The EL-9450/9400 was developed to meet the needs of an expanding education market and is based on three concepts: easy to teach, easy to learn and easy to use. The EL-9450/9400 has been designed with simplified operations and time-saving features, allowing teachers to concentrate on actual teaching.

This manual was designed to introduce teachers to the unique features of the EL-9450/9400 using detailed operation examples.
Sales points

1. Large 96 x 64-dot display

2. Graph Shift/Change shows how "changing" the graph affects the equation

3. Slide Shows reduce class preparation time

4. Equation Editor shows equations just as in textbooks

5. Rapid graph/Rapid window simplify graphing procedures

6. Rapid zoom allows easy adjustment of window size
Basic operation

Power ON/OFF

ON  . . . . . . Power on
OFF  . . . . . . Power off
2nd F ON  . . . . Power off
CL  . . . . . . Erase equations and remove error displays
QUIT  . . . . . . Cancel of previous function (Escape)

Function keys

Y =  Use to enter equations
GRAPH  Use to draw graphs
TABLE  Use to view table of function value
WINDOW  Use to set size of viewing window
ZOOM  Use to adjust the viewing range
TRACE  Use to trace graphs
SLIDE SHOW  Use to enter slide show mode
EZ  Use to operate Rapid Graph/Rapid Window and Rapid Zoom functions

Names of parts

1. Graphing keys
2. Power supply ON/OFF key
3. Alphabet specification key
4. Secondary function specification key
5. Display screen
6. Cursor movement keys
7. Clear/Quit key
8. Variable enter key
9. Calculation execute key
10. Communication port for peripheral devices
Basic operation

Guide to key use
Press \texttt{2nd F} to use secondary functions (in yellow).
Press \texttt{ALPHA} to use the alphabet keys (in blue).

Example: \texttt{sin^{-1} A}
To select “\texttt{sin}”:
To select “\texttt{sin^{-1}}”: \texttt{2nd F sin}
To select A: \texttt{ALPHA sin}

Adjusting screen contrast
• The contrast adjust screen will appear when pressing \texttt{2nd F OPTION}

Press \texttt{—} to lighten contrast.
Press \texttt{+} to darken contrast.

SET UP menu
Press \texttt{2nd F SETUP A}.
• Contents displayed on the right side of the screen are the current settings.

Reset function
1) When trouble occurs
Press \texttt{2nd F OPTION E} to enter the reset mode.

• Use this function (1 or 2) to return all settings to the default value or to delete all data.

2) All RESET operation
• If trouble still occurs, proceed as follows:
  1. Press the RESET switch on the back.
  2. Press \texttt{ON}.
• Returns to the initial display.

CAUTION
Do not press \texttt{CL} in step 2. It will delete all data stored in the calculator.

SHARP
The equation editor allows equations to be viewed just as they are written in textbooks. This aids student comprehension and allows mistakes to be found quickly.

Example

Input the equation and see how it can be easily viewed with the equation editor.

\[ \int_0^\frac{1}{2} \frac{x}{\sqrt{1-x^2}} \, dx \]

**Key Operation** | **Display** | **Notes**
--- | --- | ---
1 | Clear the display. | 
2 | Select CALC and \( \int \) (Integral function) | 
3 | Enter the range of the integral. | 
4 | Enter \( \frac{x}{\sqrt{1-x^2}} \) | 
5 | Complete equation input. | 
6 | Calculate the expression. | The blinking mark in the upper right side of the display indicates the expression is being calculated. |

SHARP
**Shift**

(Change the location of graphs) __________

Graph shift function helps students grasp the relationship between an equation and its graph. Shift the graph’s location without changing its shape, and the change is immediately reflected in the equation on the right side of the display.

### Example

**When the graph of** \( y = x^2 \) **is shifted downward, how does this affect the equation?**

<table>
<thead>
<tr>
<th>Key Operation</th>
<th>Display</th>
<th>Notes</th>
</tr>
</thead>
</table>
| **1** | | Enter **SHIFT/CHANGE** mode.  
If **SHIFT** is not already highlighted press **Enter**. |
| **2** | | Select shift. Cursor moves to the equation menu. |
| **3** | | Select the equation: \( y = x^2 \) and draw the graph. |
| **4** | | Select the location of the shift: move cursor down twice. |
| **5** | | View the result of the shift. |

\[
\begin{align*}
  y &= x^2 \\
  y &= x^2 - 2
\end{align*}
\]
Graph change function helps students grasp the relationship between an equation and its graph. Change the shape of the graph, and the change is immediately reflected in the equation on the right side of the display.

