

SHARP

INTER/MICROCASSETTE RECORDER FOR POCKET COMPUTER
RECORDED/MICROCASSETTE RECORDER FÜR TASCHENCOMPUTER
RIMANTE/MAGNETOPHONE A MICRO-CASSETTE PER ORDINATORE DI POCHE
RESOR/GRABADORA DE CINTA MICROCASSETTE PARA COMPUTADORA DE BOLSILLO
IMPATRICE/REGISTRATORE A MICROCASSETTA PER COMPUTER DA TASCA

MODEL
MODELL
MODÈLE
MODELLO
MODULO

CE-125

INSTRUCTION MANUAL

MODE D'EMPLOI
MANUAL DE INSTRUCCIONES

MANUALE DELLE ISTRUZIONI

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INTRODUCTION

Congratulations on your purchase of the SHARP CE-125 Printer and Microcassette Tape Recorder for the Pocket Computer. You'll find it a useful addition to your powerful Pocket Computer. With the Printer, you can have "hard-copies" of programs and data. The Tape Recorder can store programs and data on microcassettes. Programs and data can be "loaded" back into the PC-1251 for use at a later date, thus saving the labor of retyping them.

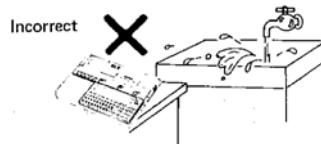
Special Notice to Sharp Customers

- 1 Your CE-125 is equipped with a rechargeable Ni-Cad battery. So that you may obtain maximum efficiency from your unit, please read the instructions below before operating the unit for the first time:
- 2 After purchasing, or when stored unused for over three months, we recommend that you recharge the battery before using the unit.
- 3 Simply connect the AC adaptor (EA-23E only) between the unit and the wall outlet. When recharging this unit, turn the printer switch OFF. (See diagram on page 10.)
- 4 The batteries are fully charged after 15 hours.
- 5 Install paper tape before operating.
- 6 To install a paper tape refer to "Installing the paper" on page 13.
- 7 Before using the unit, make sure that the microcassette tape is inserted correctly.

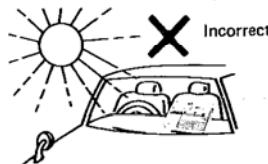
PRECAUTIONS

To insure trouble-free Printer/Microcassette Tape Recorder operation, please observe the following precautions:

Do not expose this unit to moisture, as this will damage the internal circuitry.



Do not expose the unit to temperatures higher than 60°C (140°F). The unit should not be placed in direct sunlight or in a closed vehicle, nor should it be placed near such heat sources as heaters, etc.



Do not locate or store this unit for extended periods in places subject to high humidity or dust.



Use a soft, dry cloth to clean the unit. Do not use any solvent or wet cloth.



Do not locate this unit or cassettes near objects with a strong magnetic field, such as radios, TV sets or loud speakers. Magnetic fields may reduce the tape sensitivity or even erase the recorded contents.



Notice for thermal paper

- 1) Printing on thermal paper may fade if exposed for long periods to bright light or high temperatures.
- 2) Thermal paper should be protected from extremes of temperature, moisture and sunlight.
- 3) Avoid using a solvent-type paste to stick printed thermal paper to a mount.
- 4) The thermal paper should not come in contact with PVC sheet.
Ex.: If placed in the PVC sheet envelopes, the printed thermal paper may fade.
- 5) The thermal paper should not come in contact with ammonia.
Ex.: Upon contact with the paper immediately copied by any Diazo type copier, discoloration of the printed thermal paper may develop.
- 6) The thermal paper is extremely sensitive to oil from your hands. Try to avoid touching the paper as much as possible — even light contact can cause oily discoloration which can distort the quality of printing. When loading paper, hold the paper by the edges with the side of your fingers so there is minimum contact.

OPERATING CONTROLS

① STOP/EJECT BUTTON (■):

Used to stop the tape travel, open the cassette compartment lid, and eject the tape.

② FAST-FORWARD BUTTON (◀◀):

Used to advance the tape rapidly.

③ REWIND BUTTON (▶▶):

Used to rewind the tape.

④ PLAY BUTTON (◀):

Used to transfer the program and data, (or to play back the tape).

⑤ RECORD BUTTON (●):

Used to record (save) the program and data into the tape. Pressing this button causes the PLAY button to be engaged simultaneously.

⑥ CONNECTOR (Computer connection terminal):

Used to connect the unit to the computer. To avoid possible damage to the unit from static electricity, never touch the contacts of the connector.

⑦ REMOTE SWITCH:

This turns the remote function ON and OFF. With the switch set to the ON position, the computer controls the starting and stopping of the built-in microcassette recorder. With the switch in the OFF position, these functions are cancelled (OFF), allowing the microcassette tape recorder to be operated manually.

⑧ LOW BATTERY INDICATOR:

The low battery indicator lights when the battery needs to be recharged. If the battery becomes too weak, this indicator will fail to light.

When the CE-125's power voltage declines, the low-battery indicator lights up.

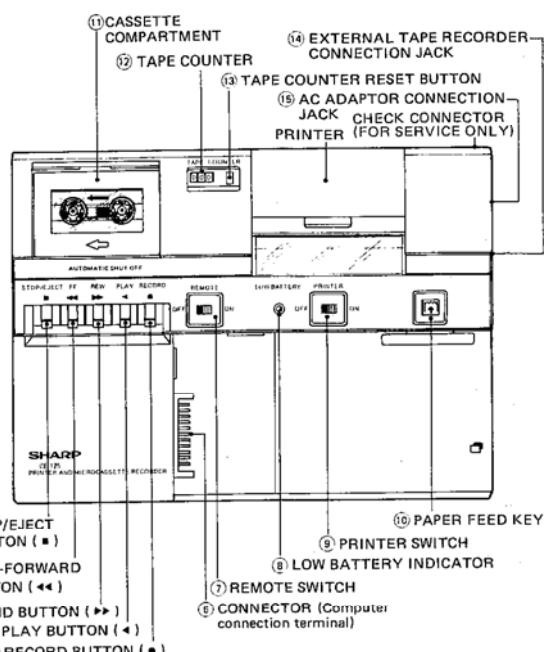
With this light on, no printout or paper advance is possible. If the computer has a PRINT statement, an error (ERROR code 8) will result. In addition, recording or transferring to the tape recorder becomes difficult, causing the CE-125 to be inoperative. Therefore, when the indicator lights, recharge the battery immediately with the printer switch in the OFF position.

⑨ PRINTER SWITCH:

The printer switch turns the printer operation ON and OFF. With the switch set to the ON position, printout or paper advance is possible.

Setting the switch to the OFF position disables the printout and paper advance.

THE KEYBOARD



⑩ PAPER FEED KEY:

With the printer switch set to the ON position, pressing this key allows the paper to advance forward. The paper feed key does not function during printing.

⑪ CASSETTE COMPARTMENT:

Holds the microcassette tape.

⑫ TAPE COUNTER:

The numbers change as the tape travels. For recording from the beginning of tape, press the reset button first to set the counter to "000." The number on the counter shifts as the tape is taken up, so write down the recorded contents and the number range. This serves as a convenient reference when searching for the recorded section or the recording section to be done next.

⑬ TAPE COUNTER RESET BUTTON:

Used to reset the tape counter to "000."

⑭ EXTERNAL CASSETTE TAPE RECORDER CONNECTION JACK:

Used to load a program and/or data from any tape recorder other than the microcassette recorder built into the CE-125. With this jack in use, no program or data can be loaded from the built-in microcassette recorder.

⑮ AC ADAPTOR CONNECTION JACK:

Used to connect the AC adaptor.

SETTING UP

Connecting the Computer to the Printer/Microcassette Recorder

The Printer/Microcassette recorder and the Computer are designed for easy interconnection. It is extremely important that you do not force the two together since damage may result to one or both machines.

1. To connect the CE-125 with the Computer, turn the Computer power OFF.
Also, set the CE-125 printer switch to the OFF position.
Important Note! It is essential that Computer and Printer/Recorder power is OFF. With the power is ON, the Computer may render all keys inoperative. If this occurs, press the ALL RESET switch on the back of the Computer.

2. Remove the protective pin cover from the left side of the Computer and snap it into place on the bottom of the Printer/Recorder (see figure).
Important Note! It is essential that Computer and Printer/Recorder power is OFF. With the power is ON, the Computer may render all keys inoperative. If this occurs, press the ALL RESET switch on the back of the Computer.



Fig. 1

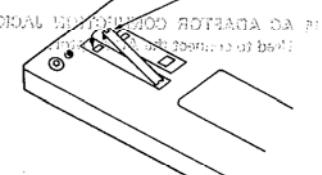


Fig. 2

3. Place the upper edge of the Computer into the "cradle" so that the Printer/Recorder guides match up with the Computer guide slots.

