smooth the edges between faces of 3D graphics. For example, if a clump is facetted, you can smooth the facets so that edges between facets appear softer.

Before smoothing After smoothing

When you construct a clump from a curved line primitive, MicroGDS facets the primitive so that the faces of the clump can be created, and then automatically smooths the clump faces. However, if you import external files the graphics are not smoothed.

You can smooth all edges in a clump between faces that meet at less than a particular angle, or you can smooth individual edges of a clump.

To show or hide smooth edges between clump faces for non-rendered 3D graphics, use the Show Smooth Edges command on the View, Hide Options menu, described next. For full details on smoothing clumps, refer to Help.

Note that smoothing clumps helps to produce clearer rendered images in MicroGDS Collaboration. For details about rendering, refer to Part Two: *Advanced 3D and rendering*.

▶ **To smooth the edges between facets of a clump**

1. On the Solid menu, click Clump, Smooth Edge.
2. Click the edge that you want to smooth.

▶ **To smooth the faces of a clump by angle**

1. Select the clumps to smooth.
2. On the Solid menu, click Clump, Smooth Angle.
3. Click the edge that you want to smooth.
4. Type the maximum angle between 0° and 120° between faces to be smoothed and press Enter.

   Faces that meet at an angle that is smaller than the angle you specify are smoothed.

You can also change the angle of smoothing for the selected clumps using the Properties window (Ctrl+Q). For details about using the Properties window, see Chapter 13, *Getting information*.

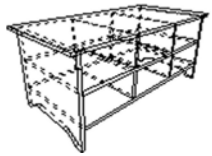
Showing graphics in different ways

You can display 3D graphics in different ways:

- draw all lines as a wireframe (the default 3D view)
- display hidden lines in a dotted linestyle
- hide hidden lines
- shade graphics using materials and lights, with or without edges

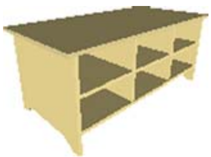
Hidden lines are those edges of a solid object that pass behind or through other solids, and would be invisible if the solids were opaque.

Wireline

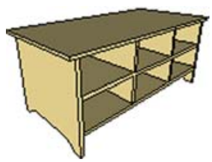


Dotted

Hidden



Shaded



Shaded with edges

You can also display the graphics in a section view to show only graphics that lie behind a specified plane or cube. This is explained in *Using section views* on page 245.

▶ To change the type of view

1 On the View menu, click Hide Mode.

2 On the Hide Mode submenu, click the hide mode you require.

You can modify the clumps in all types of view.

Note that raster images are not shown in shaded or hidden line views. For details about constructing raster primitives, see Chapter 15, *Working with different file formats*.

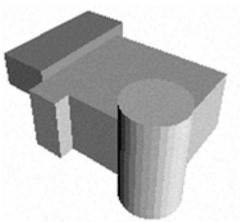
All 2D line primitives within the view extent are shown in all types of view. This includes non-3D geometry such as construction lines, light objects, and so on. If you do not want non-3D graphics to be shown, ensure that external light objects are outside the view extent, and place all construction lines onto a single layer and set that layer to Invisible. This may be particularly relevant when you view graphics using a shaded view.

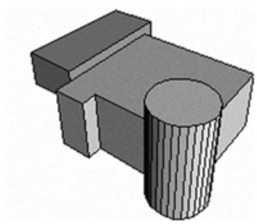
Note that when you use a shaded or hidden view, by default you cannot snap on to any hidden lines. If you want to snap on to hidden lines, you can switch this facility on in your preferences. For details, see Chapter 17, *Customizing MicroGDS*.

Using shaded views

You can display three-dimensional graphics in a 3D view so that materials and lightstyles are used to shade the graphics. There are two types of shaded view: ‘Shaded’ and ‘Shade with Edges’. The difference between these two modes is that Shaded shades clump faces and ignores the clump edges, whereas Shade with Edges adds the clump edges.

For example:





The shaded views enable you to produce fast and simple images from 3D models. You can define materials and lightstyles which MicroGDS will use to shade the graphics.

In MicroGDS Collaboration, using a shaded view is quicker than rendering, and you can draw in a shaded view, whereas you cannot draw in a rendered image. For details about creating and using materials and lightstyles, and rendering an image, see Part Two: *Advanced 3D and rendering*.

Materials are shown as plain, matte colours in a shaded view. If there are no materials in the document, MicroGDS uses a default matte shade for all graphics.

For details about creating and assigning materials for a shaded view in MicroGDS, see Chapter 11, *Working with materials*.

Materials are much more sophisticated in MicroGDS Collaboration, but many of those attributes are not used in a shaded view.

If you have not added any lights to the scene, MicroGDS uses the built-in simplified lighting. This consists of two lights, an eye light and a distant light (that looks over the left shoulder of the camera).

Where there are a large number of lights in a scene, the scene might not be lit as expected. This is because only a limited number of lights are processed and the ones that are processed might not produce the best lighting effect. In such cases, use the Simplify Lights option on the View menu to ignore all lights in the scene and simplify the lighting instead.

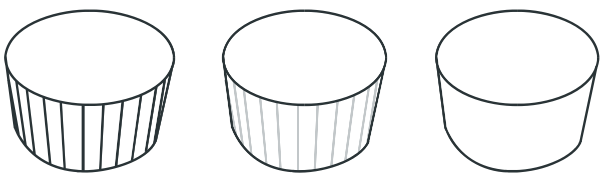
For details about creating and assigning lights for a shaded view in MicroGDS, see Chapter 10, *Working with lightstyles*.

In MicroGDS Collaboration, lights are also used when you render 3D graphics. Many additional light types are also available in MicroGDS Collaboration. For further details, see Part Two: *Advanced 3D and rendering*.

View options

MicroGDS provides options on the Hide Options submenu that you can use to select hidden-line options. These include:

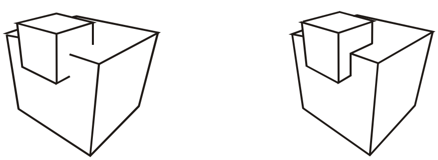
- showing (in full or partially) or omitting smooth edges between clump faces, in all views except shaded views



Show Full Show Partial Omit smooth edges

  You can show or hide smooth edges in all 3D views, except shaded views.

- showing or hiding intersection lines, in hidden and dotted views



Hide intersection lines Show intersection lines

  Show Intersection Lines is available only in hidden-line, dotted-line, and shade with edges 3D views.

You can use the Smooth commands to smooth edges and angles. Edges and angles that are smoothed are shown when you select Full or Partial smooth edges.

For full details about the Hide options that you can use, refer to Help.

Note that if you burn in the contents of a photo with a 3D view, the overlaid intersection lines are placed in a new object called *Graffiti:*. For details about photo primitives, refer to Chapter 3, *Working with primitives and objects*.

Using section views

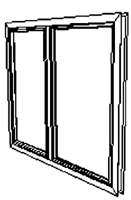
A section view lets you set a clipping point at which objects outside the section are hidden. Section views are particularly useful for constructing photos and placing them in a print layout view. You might also find it useful for removing nonessential detail when you are working within a particular 3D region.

There are two types of section view:

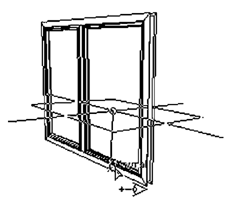
- Clip to Plane: clips the view to a single, specified plane
- Clip to Cube: clips the view to a specified cube

MicroGDS shows only graphics that lie behind the clipping plane or within the clipping cube. You can choose whether cut faces are 'closed' or 'open' and specify the linestyles and materials to use for cut edges and faces.

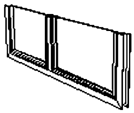
For example, you might create a section plane through a casement window to reveal the extruded window profile:



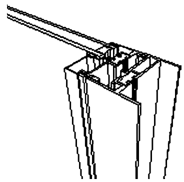
casement window



horizontal clipping plane



section view



section view, zoomed in

You can display a section view in any of the 3D hide modes described earlier.

▶ To set up a section view

1 On the View menu, click Section Clip.

2 On the Section Clip submenu, click the type of section view you require.

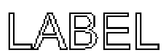
For more details about working with section views, refer to Help.

Text in 3D

If you want to modify text with the Solid commands—for example, if you want to extrude it—you must first convert the outline of the text into line primitives by ‘burning’ it in.

For example, if you burn the text primitive LABEL, it becomes eight line primitives:

Before burning in



After burning in

Once you convert a text primitive to line primitive form, it can no longer be edited as text.

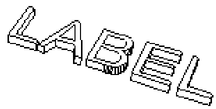
▶ To convert text primitives to line primitives

1 Select the text primitives you want to convert.

2 On the Alter menu, click Text, Burn In.

The outline of each text character is converted into a series of line primitives.

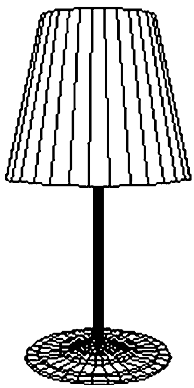
You can now use the 3D commands, such as extrude, on the converted text. For example:



If you want to edit the text as a single entity, for example, to move or copy it, first select each individual primitive. For more details, see Chapter 3, *Working with primitives and objects*.

Constructing a sample object

This final section shows how to draw a simple desk lamp demonstrating some of MicroGDS's basic 3D capabilities.



The sample drawing gives you some ideas about how to construct 3D graphics and work with 3D views.

Much of the lamp is constructed in a 2D view. This means that you will not immediately see some of the construction and geometry until you switch to 3D. If you want to see how the lamp is progressing, switch between 2D and 3D view at any time. All the construction can be done in a 3D view, but for the purpose of this exercise return to 2D view before you continue with your drawing.

It should take only a few minutes to draw the desk lamp, but it is a good idea to save at regular intervals. This will enable you to return to a previous stage if necessary.

In MicroGDS, there are usually several ways of accomplishing a task; this example illustrates just one way of creating a 3D object.

▶ To draw the desk lamp

1 Start by creating a new document:

a) On the File menu, click New.

b) On the Create a New File dialog box, select Blank and click OK.

2 To set the units of measurement to millimetres, and decimal places to one:

a) On the Set menu, click Units.

b) In the prompt bar, type mm and press Enter.

c) In the prompt bar, type 1 and press Enter.

3 To draw the lamp stem:

a) On the Construct menu, click Rectangle.

b) Press Enter to display the Rectangle dialog box.

c) In the X size box, type 8; in the Y size box, type 350 and press Enter.

A rectangle of the specified size is attached to the mouse pointer.

d) To specify the top-left corner of the rectangle, type 0/0 and press Enter.

MicroGDS constructs rectangles on the XY plane. This means that you do not need to specify the Z coordinate; MicroGDS assumes the Z coordinate to be 0.

e) To position the bottom-right corner of the rectangle, move the mouse pointer towards the bottom right of the graphics window until the rectangle appears below the axes and to the right, then click the mouse button (using a Dot snapcode).

You do not need to end the rectangle command because you will continue to use it in the next step.

4 To draw the lamp base:

a) First, you will need to change the view so that you can accurately place the three tiers that will make up the lamp base. If you are familiar with the zoom bar and zoom commands, zoom in to the bottom of the lamp stem.

Alternatively, use the View Parameters dialog box (available from the Window menu) to change the view extent to 220/–225 in the top box, and –120/–440 in the box below, and then click Apply.

b) To draw the top tier of the lamp base, press Enter to redisplay the Rectangle dialog box.

   If you have ended the previous rectangle command, you can use the 'repeat the last command' feature to quickly reselect it: first, if you used the View Parameters dialog box to change the extent, click the MicroGDS window title bar to make sure it has focus and then press Enter to repeat the last command. Then press Enter to redisplay the Rectangle dialog box.

   You could also reselect the Rectangle command on the Construct menu but using the shortcut method of repeating the last command can be quicker, especially when commands are nested on submenus.

c) In the X size box, type 80 and in the Y size box, type 7 then press Enter.

d) Click on the bottom-left corner of the lamp stem to position the top-left of the rectangle (using a Point snapcode).

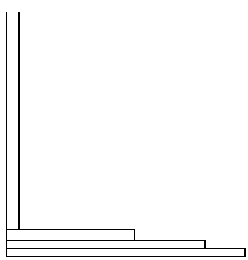
e) Move the mouse pointer towards the bottom right of the graphics window until the rectangle appears below the lamp stem and to the right, then click the mouse button.

f) Repeat steps b) to e) to draw and place two further tiers, one below the other, using the sizes:

   X size = 125, Y size = 5

   X size = 150, Y size = 5

   Your drawing should look like this:



In the next step, you will glue the four primitives to form a single primitive. You will then revolve the primitive to create a 3D lamp stem and base.

5 To glue the primitives together:

a) On the Alter menu, click Glue.

b) To glue the first two primitives, click the lamp stem and then click the top tier of the lamp base, using Line snapcodes.

The two primitives are joined and the coincident line is removed.

c) Repeat step b) to glue the newly-created graphic to the second tier, and then the second tier to the third tier.

The existing primitives are now a single line primitive, and will be treated as a single entity.

Before converting the 2D primitive to a 3D primitive, you will use the Fillet command to soften the angle between the lamp base and stem.

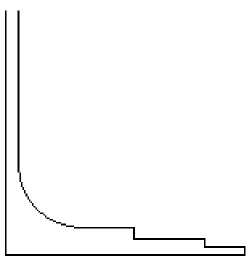
6 To fillet the primitive:

a) On the Alter menu, click Fillet.

b) At the radius size prompt, type 40 and press Enter.

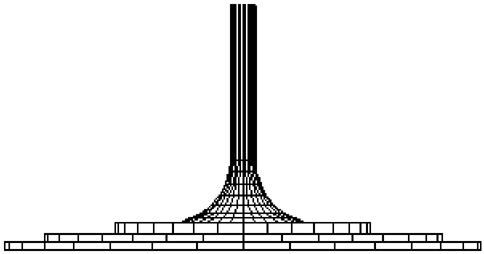
c) Click the first right-angle of the graphic. That is, the angle between the lamp stem and the first tier.

The drawing should now look like this:



7 To create the stem in 3D, on the Solid menu, click Construct, Complete Revolve.

This command constructs a *clump* from a line primitive. The graphics are revolved through 360° about the Y axis:



A clump is a 3D primitive that comprises one or more connected *faces*. A face is one surface of a closed line primitive. When you revolve a primitive, MicroGDS converts the graphics to a number of faces. The number of faces created is defined by the set number of facets. For details about changing the number of facets, refer to Help.

8 To show the graphics in the window at their maximum size:

a) On the View menu, click Zoom, Extents.

The clump is shown at its maximum size. You will now use another Zoom command to zoom out by a factor of 2, about the centre of the view.

b) On the View menu, click Zoom, Out.

In the next step, you will cut the lamp stand to the Clipboard, spin the axes about the current X axes, and then paste the lamp stand back to the window. This will stand the lamp stand vertically in the scene when viewed in 3D, and will enable you to correctly construct and position the lampshade.

9 To change the view ready to construct the lampshade:

a) On the Edit menu, click Cut.

The clump is cut from the window and placed on the Clipboard.

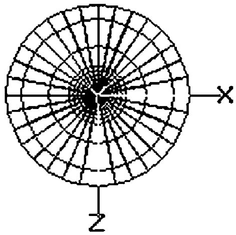
b) On the Set menu, click Axes, Spin X.

c) In the prompt bar, type 90d and press Enter.

This is the default axes rotation.

d) On the Edit menu, click Paste.

The clump is pasted back, at the specified rotation. For example:



If you have the Angle setting on the status toolbar, ‘Skew’ is shown in the Angle box to indicate that the X axis is rotated out of the default XY plane.

e) To switch the view to 3D, on the View menu, click 3D.

The first time you view a drawing in 3D, MicroGDS uses a 3-point perspective projection. If you have changed the projection, use the View Parameters dialog box (available from the Window menu) to set the view to a Perspective, 3-point, with an angle of 60°.

f) To reset the axes to the centre of the drawing sheet with a rotation of 0°, on the Set menu, click Axes, Centre.

In the next step, you will construct the shade by drawing a circle and using the Extrude command to extrude and taper it into a cone.

10 To construct the lampshade:

a) On the Construct menu, click Circle, Radius Centre.

b) At the radius prompt, type 200 and press Enter.

c) To place the circle at the axes origin, type 0/0 and press Enter.

MicroGDS constructs circles on the XY plane and so assumes the Z coordinate to be 0.

d) On the Solid menu, click Construct, Extrude.

A cylinder is attached to the mouse pointer.

e) To specify the position to extrude from, type 0/0.

As you move the mouse pointer vertically up the window a ghost cylinder is drawn, following the height of the pointer.

f) To taper the cylinder, press Enter to display the Extrude Scaling dialog box, type a scale factor of 0 and click OK.

   MicroGDS calculates the tapering as a ratio between the start point and the scaling factor. Therefore a scaling factor of 0 will join the vertices of the circle to a single point.

g) To specify the position to extrude to, type //1000 and press Enter.

   You can use // as a shortcut to mean use the same X and Y values as the previous position.

h) To show the graphics in the window at their maximum size, on the View menu, click Zoom, Extents.

You will now cut the cone using the Slice command, and remove one part. The remaining part of the cone is your lampshade.

Note that you would probably design the lampshade by tapering the extrusion to the precise scaling factor. Here, however, we want to illustrate the effectiveness of the Slice command.

Because clumps are sliced along the XY plane, you will first move the axes to where the clump will be sliced.

11 To edit the resulting clump:

a) On the Set menu, click Axes, Move.

b) To position the axes, type 0/0/350 (or //350)and press Enter.

c) To retain the orientation of the axes, press Esc.

   You will now use the Slice command to slice the cone in two. along the XY plane.

d) On the Solid menu, click Boolean, Slice.

   The cone is split into two, with both parts selected.

e) To select only the upper part of the cone, click the upper part.

f) To delete the selected graphics, press Delete.

   The lamp is complete. By default, the graphics are shown in wireline view.

12 To change the view:

a) To hide the axes, on the Set menu, click Axes, Show.

b) To change the view to hidden-line view, on the View menu, select Hide Mode and then select Hide.

Alternatively, press Ctrl+H.

13 Finally, use the zoom commands to zoom into the view, and then practice changing the position of the eye using the 3D Wheel Thumbwheel (above the vertical scroll bar).

If the thumbwheel view controls are not displayed on the window, use the View controls tab on the Customize dialog box to switch them on.

Chapter 10

Working with lightstyles

Lightstyles

In MicroGDS, you can create lightstyles to change the atmosphere of a shaded image. You can use different types of lights to cast light in different ways. For example, you can focus light along the line of sight, or use ambient lighting to illuminate all surfaces equally. Lights are used when you use a 3D shaded view.

You assign lightstyles to objects to create lights. For details about how to create objects, see Chapter 3, *Working with primitives and objects*.

In MicroGDS Collaboration, lights are also used when you render 3D graphics. Additional, more sophisticated, lightstyles are also available. For further details, see Part Two: *Advanced 3D and rendering*.

When you create a new document, two lightstyles are always available: DEFAULT and NONE.

- DEFAULT is based on an *eye* light type.

  The DEFAULT lightstyle is stored separately from any lightstyles you create and cannot be saved, deleted, or replaced.

- NONE is not a light, but is the lightstyle automatically assigned to all new objects; it cannot be modified.

  By default, no objects in a document are light sources, and so initially all have a lightstyle of NONE.

If you create an object for which you want to create a lightstyle, select the DEFAULT lightstyle first and then modify it accordingly.

Lights work together with materials to enhance the appearance of shaded images. For details about creating materials, see Chapter 11, *Working with materials*.

If there are no lights assigned in a scene, MicroGDS automatically uses the built-in simplified lighting in shaded views. Details about the simplified lighting is given on page 266.

Types of lights

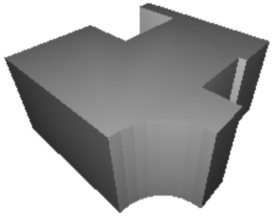
In MicroGDS, lights can be based on the following types of light:

ambient	illuminates all surfaces equally
distant	emits parallel light as if from a very distant source, such as the sun
eye	emits light from the eye position equally in all directions

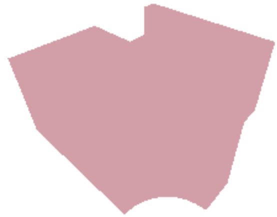
Note that an eye light and the DEFAULT light would look identical, except that you can change the colour and intensity of an eye light.

If you are using MicroGDS Collaboration, many additional light types are available. These are also used when you render the image. For details, see Part Two: *Advanced 3D and rendering*.

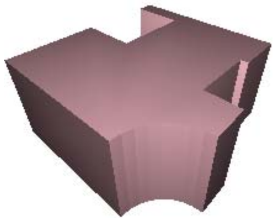
Some examples of using different light types are shown next. Simple materials have been added to the objects. The first example shows the shaded image as it would appear using only the DEFAULT light. The remaining illustrations show the same image, using each of the light types in turn.



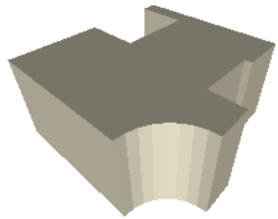
DEFAULT light



Ambient light



Eye light



Distant light

If no user-defined lights exist in the model, MicroGDS lights the scene using simplified lighting. You can also switch on simplified lighting if you want to ignore any user-defined lights. For more details, see *Using simplified lighting* on page 266.

Ambient

Ambient lights provide a general level of illumination. The position and orientation of the object to which the light is assigned is not important, because this type of light has no direction.

The colour of an ambient light tints the scene. You usually have only one ambient light, but you may need to add additional lighting to create a well-lit scene.

Distant

A distant light emits parallel light rays coming from a single, distant source. A distant light is appropriate as the main light source for sunlit scenes.

The light is directed along the negative Z axis of the object to which the light is assigned.

An example of how to create and place a distant light in a 3D scene is given in the later section *Lighting a scene—an example* on page 267.

Eye

An eye light creates a light source at the eye position and emits light equally in all directions. The position and orientation of the object to which an eye light is assigned does not affect the lighting.

The DEFAULT light is based on an eye light.

Accessing lightstyles

For single-user documents, new lightstyles are stored in the document. They are saved when you save the document.

You can also access linestyles from external style files (called LIGHTS.STY). To do this, you specify the folders in which the LIGHTS.STY files are located using the Style Search Path command on the File menu. You can add more than one folder to the style search path, but only one LIGHTS.STY file can be stored in each location. If you modify and save a style from an external style file, it is saved in the document. For more details about style files, see Chapter 2, *Exploring MicroGDS*.

For multi-user projects in MicroGDS, all lightstyles are stored in external style files (LIGHTS.STY). New lightstyles are saved in the first LIGHTS.STY location on the style search path. A lightstyle is saved in the style file as soon as you save the style, even if you do not save the project.

You can access lightstyles available to a document from the Document Organizer and also from the status toolbar.

▶ To access lightstyles using the Document Organizer

1 On the Document Organizer, click the Styles tab:

2 Double-click the Lights category, or click the plus sign (+) to the left.

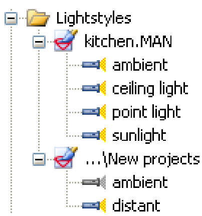
A list of all locations from where you can access lightstyles is shown:

- for a single-user document, the name of the document with which you are working is shown first, followed by the path of each style file defined in the style search path if any
- for a multi-user project, the name of the first style file defined in the style search path for the project is shown first, followed by the path of each subsequent location defined in the project

If a LIGHTS.STY file exists in the location defined for styles and fonts in your file location preferences, this location is shown last in the list. This enables you to reference a set of global style files that are available to all your documents. For more details, refer to Help.

3 To display a list of lightstyles in a location, double-click the location or click the plus sign (+) to the left.

For example:



Lightstyles are prefixed by an flash light icon. The colour of the beam determines the availability of the style:

- a yellow beam means that the lightstyle can be used in the document
- a grey beam means that the lightstyle is not currently available to the document

  (A lightstyle is unavailable if a lightstyle of the same name already exists in a location higher in the style search path.)

4 To preview a lightstyle definition, select the style and then, on the shortcut menu, click Toggle Preview.

▶ To access lightstyles from the status toolbar

- on the Light box on the status toolbar, click the arrow

  All styles available to the current document are listed.

Adding a lightstyle

You can add new lightstyles to make them available in your document. When you add a lightstyle, it immediately becomes current and any selected objects are assigned that lightstyle. Any new objects you create are also assigned the current lightstyle.

Note that if you open a document in which there are missing lightstyles, for example, if they have been deleted, MicroGDS reports the error conditions to the Problems dialog box. You can use the dialog box to correct the errors by:

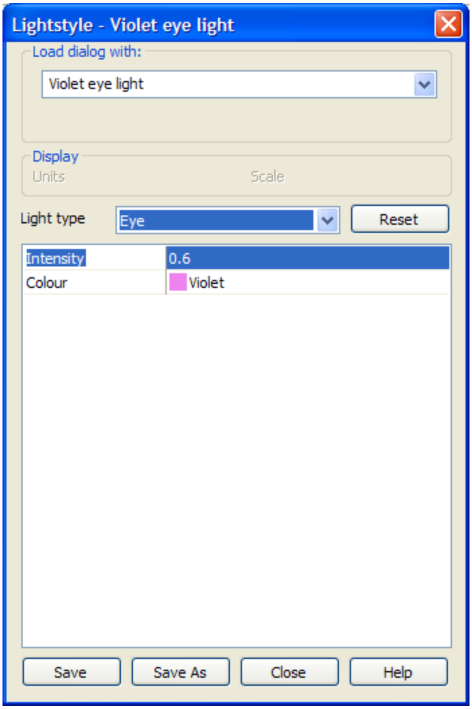
- changing the styles and fonts folder
- editing the style search path
- adding new lightstyles

▶ To add a lightstyle using the Document Organizer

1. Click the Styles tab on the Document Organizer, and then double-click the Lights category.
2. Do one of the following:
   - to create a new lightstyle based on DEFAULT, select the Lights category and then, on the shortcut menu, click New
   - to create a new lightstyle based on an existing style, select the lightstyle on which to base the new style from the required location and then, on the shortcut menu, click New based upon

   The Lightstyle dialog box is displayed, showing the characteristics of the current lightstyle.

For example:



Note that the Display options are only applicable to light types supported in MicroGDS Collaboration.

3 If you want to use or amend a lightstyle other than the current one, select the style from the ‘Load dialog with’ list.

4 To create a new lightstyle, select the type of lightstyle to create from the list: Ambient, Distant, or Eye.

5 If you want to change the intensity or colour of the light type, click the attribute and modify the setting as required.

To reset any changed attributes to the defaults for the light type, click Defaults.

For more details about lightstyle attributes, refer to Help.

6 Save the lightstyle:
   - to save the lightstyle with the existing name, as shown on the title bar, click Save
   - to save the lightstyle with a new name, click Save As, type the name in the Style Name dialog box and click OK

   The name must comply with the MicroGDS naming rules, as described later in this section.

The named lightstyle is made current and its name is shown in the Light box on the status toolbar.

▶ To add a lightstyle using commands

1 From the Light list on the status toolbar, select the lightstyle on which you want to base your new lightstyle.

2 On the Styles menu, click Lightstyle Modify.

3 Specify the settings in the Lightstyle dialog box, as required.

4 Save the lightstyle as described in step 5 in the previous procedure.

Rules for naming lightstyles

- a lightstyle name can contain up to 256 characters
- names can include spaces, except at the beginning or end of the name
- lightstyle names are case sensitive, so ‘Red Eye’ and ‘red eye’ are two different lightstyles
- you cannot save to the name DEFAULT or NONE

Changing the lightstyle

When you add a lightstyle, it immediately becomes current. The name of the current lightstyle is shown in the Light box on the status toolbar.

If you have selected several objects that have different lightstyles assigned, the Light box is blank.

Note that each time you click a graphic for which a lightstyle is assigned, the current lightstyle changes to that object’s lightstyle.

▶ **To change the current lightstyle**

1 Select any objects for which you want to change the lightstyle.

2 Do one of the following:

- from the Lightstyle list on the Properties window, select the lightstyle
- from the Styles tab on the Document Organizer, select the lightstyle you require, and then click Set as current on the shortcut menu
- from the Light list on the status toolbar, select the lightstyle
- on the Set menu, click Lightstyle, type the name of the lightstyle in the prompt bar and press Enter

  The lightstyle name must match a lightstyle that you have already added to the document.

Modifying an existing lightstyle

With the exception of DEFAULT and NONE, you can modify any existing lightstyle that is available to the document.

If you are using MicroGDS Entry Level and you modify a lightstyle that was created in MicroGDS Collaboration, the original lightstyle will be overwritten if you save it using the same name. You may not be able to re-create the lightstyle using MicroGDS Entry Level.

Note that you can only modify lights that are of types available to the MicroGDS product you are using.

▶ **To modify a lightstyle using the Document Organizer**

1 In the Document Organizer, ensure that the appropriate document is the current document.

2 On the Styles tab, locate the lightstyle that you want to modify.

3 Double-click the lightstyle name, or on the shortcut menu, click Edit.

  This command is unavailable for any lightstyle where a lightstyle of the same name exists in a location higher in the style search path.

  MicroGDS displays the Lightstyle dialog box.

4 Modify the characteristics as required.

5 To save the lightstyle, do one of the following:
- to keep the same lightstyle name, click Save

  If you retain the lightstyle name, all objects that use the lightstyle are immediately updated.
- to save the lightstyle with a new name, click Save As, type the name in the Style Name dialog box and click OK

If you modify a lightstyle from an external style file, MicroGDS creates a new local lightstyle with the name you specify.

For more details about style files, see Chapter 2, *Exploring MicroGDS*.

If you save a lightstyle to a name that exists in an external style file, the icon for the external lightstyle changes colour in the Document Organizer. This indicates that a local style of the same name now exists. For more details, see *Accessing lightstyles* on page 258.

▶ To modify a lightstyle using commands

1 From the Light list on the status toolbar, select the lightstyle to modify.

  Alternatively, select a primitive that uses the style you want to modify.

2 On the Styles menu, click Lightstyle Modify.

3 Modify the lightstyle and then save the lightstyle, as described in step 5 in the previous procedure.

Deleting a lightstyle

You can delete lightstyles that are no longer required. You cannot retrieve deleted lightstyles.

If you select a graphic whose style has been deleted, the Light box on the status toolbar is empty. You can see the name of the assigned lightstyle in the InfoTip, if your have hover highlighting on the Information bar switched on. You can also see the name in the Properties window (Ctrl+Q).

If you later create another lightstyle with the same name as the deleted lightstyle, it is used by the graphics to which the style was originally assigned (if you have not assigned a different lightstyle in the meantime).

You cannot delete the DEFAULT or NONE lightstyle.

If you are using MicroGDS Entry Level and you delete a lightstyle that was created using MicroGDS Collaboration, you may not be able to re-create the light using MicroGDS Entry Level.

▶ To delete a lightstyle

1. In the Document Organizer, ensure that the appropriate document is the current document.
2. On the Styles tab, select the lightstyle that you want to delete.

   You can delete multiple lightstyles (or multiple styles of any type), using Windows multi-select facilities.
3. Press Delete, or on the shortcut menu, click Delete.
4. To confirm the deletion, click Yes at the prompt.

Shading a scene

When you have added or changed a lightstyle, you can use one of the shaded views to see the effects. There are two types of shaded view that you can choose from: ‘Shaded’ and ‘Shaded with Edges’. The difference is that Shaded shades clump faces and ignores the clump edges, whereas Shade with Edges adds the clump edges.

▶ To switch to a shaded view

1. On the View menu, click Hide Mode.
2. On the Hide Mode submenu, click Shaded or Shade with Edges.

You can also press Ctrl+R to select Shaded view.

All 2D line primitives within the view extent are shown in the shaded view, although the primitives themselves are not shaded. This includes non-3D geometry such as construction lines, external light objects, and so on. If you do not want non-3D graphics to be shown, ensure that light objects are outside the view extent, and place all construction lines onto a single layer and set that layer to Invisible.

When graphics are selected in a shaded view, they are drawn as a wire frame.

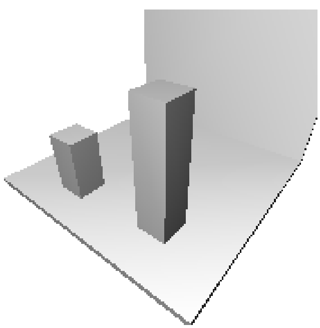
If the scene uses any advanced light types that are available only in MicroGDS Collaboration, these are approximated for shaded views in MicroGDS Entry Level. The number of lights used in MicroGDS Entry Level are also limited according to the limits of the graphics card (usually 6 or 8 lights). Advanced lights are used in MicroGDS Collaboration when the window definition is rendered. For details, see Part Two: *Advanced 3D and rendering*.

In MicroGDS Collaboration, the shaded views provide a method for quick, fully interactive views, that can be useful prior to rendering the image.

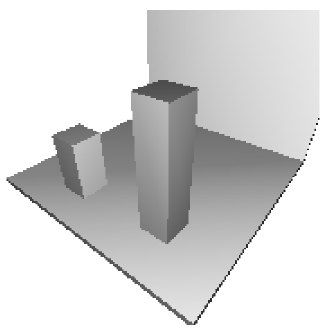
Using simplified lighting

When you view a scene in shaded view that has a large number of lights, the scene might not be lit as expected. This is because only a limited number of lights are processed and the ones that are processed might not produce the best lighting effect. In such cases, you can use the Simplify Lights option to ignore all lights in the scene and simplify the lighting instead. This uses two predefined lights: a point light and a distant light (which looks over the left shoulder of the camera).

In the following examples, the scene is first lit by the built-in lighting. The same scene is then lit with a DEFAULT light assigned to the ground plane:



simplified lighting



DEFAULT light

Note that if there are no lights in scene, MicroGDS automatically uses the built-in simplified lighting in shaded views.

▶ **To use simplified lighting in a shaded view**

- on the View menu, click Simplify Lights

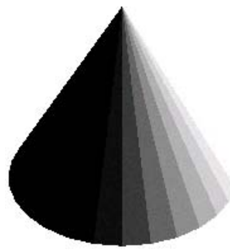
You can change this setting for each view. To preserve the setting for the current view, you must save the view and then save the document.

Lighting a scene—an example

This section shows you how to light a simple 3D scene using a distant light.

The images below show the scene first using the default lighting and then using a single distant light:

Shaded using default light



Shaded using a distant light

▶ **To create the scene**

1 Start MicroGDS and create a new document.

2 Set the scale to 1 and the units of measurement to mm.

3 Construct a circle:

a) On the Construct menu, click Circle, Radius Centre.

b) In the prompt bar, enter 50.

c) Place the circle at 0/0.

4 Extrude the circle to produce a cone:

a) On the Solid menu, click Construct, Extrude.

b) To taper the cone from the centre point of the circle, enter 0/0.

c) Press Enter to display the Extrude Scaling dialog box and enter a scale factor of 0 (zero).

d) To extrude the cone to a height of 65mm, enter //65.

The cone is tapered starting from the centre of the circle, meeting at a point at the specified height.

5 Before you continue with the scene, save the document using a name of your choice.

6 Create a new layer for the light object:

a) Press F2, or on the File menu, click Window, Edit.

b) Click the Layer tab and then click the New Layer & Phase button.

c) In the Layer Name dialog box, enter a valid name for the layer and click OK.

MicroGDS creates a new phase to reference the layer and adds it to the phases list.

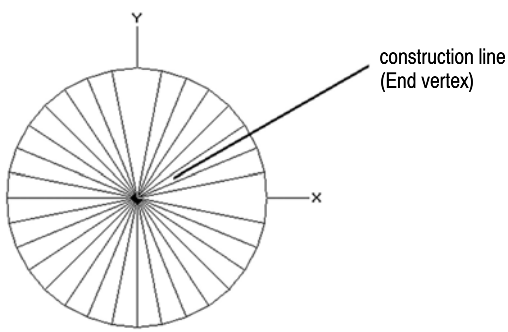
A bullet to the left of the phase means that the layer it references is now current.

d) Click the Phase tab and then select a colour for the graphics from the Phase Colour list.

e) Minimize or move the Window Editor to one side.

7 Prepare the scene for lighting:

a) Draw a construction line using the line tool, for example:



You will use the construction line when you place the light.

b) On the Alter menu, click Vertex, Move.

c) Click on the end vertex (shown in the above illustration) of the construction line.

d) In the prompt bar, enter //80.

8 Create a new object for the light object:

a) On the Object menu, click New.

b) Specify a valid name for the object and press Enter.

c) To specify the position for the object hook point, enter 0/0.

9 Draw the distant light object:

a) On the Construct menu, click Circle, Radius Centre.

b) Specify a radius of 10.

c) Place the circle at the object hook point by entering / in the prompt bar, and then press Enter.

10 Switch to 3D view by clicking 3D on the View menu.

11 To position the light object:

a) On the Object menu, click Reposition.

b) Move the pointer to the centre of the circle, and when the Centre snapcode is shown, click the mouse button.

c) Place the object at the end of the construction line, using an End snap.

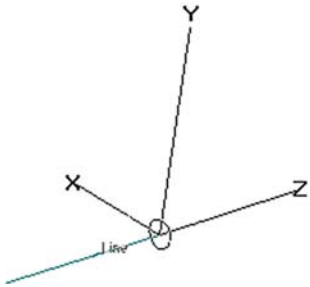
The prompt bar now requests that you set the position for the X axis. However, since the light source of a distant light is directed along the negative Z axis of the light object, you will specify the –Z direction instead.

d) To position the –Z axis, press Shift+Tab.

Notice that the prompt bar now requests you for the position for the –Z axis.

e) To direct the axis along the negative Z, use a Line snap anywhere on the construction line.

Although you may not see the entire axes in the view, the object axes and the light object in a 3D view should look similar to this:



f) The direction of the X and Y axes is not important, so press Esc to retain their current rotations.

g) To end the command, press Esc.

12 To view the scene using the default lighting, on the View menu, click Hide Mode, Shaded.

13 Now create a lightstyle:

a) If necessary, click the light object to select it.

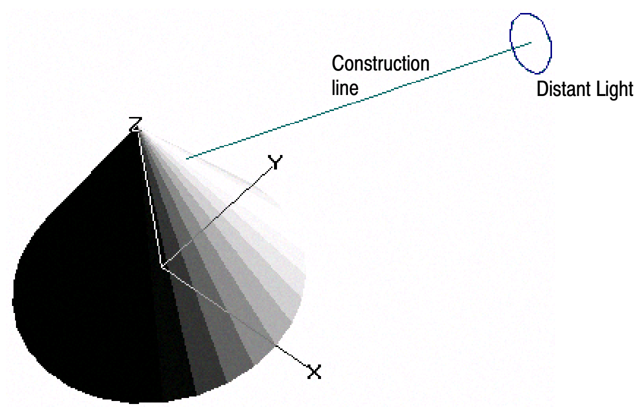
b) On the Styles menu, click Lightstyle Modify.

c) From the Light type list, select Distant and click Save As.

d) Type a name for the lightstyle and click OK.

e) To close the Lightstyle dialog box, click Close.

The shaded scene, now lit by the distant light, appears. For example:



14 You can now hide the construction line, the light object, and the axes:

a) Restore the Window Editor.

b) From the phases list in the Window Editor, select the phase that references the layer you created earlier.

c) From the Linestyle Overrides list, select BLANK and then click Close.

You can produce the same result by setting the Fading option, which *dims down* graphics on a phase, to 0%.

d) On the Set menu, click Axes, Show.

e) To deselect all graphics, click in the window away from the graphics.

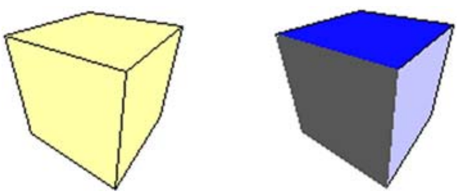
Chapter 11

Working with materials

Materials

In MicroGDS, you can create materials to assign colours to the clumps in a drawing. A clump is 'made of' a material, and can also have a different material assigned to each face of the clump. For example, a cube can be made of the material 'red', and have the material 'blue paint' on some faces. Materials are used when you view graphics in a 3D shaded view.

For example:



'solid' material three, separate face materials

MicroGDS offers a number of commands for you to construct and work with clumps, which are described in Chapter 9, *Working in 3D*.

In MicroGDS Collaboration, materials are also used when you render 3D graphics. Additional, more sophisticated, materials are available in MicroGDS Collaboration. For further details, see Part Two: *Advanced 3D and rendering*.

MicroGDS provides one pre-defined material called DEFAULT, which is a plain matte white colour. If you have not added any materials to the document, MicroGDS uses the DEFAULT material for all clumps when you select the Shaded view. You can add a material to the materials list by modifying an existing material.

Note that the DEFAULT material is stored separately from any materials you create and cannot be saved, deleted, or replaced.

Materials work together with lights to enhance the appearance of shaded images. For details about creating lights, see Chapter 10, *Working with lightstyles*.

Accessing materials

For single-user documents, new materials are stored in the document. They are saved when you save the document.

