CAT. NO.
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MATH II

Radio Shack
TRS-80
COMPUTER PRODUCTS

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Math Pak II

Radio Shack
A DIVISION OF TANDY CORPORATION
FORT WORTH, TEXAS 76102

10 9 8 7 6 5 4 3 2 1

Table of Contents

Introduction

Math Pak II consists of four programs:

Program	Description
SIMEQ	Linear simultaneous equations
GAUSS	Gaussian matrix reduction
MATINV	Matrix inversion
MATMUL	Matrix multiplication

The functions of these programs are:

SIMEQ solves systems of up to seven linear simultaneous equations for all unknowns. It can also be used to complete a Gaussian reduction of matrices from 2x2 to 7x7.

GAUSS completes a Gaussian reduction of a square matrix from 3x3 to 10x10, displays the reduced matrix, and calculates its determinant.

MATINV calculates the inverse of a square matrix, from 3x3 to 6x6.

MATMUL multiplies an IxJ matrix by a JxK matrix, displaying an IxK matrix as the product. IJ + JK must be less than or equal to 98.

At the end of each section of the manual, there is a description of the program variables. These may be useful if you want to examine intermediate results. Due to the volume of numbers involved in calculations, answers are rounded and displayed to ten significant digits.

Use the Backup instructions in Appendix A to make a working copy of the programs. See Appendix B for maintenance instructions.

Required Equipment

To use Math Pak II, you need the following equipment:

- A TRS-80 Pocket Computer II
- A TRS-80 Printer/Cassette Interface
- A cassette recorder, such as the Radio Shack Minisette-9
- Blank cassette tapes

Simultaneous Equations

This program will solve up to seven simultaneous equations, and can also be used to perform Gausian reduction on arrays of up to 7x7. The simultaneous equations are assumed to be linear, in the general form:

$$E(1,1)*X(1) + E(1,2)*X(2) + \ldots + E(1,n)*X(n) = C(1)$$
$$E(2,1)*X(1) + E(2,2)*X(2) + \ldots + E(2,n)*X(n) = C(2)$$
$$\vdots$$
$$E(n,1)*X(1) + E(n,2)*X(2) + \ldots + E(n,n)*X(n) = C(n)$$

The variable names E, X, and C are consistent throughout the program.

Starting the Program

To load SIMEQ, set the Remote switch of the Printer/Cassette Interface to the ON position. Insert the tape in the recorder and press the "Play" key. Turn the computer on, make sure the mode is set to RUN, then type: (C)(L)(O)(A)(D)(")(S)(I)(M)(E)(Q)(") and press (ENTER). When the prompt sign (>) appears, start the program either by pressing (DEF)(SPACE) or by typing (R)(U)(N) and pressing (ENTER).

The title of the program and a copyright notice will be displayed, after which the menu will appear:

SIMULTANEOUS EQUATIONS
Copr. 1982 Tandy Corp.
New Lst Edt Slv End

Each option corresponds to the key directly beneath it on the computer's keyboard. Choose a function by pressing the appropriate key: (F 1) for new data, (F 2) to list data, (F 3) to edit data, (F 4) to solve a set of equations, or (F 5) to exit the program.

Entering a New Set of Equations

Press (F 1). The display will ask: # Eqns?__. Reply with the number of equations to be solved (from 2 to 7, inclusive). The number of equations must equal the number of variables you are solving for.

The program will load the data, asking for rows from top to bottom, and each coefficient E(i,j) within a row from left to right. Each constant C(i) is loaded at the end of its row of coefficients E(i,j). When all rows have been loaded, you will return to the menu.

If no number is entered for a prompt, the program assumes a zero default.

Listing the Data

You may list the data loaded by pressing (F2). The program will ask: Hard copy? (Y/N)__. Answer (Y) for Yes or (N) for No, depending upon whether or not you want a printed copy of the list. Data will be displayed in the order in which it was entered: rows from top to bottom, columns within a row from left to right, and constants at the end of each row.