4. Lay the Computer down flat.

5. Gently slide the Computer to the left so that the Printer/Recorder pins are inserted into the Computer (see figure).

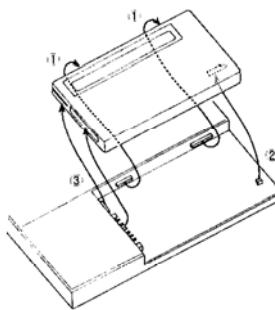


Fig. 3

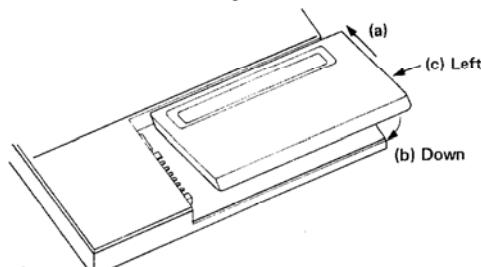


Fig. 4

Do not force the Computer and Printer/Recorder together. If match-up does not easily take place, carefully shift the Computer left and right to correctly position mating surfaces.

6. To use the printer, turn on the PC-1251 power switch, and then the printer switch.

Press the **[CL]** key.

If the **[CL]** key is not pressed, the printer may not operate.

POWER SUPPLY

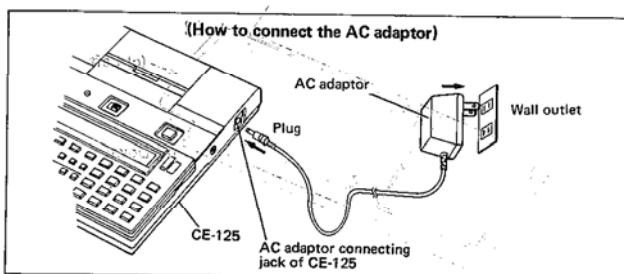
Your Printer/Recorder is powered by a rechargeable Ni-Cad battery. It may be necessary to recharge the battery the first time you use the Printer/Recorder. If the Printer/Recorder has not been used for three months or more you will probably need to recharge the battery.

To recharge the battery, turn the Computer and Printer/Recorder power OFF, connect the AC adaptor (EA-23E) to the Printer/Recorder, and plug the AC adaptor into a wall outlet. (See the diagram) It will take about 15 hours before the battery is fully charged.

(You may use the Computer and Printer/Recorder while the battery is recharging, however, it will take a longer time than usual for the battery to be full recharging;

Recharging: When the low battery indicator comes ON, recharge the battery.

Important Note! Using any AC adaptor other than the one supplied (EA-23E) may damage the Printer/Recorder.



For best operation, it is recommended that the computer be connected to a power source that is not connected to the same circuit as the printer/recorder. This will prevent damage to the printer/recorder if there is a power surge or if the power source fails.

Using the built-in battery power source (PC-1251) will not run printing jobs for very long. However, using the AC adaptor will allow you to print and record for a long period of time.

- When the Computer is used with the CE-125 and the battery power of the Computer drops, the power will be supplied to the Computer from the CE-125.

Notes: A decrease in battery power voltage during the CE-125 operation will cause the low-battery indicator to light, making the printer inoperative. If this occurs, turn the printer switch OFF, recharge the battery and turn the printer switch ON again to resume operation.

- If the battery is recharged with the printer switch ON, the indicator remains lit and the printer is inoperative even upon completion of recharging. (The printer is locked.) To unlock the printer, turn the printer switch OFF once, then ON.

If the printer is inoperative even when the printer switch is turned ON, press the **[CL]** key, and then execute the printing.

- In case no printing or paper advance is possible even if the low battery indicator is off, recharge the battery (the indicator fails to light when the battery power drops too low).

- If you don't use your Printer/Recorder for a long time, the battery may lose power. If this happens, a 15-hour recharge will not be long enough to fully charge the battery. A slightly longer recharging is needed to make the Printer/Recorder fully charged.

- Unless the AC adaptor is in use, do not operate the Printer/Recorder with the battery only partially charged. For best results, fully charge the battery before each operation.

PRINTER OPERATION

To use the printer, perform the following:

- 1) Connect the CE-125 to the PC-1251 Computer.
 - 2) Turn on the PC-1251 power switch, and then the printer switch.
Press the [CL] key. If the [CL] key is not pressed, the printer may not operate.
 - Note:** If executed when the printer switch is set at the OFF position, printing causes an error (ERROR code 8). (Low battery indicator may light for the moment.)
In this case, turn the printer switch to ON position, and press the [CL] key. Then, execute the printing again.
 - 3) To print out the formulas and results in the manual calculation, display the symbol "P" on the computer's display by depressing the **SHIFT** [**ENTER**] keys. If you do not need the printing, press the **SHIFT** and [**P-NP**] keys again to erase the symbol "P".
 - 4) For printing by use of LIST and PRINT statements, refer to the PC-1251 Instruction Manual.
- Caution:** In case an error (ERROR code 8) occurs due to a paper misfeed, tear off the paper tape, and pull the remaining part of the paper tape completely out of the printer. Then press the [CL] key to clear the error condition.
- When the printer/recorder is exposed to strong external electrical noise, it may print numbers at random. If this happens, depress the **BRK** key to stop the printing, then press the [CL] key.
 - Pressing the [CL] key will return the printer to its normal condition.
 - When the CE-125 is not in use, turn off the printer switch to save the battery life.

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Installing the Paper

- (1) Turn off the printer switch.
- (2) Open the paper cover. (Fig. 1)

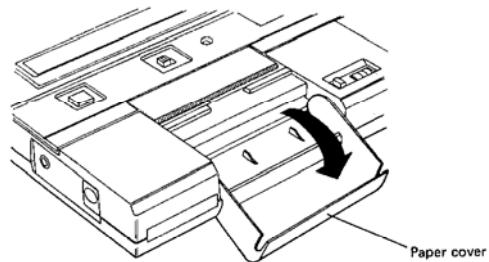


Fig. 1

- (3) Insert the leading edge of the roll of paper into the slot located in the paper tape compartment. (Fig. 2) (Fig. 3)

(Any curve or crease near the beginning of the paper makes insertion difficult.)

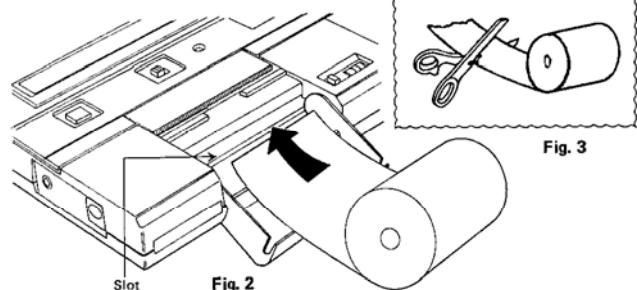
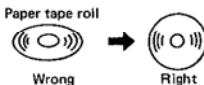


Fig. 3

NOTE: Use of irregular paper tape may cause irregular paper feeding or paper misfeed. Therefore, be sure to tighten the roll before using as shown in the figure.



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- (4) Turn on the printer switch and press the paper feed key until the paper comes out of the printer mechanism. (Fig. 4)

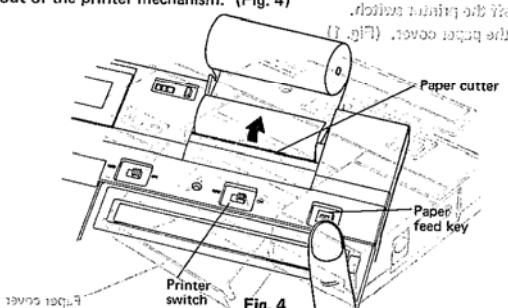


Fig. 4

- (5) Install the roll of paper into the compartment.

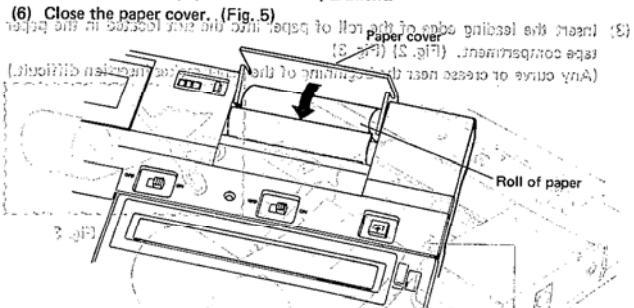


Fig. 5

- As the printer is equipped with a paper release mechanism, cut the paper roll on the paper roll compartment side, then pull the paper out straight to the paper cutter side to remove the paper from the printer.

Do not pull the paper backwards as this may cause damage to printer mechanism.