You can also access materials from external style files (called MATLS.STY). To do this, you specify the folders in which the MATLS.STY files are located using the Style Search Path command on the File menu. You can add more than one folder to the style search path, but only one MATLS.STY file can be stored in each location. If you modify and save a style from an external style file, it is saved in the document. For more details about style files, see Chapter 2, *Exploring MicroGDS*.

For multi-user projects in MicroGDS, all materials are stored in external style files (MATLS.STY). New materials are saved in the first MATLS.STY location on the style search path. A material is saved in the style file as soon as you save the style, even if you do not save the project.

You can access materials available to a document from the Document Organizer and also from the status toolbar.

▶ To access materials using the Document Organizer

1 On the Document Organizer, click the Styles tab:

2 Double-click the Materials category, or click the plus sign (+) to the left.

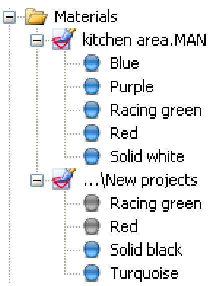
A list of all locations from where you can access materials is shown:

- for a single-user document, the name of the document with which you are working is shown first, followed by the path of each style file defined in the style search path if any
- for a multi-user project, the name of the first style file defined in the style search path for the project is shown first, followed by the path of each subsequent location defined in the project

If a MATLS.STY file exists in the location defined for styles and fonts in your file location preferences, this location is shown last in the list. This enables you to reference a set of global style files that are available to all your documents. For more details, refer to Help.

3 To display a list of materials in a location, double-click the location or click the plus sign (+) to the left.

For example:



Materials are prefixed by an icon. The colour of the icon determines the availability of the style:

- materials that can be used in the document are prefixed by a blue icon
- materials that are not currently available to the document are prefixed by a grey icon

  (A material is unavailable if a material of the same name already exists in a location higher in the style search path.)

4 To preview a material, select the style and then, on the shortcut menu, click Toggle Preview.

If you are using MicroGDS Collaboration, the graphics in which the preview is shown is set using the Preview list on the Material dialog box. For more details, see Chapter 21, *Advanced materials*.

▶ **To access materials from the status toolbar**

- on the Mat box on the status toolbar, click the arrow

All styles available to the current document are listed.

Adding a material

You can add new materials to make them available in your document. When you add a material, it immediately becomes current and any selected clumps are assigned that material. Any new clumps you create are also assigned the current material.

Note that if you open a document in which there are missing materials, for example, if they have been deleted, MicroGDS reports the error conditions to the Problems dialog box. You can use the dialog box to correct the errors by:

- changing the styles and fonts folder
- editing the style search path
- adding new materials

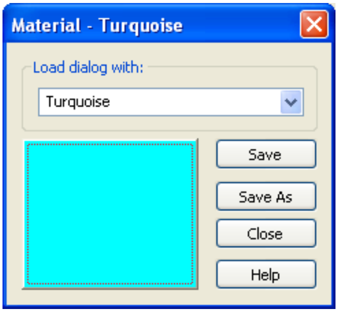
▶ To add a material using the Document Organizer

1 Click the Styles tab on the Document Organizer, and then double-click the Materials category.

2 Do one of the following:

- to create a new material based on DEFAULT, select the Materials category and then, on the shortcut menu, click New.
- to create a new material based on an existing style, select the material on which to base the new style from the required location and then, on the shortcut menu, click New based upon.

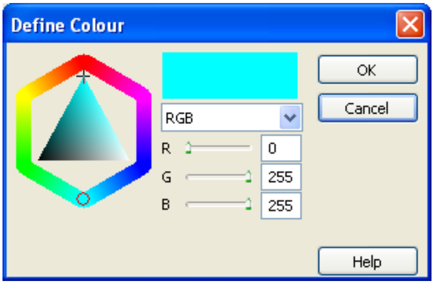
MicroGDS displays the Material dialog box, showing the colour of the material. For example:



If you are using MicroGDS Collaboration, the Material dialog box provides facilities to create far more sophisticated materials. For details about the materials in MicroGDS Collaboration, see Chapter 21, *Advanced materials* in Part Two: *Advanced 3D and rendering*.

3 If you want to use or amend a material other than the current one, select the style from the 'Load dialog with' list.

4 To define a colour for the material, click the Sample box.
MicroGDS displays the Define Colour dialog box:



5 Select or define the colour you require and click OK.
MicroGDS redisplays the Material dialog box.

6 Save the material:

- to save the material with the existing name, as shown on the title bar, click Save
- to save the material with a new name, click Save As, type the name in the Style Name dialog box and click OK

The name must comply with the MicroGDS naming rules, as described later in this section. You cannot use the name DEFAULT.

The named material is made current and its name is shown in the Mat box on the status toolbar.

▶ To add a material using commands

1 From the Mat list on the status toolbar, select the material on which you want to base your new material.

2 On the Styles menu, click Material Modify.

3 Specify the colour for the material and then save the material, as described in step 5 in the previous procedure.

Rules for naming materials

- a material name can contain up to 256 characters
- names can include spaces, except at the beginning or end of the name
- material names are case sensitive, so ‘Blue Tint’ and ‘BLUE TINT’ are two different materials
- you cannot save to the name DEFAULT

Changing the material

When you add a material, it immediately becomes current. To use another material, you select it from those available with the document. When you change the material, you can:

- change the current material
- change the material of all clumps using a specific material
- override the material of all clumps for a particular phase

In addition, MicroGDS enables you to ‘paint’ the faces of a 3D graphic in a different material from the solid material. This is similar to a veneer on a piece of chipboard. For details, see *Setting the face material* on page 282.

Changing the current material

The current material is assigned to new clumps that you create. The name of the current material is shown in the Mat box on the status toolbar.

When you draw a new primitive, or when you have only 2D graphics selected, the Mat box is blank. This is because materials only apply to clumps. In addition, if you have selected several clumps that have different materials assigned, the Mat box is blank.

Note that each time you click a clump, the current material changes to that clump’s material.

When you change the current material, any selected graphics are also changed to that material.

▶ To change the current material

1 Select any clumps for which you want to change the material.

2 Do one of the following:
   - from the Matstyle list on the Properties window, select the material
   - from the Styles tab on the Document Organizer, select the material you require, and then click Set as current on the shortcut menu

- from the Mat list on the status toolbar, select the new material
- or on the Set menu, click Material, type the name of the material in the prompt bar, and press Enter

  The material name must match a material that you have already added to the document.

If any selected clumps have face materials assigned, the face materials are not overridden by the new material. For more details, see *Setting the face material* on page 282.

You can also change the current material so that it is the same as the material used for a specified face. You may want to do this, for example, if you do not know the name of the material.

▶ To set the current material from a selected face

1. On the Solid menu, click Material, Select From Face.
2. Click the face whose material you want to use.

   The current material is immediately updated. Its name is displayed in the Mat box on the status toolbar.

   If you click a face that does not have a set face material, the current material is set to DEFAULT.
3. When you have selected the material you require, press Esc.

Changing the material globally

MicroGDS makes it very easy to change the solid material of a number of clumps drawn using one material to another material. You simply restrict editing to a specific material.

This does not change any material assigned to clump faces.

▶ To change the material globally

1. Press F3, or on the Set menu, click Edit.

   You can also use the SETEDIT button on the information bar (at the bottom-right of the MicroGDS window) to set restrictions:

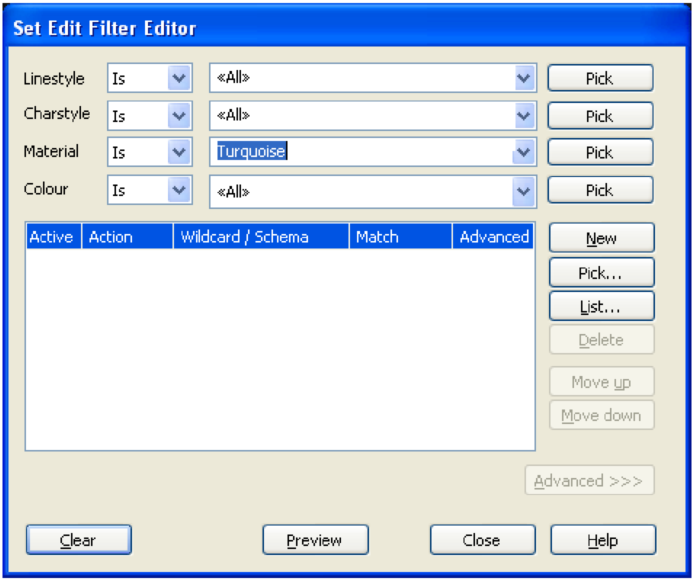
   - if SETEDIT is not currently enabled, click the button

     If SETEDIT is enabled, a single click of the button toggles the current editing restrictions on and off
   - if SETEDIT is currently enabled, double-click the button

   The Set Edit Filter Editor is displayed.

2 From the Material list, select the material to which you wish to restrict editing.

Alternatively, click the Material Pick button and click a clump primitive to which the style is assigned.



3 Click Close.

When you have set up your restrictions, the SETEDIT button on the information bar is pressed in and the text changes colour. You can toggle the editing restrictions on and off by clicking the SETEDIT button.

4 Ensure that you are in Select Primitives mode by pressing F9, or on the Edit menu, click Select Primitives.

5 In your graphics window, select the relevant clumps; the status toolbar shows you the number of primitives selected and that they all use the same material.

You cannot select any clumps that do not use the specified material.

To select all clumps that use the material, press F7, or on the Edit menu, click Select All.

6 Select the replacement material as described in *Changing the current material* on page 279.

Remember to clear the editing restriction when you have changed the material.

Overriding the materials for a phase

Usually, you assign materials to individual clumps. This means that a phase can show clumps in many different materials. You can, however, force all clumps within one phase to be displayed and printed in a single material.

▶ To override the material for all clumps in a phase

1 Press F2, or on the File menu, click Window, Edit.

2 From the phases list in the Window Editor, select the phase whose materials you want to override.

3 From the Material Overrides list on the Phase tab, select the material you wish the clumps in the phase to use.

   All clumps within the selected phase are now drawn using the chosen material. Note that although they appear on screen and print using the material override, their original materials are unchanged and still appear in the Mat box on the status toolbar.

   You can also see the name of the material assigned to a clump in the InfoTip, if you have hover highlighting on the Information bar switched on. For details about hover highlighting, see Chapter 3, *Working with primitives and objects*.

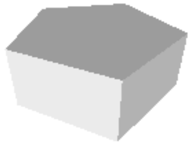
   If you later remove the override, the clumps are drawn using their original assigned styles.

You would probably use this feature as a temporary override. To change the material permanently, you would make the phase the only phase editable, then select all the graphics, and change the material.

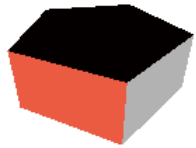
Setting the face material

You can apply additional materials to the faces of a clump. This does not change the material that the clump is 'made of' (the *solid* material).

The example shaded images shown next show a clump that uses the DEFAULT material, and the same clump for which different, customized materials have been assigned to individual faces:



The DEFAULT material



Customized materials on faces

Note that the material assigned to the clump is shown in the Properties window. To open the Properties window, press Ctrl+Q, or on the Window menu, click Properties.

The face material is also shown in an InfoTip, if you have hover highlighting on the Information bar switched on.

You can also check the material of a face using the Select From Face command described in *Changing the current material* on page 279.

MicroGDS provides a number of face commands to:

- set a face material for all faces
- set a face material for a single face or *surface*

  A surface is a region of a clump that is connected to a face by smooth edges and which share the same material.
- apply the solid material to all faces of a clump that do not have a face material
- apply a face material to the solid material and remove that face material from any face to which it is assigned

▶ To set the material for all faces

1. Select the clumps to which you want to add face materials.
2. On the Solid menu, click Material, All Faces.
3. In the prompt bar, type the name of the material and press Enter.

   To return the faces of clumps to their respective solid materials, type DEFAULT in the prompt bar.

The graphics are immediately updated. The current material is also updated to the material you specified.

▶ To set the material for individual faces

1 On the Solid menu, click Material, Per Face or Per Surface.

2 Select the name of the material to which you want to set the first face.

You can select the material from the Mat list on the status toolbar, or from the Styles tab on the Document Organizer.

To return the face of a clump to its solid material, select DEFAULT.

3 Specify a position on the face for which you want to set the material.

You can also change the material for individual faces using the Properties window:

1 Click  on the Properties window.

2 Click the clump face whose material you want to change.

3 Click the ‘Face material’ line in the Properties window, and select the material you require from the list.

For more details about using the Properties window, see Chapter 13, *Getting information*.

▶ To apply the solid material to default faces

1 On the Solid menu, click Material, Solid to Faces.

2 Specify a position on the clump for which you want to assign the solid material to all faces that do not have a face material.

All default faces of the clump are assigned the solid material of the clump.

▶ To apply a face material to the solid material

1 On the Solid menu, click Material, Faces to Solid.

2 Specify a position on the clump face whose material you wan to promote to solid.

The solid material is replaced by the face material. All faces that were assigned the picked face material are set to none. Note that faces that have a different face material to the one you pick are **not** overridden.

Modifying an existing material

With the exception of DEFAULT, you can modify any existing material that is available to the document.

If you are using MicroGDS Entry Level, and you modify a material that was created in MicroGDS Collaboration, the original material will be overwritten if you save it using the same name. You may not be able to re-create the material using MicroGDS Entry Level.

▶ **To modify a material using the Document Organizer**

1 In the Document Organizer, ensure that the appropriate document is the current document.

2 On the Styles tab, locate the material that you want to modify.

3 Double-click the material name, or on the shortcut menu, click Edit.

   This command is unavailable for any material where a material of the same name exists in a location higher in the style search path.

   MicroGDS displays the Material dialog box.

4 Modify the characteristics as required.

5 To save the material, do one of the following:

   - to keep the same material name, click Save

     If you retain the material name, all clumps that use the material are immediately updated.

   - to save the material with a new name, click Save As, type the name in the Style Name dialog box and click OK

   If you modify a material from an external style file, MicroGDS creates a new local material with the name you specify.

   For more details about style files, see Chapter 2, *Exploring MicroGDS*.

If you save a material to a name that exists in an external style file, the icon for the external material changes colour in the Document Organizer. This indicates that a local style of the same name now exists. For more details, see *Accessing materials* on page 274.

▶ To modify a material using commands

1. From the Mat list on the status toolbar, select the material to modify.

   Alternatively, select a clump that uses the style you want to modify.

2. On the Styles menu, click Material Modify.

3. Modify the material and then save the material, as described in step 5 in the previous procedure.

Deleting a material

You can delete materials that are no longer required. You cannot retrieve deleted materials.

If you select a clump whose style has been deleted, the Mat box on the status toolbar is empty. You can see the name of the assigned material in the InfoTip, if you have hover highlighting on the Information bar switched on. You can also see the name in the Properties window (Ctrl+Q).

If you later create another material with the same name as the deleted material, it is used by the clumps to which the style was originally assigned (if you have not assigned a different material in the meantime).

You cannot delete the DEFAULT material.

If you are using MicroGDS Entry Level and you delete a material that was created using MicroGDS Collaboration, you may not be able to re-create the material using MicroGDS Entry Level.

▶ To delete a material

1. In the Document Organizer, ensure that the appropriate document is the current document.

2. On the Styles tab, select the material that you want to delete.

   You can delete multiple materials (or multiple styles of any type), using Windows multi-select facilities.

3. Press Delete, or on the shortcut menu, click Delete.

4. To confirm the deletion, click Yes at the prompt.

Shading a scene

When you have added or modified a material, you can use one of the shaded views to see the effects.

▶ **To switch to a shaded view**

1 On the View menu, click Hide Mode.

2 On the Hide Mode submenu, click Shaded or Shade with Edges.

You can also press Ctrl+R to select Shaded view.

MicroGDS Entry Level does not take into account many of the more sophisticated material attributes that may have been used to create materials in MicroGDS Collaboration. The full attributes of all materials are used only in MicroGDS Collaboration when a window definition is rendered. For details, see Part Two: *Advanced 3D and rendering*.

In MicroGDS Collaboration, the shaded views provide a method for quick, fully interactive views, that may be useful prior to rendering the image.

Chapter 12

Printing and plotting

About printing

You can print a MicroGDS drawing using any printer or plotter that has a Microsoft Windows printer driver and that can generate graphical output.

If you are using MicroGDS Collaboration, you can also print a rendered image using a printer or plotter that has a Windows printer driver. For details, see Part Two: A*dvanced 3D and rendering*.

Note that plotting and printing are referred to as printing for simplicity.

In MicroGDS you can print a single view or batch print multiple views. The commands and print options differ according to the number of views you are printing.

Setting up printer settings

Before you print a MicroGDS drawing, your printer must already be installed and working in Windows. For information about this procedure, refer to the documentation for Windows, your printer, and (if applicable) your networking software.

If you are using a printer for the first time, you may need to set up default printer settings before you print a drawing.

▶ **To set up default printer settings**

1 On the File menu, click Printer Setup.

2 From the Print Setup dialog box, select the printer you wish to use and specify its default settings.

3 Click OK.

When you print a 2D or 3D view, MicroGDS prints exactly what is visible in the current view. If you want to print all the graphics in a window, ensure that they are completely in view.

When you print a print layout view, MicroGDS always prints the entire print layout view using the paper size assigned to the window definition. For details about assigning a paper size, see Chapter 2, *Exploring MicroGDS*.

You can specifically exclude graphics in a phase from being printed from the Window Editor. For example, you may want to view the graphics of an overall site plan on your screen, but want to print only the graphics referenced in a specific phase. For details about marking a phase for screen display only, see Chapter 4, *Using layers and phases*.

Note that raster images are not printed in shaded or hidden line 3D views. For details about constructing raster primitives, see Chapter 15, *Working with different file formats*.

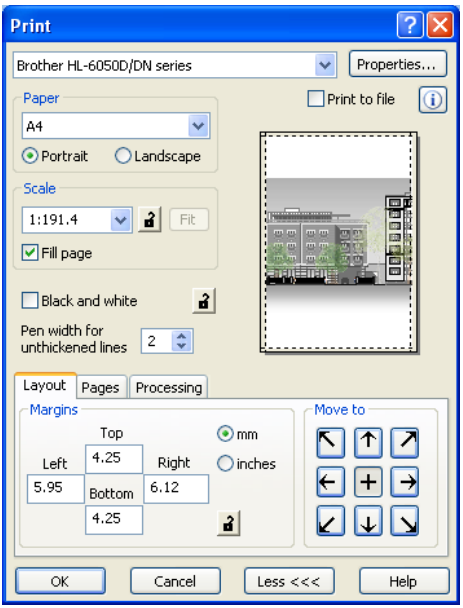
Printing a single view

▶ To print a single view

1 Ensure that the window displays the view type that you want to print.

2 On the File menu, click Print.

The Print dialog box is displayed. For example:



If necessary, click the More button (which shows Less when the dialog box is expanded) to see all the options in the dialog box.

3 Select the options you want.

- to use a different printer, select the printer from the Name list
- to change the page setup, fonts, orientation, or the document settings, click Properties to display the standard Windows Document properties dialog box

  Note that the properties available depend on the selected printer.

- to print to a file, select the ‘Print to file’ check box

  The Print File dialog box is displayed when you click OK. Specify the name and location of the file that will store the view and click OK.
- to view details about the current printer, click the Information button 
- to change the current paper, select from the Paper list:
  - for a print layout view, the paper size defined for the print layout is automatically selected

  If the defined paper size is not available on the current printer, MicroGDS selects the nearest-matching paper size.
  - for a 2D or 3D view, the printer’s default paper size is used
- to change the current Scale or Enlargement, type or select the factor you require
  - for a 2D or 3D view, MicroGDS calculates the scale to fit the view onto a single sheet of the selected paper
  - for a print layout view, a print scale of 1 is selected

  The paper size and orientation are set from the paper defined for the window definition.

  Note that if you do not print at a factor of 1, any scale factors on your drawing (such as 1:1250) will be incorrect. For more details, see *Scaling and sizing* on page 295.
- to fit the graphics onto a single sheet of paper, click the Fit button
- to adjust the extent of the region to be printed so that it exactly fills the paper, to the printable area, select the Fill page check box

  This option is not available with a print layout view. To change the region to be printed in print layout, use the Page Setup command.

  When Fill page is selected, the Fit button is not available.
- to print in black and white, select the ‘Black and white’ check box

  Note that MicroGDS sets the initial state of this check box to match the Black and White when Printed command on the View menu.

- to increase the line thickness for unthickened lines, select the number in pixels (between 1 and 100) from the ‘Pen width for unthickened lines’ list

4 Use the tabs in the lower part of the Print dialog box to make further changes:

- to change the margins and alignment of the view on the printed paper for 2D and 3D views, use the settings on the Layout tab

  The Layout tab is not available for a print layout view.

- to choose which pages to print if the scale and region to be printed will not fit on a single sheet of paper, use the settings on the Pages tab

  You can also change the number of copies to print using the Pages tab.

- to choose whether to rasterize the drawing before it is printed or to draw cut-marks on the printed page, use the settings on the Processing tab

  You might rasterize a drawing if you are using a printer that does not support transparency.

For some settings, you can choose to retain the value by clicking the appropriate padlock button 

5 On the Print dialog box, click OK.

The view is sent to the printer, plotter, or to the file specified.

Printing multiple views

▶ To print multiple views

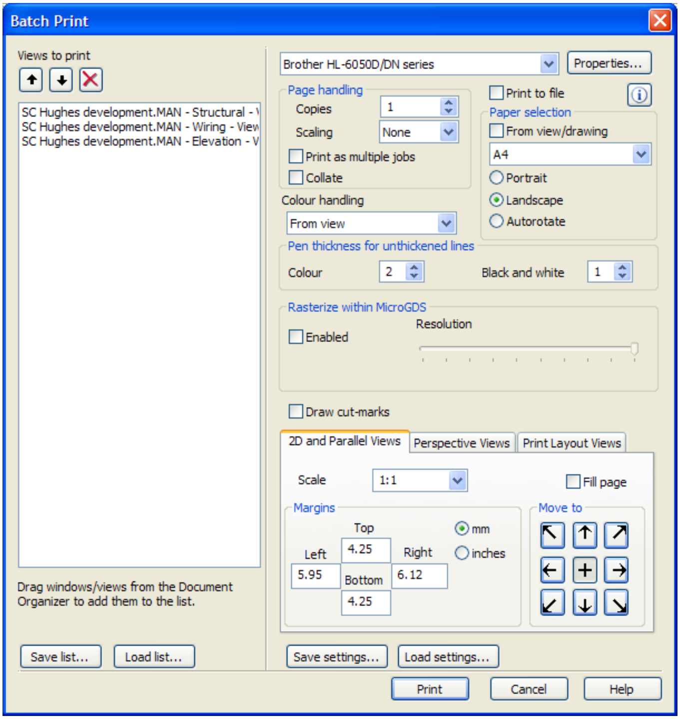
1 On the File menu, click Batch Print.

The Batch Print dialog box is displayed.

2 On the Window Definitions tab of the Document Organizer, select the views you want to print and then drag them into the ‘Views to print’ box on the Batch Print dialog box.

The selected views are listed on the left of the dialog box.

For example:



You can add to the list by dragging views from the Document Organizer. The views can be in the same document or in different documents.

You can also remove views and change the order in which the views are printed using the buttons at the top of the dialog box.

3 Select the printing options you want.

Many options are the same as described for printing a single view in the previous section. Additional options include:

- Print as multiple jobs: to send one print job per view to the printer, select this check box. To send all views to the printer as a single print job, clear the check box.

- Collate: To order multiple copies of multiple views into their proper sequence, select this check box. To print multiple copies in successions equal to the number of copies specified, clear the check box.
- Colour handling: Select the method by which to print the graphics. To use the colour defined in the view, select ‘From view’. Note that raster images are always printed in colour (on a colour printer).
- From view/drawing: To override the selected paper size and use the paper size set within the view or document, select this check box. To print all views using the selected paper size, clear the check box.
- Autorotate: To automatically adjust the orientation of mixed landscape and portrait views, select this check box. To print all views using the currently selected orientation, clear the check box.

The remaining options depend on the view type, that is, 2D and Parallel views, Perspective Views, and Print Layout Views. Again, these options are the same as described for printing single views in the previous section. For full details, refer to Help.

4 On the Batch Print dialog box, click OK.

The views are sent to the printer, plotter, or to the file specified.

You can use the buttons at the bottom of the dialog box to save and load a set of views to a text file and also save and load a set of printing parameters.

Scaling and sizing

The print dialog boxes enables you to control the scale or size at which the current drawing is printed.

If you set the Scale or Enlargement to 1, you will get a print-out at the scale (or scales) at which you drew.

If you set the Scale or Enlargement to any other value, your print-out is reduced or enlarged accordingly. You should take this into account if you will be taking dimensions from this print.

Note that if you choose Fit on the Print dialog box, the drawing is printed as large as possible to fill the sheet, without regard to scale. This option is not available on the Batch Print dialog box.

Printing and colour

When you print colour drawings using a Windows printer, the output relies upon the capability of the printer.

A colour printer will get as close as it can to the on-screen colour. A monochrome printer will approximate colours using a sequence of shades ranging from black through to white. This may give you an unclear print, unless you select the 'Black and white' check box on the print dialog box.

Where a raster image contains overlapping coloured areas which use transparency, we recommend that you select the GDI+ optimization option on the Raster tab in your preferences. This should help improve the appearance of the printed page. For details about setting preferences, see Chapter 17, *Customizing MicroGDS*.

If your printer does not support transparency, you can rasterize the drawing before it is printed by enabling the rasterize option on the print dialog box. This will ensure that the printed drawing will match the on-screen drawing. It may also help avoid other possible print driver problems.

Linestyles and charstyles with printing

When you print a drawing, you should be aware of the following considerations regarding the linestyles and charstyles.

- Many linestyle parameters are defined by specifying a distance. The values you give are real-world values. However, these values are potentially subject to scaling, rotation, and positioning. To control how linestyles are displayed on screen, and how they are printed, MicroGDS uses *co-ordinate space*.

  There are four co-ordinate space settings: Object space, Drawing space, Output space, and Version 6 space.

  Use object space, for example, if you want to move, rotate, and scale the line primitives along with their object. Use Output space, for example, if you want to fix the size of the line primitives, both on screen and when printed. For more details about the co-ordinate space settings, refer to Help.

Note that, in a print layout view, output space linestyles are drawn so that they are a scaled version of what will appear on the paper. For example, if you select A1 paper size then a 10mm dash in an output space linestyle will print 10mm long on the paper. If you print to A2 paper size with an enlargement factor of 0.5, then each dash of the 10mm linestyle will print at 5mm long.

- When you specify a size for a charstyle, the value you give is a real-world value, and, when printed, the text always appears at this size. This is always the case, no matter what the set scale is when the text was created, nor at what scale the drawing is printed (unless you use the Enlargement option on the print dialog box, which enlarges everything).
- Not all printers can produce masks, or opaque and transparent filled linestyles. You should refer to your printer's documentation before making use of these facilities.

For details about creating and modifying linestyles and charstyles, see Chapter 7, *Working with linestyles* and Chapter 8, *Working with text* respectively.

Chapter 13

Getting information

Keeping track of drawing details

MicroGDS provides a number of facilities to help you keep track of the status of your documents and their contents. These enable you to:

- view properties about the selected graphics
- query a graphic at a specific position
- measure primitives and objects, and count the objects on a layer
- track commands and prompts during the current session
- write a list of all objects in the current window, and their occurrences
- record details about objects in the current window

In addition, you can assign non-graphical information (called *attributes)* to primitives and objects. For details about attributes, see Chapter 14, *Working with attributes and schemas*.

This chapter summarizes the ways you can assign and view information. Full details are given in Help.

Viewing selection properties

A particularly useful facility for viewing information is the Properties window. You use the Properties window to view extensive details about the selected primitives or objects. You can also change the values of many properties that are displayed.

For example, you can view the colour and linestyle of a line primitive, the name of the object in which the primitive is stored, and the name of the layer on which the object resides. You can also view attributes assigned at each level.

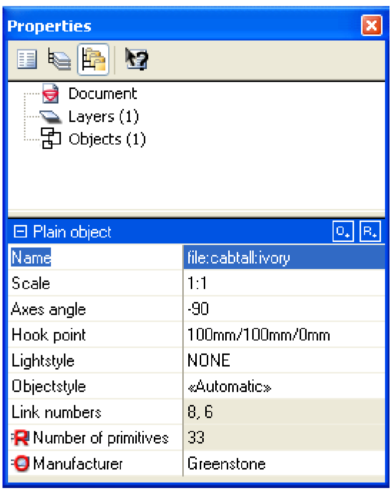
In addition, you can switch to query mode to view details about any specific position of a graphic. For example, you can query the face of a material or the length of a line.

▶ To display the Properties window

1 Press Ctrl+Q, or on the Window menu, click Properties.

2 Select the items whose properties you want to view.

The properties are shown for the currently selected items. For example:



Note that link numbers are shown only if you have ‘Show Advanced properties’ selected in your preferences.

The buttons at the top of the Properties window enable you to view and select the data in the window in different ways.

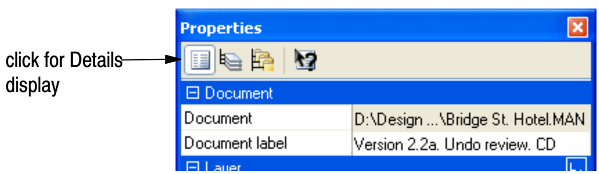
You can change the value for any property that is not read-only. Read-only values are indicated by a grey background.

3 To update the window with details about a new selection, select the items.

If you select multiple items, any property for which different values are assigned show «Mixed». For example, mixed is shown if you select two line primitives which are assigned different linestyles. Note that if you change a mixed value, the new value is assigned to all selected graphics to which the property applies.

If the selection includes graphics of different types, any property that is not common to all the selection is shown in italic. For example, if you select a line primitive and a text primitive, only colour is the common property so all other properties are shown in italic. Furthermore, if any property is the same for all graphics of the same type, that property is shown in italic. For example, if the selection includes multiple text primitives which are assigned the same charstyle, the charstyle is shown in italic.

You can also use the Properties window to assign a document label for information. This can be used, for example, as a reminder about the status of a document. Note that you must be in Details display to see the document label:



Note that if you are working with a multi-user project, you can add a project label and a workspace label.

You can copy the information from the Properties window to the Clipboard. You might do this, for example, to paste some of the information into another Windows program.

Querying graphics

You can query any primitive that has an editing status of hittable or editable that you hit. Details about the item are shown in the Properties window.

You can initiate query mode directly from the Properties window or using the Query, Details command.

▶ To query graphics

1 Do one of the following:

- on the Properties window, click 
- on the Query menu, click Details

The mouse pointer changes to 

2 Click the graphic at the position you want to query.

The details are loaded into the last selected view of the Properties window. You can change the view using the three view buttons at the top of the window.

By default, the graphic is queried at primitive level. To query the graphic at object level, press Shift when you click the graphic.

3 When you have finished querying graphics, click  or press Esc.

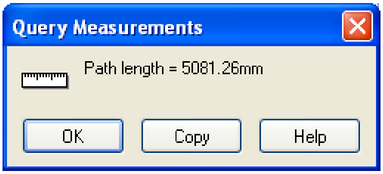
For full details about viewing and changing properties, refer to MicroGDS Help.

Measuring graphics

The Query menu provides commands for measuring graphics. For example, you can measure:

- the angle between two lines
- the area enclosed by a primitive or object
- the distance between two points

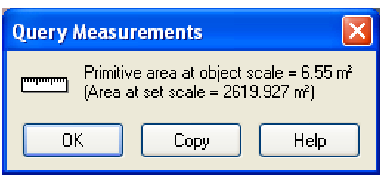
If the Query dialogues check box is selected in your preferences, a Query Measurements dialog box is displayed when you measure graphics. For example, when you measure a path of a graphic, the following dialog box is displayed:



You can use the Copy button on the dialog box to copy the displayed measurement. You can then paste the information as plain text (for example, using Edit Paste) or, for some measure commands, as linked data (for example, using Edit Paste Special) in MicroGDS or in another Windows program.

The measurement is also displayed in the Dialogue window (described next), if you have it open.

The measurement is displayed in the set units, regardless of the units used to draw the item. When you measure graphics, if the scale is important, such as when you measure the area of a graphic, MicroGDS displays the area in the object scale and the current set scale.



For details about using the query commands, refer to Help.

Viewing dialogue activity

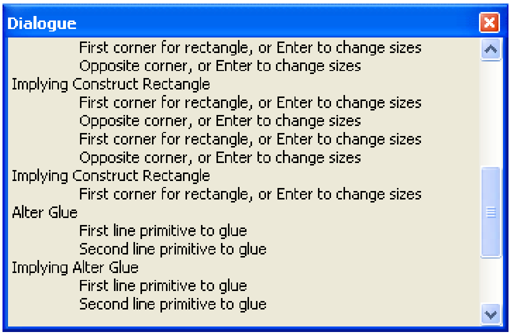
To track the commands you have chosen in the current session, with their prompts, use the Dialogue window.

You may find it useful to have the Dialogue window displayed while you are learning how to use MicroGDS, until you are familiar with the commands.

▶ To open the Dialogue window

- press Ctrl+D, or on the Window menu, click Dialogue

  The Dialogue window is displayed showing information about the session. For example:



Writing an object list to a file

MicroGDS can scan a window definition and produce a list of all the objects and the number of times they occur in each phase in the window. The list is written to a text file called list.txt, in the Text files folder specified in your preferences. If you have not specified a Text files folder, the text file is created in the folder in which MicroGDS is installed.

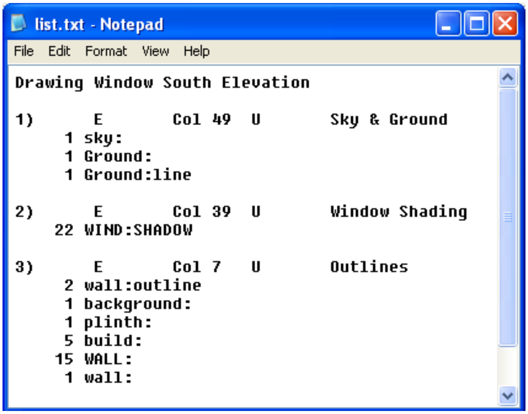
▶ To create an object list

1. Ensure that the status of each phase you want scanned is either editable, hittable, or visible.

   MicroGDS does not scan phases that are invisible.

2. On the Object menu, click List.

   MicroGDS generates the text file and displays it in a Notepad window:




```
Drawing Window South Elevation

1)      E       Col 49  U       Sky & Ground
     1 sky:
     1 Ground:
     1 Ground:line

2)      E       Col 39  U       Window Shading
    22 WIND:SHADOW

3)      E       Col 7   U       Outlines
     2 wall:outline
     1 background:
     1 plinth:
     5 build:
    15 WALL:
     1 wall:
```

The first line in the text file shows the window definition name in the MicroGDS document. The remainder shows details about:

- the phase number, together with its editing status, colour, modification status, and the name of the layer to which the phase is linked
- the name of each object included in the phase, and the number of objects with that name

Writing object details to a file

The Object Schedule facility creates a report on objects in the current window.

Before you create a report, you must create a format file (with an extension of .FRM) to determine the data and layout of the information. How to create a format file is described below.

MicroGDS writes the report to a text file in the Text files folder specified in your preferences. If you have not specified a Text files folder, the text file is created in the folder in which MicroGDS is installed. The name of the file is the same as the format file with a .txt extension. Each time you create a report, the previous report file is overwritten. Therefore, if you want to keep a report, rename the file before you create a new report.

To create an object schedule

1. On the Object menu, click Format.

   The Open dialog box is displayed for you to locate the format definition file to load.

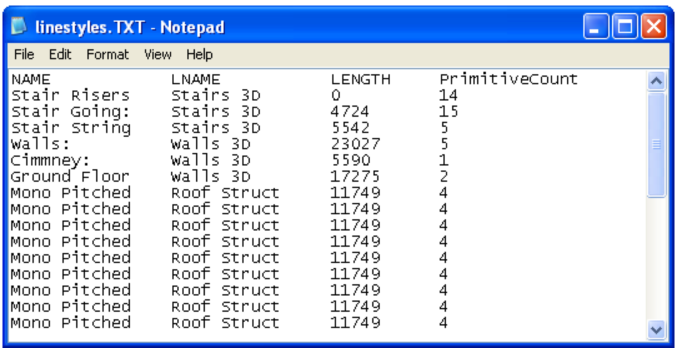
   If you have not yet created an appropriate file, see the following subsection for details.

2. Select the format definition file you want to use, and click OK.

3. On the Object menu, click Schedule.

   If you have any objects selected in the window, a dialog box is displayed in which you can choose whether to schedule only the selected objects or to schedule all objects in the window. Select the option you require.

   MicroGDS generates the report and displays it in a Notepad window:



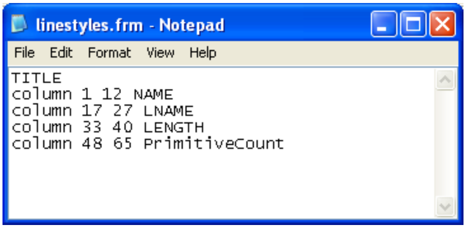
NAME	LNAME	LENGTH	PrimitiveCount
Stair Risers	Stairs 3D	0	14
Stair Going:	Stairs 3D	4724	15
Stair String	Stairs 3D	5542	5
Walls:	Walls 3D	23027	5
Cimmney:	Walls 3D	5590	1
Ground Floor	Walls 3D	17275	2
Mono Pitched	Roof Struct	11749	4
Mono Pitched	Roof Struct	11749	4
Mono Pitched	Roof Struct	11749	4
Mono Pitched	Roof Struct	11749	4
Mono Pitched	Roof Struct	11749	4
Mono Pitched	Roof Struct	11749	4
Mono Pitched	Roof Struct	11749	4
Mono Pitched	Roof Struct	11749	4
Mono Pitched	Roof Struct	11749	4

Creating a format definition file

The format definition file determines what the report produced by the Object Schedule facility looks like. The report is in the form of a table, with each row displaying details of a different object.

You create a format definition file with a text editor, such as Windows Notepad. To enable MicroGDS to locate the file, save it with a .frm extension.

The following is an example of a format definition file.



Most rows start with the word ‘column’ followed by a range of column numbers allocated to the information. For example:

```
column 1 12 NAME
```

means allocate columns 1 to 12 (in the report) for the information specified by the following keyword. In this case, NAME, which prints the object name.

For a list of available keywords, refer to Help.

Chapter 14

Working with attributes and schemas

Attributes

Attributes are non-graphical information that you assign to graphics in MicroGDS. There are three types of attributes:

- local attributes that you assign to primitives, objects, and layers

  For example, if you were refurbishing an office, you could assign attributes to provide information about the office workstations, such as their colour, cost, design, and the name of the supplier.

- computed attributes that are retrieved by performing calculations

  For example, if you were refurbishing an office, you could calculate the area of a room to determine the floor space to be carpeted.

- external attributes that are retrieved from an external database

  For example, if you were refurbishing an office, you could retrieve employees names and telephone numbers from an SQL database and assign them to the workstations.

Using attributes is similar to using a database—you can extract the information to produce parts lists, costings, reports, and so on. You can export the information for use in other Windows applications; for example, into word processors, spreadsheets, or databases.

Before you can use attributes, you must define the type of value that the attribute will store. You do this by creating a *mnemonic*. You create a mnemonic for each type of attribute you want to use. For example, you might define a text mnemonic for ‘colour’ and a numeric mnemonic for ‘cost’. Then, every time you add an attribute that specifies the colour of an item, you would use the colour mnemonic, and so on.

When you create a mnemonic, you also specify at which level the mnemonic is to apply. You can create mnemonics at primitive, reference, object, window, and layer level.

Some types of mnemonic can store multiple values. Where this is applicable, you specify the maximum number of values that can be assigned to an attribute. For example, for an attribute that defines dimensions for height, width, and depth, you would specify three as the maximum number of values in the mnemonic.

When you have created the mnemonics, you then indicate which objects and layers the specified mnemonics are to be used with. You do this by creating a *schema*. For example, a schema might specify that the mnemonics Name and Height are for use with all objects named ‘Tree:’ and ‘Building:’, and that the mnemonic ‘Tree category’ is for use only with ‘Tree:’ objects.

When you select a primitive or object to which a schema applies, the specified mnemonics are shown in the Properties window. You can then assign the appropriate values to the mnemonics.

Although you usually use a schema to associate mnemonics with graphics, you can also manually add an attribute to any primitive, object, window, or layer. You might do this, for example, where an attribute is meaningful to only a limited number of items. For more details, see *Adding new attributes* on page 322.

Accessing mnemonics and schemas

For single-user documents, new mnemonics and schemas are stored in the MAN file. They are saved when you save the document.

You can also access the mnemonics and schemas from external style files (called ATTRS.STY and SCHEMAS.STY respectively). To do this, you specify the folders in which the style files are located using the Style Search Path command on the File menu. You can add more than one folder to the style search path, but only one style file of each type can be stored in each location. If you modify and save a style from an external style file, it is saved in the document. For more details about style files, see Chapter 2, *Exploring MicroGDS*.