The display format for an array element is: E(i,j) = . . . The display for a constant is: C(i) = . . . Each display will remain on the screen for approximately one second, unless you press any key except Break. The display will freeze until you release the key. After the entire data set has been displayed, the menu will return to the screen.

Editing Data

This function is chosen by pressing (F3). It allows any array element E(i,j) or constant C(i) to be examined and/or changed. SIMEQ will ask in which row and column the element to be changed resides. Reply appropriately. To address a constant C(I) , press the number key identifying the row in answer to the Row?__ question and (ENTER) in response to the Column?__ question.

The program will display the element's current value and ask if there is any change: E(i,j) = nnnn New?__. Enter a new value if you wish, or press (ENTER) to leave the displayed value unchanged.

To return to the menu, press (ENTER) in response to the Row?__ question.

Solving the Equations

Once all the data is correctly loaded, press (F4) to solve for each unknown. When computations are complete, SIMEQ will "beep" once and ask: Hard copy? (Y/N)__. Reply with (Y) or (N), as desired. The program will then begin listing the values for each unknown in the format: X(i) = . . . Each display remains on the screen for approximately one second, unless you press any key except Break to freeze the display. The solutions will continue to list when you release the key. When all unknowns have been listed, the menu will be displayed.

Not all sets of simultaneous equations have solutions. In general, these fall into two categories: one in which there simply is no solution at all, and one in which there are infinite solutions. In either case, the condition will be detected, and the program will beep three times and display: UNSOLVABLE. Press (ENTER) to clear this display and return to the menu.

Using SIMEQ to Perform a Gaussian Reduction

Gaussian reductions may be performed easily. Load the array using [F1] (the constants C(I) are unimportant in this application), then press [F4]. Upon solution, the array will exist in the program in fully reduced (triangluar) form, and can be listed using [F2].

Example

Solve the three following simultaneous equations:

$3X_1 + 2X_2 - X_3 = 2C_1$

$-2X_1 + X_2 + X_3 = C_2$

$X_1 - 2X_2 + 2X_3 = 2C_3$

Computer displays:	You type:
New Lst Edt Slv End	[F1]
# Eqns?__	[3][ENTER]
E(1,1)?__	[3][ENTER]
E(1,2)?__	[2][2][ENTER] (an error is made)
E(1,3)?__	[-][1][ENTER]
C(1)?__	[2][ENTER]
E(2,1)?__	[-][2][ENTER]
E(2,2)?__	[1][ENTER]
E(2,3)?__	[1][ENTER]
C(2)?__	[1][ENTER]
E(3,1)?__	[1][ENTER]
E(3,2)?__	[-][2][ENTER]
E(3,3)?__	[2][ENTER]
C(3)?__	[2][ENTER]
New Lst Edt Slv End	[F2]
Hard copy? (Y/N)__	[N][ENTER]
E(1,1) = 3	
E(1,2) = 22 (the error is noted)	
E(1,3) = -1	
C(1) = 2	
E(2,1) = -2	
E(2,2) = 1	
E(2,3) = 1	
C(2) = 1	
E(3,1) = 1	
E(3,2) = -2	
E(3,3) = 2	
C(3) = 2	
New Lst Edt Slv End	[F3]
Row?__	[1][ENTER]
Column?__	[2][ENTER]
E (1,2) = 22 New?__	[2][ENTER]
Row?__	[ENTER]

Computer displays:	You type:
New Lst Edt Slv End	F4
(Beep)	
Hard copy? (Y/N)_	N ENTER
X(1) = 6.315789473E-01	
X(2) = 7.894736843E-01	
X(3) = 1.473684211	
New Lst Edt Slv End	F5 (to exit the program)
>	

Occasionally the algorithm used in this program will give a solution to a set of equations which has an infinite number of solutions. The solution given is a correct solution.