CAUTION: Paper tape is available wherever the CE-125 is sold.

Please order product No. EA-1250P (5 rolls per package) when reordering the paper tape. The paper tape is specifically designed for this unique printer. Use of any other paper tape may cause damage to the unit.

MICROCASSETTE TAPE RECORDER OPERATION

For the saving, transferring and collating of the program and data, refer to the Computer Instruction Manual.

1. Cassette Tape

The quality and condition of the cassette tapes used will directly affect the performance of this unit.

- Use only well-known brands of tape.
- The extreme thinness of the tape may result in breakage or other problems.

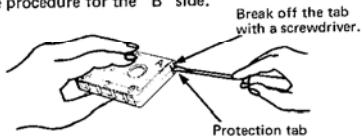
PROTECTION AGAINST CASSETTE TAPE ERASURE

All cassette tapes are provided with tabs, which allow tape erasure to be performed.

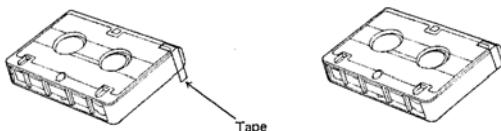
If these tabs are removed, no tape erasure is possible because the RECORD (●) button cannot be depressed.

To protect the "A" side of cassette tape, break off the "A" side tab with a screwdriver.

Follow the same procedure for the "B" side.



The tape can be rerecorded or erased by covering the tab holes with plastic tape.



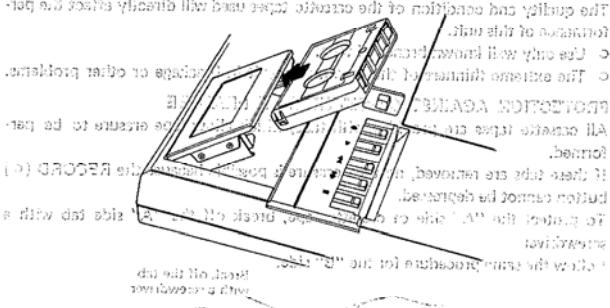
Note: Check to ensure there are no loose layers of tape visible through the cassette center window or open end. Tighten these loose layers with a pencil or ball-point pen before inserting the cassette into the unit.



2. Loading and Unloading the Cassette Tape

LOADING

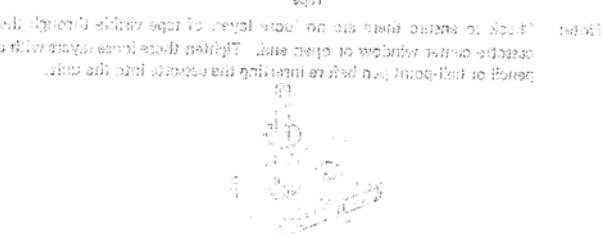
- Depress the STOP/EJECT (■) button to open the cassette compartment lid.
- Load the cassette tape into the compartment so that the title ("A" or "B") of the tape track to be used is facing upwards.
- Press the cassette compartment lid down.



UNLOADING

- Depress the STOP/EJECT (■) button to open the cassette compartment lid and remove the tape.
- Press the cassette compartment lid down.

Note: In the PLAY mode, etc., depress the STOP/EJECT (■) button once to stop the tape movement. And repress it to eject the tape.



3. Auto Stop Function

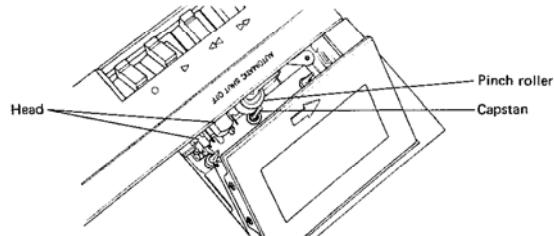
In the PLAY and RECORD modes, the tape will stop automatically when the end of tape is reached. The PLAY and/or RECORD buttons then pop up automatically.

Note: In the FAST-FORWARD and REWIND modes, the AUTO STOP FUNCTION does not work. In this case, depress the STOP/EJECT (■) button when the end of tape is reached.

4. Cleaning the Tape Head

Clean the head frequently to remove dust and tape residue. Dirt on the head will make recording and playback impossible.

- Depress the STOP/EJECT (■) button to open the cassette compartment lid.
- Remove the tape from the cassette compartment.
- Depress the PLAY (◀) and RECORD (●) buttons.
- Clean the head and pinch roller, etc. with a soft lint-free cloth or cotton swab that has been partially soaked in alcohol until the head and pinch roller, etc., are free of all dirt and residue deposits.



Notice for cassette tape:

- A program or data file saved on a micro-cassette tape by one tape recorder may not be retrievable by another tape recorder because of alignment variations between recorders.
- Do not press the cassette holder or move this unit during the operation of the built-in tape recorder. There may be instances when saving or loading is not properly performed.

SPECIFICATIONS

Model: CE-125

PRINTER PORTION

- Type: Thermal dot printer
Printing digit: 24 digits/line
Printing speed: Approx. 0.8 line/second
(Printing speed varies with the number of printing digits per line.)
Paper feed speed: Approx. 0.8 line/second
Paper: Thermal paper (heat sensitive paper), EA-1250P
18mm (23/32") roll outer diameter (max.)
58mm (2-9/32") wide

TAPE RECORDER

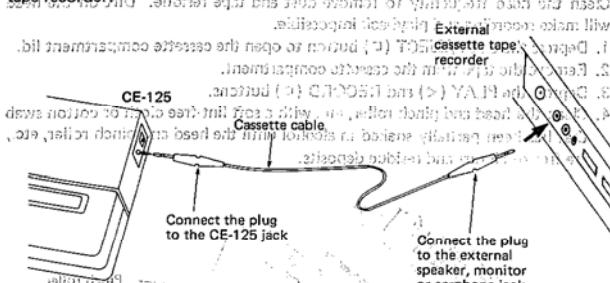
- Type: Monaural microcassette tape recorder
Track system: 2-track, 1-channel monophonic
Tape: Microcassette tape
Tape speed: 2.4 cm/second
Ex. cassette tape recorder input jack: 3.5 φ mm (diameter)
Matching impedance: Less than 1 kohm
4.8V DC: Built-in rechargeable battery
Charging: (AC) local voltage, with AC adaptor EA-23E
(Use EA-23E only)
Operating time: Approx. 4 hours (Tape operation mode only)
(printing digit)
Approx. 2,000 lines (Print mode only)
Print: 55555555555555555555 (The number of printing lines varies with the operational purpose.)
Power consumption: 2.5 W
Operating temperature: 0°C ~ 40°C (32°F ~ 104°F)
Dimensions: 205(W) x 149(D) x 23(H) mm
8-1/16"(W) x 5-7/8"(W) x 29/32"(H)
Weight: 550 g (1.21 lbs.)
Accessories: Carrying case, microcassette tape x 1, AC adaptor EA-23E, paper roll x 3, cassette cable, cotton swab (for head cleaning), instruction manual

EXTERNAL CASSETTE TAPE RECORDER

The CE-125 can be connected to any external cassette tape recorder. When you use the program and data produced by the model PC-1211, connect the external tape recorder to the CE-125. The program and data of the external tape recorder can be loaded into the PC-1251 via the CE-125. (See the section "NOTIFICATION".)

How to connect the external cassette tape recorder

Use the supplied cassette cable to connect the CE-125 and an external cassette tape recorder.



- Notes:
- When the external tape recorder is connected to the CE-125, the signal of the built-in microcassette tape recorder is automatically cut off.
 - To transfer program and data from the tape of the external cassette tape recorder, use the tape recorder with which the tape was pre-recorded. A tape recorder, if different from that used for recording, may cause no transfer of the prerecorded tape.
 - A microcassette tape recorder can be used as the external tape recorder. However, the tape recorder can not use the tape recorded with the CE-125 for transfer the program and data to the computer.

Notes:

- When the external tape recorder is connected to the CE-125, the signal of the built-in microcassette tape recorder is automatically cut off.
- To transfer program and data from the tape of the external cassette tape recorder, use the tape recorder with which the tape was pre-recorded. A tape recorder, if different from that used for recording, may cause no transfer of the prerecorded tape.
- A microcassette tape recorder can be used as the external tape recorder. However, the tape recorder can not use the tape recorded with the CE-125 for transfer the program and data to the computer.