**Example**

**When the graph of** \( y = x^2 \) **is changed, how does it affect the equation?**

**Key Operation** | **Display** | **Notes**
--- | --- | ---
1. 2nd F | | Enter [SHIFT/CHANGE] mode and specified \( \mathbf{CHANGE} \).
2. ENTER | | Select change. Cursor will move to the equation menu.
3. ENTER | | Select the equation: \( y = x^2 \) and draw the graph.
4. ▲ | | Select the location of the change: increase the value of y-coordinates.
5. ENTER | | View the result of the change.

\[
\begin{bmatrix}
  y = x^2 \\
  y = 2x^2
\end{bmatrix}
\]
Slide show assists with teacher preparation. By selecting from the built-in options or creating your own series of slides, you can demonstrate lessons with minimum preparation time.

**Example**

Use the built-in slide show of $y = x^2$ to show how the coordinates change as you move along the graph.

<table>
<thead>
<tr>
<th>Key Operation</th>
<th>Display</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 <strong>SLIDE SHOW</strong></td>
<td>![Display 1]</td>
<td>Specified SLIDE SHOW mode.</td>
</tr>
<tr>
<td>3 <strong>ENTER</strong></td>
<td>![Display 2]</td>
<td>Select $y = x^2$ and the first slide appears.</td>
</tr>
<tr>
<td>4 <strong>▼</strong></td>
<td>![Display 3]</td>
<td>Begin the slide show by pressing the ▼ cursor key.</td>
</tr>
</tbody>
</table>

Moving between the values you can follow the changes in the graph's coordinates, making the nature of the graph easier to understand.

* View the selection of built-in slide shows on the following pages.
Built-in slide show selections

1) $Y=X^2$

2) $Y=AX+B$

3) $Y=\sqrt{X}$

4) $Y=\frac{1}{X}$
Built-in slide show selections

5) $Y = \sin X$

6) $Y = \tan X$

7) $Y = \cos^{-1} X$

8) $Y = \ln X$
Graphing Procedures

The EL-9450/9400 has three unique functions that simplify graphing procedures: Rapid Graph, Rapid Window, and Rapid Zoom. Of course, the EL-9450/9400 supports conventional graphing procedures as well.

**Graphing Procedure**

Following outlines graphing procedures and indicates the steps where Sharp's unique functions can be used to simplify operations. These functions are introduced on the following pages.

<table>
<thead>
<tr>
<th><strong>Step 1</strong></th>
<th>Manual Input</th>
<th>Rapid Graph</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input equation</strong></td>
<td></td>
<td><img src="image" alt="Graphing Equation" /></td>
</tr>
<tr>
<td></td>
<td>$Y = \frac{X^3}{2} + \frac{X^2}{2}$</td>
<td>Simply select from built-in menu to modify desired type of equation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Step 2</strong></th>
<th>Manual Input</th>
<th>Rapid Window</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Set X, Y range</strong></td>
<td></td>
<td><img src="image" alt="Window Setting" /></td>
</tr>
<tr>
<td>$X_{\text{min}} = _ _ _ _$</td>
<td>$X_{\text{max}} = _ _ _ _ _$</td>
<td>Simply select from built-in menu to set window size.</td>
</tr>
<tr>
<td>$X_{\text{scl}} = _ _ _ _ _ _$</td>
<td>$Y_{\text{min}} = _ _ _ _ _$</td>
<td></td>
</tr>
<tr>
<td>$Y_{\text{max}} = _ _ _ _ _$</td>
<td>$Y_{\text{scl}} = _ _ _ _ _$</td>
<td></td>
</tr>
</tbody>
</table>

| **Step 3** | | ![Graph Drawing](image) |
| **Draw graph** | | Press Graph button to draw graph. |

