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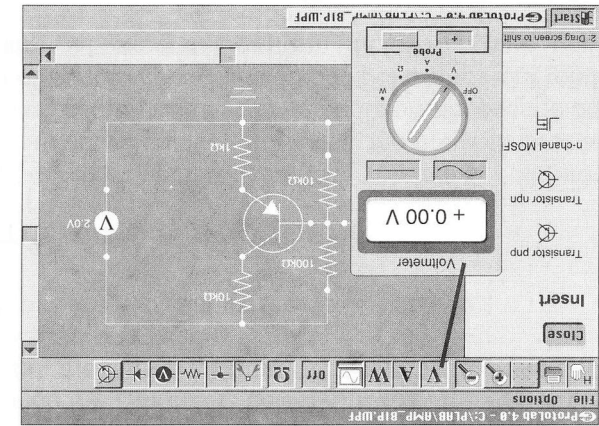


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Installation Procedure

Windows® 95 and above:
Click Start on the taskbar, choose Run, then type a:setup

System Requirements

IBM PC-386, 4MB RAM, SVGA graphics, Windows® 95 or higher

If you have any difficulty installing ProtoLab 4.0, contact:

Toll free in USA & Canada: 1-800-572-1028
email: info@globalspecialties.com
FAX: 714-921-6422
GLOBAL SPECIALTIES®
Customer Service Dept.
22820 Savi Ranch Pkwy, Yorba Linda, CA 92887

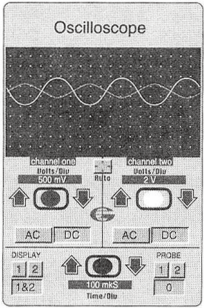
Registering ProtoLab:

You may register your ProtoLab software online by visiting:
<http://www.globalspecialties.com/register.html>

What is ProtoLab?

ProtoLab is a low cost, easy-to-use analog (AC/DC) circuit design and simulation tool. It allows the user to create and edit analog circuits instantly on a PC while choosing from a complete list of active and passive components including:

- NPN & PNP Transistors
- Diode
- Zenor Diodes
- Capacitors
- n-channel MOSFET
- Resistors
- Inductors
- Voltage Sources
- Current Sources
- Jumper wires

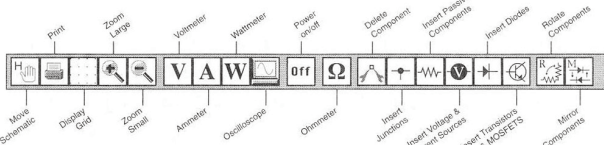


ProtoLab also allows the user to analyze circuits using built-in virtual test instruments. Instruments include:

- Oscilloscope
- Ohmmeter
- Voltmeter
- Ammeter
- Wattmeter

The ProtoLab Toolbar

All of ProtoLab's functions are performed from the main toolbar. Before getting started, please familiarize yourself with the toolbar illustrated below:



Component Placement

ProtoLab's graphical interface is extremely user-friendly. To place a component on the design palette, perform the following: Select any one of the following from the main toolbar:



Select the desired component with the mouse and click on it with the left mouse button. At this time, a menu will open on the left-hand side of the design palette. Choose the desired component from this menu and place it in the desired location on the design palette. With ProtoLab, there is no need to keep the mouse button pressed, the component will automatically be present on the mouse pointer until it is placed on the palette, and until another design element is chosen. This allows the user to place the component multiple times without going back to the placement menu.

ProtoLab Operation

Upon start-up, ProtoLab's screen will be ready for a new circuit lay-out. To load pre-designed circuits included with ProtoLab, or to load pre-existing circuits from memory, perform the following:

- Loading Pre-designed circuits or Saved circuits**
1. Under the File menu select "Load."
 2. This will take you to the ProtoLab folder, or directory.
 3. Select the desired circuit with the mouse, then left-click "OK."

To close a circuit and start a new circuit

1. Under the File menu select "Save As."
2. Under "File Name" enter the desired name of the circuit.
3. Select "OK."
4. Under the File menu select "New."
5. The design palette will now be blank and ready for circuit lay-out.