BEFORE SERVICE CALL

Before a service call, please check the following: JEN-80 Richard

Symptom	Probable cause	Remedy
Printer or microcassette recorder does not operate to indicate resulting in a decline in power voltage.	• Built-in rechargeable battery is extremely low, resulting in a decline in power voltage.	• Connect the supplied EA-23E AC adaptor to the unit for battery recharge.
Printer does not operate (no paper advance or printout is possible).	• Built-in rechargeable battery power voltage low. • Printer remains locked.	• Recharge the battery. • Turn printer switch OFF once, then ON. Printer is unlocked when low-battery indicator goes off.
If executed, PRINT statement is ignored.	• Computer does not recognize that printer is connected.	• Turn printer switch to ON position, and press CL key.
If executed, PRINT statement causes an error (ERROR code 8).	• Printer switch is turned OFF. • Paper misfeed occurs in printer.	• Turn printer switch to ON position, and press CL key to clear error. • Remove misfed paper from printer, and press CL key to clear error.
No printout is possible with manual calculation.	• PRINT mode is not set (Symbol "P" is not displayed indicated on computer display).	• Press SHIFT and ENTER keys to set PRINT mode.
No tape travel even upon depressing microcassette tape recorder button.	• Remote switch is turned ON. • Built-in rechargeable battery power voltage low.	• Turn remote switch to OFF position. • Recharge the battery.

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Symptom	Probable cause	Remedy
Record button cannot be pressed.	• Tape's erasure prevention tab is removed.	• Replace the tape. • Cover tab hole with plastic tape.
Program or data cannot be loaded from microcassette tape recorder.	• External cassette tape recorder connection jack is plugged. • Built-in rechargeable battery power voltage low.	• Unplug cord from cassette tape recorder connection jack. • Recharge the battery.
Errors often occur in transfer and collation.	• Tape recorder head, capstan and pinch roller are stained. • Tape is flawed, creased and wavy. • Built-in rechargeable battery power voltage low.	• Clean head, capstan and pinch roller. • Replace the tape. • Recharge the battery.

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PROGRAMS INCLUDED IN THE MICROCASSETTE TAPE

The programs in the examples of the PC-1251 instruction manual, as well as of the CE-125 instruction manual, are included in the supplied microcassette tape.

(File name)	(Program title)	Tape counter (criterion)
A-1 (*) NEWTON'S METHOD FOR FINDING ROOTS OF EQUATIONS	010~024
A-2 MATRIX PRODUCT	031~068
A-3 NUMERICAL INTEGRATION USING SIMPSON'S RULE	074~102
A-4 (*) AVERAGE, VARIANCE AND STANDARD DEVIATION	109~131
A-5 CORRELATION COEFFICIENT AND LINEAR REGRESSION	137~169
A-6 HISTOGRAM	174~203
A-7 (*) INTERSECTION BETWEEN CIRCLE AND STRAIGHT LINE	209~222
A-8 $\Delta \leftrightarrow Y$ CONVERSIONS	228~258
A-9 CLOTHOID CURVE	263~278
A-10 CROSS-FOOTING	283~313
A-11 (*) NUMBER OF DAYS CALCULATION	318~328
A-12 SORTING	333~349
A-13 (*) THE LOAN LIMIT, CALCULATION OF THE NUMBER OF INSTALLMENT	354~368
A-14 (*) TYPING PRACTICE	372~387
A-15 BIORHYTHM (SEMI-GRAPHIC)	392~415
A-16 (*) SOFTLANDING GAME	419~432
A-17 (*) MEMORY CHECKER	436~457
A-18 (*) BUGHUNT	461~480
A-19 (*) DOUBLE ROTATION	485~497
A-20 PORTRAIT PRINT	501~519

Note: Programs with (*) prefixed to the program title are included in the PC-1251 instruction manual. Some program list contents may differ slightly in between the programs included in the tape and the instruction manuals. In program execution, however, this difference causes no impediment.

PROGRAM EXAMPLES

Contents

(Program title)	(page)
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• CORRELATION COEFFICIENT AND LINEAR REGRESSION	119
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• $\Delta \leftrightarrow Y$ CONVERSION	130
• CLOTHOID CURVE	135
• CROSS-FOOTING	138
• SORTING	143
• THE LOAN LIMIT, CALCULATION OF THE NUMBER OF INSTALLMENT	146
• BIORHYTHM (SEMI-GRAPHIC)	150
• PORTRAIT PRINT	154

(Remark)

- All programs included in these program examples need the CE-125 to be used for execution.
- Sharp Corporation and/or its subsidiaries assume no responsibilities or obligations to any losses or damages that could arise through the use of the software programs employed in this instruction manual and the relevant software program tape.
- Showing the bytes used in each program itself. How many bytes used in each program itself is shown at the end of each program list. For instance, in the MATRIX PRODUCT program, 1079 is the bytes. The way to find this out is as follows;

 - CLEAR **ENTER**
 - 3486-MEM **ENTER** → showing the bytes.

OVERVIEW

Finding matrix products

The matrix product C ($m \times n$ matrix) is found for matrices A \times B ($m \times l$).
 (Step 1) The number of rows (m) and columns (l) for an $m \times l$ matrix A are input.
 (Step 2) The elements of matrix A are input.

- (Step 3) The number of columns (n) of matrix B are input.
 (Step 4) The data is revised by pressing [DEF] [B].
 (Step 5) The location to be revised and the revised value is input.
 (Step 6) The elements of the resulting matrix C are printed by pressing [DEF] [C].

REFERENCE (the calculation)

$$c_{ij} = \sum_{k=1}^l a_{ik} \cdot b_{kj} \quad (i=1, 2, \dots, m) \quad (j=1, 2, \dots, n)$$

$m \times l$ matrix A $\begin{pmatrix} a_{11} & a_{12} & \dots & a_{1l} \\ a_{21} & a_{22} & \dots & a_{2l} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \dots & a_{ml} \end{pmatrix}$ $l \times n$ matrix B $\begin{pmatrix} b_{11} & b_{12} & \dots & b_{1n} \\ b_{21} & b_{22} & \dots & b_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ b_{l1} & b_{l2} & \dots & b_{ln} \end{pmatrix}$ $(m \times l) \times (l \times n) = m \times n$

$(m+l+m \times n < 38)$

EXAMPLE

$m \times l$ matrix A (4, 3)	$l \times n$ matrix B (3, 2)	$m \times n$ matrix C (product) (4, 2)
$\begin{pmatrix} 4 & 0 & -1 \\ -3 & 3 & 7 \\ -9 & 2 & 5 \\ 5 & -1 & 3 \end{pmatrix}$	$\begin{pmatrix} -1 & 5 \\ -6 & -6 \\ 1 & 4 \end{pmatrix}$	$= \begin{pmatrix} -5 & 16 \\ -8 & -5 \\ 2 & -37 \\ 4 & 43 \end{pmatrix}$

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KEY OPERATION SEQUENCE

Step No.	Key Input	Display	Remarks
1	[DEF] [A]	M = _	Waiting for input of the number of rows in the $m \times l$ matrix A
2	4 [ENTER]	L = _	Waiting for input of the number of columns in the $m \times l$ matrix A
3	3 [ENTER]	A(1, 1) = _	Waiting for input of the element (1, 1) of matrix A
		?	
4	4 [ENTER]	A(1, 2) = _	
		?	
5	0 [ENTER]	A(1, 3) = _	
		⋮	
		A(4, 3) = _	
		?	
15	3 [ENTER]	L = 3	
		N = _	Waiting for input of the number of columns in the $l \times n$ matrix B
16	2 [ENTER]	B(1, 1) = _	
		?	
17	-1 [ENTER]	B(1, 2) = _	
		⋮	
		?	
22	4 [ENTER]	>	Finished

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KEY OPERATION SEQUENCE

Step No.	Key Input	Display	Remarks
1	[DEF] [B]	REVISION POSITION = _	
2	4 [ENTER]	REVISION VALUE = _	
3	-1 [ENTER]	REVISION POSITION = _	
4	5 [ENTER]	ALL DATA PRINT ?(Y/N)	
5	Y [ENTER]	All data is printed	
		> = (1, 1) A	
	N [ENTER]	> Processing is ended without data being printed	
		> = (1, 1) A	
1	[DEF] [C]	Calculation results are printed.	
		> = (1, 1) A	
		Finished	

PRINTED OUTPUTS (example of ALL DATA PRINT)

```

M=4
L=3
N=2
A(1,1)=4.
A(1,2)=0.
A(1,3)=-1.
A(2,1)=3.
A(2,2)=3.
A(2,3)=7.
A(3,1)=2.
A(3,2)=9.
A(3,3)=5.
A(4,1)=5.
A(4,2)=-1.
A(4,3)=3.
B(1,1)=-1.
B(1,2)=5.
B(2,1)=-6.
B(2,2)=6.
B(3,1)=1.
B(3,2)=4.

