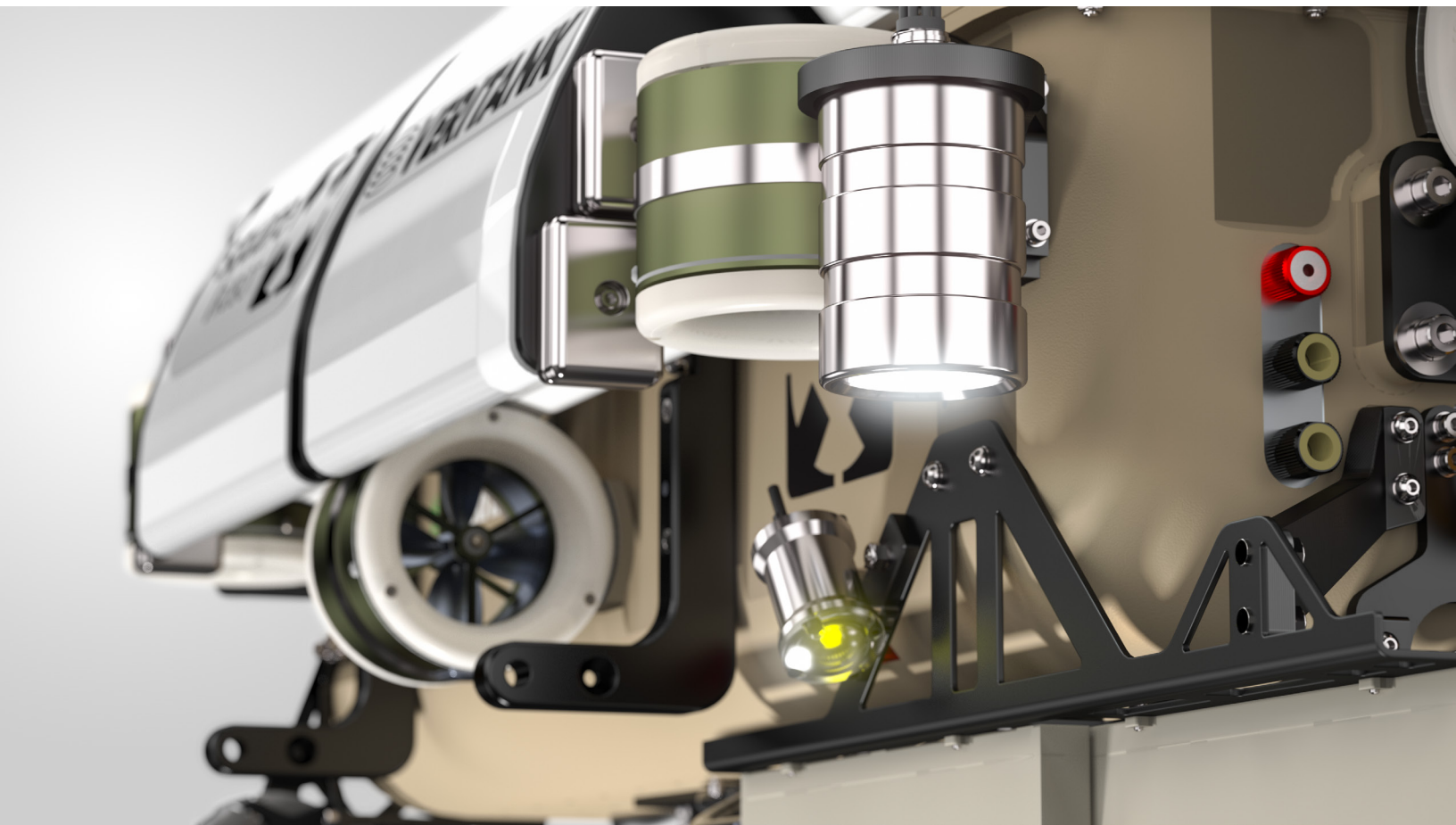


FUNDAMENTALS OF SOLIDWORKS ELECTRICAL

SOLIDWORKS EDUCATION EDITION 2022-2023



ENG

This is a preview of the Fundamentals of SOLIDWORKS Electrical.

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SOLIDWORKS® Education Edition

Fundamentals of SOLIDWORKS Electrical

**To be used with SOLIDWORKS Education Edition
2021-2022 or 2022-2023**

Dassault Systèmes SolidWorks Corporation
175 Wyman Street
Waltham, MA 02451 U.S.A.

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Contents

Introduction

To the Teacher	2
SOLIDWORKS Electrical Tutorials	2
Accessing the SOLIDWORKS Electrical Tutorials	2
My SOLIDWORKS	3
Certification Exams	3
Training Files	3
Educator Resources link	3
Prerequisites	4
Course Design Philosophy	4
Conventions Used in this Book	4
Windows	4
Use of Color	5
Graphics and Graphics Cards	5
Color Schemes	5

**Lesson 1:
Drawing Types**

What are Drawing Types?	8
Drawings	8
Scheme	8
Creating Drawings	9
Stages in the Process	9
Existing and Archived Projects	10
Opening an Existing Project	10
Unarchiving a Project	10
Closing Projects	11
Line Diagram Symbols	12
Adding Symbols	12
Symbols Library	12
Symbol Orientation	15
Adding Cables	18
Schematic Drawing	20
Scheme Best Practices	20
Stages in the Process	21
Symbols Panel	23
Schematic Symbols	24
Symbol Properties	26
Types of Properties	26
Exercise 1: Drawing Types	31

**Lesson 2:
Symbols and Components**

What is a component?	38
Component Identification	38
Component Symbol Identification	39
Stages in the Process	39
Description Columns	43
Symbol Component Association	46
Exercise 2: Symbols and Components	49

**Lesson 3:
Manufacturers Parts**

What are Manufacturers Parts? 54
 Circuits and Terminals 54
 Circuit Association 56
 Stages in the Process 57
 Finding Manufacturer Parts 59
 Search Options 60
 Editing Parts 64
 Circuit Symbols 65
 Circuit Association 67
 Electrical Assemblies 69
 Exercise 3: Manufacturers Parts 73

**Lesson 4:
Insert Components**

Insert Components 78
 Stages in the Process 78
 Align Components 81
 Inserting Terminals 83
 Exercise 4: Insert Components 84

**Lesson 5:
Routing Wires**

Routing Wires 88
 Stages in the Process 88
 Routing Path 91
 Sketch Name 91
 Route Wires 93
 3DSketch Route 93
 Routing Parameters 94
 Wire Sketches 95
 SOLIDWORKS Route 96
 Wire Segregation 97
 Exercise 5: Routing Wires 100

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Introduction

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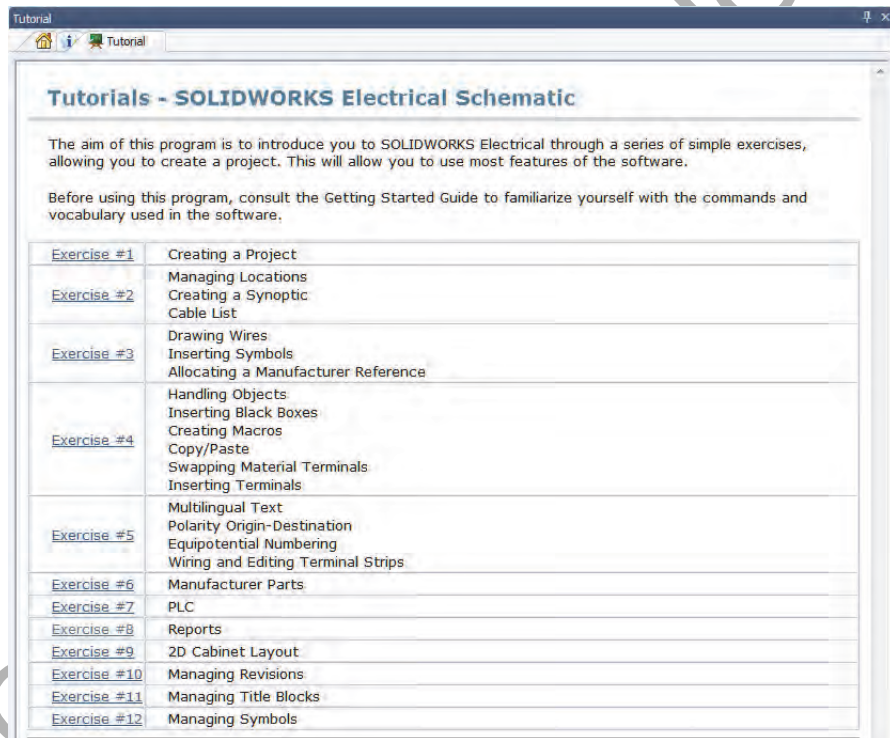
To the Teacher

The *SOLIDWORKS Education Edition - Fundamentals of SOLIDWORKS Electrical* manual is designed to assist you in teaching SOLIDWORKS Electrical in an academic setting. This guide offers a competency-based approach to teaching electrical design concepts and techniques.

Qualified schools on subscription have access to the eBook at no cost to students. Contact your SOLIDWORKS Value Added Reseller to obtain access.

SOLIDWORKS Electrical Tutorials

The *SOLIDWORKS Electrical Education Edition* manual also supplements the SOLIDWORKS Electrical Tutorials.



Accessing the SOLIDWORKS Electrical Tutorials

To start the SOLIDWORKS Electrical Tutorials, click **Help, Tutorial panel**. The Tutorials interface will be activated in the Resources side panel. There are 12 lessons in the SOLIDWORKS Electrical Tutorials, clicking on any of these will display steps and links to PDF and movies that can be reviewed while undertaking the exercises.

My SOLIDWORKS

My.SolidWorks.com is a community website to share, connect, and learn everything about SOLIDWORKS. My SOLIDWORKS learning contains additional video lessons and individual learning paths for your students.

Certification Exams

The Certified SOLIDWORKS Associate (CSWA) - Academic program provides free certification exams for you or your students in a proctored setting. Achieving CSWA proves the fundamentals of engineering design competency. Employers verify students job ready credentials through our online virtual tester. Schools that provide two or more courses in SOLIDWORKS-based instruction can also apply to be a Certified SOLIDWORKS Professional (CSWP) - Academic Provider.

More information and to apply can be found at www.solidworks.com/cswa-academic.


Training Files

A complete set of the various files used throughout the course can be downloaded from the following website:

www.solidworks.com/EDU_FundamentalsSWElectrical

The files are organized by lesson number. The Case Study folder within each lesson contains the files you need when presenting the lessons. The Exercises folder contains any files that are required for doing the laboratory exercises.