Variable List

E(7,7)—Holds Coefficients
C(7)—Holds Constants
A-E—Loop Counters and Dummies
B$—Print Text Holder
E—Temporary Result Holder
F—Matrix Size
G—Temporary Holder
P—Print/No Print Flag

Gaussian Reduction

This program carries out Gausslan reductions of arrays up to 10x10 and calculates the determinant of the resulting triangular-form array. It also includes data editing and data list functions.

To load GAUSS, set the Remote switch of the Printer/Cassette Interface to the ON position. Insert the tape in the recorder and press the "Play" key. Turn the computer on, make sure the mode is set to RUN, then type: (C)(L)(O)(A)(D)(")(G)(A)(U)(S)(S)(") and press (ENTER). When the prompt (>) appears, either press (DEF)(SPACE) or type (R)(U)(N) and press (ENTER). First you'll see the program title and a copyright notice, followed by the menu:

GAUSSIAN REDUCTION
Copr. 1982 Tandy Corp.
New Lst Edt Rdc End

Each menu option corresponds to the key directly beneath it on the Pocket Computer II's keyboard. Press the appropriate key to choose the desired option: (F1) to enter new data, (F2) to list or print current data, (F3) to edit current data, (F4) to perform a Gaussian reduction, or (F5) to exit the program.

When a solution is completed for any option, the display will return to the menu, and you can choose another option.

New Array

This option clears all data from the computer and lets you enter a completely new array. At the menu, press (F 1). The first question displayed is: Array size?__. Answer with the size of the array to be entered (it is assumed to be square). GAUSS will now ask for each element, by rows from top to bottom and by columns within each row, from left to right. The display shows: X(i,j)?__, where i designates a row and j designates a column. When you have entered all elements, the program will return to the menu.

List Array

This function lists each element in the array, in the order X(1,1), X(1,2), . . . X(1,n) , X(2,1) ... X(n,n) . Press (F 2) at the menu. The first question asked is: Hard copy? (Y/N)__. If you answer with (Y) for Yes, the list will be printed as well as displayed on the screen. If you answer with (N) for No, the list will only be displayed on the screen.

Each display remains on the screen for approximately one second, unless you press any key except Break. When you press a key, the display will freeze until you release that key. When the list is completed, you will return to the menu display.

Edit Array

This function lets you review and change any of the elements in the array. At the menu, press (F 3). The display will show: Row?__, then: Column?__. Reply with the appropriate subscripts of the element to be edited, or just press (ENTER) in answer to the Row?__ question to return to the menu.

The program will display the current value of the designated array element and ask if there will be a change: X(i,j) = nnnn New?__. Either enter a new value, or press (ENTER) to keep the displayed value as it is. You will return to the Row?__ question.

Gaussian Reduction

This option carries out a Gaussian reduction on whatever array is currently stored. Press (F 4) at the menu. On completion, the array's determinant is displayed, and the program returns to the menu.

If necessary, GAUSS can swap rows in the array. If rows have been swapped, the reduced (triangular form) array will **not** be exactly equivalent to the original array.

If there are no rows which can be swapped to make the problem solvable, the display will show: NO SOLUTION. Press [ENTER] to clear this display and return to the menu.

Example

Given the array: 3 3 1
2 0 4
1 7 9

reduce it to triangular form and calculate its determinant.

Computer displays:	You type:
New Lst Edt Rdc End	[F1]
Array size?__	[3][ENTER]
X(1,1)?__	[3][ENTER]
X(1,2)?__	[3][ENTER]
X(1,3)?__	[2][ENTER] (an error is made)
X(2,1)?__	[2][ENTER]
X(2,2)?__	[0][ENTER]
X(2,3)?__	[4][ENTER]
X(3,1)?__	[1][ENTER]
X(3.2)__	[7][ENTER]
X(3,3)?__	[9][ENTER]
New Lst Edt Rdc End	[F2]
Hard copy? (Y/N)__	[N][ENTER]
X(1,1) = 3	
X(1,2) = 3	
X(1,3) = 2 (the error is noted)	
X(2,1) = 2	
X(2,2) = 0	
X(2,3) = 4	
X(3,1) = 1	
X(3,2) = 7	
X(3,3) = 9	
New Lst Edt Rdc End	[F3]
Row?__	[1][ENTER]
Column?__	[3][ENTER]
X(1,3) = 2 New?__	[1][ENTER]
Row?__	[ENTER]
New Lst Edt Rdc End	[F4]
(Beep)	
Det = -112	[ENTER]
New Lst Edt Rdc End	[F2]
Hard copy? (Y/N)__	[N][ENTER]
X(1,1) = 3	
X(1,2) = 3	
X(1,3) = 1	
X(2,1) = 0	
X(2,2) = -2	
X(2,3) = 3.33333333	
X(3,1) = 0	
X(3,2) = 0	

