SHARP

Graphing Calculator

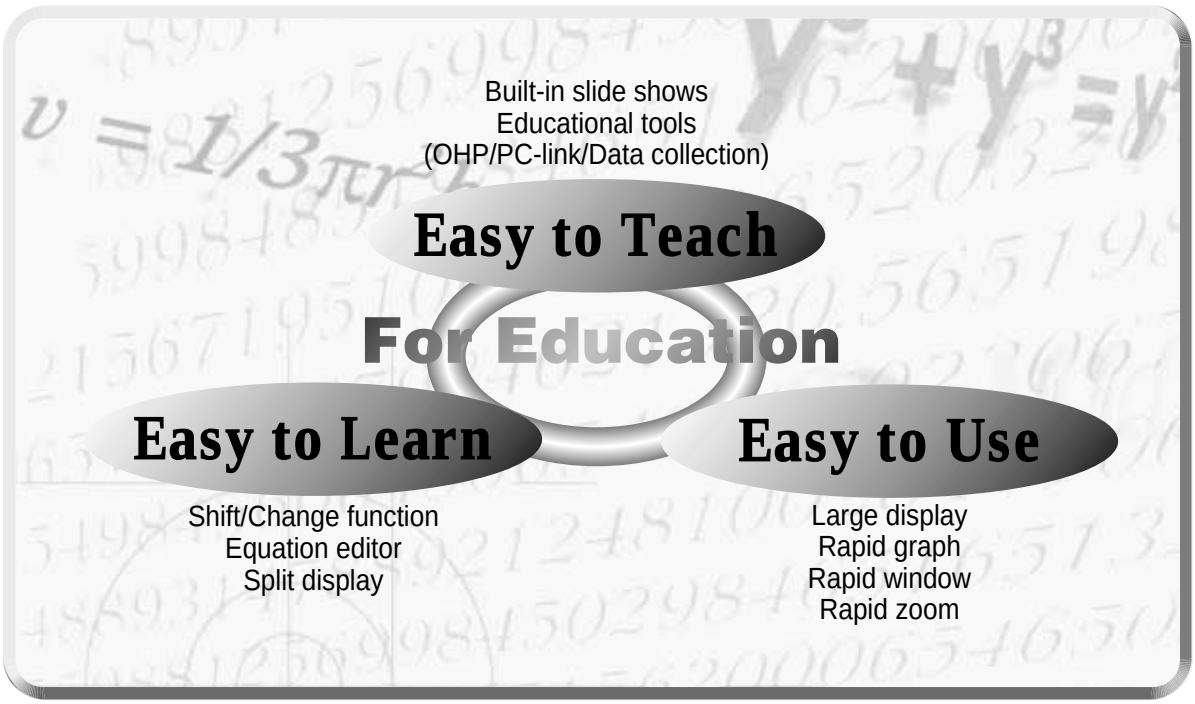
EL-9450/9400

OPERATION GUIDE

Introduction

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.



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Sales points

❶ Large 96 x 64-dot display

❷ Graph **Shift/Change** shows how "changing" the graph affects the equation

❸ **Slide Shows** reduce class preparation time

❹ **Equation Editor** shows equations just as in textbooks

❺ **Rapid graph/Rapid window** simplify graphing procedures

❻ **Rapid zoom** allows easy adjustment of window size

SHARP

Basic operation

Power ON/OFF

ON · · · · · · · Power on

OFF
2nd F **ON** · · · Power off

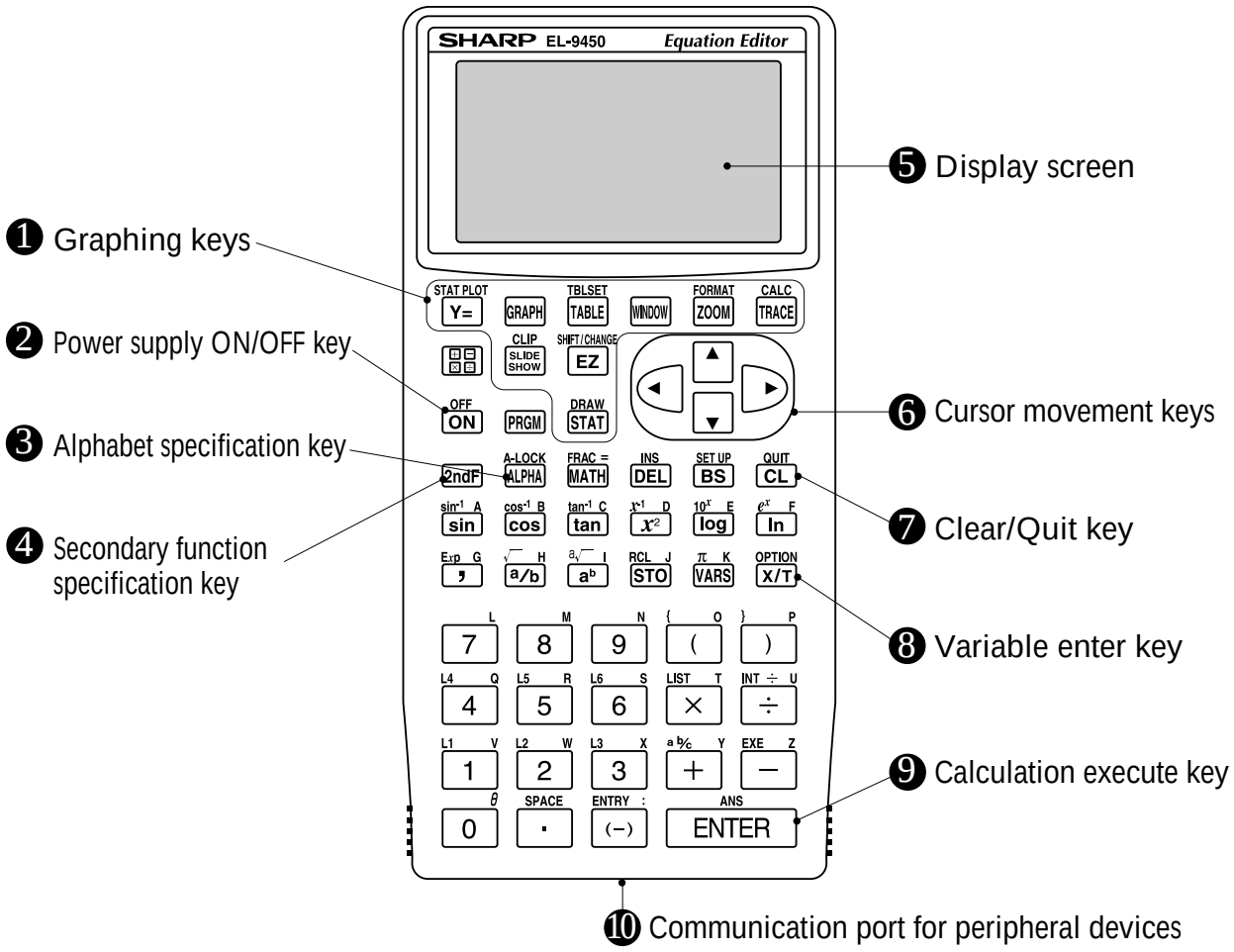
CL · · · · · · Erase equations and remove error displays

QUIT
2nd F **CL** · · · 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
	Use to enter calculation mode
SLIDE SHOW	Use to enter slide show mode
EZ	Use to operate Rapid Graph/Rapid Window and Rapid Zoom functions

Names of parts



Basic operation

Guide to key use

Press [2nd F] to use secondary functions (in yellow).

Press [ALPHA] to use the alphabet keys (in blue).

Example: [sin^{-1} A / sin]

To select "sin": [sin]

To select "sin^{-1}": [2nd F] [sin^{-1} / sin]

To select A: [ALPHA] [A / sin]

SET UP menu

Press [2nd F] [SET UP] [A].

- Contents displayed on the right side of the screen are the current settings.

[There may be differences in the results of calculations and graph plotting depending on the SET UP settings.]

Adjusting screen contrast

- The contrast adjust screen will appear when pressing [2nd F] [OPTION].