<table>
<thead>
<tr>
<th><strong>Step 4</strong></th>
<th>Manual Input</th>
<th>Rapid Zoom</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adjust viewing window</strong></td>
<td></td>
<td><img src="image" alt="Zoom Adjustment" /></td>
</tr>
<tr>
<td></td>
<td>$X_{\text{min}} = _ _ _ _ _ _ _ _$</td>
<td>Use arrows to adjust window size while viewing graph.</td>
</tr>
<tr>
<td></td>
<td>$X_{\text{max}} = _ _ _ _ _ _ _ _$</td>
<td>Go back to Step 2 to readjust window size.</td>
</tr>
<tr>
<td></td>
<td>$X_{\text{scl}} = _ _ _ _ _ _ _ _$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$Y_{\text{min}} = _ _ _ _ _ _ _ _$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$Y_{\text{max}} = _ _ _ _ _ _ _ _$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$Y_{\text{scl}} = _ _ _ _ _ _ _ _$</td>
<td></td>
</tr>
</tbody>
</table>
Graphing has never been easier. With its full range of preset equations, rapid graph simplifies equation input. Use in conjunction with the rapid window function or with any graph created.

**Example**

**Draw the graph for** \( y = 2 \text{sin} (-2x + \pi) + 2 \)** using the rapid graph function.

<table>
<thead>
<tr>
<th>Key Operation</th>
<th>Display</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ( Y = )</td>
<td>![Display Image]</td>
<td>Enter the equation entry mode.</td>
</tr>
<tr>
<td>2 ( \text{EZ} )</td>
<td>![Display Image]</td>
<td>Enter Rapid Graph mode and view the equation-type menu.</td>
</tr>
<tr>
<td>3 ( \text{▼ ENTER} )</td>
<td>![Display Image]</td>
<td>Select the type of equation: Trigonometric, and view the equation format menu.</td>
</tr>
<tr>
<td>4 ( \text{ENTER} )</td>
<td>![Display Image]</td>
<td>Select the sin equation format and view the sin equation style.</td>
</tr>
<tr>
<td>5 ( \text{ENTER} )</td>
<td>![Display Image]</td>
<td>Select the second equation style and input. If necessary, make changes to the coefficients.</td>
</tr>
<tr>
<td>6 ( \text{GRAPH} )</td>
<td>![Display Image]</td>
<td>Draw the graph. (Note: Previous range values may affect the viewing window. To reset range values, use Rapid Window.)</td>
</tr>
</tbody>
</table>
Rapid window simplifies setting window size with a range of preset values. Use in conjunction with the rapid graph function or with any graph created.

**Example**

After using Rapid Graph to draw the graph of $y = 2\sin(-2x+\pi) + 2$ (refer p. 11), set the viewing window using the rapid window function.

<table>
<thead>
<tr>
<th>Key Operation</th>
<th>Display</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><img src="image1" alt="Window Settings" /></td>
<td>Enter viewing window setup mode.</td>
</tr>
<tr>
<td>2</td>
<td><img src="image2" alt="Rapid Window Mode" /></td>
<td>Enter Rapid Window mode.</td>
</tr>
<tr>
<td>3</td>
<td><img src="image3" alt="Select No. 3 Style" /></td>
<td>Select the No. 3 style and view the X-range menu.</td>
</tr>
<tr>
<td>4</td>
<td><img src="image4" alt="Select X-range No. 4" /></td>
<td>Select X-range No. 4: $-1 &lt; X &lt; 10$ (scl=1), and view the Y-range menu.</td>
</tr>
<tr>
<td>5</td>
<td><img src="image5" alt="Move Cursor to No. 5" /></td>
<td>Move the cursor to No. 5: $-0.5 &lt; Y &lt; 5$ (scl=0.5)</td>
</tr>
<tr>
<td>7</td>
<td><img src="image6" alt="Select Y-range and Draw Graph" /></td>
<td>Select the Y-range and draw the graph.</td>
</tr>
</tbody>
</table>
Rapid zoom offers one-touch adjustment of window size while viewing the graph. No more guessing or wasting class time to find optimal values for window size.

**Example**

Adjust the viewing window for \( y = x^3 + x^2 - 2x \) to show the entire graph.