Computer displays:	You type:
X(3,3) = 18.66666667 New Lst Edt Rdc End	F 5 (to exit the program)
>	

The reduced array is: 3 3 1
0 -2 3.33333333
0 0 18.66666667

Variable List

A(9,9)—Holds Array Elements
A, B, C, D, E—Loop Counters and Dummies
B$—Print Text Holder
F—Array Size
G—Determinant
H—Sign Flag for Row Swapping
P—Print/No Print Flag

Matrix Inversion

This program calculates the inverses of matrices from 3x3 to 6x6. The original matrix is called A(i,j), and its inverse B(I,j) throughout the program. Data listing and editing are provided, and the original data is preserved during computation.

To load MATINV, set the Remote switch of the Printer/Casette Interface to the ON position. Insert the tape in the recorder and press the "Play" key. Turn the computer on, make sure the mode is set to RUN, then type: C L O A D " M A T I N V " and press ENTER. When the prompt (>) appears, start either by pressing DEF SPACE or by typing R U N and pressing ENTER. The program title and copyright notice will be displayed, followed by the menu:

MATRIX INVERSION
Copr. 1982 Tandy Corp.
New Lst Edt Inv End

Each menu option corresponds to the function key directly beneath it on the computer's keyboard. To choose an option, press the appropriate key: F1 to load new data, F2 to list or print current data, F3 to edit current data, F4 to invert a matrix, or F5 to exit the program.

Loading New Data

Press F1 to load a new matrix. You are asked the size of the matrix you wish to enter with the message: Size?__. Reply with a number from 3 to 6. (The program's capacity is a 6x6 matrix. A 2x2 matrix cannot be solved by the algorithm in this program, and can be done faster by hand, anyway.) If you enter an illegal matrix size, the Size?__ question will be repeated.

Next, MATINV will ask for each element of the matrix, by rows from top to bottom, and by columns within each row from left to right. When all data has been entered, you will return to the menu.

Listing Data

Press F2 to list the matrix currently stored in the program. You will be asked: Hard copy? (Y/N)__. Answer with Y or N, depending upon whether or not you want a printed list as well as the displayed list.

The matrix will be listed by rows from top to bottom, and by columns within each row from left to right, in this format: A(i,j) = . . . , where i identifies the row and j identifies the column. Each element will remain

on the screen for approximately one second, unless you press any key other than Break. If you press a key, the display will freeze until that key is released. When the entire matrix has been listed, the menu will be displayed.

Editing Data

Press (F 3) to change any element of the matrix. MATINV will ask which element you wish to change with the questions: Row?__ and Columm?__. Reply with the row and column of the element to be changed, or press (ENTER) to either question to return to the menu.

The program will display the element you requested, then ask if there are any changes to be made: A(i,j) = nnn New?__. Enter a new value or press (ENTER) to retain the displayed value. When you press (ENTER), the program will return to: Row?__.

Calculating the Inverse of a Matrix

When all data has been entered correctly, press (F 4) to calculate the matrix's inverse. You will be asked if you want to print the inverted matrix with: Hard copy? (Y/N)__. Answer with (Y) or (N). The inverse matrix elements will be calculated and displayed one at a time: B(i,j) = . . . To freeze the display, press any key except Break. To continue, release the key. When all elements of the inverted matrix have been displayed, the menu will be displayed.