Educator Resources link

The **Instructors Curriculum** link on the **SOLIDWORKS Resources**  tab of the Task Pane includes substantial supporting materials to aid in your course presentation. Accessing this page requires a login account for the SOLIDWORKS Customer Portal. These supporting materials afford you flexibility in scope, depth, and presentation.

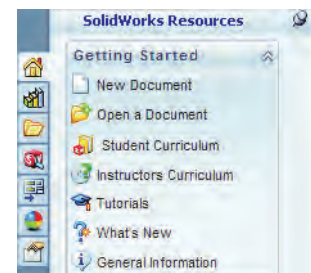
1. Start SOLIDWORKS.

Using the **Start** menu, start the SOLIDWORKS application.

2. SOLIDWORKS Content.

Click **SOLIDWORKS Resources**  to open the SOLIDWORKS Resources Task Pane.

Click on the **Instructors Curriculum** link which will take you to the SOLIDWORKS Customer Portal web page.



Prerequisites

Students attending this course are expected to have the following:

- Mechanical design experience.
- Experience with the Windows[®] operating system.
- Completed the online tutorials that are integrated in the SOLIDWORKS software. You can access the online tutorials by clicking **Help, Online Tutorial**.

Course Design Philosophy


This course is designed around a process- or task-based approach to training. A process-based training course emphasizes the processes and procedures you follow to complete a particular task. By utilizing case studies to illustrate these processes, you learn the necessary commands, options and menus in the context of completing a task.

A Note About Dimensions

The drawings and dimensions given in the lab exercises are not intended to reflect any particular drafting standard. In fact, sometimes dimensions are given in a fashion that would never be considered acceptable in industry. The reason for this is the labs are designed to encourage you to apply the information covered in class and to employ and reinforce certain techniques in modeling. As a result, the drawings and dimensions in the exercises are done in a way that complements this objective.

Conventions Used in this Book

This manual uses the following typographic conventions:

Convention	Meaning
Bold Sans Serif	SOLIDWORKS commands and options appear in this style. For example, Features > Extruded Cut  means click the Extruded Cut icon on the Features tab of the CommandManager.
Typewriter	Feature names and file names appear in this style. For example, Sketch1.
17 Do this step	Double lines precede and follow sections of the procedures. This provides separation between the steps of the procedure and large blocks of explanatory text. The steps themselves are numbered in sans serif bold.

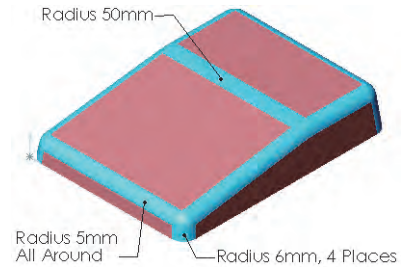
Windows

The screen shots in this manual were made using the SOLIDWORKS software running a mixture of Windows[®] 7 and Windows 10. You may notice slight differences in the appearance of the menus and windows. These differences do not affect the performance of the software.

Use of Color

The SOLIDWORKS user interface makes extensive use of color to highlight selected geometry and to provide you with visual feedback. This greatly increases the intuitiveness and ease of use of the SOLIDWORKS software. To take maximum advantage of this, the training manuals are printed in full color.

Also, in many cases, we have used additional color in the illustrations to communicate concepts, identify features, and otherwise convey important information. For example, we might show the result of a filleting operation with the fillets in a different color even though, by default, the SOLIDWORKS software would not display the results in that way.



Graphics and Graphics Cards

The SOLIDWORKS software sets a new standard with best-in-class graphics. The combination of a highly reflective material and the realism of **RealView Graphics** is an effective tool for evaluating the quality of advanced part models and surfaces.

RealView Graphics is hardware (graphics card) support of advanced shading in real time. For example, if you rotate a part, it retains its rendered appearance throughout the rotation.



Color Schemes

Out of the box, the SOLIDWORKS software provides several predefined color schemes that control, among other things, the colors used for highlighted items, selected items, sketch relation symbols, and shaded previews of features.

We have not used the same color scheme for every case study and exercise because some colors are more visible and clear than others when used with different colored parts.

In addition, we have changed the viewport background to plain white so that the illustrations reproduce better on white paper.

As a result, because the color settings on your computer may be different than the ones used by the authors of this book, the images you see on your screen may not exactly match those in the book.

User Interface Appearance

Throughout the development of the software, there have been some cosmetic User Interface changes, intended to improve visibility, that do not affect the function of the software. As a policy, dialog images in the manuals which exhibit no functional change from the previous version are not replaced. As such, you may see a mixture of current and “old” UI dialogs and color schemes.

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Lesson 1

Drawing Types

Upon successful completion of this lesson, you will be able to:

- Unarchive a project.
- Insert line diagram symbols.
- Associate symbols to components.
- Interconnect line diagram symbols.
- Draw multiple scheme wires.
- Insert scheme symbols.

What are Drawing Types?

There are multiple drawing types in SOLIDWORKS Electrical, many are automatically created by the program and populated with data applied to the project during its development, such as reports and terminal drawings.

The core design drawings allow for the creation of an overall interconnect synopsis, detailed schematic design, 2D general arrangement layouts and 3D assemblies.

This lesson will focus on two of the most common drawing types, wiring diagrams and schematics. Other drawing types will be introduced in later lessons.

Drawings

Drawings contain different information types that go to make up the complete project data set, a synopsis of the drawing types is as follows:

Cover Page

The Cover page contains a title block in which user can set attributes to display information such as the project name and description. The Draw tools may be used to add a company logo image.

Scheme

Scheme drawings contain circuit information related to the function of the electrical project.

Line Diagram

The Line diagram shows a simplified overview of project components interconnects and the cables used to form these connections.

Mixed Scheme

A Mixed scheme drawing allows users to mix the data style of scheme and line diagram type drawings to produce data rich hybrid designs. Using this drawing type can allow single line multi core cables and detailed scheme wiring to be shown between components.

Drawing Lists

The Drawing lists can contain a variety of project reports generated as drawings that can be updated automatically, on demand, or manually based on preference.

Terminal Drawings

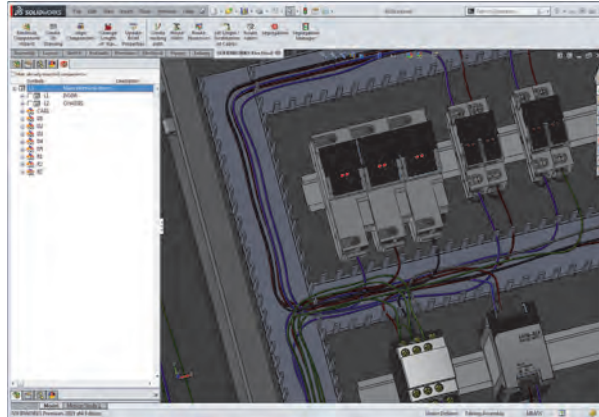
Terminals drawings are automatically created from data applied to terminals in the project drawing set and through the **Terminals editor**.

2D Assemblies

2D Assemblies are general arrangement layouts that can be created within SOLIDWORKS Electrical Schematic to aid in the positioning of components within a machine, cabinet, installation.


**SOLIDWORKS
Assemblies**

The SOLIDWORKS Assemblies allows for the development and prototyping of project data in a 3D environment.

**Data Files**

A Data file can be any type of file; XLS, PDF, CSV and provides a way to include supporting technical documentation related to the design.

Creating Drawings

Drawings can be created in a project from the **New**  command, or from the book contextual menu, the latter is best employed where the project contains multiple books.

**Stages in the
Process**

The major stages in the process are listed below:

- **Unarchiving a project.**
To start the lesson a project must be unarchived from Lesson03\Case Study\Start_Lesson03.proj.tewzip see *Unarchiving a Project* on page 10.
- **Modify a line diagram symbol.**
Open a line diagram drawing and use different methods to insert line diagram symbols.
- **Associate symbols to components.**
Understand components and symbols and how to form associations between them.
- **Cable up components.**
Interconnect components in the line diagram.
- **Draw wire interconnects.**
Use multiple wire styles to interconnect schematic symbols.
- **Add a scheme symbol.**
Open a scheme drawing and use different methods to insert scheme symbols.

Existing and Archived Projects

There are options in SOLIDWORKS Electrical for *opening* projects and *unarchiving* projects. These follow different procedures as one type uses compressed files and the other does not.


Opening an Existing Project

Existing projects are listed in the **Projects Manager** dialog. These projects have been created and opened at least once and appear with a unique **ID**, **Project name**, **Project description 1** and **Contract number**. By default, the files are stored in the C:\ProgramData\SOLIDWORKS Electrical\Projects folder and a sub-folder named for the project **ID**.

Note

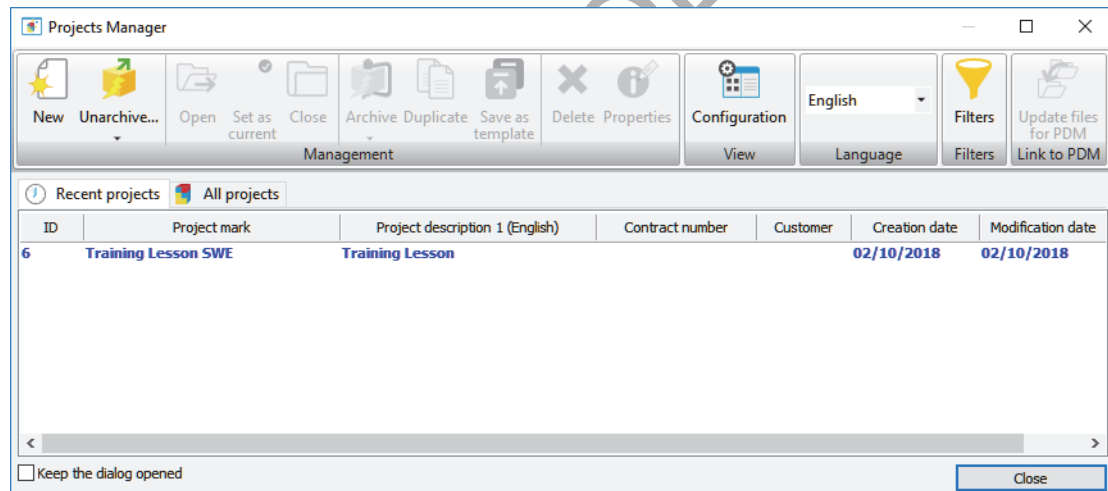
Only the projects stored in that folder will appear in the **Projects Manager** dialog.