**Key Operation**

1. \( Y = [X/T] a^3 \) \( + \) \( X/T \) \( X^2 \) \( - 2 \) \( X/T \)
2. \( \text{WINDOW} (-) \) \( 3 \) \( \text{ENTER} \) \( 3 \)
3. \( \text{ENTER} \) \( 1 \) \( \text{ENTER} \)
4. \( (-) \) \( 1 \) \( - 5 \) \( \text{ENTER} \) \( 1 \) \( - 5 \)
5. \( \text{ENTER} \) \( - 5 \) \( \text{ENTER} \) \( \text{GRAPH} \)

**Display**

**Notes**

Create the graph \( y = x^3 + x^2 - 2x \) using the following conditions:
- X-range: \( \text{xmin} = -3 \)
- \( \text{xmax} = 3 \)
- \( \text{xscl} = 1 \)
- Y-range: \( \text{ymin} = -1.5 \)
- \( \text{ymax} = 1.5 \)
- \( \text{yscl} = 0.5 \)

**EZ**

Enter Rapid Zoom mode.

**Change X-range from Ymax = 1.5 to Ymax=2. Draw the graph.**

**Repeat: Change Y-range from Ymax = 2 to Ymax=2.5. Draw the graph**

**View display (adjusted).**
Connect the EL-9450/9400 with a PC or Macintosh computer to expand the possibilities of data exchange using PC-Link software.

**What is PC LINK?**
- Creates and edits EL-9450/9400 programs on a PC.
- Receives and saves programs and various data from EL-9450/9400.
- Makes a backup of all the contents of EL-9450/9400.
- Sends programs and various data to EL-9450/9400.
- Loads image data of EL-9450/9400.
- Converts programs and various data files into a Text File. Converts program text files into a Program File.
- Prints out programs and various data files.

**Procedure**

1. Turn off the EL-9450/9400.

2. Connect the EL-9450/9400 to the PC by using the CE-450L, PC-Link adaptor and PC connector (see above diagram).

3. Make sure that the RS-232C (serial port) is connected to the PC. Use of the connector is determined by the shape of the PC serial port (see below chart).

4. Open PC-Link Software.

5. Switch on EL-9450/9400.
   * It is essential to use the same port for both the PC and the PC-Link Software.

6. Operate according to the instructions on the screen.

### What is PC LINK?

<table>
<thead>
<tr>
<th>Shape of PC serial port</th>
<th>Connecting procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 pin (male)</td>
<td>Connect the other side (25-pin side) of PC LINK adaptor to the serial port for the PC.</td>
</tr>
<tr>
<td>9 pin (male)</td>
<td>Connect the other side (25-pin side) of PC LINK adaptor to the 25-pin terminal of a converting adaptor. Also connect the other side (9-pin side) of the converting adaptor to the serial port for the PC.</td>
</tr>
<tr>
<td>8 pin (female)</td>
<td>For Macintosh</td>
</tr>
</tbody>
</table>
Set to set communication

Transfer data between two EL-9450/9400 calculators using the communication cable (CE-450L).

Communication Procedure

1. Plug the cable into both calculators.
2. Turn power on.
3. Receiver
   - Plug the cable into the receiver.
   - Press the specified LINK.
   - Press and hold the reset button (or D).
4. Enter
   - Press enter (or 2).
   - Press enter.
   - Enter.
   - Enter.
5. Sender
   - Press the specified LINK.
   - Press and hold the reset button (or D).
6. Enter
   - Press enter (or 1).
   - Enter.
   - Enter.
   - Select BACKUP.
   - Select LINK/SEND.

7. Enter
   - Enter.
8. Enter
   - Enter.
9. 2nd F EXE
   - Select SENDING [ON] to cancel
   - Execute Sending function.

List of the SEND menu

A SELECT ............... Sends files individually as described below.
1 ALL ................... Selects and displays all files.
2 GraphEq ............... Selects and displays all graph equations.
3 Program ............... Selects and displays all program files.
4 G Data .................. Selects and displays all graph data files.
5 L Data .................. Selects and displays all list data files.
6 Picture .................. Selects and displays all picture data files.
7 A-Z, Ø ................. Selects and displays all fixed memory of A to Z, and Ø
8 BACKUP ............... Menu to send all file data. Use this feature to send the entire content.
**Procedure**

1. Switch off the OHP Panel Controller.

2. Plug the cable connector of the OHP Projection Panel straight into the connection terminal of the OHP Panel Controller.