```

PROGRAM LIST

```

10: "A": CLEAR : WAIT 0:
    INPUT "X="X: LPRINT
    "M="M: GOTO 30
20:GOTO 10
30:INPUT "L="L: LPRINT
    "L="L: GOTO 50
40:GOTO 50
50:DIM B(M-1:L-1),B$(0)
60:FOR I=0 TO M-1: FOR
    J=0 TO L-1:B$(0)="
        "+ STR$ (I+1)+"+"+
        STR$ (J+1)+"="
70:PAUSE B$(0): INPUT B
    (I,J): LPRINT B$(0)
    B(I,J): GOTO 90
80:GOTO 70
90:NEXT J: NEXT I:
    PAUSE L=L
100:INPUT "N="N: LPRINT N
    "N="N: DIM C(L-1:N-
    1): GOTO 120
110:GOTO 100
120:FOR I=0 TO L-1: FOR
    J=0 TO N-1:B$(0)="
        "+ STR$ (I+1)+"+"+
        STR$ (J+1)+"="
130:PAUSE B$(0): INPUT C
    (I,J): LPRINT B$(0)
    C(I,J): GOTO 150
140:GOTO 130
150:NEXT J: NEXT I: DIM
    D(M-1:N-1): END
160:B$(0)=": INPUT
    "REVISION POSITION=":
    B$(0):Z= LEN B$(0):
    GOTO 170
170:W$= RIGHT$ (B$(0),Z-
    2):Y= VAL W$: IF Y<
    1 GOTO 160
180:w=Z- LEN STR$ Y-3
190:IF w<0 GOTO 160
200:IF MID$ (B$(0),Z-W+1
    )>=" " LET w=W-1:
    GOTO 190

```

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KEY OPERATION SEQUENCE
(when the values are input)

Step No.	Key Input	Display	Remarks
1	[DEF] A	F(X):INPUT=1/CAL.=2...	Selection of data input or equation input
2	1 [ENTER]	A = _	Waiting for the starting point of the integration interval
3	0 [ENTER]	B = _	Waiting for the ending point of the integration interval
4	5 [ENTER]	N = _	Waiting for the integration interval division number
5	40 [ENTER]	F(0) = _	Waiting for the data to be input
6	4 [ENTER]	F(0.125) = _	
7	5.5 [ENTER]	F(0.25) = _	
8	6 [ENTER]	F(0.375) = _	
9	7 [ENTER]	F(0.5) = _	
10	8 [ENTER]	F(0.625) = _	
11	9 [ENTER]	F(0.75) = _	
12	4 [ENTER]	>	

(Data revision)

Step No.	Key Input	Display	Remarks
1	[DEF] B	REVISION NO. ? = _	Waiting for the revision number input
2	3 [ENTER]	REVISION VALUE = _	Waiting for the revision value input
3	6 [ENTER]	REVISION NO. ? = _	
4	[ENTER]	ALL DATA PRINT?(Y/N) = _	
5	Y [ENTER]	>	All of the data printed out
6	N [ENTER]	>	Finished without printing

(to be continued to [DEF] C)

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KEY OPERATION SEQUENCE
(when the function equation is used)

Step No.	Key Input	Display	Remarks
1	[DEF] A	F(X):INPUT=1/CAL.=2...	Waiting for the data input method or the equation input method of calculation
2	2 [ENTER]	A = _	Waiting for the integration starting point input
3	0 [ENTER]	B = _	Waiting for the integration ending point input
4	1 [ENTER]	N = _	Waiting for the integration interval division number
5	20 [ENTER]		Prints the calculations done to find the function values using the function equation as the base
		>	

(final procedure in both cases)

Step No.	Key Input	Display	Remarks
1	[DEF] C		Integrated values printed
		>	

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PROGRAM LIST

```

10;"A": CLEAR : WAIT 0:
INPUT "F(X):INPUT=1/
CAL.=2...": GOTO 16
15:END
16:IF (D=1)&(E=2)<>1:
  GOTO 19:END
20:INPUT "A":LPRTINT
  "a":LPRTINT
30:INPUT "B":LPRTINT
  "b":LPRTINT
40:INPUT "N":LPRTINT
45:IF N<2> INT(N/2):
  GOTO 49:END
49:FOR I=1 TO N-1: IF I
  <2> INT((I/2):LET K
    =4: GOTO 350
  340:K=2
  350:S=S+K*Y(I): NEXT I:S
  =S/M/3: LPRTINT
  LPRTINT "F=":I: END
  90:Y=((X-2)*K-1)/M/2
  91:RETURN
  814
A .Integration interval starting point
B Integration interval ending point
C
D Factor used in calculating sum
E
F
G
H √
I √
J
K Term coefficient during integration
L √, Max. value of Y (i)
M h
N Number of divisions
O flag for inputting or using equation
P
Q
R
S √, Min. value of Y (i), Integration value
T
U
V
W S √
X √ Function equation X
Y Function equation Y
Z
Y (N) Input data (function value)
BS (0) √

```

Program Title: CORRELATION COEFFICIENT AND LINEAR REGRESSION

OVERVIEW (Statistics)

Data is for analysis and testing hypotheses.

This program finds the covariance and correlation coefficient for related data sets $(X_1, Y_1) \dots (X_n, Y_n)$, as well as the linear regression.

The following data input is put into the equation $Y = AX + B$, for output to the printer.

INSTRUCTIONS

1. Data input (X_i, Y_i).
2. Correction of mistaken data.
3. The covariance, correlation coefficient, regression coefficients and means are found and output to the printer.
4. Y is estimated from the X value and output to the printer.
5. The limit for the number of data entries is 100.

CALCULATION

$$\begin{aligned}
 S_{xx} &= \sum x_i^2 - n\bar{x}^2 \\
 S_{xy} &= \sum x_i y_i - n\bar{x}\bar{y} \\
 S_{yy} &= \sum y_i^2 - n\bar{y}^2 \\
 C &= S_{xy}/(n-1) \quad \text{covariance} \\
 r &= S_{xy}/\sqrt{S_{xx} S_{yy}} \quad \text{correlation coefficient} \\
 a &= S_{xy}/S_{xx} \\
 b &= \bar{y} - a\bar{x} \quad \text{regression coefficient } (y = ax + b)
 \end{aligned}$$

EXAMPLE

X	6.9	7.6	7.6	9.0	8.1	6.5	6.4	6.9
Y	12	10	9	5	6	15	14	12

Estimated value

$$\begin{aligned}
 X &= 7, \\
 X &= 8, \\
 X &= 7.5,
 \end{aligned}$$

PRINTED OUTPUTS

```

NO. OF DATA=8.          NO. OF DATA=8.           NO. OF DATA=8.
X(1)=6.9               COVARIANCE=3.0254       COVARIANCE=3.0254
Y(1)=12.                CORRELATION COEFFICIENT=-0.608714286
X(2)=7.6               -9.693968513E-01      CORRELATION COEFFICIENT=-0.608714286
Y(2)=10.                REGRESSION COEFFICIENT=A=-3.942042318
X(3)=7.6               A=-3.942042318
Y(3)=9.                 B=39.4475621
X(4)=9.                 MEAN VALUE=Y=10.375
Y(4)=8.1               X=7.375
Y(5)=6.                 Y=10.375
X(6)=6.5               *ESTIMATION*
Y(6)=15.               X=7.
X(7)=6.4               Y=11.85326587
Y(7)=14.               X=8.
X(8)=6.9               Y=7.911223556
Y(8)=12.               X=7.5
Y(8)=12.               Y=9.882244715

```

KEY OPERATION SEQUENCE

Step No.	Key Input	Display	Remarks
1	DEF A	NO. OF DATA = -	INITIALIZE
2	8 ENTER	X(1) =	Data input
	?		Input initialized
3	6.9 ENTER	Y(1) =	
	?		Input initialized
4	12 ENTER	X(2) =	
	?		Input initialized
5	⋮	⋮	⋮
6	⋮	⋮	⋮
7	⋮	⋮	⋮
8	⋮	⋮	⋮
9	⋮	⋮	⋮
10	⋮	⋮	⋮
11	⋮	⋮	⋮
12	⋮	⋮	⋮
13	⋮	⋮	⋮
14	⋮	⋮	⋮
15	⋮	⋮	⋮
16	⋮	⋮	⋮
17	⋮	⋮	⋮
18	12 ENTER	>	

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KEY OPERATION SEQUENCE

Step No.	Key Input	Display	Remarks
1	DEF B	REVISION POSITION = -	
2	X(2)	REVISION VALUE = -	
3	7.6	REVISION POSITION = -	
4		ALL DATA PRINT ?(Y/N) -	
5	Y	ENTER	Output all data to printer
		>	
N	ENTER	>	Finish without having data printed
1	DEF C		Covariance, Correlation coefficient, regression coefficient A, B and mean values X, Y are calculated and printed
		>	
1	DEF D	ESTIMATION X = -	Y estimated from the value X and printed
2	7 ENTER	ESTIMATION X = -	
3	8 ENTER	⋮ Repeat	
⋮	⋮	⋮	
	ENTER	>	If only ENTER is pressed, finished