For multi-user projects, all mnemonics and schemas are stored in external style files. New mnemonics are saved in the first location on the style search path.

You can also specify styles that you want to be available to all documents, by placing global style files in the location for styles and fonts in your file location preferences. By default, MicroGDS provides an ATTRS.STY file which is installed into the MicroGDS Fonts directory. This contains a number of useful computed attributes.

▶ To access mnemonics and schemas

1 On the Document Organizer, click the Styles tab:

2 Double-click the Mnemonics or Schemas category, or click the plus sign (+) to the left.

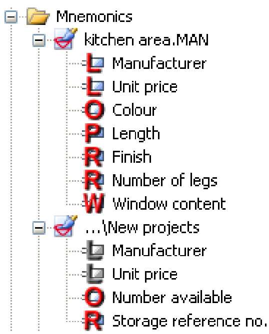
A list of all locations from where you can access the corresponding styles is shown:

- for a single-user document, the name of the document with which you are working is shown first, followed by the path of each style file defined in the style search path if any
- for a multi-user project, the name of the first style file defined in the style search path for the project is shown first, followed by the path of each subsequent location defined in the project

If an ATTRS.STY or SCHEMAS.STY exists in the location defined for styles and fonts in your file location preferences, this location is shown last in the list.

3 To display a list of styles in a location, double-click the location or click the plus sign (+) to the left.

For example:



Mnemonic and schema styles are prefixed by an icon. The colour of the icon determines the availability of the style:

- styles that can be used in the document are prefixed by a red icon
- styles that are not currently available to the document are prefixed by a grey icon

  (A style is unavailable if a style of the same name already exists in a location higher in the style search path.)

For mnemonics, the icon also denotes the level of applicability:

W	for window level
L	for layer level
O	for object level
R	for reference level
P	for primitive level

Mnemonic applicabilities is described in the next section.

4 To preview a mnemonic or schema, select the style and then, on the shortcut menu, click Toggle Preview.

You can also access mnemonics and schemas using commands on the Styles menu. For details, refer to Help.

Creating new mnemonics

You can add new mnemonics to make them available in your document.

▶ To add a mnemonic

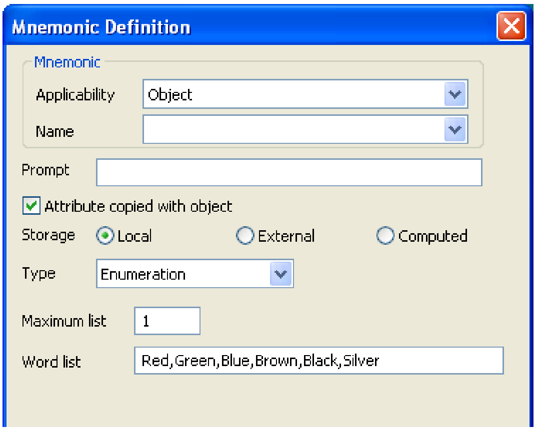
1 Click the Styles tab on the Document Organizer, and then double-click the Mnemonics category.

2 Do one of the following:

- to create a new mnemonic, select the Mnemonics category and then, on the shortcut menu, click New
- to create a new mnemonic based on an existing style, select the mnemonic on which to base the new style from the required location and then, on the shortcut menu, click New based upon

MicroGDS displays the Mnemonic Definition dialog box.

For example:



3 Under Mnemonic, select the appropriate Applicability level:

- Window: enables you to assign the mnemonic to window definitions
- Layer: enables you to assign the mnemonic to layers
- Object: enables you to assign the mnemonic to all objects of the same name
- Reference: enables you to assign the mnemonic to a specified object only
- Primitive: enables you to assign the mnemonic to primitives

4 In the Name box, type the mnemonic name.

The name must comply with the MicroGDS naming rules, as described on page 318.

You can use the same mnemonic name for different Applicability levels.

You can define hidden attributes by typing an asterisk (*) as the first character of the name. Hidden attributes are usually used only by people writing customization programs.

5 If you are defining a reference or object-level mnemonic, you can choose whether or not the attribute should be automatically copied if any object to which it is assigned is copied.

Select the 'Attribute copied with object' check box to automatically copy the attribute with the object. Otherwise, clear this check box.

Note that layer-level and primitive-level applicability attributes are always copied with the copied graphics.

6 From the Storage options, select the location for the attributes:

- Local to store attributes in the document

  You assign attributes to local mnemonics using the Properties window. For details, see *Assigning attribute values* on page 319.

- External to use data stored in a linked external database

  To access the data in an external database, you must first set up a link to the database. You can then create External mnemonics with which to query the database. You can also define a link to an Excel spreadsheet, to access its data.

  MicroGDS can read data in an external database, but does not allow you to write to the database.

  For details about linking and querying external databases, refer to Help.

- Computed to use data stored about the graphics in the document

  You do not assign attributes to a computed mnemonic, the value is the result of a calculation.

7 From the Type list, select the attribute value type.

For Local mnemonics, select from:

- Text: free text of a specified amount
- Enumeration: a chosen word from a pre-defined word list
- Double: a double-precision floating-point number

- Single: a single-precision floating-point number
- Integer: a whole number within a specified range
- Length, Area, and Volume: a measurement in the specified drawing units
- Date: a date and time in a specified format
- URL: a uniform resource locator or a file name

For External mnemonics, the list contains a subset of those shown above. For Computed mnemonics, the list contains mnemonic for making calculations, for example to calculate the area of an object or the length of a primitive.

Full details on how to creating different types of mnemonics is given in Help.

8 Complete the definition of the mnemonic by entering the appropriate details in the remainder of the dialog box.

9 If you want to add a description of the mnemonic, type it in the Prompt box.

This prompt is shown when you enter the attribute value. It is used as a reminder of the type of data to enter.

10 Click Save.

You can modify and delete mnemonics using the Document Organizer. You can also create and modify mnemonics using the Mnemonic Definition command on the Styles menu. For full details, refer to Help.

Note that you cannot change the applicability, storage, or type of a saved mnemonic.

Creating new schemas

You can add new schemas to define which mnemonics will be shown for selected primitives and objects in the Properties window.

▶ To add a schema

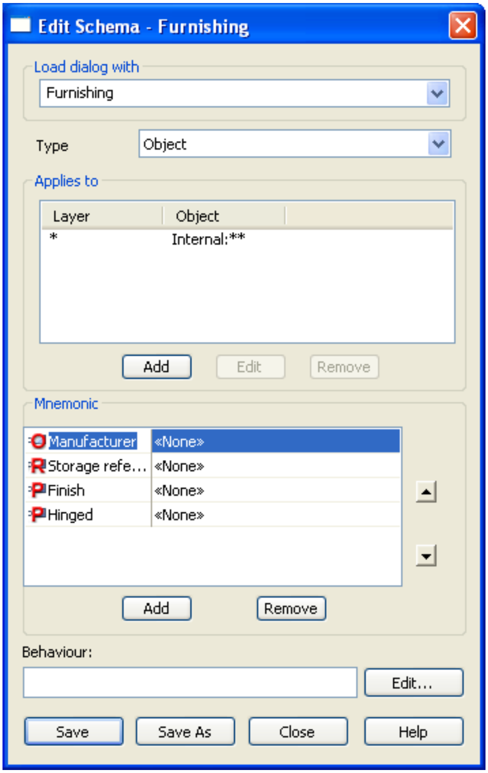
1 Click the Styles tab on the Document Organizer, and then double-click the Schemas category.

2 Do one of the following:

- to create a new schema, select the Schemas category and then, on the shortcut menu, click New

- to create a new schema based on an existing schema style, select the schema on which to base the new style from the required location and then, on the shortcut menu, click New based upon

The Define Schema dialog box is displayed, showing the characteristics of the current schema if any. For example:



Note that the Behaviour box is for defining the behaviour of intelligent objects. For more details, please refer to Help.

3 If you want to use or amend a schema other than the current one, select the style from the 'Load dialog with' list.

4 From the Type list, select the restriction type to which the schema applies:

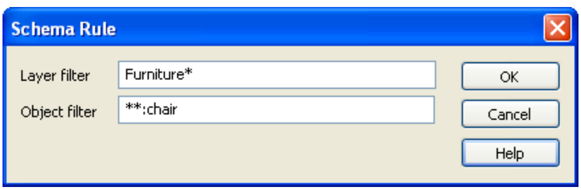
- Layer: applies the schema to the specified layers
- Object: applies the schema to the specified objects, on the specified layers
- Window: applies the schema to the specified windows

If you are creating a schema that is based on an existing schema style, you can change the type only if the current rules or mnemonics are compatible. You may need to first edit the rules or mnemonics saved in the schema.

5 Under 'Applies to', click Add and use the Schema Rule dialog box to specify the layers and objects to which the rules of the schema should apply.

You can use wildcards to set the filters for graphics. For details about wildcards, see Chapter 3, *Working with primitives and objects*.

For example, to apply a schema to all objects with the last facet 'chair' on any layer whose name begins with 'Furniture', you would set up the schema rule as:



Note that the Object filter is available only when the schema type is Object.

6 Under Mnemonic, click Add and select the mnemonics that are to be available to the graphics to which the schema applies, using the Schema Mnemonic dialog box.

The order in which the mnemonics are listed defines the order in which the attributes are displayed in the Properties window. You can use the Up and Down arrow buttons to change the order.

7 If you want to assign any default values to the mnemonics, click the attribute then do one of the following:

- type the value in the box
- click  and select the value from the list

- click to display an Edit Property Value dialog box in which to enter the attribute value

For more details on assigning attribute values, see page 321.

Note that any default attribute values become active on the Properties window only when you select the schema from the Objectstyle list on the Properties window. If you do not select a schema, all values default to «None».

8 To save the schema definition, click Save As and type the schema name.

The name must comply with the MicroGDS naming rules as described next.

You can modify and delete schemas using the Document Organizer. You can also create and modify schemas using the Schema Definition command on the Styles menu. For full details, refer to Help.

Rules for naming mnemonics and schemas

Rules for naming mnemonics and schemas are:

- a mnemonic or schema name can contain up to 255 characters
- names can include spaces, except at the beginning or end of the name
- names are case sensitive, so ‘Materials Used’ and ‘materials used’ are two different definitions

Note that the mnemonics and schemas supplied by MicroGDS for the implementation and drawing of BIM intelligent objects follow special naming conventions. For details about BIM intelligent objects, see Chapter 3, *Working with primitives and objects*.

In addition, if you want to produce an object report that includes attributes, do not name a mnemonic using any keyword used by the format definition file. If a mnemonic name matches any of the format file definition keywords, MicroGDS prints the details defined by the keyword, and not the attribute value associated with the mnemonic.

For details about object reports and format definition files, see Chapter 13, *Getting information*. Refer also to Help.

Assigning attribute values

Where a schema indicates that the selected graphics are intended to have a particular attribute, MicroGDS makes the corresponding mnemonic available in the appropriate place:

- Window-level mnemonics are made available in the Window Editor
- all other level mnemonics are shown in the Properties window

Initially, local mnemonics usually have no value, indicated by showing «None». To assign an attribute to the selected graphics, you provide a value for the mnemonic.

Note that if any default attribute values have been set in a schema, the default values are initially shown. If you change a default value for the selected graphics in the Properties window, it overrides the value set in the schema.

▶ To assign attribute values

1 Do one of the following:

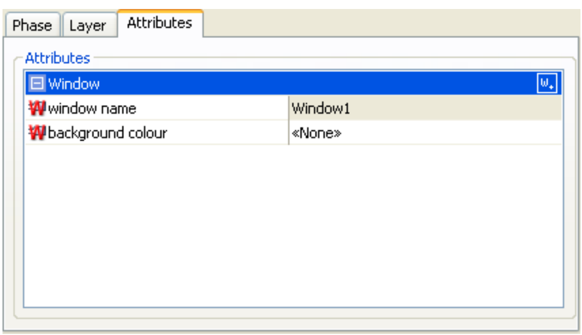
- To assign a value to a window-level mnemonic:

  a) open the window definition to which you want to assign an attribute value

  b) press F2, or on the File menu, click Window, Edit

  c) on the Window Editor, click the Attributes tab

  The Attributes tab is displayed showing any attributes associated with the window. For example:



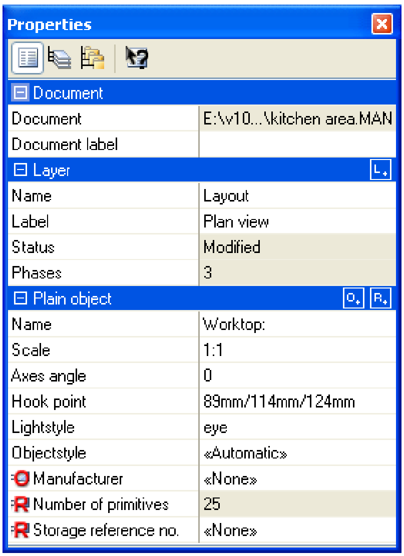
- To assign a value to any other level mnemonic:

  a) select the primitives or objects to which you want to assign attributes, and to which a schema has been applied

  b) press Ctrl+Q, or on the Window menu, click Properties

  The Properties window is displayed showing details about the selected graphics and associated attributes.

  For example:



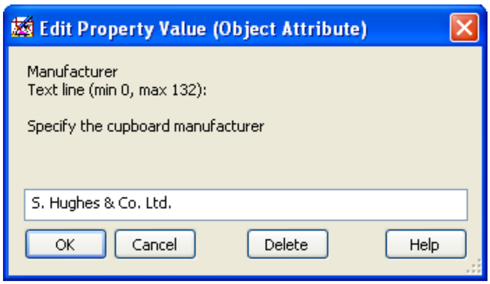
If any hidden attributes are associated with the selected graphics, they are shown only if the Show Advanced properties check box is selected in your preferences. Hidden attributes are designated by an asterisk (*) as the first character. Hidden attributes can only be modified by a custom program.

You can view details about any attribute by hovering the mouse pointer over a mnemonic name or its value. Details for the item are shown in a ToolTip. For example, if you hover over the mnemonic name, the name of the schema in which the mnemonic is included, if any, and any prompt defined for the mnemonic are shown.

2 To assign an attribute value, click the attribute then do one of the following:

- type the value in the box
- click  and select the value from the list
- click  to display an Edit Property Value dialog box in which to enter the attribute value

For example:



— when assigning enumeration from a word list, the box provides a drop-down list of the defined words for you to choose from

— when assigning multiple values, some attributes show the line numbers in the left column; to edit a line, click the right-hand box of the appropriate line

— when assigning attributes to a URL mnemonic, specify the value as a file name or a full URL

For details about the hyperlink formats you can use, see *Editing attributes* in MicroGDS Help.

When a URL mnemonic is assigned to an object or primitive, a link icon is shown to the left of the mouse pointer, which you use to open the link.

— when assigning a date attribute, MicroGDS displays an Edit Date dialog box; double-click the displayed date to set a new date

You can remove the existing attribute value by clicking Delete.

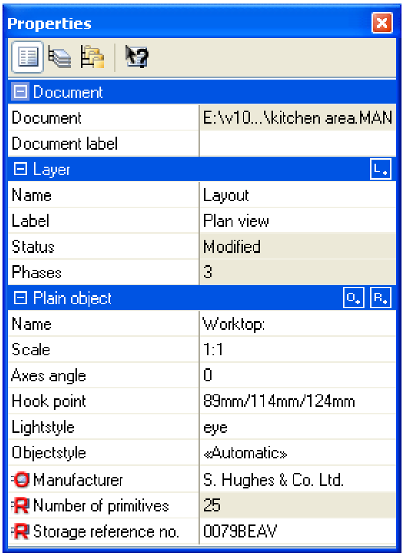
If you remove an attribute that appears in a relevant schema, it will continue to be shown in the Properties window with a value of «None».

If you remove an attribute that you have added to the selected graphics, the attribute is no longer shown in the Properties window.

3 Add further attributes as required.

The attributes are shown in the Window Editor or Properties window, as appropriate.

For example:



Adding new attributes

You usually create schemas to tell MicroGDS which entities are expected to have which attributes. Sometimes, however, you might want to explicitly assign an attribute to one or more graphic entities. You can do this by adding it to the appropriate graphics.

▶ To add new attributes

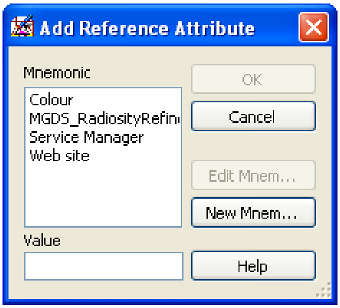
1 Follow step 1 in *Assigning attribute values* on page 319.

2 Click the Add Attribute button that is appropriate to the applicability of the mnemonic.

For example, to add an attribute to a reference level mnemonic, click the Add Reference attribute button on the Object section of the Properties window.

MicroGDS displays an Add Attribute dialog box and lists all local mnemonics of the appropriate applicability, that are available.

For example:



The dialog lists only local mnemonics because you do not explicitly assign values to external or computed mnemonics.

3 From the Mnemonic list, select the mnemonic to attach to the selected graphics.

MicroGDS shows the selected mnemonic in the Value box, and assigns a default value depending on the mnemonic type. For example:

If required, you can change the value in the same way as described in step 2 of the previous section *Assigning attribute values*.

4 To confirm the attribute and assign the value to the selected graphics, click OK.

Copying attributes with graphics

MicroGDS copies attributes according to the following rules:

Mnemonic applicability	Copying rule
Layer-level	Always copied when a document, window, or layer is copied.
Object-level	Always copied when a document, window, or layer is copied. Copied when an object, or assembly containing an object, is copied, only if the 'Attribute copied with object' check box is selected for the mnemonic. If an attribute already exists in the target document but with a different value, the target value is used and the imported value is discarded.
Reference-level	Always copied when a document, window, or layer is copied. Copied when an object, or assembly containing an object, is copied, only if the 'Attribute copied with object' check box is selected for the mnemonic.
Primitive-level	Always copied.
Window-level	Always copied when a document or window is copied.

Copying and pasting attribute values

You can copy attribute values from the Properties window to the Clipboard as DDE data. You can then paste-link this data into a MicroGDS document or into an application that can handle linked data (for example, a cell of an Excel spreadsheet). The pasted attribute value is then automatically updated whenever that attribute value is changed in the MicroGDS document.

To copy an attribute value, right right-click over the attribute and select the Copy command from the shortcut menu.

Link data in which the source and destination information is stored in different files is stored in Dynamic Data Exchange (DDE) format. The DDE link contains information about the source file name and location. Therefore, you must save the source file to disk before you can copy or cut the data for linking.

In MicroGDS, if you copy an item from a document and then paste-link it back to the same document, you should paste the information using the MicroGDS Linked Data format. This format automatically drops the overhead of the source file and location, which is not needed for links within the same document.

You can also copy some of the properties in the Properties window as linked data, provided that the corresponding computed mnemonic is available to the document. For more details, refer to Help.

Filtering objects by attributes

When you set up an inclusion list, you can filter the objects using attribute values. You use an inclusion list to:

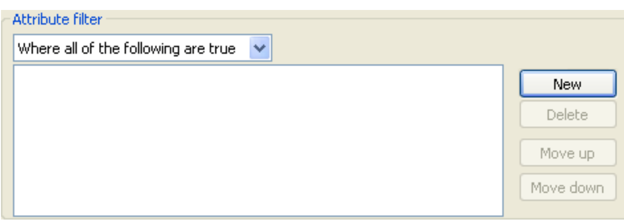
- define which objects are to be included in a phase, using the Phase Filter Editor

  For details about inclusion lists, see Chapter 4, *Using layers and phases*.

- define the objects that can or cannot be edited in a document, using the Set Edit Filter Editor

  For details about editing restrictions, see Chapter 3, *Working with primitives and objects*.

To filter objects using attributes, you use the Advanced section of the Filter Editor:



To add a filter condition, click New or to edit a filter condition, click the column you want to change.

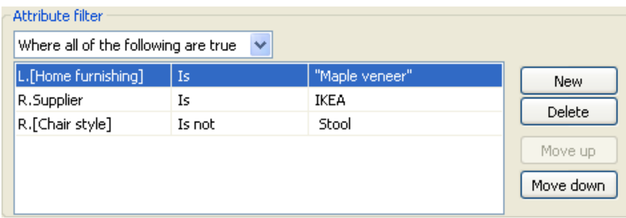
You choose whether the filter is to apply to ‘any’ or ‘all’ of the following conditions must be met by selecting from the list. You then define the filter condition to which the filter is to apply. The usual syntax of a condition is:

mnemonic_name   operator   attribute_value

For example, to find all objects which have a floor area greater than 20, you would set up the statement:

flooring > 20

To define the attribute filter, select the components from the lists. For non-specific values such as free text, type the text using wildcards if required. For example:



Full details on setting up attribute filters are given in MicroGDS Help.

Using attributes in secondary annotation

You can use attributes in a text primitive so that you need not change the text of the primitive each time the value changes. This is called *secondary annotation*. For example, you might use secondary annotation to insert the area of an object.

To insert an attribute value as secondary annotation in a text primitive, type the mnemonic name using the format:

^(*mnemonic name*)

For example:

```
The pipe length required here is ^(R.Pipe length).
```

might show:

```
The pipe length required here is 20m.
```

For more details about secondary annotation, see Chapter 8, *Working with text*.

Chapter 15

Working with different file formats

Introduction

In MicroGDS, you usually work with MicroGDS documents. However, using the import, export, publish, raster, and link commands, you can also work with other file formats.

These facilities enable you to work with files created in, converted to, or linked to, other software packages, such as AutoCAD, Adobe, and Corel Paint Shop Pro.

Opening non-MicroGDS files

You can use the File Open command to open the following non-MicroGDS file types:

- DXF (AutoCAD's drawing exchange file format)
- DWG (AutoCAD file; a smaller version of a DXF file)
- AIF (GDS ASCII Interchange Format)
- BIF (GDS Binary Interchange Format)
- SKP (SketchUp)
- 3DS 3D Studio files

When you open a non-MicroGDS file, this is, in reality, a shortcut to creating a new, blank file and then importing the third-party file. MicroGDS performs the following actions, in the background:

1. First, MicroGDS creates a new, blank document.

   If a blank MAN file template is specified in your preferences, the new document is based on the template. This enables styles to be transferred to the graphics.

2. The file is then imported into one or more window definitions.

   If you are using a style mapping table, the graphics are translated according to the style mapping table.

   For more details, see *Using mapping tables* on page 332. Refer also to Help.

   The Window label in the Window Editor shows the path of the imported file.

   For some file types, the Layer labels are set to 'Imported from *filename.xxx*'.

Note that details of third-party files cannot be displayed in the Document Organizer.

You can also transfer project files between GDS and MicroGDS projects using the GDS Transfer utility. GDS is a product of Graphic Data Systems, Corp. You can access Classic GDS Transfer from your MicroGDS, Applications menu on the Start menu. For details on how to use the utility, refer to the Classic GDS Transfer Help.

Importing files

When you have a MicroGDS document open, you can import the data from other MicroGDS documents, plus DXF, DWG, AIF, BIF, THF, SKP, and 3DS files into the document.

Things files (.THF) are an effective way of transferring 3D geometry (including 3D Classic GDS geometry) into MicroGDS.

If you want to import a WND file from a multi-user project, export the window definition to a MAN file and then import the MAN file into the document.

▶ To import a file into a MicroGDS document

1 Open the document into which you want to import the data.

If you are importing a THF file, you can import the data directly into an existing window definition in the MicroGDS file. If required, open the window definition into which to import the data.

For other file formats, new window definitions are created as necessary.

2 On the File menu, click Import File.

3 In the File to Import dialog box, select the folder to look in.

4 From the Files of type list, select the type of file to import.

5 Select the file to import and click Open.

If you are importing from DXF, DWG, AIF, BIF, or SKP format, a further Import dialog box opens. You can use the dialog box to specify the input for the resulting file. For example, you can set up style and entity mapping tables for DXF and DWG files and choose whether to create assemblies for SketchUp groups and instances. The dialog box also enables you to save sets of import options to a file so that you can reuse the same set of options another time.

Mapping tables are described further below.

With the exception of importing a Things file, a new window definition is created containing the imported file.

If you import a Things file, it is imported into the current window definition, on the current layer, and in the current object. If no window definition is selected, the file is imported into the last selected window definition. If no window definitions are open, a new window definition is created containing the imported file.

When you import a DXF/DWG or AIF/BIF file, you can use mapping tables to explicitly define the mappings of linestyles and charstyles, layers, objects, and attributes. For more details, see *Using mapping tables* on page 332. You can also refer to Help.

If you import a single-user document (a MAN file), and a window definition of the same name already exists in the document, MicroGDS prompts you to specify a new name. If styles of the same name and type already exist in the document, the styles in the imported document use the styles in the document into which you are importing. Furthermore, if unique layer names are enforced and you import a document that has the same layer names as those already in the document, unique names is not enforced and MicroGDS creates duplicate layer names. (Unique layer names can be set on the Name Assistants tab of your preferences.)

If an imported MAN file contains a photo that references another document, the source window definition is also imported.

Note that if you import a single-user document into a multi-user project, all window definitions and layer files are created in the current default alias.

Exporting and publishing files

In MicroGDS, you can export and publish a view of a window definition to a number of model-based and image-based formats. The difference is that MicroGDS translates the structure of a file for export and draws the content for publish.

For example, you export a view to DXF and SKP formats and you publish a view to PDF and BMP formats.

MicroGDS also supports exporting and publishing multiple views using batch versions of the commands. The following subsections describe how to export and publish a single view; for full details on exporting and publishing single and multiple views, refer to Help.

Exporting a view

Before you export a view to another format, please check the Help to see if there are any file-specific considerations that you need to be aware of.

Note that if you export a view which has a sectioned view, the section information is included provided that the export format supports the current section.

▶ **To export the current view to a different file format**

1 If you are saving to THF format, only clumps are exported therefore select the clumps that you want to export.

2 On the File menu, click Export.

The Export dialog box is displayed.

3 From the Save as type list, select the file format in which to export the graphics.

4 In the File name box, type the name for the file and click Save.

MicroGDS will automatically add the appropriate extension to the file name.

Depending on the file format to which you are exporting, MicroGDS opens a further dialog box which enables you to choose output options for the resulting file.

If you are exporting to:

- MicroGDS format, you can choose the action for any photos that are referenced by the window definition.
- 3DS format, you can specify how to write 3DS meshes. For more details, refer to Help.
- AIF, BIF, DXF or DWG format, you can set many options to specify how the output file should be generated. For example, MicroGDS uses default mappings for DXF and DWG files. If required, you can set up custom style mapping tables for each of these formats. You can also set up entity mapping tables to define the mapping of layers, objects, and attributes. Mapping tables are described further below.

Publishing a view

Before you publish a view to another format, please check the Help to see if there are any file-specific considerations that you need to be aware of.

Note that if you publish graphics which have a sectioned view, the invisible graphics are omitted from the resulting file.

▶ **To publish the current view to a different file format**

1 On the File menu, click Publish.

The Publish dialog box is displayed.

2 From the Save as type list, select the file format in which to publish the graphics.

3 In the File name box, type the name for the file and click Save.

MicroGDS will automatically add the appropriate extension to the file name.

Depending on the file format to which you are publishing, MicroGDS opens a further dialog box which enables you to choose output options for the resulting file. Many options in the upper part of the dialog box are identical for each file type. Additional options that you can use to set resolution and structure settings differ depending on the file type. For details on each output option, refer to Help.

If you are exporting to PDF format, MicroGDS displays the PDF Export dialog box for you to specify the output for the resulting file. Note that Adobe PDF format 1.6 is the recommended format. (Adobe Reader 7 or later is required to read PDF 1.6 format correctly.)

Using mapping tables

Mapping tables can be used when MicroGDS translates files to and from DXF, DWG, AIF, and BIF. They can be used to define how a file should be opened or saved in MicroGDS.

There are two types of mapping tables available: *style mapping tables* and *entity mapping tables*.

- a style mapping table defines which linestyles and charstyles are used when MicroGDS translates files to and from BIF, AIF, DXF, and DWG

- an entity mapping table defines how data is handled when MicroGDS translates files to and from DXF and DWG

  For example, MicroGDS objects are converted into *blocks*, and primitives are converted into *entities*.

MicroGDS supplies sample mapping tables for opening and saving files in DXF and DWG format. These files are located in the MicroGDS Programs folder.

You might set up a number of different mapping tables for different purposes. You define the location of the mapping tables to use when you start a file translation.

For more details about setting up and using mapping tables, refer to Help.

Inserting raster images

A raster image is a rectangular area of pixels. The image can represent data such as a geographical area or a scanned drawing. You can edit the size and location of a raster image in a file, but you cannot interact with (for example, snap to, select, trace or edit) the raster graphics.

Raster images are treated as rectangle line primitives whose contents are linked to the inserted raster file (specified when the image is inserted). When a raster primitive is selected, MicroGDS displays the boundary of the image, overlaid with a grid of dots. This helps you to identify raster primitives, and also speeds up redraws.

The types of raster images you can insert into MicroGDS are:

BMP	Windows bitmap image
TIFF (or TIF) images	Tagged Image File Format
JPEG (or JPG) images	Joint Photographic Experts Group compressed image file
EPX files	Piranesi Extended Pixel format
PNG files	Portable Network Graphics file
TGA files	TARGA format files (Not all TARGA format files can be used in MicroGDS; refer to Help for details.)

If the file type supports transparency, any transparent areas in the raster image are retained.

Inserting a raster image into a document

If you are inserting several raster images into a document, you can set up aliases to map the physical location of the files containing the objects to an arbitrary name. If the files are later moved to a different location, you need only change the pathname in the aliases table.

Note that if you want to use aliases, you should define the aliases before you insert the raster images into the document. For details about setting up aliases, see Chapter 3, *Working with primitives and objects*.

When you have set up aliases, you can drag a raster image from the aliased library in the Document Organizer into the active window.

▶ To insert a raster file

1. On the Construct menu, click Raster.

   The Raster Image dialog box is displayed.
2. Locate the folder that contains the image to insert, or if you are using aliases, select the appropriate alias name from the Aliases list.
3. From the Files of type list, select the image format you require.

   To list all raster types recognized by MicroGDS, select All Image Files.
4. Select the file to open and click Open.

   The Raster Details dialog box is displayed.
5. Specify the resolution and colour options you require, then click OK.

   If you are inserting a 1-bit image file, you can use the Colour Handling options to assign a transparency value to either of the image colours.

   If you use transparency, you should select the GDI+ raster optimization check box in your preferences.
6. Click in the window to position the bottom left-hand corner of the raster image, or type the coordinates of the position.

   The image is placed at the specified position, overlaid with a grid of dots. When you deselect the primitive, the dots are no longer visible.

Inserting raster images from an aliased library

When you set up raster aliases, details are added to the Raster Files tab on the Document Organizer. This enables you to access the images in the aliased locations directly from the Document Organizer.

▶ To insert an aliased raster image

1 On the Document Organizer, click the Raster Files tab:

A list of each aliased raster location is displayed.

2 Double-click the aliased location that contains the image to insert.

The raster images in the aliased location are listed.

3 To display a preview of an image, select the image's file name.

If the preview area is not currently visible, on the shortcut menu, click Toggle Preview.

4 When you have located the image to insert, drag the image into the window definition.

5 Specify the resolution and colour options you require, then click OK.

The image is placed in the window definition.

When you have placed an image in a window definition, you can use MicroGDS commands to alter the image. For example, you can move, rotate, stretch, or mirror the image. You can also manipulate the border of the image, for example, you can add vertices, move segments, and swap the boundary with a closed line primitive. For details, refer to Help.

Editing the raster image path

If an inserted raster file is deleted or moved, MicroGDS shows an empty rectangular outline, and reports the error to the Problems dialog box.

To display the image, you will need to update the raster path.

- if the location of the image is aliased, you can edit the alias path

  You can edit the alias path using the Problems dialog box or the Aliases command on the File menu.

Note that the Aliases command is available only for a single-user document. Raster aliases in a multi-user project are set up in the project database. For details, see Chapter 16, *Working with projects*.

- if the location of the image is not aliased, or you do not want to change the alias path, you can edit the image path

  You can edit the image path using the Problems dialog box, the Properties window, or the Raster, Properties command on the Alter menu.

Note that you can use the Many Paths command on the Edit menu to update the paths of multiple missing raster files.

You can also change the contents of an inserted raster primitive by changing the path, thereby pointing to a different image altogether.

For more details on these commands, refer to Help.

Editing a raster image

You can open a selected raster image in the editor specified in your Preferences. This enables you to edit the image as required.

▶ To edit a raster image

1. On the Alter menu, click Raster, Open.
2. Click on the border of the raster image you wish to edit.
3. Edit the image file as required and then save and exit from the editor.

Alternatively, double-click on the border of the raster image to open the file in the specified editor.

Updating a raster image

Raster images that you insert in your document are not updated dynamically when the raster file is changed. Therefore, you must update it to see changes made to the file.

▶ To update a raster image

1. On the Alter menu, click Raster, Update.
2. Click on the border of the raster image you wish to update.

Object linking and embedding

You use linked and embedded objects to share information between Windows programs. (Note that the term 'object' when used in this context does not refer to the special MicroGDS use of 'object'.)

You can use a linked object or an embedded object to add data created in any program that supports linked and embedded objects, to a file in another application. For example, you can embed or link MicroGDS graphics or views in other applications. Similarly, you can embed or link data from other applications in MicroGDS documents by using the Edit, Paste Special command.

You can also drag files and objects into a MicroGDS document to move, copy, and link data. For example, you can add a bitmap from Windows Explorer, or a text block from a Microsoft Word document. You can drag files and objects into a MicroGDS document using both the left and right mouse buttons. For more details, refer to Help.

Linking objects

You can link an object from a window definition in a MicroGDS document to a file in another application.

When you link an object, the linked data is stored in the source file. The destination file stores only the location of the source file and displays a representation of the linked data. The linked information is updated only if you modify the source file.

Link data in which the source and destination information is stored in different files is stored in Dynamic Data Exchange (DDE) format. The DDE link contains information about the source file name and location. Therefore, you must save the source file to disk before you can copy or cut the data for linking. If you rename or move the source file, the link is broken.

When you paste-link data from a single-user document to another application, the link is made to the principal window only. If you change the principal window, the link to the graphics in that window is lost and the link then refers to the new principal window.

In MicroGDS, if you copy an item from a document and then paste-link it back to the same document, you should paste the information using the MicroGDS Linked Data format. This format automatically drops the overhead of the source file name and location, which is not needed for links within the same document. You might use paste-link within the same document, for example, to place dynamic measurements in your documents using the Copy button on the Query Measurements dialog box. Linked Data format is available only when the source and destination document are the same.

Note that MicroGDS Linked Data should be used in preference to DDE data, which carries more overhead. Use DDE Link Data when you paste-link data between different documents or between applications.

You can double-click a linked object to open it in the source program if the source program is OLE 2 (Object Linking and Embedding) compliant. For further details, see the section *OLE* on page 339.

▶ To link measurements from a MicroGDS document to an Excel spreadsheet

1 Open the document that contains the graphics whose measurements you want to link to Excel.

2 Open the window definition that contains the graphics.

In a single-user drawing, you must ensure that the window definition containing the graphics is designated as the principal window in the document.

3 On the File menu, click Preferences.

4 On the General tab, ensure that the Query dialogues check box is selected and click OK.

5 On the Query menu, click Area.

6 Click on a closed line primitive to measure the area of the primitive.

7 When the Query Measurements dialog box opens showing the area value, click Copy.

Note that the DDE link contains information about the source file name and location. Therefore, if the source file has not yet been saved, the Copy command copies only plain text.

8 Start Excel and open a spreadsheet.

9 Select the cell in which you want to paste the area value.

10 On the Edit menu, click Paste Special.

11 Select the Paste link option and click OK.

The area of the primitive at the object scale is pasted into the cell, using the current set units and decimal places. During this session, if the item in MicroGDS is altered so that its area changes, the area value will be updated automatically in Excel.

12 If required, save the Excel spreadsheet.

When you leave Excel, the most recent data is stored along with the link information. The next time you start Excel, a prompt asks if you want to re-establish the remote link. If you click Yes, it will check for any updates to the data, and continue receiving updates during the session.

OLE

You can embed an object from a MicroGDS document in a file in another application.

OLE (Object Linking and Embedding) enables you to embed data from one Windows program in another in such a way that, if you want to edit that data, you can start the source program by double-clicking on the embedded object. The source program is then started and loads the relevant data.

For example, you might embed a window definition in a MicroGDS single-user document in a Word document.

▶ To embed a MicroGDS document in a Microsoft Word document

Note that the following steps refer to Microsoft Office 2007. If you have a different version of Microsoft Office installed, please see the Microsoft Help for details.

If you are in Word:

1 Click in the document where you want to place the embedded object.

2 On the Insert tab, in the Text group, click Object.

3 In the Object type box, double-click MicroGDS Document.

A MicroGDS document is inserted into the Word document.

4 To begin drawing in MicroGDS, select a command from the Construct menu.

5 When you have finished, on the View menu, click Save View1.

If you are in MicroGDS:

1 Open the MicroGDS document that contains the item to be embedded.
2 Open the window definition that contains the graphics.

   In a single-user drawing, you must ensure that the window definition containing the graphics is designated as the principal window in the document.
3 Select the item to be copied and, on the Edit menu, click Copy.
4 Start Microsoft Word and press CTRL+V.

   From now on, you can edit the MicroGDS document by double-clicking the object in Word.

Once a MicroGDS document is embedded in a Word document, the only way to edit it is to double-click on it in Word—you cannot start MicroGDS and load the document.

Embedding objects

When you embed an object, the embedded object becomes part of the destination file and is no longer part of the source file. The embedded information does not change if you modify the source file.

If you paste the object in an appropriate format, you can double-click the embedded object to open it in the source program if the source program is OLE 2 compliant.

If the file you want to use was created in a program that does not support linked and embedded objects, you can still copy and paste information from the file to share the information between programs.

Chapter 16

Multi-user projects

Multi-user projects

Use multi-user projects to enable several people to access the same drawing data simultaneously.

The main difference between a single-user document and a multi-user project lies in the way the drawing data is stored.

The graphical data for a multi-user project is stored in a series of layers, and each layer is stored in a separate layer file (a .LYR file). This makes it possible for different people to work on the same drawing by each editing a different layer. When one person opens and begins to edit a layer, the layer file is locked to prevent another user from editing the file at the same time. More details about layers in multi-user projects are given in Chapter 4, *Using layers and phases*.

The drawing data in a project is stored in window definitions, just as it is for a single-user document. However, each window definition in a project is stored in a separate window definition file (a .WND file).

There is virtually no limit to the number of layers you can create. You can organize the layers and window definitions into as many different folders as necessary. For example, you could group all layers that contain data for architects in one folder and all layers that contain data for electricians in another.

Project databases and project workspaces

A multi-user project comprises a *project database* and one or more *project workspaces*. The project database locates various project files, including the layer files which make up the drawing. The project workspace controls which layer files can be accessed by whom.

MicroGDS supplies a sample project called Sixhills to give you an idea of how projects can be set up. This project is installed into your MicroGDS Sample Drawings folder. You can use Windows Explorer to see how the folders and drawing data are structured. If you open the project in MicroGDS, you can use the Document Organizer to see how MicroGDS presents the project to you.

Project databases

MicroGDS project databases can be created as MicroGDS .CPD databases, SQL Server/MSDE (and SQL Server 2005 Express) databases, or any other database that has an OLE DB provider which complies to the ANSI SQL92 standard.

We do advise against using other types of database as there may be problems with creating the database table. If you do wish to create a project using other types of database, please contact MicroGDS support for more information.

By default, databases will be created in Jet 4.0 (Access 2000) format. These types of project database have the extension .CPD.

Note that you cannot create or use CPD databases if you have installed the 64-bit version of MicroGDS on a 64-bit machine. If you do have existing CPD databases that you want to continue to use, you might want to consider installing the 32-bit version of MicroGDS instead.

The project database defines the locations of the files that are to be used in the project. This includes the window definition files, layer files, raster files, and instance object libraries. It also defines the locations of the style files. Style files contain the definitions of the charstyles, linestyles, materials, lightstyles, and mnemonic definitions used in a MicroGDS project.

The locations of the project files are defined when the project database is created. Additional locations can be specified at a later time, and existing locations can be changed or removed by the project manager using the Project Administrator. The Project Administrator is available from the MicroGDS Program menu on the Windows Start menu. For details on how to use the Project Administrator, refer to the utility's online Help.

When you define the file locations, you use *aliases*. An alias is a way of mapping an arbitrary name to a physical file location. This enables you to use a name of your choice in place of specifying the full pathname, similar to using Windows shortcuts. For example, you could map the alias name 'Architectural Drawings' to the folder c:\MicroGDS\Projects\SitePlan\Architectural. If the architectural files are later moved to a different folder, only the pathname of the alias in the database needs to be changed. You do not need to update it each time one of the files is referenced.

You can use a *project template* when you create a project database. Project templates provide a folder structure for holding all files related to the project, as well as a set of styles. Templates are described on page 344.