1. Click **Projects manager**.

Click **Projects manager** . All the projects that have been opened or unarchived recently are listed.

2. Double-click a project by name.

Double-click a project name under the Recent projects tab.



Where to Find It

- **Projects Manager** PropertyManager: Double-click a recent project from the list

Unarchiving a Project

Archived projects are stored in a compressed format that must be uncompressed before opening. The archive stores all the information required to open and edit the project.

Start Files




To begin a lesson or exercise with a completely up to date project, unarchive and open the appropriate project. For example, use the file Start_Lesson_03.proj at the start of this lesson and use Start_Exercise_03.proj at the start of the related exercise.

The start files are stored in the SOLIDWORKS Training Files\SOLIDWORKS Electrical Schematic\Lesson folders and the appropriate Case Study and Exercise sub-folders.

Note

Unarchiving a file does *not* open it unless you click **Yes** on the “open” message.

1. Click **Projects manager**.

Click **Projects manager**  and click **Unarchive** . Browse to the folder C:\SOLIDWORKS Training Files\SOLIDWORKS Electrical Schematic\Lesson03\Case Study, click the file Start_Lesson_03.proj  and click **Open**.

2. Project information

The project dialog includes text information about the project. Click **OK**.

3. Messages

At the message:

Do you want to update your libraries?

Click **Update data**.

At the message:

Do you want to open this project?

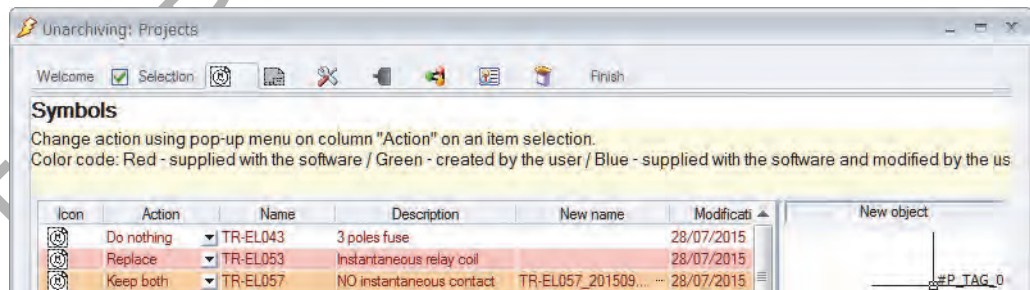
Click **Yes**.


Using Update Data

If you click **Update data**, a wizard will appear to help you decide what action to take when newer files are available in different categories. At the message:

Do you want to open this project?

Click **Yes**.

**Where to Find It**
Closing Projects■ **Projects Manager** PropertyManager: **Unarchive** 

Open projects can be closed using the **Projects manager**. Select the project from the list (open projects will appear in blue text) and click **Close** .

Where to Find It■ **Projects Manager** PropertyManager: **Close** 

Procedure Unarchive a project, open a line diagram scheme and mixed scheme, and use different methods to insert symbols and interconnect them in the different drawing types.

Where to Find It CommandManager: **Project > New > Drawing type**

1 Open a project.

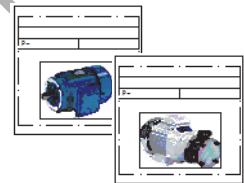
Click **Open**  project Start Lesson 03.

2 Open a line diagram.

Expand the book and double click drawing 03 - Line diagram to open it.

Line Diagram Symbols

The **Symbols Manager** stores many symbolic representations for line diagrams broken in logical classification groupings. You can copy a symbol from the library to the drawing sheet by using a number of insert symbol options.


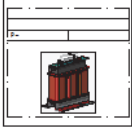
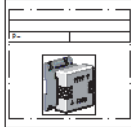
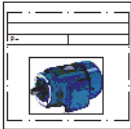

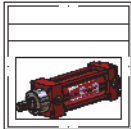


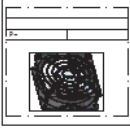
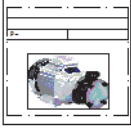
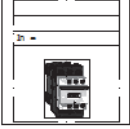

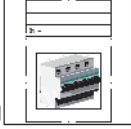
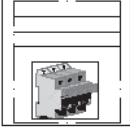
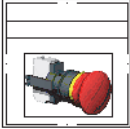
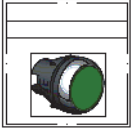
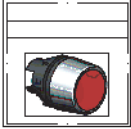
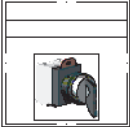
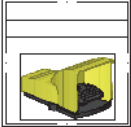
Adding Symbols

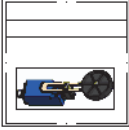


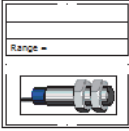


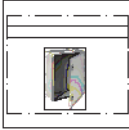


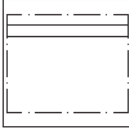
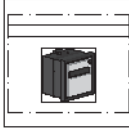


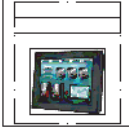
There are two main methods of adding symbols to a drawing; one uses a standard click (**Insert Symbol**) to place while the other uses the familiar drag drop method. Both methods can access the same symbol library.

Symbols Library

The side panel Symbols tab offers easier access to some of the more common symbols. These are shown in the following table.




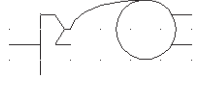





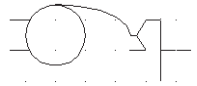

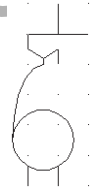
Supplies		
 EW_SY_Battery Cells battery	 EW_SY_TransformerHigh High Voltage Transformer	 EW_SY_TransformerLow Low Voltage Transformer
Loads		
 EW_SY_Motor Motor	 EW_SY_Resistor Heat Heating resistor	 EW_SY_Jack Cylinder

 <p>EW_SY_Fan Fan</p>	 <p>EW_SY_Pump Pump</p>	
Breaking devices		
 <p>EW_SY_Contactor Contactor relay</p>	 <p>EW_SY_CircuitBreaker Circuit-breaker</p>	 <p>EW_SY_CircuitBreakerMod Modular circuit-breaker</p>
 <p>EW_SY_FuseSwitch Fuse disconnecter</p>		
Command		
 <p>EW_SY_EmergencyStop Emergency stop button</p>	 <p>EW_SY_PushButtonRun NO push button</p>	 <p>EW_SY_PushButtonStop NC push button</p>
 <p>EW_SY_Switch Switch</p>	 <p>EW_SY_PedalContact Foot contact</p>	

Sensors		
		
<p>EW_SY_LimitSwitch Roller limit switch</p>	<p>EW_SY_LimitSwitchLever Lever limit switch</p>	<p>EW_SY_PressureSensor Pressure sensor</p>
		
<p>EW_SY_ProximitySensor Proximity sensor</p>	<p>EW_SY_TemperatureProbe Temperature probe</p>	
Miscellaneous		
		
<p>EW_SY_Terminal Terminal strip</p>	<p>EW_SY_Cabinet Electrical cabinet</p>	<p>EW_SY_Ammeter Ammeter</p>
		
<p>EW_SY_Voltmeter Voltmeter</p>	<p>EW_SY_BlackBox Generic frame</p>	<p>EW_SY_TimeCounter Time meter</p>
		
<p>EW_SY_MotorDrive Drive</p>	<p>EW_SY_Plc PLC</p>	<p>EW_SY_Screen Screen</p>

Symbol Orientation



The **Symbol Orientation** options control the rotation and possible mirroring of a symbol as it is added to the drawing.


<p>Original orientation</p> 		<p>90 rotation</p> 	
<p>180 rotation</p> 		<p>270 rotation</p> 	
<p>90 rotation and mirror</p> 		<p>Mirror</p> 	

Note The symbols shown in the symbol library will vary based on what type of drawing or scheme is open.

Tip Line diagram symbols do not require an image be inserted in them.

Note The Symbols tab on the resource side panel can be modified by adding selected symbols to any of the group such as **Command** and **Sensors**.

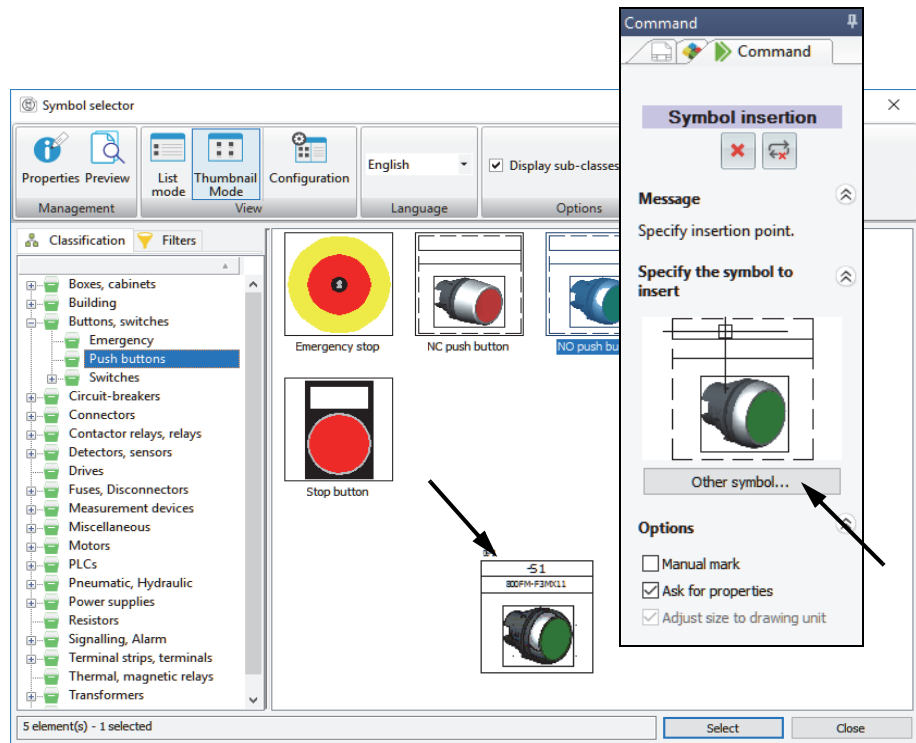
- Where to Find It**
- CommandManager: **Line diagram > Insert Symbol** 
 - Side Panel: Click **Symbols** 
 - Shortcut Menu: Right-click a component and click **Insert Symbol** 

-
- 3 Select line diagram symbol.**
Click **Insert symbol** .

Note If this is the first time you have inserted a symbol then the **Symbols selector** will be displayed automatically.

If the command has been used previously the last inserted symbol will be shown.