Press [−] to lighten contrast.

Press [+] to darken contrast.

Reset function

1) When trouble occurs

Press [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 [ON].
   - Returns to the initial display.

CAUTION

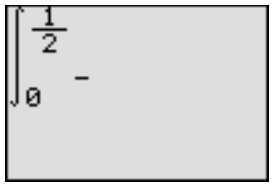
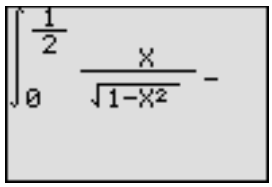
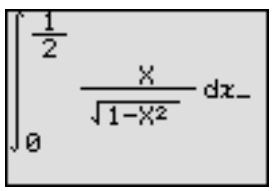
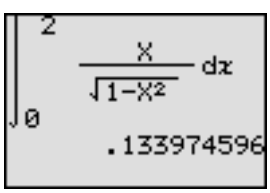
Do not press [CL] in step 2. It will delete all data stored in the calculator.

Equation editor

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. $\int_0^{\frac{1}{2}} \frac{x}{\sqrt{1-x^2}}dx$

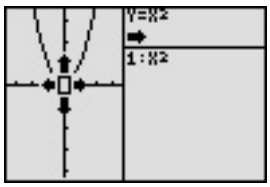
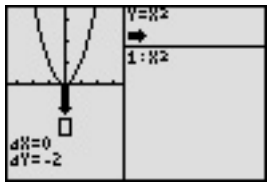
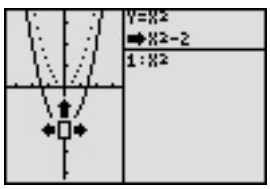
	Key Operation	***Display***	***Notes***
1	[▦] [CL]		Clear the display.
2	[MATH] [ENTER] [▼] [▼] [▼] [▼] [▼] (or [MATH] [A] [6])		Select CALC and ∫ (Integral function)
3	[ENTER] [0] [▶] [1] [a/b] [2] [▶] [▶]		Enter the range of the integral.
4	[X/T] [a/b] [2nd F] [√‾] [1] [−] [X/T] [X²] [▶] [▶]		Enter $\frac{x}{\sqrt{1-x^2}}$
5	[MATH] [ENTER] [▼] [▼] [▼] [▼] [▼] [▼] [ENTER] (or [MATH] [A] [0] [7])		Complete equation input.
6	[ENTER]		Calculate the expression. [The blinking mark in the upper right side of the display indicates the expression is being calculated.]

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?

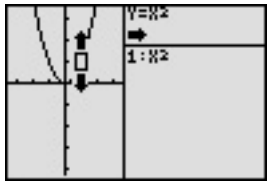
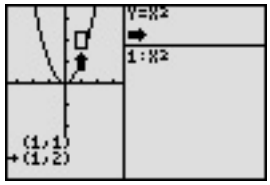
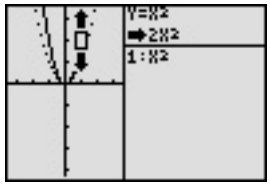
	Key Operation	***Display***	***Notes***
1	2nd F SHIFT/CHANGE		Enter **SHIFT/CHANGE** mode. [If **A**SHIFT is not already highlighted press ▲.]
2	ENTER		Select shift. Cursor moves to the equation menu.
3	ENTER		Select the equation: $y = x^2$ and draw the graph.
4	▼ ▼		Select the location of the shift: move cursor down twice.
5	ENTER		View the result of the shift. [$y = x^2$ ↓ $y = x^2-2$]

Change (Change the shape of the graphs)

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?

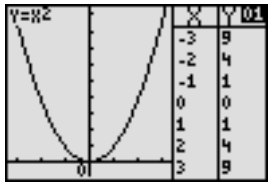
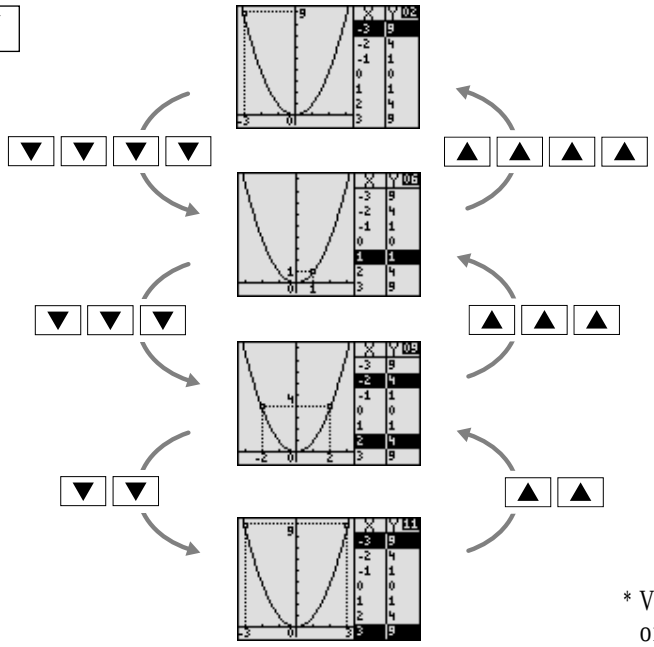
	Key Operation	***Display***	***Notes***
1	2nd F SHIFT/CHANGE ▼		Enter **SHIFT/CHANGE** mode and specified (**B CHANGE**).
2	ENTER		Select change. Cursor will move to the equation menu.
3	ENTER		Select the equation: $y = x^2$ and draw the graph.
4	▲		Select the location of the change: increase the value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

Slide show

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

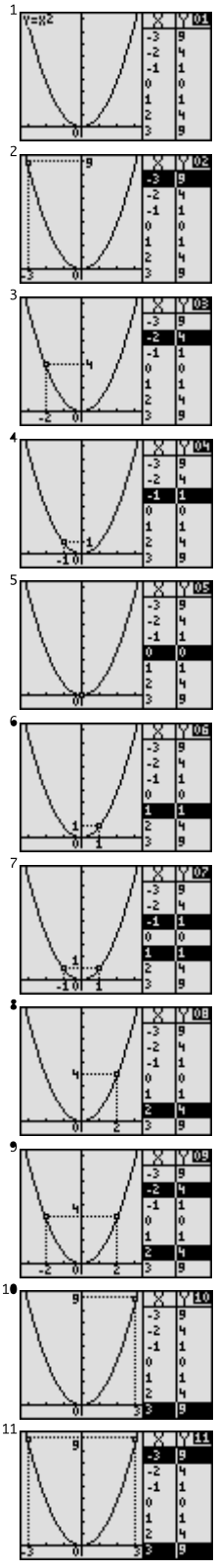
Use the built-in slide show of $y = x^2$ to show how the coordinates change as you move along the graph.

	Key Operation	*Display*	*Notes*
1	SLIDE SHOW		Specified **SLIDE SHOW** mode.
2	ENTER		Select the built-in menu.
3	ENTER		Select $y = x^2$ and the first slide appears.
4	▼		Begin the slide show by pressing the ▼ cursor key. Moving between the values you can follow the changes in the graph's coordinates, making the nature of the graph easier to understand.

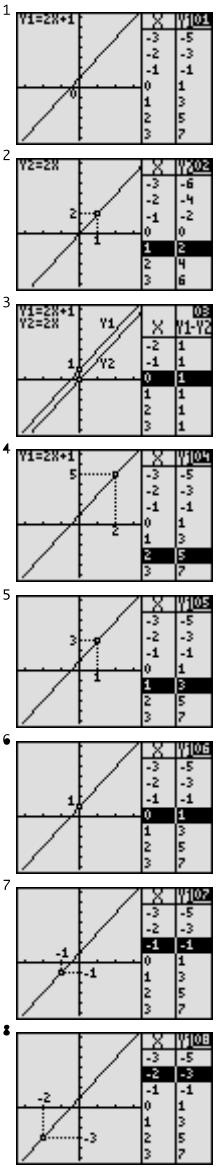
* View the selection of built-in slide shows on the following pages.