Project workspaces

The project workspace contains information relating to a project, such as the project database to be used, the layers that are editable, and the default locations in which to save new files. Many workspaces can be defined for the same project, enabling different users to access different data. A project workspace has the extension .CPJ.

For example, if you have a project to design a building, the project database would contain all the layers relating to the building. You could then set up different workspaces for different disciplines. All users would be able to see the overall building plan, but designers working on electrical data would work in the electrical workspace and have access to wiring plans, and designers working on plumbing data would work in the plumbing workspace and have access to piping layouts, and so on.

When you open a project workspace in MicroGDS, data relating to the workspace is displayed in the Document Organizer. Each tab on the Document Organizer gives access to specific project items. For example, the style categories are listed on the Styles tab, and the window aliases available to the project are listed on the Window Definitions tab.

For details about opening project workspaces and working with the project data, see *Working with project workspaces* on page 356.

Using project templates

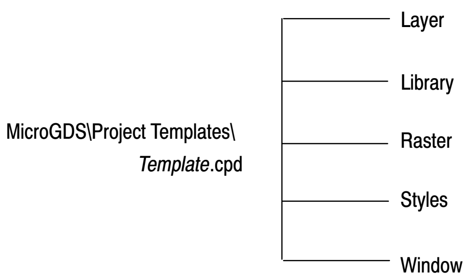
MicroGDS supplies two sample project templates that you can use (Basic.cpd and Working.cpd), or you can create your own.

The Basic and Working templates both use a MicroGDS .cpd database file, but they could use any other type of database such as a SQL Server database.

Before you can use a project template, you must add it to the template list in your preferences. For details, refer to Help.

Sample project templates

Both the Basic and the Working templates have the following structure:



The Basic template provides only the structure for the project database.

The Working template includes some additional files:

- a project workspace file (Entire Project.CPJ)
- Layer

  A layer files alias location to store the layer files (.LYR) which store the drawing data.

- Library

  A library files alias location that you can use to store and access object libraries. (An object library is a .MAN file that contains objects that can be inserted into window definitions.)
- Raster

  An image files alias location containing sample TIF files that can be used to insert raster images into a drawing.
- Styles

  Contains a CHARS.STY file and a LINES.STY file.
- Window

  A window alias location, containing a subfolder called Frames which provides some standard drawing frames.

When a new project database is based on a template, MicroGDS copies this structure to the specified location. Note that any files that were not created as part of the template are not copied.

By default, the project files are saved in the corresponding project folders. For example, the layer files (.LYR) are stored in the Layer folder, and the window definitions (.WND) are stored in the Window folder. When a new style is created, if a style file of that type does not already exist, MicroGDS automatically creates the appropriate style file in which to store the styles. For example, LIGHTS.STY is created when you create a new lightstyle and MATLS.STY is created when you create a new material.

Note that project managers can manage multi-user projects using the Project Administrator utility. The Project Administrator is available from the MicroGDS Program menu. For details on how to use the Project Administrator, refer to the utility's online Help.

Basic steps for creating a project template

The steps below summarize the basic procedure for creating new project templates. For full details, refer to Help.

▶ To create a project template

1 Create a project database, with the alias names and style search path that you want to use for the template.

2 Create the project workspaces, window definitions, and layers that you want in the template.

3 Copy any additional files that you want users of a workspace to access, into the appropriate project subfolders. For example, you might copy a number of raster images into a Raster location.

4 Add the project template to the template list on your Multi-user preferences.

   For details about adding project templates to the template list, refer to Help.

When a new project database is created based on a template, MicroGDS creates a project database with the name and in the location you specify, based on the template. Any files and folders on the same level and below the project database file (CPD) in the template will be copied to the new project database. The new project database also stores the alias names with their mapped locations, and the locations defined in the style search path. The template can reference folders outside of this structure, but the files within those folders are not copied to the new project database.

Creating multi-user projects

In this section, we describe how to create a MicroGDS Jet 4.0 (Access 2000) project database. This is the default format. The basic concepts and procedures are similar for all types of project database creation. For details about creating a project database of a different format, refer to the Project Administrator online Help.

Before you create a new multi-user project, you should plan the structure of the project. This will help to ensure that users of the workspaces have access to the locations and files they require.

The structure of a project can be changed at a later date, for example, it may be necessary to add a new folder to the style search path in the project database. However, it is better to have the project well defined before users begin to work with the project files. Changes to the database (and workspaces) can be carried out by the project manager using the Project Administrator. The Project Administrator is available from the MicroGDS program menu on the Windows Start menu. For details on how to use the Project Administrator, refer to the utility’s online help.

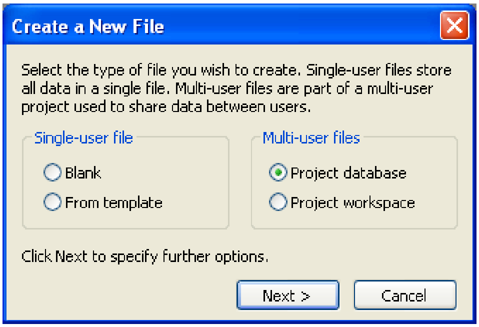
To create a new project, you:

- create the project database, if it does not already exist
- create the project workspaces

Creating the project database

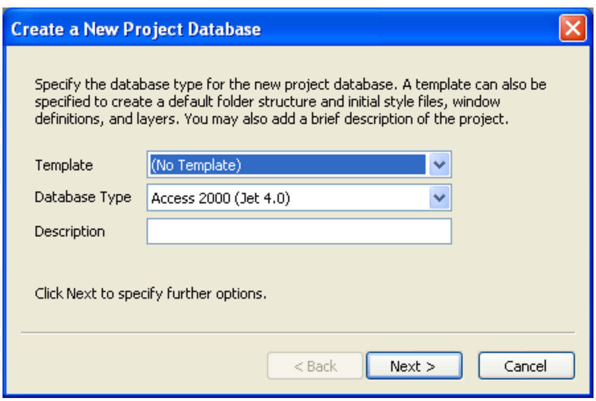
1 On the File menu, click New.

The Create a New File dialog box is displayed:



2 Select ‘Project database’ and click Next.

The Create a New Project Database dialog box is displayed:



3 From the Template list, select an existing project template on which to base your new project.

   If you do not want to use a project template, leave the selection set to (No Template).

4 From the Database Type list, select Access 2000 (Jet 4.0).

5 In the Description box, type a short description for the project database, if required.

   The description can be read and amended using the Properties window.

6 Click Next.

7 To specify the name of the project database:

   - in the Name box, type the full path

     If you type a location that does not exist, MicroGDS asks if you wish to create it.

   - or, click Browse to display a browse dialog box in which you select the location for the project database. In the File name box, type the name and click Open

   You can set a default location in which to create a new project database on the Multi-user tab of your user preferences.

   If you do not include the .CPD extension, MicroGDS adds it automatically.

8 Click Next.

   If you based the project database on a template, the project database is created and the Create a New Project Database dialog box is closed. If you now want to create a project workspace:

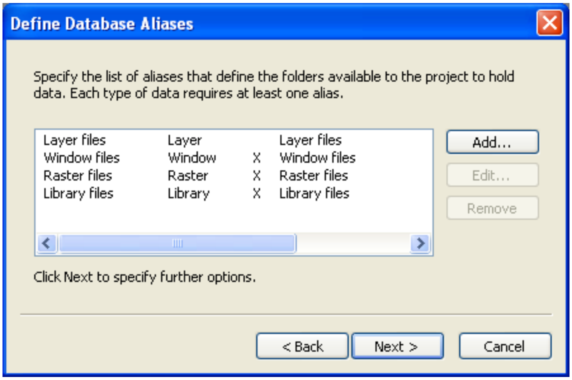
   a) On the File menu, click New.

   b) In the Create a New File dialog box, select Project workspace.

   c) Go to the next section *Creating the project workspace*.

   If you did not base the project database on a template, MicroGDS displays the Define Database Aliases dialog box.

For example:



Aliases are the names you associate with the folders available to the project. There are six alias types:

- layer aliases specify the folders for new layers
- window aliases specify the folders for new window definitions
- raster aliases specify the folders for accessing raster images
- library aliases specify the folders for accessing library files
- reference aliases specify the folders for accessing MicroGDS documents that contain windows that can be used as photos (these are optional)
- renderer aliases specify the folders for renderer files (these are optional)

Reference and renderer aliases are optional; all other types of data require at least one alias.

The default alias names for each file type are shown on the left side of the dialog box; the default folder locations, which are relative to the project database folder, are shown on the right of the dialog box.

If you accept these details, MicroGDS creates subfolders in the project database structure with the names shown, and maps those locations to the default alias names.

Note that the alias names are the names that you will see in the Document Organizer.

9 You can use the Define Database Aliases dialog box to add, edit, and remove aliases, as applicable.

Note that if you map an alias to a network drive, the assignments will work only for users who use the same standardized mapping of drive letters to disks. If you do not use a standardized network mapping system, you should specify the full network pathname when you set up aliases.

To change the default alias name and/or location for an alias:

a) In the Define Database Aliases dialog box, select the default alias and click Edit.

   MicroGDS displays the details of the selected alias in the Alias Editor.

b) Amend the alias name and the location to which the name refers, as required, then click OK.

To add an alias:

a) On the Define Database Aliases dialog box, click Add.

   MicroGDS displays the Alias Editor.

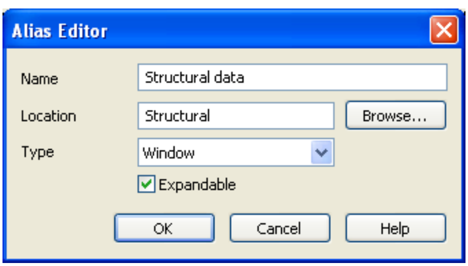
b) In the Name box, type the alias name.

c) Specify the location to which the alias name refers.

   If the location is relative to the project database, type only the folder name; you do not need to type in the full pathname. If you type a location that does not exist, MicroGDS creates the location for you.

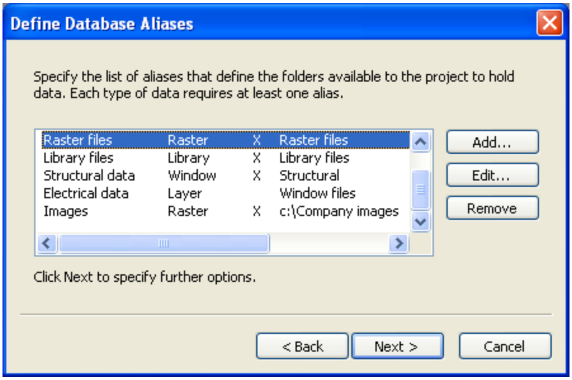
d) From the Type list, select the type of file to which the alias refers.

e) To allow the users of the workspace to expand an alias name to show any subfolders in the project workspace window, select the Expandable check box:



f) Click OK.

The following example shows a Define Database Aliases dialog box with the complete alias details for the project:



An absolute path is shown if you:

- type an absolute path
- browse to a location that is not relative to the project database folder

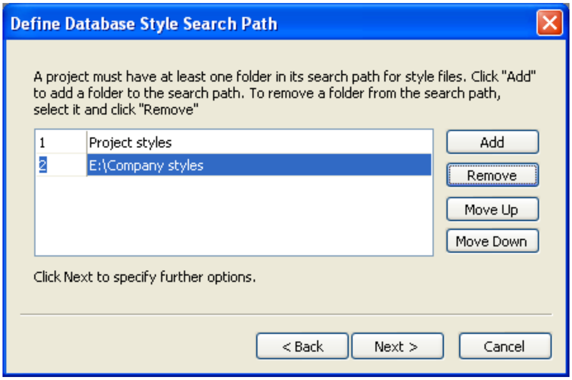
Note that an X indicates that the alias is expandable.

10 Click Next.

If any alias folders do not currently exist, MicroGDS first asks if you wish to create them.

MicroGDS then displays the Define Database Style Search Path dialog box. MicroGDS uses the style search path to read and store the style files. The default location for the style files is in the project database folder.

11 You can change the default folder, and add and remove folders from the style search path as applicable.



To change a location in the style search path:

a) Double-click the entry.

b) Click the ellipses button to the right of the current entry.

The Browse for Folder dialog box is displayed.

c) Specify the new location for the style search path and click OK.

To add a location to the style search path:

a) On the Define Database Style Search Path dialog box, click Add.

b) Specify the location of the style search path and click OK.

The first location that you specify defines the folder in which styles are updated and saved as you work. The style files in this location are the *local* style files, and these contain the local styles for the project. For example, if you create a new linestyle it will be saved in the LINES.STY file in the location defined first. If the LINES.STY file does not exist, MicroGDS creates the style file in this folder and then saves the style to the file.

If you modify a style that is stored in a file in a subsequent location, the modified version of the style is saved in the appropriate local style file, and not in the file from which it originated.

Therefore, you would probably specify the style files that are specific to the project first, and the additional style files second.

You can reorder the locations in the style search path using the Move Up and Move Down buttons.

12 Click Next.

13 To create a new workspace, select the Create a workspace check box, then click Finish.

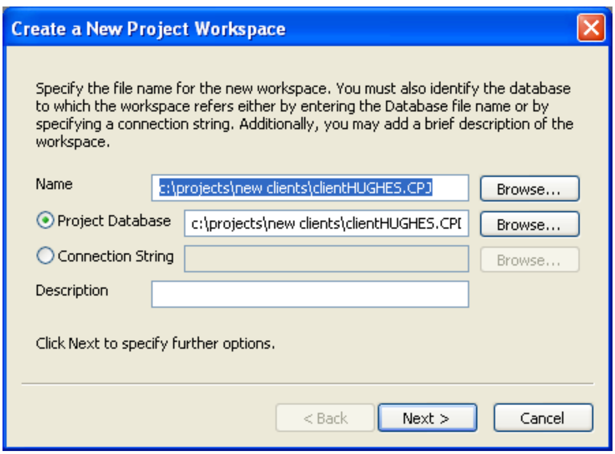
If you do not click the Create a workspace check box, you can create a workspace at a later time by selecting Project workspace on the Create a New File dialog box.

Creating the project workspace

When you create a project workspace, MicroGDS displays the Create a New Project Workspace dialog box.

If you have just created a project database that was not based on a template, and you selected the Create a workspace check box, the name of the project workspace and the database are entered automatically in the boxes.

For example:



▶ To define the project workspace

1 To specify the name of the project workspace:

- in the Name box, type the name for the project workspace, including the full path if necessary

  If you type a location that does not exist, MicroGDS asks if you wish to create it.

- or, click Browse to display a browse dialog box in which you select the location for the project workspace, then type the name in the File name box and click Open

  Note that a default location for the project workspace can be set on the Multi-user tab of your user preferences.

If you do not include the .CPJ extension, MicroGDS adds it automatically.

2 In the Project Database box, specify the project database to which the project workspace refers. You can browse for the project database by clicking Browse.

   The Connection String box is used when you create non-MicroGDS .CPD databases.

3 In the Description box, type a short description for the project workspace, if required.

   The description can be read and amended using the Properties window.

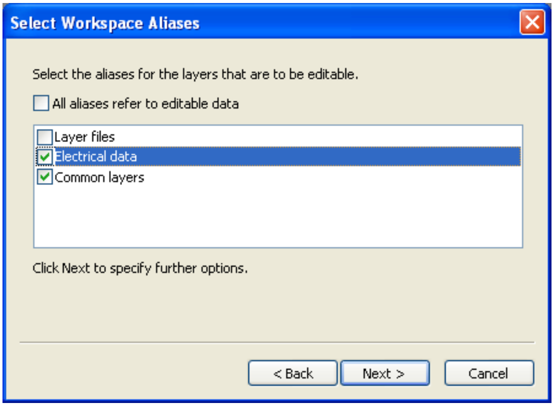
4 Click Next.

   MicroGDS displays the Select Workspace Aliases dialog box. If you did not create additional aliases for layers, only the default alias name is shown.

5 Select the layer aliases for the layers that are to be editable by users of the workspace:

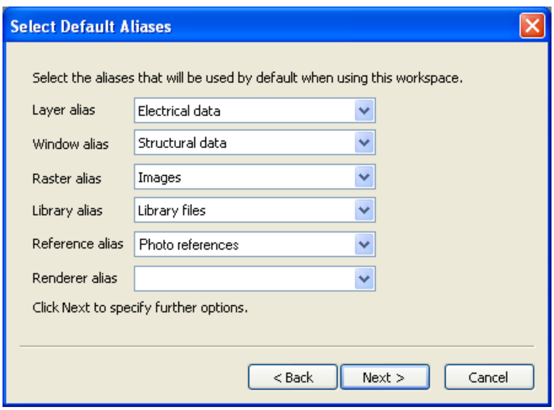
   - to enable all layers to be edited, select the All aliases refer to editable data check box
   - to disable users from editing specific layers, clear the All aliases refer to editable data check box, and then select the aliases that refer to the layer locations to be made editable

For example:



6 Click Next.

MicroGDS displays the Select Default Aliases dialog box. For example:



If additional aliases exist in the project database, you can choose an alias of each type to set the default locations for the workspace.

For example, if users of this workspace are to work with structural data, and aliases have been defined to store structural files, you can set the structural aliases as the default aliases for those types.

Note that users of the workspace can override the default aliases for new layers and windows, for the current work session. For details, see *Overriding default aliases* on page 359.

7 From the lists, select the default alias for each file type and click Next.

8 In the final dialog box, select the appropriate check boxes to choose whether to add the workspace to the Windows Start menu, and whether to open the workspace immediately.

9 Click Finish.

Working with project workspaces

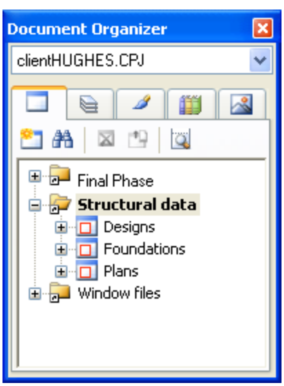
▶ To open a project workspace

- on the MicroGDS File menu, click Open and select the file to open
- or, double-click a .CPJ file in Windows Explorer
- or, drag the file from Windows Explorer into the MicroGDS window

The project workspace opens in the Document Organizer and becomes the current document. If you do not have the Document Organizer displayed, you can open it from the Window menu.

The window aliases available to the project are displayed on the Window Definitions tab in the Document Organizer.

Each project workspace has a default window alias. The default window alias name is shown in bold. If any window definitions have been saved in the default window alias, the folder to which the alias refers is expanded. For example:



▶ To save a project workspace

1. Ensure that the project is the current document in the Document Organizer.
2. Press Ctrl+S, or on the File menu, click Save Project.

   MicroGDS saves all new and modified window definitions and layers. If you have any new window definitions that you have not yet saved, MicroGDS first displays the Save Window As dialog box, for each unsaved window.

   For details about saving individual window definitions, see the next section.

▶ To close a project workspace

1. Ensure that the project is the current document in the Document Organizer.
2. On the File menu, click Close Project.

   If there are any unsaved window definitions or layers in the project, MicroGDS displays the Save Drawing dialog box for you to choose the files that you want to save before the project closes. Click:

   - Save All to save all changes and close the project
   - Save None to close the project without saving any changes
   - Save Marked to save selected changes and close the project

     To select a change to save, click its name in the list.
   - Cancel to cancel the close

Working with window definitions

In a multi-user project, each window definition is stored in a separate window definition file (a .WND file). The only difference between working with a window definition in a multi-user project and working with a window definition in a single-user document is that you must save each window definition in a project to disk.

You can save a window definition and any layers that it references; you can also save an existing window definition to a new name.

▶ To save a window definition and any layers that it references

1. Ensure that the window definition is the active window.
2. On the File menu, click Save Window & Layers.

   The window definition and any layers that it references are saved.

   However, if you are saving a new window definition, the Save Window*n* As dialog box is displayed for you to specify the window's name.

   MicroGDS opens the file location to which the default window alias refers, and lists any existing window definitions in the dialog box.
3. In the Save Window*n* As dialog box, specify the location in which you want to save the window definition.

   To save the window definition to a different folder that has an alias defined, select the alias from the Aliases list.
4. Specify the name for the new window definition file.

   If you do not include the .WND extension, MicroGDS adds it automatically.
5. Click Save.

   It is recommended that you save the window inside the project folder structure. If you save a window definition outside the project folder structure, MicroGDS advises you that this is not recommended and prompts you to confirm.

The next time you save the window definition, it is updated.

▶ To save a window definition to a new name

1. Ensure that the window definition is the active window.
2. On the File menu, click Save Window As.

   MicroGDS displays the Save Window As dialog box.
3. Specify the location and file name for the layer, as described in the previous procedure.
4. The Save Window As dialog box includes options for you to choose to reference the same layers as those referenced by the original window, or to create copies of those layers instead. Click the appropriate option.
5. Click Save.

   For more details, refer to Help.

Lock files and backup files

MicroGDS creates lock files and backup files for layers (.LYR files) and window definitions (.WND files) in the same way as it does for MAN files.

For multi-user projects, the corresponding lock files .WN# and .LY#, and the corresponding backup files .WN$ and .LY$ are created.

Note that template files (.MTF) and style files (.STY) are protected in a similar way.

More details about lock files, backup files, and setting the backup option are given in Chapter 2, *Exploring MicroGDS*.

Overriding default aliases

Aliases are created in a project database to define the file locations that will be available to the project. Because any number of workspaces may refer to the same database, there may be several aliases set up in the database for each alias type. Default aliases are stored in each workspace that refers to the database. For example, an Electrical workspace would have default aliases to store and access electrical data. This ensures that new files can be saved automatically in the appropriate locations.

If you have permission to save new files to other locations that have aliases defined, you can temporarily override the default aliases for new layers and windows. For example, you can save files in a draft area while you are making some design changes, without saving the drawings to the live project.

Overrides are used only when you save new window definitions and create new layers.

The default aliases are reset when you close the project workspace.

▶ **To override the default workspace aliases**

1 Ensure that the project is the current document in the Document Organizer.

2 Click the Layers tab or the Window Definitions tab, as appropriate.

3 Select the alias name that you want to set as the default.

The name of the default window or layer alias is shown in bold on the corresponding tab.

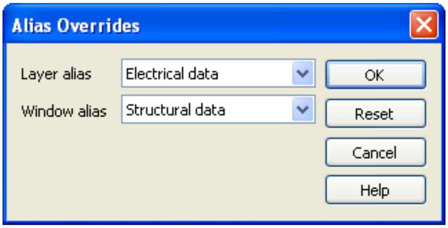
4 On the shortcut menu, click Set as Default.

The new default window or layer alias is now shown in bold instead.

▶ **Alternatively**

1 On the File menu, click Alias Overrides.

MicroGDS displays the Alias Overrides dialog box. For example:



2 From the Layer alias and Window alias lists, select the alias overrides.

To reinstate the default aliases, click Reset.

3 Click OK.

Working with styles

When you work with graphics in a window definition, you have access to all the styles that are available to the project. Styles in a multi-user project are held in external style files. The locations of these files are defined in the project database. The first location specified in the project database stores the local style files; these are the files in which styles are saved as you work.

More details about setting up new projects are given on page 346.

In some organizations, access permissions to style files may be restricted. This may be to ensure that all drawings in a project have a uniform appearance.

If you have access permissions to the style files, you can create, modify, and delete styles. However, if you select a style for deletion from a style file other than the local style files, MicroGDS informs you that you cannot delete the style.

Note that if you do not have permission to modify the local style files, the Save and Save As buttons on the Modify dialog boxes are unavailable.

You can create and modify styles using the File menu and the File toolbar buttons. You can also create and modify styles directly from the Document Organizer.

Lightstyles and materials are far more sophisticated in MicroGDS Collaboration than those available in MicroGDS Entry Level. For details about the additional lightstyle and material attributes available in MicroGDS Collaboration, refer to Chapter 20, *Advanced lightstyles* and Chapter 21, *Advanced materials*.

Transferring Classic GDS files to and from MicroGDS multi-user projects

You can transfer 2D GDS drawings to MicroGDS projects, and MicroGDS projects to GDS drawings, using the Classic GDS Transfer utility. GDS is a product of Graphic Data Systems, Corp.

Note that before you can use the transfer utility, you must ensure that a project is the current document in MicroGDS.

You can access the Classic GDS Transfer utility from the Applications menu on your MicroGDS Program menu.

For details on how to transfer files between GDS and MicroGDS, refer to the Transfer utility's online Help.

Chapter 17

Customizing MicroGDS

Changing the way MicroGDS works for you

This chapter describes the ways in which you can customize MicroGDS. It covers how to:

- start MicroGDS from the command line
- change your preferences and settings
- change the defaults of a document
- create and load profiles
- create and customize toolbars, commands, shortcuts, and menus
- customize the BIM environment and define new BIM components

System administrators can also set up specific configuration files to be used by everyone at their site.

Starting MicroGDS from a command line

You can start MicroGDS from a command line (or shortcut icon) by specifying the path and program file.

▶ **To specify the path from a command line**

- type the path that contains the MicroGDS program

  Precede each folder name by a backslash.

If any part of a path contains spaces, enclose the path in quotation marks (").

For example:

"D:\Program Files\Informatix\MicroGDS\microgds.exe"

If you have a licence for more than one MicroGDS product, you can use the /option parameter to specify which MicroGDS product to run.

You can also include a path to open a specific document in MicroGDS, and start another application to run when MicroGDS has started.

For machines running Microsoft Windows Vista and later, you can add a language name argument to set the user interface language to a specific language.

The following examples assume that the location of MicroGDS is "D:\Program Files\Informatix\MicroGDS\Microgds.exe". Each example builds upon the previous one, to show the full command line argument.

The order of the parameters on the command line is:

MicroGDS_path MicroGDS_option MicroGDS_document other_application

Examples

- To specify MicroGDS Collaboration as the program to run, type:

  "D:\Program Files\Informatix\MicroGDS\microgds.exe" /option Collaboration

- To start MicroGDS Collaboration and also open the document C:\Drawings\Building plans\Stair construction.man, type:

  "D:\Program Files\Informatix\MicroGDS\microgds.exe" /option Collaboration "C:\Drawings\Building plans\Stair construction.man"

- To start MicroGDS Entry Level, open the Stair construction.man document as above, and then start Notepad, type:

  ″D:\Program Files\Informatix\MicroGDS\microgds.exe″ /option ″Entry Level″ ″C:\Drawings\Building plans\Stair construction.man″ /app Notepad
- To start MicroGDS Entry Level and set the user interface language to German, type:

  ″D:\Program Files\Informatix\MicroGDS\microgds.exe″ /option ″Entry Level″ /language DE

If preferred, you can create a shortcut on the desktop as a fast way to start MicroGDS. For details, refer to your Windows documentation.

Changing your preferences

Many of the customization options for changing the way an individual system behaves are on the Preferences dialog box. These include:

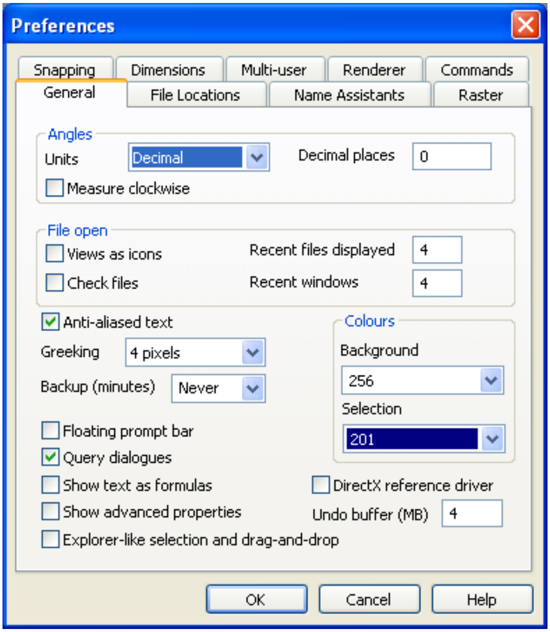
- setting the selection and background colours
- specifying the default file locations for MicroGDS support files
- setting up name assistants for objects and layers
- defining the raster editors to use when you open a raster image
- setting up snapcode and snap guide options
- specifying the linestyles and charstyles for each type of dimensions
- specifying which MicroGDS commands are to be enabled or disabled

▶ To change and save your MicroGDS preferences

1. On the File menu, click Preferences.

   The Preferences dialog box is displayed.

   For example:



   Note that if you are using MicroGDS Entry Level, you will not have the Renderer tab on the Preferences dialog box.

2. Make the changes you require, using any of the tabs.

   For a description of each option on each tab, refer to Help.

3. Click OK to save your changes.

Managing your settings

Many user settings throughout MicroGDS are managed through user preferences, just described. However, preferences and other settings can also be controlled at other levels through the Preference Files Editor. This gives control at user level, document level, CAD manager level, and program level.

Many companies will have office standards for different types of MicroGDS items, such as layer names, colours, linestyles, and so on, and have set up their working environment to suit. Sometimes a project will require its own standards, such as where a client always uses a specific set of phase colours to maintain its corporate image. As CAD manager, the Preference Files Editor lets you set general and project settings, allowing you to choose to override a setting on an individual basis.

Restrictions may be set at any level to enforce its usage. This is called a policy. For example, it might be your company policy to always display the unit of measurement in dimensions. Where a policy is in place, any subsequent change made to the setting's value at any other level is ignored. Note that settings that will be ignored due to a higher level policy setting are shown with a pink background.

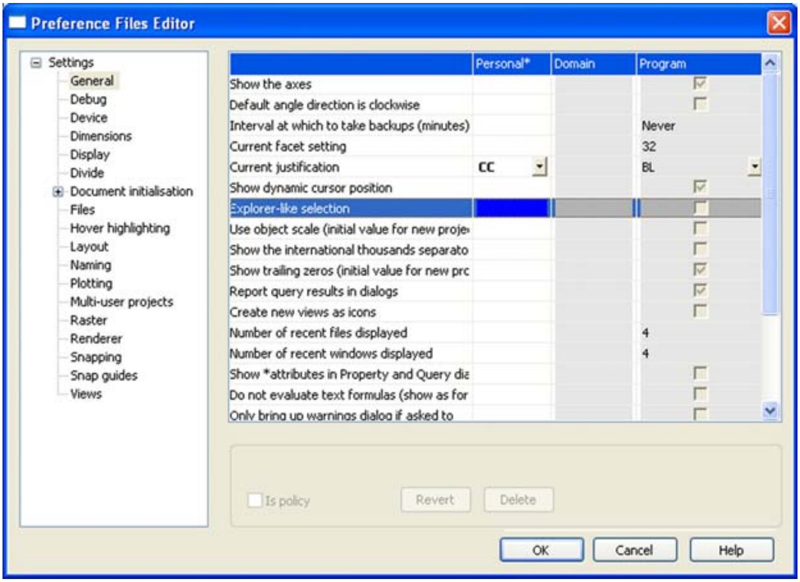
The settings and values are saved to a settings.xml files in the appropriate location. This means that settings files can easily be copied between machines. If you want to use a project-specific settings file with a different project, just copy the settings file to the location of that project.

▶ To change and save settings

1 On the File menu, click Preference Files.

The Preference Files Editor is displayed.

For example:



Use the Categories pane on the left to choose which settings to list in the Settings pane. To list all settings, click Settings in the Categories pane.

The Settings pane contains a number of columns. The first column shows the name of the setting. The remaining columns correspond to those places where the preference may be defined. To see the full path of the settings file associated with a column, point to the column title with the mouse pointer.

Each cell in each row shows the value of the setting, in each possible location. The value in a cell is shown as follows:

- bold value indicates an unsaved modified value
- grey, strikethrough value indicates an unsaved deleted value
- red value indicates a policy is in place
- Where a cell is empty, this means that the settings file does not contain an entry for the setting.

The cell background is also significant:

- where the cell background is unshaded, you can edit its value
- where the background is grey, you cannot change its value

  This is probably because you do not have write access to the file.
- where the background is pink, you may make changes to the value but it will be ignored because an overriding policy has been set

2 Click in the cell whose value you want to set.

For a description of each setting, refer to Help.

If the cell does not currently have a set value, the cell shows the setting’s default value. If you have access, you can edit the content by doing one of the following:

- type the value and press Enter
- clear or select the check box
- select the value from the list
- click  to display a dialog box in which to set the value
- press Delete to delete the value

You can also drag a value to move it to another column or copy a value by pressing Ctrl as you drag. Note that you can drag values only into unshaded cells.

Defining policies

In general, a preference is a setting that the user can alter, and a policy defines a setting that they cannot. Any MicroGDS setting can be defined as policy at any level. A policy is indicated in the Preference Files Editor by showing its value in red and when the setting is selected the ‘Is policy’ check box is selected. Later entries for the setting have a pink background indicating that even if it has a value, that value will be ignored. Users also cannot switch off its status as a policy rather than a preference.

If you have write permission to the settings file in which the setting is stored, you can set a value to be policy or unset an existing policy.

Changing the document defaults

Whenever you create a new document, MicroGDS copies the default colours and dimension settings from the document defaults to the document properties.

When you save a document, the current document defaults are saved with the document. This enables you to have different settings, in particular different colour allocations, for your documents without affecting the default settings.

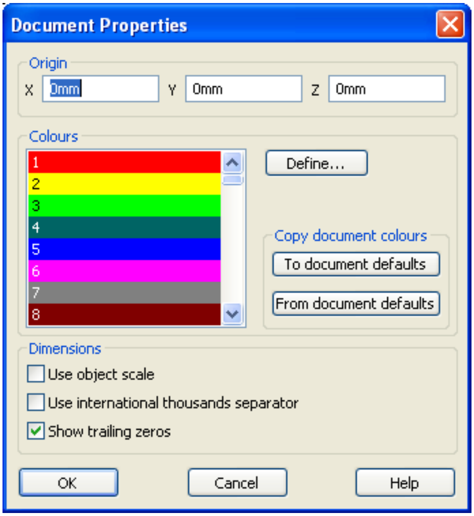
Note that if you create a new document from a template, the document properties saved in the template are used for the new document.

▶ To view and change the document properties

1 On the File menu, click Document Properties.

The Document Properties dialog box is displayed.

For example:



You can change the following settings:

- Origin
  The origin is the position on the drawing sheet that you use as a point of reference. By default, this is set at the centre of the drawing sheet.

The drawing origin is described in Chapter 2, *Exploring MicroGDS*.

- Colours
  In MicroGDS, each phase is allocated a colour. The colour table displays the colours to use for the phases in all new documents. You can specify up to 256 colours for the document.

  You can also copy the colour table in an individual document to and from the document defaults, using the ‘Copy document colours’ buttons.
- Dimensions
  You can select or clear the following options:
  - Use object scale: to show linear dimensions at the scale of the object containing the dimension
  - Use international thousands separator: to use your regional settings in metric dimension text
  - Show trailing zeros: display trailing zeros in measurements

Using profiles

A profile contains a collection of screen layout settings, in particular toolbars, other control bars, dialog box locations, window sizes and column widths.

You can create and load specific profiles to suit different working environments. The name of the current profile is shown on a status toolbar. The default profile is called ‘current’; MicroGDS automatically loads this on startup until you create or load a different profile.

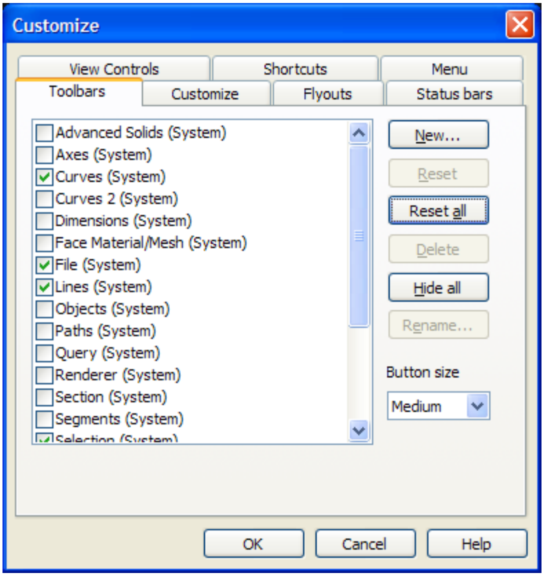
Your screen layout settings are saved to your ‘current’ profile when you exit MicroGDS.

Personal profiles are stored in the same location as your personal settings files. This is the location shown in the Preference Files Editor when you place the mouse pointer on the column title. Note that if you copy profiles between machines, ensure that you copy them to this location.

▶ To define a profile

1 On the Window menu, click Profile, Define.

The Customize dialog is displayed:



Use the dialog box to:

- customize the toolbars, flyout toolbars, and status bars
- choose the viewing buttons for MicroGDS windows and the Navigate window
- set up shortcut key assignments for commands
- customize the menus and menu bar commands

  You can also create a shortcut menu that appears when you click the right mouse button.

All settings on the Customize dialog box reflect the settings of the profile you are defining or modifying. For example, if the active profile includes the Axes, Query, and Section toolbars, the corresponding check boxes would be selected in the example above.

2 Make the changes you require, using any of the tabs.

Details on how to customize a profile are given in the following subsections.

3 Click OK to save your changes.

▶ **To save a profile**

1. Set up the MicroGDS window accordingly.
2. On the Window menu, click Profile, Save As.
3. In the Save Profile As dialog box, select the location into which to save the profile from the list.

   Note that access to some locations may be restricted by your CAD manager.
4. Type the name for the new profile and click OK.

▶ **To load a saved profile**

- from the Profile list on the status toolbar, select the profile

  Alternatively, on the Window menu, click Profile, Select and then click the name of the profile to use. If there are more than 10 profiles to choose from, click More to open the Select Profile dialog box and then locate the profile you want.

If you no longer use a particular profile, you can delete it.

▶ **To delete a profile**

1. On the Window menu, click Profile, Delete.
2. On the Delete Profile dialog box, selection the location from which to delete the profile.

   Note that access to some locations may be restricted by your CAD manager.
3. Select the name of the profile to delete and click OK.

Customizing toolbars

You can create and customize toolbars (and status toolbars) by adding and removing commands and status items.

You can customize only horizontal toolbars. To change the orientation of a toolbar, press Shift and click on the toolbar border (or on its title bar if undocked).

Note that you cannot change the orientation of a status toolbar. It is recommended that you do not add status toolbar items to system toolbars, as you will not be able to change their orientation at a later time.

Showing and hiding toolbars

▶ To show or hide a toolbar

1 On the Customize dialog box, click the Toolbars tab.

The available toolbars are listed, as shown in the illustration on page 372. Note that if you are using MicroGDS Collaboration, an Advanced Solids toolbar is also available.

MicroGDS system toolbars have (System) after their name; status toolbars and toolbars that you create have (User). If you have any toolbars created by an external API program, these have (Application) after their name.

2 Select or clear the check box next to the Toolbar name.

You can change the size for the toolbar buttons and status toolbar settings from the button size list. The default size for toolbar buttons is Small (standard Windows size).

Creating new toolbars

▶ To create a new toolbar

1 On the Customize dialog box, click the Toolbars tab.

2 Click New.

The New Toolbar dialog box is displayed.

3 In the Toolbar name box, type a unique name for the new toolbar (up to 32 alphanumeric characters), and then click OK.

The toolbar is added to the list, and an empty toolbar is displayed undocked in the MicroGDS window. For example:

To add a button to a toolbar, click the Customize tab and drag the buttons onto the toolbar, as described in the next section.

Renaming toolbars

▶ To rename a user-defined toolbar or status toolbar

1 On the Customize dialog box, click the Toolbars tab.

2 Select the user toolbar or status toolbar to rename.

3 Click Rename.

The Rename Toolbar dialog box is displayed.

4 In the Toolbar name box, type a unique name for the toolbar (up to 32 alphanumeric characters), and click OK.

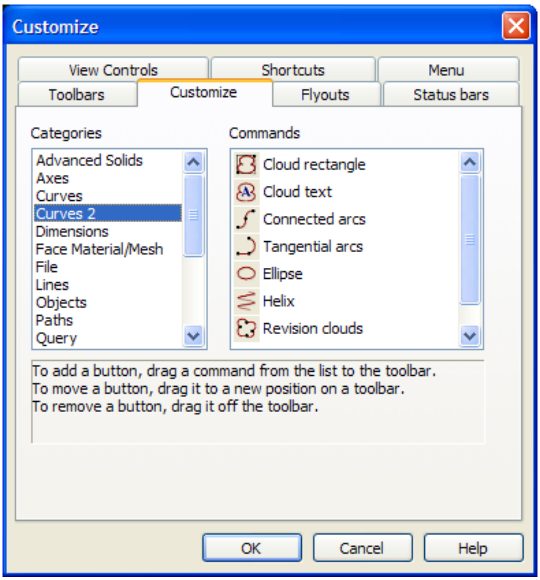
Customizing toolbar commands

▶ To customize the commands on a toolbar

- on the Customize dialog box, click the Customize tab

The Customize tab shows the toolbar categories in the left-hand list and the commands from the selected category in the right-hand list.

For example:



Each list in the Commands box ends with a Separator. You can use separators to organize toolbar commands into subsets.

Explanatory text for adding and removing toolbar buttons is given at the bottom of the Customize tab. More details are given in Help.

Creating flyout toolbars

▶ To create a flyout toolbar

1 On the Customize dialog box, click the Flyouts tab.

The names of all available toolbars are listed in the dialog box.