ProtoLab's Pre-designed Circuit Listing:

FILE NAME	DESCRIPTION
Amp_bip.wpf	Single transistor AC coupled amplifier
Amp_Jeed.wpf	Single transistor AC coupled amplifier w/ DC feedback
Bdiode.wpf	Full wave bridge circuit - widely used in a power supply
Bridge_r.wpf	Wheatstone bridge
col2.wpf	Transistor Colpitts Oscillator, sine wave osc. for A.F. or R.F.
gmos.wpf	MOSFET phase shift oscillator, inductorless osc. for A.F.
i_mirr.wpf	Current mirror circuit
int_diff.wpf	Collection of passive integrators and differentiators
mlt_mos.wpf	MOSFET multivibrator - square wave oscillator
mltl.wpf	Transistor multivibrator
Monost.wpf	Transistor Monostable or one-shot
Mos_amp.wpf	Single MOSFET amplifier
osc.wpf	Two Transistor LC oscillator
res1 .wpf	R.F. Tuned Collector Transistor Amplifier
resonan.wpf	Passive series and parallel LC tuned circuits
stab.wpf	Zener diode stabilized power supply
stab_i_1.wpf	Current stabilizer
tsh.amp	Schmitt trigger

www.globalspecialties.com
(800) 572-1028 • Fax (714) 921-6422
Yorba Linda, CA 92887
22820 Savi Ranch Pkwy.,
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Selecting Wires / Junctions

Grounds

The ground symbol is not an actual connection to ground and should only be used in the circuit to represent a ground connection. All grounds in the circuit must be connected together in order for the circuit to work properly.

Wires

To connect components to one another, select the  "Junction" button from the upper toolbar. At this time a menu will open at the left side of the design palette. From this menu, wires, junctions and grounds may be selected. When the wire is selected the mouse pointer will have a "1" attached. This is the beginning of the wire link and should be placed on an element's output. Once the "1" has been placed, the mouse pointer will now have a "2" attached. The "2" signifies the end of the connection and should be placed at the input to the next element. While the "2" is displayed, right angle runs may be placed by clicking the right mouse button until the desired node is reached.

Junctions

Junctions may be placed at any grid line. Junctions prove useful where wires cross, and are used to signify an interconnection.

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- Place the "ground" probe at potential ground of your circuit.
- Select the "1" or "2" probe depending on the desired viewing channel.
- Select the appropriate display channel according to the desired reading by using the mouse to select either Channel "1&2" at the "Display section, located at the bottom left corner of the O-scope. 
- Turn power on.
- Close the O-scope by selecting the ("**CLOSE**") button in the top left corner of the oscilloscope screen.

Voltmeter Operation

To operate the voltmeter, power to the circuit must be on. To use the voltmeter, observe the following instructions:

- Select the  button from the main toolbar.
- At this time the voltmeter window will open to the left of the design palette.
- Select the "ground" probe by selecting the  minus button directly on the voltmeter and place it at ground potential of the circuit.
- Select the "positive" probe by selecting the positive button  located on the voltmeter.
- Turn Power on to the circuit.
- The meter should now display the proper reading.

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Rotating a component

The orientation of components may be changed by selecting the  button. To do this, perform the following:

- Select a component from the toolbar.
- Once the element is selected, select the  button from the main toolbar to rotate the component to the desired orientation.
- Place the element on the design palette.

Mirroring a component

Active components may be either "rotated" or "mirrored." To rotate an active component, follow the previous procedure. Mirroring allows the user to immediately access the complement of the previously placed component without rotating. To mirror a component, perform the following:

- Select any active component  from the main toolbar.
- Select the desired component (npn transistor, pnp transistor, or n-channel MOSFET) from the toolbar on the left side of the design palette.
- Once the element is selected, select the  button from the main toolbar to mirror the component.

Setting / Changing Component Parameters

Once a component has been placed into the circuit, its value can be set or changed by performing the following:

- Click on the desired component with the **RIGHT** mouse button. This will open the "Component Parameter" window.
- Enter the desired component values
- Select "**show values**" to display the values on the circuit.
- Select "OK."