The **Other symbol** button can be used to access the **Symbols selector**.

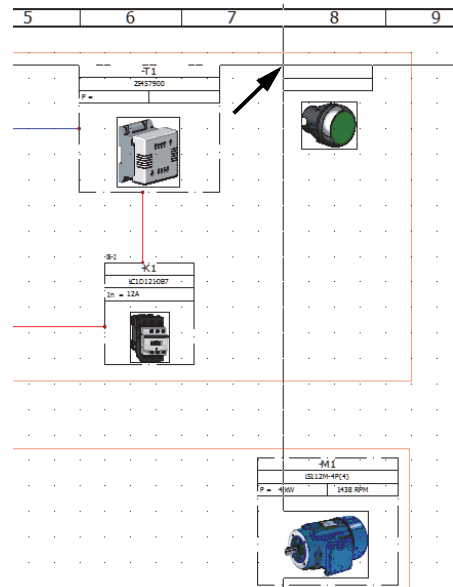


In the **Symbols selector** click the **Buttons, switches** classification.

Highlight the **NO push button** and click **Select** to return to the drawing.

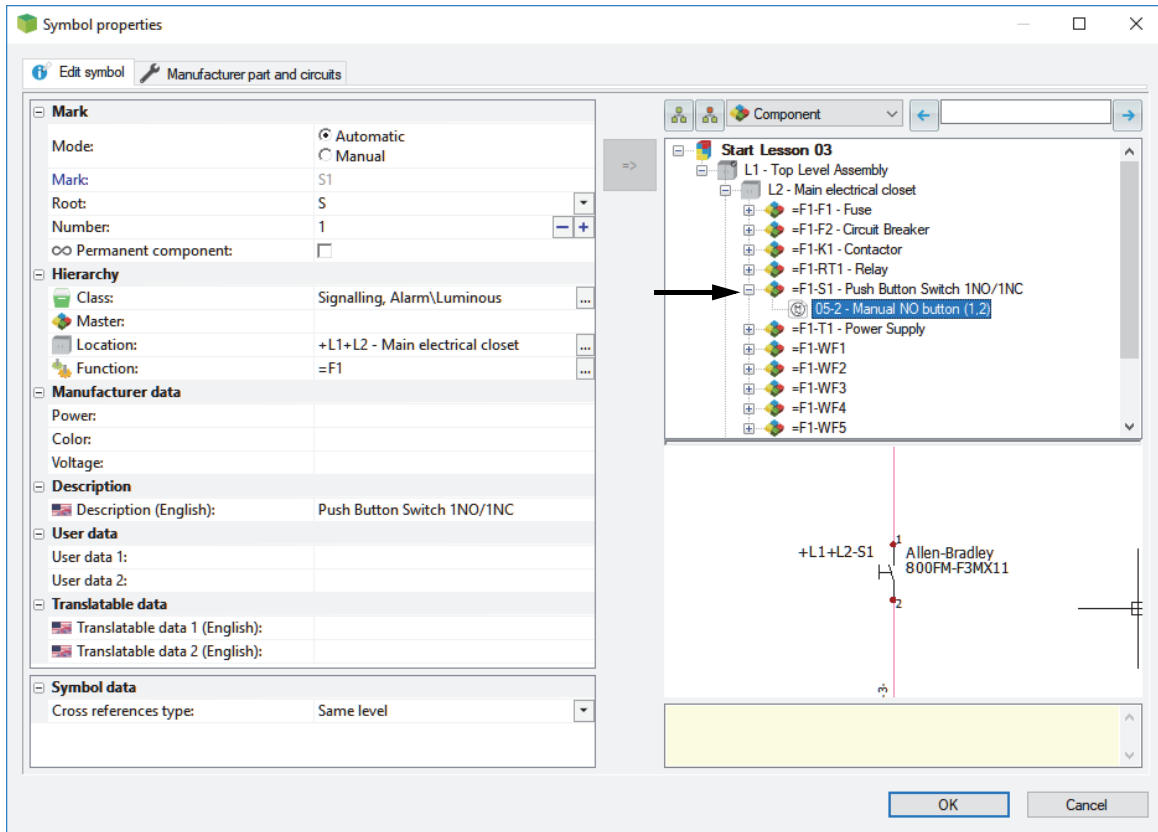
4 Insert symbol.

Click to insert the symbol to the right of -T1, in-line with -M1.



5 Symbol - component association.

Click =F1-S1 - Push Button Switch 1NO/1NC displayed in the components list.



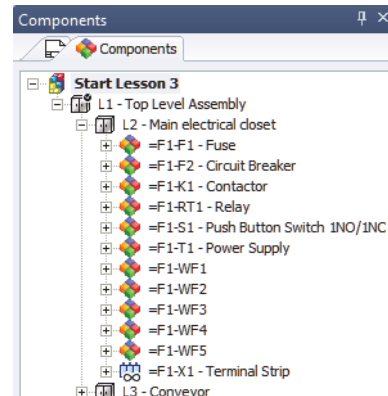
Click **OK** to create an association.

Note

By selecting an existing project component the inserted symbol will be associated. There can be multiple symbolic representations of a component across different drawings. The component is the physical part that will be purchased and installed.

6 Components side panel.

On the Components side panel expand the location L1 - Top Level Assembly and sub location L2 - Main electrical closet.

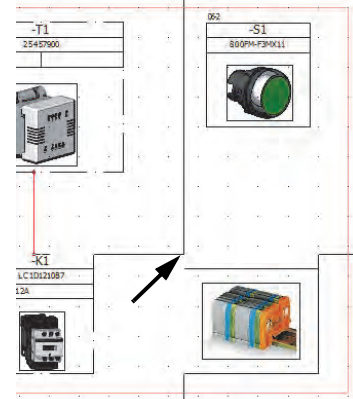


7 Insert component symbol.

Right-click component =F1-X1 -
Terminal Strip and click

Insert symbol .

Using the same methods previously outlined select Terminal strip classification, highlight symbol name EW_SY_Terminal and **Select** to return to the drawing.



Place the symbol to the right of -K1 below -S1.

Note

As the symbol is being inserted *from* a component it is automatically associated and the **Symbols properties** dialog is not displayed.

Adding Cables

Wiring diagrams indicate system level interconnects between components.

These interconnects are realized by a single line indicative of a cable.

A cable contains one or more cable cores or conductors that can be assigned to wires.

It may be used to simply indicate components connections, or to *reserve* a cable for use between two components, or define the detailed wiring between symbols in line diagrams.

Tip

This information bi-directionally updates in schemes and vice versa.

Note

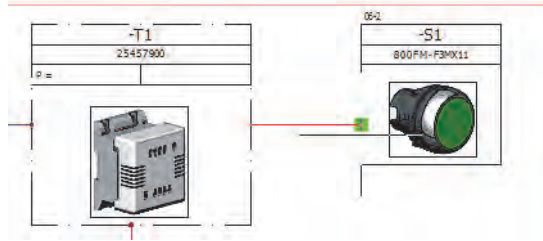
The cables are drawn to show connections between components. There is not yet any assignment of cable conductor cores to the cable.

Where to Find It

CommandManager: **Line diagram > Draw cable** 

8 Cables.

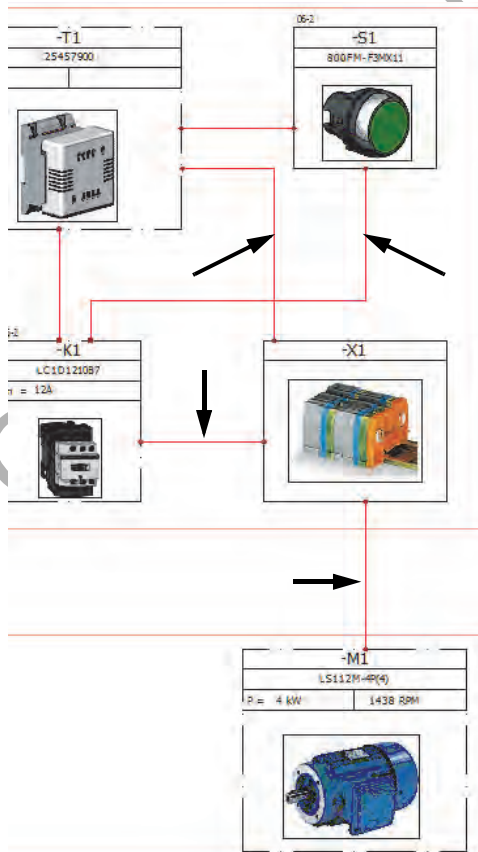
Click **Draw cable**  and connect the symbols as illustrated.



Tip

The **Esc** key will stop creating cables, when drawing a cable that does not terminate at another symbol.

Repeat the process drawing more cable interconnects as illustrated.



Command

Draw a cable

Message

- Select a cable style
- Select the action that you want to take at the end of the command
- Click first point

Cable style

Number	Name	Descripti...	Color	
1	F01	Red continu...	Red	Cont
2	F02	Red dash dot	Red	Dash
3	F03	Blue continuous	Blue	Cont
4	F04	Green conti...	Green	Cont

Action after insertion

Do nothing


Ask me

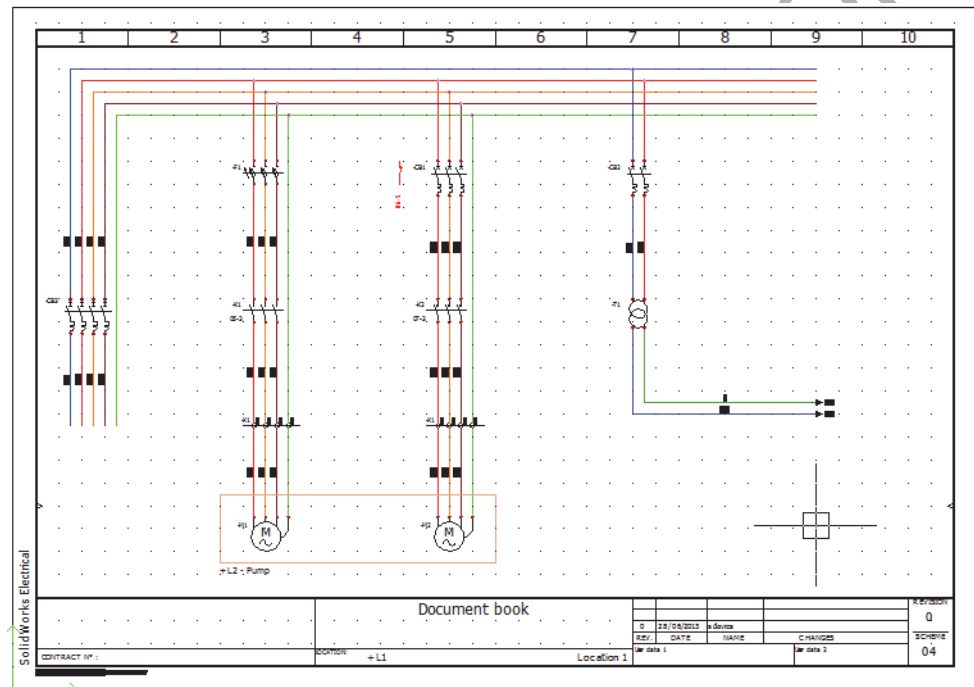
Schematic Drawing

A **Schematic** diagram is used to show the electrical components and the detailed electrical connections between them.