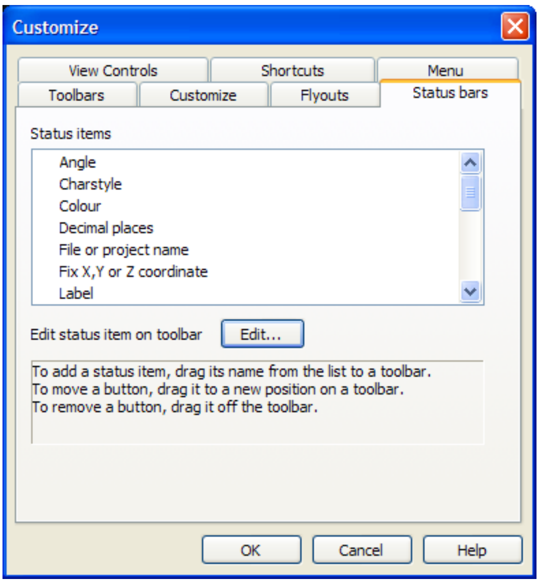
2 Add, remove, and reposition flyout toolbars in the same way as when you add, remove, and reposition buttons on a standard toolbar.

Customizing status toolbars

▶ To customize items on a status toolbar

1 On the Customize dialog box, click the Status bars tab.

The Status bars tab shows the names of available status items, organized in alphabetical order. For example:



2 Add, remove, and reposition items on a status bar using a drag-and-drop operation.

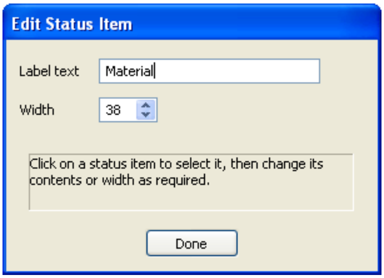
To add a text-only setting to a toolbar, drag the Label item onto a toolbar, and then edit its contents, as described next.

3 To change the Label text or the width of an item displayed on a status toolbar, click Edit.

The Edit Status Item dialog box is displayed. Until you select a status item to edit, the boxes in the dialog box are blank.

4 Click the item on the status toolbar whose properties you want to edit.

MicroGDS displays details for the item you clicked in the Edit Status Item dialog box.
For example:



5 Change the label and/or the width of the item, as applicable.

The details for the item are updated dynamically on the appropriate status toolbar.

If you change the text of a label, the width is calculated automatically. To add additional padding between a label and a list box, click the list box on the toolbar and then increase the width for that item.

6 When you have finished editing status items, click Done.

Choosing view controls for views and windows

You use the View Controls tab to specify:

- the viewing buttons to display on each view of a document window and on the Navigate window for 2D and 3D views.

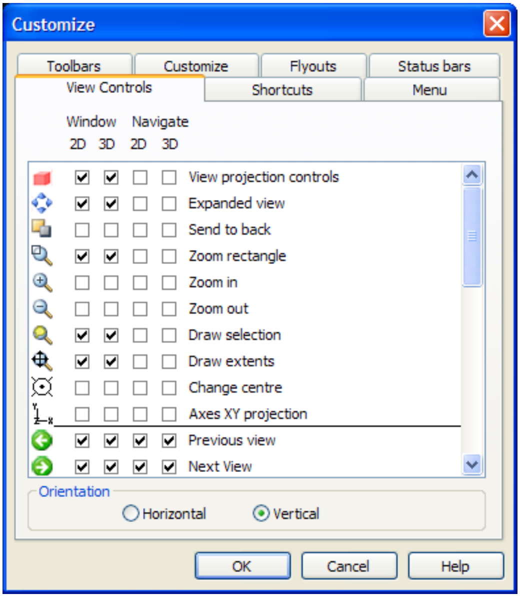
  The buttons you choose for a 2D view are also displayed for a print layout view. (Note that when you switch to print layout view, any viewing buttons for commands that are not applicable in print layout view are unavailable.)

  You also set the orientation of the buttons.
- the zoom bar
- the scroll bars
- the 3D thumbwheels

▶ To customize the view controls

1 On the Customize dialog box, click the View Controls tab.

The view controls are listed with check boxes for each type of view on which they can appear:



Note that where a view control is not appropriate to the Navigate window, no check boxes are shown.

2 Switch the zoom controls on and off by selecting and clearing check boxes as appropriate.

3 Choose the direction of the controls for all types of view by selecting the orientation you prefer.

Assigning shortcut keys to menu commands

By default, a number of MicroGDS commands are assigned a shortcut key. For example, F2 is assigned to the Window Editor, and Ctrl+C is assigned to the Copy command.

The default shortcut key assignments are set when you install MicroGDS. You can, however, assign shortcut keys to any MicroGDS menu-bar command, and change existing key assignments.

▶ To assign shortcut keys

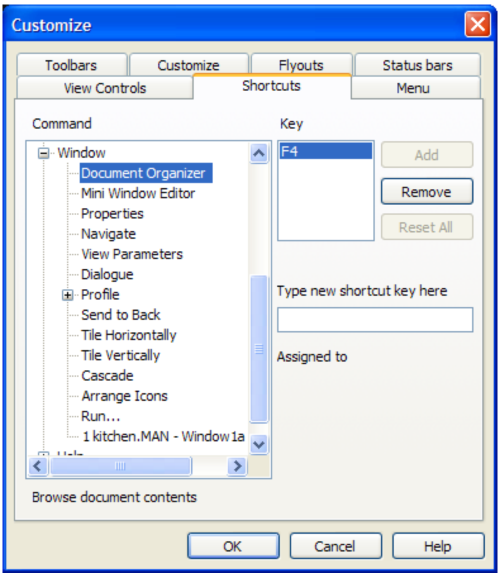
1 On the Customize dialog box, click the Shortcuts tab.

A list of the MicroGDS menu names is shown in the Commands box.

2 To display the commands, click the menu name or the plus sign (+).

3 In the Command box, select the command to which you want to assign a shortcut key.

Any shortcut keys that are currently assigned to the selected command are shown in the Key box. For example:



4 In the 'Type new shortcut key here' box, press the keys you want to assign to the selected command.

If the key or key combination you press is already assigned to a different command, the name of the command is shown under 'Assigned to'.

5 To assign the shortcut key, click Add.

MicroGDS adds the shortcut key to the Key box and assigns the new keyboard shortcut to the selected command. If the shortcut key is currently assigned to any other command, the assignment is removed.

6 To remove a shortcut key assignment, select the shortcut key in the Key box, and click Remove.

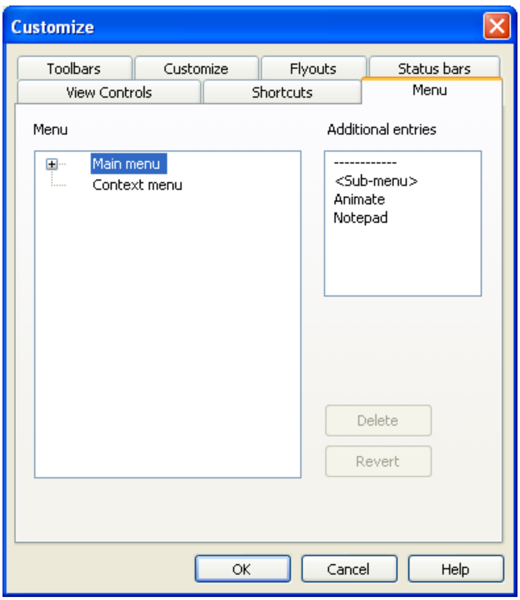
7 If you want to return all shortcut key assignments to their original settings, click Reset All.

Customizing menus and menu commands

You can customize the menus and menu commands that are available from the MicroGDS menu bar.

▶ To customize the menus

1 On the Customize dialog box, click the Menus tab.



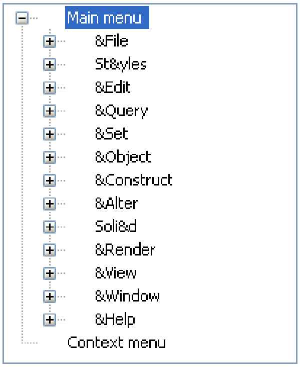
The Menu box shows two entries:

- ‘Main menu’ contains the list of MicroGDS main menu names
- ‘Context menu’ enables you to add a shortcut menu to MicroGDS that appears when you click the right mouse button

  Initially, the Context menu is empty. You can add commands to the menu, in the same way as for the main menus as detailed below, and then rename or remove commands as required.

2 To customize a menu, click the plus sign next to ‘Main menu’.

The MicroGDS main menu names are listed, with each menu command and submenu command shown below:



The ampersands (&) indicate that the next letter is underlined, to provide a shortcut for the menu or command. This enables you to press Alt+*key* as a shortcut to a menu and *key* as a shortcut to a command.

To display the commands, double-click the menu name, or click the plus sign (+) to the left.

By default, the ‘Additional entries’ box contains a menu divider and a sub-menu item. If any custom commands have been made available to the profile you are editing, these are also listed. How to define custom commands is described on page 395.

3 Do any of the following:

- To move a menu or menu command, drag the item to its new location.

  If you move a default menu item, MicroGDS places a copy in the new location and marks the original item with ✕. Menus and commands marked with a cross do not appear in MicroGDS. If you want to retain the original item, press Ctrl as you drag the item.

  If you move a non-default menu item, MicroGDS marks the item with ✚

- To rename a menu or menu command
  a) Select the item to rename and click the mouse button.
  b) Amend the name and press Enter

     Note that if you change an Alt+*key* assignment, ensure that the letter you assign is unique within the menu. Otherwise, the command will not be called by the key combination.

     MicroGDS marks the renamed item with !
- To add a defined custom command, drag the item from the 'Additional entries' box to the menu location at which it should appear
- To delete a menu or menu command, select the item and click Delete

  MicroGDS marks the item with X. Note that the item is not actually deleted, but will no longer be shown in the MicroGDS window.
- To return a menu or command to its original state, select the item and click Revert.

Customizing the BIM environment

MicroGDS provides a set of default behaviours for the BIM (Building Information Modelling) environment. These behaviours enable you to create BIM intelligent objects using predefined components, including objectstyles and drawing styles.

You can customize the BIM environment in a number of ways. You can:

- create your own objectstyles
- specify your own object naming conventions
- use an object name assistant
- change the mnemonic definitions

For details about using the MicroGDS BIM intelligent objects, see Chapter 3, *Working with primitives and objects*.

Creating your own objectstyles

An objectstyle describes the properties of an intelligent object. If you want to change some of those properties, you can do this by changing the value of the appropriate attribute of the object on the Properties window. For example, you could change a single-panel door to a double-panel door. However, if you find that you are frequently using a particular set of attribute values, you can set these up as a new objectstyle.

For example:

1 On the Styles tab of the Document Organizer, expand the Schemas folder and then expand the ..\bim location.

2 Right-click the Door schema and select 'New based upon' from the shortcut menu.

3 From the Mnemonic list:

   a) select the 'Operation type' attribute and select DOUBLE–DOOR–SINGLE_SWING from the list

   b) select the 'Overall width' attribute and change the value to 2000mm

4 Click Save As and save the schema as 'Double door'.

The objectstyle 'Double door' is now available for all appropriate objects.

Specifying your own object naming conventions

In MicroGDS, the default naming convention for BIM intelligent objects is to suffix the first facet of the object name with Ifc (Industry Foundation Classes). For example, a window object is suffixed by IfcWindow and a door object is suffixed by IfcDoor.

However, if you already have an existing naming convention for the names for door objects, you can modify the objects for which a schema applies using the Define/Edit Schema dialog boxes. For example, suppose your door naming convention is Floor1:Door, you could change the 'Applies to' filter for the door schemas to '*:Door**' to match this convention. MicroGDS uses this 'Applies to' information to restrict the schemas that are available as Objectstyles on the Properties window.

For details about defining and editing schemas, see Chapter 14, *Working with attributes and schemas*.

Changing the mnemonic definitions

With the exception of a mnemonic's Applicability, Name and Type, you can modify any other property of BIM mnemonic definitions. For example, you may want to change the Units of a Length mnemonic from mm to inches. Note that if you change the Prompt of a BIM mnemonic, your preferred name will be shown in the Properties window for that attribute.

For details about creating and editing mnemonic definitions, see Chapter 14, *Working with attributes and schemas*.

Using an object name assistant

An object name assistant is a configuration file that defines the names that can be used for objects, in a list of rules. When you work with intelligent objects, you can simplify the process of assigning suitable objectstyles to new intelligent objects by assigning the objectstyle to automatically. For more details, see *Object and layer name assistants* on page 387.

Defining new BIM components

MicroGDS provides a number of BIM components such as walls, doors, and windows. However, if you want to make an opening in a wall for an object of your own design, then you can define your own component.

You can do this using the predefined objectstyle named *UserOpening*. This might be used, for example:

- to draw a door or window yourself rather than using the supplied parametric objects
- to use a door or window object from a catalogue
- or to create a completely new opening, such as a curved arch for positioning in a garden wall

The UserOpening objectstyle is not limited to making a small opening, but could be used to slice the whole top from a wall, say to bring it up to a sloping roof.

To use the UserOpening component supplied with MicroGDS, you need access to the defined linestyles, mnemonic, and schemas that are associated to the MicroGDS BIM components. To do this, add the following entry to the document's style search path:

<*MICROGDS_COMMON_APPDATA>bim

The files in this location make the intelligent objects and drawings available.

This entry must be added to any document which includes or references a BIM intelligent object.

The basic procedure for defining a new BIM component is:

1 Set the style search path of your document to include the bim location (as shown above).

2 Create a new object and name it UserOpening.

3 On the Properties window, set the Objectstyle to UserOpening.

   The associated UserOpening schema adds the appropriate attributes to the Properties window. These will be shown when you draw the object's primitives.

4 Draw the graphics that constitute the visible representations of the object.

   These need to include each primitive that will be shown in the various drawing styles. For example, some primitives will be shown only in Detail view while others shown only in Perspective view.

   The user opening object may also need to contain mask primitives (an opaque, filled linestyle), for example so that certain primitives are drawn only in 2D views.

   You also need to create cutter clumps which cut through the wall to create the opening. Cutters are removed from the wall in which the BIM object is placed. Note that a primitive will be treated as a cutter by assigning the appropriate attribute to it (more details are given below.)

5 On the Properties window, assign a value to the primitive level attribute IOIRepresentations (shown in the window as 'Representations for primitive') for each primitive in the object.

You assign one or more values to define in which views the primitive will be shown:

D the primitive will be visible in a Detail or Ceiling drawing

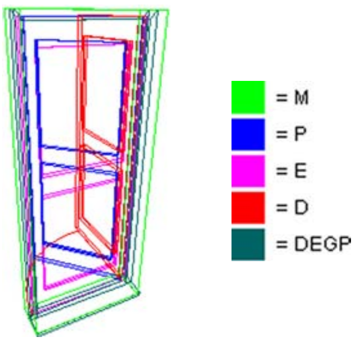
E the primitive will be visible in an Elevation drawing

G the primitive will be visible in a GA drawing

P the primitive will be visible in a Perspective drawing

M the primitive will be visible when its object (and no other) is selected

The example below shows how you could assign attribute values to the primitives of a door to show different representations of the door:



Note that the door swing, also drawn in red, is assigned DG.

The door primitives have been drawn in the colours shown in the key above, and are assigned the following IOIRepresentations values. (If you have the monochrome printed version of this guide, please refer to the full-colour version in the topic *Defining new BIM components* in MicroGDS Help.)

If your UserOpening is solely a cutter which does not have any graphics of its own, such as an arch, ensure that you assign a value that will keep the primitive visible as you work on it. For example, if you assign MP to the arch primitive, it will be visible when its object is selected and also when in a perspective view. You could also add a mask rectangle to the object and assign a value of G, for example, so that you can select the object in GA drawing type.
If you do not assign a value to an IOIRepresentations attribute, then that primitive is invisible in all drawing types.

If a primitive does not have an IOIRepresentations attribute (for example, if it has been deleted from the UserOpening schema), then that primitive is visible in all drawing types.

6 On the Properties window, assign the primitive level attribute IOICutter (shown in the Properties window as ‘Primitive is a cutter’) to your cutter clump primitives.

This can be any value, such as True or Yes; it is simply the existence of the attribute having a value that causes the primitive to be treated as a cutter

7 You can now place the object, or a copy of it, using a snap on the wall in which to create the opening.

System administration

The following sections are intended for the CAD manager or system administrator who should be experienced in setting up and maintaining configuration files.

In MicroGDS, configuration files can be set up to control:

- the object and layer name assistants
- the settings files and search list
- the strings and corresponding scales available through the Scale list on the status toolbar
- the strings and corresponding angles available through the Angle list on the status toolbar
- the paper to be used for print layout views

This section also:

- describes how to add custom commands to the MicroGDS menus
- introduces you to the sample Visual Basic and Visual Basic .NET programs supplied with MicroGDS

Object and layer name assistants

Name assistants use configuration files to define naming standards for layers and objects. They enable users to create layers and objects whose names conform to the naming standards in use at their site.

Layers and objects have separate configuration files. The files and rules they use are almost identical. However, the object name configuration file takes the layer names defined in the layer name configuration file into account.

Two sample files are supplied with MicroGDS:

- assistl.cfg is the sample layer configuration file
- assisto.cfg is the sample object configuration file

These sample files are automatically specified on the Name Assistants tab in the user's Preferences dialog box. You can change, rename, and move the files, but we recommend that you retain the cfg (configuration file) extension.

If you move the files, you should also change their location defined on the Name Assistants tab in your preferences.

The rules

The name assistants are presented as an expanding tree structure that enables a name to be built up. The expansion process is controlled by the configuration file. The file contains a main group of names, followed by a set of rules. Each rule is made up of components separated by | characters. These components are the *condition*, the *expansion*, the *description*, and an optional *layer label*.

The condition

The *condition* controls whether or not the rule is applicable. If the name so far built up in the dialog box matches the condition, the rule is applicable.

The following wildcards have special meaning within the condition:

- ? matches any single character other than a colon
- * matches any number of characters, including 0, other than a colon
- ** matches any number of characters, including 0, and including a colon

A colon is used to separate facets in object names.

Although wildcards can be very useful, use them with care. For example, if you end a condition with an asterisk (to match any number of characters), the condition will match itself and could cause a loop.

The expansion

The *expansion* is the text that is added to the name when the rule is selected.

If you want to allow a name that ends with this text to be an acceptable, valid name, append a tilde to the expansion text. The tilde is not appended to the entered text.

If your drawings use or reference BIM intelligent objects, you can associate an objectstyle with an object by appending the name of the objectstyle in parentheses to the expansion.

In MicroGDS, the expansion for layer names in multi-user projects can also use aliases to define the location in which a layer of a particular name must be stored. For full details, see Chapter 16, *Multi-user projects*.

The description

The *description* is the text that is displayed in the name assistant dialog box. It identifies the expansion.

When a name is complete, if there are further applicable rules, the name can be extended further.

Note that for object names, a single rule selection does not necessarily correspond to a single facet in the name. The expansion must contain a colon (:) to finish a facet.

The layer label

The *layer label* is optional and, if defined, is the text that is added to any new layer that conforms to the Layer Name Assistant. The label applies only to a the Layer Name Assistant; if added to the Object Name Assistant, it will be ignored.

How it works

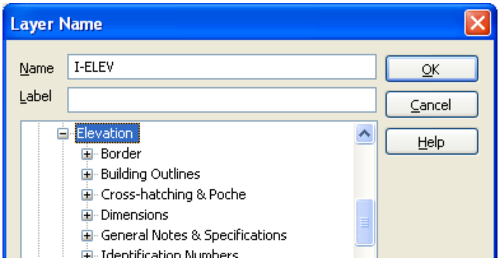
When a user creates a layer or an object, and the name assistants are both in use, MicroGDS carries out the following procedure:

1 First, MicroGDS reads the associated configuration file and presents the user with a list of entries defined in the file.

2 Each time the user selects an entry, the expansion text is read from the configuration file and is added to the Name box.

If the user expands an entry, MicroGDS reads the condition for the entry and scans the configuration file for the expansions and lists their descriptions.

For example:



3 This is repeated until no further name components are applicable.

When a name meets the valid naming rules, the OK button is enabled.

In the previous example, the rule in the sample layer configuration file that produced the name shown is:

```
?–|ELEV~|Elevation
```

and represents ‘Interior Design, Elevation’.

The layer configuration file

The layer configuration file has two sections. The first section defines the top-level naming structure. Each entry has only two components, the expansion text and the description.

For example:

```
|ARCH–|Architectural
|ELEC–|Electrical
|STRU–|Structural
```

produces three layer entries in the dialog box.

The second section of the file lists the rules that define the possible expansions of each layer.

```
ARCH–|WALL~|Walls
ARCH–|FLOOR~|Floors

ELEC–|POWER~|Power installation|Sockets
ELEC–|LIGHT~|Lighting installation|Lighting
```

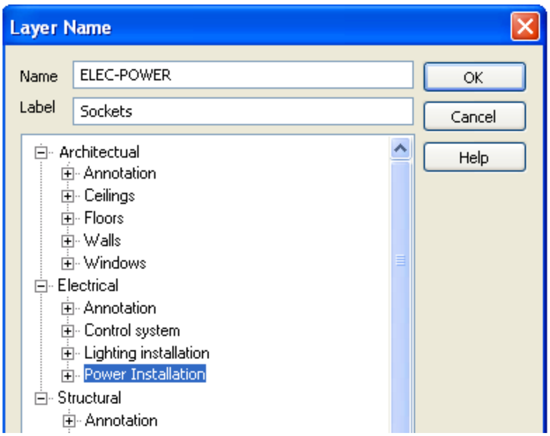
STRU–|COLUMN~|Columns
STRU–|FOUNDS~|Foundations

????–|ANNO~|Annotation

Selecting, for example, Electrical in the Layer Name dialog box inserts the expansion text ELEC in the Name box. MicroGDS scans the configuration file for any matching conditions and lists the descriptions of each below, in alphabetical order.

In the example file, Annotation appears beneath each main entry. This is because the condition matches all three main entries.

Selecting Power installation in the list inserts the expansion text POWER in the Name box and Sockets in the Label box:



The object configuration file

The object configuration file is similar in format to the layer configuration file. The difference is that object names are facetted, and the first facet in the object name is the name of the layer on which it is valid, and the last character of the object name must be a colon (:) if it is to be treated as completing a facet.

For example:

????–ANNO–????:|anno:~|Annotation

enables the user to create an annotation object on any layer that contains the text —ANNO—.

Furthermore, the rules:

ELEC–L*:|LIGHTC:~|Ceiling lights
ELEC–L*:|LIGHTW:~|Wall lights
ELEC–L*:|LIGHTE:~|External lights

mean that all objects on layers beginning with ELEC–L can have a first facet of LIGHTC:, LIGHTW, or LIGHTE:

The rule:

ELEC–*:LIGHT?:|SPOT:~|Spotlights

means that all objects on layers beginning with ELEC–, which have a first facet matching LIGHT?, can have a second facet of SPOT, indicating that it represents a spotlight. The resultant object names could be LIGHTC:SPOT:, LIGHTW:SPOT:, or LIGHTE:SPOT:

If a rule is defining the names for intelligent objects, you can specify which objectstyle should be automatically selected on the Properties window. For example:

IfcWallStandardCase:~(Brick-Cavity-Block)|Standard External Cavity Wall

means that IfcWallStandardCase: is the object name, then Brick-Cavity-Block will be set as the objectstyle when the description Standard External Cavity Wall is selected.

Creating layer and object configuration files

Before you create or amend a layer or object configuration file, take some time to familiarize yourself with the format and content of such a file. You could make a copy of one of the supplied configuration files before making changes so that you can always go back to the default version.

Before you set up the name assistants, plan the rules first. Take into account that the expansion text makes up the name, and that a name can consist of up to 256 characters.

When you write the rules, the following conventions apply:

- each rule must be written on a separate line
- condition and expansion texts are case sensitive

Although it is clearer to write the rules in a structured way, their order is not important. MicroGDS displays the matching entries in the dialog box in alphabetical order based on the description text.

The object name configuration file takes the layer names defined in the layer name configuration file into account. Therefore, if you plan to use both layer and object name assistants the two configuration files should correspond.

▶ **To create a layer or object configuration file**

1 Using a text editor, create or edit the relevant name assistant configuration file.

2 Save the file to a preferred location, using a name of your choice and preferably maintaining the cfg extension.

▶ **To use a layer or object configuration file**

1 Start MicroGDS and, on the File menu, click Preferences.

MicroGDS displays the Preferences dialog box.

2 Click the Name Assistants tab and specify the name of the configuration file in the appropriate Configuration File box, and set the applicability required.

For details of the applicability levels, refer to Help.

Managing settings files

When you start MicroGDS, the initial settings which control the look and feel are read from two files: a settings file called settings.xml and a profile file which has a .mprofile extension. Further files may then be read which may make changes to the appearance and behaviour of MicroGDS.

The files which affect this behaviour are searched for in a particular order. Modifications may be made at each stage within the search list:

- MicroGDS first looks for a settings.xml file in the same folder as the microgds.exe program

  This file can alter some of the default values or prevent later settings files from altering them. In general, this file should not be modified and any future patches or repairs to your MicroGDS installation are likely to discard any modifications.

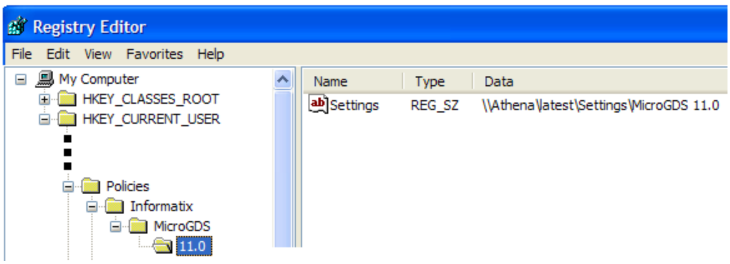
- MicroGDS then looks in your system registry for the location of a settings.xml file that is shared by all users who log on to your machine, or by all users across your Windows network domain:

— if the registry key HKEY_CURRENT_USER\Software\Policies\Informatix\MicroGDS\11.0 exists and has a String Value of Settings, it should be a string defining a directory

— if this key does not exist, and if registry key HKEY_CURRENT_USER\Software\Informatix\MicroGDS\11.0 exists and has a String Value of Settings, it should be a string defining a directory

If neither registry value exists, MicroGDS uses a subdirectory called Informatix\MicroGDS\11.0 in your computer's special folder CSIDL_COMMON_APPDATA. On Windows XP, this is typically C:\Documents and Settings\All Users\Application Data and on Windows Vista, this is typically C:\ProgramData.

For example:

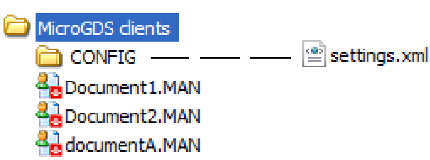


Note that setting up these registry values are currently the only way to configure any part of the search list. However, this can be set for some or all machines by the system administrator using Group Policies.

When a settings.xml file is found, MicroGDS merges configuration instructions with the results of applying the previous file.

- MicroGDS then looks for a job-specific settings.xml file in a CONFIG subdirectory immediately below the folder that contains the related MicroGDS document.

For example:



In this example, whenever Document1.MAN, Document2.MAN, or documentA.MAN is opened in MicroGDS, its document settings are read from the settings.xml file.

Anyone with write access to a job folder can create a CONFIG folder. When a job-specific setting is modified in MicroGDS, the settings.xml file is then automatically created.

- Finally, after MicroGDS has searched all the job-specific settings.xml files, it looks in your personal directory (for example, C:\Documents and Settings\Lesley\Application Data\Informatix\MicroGDS 11.0\settings.xml.

Defining custom commands

You can define custom commands that can then be added to MicroGDS. When you define a new command, you can choose the product and context in which it should be available. For example, you can specify that a command is available only in MicroGDS Entry Level and then only when the current file is single-user and there is an active window definition. You can also specify that a command is added to a shortcut menu that appears when you click the right mouse button.

▶ To define custom commands

1 On the File menu, click Preference Files.

2 On the Preference Files Editor, locate the 'Custom command definitions' setting.

You can find this setting under the General category.

3 Click the corresponding cell under the column to customize and then click

4 MicroGDS displays the Custom Command Definitions dialog box.

5 Do any of the following:

- To add a new custom command:

  a) Click Add.

  b) Select the newly added command line, and then click

  MicroGDS displays the Define Custom Command dialog box.

- To modify an existing custom command, select the custom command and then click 

  MicroGDS displays the Define Custom Command dialog box.
- To remove a custom command, select the custom command and then click Remove.

6 If you are adding or modifying a custom command, specify the command details and click OK.

  For details about specifying the command details, refer to Help.

You can add any custom commands that you define to your MicroGDS menus.

Customizing the scales list

When you change the axes' scale on the status toolbar, MicroGDS uses a scales file to determine the strings and corresponding scales. You specify the scales file to be used in your File Location preferences. Scales files have the extension .csv.

MicroGDS supplies a sample scales file called scales.csv. You can change, rename, and move the file, but we recommend that you retain the csv extension. If you change the location of the file, ensure that you redefine the path in your preferences.

Scales files are in the format:

string, *scale numerator*, *scale denominator*

For example:

```
1:1,1,1
1:20,1,20
1:75,1,75
″1″″ = 1″″″,1,1
″3″″ = 1‘″, 1, 4
″1″″ = 1‘″, 1, 12
```

Note that MicroGDS uses the scales file in a number of other places. For example, on the Photo Transform dialog box when you construct a photo from a 2D view or a 3D parallel view. For details about working with photos, refer to Help.

For more details on the format of the file, refer to Help.

Customizing the angles list

When you rotate the axes, graphics are drawn using the current axes' rotation. You can change the angle of the axes, using the Angle box on the status toolbar or the Axes Angle command, so that all new graphics are aligned with the new angle.

When you set the angle, MicroGDS uses an angles file to determine the strings and corresponding angles. You specify the angles file to be used in your preferences. Angles files have the extension .csv.

MicroGDS supplies a sample angles file called angles.csv. You can change, rename, and move the file, but you must retain the csv extension for the file to be recognized. If you change the location of the file, ensure that you redefine the path in your preferences.

Angles files are in the format:

string, *angle value*

For example:

```
–90,–90d
–60,–60d
–45,–45d
–30,–30d
0,0d
30,30d
45,45d
60,60d
```

Note that MicroGDS uses the angles file in a number of other places. For example, when you define snap guide angles on the Snapping tab of the Preferences dialog box.

For more details on the format of the file, refer to Help.

Customizing the paper sizes file

The first time that you select a print layout view for a window definition, MicroGDS displays the Page Setup dialog box for you to set your paper size requirements. MicroGDS uses a paper sizes file to determine the paper names and corresponding sizes. You specify the paper sizes file to be used in your File Location preferences. Paper sizes files have the extension .csv.

MicroGDS supplies a sample paper sizes file called ‘paper sizes.csv’. You can change, rename, and move the file, but we recommend that you retain the csv extension. If you change the location of the paper sizes file, ensure that you redefine the path in your preferences.

Paper sizes files are in the format:

name of paper, *unit of measurement*, *paper width and height*, *paper margins*

```
ISO A4 (297 by 210 mm),mm,297,210,10,10,10,10
ISO A3 (420 by 297 mm),mm,420,297,10,10,10,10
ISO A2 (594 by 420 mm),mm,594,420,10,10,10,10
ISO A1 (841 by 594 mm),mm,841,594,10,10,10,10,DEFAULT
"ANSI A (Letter, 11 by 8.5 inches)",inches,11,8.5,0.5,0.5,0.5,0.5
ANSI B (17 by 11 inches),inches,17,11,0.5,0.5,0.5,0.5
ANSI C (22 by 17 inches),inches,22,17,0.5,0.5,0.5,0.5
```

and so on.

The default paper size initially selected in the dialog box is indicated by the word DEFAULT at the end of the definition

For more details on the format of the file, refer to Help.

When you have assigned a paper sizes file to a window definition, MicroGDS uses the paper definition that you set up when you next switch to print layout. The paper definition is saved with the window definition when you save the document.

For details about print layout views, see Chapter 2, *Exploring MicroGDS*.

Sample Visual Basic programs

A number of sample Visual Basic and .NET programs are supplied with MicroGDS. You can use them as they are, you can amend or extend them, or you can simply look at them to give you ideas for programming using Visual Basic or Visual Studio .NET.

You can access the programs from your MicroGDS Applications menu on the Start menu. Each program has a corresponding document that tells you how to use the program.

If you use any programs regularly, you can add them to a new menu so that they are available from the MicroGDS menu bar. Details about adding and removing menus and commands are given in *Defining custom commands* on page 395.

The sample Visual Basic programs are not a supported part of the MicroGDS system.

Part Two

Advanced 3D and rendering

Chapter 18

Advanced 3D

Introduction

MicroGDS provides 3D commands that you can use to construct and edit clumps. In MicroGDS Collaboration, you have access to many more advanced 3D facilities to create and modify clumps.

This chapter shows some of the different types of clumps that you can construct using the advanced 3D commands. Step-by-step instructions on how to construct clumps and details about each of the clump commands are given in Help.

For information about working with clumps and details on the 3D facilities that are available in all MicroGDS products, see Chapter 9, *Working in 3D* in Part One: *Working with MicroGDS 11*. You can also refer to Help.

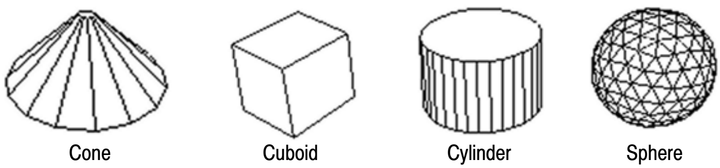
Constructing clumps

MicroGDS Collaboration offers a number of additional methods for you to create clumps. You can:

- automatically construct simple 3D clumps (using the Solid, Construct commands)
- create clumps by revolving graphics using specified angles and positions (using the Solid, Construct commands)
- use existing line primitives to create mesh clumps with surfaces (using the Solid Patch and Solid Rule Surface commands)

Constructing simple 3D graphics

MicroGDS Collaboration provides commands to generate cones, cuboids, cylinders, and spheres.



When you create a cone, cuboid, or cylinder, you can specify the dimensions of the cuboid by:

- clicking the positions in the window
- typing the coordinates at the prompt bar
- or pressing Enter to enter the sizes in a dialog box

Note that X, Y and Z sizes in the dialog boxes take precedence over snaps and coordinates. If you do not want to use exact dimensions, ensure that the sizes are set to ‘Use Snaps’ in the dialog box.

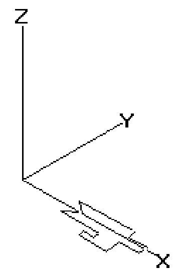
When you create a sphere, you enter the radius for the sphere and then place the sphere by clicking in the window or typing coordinates.

For full details on generating simple 3D graphics, refer to Help.

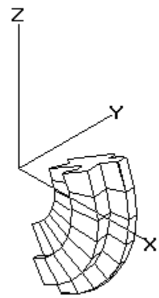
Revolving graphics

As an alternative to creating clumps using the Complete Revolve command, you can also revolve graphics:

- from one angle through to another

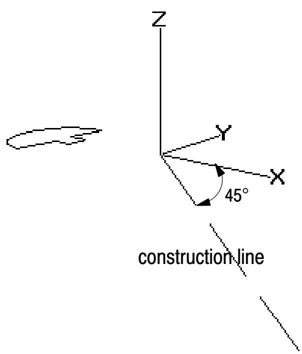


Before revolving

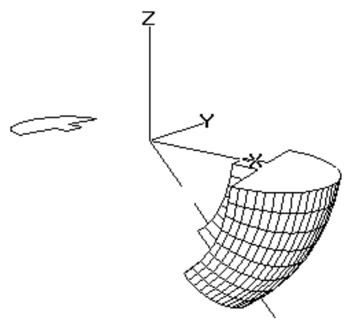


Revolving from –30° angle to 60°

- or, from a specified position, through a specified angle about the Y axis



Before revolving



Revolving from 'Line snap' through –45° angle

The angle through which the graphics are revolved is measured from the X axis.

The graphics you revolve should be in the XY plane and must not cross the Y axis.

With all revolve commands:

- each closed line primitive forms a solid clump
- each open line primitive forms a mesh clump

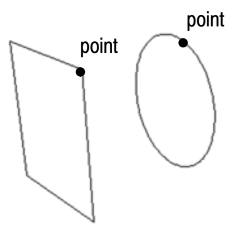
By default, the original graphics are replaced by the new clumps. To retain the original graphics, press Ctrl when you select the command.

Except when revolving through 360°, if you revolve multiple, closed line primitives that are nested, holes are created in the enclosing clump.

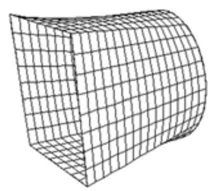
Creating surfaces

You can construct a mesh clump from existing line primitives. You can:

- create a surface between two line primitives



Before surface ruling



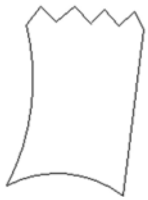
After surface ruling

By default, MicroGDS creates a patched surface with evenly distributed quadrilateral faces (as shown above). If preferred, you can choose to create long quadrilateral faces instead.

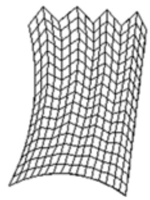
If the line primitives are closed, the position at which you select each primitive will define the start point of the edge. For example, if the primitives are one above the other, select them by points that are directly one above the other to avoid creating a twisted surface.

If the line primitives are open, MicroGDS creates the surface rule by drawing between the start points of each line. The direction of open line primitives is therefore important.

- or, create a surface from three or four bounding line primitives



Before patching



After patching

Lines can be curved and they can consist of more than one line segment.

The lines must be touching—forming a closed boundary—but they must not be sides of a closed line primitive (for example, as created by the Rectangle command).

If four lines were selected, a quad-face surface is generated with points interpolated between opposite pairs of boundary lines; if three lines were selected, a triangular-face surface is generated with points interpolated evenly between the three boundary lines.

Editing clumps

MicroGDS Collaboration offers a number of additional commands for you to edit existing clumps. You can:

- use Boolean commands to alter solid clumps
- add and edit clump faces
- change the geometry of clumps for import and export

Using Boolean operations on clumps

The Boolean operations enable you to add or subtract *volumes* from clumps. The volume is the space occupied by the content of a 3D object or primitive. You can use the Volume command on the Query menu to measure the volume of a clump. For more details about the query commands, see Chapter 13, *Getting information*.

Using the Boolean operations, you can:

- add or subtract a number of clumps from another clump (the workpiece)
- subtract or intersect a clump with the clumps currently selected

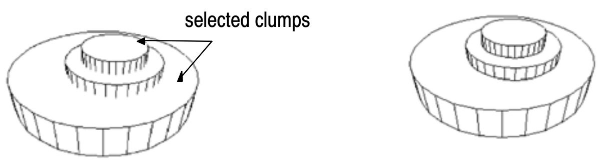
- check a selection of clumps for clashes, and create new graphics along their clash lines
- create pockets in a clump, and profiles from a clump
- punch holes in a clump, and carve a shape from a clump
- slice clumps along the XY plane, and choose to remove either the section above or below the plane
- slice clumps between the XY plane, and remove both the sections above and below the plane

In Boolean operations, the *workpiece* is the clump on which modifications will be made. The workpiece must be a solid clump. The *selection* can be one or more solid clumps that are used when making those modifications.

Editing the workpiece

When you edit the workpiece, the clumps that are being added or subtracted must intersect the workpiece. You can:

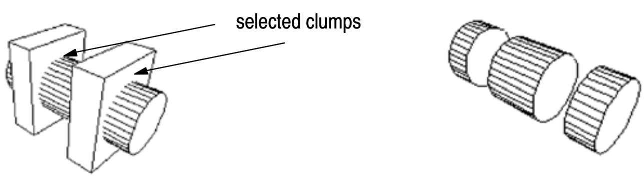
- add solid clumps to the workpiece



Before adding clumps to the workpiece

After adding clumps to the workpiece

- or, subtract solid clumps from the workpiece



Before subtracting clumps from the workpiece

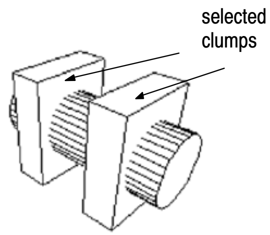
After subtracting clumps from the workpiece

By default, the original graphics are replaced by the new clumps. To retain the original graphics, press Ctrl when you select the command.