Built-in slide show selections

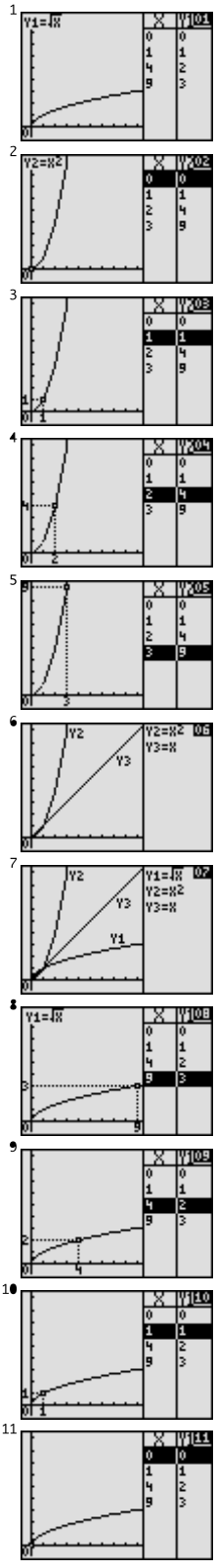
1) $Y=X^2$



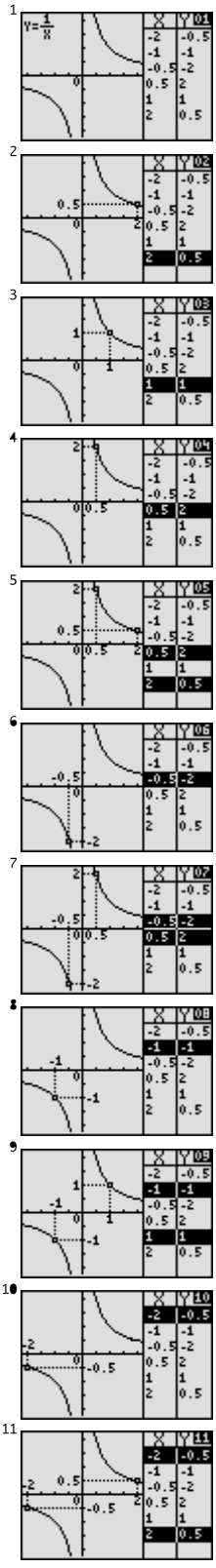
2) $Y=AX+B$



3) $Y=\sqrt{X}$

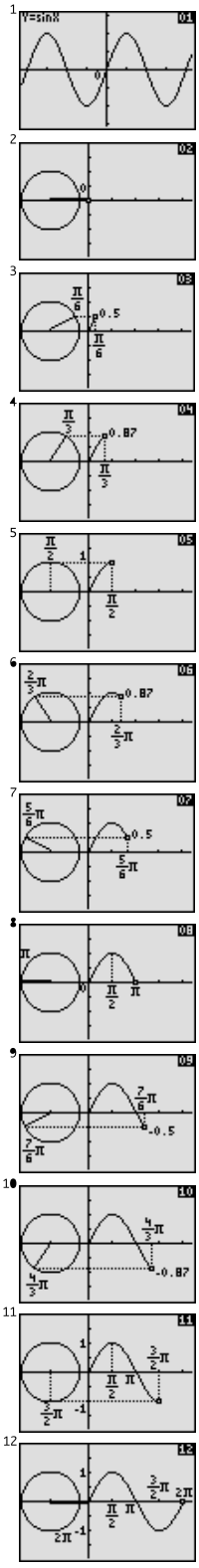


4) $Y=1/X$

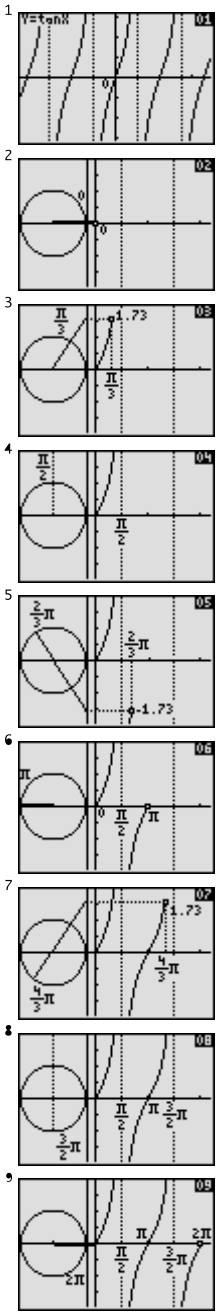


Built-in slide show selections

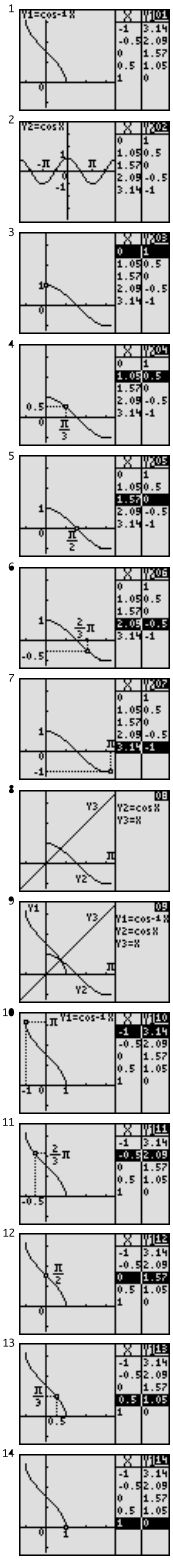
5) Y=sinX



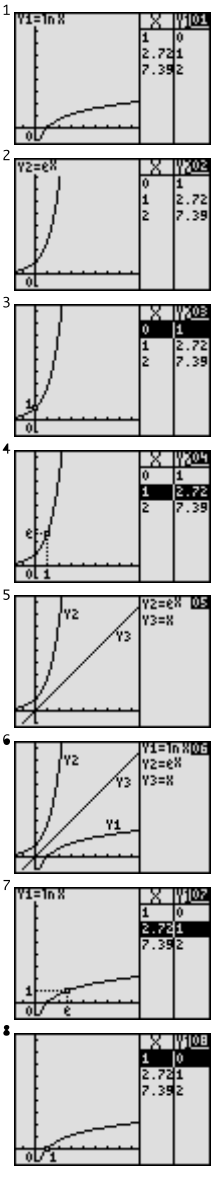
6) Y=tanX



7) Y=cos^{-1}X



8) Y=lnX



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.

Step 1

Input equation

Manual Input

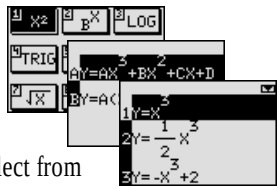
Y=

X/T a^b 3 ▶ + X/T

X^2 — 2 X/T

Rapid Graph

EZ



Simply select from built-in menu to modify desired type of equation .

Step 2

Set X, Y range

Xmin =
Xmax =
Xscl =
Ymin =
Ymax =
Yscl =

Manual Input

WINDOW

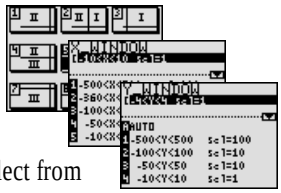
(–) 3 ENTER 3 ENTER

1 ENTER (–) 1 • 5 ENTER

1 • 5 ENTER • 5 ENTER

Rapid Window

EZ

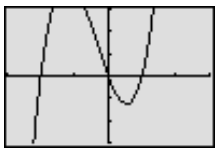


Simply select from built-in menu to set window size.

Step 3

Draw graph

GRAPH



Press Graph button to draw graph.

Step 4

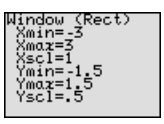
Adjust viewing window

Manual Input

WINDOW

Amending range size

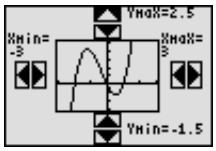
GRAPH



Go back to Step 2 to readjust window size.

Rapid Zoom

EZ



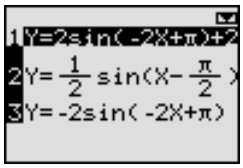
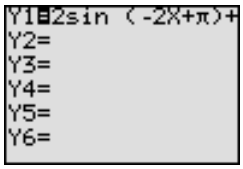
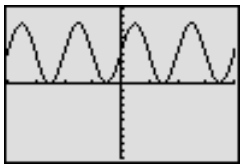
Use arrows to adjust window size while viewing graph.