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PROGRAM LIST

```

10;"A":CLEAR
12:INPUT "NO. OF DATA=";IN
13:LPRINT "NO. OF DATA=";IN
14:DIM X(N-1),Y(N-1),B$(N)
15:FOR A=1 TO N
16:B$=X(A)+STR$(A)+""
17:LPRINT B$;Y(A-1)
18:NEXT A
19:C":LPRINT "";I=0;J=0;L=0;M=0
20:FOR A=1 TO N
21:I=I+1
22:IF I>N THEN 25
23:J=J+Y(Z)
24:L=L+X(Z)*Y(Z)
25:M=M+Y(Z)*Y(Z)
26:N=N+1
27:K=K+N*I
28:L=L-N*I
29:M=M-N*J
30:H=H+(K*M)
31:LPRINT "COVARIANCE="
32:LPRINT "CORRELATION"
33:LPRINT "*REGRESSION"
34:LPRINT "COEFFICIENT="
35:LPRINT "A=";S
36:LPRINT "B=";T
37:LPRINT "*MEAN VALUE="
38:LPRINT "X=";I
39:LPRINT "Y=";J
40:S=L;K=T=J=S*I
41:LPRINT "A=";S
42:LPRINT "B=";T
43:LPRINT "*MEAN VALUE="
44:LPRINT "X=";I
45:LPRINT "Y=";J
46:END

```

500;"B":B\$(0)="";INPUT

```

505:IF B$(0)="" GOTO 560
510:V=LEN B$;D$=LEFT$(B$(0),1);U=VAL(MID$(B$(0),2,V-1))
515:IF (U<0)<(U>N)=1 GOTO 500
520:IF D$="X":INPUT "REVISION POSITION VALUE=";Y(U-1)
525:IF D$="Y":INPUT "REVISION POSITION VALUE=";X(U-1)
530:IF D$="Y":INPUT "REVISION POSITION VALUE=";Y(U-1)
535:IF D$="X":INPUT "REVISION POSITION VALUE=";X(U-1)
540:IF D$="N":INPUT "REVISION POSITION VALUE=";N
545:LPRINT "NO. OF DATA=";IN
550:GOTO 500
560:INPUT "ALL DATA PRINT ?(Y/N)"$;
570:IF (O$="Y")+(O$="N")>1 GOTO 560
580:IF O$="N":END
590:LPRINT "NO. OF DATA=";IN
600:FOR I=1 TO N
610:LPRINT "X(";STR$(I);
620:IF I>1 THEN "Y(";STR$(I-1)
630:NEXT I
640:END
650:INPUT "ESTIMATION X=";X
660:LPRINT "X=";X
670:LPRINT "Y=";Y
680:GOTO 795

```

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MEMORY CONTENTS

A	✓
B\$	✓
C	
D\$	✓
E	Estimated value X
F	Estimated value Y
G	
H	Correlation coefficient
I	✓, mean value on X
J	Mean value on Y
K	S _{xx}
L	S _{xy}
M	S _{yy}
N	Number of data
O	
P	
Q	
R	
S	Regression coefficient A
T	Regression coefficient B
U	✓
V	✓
W	
X	
Y	
Z	
X(N-1)	X data
Y(N-1)	Y data
B\$(0)	✓

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OVERVIEW

This program graphs the histogram of the data input.

CONTENTS

Give the range of the input data $A \sim B$ ($A < B$) and the interval width D of the frequency and distribution graphs. The various data X_i are valid only when $A \leq X_i \leq B$ and is ignored otherwise.

When making a graph, the frequency given to one asterisk (*) is first set. After the graph has been printed the mean value, number of valid input data, and standard deviation is also printed.

(Note) Both A and B must be integers and up to 4 digits.

INSTRUCTIONS

- The program is initiated by pressing **R U N** **ENTER**. The lower bound A, upper bound B and interval width (scale unit size) are input.
- The data is then input. The input data is printed, so if there was mistaken data entry, use **DEF B** when the display shows "DATA=" and it is waiting for data entry. The deleted data can be input once again. To continue data entry again press **DEF A** when display shows "DELETE DATA" and then continue with data input.
- When all data input is finished, input **DEF C** when the display shows "DATA=" and set the frequency of one asterisk (*), then printout of the histogram takes place.
- If when using **DEF B** the display shows "OVER-DELETED CHECK", then the data input was mistaken and the entire data-set should be checked once again and program should be restarted from the beginning.

EXAMPLE

The histogram are desired for the marks of a math exam.

78	92	63	70	42	53	45	60	97	82
98	12	24	85	36	49	53	83	72	85
42	23	70	80	95	77	81	19	36	71
29	63	49	55	67	78	62	41	32	68

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KEY OPERATION SEQUENCE

Step No.	Key Input	Display	Remarks
1	R U N ENTER	RANGE A = < DATA = < B	STUDY GUIDE VOL. 1
2	0 ENTER	B = _	Waiting for upper bound input
3	100 ENTER	SCALE UNIT SIZE = _	Waiting for scale unit size input
4	10 ENTER	DATA = _	Waiting for data input
5	78 ENTER	DATA = _	
6	92 ENTER	DATA = _	
7	... ENTER	... _	
8	... ENTER	... _	
9	... ENTER	... _	
10	... ENTER	... _	
11	... ENTER	... _	
12	... ENTER	... _	
13	... ENTER	... _	
14	... ENTER	... _	
15	... ENTER	... _	
16	... ENTER	... _	
17	... ENTER	... _	
18	... ENTER	... _	
19	... ENTER	... _	
20	... ENTER	... _	
21	49 ENTER	DATA = _	When the wrong data is input DEF B is used
22	DEF B ENTER	DELETE DATA = _	Waiting for delete data input
23	49 ENTER	DELETE DATA = _	When using DEF A for continuous data input
24	DEF A ENTER	DATA = _	
25	53 ENTER	DATA = _	
	(Repeated Input and deletion)
	
	

100 DATA= 90 .00
80 100 =HULLY HIGH
DATA= 80 .00 =VHT .070

Range 0 ~ 100

Interval 10

"*" = 1

PRINTED OUTPUTS

HISTOGRAM	
**=1.	
INPUT DATA	INPUT DATA
DATA= 78.	DATA= 55.
DATA= 92.	DATA= 83.
DATA= 63.	DATA= 72.
DATA= 70.	DATA= 85.
DATA= 42.	DATA= 42.
DATA= 53.	DATA= 23.
DATA= 45.	DATA= 70.
DATA= 60.	DATA= 80.
DATA= 97.	DATA= 95.
DATA= 82.	DATA= 77.
DATA= 98.	DATA= 81.
DATA= 12.	DATA= 19.
DATA= 24.	DATA= 36.
DATA= 85.	DATA= 71.
DATA= 36.	DATA= 29.
DATA= 49.	DATA= 63.
DATA= 49.	DATA= 49.
	DATA= 55.
DELETED DATA	DATA= 67.
** 49.	DATA= 87.
	DATA= 78.
	DATA= 62.
	DATA= 48.
	DATA= 41.
	DATA= 32.
	DATA= 68.

NO. OF DATA= 40.
MEAN VALUE= 60.425
STD. DEV.= 22.82639645

KEY OPERATION SEQUENCE

Step No.	Key Input	Display	Remarks
48	32 ENTER	DATA = _	
49	68 ENTER	DATA = _	
50	DEF B ENTER	DELETE DATA = _	
51	87 ENTER	DELETE DATA = _	
52	40 ENTER	DELETE DATA = _	DEF C is used when the data has been input and the histogram is wanted
53	DEF C ENTER	*= _	Input the frequency of **
54	1 ENTER		Output the data number, mean value, and standard deviation after the histogram have been printed
	>		Finished

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PROGRAM LIST

```

10:CLEAR : WAIT 100
20:PRINT "RANGE |A| < D"
30:INPUT "SCALE UNIT SI"
40:C=B-A:E=INT (C/D)
50:DIM D(2),B$(0)*24
60:LET F=0:FOR L=0 TO E
70:LPRINT "INPUT DATA" : A$=AT345:H=A
80:K=1:WAIT 0:F=0
90:IF "A" USING : IF F>0
100:X=E99
110:INPUT "DATA=";X
120:IF ((X>A)+(X>B)=1
130:N= INT ((X-A)/D)
140:D(N)=D(N)+1
150:U=U+X:V=V+X*X
160:K=K+1
170:GOTO 100
200:"B" USING : IF F<1
210:LET F=1: LPRINT ""
220:LPRINT "DELETED DATA"
230:INPUT "DELETE DATA=";X
240:N= INT ((X-A)/D)
250:IF D(N)-1<0 BEEP 2:
260:D(N)=D(N)-1:K=K-1
265:U=U-X:V=V-X*X
270:GOTO 210
300:"C" F=2: WAIT 100
305:LPRINT "": LPRINT ""
: LPRINT "HISTOGRAM" 953

```

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Program Title: $\Delta \leftrightarrow Y$ CONVERSIONS

OVERVIEW

The AC impedances of the Δ connection and the Y connection both undergo equivalent value conversions.