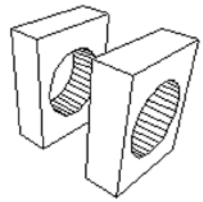
Editing the selection

When you edit the selection, you can:

- subtract a solid clump from a selection of other solid clumps

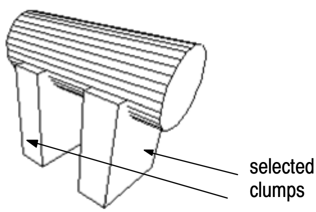


Before subtracting clumps from the selection

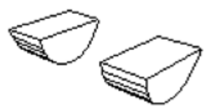


After subtracting a clump from the selection

- create a new solid clump from the intersection between one solid clump and a selection of other solid clumps



Before intersecting with the selection

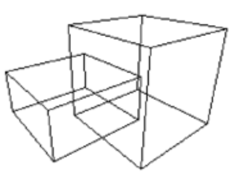


After intersecting with the selection

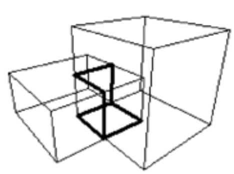
By default, the original graphics are replaced by the new clumps. To retain the original graphics, press Ctrl when you select the command.

Checking clumps for clashes

You can compare a selection of solid clumps and create new graphics along their clash lines.



Before checking clumps for clashes



After checking clumps for clashes

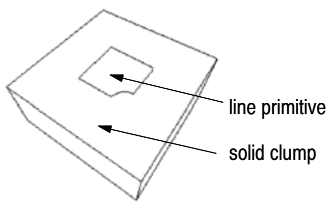
If a clash is encountered, MicroGDS creates new graphics along the clash lines (represented above by the thick lines). The original clumps are automatically deselected, leaving only the new graphics selected.

Creating pockets and profiles

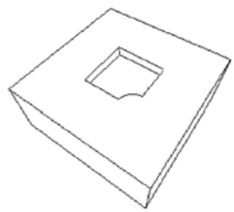
You can create a pocket in a clump, or create a profile from a solid clump. You use an existing closed line primitive to define the shape of the pocket or profile.

The difference between a pocket and a profile is that a pocket removes the solid volume inside the defined outline, whereas a profile removes the solid volume outside the defined outline.

If the line primitive is not in the XY plane, it is shadowed onto the XY plane.

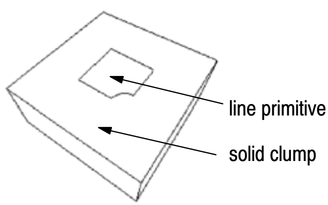


Before creating a pocket in a clump

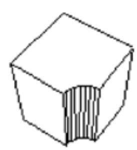


After creating a pocket in a clump

The clump now has a pocket, carved downwards from the positive Z direction, to a specified depth.



Before creating a profile from a clump



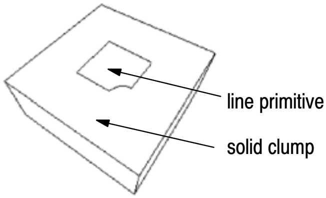
After creating a profile from a clump

By default, the original graphics are replaced by the new clumps. To retain the original graphics, press Ctrl when you select the command.

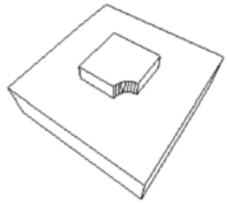
Carving and punching clumps

You can carve away the outside of a clump, or you can create a hole all the way through a clump. To define the shape of the carving or hole, you use an existing closed line primitive.

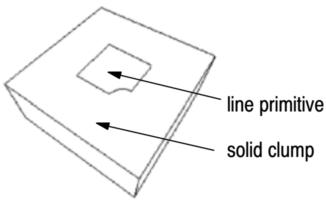
If the line primitive is not in the XY plane, it is shadowed onto the XY plane.



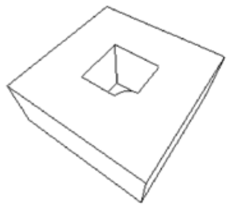
Before carving a shape from a clump


After carving a shape from a clump

The clump is carved downwards from the positive Z direction, to a specified depth.



Before punching a hole through a clump


After punching a hole through a clump

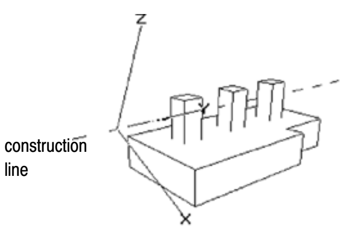
By default, the original graphics are replaced by the new clumps. To retain the original graphics, press Ctrl when you select the command.

Slicing clumps

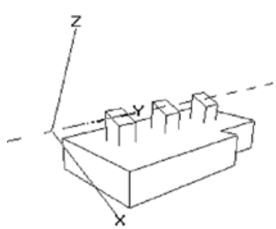
In addition to the slice command which enables you to divide a clump into smaller, separate clumps, you can:

- divide a clump into two sections and delete either the top or the bottom section

  For example:



Before slicing



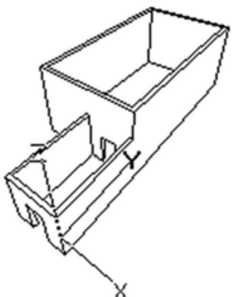
After slicing

In this example, the construction line was used to move the axes accurately thereby defining the precise angle of the slice.

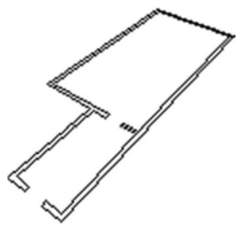
If you slice a solid clump, the cut surfaces are closed to make new solid clumps. If you slice a mesh clump, the cut surfaces remain open to create new mesh clumps.

- ‘slice between’ a clump to leave an XY section between the top and bottom, removing both the top and bottom sections.

  For example:



Before slicing



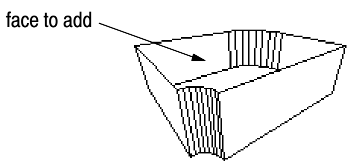
After slicing

By default, the original graphics are replaced by the new clumps. To retain the original graphics, press Ctrl when you select the command.

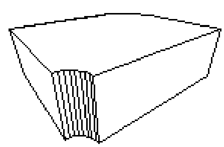
Editing clump faces

MicroGDS provides a number of face commands which enable you to edit clump faces, edges, and vertices. You can:

- add a new face to or between existing clumps



Before adding a face



After adding a face

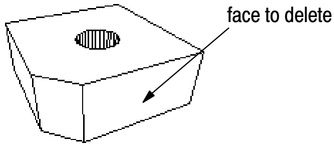
You can add a face in three ways:

— draw a face in free space

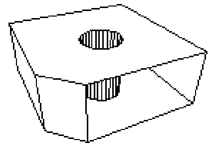
— draw a face which joins onto open edges of mesh clumps, or spans between several mesh clumps

— bridge a gap between open edges of a single mesh clump

- delete a clump face



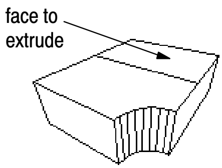
Before deleting a face



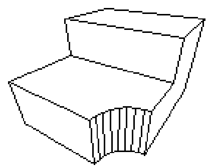
After deleting a face

If you delete a face on a solid clump, it becomes a mesh clump. If you delete a face from a mesh clump, the resulting clumps form one or more mesh clumps.

- extrude one or more clump faces



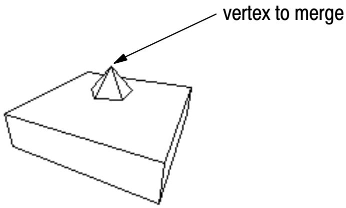
Before extruding a face



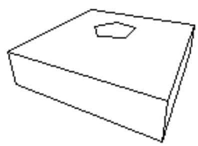
After extruding a face

The extrusion is constrained to the last face selected. You can press Tab to toggle between a constrained and unconstrained direction.

- merge faces by removing edges or vertices



Before merging faces

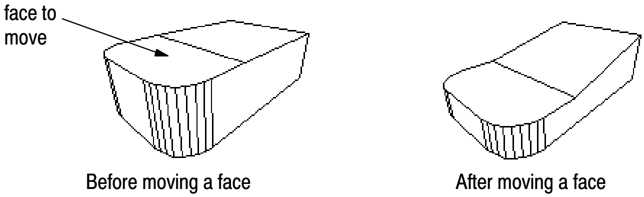


After merging faces

If you select an edge of a mesh clump, the edge between the faces is removed, and the faces either side are combined. If you select a vertex, all edges passing through the vertex are merged.

If you merge faces on a solid clump, it remains a solid clump.

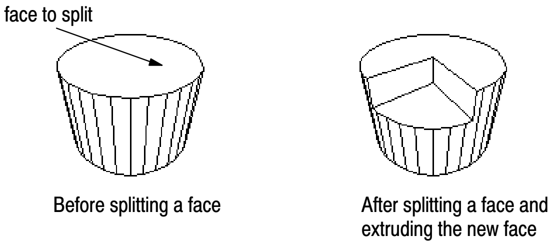
- move one or more faces



The movement is constrained to the last face selected. You can press Tab to toggle between a constrained and unconstrained direction.

- split a face in two or create a hole in a face

You might split a face, for example, to then extrude:



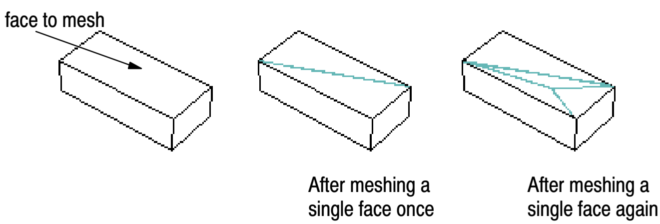
You can split a face in two ways:

— split across a face, starting and ending on edges

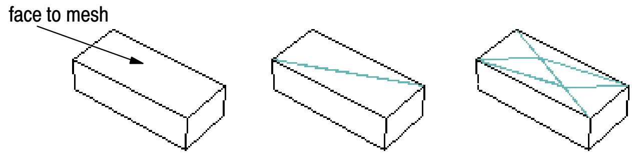
— split off a closed area inside a face, creating a new nested face

- mesh (or triangulate) a face or a group of faces

You might mesh a face or surface, for example, to import or export documents into third-party applications.



A surface is a region of a clump that is connected to a face by smooth edges, and which share the same material.



After meshing a surface once

After meshing a surface again

The face is meshed as follows:

— if the face, or any of the faces of the surface, are not triangular, then break all non-triangles into triangles

— if the face, or all of the surfaces, are triangular, sub-divide the triangles into smaller triangles

The boundary of the face or surface made by the division or sub-division is left unchanged—all splits are made within the surface.

If a surface being meshed is adjacent to a surface that is already triangular, the new meshing does not split sides of any adjacent triangles.

Importing and exporting clumps

If you are working with documents that you import or export into third-party applications, you may need to change some of the geometry of clumps.

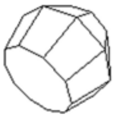
MicroGDS Collaboration provides the following commands that enable you to prepare a document for import or export:

- Mesh Clump subdivides each face of a clump into triangular faces:

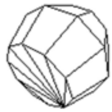
Before

After

- Quad Faces splits each face of a clump so that each face has a maximum of four sides:

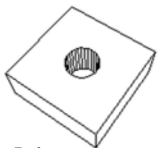


Before

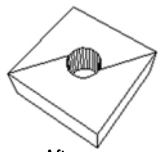


After

- Remove Holes removes holes from clumps by joining loops and splitting faces:



Before



After

You access these commands on the Solid, Clump menu. For more details on how to use the commands, refer to Help.

Chapter 19

Rendering graphics

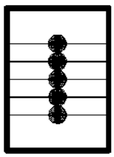
Rendering

Both MicroGDS Entry Level and Collaboration provide two Shaded views as fast and simple ways of producing images from 3D models. Shaded images appear in the current window definition. MicroGDS Collaboration users may find this view useful for previewing an image quickly, and for editing graphics.

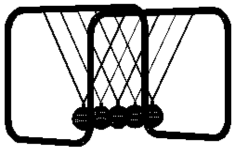
For details about using the Shaded 3D view commands, refer to Chapter 9, *Working in 3D*.

MicroGDS Collaboration provide a full range of 3D enhancing tools and rendering capabilities to create realistic, sophisticated images.

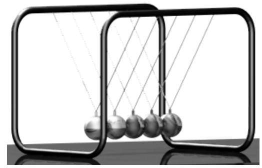
For example, you can create an object, view it in 2D and in 3D, and render it to create a finished, photo-realistic image:



2D view



3D view



Rendered image

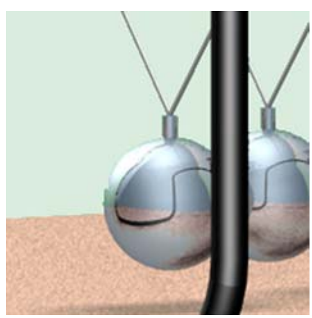
Rendered images appear in a separate window alongside other window definitions.

The renderer applies any materials and lighting you have set up, and environment settings such as foreground and background shaders.

You can also add an image to the background, for example, to show a scene through a window, or to give an impression of an outdoor scene. These combined facilities enable you to create realistic, real-world scenes.

In MicroGDS, although you can render any simple 3D object, rendering a 3D object in isolated space can give very different results to rendering the same object in a scene. This is because objects reflect the colours, shapes, lights, and so on, of their surroundings, whereas objects in space do not have any objects to reflect.

In the first illustration, a simple chrome sphere is shown suspended in space. Very little reflection or light appears in the image. In the second illustration, the sphere is part of a larger scene resulting in reflections, shadows, colours and so on.



For details about creating 3D graphics, and creating and assigning materials and lights, see the following chapters and also refer to Help:

- Chapter 9, *Working in 3D*
- Chapter 18, *Advanced 3D*
- Chapter 20, *Advanced lightstyles*
- Chapter 21, *Advanced materials*

Rendering technologies

When you render a scene, the type of rendering is determined by a number of render options.

You can render a model using simple ray-tracing or advanced global illumination. Ray-tracing is a technique that models the path taken by light by following rays of light as they interact with surfaces. Global Illumination is a term for rendering with light processed for the whole model, rather than just the visible pixels. Specifically, it deals with the reflection and re-reflection of diffuse light. This produces soft lighting, and a general ambience.

Look at the examples below. Notice how some surfaces in the ray traced model are barely reached by the lighting effects, such as the floor and any cabinets that are edge-on. Compare with the global illumination model to see here how the light now bounces off all visible surfaces to create truly realistic lighting:

rendered using ray tracing

rendered using global illumination

Two global illumination technologies are provided, which can be used independently, but work best together.

- Radiosity

  Radiosity is a physical solution to the inter-reflection of light (radiant energy), by dividing modelled faces into triangles. Light from the primary light sources is shot from the sources to all triangles that it can reach without being blocked. Each triangle then re-radiates its diffuse reflected light. The process repeats and iterates towards a solution.

  This is a global solution of the light energy throughout the whole model, seen and unseen parts alike.

  Note that radiosity alone can be very slow to produce good results.

- Final gather

  Final gather adds a final stage of lighting, where each visible surface pixel casts out rays to other surfaces (which have been lit). The diffuse light from those end-of-ray patches becomes the gathered diffuse lighting for the surface pixel. The calculation of lighting values is restricted to visible points in the image. Final gather works best when it has a radiosity solution to work from.

  With appropriate radiosity and final gather settings, accurate and well-lit images can be produced very quickly.

Planning your lighting

It is important that you plan your lighting so that you do not inadvertently overload the renderer with unnecessary detail. As an example, before you place numerous lights in a large open-plan office, and turn up the rendering quality and begin rendering, first stop and think about what you expect from your model.

Consider whether the scene is an indoor or outdoor scene, is it a daytime interior with light coming from outdoors or is it lit wholly using interior lights? Since you'll be asking for more processing for lights, can parts of the geometry be simplified and still achieve a reasonable effect? Will all lights be seen in full detail or can simpler substitutes be used in far corners?

It is also worth planning the layer structure of the model so that lights can be flipped on and off (separately from the light fixture), and placing the basic framework of walls, ceiling, and floors on separate layers from the room contents. You can then make fast renderings to experiment with different lights and see how radiosity lets the light ‘flood’ around the room.

Interior lights use lighting objects and the built-in ‘real-world’ lights (or custom lights).

Exterior lighting is most easily set up on the Render Environment dialog box: the ‘weather-based’ styles built into MicroGDS provide a number of simple scenarios which combine sun and sky lights, a basic background and an appropriate exposure setting for outdoor scenes.

Rendering graphics

You can render any 3D graphic, from a clump with a single face to a complex, detailed scene. If you have not created any materials, lighting, and so on, the renderer will use the defaults in MicroGDS.

Note that achieving the correct lighting may take several adjustments before you are completely happy with the results, so we suggest that you always start with the low quality render settings and make unimportant layers invisible. Then gradually increase the settings and bring in the rest of the model for the final rendering.

When you render an image, the image appears in a separate window at a predetermined width and height. You can change the render image size using the Renderer tab on the Preferences dialog box. For full details, refer to Help.

The basic steps of rendering are given below.

▶ To render graphics in the current window definition

1. If necessary, on the View menu, click 3D to switch to 3D view.
2. On the Window menu, click View Parameters and select the projection you require.
3. Use the commands on the View menu to set up the view to be rendered.
4. To create an environment around your rendered graphics, on the Render menu, click Edit Environment, then choose the shaders you require.

The environment defines the environment around the world, for example images in front of, behind, or around the model, plus external lighting (sun or sky), and exposure control.

For more details about each type of shader, see *Setting up a rendering environment* on page 432.

5 To select rendering options, on the Render menu, click Options and then select the settings you require.

The model is rendered using the current quality mode. Good image quality is recommended as it produces generally high quality images in a relatively short time.

For details about each quality mode, see *Choosing a render image quality* on page 424.

To use radiosity and global illumination, select the appropriate check box and then set up the level of detail you require.

6 On the Render Options dialog box, click Render Now.

This updates the environment, geometry, lights, and the view.

The image being rendered is displayed in a separate window, of a size defined in your preferences. MicroGDS initially shows a blocky, limited image, then progressively refines the image until it is fully rendered. The progress of the rendering is displayed in the Render Progress dialog box. The number of steps in a render varies according to the options you have chosen.

When the Render window is open, you can double-click in the window as a shortcut to re-rendering the image.

If you change the view associated with the Render window using the View Parameters dialog box and apply the changes, the rendered image is automatically re-rendered. Note, however, that the view parameter changes are applied to the active window, therefore if the active window is not the Render window, the image is not re-rendered.

Depending on the complexity of the drawing, rendering may take some time if you are using one of the high quality methods.

You can stop the renderer at any time, for example, if you want to change the render mode, or change the size of the Render window.

▶ To cancel the renderer

- in the Render Progress dialog box, click Cancel
- or press Ctrl+Break and click Yes at the prompt

▶ To close the Render window

- click the Close button on the Render window

Setting the global illumination options

Global illumination comprises radiosity and final gather:

- Radiosity is a global process which bounces light throughout the model regardless of whether or not the light or surfaces can be seen. Radiosity handles the repeated bouncing of light between a series of faces until it converges to a stable solution. This does allow subsequent renders to walk the camera through the model and use a single Radiosity solution, but it can also mean that extensive processing occurs on areas which never get rendered. Radiosity alone suffers from visual artefacts where the mesh of triangles (where the Radiosity lighting is calculated) become visible.
- Final Gather processing starts with the visible faces and gathers light from direct and indirect sources which reaches the visible faces, but alone it performs one bounce of light.

In conjunction with a Radiosity solution, the Final Gather gathers light which has bounced all around the scene. Gathering light from the Radiosity solution also makes the triangle mesh invisible.

The trick is to balance these two stages, and to apply enough analysis to achieve good lighting, but not too much so that the renderer makes over-long calculations.

Use the Render Options dialog box to control the image quality and global illumination settings for rendering a scene.

▶ To display the Render Options dialog box

- on the Render menu, click Options

  By default, the dialog box shows the basic rendering options. The default settings here should be sufficient for most renderings. To see the advanced options, click More.

Choosing a render image quality

MicroGDS provides three image quality modes and three legacy modes. We recommend that you choose from Preview, Good, or Best. These qualities support the following standard rendering features:

- smooth shading
- highlights
- displacements
- environments
- shadows
- texturing
- ray tracing for mirror effects
- transparency

Preview produces fully-textured images with fairly fast rendering, but has no anti-aliasing so patterns and object silhouettes may appear jagged. Use Preview to render images in their early design stages.

Good produces high quality images that are suitable for many final outputs. This quality uses anti-aliasing to remove the jagged appearance. Good image quality is recommended as it produces generally high quality images in a relatively short time.

Best produces very high, presentation-quality images which support a higher level of anti-aliasing to look for sub-pixel features that might be missed by other anti-aliasing techniques. Best quality should be used only to generate production quality images and will slow rendering considerably.

The first time you render an image, the renderer uses the default mode specified in your preferences. Whenever you select a new render mode, the mode is copied to your preferences and is used when you next refresh the rendered image.

For more details about setting the default rendering mode, refer to Help.

Setting up basic lighting

To use radiosity and final gather when you render, select the 'Use global illumination' check box.

To use global illumination effectively, you should be aware of the following:

- processing time may increase considerably
- reflected light may make the scene much brighter than traditional renders

  We recommend that you set an auto exposure option on the Render Environment dialog box.
- all lights that support fall off should be set to Inverse Squared

To use traditional ray tracing, clear the Global Illumination check box.

Specifying the scene type

Select the scene type that matches the lighting calculations most accurately.

Each scene type has a built-in scene size, shown in the current set units and scale.

- Site (100m)
- Building (30m)
- Large Room (12m)
- Small Room (6m) (the default)
- Furniture (2.5m)
- Object (0.5m)

Note that these sizes are for a model at 1:1. For example, if your scene is modelled at 1:20 the size of a Small Room would show 120m (in your current units).

Choosing the correct scene type will help ensure that the renderer does not attempt to scatter light inappropriately. For example, it will ensure that 10cm light patches are not scattered across a landscape or 10m patches across a desk scene.

You can use the Scene size box to specify an explicit size, which will override the selected Scene type. If you type a size, the Scene type changes to Custom.

Specifying the lighting accuracy

Type a number (between 1 and 10) to determine the accuracy of the Advanced Lighting parameters.

This is the amount by which to adjust the lighting parameters, taking account of the scene type or the scene size.

Usually, this is all you will need to adjust to balance between a quick, simplistic lighting and a slow accurate lighting.

If much of the light comes from reflected sources (for example, an interior with a small window and bright outside light), then you may need to increase the lighting accuracy to ensure the light bounces enough times to light the interior.

Using a selection box to limit the rendered area

Select the Selection box check box to limit detailed processing of lighting to the MicroGDS selection.

Use a box around the selection, aligned with the world axes to limit detailed processing of radiosity; simpler lighting is then used outside this extent. We suggest that you construct wireline primitives (such as from an unclumped cube) around the area of interest. Wireline primitives are not themselves rendered and so are a good choice.

For example, imagine that you are rendering a work cubicle in an open plan office with a view outside. Fit a box around the cubicle so that complex, bounced-light lighting is used within the cubicle, while the outdoors is limited to either final gather lighting or traditional ray-tracing.

In a simple scene where everything is of equal priority, you would usually clear this check box.

Setting up advanced lighting

Generally it is recommended that you combine a basic radiosity solution followed by final gather from the radiosity solution, but the progress bar may indicate that a disproportionate time is spent in one or the other stage:

- If very little time is spent in the radiosity stage, increase the radiosity weightings so the subsequent final gather will have a better lighting model.

- If too long is spent in the radiosity stage before starting the final gather, try switching off radiosity or try one of the *Advanced rendering tips* described on page 431.

Many of the values on the Render Options dialog box are fractional weights from 0 to 1, with a default neutral weighting of 0.5 which is the setting from the ‘Scene type’ and ‘Lighting accuracy’. Increasing an individual weight reduces related sizes or places more calculation effort for a single aspect of the lighting calculations, while reducing a weight uses larger size or less effort. We suggest that you start with the default weightings and only experiment if it seems necessary.

Setting up the radiosity options

To enable and use the radiosity settings when you next render, select the ‘Use radiosity’ check box.

Radiosity processing triangulates a copy of the model, scatters light from the original light sources, and then repeatedly bounces light from the triangles, patch to patch. Used alone it can be very slow, and the triangulation can leave visible marks in the image.

- For indoor scenes, radiosity combined with final gather will produce the best results.
- For outdoor scenes, final gather used alone will give the desired results in a much faster time.

If you clear the ‘Use radiosity’ check box, no radiosity processing takes place and any existing radiosity solution is temporarily ignored. Note, however, that the radiosity solution is retained and can be used in later renders by selecting the check box, provided that other changes have not invalidated it.

The following affect only radiosity and have no effect on final gather processing (except when a radiosity solution is made available as the base lighting for final gather).

Bounce accuracy: defines the relative importance for the triangle mesh and inter-triangle geometry calculations.

Completeness: defines the relative importance for the percentage completion of the repeated bouncing of light.

Wall thickness: specifies the distance to use as the lower limit for slicing mesh triangles. If you have walls touching but not cutting floors or ceilings, entering the actual thickness of walls can help, but in a large scene this may be far too small for acceptable calculation times.

If this box is blank, ‘Wall thickness’ is determined by the ‘Scene size’ and ‘Lighting accuracy’ values. Note that unless the accuracy values are too low, the initial mesh will not iterate down to the ‘Wall thickness’ distance, so these need to be balanced together.

Clutter size: specifies the size for the smallest light-bouncing elements, thereby overriding the default size.

For example, if you have furniture in a large room, the lighting is dominated by the walls and ceiling, but the furniture may draw the attention of the processor; items smaller than the clutter size are left for the final rendering and do not bounce light in radiosity.

If this box is blank, ‘Clutter size’ is determined by the ‘Scene size’ and ‘Lighting accuracy’ values.

You have greater control over this by attaching the MGDSRadiosityRefinement attribute to clutter items. For more details, refer to MicroGDS Help.

Setting up the final gather options

To enable and use the final gather settings when you next render, select the ‘Use final gather’ check box.

Final gather differs from traditional ray-traced lighting by instead of tracing rays from surfaces to light sources, rays are fired at random to sample the region around the face. These rays sample patches of lit surface, which are in turn lit by the primary light sources or prepared by radiosity processing. Even a course approximate radiosity solution can considerably improve final gather speed and quality.

Note that final gather makes only one bounce of diffuse light, as the light patches it samples are lit by direct lighting. Radiosity patches are lit by light which may have bounced between several surfaces before reaching the patch, and if these are available to final gather, it uses those for its sampling.

You can check how the scene is being sampled by selecting the ‘Show sampling points’ check box, described later.

Specular gathering: defines the relative importance of the number of extra rays scattered from glossy surfaces, to gather light for specular highlights.

Note that gathering light from extended lit patches onto rough but glossy surfaces can result in a noisy, speckled appearance. Although this may be unexpected, it is correct and accurate.

Smoothness: defines the smoothness of the raw light. Low values produce more blotchy circular patches of light.

Gathering accuracy: defines the relative importance of the ray-lengths in final gather. (Ray-lengths are calculated from the 'Scene size' and 'Lighting accuracy'.) When sampling rays fall outside existing light patches, new patches are calculated, so reducing the patch size forces more light patches, producing a more accurate lighting.

Diffuse gathering: defines the relative importance of the number of rays cast to find patches of light.

Detail size: defines the average size of small details requiring lighting. (Detail size is calculated from the 'Scene size' and 'Lighting accuracy'.)

A typical value might be the depth of narrow window-sills, or window-frame elements.

An indication that a size is required could be when window frames, lit from outside, show a speckled, bright lighting. This suggests that the frame geometry is smaller than the minimum light sample, and the frames are not being correctly lit. Note that very small detail sizes can slow rendering.

If needed, a good size for Architectural models is 50mm.

Ambient occlusion: whenever ambient lights are used with final gather rendering, MicroGDS automatically switches to using ambient occlusion lighting.

With a standard ambient light, light is spread across the whole scene but, because the amount of light is uniform and constant, this can give the effect of flattening the image. Ambient occlusion however takes into account how near the point being rendered is to other objects in the scene, and occludes the amount of ambient light at that point accordingly. This means that points close to other objects appear slightly darker than points out in the open.

Ambient occlusion also creates localised shadows where geometry details meet, for example, in the corners of a room or in the small gaps between cushions on a sofa.

You can use the following options with ambient occlusion:

- Shadow factor: controls which parts of the scene are fully lit by the ambient occlusion light and which parts are partially lit.

  At every point, final gather sampling determines a mean distance between the shade point and the rest of the scene. Where this distance is less than the shadow factor multiplied by the Scene Type size, ambient occlusion illustration will fade into shadow.
- Drop-off rate: controls the rate at which the ambient occlusion illumination drops into shadow. Smaller values see the light reluctant to fade away; larger values will push the shadows out into the brighter regions.
- Contrast: controls the contrast of the shadows. The darkest shadow is the ambient occlusion scaled by the contrast. Therefore, larger contrasts produce darker shadows.
- Bump factor: controls the appearance of displacement mapping when lit by ambient occlusion.

  A value of 0.0 switches off the effect. A value of 1.0 produces the maximum change in colour due to the bumps. Values in between can soften the effect, and –1.0 inverts the effect.

The default values provide good ambient lighting in most scenes.

Note that the intensity and colour for the ambient occlusion lighting are set in the ambient lightstyle.

Handle translucency: select this check box to consider the amount of light transmitted through surfaces with the Translucency reflectance shader, when any of the visibility rays encounter some geometry. When selected, light will be gathered from the translucent surface as well as the light passing directly through it (and then bouncing round).

Show sampling points: select this check box to overlay bright green dots at the centre of each lighting sample. This enables you to determine whether the sampling is too low or too high in parts of the scene. The correct balance is obtained when there is a loose scatter of points in flat lighting areas and a denser scatter of points where the lighting varies rapidly, such as in corners and near shadow boundaries.

Using the advanced options

You can use the three advanced options on the Render Options dialog box to:

- render objects in different materials as defined in a material substitution table

  This enables you to render objects in different materials without changing the actual materials applied to the objects. You can prepare data tables using the Material Substitution Sample Application program.

- use the default lighting and ignore modelled lights

  Simplify lights is useful when you are experimenting with viewing the scene and getting the lights set up, but the lighting or exposure is too bright or too dark.

  Note that simplified lighting uses two lights which track the eye. These can be very expensive to render with global illumination as every change to the view is considered as redefining the light and any previous saved global illumination lighting is discarded and recalculated. For this reason, it is recommended that Simplify lights (and any other lights that track the eye) are not used with global illumination.

  If no lights are present in the model, simplify lights is automatically used.

- force the next render to reload the lights and geometry and recalculate any global illumination changes if a change does not seem to show

  You would not usually use this button as the majority of changes are detected automatically.

Advanced rendering tips

- Start with 'Lighting accuracy' set to 1, set a sensible 'Scene type' size, and remove most of the small items from the scene.

  If you have an external base or external buildings, select the appropriate area and select 'Use selection box'.

- If the render is particularly slow, cancel it, change parameters, and restart. It is more important to get an initial impression than to get the perfect result.

- Look for light leakage. These indicate that:
  - there is a need to split faces (use Boolean Add to add walls to floors and ceilings)
  - or the ‘Scene type’ is too large
  - or that a higher ‘Lighting accuracy’ is needed
- If you have bright patches and dark corners, and want to see more light in the corners, increase the radiosity Completeness. But do this only if the radiosity stage is not taking overlong.
- While the scene is still fairly empty, try setting a high ‘Lighting accuracy’ render. This can verify that the level will remove artefacts caused by insufficient accuracy.
- Although Best ‘Image quality’ can produce outstanding results, it is often very slow. Therefore, avoid using Best quality until you are completely satisfied with the lighting.
- Radiosity processing on a landscape scene is generally wasted effort as there is almost no inter-reflection to process, but the broad area generates a large number of triangles which flood the radiosity mesh. Final gather or even plain ray-tracing will give good results for the landscape itself. You could use a ‘Selection box’ to just burn radiosity within the box and omit most of the actual landscape.

Setting up a rendering environment

You can create an environment around the graphics in a rendered image. The environment defines the environment around the world, for example images in front of, behind, or around the model, plus external lighting (sun or sky), and exposure control.

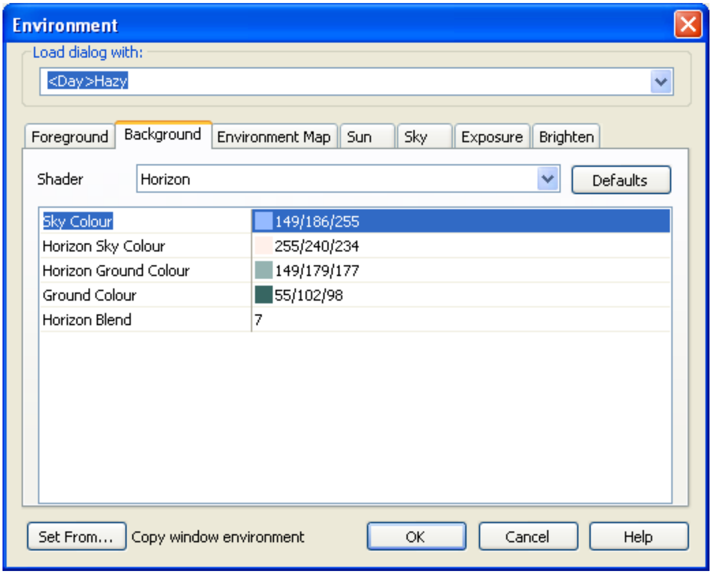
MicroGDS supplies a number of predefined schemes which you can also use or modify as required. These are described later on page 434.

The environment is stored with the window definition from which the image is rendered. You can copy an environment from one window definition to another window definition in the same document.

▶ To set up an environment

1 On the Render menu, click Edit Environment.

The Environment dialog box is displayed:



The dialog box stores the characteristics of the current environment.

2 To select a predefined weather-based scheme, select from the ‘Load dialog with’ list.

3 To select a shader type, click the appropriate tab.

Details about the available shader types is given in the following section.

4 From the Shader list, select the required shader.

5 If you want to modify the chosen shader, click the shader attribute and modify the setting as required.

You can reset any changed attributes to their defaults by clicking Defaults.

6 Click OK.

▶ To copy an environment from a window definition

1 Ensure that the window definition into which to copy an environment is the active window.

2 On the Render menu, click Edit Environment.

3 On the Environment dialog box, click Set From.

The Select Window dialog box is displayed, listing each window definition in the current document.
Note that if you are working with a project, the Open dialog box is displayed in place of the Select Window dialog box.

4 Select the window definition whose environment you want to copy, and then click OK, or double-click the window name.

The parameters in the Environment dialog box are updated to those of the selected window.

5 On the Environment dialog box, click OK.

The environment from the selected window definition is copied to the active window definition.

Selecting a predefined rendering scheme

MicroGDS supplies a number of predefined time and weather-based schemes that you can use to create an environment. All schemes are made up of Sun, Sky, Horizon (background shader), Exposure, and Brighten settings. The schemes do not alter the Foreground or Environment Map shaders.

The environments are grouped into categories: Day, Night, Twilight, and Weather. Each scheme sets the appropriate attributes for the type of environment selected. You can use these with their preset settings or modify them as required. If you do not want to use a predefined scheme, select ‘None’ from the ‘Load dialog with’ list on the Environment dialog box. All shaders set by any time or weather scheme revert to None.

Environment shaders

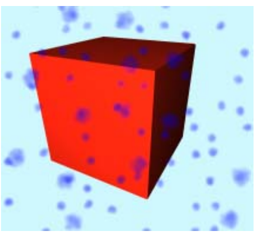
You can build up an environment using three different types of shader:

Foreground	reduces the colour of the surface of each pixel to produce an atmospheric scene
Background	adds colour to the background that is not covered by graphics
Environment Map	maps images around the scene to represent the environment
Sun	simulates a light source that emits light from the sun
Sky	simulates a diffuse light source that represents light from the sun which has been scattered by the atmosphere
Exposure	specifies an optional auto-exposure method to fit the brightness to the screen
Brighten	tweaks the brightness of the rendered scene

Details about these shaders are given in the following sections.

Foreground shaders

Use foreground environment shaders to reduce the surface colour of each pixel to produce an atmospheric scene. You can use these shaders, for example, to simulate fog or snow:



Snow effect

Foreground shaders affect only the pixels covered by graphics on the scene. Therefore, it may be necessary to add a back-plane to some scenes.

3D views are tilted according to the roll angle specified in the View Parameters dialog box. The tilting affects the display of the model and the lighting.

Some foreground shaders work in world space which means that they dip and tilt as the view changes. Other shaders work in image space and are always aligned with the screen axes. This means that they cannot be tilted.

The following foreground shaders are available:

World space

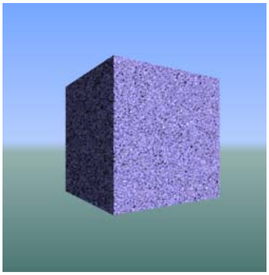
Depth Cue	Produces an impression of depth by adding colour to the rendered image dependent on the distance from the eye position.
Fog	Produces a fog effect by applying a mist across the scene at a specified distance. Increasing the distance moves the fog further from the eye position.
Scaled Image	Blends an image in front of the scene, using a mask.
Snow	An effect of snowflakes falling in front of the camera. The effect is produced by two overlaid layers of randomly dispersed snowflakes.

Screen space

Fog Light	Volume fog with a varying density. Fog light provides an atmospheric scattering of fog from Point and Spot light sources. Note that Spot lights should have an almost constant angular intensity distribution and inverse square fall-off (that is, a hard-edged illumination cone).
Ground Fog	Adds a layer of fog whose density increases closer to the ground. Use Ground fog to create more subtle fog-like effects.
Scattering Medium	Adds dense particle medium which causes light scattering. Use Scattering Medium to create a foggy or smoky atmosphere.
None	No foreground.

Background shaders

Except during the early design stages, you will not usually want to render your scene against the default black background. Use background environment shaders to define the colour of pixels in the image that are not covered by graphics. You can use these shaders, for example, to create a cloudless sky with ground and a horizon:



Horizon effect

3D views are tilted according to the roll angle specified in the View Parameters dialog box. The tilting affects the display of the model and the lighting.

Some background shaders work in world space which means that they dip and tilt as the view changes. Other shaders work in image space and are always aligned with the screen axes. This means that they cannot be tilted.

The following background shaders are available:

World space

Horizon	A simple plain, cloudless sky with ground, and a blend of colours at the horizon.
Link to Environment	Displays the selected 'Environment Map' Environment shader as the background as well as the environment. This shader is for use only with the 'Fixed Distance Cube' and 'Image Cube' environment map shaders. Ray-traced mirror reflections will sample the environment shader images, and show true reflections of the outside environment.

Screen space

Clouds	A cloudy appearance. Increasing the scale makes the clouds appear larger.
Graduated	A background that interpolates between two colours at the top and bottom of the image.
Graduated Three Colour	A background that interpolates between three colours at the top, middle, and bottom of the image.
Grid	A background that is a grid.
Image	Uses a specified image as a background. (A description on how the image is 'drawn' is given on the next page.)
None	A blank, black background. This is the default.
Plain	A background of a plain, uniform colour.
Scaled image	Provides a background of a specified image by scaling it to fit the view window.

Using an image background shader

You can display an image in the background of the Render window. The image starts from the top-left of the Render window, and is repeated vertically if the window height is greater than the image height. Similarly, the image is repeated horizontally if the window width is greater than the image width.

In other words, the background image is defined in 'window space' (the width and height of the window) not in 'world space' (the size and orientation of the geometry).

When you use background images in 'window space', highly-reflective materials, such as those using Mirror or Conductor shaders, can give unexpected results when they reflect the background, not other geometry. The reflective surface can appear to be slightly transparent because the part of the background image it is 'reflecting' is the pixel in 'window space'.

To avoid this, place the background image on an item of backdrop geometry that is placed behind the model (typically, perpendicular to the view direction). Alternatively, instead of using a background image, use an Environment Map shader to map images around the scene, as described next.

You can use aliases to help locate image files used by the Renderer. The alias is defined and managed in the same way as other aliases in MicroGDS. However, there is also a system defined alias which is mapped to the Renderer Textures location defined in your preferences.

If a file from the Renderer alias is selected, it is referred to in the appropriate file name box as:

<>*subfolder\file name*

There are four ways of defining a file with renderer aliases: absolute path, relative path, user-defined renderer alias, and system alias. For more details, refer to MicroGDS Help.

For details about setting up aliases, see Chapter 2, *Exploring MicroGDS*.

Environment Map shaders

Use ‘Environment Map’ environment shaders to map images around the scene to represent the environment. Use these shaders, for example, to create a mirror on a wall in which the reflections change depending upon the eye position.

Environment Map shaders provide a means to *environment mapping*. Environment mapping (also known as reflection mapping) creates the illusion of mirror-like reflections without the computational overhead of ray tracing. It does this by approximating a single level of inter-object reflections, that are not physically accurate in the manner of ray tracing.

For example:

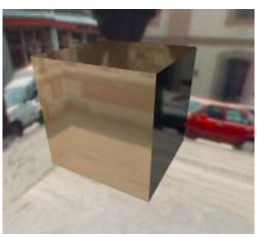


Image cube mapping

Environment mapping works by describing the appearance of the environment surrounding the graphics. Usually, it is represented as an image or a collection of images that correspond to the visual appearance of the surroundings from a particular view point. A typical use of environment mapping would be to represent a mirror on a wall, whose appearance changes with the position of the viewer.