Schematics may appear in one or more project books.

When a schematic drawing is opened a unique set of commands are available for the design development.

Filters are used for the **Insert Symbols**  command to ensure that superfluous data, such as line diagram, or footprint symbols, are unavailable.



Note

Schemes such as the drawing 04 - Power appear with the  icon in the document list.

Scheme Best Practices

There are certain recommended best practices when working in scheme drawings that help ensure connectivity and make modifications easier.

- **Snaps**

All scheme symbols are set up on a 5mm / 0.25inch grid system by maintaining **Snap** activate at these, or any divisible value, it ensures wires readily connect to symbols when inserting, moving, stretching.

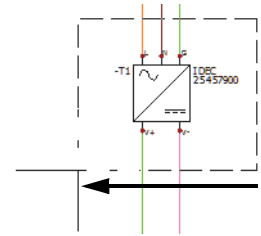
- **Ortho**

Keeping the **Ortho** active helps ensure wires drawn will be straight and improves the face of the drawing quality.

- **Selection windows**

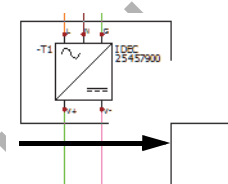
Dragging a rectangular window around geometry is a very efficient method of selecting multiple entities. It *does* make a difference whether the window is dragged left to right or from right to left.

Dragging a window *right to left* captures all the geometry in and crossing the window. In this example the symbol and all connected wires will be selected as they are within the crossing window.



The selection will be shown as a dashed line when using this option.

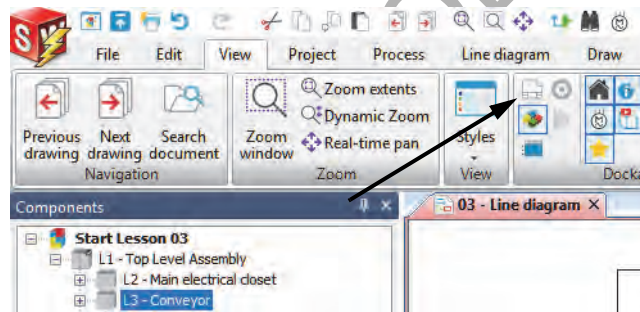
Dragging a selection window *left to right* captures geometry within the window. In this example only the symbol will be selected, as the connected wires are not fully contained in the crossing window.



The selection will be shown as a solid line when using this option.

■ View tab

The View tab has a range of options including commands that allow for panels to be toggled on or off. If a panel, such as the Documents tab, is not shown then it will have been turned off.



In this image the documents dockable panel has been deactivated and only the Components tab is shown.

Stages in the Process

The major stages in the process are listed below:

- **Schematics**
Identifying and opening a scheme drawing.
- **Draw Multiple Wires**
Multiple wires are selected and drawn in a single operation.
- **Schematic Symbols**
Schematic symbols are introduced and added to the drawing using a variety of methods.

Procedure

Complete a schematic power drawing using multiple wires and schematic symbols.

9 Scheme drawing.

Open drawing O4 - Power.

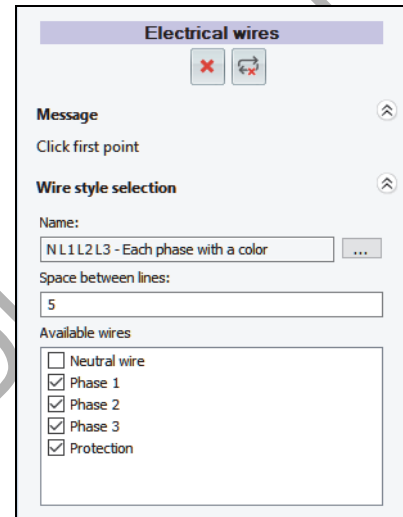
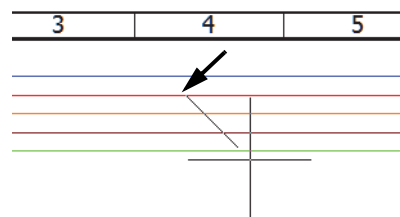
10 Select multiple wires.

Click to **Draw multiple wires** .

Click to clear the **Neutral wire** and make sure that the four **Available wires** are selected as illustrated.

11 Draw multiple wires.

Click the 2nd wire, Phase 1, as illustrated, and move the cursor below the horizontal to select the right downward phase toggle.




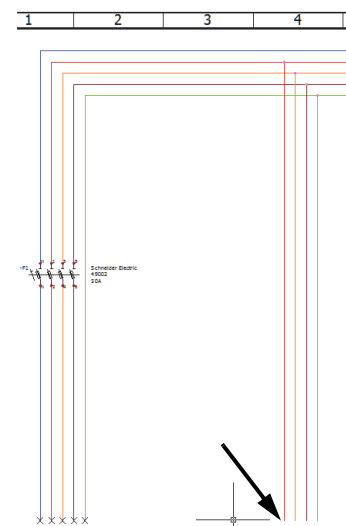
Note

On activating the command the incorrect wire style is active, by drawing off existing wires in a drawing, the program automatically adjusts the style to match the existing styles. This not only acts as a time saving feature but also helps resolve a common design error before it can occur.

12 Complete wires.

Click again on the lower part of the screen to complete the wires.

Click **OK**  to end the command.



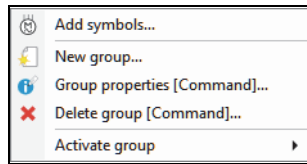
Symbols Panel

The Symbols panel is available in line diagram, schematic and mixed scheme drawings.

Depending on the drawing which is open it will only show line diagram, or schematic symbols.

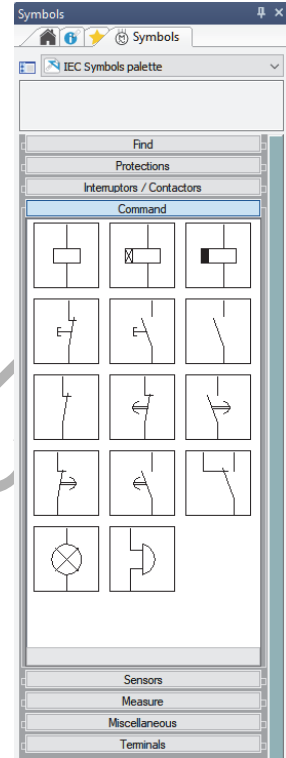
In a mixed scheme a drop down allows access to either line diagram or scheme symbols.

The symbols are grouped into generic defaults, but these can be removed, or new groups added via the contextual menu.



The groups and symbols contained in them are related to palettes that are stored in the application.

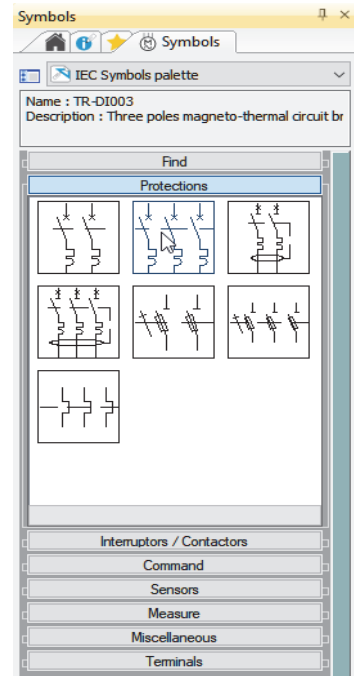
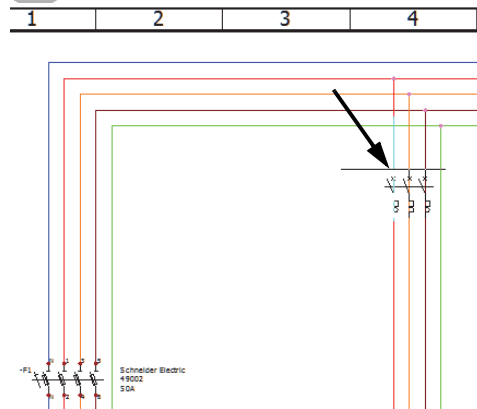
Palettes can also be added to individual projects and modified separately for each.



13 Symbols.

On the resource side panel Symbols tab select Protections group and double click the three pole circuit breaker TR-D1003.

Left-click to place the symbol as illustrated.



14 Symbol association.

The symbol being inserted is already represented in the wiring diagram, so a component exists to which it can be associated.

Highlight =F1-F2 - Circuit Breaker and click **OK**.