Rapid graph

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 $y = 2\sin(-2x+\pi) + 2$ using the rapid graph function.

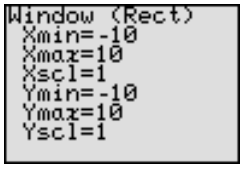
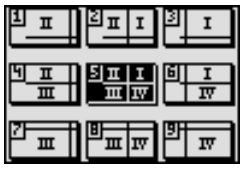
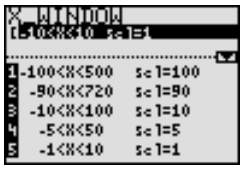
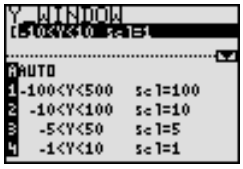
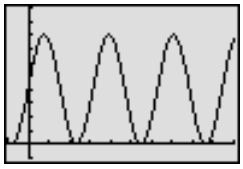
	Key Operation	*Display*	*Notes*
1	Y=		Enter the equation entry mode.
2	EZ		Enter Rapid Graph mode and view the equation-type menu.
3	▼ ENTER		Select the type of equation: Trigonometric, and view the equation format menu.
4	ENTER		Select the sin equation format and view the sin equation style.
5	ENTER		Select the second equation style and input. If necessary, make changes to the coefficients.
6	GRAPH		Draw the graph. (Note: Previous range values may affect the viewing window. To reset range values, use Rapid Window.)

Rapid window

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 = 2sin (-2x+π) + 2 (refer p. 11), set the viewing window using the rapid window function.

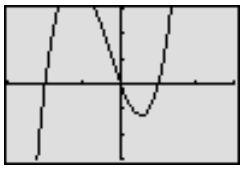
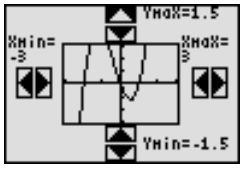
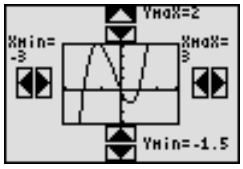
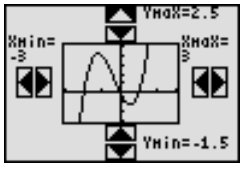
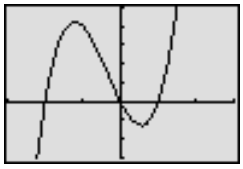
	Key Operation	***Display***	***Notes***
1	WINDOW		Enter viewing window setup mode.
2	EZ		Enter Rapid Window mode.
3	▼ ▶ ENTER		Select the No. 3 style and view the X-range menu.
4	▼ (Five times) (or 5 ENTER) ENTER		Select X-range No. 4: (-1 < X < 10 scl=1), and view the Y-range menu.
5	▼ (Six times) (or 5)		Move the cursor to No. 5: (-0.5 < Y < 5 scl=0.5)
7	ENTER		Select the Y-range and draw the graph.

Rapid zoom

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.

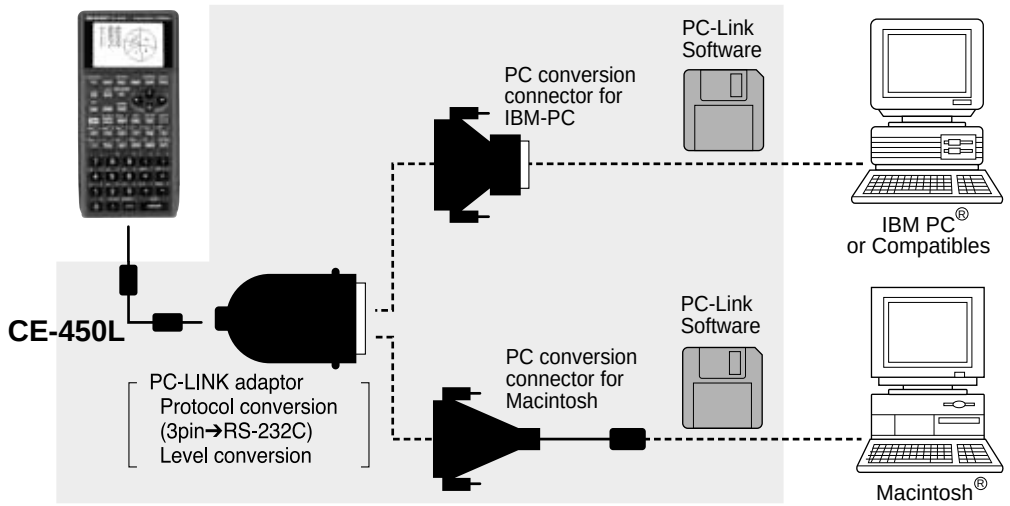
	Key Operation	***Display***	***Notes***
1	Y= X/T a^b 3 ▶ + X/T X^2 − 2 X/T WINDOW (−) 3 ENTER 3 ENTER 1 ENTER (−) 1 • 5 ENTER 1 • 5 ENTER • 5 ENTER GRAPH		Create the graph $y = x^3 + x^2 - 2x$ using the following conditions: X-range: xmin = -3 xmax = 3 xscl = 1 Y-range: ymin = -1.5 ymax = 1.5 yscl = 0.5
2	EZ		Enter Rapid Zoom mode.
3	▼ ENTER		Change X-range from Ymax = 1.5 to Ymax=2. Draw the graph.
4	ENTER		Repeat: Change Y-range from Ymax = 2 to Ymax=2.5. Draw the graph
5	GRAPH		View display (adjusted).

SHARP

PC-LINK

Connect the EL-9450/9400 with a PC or Macintosh computer to expand the possibilities of data exchange using PC-Link software.

CE-LK1P (PC-link system)



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).

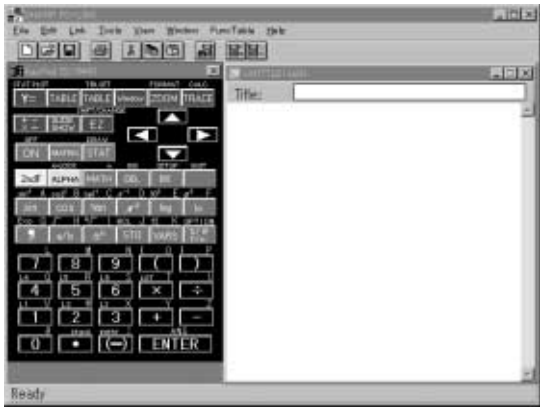
3 Make sure that the RS-232C (serial port) is connected to the PC. Use of the connector is determined by the shape of the PC serial port (see below chart).

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.



Shape of PC serial port	Connecting procedure
25 pin (male)	Connect the other side (25-pin side) of PC LINK adaptor to the serial port for the PC.
9 pin (male)	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.
8 pin (female)	For Macintosh

Set to set communication

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

Communication Procedure

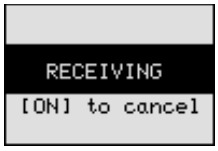
1 Plug the cable into both calculators.

2 Turn power on.

3 **Receiver**
2nd F OPTION
▼ ▼ ▼
(or D)

Specified LINK.

4 ENTER ▼
ENTER
(or 2)



Select LINK/RECEIVE.

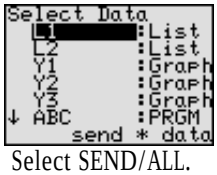
5 **Sender**
2nd F OPTION
▼ ▼ ▼
(or D)

Specified LINK.

6 ENTER ENTER
(or 1)

Select LINK/SEND.

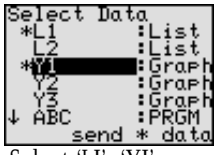
7 ENTER ENTER



Select SEND/ALL.

[List of sendable data will appear on screen.]