Additionally, environment maps are used to:

- model the reflections of remote surroundings, in which a single environment map is applied, during the shading process, to all surfaces that have specularly reflective properties

  Typically, this global environment map will be constructed from photographs of a real world scene.

- represent inter-reflections between specific surfaces in the model

  In this case, a map would be constructed synthetically to correspond to the environment that would be visible from the point of view of a particular object. When applied to that object, the environment map would approximate the reflections of other objects seen in its surface.

The following environment shaders are available:

Auto-detect	Creates an environment from a single image file, where the image file is in one of a number of formats. For example, the horizontal cross format describes six faces of a cube arranged as a horizontal cross.
Image Cube	Creates an environment cube from six image files, using a mapping that is either an infinite distance or a fixed distance. These image files correspond to the faces of a cube aligned with the coordinate axes. (That is, the images are reflected in the positive and negative X, Y, and Z directions.) This shader centres and sizes the image files as specified.
None	No environment map. This is the default.
Render Cube	An environment shader that generates an environment cube from the render geometry providing simulation of inter-geometry reflections. The environment is calculated from six rendered images of the current geometry, one in each of the global axes directions.

Use the Auto-detect and Image Cube shaders to model the reflections of surroundings; typically, this global environment map is constructed from photographs of a real world scene. To see the effect of these shaders, set the material reflectance shader to have 'mirror' properties and set the background environment shader to Link to Environment. You will see the background reflected in the materials with mirror type reflectance.

Use the Render Cube shader to create an environment cube from the render geometry. Note that for best results, you are recommended to use mirror material reflectance shaders in preference to the Render Cube shader. To see the effect of this shader, apply the material reflectance shader Environment to the relevant objects.

Sun shaders

Use a sun environment shader to simulate a light source that emits light from the sun. The shaders modify the colour of the surface of each pixel to produce an atmospheric scene.

The easiest way of defining a sun shader is to select a predefined scheme from the 'Load dialog with' list, at the top of the Environment dialog box. You can use any scheme as it is specified or modify it as required.

The following sun shaders are available:

Sun	Creates a light source that simulates light from the sun, according to time and place.
Sun + Sky	Creates a twin light source that is automatically calculated according to time and place.

Note that a sun environment is associated with the scene as a whole, whereas a sun light is associated with an object.

Sky shaders

Use a sky environment shader to simulate a diffuse light source that represents light from the sun which has been scattered by the atmosphere.

The easiest way of defining a sky shader is to select a predefined scheme from the 'Load dialog with' list, at the top of the Environment dialog box. You can use any scheme as it is specified or modify it as required.

To simulate a sun and sky light source that is automatically calculated according to time and place, use the Sun + Sky shader on the Sun tab of the dialog box.

The following Sky shaders are available:

Ambient	Creates background lighting which illuminates all surfaces equally, regardless of orientation. Note that ambient lights automatically defer to Ambient Occlusion when Final Gather rendering is used.
Environment Light	Lights the scene using an ‘Environment Map’ shader. The light values in the environment that surrounds the scene are used to provide diffuse lighting from outside, as if the scene were within a larger scene. To display the selected environment as the background (as well as the environment), use the ‘Link to Environment’ background shader.
Sky	Creates a diffuse light source that represents light from the sun which has been scattered by the atmosphere. The source does not include light arriving directly from the sun. This shader can produce some subtle effects, including accounting for the fact that some areas of the sky are brighter than others, even on overcast days.

Note that a sky environment is associated with the scene as a whole, whereas a sky light is associated with an object.

Exposure shaders

Use the exposure slider on the Environment dialog box to specify an optional auto-exposure method to fit the brightness to the screen or file limits.

The following Exposure shaders are available:

Auto-exposure	Fits the luminance values in the scene to the RGB values available on screen or in a file. You might use auto-exposure if the scene has a large amount of contrast or a wide range of brightness (for example, from global illumination calculations).
Scale	Calculates an auto-scaled brightness for the scene. The calculated scale factor is used to convert the luminance values to RGB colour values.

Brighten shaders

Use the Brighten environment shaders to tweak the brightness of the rendered scene. The effect is seen immediately in the render window. You increase or decrease the brightness by dragging the sliders as required.

Saving a rendered image

You can save a rendered image to a file of a selected type. When you save the file, you can:

- save the image exactly as it appears in the Render window
- save the image as it would appear if it was refreshed

▶ **To save the rendered image**

1 On the Render menu, click Save As.

2 Complete the Save As dialog box with the name of the file, its type, and the folder in which it will be saved.

If you have made any changes that would affect the rendered image, but have not yet refreshed the image, you can use the To File command on the Render menu to include an implicit refresh. This means you do not have to refresh the image before you save the file.

Note that the To File command also lets you save the file as:

- an EPix picture that you can use in Piranesi™

  Extended pixel format files (EPix) contain depth, colour, and material information for each image pixel. You can use EPix files with Piranesi™ to paint in 3D. Piranesi is a product of Informatix Inc.

  There are two types of EPix files that you can save a file as:

  — standard EPix image files which have an epx file extension

  — panoramic EPix image files which have an epp file extension

- a QuickTime Movie file

  QuickTime is a product of Apple Computer, Inc.

Printing a rendered image

▶ To print the rendered image

1 On the Render menu, click Print.

2 Complete the Render Print dialog box with the print size, and number of copies you require:

   - to print the image at the size shown in pixels in the image title bar, under Print Size, click Current size
   - to print the image at a customized size, under Print Size, click New size and specify the width and height for the printed image, using the specified units

3 If you specified a new size, select the Re-render check box if you want to refresh the image before it is printed.

4 Click OK.

You can set the default size for printed images by specifying a new size in your preferences. For details, refer to Help.

Chapter 20

Advanced lightstyles

Lightstyles

Lightstyles are used when you render 3D graphics in MicroGDS Collaboration. Lights can dramatically change the atmosphere of a rendered scene—lighting can be subtle or dramatic, depending on the type of scene you are creating.

Lights are also used when you view a drawing in a 3D shaded view. For details about 3D views, see Chapter 9, *Working in 3D* in Part One: *Working with MicroGDS 11*.

This chapter describes the additional lightstyles that you can create in MicroGDS Collaboration, and the effects that lightstyles have when you render 3D graphics. For details on how to add, change, modify, and delete lightstyles, see Chapter 10, *Working with lightstyles* in Part One: *Working with MicroGDS 11*. For details about rendering graphics, see Chapter 19, *Rendering graphics*. You can also refer to Help.

The following rendered image illustrates the use of one of the common light types, spot lights. Several spot lights have been used to enhance the clarity of the scene, giving an intense effect. The sample illustration is shown here in monochrome, you can see a full-colour version in Help. The online version also illustrates how the use of colour can give a more realistic appearance.

You can use different types of lights to cast light in different ways. For example, you can simulate table lamps and spotlights, and control whether or not the light casts shadows.

A lightstyle defines the type of light and its attributes. By default, objects have lightstyle NONE (which means ‘no lightstyle’) and therefore do not behave as lights.

MicroGDS provides two lightstyles: DEFAULT and NONE.

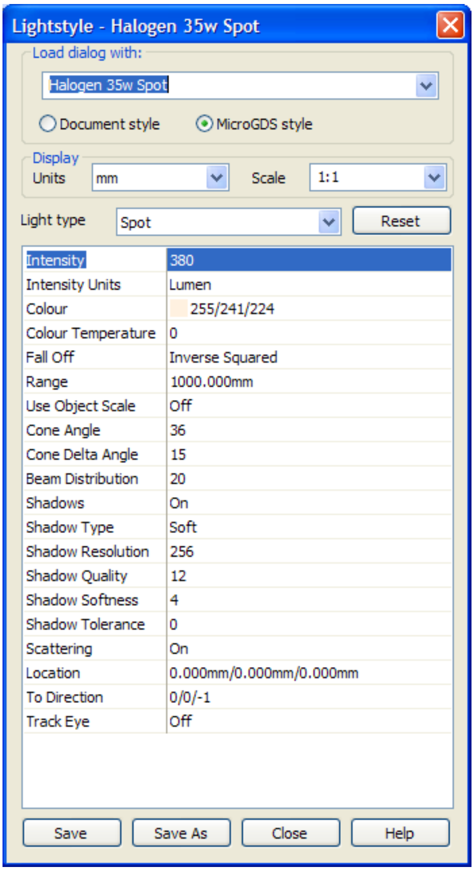
- DEFAULT is based on an Eye light type. This provides a very simple lighting model without shadows.

  Note that the DEFAULT lightstyle is stored separately from any lightstyles you create and cannot be saved, deleted, or replaced.

- NONE is not a light, but is the lightstyle automatically assigned to all new objects; it cannot be modified.

  Most objects in a drawing are not light sources, and so have a lightstyle of NONE.

MicroGDS Collaboration also provides a variety of built-in lightstyles, such as halogen or fluorescent. You can choose a built-in lightstyle using the Lightstyle dialog box. When you select a built-in style, the Lightstyle dialog box is populated with the appropriate light type and attributes. For example:



MicroGDS also provides two ‘simplify lights’ facilities that you can use in a shaded view and in a rendered image. These use the default lighting and ignore any modelled lights. Simplify lights is useful, for example, when you are setting up the view of the model.

Types of lights

In MicroGDS Collaboration, lights can be based on any of the following types of light:

ambient	illuminates all surfaces equally
area	radiates light from one or more closed line primitives
distant	emits parallel light as if from a very distant source, such as sunlight
environment light	lights the scene using an environment map shader
eye	emits light from the eye position equally in all directions
goniometric	emits varying amounts of light energy in different directions
point	emits light from a point equally in all directions
projector	projects an image across the scene
sky	creates a diffuse light source that simulates light from the sky dome
spot	emits a cone of light which is defined by the owning object's axes
sun	creates a light source that simulates light from the sun
sun + sky	creates a light source that is set by automatic control of time and place

The light types enable you to define the lighting you would like to use in your scene. For example, you could choose Point to emit unfocused light in all directions. A point light is similar to an unshaded light bulb. To focus a beam of light in a single direction towards a particular target point, you could use a spot light.

The behaviour of a light type is defined by a number of attributes. For example, when you create an eye light, you choose the intensity of the light and the colour. Some light types, such as spot, have many attributes, which include defining the angle of the cone of light, the beam distribution, a number of shadow attributes, a location for the source, and a direction.

Note that the Units and Scale settings specify how to show and interpret points and distances of the light in the Lightstyle dialog box. These settings apply only to certain types of light.

The following sections provide a brief description of each light type. For information on the associated attributes, refer to Help

Some additional information about how lights are handled when you render graphics is provided in *Lighting effects when rendering* on page 455.

Ambient

Ambient lights provide a general level of illumination. The position and orientation of the object to which the light is assigned is not important, because this type of light has no direction. The colour of an ambient light tints the scene and can be used to complement the colour of the main light source for the scene. It is usual to have only one ambient light, but you may need to add additional lighting to create a well-lit scene.

The default intensity value of 0.1 is sufficient in most situations. If you increase this value, you should do so in small increments.

Ambient lights do not cast shadows.

Note that ambient lights automatically defer to Ambient Occlusion when Final Gather rendering is used.

Area

An area light creates a light source using one or more closed line primitives in a light object, as the radiating areas.

For simple strip lights, move the axes to the height of the light, and construct a rectangle for the outline of the light area. The radiant surface created from the rectangle will shine down.

For more complex shapes (for example, a glowing sphere), construct a surface, reverse the line direction, and then construct primitives from the clump by unclumping. Note that shapes with many vertices or primitives will increase rendering time.

The primitives of the light source are not rendered. You can create a glowing effect by placing a surface with a non-shadow casting, translucency reflectance shader, in the front of the light source.

Note that you can use the Noise Factor attribute to reduce visible artifacts in direct rendering. Noise Factor should not be used with global illumination as it may introduce unwanted errors.

Distant

A distant light emits parallel light rays coming from a single, distant source. A distant light is appropriate as the main light source for sunlit scenes.

By default, the light is directed along the negative Z axis of the object to which the light is assigned. You can change the direction of the lighting using the 'To Direction' attribute.

Environment Light

An environment light is used to light the scene using an environment map shader.

The light values in the environment that surrounds the scene are used to provide diffuse lighting from outside, as if the scene were within a larger scene.

To display the selected environment as the background (as well as the environment), use the Link to Environment background shader.

Note that you can use the Noise Factor attribute to reduce visible artifacts in direct rendering. Noise Factor should not be used with global illumination as it may introduce unwanted errors.

Eye

An eye light provides a light source that is directed along the line of sight, (between the eye position and the look-at point).

The position and orientation of objects to which an eye light is assigned is not significant.

Note that eye lights do not cast shadows.

Goniometric

A goniometric light creates a light source in which the light distribution is controlled by data in a text file.

A goniometric light source is one which can emit varying amounts of light energy in different directions. For example, one goniometric light could behave like a point light, another could behave like a spot light, and another could behave in a completely different way to either. In MicroGDS, a goniometric light gets its intensity distribution (that is, how much light goes in any one direction) from an industry-standard file.

Sample text files can be found on the Internet (.ies files) or downloaded from manufacturers of light fittings.

Point

A point light is similar to an unshaded light bulb, or a star. Such lights provide a light source from a point equally in all directions.

The position of the hook point of the object to which the point light is assigned defines the position of the point source. The orientation of the object axes is not important.

Note that the point light's direction attribute, Location, enables you to offset a light without moving the object's hook point. This can be particularly useful if your light sources are instance objects.

Projector

A projector light provides a light source similar to a spot light, but projects an image across the scene as though it were a transparency in a slide projector. If a smaller angle of illumination is used, the projector light also allows the effect of light passing through a stained glass window to be modelled. A black and white image allows the light to be 'stencilled' which, for example, can give the effect of a window with shadows cast by the window frame.

By default, the light is directed along the negative Z axis of the object to which the light is assigned. The position of the hook point of the object defines the apex of the light cone. You can use the Location and To attributes to offset and tilt a projector light without moving the object's hook point. This can be particularly useful if your light sources are instance objects.

To project the image, the render quality mode must be set, at a minimum, to Preview. Otherwise, the projector will cast light but will not cast a focused image.

When you specify the location of an image file, by default, MicroGDS first looks for the file in the Textures folder specified in your Rendering preferences. You can also create Renderer aliases to point to additional locations. For details about creating renderer aliases, see Chapter 17, *Customizing MicroGDS* in Part One: *Working with MicroGDS 11*. You can also enter a full path, or browse to a different location, if required. For details about setting preferences, see Chapter 17, *Customizing MicroGDS* in Part One: *Working with MicroGDS 11*. Refer also to Help.

Sky

A sky light creates a diffuse light source that simulates light from the sky dome.

Sky lights can produce some subtle effects, including accounting for the fact that some areas of the sky are brighter than others, even on overcast days.

The sky source is oriented relative to a scene, rather than positioned somewhere within it.

Another way of simulating the source of the sky is to set up a rendering environment. You can choose from a number of predefined sun and sky schemes supplied with MicroGDS. The rendering environment is associated with the scene as a whole, whereas a lightstyle is associated with an object.

Sky lights do not render well without Final Gather. Rather than plain ray-tracing, a Final Gather render with a Lighting Accuracy of 1 will greatly improve the appearance of a sky light.

Note that sky lights can give unexpected results if the object axes to which the light is assigned are rotated. To avoid this, it is often easier to set sky light in the render's environment.

Spot

A spot light creates a cone of light. Flashlights, and car headlights are common examples of spot lights.

The light is directed along the negative Z axis of the object to which the light is assigned. The position of the hook point of the object defines the apex of the light cone.

Note that you can offset and tilt a light without moving the object's hook point using the spot light's direction attributes, Location and To. This can be particularly useful if your light sources are instance objects.

The example at the end of this chapter shows you how to create and place a spot light on a 3D image.

Sun

A sun light creates a light source that simulates light from the sun, according to time and place.

You can either specify the position of the sun in the sky (in terms of an angle over the horizon and a compass direction) or specify the position of the location on the globe (with grid references) along with a time and date. In the latter case, MicroGDS will calculate the position of the sun in the sky.

Another way of simulating the source of the sun is to set up a rendering environment. You can choose from a number of predefined sun and sky schemes supplied with MicroGDS. The rendering environment is associated with the scene as a whole, whereas a lightstyle is associated with an object.

Note that sun lights can give unexpected results if the object axes to which the light is assigned are rotated. To avoid this, it is often easier to set sun light in the environment.

Sun + Sky

A sun + sky light creates automatic lighting, controlled by time and place.

The actual colour of the sun and sky vary according to the type of sky, and the altitude of the sun. Night scenes have no sun light.

For scenes lit by Global Illumination, the default value for the sky light quality can be used as the Final Gather process renders sky lights smoothly. If Global Illumination is not used, you may need to increase the quality to avoid shadow bands. Note that Final Gather is the preferred rendering method for all sky-lit scenes.

Another way of defining the sun and sky lighting is to set up a rendering environment. The rendering environment is associated with the scene as a whole, whereas a lightstyle is associated with an object.

Where lightstyles are stored

In single-user documents, new lightstyles are stored in the document (the MAN file). They are saved when you save the document. You can delete any local lightstyle that is not in use in the current drawing. You cannot delete lightstyles from a referenced LIGHTS.STY file.

In multi-user projects, new lightstyles are stored in an external style file (LIGHTS.STY). A lightstyle is saved in the actual style file as soon as you save the style, even if you do not save project. You can delete any lightstyle from the local style file in the project. Note that MicroGDS does not check to see if the lightstyle is used in other window definitions in the project.

For details about creating, modifying, and deleting lightstyles, see Chapter 10, *Working with lightstyles* in Part One: *Working with MicroGDS 11*.

For details about working with projects, see Chapter 16, *Multi-user projects,* in Part One: *Working with MicroGDS 11*.

Rendering a scene

When you have added or modified a lightstyle, you can render the scene to see the effects.

▶ **To render the scene in the current window definition**

1 On the Window menu, click View Parameters and select the projection you require.

2 Use the commands on the View menu to set up the view to be rendered.

3 To create an environment around your rendered graphics, on the Render menu, click Edit Environment, then choose the shaders you require.

4 To select rendering options, on the Render menu, click Options and then select the settings you require.

To use radiosity and global illumination, select the appropriate check box and then set up the level of detail you require.

5 On the Render Options dialog box, click Render Now.

For further details, see Chapter 19, *Rendering graphics.*

You can also use the Hide Mode, Shaded, and Shade with Edges commands on the View menu to preview your image using a shaded view. For more details about shaded view, see Chapter 9, *Working in 3D* in Part One: *Working with MicroGDS 11*.

Lighting effects when rendering

You can use the simplify lights facility to override any modelled lights in the scene and, instead, use two lights: a point light and a distant light (looking over the left shoulder). You can switch on simplify lights using the Render Options dialog box.

If there are no lights in your model, MicroGDS automatically uses simplify lights.

Positioning of lights

Two attributes are provided with several light types to enable you to easily position lights. These are particularly useful with light sources that are instance objects.

- Location: the location of a light. This is a point in object axes.
- To Direction: controls the direction of the lighting. This is a vector, relative to the object axis, to define how the light points away from the Location point.

Tracking the eye

The following light types provide a 'Track Eye' attribute which enables the light to track the eye.

- Distant
- Goniometric
- Point
- Projector
- Spot

Track Eye works in conjunction with Location and To Direction attributes, but based on the line-of-sight rather than the object axes.

Note that Simplify Lights uses two lights which track the eye:

- a point light, with an intensity 0.65, tracking the eye at Location 0/0/0, so that it shines from the eye point, and hard shadows switched on
- a distant light, with an intensity of 0.65, tracking the eye at To Direction 1/–1/–1, so that it shines from above the viewer's left shoulder, down and to the right, and hard shadows switched on

You switch on Simplify Lights using the Render Options dialog box.

Lights which track the eye can be very expensive to render with global illumination as every change to the view is considered as redefining the light and any previous saved global illumination lighting is discarded and recalculated. For this reason, it is recommended that lights that track the eye (including Simplify Lights) are not used with global illumination.

Choosing the light intensity units

The Intensity Units attribute controls the way in which the light intensity is measured.

By default, the units are measured in empirical (arbitrary) units.

Select a value from the list; the light intensity units available depend on the type of light selected:

- Empirical: the light intensity is measured in arbitrary units, with 1.0 being normal screen white

  All renderer lights support empirical units.

- Real-world intensity units provide different effects for the type of light being simulated:
  - Point and spot-like lights, which radiate light from a point use (Kilo) Lumen and (Kilo) Candela as luminous intensity, or power they emit
  - Ambient, Environment Light, and Distant lights specify illuminance, the light incident on surfaces lit by them, using Lux or Foot Candles
  - Sky lights specify a sky-like variant on incident light, as NIT, the intensity of the zenith, in candela per square metre
  - Area lights can use either, depending on the effect you want:
- luminous emittance: light power per area of a surface (Lux or KiloLux)
- luminous power: total light power emitted by the source (Lumen or KiloLumen)

  Area lights use Lux as emittance (light from the glowing area), whereas distant lights use Lux as illuminance (light landing on the ground for example).

  Most real-world light intensities require some auto-exposure control to render effectively. For details about setting auto-exposure, see Chapter 19, *Rendering graphics*.

  More details about real-world lights can be found on many online reference web sites.

Using shadows

By default, all materials cast shadows from those lightstyles that support shadowing. You can turn shadows on or off for a material using the Shadows check box on the Material dialog box. For details about how and when to enable or disable shadowing for materials, see Chapter 21, *Advanced materials*.

All light types except ambient and eye can cast shadows.

You control the shadows using the shadow attributes for each light type. For details about the shadow attributes, refer to Help.

You can use the Shadow Type attribute to control whether the light casts hard shadows or soft shadows. Soft shadows are best suited for light sources that represent soft, interior lights. They do, however, use up extra program memory, but not processing power. Hard shadows have straight edges and are created using ray tracing. Hard shadows are generated when you render, therefore, they use very little additional memory to generate.

Note that sky, and sun + sky, lights support only hard shadows.

For soft shadows, you can set the accuracy of the shadows using the lightstyle's Shadow Resolution attribute. Increasing the resolution improves the accuracy of the shadow map, but requires more program memory. Note that point lights create six shadow maps, one in each global axis direction, and therefore use more program memory than other light types. Distant lights span the shadow map across the whole scene, so you may need a very high resolution to avoid artifacts. Consider using hard shadows for outdoor scenes, in which light sources are used to represent harsh sunlight.

You can also control the coarseness of the shadow map using the Shadow Quality attribute, and control the shadow boundaries using the Shadow Softness attribute.

For full details about shadows and the shadow attributes, refer to Help.

Shadows versus fall off

For point, spot, area, goniometric, and projector lights, you can increase the level of *fall off* to reduce the long-range effect of the light. Fall off determines the way in which the light intensity varies with the distance from the source. Although this is not an alternative to using shadows, fall off can give the effect of depth and distance without using up the program memory required by the shadow attributes.

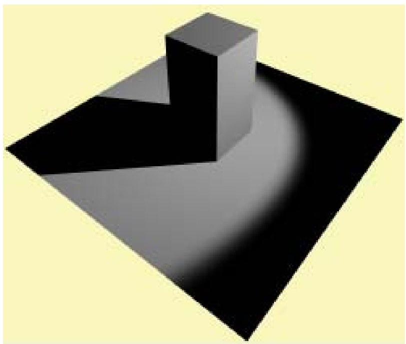
By default, the fall off is *constant* in which the light intensity does not vary with the distance from the light source. Other types of fall off are available from the Fall Off list.

The fall off distance can be measured in the model world or in object axes. This is controlled by the Use Object Scale light attribute. If set to On, the distance is scaled by the actual object axes scale of the object to which it applies. If set to Off, object scale is ignored and the distance is measured in the model world.

For further details about using fall off, refer to Help.

Lighting a scene—an example

This section takes you through the steps involved in creating and placing a spotlight on a 3D scene. For the purpose of this exercise, you will create a simple, basic scene which you will then light by creating a spotlight.



▶ **To create the scene**

1 In MicroGDS, create a new, blank document.

2 Set the scale to 1 and the units of measurement to mm.

3 Create the floor area:

a) Construct a 500 x 500mm rectangle and centre it at 0/0/0.

b) Click the Draw Extents button and then zoom out using the zoom slider.

c) To create a surface from the rectangle, on the Solid menu, click Clump, Create.

4 Create the cube:

a) On the Solid menu, click Construct, Cuboid.

b) Place the first corner of the cuboid at –50/–50.

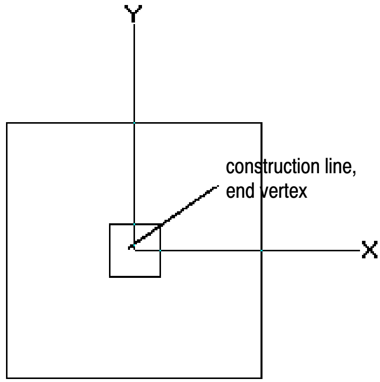
c) Place the opposite corner of the cuboid at 50/50.

d) Specify the height of the cuboid by entering //200.

If you switch to 3D view, you will see that the scene is set and now ready for lighting; switch back to 2D view.

5 Prepare the scene:

a) Draw a short construction line using the Construct Line tool, giving two Face snaps, for example:



You will use the construction line when you place the spot light.

b) Move the end of the construction line 300mm in the Z direction using the Vertex, Move, command on the Alter menu.

6 Create a new object for the light and place the hook point at 0/0.

7 Draw the spotlight object:

a) On the Construct menu, click Circle, Radius Centre.

b) Specify a radius of 30.

c) Place the circle at /

8 Switch to 3D view by clicking 3D on the View menu.

9 To position the spotlight object:

a) On the Object menu, click Reposition.

b) Move the pointer to the centre of the circle, and when the Centre snapcode is shown, click the mouse button.

c) Place the object at the end of the construction line, using an End snap.

The prompt bar now requests that you set the position for the X axis. However, since the light source of a distant light is directed along the negative Z axis of the light object, you will specify the –Z direction instead.

d) To position the –Z axis, press Shift+Tab.

Notice that the prompt bar now requests you for the position for the –Z axis.

e) To direct the axis along the negative Z, use a Line snap anywhere on the construction line.

f) The direction of the X and Y axes is not important, so press Esc to retain their current rotations.

g) To end the command, press Esc.

10 Create a lightstyle:

a) Ensure that the spotlight object is selected.

b) On the Styles menu, click Lightstyle Modify.

c) From the Light type list, select Spot.

d) Click Save As, type a name for the lightstyle, and then click OK

e) On the Lightstyle dialog box, click Close.

11 Set the rendering environment:

a) On the File menu, click Preferences, click the Renderer tab and set the image size to Custom Size, and then specify a width and height for the image of 500 x 500. Click OK to close the Preferences dialog box.

b) On the Render menu, click Edit Environment and set the Background shader to Plain. Then change the plain colour to Light Yellow and click OK.

c) On the Render menu, click Options.

d) From the Image quality options on the Render Options dialog box, select Good.

e) Click Render Now

The rendered scene lit by the spotlight appears.

Chapter 21

Advanced materials

Materials

Materials are used when you render 3D graphics in MicroGDS Collaboration. A clump is ‘made of’ a material, and can also have a different material assigned to each of its faces. For example, a cube can be made of the material ‘wood’, and have the material ‘yellow paint’ on some faces.

Materials in MicroGDS Collaboration have several characteristics, such as colour, pattern, reflectance, and transparency. By using different materials, you can create rendered scenes that are much clearer.

Materials are also used when you view a drawing in a 3D shaded view. Note that, for materials created in MicroGDS Collaboration, many material attributes are not used in a shaded view. For details about 3D views, see Chapter 9, *Working in 3D* in Part One: *Working with MicroGDS 11*.

This chapter describes the materials that you can create in MicroGDS Collaboration. For details on how to change, modify, and delete materials, see Chapter 11, *Working with materials* in Part One: *Working with MicroGDS 11*. You can also refer to Help.

MicroGDS provides one pre-defined material called DEFAULT, which is a plain matte white colour. Note that the DEFAULT material is stored separately from any materials you create and cannot be saved, deleted, or replaced.

Material shaders

In MicroGDS Collaboration, materials are made up of a combination of five types of *shaders*, each of which defines an aspect of the material's appearance:

colour shaders	define the colour of the surface at any point in space
reflectance shaders	define how much light is reflected by, or refracted through, the surface
transparency shaders	define how light is transmitted through the surface
displacement shaders	simulate small surface perturbations without changing the geometry
texture space shaders	define how the previous four shaders are wrapped around the object

Each type of shader offers a broad range of shaders, and each shader has a set of attributes that determine its specific behaviour. For example, if you choose the Plain Colour shader, you then choose the colour you wish to use. This is a very simple example. Most shader styles have many attributes, such as the Glossy Glass Reflectance shader whose attributes define reflection, refraction, and the degree to which these are blurred.

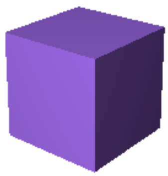
You can combine one shader of each type to build up effects. For example, you could simulate pale-blue, dimpled glass by selecting a blue colour shader, the glass reflectance shader, and the wrapped dimple displacement shader. You can also create detailed depth effects by pairing a colour shader with its matching displacement shader. For example, if you set the blue marble colour shader and the blue marble displacement shader attributes to be the same, you will achieve a realistic depth effect.

Shaders can be ‘solid’ or ‘wrapped’:

- solid shaders create a constant effect over a surface and through a solid
- wrapped shaders create an effect that is dependent on the surface position in texture space.

  For more details on texture spaces, see *Texture space shaders* on page 477.

Some shaders also allow you to use image files in a material to obtain specific textured and patterned effects. For example, with the Wrapped Image colour shader, images are wrapped around the surfaces that are assigned the material:

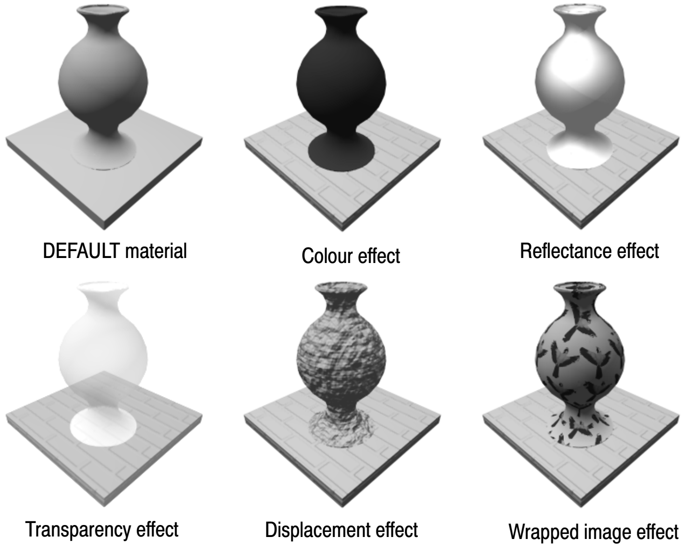


Plain colour shader

Wrapped image colour shader

When you choose a material that uses an image, by default MicroGDS looks for the image in the Textures folder specified in your Renderer preferences. You can also create Renderer aliases to point to additional locations. For details about creating renderer aliases, see Chapter 17, *Customizing MicroGDS* in Part One: *Working with MicroGDS 11*.

Some examples of different materials are shown below. The first example shows the default rendered image, as it would appear before any materials are added. In the remaining illustrations, a Wrapped Brick displacement material is assigned to the base, and a variety of effects, in turn, are assigned to the vase.



The following sections give brief descriptions of each shader. For information on the associated attributes, refer to Help.

Colour shaders

Every surface has a colour; a colour shader defines the colour of a surface at any point in space. It can range in complexity from a simple colour to a complex surface pattern. Tiled bitmap images can be applied to define the colour; these are ideal for surfaces such as brickwork, tiles, or carpeting.

The following solid colour shaders are available.

Birch	A pattern that resembles birch wood.
Blue Marble	A blue marble pattern.
Cherry	A pattern that resembles cherry wood.
Chrome	Simple chrome-like reflections.
Cubes	A three-dimensional lattice of cubes with alternating colours.
Fleck	A pattern which has a base colour with coloured flecks as seen in some plastics, composite materials, or tiles.

Granite	A pattern that resembles granite.
Height Band	A pattern of colours specified by heights on the object's surface.
Maple	A pattern that resembles maple wood.
Marble	A veined marble pattern.
Oak	A pattern that resembles oak wood.
Paving	A pattern that resembles crazy paving.
Pine	A pattern that resembles pine wood.
Plain	A plain, uniform colour (the default).
Simple Wood	A simple wood pattern. The wood grain is based on a tree trunk centred on a given axis with concentric rings of light and dark wood colours.
Solid Clouds	A pattern of clouds.
Solid Polka	A pattern of spheres embedded in a plain matrix. Slices through the matrix have a polka-dot appearance.
Turbulent	A pattern that simulates the variations in a turbulent medium, such as smoke or patchy fog.
Wood	A wood pattern. The wood is based on a tree trunk centred on a specified axis, the direction of which is aligned with the object axes, with concentric rings of light and dark wood, and grain.

The following wrapped colour shaders are available.

Wrapped Birch Floor	A wooden plank pattern in a finish that resembles birch wood.
Wrapped Brick	A simple brick pattern.
Wrapped Brick Bonds	A complex brick pattern.
Wrapped Checker	A chequer-board pattern using two alternate colours.
Wrapped Colour Blend	A pattern blending two wrapped images or two colours together.

Wrapped Cherry Floor	A wooden plank pattern in a finish that resembles cherry wood.
Wrapped Diagonal	A diagonal stripe pattern using background and stripe colours.
Wrapped Filtered Image	A wrapped texture, filtered with a specified colour, providing image colour mapping.
Wrapped Grid	A grid pattern using background and grid colours.
Wrapped Image	A wrapped texture providing image colour mapping.
Wrapped Maple Floor	A wooden plank pattern in a finish that resembles maple wood.
Wrapped Oak Floor	A wooden plank pattern in a finish that resembles oak wood.
Wrapped Pine Floor	A wooden plank pattern in a finish that resembles pine wood.
Wrapped Polka	A texture giving a polka-dot pattern created by setting a grid of circles of one colour against a background of another colour.
Wrapped Random	A wrapped texture giving a random pattern using two colours.
Wrapped Roof Tiles	A sophisticated roof tile pattern.
Wrapped S Stripe	A stripe pattern in constant *s* in texture space.
Wrapped T Stripe	A stripe pattern in constant *t* in texture space.
Wrapped Textured Brick	A sophisticated brick pattern. Each brick has a base colour randomly assigned, and is textured using a variation in colour around the base colour.
Wrapped Wood Floor	A pattern that simulates wooden-plank style patterns, such as floorboards, based on a replication scheme.

Reflectance shaders

Reflectance shaders define how much light is reflected by the surface towards the eye position. The result depends on the material properties of the surface, the lighting that illuminates the surface, and the environment that surrounds the surface.

Reflectance shaders can be thought of as defining a surface's 'finish', and are used to model properties such as matte, metal, and plastic. For example, the Copper shader simulates copper by having metallic properties with preset attribute values for copper.

The following reflectance shaders are available.

Aluminium	Simulates aluminium. Based on the Conductor shader, with the Refraction and Absorption values for aluminium.
Blurred Conductor	A metallic effect that supports reflection and also blurring of reflected images.
Blurred Dielectric	A glass-like effect that supports reflection and refraction. Blurred Dielectric also supports blurring of reflected and refracted images.
Blurred Glass	A blurred glass effect that resembles frosted glass.
Blurred Mirror	A blurred mirror-like effect using ray tracing that supports reflection and blurring.
Chrome 2D	A chrome-like effect suitable for shiny or highly, polished chrome-like materials.
Chromium	Simulates chromium. Based on the Conductor shader, with the Refraction and Absorption values for chromium.
Cobalt	Simulates cobalt (a silvery-white metallic element). Based on the Conductor shader with the Refraction and Absorption values for cobalt.
Conductor	Used for accurate simulation of metallic surface finishes, supporting secondary mirrored views through ray tracing. The Refraction and Absorption attributes are constant values; the default values given for the Refraction and Absorption coefficients are those of silver.

Constant	A constant colour, independent of the light falling on the surface.
Copper	Simulates copper. Based on the Conductor shader with the Refraction and Absorption values for copper.
Dielectric	An accurate simulation of glass-like materials which have both reflective and transmissive properties. Note that dielectric and glass materials should be used with solid clumps only. If you use a dielectric or glass material with a mesh clump, you may see unexpected results.
Environment	Provides environment mapping suitable for simulating reflective materials (such as shiny metals) in conjunction with an environment map. For details about environment mapping, see Chapter 19, *Rendering graphics.*
Eye Light Plastic	Creates a glossy plastic-like reflectance with a fixed eye light. This shader ignores all lights in the model and acts as if there is a single eye light.
Glass	Simulates glass-like materials that have both reflective and transmissive properties. Similar to the dielectric shader but with simplified attributes.
Glossy Dielectric	A glass-like dielectric effect that has both reflective and transmissive properties. Secondary mirrored and transmitted views are incorporated by the use of ray tracing.
Glossy Glass	A glass-like effect that has reflective, refraction, and blurring properties. Secondary mirrored and transmitted views are incorporated by the use of ray tracing.
Glossy Metal	A metallic effect that supports reflection and also blurring of reflected images.
Glossy Mirror	A mirror-like effect that has reflective properties. Secondary mirrored views are incorporated by the use of ray tracing.

Gold	Simulates gold. Based on the Conductor shader with the Refraction and Absorption values for gold.
Graphite	Simulates graphite. Based on the Conductor shader with the Refraction and Absorption values for graphite.
Lit Appearance	A shiny, mirror-like material that illuminates itself. This can be useful for simulating self-lit surfaces such as a backlit glass sign or a computer screen.
Matte	A dull matte-like reflectance suitable for non-glossy materials such as brick or fabric (the default).
Mercury	Simulates mercury. Based on the Conductor shader with the Refraction and Absorption attributes for mercury.
Metal	A specular metallic appearance suitable for many metallic materials such as steel or brass.
Mirror	A reflectance model that supports secondary mirrored views through ray tracing. Suitable for representing mirror-like, or polished, surface finishes.
Multilayer Paint	Simulates paint surfaces with a base colour, a separate lacquer layer, and optional metallic flakes.
Nickel	Simulates nickel. Based on the Conductor shader with the Refraction and Absorption values for nickel.
Palladium	Simulates palladium (a hard, white metallic element of platinum). Based on the Conductor shader with the Refraction and Absorption values for palladium.

Phong	A reflectance model, conforming to the popular Phong model, that produces a specular affect. The intensity of the effect depends upon the eye position in relation to both the reflecting surface and the position of the light source. This model is suitable for shiny or highly-polished materials such as ceramic or glass.
Plastic	Glossy plastic-like reflectance that provides a specular effect similar to Phong. Suitable for shiny or highly-polished materials such as plastic or varnished surfaces.
Platinum	Simulates platinum. Based on the Conductor shader with the Refraction and Absorption values for platinum.
Shadow Catcher	Creates a transparent effect enabling shadows to fall on hidden geometry.
Silver	Simulates silver. Based on the Conductor shader with the Refraction and Absorption values for silver.
Translucency	Simulates a matte-reflectance translucent surface lit from behind.
Translucent Plastic	Simulates a glossy plastic-like reflectance with translucency.
Tungsten	Simulates tungsten. Based on the Conductor shader with the Refraction and Absorption values for tungsten.

The following wrapped reflectance shaders are available:

Wrapped Anisotropic	Creates a machined surface that has parallel scratches or ridges, such as brushed metal.
Wrapped Circular Anisotropic	Creates a surface with many small areas of concentric rings of scratches or ridges repeated over the surface.
Wrapped Mirror Map	Creates a mirror material for which the reflectance is variable across the surface.

Wrapped Specular Map	Creates a mirror reflecting effect which supports reflection. The specular and mirror factors are determined by image maps.
Wrapped Woven Anisotropic	Creates a wrapped woven pattern to simulate the directional reflectance properties of surfaces consisting of woven threads, such as satin cloth.

Note that glass and dielectric-like materials should be used with solid clumps only. If you use a dielectric or glass material with a mesh clump, you may see unexpected results.

Transparency shaders

The transparency shaders define how transparent or opaque a surface is. They therefore determine how much light is able to pass through the surface.

To see the effects of transparency shaders, select the Transparency check box.

The following table describes the types of solid transparency shaders:

Eroded	An effect of erosion on a surface.
Fractional	A plain, uniform transparency between opaque and transparent.
None	A null transparency shader providing an opaque finish (the default).
Plain	A plain, uniform transparency to enable coloured transparency and translucency to be simulated.

The following wrapped transparency shaders are available:

Wrapped Alpha	A material of variable transparency by wrapping an image.
Wrapped Checker	A simple chequer-board transparency pattern.
Wrapped Grid	A grid pattern with opaque grid lines and transparent grid squares.

Wrapped Image	Image mapping for transparency shading. For consistent results, it is recommended that greyscale images are used wherever possible. Any black areas on a bitmap image can be used as a transparency stencil—ideal for use with scanned images such as trees or people.
Wrapped Mask	Image mapping for variable transparency shading.
Wrapped Stencil	Provides colour stencilling by image mapping.
X Ray	Creates X Ray-like transparency effects of varying strengths which is adjusted by amount of coverage.