This program can also be applied with direct current resistances.

CONTENTS

The impedance Z is expressed as a complex number, therefore special calculations must be carried out.

1) $\Delta \rightarrow Y$ conversion

$$\dot{Z}_a = \frac{\dot{Z}_1 \cdot \dot{Z}_2}{\Sigma} \quad [\Omega]$$

$$\dot{Z}_b = \frac{\dot{Z}_2 \cdot \dot{Z}_3}{\Sigma} \quad [\Omega]$$

$$\dot{Z}_c = \frac{\dot{Z}_3 \cdot \dot{Z}_1}{\Sigma} \quad [\Omega]$$

2) $Y \rightarrow \Delta$ conversion

$$\dot{Z}_1 = \frac{\dot{Z}}{\dot{Z}_b} \quad [\Omega]$$

$$\dot{Z}_2 = \frac{\dot{Z}}{\dot{Z}_c} \quad [\Omega]$$

$$\dot{Z}_3 = \frac{\dot{Z}}{\dot{Z}_a} \quad [\Omega]$$

INSTRUCTIONS

- DEF A** starts the $\Delta \rightarrow Y$ conversion program and **DEF B** starts the $Y \rightarrow \Delta$ conversion program.
- When the various resistance and reactance values are input the corresponding conversion values are output.

BASIC PROGRAMMING VEN

MEMORY CONTENTS

A	Lower bound
B	Upper bound
C	✓
D	Interval width
E	Interval number
F	Status flag
G	✓
H	✓
I	
J	
K	Valid input data number
L	Loop counter
M	Loop counter
N	✓
O	
P	Frequency of 1 "
Q	✓
R	
S	
T	
U	Sum of input data
V	Σx_i^2
W	Mean value
X	Input data (x_i)
Y	
Z	
D (E)	Frequency in each small interval
B\$ (0)*21	For graph printout

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EXAMPLE

- 1) The following Δ connection is converted to the equivalent value for the Y connection.

$$Z_1 \left\{ \begin{array}{l} R_1 = 5 \\ X_1 = 3 \end{array} \right. \quad Z_2 \left\{ \begin{array}{l} R_2 = 6 \\ X_2 = -2 \end{array} \right. \quad Z_3 \left\{ \begin{array}{l} R_3 = 9 \\ X_3 = 5 \end{array} \right.$$

calculations give

$$\dot{Z}_a = 1.76 - 0.13j$$

$$\dot{Z}_b = 3.10 - 0.33j$$

$$\dot{Z}_c = 2.09 + 1.97j$$

- 2) The following Y connection is converted to the equivalent value for the Δ connection.

$$Z_a \left\{ \begin{array}{l} R_a = 8 \\ X_a = 3 \end{array} \right. \quad Z_b \left\{ \begin{array}{l} R_b = 9 \\ X_b = -5 \end{array} \right. \quad Z_c \left\{ \begin{array}{l} R_c = 7 \\ X_c = 6 \end{array} \right.$$

calculations give

$$\dot{Z}_1 = 14.97 + 16.65j$$

$$\dot{Z}_2 = 23.25 - 9.21j$$

$$\dot{Z}_3 = 26.97 - 0.74j$$

PRINTED OUTPUTS

Z1 R= 5	ZA R= 8
Z1 X= 3	ZA X= 3
Z2 R= 6	ZB R= 9
Z2 X= -2	ZB X= -5
Z3 R= 9	ZC R= 7
Z3 X= 5	ZC X= 6
ZA	Z1
R= 1.76146789	R= 14.97169811
X= -1.284403668E-01	X= 16.6509434
ZB	Z2
R= 3.10091743	R= 23.24705884
X= -3.302752299E-01	X= -9.211764695
ZC	Z3
R= 2.091743119	R= 26.97260274
X= 1.972477063	X= -0.739726009

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KEY OPERATION SEQUENCE $\Delta \rightarrow Y$ Conversion

Step No.	Key Input	Display	Remarks
1	DEF A	Z1 R = $\frac{R_1 + R_2}{2}$ $R = \sqrt{\frac{R_1^2 + R_2^2}{4}}$	Waiting for the Z1 resistance to be input
2	5 ENTER	Z1 X = -	Printing of the Z1 resistance and waiting for the Z1 reactance input
3	3 ENTER	Z2 R = -	Printing of the Z2 resistance and waiting for the Z2 reactance input
4	6 ENTER	Z2 X = -	Printing of the Z2 resistance and waiting for the Z2 reactance input
5	-2 ENTER	Z3 R = -	Printing of the Z3 resistance and waiting for the Z3 reactance input
6	9 ENTER	Z3 X = -	Printing of the Z3 resistance and waiting for the Z3 reactance input
7	5 ENTER	> $\frac{R_1 + R_2 + R_3}{3}$ $R = \sqrt{\frac{R_1^2 + R_2^2 + R_3^2}{9}}$	Printing of the Z3 reactance and printing of the ZA, ZB, ZC resistance and reactance.

KEY OPERATION SEQUENCE $Y \rightarrow \Delta$ Conversion

Step No.	Key Input	Display	Remarks
1	DEF B	ZA R = $\frac{R_1 + R_2 + R_3}{3}$	Waiting for the ZA resistance to be input
2	8 ENTER	ZA X = $\sqrt{\frac{R_1^2 + R_2^2 + R_3^2}{9}}$	Printing of the ZA reactance and waiting for the ZA reactance input
3	3 ENTER	ZB R = -	Printing of the ZB reactance and waiting for the ZB reactance input
4	9 ENTER	ZB X = -	Printing of the ZB reactance and waiting for the ZB reactance input
5	-5 ENTER	ZC R = -	Printing of the ZC reactance and waiting for the ZC reactance input
6	7 ENTER	ZC X = -	Printing of the ZC reactance and waiting for the ZC reactance input
7	6 ENTER	>	Printing of the ZC reactance and printing of the Z1, Z2, Z3 resistance and reactance.

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PROGRAM LIST

```

290:LPRINT "ZB": LPRINT
  "R="; STR$ L:
  LPRINT "X="; STR$ M:
300:LPRINT "ZC": LPRINT
  "R="; STR$ N:
  LPRINT "X="; STR$ O:
310:END
350:U=J(X*X+Y*Y)
360:V= ACS (X/U)
370:IF 0>Y LET V=-V
380:RETURN
400:S=X+S:T=Y+T
410:RETURN
450:U*X* COS Y:V=Y* SIN
  Y
460:RETURN
505:"B": CLEAR
510:DEGREE : INPUT "ZA R
  ="X: LPRINT "ZA R=
  "; STR$ X
520:INPUT "ZA X="; Y:
  LPRINT "ZA X=";
  STR$ Y
530:GOSUB 350
540:B=U:C=V
550:INPUT "ZB R="; X:
  LPRINT "ZB R=";
  STR$ X
560:INPUT "ZB X="; Y:
  LPRINT "ZB X=";
  STR$ Y
570:GOSUB 350
580:D=U:E=V
590:INPUT "ZC R="; X:
  LPRINT "ZC R=";
  STR$ X
600:INPUT "ZC X="; Y:
  LPRINT "ZC X=";
  STR$ Y
610:GOSUB 350
620:F=U:G=V
630:X=0:Y=0
640:H=B*D:I=C+E
650:X=X+H*K COS I

```

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MEMORY CONTENTS

660:Y=Y+H* SIN I
 670:H=B*F:I=C+G
 680:X=X+H*COS I:IT=1000
 690:Y=Y+H* SIN IT:IT=IT+1
 710:H=D*F:IT=IT+1
 720:I=E+G:IT=IT+1
 730:X=X+H*COS IT:IT=IT+1
 740:Y=Y+H* SIN I:IT=IT+1
 750:GOSUB 350
 760:H=U:I=Y
 770:X=H/B:Y=I-C
 780:J=X* COS Y:K=X* SIN Y
 790:X=H/D:Y=I-E
 800:L=X* COS Y:M=X* SIN Y
 810:X=H/F:Y=I-G
 820:N=X* COS Y:O=X* SIN Y
 860:LPRINT "Z1": LPRINT
 "R="; STR\$ L:
 LPRINT "X="; STR\$ M:
 870:LPRINT "Z2": LPRINT
 "R="; STR\$ N:
 LPRINT "X="; STR\$ O:
 880:LPRINT "Z3": LPRINT
 "R="; STR\$ J:
 LPRINT "X="; STR\$ K:
 890:END

1076:IT=IT+1

1077:IT=IT+1

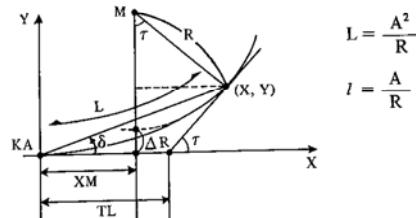
Program Title: CLOTHOID CURVE

OVERVIEW

This program will assist in finding the various elements of clothoid curves used, for instance, in the designing of roads.