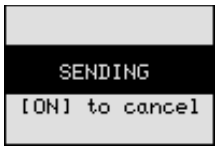
8 ENTER
▼ ▼
ENTER



Select 'LI', 'YI'

[* mark desired data to be sent.]

9 2nd F EXE



Execute Sending function.

List of the SEND menu

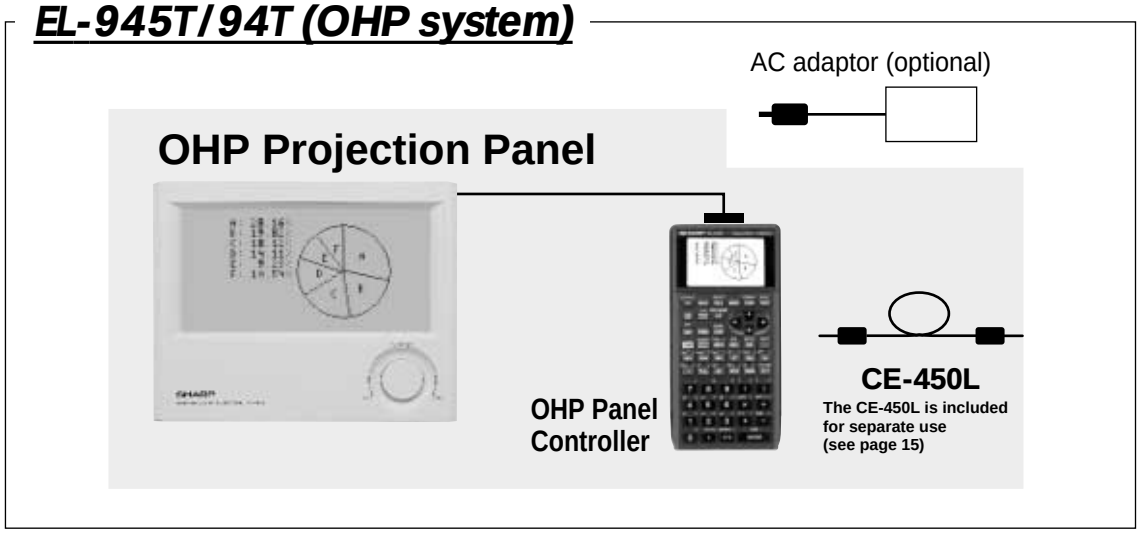
A SELECT	Sends files individually as described below.
1 ALL	Selects and displays all files.
2 List	Selects and displays all list files.
3 GraphEq	Selects and displays all graph equations.
4 Program	Selects and displays all program files.
5 G_Data	Selects and displays all graph data files.
6 L_Data	Selects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

SHARP

OHP System

Use the EL-9450/9400 OHP system with the overhead projector to make classroom presentations convenient for the whole class to see.

EL-945T/94T (OHP system)



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.)

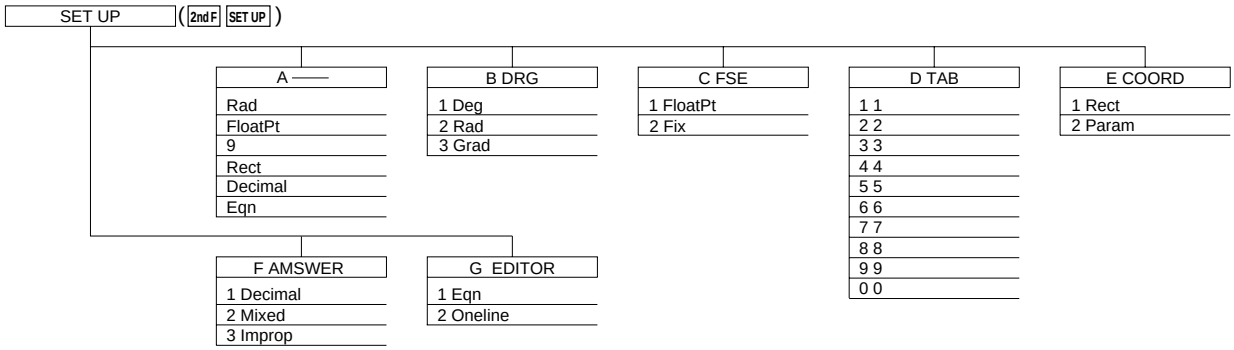
3 Switch on the OHP Panel Controller.

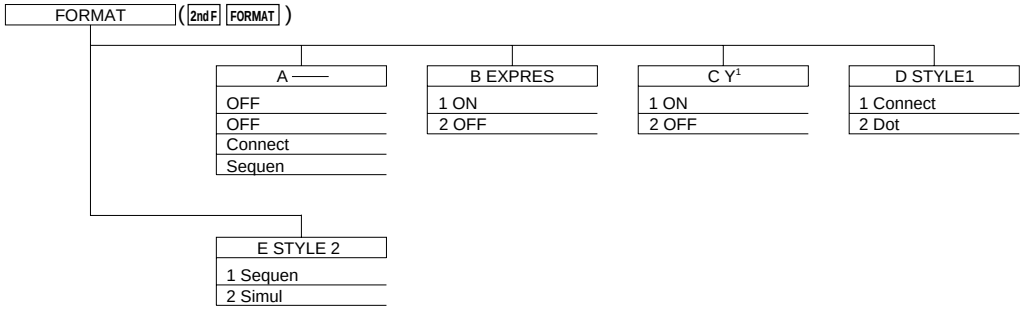
4 Operating the OHP Panel Controller.

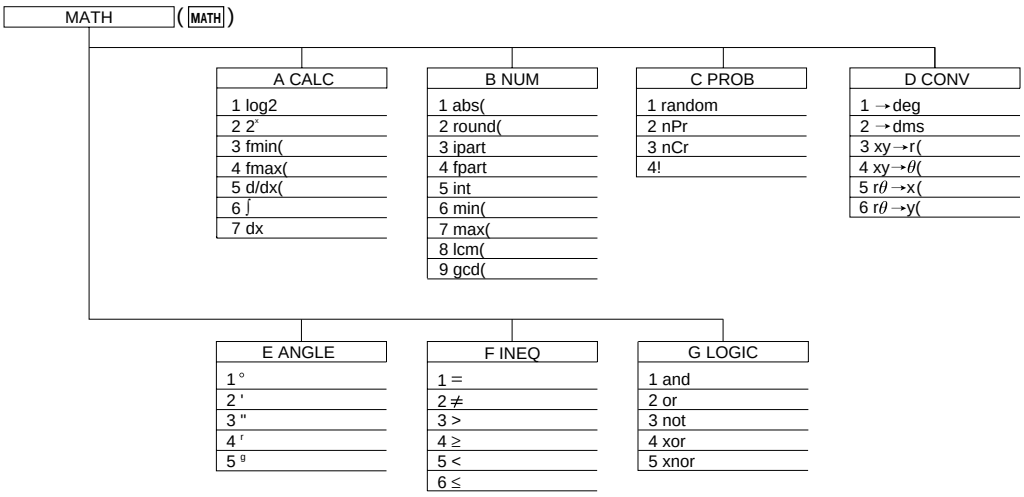
The OHP Projection Panel display is synchronized with the display of the OHP Panel Controller.
Place the OHP Projection Panel on top of the overhead projector to project images onto the screen.