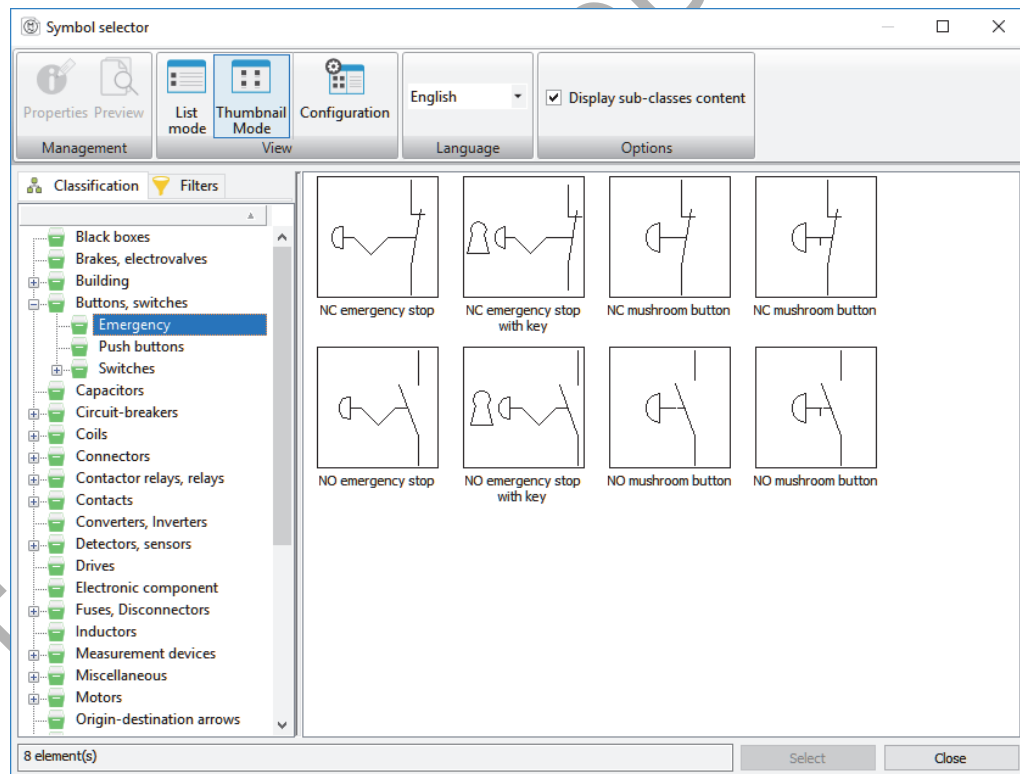
Schematic Symbols

The **Schematic Symbols** library stores many symbolic representations. The library contains different classification folders and sub-folders to suit a variety of needs.

The symbols themselves are traditional blocks, containing graphic entities and attributes, the content of the attributes is automatically populated based on command choices during the design process.

In addition symbols have properties held in the SQL database that define the symbol type, default part data.



If a required symbol is not available new symbols can be easily created.



Note

Scheme symbols are different from those for line diagrams introduced in *Line Diagram Symbols* on page 12 although they are all stored in the same general library. Those available are a filtered subset of the general set of blocks.

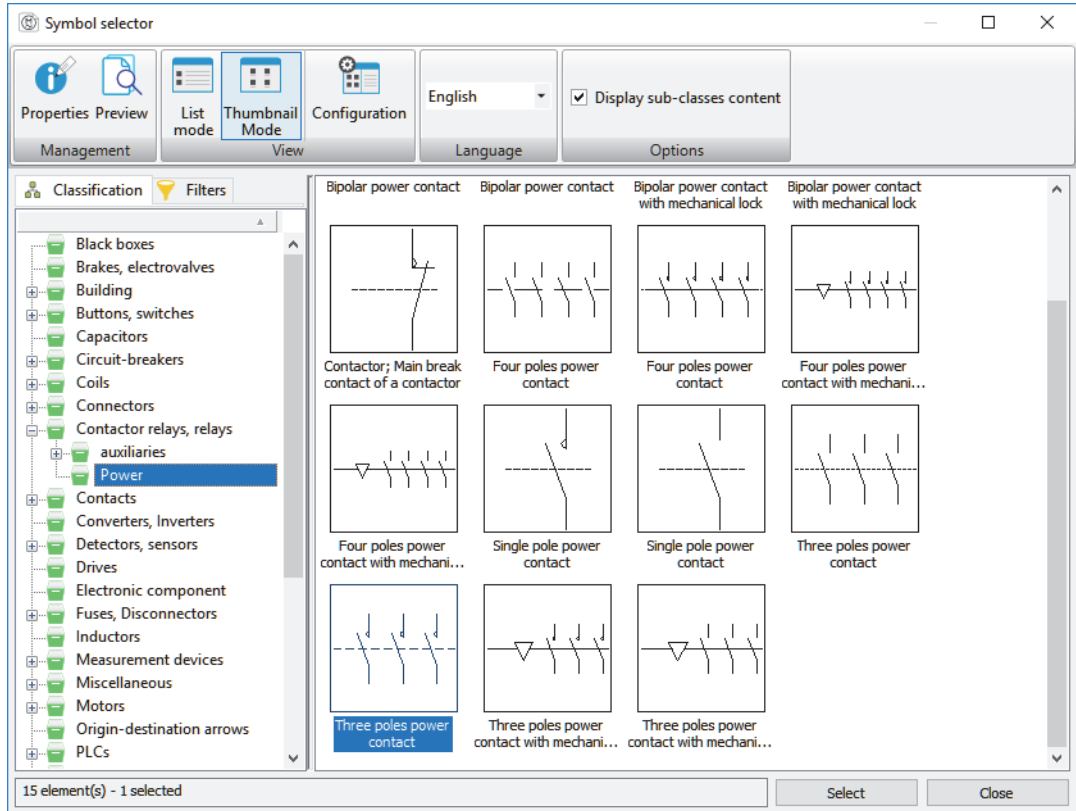
Where to Find It

- CommandManager: **Schematic > Insert Symbol** 
- Side Panel: Click **Symbols** 

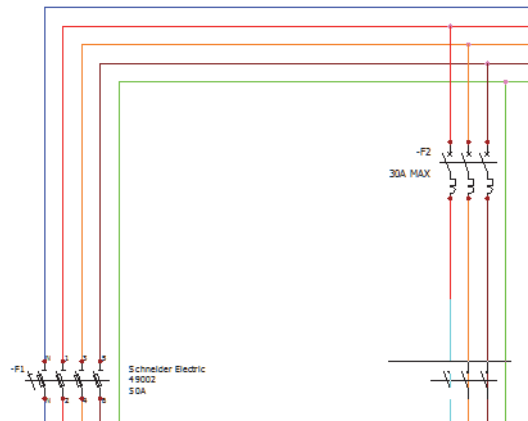
15 Insert scheme symbol.

Click to **Insert symbol**  and **Other symbol** to access the **Symbols selector** dialog.

In the **Contactor relays, relays** classification click **Three poles power contact TR-EL035**.



Click to **Select** and position the contact below -F2 in line with -F1.



Symbol Properties

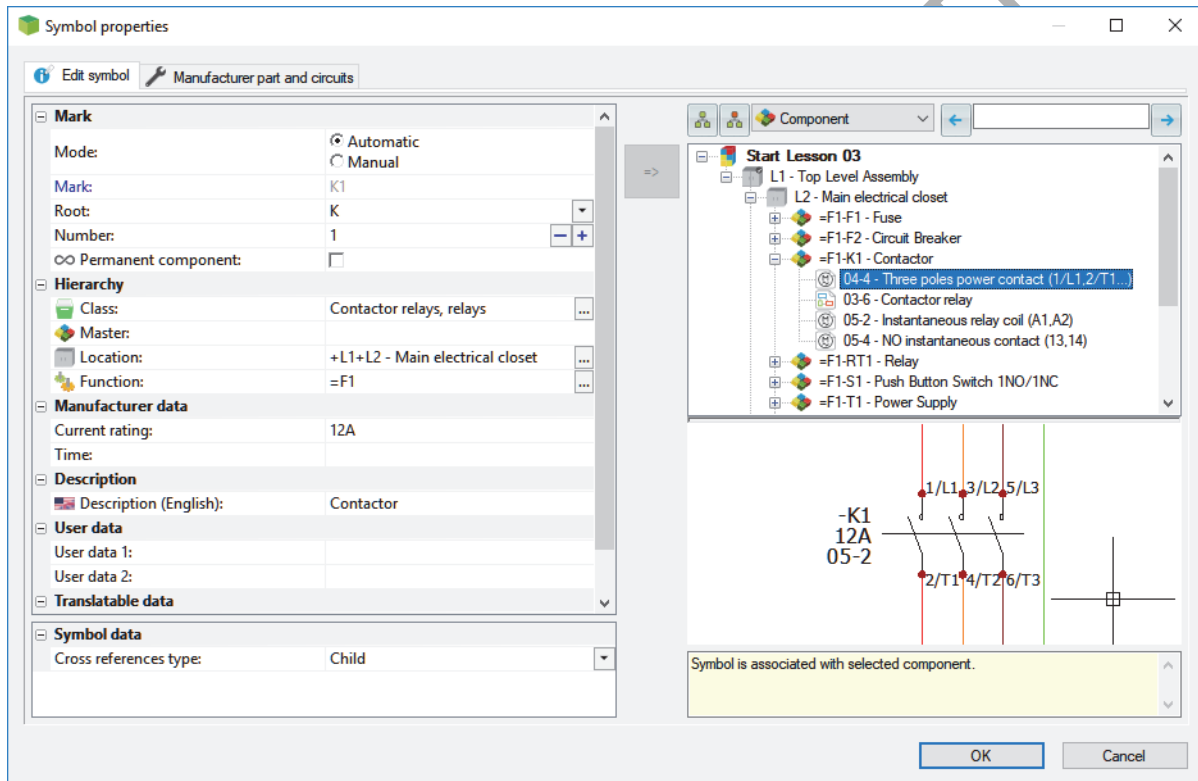
The **Symbol properties** dialog is used to set and control the attribute content of an individual symbol including the manufacturer part and the cross references to other symbols.

Types of Properties

For any symbol, there is an option to select either the **Symbol properties** or the **Component properties**. Both types include the same Manufacturer parts and circuits tab (*What are Manufacturers Parts?* on page 54) used to add manufacturer parts to the symbol.

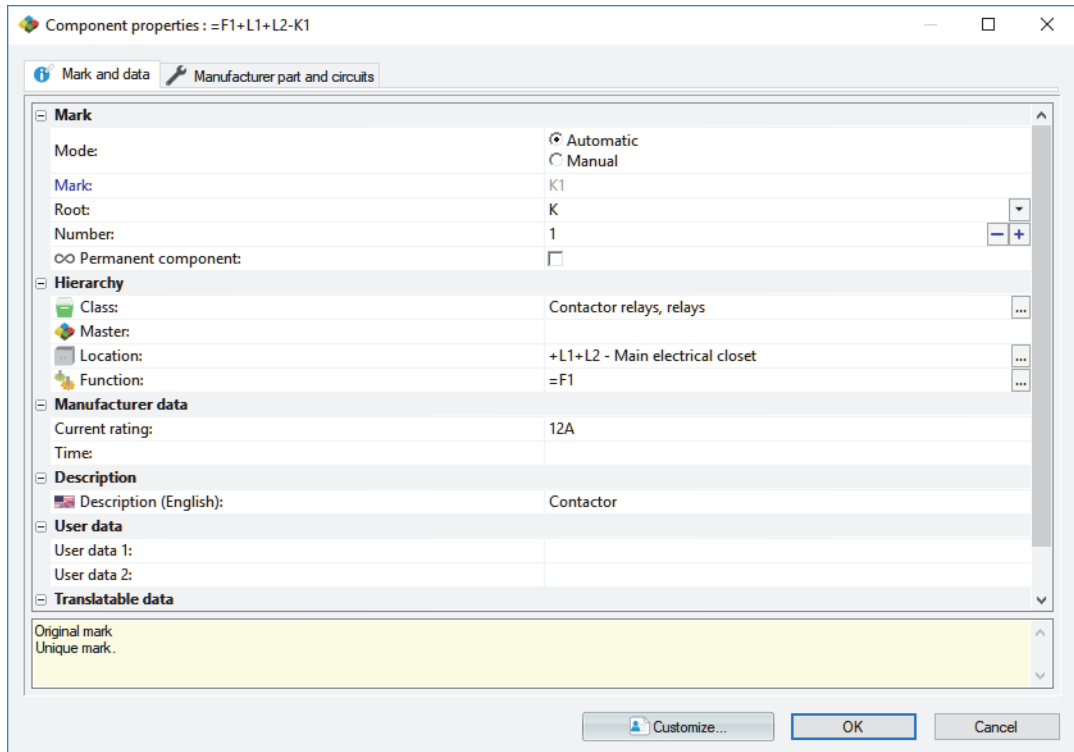
Symbol Properties

Symbol properties includes the Edit symbol and Manufacturer parts and circuits tabs. The Edit symbol tab includes textual property data as well as a listing of available components (right side column) that is useful when creating cross references.