When a matrix is inverted, the original data is kept, and you can list it using (F 2). The inverse matrix elements are calculated singly and are not stored. If you miss one and return to find that the computer has turned itself off, the last B(i,j) can be recovered by turning the computer on, typing (I), and pressing (ENTER).

Note: Occasionally, the computer will calculate an inverse of a matrix which has no inverse. This occurs because of rounding errors in the calculation. However, when this occurs, the elements of the inverted matrix will be either extremely large or extremely small numbers and can easily be detected.

Example

Invert the following matrix: 3 1 7
4 0 2
1 3 2

Computer displays:	**You type:**
New Lst Edt Inv End	(F 1)
Size?__	(3) (ENTER)

Computer displays:	You type:
Enter A(1,1):__	3 ENTER
Enter A(1,2):__	1 ENTER
Enter A(1,3):__	7 ENTER
Enter A(2,1):__	4 ENTER
Enter A(2,2):__	1 ENTER (an error is made)
Enter A(2,3):__	2 ENTER
Enter A(3,1):__	1 ENTER
Enter A(3,2):__	3 ENTER
Enter A(3,3):__	2 ENTER
New Lst Edt Inv End	F 2
Hard copy? (Y/N)__	N
A(1,1) = 3	
A(1,2) = 1	
A(1,3) = 7	
A(2,1) = 4	
A(2,2) = 1 (the error is noted)	
A(2,3) = 2	
A(3,1) = 1	
A(3,2) = 3	
A(3,3) = 2	
New Lst Edt Inv End	F 3
Row?__	2 ENTER
Column?__	2 ENTER
A(2,2) = 1 New?__	Ø ENTER
Row?__	ENTER
New Lst Edt Inv End	F 4
Hard copy? (Y/N)__	N

Computer displays:	You type:
B(1,1) = -Ø.1	
B(1,2) = -3.166666667E-Ø1	
B(1,3) = 3.333333334E-Ø2	
B(2,1) = Ø.1	
B(2,2) = -1.666666667E-Ø2	
B(2,3) = -3.666666667E-Ø1	
B(3, 1) = Ø.2	
B(3,2) = 1.333333334E-Ø1	
B(3,3) = -6.666666668E-Ø2	
New Lst Edt Inv End	F 5 (to exit the program)
>	

Variable List

A, B, C, D, E—Loop Counters and Dummies
A(12,6)—Holds Matrix Elements
B$—Print String Holder to Conserve Space
F—Matrix Size
G—Unused
H—Determinant of Cofactor Matrix
I—Determinant of Current Partial Matrix
P$—Print/No Print Flag
X, Y—Dummy Indices for Copying Arrays within Memory

Matrix Multiplication

This program lets you multiply an AxB matrix by a BxC matrix. A, B, and C may be any values as long as AB + BC x = 98 (this capacity will allow multiplication of two 7x7 matrices).

To load MATMUL, set the Remote switch on the Printer/Cassette Interface to the ON position. Insert the tape in the recorder and press the "Play" key. Turn the computer on, make sure the mode is set to RUN, then type: (C)(L)(O)(A)(D)(")(M)(A)(T)(M)(U)(L)(") and press (ENTER). When the prompt (>) appears, either press (DEF)(SPACE) or type (R)(U)(N) and press (ENTER) to start the program. First, you'll see the program title and a copyright notice, followed by the menu:

```
Matrix Multiplication
Copr. 1982 Tandy Corp.
New Lst Edt Mul End
```

Each option corresponds to a function key located directly beneath it on the computer's keyboard. To choose an option, press the appropriate key: (F1) to load a pair of matrices, (F2) to list or print the current matrix, (F3) to edit current data, (F4) to multiply the two matrices in the computer's memory, or (F5) to exit the program.