5 Turn on the power to the overhead projector.

Menu tree 1

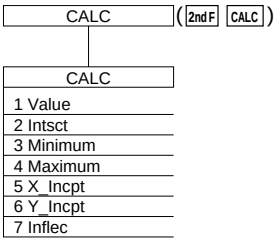

SET UP
(2nd F SET UP)
A ——
Rad
FloatPt
9
Rect
Decimal
Eqn
B DRG
1 Deg
2 Rad
3 Grad
C FSE
1 FloatPt
2 Fix
D TAB
1 1
2 2
3 3
4 4
5 5
6 6
7 7
8 8
9 9
0 0
E COORD
1 Rect
2 Param
F AMSWER
1 Decimal
2 Mixed
3 Improp
G EDITOR
1 Eqn
2 Oneline


FORMAT
(2nd F FORMAT)
A ——
OFF
OFF
Connect
Sequen
B EXPRES
1 ON
2 OFF
C Y1
1 ON
2 OFF
D STYLE1
1 Connect
2 Dot
E STYLE 2
1 Sequen
2 Simul

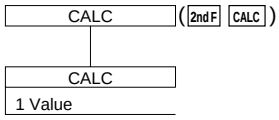

MATH
(MATH)
A CALC
1 log2
2 2ˣ
3 fmin(
4 fmax(
5 d/dx(
6 ∫
7 dx
B NUM
1 abs(
2 round(
3 ipart
4 fpart
5 int
6 min(
7 max(
8 lcm(
9 gcd(
C PROB
1 random
2 nPr
3 nCr
4!
D CONV
1 →deg
2 →dms
3 xy→r(
4 xy→θ(
5 rθ→x(
6 rθ→y(
E ANGLE
1 °
2 '
3 "
4 ʳ
5 ᵍ
F INEQ
1 =
2 ≠
3 >
4 ≥
5 <
6 ≤
G LOGIC
1 and
2 or
3 not
4 xor
5 xnor