Component Properties

Component properties includes the Mark and Data and Manufacturer parts and circuits tabs. The Mark and Data tab includes information (lower portion of dialog) about whether this symbol mark is original and unique.

**Where to Find It**

- Shortcut Menu: Right-click a symbol and click **Symbol properties**
- Shortcut Menu: Right-click a symbol and click **Component properties**

Note


Double-clicking a symbol accesses the **Component properties**.
The following section uses **Symbol properties**.

16 Coil-contact association.

The contact is a part of the relay coil already represented in the wiring diagram and control scheme, associating the contact to this component exists to which the symbol can be associated.

=F1-K1 - Contactor and click **OK** to create the association.

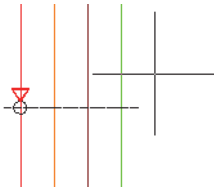
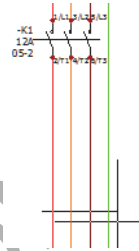
17 Insert multiple terminals.

Click to **Insert 'n' terminals**  and choose Terminal TR-B001 from the symbols selector using the processes outlined previously.

Click **Select** to return to the drawing.

Draw a horizontal line from left to right across the wires below -K1 as illustrated.

Ensure the red triangle indicator is pointing toward the bottom of the page by moving your cursor above the axis line and left-click to place.

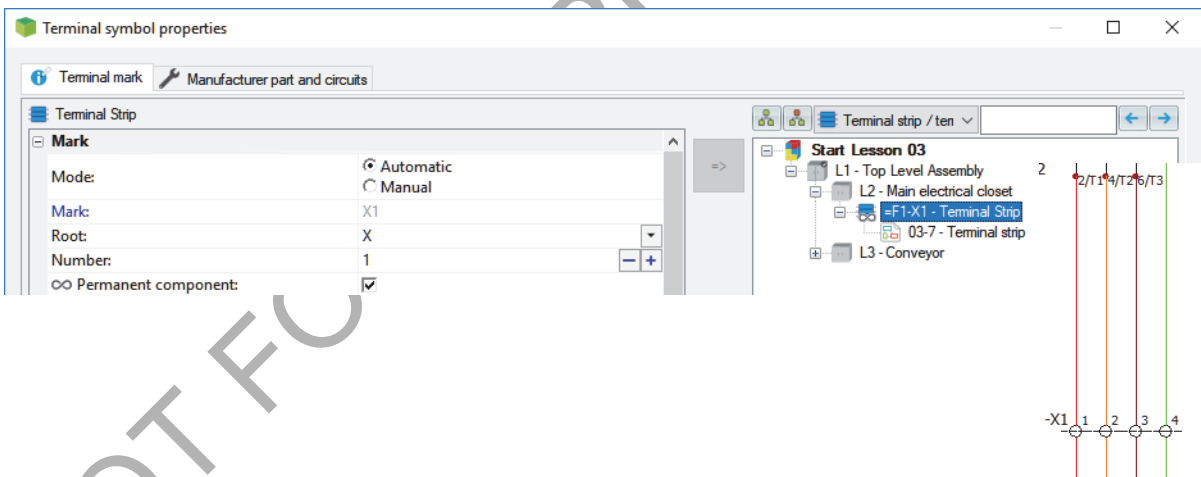


Question

What does the red arrow do?

18 Associate multiple terminals.

the existing component =F1 -X1 - Terminal strip and click **OK (all terminals)** to create multiple associations.




19 Scheme component symbol.

the Components side panel and expand location L3 - Conveyor.

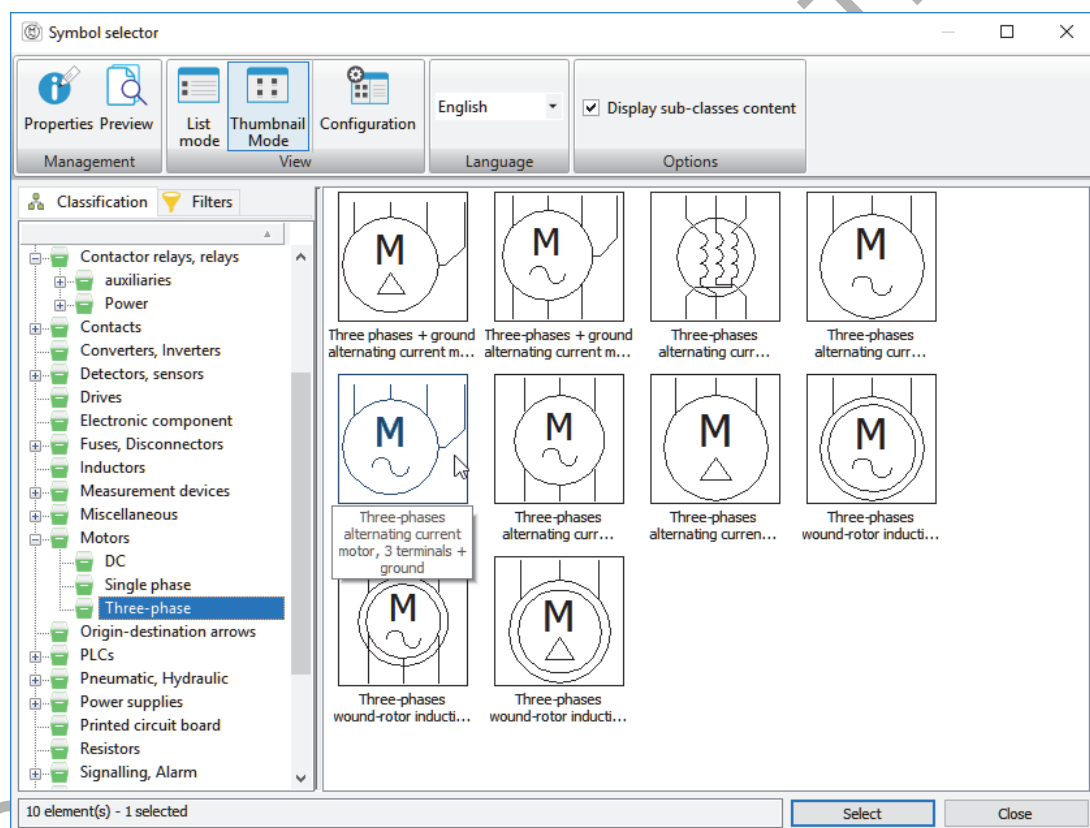
Tip

Right-clicking on the book in the Component tab shows a contextual menu where it is possible to toggle the component tree view between location and function group sorting.

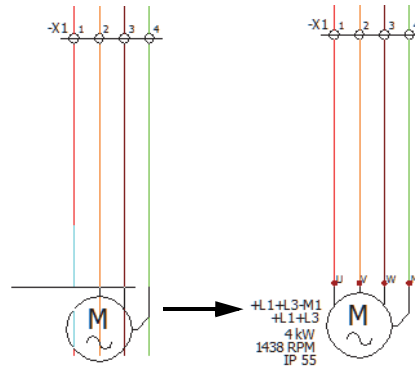
Right-click =F1-M1 - Motor component and **Insert symbol**  use the processes outlined previously to locate the following symbol:

- Classification: Motors
- Description: Three-phases alternating current motor, 3 terminals + ground

Once located click **Select** to return to the drawing.



Position the motor at the end of the wires below the terminals and insert it as illustrated.



Note

Due to the symbol being inserted from a component it automatically adopts all the assigned properties from the component without showing the Symbols properties dialog.

20 Close the project.

Right-click project name in the Documents side panel and **Close**  the project.

**Exercise 1:
Drawing Types**

Unarchive a project and create a mixed scheme, use different methods to insert symbols and interconnect the data with wires and cables.

This lab uses the following skills:

- *Unarchiving a Project* on page 10
- *Select line diagram symbol.* on page 15
- *Symbol - component association.* on page 17
- *Insert component symbol.* on page 18
- *Cables.* on page 19
- *Insert scheme symbol.* on page 25
- *Select multiple wires.* on page 22

Procedure

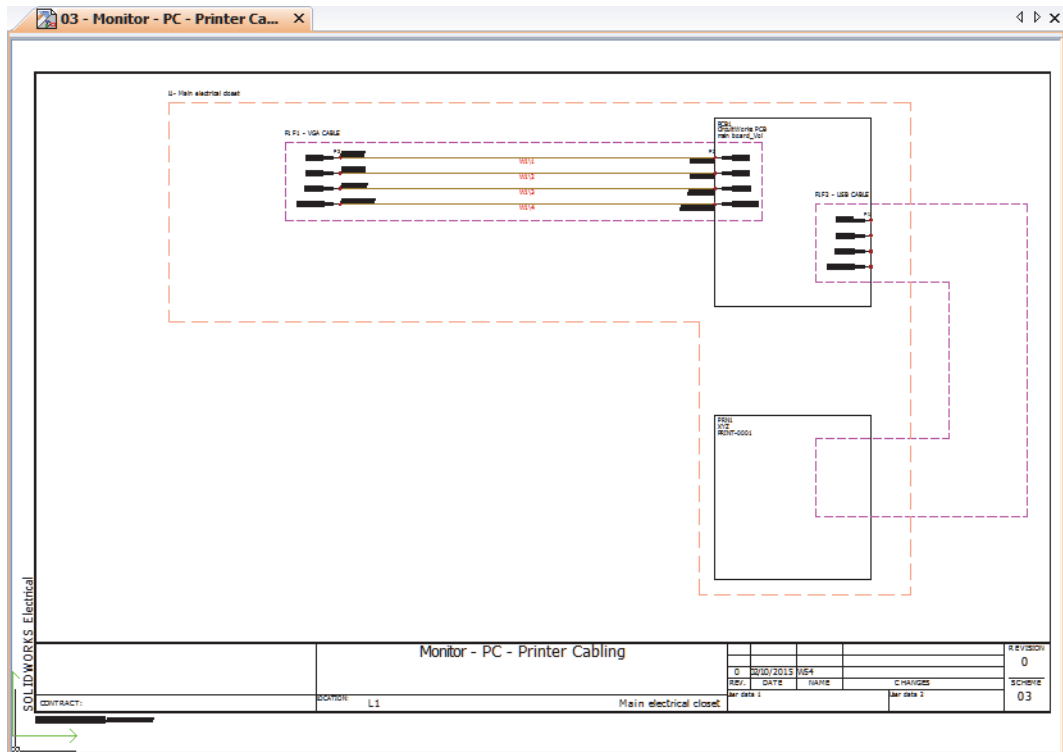
Complete a mixed scheme drawing using both line diagram and schematic tools.