Loading Matrices

Press (F1). The program will first ask for the sizes of the matrices to be multiplied:

```
1st matrix width?__
1st matrix height?__
2nd matrix width?__
```

(The height of the second matrix must be equal to the width of the first.)

After you've answered these three questions, you will enter the two matrices, called A and B. Each matrix will be loaded by rows, and each row by columns. The prompt used is: Enter A(i,j)?__ or Enter B(i,j)?__ (depending upon whether matrix A or B is being loaded), where i denotes a row and j denotes a column. When all matrix elements have been entered, the program will return to the menu.

Listing Data

Press (F 2). The program will ask: Hard copy? (Y/N)__. Answer (Y) if you want a printed list or (N) if you want to see the list only on the display. Next you are asked which matrix is to be listed: Matrix? (A/B)__. Enter (A) or (B), and the program will list the specified matrix.

Each element will be displayed for approximately one second, unless you press any key (except Break). If you press a key, the display will freeze until that key is released. When all elements have been listed, you will return to the menu.

Editing Data

Press (F 3). MATMUL will ask which matrix you want to edit with the following prompts:

Matrix? (A/B)__
Row?__
Column?__

Pressing (ENTER) to answer Row?__ will return you to the menu. After answering the three questions, the program will display the present value of the requested element and ask if there are any changes: A(i,j) = nnn. New?__. Either enter a new value, or press (ENTER) to leave the value unchanged. You will return to the Matrix? (A/B)__ question.

Multiplying Two Matrices

Press (F 4) to multiply matrix A by matrix B, resulting in a product matrix C. The program will list the elements of the product matrix, one at a time, in row and column order. When the list is complete, the menu will be displayed.

Example

Multiply: 3 2 4 by 4 0
6 0 1 1 2
7 1

Computer displays:	You type:
New Lst Edt Mul End	(F 1)
1st matrix width?__	(3)(ENTER)
1st matrix height?__	(2)(ENTER)
2nd matrix width?__	(2)(ENTER)
Enter A(1,1):__	(3)(ENTER)
Enter A(1,2):__	(2)(ENTER)

Computer displays:	You type:
Enter A(1,3):__	4 ENTER
Enter A(2,1):__	6 ENTER
Enter A(2,2):__	Ø ENTER
Enter A(2,3):__	1 ENTER
Enter B(1,1):__	4 ENTER
Enter B(1,2):__	6 ENTER (an error is made)
Enter B(2,1):__	1 ENTER
Enter B(2,2):__	2 ENTER
Enter B(3,1):__	7 ENTER
Enter B(3,2):__	1 ENTER
New Lst Edt Mul End	F2
Hard copy? (Y/N)__	N ENTER
Matrix? (A/B)__	B ENTER
B(1,1) = 4	
B(1,2) = 8 (the error is noted)	
B(2,1) = 1	
B(2,2) = 2	
B(3,1) = 7	
B(3,2) = 1	
New Lst Edt Mul End	F3
Matrix? (A/B)__	B ENTER
Row?__	1 ENTER
Column?__	2 ENTER
B(1,2) = 8 New?__	Ø ENTER
Matrix? (A/B)__	B ENTER
Row?__	ENTER

Computer displays:	You type:
New Lst Edt Mul End	F4
Hard copy? (Y/N)__	N ENTER
C(1,1) = 42	
C(1,2) = 8	
C(2,1) = 31	
C(2,2) = 1	
New Lst Edt Mul End	F5 (to exit the program)
>	
Product matrix: 42 8	
31 1	

Variable List

A (98)—Holds Array Elements
A—Matrix #1 Width
B—Matrix #1 Height
C—Matrix #2 Width
D—Elements in Matrix #1 (for Indexing later)
E$—Print Text Holder and Matrix Pointer
G, H—Temporary Holders
K, L, M—Pointers during Editing
N—Index Pointer into Array
Z—Dummy

Appendix A—Making a Backup

A Backup is a tape copy of a program and is an extremely effective method of insuring that an accident or equipment fault will not result in the loss of software. Your first action as owner of the Math Pak II package should be to make working copies of the original cassette(s) and then put the original(s) away in a safe place.