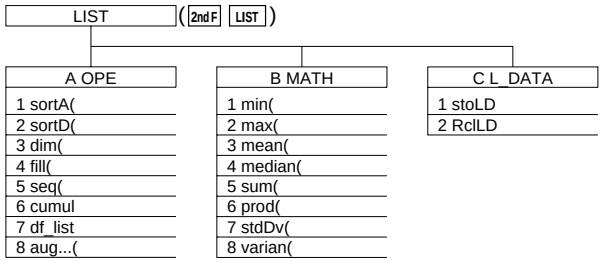
Menu tree 2

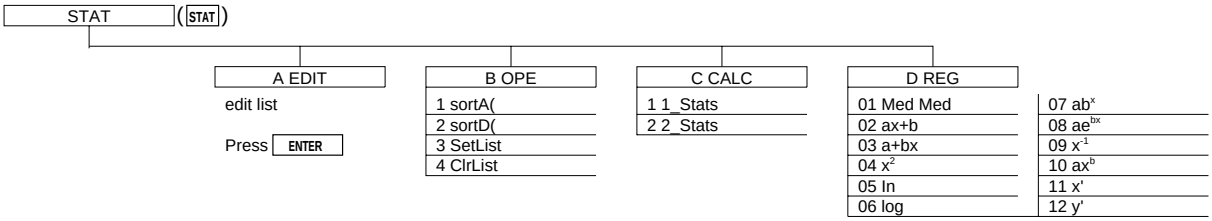
When coordinate system is Rect

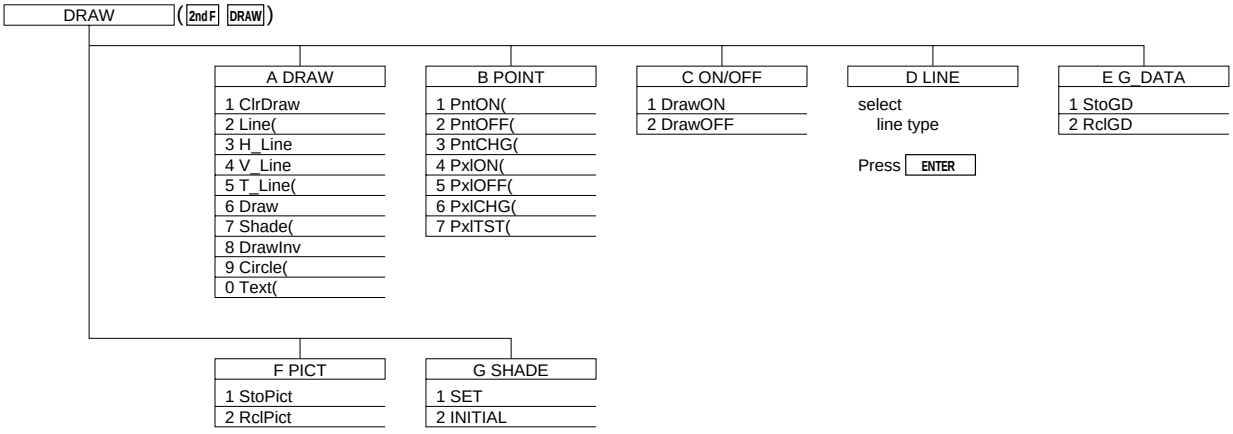


When coordinate system is Param

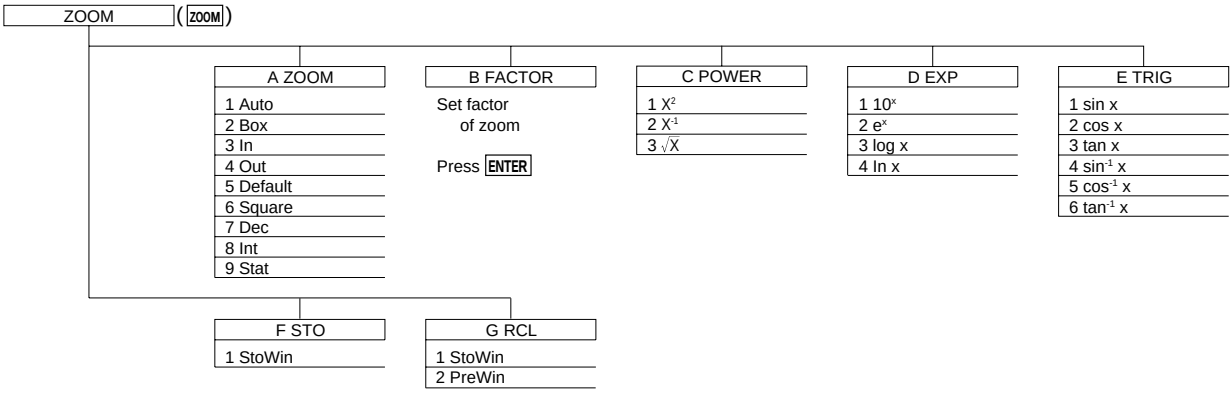


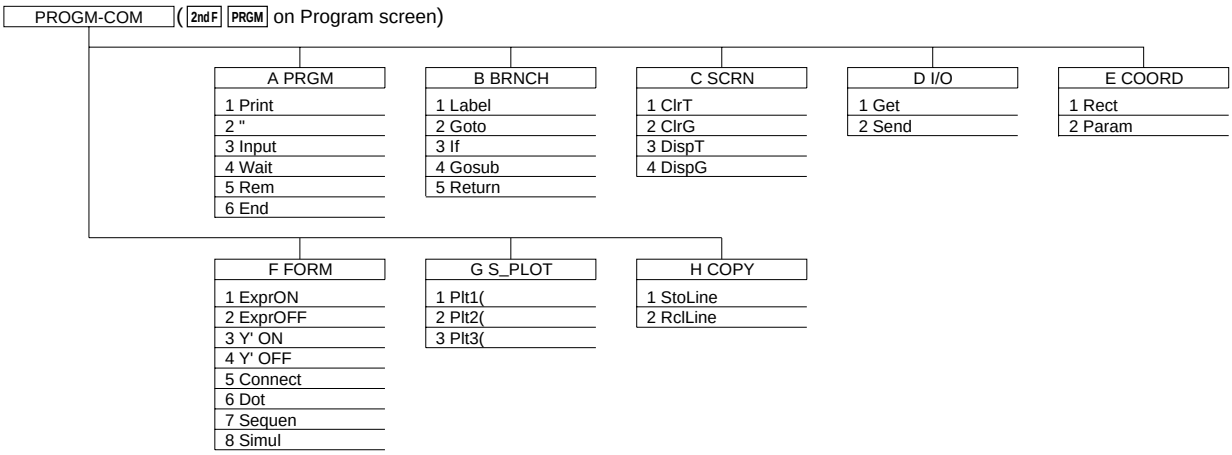


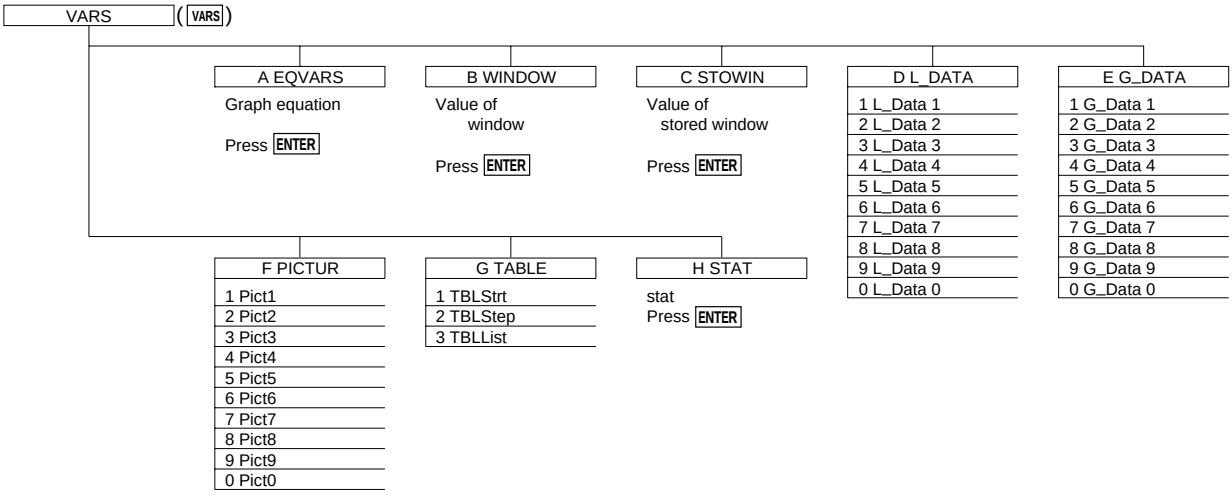




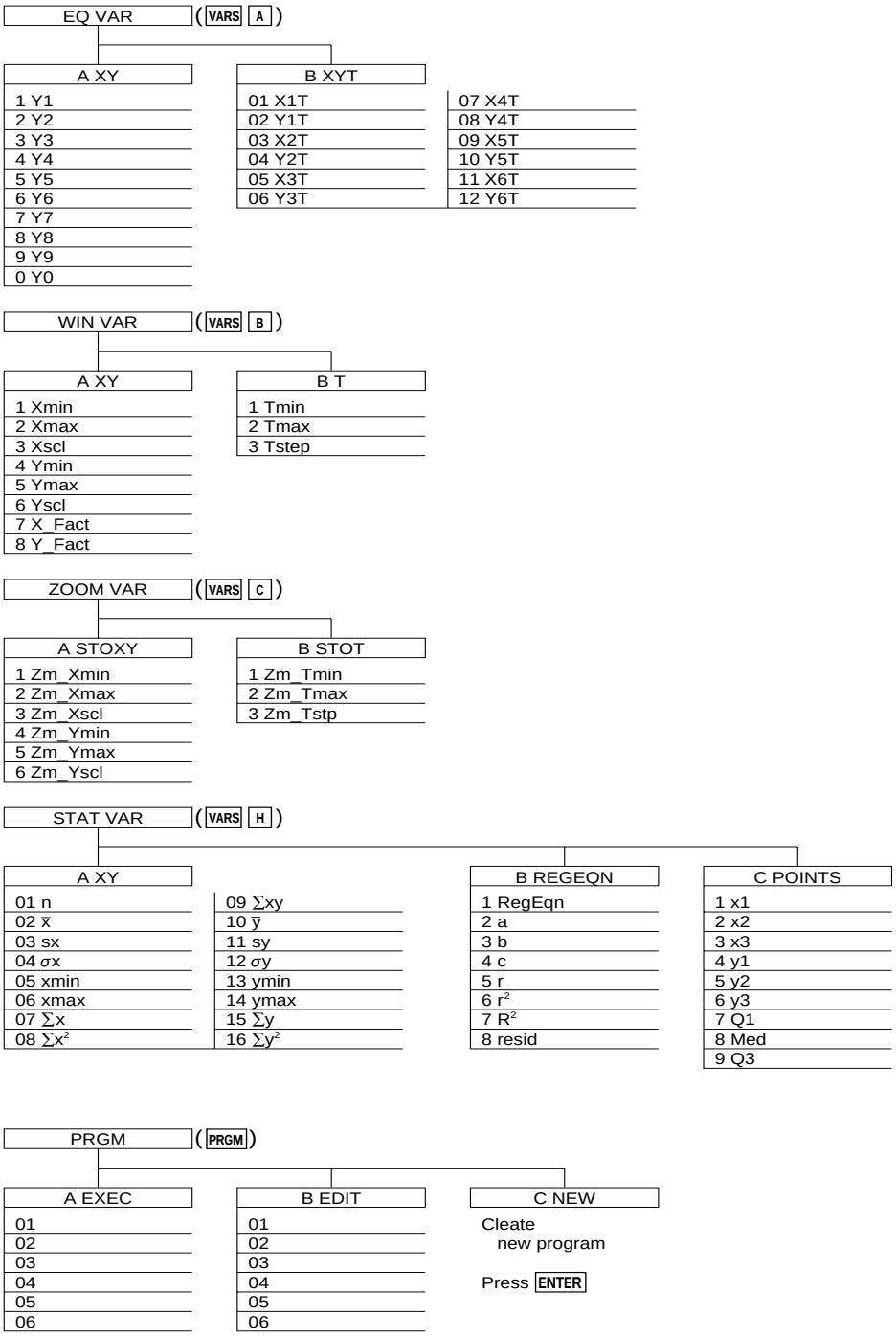
Menu tree 3


ZOOM (ZOOM)
A ZOOM
1 Auto
2 Box
3 In
4 Out
5 Default
6 Square
7 Dec
8 Int
9 Stat
B FACTOR
Set factor of zoom
Press ENTER
C POWER
1 X²
2 X⁻¹
3 √X
D EXP
1 10ˣ
2 eˣ
3 log x
4 ln x
E TRIG
1 sin x
2 cos x
3 tan x
4 sin⁻¹ x
5 cos⁻¹ x
6 tan⁻¹ x
F STO
1 StoWin
G RCL
1 StoWin
2 PreWin

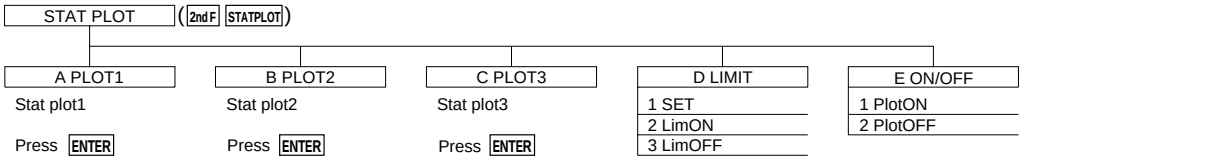

PROGM-COM (2nd F PRGM on Program screen)
A PRGM
1 Print
2 "
3 Input
4 Wait
5 Rem
6 End
B BRNCH
1 Label
2 Goto
3 If
4 Gosub
5 Return
C SCRN
1 ClrT
2 ClrG
3 DispT
4 DispG
D I/O
1 Get
2 Send
E COORD
1 Rect
2 Param
F FORM
1 ExprON
2 ExprOFF
3 Y' ON
4 Y' OFF
5 Connect
6 Dot
7 Sequen
8 Simul
G S_PLOT
1 Plt1(
2 Plt2(
3 Plt3(
H COPY
1 StoLine
2 RclLine