   (The optional AC adaptor is recommended for extended use of the OHP Projection Panel.)

3. Switch on the OHP Panel Controller.

4. Operating the OHP Panel Controller.

   The OHP Projection Panel display is synchronized with the display of the OHP Panel Controller. Place the OHP Projection Panel on top of the overhead projector to project images onto the screen.

5. Turn on the power to the overhead projector.
Menu tree 6

Y= (Y1)

RECT MODE
Y1=
Y2=
Y3=
Y4=
Y5=
Y6=
Y7=
Y8=
Y9=
Y0=

PAR MODE
X1T=
Y1T=
X2T=
Y2T=
X3T=
Y3T=
X4T=
Y4T=
X5T=
Y5T=
X6T=
Y6T=
X7T=
Y7T=
X8T=
Y8T=
X9T=
Y9T=

LINK
EXIT (EXIT) E 1)

A SELECT
1 All
2 List
3 GraphEq
4 Program

B BACKUP
5 O. Data
6 L. Data
7 Picture
8 A-Z, \phi

back up
Press ENTER
## Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions W x D x H (mm)</td>
<td>163 x 76 x 19.5 (without hardcase)</td>
</tr>
<tr>
<td>Power</td>
<td>R03 (AAA) x 4</td>
</tr>
<tr>
<td>Backup Battery</td>
<td>CR2032 x 1</td>
</tr>
<tr>
<td>Display</td>
<td></td>
</tr>
<tr>
<td>Size (dot)</td>
<td>96 x 64</td>
</tr>
<tr>
<td>Line x Characters</td>
<td>8 x 16</td>
</tr>
<tr>
<td>Character Size (dot)</td>
<td>5 x 7</td>
</tr>
<tr>
<td>Digits (mantissa + exponent)</td>
<td>10 + 2</td>
</tr>
<tr>
<td>Memory</td>
<td></td>
</tr>
<tr>
<td>Total Memory Size</td>
<td>32 KB</td>
</tr>
<tr>
<td>Constant Memory</td>
<td>27 + last answer memory</td>
</tr>
<tr>
<td>Accessory</td>
<td></td>
</tr>
<tr>
<td>Protective hard case</td>
<td></td>
</tr>
<tr>
<td>Standard Features</td>
<td></td>
</tr>
<tr>
<td>Graphing</td>
<td></td>
</tr>
<tr>
<td>Function graphing</td>
<td>Up to 10</td>
</tr>
<tr>
<td>Parametric graphing</td>
<td>Up to 6</td>
</tr>
<tr>
<td>Zoom, Trace</td>
<td></td>
</tr>
<tr>
<td>Table of function values</td>
<td></td>
</tr>
<tr>
<td>Statistics</td>
<td>Regression models</td>
</tr>
<tr>
<td>Scatter Plots and Histograms</td>
<td></td>
</tr>
<tr>
<td>Box-and-Whisker Diagrams</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>List</td>
<td>Up to 6 (Maximum length : 999)</td>
</tr>
<tr>
<td>Programming</td>
<td></td>
</tr>
<tr>
<td>Trigonometry functions (including</td>
<td>see, csc, cot)</td>
</tr>
<tr>
<td>Fraction/Decimal conversions</td>
<td></td>
</tr>
<tr>
<td>Last entry recall</td>
<td></td>
</tr>
<tr>
<td>Last answer recall</td>
<td></td>
</tr>
<tr>
<td>Features unique to Sharp</td>
<td>Equation editor, Shift/Change, Slide show (Built-in), Rapid graph,</td>
</tr>
<tr>
<td></td>
<td>Rapid window, Rapid zoom, List grouping</td>
</tr>
<tr>
<td>Peripheral</td>
<td></td>
</tr>
<tr>
<td>CE-450L</td>
<td>Unit-to-unit communications cable</td>
</tr>
<tr>
<td>CE-LK1P</td>
<td>PC-Link (Print screen/Data storage)</td>
</tr>
<tr>
<td>EL-945T/94T</td>
<td>CHP system (includes controller)</td>
</tr>
</tbody>
</table>

* Design and specifications are subject to change without notice.
* Some products may not be available in some countries.