Displacement shaders

Use displacement shaders to create a rough or an embossed surface.

Displacement shaders do not change the geometry of the graphic, but the way the surface reacts to light falling upon it.

These shaders are used to represent features that would be difficult, inefficient, or impossible, if conventional modelling techniques were used. For example, you can use the shaders to simulate regular indentations produced by pressed-sheet metal.

To see the effects of displacement shaders, select the Displacement check box.

It is important to note that the displacement shaders increase rendering time and, in some circumstances, you may be able to avoid using them. For example, if you are viewing an object from a distance, such as an exterior view of a building, the scale of the perturbations would be very small. In such cases, it may not be worth using a displacement shader.

For small objects viewed close up, you can simulate the perturbations without the cost of additional rendering time, by using a combination of colour shaders. For more details, see *Displacement effects* on page 484.

Many displacement shaders have an equivalent colour shader to match the pattern. For example, the Oak displacement shader has an equivalent Oak colour shader in which the attributes are preset to give the appearance of Oak wood. To obtain the best results when using matching shaders, ensure that you set the size and scale of the pattern to be the same in both shaders.

The following solid displacement shaders are available.

Birch	A carved, wood pattern that resembles birch wood.
Blue Marble	A raised pattern with the appearance of blue marble.
Casting	An irregular casting pattern of displacements and indentations upon those displacements.
Cherry	A carved, wood pattern that resembles cherry wood.
Cubes	A three-dimensional lattice of cubes with alternating heights.
Granite	A raised pattern that resembles granite.
Leather	A raised, leather-like textured pattern.
Link to Colour	A displacement pattern for the currently selected colour shader.
Maple	A carved, wood pattern that resembles maple wood.
Marble	A raised, veined pattern with the appearance of marble.
None	No displacement (the default).
Oak	A carved, wood pattern that resembles oak wood.
Paving	A raised pattern with the appearance of crazy paving.
Pine	A carved, wood pattern that resembles pine wood.
Rough	A rough, cast metal-like finish.
Simple Wood	A carved wood pattern with concentric rings of different heights. The wood grain is based on a tree trunk centred on a specified axis.
Solid Clouds	A raised, cloudy pattern.
Solid Polka	A pattern of raised or sunken spheres embedded in a plain matrix. Slices through the matrix have a polka-dot appearance.
Turbulent	A raised pattern that resembles smoky or patchy fog.

Undulate	An undulating surface pattern.
Wood	A carved wood pattern that simulates the wood patterns inside a tree trunk, with concentric rings of different heights.

The following wrapped displacement shaders are available.

Wrapped Birch Floor	A raised birch, wooden plank pattern.
Wrapped Brick	A simple raised brick pattern.
Wrapped Brick Bonds	A raised, complex brick pattern with a choice of different brick bonding patterns.
Wrapped Bump Map	A bump map from an image file. For consistent results, it is recommended that greyscale images are used wherever possible.
Wrapped Checker	A raised checker pattern.
Wrapped Cherry Floor	A raised cherry, wooden plank pattern.
Wrapped Diagonal	A simple raised striped pattern.
Wrapped Dimple	A regular dimpled pattern.
Wrapped Grid	A raised grid pattern.
Wrapped Height Map	A raised displacement by wrapping an image.
Wrapped Knurl	A knurled pattern similar to grips used on tool handles.
Wrapped Leather	A raised, wrapped leather-like textured pattern.
Wrapped Maple Floor	A raised maple, wooden plank pattern.
Wrapped Oak Floor	A raised oak, wooden plank pattern.
Wrapped Pine Floor	A raised pine, wooden plank pattern.
Wrapped Polka	A raised, wrapped polka-dot pattern.
Wrapped Ripple	A concentric, rippled effect in texture coordinates.

Wrapped Roof Shingles	A raised, roof shingles pattern.
Wrapped Roof Tiles	A raised, sophisticated roof tile pattern.
Wrapped Rough	A rough, cast metal-like finish.
Wrapped S Stripe	A simple raised, striped pattern in constant *s* in texture space.
Wrapped T Stripe	A simple raised, striped pattern in constant *t* in texture space.
Wrapped Textured Brick	A raised, complex brick pattern.
Wrapped Tread Plate	A tread-plate pattern of cylinders with rounded ends producing above the surface.
Wrapped Wood Floor	A raised pattern that simulates wooden plank style patterns, such as floorboards, based on a replication scheme.

Texture space shaders

Texture space shaders are a little different to the other shaders since their contribution to the material is less obvious.

Texture space shaders are used to wrap the effect of the other material shader types, (colour, reflectance, transparency, and displacement) onto the geometry. They do this by defining a two dimensional coordinate system, or texture space within which ‘wrapped’ shaders operate.

Note that the names of wrapped shaders all begin with ‘Wrapped’ in MicroGDS. Shaders that have names that do not begin with ‘Wrapped’ are not affected by texture space shaders.

For more details about how texture-space shaders contribute to the material, and how to use them, refer to Help.

The following texture space shaders are available.

Arbitrary Plane	Maps all points onto a plane of arbitrary origin and orientation. Allows asymmetric scaling of textures. By default, it is identical to the Object Z Plane texture space shader.
Auto Axis	Selects one of the three global axes (X, Y, or Z) whose plane is most-closely aligned with the surface at each point.
Auto Directed Plane	Maps along the normal vector of the face to which the material is assigned. The orientation of the texture depends on which way the face normal points.
Auto Plane	Maps along the normal vector of the face to which the material is assigned. The orientation of the texture depends on which side you are looking at it from.
Cylindrical	Maps all points in space on to a cylinder. Allows asymmetric scaling of textures around and along the axis of the cylinder.
Object Axis	Selects one of the three local object axes whose plane is most-closely aligned with the surface at each point.
Object X Plane	Maps all points in space onto a plane of constant X in local, object coordinates.
Object XY Axes	Selects the X or Y object axis whose plane is most-closely aligned with the surface at each point. The Z axis is ignored.
Object Y Plane	Maps all points in space onto a plane of constant Y in local, object coordinates.
Object Z Plane	Maps all points in space onto a plane of constant Z in local, object coordinates.
Spherical	Maps all points in space on to a sphere. Allows asymmetric scaling of textures around the sphere in latitudinal and longitudinal directions.

Adding a material

You can add new materials to make them available in your document. When you add a material, it immediately becomes current and any selected clumps are assigned that material. Any new clumps you create are also assigned the current material.

Note that if you open a document in which there are missing materials, for example, if they have been deleted, MicroGDS reports the error conditions to the Problems dialog box. You can use the dialog box to correct the errors by:

- changing the styles and fonts folder
- editing the style search path
- adding new materials

▶ To add a material using the Document Organizer

1 Click the Styles tab on the Document Organizer, and then double-click the Materials category.

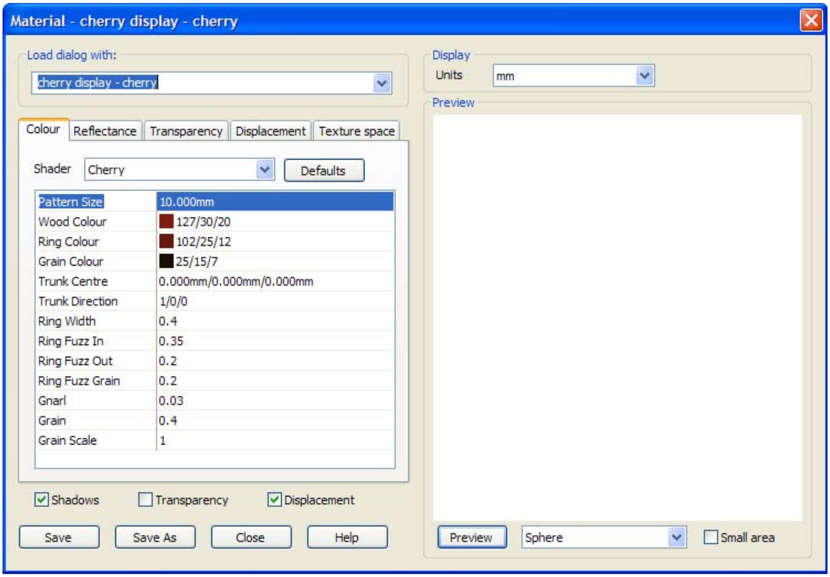
2 Do one of the following:

   - to create a new material based on DEFAULT, select the Materials category and then, on the shortcut menu, click New.
   - to create a new material based on an existing style, select the material on which to base the new style from the required location and then, on the shortcut menu, click New based upon.
   - to modify an existing material, double-click the material to modify, or on the shortcut menu, click Edit.

     If you want to edit a material referenced in a style file, you can open the style file for editing, using the shortcut menu.

   The Material dialog box is displayed. Each tab on the dialog box shows the characteristics of a type of shader.

For example:



In MicroGDS Entry Level, the Define Colour dialog box is displayed in place of the Material dialog box. For details about materials in MicroGDS Entry Level, see Chapter 11, *Working with materials* in Part One: *Working with MicroGDS 11*.

3 For each of the five shader types, click the shader you require from the Shader list.

4 If you want to modify the attributes of the chosen shader, click the attribute and modify the setting as required.

Note that the Display Units setting determines how to show and interpret the measurements you give on the dialog box.

For details about the attributes for each shader, refer to Help.

You can reset shaders to their default settings by clicking the Defaults button.

5 To see the material in the preview area, click Preview.

You can speed up the rendered preview by selecting the Small area check box.

For more information about the preview area, see the following subsection *Previewing a material*.

6 Enable or disable shadows, displacement, or transparency, by selecting or clearing the appropriate check boxes at the bottom of any tabbed property sheet.

Note that, by default, all materials cast shadows from lightstyles that support shadows. Select the Shadows check box to enable shadowing. Clear the check box to disable shadowing, for example for translucent materials especially one where the light source casts soft shadows.

7 When you are happy with the shaders and their attributes, save the material:

- to save the material with the existing name, click Save
- to save the material with a new name, click Save As, type the name in the Style Name dialog box and click OK

The name must comply with the MicroGDS naming rules. You cannot use the name DEFAULT.

The named material is made current and its name is shown in the Mat box on the status toolbar.

▶ **To add a material using commands**

1 Deselect all graphics.

2 From the Mat list on the status toolbar, select the material on which you want to base your new material.

3 On the Styles menu, click Material Modify.

4 Specify the material and then save the material, as described from step 5 above.

Previewing a material

When you are defining a material, you can preview it. You can view the material using a choice of geometric shapes. These include Cube, Cylinder, Sphere, and Cube & Polygon. Alternatively, you can look at the preview using the selected primitives in the current view (which are adjusted by applying a Zoom to Selection).

Note that MicroGDS renders the image in the preview window using the Good Image quality.

▶ **To preview a material**

1 If required, select the Small area check box on the Material dialog box.

2 Select the graphics with which to preview the material from the list.

The graphics you select from the list are also used when you preview materials in the Document Organizer.

3 Click Preview.

If you have made changes to the material, the preview is updated.

You can also double-click the preview area to update the preview. The view is updated whether or not there have been any changes.

Where materials are stored

In single-user documents, new materials are stored in the document (the MAN file). They are saved when you save the document. You can delete any local material that is not in use in the current document. You cannot delete materials from a referenced MATLS.STY file.

In multi-user projects, new materials are stored in an external style file (MATLS.STY). A material is saved in the actual style file as soon as you save the style, even if you do not save project. You can delete any material from the local style file in the project. Note that MicroGDS does not check to see if the material is used in other window definitions in the project.

For details about changing, modifying, and deleting materials, see Chapter 11, *Working with materials* in Part One: *Working with MicroGDS 11*.

For details about working with multi-user projects, see Chapter 16, *Multi-user projects*.

Rendering a scene

When you have added or modified a material, you can render the scene to see the effects.

▶ **To render the scene in the current window definition**

1 On the Window menu, click View Parameters and select the projection you require.

2 Use the commands on the View menu to set up the view to be rendered.

3 To create an environment around your rendered graphics, on the Render menu, click Edit Environment, then choose the shaders you require.

4 To select rendering options, on the Render menu, click Options and then select the settings you require.

To use radiosity and global illumination, select the appropriate check box and then set up the level of detail you require.

5 On the Render Options dialog box, click Render Now.

For further details, see Chapter 19, *Rendering graphics*.

You can also use the Hide Mode, Shaded and Shade with Edges commands on the View menu to preview your image using a shaded view. Note that the shaded views do not take into account many of the more sophisticated material attributes. For more details, see Chapter 9, *Working in 3D* in Part One: *Working with MicroGDS 11*.

Tips and techniques

Metal-based materials

You can use the Conductor reflectance shader, and the related shaders such as Copper, Gold, and Nickel, to define metal-like materials.

These shaders use a physically-accurate model of the behaviour of metal substances. In doing so they propagate a reflected ray to calculate the part of the geometry or background that appears reflected in the metal-like geometry. This provides very accurate reflections and is necessary for small-scale, highly-reflective, metal-like objects.

A simpler method, however, is to use Chrome 2D (for very shiny metals), Metal, or Phong (for duller metals) reflectance shaders. These do not reflect other parts of the scene but they do provide specular highlights, thereby simulating the behaviour of metal.

Mirror-like materials

Highly reflective materials other than metals and mirrors, such as varnished wooden surfaces, use the Mirror reflectance shader. By default, this shader has the properties of a mirror and, in most cases, is too highly reflective.

To allow the underlying colour, such as the wood, to be visible, you should decrease the Mirror Factor and increase the Diffuse Factor. The actual values used depend on the lighting conditions, but a Mirror Factor of 0.1 to 0.3, and a Diffuse Factor of 0.5 to 0.7 are useful starting values.

If your lighting includes an Ambient Light, you can also increase the Ambient Factor. This gives the reflective surface a flat appearance and reduces the effect of any shadows cast upon it.

Lighting-independent materials

You can use the Constant reflectance shader to make the colour of a material independent of the current lighting conditions. This is useful for simulating the presence of lights, such as light bulbs, and for ensuring that some geometry is permanently visible, such as image backdrops.

Displacement effects

Although the displacement shaders can model small surface perturbations on existing graphics, their use increases rendering time. In some circumstances, you can use a combination of colour shaders to simulate a displacement effect instead.

For example, to model a sandstone material, you could use a combination of a Plain colour shader with a sandstone colour, and a Rough or Wrapped Rough displacement shader. The effect appears as points of brighter and darker shades of the sandstone colour where the perturbations are lit less or more than the original surface would have been.

However, you can produce a similar effect by using the Wrapped Random colour shader which creates a random pattern between two defined colours. Therefore, by defining the first colour attribute as slightly brighter than the intended sandstone colour, and the second colour attribute as darker, a rough appearance can be achieved without the rendering overhead of the displacement shader. This solution would be suitable for objects viewed from a distance, but is unlikely to be suitable for small objects viewed close up.

Glossary

3DS file
3D Studio file format. 3D Studio is a registered trademark of Autodesk, Inc.

AIF
AIF (ASCII Interchange Format) is a type of drawing file format output by the GDS CAD system. An AIF file contains objects with lines and text in named styles, and attributes. MicroGDS can read and write AIF files.

GDS is a product of Graphic Data Systems, Corp.

alias
An alias is a reference to a physical disk location. Aliases are used to map the locations of objects, such as instance objects, and raster files, to arbitrary names. An alias name is a name given to a folder so that the path to that folder does not have to be specified in full.

aliasing
A ‘jagged’ effect sometimes visible when straight lines or edges are rendered as discrete pixels. Near-horizontal and near-vertical lines are particularly prone to this effect.

anti-aliasing
Techniques used to prevent or reduce aliasing.

assembly object
An assembly object is a collection of other objects that can be used and manipulated as a group. An assembly object does not contain any primitives of its own.

attribute
An attribute is non-graphical information that can be attached to primitives objects in a document, such as colour, cost, name of supplier, and so on. This information can be assigned and read by the user.

axes
The axes are made up of an X axis, a Y axis, and a Z axis, each of the three being normal to the plane formed by the other two. The origin of the axes is the point at which the axes meet. Coordinates are measured from the origin.

Many MicroGDS commands use the axes to draw and place graphics.

background
Those regions of an image that are not covered by any of the geometric primitives in the renderer geometry. The shading of such pixels is controlled by the current background shader.

background shader
The shader that calculates the colour of background pixels (those pixels not covered by geometry). The colour is usually derived from the location of the pixel in image space.

BIF
BIF (Binary Interchange Format) is a type of drawing file format output by the GDS CAD system. Because BIF is a binary format, some computers have different types of BIF files. MicroGDS can read and write BIF files from GDS host computers, but there are some limitations with VMS.

BIM
BIM (Building Information Modelling) is the process of generating and managing building data during its life cycle. MicroGDS incorporates this process to increase productivity in building design and construction.

bitmap
A bitmap is an image made up of pixels, stored as a collection of bits. In monochrome, each bit corresponds to one pixel, but on colour systems, more than one bit corresponds to each pixel. A bitmap can store colours in various formats, for example, there are monochrome bitmaps, 16 colour bitmaps, and 256 colour bitmaps. A bitmap usually has the file extension .BMP.

MicroGDS can read and write BMP image files.

brighten shader
An environment shader used to tweak the brightness of the rendered image.

CAD vector fonts

MicroGDS CAD vector fonts are character fonts made up of lines. Text that is displayed in a vector font can be scaled, rotated, and drawn in perspective.

You can convert CAD vector fonts to lines using the Text, Burn In command on the Alter menu.

You can create simple CAD Vector 6 fonts from basic line primitives. You can create far more complex CAD Vector 7 fonts by saving the graphics to CV7 format.

CAD vector 6 font files have the extension .CV6; CAD vector 7 font files have the extension .CV7.

charstyle

A charstyle defines the font and size in which text is drawn. You make charstyles available to a document by adding them using the File Charstyle Modify command. The name of the current charstyle is displayed in the Char box on a status toolbar. The current charstyle is applied to new text. You change the current charstyle using the status toolbar, or the Set Charstyle command.

Clipboard

The Clipboard is a temporary storage area in the computer's memory for data, which is controlled by Windows. Any application can copy data into the Clipboard, and this data can then be pasted into any other Windows application.

clump

All 3D geometry is held in 'clump' format. A clump is a primitive that comprises one or more faces. Clumps are created using the commands on the Solid menu.

colour-error diffusion

A method of displaying images of one colour resolution at a lower colour resolution. Although slower than 'dithering' it can produce more acceptable results.

colour resolution

The range of brightness and colour values that a display can show or that an image format can represent.

colour shader
A material shader that defines the colour of a point on the surface of a primitive. It can be as simple as a plain colour which is applied to all points on the surface with uniform intensity, or it may define a complex pattern such as wood or marble.

conductor
A material that conducts. All metals are conductors. Their opposites, non-conductors such as plastic or glass, are called dielectrics. In MicroGDS, conductor and dielectric are used to categorize how certain materials interact with light.

current axes
The current axes define:

- the origin from which absolute coordinates are measured
- the rotation at which graphics are drawn
- the scale at which graphics are drawn, and at which measurements are reported

current layer
The current layer is the layer on which new objects are added. When you create a new layer it becomes the current layer. You can make any other layer the current layer by double-clicking an editable phase by which it is referenced.

current object
The current object is the object to which new primitives are added. When you start a new object it becomes the current object. You can make any other object the current object by selecting it.

current position
The current position is either the last snapped position or the last point entity hovered over. The location of the current position is indicated by a small circle. It is from this point that relative coordinates are measured.

cutter
A cutter is a MicroGDS line primitive or clump primitive that is used to punch a hole through solid clump primitives. The cutter itself is removed from the resulting clump.

data source
The data source is used to point to the place where the data in an external database is stored. The specification of a data source depends on the selected provider.

DDE
DDE (Dynamic Data Exchange) is a Windows convention for linking data between applications. Links between the source and the destination programs are set up, so that when the data is modified by one program, it can be automatically updated in the other.

depth cueing
A technique for enhancing the depth information in an image (see *foreground shader*).

dielectric
See *conductor.*

diffuse reflection
A mode of light obeying Lambert's Law, which states that light striking a surface is scattered with equal intensity in all directions, that intensity being proportional to the angle of the incident light. Surfaces where the diffuse term is dominant have a matte appearance.

displacement shader
A material shader that simulates the effects of small surface perturbations. It is also known as 'bump mapping'.

dithering
Dithering is a method used to increase the colour depth on video monitors with limited colours.

document
In MicroGDS, a document is a single-user document or a multi-user project. A document has a unique file name by which it can be retrieved. By default, a single-user document has the extension .MAN; a multi-user document has the extension .CPJ.

You can also work with other types of documents in MicroGDS. For example, style documents, template documents, and font documents. You can use and reference any of these documents within your MicroGDS documents.

drawing
The term drawing is used in MicroGDS in a general sense. That is, it describes a piece of paper on screen which has lines and text drawn on it.

drawing origin
The drawing origin is the position on your drawing sheet that you use as a point of reference. You can change the drawing origin using the Document Properties command on the File menu. You can set the axes so that their origin is at the drawing origin.

drawing sheet
The drawing sheet is the area on which you can draw in MicroGDS. It has a fixed paper size of 100,000 km square, at a scale of 1:1.

drawingstyle
A drawing style is a window–based schema that contains attributes and a reference to a .NET assembly. The drawing style is associated with a specific view and can be used to control the appearance of an object.

DWF
DWF (Drawing Web Format) are compact format files developed by Autodesk for publishing CAD data on the web.

MicroGDS can read and write DWF files.

DWG
DWG (Drawing Web Format) files are the native file format for AutoCAD™.

Autodesk have not fully documented DWG format, therefore, Informatix cannot guarantee the MicroGDS DWG translators. DWG files basically contain everything in the drawing that are put in a MAN file in MicroGDS.

You can publish MicroGDS drawings to DWG format.

AutoCAD is a product of Autodesk, Inc.

DXF
DXF (Drawing eXchange Format) is a CAD data file format developed by Autodesk for enabling data interoperability between AutoCAD™ and other programs. MicroGDS can read and write DXF files.

AutoCAD is a product of Autodesk, Inc.

editable
Graphics are editable if the phase in which they are displayed has an editing status of Editable, and if there are no editing restrictions.

EMF
Enhanced Metafile (EMF) are image files that provide true device independence.

You can think of the picture stored in an enhanced Metafile as a 'snapshot' of the screen taken at a particular moment. This snapshot maintains its dimensions no matter where it appears on a printer, a plotter, the desktop, or in the client area of any application.

You can publish MicroGDS drawings to EMF format.

environment map
A render library entity that supports environment mapping. Environment maps are composed of six separate images, each representing one of the six orthogonal directions in world space.

environment mapping
Also known as reflection mapping, this is a technique that creates an illusion of mirror-like reflections on the surface of objects. It can simulate either the reflections of a surrounding environment lying at some remote distance from the objects being rendered, or inter-object reflections.

EPix
EPix is an Extended PIXel format file containing depth, colour, and material information for each image pixel. You can use EPix files with Piranesi™ to paint in 3D. Piranesi is a product of Informatix Inc.

exposure shader
An environment shader that specifies an optional auto-exposure method to fit the brightness to the screen or file limits.

eye position
The eye position is the observer's position in space. The eye position and look-at point together define the direction of viewing across the scene (the line of sight).

facet
A facet is a straight-line segment or face used to draw a portion of a curved path or surface. You specify the number of facets to be created.

final gather
Final gather adds a final stage of lighting, where each visible surface pixel casts out rays to other surfaces (which have been lit). The diffuse light from those end-of-ray patches becomes the gathered diffuse lighting for the surface pixel. The calculation of lighting values is restricted to visible points in the image.

foreground shader
An environment shader used to simulate atmospheric effects such as fog and depth cueing.

global illumination
A term for rendering with light processed for the whole model, rather than just the visible pixels. Global illumination deals with the reflection and re-reflection of diffuse light. This produces soft lighting and generation ambience. Global illumination encompasses the radiosity and final gather technologies.

hittable
Graphics are hittable if the phase in which they are displayed has an editing status of Hittable; or if the phase has an editing status of Editable and there are editing restrictions.

hook point
An object's hook point can be thought of as the 'handle' of the object and can be used, for example, to pick up and place the object at an exact point in the window definition.

hover tip
An information box that pops up when an item is being hovered over. Details about the hovered over item are shown in the information box.

inclusion list
An inclusion list is a list of object names (often containing wildcards). Every phase in a document can have an inclusion list, which is a list of objects that can be seen in the phase. Inclusion lists are a means of sub-dividing detail on a layer and showing it in different phases.

instance object
An instance object is a reference to an object in another document. An instance object does not contain graphics of its own in the current document, but is linked to the original object in the document in which it is stored.

JPEG
JPEG (Joint Photographic Experts Group) (or JPG) is the name of the committee that designed the standard image compression algorithm. JPEG is designed for compressing digital images of ‘natural’, real-world scenes.

MicroGDS can read and write JPEG image files.

layer
Graphical data is stored on a series of layers in a document. A layer holds objects and attributes. A window definition references graphics on a layer.

In a single-user document, layers are stored in the MAN file; in a multi–user project, layers are stored in separate LYR files.

lightstyle
A lightstyle defines the type of light an object casts. You make lightstyles available to a document by adding them using the File Lightstyle Modify command. The name of the current lightstyle is displayed in the Light box on a status toolbar. The current lightstyle is applied to new clumps.

You change the current lightstyle using the status toolbar, or the Set Lightstyle command. Most objects do not act as lights, and do not have lightstyles assigned to them.

line of sight
The line of sight is the line between the observer’s position in space (the eye position), and the point at which the observer is looking (the look-at point), in a 3D view.

line primitive
A line primitive is a joined up string of vertices. The vertices can be joined up with straight lines or circular arcs. Every line primitive has a linestyle which determines what the line looks like.

linestyle
A linestyle is made up of strokes. Each stroke can define the thickness, the fill, or pattern in which lines are drawn. You make linestyles available to a document by adding them using the File, Linestyle Modify command. The name of the current linestyle is displayed in the Line box on a status toolbar. The current linestyle is applied to new primitives. You change the current linestyle using the status toolbar, or the Set Linestyle command.

link number
A unique identifier assigned to every primitive, object, and layer.

look-at point
The look-at point is the point at which the observer is looking. The eye position and look-at point together define the direction of viewing across the scene.

MAN file
A MAN file stores all the graphics and related data for a MicroGDS single-user document. Local styles can be stored in the MAN file. (Styles can also be accessed from external style files.) A MAN file can be opened only by one person at a time.

material
A material defines the surface appearance of clumps. You make materials available to a document by adding them using the File Material Modify command. The name of the current material is displayed in the Mat box on a status toolbar. The current material is applied to new clumps. You change the current material using the status toolbar, or the Set Material commands.

mnemonic
A mnemonic defines the type of data that an attribute will store. Attributes are non-graphical information associated with items in a document.

MOV file
A MOV file is a QuickTime Object or Panorama Movie file. MOV files created in MicroGDS can be viewed using QuickTime Movie players version 3.0 or later.

QuickTime is a product of Apple Computer, Inc.

multi-user

Multi-user in MicroGDS is based on a system of projects. The drawing data is stored in a separate file for each layer (LYR files). Users open window definitions (WND files), which access the layer files. Each user can have one or more window definitions open at a time.

name assistants

Name assistants use configuration files to define the naming conventions for object names and layer names. You can use your user preferences to specify whether the name assistants suggest or enforce the conventions defined in the file, as required.

normal axes

The normal axes are the default axes when you create a new document. The scale is set to 1, and the angle is set to 0. Their position represents the drawing origin, unless it is moved. The point is 0 on the X, Y and Z axes (coordinates 0/0/0) and is the point from which the coordinates are measured.

object

In its simplest form, an object is a collection of graphics. In MicroGDS, there are several types of objects:

- plain objects which contain only primitives
- intelligent objects which can contain line primitives and attribute data, or just attribute data
- instance objects which do not contain graphics of their own, but have a link to a source object in the document in which they are stored
- assembly objects which can contain plain objects, instance objects, and other assembly objects

Each object has a name and a set of axes associated with it. An object is held totally on one layer.

object axes

Each object has its own set of object axes. When you create a new object, you place the origin. The origin defines the object's hook point. The rotation and scale of the set axes defines the initial rotation and scale of the object axes.

objectstyle

An objectstyle defines a set of attributes that describe the intelligence of an object. Each attribute defines a property of the object, such as the thickness or material of a wall layer.

The objectstyle of an object is shown on the Properties window. To change the objectstyle that is assigned to an object, select the object and then select the objectstyle from the list.

OLE

An OLE object is an ‘Object Linked or Embedded’ object. You use linked and embedded objects to share information between Windows programs.

You can use a linked object or an embedded object to add data, created in any program that supports linked and embedded objects, to a file in another application. For example, you can embed or link MicroGDS graphics or views in other applications. Similarly, you can embed or link data from other applications in MicroGDS documents with the Paste Special command.

path

A path is a section of a line primitive. To define a path, you specify two positions on the primitive. If the primitive is closed, MicroGDS finds the shortest route between the points along the primitive.

PDF

PDF (Portable Document Format) is an open file format created by Adobe Systems. PDF is used for representing two-dimensional documents in a device independent and resolution independent fixed-layout document format.

Adobe is either a registered trademark or trademark of Adobe Systems Incorporated in the United States and/or other countries.

MicroGDS can publish drawings to PDF format.

phase

A phase is a view onto a layer. It defines the editing status of the objects on a layer, and the colour in which they are shown.

You can specify which graphics on the layer are included in the phase. You can also define overrides that display all graphics referenced in a phase in a particular linestyle, charstyle, or strength.

photo primitive

A photo primitive is a ‘snapshot’ of the graphics in one window definition that are displayed within another window definition.

The link from the photo primitive to the window definition is live. Therefore, if the graphics in the window definition are modified, the photo contents are immediately updated with the change.

You can convert photo primitives to lines using the Photo, Burn In command on the Alter menu.

pixel

Images and displays are composed of arrays of pixels, which are rectangular ‘picture elements’ (hence the name). In a monochrome image, each pixel has an ‘on’ or ‘off’ state. Pixel values for colour images are represented by RGB (red, green, blue) values.

PNG

Portable network graphics (PNG) is an extensible file format for the lossless, portable, well-compressed storage of raster images. Indexed-colour, greyscale, and true-colour images are supported, plus an optional alpha channel and gamma information.

MicroGDS can read and write PNG image files.

policy

A policy defines a setting that cannot be edited. Any MicroGDS setting at any level can be defined as policy. If a value is given to that setting later in the search list, it will not alter the value for that setting and will be ignored. For example, if a policy is set which defines the location of your font files at domain level, any location later set at job or user level is ignored.

primitive

A primitive is a graphics item such as a line or an item of text. Primitives are grouped together into objects. A primitive can be part of only one object.

principal window

The principal window is a window definition in a single-user document (usually, a MAN file). It is the window definition MicroGDS displays when the document is opened.

By default, the principal window is the first window definition created in a document. You can designate another window definition to be the principal window, using the Document Organizer.

print layout

A print layout shows how the graphics will look when you print the window definition. You can set a paper size, orientation, and margins to be used for the layout. You can also draw and edit the graphics in a print layout view.

procedural shader

A procedural shader is a shader that is generated by repeating a defined pattern, such as bricks or dots.

profile

A profile defines the look-and-feel of the MicroGDS workspace. You can create and load profiles to suit different methods of working. For example, you might have one profile that loads a set of 2D drawing tools and hides all 3D related items and another that is specifically 3D based.

project

A project in MicroGDS is the entire set of files relating to a project. This includes the project database, all project workspaces referring to the project database, all window definitions using data identified by the project database, and all layer files.

project database

The database used by a project to locate the project's data. A single project database can be shared by several project workspaces.

project template

A project template is a pre-defined set of parameters that can be used when setting up new projects. Templates provide a database structure, and can create aliases, layers, window definitions, raster files, and instance object libraries for you. It can also define the style search path.

project workspace

The project workspace is the file opened in order to work with data in a multi-user project. The project workspace defines the project database to be used, the layers within the project that are editable, and various configuration options.

provider
A database provider is the name that identifies a particular OLE DB plug-in used to access data in a specific type of database. For example, Microsoft.OLEDB.Jet.4.0 is used to access data in a Microsoft Access database.

radiosity
A physical solution to the inter-reflection of light (radiant energy) which divides modelled faces into triangles. Light from the primary light sources is shot from the sources to all triangles that it can reach without being blocked. Each triangle then re-radiates its diffuse reflected light. The process repeats and iterates towards a solution.

raster
A raster file is an image file composed of an array of pixels (a bitmap). Raster files can be inserted into a MicroGDS document.

ray tracing
A rendering technique in which the colours are computed by tracing imaginary rays of light through a scene. It can be used to create photo-realistic rendering effects, such as mirror reflections and refractions.

reflectance shader
A material shader which models the interaction of light with a surface, and in particular, how much light is reflected towards the viewer. A reflectance shader can be thought of as defining the ‘finish’ of a surface. Reflectance shaders can be used to model the reflectance properties that simulate the effects of a surface which is composed of specific types of material, such as plastic or metal.

refraction
The change in direction of light as it crosses the boundary between two transmitting media.

rendering
The complete process of producing an image from a model. This comprises two major stages: visibility determination and shading.

scale
The current scale is the scale at which you are drawing. You set this by selecting from the Scale list on a status toolbar, or typing in the box.

When you create a new object, MicroGDS stores the scale at which it was drawn. You can use the Measure commands to measure the real world size of objects, and their size at the set scale. You can change the object scale using the Object Scale command.

schema

A schema indicates which layers, objects, and windows the specified mnemonics are intended to be used with.

Mnemonics for graphics-based attributes that are referenced by a schema are shown in the Properties window for the selected graphics, and in the Window Editor for window-level mnemonics.

segment

A line segment is the section of line that lies between two vertices. It can be straight or curved; a curved segment cannot span more than 180 degrees.

settings files

The settings files store all the parameters related to the set-up of your MicroGDS system. For example, the frequency of automatic backups is stored here. You define many settings using the File Preferences command. Further files may then be read which may make changes to the appearance and behaviour of MicroGDS.

shader

A shader is a function that calculates some aspect of the rendering environment. Shaders are categorised into the classes to which they are applicable, for example, Background shader, Material Reflectance shader.

shading

Part of the rendering process that calculates the colour and intensity of a pixel.

single-user document

In single-user documents all the drawing data is stored in a single file, usually in a MAN file. Styles, window definitions, and colours are stored in the file. Styles can also be accessed from external style files. A single-user document can be opened only by one person at a time.

SKP files
SKP format files are produced from SketchUp drawings. You can open and import SKP files in MicroGDS.

SketchUp is a trademark of Google, Inc.

sky shader
An environment shader used to simulate a diffuse light source that represents light from the sun which has been scattered by the atmosphere.

snapcode
MicroGDS uses snapcodes to snap exactly to points on the graphics or to an orthogonal direction.

snap guides
Snap guides are temporary lines that are displayed whenever you are prompted for a position in a command. Snap guides help you position and align graphics more precisely.

split bar
A split bar separates the window into two panes. You can change the size of the panes by dragging the split bar.

style file
A style file is a single-user document saved with a .STY extension. Style files enable users to share styles across different documents.

sun shader
An environment shader used to simulate a light source that emits light from the sun. The shader modifies the colour of the surface of each pixel to produce an atmospheric scene.

SVG
SVG is a vector file format and web development language based on XML. Graphics saved to SVG file format can be zoomed and scaled without loss of quality across various platforms and devices.

You need an SVG Viewer to view SVG graphics.

SVG file format was created in cooperation of the World Wide Web Consortium(W3C) and its members.

You can publish MicroGDS drawings to SVG format.

TARGA (or TGA)
An image format for bitmap images, using 24 bits per pixel, developed by Truevision Inc.

You can insert TGA images into MicroGDS as raster files.

template
A template can automatically create graphics and styles in a new document. For example, a template could include a standard frame, or a company logo. Templates are stored in MTF files.

text primitive
A text primitive is a block of text. A text primitive has a charstyle and a justification point. If you change the size of a text primitive, it changes size about its justification point. There are nine possible justification points positioned in a 3 by 3 grid around the text.

texture mapping
A technique for rendering fine surface details on an object without explicitly modelling the geometry. A two-dimensional image (a texture map) is projected onto the surface of an object. Texture maps can be either a procedurally-defined function or an image (scanned or pre-computed). Texture mapping makes use of both texture space shaders and colour shaders.

texture space
A two-dimensional coordinate system used to map a wrapped shader onto the surface of a primitive.

texture space shader
A material shader which defines the texture space to be used by wrapped shaders. Texture space shaders differ from other types of shaders in that they do not directly affect the final intensity of a pixel.

THF file
GDS 3D Things file.
GDS is a product of Graphic Data Systems, Corp.

TIF/TIFF
Tag Image File Format. This is a widely-used, general-purpose data format for the interchange of images.

MicroGDS can read and write TIF image files.

transparency shader

Defines the transparency of a surface and thus how much light can pass through it. Transparency shaders use filters, that define the colour of light passing through the surface; and stencils, which define the presence of this light.

TrueType fonts

TrueType fonts are the scalable fonts supplied by the Windows environment. They are indicated by a symbol in the Font dialog box. MicroGDS can use TrueType fonts as the basis of its charstyles. TrueType fonts provide an excellent method of displaying text if the output device in use is driven through a Windows printer driver.

MicroGDS can also use OpenType fonts, which is an extended version of TrueType, indicated by a symbol in the Font dialog box. OpenType retains TrueType's basic structure but also adds many intricate data structures for prescribing typographic behaviour.

units

MicroGDS can deal with several types of units, both metric and imperial. You select which units you want to use with the Set Units command and you can choose the number of decimal places to which you want numbers displayed. However, no matter how many decimal places are set, MicroGDS stores coordinates internally to 15 significant figures. You can still enter coordinates with more decimal places than you have set.

vertex

A vertex is a point where two line segments join (often, although not always, at a corner), or the point at the end of a line. You can use the **V**ertex snapcode to snap to a vertex.

view

A view comprises the extent of the visible window and the quality settings for that window. There are three types of view—two dimensional, three dimensional, and print layout.

- in a 2D view, you can choose the extents of the normal XY plane you want to see in a rectangular box
- in a 3D view, you can choose the eye position, the look-at point, and the type of projection you want to work with

- in a print layout view, you choose a paper size, orientation, and margins for the layout

You can display more than one view of a particular document. For example, you may want to have two views zoomed into different parts of a window definition. Views onto the same window definition are updated simultaneously.

view extent

The view extent is the current view onto the drawing sheet.

window definition

A window definition provides a view onto the graphical data in a document. It stores information about how the graphical data is presented, such as details of phases and views. You can create multiple window definitions in a document.

You can have several window definitions open at a time. Each window definition can have a zoom bar, scroll bars, and a set of viewing buttons.

In a single-user document, window definitions are stored in the MAN file; in a multi-user project, window definitions are stored in separate WND files.

Windows fonts

Each Windows operating system comes with a number of standard Windows fonts. Fonts are also frequently included with printers and others may be installed as part of a program installation. You can use any Windows font when you create and modify charstyles.

You can convert Windows fonts to lines using the Text, Burn In command on the Alter menu.

WND

A WND file is a saved window definition in a multi-user project. The graphical data is stored in layer files (LYR). The WND file references the graphics in the LYR files.

XML

XML (extensible markup language) is a basic syntax for expressing structure in data. XML can be used on a wide variety of platforms and read by a wide variety of applications.

XML was developed by an XML Working Group formed under the auspices of the World Wide Web Consortium (W3C).

Trademarks and acknowledgements

Trademarks

Microsoft, Windows, Microsoft Vista, Visual Basic and Visual Studio are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

AutoCAD is a product of Autodesk, Inc.

Adobe is either a trademark or registered trademark of Adobe Systems Incorporated in the United States and/or other countries.

3D Studio is a registered trademark of Autodesk, Inc., in the United States and/or other countries.

QuickTime is a trademark of Apple Inc.

LightWorks is a registered trademark of LightWork Design Ltd.

Real World Textures Copyright (c) 1997 John Warburton.

Targa is a trademark of Truevision, Inc.

DWGdirect (c) 2007 by Open Design Alliance Inc. All rights reserved.

Other product names mentioned in this help may be trademarks, and they are used for identification purposes only.

Acknowledgements

Piranesi is from an original concept by Simon Schofield and Paul Richens, at the Martin Centre for Architectural and Urban Studies, Cambridge University, U.K.

The following acknowledgements are for the use of DWGdirect, JPEG, LibTiff, LightWorks, OpenEXR, PNG, and zlib within MicroGDS.

DWGdirect

DWGdirect includes libraries provided by the Freetype Project. DWGdirect can be configured to use the Freetype Project libraries for font rendering and other font-related tasks.

JPEG

MicroGDS is based in part on the work of the Independent JPEG Group. The JPEG library is copyright (c) 1991–1998, Thomas G. Lane.

LibTiff

LightWorks

OpenEXR (DR) Image format

PNG Reference Library

Libpng version 1.0.24 – January 3, 2007

zlib

Index

Numbers

A

B

C

D

F

G

N

O

Q

R

S

W

X

Z