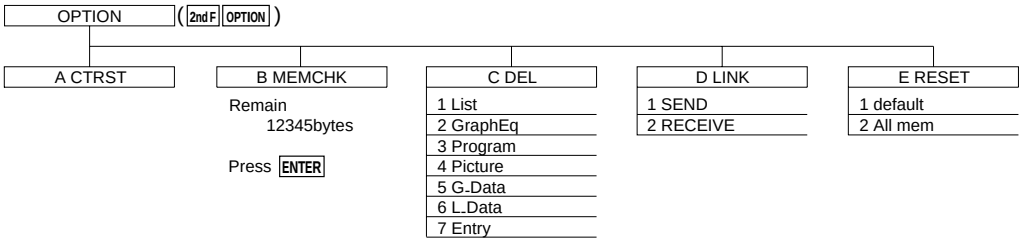

VARS (VARS)
A EQVARS
Graph equation
Press ENTER
B WINDOW
Value of window
Press ENTER
C STOWIN
Value of stored window
Press ENTER
D L_DATA
1 L_Data 1
2 L_Data 2
3 L_Data 3
4 L_Data 4
5 L_Data 5
6 L_Data 6
7 L_Data 7
8 L_Data 8
9 L_Data 9
0 L_Data 0
E G_DATA
1 G_Data 1
2 G_Data 2
3 G_Data 3
4 G_Data 4
5 G_Data 5
6 G_Data 6
7 G_Data 7
8 G_Data 8
9 G_Data 9
0 G_Data 0
F PICTUR
1 Pict1
2 Pict2
3 Pict3
4 Pict4
5 Pict5
6 Pict6
7 Pict7
8 Pict8
9 Pict9
0 Pict0
G TABLE
1 TBLStrt
2 TBLStep
3 TBLList
H STAT
stat
Press ENTER

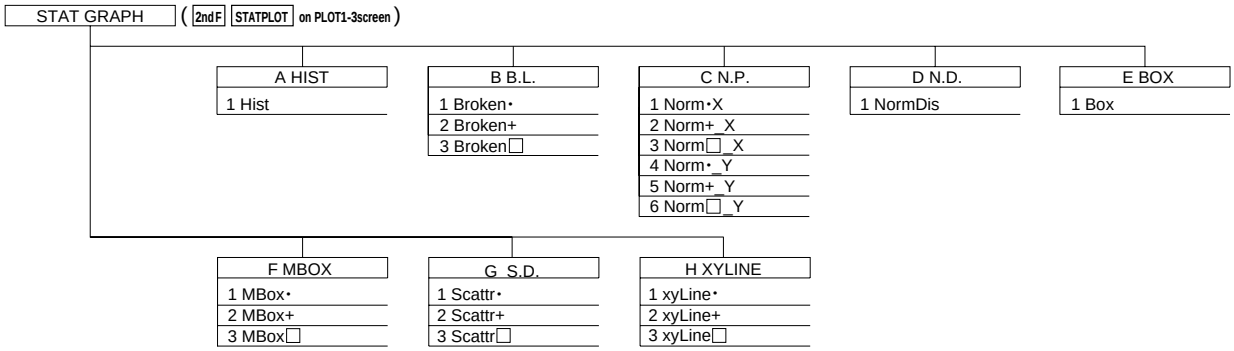
Menu tree 4

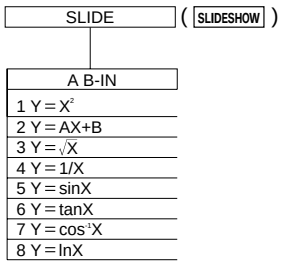

EQ VAR (VARS A)
A XY
1 Y1
2 Y2
3 Y3
4 Y4
5 Y5
6 Y6
7 Y7
8 Y8
9 Y9
0 Y0
B XYT
01 X1T
02 Y1T
03 X2T
04 Y2T
05 X3T
06 Y3T
07 X4T
08 Y4T
09 X5T
10 Y5T
11 X6T
12 Y6T
WIN VAR (VARS B)
A XY
1 Xmin
2 Xmax
3 Xscl
4 Ymin
5 Ymax
6 Yscl
7 X_Fact
8 Y_Fact
B T
1 Tmin
2 Tmax
3 Tstep
ZOOM VAR (VARS C)
A STOXY
1 Zm_Xmin
2 Zm_Xmax
3 Zm_Xscl
4 Zm_Ymin
5 Zm_Ymax
6 Zm_Yscl
B STOT
1 Zm_Tmin
2 Zm_Tmax
3 Zm_Tstp
STAT VAR (VARS H)
A XY
01 n
02 x̄
03 sx
04 σx
05 xmin
06 xmax
07 Σx
08 Σx²
09 Σxy
10 ȳ
11 sy
12 σy
13 ymin
14 ymax
15 Σy
16 Σy²
B REGEQN
1 RegEqn
2 a
3 b
4 c
5 r
6 r²
7 R²
8 resid
C POINTS
1 x1
2 x2
3 x3
4 y1
5 y2
6 y3
7 Q1
8 Med
9 Q3
PRGM (PRGM)
A EXEC
01
02
03
04
05
06
B EDIT
01
02
03
04
05
06
C NEW
Cleate
new program
Press ENTER

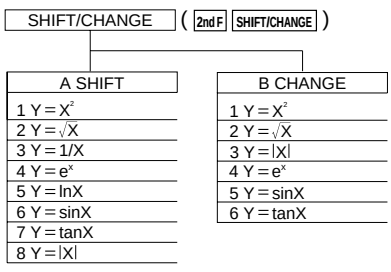
Menu tree 5


STAT PLOT (2nd F STATPLOT)
A PLOT1
Stat plot1
Press ENTER
B PLOT2
Stat plot2
Press ENTER
C PLOT3
Stat plot3
Press ENTER
D LIMIT
1 SET
2 LimON
3 LimOFF
E ON/OFF
1 PlotON
2 PlotOFF

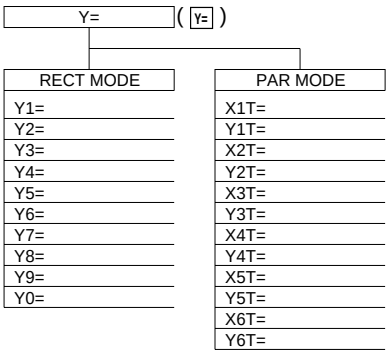

OPTION (2nd F OPTION)
A CTRST
B MEMCHK
Remain
12345bytes
Press ENTER
C DEL
1 List
2 GraphEq
3 Program
4 Picture
5 G-Data
6 L-Data
7 Entry
D LINK
1 SEND
2 RECEIVE
E RESET
1 default
2 All mem

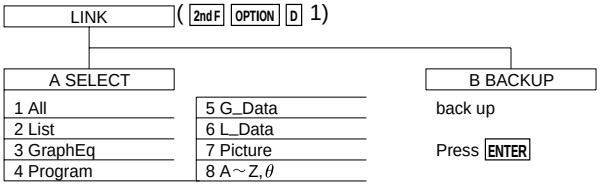

STAT GRAPH (2nd F STATPLOT on PLOT1-3screen)
A HIST
1 Hist
B B.L.
1 Broken・
2 Broken+
3 Broken□
C N.P.
1 Norm・X
2 Norm+_X
3 Norm□_X
4 Norm・_Y
5 Norm+_Y
6 Norm□_Y
D N.D.
1 NormDis
E BOX
1 Box
F MBOX
1 MBox・
2 MBox+
3 MBox□
G S.D.
1 Scattr・
2 Scattr+
3 Scattr□
H XYLINE
1 xyLine・
2 xyLine+
3 xyLine□


SLIDE (SLIDESHOW)
A B-IN
1 Y = X²
2 Y = AX+B
3 Y = √X
4 Y = 1/X
5 Y = sinX
6 Y = tanX
7 Y = cos⁻¹X
8 Y = lnX


SHIFT/CHANGE (2nd F SHIFT/CHANGE)
A SHIFT
1 Y = X²
2 Y = √X
3 Y = 1/X
4 Y = eˣ
5 Y = lnX
6 Y = sinX
7 Y = tanX
8 Y = |X|
B CHANGE
1 Y = X²
2 Y = √X
3 Y = |X|
4 Y = eˣ
5 Y = sinX
6 Y = tanX

Menu tree 6


Y=
(Y=)
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=


LINK
(2nd F OPTION D 1)
A SELECT
1 All
2 List
3 GraphEq
4 Program
5 G_Data
6 L_Data
7 Picture
8 A~Z, θ
B BACKUP
back up
Press ENTER

Specifications

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

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

SHARP

EL-9450/9400 Graphing Calculator

SHARP

SHARP CORPORATION OSAKA, JAPAN

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