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Ammeter Operation

Using the ammeter does not require you to open the circuit for a reading. ProtoLab automatically does it for you. To operate the ammeter, observe the following:

- Select the  button from the main toolbar.
- Select the  button on the meter.
- Click the left mouse button between the desired elements to measure the current. ProtoLab will automatically break the circuit and insert the ammeter where the measurement is to take place.
- Left-click anywhere on the circuit to move the meter.
- Turn the power to the circuit on.

Wattmeter Operation

To measure the wattage of a component observe the following:

- Select the  button form the main toolbar.
- Turn power to the circuit on.
- Left-click the mouse pointer on any element to read its wattage.

Ohmmeter Operation

In order to perform measurements using the Ohmmeter, power to the circuit must be off.

- Turn power off.
- Select the  button from the main toolbar.
- Select the negative lead  and place it at ground potential by left clicking the mouse pointer.
- Select the positive lead  and place it across the component or area that is to be measured.

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Deleting a Component

To delete a component, select the  button from the main toolbar. Once this button is selected, simply "click" the left mouse button on the desired element to remove it from the circuit.

Moving the Circuit

The circuit may be moved about the design palette by selecting the  button from the main toolbar. Once selected, a hand will now be displayed instead of the mouse pointer. To move the circuit, place the hand onto any part of the circuit and drag the mouse while the right mouse button is engaged.

Turning the Power ON and OFF

- Turn Power "ON" by selecting the "ON" button located at the top of the toolbar.
- Turn Power "OFF" by selecting the "OFF" button located at the top of the toolbar.

Testing a Circuit

Now that a circuit has been designed, it may be tested. ProtoLab has five virtual instruments that may be selected for circuit testing.

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Displaying the Design Palette Grid

The design palette grid may be displayed by selecting the  on the main toolbar, or by using the "Options" menu.

Under the Options menu, select "Grid." This will turn the grid on or off.

Using the "Zoom" Feature

The zoom feature allows the user to see a larger or smaller area of the design palette. The zoom feature can either be used by selecting the   buttons or by using the "Options" menu. Under the Options menu, select "Zoom," then select either "large" or "small."

Using the "Precision" feature

The precision feature allows the user to adjust timing intervals and voltage and current steps for precise analysis. Precision settings are preset to optimum operating levels for circuits of moderate size. As circuits become large, it may be necessary to change the "precision" settings to make the analysis run faster. To change the "precision" settings, perform the following:

Under the Options menu select "Precision." This will open the "Precision" menu. Change the setting according to the maximum desired operating efficiency by either selecting or deselecting the boxes marked "Steady State Analysis", "Disable Small Time Steps", and "Advanced Time Analysis".

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Oscilloscope Operation

To utilize the oscilloscope, select the  button from the toolbar. The Oscilloscope window will open to the left of the design palette.

Oscilloscope Settings

ProtoLab's oscilloscope works like any other bench-top oscilloscope. Before taking measurements, the Volts/Division and Time/Division controls must be set to accurately and comfortably monitor the circuit's performance.

Adjust the Volts/Division control for the desired channel by using the UP/DOWN buttons, which are located below the oscilloscope's display. 

Adjust the Time/Division control by using the UP/DOWN buttons, located at the bottom of the oscilloscope. 

Probe Placement

Now that the oscilloscope is set to the desired levels, it is time to place the probes. ProtoLab's oscilloscope is dual channel, therefore 2 channels may be monitored simultaneously. To place the oscilloscope probes, perform the following:

- Select the desired probe from the lower right corner of the O-scope . The "0" probe is for the "ground" probe. The "1" and "2" probes are for channel 1 and 2 respectively.

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Circuit response time may also be enhanced by increasing or decreasing the levels of V_0 , V_a , I_0 and I_a . Increasing these levels will enable the simulation to occur more quickly, but may reduce precision. Decreasing these levels will slow down the simulation, and will allow for greater accuracy.

Printing a Circuit

Circuit designs may be printed by selecting the  button from the main toolbar. Printing may also be achieved by selecting "Print" under the file menu. ProtoLab uses the printer setting already established under the Windows® operating system.

Using ProtoLab's On-line Help

ProtoLab has on-line help which is constantly displayed at the bottom of the screen just above the Windows® "START" bar. During each operation, the help bar will instruct the user on how to successfully complete each task.

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