- 1 Populate data to the application.**
Unarchive the project located in Lesson03\Exercises folder.
- 2 Data selection.**
Click to **Update data** using the **Next** button to review data for processing.
- 3 Complete the unarchive.**
Finish the unarchive process leaving the settings as they were by default.
- 4 Open the project.**
Click **Yes** to open the project.

NOT FOR REPRODUCTION

5 Open a mixed scheme.

Open mixed scheme drawing 03 - Monitor - PC - Printer Cabling.



6 Line diagram component symbol.

On the components panel use the contextual menu to **Insert symbol** for the monitor =F1-MON1 - MONITOR.

Tip

As this is a mixed scheme both line diagram and schematic tools and symbols are available.

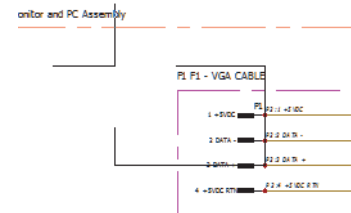
7 Select line diagram symbol.

Locate a line diagram symbol with the following properties.

- Classification: Black boxes
- Description: PCB WD
- Name: EW_BB_Blackbox_2+1

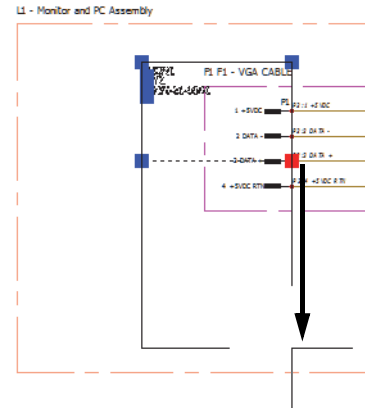
8 Insert symbol.

Place the symbol as illustrated.



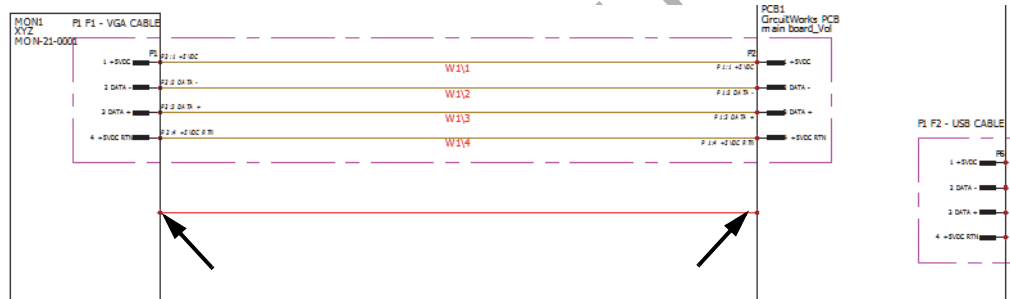
9 Resize the symbol.

Click the symbol and drag the lower right hand grip as illustrated to resize the symbol.



10 Draw a cable.

Use the line digram tools to draw a cable interconnecting MON1 and PCB1.



11 Insert scheme symbol.

Click to insert a schematic symbol from the contextual menu of component =F1=F2-P3 - PC TO PRINTER USB TYPE A.

12 Select scheme symbol.

Locate a scheme symbol with the following properties.

- Classification: Connectors
- Description: Male power pin (Training Exercise)
- Name: TR-PIN_M_O2+1+1

13 Symbol orientation.

In the Symbol insertion side panel click to rotate the symbol **180°**

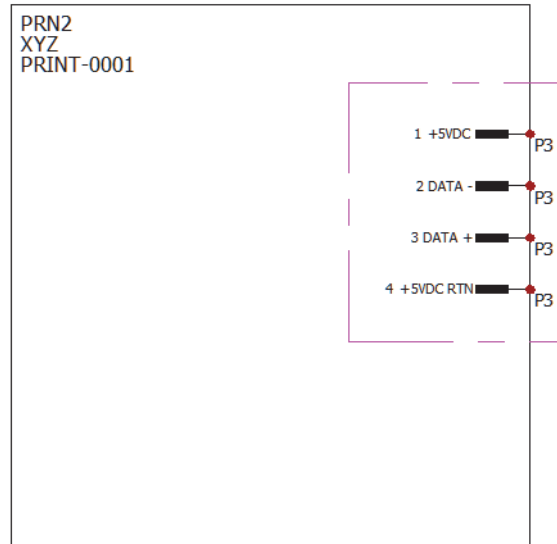
14 Pin the command.

On the Symbol insertion side panel click to **Pin** the command.

NOT FOR PUBLICATION

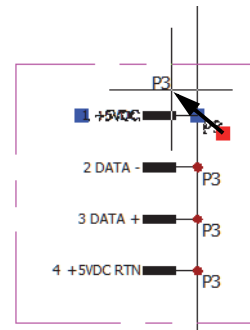
15 Position scheme symbols.

Insert 4 connector pins as illustrated.



16 Move an attribute.

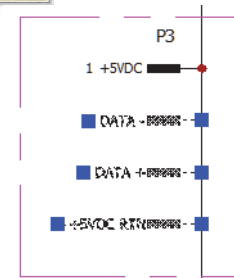
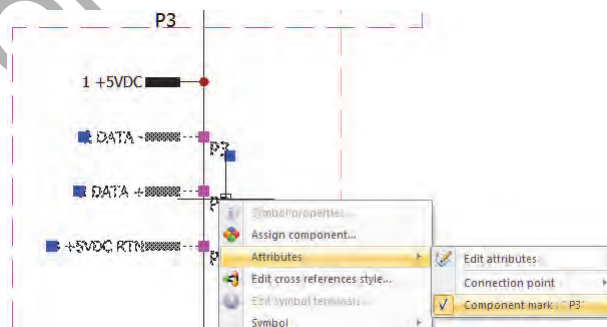
Click the connector pin 1 +5VDC and drag drop the mark P3 as illustrated.



17 Attribute visibility.

Use a window selection to highlight pins 2, 3, and 4 and right-click one of them.

Click **Attributes > Component mark** to hide the attribute on all three symbols.

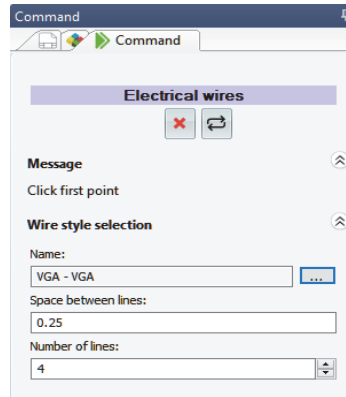


18 Select wires.

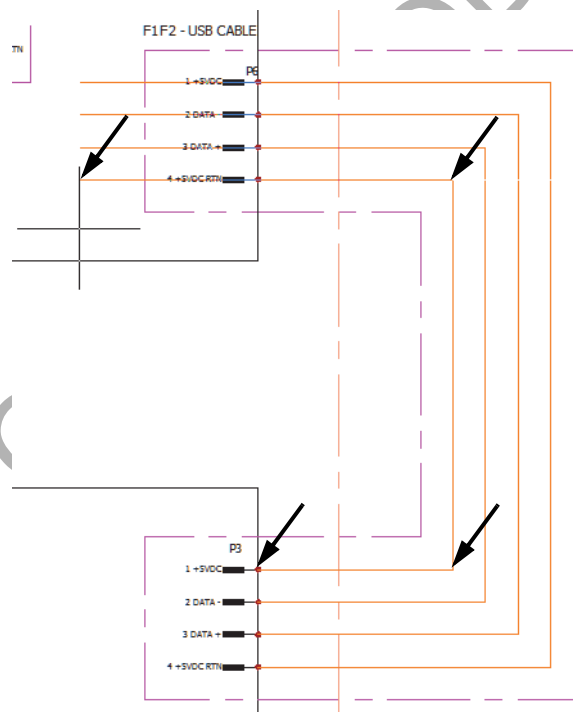
Click to **Draw single wire** selecting wire style VGA.

19 Draw multiple wires.

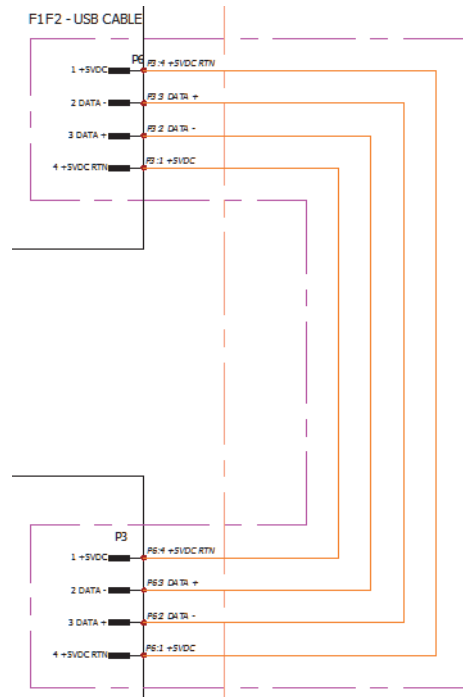
Set the electrical wires settings as illustrated.



Click at the points indicated by arrows to interconnect the pins starting on the connector P3 pin 1 +5VDC.



Then click to **Cancel**  the command.



20 Close the project.

Right-click project name in the Documents side panel and **Close**  the project.