Although it may be possible to make direct copies using two cassette recorders or on cassette duplicating equipment, the most reliable method is to use the computer itself to make the Backups. Also, for frequently used programs, you may wish to put them on separate cassettes for easier loading. Here are step-by-step instructions for making a Backup:

1. Install the computer in the Printer/Cassette Interface, and connect the Printer/Cassette Interface to the cassette recorder. Make sure the Remote switch is OFF.

2. Place the cassette containing the program(s) to be copied in the recorder and either rewind the tape to the beginning or position the tape to a blank area just prior to the desired program. Make a note of the counter number where your saved information will begin, and turn the Remote switch ON. Place the recorder in the "Play" mode. It is recommended that the volume control setting be between 8 and 10 on your recorder (or between 5 and 7 on a Minisette-9). If your recorder has a tone control, set it at maximum treble.

3. Turn on the computer, make sure that it is in RUN mode, and type: (C)(L)(O)(A)(D)(") name (") , and press (ENTER). (Name refers to the name of the program to be copied.)

4. When the program has been loaded into the computer and the cassette has stopped, turn the Remote switch OFF, and rewind the recorder to the blank space just prior to the program. Turn the Remote switch ON, and put the recorder into the "Play" mode. Type: (C)(L)(O)(A)(D)(") name (") and press (ENTER).

This is the computer's verifying function. The recorder will compare the cassette program with the program in the computer's memory. If the load is good, the recorder will stop at the end of the program and the prompt sign (>) will reappear on the display. If an error occured during the load verification, the display will show: ERROR 43. This means that the format of data to be loaded does not match the file format.

If the error message appears on the display, check the recorder volume setting, try the CLOAD function again, and verify the load.

5. When the program has been loaded successfully, remove the cassette and replace it with the cassette which is to receive the program copy. Turn the Remote switch OFF, and either rewind the tape to the beginning, or position it to the point where the copy is to start. Make a note of the counter number where your saved information begins. You should leave from 5-10 seconds of blank space if the copy is to follow another program on the same cassette. Turn the Remote switch ON, and place the recorder in "Record" mode.

6. Make sure that the computer is in the RUN mode. Type: (C)(S)(A)(V)(E)(") name (") and press (ENTER). The recorder will save your program.

7. To make absolutely sure that the program has been saved correctly, use the verification procedure as described in the fourth instruction of this appendix. If the error message appears on the display, check the recorder volume setting and try the CLOAD? function once more. If you still get an error, the tape copy is probably damaged. Use the CSAVE function once more and verify the load. It is recommended that you use Radio Shack Supertape or TRS-80 certified cassettes for backing up your Pocket Computer II programs.

8. Backup each program using steps 1 through 7 above.

9. Put the original cassettes away in a safe place and use them only for making working copies.

Appendix B—Maintenance

Maintenance of your Pocket Computer II system is not difficult. Attention to the simplest points listed below should provide the best reliability and satisfaction:

1. Keep your program cassettes in their boxes when not in use. Do not expose cassettes to temperature extremes or magnetic fields. Never touch the exposed surface of the tape on the front edge of the cassette.

2. Clean and demagnetize the tape heads in the recorder at regular intervals. Follow the recommendations in the cassette recorder's manual.

3. The most reliable loading and saving is achieved by operating the cassette recorder on AC current, rather than batteries.

4. Use only fresh alkaline-type batteries in the recorder when operating your system away from AC current.

5. Always press the recorder's "Stop" key immediately after loading or saving a program. This will release the pressure on the rubber roller which pulls the tape and prevent the roller from damaging the tape at the point of contact.

6. Always turn the computer "OFF" before installing it in or removing it from the Printer/Cassette Interface.

7. After removing the computer from the Printer/Cassette Interface, be sure to reinstall the protective plug to keep dirt out of the connector on the computer. Never touch the exposed parts on the Printer/Cassette Interface.

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