CONTENTS

For clothoid curves, A, R or A, L are input to find X, Y.



$$X \approx AI \left(1 - \frac{I^4}{40} + \frac{I^8}{3456} - \frac{I^{12}}{599040} \right)$$

$$Y \approx \frac{AI^3}{6} \left(1 - \frac{I^4}{56} + \frac{I^8}{7040} - \frac{I^{12}}{1612800} \right)$$

$$\text{Tangent angle } \tau = \frac{L}{2R} \times \frac{180}{\pi} \quad XM = X - R \sin \tau \quad \delta = \tan^{-1} \frac{Y}{X}$$

$$TL = X - Y \cot \tau \quad TK = Y \cdot \cosec \tau \quad SC = Y \cdot \cosec \delta$$

Amount of movement

$$\Delta R = Y + R \cos \tau - R$$

INSTRUCTIONS

- DEF A**: when the parameters and the radius of the clothoid curve are known, **DEF B**: when the parameters of the clothoid curve and the curve length are known.
- After inputting the data, the elements of the clothoid curve are output on the printer.

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PROGRAM LIST

```

5;"A": CLEAR : DEGREE
10:INPUT "NAME: ";D$: INPUT "NAME: ";F$: INPUT "NAME: ";G$:
15:INPUT "NAME: ";H$: INPUT "NAME: ";I$:
20:LPRINT "NAME: ";D$: INPUT "NAME: ";F$: INPUT "NAME: ";G$:
25:INPUT "NAME: ";H$: INPUT "NAME: ";I$:
30:INPUT "DATE OF BIRTH";Y$: INPUT "YEAR";M$: INPUT "MONTH";D$: INPUT "DAY";W$:
35:F$= STR$ Y$ G$= STR$ W$:
40:LPRINT "DATE OF BIRT H": LPRINT " " ;U$;";";F$;";";G$:
50:GOSUB 5001:B=X
60:INPUT "DESIRED YEAR= ";U$; "MONTH= ";V:W=0
65:F$= STR$ V:
70:LPRINT "DESIRED YEAR ,MONTH": LPRINT " " ;U$;";";F$:
75:LPRINT " "
80:GOSUB 500:A=X
100:C=A-B
110:GOSUB 700
120:GOSUB 800
130:D=C- INT (C/23)*23
140:E=C- INT (C/28)*28
150:F=C- INT (C/33)*33
160:DIM B$(2)*21
170:B$(1)="I-----+-----"
180:B$(2)="I      I"
190:LPRTIN "      - 0
200:LPRINT "      +"
210:LPRINT B$(1)
215:FOR K=1 TO Z
220:L=0: IF K=5* INT (K/5) LET L=1
230:IF L=1 LET B$(0)=B$(1): GOTO 250
240:B$(0)=B$(2)
250:G= SIN ((K+D)/23*360
    ):P$="S": GOSUB 900

```

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MEMORY CONTENTS

A	✓
B	✓
C	Total number of days
D	remaining days from a period, name
E	Emotions
F, F\$	Intellect
G, GS	Biorhythm curve, ✓
H	
I	
J	
K	Loop counter
L	✓
M	
N	✓
O	
P\$, PS	✓
Q	✓
R	
S	
T	✓
US	✓
V	Month
W	Date of birth
X	✓
Y	✓
Z, Z\$	Relevant number of days, ✓
B\$(2)*21	✓

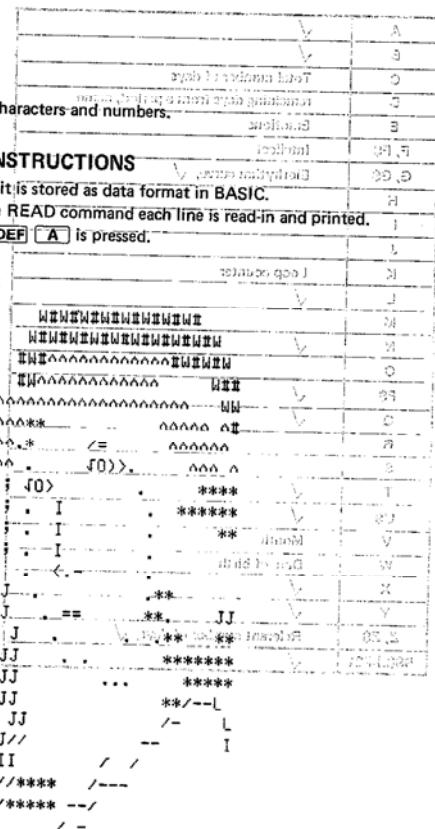
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Program Title: PORTRAIT PRINT

СИМВОЛОВЫЙ ПОРТРЕТ

OVERVIEW

Who is this person?
Isn't she beautiful!
She was drawn using characters and numbers.



CONTENTS AND INSTRUCTIONS

Each line of the portrait is stored as data format in BASIC.
Through the use of the READ command each line is read-in and printed.
To start the program DEF A is pressed.

PRINTED OUTPUTS

KEY OPERATION SEQUENCE

Step No.	Key Input	Display	Remarks
1	DEF A	PORTRAIT PRINT	
	>		

PROGRAM LIST

BOMEUDER MONTAGNE YEN

10:A":CLEAR I-WAIT 0:	250:DATA //*****
DIM B\$(0)*24	250:DATA //*****
-20:RESTORE	260:DATA //*****
25:BEEP 3: PAUSE "PORTR	270:DATA //
AIT PRINT"	280:DATA "I //
30:DATA "WWWWWWWWWW	290:DATA //
WWWWWWWWWW	295:DATA //
40:DATA "WWWWWWWWWW	300:BEEP 1: READ B\$(0):
WWWWWWWWWW	LPRINT B\$(0)
50:DATA "WWWWWWWWWW	310:IF B\$(0)="" END
WWWWWWWWWW	320:GOTO 300
60:DATA "WWWWWWWWWW	
AA	
70:DATA "WWWWWWWWWWWWWWWWWWWW	
WWWWWWWWWWWWWWWWWWWW	
80:DATA "WWWWWWWWWWWWWWWWWWWW	
WWWWWWWWWWWWWWWWWWWW	
90:DATA "WWWWWWWWWWWWWWWWWWWW	
WWWWWWWWWWWWWWWWWWWW	
100:DATA "WWWWWWWWWWWWWWWWWWWW	
WWWWWWWWWWWWWWWWWWWW	
110:DATA "WWWWWWWWWWWWWWWWWWWW	
WWWWWWWWWWWWWWWWWWWW	
120:DATA "WWWWWWWWWWWWWWWWWWWW	
WWWWWWWWWWWWWWWWWWWW	
130:DATA "WWWWWWWWWWWWWWWWWWWW	
WWWWWWWWWWWWWWWWWWWW	
140:DATA "WWWWWWWWWWWWWWWWWWWW	
WWWWWWWWWWWWWWWWWWWW	
150:DATA "J . <.-	
J .	
160:DATA "J .	
**	
170:DATA "J . ==	
**.	
180:DATA "J . .	
**.	
190:DATA "JJ . .	

200:DATA "JJJJ . .	

210:DATA "JJ .	
**/-L"	
220:DATA "JJ .	
/- L"	
230:DATA "J// .	
-- I".	
240:DATA "II . /	
//	
BS(0)*24	FOR READING DATA

MEMORY CONTENTS

A	
B	
C	
D	
E	
F	
G	
H	
I	
J	
K	
L	
M	
N	
O	
P	
Q	
R	
S	
T	
U	
V	
W	
X	
Y	
Z	
BS(0)*24	FOR READING DATA

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This apparatus complies with requirements of BS 800 and EEC directive 82/499/EEC.

Dieses Gerät stimmt mit den Bedingungen der EG-Richtlinien 82/499/EWG überein.

Cet appareil répond aux spécifications de la directive CEE 82/499/CEE.

Dit apparaat voldoet aan de vereiste EEG-reglementen 82/499/EEG.

Apparatet opfylder kravene i EF direktivet 82/499/EF.

Questo apparecchio è stato prodotto in conformità alle direttive CEE 82/499/CEE.

SHARP CORPORATION
OSAKA, JAPAN